


Impreza 2001-2002



Exit



SUBARU

IMPREZA

2002 Model Year

PDF Service Manual

GENERAL INFORMATION SECTION (Pub.No.G1840GE1)

ENGINE 1 SECTION (Pub.No.G1840GE2)

ENGINE 2 SECTION (Pub.No.G1840GE3)

TRANSMISSION SECTION (Pub.No.G1840GE4)

CHASSIS SECTION (Pub.No.G1840GE5)

BODY SECTION (Pub.No.G1840GE6)

WIRING SYSTEM SECTION (Pub.No.G1840GE7)

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.

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FOREWORD

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1. Foreword

A: FOREWORD

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

Applied model: GG***** and GD***** from 2002MY.

The additional manuals below are also available:
AUTOMATIC TRANSMISSION SERVICE MANUAL (Pub. No. G0864ZE)

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

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IMPREZA

SPECIFICATIONS

1. Impreza SA08731

A: DIMENSIONS SA08731G28

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 C.W.)	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), 1,125 (44.3)★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: 2.0 L
- ★3: 2.0 L Turbo
- ★4: With roof rail
- ★5: With sun roof

B: ENGINE SA08731G29

Model		1.6 L	Non-Turbo 2.0 L	Turbo 2.0 L	2.5 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)		99.5 × 79 (3.92 × 3.11)
Displacement	cm ³ (cu in)	1,597 (97.45)	1,994 (121.67)		2,475 (151.03)
Compression ratio		10.0 ± 0.2		8.0 ± 0.2	10.0 ± 0.2
Firing order		1 — 3 — 2 — 4			
Idle speed at Park/Neutral position	rpm	700 ± 100		750 ± 100	700 ± 100
Maximum output	kW (HP)/rpm	70 (94)/5,200	92 (123)/5,600	160 (215)/5,600	112 (150)/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	223 (22.7, 164.5) /3,600

C: ELECTRICAL SA08731G30

Model			1.6 L	Non-turbo 2.0 L	Turbo 2.0 L	2.5 L		
Ignition timing at idling speed			BTDC/rpm		5°±10°/700	10°±10°/700	12°±10°/750	MT: 10°±10°/700 AT: 15°±10°/700
Spark plug	Type and manufacturer	Without OBD	NGK: BKR6E (without catalyst) CHAMPION: RC8YC4 (with catalyst) NGK: BKR6E-11 (with catalyst)	NGK: BKR6E (without catalyst) CHAMPION: RC10YC4 (with catalyst) NGK: BKR5E-11 (with catalyst)	—	NGK: BKR6E (without catalyst) CHAMPION: RC10YC4 (with catalyst) NGK: BKR5E-11 (with catalyst)		
		With OBD	CHAMPION: RC8YC4	CHAMPION: RC10YC4	NGK: PFR6G	CHAMPION: RC10YC4		
			Alternate NGK: BKR6E-11	Alternate NGK: BKR5E-11		Alternate NGK: BKR6E-11		
Generator			12V — 75A					
Battery	Type and capacity (5HR)	For Europe and South America	12V — 48AH (55D23L)	MT: 12V — 48AH (55D23L) AT: 12V — 52AH (65D23L)			MT: 12V — 48AH (55D23L) AT: 12V — 52AH (75D23L)	
		Others	12V — 27AH (34B19L)					

D: TRANSMISSION SA08731G31

Model			1.6 L		Non-turbo 2.0 L		Turbo 2.0 L		2.5 L	
Transmission type			5MT	4AT	5MT	4AT	5MT	4AT	5MT	4AT
Clutch type			DSPD	TCC	DSPD	TCC	DSPD	TCC	DSPD	TCC
Gear ratio		1st	3.454	2.785	3.454	2.785	3.454, 3.166★1	2.785	3.454	2.785
		2nd	2.062	1.545	2.062	1.545	1.947, 1.882★1	1.545	2.062	1.545
		3rd	1.448	1.000	1.448	1.000	1.366, 1.296★1	1.000	1.448	1.000
		4th	1.088	0.694	1.088	0.694	0.972	0.694	1.088	0.694
		5th	0.825	—	0.825	—	0.738	—	0.871, 0.780★1	—
		Reverse	3.333	2.272	3.333	2.272	3.333	2.272	3.333	2.272
		Dual range	1.447	—	1.447	—	—	—	—	—
Reduction gear (Front drive)	1st reduction	Type of gear	—	Helical	—	Helical	—	Helical	—	Helical
		Gear ratio	—	1.000	—	1.000	—	1.000	—	1.000
	Final reduction	Type of gear	Hypoid	Hypoid	Hypoid	Hypoid	Hypoid	Hypoid	Hypoid	Hypoid
		Gear ratio	4.111	4.444	3.900	4.111	3.900, 4.444★1	4.111	3.700, 4.111★1	4.111
Reduction gear (Rear drive)	Transfer reduction	Type of gear	Helical	—	Helical	—	Helical	—	Helical	—
		Gear ratio	1.000	—	1.000	—	1.100, 1.000★1	—	1.000	—
	Final reduction	Type of gear	Hypoid	Hypoid	Hypoid	Hypoid	Hypoid	Hypoid	Hypoid	Hypoid
		Gear ratio	4.111	4.444	3.900	4.111	3.545, 4.444★1	4.111	3.700, 4.111★1	4.111

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

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

DSPD: Dry Single Plate Diaphragm

TCC: Torque Converter Clutch

★1: Australia spec vehicle

IMPREZA

SPECIFICATIONS

E: STEERING SA08731G32

Model		Turbo 2.0 L, 2.5 L	OUTBACK	OTHERS
Type		Rack and Pinion		
Turns, lock to lock		RHD: 2.7 LHD: 3.0	3.0	3.2
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 SA08731G33

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

G: BRAKE SA08731G34

Model	1.6 L	Non-turbo 2.0 L, 2.5 L	Turbo 2.0 L
Service brake system	Dual circuit hydraulic with vacuum suspended power unit		
Front	Ventilated disc brake		
Rear	Drum brake	Disc brake	Ventilated disc brake
Parking brake	Mechanical on rear brakes		

H: TIRE SA08731G35

Rim size	14 × 5 ¹ / ₂ JJ	15 × 6JJ	16 × 6 ¹ / ₂ JJ	17 × 7JJ
Tire size	175/70R14 84T 185/70R14 88H	185/65R15 88H 195/60R15 88H	P205/55R16 89V 205/50R16 87V	215/45R17 87W
Type	Steel belted radial, Tubeless			

I: CAPACITY SA08731G36

Model		1.6 L		Non-turbo 2.0 L		Turbo 2.0 L		2.5 L	
		5MT	4AT	5MT	4AT	5MT	4AT	5MT	4AT
Fuel tank	ℓ (US gal, Imp gal)	50 (13.2, 11.0)		50 (13.2, 11.0)		60 (15.9, 13.2)			
Engine oil	Total capacity	4.5 (4.8, 4.0)				5.0 (5.3, 4.4)		4.5 (4.8, 4.0)	
	Engine oil amount for refill	Approx. 4.5 (4.8, 4.0)				Approx. 5.0 (5.3, 4.4)		Approx. 4.5 (4.8, 4.0)	
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)	—	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)	—	9.3 (9.8, 8.2)	—	9.3 (9.8, 8.2)
AT differential gear oil	ℓ (US qt, Imp qt)	—	1.2 (1.3, 1.1)	—	1.2 (1.3, 1.1)	—	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)	7.7 (8.1, 6.8)	7.0 (7.4, 6.2)	6.9 (7.3, 6.1)

★1: Dual range

J: WEIGHT SA08731G37

1. LHD VEHICLE SA08731G3703

Sedan

Option code★1			EC		K4		K0		KS	
Model			1.6 L							
			AWD							
			TS							
			5MT	4AT	5MT	4AT	5MT	4AT	5MT	4AT
Curb weight (C.W.)	Front	kgf (lb)	730 (1,609)	750 (1,654)	750 (1,654)	770 (1,698)	750 (1,654)	770 (1,698)	740 (1,631)	760 (1,676)
	Rear	kgf (lb)	520 (1,146)	520 (1,146)	520 (1,146)	520 (1,146)	520 (1,146)	520 (1,146)	535 (1,179)	535 (1,179)
	Total	kgf (lb)	1,250 (2,755)	1,270 (2,800)	1,270 (2,800)	1,290 (2,844)	1,270 (2,800)	1,290 (2,844)	1,275 (2,810)	1,295 (2,855)
Maximum permissible axle weight (M.P.A.W.)	Front	kgf (lb)	890 (1,962)	890 (1,962)	890 (1,962)	890 (1,962)	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)	890 (1,962)	890 (1,962)	890 (1,962)	890 (1,962)
Maximum permissible weight (M.P.W.)	Total	kgf (lb)	1,700 (3,748)	1,700 (3,748)	1,700 (3,748)	1,700 (3,748)	1,700 (3,748)	1,700 (3,748)	1,700 (3,748)	1,700 (3,748)
Option	Air conditioner		—	—	○	○	○	○	○	○
	Cruise control		—	—	—	—	—	—	—	—
	ABS		—	—	—	—	—	—	—	—
	Aluminium wheel		—	—	—	—	—	—	—	—
	Rear spoiler		—	—	—	—	—	—	—	—
	Spoiler pac		—	—	—	—	—	—	—	—

Option code★1			EC		K4		K0		KS	
Model			2.0 L							
			AWD							
			GX							
			5MT	4AT	5MT	4AT	5MT	4AT	5MT	4AT
Curb weight (C.W.)	Front	kgf (lb)	745 (1,643)	770 (1,698)	765 (1,687)	790 (1,742)	760 (1,676)	795 (1,753)	750 (1,653)	780 (1,720)
	Rear	kgf (lb)	535 (1,179)	530 (1,168)	530 (1,168)	525 (1,157)	525 (1,157)	530 (1,168)	550 (1,213)	545 (1,202)
	Total	kgf (lb)	1,280 (2,822)	1,300 (2,866)	1,295 (2,855)	1,315 (2,899)	1,285 (2,833)	1,325 (2,921)	1,300 (2,866)	1,325 (2,922)
Maximum permissible axle weight (M.P.A.W.)	Front	kgf (lb)	920 (2,028)	920 (2,028)	920 (2,028)	920 (2,028)	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)	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)	1,760 (3,880)	1,760 (3,880)	1,760 (3,880)	1,760 (3,880)
Option	Air conditioner		—	—	○	○	○	○	○	○
	Cruise control		—	—	—	—	—	—	—	—
	ABS		—	—	○	○	○	○	—	○
	Aluminium wheel		—	—	○	○	—	—	○	○
	Rear spoiler		—	—	—	—	—	—	○	○
	Spoiler pac		—	—	—	—	—	—	—	—

★1: For option code, refer to ID section. <Ref. to ID-7, Option code.>

IMPREZA

SPECIFICATIONS

Option code★1		EC			
Model		2.5 L		2.0 L Turbo	
		AWD			
		RS		WRX	
		5MT	4AT	5MT	
Curb weight (C.W.)	Front	kgf (lb)	760 (1,676)	785 (1,731)	815 (1,797)
	Rear	kgf (lb)	535 (1,179)	530 (1,168)	550 (1,213)
	Total	kgf (lb)	1,295 (2,855)	1,315 (2,899)	1,365 (3,009)
Maximum permissible axle weight (M.P.A.W.)	Front	kgf (lb)	930 (2,050)	930 (2,050)	970 (2,138)
	Rear	kgf (lb)	910 (2,006)	910 (2,006)	920 (2,028)
Maximum permissible weight (M.P.W.)	Total	kgf (lb)	1,780 (3,924)	1,780 (3,924)	1,850 (4,079)
Option	Air conditioner		—	—	—
	Cruise control		—	—	—
	ABS		○	○	○
	Aluminium wheel		—	—	—
	Rear spoiler		—	—	—
	Spoiler pac		—	—	—

★1: For option code, refer to ID section. <Ref. to ID-7, Option code.>

IMPREZA

SPECIFICATIONS

Wagon

Option code★1			EC		K4		K0		KS	
Model			1.6 L							
			AWD							
			TS							
			D/R	4AT	D/R	4AT	D/R	4AT	D/R	4AT
Curb weight (C.W.)	Front	kgf (lb)	735 (1,620)	750 (1,653)	755 (1,664)	770 (1,698)	755 (1,664)	770 (1,698)	745 (1,642)	760 (1,676)
	Rear	kgf (lb)	545 (1,202)	545 (1,202)	545 (1,202)	545 (1,202)	545 (1,202)	545 (1,202)	560 (1,235)	560 (1,235)
	Total	kgf (lb)	1,280 (2,822)	1,295 (2,855)	1,300 (2,866)	1,315 (2,900)	1,300 (2,866)	1,315 (2,900)	1,305 (2,877)	1,320 (2,911)
Maximum permissible axle weight (M.P.A.W.)	Front	kgf (lb)	900 (1,984)	900 (1,984)	900 (1,984)	900 (1,984)	900 (1,984)	900 (1,984)	900 (1,984)	900 (1,984)
	Rear	kgf (lb)	910 (2,006)	910 (2,006)	910 (2,006)	910 (2,006)	910 (2,006)	910 (2,006)	910 (2,006)	910 (2,006)
Maximum permissible weight (M.P.W.)	Total	kgf (lb)	1,730 (3,814)	1,730 (3,814)	1,730 (3,814)	1,730 (3,814)	1,730 (3,814)	1,730 (3,814)	1,730 (3,814)	1,730 (3,814)
Option	Air conditioner		—	—	○	○	○	○	○	○
	Cruise control		—	—	—	—	—	—	—	—
	ABS		—	—	—	—	—	—	—	—
	Aluminium wheel		—	—	—	—	—	—	—	—
	Rear spoiler		—	—	—	—	—	—	—	—
	Spoiler pac		—	—	—	—	—	—	—	—

Option code★1			EC		K4		K0		KS	
Model			2.0 L							
			AWD							
			GX							
			D/R	4AT	D/R	4AT	D/R	4AT	D/R	4AT
Curb weight (C.W.)	Front	kgf (lb)	755 (1,664)	770 (1,698)	775 (1,709)	790 (1,742)	780 (1,720)	795 (1,753)	760 (1,676)	780 (1,720)
	Rear	kgf (lb)	570 (1,257)	565 (1,246)	565 (1,246)	560 (1,235)	570 (1,257)	565 (1,246)	580 (1,279)	575 (1,268)
	Total	kgf (lb)	1,325 (2,921)	1,335 (2,944)	1,340 (2,955)	1,350 (2,977)	1,350 (2,977)	1,360 (2,999)	1,340 (2,955)	1,355 (2,988)
Maximum permissible axle weight (M.P.A.W.)	Front	kgf (lb)	920 (2,028)	920 (2,028)	920 (2,028)	920 (2,028)	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)	960 (2,116)	960 (2,116)	960 (2,116)	960 (2,116)
Maximum permissible weight (M.P.W.)	Total	kgf (lb)	1,800 (3,969)	1,800 (3,969)	1,800 (3,969)	1,800 (3,969)	1,800 (3,969)	1,800 (3,969)	1,800 (3,969)	1,800 (3,969)
Option	Air conditioner		—	—	○	○	○	○	○	○
	Cruise control		—	—	—	—	—	—	—	—
	ABS		—	—	○	○	○	○	—	○
	Aluminium wheel		—	—	○	○	—	—	○	○
	Rear spoiler		—	—	—	—	—	—	—	—
	Spoiler pac		—	—	—	—	—	—	—	—

D/R: Dual range

★1: For option code, refer to ID section. <Ref. to ID-7, Option code.>

IMPREZA

SPECIFICATIONS

Option code★1		EC	K4	
Model		2.0 L Turbo		
		AWD		
		WRX		
		5MT		
Curb weight (C.W.)	Front	kgf (lb)	805 (1,775)	825 (1,819)
	Rear	kgf (lb)	585 (1,290)	585 (1,290)
	Total	kgf (lb)	1,390 (3,065)	1,410 (3,109)
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 (4,101)	1,860 (4,101)
Option	Air conditioner		—	○
	Cruise control		—	—
	ABS		○	○
	Aluminium wheel		—	—
	Rear spoiler		—	—
	Spoiler pac		—	—

D/R: Dual range

★1: For option code, refer to ID section. <Ref. to ID-7, Option code.>

2. RHD VEHICLE SA08731G3704

Sedan

Option code★1		EK		K1		
Model		1.6 L				
		AWD				
		TS				
		5MT	4AT	5MT	4AT	
Curb weight (C.W.)	Front	kgf (lb)	735 (1,621)	755 (1,665)	750 (1,654)	770 (1,698)
	Rear	kgf (lb)	520 (1,146)	520 (1,146)	520 (1,146)	520 (1,146)
	Total	kgf (lb)	1,255 (2,767)	1,275 (2,811)	1,270 (2,800)	1,290 (2,844)
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)	1,700 (3,748)	1,700 (3,748)	1,700 (3,748)	1,700 (3,748)
Option	Air conditioner		—	—	○	○
	Cruise control		—	—	—	—
	ABS		○	○	—	—
	Aluminium wheel		—	—	—	—
	Rear spoiler		—	—	—	—
	Spoiler pac		○	○	—	—

Option code★1		EK		K1		
Model		2.0 L				
		AWD				
		GX				
		5MT	4AT	5MT	4AT	
Curb weight (C.W.)	Front	kgf (lb)	765 (1,687)	790 (1,742)	770 (1,698)	795 (1,753)
	Rear	kgf (lb)	535 (1,179)	530 (1,168)	535 (1,179)	530 (1,168)
	Total	kgf (lb)	1,300 (2,866)	1,320 (2,910)	1,305 (2,877)	1,325 (2,921)
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)
Option	Air conditioner		○	○	○	○
	Cruise control		—	—	—	—
	ABS		○	○	○	○
	Aluminium wheel		○	○	—	—
	Rear spoiler		○	○	—	—
	Spoiler pac		○	○	—	—

★1: For option code, refer to ID section. <Ref. to ID-7, Option code.>

IMPREZA

SPECIFICATIONS

Option code★1			KA						EK		
Model			2.0 L		2.5 L		2.0 L Turbo				
			AWD								
			GX		RS		WRX				
			5MT	4AT	5MT	4AT	5MT	4AT	5MT		
Curb weight (C.W.)	Front	kgf (lb)	750 (1,653)	775 (1,709)	780 (1,720)	805 (1,775)	830 (1,830)	855 (1,885)	830 (1,830)		
	Rear	kgf (lb)	535 (1,179)	530 (1,168)	540 (1,191)	535 (1,179)	560 (1,235)	555 (1,224)	560 (1,235)		
	Total	kgf (lb)	1,285 (2,833)	1,305 (2,877)	1,320 (2,910)	1,340 (2,954)	1,390 (3,065)	1,410 (3,109)	1,390 (3,065)		
Maximum permissible axle weight (M.P.A.W.)	Front	kgf (lb)	920 (2,028)	920 (2,028)	930 (2,050)	930 (2,050)	970 (2,138)	970 (2,138)	970 (2,138)		
	Rear	kgf (lb)	910 (2,006)	910 (2,006)	910 (2,006)	910 (2,006)	920 (2,028)	920 (2,028)	920 (2,028)		
Maximum permissible weight (M.P.W.)	Total	kgf (lb)	1,760 (3,880)	1,760 (3,880)	1,780 (3,924)	1,780 (3,924)	1,850 (4,079)	1,850 (4,079)	1,850 (4,079)		
Option	Air conditioner		—	—	○	○	○	○	○		
	Cruise control		○	○	○	○	○	○	—		
	ABS		○	○	○	○	○	○	○		
	Aluminium wheel		—	—	—	—	—	—	—		
	Rear spoiler		—	—	○	○	○	○	○		
	Spoiler pac		—	—	—	—	—	—	—		

★1: For option code, refer to ID section. <Ref. to ID-7, Option code.>

IMPREZA

SPECIFICATIONS

Wagon

Option code★1		EK		K1		
Model		1.6 L				
		AWD				
		TS				
		D/R	4AT	D/R	4AT	
Curb weight (C.W.)	Front	kgf (lb)	740 (1,631)	755 (1,664)	755 (1,664)	770 (1,698)
	Rear	kgf (lb)	545 (1,202)	545 (1,202)	545 (1,202)	545 (1,202)
	Total	kgf (lb)	1,285 (2,833)	1,300 (2,866)	1,300 (2,866)	1,315 (2,900)
Maximum permissible axle weight (M.P.A.W.)	Front	kgf (lb)	900 (1,984)	900 (1,984)	900 (1,984)	900 (1,984)
	Rear	kgf (lb)	910 (2,006)	910 (2,006)	910 (2,006)	910 (2,006)
Maximum permissible weight (M.P.W.)	Total	kgf (lb)	1,730 (3,814)	1,730 (3,814)	1,730 (3,814)	1,730 (3,814)
Option	Air conditioner		—	—	○	○
	Cruise control		—	—	—	—
	ABS		○	○	—	—
	Aluminium wheel		—	—	—	—
	Rear spoiler		—	—	—	—
	Spoiler pac		—	—	—	—

Option code★1		EK		K1		
Model		2.0 L				
		AWD				
		GX				
		D/R	4AT	D/R	4AT	
Curb weight (C.W.)	Front	kgf (lb)	775 (1,709)	790 (1,742)	780 (1,720)	795 (1,753)
	Rear	kgf (lb)	570 (1,257)	565 (1,246)	570 (1,257)	565 (1,246)
	Total	kgf (lb)	1,345 (2,965)	1,355 (2,987)	1,350 (2,977)	1,360 (2,999)
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)
Option	Air conditioner		○	○	○	○
	Cruise control		—	—	—	—
	ABS		○	○	○	○
	Aluminium wheel		○	○	—	—
	Rear spoiler		—	—	—	—
	Spoiler pac		○	○	—	—

D/R: Dual range

★1: For option code, refer to ID section. <Ref. to ID-7, Option code.>

IMPREZA

SPECIFICATIONS

Option code★1		KA				
Model		2.0 L				
		AWD				
		GX		OUT BACK		
		D/R	4AT	D/R	4AT	
Curb weight (C.W.)	Front	kgf (lb)	760 (1,676)	775 (1,709)	750 (1,653)	765 (1,687)
	Rear	kgf (lb)	570 (1,257)	565 (1,246)	570 (1,257)	570 (1,257)
	Total	kgf (lb)	1,330 (2,932)	1,340 (2,954)	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)
Option	Air conditioner		—	—	—	—
	Cruise control		○	○	○	○
	ABS		○	○	○	○
	Aluminium wheel		—	—	—	—
	Rear spoiler		—	—	—	—
	Spoiler pac		—	—	—	—

Option code★1		EX		KA	
Model		2.0 L Turbo			
		AWD			
		WRX			
		5MT		5MT	
Curb weight (C.W.)	Front	kgf (lb)	825 (1,819)	825 (1,819)	850 (1,874)
	Rear	kgf (lb)	585 (1,290)	585 (1,290)	585 (1,290)
	Total	kgf (lb)	1,410 (3,109)	1,410 (3,109)	1,435 (3,164)
Maximum permissible axle weight (M.P.A.W.)	Front	kgf (lb)	970 (2,138)	970 (2,138)	970 (2,138)
	Rear	kgf (lb)	950 (2,094)	950 (2,094)	950 (2,094)
Maximum permissible weight (M.P.W.)	Total	kgf (lb)	1,860 (4,101)	1,860 (4,101)	1,860 (4,101)
Option	Air conditioner		○	○	○
	Cruise control		—	○	○
	ABS		○	○	○
	Aluminium wheel		—	—	—
	Rear spoiler		—	—	—
	Spoiler pac		—	—	—

D/R: Dual range

★1: For option code, refer to ID section. <Ref. to ID-7, Option code.>

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: Disconnect the ground cable from battery.

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 the harnesses or connectors to carry 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.

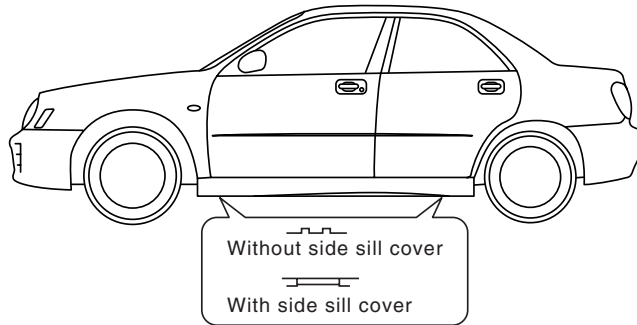
4. SERVICE PARTS

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.

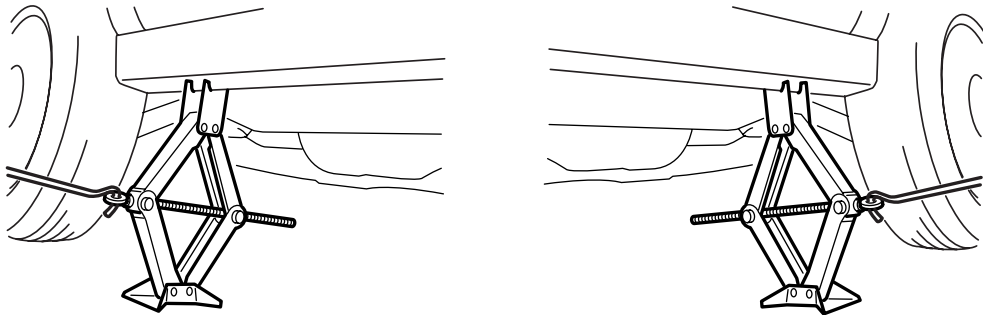
5. LIFTS AND JACKS

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.

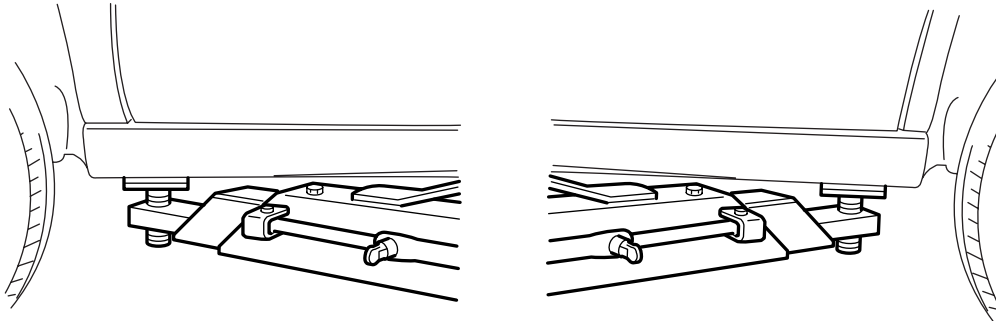
Support locations



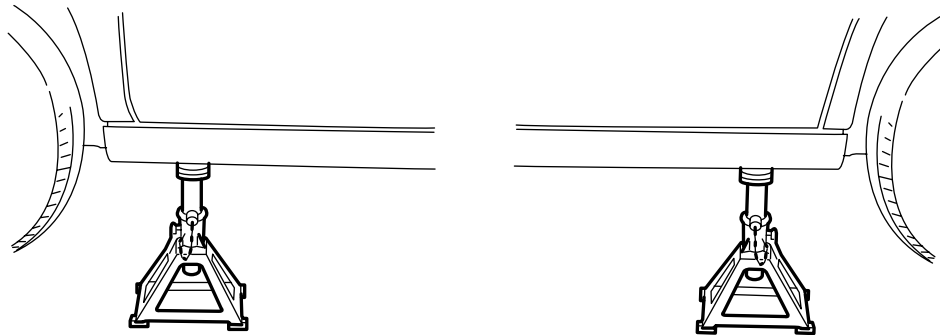
Pantograph jack



Lift



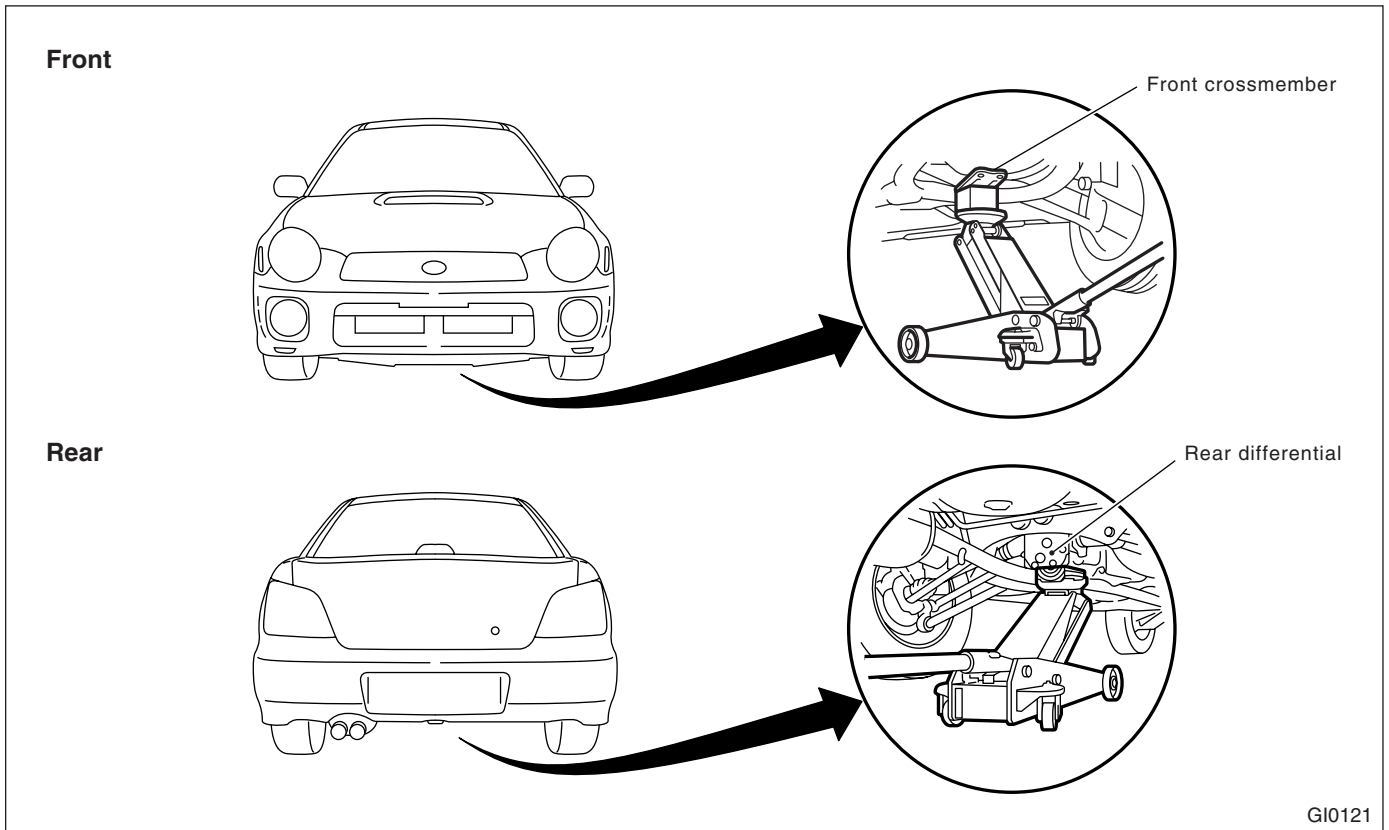
Safety stand



GI0120

NOTE

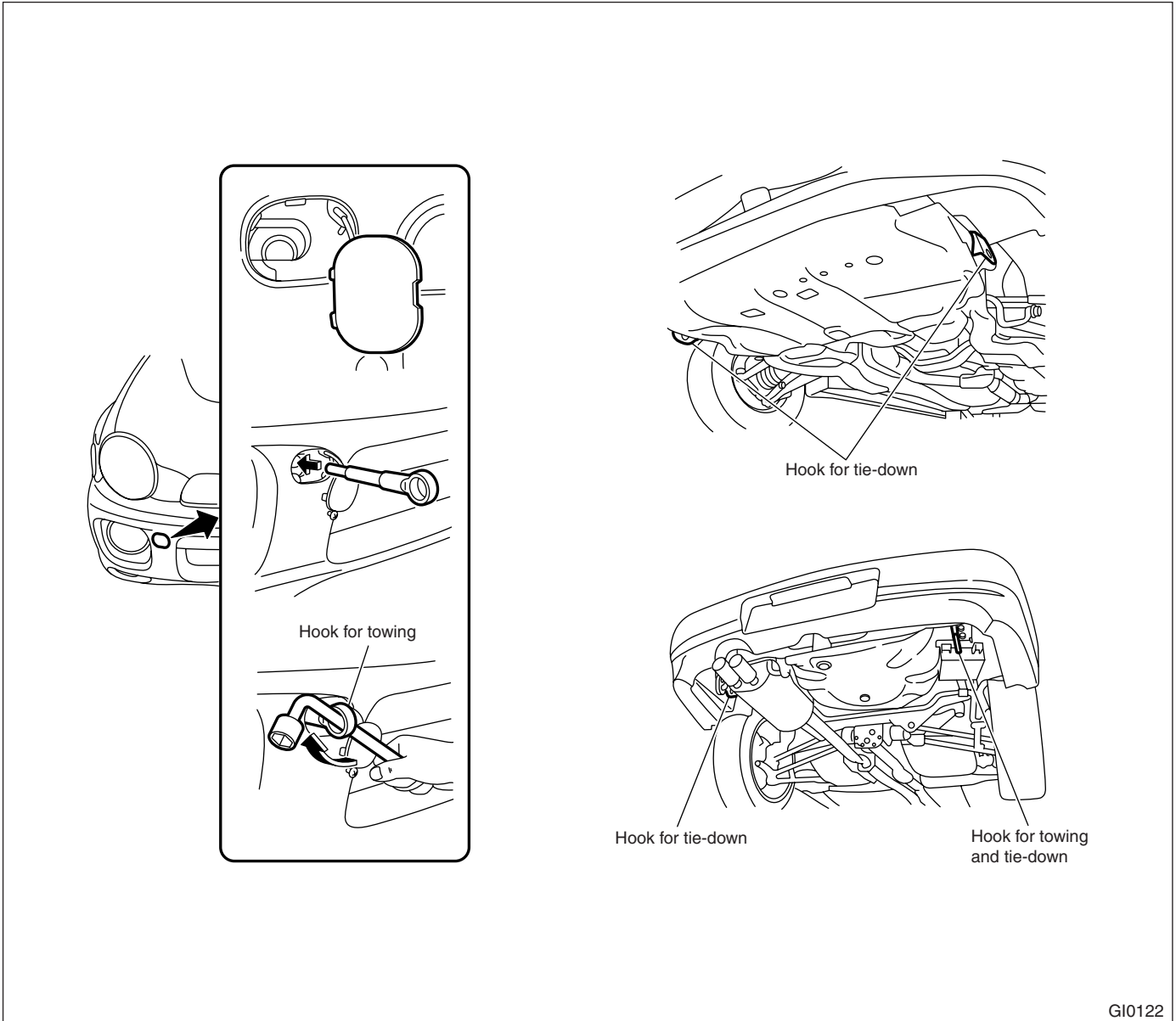
NOTE



GI0121

6. TIE DOWNS

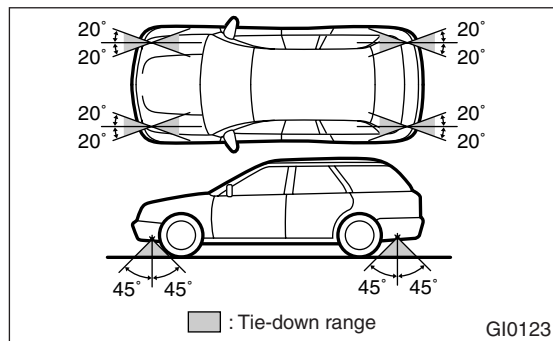
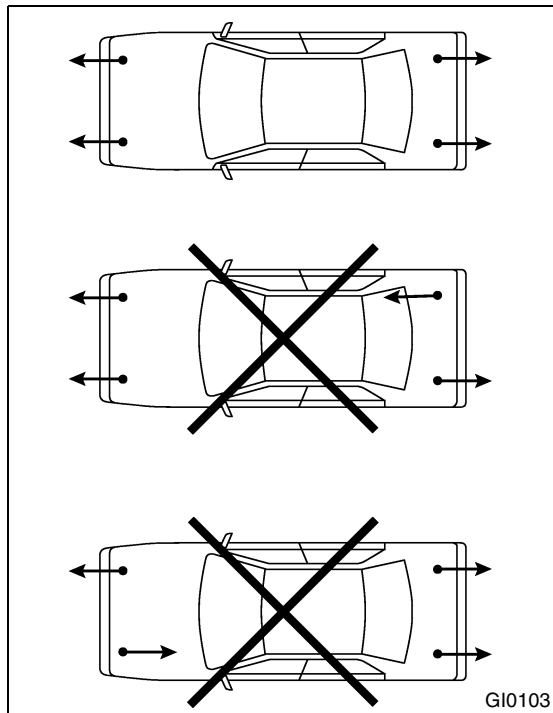
Tie downs are used when transporting vehicles and when using the chassis dynamo. Attach tie downs only to the specified points on the vehicle.



GI0122

NOTE

NOTE



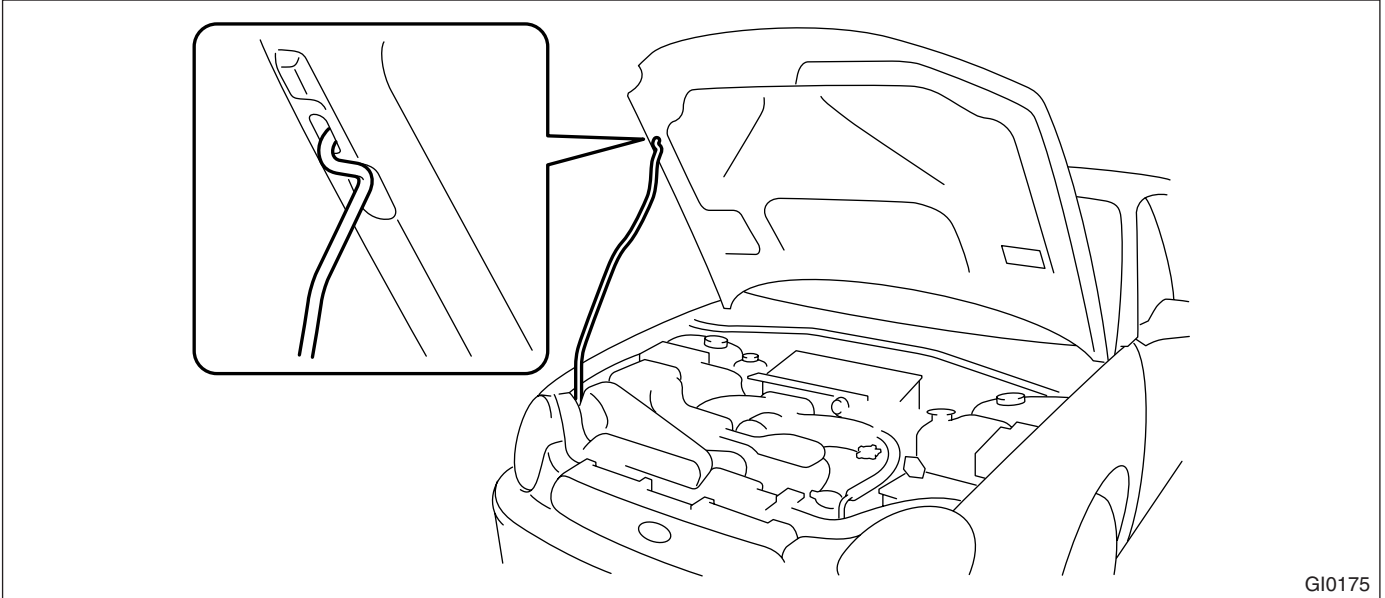
7. TOWING

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

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

8. FRONT HOOD STAY INSTALLATION

- At the check and general maintenance

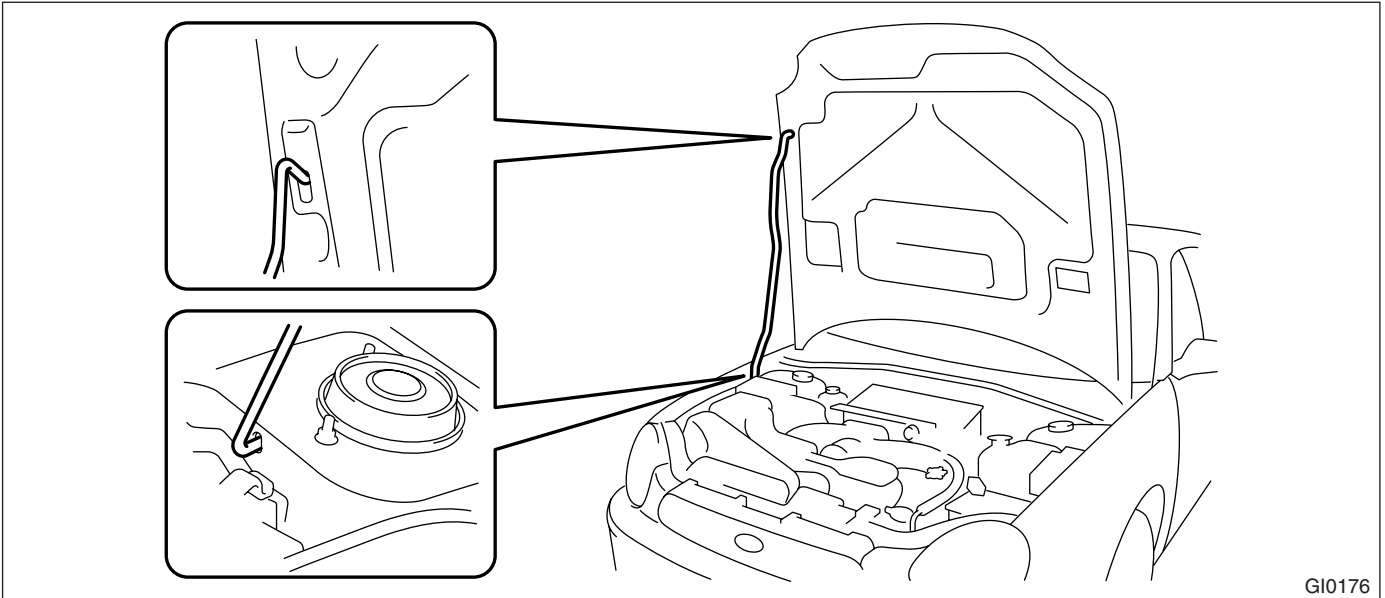


- When wider hood opening is necessary

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

NOTE:

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



9. TRAINING

For information about training, contact a dealer or agent.

10. GENERAL SCAN TOOL

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

NOTE

NOTE

IDENTIFICATION

ID

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IDENTIFICATION

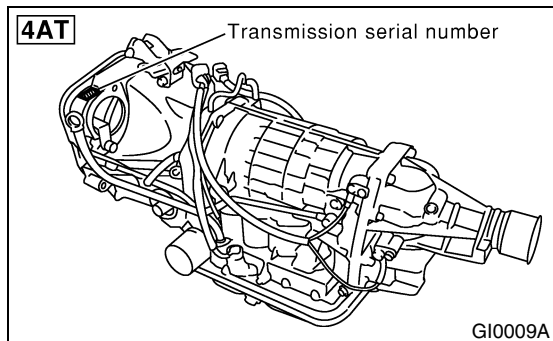
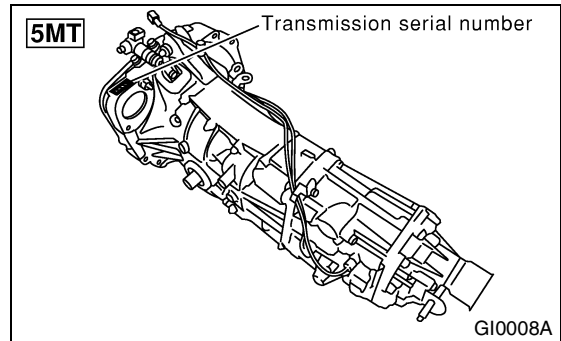
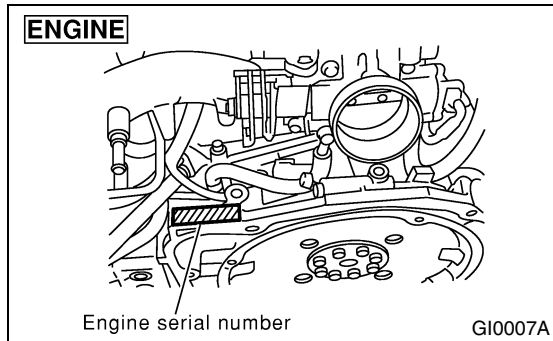
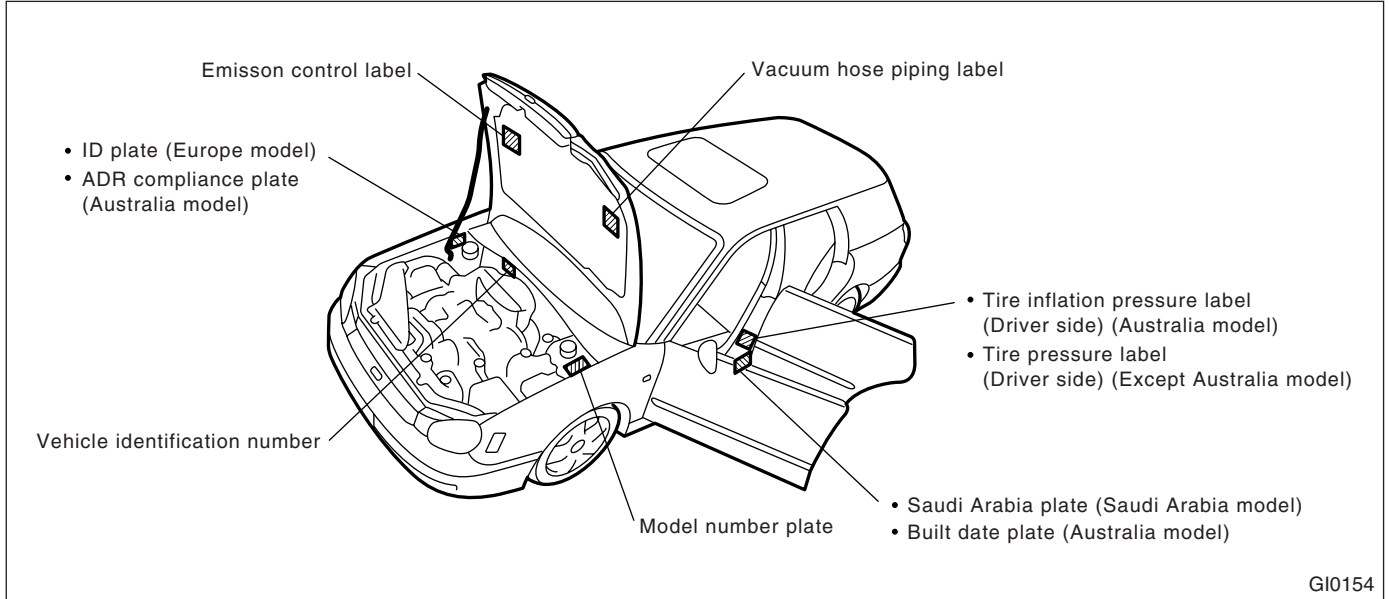
IDENTIFICATION

1. Identification

A: IDENTIFICATION

1. IDENTIFICATION NUMBER AND LABEL LOCATIONS

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



IDENTIFICATION

IDENTIFICATION

2. MEANING OF V.I.N.

The meaning of the VIN is as follows:

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

]JF1GD5LJ31G002001[

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	5: 1.6 L AWD 9: 2.0 L AWD A: 2.0 L AWD Turbo E: 2.5 L AWD
7	L	Steering position	K: RHD (Right-hand drive) L: LHD (Left-hand drive)
8	J	Engine & transmission	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 P: DOHC Turbo 4-speed AT
9	3	Drive type	3: Full-time AWD Single range 4: Full-time AWD Dual range 5: AWD AT
10	2	Model year	2: 2002MY 3: 2003MY
11	G	Factory location	G: FHI (Gunma)
12 to 17	002001	Serial number	—

• **GCC countries (Saudi Arabia, etc.)**

]JF1GD33MX1G002001[

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	4	Displacement	4: 1.6 L AWD 8: 2.0 L AWD
7	5	Grade	5: TS 7: GX
8	M	Restraint	M: Manual belts, dual airbag
9	X	Check digit	—
10	2	Model year	2: 2002MY 3: 2003MY
11	G	Transmission type	G: Full-time AWD 5-speed MT single range H: Full-time AWD 4-speed AT J: Full-time AWD 5-speed MT dual range
12 to 17	002001	Serial number	—

3. MODEL NUMBER PLATE

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

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	5: 1.6 L AWD 9: 2.0 L AWD E: 2.5 L AWD
4	A	Minor change	2002MY
5	L	Destination	K: Right-hand drive market L: Left-hand drive market
6	7	Grade	4: TS 5: GX 6: RS 7: OUTBACK 8: WRX
7	R	Transmission, fuel feed system	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 25: 2.5 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

TV1B4VYAAA

Digits	Code	Meaning	Details
1	T	Transmission	T: Transmission
2	V	Transmission type	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: 5MT
			AT 4: AT
6	V	Transmission specifications	S: Part-time AWD 5-speed MT Single range D: Part-time AWD 5-speed MT Dual range 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	YAAA	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: AWD
2	A	Type	A: A type
3	1	Hypoid gear diameter mm (in)	1: 152 (6.0) dia. 2: 160 (6.3) 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

EG

Code	Reduction gear ratio	LSD
EG	3.900	No
ER	3.700	Viscous
EM	4.444	SURETRAC®
EJ	4.111	Viscous
EF	3.545	Viscous

IDENTIFICATION

IDENTIFICATION

• Option code

ECPS

Digits	Code	Meaning	Details
1 to 2	EC	Destination	EC: EC KO: KO K4: K4 KS: KS EK: EK KA: KA K1: K1
3 to 4	PS	Main option of vehicle	—

IDENTIFICATION

IDENTIFICATION

RECOMMENDED MATERIALS

RM

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1. Recommended Materials	2



RECOMMENDED MATERIALS

RECOMMENDED MATERIALS

1. Recommended Materials

A: RECOMMENDED MATERIALS

1. GENERAL

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

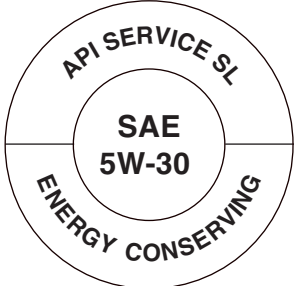

On vehicles without catalytic converter, use gasoline with an octane value of 90 RON or higher.

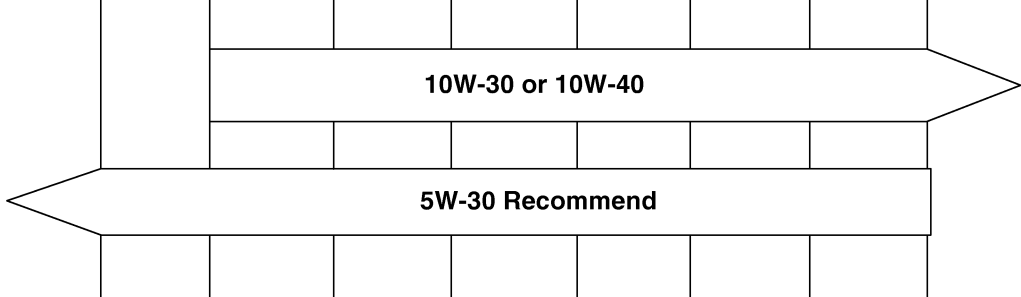
RECOMMENDED MATERIALS

RECOMMENDED MATERIALS

3. LUBRICANTS

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

Lubricant	Recommended			Alternative
	API Spec.	CCMC Spec.	ACEA Spec.	
Engine oil	SL or SJ Grade "Energy conserving"  B1M0495  GI0002	G4 or G5	A1, A2 or A3	API: SH or SG
Manual transmission oil	GL-5	—	—	—
Front differential	GL-5	—	—	—
Rear differential	GL-5	—	—	—

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
									
	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	
	90									
	85W									
	80W									
Rear differential	75W-90									
	GI0004A									
	Front differential	(°C)	-30	-20	-10	0	10	20	30	40
		(°F)	-22	-4	14	32	50	68	86	104
		90								
85W										
80W										
80W-90										
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

RECOMMENDED MATERIALS

RECOMMENDED MATERIALS

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 DH-PR.

Air conditioner	Recommended	Item number	Alternative
Refrigerant	HFC134a	—	None
Compressor oil	DH-PR	—	None

7. GREASE

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

Grease	Application point	Recommended	Item number	Alternative
Supplementary lubricants	<ul style="list-style-type: none"> O2 sensor Bolts, etc. 	SUBARU CRC	004301003	—
Grease	MT main shaft	FX clutch grease	000040901	—
	Clutch master cylinder push rod	Slicolube G-40M	004404003	—
	<ul style="list-style-type: none"> Steering shaft bearing Gear shift bush 	SUNLIGHT2	003602010	—
	Steering gear box	Valiant grease M-2	003608001	—
	Disc brake	Niglube RX-2	725191040	—
	Drum brake	Molykote No. 7439	72519460	—
	<ul style="list-style-type: none"> Brake pad Brake shoe 	Molykote AS-880N	26298AC000	—
	Front axle SFJ	SSG-6003	28093TA000	—
	<ul style="list-style-type: none"> Front EBJ Rear axle EBJ 	NTG 2218	28093AA000	—
	Rear axle BJ	Molylex No. 2	723223010	—
	Rear axle DOJ	VU-3A702	23223GA050	—
	<ul style="list-style-type: none"> 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
	Soft vinyl	Cemedine 540	—	3M's EC-776 EC-847 or EC-1022 (Spray type)
	Momentary sealant	Cemedine 3000	—	Armstrong's Eastman 910

RECOMMENDED MATERIALS

RECOMMENDED MATERIALS

9. SEAL MATERIAL

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

Seal material	Application point	Recommended	Item number	Alternative
Seal material	<ul style="list-style-type: none">• Engine case• Torque converter clutch 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	—

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. Connection of air conditioner harness	(7) If the vehicle is about to be delivered to the customer, connect the air conditioner harness.
5. Check the doors for lock/unlock and open/close operations.	(8) Using the key, check if the door can be locked and unlocked normally. (9) Open and close all doors to see that there are no abnormal conditions.
6. Check the trunk lid for open/close operations.	(10) Operate the trunk lock release lever to check that the trunk opens normally. (11) Using the key, check if the trunk lid can be unlocked normally. (12) Open and close the trunk lid to see that there are no abnormal conditions.
7. Check the rear gate for lock/unlock and open/close operations.	(13) Using the key, check if the rear gate can be lock and unlocked normally. (14) Open and close the rear gate to see that there are no abnormal conditions. (15) Operate the power door locking switch to check that the rear gate is locked and unlocked normally.
8. Operation check of fuel lid opener lock release lever	(16) Operate the fuel lid opener to check that the fuel lid is unlocked normally.
9. Accessory check	Check that the following accessories are provided: <ul style="list-style-type: none"> • Owner's manual • Warranty booklet • Service booklet • Spare key • Jack • Tool set • Spare tire
10. Operation check of hood lock release system	(17) Operate the hood lock release lever to check that the hood opens normally.
11. Battery	(18) Check the battery for any abnormal conditions such as rust and trace of battery fluid leaks.
12. Brake fluid	(19) Check the fluid amount.
13. Engine oil	(20) Check the oil amount.
14. Transmission fluid	(21) Check the fluid amount. (22) For AT, check the front differential oil.
15. AT front differential oil	(23) Check the AT front differential oil amount.
16. Coolant	(24) Check the coolant amount.
17. Clutch fluid	(25) Check the clutch fluid amount.
18. Window washer fluid	(26) Check the window washer fluid amount.
19. Hood latch check	(27) Check that the hood is closed and latched securely.
20. Keyless entry system	(28) Check that the keyless entry system operates normally.
21. Seat	(29) Check the seat surfaces for smears or dirt. (30) Check the seat installation conditions and functionality.
22. Seat belt	(31) Check the seat belt installation conditions and functionality.
23. Wheel alignment	(32) Check that the wheel alignments are properly adjusted.

PRE-DELIVERY INSPECTION

PRE-DELIVERY INSPECTION

Checks with the Engine Running

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

Dynamic Test with the Vehicle Running

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

Checks after Dynamic Test

Step	Check point
41. ATF level	(1) Check that the ATF level is normal.
42. Power steering fluid level	(2) Check that the power steering fluid level is normal.
43. Fluid leak check	(3) Check for fluid/oil leaks.
44. Water leak check	(4) Spray the vehicle with water and check for water leaks.
45. 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.

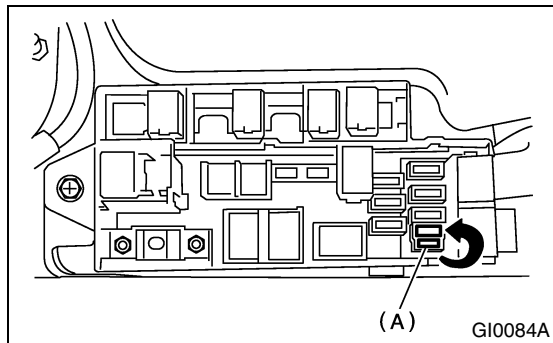
2. TIRE CHECK

- 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)
205/50R16	220 (2.2, 32)	220 (2.2, 32)
215/45R17	230 (2.3, 33)	220 (2.2, 32)

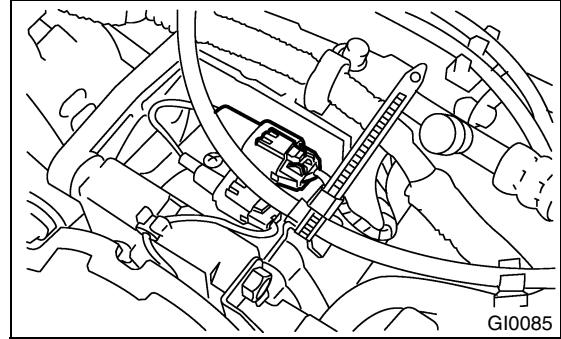
3. FUSE INSTALLATION

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



4. 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.

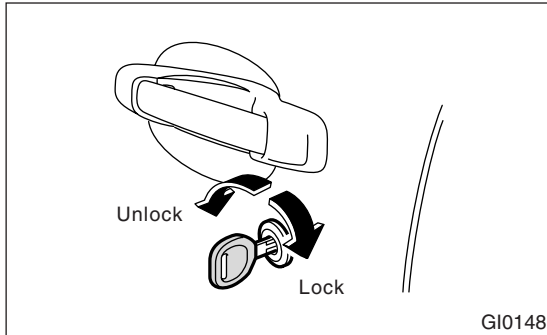


PRE-DELIVERY INSPECTION

PRE-DELIVERY INSPECTION

5. CHECK THE DOORS FOR LOCK/UNLOCK AND OPEN/CLOSE OPERATIONS.

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.



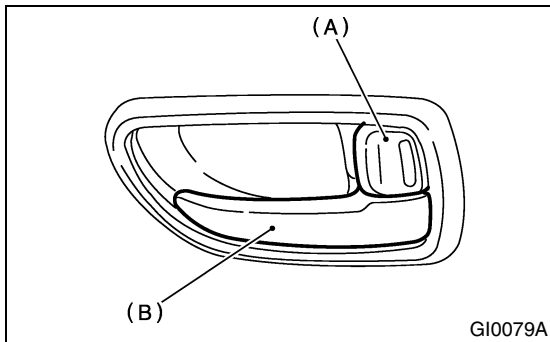
• Vehicles with manual door locks:

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:

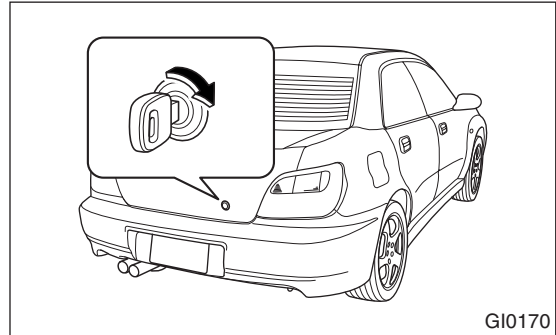
Sit in the driver seat, close the driver's door completely, and place the door lock knob (A) to the lock position. Then pull all inside door handles (B) to ensure that all doors will not open.

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



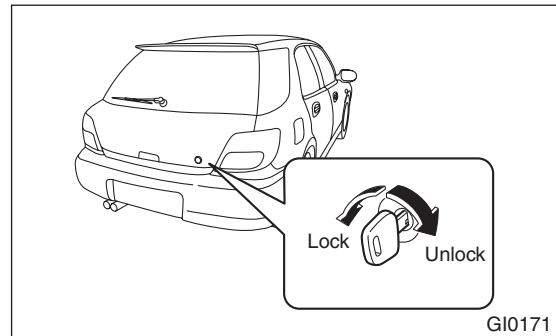
6. CHECK THE TRUNK LID FOR OPEN/CLOSE OPERATIONS.

- Operate the trunk lock release lever and verify that the trunk lid opens.
- Using the key, open the trunk lid several times to check for normal operation.
- Open and close the trunk lid several times for smooth movement.



7. CHECK THE REAR GATE FOR LOCK/UNLOCK AND OPEN/CLOSE OPERATIONS.

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



- Operate the driver's side door lock knob to check that the rear gate is locked and unlocked normally.

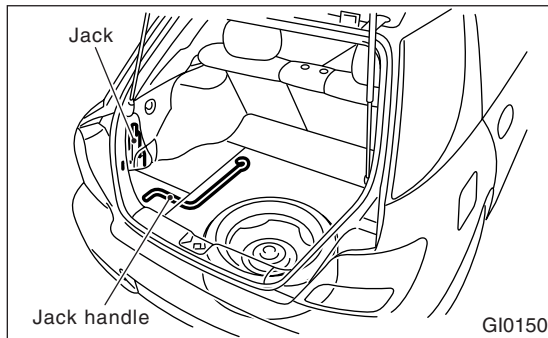
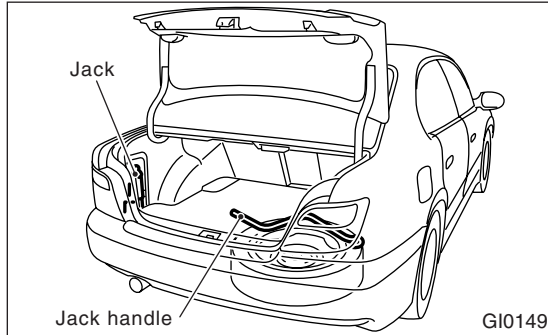
8. OPERATION CHECK OF FUEL LID OPENER LOCK RELEASE LEVER

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

9. ACCESSORY CHECK

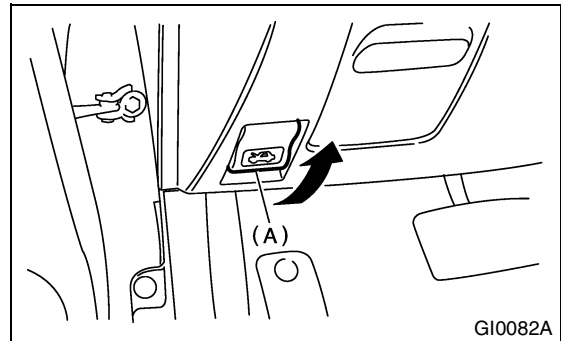
Check that the following accessories are provided in the luggage compartment or cargo area.

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

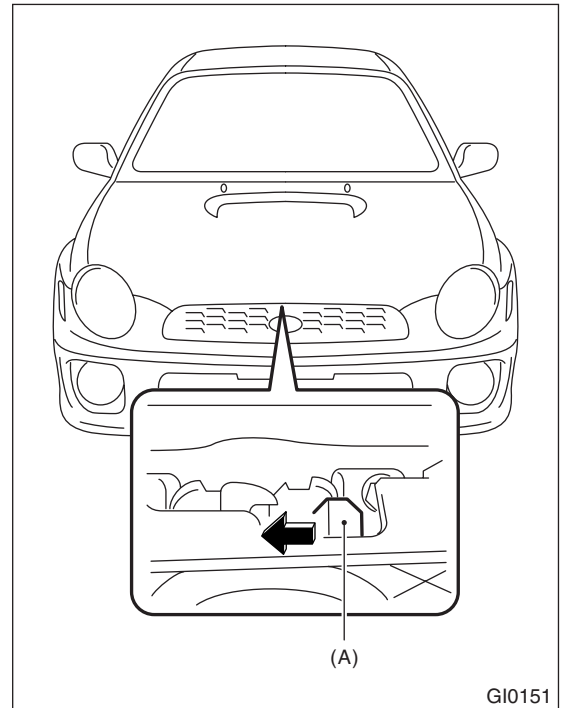


10. OPERATION CHECK OF HOOD LOCK RELEASE SYSTEM

Operate the hood release knob (A) and check that the hood is unlocked normally.



Operate the lever (A) and check that the hood is opened normally. Then support the hood with hood stay.

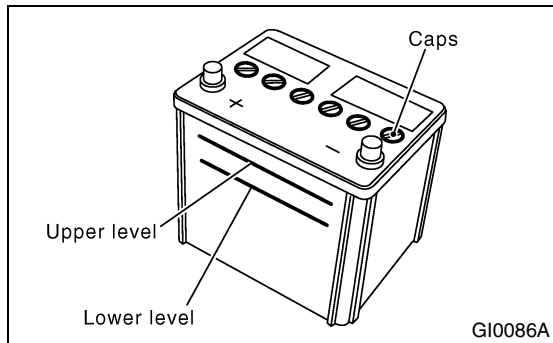


PRE-DELIVERY INSPECTION

PRE-DELIVERY INSPECTION

11. BATTERY

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

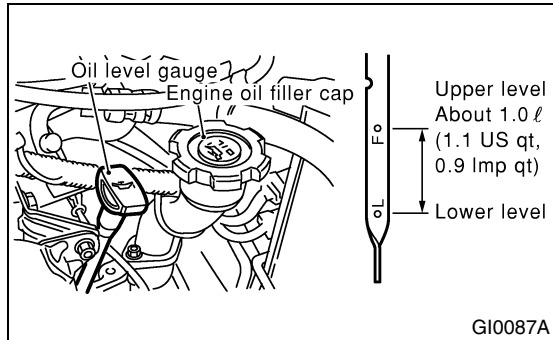


12. BRAKE FLUID

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.

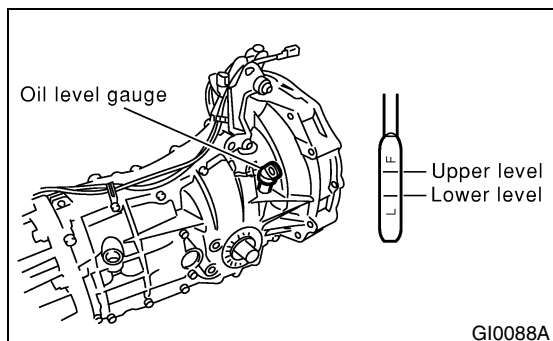
13. ENGINE OIL

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.



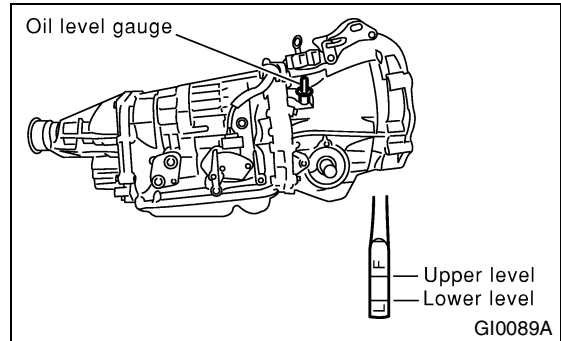
14. TRANSMISSION FLUID

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.



15. 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.

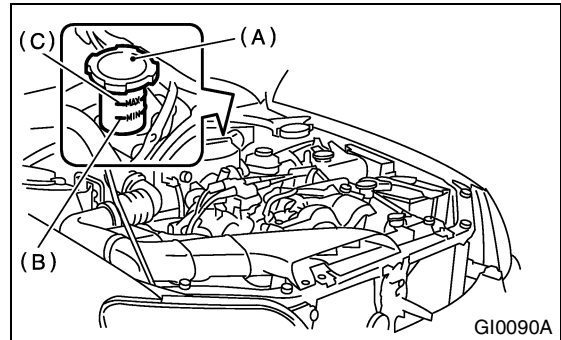


16. COOLANT

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.

17. CLUTCH FLUID

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



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

18. 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.

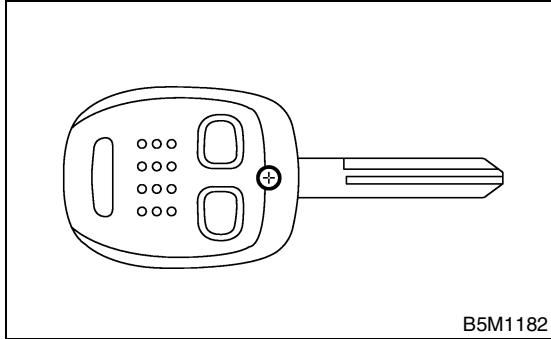
19. HOOD LATCH CHECK

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

20.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 all doors are 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.

21.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.

22.SEAT BELT

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

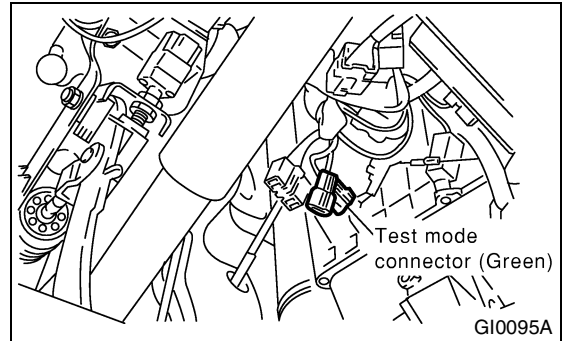
23.WHEEL ALIGNMENT

Check the wheel alignments. <Ref. to FS-8, Wheel Alignment.> and <Ref. to RS-9, Wheel Alignment.>

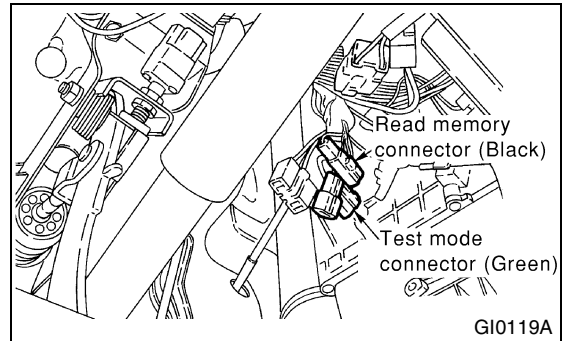
24.READ MEMORY AND TEST MODE CONNECTORS

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



25.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.

26.EXHAUST SYSTEM

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

27.INDICATOR LIGHT

Check that all the indicator lights are off.

28.CLOCK

Check the clock for normal operations and enough accuracy.

29.RADIO

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

PRE-DELIVERY INSPECTION

PRE-DELIVERY INSPECTION

30. CIGARETTE LIGHTER

Check the cigarette lighter operations.

31. LIGHTING SYSTEM

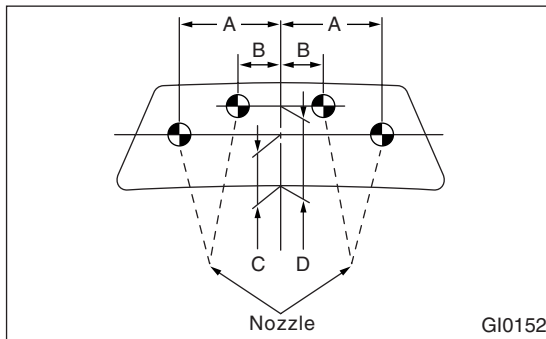
- Check the headlight operations.
- Check the brake light operations.
- Check the other lights for normal operations.

32. WINDOW WASHER

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

Front injection position:

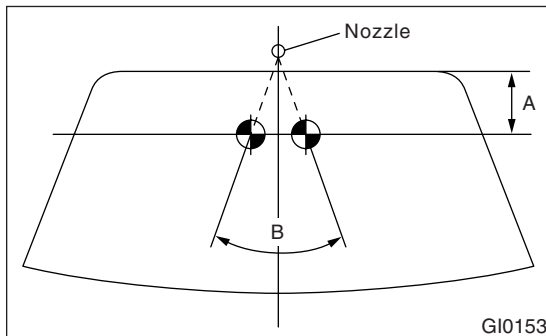
- A: 350mm (13.78 in)**
- B: 162mm (5.91 in)**
- C: 300mm (11.81 in)**
- D: 500mm (23.62 in)**



GI0152

Rear injection position:

- A: 39 mm (2.36 in)**
- B: 72°**



GI0153

33. WIPER

Check the front and rear wipers for normal operations.

34. 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.

35. BRAKE TEST

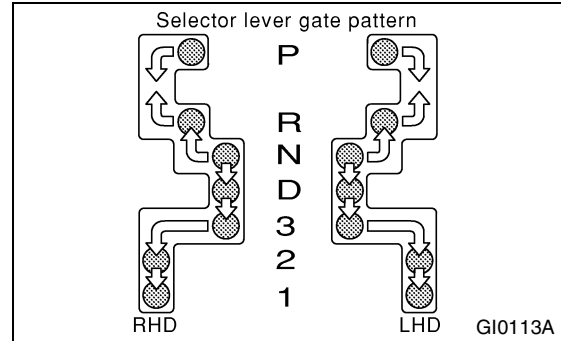
Check the foot brake for normal operations.

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

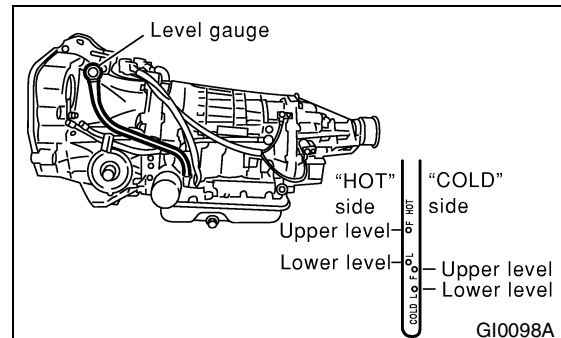
Operate the air conditioner. Check that the A/C compressor operates normally and enough cooling is provided.

40. CRUISE CONTROL

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

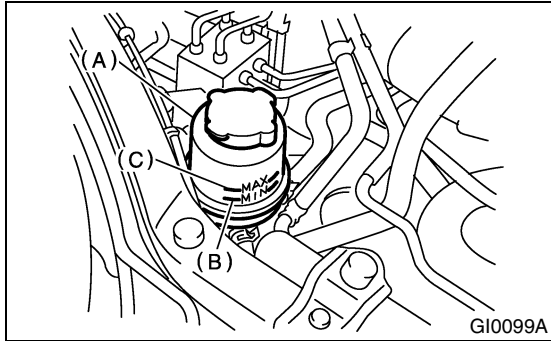
41. ATF LEVEL

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



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.



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

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 windows completely, and then close all 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 — 25 ℓ (5.3 — 6.6 US gal, 4.4 — 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 compartment 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.

PRE-DELIVERY INSPECTION

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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	Fuel line			I		I	
7	Fuel filter					R	
8	Air cleaner element		I	R	I	R	
9	Cooling system			I		I	
10	Coolant			R		R	
11	Idle mixture	I	I	I	I	I	For models without catalyst converter
12	Clutch system		I	I	I	I	
13	Hill-holder system	I	I	I	I	I	
14	Transmission oil			R		R	
15	ATF			R		R	
16	Front & rear differential oil			R		R	
17	Brake line			I		I	
18	Brake fluid			R		R	
19	Disc brake pads & discs		I	I	I	I	
20	Brake linings and drums			I		I	
21	Parking brake		I	I	I	I	
22	Suspension		I	I	I	I	
23	Wheel bearing					(I)	

SCHEDULE

PERIODIC MAINTENANCE SERVICES

		Maintenance Interval [Number of months or km (miles), whichever occurs first]					
	Months		12	24	36	48	Remarks
	× 1,000 km	1.6	25	50	75	100	
	× 1,000 miles	1	15	30	45	60	
24	Axle boots & joints		I	I	I	I	
25	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 a maintenance free part. ATF filter needs replacement, when it is 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						

B: INSPECTION

- 1) Park the vehicle on a level surface.
- 2) Remove the oil level gauge and wipe it clean.
- 3) Reinsert the level gauge all the way. Be sure that the level gauge is correctly inserted and in the proper orientation.
- 4) Remove it again and note the reading. If the 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 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.

ENGINE OIL FILTER

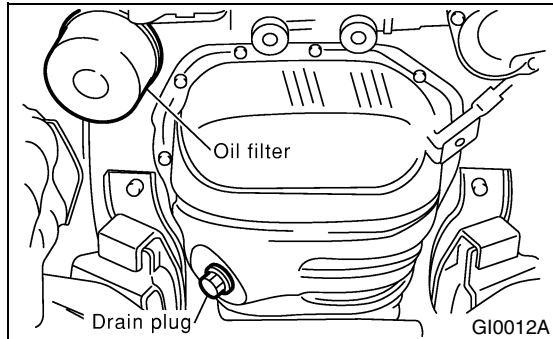
PERIODIC MAINTENANCE SERVICES

4. Engine Oil Filter

A: REPLACEMENT

1) Remove the 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 the oil filter by turning it by hand, being careful not to damage the seal rubber.

4) Tighten more (approx. 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 the oil filter, run the engine and make sure that no oil is leaking around seal rubber.

NOTE:

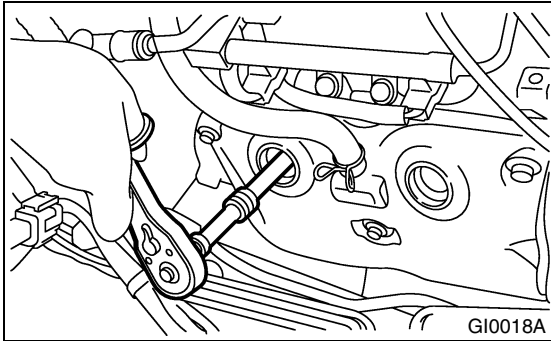
The filter element and filter case are permanently joined; therefore, interior cleaning is not necessary.

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

5. Spark Plugs

A: REPLACEMENT

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



- 5) Set the new spark plug.

Recommended spark plug :

SOHC

CHAMPION: RC10YC4

CHAMPION: RC8YC4

NGK: BKR6E-11

DENSO: 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 the 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 a torque wrench is not available, tighten the spark plug until gasket contacts cylinder head; then tighten further 1/4 to 1/2 turns.

DRIVE BELT(S)

PERIODIC MAINTENANCE SERVICES

6. Drive Belt(s)

A: INSPECTION

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

Belt tension

(A)

replaced: 7 — 9 mm (0.276 — 0.354 in)

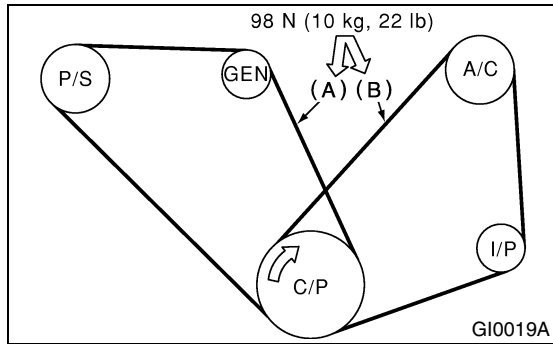
reused: 9.0 — 10.0 mm (0.354 — 0.394 in)

(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.

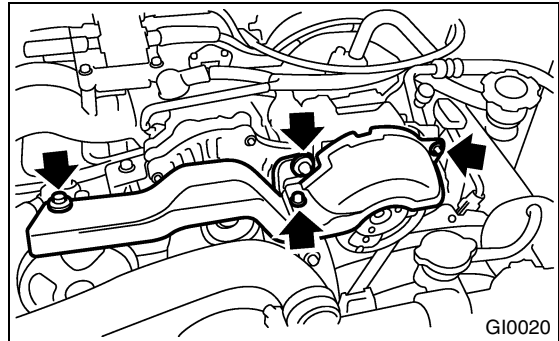


C/P	Crankshaft pulley
GEN	Generator
P/S	Power steering oil pump pulley
A/C	Air conditioning compressor pulley
I/P	Idler pulley

B: REPLACEMENT

1. V-BELT COVER

- 1) Remove the 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).

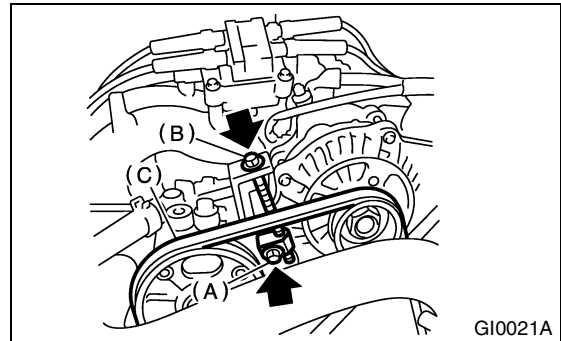
Tightening torque:

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)

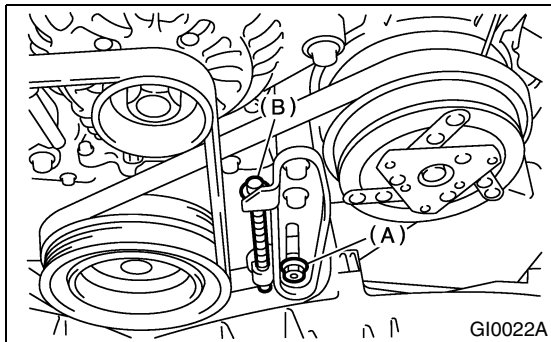
NOTE:

- 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

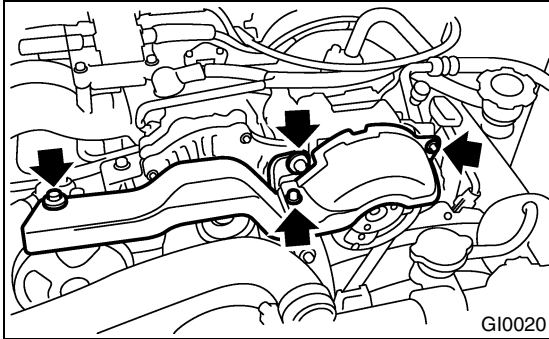
PERIODIC MAINTENANCE SERVICES

7. Camshaft Drive Belt

A: REPLACEMENT

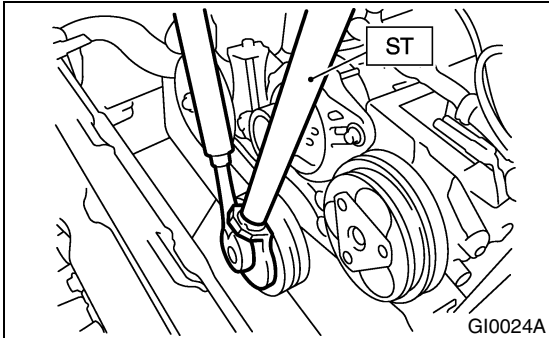
1. SOHC MODEL

- 1) Remove the radiator fan <Ref. to CO-10, Radiator Main Fan System.> and air conditioner fan. <Ref. to CO-18, Radiator Sub Fan System.>
- 2) Remove the V-belt cover.

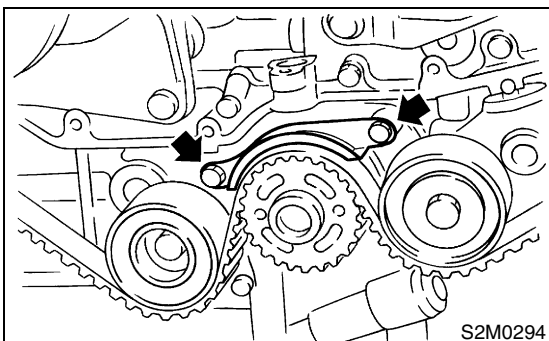


- 3) Remove the V-belts. <Ref. to ME-44, V-belt.>
- 4) Remove the air conditioning compressor drive belt tensioner.
- 5) Remove the pulley bolt. To lock the crankshaft, use ST.

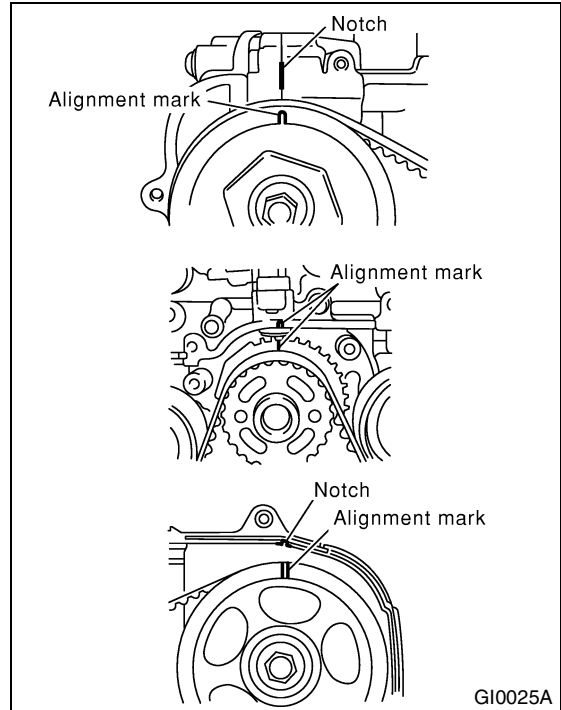
ST 499977100 CRANKSHAFT PULLEY WRENCH



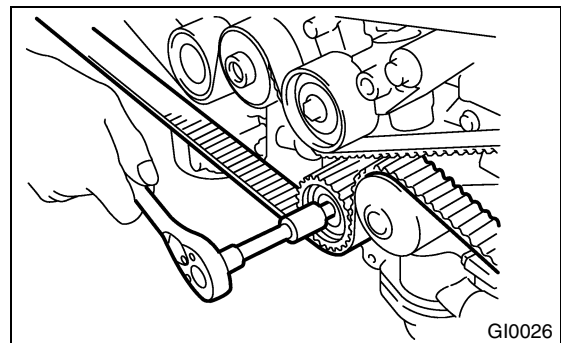
- 6) Remove the crankshaft pulley.
- 7) Remove the left side belt cover.
- 8) Remove the front belt cover.
- 9) Remove the timing belt guide. (MT vehicle only)



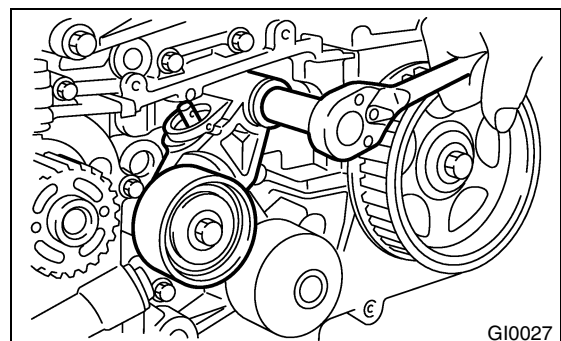
- 10) Turn the crankshaft and align alignment marks on crankshaft, and right and left camshaft sprockets with notches of belt cover and cylinder block.
- ST 499987500 CRANKSHAFT SOCKET



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



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

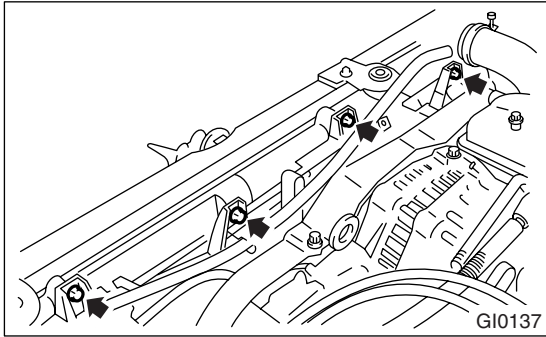


CAMSHAFT DRIVE BELT

PERIODIC MAINTENANCE SERVICES

2. DOHC MODEL

1) Remove the radiator fan and air conditioner fan.

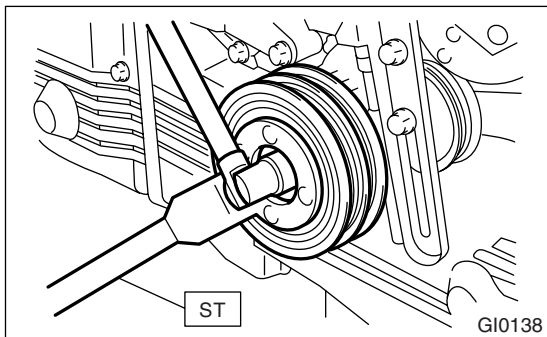


2) Remove the V-belts. <Ref. to ME(TURBO)-44, V-belt.>

3) Remove the air conditioning compressor drive belt tensioner.

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

ST 499977300 CRANKSHAFT PULLEY WRENCH



5) Remove the crankshaft pulley.

6) Remove the air conditioning compressor drive belt tensioner.

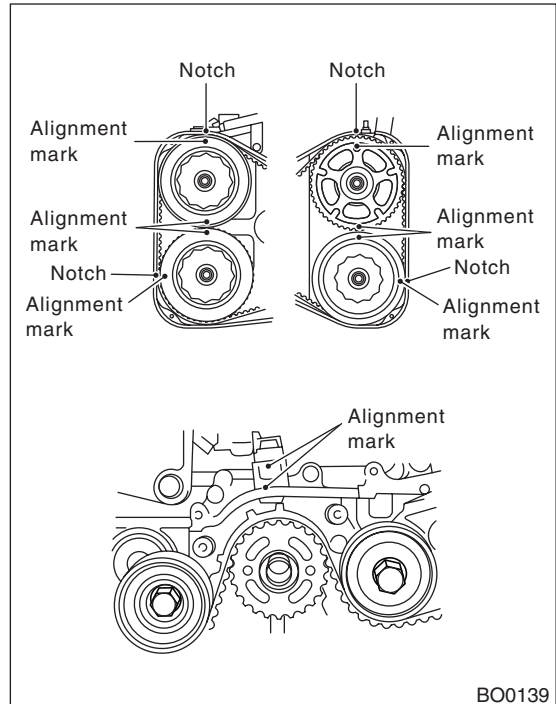
7) Remove the belt cover (LH).

8) Remove the belt cover (RH).

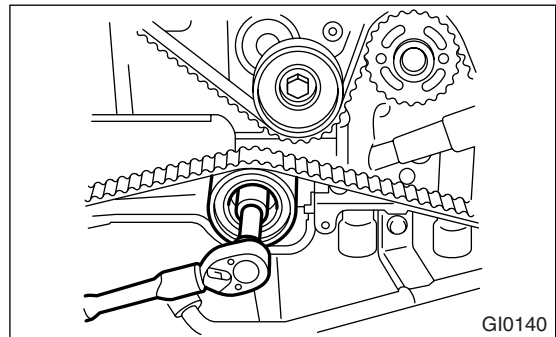
9) Remove the front belt cover.

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

ST 499987500 CRANKSHAFT SOCKET

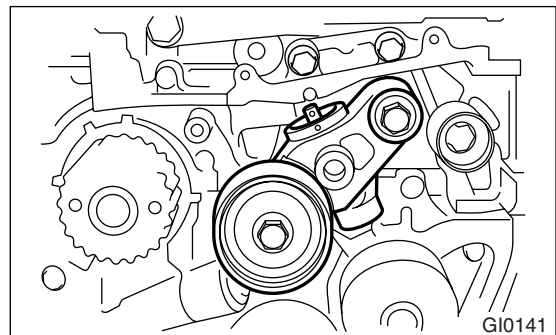


11) Remove the belt idler.



12) Remove the timing belt.

13) Remove the automatic belt tension adjuster assembly.



CAMSHAFT DRIVE BELT

PERIODIC MAINTENANCE SERVICES

B: INSTALLATION

1. SOHC MODEL

Install in the reverse order of removal. <Ref. to ME-49, Timing Belt Assembly.>

2. DOHC MODEL

Install in the reverse order of removal. <Ref. to ME(TURBO)-48, Timing Belt Assembly.>

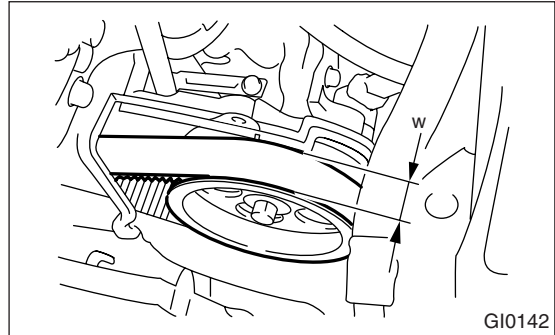
CAUTION:

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

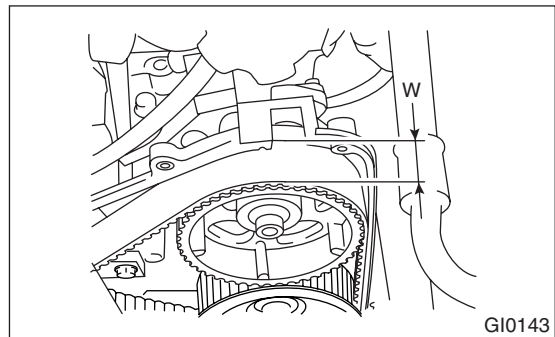
- 1) Remove the belt covers (RH) and (LH).
- 2) While cranking the engine at least four rotations, check the timing belt back surface for cracks or damage. Replace the faulty timing belt as needed.
- 3) Measure the timing belt width W. If it is less than 27 mm (1.06 in), check idlers, tensioner, water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



- 4) Install the belt covers (RH) and (LH).

2. DOHC MODEL

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



8. Fuel Line

A: INSPECTION

The fuel line is located mostly internally, so check pipes, areas near pipes, and engine compartment piping for rust, hose damage, loose bands, etc. If faulty parts are found, repair or replace them. <Ref. to FU-71, Fuel Delivery, Return and Evaporation Lines.> or <Ref. to FU(w/oOBD)-68, Fuel Delivery, Return and Evaporation Lines.> or <Ref. to FU(TURBO)-68, Fuel Delivery, Return and Evaporation Lines.>

9. Fuel Filter

A: REPLACEMENT

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

<Ref. to FU-68, Fuel Filter.> or <Ref. to FU(w/oOBD)-65, Fuel Filter.> or <Ref. to FU(TURBO)-65, Fuel Filter.>

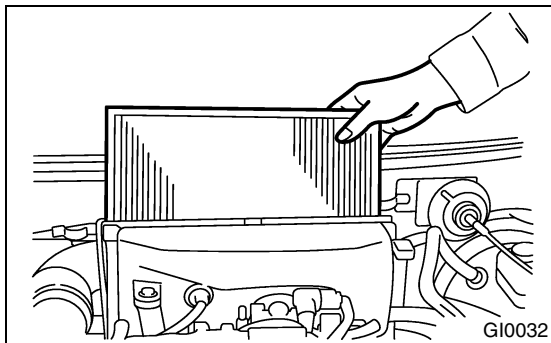
10. Air Cleaner Element

A: REPLACEMENT

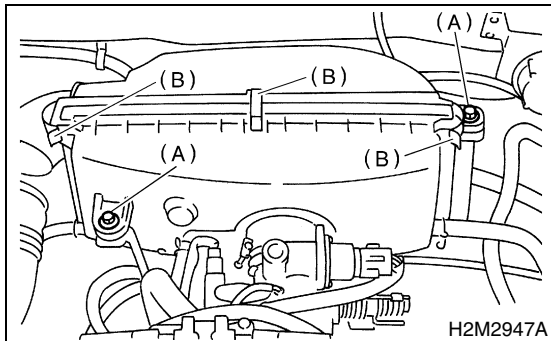
NOTE:

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

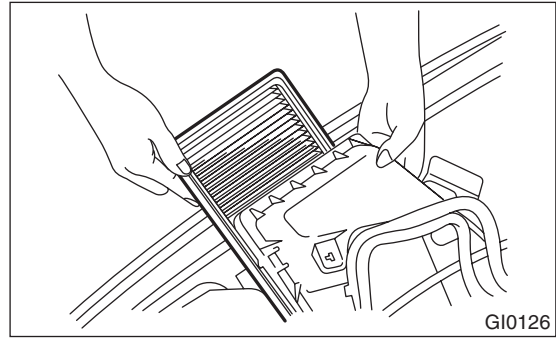


- 3) Remove the air cleaner.
- 4) Install in the reverse order of removal.

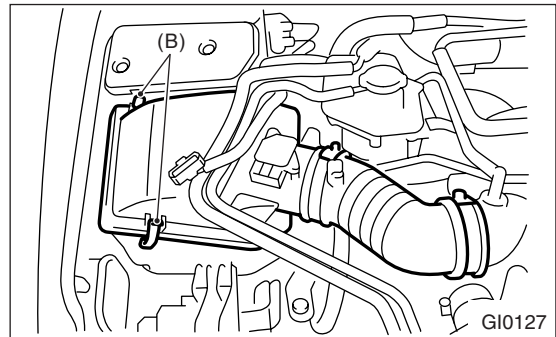
CAUTION:

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

2. TURBO MODEL



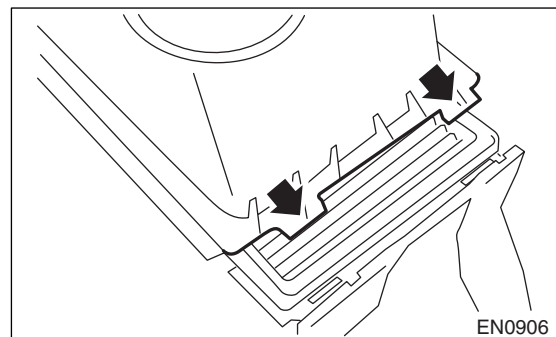
- 1) Remove the clip (B) above the air cleaner case.



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

CAUTION:

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



COOLING SYSTEM

PERIODIC MAINTENANCE SERVICES

11. Cooling System

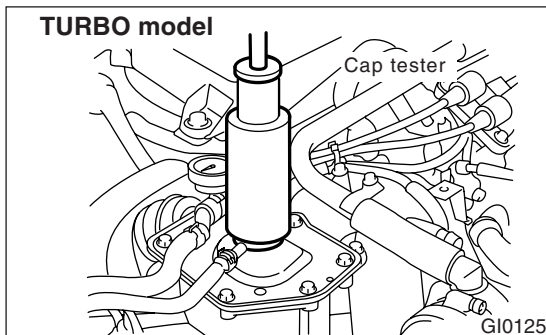
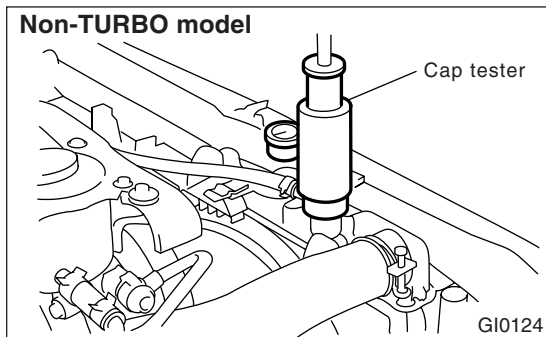
A: INSPECTION

1) Check the radiator for leakage, filling it with coolant and attach the radiator cap tester to 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 the radiator with coolant.
- Wipe off check points before applying pressure.
- Use care not to spill coolant when detaching the tester from radiator.

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

NOTE:

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

Raise the pressure until the needle of gauge stops and see if the pressure can be retained for 5 to 6 seconds. The radiator cap is normal if a pressure above the service limit value has been maintained for this period.

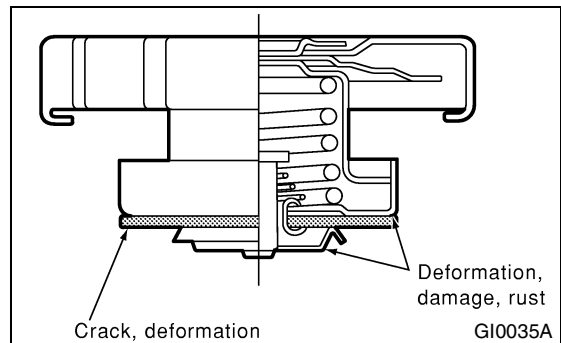
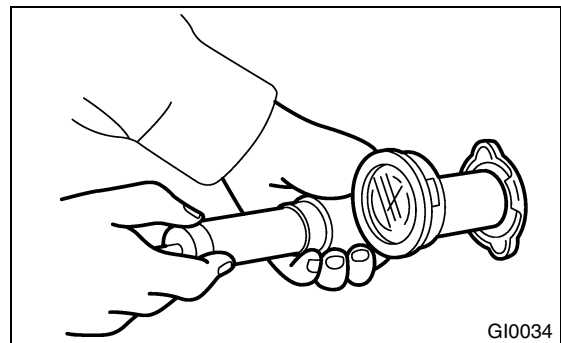
Radiator cap valve open pressure

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 the thermostat does not open at 76.0 to 80.0°C (169 to 176°F), replace it with a new one.

4) If the electric fan does not operate when coolant temperature exceeds 90 to 94°C (194 to 201°F), check the thermostitch or fan motor.

12. Coolant

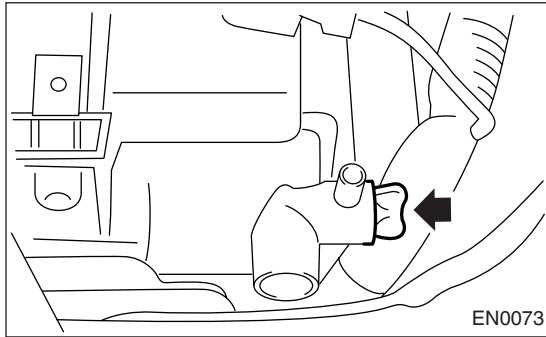
A: REPLACEMENT

1. REPLACEMENT OF COOLANT

WARNING:

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

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



- 5) For quick draining, open the radiator cap.

CAUTION:

Be careful not to spill coolant on the floor.

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

- 8) Slowly pour the 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)

2.0 L Non-turbo AT model:

Approx. 6.9 ℓ (7.3 US qt, 6.1 Imp qt)

2.0 L Non-turbo MT model:

Approx. 7.0 ℓ (7.4 US qt, 6.2 Imp qt)

2.0 L Turbo AT model:

Approx. 7.7 ℓ (8.1 US qt, 6.8 Imp qt)

2.0 L Turbo MT model:

Approx. 7.7 ℓ (8.1 US qt, 6.8 Imp qt)

2.5 L AT model:

Approx. 6.9 ℓ (7.3 US qt, 6.1 Imp qt)

2.5 L MT model:

Approx. 7.0 ℓ (7.4 US qt, 6.2 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 the radiator cap.
- 10) Run the engine for more than 5 minutes at 2,000 to 3,000 rpm. (Run the engine until radiator becomes hot in order to purge the air trapped in cooling system.)
- 11) Stop the engine and wait until coolant temperature lowers. Then open the 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 the radiator and reservoir tank caps.

COOLANT

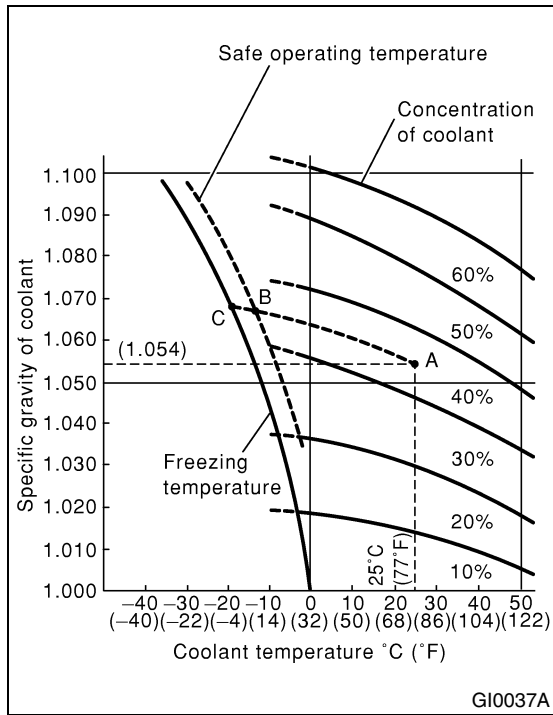
PERIODIC MAINTENANCE SERVICES

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

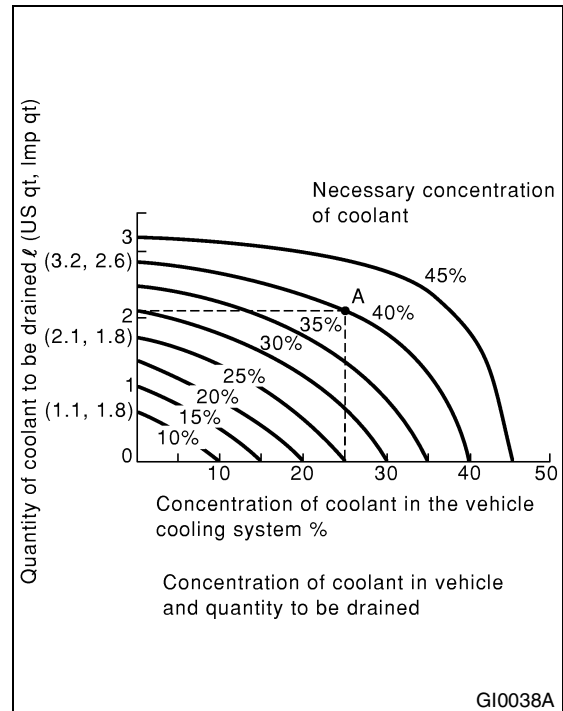
To adjust the concentration of the coolant according to temperature, find the proper fluid concentration in the above diagram and replace the necessary amount of coolant with an undiluted solution of SUBARU genuine coolant (concentration 50).

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.



13. 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 the engine sufficiently until cooling fan starts to operate.
- 3) Measure the idle mixture using CO meter.

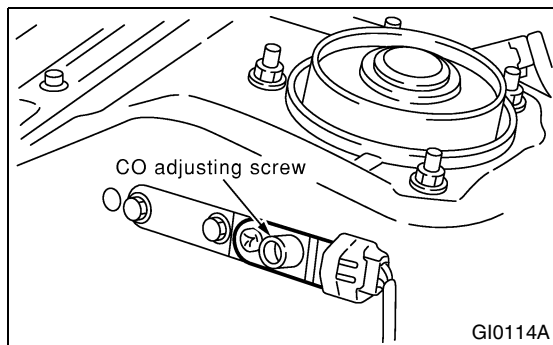
Engine idle speed	CO
700±100 rpm	1.0±0.5%

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 the 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 the 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.

CLUTCH SYSTEM

PERIODIC MAINTENANCE SERVICES

14. Clutch System

A: INSPECTION AND ADJUSTMENT

1. MECHANICAL CLUTCH TYPE

1) Inspect the 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):

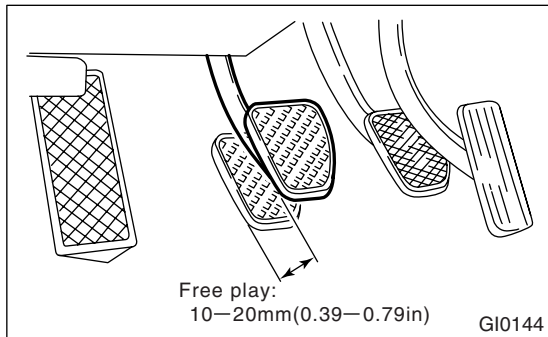
4.4 — 7.4 N·m

(0.45 — 0.75 kgf-m, 3.3 — 5.4 ft-lb)

Standard free play:

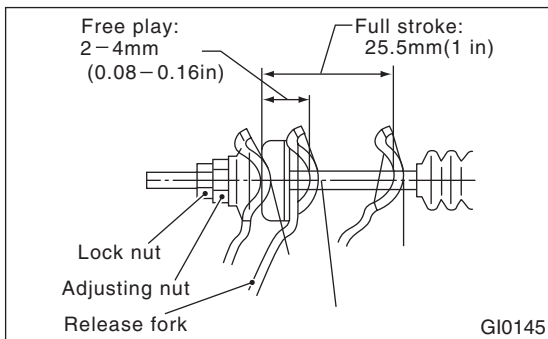
AT clutch pedal

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 the parking brake lever completely.

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

(3) Stop depressing the clutch pedal when gearshifting is complete. With the 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:

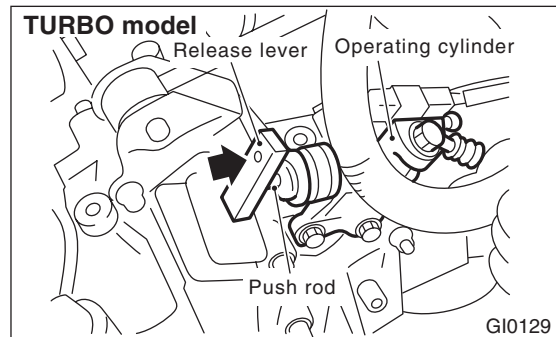
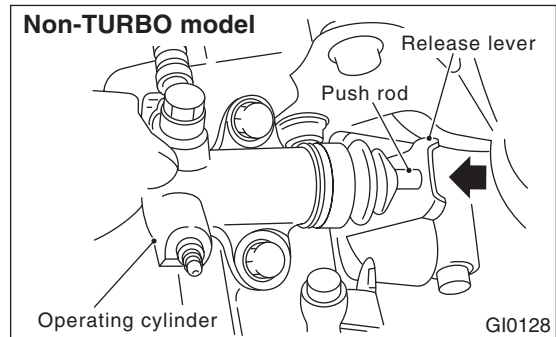
80 mm (3.15 in) or more

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-41, Clutch Pedal.>

4) Inspect the underside of master cylinder, clutch damper and operating cylinder for clutch system, hoses, piping and their couplings for fluid leaks. If fluid leaks are found, correct them by retightening their fitting bolt and/or replacing their parts.

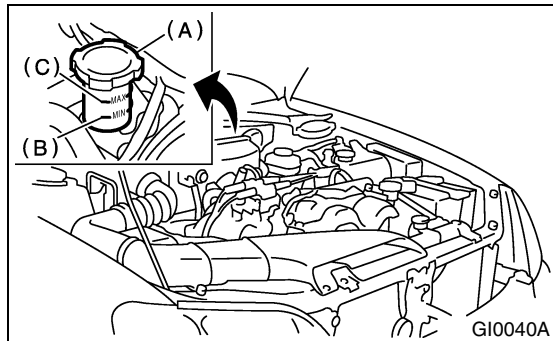
5) Check the fluid level using the scale on the outside of the clutch master cylinder tank (A). If the level is below "MIN" (B), add clutch fluid to bring it up to "MAX" (C).

Recommended clutch fluid:

FMVSS No. 116, fresh DOT3 or DOT4 brake fluid

NOTE:

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



15.Hill-holder System

A: INSPECTION AND ADJUSTMENT

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

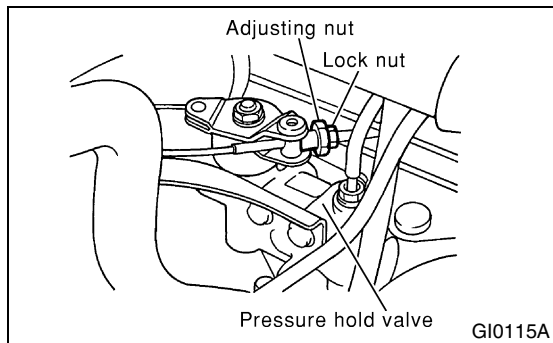
(1) When the vehicle does not stop;
Tighten the adjusting nut of PHV cable.

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

B; When the hill-holder is released earlier than engagement to clutch (vehicle slips down slightly): Tighten the 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 the adjusting nut, hold the inner cable with pliers to prevent it from turning.
- Replace the pressure hold valve (PHV), return spring of PHV or PHV cable with a new one, if they are defective and/or damaged.



16. Transmission Oil

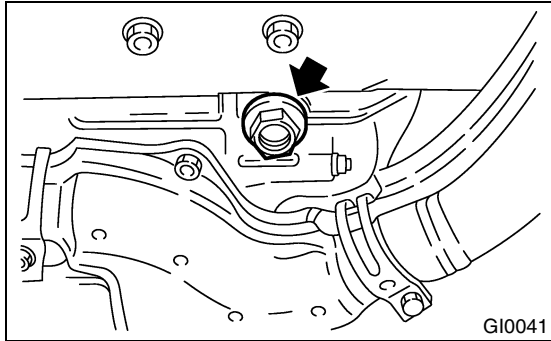
A: REPLACEMENT

1. MANUAL TRANSMISSION

1) Drain the 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 the 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.

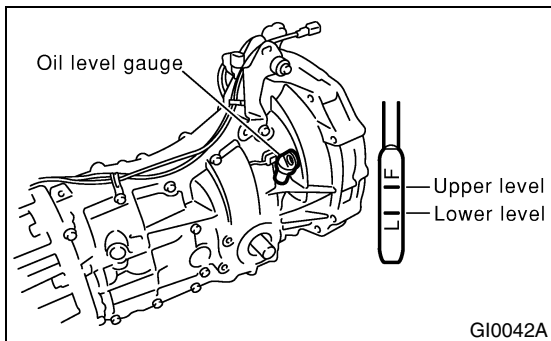
Gear oil capacity:

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)



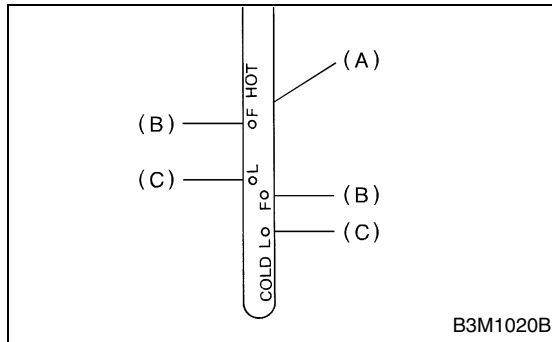
17.ATF

A: INSPECTION

1) Raise the ATF temperature to 70 to 80°C (158 to 176°F) from 20 to 30°C (68 to 86°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 the fluid level with engine idling.

NOTE:

After running, idle the engine for 1 or 2 minutes before measurement.

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

CAUTION:

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

4) Fluid temperature rising speed

- By idling the engine

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

<Reference>

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

- By running the vehicle

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

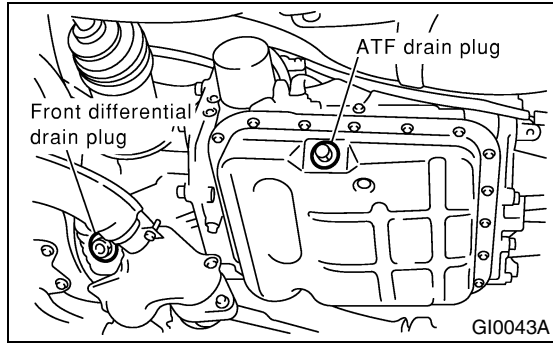
B: REPLACEMENT

1. AUTOMATIC TRANSMISSION FLUID

1) Drain the 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 the 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.

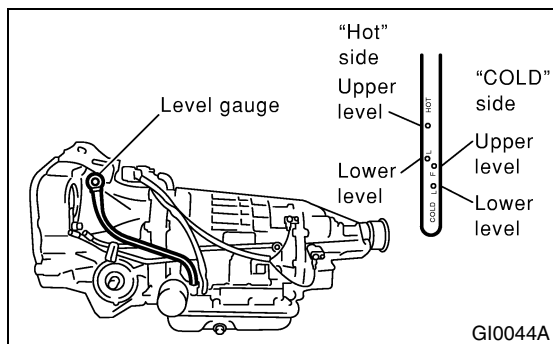
Recommended fluid:

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 a 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-45, ATF Filter.>

FRONT & REAR DIFFERENTIAL OIL

PERIODIC MAINTENANCE SERVICES

18. Front & Rear Differential Oil

A: REPLACEMENT

1. FRONT DIFFERENTIAL (MANUAL TRANSMISSION)

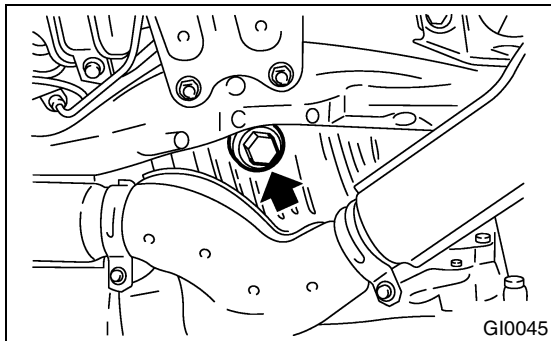
For MT vehicle, manual transmission oil works as differential oil to lubricate differential. Refer to "Transmission Oil". <Ref. to PM-25, Transmission Oil.>

2. FRONT DIFFERENTIAL (AUTOMATIC TRANSMISSION)

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

Tightening torque:

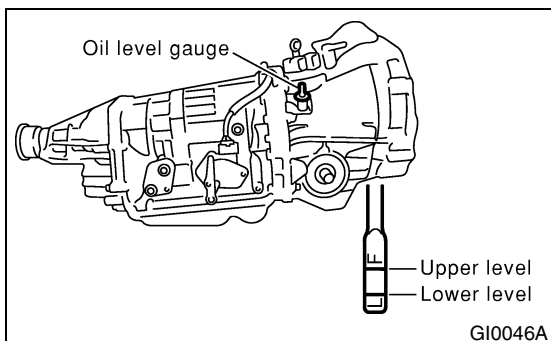
44 N-m (4.5 kgf-m, 32.5 ft-lb)

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

NOTE:

- Apply fluid packing to the 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 1.6 L and Non-turbo AT model:

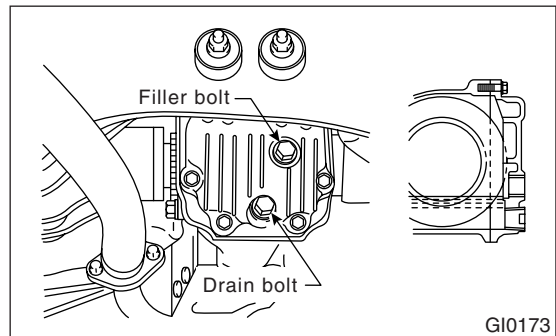
49.0 N-m (5.0 kgf-m, 36.2 ft-lb)

1.6 L and Non-turbo AT model:

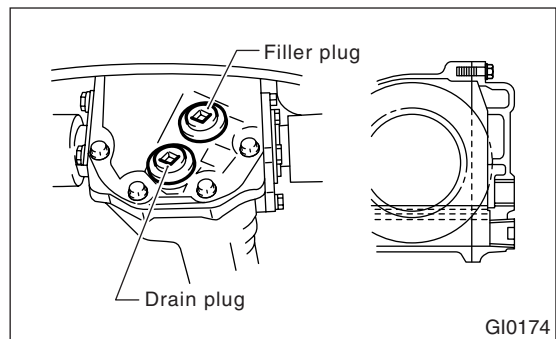
34 N-m (3.5 kgf-m, 25.3 ft-lb)

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

- 1.6 L and Non-turbo AT MODEL



- Except 1.6 L and Non-turbo MODEL



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.

FRONT & REAR DIFFERENTIAL OIL

PERIODIC MAINTENANCE SERVICES

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

NOTE:

- Apply fluid packing to the 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 1.6 L and Non-turbo AT model:

49.0 N·m (5.0 kgf-m, 36.2 ft-lb)

1.6 L and Non-turbo AT model:

34 N·m (3.5 kgf-m, 25.3 ft-lb)

BRAKE LINE

PERIODIC MAINTENANCE SERVICES

19. Brake Line

A: INSPECTION

1. BRAKE LINE

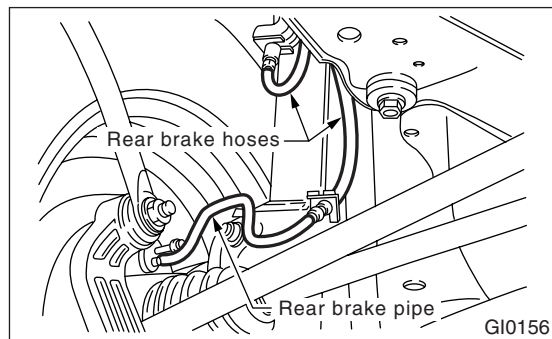
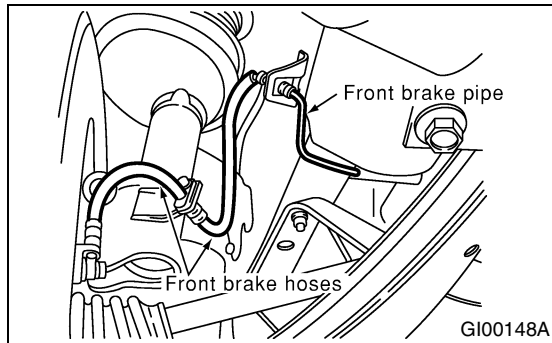
1) Check scratches, swelling, corrosion and/or traces of fluid leakage on the brake hoses or pipe joints.

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 the 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 the brake hose (using a mirror where it is difficult to see) for any damage.



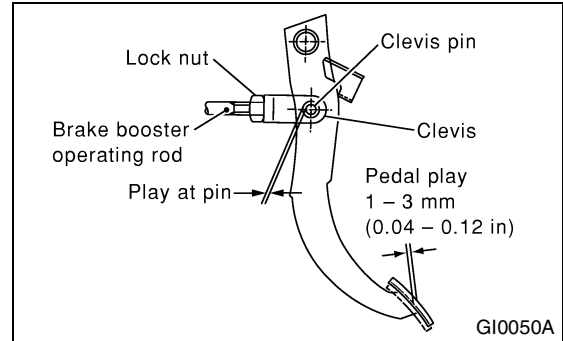
B: CHECKING

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)

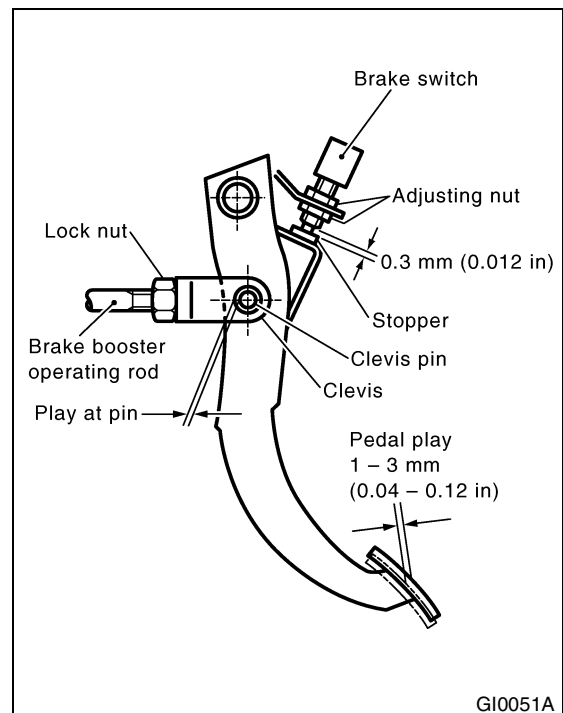


2) If the free play is out of specifications above, adjust the brake pedal as follows:

- (1) Be sure the 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).]

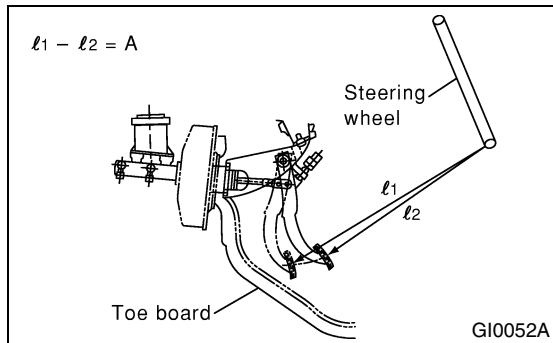
- (3) Depress the surface of brake pad by hand.
- (4) If there is no free play between clevis pin and clevis, turn the brake switch adjusting nut until the clearance between stopper and screw of brake switch becomes 0.3 mm (0.012 in).



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 brake pedal and steering wheel. With the brake pedal released, measure the distance between 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 possibility of air inside 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.

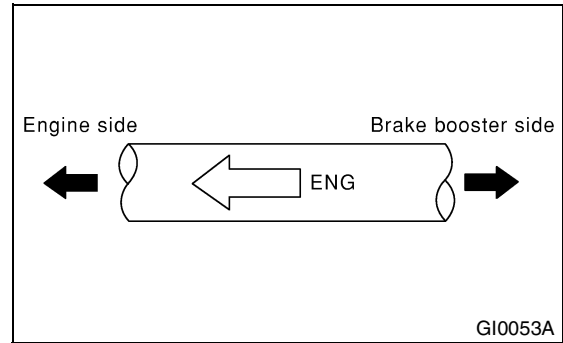
2) With the brake pedal depressed, start the engine: Make sure the pedal should move slightly toward the floor.

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 the vacuum hose. Disconnect the vacuum hose to inspect function of check valve.

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

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



5) Check the 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.

20. Brake Fluid

A: REPLACEMENT

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

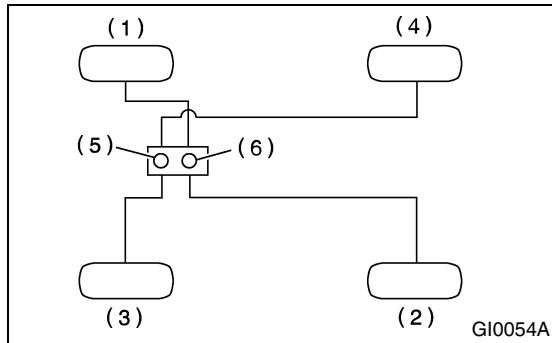
Recommended brake fluid:

FMVSS No. 116, fresh DOT3 or 4 brake fluid

NOTE:

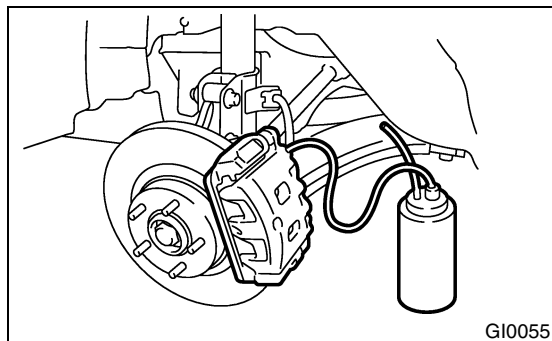
- Avoid mixing different brands of brake fluid to prevent degrading the quality of the fluid.
- Be careful not to allow dirt or dust to get into the reservoir tank.

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 the bleeder with waste cloth, when loosening it, to prevent brake fluid from being splashed over surrounding parts.
 - During bleeding operation, keep the brake reservoir tank filled with brake fluid to eliminate entry of air.
 - Brake pedal operation must be very slow.
 - For convenience and safety, it is advisable to have two men working.
 - The amount of brake fluid required is approx. 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 the bleeder screw approx. 1/4 turn until a small amount of brake fluid drains into container, and then quickly tighten the screw.
 - 8) Repeat steps 6) and 7) above until there are no air bubbles in the 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 the 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 the brake pedal with a force of approx. 294 N (30 kgf, 66 lb) and hold it there for approx. 20 seconds. At this time check the pedal to see if it makes any unusual movement. Visually inspect the bleeder screws and brake pipe joints to make sure that there is no fluid leakage.
- 12) Install the wheels, and drive the vehicle for a short distance between 2 to 3 km (1 to 2 miles) to make sure that brakes are operating properly.

DISC BRAKE PADS AND DISCS

PERIODIC MAINTENANCE SERVICES

21. Disc Brake Pads and Discs

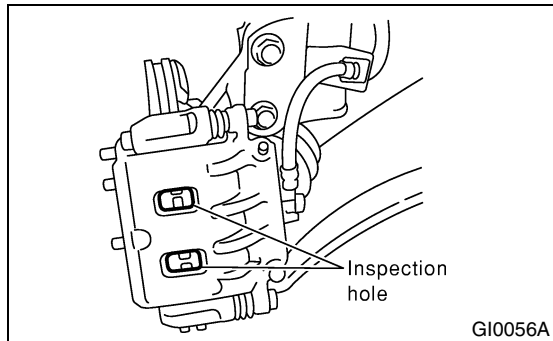
A: INSPECTION

1. DISC BRAKE PAD AND DISC

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

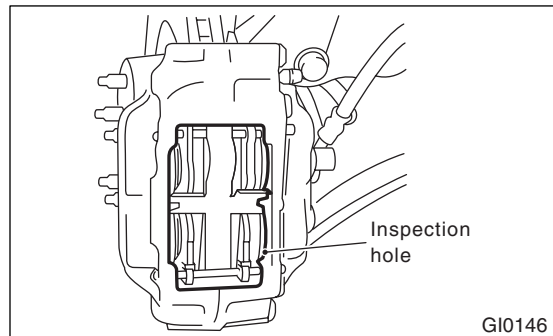
2) Visually check the pad thickness through inspection hole of disc brake assembly. Replace the pad if necessary.

- Non-turbo MODEL

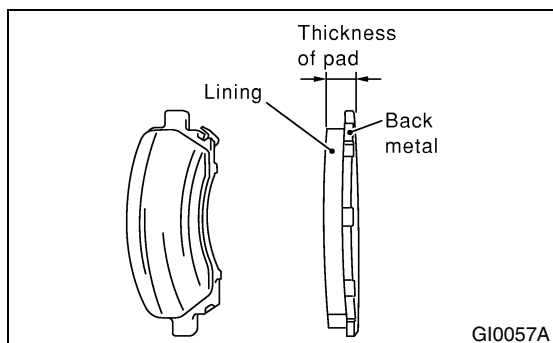


Pad thickness including back metal		mm (in)
	Front	Rear
Standard	17 (0.67)	14 (0.55)
Service limit	7.5 (0.295)	6.5 (0.256)

- 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.

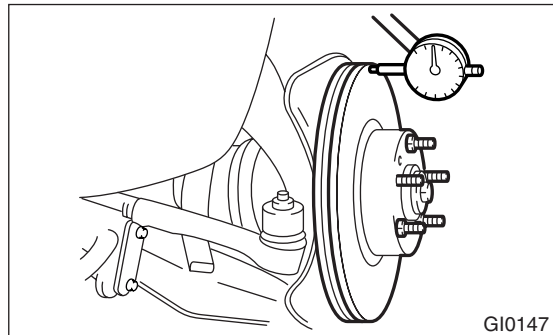
Disc rotor runout limit:

Front: 0.070 mm (0.0028 in)

Rear: 0.075 mm (0.0030 in)

NOTE:

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



BRAKE LININGS AND DRUMS

PERIODIC MAINTENANCE SERVICES

22. Brake Linings and Drums

A: INSPECTION

1. REAR DRUM BRAKE

1) Remove the 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 the brake shoes for damage or deformities and check brake linings for wear.

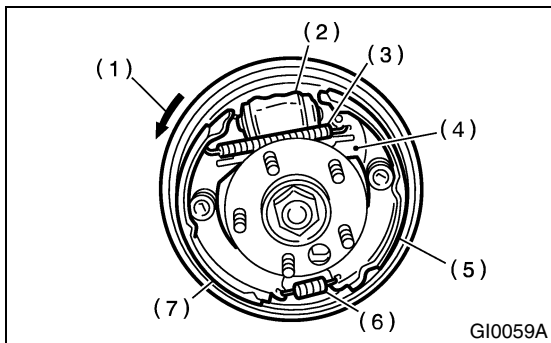
NOTE:

- Always replace both leading and trailing brake shoes for the right and left wheels at the same time.
- When either the right and left 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 the trailing shoe, remove the cotter pin. Clevis pin should also be replaced if worn.

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

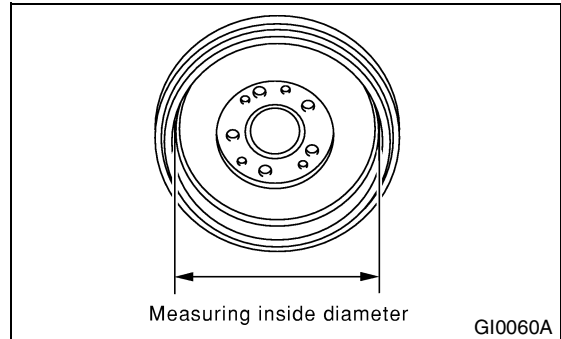
If the inside surface of brake drum is streaked, correct the surface with emery cloth (#200 or more). If it is unevenly worn, tapered, or the outside surface of brake drum is damaged, correct or replace it.

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

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

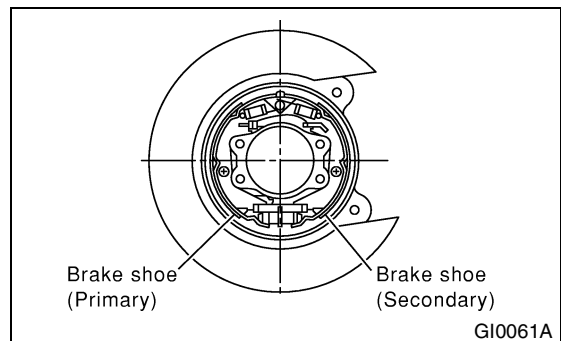
NOTE:

Always replace both primary and secondary brake shoes for the right and left 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)



BRAKE LININGS AND DRUMS

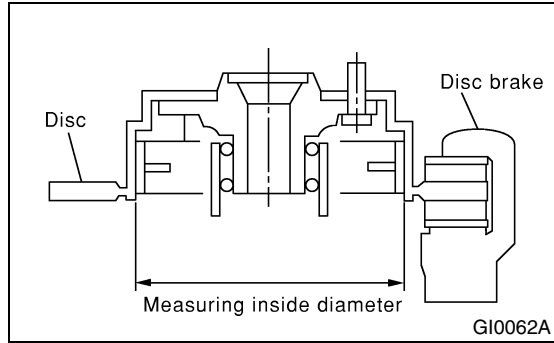
PERIODIC MAINTENANCE SERVICES

2) Check the 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

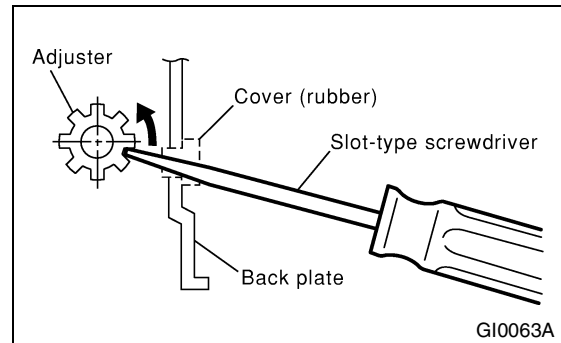
The main brake is adjusted automatically, and so there is no need to adjust it.

2. PARKING BRAKE (REAR DISC BRAKE)

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

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

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



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

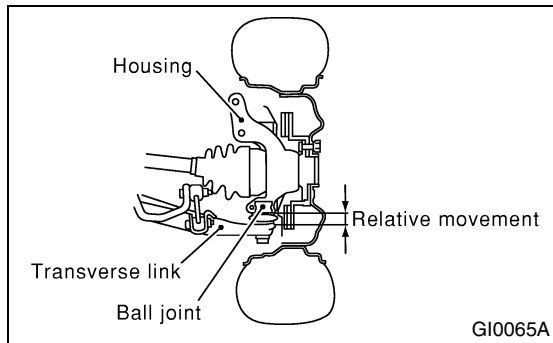
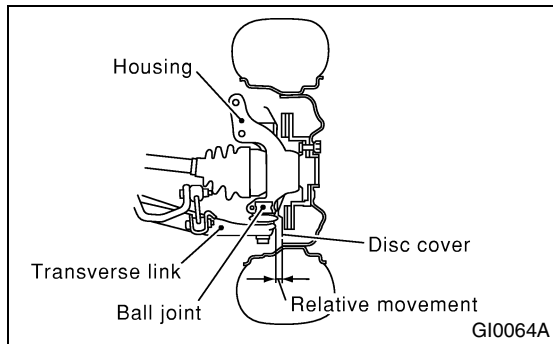
4) Install the cover (rubber) at original position correctly.

23. Suspension

A: INSPECTION

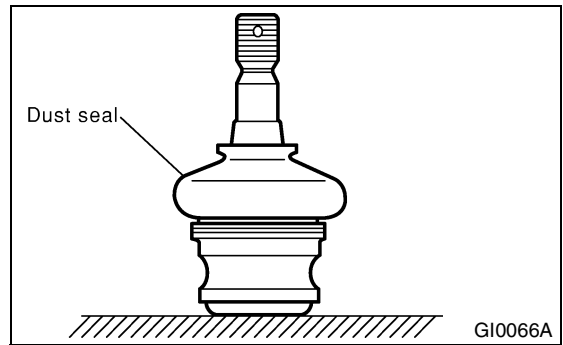
1. SUSPENSION BALL JOINT

- 1) Jack-up the vehicle until front wheels are off ground.
- 2) Next, grasp the bottom of tire and move it in and out. If relative movement is observed between the brake disc cover and end of transverse link, ball joint may be excessively worn.
- 3) Next, grasp the end of transverse link and move it up and down. Relative movement between the 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 the ball joint. If free play exceeds standard, replace the ball joint. <Ref. to FS-18, Front Ball Joint.>



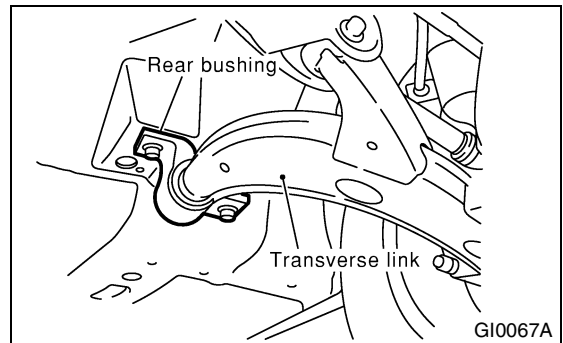
- 5) Damage of dust seal
Visually inspect the ball joint dust seal. If it is damaged, remove the transverse link. <Ref. to FS-16, Front Transverse Link.> And measure free play of ball joint. <Ref. to FS-18, Front Ball Joint.>
 - (1) When looseness exceeds standard value, replace the ball joint.
 - (2) If the dust seal is damaged, replace with the new ball joint.

NOTE:
When the transverse link ball joint has been removed or replaced, check the toe-in of front wheel. If the front wheel toe-in is not at specified value, adjust the 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 the bushing.



3. WHEEL ARCH HEIGHT

- 1) Unload cargoes and set the vehicle in curb weight (empty) condition.
- 2) Then, check the wheel arch height of front and rear suspensions to ensure that they are within specified values.
- 3) When the wheel arch height is out of standard, visually inspect the 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 the wheel arch height by replacing coil spring in the suspension which wheel arch height is out of standard. <Ref. to FS-8, Wheel Alignment.> <Ref. to RS-9, Wheel Alignment.>

4. WHEEL ALIGNMENT OF FRONT SUSPENSION

- 1) Check the 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 the caster angle does not conform to standard value, visually inspect the following components and replace deformed parts.
 - Suspension components [Strut assembly, cross-member, transverse link, etc.]
 - Body parts to which suspensions are installed.
- 3) When the toe-in and camber are out of standard value, adjust them so that they conform to respective service standard.
- 4) When the right-and-left turning angles of tire are out of standard, adjust to standard value.

5. WHEEL ALIGNMENT OF REAR SUSPENSION

- 1) Check the alignment of rear suspension to ensure that following items are within standard values.
 - Toe-in
 - Camber angle
 - Thrust angle<Ref. to RS-9, Wheel Alignment.>
- 2) When the camber angle does not conform to standard value, visually inspect parts listed below. If deformation is observed, replace the 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 the 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 the 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 the bolts and nuts shown in the figure for looseness. Retighten the bolts and nuts to specified torque. If the 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.>

SUSPENSION

PERIODIC MAINTENANCE SERVICES

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 the damaged parts with new ones. If minor rust formation, pitting, etc. are noted, remove the 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.

24. Wheel Bearing

A: INSPECTION

1. FRONT WHEEL BEARING

NOTE:

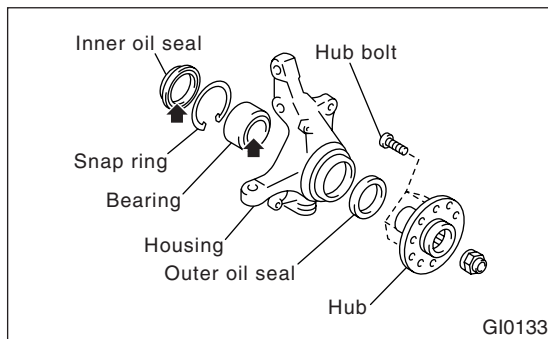
Inspect the condition of front wheel bearing grease.

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

Service limit:

Straight-ahead position within 0.05 mm (0.0020 in)

- 5) Remove the bolts and self-locking nuts, and extract transverse link from front crossmember.
 - 6) While lightly hammering the spring pin which secures S.F.J. to transmission spindle, remove it.
 - 7) Extract the S.F.J. from transmission spindle. <Ref. to DS-18, Front Axle.>
 - 8) While supporting the front drive shaft horizontally with one hand, turn the hub with the other to check for noise or binding.
- If the hub is noisy or binds, disassemble the front axle and check condition of oil seals, bearing, etc.



2. REAR WHEEL BEARING

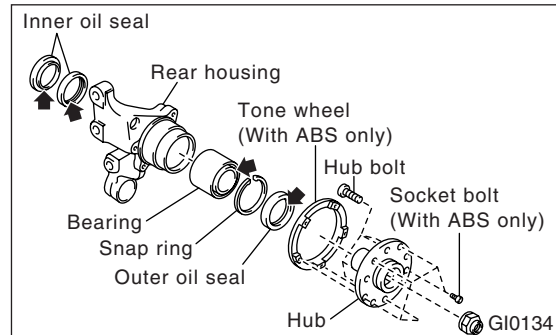
- 1) Jack-up the rear of vehicle.
- 2) While holding the rear wheel by hand, swing it in and out to check bearing free play.
- 3) Loosen the wheel nuts and remove rear wheel.
- 4) If the bearing free play exists in step 2) above, attach a dial gauge to the hub COMPL and measure axial displacement in 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-39, Rear Drive Shaft.>

- 6) While supporting the rear drive shaft horizontally with one hand, turn the hub COMPL with the other to check for noise or binding.
- If the hub COMPL is noisy or binds, disassemble the rear axle and check condition of oil seals, bearings, etc.



AXLE BOOTS & JOINTS

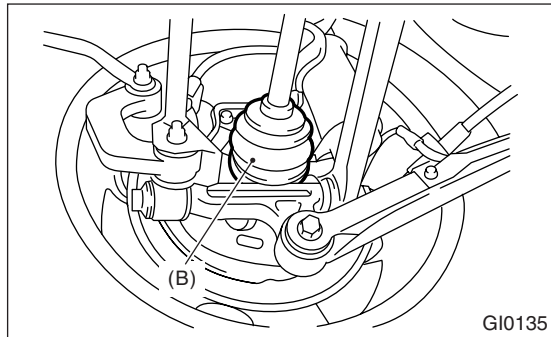
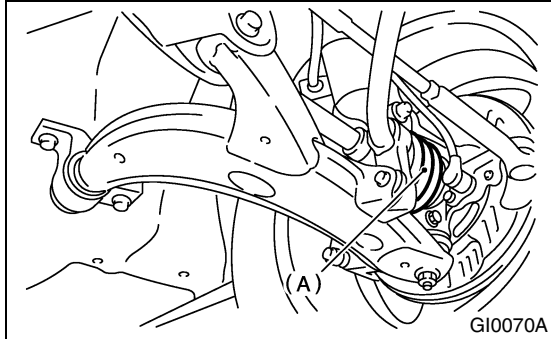
PERIODIC MAINTENANCE SERVICES

25. Axle Boots & Joints

A: INSPECTION

1. FRONT AND REAR AXLE BOOTS

Inspect the front axle boots (A) and rear axle boots (B) for deformation, damage or failure. If faulty, replace them with new ones. <Ref. to DS-33, Front Drive Shaft.> <Ref. to DS-39, Rear Drive Shaft.>



2. PROPELLER SHAFT

Inspect the propeller shaft for damage or failure. If faulty, replace with a new one. <Ref. to DS-15, Propeller Shaft.>

26. Steering System (Power Steering)

A: INSPECTION

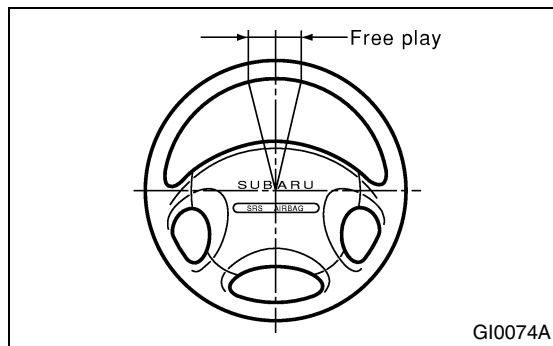
1. STEERING WHEEL

- 1) Set the steering wheel in a straight-ahead position, and check the wheel spokes to make sure they are correctly set in their specified positions.
- 2) Lightly turn the steering wheel to the right and left 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 the 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 the 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:

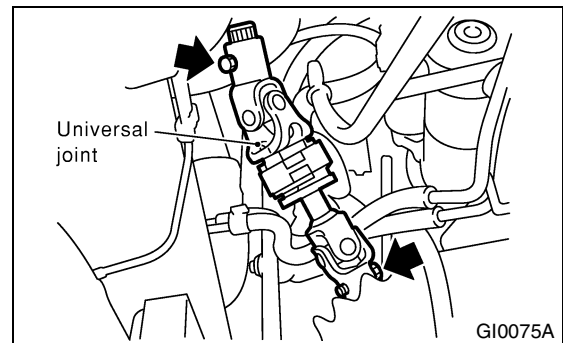
0.5 mm (0.020 in)

2. STEERING SHAFT JOINT

- 1) When the steering wheel free play is excessive, disconnect the 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)



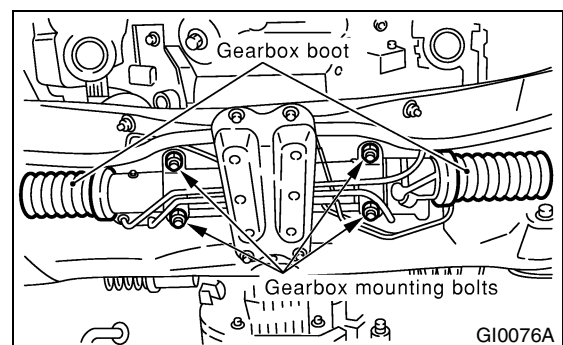
3. GEARBOX

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

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

Tightening torque:

59 N·m (6.0 kgf·m, 43.4 ft·lb)



- 2) Check the boot for damage, cracks or deterioration.

- 3) With the vehicle on a level surface, quickly turn the steering wheel to the right and left.

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

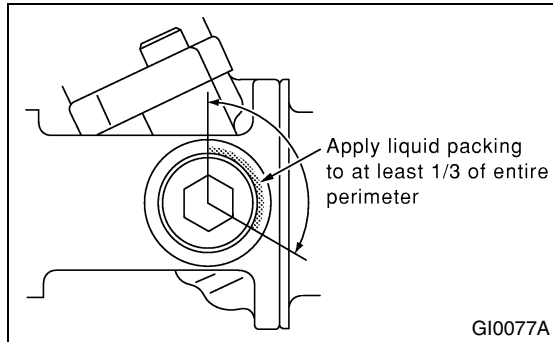
- (1) Tighten the adjusting screw to 7.4 N·m (0.75 kgf·m, 5.4 ft·lb) and then loosen. Repeat this operation twice.

- (2) Retighten the 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 the lock nut. While holding the adjusting screw with a wrench, tighten the lock nut using ST.

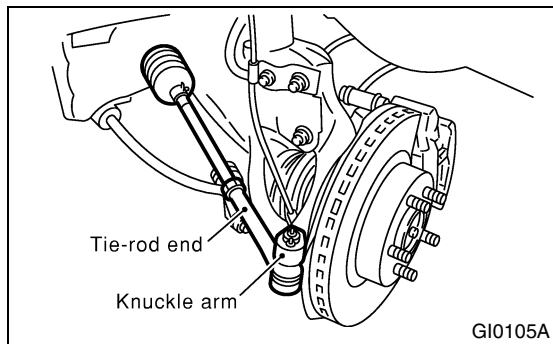
ST 926230000 SPANNER

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

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

4. TIE-ROD

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



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

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

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

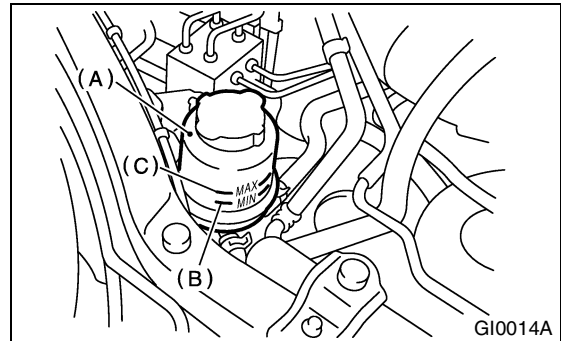
Tightening torque:
83 N·m (8.5 kgf·m, 61.5 ft·lb)

5. POWER STEERING FLUID LEVEL

NOTE:

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

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



NOTE:

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

Recommended fluid:
Dexron IIE or III

Fluid capacity:
0.7 l (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:

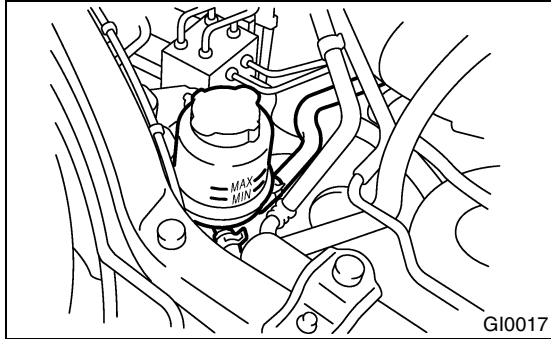
- Wipe the leakage fluid off after correcting fluid leaks, or a wrong diagnosis is taken later.
- Also pay attention to clearances between hoses (or pipings) and other parts when inspecting fluid leaks.

7. HOSES OF OIL PUMP FOR DAMAGES

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

NOTE:

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



8. POWER STEERING PIPES FOR DAMAGE

Check the power steering pipes for corrosion and damage.

Replace the pipes with a new one if necessary.

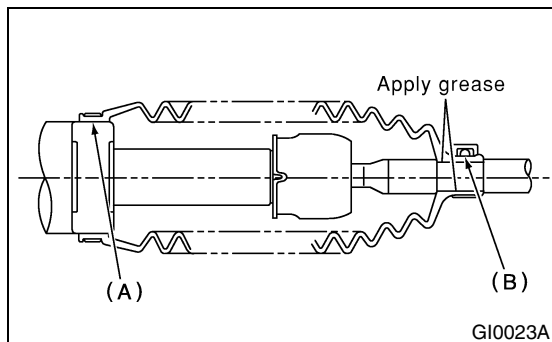
9. GEARBOX BOOTS

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) the position of gearbox boot against twist of it produced by adjustment of toe-in, etc.



10. FITTING BOLTS AND NUTS

Inspect the 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.

SUPPLEMENTAL RESTRAINT SYSTEM

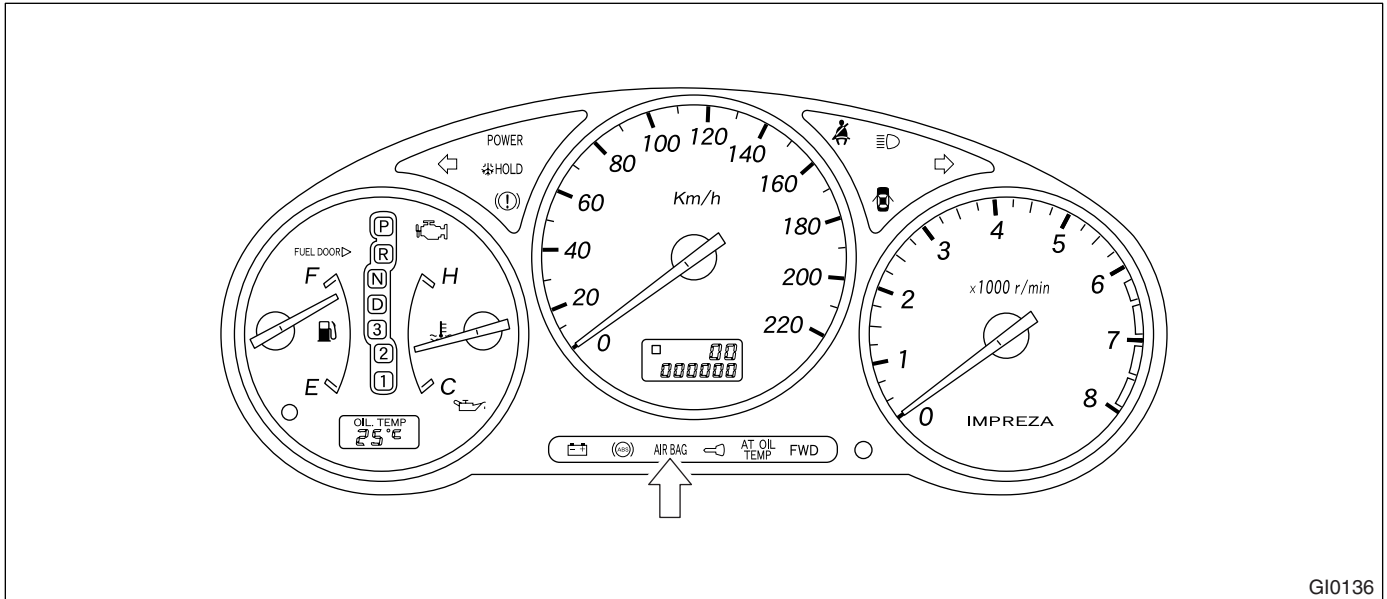
PERIODIC MAINTENANCE SERVICES

27. 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. When the ignition switch is turned ON with the connector(s) disconnected, the airbag warning light blinks to identify the fault.



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

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

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

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

INTAKE (INDUCTION) IN

MECHANICAL ME

EXHAUST EX

COOLING CO

LUBRICATION LU

SPEED CONTROL SYSTEMS SP

IGNITION IG

STARTING/CHARGING SYSTEMS SC

ENGINE (DIAGNOSTICS) EN

FUEL INJECTION (FUEL SYSTEMS)



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GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

1. General Description

A: SPECIFICATIONS

Model		1600 cc and 2000 cc	2500 cc
Fuel tank	Capacity	50 ℓ (13.2 US gal, 11.0 Imp gal)	60 ℓ (15.9 US gal, 13.2 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

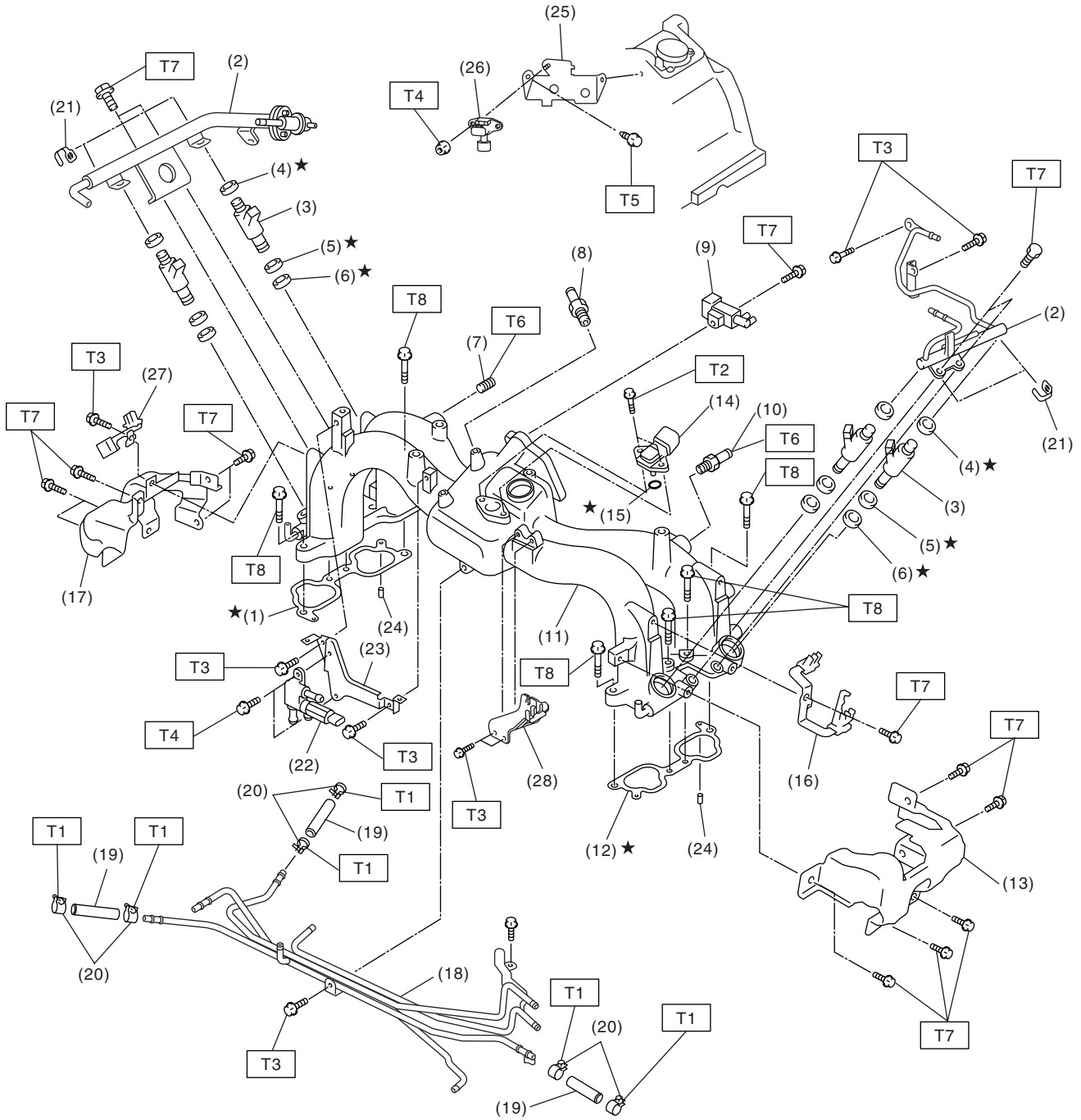
FUEL INJECTION (FUEL SYSTEMS)

GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

B: COMPONENT

1. INTAKE MANIFOLD



EN1383

GENERAL DESCRIPTION

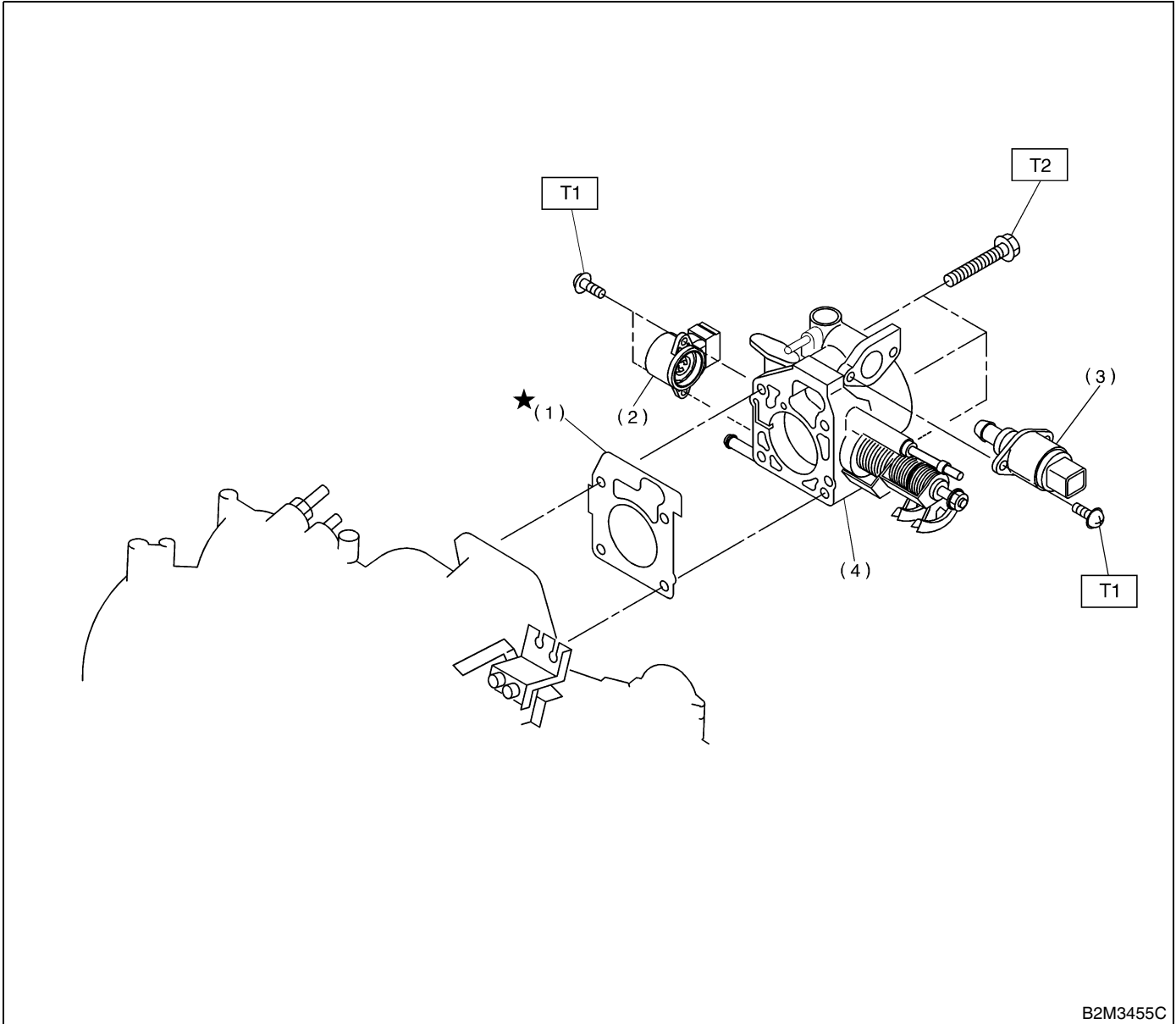
FUEL INJECTION (FUEL SYSTEMS)

(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	<hr/> Tightening torque: N-m (kgf-m, ft-lb)
(5) O-ring	(19) Fuel hose	T1: 1.5 (0.15, 1.1)
(6) O-ring	(20) Clip	T2: 3.4 (0.35, 2.5)
(7) Plug	(21) Clip	T3: 5.0 (0.51, 3.7)
(8) PCV valve	(22) Air assist injector solenoid valve	T4: 6.4 (0.65, 4.7)
(9) Purge control solenoid valve	(23) Air assist injector solenoid valve bracket	T5: 7.4 (0.75, 5.4)
(10) Nipple		T6: 17(1.7, 12.5)
(11) Intake manifold	(24) Guide pin	T7: 19 (1.9, 14.0)
(12) Intake manifold gasket LH	(25) Atmospheric pressure sensor bracket	T8: 25 (2.5, 18.4)
(13) Fuel pipe protector LH		<hr/>
(14) Intake air temperature and pressure sensor	(26) Atmospheric pressure sensor	
	(27) Plug cord holder RH	

GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

2. AIR INTAKE SYSTEM



B2M3455C

- (1) Gasket
- (2) Throttle position sensor
- (3) Idle air control solenoid valve

- (4) Throttle body

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

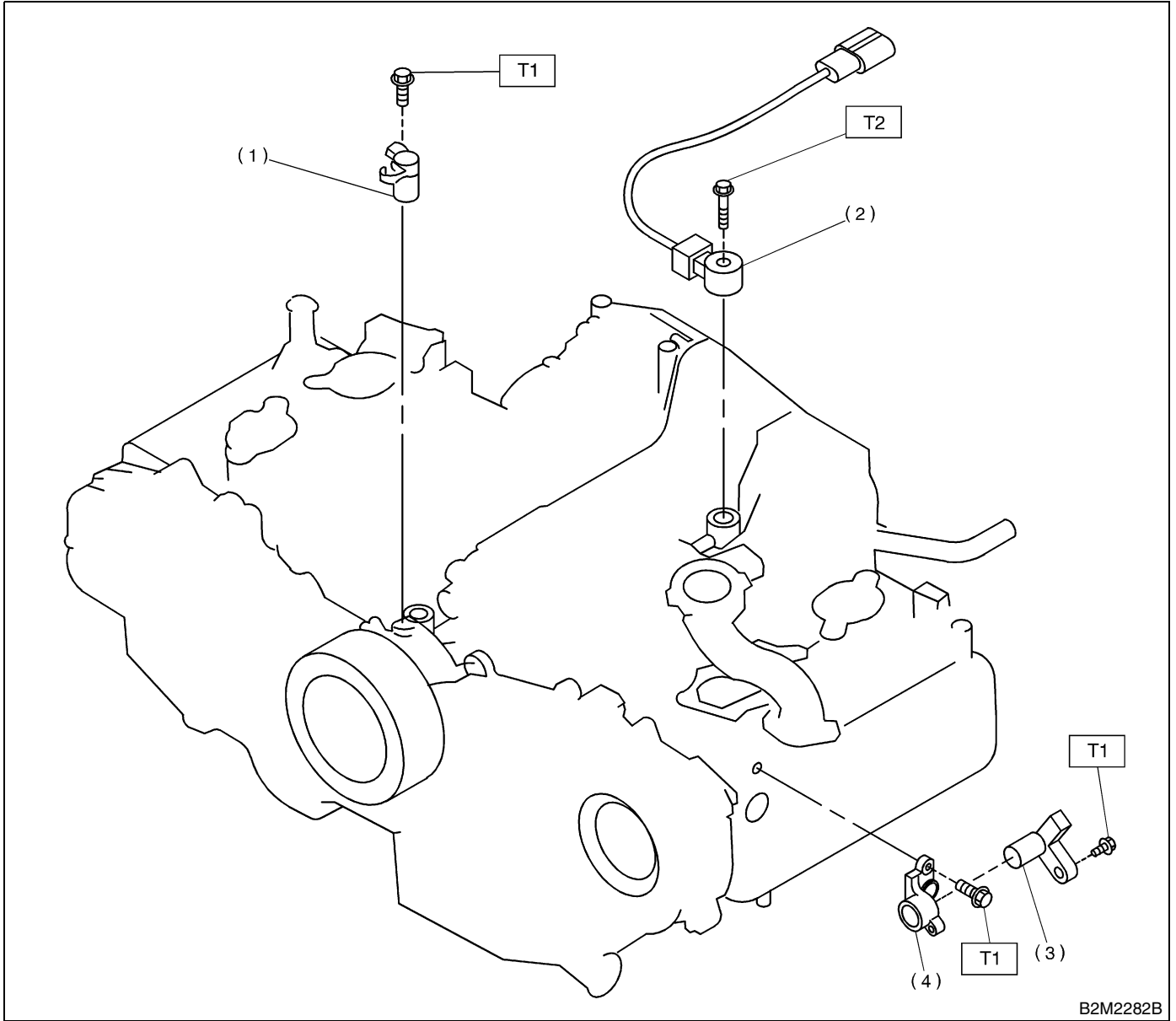
T1: 1.6 (0.16, 1.2)

T2: 22 (2.2, 16.2)

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)

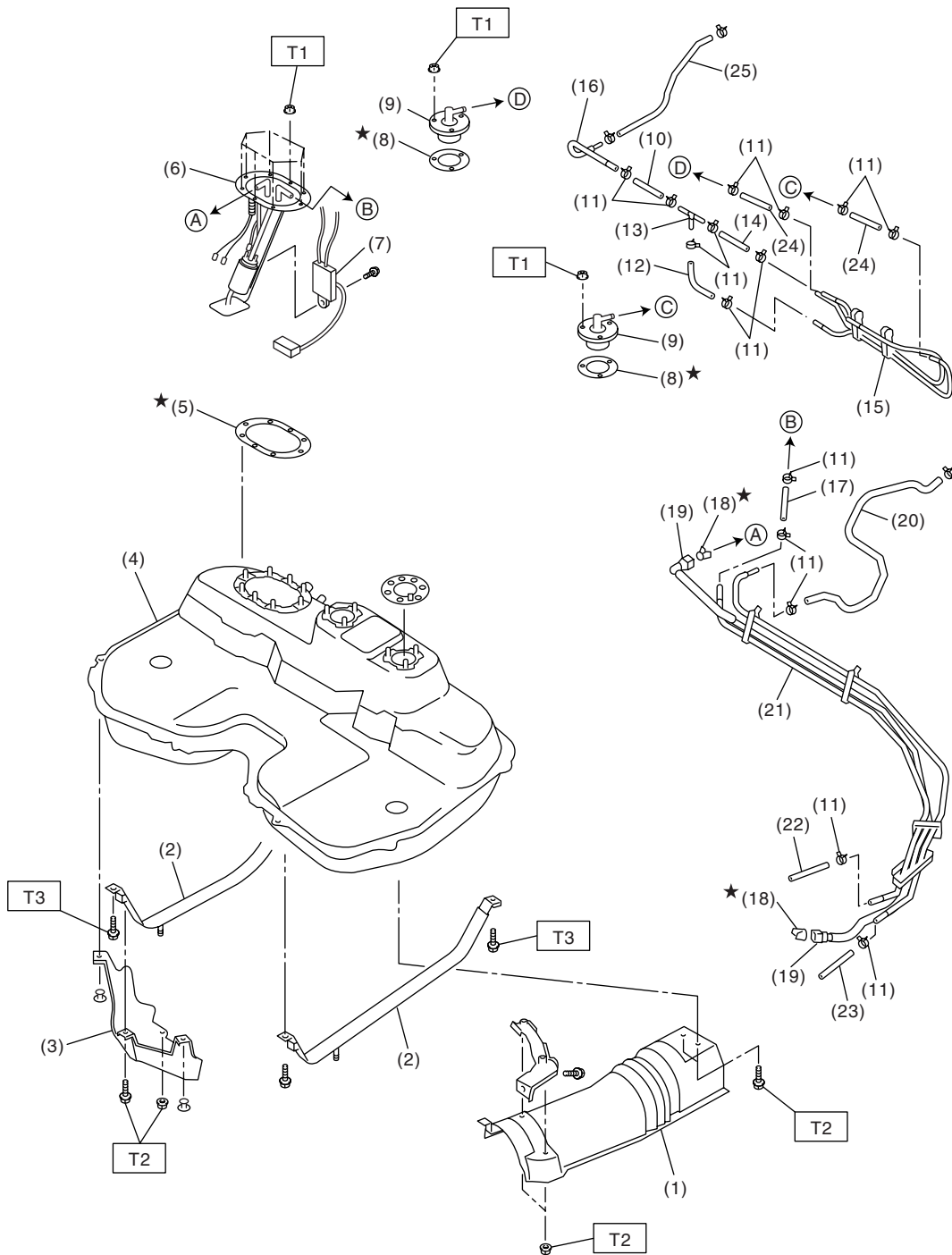
T2: 24 (2.4, 17.4)

GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

4. FUEL TANK

• 1600 CC and 2000 CC MODEL



EN0439

GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

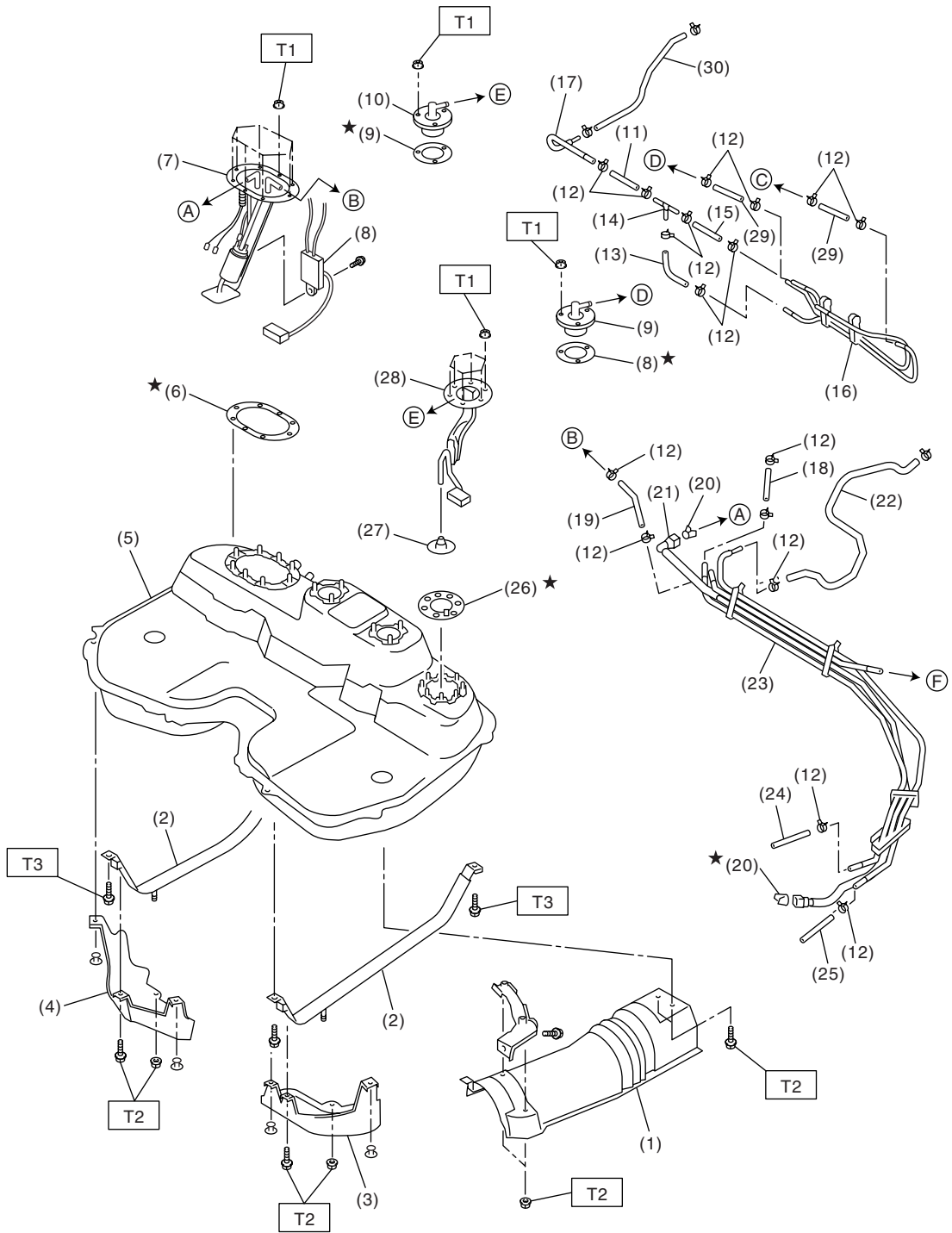
(1) Heat shield cover	(11) Clip	(21) Fuel pipe ASSY
(2) Fuel tank band	(12) Evaporation hose B	(22) Evaporation hose F
(3) Protector RH	(13) Joint pipe	(23) Fuel return hose B
(4) Fuel tank	(14) Evaporation hose C	(24) Evaporation hose G
(5) Fuel pump gasket	(15) Evaporation pipe ASSY	(25) Evaporation 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, 24.3)**

GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

• 2500 CC MODEL



EN1503

GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

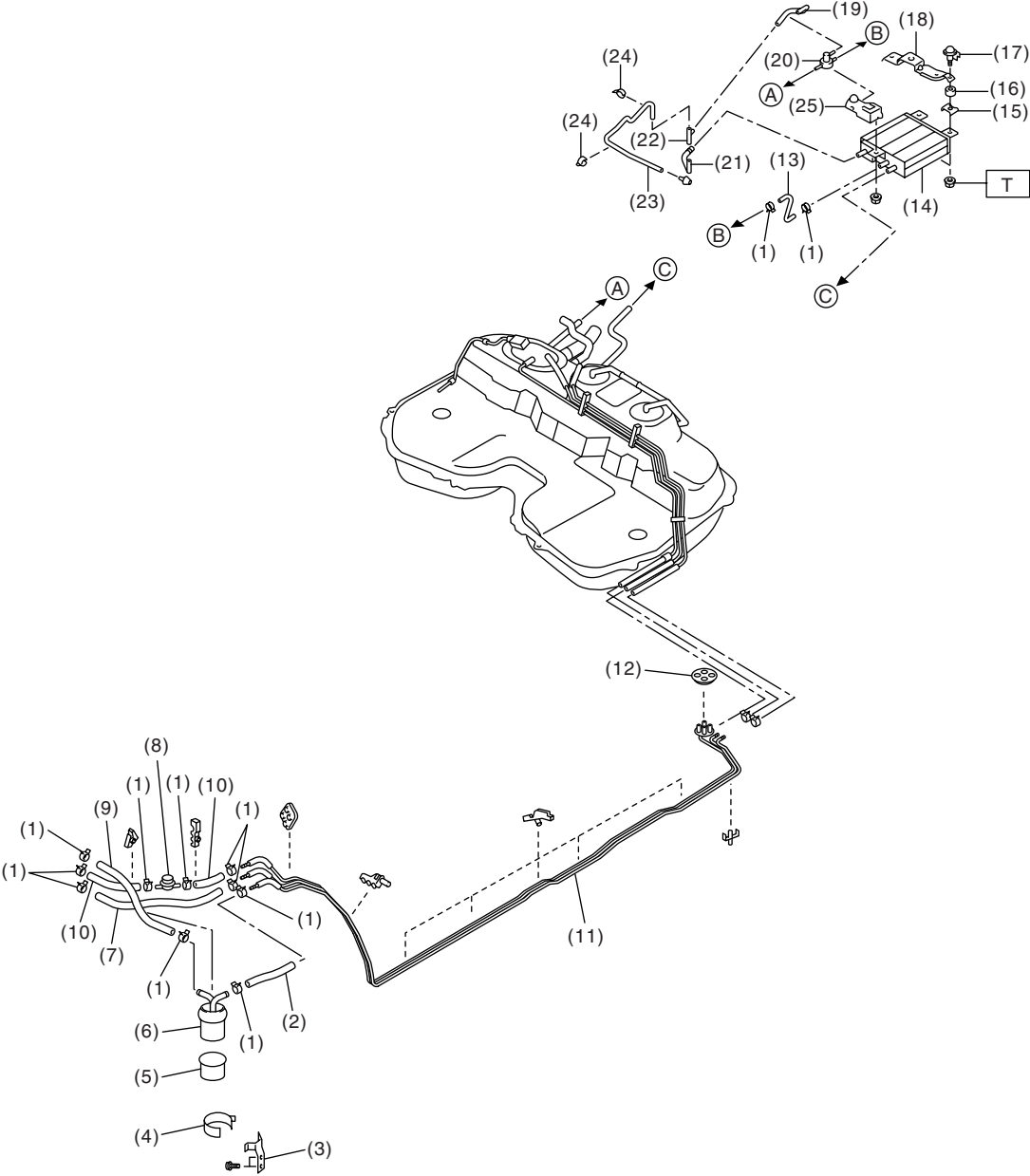
- | | | |
|---------------------------|----------------------------|----------------------------|
| (1) Heat shield cover | (13) Evaporation hose B | (25) Fuel return hose B |
| (2) Fuel tank band | (14) Joint pipe | (26) Fuel sub meter gasket |
| (3) Protector LH | (15) Evaporation hose C | (27) Jet 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, 24.3)**

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 | |

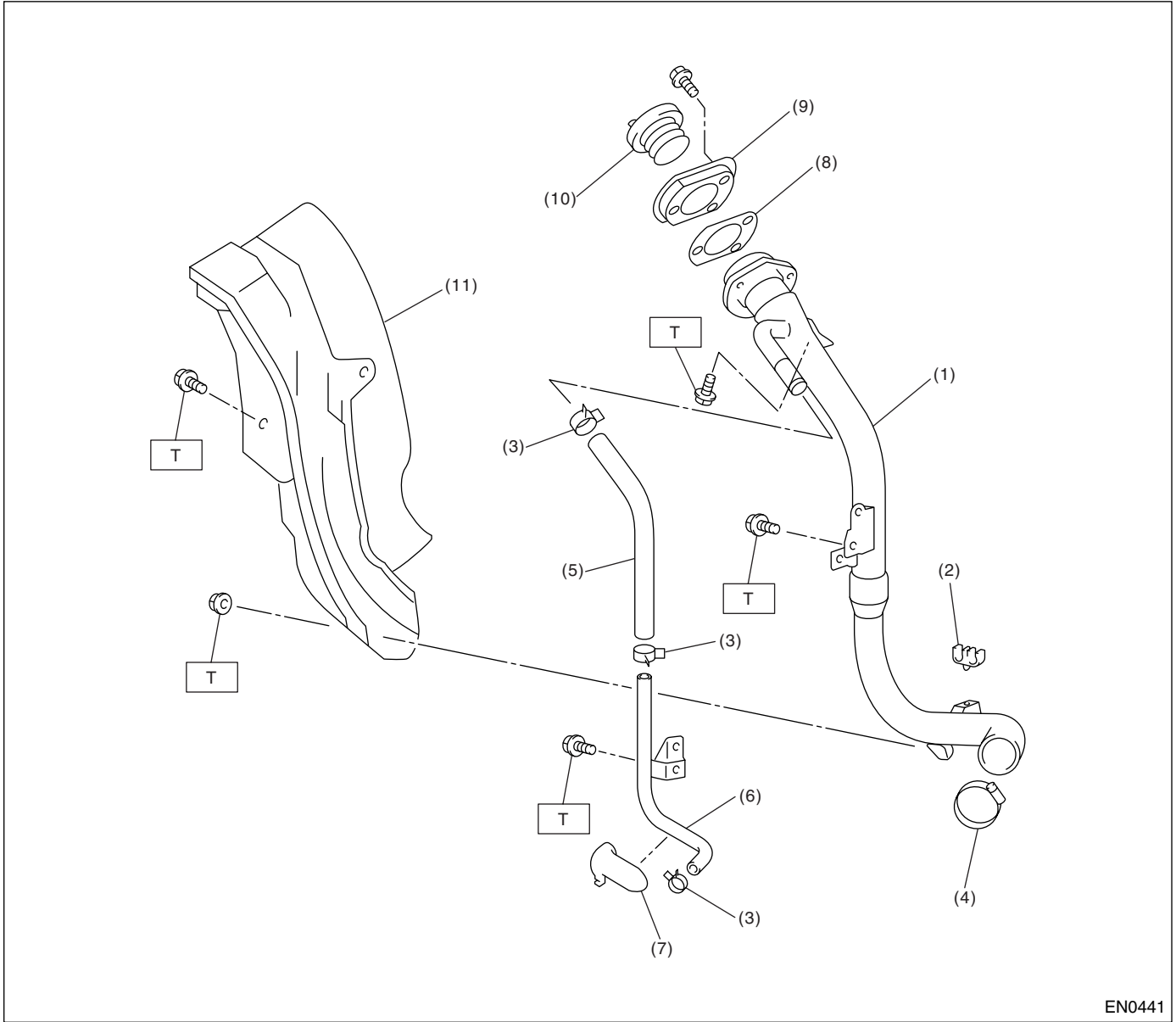
Tightening torque: N·m (kgf-m, ft-lb)

T: 23 (2.3, 17.0)

GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

6. FUEL FILLER PIPE



EN0441

- (1) Fuel filler pipe ASSY
- (2) Evaporation hose holder
- (3) Clip
- (4) Clamp
- (5) Air vent hose

- (6) Air vent pipe
- (7) Air vent pipe holder
- (8) Filler pipe packing
- (9) Filler ring
- (10) Filler cap

- (11) Filler pipe protector

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

T: 7.5 (0.76, 5.53)

GENERAL DESCRIPTION

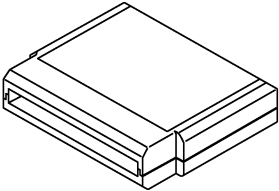

FUEL INJECTION (FUEL SYSTEMS)

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

D: PREPARATION TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p>B2M3876</p>	24082AA190 (Newly adopted tool)	CARTRIDGE	Troubleshooting for electrical system.
 <p>B2M3877</p>	22771AA030	SELECT MONITOR KIT	Troubleshooting for electrical systems. <ul style="list-style-type: none"> • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

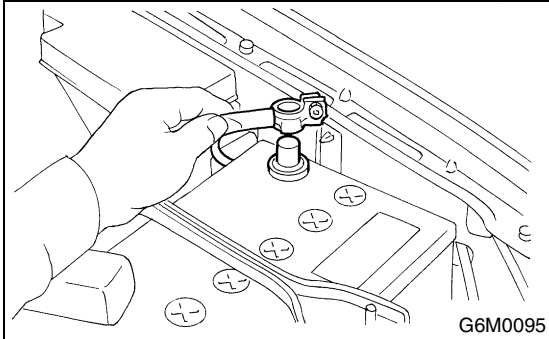
THROTTLE BODY

FUEL INJECTION (FUEL SYSTEMS)

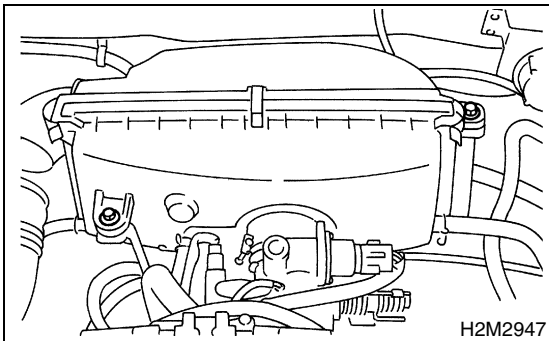
2. Throttle Body

A: REMOVAL

1) Disconnect the ground cable from battery.

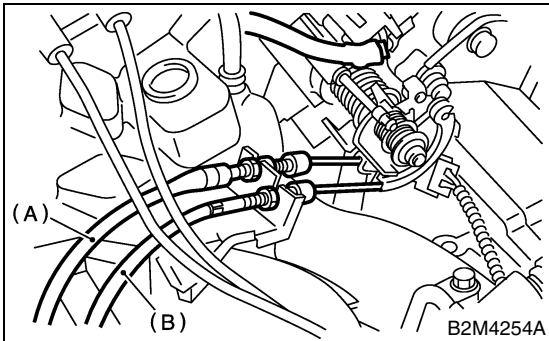


2) Remove the air cleaner case.



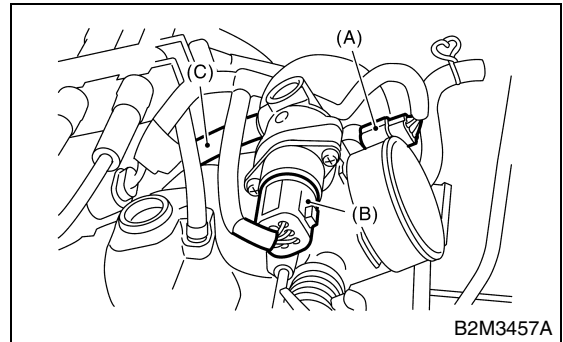
3) Disconnect the accelerator cable (A).

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



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

6) Disconnect the air by-pass hose from air assist injector solenoid valve.

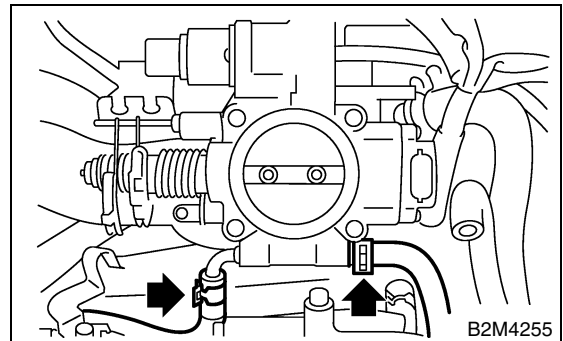


(A) Throttle position sensor

(B) Idle air control solenoid valve

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

7) Disconnect the engine coolant hoses from throttle body.



8) Remove the bolts which install throttle body to intake manifold.

B: INSTALLATION

Install in the reverse order of removal.

NOTE:

Always use a new gasket.

Tightening torque:

Throttle body;

22 N·m (2.2 kgf-m, 16.2 ft-lb)

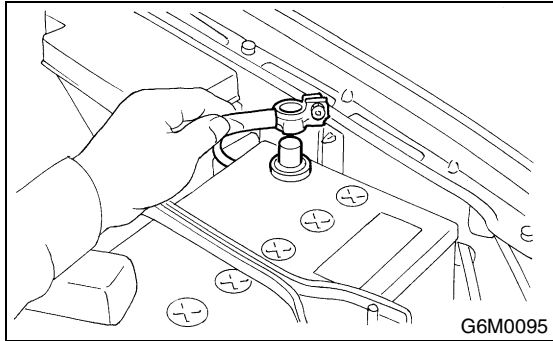
Air cleaner case;

6.5 N·m (0.66 kgf-m, 4.8 ft-lb)

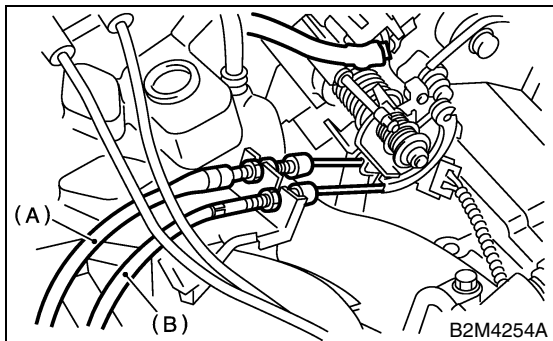
3. Intake Manifold

A: REMOVAL

- 1) Release the fuel pressure.
<Ref. to FU-54, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 2) Open the fuel flap lid and remove fuel filler cap.
- 3) Disconnect the ground cable from battery.



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

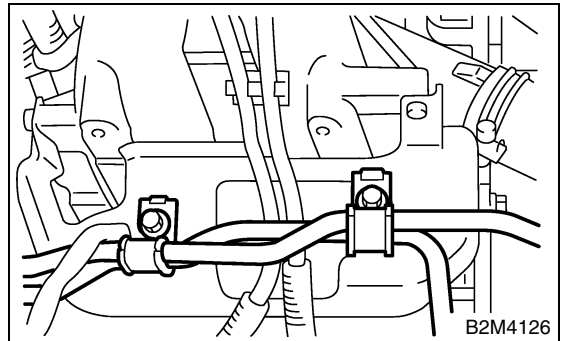


- 7) Remove the power steering pump and tank from brackets.
 - (1) Remove the resonator chamber.
<Ref. to IN-8, REMOVAL, Resonator Chamber.>
 - (2) Remove the front side V-belt.
<Ref. to ME-44, REMOVAL, V-belt.>

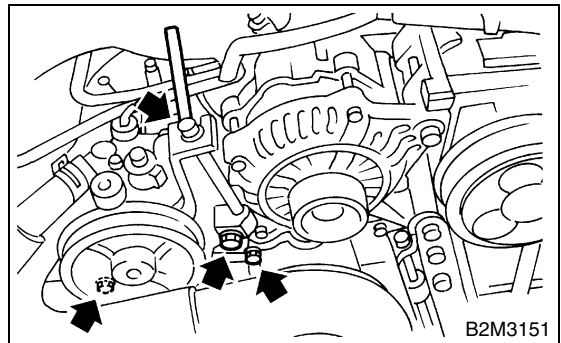
- (3) Remove the bolts which hold power steering pipes onto intake manifold protector.

NOTE:

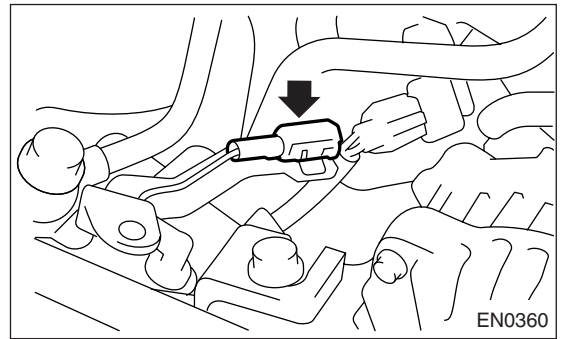
Do not disconnect the power steering hose.



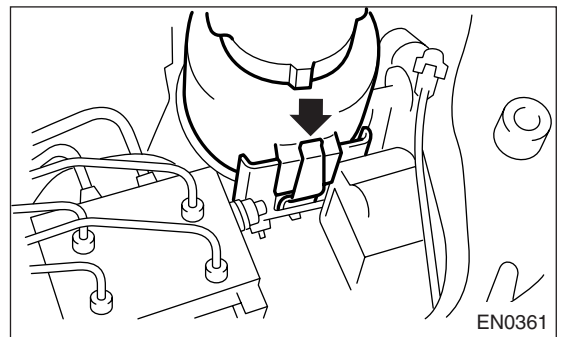
- (4) Remove the bolts which install power steering pump bracket.



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



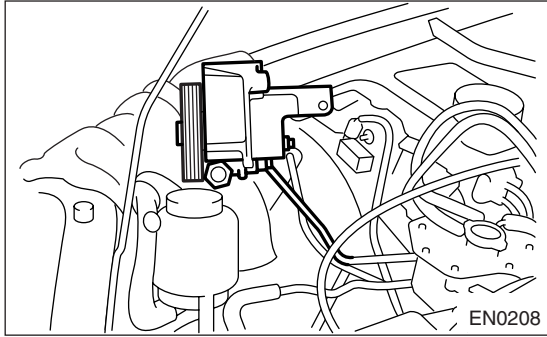
- (6) Remove the power steering tank from the bracket by pulling it upwards.



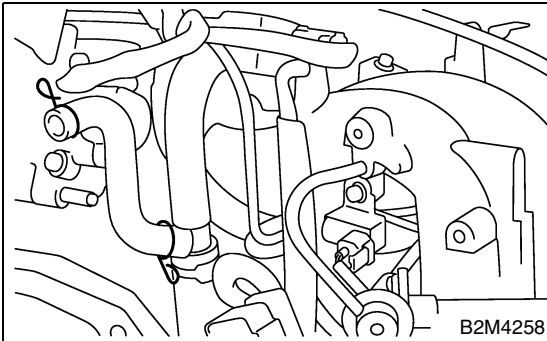
INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

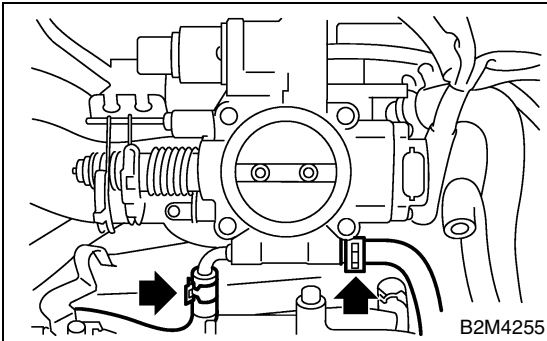
- (7) Place the power steering pump and tank on right side wheel apron.



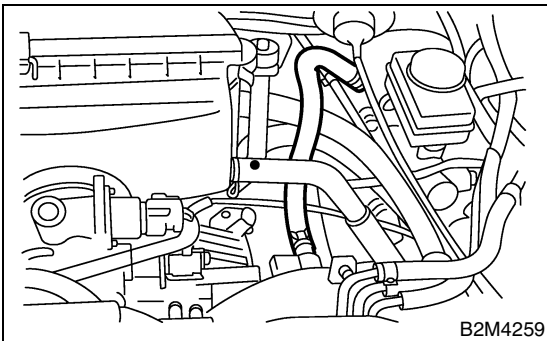
- 8) Disconnect the spark plug cords from spark plugs.
9) Disconnect the PCV hose from intake manifold.



- 10) Disconnect the engine coolant hose from throttle body.



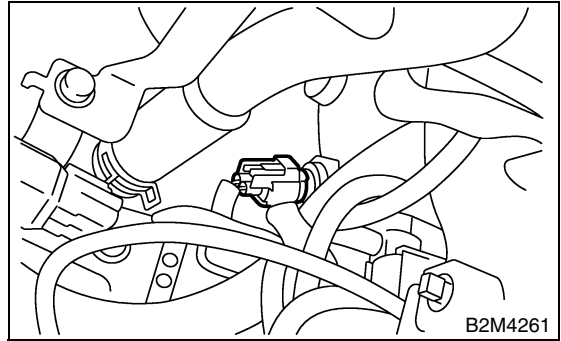
- 11) Disconnect the brake booster hose.



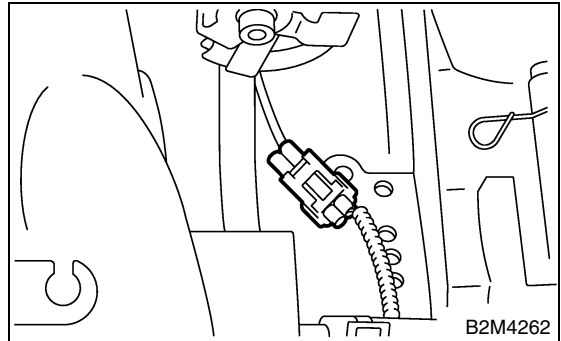
- 12) Remove the air cleaner case stay RH and engine harness bracket, and disconnect the engine harness connectors from bulkhead harness connectors.



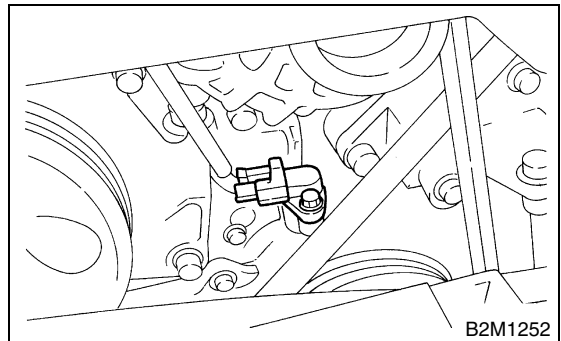
- 13) Disconnect the connectors from engine coolant temperature sensor.



- 14) Disconnect the knock sensor connector.



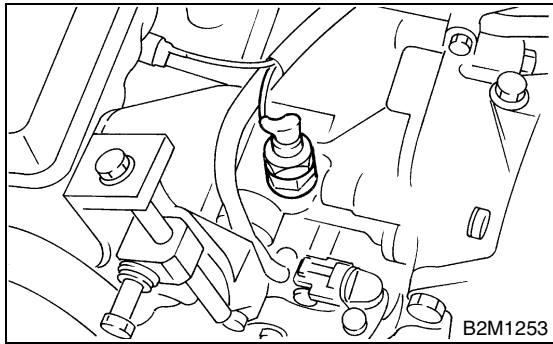
- 15) Disconnect the connector from crankshaft position sensor.



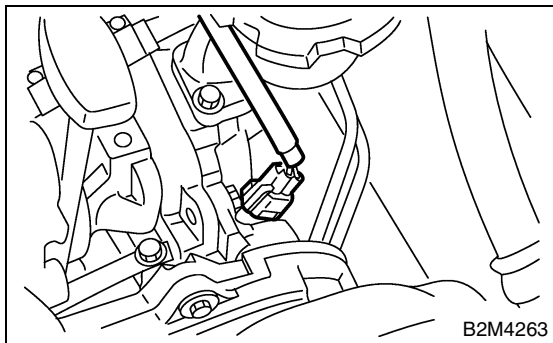
INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

16) Disconnect the connector from oil pressure switch.



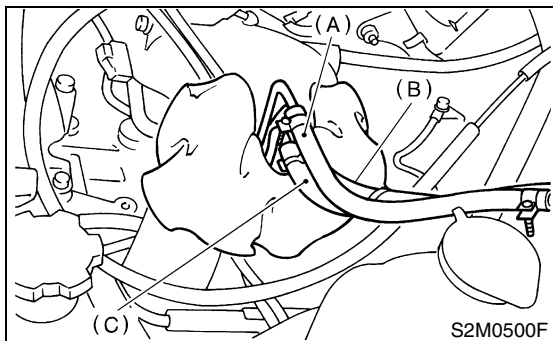
17) Disconnect the connector from camshaft position sensor.



18) Disconnect the fuel hoses from fuel pipes.

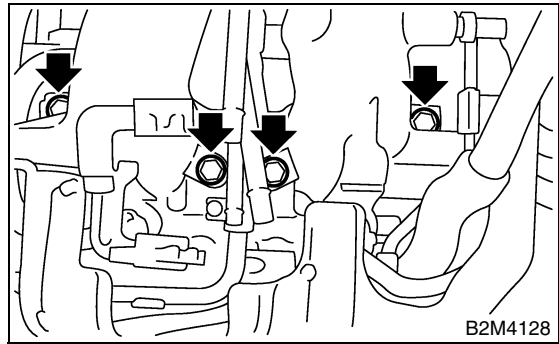
WARNING:

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

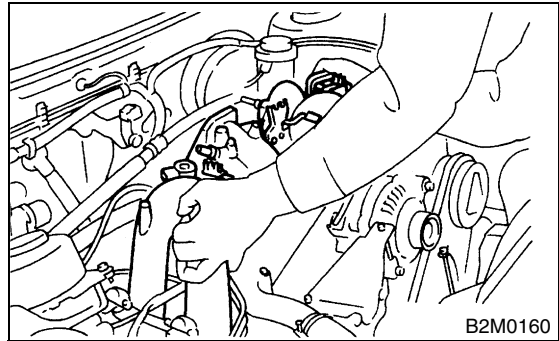


- (A) Fuel delivery hose
- (B) Return hose
- (C) Evaporation hose

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



20) Remove the intake manifold.



B: INSTALLATION

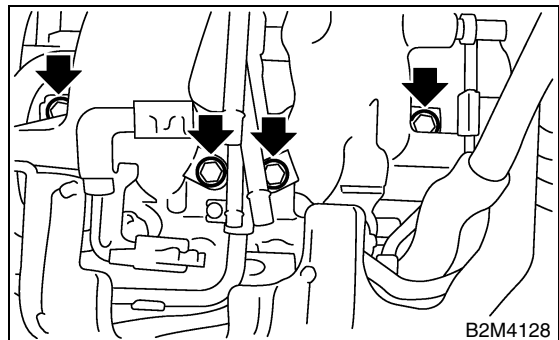
1) Install the intake manifold onto cylinder heads.

NOTE:

Always use new gaskets.

Tightening torque:

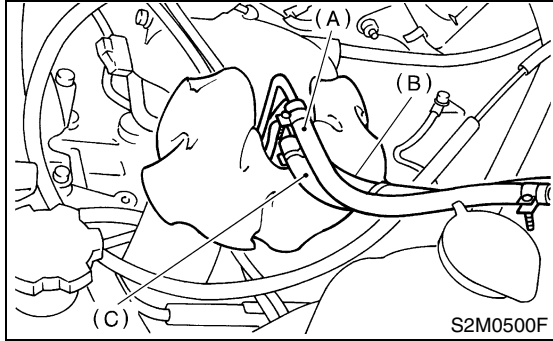
25 N·m (2.5 kgf·m, 18.4 ft·lb)



INTAKE MANIFOLD

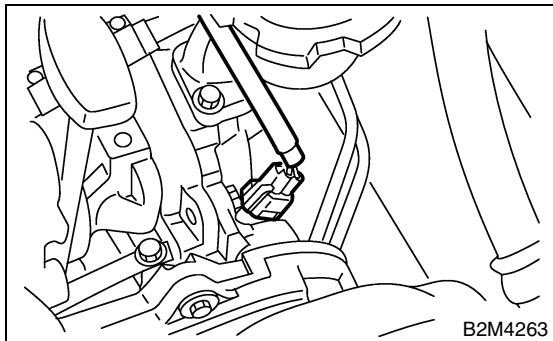
FUEL INJECTION (FUEL SYSTEMS)

2) Connect the fuel hoses.

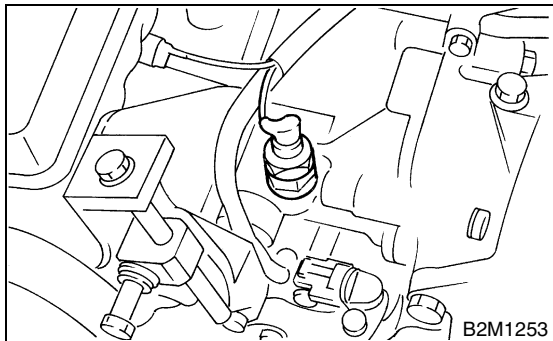


- (A) Fuel delivery hose
- (B) Return hose
- (C) Evaporation hose

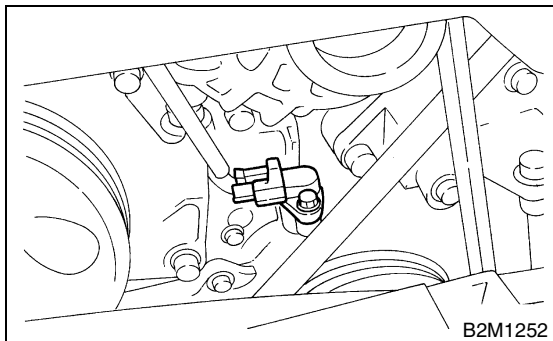
3) Connect the connector to camshaft position sensor.



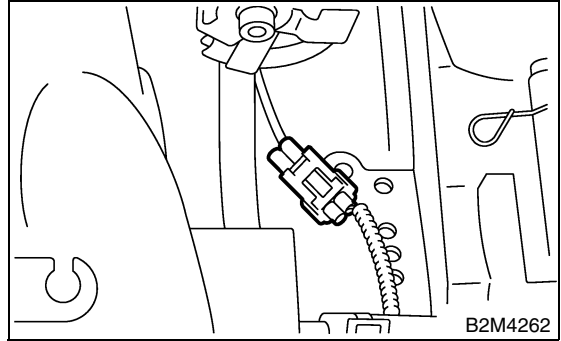
4) Connect the connector to oil pressure switch.



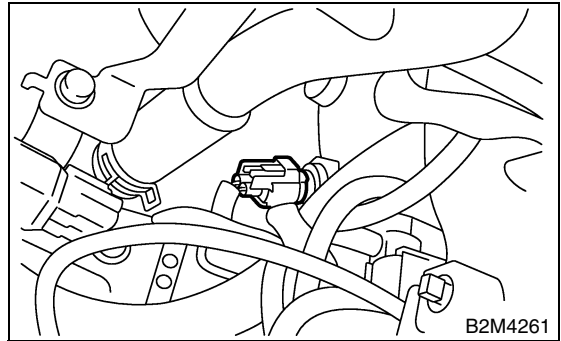
5) Connect the connector to crankshaft position sensor.



6) Connect the knock sensor connector.



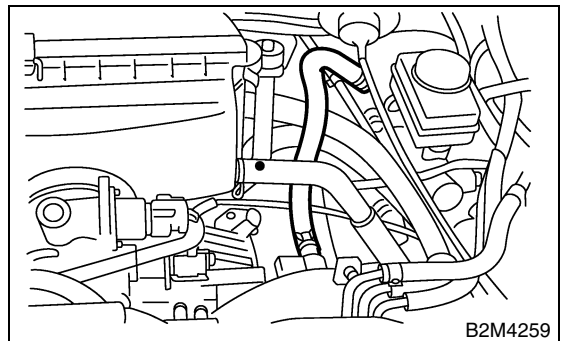
7) Connect the connectors to engine coolant temperature sensor.



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



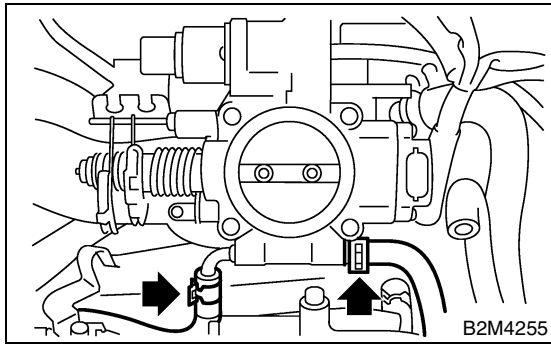
9) Connect the brake booster hose.



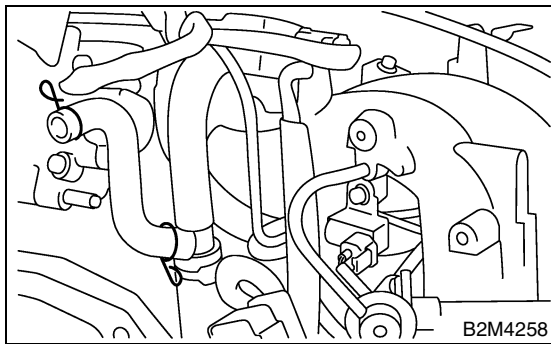
INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

10) Connect the engine coolant hose to throttle body.

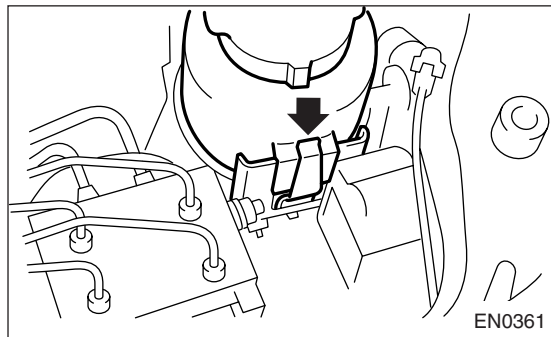


11) Connect the PCV hose to intake manifold.

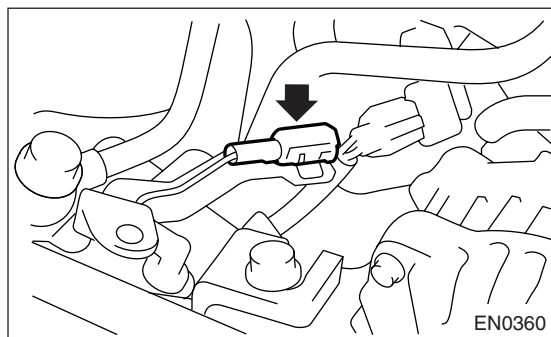


12) Connect the spark plug cords to spark plugs.
13) Install the power steering pump and tank on brackets.

(1) Install the power steering tank on bracket.

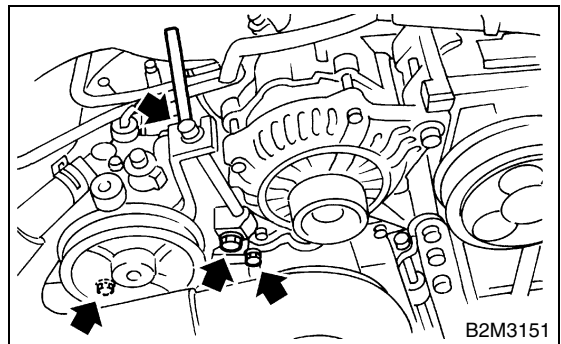


(2) Connect the connector to power steering pump switch.

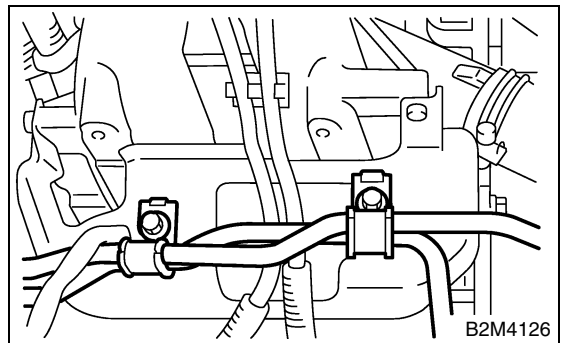


(3) Tighten the bolts which install power steering pump on bracket.

Tightening torque:
22 N·m (2.2 kgf·m, 16.2 ft·lb)

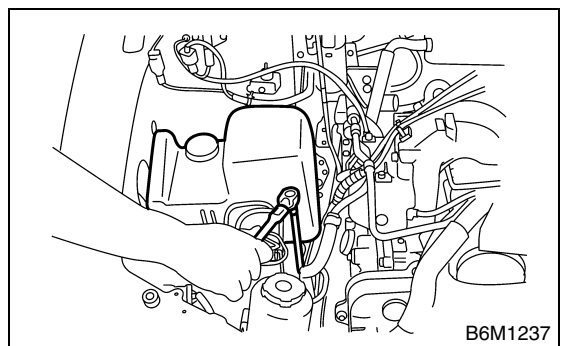


(4) Install the power steering pipes onto right side intake manifold protector.



(5) Install the front side V-belt.
<Ref. to ME-44, INSTALLATION, V-belt.>
(6) Install the resonator chamber.

Tightening torque:
33 N·m (3.4 kgf·m, 24.3 ft·lb)

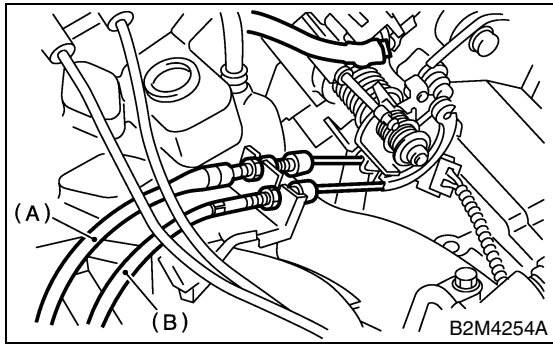


14) Connect the accelerator cable (A).

INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

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

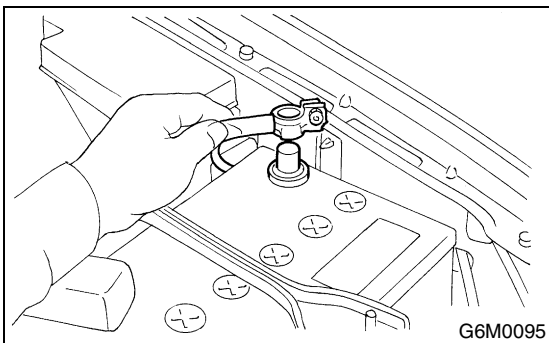


16) Install the air intake duct and air cleaner assembly.
<Ref. to IN-7, INSTALLATION, Air Intake Duct.>
and <Ref. to IN-6, INSTALLATION, Air Cleaner Case.>

17) Connect the connector to fuel pump relay.

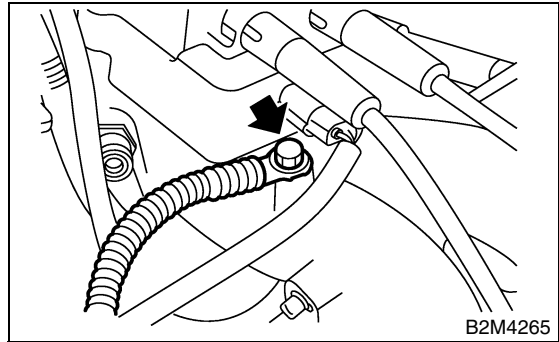


18) Connect the battery ground cable to battery.

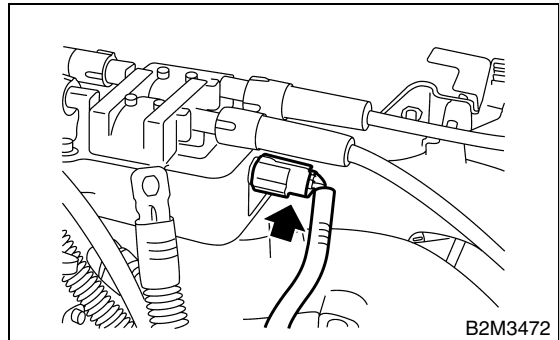


C: DISASSEMBLY

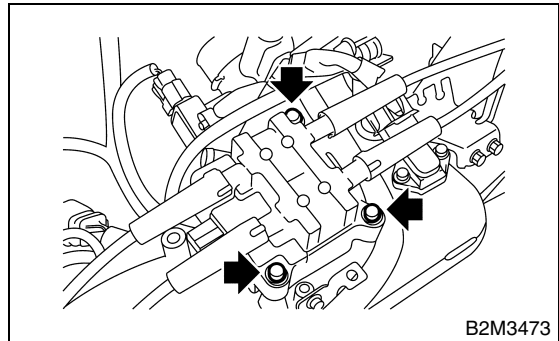
1) Disconnect the engine ground cable from intake manifold.



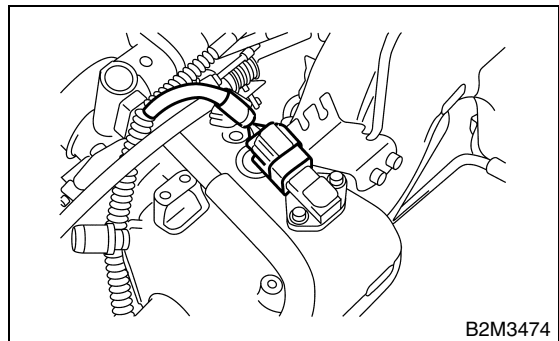
2) Disconnect the connector from ignition coil and ignitor assembly.



3) Remove the ignition coil and ignitor assembly.



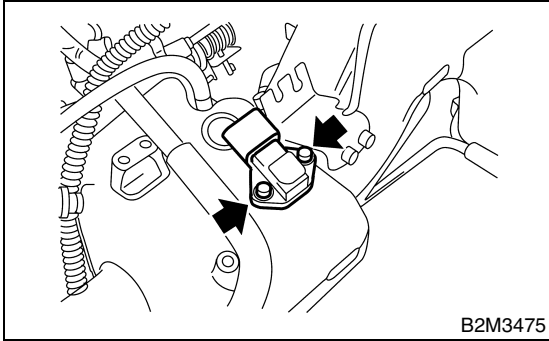
4) Disconnect the connector from intake air temperature and pressure sensor.



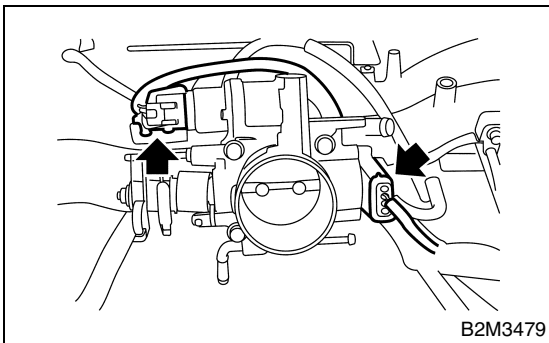
INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

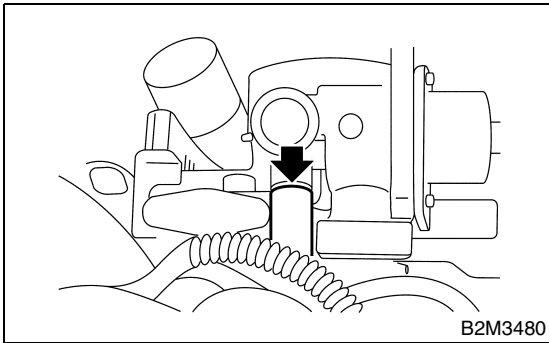
5) Remove the intake air temperature and pressure sensor from intake manifold.



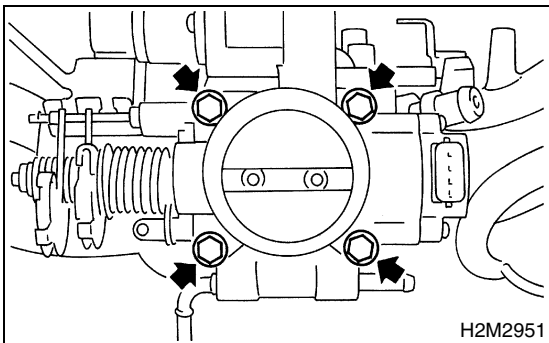
6) Disconnect the connectors from throttle position sensor and idle air control solenoid valve.



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

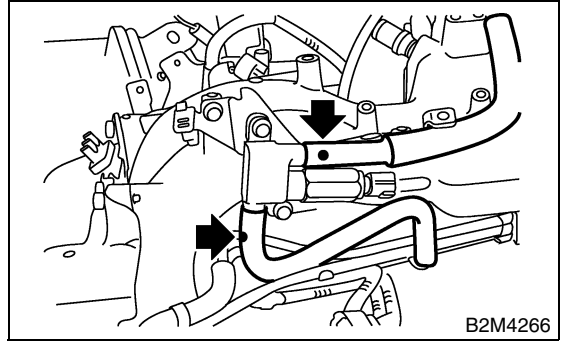


8) Remove the throttle body.

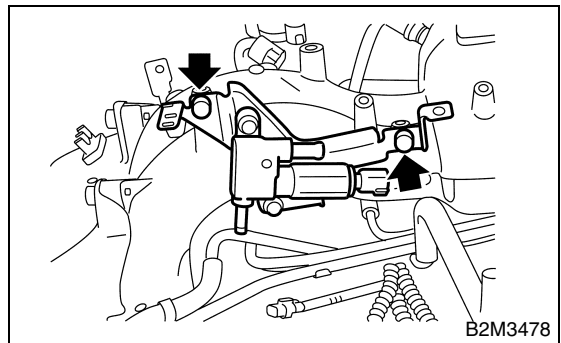


9) Disconnect the connector from air assist injector solenoid valve.

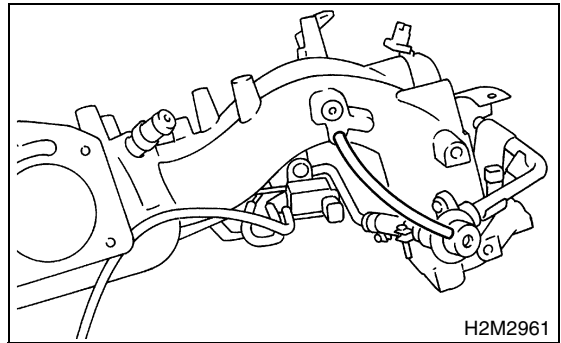
10) Disconnect the air by-pass hoses from air assist solenoid valve.



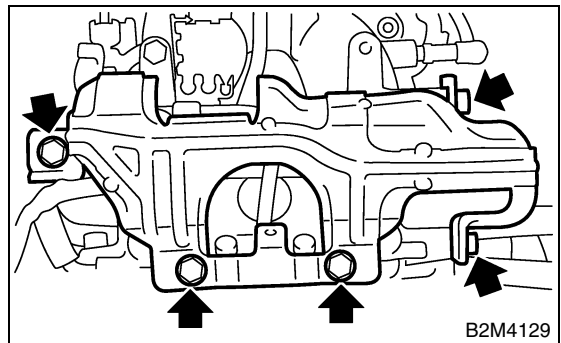
11) Remove the air assist injector solenoid valve from intake manifold.



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



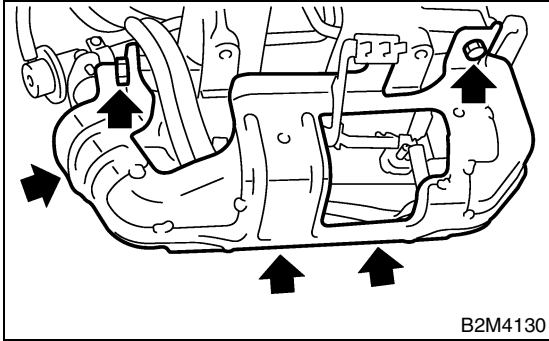
13) Remove the fuel pipe protector LH.



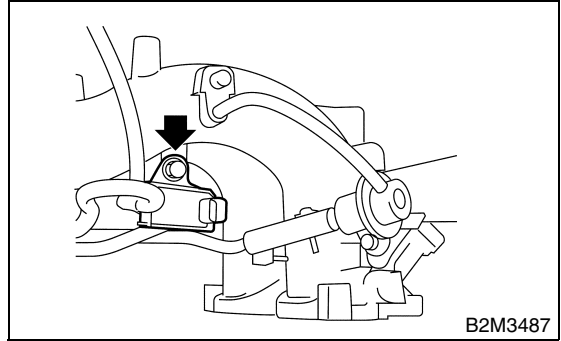
INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

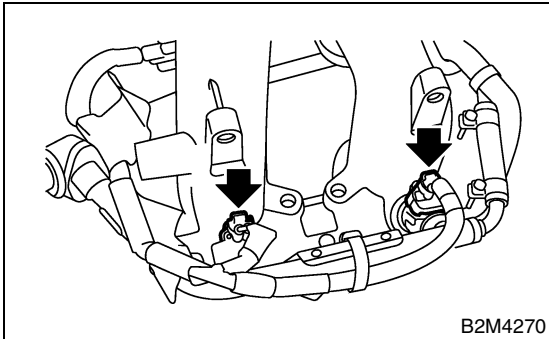
14) Remove the fuel pipe protector RH.



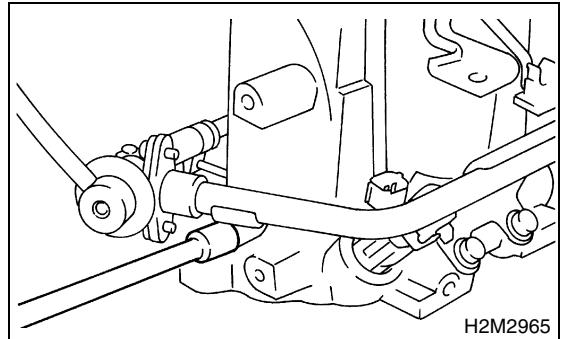
20) Remove the purge control solenoid valve.



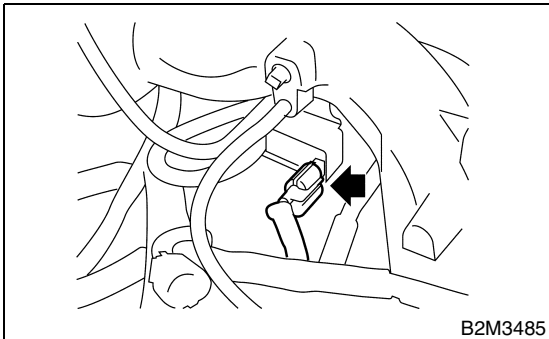
15) Disconnect the connectors from fuel injectors.



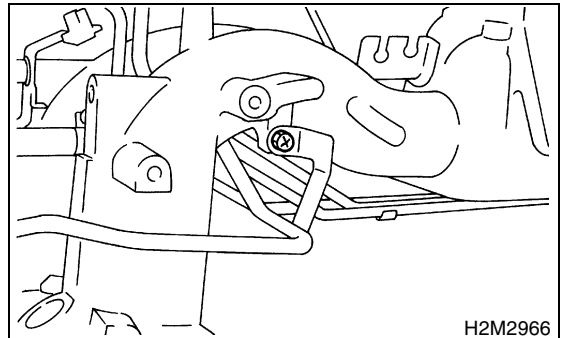
21) Remove the bolt which installs injector pipe on intake manifold as shown in the figure.



16) Disconnect the connector from purge control solenoid valve.

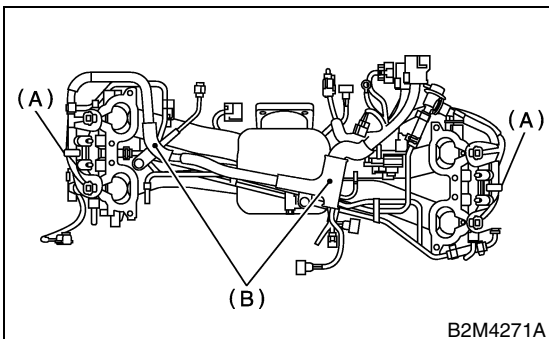


22) Remove the bolt which installs injector pipe on intake manifold.

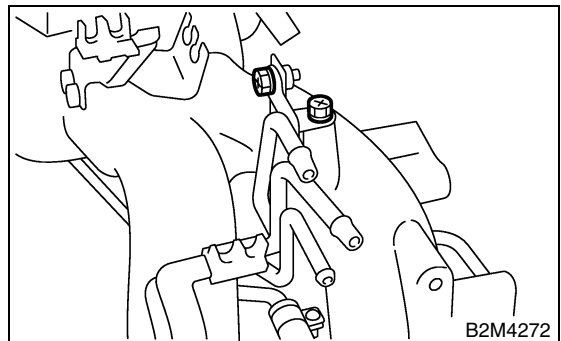


17) Disconnect the air by-pass hose from purge control solenoid valve.

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



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



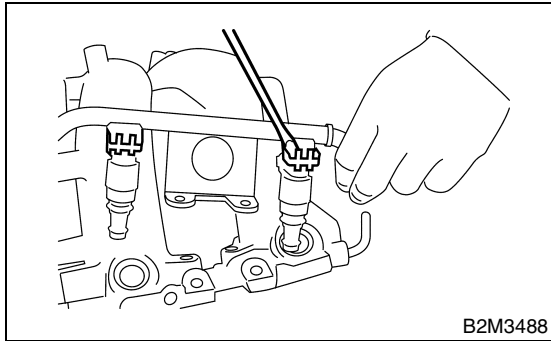
19) Remove the engine harness from intake manifold.

INTAKE MANIFOLD

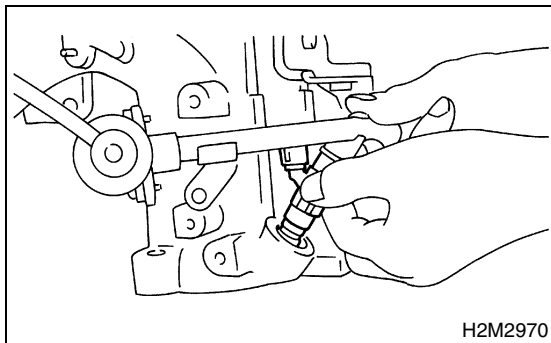
FUEL INJECTION (FUEL SYSTEMS)

24) Remove the fuel injectors.

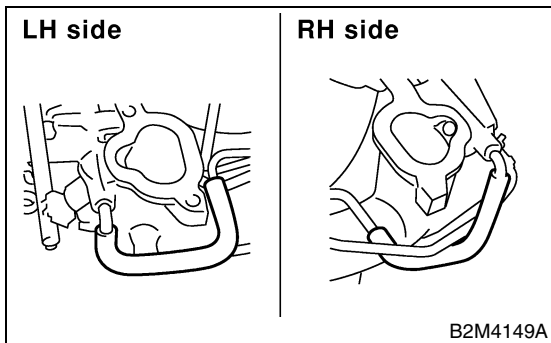
(1) Remove the fuel injector securing clip.



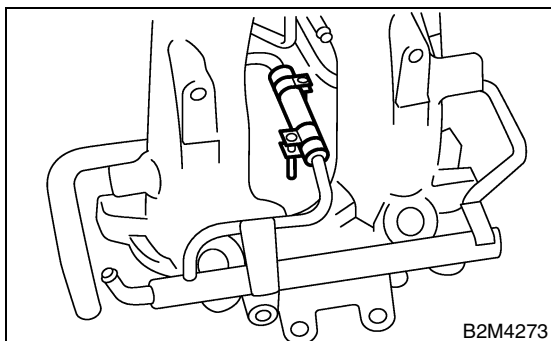
(2) Remove the fuel injector while lifting up the fuel injector pipe.



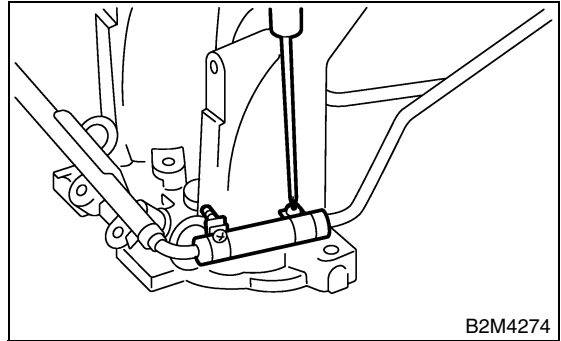
25) Disconnect the air by-pass hoses from intake manifold.



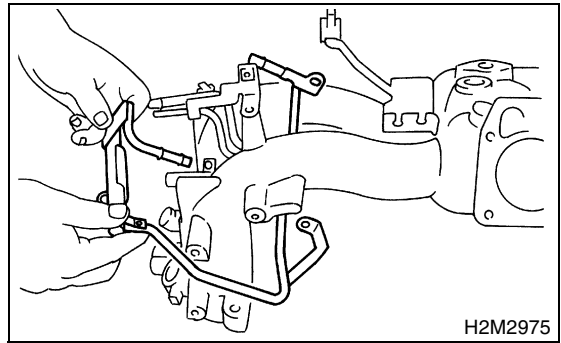
26) Loosen the clamp which holds front left side fuel hose to injector pipe, and remove the pipe from fuel hose.



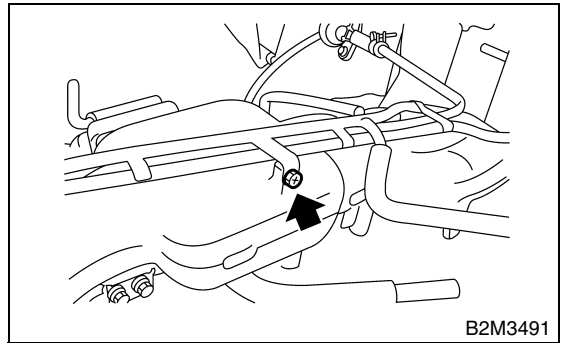
27) Loosen the clamp which holds front right side fuel hose to injector pipe, and remove the pipe from fuel hose.



28) Remove the fuel injector pipe.



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



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

INTAKE MANIFOLD

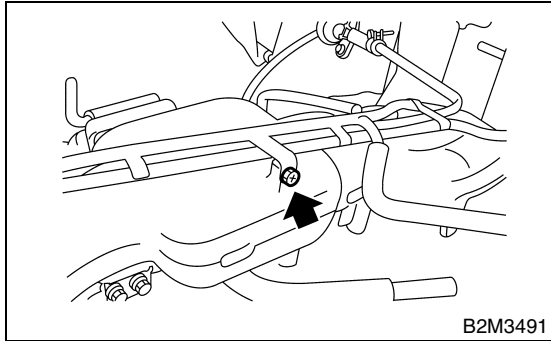
FUEL INJECTION (FUEL SYSTEMS)

D: ASSEMBLY

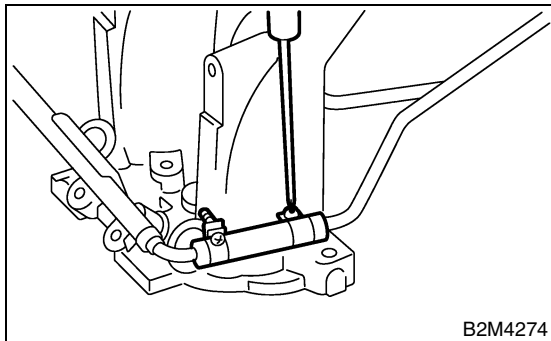
- 1) Install the fuel pipe assembly and pressure regulator, etc. to intake manifold.
- 2) Tighten the bolt which installs fuel pipes on intake manifold.

Tightening torque:

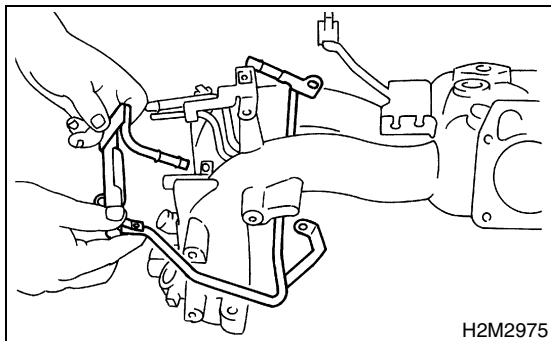
5.0 N·m (0.51 kgf-m, 3.7 ft-lb)



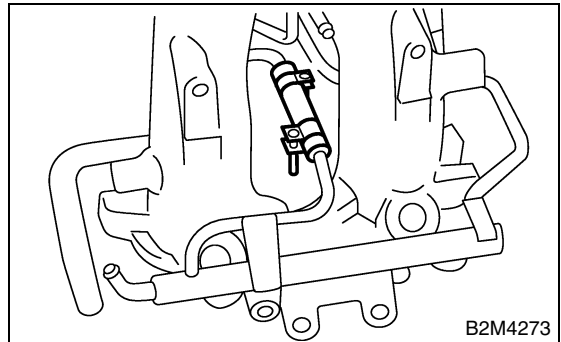
- 3) Connect the right side fuel hose to injector pipe, and tighten the clamp screw.



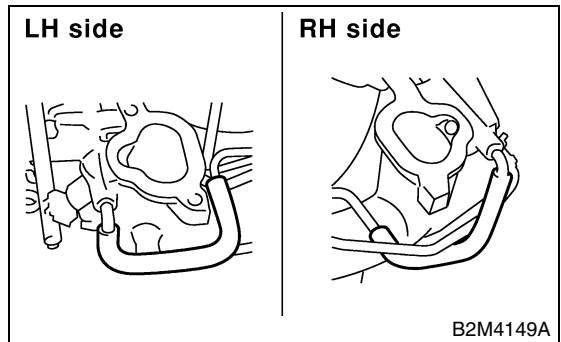
- 4) Install the fuel injector pipe.



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



- 6) Connect the air assist hoses.



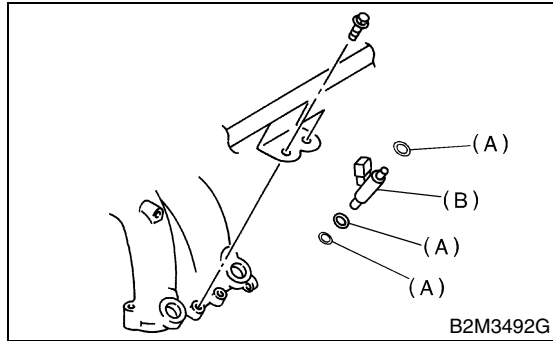
INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

7) Install the fuel injectors.

NOTE:

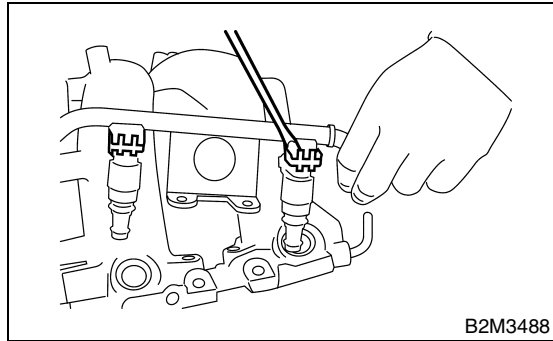
Always use new O-rings.



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

NOTE:

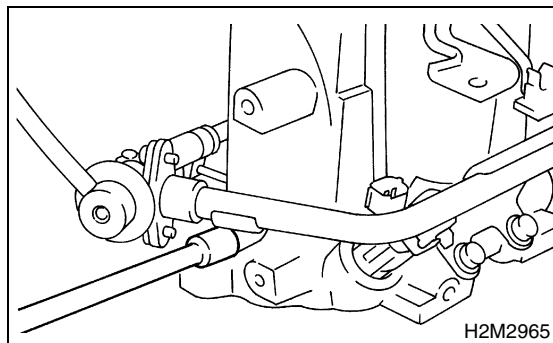
Do not forget to install the fuel injector securing clip.



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

Tightening torque:

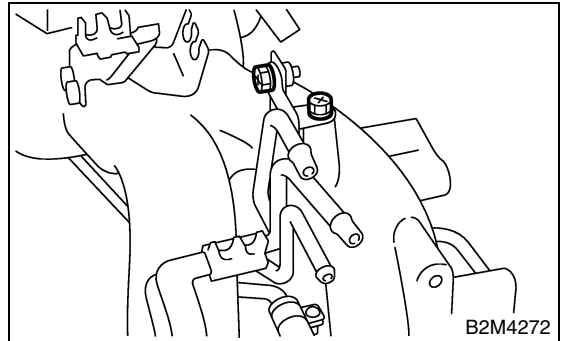
5.0 N-m (0.51 kgf-m, 3.7 ft-lb)



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

Tightening torque:

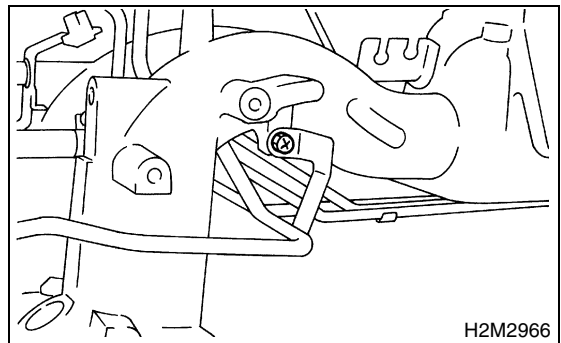
5.0 N-m (0.51 kgf-m, 3.7 ft-lb)



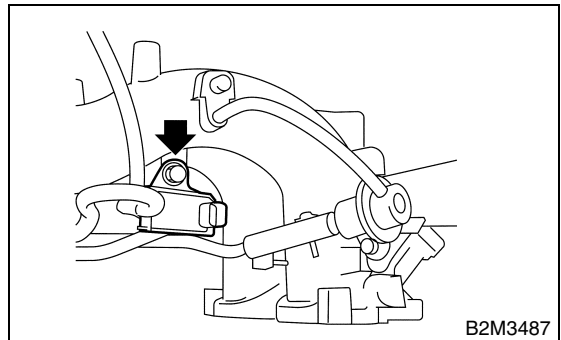
10) Tighten the bolt which installs injector pipe on intake manifold.

Tightening torque:

5.0 N-m (0.51 kgf-m, 3.7 ft-lb)



11) Install the purge control solenoid valve.



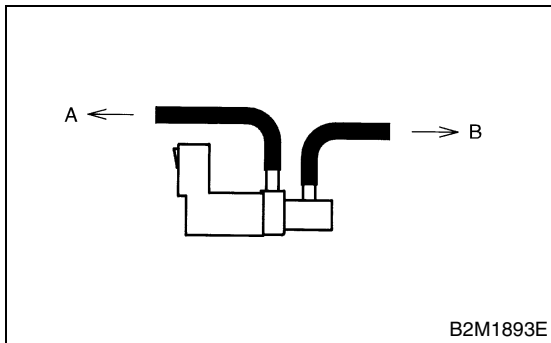
INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

12) Connect the hoses to purge control solenoid valve.

CAUTION:

Carefully connect the evaporation hoses.



- (A) To fuel pipe
- (B) To intake manifold

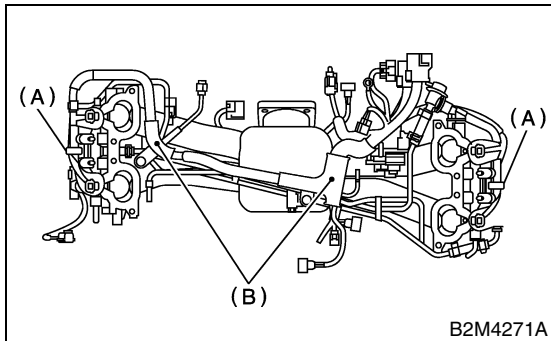
13) Install the engine harness onto intake manifold.

Tightening torque:

16 N·m (1.6 kgf-m, 11.8 ft-lb)

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

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



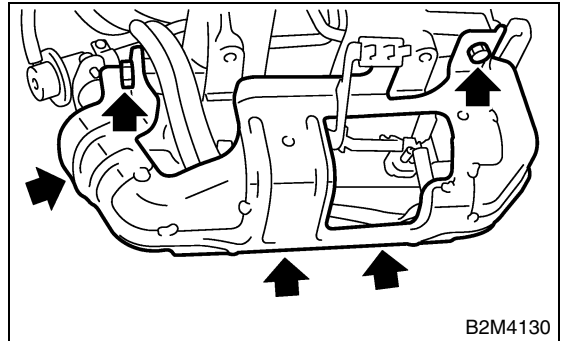
NOTE:

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

16) Install the fuel pipe protector RH.

Tightening torque:

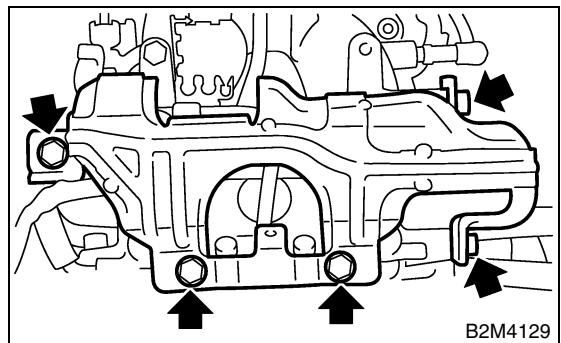
19 N·m (1.9 kgf-m, 14.0 ft-lb)



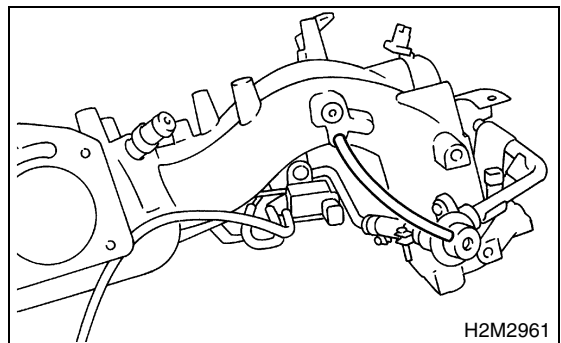
17) Install the fuel pipe protector LH.

Tightening torque:

19 N·m (1.9 kgf-m, 14.0 ft-lb)



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

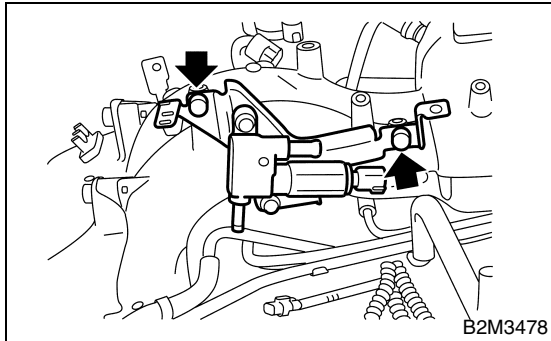


INTAKE MANIFOLD

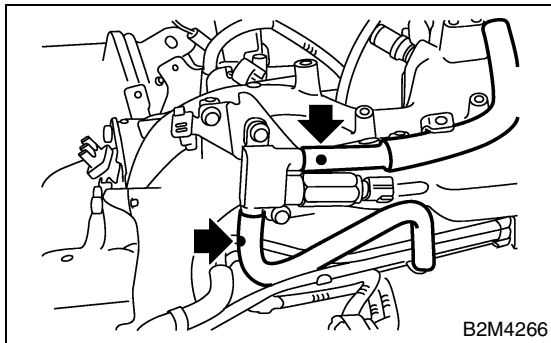
FUEL INJECTION (FUEL SYSTEMS)

19) Install the air assist injector solenoid valve to bracket.

Tightening torque:
5.0 N·m (0.51 kgf-m, 3.7 ft-lb)



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



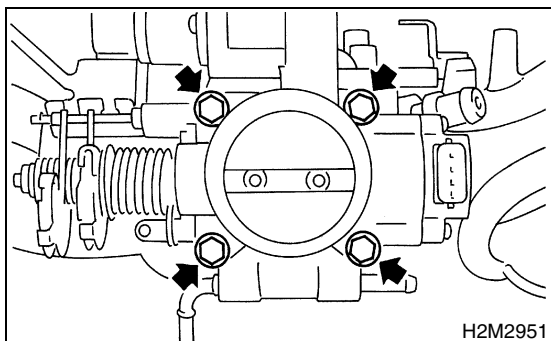
21) Connect the connector to air assist solenoid valve.

22) Install the throttle body to intake manifold.

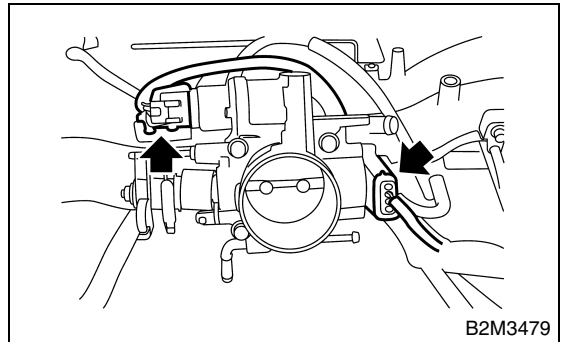
NOTE:

Replace the gasket with a new one.

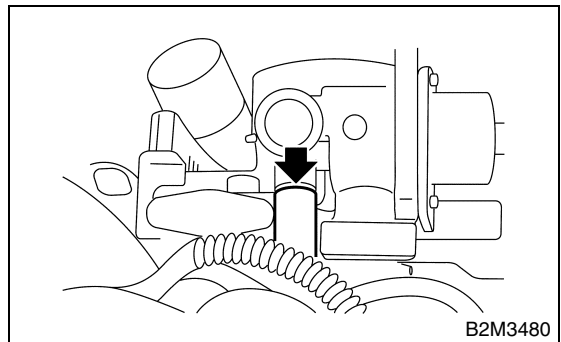
Tightening torque:
22 N·m (2.2 kgf-m, 16.2 ft-lb)



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

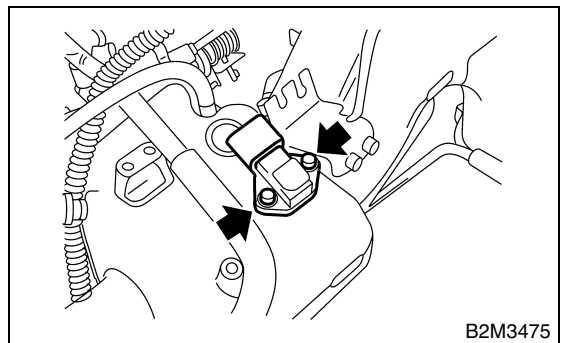


24) Connect the air by-pass hose to throttle body.



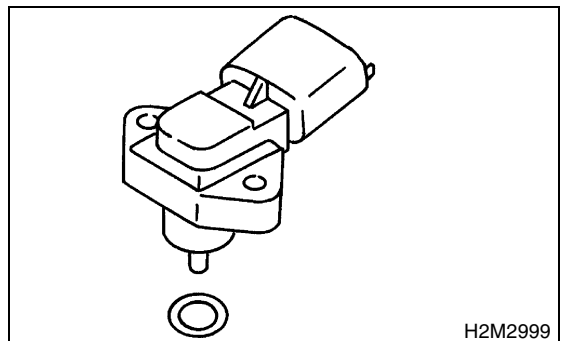
25) Install the intake air temperature and pressure sensor.

Tightening torque:
3.4 N·m (0.35 kgf-m, 2.5 ft-lb)



NOTE:

Replace the O-ring with a new one.

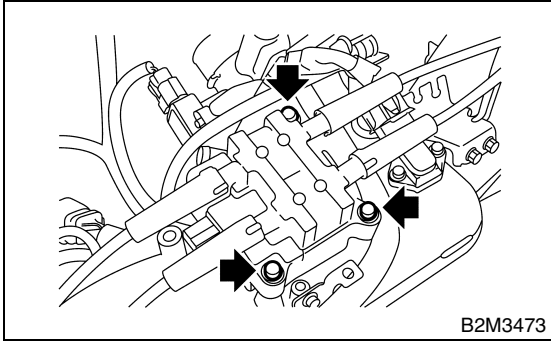


INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

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

27) Install the ignition coil and ignitor assembly.

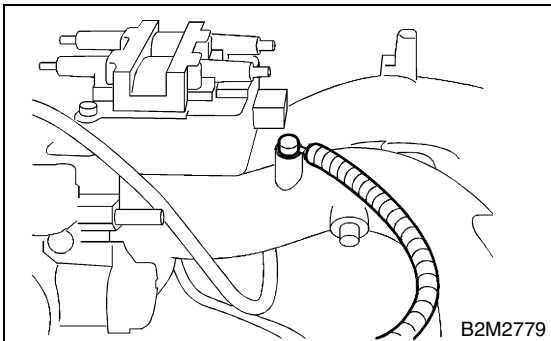


28) Connect the connector to ignition coil and ignitor assembly.

29) Install the engine ground cable to intake manifold.

Tightening torque:

19 N·m (1.9 kgf-m, 14.0 ft-lb)



E: INSPECTION

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

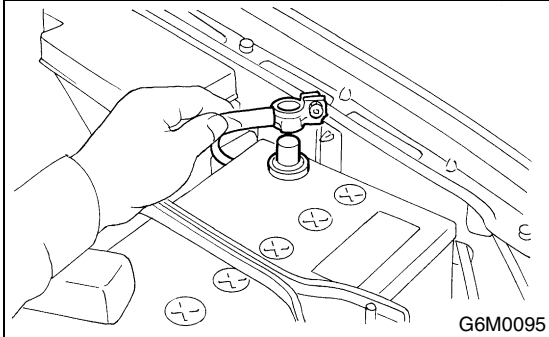
ENGINE COOLANT TEMPERATURE SENSOR

FUEL INJECTION (FUEL SYSTEMS)

4. Engine Coolant Temperature Sensor

A: REMOVAL

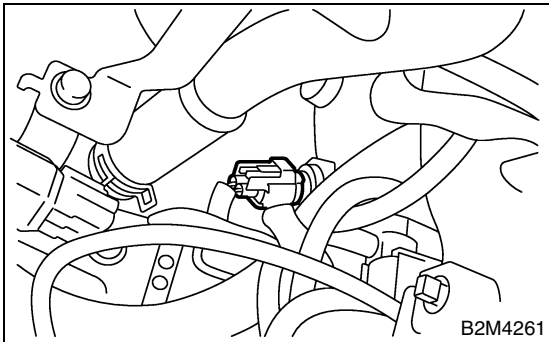
1) Disconnect the ground cable from battery.



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

<Ref. to IN-7, REMOVAL, Air Intake Duct.> and
<Ref. to IN-6, REMOVAL, Air Cleaner Case.>

3) Disconnect the connector from engine coolant temperature sensor.



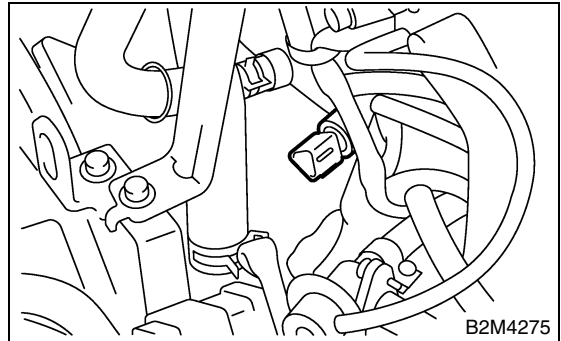
4) Remove the engine coolant temperature sensor.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

16 N·m (1.6 kgf-m, 11.8 ft-lb)



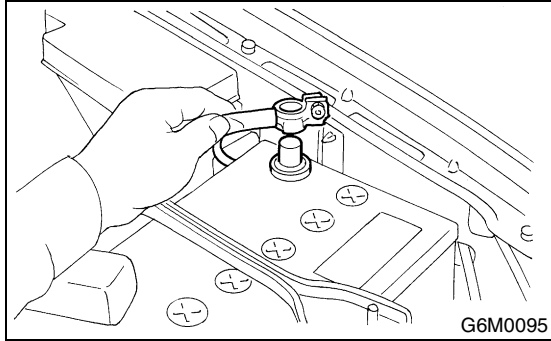
CRANKSHAFT POSITION SENSOR

FUEL INJECTION (FUEL SYSTEMS)

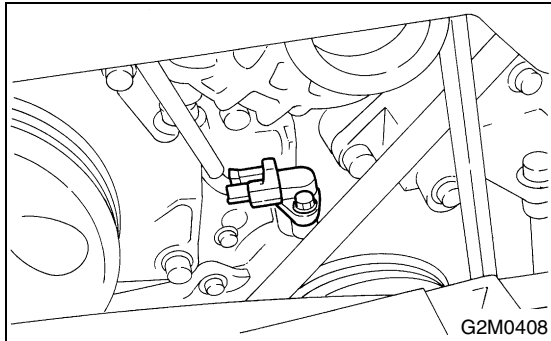
5. Crankshaft Position Sensor

A: REMOVAL

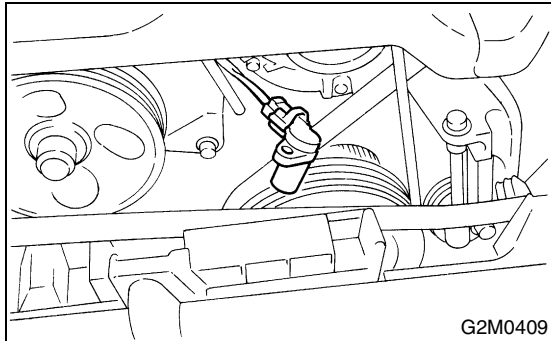
1) Disconnect the ground cable from battery.



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



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

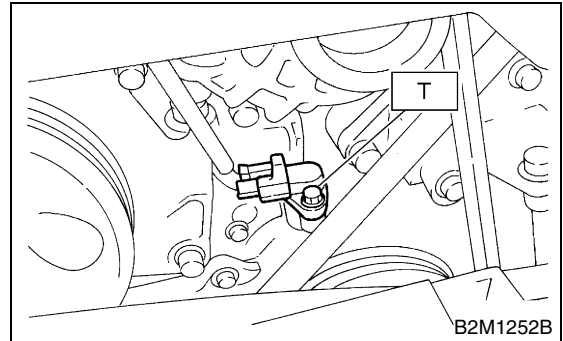


B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

T: 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



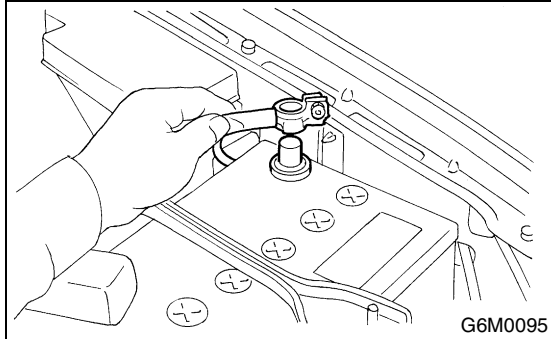
CAMSHAFT POSITION SENSOR

FUEL INJECTION (FUEL SYSTEMS)

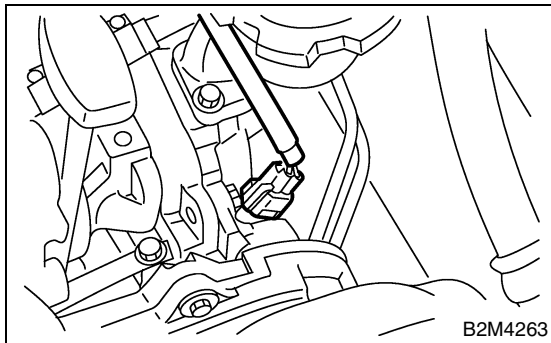
6. Camshaft Position Sensor

A: REMOVAL

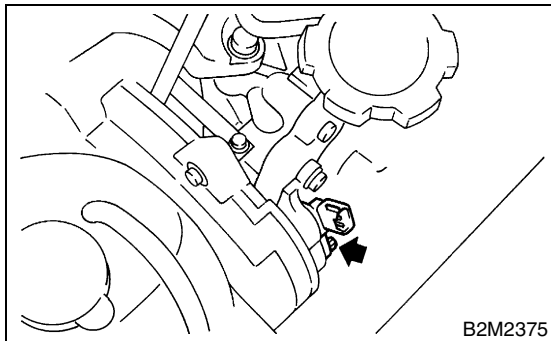
1) Disconnect the ground cable from battery.



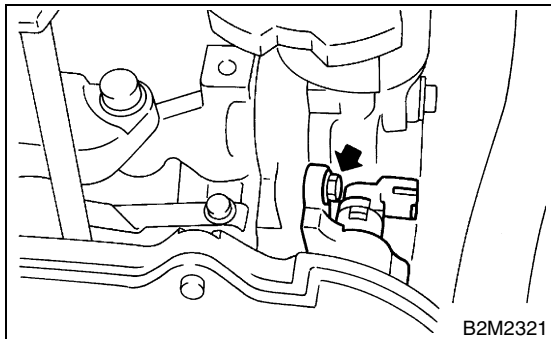
2) Disconnect the connector from camshaft position sensor.



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

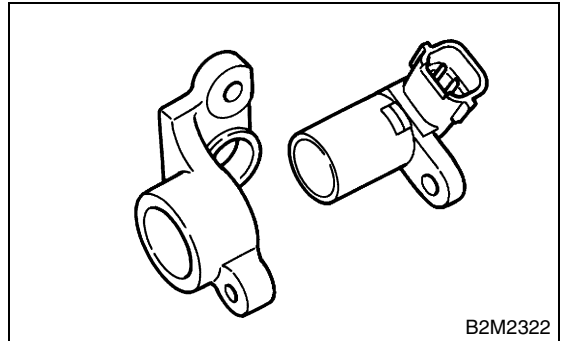


4) Remove the bolt which installs camshaft position sensor support to camshaft cap LH.



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

6) Remove the camshaft position sensor itself.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

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

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

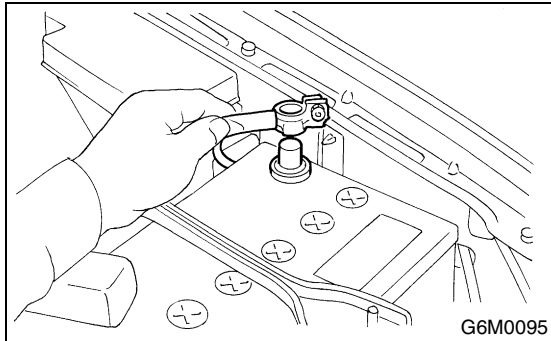
KNOCK SENSOR

FUEL INJECTION (FUEL SYSTEMS)

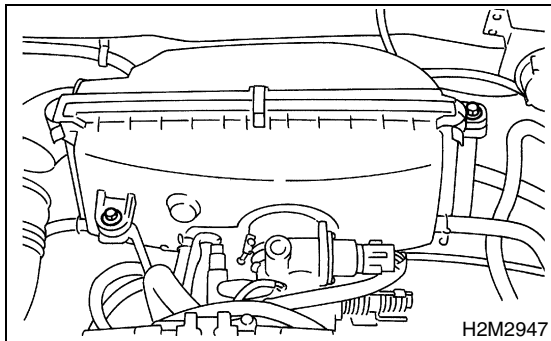
7. Knock Sensor

A: REMOVAL

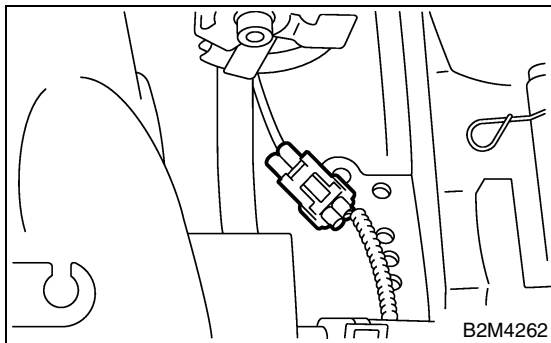
- 1) Disconnect the ground cable from battery.



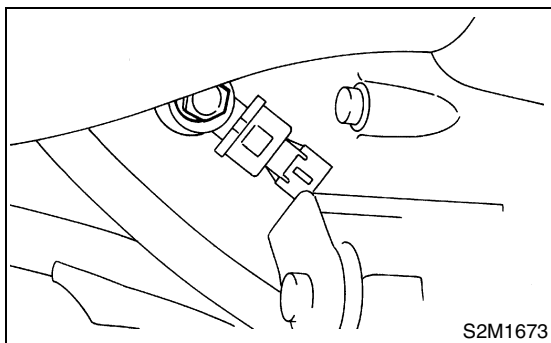
- 2) Remove the air cleaner case.



- 3) Disconnect the knock sensor connector.



- 4) Remove the knock sensor from cylinder block.



B: INSTALLATION

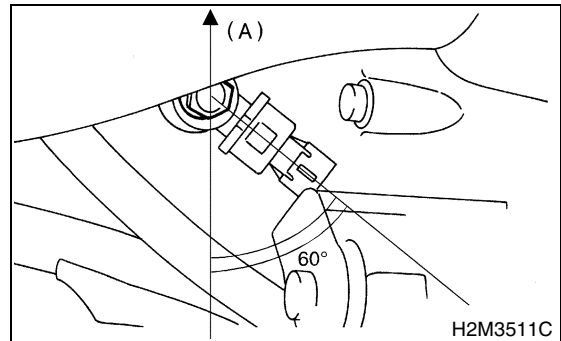
- 1) Install the knock sensor to cylinder block.

Tightening torque:

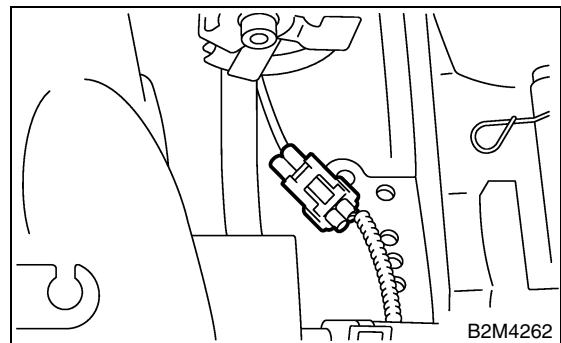
24 N·m (2.4 kgf-m, 17.4 ft-lb)

NOTE:

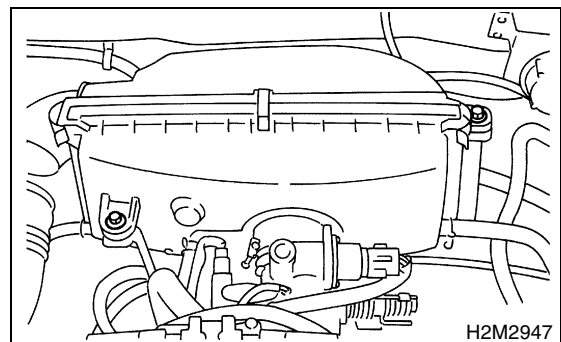
The extraction area of the knock sensor cord must be positioned at a 60° angle relative to engine rear.



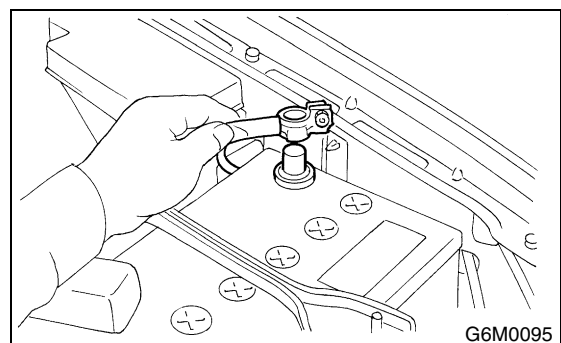
- 2) Connect the knock sensor connector.



- 3) Install the air cleaner case.



- 4) Connect the battery ground cable to battery.



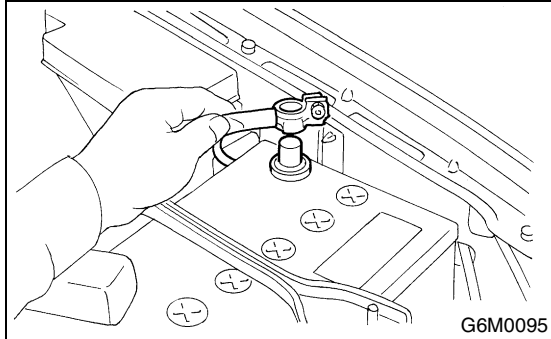
THROTTLE POSITION SENSOR

FUEL INJECTION (FUEL SYSTEMS)

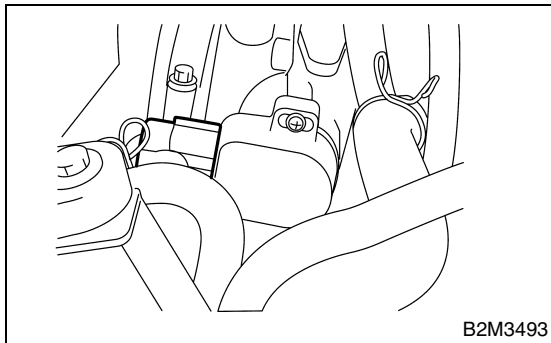
8. Throttle Position Sensor

A: REMOVAL

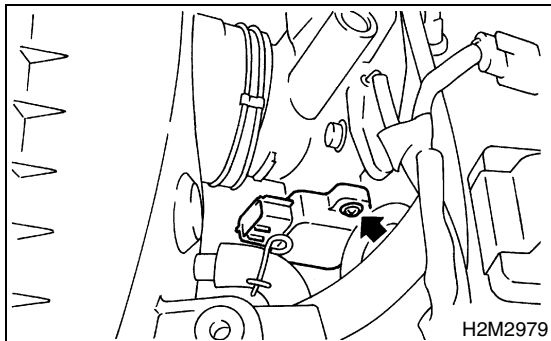
- 1) Disconnect the ground cable from battery.



- 2) Disconnect the connector from throttle position sensor.



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



B: INSTALLATION

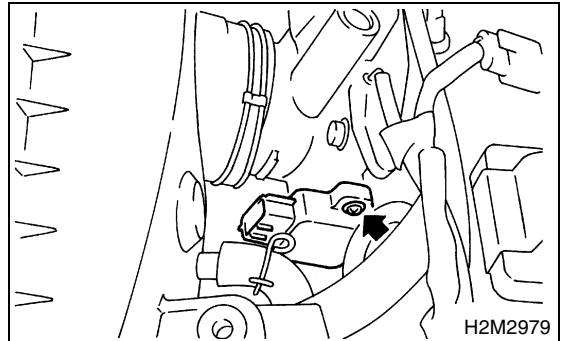
Install in the reverse order of removal.

Tightening torque:

1.6 N·m (0.16 kgf·m, 1.2 ft·lb)

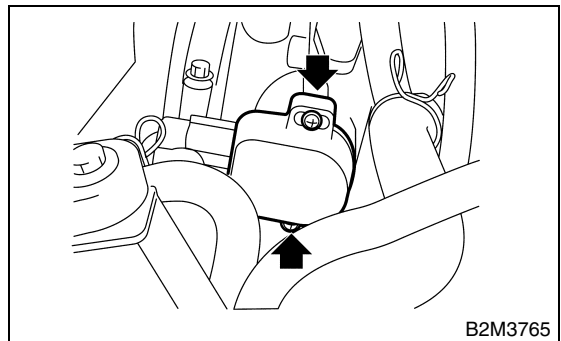
CAUTION:

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



C: ADJUSTMENT

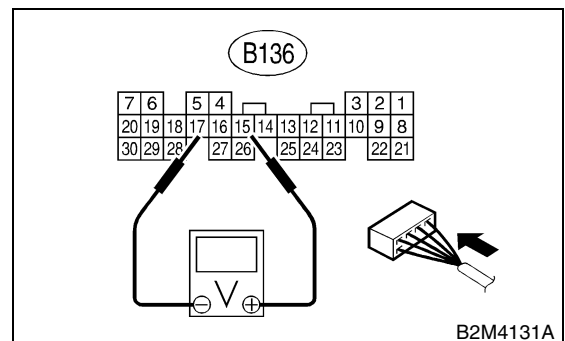
- 1) Turn the ignition switch to OFF.
- 2) Loosen the throttle position sensor holding screws.



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

Connector & terminal/Specified voltage

(B136) No. 15 — (B136) No. 17/0.45 — 0.55 V [Fully closed.]



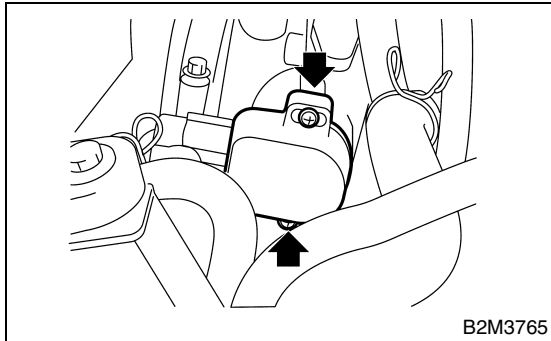
THROTTLE POSITION SENSOR

FUEL INJECTION (FUEL SYSTEMS)

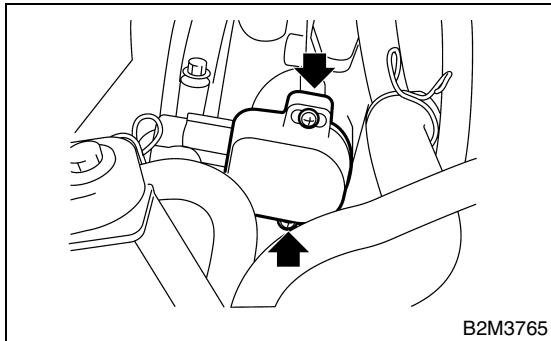
- (4) Tighten the throttle position sensor holding screws.

Tightening torque:

1.6 N·m (0.16 kgf·m, 1.2 ft·lb)



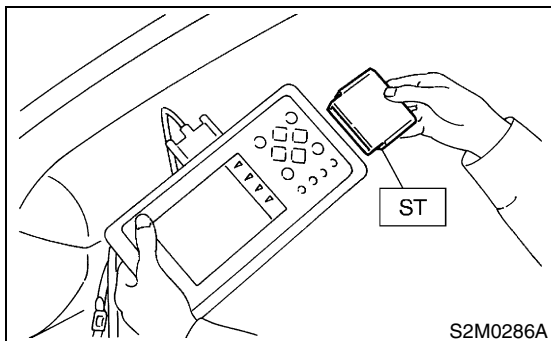
- 4) When using the Subaru Select Monitor;
 - (1) Turn the ignition switch to OFF.
 - (2) Loosen the throttle position sensor holding screws.



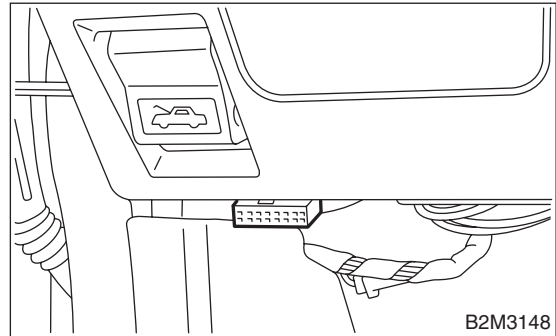
NOTE:

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

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



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



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

Condition: Throttle fully closed

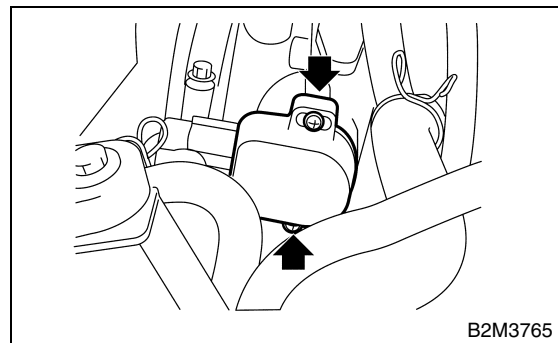
Throttle opening angle 0.00 %

Throttle sensor voltage 0.50 V

- 11) Tighten the throttle position sensor holding screws.

Tightening torque:

1.6 N·m (0.16 kgf·m, 1.2 ft·lb)



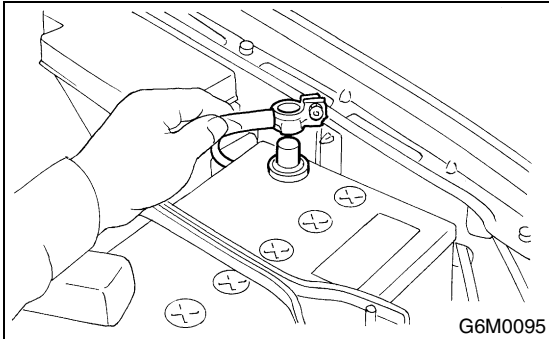
INTAKE AIR TEMPERATURE AND PRESSURE SENSOR

FUEL INJECTION (FUEL SYSTEMS)

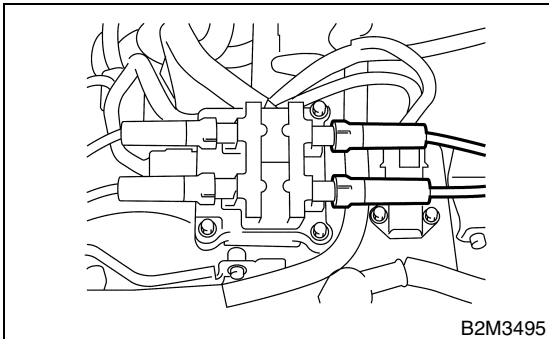
9. Intake Air Temperature and Pressure Sensor

A: REMOVAL

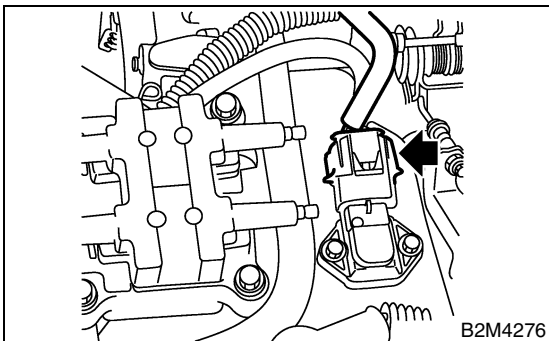
1) Disconnect the ground cable from battery.



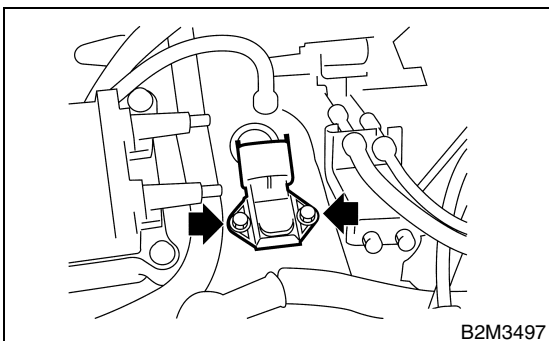
2) Disconnect the spark plug cord from ignition coil and ignitor assembly.



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



4) Remove the intake air temperature and pressure sensor.

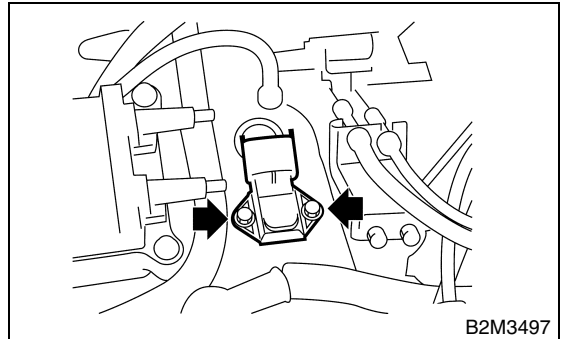


B: INSTALLATION

Install in the reverse order of removal.

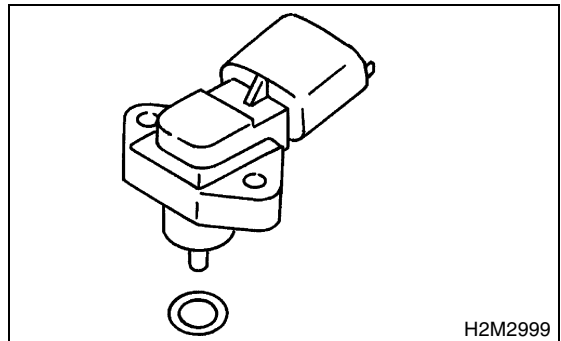
Tightening torque:

3.4 N·m (0.35 kgf-m, 2.5 ft-lb)



NOTE:

Replace the O-ring with a new one.



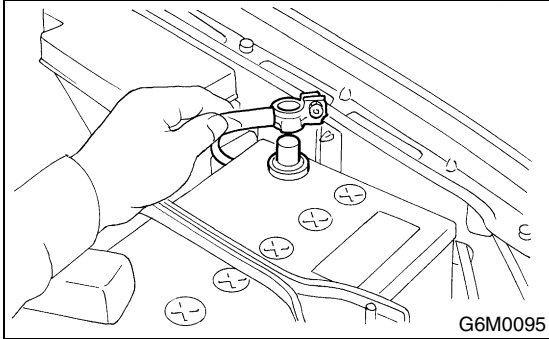
ATMOSPHERIC PRESSURE SENSOR

FUEL INJECTION (FUEL SYSTEMS)

10. Atmospheric Pressure Sensor

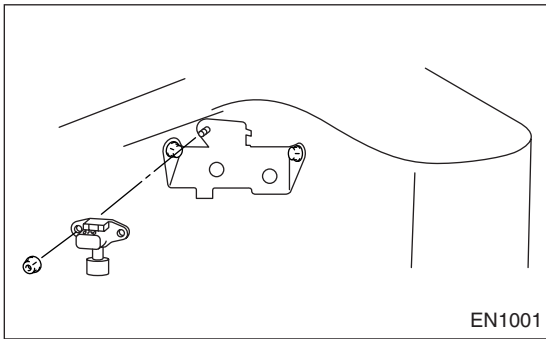
A: REMOVAL

1) Disconnect the ground cable from battery.



2) Disconnect the connector from atmospheric pressure sensor.

3) Remove the atmospheric pressure sensor from bracket.

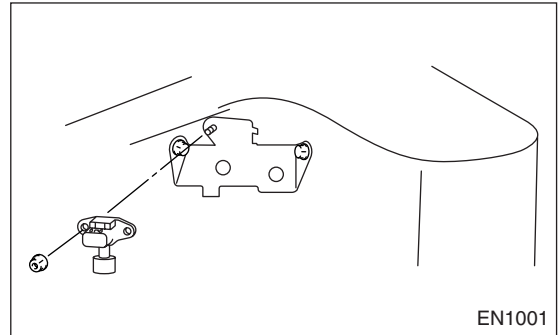


B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



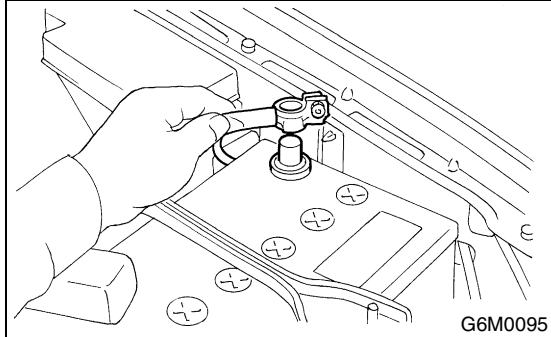
IDLE AIR CONTROL SOLENOID VALVE

FUEL INJECTION (FUEL SYSTEMS)

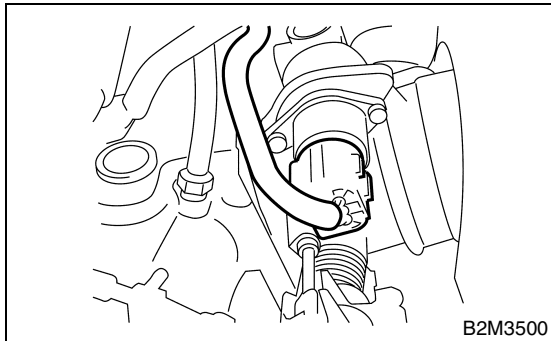
11. Idle Air Control Solenoid Valve

A: REMOVAL

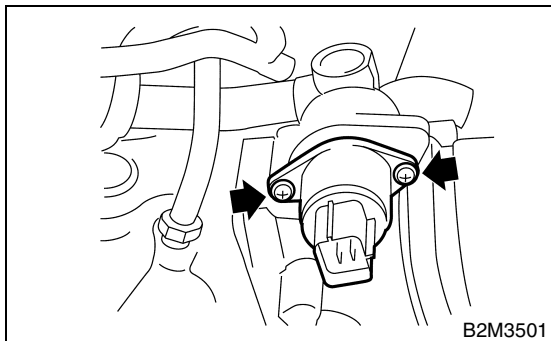
- 1) Disconnect the ground cable from battery.



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



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



B: INSTALLATION

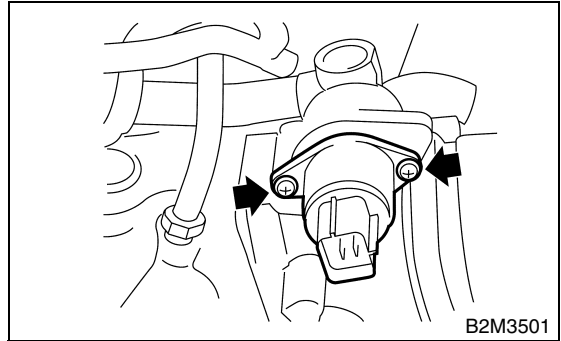
Install in the reverse order of removal.

NOTE:

Always use a new gasket.

Tightening torque:

1.6 N·m (0.16 kgf-m, 1.2 ft-lb)



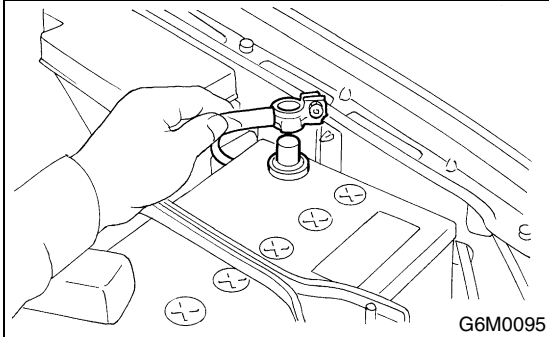
AIR ASSIST INJECTOR SOLENOID VALVE

FUEL INJECTION (FUEL SYSTEMS)

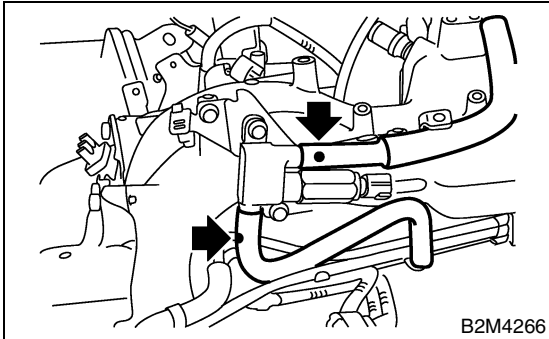
12. Air Assist Injector Solenoid Valve

A: REMOVAL

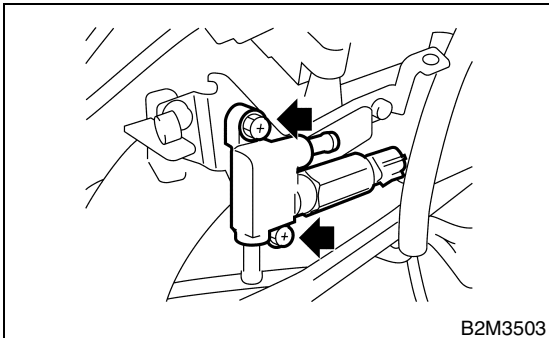
1) Disconnect the ground cable from battery.



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



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

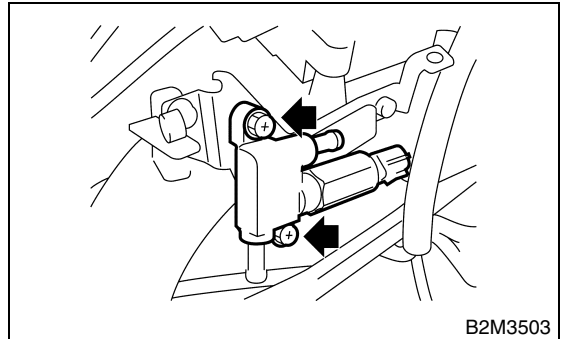


B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

6.4 N·m (0.65 kgf·m, 4.7 ft·lb)

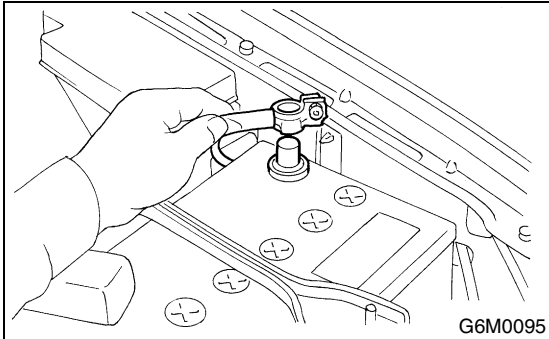


13. Fuel Injector

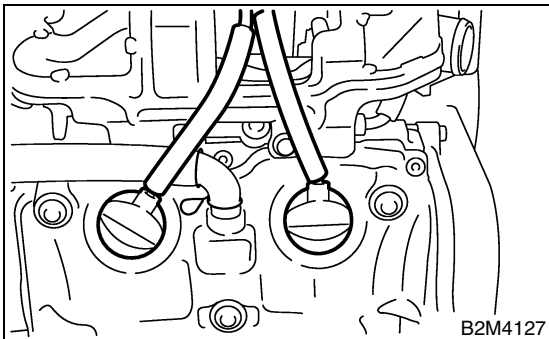
A: REMOVAL

1. RH SIDE

- 1) Release the fuel pressure.
<Ref. to FU-54, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 2) Open the fuel filler flap lid and remove fuel filler cap.
- 3) Disconnect the ground cable from battery.

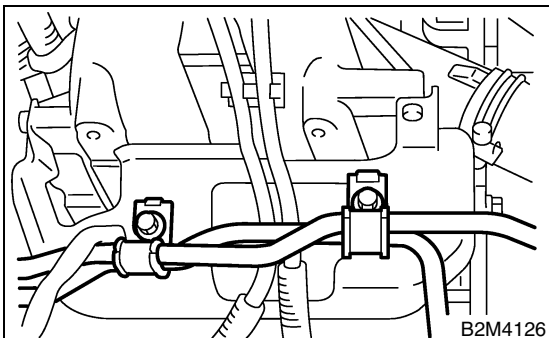


- 4) Remove the resonator chamber.
<Ref. to IN-8, REMOVAL, Resonator Chamber.>
- 5) Remove the spark plug cords from spark plugs (#1 and #3 cylinders).

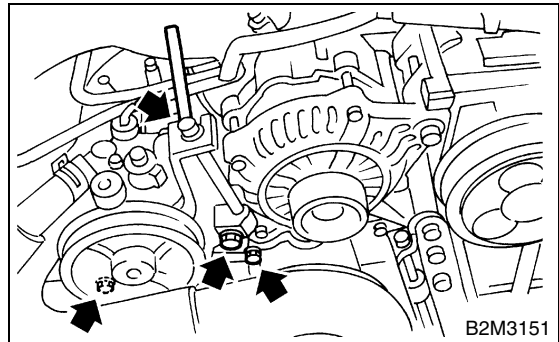


- 6) Remove the power steering pump and tank from brackets.

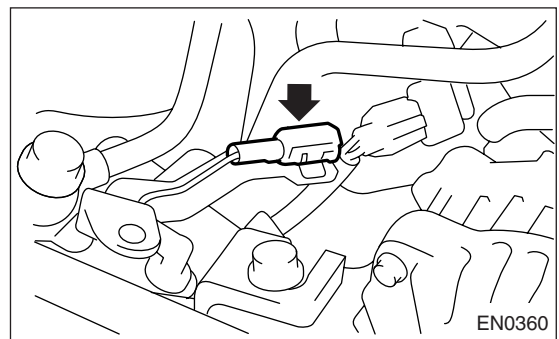
- (1) Remove the front side V-belt.
<Ref. to ME-44, REMOVAL, V-belt.>
- (2) Remove the bolts which hold power steering pipes onto intake manifold protector.



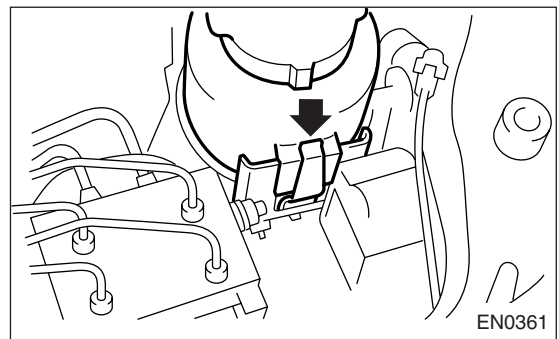
- (3) Remove the bolts which install power steering pump to bracket.



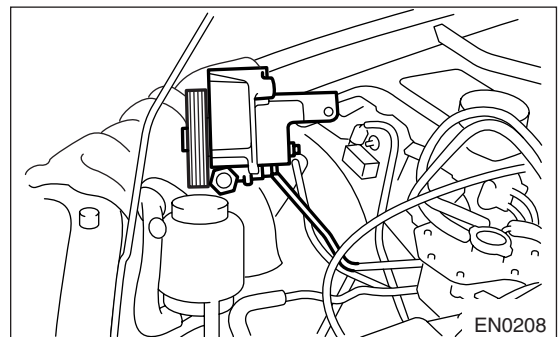
- (4) Disconnect the connector from power steering pump switch.



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



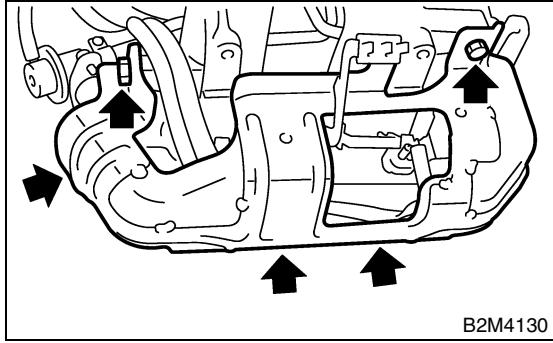
- (6) Place the power steering pump and tank on the right side wheel apron.



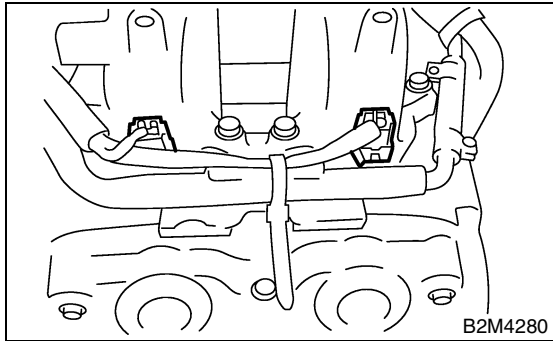
FUEL INJECTOR

FUEL INJECTION (FUEL SYSTEMS)

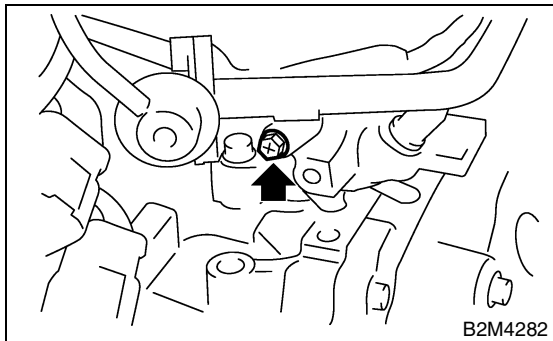
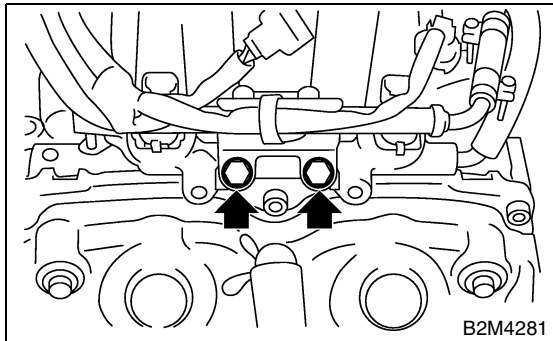
7) Remove the fuel pipe protector RH.



8) Disconnect the connector from fuel injector.

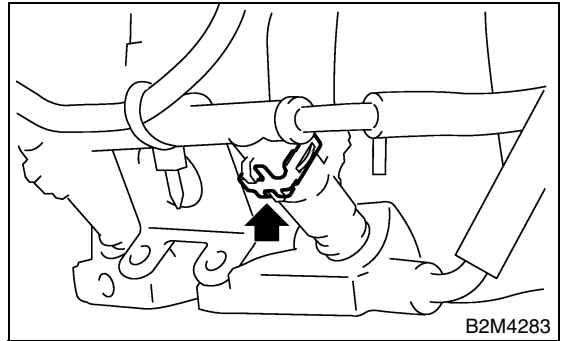


9) Remove the bolts which hold injector pipe to intake manifold.

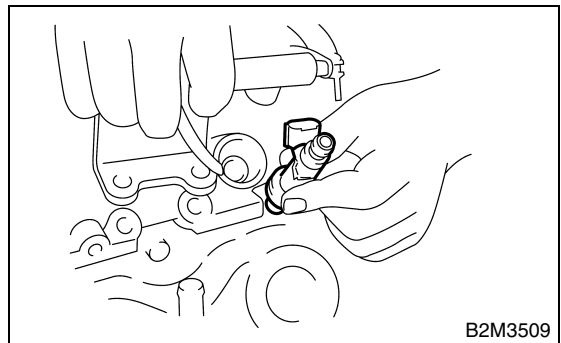


10) Remove the fuel injector from intake manifold.

(1) Remove the fuel injector securing clip.



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

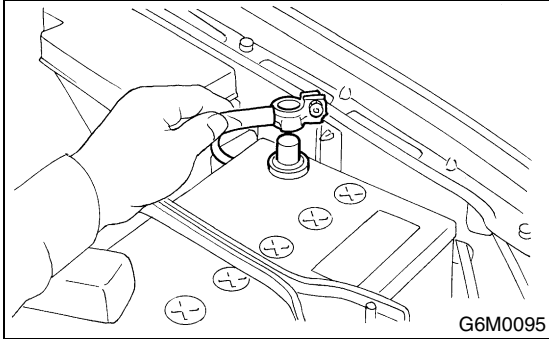


FUEL INJECTOR

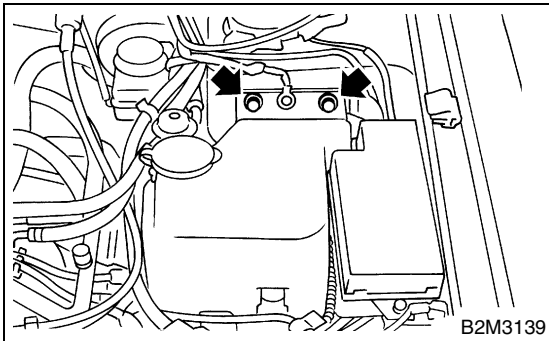
FUEL INJECTION (FUEL SYSTEMS)

2. LH SIDE

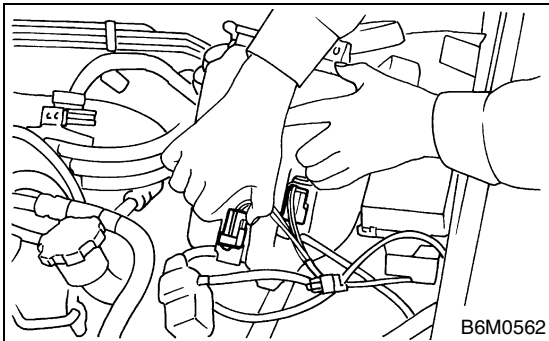
- 1) Release the fuel pressure.
<Ref. to FU-54, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 2) Open the fuel filler flap lid and remove fuel filler cap.
- 3) Disconnect the ground cable from battery.



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

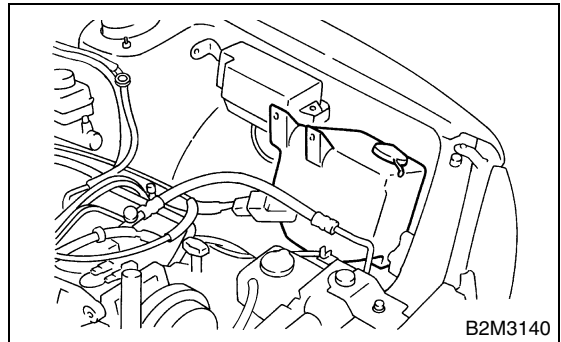


- 5) Disconnect the connector from front window washer motor.
- 6) Disconnect the connector from rear gate glass washer motor.

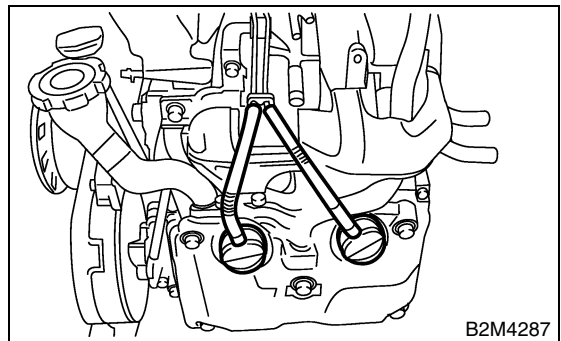


- 7) Disconnect the rear window glass washer hose from washer motor, then plug connection with a suitable cap.

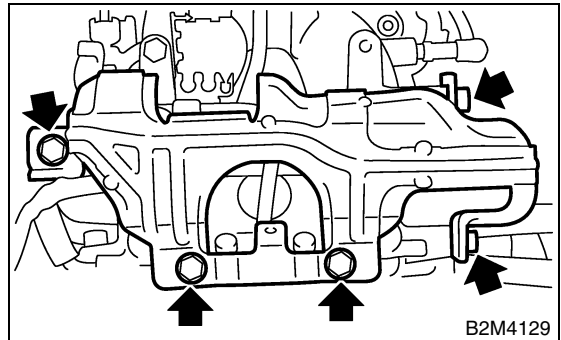
- 8) Move the washer tank, and secure it away from working area.



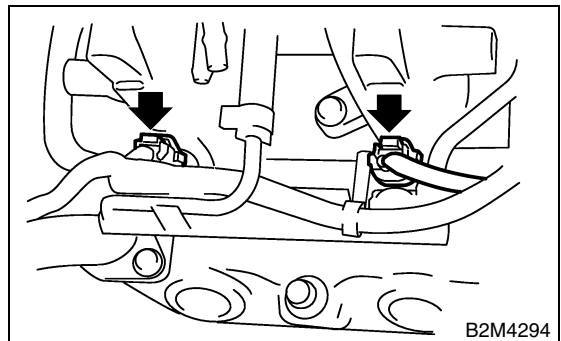
- 9) Remove the spark plug cords from spark plugs (#2 and #4 cylinders).



- 10) Remove the fuel pipe protector LH.



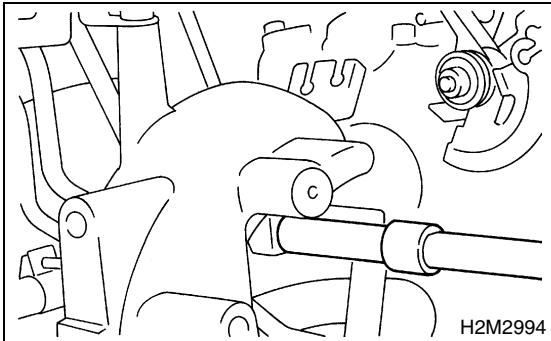
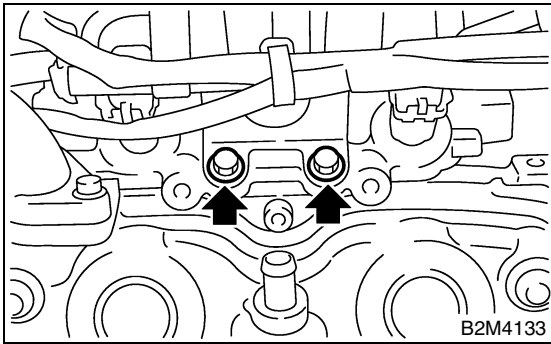
- 11) Disconnect the connector from fuel injector.



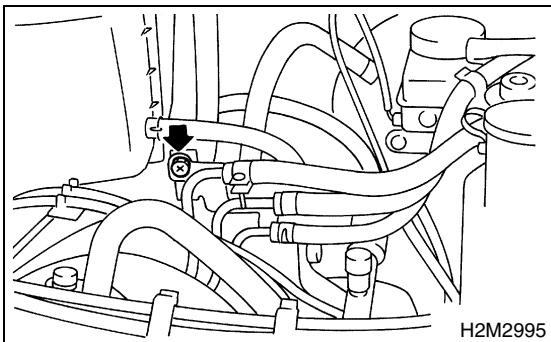
FUEL INJECTOR

FUEL INJECTION (FUEL SYSTEMS)

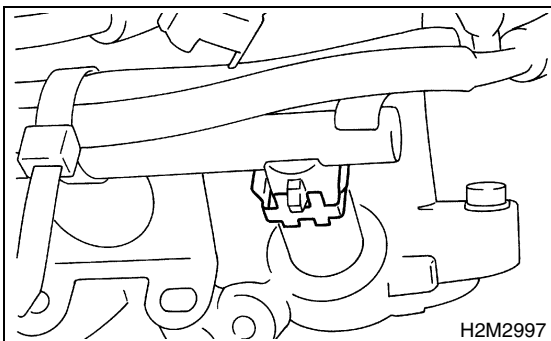
12) Remove the bolt which installs injector pipe to intake manifold.



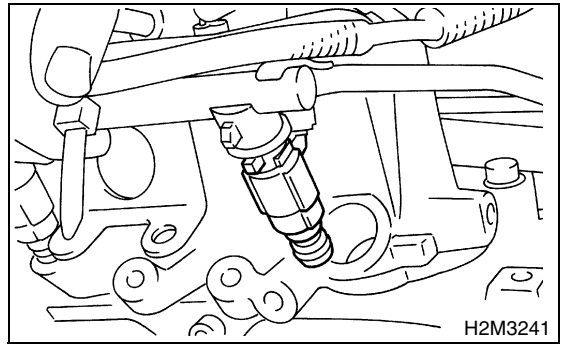
13) Remove the bolt which holds fuel pipe on the left side intake manifold.



14) Remove the fuel injector from intake manifold.
(1) Remove the fuel injector securing clip.



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



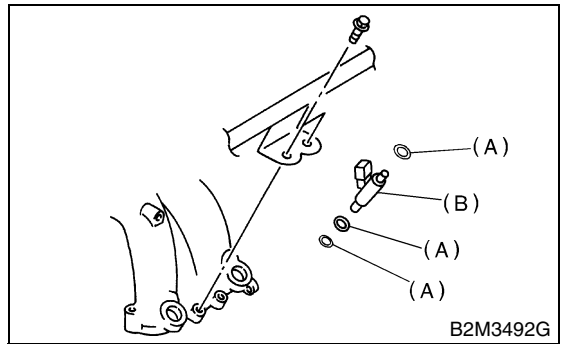
B: INSTALLATION

1. RH SIDE

Install in the reverse order of removal.

NOTE:

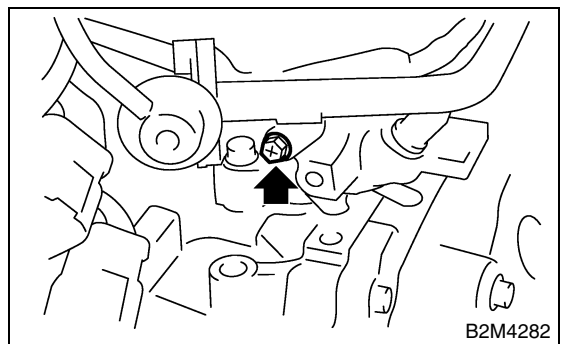
Replace the O-rings with a new one.



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

Tightening torque:

5.0 N·m (0.51 kgf-m, 3.7 ft-lb)

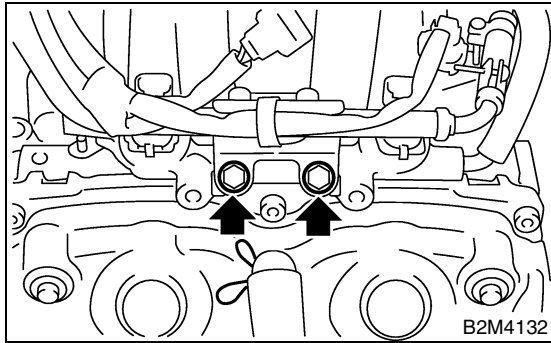


FUEL INJECTOR

FUEL INJECTION (FUEL SYSTEMS)

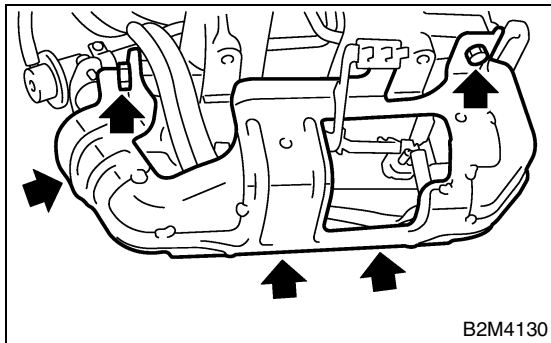
Tightening torque:

19 N-m (1.9 kgf-m, 14.0 ft-lb)



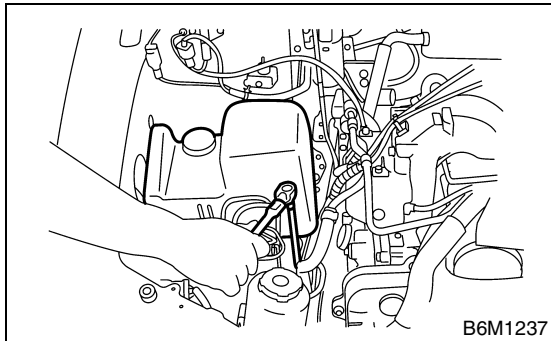
Tightening torque:

19 N-m (1.9 kgf-m, 14.0 ft-lb)



Tightening torque:

33 N-m (3.4 kgf-m, 24.3 ft-lb)

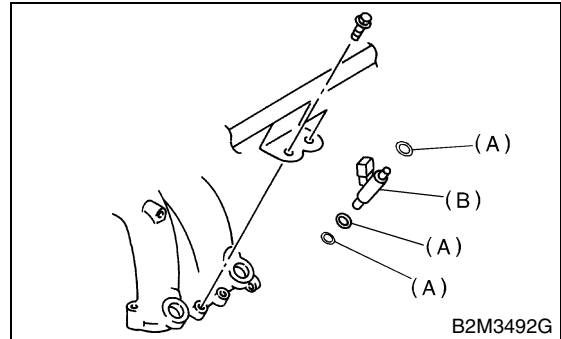


2. LH SIDE

Install in the reverse order of removal.

NOTE:

Replace the O-rings with a new one.

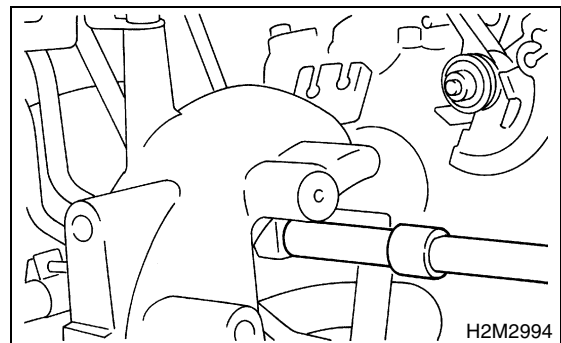


(A) O-ring

(B) Fuel injector

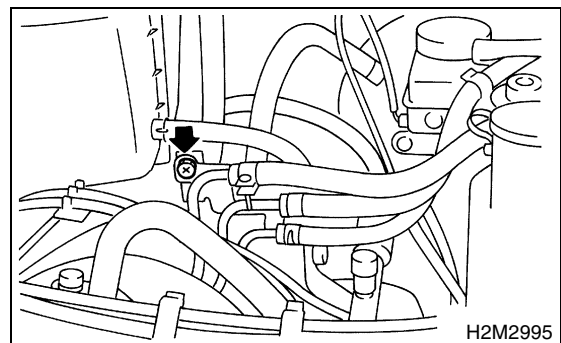
Tightening torque:

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)

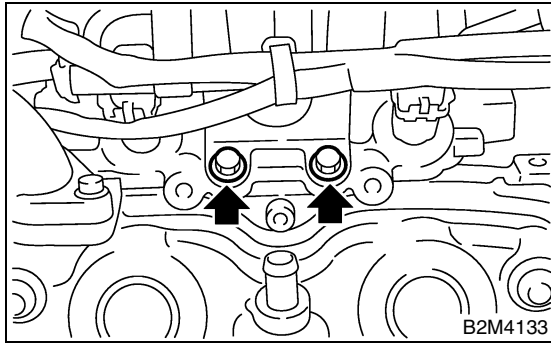


FUEL INJECTOR

FUEL INJECTION (FUEL SYSTEMS)

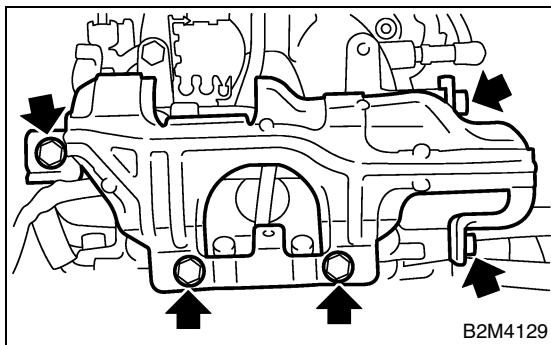
Tightening torque:

19 N·m (1.9 kgf·m, 14.0 ft·lb)



Tightening torque:

19 N·m (1.9 kgf·m, 14.0 ft·lb)



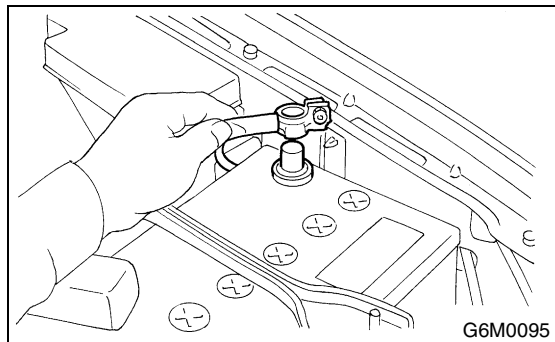
FRONT OXYGEN (A/F) SENSOR

FUEL INJECTION (FUEL SYSTEMS)

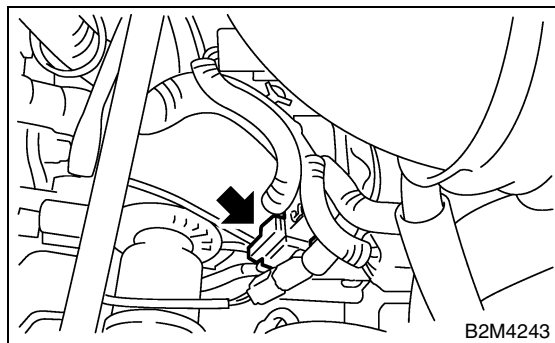
14. Front Oxygen (A/F) Sensor

A: REMOVAL

- 1) Disconnect the ground cable from battery.



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



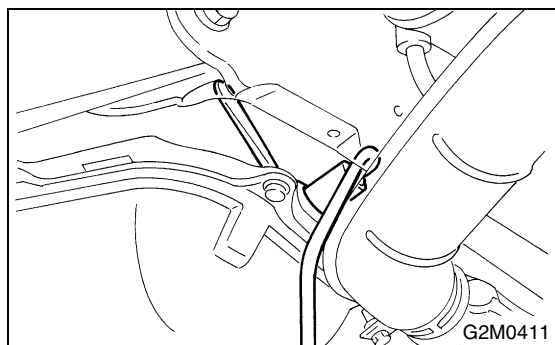
- 3) Lift-up the vehicle.
- 4) Apply SUBARU CRC or its equivalent to the threaded portion of front oxygen (A/F) sensor, and leave it for 1 minute or more.

SUBARU CRC (Part No. 004301003)

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

CAUTION:

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



B: INSTALLATION

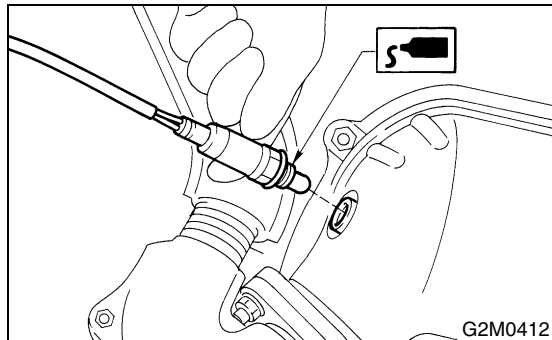
- 1) Before installing the front oxygen (A/F) sensor, apply anti-seize compound only to the threaded portion of front oxygen (A/F) sensor to make the next removal easier.

Anti-seize compound:

SS-30 by JET LUBE

CAUTION:

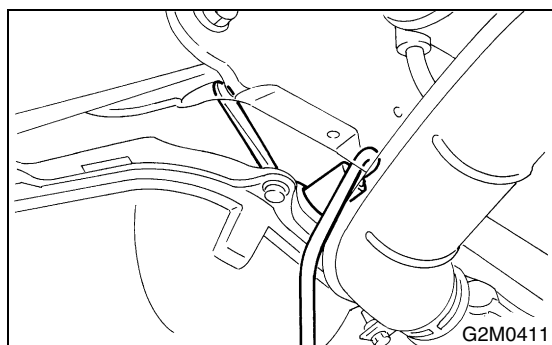
Never apply anti-seize compound to the protector of front oxygen (A/F) sensor.



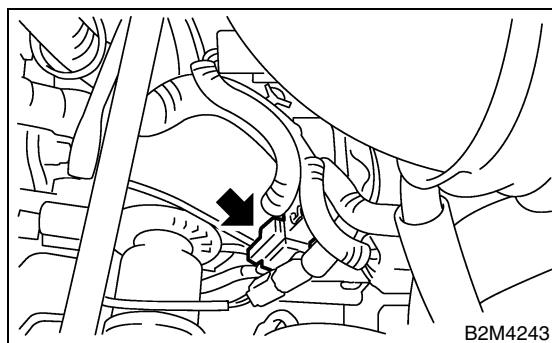
- 2) Install the front oxygen (A/F) sensor.

Tightening torque:

21 N·m (2.1 kgf-m, 15.2 ft-lb)



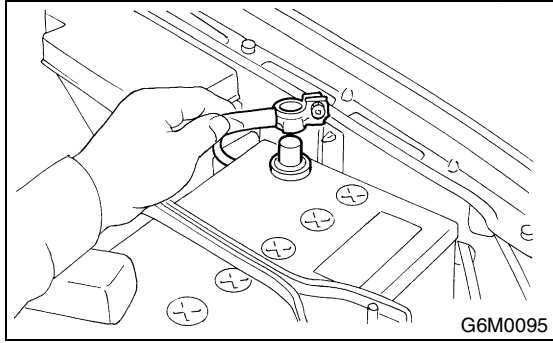
- 3) Lower the vehicle.
- 4) Connect the connector of front oxygen (A/F) sensor.



FRONT OXYGEN (A/F) SENSOR

FUEL INJECTION (FUEL SYSTEMS)

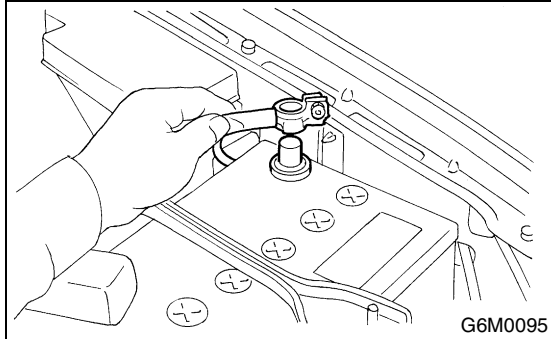
5) Connect the battery ground cable to battery.



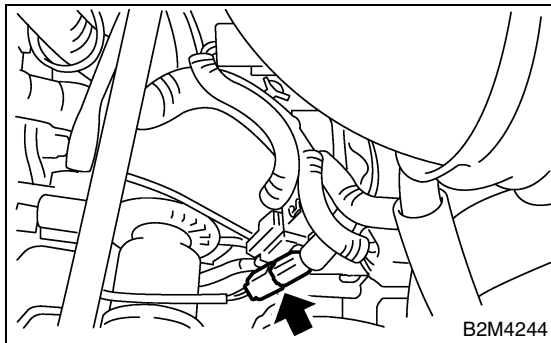
15. Rear Oxygen Sensor

A: REMOVAL

- 1) Disconnect the ground cable from battery.



- 2) Disconnect the connector from rear oxygen sensor.



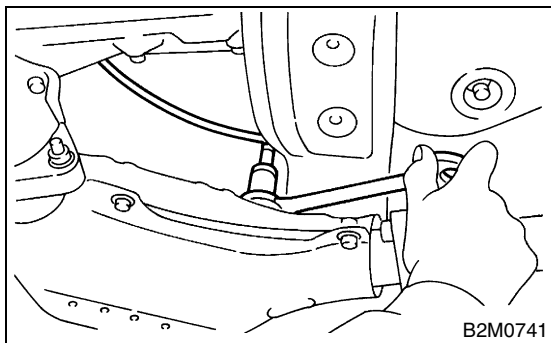
- 3) Lift-up the vehicle.
- 4) Apply SUBARU CRC or its equivalent to the threaded portion of rear oxygen sensor, and leave it for 1 minute or more.

SUBARU CRC (Part No. 004301003)

- 5) Remove the rear oxygen sensor.

CAUTION:

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



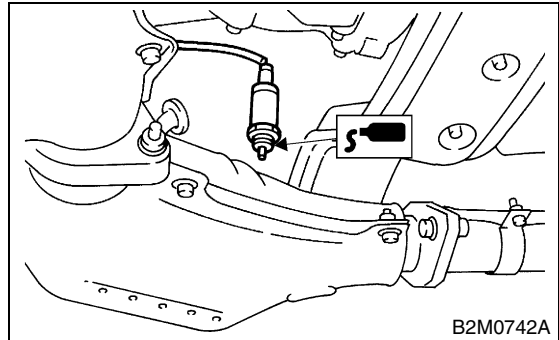
B: INSTALLATION

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

Anti-seize compound:
SS-30 by JET LUBE

CAUTION:

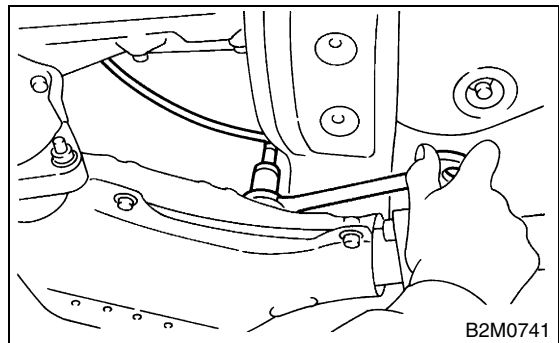
Never apply anti-seize compound to the protector of rear oxygen sensor.



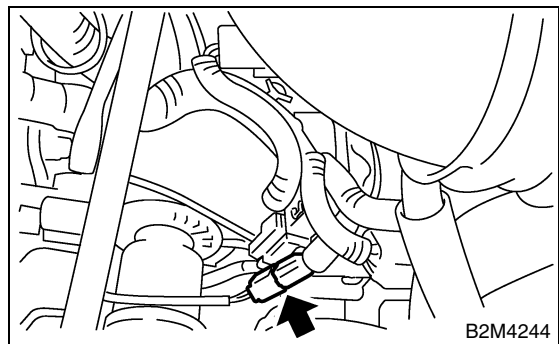
- 2) Install the rear oxygen sensor.

Tightening torque:

21 N·m (2.1 kgf-m, 15.2 ft-lb)



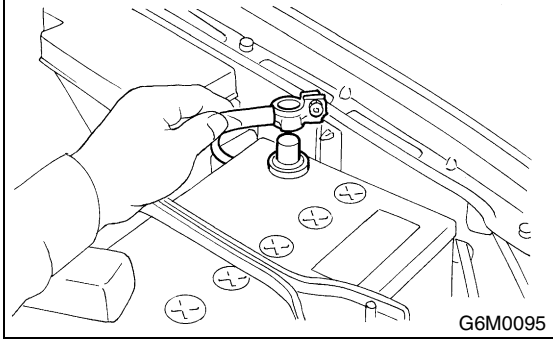
- 3) Lower the vehicle.
- 4) Connect the connector to rear oxygen sensor.



REAR OXYGEN SENSOR

FUEL INJECTION (FUEL SYSTEMS)

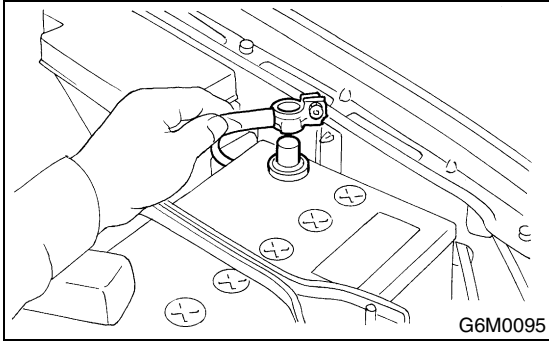
5) Connect the battery ground cable to battery.



16.Engine Control Module

A: REMOVAL

1) Disconnect the ground cable from battery.

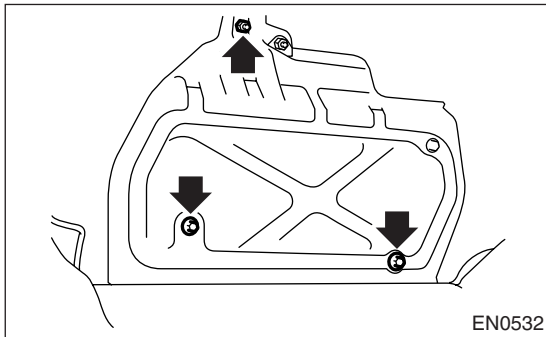


2) Remove the lower inner trim of passenger side.

<Ref. to EI-45, REMOVAL, Lower Inner Trim.>

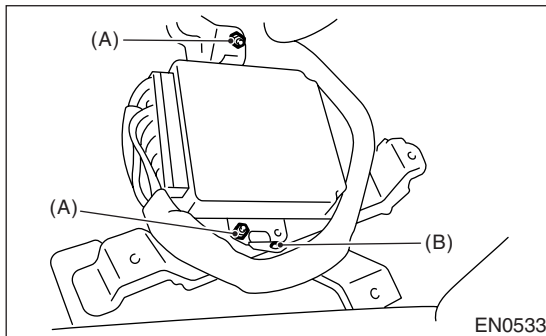
3) Detach the floor mat of front passenger seat.

4) Remove the protect cover.



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

6) Remove the clip (B) from bracket.



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

B: INSTALLATION

Install in the reverse order of removal.

CAUTION:

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

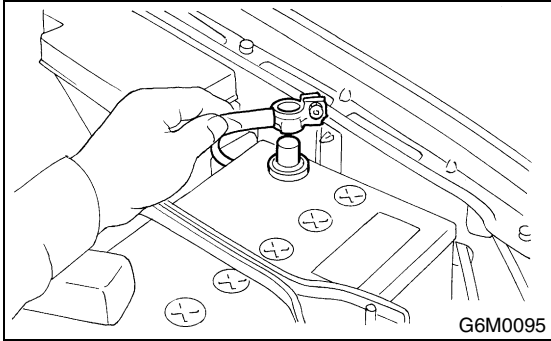
MAIN RELAY

FUEL INJECTION (FUEL SYSTEMS)

17.Main Relay

A: REMOVAL

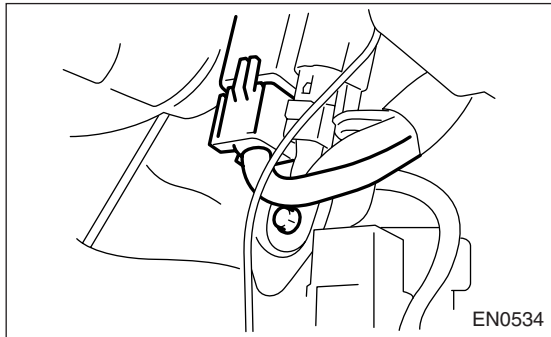
1) Disconnect the ground cable from battery.



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

3) Remove the bolt which holds main relay bracket on body.

4) Disconnect the connectors from main relay.



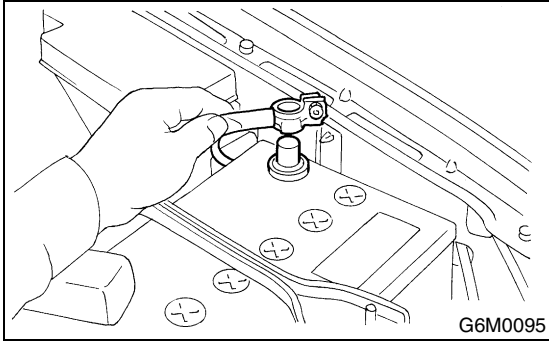
B: INSTALLATION

Install in the reverse order of removal.

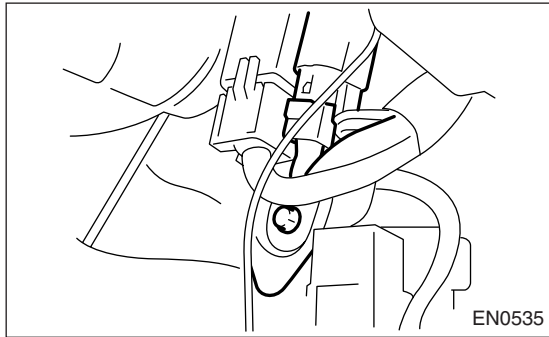
18. Fuel Pump Relay

A: REMOVAL

- 1) Disconnect the ground cable from battery.



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



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

B: INSTALLATION

Install in the reverse order of removal.

19. Fuel

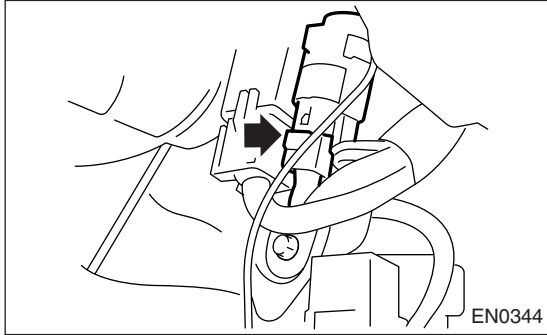
A: OPERATION

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 the connector from fuel pump relay.



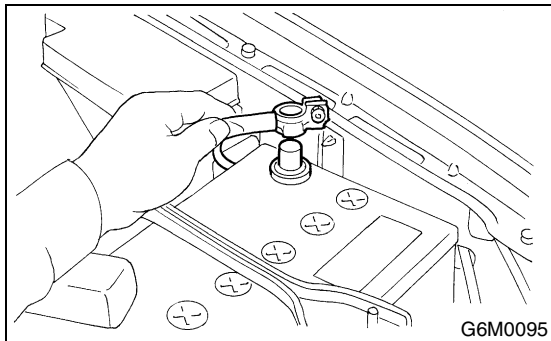
- 2) Start the engine and run it until it stalls.
 3) After the engine stalls, crank it for 5 more seconds.
 4) Turn the ignition switch to OFF.

2. DRAINING FUEL

WARNING:

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

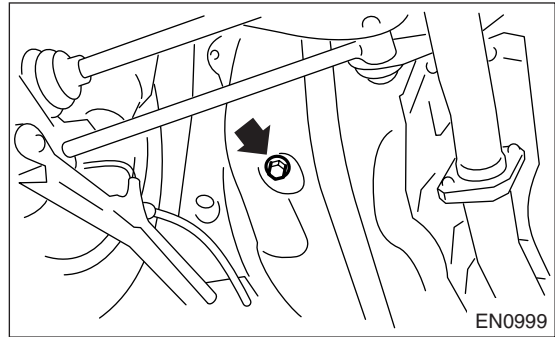
- 1) Set the vehicle on a lift.
 2) Disconnect the ground cable from battery.



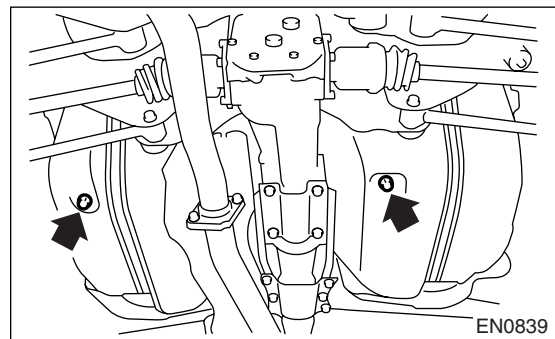
- 3) Open the fuel filler flap lid and remove fuel filler cap.
 4) Lift-up the vehicle.

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

- 1600 cc and 2000 cc MODEL



- 2500 cc MODEL

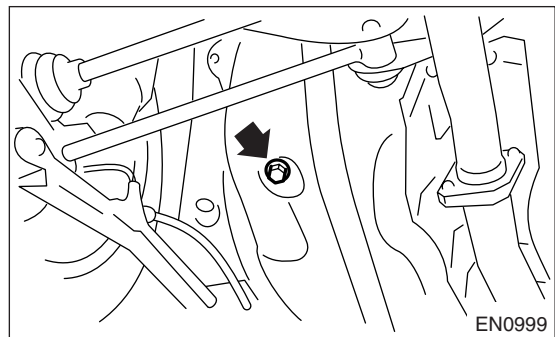


6) Tighten the fuel drain plug.

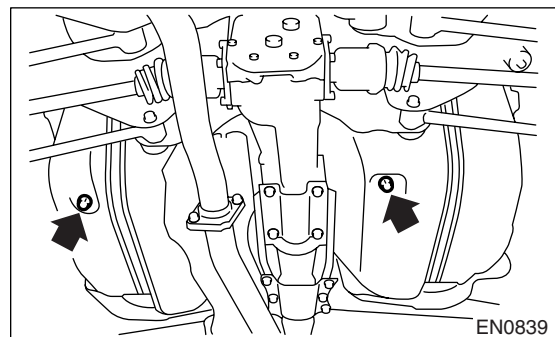
Tightening torque:

26 N·m (2.7 kgf-m, 19.2 ft-lb)

- 1600 cc and 2000 cc MODEL



- 2500 cc MODEL



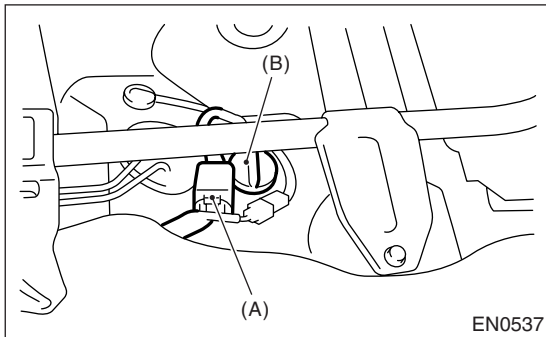
20. Fuel Tank

A: REMOVAL

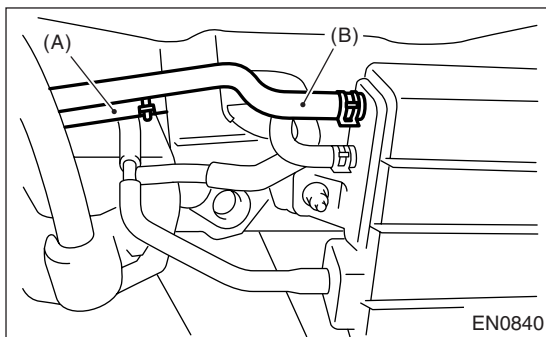
WARNING:

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

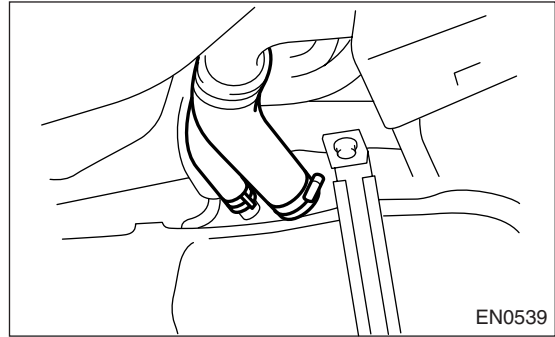
- 1) Set the vehicle on a lift.
- 2) Release the fuel pressure.
<Ref. to FU-54, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 3) Drain fuel from the fuel tank.
<Ref. to FU-54, DRAINING FUEL, OPERATION, Fuel.>
- 4) Remove the rear seat.
- 5) Disconnect the connector (A) of fuel tank cord to rear harness.
- 6) Push the grommet (B) which holds fuel tank cord on floor panel into under the body.



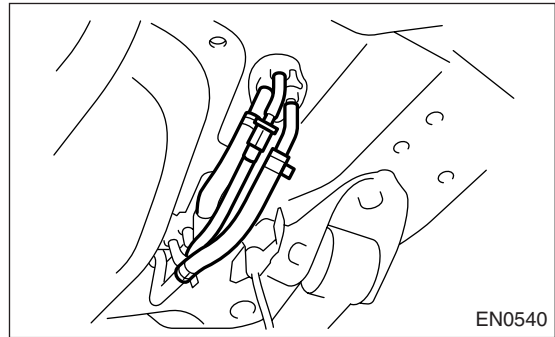
- 7) Remove the rear crossmember. <Ref. to RS-21, REMOVAL, Rear Crossmember.>
- 8) Disconnect the two-way valve hose (A) from two-way valve and disconnect the canister hose (B) from canister.



- 9) Loosen the clamp and disconnect the fuel filler hose and air vent hose from fuel filler pipe.



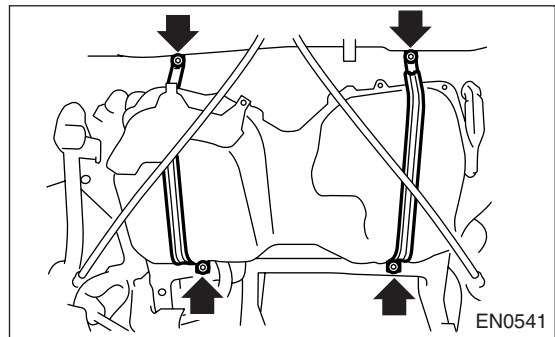
- 10) Move the clips, and disconnect quick connector.
<Ref. to FU-71, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>
- 11) Disconnect the fuel hoses.



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

WARNING:

A helper is required to perform this work.



FUEL TANK

FUEL INJECTION (FUEL SYSTEMS)

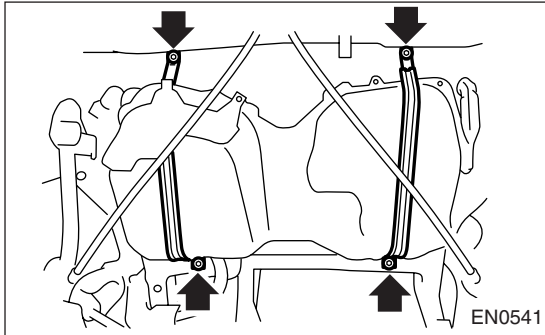
B: INSTALLATION

1) Support the fuel tank with transmission jack and push the fuel tank harness into access hole with grommet.

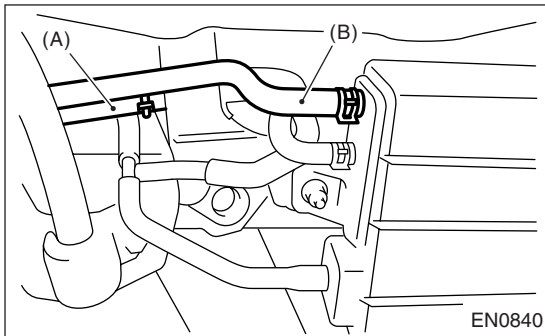
2) Set the fuel tank and temporarily tighten the bolts of fuel tank bands.

WARNING:

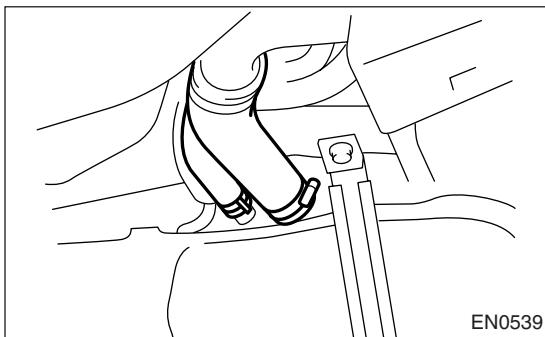
A helper is required to perform this work.



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

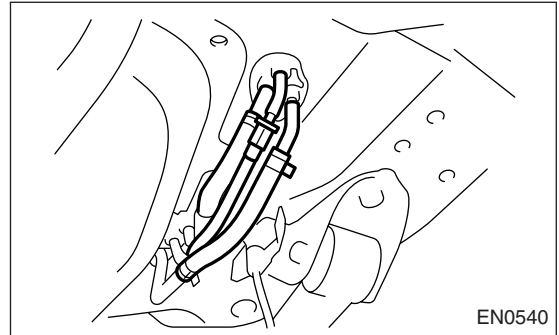


4) Connect the fuel filler hose and air vent hose.



5) Connect the fuel hoses, and secure them with clips and quick connector.

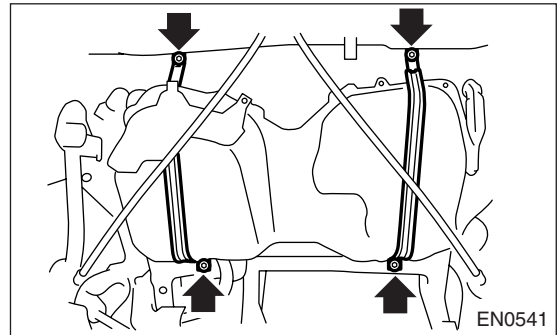
<Ref. to FU-73, INSTALLATION, Fuel Delivery, Return and Evaporation Lines.>



6) Tighten the band mounting bolts.

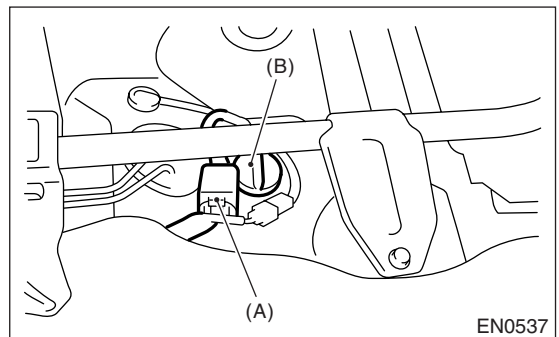
Tightening torque:

33 N·m (3.4 kgf-m, 24.3 ft-lb)



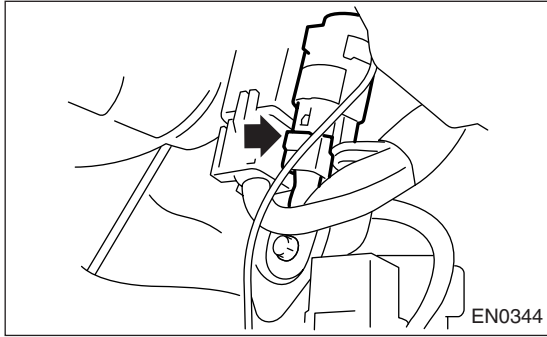
7) Install the rear crossmember. <Ref. to RS-21, INSTALLATION, Rear Crossmember.>

8) Connect the connector (A) to fuel tank cord and plug the service hole with grommet (B).



9) Set the rear seat and floor mat.

10) Connect the 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.

FUEL FILLER PIPE

FUEL INJECTION (FUEL SYSTEMS)

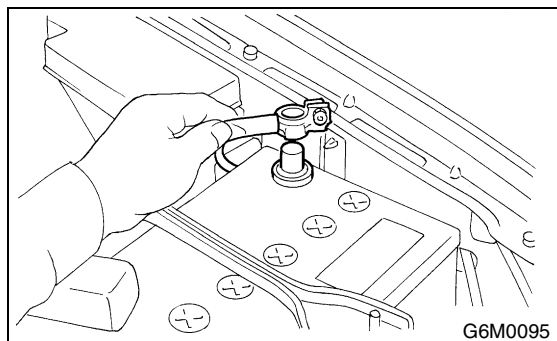
21. Fuel Filler Pipe

A: REMOVAL

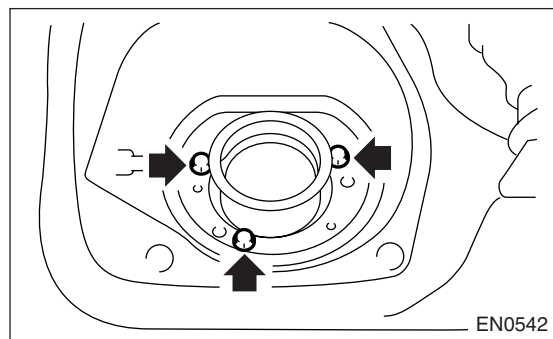
WARNING:

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

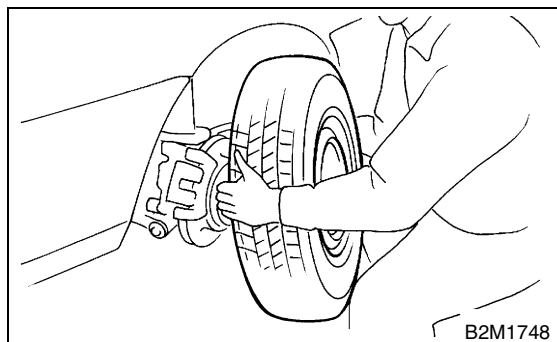
- 1) Set the vehicle on a lift.
- 2) Release the fuel pressure.
<Ref. to FU-54, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 3) Open the fuel filler flap lid and remove fuel filler cap.
- 4) Disconnect the ground cable from battery.



- 5) Remove the screws holding packing in place.

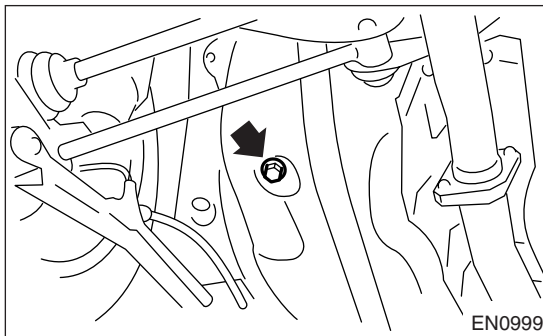


- 6) Remove the rear right side wheel nuts.
- 7) Lift-up the vehicle.
- 8) Remove the rear right side wheel.

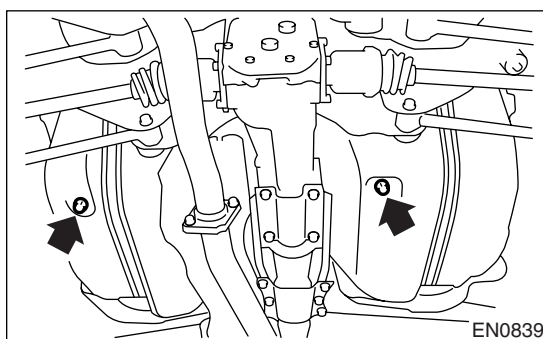


- 9) Drain fuel from the fuel tank. Set a container under the vehicle and remove the drain plug from fuel tank.

- 1600 cc and 2000 cc MODEL



- 2500 cc MODEL

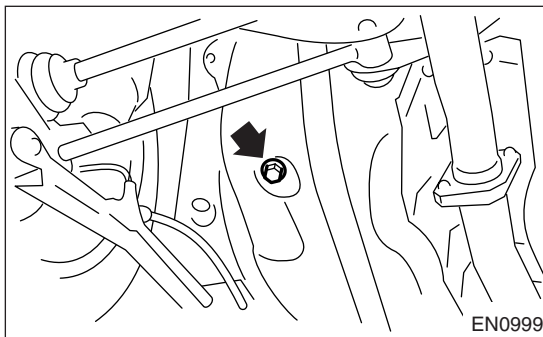


- 10) Tighten the fuel drain plug and then install the front right side tank cover.

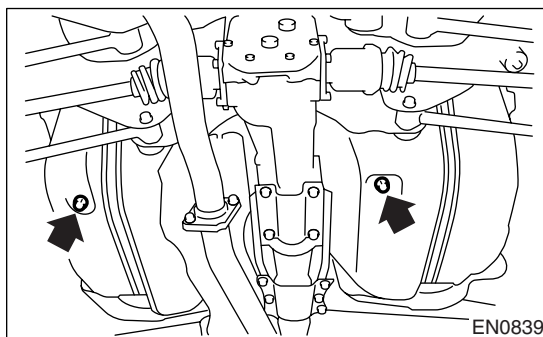
Tightening torque:

26 N·m (2.7 kgf-m, 19.2 ft-lb)

- 1600 cc and 2000 cc MODEL



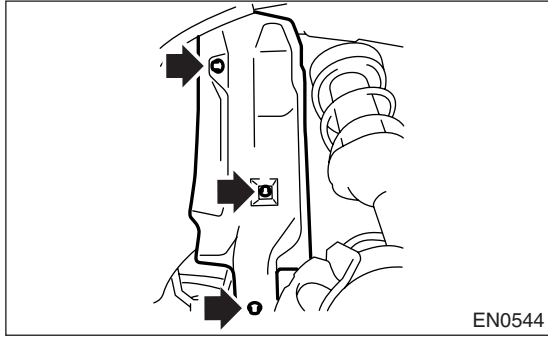
- 2500 cc MODEL



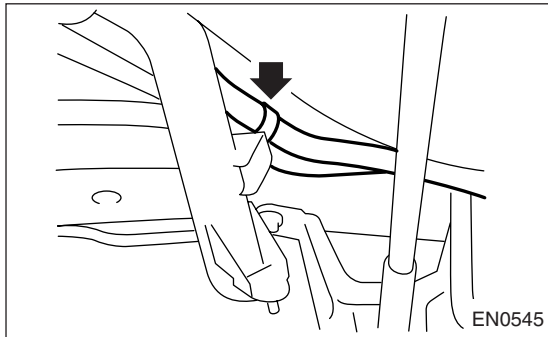
FUEL FILLER PIPE

FUEL INJECTION (FUEL SYSTEMS)

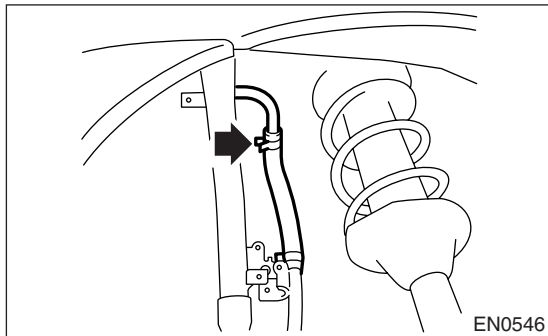
11) Remove the fuel filler pipe protector.



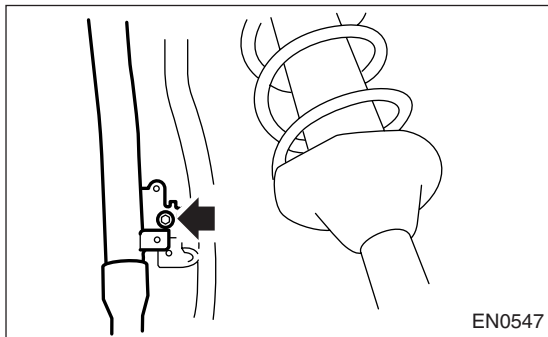
12) Separate the evaporation hoses from clip of fuel filler pipe.



13) Disconnect the air vent hose from fuel filler pipe.

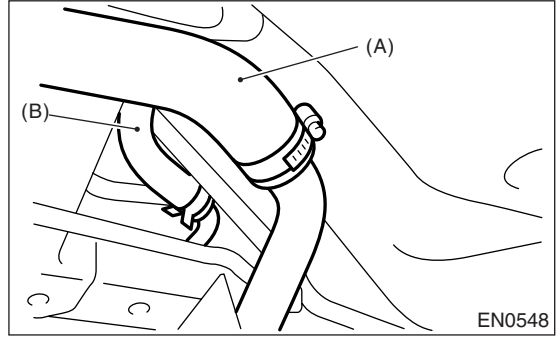


14) Remove the bolt which holds fuel filler pipe bracket on body.



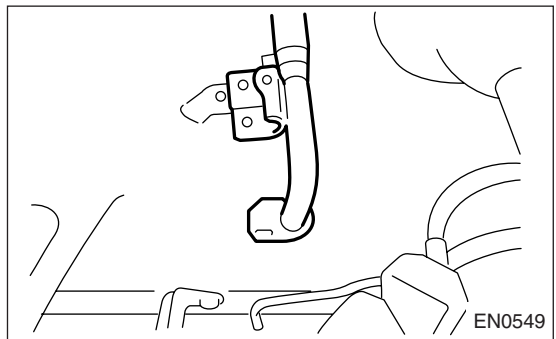
15) Loosen the clamp and separate fuel filler hose (A) from fuel filler pipe.

16) Move the clip and separate air vent hose (B).



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

18) Remove the air vent pipe together with clip from body.



B: INSTALLATION

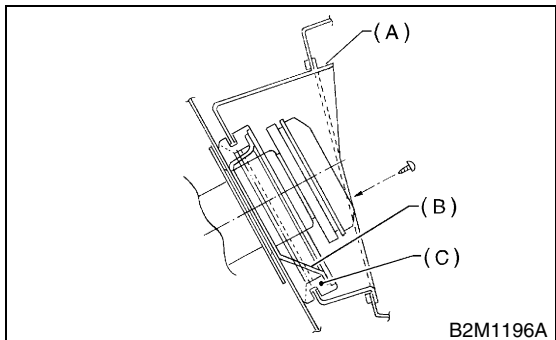
1) Hold the fuel filler flap open.

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

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

NOTE:

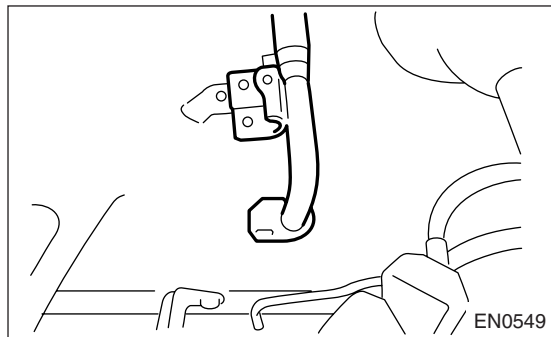
If the edges of rubber packing are folded toward inside, straighten it with a screwdriver.



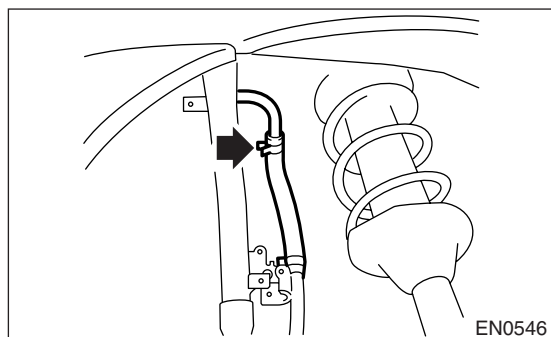
FUEL FILLER PIPE

FUEL INJECTION (FUEL SYSTEMS)

4) Install the air vent pipe.



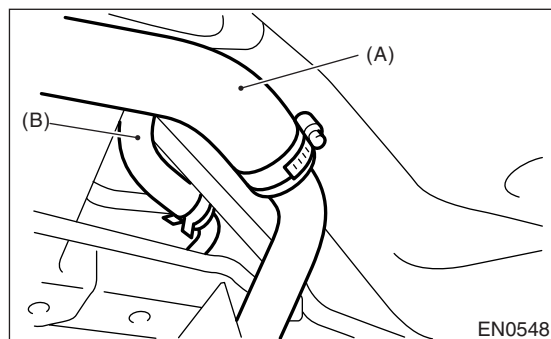
5) Connect the air vent hose to fuel filler pipe.



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

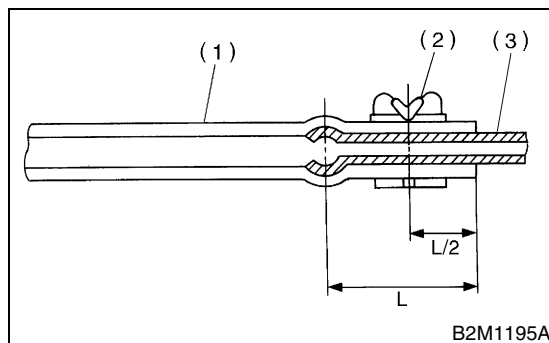
CAUTION:

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



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

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

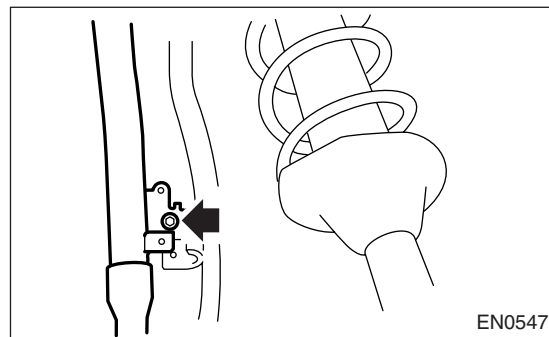


- (1) Hose
- (2) Clip
- (3) Pipe

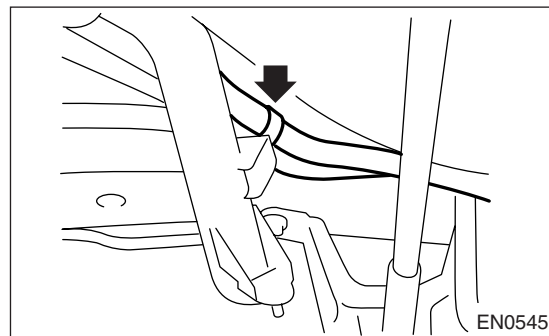
8) Tighten the bolt which holds fuel filler pipe bracket on body.

Tightening torque:

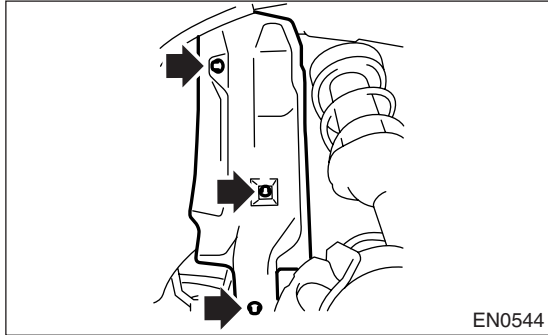
$7.5 \text{ N}\cdot\text{m (0.75 kgf}\cdot\text{m, 5.4 ft}\cdot\text{lb)}$



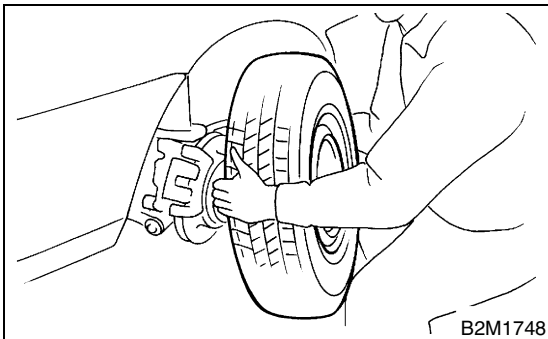
9) Tighten the bolts which hold evaporation hoses onto clip of fuel filler pipe.



10) Install the fuel filler pipe protector.



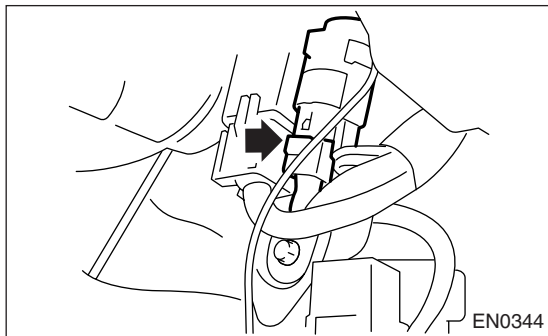
11) Install the rear right wheel.



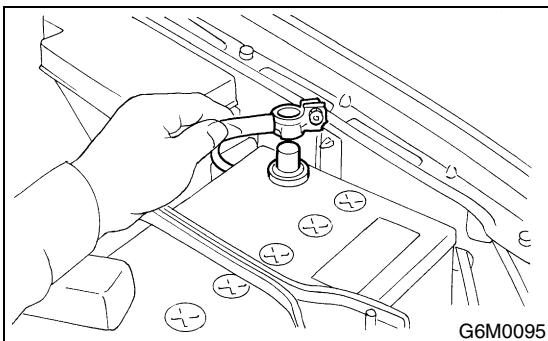
12) Lower the vehicle.

13) Tighten the wheel nuts.

14) Connect the connector to fuel pump relay.



15) Connect the battery ground cable to battery.



FUEL PUMP

FUEL INJECTION (FUEL SYSTEMS)

22. Fuel Pump

A: REMOVAL

WARNING:

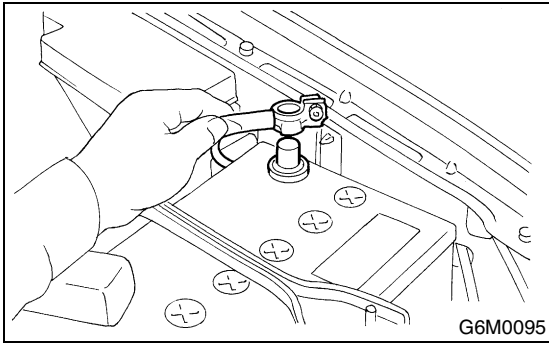
- Place “NO FIRE” signs near the working area.
- Be careful not to spill fuel on the floor.

NOTE:

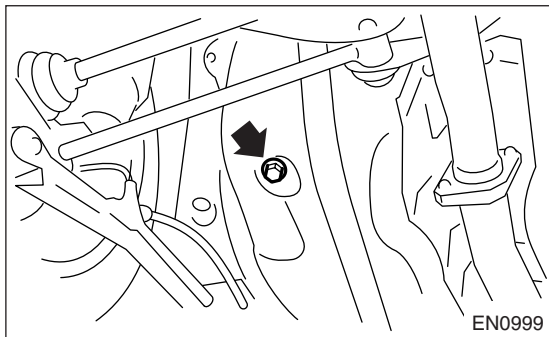
Fuel pump assembly consists of fuel pump and fuel level sensor.

• 1600 cc and 2000 cc MODEL

- 1) Release the fuel pressure.
<Ref. to FU-54, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 2) Open the fuel filler flap lid and remove fuel filler cap.
- 3) Disconnect the ground cable from battery.



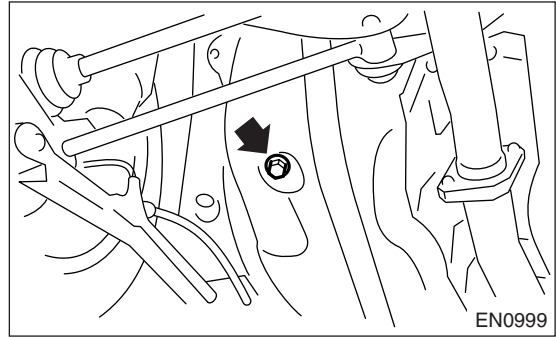
- 4) Lift-up the vehicle.
- 5) Drain fuel from the fuel tank. Set a container under the vehicle and remove the drain plug from fuel tank.



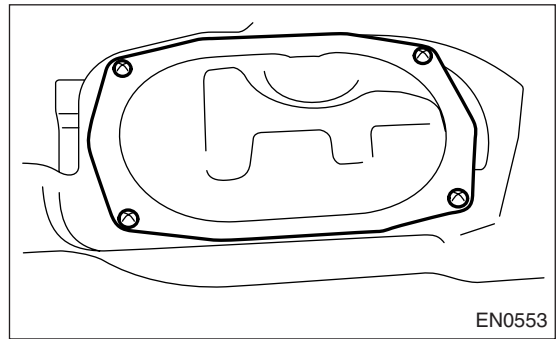
- 6) Tighten the fuel drain plug.

Tightening torque:

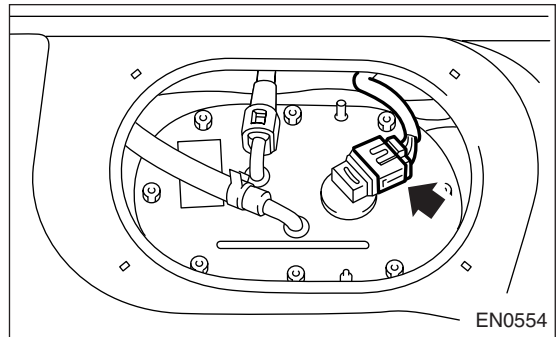
26 N·m (2.7 kgf·m, 19.2 ft·lb)



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



- 9) Disconnect the connector from fuel pump.

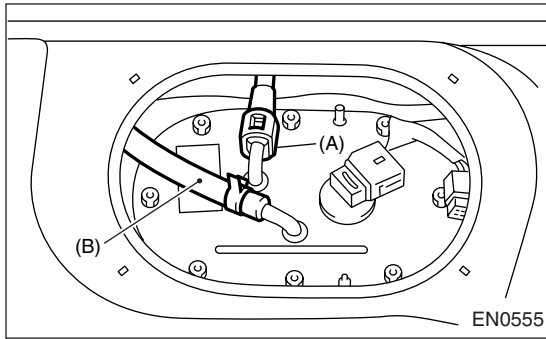


- 10) Disconnect the quick connector and then disconnect fuel delivery hose (A).
<Ref. to FU-71, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>

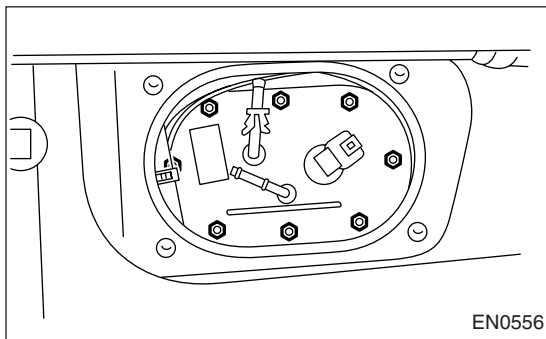
FUEL PUMP

FUEL INJECTION (FUEL SYSTEMS)

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

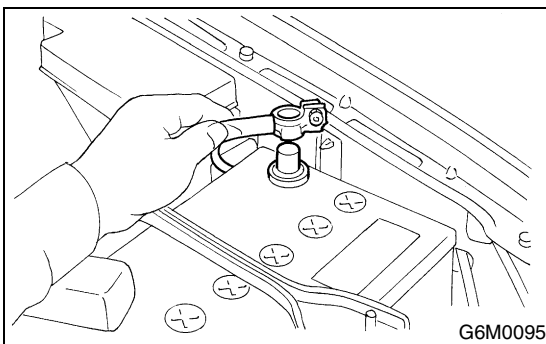


- 12) Remove the nuts which install fuel pump assembly onto fuel tank.



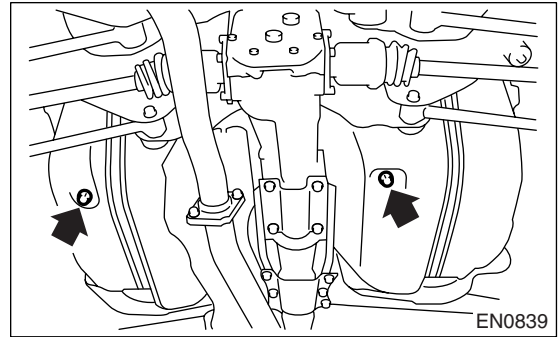
- 13) Take off the fuel pump assembly from fuel tank.
• 2500 cc MODEL

- 1) Release the fuel pressure. <Ref. to FU-54, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
2) Open the fuel filler flap lid and remove fuel filler cap.
3) Disconnect the ground cable from battery.



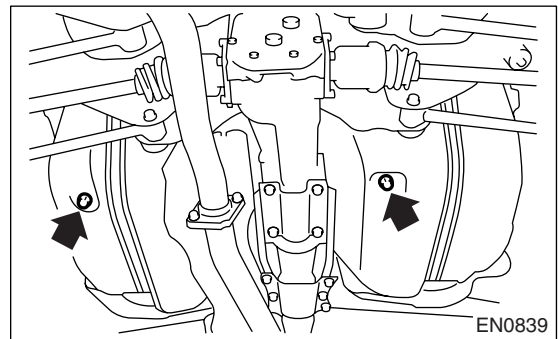
- 4) Lift-up the vehicle.

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

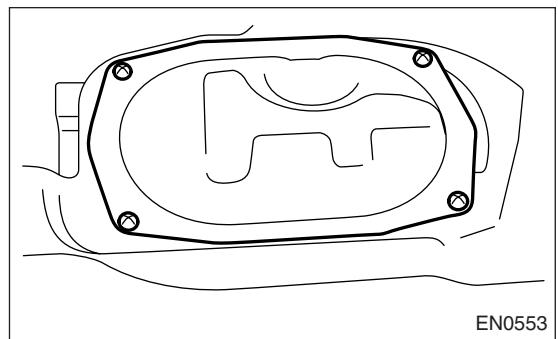


- 6) Tighten the fuel drain plug.

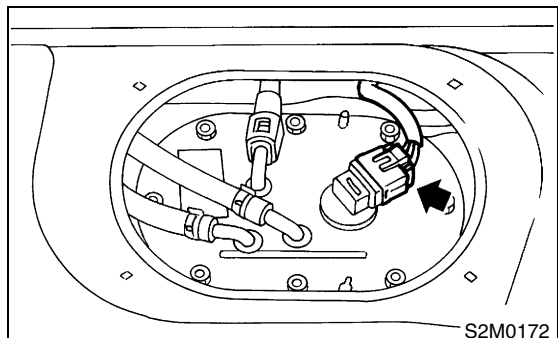
Tightening torque:
26 N·m (2.7 kgf·m, 19.2 ft·lb)



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



- 9) Disconnect the connector from fuel pump.

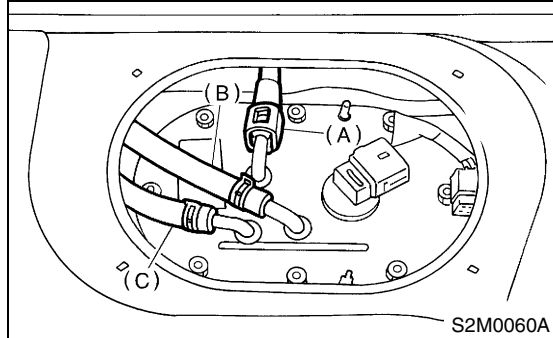


FUEL PUMP

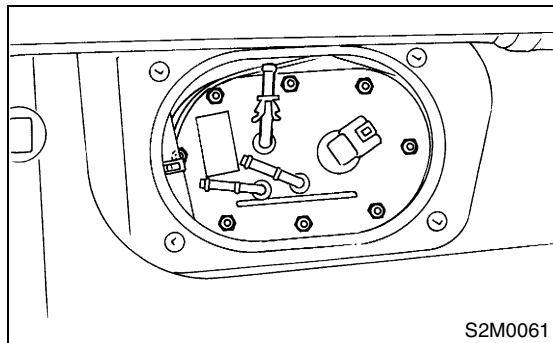
FUEL INJECTION (FUEL SYSTEMS)

10) Disconnect the quick connector and then disconnect fuel delivery hose (A). <Ref. to FU(TURBO)-68, Fuel Delivery, Return and Evaporation Lines.>

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



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



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

B: INSTALLATION

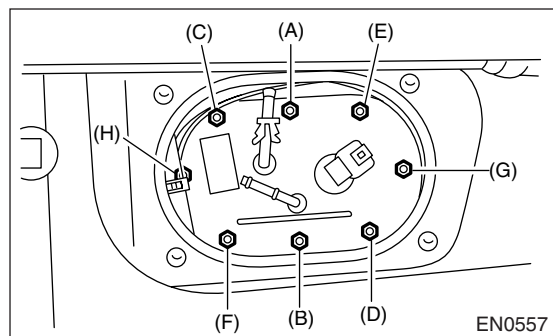
Install in the reverse order of removal. Do the following:

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

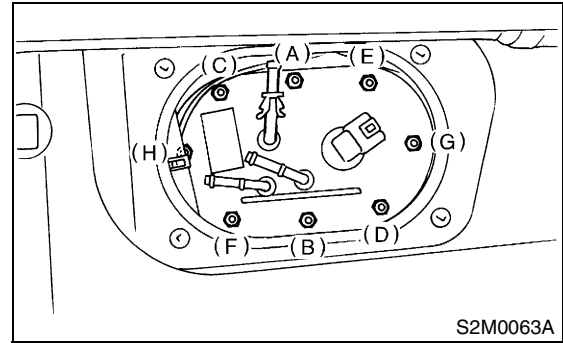
Tightening torque:

4.4 N·m (0.45 kgf-m, 3.3 ft-lb)

- 1600 cc and 2000 cc MODEL



- 2500 cc MODEL

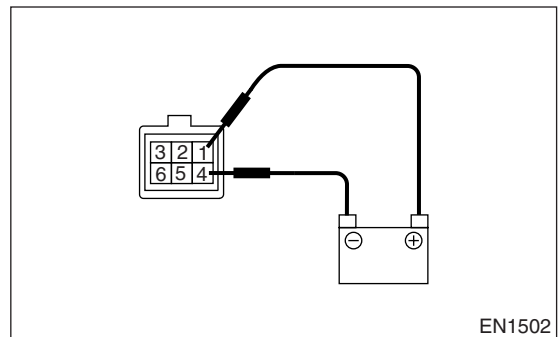


C: INSPECTION

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

WARNING:

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



23. Fuel Level Sensor

A: REMOVAL

WARNING:

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

NOTE:

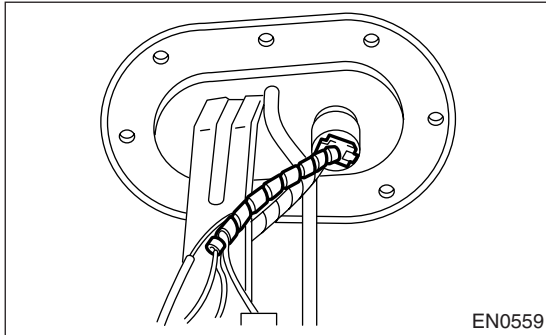
Fuel level sensor is built in the fuel pump assembly.

1) Remove the fuel pump assembly.

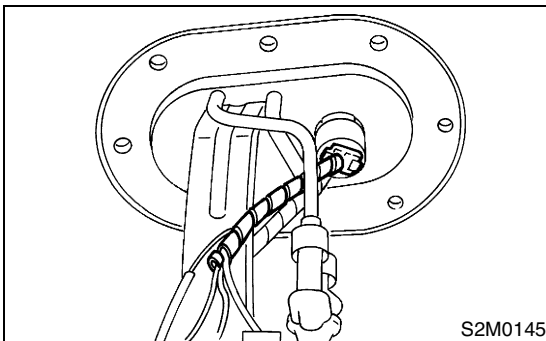
<Ref. to FU-62, REMOVAL, Fuel Pump.>

2) Disconnect the connector from fuel pump bracket.

- 1600 cc and 2000 cc MODEL

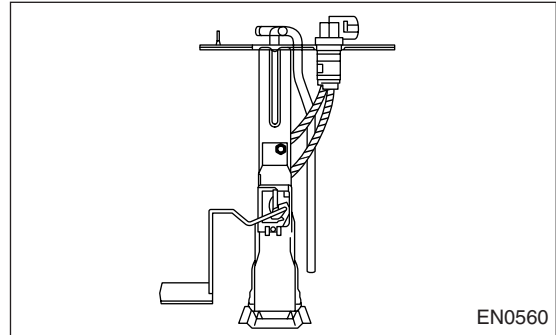


- 2500 cc MODEL

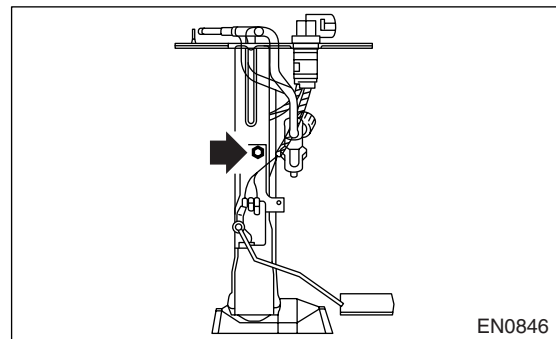


3) Remove the bolt which installs fuel level sensor on mounting bracket.

- 1600 cc and 2000 cc MODEL



- 2500 cc MODEL



B: INSTALLATION

Install in the reverse order of removal.

FUEL SUB LEVEL SENSOR

FUEL INJECTION (FUEL SYSTEMS)

24. Fuel Sub Level Sensor

A: REMOVAL

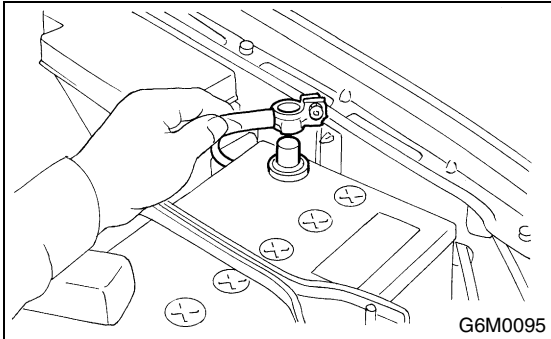
NOTE:

Fuel sub level sensor is equipped to only 2500 cc model.

WARNING:

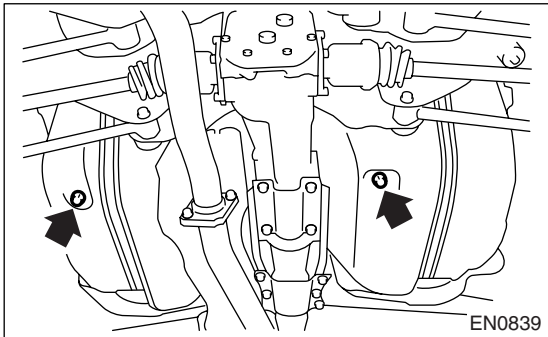
- Place “NO FIRE” signs near the working area.
- Be careful not to spill fuel on the floor.

1) Disconnect the ground cable from battery.



2) Lift-up the vehicle.

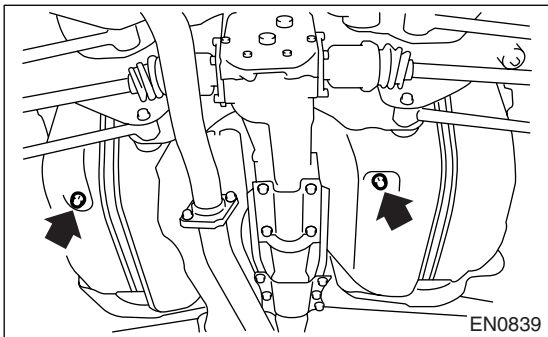
3) Drain fuel from the fuel tank. Set a container under the vehicle and remove the drain plug from fuel tank.



4) Tighten the fuel drain plug.

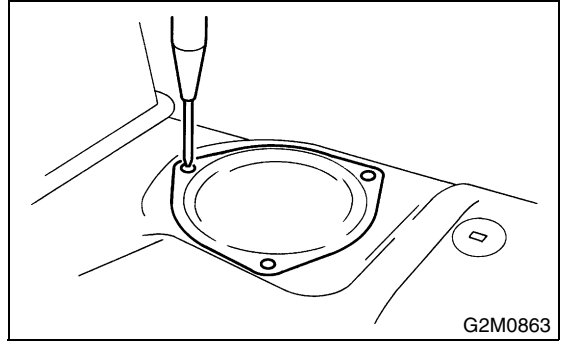
Tightening torque:

26 N·m (2.7 kgf-m, 19.2 ft-lb)



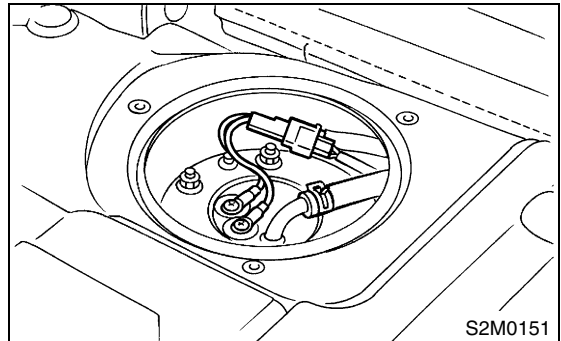
5) Remove the rear seat.

6) Remove the service hole cover.

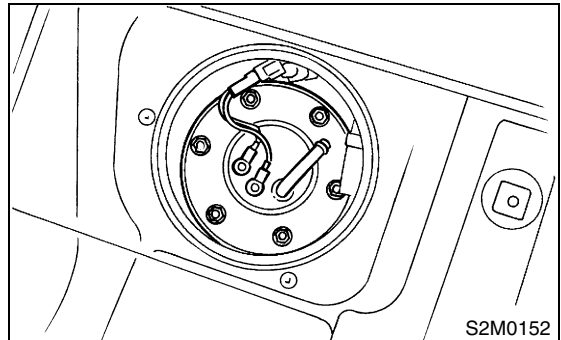


7) Disconnect the connector from fuel sub meter.

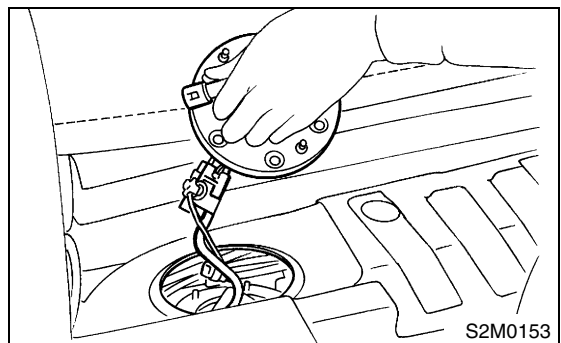
8) Disconnect the fuel jet pump hose.



9) Remove the bolts which install fuel sub meter unit on fuel tank.



10) Remove the fuel sub meter unit.



FUEL SUB LEVEL SENSOR

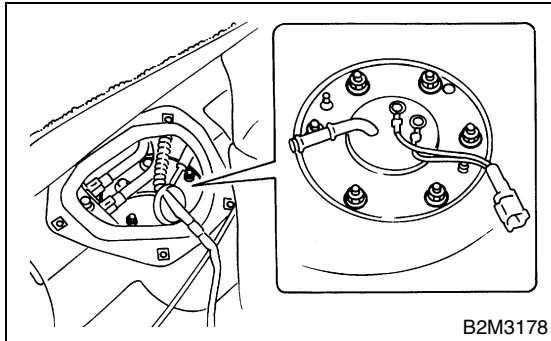
FUEL INJECTION (FUEL SYSTEMS)

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



25. Fuel Filter

A: REMOVAL

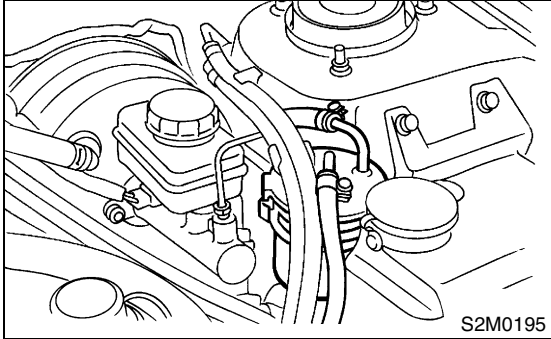
WARNING:

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

1) Release the fuel pressure.

<Ref. to FU-54, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>

2) Disconnect the fuel delivery hoses from fuel filter.



3) Remove the filter from holder.

B: INSTALLATION

CAUTION:

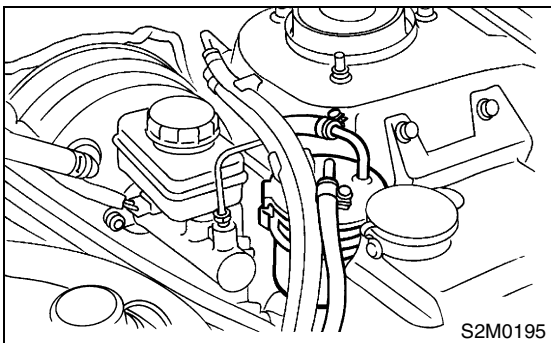
- If fuel hoses are damaged at the connecting portion, replace it with a new one.
- If clamps are badly damaged, replace with new ones.

1) Install in the reverse order of removal.

2) Tighten the hose clamp screws.

Tightening torque:

1.25 N·m (0.13 kgf-m, 0.94 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.

26. Fuel Cut Valve

A: REMOVAL

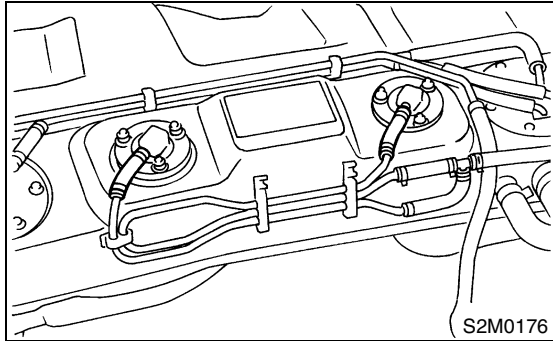
WARNING:

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

1) Remove the fuel tank.

<Ref. to FU-55, REMOVAL, Fuel Tank.>

2) Move the clip and disconnect the evaporation hose from fuel cut valve.



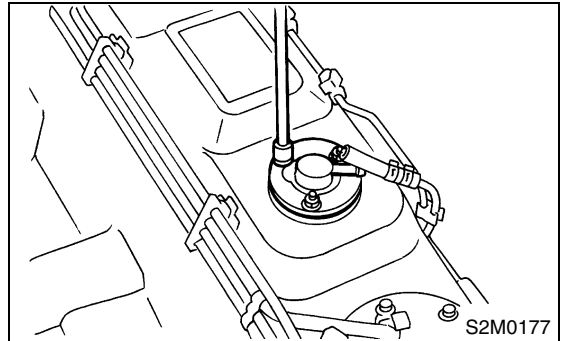
3) Remove the bolts which install fuel cut valve.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

4.4 N·m (0.45 kgf·m, 3.3 ft·lb)



FUEL DAMPER VALVE

FUEL INJECTION (FUEL SYSTEMS)

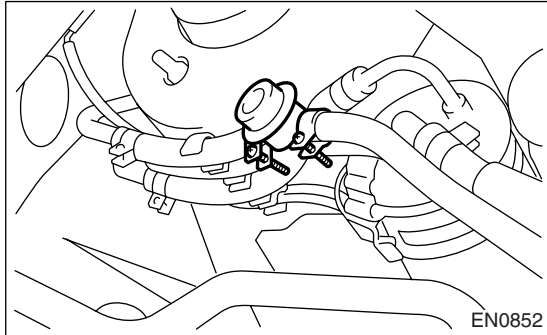
27. Fuel Damper Valve

A: REMOVAL

- 1) Release the fuel pressure.
<Ref. to FU-54, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 2) Remove the fuel damper valve from fuel return line.

B: INSTALLATION

Install in the reverse order of removal.



28. Fuel Delivery, Return and Evaporation Lines

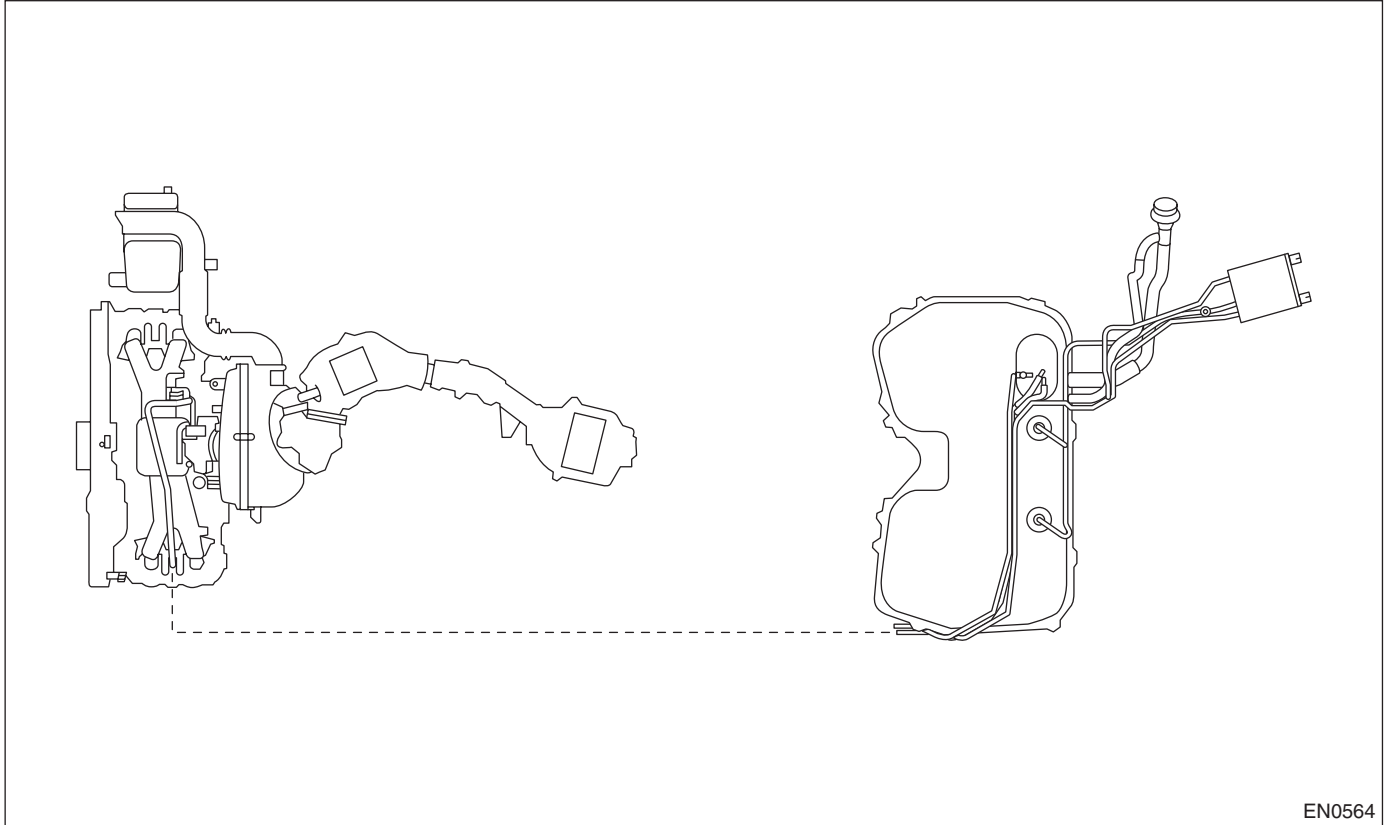
A: REMOVAL

- 1) Set the vehicle on a lift.
- 2) Release the fuel pressure.
<Ref. to FU-54, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>

3) Open the fuel filler flap lid and remove fuel filler cap.

4) Remove the floor mat. <Ref. to EI-53, REMOVAL, Floor Mat.>

5) Remove the fuel delivery pipes and hoses, fuel return pipes and hoses, evaporation pipes and hoses.

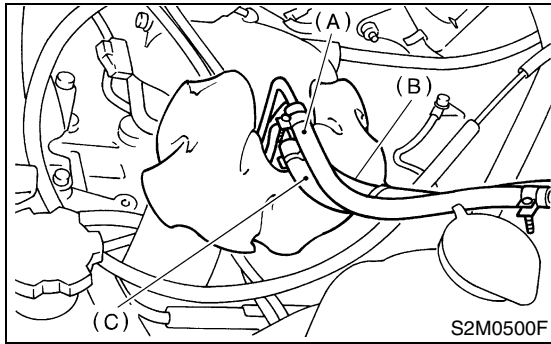


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FUEL DELIVERY, RETURN AND EVAPORATION LINES

FUEL INJECTION (FUEL SYSTEMS)

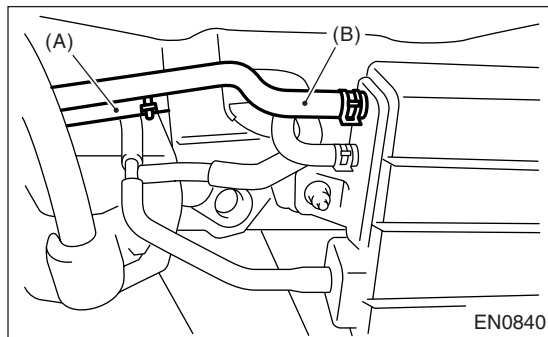
6) In the engine compartment, detach the fuel delivery hoses, return hoses and evaporation hose.



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

7) Lift-up the vehicle.

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

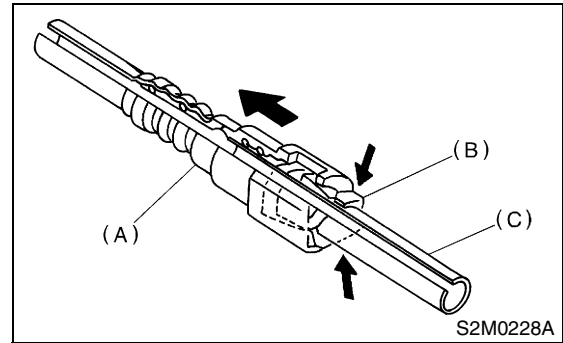


9) Separate the quick connector on fuel delivery and return line.

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

NOTE:

Replace the retainer with new ones.



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

FUEL DELIVERY, RETURN AND EVAPORATION LINES

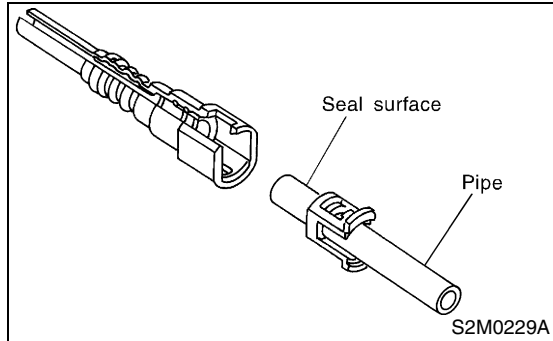
FUEL INJECTION (FUEL SYSTEMS)

B: INSTALLATION

1) Connect the quick connector on fuel delivery line.

NOTE:

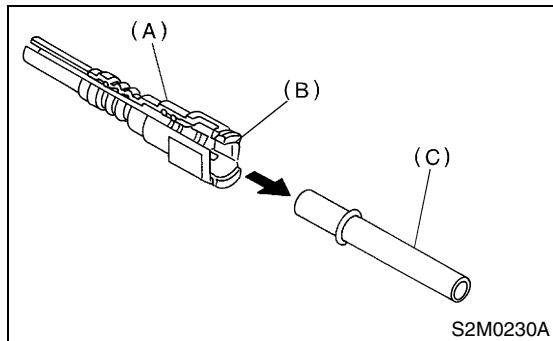
- Always use a new retainer.
- Make sure that the connected portion is not damaged or has dust. If necessary, clean the seal surface of pipe.



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

NOTE:

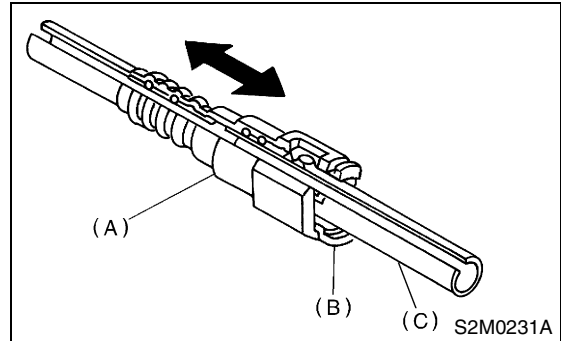
At this time, two clicking sounds are heard.



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

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 the hoses and their connections for any leakage of fuel.



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

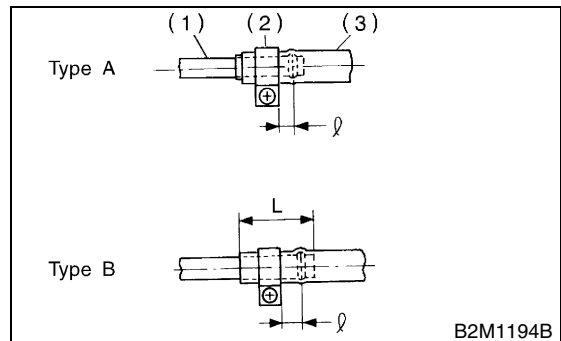
2) Connect the fuel delivery hose to pipe with an overlap of 20 to 25 mm (0.79 to 0.98 in).

Type A: When the fitting length is specified.

Type B: When the 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

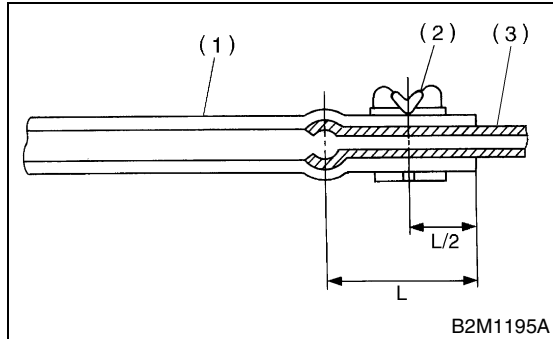
FUEL INJECTION (FUEL SYSTEMS)

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

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

CAUTION:

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



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

C: INSPECTION

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

FUEL SYSTEM TROUBLE IN GENERAL

FUEL INJECTION (FUEL SYSTEMS)

29. Fuel System Trouble in General

A: INSPECTION

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

NOTE:

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

To prevent water condensation.

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

(2) Drain water condensation from the fuel filter.

- Refilling the fuel tank.

Refill the fuel tank while there is still some fuel left in the tank.

- Protecting the fuel system against freezing and water condensation.

(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)

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

EC

	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 the ground cable from battery.

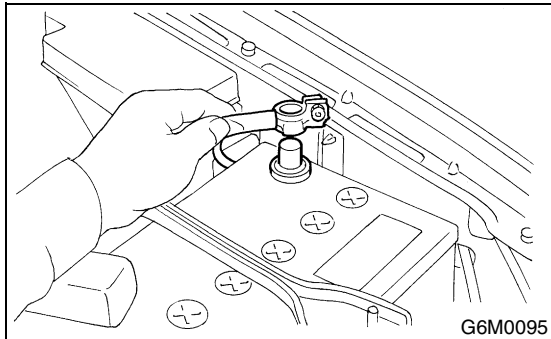
FRONT CATALYTIC CONVERTER

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

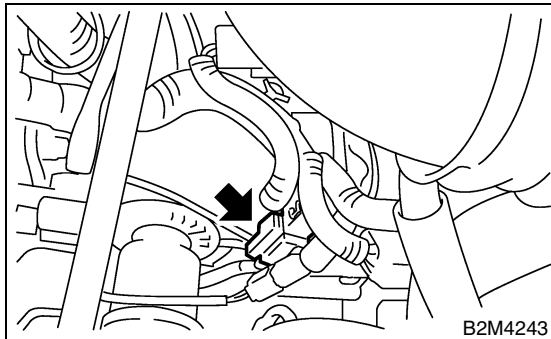
2. Front Catalytic Converter

A: REMOVAL

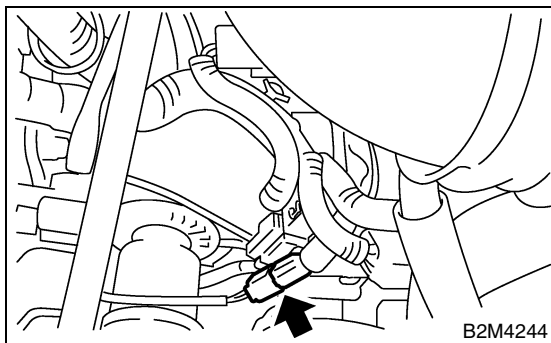
- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from battery.



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



- 4) Disconnect the connector from rear oxygen sensor connector.

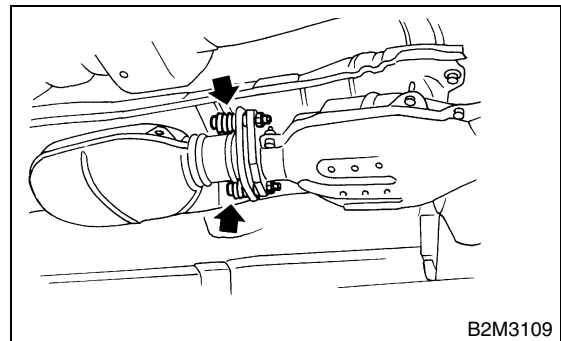


- 5) Lift-up the vehicle.
- 6) Remove the under cover.

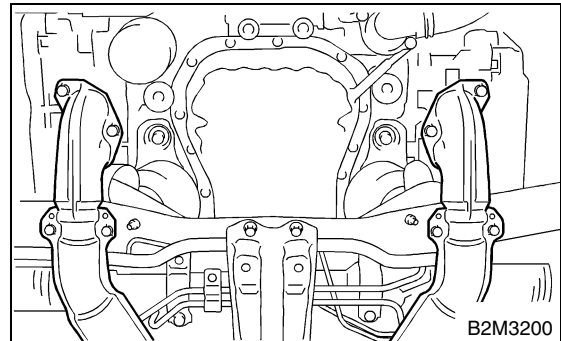
- 7) Separate the center exhaust pipe from rear exhaust pipe.

CAUTION:

Be careful, the exhaust pipe is hot.



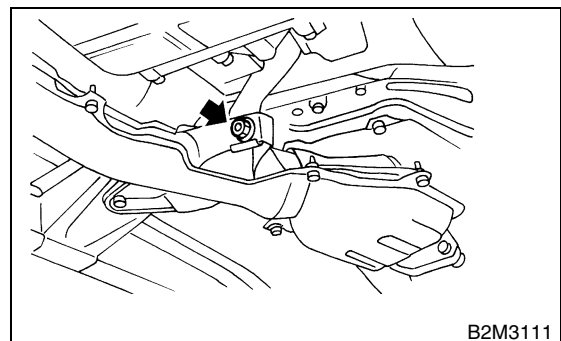
- 8) Remove the nuts which hold front exhaust pipe onto cylinder heads.



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

CAUTION:

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



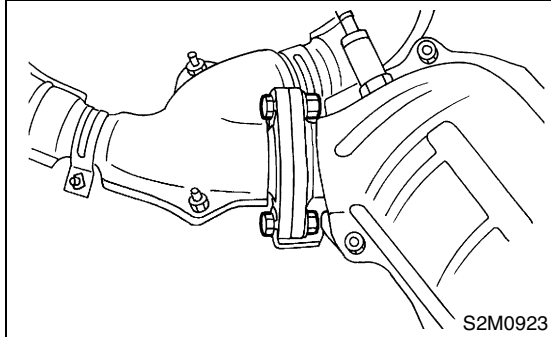
FRONT CATALYTIC CONVERTER

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

10) Separate the 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

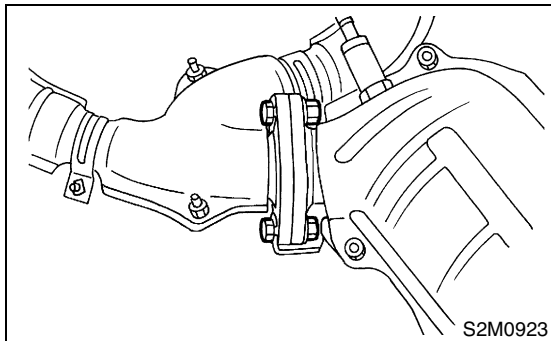
NOTE:

Replace gaskets with new ones.

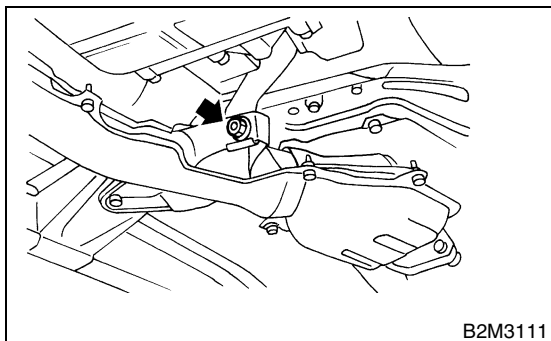
1) Install the front catalytic converter to front exhaust pipe.

Tightening torque:

30 N-m (3.1 kgf-m, 22.4 ft-lb)



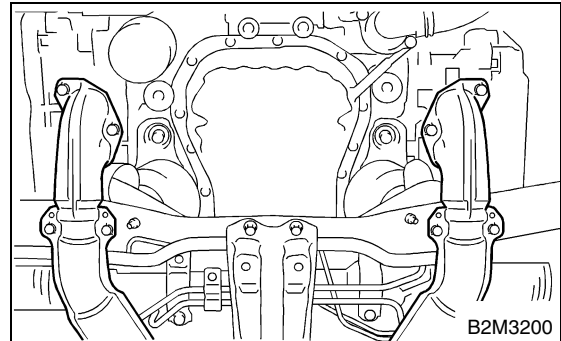
2) Install the front and center exhaust pipe assembly to the vehicle. And temporarily tighten the bolt which installs center exhaust pipe to hanger bracket.



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

Tightening torque:

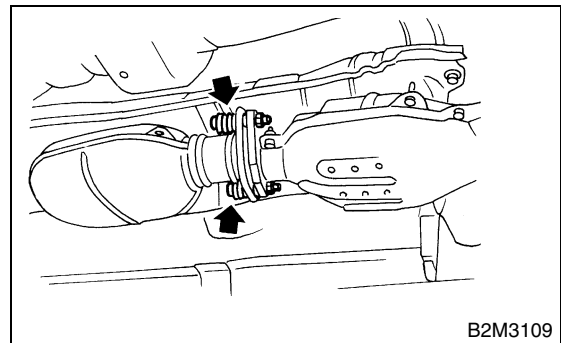
30 N-m (3.1 kgf-m, 22.4 ft-lb)



4) Tighten the bolts which install front and center exhaust pipe to rear exhaust pipe.

Tightening torque:

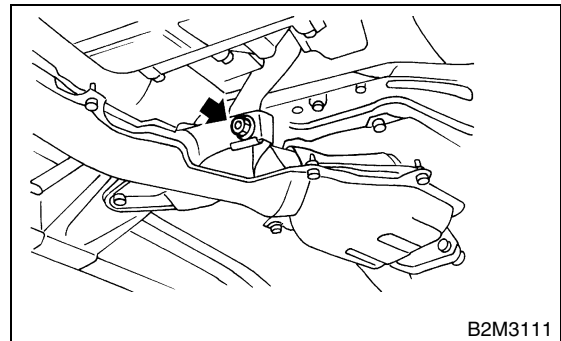
18 N-m (1.8 kgf-m, 13.0 ft-lb)



5) Tighten the bolt which holds front and center exhaust pipe assembly to hanger bracket.

Tightening torque:

35 N-m (3.6 kgf-m, 26.0 ft-lb)



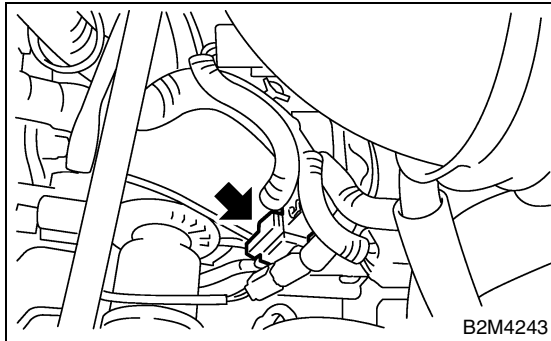
6) Install the under cover.

FRONT CATALYTIC CONVERTER

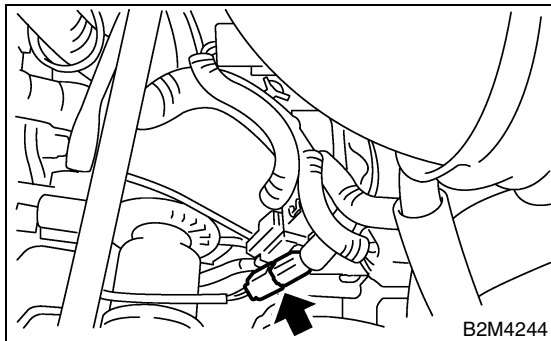
EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

7) Lower the vehicle.

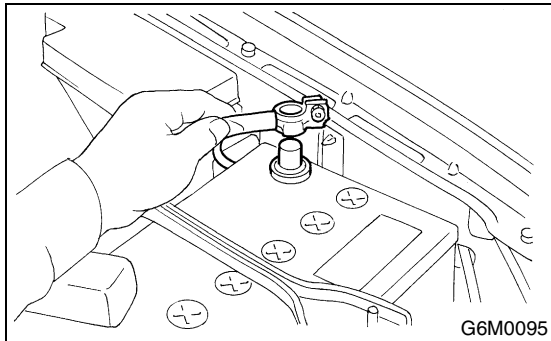
8) Connect the front oxygen (A/F) sensor connector.



9) Connect the connector to rear oxygen sensor connector.



10) Connect the battery ground cable to battery.



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.

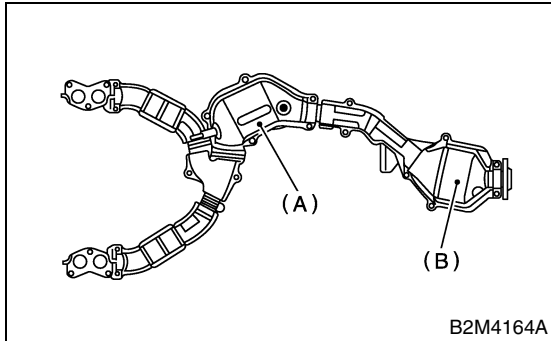
REAR CATALYTIC CONVERTER

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

3. Rear Catalytic Converter

A: REMOVAL

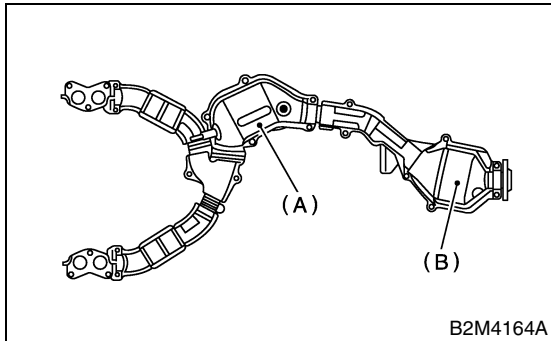
The front and rear catalytic converter and center exhaust pipe are integrated into one unit. Therefore, the removal and installation procedures are the same as the those for the front catalytic converter. <Ref. to EC-3, REMOVAL, Front Catalytic Converter.>



- (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-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.

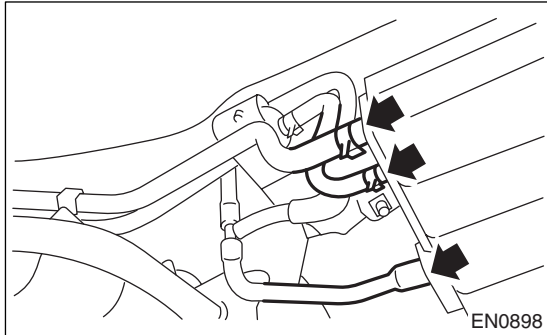
CANISTER

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

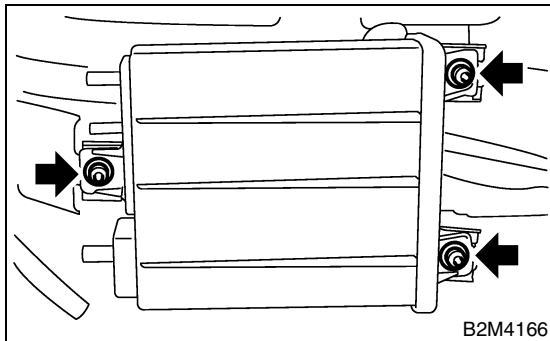
4. Canister

A: REMOVAL

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



- 3) Remove the canister from body.

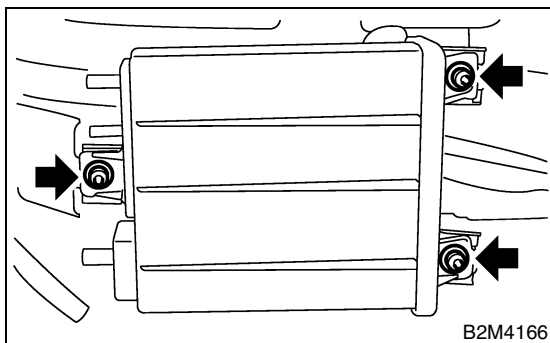


B: INSTALLATION

- 1) Install in the reverse order of removal.

Tightening torque:

23 N·m (2.3 kgf-m, 17 ft-lb)



C: INSPECTION

Make sure the canister and canister hoses are not cracked or loose.

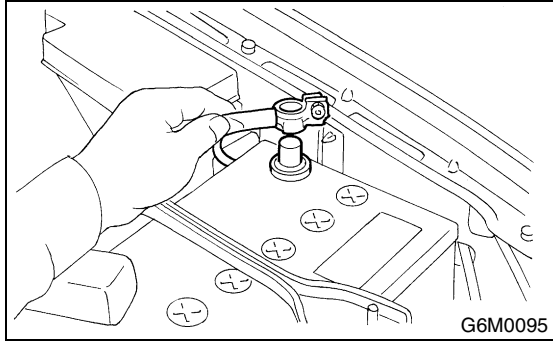
PURGE CONTROL SOLENOID VALVE

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

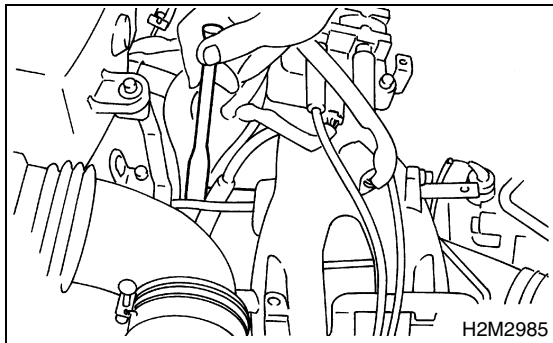
5. Purge Control Solenoid Valve

A: REMOVAL

1) Disconnect the ground cable from battery.

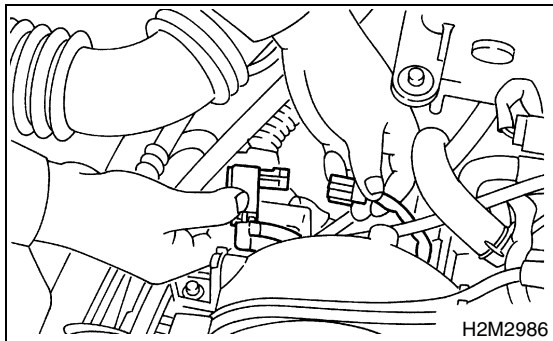


2) Remove the bolt which installs purge control solenoid valve onto intake manifold.



3) Take out the purge control solenoid valve through the bottom of intake manifold.

4) Disconnect the connector and hoses from purge control solenoid valve.

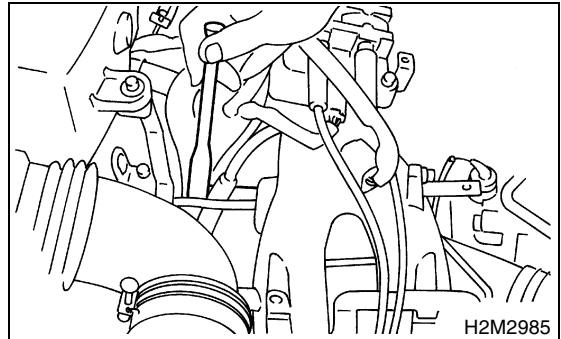


B: INSTALLATION

1) Install in the reverse order of removal.

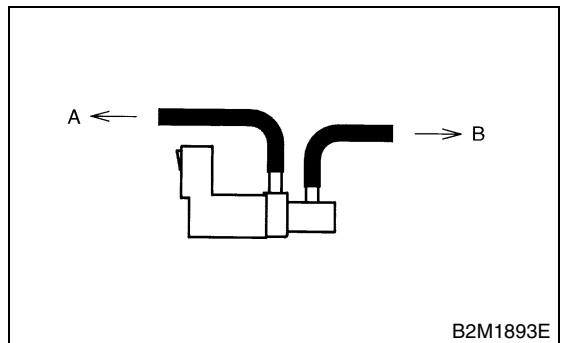
Tightening torque:

16 N·m (1.6 kgf-m, 11.6 ft-lb)



CAUTION:

Carefully connect the evaporation hoses.



A: To fuel pipe

B: To intake manifold

C: INSPECTION

Make sure hoses are not cracked or loose.

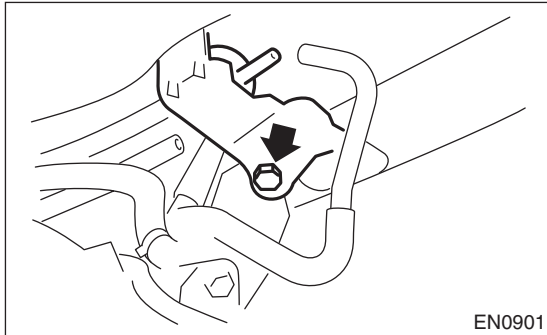
TWO-WAY VALVE

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

6. Two-way Valve

A: REMOVAL

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



- 4) Remove the two-way valve from bracket.

B: INSTALLATION

- 1) Install in the reverse order of removal.

C: INSPECTION

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

TWO-WAY VALVE

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

INTAKE (INDUCTION)

IN

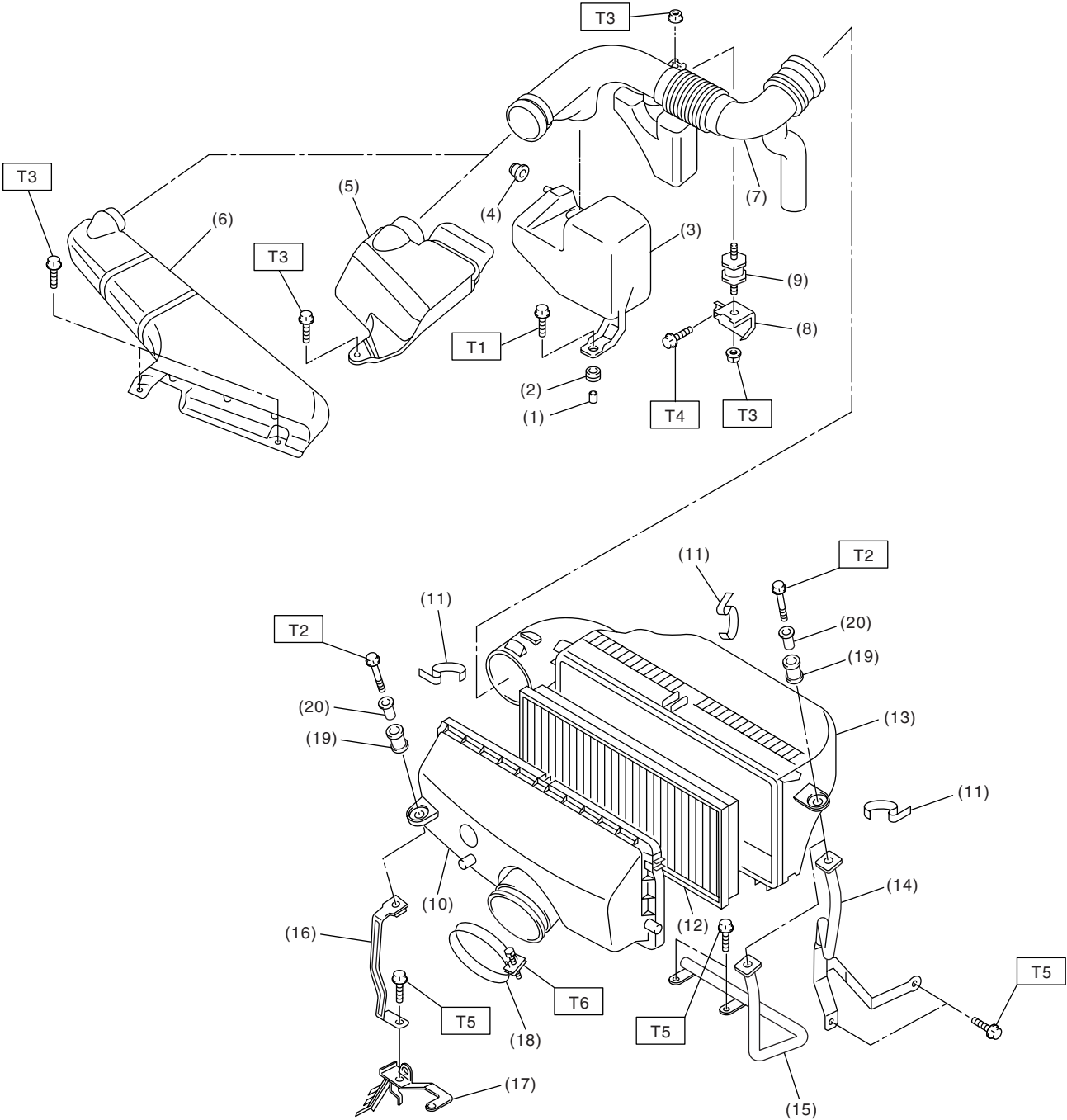
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2. Air Cleaner Element	5
3. Air Cleaner Case	6
4. Air Intake Duct	7
5. Resonator Chamber	8

GENERAL DESCRIPTION

INTAKE (INDUCTION)

1. General Description

A: COMPONENT



EN1336

GENERAL DESCRIPTION

INTAKE (INDUCTION)

(1) Spacer	(11) Clip	(20) Spacer
(2) Bush	(12) Air cleaner element	
(3) Resonator chamber	(13) Air cleaner case B	<hr/> <i>Tightening torque: N·m (kgf·m, ft·lb)</i>
(4) Cushion rubber	(14) Air cleaner case stay LH (MT vehicles)	<i>T1: 33 (3.4, 24.6)</i>
(5) Air intake duct A (1600 cc and 2000 cc model)	(15) Air cleaner case stay LH (AT vehicles)	<i>T2: 6.5 (0.66, 4.8)</i>
(6) Air intake duct A (2500 cc model)	(16) Air cleaner case stay RH	<i>T3: 7.5 (0.76, 5.5)</i>
(7) Air intake duct B	(17) Engine harness bracket	<i>T4: 14 (1.4, 10)</i>
(8) Holder	(18) Clamp	<i>T5: 16 (1.6, 11.6)</i>
(9) Cushion	(19) Bush	<i>T6: 3 (0.3, 2.2)</i>
(10) Air cleaner case A		<hr/>

GENERAL DESCRIPTION

INTAKE (INDUCTION)

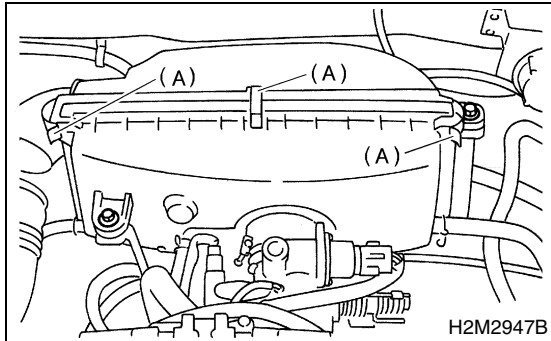
B: CAUTION

- 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 the ground cable from battery.

2. Air Cleaner Element

A: REMOVAL

1) Remove the clip (A) above the air cleaner case.



2) Remove the air cleaner element.

B: INSTALLATION

Install in the reverse order of removal.

CAUTION:

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

C: INSPECTION

Replace if excessively damaged or dirty.

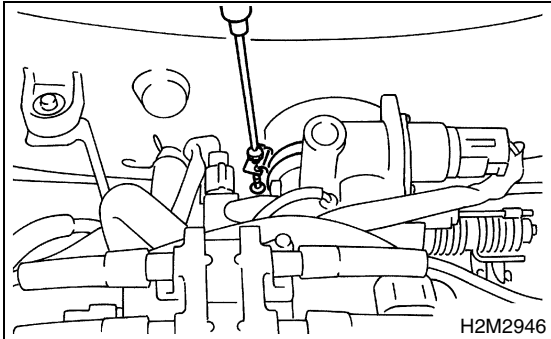
AIR CLEANER CASE

INTAKE (INDUCTION)

3. Air Cleaner Case

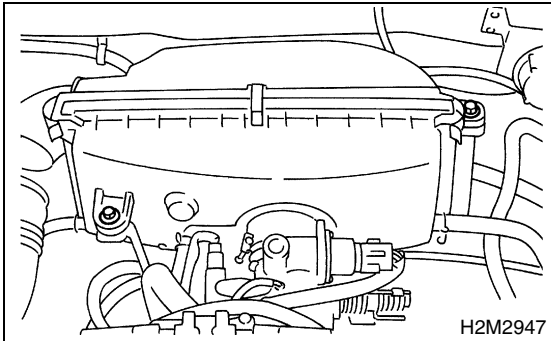
A: REMOVAL

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



2) Disconnect the hoses and intake duct from air cleaner case.

3) Remove the bolts which install air cleaner case to stays.



4) Remove the air cleaner case.

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

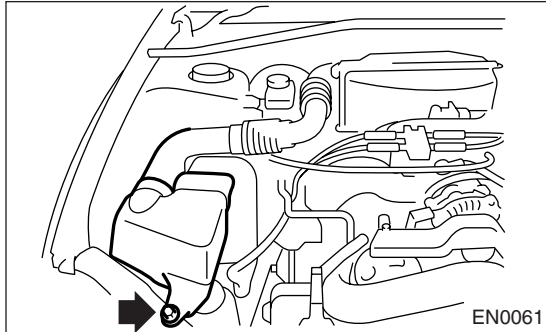
Inspect for cracks and loose connections.

4. Air Intake Duct

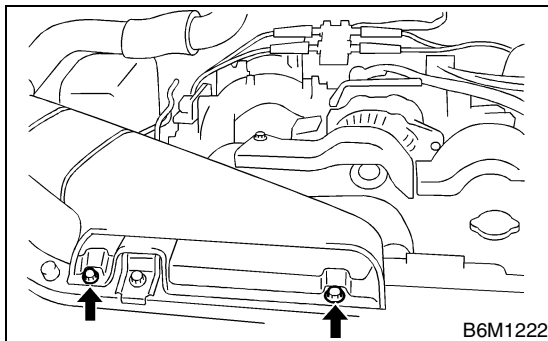
A: REMOVAL

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

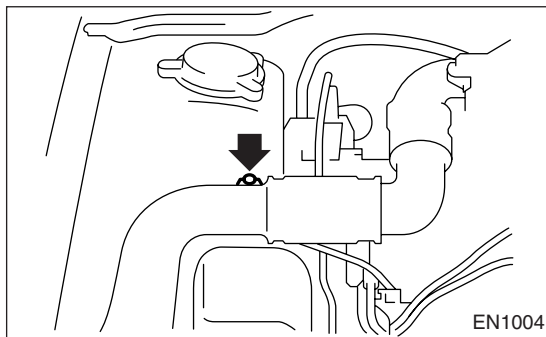
- 1600 cc and 2000 cc MODEL



- 2500 cc MODEL

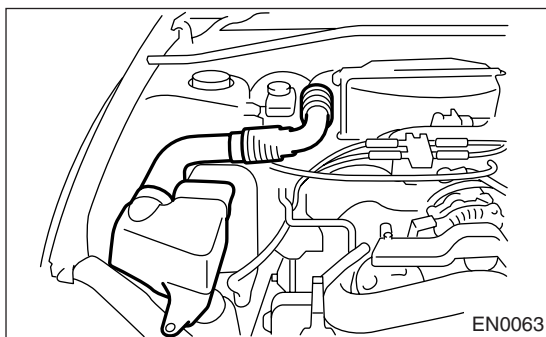


2) Remove the bolt which installs air intake duct B on body.

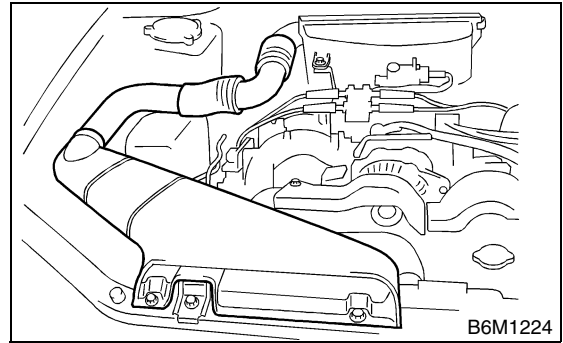


3) Remove the air intake ducts as a unit.

- 1600 cc and 2000 cc MODEL



- 2500 cc MODEL



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.

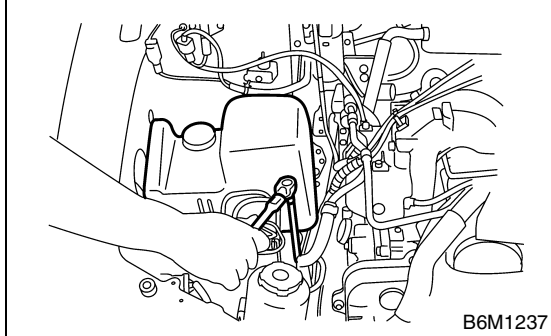
RESONATOR CHAMBER

INTAKE (INDUCTION)

5. Resonator Chamber

A: REMOVAL

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

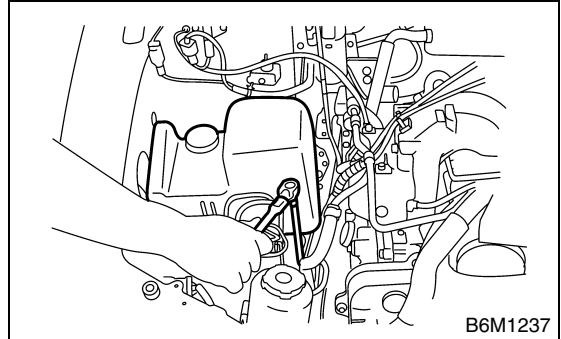


B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

33 N·m (3.4 kgf-m, 24.6 ft-lb)



C: INSPECTION

Inspect for cracks and loose connections.

MECHANICAL

ME

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GENERAL DESCRIPTION

MECHANICAL

1. General Description

A: SPECIFICATIONS

Model		1600 cc	2000 cc	2500 cc
Type		Horizontally opposed, liquid cooled, 4-cylinder, 4-stroke gasoline engine		
Valve arrangement		Belt driven, single over-head camshaft, 4-valve/cylinder		
Bore x Stroke	mm (in)	87.9 x 65.8 (3.46 x 2.591)	92 x 75 (3.62 x 2.95)	99.5 x 79.0 (3.917 x 3.110)
Displacement	cm ³ (cu in)	1,597 (97.45)	1,994 (121.67)	2,457 (150)
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	1° BTDC
	Closing	46° ABDC	48° ABDC	51° ABDC
Exhaust valve timing	Opening	42° BBDC	48° BBDC	50° BBDC
	Closing	10° ATDC	4° ATDC	6° ATDC
Valve clearance	Intake mm (in)	0.20±0.02 (0.0079±0.0008)		
	Exhaust mm (in)	0.25±0.02 (0.0098±0.0008)		
Idling speed [At neutral position on MT, or "P" or "N" position on AT]	rpm	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		0.020 — 0.054 mm (0.0008 — 0.0021 in)
	Limit		0.10 mm (0.0039 in)

GENERAL DESCRIPTION

MECHANICAL

Camshaft	Bend limit				0.025 mm (0.0010 in)
	Thrust clearance			STD	0.030 — 0.090 mm (0.0012 — 0.0035 in)
				Limit	0.10 mm (0.0039 in)
	Cam lobe height	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)
		2500 cc	Intake	STD	39.485 — 39.585 mm (1.5545 — 1.5585 in)
				Limit	39.385 mm (1.5506 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 seat	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				214 — 246 N (21.8 — 25.1 kgf, 48.1 — 55.3 lb)/ 45.0 mm (1.772 in) 526 — 582 N (53.6 — 59.3 kgf, 118.3 — 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)	
		2500 cc	STD	A	99.505 — 99.515 mm (3.9175 — 3.9179 in)	
				B	99.495 — 99.505 mm (3.9171 — 3.9175 in)	
	Taper			STD	0.015 mm (0.0006 in)	
				Limit	0.050 mm (0.0020 in)	
	Out-of-roundness			STD	0.010 mm (0.0004 in)	
				Limit	0.050 mm (0.0020 in)	
Piston clearance			STD	0.010 — 0.030 mm (0.0004 — 0.0012 in)		
			Limit	0.050 mm (0.0020 in)		
Enlarging (boring) limit			0.5 mm (0.020 in)			
Piston	Outer diameter	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)		
		2500 cc	STD	A	99.485 — 99.495 mm (3.9167 — 3.9171 in)	
				B	99.475 — 99.485 mm (3.9163 — 3.9167 in)	
			0.25 mm (0.0098 in) OS		99.725 — 99.735 mm (3.9262 — 3.9266 in)	
			0.50 mm (0.0197 in) OS		99.975 — 99.985 mm (3.9360 — 3.9364 in)	
Standard inner diameter of piston pin hole			23.000 — 23.006 mm (0.9055 — 0.9057 in)			
Piston pin	Outer diameter			22.994 — 23.000 mm (0.9053 — 0.9055 in)		
	Standard clearance between piston pin and 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 — 0.50 mm (0.0079 — 0.0197 in)		
			Limit	1.5 mm (0.059 in)		
	Clearance between piston ring and piston ring groove	Top ring	STD	0.055 — 0.090 mm (0.0022 — 0.0035 in)		
			Limit	0.15 mm (0.0059 in)		
Second ring		STD	0.030 — 0.070 mm (0.0012 — 0.0028 in)			
		Limit	0.15 mm (0.0059 in)			
Connecting rod	Bend twist per 100 mm (3.94 in) in length		Limit	0.10 mm (0.0039 in)		
	Side clearance		STD	0.070 — 0.330 mm (0.0028 — 0.0130 in)		
			Limit	0.4 mm (0.016 in)		

GENERAL DESCRIPTION

MECHANICAL

Connecting rod bearing	Oil clearance	1600 cc	STD	0.010 — 0.038 mm (0.0004 — 0.0015 in)	
			Limit	0.05 mm (0.0020 in)	
		2500 cc	STD	0.012 — 0.037 mm (0.0005 — 0.0015 in)	
			Limit	0.05 mm (0.0020 in)	
	Thickness at center portion	1600 cc	2000 cc	STD	1.492 — 1.501 mm (0.0587 — 0.0591 in)
				0.03 mm (0.0012 in) US	1.510 — 1.513 mm (0.0594 — 0.0596 in)
			0.05 mm (0.0020 in) US	1.520 — 1.523 mm (0.0598 — 0.0600 in)	
			0.25 mm (0.0098 in) US	1.620 — 1.623 mm (0.0638 — 0.0639 in)	
		2500 cc	STD	1.490 — 1.502 mm (0.0587 — 0.0591 in)	
			0.03 mm (0.0012 in) US	1.504 — 1.512 mm (0.0592 — 0.0595 in)	
			0.05 mm (0.0020 in) US	1.514 — 1.522 mm (0.0596 — 0.0599 in)	
			0.25 mm (0.0098 in) US	1.614 — 1.622 mm (0.0635 — 0.0639 in)	
Connecting rod bushing	Clearance between piston pin and bushing		STD	0 — 0.022 mm (0 — 0.0009 in)	
			Limit	0.030 mm (0.0012 in)	
Crankshaft	Bend limit			0.035 mm (0.0014 in)	
	Crank pin and crank journal	Out-of-roundness		0.020 mm (0.0008 in) or less	
		Grinding limit		0.250 mm (0.0098 in)	
	Crank pin outer diameter	1600 cc	STD	47.984 — 48.000 mm (1.8880 — 1.8898 in)	
			0.03 mm (0.0012 in) US	47.954 — 47.970 mm (1.8879 — 1.8886 in)	
			0.05 mm (0.0020 in) US	47.934 — 47.950 mm (1.8872 — 1.8878 in)	
			0.25 mm (0.0098 in) US	47.734 — 47.750 mm (1.8793 — 1.8799 in)	
		2000 cc 2500 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)

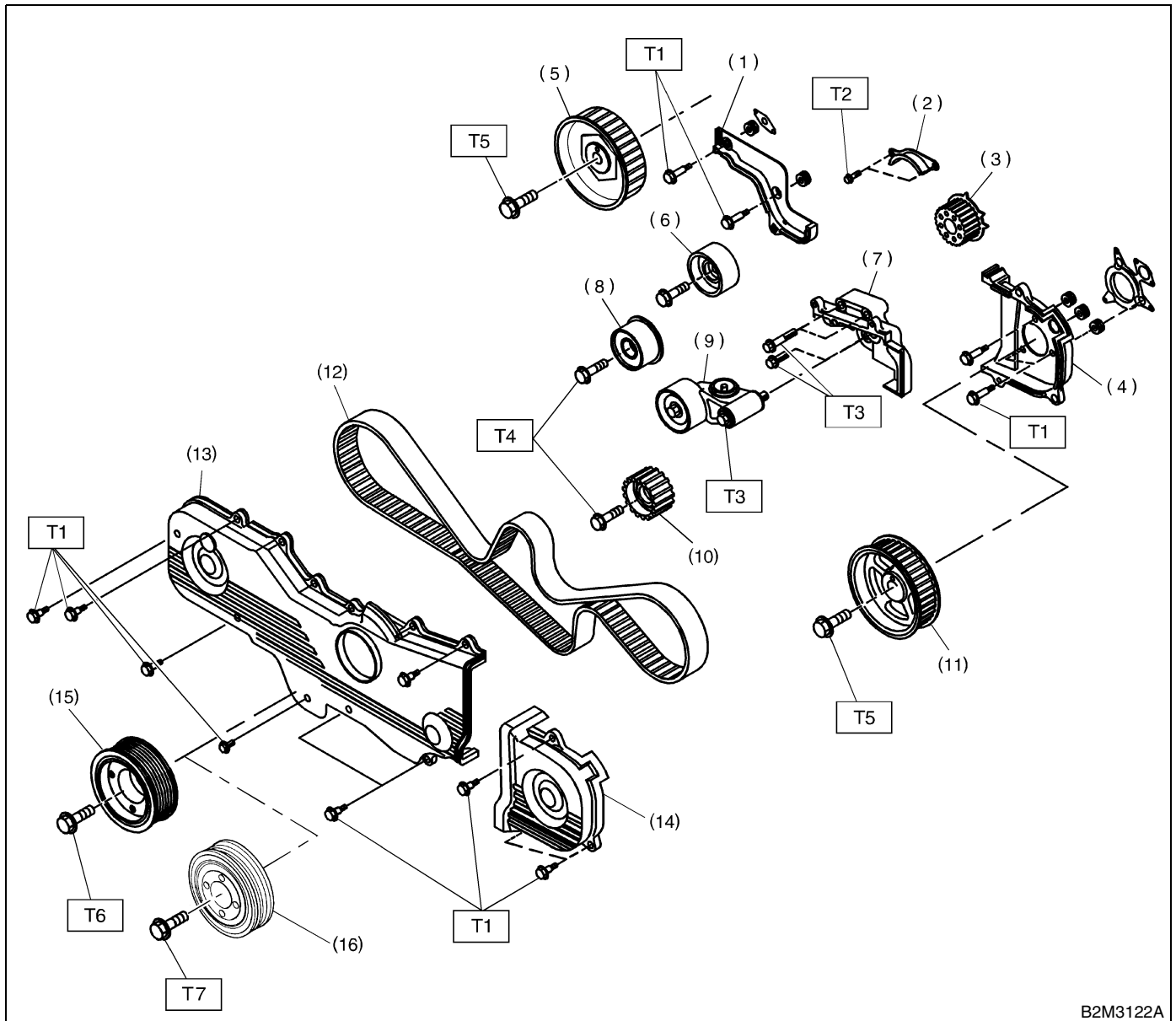
GENERAL DESCRIPTION

MECHANICAL

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)

B: COMPONENT

1. TIMING BELT



B2M3122A

- | | |
|--|--|
| (1) Belt cover No. 2 (RH) | (9) Automatic belt tension adjuster ASSY |
| (2) Timing belt guide (MT vehicles only) | (10) Belt idler No. 2 |
| (3) Crankshaft sprocket | (11) Camshaft sprocket No. 2 |
| (4) Belt cover No. 2 (LH) | (12) Timing belt |
| (5) Camshaft sprocket No. 1 | (13) Front belt cover |
| (6) Belt idler (No. 1) | (14) Belt cover (LH) |
| (7) Tensioner bracket | (15) Crankshaft pulley (1600 cc and 2000 cc model) |
| (8) Belt idler (No. 2) | (16) Crankshaft pulley (2500 cc model) |

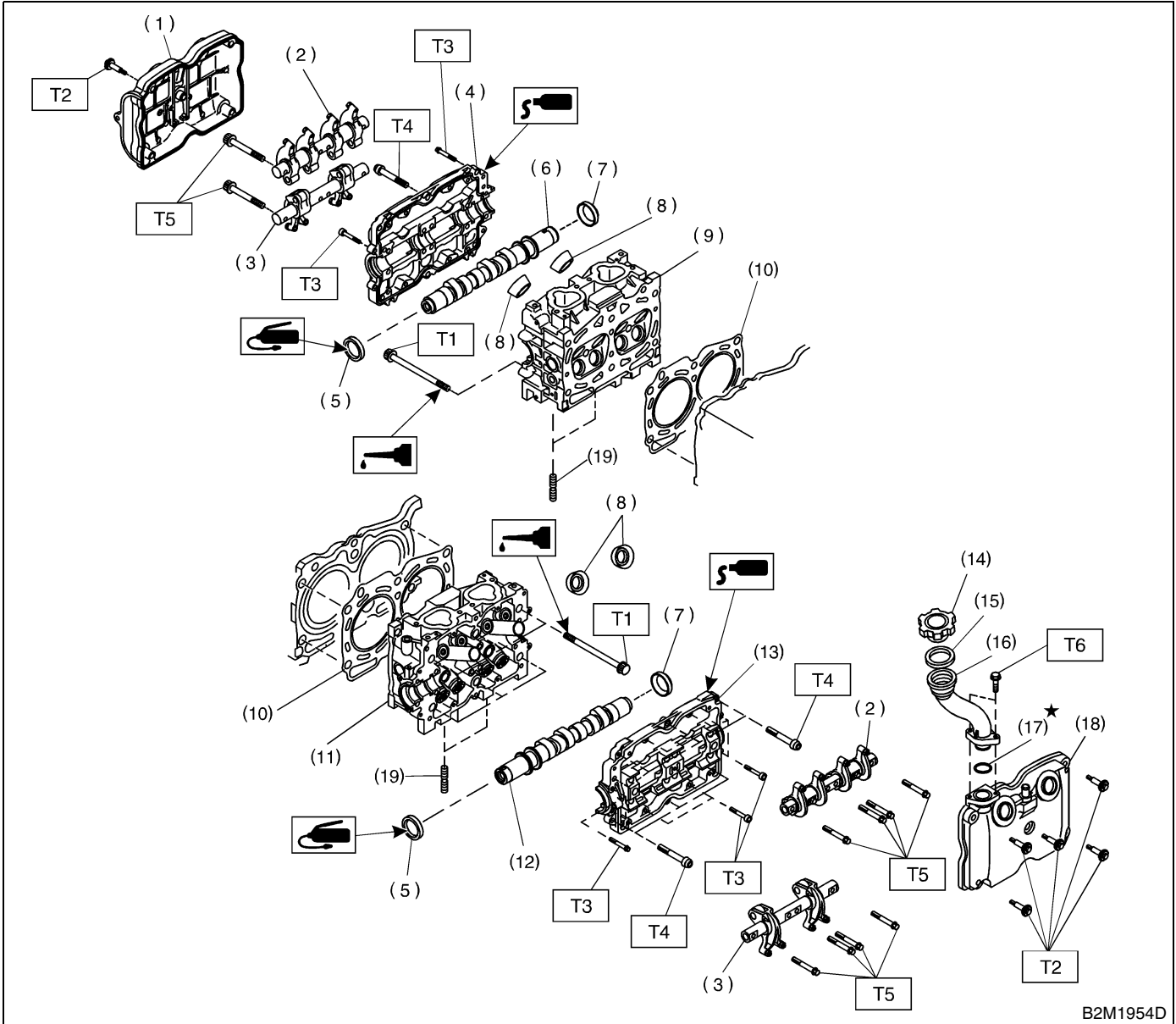
Tightening torque: N·m (kgf·m, ft·lb)

- T1: 5 (0.5, 3.6)**
T2: 10 (1.0, 7.2)
T3: 25 (2.5, 18.1)
T4: 39 (4.0, 28.9)
T5: 78 (8.0, 57.9)
T6: <Ref. to ME-46, Installation, Crankshaft Pulley.>
T7: <Ref. to ME-46, Installation, Crankshaft Pulley.>

GENERAL DESCRIPTION

MECHANICAL

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-63, Installation, Cylinder Head Assembly.>

T2: 5 (0.5, 3.6)

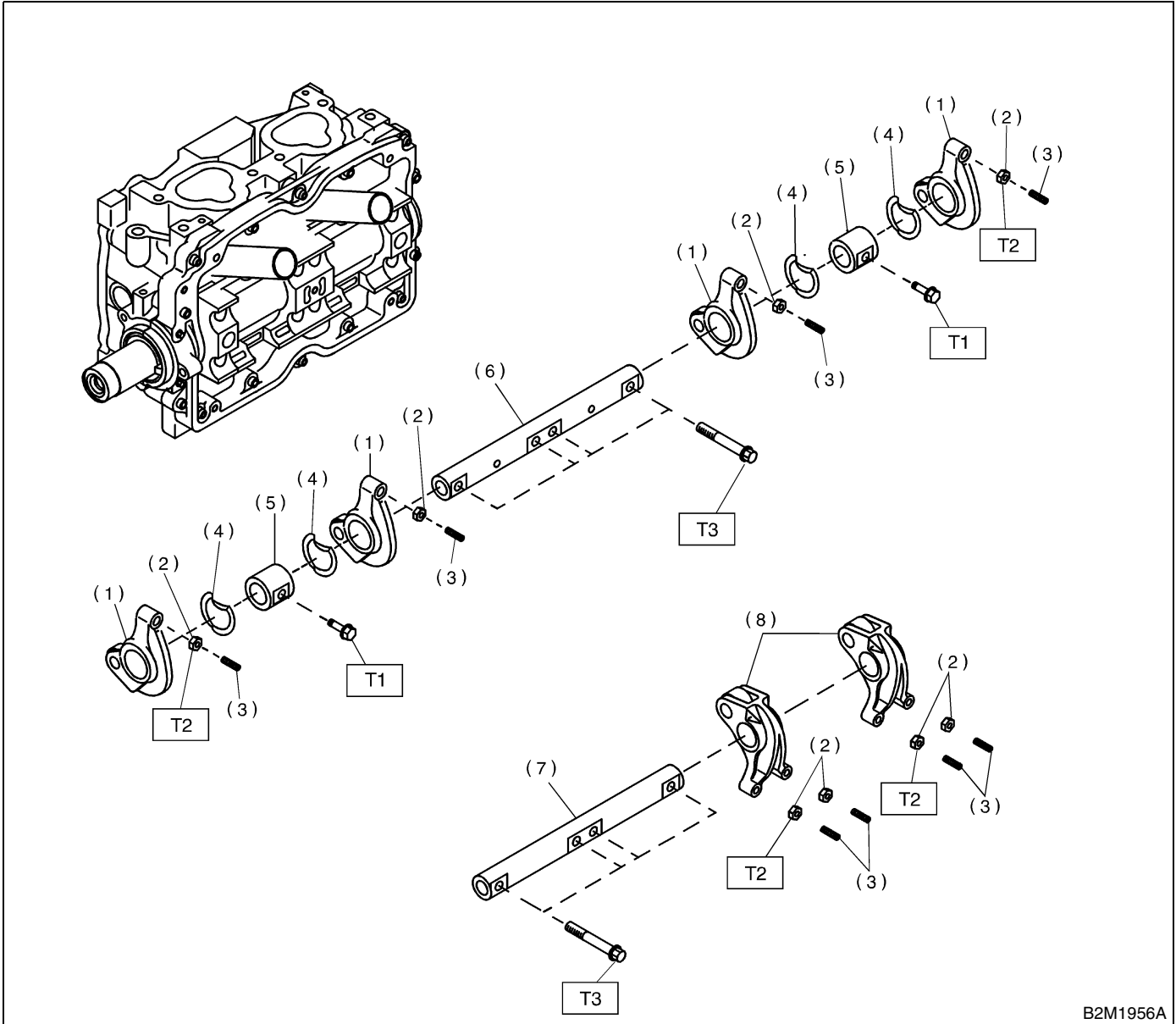
T3: 10 (1.0, 7.2)

T4: 18 (1.8, 13.0)

T5: 25 (2.5, 18.1)

T6: 6.4 (0.65, 4.7)

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)

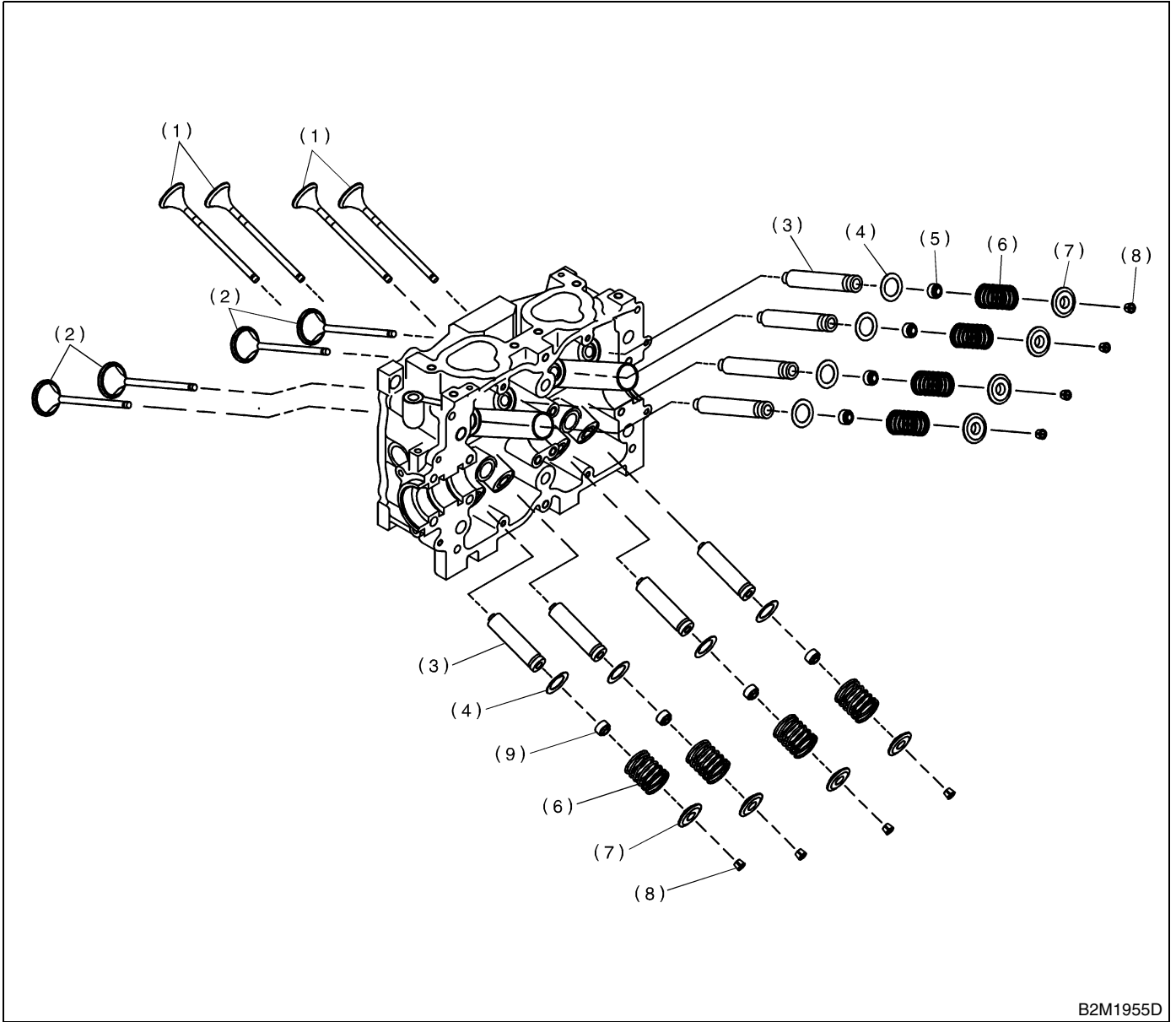
T2: 10 (1.0, 7.2)

T3: 25 (2.5, 18.1)

GENERAL DESCRIPTION

MECHANICAL

4. CYLINDER HEAD AND VALVE ASSEMBLY



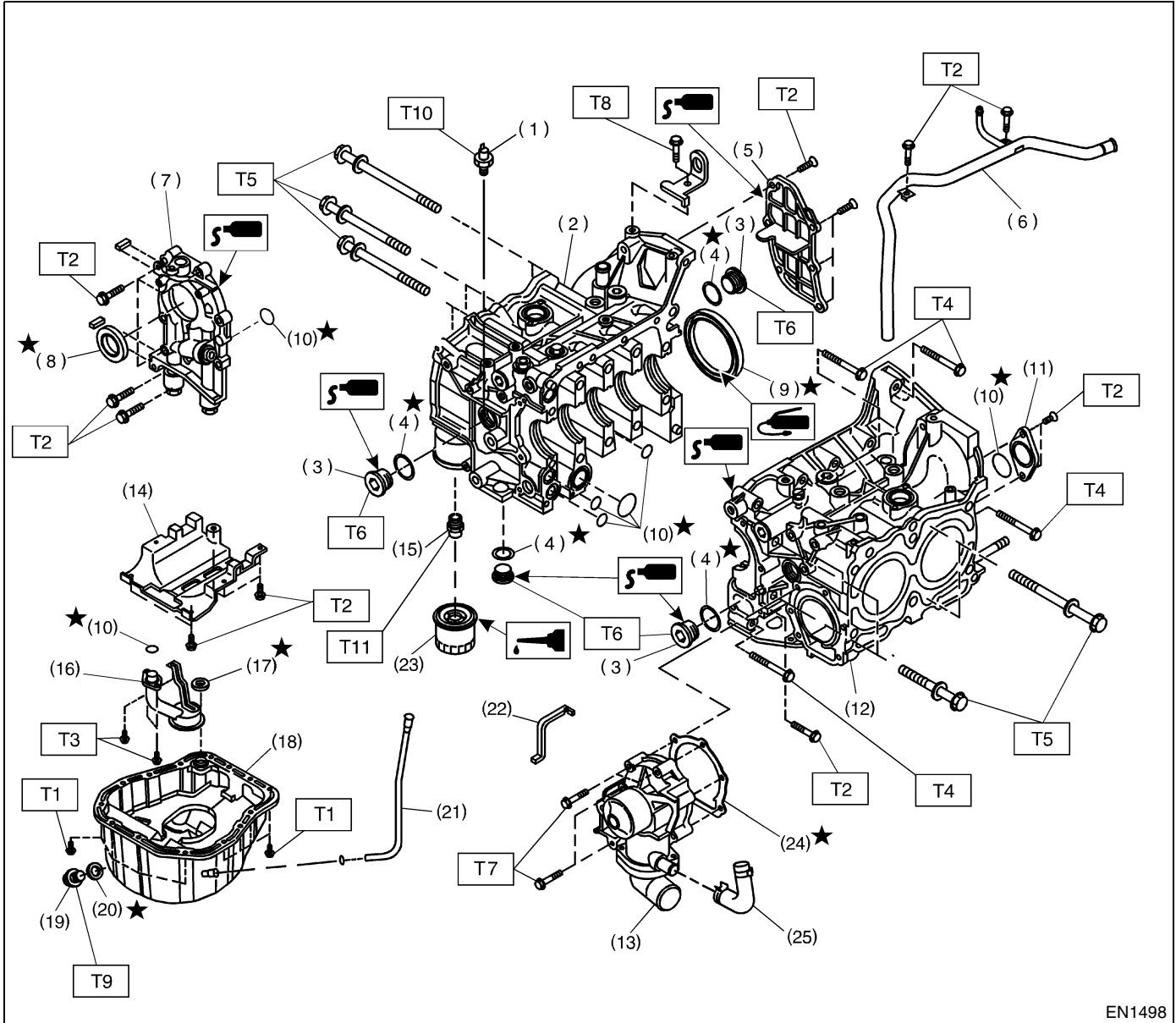
B2M1955D

- (1) Exhaust valve
- (2) Intake valve
- (3) Valve guide
- (4) Valve spring seat

- (5) Intake valve oil seal
- (6) Valve spring
- (7) Retainer
- (8) Retainer key

- (9) Exhaust valve oil seal

5. CYLINDER BLOCK



EN1498

- | | |
|--------------------------|----------------------------|
| (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, 7.2)

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)

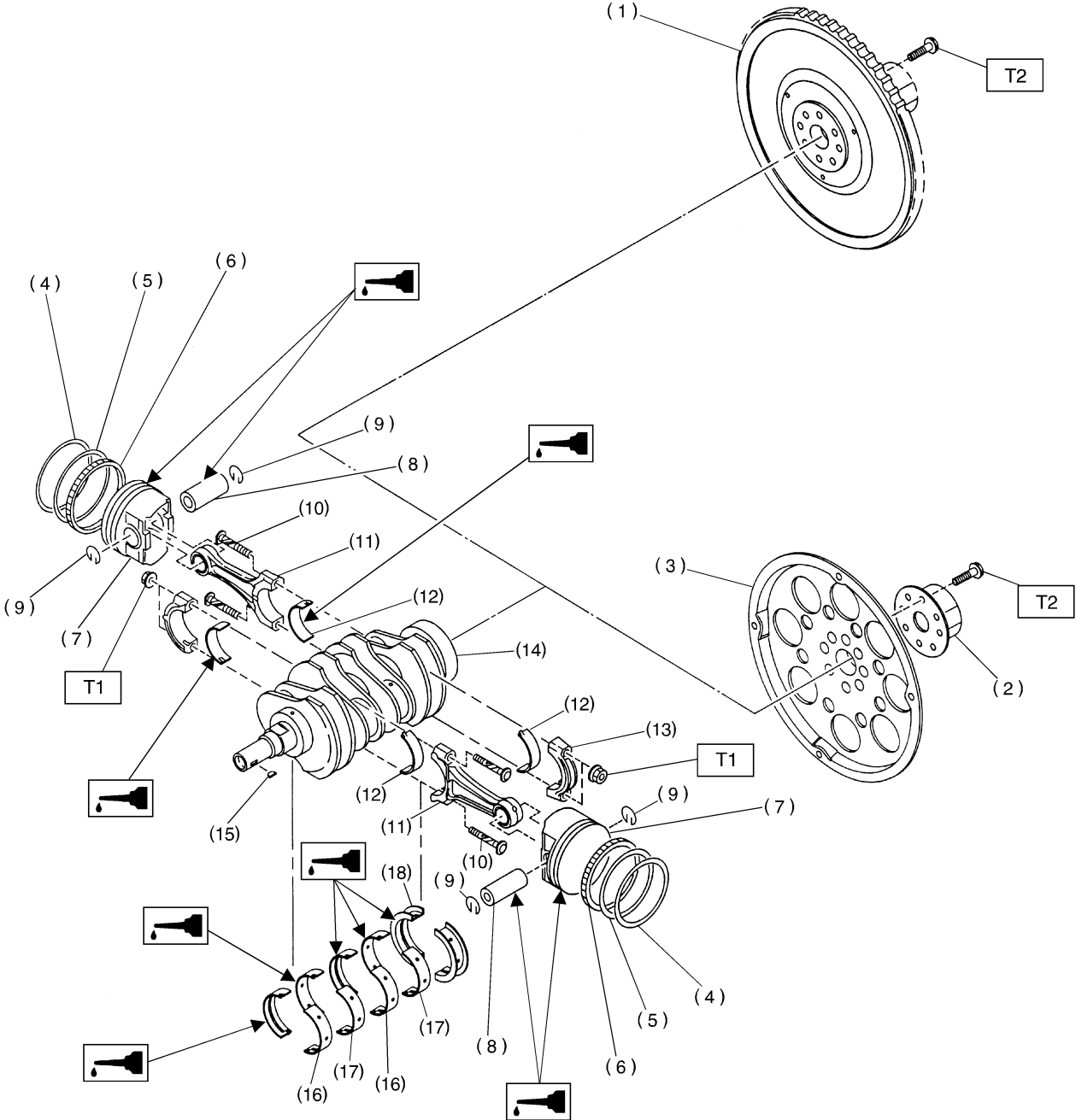
T10: 25 (2.5, 18.1)

T11: 54 (5.5, 39.8)

GENERAL DESCRIPTION

MECHANICAL

6. CRANKSHAFT AND PISTON



B2M3429A

GENERAL DESCRIPTION

MECHANICAL

- | | | |
|------------------------|--------------------------------|--------------------------------|
| (1) Flywheel (MT) | (9) Circlip | (17) Crankshaft bearing #2, #4 |
| (2) Reinforcement (AT) | (10) Connecting rod bolt | (18) Crankshaft bearing #5 |
| (3) Drive plate (AT) | (11) Connecting rod | |
| (4) Top ring | (12) Connecting rod bearing | |
| (5) Second ring | (13) Connecting rod cap | |
| (6) Oil ring | (14) Crankshaft | |
| (7) Piston | (15) Woodruff key | |
| (8) Piston pin | (16) Crankshaft bearing #1, #3 | |

Tightening torque: N·m (kgf·m, ft·lb)

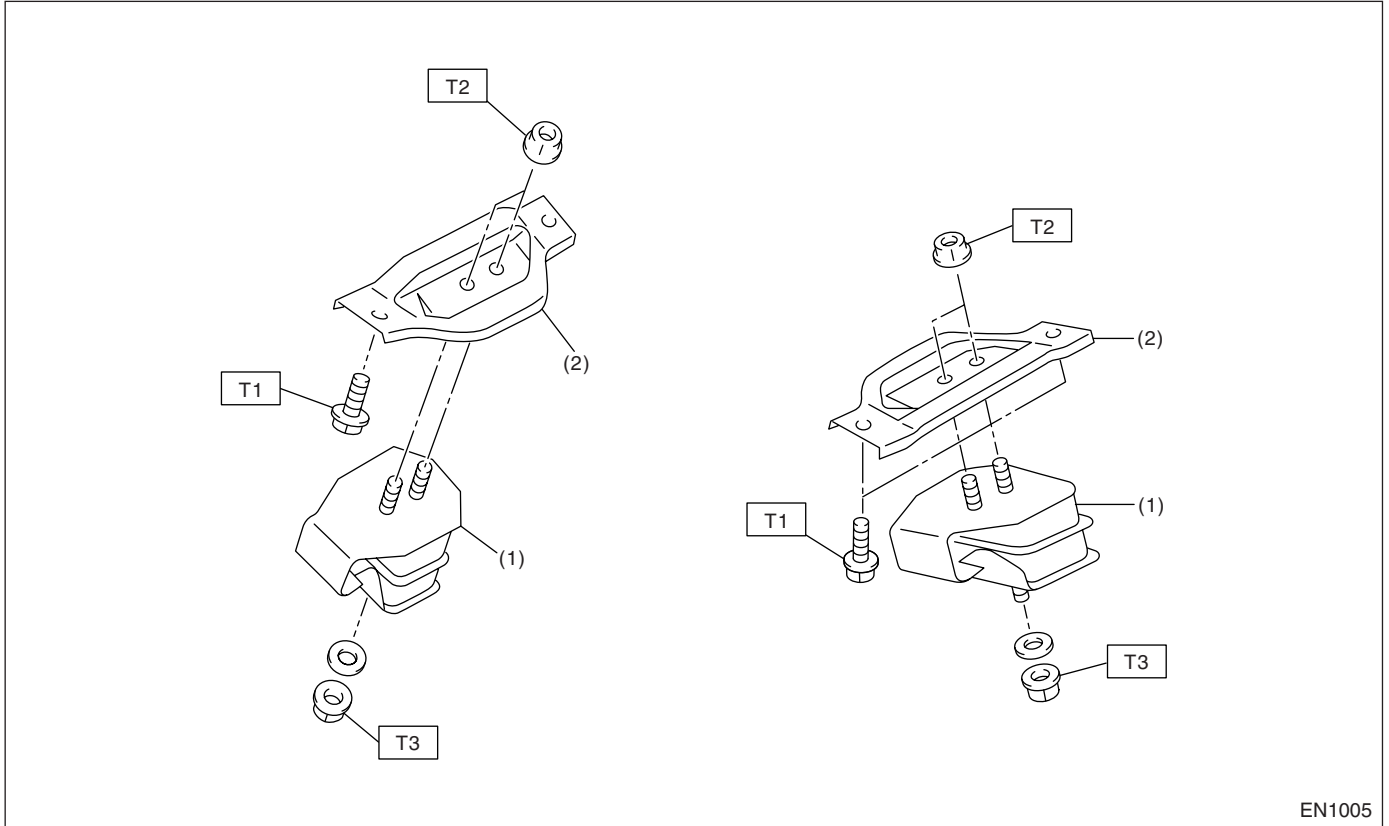
T1: 44.6 (4.55, 32.9)

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)

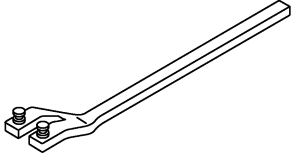
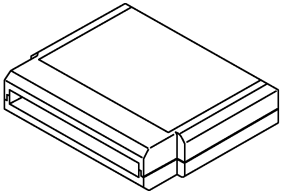
C: CAUTION

- 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 the ground cable from battery.
- All parts should be thoroughly cleaned, paying special attention to the engine oil passages, pistons and bearings.

- Rotating parts and sliding parts such as piston, bearing and gear should be coated with oil prior to assembly.
- Be careful not to let oil, grease or coolant contact the timing belt, clutch disc and flywheel.
- All removed parts, if to be reused, should be re-installed in the original positions and directions.
- Bolts, nuts and washers should be replaced with new ones as required.
- Even if necessary inspections have been made in advance, proceed with assembly work while making rechecks.
- Remove or install engine in an area where chain hoists, lifting devices, etc. are available for ready use.
- Be sure not to damage coated surfaces of body panels with tools or stain seats and windows with coolant or oil. Place a cover over fenders, as required, for protection.
- Prior to starting work, prepare the following:
Service tools, clean cloth, containers to catch coolant and oil, wire ropes, chain hoist, transmission jacks, etc.
- Lift-up or lower the vehicle when necessary. Make sure to support the correct positions.


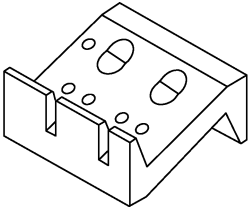
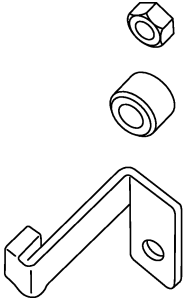
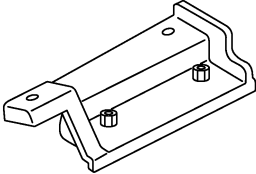
D: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B2M3859	18231AA010 (Newly adopted tool)	CAMSHAFT SPROCKET WRENCH	<ul style="list-style-type: none"> • Used for removing and installing camshaft sprocket. (LH side) • Also the CAMSHAFT SPROCKET WRENCH (499207100) can be used. NOTE: For common use with turbo model, this ST is changed and registered as a newly adopted tool. Though the previous ST also can be used.
 B2M3876	24082AA190 (Newly adopted tool)	CARTRIDGE	Troubleshooting for electrical systems.

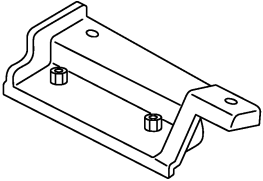
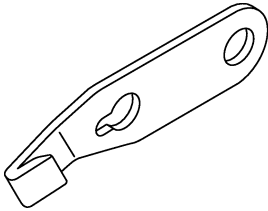
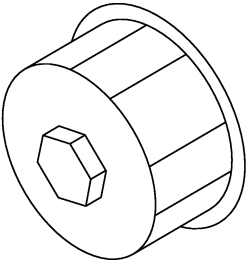
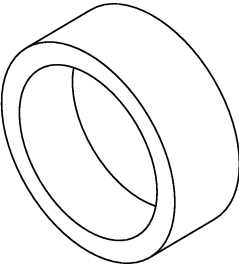
GENERAL DESCRIPTION

MECHANICAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: right;">B2M3877</p>	22771AA030	SELECT MONI-TOR KIT	Troubleshooting for electrical systems. <ul style="list-style-type: none"> • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)
 <p style="text-align: right;">B2M3850</p>	498267800	CYLINDER HEAD TABLE	<ul style="list-style-type: none"> • Used for replacing valve guides. • Used for removing and installing valve springs.
 <p style="text-align: right;">B2M2043</p>	498277200	STOPPER SET	Used for installing automatic transmission assembly to engine.
 <p style="text-align: right;">B2M3851</p>	498457000	ENGINE STAND ADAPTER RH	Used with ENGINE STAND (499817000).

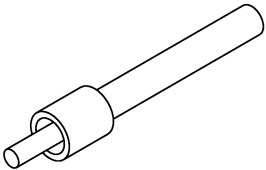
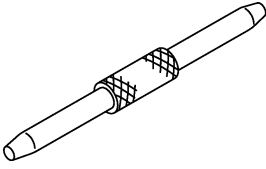
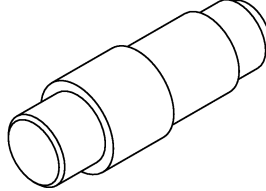
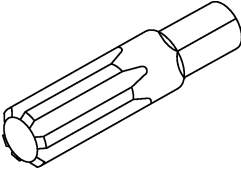
GENERAL DESCRIPTION

MECHANICAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: right;">B2M3852</p>	498457100	ENGINE STAND ADAPTER LH	Used with ENGINE STAND (499817000).
 <p style="text-align: right;">B2M3853</p>	498497100	CRANKSHAFT STOPPER	Used for stopping rotation of flywheel when loosening and tightening crankshaft pulley bolt, etc.
 <p style="text-align: right;">B2M3872</p>	498547000	OIL FILTER WRENCH	Used for removing and installing oil filter.
 <p style="text-align: right;">B2M3854</p>	498747000 (1600 cc model) 398744300 (2000 cc model) 498747300 (2500 cc model)	PISTON GUIDE	Used for installing piston in cylinder.

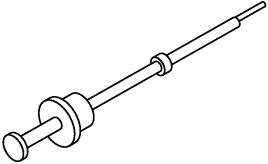
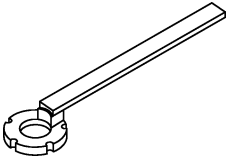
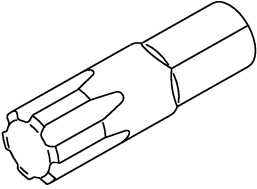
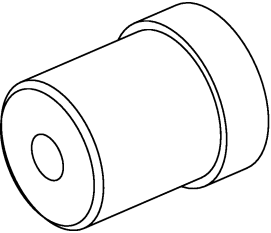
GENERAL DESCRIPTION

MECHANICAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: right;">B2M3855</p>	498857100	VALVE OIL SEAL GUIDE	Used for press-fitting of intake and exhaust valve guide oil seals.
 <p style="text-align: right;">B2M3856</p>	499017100	PISTON PIN GUIDE	Used for installing piston pin, piston and connecting rod.
 <p style="text-align: right;">B2M3857</p>	499037100	CONNECTING ROD BUSHING REMOVER & INSTALLER	Used for removing and installing connecting rod bushing.
 <p style="text-align: right;">B2M4159</p>	499057000	TORX PLUS	Used for removing flywheel (Dual mass flywheel).

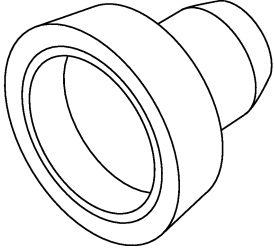
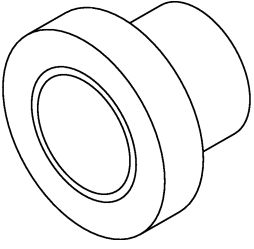
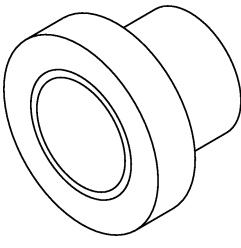
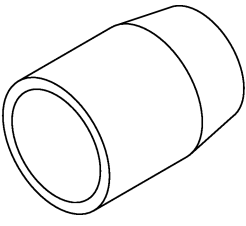
GENERAL DESCRIPTION

MECHANICAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: right;">B2M3858</p>	499097700	PISTON PIN REMOVER ASSY	Used for removing piston pin.
 <p style="text-align: right;">B2M4158</p>	499207400	CAMSHAFT SPROCKET WRENCH	Used for removing and installing camshaft sprocket. (RH side)
 <p style="text-align: right;">B2M3873</p>	499497000	TORX PLUS	Used for removing and installing camshaft cap.
 <p style="text-align: right;">B2M3875</p>	499587100	OIL SEAL INSTALLER	Used for installing oil pump oil seal.

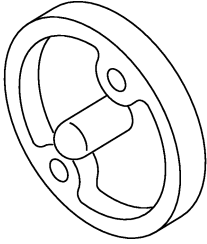
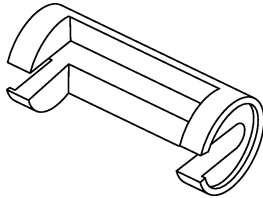
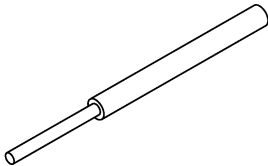
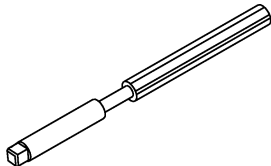
GENERAL DESCRIPTION

MECHANICAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: right;">B2M3861</p>	499587200	CRANKSHAFT OIL SEAL INSTALLER	<ul style="list-style-type: none"> • Used for installing crankshaft oil seal. • Used with CRANKSHAFT OIL SEAL GUIDE (499597100).
 <p style="text-align: right;">B2M3874</p>	499587500	OIL SEAL INSTALLER	Used for installing camshaft oil seal.
 <p style="text-align: right;">B2M3860</p>	499587700	CAMSHAFT OIL SEAL INSTALLER	Used for installing cylinder head plug.
 <p style="text-align: right;">B2M3862</p>	499597000	OIL SEAL GUIDE	<ul style="list-style-type: none"> • Used for installing camshaft oil seal. • Used with OIL SEAL INSTALLER (499587500).

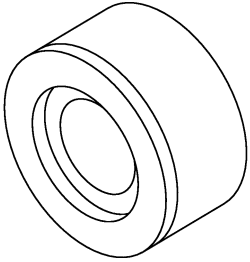
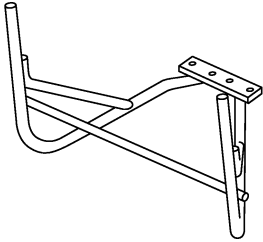
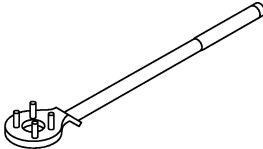
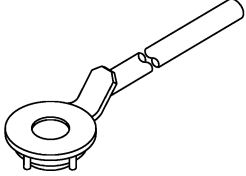
GENERAL DESCRIPTION

MECHANICAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: right;">B2M3863</p>	499597100	CRANKSHAFT OIL SEAL GUIDE	<ul style="list-style-type: none"> • Used for installing crankshaft oil seal. • Used with CRANKSHAFT OIL SEAL INSTALLER (499587200).
 <p style="text-align: right;">B2M3864</p>	499718000	VALVE SPRING REMOVER	Used for removing and installing valve spring.
 <p style="text-align: right;">B2M3867</p>	499767200	VALVE GUIDE REMOVER	Used for removing valve guides.
 <p style="text-align: right;">B2M3868</p>	499767400	VALVE GUIDE REAMER	Used for reaming valve guides.

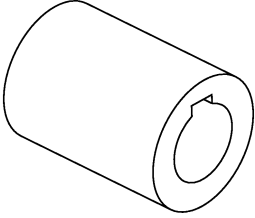
GENERAL DESCRIPTION

MECHANICAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: right;">B2M3865</p>	499767700 (Intake side) 499767800 (Exhaust side)	VALVE GUIDE ADJUSTER	Used for installing valve guides.
 <p style="text-align: right;">B2M3869</p>	499817100	ENGINE STAND	<ul style="list-style-type: none"> • Stand used for engine disassembly and assembly. • Used with ENGINE STAND ADAPTER RH (498457000) & LH (498457100).
 <p style="text-align: right;">B2M3870</p>	499977100	CRANK PULLEY WRENCH	Used for stopping rotation of crankshaft pulley when loosening and tightening crankshaft pulley bolts. (2500 cc model)
 <p style="text-align: right;">B2M4157</p>	499977300	CRANK PULLEY WRENCH	Used for stopping rotation of crankshaft pulley when loosening and tightening crankshaft pulley bolts. (1600 cc and 2000 cc model)

GENERAL DESCRIPTION

MECHANICAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B2M3871	499987500	CRANKSHAFT SOCKET	Used for rotating crankshaft.

2. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Compression Gauge	Used for measuring compression.
Tachometer (Secondary pick-up type)	Used for measuring idle speed.
Timing Light	Used for measuring ignition timing.

E: PROCEDURE

It is possible to conduct the following service procedures with engine on the vehicle, however, the procedures described in this section are based on the condition that the engine is removed from the vehicle.

- V-belt
- Timing Belt
- Valve Rocker Assembly
- Camshaft
- Cylinder Head

2. Compression

A: INSPECTION

CAUTION:

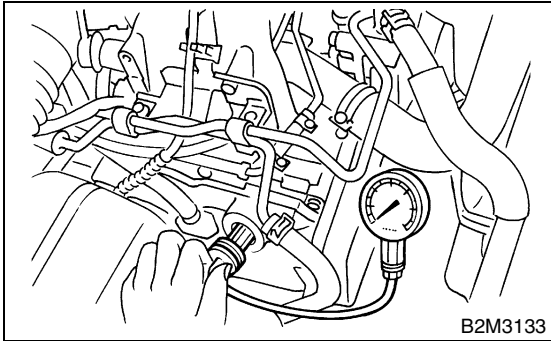
After warming-up, engine becomes very hot. Be careful not to burn yourself during measurement.

- 1) After warming-up the engine, turn the ignition switch to OFF.
- 2) Make sure that the battery is fully charged.
- 3) Release the fuel pressure. <Ref. to FU-54, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.> or <Ref. to FU(w/oOBD)-51, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 4) Remove all the spark plugs. <Ref. to IG-5, REMOVAL, Spark Plug.> or <Ref. to IG(w/oOBD)-5, REMOVAL, Spark Plug.>
- 5) Fully open the throttle valve.
- 6) Check the starter motor for satisfactory performance and operation.
- 7) Hold the compression gauge tight against spark plug hole.

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 starter motor, and then read the maximum value on the gauge when the pointer is steady.



- 9) Perform at least two measurements per cylinder, and make sure that the values are correct.

Compression (350 rpm and fully open throttle):

Standard;

1,275 kPa (13.0 kgf/cm², 185 psi)

Limit;

1,020 kPa (10.4 kgf/cm², 148 psi)

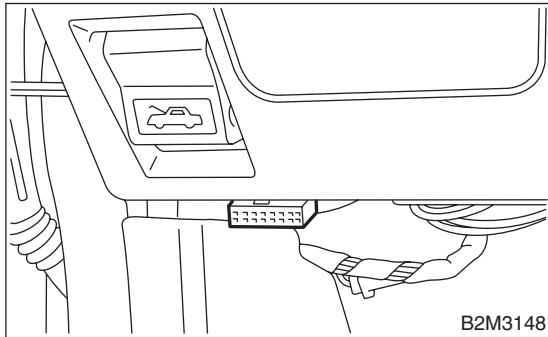
Difference between cylinders;

49 kPa (0.5 kgf/cm², 7 psi), or less

3. Idle Speed

A: INSPECTION

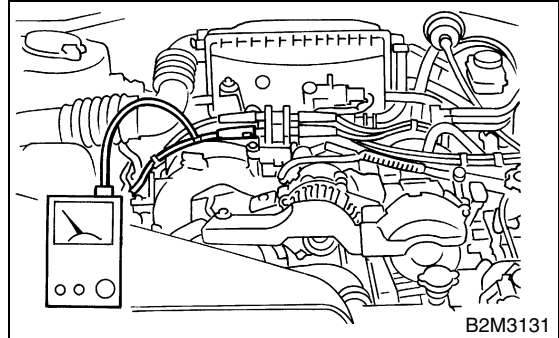
- 1) Before checking idle speed, check the following:
 - (1) Ensure the air cleaner element is free from clogging, ignition timing is correct, spark plugs are in good condition, and the hoses are connected properly.
 - (2) Ensure the malfunction indicator light (CHECK ENGINE light) does not illuminate.
- 2) Warm-up the engine.
- 3) Stop the engine, and then turn the ignition switch to OFF.
- 4) When using the SUBARU SELECT MONITOR <Ref. to ME-15, SPECIAL TOOLS, PREPARATION TOOL, General Description.>
 - (1) Insert the cartridge to SUBARU SELECT MONITOR.
 - (2) Connect the SUBARU SELECT MONITOR to data link connector.



- (3) Turn the ignition switch to ON, and SUBARU SELECT MONITOR switch to ON.
- (4) Select the {2. Each System Check} in Main Menu.
- (5) Select the {Engine Control System} in Selection Menu.
- (6) Select the {1. Current Data Display & Save} in Engine Control System Diagnosis.
- (7) Select the {1.12 Data Display} in Data Display Menu.
- (8) Start the engine, and then read the engine idle speed.

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

- (1) Attach the pick-up clip to No. 1 cylinder spark plug cord.
- (2) Start the engine, and then read the engine idle speed.



NOTE:

- When using the OBD-II general scan tool, carefully read its operation manual.
- This ignition system provides simultaneous ignition for #1 and #2 plugs. It must be noted that some tachometers may register twice that of actual engine speed.

- 6) Check the idle speed when unloaded. (With headlights, heater fan, rear defroster, radiator fan, air conditioning, etc. OFF)

Idle speed (No load and gears in neutral (MT), or N or P (AT) position):
700±100 rpm

- 7) Check the idle speed when loaded. (Turn the air conditioning switch to “ON” and operate the compressor for at least 1 minute before measurement.)

Idle speed [A/C “ON”, no load and gears in neutral (MT) or N or P (AT) position]:
850±100 rpm

CAUTION:

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

4. Ignition Timing

A: INSPECTION

CAUTION:

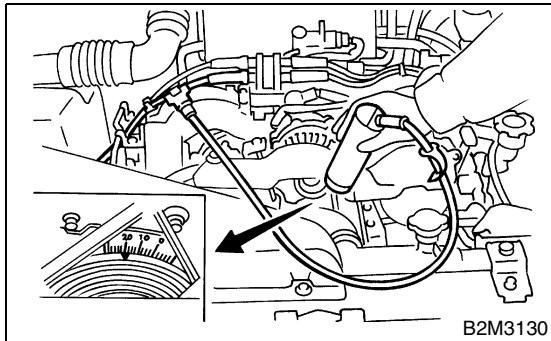
After warming-up, engine becomes very hot. Be careful not to burn yourself during measurement.

- 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 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 and 2500 cc MODEL)



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

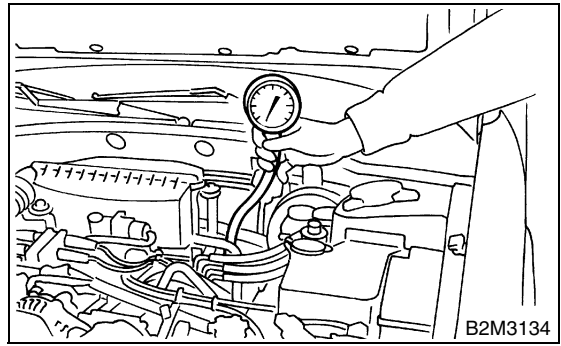
Refer to Engine Control System. <Ref. to EN-2, Basic Diagnostic Procedure.> or <Ref. to EN(w/oOBD)-2, Basic Diagnostic Procedure.>

5. Intake Manifold Vacuum

A: INSPECTION

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

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



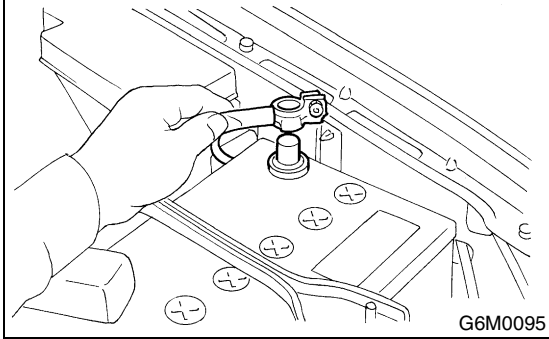
Vacuum pressure (at idling, A/C "OFF"):
Less than -60.0 kPa (-450 mmHg, -17.72 in-Hg)

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 the ground cable from battery.



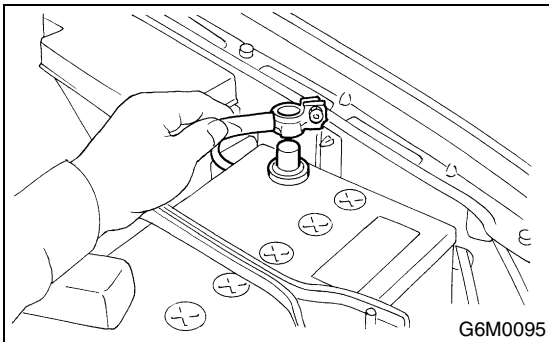
2) Remove the generator from bracket. <Ref. to SC-14, REMOVAL, Generator.>

3) Disconnect the connector from oil pressure switch.

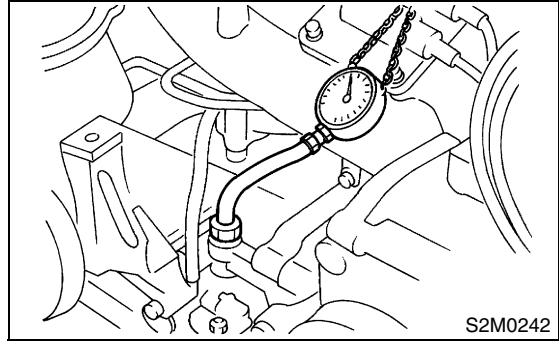
4) Remove the oil pressure switch from engine cylinder block. <Ref. to LU-21, REMOVAL, Oil Pressure Switch.>

5) Connect the oil pressure gauge hose to cylinder block.

6) Connect the battery ground cable to battery.



7) Start the engine, and then measure the oil pressure.



Oil pressure:

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 the oil pressure is out of specification, check the oil pump, oil filter and lubrication line. <Ref. to LU-25, INSPECTION, Engine Lubrication System Trouble in General.>

- If the oil pressure warning light is turned ON and oil pressure is in specification, replace the oil pressure switch. <Ref. to LU-25, INSPECTION, Engine Lubrication System Trouble in General.>

NOTE:

The specified data is based on an engine oil temperature of 80°C (176°F).

8) After measuring the oil pressure, install the oil pressure switch. <Ref. to LU-21, INSTALLATION, Oil Pressure Switch.>

Tightening torque:

25 N·m (2.5 kgf·m, 18.1 ft·lb)

9) Install the generator and V-belt in the reverse order of removal, and then adjust the V-belt deflection. <Ref. to ME-44, INSTALLATION, V-belt.>

7. Fuel Pressure

A: INSPECTION

WARNING:

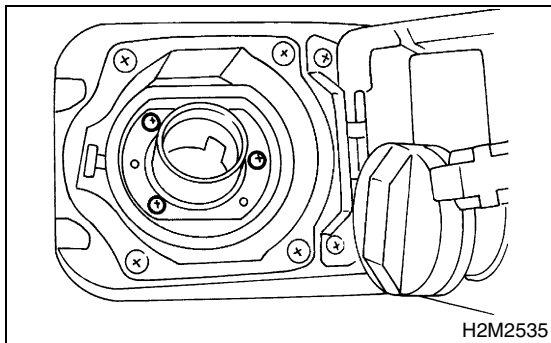
Before removing the fuel pressure gauge, release the fuel pressure.

NOTE:

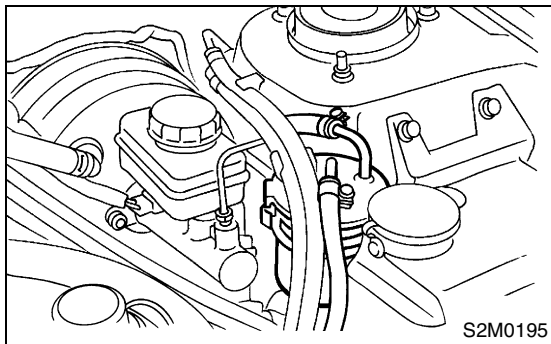
If out of specification, check or replace the pressure regulator and pressure regulator vacuum hose.

1) Release the fuel pressure. <Ref. to FU-54, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.> or <Ref. to FU(w/oOBD)-51, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>

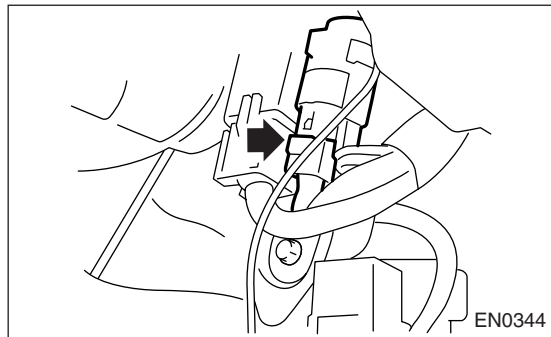
2) Open the fuel flap lid, and then remove the fuel filler cap.



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



4) Connect the connector of fuel pump relay.

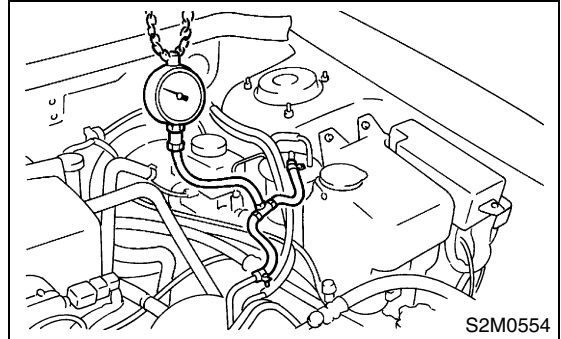


5) Start the engine.

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

Fuel pressure:

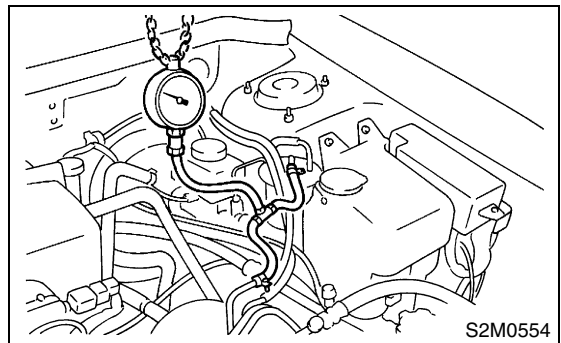
Standard; 284 — 314 kPa (2.9 — 3.2 kg/cm², 41 — 46 psi)



7) After connecting the pressure regulator vacuum hose, measure the fuel pressure.

Fuel pressure:

Standard; 206 — 235 kPa (2.1 — 2.4 kg/cm², 30 — 34 psi)



NOTE:

The fuel pressure gauge registers 10 to 20 kPa (0.1 to 0.2 kg/cm², 1 to 3 psi) higher than standard values during high-altitude operations.

VALVE CLEARANCE

MECHANICAL

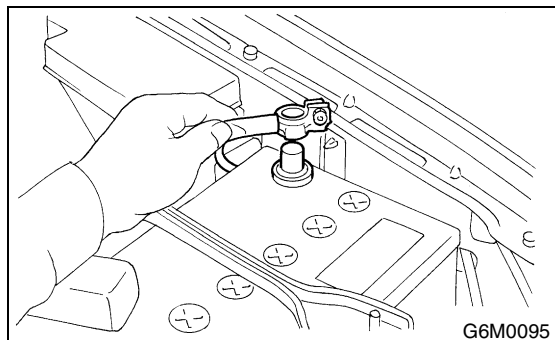
8. Valve Clearance

A: INSPECTION

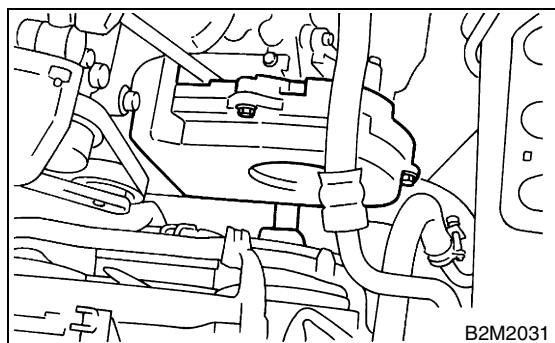
CAUTION:

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

- 1) Set the vehicle on a lift.
- 2) Lift-up the vehicle.
- 3) Remove the under cover.
- 4) Lower the vehicle.
- 5) Disconnect the ground cable from battery.



- 6) Remove the belt cover (LH).



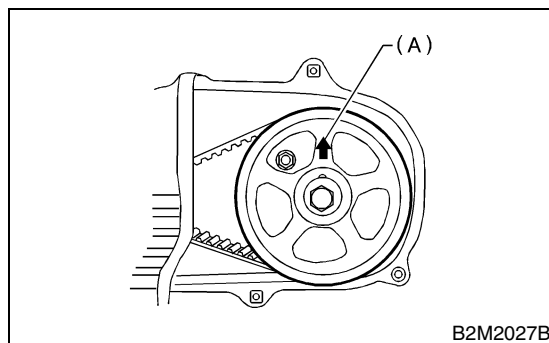
- 7) When inspecting the #1 and #3 cylinders;
 - (1) Disconnect the spark plug cords from spark plugs RH side. <Ref. to IG-5, RH SIDE, REMOVAL, Spark Plug.> or <Ref. to IG(w/oOBD)-5, RH SIDE, REMOVAL, Spark Plug.>
 - (2) Disconnect the PCV hose from rocker cover (RH).
 - (3) Remove the bolts, and then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

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

- ST 499977300 CRANK PULLEY WRENCH
(1600 cc and 2000 cc model)
ST 499977100 CRANK PULLEY WRENCH
(2500 cc model)

NOTE:

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



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

CAUTION:

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

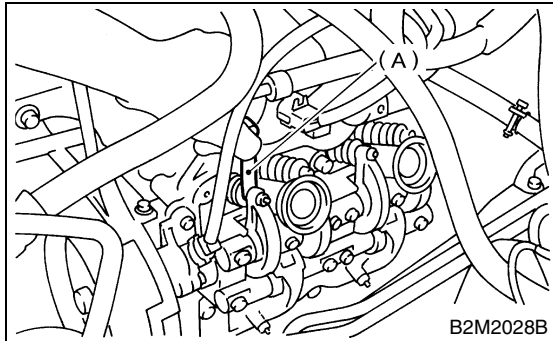
Valve clearance:

Intake;

0.20 ± 0.02 mm (0.0079 ± 0.0008 in)

Exhaust;

0.25 ± 0.02 mm (0.0098 ± 0.0008 in)



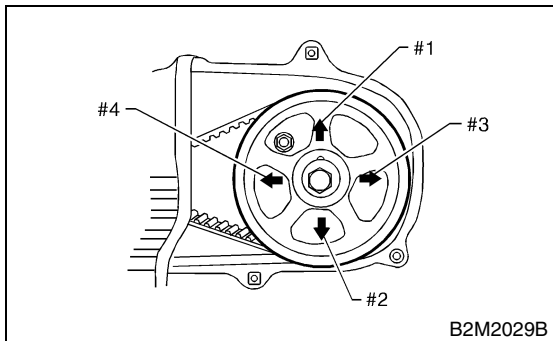
B2M2028B

11) If necessary, adjust the valve clearance. <Ref. to ME-32, ADJUSTMENT, Valve Clearance.>

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

NOTE:

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



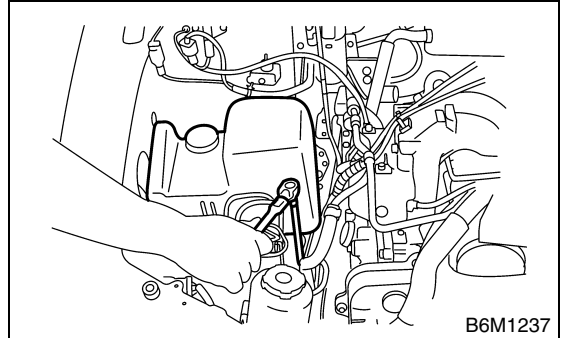
B2M2029B

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)



B6M1237

VALVE CLEARANCE

MECHANICAL

B: ADJUSTMENT

CAUTION:

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

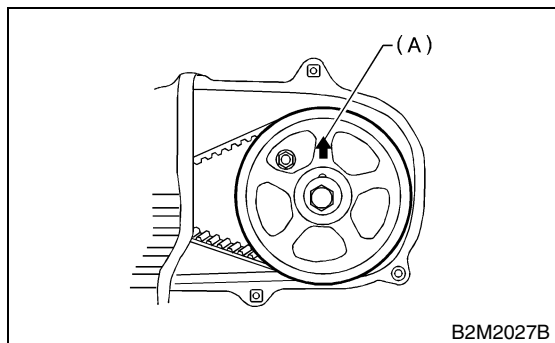
1) Set the #1 cylinder piston to top dead center of compression stroke by rotating crankshaft pulley clockwise using ST.

ST 499977300 CRANK PULLEY WRENCH
(1600 cc and 2000 cc model)

ST 499977100 CRANK PULLEY WRENCH
(2500 cc model)

NOTE:

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



2) Adjust the #1 cylinder valve clearance.

- (1) Loosen the valve rocker nut and screw.
- (2) Place suitable thickness gauge.
- (3) While noting the valve clearance, tighten the valve rocker adjust screw.
- (4) When specified valve clearance is obtained, tighten the valve rocker nut.

Tightening torque:

10 N·m (1.0 kgf-m, 7.2 ft-lb)

CAUTION:

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

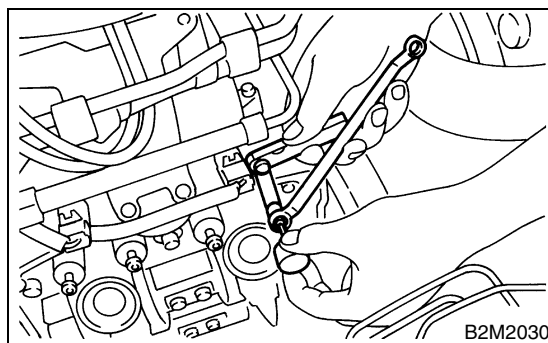
Valve clearance:

Intake;

0.20±0.02 mm (0.0079±0.0008 in)

Exhaust;

0.25±0.02 mm (0.0098±0.0008 in)



3) Ensure the valve clearances are within specifications.

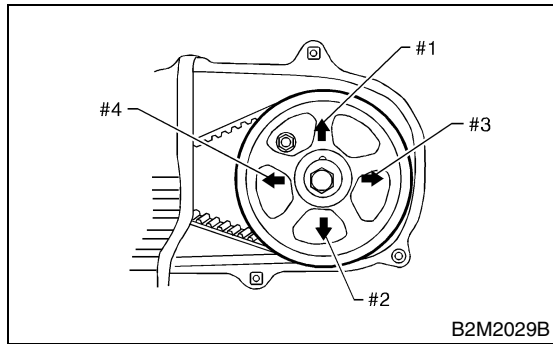
4) Turn the crankshaft two complete rotations until #1 cylinder piston is again set to the top dead center on compression stroke.

5) Ensure the valve clearances are within specifications. If necessary, readjust the valve clearances.

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

NOTE:

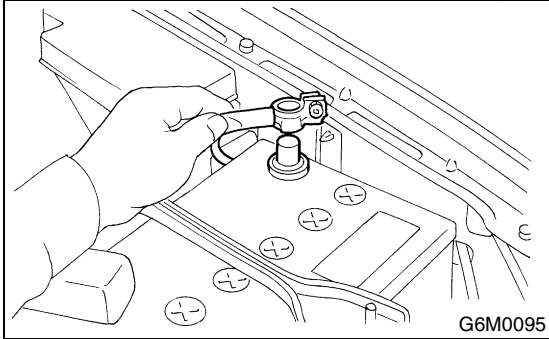
- Be sure to set the cylinder pistons to their respective top dead centers on compression stroke before adjusting valve clearances.
- To set the #3, #2 and #4 cylinder pistons to their top dead centers on compression stroke, turn the crankshaft pulley clockwise 90° at a time starting with arrow mark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



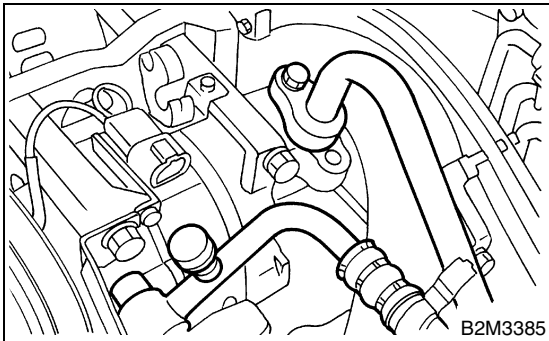
9. Engine Assembly

A: REMOVAL

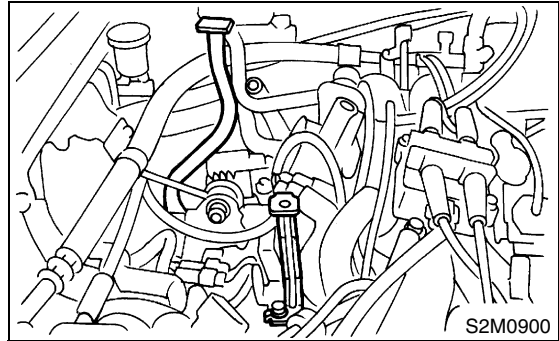
- 1) Set the vehicle on lift arms.
- 2) Open the front hood fully, and then support with the hood stay.
- 3) Release the fuel pressure. <Ref. to FU-54, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.> or <Ref. to FU(w/oOBD)-51, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 4) Remove the filler cap.
- 5) Disconnect the ground cable from battery.



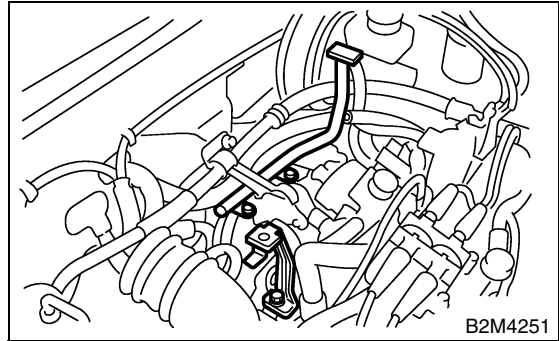
- 6) Remove the air intake duct and air cleaner case. <Ref. to IN-7, REMOVAL, Air Intake Duct.> and <Ref. to IN-6, REMOVAL, Air Cleaner Case.>
- 7) Remove the under cover.
- 8) Remove the radiator from vehicle. <Ref. to CO-39, REMOVAL, Radiator.>
- 9) Collect the refrigerant, and then remove the pressure hoses. (With A/C)
 - (1) Place and connect the attachment hose to refrigerant recycle system.
 - (2) Collect the refrigerant from A/C system.
 - (3) Disconnect the A/C pressure hoses from A/C compressor.



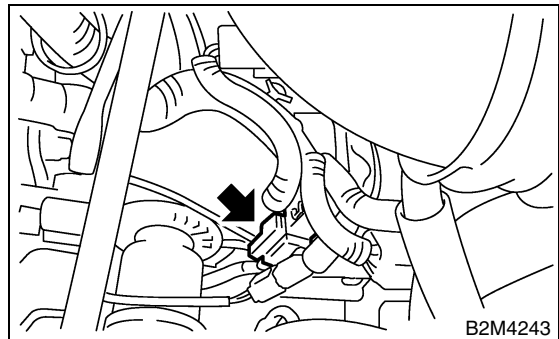
- 10) Remove the air cleaner case stay.
 - MT MODEL



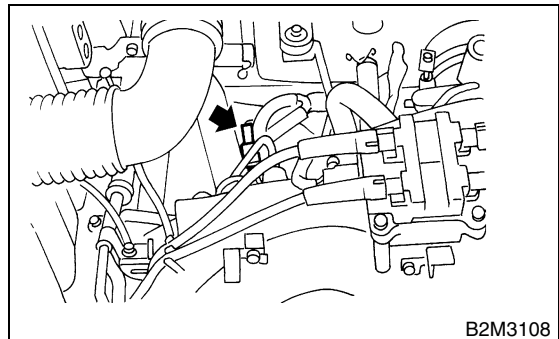
- AT MODEL



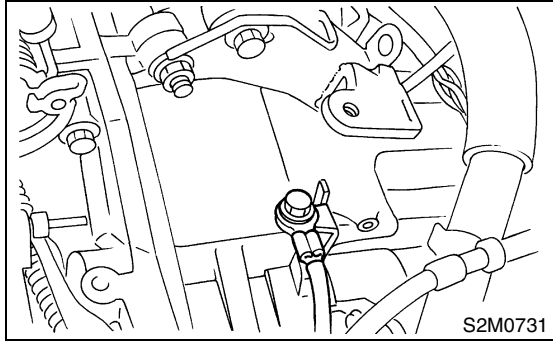
- 11) Disconnect the following connectors and cables.
 - (1) Front oxygen (A/F) sensor connector (With OBD)



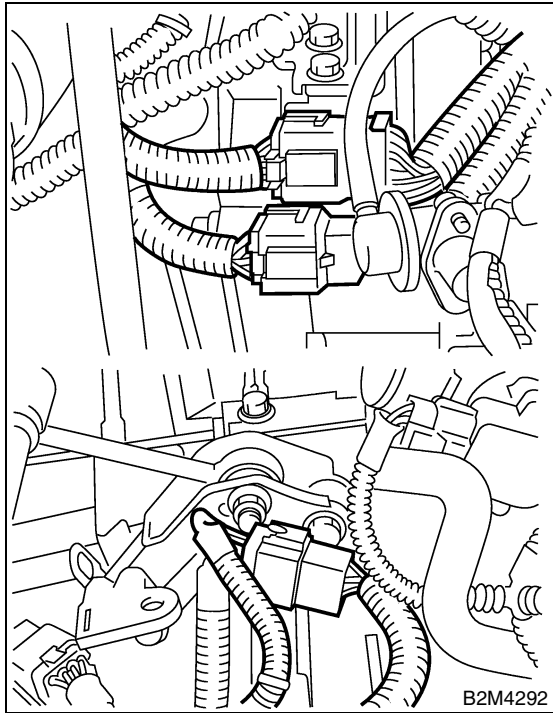
- (2) Front oxygen sensor connector (Without OBD)



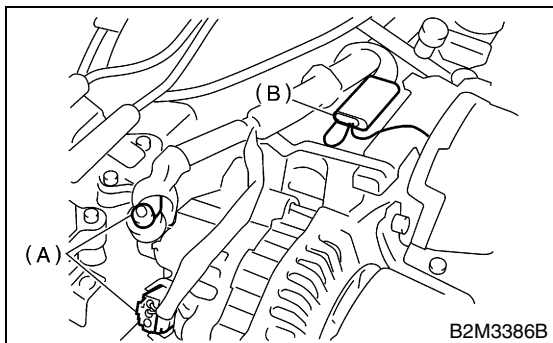
(3) Engine ground cable



(4) Engine harness connectors

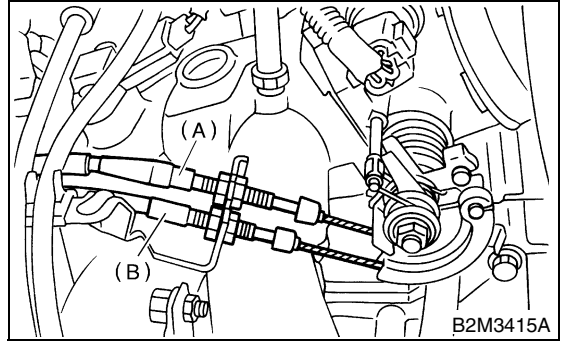


(5) Generator connector, terminal and A/C compressor connector



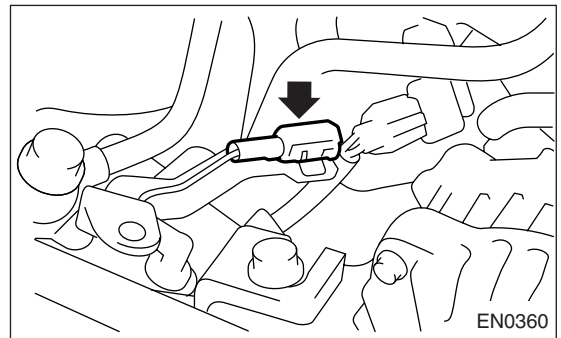
- (A) Generator connector and terminal
- (B) A/C compressor connector

(6) Accelerator cable and cruise control cable

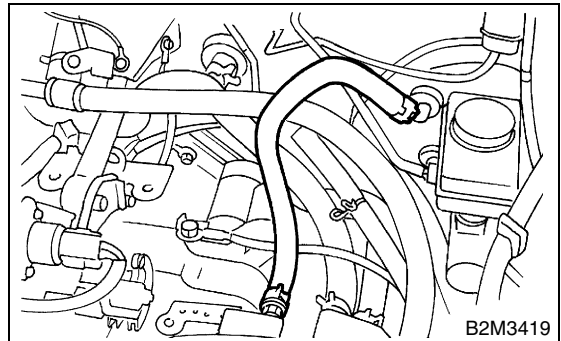


- (A) Accelerator cable
- (B) Cruise control cable

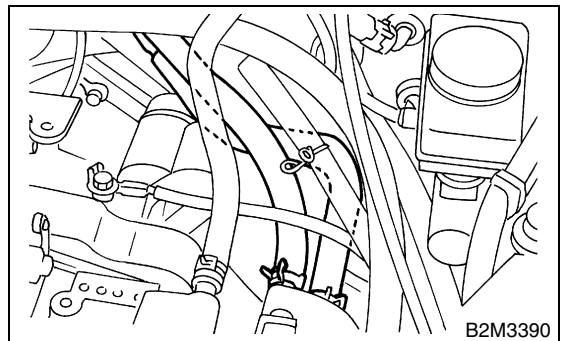
(7) Pressure switch



- 12) Disconnect the following hoses.
- (1) Brake booster vacuum hose



- (2) Heater inlet outlet hose

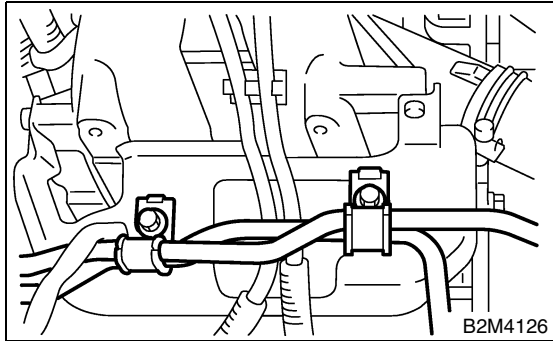


ENGINE ASSEMBLY

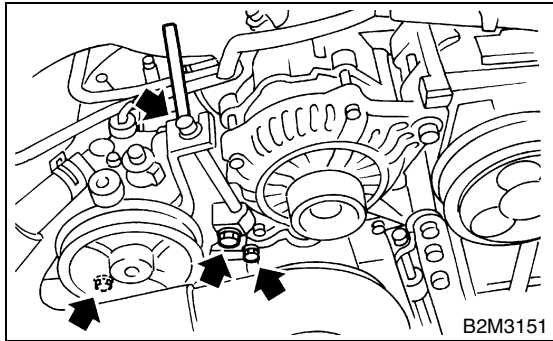
MECHANICAL

13) Remove the power steering pump from bracket.

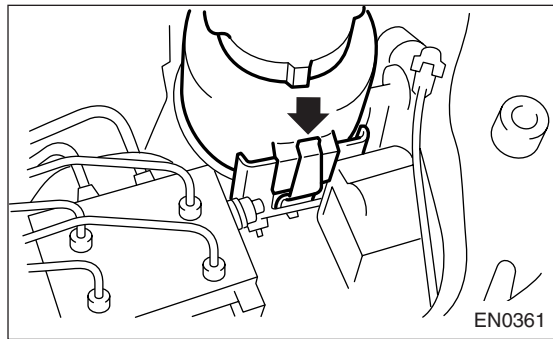
- (1) Remove the resonator chamber.
- (2) Loosen the lock bolt and slider bolt, and then remove the front side V-belt.<Ref. to ME-44, FRONT SIDE BELT, REMOVAL, V-belt.>
- (3) Remove the pipe with bracket.



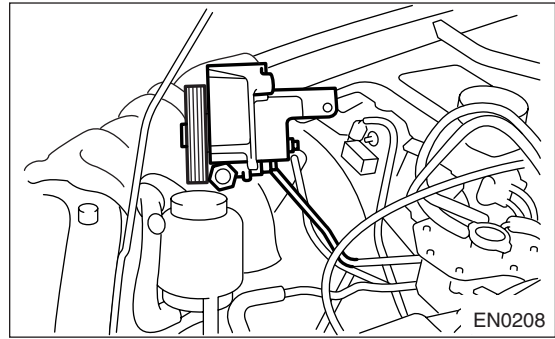
(4) Remove the bolts which install power steering pump bracket.



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

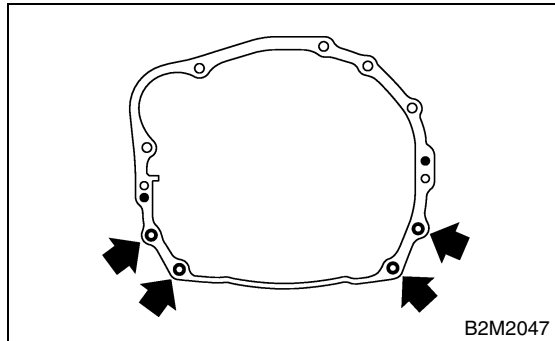


(6) Place the power steering pump on right side wheel apron.

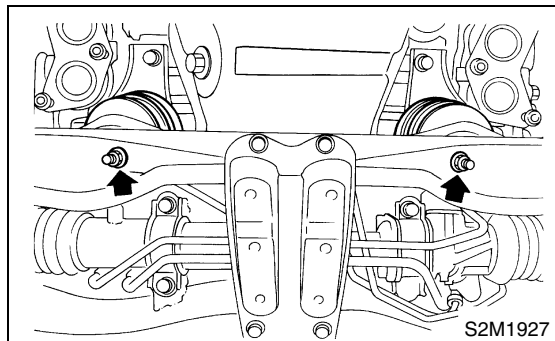


14) Remove the front and center exhaust pipe.<Ref. to EX-7, REMOVAL, Front Exhaust Pipe.> or <Ref. to EX(w/oOBD)-9, REMOVAL, Front Exhaust Pipe.>

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



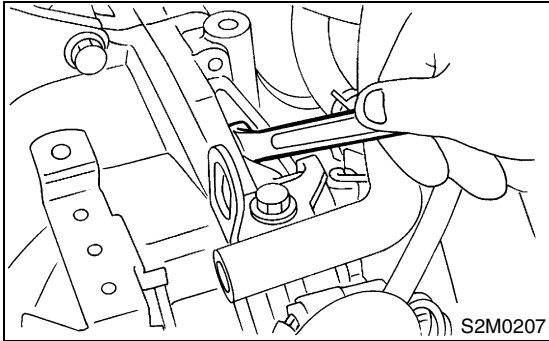
16) Remove the nuts which install front cushion rubber onto front crossmember.



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

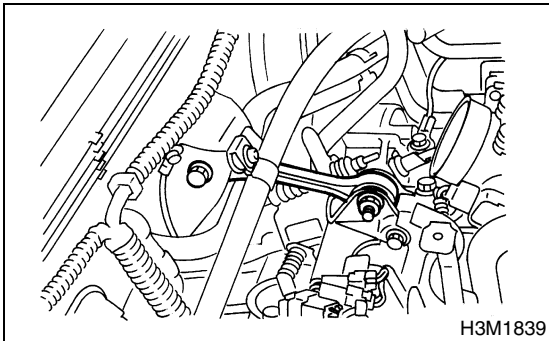
- (1) Lower the vehicle.
- (2) Remove the service hole plug.
- (3) Remove the bolts which hold torque converter clutch to drive plate.
- (4) Remove other bolts while rotating the engine using ST.

- ST 499977300 CRANK PULLEY WRENCH
(1600 cc and 2000 cc model)
- ST 499977100 CRANK PULLEY WRENCH
(2500 cc model)



S2M0207

18) Remove the pitching stopper.

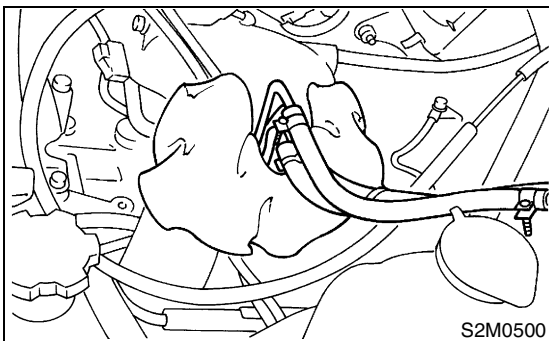


H3M1839

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

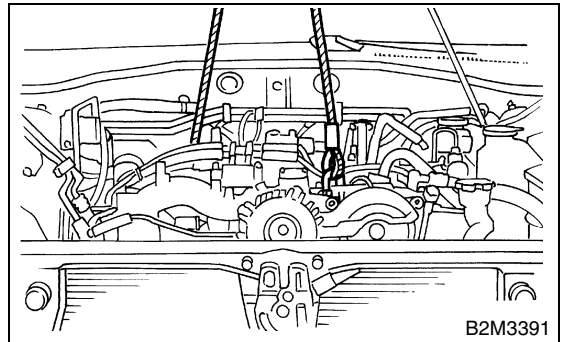
CAUTION:

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



S2M0500

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

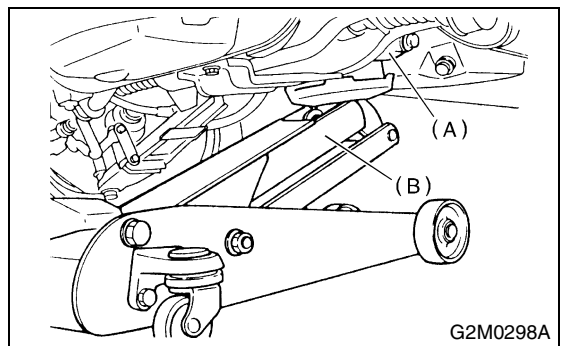


B2M3391

21) Support the transmission with a garage jack.

CAUTION:

Before moving the engine away from transmission, check to be sure no work has been overlooked. Doing this is very important in order to facilitate re-installation and because the transmission lowers under its own weight.

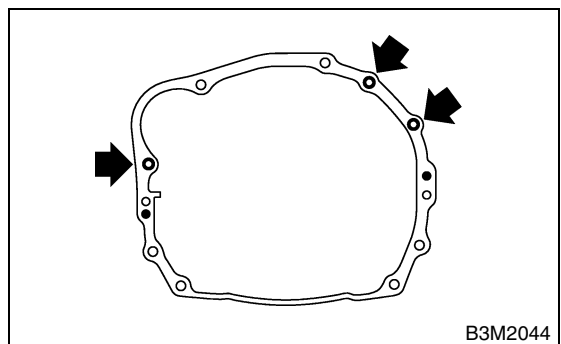


G2M0298A

- (A) Transmission
(B) Garage jack

22) Separation of the engine and transmission.

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



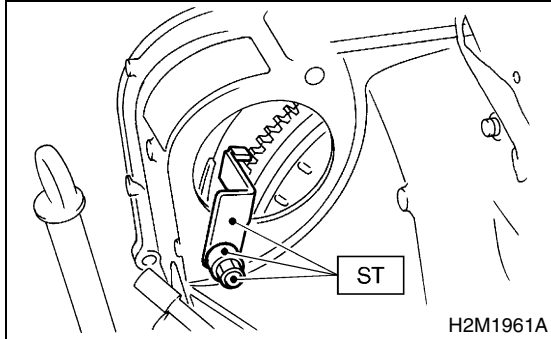
B3M2044

ENGINE ASSEMBLY

MECHANICAL

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

ST 498277200 STOPPER SET

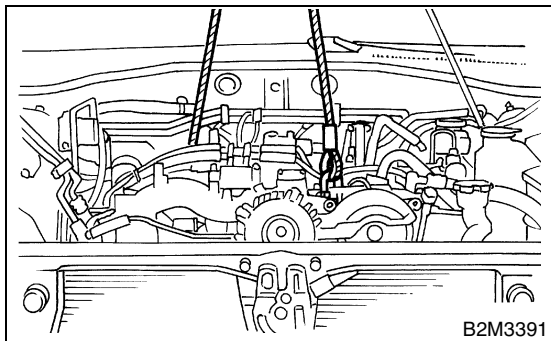


24) Remove the engine from vehicle.

- (1) Slightly raise the engine.
- (2) Raise the transmission with garage jack.
- (3) Move the engine horizontally until main shaft is withdrawn from clutch cover.
- (4) Slowly move the engine away from engine compartment.

CAUTION:

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



25) Remove the front cushion rubbers.

B: INSTALLATION

1) Install the front cushion rubbers.

Tightening torque:

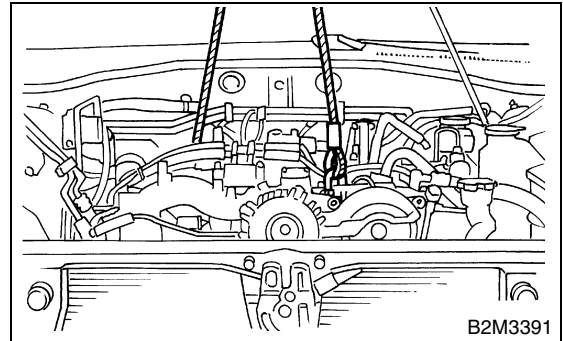
34 N·m (3.5 kgf-m, 25.3 ft-lb)

2) Install the engine onto transmission.

- (1) Position the engine in engine compartment and align it with transmission.

CAUTION:

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

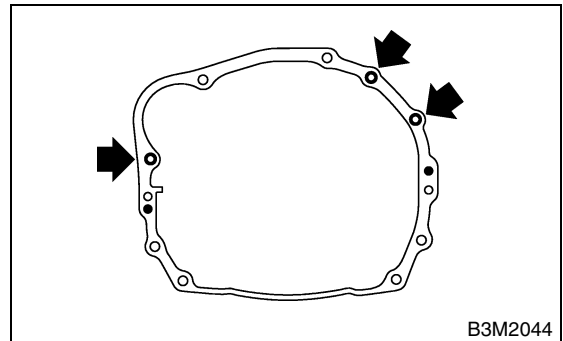


- (2) Apply a small amount of grease to the spline of main shaft. (MT model)

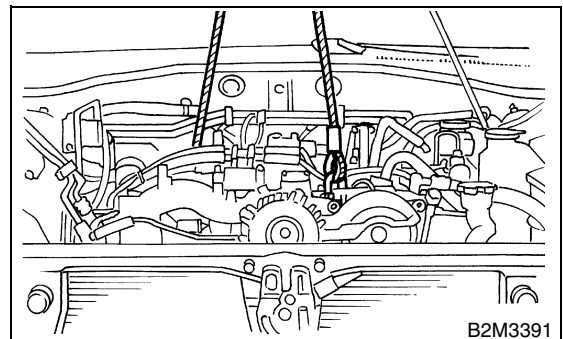
3) Tighten the bolts which hold upper side of transmission to engine.

Tightening torque:

50 N·m (5.1 kgf-m, 36.9 ft-lb)



4) Remove the lifting device and wire ropes.



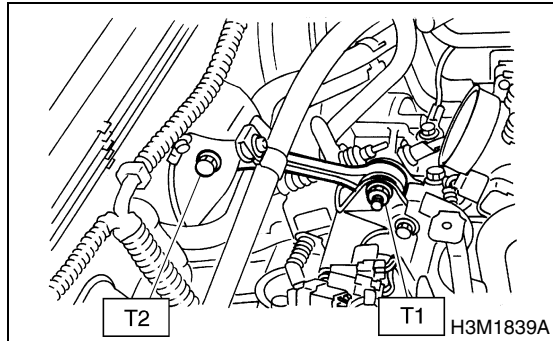
5) Remove the garage jack.

6) Install the pitching stopper.

Tightening torque:

T1: 50 N·m (5.1 kgf·m, 37 ft·lb)

T2: 58 N·m (5.9 kgf·m, 43 ft·lb)



7) Remove the ST from torque converter clutch case. (AT model)

NOTE:

Be careful not to drop the ST into torque converter clutch case when removing ST.

ST 498277200 STOPPER SET

8) Install the starter. <Ref. to SC-6, INSTALLATION, Starter.>

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

(1) Tighten the bolts which hold torque converter clutch to drive plate.

(2) Tighten other bolts while rotating the engine by using ST.

CAUTION:

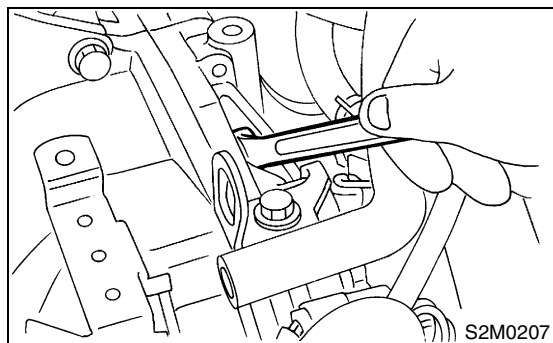
Be careful not to drop the bolts into torque converter clutch housing.

ST 499977300 CRANK PULLEY WRENCH (1600 cc and 2000 cc model)

ST 499977100 CRANK PULLEY WRENCH (2500 cc model)

Tightening torque:

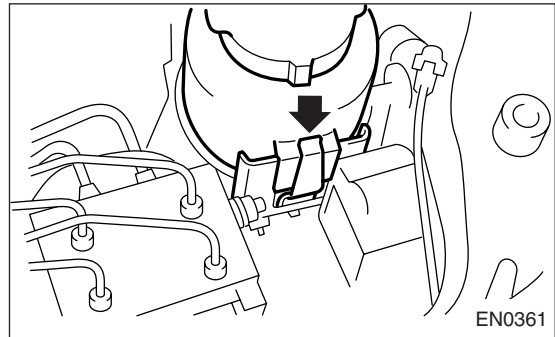
25 N·m (2.5 kgf·m, 18.1 ft·lb)



(3) Clog the plug onto service hole.

10) Install the power steering pump on bracket.

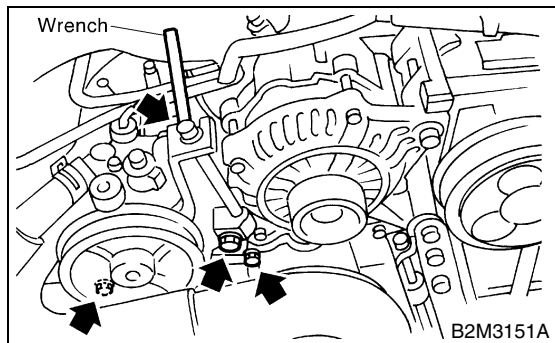
(1) Install the power steering tank on bracket.



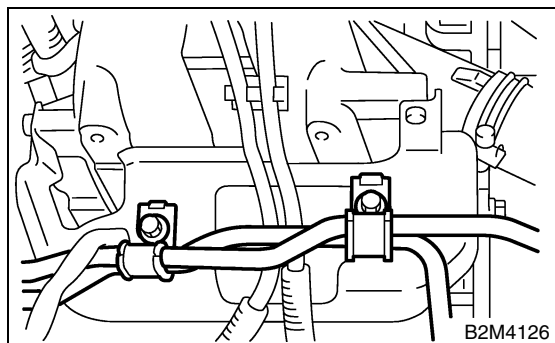
(2) Install the power steering pump on bracket, and then tighten the bolts.

Tightening torque:

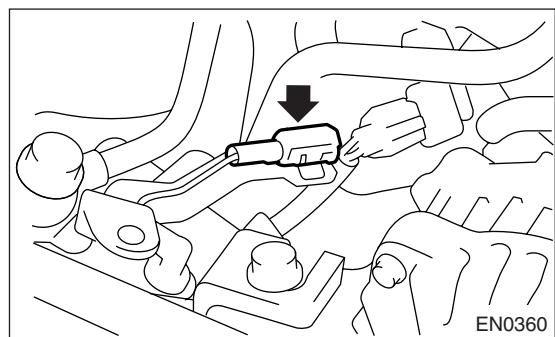
20.1 N·m (2.05 kgf·m, 14.8 ft·lb)



(3) Tighten the bolts which install power steering pump bracket, and then install the spark plug cords.



(4) Connect the power steering switch connector.



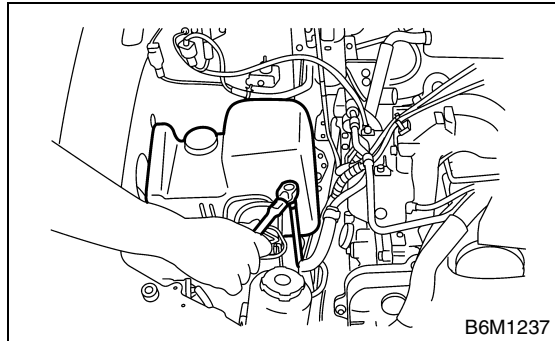
ENGINE ASSEMBLY

MECHANICAL

- (5) Install the front side V-belt, and adjust it. <Ref. to ME-44, FRONT SIDE BELT, INSTALLATION, V-belt.>
- (6) Install the resonator chamber.

Tightening torque:

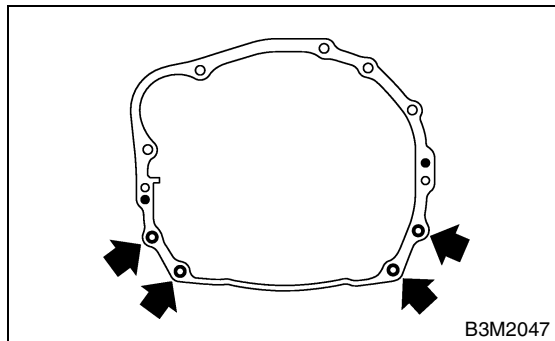
33 N·m (3.4 kgf-m, 24.6 ft-lb)



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

Tightening torque:

50 N·m (5.1 kgf-m, 36.9 ft-lb)



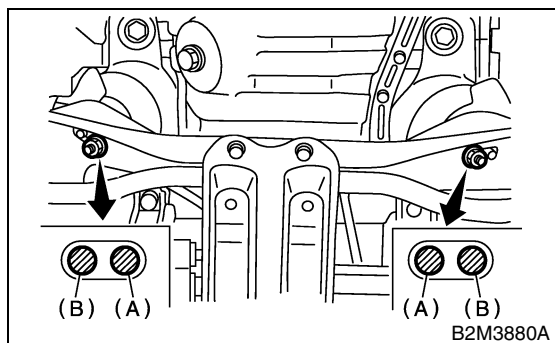
- 12) Tighten the nuts which install front cushion rubber onto crossmember.

Tightening torque:

85 N·m (8.7 kgf-m, 63 ft-lb)

CAUTION:

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



- 13) Install the front and center exhaust pipe. <Ref. to EX-8, INSTALLATION, Front Exhaust Pipe.> and <Ref. to EX(w/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 cables

Tightening torque:

14 N·m (1.4 kgf-m, 10.1 ft-lb)

- (2) Engine harness connectors
- (3) Generator connector and terminal
- (4) A/C compressor connectors
- (5) Power steering pressure switch

- 16) Connect the following cables.

- (1) Accelerator cable
- (2) Cruise control cables (With cruise control)

CAUTION:

After connecting each cable, adjust them.

- 17) Install the air cleaner case stay.

Tightening torque:

16 N·m (1.6 kgf-m, 11.6 ft-lb)

- 18) Install the A/C pressure hoses.

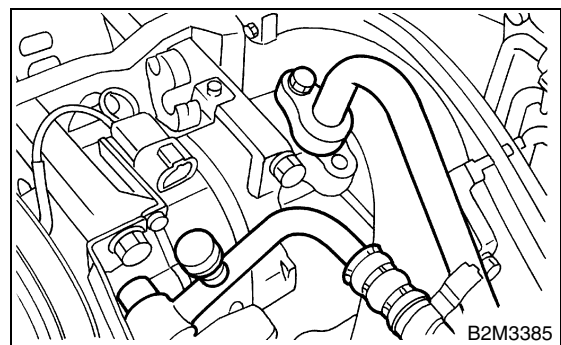
<Ref. to AC-37, INSTALLATION, Hose and Tube.>

NOTE:

Use new O-rings.

Tightening torque:

25 N·m (2.5 kgf-m, 18.1 ft-lb)



- 19) Install the radiator to vehicle. <Ref. to CO-42, INSTALLATION, Radiator.>

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

- 21) Install the under cover.

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

- 23) Fill engine coolant.
<Ref. to CO-26, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
- 24) Check the ATF level and correct if necessary. (AT model)
<Ref. to AT-9, INSPECTION, Automatic Transmission Fluid.>
- 25) Charge the A/C system with refrigerant.
<Ref. to AC-22, OPERATION, Refrigerant Charging Procedure.>
- 26) Remove the front hood stay, and then close the front hood.
- 27) Take off the vehicle from lift arms.

C: INSPECTION

- 1) Make sure the pipes and hoses are installed correctly.
- 2) Make sure the engine coolant and ATF are at specified levels.

10.Engine Mounting

A: REMOVAL

- 1) Remove the engine assembly. <Ref. to ME-34, REMOVAL, Engine Assembly.>
- 2) Remove the engine mounting from engine assembly.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

Engine mounting;

34 N·m (3.5 kgf-m, 25.3 ft-lb)

C: INSPECTION

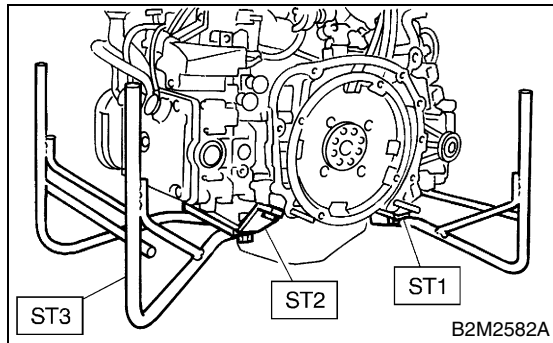
Make sure there are no cracks or other damage.

11.Preparation for Overhaul

A: PROCEDURE

1) After removing the engine from body, secure it in the ST shown below.

- | | | |
|-----|-----------|----------------------------|
| ST1 | 498457000 | ENGINE STAND ADAPTER
RH |
| ST2 | 498457100 | ENGINE STAND ADAPTER
LH |
| ST3 | 499817100 | ENGINE STAND |



2) In this section the procedures described under each index are all connected and stated in order. It will be the complete procedure for overhauling of the engine itself when you go through all steps in the process.

Therefore, in this section, to conduct the particular procedure within the flow of a section, you need to go back and conduct the procedure described previously in order to do that particular procedure.

12.V-belt

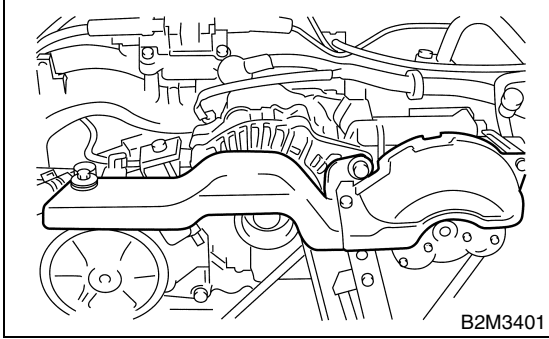
A: REMOVAL

1. FRONT SIDE BELT

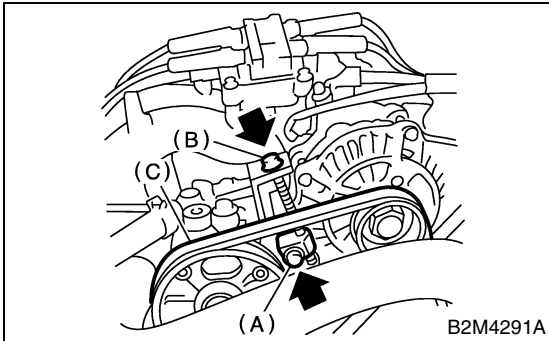
NOTE:

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

- 1) Remove the V-belt cover.

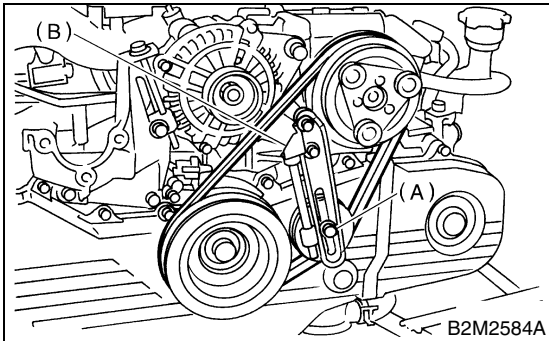


- 2) Loosen the lock bolt (A).
- 3) Loosen the slider bolt (B).
- 4) Remove the front side belt (C).

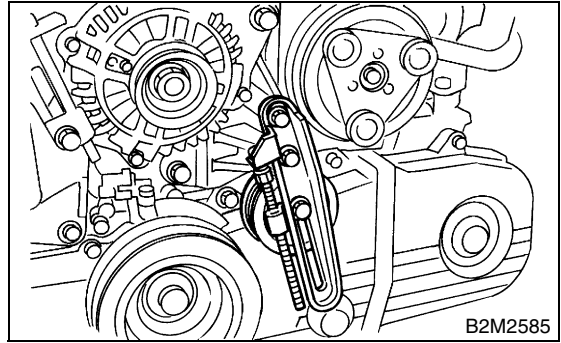


2. REAR SIDE BELT

- 1) Loosen the lock nut (A).
- 2) Loosen the slider bolt (B).



- 3) Remove the A/C belt.
- 4) Remove the A/C belt tensioner.



B: INSTALLATION

1. FRONT SIDE BELT

CAUTION:

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

- 1) Install the belt (C), and tighten the slider bolt so as to obtain the specified belt tension <Ref. to ME-45, INSPECTION, V-belt.>
- 2) Tighten the lock bolt (A)
- 3) Tighten the slider bolt (B).

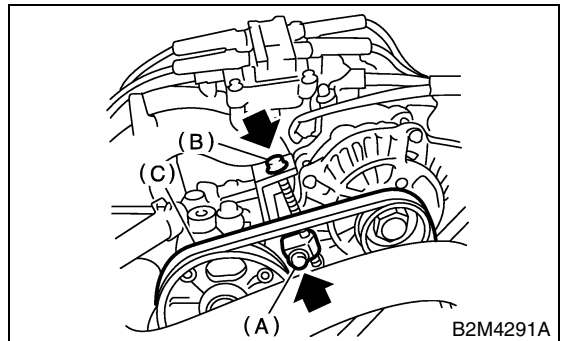
Tightening torque:

Lock bolt through bolt:

25 N·m (2.5 kgf-m, 18.1 ft-lb)

Slider bolt:

8 N·m (0.8 kgf-m, 5.5 ft-lb)



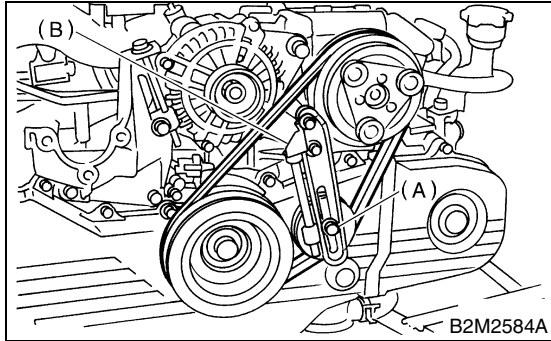
2. REAR SIDE BELT

- 1) Install the belt, and tighten the slider bolt (B) so as to obtain the specified belt tension. <Ref. to ME-45, INSPECTION, V-belt.>
- 2) Tighten the lock nut (A).

Tightening torque:

Lock nut (A);

22.6 N·m (2.3 kgf·m, 16.6 ft·lb)



C: INSPECTION

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

Belt tension

(A)

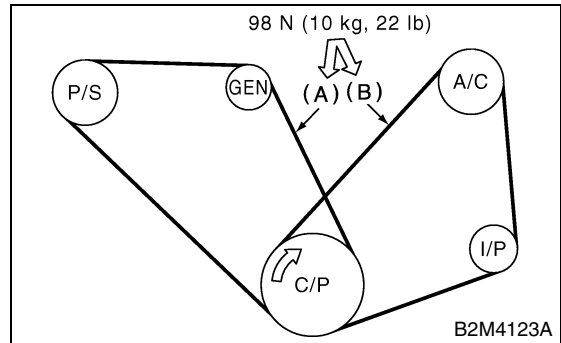
replaced: 7 — 9 mm (0.276 — 0.354 in)

reused: 9 — 11 mm (0.354 — 0.433 in)

(B)*

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

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



C/P Crankshaft pulley

GEN Generator

P/S Power steering oil pump pulley

A/C Air conditioning compressor pulley

I/P Idler pulley

CRANKSHAFT PULLEY

MECHANICAL

13. Crankshaft Pulley

A: REMOVAL

1) Remove the V-belt. <Ref. to ME-44, REMOVAL, V-belt.>

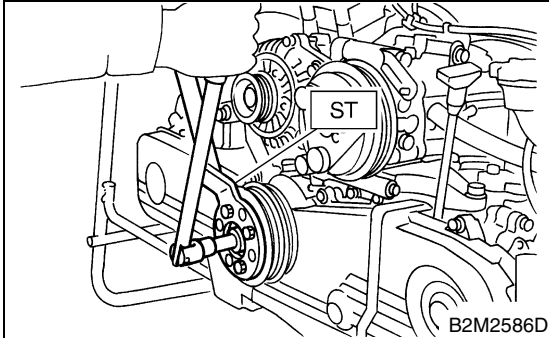
2) Remove the crankshaft pulley bolt. To lock the crankshaft, use ST.

ST 499977300 (1600 cc and 2000 cc model)

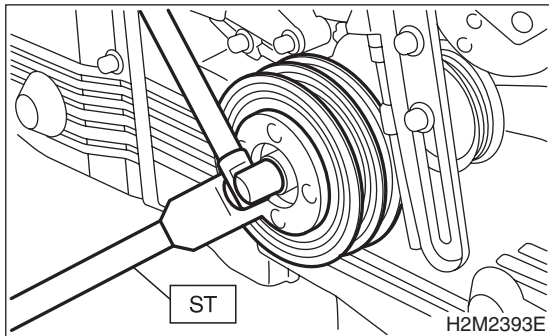
ST 499977100 (2500 cc model)

CRANKSHAFT PULLEY WRENCH

- 1600 cc and 2000 cc MODEL



- 2500 cc MODEL



3) Remove the crankshaft pulley.

B: INSTALLATION

1) Install the crankshaft pulley.

2) Install the pulley bolt. (1600 cc and 2000 cc model)

To lock the crankshaft, use ST.

ST 499977300 CRANK PULLEY WRENCH

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

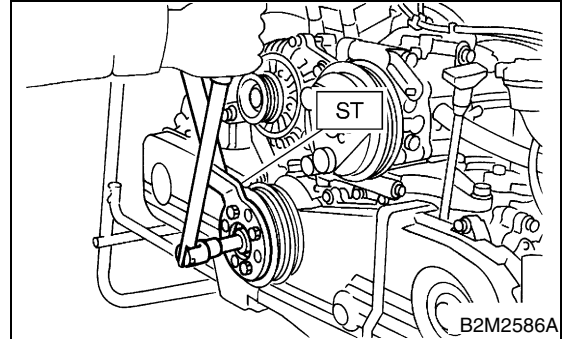
(2) Apply engine oil to the crankshaft pulley bolt seat and thread.

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

(4) Tighten the crankshaft pulley bolts.

Tightening torque:

127 N·m (13.0 kgf·m, 94.0 ft·lb)



3) Confirm that the tightening angle of crankshaft pulley bolt is 45 degrees or more. If 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 crankshaft pulley bolt referring to the gauge indicated on belt cover.

4) Install the pulley bolt. (2500 cc model)

To lock the crankshaft, use ST.

ST 499977100 CRANK PULLEY WRENCH

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

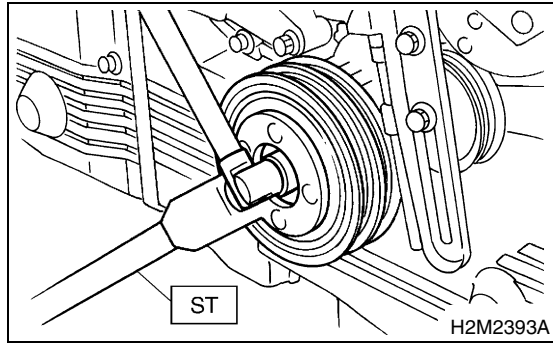
(2) Apply engine oil to the crankshaft pulley bolt seat and thread.

(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)



5) Confirm that the tightening angle of crankshaft pulley bolt is 65 degrees or more. If not, conduct the following procedures (1) through (4).

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

Crankshaft pulley bolt:

12369AA011

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

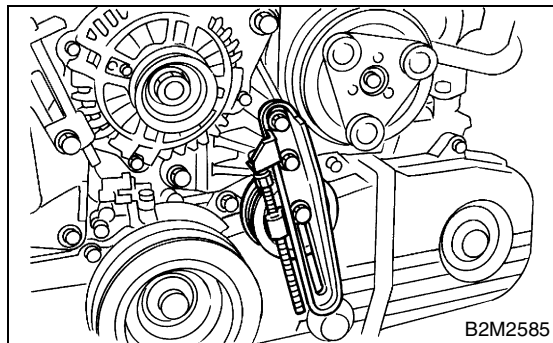
(3) Tighten the bolts temporarily with tightening torque of 44 N·m (4.5 kgf·m, 33 ft·lb).

(4) Tighten the crankshaft pulley bolts keeping them in an angle between 65 degrees and 75 degrees.

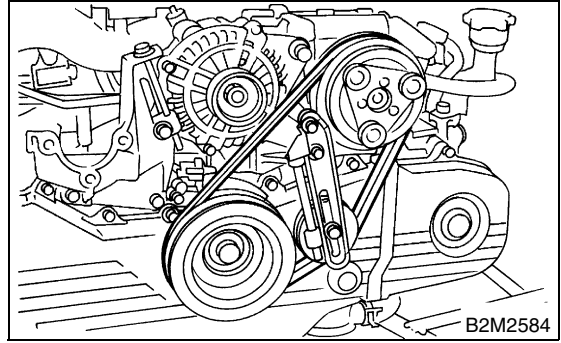
CAUTION:

Conduct the tightening procedures by confirming the turning angle of crankshaft pulley bolt referring to the gauge indicated on belt cover.

6) Install the A/C belt tensioner.



7) Install the A/C belt.



C: INSPECTION

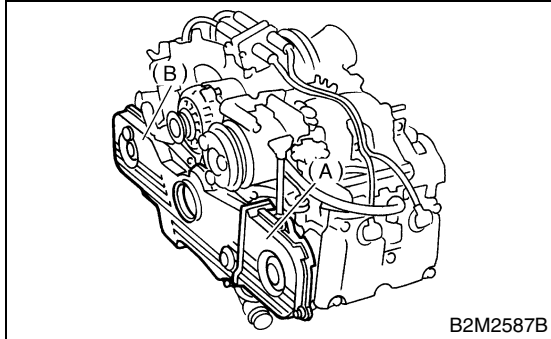
1) Make sure the V-belt is not worn or otherwise damaged.

2) Check the tension of the belt. <Ref. to ME-45, INSPECTION, V-belt.>

14. Belt Cover

A: REMOVAL

- 1) Remove the V-belt. <Ref. to ME-44, REMOVAL, V-belt.>
- 2) Remove the crankshaft pulley. <Ref. to ME-46, REMOVAL, Crankshaft Pulley.>
- 3) Remove the belt cover (LH).
- 4) Remove the front belt cover.



- (A) Belt cover (LH)
(B) Front belt cover

B: INSTALLATION

- 1) Install the front belt cover.

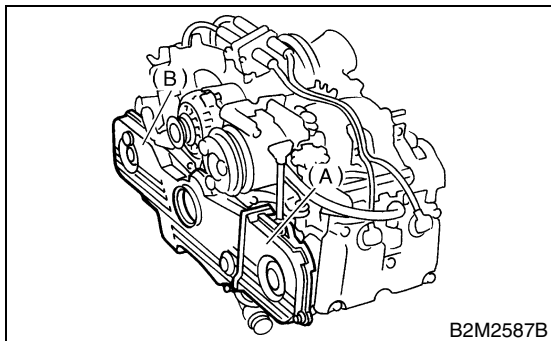
Tightening torque:

5 N·m (0.5 kgf·m, 3.6 ft·lb)

- 2) Install the belt cover (LH).

Tightening torque:

5 N·m (0.5 kgf·m, 3.6 ft·lb)



- (A) Belt cover (LH)
(B) Front belt cover

- 3) Install the crankshaft pulley. <Ref. to ME-46, INSTALLATION, Crankshaft Pulley.>
- 4) Install the V-belt. <Ref. to ME-44, INSTALLATION, V-belt.>

C: INSPECTION

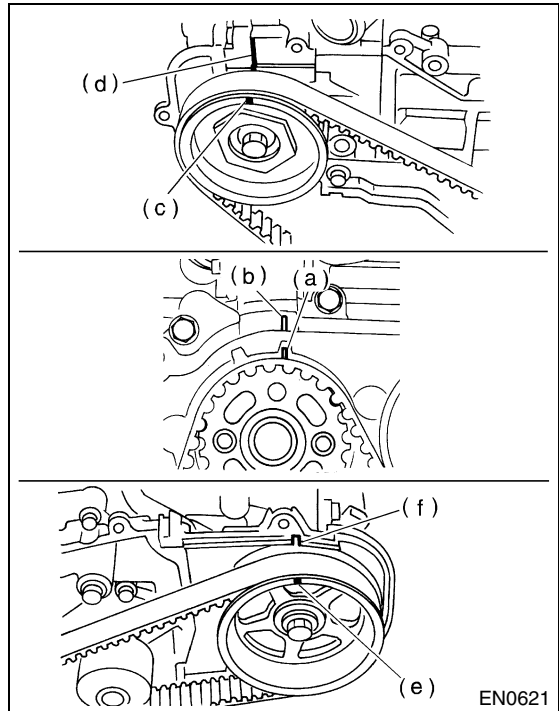
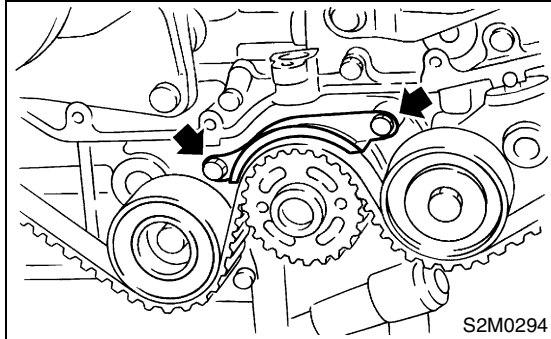
Make sure the cover is not damaged.

15. Timing Belt Assembly

A: REMOVAL

1. TIMING BELT

- 1) Remove the V-belt. <Ref. to ME-44, REMOVAL, V-belt.>
- 2) Remove the crankshaft pulley. <Ref. to ME-46, REMOVAL, Crankshaft Pulley.>
- 3) Remove the belt cover. <Ref. to ME-48, REMOVAL, Belt Cover.>
- 4) Remove the timing belt guide. (MT vehicle only)

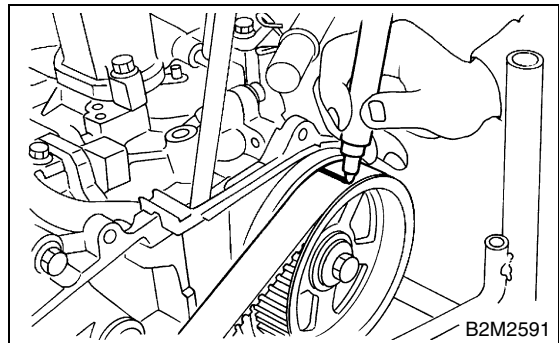
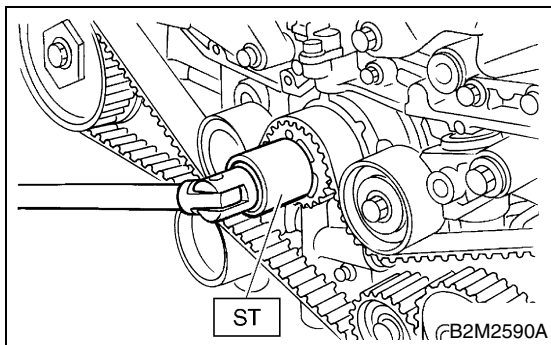


5) If the alignment mark (a) and/or arrow mark (which indicates rotation direction) on timing belt fade away, put new marks before removing the timing belt as shown in procedures below.

(1) Turn the crankshaft using ST. Align the mark (a) of sprocket to cylinder block notch (b) and ensure the right side cam sprocket mark (c), cam cap and cylinder head matching surface (d) and/or left side cam sprocket mark (e) and belt cover notch (f) are properly adjusted.

ST 499987500 CRANKSHAFT SOCKET

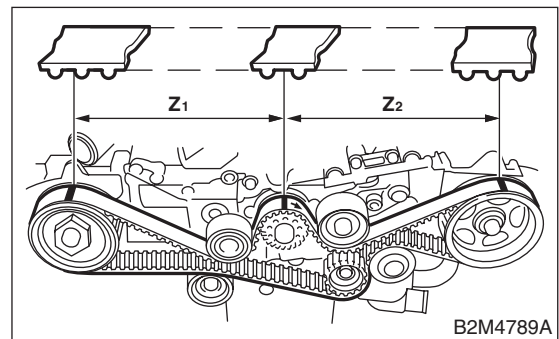
(2) Using white paint, put alignment and/or arrow marks on the timing belts in relation to crank sprocket and cam sprockets.



Specified data:

Z₁: 46.8 tooth length

Z₂: 43.7 tooth length

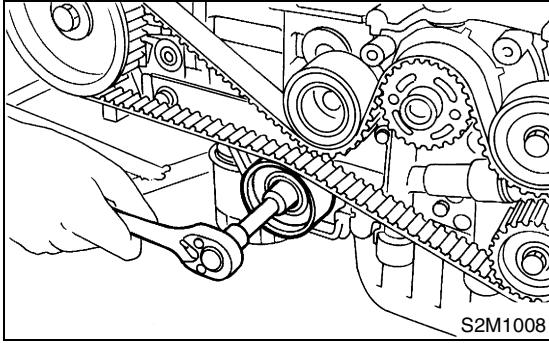


6) Remove the belt idler (No. 2).

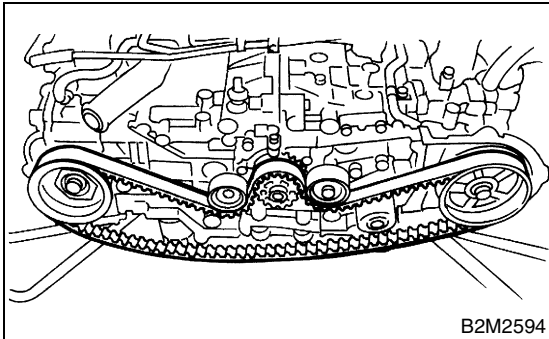
TIMING BELT ASSEMBLY

MECHANICAL

7) Remove the belt idler No. 2.

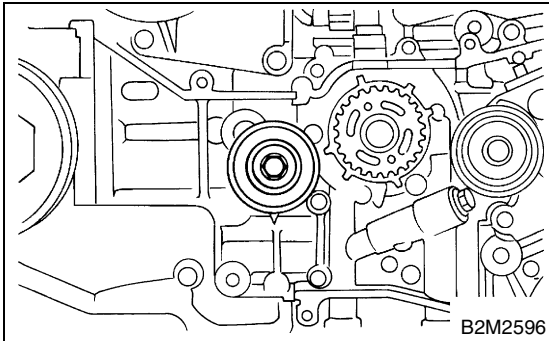


8) Remove the timing belt.

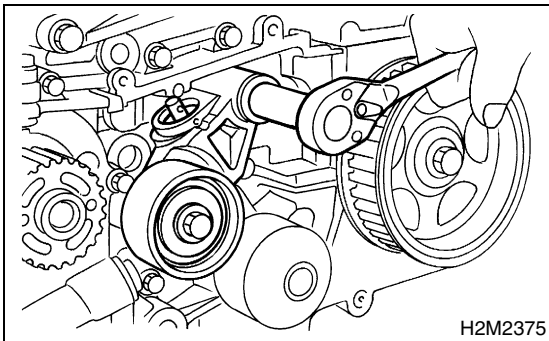


2. BELT IDLER AND AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY

1) Remove the belt idler (No. 1).



2) Remove the automatic belt tension adjuster assembly.



B: INSTALLATION

1. AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER

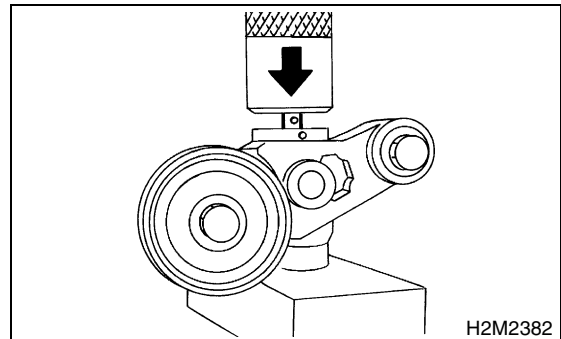
1) Preparation for installation of automatic belt tension adjuster assembly;

CAUTION:

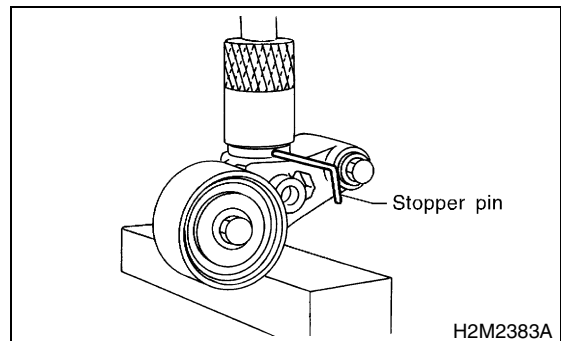
- Always use a vertical type pressing tool to move the adjuster rod down.
- Do not use a lateral type vise.
- Push the adjuster rod vertically.
- Be sure to slowly move the adjuster rod down applying a pressure of 294 N (30 kgf, 66 lb).
- Press-in the push adjuster rod gradually taking more than 3 minutes.
- Do not allow press pressure to exceed 9,807 N (1,000 kgf, 2,205 lb).
- Press the adjuster rod as far as the end surface of cylinder. Do not press the adjuster rod into the cylinder. Doing so may damage the cylinder.
- Do not release the press pressure until stopper pin is completely inserted.

(1) Attach the automatic belt tension adjuster assembly to the vertical pressing tool.

(2) Slowly move the adjuster rod down with a pressure of 294 N (30 kgf, 66 lb) until the adjuster rod is aligned with the stopper pin hole in the cylinder.



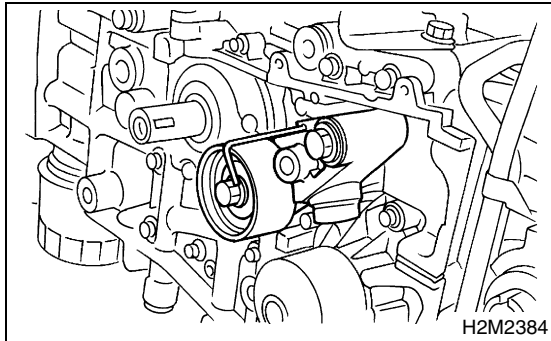
(3) With a 2 mm (0.08 in) dia. stopper pin or a 2 mm (0.08 in) (nominal) dia. hex bar wrench inserted into the stopper pin hole in the cylinder, secure the adjuster rod.



2) Install the automatic belt tension adjuster assembly.

Tightening torque:

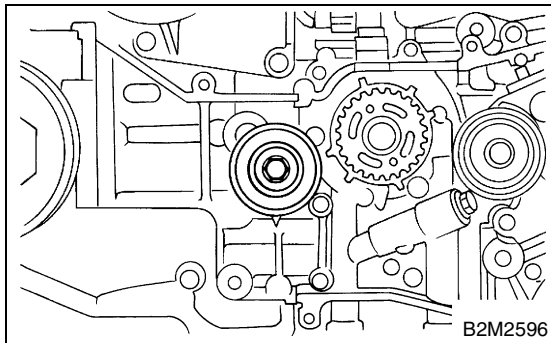
25 N·m (2.5 kgf-m, 18.1 ft-lb)



3) Install the belt idler (No. 1).

Tightening torque:

39 N·m (4.0 kgf-m, 28.9 ft-lb)



2. TIMING BELT

1) Preparation for the installation of automatic belt tension adjuster assembly. <Ref. to ME-50, AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER, INSTALLATION, Timing Belt Assembly.>

2) Installation of timing belt

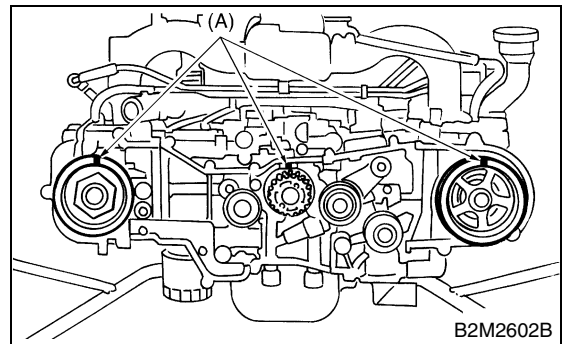
(1) Turn the camshaft sprocket No. 2 using ST1, and then turn the camshaft sprocket No. 1 using ST2 so that their alignment marks (A) come to top positions.

ST1 18231AA010 CAMSHAFT SPROCKET WRENCH

NOTE:

Also the CAMSHAFT SPROCKET WRENCH (499207100) can be used.

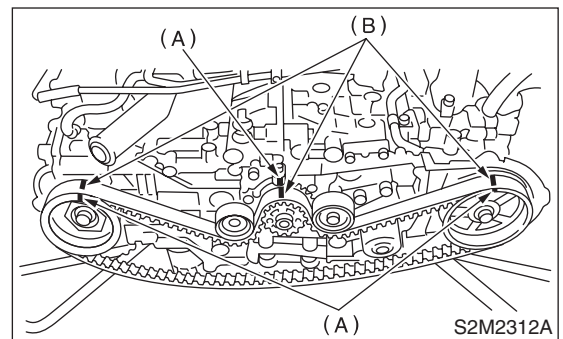
ST2 499207400 CAMSHAFT SPROCKET WRENCH



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

CAUTION:

Ensure belt's rotating direction is correct.



3) Install the belt idler No. 2.

Tightening torque:

39 N·m (4.0 kgf-m, 28.9 ft-lb)

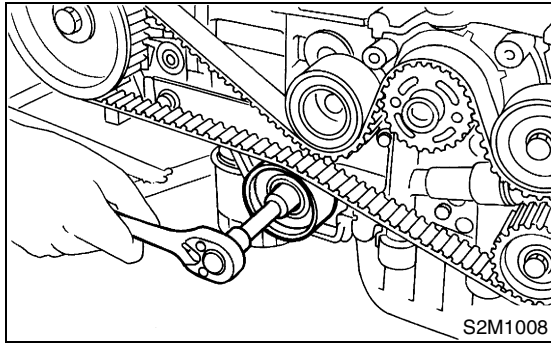
TIMING BELT ASSEMBLY

MECHANICAL

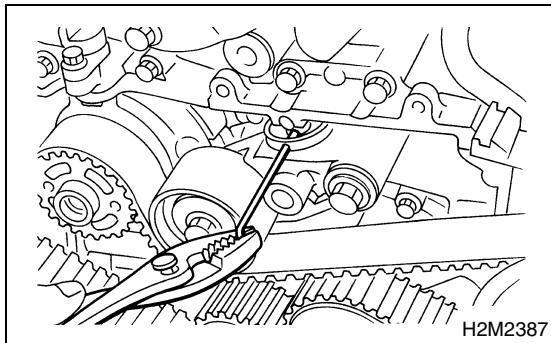
4) Install the belt idler (No. 2).

Tightening torque:

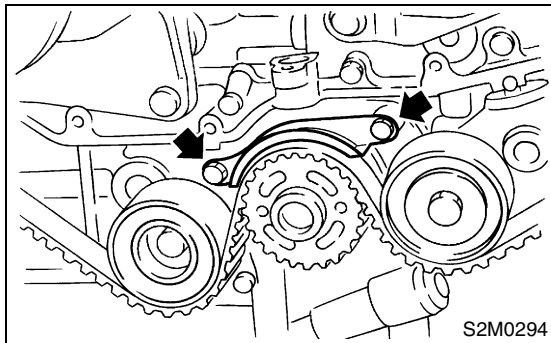
39 N·m (4.0 kgf·m, 28.9 ft·lb)



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



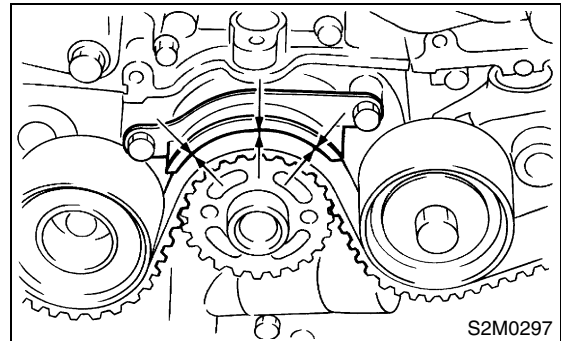
6) Install the timing belt guide. (MT vehicles only)
(1) Temporarily tighten the remaining bolts.



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

Clearance:

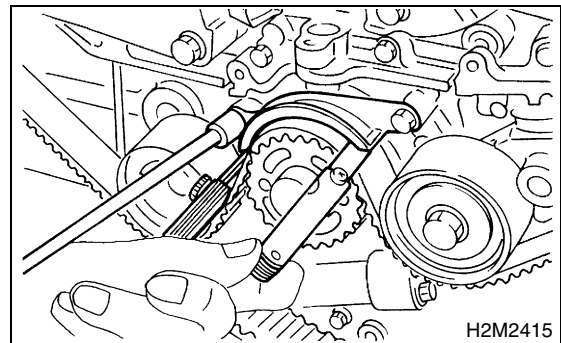
1.0±0.5 mm (0.039±0.020 in)



(3) Tighten the remaining bolts.

Tightening torque:

10 N·m (1.0 kgf·m, 7.2 ft·lb)



7) Install the belt cover. <Ref. to ME-48, INSTALLATION, Belt Cover.>

8) Install the crankshaft pulley. <Ref. to ME-46, REMOVAL, Crankshaft Pulley.>

9) Install the V-belt. <Ref. to ME-44, INSTALLATION, V-belt.>

C: INSPECTION

1. TIMING BELT

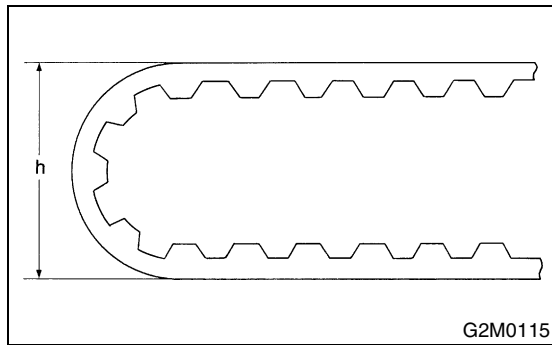
- 1) Check the timing belt teeth for breaks, cracks, and wear. If any fault is found, replace belt.
- 2) Check the condition of back side of belt; if any crack is found, replace the belt.

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:

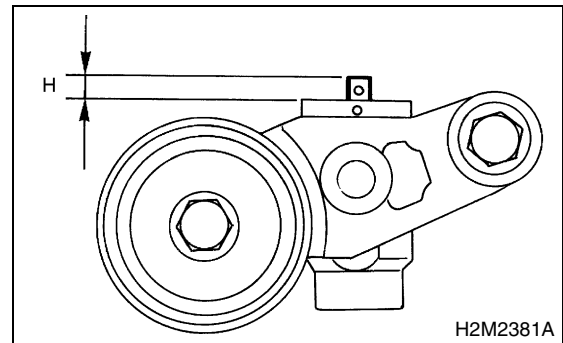
- (1) Slowly press the adjuster rod down to the end surface of the cylinder. Repeat this motion 2 or 3 times.
- (2) With the adjuster rod moved all the way up, apply a pressure of 294 N (30 kgf, 66 lb) to it. Check adjuster rod stiffness.
- (3) If the adjuster rod is not stiff and moves down, replace 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 the adjuster rod vertically.
 - Press-in the push adjuster rod gradually taking more than 3 minutes.
 - Do not allow press pressure to exceed 9,807 N (1,000 kgf, 2,205 lb).
 - Press the adjuster rod as far as the end surface of the cylinder. Do not press the adjuster rod into the cylinder. Doing so may damage the cylinder.
- 4) Measure the extension of rod beyond the body. If it is not within specifications, replace with a new one.

Rod extension: *H*

5.7±0.5 mm (0.224±0.020 in)



3. BELT TENSION PULLEY

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

4. BELT IDLER

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

CAMSHAFT SPROCKET

MECHANICAL

16. Camshaft Sprocket

A: REMOVAL

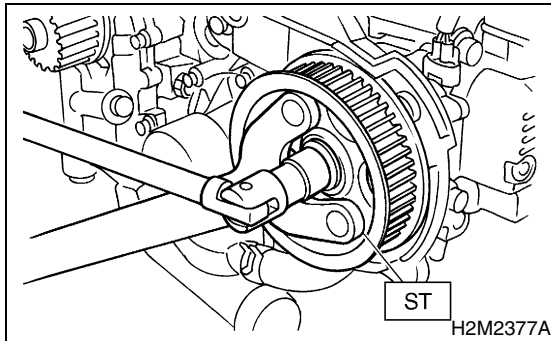
1. REMOVAL

- 1) Remove the V-belt. <Ref. to ME-44, REMOVAL, V-belt.>
- 2) Remove the crankshaft pulley. <Ref. to ME-46, REMOVAL, Crankshaft Pulley.>
- 3) Remove the belt cover. <Ref. to ME-48, REMOVAL, Belt Cover.>
- 4) Remove the timing belt assembly. <Ref. to ME-49, REMOVAL, Timing Belt Assembly.>
- 5) Remove the camshaft position sensor. <Ref. to FU-33, REMOVAL, Camshaft Position Sensor.> or <Ref. to FU(w/oOBD)-32, REMOVAL, Camshaft Position Sensor.>
- 6) Remove the camshaft sprocket No. 2. To lock the camshaft, use ST.

ST 18231AA010 CAMSHAFT SPROCKET WRENCH

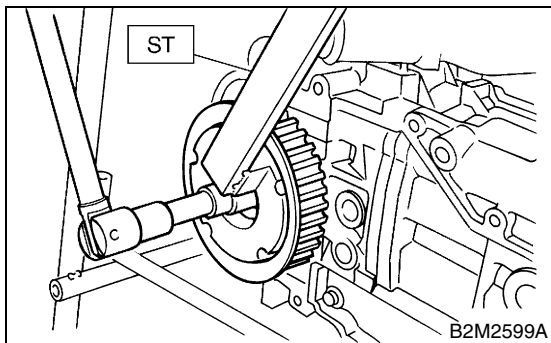
NOTE:

Also the CAMSHAFT SPROCKET WRENCH (499207100) can be used.



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

ST 499207400 CAMSHAFT SPROCKET WRENCH



B: INSTALLATION

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

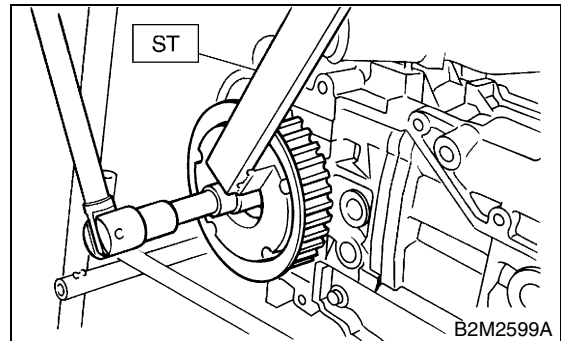
ST 499207400 CAMSHAFT SPROCKET WRENCH

Tightening torque:

78 N·m (8.0 kgf·m, 57.9 ft·lb)

CAUTION:

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



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

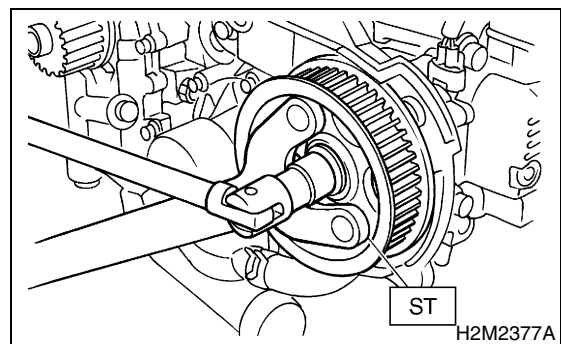
ST 18231AA010 CAMSHAFT SPROCKET WRENCH

NOTE:

Also the CAMSHAFT SPROCKET WRENCH (499207100) can be used.

Tightening torque:

78 N·m (8.0 kgf·m, 57.9 ft·lb)



- 3) Install the camshaft position sensor. <Ref. to FU-33, INSTALLATION, Camshaft Position Sensor.> or <Ref. to FU(w/oOBD)-32, INSTALLATION, Camshaft Position Sensor.>

- 4) Install the timing belt assembly. <Ref. to ME-50, INSTALLATION, Timing Belt Assembly.>

- 5) Install the belt cover. <Ref. to ME-48, INSTALLATION, Belt Cover.>

- 6) Install the crankshaft pulley. <Ref. to ME-46, INSTALLATION, Crankshaft Pulley.>

7) Install the V-belt. <Ref. to ME-44, INSTALLATION, V-belt.>

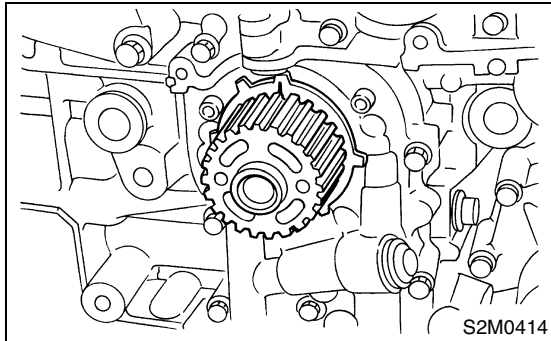
C: INSPECTION

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

17. Crankshaft Sprocket

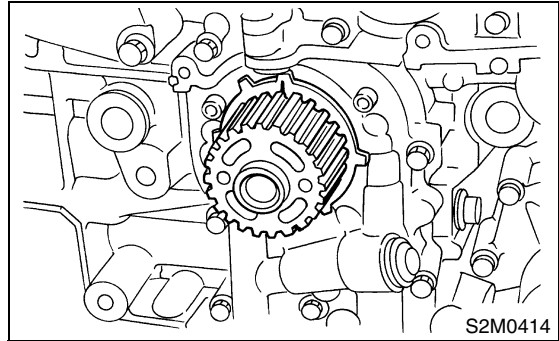
A: REMOVAL

- 1) Remove the V-belt. <Ref. to ME-44, REMOVAL, V-belt.>
- 2) Remove the crankshaft pulley. <Ref. to ME-46, REMOVAL, Crankshaft Pulley.>
- 3) Remove the belt cover. <Ref. to ME-48, REMOVAL, Belt Cover.>
- 4) Remove the timing belt assembly. <Ref. to ME-49, REMOVAL, Timing Belt Assembly.>
- 5) Remove the camshaft sprocket. <Ref. to ME-54, REMOVAL, Camshaft Sprocket.>
- 6) Remove the crankshaft sprocket.



B: INSTALLATION

- 1) Install the crankshaft sprocket.



- 2) Install the camshaft sprocket. <Ref. to ME-54, INSTALLATION, Camshaft Sprocket.>
- 3) Install the timing belt assembly. <Ref. to ME-50, INSTALLATION, Timing Belt Assembly.>
- 4) Install the belt cover. <Ref. to ME-48, INSTALLATION, Belt Cover.>
- 5) Install the crankshaft pulley. <Ref. to ME-46, INSTALLATION, Crankshaft Pulley.>
- 6) Install the V-belt. <Ref. to ME-44, INSTALLATION, V-belt.>

C: INSPECTION

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

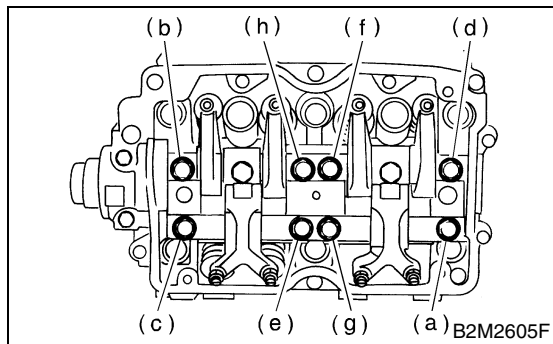
18. Valve Rocker Assembly

A: REMOVAL

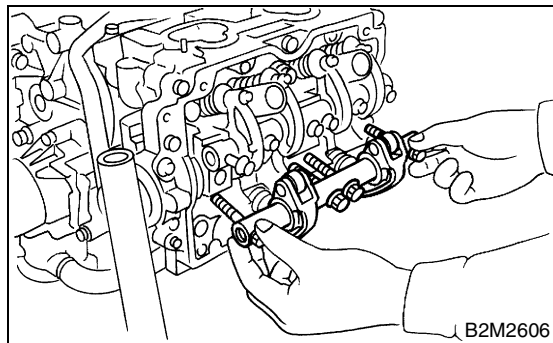
- 1) Remove the V-belt. <Ref. to ME-44, REMOVAL, V-belt.>
- 2) Remove the crankshaft pulley. <Ref. to ME-46, REMOVAL, Crankshaft Pulley.>
- 3) Remove the belt cover. <Ref. to ME-48, REMOVAL, Belt Cover.>
- 4) Remove the timing belt assembly. <Ref. to ME-49, REMOVAL, Timing Belt Assembly.>
- 5) Remove the camshaft sprocket. <Ref. to ME-54, REMOVAL, Camshaft Sprocket.>
- 6) Disconnect the PCV hose and remove rocker cover.
- 7) Removal of valve rocker assembly
 - (1) Remove the bolts (a) through (h) in alphabetical sequence.

CAUTION:

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



- (2) Remove the valve rocker assembly.



B: INSTALLATION

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

CAUTION:

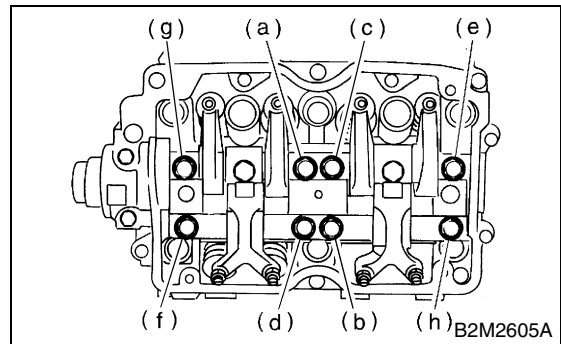
Do not allow the valve rocker assembly to gouge knock pins.

- (2) Tighten the bolts (e) through (h) to specified torque.

- (3) Tighten the bolts (a) through (d) to specified torque.

Tightening torque:

25 N·m (2.5 kgf·m, 18.1 ft·lb)



- 2) Adjust the valve clearances. <Ref. to ME-32, ADJUSTMENT, Valve Clearance.>
- 3) Install the rocker cover and connect PCV hose.
- 4) Install the camshaft sprocket. <Ref. to ME-54, INSTALLATION, Camshaft Sprocket.>
- 5) Install the timing belt assembly. <Ref. to ME-50, INSTALLATION, Timing Belt Assembly.>
- 6) Install the belt cover. <Ref. to ME-48, INSTALLATION, Belt Cover.>
- 7) Install the crankshaft pulley. <Ref. to ME-46, INSTALLATION, Crankshaft Pulley.>
- 8) Install the V-belt. <Ref. to ME-44, INSTALLATION, V-belt.>

C: DISASSEMBLY

- 1) Remove the bolts which secure rocker shaft.
- 2) Extract the rocker shaft. Remove the 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 the nut and adjuster screw from valve rocker.

D: ASSEMBLY

- 1) Install the adjuster screw and nut to valve rocker.
- 2) Arrange the valve rocker arms, springs and shaft supports in assembly order and insert valve rocker shaft.

Tightening torque (Shaft supports installing bolts):

5 N·m (0.5 kgf·m, 3.6 ft·lb)

CAUTION:

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

- 3) Install the valve rocker shaft securing bolts.

VALVE ROCKER ASSEMBLY

MECHANICAL

E: INSPECTION

1. VALVE ROCKER ARM

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

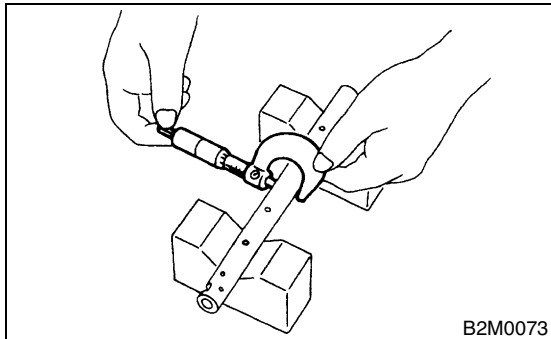
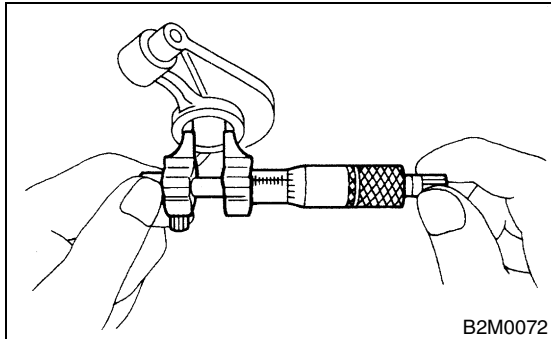
Clearance between arm and shaft:

Standard

0.020 — 0.054 mm (0.0008 — 0.0021 in)

Limit

0.10 mm (0.0039 in)



2) If oil clearance exceeds the limit, replace the valve rocker arm or shaft, whichever shows greater amount of wear.

Rocker arm inside diameter:

22.020 — 22.041 mm (0.8669 — 0.8678 in)

Rocker shaft diameter:

21.987 — 22.000 mm (0.8656 — 0.8661 in)

3) Measure the 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 the 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 the valve rocker arm.

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

2. INTAKE AND EXHAUST VALVE ROCKER SHAFT

Visually check the 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 the valve rocker shaft as necessary.

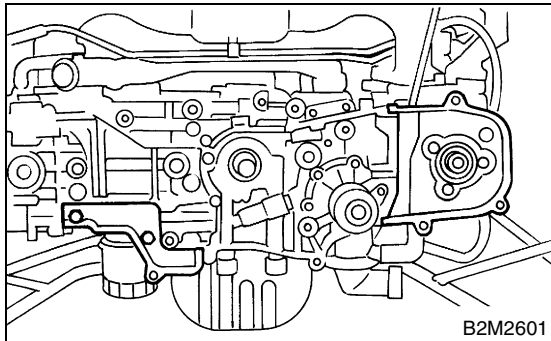
19. Camshaft

A: REMOVAL

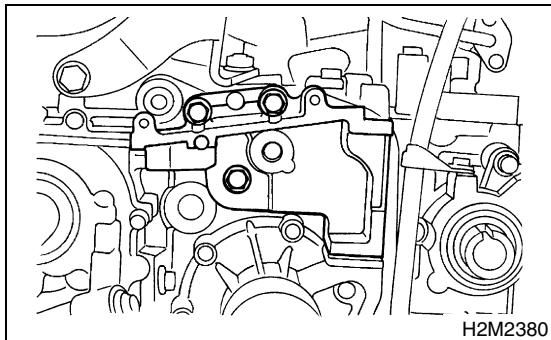
- 1) Remove the V-belt. <Ref. to ME-44, INSTALLATION, V-belt.>
- 2) Remove the crankshaft pulley. <Ref. to ME-46, REMOVAL, Crankshaft Pulley.>
- 3) Remove the belt cover. <Ref. to ME-48, REMOVAL, Belt Cover.>
- 4) Remove the timing belt assembly. <Ref. to ME-49, REMOVAL, Timing Belt Assembly.>
- 5) Remove the camshaft sprocket. <Ref. to ME-54, REMOVAL, Camshaft Sprocket.>
- 6) Remove the crankshaft sprocket. <Ref. to ME-56, REMOVAL, Crankshaft Sprocket.>
- 7) Remove the belt cover No. 2 (LH).
- 8) Remove the belt cover No. 2 (RH).

CAUTION:

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

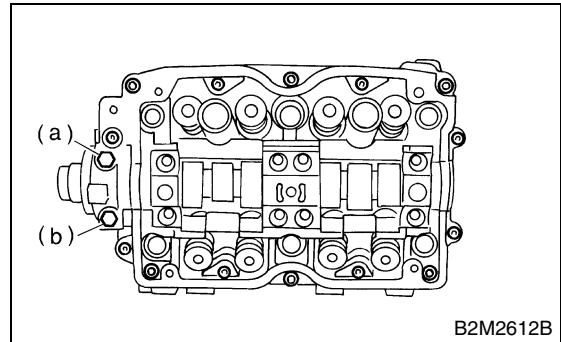


- 9) Remove the tensioner bracket.

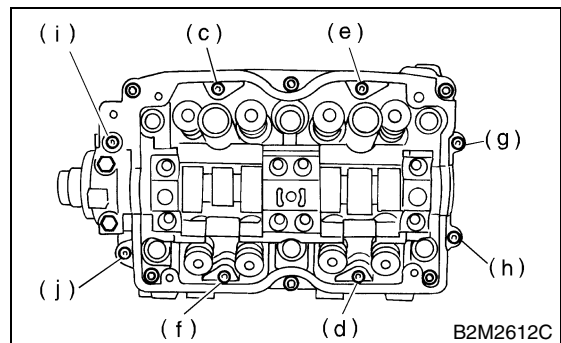


- 10) Remove the camshaft position sensor support. (LH side only)
- 11) Remove the oil level gauge guide. (LH side only)
- 12) Remove the valve rocker assembly. <Ref. to ME-57, REMOVAL, Valve Rocker Assembly.>
- 13) Remove the camshaft cap.

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

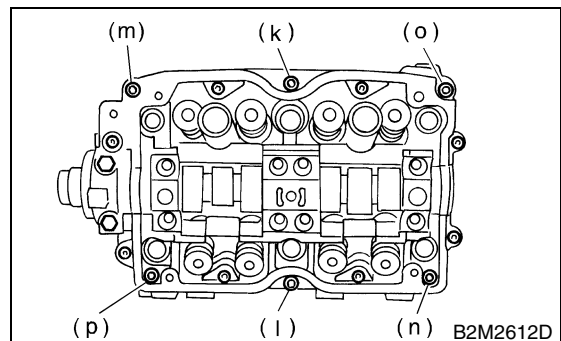


- (2) Equally loosen the bolts (c) through (j) all the way in alphabetical sequence.

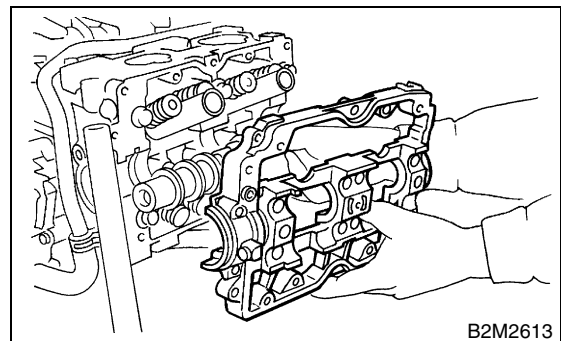


- (3) Remove the bolts (k) through (p) in alphabetical sequence using ST.

ST 499497000 TORX PLUS



- (4) Remove the camshaft cap.



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

CAMSHAFT

MECHANICAL

16) Remove the plug from rear side of camshaft.

CAUTION:

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

B: INSTALLATION

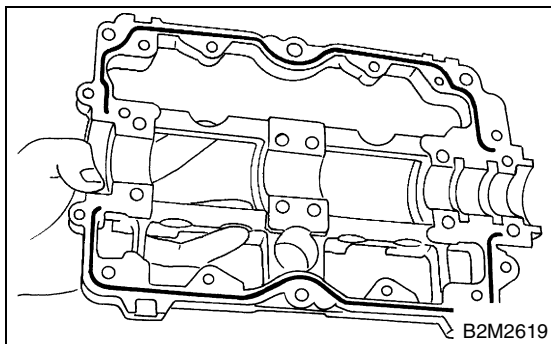
1) Apply a coat of engine oil to the camshaft journals, and then install the camshaft.
2) Install the camshaft cap.

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

Liquid gasket:

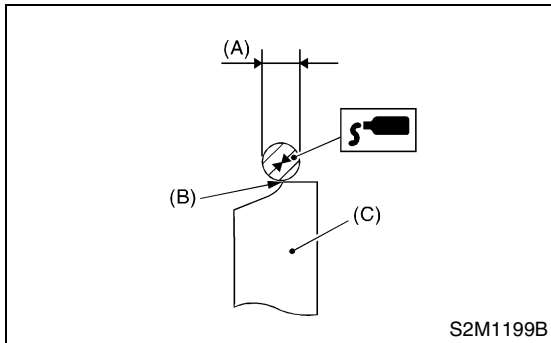
THREE BOND 1280B

P/N K0877YA018

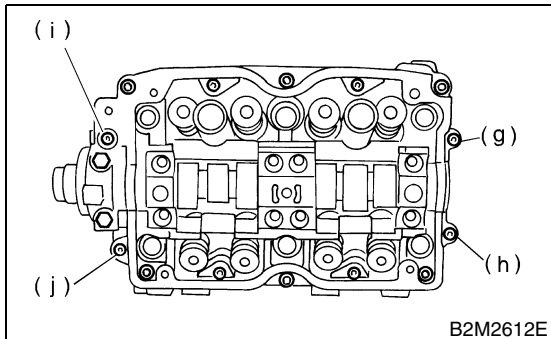


NOTE:

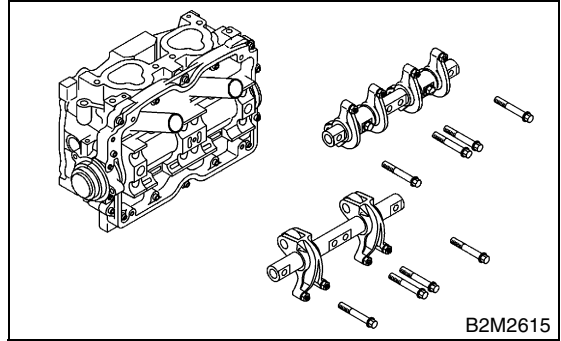
Apply a coat of 3 mm (0.12 in) dia (A). liquid gasket along edge (B) of the camshaft cap (C) mating surface.



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



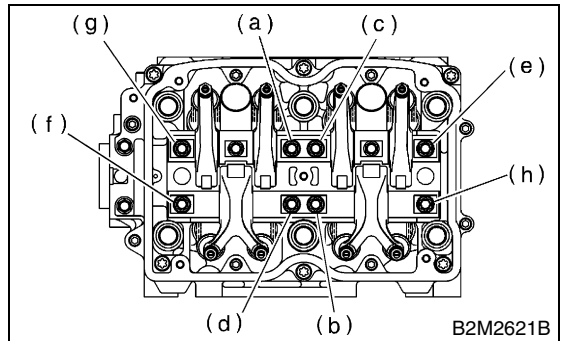
(3) Install the valve rocker assembly.



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

Tightening torque:

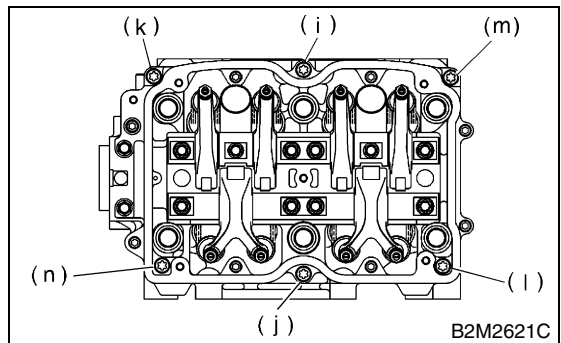
25 N·m (2.5 kgf·m, 18.1 ft·lb)



(5) Tighten the TORX bolts (i) through (n) in alphabetical sequence using ST. ST 499497000 TORX PLUS

Tightening torque:

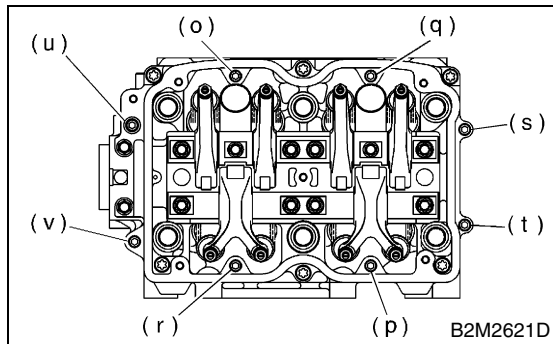
18 N·m (1.8 kgf·m, 13.0 ft·lb)



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

Tightening torque:

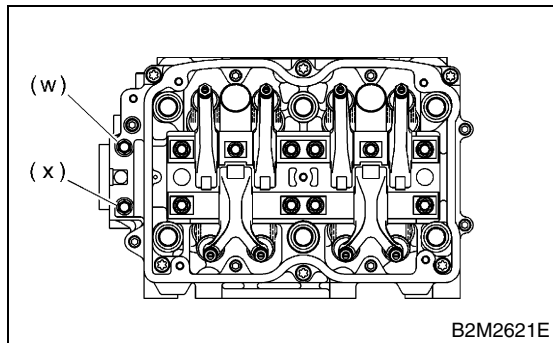
10 N·m (1.0 kgf·m, 7.2 ft·lb)



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

Tightening torque:

10 N·m (1.0 kgf·m, 7.2 ft·lb)

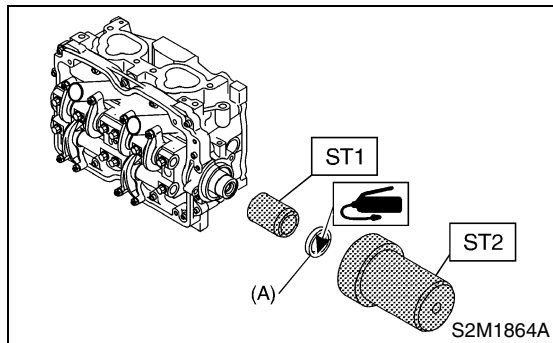


3) Apply a coat of grease to oil seal lips, and then install the oil seal (A) on camshaft using ST1 and ST2.

NOTE:

Use a new oil seal.

ST1	499597000	OIL SEAL GUIDE
ST2	499587500	OIL SEAL INSTALLER



4) Install the plug using ST.

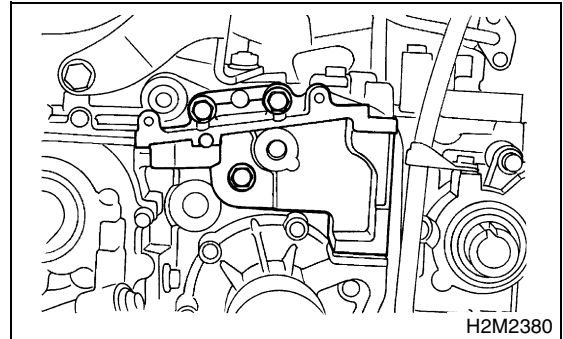
ST	499587700	CAMSHAFT OIL SEAL INSTALLER
----	-----------	-----------------------------

5) Adjust the valve clearance. <Ref. to ME-32, ADJUSTMENT, Valve Clearance.>

- 6) Install the rocker cover and connect PCV hose.
- 7) Install the oil level gauge guide. (LH side only)
- 8) Install the camshaft position sensor support. (LH side only)
- 9) Install the tensioner bracket.

Tightening torque:

25 N·m (2.5 kgf·m, 18.1 ft·lb)



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

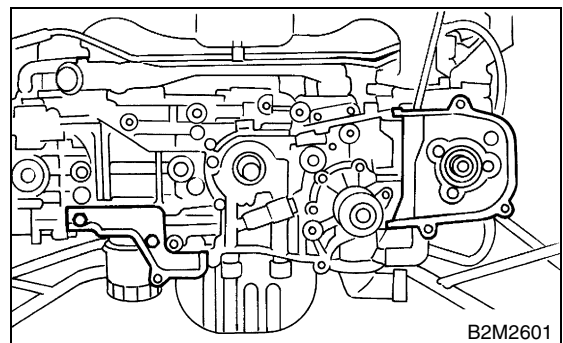
Tightening torque:

5 N·m (0.5 kgf·m, 3.6 ft·lb)

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

Tightening torque:

5 N·m (0.5 kgf·m, 3.6 ft·lb)



12) Install the crankshaft sprocket. <Ref. to ME-56, INSTALLATION, Crankshaft Sprocket.>

13) Install the camshaft sprocket. <Ref. to ME-54, INSTALLATION, Camshaft Sprocket.>

14) Install the timing belt assembly. <Ref. to ME-50, INSTALLATION, Timing Belt Assembly.>

15) Install the belt cover. <Ref. to ME-48, INSTALLATION, Belt Cover.>

16) Install the crankshaft pulley. <Ref. to ME-46, INSTALLATION, Crankshaft Pulley.>

17) Install the V-belt. <Ref. to ME-44, INSTALLATION, V-belt.>

CAMSHAFT

MECHANICAL

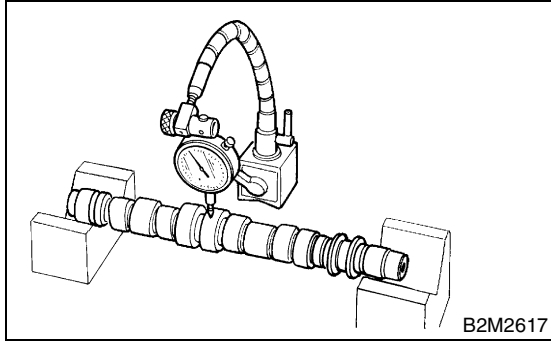
C: INSPECTION

1. CAMSHAFT

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

Limit:

0.025 mm (0.0010 in)



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

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

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

Cam height: H

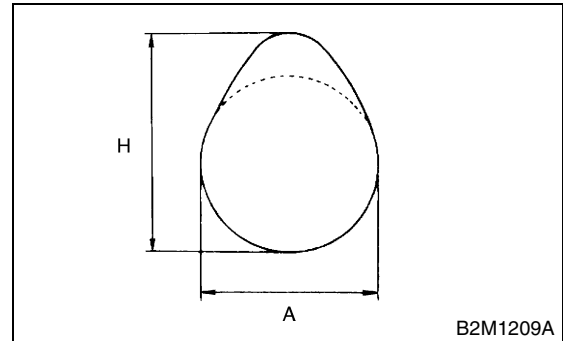
Model	Item	Unit: mm (in)	
1600 cc	Intake	STD	39.378 — 39.478 (1.5503 — 1.5542)
		Limit	39.278 (1.5464)
	Exhaust	STD	39.565 — 39.665 (1.5577 — 1.5616)
		Limit	39.465 (1.5537)
2000 cc	Intake	STD	38.732 — 38.832 (1.5249 — 1.52885)
		Limit	39.632 (1.5209)
	Exhaust	STD	39.257 — 39.357 (1.5455 — 1.5495)
		Limit	39.157 (1.5416)

Model	Item	Unit: mm (in)	
2500 cc	Intake	STD	39.485 — 39.585 (1.5545 — 1.5585)
		Limit	39.385 (1.5506)
	Exhaust	STD	39.257 — 39.357 (1.5455 — 1.5495)
		Limit	39.157 (1.5416)

Cam base circle diameter A:

IN: 34.00 mm (1.3386 in)

EX: 34.00 mm (1.3386 in)



2. CAMSHAFT SUPPORT

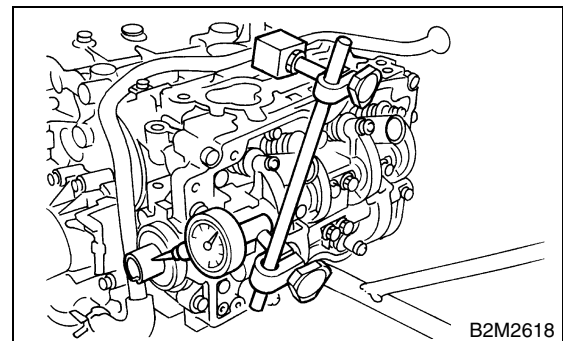
Measure the thrust clearance of camshaft with dial gauge. If the clearance exceeds the limit, replace the camshaft support.

Standard:

0.030 — 0.090 mm (0.0012 — 0.0035 in)

Limit:

0.10 mm (0.0039 in)



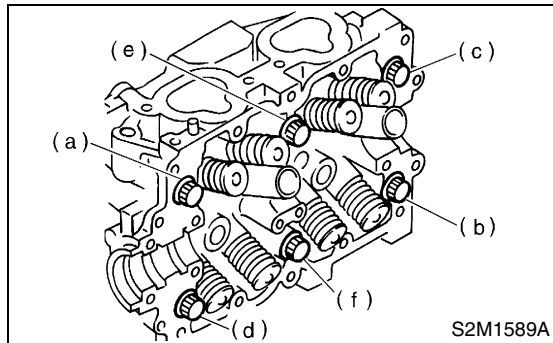
20. Cylinder Head Assembly

A: REMOVAL

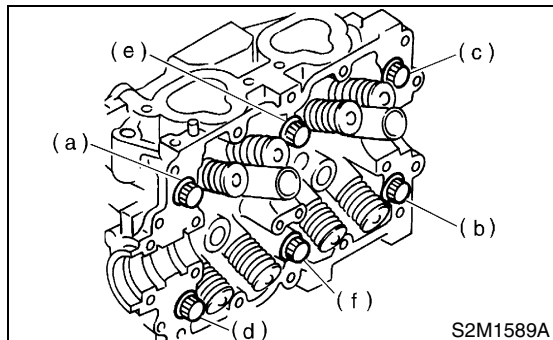
- 1) Remove the V-belt. <Ref. to ME-44, REMOVAL, V-belt.>
- 2) Remove the crankshaft pulley. <Ref. to ME-46, REMOVAL, Crankshaft Pulley.>
- 3) Remove the belt cover. <Ref. to ME-48, REMOVAL, Belt Cover.>
- 4) Remove the timing belt assembly. <Ref. to ME-49, REMOVAL, Timing Belt Assembly.>
- 5) Remove the camshaft sprocket. <Ref. to ME-54, REMOVAL, Camshaft Sprocket.>
- 6) Remove the intake manifold. <Ref. to FU-17, REMOVAL, Intake Manifold.> or <Ref. to FU(w/oOBD)-17, REMOVAL, Intake Manifold.>
- 7) Remove the bolt which installs A/C compressor bracket on cylinder head.
- 8) Remove the valve rocker assembly. <Ref. to ME-57, REMOVAL, Valve Rocker Assembly.>
- 9) Remove the camshaft. <Ref. to ME-59, REMOVAL, Camshaft.>
- 10) Remove the cylinder head bolts in alphabetical sequence shown in the figure.

CAUTION:

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



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



- 13) Remove the cylinder head gasket.

CAUTION:

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

- 14) Similarly, remove the right side cylinder head.

B: INSTALLATION

- 1) Install the 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 the cylinder head bolts.
 - (1) Apply a coat of engine oil to the washers and bolt threads.
 - (2) Tighten all bolts to 29 N·m (3.0 kgf-m, 22 ft-lb) in alphabetical sequence. Then tighten all bolts to 69 N·m (7.0 kgf-m, 51 ft-lb) in alphabetical sequence.
 - (3) Back off all bolts by 180° first; back them off by 180° again.
 - (4) Tighten the bolts (a) and (b) to 34 N·m (3.5 kgf-m, 25 ft-lb).
 - (5) Tighten the bolts (c), (d), (e) and (f) to 15 N·m (1.5 kgf-m, 11 ft-lb).
 - (6) Tighten all bolts by 80 to 90° in alphabetical sequence.

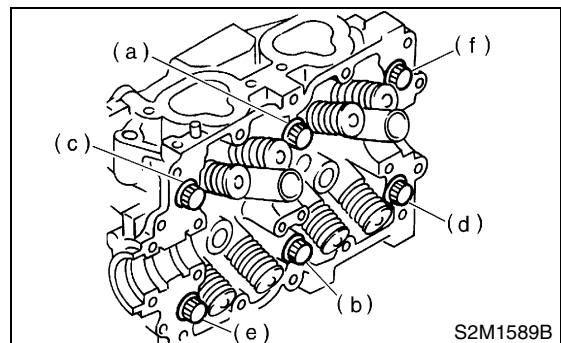
CAUTION:

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 the camshaft. <Ref. to ME-60, INSTALLATION, Camshaft.>
- 4) Install the valve rocker assembly. <Ref. to ME-57, INSTALLATION, Valve Rocker Assembly.>
- 5) Install the A/C compressor bracket on cylinder head.

CYLINDER HEAD ASSEMBLY

MECHANICAL

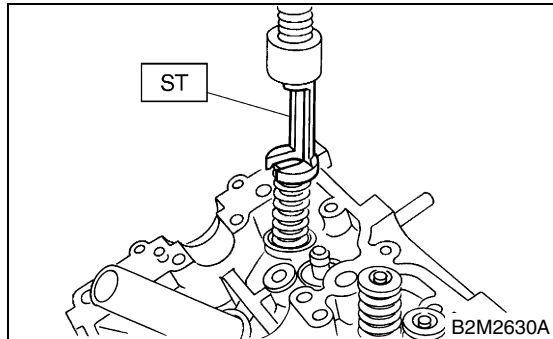
- 6) Install the intake manifold. <Ref. to FU-19, INSTALLATION, Intake Manifold.> or <Ref. to FU(w/oOBD)-20, INSTALLATION, Intake Manifold.>
- 7) Install the camshaft sprocket. <Ref. to ME-54, INSTALLATION, Camshaft Sprocket.>
- 8) Install the timing belt assembly. <Ref. to ME-50, INSTALLATION, Timing Belt Assembly.>
- 9) Install the belt cover. <Ref. to ME-48, INSTALLATION, Belt Cover.>
- 10) Install the crankshaft pulley. <Ref. to ME-46, INSTALLATION, Crankshaft Pulley.>
- 11) Install the V-belt. <Ref. to ME-44, INSTALLATION, V-belt.>

C: DISASSEMBLY

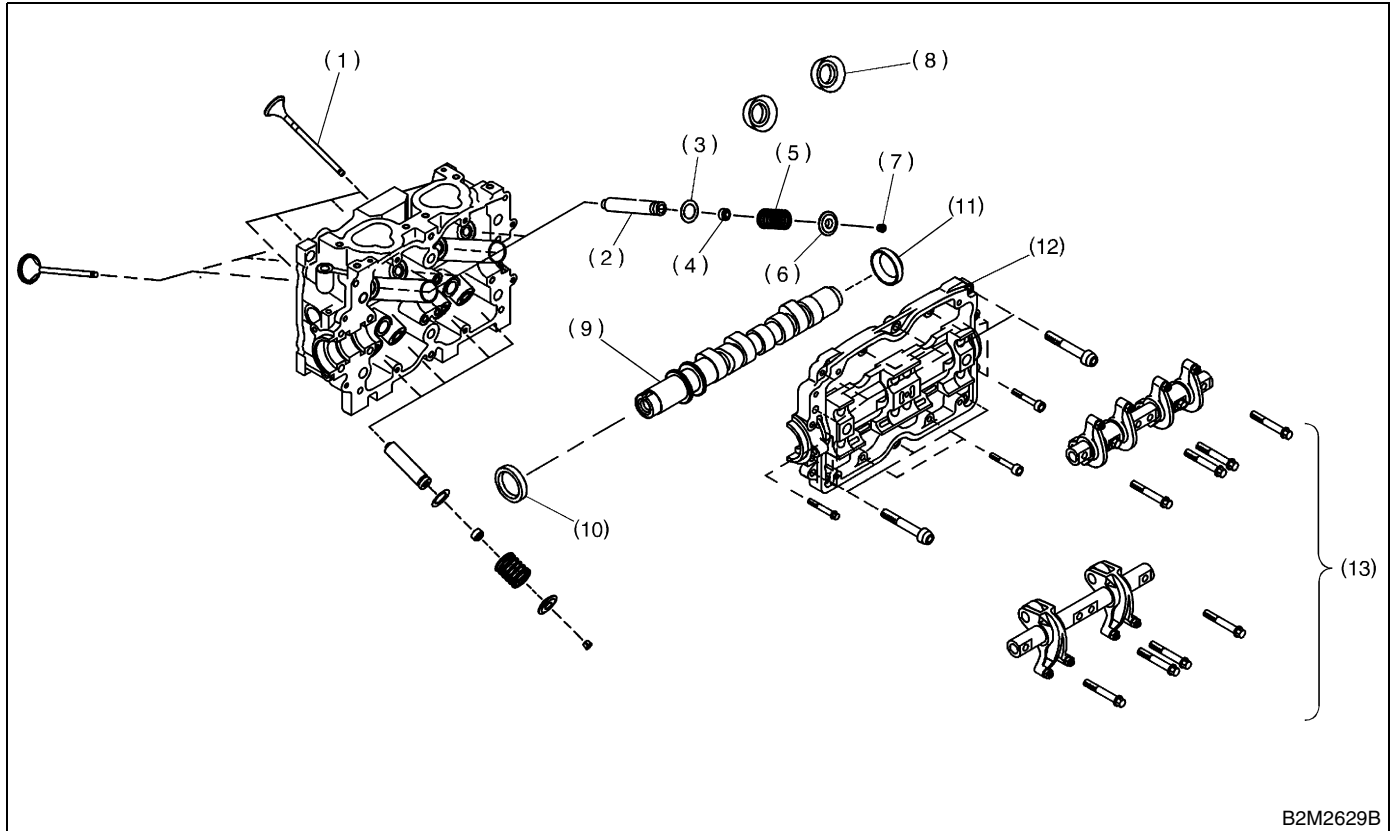
- 1) Place the cylinder head on ST.
ST 498267800 CYLINDER HEAD TABLE
- 2) Set the ST on valve spring. Compress the valve spring, and then remove the valve spring retainer key. Remove each valve and valve spring.
ST 499718000 VALVE SPRING REMOVER

CAUTION:

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



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 | |

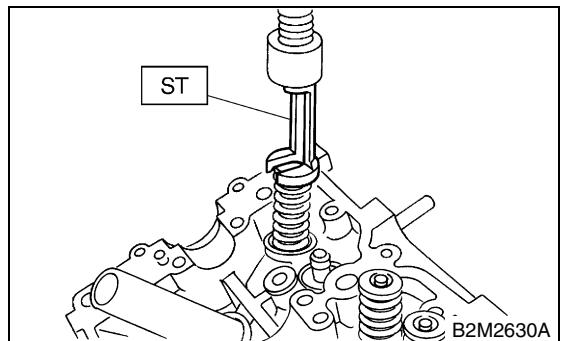
- 1) Installation of valve spring and valve
 (1) Place the cylinder head on ST.
 ST 498267800 CYLINDER HEAD TABLE
 (2) Coat the stem of each valve with engine oil and insert valve into valve guide.

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

- (3) Install the 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 the ST on valve spring.
 ST 499718000 VALVE SPRING REMOVER

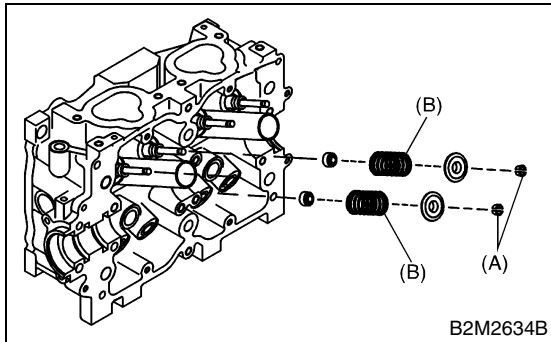


B2M2630A

CYLINDER HEAD ASSEMBLY

MECHANICAL

(5) Compress the valve spring, and then fit the valve spring retainer key.



- (A) Retainer
- (B) Painted face

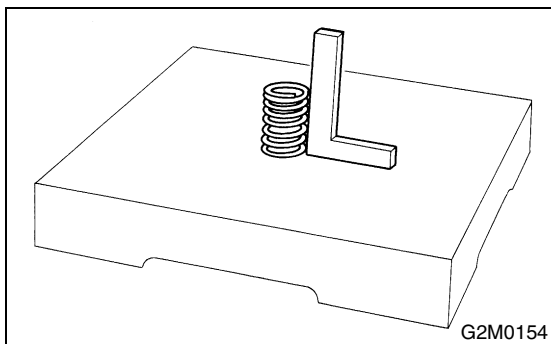
(6) After installing, tap the valve spring retainers lightly with wooden hammer for better seating.

E: INSPECTION

1. VALVE SPRING

- 1) Check the valve springs for damage, free length, and tension. Replace the valve spring if it is not to the specifications presented below.
- 2) To measure the squareness of valve spring, stand the spring on a surface plate and measure its deflection at the top using a try square.

Free length	54.30 mm (2.1378 in)
Squareness	2.5°, 2.4 mm (0.094 in)
Tension/spring height	214 — 246 N (21.8 — 25.1 kgf, 48.1 — 55.3 lb)/ 45.0 mm (1.772 in)
	526 — 582 N (53.6 — 59.3 kgf, 118.3 — 130.8 lb)/ 34.7 mm (1.366 in)



2. INTAKE AND EXHAUST VALVE OIL SEAL

Replace the oil seal with new one, if lip is damaged or spring out of place, or when the surfaces of 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 the 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.

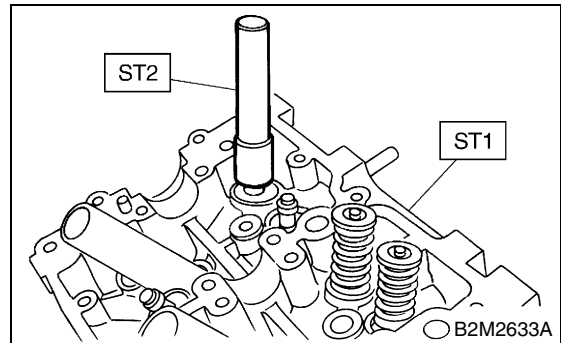
ST1 498267800 CYLINDER HEAD TABLE
ST2 498857100 VALVE OIL SEAL GUIDE

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 the cylinder head on ST.

ST 498267800 CYLINDER HEAD TABLE

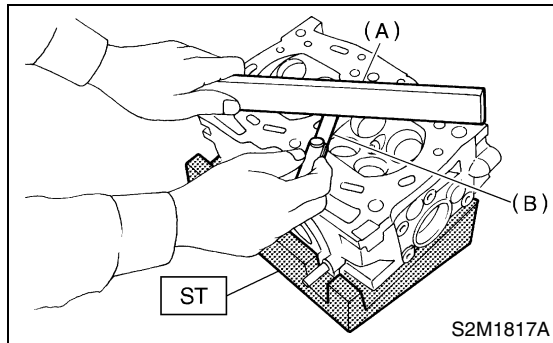
3) Measure the warping of the cylinder head surface that mates with crankcase using a straight edge and thickness gauge.
If the warping exceeds 0.05 mm (0.0020 in), re-grind the surface with a surface grinder.

Warping limit:
0.05 mm (0.0020 in)

Grinding limit:
0.1 mm (0.004 in)

Standard height of cylinder head:
97.5 mm (3.839 in)

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



- (A) Straight edge
- (B) Thickness gauge

2. VALVE SEAT

Inspect the intake and exhaust valve seats, and then correct the contact surfaces with valve seat cutter if they are defective or when valve guides are replaced.

Valve seat width: *W*

Intake

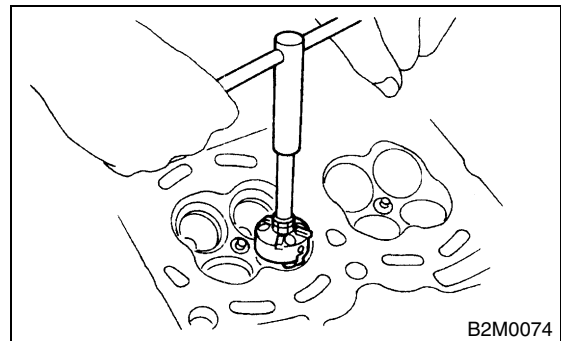
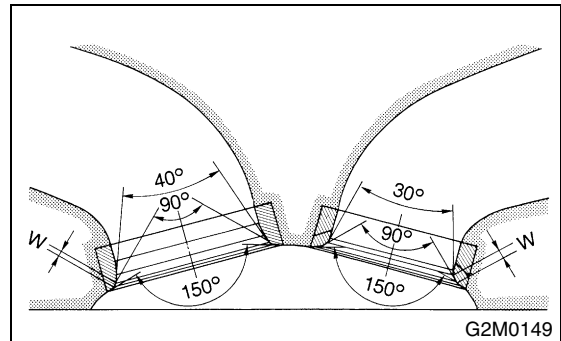
Standard 1.0 mm (0.039 in)

Limit 1.7 mm (0.067 in)

Exhaust

Standard 1.4 mm (0.055 in)

Limit 2.1 mm (0.083 in)



CYLINDER HEAD ASSEMBLY

MECHANICAL

3. VALVE GUIDE

1) Check the clearance between valve guide and stem. The clearance can be checked by measuring the outside diameter of valve stem and the inside diameter of valve guide with outside and inside micrometers respectively.

Clearance between the valve guide and valve stem:

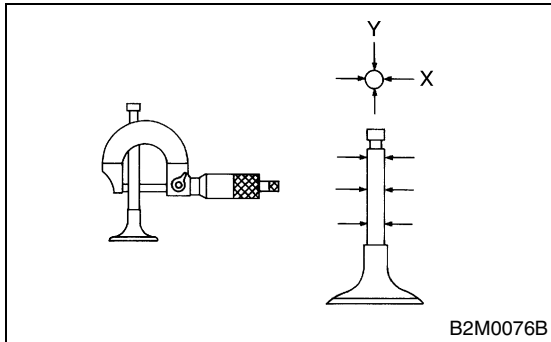
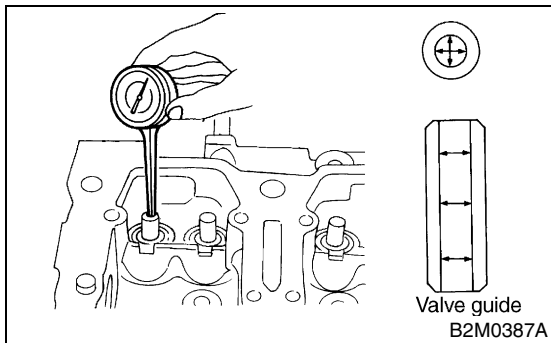
Standard

Intake 0.035 — 0.062 mm (0.0014 — 0.0024 in)

Exhaust 0.040 — 0.067 mm (0.0016 — 0.0026 in)

Limit

0.15 mm (0.0059 in)



2) If the clearance between valve guide and stem exceeds the limit, replace the valve guide or valve itself whichever shows greater amount of wear. See the following procedure for valve guide replacement.

Valve guide inner diameter:

6.000 — 6.012 mm (0.2362 — 0.2367 in)

Valve stem outer diameters:

Intake

5.950 — 5.965 mm (0.2343 — 0.2348 in)

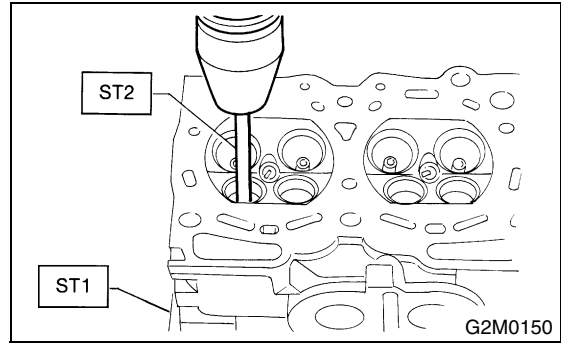
Exhaust

5.945 — 5.960 mm (0.2341 — 0.2346 in)

(1) Place the cylinder head on ST1 with the combustion chamber upward so that valve guides enter the holes in ST1.

(2) Insert the ST2 into valve guide and press it down to remove valve guide.

ST1 498267800 CYLINDER HEAD TABLE
ST2 499767200 VALVE GUIDE REMOVER



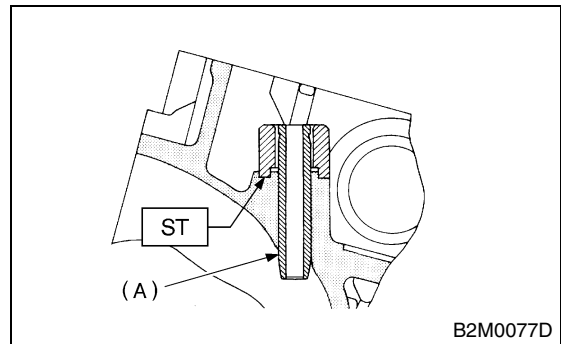
(3) Turn the cylinder head upside down and place ST as shown in the figure.

Intake side:

ST 499767700 VALVE GUIDE ADJUSTER

Exhaust side:

ST 499767800 VALVE GUIDE ADJUSTER



(A) Valve guide

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

(5) Put new valve guide, coated with sufficient oil, in the cylinder, and then insert the ST1 into valve guide. Press in until the valve guide upper end is flush with the upper surface of ST2.

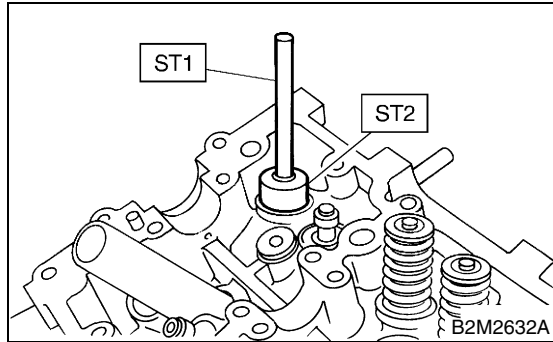
ST1 499767200 VALVE GUIDE REMOVER

Intake side:

ST2 499767700 VALVE GUIDE ADJUSTER

Exhaust side:

ST2 499767800 VALVE GUIDE ADJUSTER



(6) Check the valve guide protrusion.

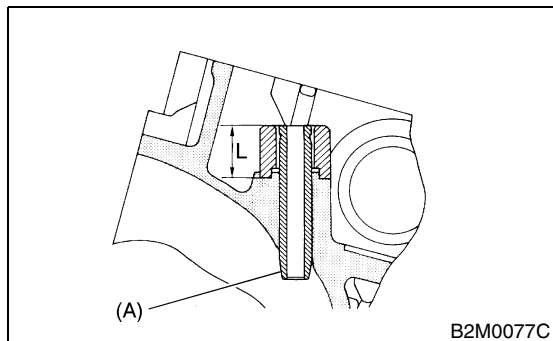
Valve guide protrusion: L

Intake

20.0 — 20.5 mm (0.787 — 0.807 in)

Exhaust

16.5 — 17.0 mm (0.650 — 0.669 in)



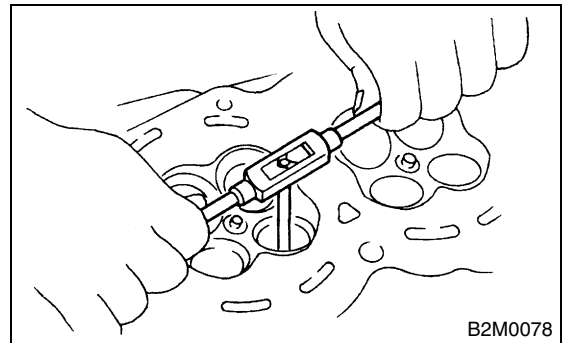
(A) Valve guide

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

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.

ST 499767400 VALVE GUIDE 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 1.0 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)

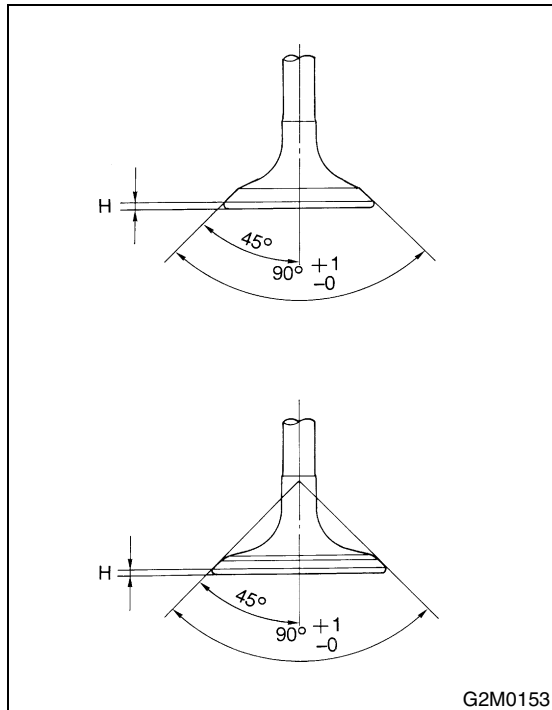
Valve overall length:

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-67, VALVE SEAT, ADJUSTMENT, Cylinder Head Assembly.> Install a new intake valve oil seal after lapping.

21. Cylinder Block

A: REMOVAL

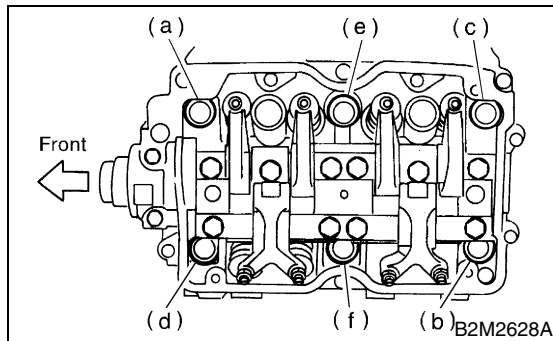
NOTE:

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

- 1) Remove the intake manifold. <Ref. to FU-17, REMOVAL, Intake Manifold.> or <Ref. to FU(w/oOBD)-17, REMOVAL, Intake Manifold.>
- 2) Remove the V-belt. <Ref. to ME-44, REMOVAL, V-belt.>
- 3) Remove the crankshaft pulley. <Ref. to ME-46, REMOVAL, Crankshaft Pulley.>
- 4) Remove the belt cover. <Ref. to ME-48, REMOVAL, Belt Cover.>
- 5) Remove the timing belt assembly. <Ref. to ME-49, REMOVAL, Timing Belt Assembly.>
- 6) Remove the camshaft sprocket. <Ref. to ME-54, REMOVAL, Camshaft Sprocket.>
- 7) Remove the crankshaft sprocket. <Ref. to ME-46, REMOVAL, Crankshaft Pulley.>
- 8) Remove the generator and A/C compressor with their brackets.
- 9) Remove the rocker cover.
- 10) Remove the cylinder head bolts in alphabetical sequence shown in the figure.

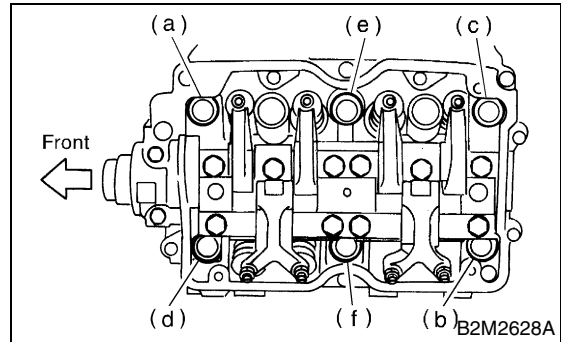
CAUTION:

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



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

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



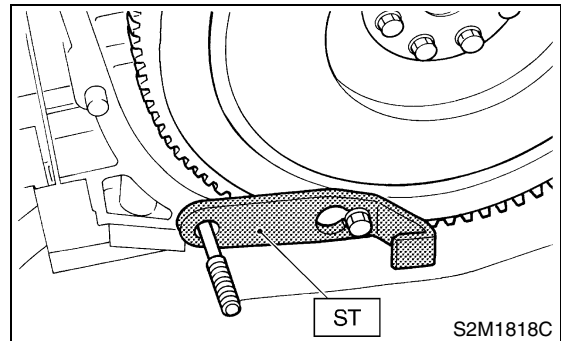
- 13) Remove the cylinder head gasket.

CAUTION:

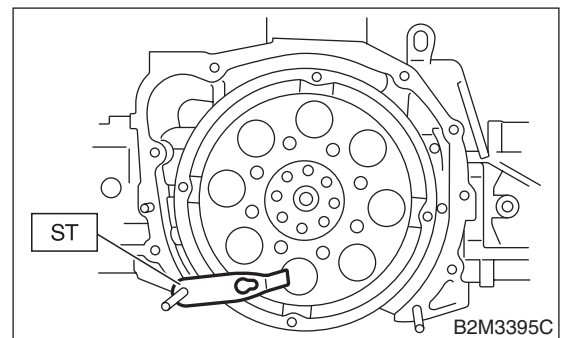
Do not scratch the mating surface of cylinder head and cylinder block.

- 14) Similarly, remove the right side cylinder head.
 - 15) Remove the clutch housing cover (MT vehicles only).
 - 16) Remove the flywheel (MT vehicles only) or drive plate (AT vehicles only).
- Using the ST, lock the crankshaft.
ST 498497100 CRANKSHAFT STOPPER

• MT MODEL



• AT MODEL



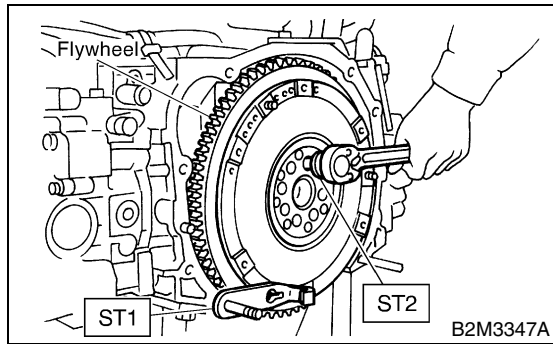
NOTE:

Use the ST to remove flywheel (MT vehicles only) for 2500 cc model.

CYLINDER BLOCK

MECHANICAL

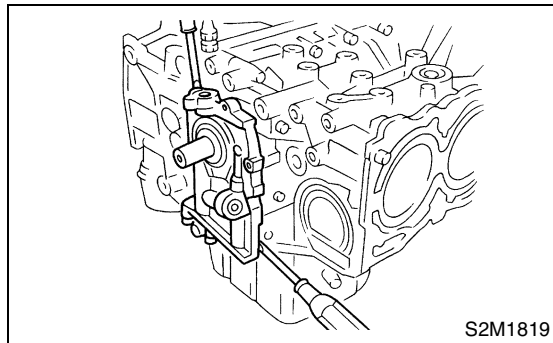
ST1 498497100 CRANKSHAFT STOPPER
ST2 499057000 TORX PLUS



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

CAUTION:

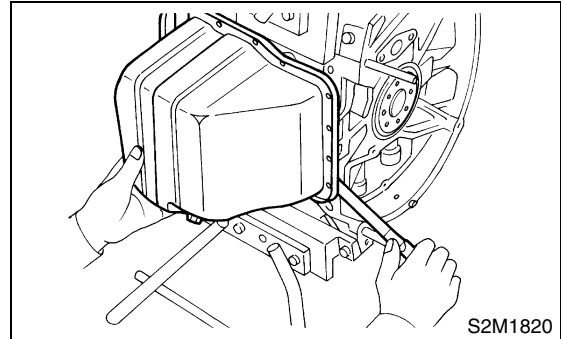
Be careful not to scratch the mating surface of cylinder block and oil pump.



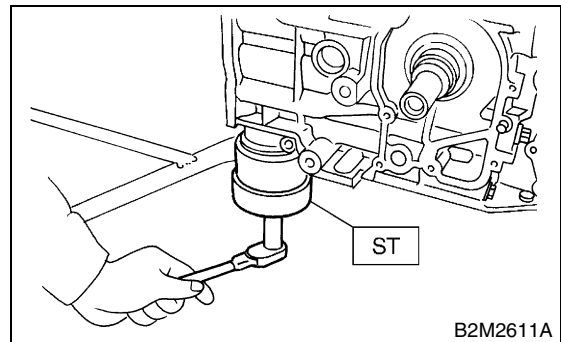
- 21) Removal of oil pan
 - (1) Turn the cylinder block with #2 and #4 piston sides facing upward.
 - (2) Remove the bolts which secure oil pan to cylinder block.
 - (3) Insert a oil pan cutter blade between cylinder block-to-oil pan clearance, and then remove the oil pan.

CAUTION:

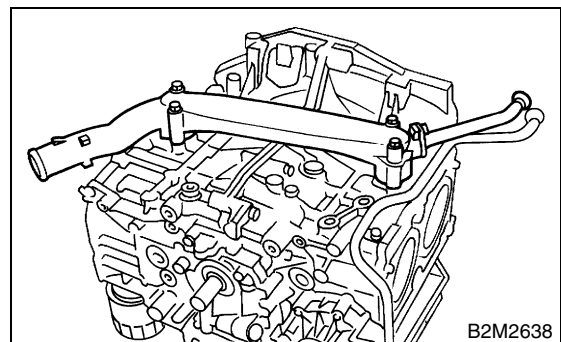
Do not use a screwdriver or similar tool in place of oil pan cutter.



- 22) Remove the oil strainer stay.
 - 23) Remove the oil strainer.
 - 24) Remove the baffle plate.
 - 25) Remove the oil filter using ST.
- ST 498547000 OIL FILTER WRENCH

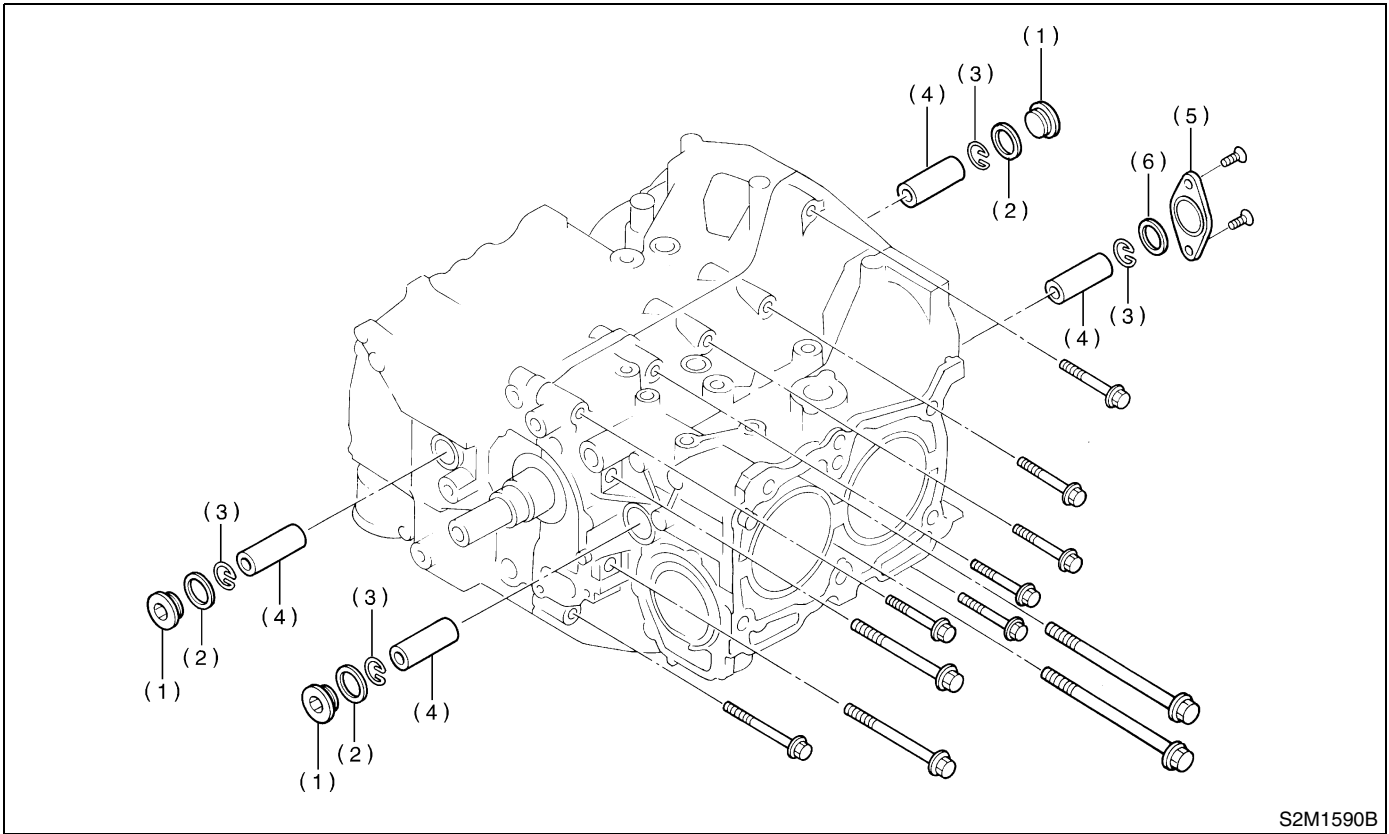


- 26) Remove the water pipe.



CYLINDER BLOCK

MECHANICAL



(1) Service hole plug

(2) Gasket

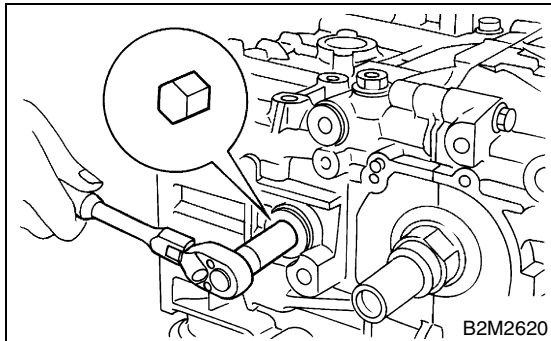
(3) Circlip

(4) Piston pin

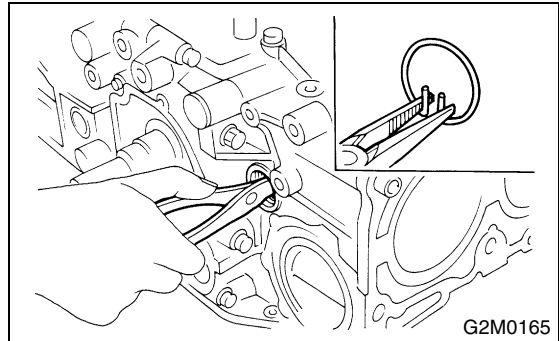
(5) Service hole cover

(6) O-ring

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



28) Rotate the crankshaft to bring #1 and #2 pistons to bottom dead center position, and then remove the piston circlip through service hole of #1 and #2 cylinders.



CYLINDER BLOCK

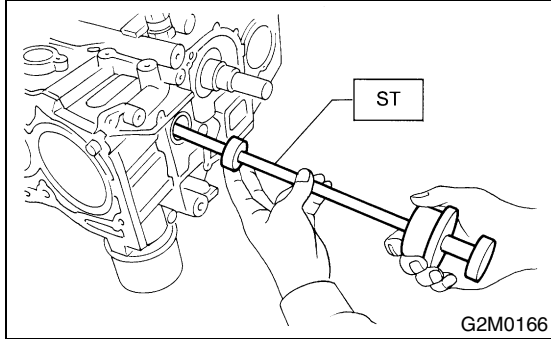
MECHANICAL

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

ST 499097700 PISTON PIN REMOVER

CAUTION:

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



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

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

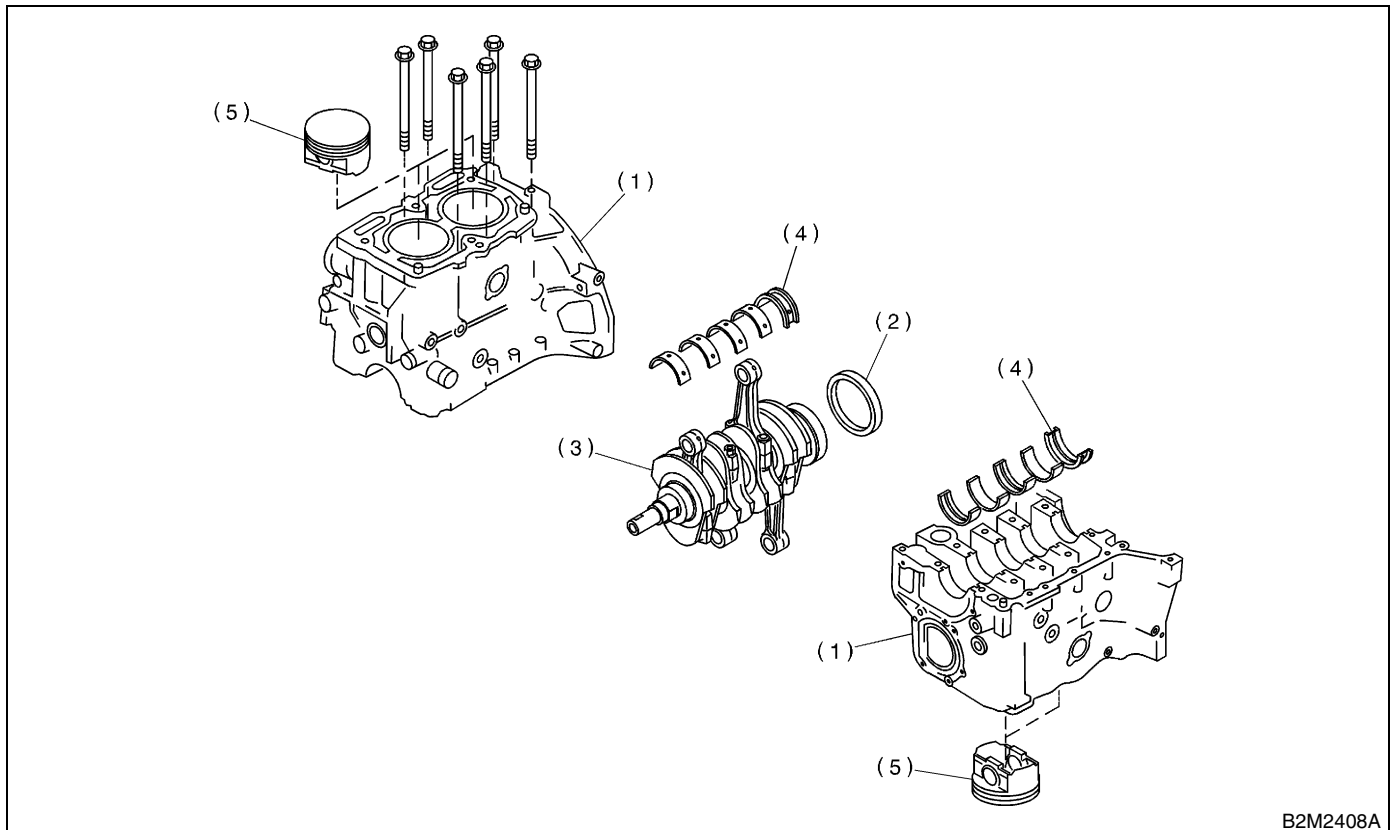
32) Back off the bolts which connect cylinder block on the side of #1 and #3 cylinders two or three turns.

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

34) Separate the cylinder blocks (RH) and (LH).

CAUTION:

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



(1) Cylinder block

(2) Rear oil seal

(3) Crankshaft

(4) Crankshaft bearing

(5) Piston

35) Remove the rear oil seal.

36) Remove the crankshaft together with connecting rod.

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

CAUTION:

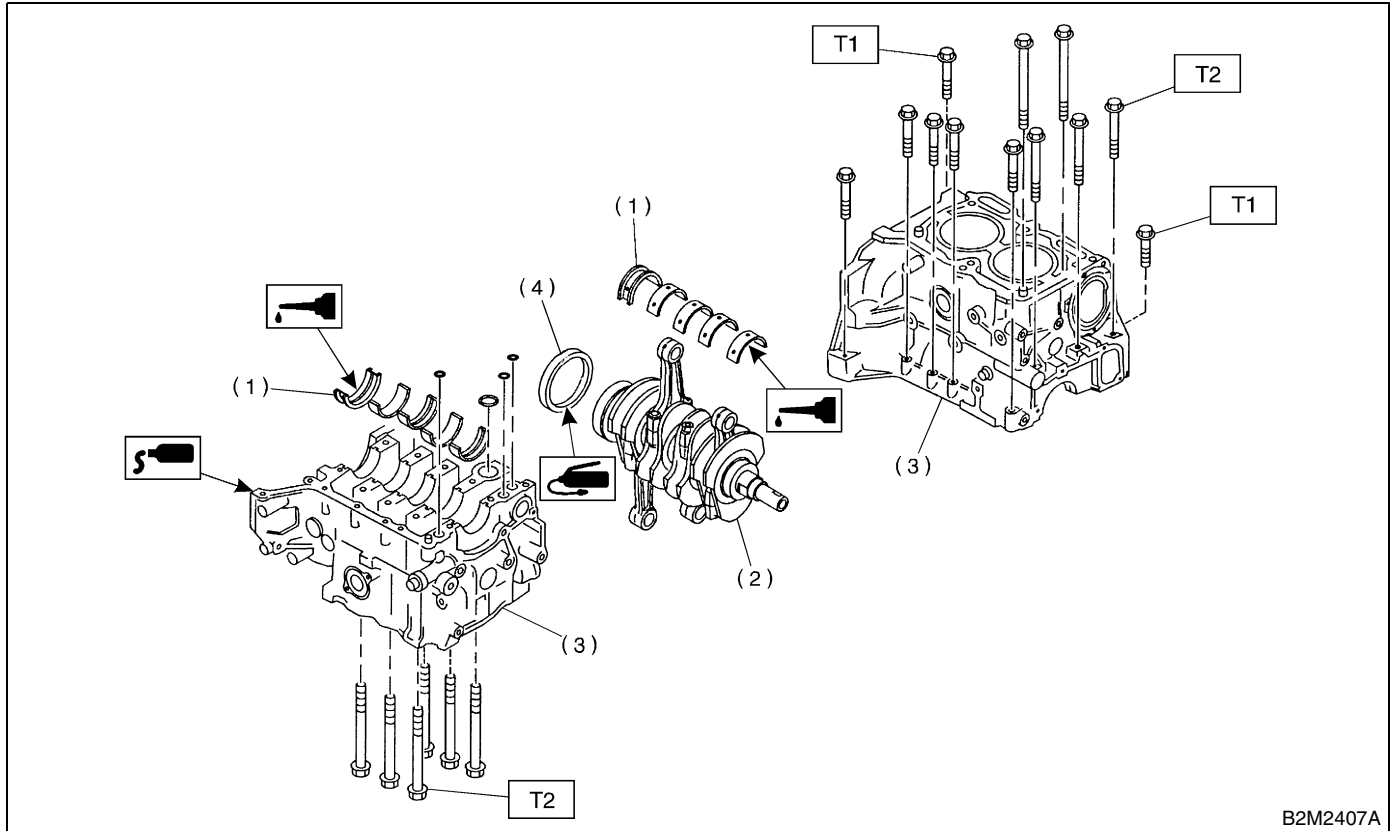
Do not confuse the combination of crankshaft bearings. Press bearing at the end opposite to locking lip.

38) Draw out each piston from cylinder block using wooden bar or hammer handle.

CAUTION:

Do not confuse the combination of piston and cylinder.

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 the crankshaft on #2 and #4 cylinder block.

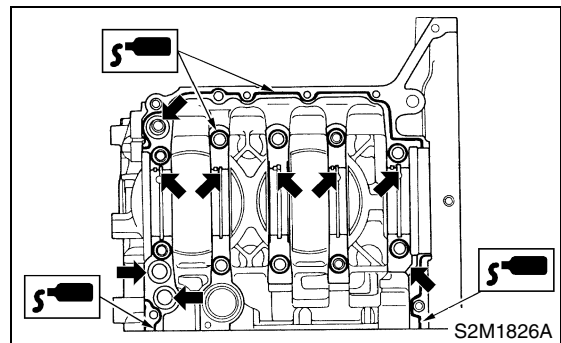
2) Apply fluid packing to the mating surface of #1 and #3 cylinder block, and position it on #2 and #4 cylinder block.

Fluid packing:

THREE BOND 1215 or equivalent

CAUTION:

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

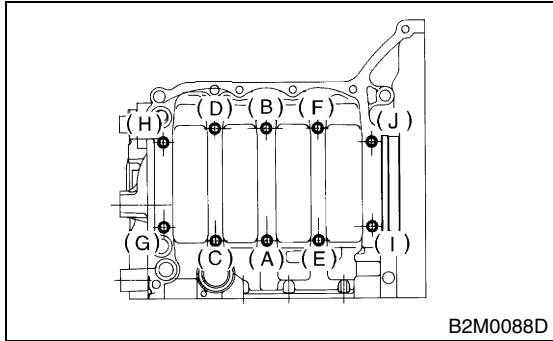


S2M1826A

CYLINDER BLOCK

MECHANICAL

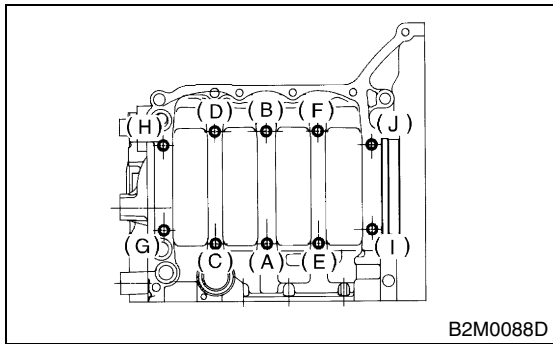
3) Temporarily tighten the 10 mm cylinder block connecting bolts in alphabetical sequence shown in the figure.



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

Tightening torque:

47 N·m (4.8 kgf-m, 34.7 ft-lb)

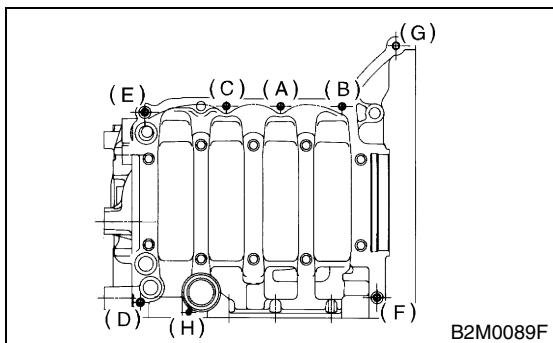


5) Tighten the 8 mm and 6 mm cylinder block connecting bolts in alphabetical sequence shown in the figure.

Tightening torque:

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

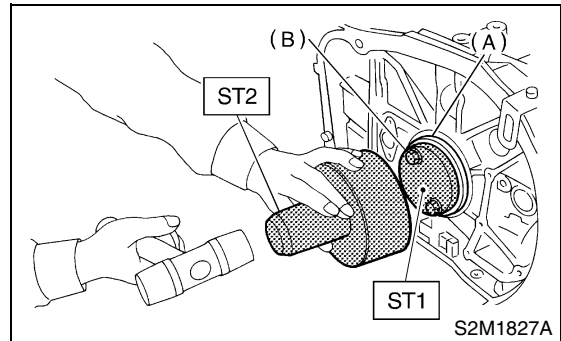
(H): 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



6) Install the rear oil seal using ST1 and ST2.

ST1 499597100 OIL SEAL GUIDE

ST2 499587200 OIL SEAL INSTALLER



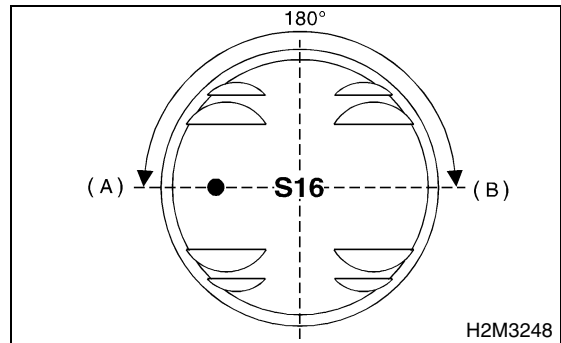
(A) Rear oil seal

(B) Fly wheel attaching bolt

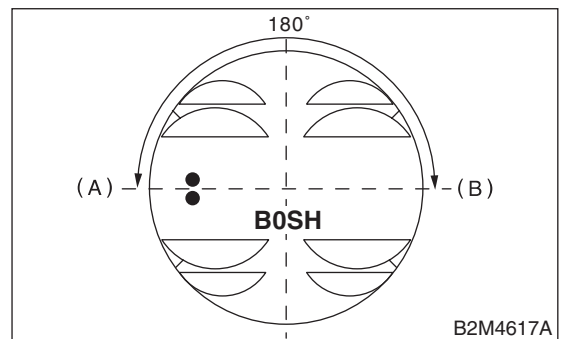
7) Position the top ring gap at (A) or (B) in the figure.

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

- 1600 cc MODEL



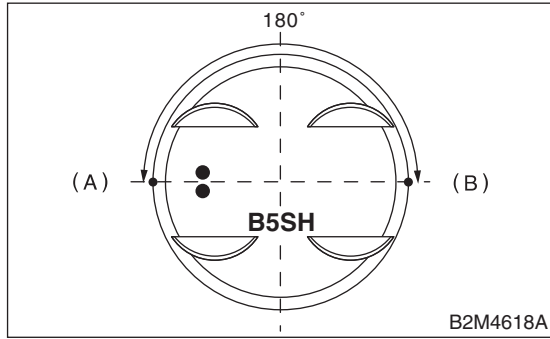
- 2000 cc MODEL



CYLINDER BLOCK

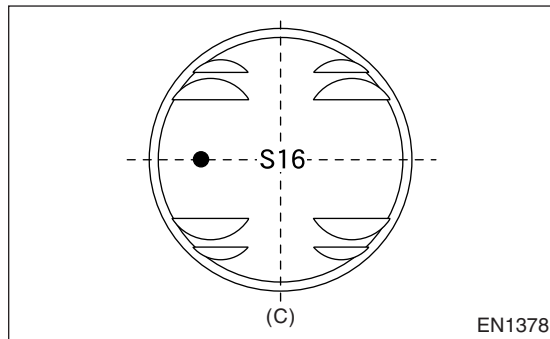
MECHANICAL

- 2500 cc MODEL

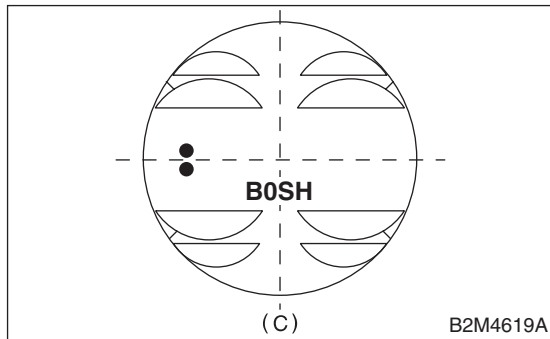


- 9) Position the expander gap at (C) in the figure.

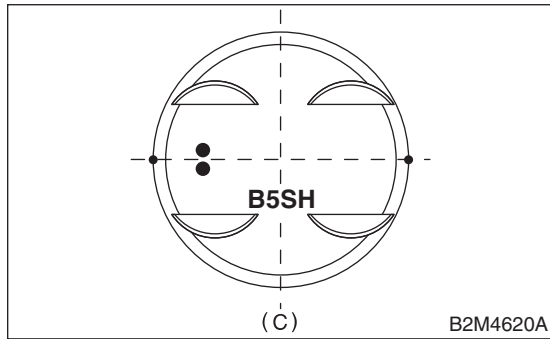
- 1600 cc MODEL



- 2000 cc MODEL

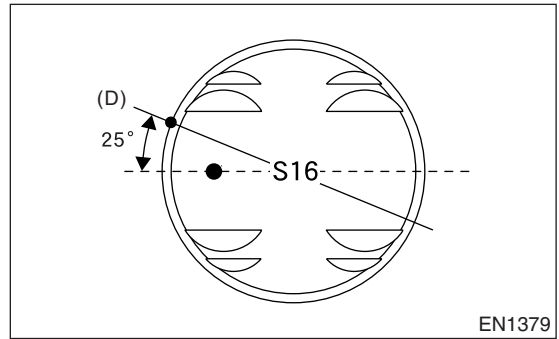


- 2500 cc MODEL

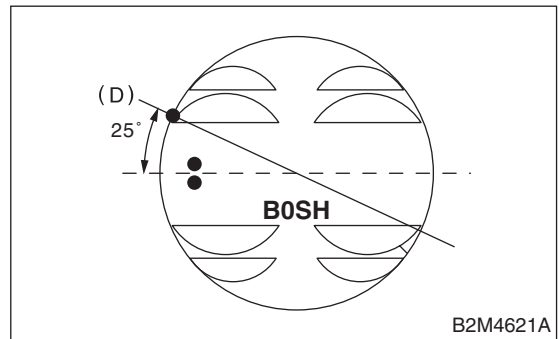


- 10) Position the lower rail gap at (D) in the figure.

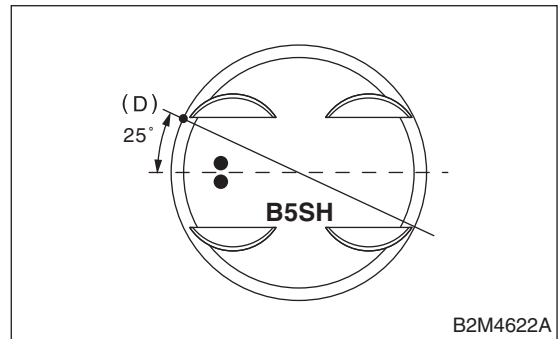
- 1600 cc MODEL



- 2000 cc MODEL

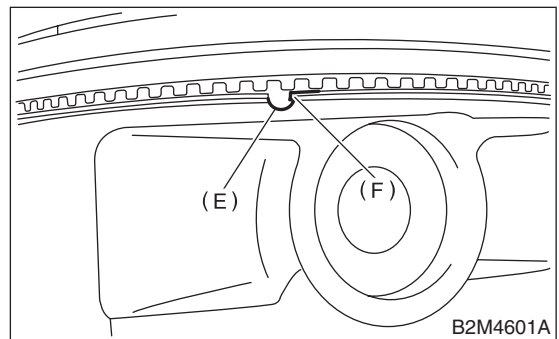


- 2500 cc MODEL



NOTE:

Align the lower rail stopper (F) to the lateral hole (E) on the piston.

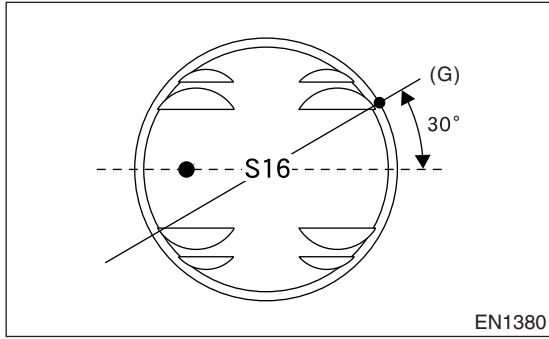


CYLINDER BLOCK

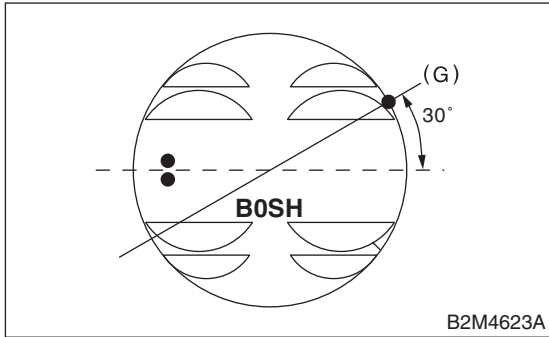
MECHANICAL

11) Position the upper rail gap at (G) in the figure.

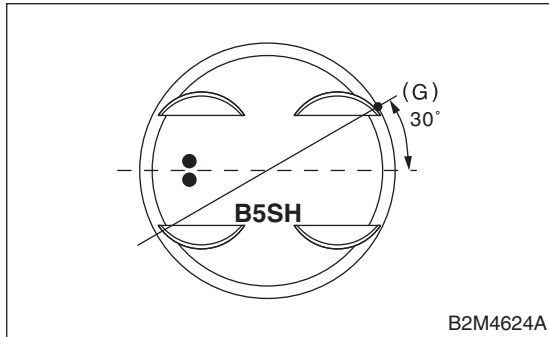
- 1600 cc MODEL



- 2000 cc MODEL



- 2500 cc MODEL



CAUTION:

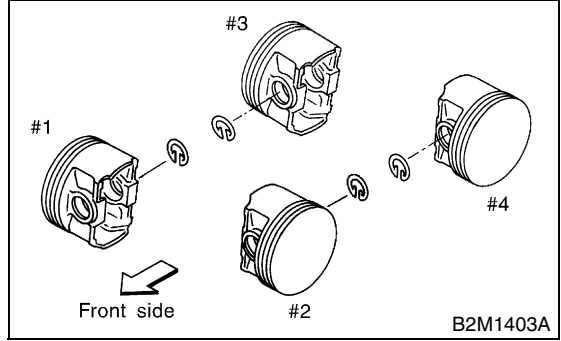
- Ensure ring gaps do not face the same direction.
- Ensure ring gaps are not within the piston skirt area.

12) Install circlip.

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

NOTE:

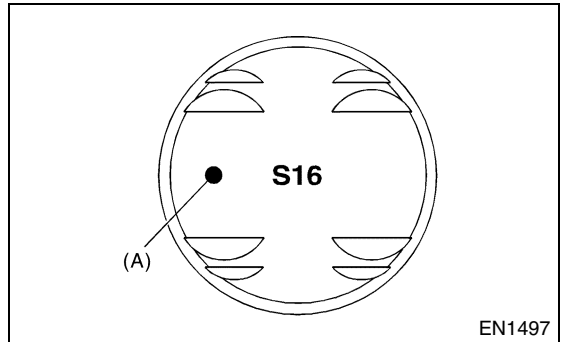
Use new circlips.



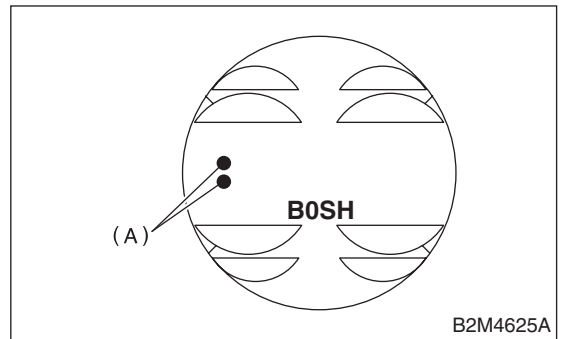
CAUTION:

Piston front mark faces towards the front of the engine.

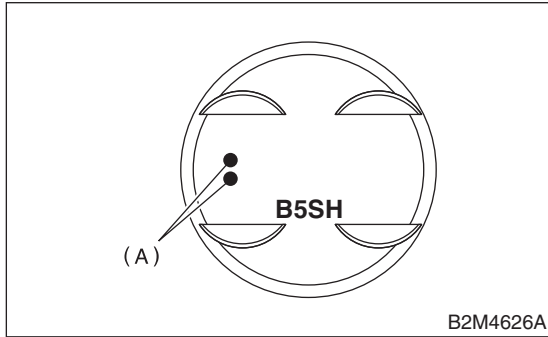
- 1600 cc MODEL



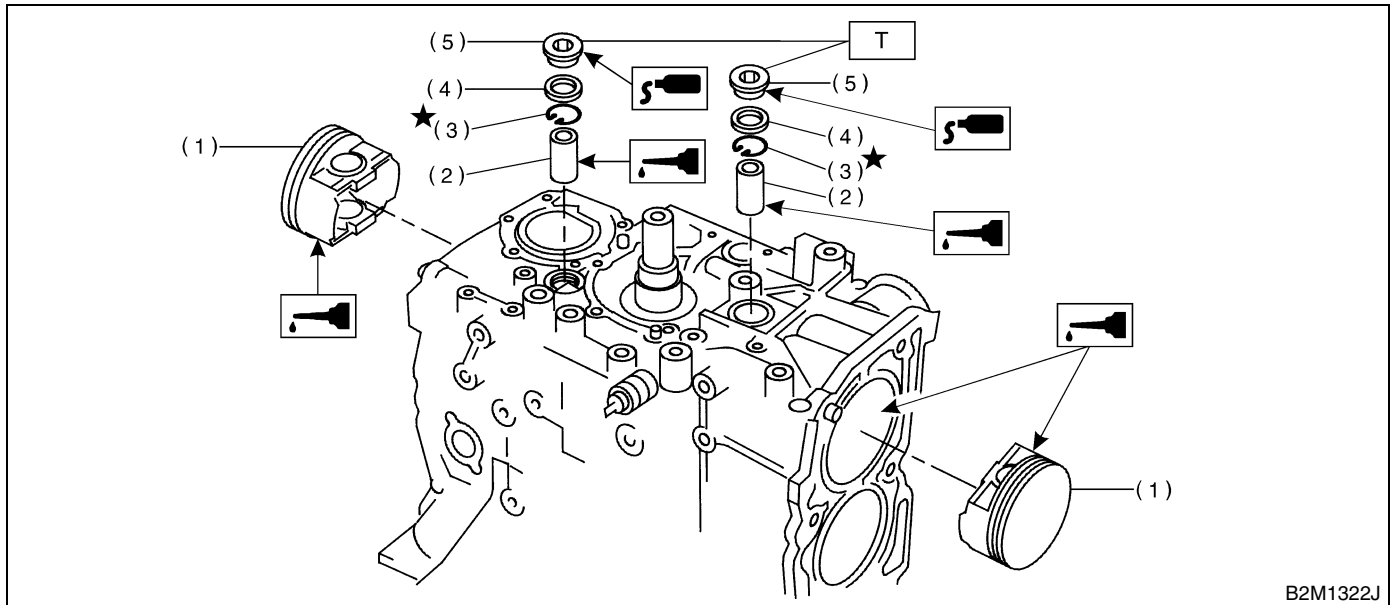
- 2000 cc MODEL



• 2500 cc MODEL



(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)

13) Installing piston

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

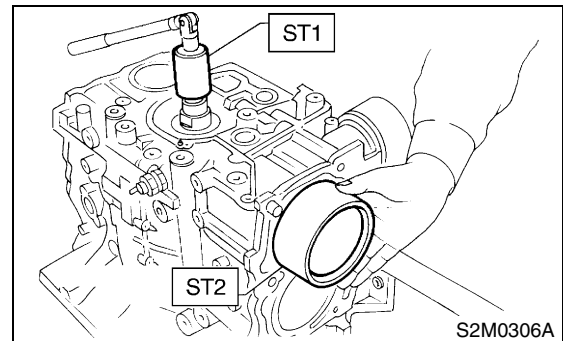
ST1 499987500 CRANKSHAFT SOCKET

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

ST2 498747000 PISTON GUIDE (1600 cc model)

ST2 398744300 PISTON GUIDE (2000 cc model)

ST2 498747300 PISTON GUIDE (2500 cc model)



CYLINDER BLOCK

MECHANICAL

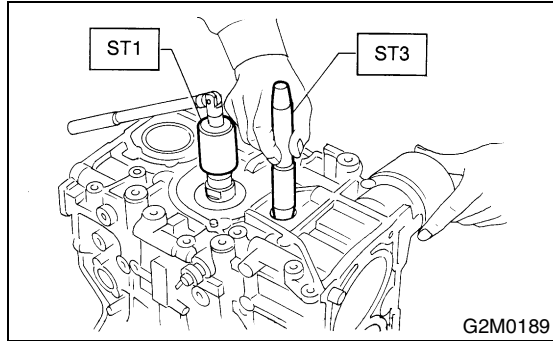
14) Installing piston pin

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

CAUTION:

Apply a coat of engine oil to the ST3 before insertion.

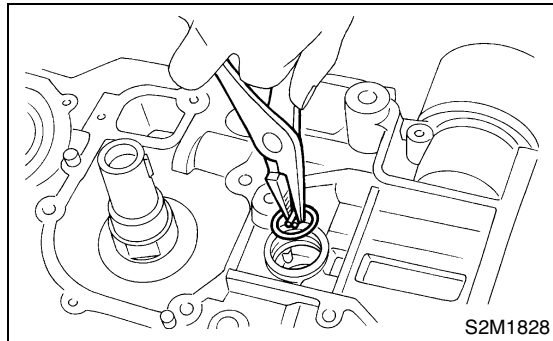
ST3 499017100 PISTON PIN GUIDE



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

NOTE:

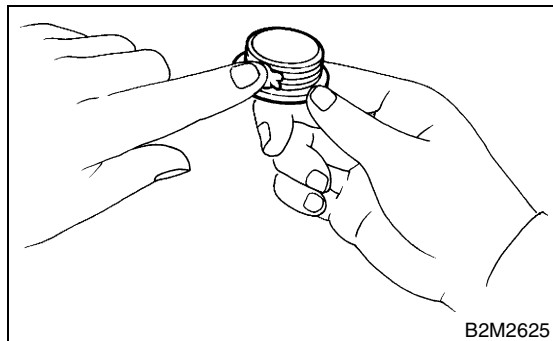
Use new circlips.



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

Fluid packing:

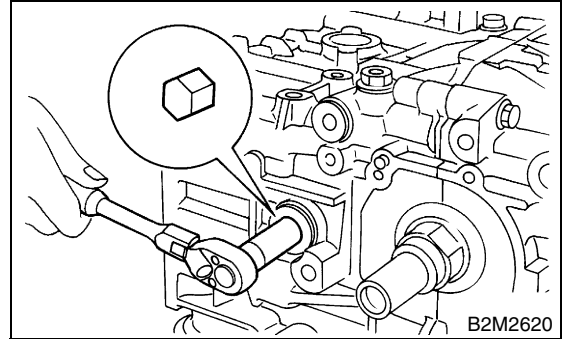
THREE BOND 1215 or equivalent

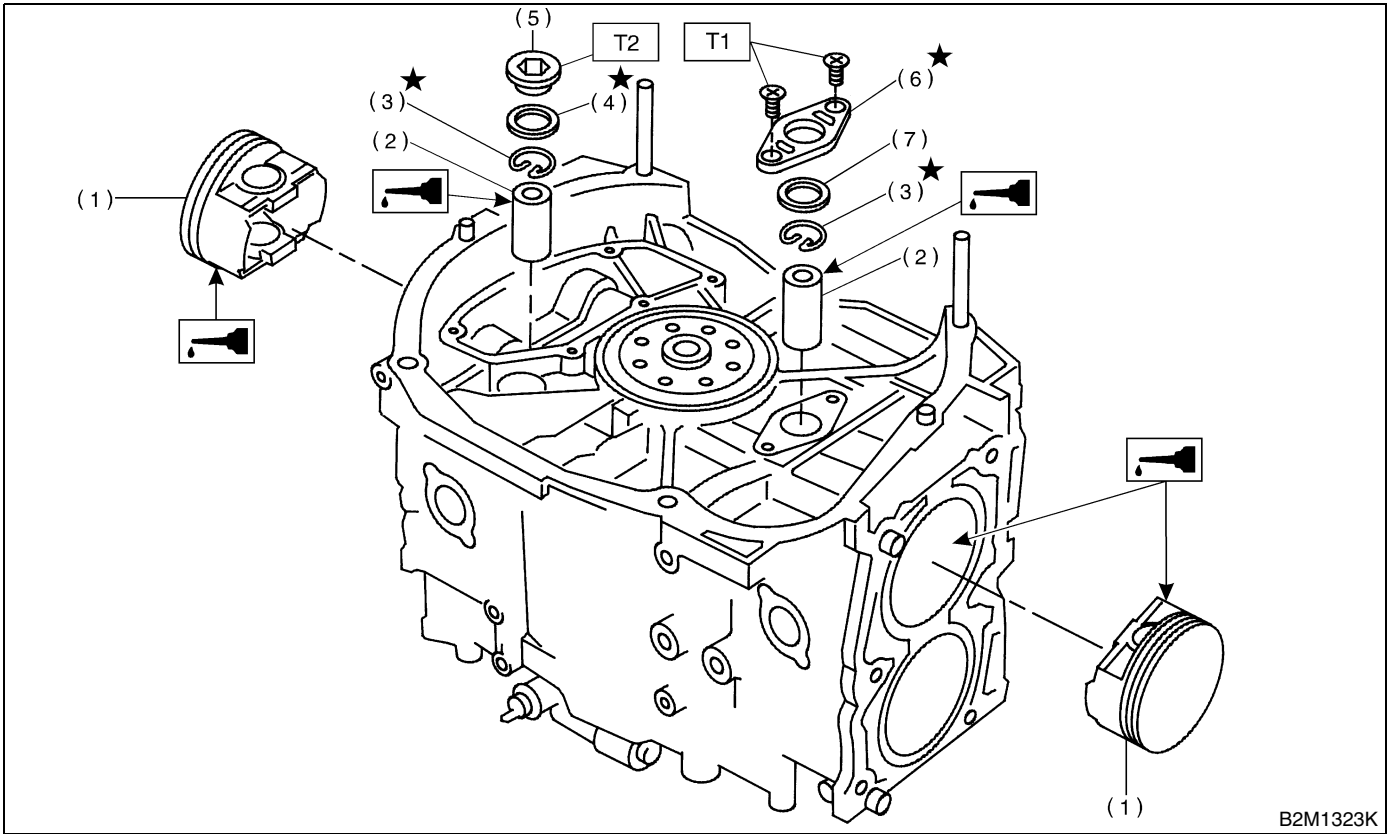


- (5) Install the service hole plug and gasket.

NOTE:

Use a new gasket.





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

Tightening torque: N·m (kgf·m, ft·lb)

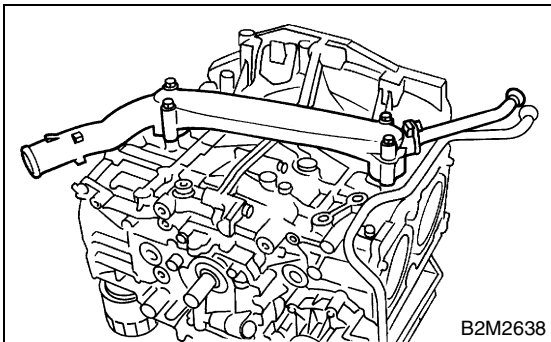
T1: 6.4 (0.65, 4.7)

T2: 69 (7.0, 50.6)

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

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

Fluid packing:
THREE BOND 1215 or equivalent



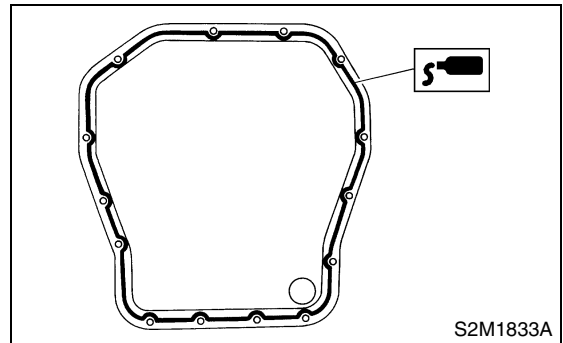
- 16) Install the baffle plate.

Tightening torque:
6.4 N·m (0.65 kgf·m, 4.7 ft·lb)

- 17) Install the oil strainer and O-ring

Tightening torque:
10 N·m (1.0 kgf·m, 7 ft·lb)

- 18) Install the oil strainer stay.

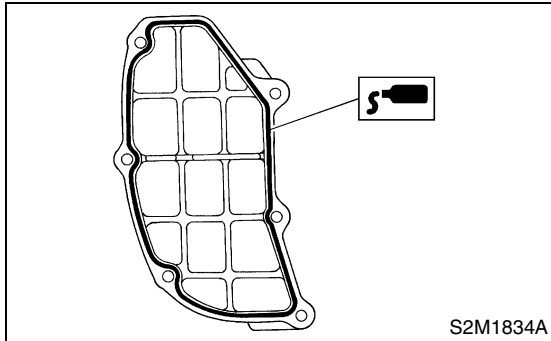


CYLINDER BLOCK

MECHANICAL

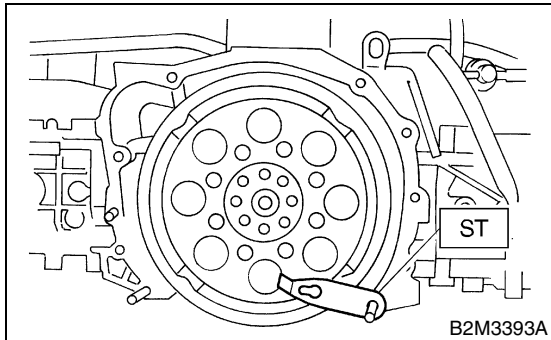
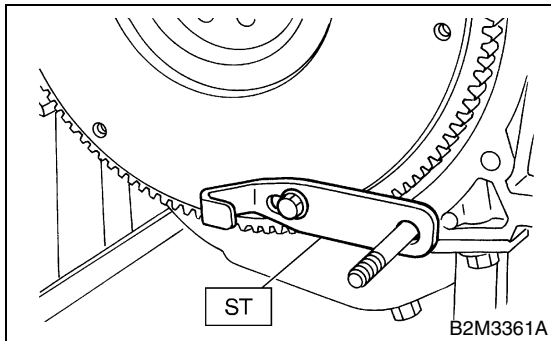
20) Apply fluid packing to the matching surfaces, and then install the oil separator cover.

Fluid packing:
THREE BOND 1215 or equivalent



21) Install the flywheel or drive plate.
To lock the crankshaft, use ST.
ST 498497100 CRANKSHAFT STOPPER

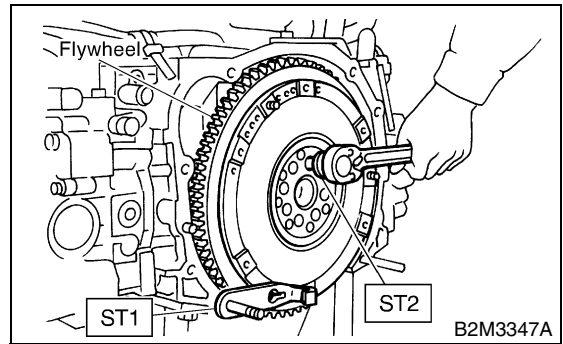
Tightening torque:
72 N-m (7.3 kgf-m, 52.8 ft-lb)



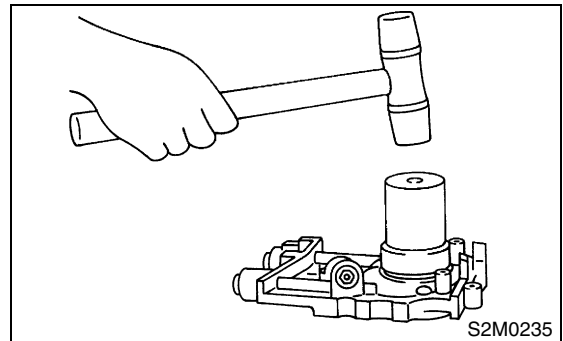
NOTE:
Use the ST to remove flywheel (MT vehicles only) for 2500 cc model.

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

ST1 498497100 CRANKSHAFT STOPPER
ST2 499057000 TORX PLUS

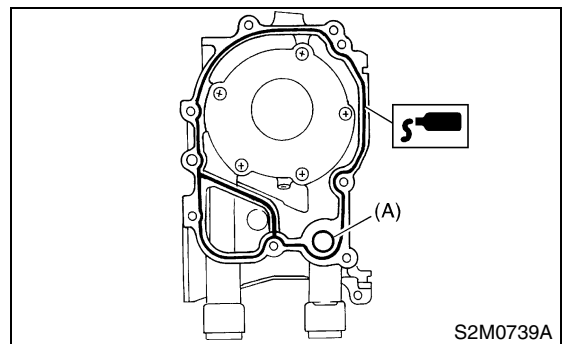


22) Install the housing cover.
23) Installation of oil pump
(1) Discard the front oil seal after removal. Replace with a new one using the ST.
ST 499587100 OIL SEAL INSTALLER

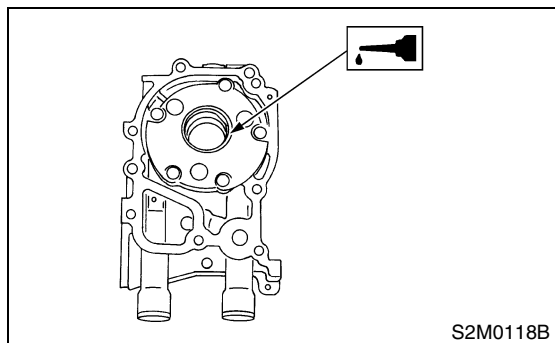


(2) Apply fluid packing to the matching surface of oil pump.

Fluid packing:
THREE BOND 1215 or equivalent



(A) O-ring



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

Tightening torque:

6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

CAUTION:

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

24) Install the water pump and gasket.

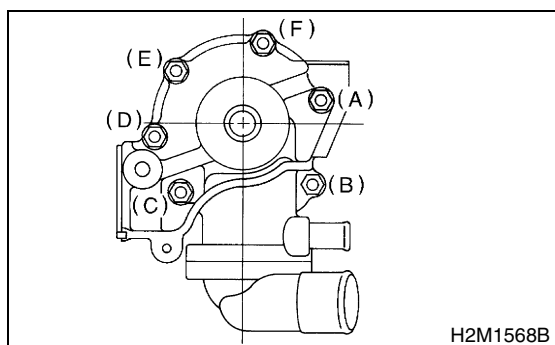
Tightening torque:

First; 12 N·m (1.2 kgf-m, 8.7 ft-lb)

Second; 12 N·m (1.2 kgf-m, 8.7 ft-lb)

CAUTION:

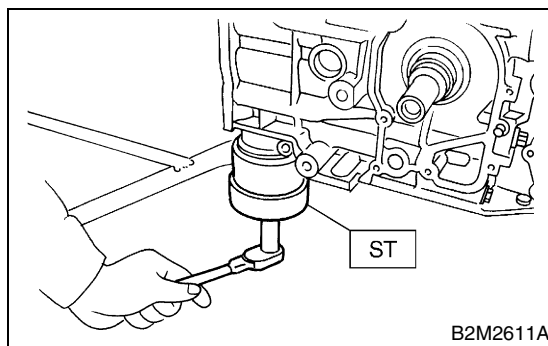
- Be sure to use a new gasket.
- When installing the water pump, tighten the bolts in two stages in alphabetical sequence as shown in the figure.



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

26) Install the oil filter using ST.

ST 498547000 OIL FILTER WRENCH



27) Tighten the cylinder head bolts.

- (1) Apply a coat of engine oil to the washers and bolt threads.
- (2) Tighten all bolts to 29 N·m (3.0 kgf-m, 22 ft-lb) in alphabetical sequence. Then tighten all bolts to 69 N·m (7.0 kgf-m, 51 ft-lb) in alphabetical sequence.
- (3) Back off all bolts by 180° first; back them off by 180° again.
- (4) Tighten the bolts (a) and (b) to 34 N·m (3.5 kgf-m, 25 ft-lb).
- (5) Tighten the bolts (c), (d), (e) and (f) to 15 N·m (1.5 kgf-m, 11 ft-lb).
- (6) Tighten all bolts by 80 to 90° in alphabetical sequence.

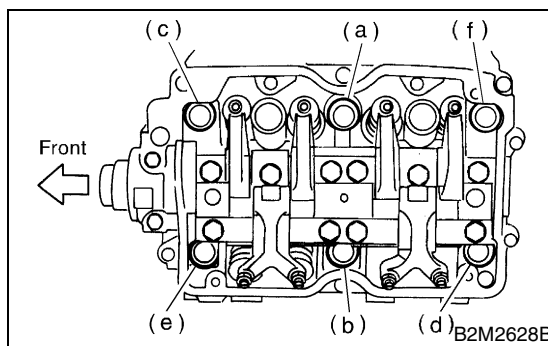
CAUTION:

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 the oil level gauge guide, and then tighten the attaching bolt (left side only).

29) Install the rocker cover.

30) Install the crankshaft sprocket. <Ref. to ME-56, INSTALLATION, Crankshaft Sprocket.>

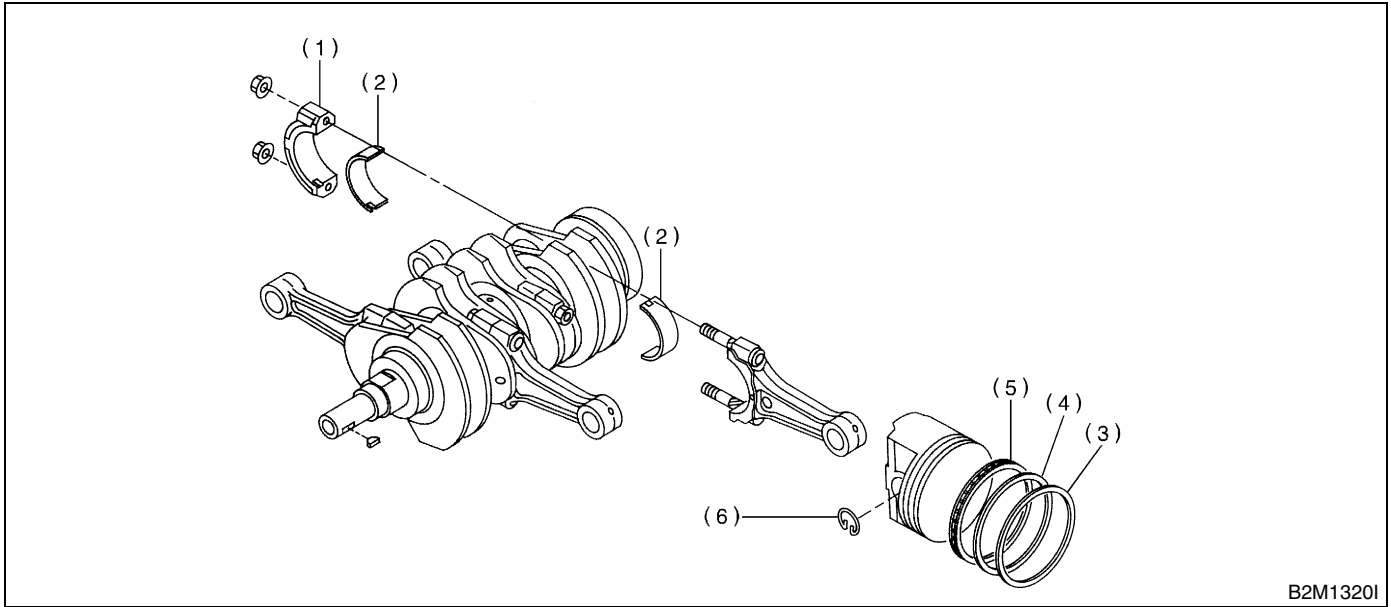
31) Install the camshaft sprocket. <Ref. to ME-54, INSTALLATION, Camshaft Sprocket.>

CYLINDER BLOCK

MECHANICAL

- 32) Install the timing belt assembly. <Ref. to ME-50, INSTALLATION, Timing Belt Assembly.>
- 33) Install the belt cover. <Ref. to ME-48, INSTALLATION, Belt Cover.>
- 34) Install the crankshaft pulley. <Ref. to ME-46, INSTALLATION, Crankshaft Pulley.>
- 35) Install the generator and A/C compressor brackets on cylinder head.
- 36) Install the V-belt. <Ref. to ME-44, INSTALLATION, V-belt.>
- 37) Install the intake manifold. <Ref. to FU-19, INSTALLATION, Intake Manifold.> or <Ref. to FU(w/oOBD)-20, INSTALLATION, Intake Manifold.>

C: DISASSEMBLY



B2M1320I

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

- 1) Remove the connecting rod cap.
- 2) Remove the connecting rod bearing.

CAUTION:

Arrange the removed connecting rod, connecting rod cap and bearing in order to prevent confusion.

- 3) Remove the piston rings using the piston ring expander.
- 4) Remove the oil ring by hand.

CAUTION:

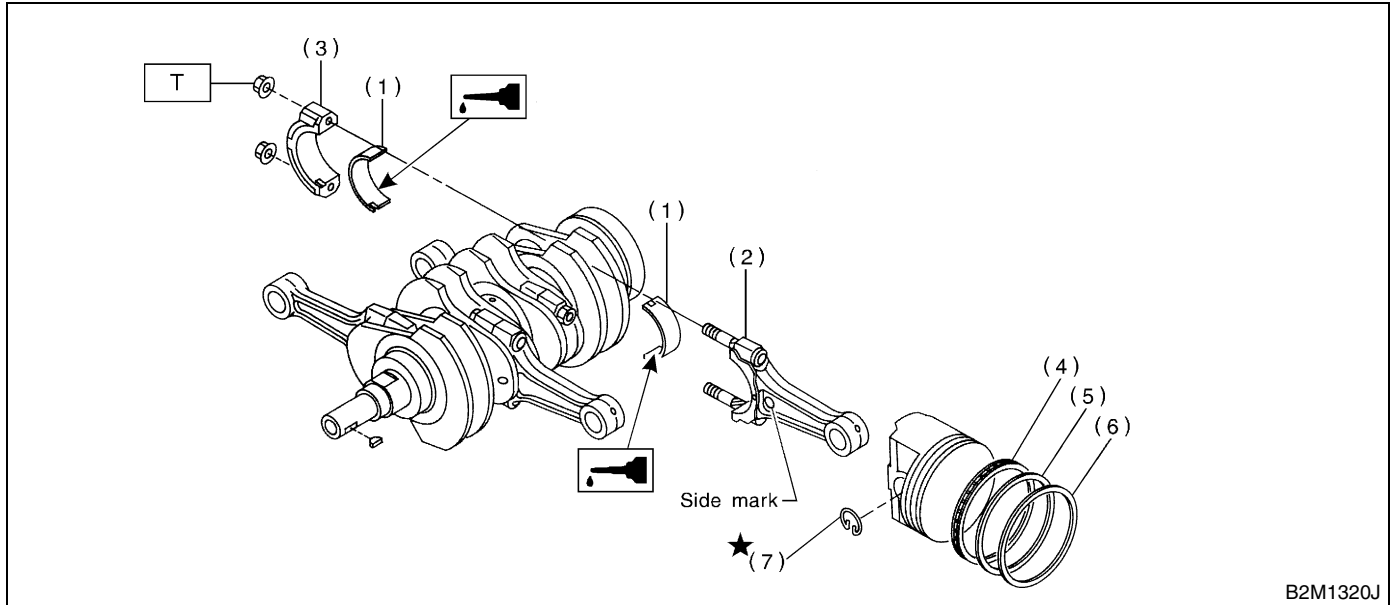
Arrange the removed piston rings in good order to prevent confusion.

- 5) Remove the circlip.

CYLINDER BLOCK

MECHANICAL

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 the connecting rod bearings on connecting rods and connecting rod caps.

CAUTION:

Apply oil to the surfaces of the connecting rod bearings.

2) Install the connecting rod on crankshaft.

CAUTION:

Position each connecting rod with the side marked facing forward.

3) Install the connecting rod cap with connecting rod nut.

Ensure the arrow on connecting rod cap faces the front during installation.

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

E: INSPECTION

1. CYLINDER BLOCK

1) Visually check for cracks and damage. Especially, inspect the important parts by means of red lead check.

2) Check the oil passages for clogging.

3) Inspect the crankcase surface that mates with cylinder head for warping by using a straight edge, and correct by grinding if necessary.

Warping limit:

0.05 mm (0.0020 in)

Grinding limit:

0.1 mm (0.004 in)

Standard height of cylinder block:

201.0 mm (7.91 in)

2. CYLINDER AND PISTON

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

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.

CYLINDER BLOCK

MECHANICAL

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

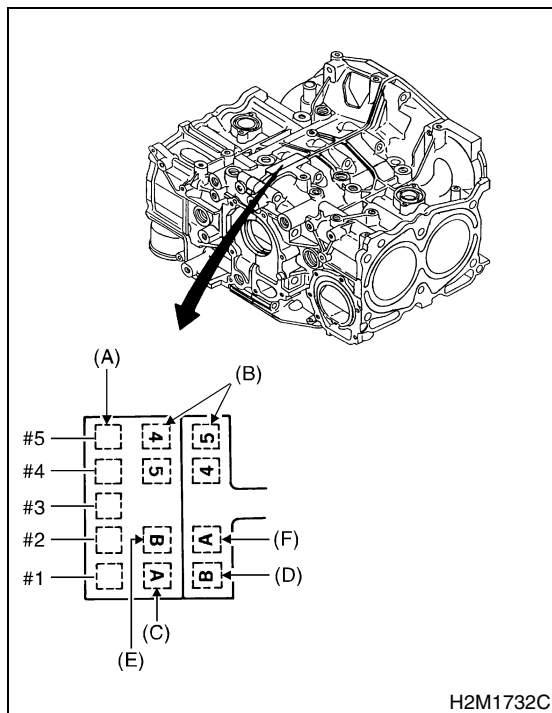
A: 92.005 — 92.015 mm (3.6222 — 3.6226 in)

B: 91.995 — 92.005 mm (3.6218 — 3.6222 in)

2500 cc MODEL

A: 99.505 — 99.515 mm (3.9175 — 3.9179 in)

B: 99.495 — 99.505 mm (3.9171 — 3.9175 in)



- (A) Main journal size mark
- (B) Cylinder block RH-LH combination mark
- (C) #1 cylinder bore size mark
- (D) #2 cylinder bore size mark
- (E) #3 cylinder bore size mark
- (F) #4 cylinder bore size mark

2) How to measure the inner diameter of each cylinder

Measure the inner diameter of each cylinder in both the thrust and piston pin directions at the heights shown in the figure, using a cylinder bore gauge.

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)

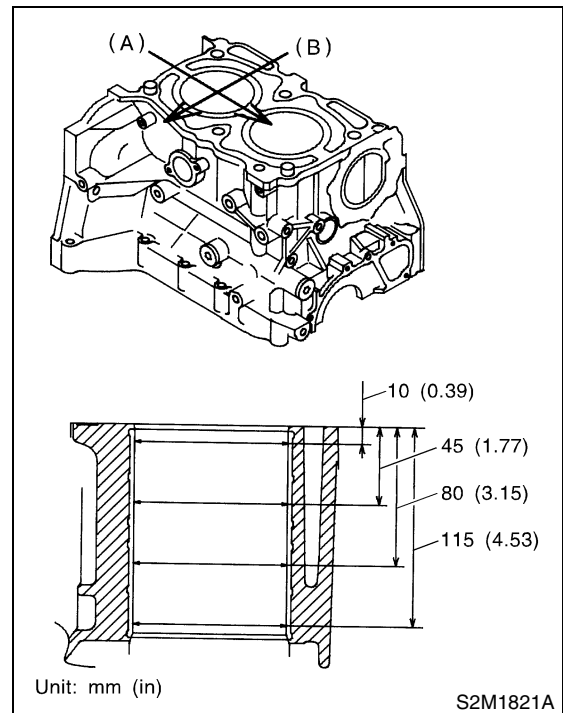
Out-of-roundness:

Standard

0.010 mm (0.0004 in)

Limit

0.050 mm (0.0020 in)



- (A) Piston pin direction
- (B) Thrust direction

3) When the piston is to be replaced due to general or cylinder wear, determine a suitable sized piston by measuring the piston clearance.

CYLINDER BLOCK

MECHANICAL

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:

1600 cc and 2000 cc MODEL

40.0 mm (1.575 in)

2500 cc MODEL

37.0 mm (1.457 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)

2500 cc MODEL

Standard

A: 99.485 — 99.495 mm

(3.9167 — 3.9171 in)

B: 99.475 — 99.485 mm

(3.9163 — 3.9167 in)

0.25 mm (0.0098 in) oversize

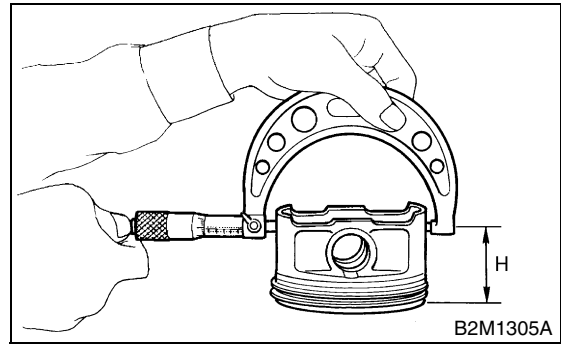
99.725 — 99.735 mm

(3.9262 — 3.9266 in)

0.50 mm (0.0197 in) oversize

99.975 — 99.985 mm

(3.9360 — 3.9364 in)



5) Calculate the clearance between cylinder and piston.

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, rebores 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 the pistons and piston pins for damage, cracks, and wear and the piston ring grooves for wear and damage. Replace if defective.
- 2) Measure the piston-to-cylinder clearance at each cylinder. <Ref. to ME-86, 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 the sure that piston pin can be inserted into piston pin hole with a thumb at 20°C (68°F). Replace if defective.

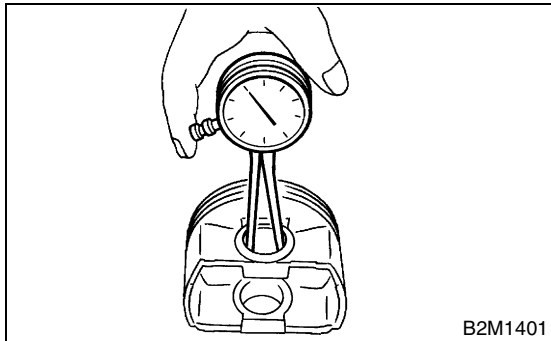
Standard clearance between piston pin and hole in piston:

Standard

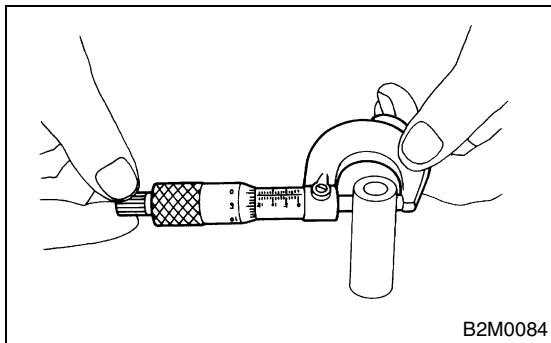
0.004 — 0.008 mm (0.0002 — 0.0003 in)

Limit

0.020 mm (0.0008 in)

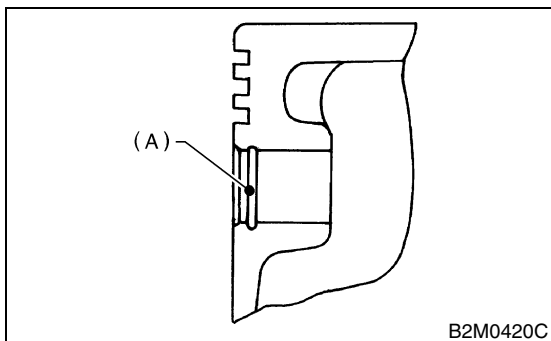


B2M1401



B2M0084

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



B2M0420C

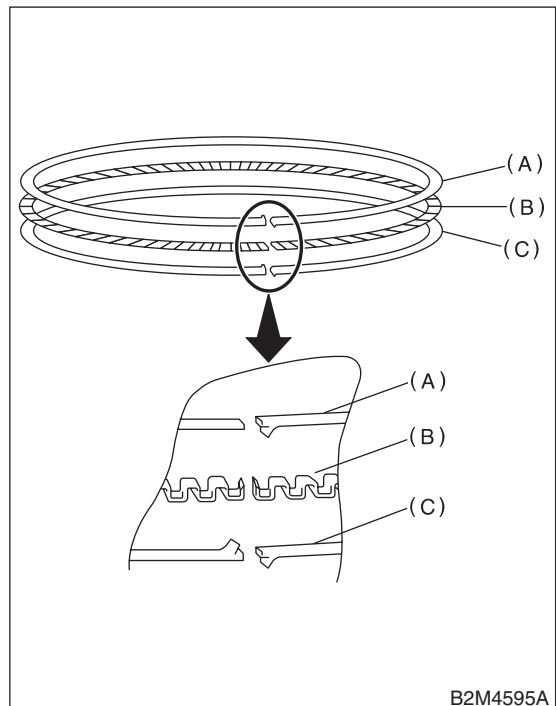
- 5) Check the piston pin circlip for distortion, cracks and wear.

4. PISTON RING

- 1) If the piston ring is broken, damaged, or worn, or if its tension is insufficient, or when the piston is replaced, replace the piston ring with a new one of the same size as the piston.

CAUTION:

- Marks are shown on the end of top and second rings. When installing the rings to piston, face these marks upward.
- Oil ring is composed of upper rail, expander and lower rail. Be careful of the rail direction when installing oil ring to the piston.



B2M4595A

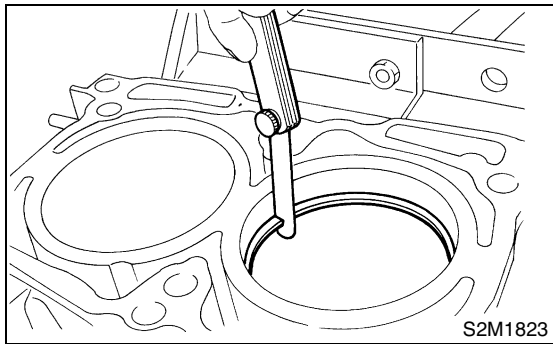
- (A) Upper rail
- (B) Expander
- (C) Lower rail

CYLINDER BLOCK

MECHANICAL

2) Squarely place the piston ring and oil ring in cylinder, and then measure the piston ring gap with a thickness gauge.

		Unit: mm (in)	
		Standard	Limit
Piston ring gap	Top ring	0.20 — 0.35 (0.0079 — 0.0138)	1.0 (0.039)
	Second ring	0.35 — 0.50 (0.0138 — 0.0197)	1.0 (0.039)
	Oil ring rail	0.20 — 0.50 (0.0079 — 0.0197)	1.5 (0.059)

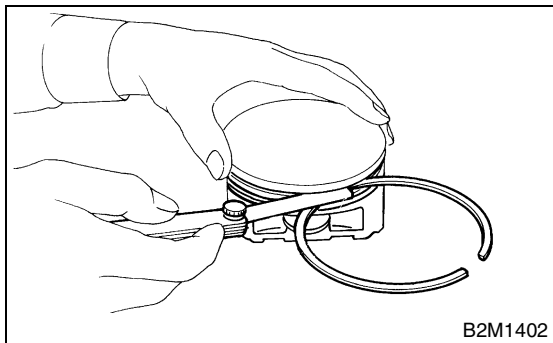


3) Measure the clearance between piston ring and piston ring groove with a thickness gauge.

CAUTION:

Before measuring the clearance, clean the piston ring groove and piston ring.

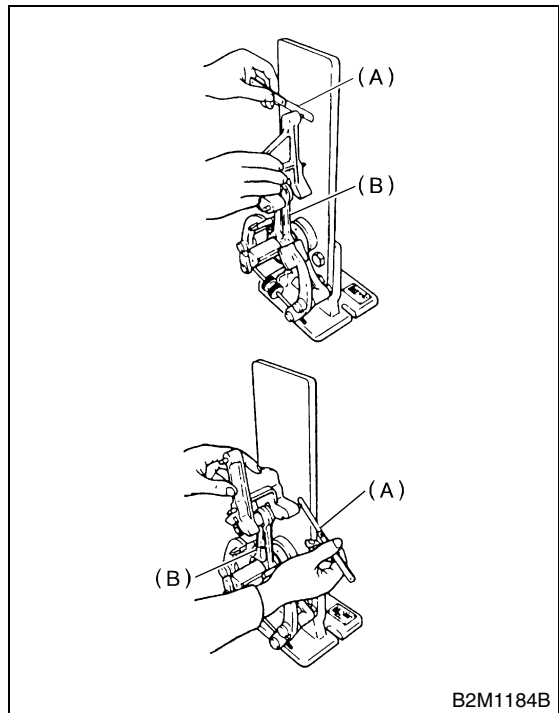
		Unit: mm (in)	
		Standard	Limit
Clearance between piston ring and piston ring groove	Top ring	0.055 — 0.090 (0.0022 — 0.0035)	0.15 (0.0059)
	Second ring	0.030 — 0.070 (0.0012 — 0.0028)	0.15 (0.0059)



5. CONNECTING ROD

- 1) Replace the connecting rod, if the large or small end thrust surface is damaged.
- 2) Check for bend or twist using a connecting rod aligner. Replace the connecting rod if the bend or twist exceeds the limit.

Limit of bend or twist per 100 mm (3.94 in) in length:
0.10 mm (0.0039 in)



- (A) Thickness gauge
 (B) Connecting rod

3) Install the connecting rod fitted with bearing to crankshaft, and then measure the side clearance (thrust clearance). Replace the connecting rod if the side clearance exceeds the specified limit.

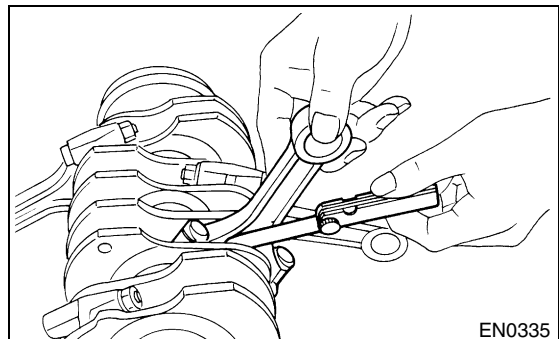
Connecting rod side clearance:

Standard

0.070 — 0.330 mm (0.0028 — 0.0130 in)

Limit

0.4 mm (0.016 in)



4) Inspect the connecting rod bearing for scar, peeling, seizure, melting, wear, etc.

5) Measure the oil clearance on individual connecting rod bearings by means of plastigauge. If any oil clearance is not within specification, replace the defective bearing with a new one of standard size or undersize as necessary. (See the table below.)

Connecting rod oil clearance:

• 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)

Connecting rod oil clearance:

• 2500 cc MODEL

Standard

0.012 — 0.037 mm (0.0005 — 0.0015 in)

Limit

0.050 mm (0.0020 in)

Unit: mm (in)		
Bearing	Bearing size (Thickness at center)	Outer diameter of crank pin
Standard	1.490 — 1.502 (0.0587 — 0.0591)	51.984 — 52.000 (2.0466 — 2.0472)
0.03 (0.0012) undersize	1.504 — 1.512 (0.0592 — 0.0595)	51.954 — 51.970 (2.0454 — 2.0461)
0.05 (0.0020) undersize	1.514 — 1.522 (0.0596 — 0.0599)	51.934 — 51.950 (2.0446 — 2.0453)
0.25 (0.0098) undersize	1.614 — 1.622 (0.0635 — 0.0639)	51.734 — 51.750 (2.0368 — 2.0374)

6) Inspect the bushing at connecting rod small end, and replace if worn or damaged. Also measure the piston pin clearance at connecting rod small end.

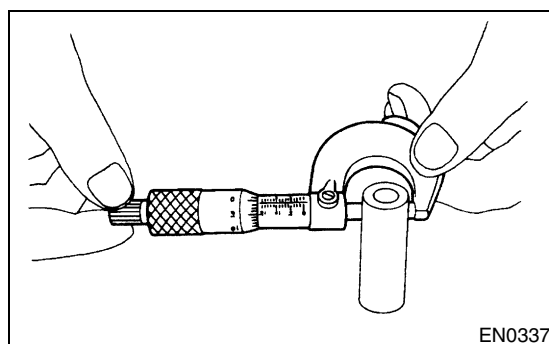
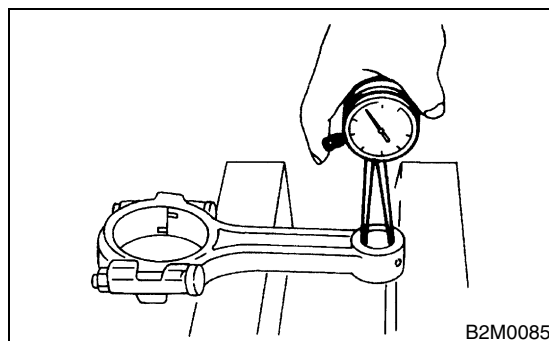
Clearance between piston pin and bushing:

Standard

0 — 0.022 mm (0 — 0.0009 in)

Limit

0.030 mm (0.0012 in)



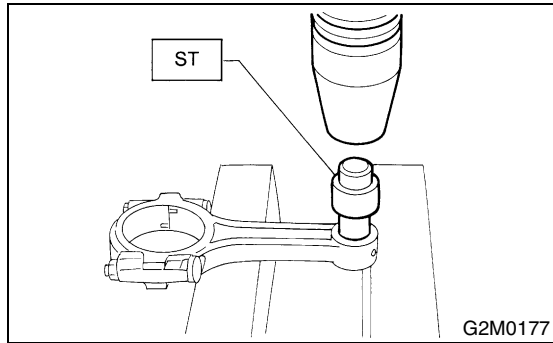
CYLINDER BLOCK

MECHANICAL

7) Replacement procedure is as follows.

- (1) Remove the bushing from connecting rod with ST and press.
- (2) Press the bushing with ST after applying oil on the periphery of bushing.

ST 499037100 CONNECTING ROD BUSHING REMOVER AND INSTALLER



- (3) Make two 3 mm (0.12 in) holes in bushing. Ream the inside of bushing.
- (4) After the completion of reaming, clean the bushing to remove chips.

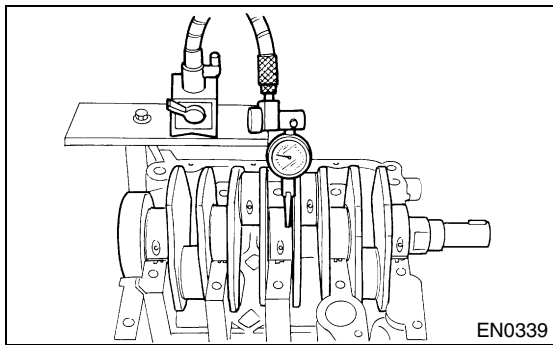
6. CRANKSHAFT AND CRANKSHAFT BEARING

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

CAUTION:

If a suitable V-block is not available, install the #1 and #5 crankshaft bearing on cylinder block, position the crankshaft on these bearings and measure the crankshaft bend using a dial gauge.

Crankshaft bend limit:
0.035 mm (0.0014 in)



- 3) Inspect the crank journal and crank pin for wear. If they are not within the specifications, replace the bearing with a suitable (undersize) one, and then replace or recondition the crankshaft as necessary. When grinding the crank journal or crank pin, finish them to specified dimensions according to the undersize bearing to be used.

Crank pin and crank journal:

Out-of-roundness

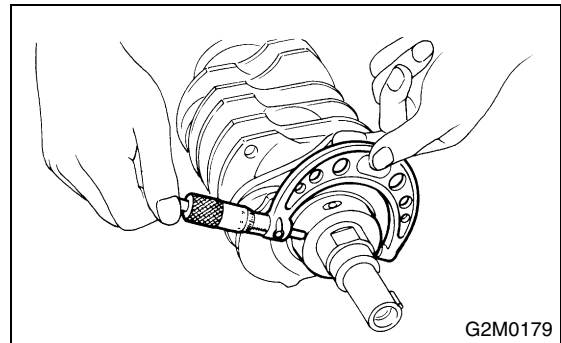
0.020 mm (0.0008 in) or less

Taper limit

0.07 mm (0.0028 in)

Grinding limit

0.250 mm (0.0098 in)



		Unit: mm (in)				
		Crank journal diameter		Crank pin diameter		
		#1, #3	#2, #4, #5	1600 cc	2000 cc	2500 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)	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)	1.490 — 1.502 (0.0587 — 0.0591)
0.03 (0.0012) undersize	Journal O.D.	59.962 — 59.978 (2.3607 — 2.3613)	59.962 — 59.978 (2.3607 — 2.3613)	47.954 — 47.970 (1.8879 — 1.8886)	51.954 — 51.970 (2.0454 — 2.0461)	51.954 — 51.970 (2.0454 — 2.0461)
	Bearing size (Thickness at center)	2.017 — 2.020 (0.0794 — 0.0795)	2.019 — 2.022 (0.0795 — 0.0796)	1.510 — 1.513 (0.0594 — 0.0596)	1.510 — 1.513 (0.0594 — 0.0596)	1.504 — 1.512 (0.0592 — 0.0595)
0.05 (0.0020) undersize	Journal O.D.	59.942 — 59.958 (2.3599 — 2.3605)	59.942 — 59.958 (2.3599 — 2.3605)	47.934 — 47.950 (1.8872 — 1.8878)	51.934 — 51.950 (2.0446 — 2.0453)	51.934 — 51.950 (2.0446 — 2.0453)
	Bearing size (Thickness at center)	2.027 — 2.030 (0.0798 — 0.0799)	2.029 — 2.032 (0.0799 — 0.0800)	1.520 — 1.523 (0.0598 — 0.0600)	1.520 — 1.523 (0.0598 — 0.0600)	1.514 — 1.522 (0.0596 — 0.0599)
0.25 (0.0098) undersize	Journal O.D.	59.742 — 59.758 (2.3520 — 2.3527)	59.742 — 59.758 (2.3520 — 2.3527)	47.734 — 47.750 (1.8793 — 1.8799)	51.734 — 51.750 (2.0368 — 2.0374)	51.734 — 51.750 (2.0368 — 2.0374)
	Bearing size (Thickness at center)	2.127 — 2.130 (0.0837 — 0.0839)	2.129 — 2.132 (0.0838 — 0.0839)	1.620 — 1.623 (0.0638 — 0.0639)	1.620 — 1.623 (0.0638 — 0.0639)	1.614 — 1.622 (0.0635 — 0.0639)

O.D. : Outer Diameter

CYLINDER BLOCK

MECHANICAL

4) Measure the thrust clearance of crankshaft at center bearing. If the clearance exceeds the limit, replace bearing.

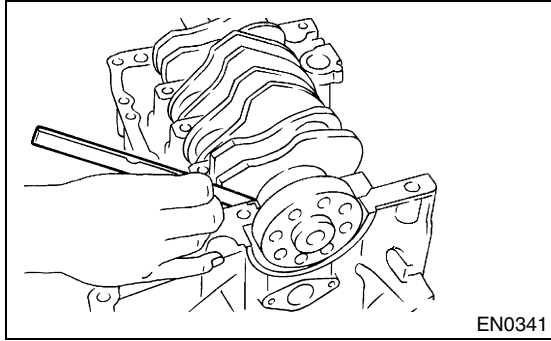
Crankshaft thrust clearance:

Standard

0.030 — 0.115 mm (0.0012 — 0.0045 in)

Limit

0.25 mm (0.0098 in)



5) Inspect the individual crankshaft bearings for signs of flaking, seizure, melting, and wear.

6) Measure the oil clearance on each crankshaft bearing by means of plastigauge. If the measurement is not within the specification, replace the defective bearing with an undersize one, and then replace or recondition the crankshaft as necessary.

Unit: mm (in)	
Crankshaft oil clearance	
Standard	0.010 — 0.030 (0.0004 — 0.0012)
Limit	0.040 (0.0016)

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-2, Basic Diagnostic Procedure.> or <Ref. to EN(w/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-2, Basic Diagnostic Procedure.> or <Ref. to EN(w/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-2, Basic Diagnostic Procedure.> or <Ref. to EN(w/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-2, Basic Diagnostic Procedure.> or <Ref. to EN(w/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 filler cap	B
		• Dirty air cleaner element	C
	• Fuel line	• Defective fuel pump and relay	C
		• Clogged fuel line	C
		• Lack of or insufficient fuel	B
	• Belt	• Defective timing	C
	• Compression	• Incorrect valve clearance	B
		• Loosened spark plugs or defective gasket	B
		• Loosened cylinder head bolts or defective gasket	B
		• Improper valve seating	B
		• Defective valve stem	C
		• Worn or broken valve spring	B
		• Worn or stuck piston rings, cylinder and piston	B
		• Incorrect valve timing	A
	• Improper engine oil (low viscosity)	B	
• Lubrication system	• Incorrect oil pressure	B	
	• Defective rocker cover gasket	C	
• Cooling system	• Overheating	C	
• Others	• Malfunction of evaporative emission control system	A	
	• Stuck or damaged throttle valve	B	
	• Accelerator cable out of adjustment	C	

ENGINE TROUBLE IN GENERAL

MECHANICAL

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
3. Low output, hesitation and poor acceleration	• Engine control system <Ref. to EN-2, Basic Diagnostic Procedure.> or <Ref. to EN(w/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 filler cap	B
		• Dirty air cleaner element	A
	• Fuel line	• Defective fuel pump and relay	B
		• Clogged fuel line	B
		• Lack of or insufficient fuel	C
	• Belt	• Defective timing	B
	• Compression	• Incorrect valve clearance	B
		• Loosened spark plugs or defective gasket	B
		• Loosened cylinder head bolts or defective gasket	B
		• Improper valve seating	B
		• Defective valve stem	C
		• Worn or broken valve spring	B
		• Worn or stuck piston rings, cylinder and piston	C
		• Incorrect valve timing	A
• Improper engine oil (low viscosity)	B		
• Lubrication system	• Incorrect oil pressure	B	
• Cooling system	• Overheating	C	
	• Over cooling	C	
• Others	• Malfunction of evaporative emission control system	A	
4. Surging	• Engine control system <Ref. to EN-2, Basic Diagnostic Procedure.> or <Ref. to EN(w/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 filler cap	B
		• Dirty air cleaner element	B
	• Fuel line	• Defective fuel pump and relay	B
		• Clogged fuel line	B
		• Lack of or insufficient fuel	C
	• Belt	• Defective timing	B
	• Compression	• Incorrect valve clearance	B
		• Loosened spark plugs or defective gasket	C
		• Loosened cylinder head bolts or defective gasket	C
		• Improper valve seating	C
		• Defective valve stem	C
		• Worn or broken valve spring	C
		• Worn or stuck piston rings, cylinder and piston	C
		• Incorrect valve timing	A
• Improper engine oil (low viscosity)	B		
• Cooling system	• Overheating	B	
• Others	• Malfunction of evaporative emission control system	C	

ENGINE TROUBLE IN GENERAL

MECHANICAL

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
5. Engine does not return to idle.	• Engine control system <Ref. to EN-2, Basic Diagnostic Procedure.> or <Ref. to EN(w/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-2, Basic Diagnostic Procedure.> or <Ref. to EN(w/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-2, Basic Diagnostic Procedure.> or <Ref. to EN(w/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-2, Basic Diagnostic Procedure.> or <Ref. to EN(w/oOBD)-2, Basic Diagnostic Procedure.>		A
	• Intake system	• Loosened oil filler cap	B
	• Belt	• Defective timing	B
	• Compression	• Incorrect valve clearance	C
		• Incorrect valve timing	B
	• Cooling system	• Overheating	A
9. Excessive engine oil consumption	• Intake system	• Loosened or cracked PCV hose	A
		• Defective PCV valve	B
		• Loosened oil filler cap	C
	• Compression	• Defective valve stem	A
		• Worn or stuck piston rings, cylinder and piston	A
	• Lubrication system	• Loosened oil pump attaching bolts and defective gasket	B
		• Defective oil 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-2, Basic Diagnostic Procedure.> or <Ref. to EN(w/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.	<ul style="list-style-type: none"> • Valve mechanism is defective. • Incorrect valve clearance • Worn valve rocker • Worn camshaft • Broken valve spring
Heavy and dull clank	Oil pressure is low.	<ul style="list-style-type: none"> • Worn crankshaft main bearing • Worn connecting rod bearing (big end)
	Oil pressure is normal.	<ul style="list-style-type: none"> • Loose flywheel mounting bolts • Damaged engine mounting
High-pitched clank (Spark knock)	Sound is noticeable when accelerating with an overload.	<ul style="list-style-type: none"> • Ignition timing advanced • Accumulation of carbon inside combustion chamber • Wrong spark plug • Improper gasoline
Clank when engine speed is medium (1,000 to 2,000 rpm).	Sound is reduced when fuel injector connector of noisy cylinder is disconnected. (NOTE*)	<ul style="list-style-type: none"> • Worn crankshaft main bearing • Worn bearing at crankshaft end of connecting rod
Knocking sound when engine is operating under idling speed and engine is warm	Sound is reduced when fuel injector connector of noisy cylinder is disconnected. (NOTE*)	<ul style="list-style-type: none"> • Worn cylinder liner and piston ring • Broken or stuck piston ring • Worn piston pin and hole at piston end of connecting rod
	Sound is not reduced if each fuel injector connector is disconnected in turn. (NOTE*)	<ul style="list-style-type: none"> • Unusually worn valve lifter • Worn cam gear • Worn camshaft journal bore in crankcase
Squeaky sound	—	<ul style="list-style-type: none"> • Insufficient generator lubrication
Rubbing sound	—	<ul style="list-style-type: none"> • Defective generator brush and rotor contact
Gear scream when starting engine	—	<ul style="list-style-type: none"> • Defective ignition starter switch • Worn gear and starter pinion
Sound like polishing glass with a dry cloth	—	<ul style="list-style-type: none"> • Loose drive belt • Defective water pump shaft
Hissing sound	—	<ul style="list-style-type: none"> • Loss of compression • Air leakage in air intake system, hoses, connections or manifolds
Timing belt noise	—	<ul style="list-style-type: none"> • Loose timing belt • Belt contacting case/adjacent part
Valve tappet noise	—	<ul style="list-style-type: none"> • Incorrect valve clearance

NOTE*:

When disconnecting fuel injector connector, Malfunction Indicator Light (CHECK ENGINE light) illuminates and trouble code is stored in ECM memory.

Therefore, carry out the CLEAR MEMORY MODE <Ref. to EN-49, OPERATION, Clear Memory Mode.> or <Ref. to EN(w/oOBD)-30, OPERATION, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN-42, OPERATION, Inspection Mode.> or <Ref. to EN(w/oOBD)-28, OPERATION, Inspection Mode.> after connecting fuel injector connector.

EXHAUST

EX

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

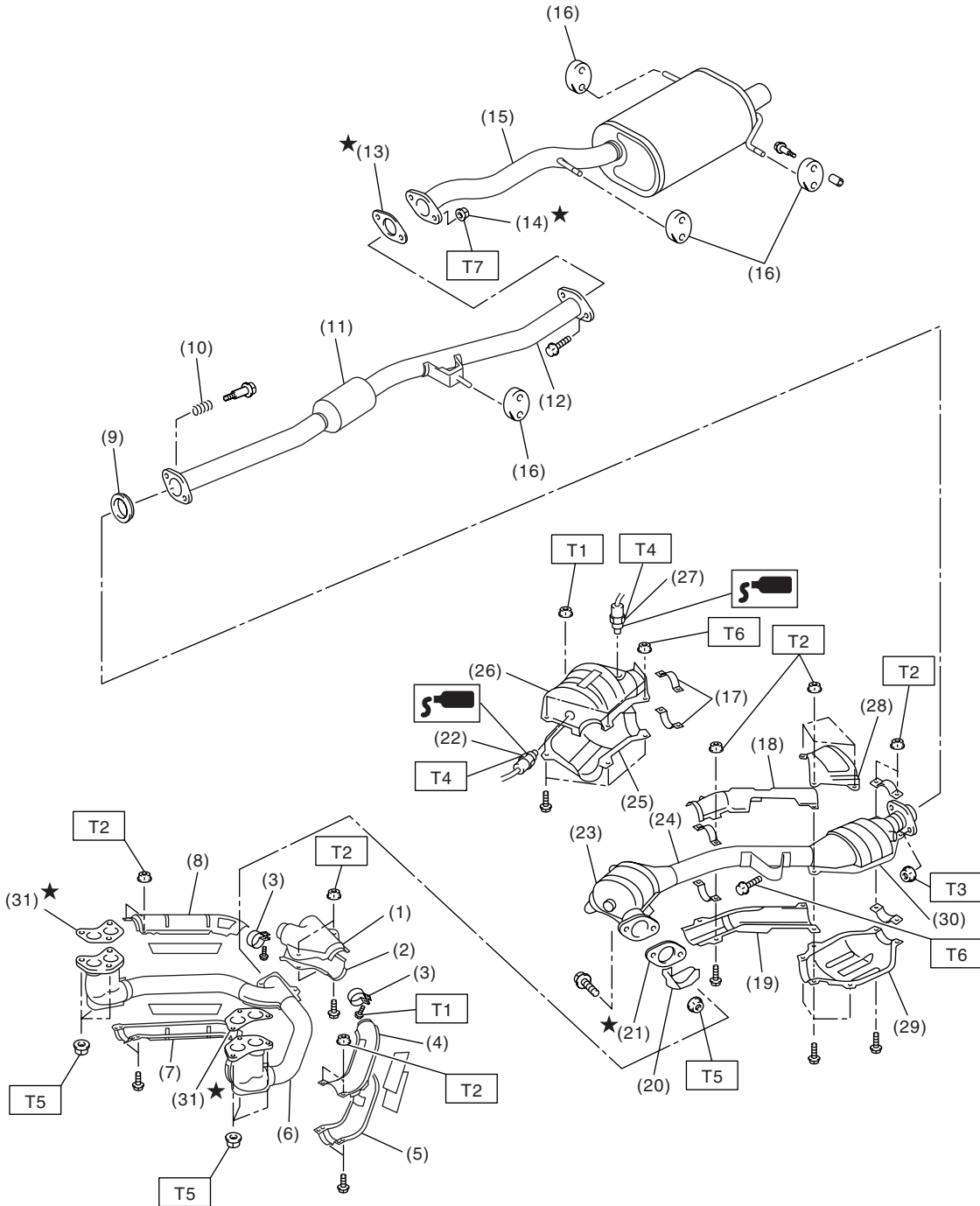
GENERAL DESCRIPTION

EXHAUST

1. General Description

A: COMPONENT

1. 1600 CC



EN1372

GENERAL DESCRIPTION

EXHAUST

(1) Upper front exhaust pipe cover CTR	(13) Gasket	(27) Rear oxygen sensor
(2) Lower front exhaust pipe cover CTR	(14) Self-locking nut	(28) Upper rear catalytic converter cover
(3) Clamp	(15) Muffler	(29) Lower rear catalytic converter cover
(4) Upper front exhaust pipe cover LH	(16) Cushion rubber	(30) Rear catalytic converter
(5) Lower front exhaust pipe cover LH	(17) Lower clamp	(31) Gasket
(6) Front exhaust pipe	(18) Upper center exhaust pipe cover	
(7) Lower front exhaust pipe cover RH	(19) Lower center exhaust pipe cover	
(8) Upper front exhaust pipe cover RH	(20) Protector	
(9) Gasket	(21) Gasket	
(10) Spring	(22) Front oxygen (A/F) sensor	
(11) Chamber	(23) Front catalytic converter	
(12) Rear exhaust pipe	(24) Center exhaust pipe	
	(25) Lower front catalytic converter cover	
	(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: 21 (2.1, 15.2)

T5: 30 (3.1, 22.4)

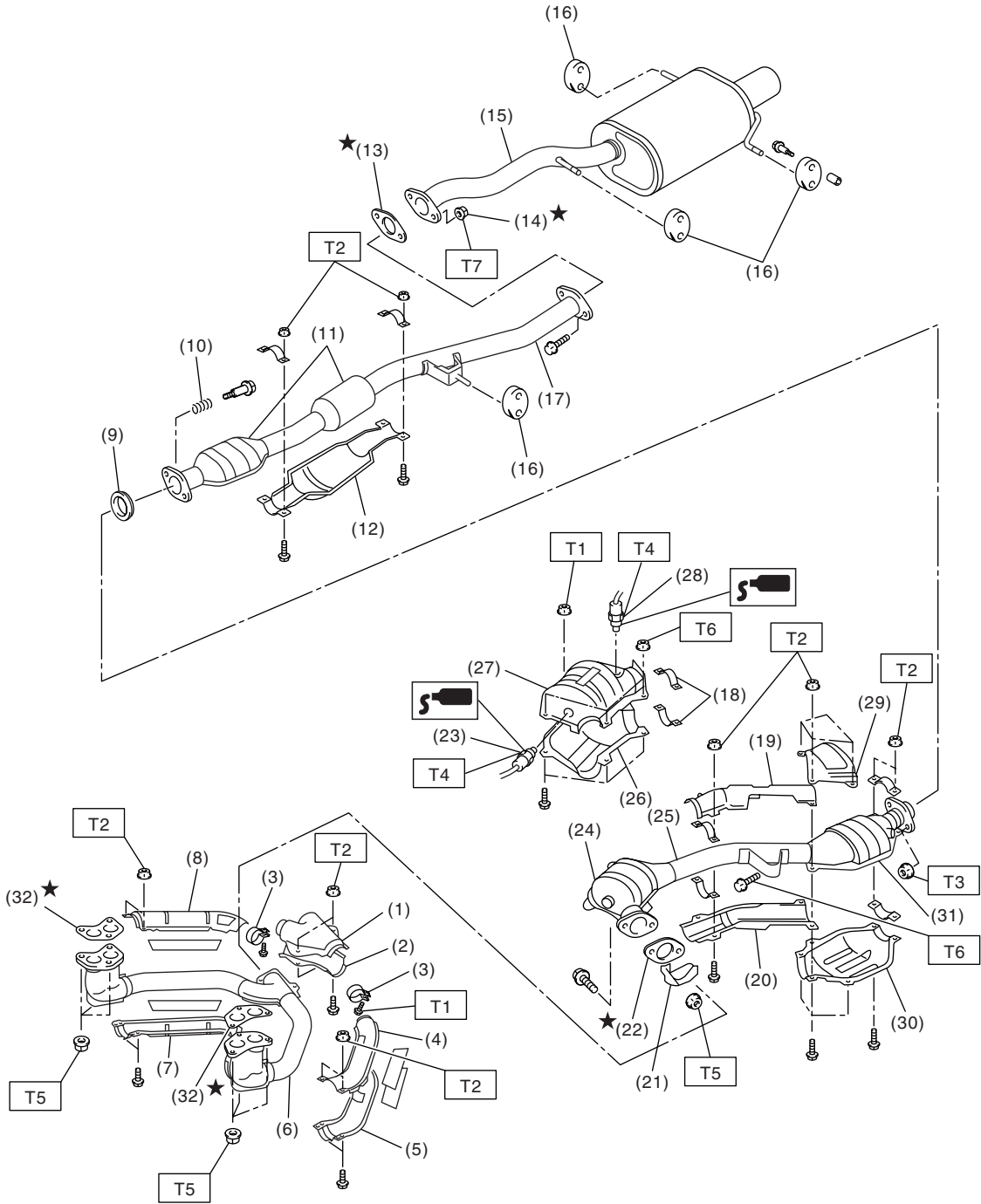
T6: 35 (3.6, 26.0)

T7: 48 (4.9, 35.4)

GENERAL DESCRIPTION

EXHAUST

2. 2000 CC AND 2500 CC



EN1373

GENERAL DESCRIPTION

EXHAUST

(1) Upper front exhaust pipe cover CTR	(14) Self-locking nut	(29) Upper rear catalytic converter cover
(2) Lower front exhaust pipe cover CTR	(15) Muffler	(30) Lower rear catalytic converter cover
(3) Clamp	(16) Cushion rubber	(31) Rear catalytic converter
(4) Upper front exhaust pipe cover LH	(17) Rear exhaust pipe	(32) Gasket
(5) Lower front exhaust pipe cover LH	(18) Lower clamp	
(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	<hr/> Tightening torque: N-m (kgf-m, ft-lb)
(9) Gasket	(22) Gasket	T1: 8 (0.8, 5.8)
(10) Spring	(23) Front oxygen (A/F) sensor	T2: 13 (1.3, 9.4)
(11) Chamber	(24) Front catalytic converter	T3: 18 (1.8, 13.0)
(12) Rear exhaust pipe cover	(25) Center exhaust pipe	T4: 21 (2.1, 15.2)
(13) Gasket	(26) Lower front catalytic converter cover	T5: 30 (3.1, 22.4)
	(27) Upper front catalytic converter cover	T6: 35 (3.6, 26.0)
	(28) Rear oxygen sensor	T7: 48 (4.9, 35.4)

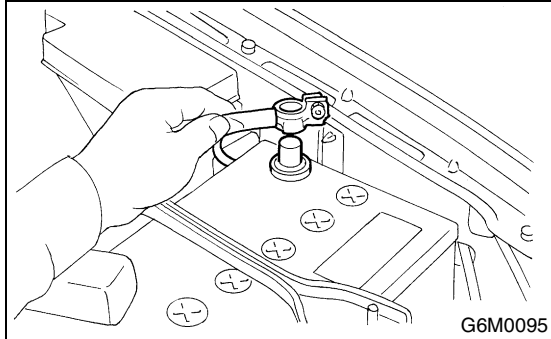
B: CAUTION

- 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 the ground cable from battery.

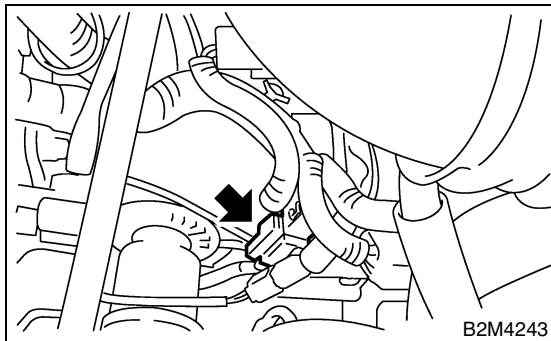
2. Front Exhaust Pipe

A: REMOVAL

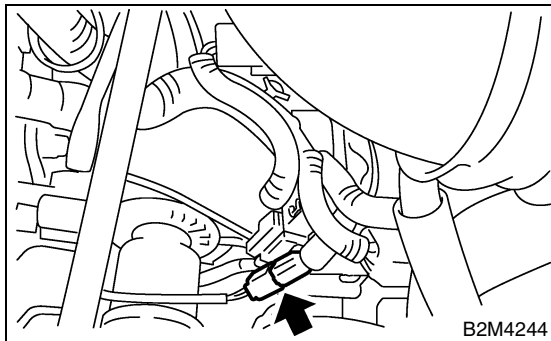
1) Disconnect the ground cable from battery.



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



3) Disconnect the rear oxygen sensor connector.

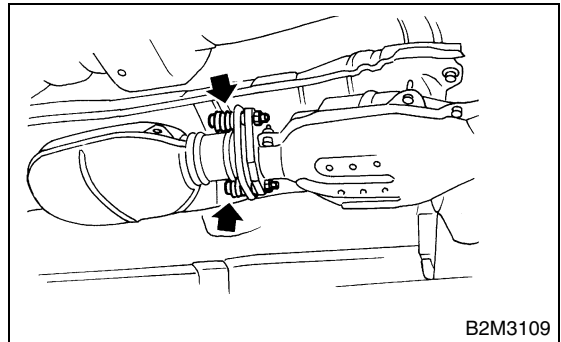


4) Lift-up the vehicle.

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

WARNING:

Be careful, the exhaust pipe is hot.

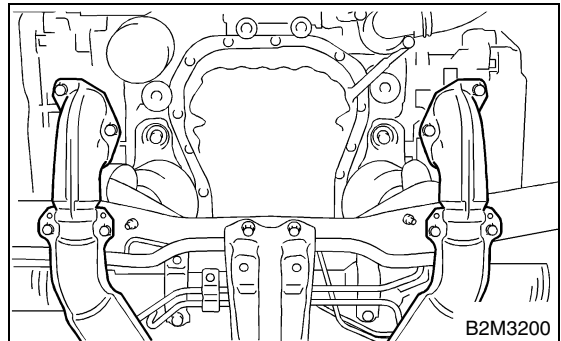


6) Remove the under cover.

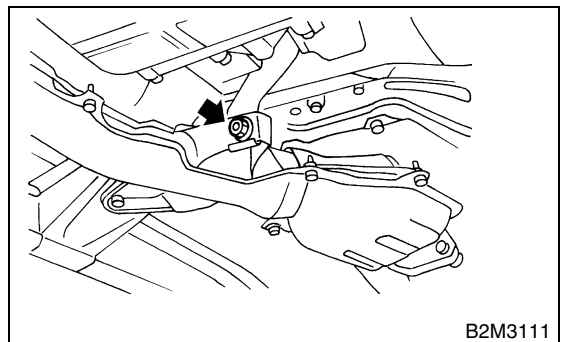
7) Remove the nuts which hold front exhaust pipe onto cylinder heads.

CAUTION:

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



8) Remove the bolt which installs front and center exhaust pipe assembly to hanger bracket.



FRONT EXHAUST PIPE

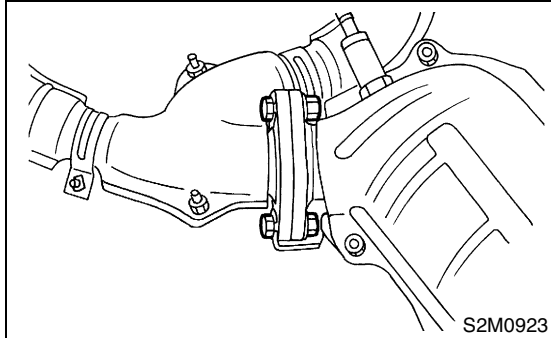
EXHAUST

9) Remove the front and center exhaust pipe assembly from vehicle.

CAUTION:

- Be careful not to let the front and center exhaust pipe assembly fall off when removing as it is quite heavy.
- After removing the front and center exhaust pipe assembly, do not apply excessive pulling force on the rear exhaust pipe.

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



11) Remove the front oxygen (A/F) sensor and the rear oxygen sensor. <Ref. to FU-47, REMOVAL, Front Oxygen (A/F) Sensor.> and <Ref. to FU-49, REMOVAL, Rear Oxygen Sensor.> .

B: INSTALLATION

1) Install the front oxygen (A/F) sensor and the rear oxygen sensor. <Ref. to FU-47, INSTALLATION, Front Oxygen (A/F) Sensor.> and <Ref. to FU-49, INSTALLATION, Rear Oxygen Sensor.> .

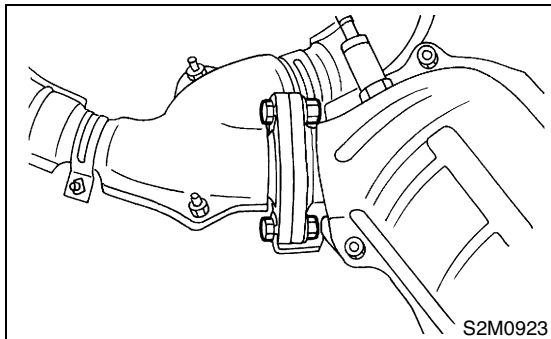
2) Install the front exhaust pipe to center exhaust pipe.

NOTE:

Replace the gaskets with new ones.

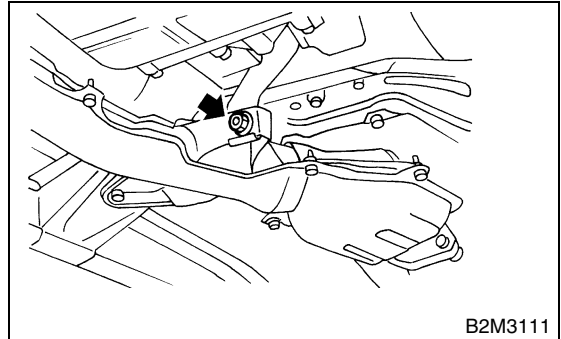
Tightening torque:

30 N·m (3.1 kgf·m, 22.4 ft·lb)



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

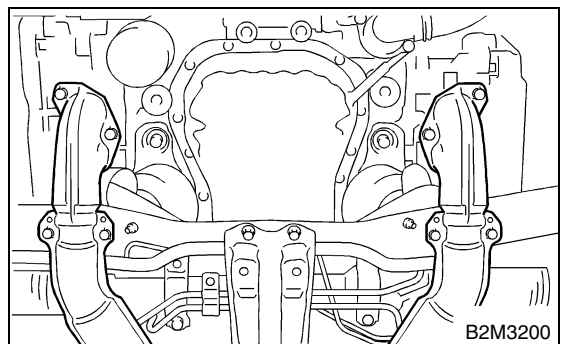
4) Temporarily tighten the bolt which installs front and center exhaust pipe assembly to hanger bracket.



5) Tighten the nuts which hold front exhaust pipe onto cylinder heads.

Tightening torque:

30 N·m (3.1 kgf·m, 22.4 ft·lb)

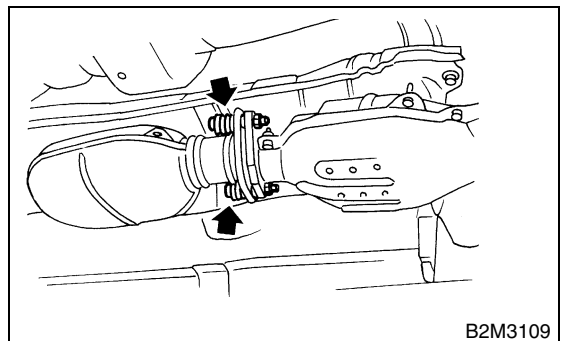


6) Install the under cover.

7) Tighten the bolts which install front and center exhaust pipe assembly to rear exhaust pipe.

Tightening torque:

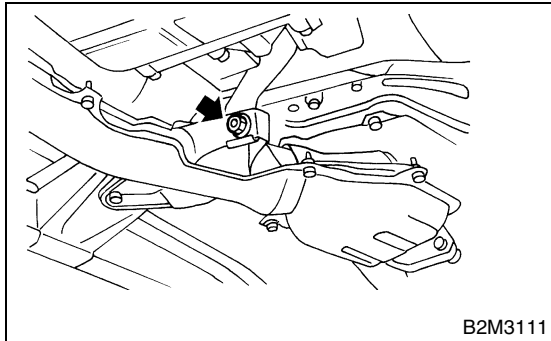
18 N·m (1.8 kgf·m, 13.0 ft·lb)



8) Tighten the bolt which holds front and center exhaust pipe assembly to hanger bracket.

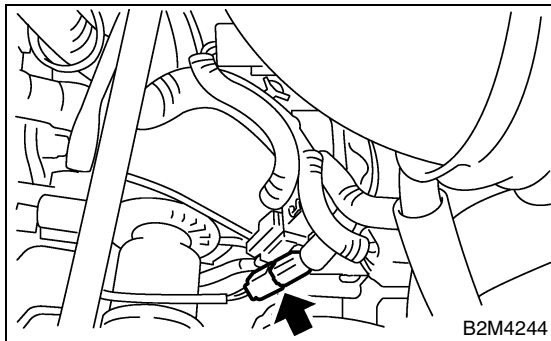
Tightening torque:

35 N·m (3.6 kgf·m, 26.0 ft·lb)

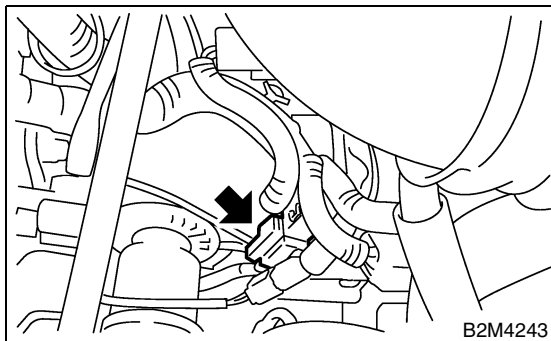


9) Lower the vehicle.

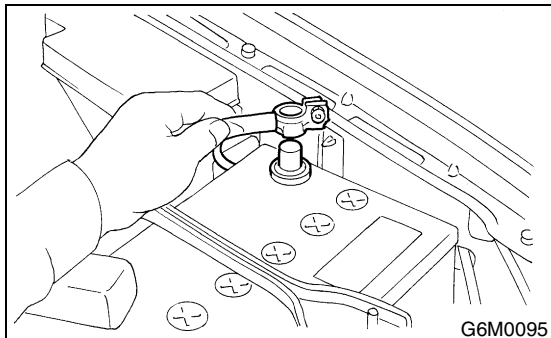
10) Connect the rear oxygen sensor connector.



11) Connect the front oxygen (A/F) sensor connector.



12) Connect the battery ground cable to battery.



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-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-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.

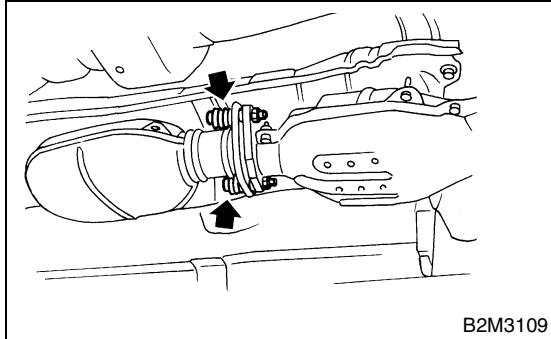
4. Rear Exhaust Pipe

A: REMOVAL

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

CAUTION:

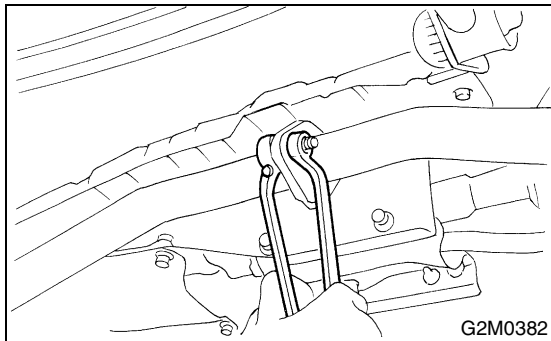
Be careful, the exhaust pipe is hot.



2) Separate the rear exhaust pipe from muffler.

CAUTION:

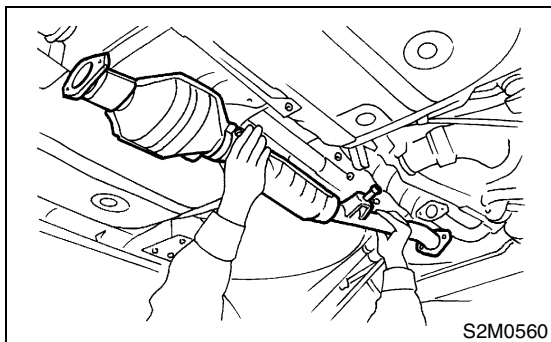
Be careful not to pull down the rear exhaust pipe.



3) Apply a coat of SUBARU CRC to mating area of the cushion rubbers in advance.

SUBARU CRC (Part No. 004301003)

4) Remove the rear exhaust pipe bracket from the cushion rubber.

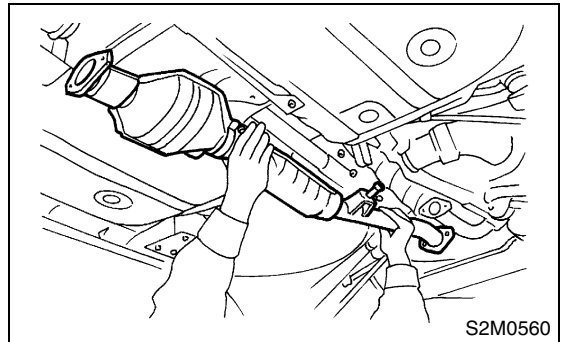


B: INSTALLATION

1) Apply a coat of SUBARU CRC to mating area of the cushion rubbers in advance.

SUBARU CRC (Part No. 004301003)

2) Install the rear exhaust pipe bracket to cushion rubber.



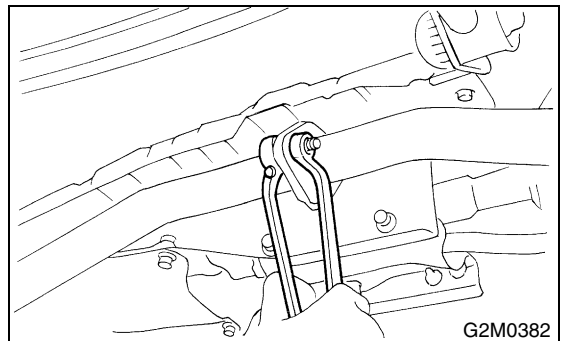
NOTE:

Replace the gaskets with new ones.

3) Install the rear exhaust pipe to muffler.

Tightening torque:

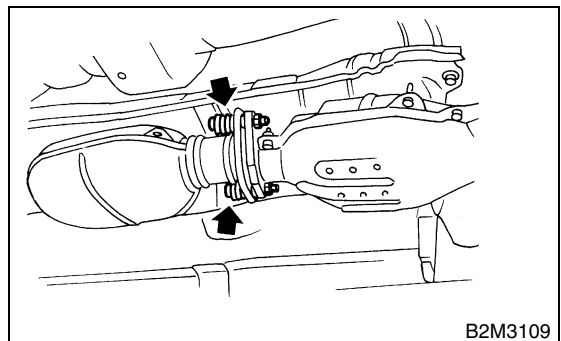
48 N·m (4.9 kgf·m, 35.4 ft·lb)



4) Install the 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.

MUFFLER

EXHAUST

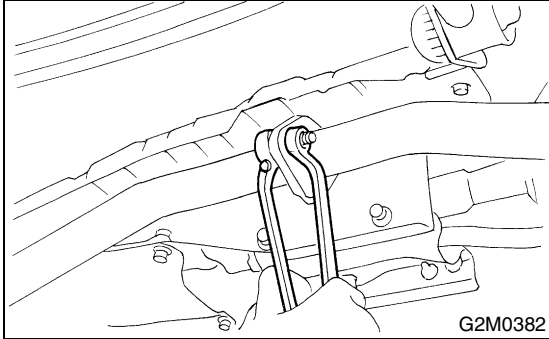
5. Muffler

A: REMOVAL

1) Separate the muffler from rear exhaust pipe.

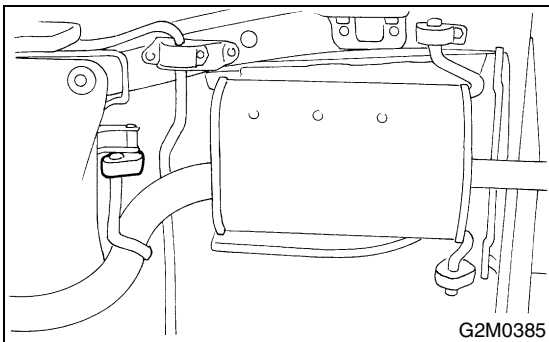
CAUTION:

Be careful, the exhaust pipe is hot.



2) Apply a coat of SUBARU CRC to mating area of the cushion rubbers in advance.

SUBARU CRC (Part No. 004301003)



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

B: INSTALLATION

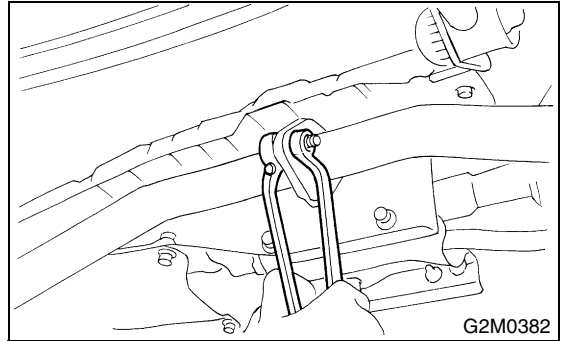
1) Install in the reverse order of removal.

NOTE:

Replace the gasket with a new one.

Tightening torque:

48 N·m (4.9 kgf-m, 35.4 ft-lb)



C: INSPECTION

1) Make sure there are no exhaust leaks from connections and welds.

2) Make sure there are no holes or rusting.

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

COOLING

CO

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GENERAL DESCRIPTION

COOLING

1. General Description

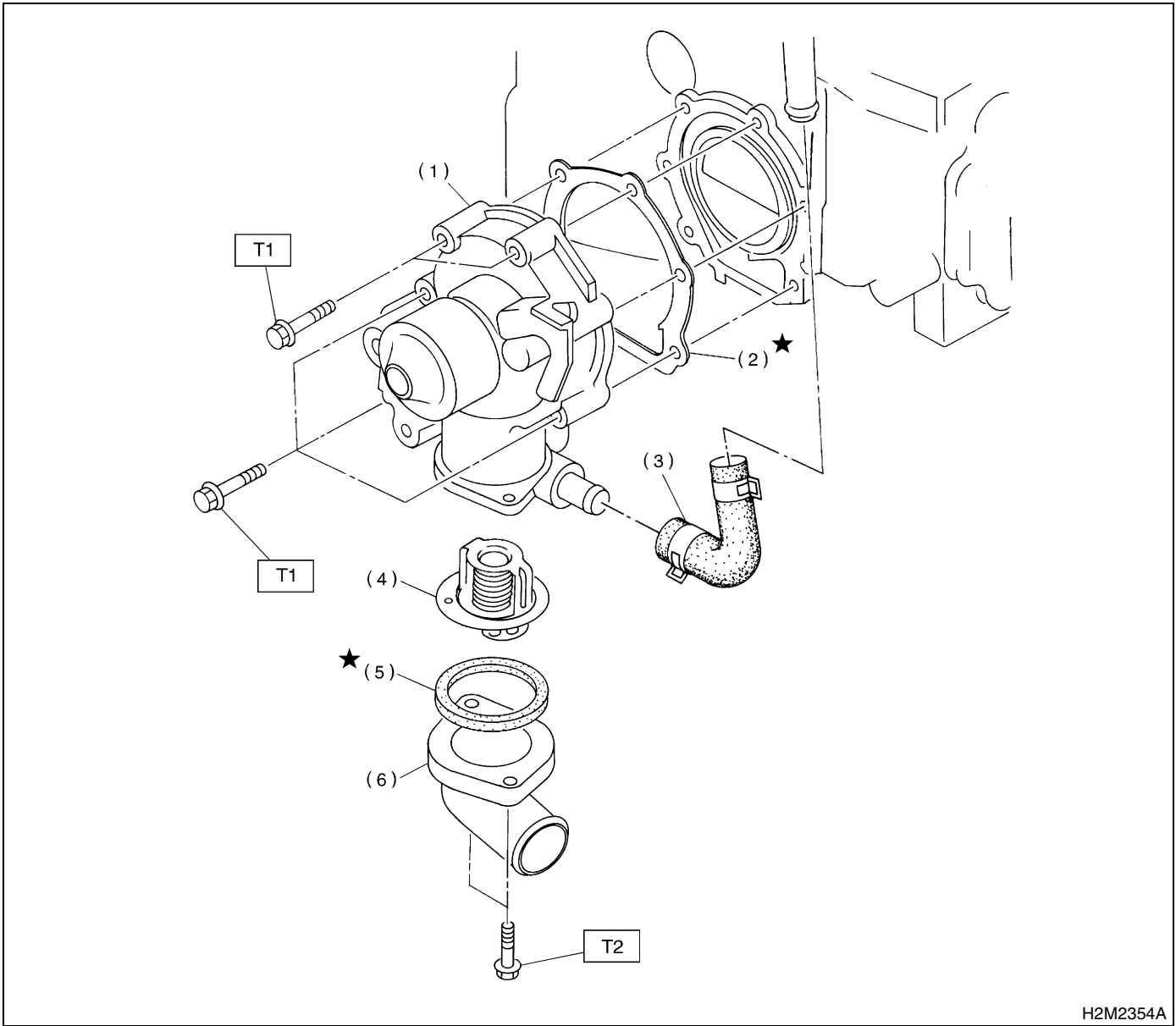
A: SPECIFICATIONS

Model		Non-turbo	Turbo	
Cooling system		Electric fan + Forced engine coolant circulation system		
Total engine coolant capacity \varnothing (US qt, Imp qt)		1.6 L AT: Approx. 7.3 (7.71, 6.42) 1.6 L MT: Approx. 7.4 (7.82, 6.51) 2.0 and 2.5 L AT: Approx. 6.9 (7.29, 6.07) 2.0 and 2.5 L MT: Approx. 7 (7.4, 6.2)	AT: Approx. 7.6 (8.03, 6.69) MT: Approx. 7.7 (8.14, 6.78)	
Water pump	Type	Centrifugal impeller type		
	Discharge performance I	Discharge	20 \varnothing (5.3 US gal, 4.4 Imp gal)/min.	
		Pump speed—total engine coolant head	760 rpm — 0.3 mAq (1.0 ftAq)	
		Engine coolant temperature	85°C (185°F)	
	Discharge performance II	Discharge	100 \varnothing (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 \varnothing (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 \times Blade		320 mm (11.81 in) \times 5 (main fan) 320 mm (11.81 in) \times 7 (sub fan)	
Radiator	Type	Down flow, pressure type		
	Core dimensions	691.5 \times 340 \times 16 mm (27.22 \times 13.39 \times 0.63 in)	AT: 691.5 \times 340 \times 16 mm (27.22 \times 13.39 \times 0.63 in) MT: 691.5 \times 340 \times 27 mm (27.22 \times 13.39 \times 1.06 in)	
	Pressure range in which cap valve is open	Above: 108 \pm 15 kPa (1.1 \pm 0.15 kg/cm ² , 16 \pm 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 \varnothing (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)

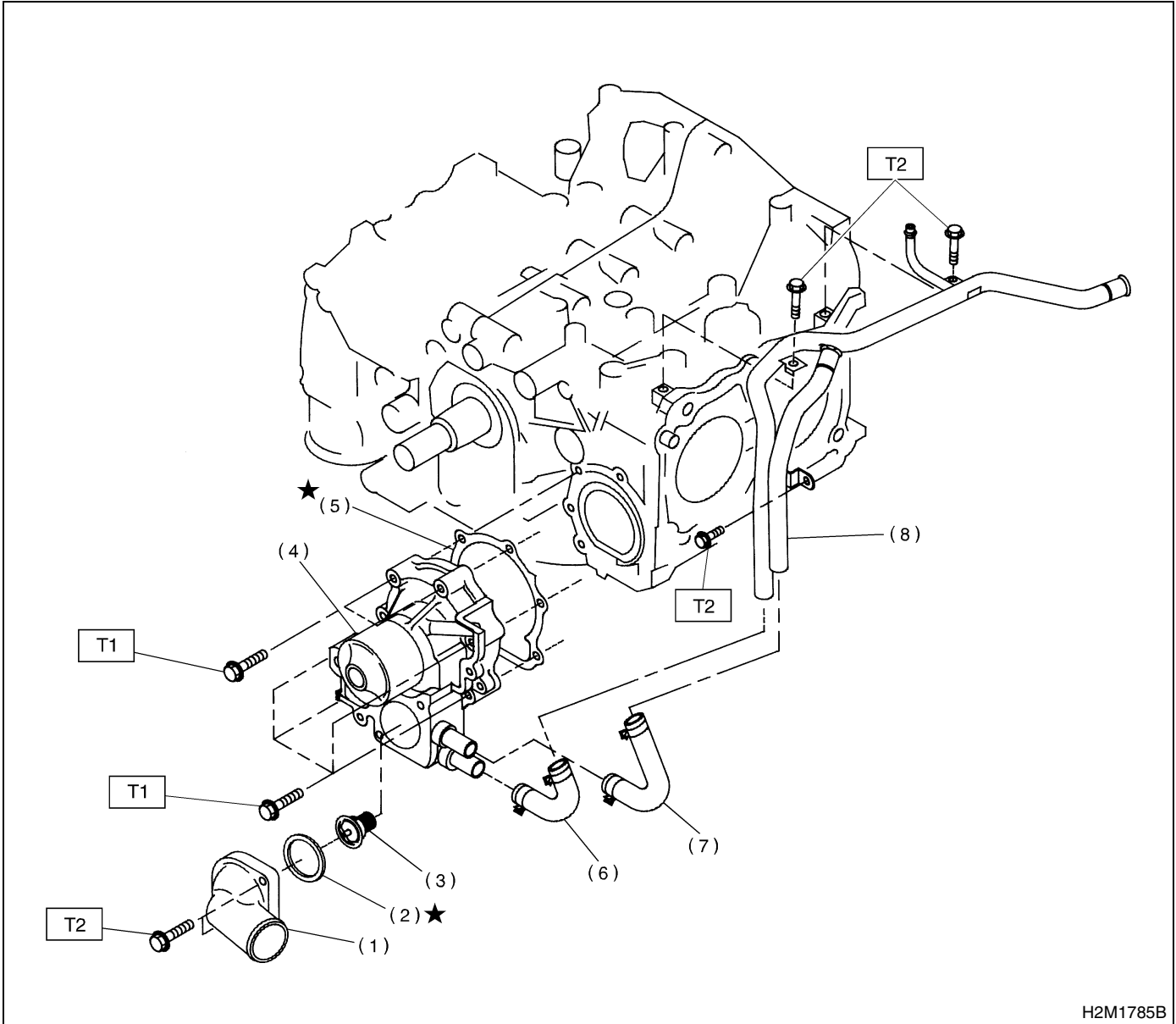
**T1: First 12 (1.2, 8.7)
Second 12 (1.2, 8.7)**

T2: 6.4 (0.65, 4.7)

GENERAL DESCRIPTION

COOLING

• TURBO MODEL



- | | |
|----------------------|--------------------------------------|
| (1) Thermostat cover | (6) Heater by-pass hose |
| (2) Gasket | (7) Coolant filler tank by-pass hose |
| (3) Thermostat | (8) Water by-pass pipe |
| (4) Water pump ASSY | |
| (5) Gasket | |

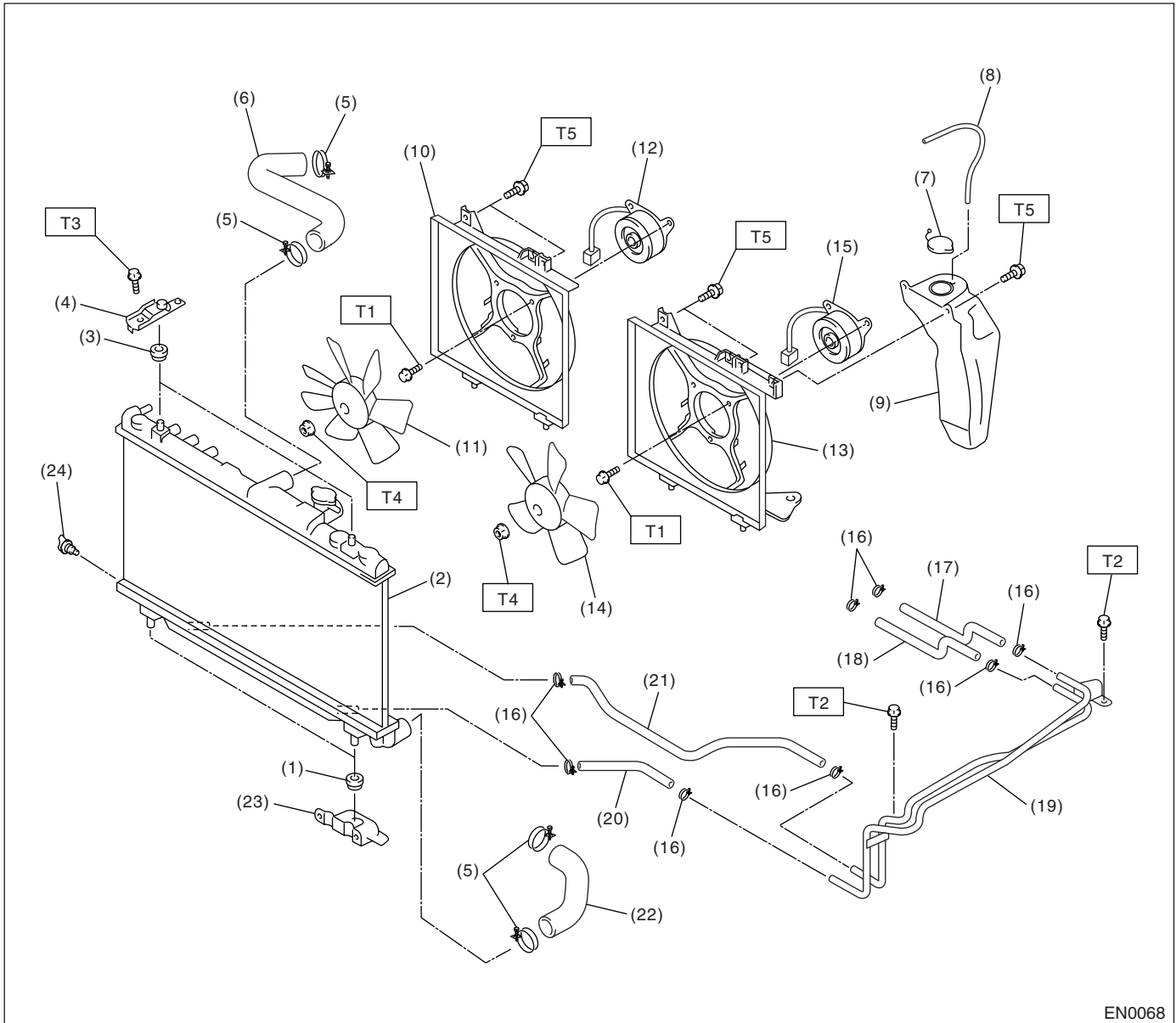
Tightening torque: N·m (kgf·m, ft·lb)

**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 | (14) Radiator main fan | (22) Radiator outlet hose |
| (2) Radiator | (15) Radiator main fan motor | (23) Radiator lower bracket |
| (3) Radiator upper cushion | (16) ATF hose clamp (AT vehicles only) | (24) Radiator drain plug |
| (4) Radiator upper bracket | (17) ATF inlet hose A (AT vehicles only) | |
| (5) Clamp | (18) ATF outlet hose A (AT vehicles only) | |
| (6) Radiator inlet hose | (19) ATF pipe (AT vehicles only) | |
| (7) Engine coolant reservoir tank cap | (20) ATF inlet hose B (AT vehicles only) | |
| (8) Over flow hose | (21) ATF outlet hose B (AT vehicles only) | |
| (9) Engine coolant reservoir tank | | |
| (10) Radiator sub fan shroud | | |
| (11) Radiator sub fan | | |
| (12) Radiator sub fan motor | | |
| (13) Radiator main fan shroud | | |

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)

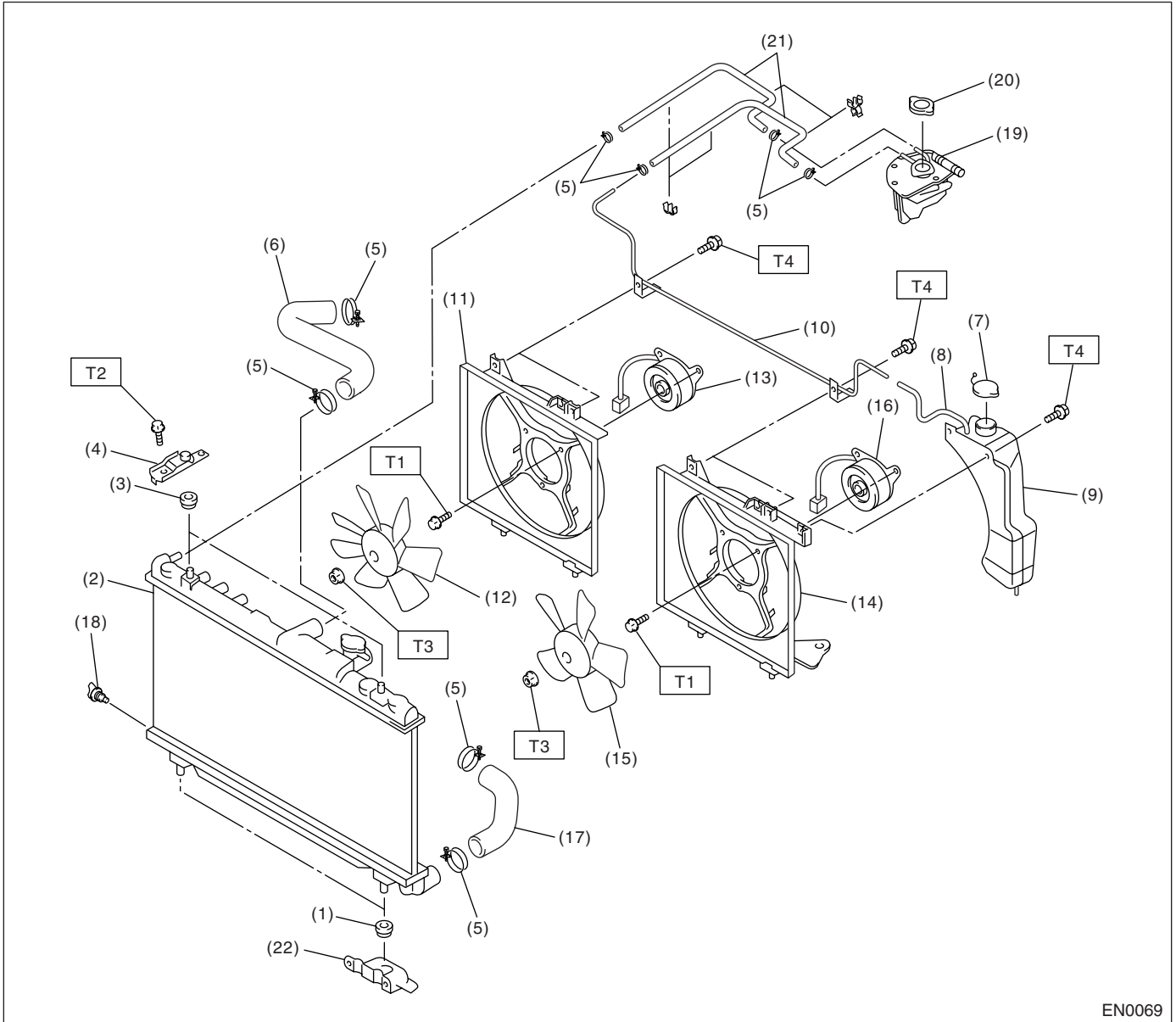
T4: 3.4 (0.35, 2.5)

T5: 4.9 (0.50, 3.6)

GENERAL DESCRIPTION

COOLING

• TURBO MODEL



EN0069

(1) Radiator lower cushion	(10) Over flow pipe	(19) Engine coolant filler tank
(2) Radiator	(11) Radiator sub fan shroud	(20) Engine coolant filler tank cap
(3) Radiator upper cushion	(12) Radiator sub fan	(21) Engine coolant hose
(4) Radiator upper bracket	(13) Radiator sub fan motor	(22) Radiator lower bracket
(5) Clamp	(14) Radiator 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	

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

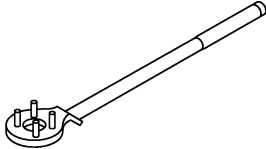
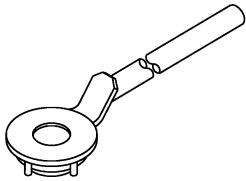
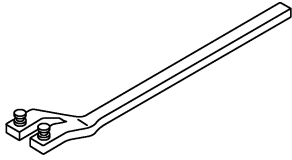
- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation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

GENERAL DESCRIPTION

COOLING

D: PREPARATION TOOL

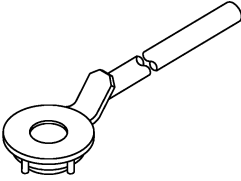
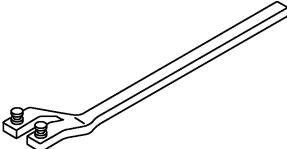
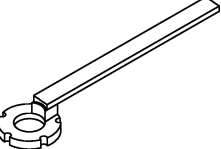
1. NON-TURBO MODEL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: right;">B2M3870</p>	499977100	CRANK PULLEY WRENCH	Used for stopping crankshaft pulley when loosening and tightening crankshaft pulley bolts. (2500 cc model)
 <p style="text-align: right;">B2M4157</p>	499977300	CRANK PULLEY WRENCH	Used for stopping crankshaft pulley when loosening and tightening crankshaft pulley bolts. (1600 cc and 2000 cc model)
 <p style="text-align: right;">B2M3859</p>	18231AA010 (Newly adopted tool)	CAMSHAFT SPROCKET WRENCH	<ul style="list-style-type: none"> • Used for removing and installing camshaft sprocket. • Also the CAMSHAFT SPROCKET WRENCH (499207100) can be used. <p>NOTE: For common use with turbo model, this ST is changed and registered as a newly adopted tool. Though the previous ST also can be used.</p>

GENERAL DESCRIPTION

COOLING

2. TURBO MODEL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: right;">B2M4157</p>	499977300	CRANK PULLEY WRENCH	Used for stopping crankshaft pulley when loosening and tightening crankshaft pulley bolts.
 <p style="text-align: right;">B2M3859</p>	18231AA010 (Newly adopted tool)	CAMSHAFT SPROCKET WRENCH	Used for removing and installing camshaft sprocket. (Intake)
 <p style="text-align: right;">B2M4158</p>	499207400	CAMSHAFT SPROCKET WRENCH	Used for removing and installing camshaft sprocket. (Exhaust)

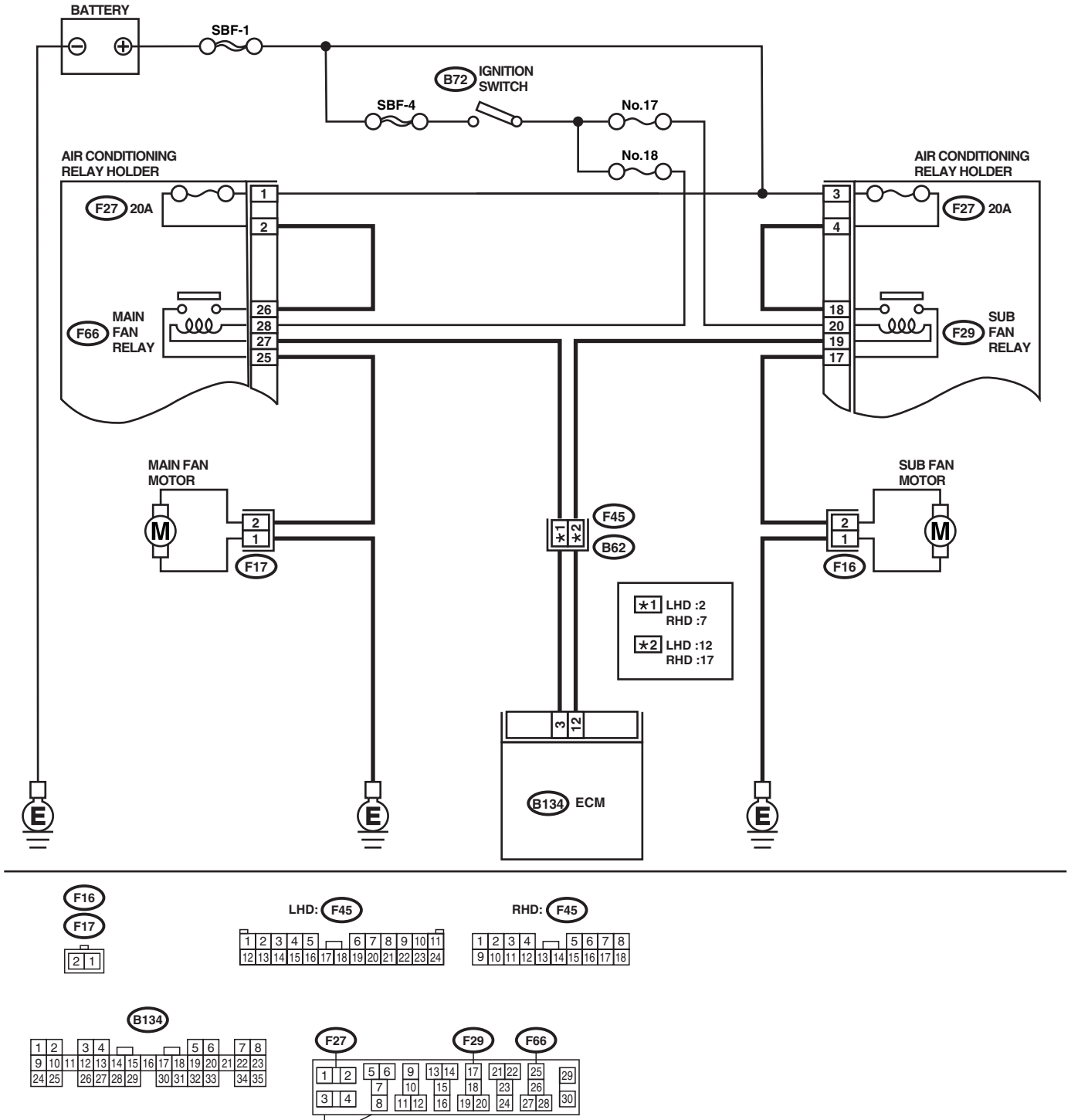
RADIATOR MAIN FAN SYSTEM

COOLING

2. Radiator Main Fan System

A: SCHEMATIC

1. NON-TURBO MODEL

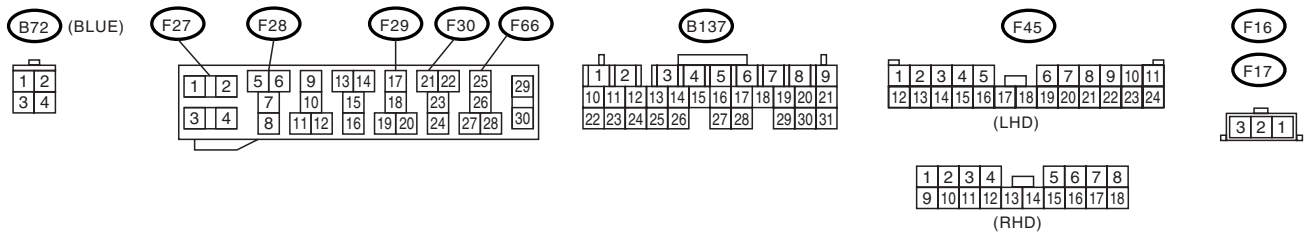
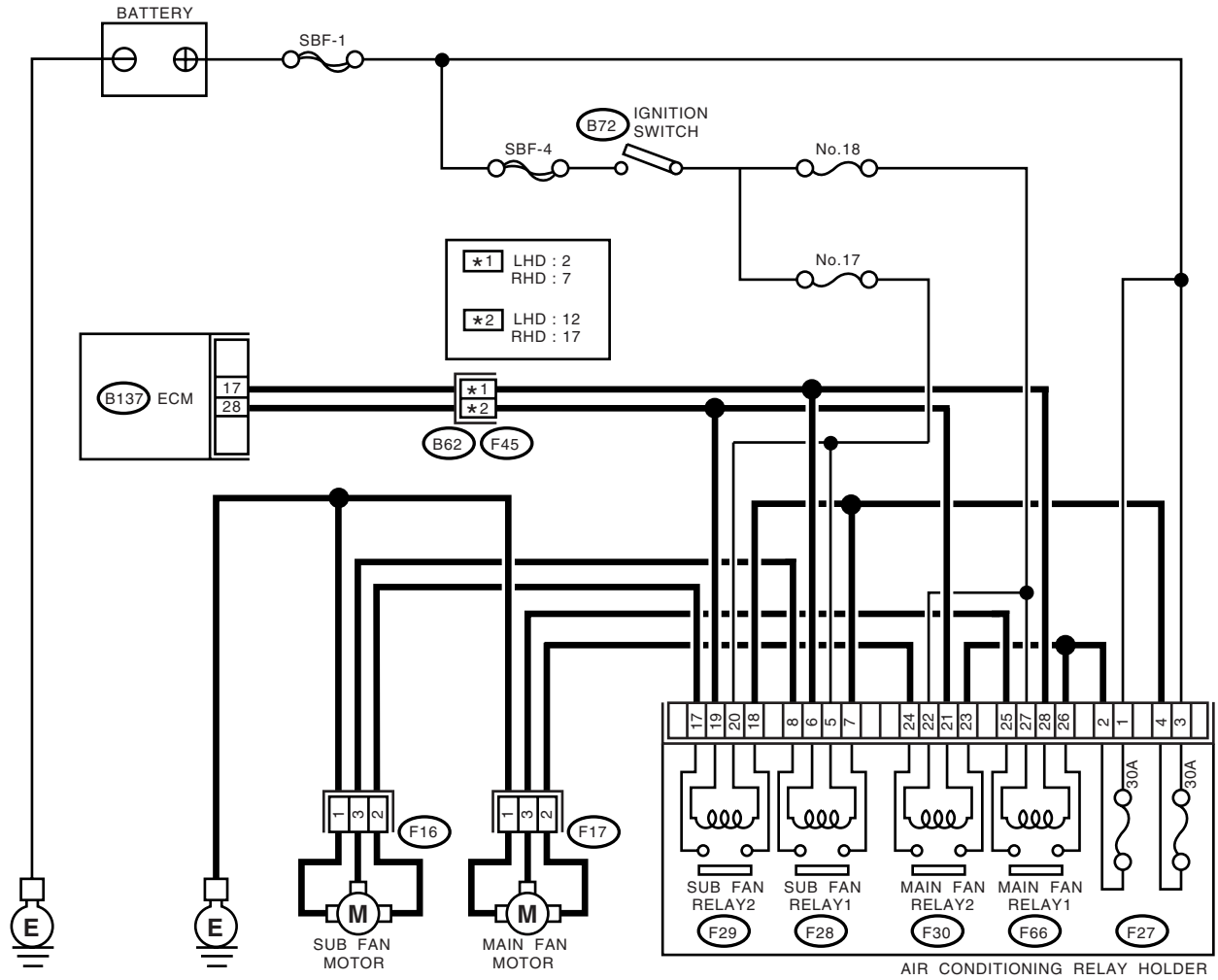


EN1413

RADIATOR MAIN FAN SYSTEM

COOLING

2. TURBO MODEL



EN0260

RADIATOR MAIN FAN SYSTEM

COOLING

B: INSPECTION

1. NON-TURBO MODEL

DETECTING 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	<p>CHECK POWER SUPPLY TO MAIN FAN MOTOR.</p> <p>CAUTION: Be careful not to overheat the engine during repair.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the 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 the voltage between main fan motor connector and chassis ground.</p> <p>Connector & terminal (F17) No. 2 (+) — Chassis ground (-):</p>	Is the voltage more than 10 V?	Go to step 2.	Go to step 5.
2	<p>CHECK GROUND CIRCUIT OF MAIN FAN MOTOR.</p> <p>1) Turn the ignition switch to OFF. 2) Measure the resistance between main fan motor connector and chassis ground.</p> <p>Connector & terminal (F17) No. 1 — Chassis ground:</p>	Is the resistance less than 5 Ω?	Go to step 3.	Repair the open circuit in harness between main fan motor connector and chassis ground.
3	<p>CHECK POOR CONTACT.</p> <p>Check poor contact in main fan motor connector.</p>	Is there poor contact in main fan motor connector?	Repair the poor contact in main fan motor connector.	Go to step 4.
4	<p>CHECK MAIN FAN MOTOR.</p> <p>Connect the battery positive (+) terminal to terminal No. 2, and ground (-) terminal to terminal No. 1 of main fan motor connector.</p>	Does the main fan rotate?	Repair the poor contact in main fan motor connector.	Replace the main fan motor with a new one.
5	<p>CHECK POWER SUPPLY TO MAIN FAN RELAY.</p> <p>1) Turn the ignition switch to OFF. 2) Remove the main fan relay from A/C relay holder. 3) Measure the voltage between main fan relay terminal and chassis ground.</p> <p>Connector & terminal (F66) No. 26 (+) — Chassis ground (-):</p>	Is the voltage more than 10 V?	Go to step 6.	Go to step 7.
6	<p>CHECK POWER SUPPLY TO MAIN FAN RELAY.</p> <p>1) Turn the ignition switch to ON. 2) Measure the voltage between main fan relay terminal and chassis ground.</p> <p>Connector & terminal (F66) No. 28 (+) — Chassis ground (-):</p>	Is the voltage more than 10 V?	Go to step 10.	Go to step 9.

RADIATOR MAIN FAN SYSTEM

COOLING

Step	Check	Yes	No
7 CHECK 20 A FUSE. 1)Remove the 20 A fuse from A/C relay holder. 2)Check the condition of fuse.	Is the fuse blown-out?	Replace the fuse.	Go to step 8 .
8 CHECK POWER SUPPLY TO A/C RELAY HOLDER 20 A FUSE TERMINAL. Measure the voltage of harness between A/C relay holder 20 A fuse terminal and chassis ground. <i>Connector & terminal</i> <i>(F27) No. 1 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Repair the open circuit in harness between 20 A fuse and main fan relay terminal.	Repair the open circuit in harness between main fuse box connector and 20 A fuse terminal.
9 CHECK FUSE. 1)Turn the ignition switch to OFF. 2)Remove the fuse No. 18 from joint box. 3)Check the condition of fuse.	Is the fuse blown-out?	Replace the fuse.	Repair the open circuit in harness between main fan relay and ignition switch.
10 CHECK MAIN FAN RELAY. 1)Turn the ignition switch to OFF. 2)Remove the main fan relay. 3)Measure the resistance of main fan relay. <i>Terminal</i> <i>No. 26 — No. 25:</i>	Is the resistance more than 1 M Ω ?	Go to step 11 .	Replace the main fan relay.
11 CHECK MAIN FAN RELAY. 1)Connect the battery to terminals No. 27 and No. 28 of main fan relay. 2)Measure the resistance of main fan relay. <i>Terminal</i> <i>No. 26 — No. 25:</i>	Is the resistance less than 1 Ω ?	Go to step 12 .	Replace the main fan relay.
12 CHECK HARNESS BETWEEN MAIN FAN RELAY TERMINAL AND MAIN FAN MOTOR CONNECTOR. Measure the resistance of harness between main fan motor connector and main fan relay terminal. <i>Connector & terminal</i> <i>(F17) No. 2 — (F66) No. 25:</i>	Is the resistance less than 1 Ω ?	Go to step 13 .	Repair the 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 the ignition switch to OFF. 2)Disconnect the connector from ECM. 3)Measure the resistance of harness between main fan relay connector and ECM connector. <i>Connector & terminal</i> <i>(F66) No. 27 — (B134) No. 3:</i>	Is the resistance less than 1 Ω ?	Go to step 14 .	Repair the 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 the poor contact connector.	Contact with your Subaru distributor service.

NOTE:

Inspection by your Subaru distributor is required, because probable cause is deterioration of multiple parts.

RADIATOR MAIN FAN SYSTEM

COOLING

2. TURBO MODEL

DETECTING 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 the engine during repair. 1)Turn the ignition switch to OFF. 2)Disconnect the 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 the 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 the ignition switch to OFF. 2)Measure the 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 the 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 the poor contact in main fan motor connector.	Go to step 6.
6 CHECK MAIN FAN MOTOR. Connect the battery positive (+) terminal to terminal No. 3, and ground (-) terminal to terminal No. 1 of main fan motor connector.	Does the main fan rotate?	Repair the poor contact in main fan motor connector.	Replace the main fan motor with a new one.

RADIATOR MAIN FAN SYSTEM

COOLING

Step	Check	Yes	No
<p>7 CHECK POWER SUPPLY TO MAIN FAN RELAY1. 1) Turn the ignition switch to OFF. 2) Remove the main fan relay1 from A/C relay holder. 3) Measure the voltage between main fan relay1 terminal and chassis ground. Connector & terminal (F66) No. 26 (+) — Chassis ground (-):</p>	Is the voltage more than 10 V?	Go to step 8.	Go to step 9.
<p>8 CHECK POWER SUPPLY TO MAIN FAN RELAY1. 1) Turn the ignition switch to ON. 2) Measure the voltage between main fan relay1 terminal and chassis ground. Connector & terminal (F66) No. 27 (+) — Chassis ground (-):</p>	Is the voltage more than 10 V?	Go to step 12.	Go to step 11.
<p>9 CHECK 30 A FUSE. 1) Remove the 30 A fuse from A/C relay holder. 2) Check the condition of fuse.</p>	Is the fuse blown-out?	Replace the fuse.	Go to step 10.
<p>10 CHECK POWER SUPPLY TO A/C RELAY HOLDER 30 A FUSE TERMINAL. Measure the voltage of harness between A/C relay holder 30 A fuse terminal and chassis ground. Connector & terminal (F27) No. 1 (+) — Chassis ground (-):</p>	Is the voltage more than 10 V?	Repair the open circuit in harness between 30 A fuse and main fan relay terminal.	Repair the open circuit in harness between main fuse box connector and 30 A fuse terminal.
<p>11 CHECK FUSE. 1) Turn the ignition switch to OFF. 2) Remove the fuse No. 18 from joint box. 3) Check the condition of fuse.</p>	Is the fuse blown-out?	Replace the fuse.	Repair the open circuit in harness between main fan relay and ignition switch.
<p>12 CHECK MAIN FAN RELAY. 1) Turn the ignition switch to OFF. 2) Remove the main fan relay1. 3) Measure the resistance of main fan relay1. Terminal No. 26 — No. 25:</p>	Is the resistance more than 1 M Ω ?	Go to step 13.	Replace the main fan relay.
<p>13 CHECK MAIN FAN RELAY. 1) Connect the battery to terminals No. 27 and No. 28 of main fan relay1. 2) Measure the resistance of main fan relay1. Terminal No. 26 — No. 25:</p>	Is the resistance less than 1 Ω ?	Go to step 14.	Replace the main fan relay.
<p>14 CHECK HARNESS BETWEEN MAIN FAN RELAY TERMINAL AND MAIN FAN MOTOR CONNECTOR. Measure the resistance of harness between main fan motor connector and main fan relay terminal. Connector & terminal (F17) No. 3 — (F66) No. 25:</p>	Is the resistance less than 1 Ω ?	Go to step 15.	Repair the open circuit in harness between main fan motor connector and main fan relay terminal.
<p>15 CHECK HARNESS BETWEEN MAIN FAN RELAY AND ECM. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between main fan relay connector and ECM connector. Connector & terminal (F66) No. 28 — (B137) No. 17:</p>	Is the resistance less than 1 Ω ?	Go to step 16.	Repair the open circuit in harness between main fan relay and ECM.

RADIATOR MAIN FAN SYSTEM

COOLING

Step	Check	Yes	No
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 the poor contact connector.	Contact with your Subaru distributor service.
17 CHECK POWER SUPPLY TO MAIN FAN MOTOR. CAUTION: Be careful not to overheat the engine during repair. 1)Turn the ignition switch to OFF. 2)Disconnect the 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 the voltage while A/C compressor is rotating. 6)Measure the 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 the poor contact in main fan motor connector.	Go to step 19.
19 CHECK MAIN FAN MOTOR. Connect the battery positive (+) terminal to terminal No. 2, and ground (-) terminal to terminal No. 1 of main fan motor connector.	Does the main fan rotate?	Repair the poor contact in main fan motor connector.	Replace the main fan motor with a new one.
20 CHECK POWER SUPPLY TO MAIN FAN RELAY2. 1)Turn the ignition switch to OFF. 2)Remove the main fan relay2 from A/C relay holder. 3)Measure the 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 the ignition switch to ON. 2)Measure the 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 the 30 A fuse from A/C relay holder. 2)Check the condition of fuse.	Is the fuse blown-out?	Replace the fuse.	Go to step 23.
23 CHECK POWER SUPPLY TO A/C RELAY HOLDER 30 A FUSE TERMINAL. Measure the 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 the open circuit in harness between 30 A fuse and main fan relay terminal.	Repair the open circuit in harness between main fuse box connector and 30 A fuse terminal.
24 CHECK FUSE. 1)Turn the ignition switch to OFF. 2)Remove the fuse No. 18 from joint box. 3)Check the condition of fuse.	Is the fuse blown-out?	Replace the fuse.	Repair the 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 the ignition switch to OFF. 2) Remove the main fan relay. 3) Measure the resistance of main fan relay. <i>Terminal</i> <i>No. 23 — No. 24:</i>	Is the resistance more than 1 MΩ?	Go to step 26.	Replace the main fan relay.
26 CHECK MAIN FAN RELAY. 1) Connect the battery to terminals No. 21 and No. 22 of main fan relay. 2) Measure the resistance of main fan relay. <i>Terminal</i> <i>No. 23 — No. 24:</i>	Is the resistance less than 1 Ω?	Go to step 27.	Replace the main fan relay.
27 CHECK HARNESS BETWEEN MAIN FAN RELAY TERMINAL AND MAIN FAN MOTOR CONNECTOR. Measure the resistance of harness between main fan motor connector and main fan relay terminal. <i>Connector & terminal</i> <i>(F17) No. 2 — (F66) No. 24:</i>	Is the resistance less than 1 Ω?	Go to step 28.	Repair the 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 the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between main fan relay connector and ECM connector. <i>Connector & terminal</i> <i>(F30) No. 21 — (B134) No. 28:</i>	Is the resistance less than 1 Ω?	Go to step 29.	Repair the 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 the poor contact connector.	Contact with your Subaru distributor service.

NOTE:

Inspection by your Subaru distributor is required, because probable cause is deterioration of multiple parts.

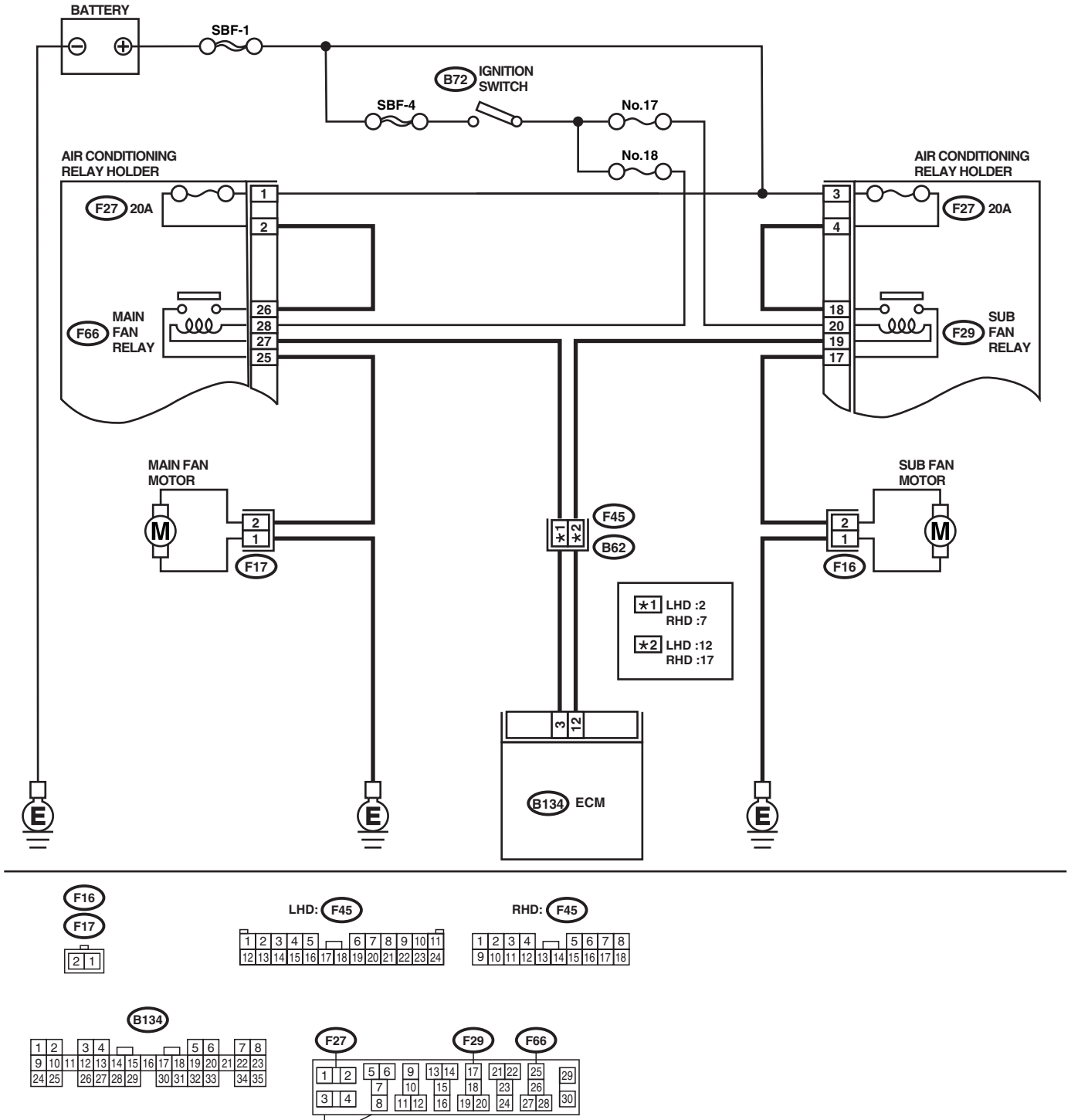
RADIATOR SUB FAN SYSTEM

COOLING

3. Radiator Sub Fan System

A: SCHEMATIC

1. NON-TURBO MODEL

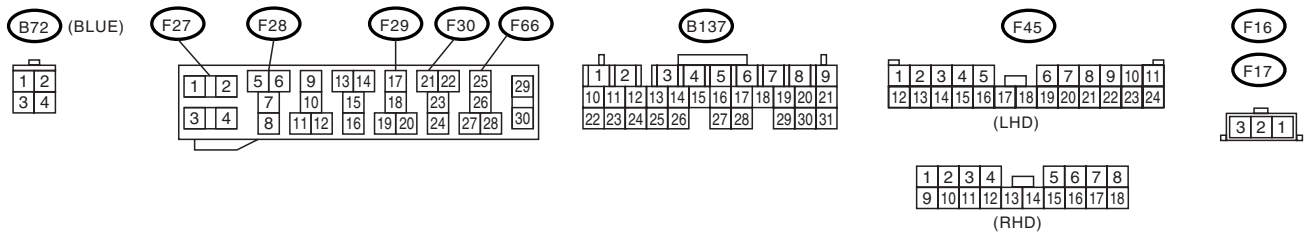
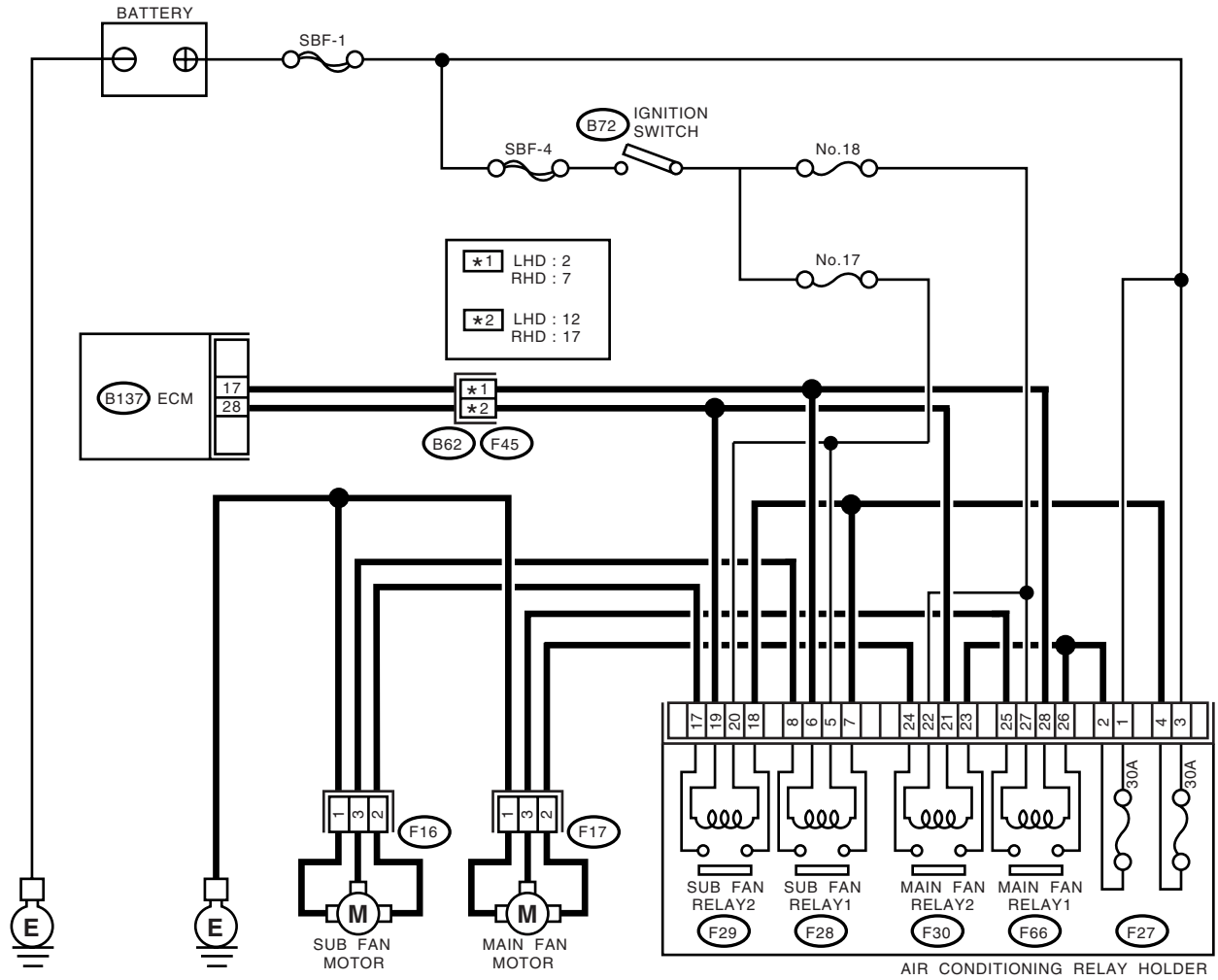


EN1413

RADIATOR SUB FAN SYSTEM

COOLING

2. TURBO MODEL



EN0260

RADIATOR SUB FAN SYSTEM

COOLING

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 the engine during repair. 1) Turn the ignition switch to OFF. 2) Disconnect the 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 the 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 the ignition switch to OFF. 2) Measure the 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 the 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 the poor contact in sub fan motor connector.	Go to step 4.
4 CHECK SUB FAN MOTOR. Connect the battery positive (+) terminal to terminal No. 2, and ground (-) terminal to terminal No. 1 of sub fan motor connector.	Does the sub fan rotate?	Repair the poor contact in sub fan motor connector.	Replace the sub fan motor with a new one.
5 CHECK POWER SUPPLY TO SUB FAN RELAY. 1) Turn the ignition switch to OFF. 2) Remove the sub fan relay from A/C relay holder. 3) Measure the voltage between sub fan relay terminal and chassis ground. Connector & terminal (F29) No. 18 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 6.	Go to step 7.

RADIATOR SUB FAN SYSTEM

COOLING

Step	Check	Yes	No
6 CHECK POWER SUPPLY TO SUB FAN RELAY. 1) Turn the ignition switch to ON. 2) Measure the voltage between sub fan relay terminal and chassis ground. <i>Connector & terminal</i> <i>(F29) No. 20 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Go to step 10.	Go to step 9.
7 CHECK 20 A FUSE. 1) Remove the 20 A fuse from A/C relay holder. 2) Check the condition of fuse.	Is the fuse blown-out?	Replace the fuse.	Go to step 8.
8 CHECK POWER SUPPLY TO A/C RELAY HOLDER 20 A FUSE TERMINAL. Measure the voltage of harness between A/C relay holder 20 A fuse terminal and chassis ground. <i>Connector & terminal</i> <i>(F27) No. 3 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Repair the open circuit in harness between 20 A fuse and sub fan relay terminal.	Repair the open circuit in harness between main fuse box connector and 20 A fuse terminal.
9 CHECK FUSE. 1) Turn the ignition switch to OFF. 2) Remove the fuse No. 17 from joint box. 3) Check the condition of fuse.	Is the fuse blown-out?	Replace the fuse.	Repair the open circuit in harness between sub fan relay and ignition switch.
10 CHECK SUB FAN RELAY. 1) Turn the ignition switch to OFF. 2) Measure the resistance of sub fan relay. <i>Terminal</i> <i>No. 17 — No. 18:</i>	Is the resistance more than 1 M Ω ?	Go to step 11.	Replace the sub fan relay.
11 CHECK SUB FAN RELAY. 1) Connect the battery to terminals No. 20 and No. 19 of sub fan relay. 2) Measure the resistance of sub fan relay. <i>Terminal</i> <i>No. 17 — No. 18:</i>	Is the resistance less than 1 Ω ?	Go to step 12.	Replace the sub fan relay.
12 CHECK HARNESS BETWEEN SUB FAN RELAY TERMINAL AND SUB FAN MOTOR CONNECTOR. Measure the resistance of harness between sub fan motor connector and sub fan relay terminal. <i>Connector & terminal</i> <i>(F16) No. 2 — (F29) No. 17:</i>	Is the resistance less than 1 Ω ?	Go to step 13.	Repair the open circuit in harness between sub fan motor and sub fan relay connector.
13 CHECK HARNESS BETWEEN SUB FAN RELAY AND ECM. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between sub fan relay connector and ECM connector. <i>Connector & terminal</i> <i>(F29) No. 19 — (B134) No. 12:</i>	Is the resistance less than 1 Ω ?	Go to step 14.	Repair the 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 the poor contact connector.	Contact with your Subaru distributor service.

NOTE:

Inspection by your Subaru distributor is required, because probable cause is deterioration of multiple parts.

RADIATOR SUB FAN SYSTEM

COOLING

2. TURBO MODEL

DETECTING 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 the engine during repair. 1)Turn the ignition switch to OFF. 2)Disconnect the 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 the 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 the ignition switch to OFF. 2)Measure the 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 the 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 the poor contact in sub fan motor connector.	Go to step 6.
6 CHECK MAIN FAN MOTOR. Connect the battery positive (+) terminal to terminal No. 3, and ground (-) terminal to terminal No. 1 of sub fan motor connector.	Does the main fan rotate?	Repair the poor contact in sub fan motor connector.	Replace the sub fan motor with a new one.

RADIATOR SUB FAN SYSTEM

COOLING

Step	Check	Yes	No
7 CHECK POWER SUPPLY TO SUB FAN RELAY1. 1)Turn the ignition switch to OFF. 2)Remove the sub fan relay1 from A/C relay holder. 3)Measure the voltage between sub fan relay1 terminal and chassis ground. <i>Connector & terminal</i> <i>(F28) No. 7 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Go to step 8.	Go to step 9.
8 CHECK POWER SUPPLY TO SUB FAN RELAY1. 1)Turn the ignition switch to ON. 2)Measure the voltage between sub fan relay1 terminal and chassis ground. <i>Connector & terminal</i> <i>(F28) No. 5 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Go to step 12.	Go to step 11.
9 CHECK 30 A FUSE. 1)Remove the 30 A fuse from A/C relay holder. 2)Check the condition of fuse.	Is the fuse blown-out?	Replace the fuse.	Go to step 10.
10 CHECK POWER SUPPLY TO A/C RELAY HOLDER 30 A FUSE TERMINAL. Measure the voltage of harness between A/C relay holder 30 A fuse terminal and chassis ground. <i>Connector & terminal</i> <i>(F27) No. 3 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Repair the open circuit in harness between 30 A fuse and sub fan relay terminal.	Repair the open circuit in harness between sub fuse box connector and 30 A fuse terminal.
11 CHECK FUSE. 1)Turn the ignition switch to OFF. 2)Remove the fuse No. 17 from joint box. 3)Check the condition of fuse.	Is the fuse blown-out?	Replace the fuse.	Repair the open circuit in harness between sub fan relay and ignition switch.
12 CHECK SUB FAN RELAY. 1)Turn the ignition switch to OFF. 2)Remove the main fan relay1. 3)Measure the resistance of sub fan relay1. <i>Terminal</i> <i>No. 7 — No. 8:</i>	Is the resistance more than 1 M Ω ?	Go to step 13.	Replace the sub fan relay.
13 CHECK SUB FAN RELAY. 1)Connect the battery to terminals No. 6 and No. 5 of sub fan relay1. 2)Measure the resistance of sub fan relay. <i>Terminal</i> <i>No. 7 — No. 8:</i>	Is the resistance less than 1 Ω ?	Go to step 14.	Replace the sub fan relay.
14 CHECK HARNESS BETWEEN SUB FAN RELAY TERMINAL AND SUB FAN MOTOR CONNECTOR. Measure the resistance of harness between sub fan motor connector and sub fan relay terminal. <i>Connector & terminal</i> <i>(F16) No. 3 — (F28) No. 8:</i>	Is the resistance less than 1 Ω ?	Go to step 15.	Repair the 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 the ignition switch to OFF. 2)Disconnect the connector from ECM. 3)Measure the resistance of harness between sub fan relay connector and ECM connector. <i>Connector & terminal</i> <i>(F28) No. 6 — (B137) No. 17:</i>	Is the resistance less than 1 Ω ?	Go to step 16.	Repair the open circuit in harness between sub fan relay and ECM.

RADIATOR SUB FAN SYSTEM

COOLING

Step	Check	Yes	No
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 the poor contact connector.	Contact with your Subaru distributor service.
17 CHECK POWER SUPPLY TO SUB FAN MOTOR. CAUTION: Be careful not to overheat the engine during repair. 1)Turn the ignition switch to OFF. 2)Disconnect the 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 the voltage while A/C compressor is rotating. 6)Measure the 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 the poor contact in sub fan motor connector.	Go to step 19.
19 CHECK SUB FAN MOTOR. Connect the battery positive (+) terminal to terminal No. 2, and ground (-) terminal to terminal No. 1 of sub fan motor connector.	Does the main fan rotate?	Repair the poor contact in sub fan motor connector.	Replace the sub fan motor with a new one.
20 CHECK POWER SUPPLY TO SUB FAN RELAY2. 1)Turn the ignition switch to OFF. 2)Remove the sub fan relay2 from A/C relay holder. 3)Measure the 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 the ignition switch to ON. 2)Measure the 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 the 30 A fuse from A/C relay holder. 2)Check the condition of fuse.	Is the fuse blown-out?	Replace the fuse.	Go to step 23.
23 CHECK POWER SUPPLY TO A/C RELAY HOLDER 30 A FUSE TERMINAL. Measure the 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 the open circuit in harness between 30 A fuse and sub fan relay terminal.	Repair the open circuit in harness between sub fuse box connector and 30 A fuse terminal.
24 CHECK FUSE. 1)Turn the ignition switch to OFF. 2)Remove the fuse No. 17 from joint box. 3)Check the condition of fuse.	Is the fuse blown-out?	Replace the fuse.	Repair the 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 the ignition switch to OFF. 2) Remove the sub fan relay. 3) Measure the resistance of main fan relay. <i>Terminal</i> <i>No. 18 — No. 17:</i>	Is the resistance more than 1 MΩ?	Go to step 26.	Replace the sub fan relay.
26 CHECK MAIN FAN RELAY. 1) Connect the battery to terminals No. 19 and No. 20 of sub fan relay. 2) Measure the resistance of main fan relay. <i>Terminal</i> <i>No. 18 — No. 17:</i>	Is the resistance less than 1 Ω?	Go to step 27.	Replace the sub fan relay.
27 CHECK HARNESS BETWEEN SUB FAN RELAY TERMINAL AND SUB FAN MOTOR CONNECTOR. Measure the resistance of harness between sub fan motor connector and sub fan relay terminal. <i>Connector & terminal</i> <i>(F16) No. 2 — (F29) No. 17:</i>	Is the resistance less than 1 Ω?	Go to step 28.	Repair the 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 the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between sub fan relay connector and ECM connector. <i>Connector & terminal</i> <i>(F29) No. 19 — (B137) No. 28:</i>	Is the resistance less than 1 Ω?	Go to step 29.	Repair the 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 the poor contact connector.	Contact with your Subaru distributor service.

NOTE:

Inspection by your Subaru distributor is required, because probable cause is deterioration of multiple parts.

4. Engine Coolant

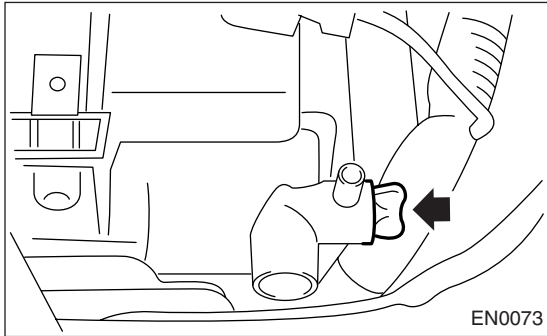
A: REPLACEMENT

1. DRAINING OF ENGINE COOLANT

- 1) Lift-up the vehicle.
- 2) Remove the under cover.
- 3) Remove the drain cock to drain engine coolant into container.

NOTE:

Remove the radiator cap so that engine coolant will drain faster.



2. FILLING OF ENGINE COOLANT

- 1) Fill engine coolant into the radiator up to filler neck position.

Coolant capacity (fill up to "FULL" level):

1.6 L AT model

Approx. 7.3 ℓ (7.71 US qt, 6.42 Imp qt)

1.6 L MT model

Approx. 7.4 ℓ (7.82 US qt, 6.51 Imp qt)

Non-turbo 2.0 L and 2.5 L AT model

Approx. 6.9 ℓ (7.29 US qt, 6.07 Imp qt)

Non-turbo 2.0 L and 2.5 L MT model

Approx. 7 ℓ (7.4 US qt, 6.2 Imp qt)

Turbo AT model

Approx. 7.6 ℓ (8.03 US qt, 6.69 Imp qt)

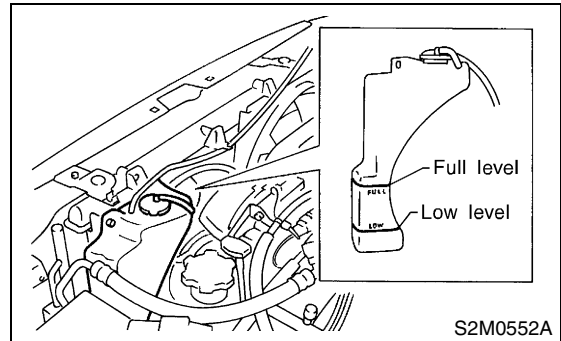
Turbo MT model

Approx. 7.7 ℓ (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 the reservoir tank up to upper level.



- 3) Warm-up the engine completely for more than 5 minutes at 2,000 to 3,000 rpm.
- 4) If the engine coolant level drops in radiator, add engine coolant to filler neck position.
- 5) If the engine coolant level drops from upper level of reservoir tank, add engine coolant to upper level.
- 6) Attach the radiator cap and reservoir tank cap properly.

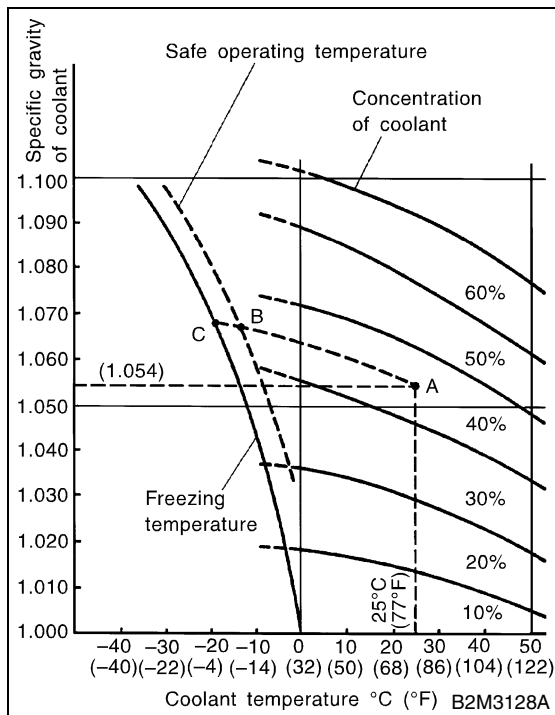
B: INSPECTION

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

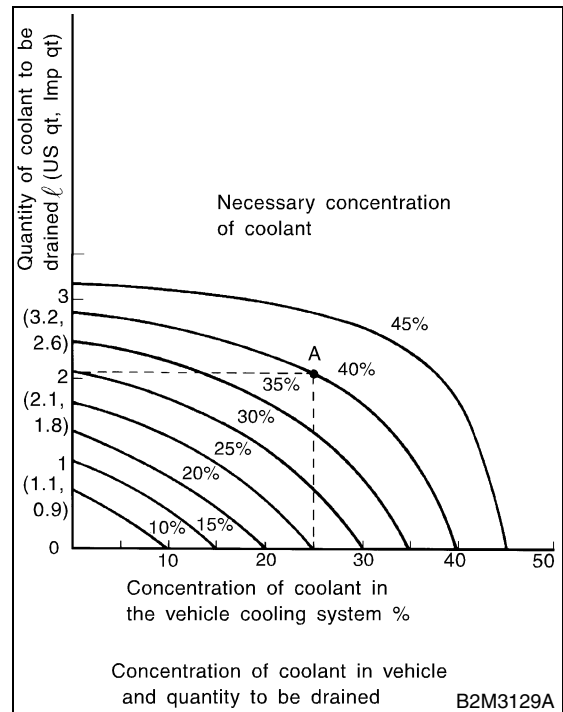
To adjust the concentration of the coolant according to temperature, find the proper fluid concentration in the above diagram and replace the necessary amount of coolant with an undiluted solution of SUBARU genuine coolant (concentration 50%).

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 ℓ (2.2 US qt, 1.8 Imp qt). Drain 2.1 ℓ (2.2 US qt, 1.8 Imp qt) of coolant from the cooling system and add 2.1 ℓ (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.

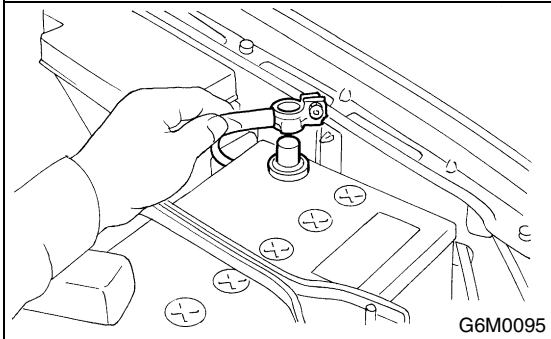


5. Water Pump

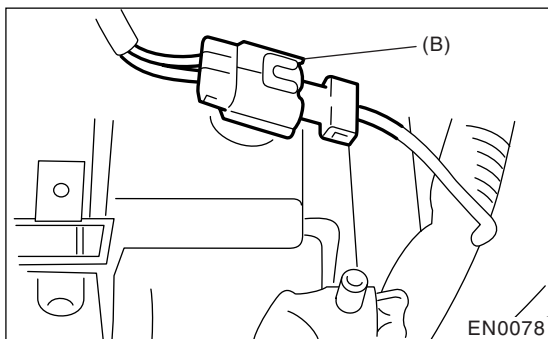
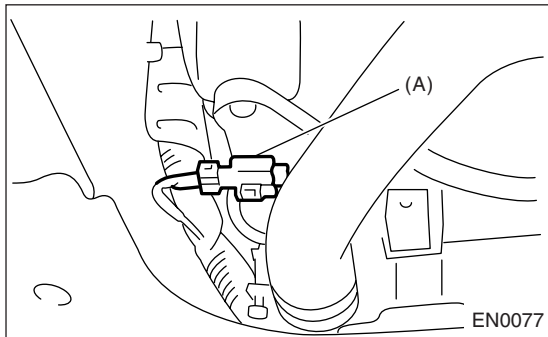
A: REMOVAL

1. NON-TURBO MODEL

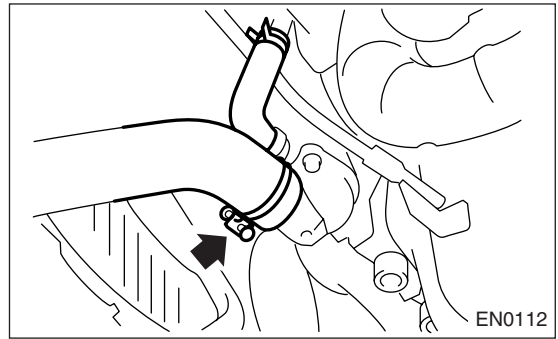
- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from battery.



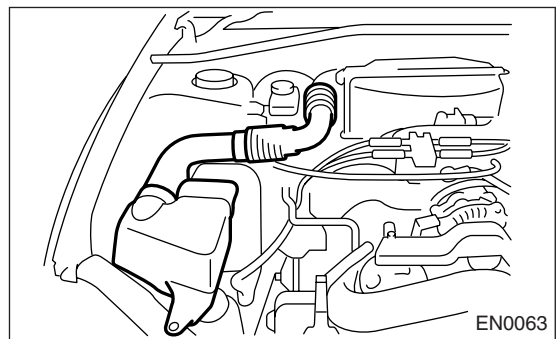
- 3) Lift-up the vehicle.
- 4) Remove the under cover.
- 5) Drain the engine coolant completely.
<Ref. to CO-26, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
- 6) Disconnect the connectors from radiator main fan motor (A) and sub fan motor (B).



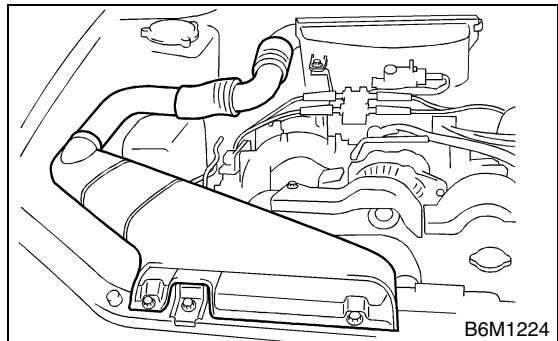
- 7) Disconnect the radiator outlet hose and heater hose from water pump.



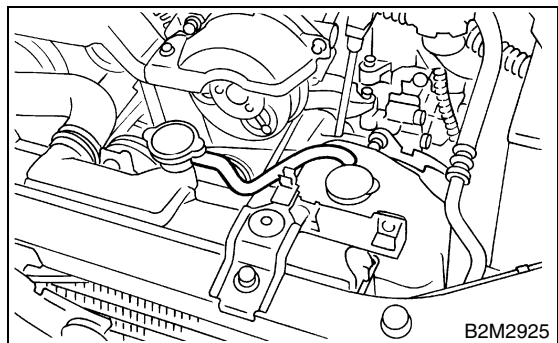
- 8) Lower the vehicle.
- 9) Remove the air intake duct.
 - 1600 cc and 2000 cc MODEL



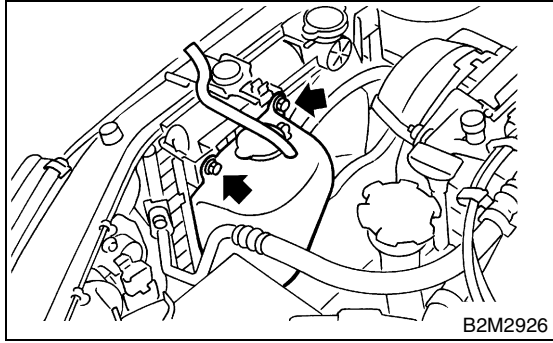
- 2500 cc MODEL



- 10) Disconnect the over flow hose.



11) Remove the reservoir tank.



12) Remove the radiator main fan and sub fan assemblies. <Ref. to CO-48, REMOVAL, Radiator Main Fan and Fan Motor.> and <Ref. to CO-50, REMOVAL, Radiator Sub Fan and Fan Motor.>

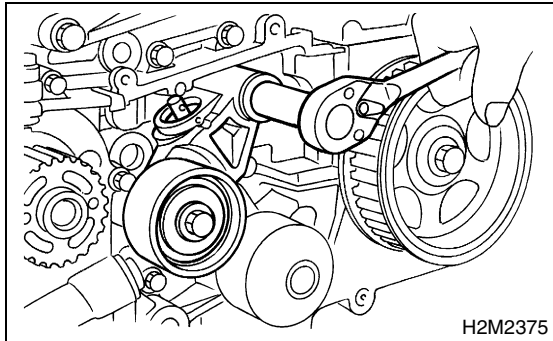
13) Remove the V-belts.

<Ref. to ME-44, REMOVAL, V-belt.>

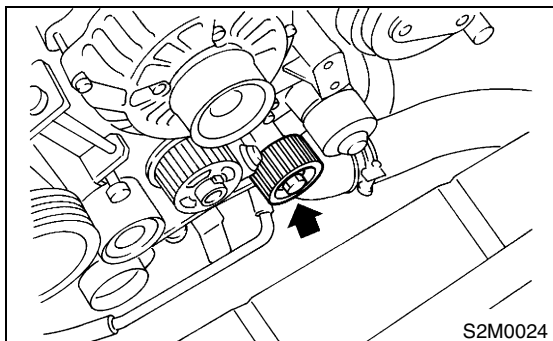
14) Remove the timing belt.

<Ref. to ME-49, TIMING BELT, REMOVAL, Timing Belt Assembly.>

15) Remove the automatic belt tension adjuster.



16) Remove the belt idler No. 2.

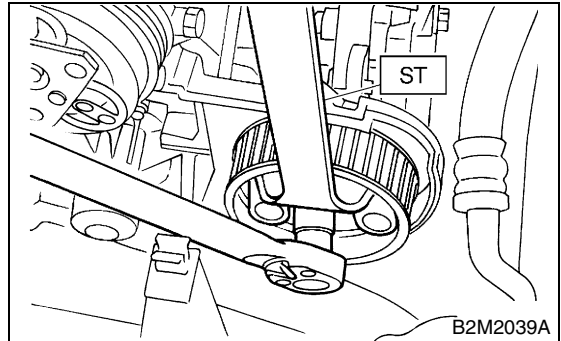


17) Remove the camshaft sprocket (LH) by using ST.

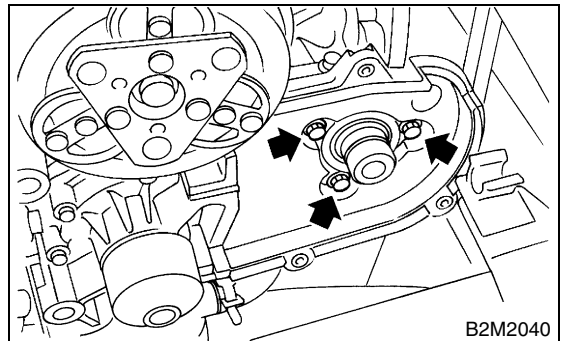
ST 18231AA010 CAMSHAFT SPROCKET WRENCH

NOTE:

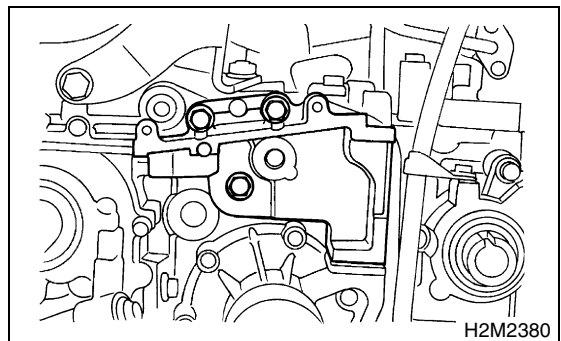
Also the CAMSHAFT SPROCKET WRENCH (499207100) can be used.



18) Remove the belt cover No. 2 (LH).

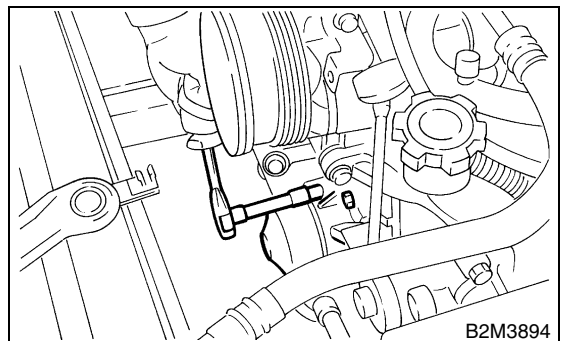


19) Remove the tensioner bracket.



20) Disconnect the heater hose from water pump.

21) Remove the water pump.



WATER PUMP

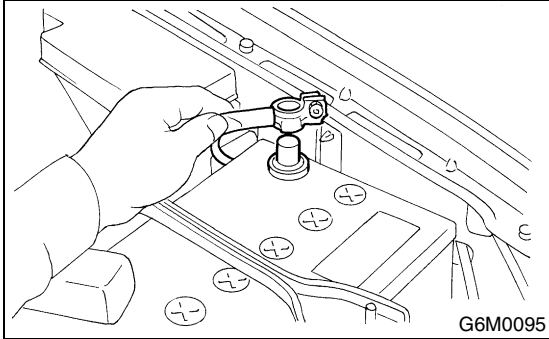
COOLING

2. TURBO MODEL

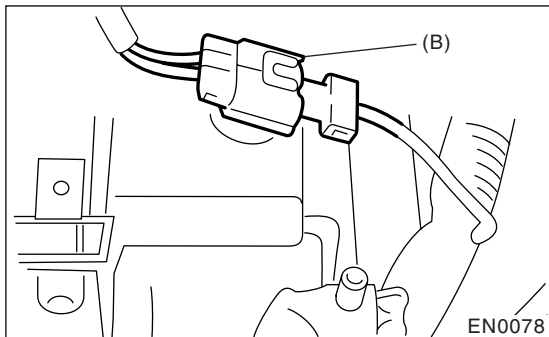
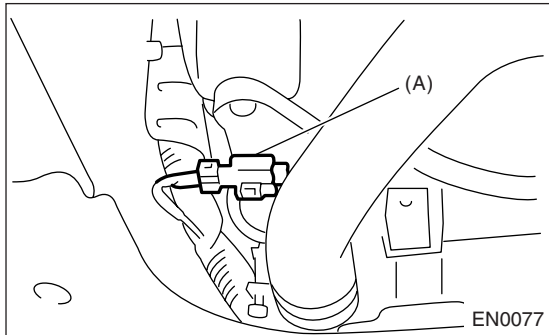
WARNING:

The radiator is pressurized. Wait until the engine cools down before working on the radiator.

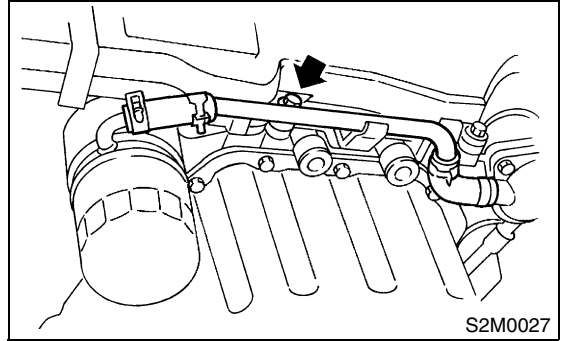
- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from battery.



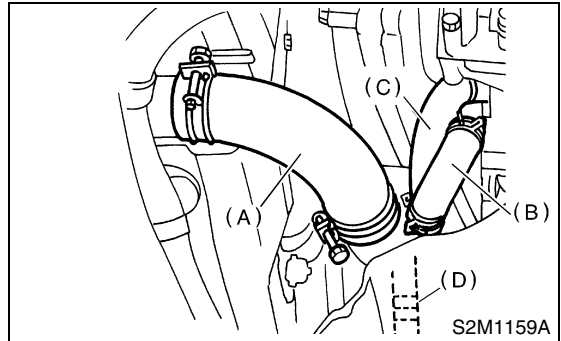
- 3) Lift-up the vehicle.
- 4) Remove the under cover.
- 5) Drain the engine coolant completely. <Ref. to CO-26, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
- 6) Disconnect the connectors of radiator main fan motor (A) and sub fan motor (B).



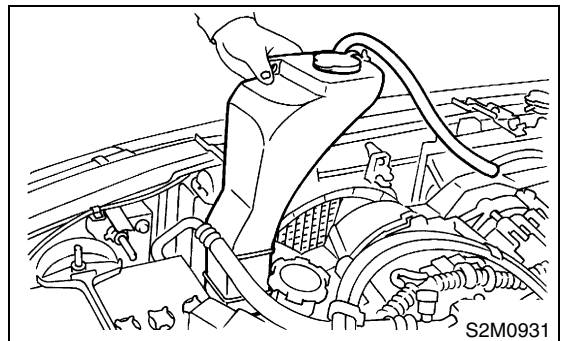
- 7) Remove the bolt which installs water by-pass pipe of oil cooler onto oil pump.



- 8) Disconnect the radiator outlet hose (A) and heater hose (B) from water pump.
- 9) Disconnect the water by-pass hose (C) and oil cooler hose (D).

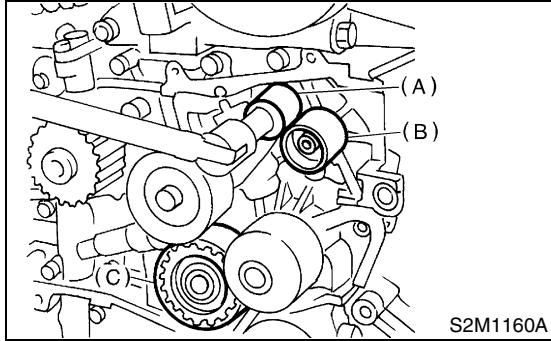


- 10) Lower the vehicle.
- 11) Disconnect the over flow hose.
- 12) Remove the reservoir tank.



- 13) Remove the radiator main fan and sub fan assemblies. <Ref. to CO-48, REMOVAL, Radiator Main Fan and Fan Motor.> and <Ref. to CO-50, REMOVAL, Radiator Sub Fan and Fan Motor.>
- 14) Remove the V-belts. <Ref. to ME(TURBO)-44, REMOVAL, V-belt.>
- 15) Remove the timing belt. <Ref. to ME(TURBO)-48, REMOVAL, Timing Belt Assembly.>
- 16) Remove the automatic belt tension adjuster (A).
- 17) Remove the belt idler (B).

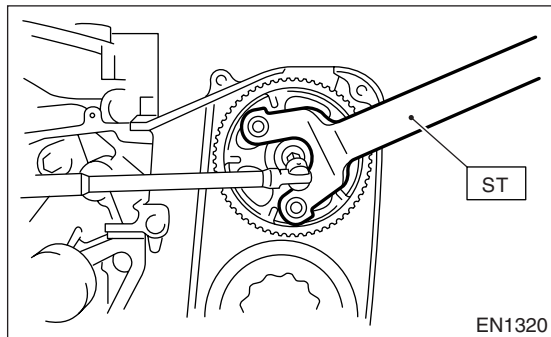
18) Remove the belt idler No. 2 (C).



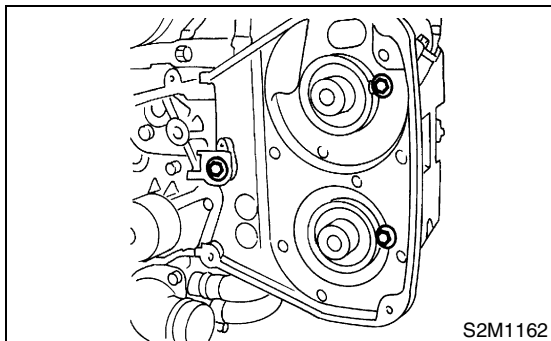
19) Remove the camshaft position sensor. <Ref. to FU(TURBO)-31, REMOVAL, Camshaft Position Sensor.>

20) Remove the camshaft sprockets (LH) by using ST.

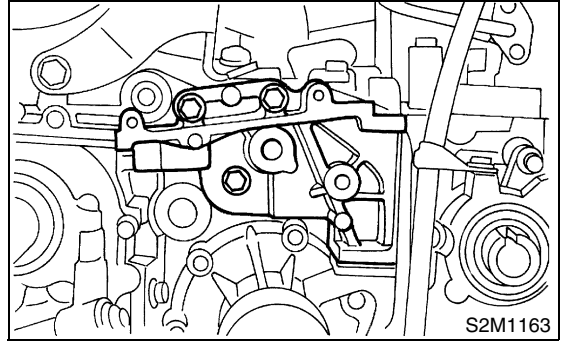
- ST 18231AA010 CAMSHAFT SPROCKET WRENCH (Intake)
- ST 499207400 CAMSHAFT SPROCKET WRENCH (Exhaust)



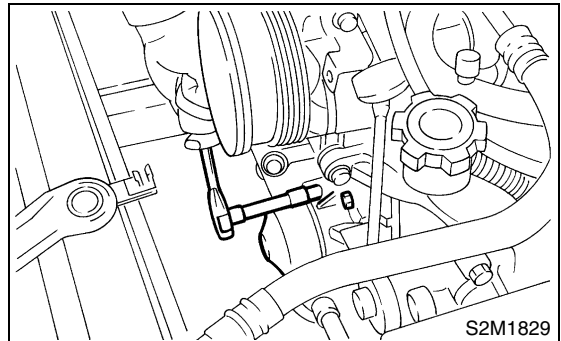
21) Remove the belt cover No. 2 (LH).



22) Remove the tensioner bracket.



23) Disconnect the heater hose from water pump.
24) Remove the water pump.



B: INSTALLATION

1. NON-TURBO MODEL

1) Install water pump onto cylinder head (LH).

NOTE:

- Replace the gasket with a new one.
- When installing the water pump, tighten bolts in two stages in alphabetical sequence as shown in the figure.

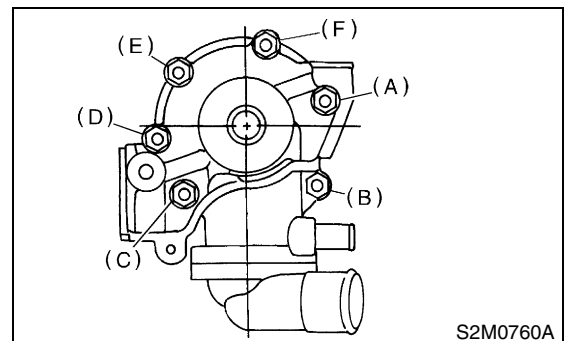
Tightening torque:

First:

12 N·m (1.2 kgf-m, 8.7 ft-lb)

Second:

12 N·m (1.2 kgf-m, 8.7 ft-lb)



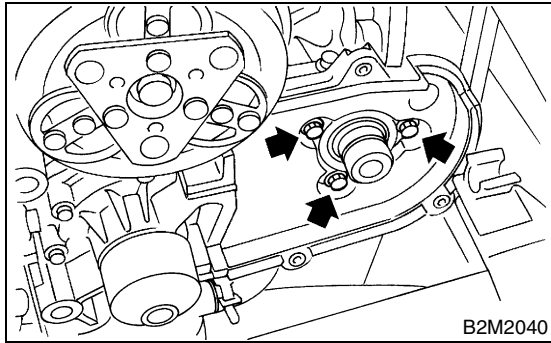
WATER PUMP

COOLING

2) Install the belt cover No. 2 (LH).

Tightening torque:

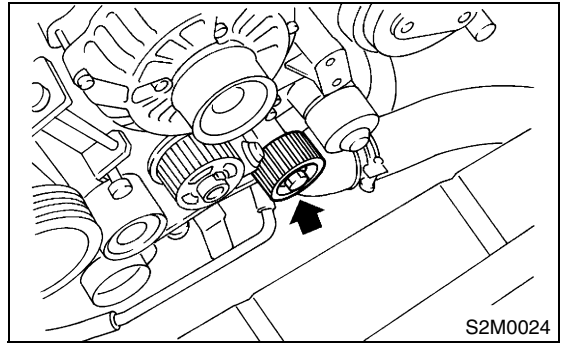
5 N·m (0.5 kgf·m, 3.6 ft·lb)



5) Install the belt idler No. 2.

Tightening torque:

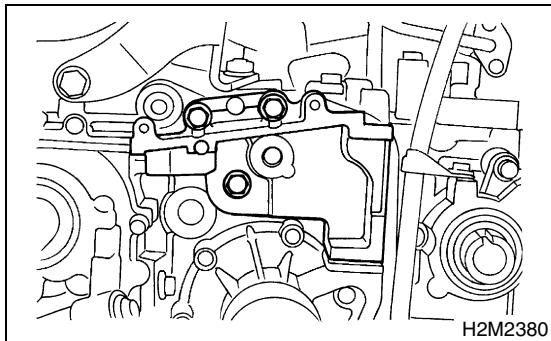
39 N·m (4.0 kgf·m, 28.9 ft·lb)



3) Install the tensioner bracket.

Tightening torque:

25 N·m (2.5 kgf·m, 18.1 ft·lb)



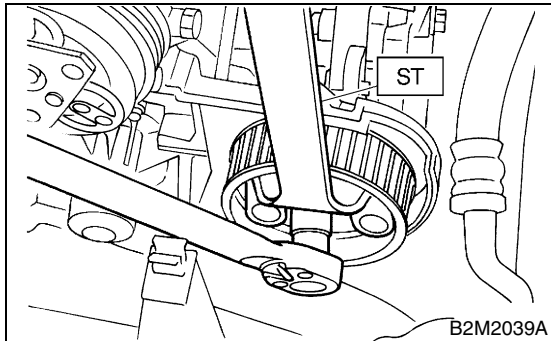
4) Install the camshaft sprockets (LH) by using ST.
ST 18231AA010 CAMSHAFT SPROCKET
WRENCH

NOTE:

Also the CAMSHAFT SPROCKET WRENCH
(499207100) can be used.

Tightening torque:

78 N·m (8.0 kgf·m, 57.9 ft·lb)



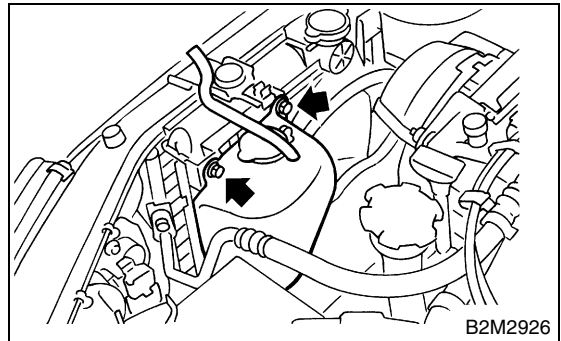
6) Install the automatic belt tension adjuster which tension rod is held with pin. <Ref. to ME-50, AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER, INSTALLATION, Timing Belt Assembly.>

7) Install the timing belt. <Ref. to ME-51, TIMING BELT, INSTALLATION, Timing Belt Assembly.>

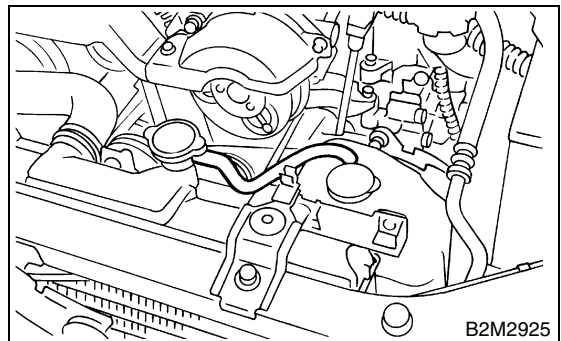
8) Install the V-belts. <Ref. to ME-44, INSTALLATION, V-belt.>

9) Install the radiator main fan and sub fan motor assemblies. <Ref. to CO-49, INSTALLATION, Radiator Main Fan and Fan Motor.> and <Ref. to CO-50, INSTALLATION, Radiator Sub Fan and Fan Motor.>

10) Install the reservoir tank.

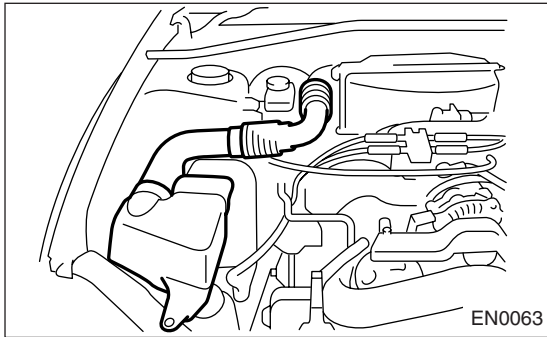


11) Connect the over flow hose.

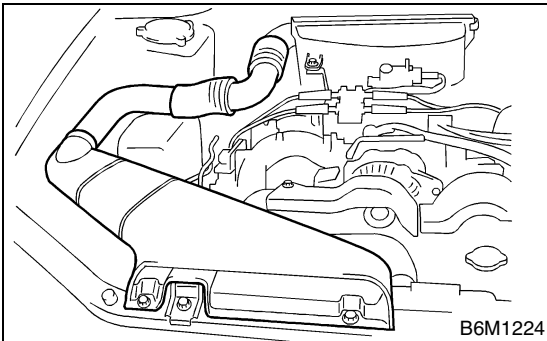


12) Install air intake duct.

- 1600 cc and 2000 cc MODEL

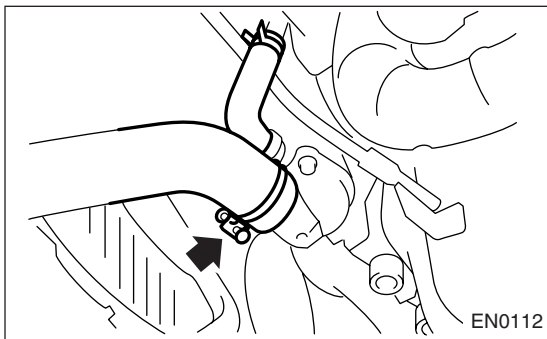


- 2500 cc MODEL

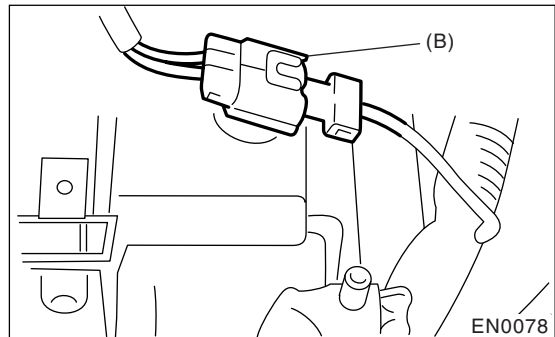
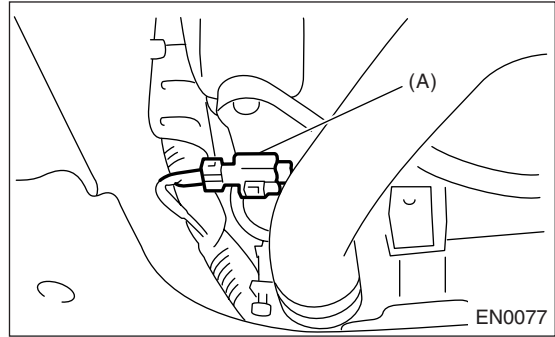


13) Lift-up the vehicle.

14) Connect the radiator outlet hose and heater hose to water pump.



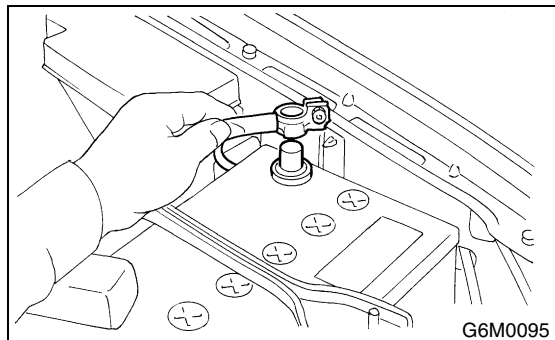
15) Connect the connectors to radiator main fan motor (A) and sub fan motor (B).



16) Install the under cover.

17) Lower the vehicle.

18) Connect the battery ground cable to battery.



19) Fill engine coolant. <Ref. to CO-26, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

WATER PUMP

COOLING

2. TURBO MODEL

1) Install the water pump onto cylinder head (LH).

NOTE:

- Replace the gasket with a new one.
- When installing the water pump, tighten bolts in two stages in alphabetical sequence as shown in the figure.

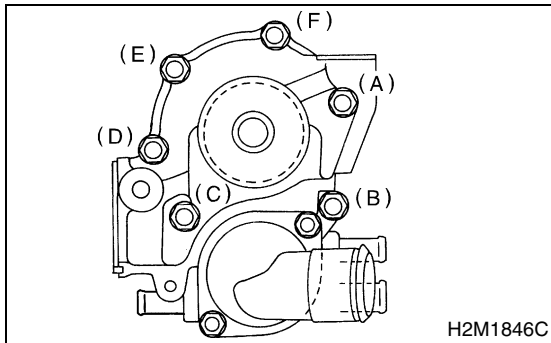
Tightening torque:

First:

12 N·m (1.2 kgf·m, 8.7 ft·lb)

Second:

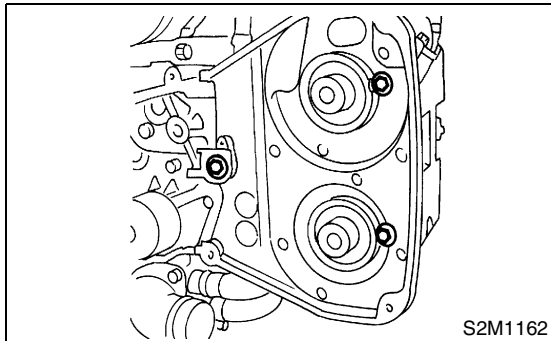
12 N·m (1.2 kgf·m, 8.7 ft·lb)



2) Install the belt cover No. 2 (LH).

Tightening torque:

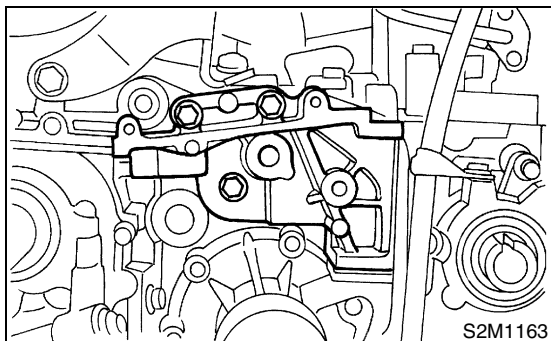
5 N·m (0.5 kgf·m, 3.6 ft·lb)



3) Install the tensioner bracket.

Tightening torque:

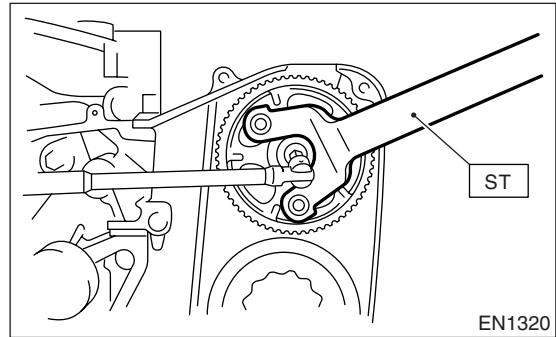
25 N·m (2.5 kgf·m, 18.1 ft·lb)



- 4) Install the camshaft sprockets (LH) by using ST.
- | | |
|---------------|------------------------------------|
| ST 18231AA010 | CAMSHAFT SPROCKET WRENCH (Intake) |
| ST 499207400 | CAMSHAFT SPROCKET WRENCH (Exhaust) |

Tightening torque:

98 N·m (10.0 kgf·m, 72.4 ft·lb)



5) Install the camshaft position sensor. <Ref. to FU(TURBO)-31, INSTALLATION, Camshaft Position Sensor.>

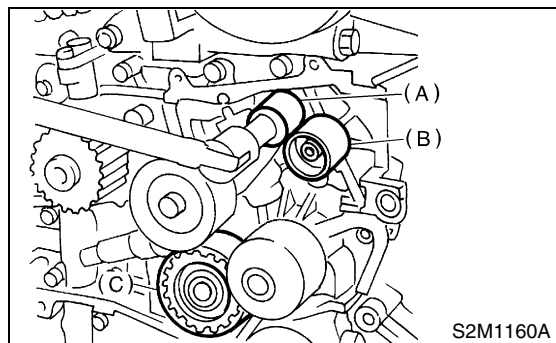
6) Install the belt idler No. 2 (C).

7) Install the belt idler (B).

8) Install the automatic belt tension adjuster (A) which has a tension rod held by a pin. <Ref. to ME(TURBO)-50, 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)

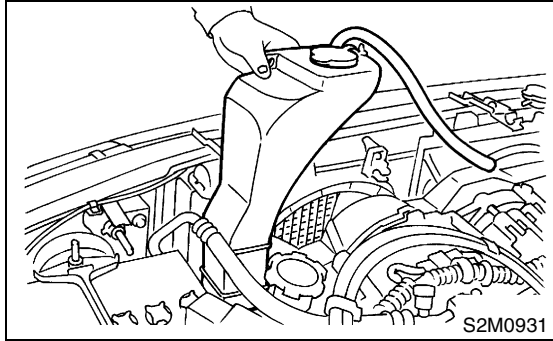


9) Install the timing belt. <Ref. to ME(TURBO)-51, TIMING BELT, INSTALLATION, Timing Belt Assembly.>

10) Install the V-belts. <Ref. to ME(TURBO)-45, INSTALLATION, V-belt.>

11) Install the radiator main fan and sub fan motor assemblies. <Ref. to CO-49, INSTALLATION, Radiator Main Fan and Fan Motor.> and <Ref. to CO-50, INSTALLATION, Radiator Sub Fan and Fan Motor.>

12) Install the reservoir tank.

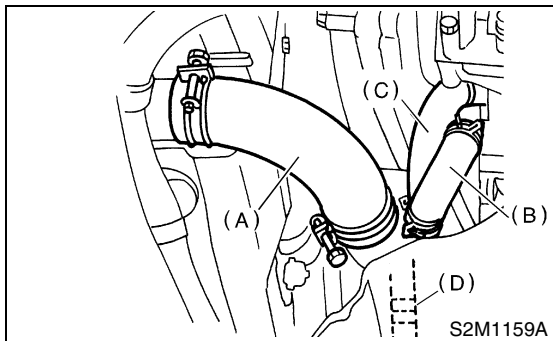


13) Connect the over flow hose.

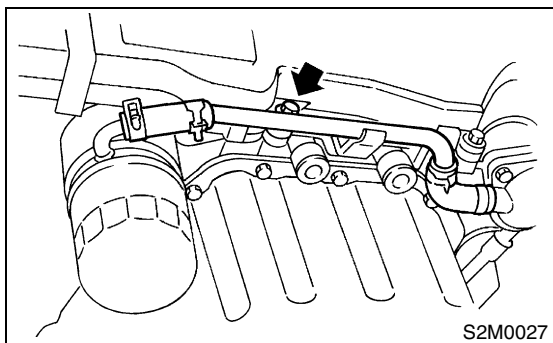
14) Lift-up the vehicle.

15) Connect the radiator outlet hose (A) and heater hose (B) to water pump.

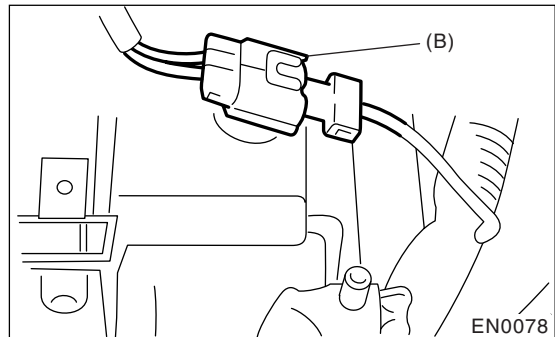
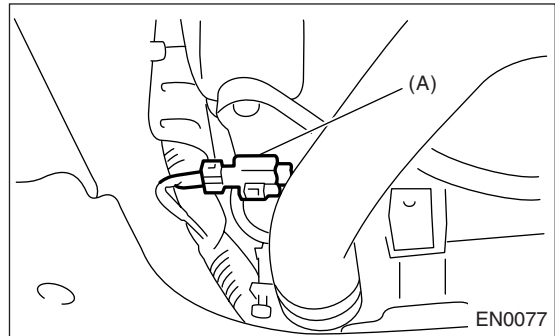
16) Connect the water by-pass hose (C) and oil cooler hose (D).



17) Install the bolt which installs water by-pass pipe onto oil pump.



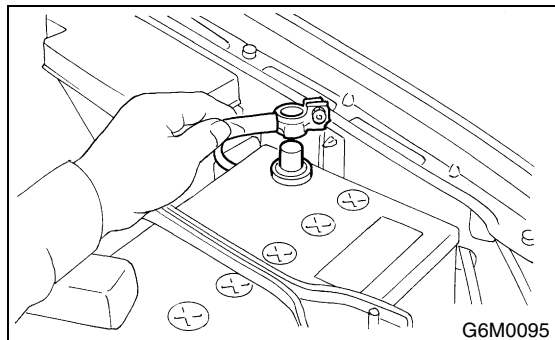
18) Connect the connectors to radiator main fan motor (A) and sub fan motor (B).



19) Install the under cover.

20) Lower the vehicle.

21) Connect the battery ground cable to battery.



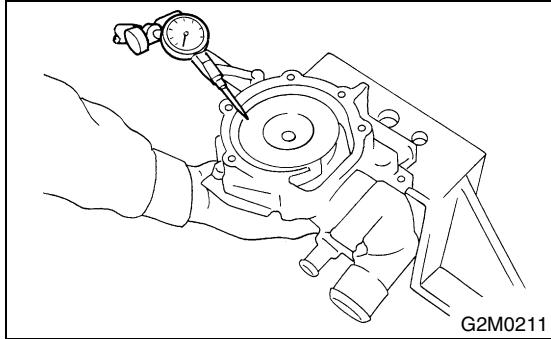
22) Fill engine coolant. <Ref. to CO-26, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

C: INSPECTION

- 1) Check the water pump bearing for smooth rotation.
- 2) Check the water pump pulley for abnormalities.
- 3) Using a dial gauge, measure the impeller runout in thrust direction while rotating the pulley.

“Thrust” runout limit:

0.5 mm (0.020 in)



- 4) Check the clearance between impeller and pump case.

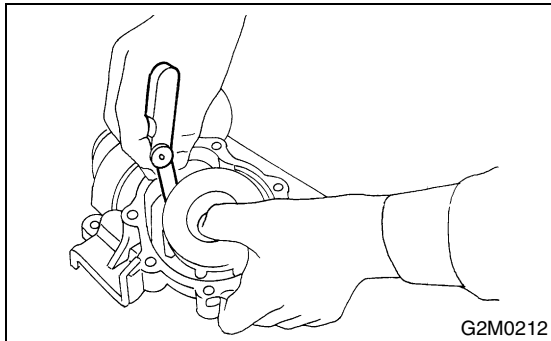
Clearance between impeller and pump case:

Standard

0.5 — 0.7 mm (0.020 — 0.028 in)

Limit

1.0 mm (0.039 in)

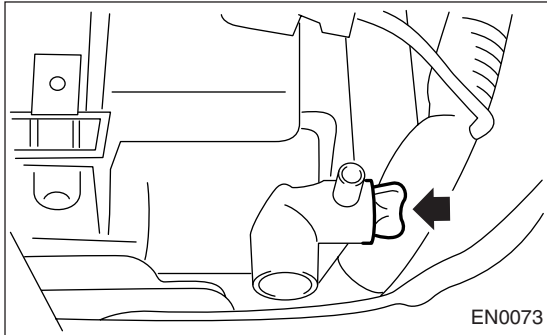


- 5) After water pump installation, check the pulley shaft for engine coolant leaks. If leaks are noted, replace the water pump assembly.

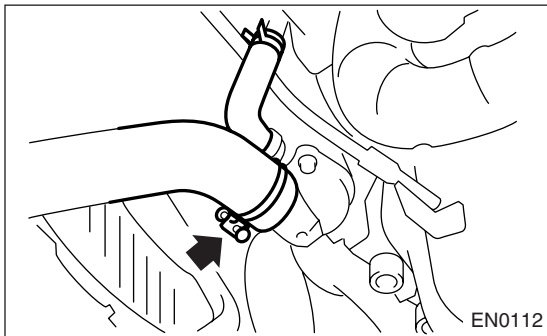
6. Thermostat

A: REMOVAL

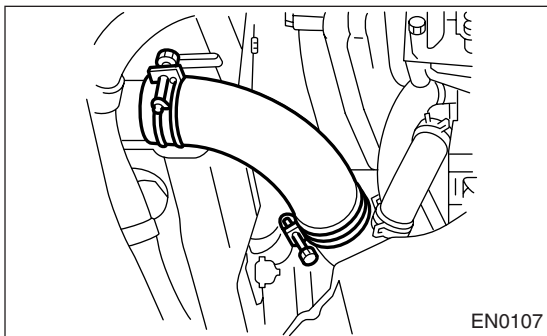
- 1) Lift-up the vehicle.
- 2) Remove the under cover.
- 3) Drain the engine coolant completely. <Ref. to CO-26, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>



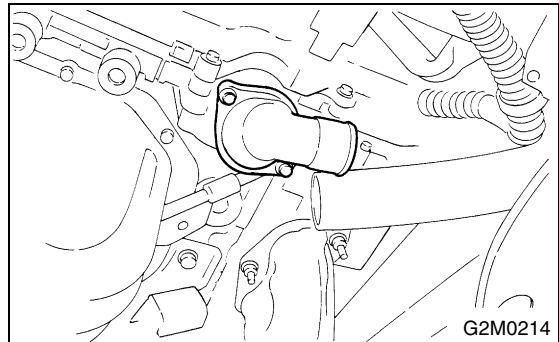
- 4) Disconnect the radiator outlet hose from thermostat cover.
 - Non-turbo MODEL



- 5) Disconnect the radiator outlet hose.
 - Turbo MODEL



- 6) Remove the thermostat cover and gasket, and pull out the thermostat.



B: INSTALLATION

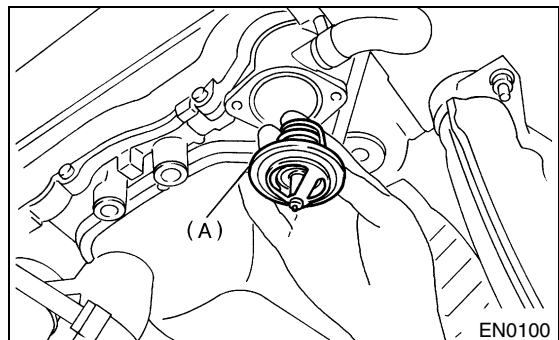
- 1) Install the thermostat in the water pump, and then install the thermostat cover together with a gasket.

NOTE:

- 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 engine coolant. <Ref. to CO-26, 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.

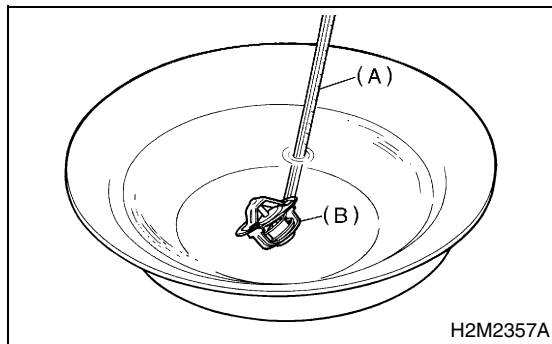
Immerse the thermostat and a thermometer in water. Raise water temperature gradually, and measure the temperature and valve lift when the valve begins to open and when the valve is fully opened. During the test, agitate the water for even temperature distribution. The measurement should be to the specification.

Starts to open:

76 — 80°C (169 — 176°F)

Fully opens:

91°C (196°F)



(A) Thermometer

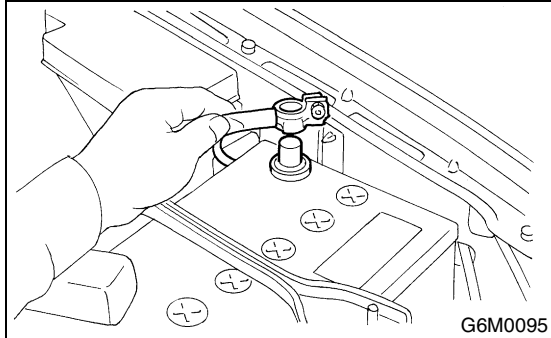
(B) Thermostat

7. Radiator

A: REMOVAL

1. NON-TURBO MODEL

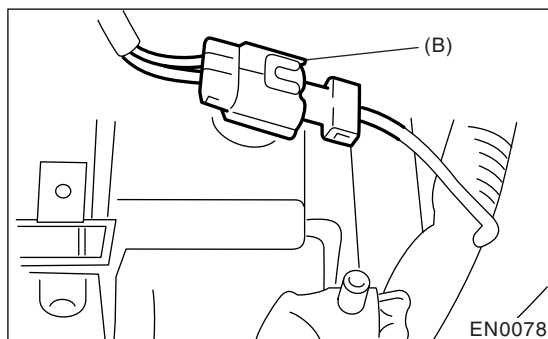
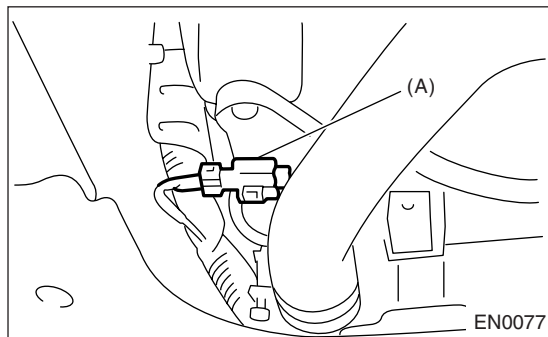
1) Disconnect the ground cable from battery.



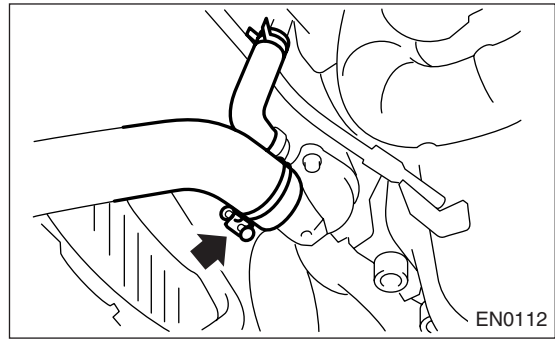
2) Lift-up the vehicle.

3) Drain the engine coolant completely. <Ref. to CO-26, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

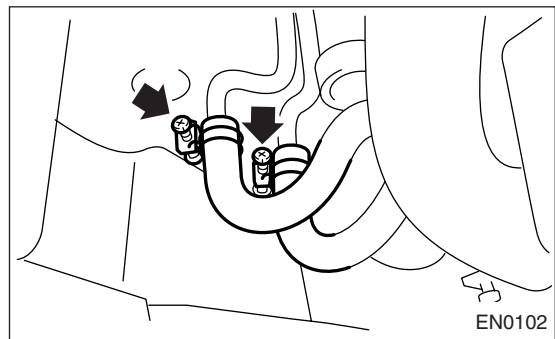
4) Disconnect the connectors of radiator main fan motor (A) and sub fan motor (B).



5) Disconnect the radiator outlet hose from thermostat cover.



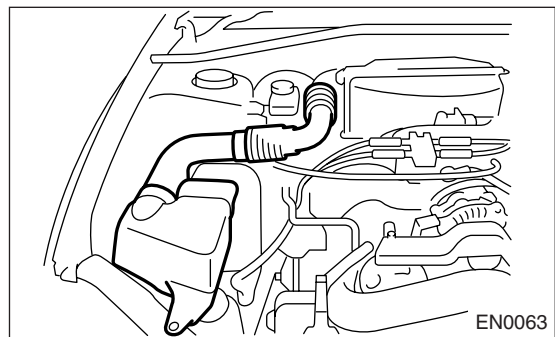
6) Disconnect the ATF cooler hoses from radiator. (AT vehicles only)



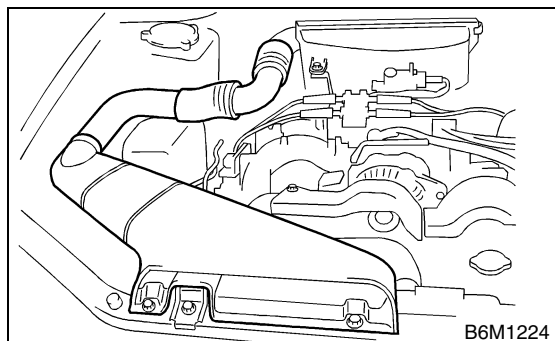
7) Lower the vehicle.

8) Remove the air intake duct.

- 1600 cc and 2000 cc MODEL



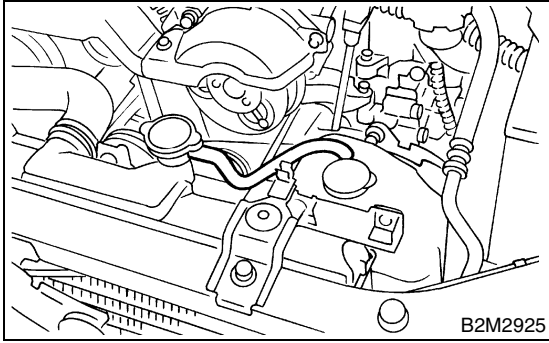
- 2500 cc MODEL



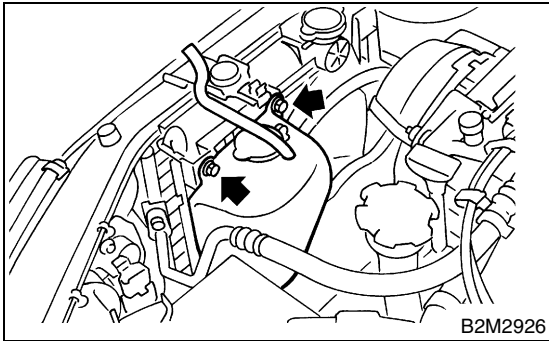
RADIATOR

COOLING

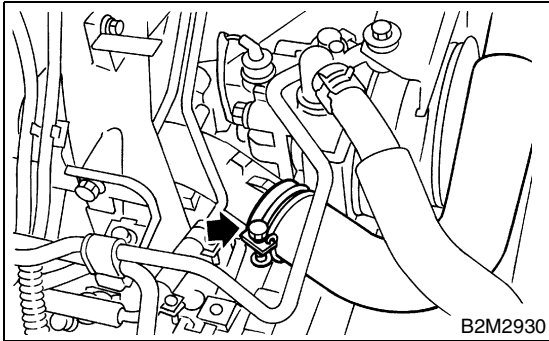
9) Disconnect the over flow hose.



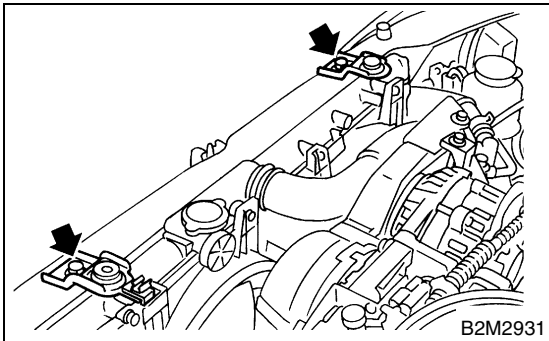
10) Remove the reservoir tank.



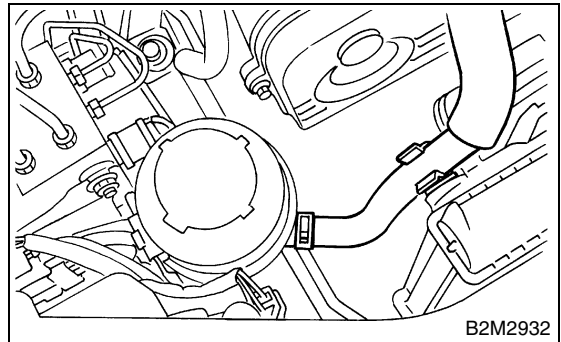
11) Disconnect the radiator inlet hose from engine.



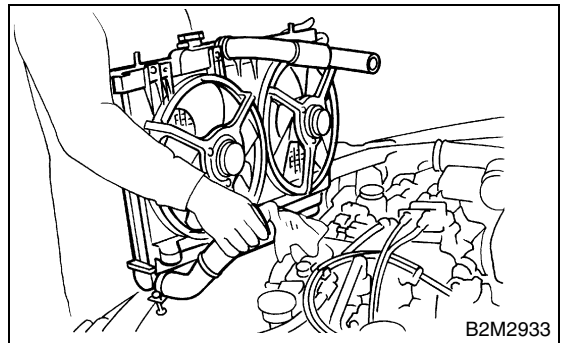
12) Remove the radiator upper brackets.



13) Detach the power steering hose from the clip on the radiator.



14) While slightly lifting the radiator, slide it to left.
15) Lift the radiator up and away from vehicle.

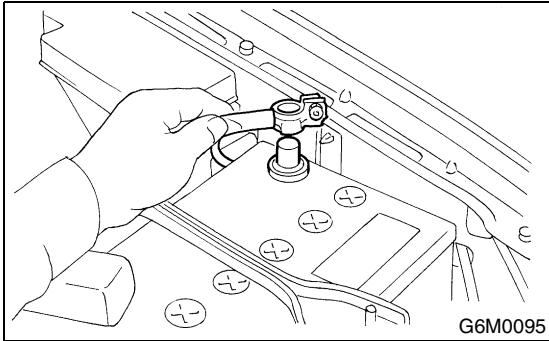


2. TURBO MODEL

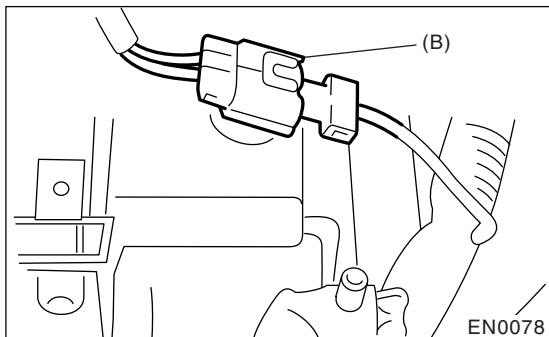
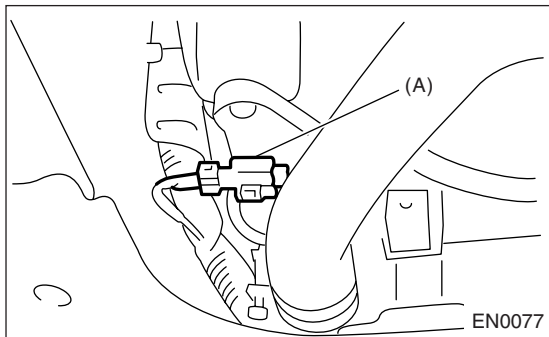
WARNING:

The radiator is pressurized. Wait until the engine cools down before working on the radiator.

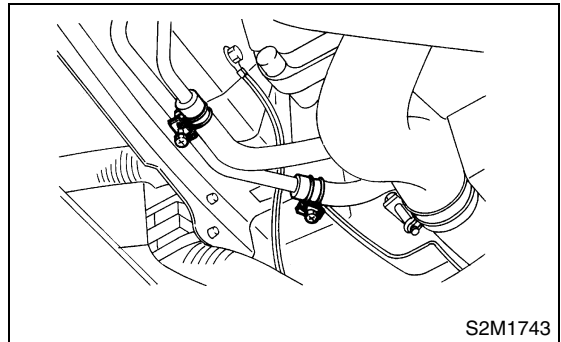
- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from battery.



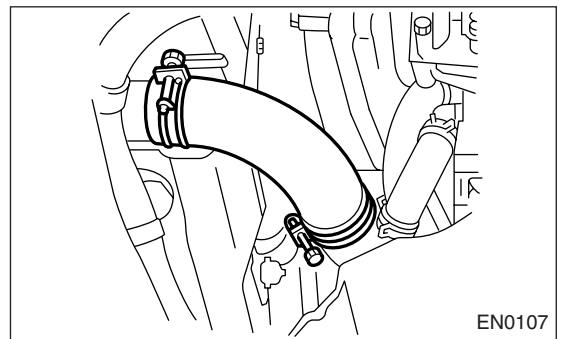
- 3) Lift-up the vehicle.
- 4) Remove the under cover.
- 5) Drain the engine coolant completely. <Ref. to CO-26, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
- 6) Disconnect the connectors of radiator main fan motor (A) and sub fan motor (B).



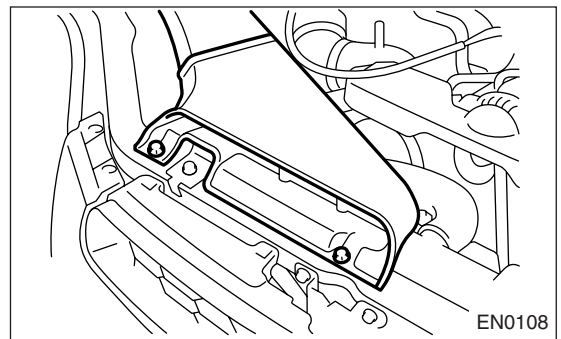
- 7) Disconnect the oil cooler hoses from oil cooler pipes. (if equipped)



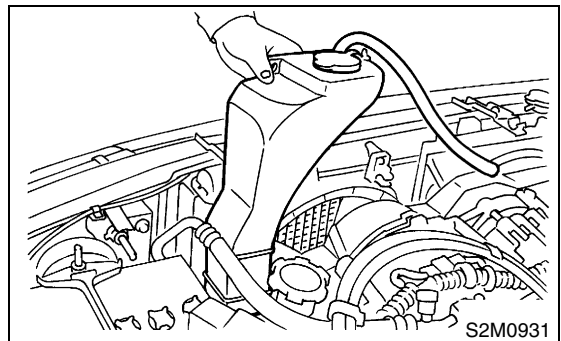
- 8) Disconnect the radiator outlet hose from thermostat cover.



- 9) Lower the vehicle.
- 10) Remove the air intake duct.



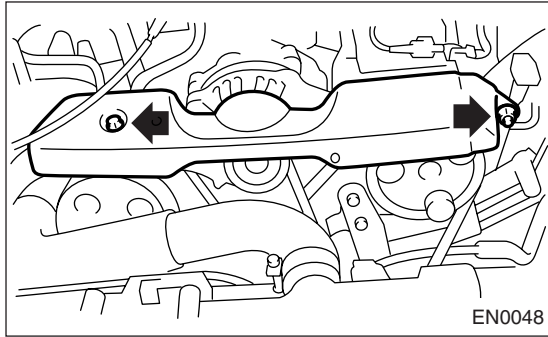
- 11) Disconnect the over flow hose.
- 12) Remove the reservoir tank.



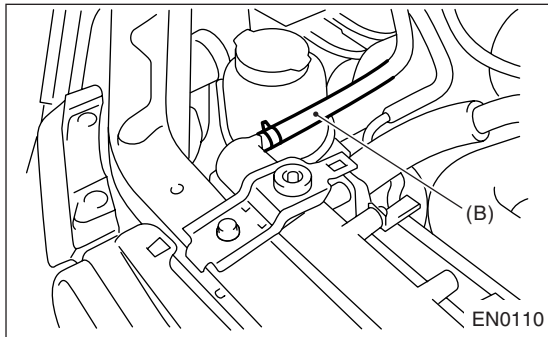
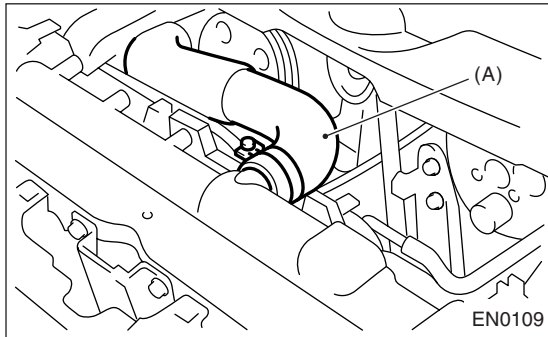
RADIATOR

COOLING

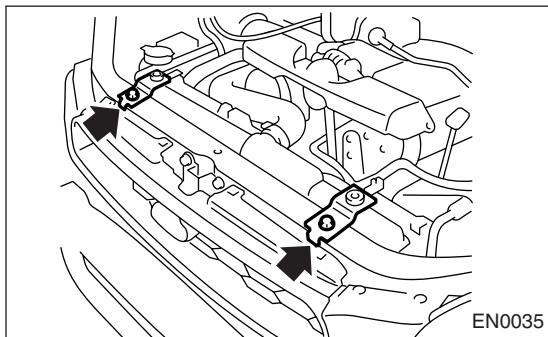
13) Remove the V-belt covers.



14) Disconnect the radiator inlet hose (A) and water tank hose (B) from radiator.



15) Remove the radiator upper brackets.



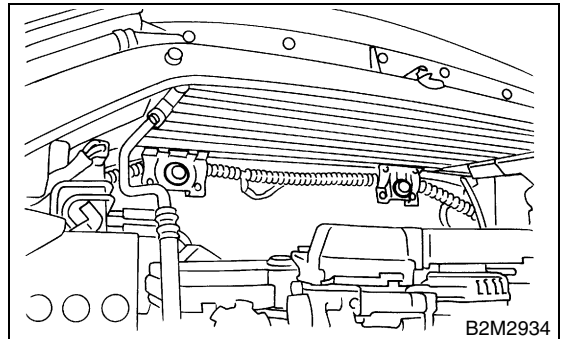
16) While slightly lifting the radiator, slide it to left.

17) Lift the radiator up and away from vehicle.

B: INSTALLATION

1. NON-TURBO MODEL

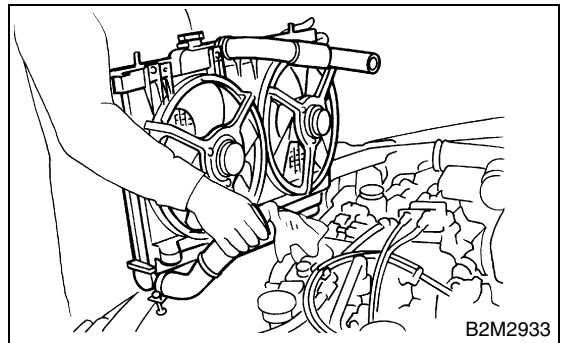
1) Attach the radiator mounting cushions to holes on the vehicle.



2) Install the radiator while fitting radiator pins to cushions.

NOTE:

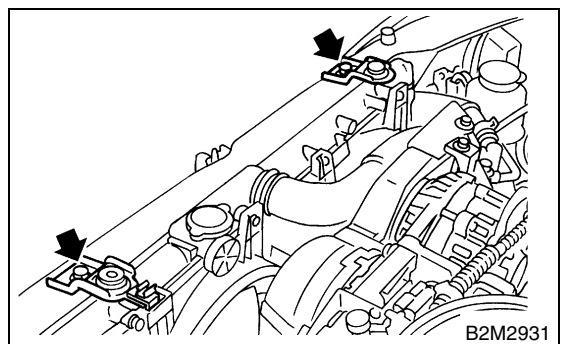
Fit pins on the lower side of radiator into cushions on body side.



3) Install the radiator brackets and tighten bolts.

Tightening torque:

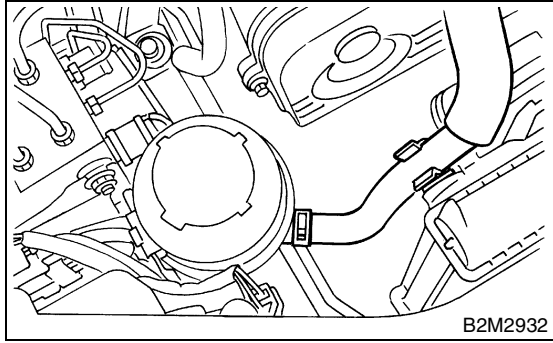
18 N·m (1.8 kgf·m, 13.0 ft·lb)



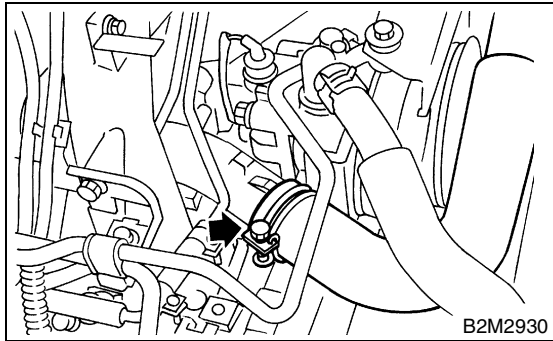
RADIATOR

COOLING

4) Attach the power steering hose to radiator.



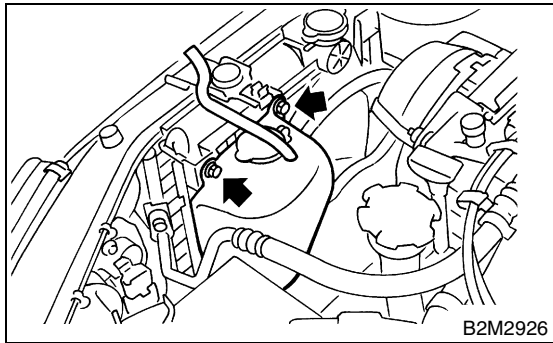
5) Connect the radiator inlet hose.



6) Install the reservoir tank.

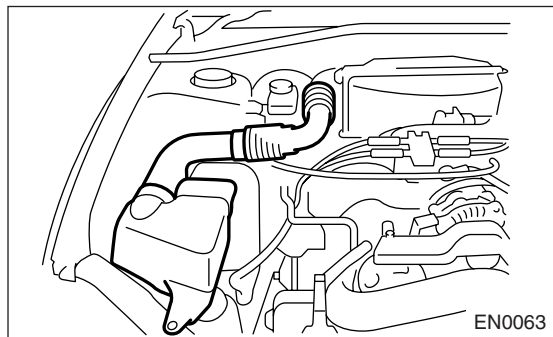
Tightening torque:

4.9 N·m (0.50 kgf·m, 3.6 ft·lb)

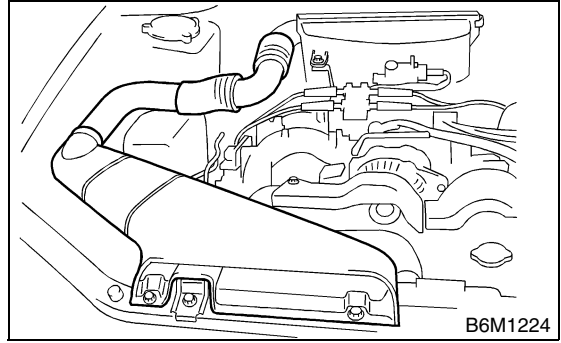


7) Install the air intake duct.

• 1600 cc and 2000 cc MODEL

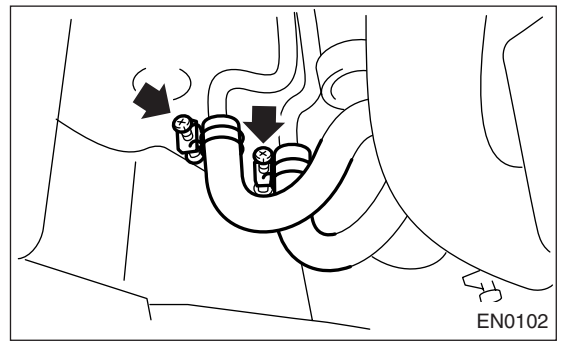


• 2500 cc MODEL

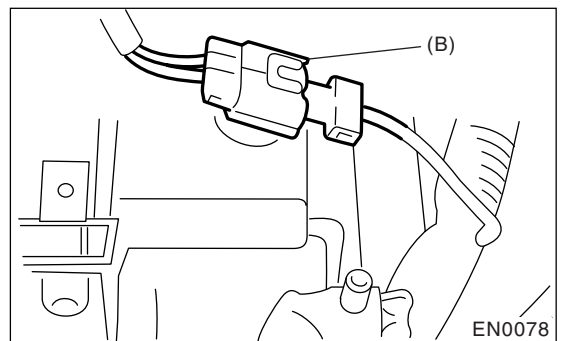
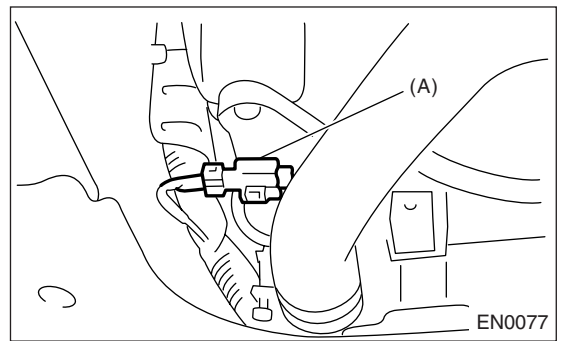


8) Lift-up the vehicle.

9) Connect the ATF cooler hoses. (AT vehicles only)



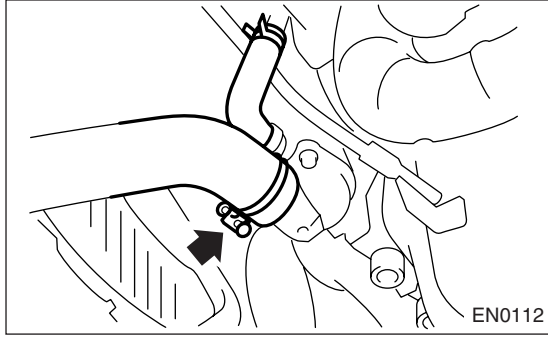
10) Connect the connectors to radiator main fan motor (A) and sub fan motor (B).



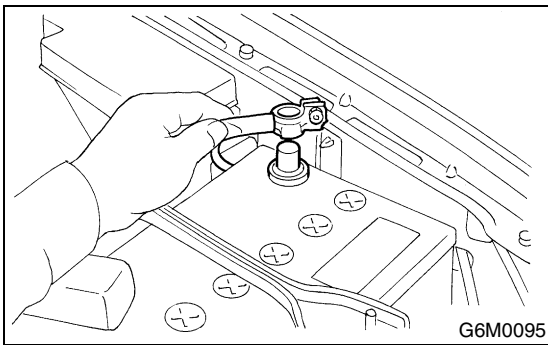
RADIATOR

COOLING

- 11) Connect the radiator outlet hose.



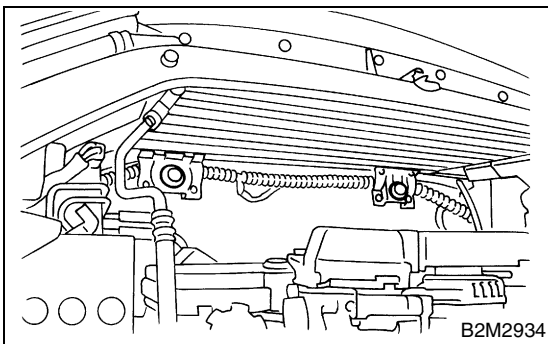
- 12) Install the under cover.
13) Lower the vehicle.
14) Connect the battery ground cable to battery.



- 15) Fill engine coolant. <Ref. to CO-26, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
16) Check the ATF level. <Ref. to AT-9, INSPECTION, Automatic Transmission Fluid.>

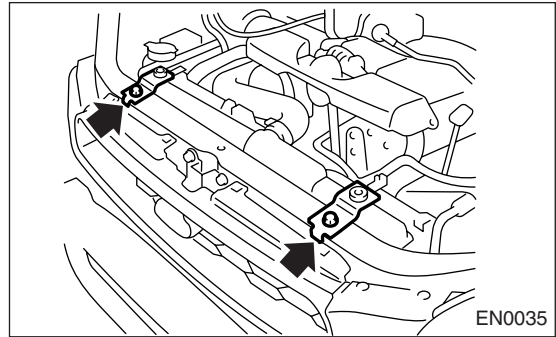
2. TURBO MODEL

- 1) Attach the radiator mounting cushions to holes on the vehicle.

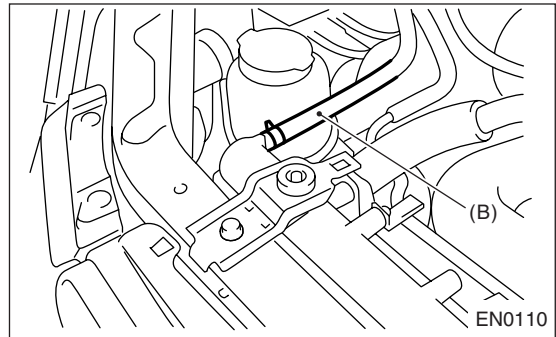
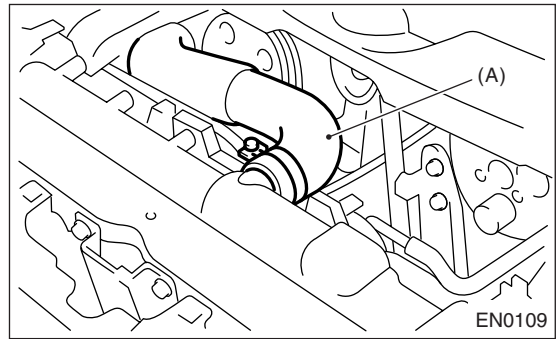


- 2) Install the radiator brackets, and then tighten the bolts.

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

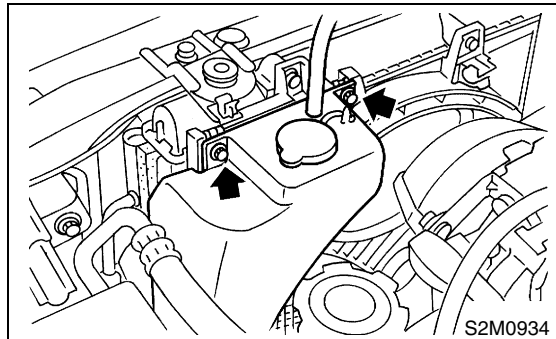


- 3) Connect the radiator inlet hose (A) and water tank hose (B).

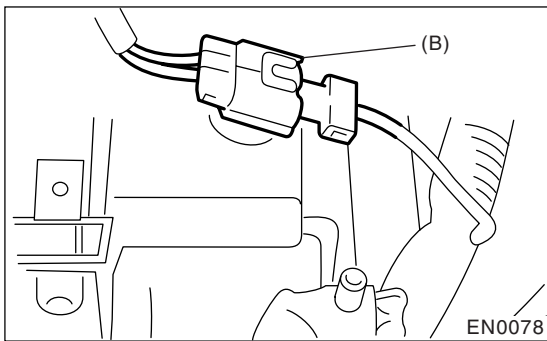
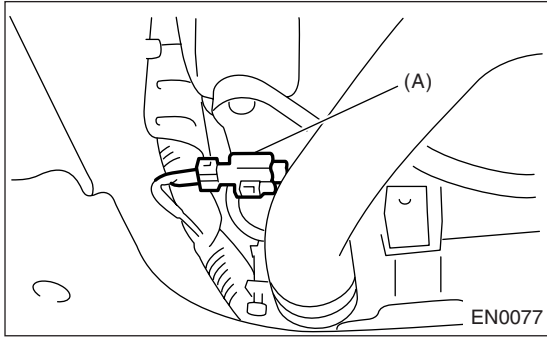


- 4) Install the reservoir tank.

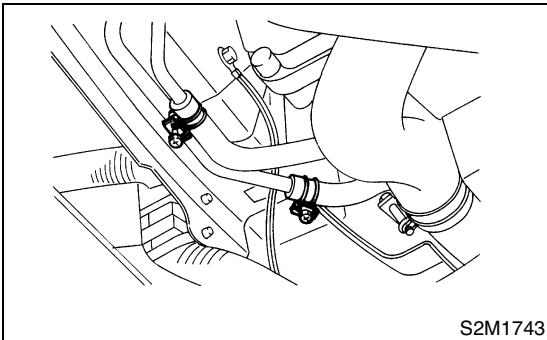
Tightening torque:
4.9 N·m (0.50 kgf·m, 3.6 ft·lb)



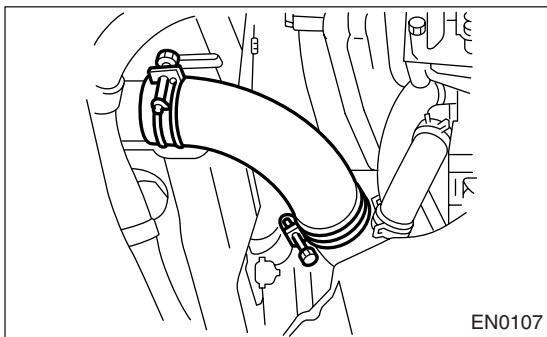
- 5) Connect the over flow hose.
- 6) Lift-up the vehicle.
- 7) Connect the connectors to radiator main fan motor (A) and sub fan motor (B).



- 8) Connect the oil cooler hoses. (if equipped)

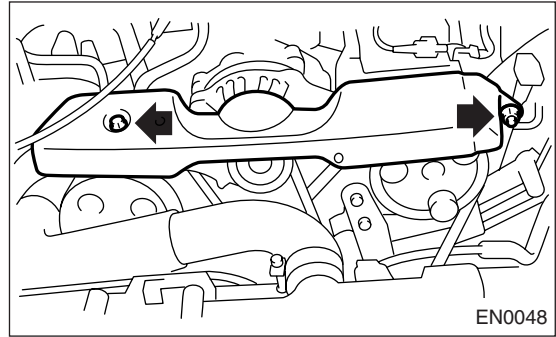


- 9) Connect the radiator outlet hose.

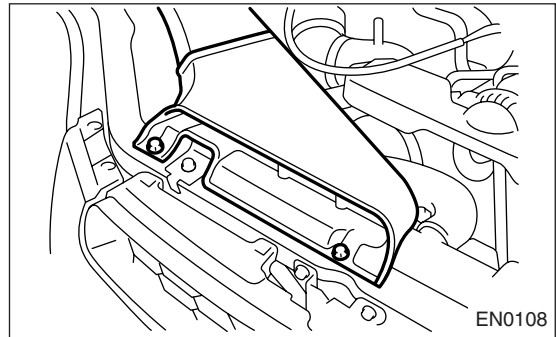


- 10) Install the under cover.
- 11) Lower the vehicle.

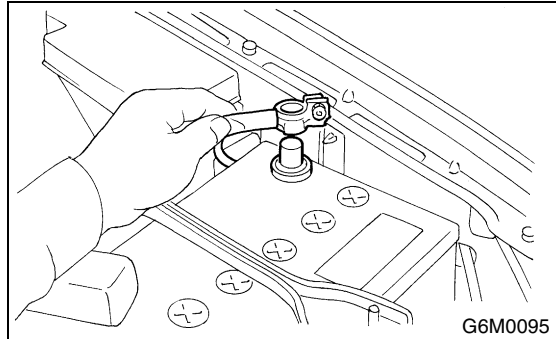
- 12) Install the V-belt covers.



- 13) Install the air intake duct.



- 14) Connect the battery ground cable to battery.



- 15) Fill engine coolant. <Ref. to CO-26, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

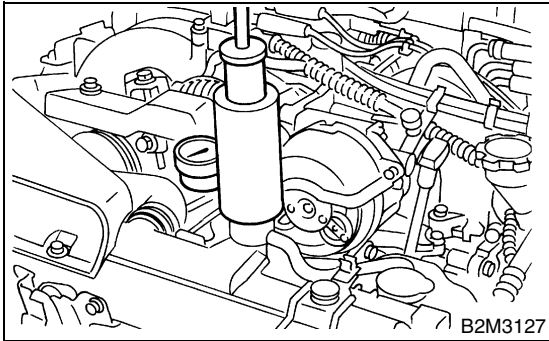
RADIATOR

COOLING

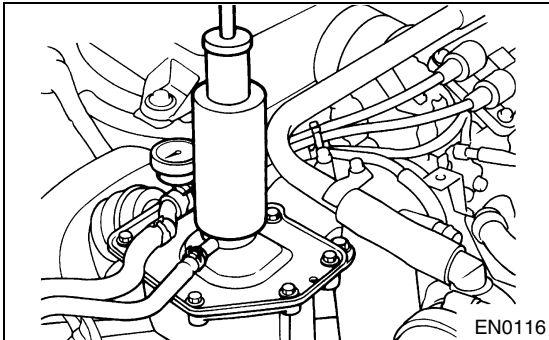
C: INSPECTION

1) Remove the radiator cap, top off radiator, and then attach the 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 the radiator to check if:

- (1) Engine coolant leaks at/around radiator.
- (2) Engine coolant leaks at/around hoses or connections.

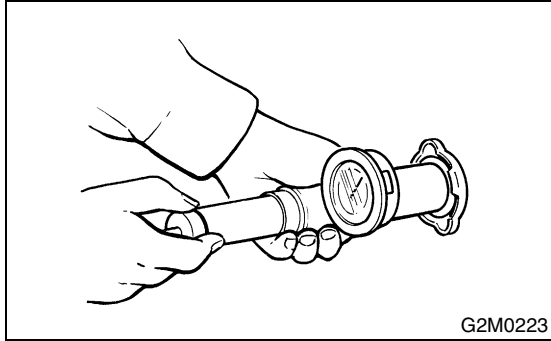
CAUTION:

- Engine should be off.
- Wipe engine coolant from check points in advance.
- Be careful to prevent engine coolant from spurting out when removing the tester.
- Be careful also not to deform the filler neck of radiator when installing or removing tester.

8. Radiator Cap

A: INSPECTION

1) Attach the radiator cap to tester.



2) Increase the pressure until tester gauge pointer stops. Radiator cap is functioning properly if it holds the service limit pressure for 5 to 6 seconds.

Standard pressure:

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

Service limit pressure:

83 kPa (0.85 kg/cm², 12 psi)

CAUTION:

Be sure to remove foreign matter and rust from the cap in advance otherwise, results of pressure test will be incorrect.

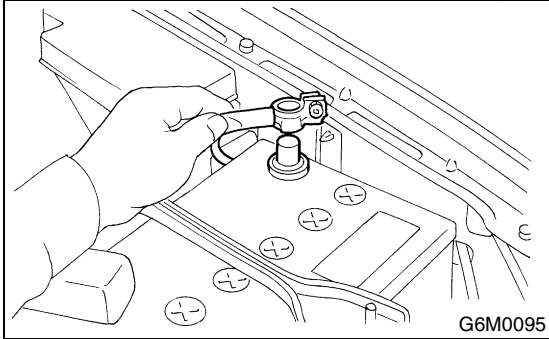
RADIATOR MAIN FAN AND FAN MOTOR

COOLING

9. Radiator Main Fan and Fan Motor

A: REMOVAL

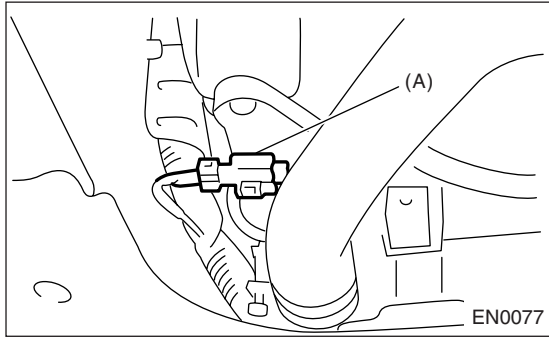
1) Disconnect the ground cable from battery.



2) Lift-up the vehicle.

3) Remove the under cover.

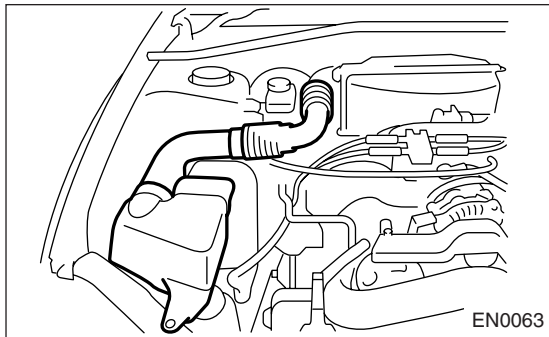
4) Disconnect the connector of main fan motor (A).



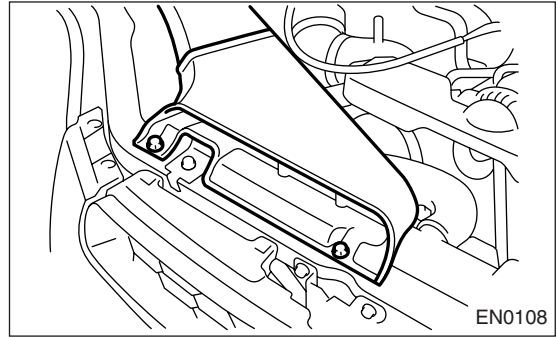
5) Lower the vehicle.

6) Remove the air intake duct.

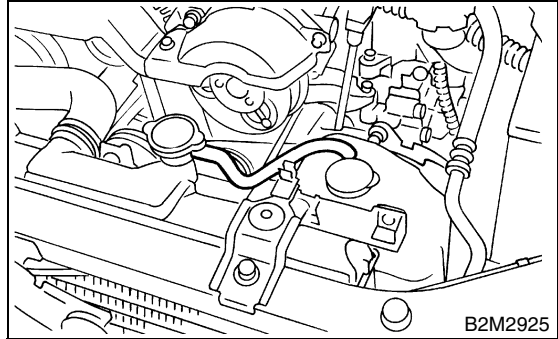
• Non-turbo MODEL (except 2500 cc MODEL)



• Turbo MODEL (includes Non-turbo 2500 cc MODEL)

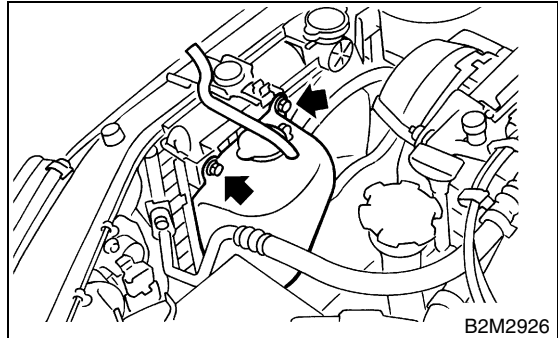


7) Disconnect the over flow hose.

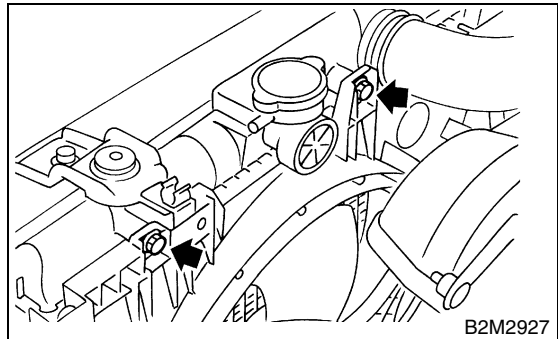


8) Remove the over flow pipe. (Turbo model)

9) Remove the reservoir tank.



10) Remove the radiator main fan motor assembly.



B: INSTALLATION

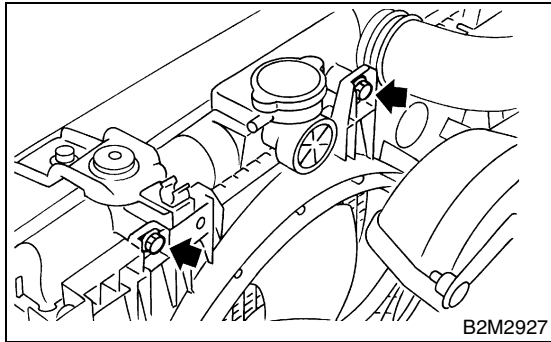
Install in the reverse order of removal.

NOTE:

When the main fan motor assembly cannot be installed as is, loosen the sub fan motor assembly securing bolts to install it.

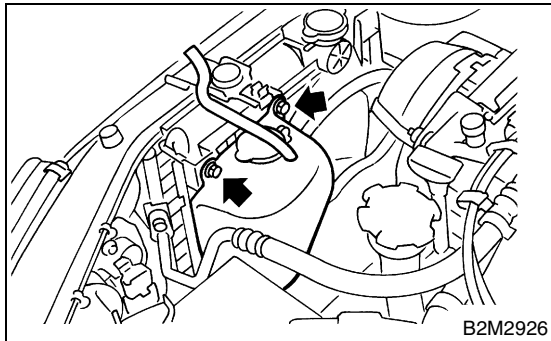
Tightening torque:

4.9 N·m (0.50 kgf·m, 3.6 ft·lb)



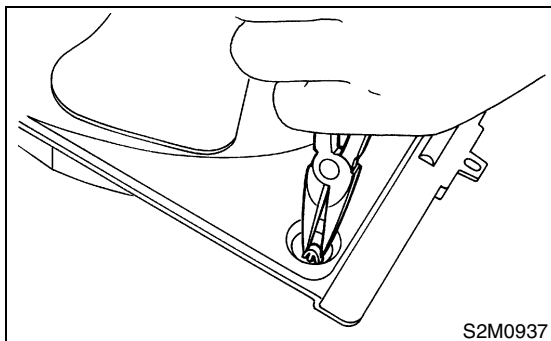
Tightening torque:

4.9 N·m (0.50 kgf·m, 3.6 ft·lb)

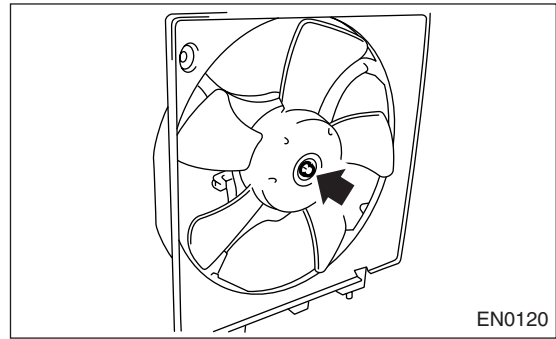


C: DISASSEMBLY

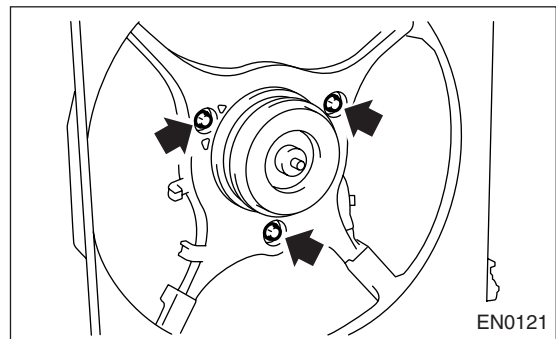
1) Remove the clip which holds motor connector onto shroud.



2) Remove the nut which holds fan itself onto fan motor and shroud assembly.



3) Remove the bolts which install fan motor onto shroud.

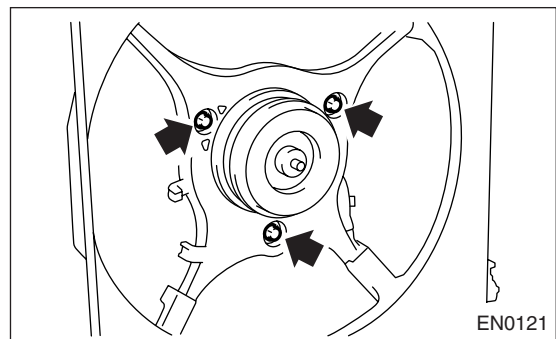


D: ASSEMBLY

Assemble in the reverse order of disassembly.

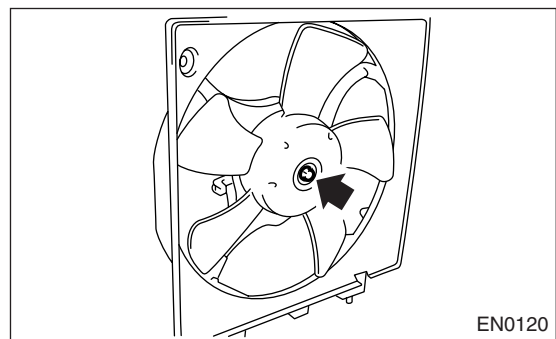
Tightening torque:

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)



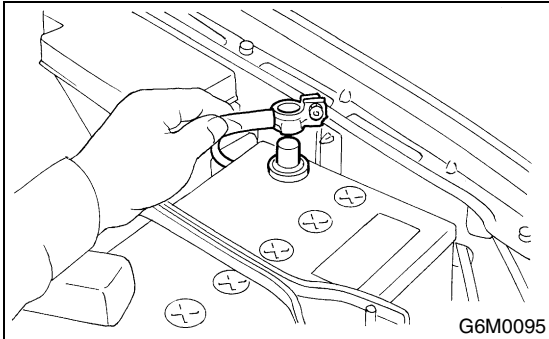
RADIATOR SUB FAN AND FAN MOTOR

COOLING

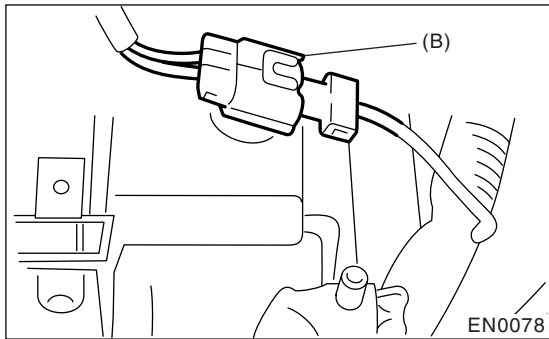
10. Radiator Sub Fan and Fan Motor

A: REMOVAL

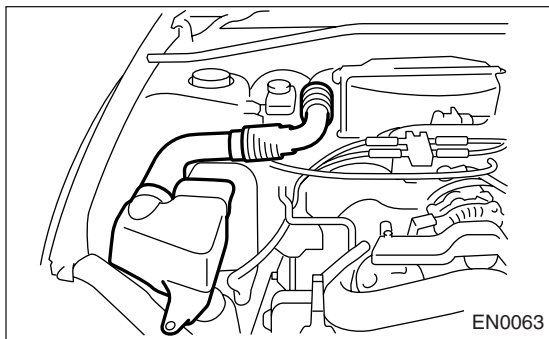
1) Disconnect the ground cable from battery.



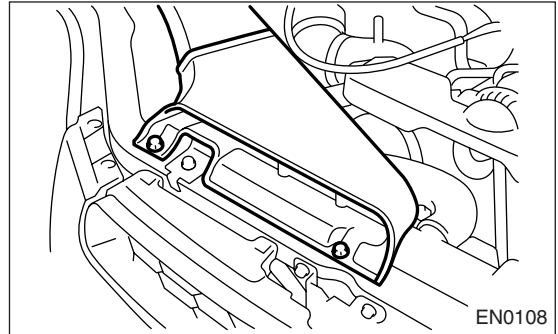
- 2) Lift-up the vehicle.
- 3) Remove the under cover.
- 4) Disconnect the connector of sub fan motor (B).



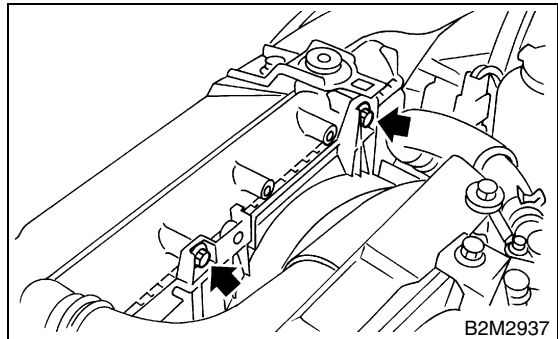
- 5) Lower the vehicle.
- 6) Remove the air intake duct.
 - Non-turbo MODEL (except 2500 cc MODEL)



- Turbo MODEL (includes Non-turbo 2500 cc MODEL)



- 7) Remove the bolts which hold sub fan shroud to radiator.
- 8) Remove the over flow pipe. (Turbo model)
- 9) Remove the radiator sub fan shroud through the under side of vehicle.

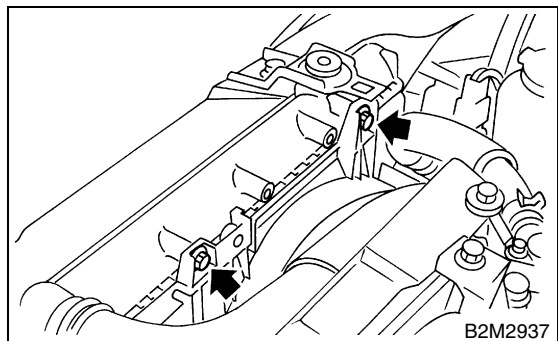


B: INSTALLATION

Install in the reverse order of removal.

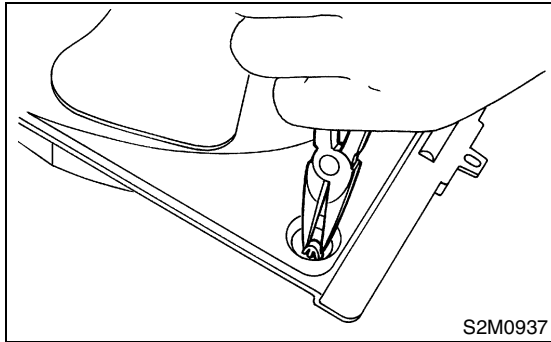
Tightening torque:

4.9 N·m (0.50 kgf·m, 3.6 ft·lb)

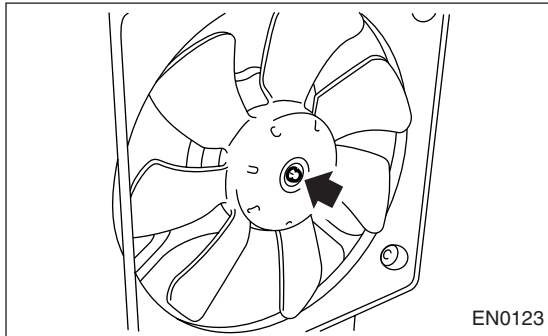


C: DISASSEMBLY

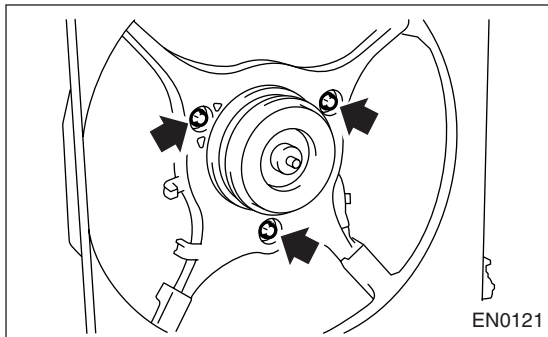
1) Remove the clip which holds motor harness onto shroud.



2) Remove the nut which holds fan itself onto fan motor and shroud assembly.



3) Remove the bolts which install fan motor onto shroud.

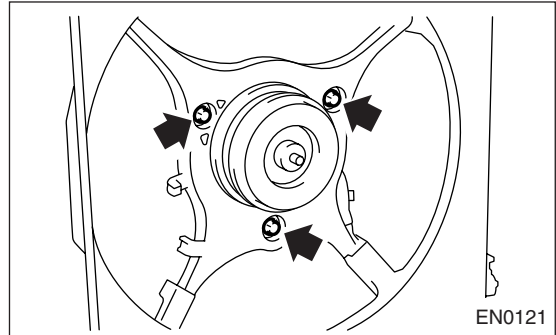


D: ASSEMBLY

Assemble in the reverse order of disassembly.

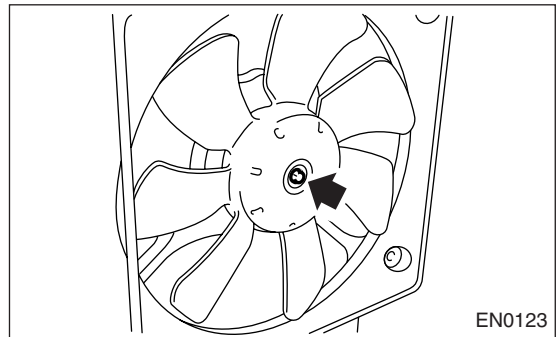
Tightening torque:

4.4 N·m (0.45 kgf·m, 3.3 ft·lb)



Tightening torque:

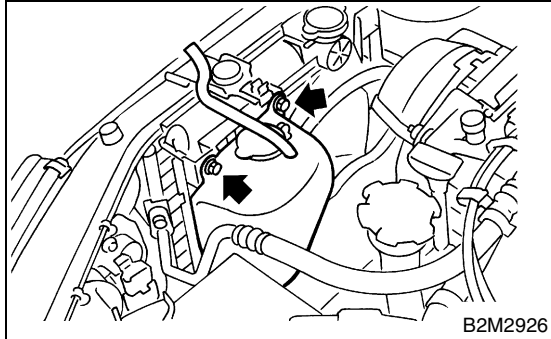
3.4 N·m (0.35 kgf·m, 2.5 ft·lb)



11. Reservoir Tank

A: REMOVAL

- 1) Disconnect the over flow hose from radiator filler neck position.
- 2) Remove the bolts which install reservoir tank onto radiator main fan shroud.
- 3) Remove the reservoir tank.

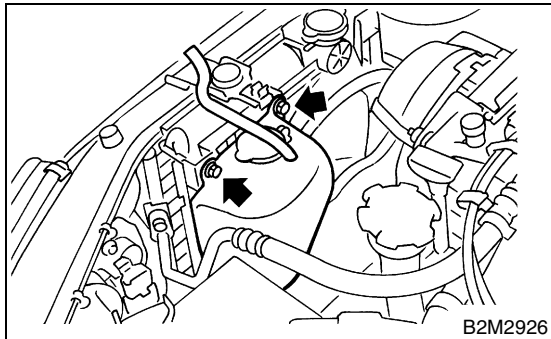


B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

4.9N-m (0.50 kgf-m, 3.6 ft-lb)



C: INSPECTION

Make sure the engine coolant level is between full and low.

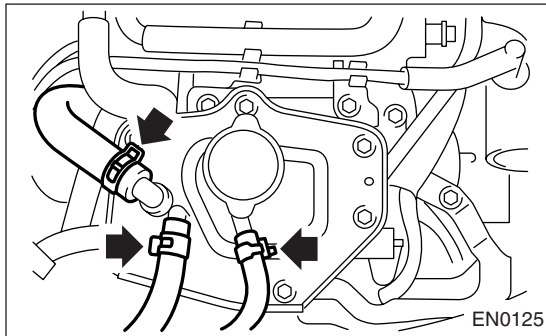
12. Coolant Filler Tank

A: REMOVAL

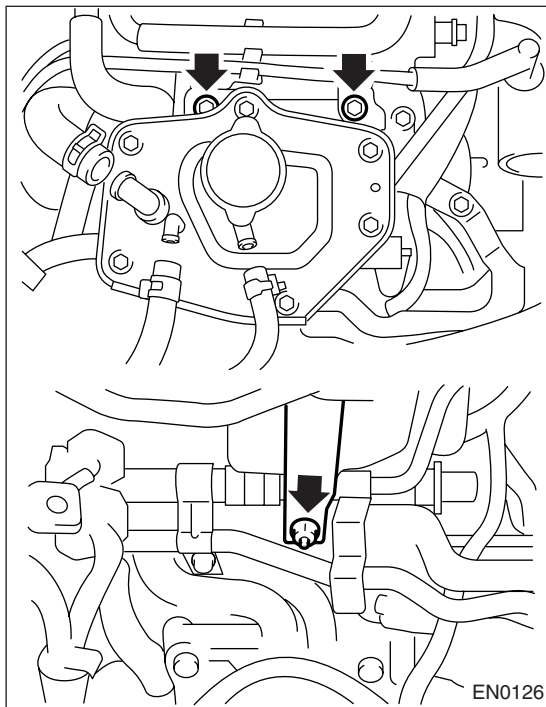
WARNING:

The radiator is pressurized. Wait until the engine cools down before working on the radiator.

- 1) Drain the coolant about 3.0 ℓ (3.2 US qt, 2.6 Imp qt). <Ref. to CO-26, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
- 2) Remove the air cleaner upper cover and air intake boot. <Ref. to IN(TURBO)-7, REMOVAL, Air Cleaner.>
- 3) Remove the air cleaner element.
- 4) Disconnect the engine coolant hoses from coolant filler tank.



- 5) Remove the bolts and nut which install coolant filler tank.
- 6) Disconnect the engine coolant hose which connects under side of coolant filler tank.
- 7) Remove the coolant filler tank.



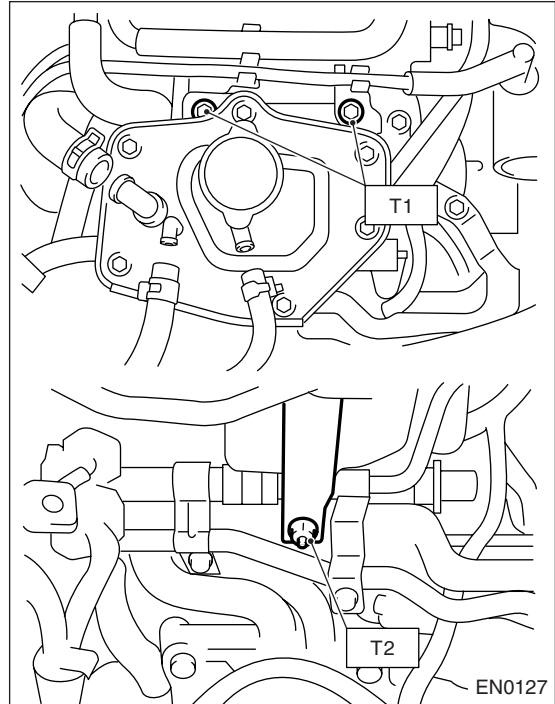
B: INSTALLATION

- 1) Install in the reverse order of removal.

Tightening torque:

T1: 19 N·m (1.9 kgf-m, 13.7 ft-lb)

T2: 21 N·m (2.1 kgf-m, 15.2 ft-lb)



- 2) Fill engine coolant. <Ref. to CO-26, 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 the engine coolant, inspect for leakage, and repair.
	b. Loose timing belt	Repair or replace the 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 the ignition control system. <Ref. to EN-2, Basic Diagnostic Procedure.> or <Ref. to EN(w/oOBD)-2, Basic Diagnostic Procedure.> or <Ref. to EN(TURBO)-2, PROCEDURE, Basic Diagnostic Procedure.>
	h. Clogged or leaking radiator	Clean or repair, or replace.
	i. Improper engine oil in engine coolant	Replace the engine coolant.
	j. Air/fuel mixture ratio too lean	Inspect and repair the fuel injection system. <Ref. to EN-2, Basic Diagnostic Procedure.> or <Ref. to EN(w/oOBD)-2, Basic Diagnostic Procedure.> or <Ref. to EN(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 the radiator fan relay, engine coolant temperature sensor or radiator motor and replace there.	
Over-cooling	a. Atmospheric temperature extremely low	Partly cover the 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 the 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 the water pump.
	d. Defective water pump mechanical seal	Replace the water pump.

LUBRICATION

LU

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6. Oil Pressure Switch.....	21
7. Engine Oil Cooler	22
8. Engine Oil Filter.....	24
9. Engine Lubrication System Trouble in General.....	25

GENERAL DESCRIPTION

LUBRICATION

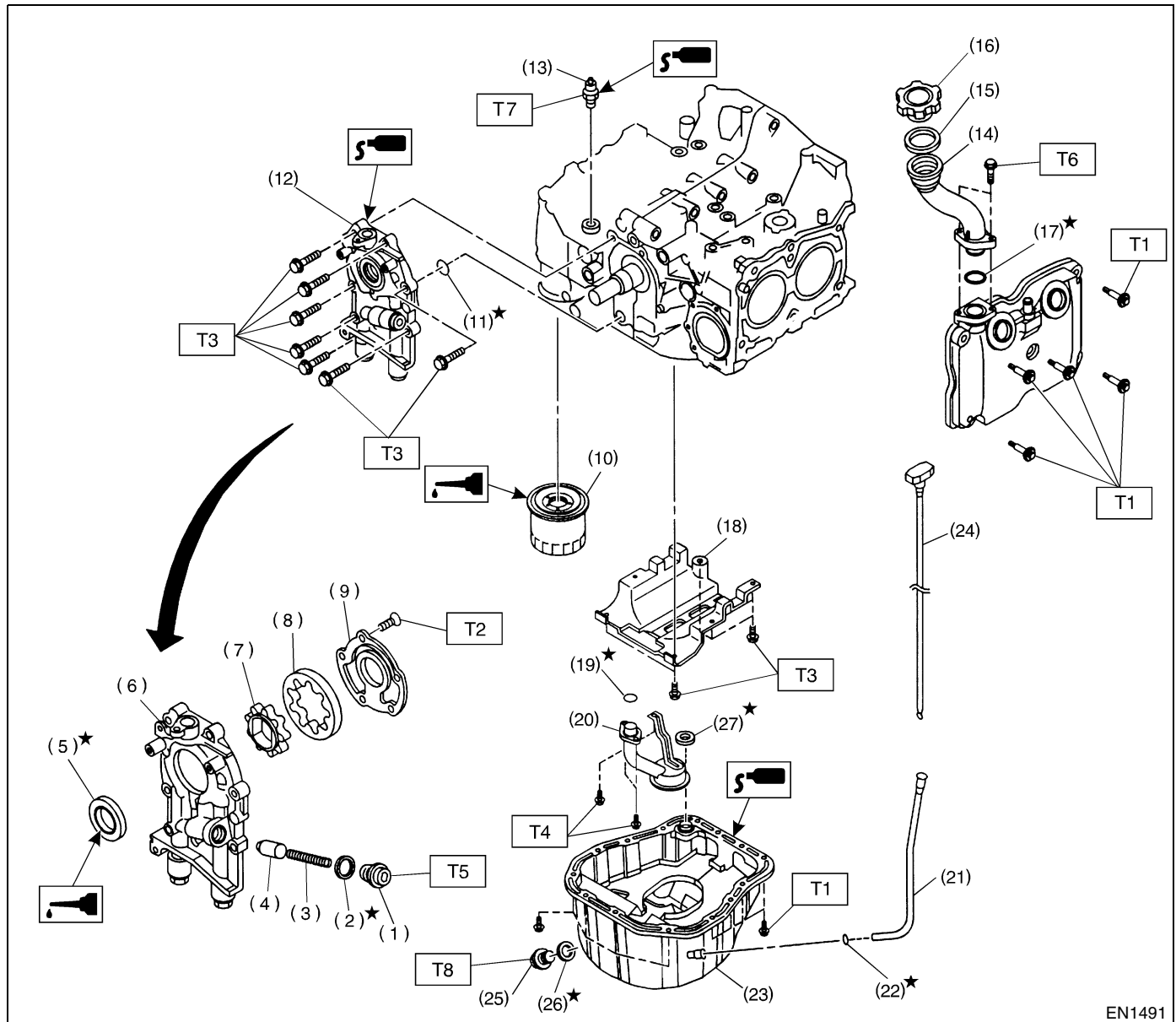
1. General Description

A: SPECIFICATIONS

Lubrication method				Forced lubrication	
Oil pump	Pump type			Trochoid type	
	Number of teeth	Inner rotor		9	
		Outer rotor		10	
	Outer rotor diameter × thickness			78 × 7 mm (3.07 × 0.28 in)	
	Tip clearance between inner and outer rotor			STANDARD	0.04 — 0.14 mm (0.0016 — 0.0055 in)
				LIMIT	0.18 mm (0.0071 in)
	Side clearance between inner rotor and pump case			STANDARD	0.02 — 0.07 mm (0.0008 — 0.0028 in)
				LIMIT	0.12 mm (0.0047 in)
	Case clearance between outer rotor and pump case			STANDARD	0.10 — 0.175 mm (0.0039 — 0.0069 in)
				LIMIT	0.20 mm (0.0079 in)
	Capacity at 80°C (176°F)	600 rpm	Discharge	- pressure	98 kPa (1.0 kg/cm ² , 14 psi)
- quantity				3.2 ℓ (3.4 US qt, 2.8 Imp qt)/min.	
5,000 rpm		Discharge	- pressure	294 kPa (3.0 kg/cm ² , 43 psi)	
			- quantity	32.6 ℓ (8.6 US gal, 7.2 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



EN1491

- | | |
|--------------------------|----------------------------|
| (1) Plug | (14) Oil filler duct |
| (2) Gasket | (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 (4.5, 32.5)
T6: 6.4 (0.65, 4.7)
T7: 25 (2.5, 18.1)
T8: 44 (4.5, 32.5)

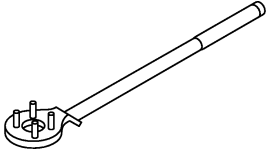
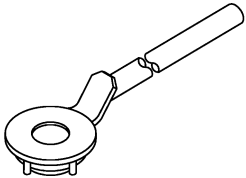
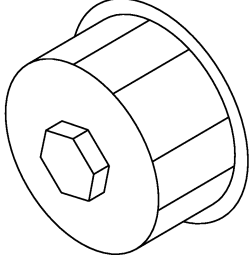
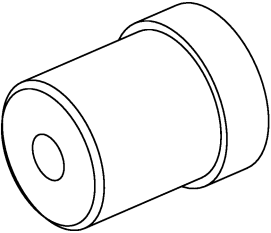
C: CAUTION

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn your hands, because each part in the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.

GENERAL DESCRIPTION

LUBRICATION

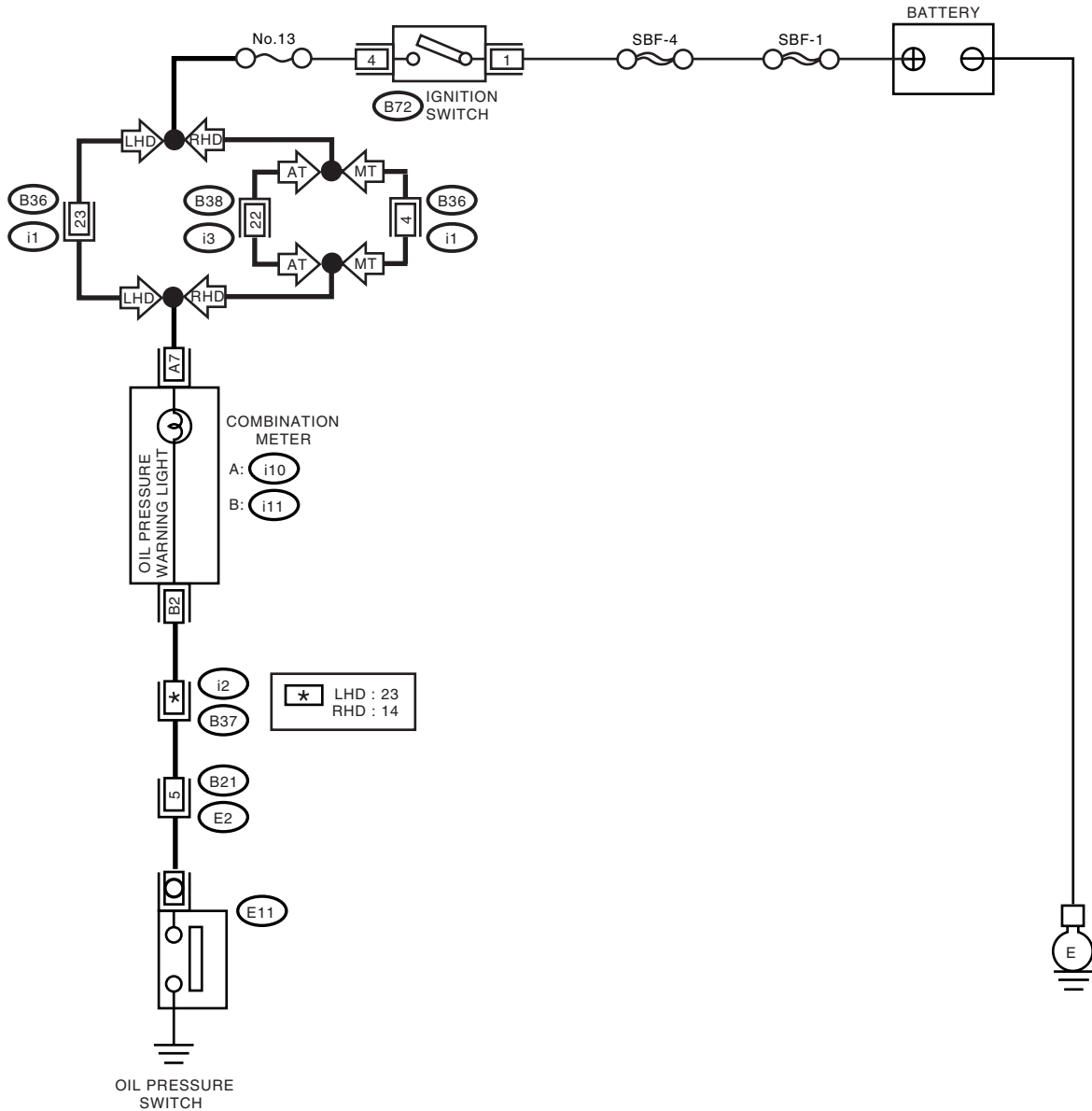
D: PREPARATION TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: right;">B2M3870</p>	499977100	CRANK PULLEY WRENCH	Used for stopping rotation of crankshaft pulley when loosening and tightening crankshaft pulley bolt. (2500 cc model)
 <p style="text-align: right;">B2M4157</p>	499977300	CRANK PULLEY WRENCH	Used for stopping rotation of crankshaft pulley when loosening and tightening crankshaft pulley bolt. (1600 cc and 2000 cc model)
 <p style="text-align: right;">B2M3872</p>	498547000	OIL FILTER WRENCH	Used for removing and installing oil filter.
 <p style="text-align: right;">B2M3875</p>	499587100	OIL SEAL INSTALLER	Used for installing oil pump oil seal.

2. Oil Pressure System

A: SCHEMATIC

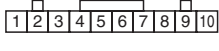
1. NON-TURBO MODEL



B72



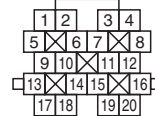
A: i10



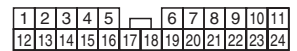
B: i11



B21

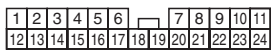


i2

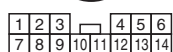


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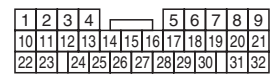
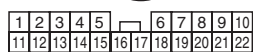
LHD: B36



RHD: i1



RHD: i3



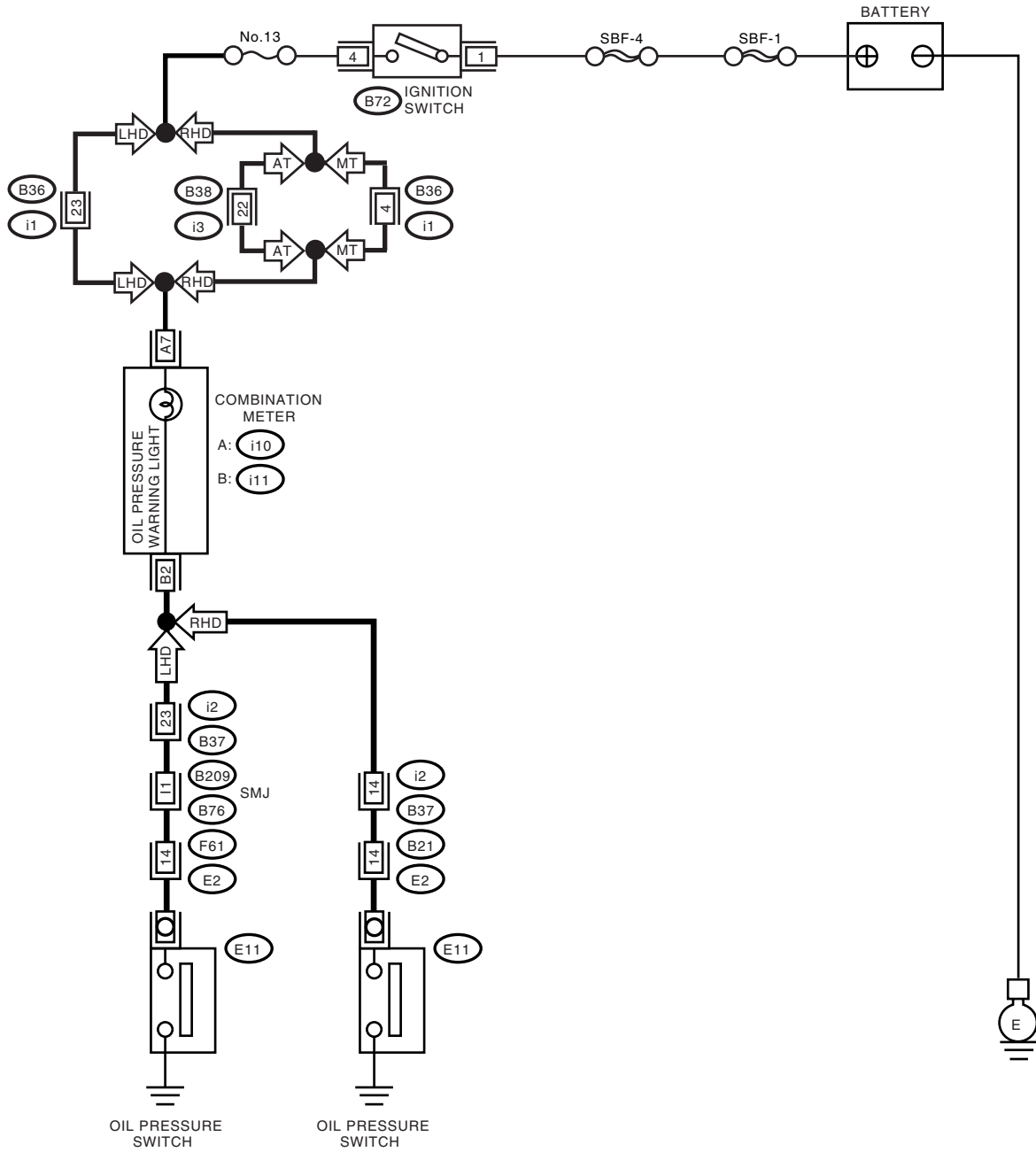
(RHD)

EN1381

OIL PRESSURE SYSTEM

LUBRICATION

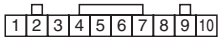
2. TURBO MODEL



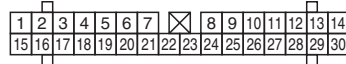
B72



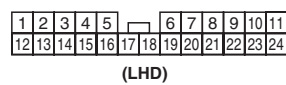
A: i10



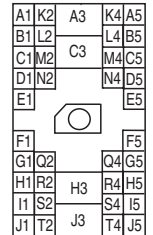
B: i11



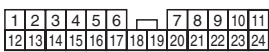
i2



B209



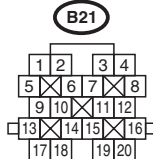
LHD: B36



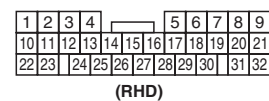
RHD: i3



F61



B21



RHD: i1



EN1382

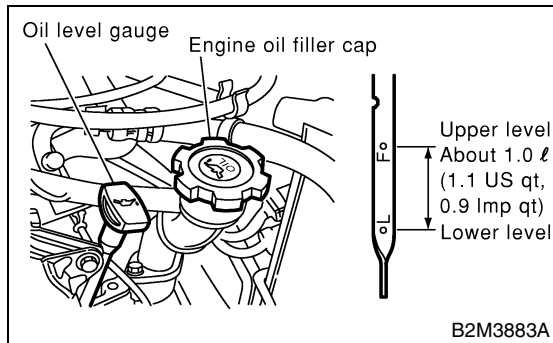
B: INSPECTION

Step	Check	Yes	No
1 CHECK COMBINATION METER. 1) Turn the 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-5, INSPECTION, Combination Meter System.>
2 CHECK HARNESS CONNECTOR BETWEEN COMBINATION METER AND OIL PRESSURE SWITCH. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from oil pressure switch. 3) Turn the ignition switch ON. 4) Measure the voltage of harness between the combination meter connector and chassis ground. <i>Connector & terminal</i> <i>(E11) No. 1 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Replace the oil pressure switch.	Go to step 3.
3 CHECK COMBINATION METER. 1) Turn the ignition switch to OFF. 2) Remove the combination meter. 3) Measure the resistance of combination meter. <i>Terminal</i> <i>No. A7 — No. B2:</i>	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

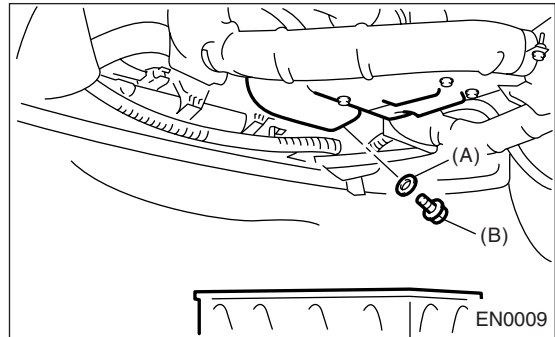
- 1) Park the vehicle on a level surface.
- 2) Remove the oil level gauge and wipe it clean.
- 3) Reinsert the level gauge all the way. Be sure that the level gauge is correctly inserted and in the proper orientation.
- 4) Remove it again and note the reading. If the engine oil level is below the "L"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



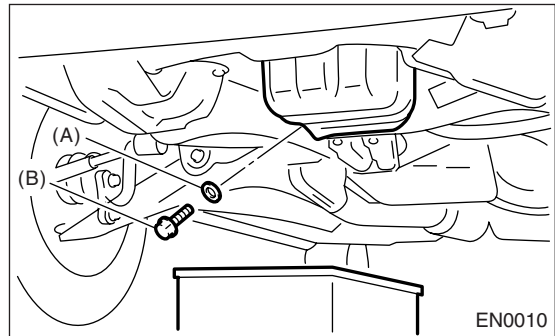
B: REPLACEMENT

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

• Non-Turbo MODEL

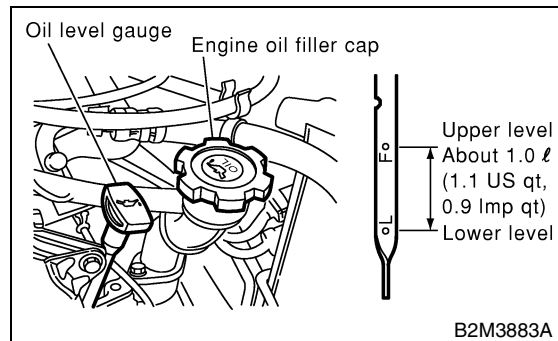


• Turbo MODEL



- (A) Gasket
- (B) Drain plug

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



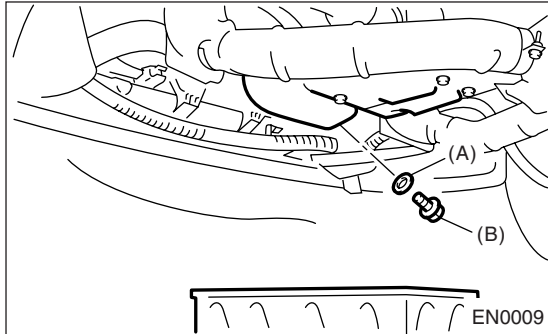
- 3) Replace the drain plug gasket.

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

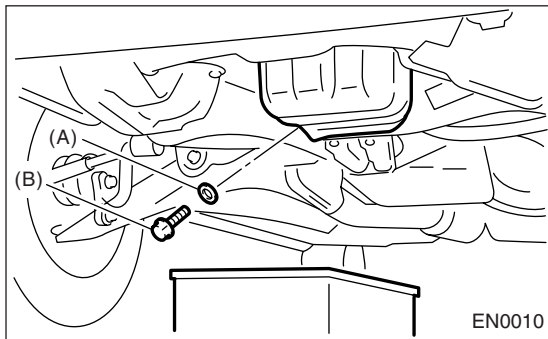
Tightening torque:

44 N·m (4.5 kgf-m, 32.5 ft-lb)

- Non-Turbo MODEL



- Turbo MODEL



- (A) Gasket
- (B) Drain plug

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

Recommended oil

API classification

SL or 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 SL or 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	
				10W-30, 10W-40				
			5W-30 PREFERRED					

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:

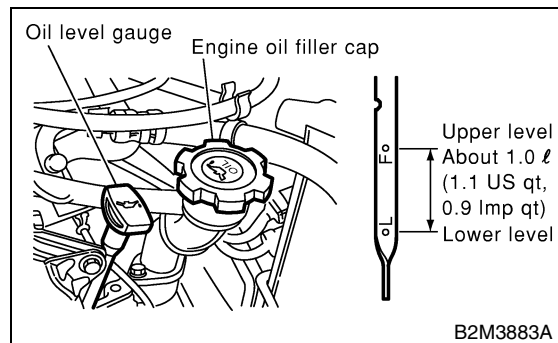
If the vehicle is used in desert areas with very high temperatures or for other heavy duty applications, the following viscosity oils may be used: API classification: SL or SJ or SH

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

6) Close the engine oil filler cap.

7) Start the engine and warm it up for a time.

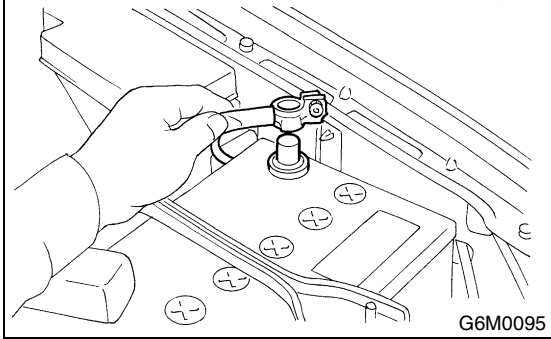
8) After the engine stops, recheck the oil level. If necessary, add engine oil up to the upper level on level gauge.



4. Oil Pump

A: REMOVAL

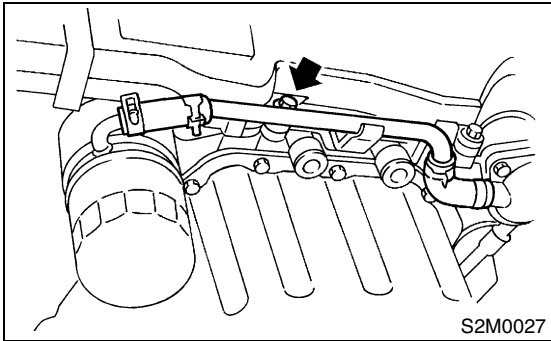
1) Disconnect the ground cable from battery.



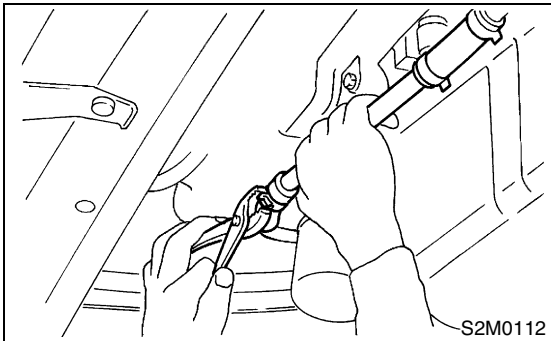
2) Lift-up the vehicle.

3) Remove the under cover.

4) Remove the bolts which install water pipe of oil cooler to oil pump. (Turbo model)

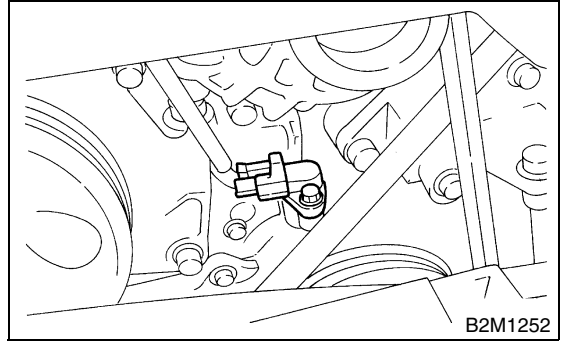


5) Remove the water pipe and hoses between oil cooler and water pump. (Turbo model)



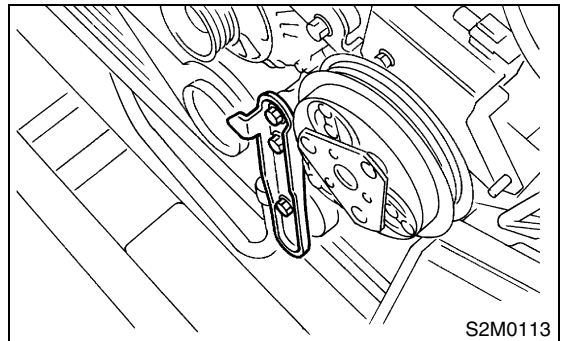
6) Remove the radiator. <Ref. to CO-39, REMOVAL, Radiator.>

7) Remove the crankshaft position sensor.



8) Remove the V-belts. <Ref. to ME-44, REMOVAL, V-belt.> or <Ref. to ME(TURBO)-44, REMOVAL, V-belt.>

9) Remove the rear side V-belt tensioner.



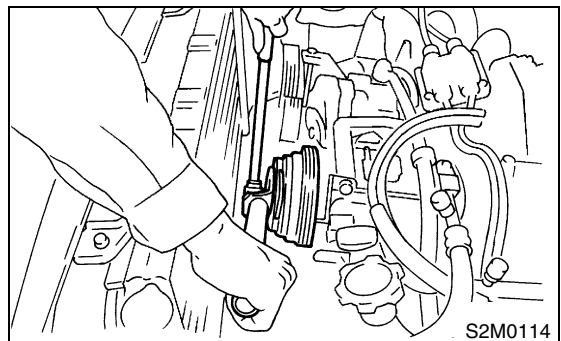
10) Remove the crankshaft pulley by using ST.

1600 cc and 2000 cc model:

ST 499977300 CRANKSHAFT PULLEY WRENCH

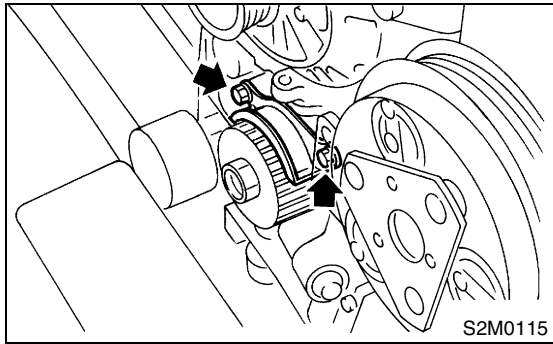
2500 cc model:

ST 499977100 CRANKSHAFT PULLEY WRENCH

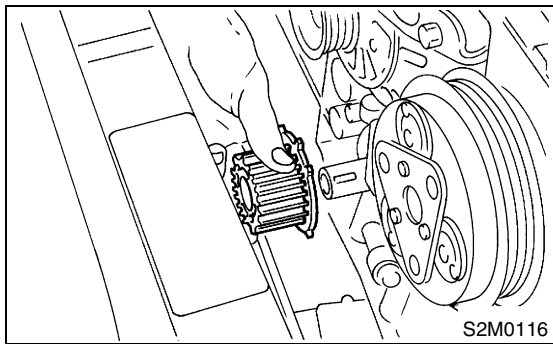


11) Remove the water pump. <Ref. to CO-28, REMOVAL, Water Pump.>

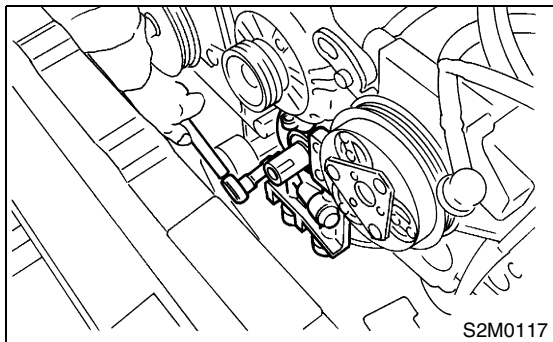
12) Remove the timing belt guide. (MT vehicles only)



13) Remove the crankshaft sprocket.

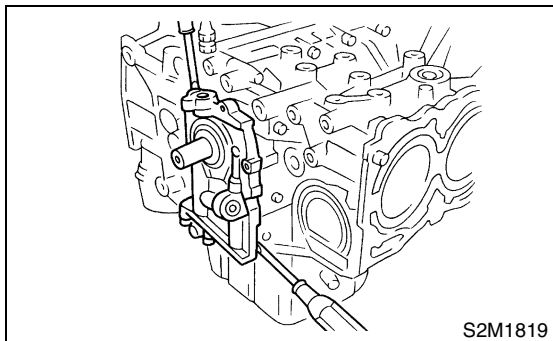


14) Remove the bolts which install oil pump onto cylinder block.



15) Remove the oil pump by using flat bladed screwdriver.

CAUTION:
Be careful not to scratch the mating surfaces of cylinder block and oil pump.



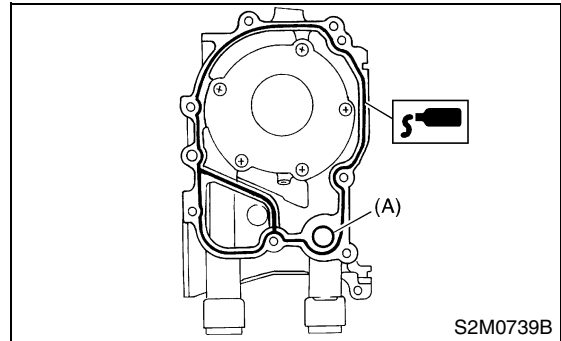
B: INSTALLATION

Install in the reverse order of removal.

Do the following:

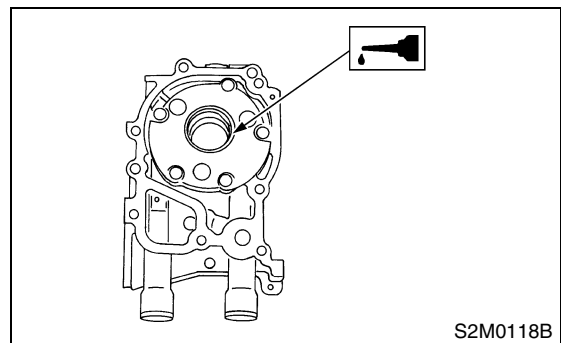
1) Apply fluid packing to the matching surfaces of oil pump.

Fluid packing:
THREE BOND 1215 or equivalent



2) Replace the O-ring (A) with a new one.

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



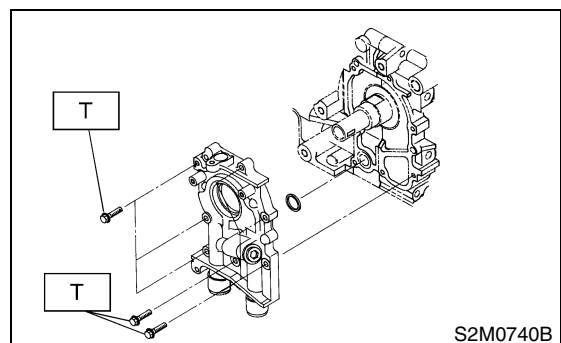
4) Be careful not to scratch the oil seal when installing oil pump on cylinder block.

5) Position the oil pump, aligning the notched area with crankshaft, and push the oil pump straight.

CAUTION:
Make sure the oil seal lip is not folded.

6) Install the oil pump.

Tightening torque:
6.4 N·m (0.65 kgf·m, 4.7 ft·lb)



OIL PUMP

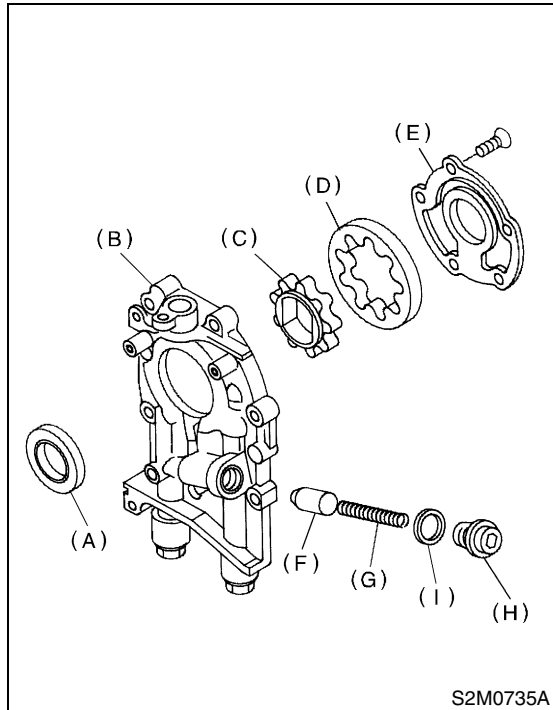
LUBRICATION

C: DISASSEMBLY

Remove the screws which secure oil pump cover and disassemble oil pump. Inscribe alignment marks on the inner and outer rotors so that they can be replaced in their original positions during reassembly.

CAUTION:

Before removing the relief valve, loosen the plug when removing oil pump from cylinder block.



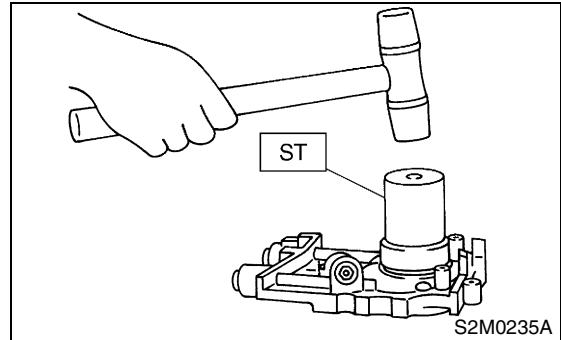
- (A) Oil seal
- (B) Pump case
- (C) Inner rotor
- (D) Outer rotor
- (E) Pump cover
- (F) Relief valve
- (G) Relief valve spring
- (H) Plug
- (I) Gasket

D: ASSEMBLY

1) Install the front oil seal by using ST.
ST 499587100 OIL SEAL INSTALLER

NOTE:

Use a new oil seal.



2) Apply a coat of engine oil to the inner and outer rotors.

3) Install the inner and outer rotors in their original positions.

4) Install the oil relief valve and relief valve spring and plug.

NOTE:

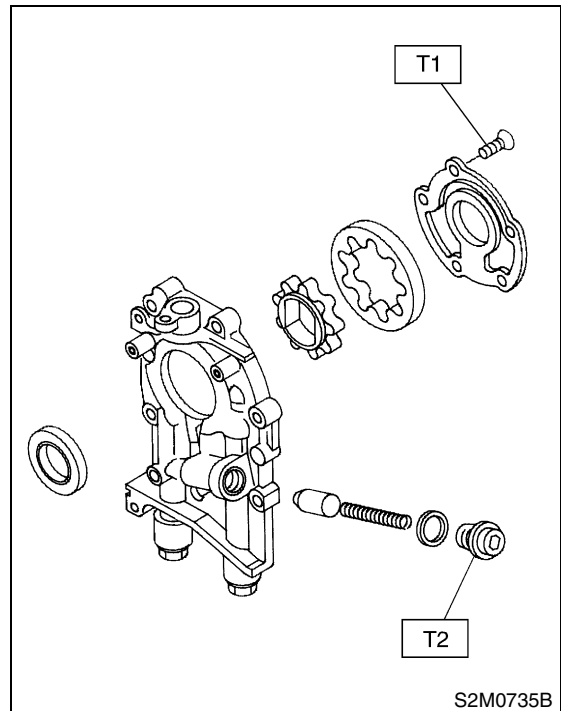
Use a new gasket.

5) Install the 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**

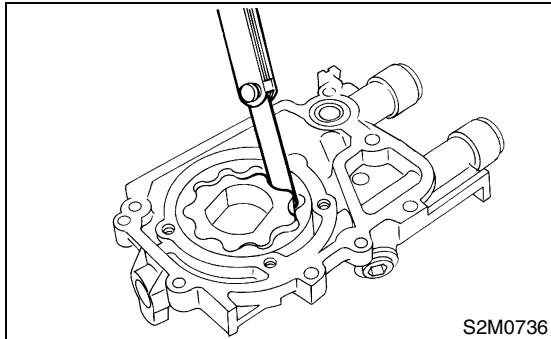
Measure the tip clearance of rotors. If clearance exceeds the limit, replace the rotors as a matched set.

Tip clearance:**Standard**

0.04 — 0.14 mm (0.0016 — 0.0055 in)

Limit

0.18 mm (0.0071 in)

**2. CASE CLEARANCE**

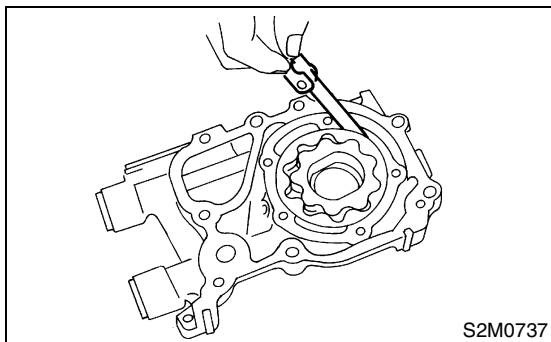
Measure the clearance between the outer rotor and cylinder block rotor housing. If clearance exceeds the limit, replace the rotor.

Case clearance:**Standard**

0.10 — 0.175 mm (0.0039 — 0.0069 in)

Limit

0.20 mm (0.0079 in)

**3. SIDE CLEARANCE**

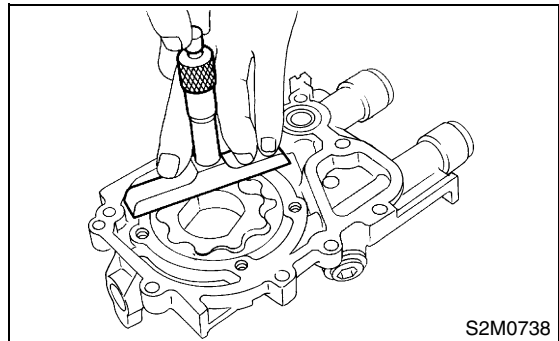
Measure the clearance between the oil pump inner rotor and pump cover. If clearance exceeds the limit, replace the rotor or pump body.

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 kgf, 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.

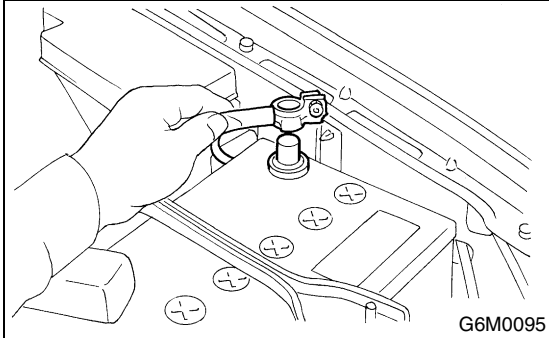
OIL PAN AND STRAINER

LUBRICATION

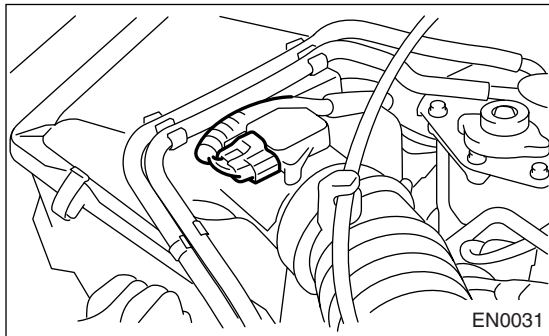
5. Oil Pan and Strainer

A: REMOVAL

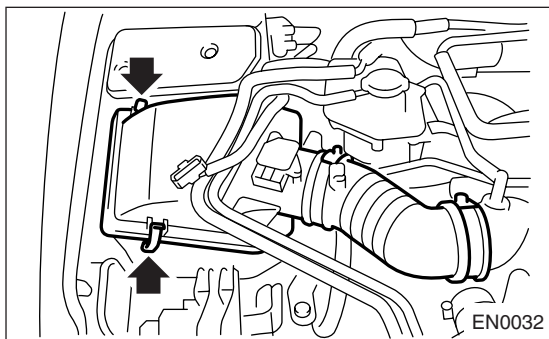
- 1) Set the vehicle on lift arms.
- 2) Remove the front wheels.
- 3) Disconnect the ground cable from battery.



- 4) Remove the air intake duct and air cleaner case. (Non-Turbo model)
<Ref. to IN-7, REMOVAL, Air Intake Duct.> and
<Ref. to IN-6, REMOVAL, Air Cleaner Case.>
- 5) Disconnect the connector from mass air flow sensor. (Turbo model)

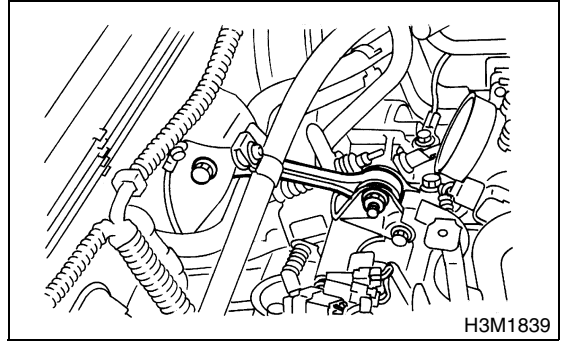


- 6) Remove the air intake boot and air cleaner upper cover. (Turbo model)

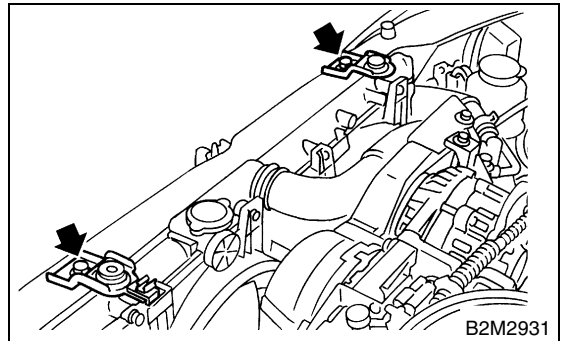


- 7) Remove the intercooler (Turbo model) <Ref. to IN(TURBO)-10, REMOVAL, Intercooler.>

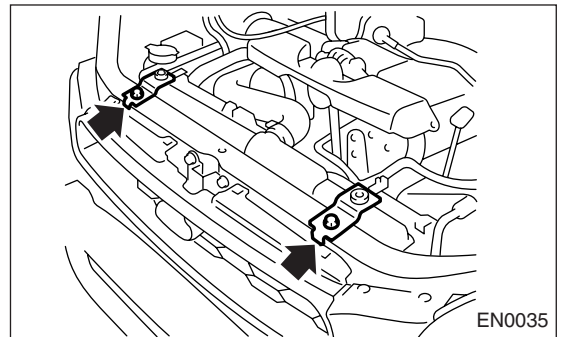
- 8) Remove the pitching stopper.



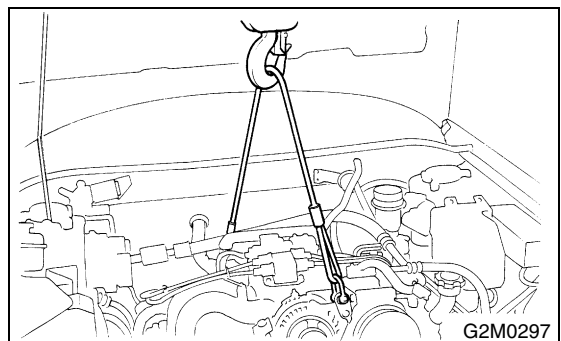
- 9) Remove the radiator upper brackets.
- Non-Turbo MODEL



- Turbo MODEL



- 10) Support the engine with a lifting device and wire ropes.



- 11) Lift-up the vehicle.

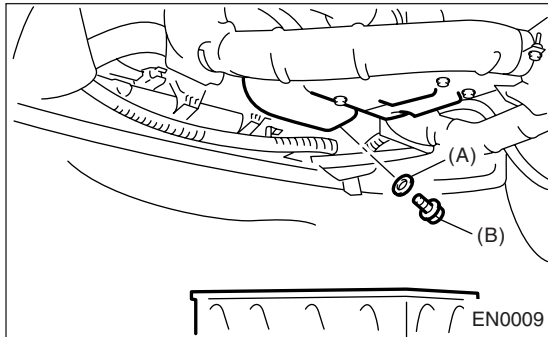
CAUTION:

At this time, raise up the wire ropes.

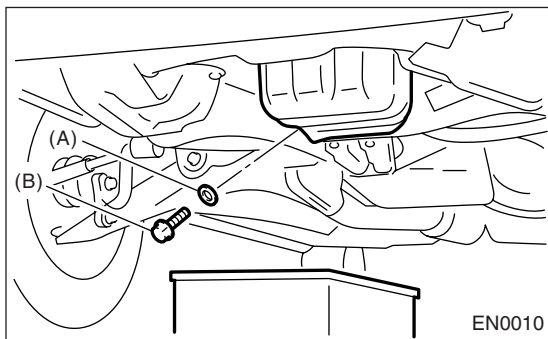
- 12) Remove the under cover.

13) Drain the engine oil.
Set a container under the vehicle, and remove the drain plug from oil pan.

- Non-Turbo MODEL



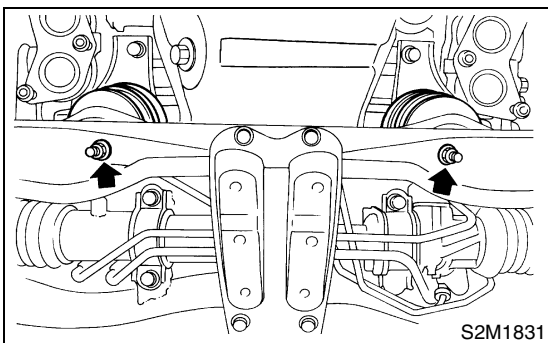
- Turbo MODEL



- (A) Gasket
- (B) Drain plug

14) Remove the front and center exhaust pipes. (Non-Turbo model) <Ref. to EX-7, REMOVAL, Front Exhaust Pipe.> or <Ref. to EX(w/oOBD)-9, REMOVAL, Front Exhaust Pipe.>

15) Remove the nuts which install front cushion rubber onto front crossmember.



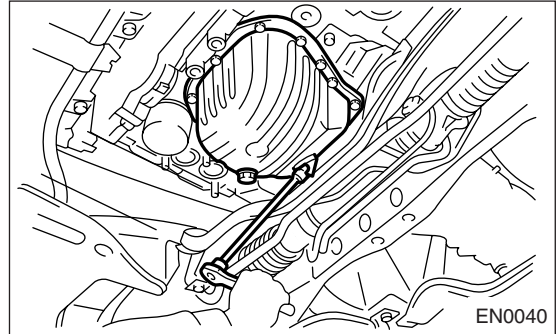
16) Remove the bolts which install oil pan on cylinder block while raising up engine.

17) Insert the oil pan cutter blade between the cylinder block-to-oil pan clearance.

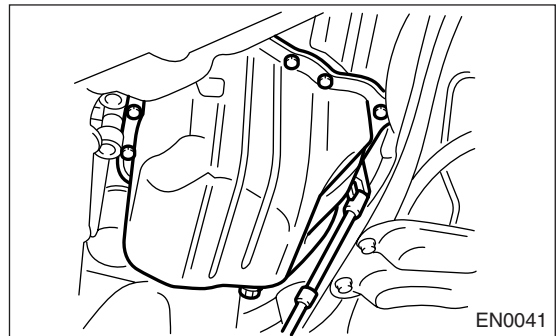
CAUTION:

Do not use a screwdriver or similar tool in place of oil pan cutter.

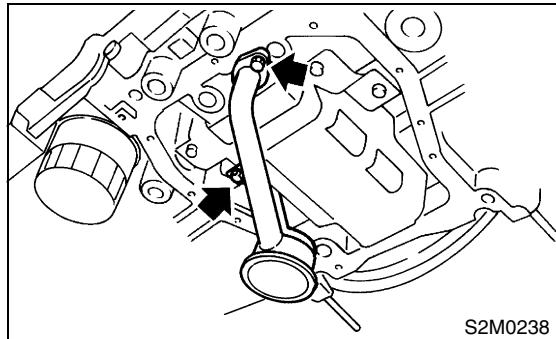
- Non-Turbo MODEL



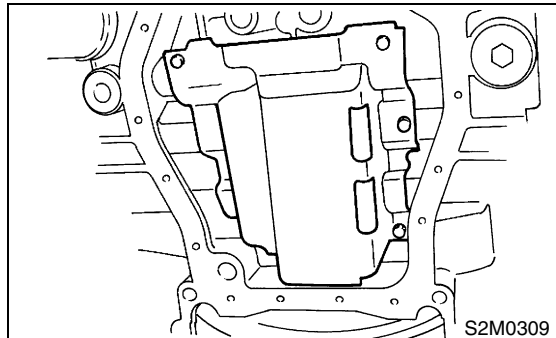
- Turbo MODEL



18) Remove the oil strainer.



19) Remove the baffle plate.



OIL PAN AND STRAINER

LUBRICATION

B: INSTALLATION

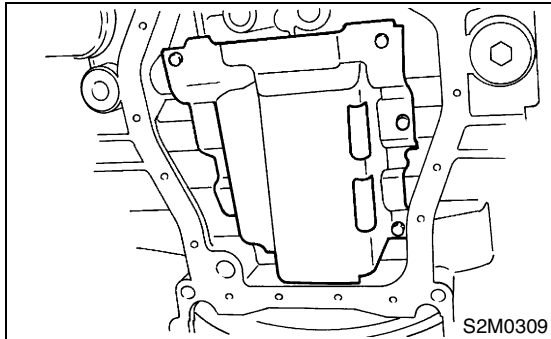
CAUTION:

Before installing the oil pan, clean sealant from oil pan and engine block.

1) Install the baffle plate.

Tightening torque:

6.4 N-m (0.65 kgf-m, 4.7 ft-lb)



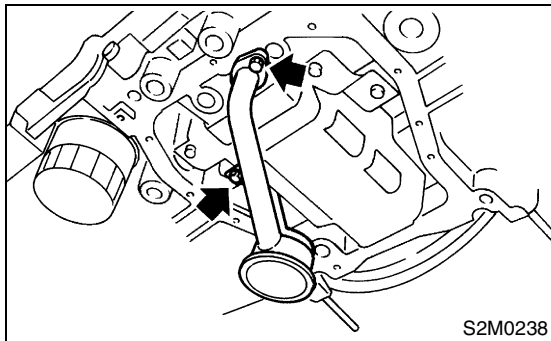
2) Install the oil strainer onto baffle plate.

NOTE:

Replace the O-ring with a new one.

Tightening torque:

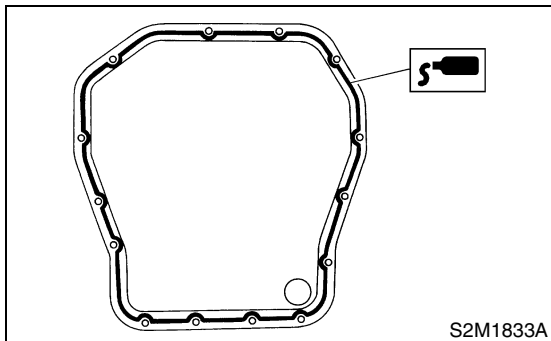
10 N-m (1.0 kgf-m, 7.2 ft-lb)



3) Apply fluid packing to the mating surfaces and install oil pan.

Fluid packing:

THREE BOND 1215 or equivalent

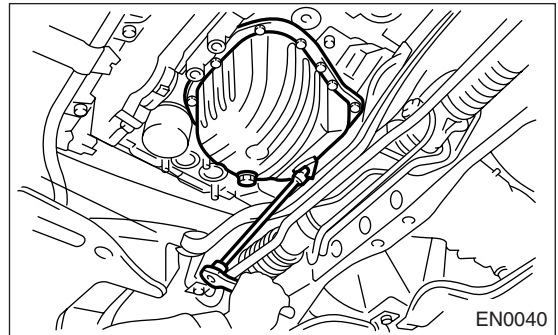


4) Tighten the bolts which install the oil pan onto engine block.

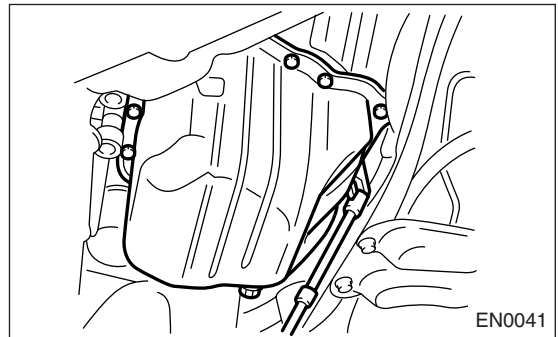
Tightening torque:

5 N-m (0.5 kgf-m, 3.6 ft-lb)

- Non-Turbo MODEL



- Turbo MODEL

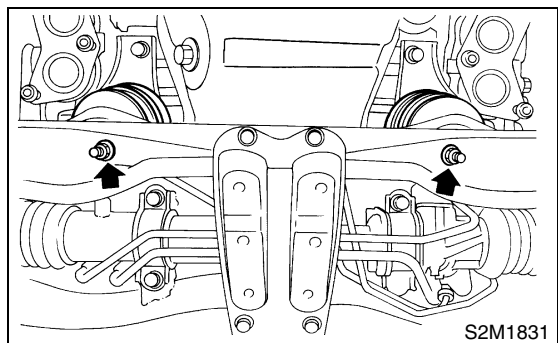


5) Lower the engine onto front crossmember.

6) Tighten the nuts which install front cushion rubber onto front crossmember.

Tightening torque:

69 N-m (7.0 kgf-m, 50.9 ft-lb)

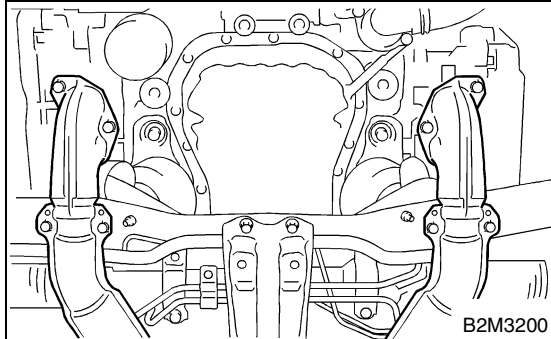


7) Install the front and center exhaust pipes. (Non-Turbo model)

<Ref. to EX-8, INSTALLATION, Front Exhaust Pipe.> or <Ref. to EX(w/oOBD)-10, INSTALLATION, Front Exhaust Pipe.>

NOTE:

Always use new gaskets.



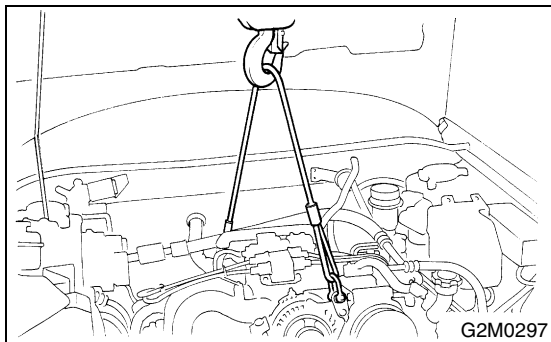
8) Install the under cover.

9) Lower the vehicle.

CAUTION:

At this time, lower the lifting device and release steel cables.

10) Remove the lifting device and steel cables.

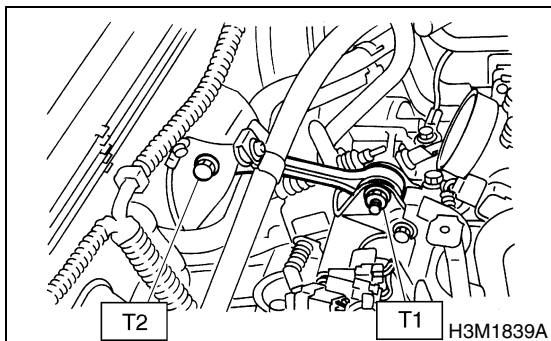


11) Install the pitching stopper.

Tightening torque:

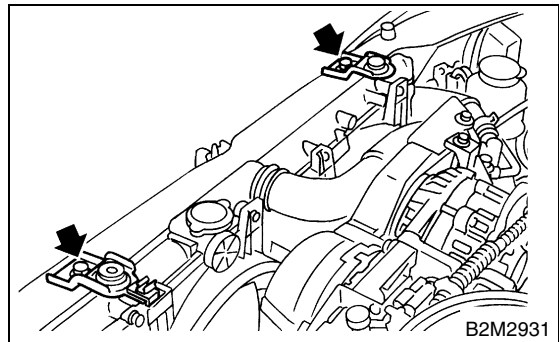
T1: 50 N·m (5.1 kgf-m, 36.9 ft-lb)

T2: 58 N·m (5.9 kgf-m, 42.8 ft-lb)

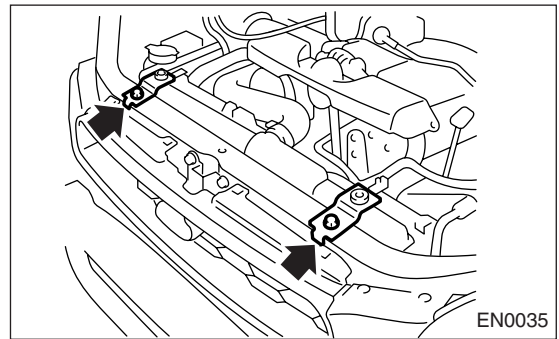


12) Install the radiator upper brackets.

- Non-Turbo MODEL



- Turbo MODEL

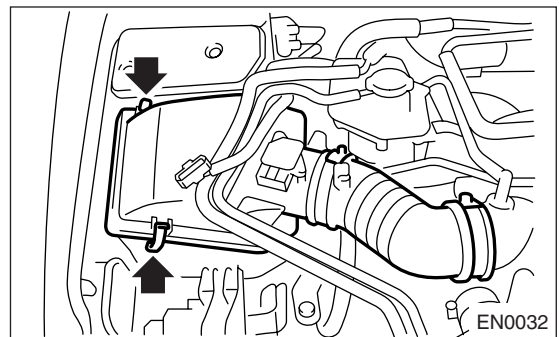


13) Install the air intake duct and air cleaner case. (Non-Turbo model)

<Ref. to IN-6, INSTALLATION, Air Cleaner Case.> and <Ref. to IN-7, INSTALLATION, Air Intake Duct.>

14) Install the intercooler. (Turbo model) <Ref. to IN(TURBO)-11, INSTALLATION, Intercooler.>

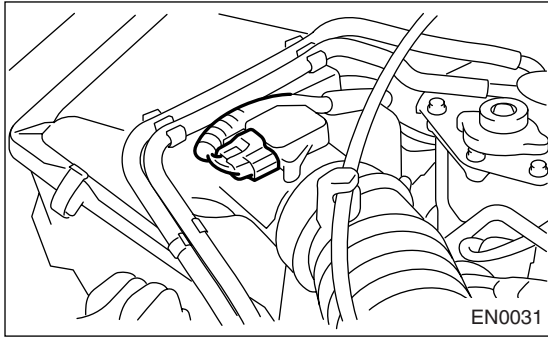
15) Install the air intake boot and air cleaner upper cover. (Turbo model)



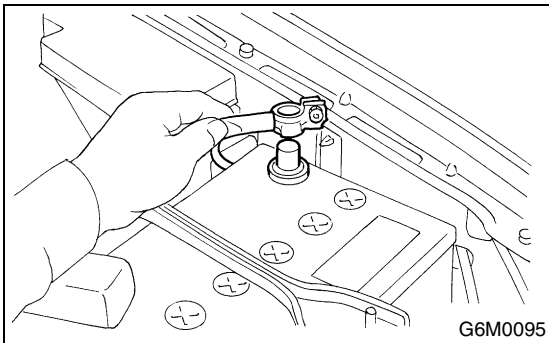
OIL PAN AND STRAINER

LUBRICATION

- 16) Connect the connector to mass air flow sensor.
(Turbo model)



- 17) Install the front wheels.
18) Connect the battery ground cable to battery.



- 19) Fill engine oil. <Ref. to LU-10, INSPECTION, Engine Oil.>

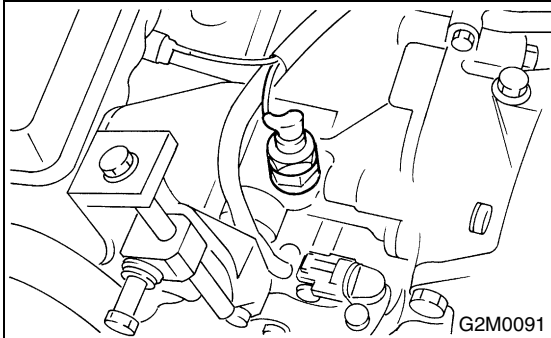
C: INSPECTION

By visual check make sure the oil pan, oil strainer, oil strainer stay and baffle plate are not damaged.

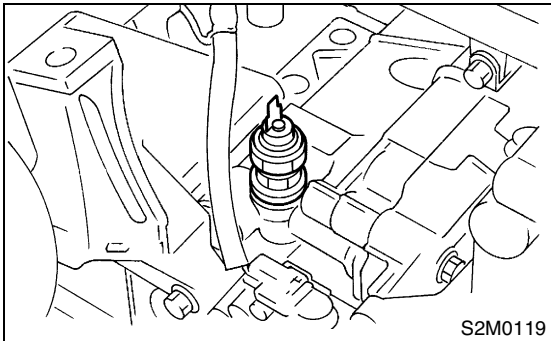
6. Oil Pressure Switch

A: REMOVAL

- 1) Remove the generator from bracket. <Ref. to SC-14, REMOVAL, Generator.>
- 2) Disconnect the terminal from oil pressure switch.



- 3) Remove the oil pressure switch.

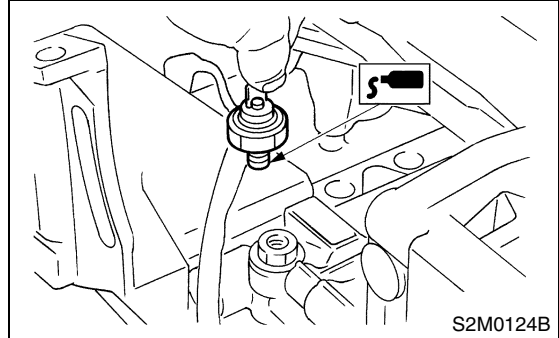


B: INSTALLATION

- 1) Apply fluid packing to the oil pressure switch threads.

Fluid packing:

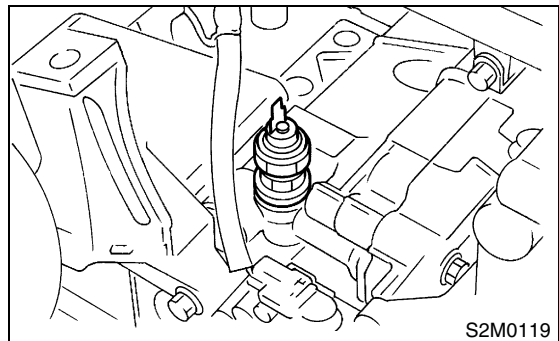
THREE BOND 1215 or equivalent



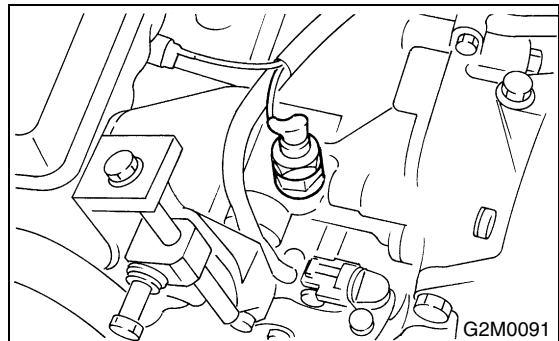
- 2) Install the oil pressure switch onto engine block.

Tightening torque:

25 N·m (2.5 kgf·m, 18.1 ft·lb)



- 3) Connect the terminal of oil pressure switch.



- 4) Install the generator on bracket. <Ref. to SC-14, INSTALLATION, Generator.>

C: INSPECTION

Make sure oil does not leak or seep from where the oil pressure switch is installed.

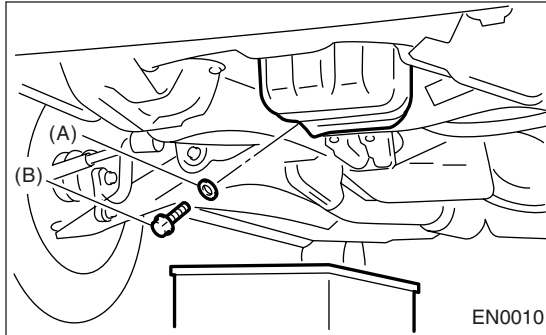
ENGINE OIL COOLER

LUBRICATION

7. Engine Oil Cooler

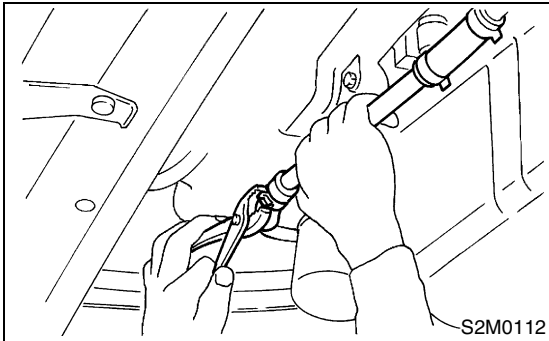
A: REMOVAL

- 1) Lift-up the vehicle.
- 2) Remove the under cover.
- 3) Drain the engine oil.
Set a container under the vehicle, and remove the drain plug from oil pan.



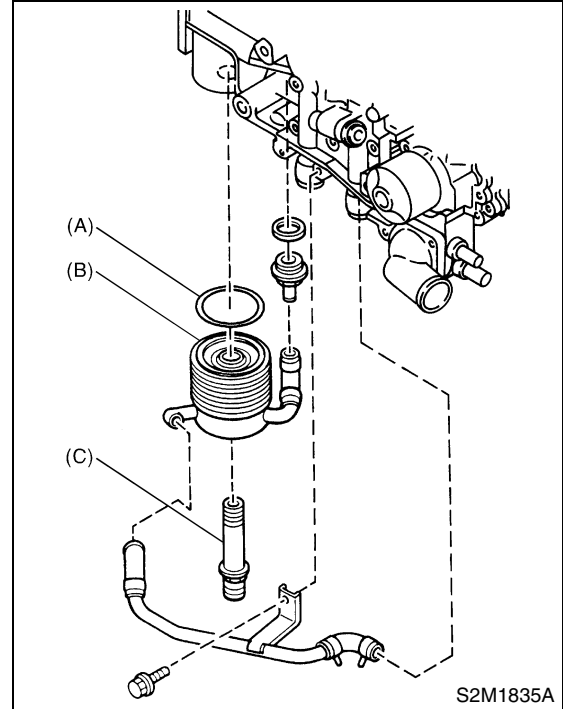
- (A) Gasket
- (B) Drain plug

- 4) Drain the engine coolant.
- 5) Remove the water by-pass pipe between oil cooler and water pump.



- 6) Remove the engine oil filter. <Ref. to LU-24, REMOVAL, Engine Oil Filter.>

- 7) Remove the connector and remove oil cooler.



- (A) O-ring
- (B) Oil cooler
- (C) Connector

B: INSTALLATION

1) Install in the reverse order of removal.

Tightening torque:

T: 54 N·m (5.5 kgf·m, 40 ft·lb)

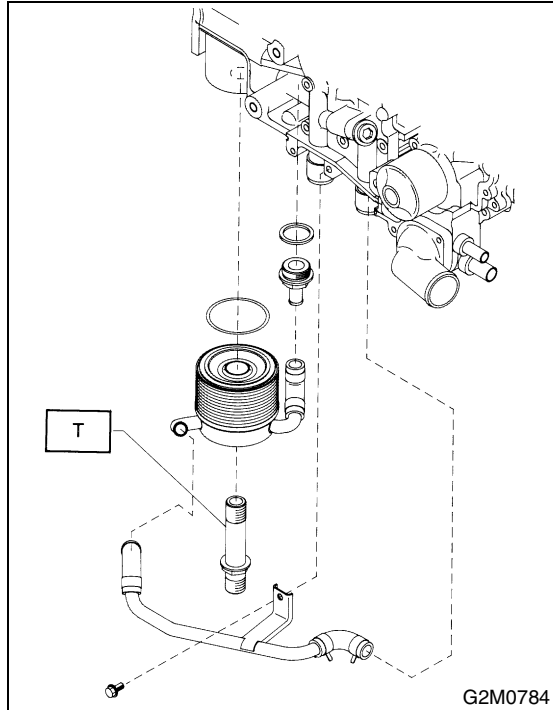
NOTE:

Always use a new O-ring.

C: INSPECTION

1) Check that the coolant passages are not clogged using air blow method.

2) Check the mating surfaces of cylinder block, O-ring groove and oil filter for damage.



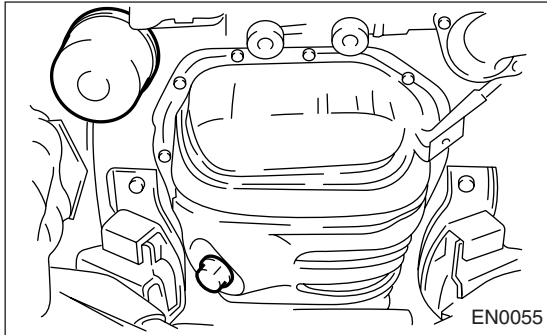
8. Engine Oil Filter

A: REMOVAL

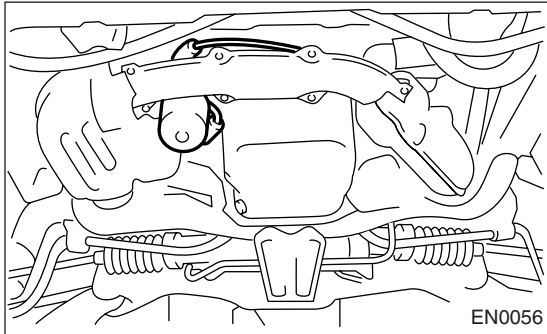
- 1) Remove the under cover.
- 2) Remove the oil filter with ST.

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 the oil filter by turning it by hand, being careful not to damage seal rubber.
- 3) Tighten more (approx. 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 the oil filter, run the 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.>

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.
		Malfunition of oil by-pass valve of oil filter	Clean or replace.
		Malfunition of oil relief valve of oil pump	Clean or replace.
		Clogged oil passage	Clean.
		Excessive tip clearance and side clearance of oil pump rotor and gear	Replace.
		Clogged oil strainer or broken pipe	Clean or replace.
	3) No oil pressure	Insufficient engine oil	Replenish.
		Broken pipe of oil strainer	Replace.
Stuck oil pump rotor		Replace.	
2. Warning light does not go on.	1) Burn-out bulb	Replace.	
	2) Poor contact of switch contact points	Replace.	
	3) Disconnection of wiring	Repair.	
3. Warning light flickers momentarily.	1) Poor contact at terminals	Repair.	
	2) Defective wiring harness	Repair.	
	3) Low oil pressure	Check for the same possible causes as listed in 1.—2).	

ENGINE LUBRICATION SYSTEM TROUBLE IN GENERAL

LUBRICATION

SPEED CONTROL SYSTEMS

SP

	Page
1. General Description	2
2. Accelerator Pedal	4
3. Accelerator Control Cable	9

GENERAL DESCRIPTION

SPEED CONTROL SYSTEMS

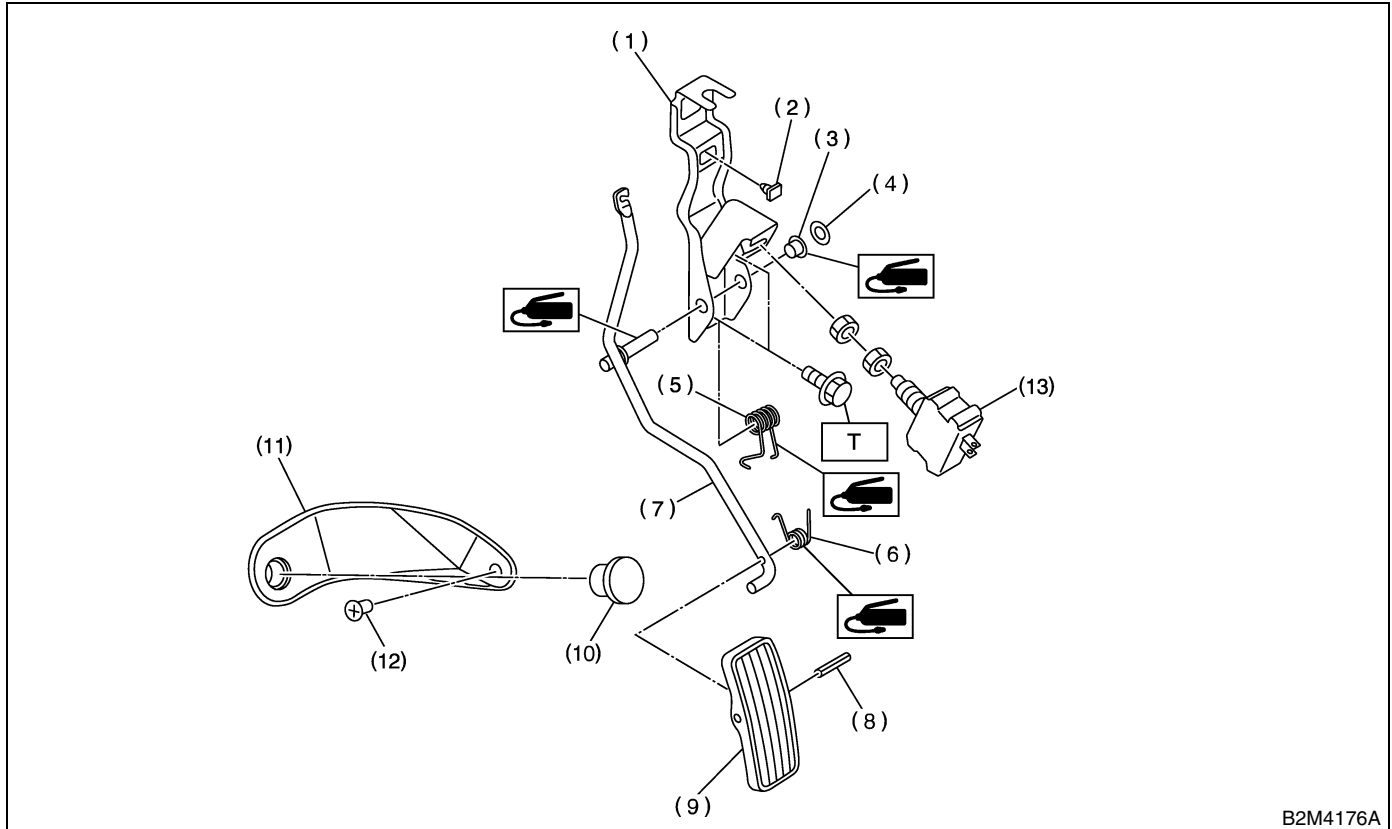
1. General Description

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



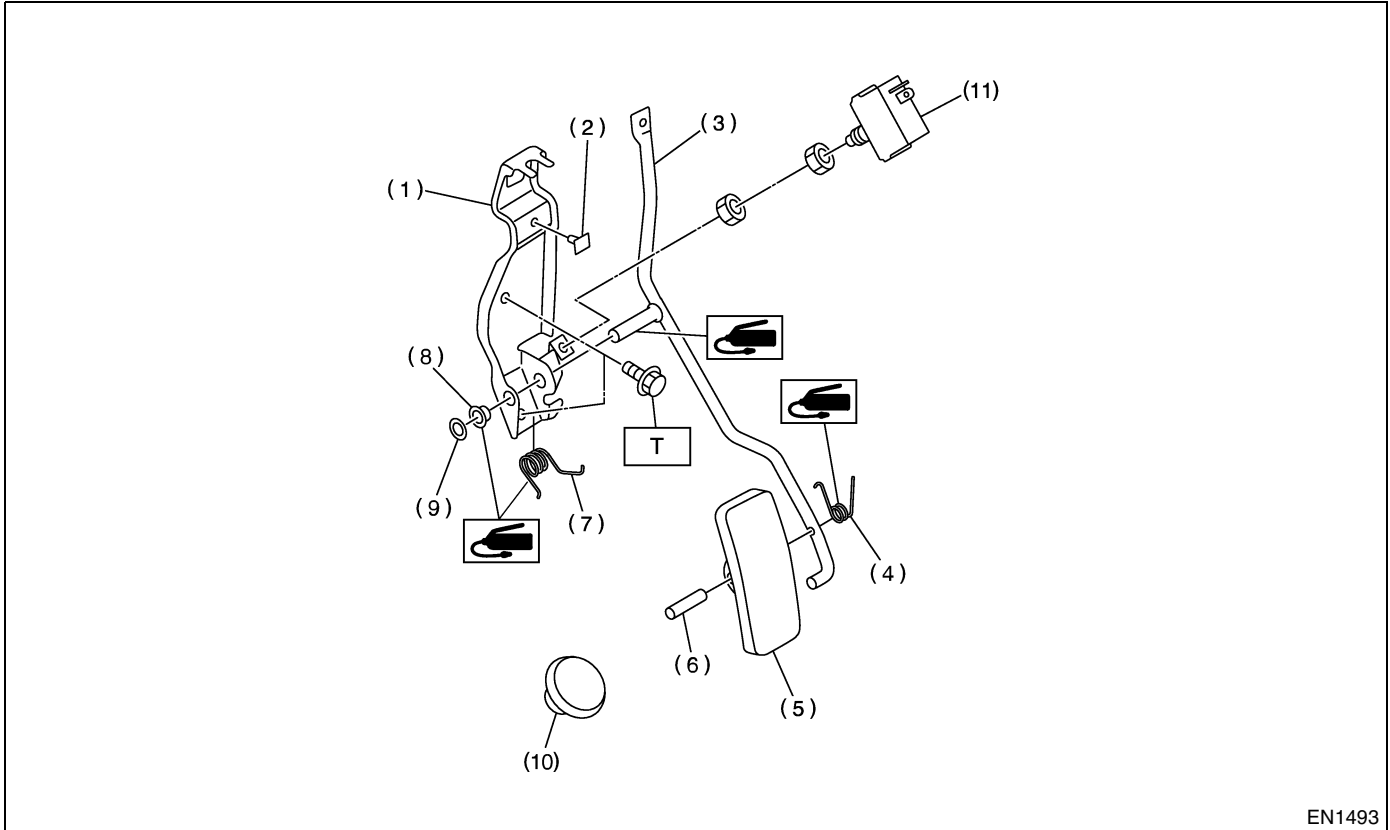
B2M4176A

- | | | |
|------------------------------|-----------------------------|----------------------------------|
| (1) Accelerator bracket | (7) Accelerator pedal lever | (13) Kick-down switch (AT model) |
| (2) Stopper | (8) Spring pin | |
| (3) Bushing | (9) Accelerator pedal | |
| (4) Clip | (10) Accelerator stopper | |
| (5) Accelerator spring | (11) Accelerator plate | |
| (6) Accelerator pedal spring | (12) Clip | |

Tightening torque: N·m (kgf·m, ft·lb)

T: 18 (1.8, 13.0)

2. RHD MODEL



EN1493

- | | |
|------------------------------|--------------------------|
| (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 the ground cable from battery.

ACCELERATOR PEDAL

SPEED CONTROL SYSTEMS

2. Accelerator Pedal

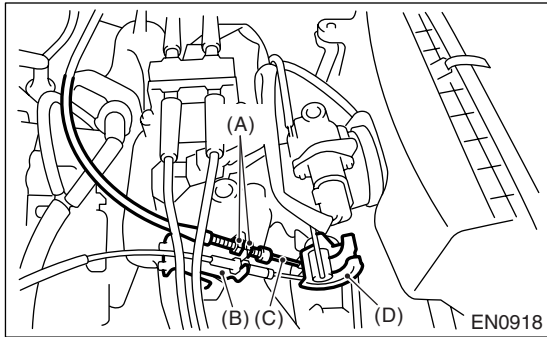
A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the lock nut from accelerator cable bracket.
- 3) Separate the accelerator cable from bracket.
- 4) Remove the accelerator cable end from throttle cam.
- 5) Disconnect the accelerator cable from throttle body.

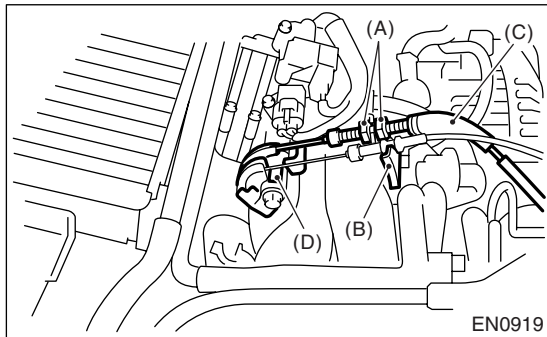
CAUTION:

Be careful not to kink the accelerator cable.

• SOHC MODEL



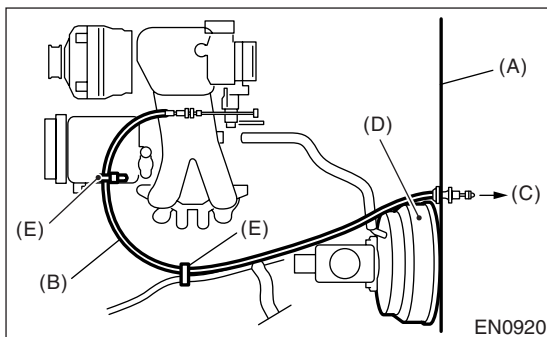
• DOHC turbo MODEL



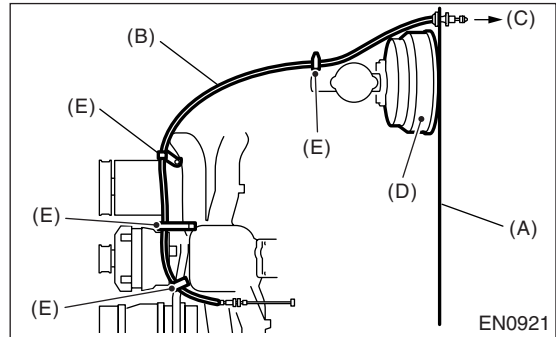
- (A) Lock nut
- (B) Accelerator cable bracket
- (C) Accelerator cable
- (D) Throttle cam

- 6) Remove the clip inside engine compartment.

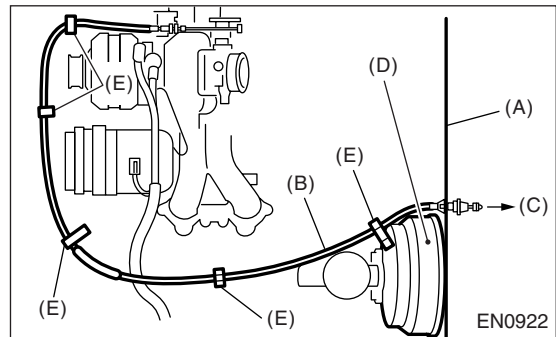
• LHD SOHC MODEL



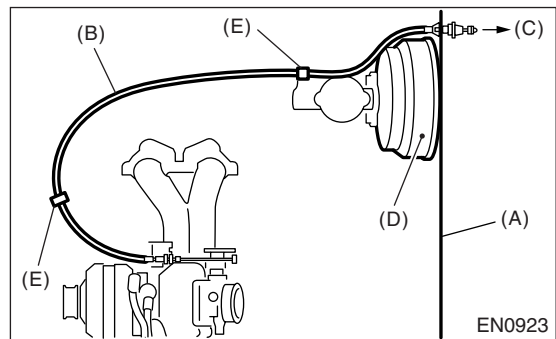
• RHD SOHC MODEL



• 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 the instrument panel lower cover from instrument panel, and connector.

- 8) Disconnect the connector from kick-down switch. (AT model)

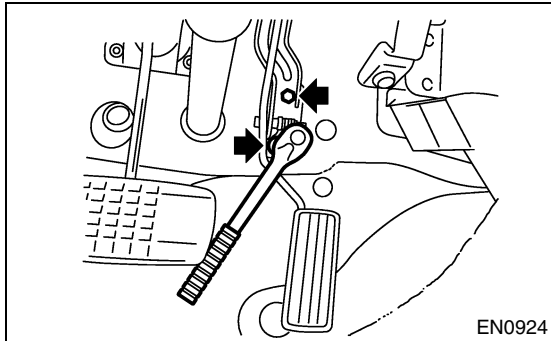
- 9) Remove the brake and clutch pedal bracket. (LHD MT model) <Ref. to BR-65, REMOVAL, Brake Pedal.>

ACCELERATOR PEDAL

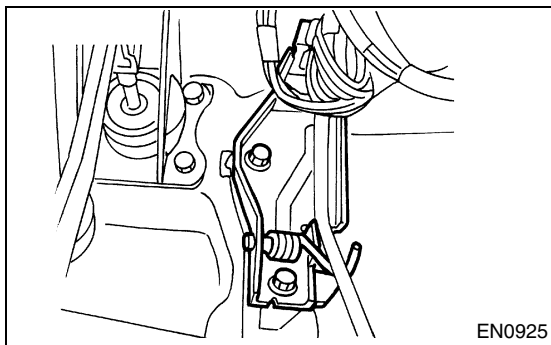
SPEED CONTROL SYSTEMS

10) Remove the accelerator pedal connecting bolt from accelerator pedal bracket.

• LHD MODEL



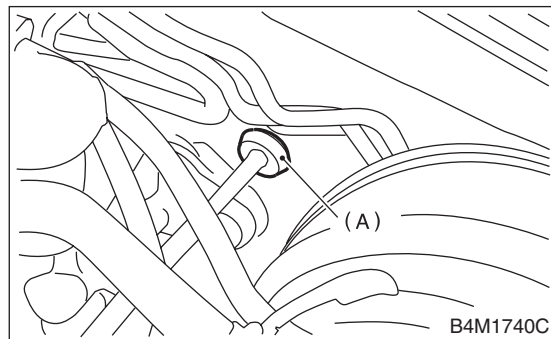
• RHD MODEL



11) Disconnect the grommet from toe board.

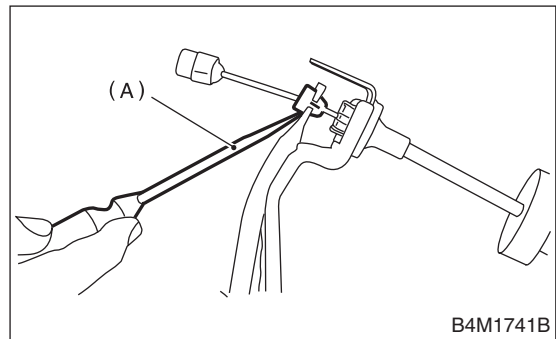
NOTE:

From the inside compartment, push the grommet (A) into hole.



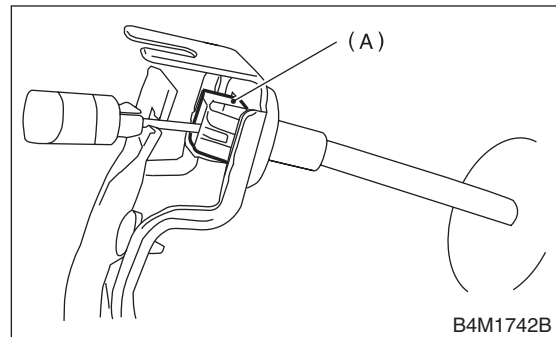
12) Pull out the cable from toe board hole.

13) Disconnect the accelerator cable bushing from accelerator pedal lever.



(A) Slot type screwdriver

14) Disconnect the accelerator cable stopper (A) from bracket.



15) Separate the accelerator cable and bracket.

B: INSTALLATION

1) Install in the reverse order of removal.

CAUTION:

- If the cable clamp is damaged, replace it with a new one.
- Never fail to cover the outer cable end with boot.
- Be careful not to kink the accelerator cable.
- Always use new clevis pins.

ACCELERATOR PEDAL

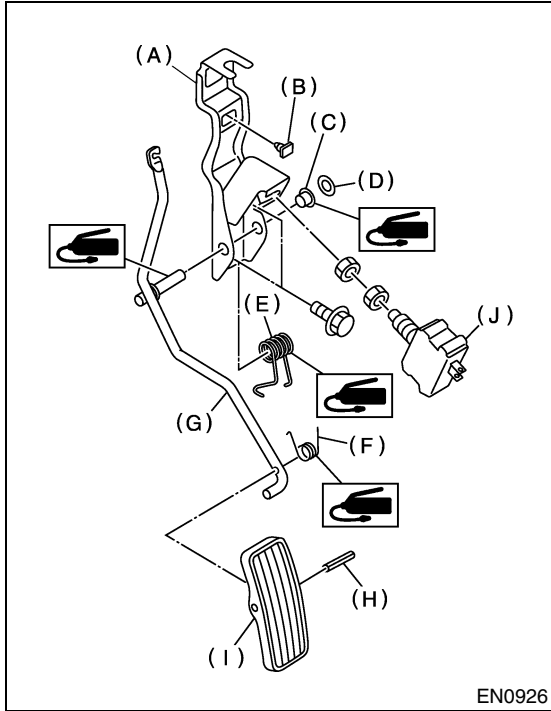
SPEED CONTROL SYSTEMS

C: DISASSEMBLY

1) Remove the clip, and then remove the accelerator pedal from bracket.

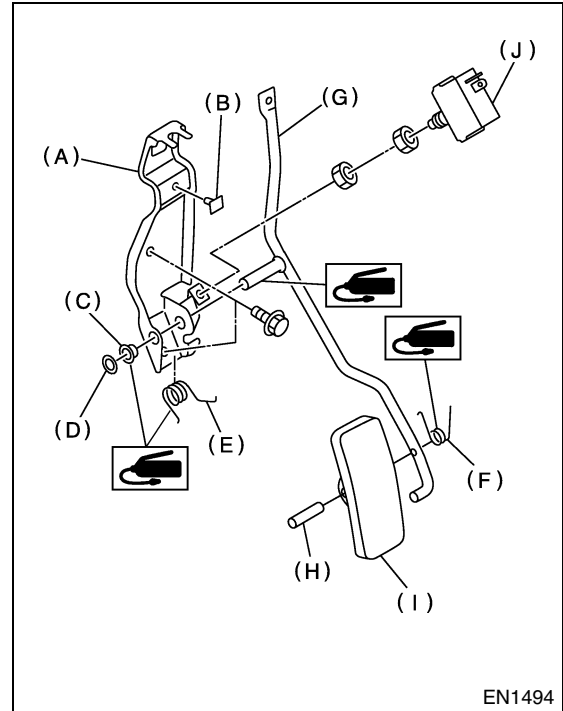
2) Pull out the spring pin, and then remove the accelerator pedal from accelerator pedal lever.

• LHD MODEL



- (A) Accelerator bracket
- (B) Stopper
- (C) Bushing
- (D) Clip
- (E) Accelerator spring
- (F) Accelerator pedal spring
- (G) Accelerator pedal lever
- (H) Spring pin
- (I) Accelerator pedal
- (J) Kick-down switch (AT model)

• RHD MODEL



- (A) Accelerator bracket
- (B) Stopper
- (C) Bushing
- (D) Clip
- (E) Accelerator spring
- (F) Accelerator pedal spring
- (G) Accelerator pedal lever
- (H) Spring pin
- (I) Accelerator pedal
- (J) Kick-down switch (AT model)

D: ASSEMBLY

Assemble in the reverse order of disassembly.

CAUTION:

Clean and apply grease to the portions indicated in the figure.

Grease:

Nigtight — LYW No.2 or equivalent

E: INSPECTION

1. ACCELERATOR PEDAL

Lightly move the pedal pad in lateral direction to ensure that pedal deflection is in specified range.

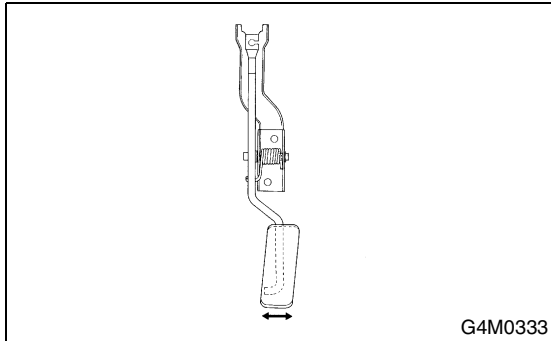
CAUTION:

If excessive deflection is noted, replace the bushing and clip with new ones.

Deflection of accelerator pedal:

Service limit

5.0 mm (0.197 in) or less

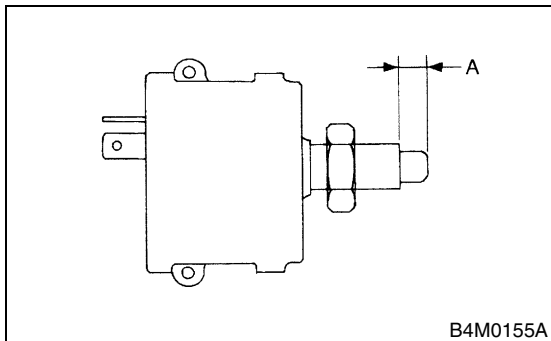


2. KICK-DOWN SWITCH

If the kick-down switch does not operate properly (or if it does not stop at the specified position), replace with a new one.

Specified position: A

$2^{+1.5}/_0$ mm (0.079 $^{+0.059}/_0$ in)



F: ADJUSTMENT

1) Check the pedal stroke and free play by operating accelerator pedal by hand.

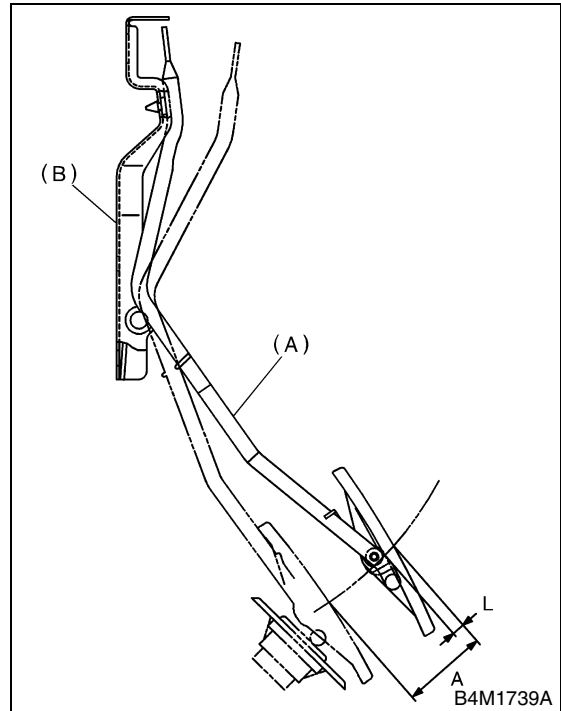
If it is not within specified value, adjust it by turning the nut connecting the accelerator cable to throttle body.

Free play at pedal pad: L

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 within specified value, adjust it by adjusting the position of kick-down switch.

CAUTION:

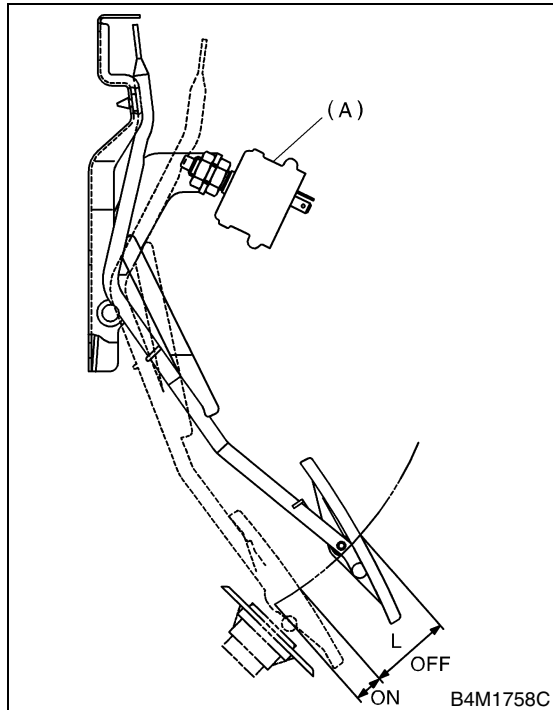
Be careful not to rotate the kick-down switch.

Kick-down switch stroke: A

48±1 mm (1.89±0.04 in)

Kick-down switch tightening torque:

12 N·m (1.2 kgf·m, 9 ft·lb)



(A) Kick down switch

3. Accelerator Control Cable

A: REMOVAL

- 1) Remove the accelerator pedal. <Ref. to SP-4, REMOVAL, Accelerator Pedal.>
- 2) Separate the accelerator cable and accelerator pedal.

B: INSTALLATION

- 1) Install in the reverse order of removal.

CAUTION:

- If the cable clamp is damaged, replace it with a new one.
- Never fail to cover the outer cable end with boot.
- Be careful not to kink the accelerator cable.
- Do not apply grease to the throttle cable on 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

IGNITION

IG

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1. General Description	2
2. Spark Plug.....	5
3. Ignition Coil and Ignitor Assembly	8
4. Spark Plug Cord	10

GENERAL DESCRIPTION

IGNITION

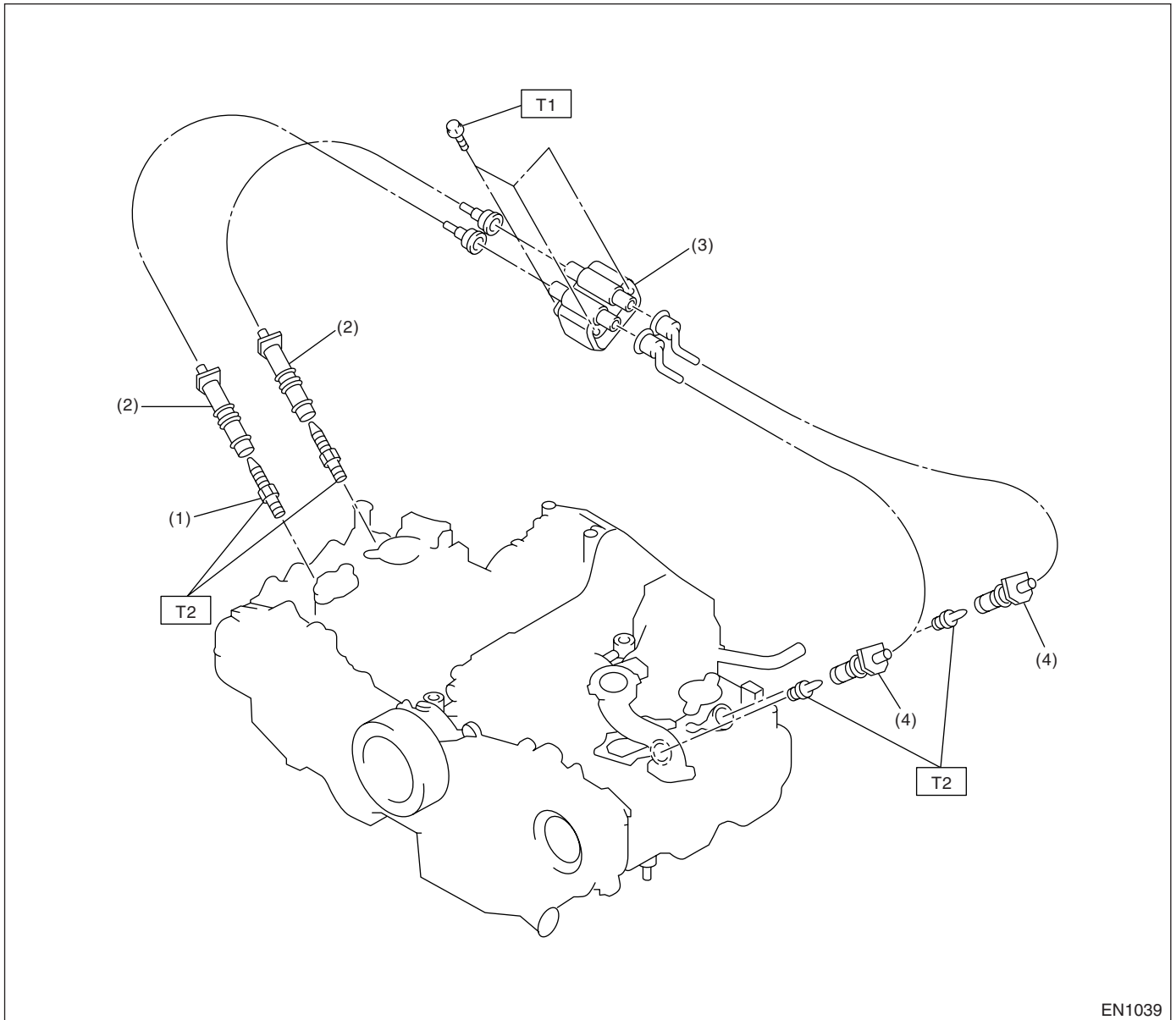
1. General Description

A: SPECIFICATIONS

Item		Designation	
Ignition coil and ignitor assembly	Model	1600 cc	CM12—100C
		2000 cc and 2500 cc	FH0137
	Manufacturer	1600 cc	HITACHI
		2000 cc and 2500 cc	DIAMOND
	Primary coil resistance	1600 cc	0.7 $\Omega \pm 10\%$
		2000 cc and 2500 cc	0.73 $\Omega \pm 10\%$
	Secondary coil resistance	1600 cc	13.0 k $\Omega \pm 20\%$
2000 cc and 2500 cc		12.8 k $\Omega \pm 15\%$	
Insulation resistance between primary terminal and case		More than 100 M Ω	
Spark plug	Type and manufacturer	1600 cc	CHAMPION: RC8YC4
			NGK: BKR6E-11 (Alternate)
		2000 cc and 2500 cc	CHAMPION: RC10YC4
			NGK: BKR5E-11 (Alternate)
	Thread size	mm	14, P = 1.25
Spark gap	mm (in)	1.0 — 1.1 (0.039 — 0.043)	

B: COMPONENT

1. 1600 CC MODEL



EN1039

- (1) Spark plug
- (2) Spark plug cord (#1, #3)
- (3) Ignition coil and ignitor ASSY

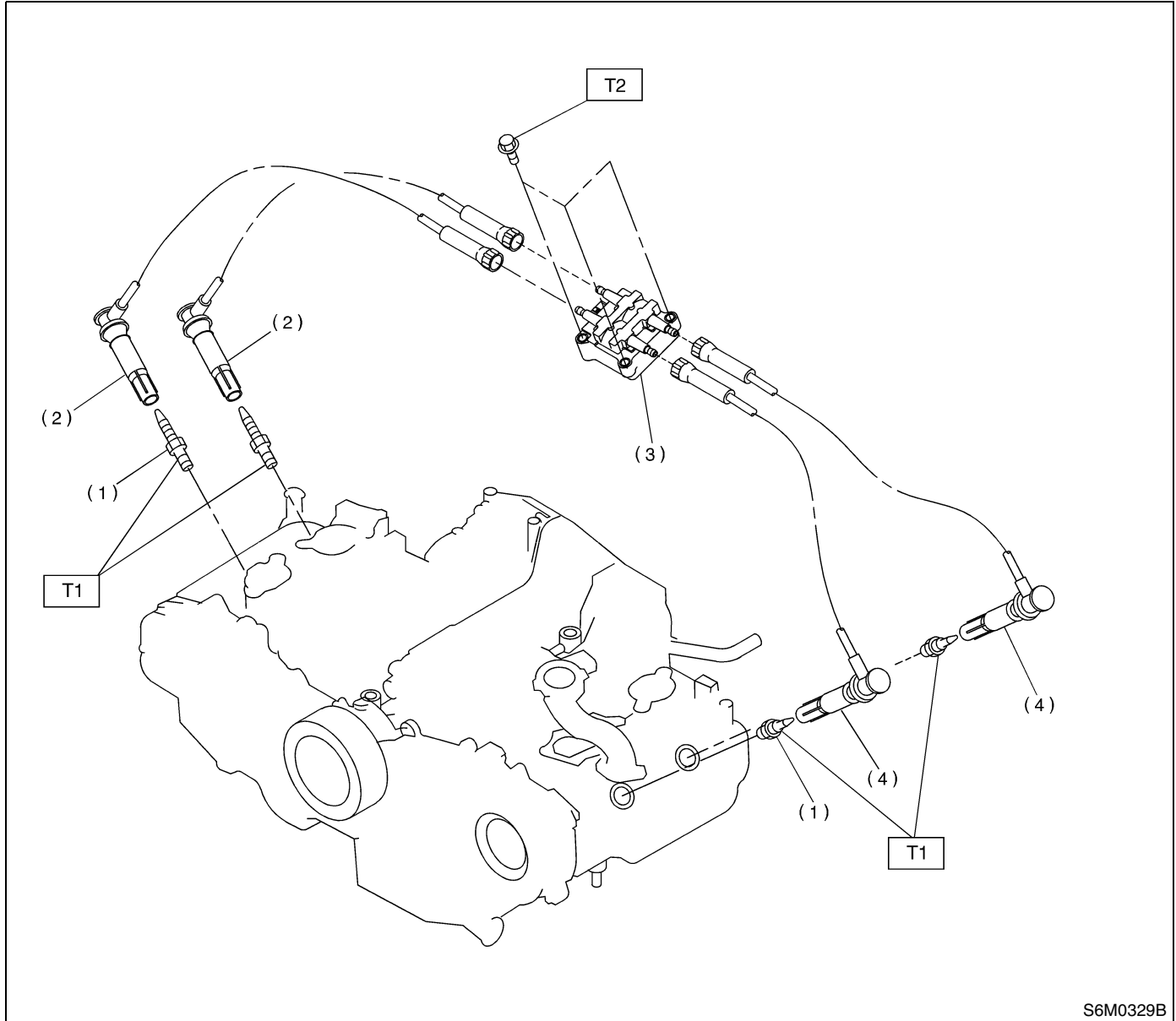
- (4) Spark plug cord (#2, #4)

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. 2000 CC AND 2500 CC 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: 21 (2.1, 15.2)

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 the ground cable from battery.

2. Spark Plug

A: REMOVAL

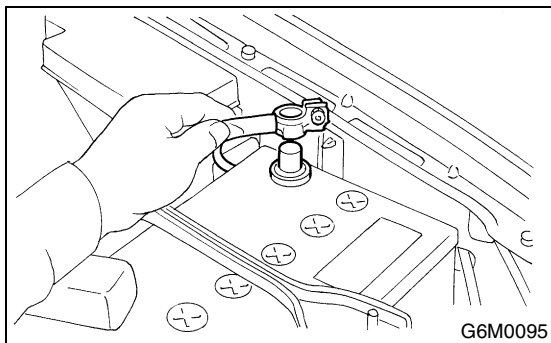
CAUTION:

All spark plugs installed on an engine, must be of the same heat range.

Spark plug	
1600 cc	CHAMPION: RC8YC4 NGK: BKR6E-11 (Alternate)
2000 cc and 2500 cc	CHAMPION: RC10YC4 NGK: BKR5E-11 (Alternate)

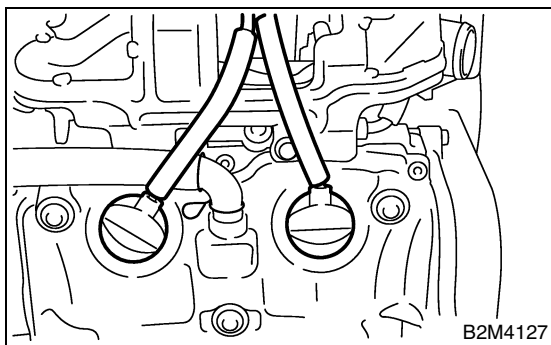
1. RH SIDE

1) Disconnect the ground cable from battery.

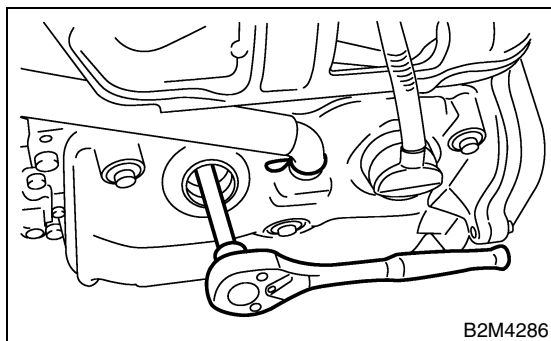


2) Remove the resonator chamber. <Ref. to IN-8, REMOVAL, Resonator Chamber.>

3) Remove the spark plug cords by pulling boot, not the cord itself.

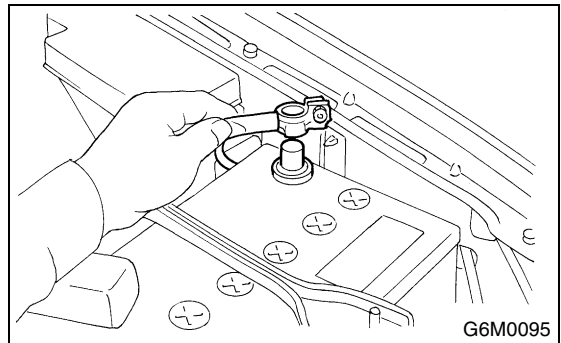


4) Remove the spark plugs with spark plug sockets.

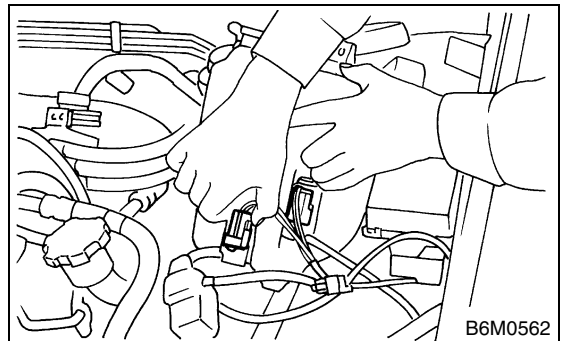


2. LH SIDE

1) Disconnect the ground cable from battery.

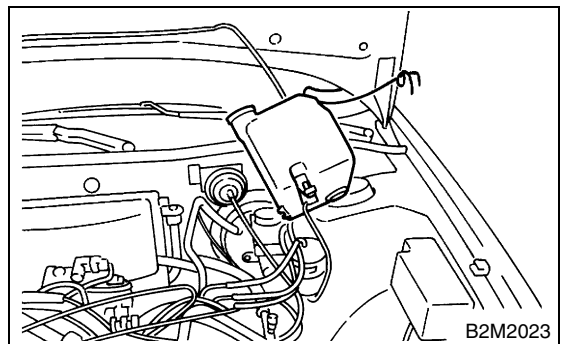


2) Disconnect the washer motor connector.

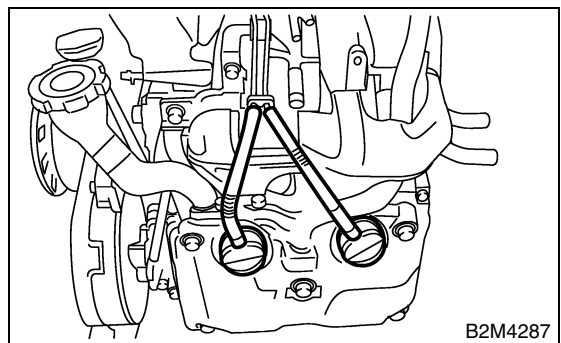


3) Disconnect the rear window glass washer hose from washer motor, then plug connection with a suitable cap.

4) Remove the two bolts which hold washer tank, then take the tank away from the working area.



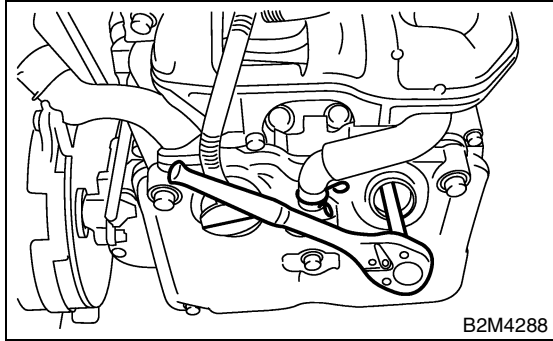
5) Remove the spark plugs cord by pulling boot, not the cord itself.



SPARK PLUG

IGNITION

6) Remove the spark plugs with spark plug sockets.



B: INSTALLATION

1. RH SIDE

1) Install in the reverse order of removal.

Tightening torque (Spark plug):
21 N·m (2.1 kgf-m, 15.2 ft-lb)

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 approx. 1/3 of the specified torque in order to avoid over-stressing.

2. LH SIDE

1) Install in the reverse order of removal.

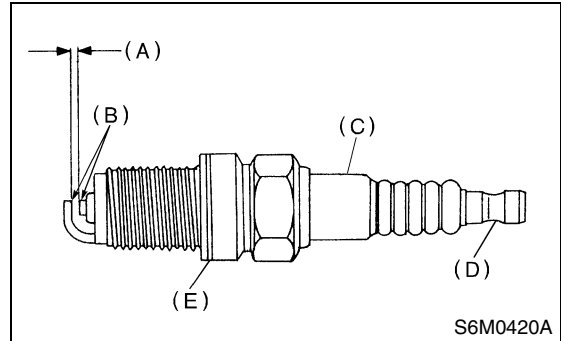
Tightening torque (Spark plug):
21 N·m (2.1 kgf-m, 15.2 ft-lb)

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 approx. 1/3 of the specified torque in order to avoid over-stressing.

C: INSPECTION

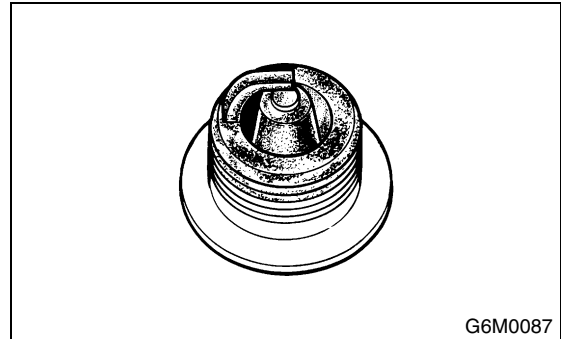
Check the electrodes and inner and outer porcelain of plugs, noting the type of deposits and the degree of electrode erosion.



- (A) Electrode gap
- (B) Carbon accumulation or wear
- (C) Cracks
- (D) Damage
- (E) Damaged gasket

1) Normal:

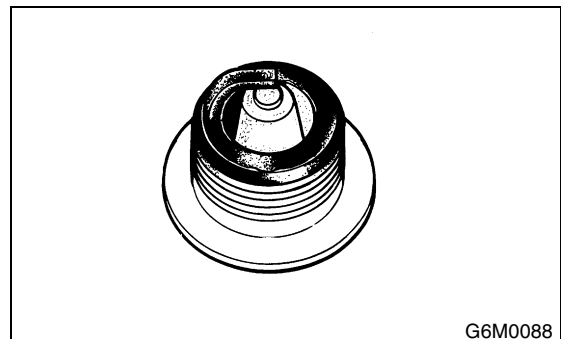
Brown to grayish-tan deposits and slight electrode wear indicates correct spark plug heat range.



2) Carbon fouled:

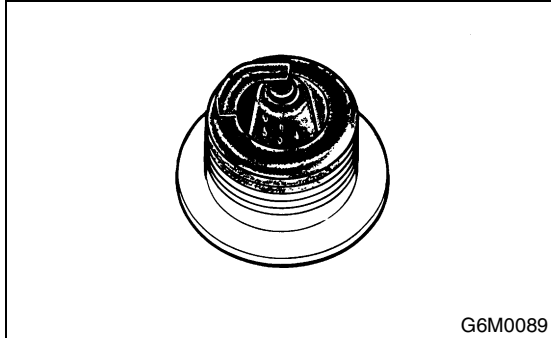
Dry fluffy carbon deposits on insulator and electrode are mostly caused by slow speed driving in city, weak ignition, too rich fuel mixture, dirty air cleaner, etc.

It is advisable to replace with plugs having hotter heat range.



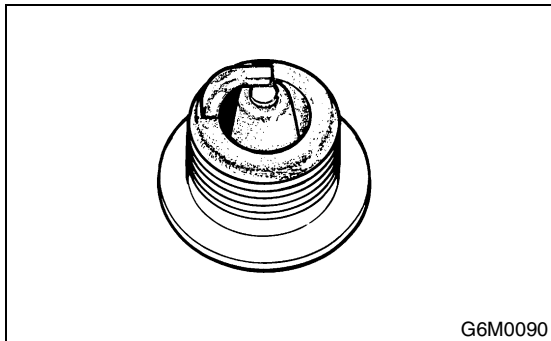
3) Oil fouled:

Wet black deposits show excessive oil entrance into combustion chamber through worn rings and pistons or excessive clearance between valve guides and stems. If the same condition remains after repair, use a hotter plug.



4) Overheating:

White or light gray insulator with black or gray brown spots and bluish burnt electrodes indicates engine overheating. Moreover, the appearance results from incorrect ignition timing, loose spark plugs, wrong selection of fuel, hotter range plug, etc. It is advisable to replace with plugs having colder heat range.

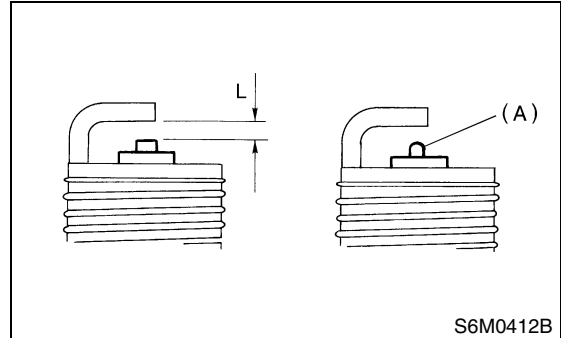


E: ADJUSTMENT

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 a new spark plug if this area (A) is worn to "ball" shape.

D: CLEANING

Clean the spark plugs in a sand blast type cleaner. Avoid excessive blasting. Clean and remove the carbon or oxide deposits, but do not wear away porcelain.

If deposits are too stubborn, replace the spark plugs.

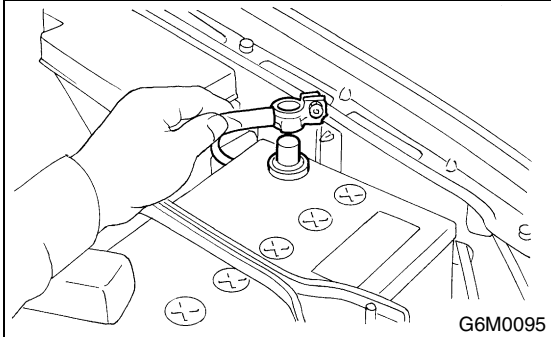
IGNITION COIL AND IGNITOR ASSEMBLY

IGNITION

3. Ignition Coil and Ignitor Assembly

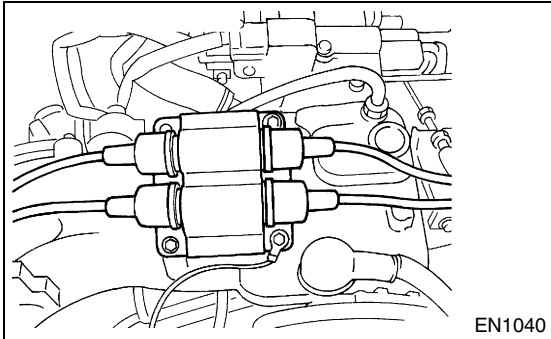
A: REMOVAL

1) Disconnect the ground cable from battery.

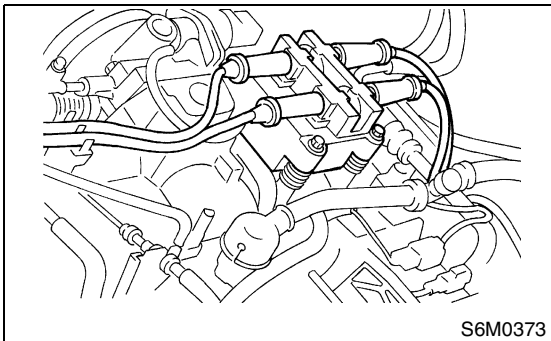


2) Disconnect the spark plug cords from ignition coil and ignitor assembly.

- 1600 cc MODEL



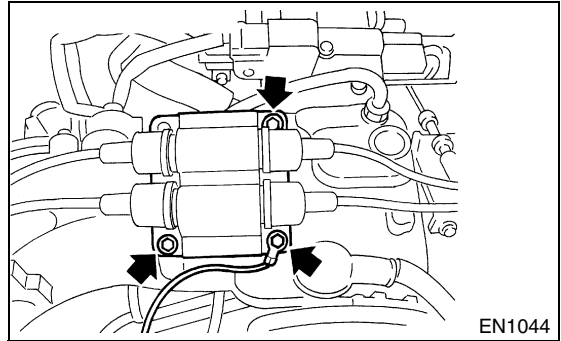
- 2000 cc and 2500 cc MODEL



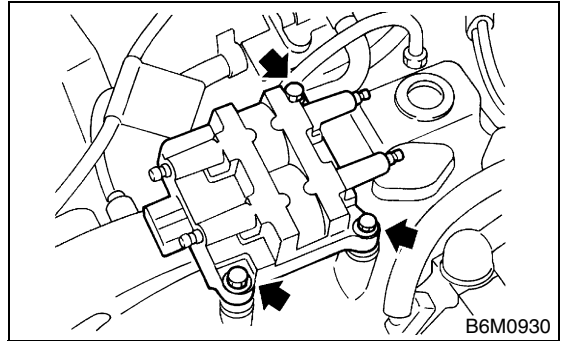
3) Disconnect the connector from ignition coil and ignitor assembly.

4) Remove the ignition coil and ignitor assembly.

- 1600 cc MODEL



- 2000 cc and 2500 cc MODEL



B: INSTALLATION

1) Install in the reverse order of removal.

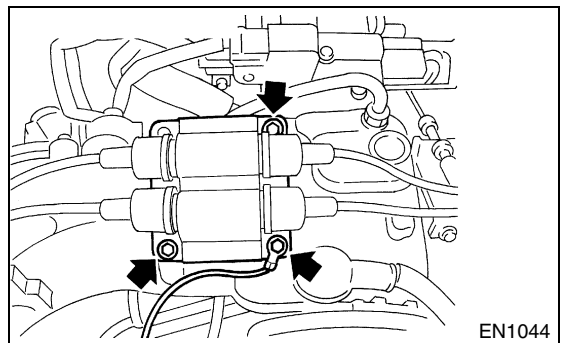
Tightening torque:

6.4 N·m (0.65 kgf·m, 4.7 ft·lb)

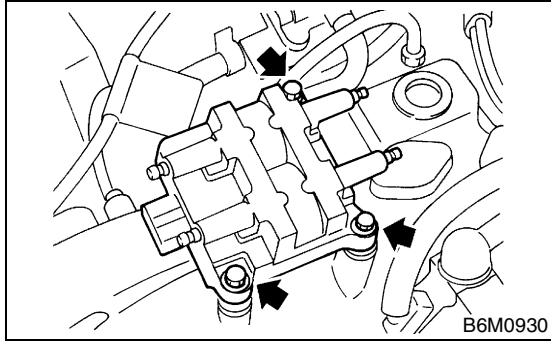
CAUTION:

Be sure to connect wires to their proper positions. Failure to do so will damage unit.

- 1600 cc MODEL



- 2000 cc and 2500 cc MODEL



Specified resistance: (2000 cc and 2500 cc)

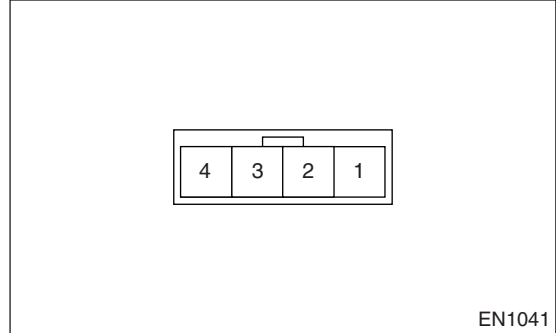
[Primary side]

Between terminal No. 1 and No. 2

0.73 Ω±10%

Between terminal No. 2 and No. 4

0.73 Ω±10%



C: INSPECTION

Using the 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:(1600 cc)

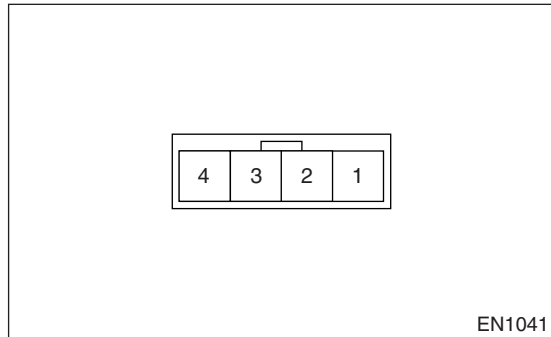
[Primary side]

Between terminal No. 1 and No. 4

0.7 Ω±10%

Between terminal No. 1 and No. 2

0.7 Ω±10%



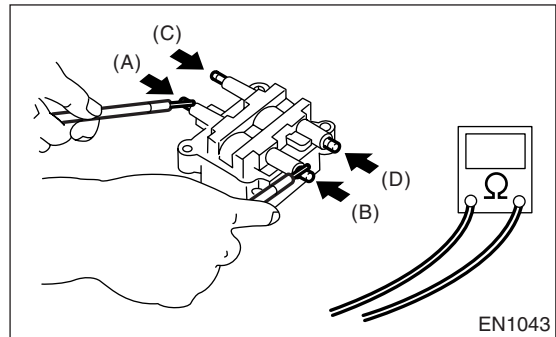
[Secondary side]

Between (A) and (B)

12.8 kΩ±15%

Between (C) and (D)

12.8 kΩ±15%



- 3) Insulation between primary terminal and case: 100 MΩ or more.

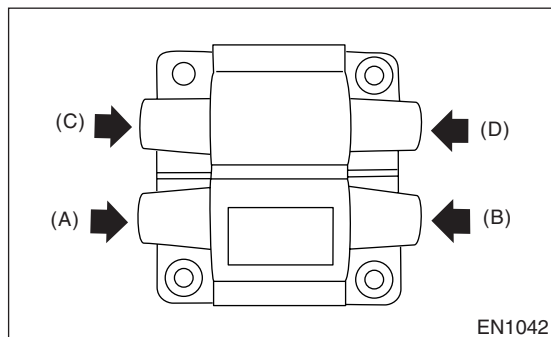
[Secondary side]

Between (A) and (B)

13.0 kΩ±20%

Between (C) and (D)

13.0 kΩ±20%



4. Spark Plug Cord

A: INSPECTION

Check for:

- 1) Damage to cords, deformation, burning or rust formation of terminals
- 2) Resistance values of cords

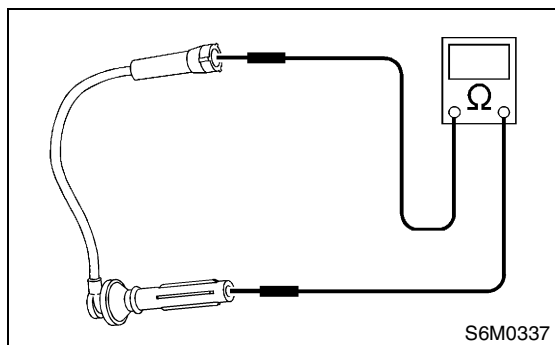
Resistance value:

#1 cord: 5.6 — 10.6 k Ω

#2 cord: 7.3 — 13.7 k Ω

#3 cord: 5.9 — 11.1 k Ω

#4 cord: 7.3 — 13.7 k Ω



STARTING/CHARGING SYSTEMS

SC

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2. Starter	5
3. Generator	14
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GENERAL DESCRIPTION

STARTING/CHARGING SYSTEMS

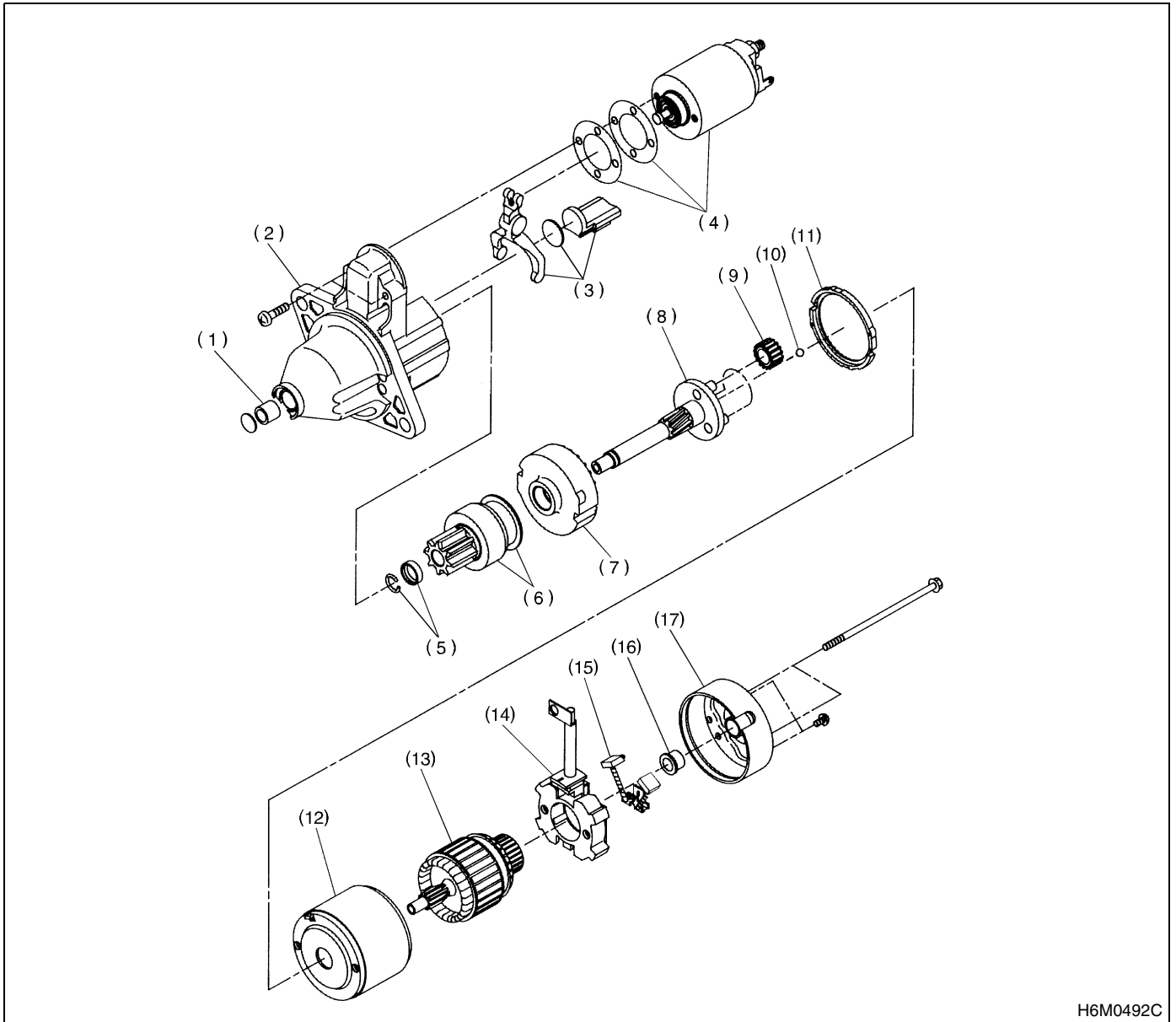
1. General Description

A: SPECIFICATIONS

Item		Designation		
Starter	Type	Reduction type		
	Vehicle type	MT vehicles	AT vehicles	
	Model	M000T83981	M001T86381	
	Manufacturer	Mitsubishi Electric		
	Voltage and output	12 V — 1.0 kW	12 V — 1.4 kW	
	Direction of rotation	Counterclockwise (when observed from pinion)		
	Number of pinion teeth	8	9	
	No-load characteristics	Voltage	11 V	
		Current	90 A or less	
		Rotating speed	2,800 rpm or more	2,400 rpm or more
	Load characteristics	Voltage	7.5 V	7.7 V
		Current	300 A	400 A
		Torque	8.6 N (0.88 kgf, 1.93 lb) or more	16.0 N (1.63 kgf, 3.60 lb) or more
		Rotating speed	920 rpm or more	740 rpm or more
	Lock characteristics	Voltage	4 V	3.5 V
		Current	650 A or less	940 A or less
Torque		14.7 N (1.50 kgf, 3.30 lb) or more	28.9 N (2.95 kgf, 6.50 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



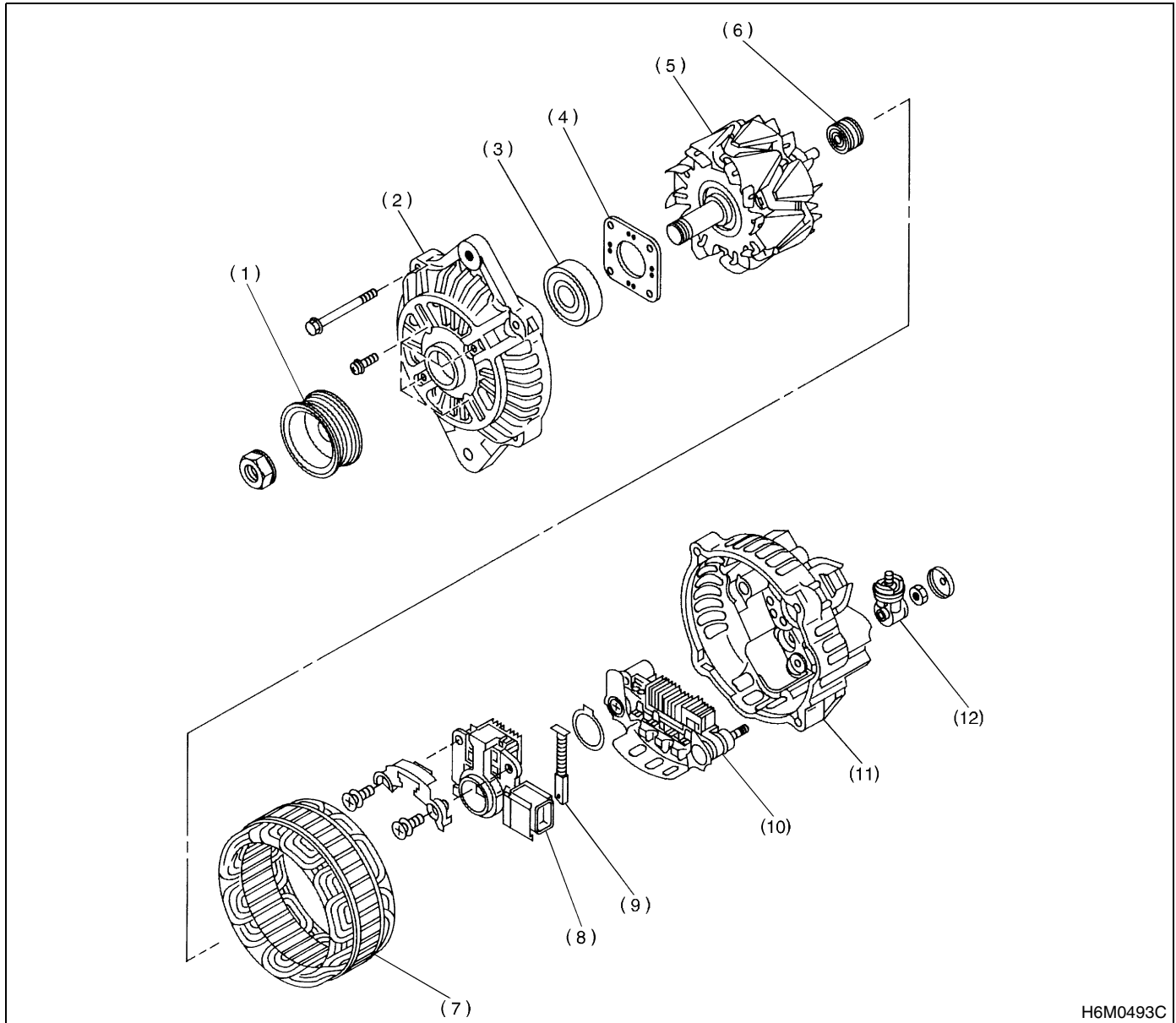
H6M0492C

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

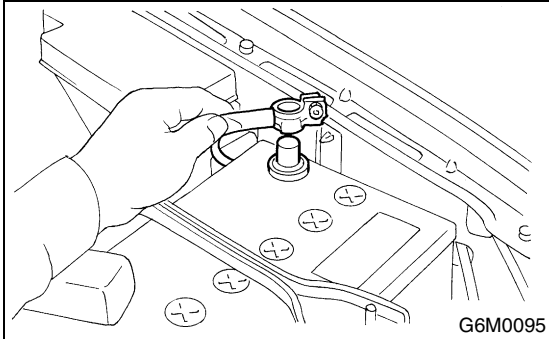
- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation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

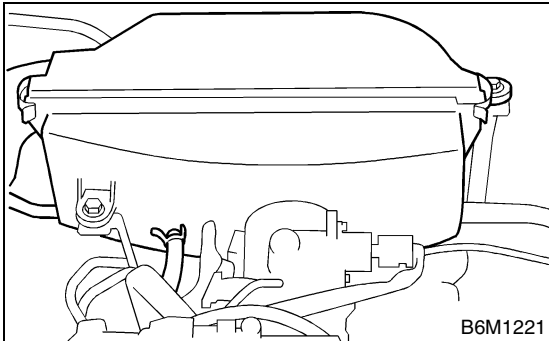
2. Starter

A: REMOVAL

1) Disconnect the ground cable from battery.



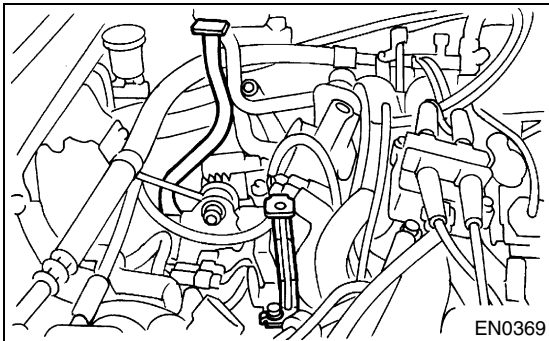
2) Remove the air cleaner case. (Non-Turbo Model)



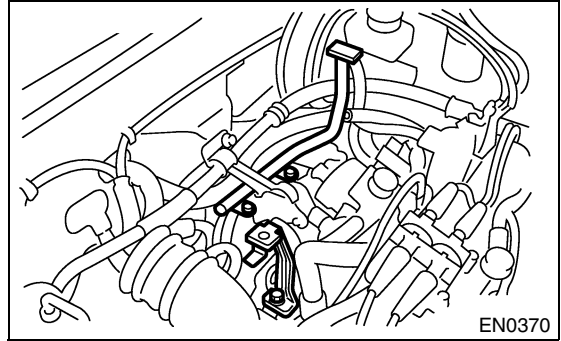
3) Remove the intercooler. (Turbo Model) <Ref. to IN(TURBO)-10, REMOVAL, Intercooler.>

4) Remove the air cleaner case stay. (Non-Turbo Model)

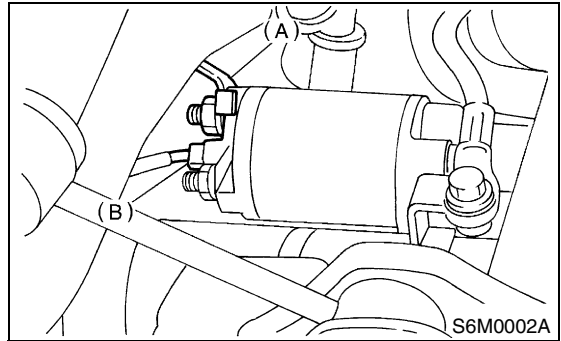
• MT vehicles



• AT vehicles



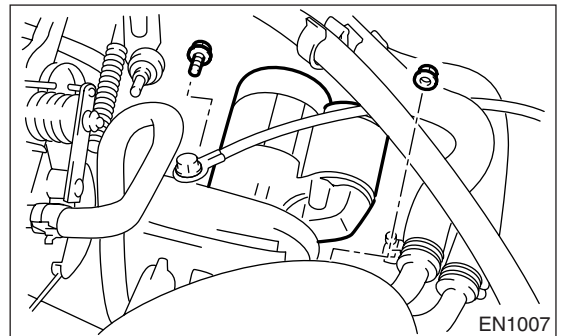
5) Disconnect the connector and terminal from starter.



(A) Terminal

(B) Connector

6) Remove the starter from transmission.



STARTER

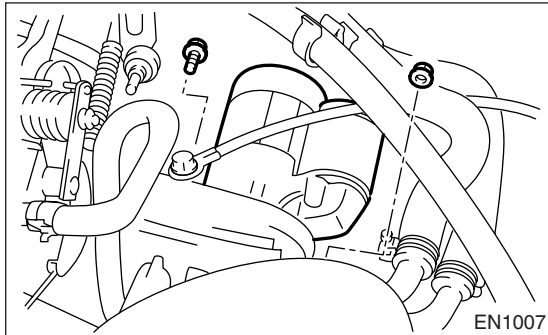
STARTING/CHARGING SYSTEMS

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

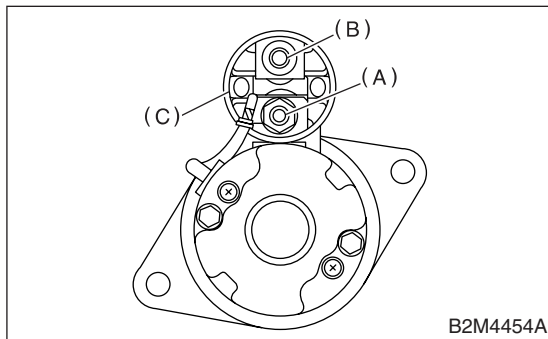
50 N·m (5.1 kgf-m, 37 ft-lb)



C: DISASSEMBLY

1. STARTER ASSEMBLY

1) Loosen the nut which holds terminal M of switch assembly, and then disconnect the connector.

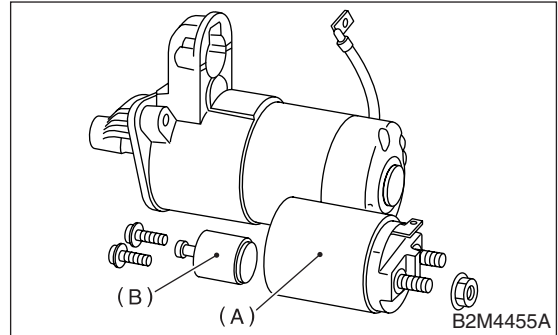


- (A) Terminal M
- (B) Terminal B
- (C) Terminal S

2) Remove the bolts which hold switch assembly, and then remove the switch assembly, plunger and plunger spring from starter as a unit.

CAUTION:

Be careful because the pinion gap adjustment washer may sometimes be used on the mounting surface of switch assembly.

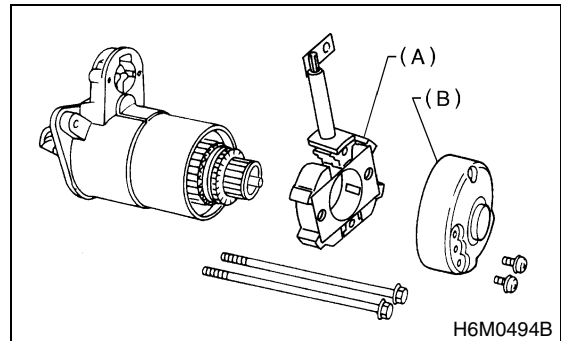


- (A) Switch ASSY
- (B) Plunger

3) Remove both through-bolts and brush holder screws, and then detach the rear bracket and brush holder.

CAUTION:

Before removal, confirm the attachment locations of brush holder and rear bracket.



- (A) Brush holder
- (B) Rear bracket

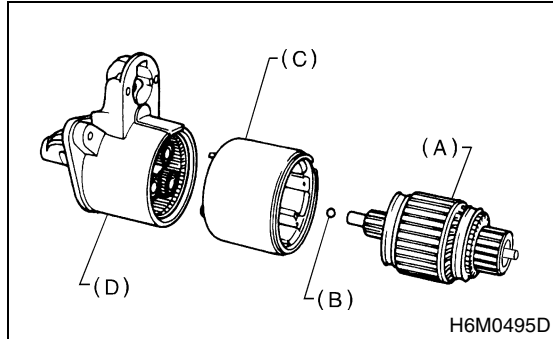
STARTER

STARTING/CHARGING SYSTEMS

4) Remove the armature and yoke. The ball used as a bearing will then be removed from the end of armature.

CAUTION:

Be sure to mark an alignment mark on the yoke and front bracket before removing yoke.



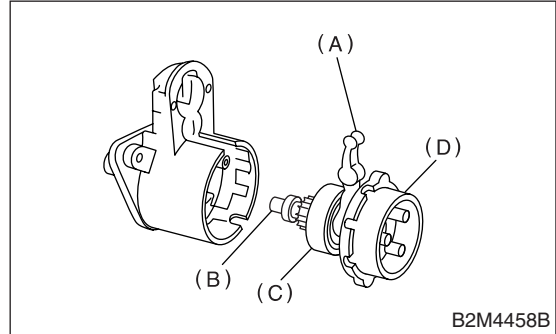
- (A) Armature
- (B) Ball
- (C) Yoke
- (D) Front bracket

6) Remove the shaft assembly and overrunning clutch as a unit.

CAUTION:

Before removal, confirm the following:

- Lever direction
- Internal gear assembly position

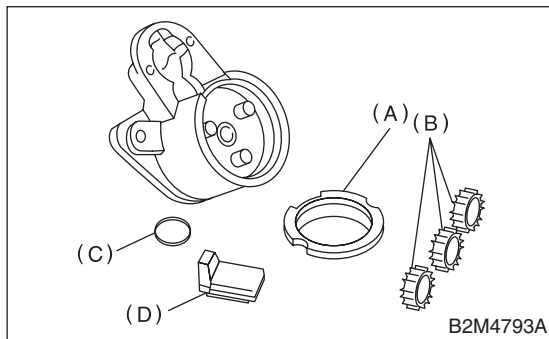


- (A) Lever
- (B) Shaft ASSY
- (C) Overrunning clutch
- (D) Internal gear ASSY

5) Remove the packing A, three planetary gears, packing B and plate.

CAUTION:

Before removal, confirm the inserting location of packing A.



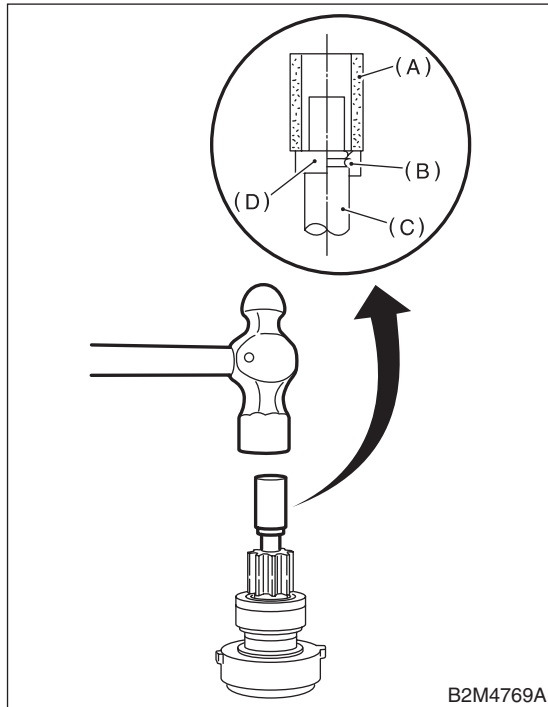
- (A) Packing A
- (B) Planetary gear
- (C) Plate
- (D) Packing B

STARTER

STARTING/CHARGING SYSTEMS

7) Remove the overrunning clutch from shaft assembly as follows:

- (1) Remove the stopper from ring by lightly tapping the stopper with an appropriate tool (such as a 14 mm (0.55 in) socket wrench).
- (2) Remove the ring, stopper and clutch from shaft.



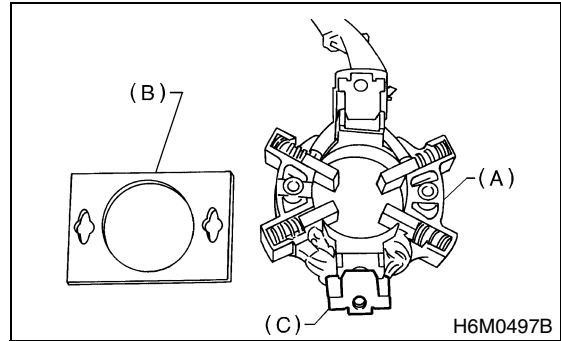
- (A) Socket wrench
- (B) Ring
- (C) Shaft
- (D) Stopper

2. BRUSH HOLDER

Slightly open the metal fitting holding the insulating plate to brush holder. Remove the insulating plate.

NOTE:

The brush and spring can be easily removed from the brush holder at this time.



- (A) Brush holder
- (B) Insulating plate
- (C) Metal fitting

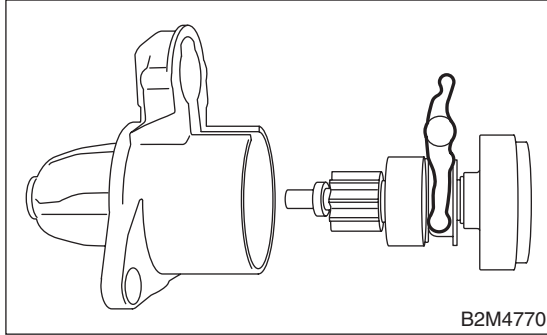
D: ASSEMBLY

Assemble in the reverse order of disassembly. Do the following:

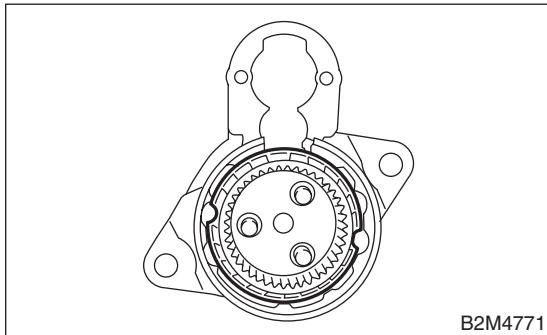
1) Carefully assemble all parts in the order of assembly and occasionally inspect nothing has been overlooked.

2) When installing the shaft assembly to front bracket, be careful of the following.

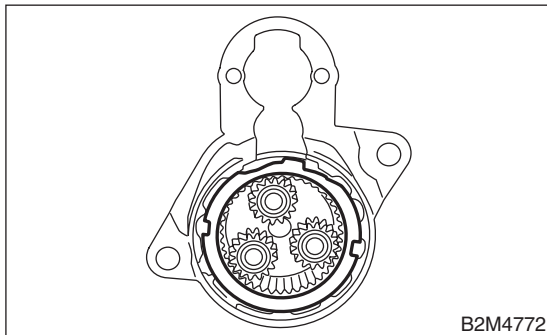
- Lever direction



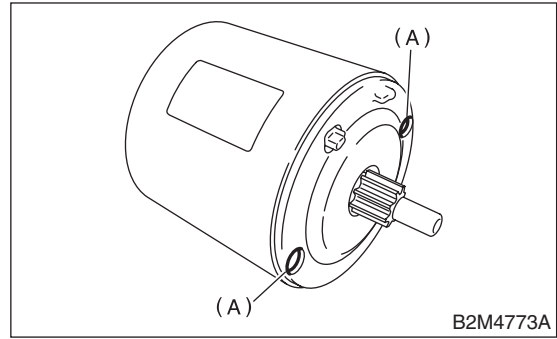
- Internal gear position



- Packing position

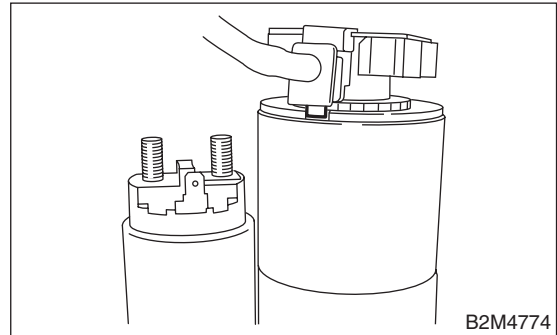


3) When installing the yoke to the front bracket, match bolt hole.



(A) Bolt hole

4) When installing the rear bracket, match brush holder and yoke's groove.



5) When installing the switch assembly, catch plunger protrusion to lever edge.

6) 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

7) After assembling parts correctly, make sure the starter operates properly.

STARTER

STARTING/CHARGING SYSTEMS

E: INSPECTION

1. ARMATURE

1) Check the commutator for any sign of burns or rough surfaces or stepped wear. If wear is of a minor nature, correct it by using sand paper.

2) Run-out test

Check the commutator run-out, and then replace if it exceeds the limit.

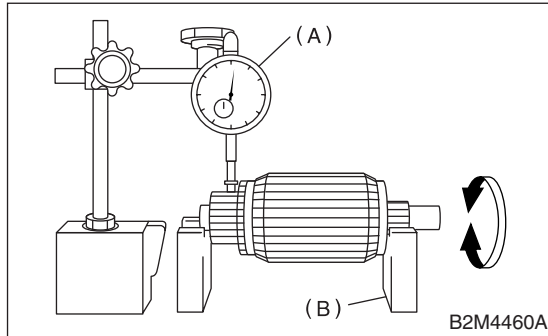
Commutator run-out:

Standard

0.05 mm (0.0020 in)

Service limit

Less than 0.10 mm (0.0039 in)



(A) Dial gauge

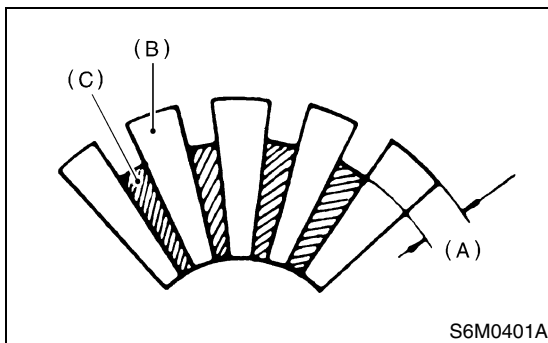
(B) V-block

3) Depth of segment mold

Check the depth of segment mold.

Depth of segment mold:

0.5 mm (0.020 in)



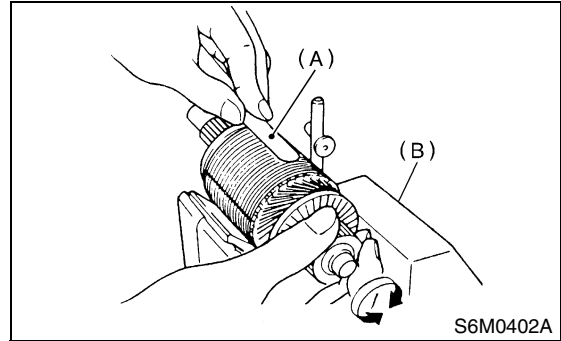
(A) Depth of mold

(B) Segment

(C) Mold

4) Armature short-circuit test

Check the armature for short-circuit by placing it on growler tester. Hold a hacksaw blade against the 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.



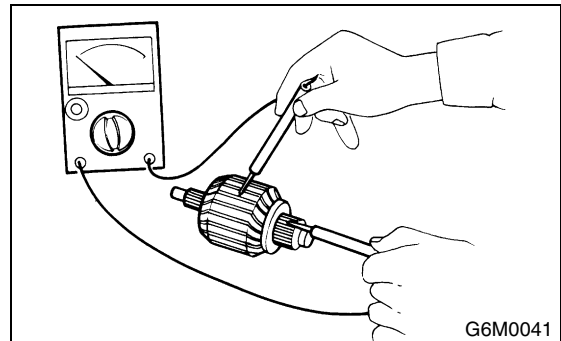
(A) Iron sheet

(B) Growler tester

5) Armature ground test

Using a circuit tester, touch one probe to the commutator segment and the other to shaft. There should be no continuity. If there is continuity, the armature is grounded.

Replace the armature if it is grounded.



2. YOKE

Make sure the pole is set in position.

3. OVERRUNNING CLUTCH

Inspect the teeth of pinion for wear and damage. Replace if it is damaged. Rotate the pinion in direction of rotation (counterclockwise). It should rotate smoothly. But in opposite direction, it should be locked.

CAUTION:

Do not clean the overrunning clutch with oil to prevent grease from flowing out.

4. BRUSH AND BRUSH HOLDER

1) Brush length

Measure the brush length, and then replace if it exceeds the service limit.

Replace if abnormal wear or cracks are noticed.

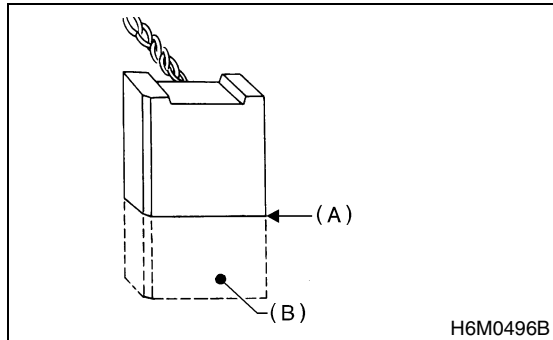
Brush length:

Standard

12.3 mm (0.484 in)

Service limit

7.0 mm (0.276 in)



(A) Service limit line

(B) Brush

2) Brush movement

Be sure the brush moves smoothly inside brush holder.

3) Brush spring force

Measure the brush spring force with a spring scale. If it is less than the service limit, replace the brush holder.

Brush spring force:

Standard

21.6 N (2.2 kgf, 4.9 lb) (when new)

Service limit

5.9 N (0.6 kgf, 1.3 lb)

5. SWITCH ASSEMBLY

Be sure there is continuity between the terminals S and M, and between terminal S and ground. Use a circuit tester (set in "ohm").

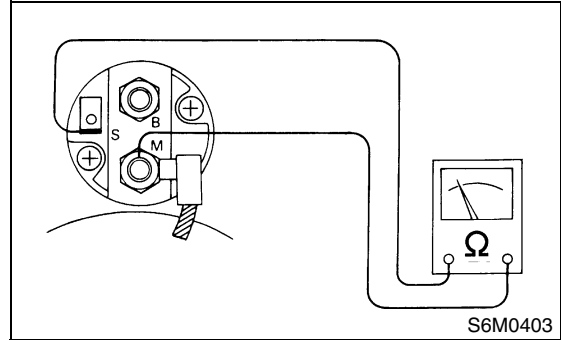
Also check to be sure there is no continuity between terminal M and B.

Terminal / Specified resistance:

S — M / Less than 1 Ω

S — Ground / Less than 1 Ω

M — B / More than 1 M Ω



6. SWITCH ASSEMBLY OPERATION

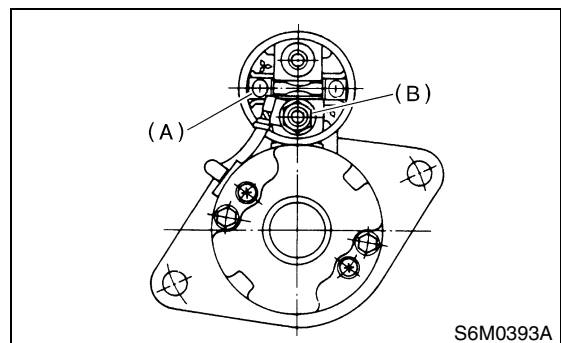
1) Connect the terminal S of switch assembly to positive terminal of battery with a lead wire, and starter body to ground terminal of battery. The pinion should be forced endwise on shaft.

CAUTION:

With the pinion forced endwise on shaft, starter motor can sometimes rotate because current flows, through pull-in coil, to motor. This is not a problem.

2) Disconnect the connector from terminal M, and then connect the positive terminal of battery and terminal M using a lead wire and ground terminal to starter body.

In this test set up, the pinion should return to its original position even when it is pulled out with a screwdriver.



(A) Terminal S

(B) Terminal M

STARTER

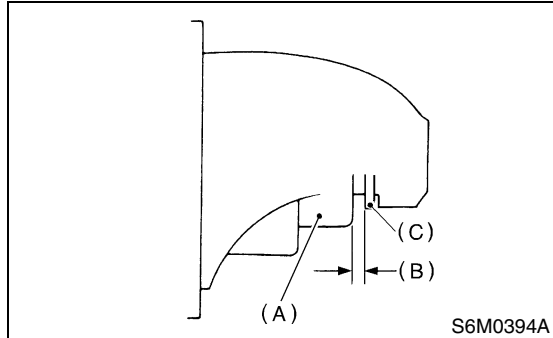
STARTING/CHARGING SYSTEMS

7. PINION GAP

1) Measure the pinion gap while the pinion is pulled out as shown in the figure.

Pinion gap:

0.5 — 2.0 mm (0.020 — 0.079 in)



- (A) Pinion
- (B) Gap
- (C) Stopper

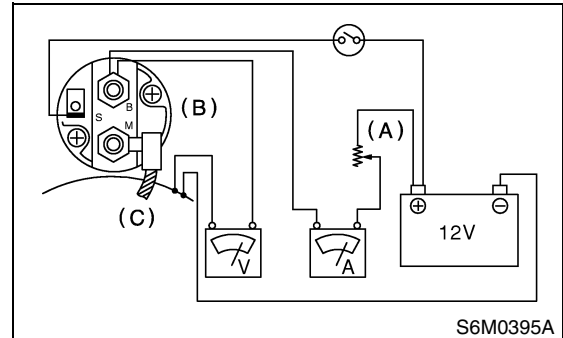
If the motor is running with the pinion forced end-wise on shaft, disconnect the connector from terminal M of switch assembly, and then connect terminal M to ground terminal (-) of battery with a lead wire. Next, gently push the pinion back with your fingertips, and then measure the pinion gap.
2) If the pinion gap is outside specified range, remove or add number of adjustment washers used on the mounting surface of switch assembly until correct pinion gap is obtained.

8. PERFORMANCE TEST

The starter should be submitted to performance tests whenever it has been overhauled, to assure its satisfactory performance when installed on the engine.

Three performance tests, no-load test, load test, and lock test, are presented here; however, if the load test and lock test cannot be performed, carry out at least the no-load test.

For these performance tests, use the circuit shown in figure.



- (A) Variable resistance
- (B) Magnetic switch
- (C) Starter body

1) No-load test

With switch on, adjust the variable resistance to obtain 11 V, take the ammeter reading, and then 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 the specifications.

Load test (Standard):

Voltage / Load

MT vehicles

7.5 V/8.6 N (0.88 kgf, 1.93 lb)

AT vehicles

7.7 V/16.0 N (1.63 kgf, 3.60 lb)

Current / Speed

MT vehicles

300 A/920 rpm or more

AT vehicles

400 A/740 rpm or more

3) Lock test

With the starter stalled, or not rotating, measure the torque developed and current draw when the voltage is adjusted to the specified voltage.

Lock test (Standard):

Voltage / Current

MT vehicles

4 V/650 A or less

AT vehicles

3.5 V/940 A or less

Torque

MT vehicles

14.7 N (1.50 kgf, 3.30 lb) or more

AT vehicles

28.9 N (2.95 kgf, 6.50 lb) or more

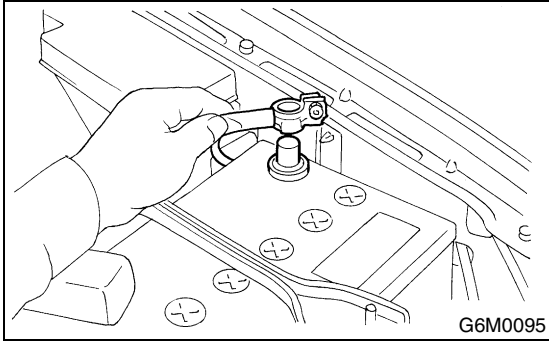
GENERATOR

STARTING/CHARGING SYSTEMS

3. Generator

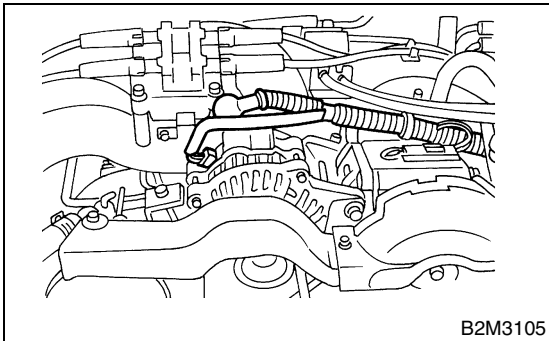
A: REMOVAL

1) Disconnect the ground cable from battery.

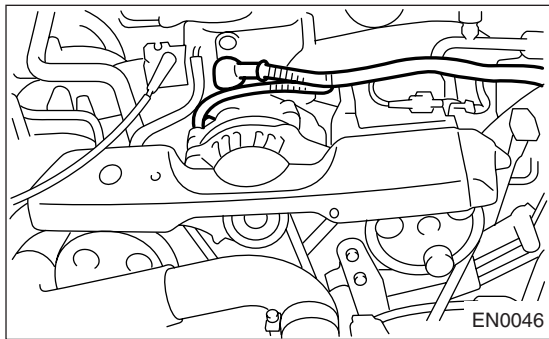


2) Disconnect the connector and terminal from generator.

- Non-Turbo Model

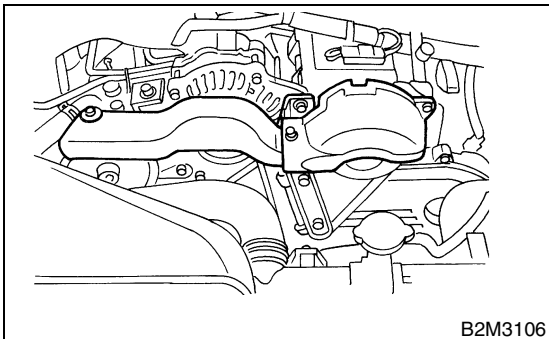


- Turbo Model

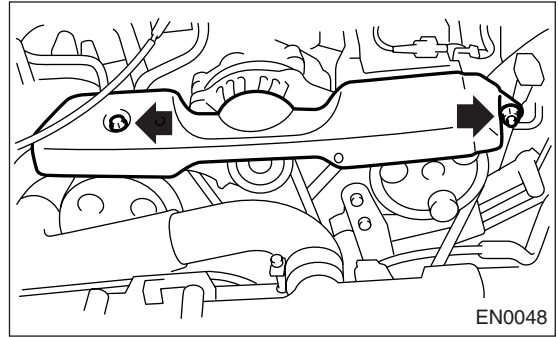


3) Remove the V-belt cover.

- Non-Turbo Model



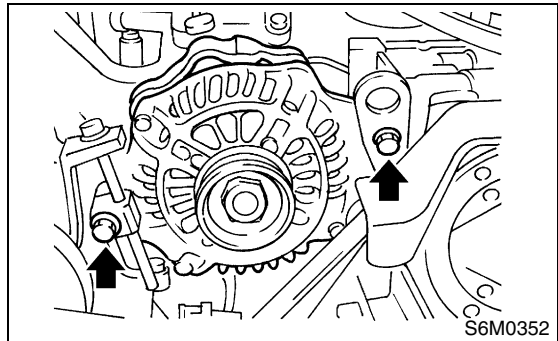
- Turbo Model



4) Remove the front side V-belt.

<Ref. to ME-44, FRONT SIDE BELT, REMOVAL, V-belt.> or <Ref. to ME(TURBO)-44, FRONT SIDE BELT, REMOVAL, V-belt.>

5) Remove the bolts which install generator onto bracket.

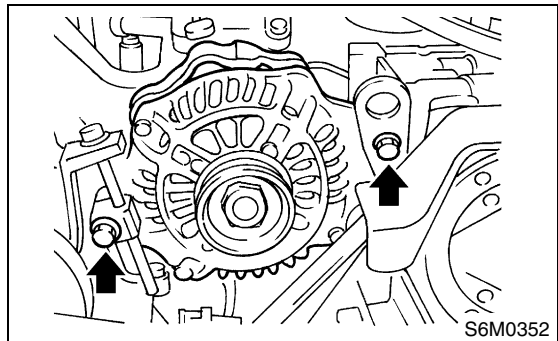


B: INSTALLATION

Install in the reverse order of removal.

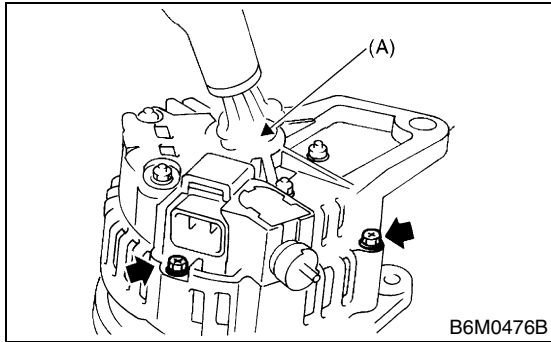
CAUTION:

Check and adjust the V-belt tension. <Ref. to ME-45, INSPECTION, V-belt.> or <Ref. to ME(TURBO)-45, INSPECTION, V-belt.>



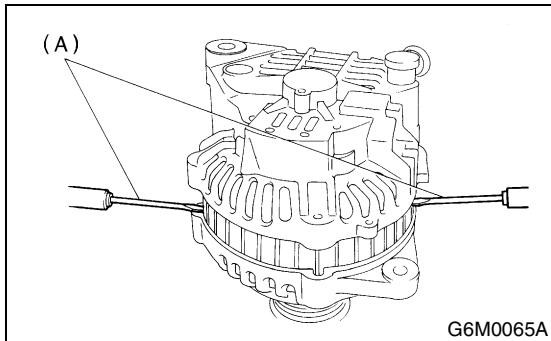
C: DISASSEMBLY

1) Heat the portion (A) of rear cover to 50°C (122°F) with heater drier.



B6M0476B

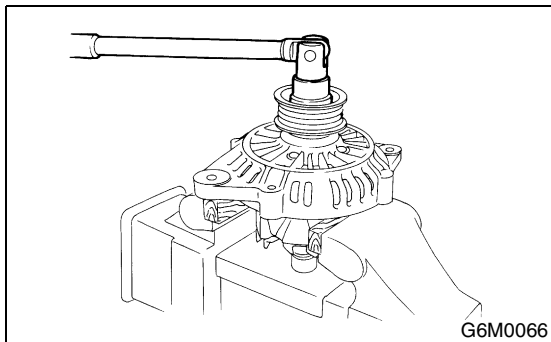
2) Remove the four through bolts. Then insert the tip of a flat-head screwdriver into the gap between stator core and front bracket. Pry them apart to disassemble.



G6M0065A

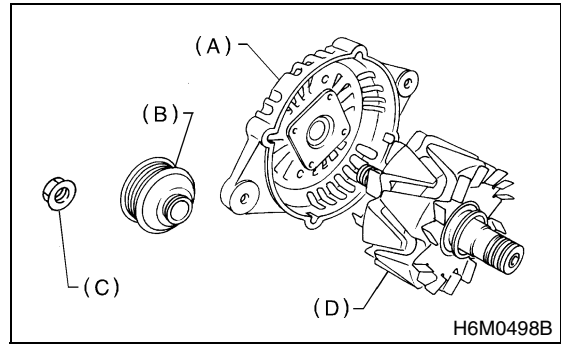
(A) Screwdriver

3) Hold the rotor with a vise and remove pulley nut.



G6M0066

CAUTION:
When holding the rotor with vise, insert aluminum plates or wood pieces on the contact surfaces of vise to prevent rotor from damage.



H6M0498B

(A) Front bracket

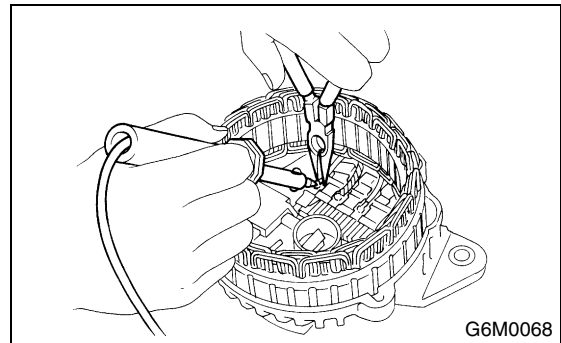
(B) Pulley

(C) Nut

(D) Rotor

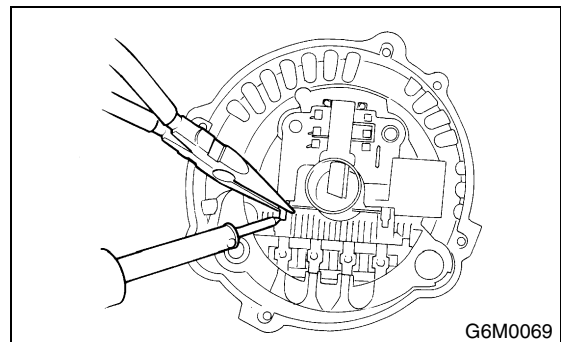
4) Unsolder connection between rectifier and stator coil to remove the stator coil.

CAUTION:
Finish the work rapidly (less than 3 seconds) because the rectifier cannot withstand heat very well.



G6M0068

5) Remove the screws which secure IC regulator to rear cover, and then unsolder connection between IC regulator and rectifier to remove the IC regulator.

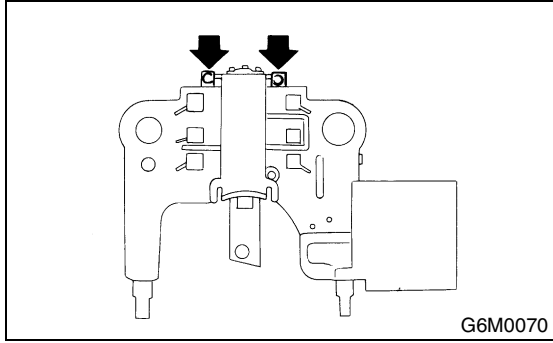


G6M0069

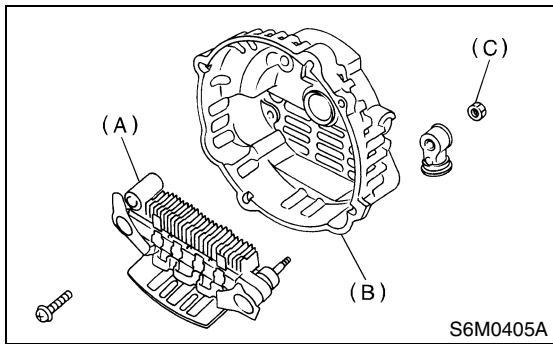
GENERATOR

STARTING/CHARGING SYSTEMS

6) Remove the brushes by unsoldering at pigtails.



7) Remove the nut and insulating bushing at terminal B, and then remove the rectifier.



- (A) Rectifier
- (B) Rear cover
- (C) Nut

D: ASSEMBLY

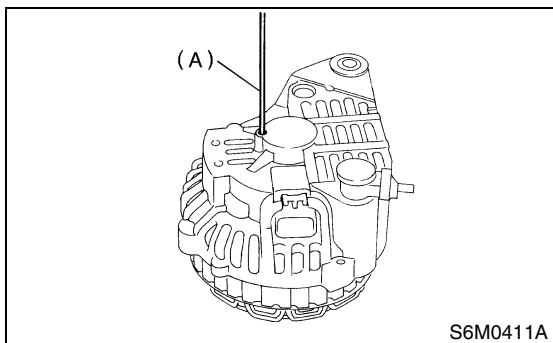
To assemble, reverse order of disassembly.

1) Pulling up brush

Before assembling, press the brush down into brush holder with your finger, and then 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.



2) Heat the bearing box in rear bracket [50 to 60°C (122 to 140°F)], and then press the rear bearing into rear bracket.

CAUTION:

Grease should not be applied to rear bearing. Remove the oil completely if it is found on bearing box.

3) After reassembly, turn the pulley by hand to check that rotor turns smoothly.

E: INSPECTION

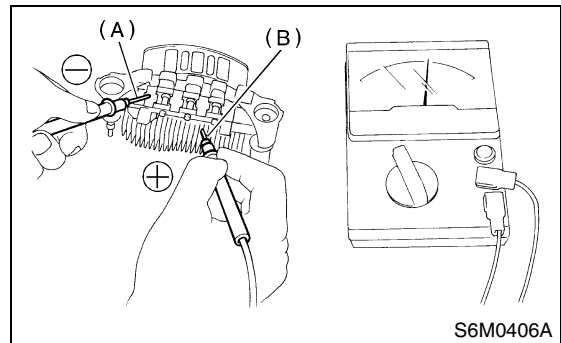
1. DIODE

CAUTION:

Never use a mega tester (measuring use for high voltage) or any other similar measure for this test; otherwise, the diodes may be damaged.

1) Checking positive diode

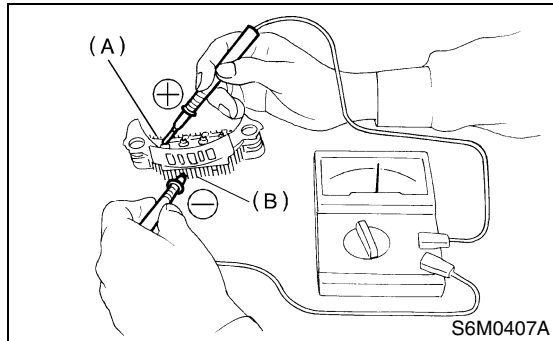
Check for continuity between the diode lead and positive side heat sink. The positive diode is in good condition if resistance is 1 Ω or less only in the direction from the diode lead to heat sink.



- (A) Diode lead
- (B) Heat sink (Positive side)

2) Checking negative diode

Check for continuity between the negative side heat sink and diode lead. The negative diode is in good condition if resistance is 1Ω or less only in the direction from the heat sink to diode lead.



- (A) Diode lead
- (B) Heat sink (Negative side)

2. ROTOR

1) Slip ring surface

Inspect the slip rings for contamination or any roughness of the sliding surface. Repair the slip ring surface using a lathe or sand paper.

2) Slip ring outer diameter

Measure the slip ring outer diameter. If the slip ring is worn replace rotor assembly.

Slip ring outer diameter:

Standard

22.7 mm (0.894 in)

Limit

22.1 mm (0.870 in)

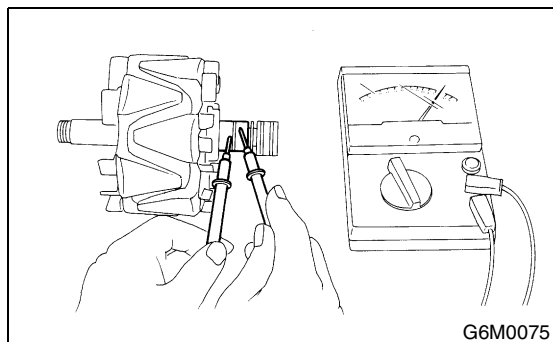
3) Continuity test

Check the resistance between slip rings using circuit tester.

If the resistance is not within specification, replace the rotor assembly.

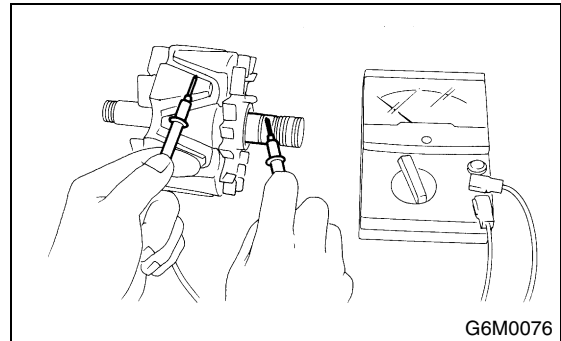
Specified resistance:

Approx. 2.7 — 3.2 Ω



4) Insulation test

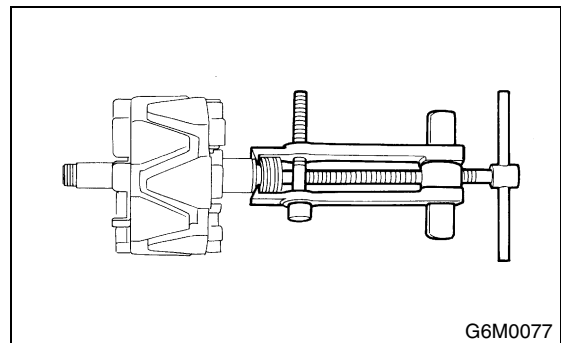
Check the continuity between slip ring and rotor core or shaft. If resistance is 1Ω or less, the rotor coil is grounded, and so replace the rotor assembly.



5) Ball bearing (rear side)

(1) Check the rear ball bearing. Replace if it is noisy or if the rotor does not turn smoothly.

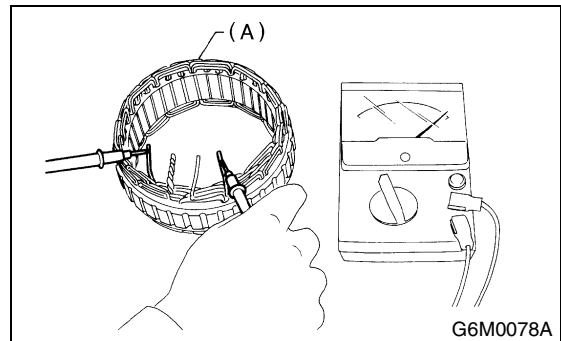
(2) The rear bearing can be removed by using common bearing puller.



3. STATOR

1) Continuity test

Inspect the stator coil for continuity between each end of the lead wires. If resistance is $1 M \Omega$ or more, the lead wire is broken, and so replace the stator assembly.



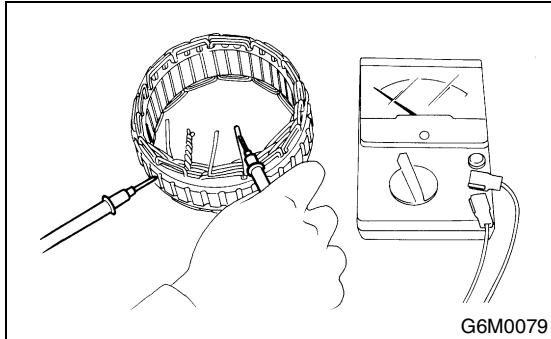
- (A) Stator

GENERATOR

STARTING/CHARGING SYSTEMS

2) Insulation test

Inspect the stator coil for continuity between stator core and each end of lead wire. If resistance is 1Ω or less, the stator coil is grounded, and so replace the stator assembly.



4. BRUSH

1) Measure the length of each brush. If wear exceeds the service limit, replace the brush. Each brush has the service limit mark (A) on it.

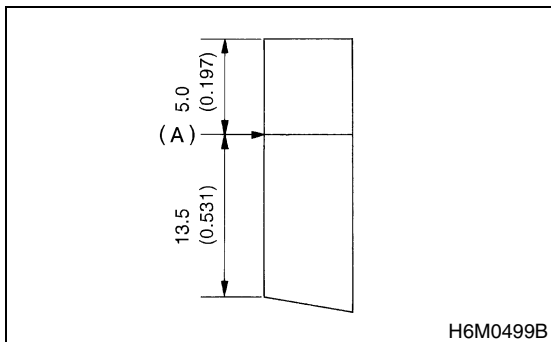
Brush length:

Standard

18.5 mm (0.728 in)

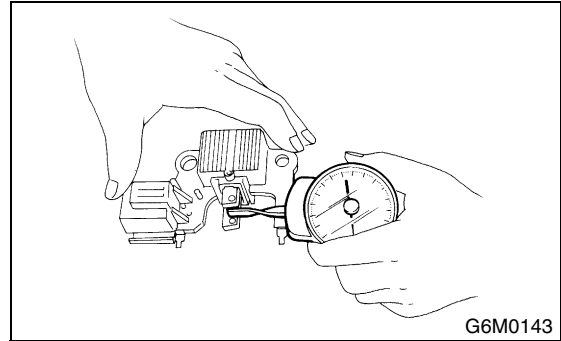
Service limit

5.0 mm (0.197 in)



2) Checking brush spring for proper pressure

Using a spring pressure indicator, push the brush into the brush holder until its tip protrudes 2 mm (0.08 in). Then measure the pressure of brush spring. If the pressure is less than 2.648 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).



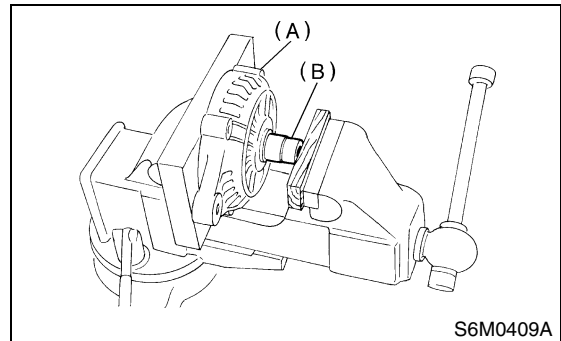
5. BEARING (FRONT SIDE)

1) Check the front ball bearing. If the resistance is felt while rotating, or if abnormal noise is heard, replace the ball bearing.

2) Replacing front bearing

(1) Remove the 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.

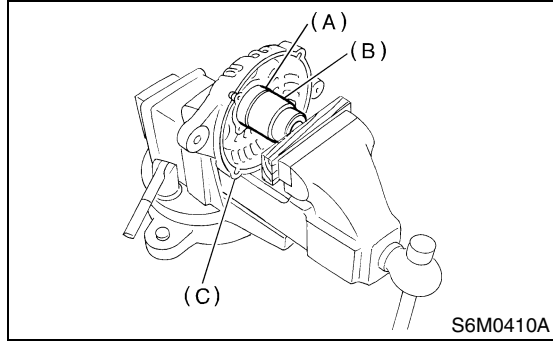


(A) Front bracket

(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 the front bearing retainer.



- (A) Bearing
- (B) Socket wrench
- (C) Front bracket

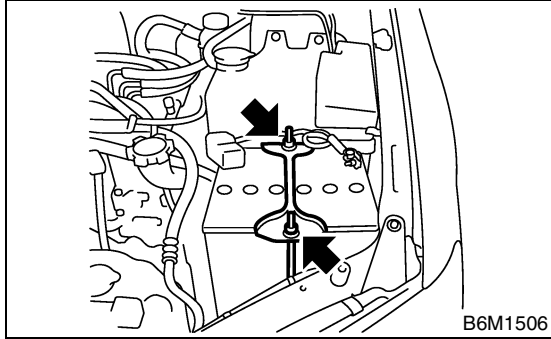
BATTERY

STARTING/CHARGING SYSTEMS

4. Battery

A: REMOVAL

- 1) Disconnect the positive (+) cable after disconnecting the ground (-) cable of battery.
- 2) Remove the flange nuts from battery rods, and then take off the battery holder.



- 3) Remove the battery.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

3.4 N·m (0.35 kgf-m, 2.5 ft-lb)

NOTE:

- Clean the battery cable terminals, and then apply grease to retard formation of corrosion.
- Connect the positive (+) cable of battery and then the ground (-) cable of battery.

C: INSPECTION

WARNING:

- Electrolyte has toxicity; be careful handling the fluid.
- Avoid contact with skin, eyes or clothing. Especially at contact with eyes, 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 the battery fluid contact eyes, skin, fabrics, or paint-work because battery fluid is corrosive acid.
- To lessen the risk of sparks, remove rings, metal watch-bands, and other metal jewelry. Never allow metal tools to contact the positive battery terminal and anything connected to it while you are at the same time in contact with any other metallic portion of the vehicle because a short circuit will be caused.

1. EXTERNAL PARTS:

Check for the existence of dirt or cracks on battery case, top cover, vent plugs, and terminal posts. If necessary, clean with water and wipe with a dry cloth.

Apply a thin coat of grease on the terminal posts to prevent corrosion.

2. ELECTROLYTE LEVEL:

Check the electrolyte level in each cell. If the level is below MIN LEVEL, bring the level to MAX LEVEL by pouring distilled water into the battery cell. Do not fill beyond MAX LEVEL.

3. SPECIFIC GRAVITY OF ELECTROLYTE:

1) Measure the specific gravity of electrolyte using a hydrometer and a thermometer. Specific gravity varies with temperature of electrolyte so that it must be corrected at 20°C (68°F) using the following equation:

$$S_{20} = St + 0.0007 \times (t - 20)$$

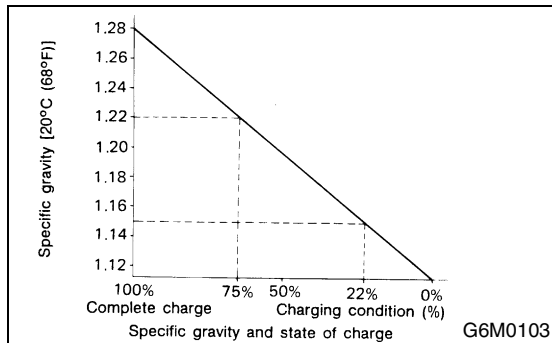
S₂₀: Specific gravity corrected at electrolyte temperature of 20°C

St : Measured specific gravity

t : Measured temperature (°C)

Determine whether or not battery must be charged, according to corrected specific gravity.

Standard specific gravity: 1.220 — 1.290 [at 20°C (68°F)]



2) Measuring the specific gravity of the electrolyte in battery will disclose the state of charge of battery. The relation between specific gravity and state of charge is as shown in the 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 the battery electrolyte overflows while charging the battery.
- Observe the instructions when handling battery charger.
- Before charging the battery on vehicle, disconnect battery ground terminal. Failure to follow this rule may damage alternator's diodes or other electrical units.

1. JUDGMENT OF BATTERY IN CHARGED CONDITION

- 1) Specific gravity of electrolyte is held at a specific value in a range from 1.250 to 1.290 for more than one hour.
- 2) Voltage per battery cell is held at a specific value in a range from 2.5 to 2.8 volts for more than one hour.

2. CHECK HYDROMETER FOR STATE OF CHARGE

Hydrometer indicator	State of charge	Required action
Green dot	Above 65%	Load test
Dark dot	Below 65%	Charge battery
Clear dot	Low electrolyte	Replace battery* (If cranking complaint)

*: Check electrical system before replacement.

3. NORMAL CHARGING

Charge the battery at current value specified by manufacturer or at approx. 1/10 of battery's ampere-hour rating.

4. QUICK CHARGING

Quick charging is a method in which the battery is charged in a short period of time with a relatively large current by using a quick charger.

Since a large current flow raises electrolyte temperature, the battery is subject to damage if large current is used for prolonged time. For this reason, the quick charging must be carried out within a current range that will not increase the electrolyte temperature above 40°C (104°F).

It should be also remembered that the quick charging is a temporary means to bring battery voltage up to a fair value and, as a rule, a battery should be charged slowly with a low current.

CAUTION:

- Observe the items in 1. NORMAL CHARGING.
- Never use more than 10 amperes when charging the battery because that will shorten battery life.

ENGINE (DIAGNOSTICS)

EN

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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-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-62, Diagnostics for Engine Starting Failure.>
2 CHECK ILLUMINATION OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL).	Does the CHECK ENGINE malfunction indicator lamp illuminate?	Go to step 3.	Inspection using “General Diagnostics Table”. <Ref. to EN-292, INSPECTION, General Diagnostic Table.>
3 CHECK INDICATION OF DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY. 1)Turn the ignition switch to OFF. 2)Connect the Subaru Select Monitor or OBD-II general scan tool to data link connector. 3)Turn the ignition switch to ON and Subaru Select Monitor or OBD-II general scan tool switch to ON. 4)Read the 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 the DTC. Repair the trouble cause. <Ref. to EN-83, List of Diagnostic Trouble Code (DTC).> Go to step 4.	Repair the related parts. NOTE: If a 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-52, Engine Malfunction Indicator Lamp (MIL).>
4 PERFORM THE DIAGNOSIS. 1)Perform the clear memory mode. <Ref. to EN-49, Clear Memory Mode.> 2)Perform the inspection mode. <Ref. to EN-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-90, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Complete the diagnosis.

2. AUTOMATIC TRANSMISSION

When the diagnostic trouble code (DTC) 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

A: CHECK

1. CHECK LIST NO. 1

Check the following items when problem has occurred.

NOTE:

Use copies of this page for interviewing customers.

Customer's name		Engine No.	
Date of sale		Fuel brand	
Date of repair		Odometer reading	km
Vin No.			miles
Weather	<input type="checkbox"/> Fine <input type="checkbox"/> Cloudy <input type="checkbox"/> Rainy <input type="checkbox"/> Snowy <input type="checkbox"/> Various/Others:		
Outdoor temperature	°C (°F)		
	<input type="checkbox"/> Hot <input type="checkbox"/> Warm <input type="checkbox"/> Cool <input type="checkbox"/> Cold		
Place	<input type="checkbox"/> Highway <input type="checkbox"/> Suburbs <input type="checkbox"/> Inner city <input type="checkbox"/> Uphill <input type="checkbox"/> Downhill <input type="checkbox"/> Rough road <input type="checkbox"/> Others:		
Engine temperature	<input type="checkbox"/> Cold <input type="checkbox"/> Warming-up <input type="checkbox"/> After warming-up <input type="checkbox"/> Any temperature <input type="checkbox"/> Others:		
Engine speed	rpm		
Vehicle speed	MPH		
Driving conditions	<input type="checkbox"/> Not affected <input type="checkbox"/> At starting <input type="checkbox"/> While idling <input type="checkbox"/> At racing <input type="checkbox"/> While accelerating <input type="checkbox"/> While cruising <input type="checkbox"/> While decelerating <input type="checkbox"/> While turning (RH/LH)		
Headlight	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF	Rear defogger	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF
Blower	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF	Radio	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF
A/C compressor	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF	CD/Cassette	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF
Cooling fan	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF	Car phone	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF
Front wiper	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF	CB	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF
Rear wiper	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF		

CHECK LIST FOR INTERVIEW

ENGINE (DIAGNOSTICS)

2. CHECK LIST NO. 2

Check the following items about the vehicle's state when MIL turns on.

NOTE:

Use copies of this page for interviewing customers.

a) Other warning lights or indicators turn on. <input type="checkbox"/> Yes/ <input type="checkbox"/> No
<input type="checkbox"/> Low fuel warning light <input type="checkbox"/> Charge indicator light <input type="checkbox"/> AT diagnostics indicator light <input type="checkbox"/> ABS warning light <input type="checkbox"/> Engine oil pressure warning light
b) Fuel level
<ul style="list-style-type: none">• Lack of gasoline: <input type="checkbox"/> Yes/<input type="checkbox"/> No• Indicator position of fuel gauge:
c) Intentional connecting or disconnecting of harness connectors or spark plug cords: <input type="checkbox"/> Yes/ <input type="checkbox"/> No
<ul style="list-style-type: none">• What:
d) Intentional connecting or disconnecting of hoses: <input type="checkbox"/> Yes/ <input type="checkbox"/> No
<ul style="list-style-type: none">• What:
e) Installing of parts other than genuine parts: <input type="checkbox"/> Yes/ <input type="checkbox"/> No
<ul style="list-style-type: none">• What:• Where:
f) Occurrence of noise: <input type="checkbox"/> Yes/ <input type="checkbox"/> No
<ul style="list-style-type: none">• From where:• What kind:
g) Occurrence of smell: <input type="checkbox"/> Yes/ <input type="checkbox"/> No
<ul style="list-style-type: none">• From where:• What kind:
h) Intrusion of water into engine compartment or passenger compartment: <input type="checkbox"/> Yes/ <input type="checkbox"/> No
i) Troubles occurred
<input type="checkbox"/> Engine does not start. <input type="checkbox"/> Engine stalls during idling. <input type="checkbox"/> Engine stalls while driving. <input type="checkbox"/> Engine speed decreases. <input type="checkbox"/> Engine speed does not decrease. <input type="checkbox"/> Rough idling <input type="checkbox"/> Poor acceleration <input type="checkbox"/> Back fire <input type="checkbox"/> After fire <input type="checkbox"/> No shift <input type="checkbox"/> Excessive shift shock

GENERAL DESCRIPTION

ENGINE (DIAGNOSTICS)

3. General Description

A: CAUTION

1) Airbag system wiring harness is routed near the engine control module (ECM), main relay and fuel pump relay.

CAUTION:

- All airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuit.
- Be careful not to damage the airbag system wiring harness when servicing the engine control module (ECM), transmission control module (TCM), main relay and fuel pump relay.

2) Never connect the battery in reverse polarity.

- The ECM will be destroyed instantly.
 - The fuel injector and other part will be damaged in just a few minutes more.
- 3) Do not disconnect the battery cables while the engine is running.

- A large counter electromotive force will be generated in the alternator, and this voltage may damage electronic parts such as ECM, etc.

4) Before disconnecting the connectors of each sensor and the ECM, be sure to turn the ignition switch to OFF.

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 the ECM from located position, disconnect two cables on battery.

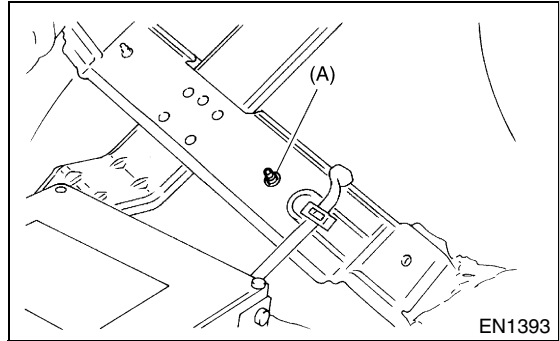
- Otherwise, the ECM may be damaged.

CAUTION:

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

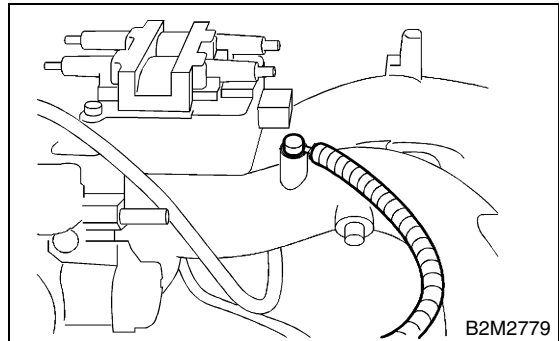
7) The connectors to each sensor in the engine compartment and the harness connectors on the engine side and body side are all designed to be waterproof. However, it is still necessary to take care not to allow water to get into the connectors when washing the vehicle, or when servicing the vehicle on a rainy day.

8) Use the ECM mounting stud bolt at the body head grounding points when measuring voltage and resistance inside the passenger compartment.

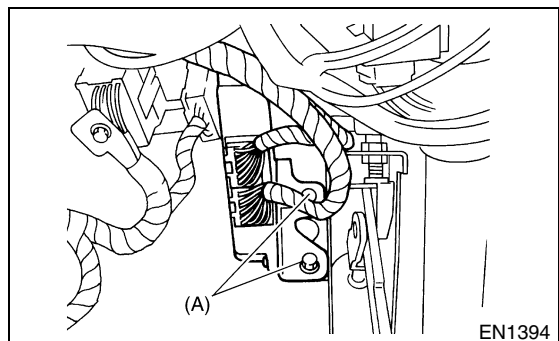


(A) Stud bolt

9) Use the engine grounding terminal or engine proper as the grounding point to the body, when measuring voltage and resistance in the engine compartment.



10) Use the TCM mounting stud bolts at the body head grounding point, when measuring voltage and resistance inside the passenger compartment.



(A) Stud bolt

11) Every MFI-related part is a precision part. Do not drop them.

12) Observe the following cautions when installing a radio in MFI equipped models.

CAUTION:

- The antenna must be kept as far apart as possible from the control unit.
(The ECM is located under the steering column, inside of the instrument panel lower trim panel.)
- The antenna feeder must be placed as far apart as possible from the ECM and MFI harness.
- Carefully adjust the antenna for correct matching.
- When mounting a large power type radio, pay special attention to the three items above mentioned.
- Incorrect installation of the radio may affect the operation of the ECM.

13) Before disconnecting the fuel hose, disconnect the fuel pump connector and crank the engine for more than 5 seconds to release pressure in the fuel system. If the 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 5 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 the battery voltage and specific gravity of electrolyte.

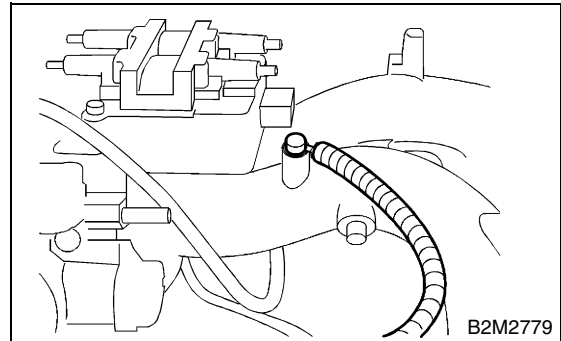
Standard voltage: 12 V

Specific gravity: Above 1.260

2) Check the condition of the main and other fuses, and harnesses and connectors. Also check for proper grounding.

2. ENGINE GROUNDING

Make sure the engine grounding cable is properly connected to the engine.



GENERAL DESCRIPTION

ENGINE (DIAGNOSTICS)

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.

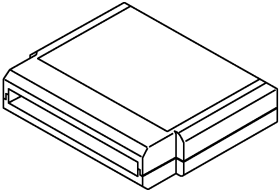

3. AUTOMATIC TRANSMISSION AND ELECTRONIC-HYDRAULIC CONTROL SYSTEM

The electronic-hydraulic control system consists of various sensors and switches, a transmission control module (TCM) and the hydraulic controller including solenoid valves. The system controls the transmission proper including shift control, lock-up control, overrunning clutch control, line pressure control and shift timing control. It also controls the AWD transfer clutch. In other words, the system detects various operating conditions from various input signals and sends output signals to shift solenoids 1, 2 and low clutch timing solenoid and 2-4 brake timing solenoid, line pressure duty solenoid, lock-up duty solenoid, transfer duty solenoid and 2-4 brake duty solenoid (a total of eight solenoids).

GENERAL DESCRIPTION

ENGINE (DIAGNOSTICS)

D: PREPARATION TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B2M3876	24082AA190 (New adopted tool)	CARTRIDGE	Troubleshooting for electrical systems.
 B2M3877	22771AA030	SELECT MONITOR KIT	Troubleshooting for electrical systems. <ul style="list-style-type: none">• English: 22771AA030 (Without printer)• German: 22771AA070 (Without printer)• French: 22771AA080 (Without printer)• Spanish: 22771AA090 (Without printer)

ELECTRICAL COMPONENTS LOCATION

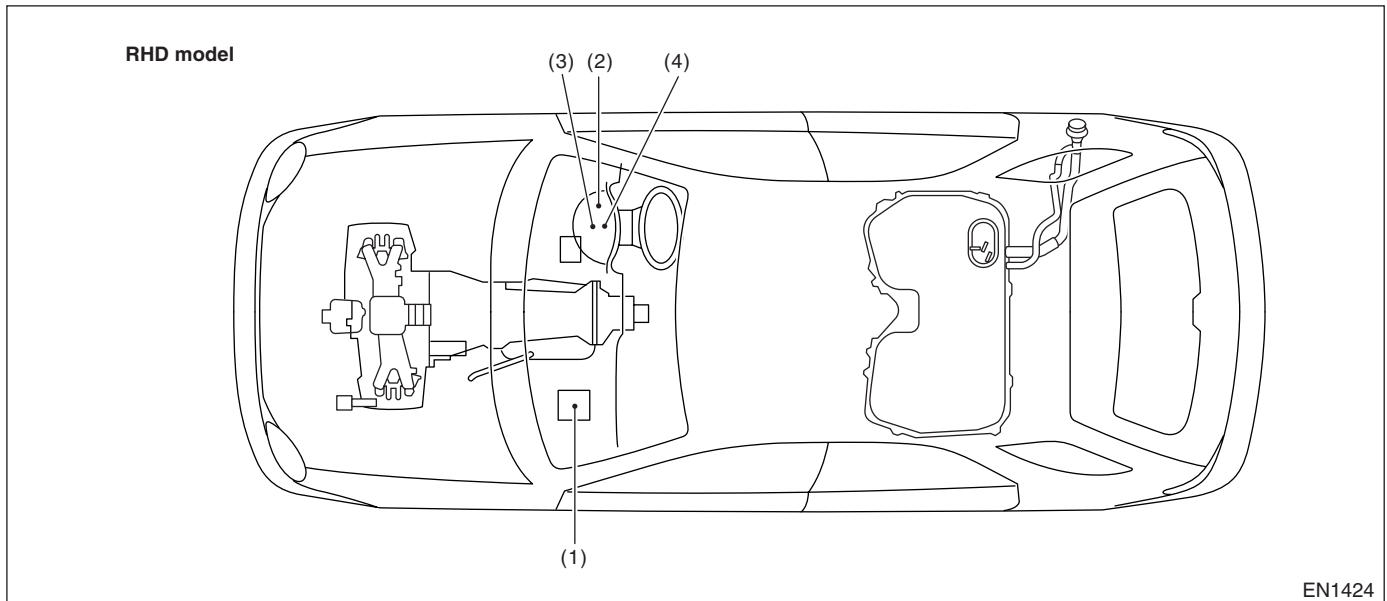
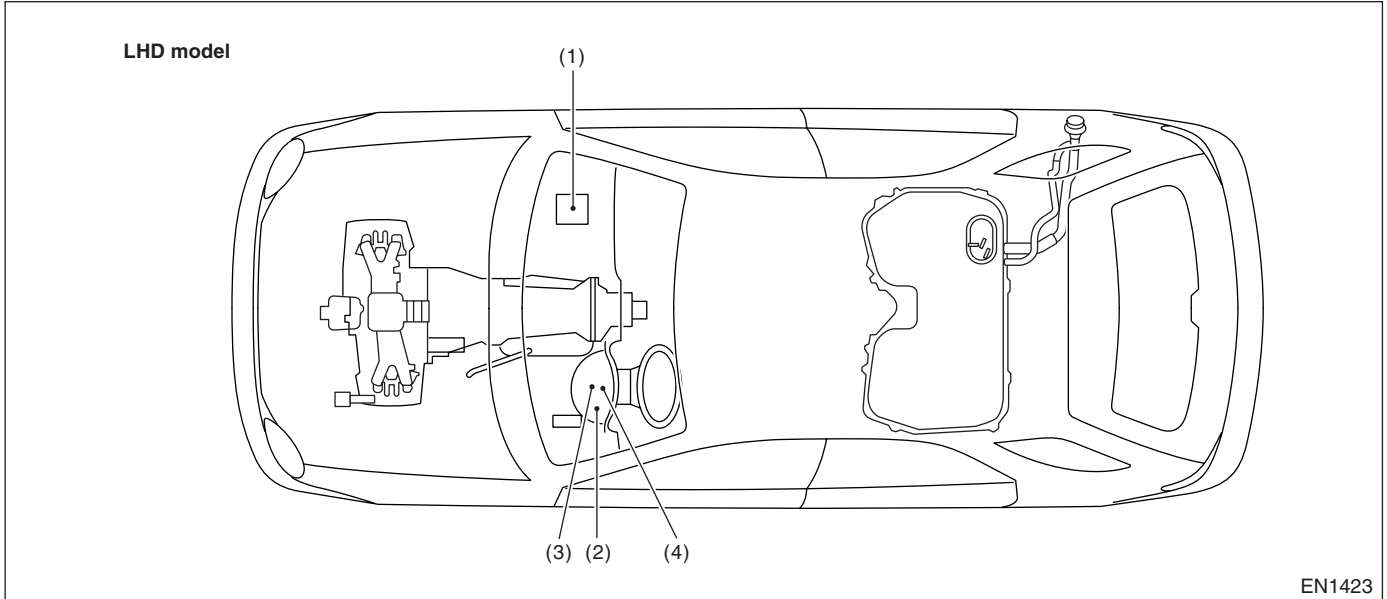
ENGINE (DIAGNOSTICS)

4. Electrical Components Location

A: LOCATION

1. ENGINE

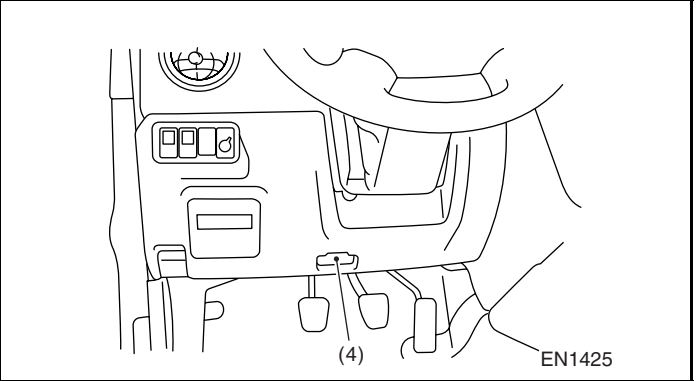
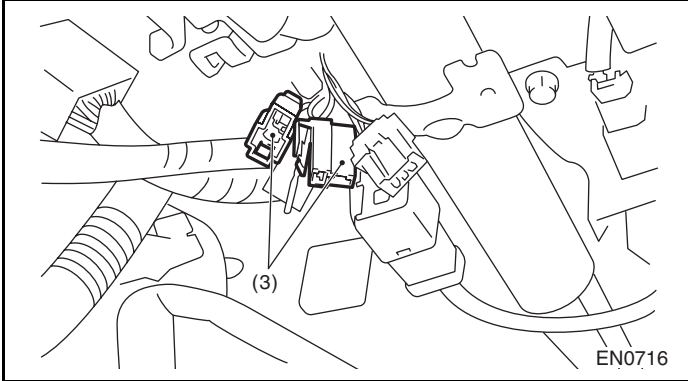
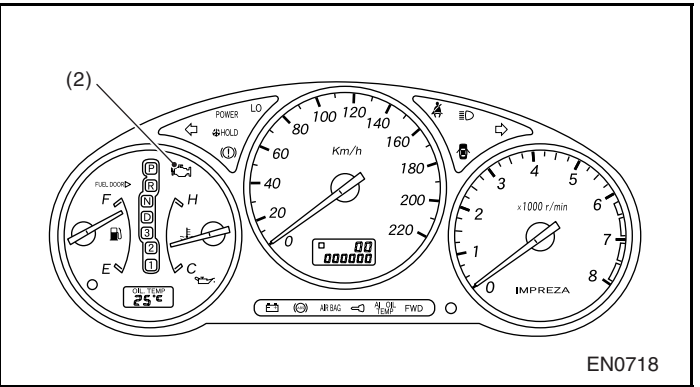
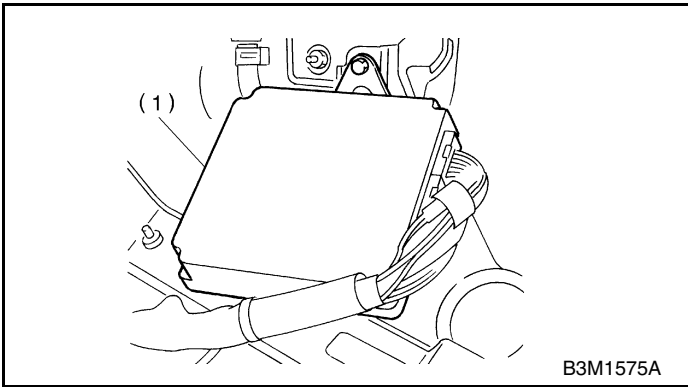
• Module



- | | |
|---|-------------------------|
| (1) Engine control module (ECM) | (3) Test mode connector |
| (2) CHECK ENGINE malfunction indicator lamp (MIL) | (4) Data link connector |

ELECTRICAL COMPONENTS LOCATION

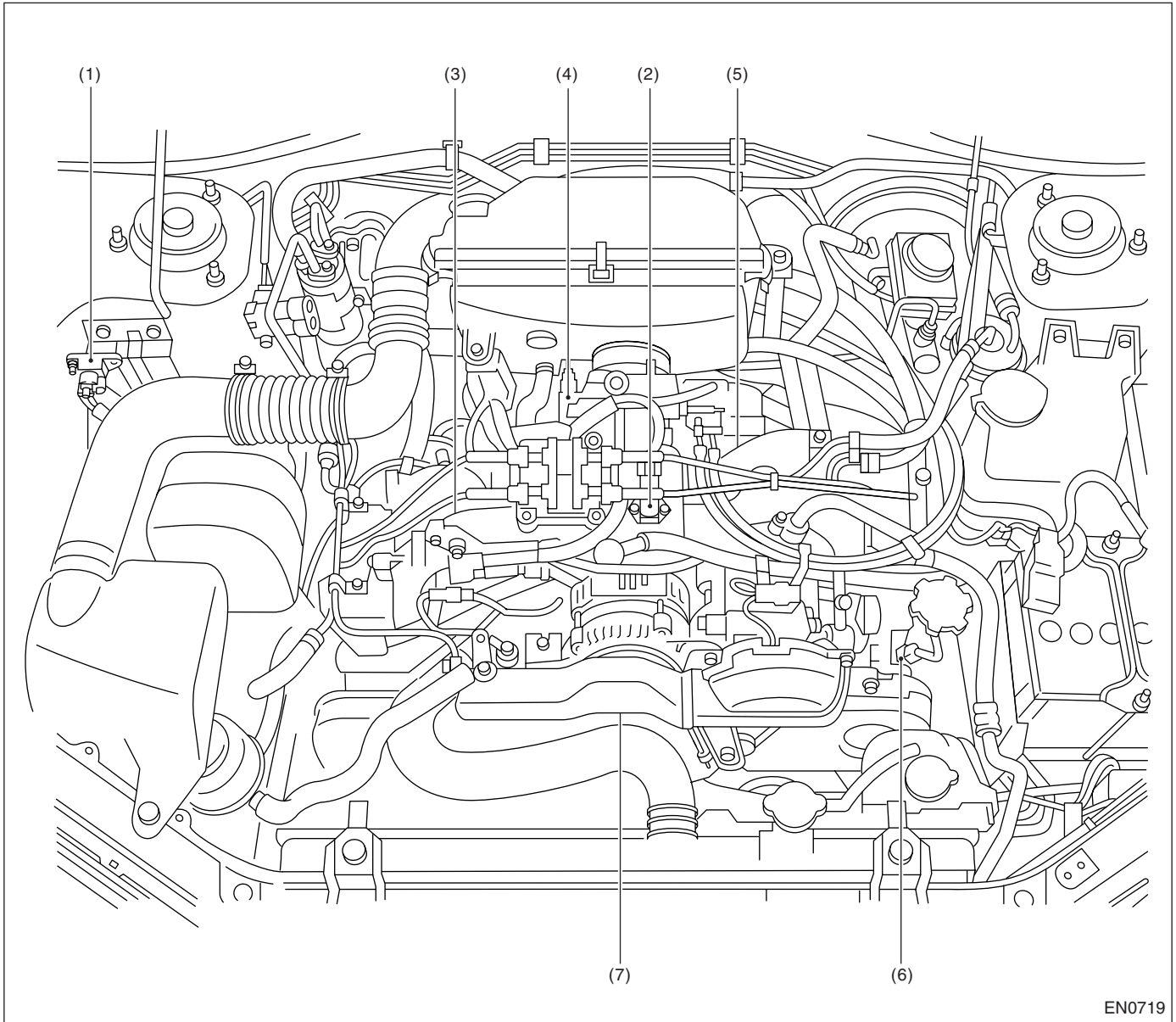
ENGINE (DIAGNOSTICS)



ELECTRICAL COMPONENTS LOCATION

ENGINE (DIAGNOSTICS)

• Sensor



EN0719

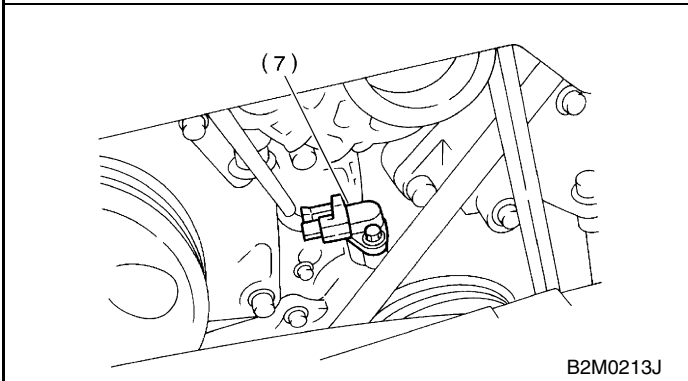
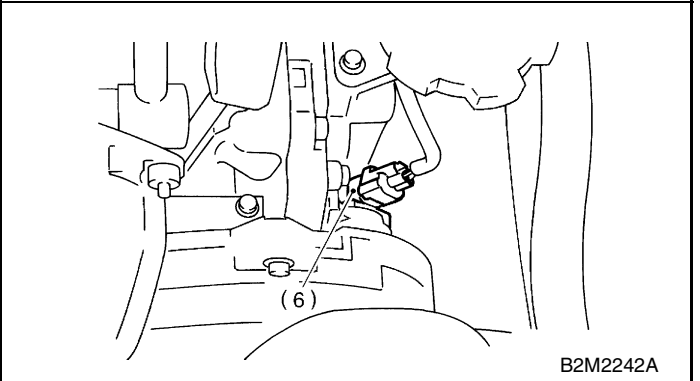
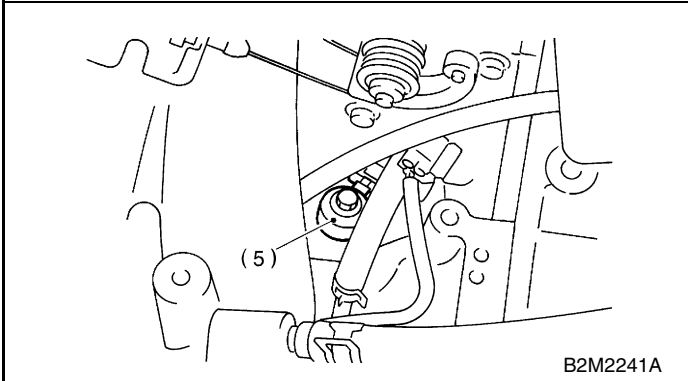
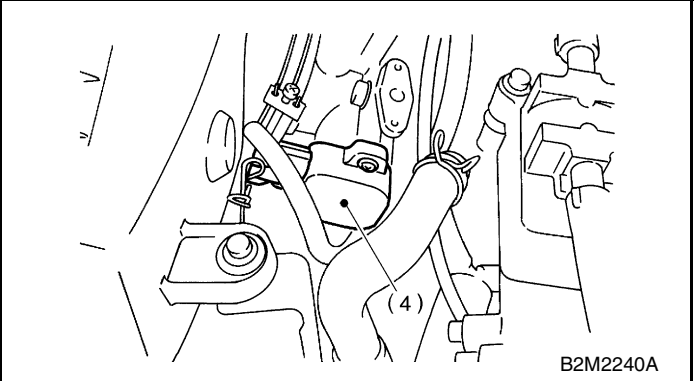
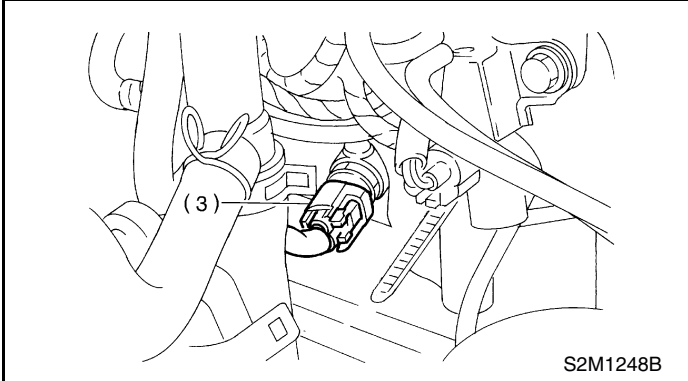
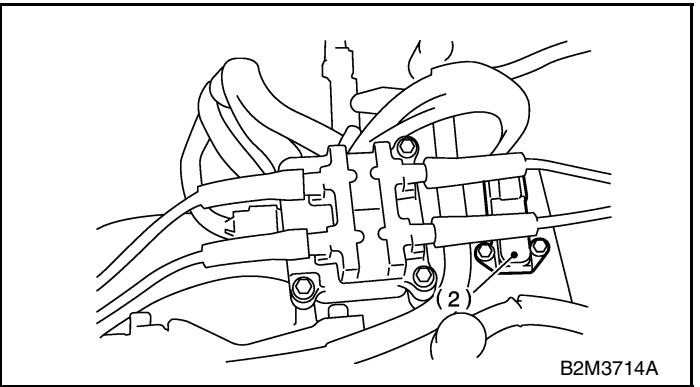
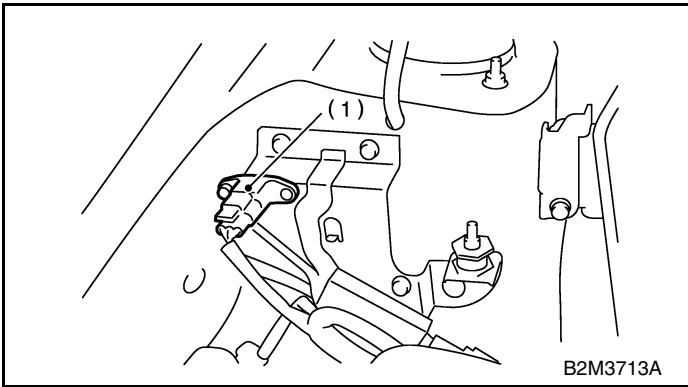
- (1) Atmospheric pressure sensor
- (2) Intake air temperature and pressure sensor

- (3) Engine coolant temperature sensor
- (4) Throttle position sensor

- (5) Knock sensor
- (6) Camshaft position sensor
- (7) Crankshaft position sensor

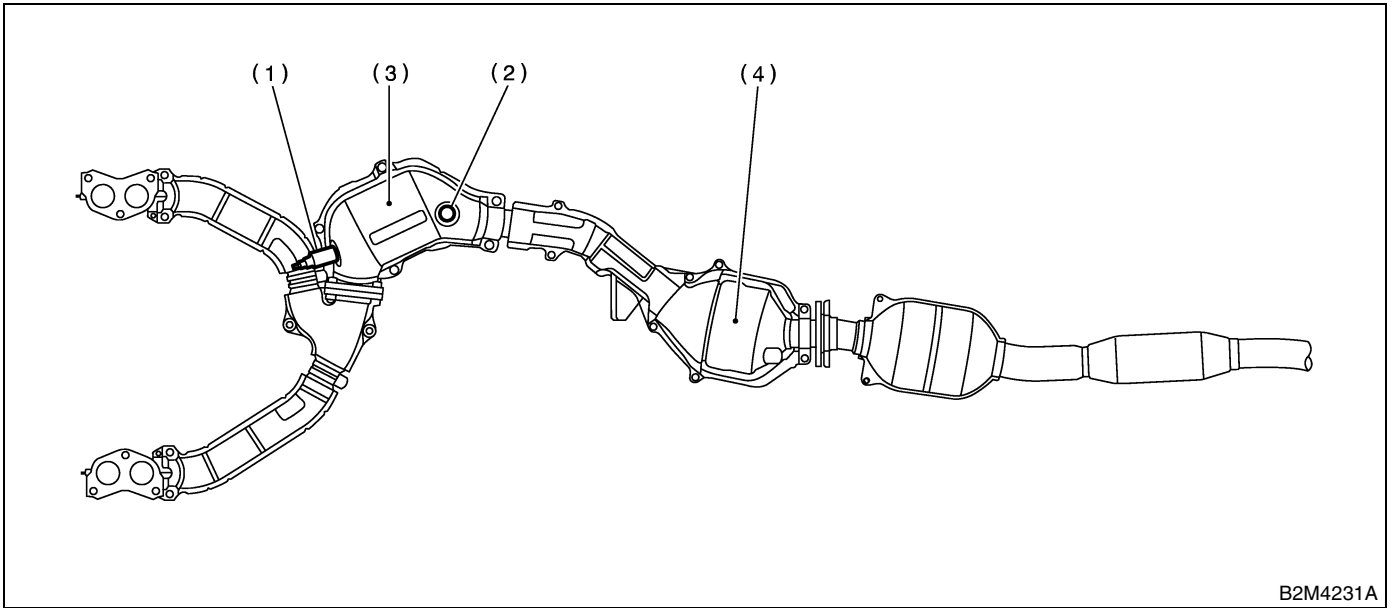
ELECTRICAL COMPONENTS LOCATION

ENGINE (DIAGNOSTICS)



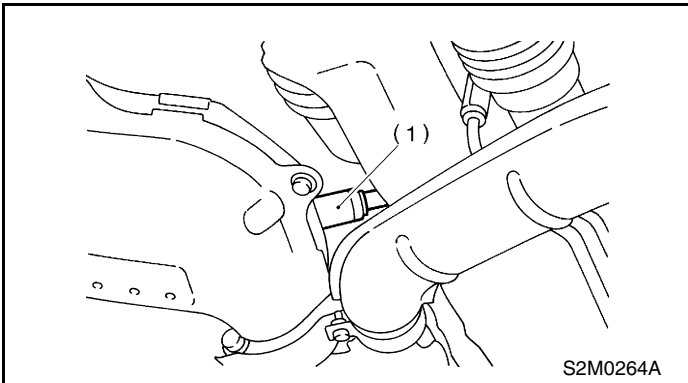
ELECTRICAL COMPONENTS LOCATION

ENGINE (DIAGNOSTICS)

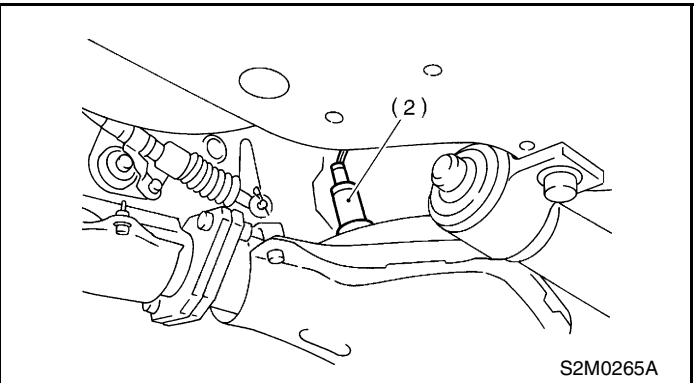


B2M4231A

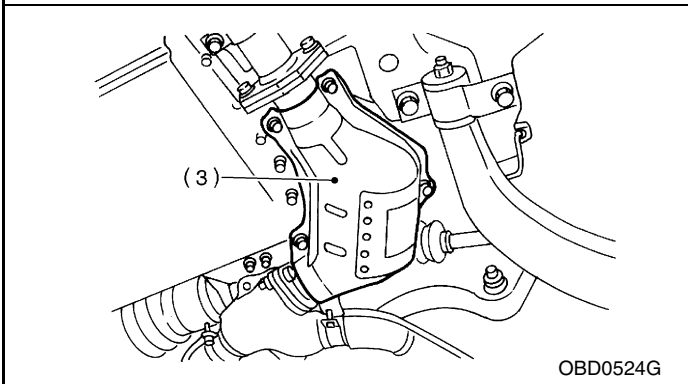
- (1) Front oxygen (A/F) sensor
- (2) Rear oxygen sensor
- (3) Front catalytic converter
- (4) Rear catalytic converter



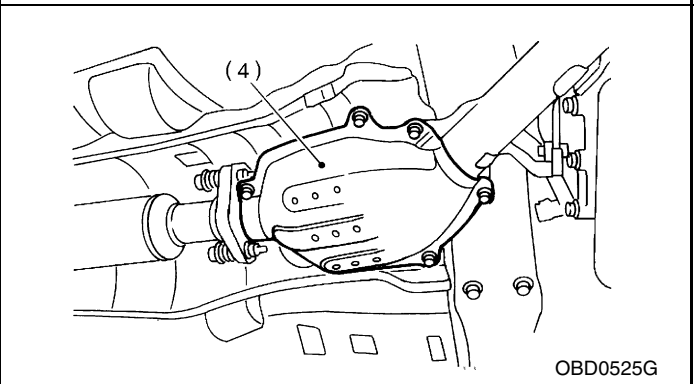
S2M0264A



S2M0265A



OBD0524G

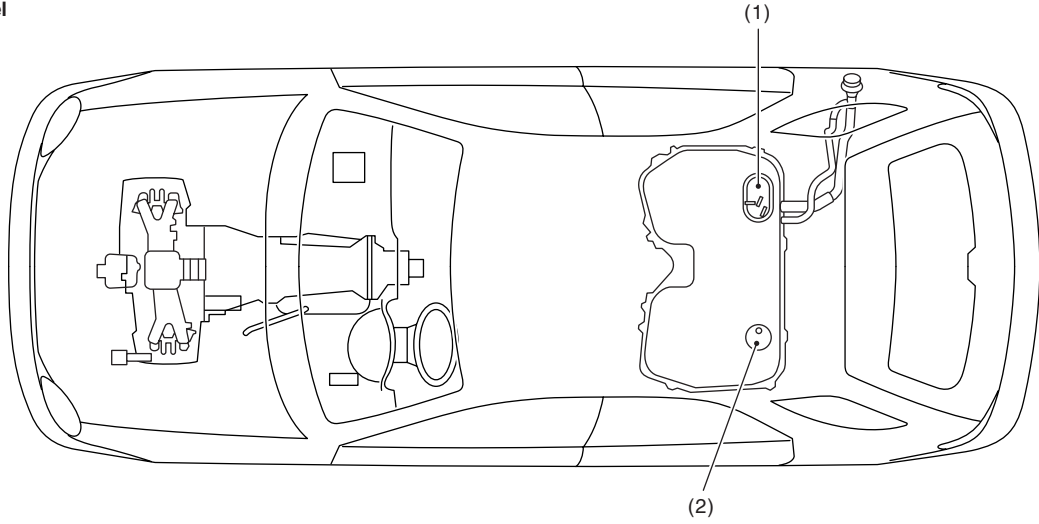


OBD0525G

ELECTRICAL COMPONENTS LOCATION

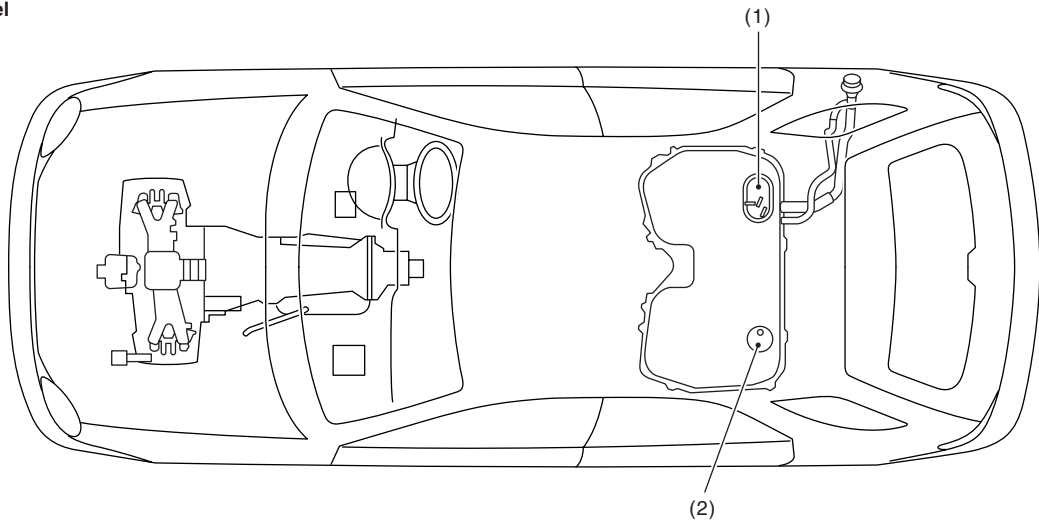
ENGINE (DIAGNOSTICS)

LHD model



EN1019

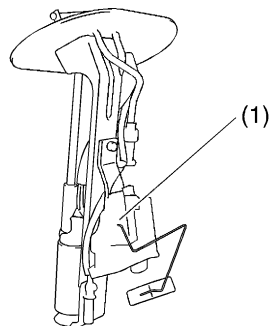
RHD model



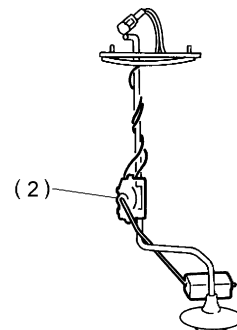
EN1020

(1) Fuel level sensor

(2) Fuel sub level sensor (2500 cc model only)



EN1036

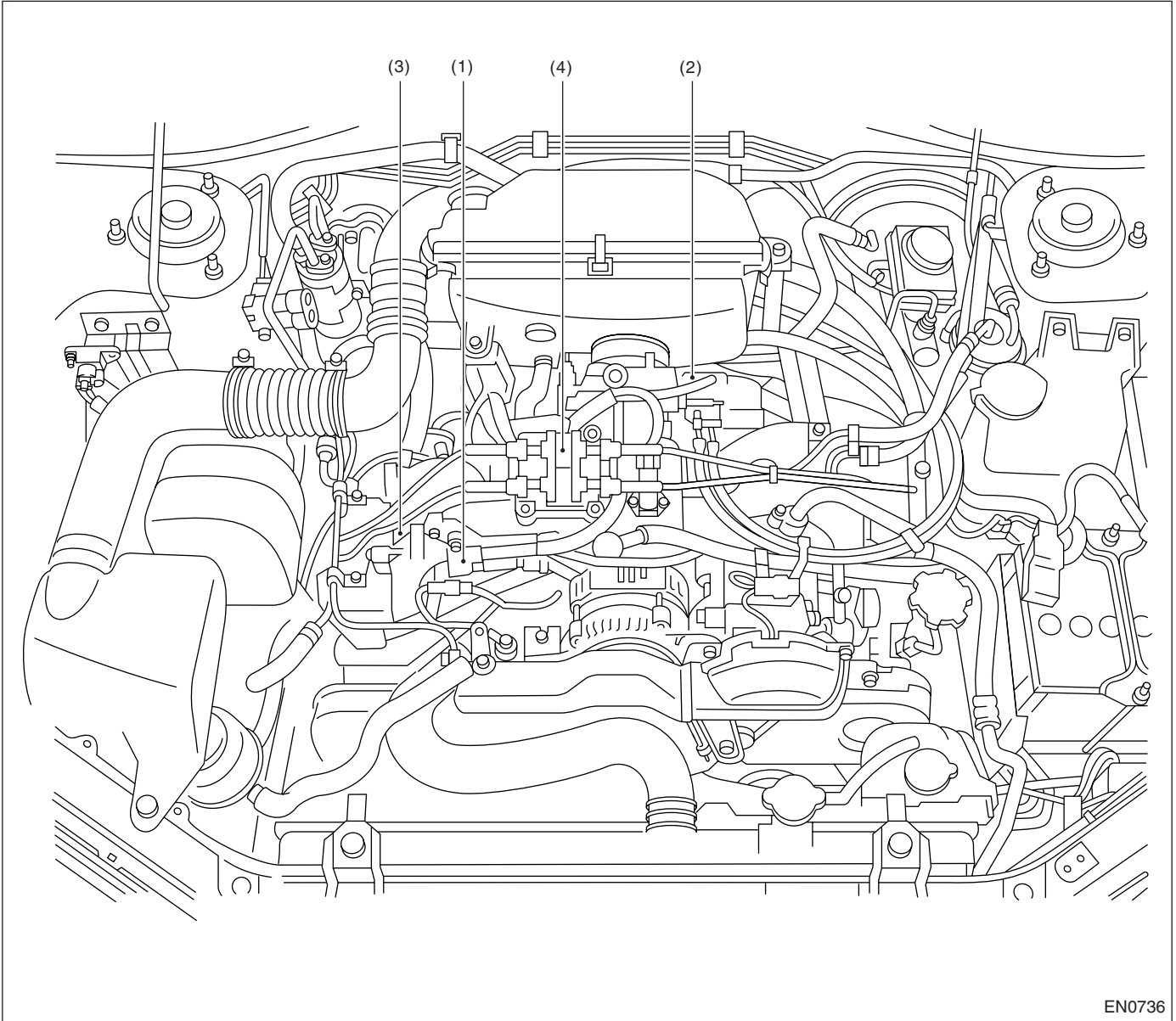


EN1037

ELECTRICAL COMPONENTS LOCATION

ENGINE (DIAGNOSTICS)

• Solenoid Valve, Emission Control System Parts and Ignition System Parts



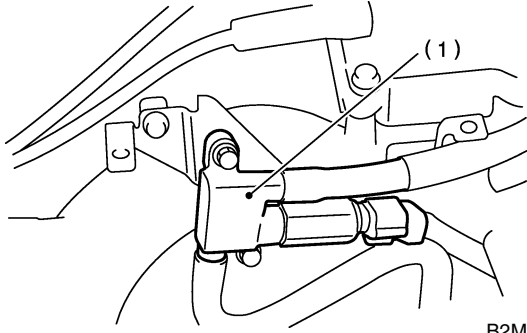
EN0736

- (1) Air assist injector solenoid valve
- (2) Idle air control solenoid valve

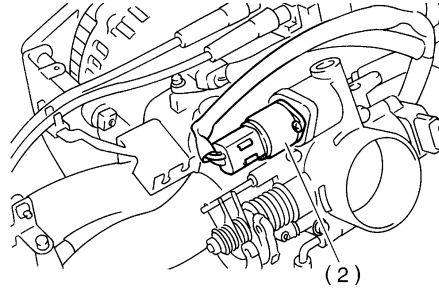
- (3) Purge control solenoid valve
- (4) Ignition coil & ignitor ASSY

ELECTRICAL COMPONENTS LOCATION

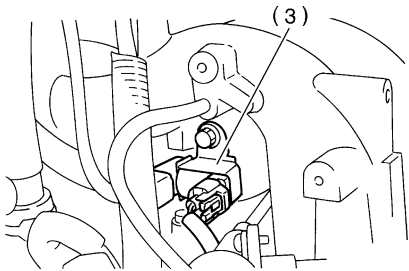
ENGINE (DIAGNOSTICS)



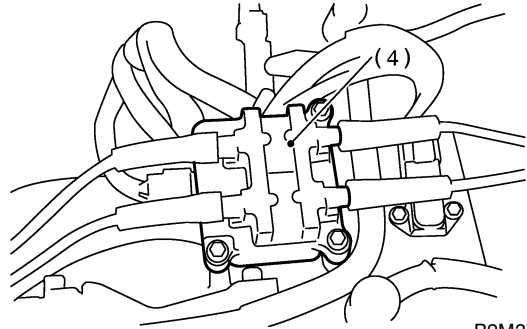
B2M3715A



H2M3259A



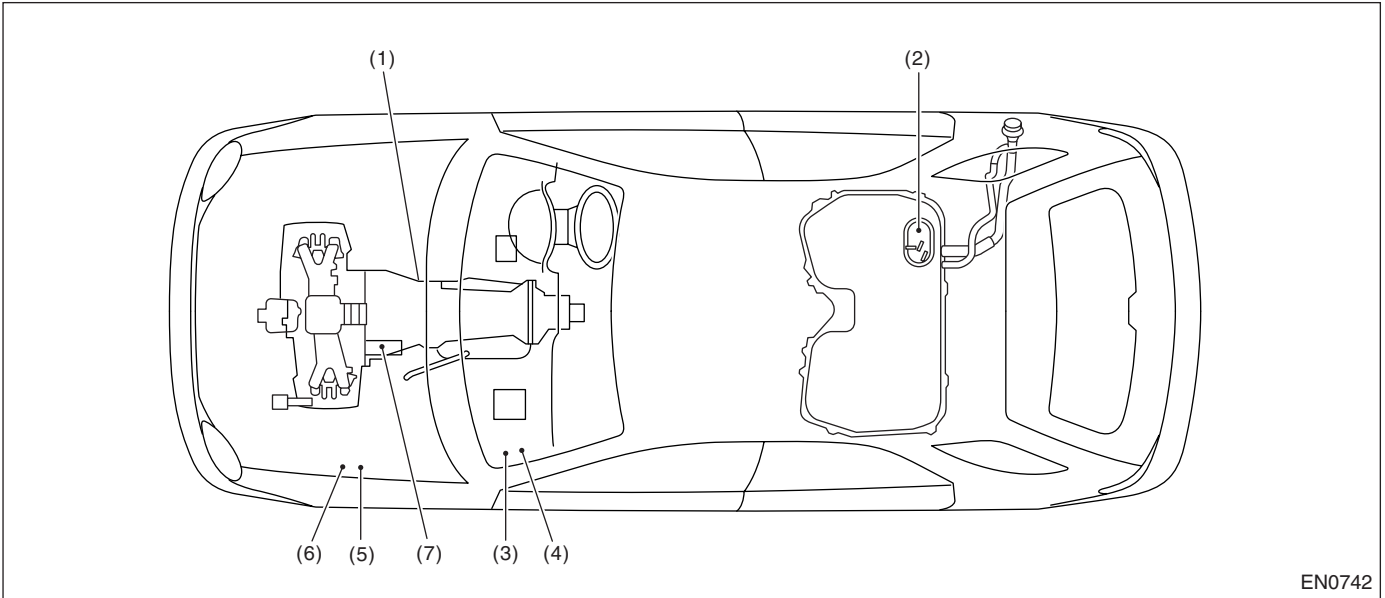
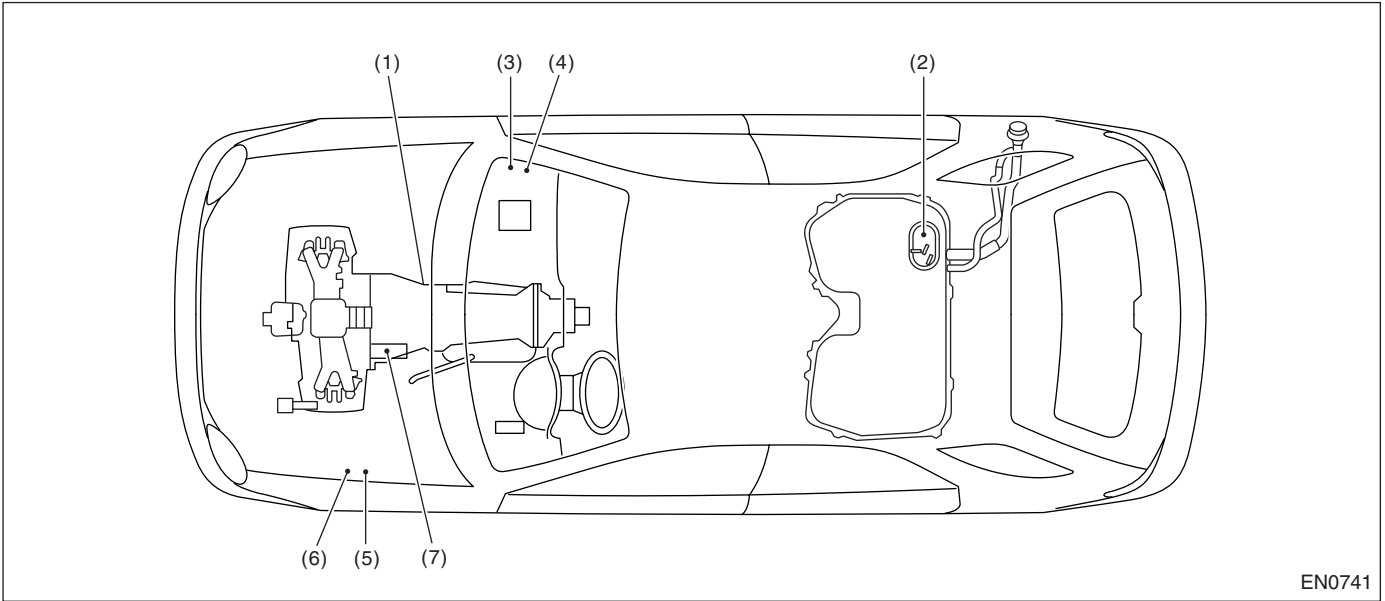
H2M3258B



B2M3720A

ELECTRICAL COMPONENTS LOCATION

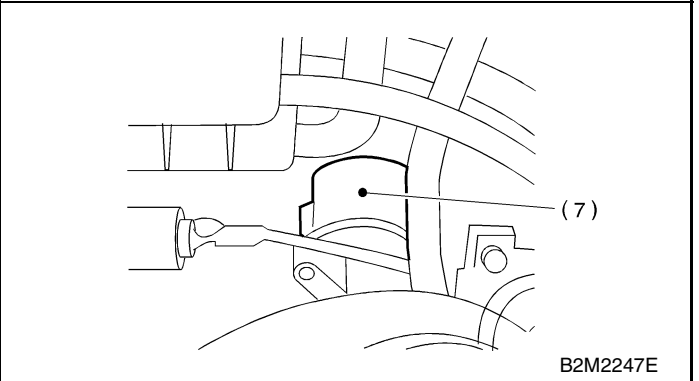
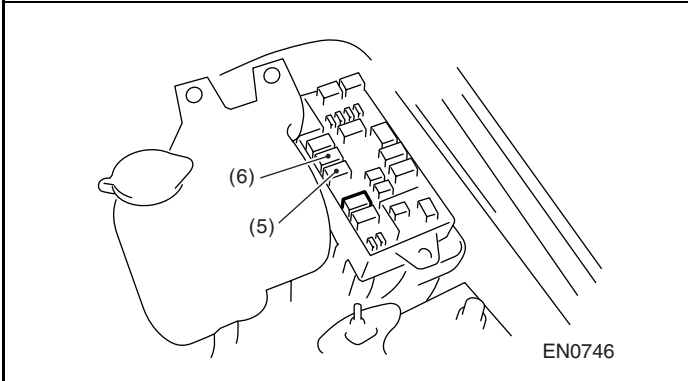
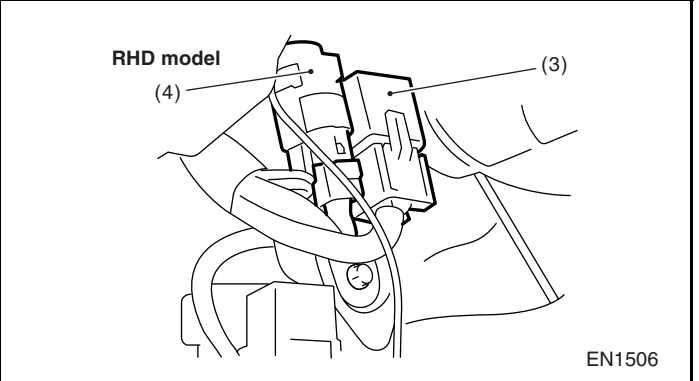
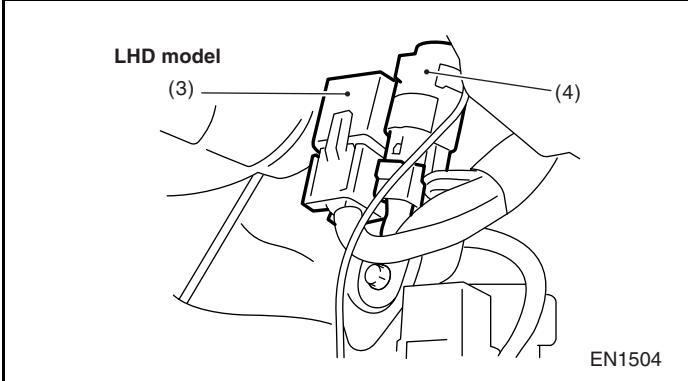
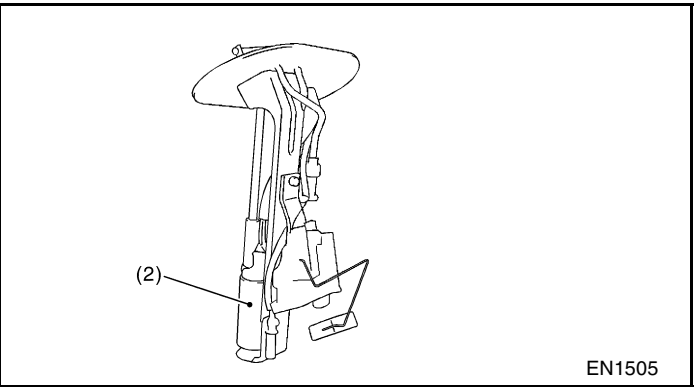
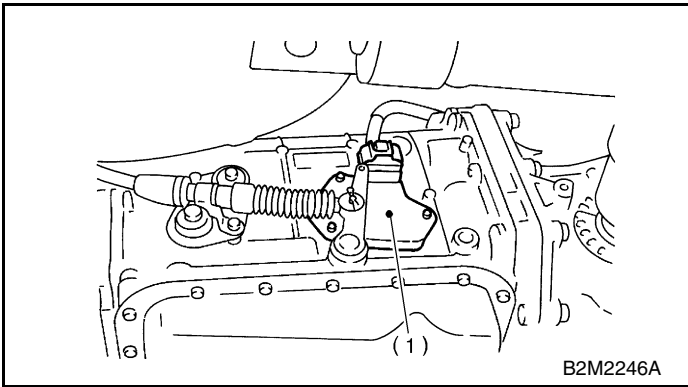
ENGINE (DIAGNOSTICS)



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

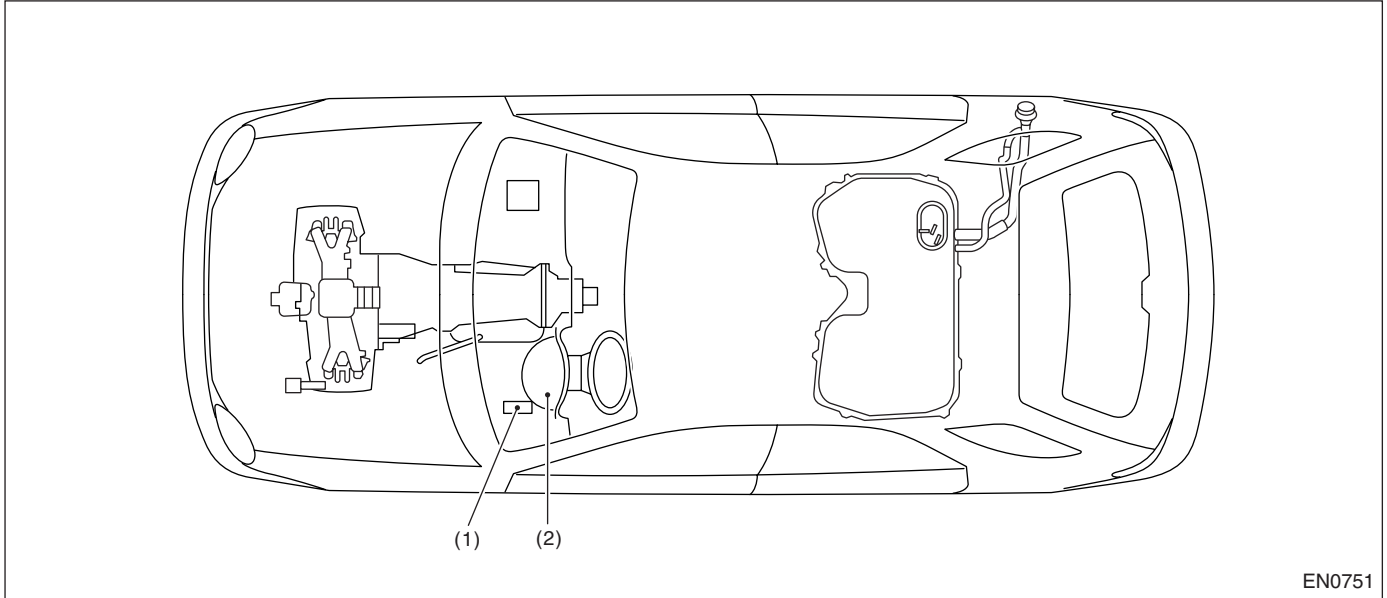


ELECTRICAL COMPONENTS LOCATION

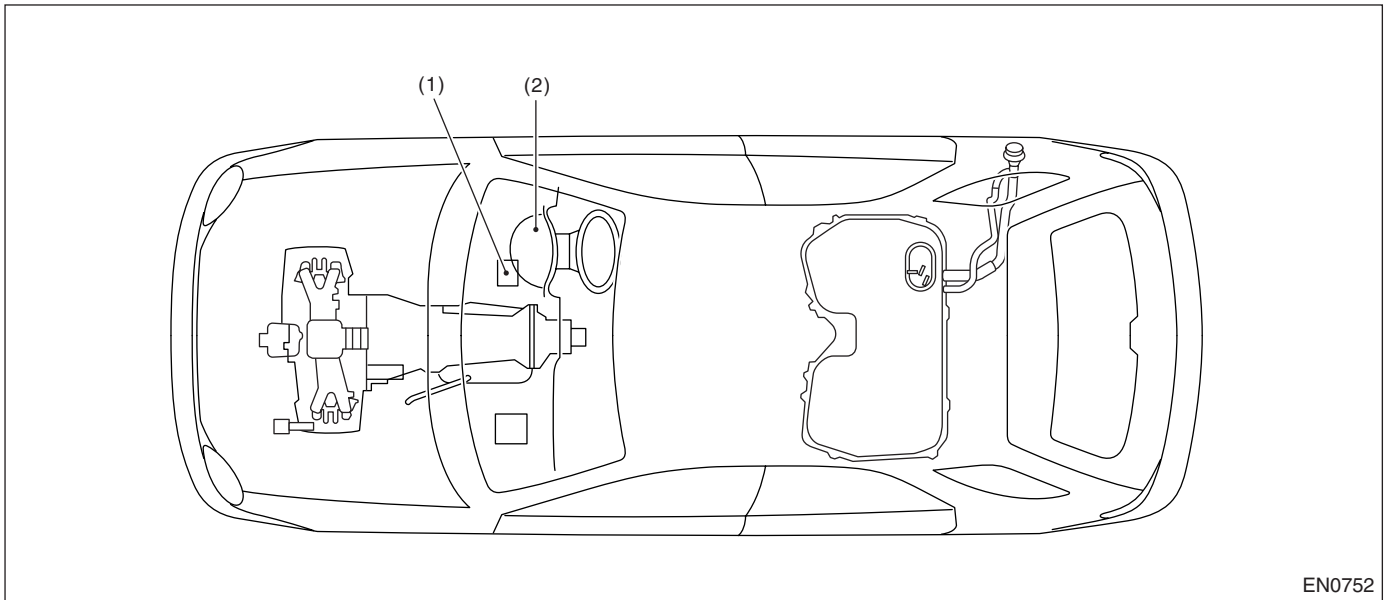
ENGINE (DIAGNOSTICS)

2. TRANSMISSION

• Module



EN0751



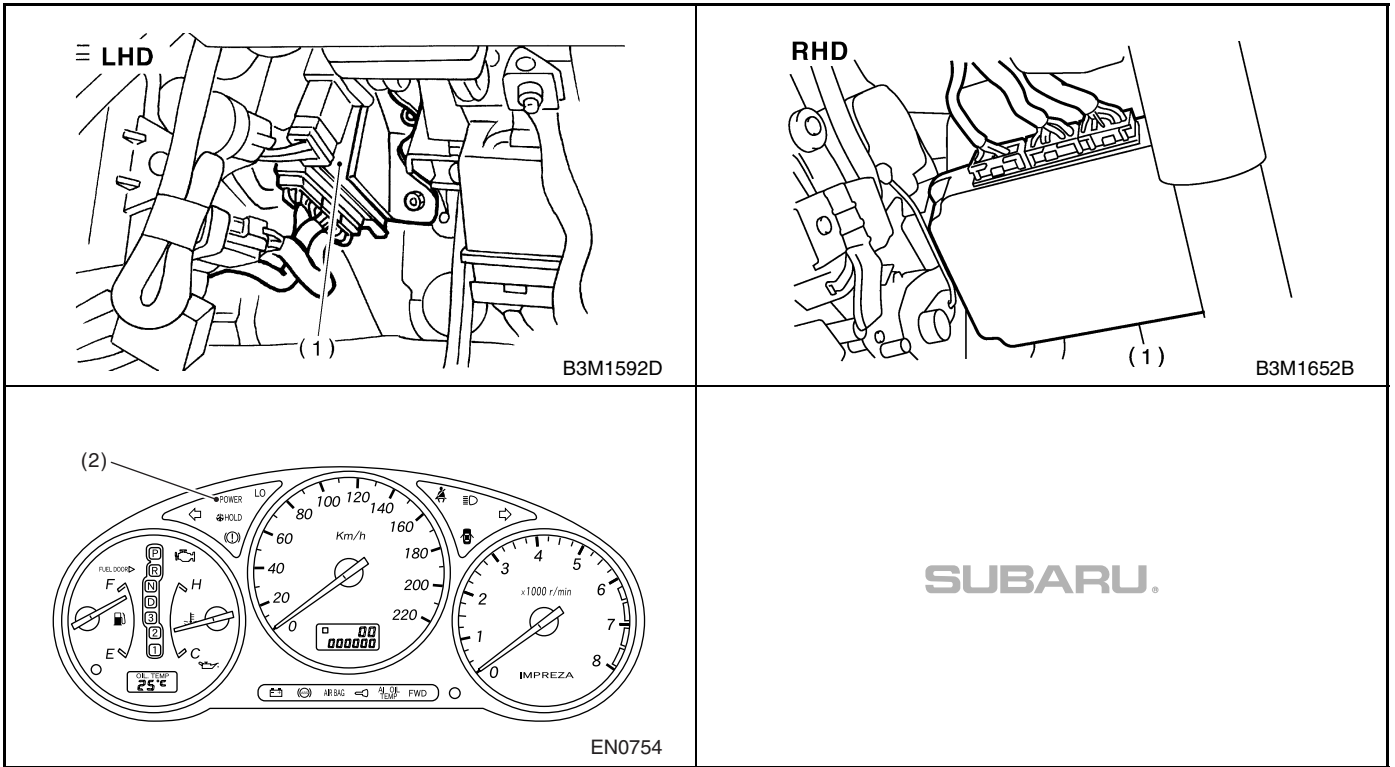
EN0752

(1) Transmission control module (TCM) (for AT vehicles)

(2) AT diagnostic indicator light (for AT vehicles)

ELECTRICAL COMPONENTS LOCATION

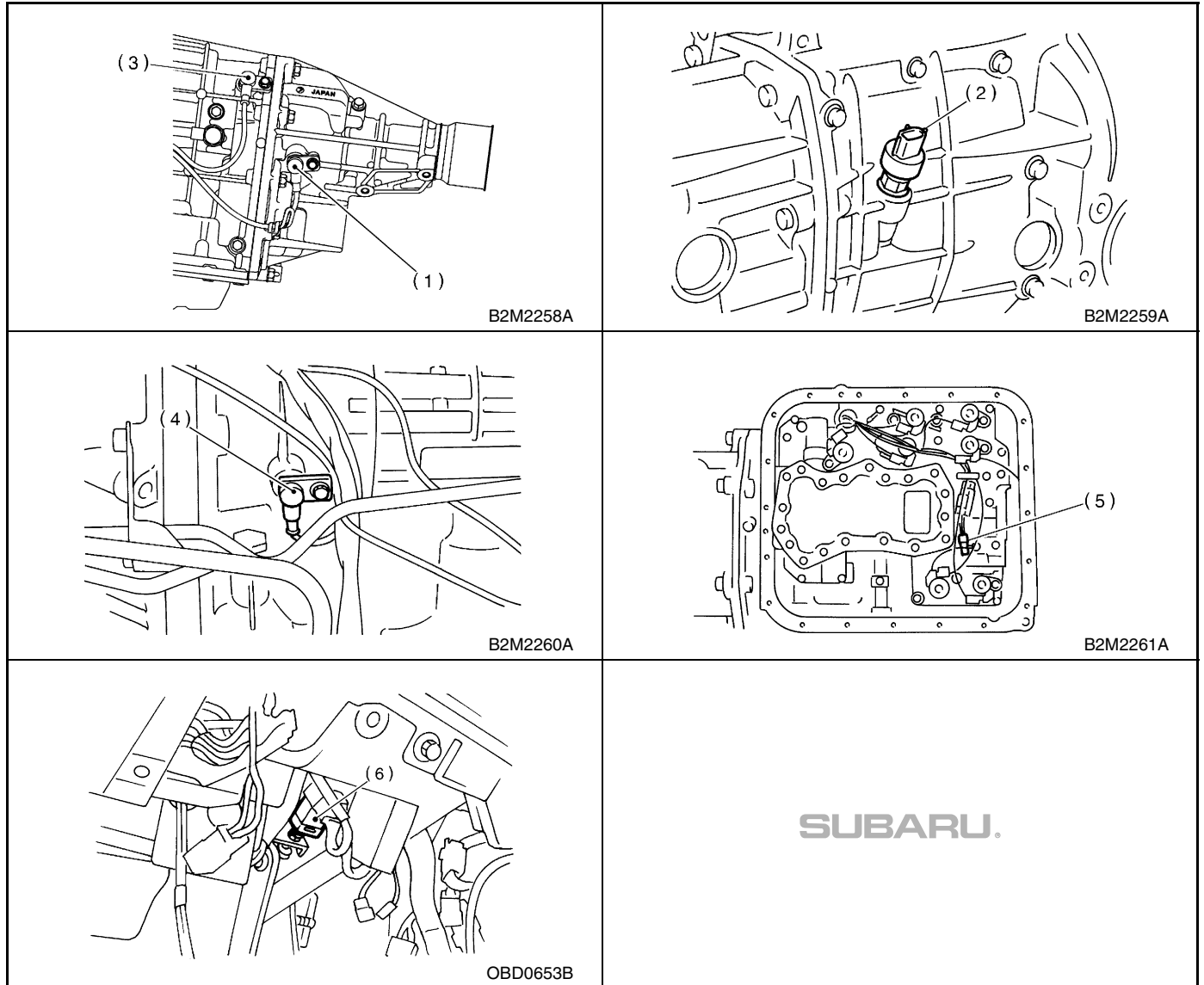
ENGINE (DIAGNOSTICS)



ELECTRICAL COMPONENTS LOCATION

ENGINE (DIAGNOSTICS)

• Sensor

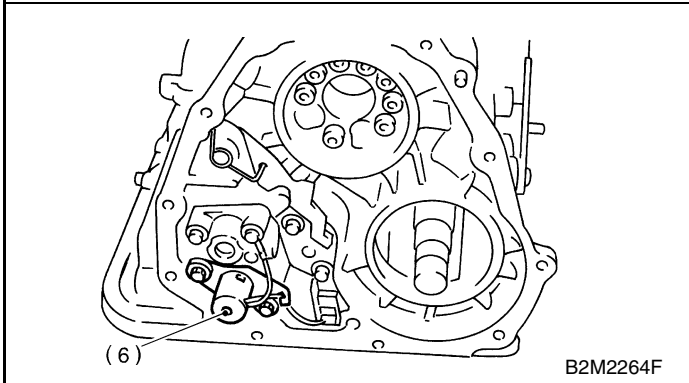
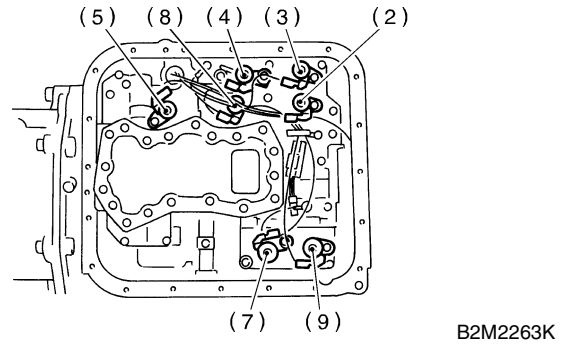
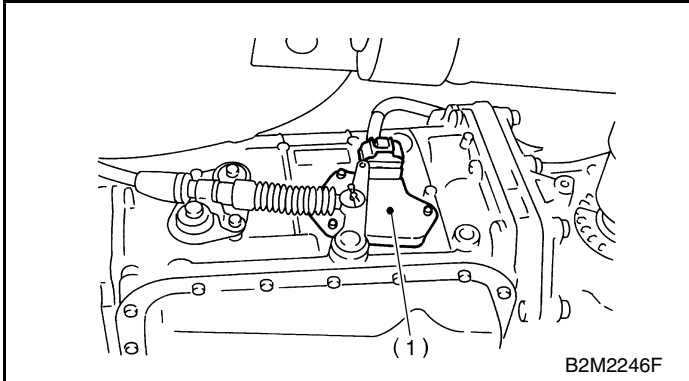


- (1) Rear vehicle speed sensor (for AT vehicles)
- (2) Front vehicle speed sensor (for MT vehicles)
- (3) Front vehicle speed sensor (for AT vehicles)
- (4) Torque converter turbine speed sensor
- (5) ATF temperature sensor (for AT vehicles)
- (6) Brake light switch

ELECTRICAL COMPONENTS LOCATION

ENGINE (DIAGNOSTICS)

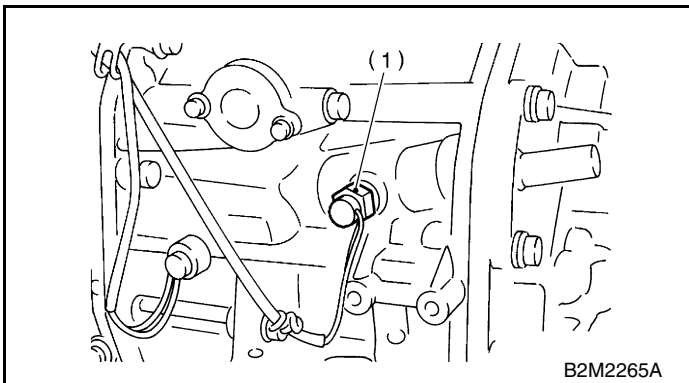
• Solenoid Valve and Switch (AT vehicles)



SUBARU.

- (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)



SUBARU.

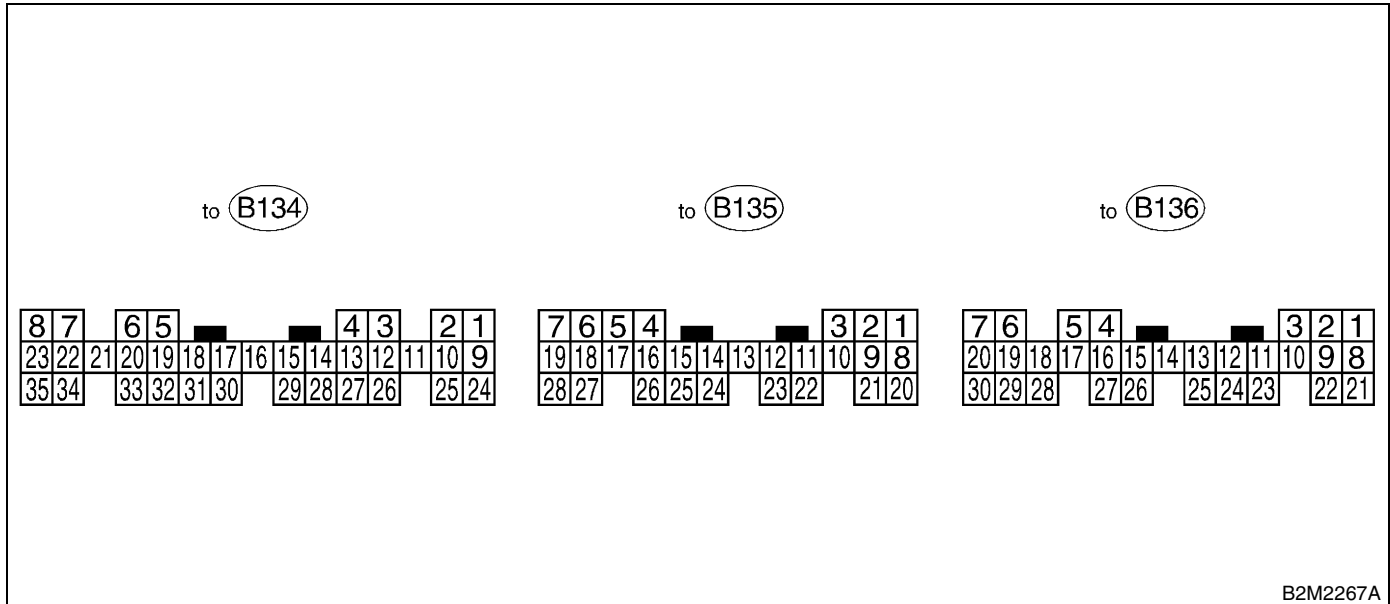
- (1) Neutral position switch

ENGINE CONTROL MODULE (ECM) I/O SIGNAL

ENGINE (DIAGNOSTICS)

5. Engine Control Module (ECM) I/O Signal

A: ELECTRICAL SPECIFICATION



B2M2267A

Content		Con- nector No.	Terminal No.		Signal (V)		Note
					Ignition SW ON (Engine OFF)	Engine ON (Idling)	
Crank- shaft position sensor	Signal (+)	B135	2*	1	0	-7 — +7	Sensor output waveform
	Signal (-)	B135	9*	8	0	0	—
	Shield	B135	10		0	0	—
Camshaft position sensor	Signal (+)	B135	1*	2	0	-7 — +7	Sensor output waveform
	Signal (-)	B135	8*	9	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 (sensor)	B136	16		0	0	—
Rear oxygen sensor	Signal	B136	18		0	0 — 0.9	—
	Shield	B136	24		0	0	—
	GND (sensor)	B136	16		0	0	—
Front oxygen (A/F) sensor heater	Signal 1	B134	23		0 — 1.0	0 — 1.0	—
	Signal 2	B134	22		0 — 1.0	0 — 1.0	—
Rear oxygen sensor heater signal		B134	21		0 — 1.0	0 — 1.0	—
Engine coolant temperature sensor	Signal	B136	14		1.0 — 1.4	1.0 — 1.4	After warm-up the engine.
	GND (sensor)	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 displayed when vehicle is driven.

*: 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)		
Starter switch	B135	28	0	0	Cranking: 8 — 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: 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	More than 4 V	—
Torque control 2 signal	B135	17		5	More than 4 V	—
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	

*: 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)	
Fuel level sensor	B136	27	0.12 — 4.75	0.12 — 4.75	For europe model
AT diagnosis input sig- nal	B135	4	Less than 1 ←→ More than 4	Less than 1 ←→ 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) sen- sor signal 1	B136	19	2.8 — 3.2	2.8 — 3.2	—
Front oxygen (A/F) sen- sor signal 2	B136	6	2.4 — 2.7	2.4 — 2.7	—
Front oxygen (A/F) sen- sor signal 3	B136	7	0.2 — 4.9	0.2 — 4.9	—
Front oxygen (A/F) sen- sor 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 communica- tion line	B135	3	Less than 1 ←→ More than 4	Less than 1 ←→ 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:

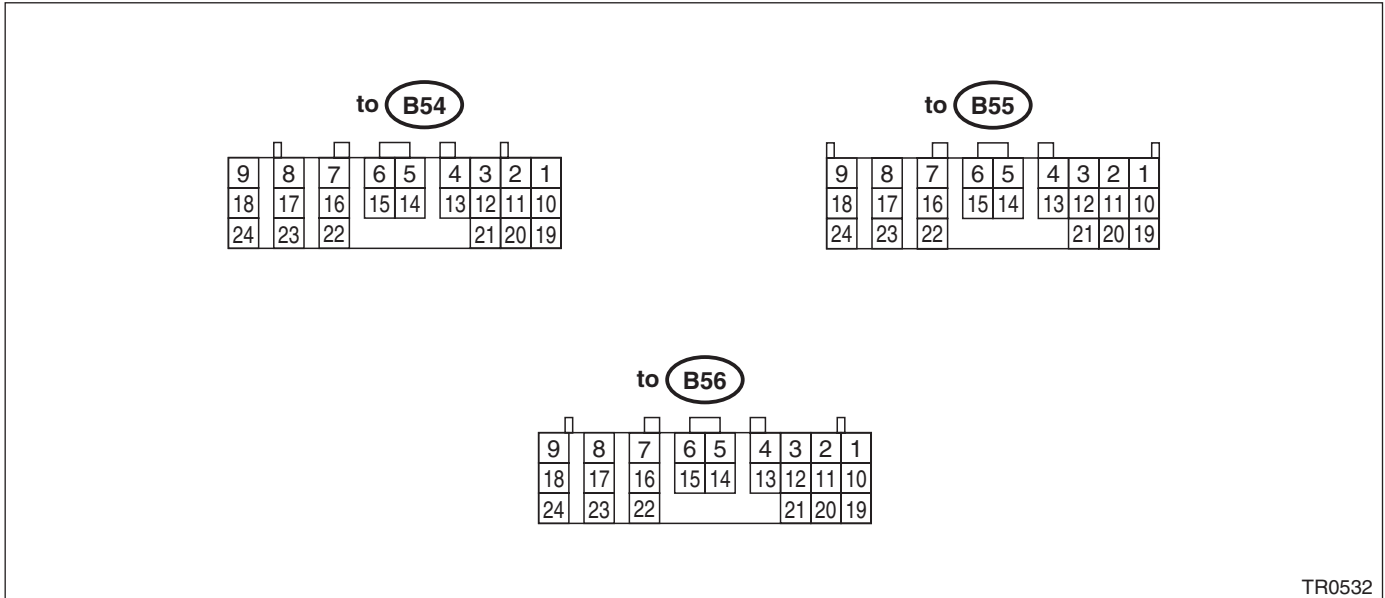
- After warm-up the engine.
- Gear position is in “N” or “P” position.
- A/C is turned to OFF.
- All accessory switches are turned to OFF.

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	Connector No.	Terminal No.	Measuring conditions	Voltage (V)	Resistance to body (ohms)	
Back-up power supply	B56	1	Ignition switch OFF	10 — 13	—	
Ignition power supply	B54	23	Ignition switch ON (with engine OFF)	10 — 13	—	
	B54	24				
Inhibitor switch	“P” range switch	B55	1	Select lever in “P” range	Less than 1	—
				Select lever in any other than “P” range (except “N” range)	More than 8	
	“N” range switch	B55	14	Select lever in “N” range	Less than 1	—
				Select lever in any other than “N” range (except “P” range)	More than 8	
	“R” range switch	B55	3	Select lever in “R” range	Less than 1	—
				Select lever in any other than “R” range	More than 8	
	“D” range switch	B55	4	Select lever in “D” range	Less than 1	—
				Select lever in any other than “D” range	More than 8	
	“3” range switch	B55	5	Select lever in “3” range	Less than 1	—
				Select lever in any other than “3” range	More than 8	
	“2” range switch	B55	6	Select lever in “2” range	Less than 1	—
				Select lever in any other than “2” range	More than 8	
	“1” range switch	B55	7	Select lever in “1” range	Less than 1	—
				Select lever in any other than “1” range	More than 8	
Brake switch	B55	12	Brake pedal depressed.	More than 10.5	—	
			Brake pedal released.	Less than 1		
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.	0.4 — 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	Connector 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	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 on FWD switch	Less than 1	—
			Fuse removed from FWD switch	More than 9	
Data link signal (Subaru Select Monitor)	B56	15	—	—	—

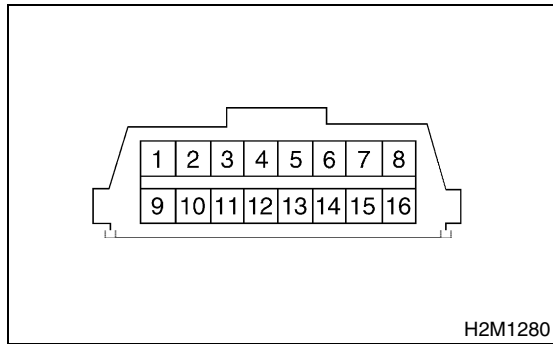
8. Data Link Connector

A: NOTE

- 1) This connector is used both for the OBD-II general scan tools and Subaru Select Monitor.
- 2) Terminal No. 4 to No. 6 of the data link connector is used for the Subaru Select Monitor signal.

CAUTION:

Do not connect any scan tools other than the OBD-II general scan tools and Subaru Select Monitor, because the circuit for 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

OBD-II GENERAL SCAN TOOL

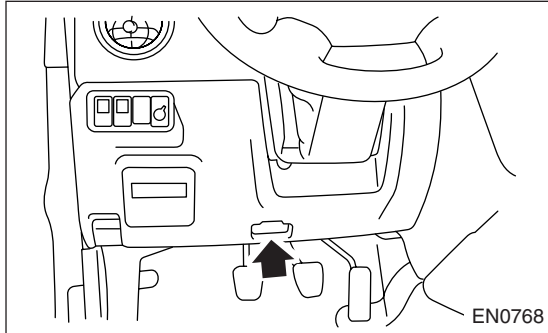
ENGINE (DIAGNOSTICS)

9. OBD-II General Scan Tool

A: OPERATION

1. HOW TO USE OBD-II GENERAL SCAN TOOL

- 1) Prepare a general scan tool (OBD-II general scan tool) required by SAE J1978.
- 2) Connect the OBD-II general scan tool to data link connector located in the lower portion of instrument panel (on the driver's side).



3) Using the OBD-II general scan tool, call up diagnostic trouble code(s) (DTC(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 (DTCs)
- (4) MODE \$04: Clear/Reset emission-related diagnostic information

Read out the 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 (DTCs), refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN-83, 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-41, Read Diagnostic Trouble Code (DTC).>

5. MODE \$04 (CLEAR/RESET EMISSION-RELATED DIAGNOSTIC INFORMATION)

Refers to the mode used to clear or reset emission-related diagnostic information (OBD-II trouble diagnostic information).

NOTE:

Refer to OBD-II general scan tool manufacturer's instruction manual to clear or reset emission-related diagnostic information (MODE \$04).

SUBARU SELECT MONITOR

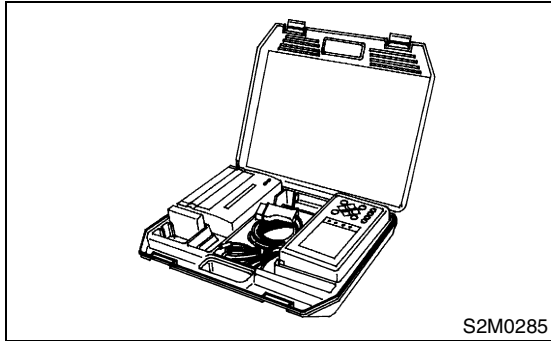
ENGINE (DIAGNOSTICS)

10. Subaru Select Monitor

A: OPERATION

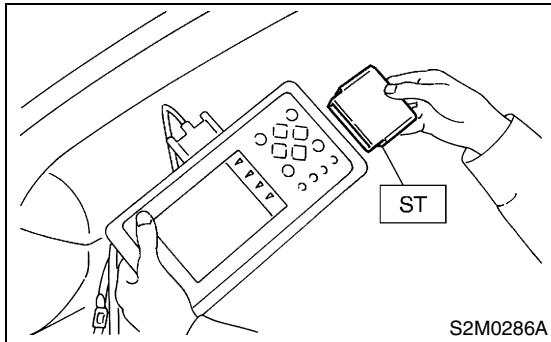
1. HOW TO USE SUBARU SELECT MONITOR

1) Prepare the Subaru Select Monitor kit. <Ref. to EN-9, PREPARATION TOOL, General Description.>



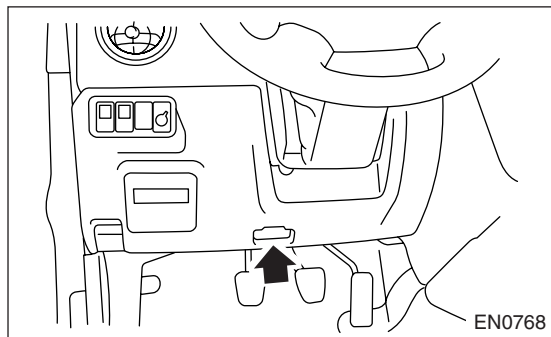
2) Connect the diagnosis cable to Subaru Select Monitor.

3) Insert the cartridge into Subaru Select Monitor. <Ref. to EN-9, PREPARATION TOOL, General Description.>



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

(1) Data link connector located in the lower portion of instrument panel (on the driver's side).

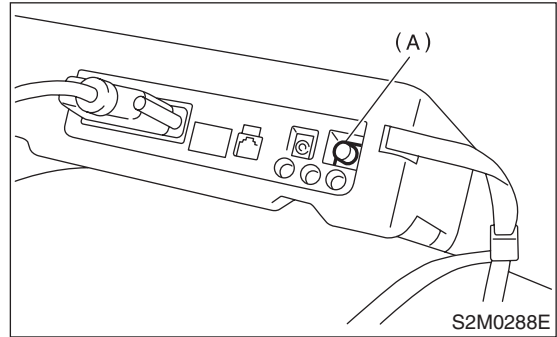


(2) Connect the diagnosis cable to data link connector.

CAUTION:

Do not connect the scan tools except for Subaru Select Monitor and OBD-II general scan tool.

5) Turn the ignition switch to ON (engine OFF) and Subaru Select Monitor switch to ON.



(A) Power switch

6) Using the Subaru Select Monitor, call up diagnostic trouble code(s) (DTC(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-41, Read Diagnostic Trouble Code (DTC).>

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-41, Read Diagnostic Trouble Code (DTC).>

4. READ CURRENT DATA FOR ENGINE. (NORMAL MODE)

- 1) On the «Main Menu» display screen, select the {Each System Check} and press [YES] key.
 - 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press [YES] key.
 - 3) Press the [YES] key after displayed the information of engine type.
 - 4) On the «Engine Diagnosis» display screen, select the {Current Data Display & Save} and press [YES] key.
 - 5) On the «Data Display Menu» display screen, select the {Data Display} and press [YES] key.
 - 6) Using the scroll key, move the display screen up or down until desired data is shown.
- A list of the support data is shown in the following table.

Contents	Display	Unit of measure
Battery voltage	Battery Voltage	V
Vehicle speed signal	Vehicle Speed	km/h or MPH
Engine speed signal	Engine Speed	rpm
Engine coolant temperature signal	Coolant Temp.	°C or °F
Ignition timing signal	Ignition Timing	deg
Throttle position signal	Throttle Opening Angle	%
Throttle position signal	Throttle Sensor Voltage	V
Injection pulse width	Fuel Injection #1 Pulse	ms
Idle air control signal	ISC Valve 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 [YES] key.
 - 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press [YES] key.
 - 3) Press the [YES] key after displayed the information of engine type.
 - 4) On the «Engine Diagnosis» display screen, select the {OBD System} and press [YES] key.
 - 5) On the «OBD Menu» display screen, select the {Current Data Display & Save} and press [YES] key.
 - 6) On the «Data Display Menu» display screen, select the {Data Display} and press [YES] key.
 - 7) Using the scroll key, move the display screen up or down until desired data is shown.
- A list of the support data is shown in the following table.

Contents	Display	Unit of measure
Number of diagnosis code	Number of Diagnosis Code	—
Malfunction indicator lamp status	MI (MIL)	ON or OFF
Monitoring test of misfire	Misfire monitoring	Complete or incomplete
Monitoring test of fuel system	Fuel system monitoring	Complete or incomplete
Monitoring test of comprehensive component	Component monitoring	Complete or incomplete
Test of catalyst	Catalyst Diagnosis	Complete or incomplete
Test of heated catalyst	Heated catalyst	No support
Test of evaporative emission purge control system	Evaporative purge system	No support
Test of secondary air system	Secondary air system	No support
Test of air conditioning system refrigerant	A/C system refrigerant	No support
Test of oxygen sensor	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 [YES] key.
 - 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press [YES] key.
 - 3) Press the [YES] key after displayed the information of engine type.
 - 4) On the «Engine Diagnosis» display screen, select the {OBD System} and press [YES] key.
 - 5) On the «OBD Menu» display screen, select the {Freeze Frame Data} and press [YES] key.
- A list of the support data is shown in the following table.

Contents	Display	Unit of measure
Diagnostic trouble code (DTC) for freeze frame data	Freeze frame data	DTC
Air fuel ratio control system for bank 1	Fuel system for Bank1	ON or OFF
Engine load data	Engine Load	%
Engine coolant temperature signal	Coolant Temp.	°C or °F
Short term fuel trim by front oxygen (A/F) sensor	Short term fuel trim B1	%
Long term fuel trim by front oxygen (A/F) sensor	Long term fuel trim B1	%
Intake manifold absolute pressure signal	Mani. Absolute Pressure	mmHg or kPa or inHg or 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 [YES] key.
 - 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press [YES] key.
 - 3) Press the [YES] key after displayed the information of engine type.
 - 4) On the «Engine Diagnosis» display screen, select the {OBD System} and press [YES] key.
 - 5) On the «OBD Menu» display screen, select the {O2 Sensor Monitor} and press [YES] key.
 - 6) On the «O2 Sensor Select» display screen, select the {Bank 1-Sensor1} or {Bank 1-Sensor2} and press [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 [YES] key.
- 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press [YES] key.
- 3) Press the [YES] key after displayed the information of engine type.
- 4) On the «Engine Diagnosis» display screen, select the {Current Data Display & Save} and press [YES] key.
- 5) On the «Data Display Menu» display screen, select the {Data & LED Display} and press [YES] key.
- 6) Using the scroll key, move the display screen up or down until the desired data is shown.
 - A list of the support data is shown in the following table.

Contents	Display	Message	LED "ON" requirements
Ignition switch signal	Ignition Switch	ON or OFF	When ignition switch is turned to 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 [YES] key.
- 2) On the «System Selection Menu» display screen, select the {Transmission Control System} and press [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 [YES] key.
- 5) On the «Data Display Menu» display screen, select the {Data Display} and press [YES] key.
- 6) Using the scroll key, move the display screen up or down until desired data is shown.
 - A list of the support data is shown in the following table.

Contents	Display	Unit of measure
Battery voltage	Battery Voltage	V
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 (DTC)

A: OPERATION

1. SUBARU SELECT MONITOR (NORMAL MODE)

- 1) On the «Main Menu» display screen, select the {Each System Check} and press [YES] key.
- 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press [YES] key.
- 3) Press the [YES] key after displayed the information of engine type.
- 4) On the «Engine Diagnosis» display screen, select the {Diagnostic Code(s) Display} and press [YES] key.
- 5) On the «Diagnostic Code(s) Display» display screen, select the {Current Diagnostic Code(s)} or {History Diagnostic Code(s)} and press [YES] key.

NOTE:

- For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
- For detailed concerning diagnostic trouble codes, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN-83, List of Diagnostic Trouble Code (DTC).>

2. SUBARU SELECT MONITOR (OBD MODE)

- 1) On the «Main Menu» display screen, select the {2. Each System Check} and press [YES] key.
- 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press [YES] key.
- 3) Press the [YES] key after displayed the information of engine type.
- 4) On the «Engine Diagnosis» display screen, select the {OBD System} and press [YES] key.
- 5) On the «OBD Menu» display screen, select the {Diagnosis Code(s) Display} and press [YES] key.
- 6) Make sure that a diagnostic trouble code (DTC) is shown on the display screen.

NOTE:

- For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
- For detailed concerning diagnostic trouble codes (DTCs), refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN-83, List of Diagnostic Trouble Code (DTC).>

3. OBD-II GENERAL SCAN TOOL

Refers to data denoting emission-related powertrain diagnostic trouble codes (DTCs).

For details concerning diagnostic trouble codes (DTCs), refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN-83, List of Diagnostic Trouble Code (DTC).>

NOTE:

Refer to OBD-II general scan tool manufacturer's instruction manual to access emission-related powertrain diagnostic trouble codes (DTCs) (MODE \$03).

INSPECTION MODE

ENGINE (DIAGNOSTICS)

12. Inspection Mode

A: OPERATION

Carry out trouble diagnosis shown in the following DTC table.

When performing trouble diagnosis which is not shown in the DTC table, refer to the next item Drive cycle.

<Ref. to EN-47, Drive Cycle.>

DTC No.	Item
P0031	Front oxygen (A/F) sensor heater circuit low input
P0032	Front oxygen (A/F) sensor heater circuit high input
P0037	Rear oxygen sensor heater circuit malfunction
P0038	Rear oxygen sensor heater circuit high input
P0066	Air assist injector solenoid valve circuit low input
P0067	Air assist injector solenoid valve circuit high input
P0106	Pressure sensor circuit range/performance problem (low input)
P0107	Pressure sensor circuit low input
P0108	Pressure sensor circuit high input
P0112	Intake air temperature sensor circuit low input
P0113	Intake air temperature sensor circuit high input
P0117	Engine coolant temperature sensor circuit low input
P0118	Engine coolant temperature sensor circuit high input
P0122	Throttle position sensor circuit low input
P0123	Throttle position sensor circuit high input
P0131	Front oxygen (A/F) sensor circuit malfunction (open circuit)
P0132	Front oxygen (A/F) sensor circuit malfunction (short circuit)
P0136	Rear oxygen sensor circuit malfunction
P0327	Knock sensor circuit low input
P0328	Knock sensor circuit high input
P0335	Crankshaft position sensor circuit malfunction
P0336	Crankshaft position sensor circuit range/performance problem
P0340	Camshaft position sensor circuit malfunction
P0341	Camshaft position sensor circuit range/performance problem
P0444	Evaporative emission control system purge control valve circuit low input
P0462	Fuel level sensor circuit low input
P0463	Fuel level sensor circuit high input
P0480	Cooling fan relay 1 circuit low input
P0500	Vehicle speed sensor malfunction
P0512	Starter switch circuit high input
P0513	Incorrect immobilizer key
P0562	Charge system circuit low input
P0563	Charge system circuit high input
P0604	Internal control module memory check sum error
P0703	Brake switch input malfunction
P0705	Transmission range sensor circuit malfunction
P0710	Transmission fluid temperature sensor circuit malfunction
P0715	Torque converter turbine speed sensor circuit malfunction
P0720	Output speed sensor (vehicle speed sensor 2) circuit malfunction
P0725	Engine speed input circuit malfunction
P0731	Gear 1 incorrect ratio
P0732	Gear 2 incorrect ratio
P0733	Gear 3 incorrect ratio
P0734	Gear 4 incorrect ratio
P0741	Torque converter clutch system malfunction

INSPECTION MODE

ENGINE (DIAGNOSTICS)

DTC No.	Item
P0743	Torque converter clutch system (Lock-up duty solenoid) electrical
P0748	Pressure control solenoid (Line pressure duty solenoid) electrical
P0753	Shift solenoid A (Shift solenoid 1) electrical
P0758	Shift solenoid B (Shift solenoid 2) electrical
P0778	2-4 brake pressure control solenoid valve circuit malfunction
P0785	2-4 brake timing control solenoid valve circuit malfunction
P1110	Atmospheric pressure sensor low input
P1111	Atmospheric pressure sensor high input
P1112	Atmospheric pressure sensor range/performance problem
P1146	Pressure sensor circuit range/performance problem (high input)
P1480	Cooling fan relay 1 circuit high input
P1507	Idle control system malfunction (fail-safe)
P1510	Idle air control solenoid valve signal 1 circuit low input
P1511	Idle air control solenoid valve signal 1 circuit high input
P1512	Idle air control solenoid valve signal 2 circuit low input
P1513	Idle air control solenoid valve signal 2 circuit high input
P1514	Idle air control solenoid valve signal 3 circuit low input
P1515	Idle air control solenoid valve signal 3 circuit high input
P1516	Idle air control solenoid valve signal 4 circuit low input
P1517	Idle air control solenoid valve signal 4 circuit high input
P1518	Starter switch circuit low input
P1540	Vehicle speed sensor malfunction 2
P1560	Back-up voltage circuit malfunction
P1570	Antenna
P1571	Reference code incompatibility
P1572	IMM circuit failure except antenna circuit
P1574	Key communication failure
P1576	EGI control module EEPROM
P1577	IMM control module EEPROM
P1590	Neutral position switch circuit high input (AT model)
P1591	Neutral position switch circuit low input (AT model)
P1592	Neutral position switch circuit (MT model)
P1594	Automatic transmission diagnosis input signal circuit malfunction
P1595	Automatic transmission diagnosis input signal circuit low input
P1596	Automatic transmission diagnosis input signal circuit high input
P1698	Engine torque control cut signal circuit low input
P1699	Engine torque control cut signal circuit high input
P1700	Throttle position sensor circuit malfunction for automatic transmission
P1701	Cruise control set signal circuit malfunction for automatic transmission
P1703	Low clutch timing control solenoid valve circuit malfunction
P1711	Engine torque control signal 1 circuit malfunction
P1712	Engine torque control signal 2 circuit malfunction

INSPECTION MODE

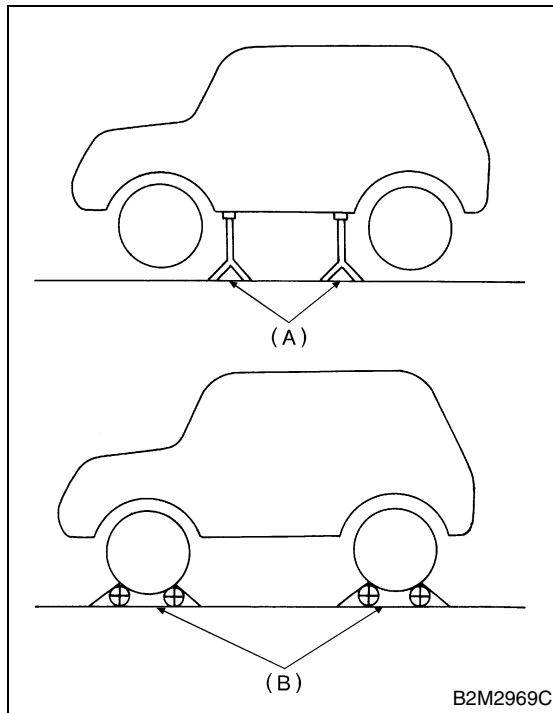
ENGINE (DIAGNOSTICS)

1. PREPARATION FOR THE INSPECTION MODE

- 1) Make sure that the fuel remains approx. half amount [20 — 40 ℓ (5.3 — 10.6 US gal, 4.4 — 8.8 Imp gal)] and the battery voltage is 12 V or more.
- 2) Raise the vehicle using a garage jack and place on safety stands or drive the vehicle onto free rollers.

WARNING:

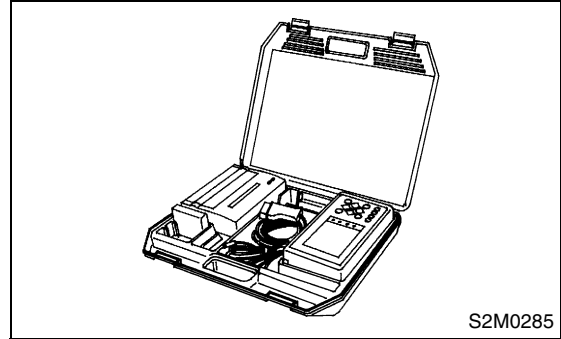
- Before raising the vehicle, ensure the parking brake is applied.
- Do not use a pantograph jack in place of a safety stand.
- Secure a rope or wire to the front and rear towing or tie-down hooks to prevent the lateral runout of front wheels.
- Do not abruptly depress/release the clutch pedal or accelerator pedal during works even when engine is operating at low speeds since this may cause vehicle to jump off free rollers.
- In order to prevent the vehicle from slipping due to vibration, do not place any wooden blocks or similar items between the safety stands and the vehicle.
- Since the rear wheels will also rotate, do not place anything near them. Also, make sure that nobody goes in front of the vehicle.



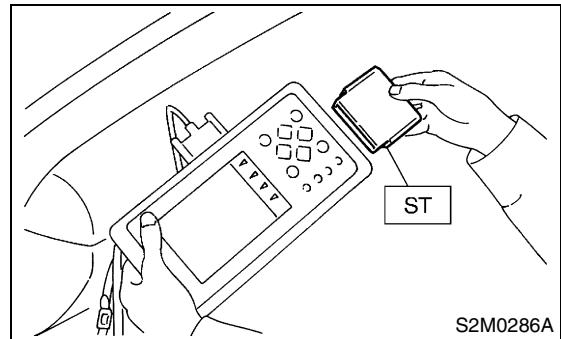
- (A) Safety stand
(B) Free rollers

2. SUBARU SELECT MONITOR

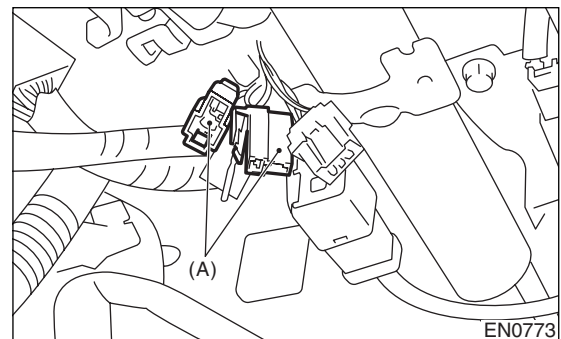
- 1) After performing the diagnostics and clearing the memory, check for any remaining unresolved trouble data. <Ref. to EN-49, Clear Memory Mode.>
- 2) Warm up the engine.
- 3) Prepare the Subaru Select Monitor kit. <Ref. to EN-9, PREPARATION TOOL, General Description.>



- 4) Connect the diagnosis cable to Subaru Select Monitor.
- 5) Insert the cartridge into Subaru Select Monitor. <Ref. to EN-9, PREPARATION TOOL, General Description.>

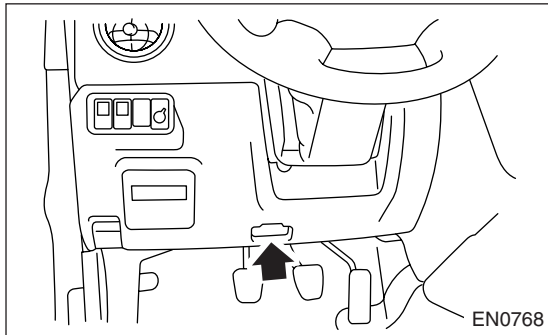


- 6) Connect the test mode connector (A) at the lower portion of instrument panel (on the driver's side).



7) Connect the Subaru Select Monitor to data link connector.

- (1) Connect the Subaru Select Monitor to data link connector located in the lower portion of the instrument panel (on the driver's side).

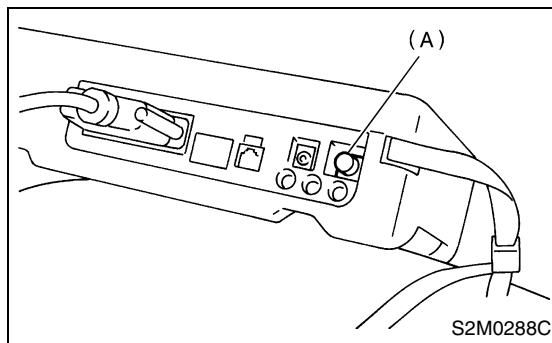


- (2) Connect the diagnosis cable to data link connector.

CAUTION:

Do not connect the scan tools except for Subaru Select Monitor and OBD-II general scan tool.

8) Turn the ignition switch to ON (engine OFF) and Subaru Select Monitor switch to ON.



(A) Power switch

9) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.

10) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.

11) Press the [YES] key after displayed the information of engine type.

12) On the «Engine Diagnosis» display screen, select the {Dealer Check Mode Procedure} and press the [YES] key.

13) When the “Perform Inspection (Dealer Check) Mode?” is shown on the display screen, press the [YES] key.

14) Perform subsequent procedures as instructed on the display screen.

- If trouble still remains in the memory, the corresponding diagnostic trouble code (DTC) appears on the display screen.

NOTE:

- For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

- For detailed concerning the diagnostic trouble codes (DTCs), refer to the List of Diagnostic Trouble Code (DTC).

<Ref. to EN-83, List of Diagnostic Trouble Code (DTC).>

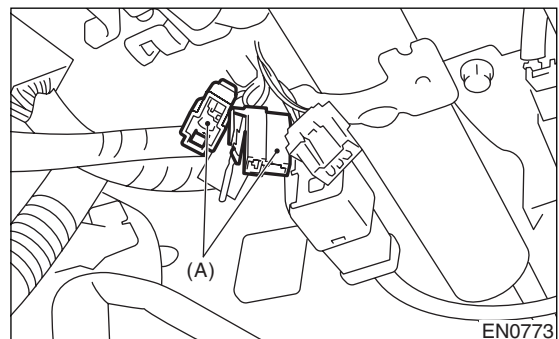
- Release the parking brake.
- The speed difference between front and rear wheels may light either the ABS warning light, but this indicates no malfunctions. When the engine control diagnosis is finished, perform the ABS memory clearance procedure of self-diagnosis system.

3. OBD-II GENERAL SCAN TOOL

1) After performing the diagnostics and clearing memory, check for any remaining unresolved trouble data: <Ref. to EN-49, Clear Memory Mode.>

2) Warm up the engine.

3) Connect the test mode connector (A) at the lower side of instrument panel (on the driver's side).



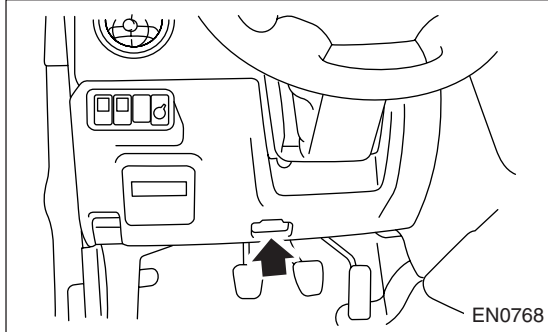
INSPECTION MODE

ENGINE (DIAGNOSTICS)

4) Connect the OBD-II general scan tool to its data link connector in the lower portion of 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.



5) Start the engine.

NOTE:

- Ensure the selector lever is placed in “P” position before starting. (AT vehicles)
- Depress the clutch pedal when starting engine. (MT vehicles)

6) Using the selector lever or shift lever, turn the “P” position switch and “N” position switch to ON.

7) Depress the brake pedal to turn brake switch ON. (AT vehicles)

8) Keep the engine speed in 2,500 — 3,000 rpm range for 40 seconds.

9) Place the selector lever or shift lever in “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 ABS warning light, but this indicates no malfunctions. When the engine control diagnosis is finished, perform the ABS memory clearance procedure of self-diagnosis system.

10) Using the OBD-II general scan tool, check for diagnostic trouble code(s) (DTC(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-83, List of Diagnostic Trouble Code (DTC).>

13. Drive Cycle

A: OPERATION

There are three drive patterns for the trouble diagnosis. Driving in the specified pattern allows to diagnose malfunctioning items listed below. After the malfunctioning items listed below are repaired, always check whether they correctly resume their functions by driving in the required drive pattern.

1. PREPARATION FOR THE DRIVE CYCLE

- 1) Make sure that the fuel remains approx. half amount [20 — 40 ℓ (5.3 — 10.6 US gal, 4.4 — 8.8 Imp gal)], and battery voltage is 12V or more.
- 2) After performing the diagnostics and cleaning memory, check for any remaining unresolved trouble data. <Ref. to EN-49, Clear Memory Mode.>
- 3) Separate the test mode connector.

NOTE:

- Except for the water temperature specified items at starting, the diagnosis is carried out after engine warm up.
- Carry out the diagnosis which is marked * on DTC twice, then, after finishing first diagnosis, stop the engine and do second time at the same condition.

2. AFTER RUNNING 20 MINUTES AT 80 KM/H (50 MPH), IDLE ENGINE FOR 1 MINUTE.

DTC No.	Item	Condition
*P0111	Intake air temperature sensor circuit range/performance problem	Coolant temperature at start is less than 30°C (86°F).
*P0125	Insufficient coolant temperature for closed loop fuel control	Coolant temperature at start is less than 20°C (68°F).
*P0130	Front oxygen (A/F) sensor circuit range/performance problem (Lean)	—
*P0133	Front oxygen (A/F) sensor circuit slow response	—
*P0170	Fuel trim malfunction	—
*P0420	Catalyst system efficiency below threshold	—
P0445	Evaporative emission control system purge control valve circuit high input	—
P0461	Fuel level sensor circuit range/performance problem	—
*P0464	Fuel level sensor intermittent input	—
*P1137	Front oxygen (A/F) sensor circuit range/performance problem	—
*P1442	Fuel level sensor circuit range/performance problem 2	—

DRIVE CYCLE

ENGINE (DIAGNOSTICS)

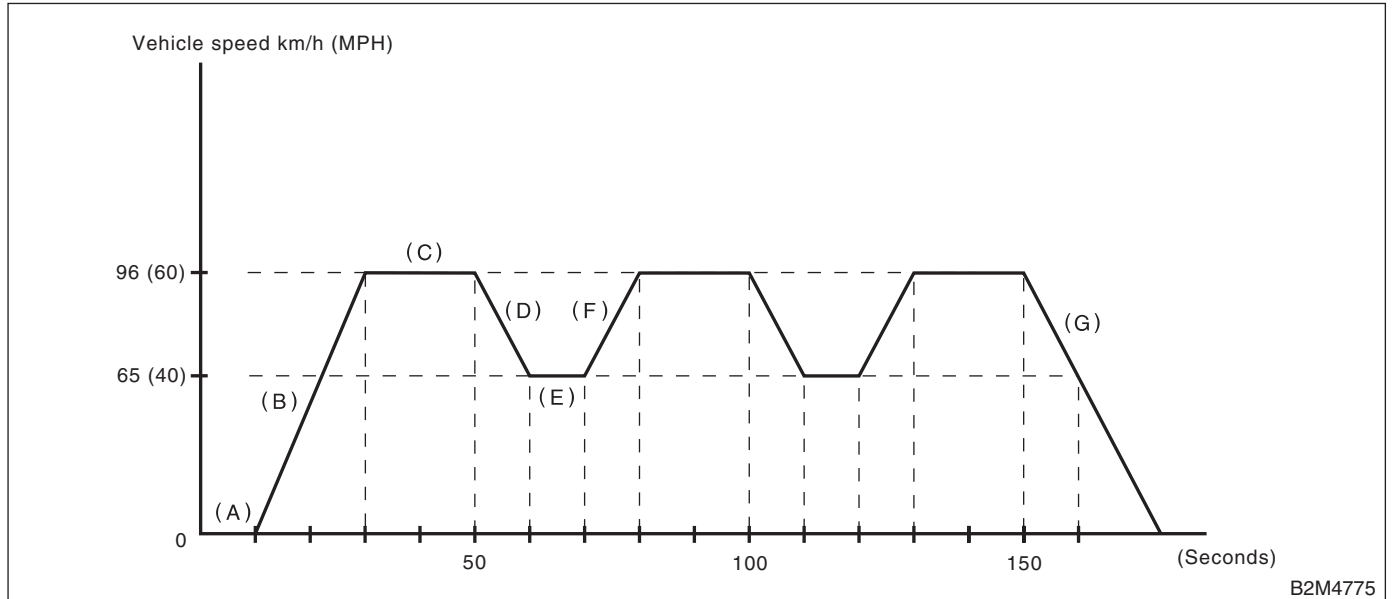
3. IDLE FOR 10 MINUTES

NOTE:

Before the diagnosis, drive the vehicle at 4 km/h (6 MPH) or more.

DTC No.	Item	Condition
*P0483	Cooling fan function problem	—
*P0506	Idle control system RPM lower than expected	—
*P0507	Idle control system RPM higher than expected	—

4. DRIVE ACCORDING TO THE FOLLOWING DRIVE PATTERN



- | | | |
|---|--|--|
| (A) Idle engine for 1 minute. | (D) Decelerate with fully closed throttle to 64 km/h (40 MPH). | (G) Stop vehicle with throttle fully closed. Stop vehicle with throttle fully closed. Stop vehicle with throttle fully closed. |
| (B) Accelerate to 97 km/h (60 MPH) within 20 seconds. | (E) Drive vehicle at 64 km/h (40 MPH) for 10 seconds. | |
| (C) Drive vehicle at 97 km/h (60 MPH) for 20 seconds. | (F) Accelerate to 97 km/h (60 MPH) within 10 seconds. | |

DTC No.	Item	Condition
*P0121	Throttle position sensor circuit range/performance problem (high input)	—
*P0139	Rear oxygen sensor circuit slow response	—
*P0301	Cylinder 1 misfire detected	—
*P0302	Cylinder 2 misfire detected	—
*P0303	Cylinder 3 misfire detected	—
*P0304	Cylinder 4 misfire detected	—
*P1142	Throttle position sensor circuit range/performance problem (low input)	—

14. Clear Memory Mode

A: OPERATION

1. SUBARU SELECT MONITOR (NORMAL MODE)

- 1) On the «Main Menu» display screen, select the {2. Each System Check} and press [YES] key.
- 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press [YES] key.
- 3) Press the [YES] key after displayed the information of engine type.
- 4) On the «Engine Diagnosis» display screen, select the {Clear Memory} and press [YES] key.
- 5) When the 'Done' and 'Turn Ignition Switch OFF' are shown on the display screen, turn the Subaru Select Monitor and ignition switch to OFF.

NOTE:

- After the memory has been cleared, the idle air control solenoid valve must be initialized. To do this, turn the ignition switch to ON. 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 [YES] key.
- 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press [YES] key.
- 3) Press the [YES] key after displayed the information of engine type.
- 4) On the «Engine Diagnosis» display screen, select the {OBD System} and press [YES] key.
- 5) On the «OBD Menu» display screen, select the {4. Diagnosis Code(s) Cleared} and press [YES] key.
- 6) When the 'Clear Diagnostic Code?' is shown on the display screen, press [YES] key.
- 7) Turn the Subaru Select Monitor and ignition switch to OFF.

NOTE:

- After the memory has been cleared, the idle air control solenoid valve must be initialized. To do this, turn the ignition switch to ON. 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 ON. Wait 3 seconds before starting the engine.

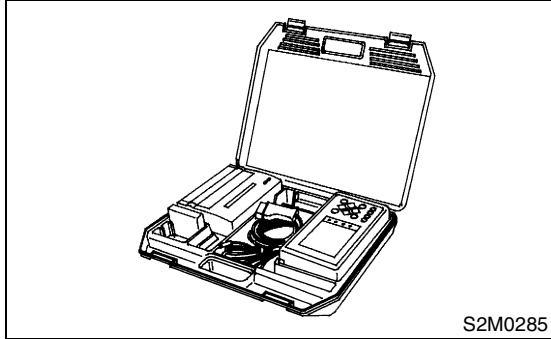
COMPULSORY VALVE OPERATION CHECK MODE

ENGINE (DIAGNOSTICS)

15. Compulsory Valve Operation Check Mode

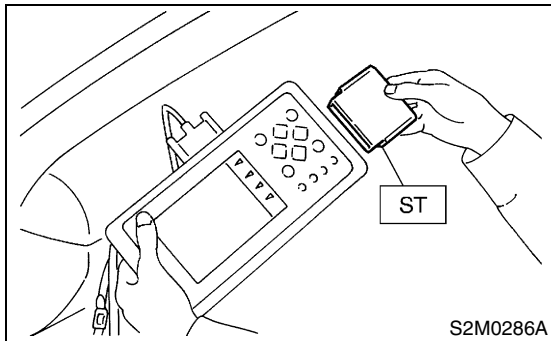
A: OPERATION

1) Prepare the Subaru Select Monitor kit. <Ref. to EN-9, PREPARATION TOOL, General Description.>

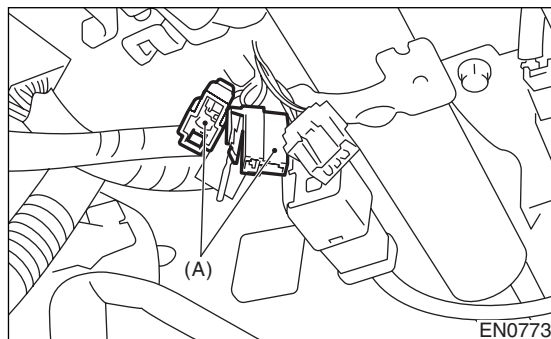


2) Connect the diagnosis cable to Subaru Select Monitor.

3) Insert the cartridge into Subaru Select Monitor. <Ref. to EN-9, PREPARATION TOOL, General Description.>

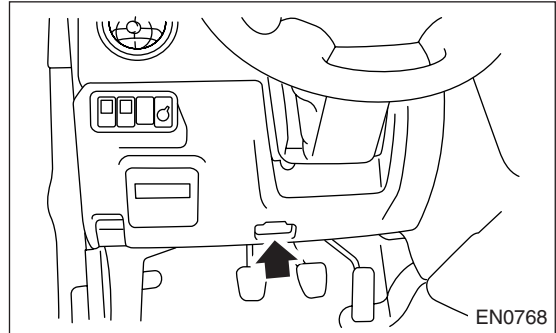


4) Connect the test mode connector (A) at the lower portion of instrument panel (on the driver's side).



5) Connect the Subaru Select Monitor to data link connector.

(1) Connect the Subaru Select Monitor to data link connector located in the lower portion of instrument panel (on the driver's side).

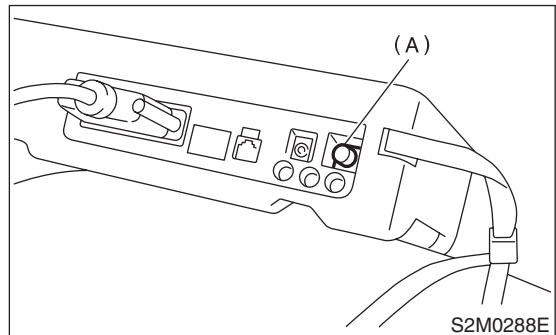


(2) Connect the diagnosis cable to data link connector.

CAUTION:

Do not connect the scan tools except for Subaru Select Monitor and OBD-II general scan tool.

6) Turn the ignition switch to ON (engine OFF) and Subaru Select Monitor switch to ON.



(A) Power switch

7) On the «Main Menu» display screen, select the {2. Each System Check} and press [YES] key.

8) On the «System Selection Menu» display screen, select the {Engine Control System} and press [YES] key.

9) Press the [YES] key after displayed the information of engine type.

10) On the «Engine Diagnosis» display screen, select the {System Operation Check Mode} and press [YES] key.

11) On the «System Operation Check Mode» display screen, select the {Actuator ON/OFF Operation} and press [YES] key.

12) Select the desired compulsory actuator on the «Actuator ON/OFF Operation» display screen and press [YES] key.

COMPULSORY VALVE OPERATION CHECK MODE

ENGINE (DIAGNOSTICS)

13) Pressing the [NO] key completes the compulsory operation check mode. The display will then return to the «Actuator ON/OFF Operation» screen.

- A list of the support data is shown in the following table.

Contents	Display
Compulsory fuel pump relay operation check	Fuel Pump Relay
Compulsory radiator fan relay operation check	Radiator Fan Relay
Compulsory air conditioning relay operation check	A/C Compressor Relay
Compulsory purge control solenoid valve operation check	CPC Solenoid Valve
Compulsory 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)

16.Engine Malfunction Indicator Lamp (MIL)

A: PROCEDURE

1. Activation of check engine malfunction indicator lamp (MIL). <Ref. to EN-53, ACTIVATION OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL), Engine Malfunction Indicator Lamp (MIL).>
↓
2. Check that engine malfunction indicator lamp (MIL) does not come on. <Ref. to EN-54, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT COME ON., Engine Malfunction Indicator Lamp (MIL).>
↓
3. Check that engine malfunction indicator lamp (MIL) does not go off. <Ref. to EN-56, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT GO OFF., Engine Malfunction Indicator Lamp (MIL).>
↓
4. Check that engine malfunction indicator lamp (MIL) does not blink at a cycle of 3 Hz. <Ref. to EN-58, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT BLINK AT A CYCLE OF 3 HZ., Engine Malfunction Indicator Lamp (MIL).>
↓
5. Check that engine malfunction indicator lamp (MIL) remains blinking at a cycle of 3 Hz. <Ref. to EN-60, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) REMAINS BLINKING AT A CYCLE OF 3 HZ., Engine Malfunction Indicator Lamp (MIL).>

ENGINE MALFUNCTION INDICATOR LAMP (MIL)

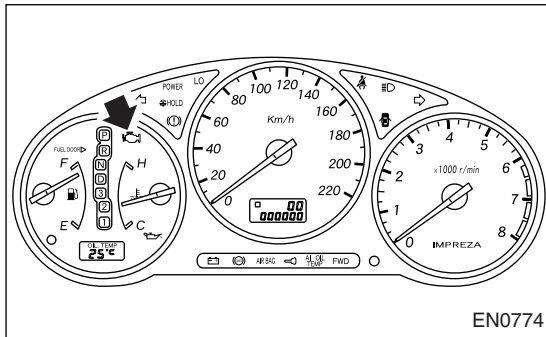
ENGINE (DIAGNOSTICS)

B: ACTIVATION OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL)

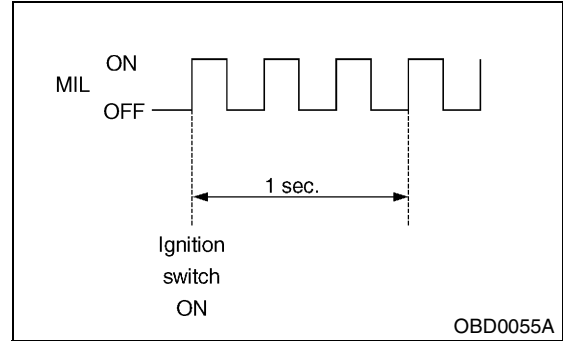
1) When the ignition switch is turned to ON (engine OFF), the CHECK ENGINE malfunction indicator lamp (MIL) in the combination meter illuminates.

NOTE:

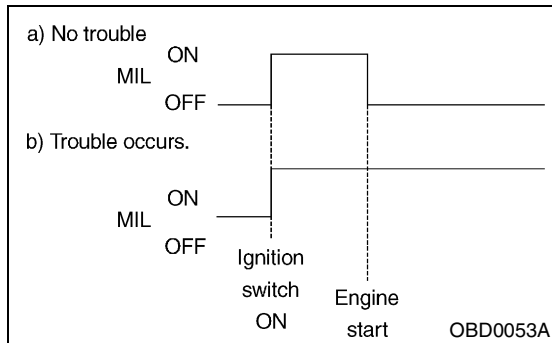
If the MIL does not illuminate, perform diagnostics of the CHECK ENGINE light circuit or the combination meter circuit. <Ref. to EN-54, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT COME ON., Engine Malfunction Indicator Lamp (MIL).>



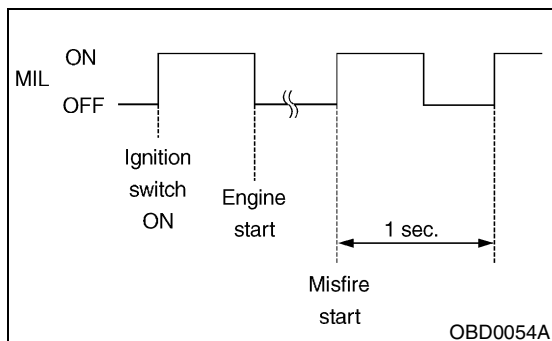
4) When the ignition switch is turned to ON (engine OFF) or to START with the test mode connector connected, the MIL blinks at a cycle of 3 Hz.



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.



ENGINE MALFUNCTION INDICATOR LAMP (MIL)

ENGINE (DIAGNOSTICS)

C: CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT COME ON.

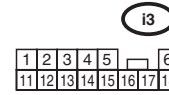
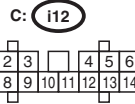
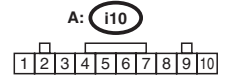
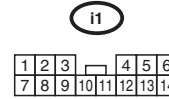
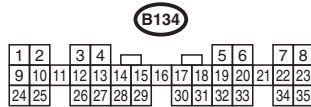
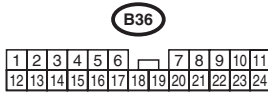
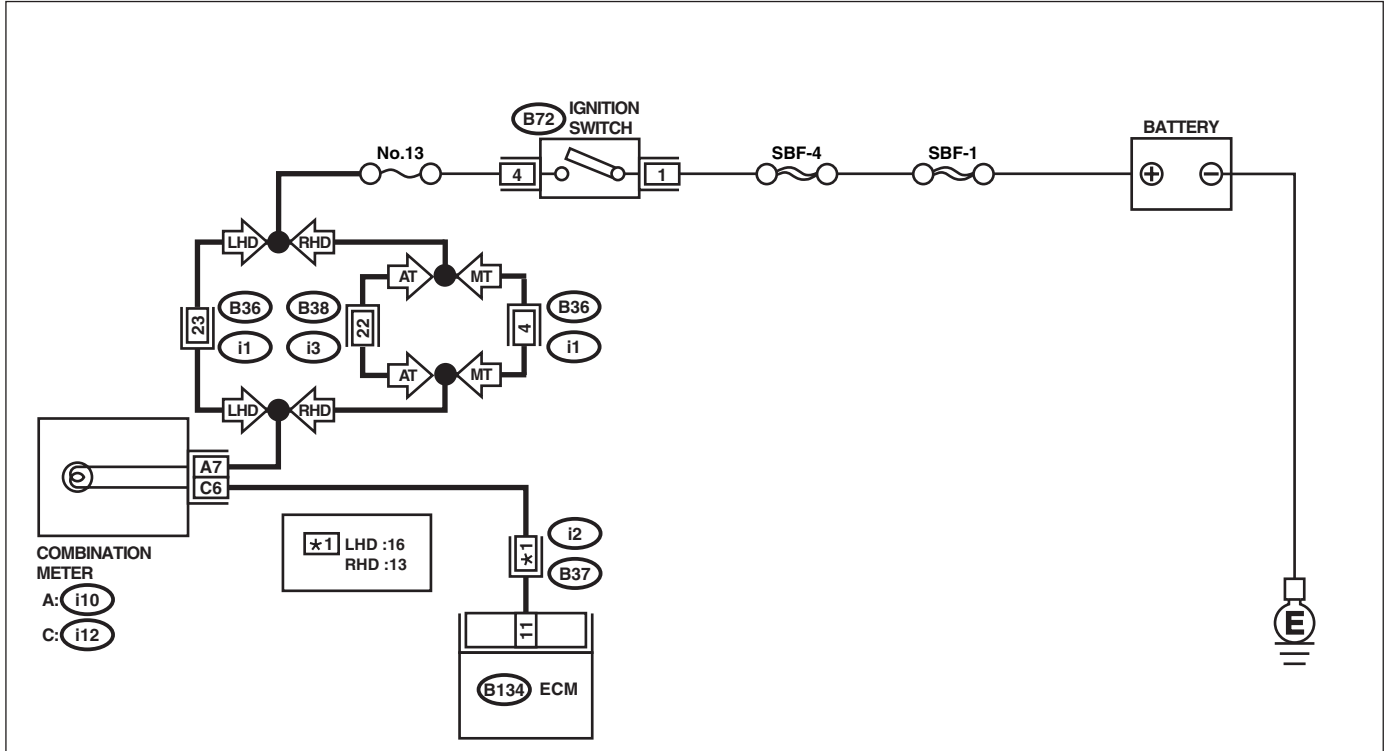
• DIAGNOSIS:

- The CHECK ENGINE malfunction indicator lamp (MIL) circuit is open or shorted.

• TROUBLE SYMPTOM:

- When the ignition switch is turned to ON (engine OFF), MIL does not come on.

• WIRING DIAGRAM:



EN1395

Step	Check	Yes	No
1 CHECK OUTPUT SIGNAL FROM ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector and chassis ground. Connector & terminal (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 the 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 the ECM connector correctly connected?	Replace the ECM. <Ref. to FU-51, Engine Control Module.>	Repair the connection of ECM connector.
4 CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Remove the combination meter. <Ref. to IDI-15, Combination Meter Assembly.> 3) Disconnect the connector from ECM and combination meter. 4) Measure the resistance of harness between ECM and combination meter connector. Connector & terminal (B134) No. 11 — (i12) No. 6:	Is the resistance less than 1 Ω ?	Go to step 5.	Repair the harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between ECM and combination meter connector • Poor contact in coupling connector (i2)
5 CHECK POOR CONTACT. Check poor contact in combination meter connector.	Is there poor contact in combination meter connector?	Repair the poor contact in combination meter connector.	Go to step 6.
6 CHECK HARNESS BETWEEN COMBINATION METER AND IGNITION SWITCH CONNECTOR. 1) Turn the ignition switch to ON. 2) Measure the voltage between combination meter connector and chassis ground. Connector & terminal (i10) No. 7 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 7.	Check the following and repair if necessary. NOTE: <ul style="list-style-type: none"> • Broken down ignition relay • Blown out fuse (No. 5) • If replaced fuse (No. 5) blows easily, check the harness for short circuit of harness between fuse (No. 5) and ignition relay connector. • Open or short circuit in harness between fuse (No. 5) and battery terminal • Open circuit in harness between fuse (No. 5) and ignition relay connector • Poor contact in ignition relay connector • Poor contact in ignition switch connector
7 CHECK LAMP BULB. Remove the engine malfunction indicator lamp bulb.	Is the lamp bulb condition OK?	Repair the combination meter connector.	Replace the lamp bulb.

ENGINE MALFUNCTION INDICATOR LAMP (MIL)

ENGINE (DIAGNOSTICS)

D: CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT GO OFF.

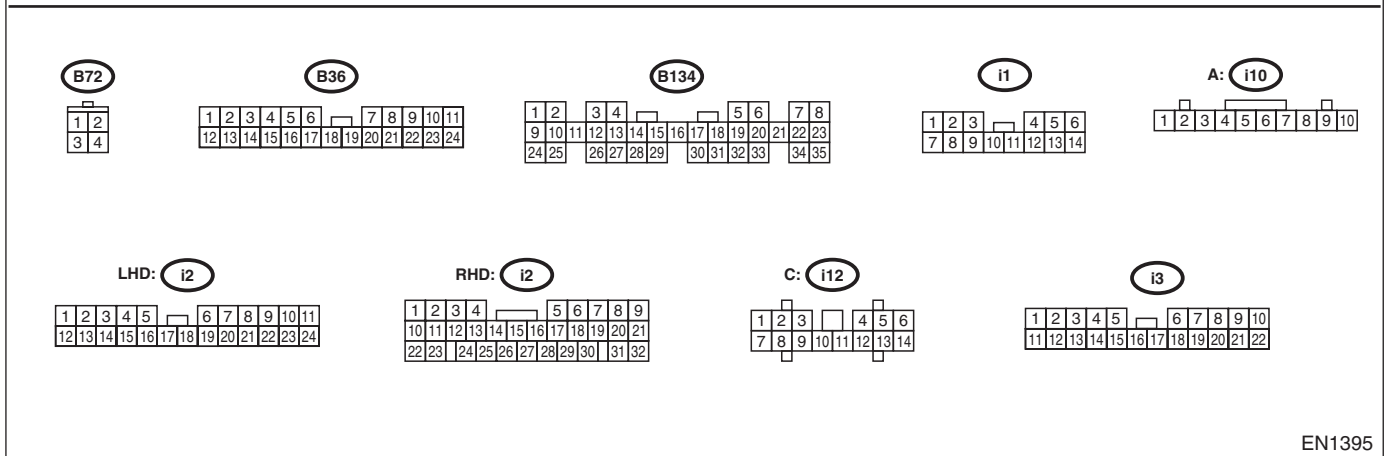
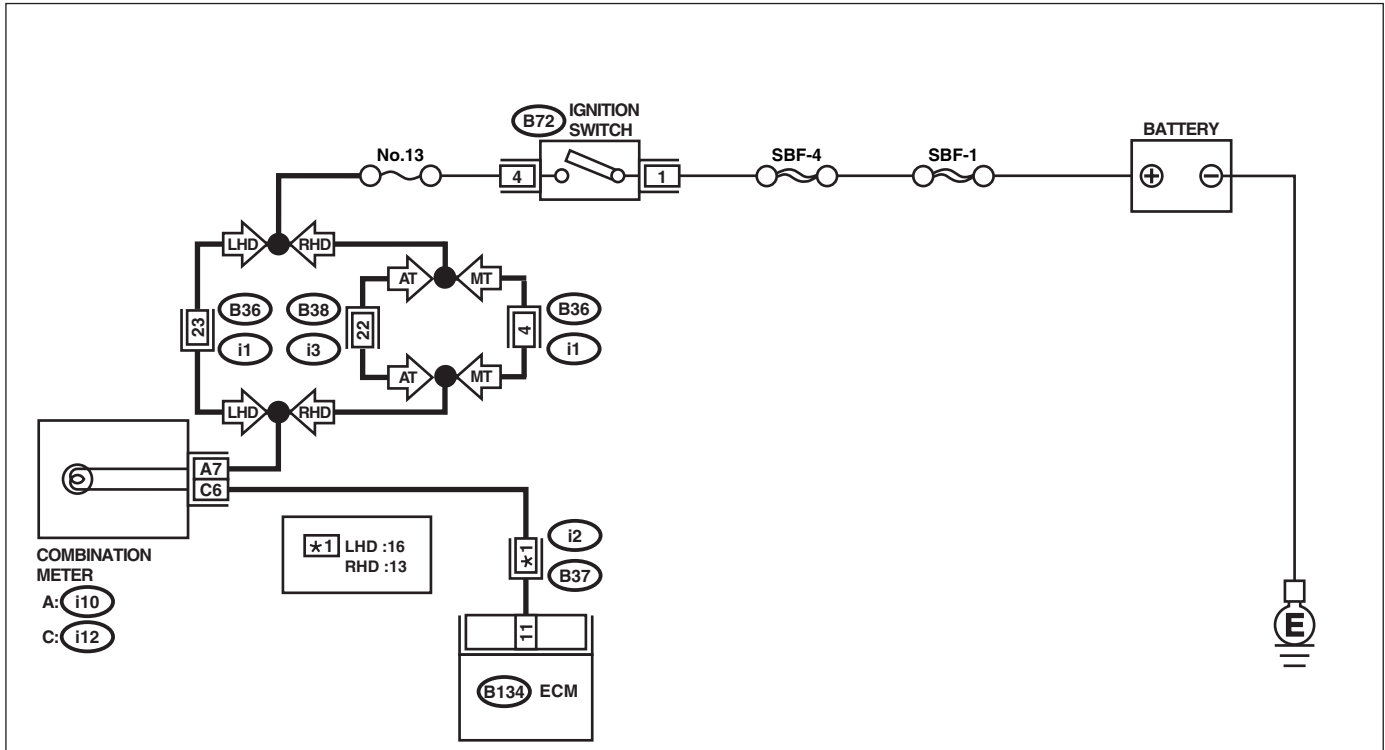
• DIAGNOSIS:

- The CHECK ENGINE malfunction indicator lamp (MIL) circuit is shorted.

• TROUBLE SYMPTOM:

- Although MIL comes on when engine runs, but trouble code is not shown on Subaru Select Monitor or OBD-II general scan tool display.

• WIRING DIAGRAM:



EN1395

Step	Check	Yes	No
1 CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Turn the ignition switch to ON.	Does the MIL come on?	Repair the short circuit in harness between combination meter and ECM connector.	Replace the ECM. <Ref. to FU-51, Engine Control Module.>

ENGINE MALFUNCTION INDICATOR LAMP (MIL)

ENGINE (DIAGNOSTICS)

ENGINE MALFUNCTION INDICATOR LAMP (MIL)

ENGINE (DIAGNOSTICS)

E: CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT BLINK AT A CYCLE OF 3 HZ.

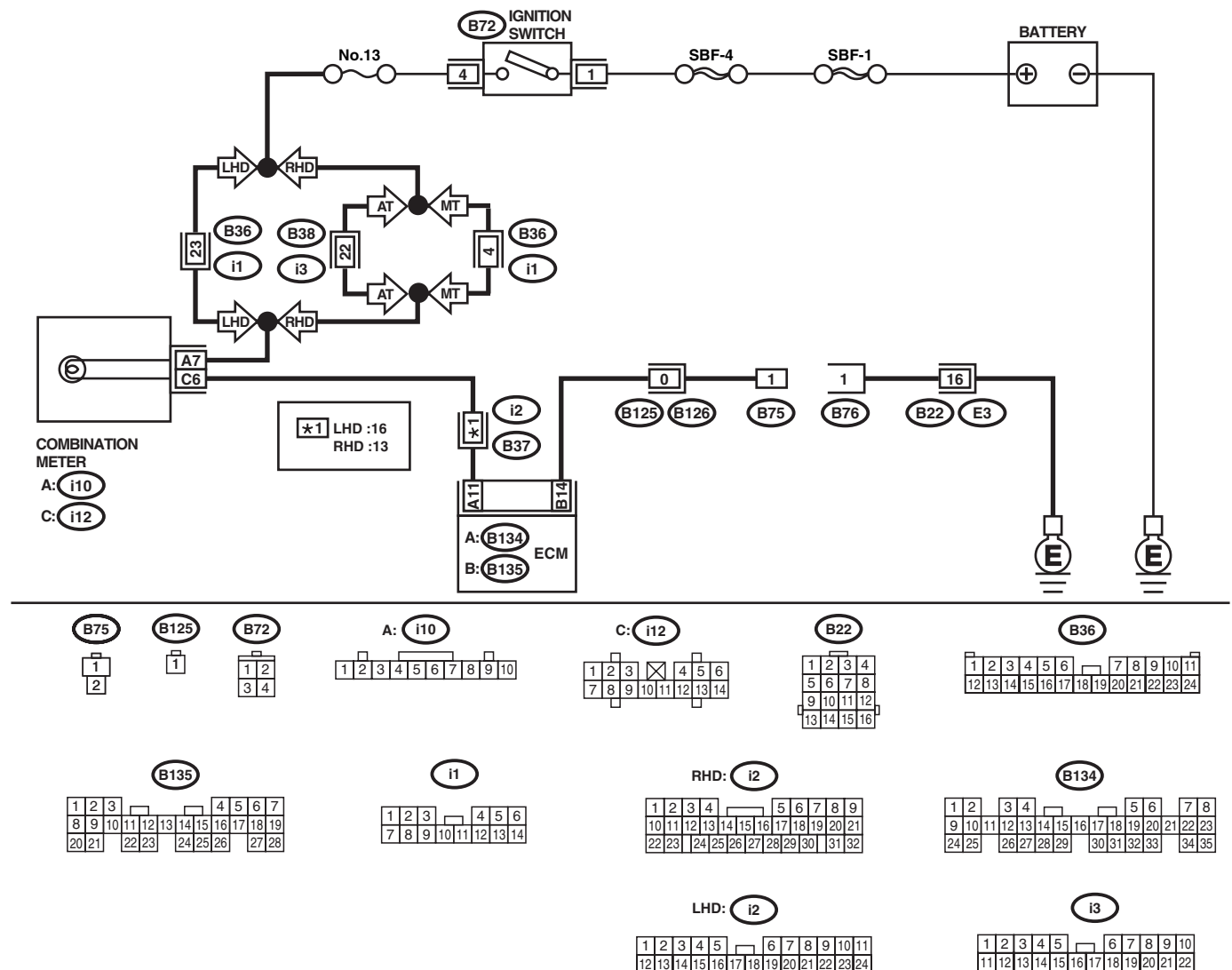
• DIAGNOSIS:

- The CHECK ENGINE malfunction indicator lamp (MIL) circuit is open or shorted.
- Test mode connector circuit is open.

• TROUBLE SYMPTOM:

- During inspection mode, MIL does not blink at a cycle of 3 Hz.

• WIRING DIAGRAM:



EN1396

ENGINE MALFUNCTION INDICATOR LAMP (MIL)

ENGINE (DIAGNOSTICS)

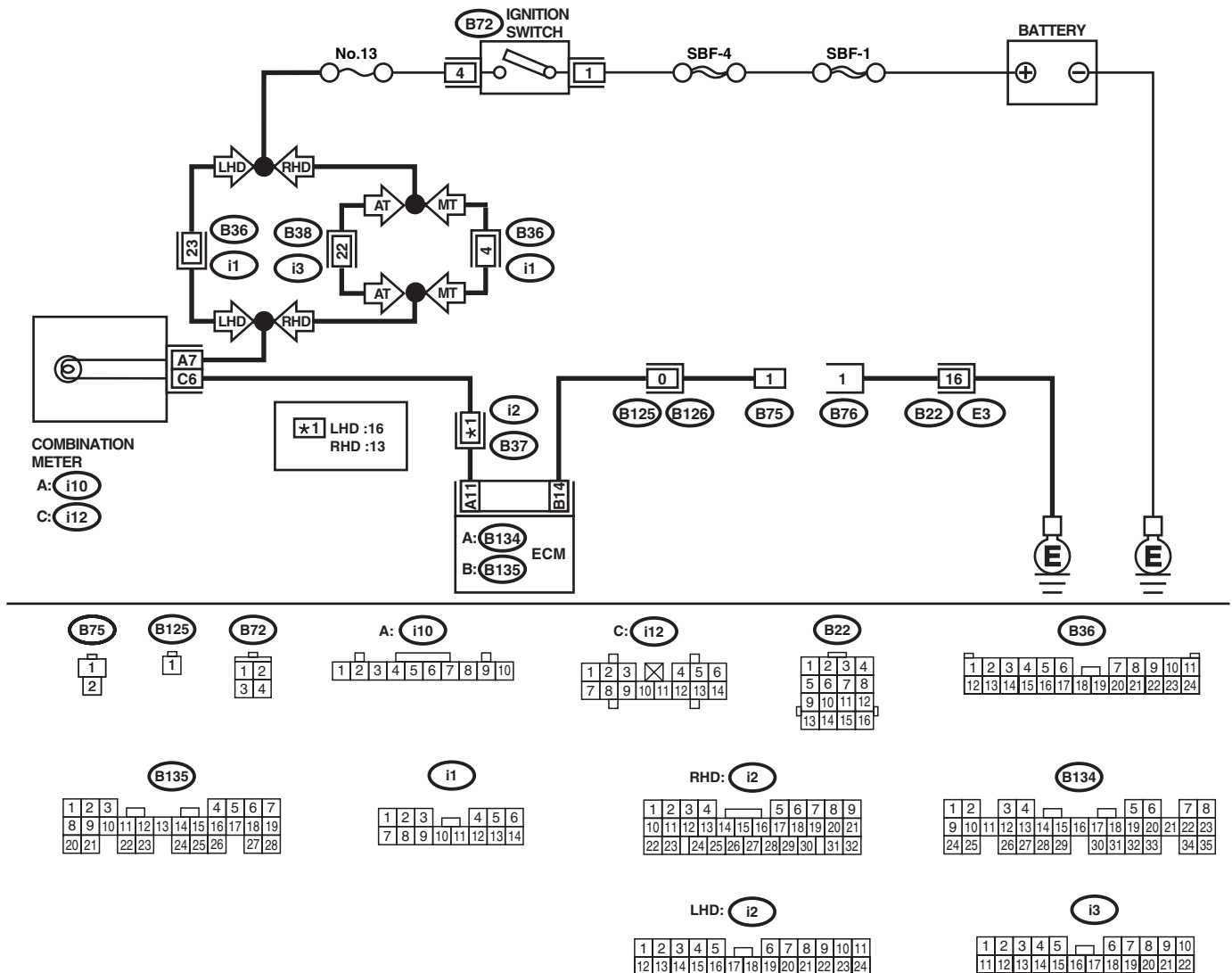
Step	Check	Yes	No
1 CHECK STATUS OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL). 1) Turn the ignition switch to OFF. 2) Disconnect the test mode connector. 3) Turn the ignition switch to ON. (engine OFF)	Does the MIL come on?	Go to step 2.	Repair the MIL circuit. <Ref. to EN-54, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT COME ON., Engine Malfunction Indicator Lamp (MIL).>
2 CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Turn the ignition switch to ON.	Does the MIL come on?	Repair the ground short circuit in harness between combination meter and ECM connector.	Go to step 3.
3 CHECK HARNESS BETWEEN TEST MODE CONNECTOR AND CHASSIS GROUND. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between test mode connector and chassis ground. <i>Connector & terminal</i> <i>(B76) No. 1 — Chassis ground:</i>	Is the resistance less than 1 Ω ?	Go to step 4.	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between test mode connector and chassis ground
4 CHECK POOR CONTACT. Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Go to step 5.
5 CHECK HARNESS BETWEEN ECM AND TEST MODE CONNECTOR. 1) Connect the test mode connector. 2) Measure the resistance of harness between ECM and chassis ground. <i>Connector & terminal</i> <i>(B135) No. 14 — Chassis ground:</i>	Is the resistance less than 1 Ω ?	Go to step 6.	Repair the open circuit in harness between ECM and test mode connector.
6 CHECK POOR CONTACT. Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU-51, 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.
- **WIRING DIAGRAM:**



EN1396

ENGINE MALFUNCTION INDICATOR LAMP (MIL)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK TEST MODE CONNECTOR. 1)Disconnect the test mode connector. 2)Turn the ignition switch to ON.	Does the 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 the ignition switch to OFF. 2)Disconnect the connector from ECM. 3)Measure the resistance of harness between ECM connector and chassis ground. Connector & terminal (B135) No. 14 — Chassis ground:	Is the resistance less than 5 Ω ?	Repair the short circuit in harness between ECM and test mode connector.	Replace the ECM. <Ref. to FU-51, Engine Control Module.>

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

17. Diagnostics for Engine Starting Failure

A: PROCEDURE

1. Inspection of starter motor circuit. <Ref. to EN-64, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
2. Inspection of ECM power supply and ground line. <Ref. to EN-68, CONTROL MODULE POWER SUPPLY AND GROUND LINE, Diagnostics for Engine Starting Failure.>
↓
3. Inspection of ignition control system. <Ref. to EN-72, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>
↓
4. Inspection of fuel pump circuit. <Ref. to EN-76, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
5. Inspection of fuel injector circuit. <Ref. to EN-80, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

DIAGNOSTICS FOR ENGINE STARTING FAILURE

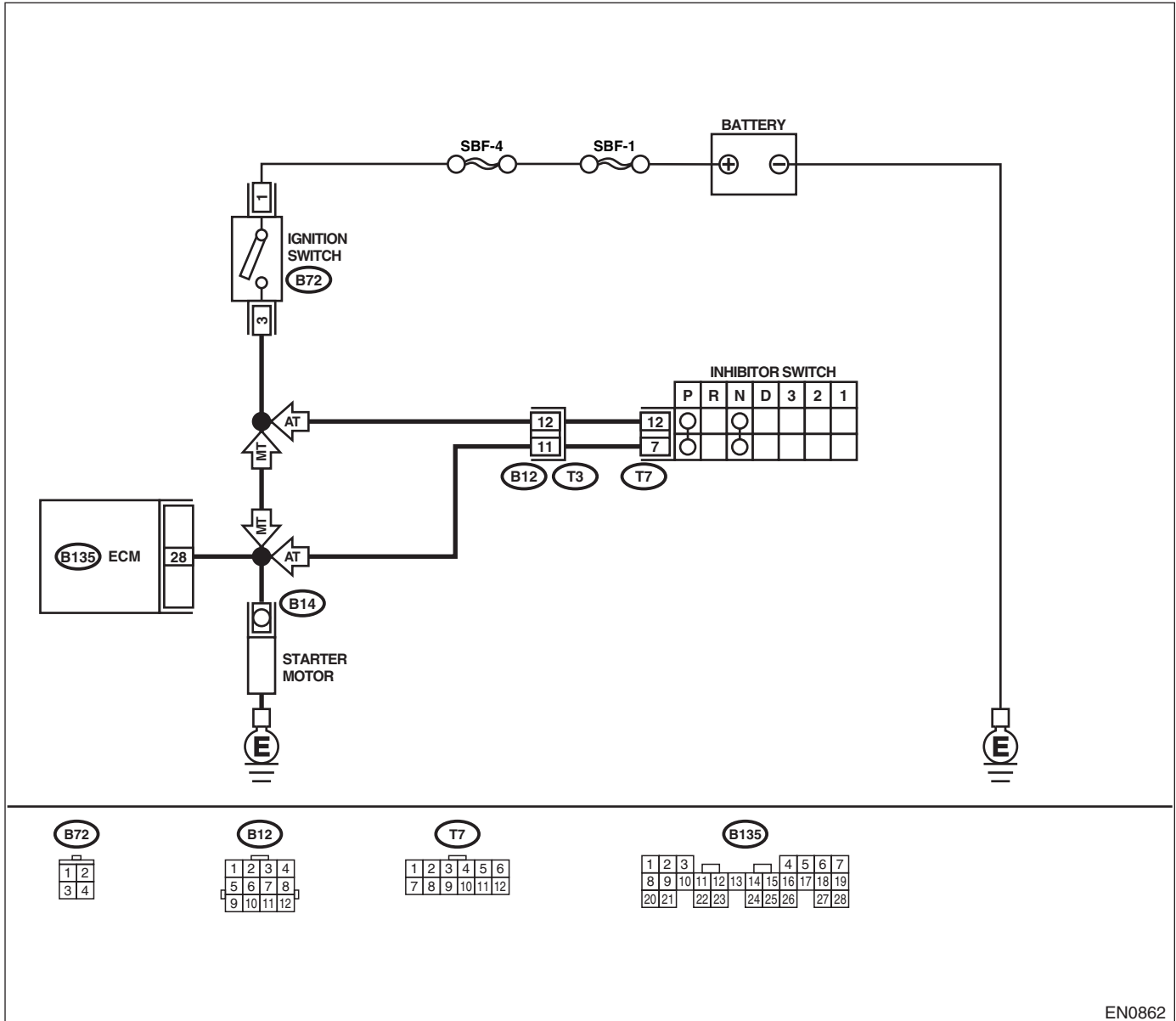
ENGINE (DIAGNOSTICS)

B: STARTER MOTOR CIRCUIT

CAUTION:

After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN-49, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN-42, Inspection Mode.> .

• WIRING DIAGRAM:



EN0862

Step	Check	Yes	No
1	CHECK OPERATION OF STARTER MOTOR. Does the starter motor operate when the switch starts?	Go to step 2.	Go to step 3.
2	CHECK DIAGNOSTIC TROUBLE CODE (DTC). <Ref. to EN-41, OPERATION, Read Diagnostic Trouble Code (DTC).>	Record the DTC. Repair the trouble case. <Ref. to EN-90, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Go to step 3.

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
3 CHECK INPUT SIGNAL FOR STARTER MOTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from starter motor. 3) Turn the ignition switch to START. 4) Measure the power supply voltage between starter motor connector terminal and engine ground. <i>Connector & terminal</i> <i>(B14) No. 1 (+) — Engine ground (-):</i> 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 the ignition switch to OFF. 2) Disconnect the terminal from starter motor. 3) Measure the resistance of ground cable between ground cable terminal and engine ground.	Is the resistance less than 5 Ω ?	Check the starter motor. <Ref. to SC-5, Starter.>	Repair the open circuit of ground cable.
5 CHECK HARNESS BETWEEN ECM AND STARTER MOTOR CIRCUIT. 1) Turn the ignition switch to OFF. 2) Measure the resistance between starter motor and ECM. <i>Connector & terminal</i> <i>(B14) No. 1 — Engine ground:</i>	Is the resistance less than 1 Ω ?	Repair the ground short circuit.	Go to step 6.
6 CHECK HARNESS BETWEEN ECM AND STARTER MOTOR CIRCUIT. 1) Turn the ignition switch to START. 2) Measure the resistance of fuse. <i>Connector & terminal</i> <i>(B14) No. 1 — Engine ground:</i>	Is the resistance less than 1 Ω ?	Go to step 7.	Repair the ground short circuit.
7 CHECK HARNESS BETWEEN BATTERY AND IGNITION SWITCH CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ignition switch. 3) Measure the power supply voltage between ignition switch connector and chassis ground. <i>Connector & terminal</i> <i>(B72) No. 1 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Go to step 8.	Repair the open circuit in harness between ignition switch and battery.
8 CHECK HARNESS BETWEEN BATTERY AND IGNITION SWITCH CONNECTOR. 1) Connect the connector to ignition switch. 2) Turn the ignition switch to START. 3) Measure the voltage between ignition switch and chassis ground. <i>Connector & terminal</i> <i>(B72) No. 3 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Go to step 9.	Replace the ignition switch.
9 CHECK TRANSMISSION TYPE.	Is the vehicle AT?	Go to step 10.	Repair the open circuit between ignition switch and starter motor circuit.

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
10 CHECK INHIBITOR SWITCH CIRCUIT. 1) Turn the ignition switch to OFF. 2) Place the selector lever in the "P" or "N" position. 3) Separate the transmission harness connector. 4) Measure the resistance between transmission harness connector receptacle's terminals. <i>Connector & terminal</i> <i>(T3) No. 11 — No. 12:</i>	Is the resistance less than 1 Ω ?	Repair the open circuit in harness between starter motor and ignition switch connector.	Go to step 11.
11 CHECK TRANSMISSION HARNESS. 1) Disconnect the connector from inhibitor switch. 2) Measure the resistance of harness between transmission harness and inhibitor switch connector. <i>Connector & terminal</i> <i>(T3) No. 11 — (T7) No. 7:</i>	Is the resistance less than 1 Ω ?	Go to step 12.	Repair the 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 the poor contact in inhibitor switch connector.	Replace the inhibitor switch.

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

DIAGNOSTICS FOR ENGINE STARTING FAILURE

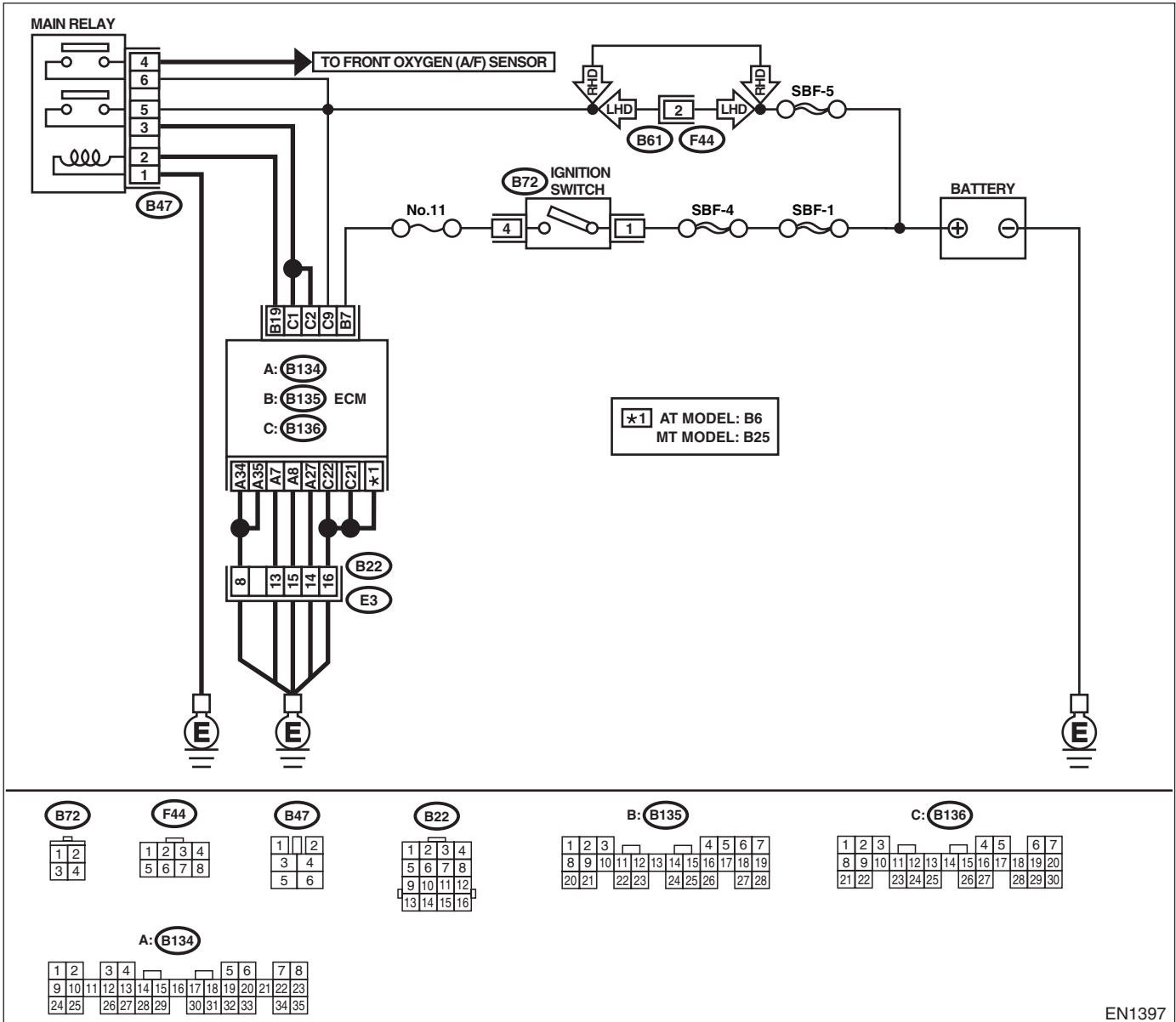
ENGINE (DIAGNOSTICS)

C: CONTROL MODULE POWER SUPPLY AND GROUND LINE

CAUTION:

After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN-49, Clear Memory Mode.> and INSPECTION MODE. <Ref. to EN-42, Inspection Mode.>

• WIRING DIAGRAM:



EN1397

Step	Check	Yes	No
1 CHECK MAIN RELAY. 1) Turn the ignition switch to OFF. 2) Remove the main relay. 3) Connect the battery to main relay terminals No. 1 and No. 2. 4) Measure the resistance between main relay terminals. Terminals No. 3 — No. 5: No. 4 — No. 6:	Is the resistance less than 10 Ω?	Go to step 2.	Replace the main relay.

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>2 CHECK GROUND CIRCUIT OF ECM. 1) Disconnect the connector from ECM. 2) Measure the 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> <i>(B135) No. 6 — Chassis ground: (AT vehicle)</i></p>	Is the resistance less than 5 Ω ?	Go to step 3.	Repair the open circuit in harness between ECM connector and engine grounding terminal.
<p>3 CHECK INPUT VOLTAGE OF ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal <i>(B136) No. 9 (+) — Chassis ground (-):</i></p>	Is the voltage more than 10 V?	Go to step 4.	Repair the open or ground short circuit of power supply circuit.
<p>4 CHECK INPUT VOLTAGE OF ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector and chassis ground. Connector & terminal <i>(B135) No. 7 (+) — Chassis ground (-):</i></p>	Is the voltage more than 10 V?	Go to step 5.	Repair the open or ground short circuit of power supply circuit.
<p>5 CHECK HARNESS BETWEEN ECM AND MAIN RELAY CONNECTOR. 1) Turn the ignition switch to OFF. 2) Measure the resistance between ECM and chassis ground. Connector & terminal <i>(B135) No. 19 — Chassis ground:</i></p>	Is the resistance more than 1 M Ω ?	Go to step 6.	Repair the ground short circuit in harness between ECM connector and main relay connector, then replace the ECM.
<p>6 CHECK OUTPUT VOLTAGE FROM ECM. 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM connector and chassis ground. Connector & terminal <i>(B135) No. 19 (+) — Chassis ground (-):</i></p>	Is the voltage more than 10 V?	Go to step 7.	Replace the ECM.
<p>7 CHECK INPUT VOLTAGE OF MAIN RELAY. Check the voltage between main relay connector and chassis ground. Connector & terminal <i>(B47) No. 2 (+) — Chassis ground (-):</i></p>	Is the voltage more than 10 V?	Go to step 8.	Repair the open circuit in harness between ECM connector and main relay connector.
<p>8 CHECK GROUND CIRCUIT OF MAIN RELAY. 1) Turn the ignition switch to OFF. 2) Measure the resistance between main relay connector and chassis ground. Connector & terminal <i>(B47) No. 1 — Chassis ground:</i></p>	Is the resistance less than 5 Ω ?	Go to step 9.	Repair the open circuit between main relay and chassis ground.
<p>9 CHECK INPUT VOLTAGE OF MAIN RELAY. Measure the voltage between main relay connector and chassis ground. Connector & terminal <i>(B47) No. 5 (+) — Chassis ground (-):</i> <i>(B47) No. 6 (+) — Chassis ground (-):</i></p>	Is the voltage more than 10 V?	Go to step 10.	Repair the 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 the main relay connector. 2)Turn the ignition switch to ON. 3)Measure the 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 the ignition control system. <Ref. to EN-72, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>	Repair the open or ground short circuit in harness between ECM connector and main relay connector.

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

DIAGNOSTICS FOR ENGINE STARTING FAILURE

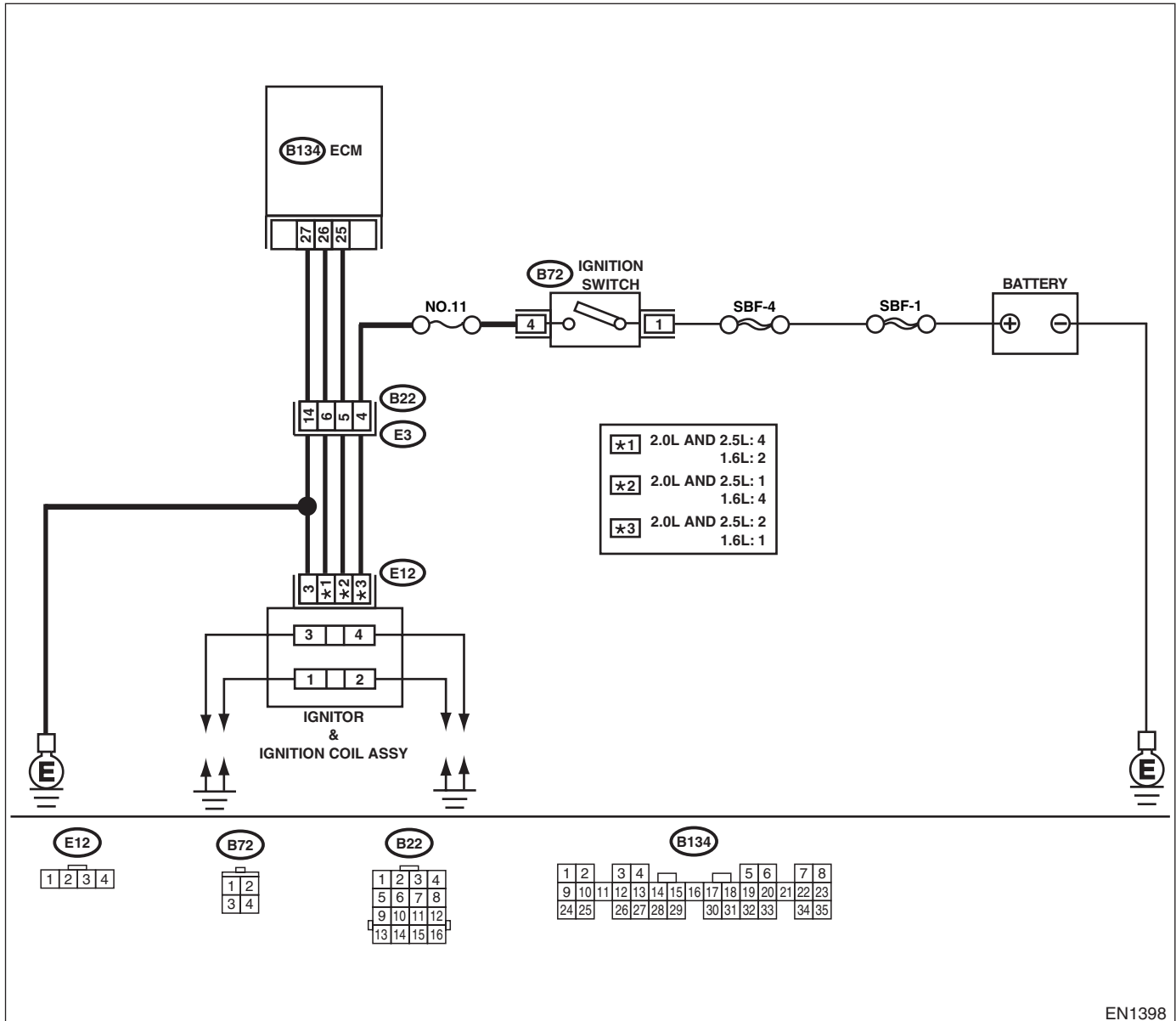
ENGINE (DIAGNOSTICS)

D: IGNITION CONTROL SYSTEM

CAUTION:

After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN-49, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN-42, Inspection Mode.> .

• WIRING DIAGRAM:



EN1398

Step	Check	Yes	No
1 CHECK IGNITION SYSTEM FOR SPARKS. 1) Remove the 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 the spark plug's thread portion on engine. 4) While opening the throttle valve fully, crank engine to check that spark occurs at each cylinder.	Does spark occur at each cylinder?	Check the fuel pump system. <Ref. to EN-76, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>	Go to step 2.

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>2 CHECK POWER SUPPLY CIRCUIT FOR IGNITION COIL & IGNITOR ASSEMBLY. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ignition coil & ignitor assembly. 3) Turn the ignition switch to ON. 4) Measure the power supply voltage between ignition coil & ignitor assembly connector and engine ground.</p> <p>Connector & terminal</p> <ul style="list-style-type: none"> • 2.0 L and 2.5 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 the harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between ignition coil & ignitor assembly, and ignition switch connector • Poor contact in coupling connectors (B22)
<p>3 CHECK HARNESS OF IGNITION COIL & IGNITOR ASSEMBLY GROUND CIRCUIT. 1) Turn the ignition switch to OFF. 2) Measure the resistance between ignition coil & ignitor assembly connector and engine ground.</p> <p>Connector & terminal (E12) No. 3 — Engine ground:</p>	Is the resistance between less than 5 Ω?	Go to step 4.	Repair the harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between ignition coil & ignitor assembly connector and engine grounding terminal
<p>4 CHECK IGNITION COIL & IGNITOR ASSEMBLY. 1) Remove the spark plug cords. 2) Measure the resistance between spark plug cord contact portions to check secondary coil.</p> <p>Terminals</p> <ul style="list-style-type: none"> • 2.0 L and 2.5 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 the ignition coil & ignitor assembly. <Ref. to IG-8, Ignition Coil and Ignitor Assembly.>
<p>5 CHECK IGNITION COIL & IGNITOR ASSEMBLY. Measure the resistance between spark plug cord contact portions to check secondary coil.</p> <p>Terminals</p> <ul style="list-style-type: none"> • 2.0 L and 2.5 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 the ignition coil & ignitor assembly. <Ref. to IG-8, Ignition Coil and Ignitor Assembly.>
<p>6 CHECK INPUT SIGNAL FOR IGNITION COIL & IGNITOR ASSEMBLY. 1) Connect the connector to ignition coil & ignitor assembly. 2) Check if the voltage varies synchronously with engine speed when cranking, while monitoring voltage between ignition coil & ignitor assembly connector and engine ground.</p> <p>Connector & terminal</p> <ul style="list-style-type: none"> • 2.0 L and 2.5 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 the ignition coil & ignitor assembly. <Ref. to IG-8, Ignition Coil and Ignitor Assembly.>

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>7 CHECK INPUT SIGNAL FOR IGNITION COIL & IGNITOR ASSEMBLY. Check if the voltage varies synchronously with engine speed when cranking, while monitoring voltage between ignition coil & ignitor assembly connector and engine ground.</p> <p>Connector & terminal</p> <ul style="list-style-type: none"> • 2.0 L and 2.5 L (E12) No. 4 (+) — Engine ground (-): • 1.6 L (E12) No. 2 (+) — Engine ground (-): 	Is the voltage more than 10 V?	Go to step 8.	Replace the ignition coil & ignitor assembly. <Ref. to IG-8, Ignition Coil and Ignitor Assembly.>
<p>8 CHECK HARNESS BETWEEN ECM AND IGNITION COIL & IGNITOR ASSEMBLY CONNECTOR.</p> <ol style="list-style-type: none"> 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from ignition coil & ignitor assembly. 4) Measure the resistance of harness between ECM and ignition coil & ignitor assembly connector. <p>Connector & terminal</p> <ul style="list-style-type: none"> • 2.0 L and 2.5 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.	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Open circuit in harness between ECM and ignition coil & ignitor assembly connector • Poor contact in coupling connector (B22)
<p>9 CHECK HARNESS BETWEEN ECM AND IGNITION COIL & IGNITOR ASSEMBLY CONNECTOR.</p> <p>Measure the resistance of harness between ECM and ignition coil & ignitor assembly connector.</p> <p>Connector & terminal</p> <ul style="list-style-type: none"> • 2.0 L and 2.5 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.	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Open circuit in harness between ECM and ignition coil & ignitor assembly connector • Poor contact in coupling connector (B22)
<p>10 CHECK HARNESS BETWEEN ECM AND IGNITION COIL & IGNITOR ASSEMBLY CONNECTOR.</p> <p>Measure the resistance of harness between ECM and engine ground.</p> <p>Connector & terminal: (B134) No. 25 — Engine ground:</p>	Is the resistance more than 1 $M\Omega$?	Go to step 11.	Repair the ground short circuit in harness between ECM and ignition coil & ignitor assembly connector.
<p>11 CHECK HARNESS BETWEEN ECM AND IGNITION COIL & IGNITOR ASSEMBLY CONNECTOR.</p> <p>Measure the resistance of harness between ECM and engine ground.</p> <p>Connector & terminal (B134) No. 26 — Engine ground:</p>	Is the resistance more than 1 $M\Omega$?	Go to step 12.	Repair the ground short circuit in harness between ECM and ignition coil & ignitor assembly connector.

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
12 CHECK POOR CONTACT. Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Check the fuel pump circuit. <Ref. to EN-76, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>

DIAGNOSTICS FOR ENGINE STARTING FAILURE

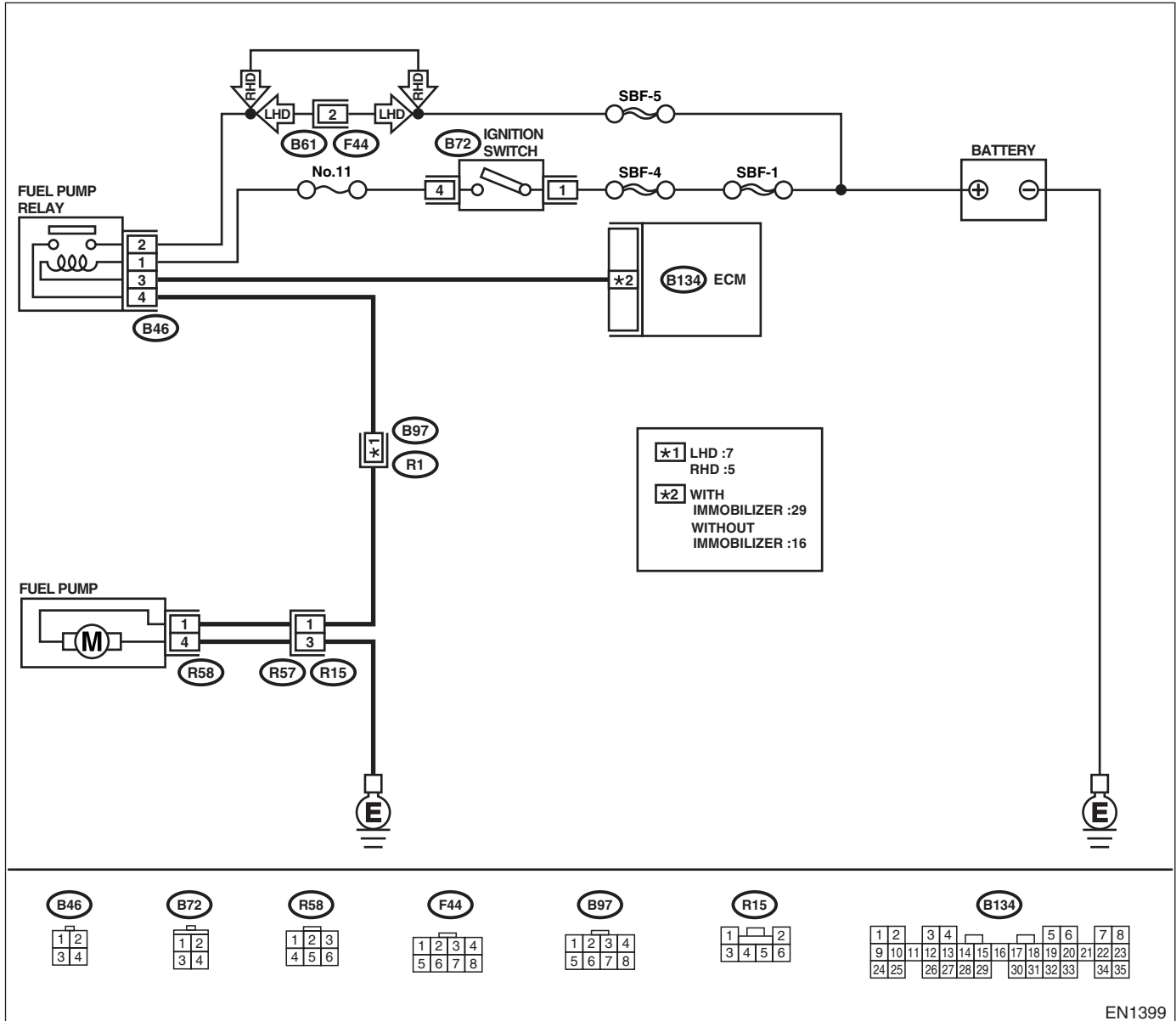
ENGINE (DIAGNOSTICS)

E: FUEL PUMP CIRCUIT

CAUTION:

After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN-49, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN-42, Inspection Mode.> .

• WIRING DIAGRAM:



EN1399

Step	Check	Yes	No
1	<p>CHECK OPERATING SOUND OF FUEL PUMP.</p> <p>Make sure that the fuel pump is in operation for 2 seconds when turning ignition switch to ON.</p> <p>NOTE: Fuel pump operation can also be executed using the Subaru Select Monitor (Function mode: FD01). For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN-50, Compulsory Valve Operation Check Mode.></p>	<p>Does the fuel pump produce operating sound?</p> <p>Check the fuel injector circuit. <Ref. to EN-80, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.></p>	<p>Go to step 2.</p>

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>2 CHECK GROUND CIRCUIT OF FUEL PUMP. 1) Turn the ignition switch to OFF. 2) Remove the fuel pump access hole lid located on the right rear of trunk compartment floor (Sedan) or luggage compartment floor (Wagon). 3) Disconnect the connector from fuel pump. 4) Measure the resistance of harness connector between fuel pump and chassis ground. Connector & terminal (R58) No. 4 — Chassis ground:</p>	<p>Is the resistance less than 5 Ω?</p>	<p>Go to step 3.</p>	<p>Repair the harness and connector. NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Open circuit in harness between fuel pump connector and chassis grounding terminal • Poor contact in coupling connector (R15)
<p>3 CHECK POWER SUPPLY TO FUEL PUMP. 1) Turn the ignition switch to ON. 2) Measure the voltage of power supply circuit between fuel pump connector and chassis ground. Connector & terminal (R58) No. 1 (+) — Chassis ground (-):</p>	<p>Is the voltage more than 10 V?</p>	<p>Replace the fuel pump. <Ref. to FU-62, Fuel Pump.></p>	<p>Go to step 4.</p>
<p>4 CHECK HARNESS BETWEEN FUEL PUMP AND FUEL PUMP RELAY CONNECTOR. 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness connector between fuel pump and fuel pump relay. Connector & terminal (R58) No. 1 — (B46) No. 4:</p>	<p>Is the resistance less than 1 Ω?</p>	<p>Go to step 5.</p>	<p>Repair the harness and connector. NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Open circuit in harness between fuel pump connector and chassis grounding terminal • Poor contact in coupling connectors (R15 and B97)
<p>5 CHECK HARNESS BETWEEN FUEL PUMP AND FUEL PUMP RELAY CONNECTOR. Measure the resistance of harness between fuel pump and fuel pump relay connector. Connector & terminal (R58) No. 1 — Chassis ground:</p>	<p>Is the resistance more than 1 MΩ?</p>	<p>Go to step 6.</p>	<p>Repair the short circuit in harness between fuel pump and fuel pump relay connector.</p>
<p>6 CHECK FUEL PUMP RELAY. 1) Disconnect the connectors from fuel pump relay and main relay. 2) Remove the fuel pump relay and main relay with bracket. 3) Connect the battery to fuel pump relay connector terminals No. 1 and No. 3. 4) Measure the resistance between connector terminals of fuel pump relay. Terminals No. 2 — No. 4:</p>	<p>Is the resistance less than 10 Ω?</p>	<p>Go to step 7.</p>	<p>Replace the fuel pump relay. <Ref. to FU-53, Fuel Pump Relay.></p>

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
7 CHECK HARNESS BETWEEN ECM AND FUEL PUMP RELAY CONNECTOR. 1) Disconnect the connectors from ECM. 2) Measure the resistance of harness between ECM and fuel pump relay connector. Connector & terminal <ul style="list-style-type: none"> • <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 the 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 the poor contact in ECM connector.	Check the fuel injector circuit. <Ref. to EN-80, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

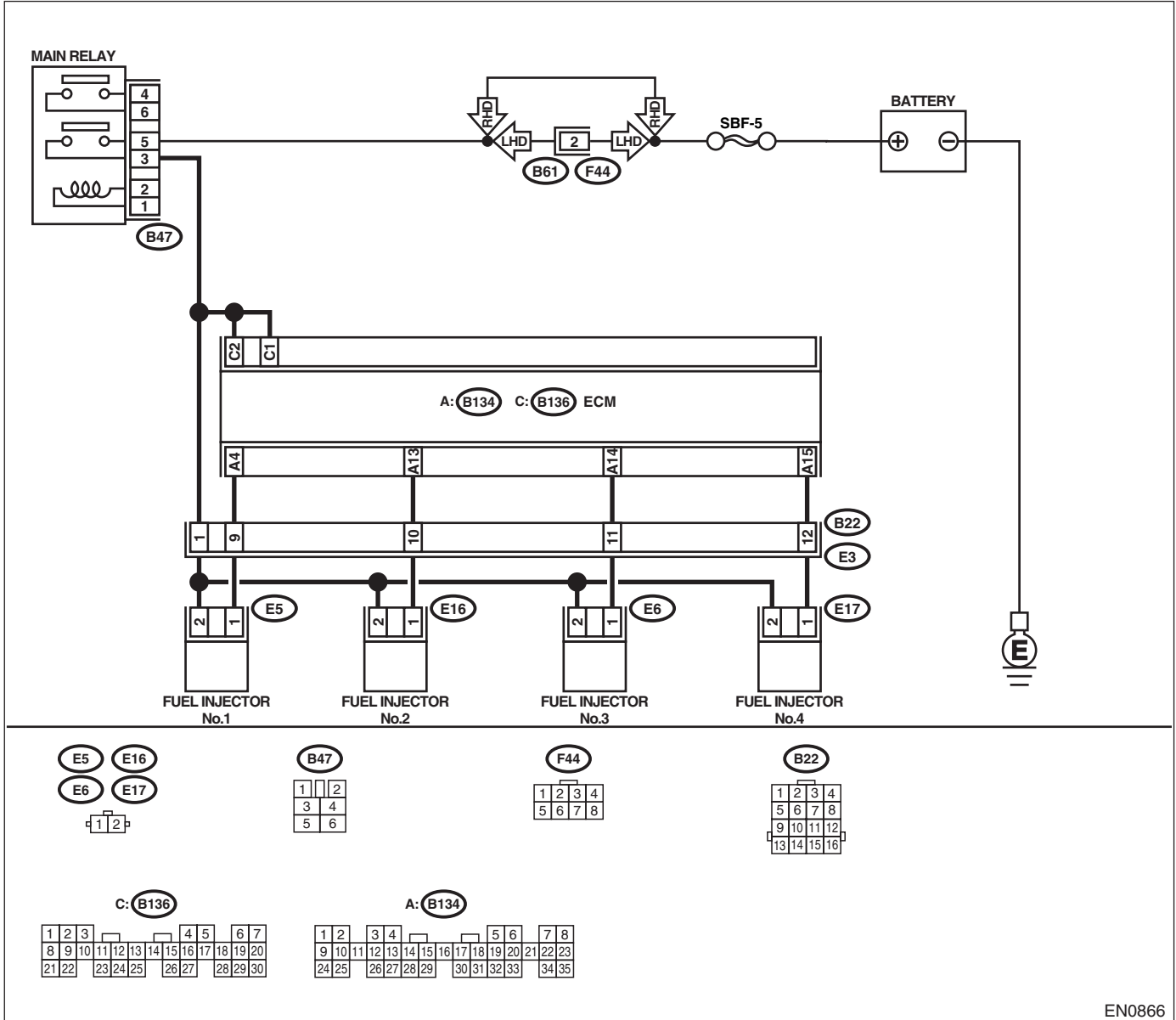
DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

F: FUEL INJECTOR CIRCUIT

CAUTION:

- Check or repair only faulty parts.
- After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN-49, Clear Memory Mode.> and INSPECTION MODE. <Ref. to EN-42, Inspection Mode.>
- WIRING DIAGRAM:



EN0866

Step	Check	Yes	No	
1	<p>CHECK OPERATION OF EACH FUEL INJECTOR.</p> <p>While cranking the engine, check that each fuel injector emits "operating" sound. Use a sound scope or attach a screwdriver to injector for this check.</p>	<p>Does the fuel injector emit "operating" sound?</p>	<p>Check the fuel pressure. <Ref. to ME-29, INSPECTION, Fuel Pressure.></p>	<p>Go to step 2.</p>

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>2</p> <p>CHECK POWER SUPPLY TO EACH FUEL INJECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from #1 cylinder fuel injector. 3) Turn the ignition switch to ON. 4) Measure the power supply voltage between the fuel injector terminal and engine ground.</p> <p>Connector & terminal #1 (E5) No. 2 (+) — Engine ground (-): #2 (E16) No. 2 (+) — Engine ground (-): #3 (E6) No. 2 (+) — Engine ground (-): #4 (E17) No. 2 (+) — Engine ground (-):</p>	<p>Is the voltage more than 10 V?</p>	<p>Go to step 3.</p>	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Open circuit in harness between main relay and fuel injector connector • Poor contact in main relay connector • Poor contact in coupling connector (B22) • Poor contact in fuel injector connector
<p>3</p> <p>CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR. 1) Disconnect the connector from ECM. 2) Measure the resistance of harness between ECM and fuel injector connector.</p> <p>Connector & terminal (B134) No. 4 — (B136) No. 2:</p>	<p>Is the resistance between 5 and 20 Ω?</p>	<p>Go to step 4.</p>	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Open circuit in harness between ECM and fuel injector connector • Poor contact in coupling connector (B22)
<p>4</p> <p>CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR. Measure the resistance of harness between ECM and fuel injector connector.</p> <p>Connector & terminal (B134) No. 4 — Chassis ground:</p>	<p>Is the resistance less than 1 Ω?</p>	<p>Repair the ground short circuit in harness between ECM and fuel injector connector.</p>	<p>Go to step 5.</p>
<p>5</p> <p>CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR. Measure the resistance of harness between ECM and fuel injector connector.</p> <p>Connector & terminal (B134) No. 13 — (B136) No. 2:</p>	<p>Is the resistance between 5 and 20 Ω?</p>	<p>Go to step 6.</p>	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Open circuit in harness between ECM and fuel injector connector • Poor contact in coupling connector (B22)
<p>6</p> <p>CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR. Measure the resistance of harness between ECM and fuel injector connector.</p> <p>Connector & terminal (B134) No. 13 — Chassis ground:</p>	<p>Is the resistance less than 1 Ω?</p>	<p>Repair the ground short circuit in harness between ECM and fuel injector connector.</p>	<p>Go to step 7.</p>

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
7 CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR. Measure the resistance of harness between ECM and fuel injector connector. <i>Connector & terminal</i> <i>(B134) No. 14 — (B136) No. 2:</i>	Is the resistance between 5 and 20 Ω?	Go to step 8 .	Repair the harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between ECM and fuel injector connector • Poor contact in coupling connector (B22)
8 CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR. Measure the resistance of harness between ECM and fuel injector connector. <i>Connector & terminal</i> <i>(B134) No. 14 — Chassis ground:</i>	Is the resistance less than 1 Ω?	Repair the 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 the resistance of harness between ECM and fuel injector connector. <i>Connector & terminal</i> <i>(B134) No. 15 — (B136) No. 2:</i>	Is the resistance between 5 and 20 Ω?	Go to step 10 .	Repair the harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between ECM and fuel injector connector • Poor contact in coupling connector (B22)
10 CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR. Measure the resistance of harness between ECM and fuel injector connector. <i>Connector & terminal</i> <i>(B134) No. 15 — Chassis ground:</i>	Is the resistance less than 1 Ω?	Repair the ground short circuit in harness between ECM and fuel injector connector.	Go to step 11 .
11 CHECK EACH FUEL INJECTOR. 1) Turn the ignition switch to OFF. 2) Measure the resistance between each fuel injector terminals. <i>Terminals</i> <i>No. 1 — No. 2:</i>	Is the resistance between 5 and 20 Ω?	Go to step 12 .	Replace the faulty fuel injector.
12 CHECK POOR CONTACT. Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Inspection using "General Diagnostic Table". <Ref. to EN-292, INSPECTION, General Diagnostic Table.>

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

18. List of Diagnostic Trouble Code (DTC)

A: LIST

DTC No.	Item	Index
P0031	Front oxygen (A/F) sensor heater circuit low input	<Ref. to EN-90, 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-94, 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-96, 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-100, 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-102, 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-104, 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-106, 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-110, DTC P0107 — PRESSURE SENSOR CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0108	Pressure sensor circuit high input	<Ref. to EN-114, 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-118, 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-120, 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-122, 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-126, 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-128, 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-132, 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-134, 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-138, 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-140, DTC P0125 — INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

DTC No.	Item	Index
P0130	Front oxygen (A/F) sensor circuit range/performance problem (Lean)	<Ref. to EN-142, 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-144, 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-146, 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-148, 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-150, DTC P0136 — REAR OXYGEN SENSOR CIRCUIT MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0139	Rear oxygen sensor circuit slow response	<Ref. to EN-154, DTC P0139 — REAR OXYGEN SENSOR CIRCUIT SLOW RESPONSE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0170	Fuel trim malfunction	<Ref. to EN-156, DTC P0170 — FUEL TRIM MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0301	Cylinder 1 misfire detected	<Ref. to EN-158, DTC P0301 — CYLINDER 1 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0302	Cylinder 2 misfire detected	<Ref. to EN-158, DTC P0302 — CYLINDER 2 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0303	Cylinder 3 misfire detected	<Ref. to EN-158, DTC P0303 — CYLINDER 3 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0304	Cylinder 4 misfire detected	<Ref. to EN-160, DTC P0304 — CYLINDER 4 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0327	Knock sensor circuit low input	<Ref. to EN-166, DTC P0327 — KNOCK SENSOR CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0328	Knock sensor circuit high input	<Ref. to EN-168, DTC P0328 — KNOCK SENSOR CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0335	Crankshaft position sensor circuit malfunction	<Ref. to EN-170, 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-172, 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-174, 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-176, 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-179, 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-184, 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-188, 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-190, DTC P0461 — FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

DTC No.	Item	Index
P0462	Fuel level sensor circuit low input	<Ref. to EN-192, 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-196, DTC P0463 — FUEL LEVEL SENSOR CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0464	Fuel level sensor intermittent input	<Ref. to EN-200, 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-203, DTC P0480 — COOLING FAN RELAY 1 CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0483	Cooling fan function problem	<Ref. to EN-207, DTC P0483 — COOLING FAN FUNCTION PROBLEM —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0500	Vehicle speed sensor malfunction	<Ref. to EN-210, DTC P0500 — VEHICLE SPEED SENSOR MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0506	Idle control system RPM lower than expected	<Ref. to EN-212, 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-214, 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-216, DTC P0512 — STARTER SWITCH CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0513	Incorrect immobilizer key	<Ref. to IM-22, DTC P0153 INCORRECT IMMOBILIZER KEY (USE OF UNREGISTERED KEY), Diagnostics Chart with Diagnostic Trouble Code (DTC).>
P0562	Charge system circuit low input	<Ref. to EN-218, DTC P0562 — CHARGE SYSTEM CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0563	Charge system circuit high input	<Ref. to EN-220, 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-222, DTC P0604 — INTERNAL CONTROL MODULE MEMORY CHECK SUM ERROR —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0703	Brake switch input malfunction	<Ref. to EN-224, DTC P0703 — BRAKE SWITCH INPUT MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0705	Transmission range sensor circuit malfunction	<Ref. to AT-119, CHECK INHIBITOR SWITCH., Diagnostic Procedure for No-diagnostic Trouble Code (DTC).>
P0710	Transmission fluid temperature sensor circuit malfunction	<Ref. to AT-46, DTC 27 ATF TEMPERATURE SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0715	Torque converter turbine speed sensor circuit malfunction	<Ref. to AT-62, DTC 36 TORQUE CONVERTER TURBINE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0720	Output speed sensor (vehicle speed sensor 2) circuit malfunction	<Ref. to AT-57, DTC 33 FRONT VEHICLE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0725	Engine speed input circuit malfunction	<Ref. to AT-42, DTC 11 ENGINE SPEED SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0731	Gear 1 incorrect ratio	<Ref. to EN-226, DTC P0731 — GEAR 1 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0732	Gear 2 incorrect ratio	<Ref. to EN-226, DTC P0732 — GEAR 2 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0733	Gear 3 incorrect ratio	<Ref. to EN-226, DTC P0733 — GEAR 3 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0734	Gear 4 incorrect ratio	<Ref. to EN-227, DTC P0734 — GEAR 4 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0741	Torque converter clutch system malfunction	<Ref. to EN-228, 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-94, DTC 77 LOCK-UP DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

DTC No.	Item	Index
P0748	Pressure control solenoid (Line pressure duty solenoid) electrical	<Ref. to AT-86, DTC 75 LINE PRESSURE DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0753	Shift solenoid A (Shift solenoid 1) electrical	<Ref. to AT-70, DTC 71 SHIFT SOLENOID 1, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0758	Shift solenoid B (Shift solenoid 2) electrical	<Ref. to AT-74, DTC 72 SHIFT SOLENOID 2, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0778	2-4 brake pressure control solenoid valve circuit malfunction	<Ref. to AT-90, DTC 76 2-4 BRAKE DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0785	2-4 brake timing control solenoid valve circuit malfunction	<Ref. to AT-82, DTC 74 2-4 BRAKE TIMING SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1110	Atmospheric pressure sensor circuit low input	<Ref. to EN-230, DTC P1110 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1111	Atmospheric pressure sensor circuit high input	<Ref. to EN-234, DTC P1111 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1112	Atmospheric pressure sensor circuit range/performance problem	<Ref. to EN-238, 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-240, 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-242, 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-244, 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-247, 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-249, 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-252, 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-254, 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-254, 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-254, 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-254, DTC P1513 — IDLE AIR CONTROL SOLENOID VALVE SIGNAL 2 CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1514	Idle air control solenoid valve signal 3 circuit low input	<Ref. to EN-254, 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-254, DTC P1515 — IDLE AIR CONTROL SOLENOID VALVE SIGNAL 3 CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

DTC No.	Item	Index
P1516	Idle air control solenoid valve signal 4 circuit low input	<Ref. to EN-256, 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-260, 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-262, DTC P1518 — STARTER SWITCH CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1540	Vehicle speed sensor malfunction 2	<Ref. to EN-264, DTC P1540 — VEHICLE SPEED SENSOR MALFUNCTION 2 —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1560	Back-up voltage circuit malfunction	<Ref. to EN-266, DTC P1560 — BACK-UP VOLTAGE CIRCUIT MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1570	Antenna	<Ref. to IM-24, DTC P1570 ANTENNA, Diagnostics Chart with Diagnostic Trouble Code (DTC).>
P1571	Reference code incompatibility	<Ref. to IM-17, DTC P1571 REFERENCE CODE INCOMPATIBILITY, Diagnostics Chart with Diagnostic Trouble Code (DTC).>
P1572	IMM circuit failure except antenna circuit	<Ref. to IM-18, DTC P1572 IMM CIRCUIT FAILURE (EXCEPT ANTENNA CIRCUIT), Diagnostics Chart with Diagnostic Trouble Code (DTC).>
P1574	Key communication failure	<Ref. to IM-21, DTC P1574 KEY COMMUNICATION FAILURE, Diagnostics Chart with Diagnostic Trouble Code (DTC).>
P1576	EGI control module EEPROM	<Ref. to IM-22, DTC P1576 EGI CONTROL MODULE EEPROM, Diagnostics Chart with Diagnostic Trouble Code (DTC).>
P1577	IMM control module EEPROM	<Ref. to IM-22, DTC P1577 IMM CONTROL MODULE EEPROM, Diagnostics Chart with Diagnostic Trouble Code (DTC).>
P1590	Neutral position switch circuit high input (AT model)	<Ref. to EN-268, 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-272, DTC P1591 — NEUTRAL POSITION SWITCH CIRCUIT LOW INPUT (AT MODEL) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1592	Neutral position switch circuit low input (MT model)	<Ref. to EN-274, 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-276, 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-278, 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-280, 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-282, 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-284, DTC P1699 — ENGINE TORQUE CONTROL CUT SIGNAL CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1700	Throttle position sensor circuit malfunction for automatic transmission	<Ref. to AT-50, DTC 31 THROTTLE POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1701	Cruise control set signal circuit malfunction for automatic transmission	<Ref. to EN-286, 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-78, DTC 73 LOW CLUTCH TIMING SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

DTC No.	Item	Index
P1711	Engine torque control signal 1 circuit malfunction	<Ref. to EN-288, 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-290, DTC P1712 — ENGINE TORQUE CONTROL SIGNAL 2 CIRCUIT MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

19. Diagnostic Procedure with Diagnostic Trouble Code (DTC)

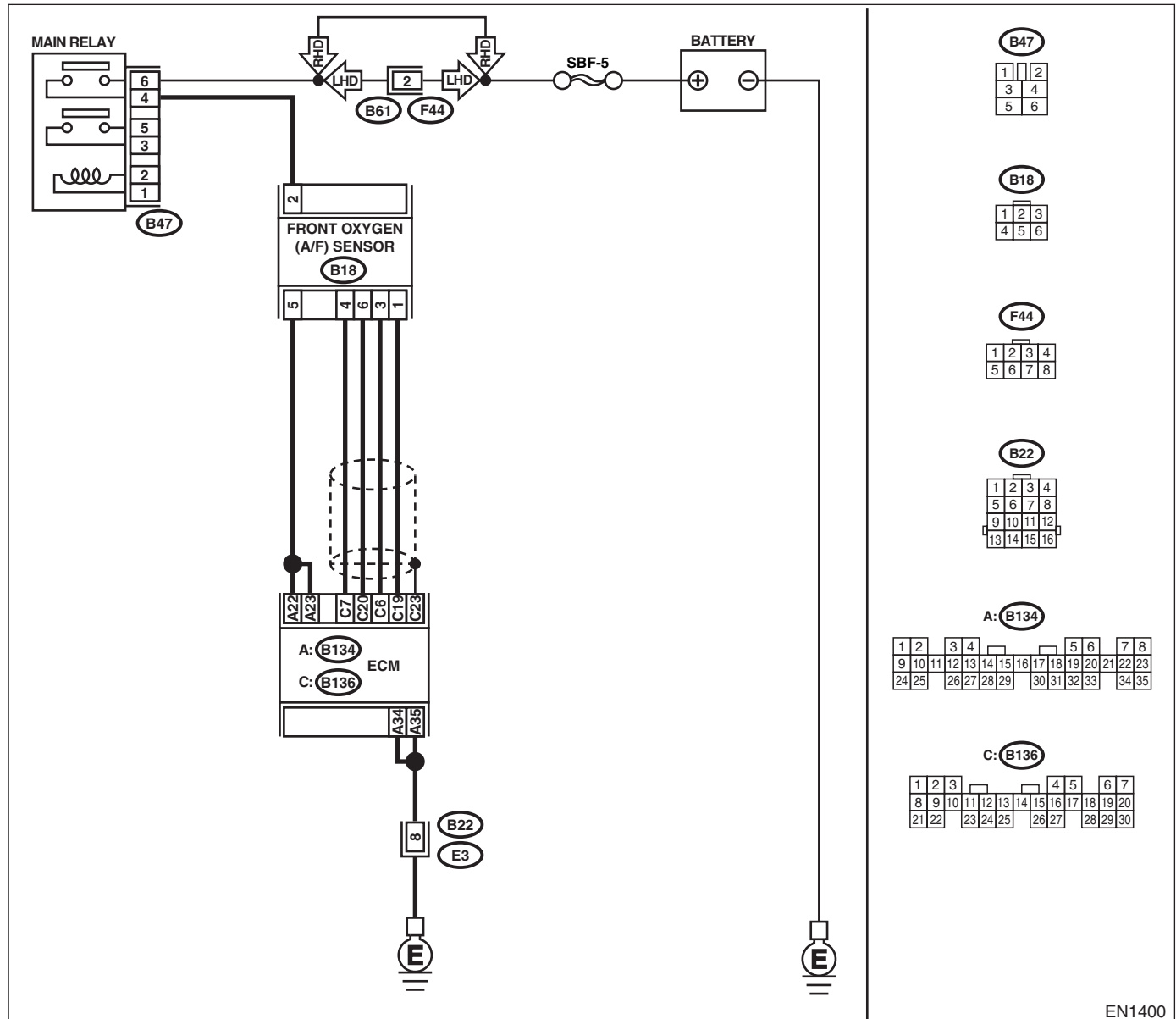
A: DTC P0031 — FRONT OXYGEN (A/F) SENSOR HEATER CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
 - Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN-42, OPERATION, Inspection Mode.> .

• **WIRING DIAGRAM:**



Step	Check	Yes	No
1	CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.	Go to step 2.	Go to step 5.
	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0031 and P0037 at the same time?		

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>2</p> <p>CHECK POWER SUPPLY TO FRONT OXYGEN (A/F) SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from front oxygen (A/F) sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between front oxygen (A/F) sensor connector and engine ground.</p> <p>Connector & terminal (B18) No. 2 (+) — Engine ground (-):</p>	Is the voltage more than 10 V?	Go to step 3.	Repair the power supply line. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between main relay and front oxygen (A/F) sensor connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in main relay connector
<p>3</p> <p>CHECK GROUND CIRCUIT OF ECM. Measure the resistance of harness between ECM connector and chassis ground.</p> <p>Connector & terminal (B134) No. 35 — Chassis ground: (B134) No. 34 — Chassis ground:</p>	Is the resistance less than 5 Ω?	Go to step 4.	Repair the harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between ECM and engine ground terminal • Poor contact in ECM connector • Poor contact in coupling connector (B22)
<p>4</p> <p>CHECK CURRENT DATA. 1) Start the engine. 2) Read the data of front oxygen (A/F) sensor heater current using Subaru Select Monitor or OBD-II general scan tool.</p> <p>NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN-34, Subaru Select Monitor.> • OBD-II scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.</p>	Is the value more than 0.2 A?	Repair the poor contact in connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector 	Go to step 5.
<p>5</p> <p>CHECK OUTPUT SIGNAL FROM ECM. 1) Start and idle the engine. 2) Measure the voltage between ECM connector and chassis ground.</p> <p>Connector & terminal (B134) No. 22 (+) — Chassis ground (-):</p>	Is the voltage less than 1.0 V?	Go to step 7.	Go to step 6.
<p>6</p> <p>CHECK OUTPUT SIGNAL FROM ECM. Measure the voltage between ECM connector and chassis ground.</p> <p>Connector & terminal (B134) No. 22 (+) — Chassis ground (-):</p>	Does the voltage change less than 1.0 V by shaking harness and connector of ECM while monitoring the value with voltage meter?	Repair the poor contact in ECM connector.	Go to step 7.
<p>7</p> <p>CHECK OUTPUT SIGNAL FROM ECM. Measure the voltage between ECM connector and chassis ground.</p> <p>Connector & terminal (B134) No. 23 (+) — Chassis ground (-):</p>	Is the voltage less than 1.0 V?	Go to step 9.	Go to step 8.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
8 CHECK OUTPUT SIGNAL FROM ECM. Measure the voltage between ECM connector and chassis ground. <i>Connector & terminal</i> <i>(B134) No. 23 (+) — Chassis ground (-):</i>	Does the voltage change less than 1.0 V by shaking harness and connector of ECM while monitoring the value with voltage meter?	Repair the poor contact in ECM connector.	Go to step 9 .
9 CHECK FRONT OXYGEN (A/F) SENSOR. 1) Turn the ignition switch to OFF. 2) Measure the resistance between front oxygen (A/F) sensor connector terminals. <i>Terminals</i> <i>No. 2 — No. 5:</i>	Is the resistance less than 10 Ω ?	Repair the harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open or ground short circuit in harness between front oxygen (A/F) sensor and ECM connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector 	Replace the front oxygen (A/F) sensor. <Ref. to FU-54, Fuel.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

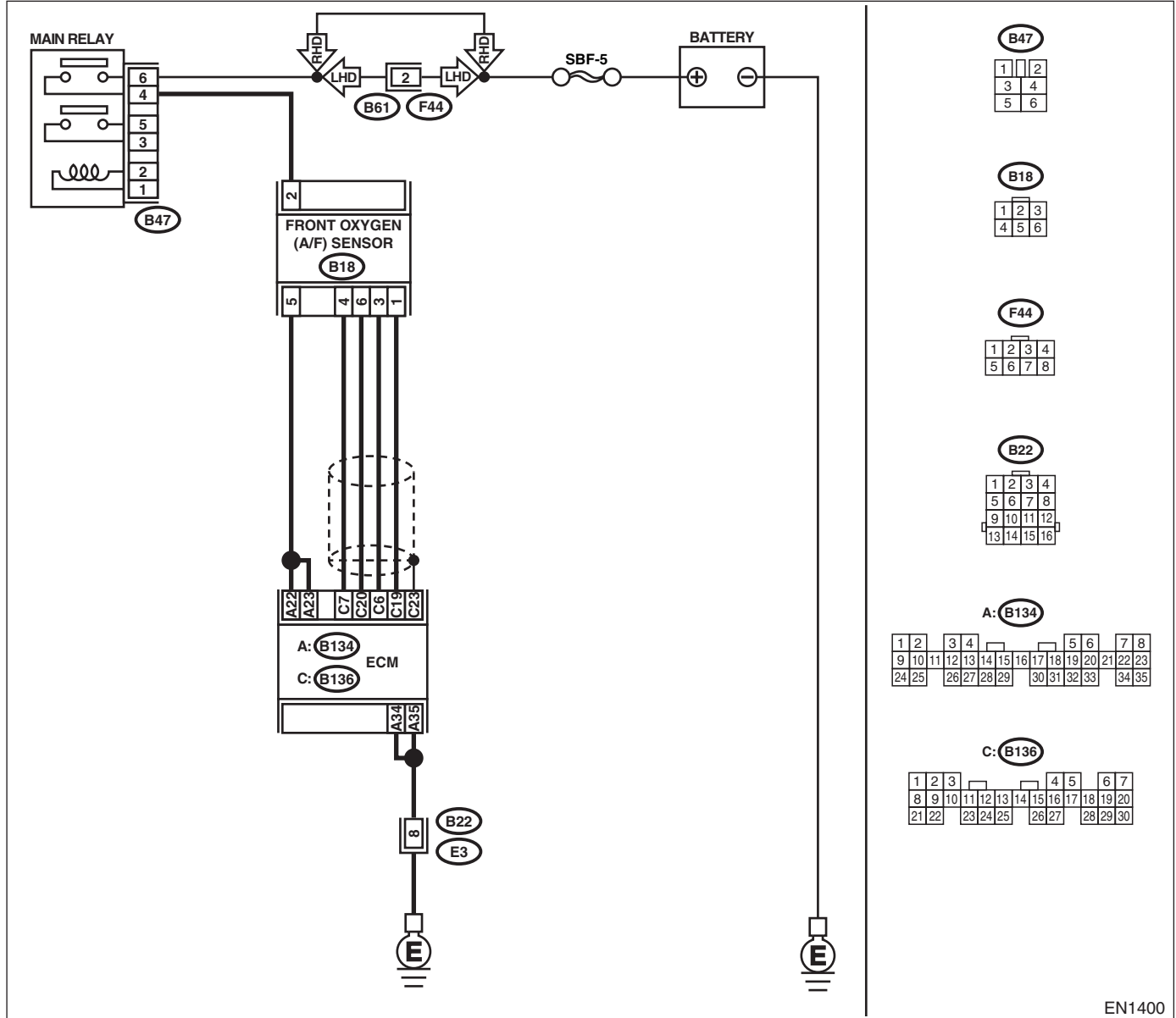
B: DTC P0032 — FRONT OXYGEN (A/F) SENSOR HEATER CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
 - Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN-42, Inspection Mode.> .

• **WIRING DIAGRAM:**



EN1400

Step	Check	Yes	No	
1	<p>CHECK OUTPUT SIGNAL FROM ECM.</p> <p>1) Turn the ignition switch to ON.</p> <p>2) Measure the voltage between ECM connector and chassis ground.</p> <p>Connector & terminal (B134) No. 23 (+) — Chassis ground (-):</p>	Is the voltage more than 8 V?	Go to step 3.	Go to step 2.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
2 CHECK OUTPUT SIGNAL FROM ECM. Measure the voltage between ECM connector and chassis ground. <i>Connector & terminal</i> <i>(B134) No. 22 (+) — Chassis ground (-):</i>	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 the ignition switch to OFF. 2) Repair the battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. 3) Turn the ignition switch to ON. 4) Read the data of front oxygen (A/F) sensor heater current using Subaru Select Monitor 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-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 the ECM. <Ref. to FU-51, Engine Control Module.>	END
4 CHECK OUTPUT SIGNAL FROM ECM. Measure the voltage between ECM connector and chassis ground. <i>Connector & terminal</i> <i>(B134) No. 23 (+) — Chassis ground (-):</i>	Does the voltage change more than 8 V by shaking harness and connector of ECM while monitoring the value with voltage meter?	Repair the 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 the voltage between ECM connector and chassis ground. <i>Connector & terminal</i> <i>(B134) No. 22 (+) — Chassis ground (-):</i>	Does the voltage change more than 8 V by shaking harness and connector of ECM while monitoring the value with voltage meter?	Repair the battery short circuit in harness between ECM and front oxygen (A/F) sensor connector.	END

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

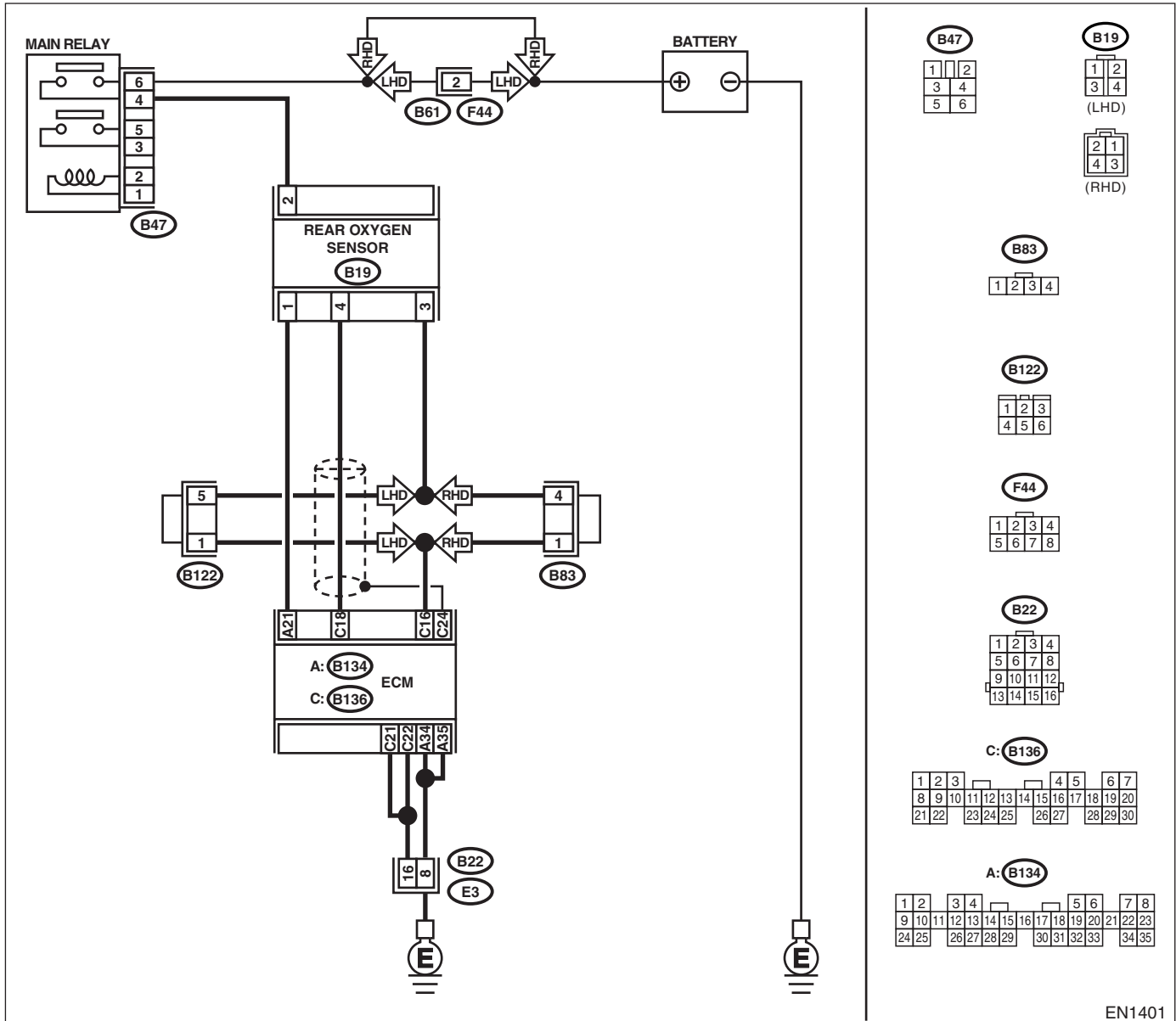
C: DTC P0037 — REAR OXYGEN SENSOR HEATER CIRCUIT MALFUNCTION

- **DTC DETECTING CONDITION:**
 - Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN-42, OPERATION, Inspection Mode.> .

• **WIRING DIAGRAM:**



EN1401

Step	Check	Yes	No
<p>1</p> <p>CHECK GROUND CIRCUIT OF ECM.</p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Disconnect the connector from ECM.</p> <p>3) Measure the resistance of harness between ECM connector and chassis ground.</p> <p>Connector & terminal (B134) No. 35 — Chassis ground:</p>	<p>Is the resistance less than 5 Ω?</p>	<p>Go to step 3.</p>	<p>Go to step 2.</p>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>2</p> <p>CHECK GROUND CIRCUIT OF ECM. 1)Repair the harness and connector. 2)Measure the resistance of harness between ECM connector and chassis ground. Connector & terminal (B134) No. 34 — Chassis ground:</p>	<p>Is the resistance less than 5 Ω?</p>	<p>Go to step 3.</p>	<p>Repair the harness and connector. NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Open circuit in harness between ECM and engine ground terminal • Poor contact in ECM connector • Poor contact in coupling connector (B22)
<p>3</p> <p>CHECK CURRENT DATA. 1)Start the engine. 2)Read the 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-34, Subaru Select Monitor.> •OBD-II scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.</p>	<p>Is the value more than 0.2 A?</p>	<p>Repair the connector. NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Poor contact in rear oxygen sensor connector • Poor contact in rear oxygen sensor connecting harness connector • Poor contact in ECM connector 	<p>Go to step 4.</p>
<p>4</p> <p>CHECK OUTPUT SIGNAL FROM ECM. 1)Start and idle the engine. 2)Measure the voltage between ECM connector and chassis ground. Connector & terminal (B134) No. 21 (+) — Chassis ground (-):</p>	<p>Is the voltage less than 1.0 V?</p>	<p>Go to step 7.</p>	<p>Go to step 5.</p>
<p>5</p> <p>CHECK OUTPUT SIGNAL FROM ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B134) No. 21 (+) — Chassis ground (-):</p>	<p>Does the voltage change less than 1.0 V by shaking harness and connector of ECM while monitoring the value with voltage meter?</p>	<p>Repair the poor contact in ECM connector.</p>	<p>Go to step 6.</p>
<p>6</p> <p>CHECK OUTPUT SIGNAL FROM ECM. 1)Disconnect the connector from rear oxygen sensor. 2)Measure the voltage between ECM connector and chassis ground. Connector & terminal (B134) No. 21 (+) — Chassis ground (-):</p>	<p>Is the voltage less than 1.0 V?</p>	<p>Contact with your Subaru distributor service.</p>	<p>Repair the battery short circuit in harness between ECM and rear oxygen sensor connector.</p>
<p>7</p> <p>CHECK POWER SUPPLY TO REAR OXYGEN SENSOR. 1)Turn the ignition switch to OFF. 2)Disconnect the connector from rear oxygen sensor. 3)Turn the ignition switch to ON. 4)Measure the voltage between rear oxygen sensor connector and engine ground or chassis ground. Connector & terminal (B19) No. 2 (+) — Chassis ground (-):</p>	<p>Is the voltage more than 10 V?</p>	<p>Go to step 8.</p>	<p>Repair the power supply line. NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Open circuit in harness between main relay and rear oxygen sensor connector • Poor contact in rear oxygen sensor connector

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
8	CHECK REAR OXYGEN SENSOR. 1) Turn the ignition switch to OFF. 2) Measure the resistance between rear oxygen sensor connector terminals. Terminals No. 1 — No. 2:	Is the resistance less than 30 Ω ?	Repair the harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none">• Open circuit in harness between rear oxygen sensor and ECM connector• Poor contact in rear oxygen sensor connector• Poor contact in ECM connector	Replace the rear oxygen sensor. <Ref. to FU-49, Rear Oxygen Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

D: DTC P0038 — REAR OXYGEN SENSOR HEATER CIRCUIT HIGH INPUT —

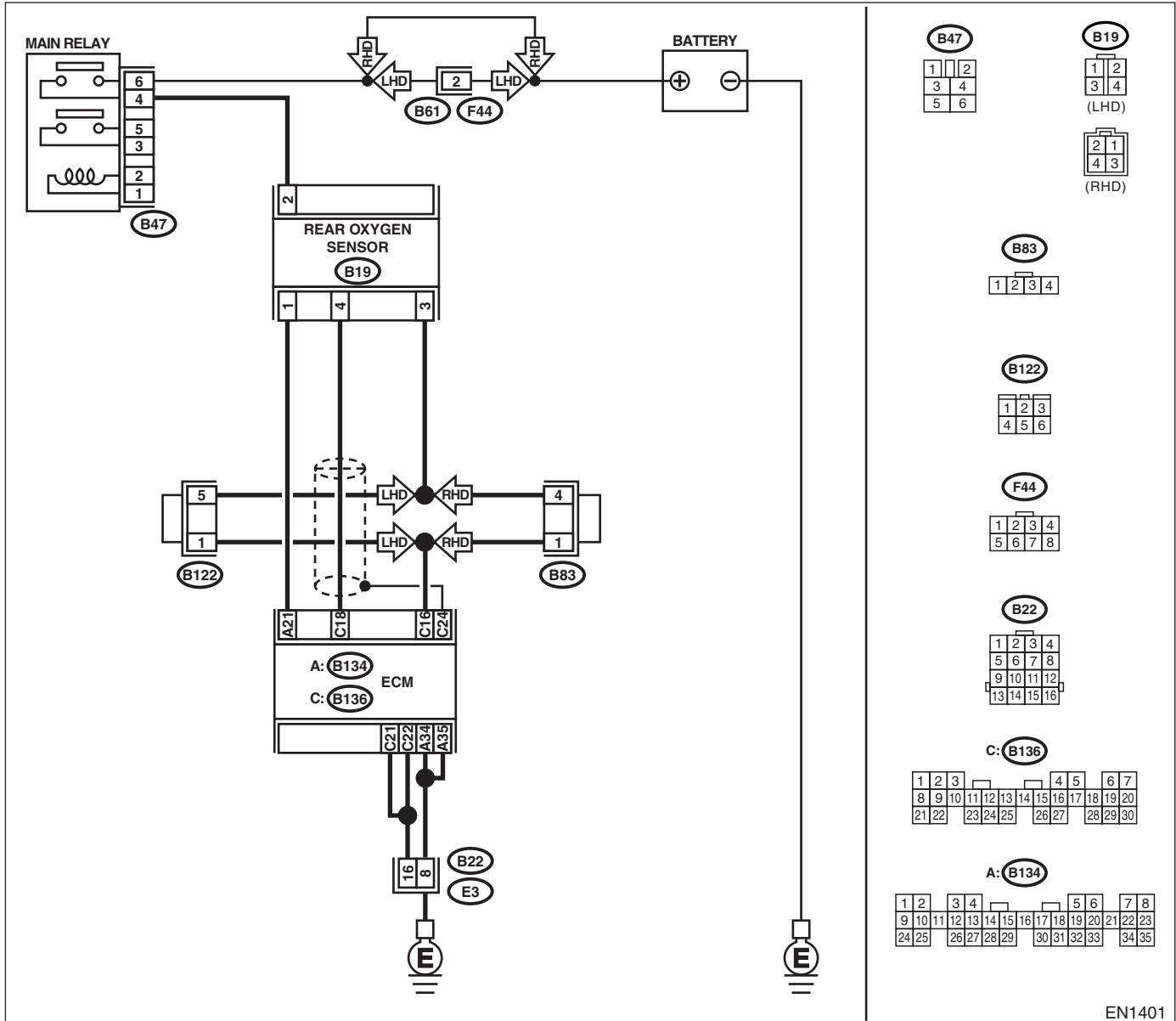
• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN-42, OPERATION, Inspection Mode.> .

• WIRING DIAGRAM:



EN1401

Step	Check	Yes	No
1	<p>CHECK INPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B134) No. 21 (+) — Chassis ground (-):</p>	Is the voltage more than 8 V? Go to step 2.	Go to step 3.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>2 CHECK CURRENT DATA. 1) Turn the ignition switch to OFF. 2) Repair the battery short circuit in harness between ECM and rear oxygen sensor connector. 3) Turn the ignition switch to ON. 4) Read the data of rear oxygen sensor heater current using Subaru Select Monitor or OBD-II general scan tool.</p> <p>NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.</p>	<p>Is the value more than 7 A?</p>	<p>Replace the ECM. <Ref. to FU-51, Engine Control Module.></p>	<p>END</p>
<p>3 CHECK POOR CONTACT. Check poor contact in ECM connector.</p>	<p>Is there poor contact in ECM connector?</p>	<p>Repair the poor contact in ECM connector.</p>	<p>END</p>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

E: DTC P0066 — AIR ASSIST INJECTOR SOLENOID VALVE CIRCUIT LOW INPUT —

• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

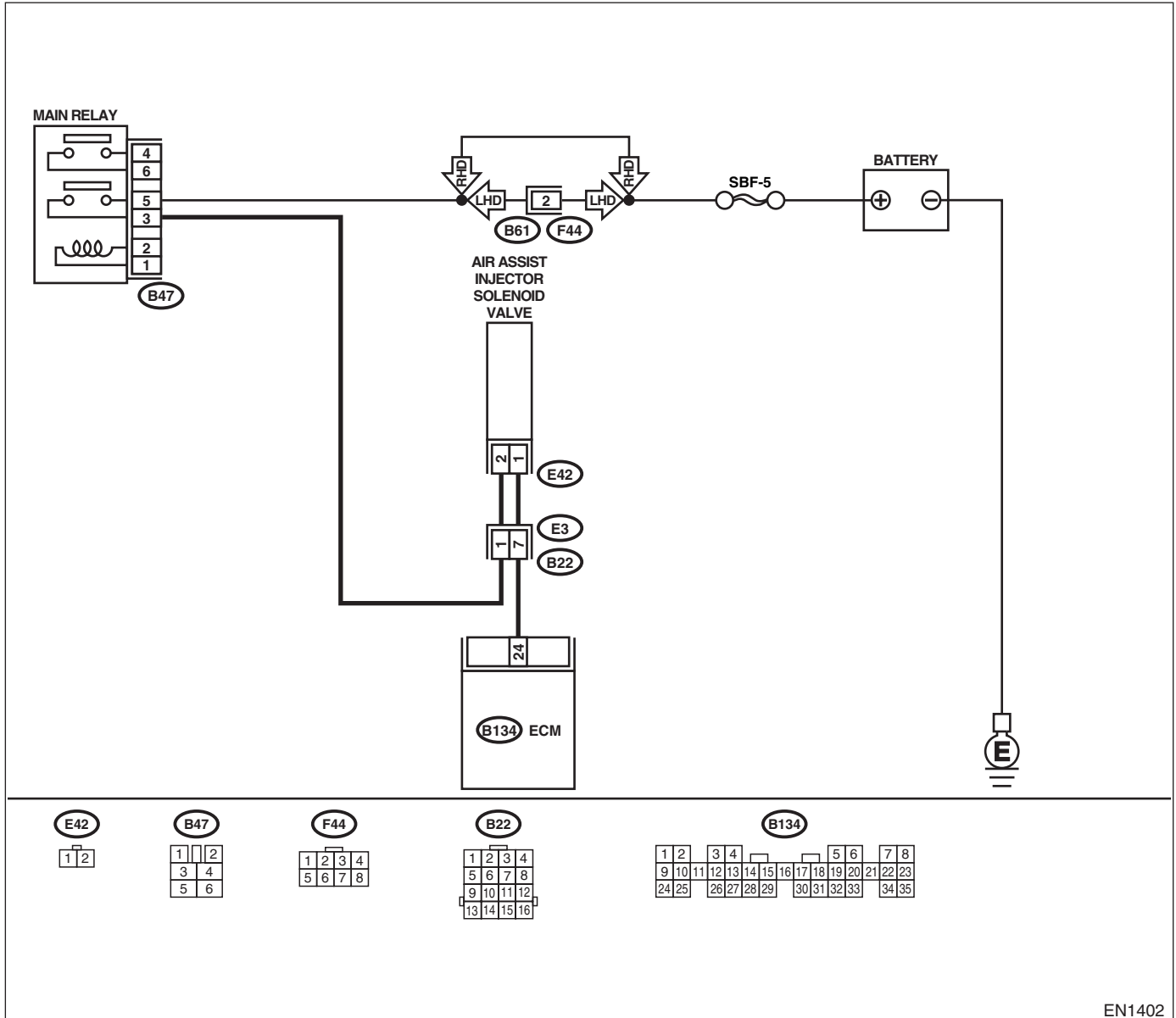
• TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN-42, OPERATION, Inspection Mode.> .

• WIRING DIAGRAM:



EN1402

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>1 CHECK OUTPUT SIGNAL FROM ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. Connector & terminal (B134) No. 24 (+) — Chassis ground (-):</p>	Is the voltage more than 10 V?	Repair the poor contact in ECM connector.	Go to step 2.
<p>2 CHECK POWER SUPPLY TO AIR ASSIST INJECTOR SOLENOID VALVE. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from air assist injector solenoid valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between air assist injector solenoid valve and engine ground. Connector & terminal (E42) No. 2 (+) — Engine ground (-):</p>	Is the voltage more than 10 V?	Go to step 3.	Repair the harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between air assist injector solenoid valve and main relay connector • Poor contact in coupling connector (B22)
<p>3 CHECK HARNESS BETWEEN ECM AND AIR ASSIST INJECTOR SOLENOID VALVE CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM and air assist injector solenoid valve connector. Connector & terminal (B134) No. 24 — (E42) No. 1:</p>	Is the resistance less than 1 Ω ?	Go to step 4.	Repair the harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between ECM and air assist injector solenoid valve connector • Poor contact in coupling connector (B22)
<p>4 CHECK HARNESS BETWEEN ECM AND AIR ASSIST INJECTOR SOLENOID VALVE CONNECTOR. Measure the resistance of harness between ECM and chassis ground. Connector & terminal (B134) No. 24 — Chassis ground:</p>	Is the resistance less than 10 Ω ?	Repair the ground short circuit in harness between ECM and air assist injector solenoid valve connector.	Go to step 5.
<p>5 CHECK POOR CONTACT. Check poor contact in ECM and air assist injector solenoid valve connectors.</p>	Is there poor contact in ECM and air assist injector solenoid valve connectors?	Repair the poor contact in ECM and air assist injector solenoid valve connectors.	Replace the air assist injector solenoid valve. <Ref. to FU-40, Air Assist Injector Solenoid Valve.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

F: DTC P0067 — AIR ASSIST INJECTOR SOLENOID VALVE CIRCUIT HIGH INPUT —

• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

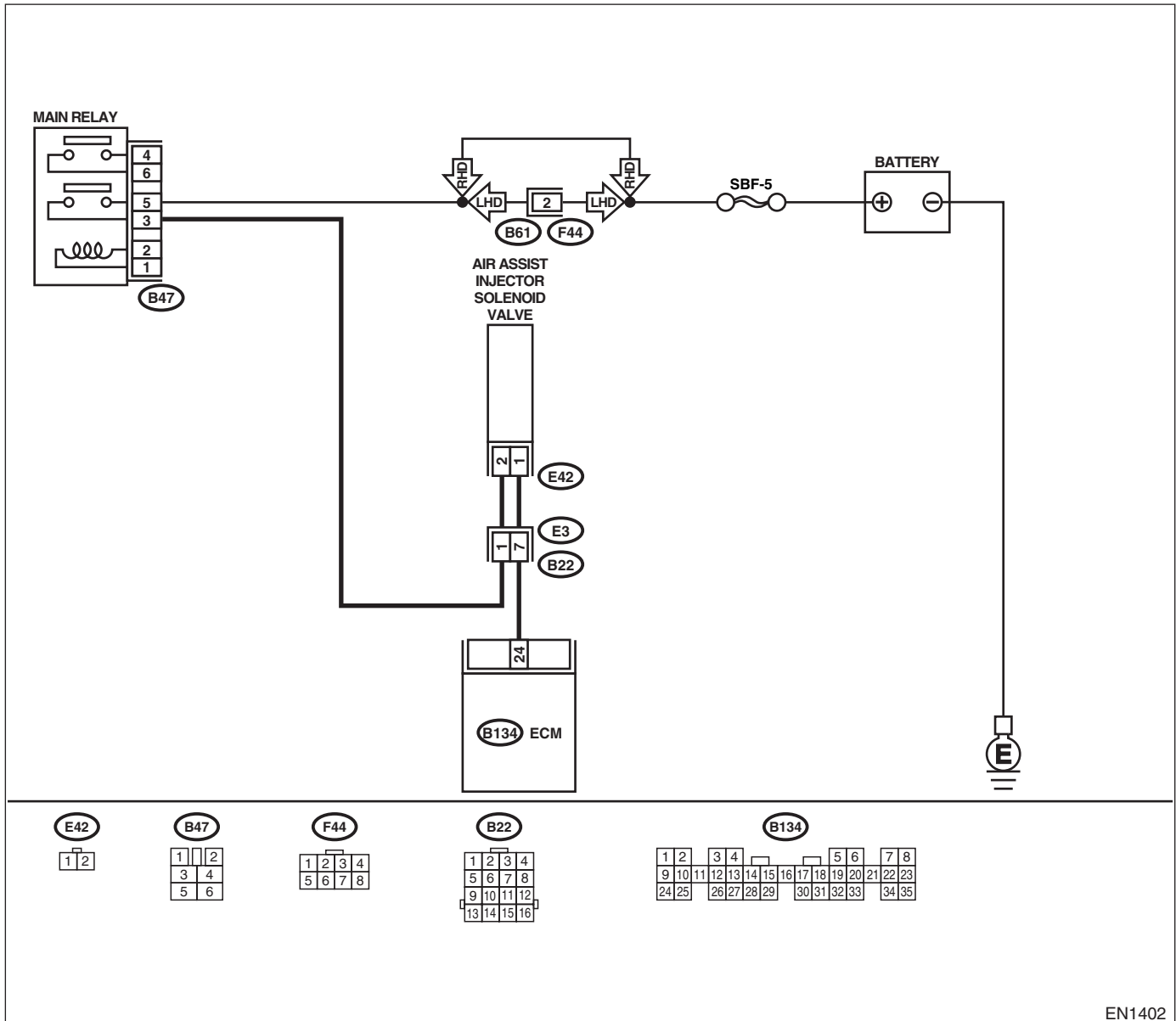
• TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN-42, OPERATION, Inspection Mode.> .

• WIRING DIAGRAM:



EN1402

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OUTPUT SIGNAL FROM ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. <i>Connector & terminal</i> <i>(B134) No. 24 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Go to step 2.	Go to step 3.
2 CHECK OUTPUT SIGNAL FROM ECM. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from air assist injector solenoid valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. <i>Connector & terminal</i> <i>(B134) No. 24 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Repair the battery short circuit in harness between ECM and air assist injector solenoid valve connector. After repair, replace the ECM. <Ref. to FU-51, Engine Control Module.>	Replace the air assist injector solenoid valve <Ref. to FU-40, Air Assist Injector Solenoid Valve.> and ECM <Ref. to FU-51, Engine Control Module.>
3 CHECK OUTPUT SIGNAL FROM ECM. Measure the voltage between ECM and chassis ground. <i>Connector & terminal</i> <i>(B134) No. 24 (+) — 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 the battery short circuit in harness between ECM and air assist injector solenoid valve connector. After repair, replace the ECM. <Ref. to FU-51, Engine Control Module.>	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)

G: DTC P0106 — PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (LOW INPUT) —

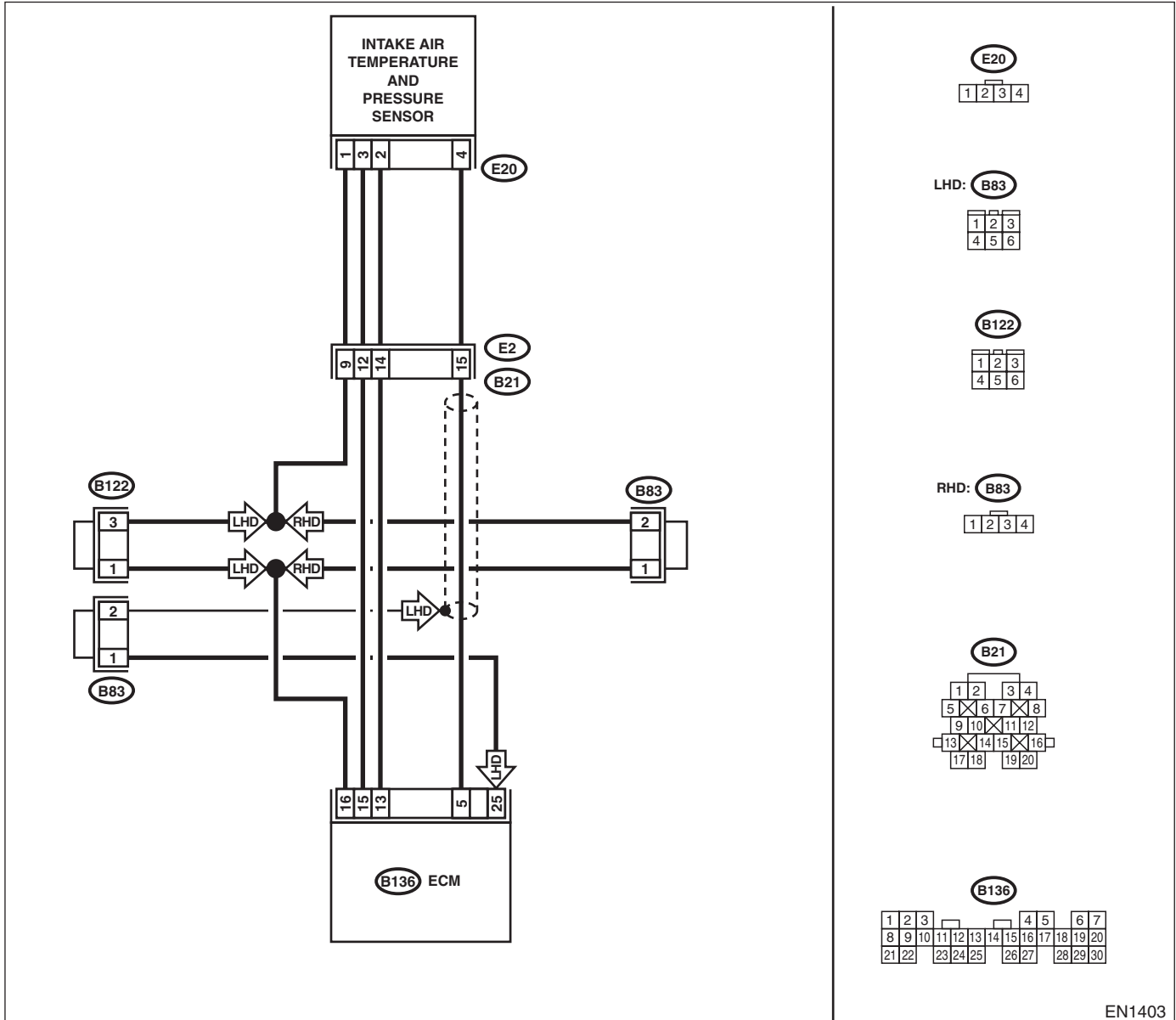
• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN-42, OPERATION, Inspection Mode.> .

• WIRING DIAGRAM:



EN1403

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>1</p> <p>CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.</p>	<p>Is any other DTC displayed?</p>	<p>Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN-83, List of Diagnostic Trouble Code (DTC).></p> <p>NOTE: In this case, it is not necessary to inspect DTC P0106.</p>	<p>Go to step 2.</p>
<p>2</p> <p>CHECK AIR INTAKE SYSTEM.</p>	<p>Are there holes, loose bolts or disconnection of hose on air intake system?</p>	<p>Repair the air intake system.</p>	<p>Go to step 3.</p>
<p>3</p> <p>CHECK PRESSURE SENSOR.</p> <p>1)Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F).</p> <p>2)Place the shift lever in the selector lever in "N" or "P" position.</p> <p>3)Turn the A/C switch to OFF.</p> <p>4)Turn all accessory switches to OFF.</p> <p>5)Read the data of intake manifold pressure sensor signal using Subaru Select Monitor or OBD-II general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> •Subaru Select Monitor <p>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE".</p> <p><Ref. to EN-34, Subaru Select Monitor.></p> <ul style="list-style-type: none"> •OBD-II general scan tool <p>For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.</p> <p>Specification:</p> <ul style="list-style-type: none"> •Intake manifold absolute pressure <p>Ignition ON</p> <p style="padding-left: 20px;">73.3 — 106.6 kPa (550 — 800 mmHg, 21.65 — 31.50 inHg)</p> <p>Idling</p> <p style="padding-left: 20px;">20.0 — 46.7 kPa (150 — 350 mmHg, 5.91 — 13.78 inHg)</p>	<p>Is the value within the specifications?</p>	<p>Go to step 4.</p>	<p>Replace the intake air temperature sensor and pressure sensor. <Ref. to FU-37, Intake Air Temperature and Pressure Sensor.></p>
<p>4</p> <p>CHECK THROTTLE POSITION.</p> <p>Read the data of throttle position signal using Subaru Select Monitor or OBD-II general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> •Subaru Select Monitor <p>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE".</p> <p><Ref. to EN-34, Subaru Select Monitor.></p> <ul style="list-style-type: none"> •OBD-II general scan tool <p>For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.</p>	<p>Is the throttle positioning ratio equal to or less than 5 % when throttle is fully closed?</p>	<p>Go to step 5.</p>	<p>Adjust or replace the throttle position sensor. <Ref. to FU-35, Throttle Position Sensor.></p>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
5 CHECK THROTTLE POSITION.	Is the throttle positioning ratio equal to or more than 85 % when throttle is fully open?	Replace the intake air temperature and pressure sensor. <Ref. to FU-37, Intake Air Temperature and Pressure Sensor.>	Replace the throttle position sensor. <Ref. to FU-35, Throttle Position Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

H: DTC P0107 — PRESSURE SENSOR CIRCUIT LOW INPUT —

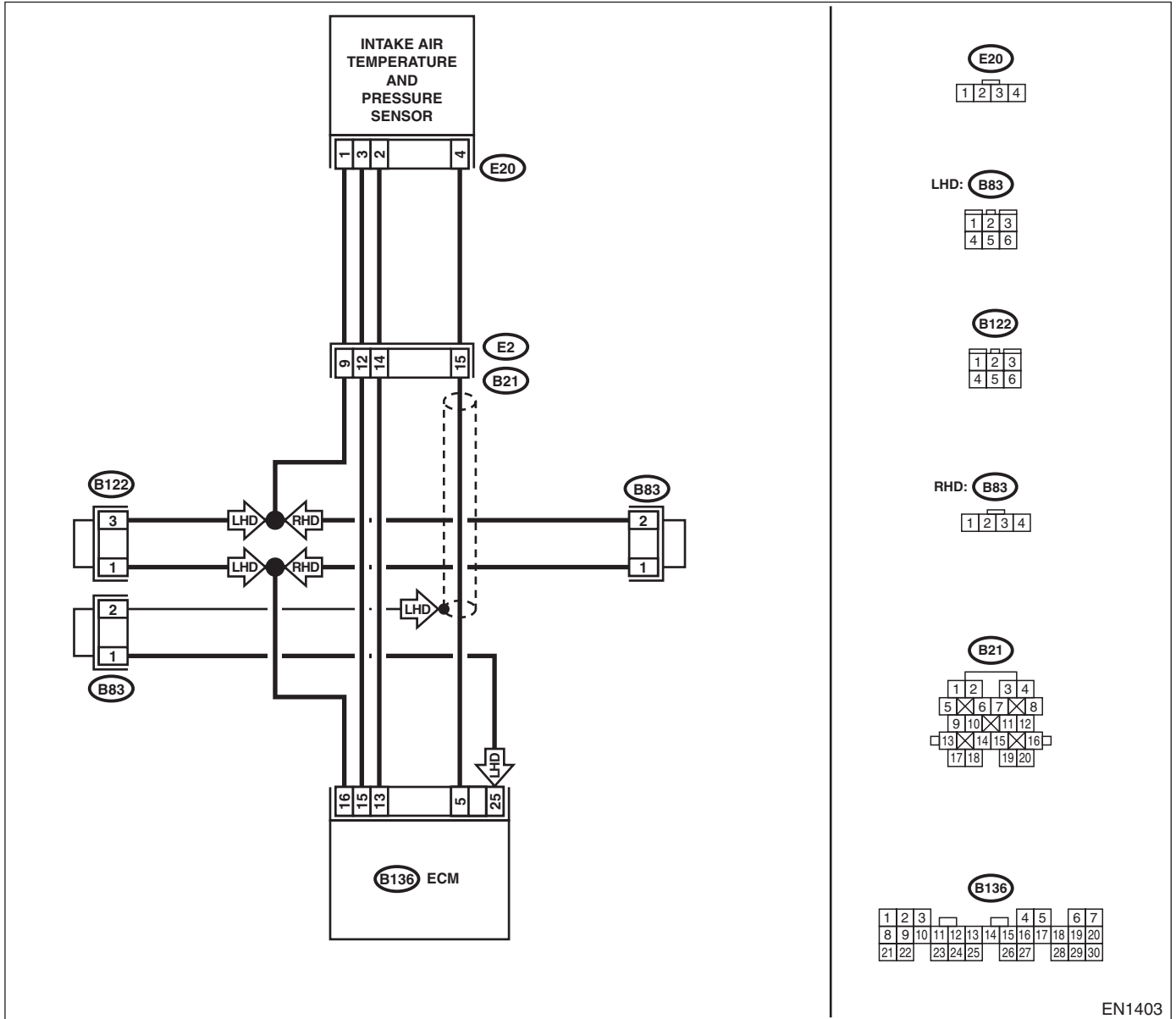
DTC DETECTING CONDITION:

- Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN-42, OPERATION, Inspection Mode.> .

WIRING DIAGRAM:



EN1403

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>1 CHECK CURRENT DATA. 1)Start the engine. 2)Read the data of intake manifold absolute pressure signal using Subaru Select Monitor or OBD-II general scan tool.</p> <p>NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.</p>	Is the value less than 13.3 kPa (100 mmHg, 3.94 inHg)?	Go to step 3.	Go to step 2.
<p>2 CHECK POOR CONTACT. Check poor contact in ECM and pressure sensor connector.</p>	Is there poor contact in ECM or pressure sensor connector?	Repair the poor contact in ECM or pressure sensor connector.	Even if MIL lights up, the circuit has returned to a normal condition at this time.
<p>3 CHECK INPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B136) No. 15 (+) — Chassis ground (-):</p>	Is the voltage more than 4.5 V?	Go to step 5.	Go to step 4.
<p>4 CHECK INPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B136) No. 15 (+) — Chassis ground (-):</p>	Does the voltage change more than 4.5 V by shaking harness and connector of ECM while monitoring the value with voltage meter?	Repair the 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.
<p>5 CHECK INPUT SIGNAL FOR ECM. Measure the voltage between ECM and chassis ground. Connector & terminal (B136) No. 5 (+) — Chassis ground (-):</p>	Is the voltage less than 0.2 V?	Go to step 7.	Go to step 6.
<p>6 CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.) Read the 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-34, Subaru Select Monitor.></p>	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 the poor contact in ECM connector.	Go to step 7.
<p>7 CHECK HARNESS BETWEEN ECM AND INTAKE AIR TEMPERATURE AND PRESSURE SENSOR CONNECTOR. 1)Turn the ignition switch to OFF. 2)Disconnect the connector from intake air temperature and pressure sensor. 3)Turn the ignition switch to ON. 4)Measure the voltage between intake air temperature sensor and pressure sensor connector and engine ground. Connector & terminal (E20) No. 3 (+) — Engine ground (-):</p>	Is the voltage more than 4.5 V?	Go to step 8.	Repair the 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 the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM and intake air temperature and pressure sensor connector. <i>Connector & terminal</i> <i>(B136) No. 16 — (E20) No. 1:</i>	Is the resistance less than 1 Ω ?	Go to step 9 .	Repair the 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 the resistance of harness between intake air temperature and pressure sensor connector and engine ground. <i>Connector & terminal</i> <i>(E20) No. 4 — Engine ground:</i>	Is the resistance more than 500 k Ω ?	Go to step 10 .	Repair the 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 the poor contact in intake air temperature and pressure sensor connector.	Replace the intake air temperature and pressure sensor. <Ref. to FU-37, Intake Air Temperature and Pressure Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

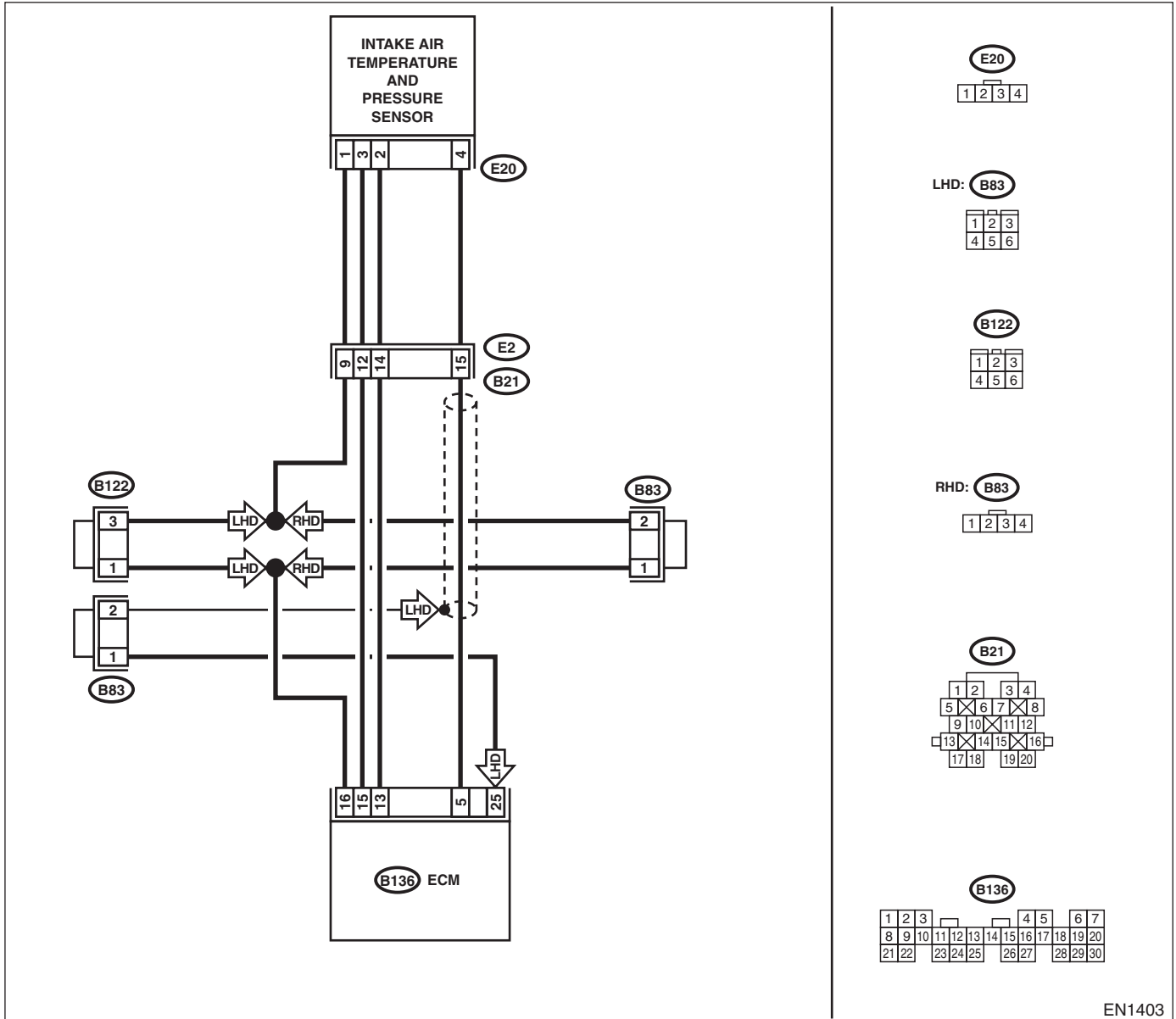
I: DTC P0108 — PRESSURE SENSOR CIRCUIT HIGH INPUT —

- DTC DETECTING CONDITION:
 - Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN-42, Operation.> .

- WIRING DIAGRAM:



EN1403

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK CURRENT DATA. 1)Start the 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-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 the 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 the 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 the 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 the 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 the 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-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 the poor contact in ECM connector.	Go to step 6 .
6 CHECK HARNESS BETWEEN ECM AND INTAKE AIR TEMPERATURE AND PRESSURE SENSOR CONNECTOR. 1)Turn the ignition switch to OFF. 2)Disconnect the connector from intake air temperature and pressure sensor. 3)Turn the ignition switch to ON. 4)Measure the 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 the 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 the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the 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 the 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 the 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 the 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 the poor contact in intake air temperature and pressure sensor connector.	Replace the intake air temperature and pressure sensor. <Ref. to FU-37, Intake Air Temperature and Pressure Sensor.>
10 CHECK HARNESS BETWEEN ECM AND INTAKE AIR TEMPERATURE AND PRESSURE SENSOR CONNECTOR. 1) Turn the ignition switch to OFF and Subaru Select Monitor or OBD-II general scan tool switch to OFF. 2) Disconnect the connector from intake air temperature and pressure sensor. 3) Turn the ignition switch to ON and Subaru Select Monitor or the OBD-II general scan tool switch to ON. 4) 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-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 the battery short circuit in harness between ECM and intake air temperature and pressure sensor connector.	Replace the intake air temperature and pressure sensor. <Ref. to FU-37, Intake Air Temperature and Pressure Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

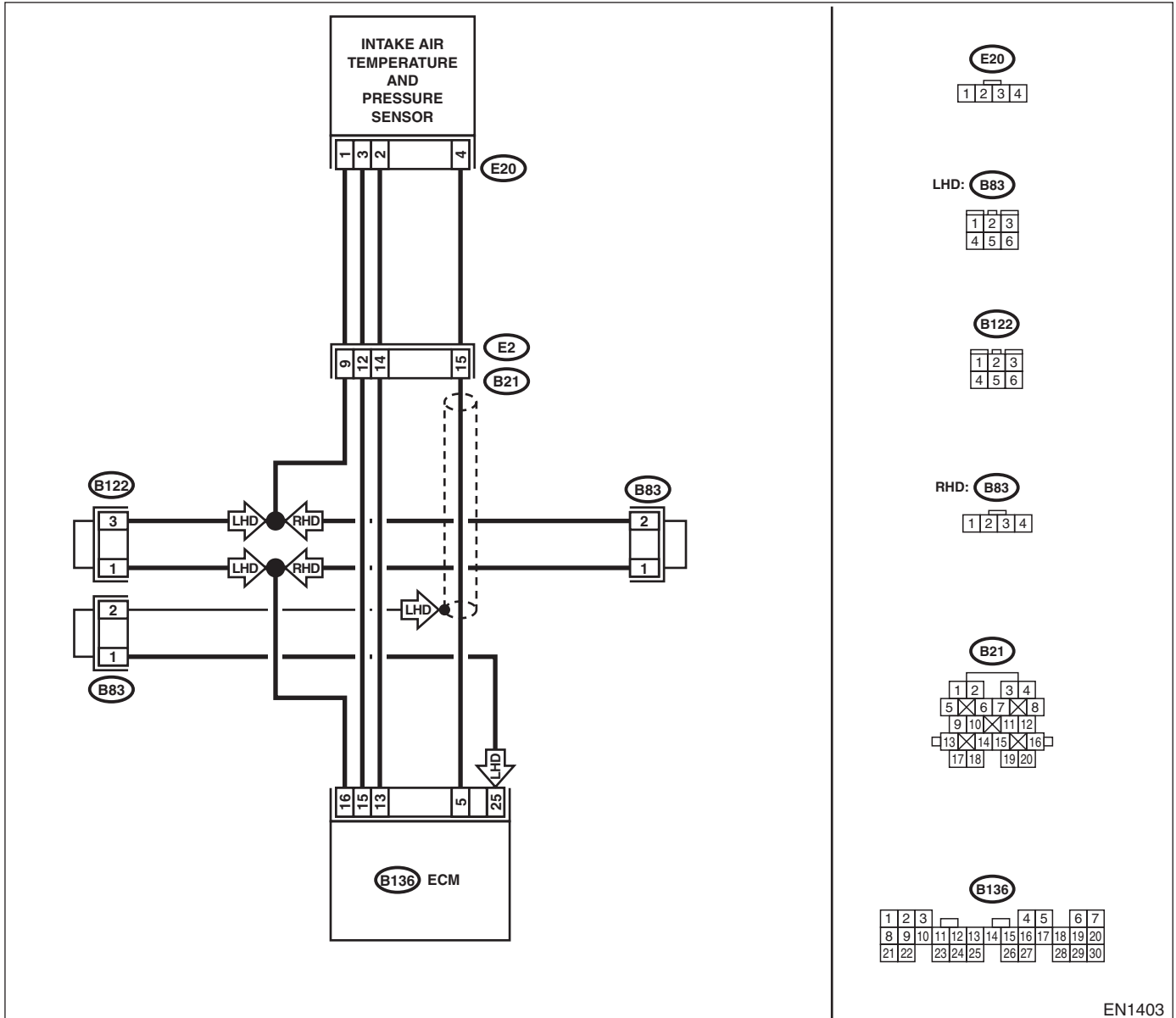
J: DTC P0111 — INTAKE AIR TEMPERATURE SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM —

- **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-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN1403

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN-83, 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 the 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-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 the intake air temperature and pressure sensor. <Ref. to FU-37, Intake Air Temperature and Pressure Sensor.>	Inspect the DTC P0125 using "17. List of Diagnostic Trouble Code (DTC)". <Ref. to EN-83, List of Diagnostic Trouble Code (DTC).>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

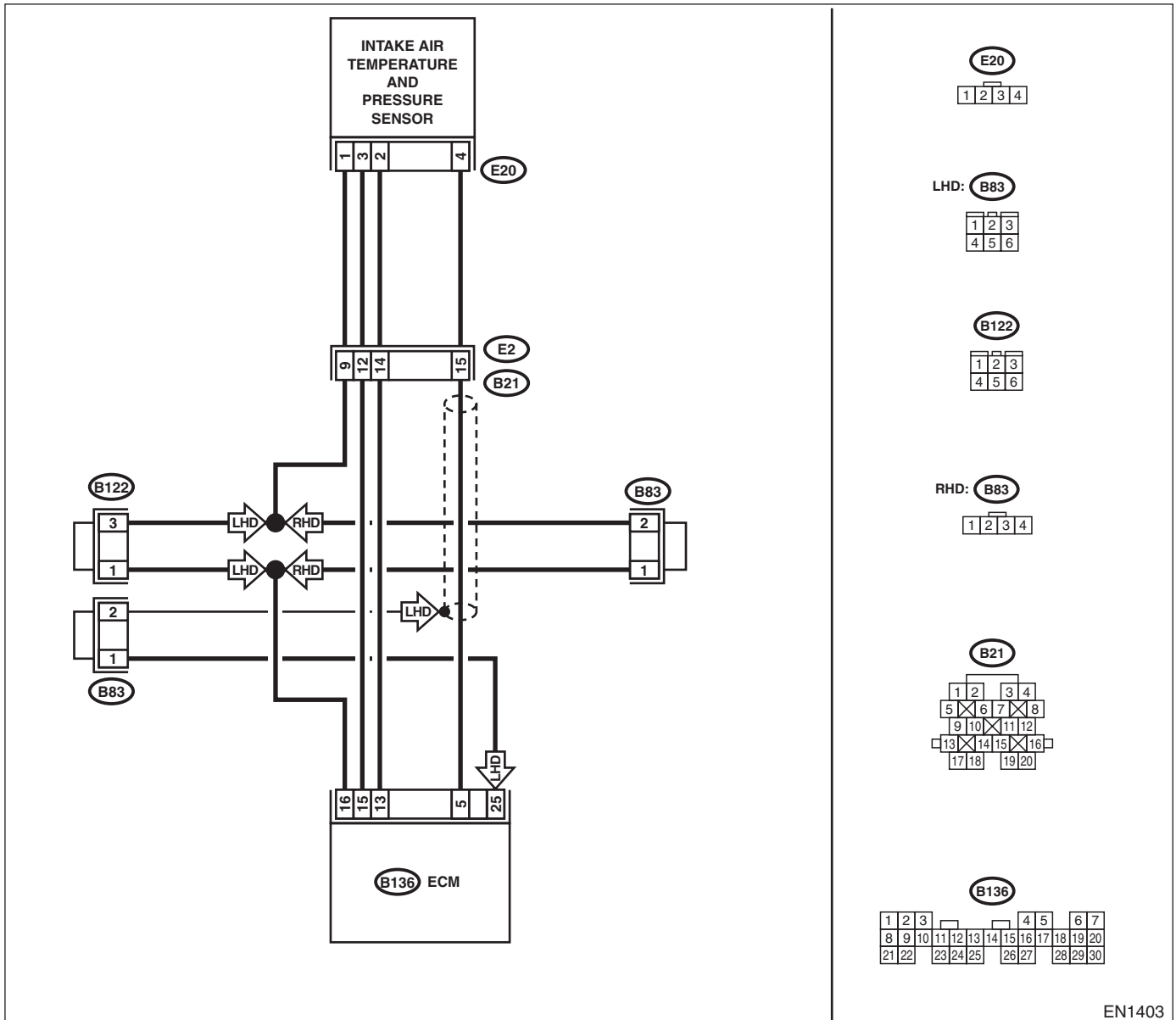
K: DTC P0112 — INTAKE AIR TEMPERATURE SENSOR CIRCUIT LOW INPUT

- **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-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>1</p> <p>CHECK CURRENT DATA.</p> <p>1) Start the engine.</p> <p>2) Read the data of intake air temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> • Subaru Select Monitor <p>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE".</p> <p><Ref. to EN-34, Subaru Select Monitor.></p> <ul style="list-style-type: none"> • OBD-II general scan tool <p>For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.</p>	<p>Is the value greater than 120°C (248°F)?</p>	<p>Go to step 2.</p>	<p>Repair the poor contact.</p> <p>NOTE:</p> <p>In this case, repair the following:</p> <ul style="list-style-type: none"> • Poor contact in intake air temperature and pressure sensor • Poor contact in ECM • Poor contact in coupling connector (B21) • Poor contact in joint connector (B83), (B122)
<p>2</p> <p>CHECK HARNESS BETWEEN INTAKE AIR TEMPERATURE AND PRESSURE SENSOR AND ECM CONNECTOR.</p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Disconnect the connector from intake air temperature and pressure sensor.</p> <p>3) Turn the ignition switch to ON.</p> <p>4) Read the data of intake air temperature sensor signal using Subaru Select Monitor or the OBD-II general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> • Subaru Select Monitor <p>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE".</p> <p><Ref. to EN-34, Subaru Select Monitor.></p> <ul style="list-style-type: none"> • OBD-II general scan tool <p>For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.</p>	<p>Is the value less than -40°C (-40°F)?</p>	<p>Replace the intake air temperature and pressure sensor. <Ref. to FU-37, Intake Air Temperature and Pressure Sensor.></p>	<p>Repair the ground short circuit in harness between intake air temperature sensor and ECM connector.</p>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
 ENGINE (DIAGNOSTICS)

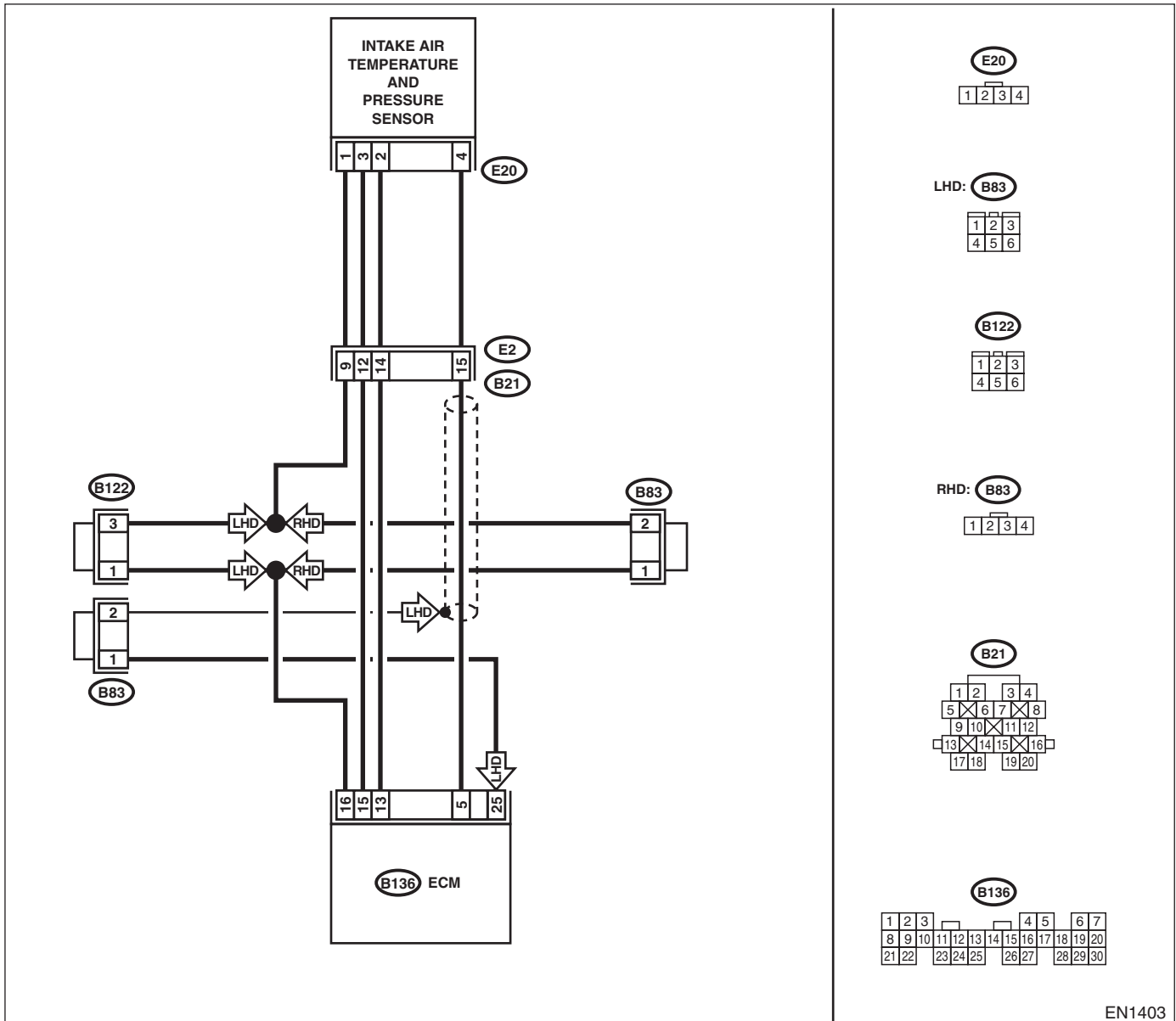
L: DTC P0113 — INTAKE AIR TEMPERATURE SENSOR CIRCUIT HIGH INPUT

- **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-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN-42, OPERATION, Inspection Mode.> .

• **WIRING DIAGRAM:**



DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>1</p> <p>CHECK CURRENT DATA. 1)Start the engine. 2)Read the data of intake air temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool.</p> <p>NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.</p>	<p>Is the value less than -40°C (-40°F)?</p>	<p>Go to step 2.</p>	<p>Repair the poor contact.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • 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)
<p>2</p> <p>CHECK HARNESS BETWEEN INTAKE AIR TEMPERATURE AND PRESSURE SENSOR AND ECM CONNECTOR. 1)Turn the ignition switch to OFF. 2)Disconnect the connector from intake air temperature and pressure sensor. 3)Measure the voltage between intake air temperature and pressure sensor connector and engine ground.</p> <p>Connector & terminal (E20) No. 2 (+) — Engine ground (-):</p>	<p>Is the voltage more than 10 V?</p>	<p>Repair the battery short circuit in harness between intake air temperature and pressure sensor and ECM connector.</p>	<p>Go to step 3.</p>
<p>3</p> <p>CHECK HARNESS BETWEEN INTAKE AIR TEMPERATURE AND PRESSURE SENSOR AND ECM CONNECTOR. 1)Turn the ignition switch to ON. 2)Measure the voltage between intake air temperature and pressure sensor connector and engine ground.</p> <p>Connector & terminal (E20) No. 2 (+) — Engine ground (-):</p>	<p>Is the voltage more than 10 V?</p>	<p>Repair the battery short circuit in harness between intake air temperature and pressure sensor and ECM connector.</p>	<p>Go to step 4.</p>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>4</p> <p>CHECK HARNESS BETWEEN INTAKE AIR TEMPERATURE AND PRESSURE SENSOR AND ECM CONNECTOR. Measure the voltage between intake air temperature and pressure sensor connector and engine ground. Connector & terminal (E20) No. 2 (+) — Engine ground (-):</p>	<p>Is the voltage more than 3 V?</p>	<p>Go to step 5.</p>	<p>Repair the harness and connector. NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • 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)
<p>5</p> <p>CHECK HARNESS BETWEEN INTAKE AIR TEMPERATURE AND PRESSURE SENSOR AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between intake air temperature and pressure sensor connector and engine ground. Connector & terminal (E20) No. 1 — Engine ground:</p>	<p>Is the resistance less than 5 Ω?</p>	<p>Replace the intake air temperature and pressure sensor. <Ref. to FU-37, Intake Air Temperature and Pressure Sensor.></p>	<p>Repair the harness and connector. NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • 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)

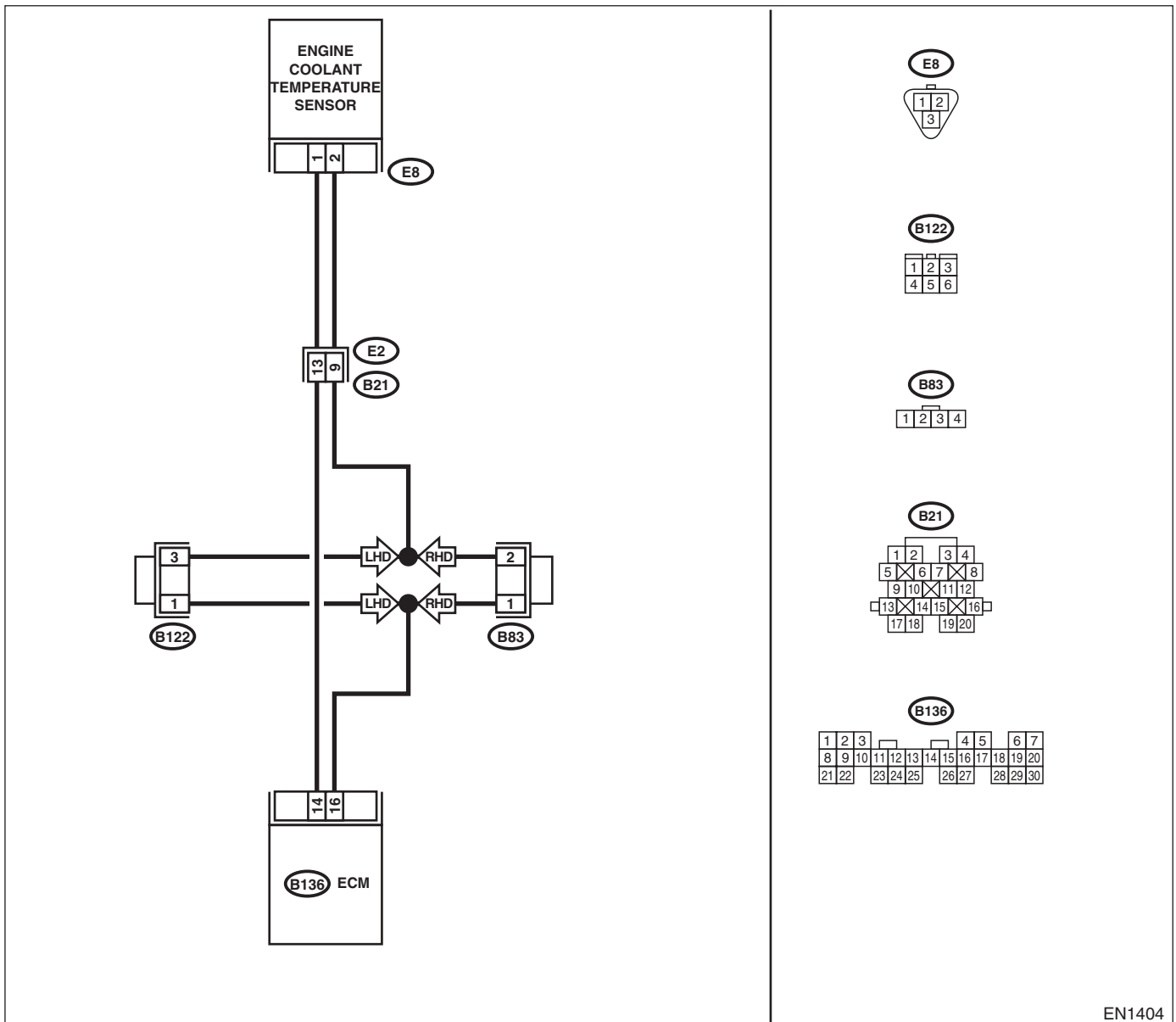
M: DTC P0117 — ENGINE COOLANT TEMPERATURE SENSOR CIRCUIT LOW INPUT —

- **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-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN-42, Operation.> .

• **WIRING DIAGRAM:**



DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>1</p> <p>CHECK CURRENT DATA. 1) Start the engine. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool.</p> <p>NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN-34, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.</p>	<p>Is the value greater than 150°C (302°F)?</p>	<p>Go to step 2.</p>	<p>Repair the poor contact.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Poor contact in engine coolant temperature sensor • Poor contact in ECM • Poor contact in coupling connector (B21) • Poor contact in joint connector (B83) or (B122)
<p>2</p> <p>CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from engine coolant temperature sensor. 3) Turn the ignition switch to ON. 4) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool.</p> <p>NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN-34, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.</p>	<p>Is the value less than -40°C (-40°F)?</p>	<p>Replace the engine coolant temperature sensor. <Ref. to FU-31, Engine Coolant Temperature Sensor.></p>	<p>Repair the ground short circuit in harness between engine coolant temperature sensor and ECM connector.</p>

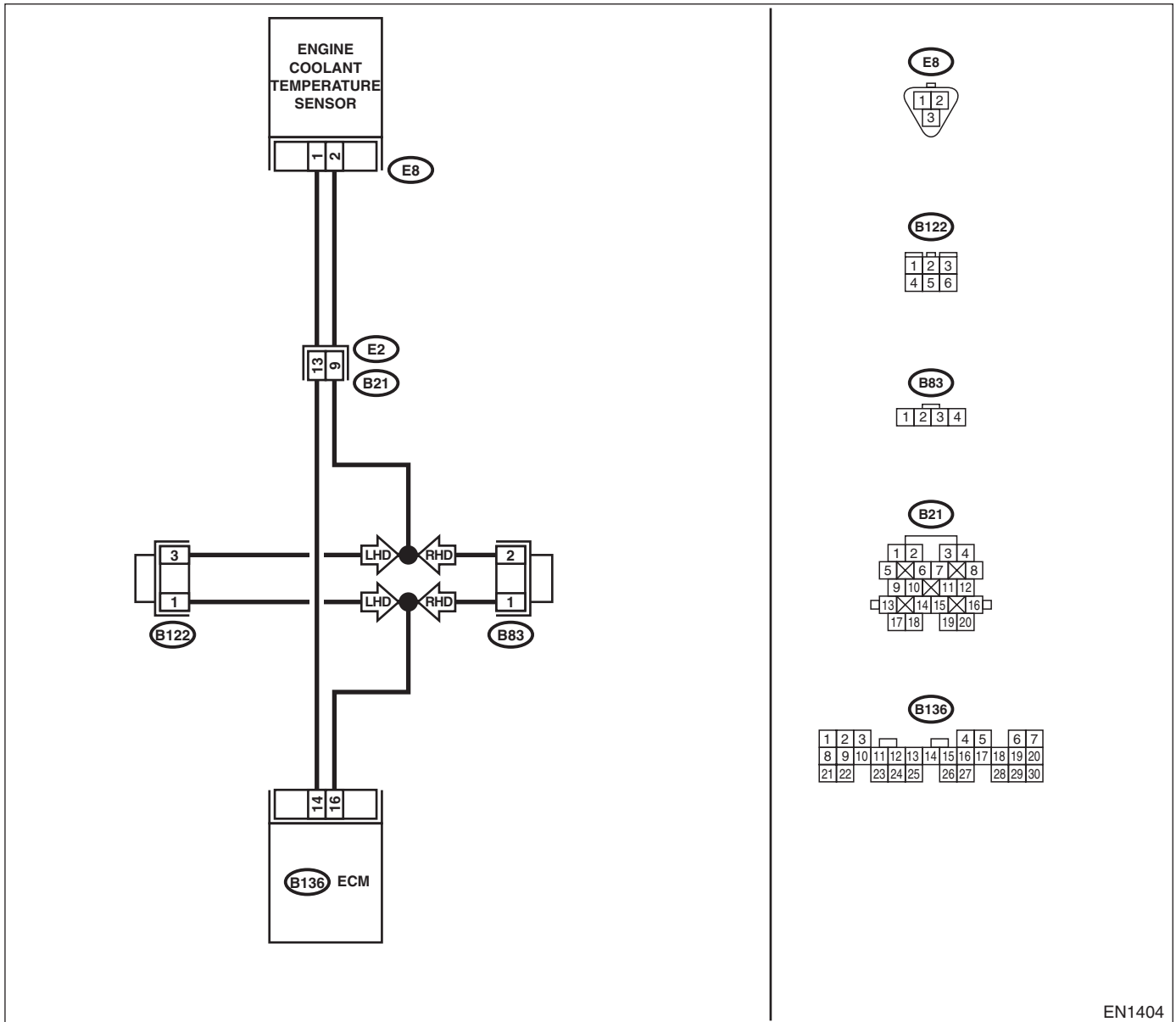
N: DTC P0118 — ENGINE COOLANT TEMPERATURE SENSOR CIRCUIT HIGH INPUT —

- **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-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN1404

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>1</p> <p>CHECK CURRENT DATA.</p> <p>1) Start the engine.</p> <p>2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> • Subaru Select Monitor <p>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE".</p> <p><Ref. to EN-34, Subaru Select Monitor.></p> <ul style="list-style-type: none"> • OBD-II general scan tool <p>For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.</p>	<p>Is the value less than -40°C (-40°F)?</p>	<p>Go to step 2.</p>	<p>Repair the poor contact.</p> <p>NOTE:</p> <p>In this case, repair the following:</p> <ul style="list-style-type: none"> • Poor contact in engine coolant temperature sensor • Poor contact in ECM • Poor contact in coupling connector (B21) • Poor contact in joint connector (B83) or (B122)
<p>2</p> <p>CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.</p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Disconnect the connector from engine coolant temperature sensor.</p> <p>3) Measure the voltage between engine coolant temperature sensor connector and engine ground.</p> <p>Connector & terminal (E8) No. 1 (+) — Engine ground (-):</p>	<p>Is the voltage more than 10 V?</p>	<p>Repair the battery short circuit in harness between ECM and engine coolant temperature sensor connector.</p>	<p>Go to step 3.</p>
<p>3</p> <p>CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.</p> <p>1) Turn the ignition switch to ON.</p> <p>2) Measure the voltage between engine coolant temperature sensor connector and engine ground.</p> <p>Connector & terminal (E8) No. 1 (+) — Engine ground (-):</p>	<p>Is the voltage more than 10 V?</p>	<p>Repair the battery short circuit in harness between ECM and engine coolant temperature sensor connector.</p>	<p>Go to step 4.</p>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>4</p> <p>CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR. Measure the voltage between engine coolant temperature sensor connector and engine ground. <i>Connector & terminal</i> <i>(E8) No. 1 (+) — Engine ground (-):</i></p>	<p>Is the voltage more than 4 V?</p>	<p>Go to step 5.</p>	<p>Repair the harness and connector. NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Open circuit in harness between ECM and engine coolant temperature sensor connector • Poor contact in engine coolant temperature sensor connector • Poor contact in ECM connector • Poor contact in coupling connector (B21) • Poor contact in joint connector (B83) or (B122)
<p>5</p> <p>CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between engine coolant temperature sensor connector and engine ground. <i>Connector & terminal</i> <i>(E8) No. 2 — Engine ground:</i></p>	<p>Is the resistance less than 5 Ω?</p>	<p>Replace the engine coolant temperature sensor. <Ref. to FU-31, Engine Coolant Temperature Sensor.></p>	<p>Repair the harness and connector. NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Open circuit in harness between ECM and engine coolant temperature sensor connector • Poor contact in engine coolant temperature sensor connector • Poor contact in ECM connector • Poor contact in coupling connector (B21) • Poor contact in joint connector (B83) or (B122)

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

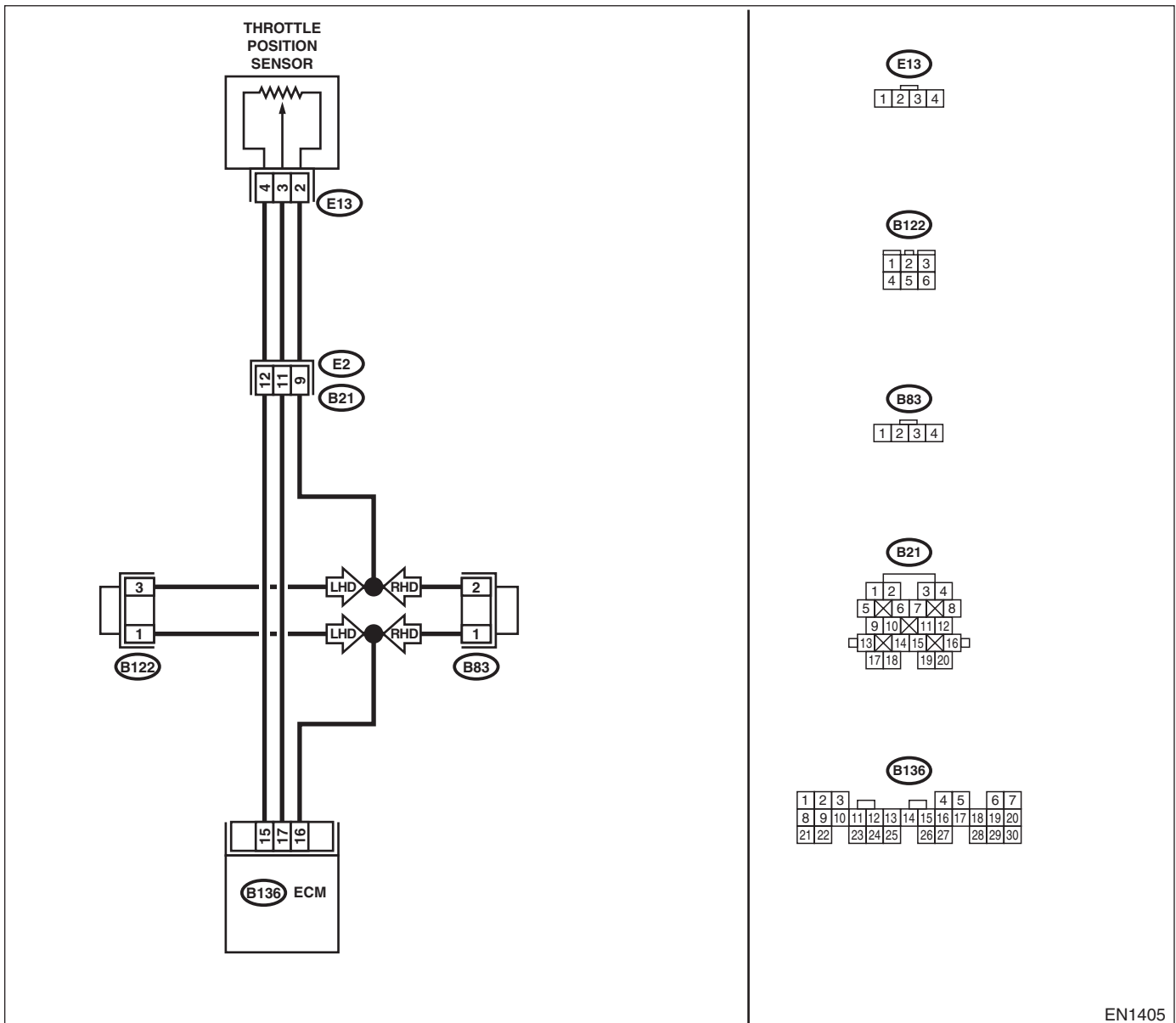
O: DTC P0121 — THROTTLE POSITION SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (HIGH INPUT) —

- **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-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN-42, OPERATION, Inspection Mode.> .

• **WIRING DIAGRAM:**



DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN-83, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0121.	Replace the throttle position sensor. <Ref. to FU-35, Throttle Position Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

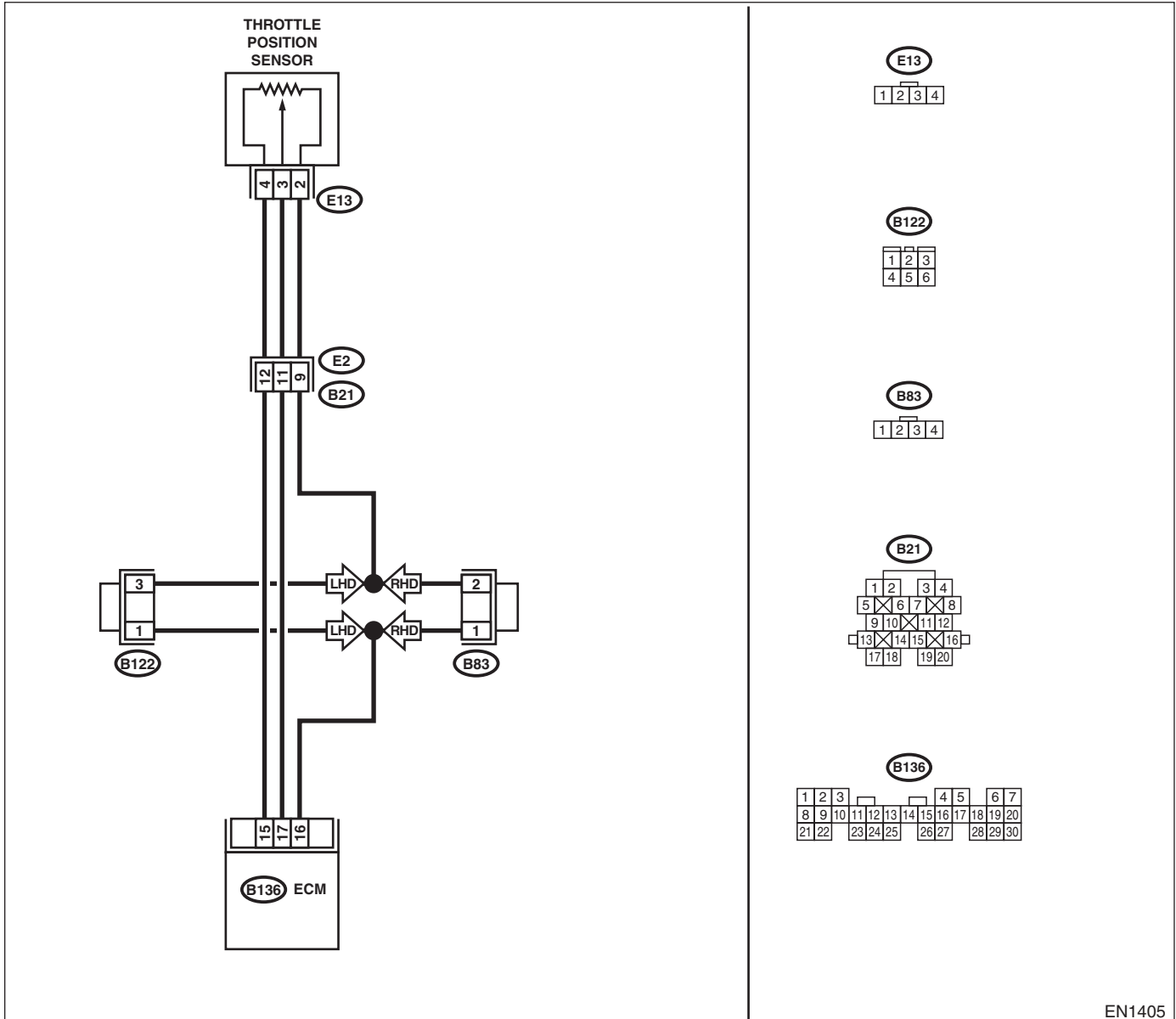
P: DTC P0122 — THROTTLE POSITION SENSOR CIRCUIT LOW INPUT —

- **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-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN-42, OPERATION, Inspection Mode.> .

• WIRING DIAGRAM:



EN1405

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>1</p> <p>CHECK CURRENT DATA. 1) Start the engine. 2) Read the data of throttle position sensor signal using Subaru Select Monitor or OBD-II general scan tool.</p> <p>NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN-34, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.</p>	<p>Is the value less than 0.1 V?</p>	<p>Go to step 2.</p>	<p>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.</p> <p>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)</p>
<p>2</p> <p>CHECK INPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground while throttle valve is fully closed.</p> <p>Connector & terminal (B136) No. 15 (+) — Chassis ground (-):</p>	<p>Is the voltage more than 4.5 V?</p>	<p>Go to step 4.</p>	<p>Go to step 3.</p>
<p>3</p> <p>CHECK INPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground.</p> <p>Connector & terminal (B136) No. 15 (+) — Chassis ground (-):</p>	<p>Does the voltage change more than 4.5 V by shaking harness and connector of ECM while monitoring the value with voltage meter?</p>	<p>Repair the poor contact in ECM connector.</p>	<p>Contact with your Subaru distributor service.</p> <p>NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.</p>
<p>4</p> <p>CHECK INPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground.</p> <p>Connector & terminal (B136) No. 17 (+) — Chassis ground (-):</p>	<p>Is the voltage less than 0.1 V?</p>	<p>Go to step 6.</p>	<p>Go to step 5.</p>
<p>5</p> <p>CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.) Measure the voltage between ECM connector and chassis ground.</p>	<p>Does the voltage change more than 0.1 V by shaking harness and connector of ECM while monitoring the value with Subaru Select Monitor?</p>	<p>Repair the poor contact in ECM connector.</p>	<p>Go to step 6.</p>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>6</p> <p>CHECK HARNESS BETWEEN ECM AND THROTTLE POSITION SENSOR CONNECTOR.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connectors from throttle position sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between throttle position sensor connector and engine ground.</p> <p>Connector & terminal (E13) No. 4 (+) — Engine ground (-):</p>	<p>Is the voltage more than 4.5 V?</p>	<p>Go to step 7.</p>	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Open circuit in harness between 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)
<p>7</p> <p>CHECK HARNESS BETWEEN ECM AND THROTTLE POSITION SENSOR CONNECTOR.</p> <p>1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between ECM connector and throttle position sensor connector.</p> <p>Connector & terminal (B136) No. 17 — (E13) No. 3:</p>	<p>Is the resistance less than 1 Ω?</p>	<p>Go to step 8.</p>	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Open circuit in harness between throttle position sensor and ECM connector • Poor contact in ECM connector • Poor contact in throttle position sensor connector • Poor contact in coupling connector (B21)
<p>8</p> <p>CHECK HARNESS BETWEEN ECM AND THROTTLE POSITION SENSOR CONNECTOR.</p> <p>Measure the resistance of harness between throttle position sensor connector and engine ground.</p> <p>Connector & terminal (E13) No. 3 — Engine ground:</p>	<p>Is the resistance less than 10 Ω?</p>	<p>Repair the ground short circuit in harness between throttle position sensor and ECM connector.</p>	<p>Go to step 9.</p>
<p>9</p> <p>CHECK POOR CONTACT.</p> <p>Check poor contact in throttle position sensor connector.</p>	<p>Is there poor contact in throttle position sensor connector?</p>	<p>Repair the poor contact in throttle position sensor connector.</p>	<p>Replace the throttle position sensor. <Ref. to FU-35, Throttle Position Sensor.></p>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

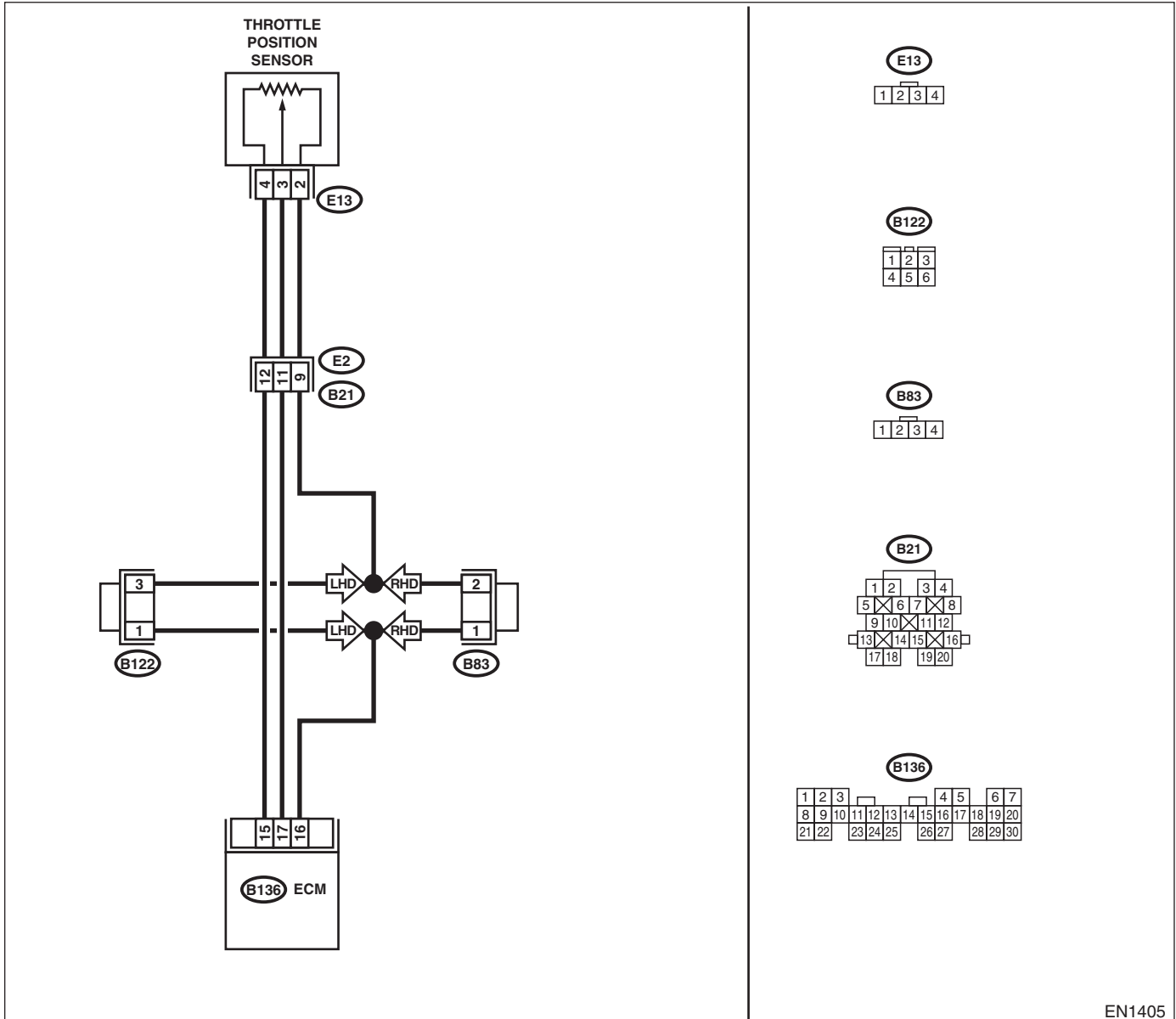
Q: DTC P0123 — THROTTLE POSITION SENSOR CIRCUIT HIGH INPUT —

- **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-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN-42, OPERATION, Inspection Mode.> .

• WIRING DIAGRAM:



EN1405

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>1</p> <p>CHECK CURRENT DATA.</p> <p>1)Start the engine. 2)Read the data of throttle position sensor signal using Subaru Select Monitor or OBD-II general scan tool.</p> <p>NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.</p>	<p>Is the value more than 4.9 V?</p>	<p>Go to step 2.</p>	<p>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.</p> <p>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)</p>
<p>2</p> <p>CHECK HARNESS BETWEEN THROTTLE POSITION SENSOR AND ECM CONNECTOR.</p> <p>1)Turn the ignition switch to OFF. 2)Disconnect the connector from throttle position sensor. 3)Measure the resistance of harness between throttle position sensor connector and engine ground.</p> <p>Connector & terminal (E13) No. 2 — Engine ground:</p>	<p>Is the resistance less than 5 Ω?</p>	<p>Go to step 3.</p>	<p>Repair the harness and connector.</p> <p>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) or (B122)</p>
<p>3</p> <p>CHECK HARNESS BETWEEN THROTTLE POSITION SENSOR AND ECM CONNECTOR.</p> <p>1)Turn the ignition switch to ON. 2)Measure the voltage between throttle position sensor connector and engine ground.</p> <p>Connector & terminal (E13) No. 3 (+) — Engine ground (-):</p>	<p>Is the voltage more than 4.9 V?</p>	<p>Repair the battery short circuit in harness between throttle position sensor and ECM connector. After repair, replace the ECM. <Ref. to FU-51, Engine Control Module.></p>	<p>Replace the throttle position sensor. <Ref. to FU-35, Throttle Position Sensor.></p>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

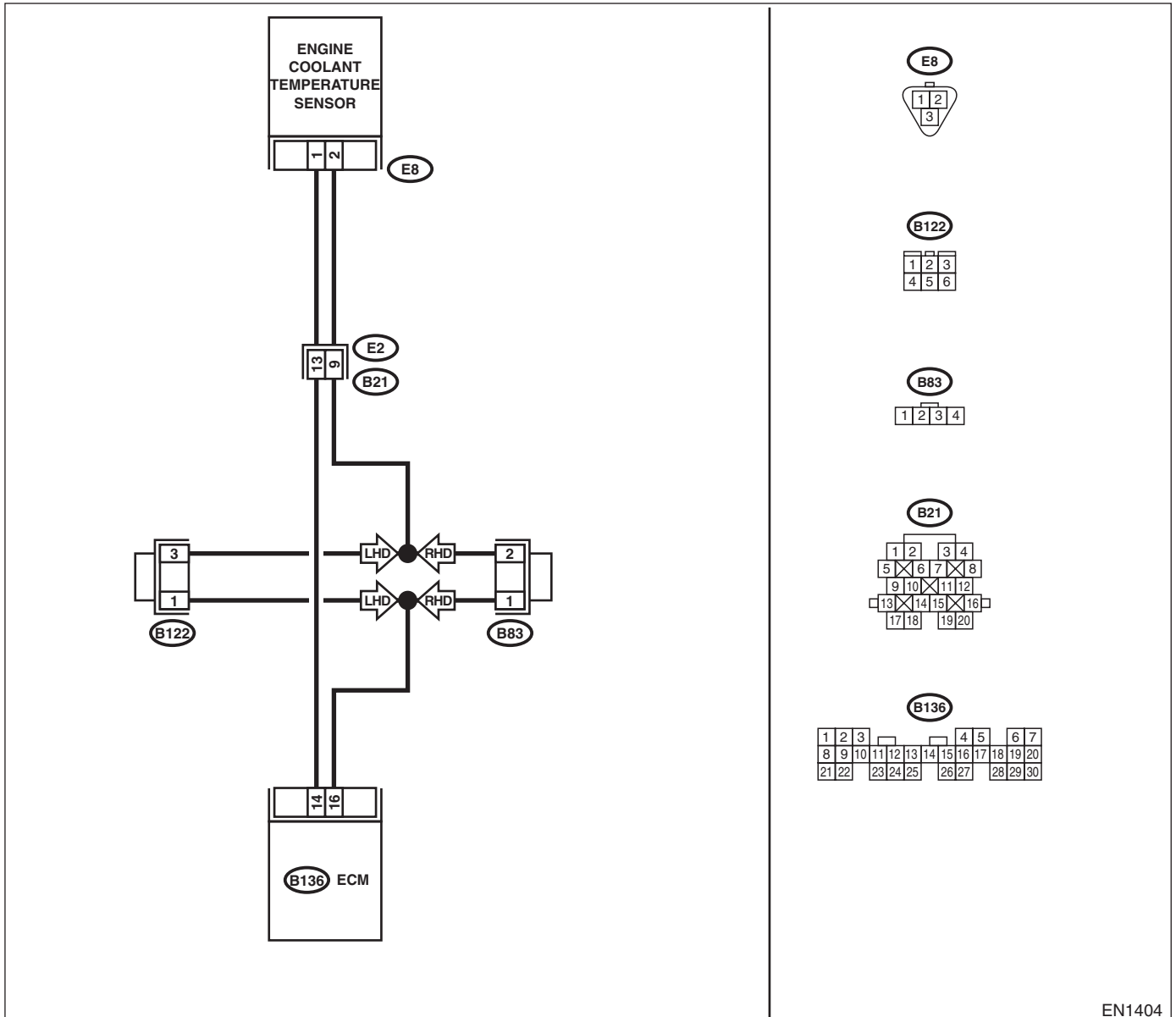
R: DTC P0125 — INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL —

- **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-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN1404

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1	CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN-83, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect P0125.
2	CHECK THERMOSTAT.	Does thermostat remain opened?	Go to step 2. Replace the thermostat. <Ref. to CO-37, Thermostat.> Replace the engine coolant temperature sensor. <Ref. to FU-31, Engine Coolant Temperature Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

S: DTC P0130 — FRONT OXYGEN (A/F) SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (LEAN) —

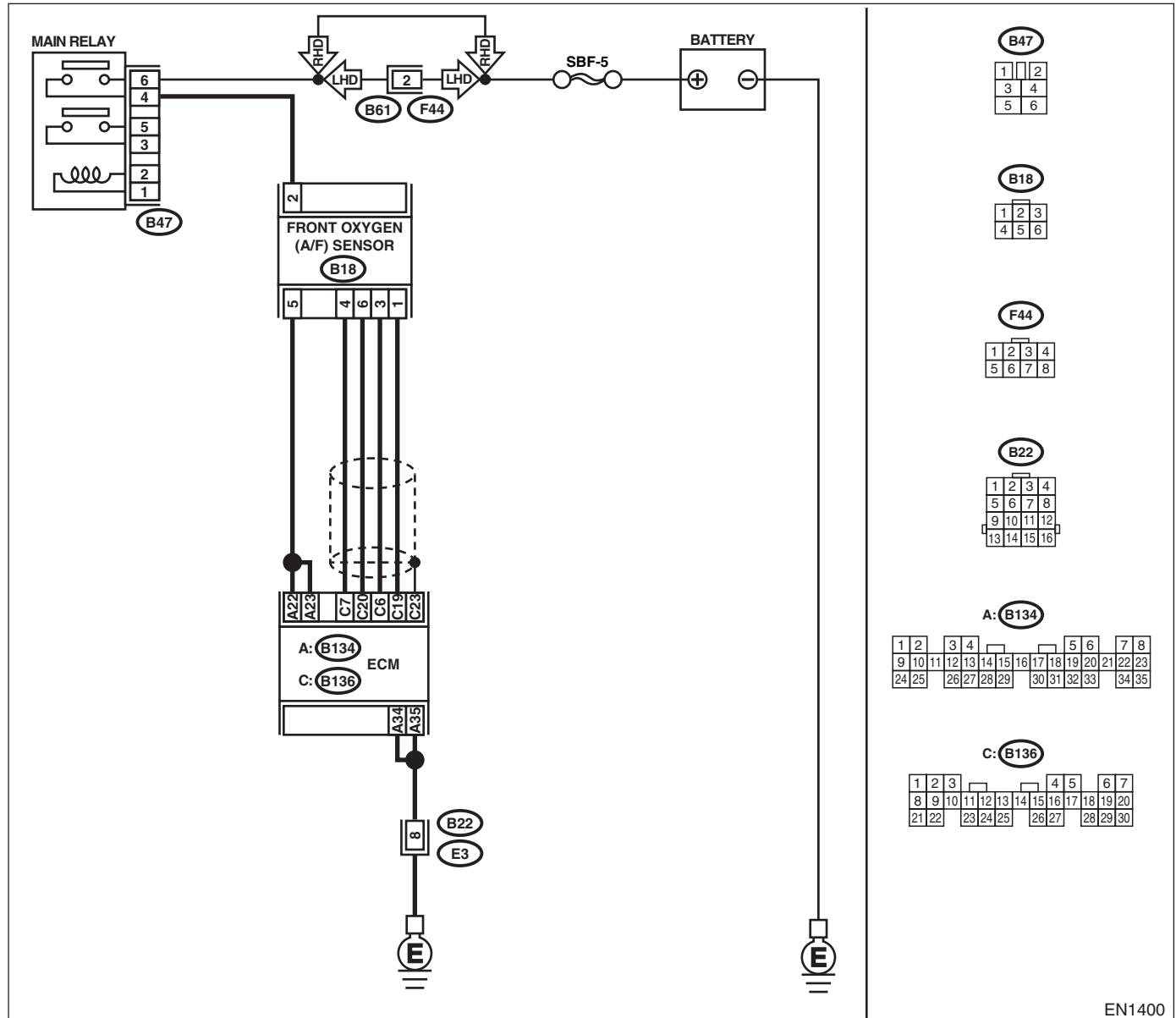
• DTC DETECTING CONDITION:

- Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN-42, OPERATION, Inspection Mode.> .

• WIRING DIAGRAM:



EN1400

Step	Check	Yes	No
1	CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN-83, List of Diagnostic Trouble Code (DTC).>	Go to step 2.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>2</p> <p>CHECK FRONT OXYGEN (A/F) SENSOR DATA. 1)Start the 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 the data of front oxygen (A/F) sensor signal using Subaru Select Monitor or OBD-II general scan tool.</p> <p>NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.</p>	<p>Is the value equal to or more than 0.85 and equal to less than 1.15 in idling?</p>	<p>Go to step 3.</p>	<p>Go to step 4.</p>
<p>3</p> <p>CHECK FRONT OXYGEN (A/F) SENSOR DATA. Race the engine at speeds from idling to 5,000 rpm for a total of 5 cycles.</p> <p>NOTE: To increase the engine speed to 5,000 rpm, slowly depress accelerator pedal, taking approximately 5 seconds, and quickly release accelerator pedal to decrease engine speed.</p>	<p>Is the value more than 1.1 for a moment?</p>	<p>Go to step 6.</p>	<p>Go to step 4.</p>
<p>4</p> <p>CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR. 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ECM and front oxygen (A/F) sensor connector. 3)Measure the resistance between ECM and front oxygen (A/F) sensor.</p> <p>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:</p>	<p>Is the resistance less than 5 Ω?</p>	<p>Go to step 5.</p>	<p>Repair the open circuit between ECM and front oxygen (A/F) sensor.</p>
<p>5</p> <p>CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR. Measure the resistance between ECM and chassis ground.</p> <p>Connector & terminals (B136) No. 6 — Chassis ground: (B136) No. 7 — Chassis ground: (B136) No. 19 — Chassis ground: (B136) No. 20 — Chassis ground:</p>	<p>Is the resistance more than 1 MΩ?</p>	<p>Go to step 6.</p>	<p>Repair the ground short circuit between ECM and front oxygen (A/F) sensor.</p>
<p>6</p> <p>CHECK EXHAUST SYSTEM. Check the exhaust system parts.</p> <p>NOTE: Check the following items. •Loose installation of portions •Damage (crack, hole etc.) of parts •Looseness of front oxygen (A/F) sensor •Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor</p>	<p>Is there a fault in exhaust system?</p>	<p>Repair or replace the faulty parts.</p>	<p>Replace the front oxygen (A/F) sensor. <Ref. to FU-47, Front Oxygen (A/F) Sensor.></p>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

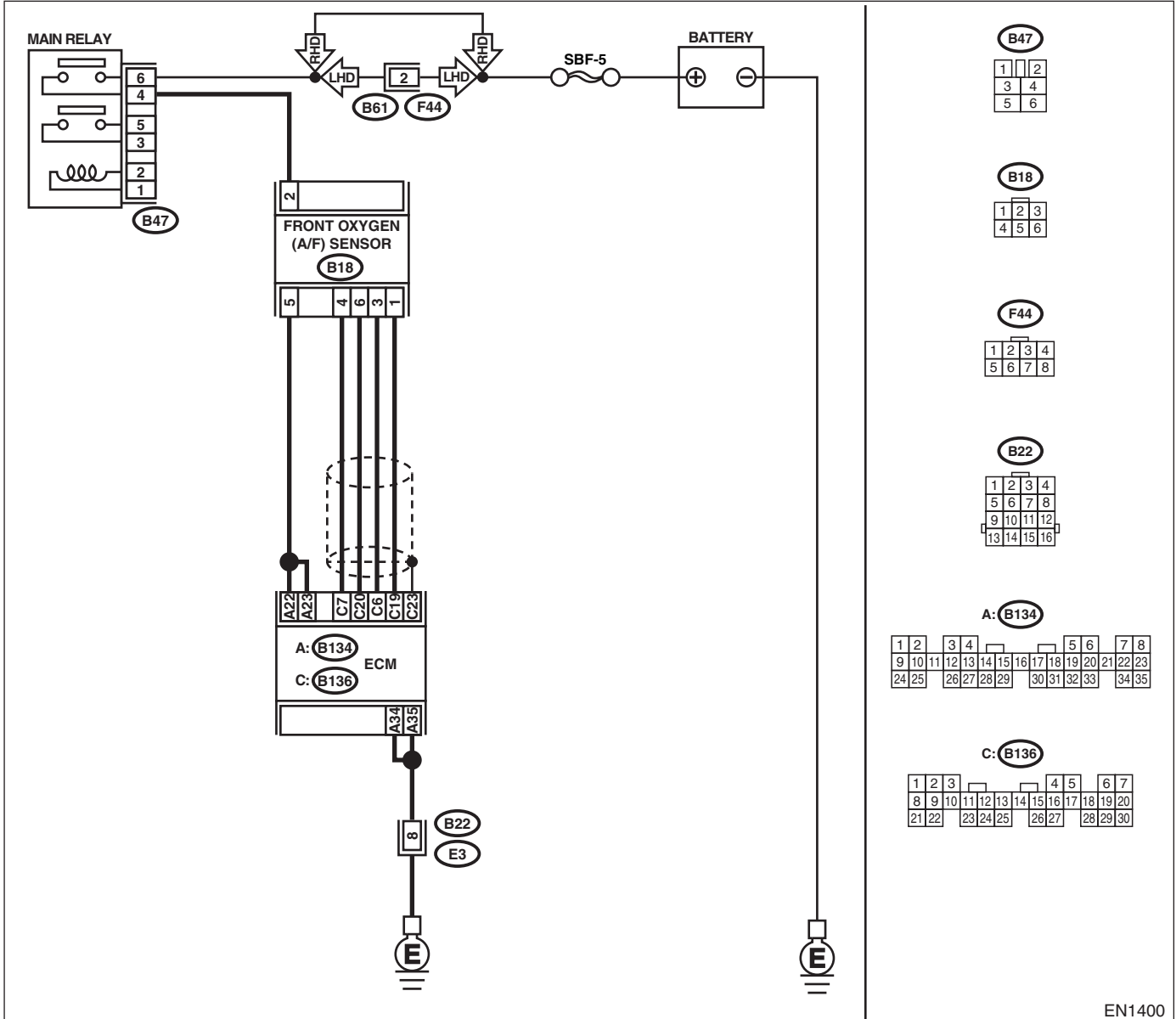
T: DTC P0131 — FRONT OXYGEN (A/F) SENSOR CIRCUIT MALFUNCTION (OPEN CIRCUIT) —

- DTC DETECTING CONDITION:
 - Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN-42, OPERATION, Inspection Mode.> .

- WIRING DIAGRAM:



EN1400

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>1</p> <p>CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and front oxygen (A/F) sensor connector. 3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector.</p> <p>Connector & terminal <i>(B136) No. 6 — (E24) No. 3:</i> <i>(B136) No. 7 — (E24) No. 4:</i> <i>(B136) No. 19 — (E24) No. 1:</i> <i>(B136) No. 20 — (E24) No. 6:</i></p>	<p>Is the resistance less than 1 Ω?</p>	<p>Go to step 2.</p>	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Open circuit in harness between ECM and front oxygen (A/F) sensor connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector
<p>2</p> <p>CHECK POOR CONTACT.</p> <p>Check poor contact in front oxygen (A/F) sensor connector.</p>	<p>Is there poor contact in front oxygen (A/F) sensor connector?</p>	<p>Repair the poor contact in front oxygen (A/F) sensor connector.</p>	<p>Replace the front oxygen (A/F) sensor. <Ref. to FU-47, Front Oxygen (A/F) Sensor.></p>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

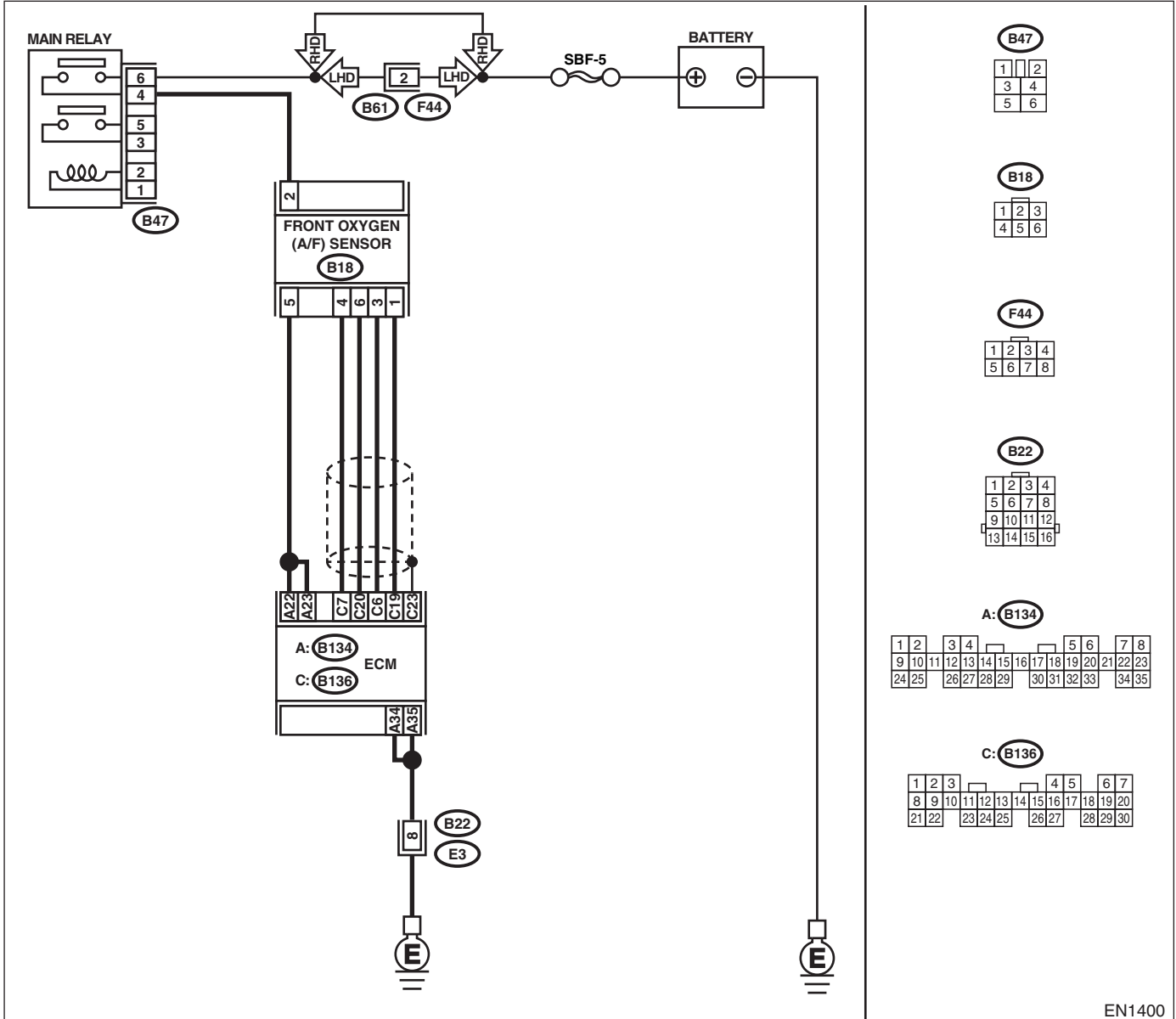
U: DTC P0132 — FRONT OXYGEN (A/F) SENSOR CIRCUIT MALFUNCTION (SHORT CIRCUIT) —

- DTC DETECTING CONDITION:
 - Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN-42, OPERATION, Inspection Mode.> .

- WIRING DIAGRAM:



EN1400

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>1</p> <p>CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM connector and chassis ground.</p> <p>Connector & terminal</p> <p>(B136) No. 6 — Chassis ground: (B136) No. 7 — Chassis ground: (B136) No. 19 — Chassis ground: (B136) No. 20 — Chassis ground:</p>	<p>Is the resistance more than 10 Ω?</p>	<p>Replace the front oxygen (A/F) sensor. <Ref. to FU-47, Front Oxygen (A/F) Sensor.></p>	<p>Repair the ground short circuit in harness between ECM and front oxygen (A/F) sensor connector.</p>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

V: DTC P0133 — FRONT OXYGEN (A/F) SENSOR CIRCUIT SLOW RESPONSE

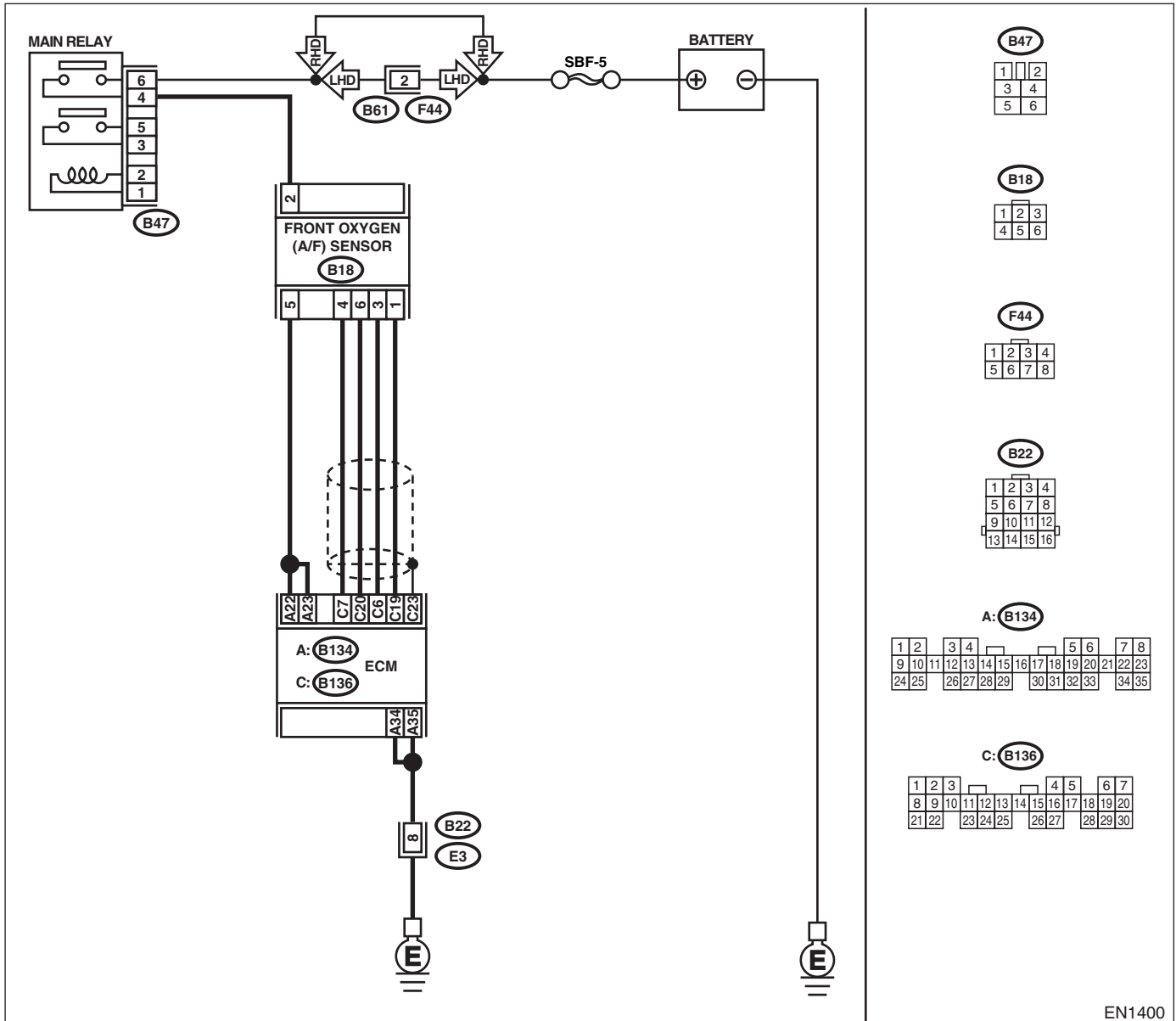
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN-49, Operation.> and Inspection Mode <Ref. to EN-42, OPERATION, Inspection Mode.> .

WIRING DIAGRAM:



EN1400

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1	CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN-83, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0133.	Go to step 2.
2	CHECK EXHAUST SYSTEM. NOTE: Check the following items. <ul style="list-style-type: none">•Loose installation of front portion of exhaust pipe onto cylinder heads•Loose connection between front exhaust pipe and front catalytic converter•Damage of exhaust pipe resulting in a hole	Is there a fault in exhaust system? Repair the exhaust system.	Replace the front oxygen (A/F) sensor. <Ref. to FU-47, Front Oxygen (A/F) Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

W: DTC P0136 — REAR OXYGEN SENSOR CIRCUIT MALFUNCTION —

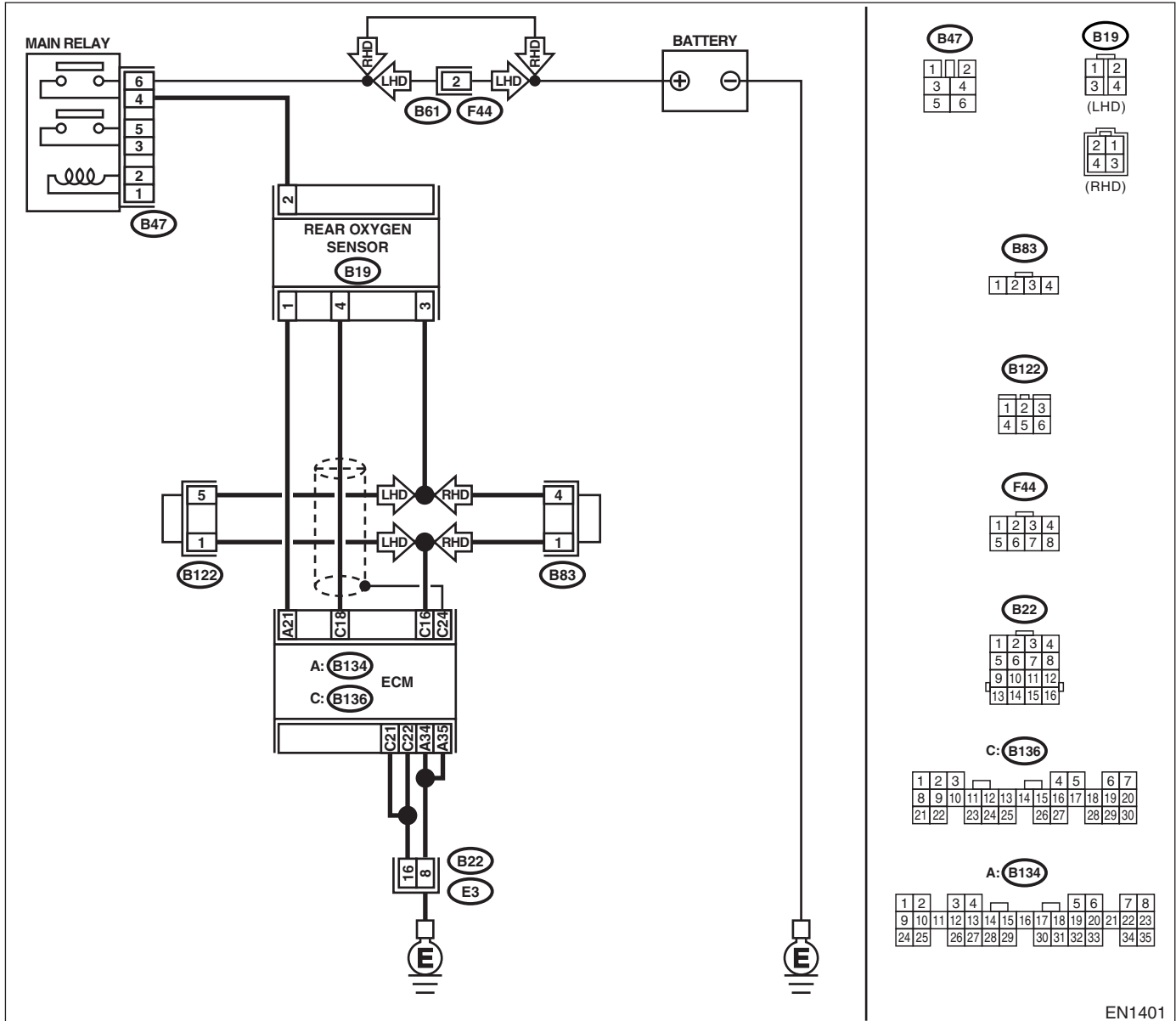
• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN-42, OPERATION, Inspection Mode.> .

• WIRING DIAGRAM:



EN1401

Step	Check	Yes	No	
1	CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (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
<p>2</p> <p>CHECK FAILURE CAUSE OF P0131 or P0132. Inspect the DTC P0131 or P0132 using "17. List of Diagnostic Trouble Code (DTC)". <Ref. to EN-83, List of Diagnostic Trouble Code (DTC).></p>	Is the failure cause of P0131 or P0132 in the fuel system?	Check the fuel system. NOTE: In this case, it is not necessary to inspect DTC P0136.	Go to step 3.
<p>3</p> <p>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 2 minutes. 2) Read the 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-34, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.</p>	Does the value fluctuate?	Go to step 7.	Go to step 4.
<p>4</p> <p>CHECK REAR OXYGEN SENSOR DATA. Read the data of rear oxygen sensor signal using Subaru Select Monitor or OBD-II general scan tool. 1) Keep the engine speed at 4,500 rpm for 5 seconds. 2) Release the accelerator quickly and idle the engine for 10 seconds. 3) Repeat this cycle for three times.</p>	Is the value fixed between 0.2 and 0.4 V?	Go to step 5.	Replace the rear oxygen sensor. <Ref. to FU-47, Front Oxygen (A/F) Sensor.>
<p>5</p> <p>CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and rear oxygen sensor. 3) Measure the resistance of harness between ECM and rear oxygen sensor connector. Connector & terminal (B136) No. 16 — (B19) No. 3:</p>	Is the resistance more than 3 Ω?	Repair the open circuit in harness between ECM and rear oxygen sensor connector.	Go to step 6.
<p>6</p> <p>CHECK GROUND CIRCUIT ON ECM. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM connector and chassis ground. Connector & terminal (B136) No. 21 — Chassis ground:</p>	Is the resistance less than 5 Ω?	Go to step 8.	Go to step 7.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
7 CHECK GROUND CIRCUIT OF ECM. 1)Repair the harness and connector. 2)Measure the resistance of harness between ECM connector and chassis ground. Connector & terminal (B136) No. 22 — Chassis ground:	Is the resistance less than 5 Ω ?	Go to step 8 .	Repair the harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between ECM and engine ground terminal • Poor contact in ECM connector • Poor contact in coupling connector (B22)
8 CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR. 1)Turn the ignition switch to OFF. 2)Disconnect the connector from rear oxygen sensor. 3)Turn the ignition switch to ON. 4)Measure the voltage between rear oxygen sensor harness connector and engine ground or chassis ground. Connector & terminal (B19) No. 4 (+) — Engine ground (-):	Is the voltage more than 0.2 V?	Replace the rear oxygen sensor. <Ref. to FU-47, Front Oxygen (A/F) Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor connector • Poor contact in ECM connector
9 CHECK EXHAUST SYSTEM. Check the exhaust system parts. NOTE: Check the following items. <ul style="list-style-type: none"> •Loose installation of portions •Damage (crack, hole etc.) of parts •Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor 	Is there a fault in exhaust system?	Repair or replace the faulty parts.	Replace the rear oxygen sensor. <Ref. to FU-47, Front Oxygen (A/F) Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

X: DTC P0139 — REAR OXYGEN SENSOR CIRCUIT SLOW RESPONSE —

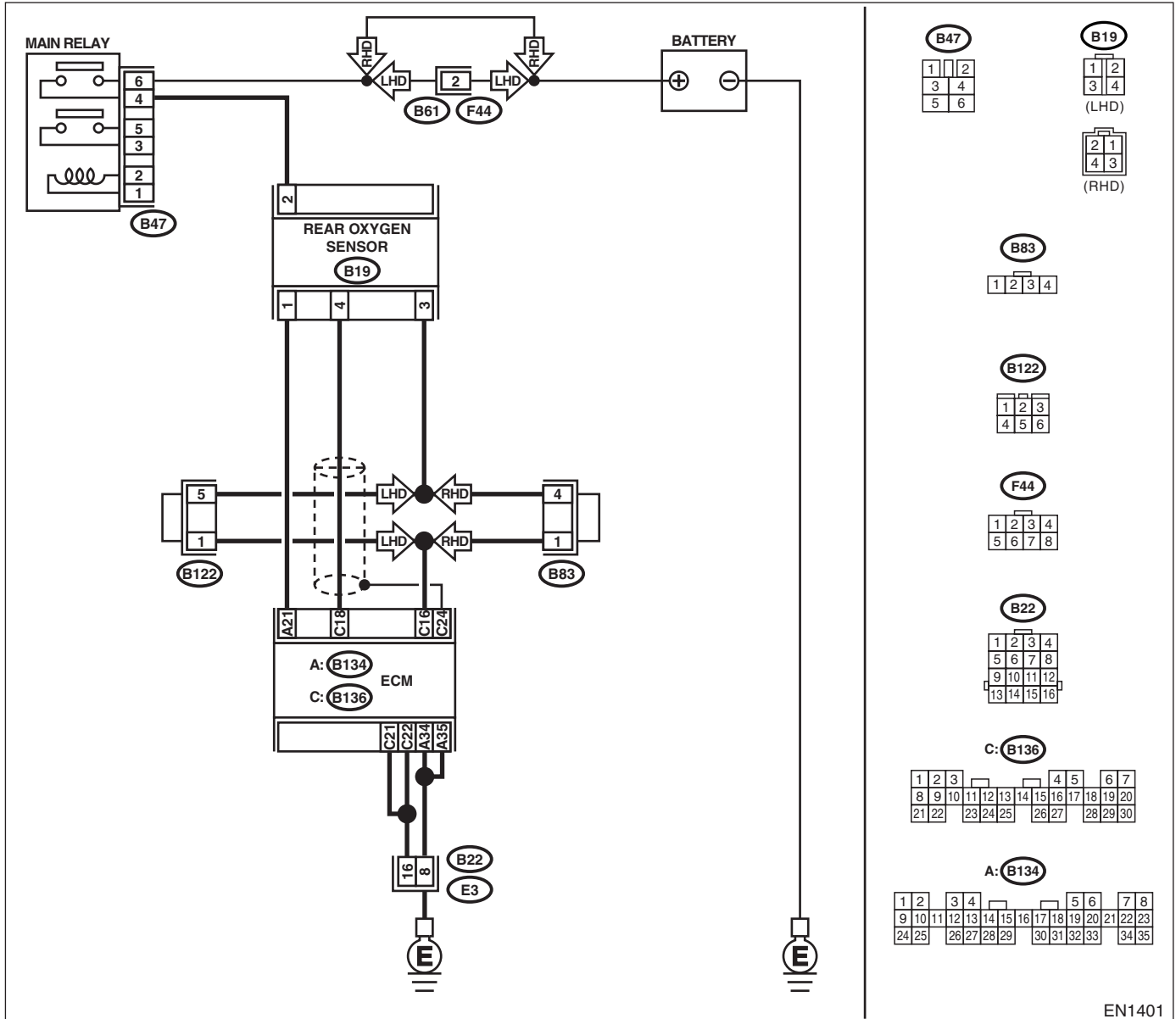
• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN-42, OPERATION, Inspection Mode.> .

• WIRING DIAGRAM:



EN1401

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN-83, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0139.	Replace the rear oxygen sensor. <Ref. to FU-47, Front Oxygen (A/F) Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

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-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN-42, OPERATION, Inspection Mode.> .

Step	Check	Yes	No	
1	CHECK EXHAUST SYSTEM.	Are there holes or loose bolts on exhaust system?	Repair the 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 the 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 the fuel pressure. (1) Disconnect the connector from fuel pump relay. (2) Start the engine and run it until it stalls. (3) After the engine stalls, crank it for 5 more seconds. (4) Turn the ignition switch to OFF. 2)Connect the connector to fuel pump relay. 3)Disconnect the fuel delivery hose from fuel filter, and connect fuel pressure gauge. 4)Install the fuel filler cap. 5)Start the engine and idle while gear position is neutral. 6)Measure the fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold. Warning: Before removing the fuel pressure gauge, release the fuel pressure. NOTE: If the fuel pressure does not increase, squeeze the fuel return hose 2 to 3 times, then measure fuel pressure again.	Is the fuel pressure between 284 — 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: • Clogged fuel supply line • Improper fuel pump discharge

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>4</p> <p>CHECK FUEL PRESSURE. After connecting the pressure regulator vacuum hose, measure the fuel pressure.</p> <p>Warning: Before removing the fuel pressure gauge, release fuel pressure.</p> <p>NOTE: •If the fuel pressure does not increase, squeeze the fuel return hose 2 to 3 times, then measure fuel pressure again. •If out of specification as measured at this step, check or replace the pressure regulator and pressure regulator vacuum hose.</p>	<p>Is the fuel pressure between 206 — 235 kPa (2.1 — 2.4 kg/cm², 30 — 34 psi)?</p>	<p>Go to step 5.</p>	<p>Repair the following items. Fuel pressure too high:</p> <ul style="list-style-type: none"> • Faulty pressure regulator • Clogged fuel return line or bent hose <p>Fuel pressure too low:</p> <ul style="list-style-type: none"> • Faulty pressure regulator • Improper fuel pump discharge • Clogged fuel supply line
<p>5</p> <p>CHECK ENGINE COOLANT TEMPERATURE SENSOR. 1)Start the engine and warm-up completely. 2)Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool.</p> <p>NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.</p>	<p>Is the temperature between 70°C (158°F) and 100°C (212°F)?</p>	<p>Go to step 6.</p>	<p>Replace the engine coolant temperature sensor. <Ref. to FU-31, Engine Coolant Temperature Sensor.></p>
<p>6</p> <p>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 the A/C switch to OFF. 4)Turn all accessory switches to OFF. 5)Read the data of intake manifold pressure sensor signal using Subaru Select Monitor or OBD-II general scan tool.</p> <p>NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.</p> <p>Specification:</p> <p>Idling 24.0 — 41.3 kPa (180 — 310 mmHg, 7.09 — 12.20 inHg)</p> <p>Ignition ON 73.3 — 106.6 kPa (550 — 800 mmHg, 21.65 — 31.50 inHg)</p>	<p>Is the voltage within the specifications?</p>	<p>Contact with your Subaru distributor service.</p> <p>NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.</p>	<p>Replace the intake air temperature and pressure sensor. <Ref. to FU-37, Intake Air Temperature and Pressure Sensor.></p>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Z: DTC P0301 — CYLINDER 1 MISFIRE DETECTED —

NOTE:

For the diagnostic procedure, refer to DTC P0304. <Ref. to EN-160, 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-160, 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-160, DTC P0304 — CYLINDER 4 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

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.)

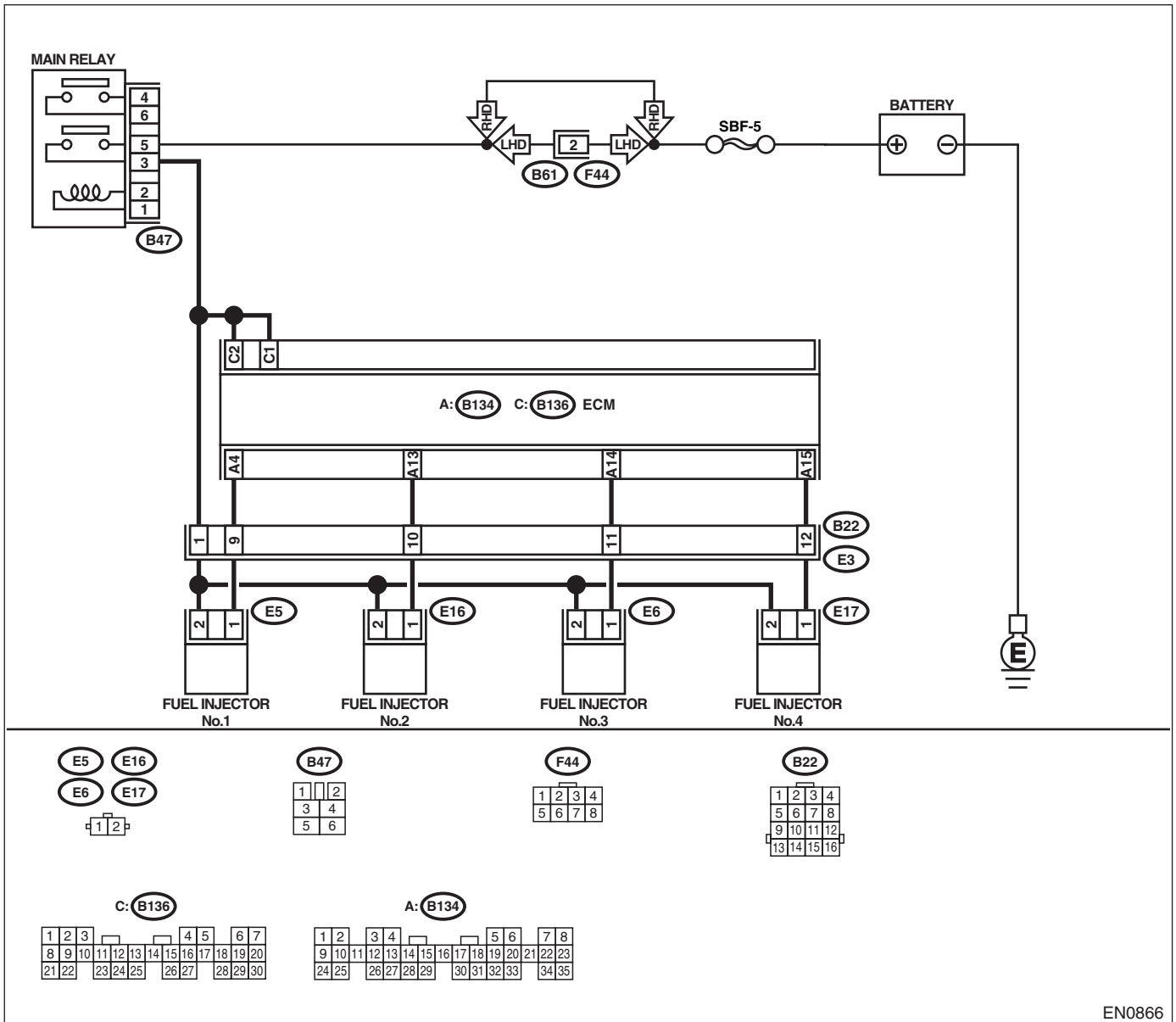
TROUBLE SYMPTOM:

- Engine stalls.
- Erroneous idling
- Rough driving

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN-42, OPERATION, Inspection Mode.> .

WIRING DIAGRAM:



EN0866

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>1</p> <p>CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.</p>	<p>Is any other DTC displayed?</p>	<p>Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN-83, List of Diagnostic Trouble Code (DTC).></p> <p>NOTE: In this case, it is not necessary to inspect P0301, P0302, P0303, P0304.</p>	<p>Go to step 2.</p>
<p>2</p> <p>CHECK OUTPUT SIGNAL FROM ECM.</p> <p>1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector and chassis ground on faulty cylinders.</p> <p>Connector & terminal</p> <p>#1 (B134) No. 4 (+) — Chassis ground (-): #2 (B134) No. 13 (+) — Chassis ground (-): #3 (B134) No. 14 (+) — Chassis ground (-): #4 (B134) No. 15 (+) — Chassis ground (-):</p>	<p>Is the voltage more than 10 V?</p>	<p>Go to step 7.</p>	<p>Go to step 3.</p>
<p>3</p> <p>CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel injector on faulty cylinders. 3) Measure the resistance between ECM connector and engine ground on faulty cylinders.</p> <p>Connector & terminal</p> <p>#1 (E5) No. 1 — Engine ground: #2 (E16) No. 1 — Engine ground: #3 (E6) No. 1 — Engine ground: #4 (E17) No. 1 — Engine ground:</p>	<p>Is the resistance less than 10 Ω?</p>	<p>Repair the ground short circuit in harness between fuel injector and ECM connector.</p>	<p>Go to step 4.</p>
<p>4</p> <p>CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR.</p> <p>Measure the resistance of harness connector between ECM connector and fuel injector on faulty cylinders.</p> <p>Connector & terminal</p> <p>#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:</p>	<p>Is the resistance less than 1 Ω?</p>	<p>Go to step 5.</p>	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Open circuit in harness between ECM and fuel injector connector • Poor contact in coupling connector (B22)
<p>5</p> <p>CHECK FUEL INJECTOR.</p> <p>Measure the resistance between fuel injector terminals on faulty cylinder.</p> <p>Terminals</p> <p>No. 1 — No. 2:</p>	<p>Is the resistance between 5 and 20 Ω?</p>	<p>Go to step 6.</p>	<p>Replace the faulty fuel injector. <Ref. to FU-41, Fuel Injector.></p>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>6</p> <p>CHECK POWER SUPPLY LINE. 1) Turn the ignition switch to ON. 2) Measure the voltage between fuel injector and engine ground on faulty cylinders.</p> <p>Connector & terminal #1 (E5) No. 2 (+) — Engine ground (-): #2 (E16) No. 2 (+) — Engine ground (-): #3 (E6) No. 2 (+) — Engine ground (-): #4 (E17) No. 2 (+) — Engine ground (-):</p>	Is the voltage more than 10 V?	Repair the poor contact in all connectors in fuel injector circuit.	Repair the 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
<p>7</p> <p>CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel injector on faulty cylinder. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM connector and chassis ground on faulty cylinders.</p> <p>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 (-):</p>	Is the voltage more than 10 V?	Repair the battery short circuit in harness between ECM and fuel injector. After repair, replace ECM. <Ref. to FU-51, Engine Control Module.>	Go to step 8.
<p>8</p> <p>CHECK FUEL INJECTOR. 1) Turn the ignition switch to OFF. 2) Measure the resistance between fuel injector terminals on faulty cylinder.</p> <p>Terminals No. 1 — No. 2:</p>	Is the resistance less than 1 Ω ?	Replace the faulty fuel injector <Ref. to FU-41, Fuel Injector.> and ECM <Ref. to FU-51, Engine Control Module.>	Go to step 9.
<p>9</p> <p>CHECK INSTALLATION OF CAMSHAFT POSITION SENSOR/CRANKSHAFT POSITION SENSOR.</p>	Is the camshaft position sensor or crankshaft position sensor loosely installed?	Tighten the camshaft position sensor or crankshaft position sensor.	Go to step 10.
<p>10</p> <p>CHECK CRANKSHAFT SPROCKET. Remove the timing belt cover.</p>	Is the crankshaft sprocket rusted or does it have broken teeth?	Replace the crankshaft sprocket. <Ref. to ME-56, Crankshaft Sprocket.>	Go to step 11.
<p>11</p> <p>CHECK INSTALLATION CONDITION OF TIMING BELT. Turn the crankshaft using ST, and align the alignment mark on crankshaft sprocket with alignment mark on cylinder block. ST 499987500 CRANKSHAFT SOCKET</p>	Is the timing belt dislocated from its proper position?	Repair the installation condition of timing belt. <Ref. to ME-49, 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 the 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 the memory using Subaru Select Monitor. <Ref. to EN-49, 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 the diagnostics operation, if the engine has no abnormality. NOTE: Ex. Remove spark plug cord, etc.	Repair the poor contact. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Poor contact in ignitor connector • Poor contact in ignition coil connector • Poor contact in fuel injector connector on faulty cylinders • Poor contact in ECM connector • Poor contact in coupling connector
15 CHECK AIR INTAKE SYSTEM.	Is there a fault in air intake system?	Repair the air intake system. NOTE: Check the following items: <ul style="list-style-type: none"> • Are there air leaks or air suction caused by loose or dislocated nuts and bolts? • Are there cracks or any disconnection of hoses? 	Go to step 16 .
16 CHECK MISFIRE SYMPTOM. 1)Turn the ignition switch to ON. 2)Read the DTC. •Subaru Select Monitor <Ref. to EN-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 the faulty parts. NOTE: Check the following items. <ul style="list-style-type: none"> • Spark plug • Spark plug cord • Fuel injector • Compression ratio 	Go to DTC P0170. <Ref. to EN-156, 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 the faulty parts. NOTE: <ul style="list-style-type: none"> • Check the following items. <ul style="list-style-type: none"> • Spark plugs • Fuel injectors • Ignition coil • Compression ratio • If no abnormal is discovered, check for "IGNITION CONTROL SYSTEM" of #1 and #2 cylinders side. <Ref. to EN-72, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.> 	Go to DTC P0170. <Ref. to EN-156, 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 the 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-72, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>	Go to DTC P0170. <Ref. to EN-156, 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 the faulty parts. NOTE: Check the following items. • Spark plugs • Fuel injectors • Skipping timing belt teeth	Go to DTC P0170. <Ref. to EN-156, 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 the faulty parts. NOTE: Check the following items. • Spark plugs • Fuel injectors • Compression ratio • Skipping timing belt teeth	Go to DTC P0170. <Ref. to EN-156, 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-156, DTC P0170 — FUEL TRIM MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Repair or replace the faulty parts. NOTE: Check the following items. • Spark plugs • Fuel injectors • Compression ratio

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

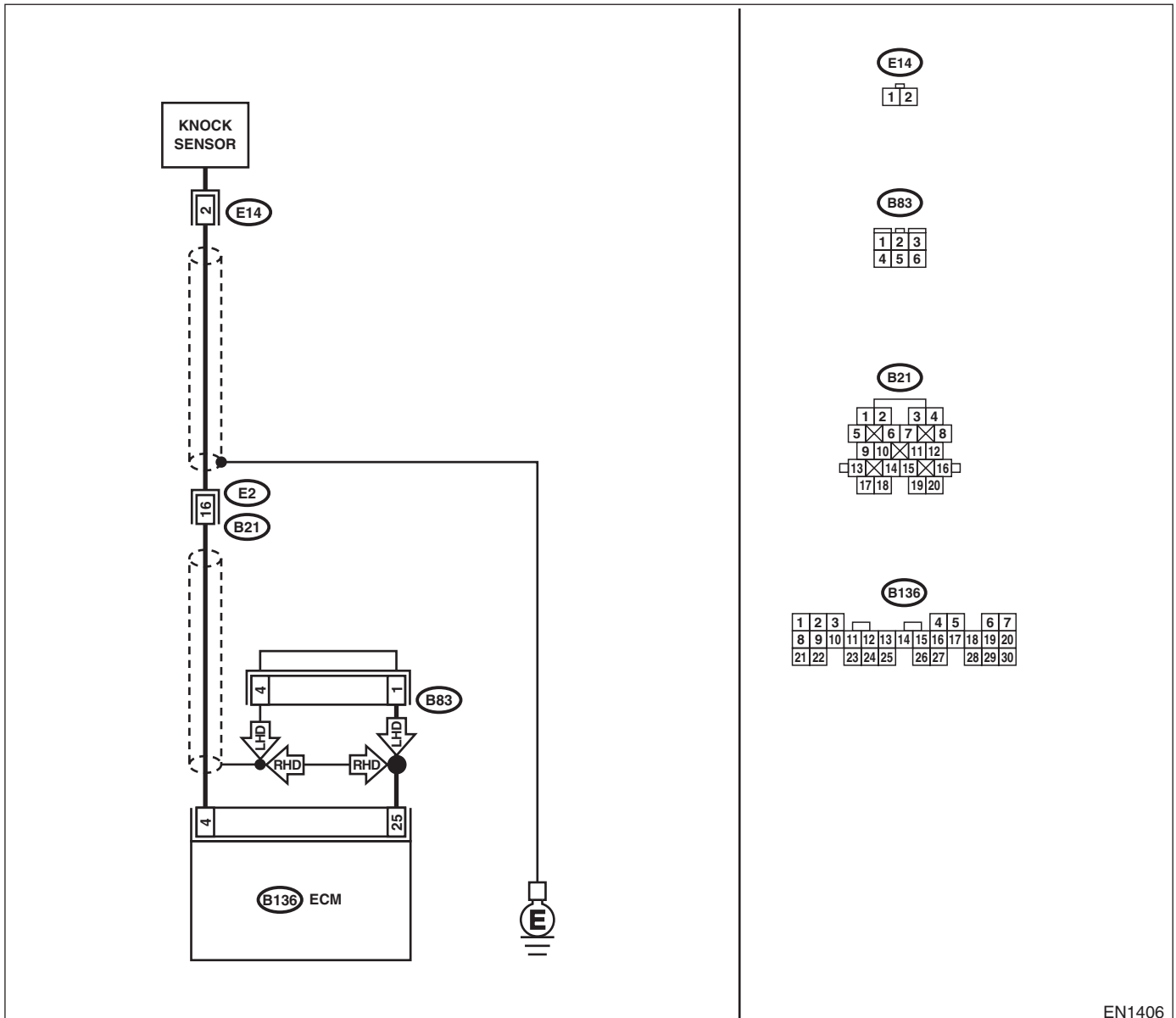
AD:DTC P0327 — KNOCK SENSOR CIRCUIT LOW INPUT —

- **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-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN1406

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>1</p> <p>CHECK HARNESS BETWEEN KNOCK SENSOR AND ECM CONNECTOR.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between ECM harness connector and chassis ground.</p> <p>Connector & terminal (B136) No. 4 — Chassis ground:</p>	<p>Is the resistance more than 700 kΩ?</p>	<p>Go to step 2.</p>	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Open circuit in harness between knock sensor and ECM connector • Poor contact in knock sensor connector • Poor contact in coupling connector (B21)
<p>2</p> <p>CHECK KNOCK SENSOR.</p> <p>1) Disconnect the connector from knock sensor. 2) Measure the resistance between knock sensor connector terminal and engine ground.</p> <p>Terminal No. 2 — Engine ground:</p>	<p>Is the resistance more than 700 kΩ?</p>	<p>Go to step 3.</p>	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Open circuit in harness between knock sensor and ECM connector • Poor contact in knock sensor connector • Poor contact in coupling connector (B21)
<p>3</p> <p>CHECK CONDITION OF KNOCK SENSOR INSTALLATION.</p>	<p>Is the knock sensor installation bolt tightened securely?</p>	<p>Replace the knock sensor. <Ref. to FU-34, Knock Sensor.></p>	<p>Tighten the knock sensor installation bolt securely.</p>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

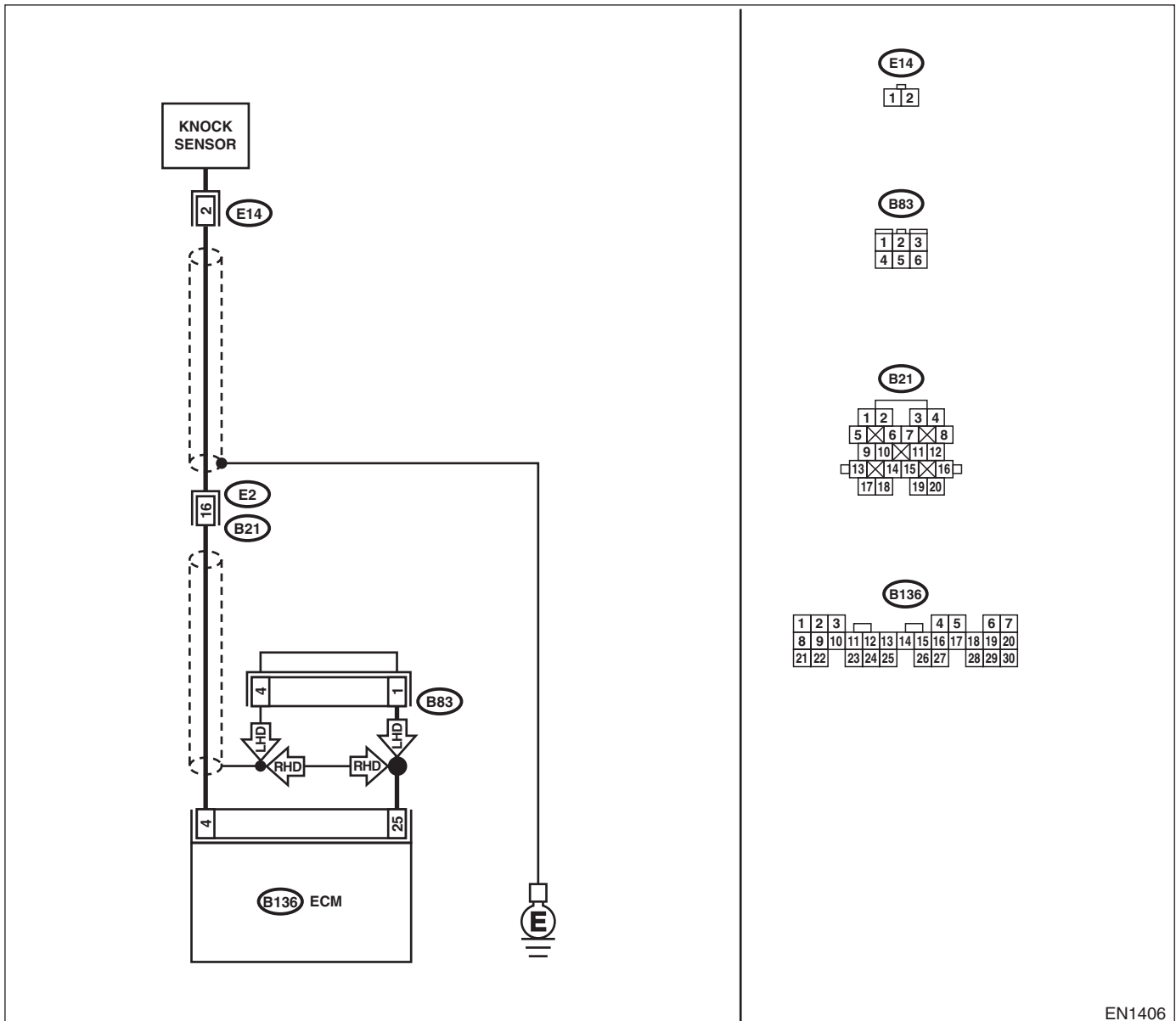
AE:DTC P0328 — KNOCK SENSOR CIRCUIT HIGH INPUT —

- **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-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN-42, OPERATION, Inspection Mode.> .

• **WIRING DIAGRAM:**



EN1406

Step	Check	Yes	No	
1	<p>CHECK HARNESS BETWEEN KNOCK SENSOR AND ECM CONNECTOR. Measure the resistance of harness between ECM connector and chassis ground. Connector & terminal (B136) No. 4 — Chassis ground:</p>	Is the resistance less than 400 kΩ?	Go to step 2.	Go to step 3.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>2</p> <p>CHECK KNOCK SENSOR. 1) Disconnect the connector from knock sensor. 2) Measure the resistance between knock sensor connector terminal and engine ground. <i>Terminal</i> <i>No. 2 — Engine ground:</i></p>	<p>Is the resistance less than 400 kΩ?</p>	<p>Replace the knock sensor. <Ref. to FU-34, Knock Sensor.></p>	<p>Repair the ground short circuit in harness between knock sensor connector and ECM connector. NOTE: The harness between both connectors is shielded. Repair the short circuit of harness together with shield.</p>
<p>3</p> <p>CHECK INPUT SIGNAL FOR ECM. 1) Connect the connectors to ECM and knock sensor. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM and chassis ground. <i>Connector & terminal</i> <i>(B136) No. 4 (+) — Chassis ground (-):</i></p>	<p>Is the voltage more than 2 V?</p>	<p>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:</p> <ul style="list-style-type: none"> • Poor contact in knock sensor connector • Poor contact in ECM connector • Poor contact in coupling connector (B21) 	<p>Repair the poor contact in ECM connector.</p>

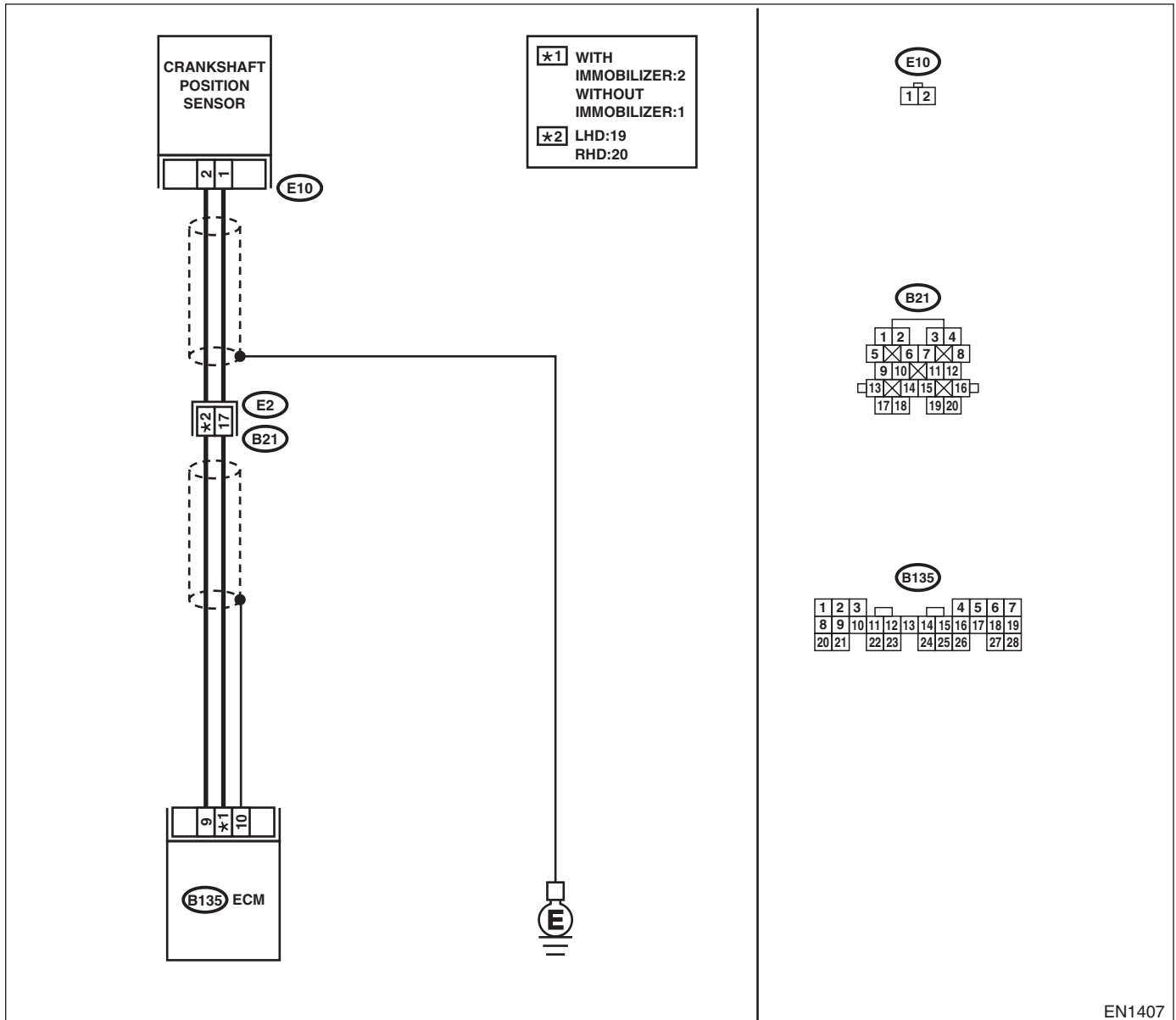
AF:DTC P0335 — CRANKSHAFT POSITION SENSOR CIRCUIT MALFUNCTION

- **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-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN1407

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>1</p> <p>CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connector from crankshaft position sensor. 3) Measure the resistance of harness between crankshaft position sensor connector and engine ground.</p> <p>Connector & terminal (E10) No. 1 — Engine ground:</p>	<p>Is the resistance more than 100 kΩ?</p>	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Open circuit in harness between crankshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector (B21) 	<p>Go to step 2.</p>
<p>2</p> <p>CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR.</p> <p>Measure the resistance of harness between crankshaft position sensor connector and engine ground.</p> <p>Connector & terminal (E10) No. 1 — Engine ground:</p>	<p>Is the resistance less than 10 Ω?</p>	<p>Repair the ground short circuit in harness between crankshaft position sensor and ECM connector.</p> <p>NOTE: The harness between both connectors are shielded. Repair ground short circuit in harness together with shield.</p>	<p>Go to step 3.</p>
<p>3</p> <p>CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR.</p> <p>Measure the resistance of harness between crankshaft position sensor connector and engine ground.</p> <p>Connector & terminal (E10) No. 2 — Engine ground:</p>	<p>Is the resistance less than 5 Ω?</p>	<p>Go to step 4.</p>	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Open circuit in harness between crankshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector (B21)
<p>4</p> <p>CHECK CONDITION OF CRANKSHAFT POSITION SENSOR.</p>	<p>Is the crankshaft position sensor installation bolt tightened securely?</p>	<p>Go to step 5.</p>	<p>Tighten the crankshaft position sensor installation bolt securely.</p>
<p>5</p> <p>CHECK CRANKSHAFT POSITION SENSOR.</p> <p>1) Remove the crankshaft position sensor. 2) Measure the resistance between connector terminals of crankshaft position sensor.</p> <p>Terminals No. 1 — No. 2:</p>	<p>Is the resistance between 1 and 4 kΩ?</p>	<p>Repair the poor contact in crankshaft position sensor connector.</p>	<p>Replace the crankshaft position sensor. <Ref. to FU-32, Crankshaft Position Sensor.></p>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

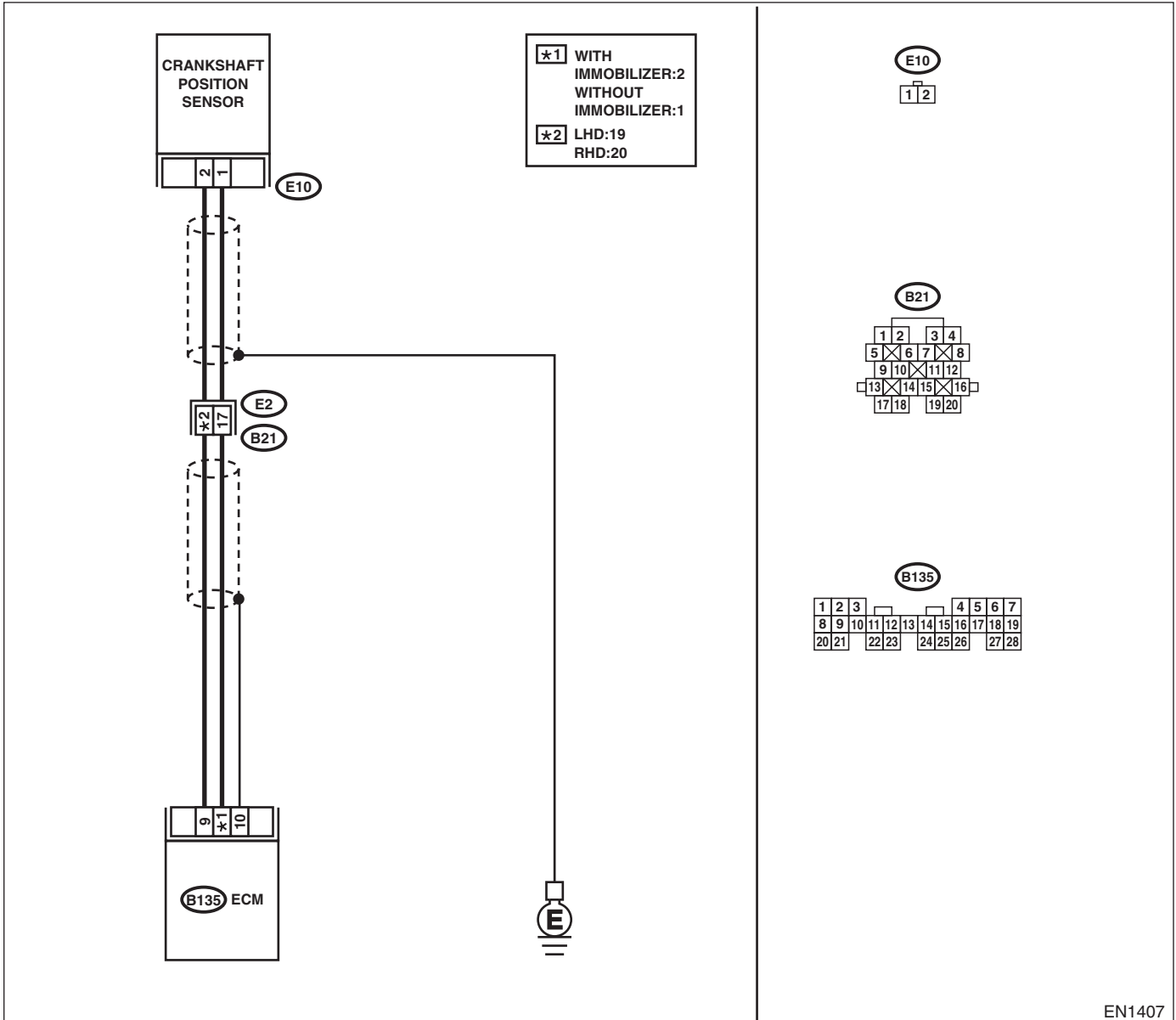
AG:DTC P0336 — CRANKSHAFT POSITION SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM —

- **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-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN1407

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No	
1	CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0335?	Inspect DTC P0335 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN-83, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2	CHECK CONDITION OF CRANKSHAFT POSITION SENSOR. Turn the ignition switch to OFF.	Is the crankshaft position sensor installation bolt tightened securely?	Go to step 3.	Tighten the crankshaft position sensor installation bolt securely.
3	CHECK CRANKSHAFT SPROCKET. Remove the front belt cover.	Are the crankshaft sprocket teeth cracked or damaged?	Replace the crankshaft sprocket. <Ref. to ME-56, Crankshaft Sprocket.>	Go to step 4.
4	CHECK INSTALLATION CONDITION OF TIMING BELT. Turn the crankshaft using ST, and align the alignment mark on crankshaft sprocket with alignment mark on cylinder block. ST 499987500 CRANKSHAFT SOKET	Is the timing belt dislocated from its proper position?	Repair the installation condition of timing belt. <Ref. to ME-49, Timing Belt Assembly.>	Replace the crankshaft position sensor. <Ref. to <Ref. to FU-32, Crankshaft Position Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

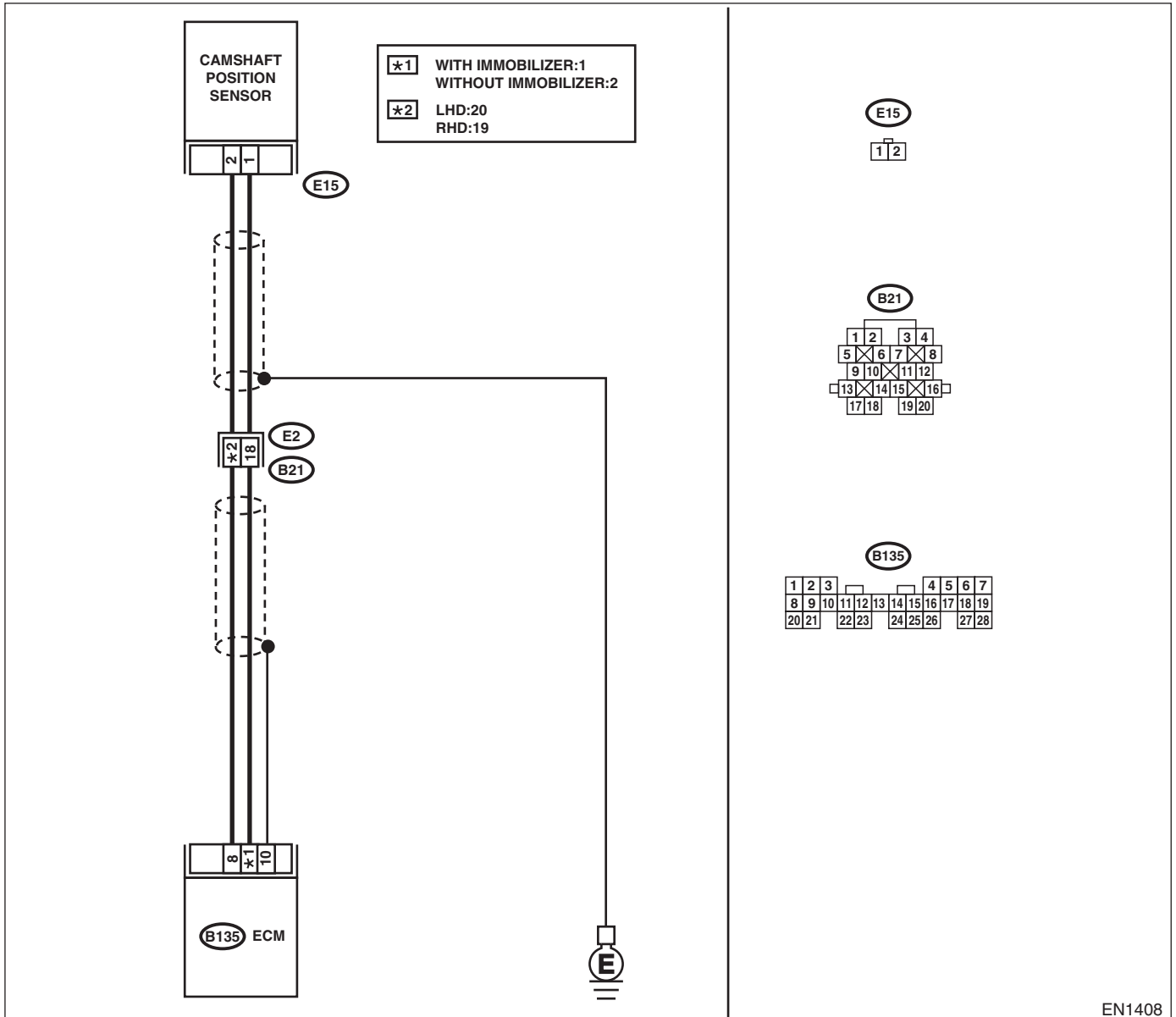
AH:DTC P0340 — CAMSHAFT POSITION SENSOR CIRCUIT MALFUNCTION —

- **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-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN-42, OPERATION, Inspection Mode.> .

• **WIRING DIAGRAM:**



EN1408

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>1</p> <p>CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connector from camshaft position sensor. 3) Measure the resistance of harness between camshaft position sensor connector and engine ground.</p> <p>Connector & terminal (E15) No. 1 — Engine ground:</p>	<p>Is the resistance more than 100 kΩ?</p>	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Open circuit in harness between camshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector (B21) 	<p>Go to step 2.</p>
<p>2</p> <p>CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR.</p> <p>Measure the resistance of harness between camshaft position sensor connector and engine ground.</p> <p>Connector & terminal (E15) No. 1 — Engine ground:</p>	<p>Is the resistance less than 10 Ω?</p>	<p>Repair the ground short circuit in harness between camshaft position sensor and ECM connector.</p> <p>NOTE: The harness between both connectors are shielded. Repair ground short circuit in harness together with shield.</p>	<p>Go to step 3.</p>
<p>3</p> <p>CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR.</p> <p>Measure the resistance of harness between camshaft position sensor connector and engine ground.</p> <p>Connector & terminal (E15) No. 2 — Engine ground:</p>	<p>Is the resistance less than 5 Ω?</p>	<p>Go to step 4.</p>	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Open circuit in harness between camshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector (B21)
<p>4</p> <p>CHECK CONDITION OF CAMSHAFT POSITION SENSOR.</p>	<p>Is the camshaft position sensor installation bolt tightened securely?</p>	<p>Go to step 5.</p>	<p>Tighten the camshaft position sensor installation bolt securely.</p>
<p>5</p> <p>CHECK CAMSHAFT POSITION SENSOR.</p> <p>1) Remove the camshaft position sensor. 2) Measure the resistance between connector terminals of camshaft position sensor.</p> <p>Terminals No. 1 — No. 2:</p>	<p>Is the resistance between 1 and 4 kΩ?</p>	<p>Repair the poor contact in camshaft position sensor connector.</p>	<p>Replace the camshaft position sensor. <Ref. to FU-33, Camshaft Position Sensor.></p>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

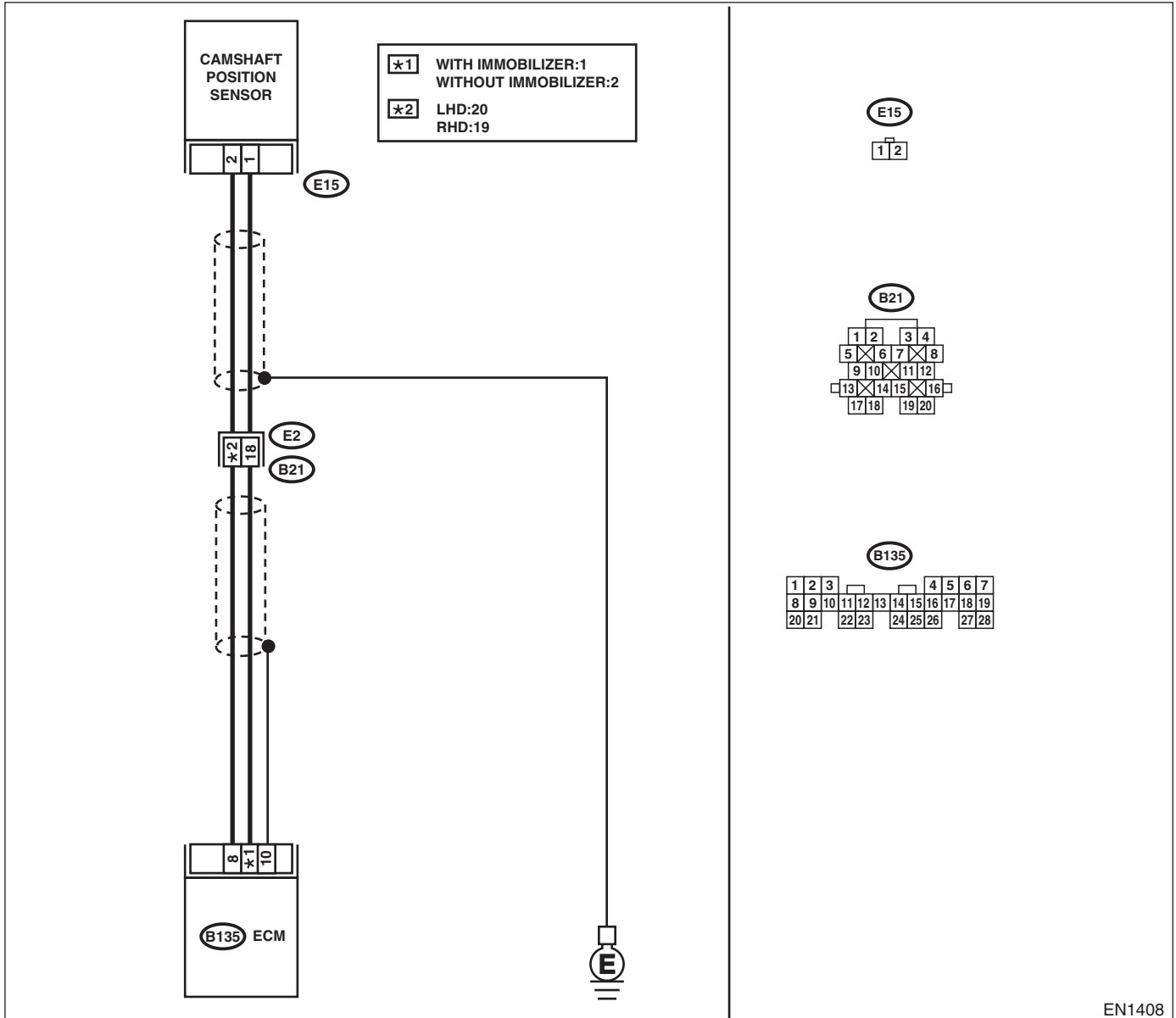
AI: DTC P0341 — CAMSHAFT POSITION SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM —

- **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-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN1408

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No	
1	CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0340?	Inspect DTC P0340 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN-83, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2	CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from camshaft position sensor. 3) Measure the resistance of harness between camshaft position sensor connector and engine ground. Connector & terminal (E15) No. 1 — Engine ground:	Is the resistance more than 100 k Ω ?	Repair the 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 the 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 the 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 the 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 the 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 the 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 the camshaft position sensor. 2)Measure the 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 the camshaft position sensor. <Ref. to FU-33, Camshaft Position Sensor.>
7 CHECK CONDITION OF CAMSHAFT POSITION SENSOR. Turn the ignition switch to OFF.	Is the camshaft position sensor installation bolt tightened securely?	Go to step 8.	Tighten the camshaft position sensor installation bolt securely.
8 CHECK CAMSHAFT SPROCKET. Remove the front belt cover. <Ref. to ME-48, Belt Cover.>	Are the camshaft sprocket teeth cracked or damaged?	Replace the camshaft sprocket. <Ref. to ME-54, Camshaft Sprocket.>	Go to step 9.
9 CHECK INSTALLATION CONDITION OF TIMING BELT. Turn the camshaft using ST, and align the alignment mark on camshaft sprocket with alignment mark on timing belt cover LH. ST 18231AA010 CAMSHAFT SPROCKET WRENCH NOTE: Also the CAMSHAFT SPROCKET WRENCH (499207100) can be used.	Is the timing belt dislocated from its proper position?	Repair the installation condition of timing belt. <Ref. to ME-49, Timing Belt Assembly.>	Replace the camshaft position sensor. <Ref. to FU-33, 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.

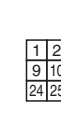
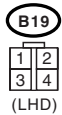
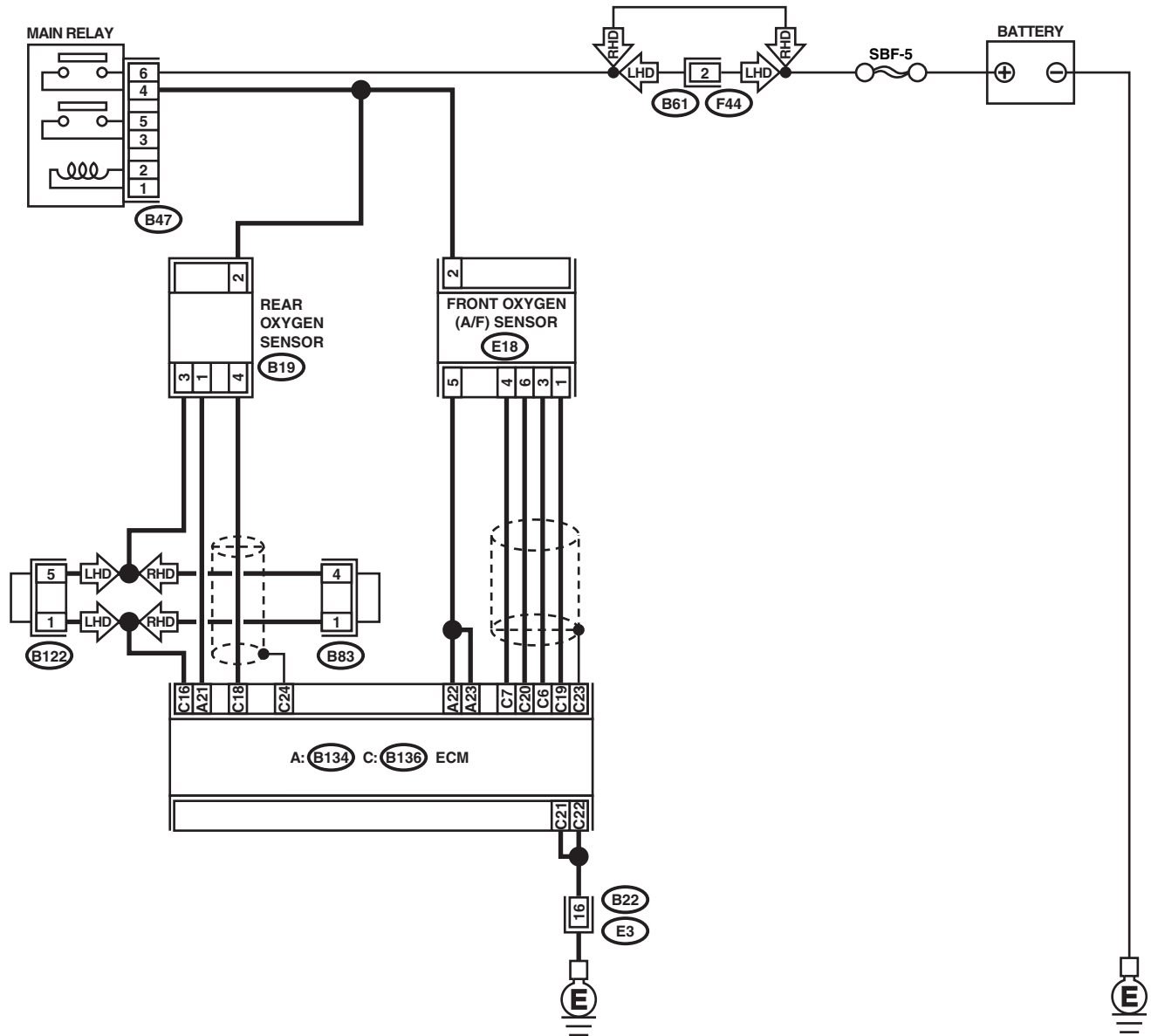
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN-42, OPERATION, Inspection Mode.> .

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

• WIRING DIAGRAM:



EN1409

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1	CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN-83, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0420.	Go to step 2.
2	CHECK EXHAUST SYSTEM. Check for gas leaks or air suction caused by loose or dislocated nuts and bolts, and open hole at exhaust pipes. 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 the exhaust system. <Ref. to EX-2, General Description.>
3	CHECK REAR CATALYTIC CONVERTER. Separate the rear catalytic converter from rear exhaust pipe.	Is there damage at rear face of rear catalyst?	Go to step 4.
4	CHECK FRONT CATALYTIC CONVERTER. Remove the front catalytic converter.	Is there damage at rear face or front face of front catalyst?	Go to step 5.
5	CHECK REAR OXYGEN SENSOR HARNESS SHIELD. Visually check the rear oxygen sensor harness shield for damage or open.	Is there damage or open on the rear oxygen sensor harness shield?	Go to step 6.
6	CHECK GROUND CIRCUIT ON ECM. 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ECM. 3)Measure the resistance of harness between ECM connector and chassis ground. Connector & terminal (B136) No. 21 — Chassis ground:	Is the resistance less than 5 Ω?	Go to step 7. 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)

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
7	<p>CHECK GROUND CIRCUIT OF ECM. 1)Repair the harness and connector. 2)Measure the resistance of harness between ECM connector and chassis ground. Connector & terminal (B136) No. 22 — Chassis ground:</p>	<p>Is the resistance less than 5 Ω?</p>	<p>Contact with your Subaru distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.</p>	<p>Repair the harness and connector. NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Open circuit in harness between ECM and engine ground terminal • Poor contact in ECM connector • Poor contact in coupling connector (B22)

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

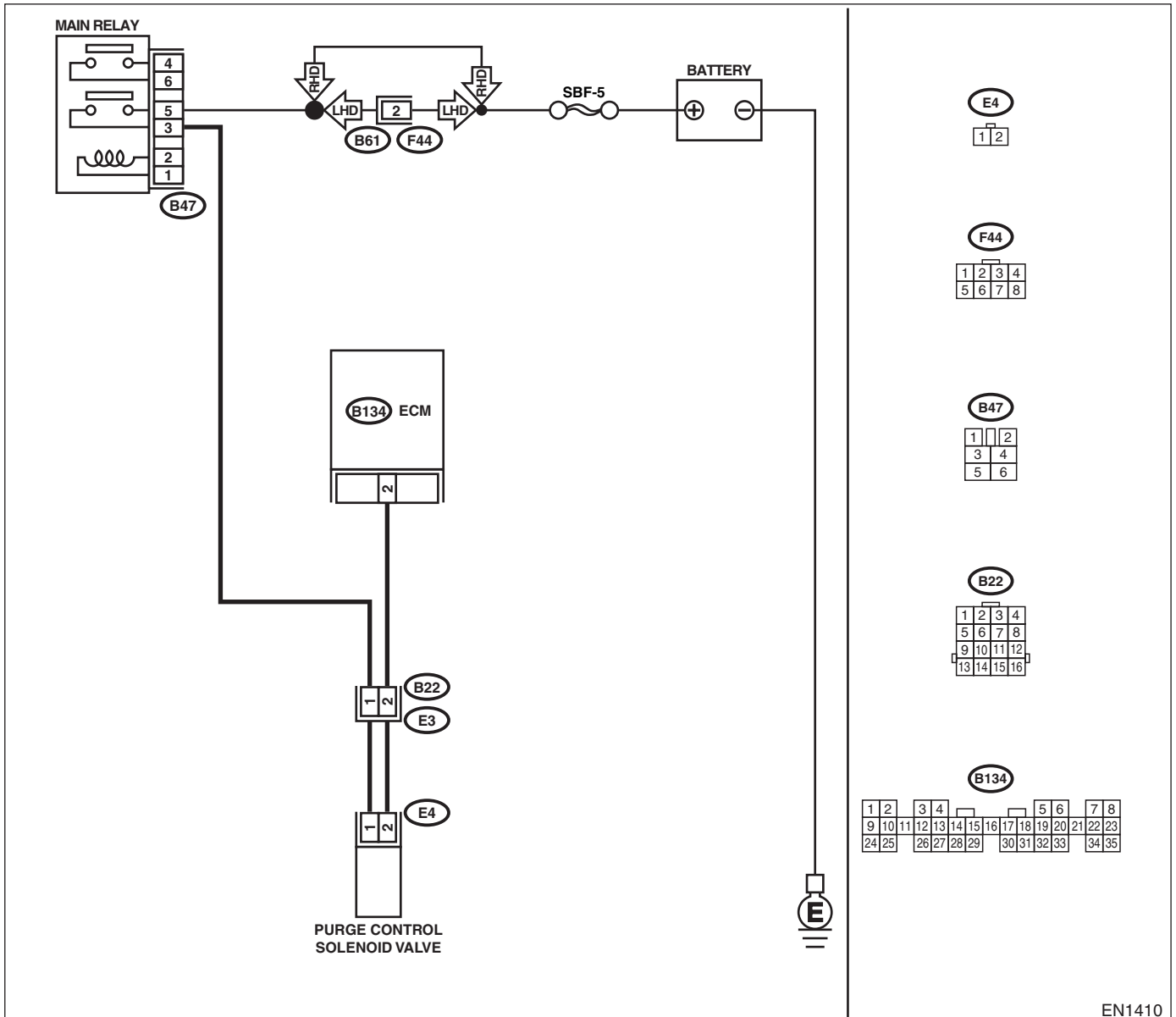
AK:DTC P0444 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW INPUT —

- **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-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN-42, OPERATION, Inspection Mode.> .

• **WIRING DIAGRAM:**



EN1410

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>1</p> <p>CHECK OUTPUT SIGNAL FROM ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. Connector & terminal (B134) No. 2 (+) — Chassis ground (-):</p>	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 service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.	Go to step 2.
<p>2</p> <p>CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from purge control solenoid valve and ECM. 3) Measure the resistance of harness between purge control solenoid valve connector and engine ground. Connector & terminal (E4) No. 2 — Engine ground:</p>	Is the resistance less than 10 Ω ?	Repair the ground short circuit in harness between ECM and purge control solenoid valve connector.	Go to step 3.
<p>3</p> <p>CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR. Measure the resistance of harness between ECM and purge control solenoid valve of harness connector. Connector & terminal (B134) No. 2 — (E4) No. 2:</p>	Is the resistance less than 1 Ω ?	Go to step 4.	Repair the 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)
<p>4</p> <p>CHECK PURGE CONTROL SOLENOID VALVE. 1) Remove the purge control solenoid valve. 2) Measure the resistance between purge control solenoid valve terminals. Terminals No. 1 — No. 2:</p>	Is the resistance between 10 and 100 Ω ?	Go to step 5.	Replace the purge control solenoid valve. <Ref. to EC-8, Purge Control Solenoid Valve.>
<p>5</p> <p>CHECK POWER SUPPLY TO PURGE CONTROL SOLENOID VALVE. 1) Turn the ignition switch to ON. 2) Measure the voltage between purge control solenoid valve and engine ground. Connector & terminal (E4) No. 1 (+) — Engine ground (-):</p>	Is the voltage more than 10 V?	Go to step 6.	Repair the 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 the poor contact in purge control solenoid valve connector.	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)

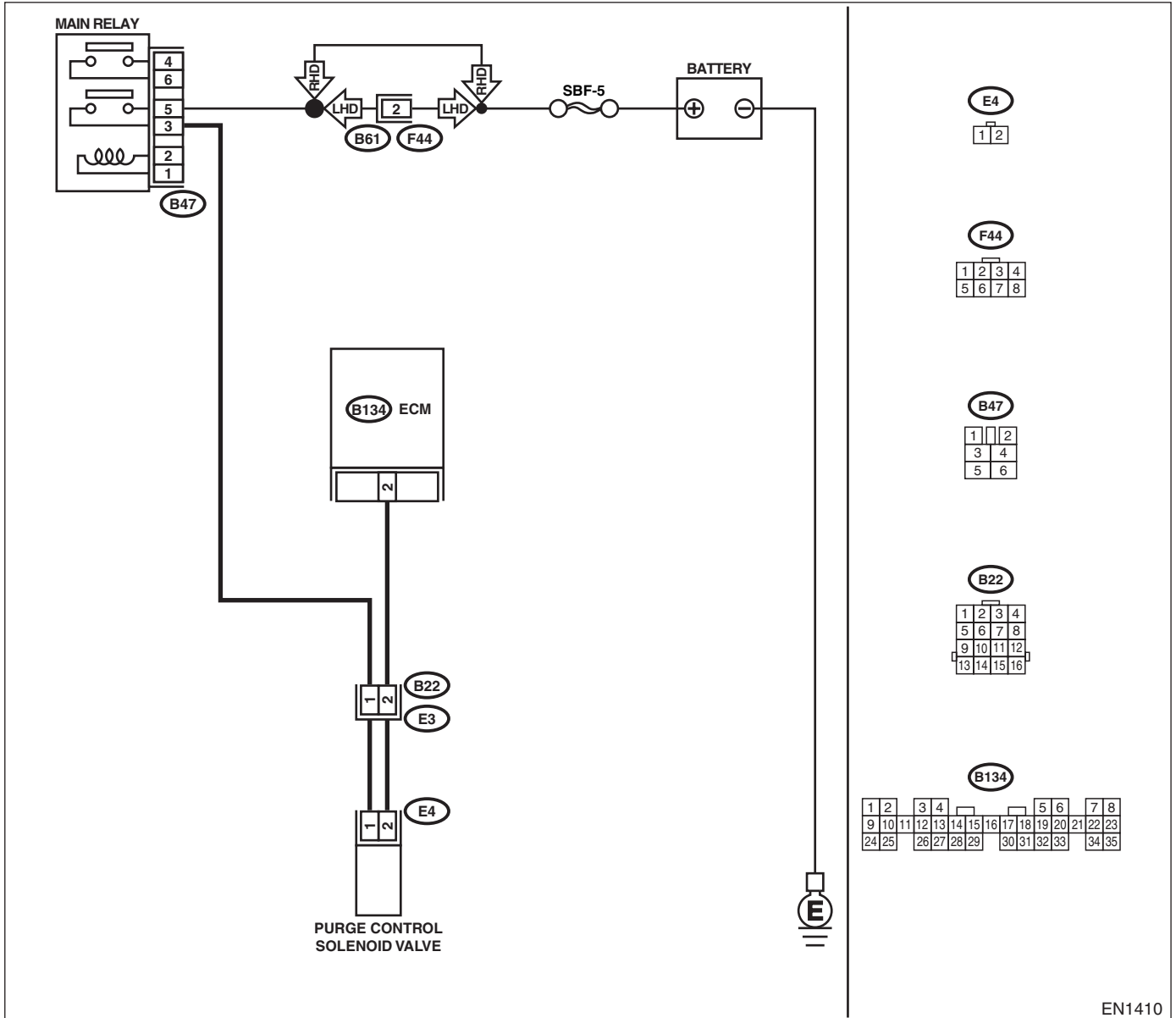
AL:DTC P0445 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH INPUT —

- **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-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN-42, OPERATION, Inspection Mode.> .

• **WIRING DIAGRAM:**



DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OUTPUT SIGNAL FROM ECM. 1) Turn the ignition switch to OFF. 2) Connect the test mode connector at the lower portion of instrument panel (on the driver's side). 3) Turn the ignition switch to ON. 4) While operating the purge control solenoid valve, measure the voltage between ECM and chassis ground. NOTE: Purge control solenoid valve operation can be executed using the Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN-50, 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 the poor contact in ECM connector.
2 CHECK OUTPUT SIGNAL FROM ECM. 1) Turn the ignition switch to ON. 2) Measure the 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 the poor contact in ECM connector.	Replace the ECM. <Ref. to FU-51, Engine Control Module.>
4 CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from purge control solenoid valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. Connector & terminal (B134) No. 2 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Repair the battery short circuit in harness between ECM and purge control solenoid valve connector. After repair, replace the ECM. <Ref. to FU-51, Engine Control Module.>	Go to step 5.
5 CHECK PURGE CONTROL SOLENOID VALVE. 1) Turn the ignition switch to OFF. 2) Measure the resistance between purge control solenoid valve terminals. Terminals No. 1 — No. 2:	Is the resistance less than 1 Ω ?	Replace the purge control solenoid valve <Ref. to EC-8, Purge Control Solenoid Valve.> and ECM <Ref. to FU-51, 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 the poor contact in ECM connector.	Replace the ECM. <Ref. to FU-51, Engine Control Module.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC) ENGINE (DIAGNOSTICS)

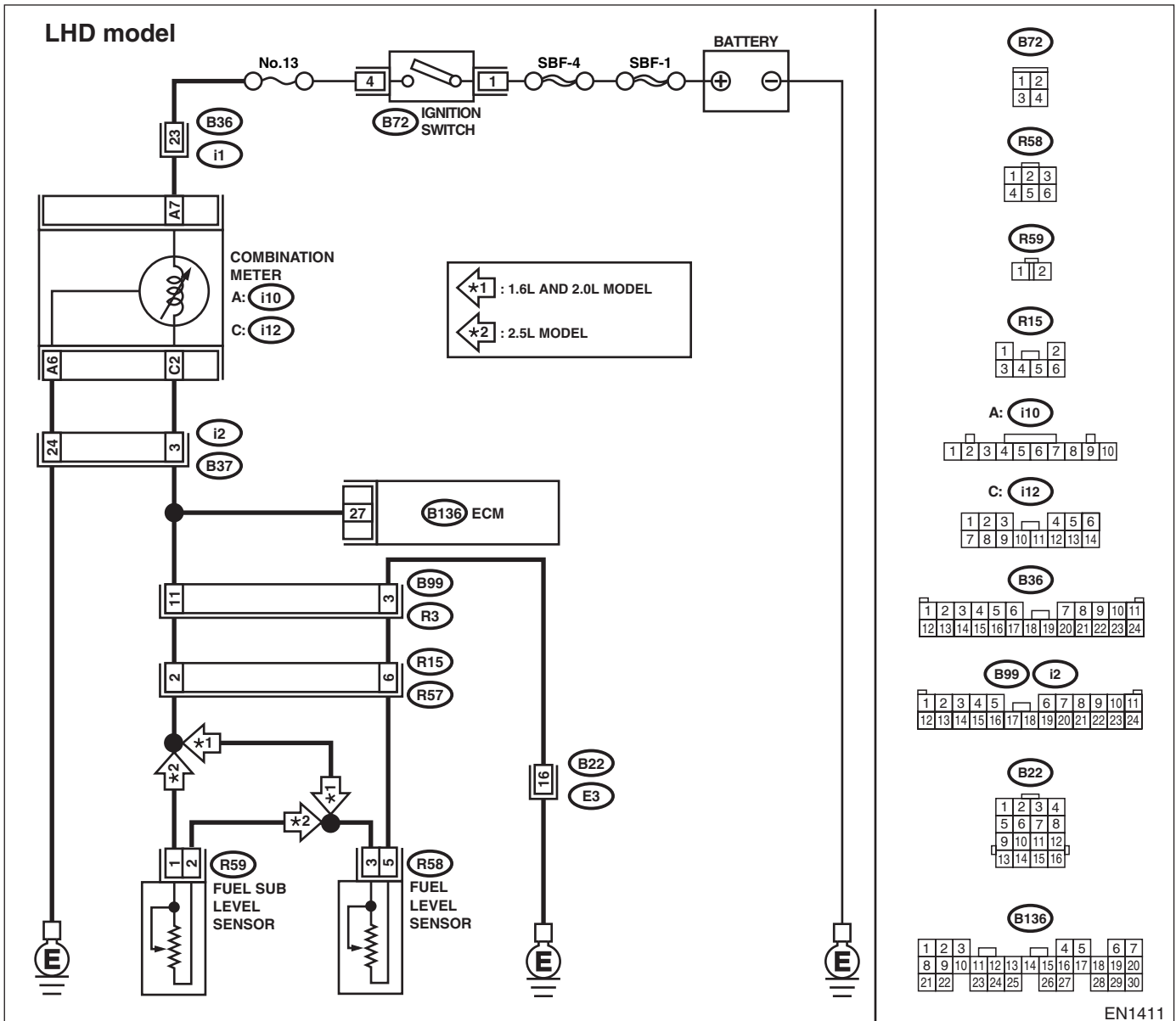
AM:DTC P0461 — FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM —

- DTC DETECTING CONDITION:
 - Two consecutive driving cycles with fault

CAUTION:

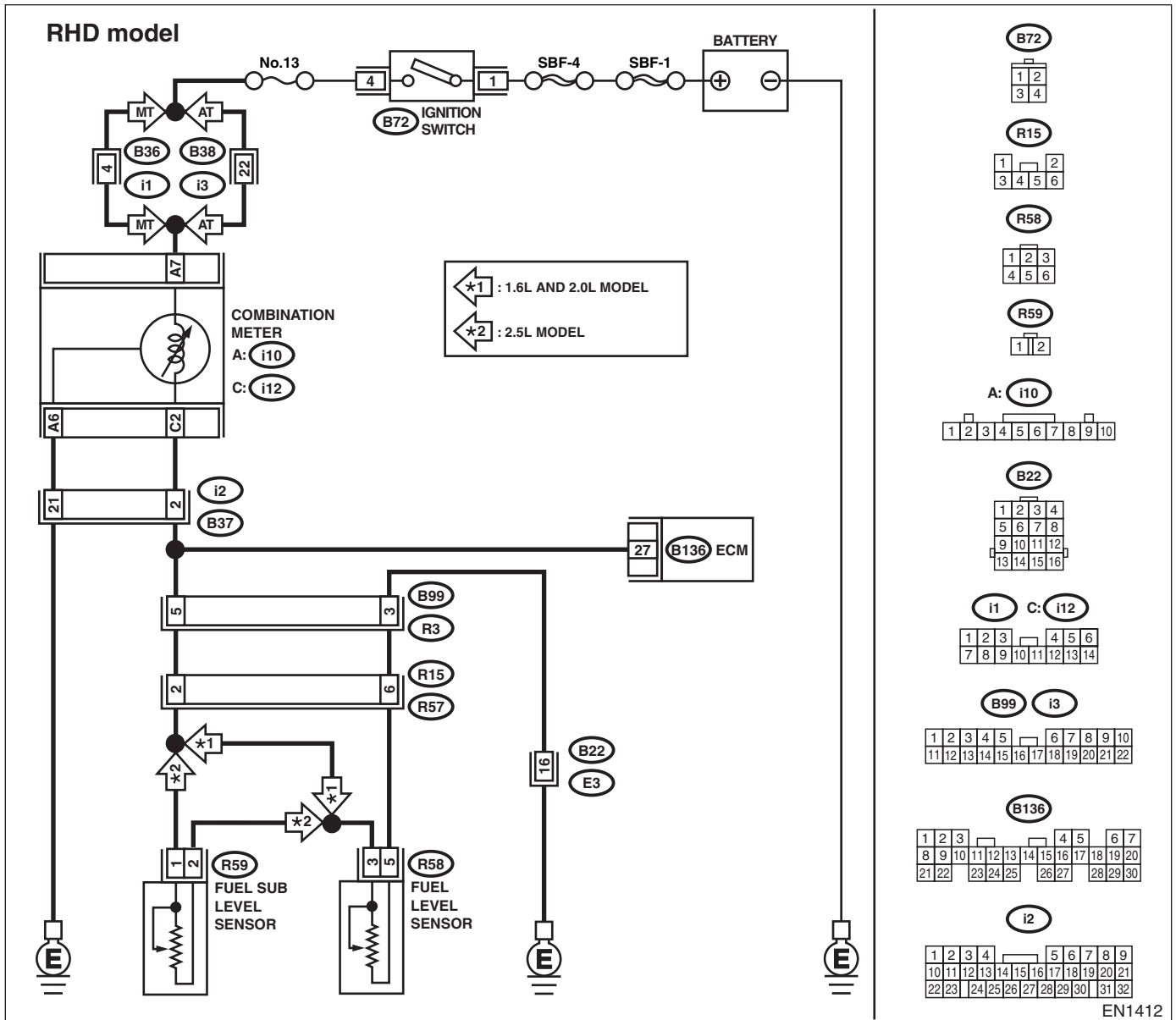
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN-42, OPERATION, Inspection Mode.> .

- WIRING DIAGRAM:



EN1411

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC) ENGINE (DIAGNOSTICS)



EN1412

Step	Check	Yes	No	
1	CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN-83, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect P0461.	Replace the fuel level sensor <Ref. to FU-65, Fuel Level Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

AN:DTC P0462 — FUEL LEVEL SENSOR CIRCUIT LOW INPUT —

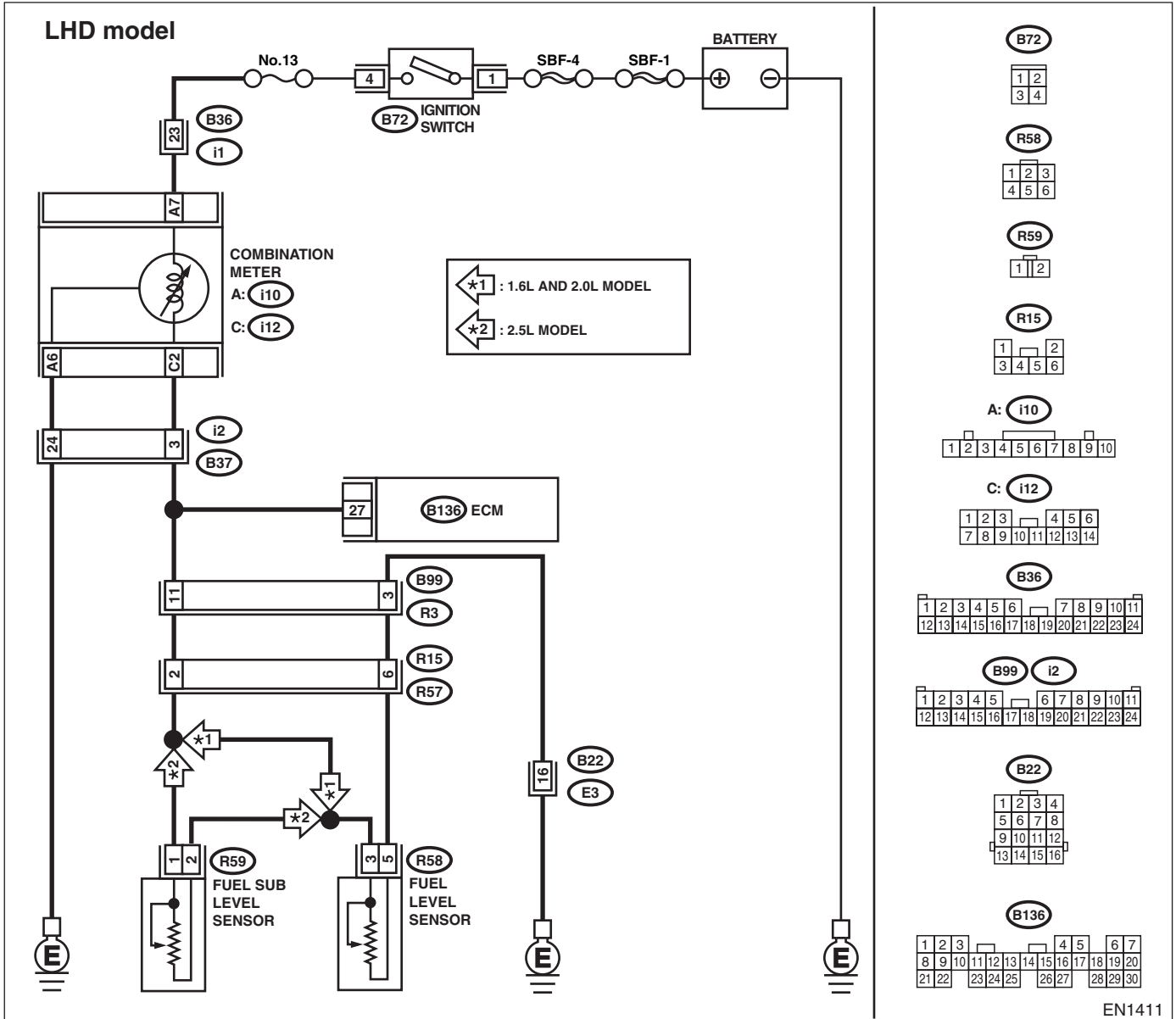
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

CAUTION:

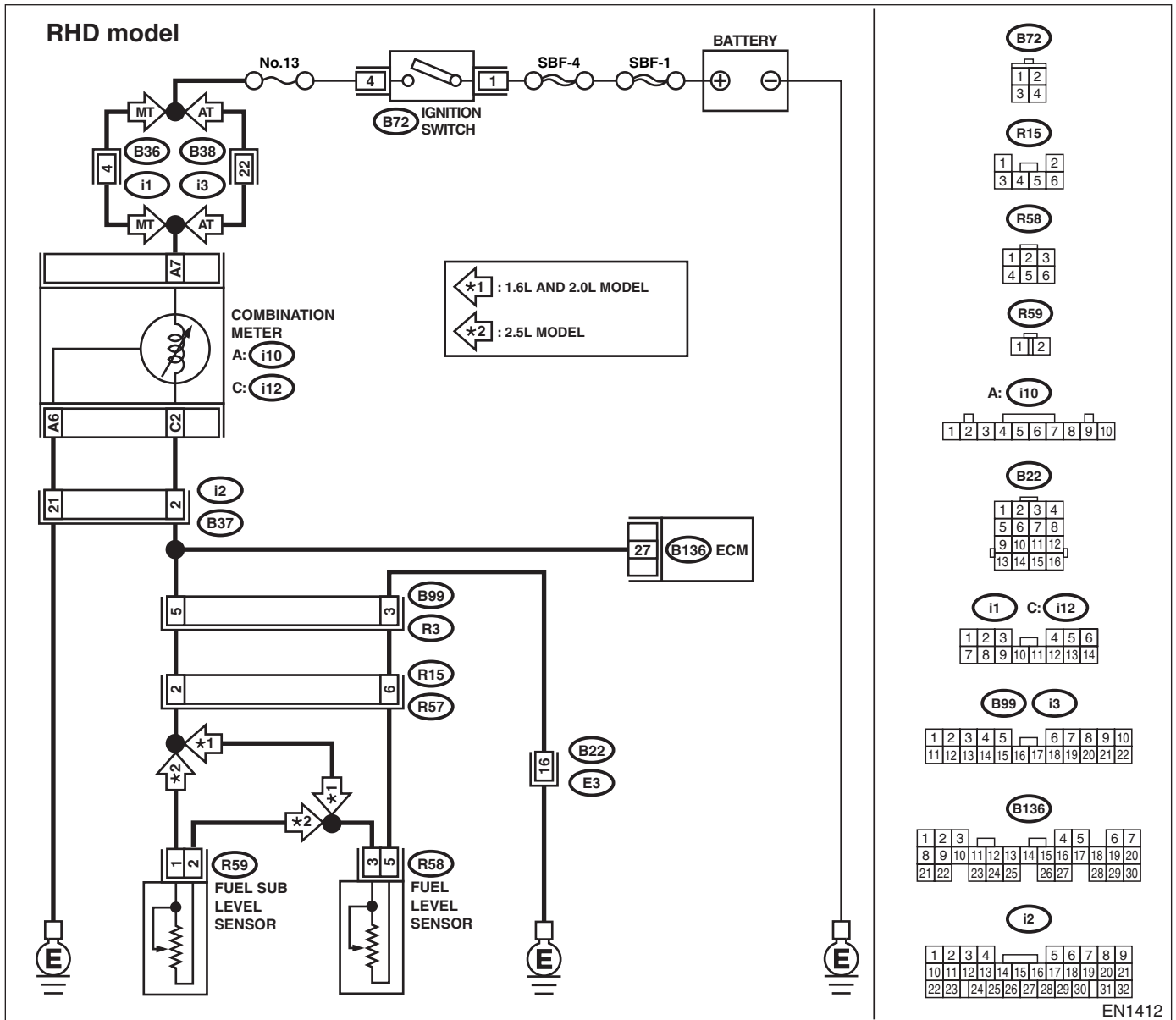
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN-42, OPERATION, Inspection Mode.> .

• WIRING DIAGRAM:



EN1411

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC) ENGINE (DIAGNOSTICS)



EN1412

Step	Check	Yes	No	
1	CHECK SPEEDOMETER AND TACHOMETER OPERATION IN COMBINATION METER.	Does the speedometer and tachometer operate normally?	Go to step 2.	Repair or replace the combination meter. <Ref. to IDI-4, Combination Meter System.>
2	CHECK INPUT SIGNAL FOR ECM. 1) Turn the ignition switch to ON. (engine OFF) 2) Measure the voltage between ECM connector and chassis ground. Connector & terminal (B136) No. 27 (+) — Chassis ground (-):	Is the voltage less than 0.12 V?	Go to step 6.	Go to step 3.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
3 CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.) Read the 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-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 the 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 the ignition switch to OFF. 2)Separate the fuel tank cord connector (R57) and rear wiring harness connector (R15). 3)Turn the ignition switch to ON. 4)Measure the 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 8.
5 CHECK HARNESS BETWEEN ECM AND COMBINATION METER. 1)Turn the ignition switch to OFF. 2)Disconnect the connector from connector (i10) and ECM connector. 3)Measure the resistance between ECM and chassis ground. Connector & terminal (B136) No. 27 — Chassis ground:	Is the resistance more than 1 M Ω ?	Go to step 6.	Repair the ground short circuit in harness between ECM and combination meter connector.
6 CHECK HARNESS BETWEEN ECM AND COMBINATION METER. Measure the resistance between ECM and combination meter connector. Connector & terminal (B136) No. 27 — (i12) No. 2:	Is the resistance less than 10 Ω ?	Repair or replace the combination meter. <Ref. to IDI-4, Combination Meter System.>	Repair the open circuit between ECM and combination meter connector. NOTE: In this case, repair the following: Poor contact in coupling connector (i2)
7 CHECK ENGINE DISPLACEMENT.	Is the engine displacement 2.5 L?	Go to step 10.	Go to step 8.
8 CHECK FUEL TANK CORD. 1)Disconnect the connector from fuel pump assembly. 2)Measure the resistance between fuel pump assembly and chassis ground. Connector & terminal (R58) No. 3 — Chassis ground:	Is the resistance more than 1 M Ω ?	Go to step 9.	Repair the ground short circuit in fuel tank cord.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
9 CHECK FUEL LEVEL SENSOR. 1)Remove the fuel pump assembly. <Ref. to FU-62, Fuel Pump.> 2)Measure the 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 the poor contact in harness between ECM and combination meter connector.	Replace the fuel level sensor.
10 CHECK FUEL TANK CORD. 1)Turn the ignition switch to OFF. 2)Disconnect the connector from fuel sub level sensor. 3)Measure the resistance between fuel sub level sensor and chassis ground. <i>Connector & terminal</i> <i>(R59) No. 1 — Chassis ground:</i>	Is the resistance more than 1 M Ω ?	Go to step 11.	Repair the ground short circuit in fuel tank cord.
11 CHECK FUEL TANK CORD. 1)Disconnect the connector from fuel pump assembly. 2)Measure the resistance between fuel pump assembly and chassis ground. <i>Connector & terminal</i> <i>(R59) No. 2 — Chassis ground:</i>	Is the resistance more than 1 M Ω ?	Go to step 12.	Repair the ground short circuit in fuel tank cord.
12 CHECK FUEL LEVEL SENSOR. 1)Remove the fuel pump assembly. <Ref. to FU-62, Fuel Pump.> 2)Measure the resistance between fuel level sensor and terminals with its float set to the full position. <i>Terminals</i> <i>No. 3 — No. 5:</i>	Is the resistance between 0.5 and 2.5 Ω ?	Go to step 13.	Replace the fuel level sensor.
13 CHECK FUEL SUB LEVEL SENSOR. 1)Remove the fuel sub level sensor. <Ref. to FU-66, Fuel Sub Level Sensor.> 2)Measure the resistance between fuel sub level sensor and terminals with its float set to the full position. <i>Terminals</i> <i>No. 1 — No. 2:</i>	Is the resistance between 0.5 and 2.5 Ω ?	Repair the poor contact in harness between ECM and combination meter connector.	Replace the fuel sub level sensor.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

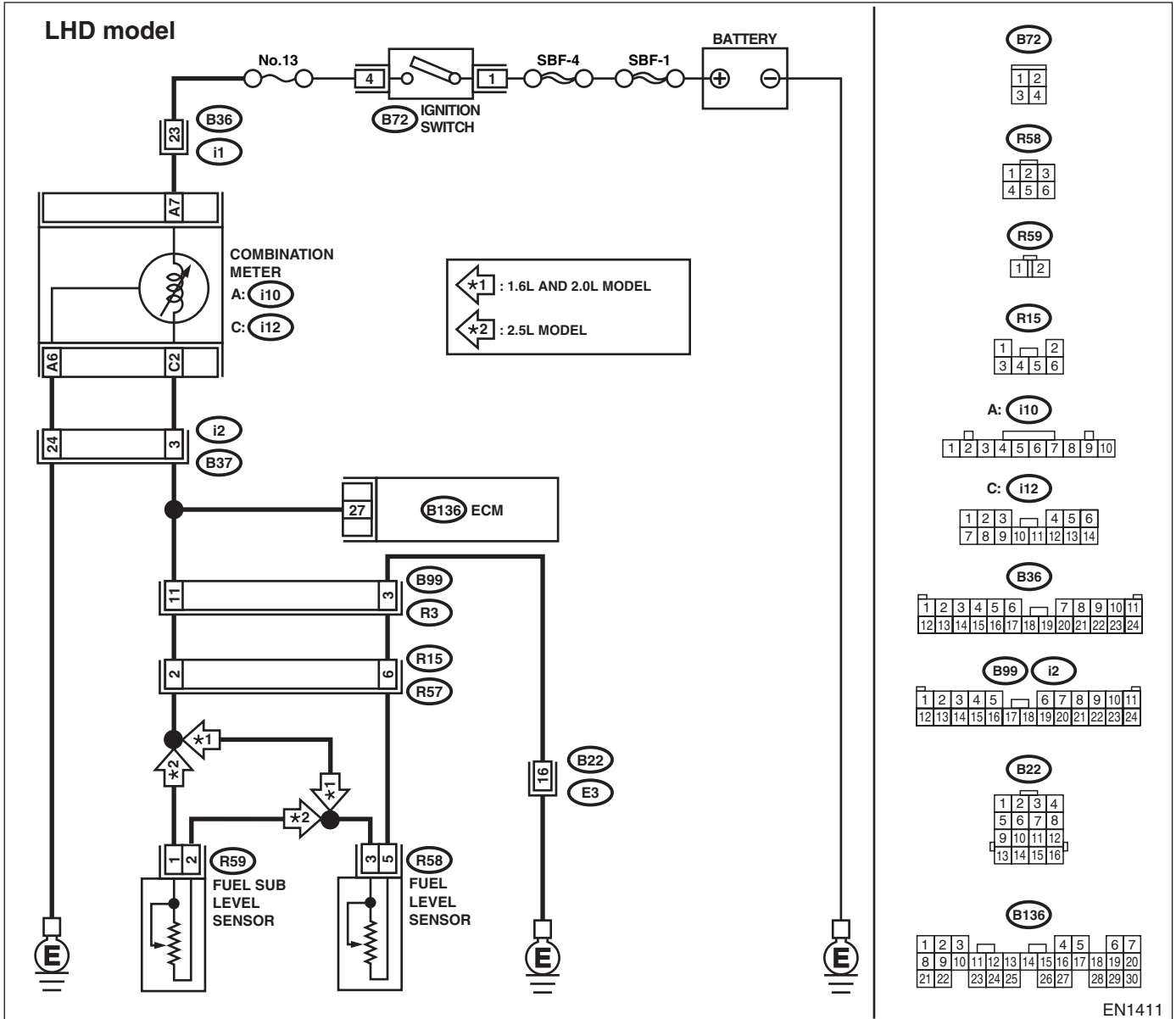
AO:DTC P0463 — FUEL LEVEL SENSOR CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
 - Two consecutive driving cycles with fault

CAUTION:

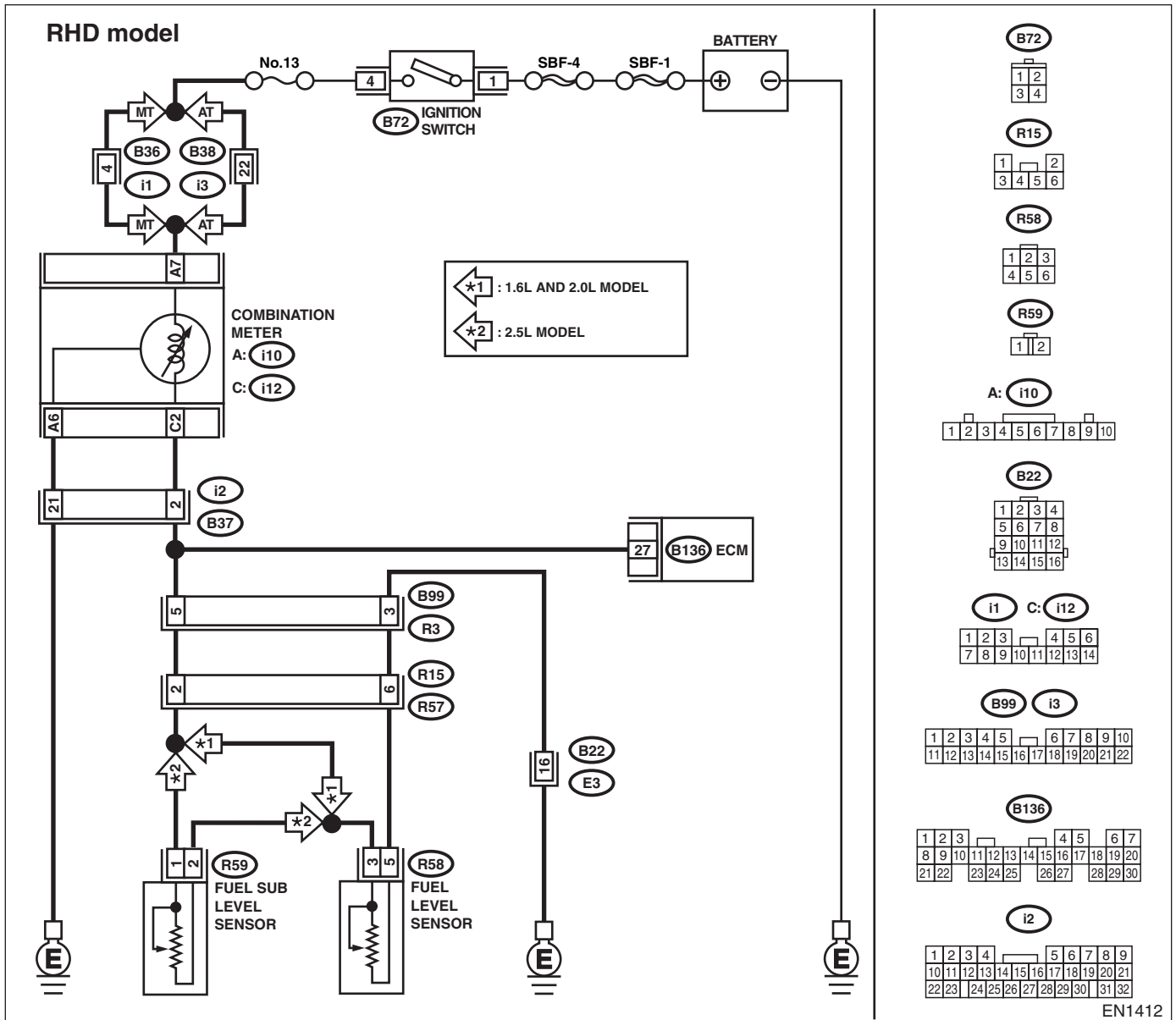
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN-42, OPERATION, Inspection Mode.> .

• **WIRING DIAGRAM:**



EN1411

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC) ENGINE (DIAGNOSTICS)



EN1412

Step	Check	Yes	No
1	CHECK SPEEDOMETER AND TACHOMETER OPERATION IN COMBINATION METER.	Does the speedometer and tachometer operate normally?	Go to step 2.
			Repair or replace the 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 the ignition switch to ON. (engine OFF) 2) Measure the 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: <ul style="list-style-type: none"> • Poor contact in fuel pump connector • Poor contact in coupling connector (B22, B99 and R15)
3 CHECK INPUT VOLTAGE OF ECM. 1) Turn the ignition switch to OFF. 2) Disconnect the combination meter connector (i10) and ECM connector. 3) Turn the ignition switch to ON. 4) Measure the 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 the battery short circuit between ECM and combination meter connector.
4 CHECK HARNESS BETWEEN ECM AND FUEL TANK CORD. 1) Turn the ignition switch to OFF. 2) Separate the fuel tank cord connector (R57) and rear wiring harness connector (R15). 3) Measure the 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 the open circuit between ECM and fuel tank cord.
5 CHECK HARNESS BETWEEN FUEL TANK CORD AND CHASSIS GROUND. Measure the 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 the 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 the connector from fuel level sensor. 2) Measure the 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 the open circuit between coupling connector and fuel level sensor.
7 CHECK ENGINE DISPLACEMENT.	Is the engine displacement 2.5 L?	Go to step 10.	Go to step 7.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
8 CHECK FUEL TANK CORD. 1)Disconnect the connector from fuel level sensor. 2)Measure the 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 9.	Repair the open circuit between coupling connector and fuel level sensor.
9 CHECK FUEL LEVEL SENSOR. 1)Remove the fuel pump assembly. <Ref. to FU-62, Fuel Pump.> 2)While moving the fuel level sensor float up and down, measure the resistance between fuel level sensor terminals. Terminals No. 3 — No. 5:	Is the resistance more than 100 Ω ?	Replace the fuel level sensor. <Ref. to FU-65, Fuel Level Sensor.>	Replace the combination meter. <Ref. to IDI-15, Combination Meter Assembly.>
10 CHECK FUEL TANK CORD. 1)Disconnect the connector from fuel sub level sensor. 2)Measure the 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 11.	Repair the open circuit between fuel level sensor and fuel sub level sensor.
11 CHECK FUEL TANK CORD. Measure the 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 12.	Repair the open circuit between coupling connector and fuel sub level sensor.
12 CHECK FUEL LEVEL SENSOR. 1)Remove the fuel pump assembly. <Ref. to FU-62, Fuel Pump.> 2)While moving the 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 the fuel level sensor. <Ref. to FU(TURBO)-62, Fuel Level Sensor.>	Go to step 13.
13 CHECK FUEL SUB LEVEL SENSOR. 1)Remove the fuel sub level sensor. <Ref. to FU-66, Fuel Sub Level Sensor.> 2)While moving the 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 the fuel sub level sensor. <Ref. to FU(TURBO)-63, Fuel Sub Level Sensor.>	Replace the combination meter. <Ref. to IDI-15, Combination Meter Assembly.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

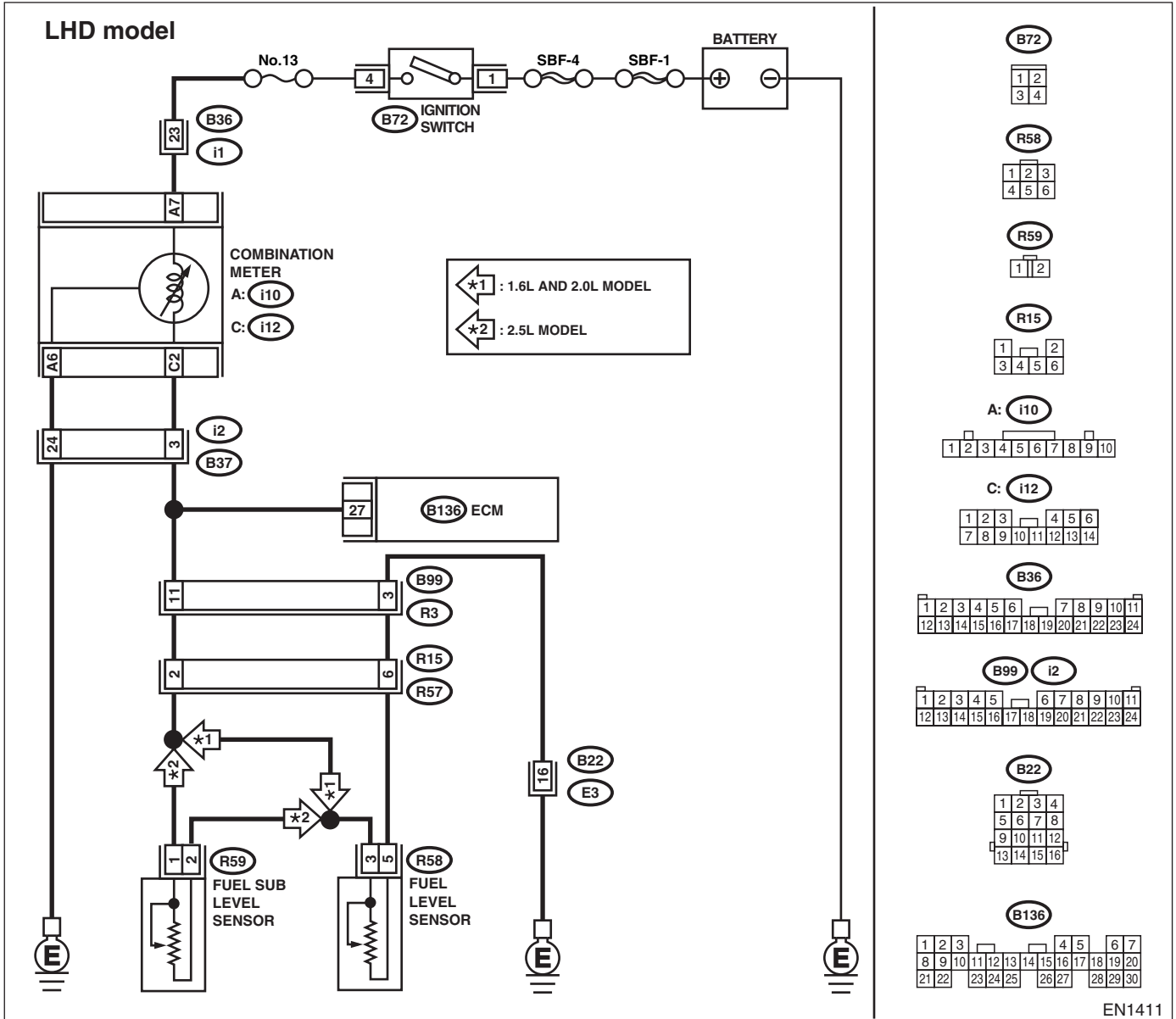
AP:DTC P0464 — FUEL LEVEL SENSOR INTERMITTENT INPUT—

- DTC DETECTING CONDITION:
 - Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN-42, OPERATION, Inspection Mode.> .

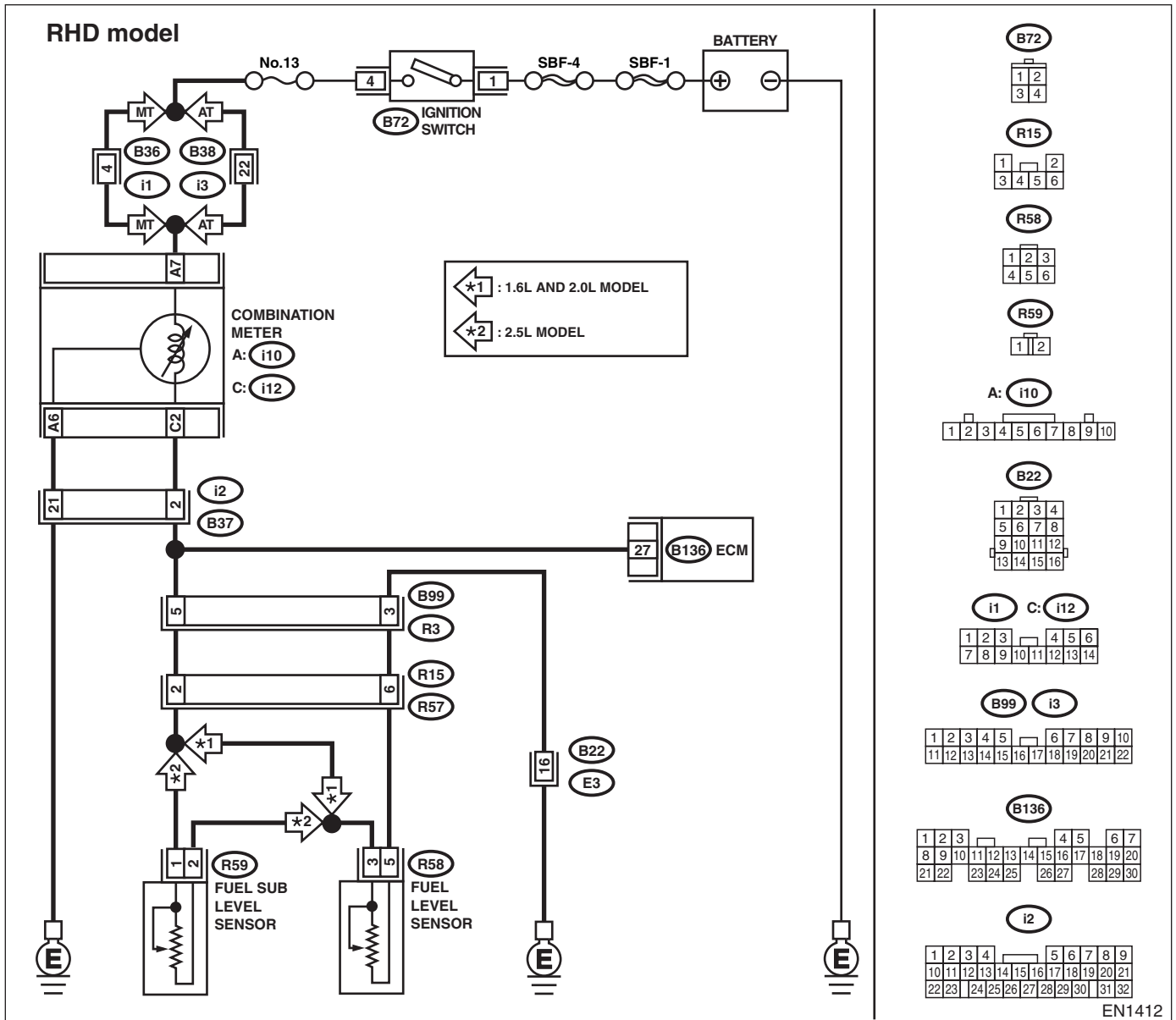
• WIRING DIAGRAM:



EN1411

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)



Step	Check	Yes	No	
1	CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN-83, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2	CHECK FUEL LEVEL SENSOR. 1) Remove the fuel pump assembly. <Ref. to FU-62, Fuel Pump.> 2) While moving the 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?	2.5 L: Go to step 3. 1.6 L and 2.0 L: Repair the poor contact in ECM, combination meter and coupling connectors.	Replace the fuel level sensor. <Ref. to FU-65, Fuel Level Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>3 CHECK FUEL SUB LEVEL SENSOR. 1)Remove the fuel sub level sensor. 2)<Ref. to FU-66, Fuel Sub Level Sensor.> 3)While moving the fuel sub level sensor float up and down, make sure that the resistance between fuel level sensor terminals changes smoothly.</p> <p>Terminals No. 1 — No. 2:</p>	Does the resistance change smoothly between approx. 0.5 Ω and approx. 44 Ω ?	Repair the poor contact in ECM, combination meter and coupling connectors.	Replace the fuel sub level sensor. <Ref. to FU-66, Fuel Sub Level Sensor.>

AQ:DTC P0480 — COOLING FAN RELAY 1 CIRCUIT LOW INPUT —

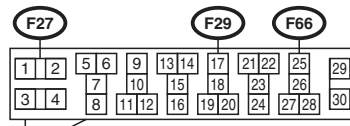
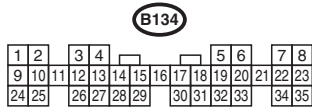
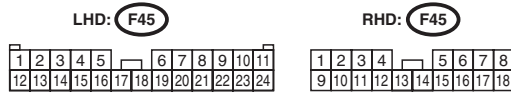
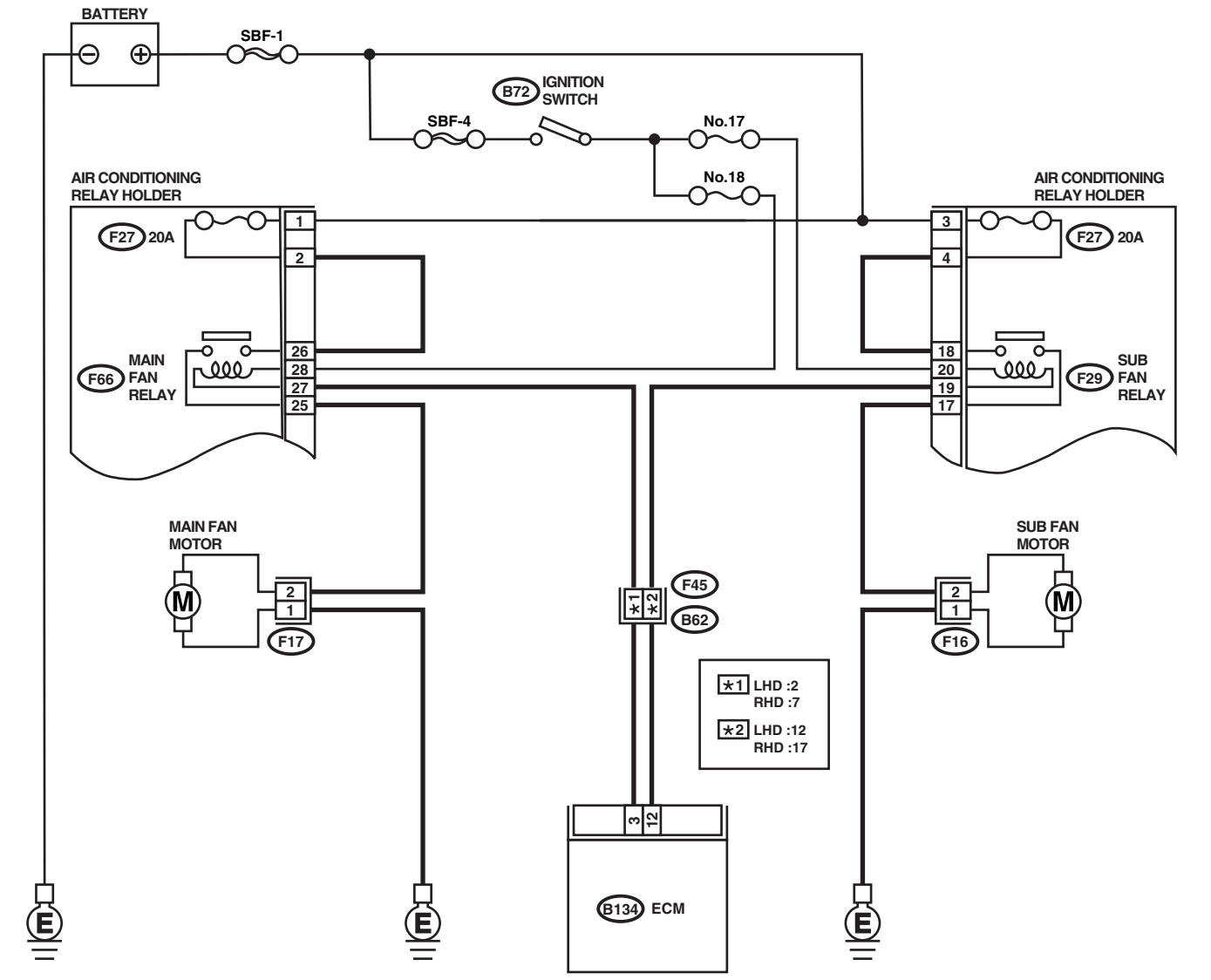
- **DTC DETECTING CONDITION:**
 - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
 - Radiator fan does not operate properly.
 - Overheating

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN-42, OPERATION, Inspection Mode.> .

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC) ENGINE (DIAGNOSTICS)

• WIRING DIAGRAM:



EN1413

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>1 CHECK OUTPUT SIGNAL FROM ECM. 1) Turn the ignition switch to OFF. 2) Connect the test mode connector at the lower portion of instrument panel (on the driver's side). 3) Turn the ignition switch to ON. 4) While operating the radiator fan relay, measure the voltage between ECM terminal and ground.</p> <p>NOTE: Radiator fan relay operation can be executed using the Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode".<Ref. to EN-34, Subaru Select Monitor.></p> <p>Connector & terminal (B134) No. 3 (+) — Chassis ground (-):</p>	Does voltage change between 0 and 10 V?	Repair the poor contact in ECM connector.	Go to step 2.
<p>2 CHECK GROUND SHORT CIRCUIT IN RADIATOR MAIN FAN RELAY CONTROL CIRCUIT. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance of harness between ECM connector and chassis ground.</p> <p>Connector & terminal (B134) No. 3 — Chassis ground:</p>	Is the resistance less than 10 Ω ?	Repair the ground short circuit in radiator main fan relay control circuit.	Go to step 3.
<p>3 CHECK POWER SUPPLY FOR RELAY. 1) Remove the main fan relay from A/C relay holder. 2) Turn the ignition switch to ON. 3) Measure the voltage between fuse and relay box (F/B) connector and chassis ground.</p> <p>Connector & terminal (F66) No. 28 (+) — Chassis ground (-):</p>	Is the voltage more than 10 V?	Go to step 4.	Repair the open circuit in harness between ignition switch and fuse and relay box (F/B) connector.
<p>4 CHECK MAIN FAN RELAY. 1) Turn the ignition switch to OFF. 2) Measure the resistance between main fan relay terminals.</p> <p>Terminal No. 28 — No. 27:</p>	Is the resistance between 87 and 107 Ω ?	Go to step 5.	Replace the main fan relay.
<p>5 CHECK OPEN CIRCUIT IN MAIN FAN RELAY CONTROL CIRCUIT. Measure the resistance of harness between ECM and main fan relay connector.</p> <p>Connector & terminal (B134) No. 3 — (F66) No. 27:</p>	Is the resistance less than 1 Ω ?	Go to step 6.	Repair the harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between ECM and main fan relay connector • Poor contact in coupling connector (F45)
<p>6 CHECK POOR CONTACT. Check poor contact in ECM or main fan relay connector.</p>	Is there poor contact in ECM or main fan relay connector?	Repair the 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:

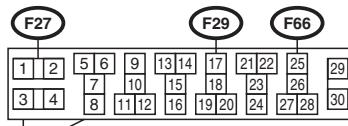
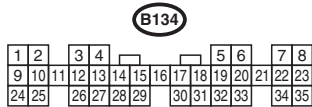
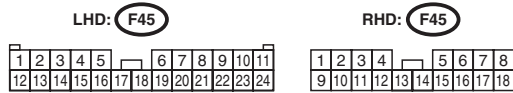
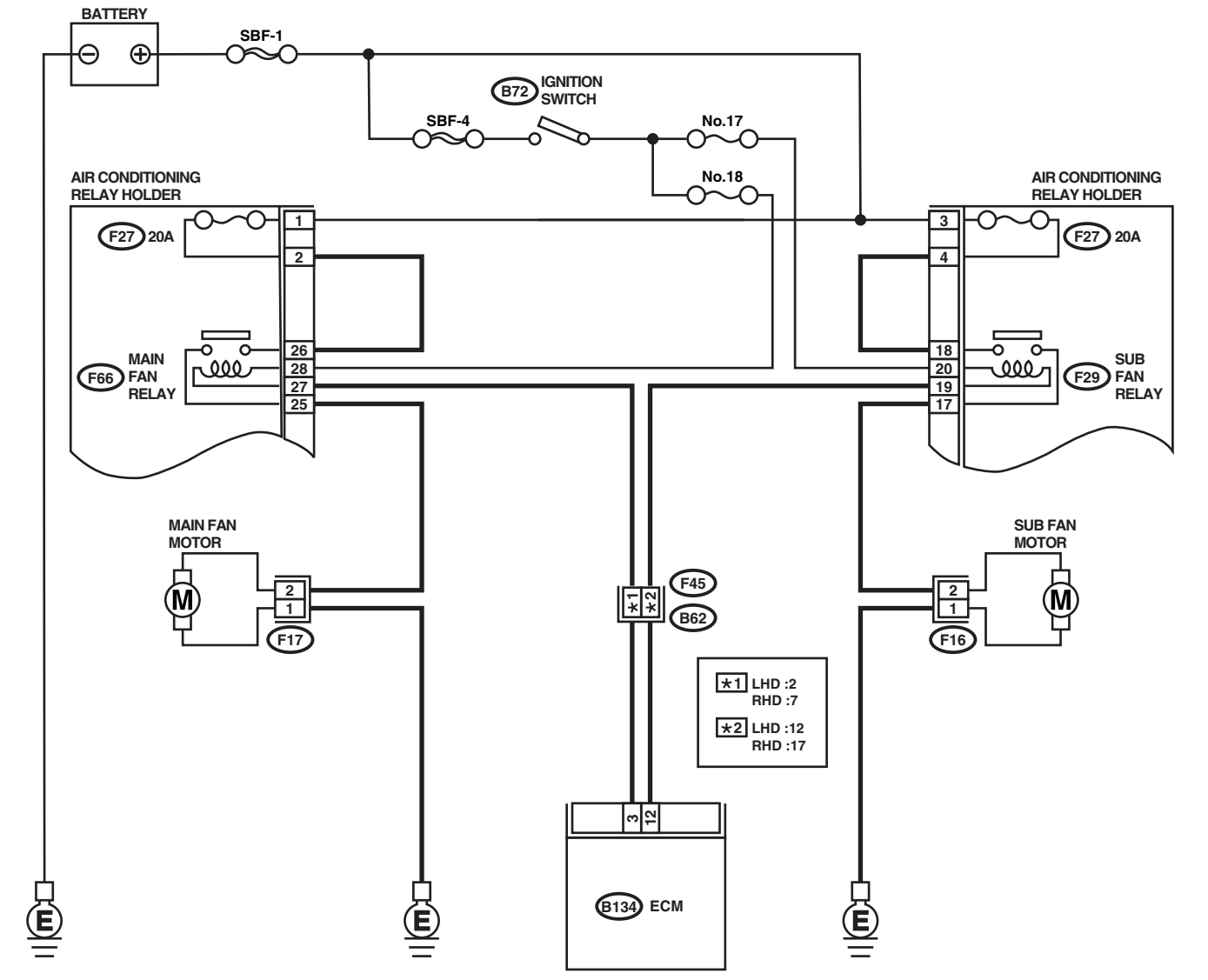
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN-42, OPERATION, Inspection Mode.> .

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:



EN1413

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN-83, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK ENGINE COOLANT AMOUNT	Is the amount of engine coolant at specified level?	Check the radiator fan and fan motor. <Ref. to CO-10, Radiator Main Fan System.> and <Ref. to CO-18, Radiator Sub Fan System.>	Add engine coolant.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

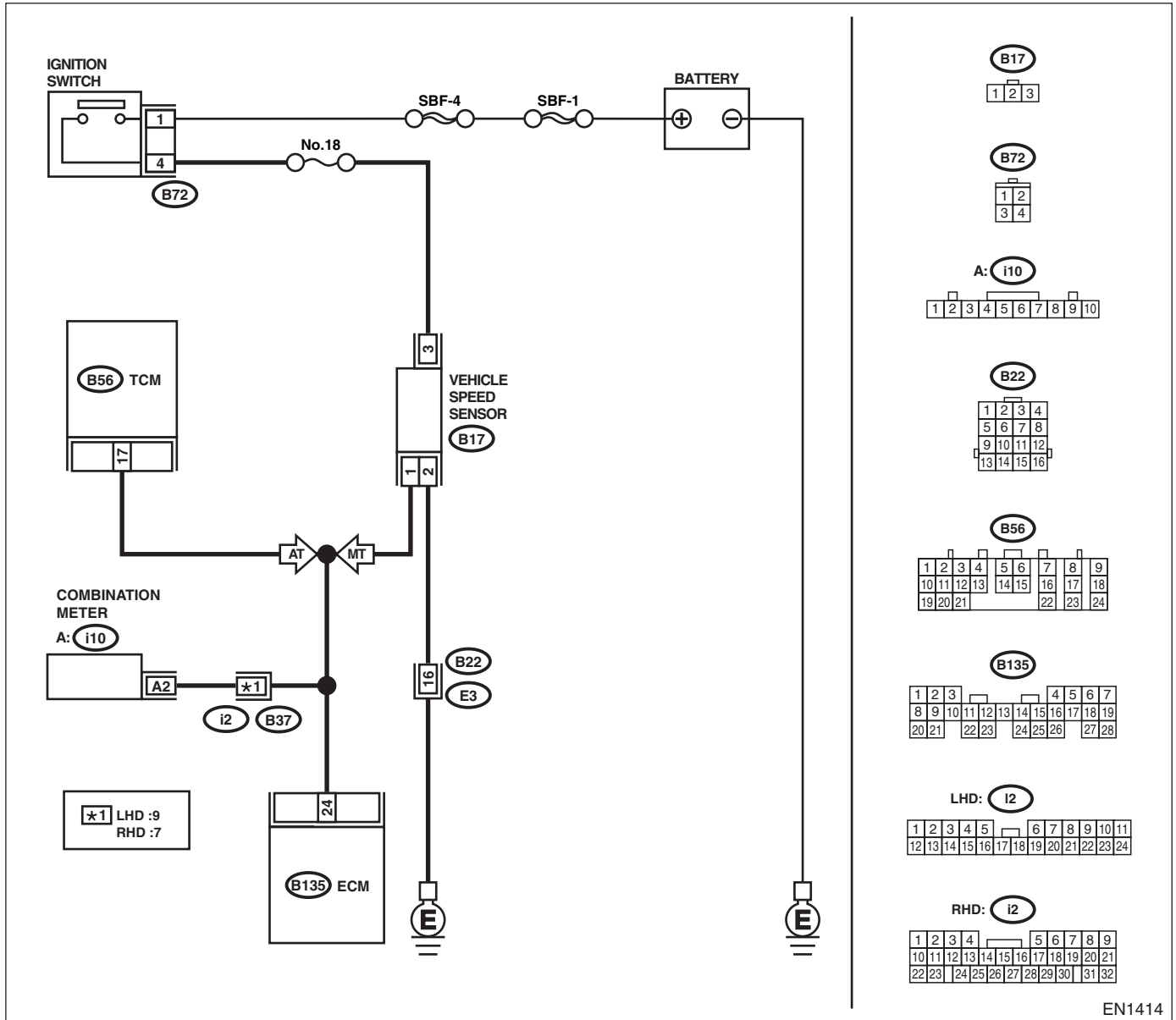
AS:DTC P0500 — VEHICLE SPEED SENSOR MALFUNCTION —

- **DTC DETECTING CONDITION:**
 - Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN-42, OPERATION, Inspection Mode.> .

• **WIRING DIAGRAM:**



EN1414

Step	Check	Yes	No
1	CHECK TRANSMISSION TYPE.	Is the transmission type AT?	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 the front vehicle speed sensor signal circuit. <Ref. to AT-57, DTC 33 FRONT VEHICLE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
3	CHECK SPEEDOMETER OPERATION IN COMBINATION METER.	Does the speedometer operate normally?	Go to step 4. Check the speedometer and vehicle speed sensor. <Ref. to IDI-17, Speedometer.> and <Ref. to AT-32, Front Vehicle Speed Sensor.> and <Ref. to AT-36, Rear Vehicle Speed Sensor.> and <Ref. to AT-37, Torque Converter Turbine Speed Sensor.>
4	CHECK HARNESS BETWEEN ECM AND COMBINATION METER CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from combination meter. 3) Measure the resistance between ECM and combination meter. Connector & terminal (B135) No. 24 — (i10) No. 2:	Is the resistance less than 10 Ω?	Repair the poor contact in ECM connector. Repair the 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)

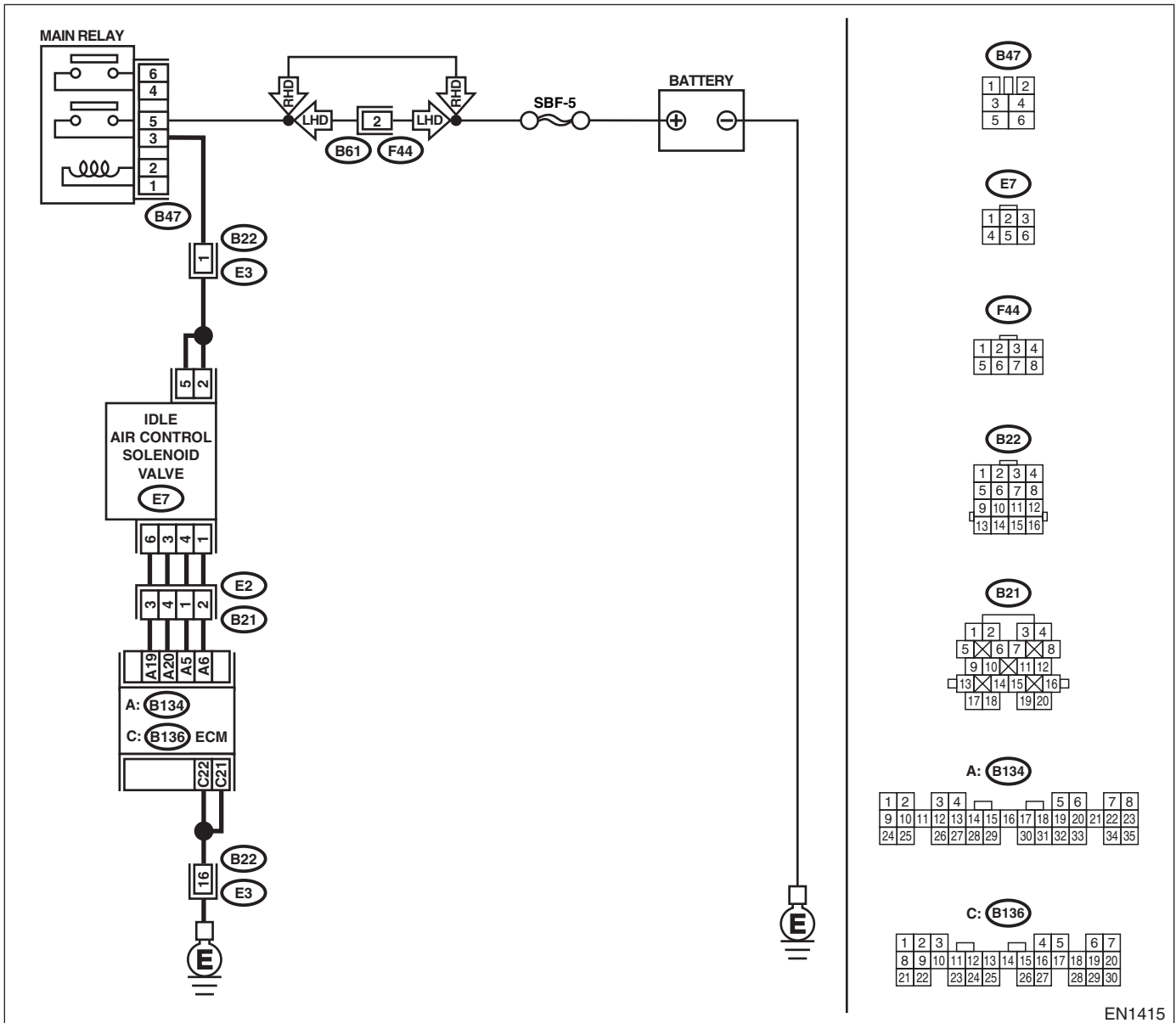
AT:DTC P0506 — IDLE CONTROL SYSTEM RPM LOWER THAN EXPECTED —

- **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-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN-42, OPERATION, Inspection Mode.> .

• **WIRING DIAGRAM:**



EN1415

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN-83, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0506.	Go to step 2.
2 CHECK AIR BY-PASS LINE. 1) Turn the ignition switch to OFF. 2) Remove the idle air control solenoid valve from throttle body. <Ref. to FU-39, REMOVAL, Idle Air Control Solenoid Valve.> 3) Remove the throttle body from intake manifold. <Ref. to FU-16, REMOVAL, Throttle Body.> 4) Using an air gun, force air into the idle air control solenoid valve installation area. Confirm that forced air subsequently escapes from the throttle body interior.	Does air flow out?	Replace the idle air control solenoid valve. <Ref. to FU-39, INSTALLATION, Idle Air Control Solenoid Valve.>	Replace the throttle body. <Ref. to FU-16, INSTALLATION, Throttle Body.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

AU:DTC P0507 — IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED —

• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

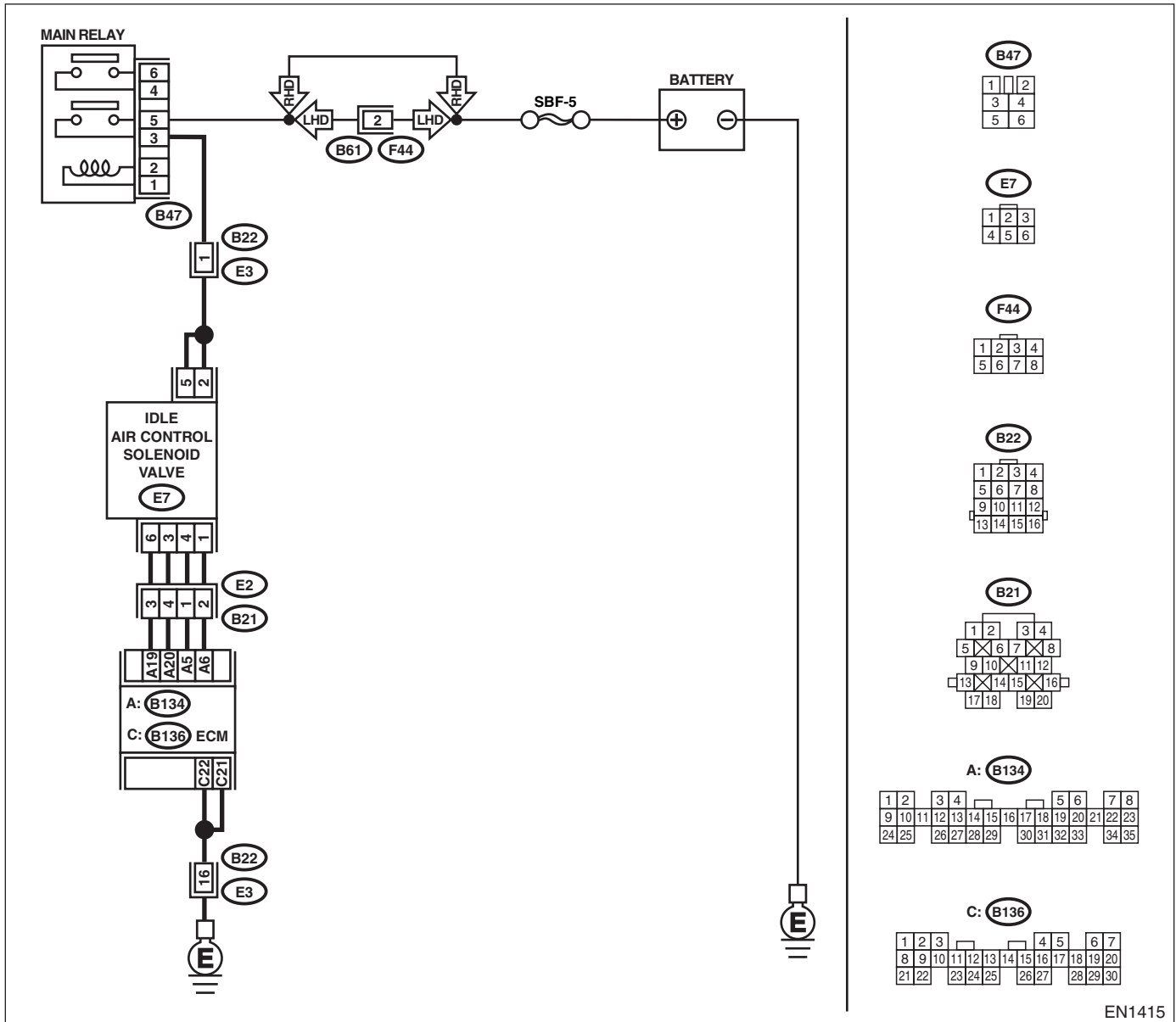
• TROUBLE SYMPTOM:

- 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-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN-42, OPERATION, Inspection Mode.> .

• WIRING DIAGRAM:



EN1415

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN-83, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0507.	Go to step 2.
2 CHECK AIR INTAKE SYSTEM. 1)Turn the ignition switch to ON. 2)Start the engine, and idle it. 3)Check the following items. •Loose installation of intake manifold, idle air control solenoid valve and throttle body •Cracks of intake manifold gasket, idle air control solenoid valve gasket and throttle body gasket •Disconnections of vacuum hoses	Is there a fault in air intake system?	Repair the air suction and leaks.	Go to step 3.
3 CHECK THROTTLE CABLE.	Does the throttle cable have play for adjustment?	Go to step 4.	Adjust the throttle cable. <Ref. to SP-9, INSTALLATION, Accelerator Control Cable.>
4 CHECK AIR BY-PASS LINE. 1)Turn the ignition switch to OFF. 2)Remove the idle air control solenoid valve from throttle body. <Ref. to FU-39, 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 the foreign particles from by-pass air line.	Replace the idle air control solenoid valve. <Ref. to FU-39, INSTALLATION, Idle Air Control Solenoid Valve.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

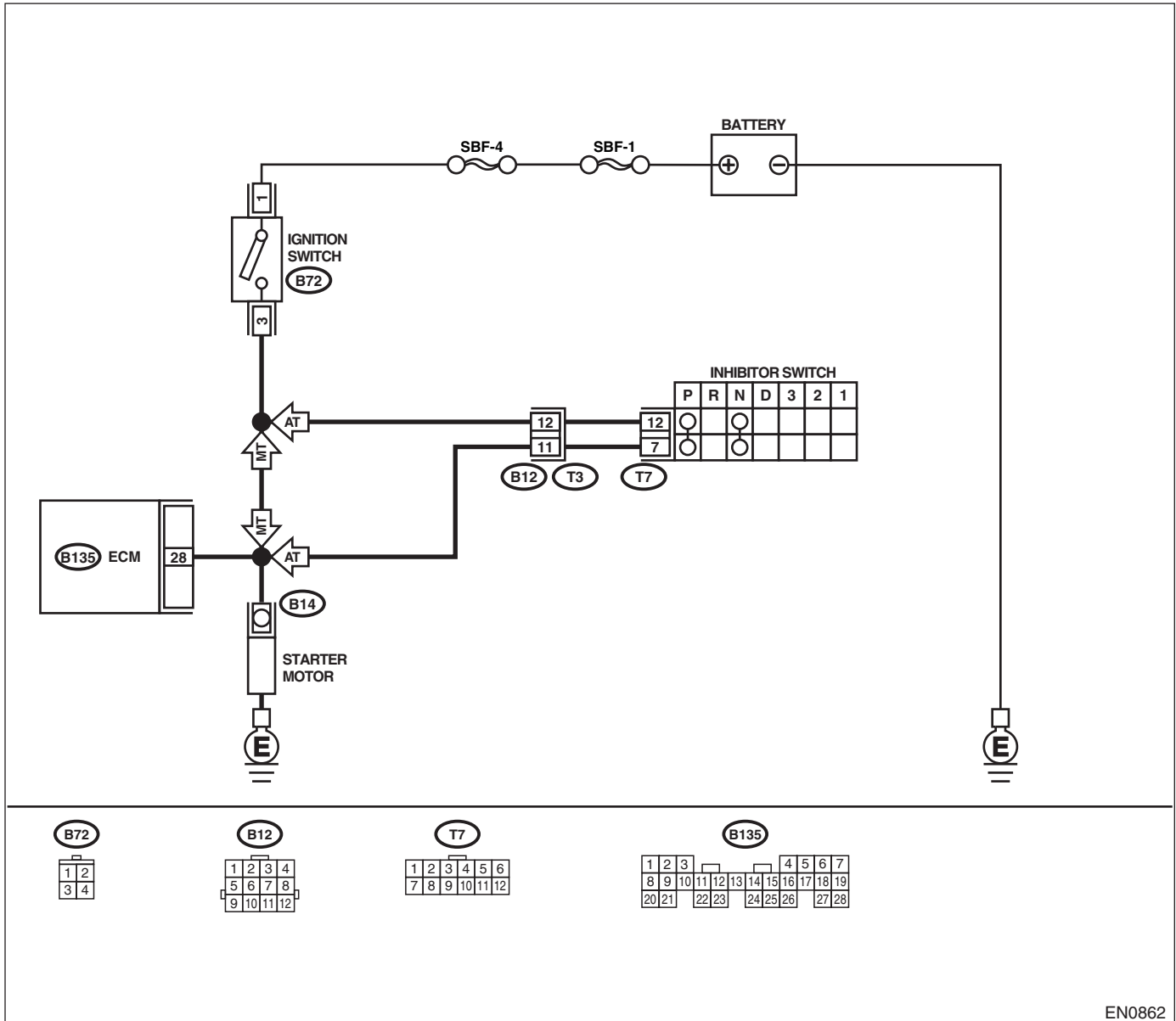
AV:DTC P0512 — STARTER SWITCH CIRCUIT HIGH INPUT —

- **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-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN0862

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 the starter motor operate when ignition switch is turned to ON?	Repair the battery short circuit in starter motor circuit.	Check the starter motor circuit. <Ref. to EN-64, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

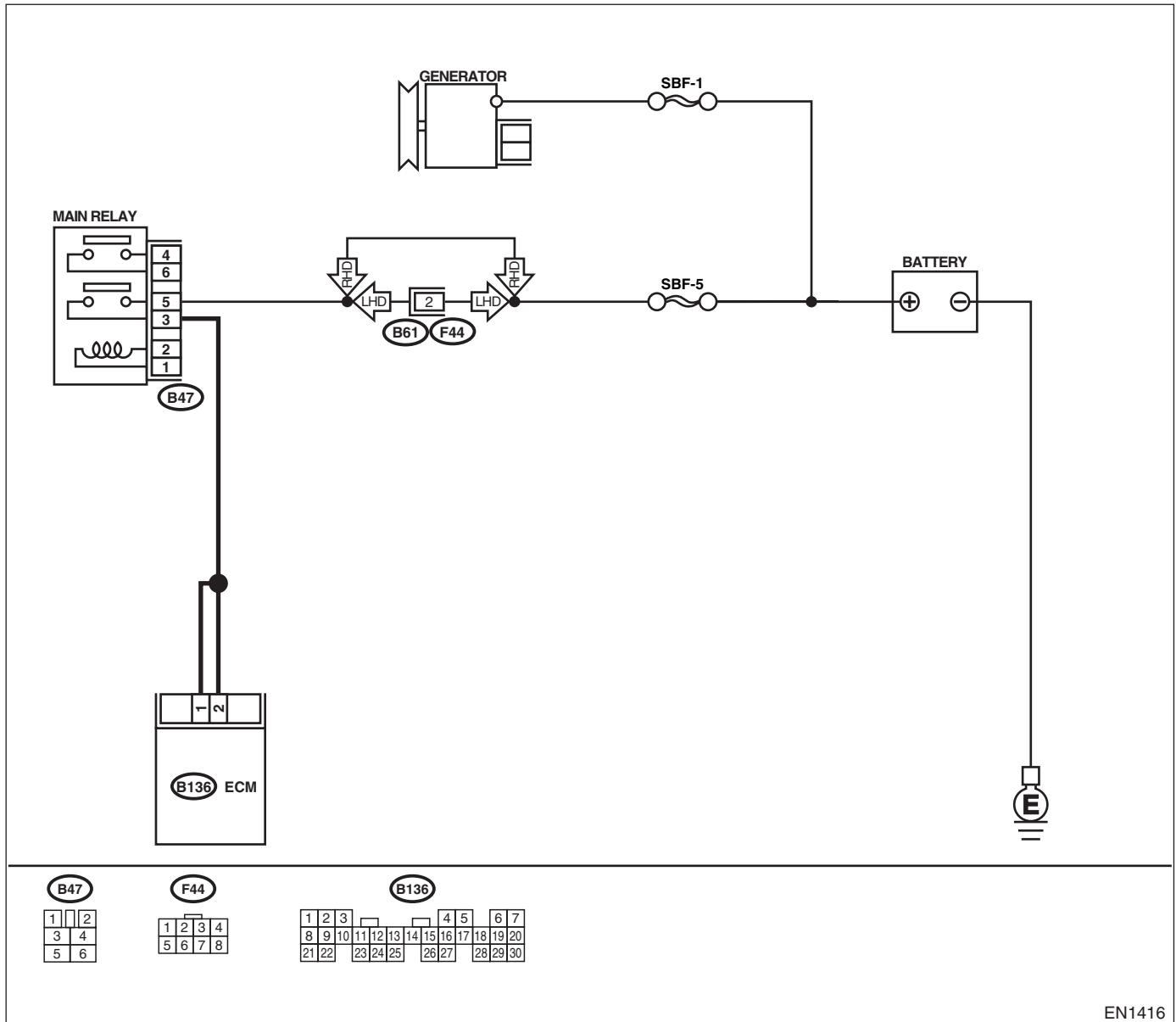
AW:DTC P0562 — CHARGE SYSTEM CIRCUIT LOW INPUT —

- **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-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN-42, OPERATION, Inspection Mode.> .

• WIRING DIAGRAM:



EN1416

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK GENERATOR. 1)Start the engine. 2)Idle after warm-up. 3)Measure the voltage between generator B terminal and chassis ground. <i>Terminal</i> <i>Generator B terminal (+) — Chassis ground (-):</i>	Is the voltage less than 10.8 V?	Go to step 2.	Repair the generator. <Ref. to CS-21, General Diagnostic.>
2 CHECK GENERATOR. 1)Run the engine at 5,000 rpm. 2)Measure the voltage between generator B terminal and chassis ground. <i>Terminal</i> <i>Generator B terminal (+) — Chassis ground (-):</i>	Is the voltage less than 10.8 V?	Go to step 3.	Repair the generator. <Ref. to CS-21, General Diagnostic.>
3 CHECK BATTERY TERMINAL. Turn the ignition switch to OFF.	Are the positive and ground 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 the voltage between ECM connector and chassis ground. <i>Connector & terminal</i> <i>(B136) No. 1 (+) — Chassis ground (-):</i> <i>(B136) No. 2 (+) — Chassis ground (-):</i>	Is the voltage less than 10.8 V?	Go to step 5.	Repair the harness connector between battery, main relay and ECM.
5 CHECK POOR CONTACT IN CONNECTORS.	Is there poor contact in connectors between generator, battery and ECM?	Repair the connector.	Go to step 6.
6 CHECK ECM. 1)Connect all connectors. 2)Erase the memory. <Ref. to EN-49, Clear Memory Mode.> 3)Perform inspection mode. <Ref. to EN-42, Inspection Mode.> 4)Read out the DTC. <Ref. to EN-41, Read Diagnostic Trouble Code (DTC).>	Is the same DTC as in the current diagnosis still being output?	Replace the generator.	Go to step 7.
7 CHECK ANY OTHER TROUBLE CODES APPEARANCE.	Are other DTC being output?	Proceed with the diagnosis corresponding to the DTC.	A temporary poor contact.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

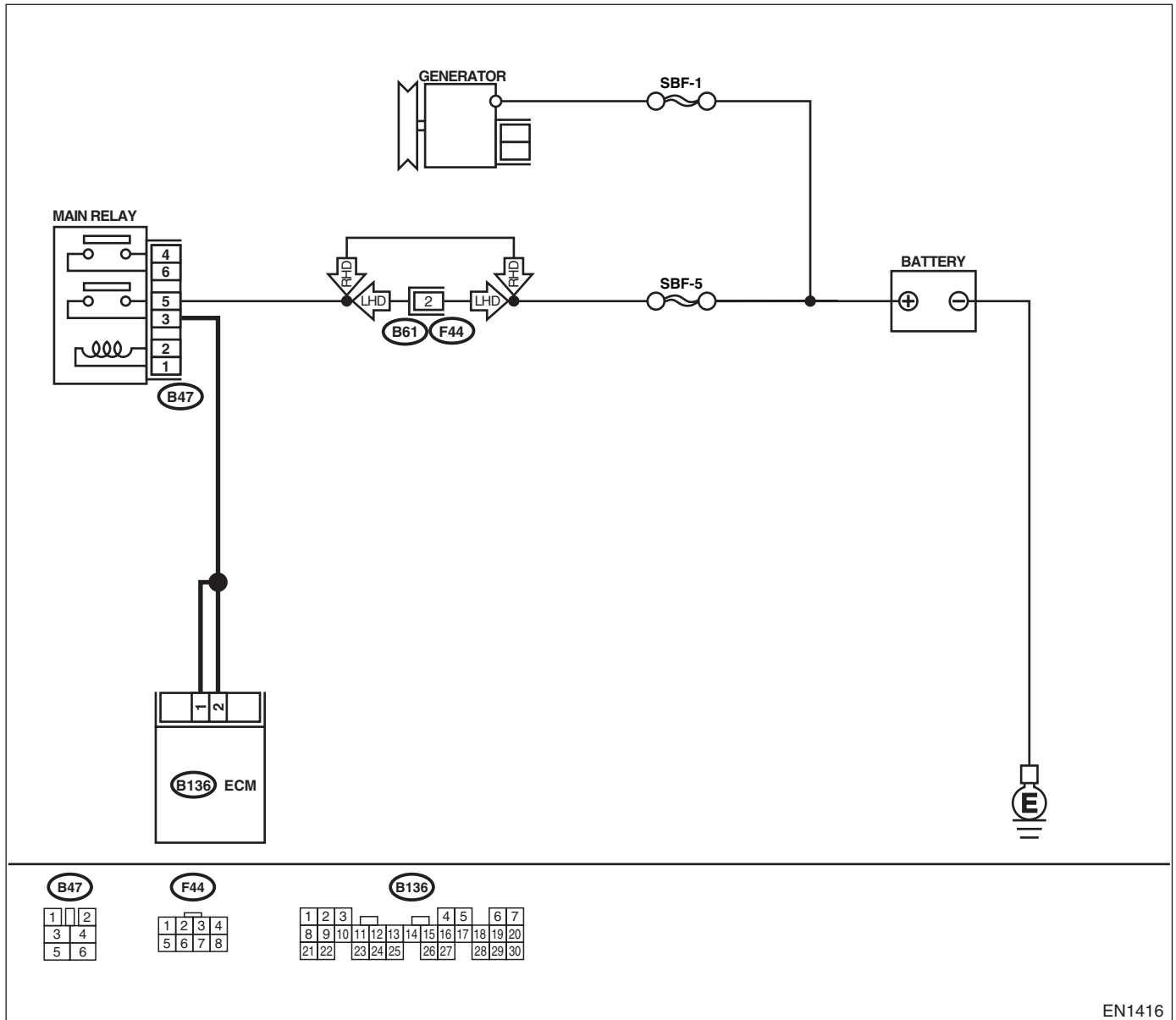
AX:DTC P0563 — CHARGE SYSTEM CIRCUIT HIGH INPUT —

- **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-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN-42, OPERATION, Inspection Mode.> .

• **WIRING DIAGRAM:**



EN1416

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK GENERATOR. 1)Start the engine. 2)Idle after warm-up. 3)Measure the voltage between generator B terminal and chassis ground. <i>Terminal</i> <i>Generator B terminal (+) — Chassis ground (-):</i>	Is the voltage more than 16.2 V?	Go to step 2.	Repair the generator. <Ref. to CS-21, General Diagnostic.>
2 CHECK GENERATOR. 1)Run the engine at 5,000 rpm. 2)Measure the voltage between generator B terminal and chassis ground. <i>Terminal</i> <i>Generator B terminal (+) — Chassis ground (-):</i>	Is the voltage more than 16.2 V?	Go to step 3.	Repair the generator. <Ref. to CS-21, General Diagnostic.>
3 CHECK BATTERY TERMINAL. Turn the ignition switch to OFF.	Are the positive and ground 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 the voltage between ECM connector and chassis ground. <i>Connector & terminal</i> <i>(B136) No. 1 (+) — Chassis ground (-):</i> <i>(B136) No. 2 (+) — Chassis ground (-):</i>	Is the voltage more than 16.2 V?	Go to step 5.	Repair the harness connector between battery, main relay and ECM.
5 CHECK POOR CONTACT IN CONNECTORS.	Is there poor contact in connectors between generator, battery and ECM?	Repair the connector.	Go to step 6.
6 CHECK ECM. 1)Connect all connectors. 2)Erase the memory. <Ref. to EN-49, Clear Memory Mode.> 3)Perform the inspection mode. <Ref. to EN-42, Inspection Mode.> 4)Read out the DTC. <Ref. to EN-41, Read Diagnostic Trouble Code (DTC).>	Is the same DTC as in the current diagnosis still being output?	Replace the generator.	Go to step 7.
7 CHECK ANY OTHER TROUBLE CODES APPEARANCE.	Are other DTC being output?	Proceed with the diagnosis corresponding to the DTC.	A temporary poor contact.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC) ENGINE (DIAGNOSTICS)

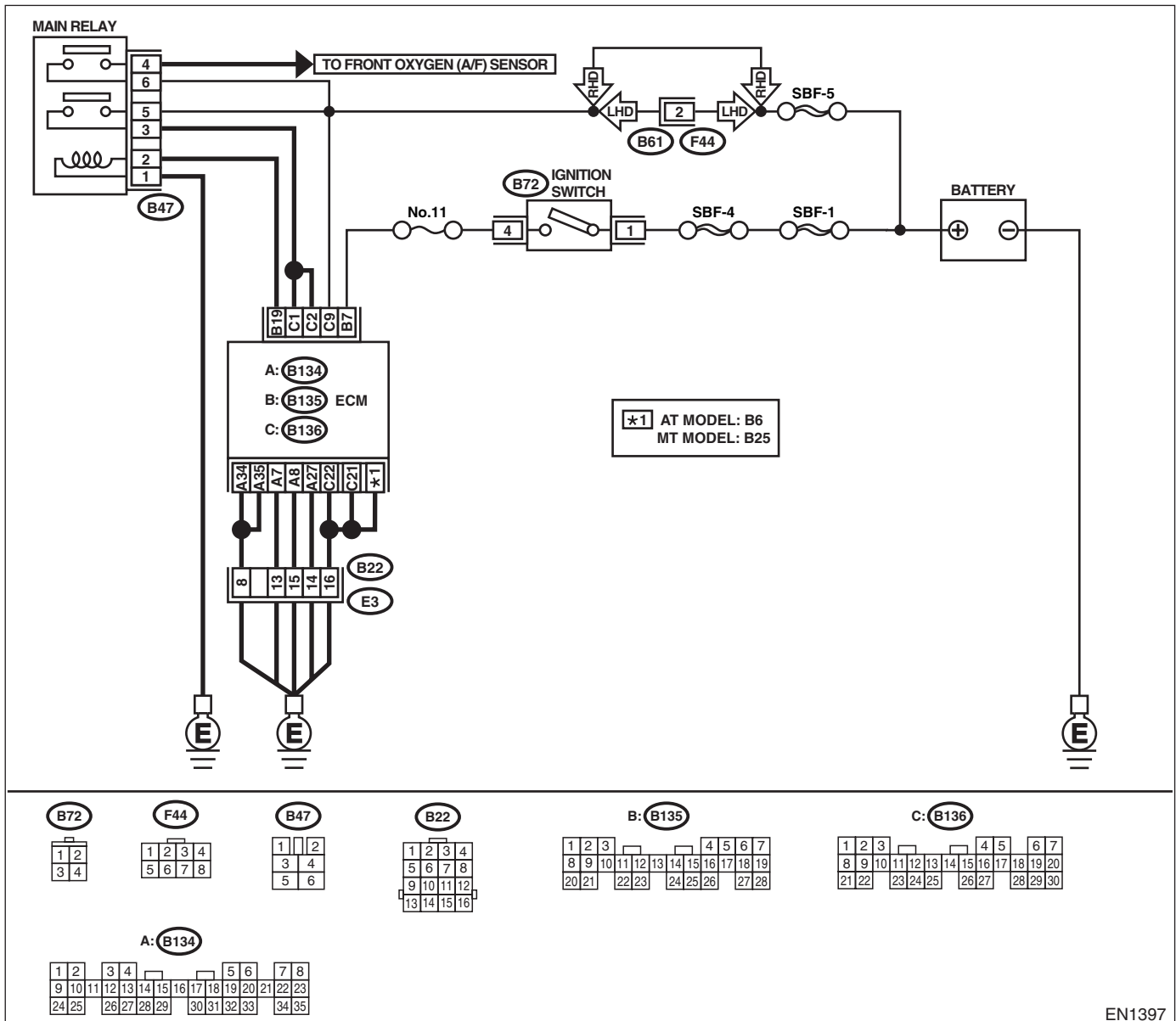
AY:DTC P0604 — INTERNAL CONTROL MODULE MEMORY CHECK SUM ERROR —

- **DTC DETECTING CONDITION:**
 - 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-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN-42, OPERATION, Inspection Mode.> .

• WIRING DIAGRAM:



EN1397

Step	Check	Yes	No	
1	CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0604?	Replace the ECM. <Ref. to FU-51, Engine Control Module.>	It is not necessary to inspect DTC P0604.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

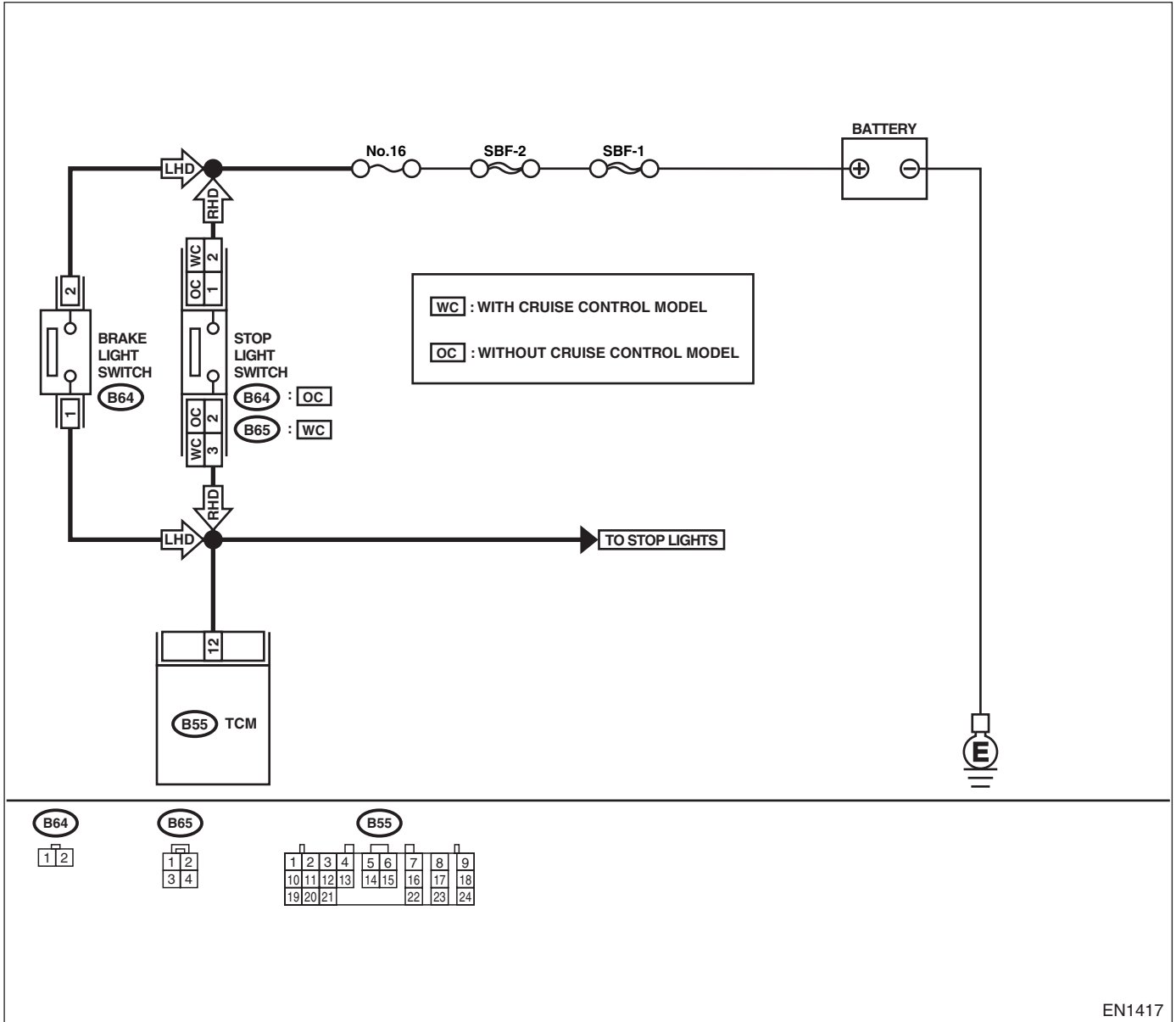
AZ:DTC P0703 — BRAKE SWITCH INPUT MALFUNCTION —

- **DTC DETECTING CONDITION:**
 - Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN-42, OPERATION, Inspection Mode.> .

• **WIRING DIAGRAM:**



Step	Check	Yes	No
1	CHECK OPERATION OF BRAKE LIGHT. Does the brake light come on when depressing the brake pedal?	Go to step 2.	Repair or replace the brake light circuit.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>2</p> <p>CHECK HARNESS BETWEEN TCM AND BRAKE LIGHT SWITCH CONNECTOR. 1)Disconnect the connectors from TCM and brake light switch. 2)Measure the resistance of harness between TCM and brake light switch connector. Connector & terminal</p> <ul style="list-style-type: none"> • LHD <i>(B55) No. 12 — (B64) No. 1:</i> • RHD <i>Without cruise control</i> <i>(B55) No. 12 — (B64) No. 2</i> <i>With cruise control</i> <i>(B55) No. 12 — (B65) No. 3</i> 	Is the resistance less than 1 Ω ?	Go to step 3.	Repair or replace the harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between TCM and brake light switch connector • Poor contact in TCM connector • Poor contact in brake light switch connector
<p>3</p> <p>CHECK HARNESS BETWEEN TCM AND BRAKE LIGHT SWITCH CONNECTOR. Measure the resistance of harness between TCM and chassis ground. Connector & terminal <i>(B55) No. 12 — Chassis ground:</i></p>	Is the resistance more than 1 M Ω ?	Go to step 4.	Repair the ground short circuit in harness between TCM and brake light switch connector.
<p>4</p> <p>CHECK INPUT SIGNAL FOR TCM. 1)Connect the connectors to TCM and brake light switch. 2)Measure the voltage between TCM and chassis ground. Connector & terminal <i>(B55) No. 12 (+) — Chassis ground (-):</i></p>	Is the voltage less than 1 V when releasing the brake pedal?	Go to step 5.	Adjust or replace the brake light switch. <Ref. to LI-8, STOP LIGHT SWITCH, INSPECTION, Stop Light System.>
<p>5</p> <p>CHECK INPUT SIGNAL FOR TCM. Measure the voltage between TCM and chassis ground. Connector & terminal <i>(B55) No. 12 (+) — Chassis ground (-):</i></p>	Is the voltage more than 10 V when depressing the brake pedal?	Go to step 6.	Adjust or replace the brake light switch. <Ref. to LI-8, STOP LIGHT SWITCH, INSPECTION, Stop Light System.>
<p>6</p> <p>CHECK POOR CONTACT. Check poor contact in TCM connector.</p>	Is there poor contact in TCM connector?	Repair the poor contact in TCM connector.	Replace the TCM. <Ref. to AT-46, 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-227, 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-227, 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-227, DTC P0734 — GEAR 4 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

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-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN-42, OPERATION, Inspection Mode.> .

• WIRING DIAGRAM:

Step	Check	Yes	No	
1	CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN-83, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2	CHECK THROTTLE POSITION SENSOR CIRCUIT. Check the throttle position sensor circuit. <Ref. to AT-50, DTC 31 THROTTLE POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble in throttle position sensor circuit?	Repair or replace the throttle position sensor circuit.	Go to step 3.
3	CHECK FRONT VEHICLE SPEED SENSOR CIRCUIT. Check the front vehicle speed sensor circuit. <Ref. to AT-57, DTC 33 FRONT VEHICLE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble in front vehicle speed sensor circuit?	Repair or replace the front vehicle speed sensor circuit.	Go to step 4.
4	CHECK TORQUE CONVERTER TURBINE SPEED SENSOR CIRCUIT. Check the torque converter turbine speed sensor circuit. <Ref. to AT-62, DTC 36 TORQUE CONVERTER TURBINE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble in torque converter turbine speed sensor circuit?	Repair or replace the 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 the 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 the automatic transmission. <Ref. to AT-12, INSPECTION, Road Test.>	Replace the TCM. <Ref. to AT-46, Transmission Control Module (TCM).>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

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-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN-42, OPERATION, Inspection Mode.> .

Step	Check	Yes	No	
1	CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN-83, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2	CHECK LOCK-UP DUTY SOLENOID CIRCUIT. Check the lock-up duty solenoid circuit. <Ref. to AT-94, DTC 77 LOCK-UP DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble in lock-up duty solenoid circuit?	Repair or replace the lock-up duty solenoid circuit.	Go to step 3.
3	CHECK THROTTLE POSITION SENSOR CIRCUIT. Check the throttle position sensor circuit. <Ref. to AT-50, DTC 31 THROTTLE POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble in throttle position sensor circuit?	Repair or replace the throttle position sensor circuit.	Go to step 4.
4	CHECK TORQUE CONVERTER TURBINE SPEED SENSOR CIRCUIT. Check the torque converter turbine speed sensor circuit. <Ref. to AT-62, DTC 36 TORQUE CONVERTER TURBINE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble in torque converter turbine speed sensor circuit?	Repair or replace the torque converter turbine speed sensor circuit.	Go to step 5.
5	CHECK ENGINE SPEED INPUT CIRCUIT. Check the engine speed input circuit. <Ref. to AT-42, DTC 11 ENGINE SPEED SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble in engine speed input circuit?	Repair or replace the engine speed input circuit.	Go to step 6.
6	CHECK INHIBITOR SWITCH CIRCUIT. Check the inhibitor switch circuit. <Ref. to AT-119, CHECK INHIBITOR SWITCH., Diagnostic Procedure for No-diagnostic Trouble Code (DTC).>	Is there any trouble in inhibitor switch circuit?	Repair or replace the inhibitor switch circuit.	Go to step 7.
7	CHECK BRAKE LIGHT SWITCH CIRCUIT. Check the brake light switch circuit. <Ref. to AT-110, CHECK BRAKE SWITCH., Diagnostic Procedure for No-diagnostic Trouble Code (DTC).>	Is there any trouble in brake light switch circuit?	Repair or replace the brake light switch circuit.	Go to step 8.
8	CHECK ATF TEMPERATURE SENSOR CIRCUIT. Check the ATF temperature sensor circuit. <Ref. to AT-46, DTC 27 ATF TEMPERATURE SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble in ATF temperature sensor circuit?	Repair or replace the ATF temperature sensor circuit.	Go to step 9.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
9 CHECK POOR CONTACT. Check poor contact in TCM connector.	Is there poor contact in TCM connector?	Repair the 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 the automatic transmission. <Ref. to AT-12, INSPECTION, Road Test.>	Replace the TCM. <Ref. to AT-46, Transmission Control Module (TCM).>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

BF:DTC P1110 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT LOW INPUT —

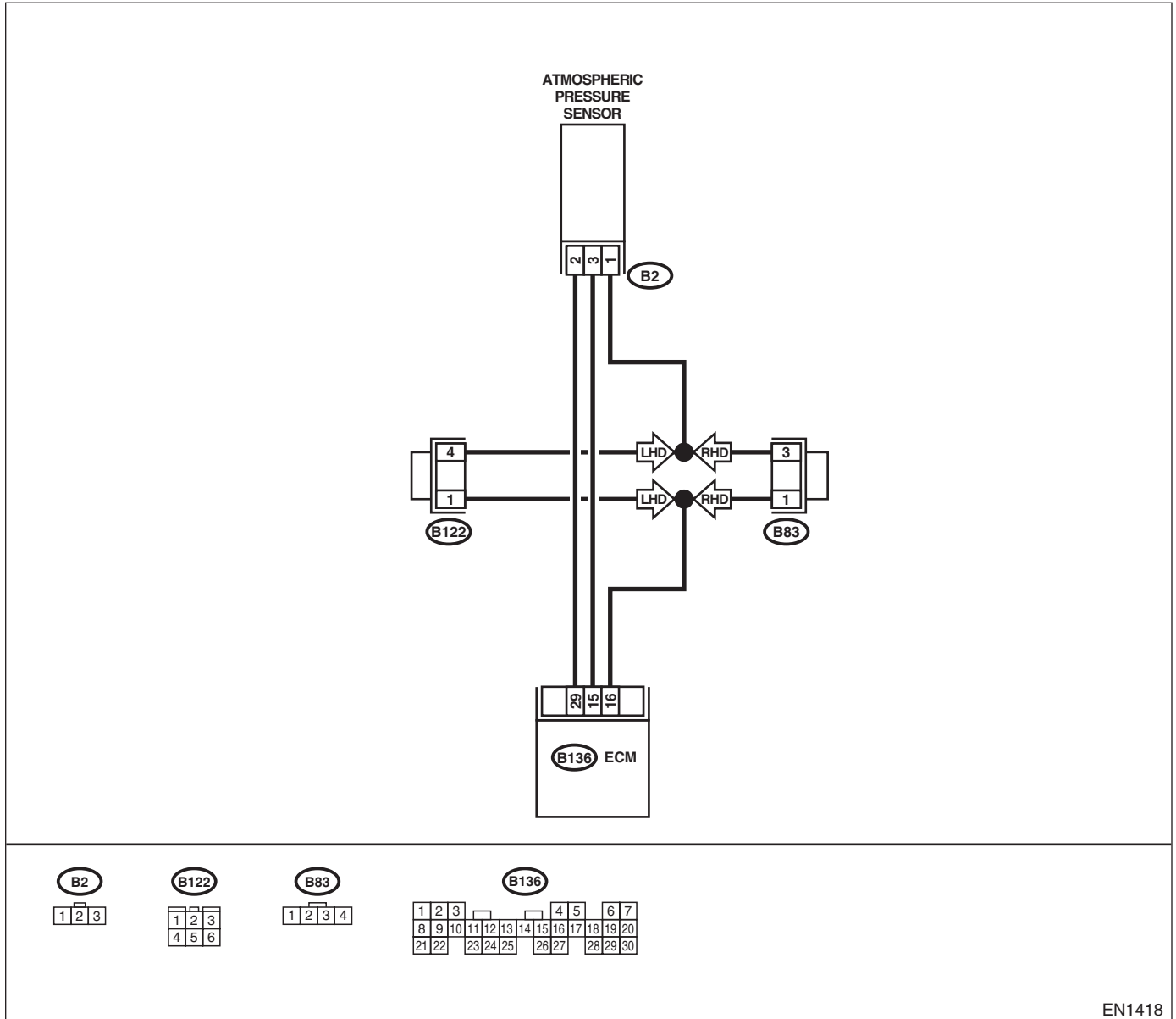
• DTC DETECTING CONDITION:

- Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN-42, OPERATION, Inspection Mode.> .

• WIRING DIAGRAM:



EN1418

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK CURRENT DATA. 1)Start the 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-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 the 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 the 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 the 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 the 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 the 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 the 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-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 the poor contact in ECM connector.	Go to step 7.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
7 CHECK HARNESS BETWEEN ECM AND ATMOSPHERIC PRESSURE SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from atmospheric pressure sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between atmospheric pressure sensor connector and engine ground. <i>Connector & terminal</i> <i>(B2) No. 3 (+) — Engine ground (-):</i>	Is the voltage more than 4.5 V?	Go to step 8 .	Repair the harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between ECM and atmospheric pressure sensor connector • Poor contact in joint connector (B83) or (B122)
8 CHECK HARNESS BETWEEN ECM AND ATMOSPHERIC PRESSURE SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM and pressure sensor connector. <i>Connector & terminal</i> <i>(B136) No. 16 — (B2) No. 1:</i>	Is the resistance less than 1 Ω ?	Go to step 9 .	Repair the harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between ECM and pressure sensor connector
9 CHECK HARNESS BETWEEN ECM AND ATMOSPHERIC PRESSURE SENSOR CONNECTOR. Measure the resistance of harness between pressure sensor connector and engine ground. <i>Connector & terminal</i> <i>(B2) No. 2 — Engine ground:</i>	Is the resistance more than 500 k Ω ?	Go to step 10 .	Repair the 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 the poor contact in atmospheric pressure sensor connector.	Replace the atmospheric pressure sensor. <Ref. to FU-38, Atmospheric Pressure Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

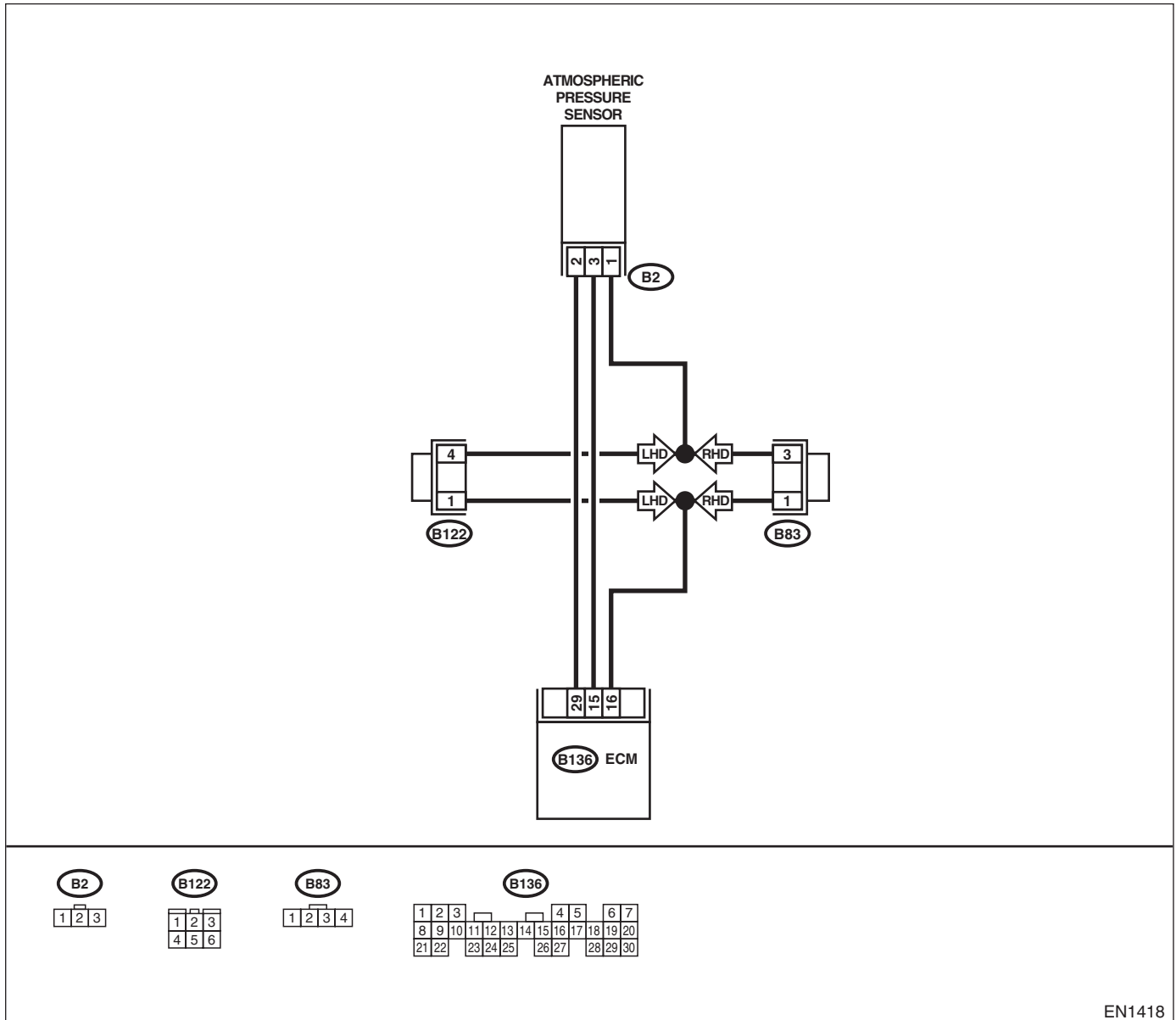
BG:DTC P1111 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT HIGH INPUT

- **DTC DETECTING CONDITION:**
 - Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN1418

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK CURRENT DATA. 1) Start the 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-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 the 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 the 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 the 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 the 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 the 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-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 the poor contact in ECM connector.	Go to step 6.
6 CHECK HARNESS BETWEEN ECM AND PRESSURE SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from atmospheric pressure sensor. 3) Turn the ignition switch to ON. 4) Measure the 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 the 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) or (B122)

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
7 CHECK HARNESS BETWEEN ECM AND PRESSURE SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM and pressure sensor connector. Connector & terminal (B136) No. 29 — (B2) No. 2:	Is the resistance less than 1 Ω ?	Go to step 8 .	Repair the harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between ECM and pressure sensor connector
8 CHECK HARNESS BETWEEN ECM AND PRESSURE SENSOR CONNECTOR. Measure the 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 the harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • 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 the poor contact in atmospheric pressure sensor connector.	Replace the atmospheric pressure sensor. <Ref. to FU-38, Atmospheric Pressure Sensor.>
10 CHECK CURRENT DATA. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from atmospheric pressure sensor. 3) Turn the ignition switch to ON. 4) Read the data of intake manifold absolute pressure signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: <ul style="list-style-type: none"> • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN-34, Subaru Select Monitor.> <ul style="list-style-type: none"> • 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 the battery short circuit in harness between ECM and atmospheric pressure sensor connector.	Replace the atmospheric pressure sensor. <Ref. to FU-38, Atmospheric Pressure Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

BH:DTC P1112 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM —

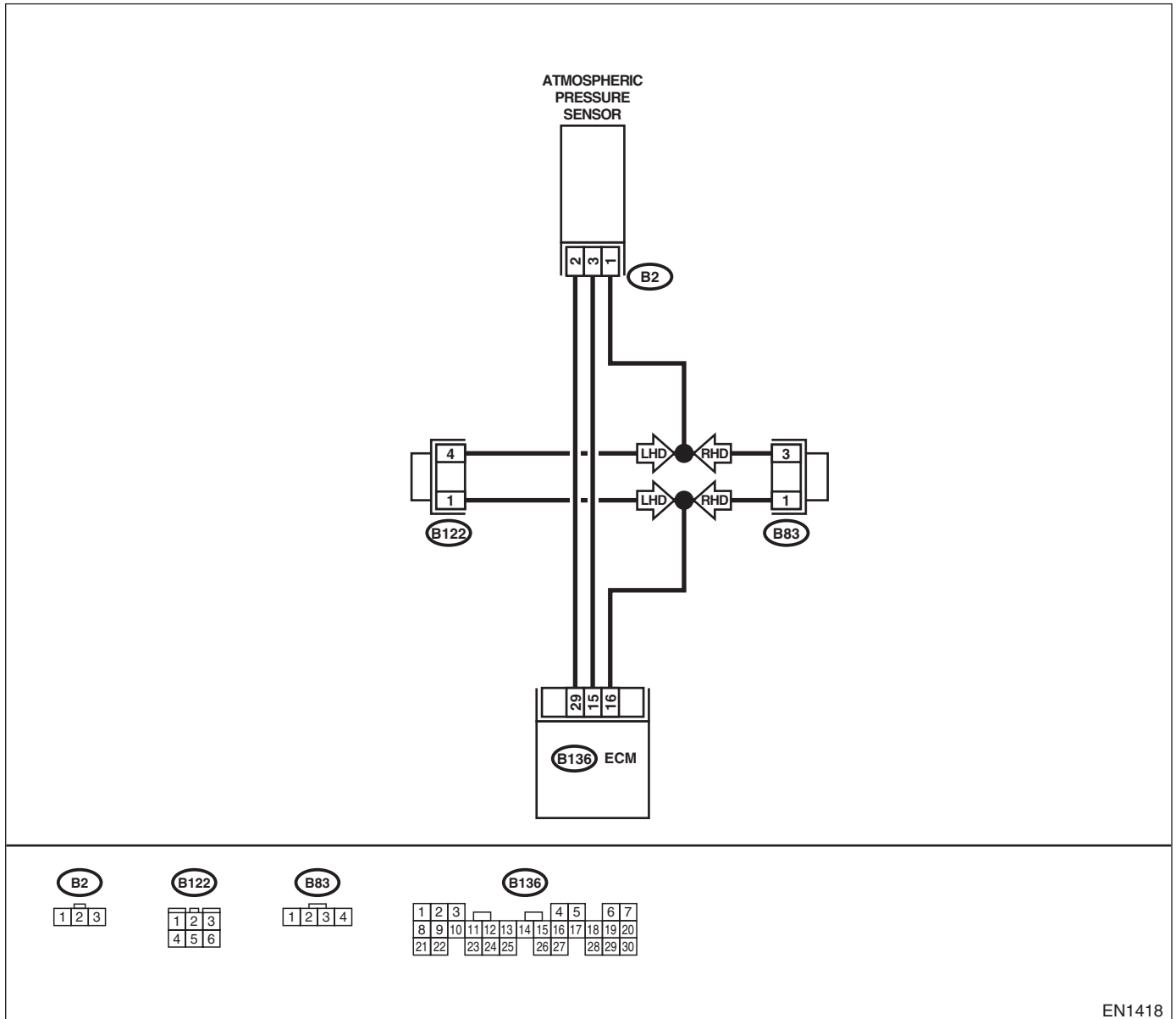
• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN-42, OPERATION, Inspection Mode.> .

• WIRING DIAGRAM:



EN1418

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN-83, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect P1112.	Go to step 2.
2 CHECK ATMOSPHERIC PRESSURE SENSOR FILTER. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from atmospheric pressure sensor. 3) Remove the atmospheric pressure sensor. 4) Check the atmospheric pressure sensor filter.	Is the atmospheric pressure sensor filter non-functional? (Check for contamination, damage, water leakage, etc.)	Replace the atmospheric pressure sensor filter.	Go to step 3.
3 CHECK CURRENT DATA. 1) Turn the ignition switch to ON. 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-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 the atmospheric pressure sensor. <Ref. to FU-38, Atmospheric Pressure Sensor.>	Replace the intake air temperature and pressure sensor. <Ref. to FU-37, 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 —

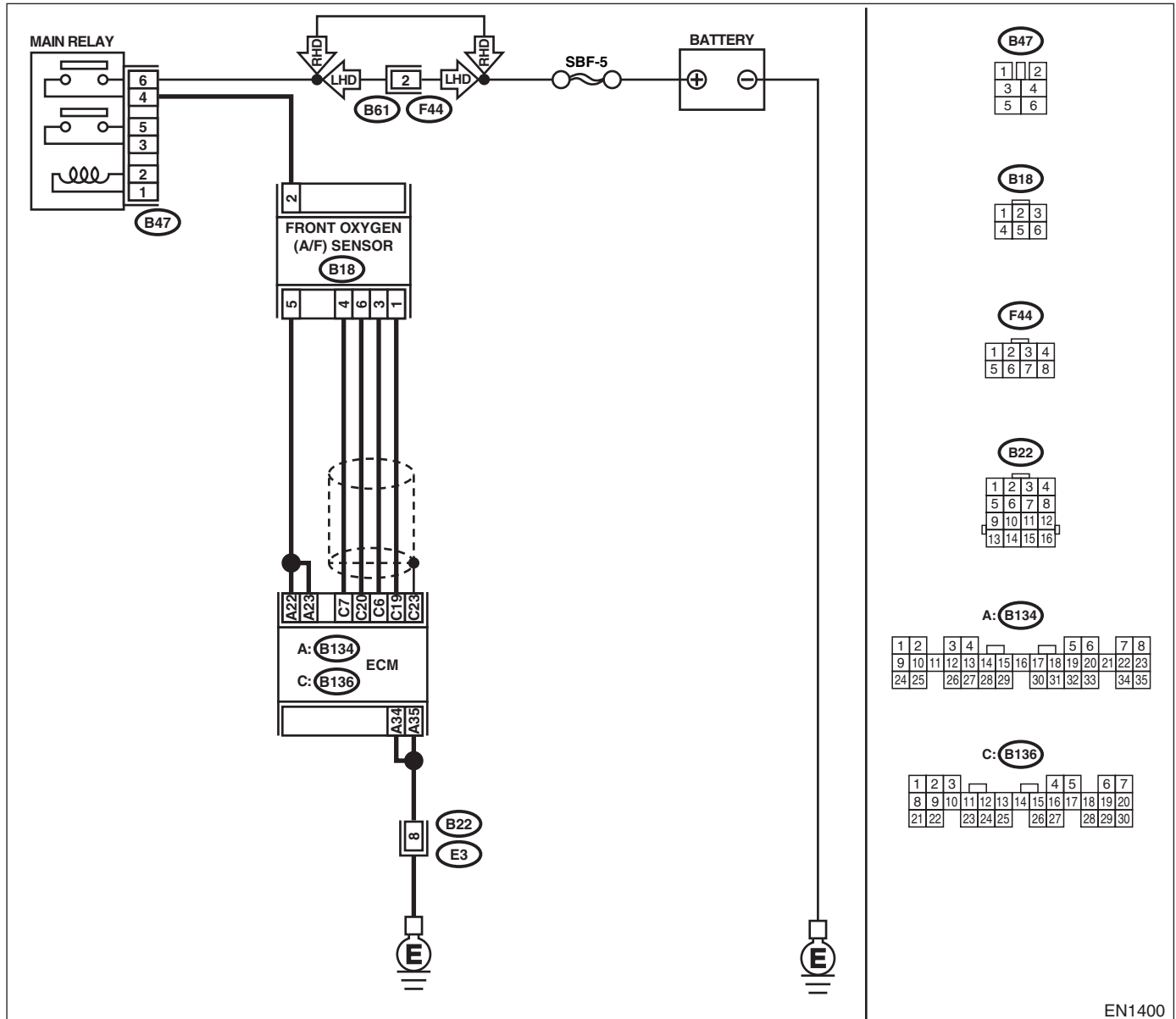
• DTC DETECTING CONDITION:

- Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN-42, OPERATION, Inspection Mode.> .

• WIRING DIAGRAM:



EN1400

Step	Check	Yes	No	
1	CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN-83, List of Diagnostic Trouble Code (DTC).>	Go to step 2.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>2 CHECK FRONT OXYGEN (A/F) SENSOR DATA. 1) Start the 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 the data of front oxygen (A/F) sensor signal using Subaru Select Monitor or OBD-II general scan tool.</p> <p>NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN-34, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.</p>	<p>Is the value equal to or more than 0.85 and equal to less than 1.15 in idling?</p>	<p>Go to step 3.</p>	<p>Go to step 4.</p>
<p>3 CHECK FRONT OXYGEN (A/F) SENSOR DATA. Race the engine at speeds from idling to 5,000 rpm for a total of 5 cycles.</p> <p>NOTE: To increase the engine speed to 5,000 rpm, slowly depress the accelerator pedal, taking approx. 5 seconds, and quickly release the accelerator pedal to decrease engine speed.</p>	<p>Is the value more than 1.1 for a moment?</p>	<p>Go to step 6.</p>	<p>Go to step 4.</p>
<p>4 CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and front oxygen (A/F) sensor connector. 3) Measure the resistance between ECM and front oxygen (A/F) sensor.</p> <p>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:</p>	<p>Is the resistance less than 5 Ω?</p>	<p>Go to step 5.</p>	<p>Repair the open circuit between ECM and front oxygen (A/F) sensor.</p>
<p>5 CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR. Measure the resistance between ECM and chassis ground.</p> <p>Connector & terminals (B136) No. 6 — Chassis ground: (B136) No. 7 — Chassis ground: (B136) No. 19 — Chassis ground: (B136) No. 20 — Chassis ground:</p>	<p>Is the resistance more than 1 MΩ?</p>	<p>Go to step 6.</p>	<p>Repair the ground short circuit between ECM and front oxygen (A/F) sensor.</p>
<p>6 CHECK EXHAUST SYSTEM. Check the exhaust system parts.</p> <p>NOTE: Check the following items. • Loose installation of portions • Damage (crack, hole etc.) of parts • Looseness of front oxygen (A/F) sensor • Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor</p>	<p>Is there a fault in exhaust system?</p>	<p>Repair or replace the faulty parts.</p>	<p>Replace the front oxygen (A/F) sensor. <Ref. to FU-47, Front Oxygen (A/F) Sensor.></p>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

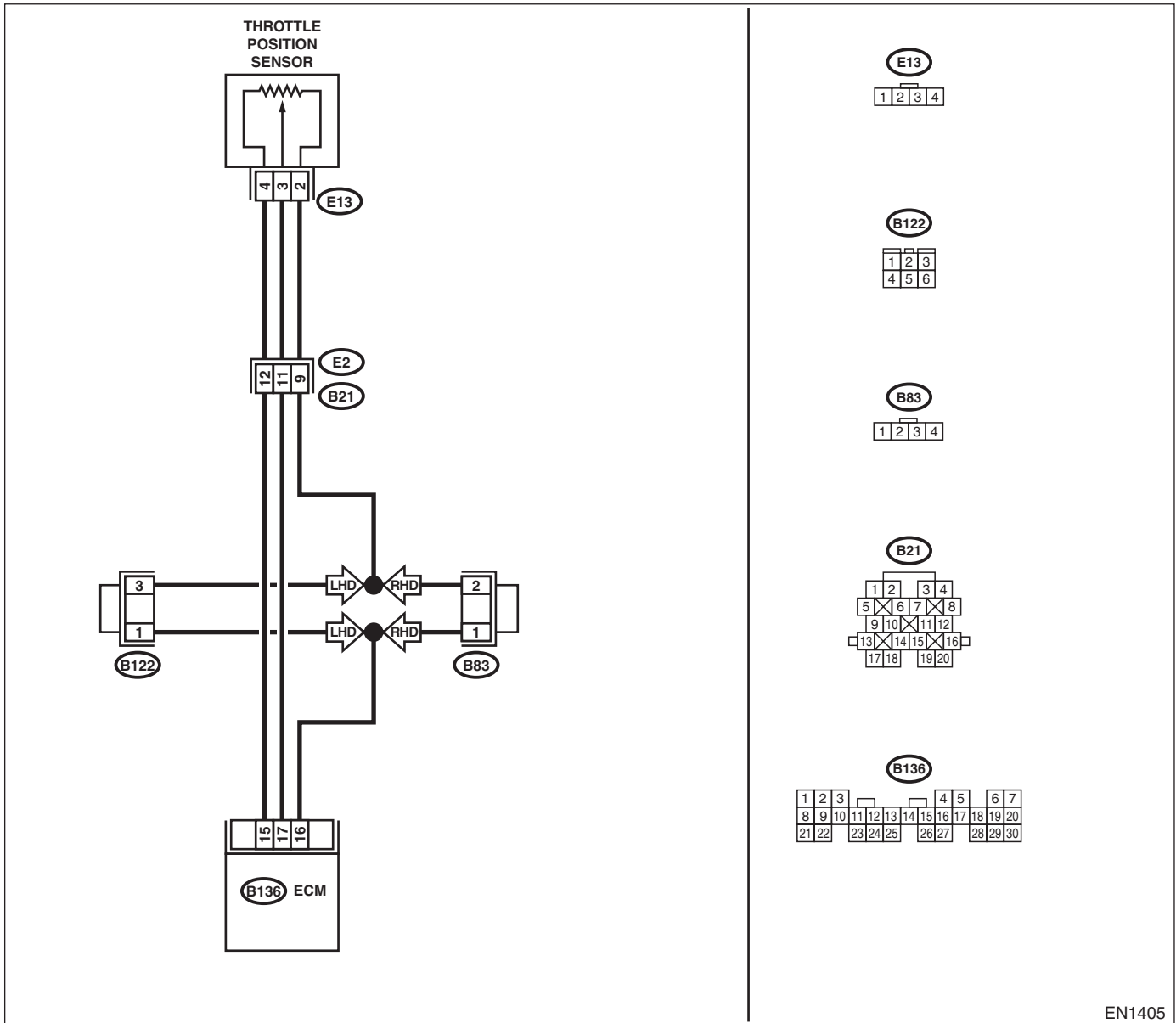
BJ:DTC P1142 — THROTTLE POSITION SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (LOW INPUT) —

- **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-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN-42, OPERATION, Inspection Mode.> .

• **WIRING DIAGRAM:**



EN1405

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN-83, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect P1142.	Replace the throttle position sensor. <Ref. to FU-35, Throttle Position Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

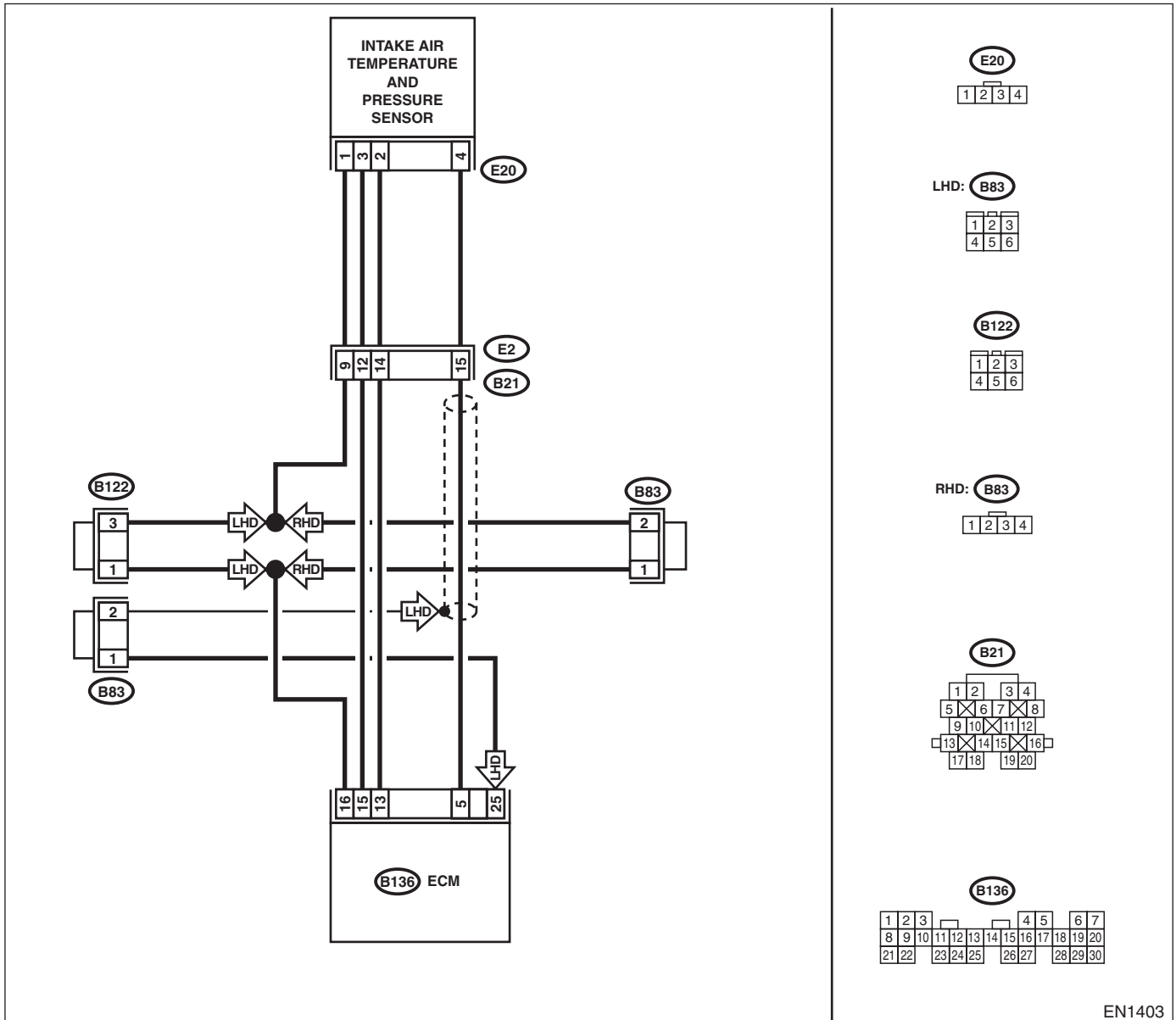
BK:DTC P1146 — PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (HIGH INPUT) —

- DTC DETECTING CONDITION:
 - Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN-42, OPERATION, Inspection Mode.> .

- WIRING DIAGRAM:



EN1403

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>1</p> <p>CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.</p>	<p>Is any other DTC displayed?</p>	<p>Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN-83, List of Diagnostic Trouble Code (DTC).></p> <p>NOTE: In this case, it is not necessary to inspect P1146.</p>	<p>Go to step 2.</p>
<p>2</p> <p>CHECK AIR INTAKE SYSTEM.</p>	<p>Are there holes, loose bolts or disconnection of hose on the air intake system?</p>	<p>Repair the air intake system.</p>	<p>Go to step 3.</p>
<p>3</p> <p>CHECK PRESSURE SENSOR.</p> <p>1)Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F).</p> <p>2)Place the shift lever in the selector lever in "N" or "P" position.</p> <p>3)Turn the A/C switch to OFF.</p> <p>4)Turn all accessory switches to OFF.</p> <p>5)Read the data of intake manifold pressure sensor signal using Subaru Select Monitor or OBD-II general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> •Subaru Select Monitor <p>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN-34, Subaru Select Monitor.></p> <ul style="list-style-type: none"> •OBD-II general scan tool <p>For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.</p> <p>Specification:</p> <ul style="list-style-type: none"> •Intake manifold absolute pressure <p>Ignition ON</p> <p style="padding-left: 20px;">73.3 — 106.6 kPa (550 — 800 mmHg, 21.65 — 31.50 inHg)</p> <p>Idling</p> <p style="padding-left: 20px;">20.0 — 46.7 kPa (150 — 350 mmHg, 5.91 — 13.78 inHg)</p>	<p>Is the value within the specifications?</p>	<p>Go to step 4.</p>	<p>Replace the intake air temperature sensor and pressure sensor. <Ref. to FU-37, Intake Air Temperature and Pressure Sensor.></p>
<p>4</p> <p>CHECK THROTTLE POSITION.</p> <p>Read the data of throttle position signal using Subaru Select Monitor or OBD-II general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> •Subaru Select Monitor <p>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN-34, Subaru Select Monitor.></p> <ul style="list-style-type: none"> •OBD-II general scan tool <p>For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.</p>	<p>Is the throttle positioning ratio equal to or less than 5 % when throttle is fully closed?</p>	<p>Go to step 5.</p>	<p>Adjust or replace the throttle position sensor. <Ref. to FU-35, Throttle Position Sensor.></p>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
5 CHECK THROTTLE POSITION.	Is the throttle positioning ratio equal to or more than 85 % when throttle is fully open?	Replace the intake air temperature and pressure sensor. <Ref. to FU-37, Intake Air Temperature and Pressure Sensor.>	Replace the throttle position sensor. <Ref. to FU-35, Throttle Position Sensor.>

BL:DTC P1442 — FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM 2 —

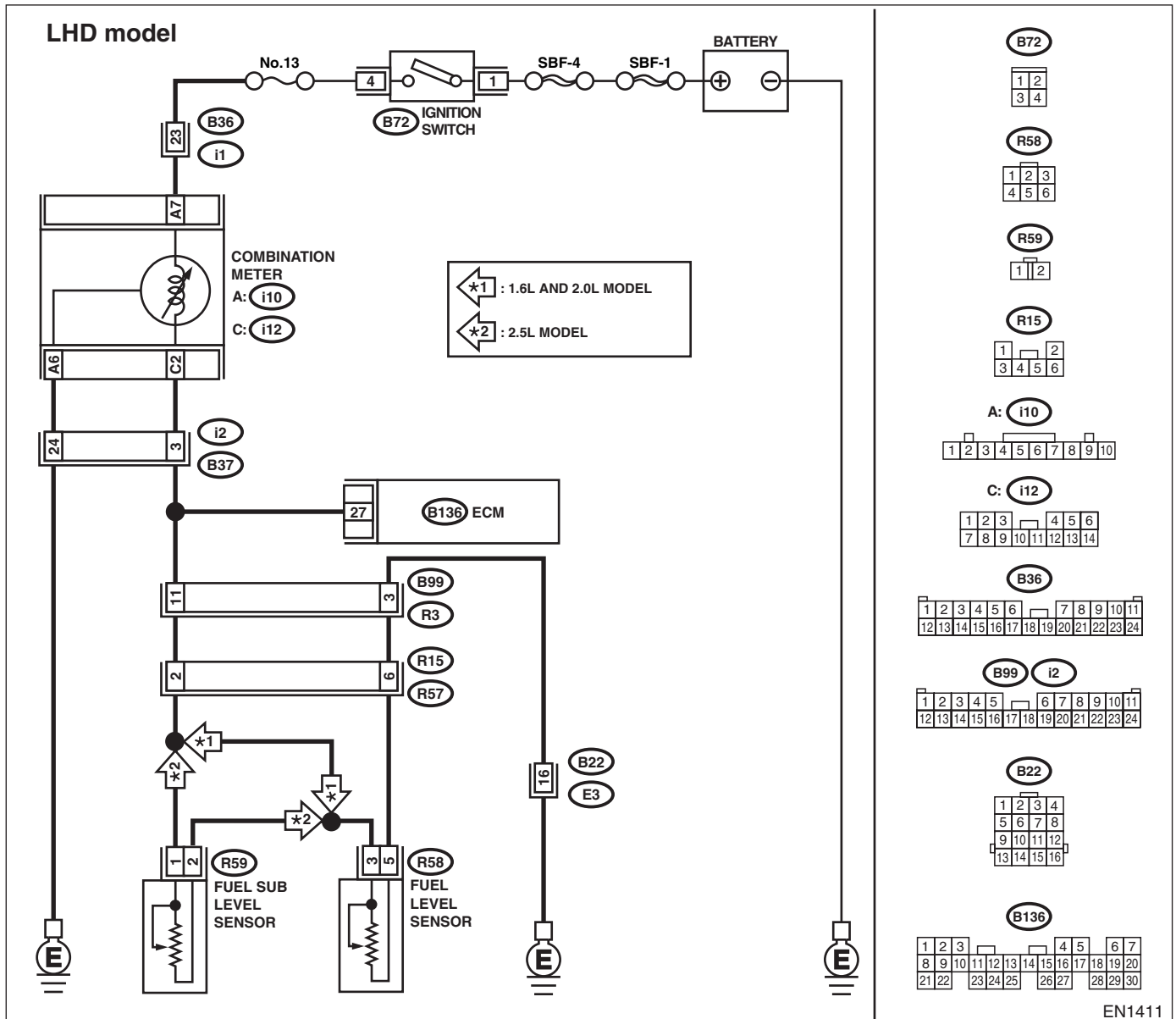
• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

CAUTION:

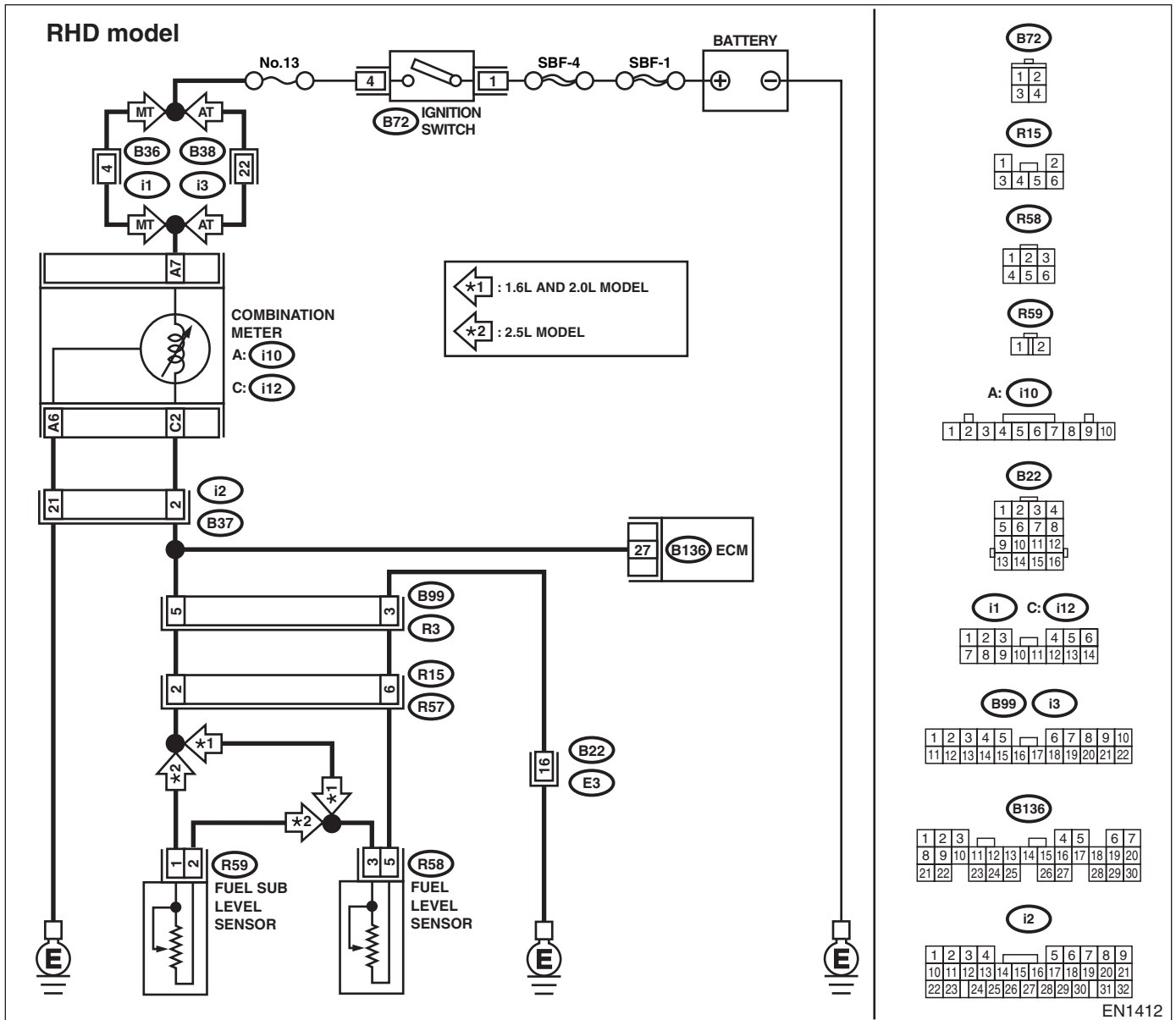
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN-42, OPERATION, Inspection Mode.> .

• WIRING DIAGRAM:



EN1411

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC) ENGINE (DIAGNOSTICS)



EN1412

Step	Check	Yes	No
1	CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN-83, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect P1442.	Replace the fuel level sensor. <Ref. to FU-65, Fuel Level Sensor.>

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

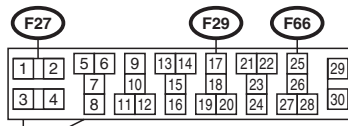
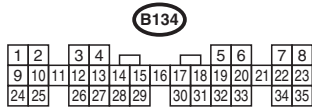
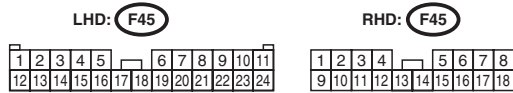
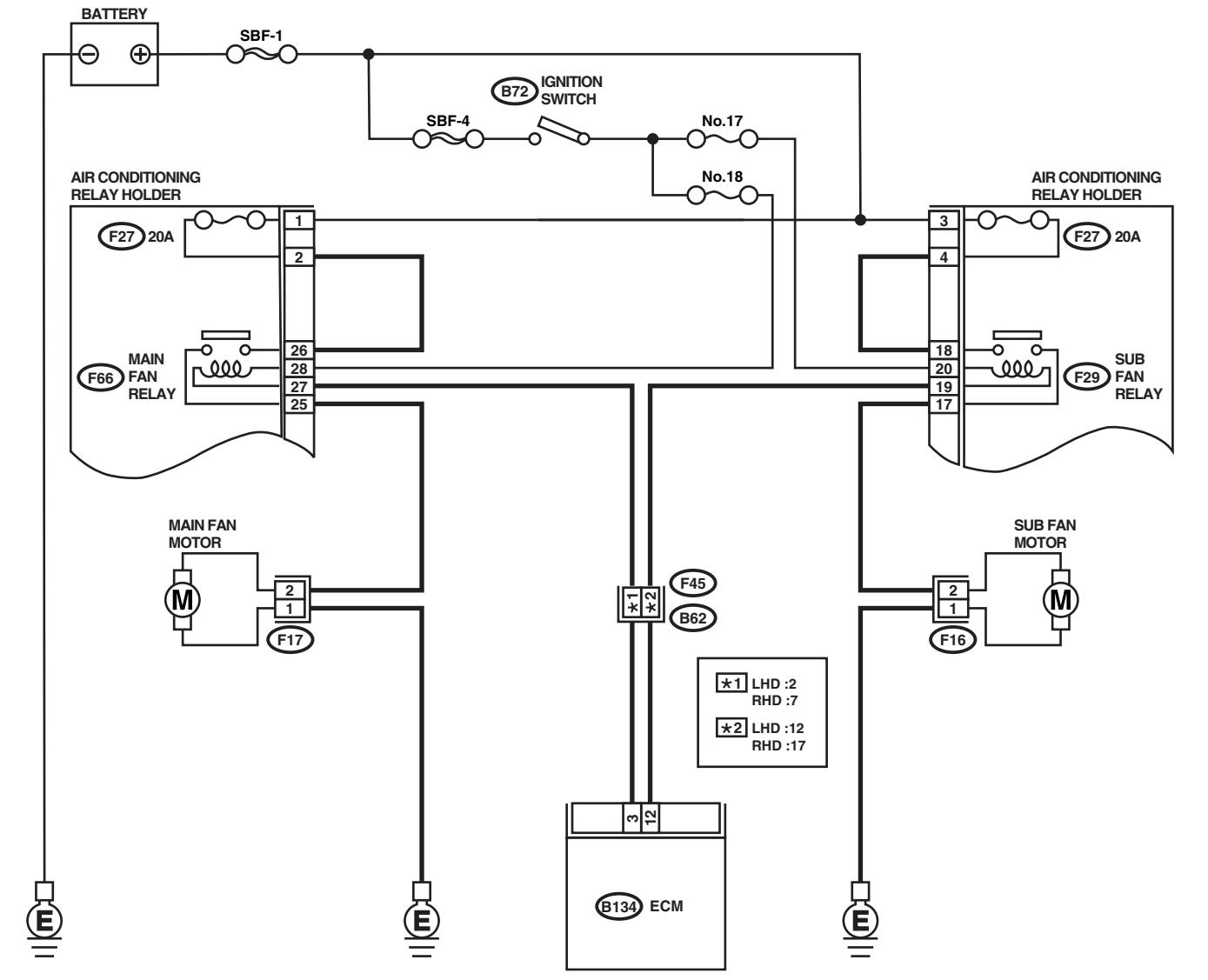
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN-42, OPERATION, Inspection Mode.> .

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

• WIRING DIAGRAM:



EN1413

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>1 CHECK OUTPUT SIGNAL FROM ECM. 1) Turn the ignition switch to OFF. 2) Connect the test mode connector at the lower portion of instrument panel (on the driver's side). 3) Turn the ignition switch to ON. 4) While operating the radiator fan relay, measure the voltage between ECM and chassis ground.</p> <p>NOTE: Radiator fan relay operation can be executed using the Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN-50, Compulsory Valve Operation Check Mode.></p> <p>Connector & terminal (B134) No. 3 (+) — Chassis ground (-):</p>	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 the poor contact in ECM connector.	Go to step 2.
<p>2 CHECK SHORT CIRCUIT IN RADIATOR FAN RELAY CONTROL CIRCUIT. 1) Turn the ignition switch to OFF. 2) Remove the main fan relay and sub fan relay. (with A/C models) 3) Disconnect the test mode connector. 4) Turn the ignition switch to ON. 5) Measure the voltage between ECM and chassis ground.</p> <p>Connector & terminal (B134) No. 3 (+) — Chassis ground (-):</p>	Is the voltage more than 10 V?	Repair the battery short circuit in radiator fan relay control circuit.	Go to step 3.
<p>3 CHECK MAIN FAN RELAY. 1) Turn the ignition switch to OFF. 2) Remove the main fan relay. 3) Measure the resistance between main fan relay terminals.</p> <p>Terminal No. 26 — No. 25:</p>	Is the resistance less than 1 Ω ?	Replace the main fan relay.	Go to step 4.
<p>4 CHECK SUB FAN RELAY. 1) Remove the sub fan relay. 2) Measure the resistance between sub fan relay terminals.</p> <p>Terminal No. 18 — No. 17</p>	Is the resistance less than 1 Ω ?	Replace the sub fan relay.	Go to step 5.
<p>5 CHECK POOR CONTACT. Check poor contact in ECM connector.</p>	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU-51, Engine Control Module.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

BN:DTC P1507 — IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE) —

• DTC DETECTING CONDITION:

- Immediately at fault recognition

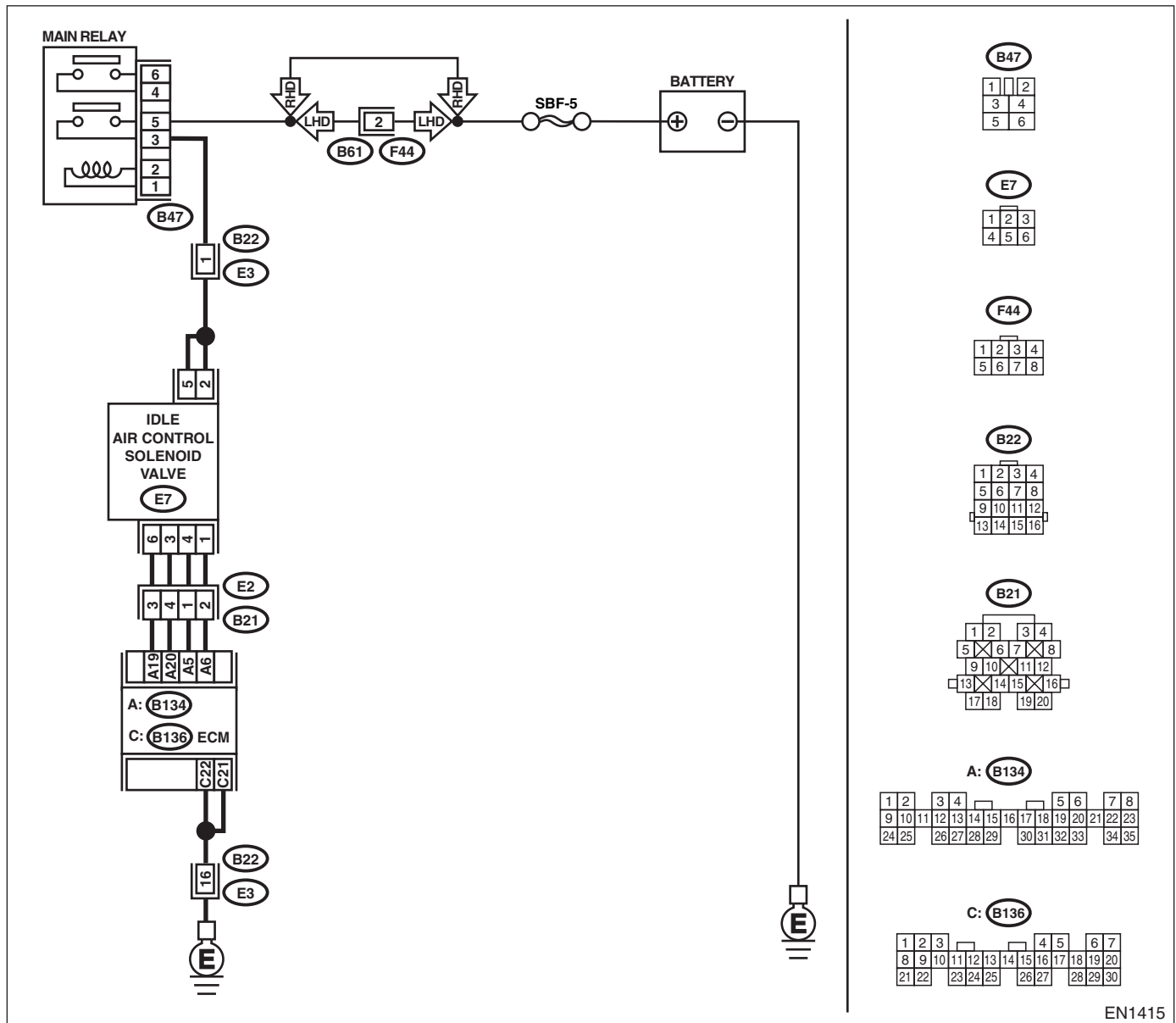
• TROUBLE SYMPTOM:

- Engine keeps running at higher revolution than specified idling revolution.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN-42, OPERATION, Inspection Mode.> .

• WIRING DIAGRAM:



EN1415

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN-83, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect P1507.	Go to step 2.
2 CHECK AIR INTAKE SYSTEM. 1) Turn the ignition switch to ON. 2) Start the engine, and idle it. 3) Check the following items. <ul style="list-style-type: none">• Loose installation of intake manifold, idle air control solenoid valve and throttle body• Cracks of intake manifold gasket, idle air control solenoid valve gasket and throttle body gasket• Disconnections of vacuum hoses	Is there a fault in the air intake system?	Repair the air suction and leaks.	Go to step 3.
3 CHECK THROTTLE CABLE.	Does the throttle cable have play for adjustment?	Go to step 4.	Adjust the throttle cable. <Ref. to SP-9, INSTALLATION, Accelerator Control Cable.>
4 CHECK AIR BY-PASS LINE. 1) Turn the ignition switch to OFF. 2) Remove the idle air control solenoid valve from throttle body. <Ref. to FU-39, Idle Air Control Solenoid Valve.> 3) Confirm that there are no foreign particles in the by-pass air line.	Are foreign particles in by-pass air line?	Remove the foreign particles from by-pass air line.	Replace the idle air control solenoid valve. <Ref. to FU-39, Idle Air Control Solenoid Valve.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

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-256, 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-260, 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-256, 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-260, 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-256, 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-260, DTC P1517 — IDLE AIR CONTROL SOLENOID VALVE SIGNAL 4 CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

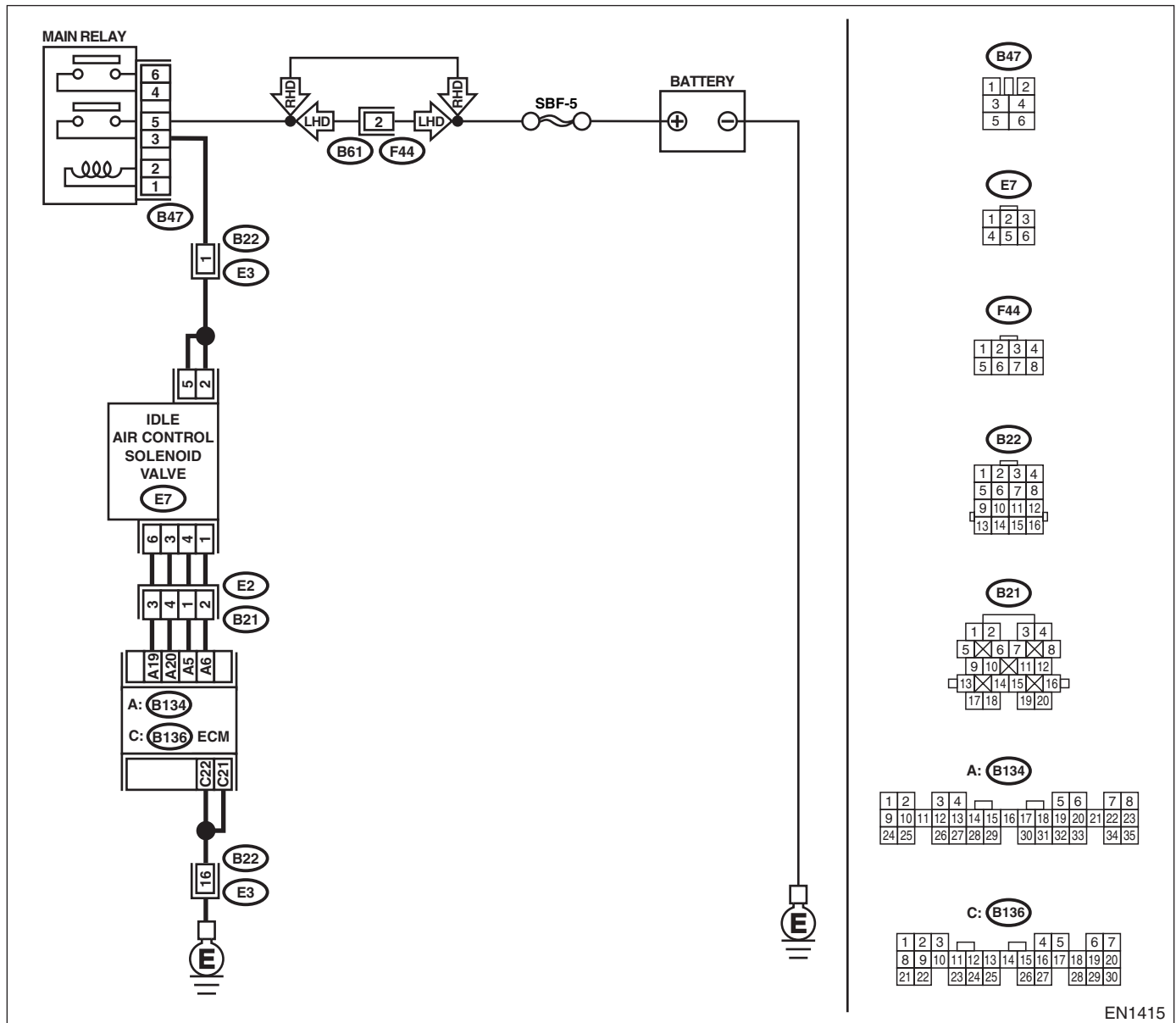
BU:DTC P1516 — IDLE AIR CONTROL SOLENOID VALVE SIGNAL 4 CIRCUIT LOW INPUT —

- **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-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN-42, OPERATION, Inspection Mode.> .

• **WIRING DIAGRAM:**



EN1415

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>1</p> <p>CHECK POWER SUPPLY TO IDLE AIR CONTROL SOLENOID VALVE. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from idle air control solenoid valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between idle air control solenoid valve connector and engine ground.</p> <p>Connector & terminal (E7) No. 2 (+) — Engine ground (-):</p>	Is the voltage more than 10 V?	Go to step 2.	Repair the harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between idle air control solenoid valve and main relay connector • Poor contact in coupling connector (B22)
<p>2</p> <p>CHECK POWER SUPPLY TO IDLE AIR CONTROL SOLENOID VALVE. Measure the voltage between idle air control solenoid valve connector and engine ground.</p> <p>Connector & terminal (E7) No. 5 (+) — Engine ground (-):</p>	Is the voltage more than 10 V?	Go to step 3.	Repair the harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between idle air control solenoid valve and main relay connector • Poor contact in coupling connector (B22)
<p>3</p> <p>CHECK HARNESS BETWEEN ECM AND IDLE AIR CONTROL SOLENOID VALVE CONNECTOR. 1) Turn the ignition switch to OFF. 2) Measure the resistance between ECM and idle air control solenoid valve connector.</p> <p>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:</p>	Is the resistance less than 1 Ω ?	Go to step 4.	Repair the harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between ECM and idle air control solenoid valve connector • Poor contact in coupling connector (B21)
<p>4</p> <p>CHECK HARNESS BETWEEN ECM AND IDLE AIR CONTROL SOLENOID VALVE CONNECTOR. 1) Disconnect the connector from ECM. 2) Measure the resistance between ECM connector and chassis ground.</p> <p>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:</p>	Is the resistance less than 10 Ω ?	Repair the 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 the poor contact in ECM connector or idle air control solenoid valve connector.	Replace the idle air control solenoid valve. <Ref. to FU-39, Idle Air Control Solenoid Valve.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

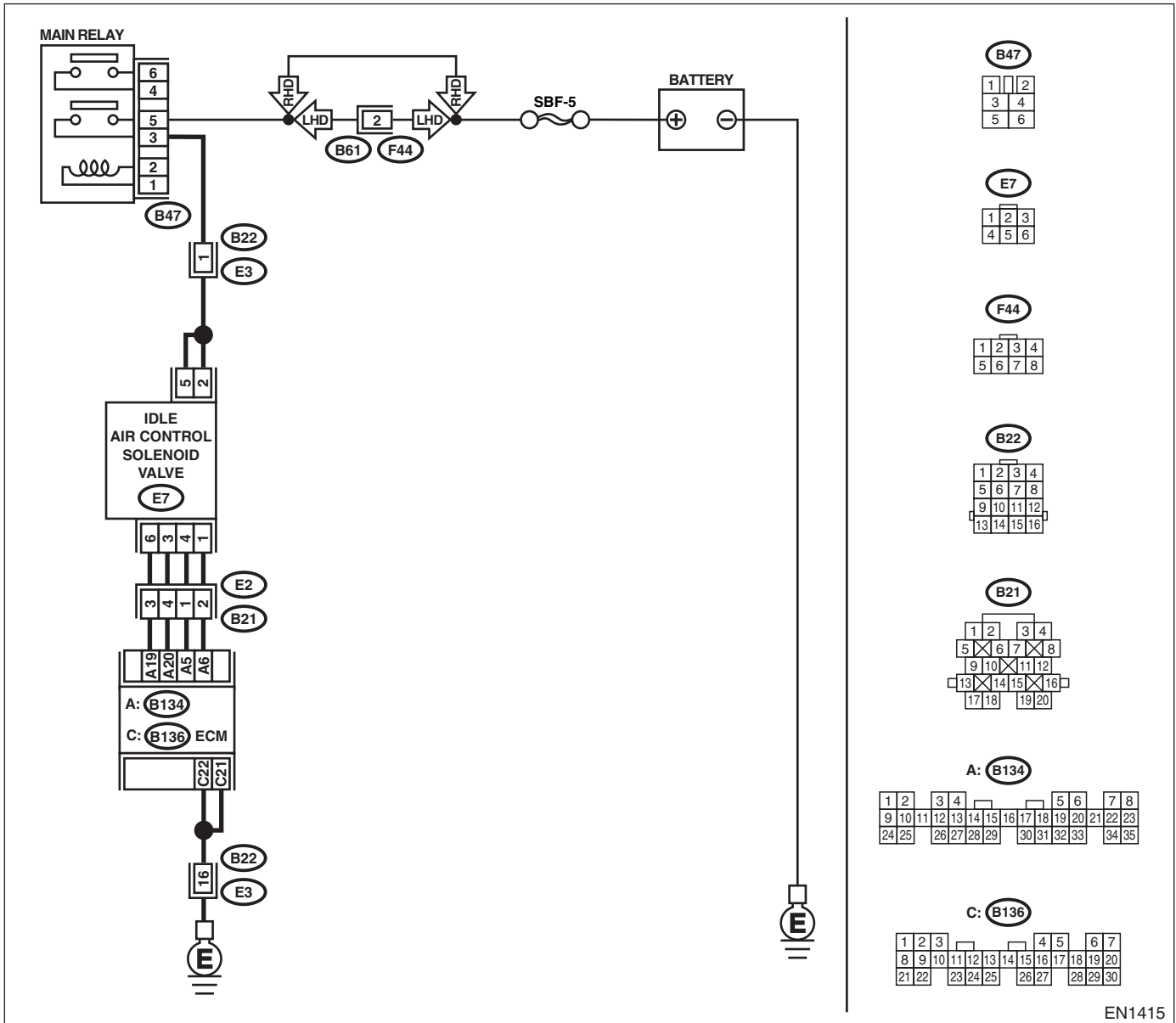
BV:DTC P1517 — IDLE AIR CONTROL SOLENOID VALVE SIGNAL 4 CIRCUIT HIGH INPUT —

- **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-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN-42, OPERATION, Inspection Mode.> .

• **WIRING DIAGRAM:**



EN1415

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (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 the ignition switch to OFF. 2) Measure the resistance between ECM connector and chassis ground. <i>Connector & terminal</i> <i>(B136) No. 21 — Chassis ground:</i> <i>(B136) No. 22 — Chassis ground:</i>	Is the resistance less than 5 Ω?	Go to step 3 .	Repair the harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit 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 the ignition switch to OFF. 2) Disconnect the connector from idle air control solenoid valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM connector and chassis ground. <i>Connector & terminal</i> <i>DTC P1511; (B134) No. 5 (+) — Chassis ground (-):</i> <i>DTC P1513; (B134) No. 6 (+) — Chassis ground (-):</i> <i>DTC P1515; (B134) No. 19 (+) — Chassis ground (-):</i> <i>DTC P1517; (B134) No. 20 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Repair the battery short circuit in harness between ECM and idle air control solenoid valve connector. After repair, replace the ECM. <Ref. to FU-51, Engine Control Module.>	Replace the ECM. <Ref. to FU-51, Engine Control Module.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

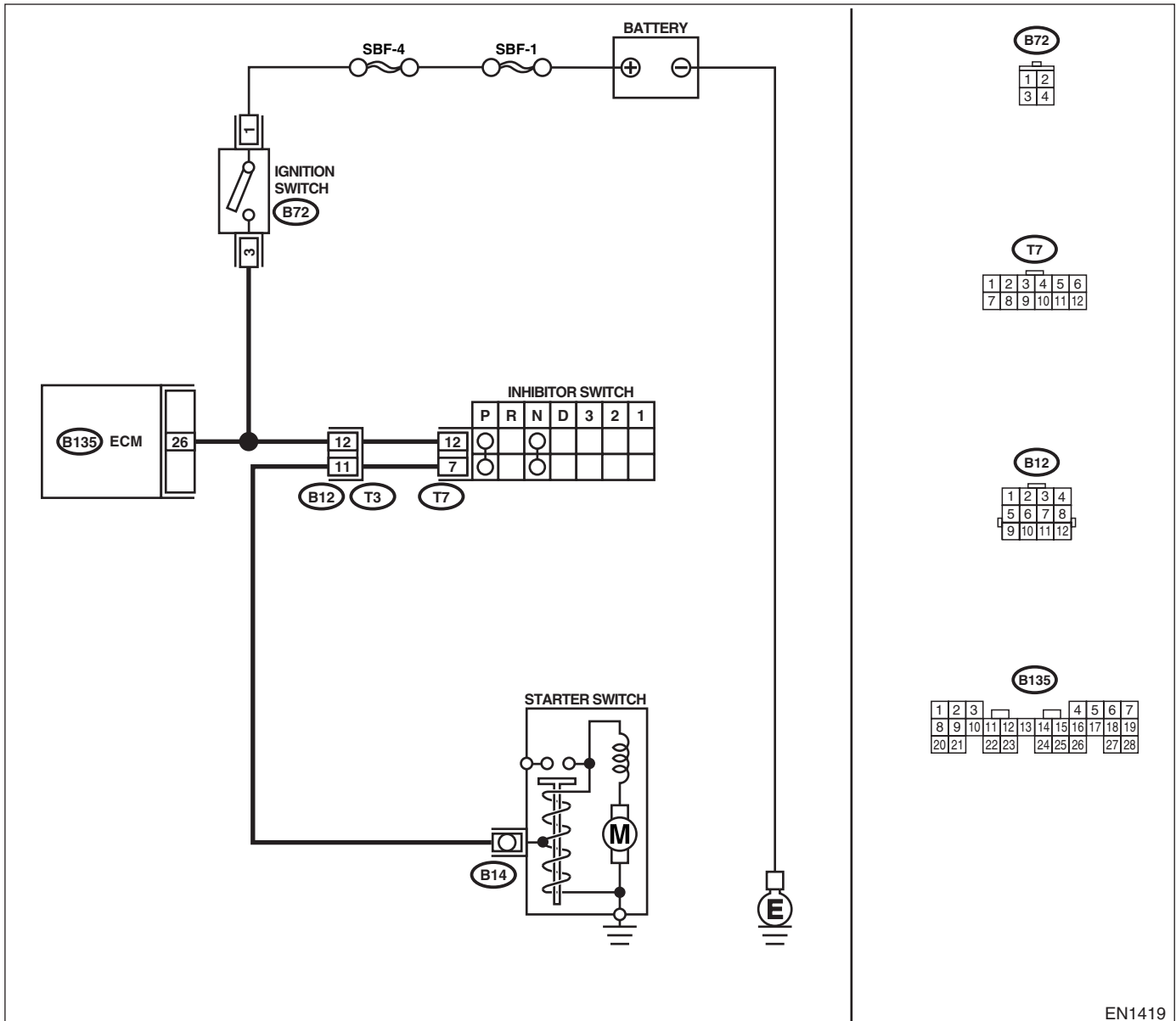
BW:DTC P1518 — STARTER SWITCH CIRCUIT LOW INPUT —

- **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-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN-42, OPERATION, Inspection Mode.> .

• WIRING DIAGRAM:



EN1419

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 the starter motor operate when ignition switch is turned to START?	Repair the harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none">• Open or ground short circuit in harness between ECM and starter motor connector• Poor contact in ECM connector	Check the starter motor circuit. <Ref. to EN-64, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

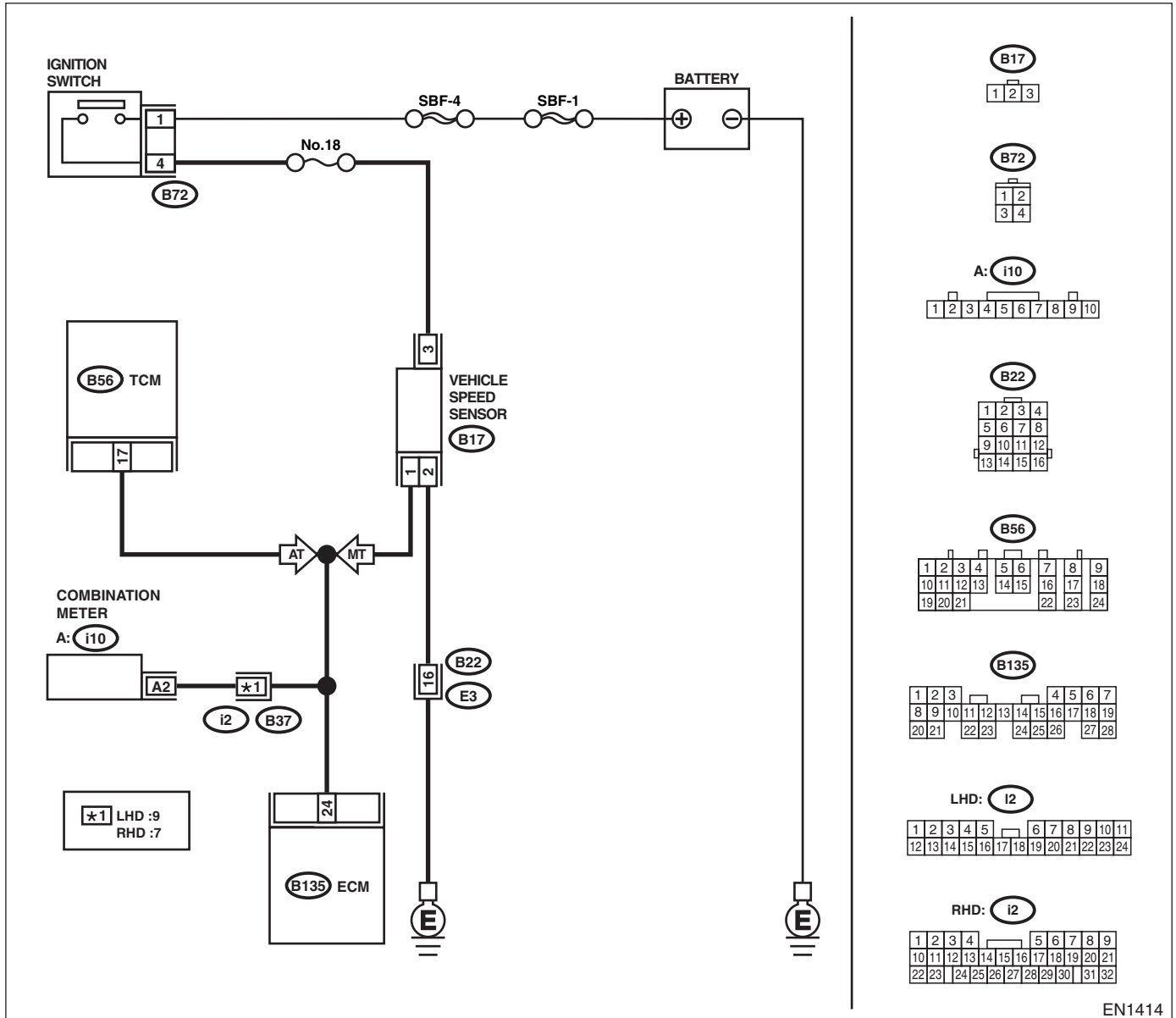
BX:DTC P1540 — VEHICLE SPEED SENSOR MALFUNCTION 2 —

- DTC DETECTING CONDITION:
 - Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN-42, OPERATION, Inspection Mode.> .

- WIRING DIAGRAM:



EN1414

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 the front vehicle speed sensor signal circuit. <Ref. to AT-57, DTC 33 FRONT VEHICLE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
2	CHECK SPEEDOMETER OPERATION IN COMBINATION METER.	Does the speedometer operate normally?	Go to step 3. Check the speedometer and vehicle speed sensor. <Ref. to IDI-17, Speedometer.>
3	CHECK HARNESS BETWEEN ECM AND COMBINATION METER CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from combination meter. 3) Measure the resistance between ECM and combination meter. Connector & terminal (B135) No. 24 — (i10) No. 2:	Is the resistance less than 10 Ω ?	Repair the poor contact in ECM connector. Repair the 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 —

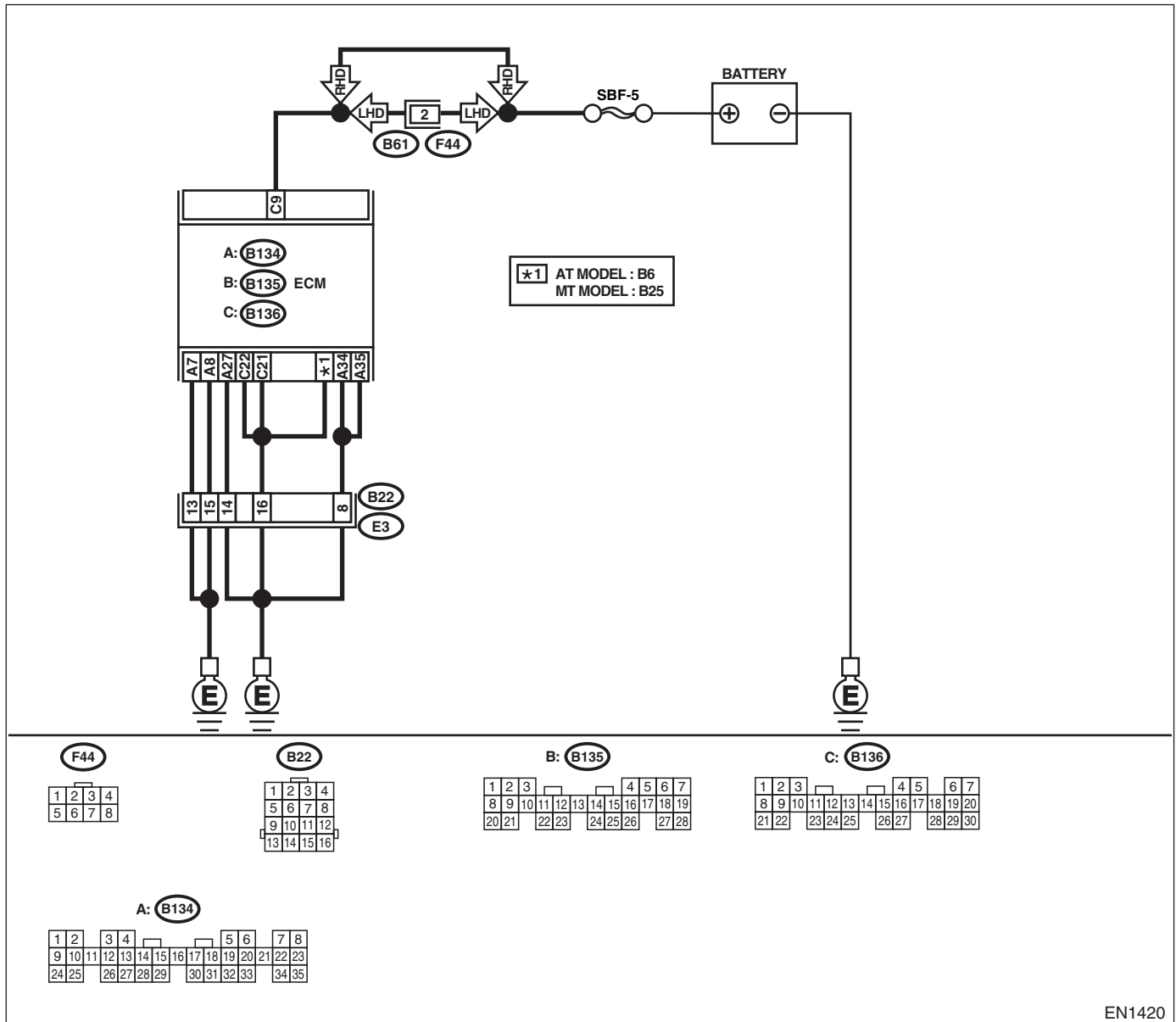
• DTC DETECTING CONDITION:

- Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN-42, OPERATION, Inspection Mode.> .

• WIRING DIAGRAM:



EN1420

Step	Check	Yes	No	
1	<p>CHECK INPUT SIGNAL FOR ECM.</p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Measure the voltage between ECM and chassis ground.</p> <p>Connector & terminal (B136) No. 9 (+) — Chassis ground (-):</p>	Is the voltage more than 10 V?	Repair the 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 the connector from ECM. 2)Measure the resistance of harness between ECM and chassis ground. Connector & terminal (B136) No. 9 — Chassis ground:	Is the resistance less than 10 Ω ?	Repair the ground short circuit in harness between ECM connector and battery terminal.	Go to step 3 .
3 CHECK FUSE SBF-5.	Is the fuse blown?	Replace the fuse.	Repair the harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none">• Open circuit in harness between ECM and battery• Poor contact in ECM connector• Poor contact in battery terminal

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

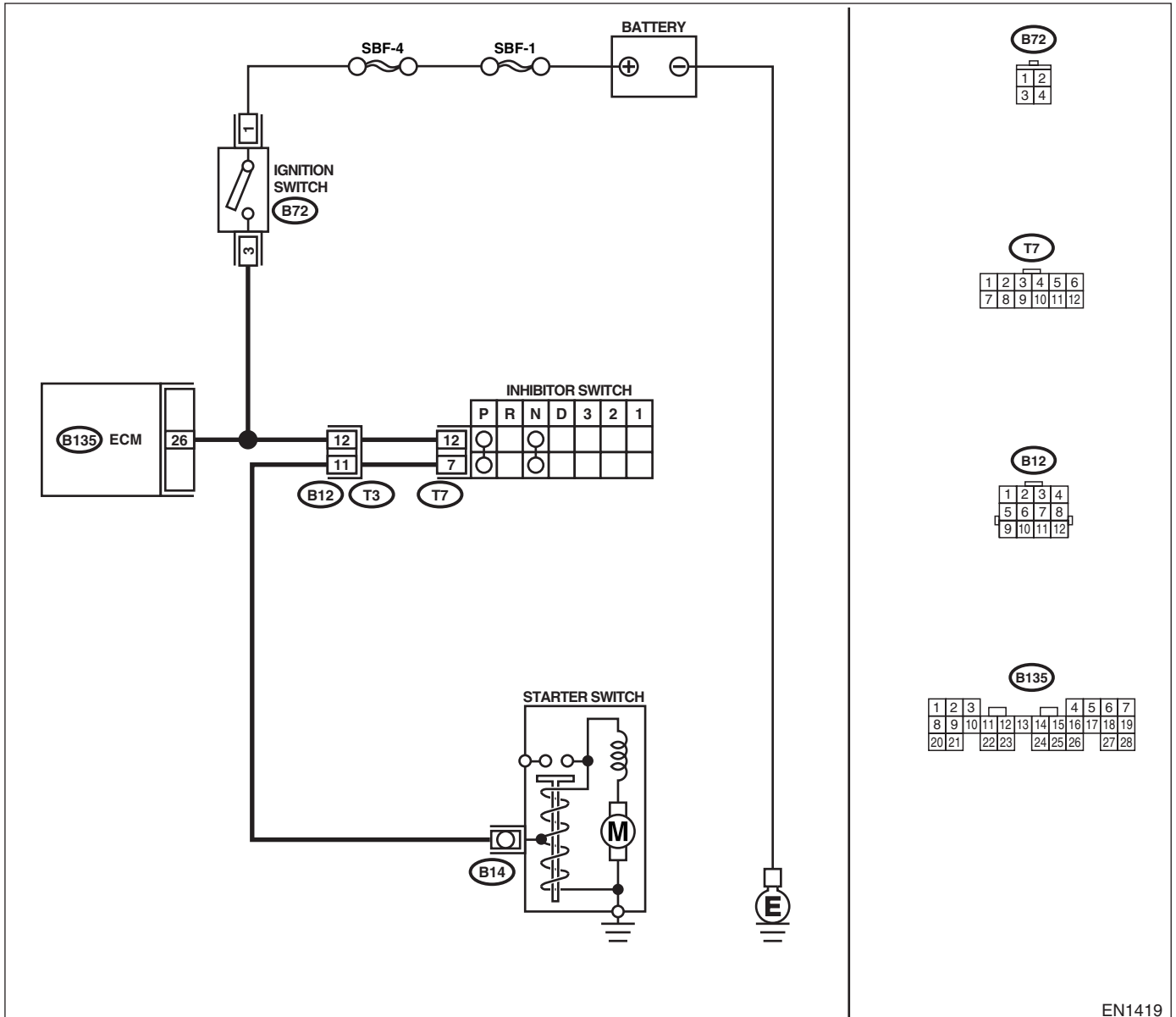
BZ:DTC P1590 — NEUTRAL POSITION SWITCH CIRCUIT HIGH INPUT (AT MODEL) —

- **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-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN-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.	Inspect DTC P0705 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN-83, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2	CHECK INPUT SIGNAL FOR ECM. 1) Turn the ignition switch to ON. 2) Measure the 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.
3	CHECK INPUT SIGNAL FOR ECM. Measure the 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.
4	CHECK POOR CONTACT. Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Go to step 5.
5	CHECK INPUT SIGNAL FOR ECM. Measure the voltage between ECM and chassis ground. Connector & terminal (B135) No. 26 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 6.
6	CHECK HARNESS BETWEEN ECM AND INHIBITOR SWITCH CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and inhibitor switch. 3) Measure the 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 the 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.
		Repair the battery short circuit in harness between ECM and inhibitor switch connector.	Go to step 6.
		Go to step 7.	Repair the 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 the 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 the open circuit in harness between inhibitor switch connector and starter motor ground line. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between inhibitor switch connector and starter motor ground line • Poor contact in starter motor connector • Poor contact in starter motor ground • Starter motor
8 CHECK INHIBITOR SWITCH. Measure the 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 the 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 the 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.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

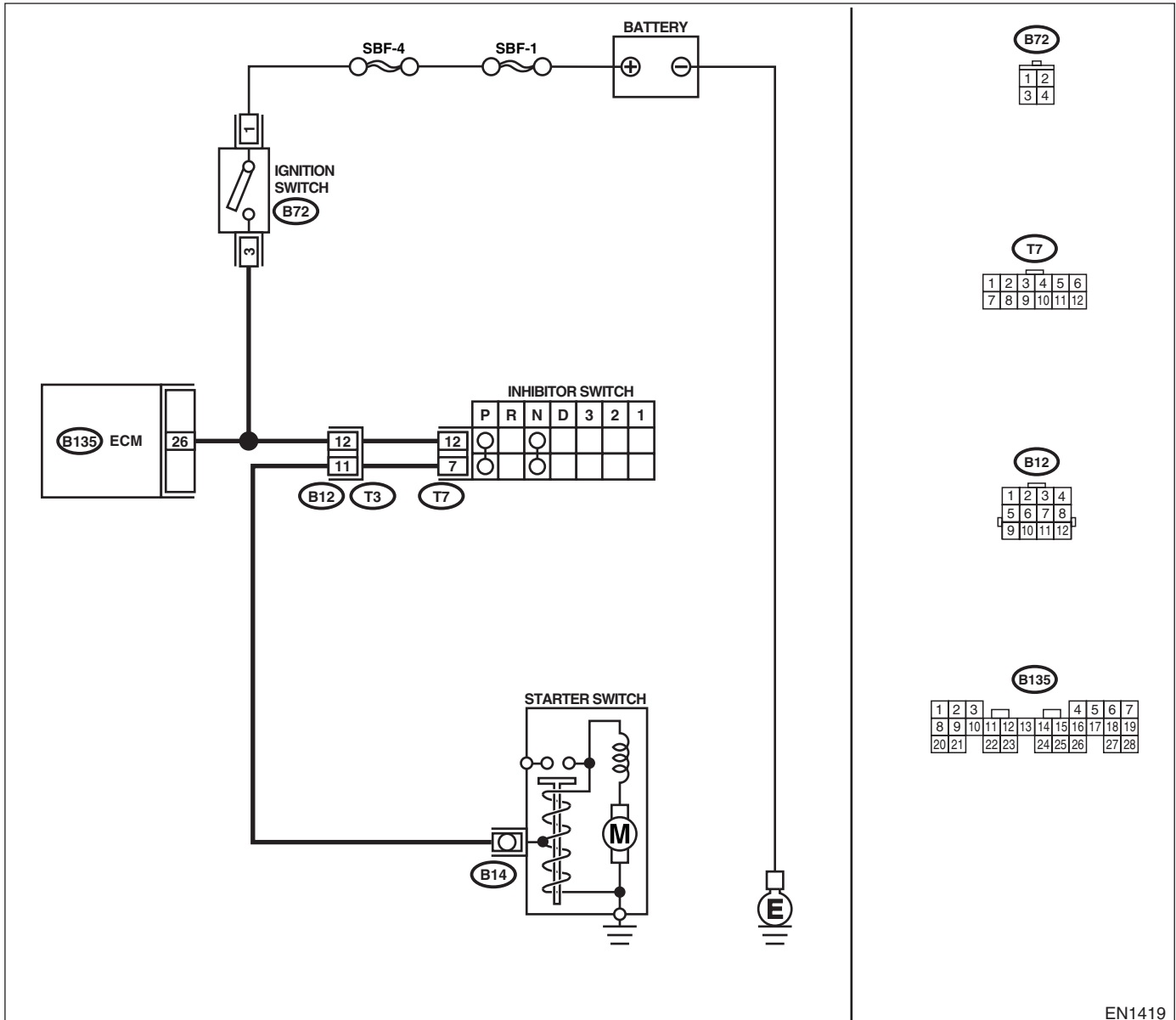
CA:DTC P1591 — NEUTRAL POSITION SWITCH CIRCUIT LOW INPUT (AT MODEL) —

- **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-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN-42, OPERATION, Inspection Mode.> .

• **WIRING DIAGRAM:**



EN1419

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1	CHECK DTC P0705 ON DISPLAY.	Inspect the DTC P0705 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN-83, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2	CHECK INPUT SIGNAL FOR ECM. 1) Turn the ignition switch to ON. 2) Measure the 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.
3	CHECK HARNESS BETWEEN ECM AND TRANSMISSION HARNESS CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and transmission harness connector (T3). 3) Measure the resistance of harness between ECM connector and chassis ground. Connector & terminal (B135) No. 26 — Chassis ground:	Is the resistance less than 10 Ω?	Repair the ground short circuit in harness between ECM and transmission harness connector.
4	CHECK TRANSMISSION HARNESS CONNECTOR. 1) Disconnect the connector from inhibitor switch. 2) Measure the 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 the ground short circuit in harness between transmission harness and inhibitor switch connector.
5	CHECK INHIBITOR SWITCH. Measure the 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 MΩ at except "N" and "P" positions?	Go to step 6. Replace the 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 the 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.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

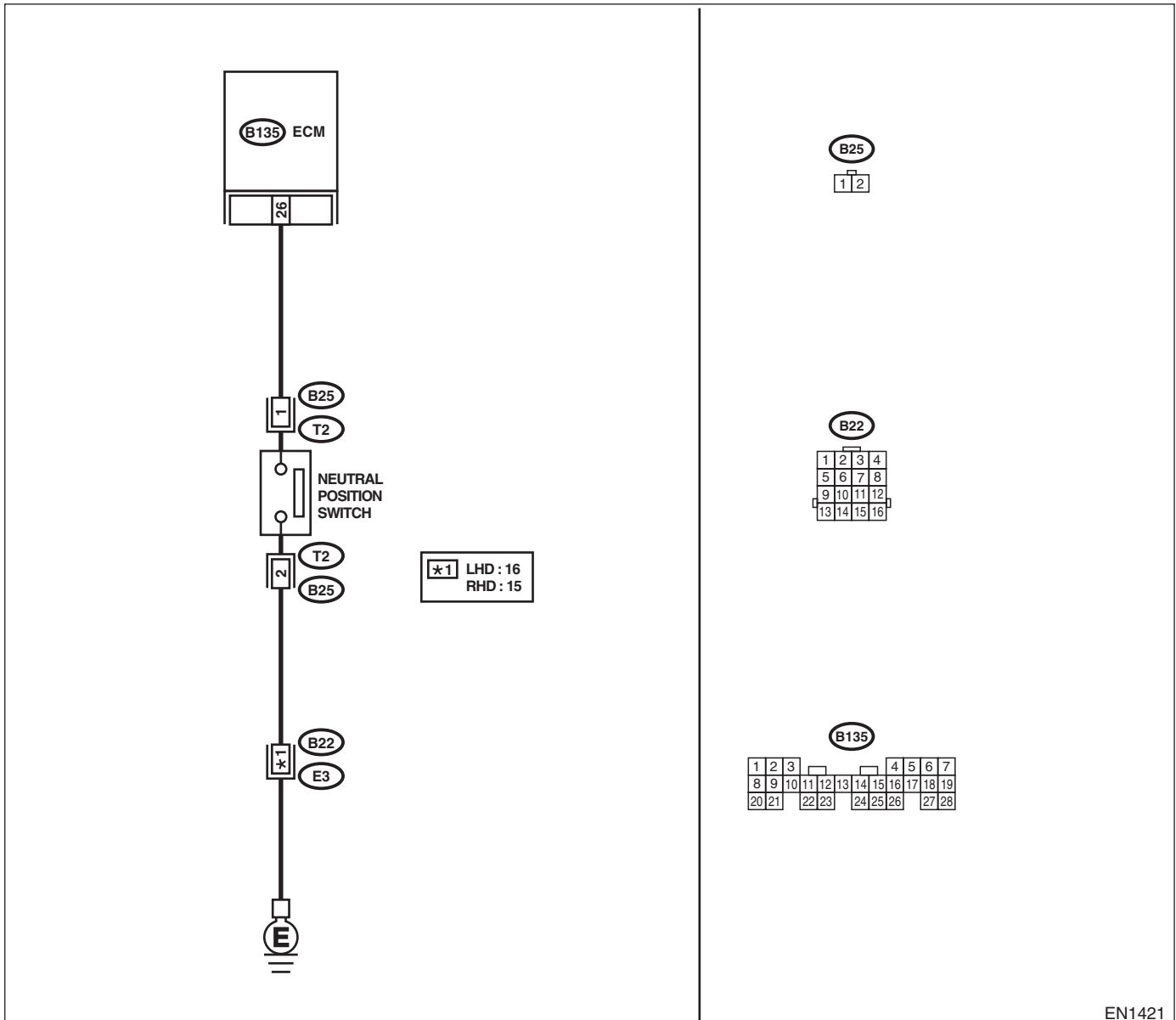
CB:DTC P1592 — NEUTRAL POSITION SWITCH CIRCUIT LOW INPUT (MT MODEL) —

- **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-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



Step	Check	Yes	No
1 CHECK INPUT SIGNAL FOR ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. <i>Connector & terminal</i> <i>(B135) No. 26 (+) — Chassis ground (-):</i>	Is the voltage more than 10V in neutral position?	Go to step 2.	Go to step 4.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
2 CHECK INPUT SIGNAL FOR ECM. Measure the voltage between ECM and chassis ground. <i>Connector & terminal</i> <i>(B135) No. 26 (+) — Chassis ground (-):</i>	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 the poor contact in ECM connector.	Contact with your Subaru distributor service.
4 CHECK NEUTRAL POSITION SWITCH. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from transmission harness. 3) Measure the resistance between transmission harness and connector terminals. <i>Connector & terminal</i> <i>(T2) No. 1 — No. 2:</i>	Is the resistance more than 1M Ω in neutral position?	Go to step 5.	Repair the short circuit in transmission harness or replace neutral position switch.
5 CHECK NEUTRAL POSITION SWITCH. Measure the resistance between transmission harness connector terminals.	Is the resistance less than 1 Ω in other positions?	Go to step 6.	Repair the short circuit in transmission harness or replace neutral position switch.
6 CHECK HARNESS BETWEEN ECM AND NEUTRAL POSITION SWITCH CONNECTOR. Measure the resistance between ECM and chassis ground. <i>Connector & terminal</i> <i>(B135) No. 26 — Chassis ground:</i>	Is the resistance less than 10 Ω ?	Repair the 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 the connector from ECM. 2) Measure the resistance of harness between ECM and transmission harness connector. <i>Connector & terminal</i> <i>(B135) No. 26 — (B25) No. 1:</i>	Is the resistance less than 1 Ω ?	Go to step 8.	Repair the open circuit in harness between ECM and transmission harness connector.
8 CHECK HARNESS BETWEEN ECM AND NEUTRAL POSITION SWITCH CONNECTOR. Measure the resistance of harness between transmission harness connector and engine ground. <i>Connector & terminal</i> <i>(B25) No. 2 — Engine ground:</i>	Is the resistance less than 5 Ω ?	Go to step 9.	Repair the 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 the poor contact in transmission harness connector.	Contact with your Subaru distributor service.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

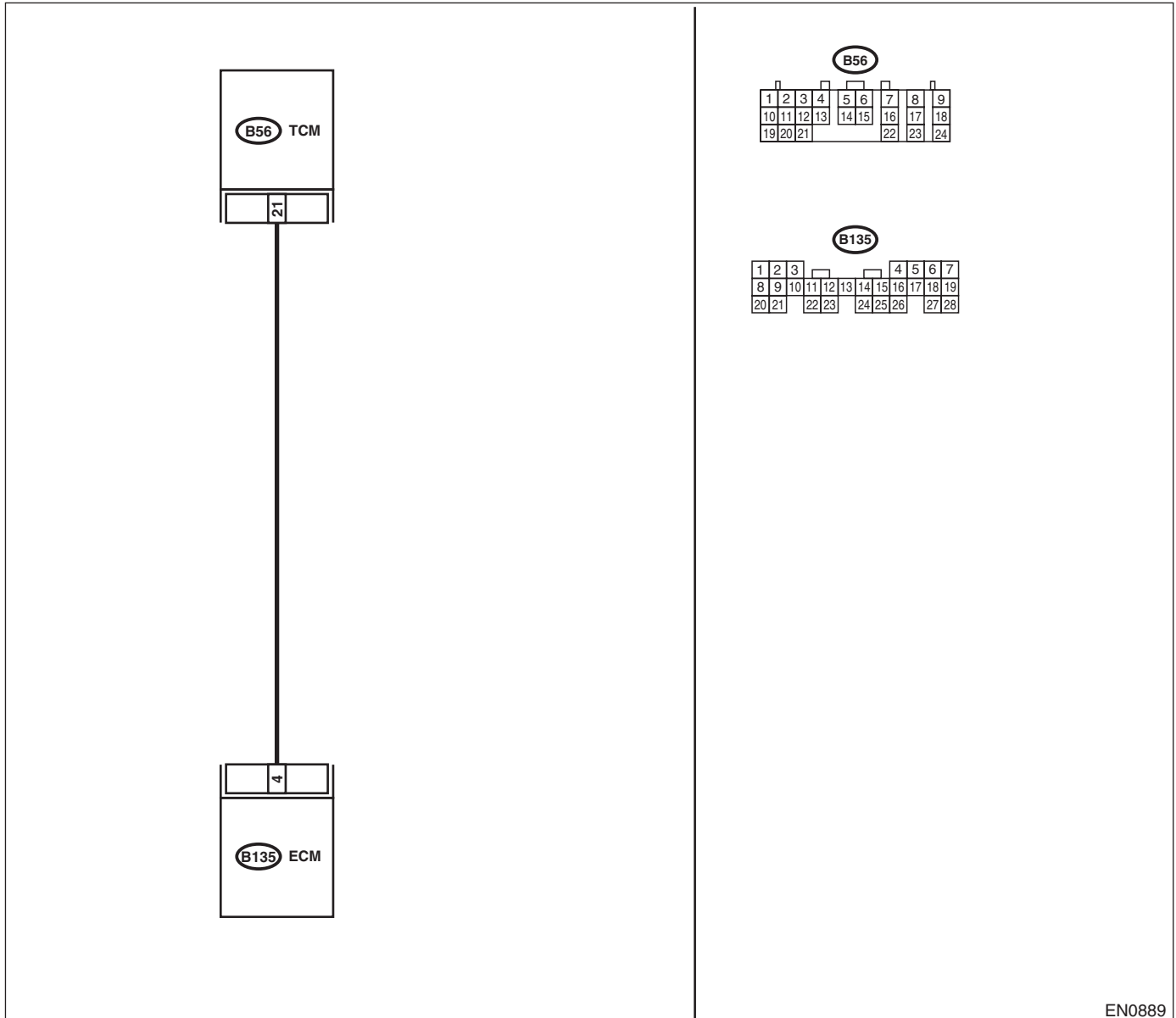
CC:DTC P1594 — AUTOMATIC TRANSMISSION DIAGNOSIS INPUT SIGNAL CIRCUIT MALFUNCTION —

- **DTC DETECTING CONDITION:**
 - Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN-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 the AT shift control functioning properly?	Go to step 2.	Replace the TCM. <Ref. to AT-46, Transmission Control Module (TCM).>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
2 CHECK ACCESSORY.	Are the car phone and/or CB installed on vehicle?	Repair the grounding line of car phone or CB system.	Replace the TCM. <Ref. to AT-46, Transmission Control Module (TCM).>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

CD:DTC P1595 — AUTOMATIC TRANSMISSION DIAGNOSIS INPUT SIGNAL CIRCUIT LOW INPUT —

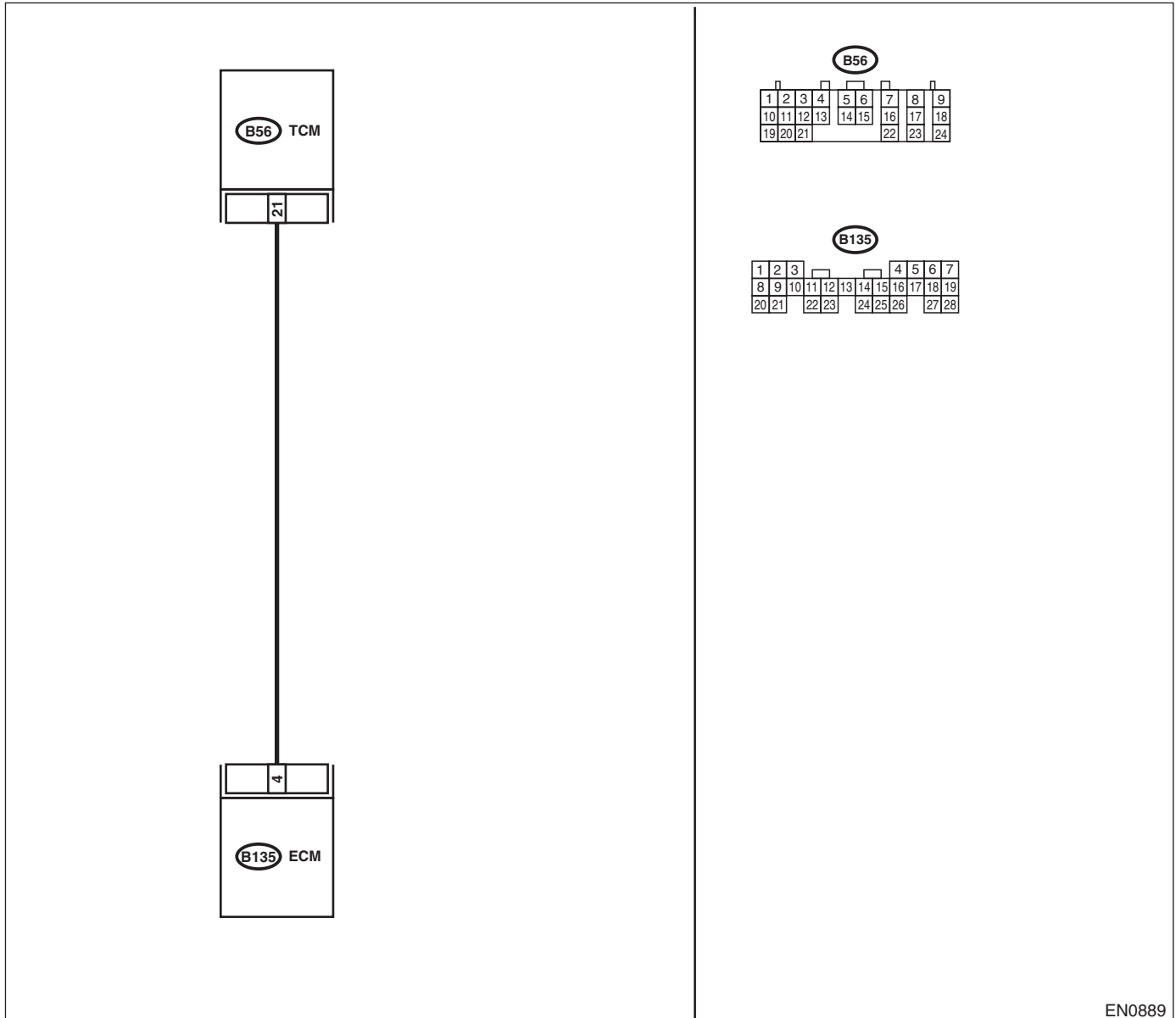
• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN-42, OPERATION, Inspection Mode.> .

• WIRING DIAGRAM:



EN0889

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>1</p> <p>CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. <i>Connector & terminal</i> <i>(B135) No. 4 (+) — Chassis ground (-):</i></p>	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: <ul style="list-style-type: none"> • Poor contact in ECM connector • Poor contact in TCM connector
<p>2</p> <p>CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and TCM. 3) Measure the resistance of harness between ECM and chassis ground. <i>Connector & terminal</i> <i>(B135) No. 4 — Chassis ground:</i></p>	Is the resistance less than 10 Ω ?	Repair the ground short circuit in harness between ECM and TCM connector.	Go to step 3.
<p>3</p> <p>CHECK OUTPUT SIGNAL FOR ECM. 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM and chassis ground. <i>Connector & terminal</i> <i>(B135) No. 4 (+) — Chassis ground (-):</i></p>	Is the voltage more than 5 V?	Go to step 4.	Repair the poor contact in ECM connector.
<p>4</p> <p>CHECK TROUBLE CODE FOR AUTOMATIC TRANSMISSION. Read the DTC for automatic transmission. <Ref. to AT-22, Read Diagnostic Trouble Code (DTC).></p>	Does the DTC appear for automatic transmission?	Inspect the DTC for automatic transmission. <Ref. to AT-42, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Replace the TCM. <Ref. to AT-46, Transmission Control Module (TCM).>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

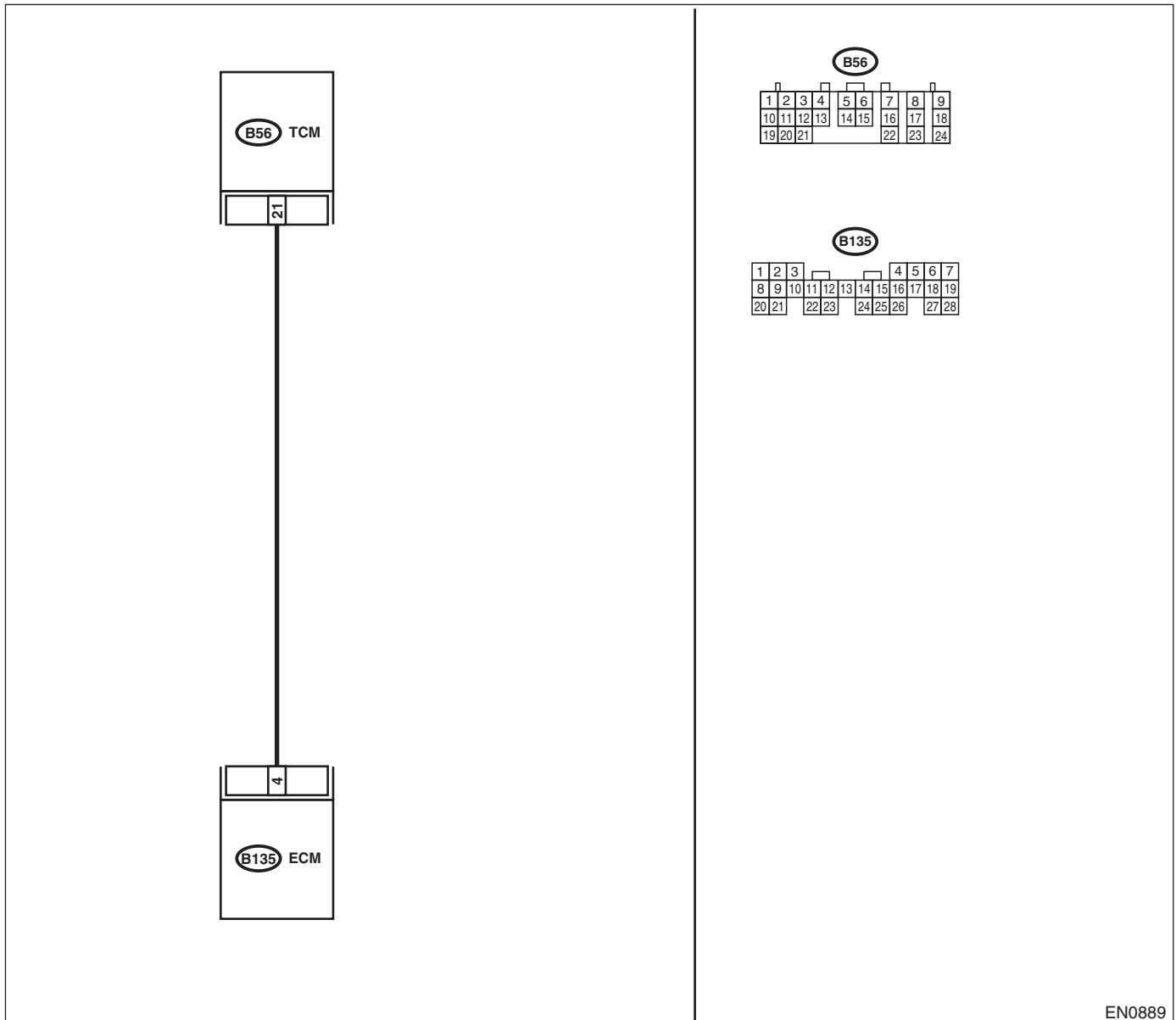
CE:DTC P1596 — AUTOMATIC TRANSMISSION DIAGNOSIS INPUT SIGNAL CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
 - Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN0889

Step	Check	Yes	No
1 CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR. 1) Turn the ignition switch to ON. 2) Measure the 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.	Go to step 2.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
2 CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR. Measure the 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 the 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 the poor contact in ECM connector.	Go to step 4.
4 CHECK OUTPUT SIGNAL FROM ECM. Measure the 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: <ul style="list-style-type: none"> • 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 the voltage between TCM and chassis ground. <i>Connector & terminal</i> <i>(B56) No. 21 (+) — Chassis ground (-):</i>	Is the voltage more than 4 V?	Go to step 6.	Repair the 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 the poor contact in TCM connector.	Check the TCM power supply line and grounding line.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

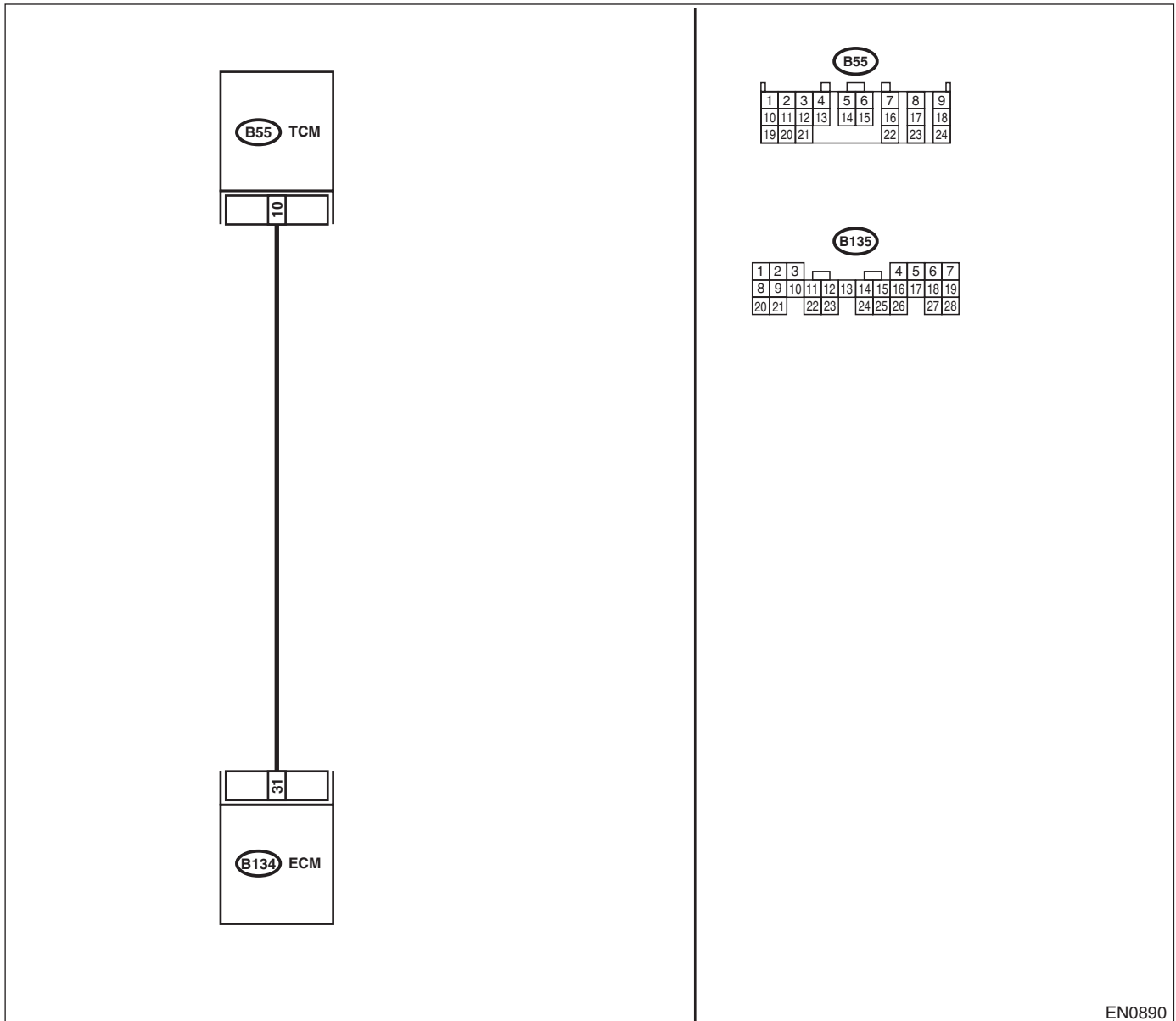
CF:DTC P1698 — ENGINE TORQUE CONTROL CUT SIGNAL CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
 - Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN-42, OPERATION, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN0890

Step	Check	Yes	No
1 CHECK OUTPUT SIGNAL FROM ECM. 1) Start the engine and warm-up engine. 2) Turn the ignition switch to OFF. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. Connector & terminal (B134) No. 31 (+) — Chassis ground (-):	Is the voltage more than 3 V?	Repair the 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 TCM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and TCM. 3) Measure the resistance of harness between ECM and chassis ground. Connector & terminal (B134) No. 31 — Chassis ground:	Is the resistance less than 10 Ω ?	Repair the ground short circuit in harness between ECM and TCM connector.	Go to step 3.
3 CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR. Measure the resistance of harness between ECM and TCM connector. Connector & terminal (B134) No. 31 — (B55) No. 10:	Is the resistance less than 1 Ω ?	Repair the poor contact in ECM or TCM connector.	Repair the 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 —

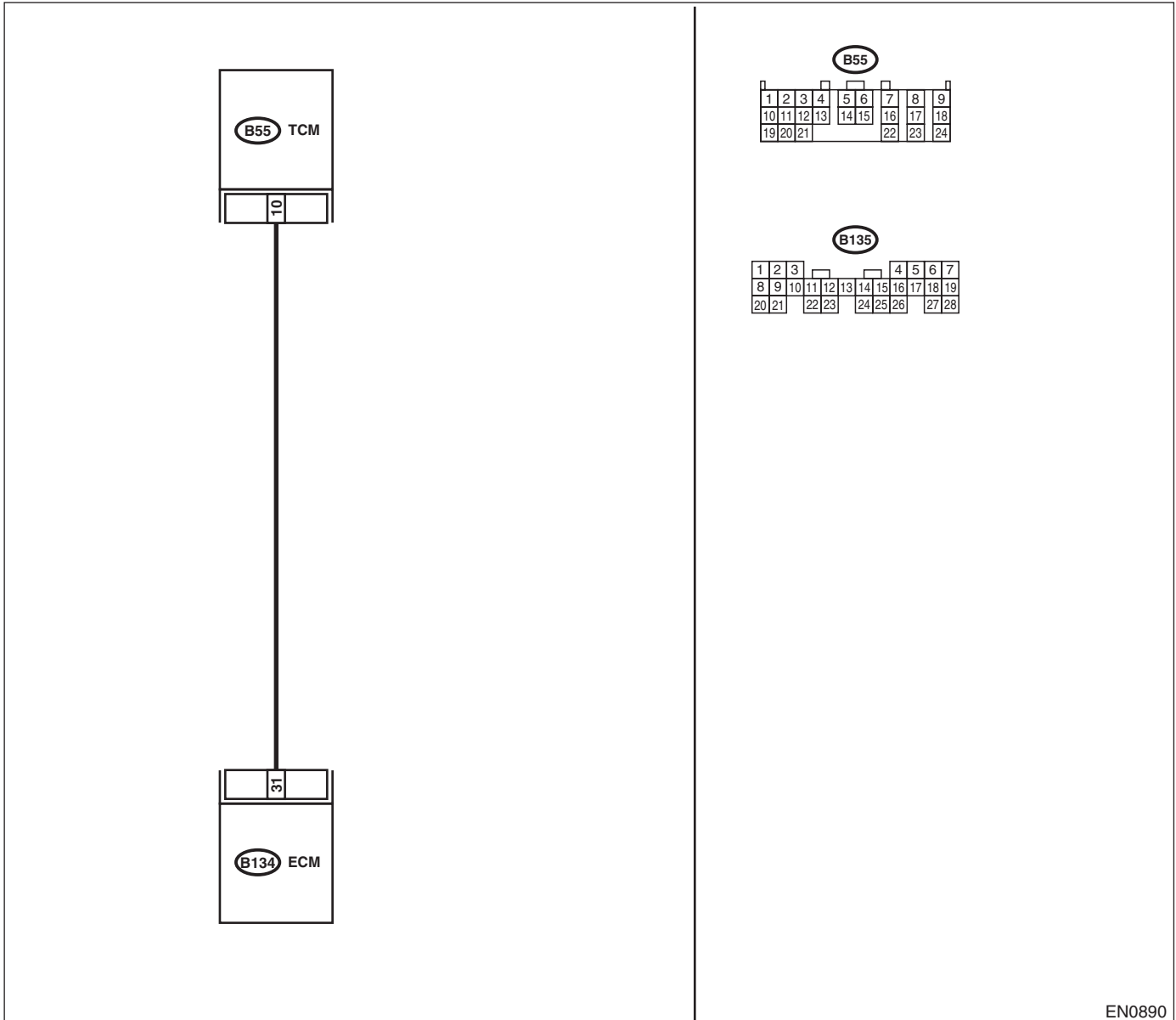
• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN-42, OPERATION, Inspection Mode.> .

• WIRING DIAGRAM:



EN0890

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>1</p> <p>CHECK OUTPUT SIGNAL FROM ECM. 1)Start the engine and warm-up engine. 2)Turn the ignition switch to OFF. 3)Disconnect the connector from TCM. 4)Turn the ignition switch to ON. 5)Measure the voltage between ECM and chassis ground.</p> <p>Connector & terminal (B134) No. 31 (+) — Chassis ground (-):</p>	<p>Is the voltage less than 3 V?</p>	<p>Go to step 2.</p>	<p>Repair the battery short circuit in harness between ECM and TCM connector. After repair, replace the ECM. <Ref. to FU-51, Engine Control Module.></p>
<p>2</p> <p>CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR. 1)Turn the ignition switch to OFF. 2)Measure the voltage between ECM and chassis ground.</p> <p>Connector & terminal (B134) No. 31 (+) — Chassis ground (-):</p>	<p>Does the voltage change more than 10 V by shaking harness and connector of ECM while monitoring the value with voltage meter?</p>	<p>Repair the battery short circuit in harness between ECM and TCM connector. After repair, replace the ECM. <Ref. to FU-51, Engine Control Module.></p>	<p>Contact with your Subaru distributor service.</p> <p>NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.</p>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

CH:DTC P1701 — CRUISE CONTROL SET SIGNAL CIRCUIT MALFUNCTION FOR AUTOMATIC TRANSMISSION —

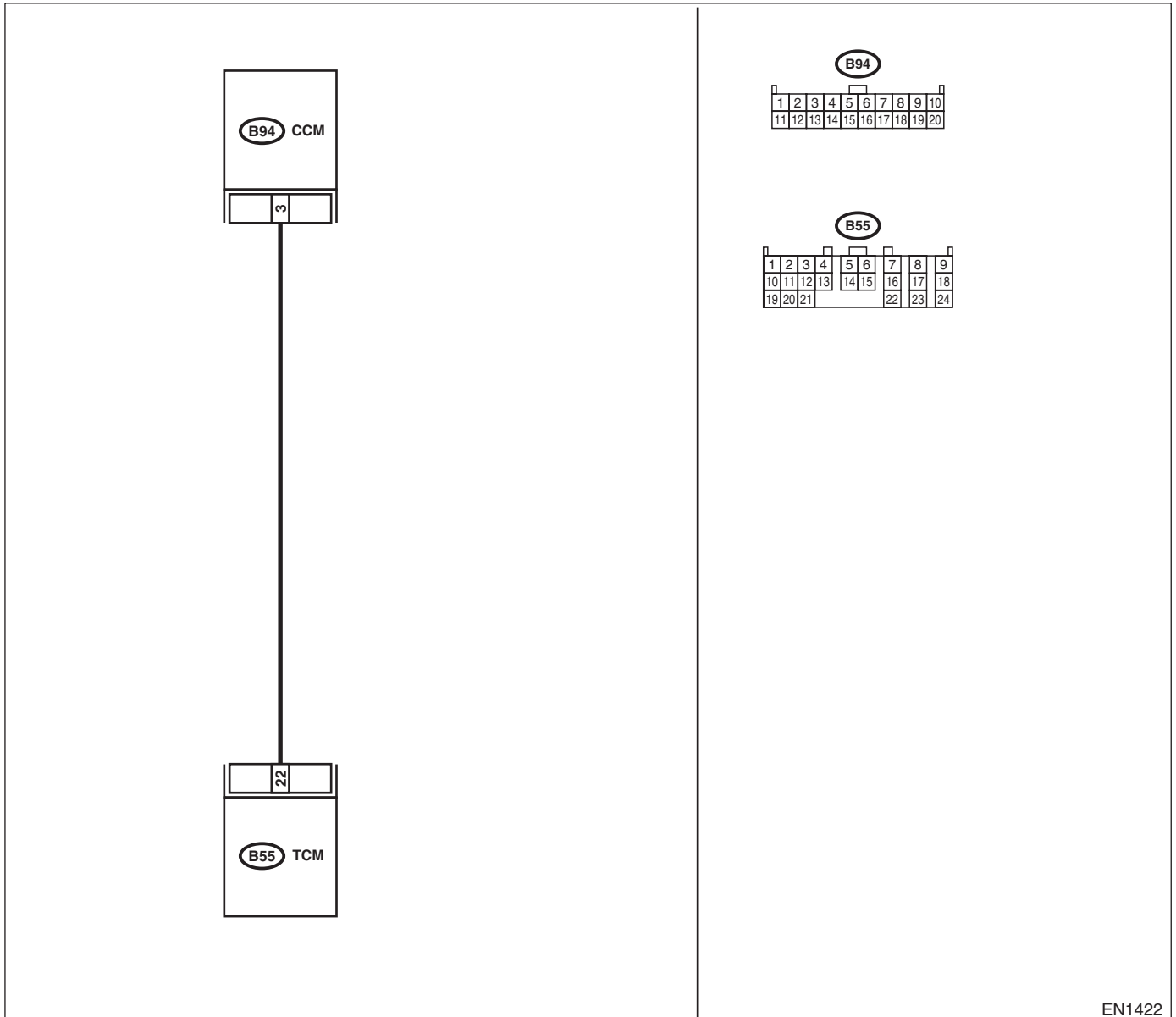
• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN-42, OPERATION, Inspection Mode.> .

• WIRING DIAGRAM:



EN1422

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS BETWEEN TCM AND CCM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM and CCM. 3) Measure the resistance of harness between TCM and CCM connector. Connector & terminal (B55) No. 22 — (B94) No. 3:	Is the resistance less than 1 Ω ?	Go to step 2.	Repair the open circuit in harness between TCM and CCM connector.
2 CHECK HARNESS BETWEEN TCM AND CCM CONNECTOR. Measure the resistance of harness between TCM and chassis ground. Connector & terminal (B55) No. 22 — Chassis ground:	Is the resistance less than 10 Ω ?	Repair the short circuit in harness between TCM and CCM connector.	Go to step 3.
3 CHECK INPUT SIGNAL FOR TCM. 1) Connect the 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 the selector lever to "D" range and slowly increase vehicle speed to 50 km/h (31 MPH). 6) Cruise control command switch to ON. 7) Measure the 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 the 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 the poor contact in TCM connector.	Replace the TCM. <Ref. to AT-46, Transmission Control Module (TCM).>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

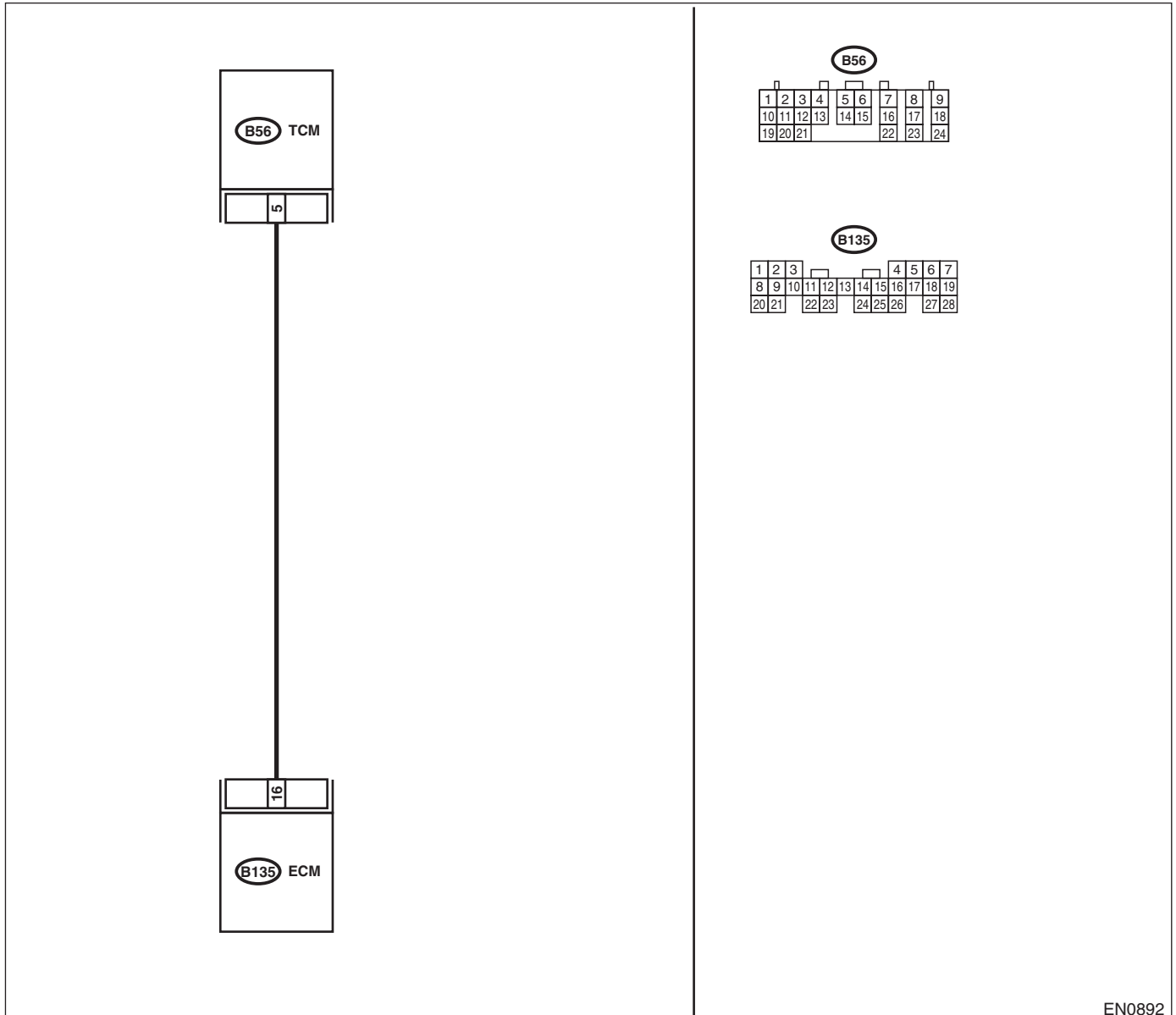
CI: DTC P1711 — ENGINE TORQUE CONTROL SIGNAL 1 CIRCUIT MALFUNCTION —

- **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-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN-42, OPERATION, Inspection Mode.> .

• **WIRING DIAGRAM:**



EN0892

Step	Check	Yes	No
1 CHECK INPUT SIGNAL FOR ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. <i>Connector & terminal</i> <i>(B135) No. 16 (+) — Chassis ground (-):</i>	Is the voltage more than 4.5 V?	Go to step 2.	Go to step 4.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
2 CHECK INPUT SIGNAL FOR ECM. Measure the voltage between ECM and chassis ground. <i>Connector & terminal</i> <i>(B135) No. 16 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Repair the 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 the poor contact in ECM connector.	Replace the ECM. <Ref. to FU-51, Engine Control Module.>
4 CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and TCM. 3) Measure the resistance of harness between ECM and TCM connector. <i>Connector & terminal</i> <i>(B135) No. 16 — (B56) No. 5:</i>	Is the resistance less than 1 Ω ?	Go to step 5.	Repair the open circuit in harness between ECM and TCM connector.
5 CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR. Measure the resistance of harness between ECM and chassis ground. <i>Connector & terminal</i> <i>(B135) No. 16 — Chassis ground:</i>	Is the resistance less than 10 Ω ?	Repair the 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 the poor contact in TCM connector.	Replace the TCM. <Ref. to AT-46, Transmission Control Module (TCM).>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

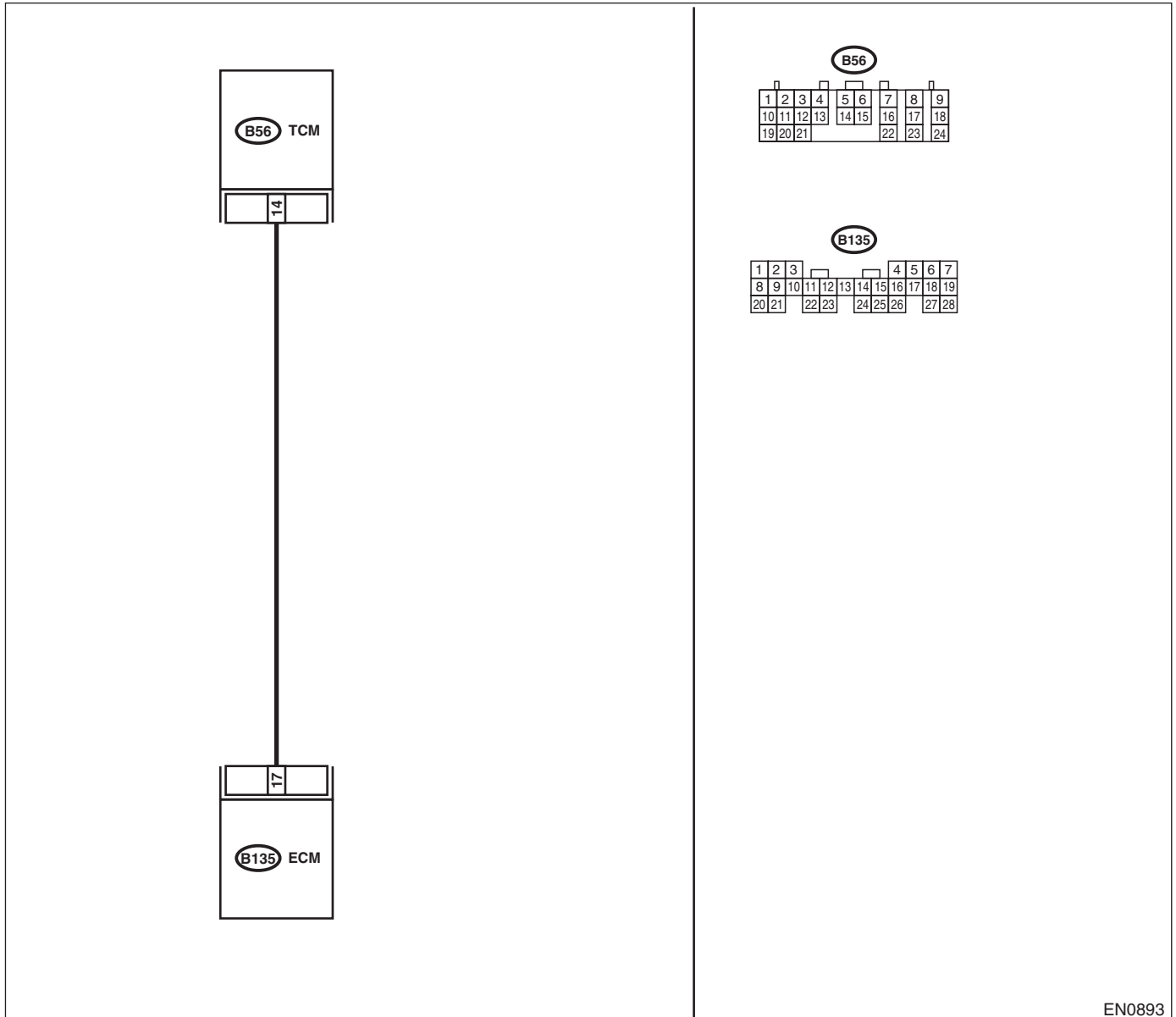
CJ:DTC P1712 — ENGINE TORQUE CONTROL SIGNAL 2 CIRCUIT MALFUNCTION —

- **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-49, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN-42, OPERATION, Inspection Mode.> .

• **WIRING DIAGRAM:**



EN0893

Step	Check	Yes	No
1 CHECK INPUT SIGNAL FOR ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. <i>Connector & terminal</i> <i>(B135) No. 17 (+) — Chassis ground (-):</i>	Is the voltage more than 4.5 V?	Go to step 2.	Go to step 4.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No	
2	CHECK INPUT SIGNAL FOR ECM. Measure the voltage between ECM and chassis ground. Connector & terminal (B135) No. 17 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Repair the 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 the poor contact in ECM connector.	Replace the ECM. <Ref. to FU-51, Engine Control Module.>
4	CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and TCM. 3) Measure the 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 the open circuit in harness between ECM and TCM connector.
5	CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR. Measure the resistance of harness between ECM and chassis ground. Connector & terminal (B135) No. 17 — Chassis ground:	Is the resistance less than 10 Ω ?	Repair the 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 the poor contact in TCM connector.	Replace the TCM. <Ref. to AT-46, Transmission Control Module (TCM).>

GENERAL DIAGNOSTIC TABLE

ENGINE (DIAGNOSTICS)

20. General Diagnostic Table

A: INSPECTION

1. ENGINE

NOTE:

Malfunction of parts other than those listed is also possible. <Ref. to ME-95, 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(w/oOBD)
EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)	EC(w/oOBD)
EXHAUST	EX(w/oOBD)
IGNITION	IG(w/oOBD)
ENGINE(DIAGNOSTICS)	EN(w/oOBD)
FUEL INJECTION (FUEL SYSTEMS)	FU(TURBO)
EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)	EC(TURBO)
INTAKE (INDUCTION)	IN(TURBO)
MECHANICAL	ME(TURBO)
EXHAUST	EX(TURBO)
IGNITION	IG(TURBO)
ENGINE (DIAGNOSTICS)	EN(TURBO)

FUEL INJECTION (FUEL SYSTEMS)

FU(w/oOBD)

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GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

1. General Description

A: SPECIFICATIONS

Model		1600 cc and 2000 cc	2500 cc
Fuel tank	Capacity	50 ℓ (13.2 US gal, 11.0 Imp gal)	60 ℓ (15.9 US gal, 13.2 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

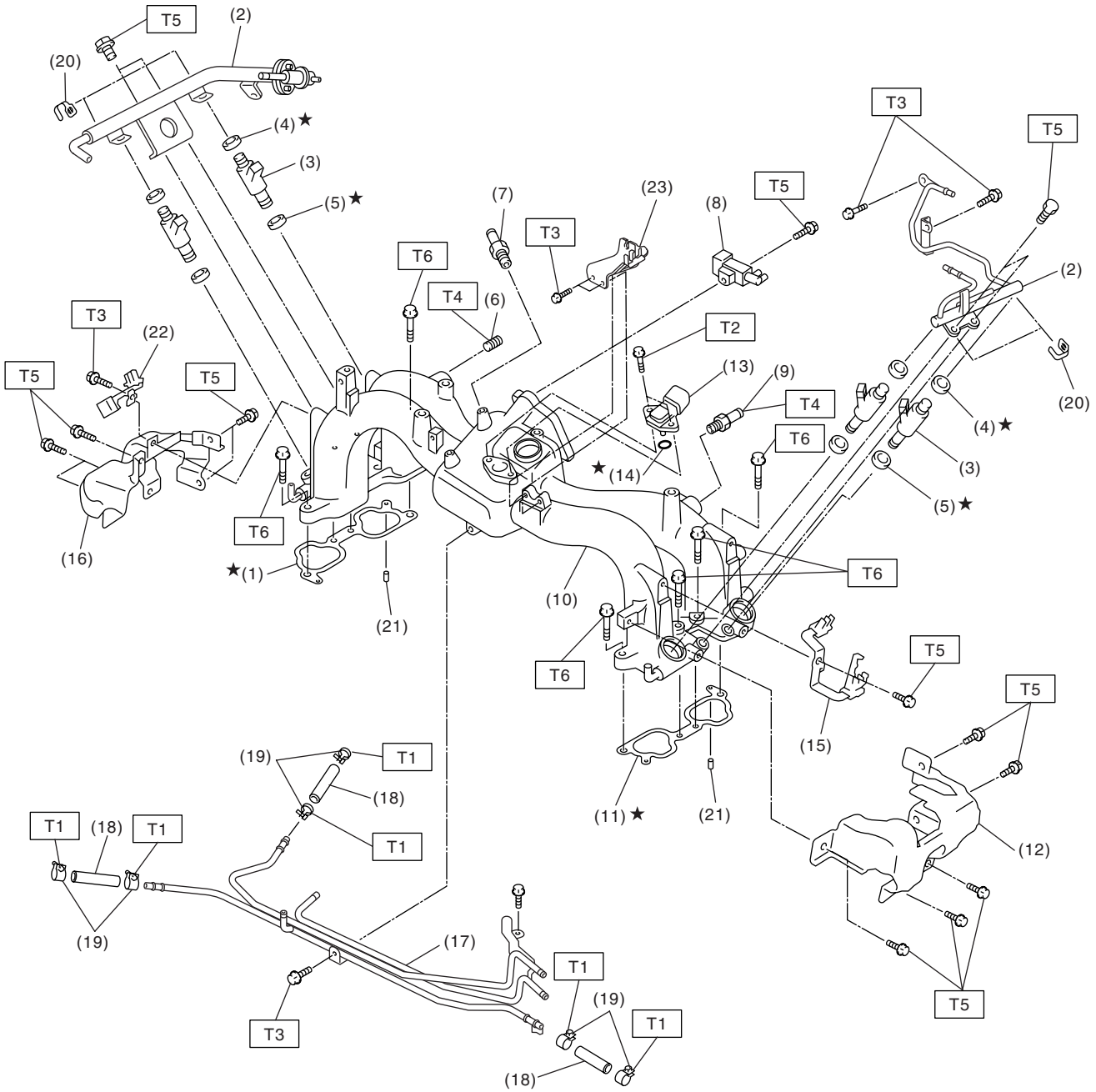
FUEL INJECTION (FUEL SYSTEMS)

GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

B: COMPONENT

1. INTAKE MANIFOLD



EN1385

GENERAL DESCRIPTION

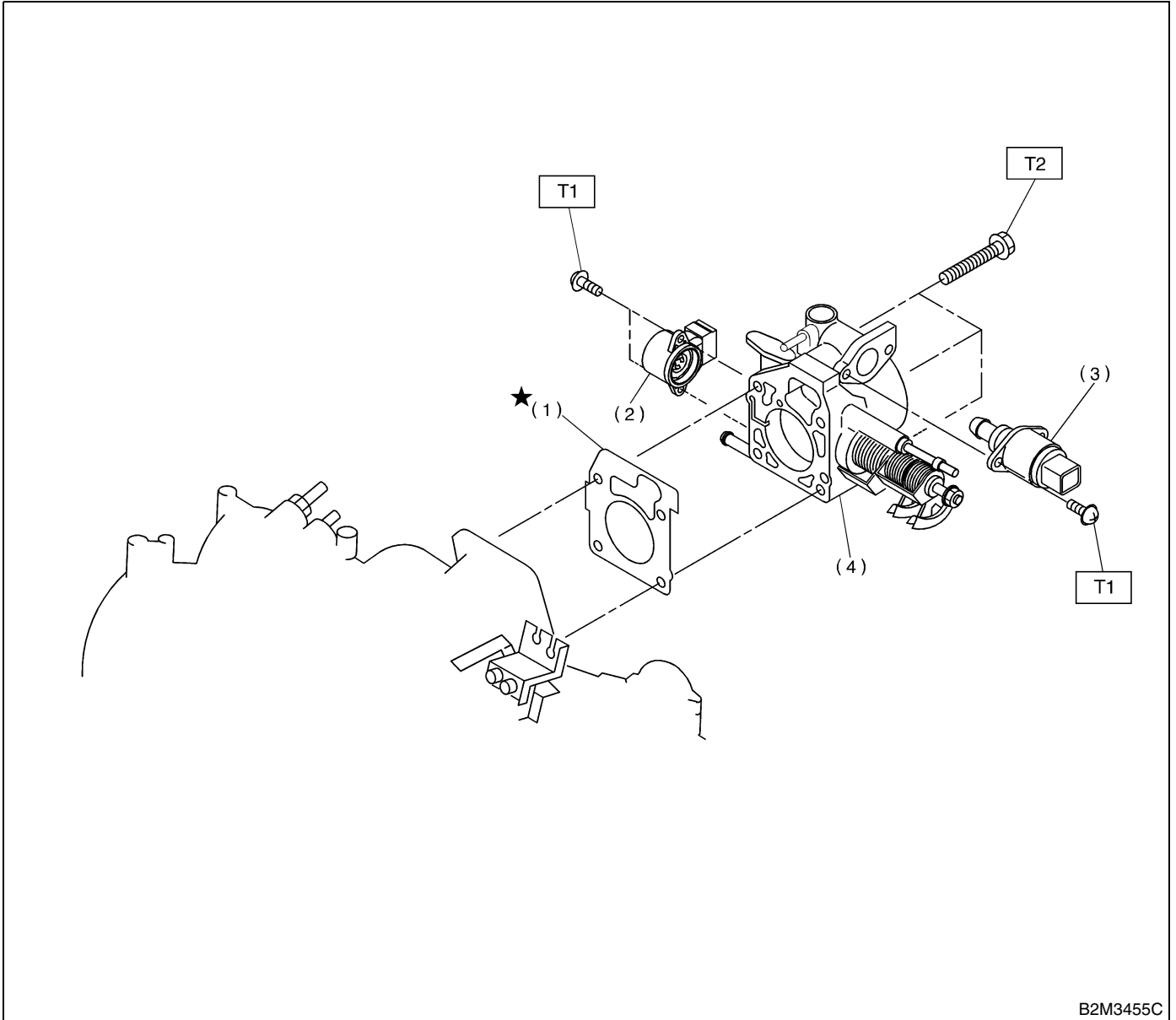
FUEL INJECTION (FUEL SYSTEMS)

(1) Intake manifold gasket RH	(12) Fuel pipe protector LH	(22) Plug cord holder RH
(2) Fuel injector pipe	(13) Intake air temperature and pressure sensor	(23) Accelerator cable bracket
(3) Fuel injector		
(4) O-ring	(14) O-ring	<i>Tightening torque: N·m (kgf-m, ft-lb)</i>
(5) O-ring	(15) Plug cord holder LH	<i>T1: 1.5 (0.15, 1.1)</i>
(6) Plug	(16) Fuel pipe protector RH	<i>T2: 3.4 (0.35, 2.5)</i>
(7) PCV valve	(17) Fuel pipe ASSY	<i>T3: 5.0 (0.51, 3.7)</i>
(8) Purge control solenoid valve	(18) Fuel hose	<i>T4: 17 (1.7, 12.5)</i>
(9) Nipple	(19) Clip	<i>T5: 19 (1.9, 14.0)</i>
(10) Intake manifold	(20) Clip	<i>T6: 25 (2.5, 18.4)</i>
(11) Intake manifold gasket LH	(21) Guide pin	

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)

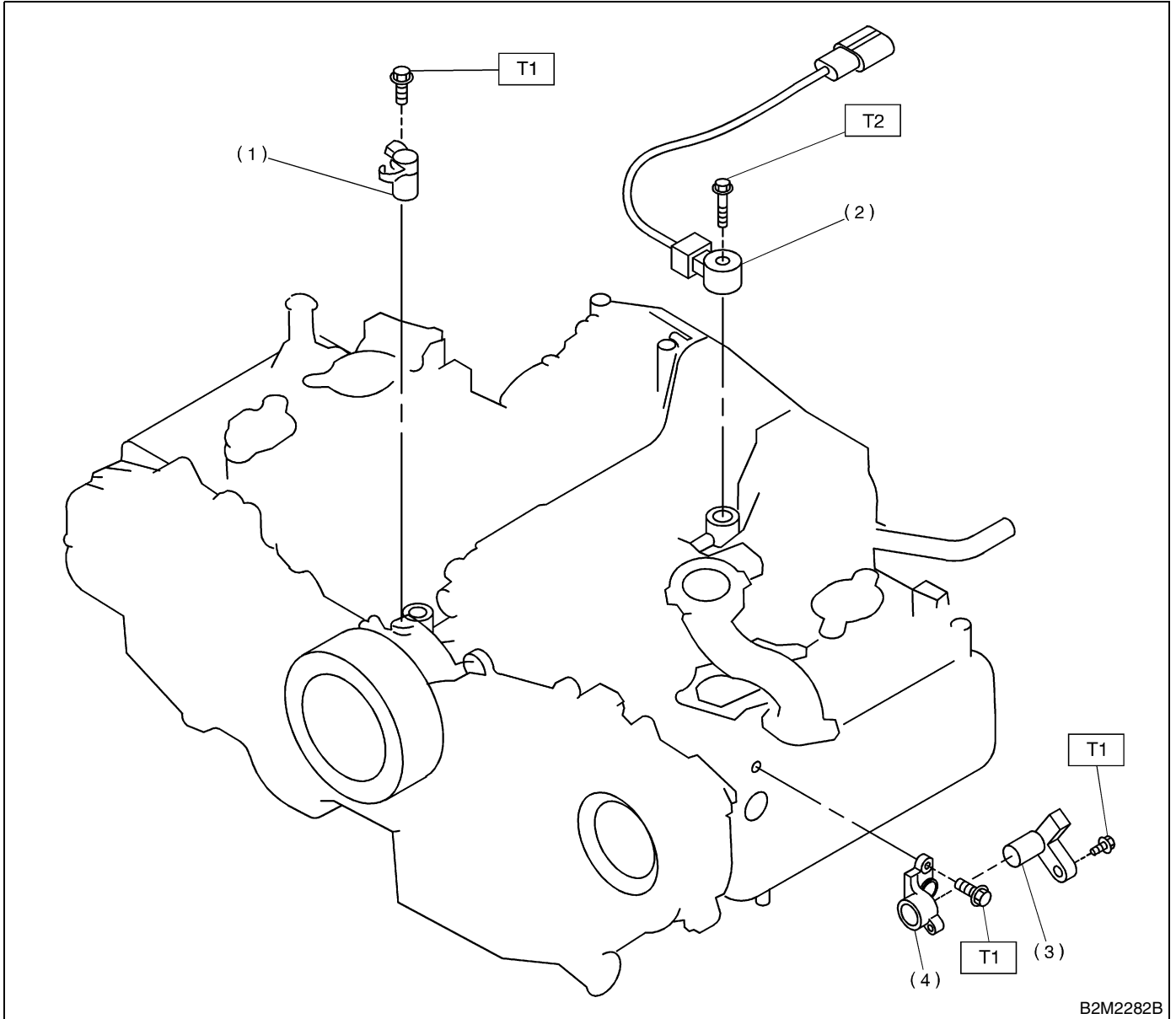
T1: 1.6 (0.16, 1.2)

T2: 22 (2.2, 16.2)

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)

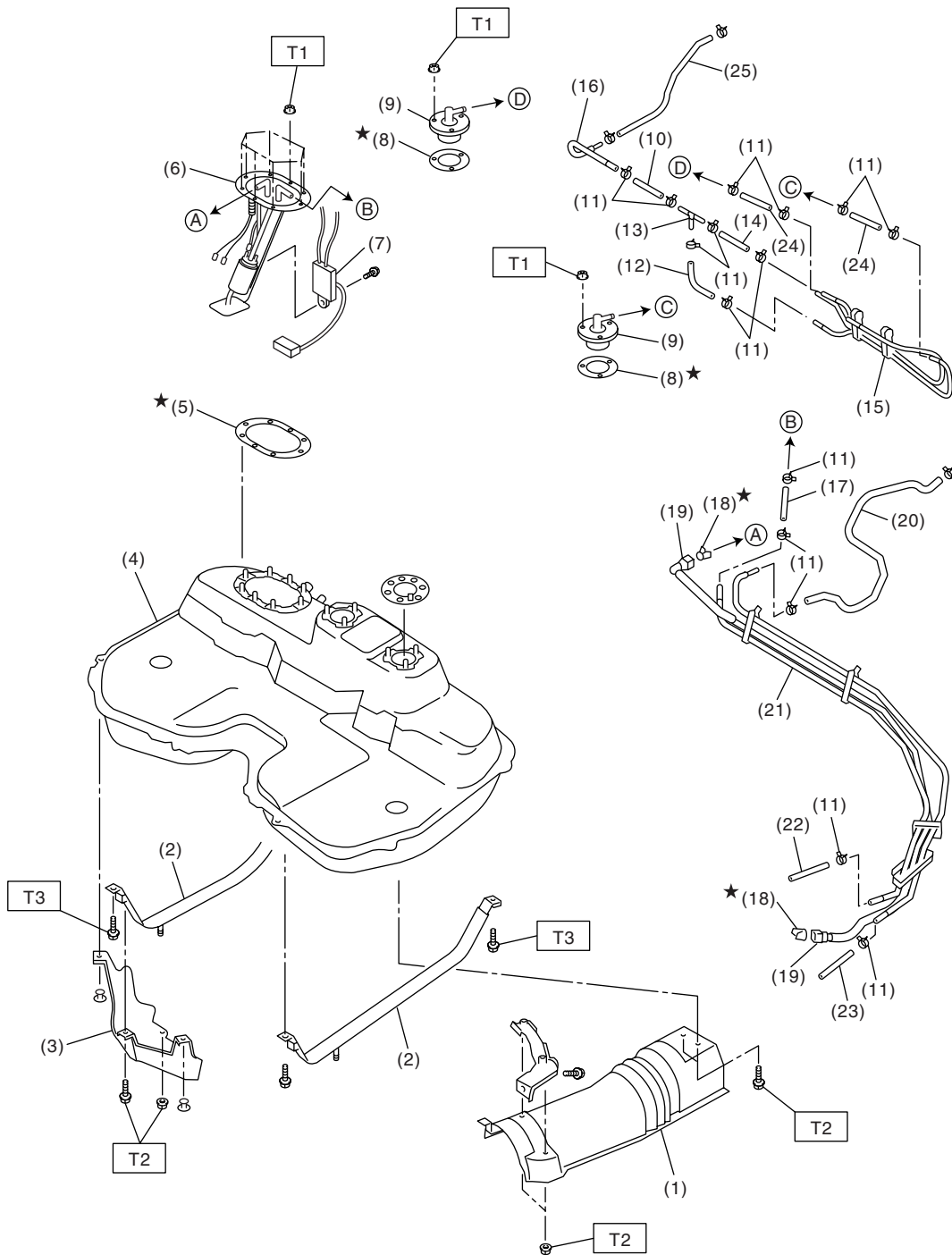
T2: 24 (2.4, 17.4)

GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

4. FUEL TANK

• 1600 CC and 2000 CC MODEL



EN0439

GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

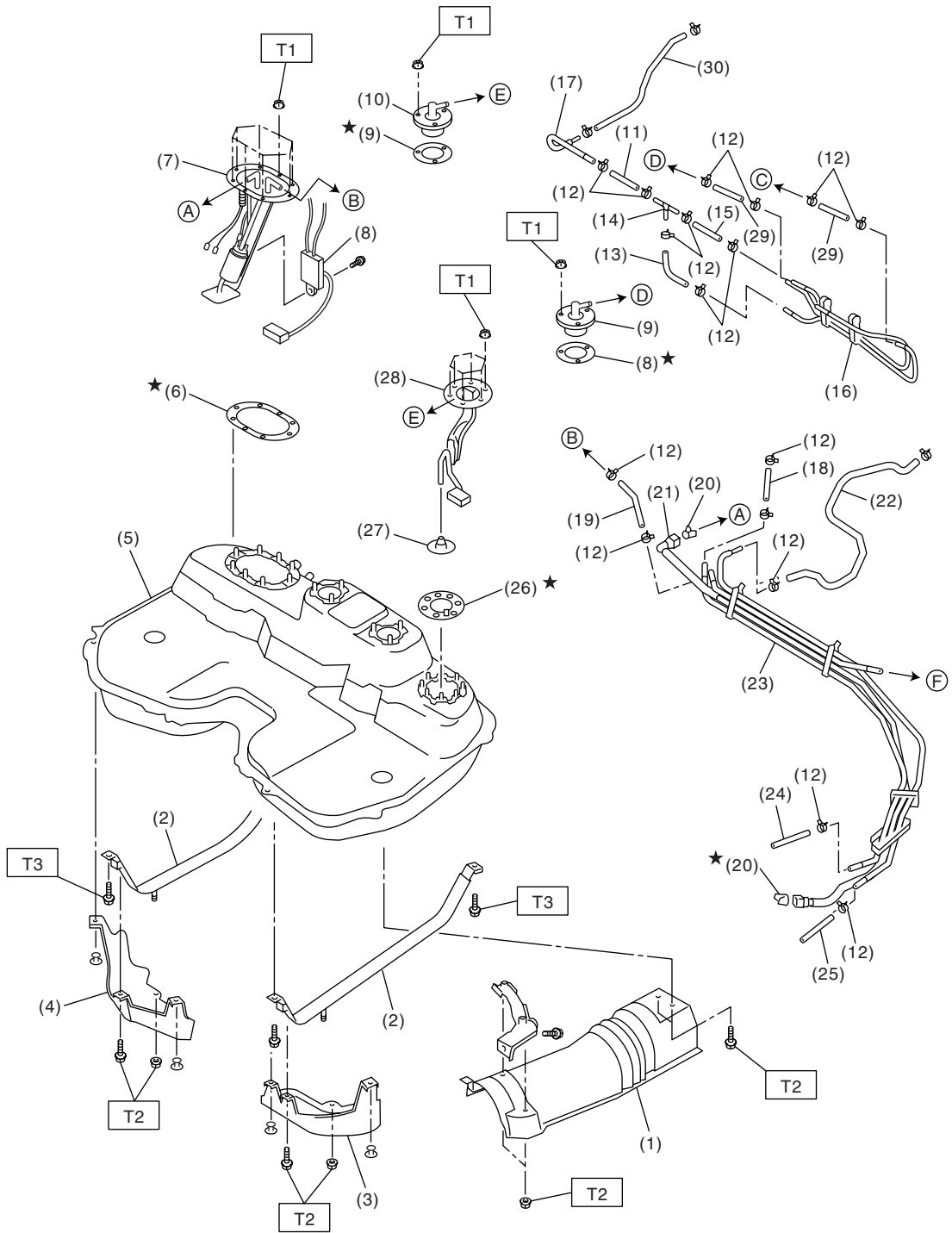
(1) Heat shield cover	(11) Clip	(21) Fuel pipe ASSY
(2) Fuel tank band	(12) Evaporation hose B	(22) Evaporation hose F
(3) Protector RH	(13) Joint pipe	(23) Fuel return hose B
(4) Fuel tank	(14) Evaporation hose C	(24) Evaporation hose G
(5) Fuel pump gasket	(15) Evaporation pipe ASSY	(25) Evaporation 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, 24.3)**

GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

• 2500 CC MODEL



EN1503

GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

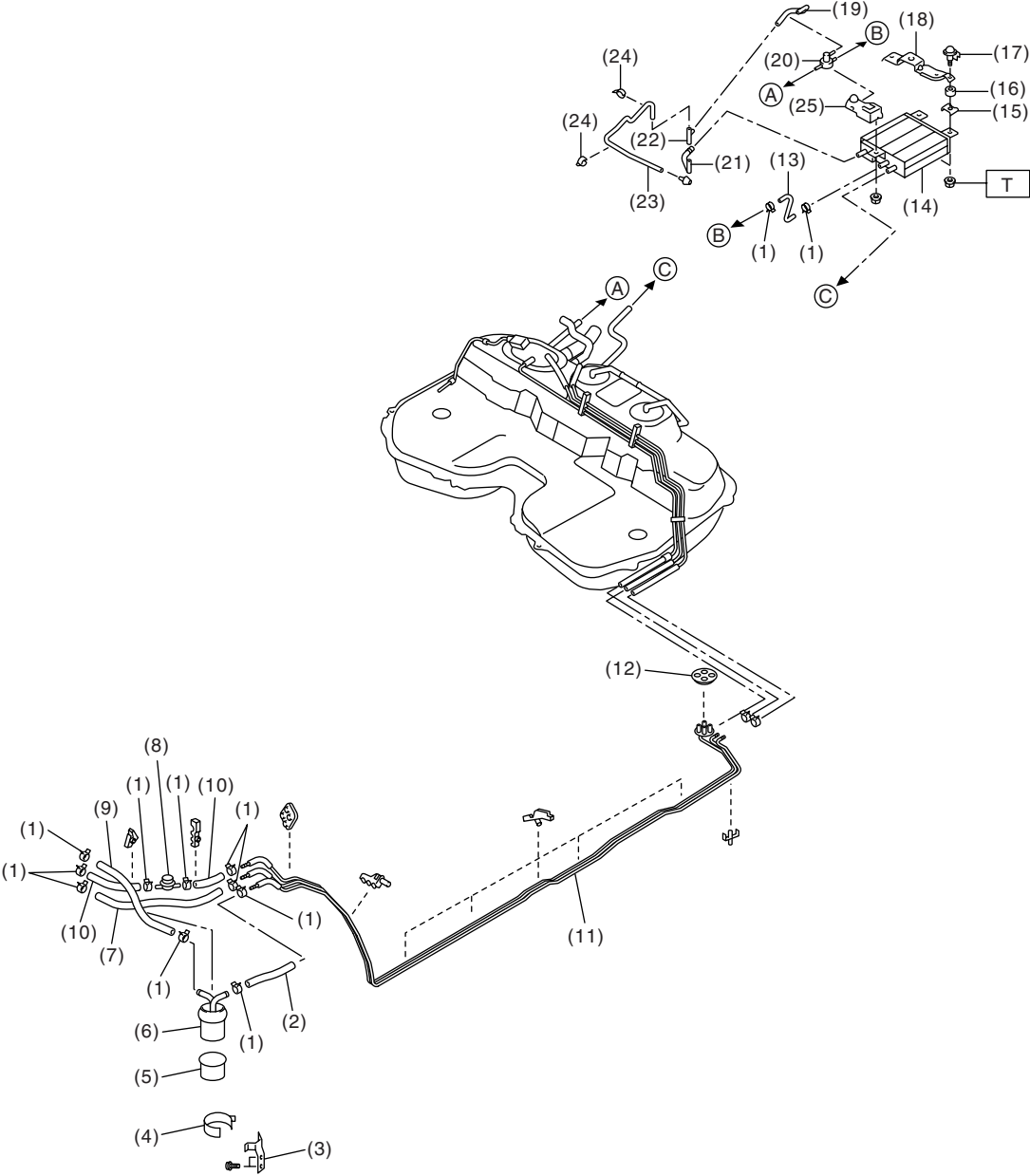
- | | | |
|---------------------------|----------------------------|----------------------------|
| (1) Heat shield cover | (13) Evaporation hose B | (25) Fuel return hose B |
| (2) Fuel tank band | (14) Joint pipe | (26) Fuel sub meter gasket |
| (3) Protector LH | (15) Evaporation hose C | (27) Jet 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, 24.3)**

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 | |

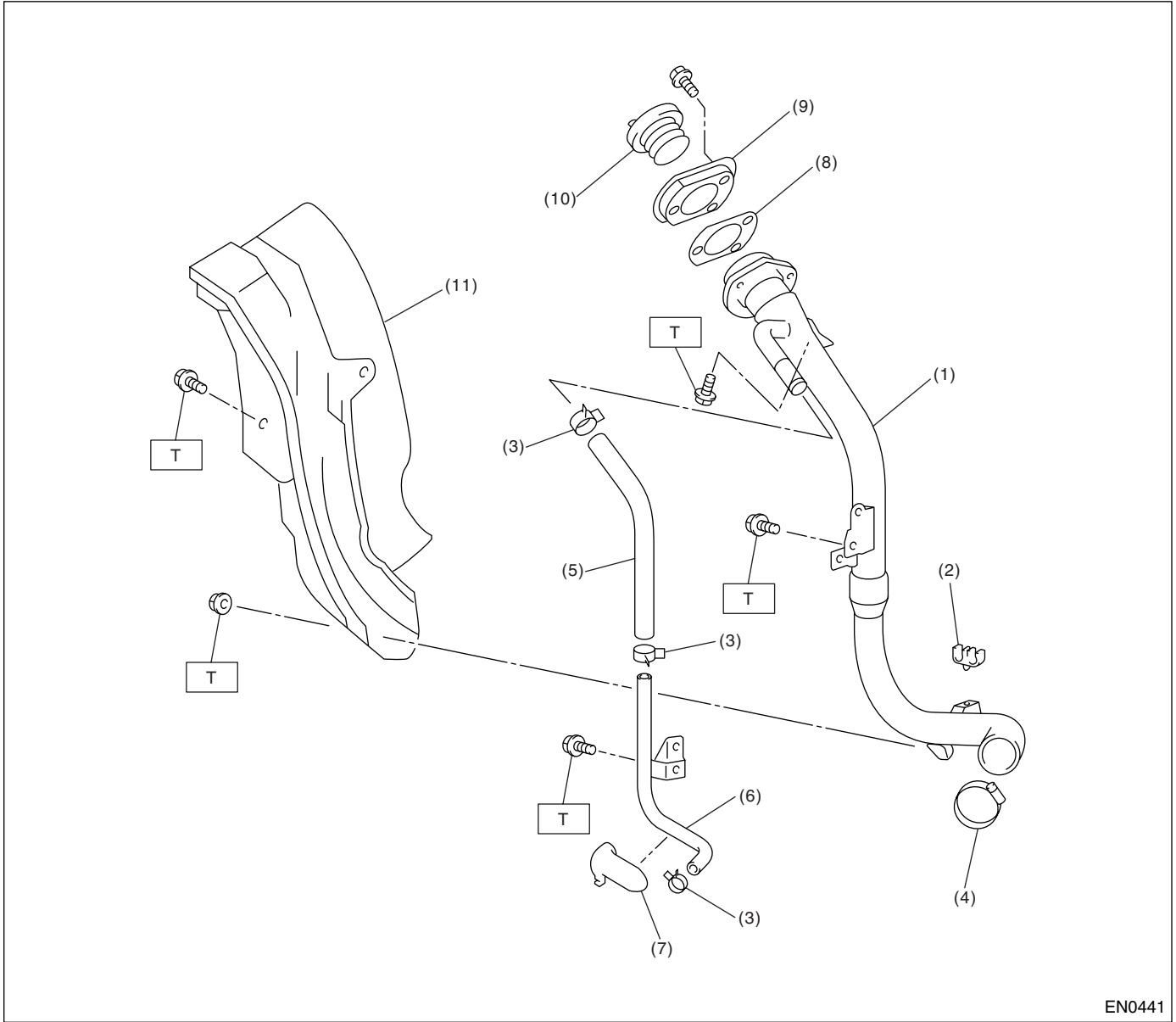
Tightening torque: N·m (kgf·m, ft·lb)

T: 23 (2.3, 17.0)

GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

6. FUEL FILLER PIPE



- | | |
|-----------------------------|----------------------------|
| (1) Fuel filler pipe ASSY | (7) Air vent pipe holder |
| (2) Evaporation hose holder | (8) Filler pipe packing |
| (3) Clip | (9) Filler ring |
| (4) Clamp | (10) Filler cap |
| (5) Air vent hose | (11) Filler pipe protector |
| (6) Air vent pipe | |

Tightening torque: N-m (kgf-m, ft-lb)
T: 7.5 (0.76, 5.5)

GENERAL DESCRIPTION

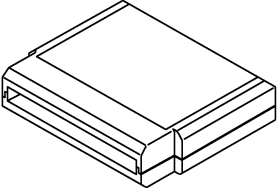

FUEL INJECTION (FUEL SYSTEMS)

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

D: PREPARATION TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p>B2M3876</p>	24082AA190 (Newly adopted tool)	CARTRIDGE	Troubleshooting for electrical system.
 <p>B2M3877</p>	22771AA030	SELECT MONITOR KIT	Troubleshooting for electrical systems. <ul style="list-style-type: none"> • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

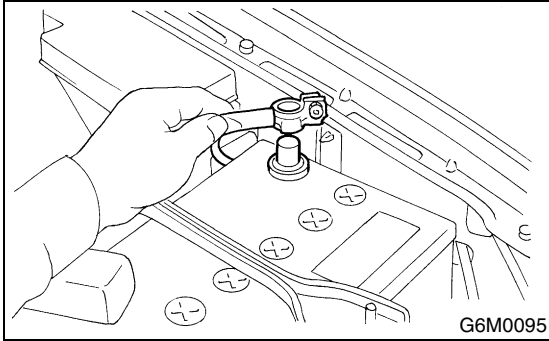
THROTTLE BODY

FUEL INJECTION (FUEL SYSTEMS)

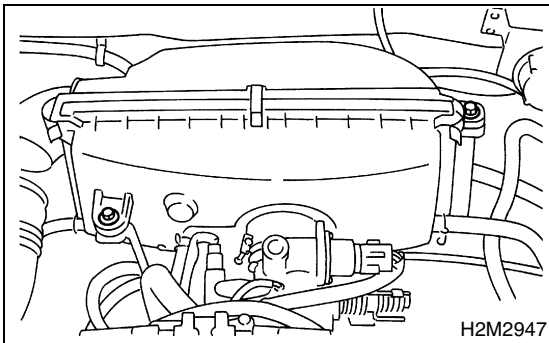
2. Throttle Body

A: REMOVAL

1) Disconnect the ground cable from battery.

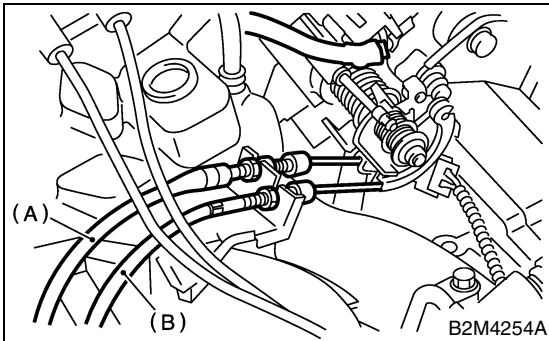


2) Remove the air cleaner case.



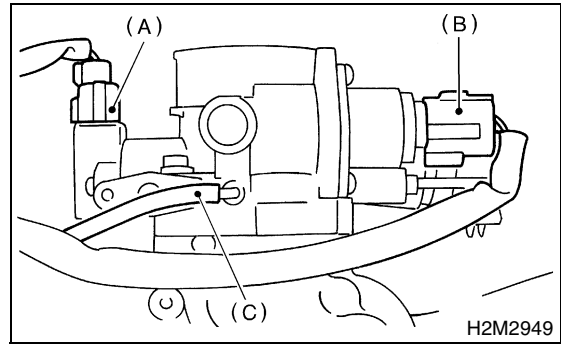
3) Disconnect the accelerator cable (A).

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



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

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

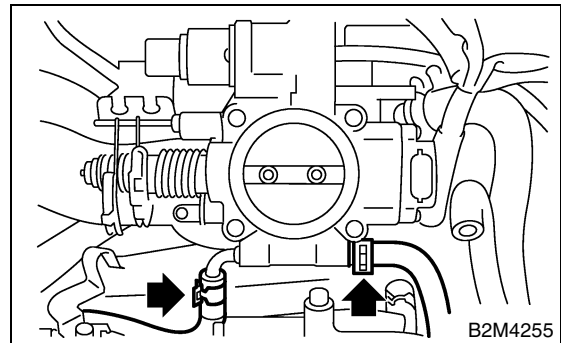


(A) Throttle position sensor

(B) Idle air control solenoid valve

(C) Air by-pass hose from purge control solenoid valve

7) Disconnect the engine coolant hoses from throttle body.



8) Remove the bolts which install throttle body to intake manifold.

B: INSTALLATION

Install in the reverse order of removal.

NOTE:

Always use a new gasket.

Tightening torque:

Throttle body;

22 N·m (2.2 kgf-m, 16.2 ft-lb)

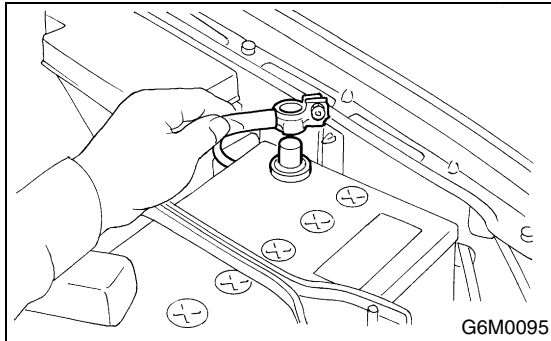
Air cleaner case;

6.5 N·m (0.66 kgf-m, 4.8 ft-lb)

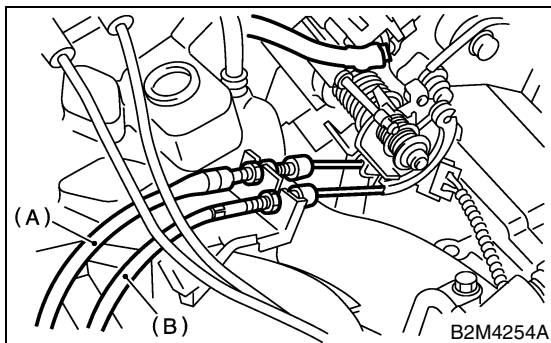
3. Intake Manifold

A: REMOVAL

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



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

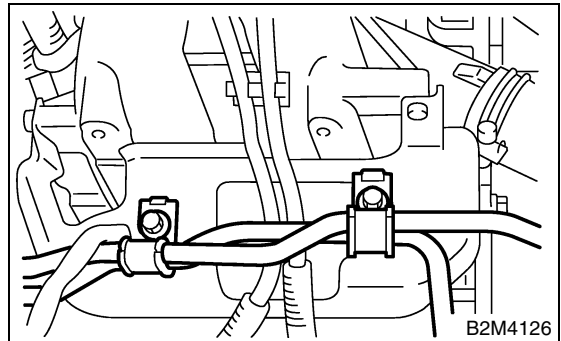


- 7) Remove the power steering pump and tank from brackets.

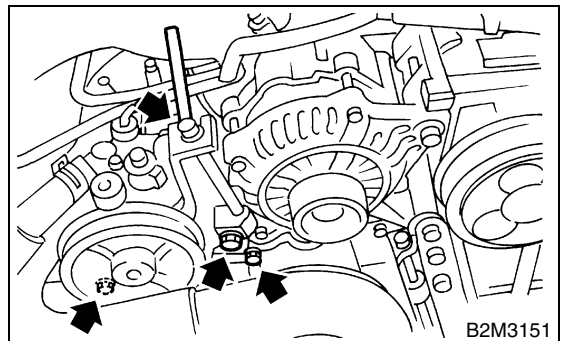
- (1) Remove the resonator chamber. <Ref. to IN-8, REMOVAL, Resonator Chamber.>
- (2) Remove the front side V-belt. <Ref. to ME-44, REMOVAL, V-belt.>
- (3) Remove the bolts which hold power steering pipes onto intake manifold protector.

NOTE:

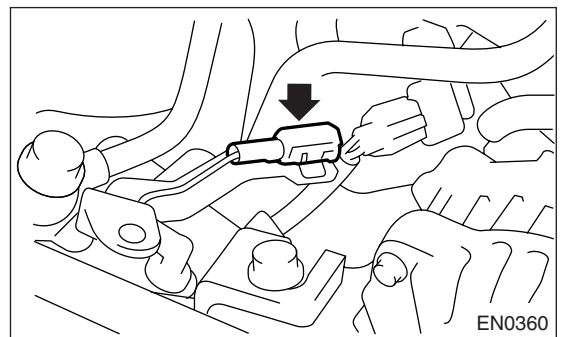
Do not disconnect the power steering hose.



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



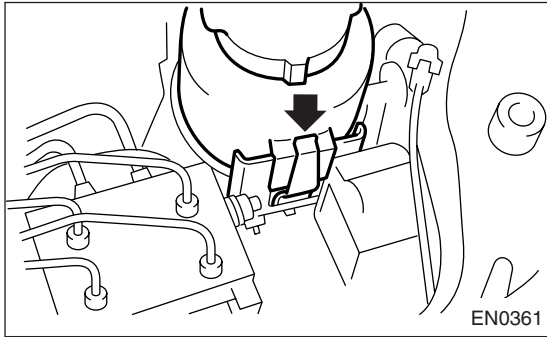
- (5) Disconnect the connector from power steering pump switch.



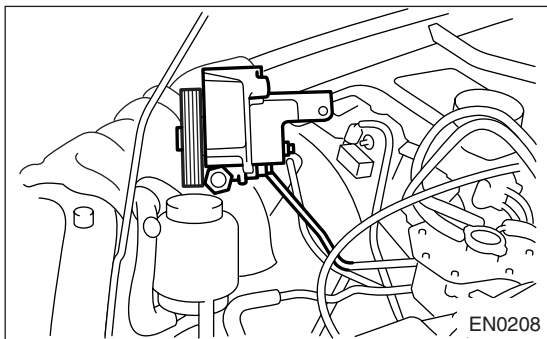
INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

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

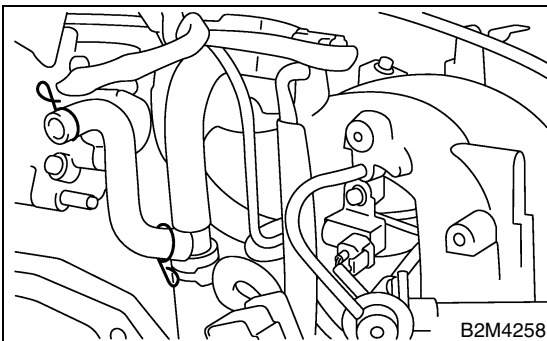


(7) Place the power steering pump and tank on right side wheel apron.

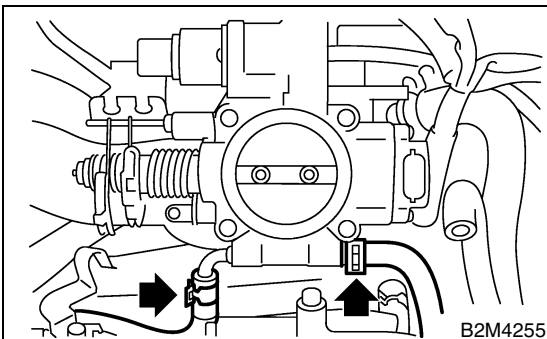


8) Disconnect the spark plug cords from spark plugs.

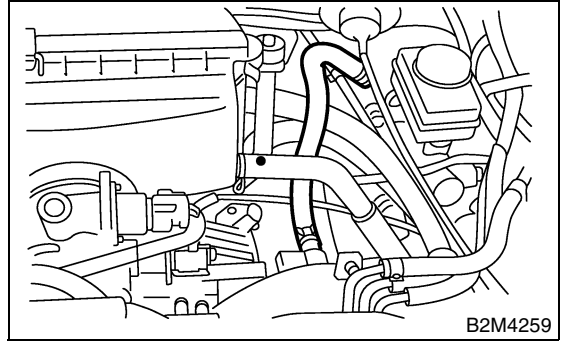
9) Disconnect the PCV hose from intake manifold.



10) Disconnect the engine coolant hose from throttle body.



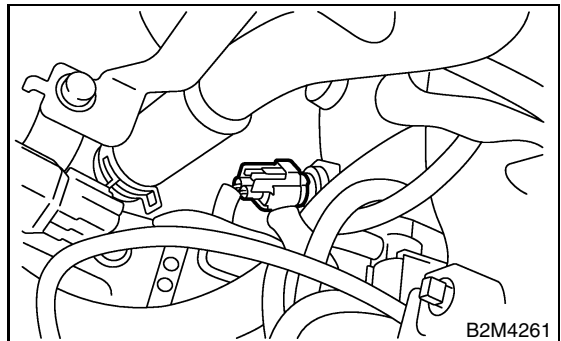
11) Disconnect the brake booster hose.



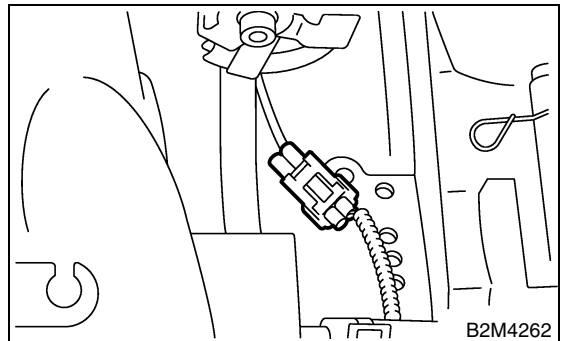
12) Remove the air cleaner case stay RH and engine harness bracket, and then disconnect the engine harness connectors from bulkhead harness connectors.



13) Disconnect the connectors from engine coolant temperature sensor.



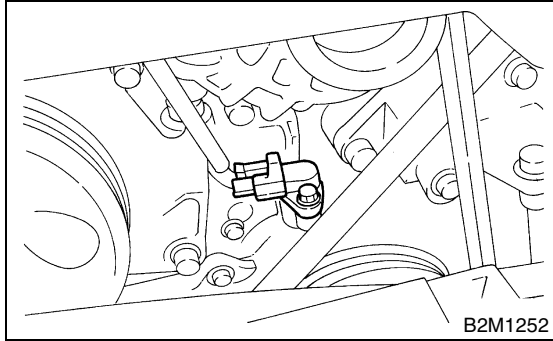
14) Disconnect the knock sensor connector.



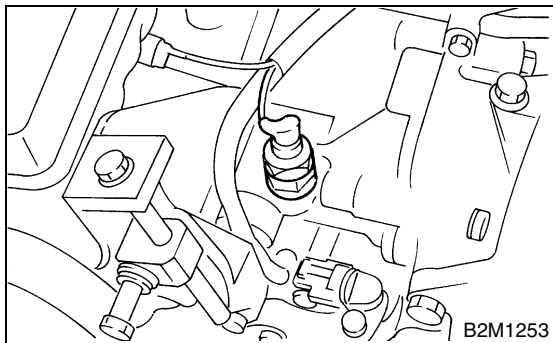
INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

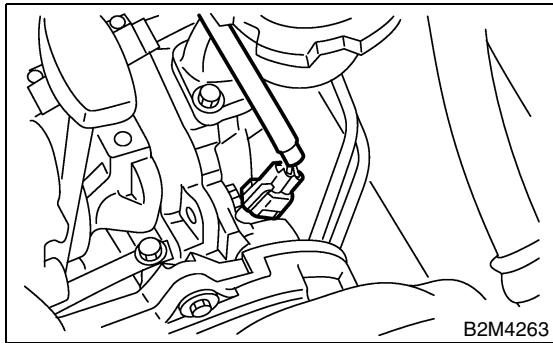
15) Disconnect the connector from crankshaft position sensor.



16) Disconnect the connector from oil pressure switch.



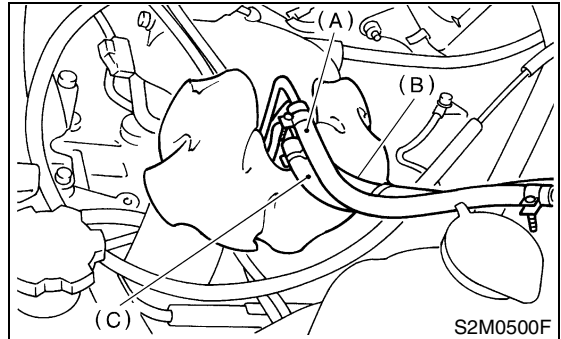
17) Disconnect the connector from camshaft position sensor.



18) Disconnect the fuel hoses from fuel pipes.

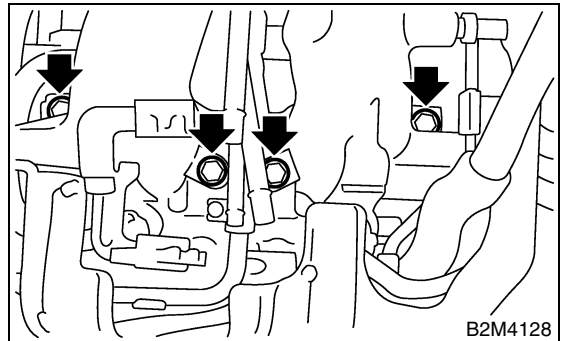
WARNING:

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

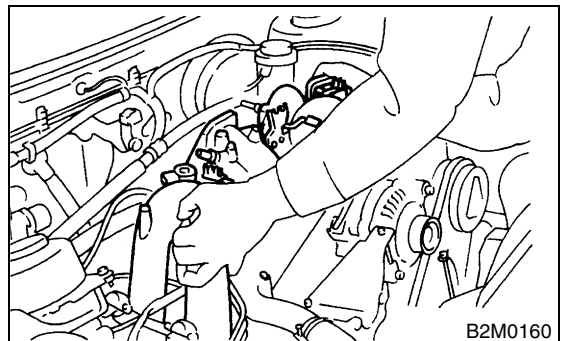


- (A) Fuel delivery hose
- (B) Return hose
- (C) Evaporation hose

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



20) Remove the intake manifold.



INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

B: INSTALLATION

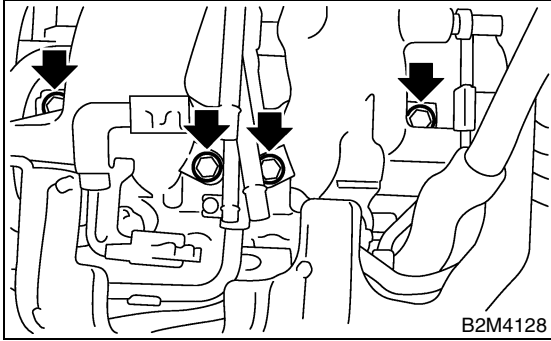
1) Install the intake manifold onto cylinder heads.

NOTE:

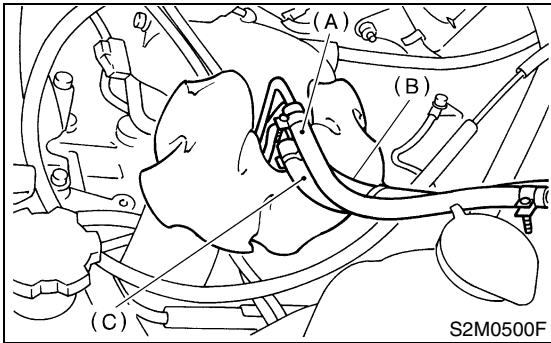
Always use new gaskets.

Tightening torque:

25 N·m (2.5 kgf-m, 18.4 ft-lb)



2) Connect the fuel hoses.

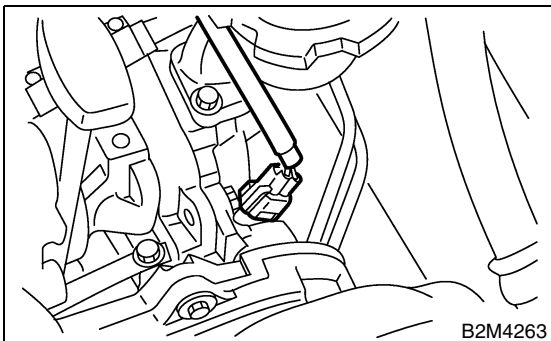


(A) Fuel delivery hose

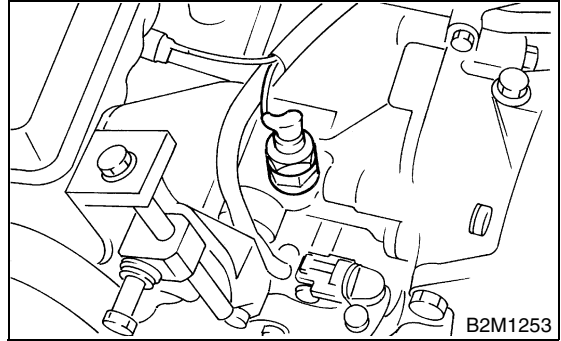
(B) Return hose

(C) Evaporation hose

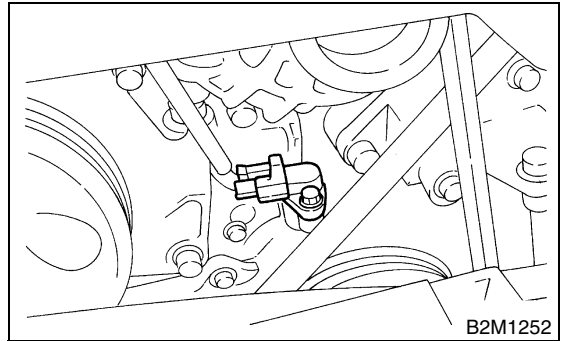
3) Connect the connector to camshaft position sensor.



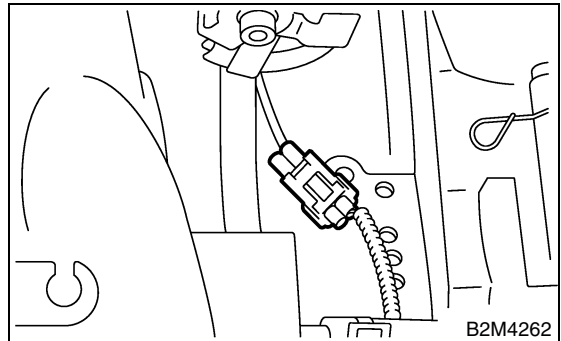
4) Connect the connector to oil pressure switch.



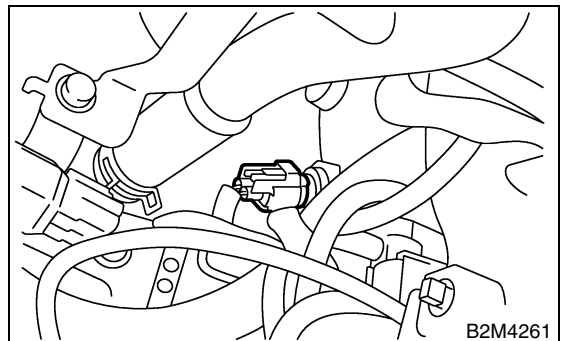
5) Connect the connector to crankshaft position sensor.



6) Connect the knock sensor connector.



7) Connect the connectors to engine coolant temperature sensor.



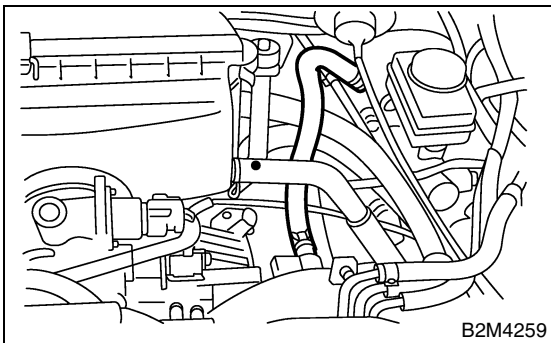
INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

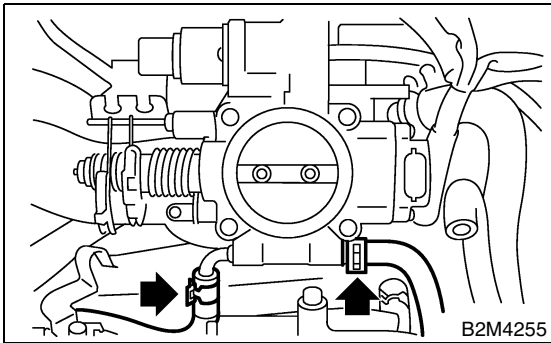
8) Install the air cleaner case stay RH and engine harness bracket, and then connect the engine harness connectors to bulkhead connectors.



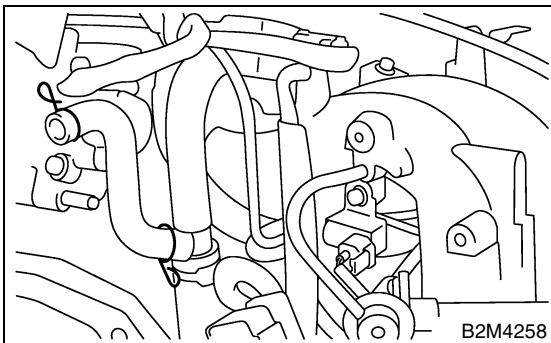
9) Connect the brake booster hose.



10) Connect the engine coolant hose to throttle body.



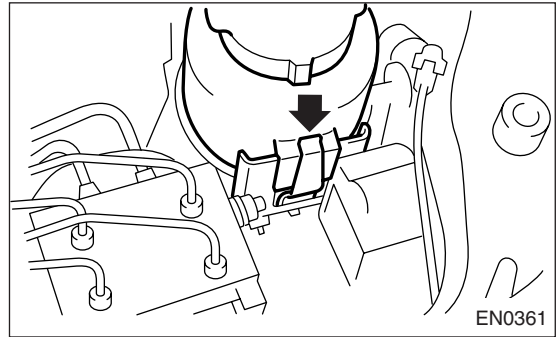
11) Connect the PCV hose to intake manifold.



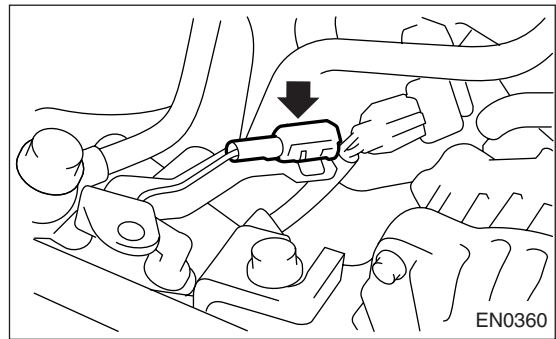
12) Connect the spark plug cords to spark plugs.

13) Install the power steering pump and tank on brackets.

(1) Install the power steering tank on bracket.

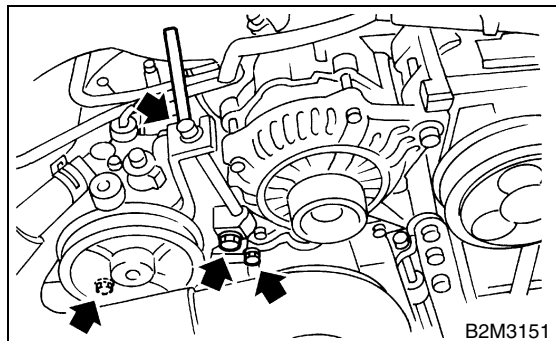


(2) Connect the connector to power steering pump switch.

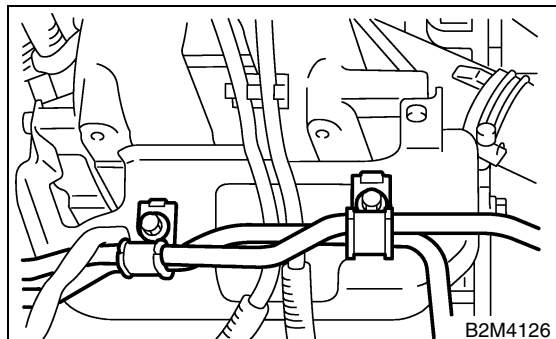


(3) Tighten the bolts which install power steering pump on bracket.

Tightening torque:
22 N·m (2.2 kgf-m, 16.2 ft-lb)



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



INTAKE MANIFOLD

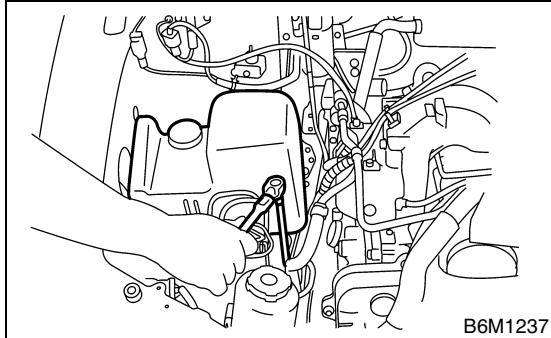
FUEL INJECTION (FUEL SYSTEMS)

(5) Install the front side V-belt. <Ref. to ME-44, INSTALLATION, V-belt.>

(6) Install the resonator chamber.

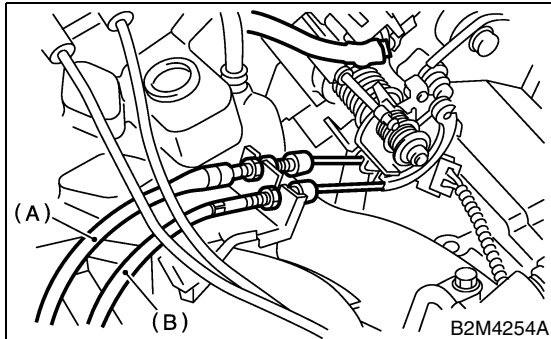
Tightening torque:

33 N·m (3.4 kgf·m, 24.3 ft·lb)



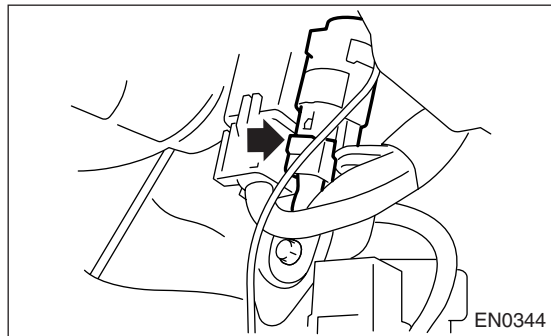
14) Connect the accelerator cable (A).

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

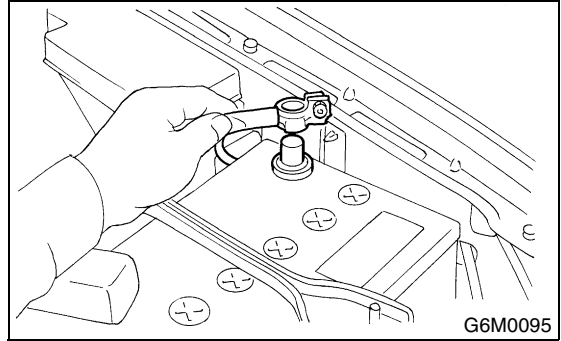


16) Install the air intake duct and air cleaner assembly. <Ref. to IN-7, INSTALLATION, Air Intake Duct.> and <Ref. to IN-6, INSTALLATION, Air Cleaner Case.>

17) Connect the connector to fuel pump relay.

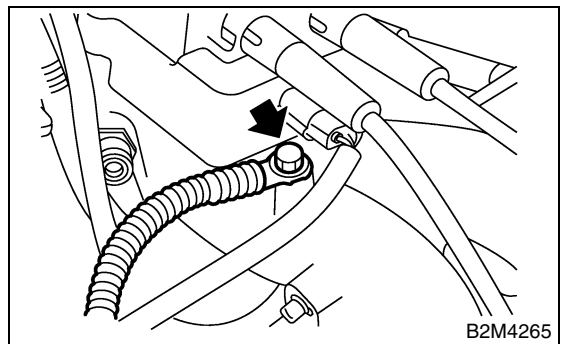


18) Connect the battery ground cable to battery.

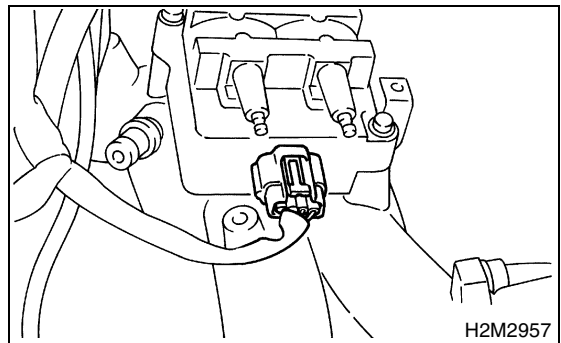


C: DISASSEMBLY

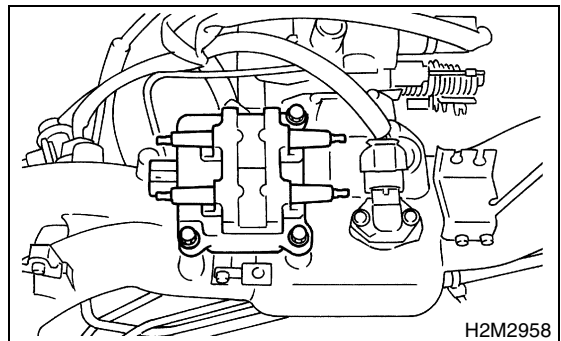
1) Disconnect the engine ground cable from intake manifold.



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



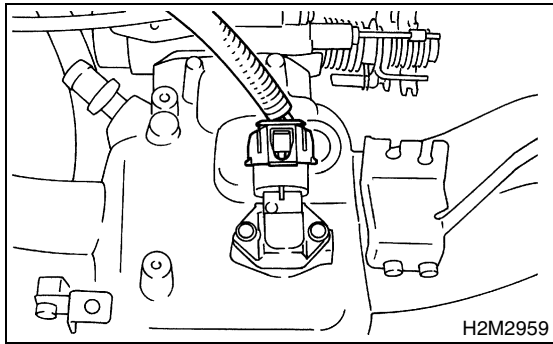
3) Remove the ignition coil and ignitor assembly.



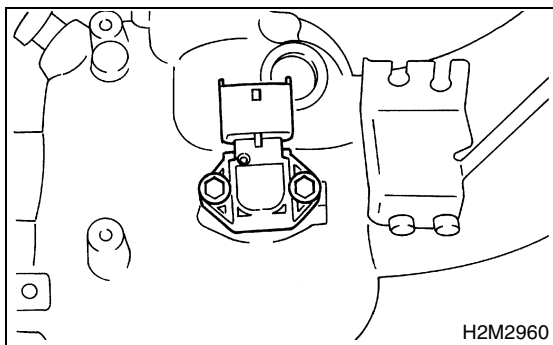
INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

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

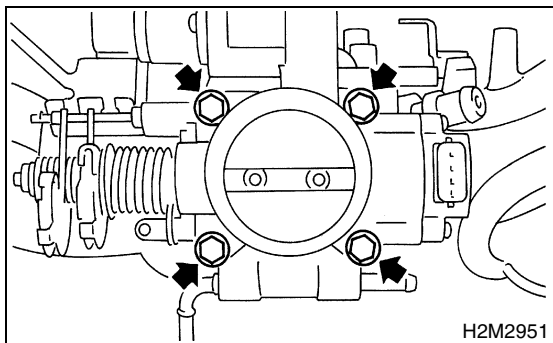


5) Remove the intake air temperature and pressure sensor from intake manifold.

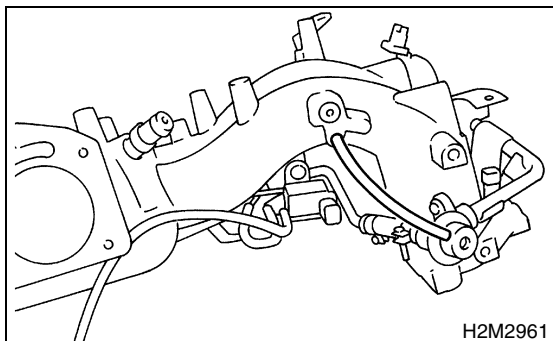


6) Disconnect the connectors from throttle position sensor and idle air control solenoid valve.

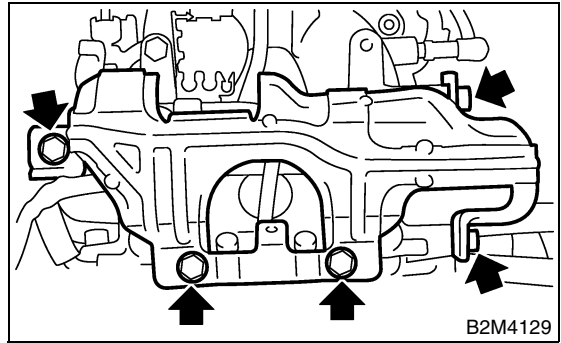
7) Remove the throttle body.



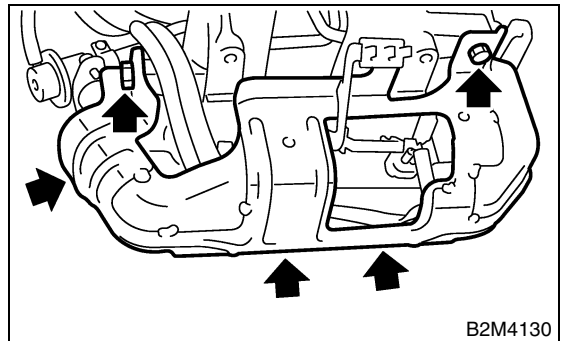
8) Disconnect the pressure regulator vacuum hose from intake manifold.



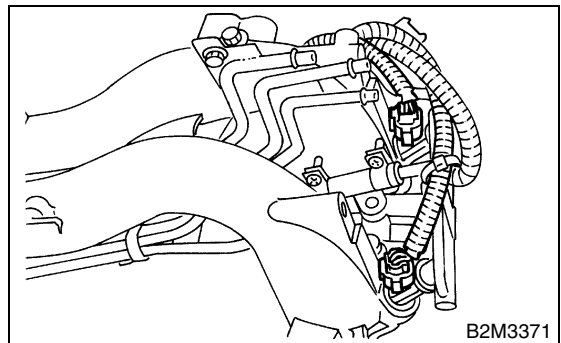
9) Remove the fuel pipe protector LH.



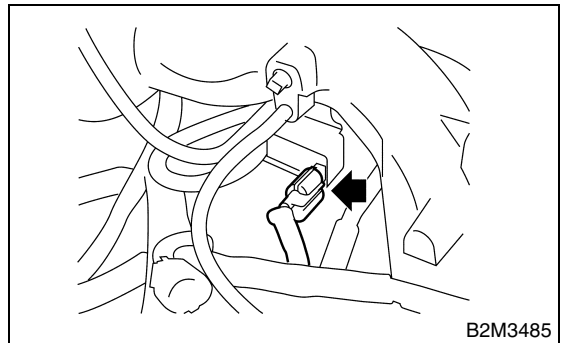
10) Remove the fuel pipe protector RH.



11) Disconnect the connectors from fuel injectors.



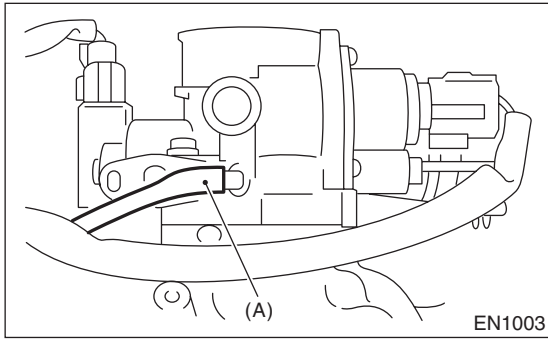
12) Disconnect the connector from purge control solenoid valve.



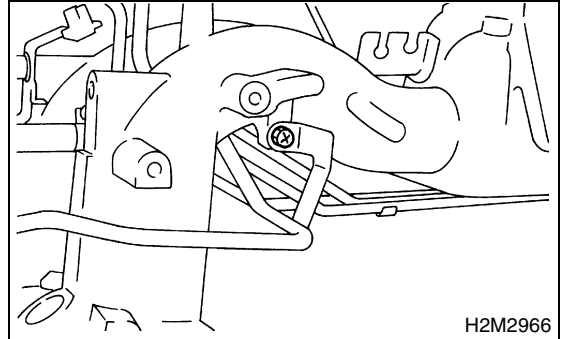
INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

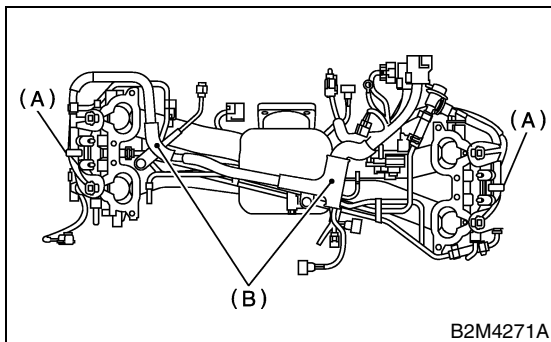
13) Disconnect the air by-pass hose (A) from purge control solenoid valve.



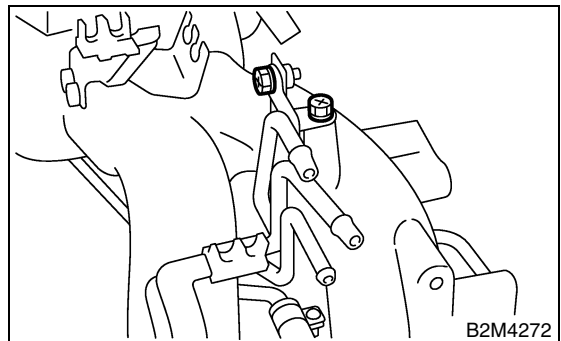
18) Remove the bolt which installs injector pipe on intake manifold.



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

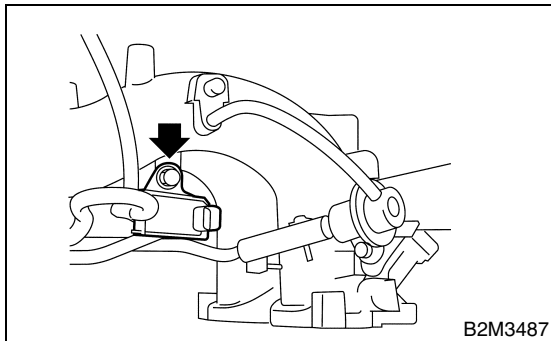


19) Remove the two bolts which hold fuel pipes on the left side of intake manifold.



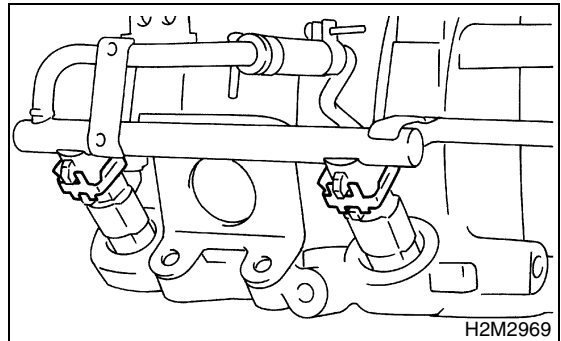
15) Remove the engine harness from intake manifold.

16) Remove the purge control solenoid valve.

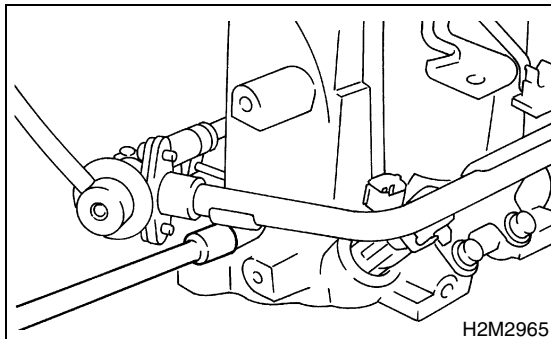


20) Remove the fuel injectors.

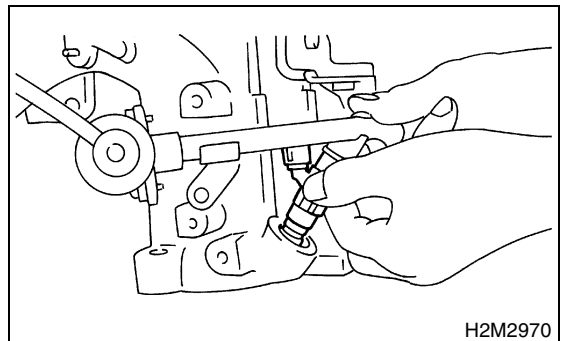
(1) Remove the fuel injector securing clip.



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



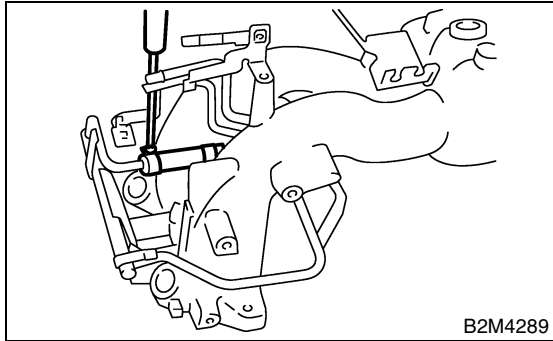
(2) Remove the fuel injector while lifting up the fuel injector pipe.



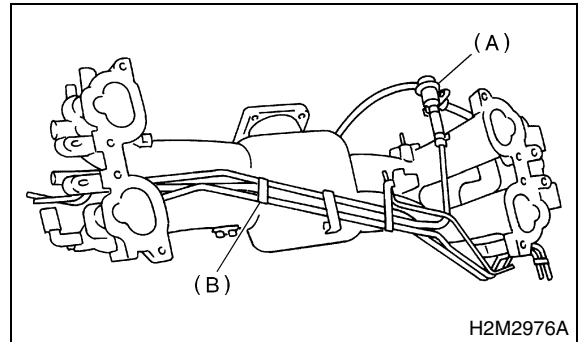
INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

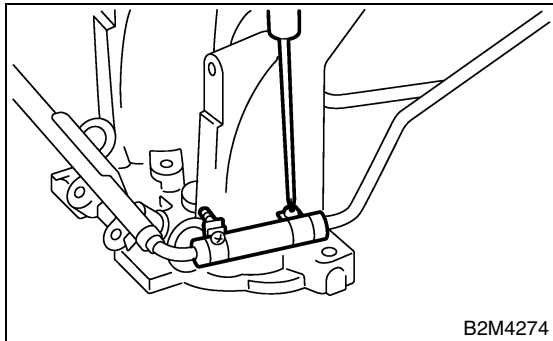
21) Loosen the clamp which holds front left side fuel hose to injector pipe, and then remove the pipe from fuel hose.



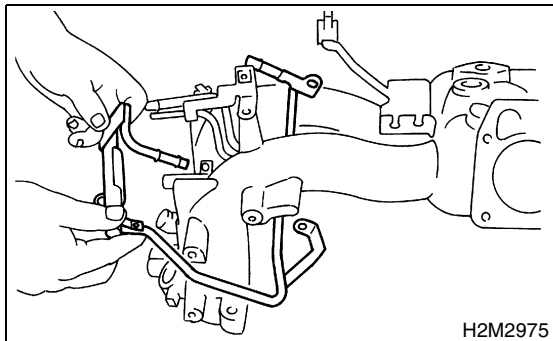
25) Remove the fuel pipe assembly (B) and pressure regulator (A) from intake manifold.



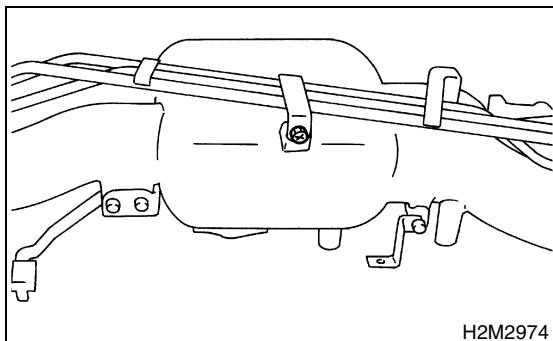
22) Loosen the clamp which holds front right side fuel hose to injector pipe, and remove the pipe from fuel hose.



23) Remove the fuel injector pipe.



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

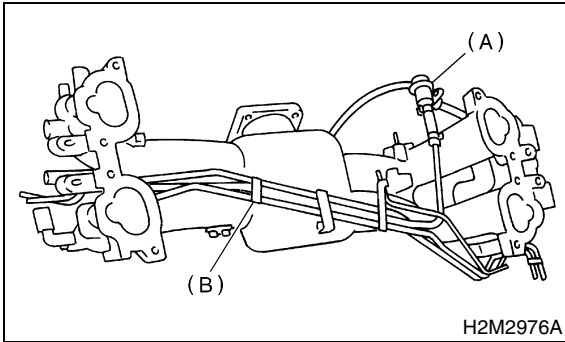


INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

D: ASSEMBLY

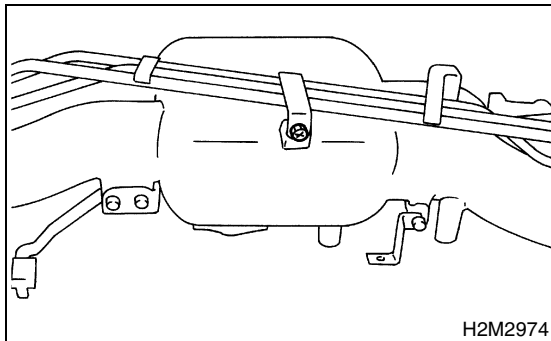
1) Install the fuel pipe assembly (B) and pressure regulator (A), etc. to intake manifold.



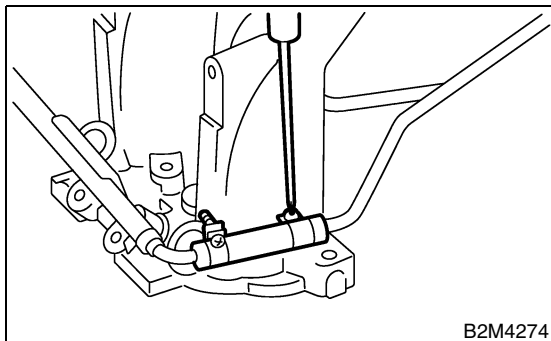
2) Tighten the bolt which installs fuel pipes on intake manifold.

Tightening torque:

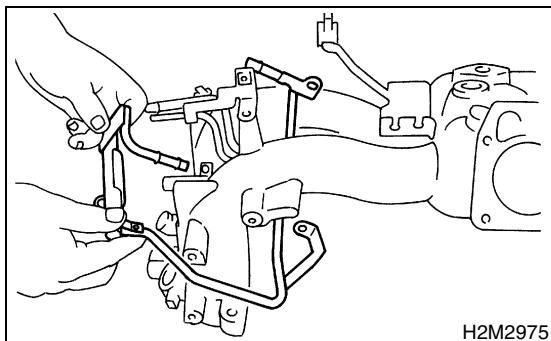
5.0 N·m (0.51 kgf·m, 3.7 ft·lb)



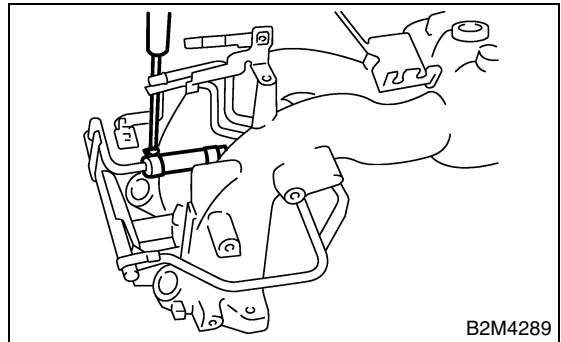
3) Connect the right side fuel hose to injector pipe, and tighten the clamp screw.



4) Install the fuel injector pipe.



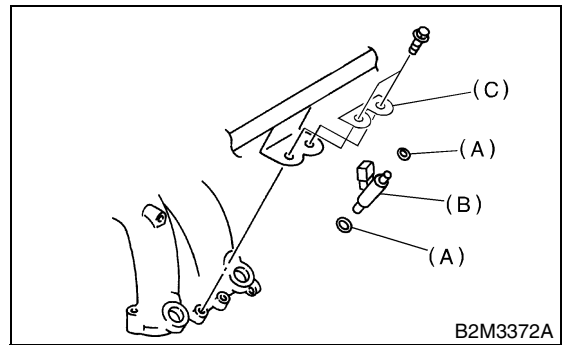
5) Connect the left side fuel hose to injector pipe, and then tighten the clamp screw.



6) Install the fuel injectors.

NOTE:

Always use new O-rings.



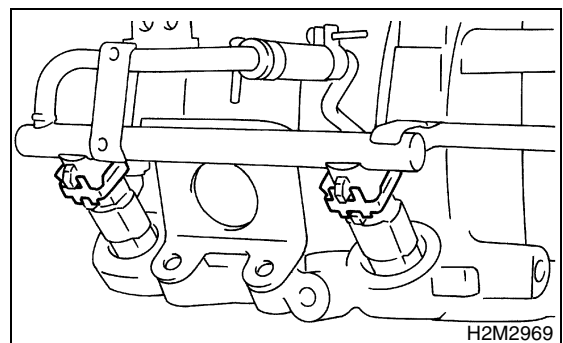
(A) O-ring

(B) Fuel injector

(C) Intake manifold protector

NOTE:

Do not forget to install the fuel injector securing clip.



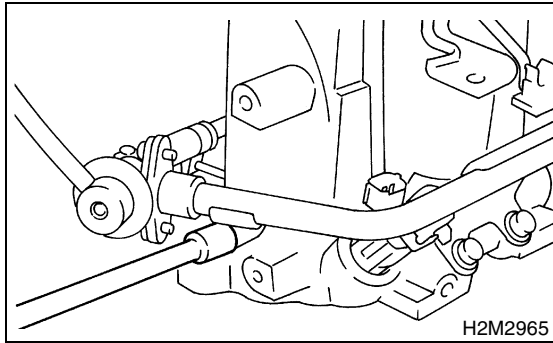
INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

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

Tightening torque:

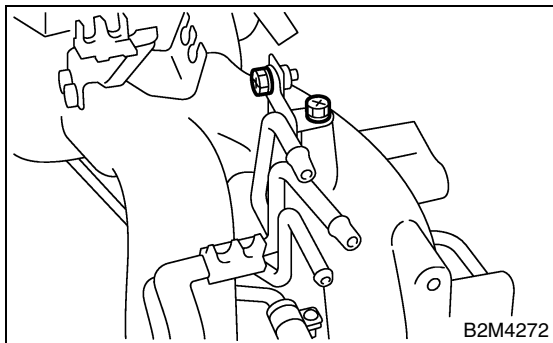
5.0 N·m (0.51 kgf-m, 3.7 ft-lb)



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

Tightening torque:

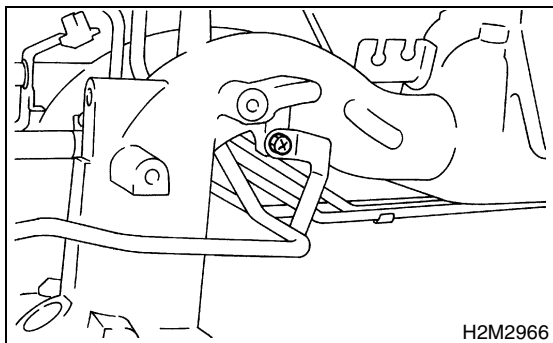
5.0 N·m (0.51 kgf-m, 3.7 ft-lb)



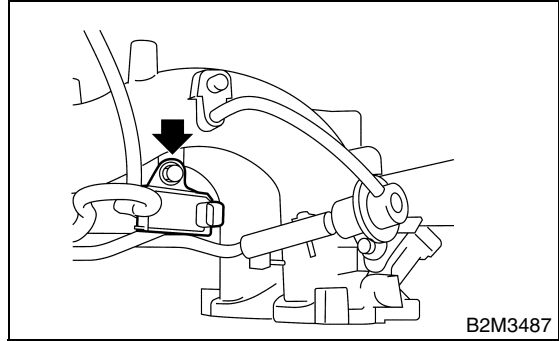
9) Tighten the bolt which installs injector pipe on intake manifold.

Tightening torque:

5.0 N·m (0.51 kgf-m, 3.7 ft-lb)



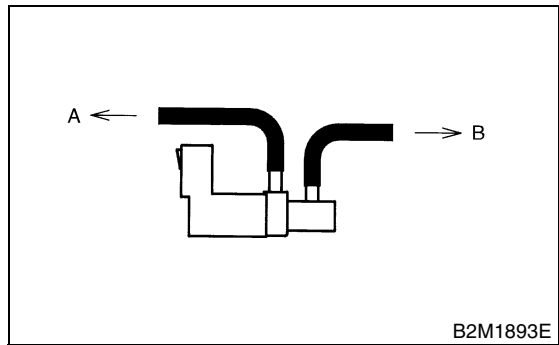
10) Install the purge control solenoid valve.



11) Connect the hoses to purge control solenoid valve.

CAUTION:

Carefully connect the evaporation hoses.



A: To fuel pipe

B: To throttle body

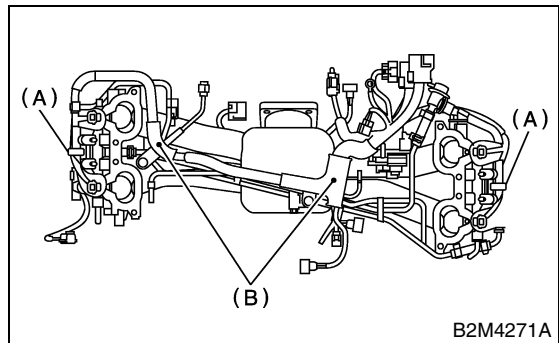
12) Install the engine harness onto intake manifold.

Tightening torque:

16 N·m (1.6 kgf-m, 11.8 ft-lb)

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

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



NOTE:

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

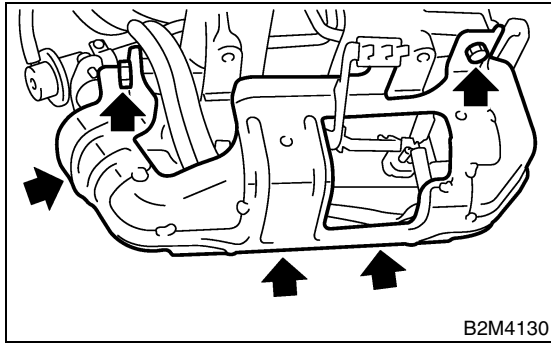
INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

15) Install the fuel pipe protector RH.

Tightening torque:

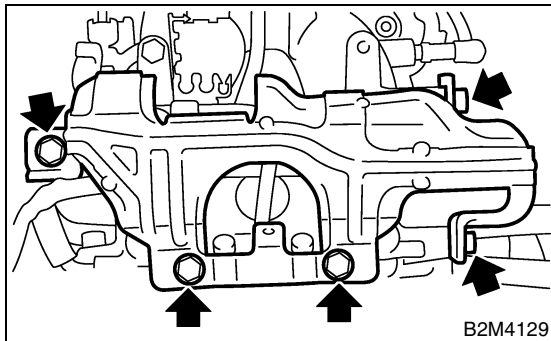
19 N-m (1.9 kgf-m, 14.0 ft-lb)



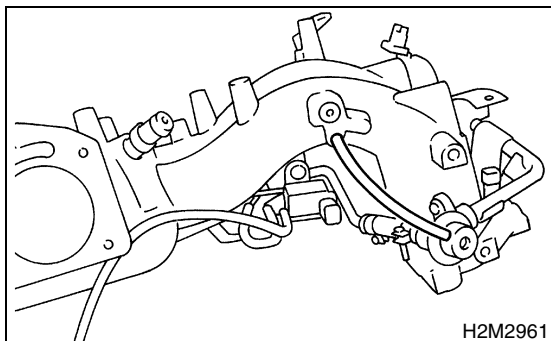
16) Install the fuel pipe protector LH.

Tightening torque:

19 N-m (1.9 kgf-m, 14.0 ft-lb)



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



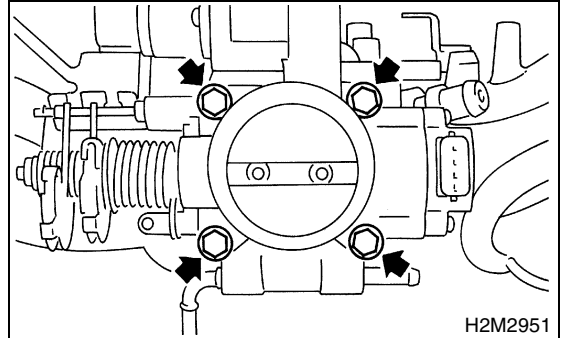
18) Install the throttle body to intake manifold.

NOTE:

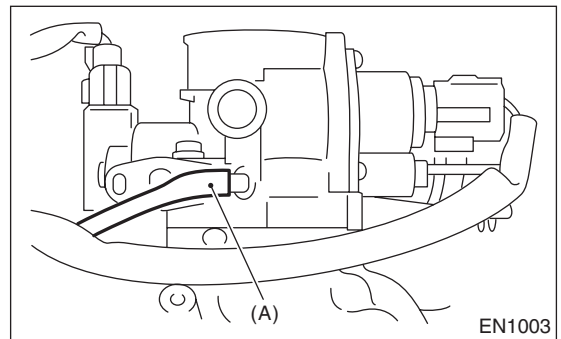
Replace the gasket with a new one.

Tightening torque:

22 N-m (2.2 kgf-m, 16.2 ft-lb)



19) Connect the air by-pass hose (A) from purge control solenoid valve to intake manifold.



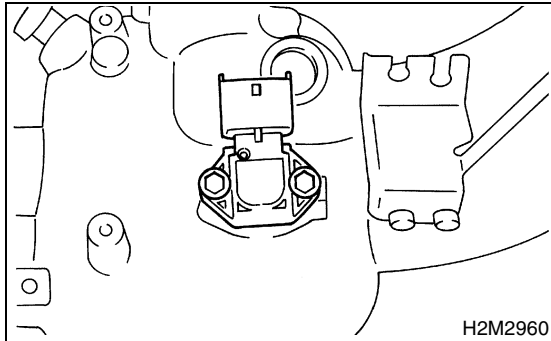
INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

20) Install the intake air temperature and pressure sensor.

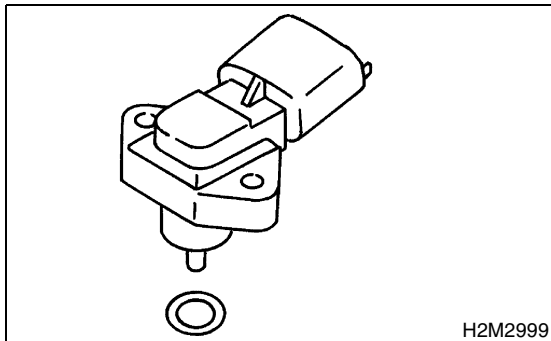
Tightening torque:

3.4 N·m (0.35 kgf·m, 2.5 ft·lb)



NOTE:

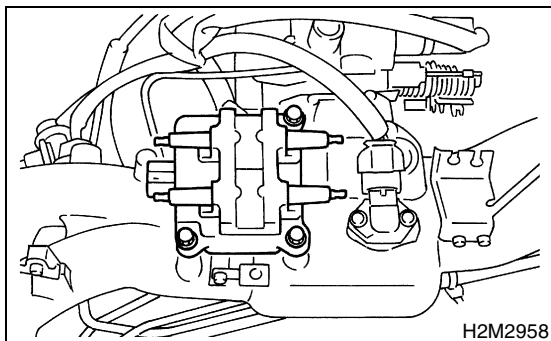
Replace the O-ring with a new one.



21) Connect the connector to intake air temperature and pressure sensor.

22) Connect the connectors to throttle position sensor and idle air control solenoid valve.

23) Install the ignition coil and ignitor assembly.

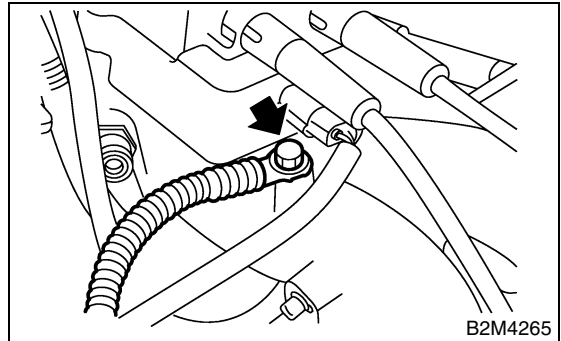


24) Connect the connector to ignition coil and ignitor assembly.

25) Install the engine ground cable to intake manifold.

Tightening torque:

19 N·m (1.9 kgf·m, 14.0 ft·lb)



E: INSPECTION

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

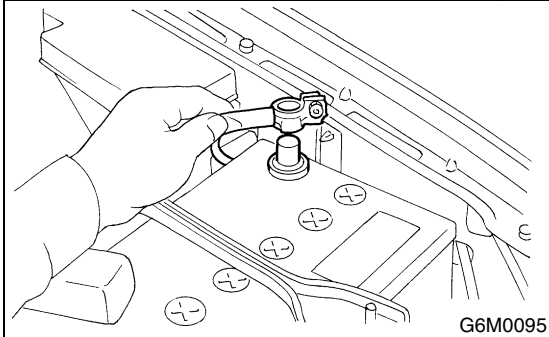
ENGINE COOLANT TEMPERATURE SENSOR

FUEL INJECTION (FUEL SYSTEMS)

4. Engine Coolant Temperature Sensor

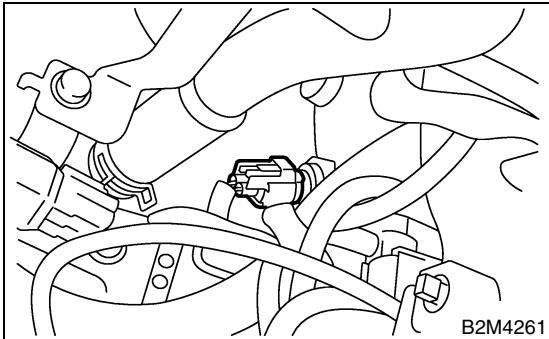
A: REMOVAL

1) Disconnect the ground cable from battery.



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

3) Disconnect the connector from engine coolant temperature sensor.



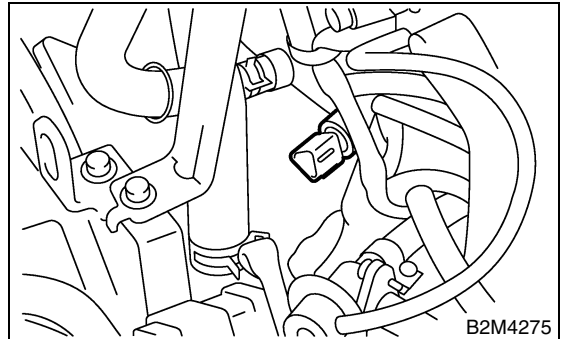
4) Remove the engine coolant temperature sensor.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

16 N·m (1.6 kgf-m, 11.8 ft-lb)



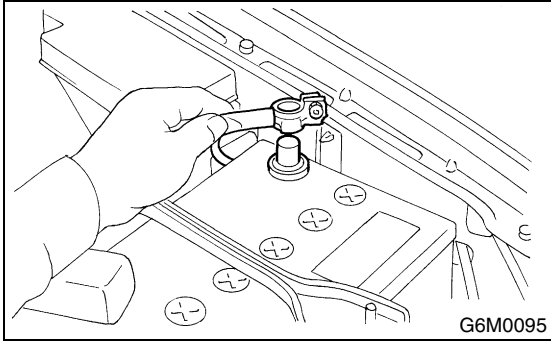
CRANKSHAFT POSITION SENSOR

FUEL INJECTION (FUEL SYSTEMS)

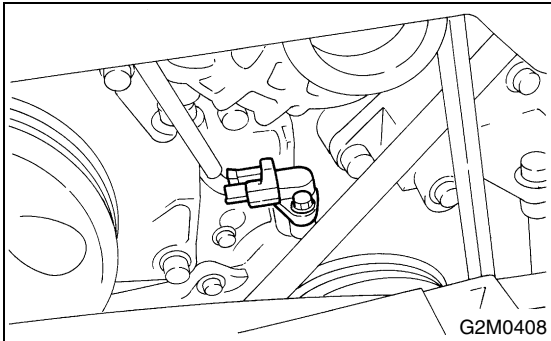
5. Crankshaft Position Sensor

A: REMOVAL

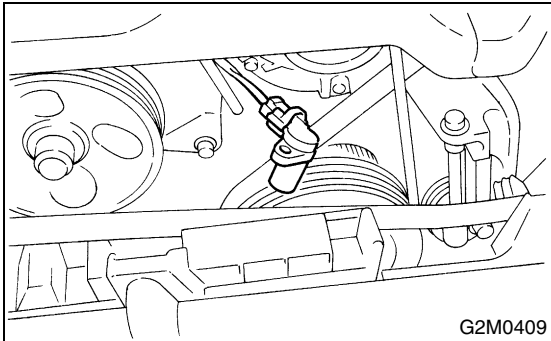
1) Disconnect the ground cable from battery.



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



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

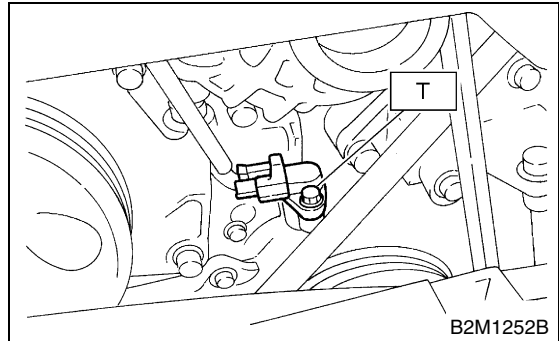


B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

T: 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



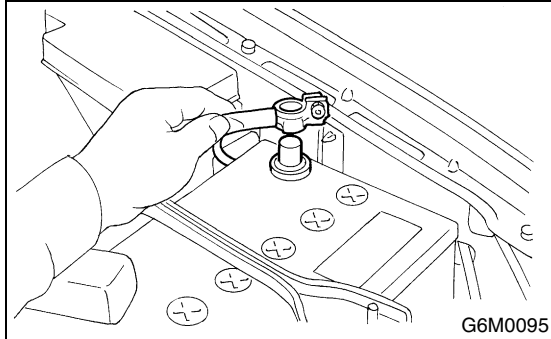
CAMSHAFT POSITION SENSOR

FUEL INJECTION (FUEL SYSTEMS)

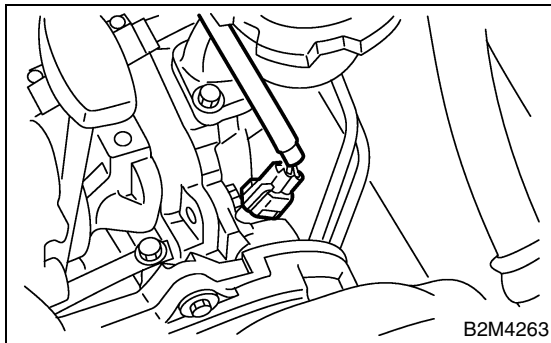
6. Camshaft Position Sensor

A: REMOVAL

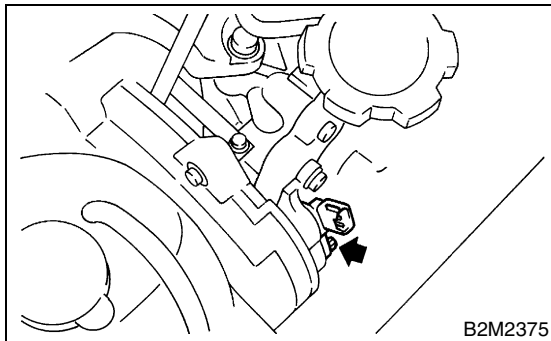
1) Disconnect the ground cable from battery.



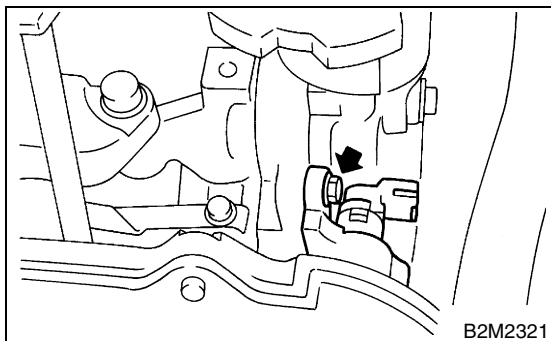
2) Disconnect the connector from camshaft position sensor.



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

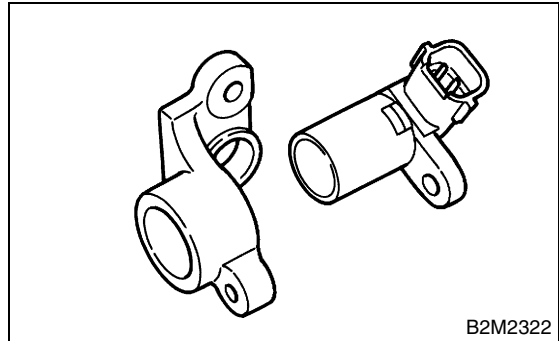


4) Remove the bolt which installs camshaft position sensor support to camshaft cap LH.



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

6) Remove the camshaft position sensor itself.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

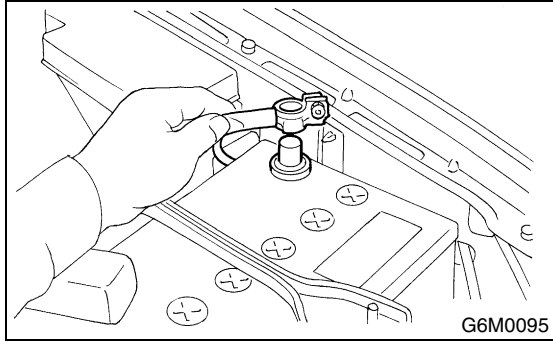
Camshaft position sensor support;
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

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

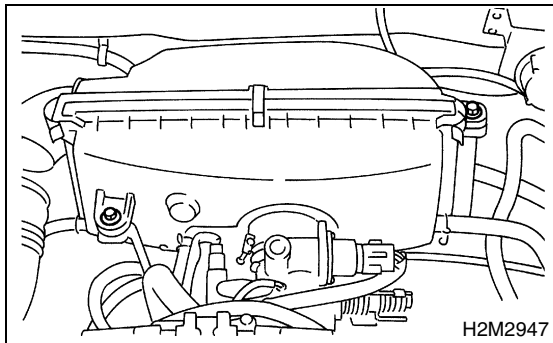
7. Knock Sensor

A: REMOVAL

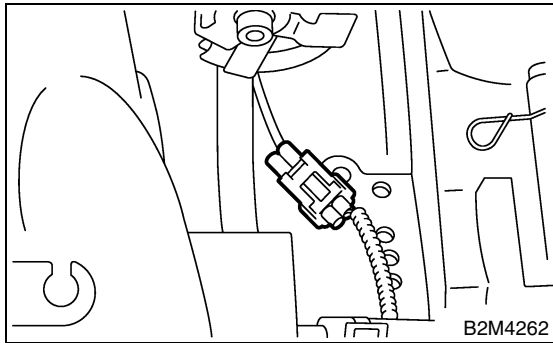
- 1) Disconnect the ground cable from battery.



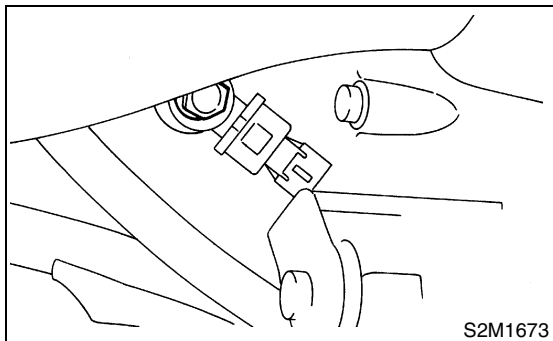
- 2) Remove the air cleaner case.



- 3) Disconnect the knock sensor connector.



- 4) Remove the knock sensor from cylinder block.



B: INSTALLATION

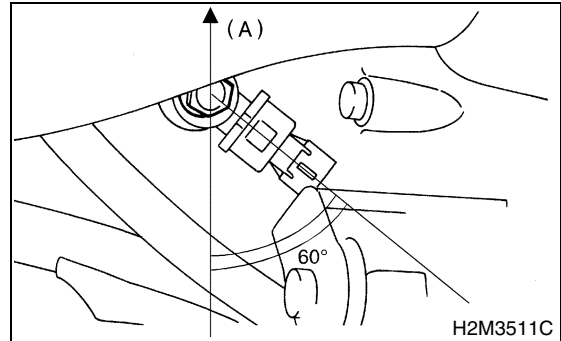
- 1) Install the knock sensor to cylinder block.

Tightening torque:

24 N·m (2.4 kgf-m, 17.4 ft-lb)

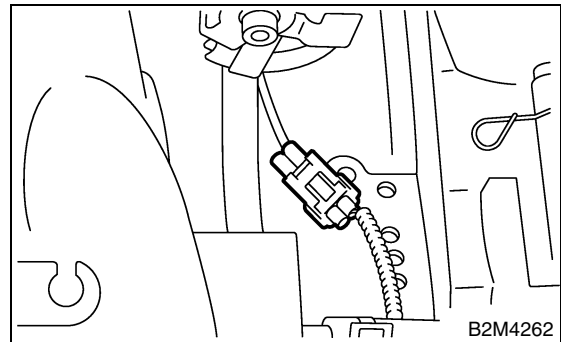
NOTE:

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

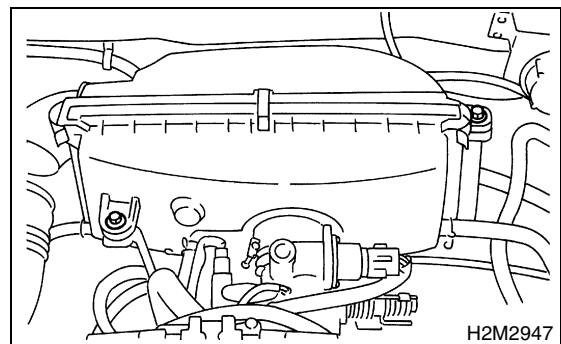


(A) Front side

- 2) Connect the knock sensor connector.



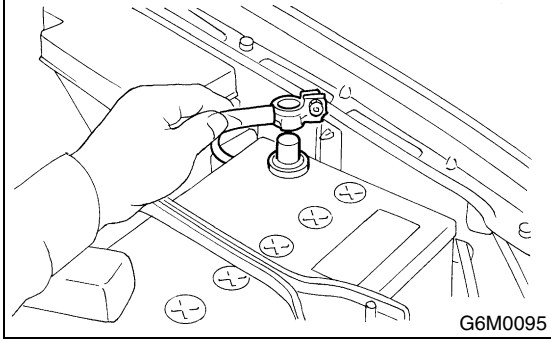
- 3) Install the air cleaner case.



KNOCK SENSOR

FUEL INJECTION (FUEL SYSTEMS)

4) Connect the battery ground cable to battery.



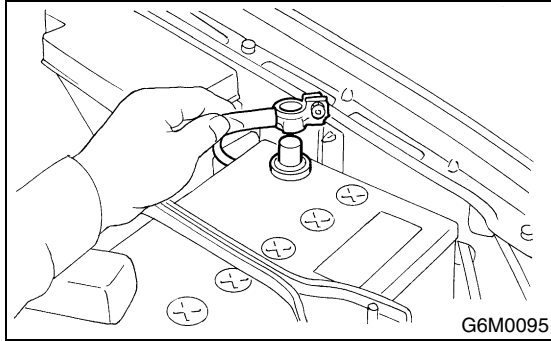
THROTTLE POSITION SENSOR

FUEL INJECTION (FUEL SYSTEMS)

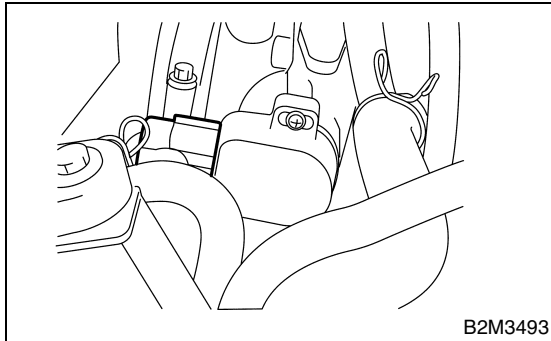
8. Throttle Position Sensor

A: REMOVAL

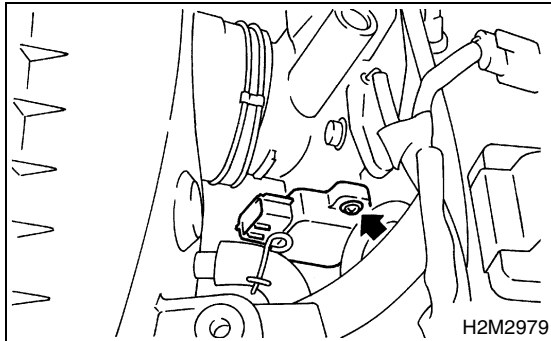
1) Disconnect the ground cable from battery.



2) Disconnect the connector from throttle position sensor.



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



B: INSTALLATION

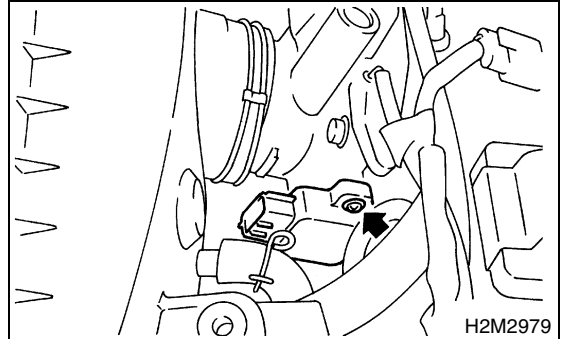
Install in the reverse order of removal.

Tightening torque:

1.6 N·m (0.16 kgf·m, 1.2 ft·lb)

CAUTION:

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

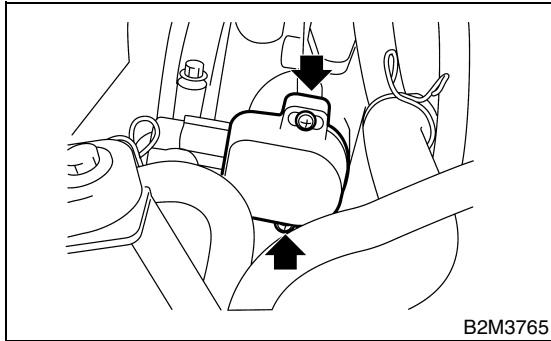


THROTTLE POSITION SENSOR

FUEL INJECTION (FUEL SYSTEMS)

C: ADJUSTMENT

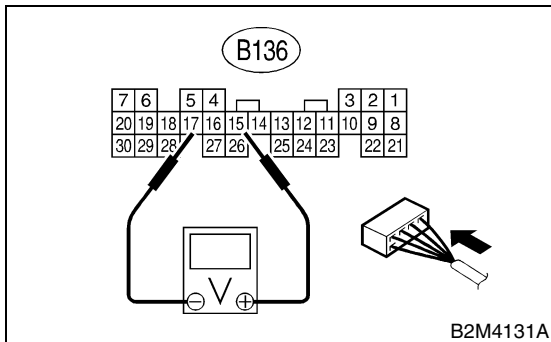
- 1) Turn the ignition switch to OFF.
- 2) Loosen the throttle position sensor holding screws.



B2M3765

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

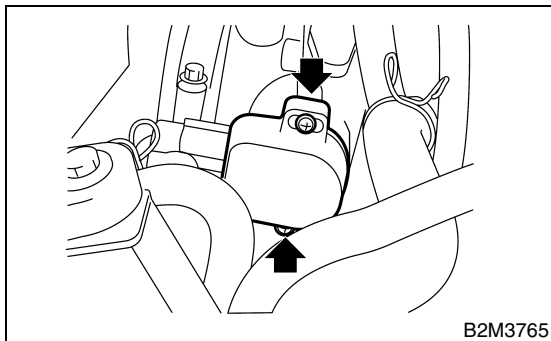
Connector & terminal/Specified voltage
(B136) No. 15 — (B136) No. 17/0.45 — 0.55 V
[Fully closed.]



B2M4131A

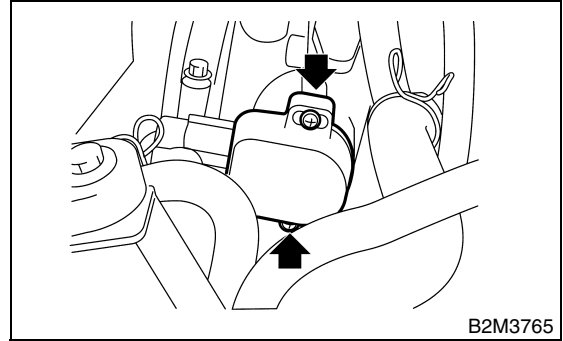
- (4) Tighten the throttle position sensor holding screws.

Tightening torque:
1.6 N·m (0.16 kgf-m, 1.2 ft-lb)



B2M3765

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

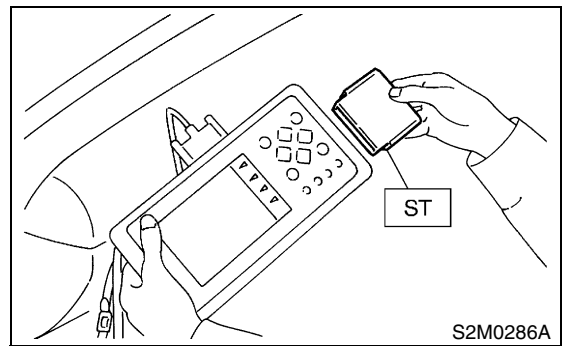


B2M3765

NOTE:

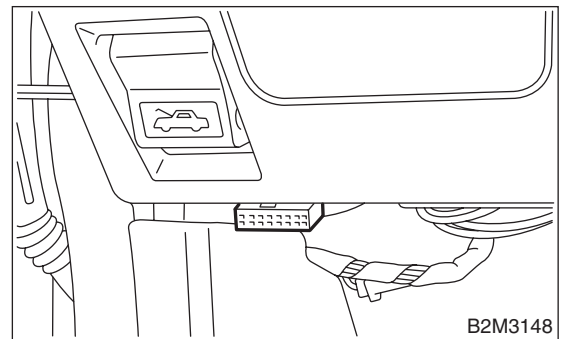
For detailed operation procedures, refer to the Subaru Select Monitor Operation Manual.

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



S2M0286A

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



B2M3148

- 5) Turn the ignition switch to ON, and Subaru Select Monitor switch to ON.
- 6) Select the {2. Each System Check} in Main Menu.
- 7) Select the {Engine Control System} in Selection Menu.
- 8) Select the {1. Current Data Display & Save} in Engine Control System Diagnosis.
- 9) Select the {1.12 Data Display} in Data Display Menu.

THROTTLE POSITION SENSOR

FUEL INJECTION (FUEL SYSTEMS)

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

Condition: Throttle fully closed

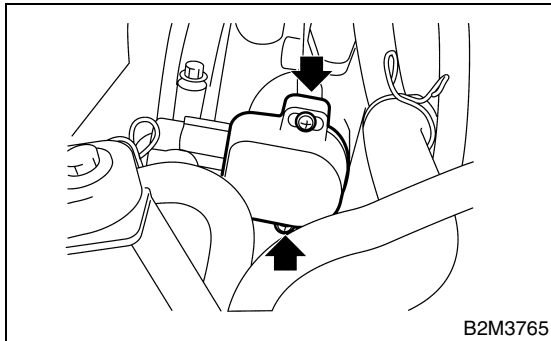
Throttle opening angle 0.00 %

Throttle sensor voltage 0.50 V

11) Tighten the throttle position sensor holding screws.

Tightening torque:

1.6 N·m (0.16 kgf-m, 1.2 ft-lb)



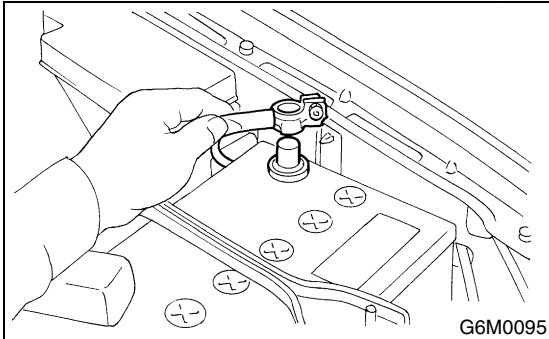
INTAKE AIR TEMPERATURE AND PRESSURE SENSOR

FUEL INJECTION (FUEL SYSTEMS)

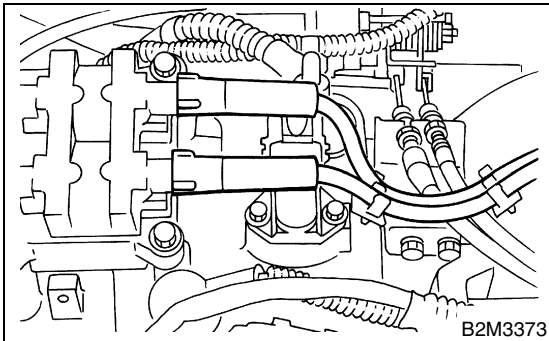
9. Intake Air Temperature and Pressure Sensor

A: REMOVAL

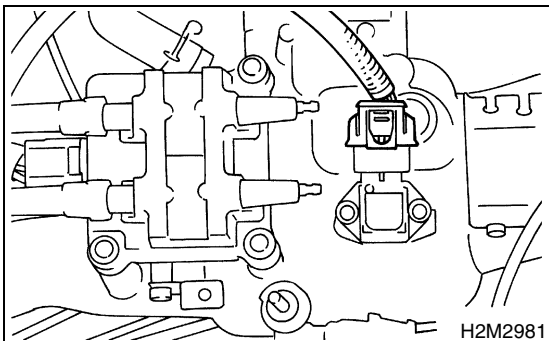
1) Disconnect the ground cable from battery.



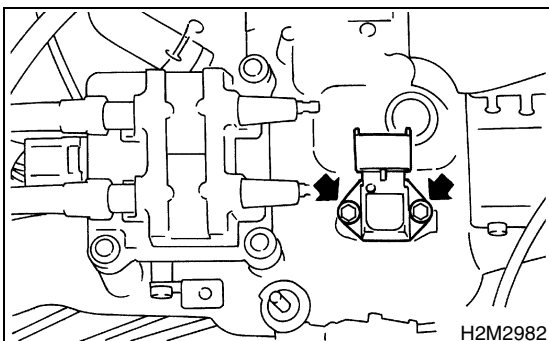
2) Disconnect the spark plug cord from ignition coil and ignitor assembly.



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



4) Remove the intake air temperature and pressure sensor.

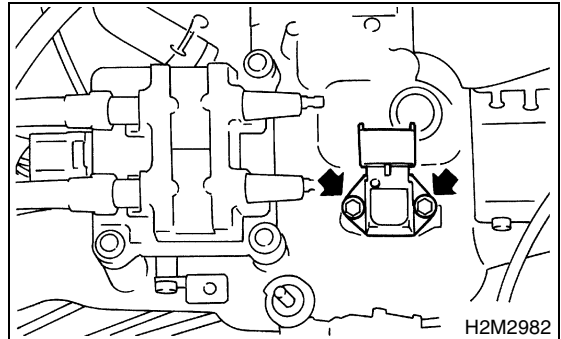


B: INSTALLATION

Install in the reverse order of removal.

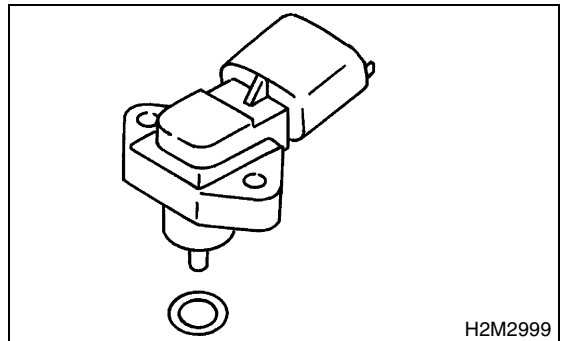
Tightening torque:

3.4 N·m (0.35 kgf·m, 2.5 ft·lb)



NOTE:

Replace the O-ring with a new one.



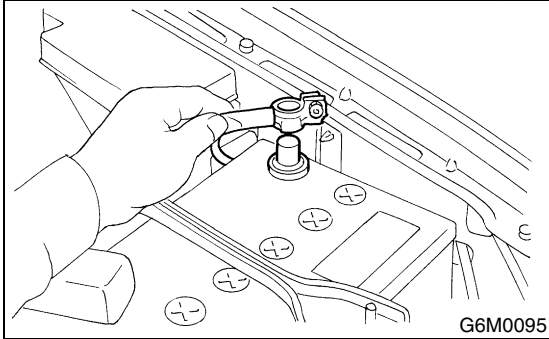
IDLE AIR CONTROL SOLENOID VALVE

FUEL INJECTION (FUEL SYSTEMS)

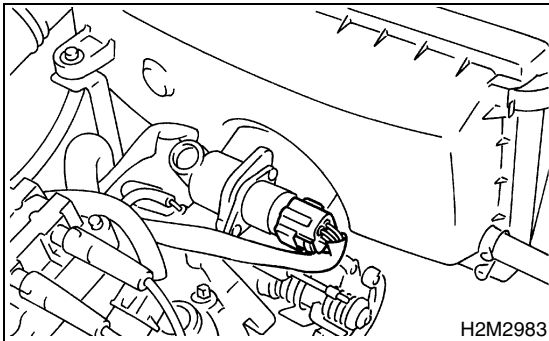
10. Idle Air Control Solenoid Valve

A: REMOVAL

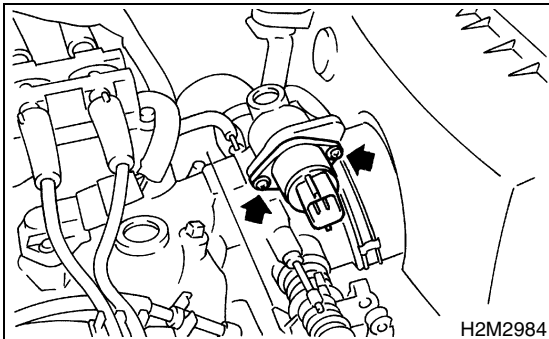
1) Disconnect the ground cable from battery.



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



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



B: INSTALLATION

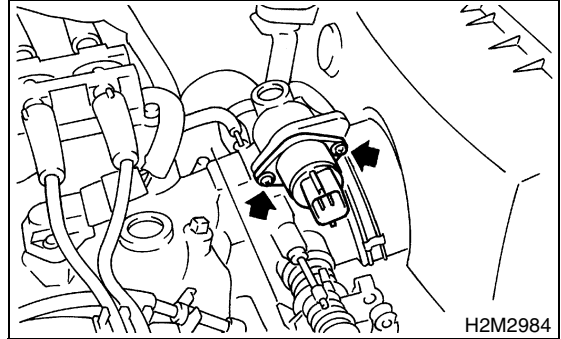
Install in the reverse order of removal.

NOTE:

Always use a new gasket.

Tightening torque:

1.6 N·m (0.16 kgf-m, 1.2 ft-lb)



FUEL INJECTOR

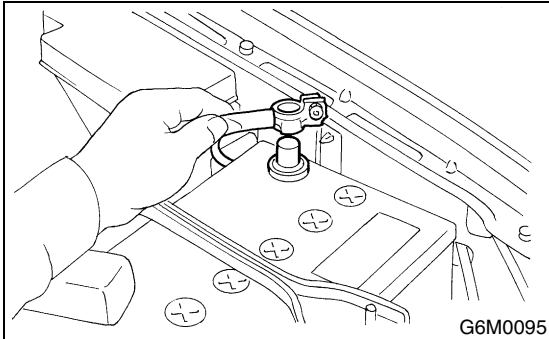
FUEL INJECTION (FUEL SYSTEMS)

11. Fuel Injector

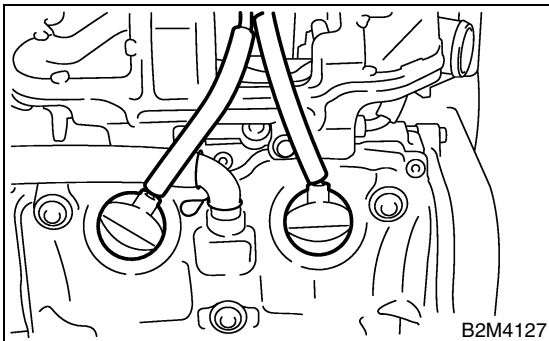
A: REMOVAL

1. RH SIDE

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

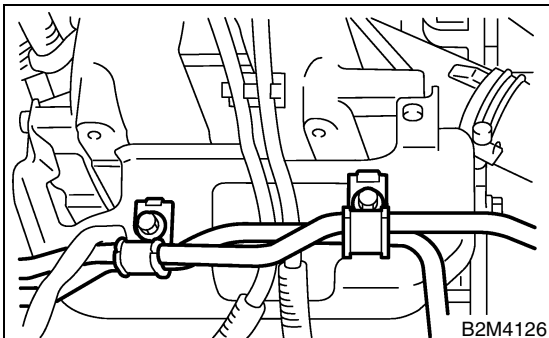


- 4) Remove the resonator chamber. <Ref. to IN-8, REMOVAL, Resonator Chamber.>
- 5) Remove the spark plug cords from spark plugs (#1 and #3 cylinders).

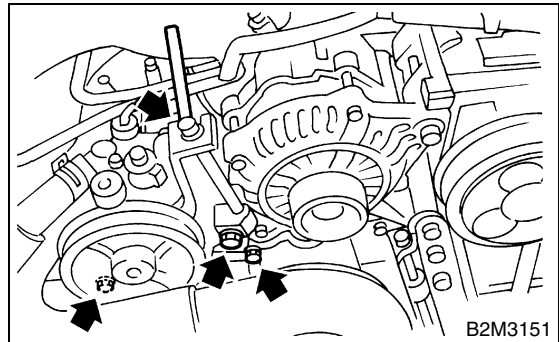


- 6) Remove the power steering pump and tank from brackets.

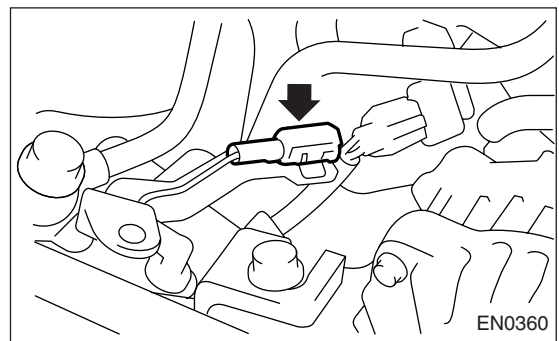
- (1) Remove the front side V-belt. <Ref. to ME-44, REMOVAL, V-belt.>
- (2) Remove the bolts which hold power steering pipes onto intake manifold protector.



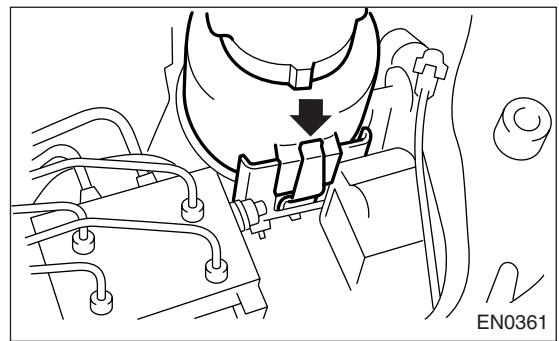
- (3) Remove the bolts which install power steering pump to bracket.



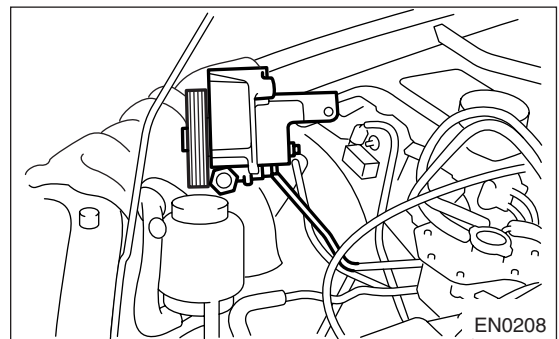
- (4) Disconnect the connector from power steering pump switch.



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



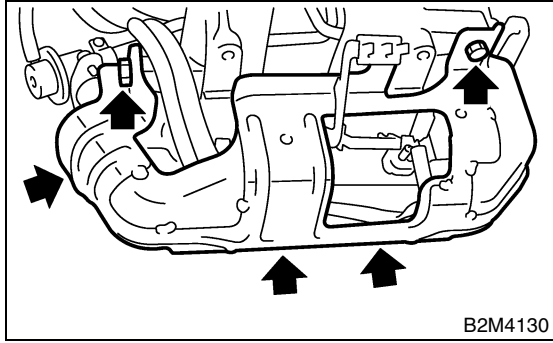
- (6) Place the power steering pump and tank on the right side wheel apron.



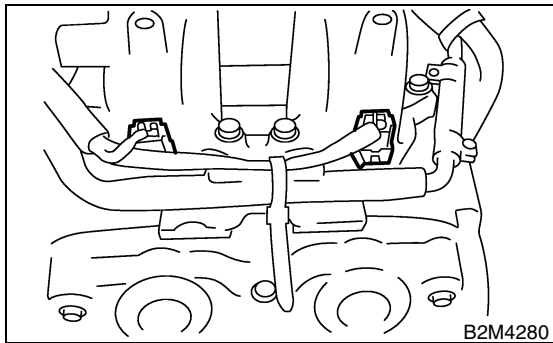
FUEL INJECTOR

FUEL INJECTION (FUEL SYSTEMS)

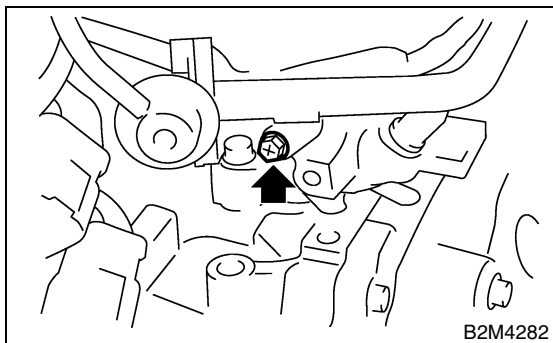
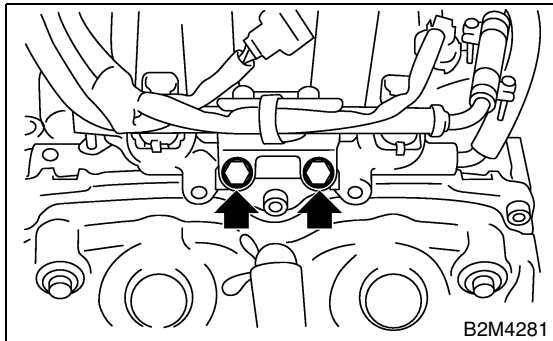
7) Remove the fuel pipe protector RH.



8) Disconnect the connector from fuel injector.

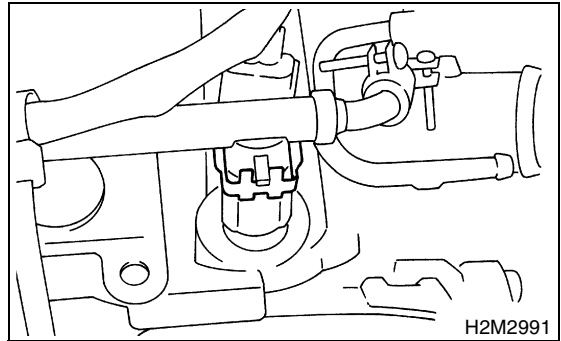


9) Remove the bolts which hold injector pipe to intake manifold.

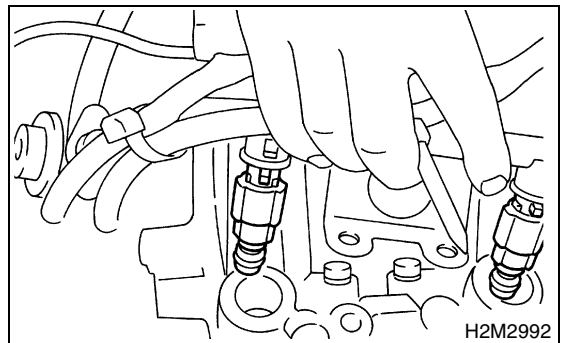


10) Remove the fuel injector from intake manifold.

(1) Remove the fuel injector securing clip.



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

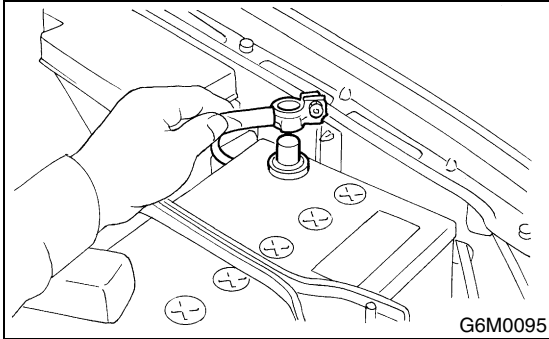


FUEL INJECTOR

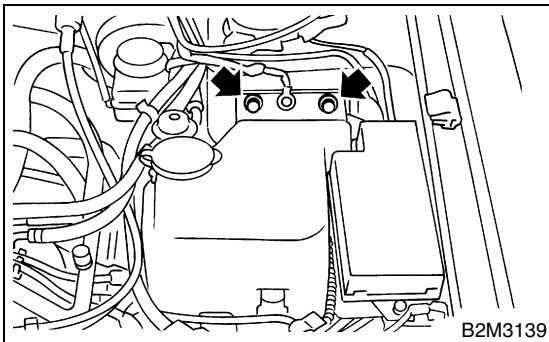
FUEL INJECTION (FUEL SYSTEMS)

2. LH SIDE

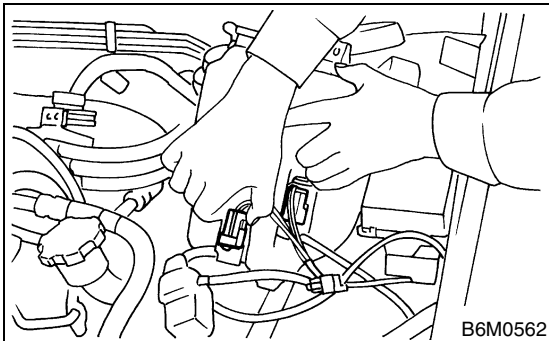
- 1) Release the fuel pressure. <Ref. to FU(w/oOBD)-51, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 2) Open the fuel filler flap lid and remove fuel filler cap.
- 3) Disconnect the ground cable from battery.



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

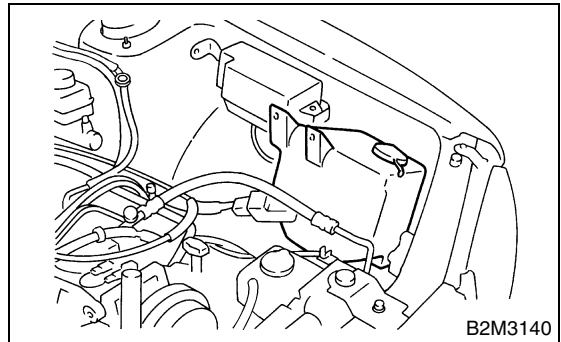


- 5) Disconnect the connector from front window washer motor.
- 6) Disconnect the connector from rear gate glass washer motor.

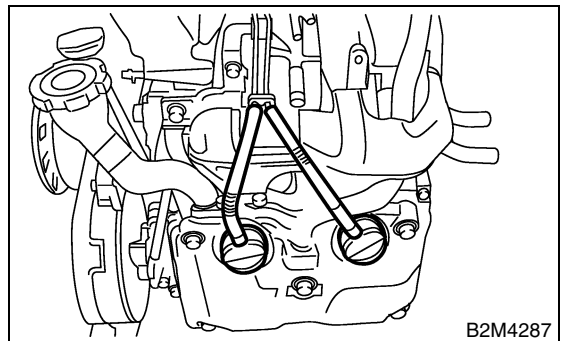


- 7) Disconnect the rear window glass washer hose from washer motor, then plug connection with a suitable cap.

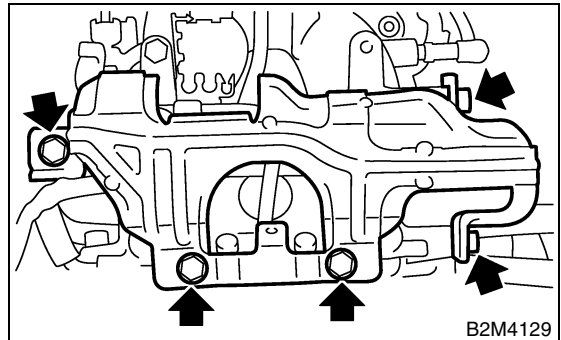
- 8) Move the washer tank, and secure it away from working area.



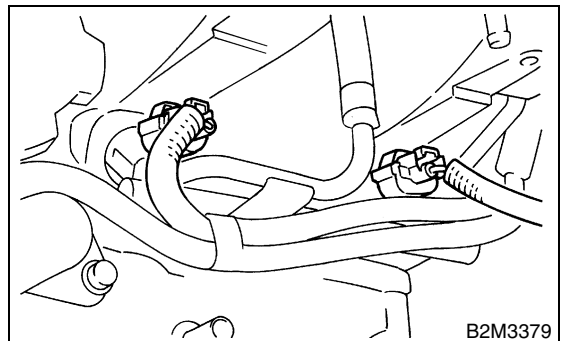
- 9) Remove the spark plug cords from spark plugs (#2 and #4 cylinders).



- 10) Remove the fuel pipe protector LH.



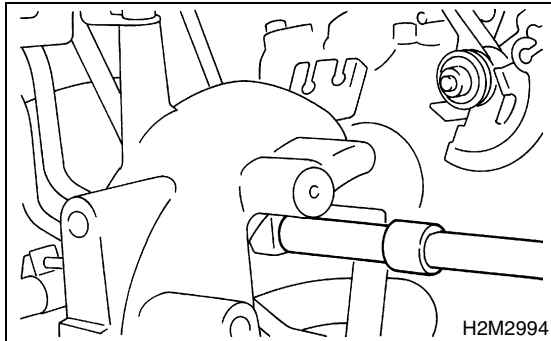
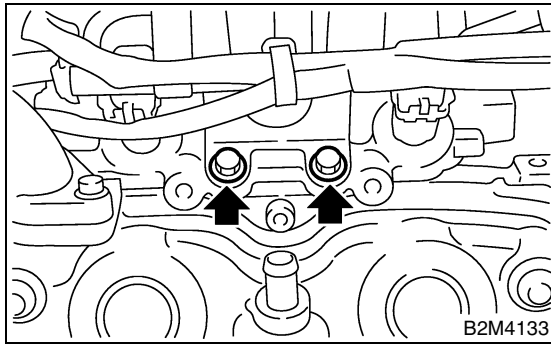
- 11) Disconnect the connector from fuel injector.



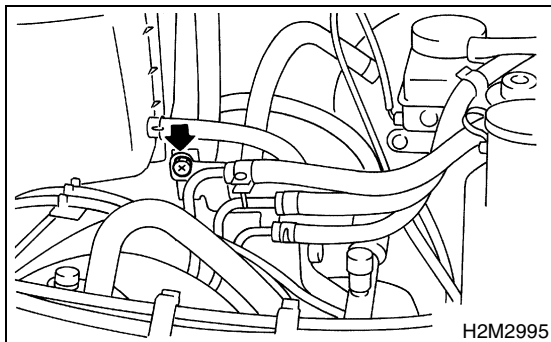
FUEL INJECTOR

FUEL INJECTION (FUEL SYSTEMS)

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

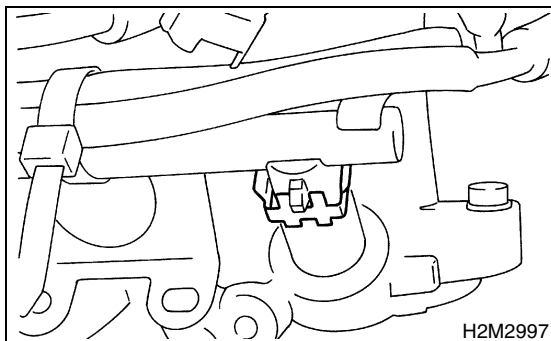


13) Remove the bolt which holds fuel pipe on the left side intake manifold.

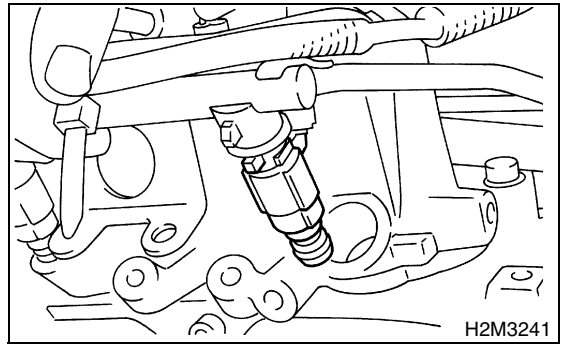


14) Remove the fuel injector from intake manifold.

(1) Remove the fuel injector securing clip.



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



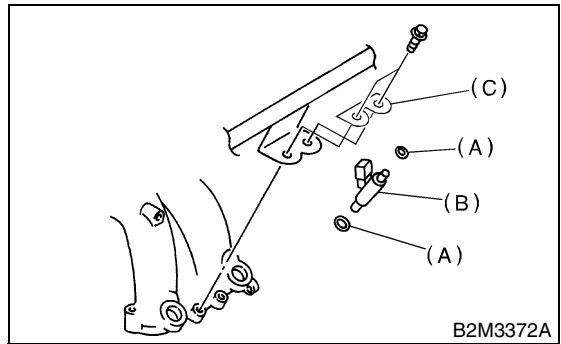
B: INSTALLATION

1. RH SIDE

Install in the reverse order of removal.

NOTE:

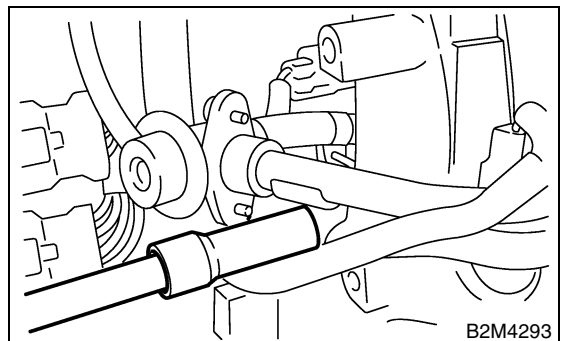
Replace the O-rings with a new one.



- (A) O-ring
- (B) Fuel injector
- (C) Intake manifold protector

Tightening torque:

5.0 N·m (0.51 kgf-m, 3.7 ft-lb)

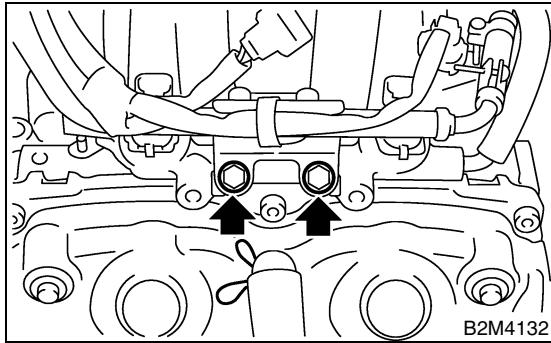


FUEL INJECTOR

FUEL INJECTION (FUEL SYSTEMS)

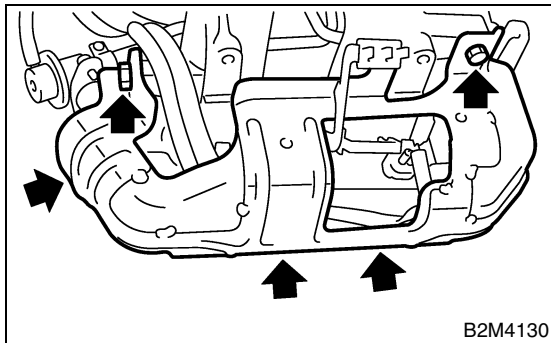
Tightening torque:

19 N-m (1.9 kgf-m, 14.0 ft-lb)



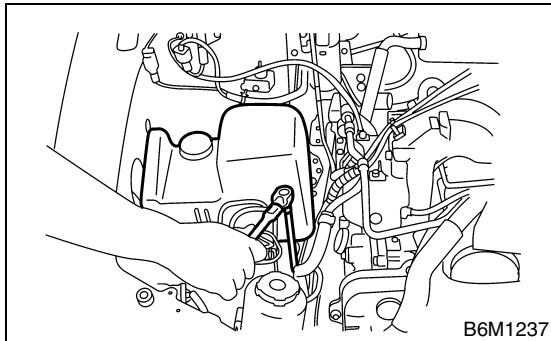
Tightening torque:

19 N-m (1.9 kgf-m, 14.0 ft-lb)



Tightening torque:

33 N-m (3.4 kgf-m, 24.3 ft-lb)

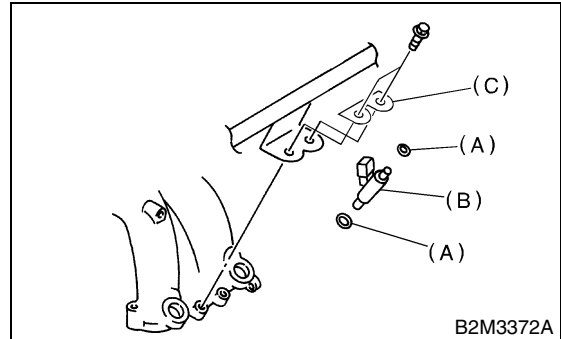


2. LH SIDE

Install in the reverse order of removal.

NOTE:

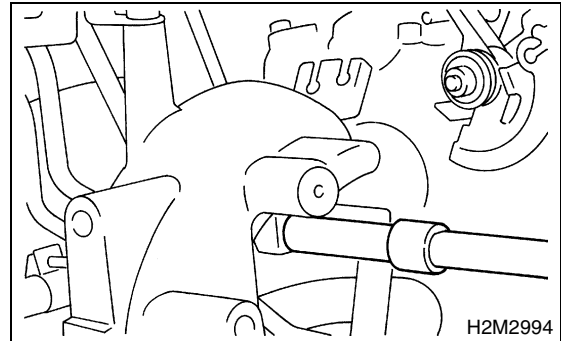
Replace the O-rings with a new one.



- (A) O-ring
- (B) Fuel injector
- (C) Intake manifold protector

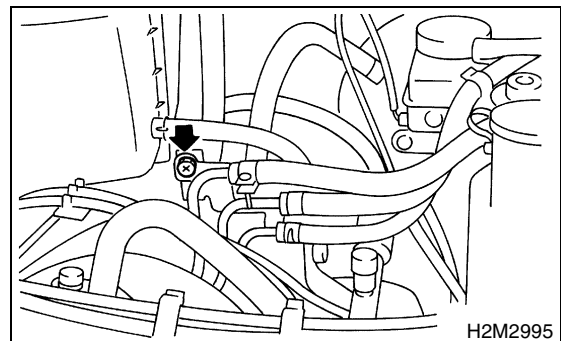
Tightening torque:

5.0 N-m (0.51 kgf-m, 3.7 ft-lb)



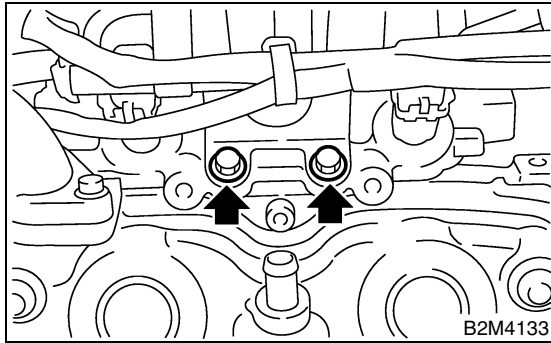
Tightening torque:

5.0 N-m (0.51 kgf-m, 3.7 ft-lb)



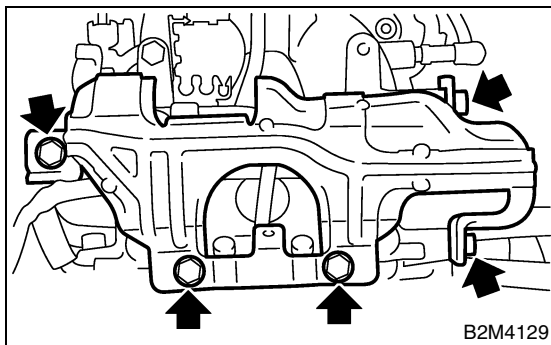
Tightening torque:

19 N·m (1.9 kgf·m, 14.0 ft·lb)



Tightening torque:

19 N·m (1.9 kgf·m, 14.0 ft·lb)



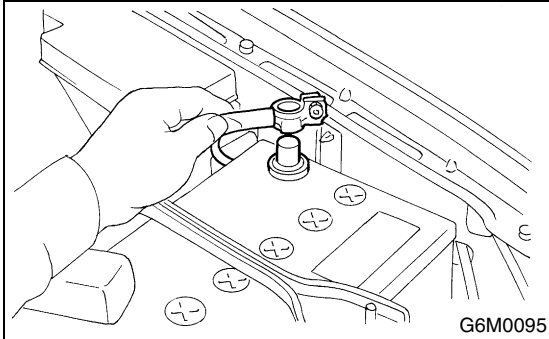
OXYGEN SENSOR

FUEL INJECTION (FUEL SYSTEMS)

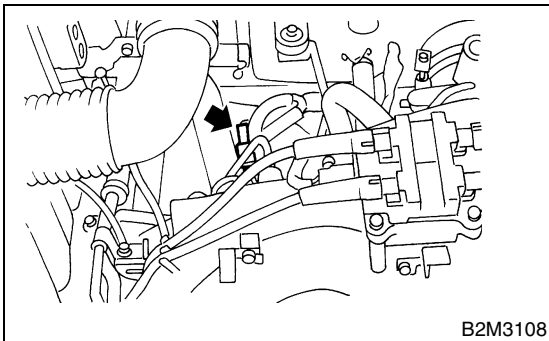
12. Oxygen Sensor

A: REMOVAL

- 1) Disconnect the ground cable from battery.



- 2) Disconnect the connector from oxygen sensor.



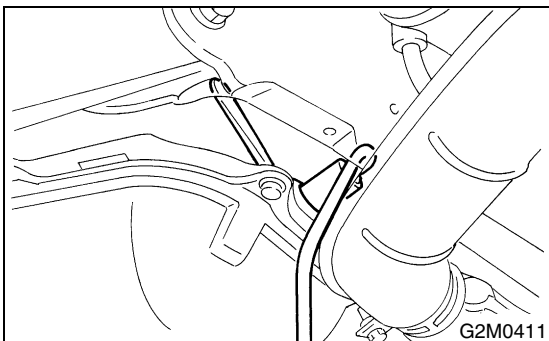
- 3) Lift-up the vehicle.
- 4) Apply SUBARU CRC or its equivalent to the threaded portion of oxygen sensor, and leave it for 1 minute or more.

SUBARU CRC (Part No. 004301003)

- 5) Remove the oxygen sensor.

CAUTION:

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



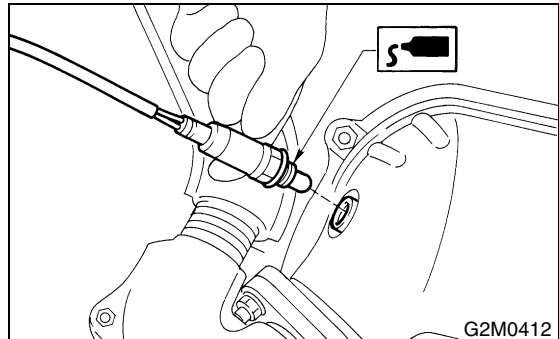
B: INSTALLATION

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

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

CAUTION:

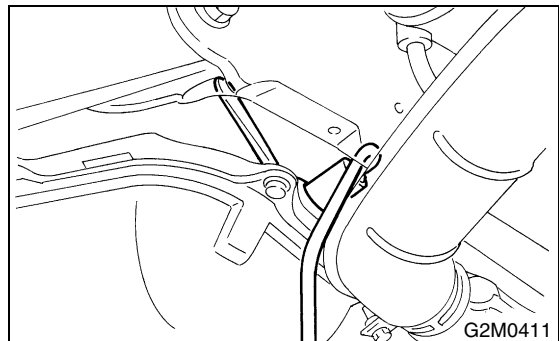
Never apply anti-seize compound to the protector of oxygen sensor.



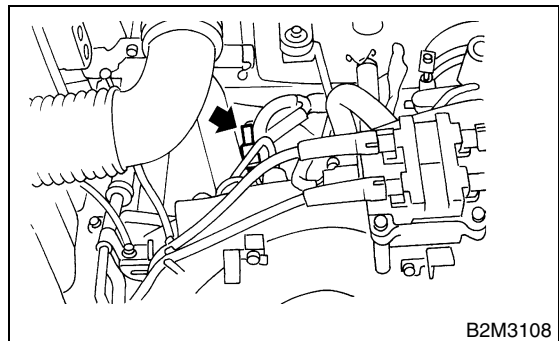
- 2) Install the oxygen sensor.

Tightening torque:

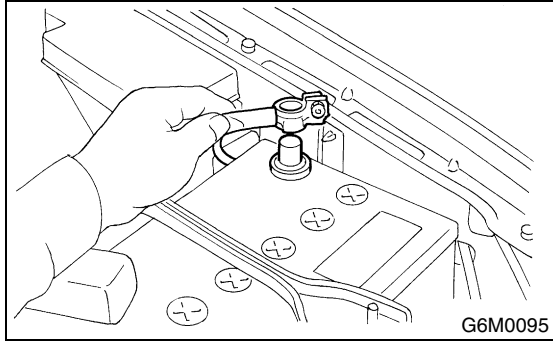
21 N·m (2.1 kgf·m, 15.2 ft·lb)



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



5) Connect the battery ground cable to battery.



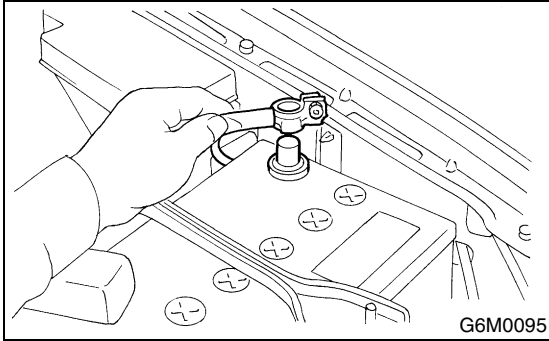
ENGINE CONTROL MODULE

FUEL INJECTION (FUEL SYSTEMS)

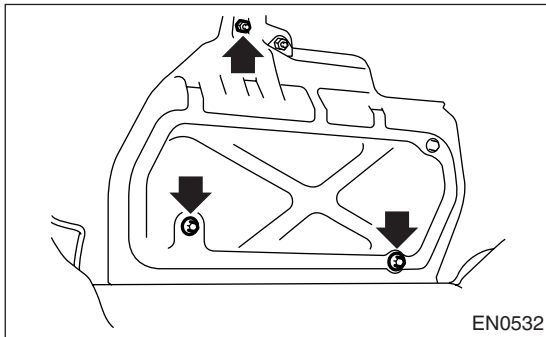
13.Engine Control Module

A: REMOVAL

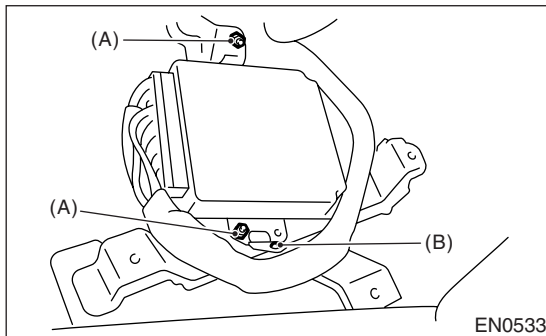
- 1) Disconnect the ground cable from battery.



- 2) Remove the lower inner trim of passenger side.
<Ref. to EI-45, REMOVAL, Lower Inner Trim.>
- 3) Detach the floor mat of front passenger seat.
- 4) Remove the protect cover.



- 5) Remove the nuts (A) which hold ECM to bracket.
- 6) Remove the clip (B) from bracket.



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

B: INSTALLATION

Install in the reverse order of removal.

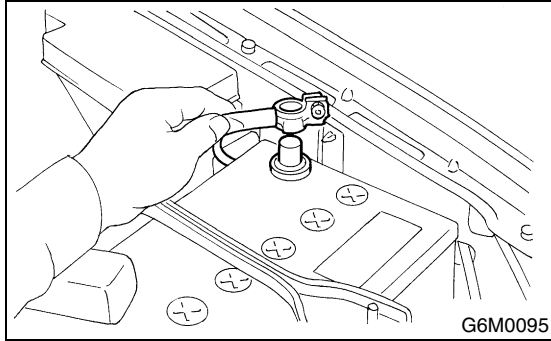
CAUTION:

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

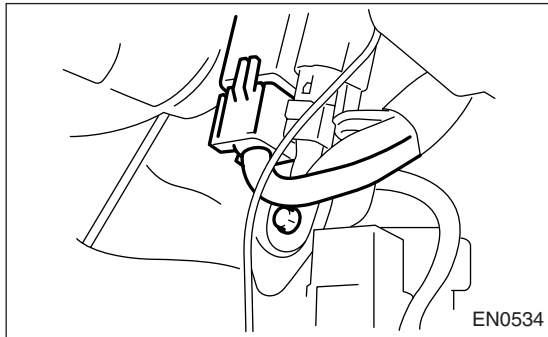
14.Main Relay

A: REMOVAL

- 1) Disconnect the ground cable from battery.



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



B: INSTALLATION

Install in the reverse order of removal.

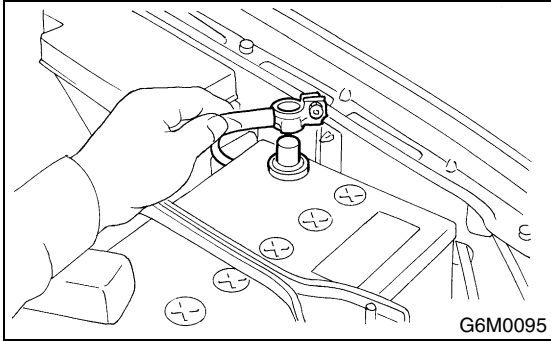
FUEL PUMP RELAY

FUEL INJECTION (FUEL SYSTEMS)

15. Fuel Pump Relay

A: REMOVAL

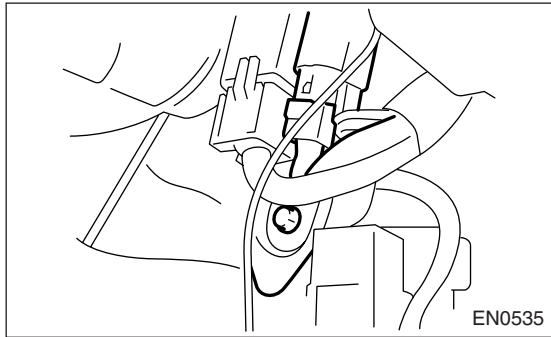
1) Disconnect the ground cable from battery.



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

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

4) Disconnect the connector from fuel pump relay.



5) Remove the fuel pump relay from mounting bracket.

B: INSTALLATION

Install in the reverse order of removal.

16.Fuel

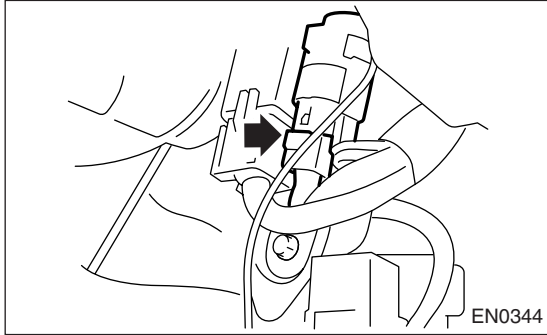
A: OPERATION

1. RELEASING OF FUEL PRESSURE

WARNING:

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

1) Disconnect the connector from fuel pump relay.



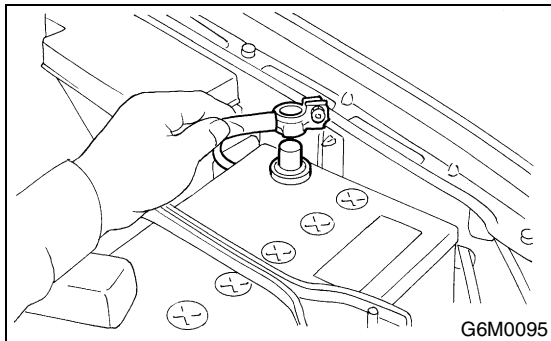
- 2) Start the engine and run it until it stalls.
 3) After the engine stalls, crank it for 5 more seconds.
 4) Turn the ignition switch to OFF.

2. DRAINING FUEL

WARNING:

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

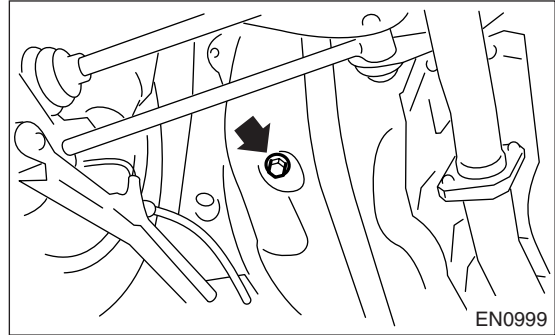
- 1) Set the vehicle on a lift.
 2) Disconnect the ground cable from battery.



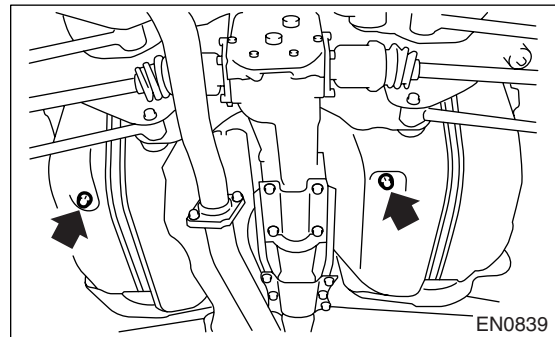
- 3) Open the fuel filler flap lid and remove fuel filler cap.
 4) Lift-up the vehicle.

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

- 1600 cc and 2000 cc MODEL



- 2500 cc MODEL

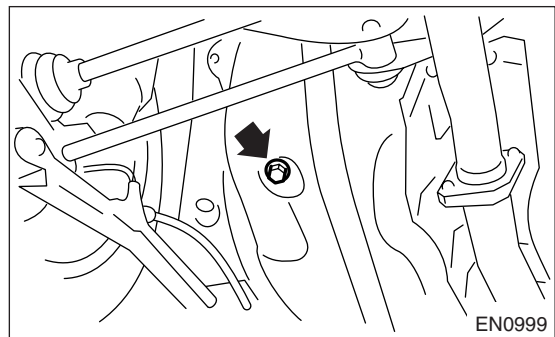


- 6) Tighten the fuel drain plug.

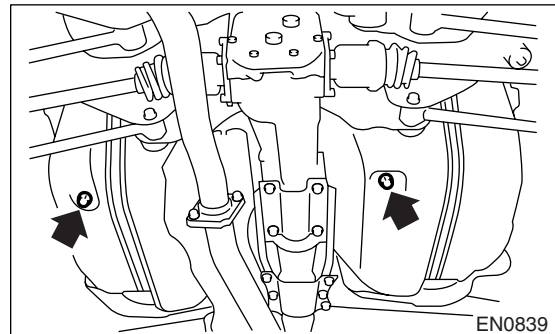
Tightening torque:

26 N·m (2.7 kgf-m, 19.2 ft-lb)

- 1600 cc and 2000 cc MODEL



- 2500 cc MODEL



FUEL TANK

FUEL INJECTION (FUEL SYSTEMS)

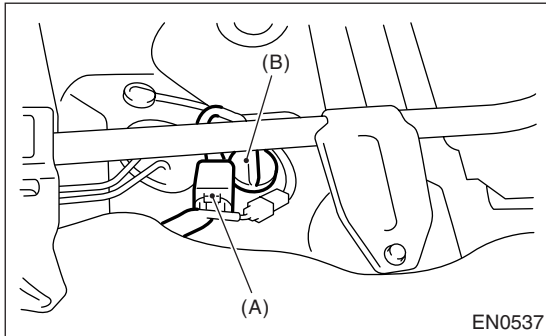
17. Fuel Tank

A: REMOVAL

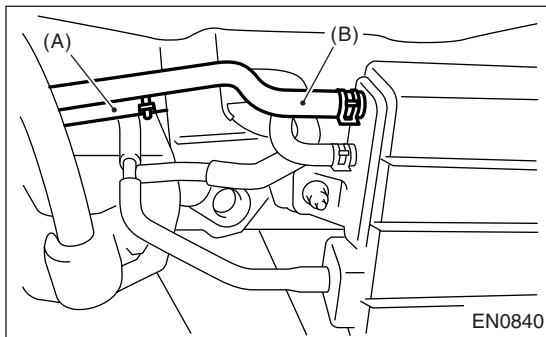
WARNING:

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

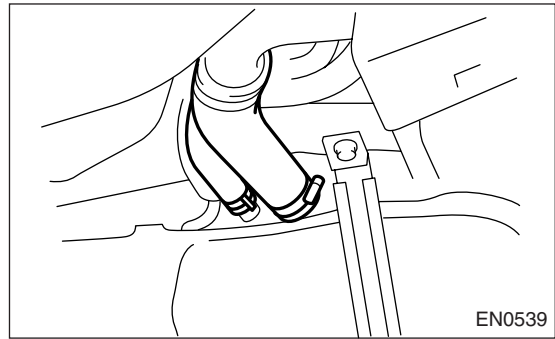
- 1) Set the vehicle on a lift.
- 2) Release the fuel pressure. <Ref. to FU(w/oOBD)-51, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 3) Drain fuel from the fuel tank. <Ref. to FU(w/oOBD)-51, DRAINING FUEL, OPERATION, Fuel.>
- 4) Remove the rear seat.
- 5) Disconnect the connector (A) of fuel tank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



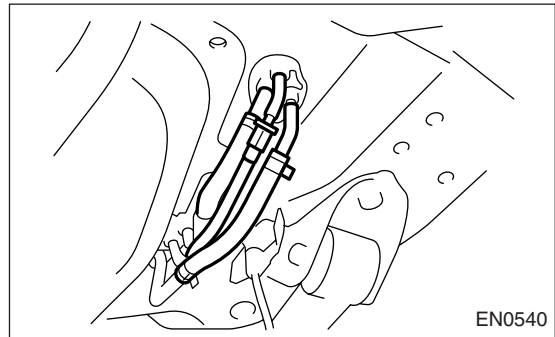
- 7) Remove the rear crossmember. <Ref. to RS-21, REMOVAL, Rear Crossmember.>
- 8) Disconnect the two-way valve hose (A) from two-way valve and disconnect the canister hose (B) from canister.



- 9) Loosen the clamp and disconnect the fuel filler hose and air vent hose from fuel filler pipe.



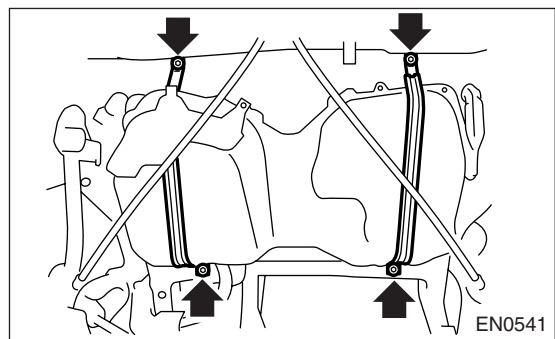
- 10) Move the clips, and then disconnect quick connector. <Ref. to FU(w/oOBD)-68, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>
- 11) Disconnect the fuel hoses.



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

WARNING:

A helper is required to perform this work.



FUEL TANK

FUEL INJECTION (FUEL SYSTEMS)

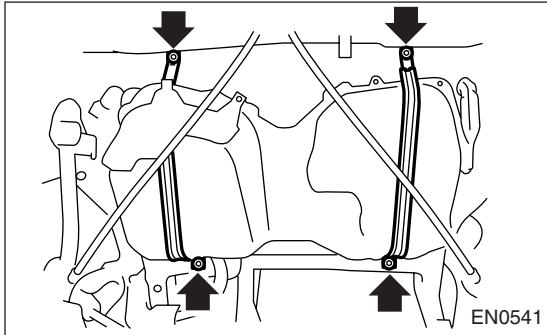
B: INSTALLATION

1) Support the fuel tank with transmission jack and push the fuel tank harness into access hole with grommet.

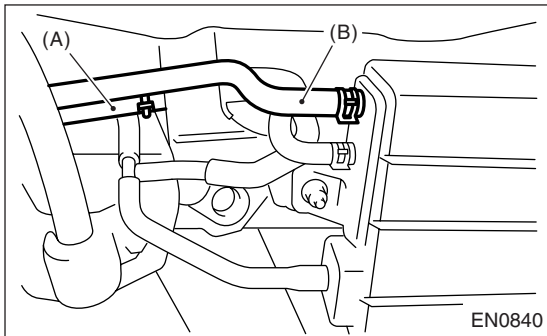
2) Set the fuel tank and temporarily tighten the bolts of fuel tank bands.

WARNING:

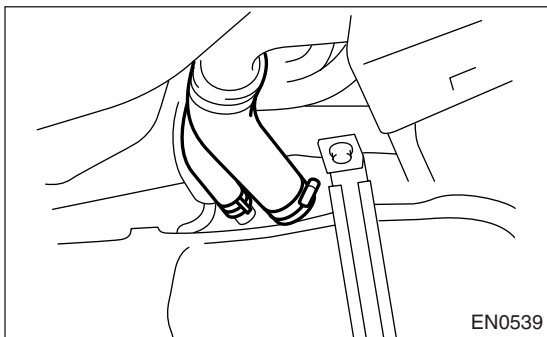
A helper is required to perform this work.



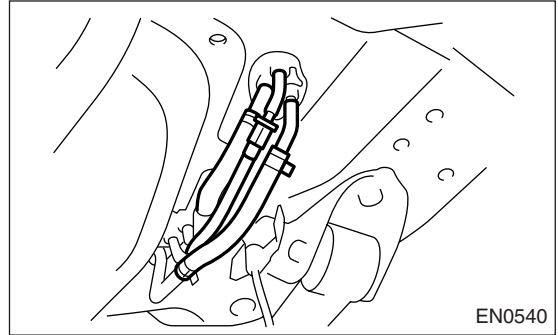
3) Connect the two-way valve hose (A) to two-way valve and connect the canister hose (B) to canister.



4) Connect the fuel filler hose and air vent hose.



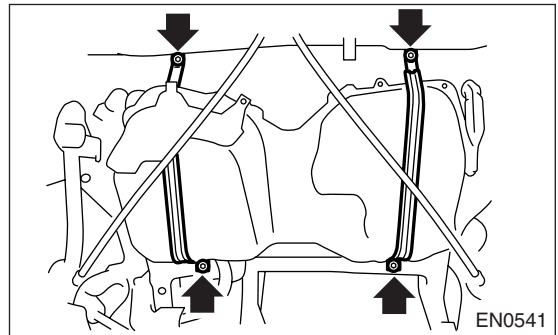
5) Connect the fuel hoses, and then secure them with clips and quick connector. <Ref. to FU(w/oOBD)-69, INSTALLATION, Fuel Delivery, Return and Evaporation Lines.>



6) Tighten the band mounting bolts.

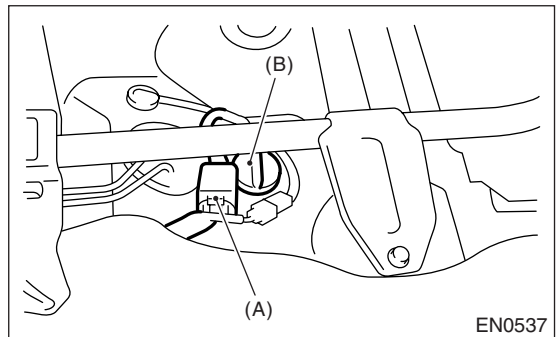
Tightening torque:

33 N·m (3.4 kgf·m, 24.3 ft·lb)



7) Install the rear crossmember. <Ref. to RS-21, INSTALLATION, Rear Crossmember.>

8) Connect the connectors (A) to fuel tank cord and plug the service hole with grommet (B).

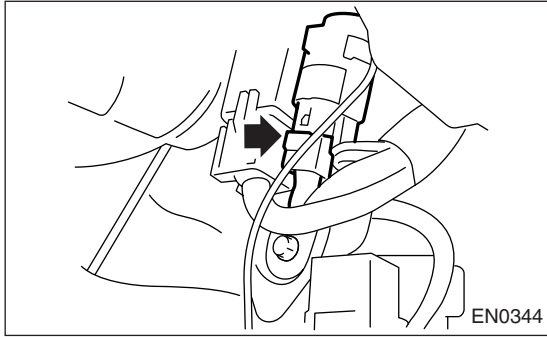


9) Set the rear seat and floor mat.

FUEL TANK

FUEL INJECTION (FUEL SYSTEMS)

10) Connect the 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.

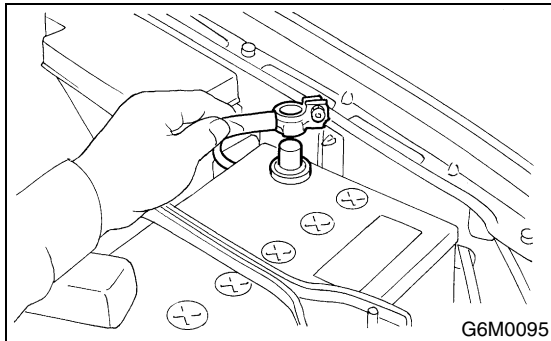
18. Fuel Filler Pipe

A: REMOVAL

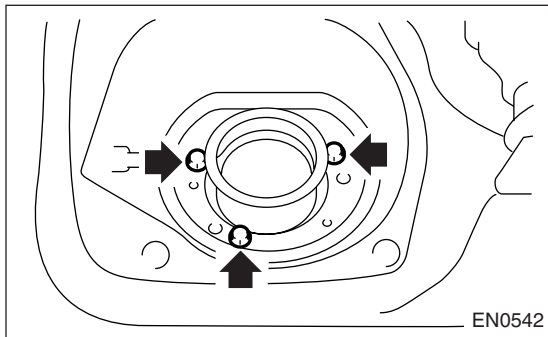
WARNING:

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

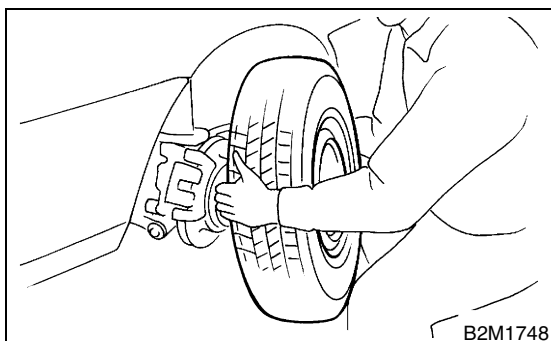
- 1) Set the vehicle on a lift.
- 2) Release the fuel pressure. <Ref. to FU(w/oOBD)-51, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 3) Open the fuel filler flap lid and remove fuel filler cap.
- 4) Disconnect the ground cable from battery.



- 5) Remove the screws holding packing in place.

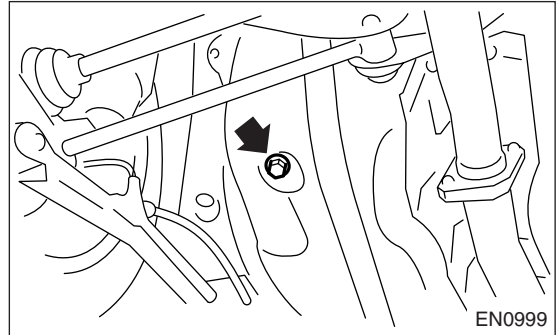


- 6) Remove the rear right side wheel nuts.
- 7) Lift-up the vehicle.
- 8) Remove the rear right side wheel.

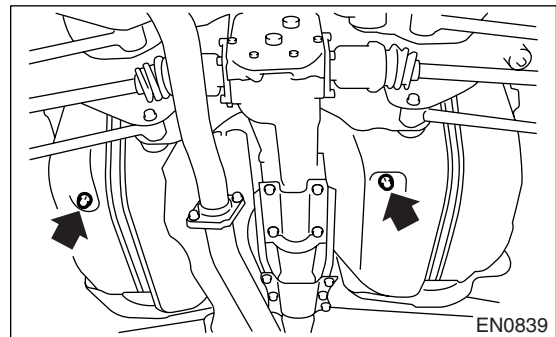


- 9) Drain fuel from the fuel tank. Set a container under the vehicle and remove the drain plug from fuel tank.

- 1600 cc and 2000 cc MODEL



- 2500 cc MODEL

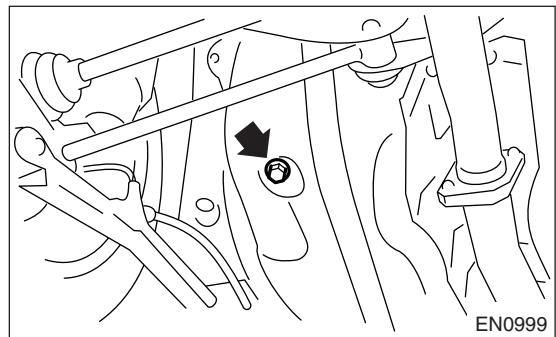


- 10) Tighten the fuel drain plug and then install the front right side tank cover.

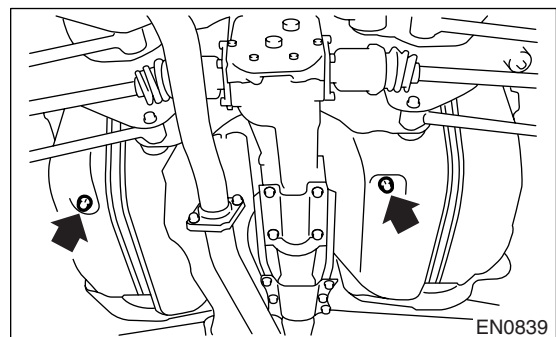
Tightening torque:

26 N·m (2.7 kgf-m, 19.2 ft-lb)

- 1600 cc and 2000 cc MODEL



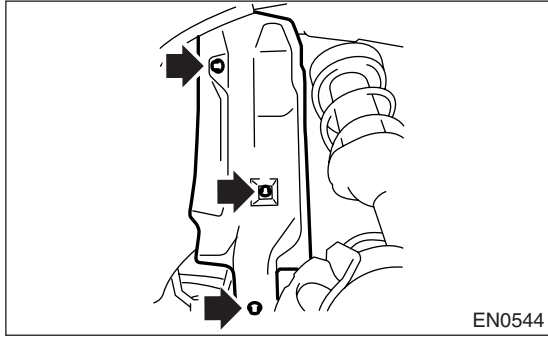
- 2500 cc MODEL



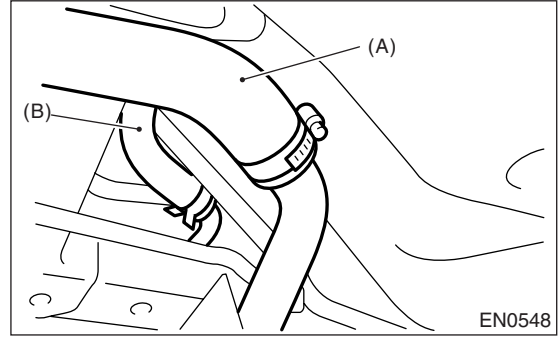
FUEL FILLER PIPE

FUEL INJECTION (FUEL SYSTEMS)

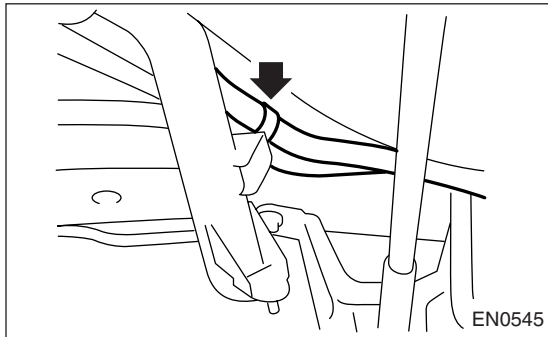
11) Remove the fuel filler pipe protector.



16) Move the clip and separate air vent hose (B).

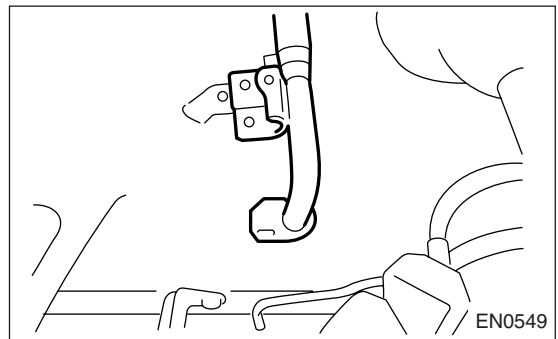


12) Separate the evaporation hoses from clip of fuel filler pipe.

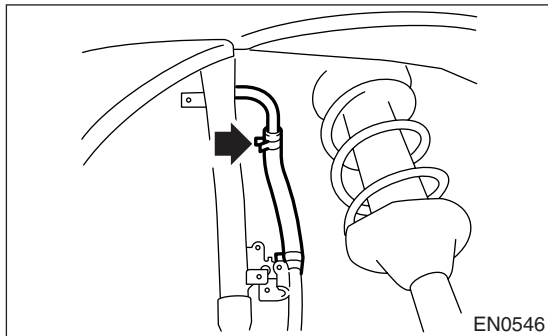


17) Remove the fuel filler pipe to under side of the vehicle.

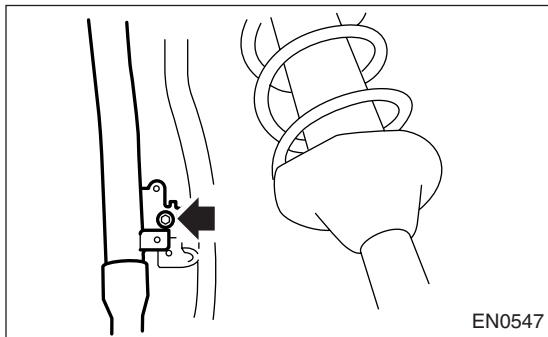
18) Remove the air vent pipe together with clip from body.



13) Disconnect the air vent hose from fuel filler pipe.



14) Remove the bolt which holds fuel filler pipe bracket on body.



15) Loosen the clamp and separate fuel filler hose (A) from fuel filler pipe.

FUEL FILLER PIPE

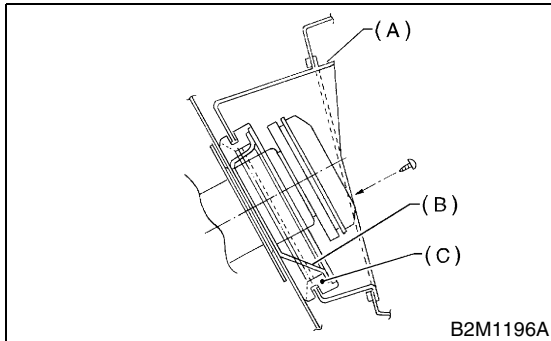
FUEL INJECTION (FUEL SYSTEMS)

B: INSTALLATION

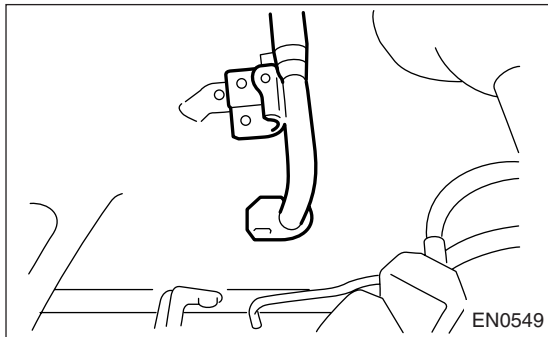
- 1) Hold the fuel filler flap open.
- 2) Set the fuel saucer (A) with rubber packing (C) and insert the fuel filler pipe into hole from the inner side of apron.
- 3) Align the holes in fuel filler pipe neck and set cup (B), and tighten the screws.

NOTE:

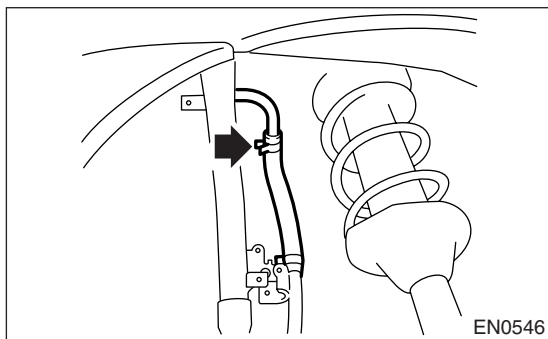
If the edges of rubber packing are folded toward inside, straighten it with a screwdriver.



- 4) Install the air vent pipe.



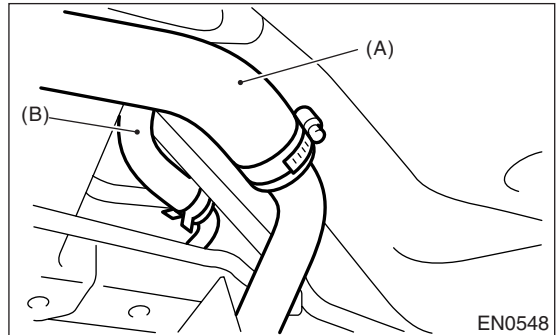
- 5) Connect the air vent hose to fuel filler pipe.



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

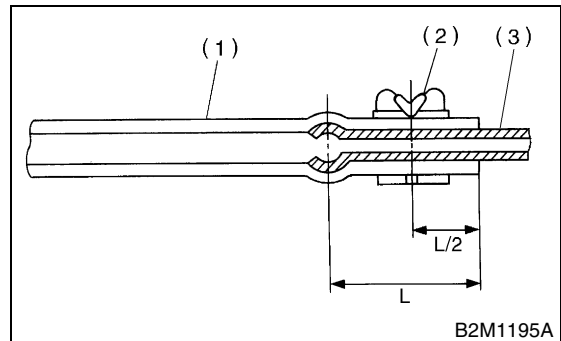
CAUTION:

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



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

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

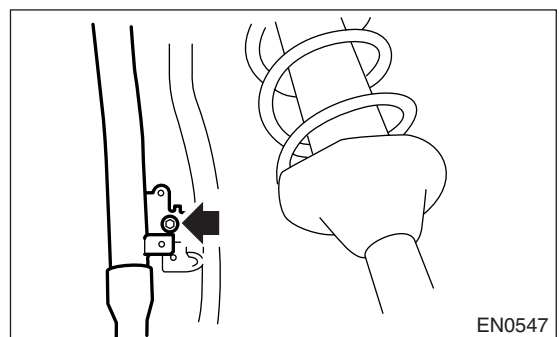


- (1) Hose
- (2) Clip
- (3) Pipe

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

Tightening torque:

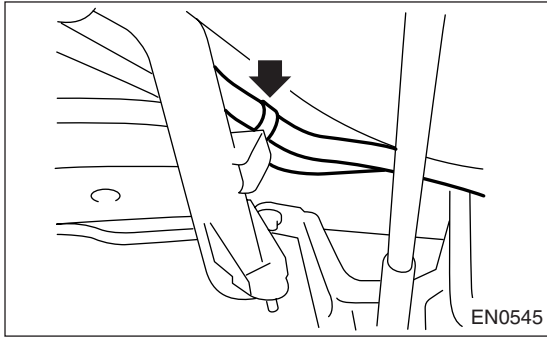
$7.5 \text{ N}\cdot\text{m (0.75 kgf}\cdot\text{m, 5.4 ft}\cdot\text{lb)}$



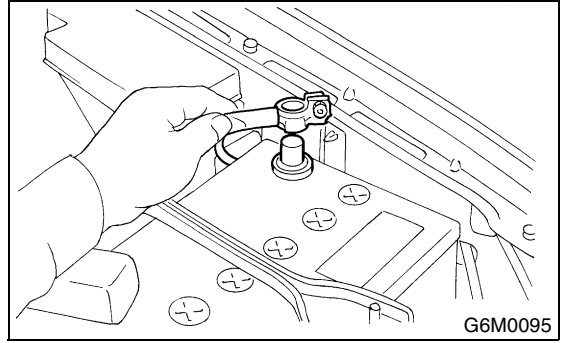
FUEL FILLER PIPE

FUEL INJECTION (FUEL SYSTEMS)

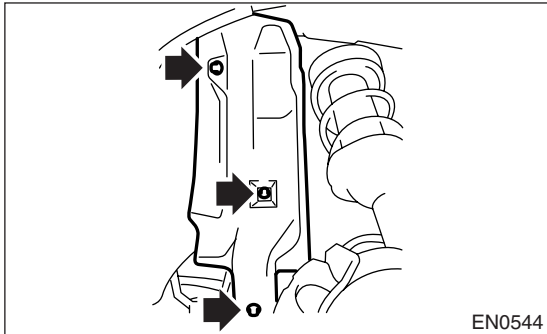
9) Tighten the bolts which hold evaporation hoses onto clip of fuel filler pipe.



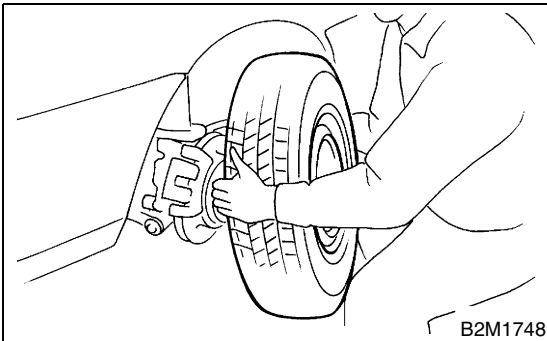
15) Connect the battery ground cable to battery.



10) Install the fuel filler pipe protector.



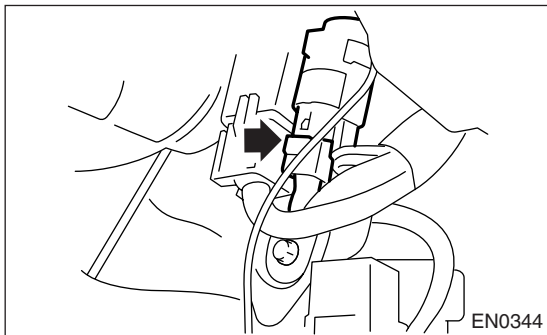
11) Install the rear right wheel.



12) Lower the vehicle.

13) Tighten the wheel nuts.

14) Connect the connector to fuel pump relay.



19. Fuel Pump

A: REMOVAL

WARNING:

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

NOTE:

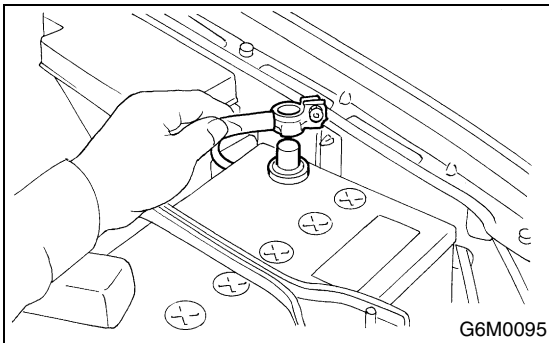
Fuel pump assembly consists of fuel pump and fuel level sensor.

• 1600 cc and 2000 cc MODEL

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

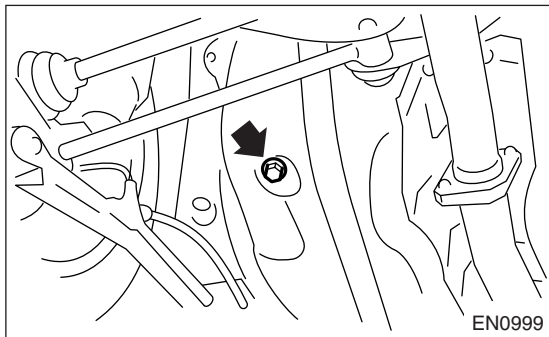
2) Open the fuel filler flap lid and remove fuel filler cap.

3) Disconnect the ground cable from battery.



4) Lift-up the vehicle.

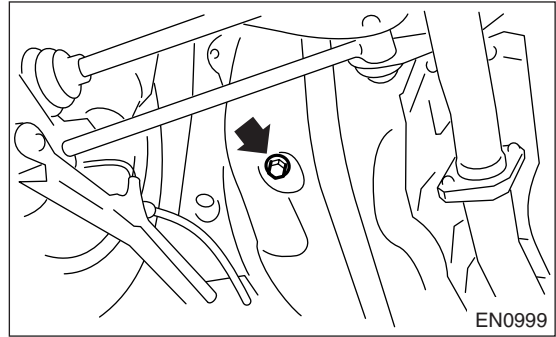
5) Drain fuel from the fuel tank. Set a container under the vehicle and remove the drain plug from fuel tank.



6) Tighten the fuel drain plug.

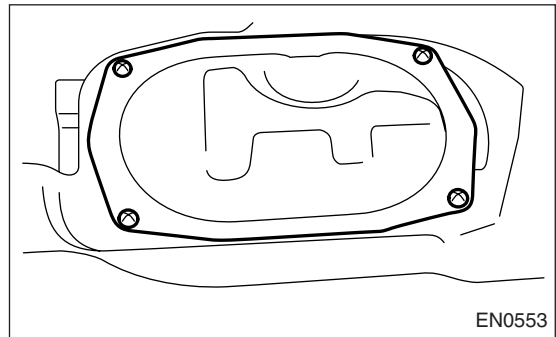
Tightening torque:

26 N·m (2.7 kgf·m, 19.2 ft·lb)

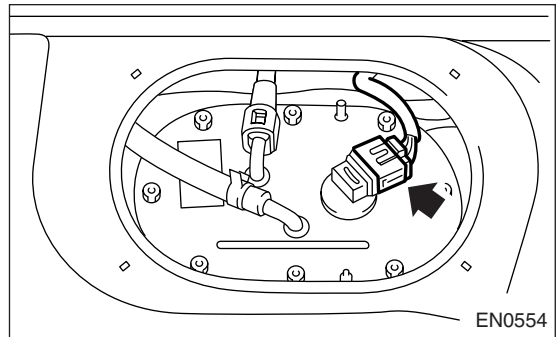


7) Raise the rear seat and turn floor mat up.

8) Remove the access hole lid.



9) Disconnect the connector from fuel pump.

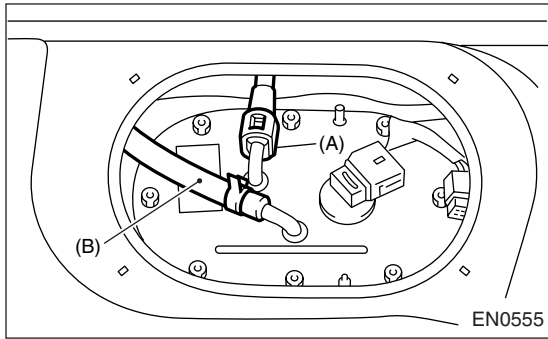


10) Disconnect the quick connector and then disconnect fuel delivery hose (A). <Ref. to FU(w/oOBD)-68, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>

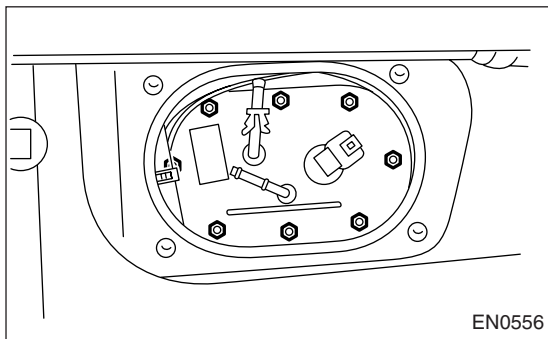
FUEL PUMP

FUEL INJECTION (FUEL SYSTEMS)

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



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



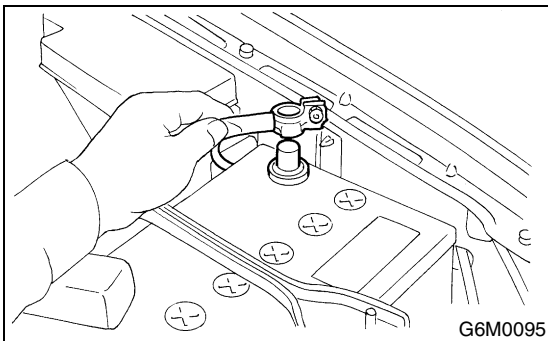
13) Take off the fuel pump assembly from fuel tank.

• 2500 cc MODEL

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

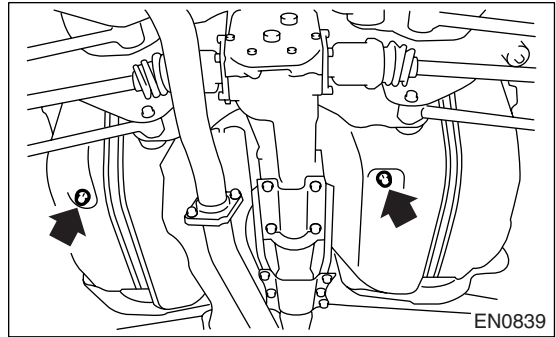
2) Open the fuel filler flap lid and remove fuel filler cap.

3) Disconnect the ground cable from battery.



4) Lift-up the vehicle.

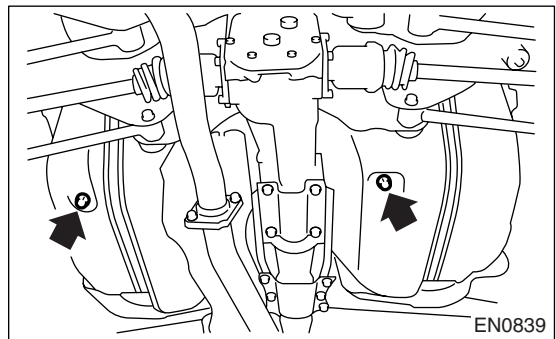
5) Drain fuel from the fuel tank. Set a container under the vehicle and remove the drain plug from fuel tank.



6) Tighten the fuel drain plug.

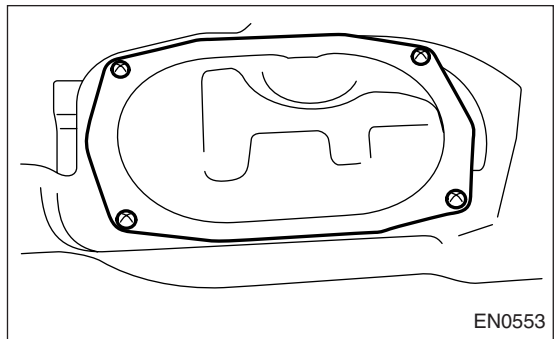
Tightening torque:

26 N·m (2.7 kgf·m, 19.2 ft·lb)

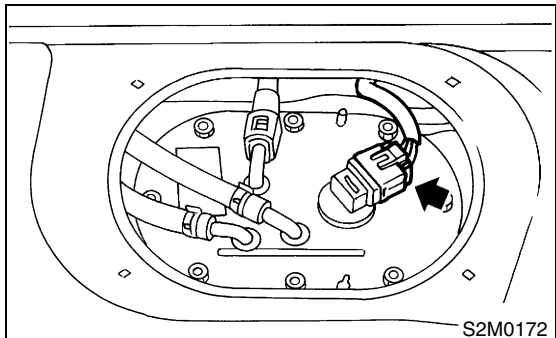


7) Raise the rear seat and turn floor mat up.

8) Remove the access hole lid.



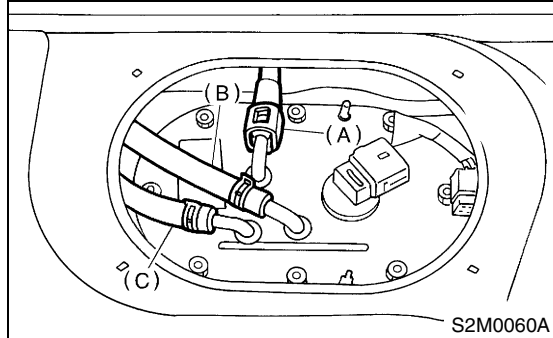
9) Disconnect the connector from fuel pump.



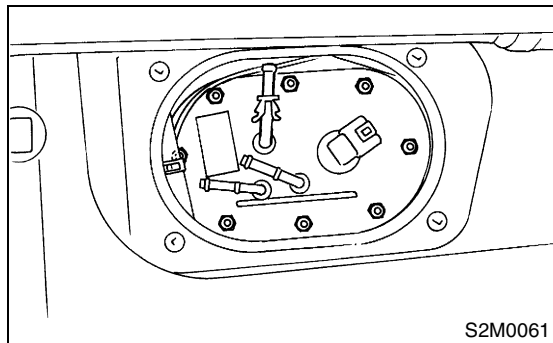
FUEL PUMP

10) Disconnect the quick connector, and then disconnect fuel delivery hose (A). <Ref. to FU(w/oOBD)-68, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>

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



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



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

B: INSTALLATION

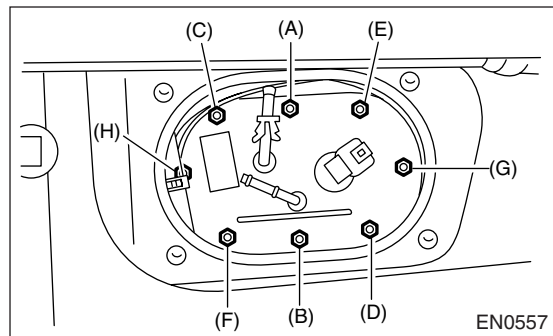
Install in the reverse order of removal. Do the following:

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

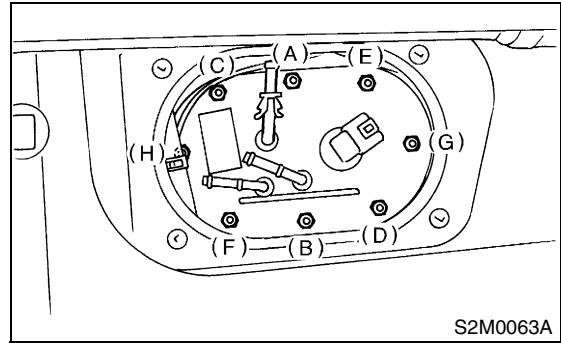
Tightening torque:

4.4 N·m (0.45 kgf·m, 3.3 ft·lb)

- 1600 cc and 2000 cc MODEL



- 2500 cc MODEL

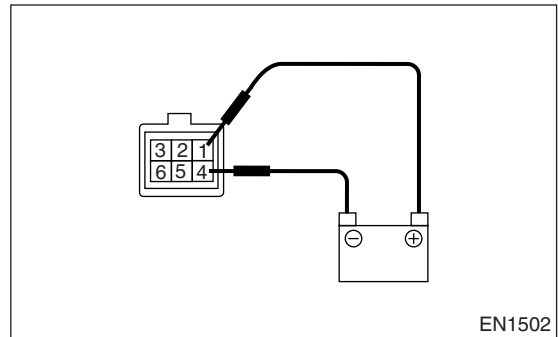


C: INSPECTION

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

WARNING:

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



FUEL LEVEL SENSOR

FUEL INJECTION (FUEL SYSTEMS)

20. Fuel Level Sensor

A: REMOVAL

WARNING:

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

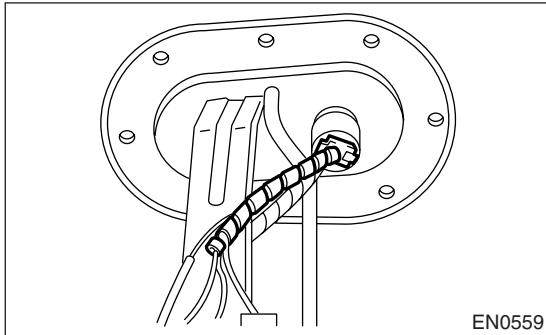
NOTE:

Fuel level sensor is built in the fuel pump assembly.

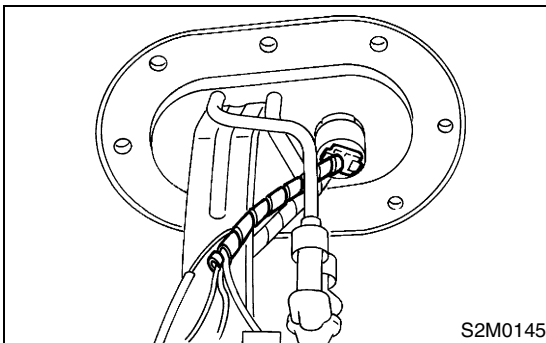
1) Remove the fuel pump assembly. <Ref. to FU(w/oOBD)-59, REMOVAL, Fuel Pump.>

2) Disconnect the connector from fuel pump bracket.

- 1600 cc and 2000 cc MODEL

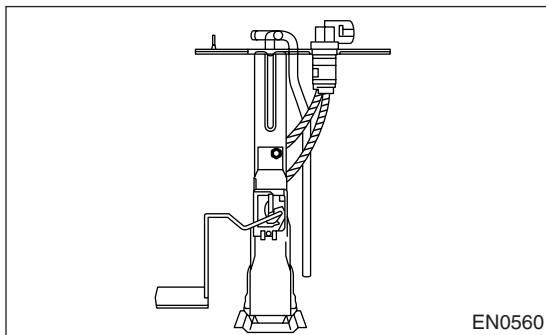


- 2500 cc MODEL

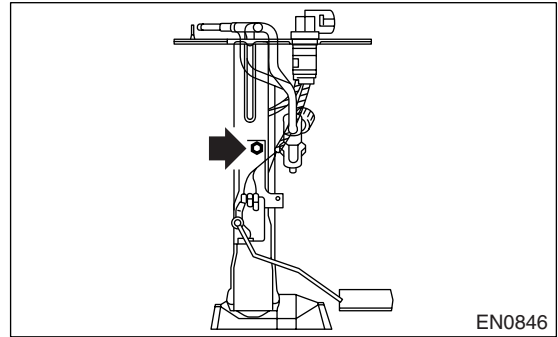


3) Remove the bolt which installs fuel level sensor on mounting bracket.

- 1600 cc and 2000 cc MODEL



- 2500 cc MODEL



B: INSTALLATION

Install in the reverse order of removal.

FUEL SUB LEVEL SENSOR

FUEL INJECTION (FUEL SYSTEMS)

21. Fuel Sub Level Sensor

A: REMOVAL

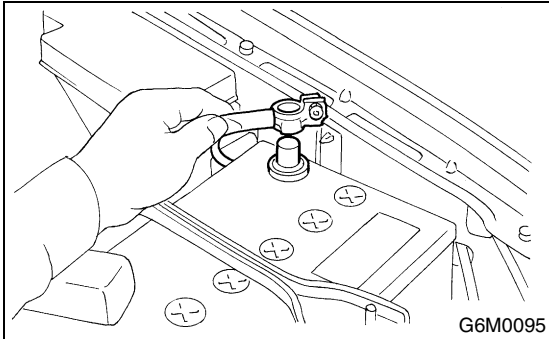
NOTE:

Fuel sub level sensor is equipped to only 2500 cc model.

WARNING:

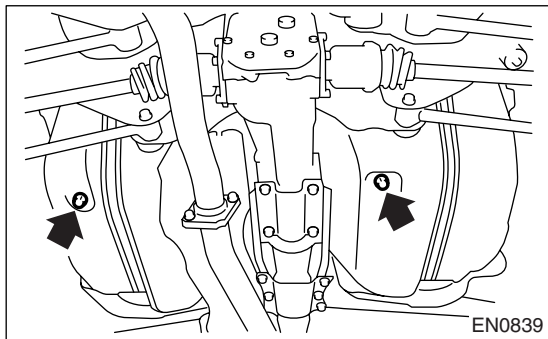
- Place “NO FIRE” signs near the working area.
- Be careful not to spill fuel on the floor.

1) Disconnect the ground cable from battery.



2) Lift-up the vehicle.

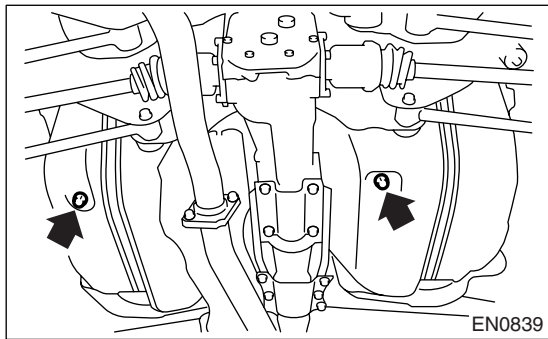
3) Drain fuel from the fuel tank. Set a container under the vehicle and remove the drain plug from fuel tank.



4) Tighten the fuel drain plug.

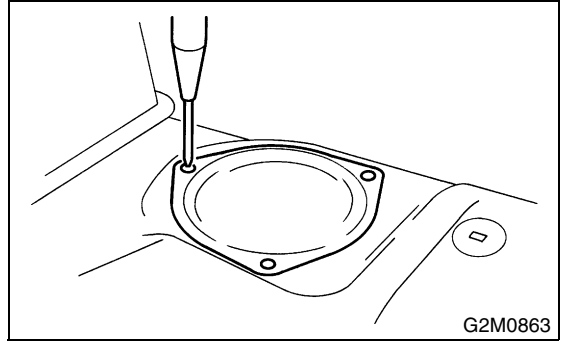
Tightening torque:

26 N·m (2.7 kgf-m, 19.2 ft-lb)



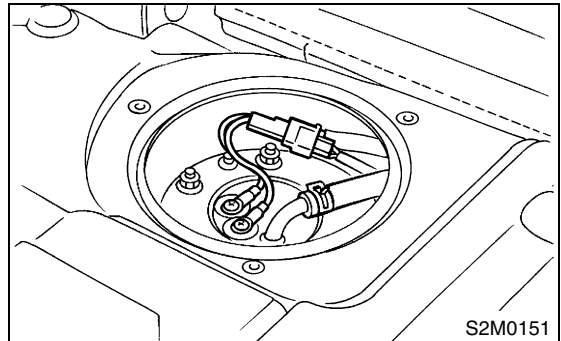
5) Remove the rear seat.

6) Remove the service hole cover.

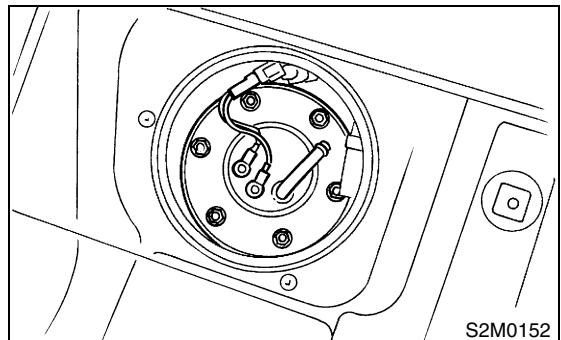


7) Disconnect the connector from fuel sub meter.

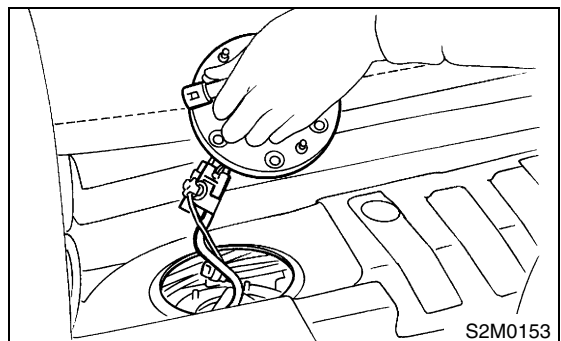
8) Disconnect the fuel jet pump hose.



9) Remove the bolts which install the fuel sub meter unit on fuel tank.



10) Remove the fuel sub meter unit.



FUEL SUB LEVEL SENSOR

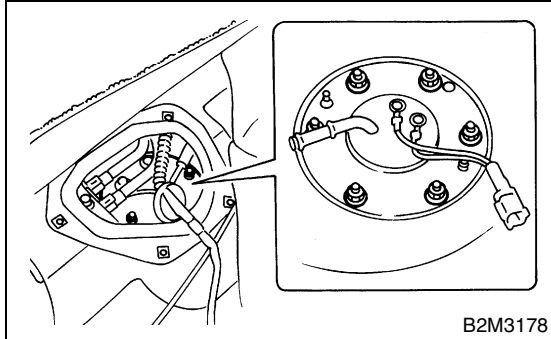
FUEL INJECTION (FUEL SYSTEMS)

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



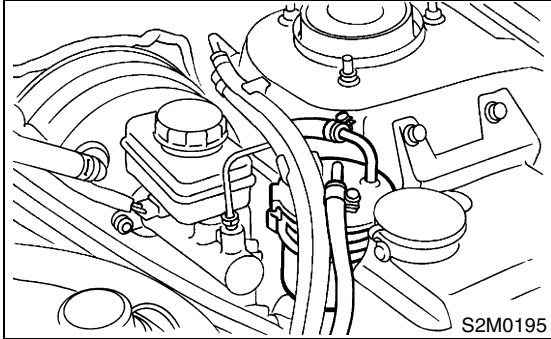
22. Fuel Filter

A: REMOVAL

WARNING:

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

- 1) Release the fuel pressure. <Ref. to FU(w/oOBD)-51, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 2) Disconnect the fuel delivery hoses from fuel filter.



- 3) Remove the filter from holder.

B: INSTALLATION

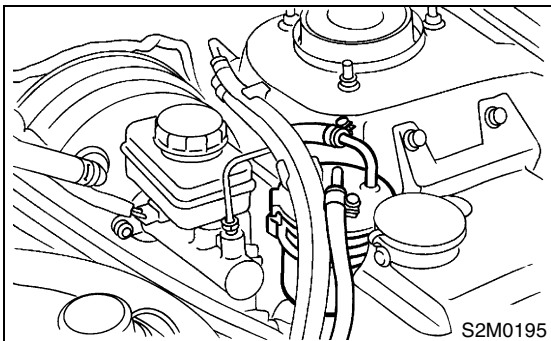
CAUTION:

- 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 the hose clamp screws.

Tightening torque:

1.25 N·m (0.13 kgf·m, 0.94 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

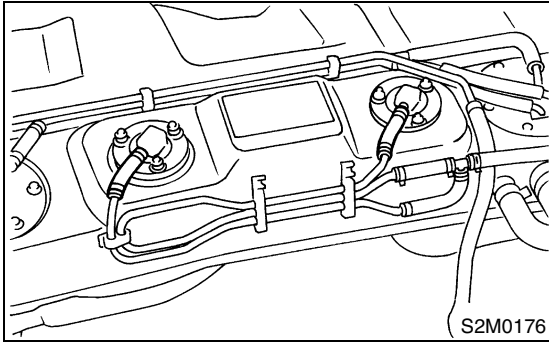
FUEL INJECTION (FUEL SYSTEMS)

23. 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 the fuel tank. <Ref. to FU(w/oOBD)-52, REMOVAL, Fuel Tank.>
 - 2) Move the clip and disconnect the evaporation hose from fuel cut valve.



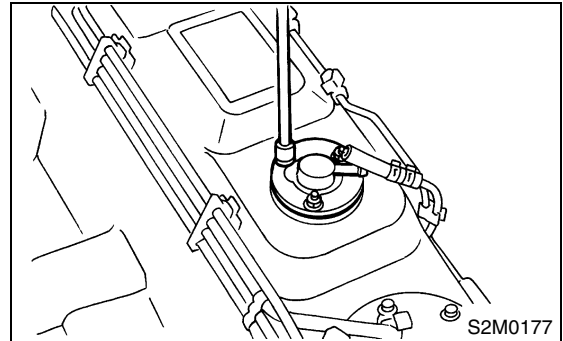
- 3) Remove the bolts which install fuel cut valve.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



24. Fuel Damper Valve

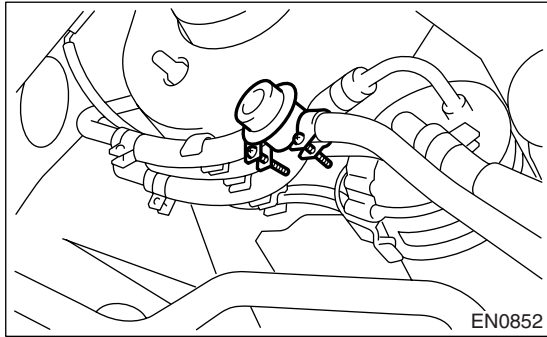
A: REMOVAL

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

2) Remove the fuel damper valve from fuel return line.

B: INSTALLATION

Install in the reverse order of removal.



FUEL DELIVERY, RETURN AND EVAPORATION LINES

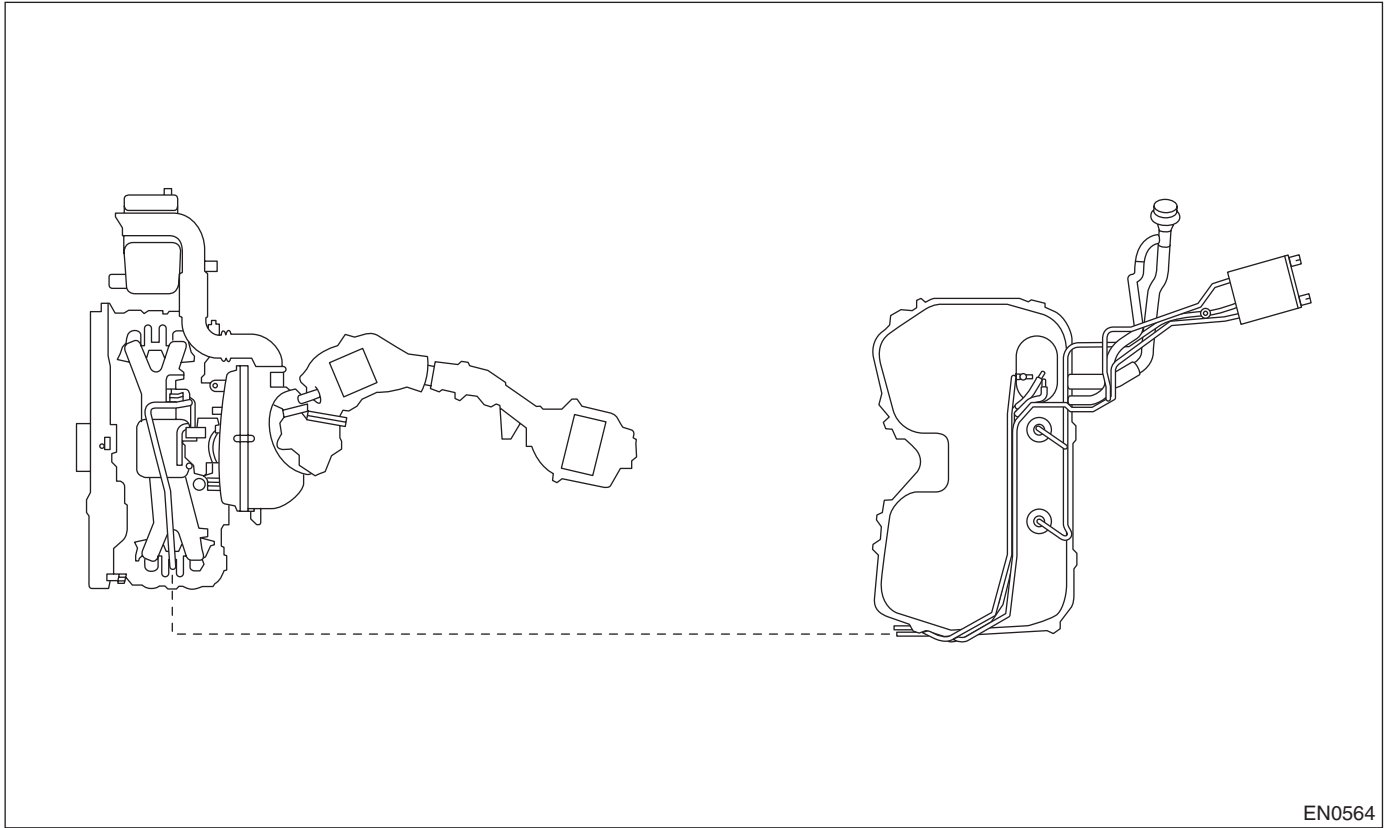
FUEL INJECTION (FUEL SYSTEMS)

25. Fuel Delivery, Return and Evaporation Lines

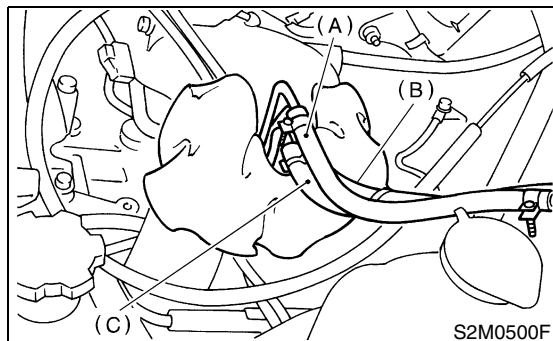
A: REMOVAL

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

- 3) Open the fuel filler flap lid and remove fuel filler cap.
- 4) Remove the floor mat. <Ref. to EI-53, REMOVAL, Floor Mat.>
- 5) Remove the fuel delivery pipes and hoses, fuel return pipes and hoses, evaporation pipes and hoses.



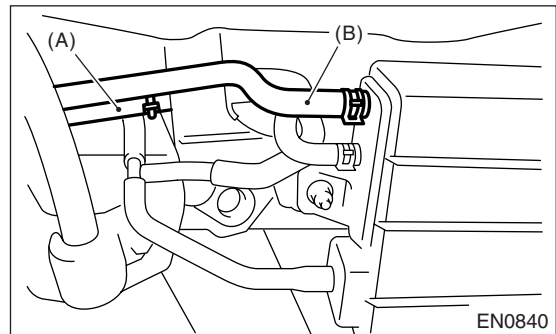
- 6) In the engine compartment, detach the fuel delivery hoses, return hoses and evaporation hose.



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

- 7) Lift-up the vehicle.

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



FUEL DELIVERY, RETURN AND EVAPORATION LINES

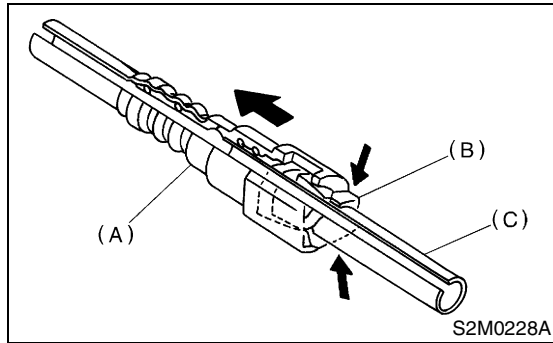
FUEL INJECTION (FUEL SYSTEMS)

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

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

NOTE:

Replace the retainer with new ones.



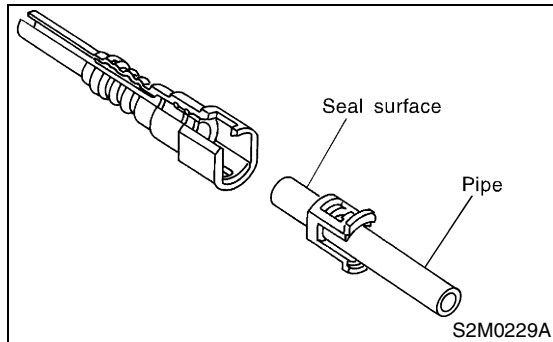
- (A) Connector
- (B) Retainer
- (C) Pipe

B: INSTALLATION

1) Connect the quick connector on fuel delivery line.

NOTE:

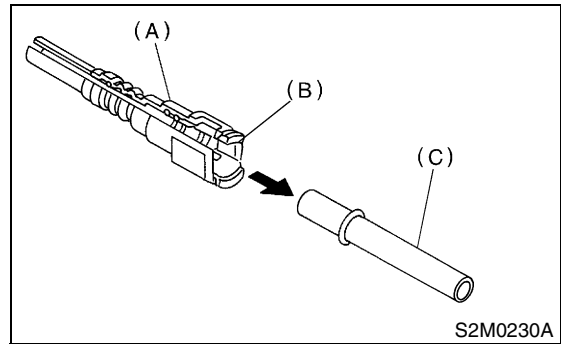
- Always use a new retainer.
- Make sure that the connected portion is not damaged or has dust. If necessary, clean the seal surface of pipe.



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

NOTE:

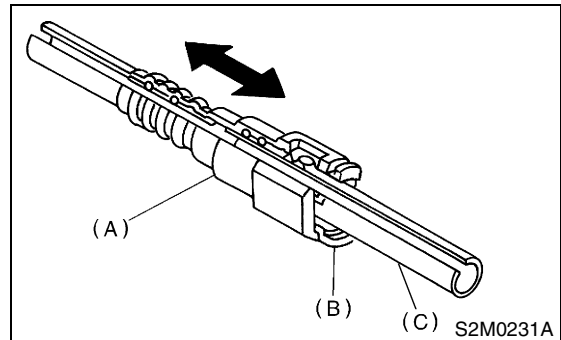
At this time, two clicking sounds are heard.



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

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 the hoses and their connections for any leakage of fuel.



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

FUEL DELIVERY, RETURN AND EVAPORATION LINES

FUEL INJECTION (FUEL SYSTEMS)

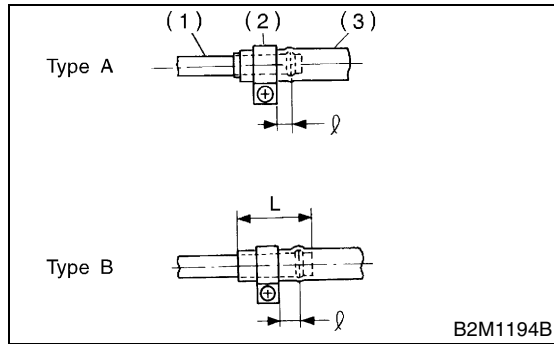
2) Connect the fuel delivery hose to pipe with an overlap of 20 to 25 mm (0.79 to 0.98 in).

Type A: When the fitting length is specified.

Type B: When the fitting length is not specified.

\varnothing : 2.5 ± 1.5 mm (0.098 ± 0.059 in)

L : 22.5 ± 2.5 mm (0.886 ± 0.098 in)



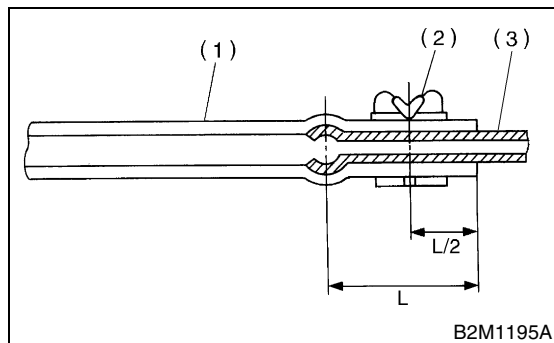
- (1) Fitting
- (2) Clamp
- (3) Hose

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

$L = 17.5 \pm 2.5$ mm (0.689 ± 0.098 in)

CAUTION:

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



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

C: INSPECTION

1) Make sure that there are no cracks on the fuel pipes and fuel hoses.

2) Make sure that the fuel pipe and fuel hose connections are tight.

FUEL SYSTEM TROUBLE IN GENERAL

FUEL INJECTION (FUEL SYSTEMS)

26. Fuel System Trouble in General

A: INSPECTION

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

NOTE:

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

To prevent water condensation.

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

(2) Drain water condensation from the fuel filter.

- Refilling the fuel tank.

Refill the fuel tank while there is still some fuel left in the tank.

- Protecting the fuel system against freezing and water condensation.

(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)

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

EC(w/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 the ground cable from battery.

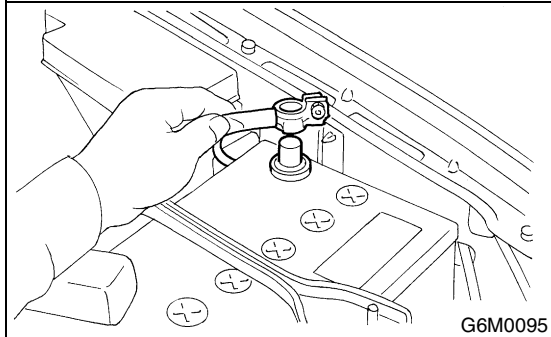
FRONT CATALYTIC CONVERTER

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

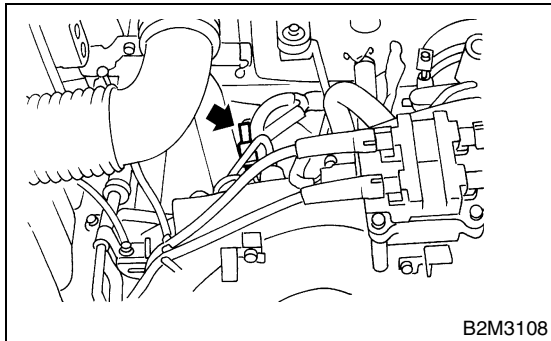
2. Front Catalytic Converter

A: REMOVAL

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

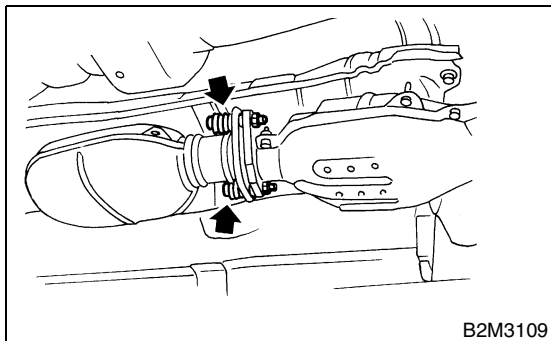


- 3) Disconnect the front oxygen sensor connector.

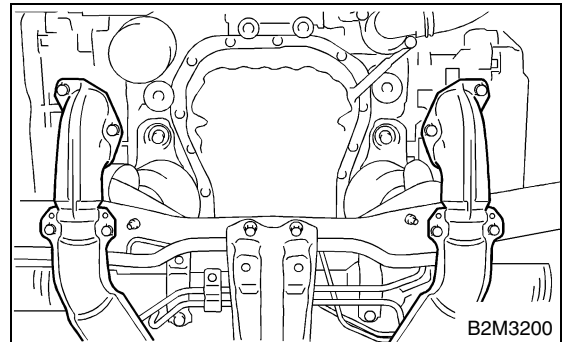


- 4) Lift-up the vehicle.
- 5) Remove the under cover.
- 6) Separate the center exhaust pipe from rear exhaust pipe.

CAUTION:
Be careful, the exhaust pipe is hot.

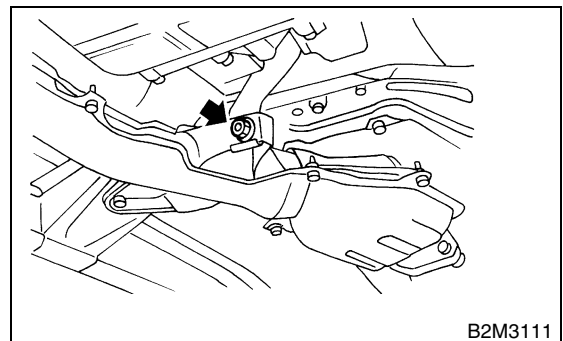


- 7) Remove the nuts which hold front exhaust pipe onto cylinder heads.

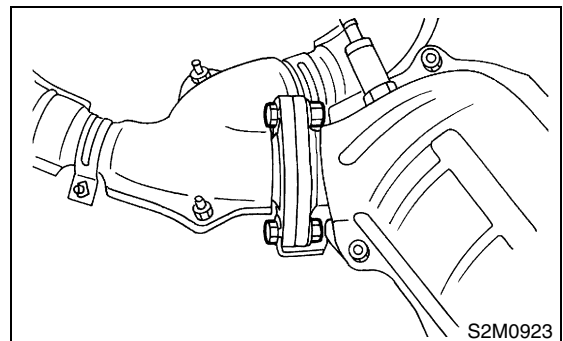


- 8) Remove the front and center exhaust pipe from hanger bracket.

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



- 9) Separate the front catalytic converter from front exhaust pipe.



FRONT CATALYTIC CONVERTER

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

B: INSTALLATION

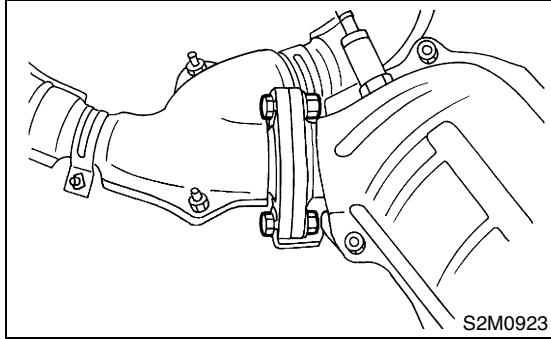
NOTE:

Replace gaskets with new ones.

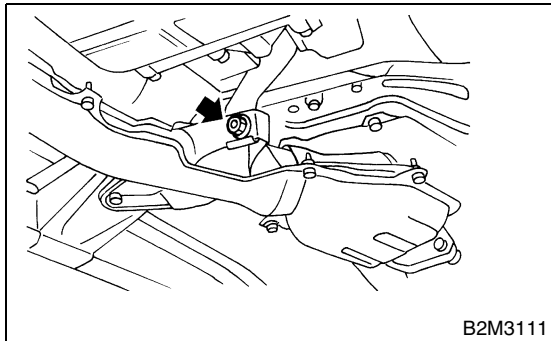
1) Install the front catalytic converter to front exhaust pipe.

Tightening torque:

30 N·m (3.1 kgf·m, 22.4 ft·lb)



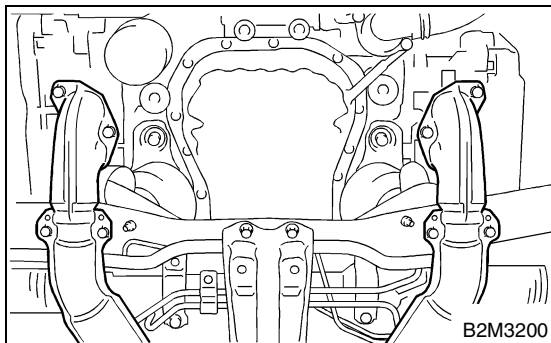
2) Install the front and center exhaust pipe assembly to the vehicle. And temporarily tighten the bolt which installs center exhaust pipe to hanger bracket.



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

Tightening torque:

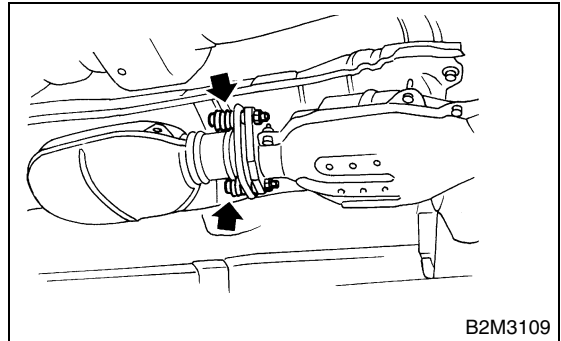
30 N·m (3.1 kgf·m, 22.4 ft·lb)



4) Tighten the bolts which install front and center exhaust pipe assembly to rear exhaust pipe.

Tightening torque:

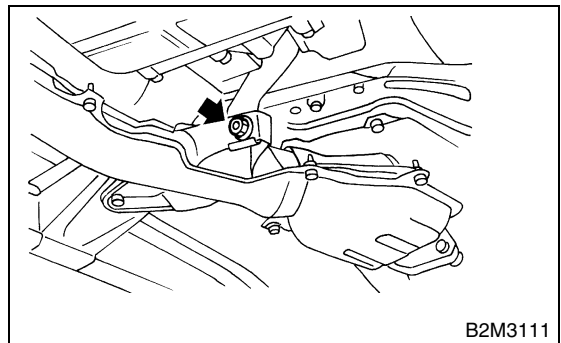
18 N·m (1.8 kgf·m, 13.0 ft·lb)



5) Tighten the bolt which holds front and center exhaust pipe assembly to hanger bracket.

Tightening torque:

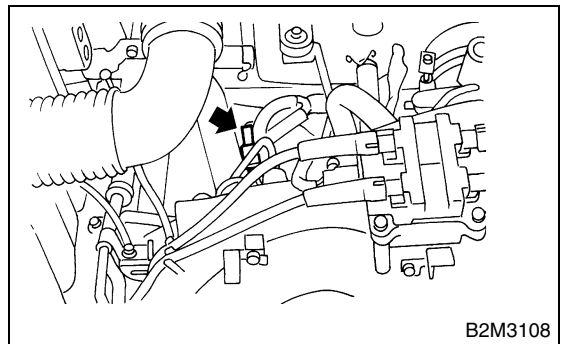
35 N·m (3.6 kgf·m, 26.0 ft·lb)



6) Install the under cover.

7) Lower the vehicle.

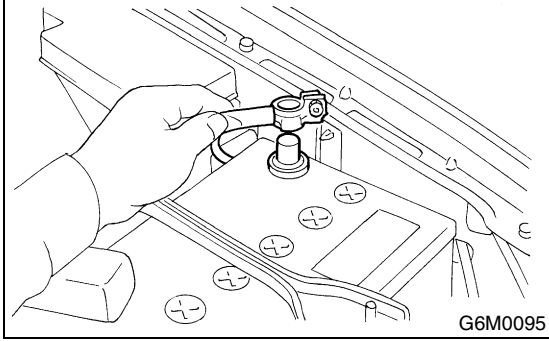
8) Connect the front oxygen sensor connector.



FRONT CATALYTIC CONVERTER

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

9) Connect the battery ground cable to battery.



C: INSPECTION

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

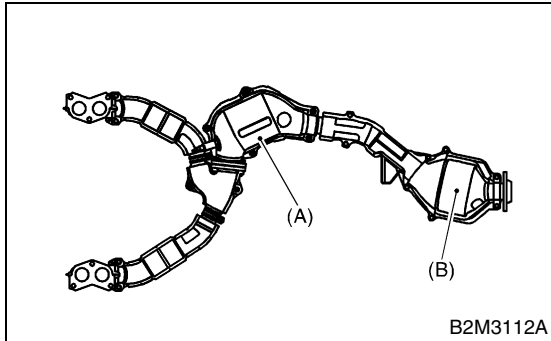
REAR CATALYTIC CONVERTER

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

3. Rear Catalytic Converter

A: REMOVAL

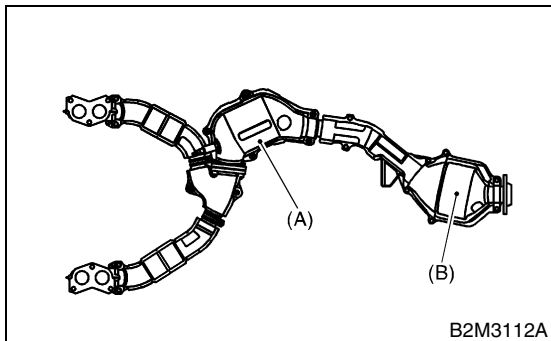
The front and rear catalytic converter and center exhaust pipe are integrated into one unit. Therefore, the removal and installation procedures are the same as the those for the front catalytic converter. <Ref. to EC(w/oOBD)-3, REMOVAL, Front Catalytic Converter.>



- (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(w/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.

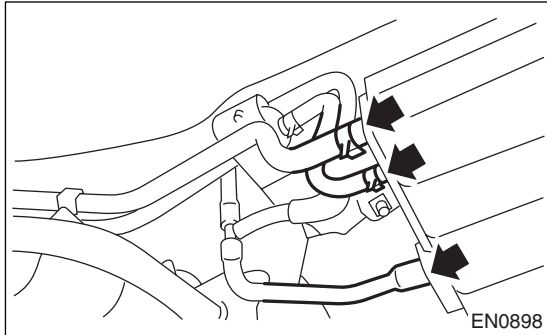
CANISTER

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

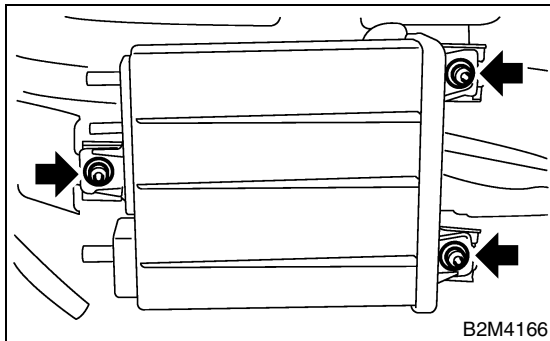
4. Canister

A: REMOVAL

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



- 3) Remove the canister from body.

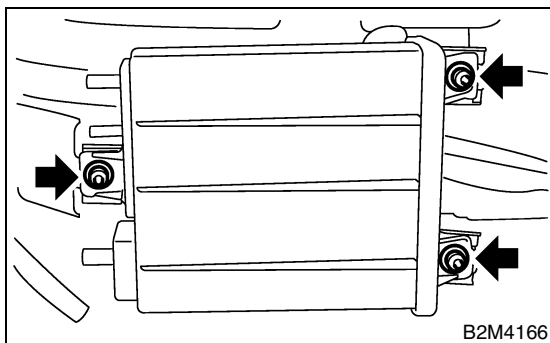


B: INSTALLATION

- 1) Install in the reverse order of removal.

Tightening torque:

23 N·m (2.3 kgf-m, 17 ft-lb)



C: INSPECTION

Make sure the canister and canister hoses are not cracked or loose.

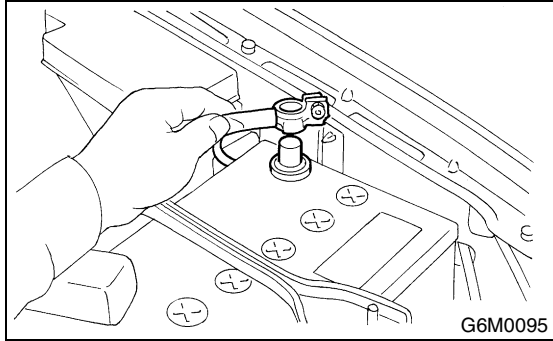
PURGE CONTROL SOLENOID VALVE

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

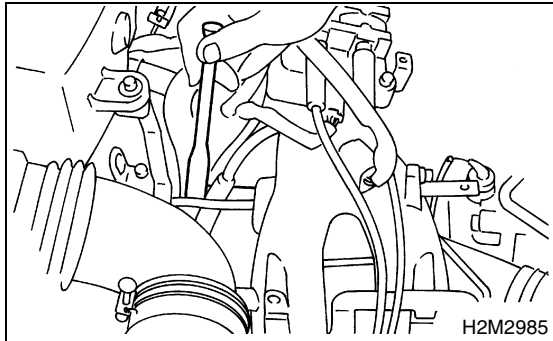
5. Purge Control Solenoid Valve

A: REMOVAL

1) Disconnect the ground cable from battery.

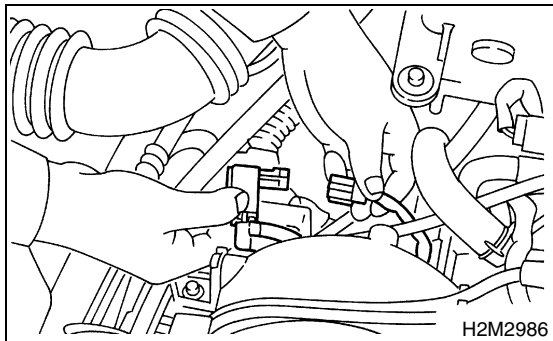


2) Remove the bolt which installs purge control solenoid valve onto intake manifold.



3) Take out the purge control solenoid valve through the bottom of intake manifold.

4) Disconnect the connector and hoses from purge control solenoid valve.

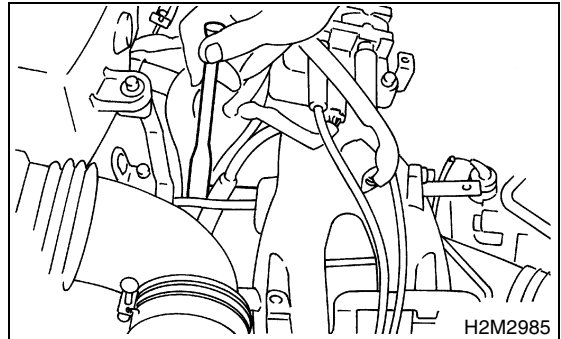


B: INSTALLATION

Install in the reverse order of removal.

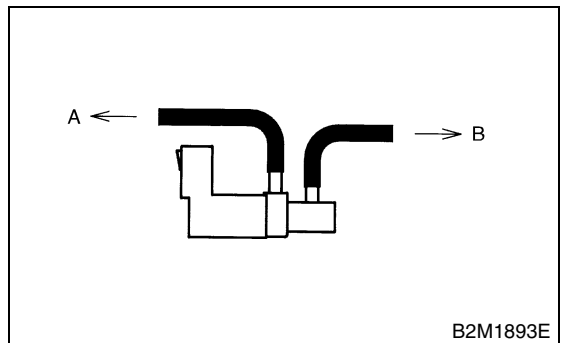
Tightening torque:

16 N·m (1.6 kgf-m, 11.6 ft-lb)



CAUTION:

Carefully connect the evaporation hoses.



A: To fuel pipe

B: To throttle body

C: INSPECTION

Make sure hoses are not cracked or loose.

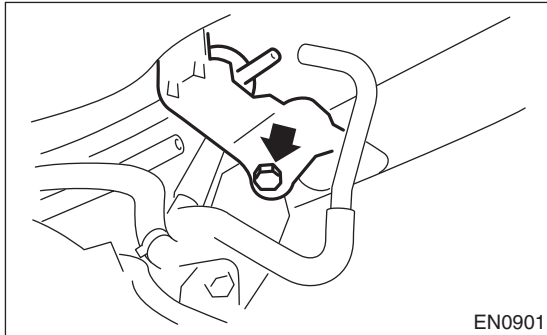
TWO-WAY VALVE

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

6. Two-way Valve

A: REMOVAL

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



- 4) Remove the two-way valve from bracket.

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Make sure that the hoses are not cracked or loose.

TWO-WAY VALVE

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

EXHAUST

EX(w/oOBD)

	Page
1. General Description	2
2. Front Exhaust Pipe.....	9
3. Center Exhaust Pipe	12
4. Rear Exhaust Pipe	13
5. Muffler	14

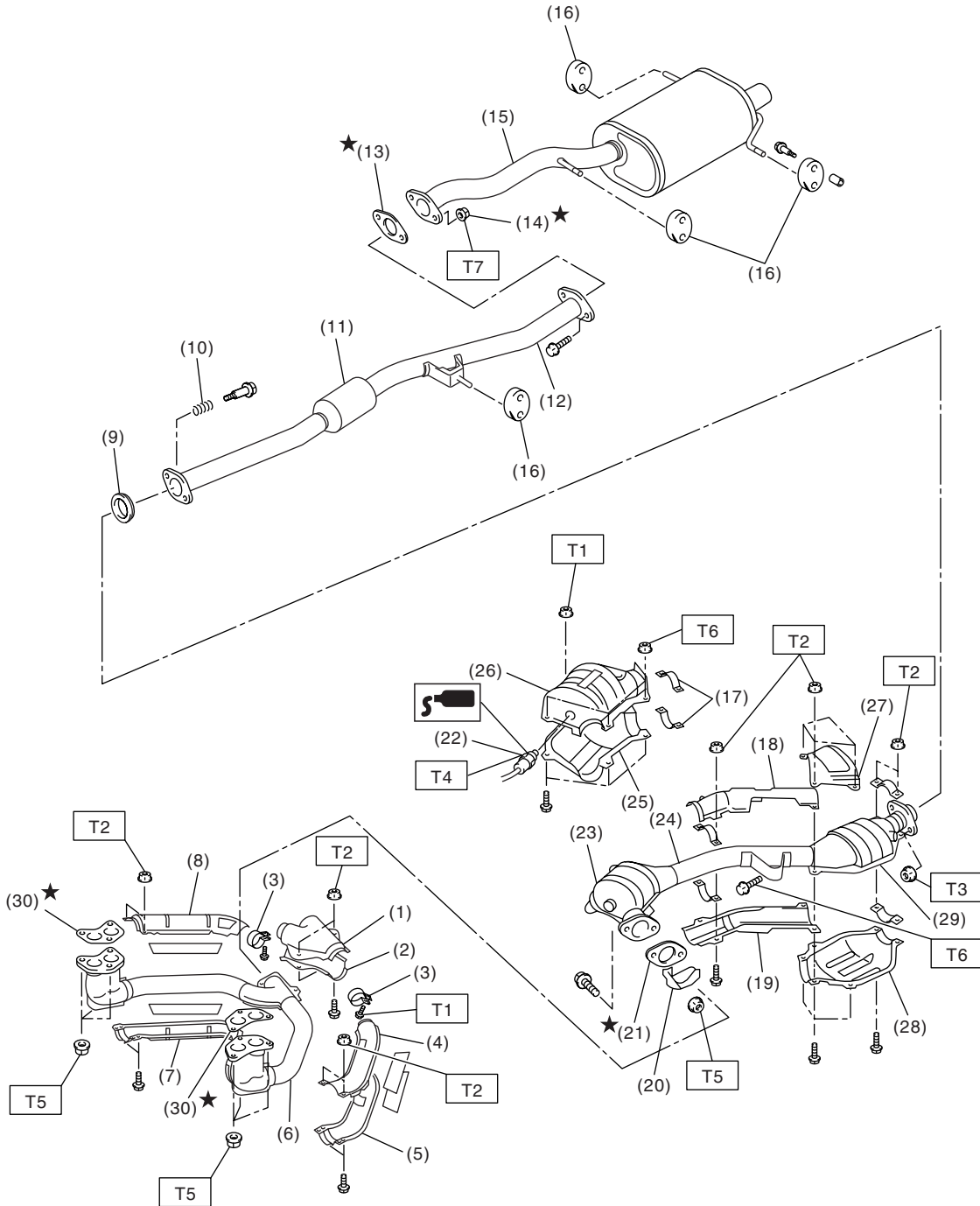
GENERAL DESCRIPTION

EXHAUST

1. General Description

A: COMPONENT

1. WITH CATALYTIC CONVERTER (1600 CC MODEL)



EN1374

GENERAL DESCRIPTION

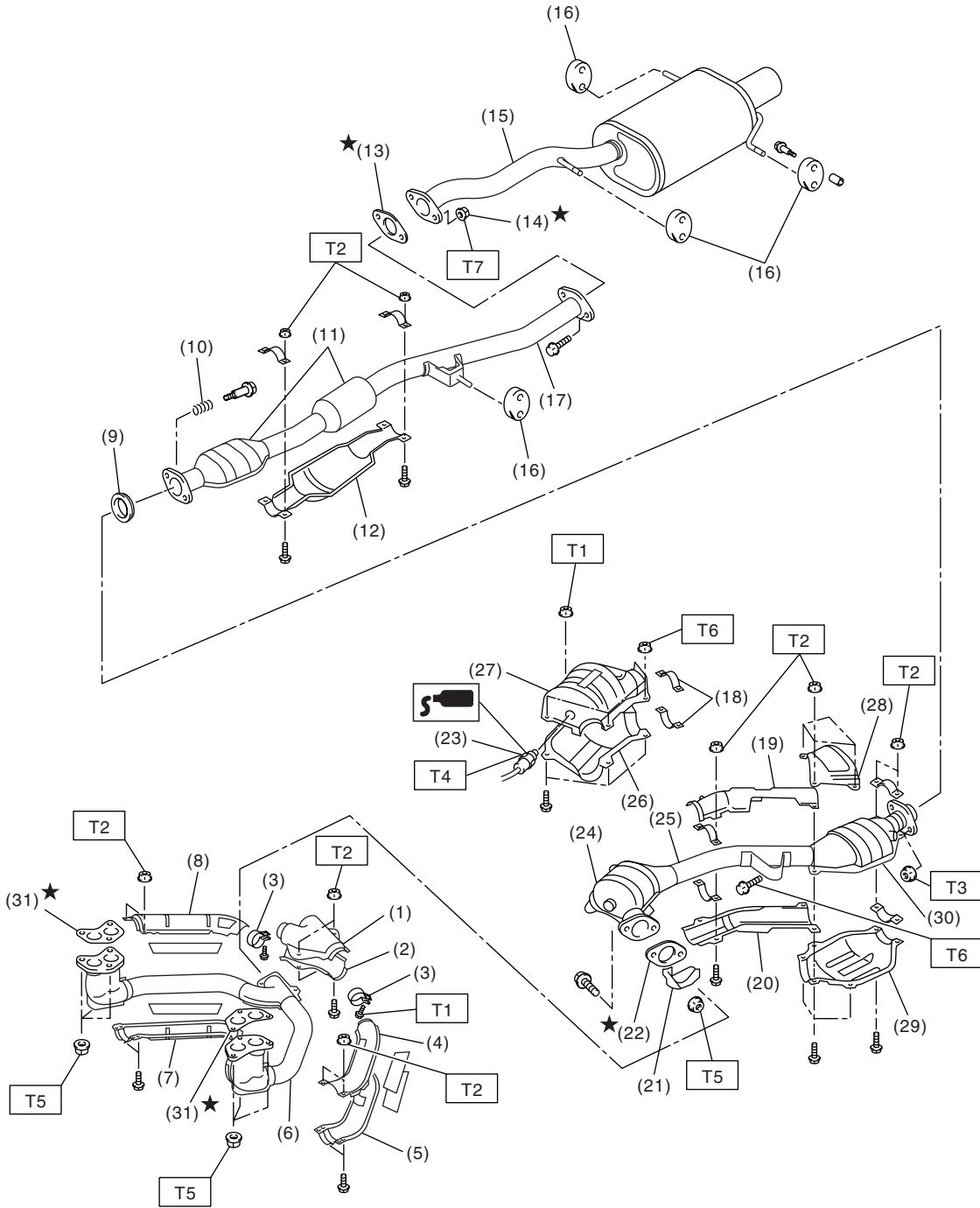
EXHAUST

(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	(30) Gasket
(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	<i>Tightening torque: N·m (kgf·m, ft·lb)</i>
(9) Gasket	(22) Oxygen sensor	<i>T1: 8 (0.8, 5.8)</i>
(10) Spring	(23) Front catalytic converter	<i>T2: 13 (1.3, 9.4)</i>
(11) Chamber	(24) Center exhaust pipe	<i>T3: 18 (1.8, 13.0)</i>
(12) Rear exhaust pipe	(25) Lower front catalytic converter cover	<i>T4: 21 (2.1, 15.2)</i>
(13) Gasket	(26) Upper front catalytic converter cover	<i>T5: 30 (3.1, 22.4)</i>
		<i>T6: 35 (3.6, 26.0)</i>
		<i>T7: 48 (4.9, 35.4)</i>

GENERAL DESCRIPTION

EXHAUST

2. WITH CATALYTIC CONVERTER (2000 CC AND 2500 CC MODEL)



EN1375

GENERAL DESCRIPTION

EXHAUST

(1) Upper front exhaust pipe cover CTR	(15) Muffler	(28) Upper rear catalytic converter cover
(2) Lower front exhaust pipe cover CTR	(16) Cushion rubber	(29) Lower rear catalytic converter cover
(3) Clamp	(17) Rear exhaust pipe	(30) Rear catalytic converter
(4) Upper front exhaust pipe cover LH	(18) Lower clamp	(31) Gasket
(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) Oxygen 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		

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: 21 (2.1, 15.2)

T5: 30 (3.1, 22.4)

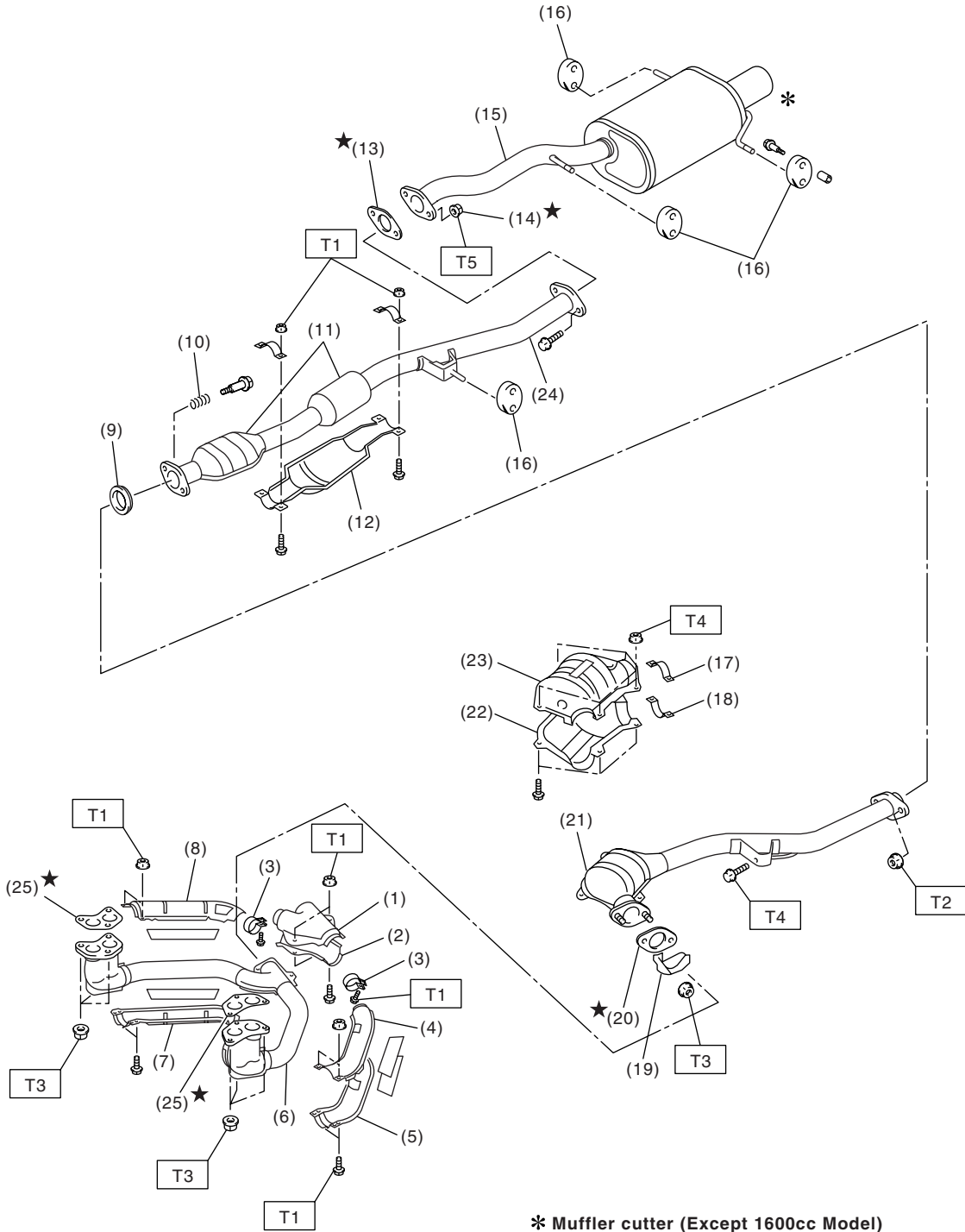
T6: 35 (3.6, 26.0)

T7: 48 (4.9, 35.4)

GENERAL DESCRIPTION

EXHAUST

3. WITHOUT CATALYTIC CONVERTER



EN1376

GENERAL DESCRIPTION

EXHAUST

(1) Upper front exhaust pipe cover CTR	(11) Chamber	(23) Upper center exhaust pipe cover
(2) Lower front exhaust pipe cover CTR	(12) Rear exhaust pipe cover	(24) Rear exhaust pipe
(3) Clamp	(13) Gasket	(25) Gasket
(4) Upper front exhaust pipe cover LH	(14) Self-locking nut	
(5) Lower front exhaust pipe cover LH	(15) Muffler	<hr/> Tightening torque: N·m (kgf·m, ft·lb)
(6) Front exhaust pipe	(16) Cushion rubber	T1: 13 (1.3, 9.4)
(7) Lower front exhaust pipe cover RH	(17) Upper clamp	T2: 18 (1.8, 13.0)
(8) Upper front exhaust pipe cover RH	(18) Lower clamp	T3: 30 (3.1, 22.4)
(9) Gasket	(19) Protector	T4: 35 (3.6, 26.0)
(10) Spring	(20) Gasket	T5: 48 (4.9, 35.4)
	(21) Center exhaust pipe	<hr/>
	(22) Lower center exhaust pipe cover	

GENERAL DESCRIPTION

EXHAUST

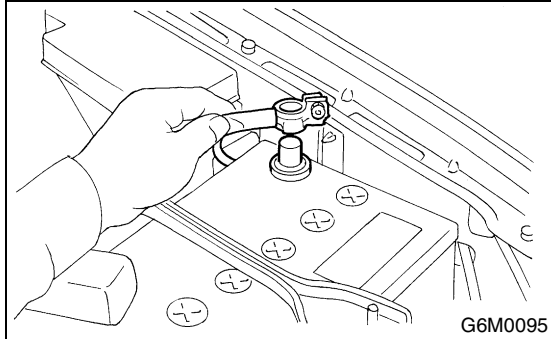
B: CAUTION

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn your hands, because each part on the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.

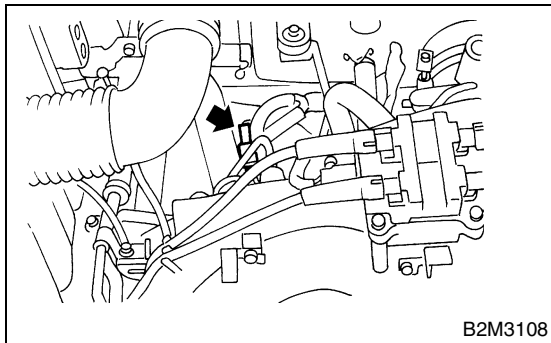
2. Front Exhaust Pipe

A: REMOVAL

1) Disconnect the ground cable from battery.



2) Disconnect the oxygen sensor connector. (With catalytic converter)

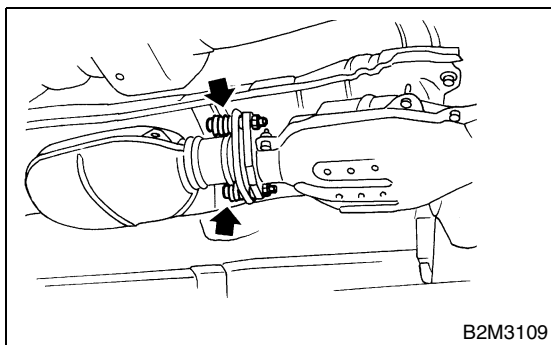


3) Lift-up the vehicle.

4) Separate the front and center exhaust pipe assembly from rear exhaust pipe.

WARNING:

Be careful, the exhaust pipe is hot.

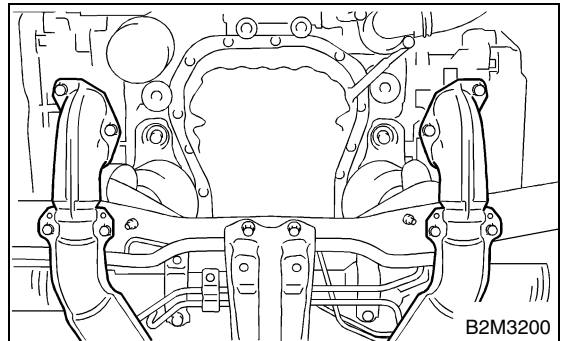


5) Remove the under cover.

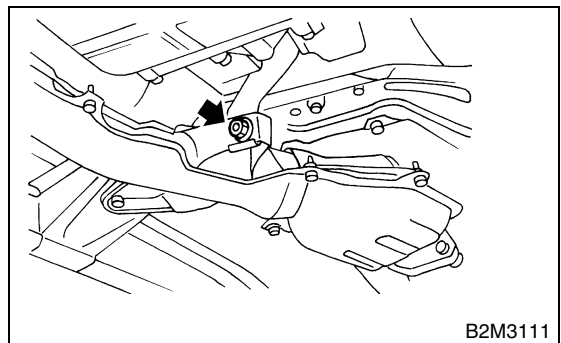
6) Remove the nuts which hold front exhaust pipe onto cylinder heads.

CAUTION:

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



7) Remove the bolt which installs front and center exhaust pipe assembly to hanger bracket.



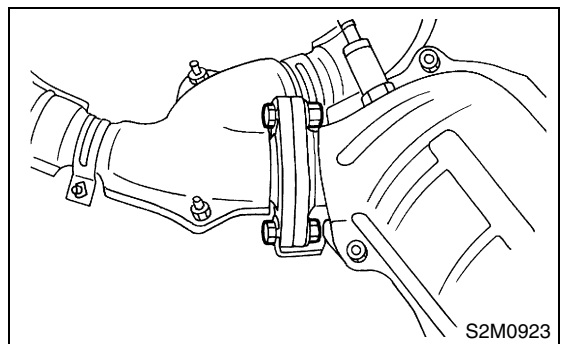
8) Remove the front and center exhaust pipe assembly from vehicle.

CAUTION:

• **Be careful not to let the front and center exhaust pipe assembly fall off when removing as it is quite heavy.**

• **After removing the front and center exhaust pipe assembly, do not apply excessive pulling force on the rear exhaust pipe.**

9) Separate the front exhaust pipe from center exhaust pipe.



10) Remove the oxygen sensor. (With catalytic converter) <Ref. to FU(w/oOBD)-46, REMOVAL, Oxygen Sensor.>

FRONT EXHAUST PIPE

EXHAUST

B: INSTALLATION

1) Install the oxygen sensor. (With catalytic converter) <Ref. to FU(w/oOBD)-46, INSTALLATION, Oxygen Sensor.>

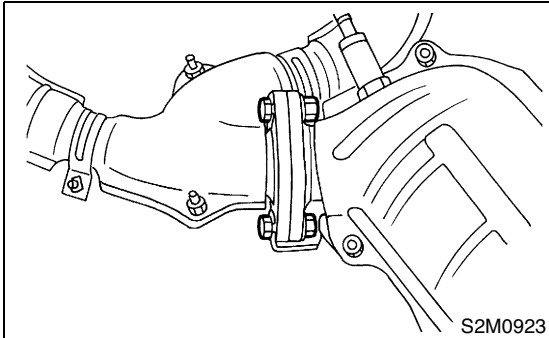
2) Install the front exhaust pipe to center exhaust pipe.

NOTE:

Replace the gaskets with new ones.

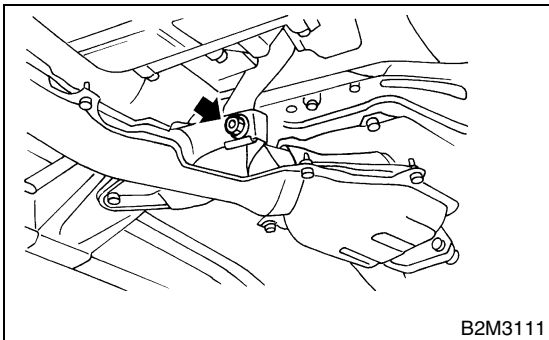
Tightening torque:

30 N·m (3.1 kgf·m, 22.4 ft·lb)



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

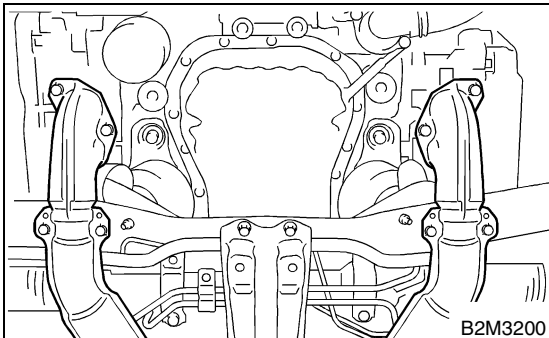
4) Temporarily tighten the bolt which installs front and center exhaust pipe assembly to hanger bracket.



5) Tighten the nuts which hold front exhaust pipe onto cylinder heads.

Tightening torque:

30 N·m (3.1 kgf·m, 22.4 ft·lb)

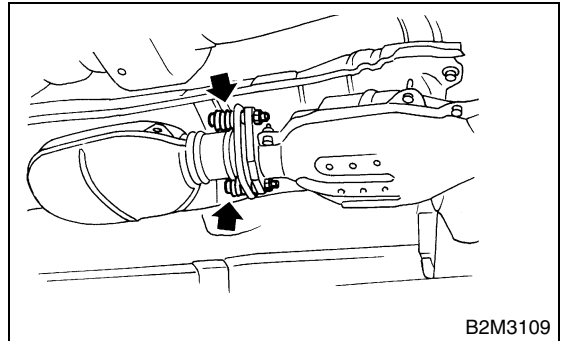


6) Install the under cover.

7) Tighten the bolts which install front and center exhaust pipe assembly to rear exhaust pipe.

Tightening torque:

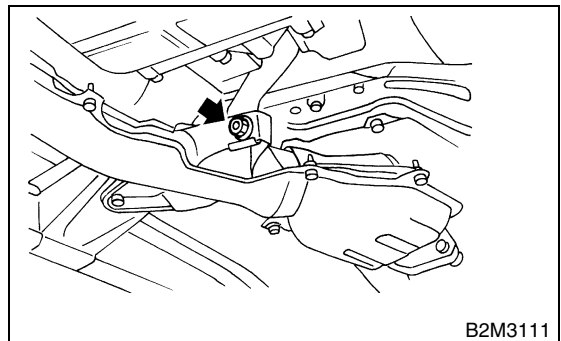
18 N·m (1.8 kgf·m, 13.0 ft·lb)



8) Tighten the bolt which holds front and center exhaust pipe assembly to hanger bracket.

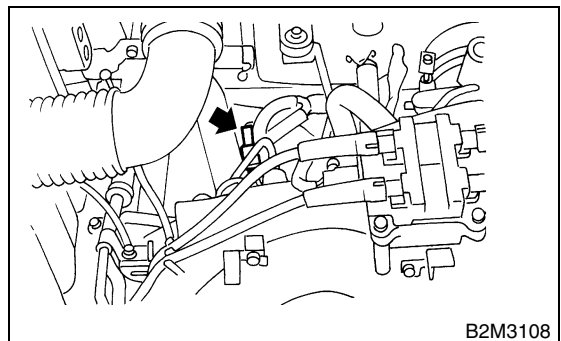
Tightening torque:

35 N·m (3.6 kgf·m, 26.0 ft·lb)

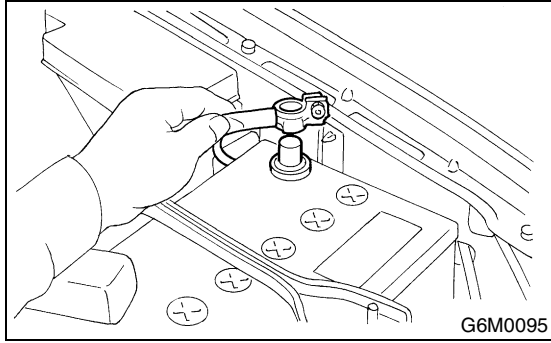


9) Lower the vehicle.

10) Connect the oxygen sensor connector. (With catalytic converter)



11) Connect the battery ground cable to battery.



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(w/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(w/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.

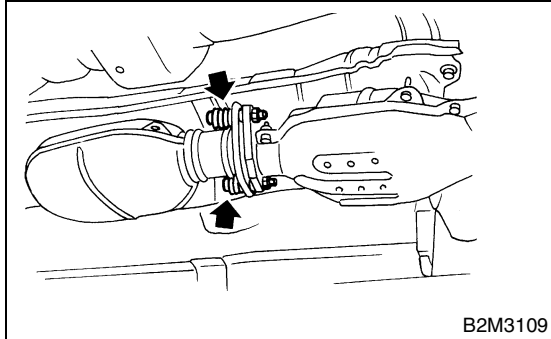
4. Rear Exhaust Pipe

A: REMOVAL

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

CAUTION:

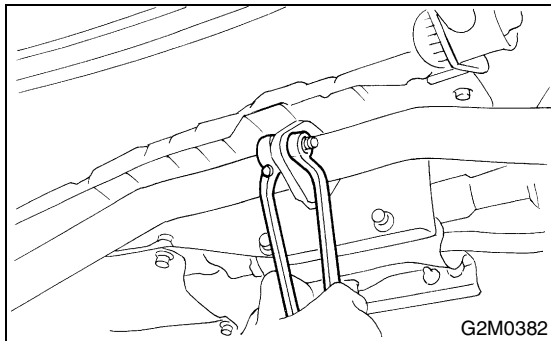
Be careful, the exhaust pipe is hot.



2) Separate the rear exhaust pipe from muffler.

CAUTION:

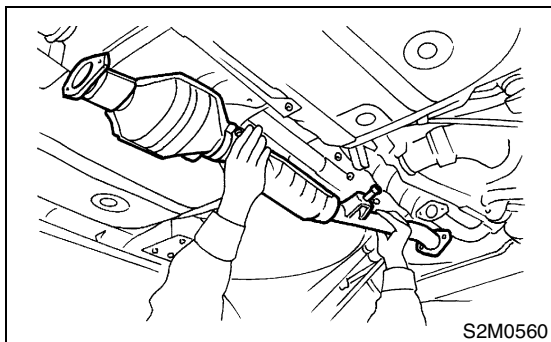
Be careful not to pull down the rear exhaust pipe.



3) Apply a coat of SUBARU CRC to mating area of the cushion rubbers in advance.

SUBARU CRC (Part No. 004301003)

4) Remove the rear exhaust pipe bracket from the cushion rubber.

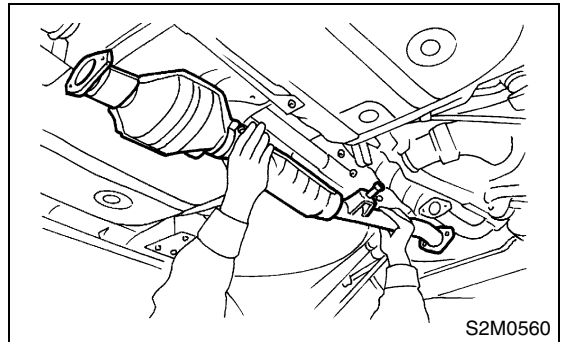


B: INSTALLATION

1) Apply a coat of SUBARU CRC to mating area of the cushion rubbers in advance.

SUBARU CRC (Part No. 004301003)

2) Install the rear exhaust pipe bracket to cushion rubber.



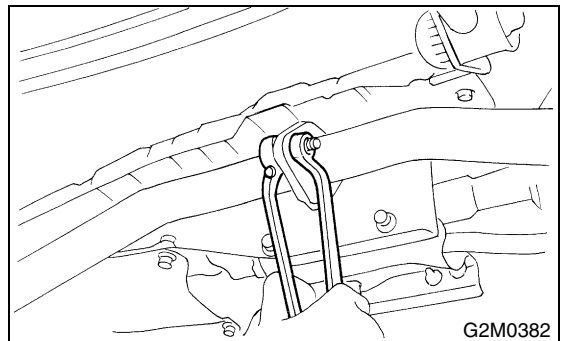
NOTE:

Replace the gaskets with new ones.

3) Install the rear exhaust pipe to muffler.

Tightening torque:

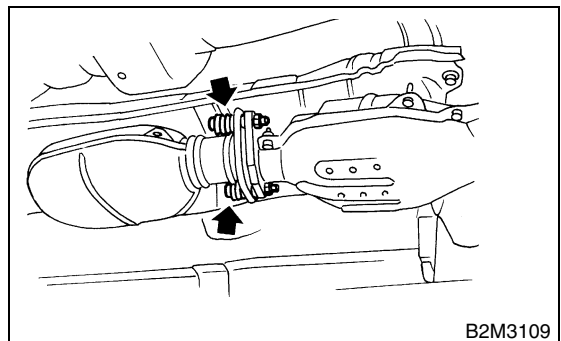
48 N·m (4.9 kgf·m, 35.4 ft·lb)



4) Install the 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.

MUFFLER

EXHAUST

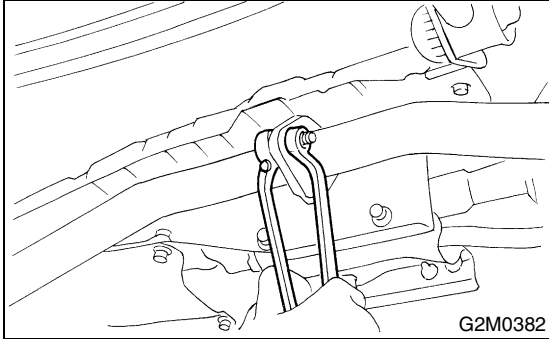
5. Muffler

A: REMOVAL

1) Separate the muffler from rear exhaust pipe.

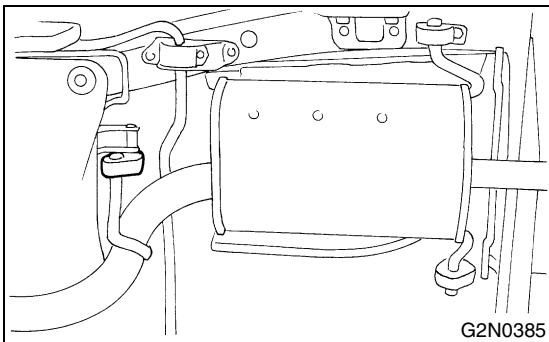
CAUTION:

Be careful, the exhaust pipe is hot.



2) Apply a coat of SUBARU CRC to mating area of the cushion rubbers in advance.

SUBARU CRC (Part No. 004301003)



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

B: INSTALLATION

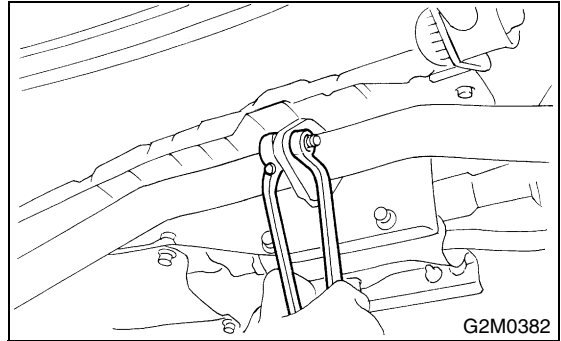
1) Install in the reverse order of removal.

NOTE:

Replace the gasket with a new one.

Tightening torque:

48 N·m (4.9 kgf-m, 35.4 ft-lb)



C: INSPECTION

1) Make sure there are no exhaust leaks from connections and welds.

2) Make sure there are no holes or rusting.

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

IGNITION

IG(w/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

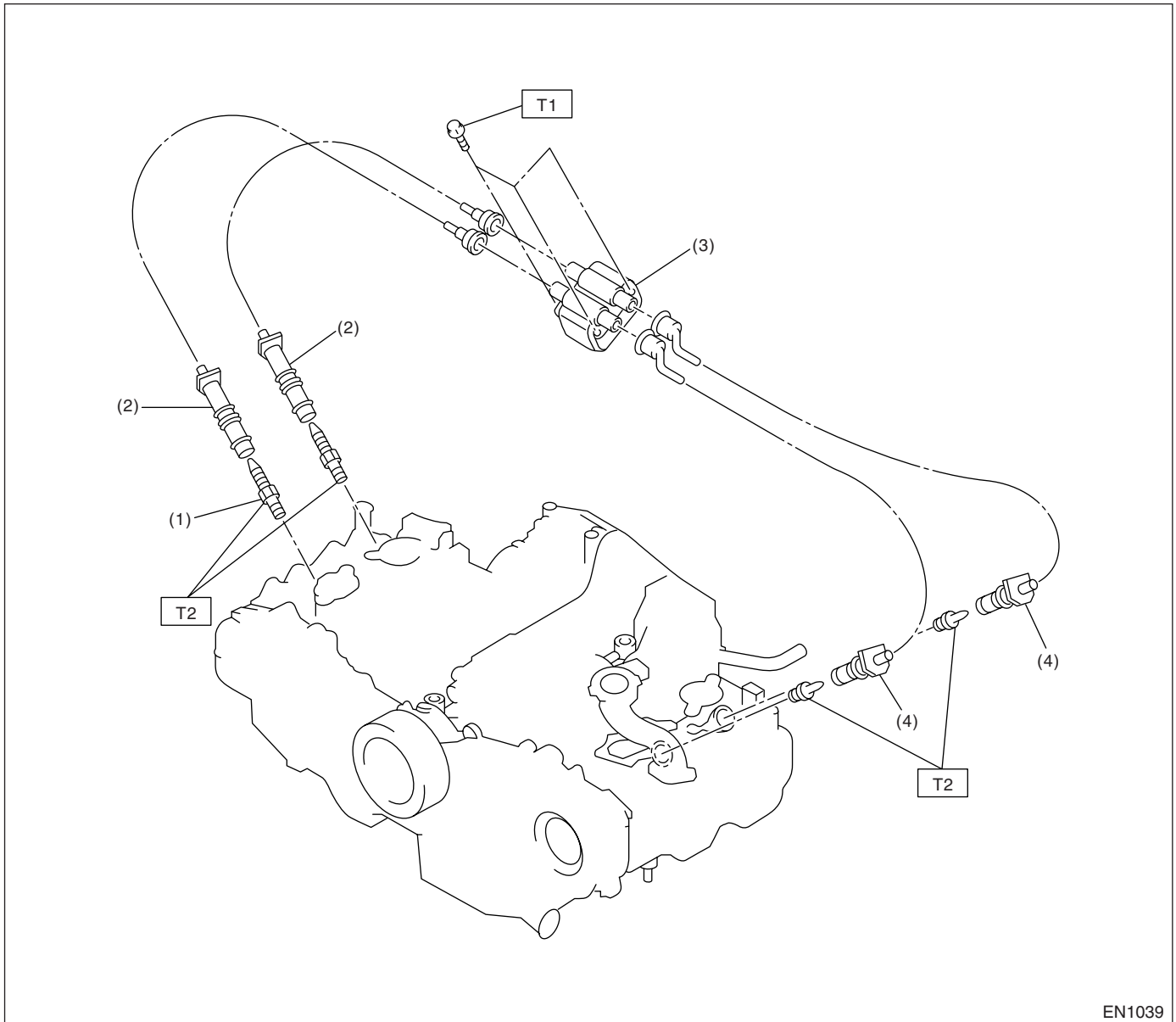
Item		Designation	
Ignition coil and ignitor assembly	Model	1600 cc	CM12—100C
		2000 cc and 2500 cc	FH0137
	Manufacturer	1600 cc	HITACHI
		2000 cc and 2500 cc	DIAMOND
	Primary coil resistance	1600 cc	0.7 Ω ±10%
		2000 cc and 2500 cc	0.73 Ω ±10%
	Secondary coil resistance	1600 cc	13.0 k Ω ±20%
2000 cc and 2500 cc		12.8 k Ω ±15%	
Insulation resistance between primary terminal and case		More than 100 M Ω	
Spark plug	Type and manufacturer	1600 cc	NGK: BKR6E* CHAMPION: RC8YC4** NGK: BKR6E-11** (Alternate)
		2000 cc and 2500 cc	NGK: BKR6E* CHAMPION: RC10YC4** NGK: BKR5E-11** (Alternate)
	Thread size	mm	14, P = 1.25
	Spark gap	mm (in)	0.7 — 0.8 (0.028 — 0.031)* 1.0 — 1.1 (0.039 — 0.043)**

*: Without catalytic converter

** : With catalytic converter

B: COMPONENT

1. 1600 CC 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)

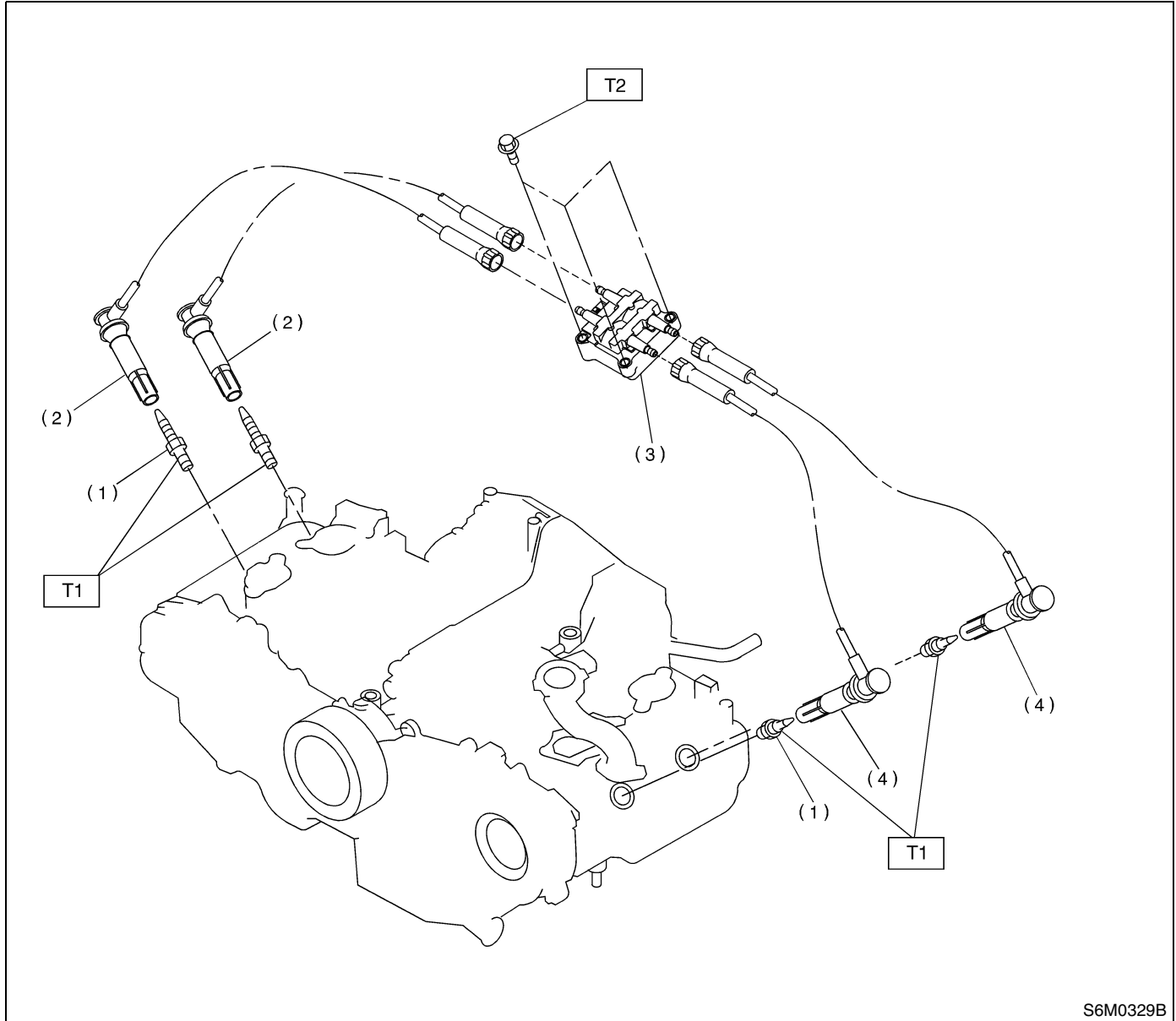
T1: 6.4 (0.65, 4.7)

T2: 21 (2.1, 15.2)

GENERAL DESCRIPTION

IGNITION

2. 2000 CC AND 2500 CC 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: 21 (2.1, 15.2)

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 the ground cable from battery.

2. Spark Plug

A: REMOVAL

CAUTION:

All spark plugs installed on an engine, must be of the same heat range.

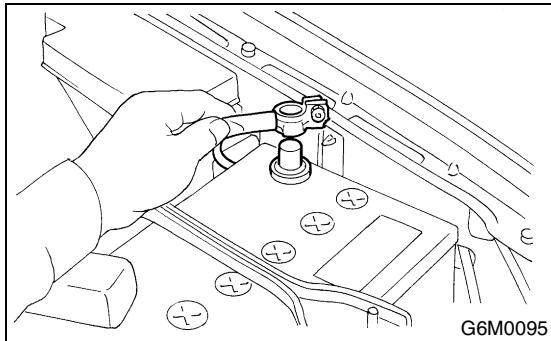
Spark plug	
1600 cc	NGK: BKR6E* CHAMPION: RC8YC4** NGK: BKR6E-11** (Alternate)
2000 cc and 2500 cc	NGK: BKR6E* CHAMPION: RC10YC4** NGK: BKR6E-11** (Alternate)

*: Without catalytic converter

** : With catalytic converter

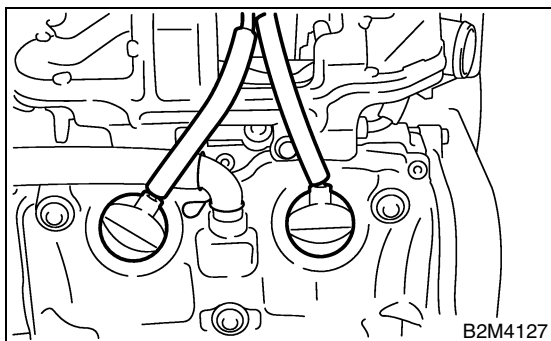
1. RH SIDE

- 1) Disconnect the ground cable from battery.

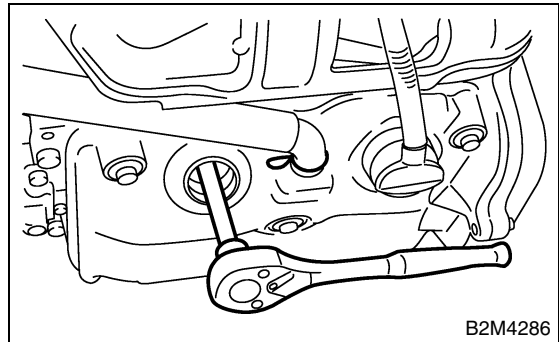


- 2) Remove the resonator chamber. <Ref. to IN-8, REMOVAL, Resonator Chamber.>

- 3) Remove the spark plug cords by pulling boot, not the cord itself.

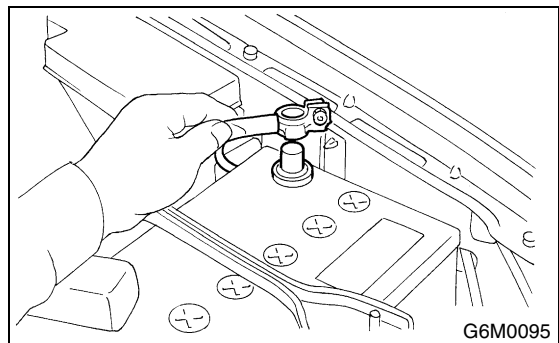


- 4) Remove the spark plugs with the spark plug sockets.

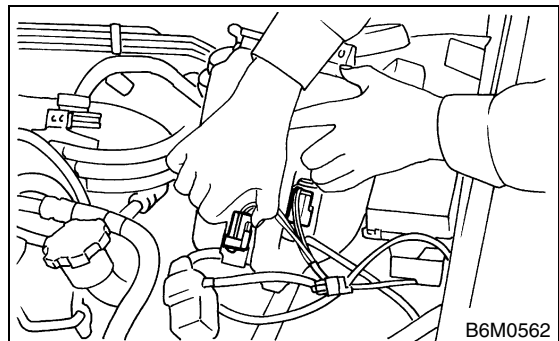


2. LH SIDE

- 1) Disconnect the ground cable from battery.

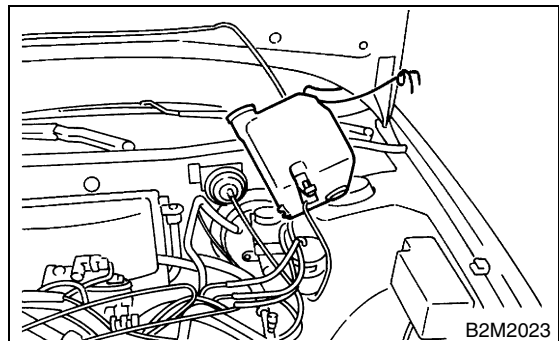


- 2) Disconnect the washer motor connector.



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

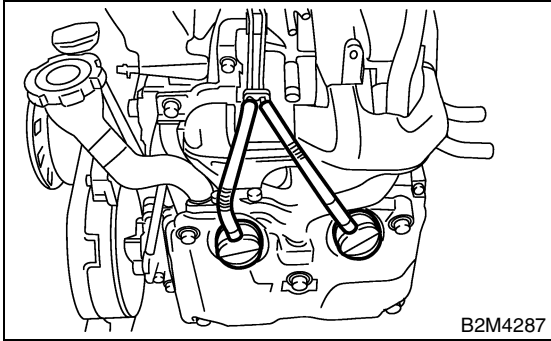
- 4) Remove the two bolts which hold washer tank, then take the tank away from working area.



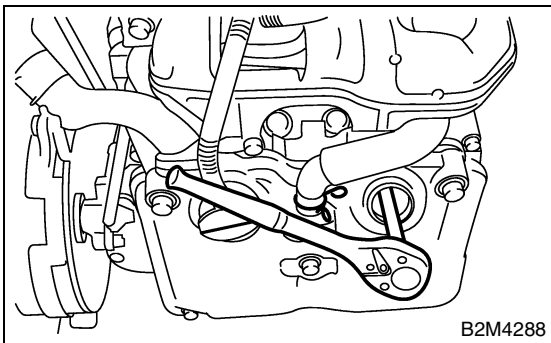
SPARK PLUG

IGNITION

5) Remove the spark plug cords by pulling boot, not the cord itself.



6) Remove the spark plugs with spark plug sockets.



B: INSTALLATION

1. RH SIDE

1) Install in the reverse order of removal.

Tightening torque (Spark plug):
21 N-m (2.1 kgf-m, 15.2 ft-lb)

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 approx. 1/3 of the specified torque in order to avoid over-stressing.

2. LH SIDE

1) Install in the reverse order of removal.

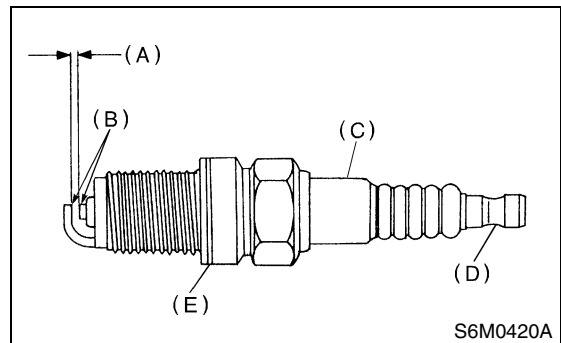
Tightening torque (Spark plug):
21 N-m (2.1 kgf-m, 15.2 ft-lb)

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 approx. 1/3 of the specified torque in order to avoid over-stressing.

C: INSPECTION

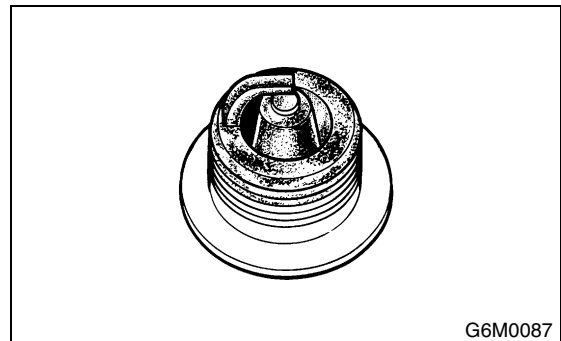
Check the electrodes and inner and outer porcelain of plugs, noting the type of deposits and the degree of electrode erosion.



- (A) Electrode gap
- (B) Carbon accumulation or wear
- (C) Cracks
- (D) Damage
- (E) Damaged gasket

1) Normal:

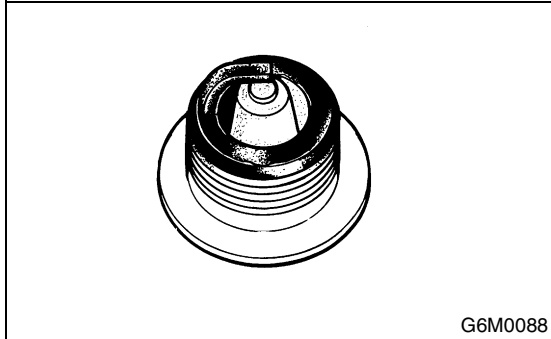
Brown to grayish-tan deposits and slight electrode wear indicates correct spark plug heat range.



2) Carbon fouled:

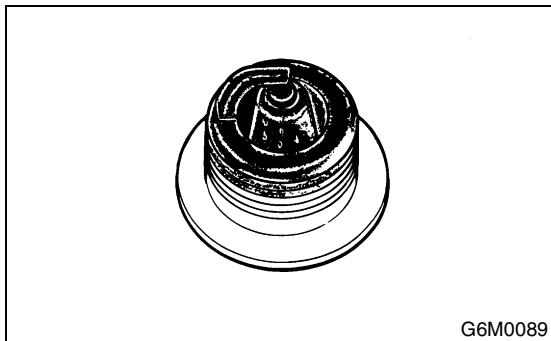
Dry fluffy carbon deposits on insulator and electrode are mostly caused by slow speed driving in city, weak ignition, too rich fuel mixture, dirty air cleaner, etc.

It is advisable to replace with plugs having hotter heat range.



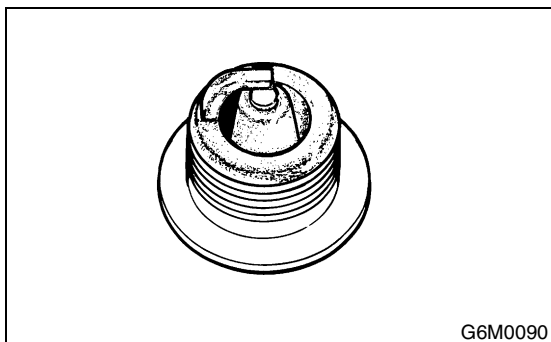
3) Oil fouled:

Wet black deposits show excessive oil entrance into combustion chamber through worn rings and pistons or excessive clearance between valve guides and stems. If the same condition remains after repair, use a hotter plug.



4) Overheating:

White or light gray insulator with black or gray brown spots and bluish burnt electrodes indicates engine overheating. Moreover, the appearance results from incorrect ignition timing, loose spark plugs, wrong selection of fuel, hotter range plug, etc. It is advisable to replace with plugs having colder heat range.



D: CLEANING

Clean the spark plugs in a sand blast type cleaner. Avoid excessive blasting. Clean and remove the carbon or oxide deposits, but do not wear away porcelain.

If deposits are too stubborn, replace the plugs.

E: ADJUSTMENT

Correct it if the spark plug gap is measured with a gap gauge, and it is necessary.

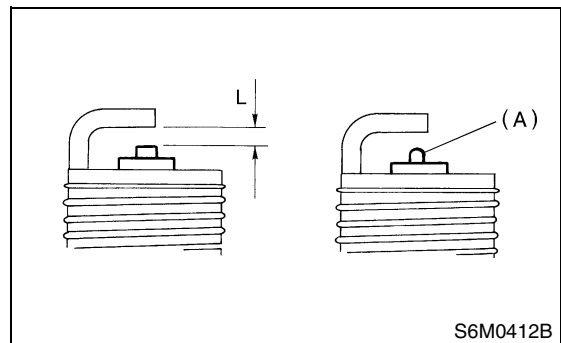
Spark plug gap: L

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 a new spark plug if this area (A) is worn to "ball" shape.

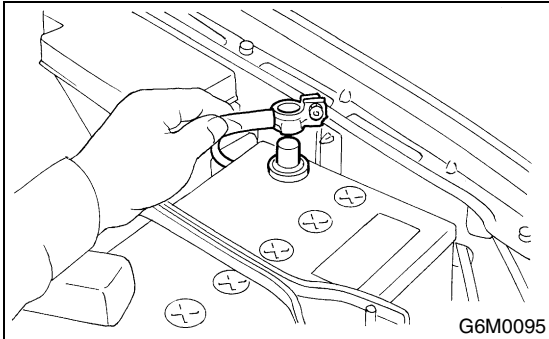
IGNITION COIL AND IGNITOR ASSEMBLY

IGNITION

3. Ignition Coil and Ignitor Assembly

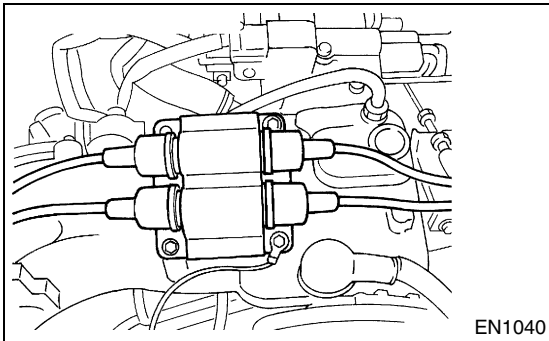
A: REMOVAL

1) Disconnect the ground cable from battery.

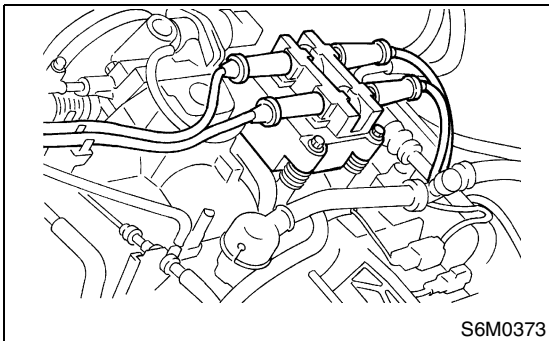


2) Disconnect the spark plug cords from ignition coil and ignitor assembly.

- 1600 cc MODEL



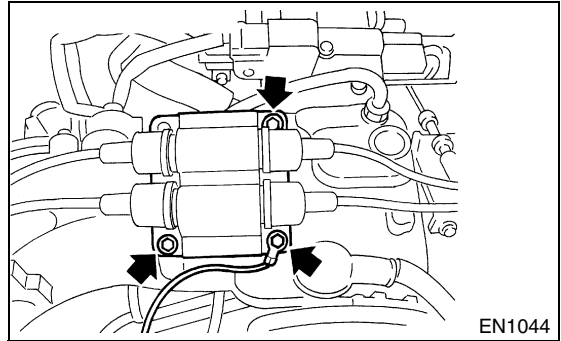
- 2000 cc and 2500 cc MODEL



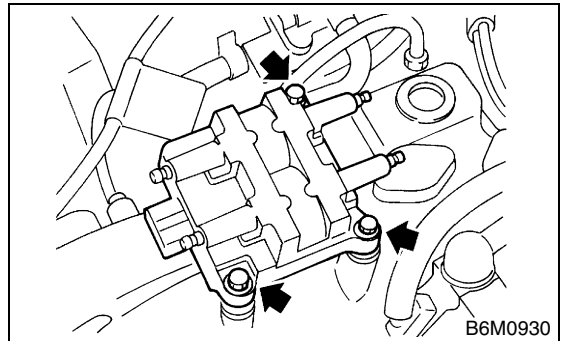
3) Disconnect the connector from ignition coil and ignitor assembly.

4) Remove the ignition coil and ignitor assembly.

- 1600 cc MODEL



- 2000 cc and 2500 cc MODEL



B: INSTALLATION

1) Install in the reverse order of removal.

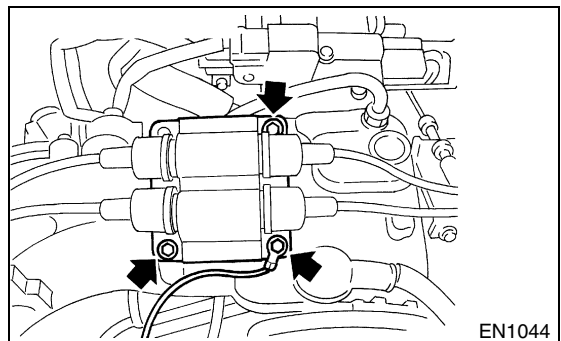
Tightening torque:

6.4 N·m (0.65 kgf·m, 4.7 ft·lb)

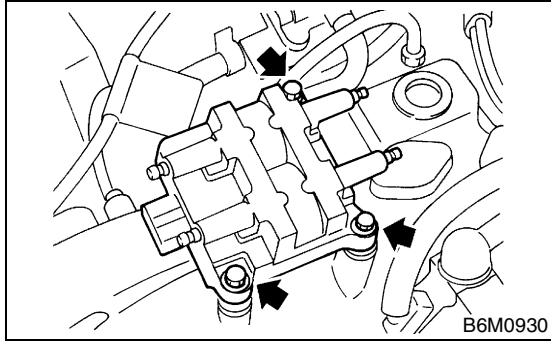
CAUTION:

Be sure to connect the wires to their proper positions. Failure to do so will damage the unit.

- 1600 cc MODEL



- 2000 cc and 2500 cc MODEL



C: INSPECTION

Using the 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:(1600 cc)

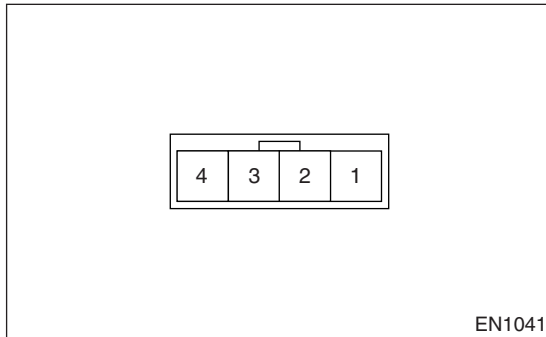
[Primary side]

Between terminal No. 1 and No. 4

0.7 Ω ±10%

Between terminal No. 1 and No. 2

0.7 Ω ±10%



Specified resistance:(2000 cc and 2500 cc)

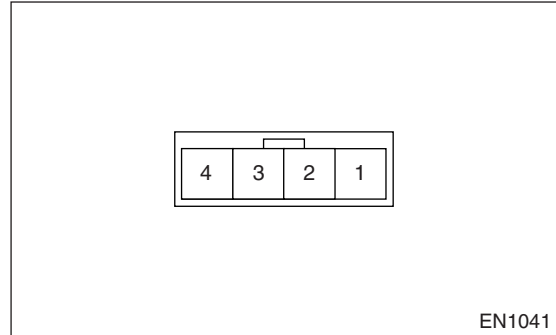
[Primary side]

Between terminal No. 1 and No. 2

0.73 Ω ±10%

Between terminal No. 2 and No. 4

0.73 Ω ±10%



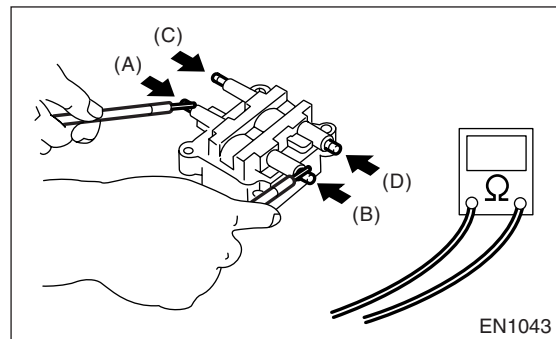
[Secondary side]

Between (A) and (B)

12.8 k Ω ±15%

Between (C) and (D)

12.8 k Ω ±15%



- 3) Insulation between primary terminal and case: 100 M Ω or more.

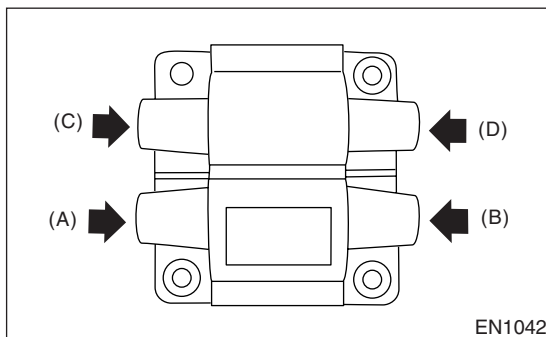
[Secondary side]

Between (A) and (B)

13.0 k Ω ±20%

Between (C) and (D)

13.0 k Ω ±20%



4. Spark Plug Cord

A: INSPECTION

Check for:

- 1) Damage to cords, deformation, burning or rust formation of terminals
- 2) Resistance values of cords

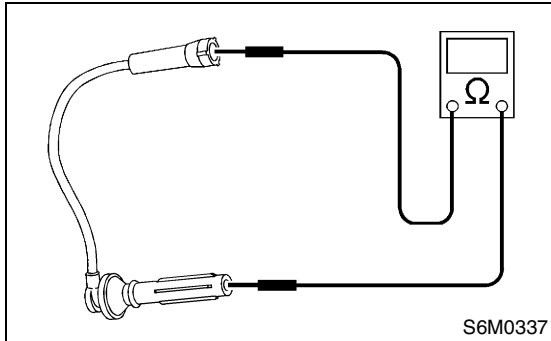
Resistance value:

#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 (DIAGNOSTICS)

EN(w/oOBD)

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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 trouble occurred using the interview check list. <Ref. to EN(w/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(w/oOBD)-42, Diagnostics for Engine Starting Failure.>
2 CHECK ILLUMINATION OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL). <Ref. to EN(w/oOBD)-32, ACTIVATION OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL), Engine Malfunction Indicator Lamp (MIL).>	Does the MIL illuminate?	Go to step 3.	Inspection using "General Diagnostic Table". <Ref. to EN(w/oOBD)-110, INSPECTION, General Diagnostic Table.>
3 CHECK INDICATION OF DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY. 1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor to data link connector. 3) Turn the ignition switch to ON and the Subaru Select Monitor switch to ON. 4) Read any DTC on Subaru Select Monitor. <Ref. to EN(w/oOBD)-26, WITH SUBARU SELECT MONITOR, OPERATION, Read Diagnostic Trouble Code (DTC).>	Does the Subaru Select Monitor indicate DTC? <Ref. to EN(w/oOBD)-63, LIST, List of Diagnostic Trouble Code (DTC).>	Record the DTC. Repair the trouble cause. <Ref. to EN(w/oOBD)-66, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> Go to step 4.	Repair the related parts. NOTE: If a DTC is not shown on display although MIL illuminates, perform diagnostics of MIL (CHECK ENGINE malfunction indicator lamp) circuit or combination meter. <Ref. to EN(w/oOBD)-32, Engine Malfunction Indicator Lamp (MIL).>
4 PERFORM THE DIAGNOSIS. 1) Perform the clear memory mode. <Ref. to EN(w/oOBD)-30, OPERATION, Clear Memory Mode.> 2) Perform the inspection mode. <Ref. to EN(w/oOBD)-28, OPERATION, Inspection Mode.>	Does the Subaru Select Monitor indicate DTC? <Ref. to EN(w/oOBD)-63, LIST, List of Diagnostic Trouble Code (DTC).>	Record the DTC. Repair the trouble cause. <Ref. to EN(w/oOBD)-66, 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 trouble occurred using interview check list. <Ref. to EN(w/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(w/oOBD)-42, Diagnostics for Engine Starting Failure.>
2 CHECK ILLUMINATION OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL). <Ref. to EN(w/oOBD)-32, ACTIVATION OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL), Engine Malfunction Indicator Lamp (MIL).>	Does the MIL illuminate?	Go to step 3.	Inspection using "General Diagnostic Table". <Ref. to EN(w/oOBD)-110, INSPECTION, General Diagnostic Table.>
3 CHECK INDICATION OF DIAGNOSTIC TROUBLE CODE (DTC) ON MIL. 1)Perform the read DTC (read memory mode).<Ref. to EN(w/oOBD)-26, WITHOUT SUBARU SELECT MONITOR, OPERATION, Read Diagnostic Trouble Code (DTC).> 2)Read any DTC on MIL.	Does the MIL indicate DTC? <Ref. to EN(w/oOBD)-63, LIST, List of Diagnostic Trouble Code (DTC).>	Repair the trouble cause. Go to step 4.	Repair the related parts. NOTE: If the DTC is not shown on MIL although MIL illuminates, perform diagnostics of MIL (CHECK ENGINE malfunction indicator lamp) circuit or combination meter.<Ref. to EN(w/oOBD)-32, Engine Malfunction Indicator Lamp (MIL).>
4 PERFORM THE DIAGNOSIS. 1)Perform the clear memory mode. <Ref. to EN(w/oOBD)-30, OPERATION, Clear Memory Mode.> 2)Perform the inspection mode. <Ref. to EN(w/oOBD)-28, OPERATION, Inspection Mode.>	Does the MIL indicate DTC? <Ref. to EN(w/oOBD)-63, 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	<input type="checkbox"/> Fine <input type="checkbox"/> Cloudy <input type="checkbox"/> Rainy <input type="checkbox"/> Snowy <input type="checkbox"/> Various/Others:		
Outdoor temperature	°F (°C)		
	<input type="checkbox"/> Hot <input type="checkbox"/> Warm <input type="checkbox"/> Cool <input type="checkbox"/> Cold		
Place	<input type="checkbox"/> Highway <input type="checkbox"/> Suburbs <input type="checkbox"/> Inner city <input type="checkbox"/> Uphill <input type="checkbox"/> Downhill <input type="checkbox"/> Rough road <input type="checkbox"/> Others:		
Engine temperature	<input type="checkbox"/> Cold <input type="checkbox"/> Warming-up <input type="checkbox"/> After warming-up <input type="checkbox"/> Any temperature <input type="checkbox"/> Others:		
Engine speed	rpm		
Vehicle speed	MPH		
Driving conditions	<input type="checkbox"/> Not affected <input type="checkbox"/> At starting <input type="checkbox"/> While idling <input type="checkbox"/> At racing <input type="checkbox"/> While accelerating <input type="checkbox"/> While cruising <input type="checkbox"/> While decelerating <input type="checkbox"/> While turning (RH/LH)		
Headlight	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF	Rear defogger	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF
Blower	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF	Radio	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF
A/C compressor	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF	CD/Cassette	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF
Cooling fan	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF	Car phone	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF
Front wiper	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF	CB	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF
Rear wiper	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF		

CHECK LIST FOR INTERVIEW

ENGINE (DIAGNOSTICS)

2. CHECK LIST NO. 2

Check the following items about the vehicle's state when MIL turns on.

NOTE:

Use copies of this page for interviewing customers.

a) Other warning lights or indicators turn on. <input type="checkbox"/> Yes/ <input type="checkbox"/> No
<input type="checkbox"/> Low fuel warning light <input type="checkbox"/> Charge indicator light <input type="checkbox"/> AT diagnostics indicator light <input type="checkbox"/> ABS warning light <input type="checkbox"/> Engine oil pressure warning light
b) Fuel level
<ul style="list-style-type: none">• Lack of gasoline: <input type="checkbox"/> Yes/<input type="checkbox"/> No• Indicator position of fuel gauge:
c) Intentional connecting or disconnecting of harness connectors or spark plug cords: <input type="checkbox"/> Yes/ <input type="checkbox"/> No
<ul style="list-style-type: none">• What:
d) Intentional connecting or disconnecting of hoses: <input type="checkbox"/> Yes/ <input type="checkbox"/> No
<ul style="list-style-type: none">• What:
e) Installing of parts other than genuine parts: <input type="checkbox"/> Yes/ <input type="checkbox"/> No
<ul style="list-style-type: none">• What:• Where:
f) Occurrence of noise: <input type="checkbox"/> Yes/ <input type="checkbox"/> No
<ul style="list-style-type: none">• From where:• What kind:
g) Occurrence of smell: <input type="checkbox"/> Yes/ <input type="checkbox"/> No
<ul style="list-style-type: none">• From where:• What kind:
h) Intrusion of water into engine compartment or passenger compartment: <input type="checkbox"/> Yes/ <input type="checkbox"/> No
i) Troubles occurred
<input type="checkbox"/> Engine does not start. <input type="checkbox"/> Engine stalls during idling. <input type="checkbox"/> Engine stalls while driving. <input type="checkbox"/> Engine speed decreases. <input type="checkbox"/> Engine speed does not decrease. <input type="checkbox"/> Rough idling <input type="checkbox"/> Poor acceleration <input type="checkbox"/> Back fire <input type="checkbox"/> After fire <input type="checkbox"/> No shift <input type="checkbox"/> Excessive shift shock

GENERAL DESCRIPTION

ENGINE (DIAGNOSTICS)

3. General Description

A: CAUTION

1) Airbag system wiring harness is routed near engine control module (ECM), main relay and fuel pump relay.

CAUTION:

- All airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuit.
- Be careful not to damage the airbag system wiring harness when servicing the engine control module (ECM), transmission control module (TCM), main relay and fuel pump relay.

2) Never connect the battery in reverse polarity.

- The ECM will be destroyed instantly.
 - The fuel injector and other part will be damaged in just a few minutes more.
- 3) Do not disconnect the battery cables while the engine is running.

- A large counter electromotive force will be generated in the alternator, and this voltage may damage electronic parts such as ECM, etc.

4) Before disconnecting the connectors of each sensor and the ECM, be sure to turn the ignition switch to OFF.

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 the ECM from located position, disconnect two cables on battery.

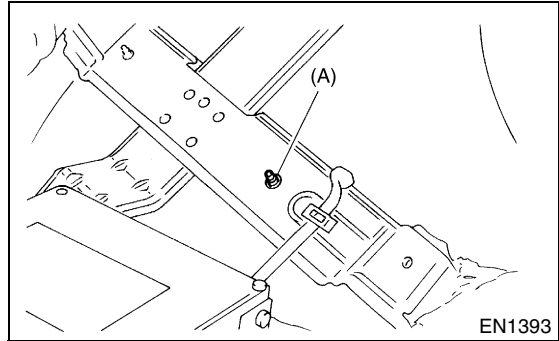
- Otherwise, the ECM may be damaged.

CAUTION:

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

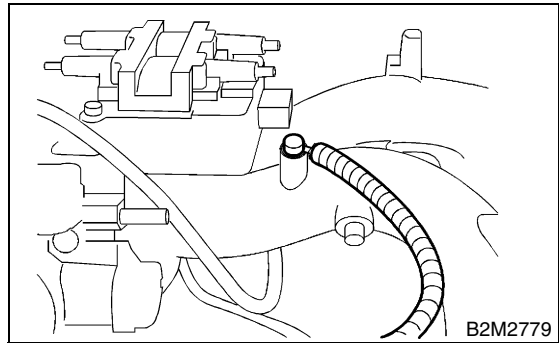
7) The connectors to each sensor in the engine compartment and the harness connectors on the engine side and body side are all designed to be waterproof. However, it is still necessary to take care not to allow water to get into the connectors when washing the vehicle, or when servicing the vehicle on a rainy day.

8) Use the ECM mounting stud bolt at the body head grounding points when measuring voltage and resistance inside the passenger compartment.

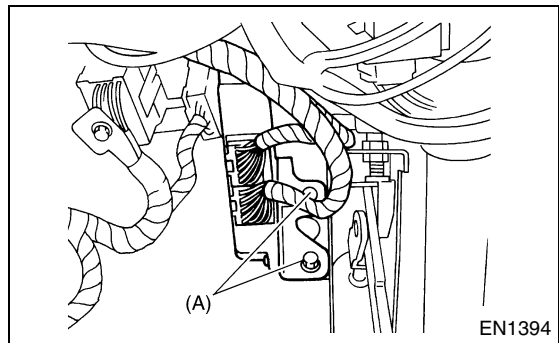


(A) Stud bolt

9) Use the engine grounding terminal or engine proper as the grounding point to the body, when measuring voltage and resistance in the engine compartment.



10) Use the TCM mounting stud bolts at the body head grounding point, when measuring voltage and resistance inside the passenger compartment.



(A) Stud bolt

11) Every MFI-related part is a precision part. Do not drop them.

12) Observe the following cautions when installing a radio in MFI equipped models.

CAUTION:

- The antenna must be kept as far apart as possible from the control unit.
(The ECM is located under the steering column, inside of the instrument panel lower trim panel.)
- The antenna feeder must be placed as far apart as possible from the ECM and MFI harness.
- Carefully adjust the antenna for correct matching.
- When mounting a large power type radio, pay special attention to the three items above mentioned.
- Incorrect installation of the radio may affect the operation of the ECM.

13) Before disconnecting the fuel hose, disconnect the fuel pump connector and crank the engine for more than 5 seconds to release pressure in the fuel system. If the 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 customer's complaint, and distinguish between the three causes.

16) In AT vehicles, do not continue the stall for more than 5 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 the battery voltage and specific gravity of electrolyte.

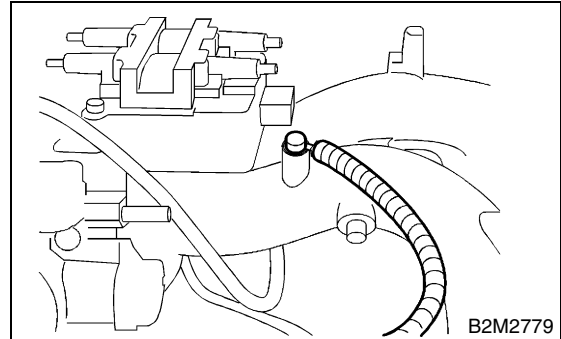
Standard voltage: 12 V

Specific gravity: Above 1.260

2) Check the condition of the main and other fuses, and harnesses and connectors. Also check for proper grounding.

2. ENGINE GROUNDING

Make sure the engine grounding cable 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.

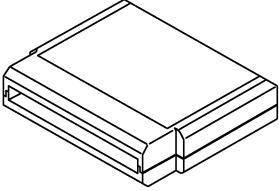

The MFI system also has the following features:

- 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	24082AA190 (Newly adopted tool)	CARTRIDGE	Troubleshooting for electrical systems.
 B2M3877	22771AA030	SELECT MONITOR KIT	Troubleshooting for electrical systems. <ul style="list-style-type: none">• English: 22771AA030 (Without printer)• German: 22771AA070 (Without printer)• French: 22771AA080 (Without printer)• Spanish: 22771AA090 (Without printer)

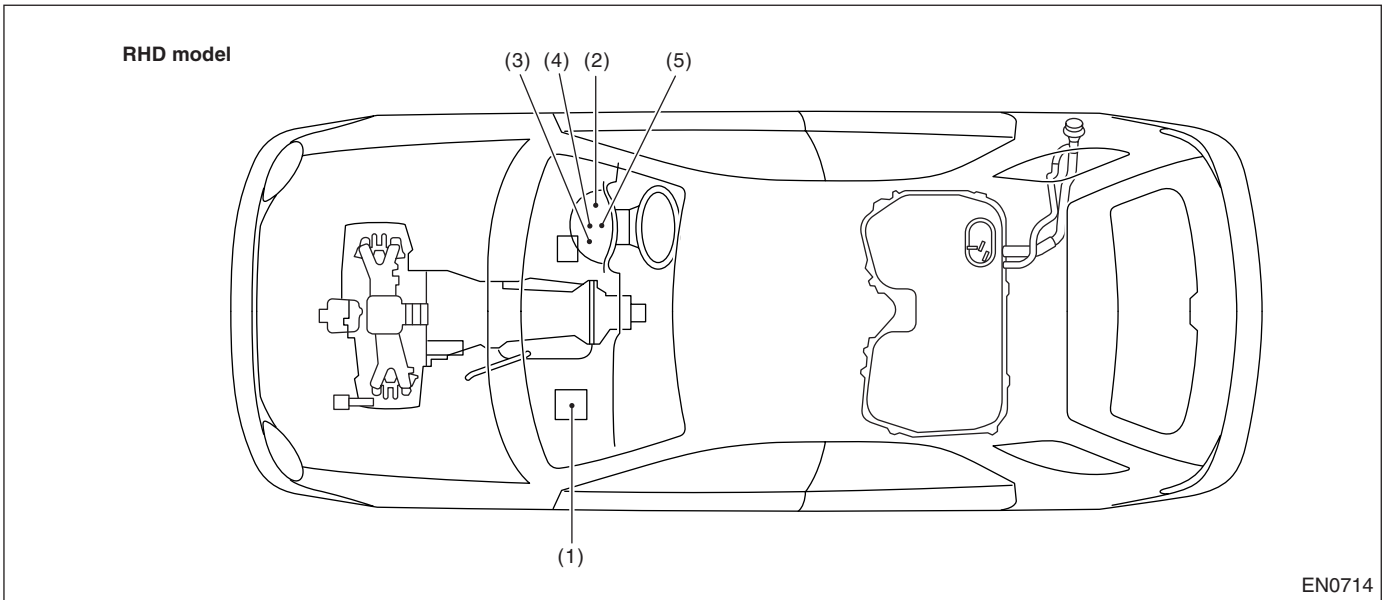
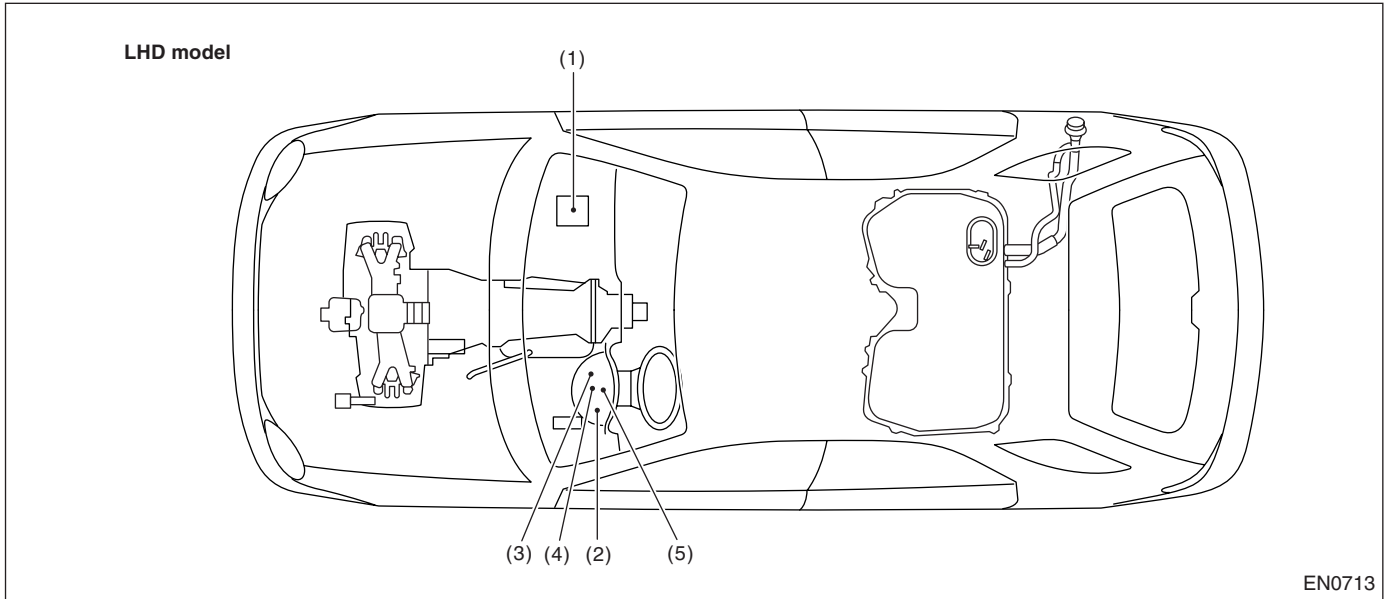
ELECTRICAL COMPONENTS LOCATION

ENGINE (DIAGNOSTICS)

4. Electrical Components Location

A: LOCATION

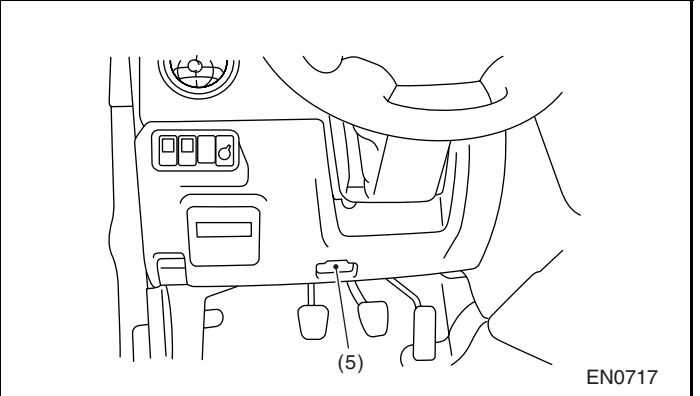
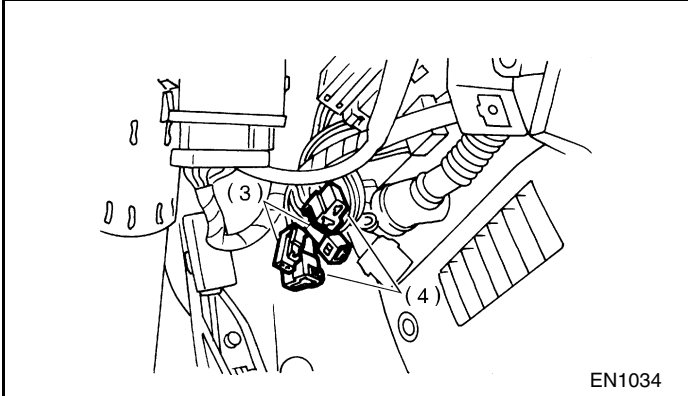
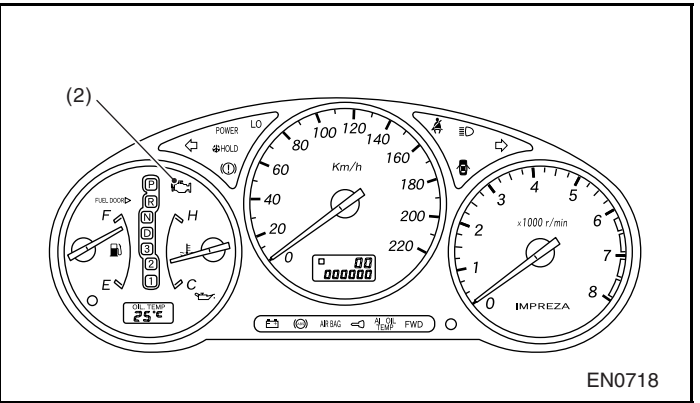
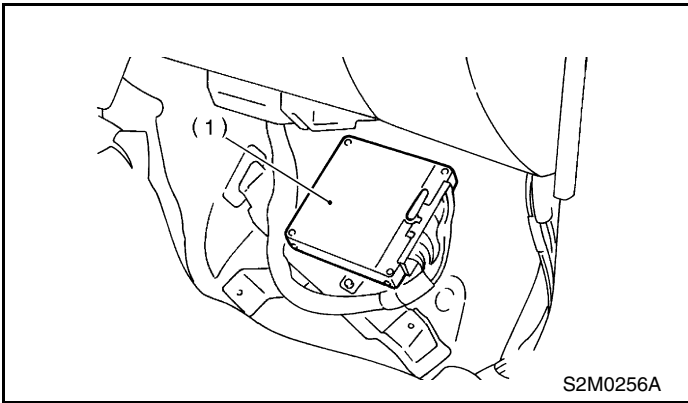
1. MODULE



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

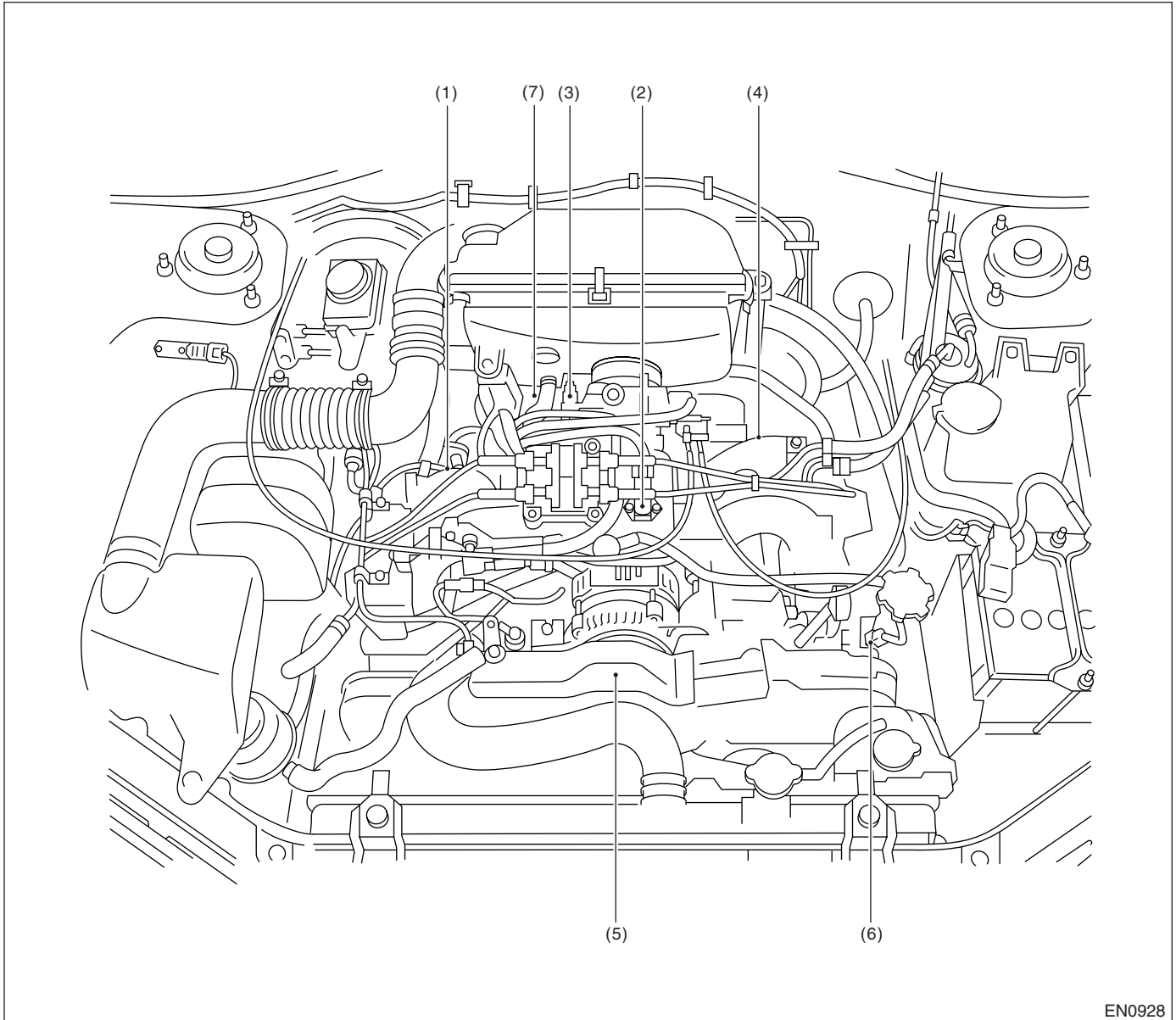
ENGINE (DIAGNOSTICS)



ELECTRICAL COMPONENTS LOCATION

ENGINE (DIAGNOSTICS)

2. SENSOR

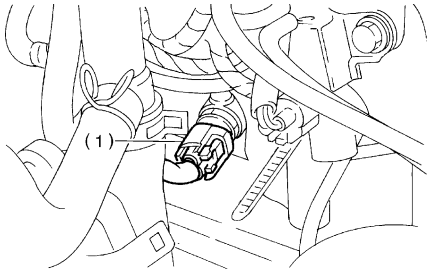


EN0928

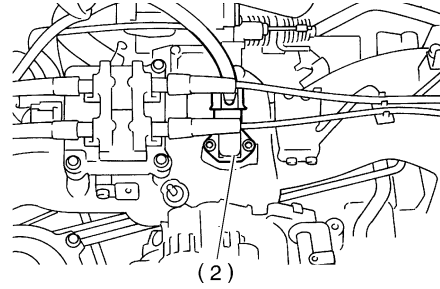
- | | | |
|--|--------------------------------|--------------------------|
| (1) Engine coolant temperature sensor | (3) Throttle position sensor | (7) Vehicle speed sensor |
| (2) Intake air temperature and pressure sensor | (4) Knock sensor | |
| | (5) Crankshaft position sensor | |
| | (6) Camshaft position sensor | |

ELECTRICAL COMPONENTS LOCATION

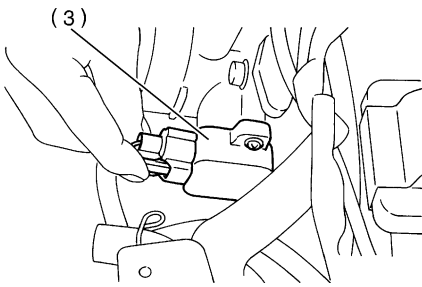
ENGINE (DIAGNOSTICS)



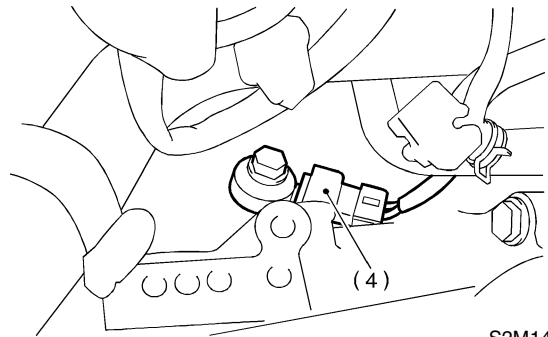
S2M1248A



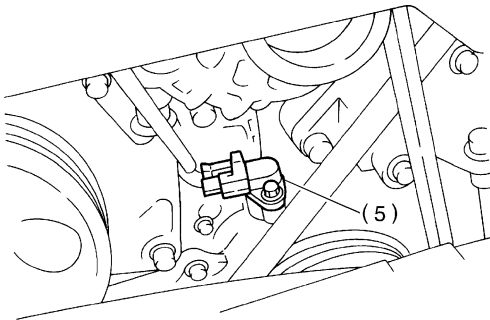
H2M3255A



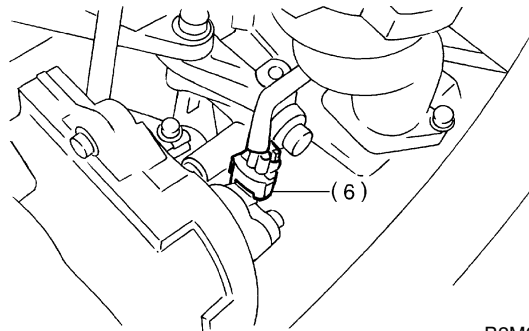
H2M3256A



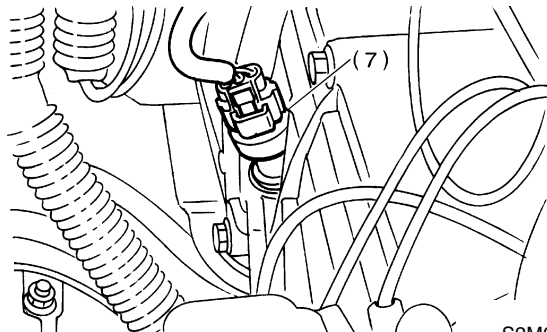
S2M1406B



B2M0213M



B2M0212F

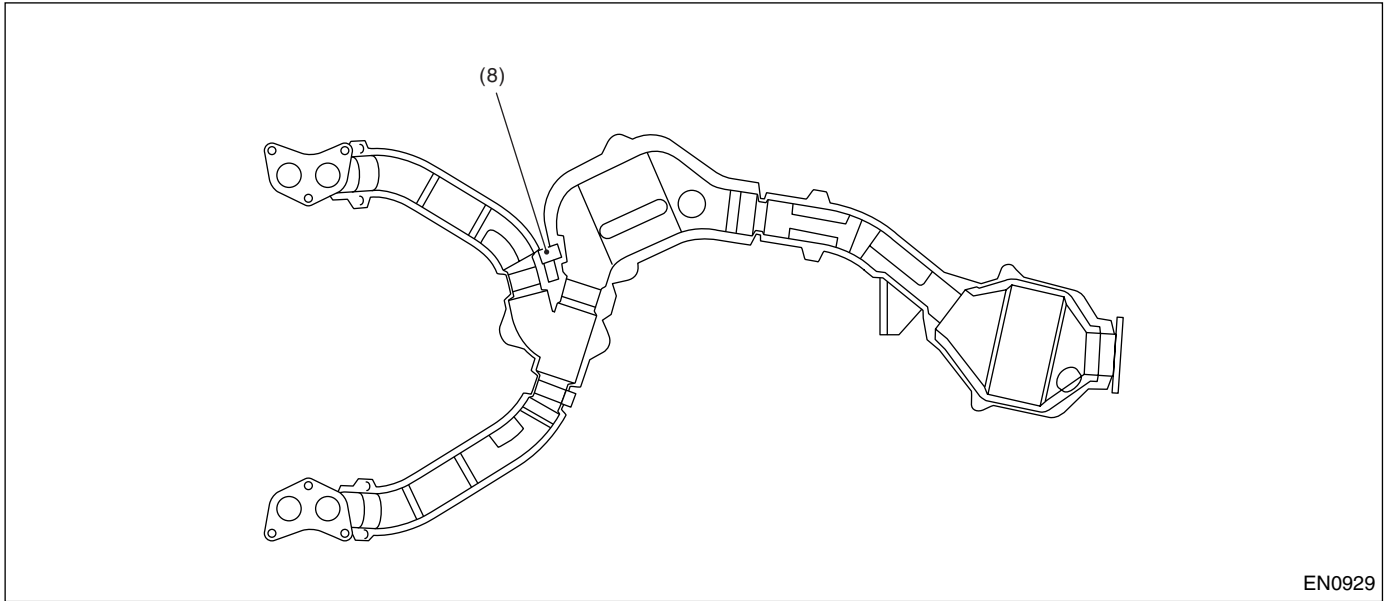


S2M0907C

SUBARU.

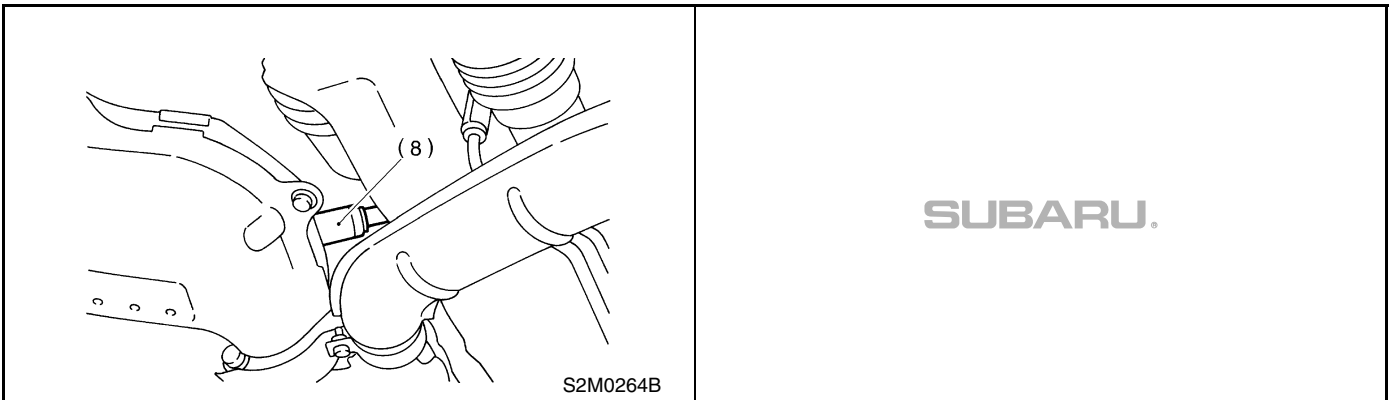
ELECTRICAL COMPONENTS LOCATION

ENGINE (DIAGNOSTICS)



EN0929

- (8) Oxygen sensor (With catalyst model)



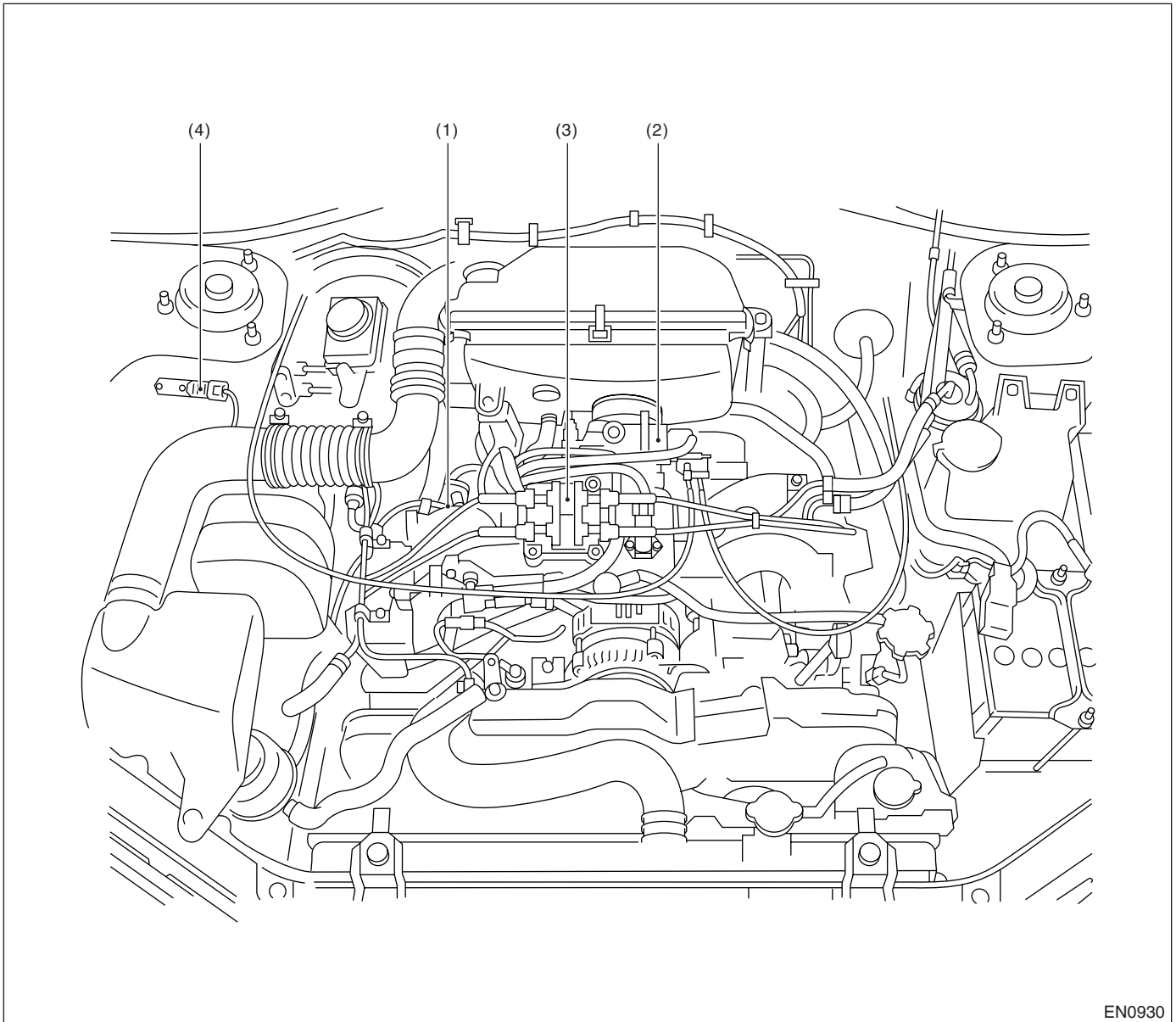
S2M0264B

SUBARU.

ELECTRICAL COMPONENTS LOCATION

ENGINE (DIAGNOSTICS)

3. SOLENOID VALVE, EMISSION CONTROL SYSTEM PARTS AND IGNITION SYSTEM PARTS



EN0930

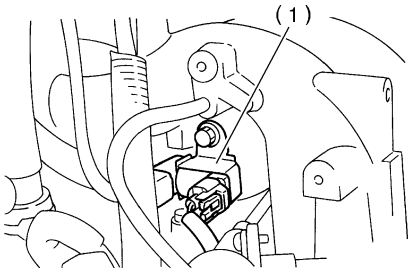
- (1) Purge control solenoid valve
- (2) Idle air control solenoid valve

- (3) Ignition coil and ignitor ASSY

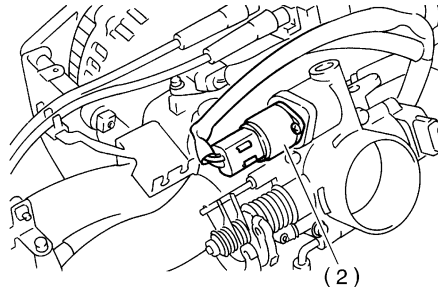
- (4) CO resistor (Without catalyst model)

ELECTRICAL COMPONENTS LOCATION

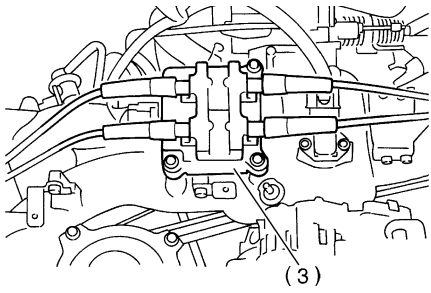
ENGINE (DIAGNOSTICS)



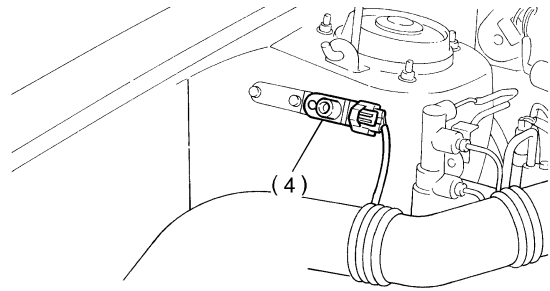
H2M3258A



H2M3259A



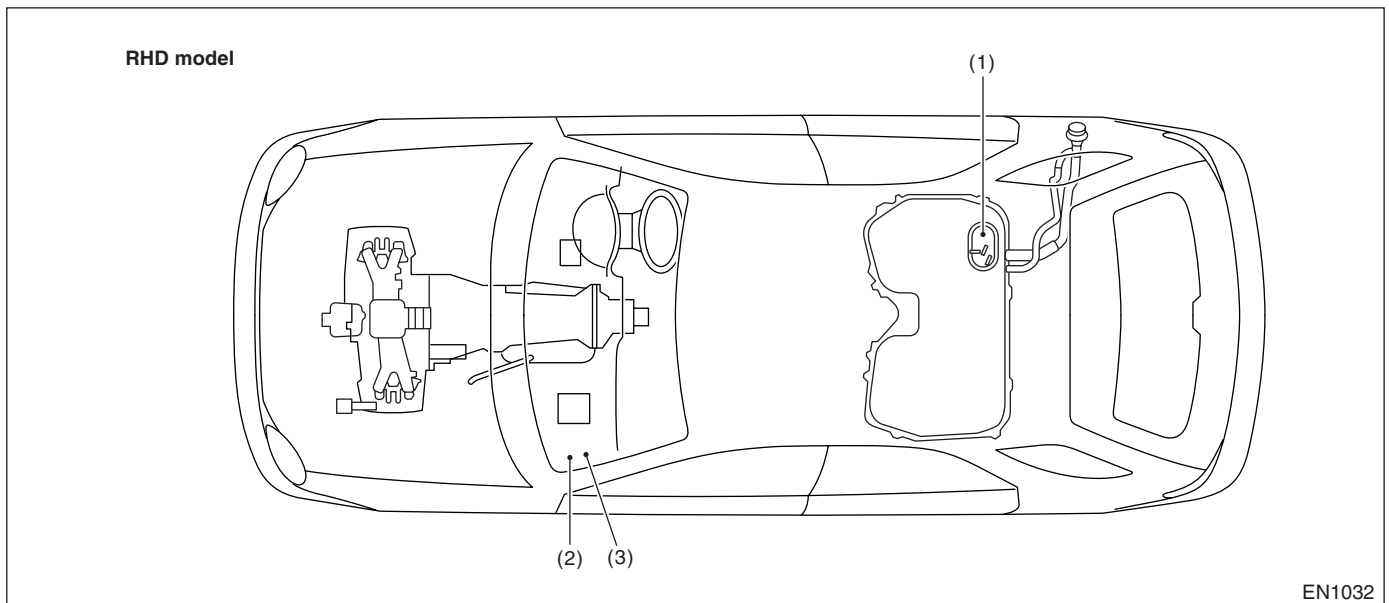
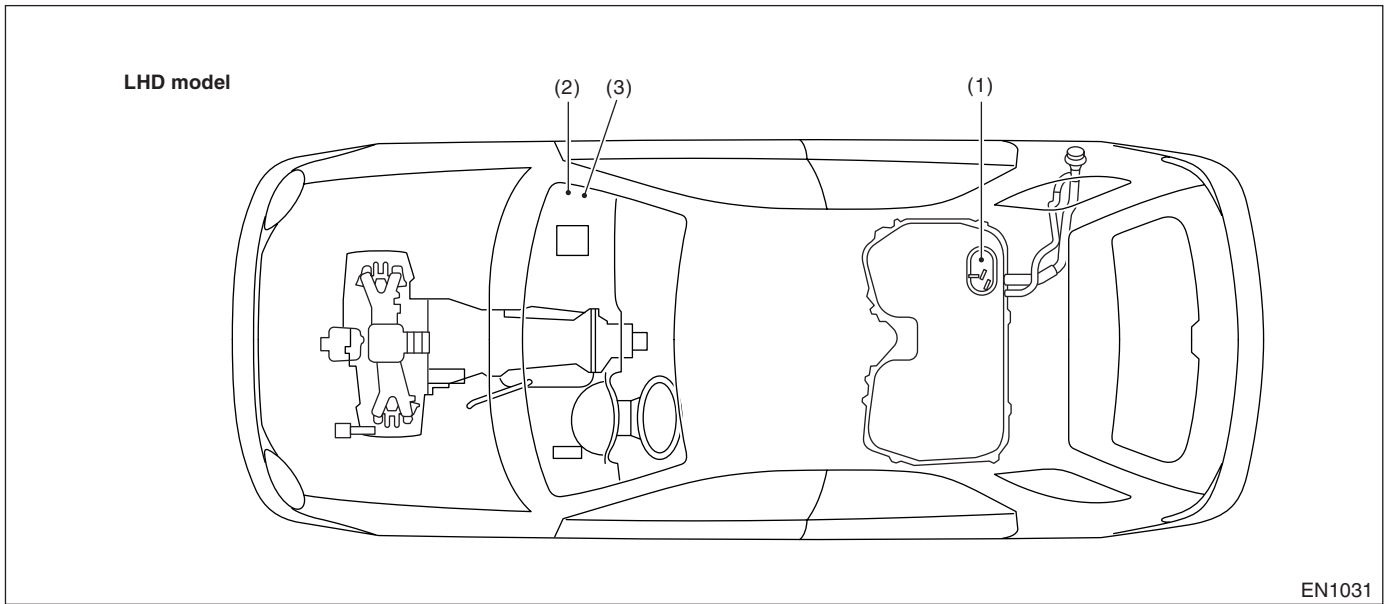
H2M3261A



S2M1764B

ELECTRICAL COMPONENTS LOCATION

ENGINE (DIAGNOSTICS)



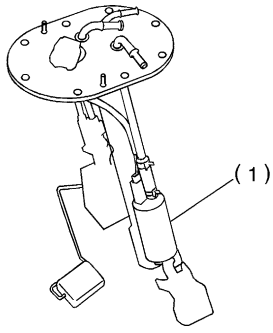
(1) Fuel pump

(2) Main relay

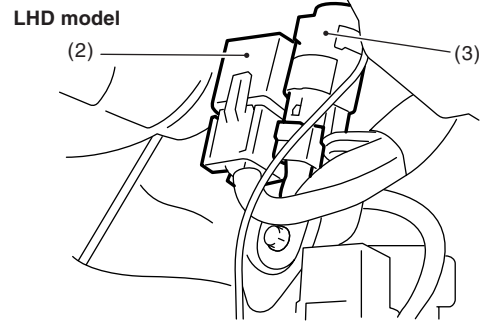
(3) Fuel pump relay

ELECTRICAL COMPONENTS LOCATION

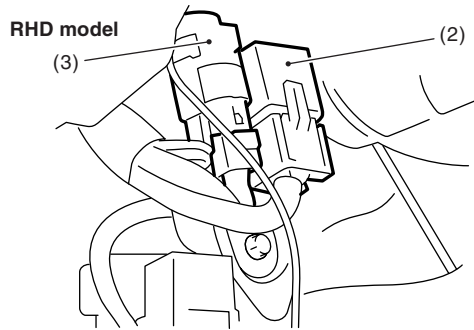
ENGINE (DIAGNOSTICS)



EN1501



EN0744



EN0748

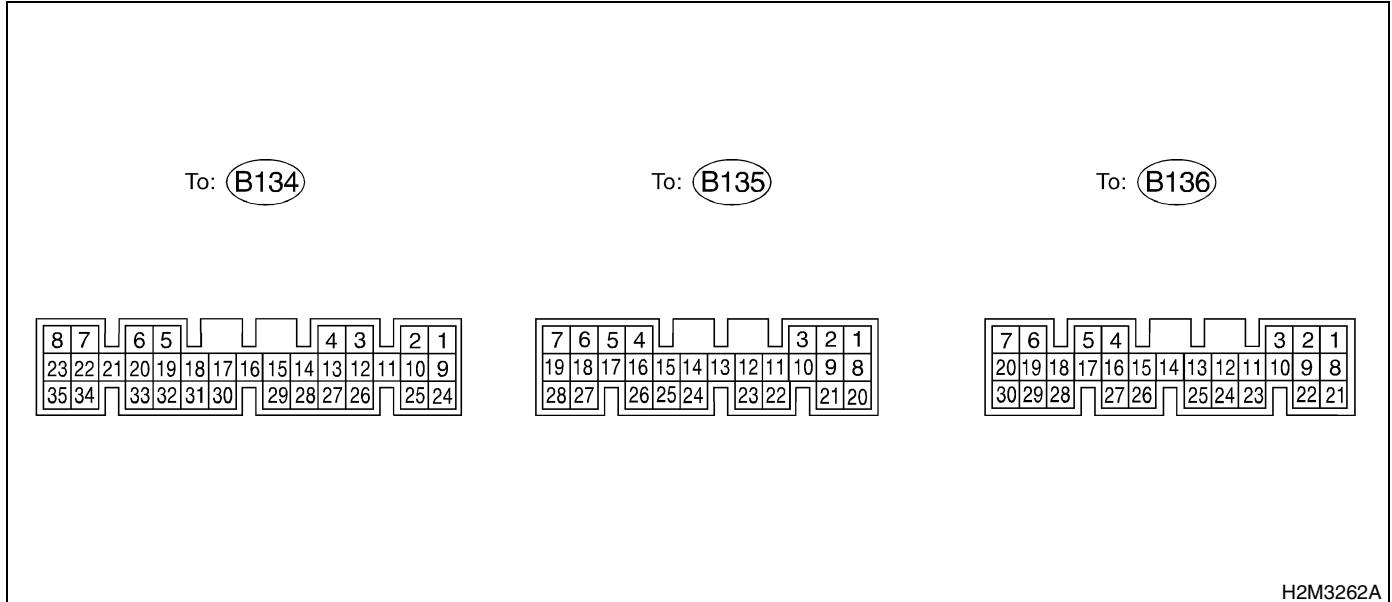
SUBARU.

ENGINE CONTROL MODULE (ECM) I/O SIGNAL

ENGINE (DIAGNOSTICS)

5. Engine Control Module (ECM) I/O Signal

A: ELECTRICAL SPECIFICATION



H2M3262A

Content	Connector No.	Terminal No.	Signal (V)		Note		
			Ignition SW	Engine ON			
			ON (Engine OFF)	(Idling)			
Crankshaft position sensor	Signal (+)	B135	*2	1	0	±6	Sensor output waveform
	Signal (-)	B135	8		0	0	—
	Shield	B135	10		0	0	—
Camshaft position sensor	Signal (+)	B135	*1	2	0	±6	Sensor output waveform
	Signal (-)	B135	8		0	0	—
	Shield	B135	10		0	0	—
Intake air temperature sensor	Signal	B136	13		2.3 — 2.5	1.4 — 1.6	Ambient temperature: 25°C (77°F)
Throttle position sensor	Signal	B136	17		Fully closed: 0.5±0.3 Fully opened: 4.3±0.3		—
	Power supply	B136	15		5	5	—
	GND	B136	16		0	0	—
Oxygen sensor	Signal	B136	7		0		Rich mixture: 0.7 Lean mixture: 0
	Shield	B136	23		0	0	—
Engine coolant temperature sensor	Signal	B136	14		0.6 — 1.0	0.6 — 1.0	After warm-up
	GND	B136	16		0	0	—
Vehicle speed sensor	B135	24			0 or 5	0 or 5	"5" and "0" are repeatedly displayed when vehicle is driven.
Starter switch	B135	28			0	0	Cranking: 10 to 14
A/C switch	B135	27			ON: 10 — 13 OFF: 0	ON: 13 — 14 OFF: 0	—
Ignition switch	B135	7			10 — 13	13 — 14	—
Neutral position switch (MT)	B135	26			ON: 5 OFF: 0		Switch is ON when gear is in neutral position.
Park/Neutral position switch (AT)	B135	26			ON: 0 OFF: 5		Switch is ON when shift lever is in "P" or "N" position.

ENGINE CONTROL MODULE (ECM) I/O SIGNAL

ENGINE (DIAGNOSTICS)

Content	Connec- tor No.	Terminal No.	Signal (V)		Note	
			Ignition SW	Engine ON		
			ON (Engine OFF)	(Idling)		
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	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	25		MT: 0 AT: 5	MT: 0 AT: 5	—

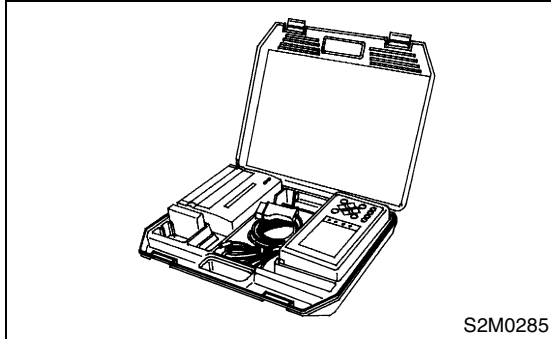
*: With immobilizer

6. Subaru Select Monitor

A: OPERATION

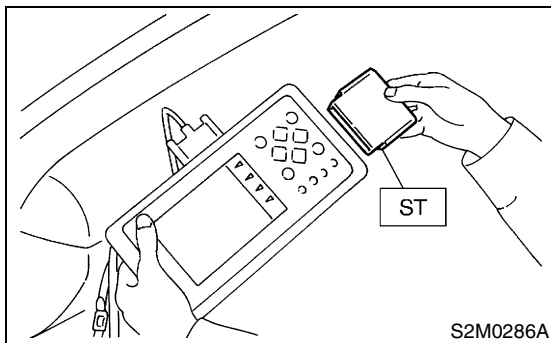
1. HOW TO USE SUBARU SELECT MONITOR

1) Prepare the Subaru Select Monitor kit.



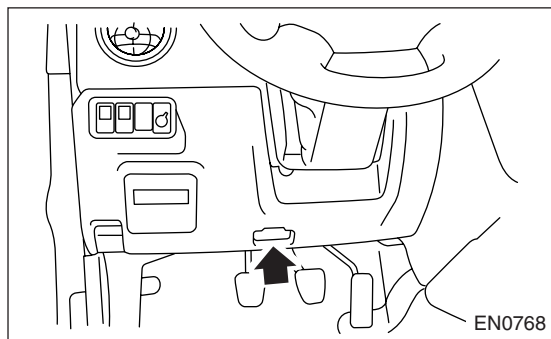
2) Connect the diagnosis cable to Subaru Select Monitor.

3) Insert the cartridge into Subaru Select Monitor.



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

(1) The data link connector is located in lower portion of instrument panel (on driver's side).

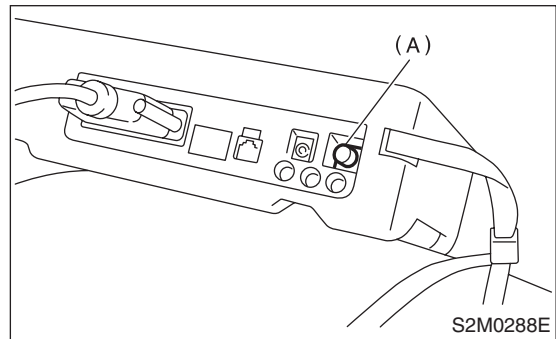


(2) Connect the diagnosis cable to data link connector.

CAUTION:

Do not connect the scan tools except for Subaru Select Monitor.

5) Turn the ignition switch to ON (engine OFF) and Subaru Select Monitor switch to ON.



(A) Power switch

6) Using the Subaru Select Monitor, call up any DTCs 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 the DTC. <Ref. to EN(w/oOBD)-26, Read Diagnostic Trouble Code (DTC).>

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 [YES] key.
- 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press [YES] key.
- 3) Press the [YES] key after displayed information of engine type.
- 4) On the «Engine Diagnosis» display screen, select the {1. Current Data Display & Save} and press [YES] key.
- 5) On the «Data Display Menu» display screen, select the {1. 12 Data Display} and press [YES] key.
- 6) Using the scroll key, move the display screen up or down until desired data is shown.
 - A list of the support data is shown in the following table.

Contents	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

SUBARU SELECT MONITOR

ENGINE (DIAGNOSTICS)

NOTE:

For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

4. LED OPERATION MODE FOR ENGINE

Contents	Message	LED "ON" requirements
Ignition switch signal	ON or OFF	When ignition switch is turned ON.
Automatic transmission vehicle identification signal	ON or OFF	When AT identification signal is entered.
Test mode connector signal	ON or OFF	When test mode connector is connected.
Neutral position switch signal*1	ON or OFF	When neutral position switch signal is entered.
Air conditioning switch signal	ON or OFF	When air conditioning switch is turned ON.
Air conditioning compressor signal	ON or OFF	When air conditioning compressor is in function.
Radiator fan relay signal #1	ON or OFF	When radiator fan relay #1 is in function.
Fuel pump relay signal	ON or OFF	When fuel pump relay is in function.
Knocking signal	ON or OFF	When knocking signal is entered.
Radiator fan relay signal #2	ON or OFF	When radiator fan relay #2 is in function.
Engine torque control signal #1	ON or OFF	When torque control signal #1 is entered.
Torque control signal #2	ON or OFF	When torque control signal #2 is entered.
Torque permission signal	ON or OFF	When torque permission signal is entered.
TCS AET signal	ON or OFF	When TCS AET signal is entered.
Canister purge control solenoid valve	ON or OFF	When canister purge control solenoid valve is in function.
Oxygen sensor rich signal*2	ON or OFF	When oxygen sensor mixture ratio is rich.
Read memory connector signal	ON or OFF	When read memory connector is connected.
P/S switch	ON or OFF	When steering wheel is turned.
Starter switch	ON or OFF	When starter switch signal is entered.
Crankshaft position sensor signal	ON or OFF	When crankshaft position sensor signal is entered.
Camshaft position sensor signal	ON or OFF	When camshaft position sensor signal is entered.
Rear defogger switch	ON or OFF	When rear defogger switch signal is entered.
Blower fan switch	ON or OFF	When blower fan switch signal is entered.
Light switch	ON or OFF	When light switch signal is entered.
Idle switch signal	ON or OFF	When throttle sensor sends signal that throttle opening angle is in idle position.

*1: On MT model, switch is turned ON when gear position is in neutral position.

On AT model, switch is turned ON when shift position is in "P" or "N" position.

*2: With catalyst model only

NOTE:

For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

READ DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

7. Read Diagnostic Trouble Code (DTC)

A: OPERATION

1. WITH SUBARU SELECT MONITOR

- 1) On the «Main Menu» display screen, select the {Each System Check} and press [YES] key.
- 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press [YES] key.
- 3) Press the [YES] key after displayed the information of engine type.
- 4) On the «Engine Diagnosis» display screen, select the {Diagnostic Code(s) Display} and press [YES] key.
- 5) On the «Diagnostic Code(s) Display» display screen, select the {Current Diagnostic Code(s)} or {History Diagnostic Code(s)} and press [YES] key.

NOTE:

- For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
- For detailed concerning diagnostic trouble codes, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(w/oOBD)-63, 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 the ignition switch to OFF. 2) Connect the read memory connector. <Ref. to EN(w/oOBD)-10, LOCATION, Electrical Components Location.> 3) Turn the ignition switch to ON.	Does the MIL come on?	Go to step 2.	Check the following and repair if necessary. NOTE: <ul style="list-style-type: none">• Open or short circuit in engine control module power supply or ground line• Open or short circuit in CHECK ENGINE malfunction indicator lamp
2 CHECK DIAGNOSTIC TROUBLE CODE (DTC).	Does the MIL indicate DTC?	Record the DTC. Then turn the ignition switch to OFF, disconnect read memory connector.	Complete the read DTC. Turn the ignition switch to OFF and disconnect read memory connector.

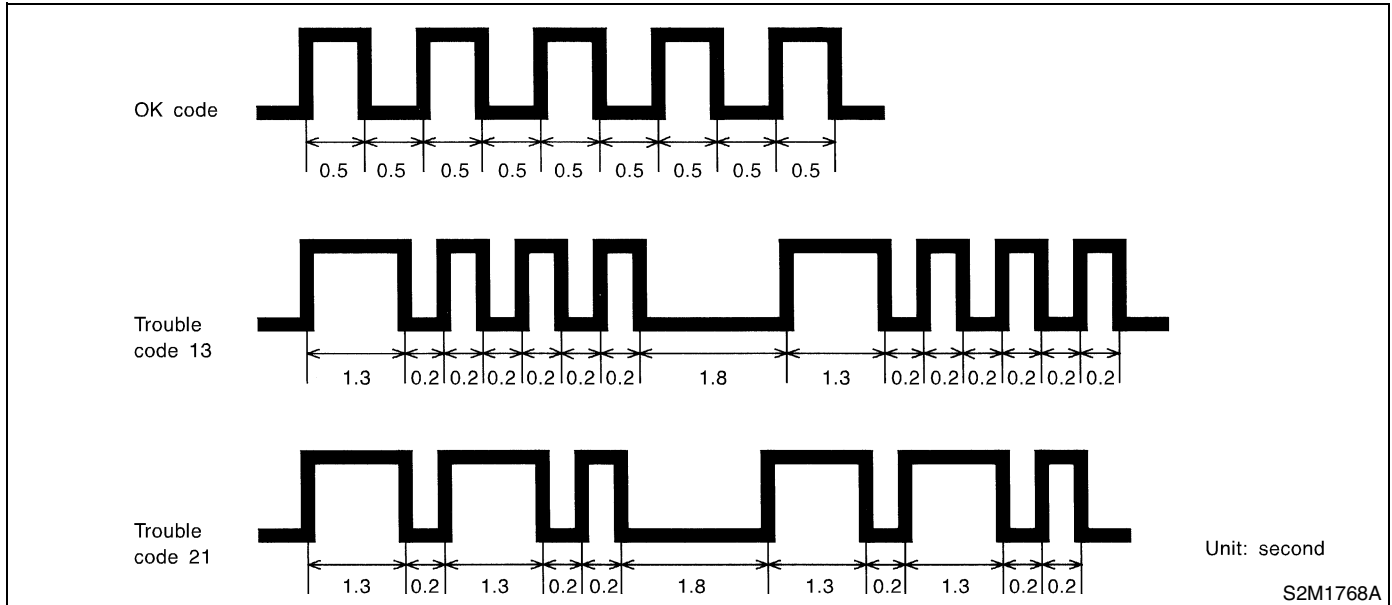
READ DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

The CHECK ENGINE malfunction indicator lamp (MIL) flashes code corresponding to 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(w/oOBD)-63, LIST, List of Diagnostic Trouble Code (DTC).>



8. Inspection Mode

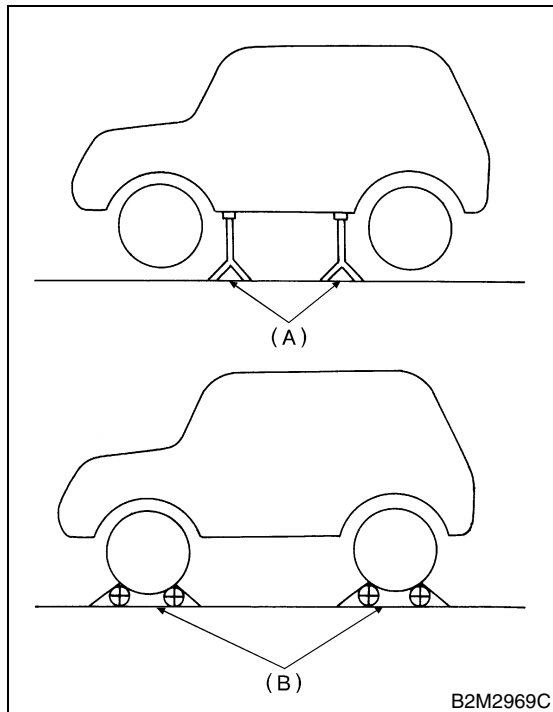
A: OPERATION

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 brake is 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 runoff of front wheels.
- Do not abruptly depress/release the clutch pedal or accelerator pedal during works even when engine is operating at low speeds since this may cause vehicle to jump off free rollers.
- In order to prevent the vehicle from slipping due to vibration, do not place any wooden blocks or similar items between the safety stands and the vehicle.
- Since the rear wheels will also rotate, do not place anything near them. Also, make sure that nobody goes in front of the vehicle.



(A) Safety stand
(B) Free rollers

2. WITH SUBARU SELECT MONITOR

After performing diagnostics and clearing memory, check for any remaining unresolved trouble data.

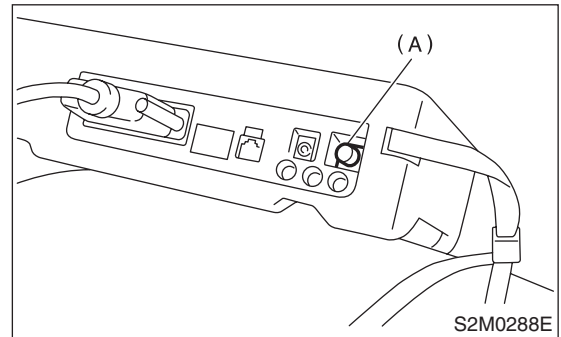
- 1) Connect the test mode connector (green) at the lower portion of instrument panel (on the driver's side).



(A) Test mode connector

- 2) Connect the Subaru Select Monitor to data link connector. <Ref. to EN(w/oOBD)-10, LOCATION, Electrical Components Location.>

- 3) Turn the ignition switch to ON (engine OFF) and Subaru Select Monitor switch to ON.



(A) Power switch

- 4) On the «Main Menu» display screen, select the {2. Each System Check} and press [YES] key.
- 5) On the «System Selection Menu» display screen, select the {Engine Control System} and press [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 [YES] key.
- 8) When the "Perform Inspection (Dealer Check) Mode?" is shown on the display screen, press [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 (DTCs), refer to the DIAGNOSTIC TROUBLE CODE (DTC) LIST. <Ref. to EN(w/oOBD)-63, 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 ABS warning light, but this indicates no malfunctions. When the engine control diagnosis is finished, perform the ABS memory.

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 the ignition switch to OFF. 3)Set the shift lever to neutral position (MT vehicles), or set selector lever to "P" position (AT vehicles). 4)Connect the test mode connector (green) at lower portion of instrument panel (on driver's side). 5)Turn the 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 the 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 DTC?	Record the DTC and inspect using DTC. <Ref. to EN(w/oOBD)-66, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Go to step 3.
3 CHECK DIAGNOSTIC TROUBLE CODE (DTC). 1)Drive the vehicle at speed greater than 11 km/h (7 MPH) for at least 1 minute. 2)Warm-up the engine above 2,000 rpm.	Does the MIL indicate DTC?	Record the DTC and inspect using DTC. <Ref. to EN(w/oOBD)-66, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Turn the ignition switch to OFF. Disconnect the test mode connector. Complete the inspection mode. NOTE: When the on-board diagnosis system indicates no trouble, trouble is in a different symptom.

CLEAR MEMORY MODE

ENGINE (DIAGNOSTICS)

9. Clear Memory Mode

A: OPERATION

1. WITH SUBARU SELECT MONITOR

- 1) On the «Main Menu» display screen, select the {2. Each System Check} and press [YES] key.
- 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press [YES] key.
- 3) Press the [YES] key after displayed the information of engine type.
- 4) On the «Engine Diagnosis» display screen, select the {Clear Memory} and press [YES] key.
- 5) When the “Done” and “Turn Ignition Switch OFF” are shown on the display screen, turn the Subaru Select Monitor and ignition switch to OFF.

NOTE:

- 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.

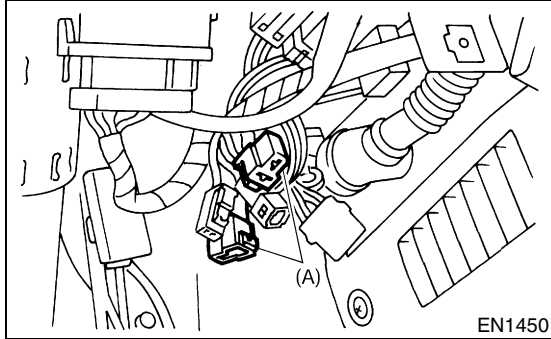
2. WITHOUT SUBARU SELECT MONITOR

Step	Check	Yes	No
1 CHECK STATUS OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL). 1) Turn the ignition switch to OFF. 2) Set the shift lever to neutral position (MT vehicles), or set selector lever to “P” position (AT vehicles). 3) Connect the test mode connector and read memory connector at lower portion of instrument panel (on driver’s side). 4) Turn the ignition switch to ON.	Does the MIL come on?	Go to step 2.	Check the following and repair if necessary. NOTE: <ul style="list-style-type: none">• Open or short circuit in engine control module power supply or ground line• Open or short circuit in CHECK ENGINE malfunction indicator lamp
2 CHECK DIAGNOSTIC TROUBLE CODE (DTC). 1) Set the selector lever to “N” position, and then set selector lever to “P” position again (AT vehicles only). 2) Start the engine. 3) Drive the vehicle at speed greater than 11 km/h (7 MPH) for at least 1 minute. 4) Warm-up engine above 2,000 rpm.	Does the MIL indicate DTC? <Ref. to EN(w/oOBD)-63, LIST, List of Diagnostic Trouble Code (DTC).>	Record the DTC. Repair the trouble cause. <Ref. to EN(w/oOBD)-66, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Turn the ignition switch to OFF. Disconnect the read memory connector and test mode connector. Complete the clear memory mode.

10. Compulsory Valve Operation Check Mode

A: OPERATION

1) Connect the test mode connector at the lower portion of instrument panel (on the driver's side).



(A) Test mode connector

2) Each valve functions when the 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

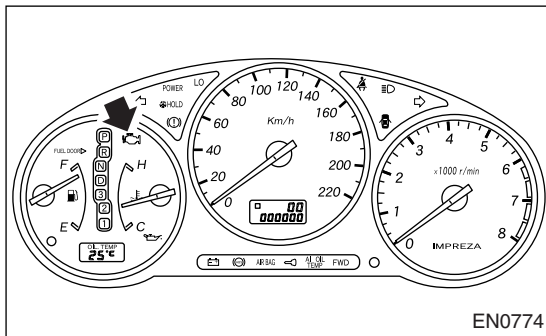
1. Activation of check engine malfunction indicator lamp (MIL). <Ref. to EN(w/oOBD)-32, ACTIVATION OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL), Engine Malfunction Indicator Lamp (MIL).>
2. Check that engine malfunction indicator lamp (MIL) does not come on. <Ref. to EN(w/oOBD)-34, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT COME ON., Engine Malfunction Indicator Lamp (MIL).>
3. Check that engine malfunction indicator lamp (MIL) does not go off. <Ref. to EN(w/oOBD)-36, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT GO OFF., Engine Malfunction Indicator Lamp (MIL).>
4. Check that engine malfunction indicator lamp (MIL) does not blink at a cycle of 3 Hz. <Ref. to EN(w/oOBD)-38, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT BLINK AT A CYCLE OF 3 HZ., Engine Malfunction Indicator Lamp (MIL).>
5. Check that engine malfunction indicator lamp (MIL) remains blinking at a cycle of 3 Hz. <Ref. to EN(w/oOBD)-40, 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)

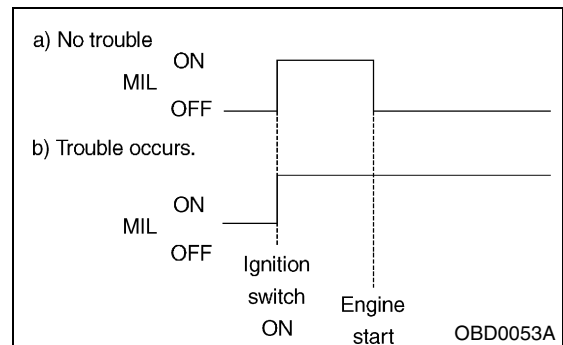
1) When the ignition switch is turned to ON (engine off), the CHECK ENGINE malfunction indicator lamp (MIL) in the combination meter illuminates.

NOTE:

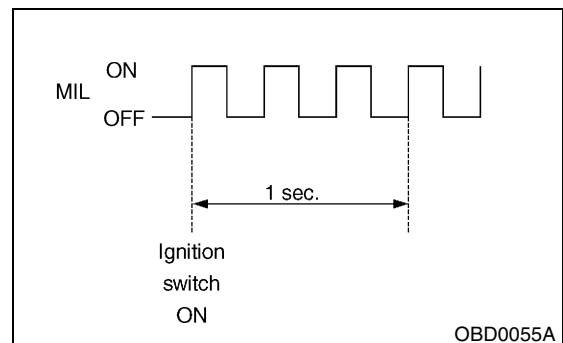
If the MIL does not illuminate, perform diagnostics of the CHECK ENGINE light circuit or the combination meter circuit. <Ref. to IDI-15, Combination Meter Assembly.>



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(w/oOBD)-2, PROCEDURE, Basic Diagnostic Procedure.>



3) When the 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.

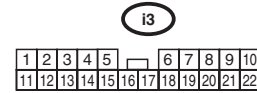
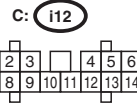
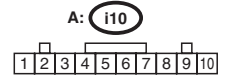
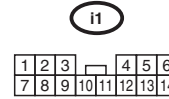
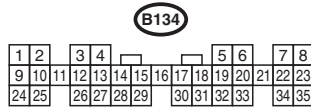
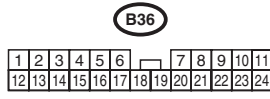
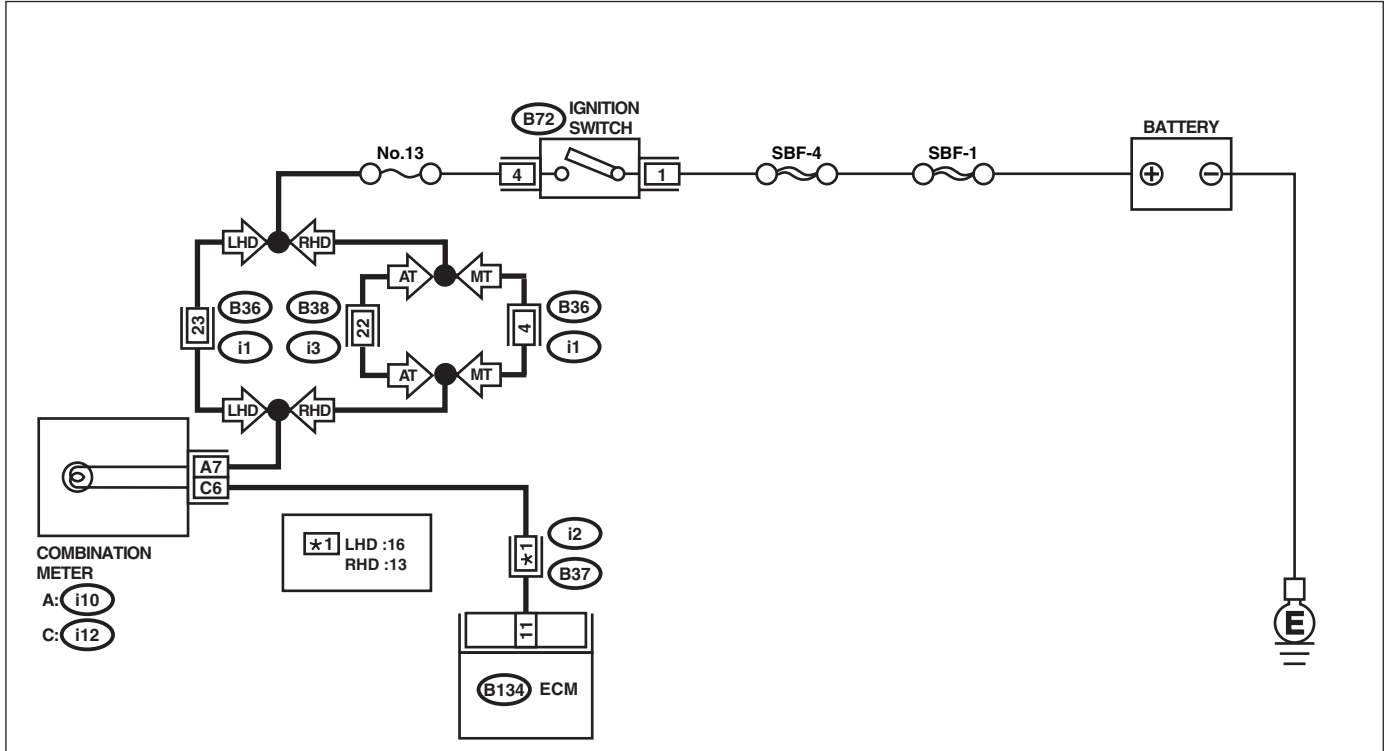
• DIAGNOSIS:

- The CHECK ENGINE malfunction indicator lamp (MIL) circuit is open or shorted.

• TROUBLE SYMPTOM:

- When the ignition switch is turned ON (engine OFF), MIL does not come on.

• WIRING DIAGRAM:



EN1395

Step	Check	Yes	No
1 CHECK OUTPUT SIGNAL FROM ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector and chassis ground. Connector & terminal (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 the ECM connector.	Go to step 3.

ENGINE MALFUNCTION INDICATOR LAMP (MIL)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
3 CHECK ECM CONNECTOR.	Is the ECM connector correctly connected?	Replace the ECM.	Repair the connection of ECM connector.
4 CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Remove the combination meter. <Ref. to IDI-15, Combination Meter Assembly.> 3) Disconnect the connector from ECM and combination meter. 4) Measure the resistance of harness between ECM and combination meter connector. Connector & terminal (B134) No. 11 — (i12) No. 6:	Is the resistance less than 1 Ω ?	Go to step 5.	Repair the harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between ECM and combination meter connector • Poor contact in coupling connector
5 CHECK POOR CONTACT. Check poor contact in combination meter connector. <Ref. to IDI-15, Combination Meter Assembly.>	Is there poor contact in combination meter connector?	Repair the poor contact in combination meter connector.	Go to step 6.
6 CHECK HARNESS BETWEEN COMBINATION METER AND IGNITION SWITCH CONNECTOR. 1) Turn the ignition switch to ON. 2) Measure the voltage between combination meter connector and chassis ground. Connector & terminal (i10) No. 7 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 7.	Check the following and repair if necessary. NOTE: <ul style="list-style-type: none"> • Broken down ignition relay • Blown out fuse (No. 5) • If replaced fuse (No. 5) blows easily, check the harness for short circuit of harness between fuse (No. 5) and ignition relay connector. • Open or short circuit in harness between fuse (No. 5) and battery terminal • Open circuit in harness between fuse (No. 5) and ignition relay connector • Poor contact in ignition relay connector • Poor contact in ignition switch connector
7 CHECK POOR CONTACT. Check poor contact in combination meter connector. <Ref. to IDI-15, Combination Meter Assembly.>	Is there poor contact in combination meter connector?	Repair the poor contact in combination meter connector.	Replace the bulb or combination meter.

ENGINE MALFUNCTION INDICATOR LAMP (MIL)

ENGINE (DIAGNOSTICS)

D: CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT GO OFF.

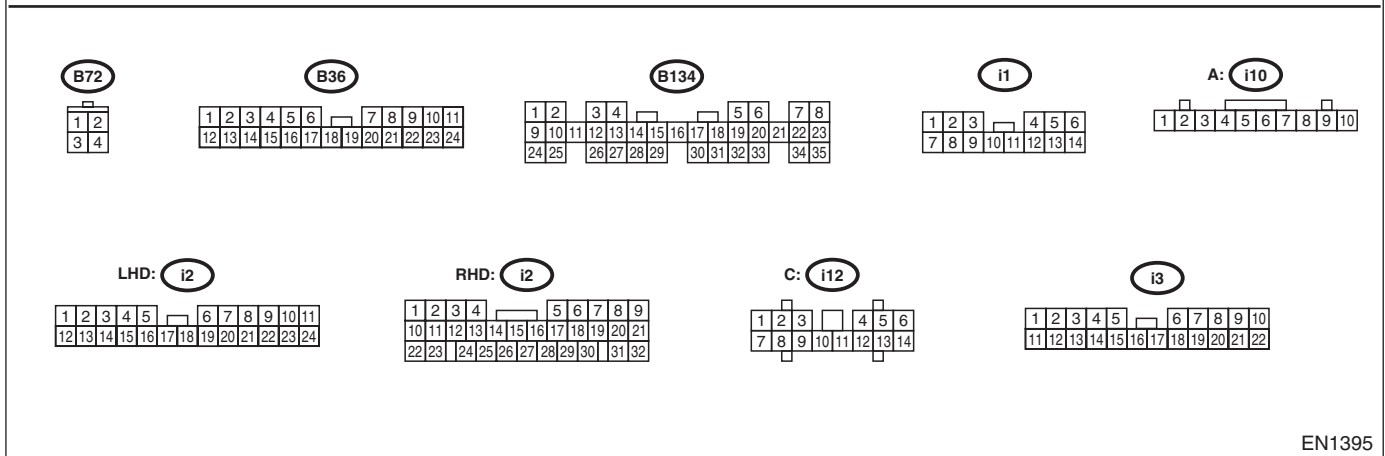
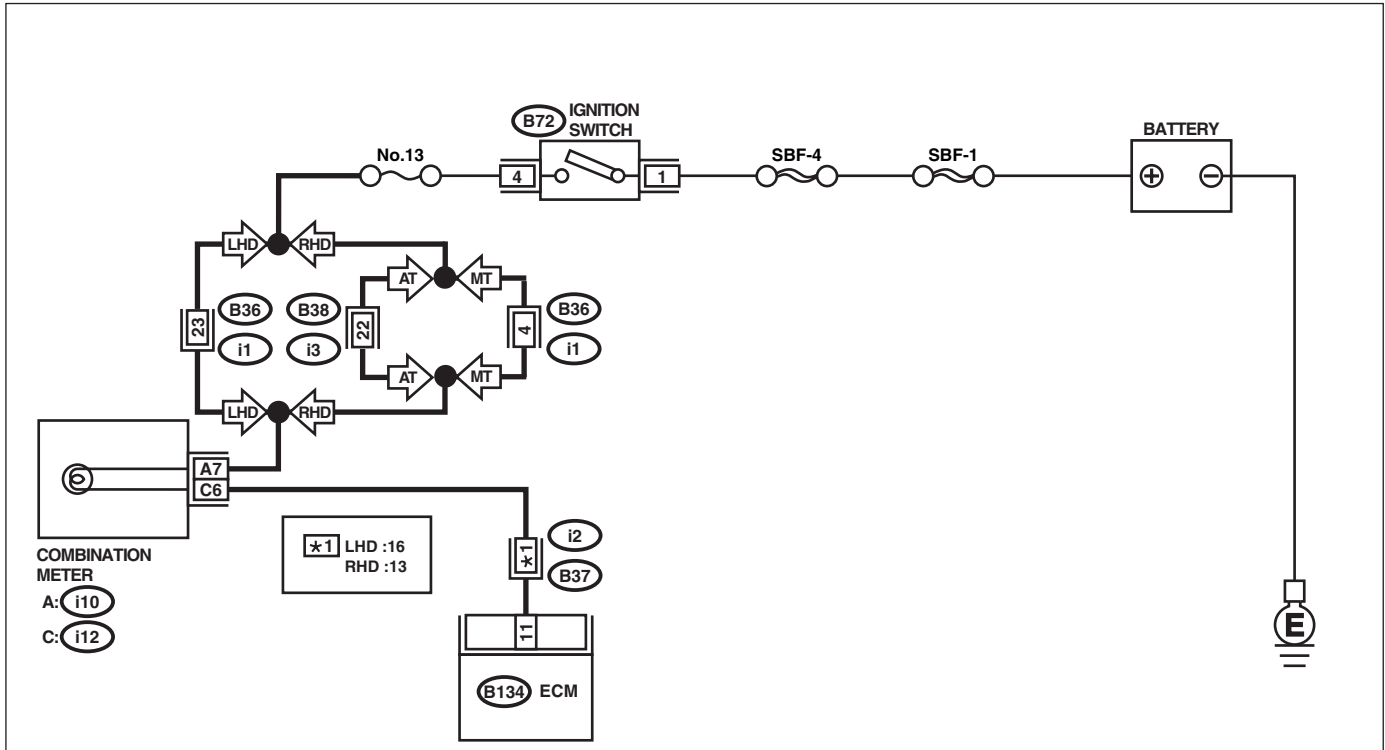
• DIAGNOSIS:

- The CHECK ENGINE malfunction indicator lamp (MIL) circuit is shorted.

• TROUBLE SYMPTOM:

- Although MIL comes on when engine runs, but trouble code is not shown on Subaru Select Monitor or OBD-II general scan tool display.

• WIRING DIAGRAM:



EN1395

Step	Check	Yes	No
1 CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Turn the ignition switch to ON.	Does the MIL come on?	Repair the short circuit in harness between combination meter and ECM connector.	Replace the ECM. <Ref. to FU(w/oOBD)-48, Engine Control Module.>

ENGINE MALFUNCTION INDICATOR LAMP (MIL)

ENGINE (DIAGNOSTICS)

ENGINE MALFUNCTION INDICATOR LAMP (MIL)

ENGINE (DIAGNOSTICS)

E: CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT BLINK AT A CYCLE OF 3 HZ.

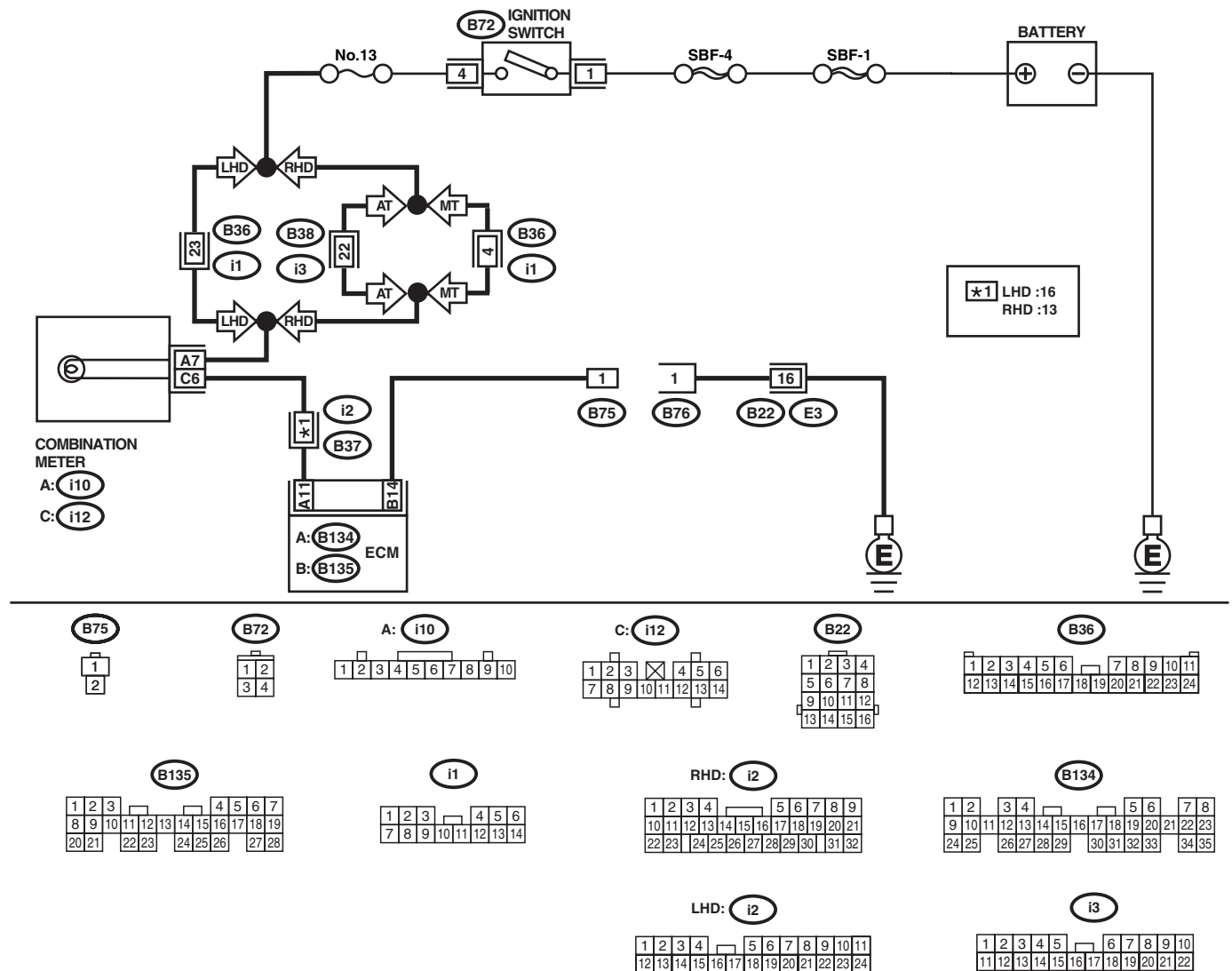
• DIAGNOSIS:

- The CHECK ENGINE malfunction indicator lamp (MIL) circuit is open or shorted.
- Test mode connector circuit is in open.

• TROUBLE SYMPTOM:

- During inspection mode, MIL does not blink at a cycle of 3 Hz.

• WIRING DIAGRAM:



EN1451

ENGINE MALFUNCTION INDICATOR LAMP (MIL)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK STATUS OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL). 1)Turn the ignition switch to OFF. 2)Disconnect the test mode connector at lower portion of instrument panel (on driver's side). 3)Turn the ignition switch to ON.	Does the MIL come on?	Go to step 2.	Repair the MIL circuit. <Ref. to EN(w/oOBD)-34, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT COME ON., Engine Malfunction Indicator Lamp (MIL).>
2 CHECK OUTPUT SIGNAL FROM ECM. Measure the voltage between test mode connector and chassis ground. Connector & terminal (B75) No. 1 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Go to step 3.	Go to step 5.
3 CHECK HARNESS BETWEEN ECM AND TEST MODE CONNECTOR. 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ECM. 3)Measure the resistance of harness between ECM and test mode connector. Connector & terminal (B135) No. 14 — (B75) No. 1:	Is the resistance less than 1 Ω ?	Go to step 4.	Repair the harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between ECM and test mode connector
4 CHECK POOR CONTACT. Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(w/oOBD)-48, Engine Control Module.>
5 CHECK HARNESS BETWEEN TEST MODE CONNECTOR AND CHASSIS GROUND. 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ECM. 3)Measure the resistance of harness between test mode connector and chassis ground. Connector & terminal (B76) No. 1 — Chassis ground:	Is the resistance less than 1 Ω ?	Go to step 6.	Repair the harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • 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 the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(w/oOBD)-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.

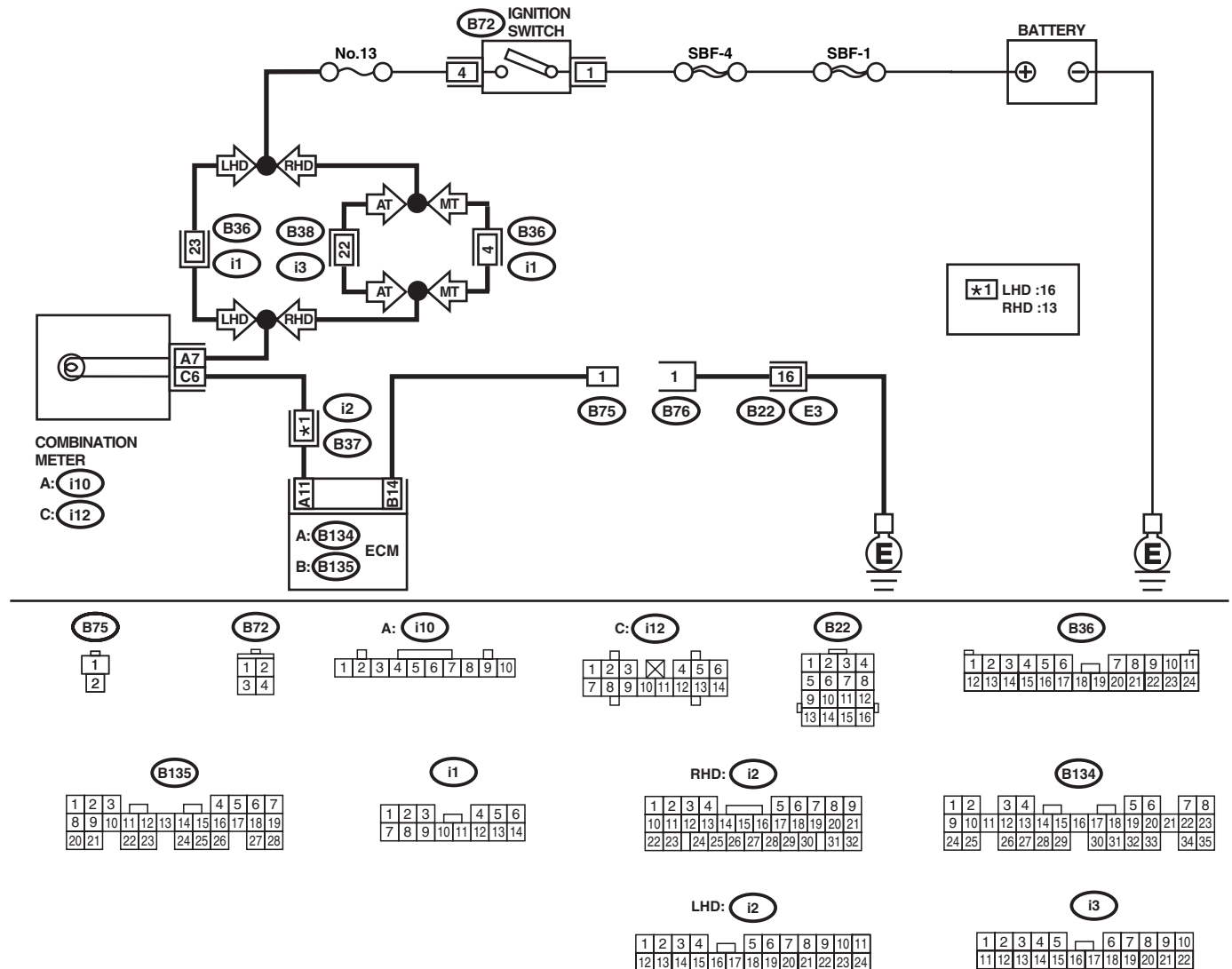
• **DIAGNOSIS:**

- Test mode connector circuit is shorted.

• **TROUBLE SYMPTOM:**

- 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
<p>1</p> <p>CHECK HARNESS BETWEEN ECM CONNECTOR AND ENGINE GROUNDING TERMINAL.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM connector and engine ground.</p> <p>Connector & terminal (B135) No. 14 — Engine ground:</p>	<p>Is the resistance less than 5 Ω?</p>	<p>Repair the short circuit in harness between ECM and test mode connector.</p>	<p>Replace the ECM. <Ref. to FU(w/oOBD)-48, Engine Control Module.></p>

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

12. Diagnostics for Engine Starting Failure

A: PROCEDURE

1. Inspection of starter motor circuit. <Ref. to EN(w/oOBD)-44, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
2. Inspection of ECM power supply and ground line. <Ref. to EN(w/oOBD)-48, CONTROL MODULE POWER SUPPLY AND GROUND LINE, Diagnostics for Engine Starting Failure.>
↓
3. Inspection of ignition control system. <Ref. to EN(w/oOBD)-52, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>
↓
4. Inspection of fuel pump circuit. <Ref. to EN(w/oOBD)-56, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
5. Inspection of fuel injector circuit. <Ref. to EN(w/oOBD)-60, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

DIAGNOSTICS FOR ENGINE STARTING FAILURE

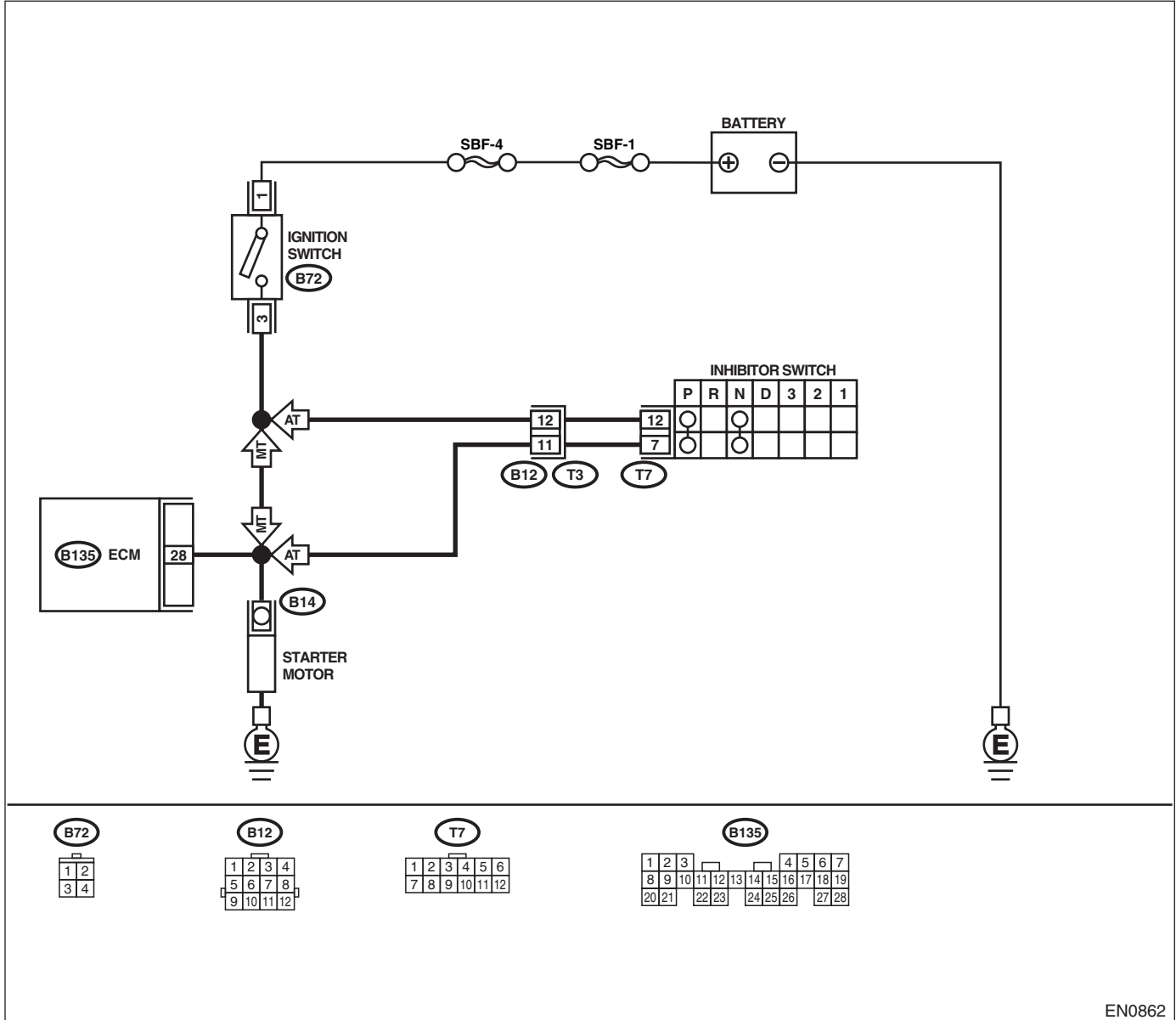
ENGINE (DIAGNOSTICS)

B: STARTER MOTOR CIRCUIT

CAUTION:

After repair or replacement of faulty parts, conduct **CLEAR MEMORY** and **INSPECTION MODES**. <Ref. to EN(w/oOBD)-30, OPERATION, Clear Memory Mode.> and <Ref. to EN(w/oOBD)-28, OPERATION, Inspection Mode.>

• WIRING DIAGRAM:



EN0862

Step	Check	Yes	No
1	CHECK OPERATION OF STARTER MOTOR.	Go to step 2.	Go to step 3.
2	CHECK DIAGNOSTIC TROUBLE CODE (DTC). <Ref. to EN(w/oOBD)-26, OPERATION, Read Diagnostic Trouble Code (DTC).>	Record the DTC. Repair the trouble cause. <Ref. to EN(w/oOBD)-66, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Go to step 3.

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
3 CHECK INPUT SIGNAL FOR STARTER MOTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from starter motor. 3) Turn the ignition switch to START. 4) Measure the 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 the ignition switch to OFF. 2) Disconnect the terminal from starter motor. 3) Measure the resistance of ground cable between ground cable terminal and engine ground.	Is the resistance less than 5 Ω?	Check the starter motor. <Ref. to SC-10, INSPECTION, Starter.>	Repair the open circuit of ground cable.
5 CHECK HARNESS BETWEEN ECM AND STARTER MOTOR CIRCUIT. 1) Turn the ignition switch to OFF. 2) Measure the resistance between starter motor and ECM. Connector & terminal (B14) No. 1 — Engine ground:	Is the resistance less than 1 Ω?	Repair the ground short circuit.	Go to step 6.
6 CHECK HARNESS BETWEEN ECM AND STARTER MOTOR CIRCUIT. 1) Turn the ignition switch to START. 2) Measure the resistance of fuse. Connector & terminal (B14) No. 1 — Engine ground:	Is the resistance less than 1 Ω?	Go to step 7.	Repair the ground short circuit.
7 CHECK HARNESS BETWEEN BATTERY AND IGNITION SWITCH CONNECTOR. 1) Ignition the switch to OFF. 2) Disconnect the connector from ignition switch. 3) Measure the power supply voltage between ignition switch connector and chassis ground. Connector & terminal (B72) No. 1 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 8.	Repair the open circuit in harness between ignition switch and battery.
8 CHECK HARNESS BETWEEN BATTERY AND IGNITION SWITCH CONNECTOR. 1) Connect the connector to ignition switch. 2) Turn the ignition switch to START. 3) Measure the 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 the ignition switch.
9 CHECK TRANSMISSION TYPE.	Is the vehicle AT?	Go to step 10.	Repair the open circuit between ignition switch and starter motor circuit.

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
10 CHECK INHIBITOR SWITCH CIRCUIT. 1) Turn the ignition switch to OFF. 2) Place the selector lever in the "P" or "N" position. 3) Separate the transmission harness connector. 4) Measure the resistance between transmission harness connector receptacle's terminals. <i>Connector & terminal</i> <i>(T3) No. 11 — No. 12:</i>	Is the resistance less than 1 Ω ?	Repair the open circuit in harness between starter motor and ignition switch connector.	Go to step 11.
11 CHECK TRANSMISSION HARNESS. 1) Disconnect the connector from inhibitor switch. 2) Measure the resistance of harness between transmission harness and inhibitor switch connector. <i>Connector & terminal</i> <i>(T3) No. 11 — (T7) No. 7:</i> <i>(T3) No. 12 — (T7) No. 12:</i>	Is the resistance less than 1 Ω ?	Go to step 12.	Repair the 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 the poor contact in inhibitor switch connector.	Replace the inhibitor switch.

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

DIAGNOSTICS FOR ENGINE STARTING FAILURE

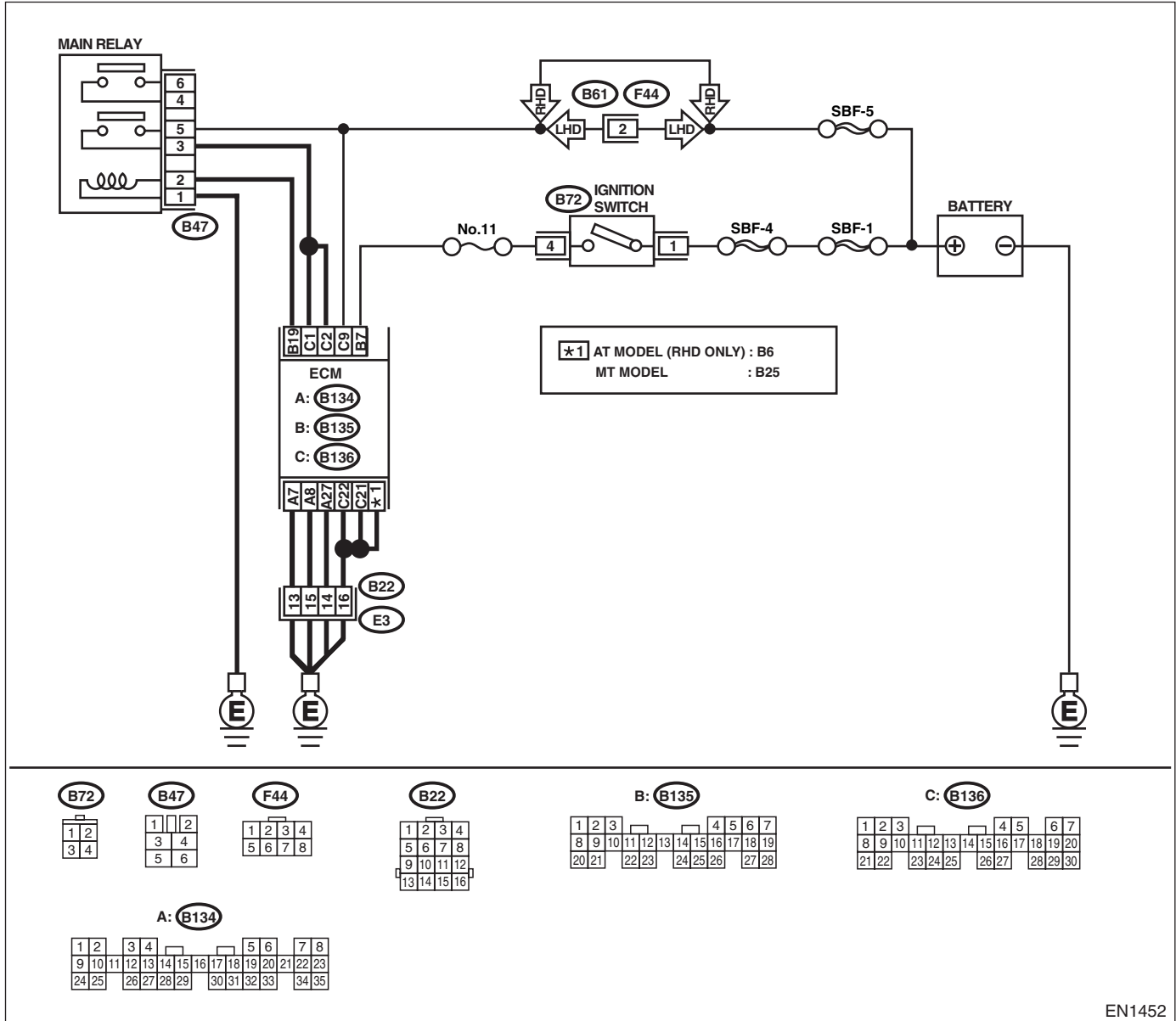
ENGINE (DIAGNOSTICS)

C: CONTROL MODULE POWER SUPPLY AND GROUND LINE

CAUTION:

After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES. <Ref. to EN(w/oOBD)-30, OPERATION, Clear Memory Mode.> and <Ref. to EN(w/oOBD)-28, OPERATION, Inspection Mode.>

• WIRING DIAGRAM:



EN1452

Step	Check	Yes	No
1 CHECK MAIN RELAY. 1) Turn the ignition switch to OFF. 2) Remove the main relay. 3) Connect the battery to main relay terminals No. 1 and No. 2. 4) Measure the resistance between main relay terminals. Terminals No. 3 — No. 5: No. 4 — No. 6:	Is the resistance less than 10 Ω?	Go to step 2.	Replace the main relay.

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>2 CHECK GROUND CIRCUIT OF ECM. 1) Disconnect the connector from ECM. 2) Measure the 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>(B135) No. 25 — Chassis ground: (MT vehicle)</i> <i>(B135) No. 6 — Chassis ground: (AT vehicle (RHD ONLY))</i></p>	Is the resistance less than 5 Ω ?	Go to step 3.	Repair the open circuit in harness between ECM connector and engine grounding terminal.
<p>3 CHECK INPUT VOLTAGE OF ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal <i>(B136) No. 9 (+) — Chassis ground (-):</i></p>	Is the voltage more than 10 V?	Go to step 4.	Repair the open or ground short circuit of power supply circuit.
<p>4 CHECK INPUT VOLTAGE OF ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector and chassis ground. Connector & terminal <i>(B135) No. 7 (+) — Chassis ground (-):</i></p>	Is the voltage more than 10 V?	Go to step 5.	Repair the open or ground short circuit of power supply circuit.
<p>5 CHECK HARNESS BETWEEN ECM AND MAIN RELAY CONNECTOR. 1) Turn the ignition switch to OFF. 2) Measure the resistance between ECM and chassis ground. Connector & terminal <i>(B135) No. 19 — Chassis ground:</i></p>	Is the resistance more than 1 M Ω ?	Go to step 6.	Repair the ground short circuit in harness between ECM connector and main relay connector, and then replace the ECM.
<p>6 CHECK OUTPUT VOLTAGE FROM ECM. 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM connector and chassis ground. Connector & terminal <i>(B135) No. 19 (+) — Chassis ground (-):</i></p>	Is the voltage more than 10 V?	Go to step 7.	Replace the ECM.
<p>7 CHECK INPUT VOLTAGE OF MAIN RELAY. Check the voltage between main relay connector and chassis ground. Connector & terminal <i>(B47) No. 2 (+) — Chassis ground (-):</i></p>	Is the voltage more than 10 V?	Go to step 8.	Repair the open circuit in harness between ECM connector and main relay connector.
<p>8 CHECK GROUND CIRCUIT OF MAIN RELAY. 1) Turn the ignition switch to OFF. 2) Measure the resistance between main relay connector and chassis ground. Connector & terminal <i>(B47) No. 1 — Chassis ground:</i></p>	Is the resistance less than 5 Ω ?	Go to step 9.	Repair the open circuit between main relay and chassis ground.
<p>9 CHECK INPUT VOLTAGE OF MAIN RELAY. Measure the voltage between main relay connector and chassis ground. Connector & terminal <i>(B47) No. 5 (+) — Chassis ground (-):</i> <i>(B47) No. 6 (+) — Chassis ground (-):</i></p>	Is the voltage more than 10 V?	Go to step 10.	Repair the 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 the main relay connector. 2)Turn the ignition switch to ON. 3)Measure the 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 the ignition control system. <Ref. to EN(w/oOBD)-52, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>	Repair the open or ground short circuit in harness between ECM connector and main relay connector.

DIAGNOSTICS FOR ENGINE STARTING FAILURE

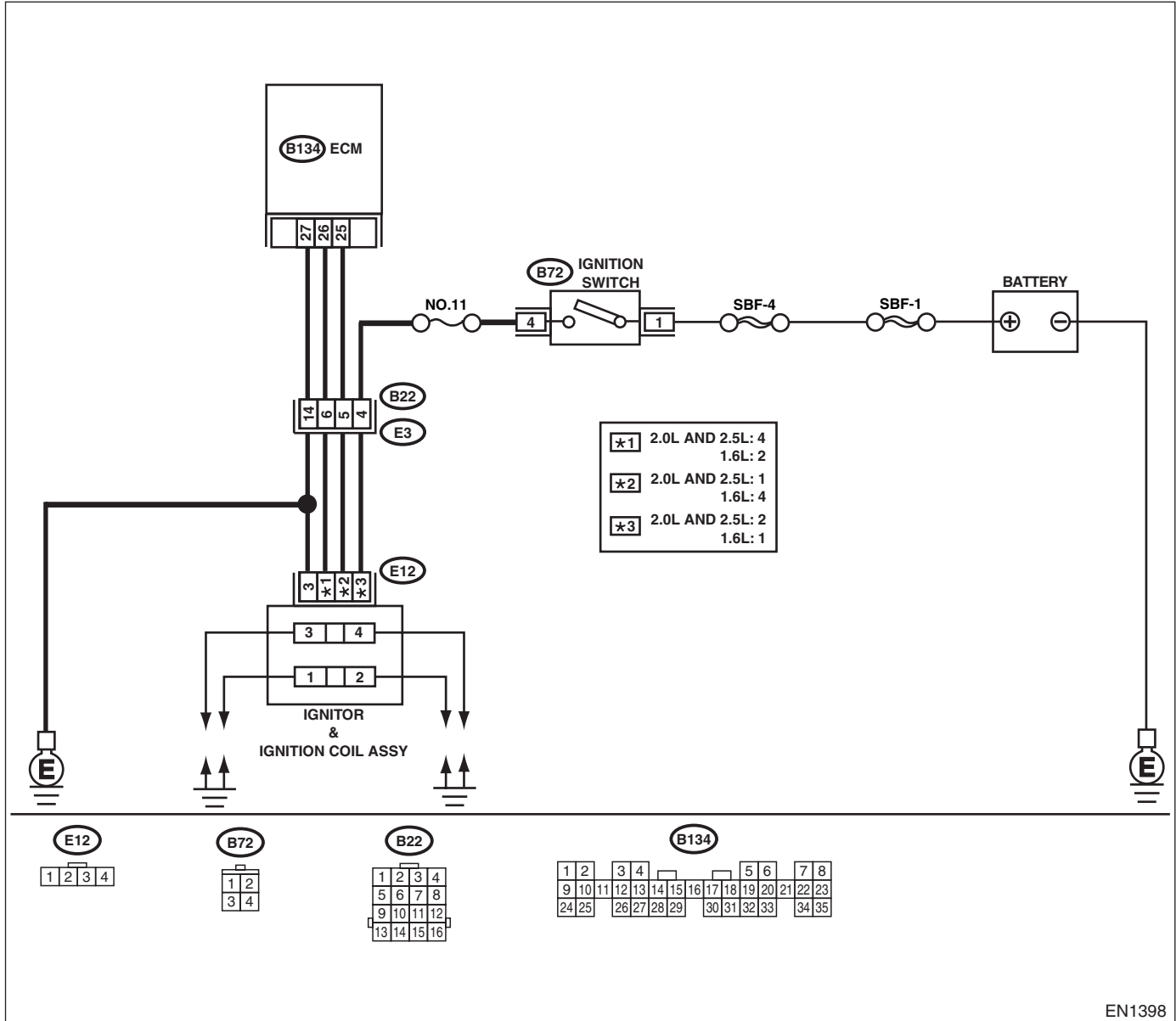
ENGINE (DIAGNOSTICS)

D: IGNITION CONTROL SYSTEM

CAUTION:

After repair or replacement of the faulty parts, conduct the CLEAR MEMORY and INSPECTION MODES. <Ref. to EN(w/oOBD)-30, OPERATION, Clear Memory Mode.> and <Ref. to EN(w/oOBD)-28, OPERATION, Inspection Mode.>

• WIRING DIAGRAM:



EN1398

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>1</p> <p>CHECK IGNITION SYSTEM FOR SPARKS. 1)Remove the plug cord cap from each spark plug. 2)Install new spark plug on the plug cord cap. CAUTION: Do not remove the spark plug from engine. 3)Contact the spark plug's thread portion on engine. 4)While opening the throttle valve fully, crank engine to check that spark occurs at each cylinder.</p>	Does spark occur at each cylinder?	Check the fuel pump system. <Ref. to EN(w/oOBD)-56, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>	Go to step 2.
<p>2</p> <p>CHECK POWER SUPPLY CIRCUIT FOR IGNITION COIL & IGNITOR ASSEMBLY. 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ignition coil & ignitor assembly. 3)Turn the ignition switch to ON. 4)Measure the power supply voltage between ignition coil & ignitor assembly connector and engine ground. Connector & terminal •1.6 L (E12) No. 1 (+) — Engine ground (-): •2.0 L and 2.5 L (E12) No. 2 (+) — Engine ground (-):</p>	Is the voltage more than 10 V?	Go to step 3.	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit or ground short in harness between ignition coil & ignitor assembly, and ignition switch connector • Poor contact in coupling connector (B22)
<p>3</p> <p>CHECK HARNESS OF IGNITION COIL & IGNITOR ASSEMBLY GROUND CIRCUIT. 1)Turn the ignition switch to OFF. 2)Measure the resistance between ignition coil & ignitor assembly connector and engine ground. Connector & terminal (E12) No. 3 — Engine ground:</p>	Is the resistance between less than 5 Ω?	Go to step 4.	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ignition coil & ignitor assembly connector and engine grounding terminal
<p>4</p> <p>CHECK IGNITION COIL & IGNITOR ASSEMBLY. 1)Remove the spark plug cords. 2)Measure the resistance between spark plug cord contact portions to check secondary coil. Terminals •1.6 L No. 4 — No. 1: •2.0 L and 2.5 L No. 1 — No. 2:</p>	Is the resistance between 10 and 15 Ω?	Go to step 5.	Replace the ignition coil & ignitor assembly.
<p>5</p> <p>CHECK IGNITION COIL & IGNITOR ASSEMBLY. Measure the resistance between spark plug cord contact portions to check secondary coil. Terminals •1.6 L No. 3 — No. 2: •2.0 L and 2.5 L No. 3 — No. 4:</p>	Is the resistance between 10 and 15 Ω?	Go to step 6.	Replace the ignition coil & ignitor assembly.

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>6 CHECK INPUT SIGNAL FOR IGNITION COIL & IGNITOR ASSEMBLY. Check if the voltage varies synchronously with engine speed when cranking, while monitoring voltage between ignition coil & ignitor assembly connector and engine ground.</p> <p>Connector & terminal</p> <ul style="list-style-type: none"> •1.6 L (E12) No. 4 (+) — Engine ground (-): •2.0 L and 2.5 L (E12) No. 1 (+) — Engine ground (-): 	Is the voltage more than 10 V?	Go to step 7.	Replace the ignition coil & ignitor assembly.
<p>7 CHECK INPUT SIGNAL FOR IGNITION COIL & IGNITOR ASSEMBLY. Check if the voltage varies synchronously with engine speed when cranking, while monitoring voltage between ignition coil & ignitor assembly connector and engine ground.</p> <p>Connector & terminal</p> <ul style="list-style-type: none"> •1.6 L (E12) No. 2 (+) — Engine ground (-): •2.0 L and 2.5 L (E12) No. 4 (+) — Engine ground (-): 	Is the voltage more than 10 V?	Go to step 8.	Replace the ignition coil & ignitor assembly.
<p>8 CHECK HARNESS BETWEEN ECM AND IGNITION COIL & IGNITOR ASSEMBLY CONNECTOR. 1)Disconnect the connector from ECM. 2)Measure the resistance of harness between ECM and ignition coil & ignitor assembly connector.</p> <p>Connector & terminal</p> <ul style="list-style-type: none"> •1.6 L (B134) No. 26 — (E12) No. 2: •2.0 L and 2.5 L (B134) No. 26 — (E12) No. 4: 	Is the resistance less than 1 Ω ?	Go to step 9.	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and ignition coil & ignitor assembly connector • Poor contact in a coupling connector (B22)
<p>9 CHECK HARNESS BETWEEN ECM AND IGNITION COIL & IGNITOR ASSEMBLY CONNECTOR. Measure the resistance of harness between ECM and ignition coil & ignitor assembly connector.</p> <p>Connector & terminal</p> <ul style="list-style-type: none"> •1.6 L (B134) No. 25 — (E12) No. 4: •2.0 L and 2.5 L (B134) No. 25 — (E12) No. 1: 	Is the resistance less than 1 Ω ?	Go to step 10.	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and ignition coil & ignitor assembly connector • Poor contact in 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 the resistance of harness between ECM and ignition coil & ignitor assembly connector. <i>Connector & terminal:</i> <i>(B134) No. 27 — (E12) No. 3:</i>	Is the resistance less than 1 Ω ?	Go to step 11.	Repair the harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between ECM and ignition coil & ignitor assembly connector • Poor contact in a coupling connector (B22)
11 CHECK HARNESS BETWEEN ECM AND IGNITION COIL & IGNITOR ASSEMBLY CONNECTOR. Measure the resistance of harness between ECM and chassis ground. <i>Connector & terminal:</i> <i>(B134) No. 26 — Chassis ground:</i>	Is the resistance more than 1 M Ω ?	Go to step 12.	Repair the 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 the resistance of harness between ECM and chassis ground. <i>Connector & terminal</i> <i>(B134) No. 25 — Chassis ground:</i>	Is the resistance more than 1 M Ω ?	Go to step 13.	Repair the 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 the poor contact in ECM connector.	Check the spark plug and spark plug cord. <Ref. to IG(w/oOBD)-6, INSPECTION, Spark Plug.> <Ref. to IG(w/oOBD)-10, INSPECTION, Spark Plug Cord.>

DIAGNOSTICS FOR ENGINE STARTING FAILURE

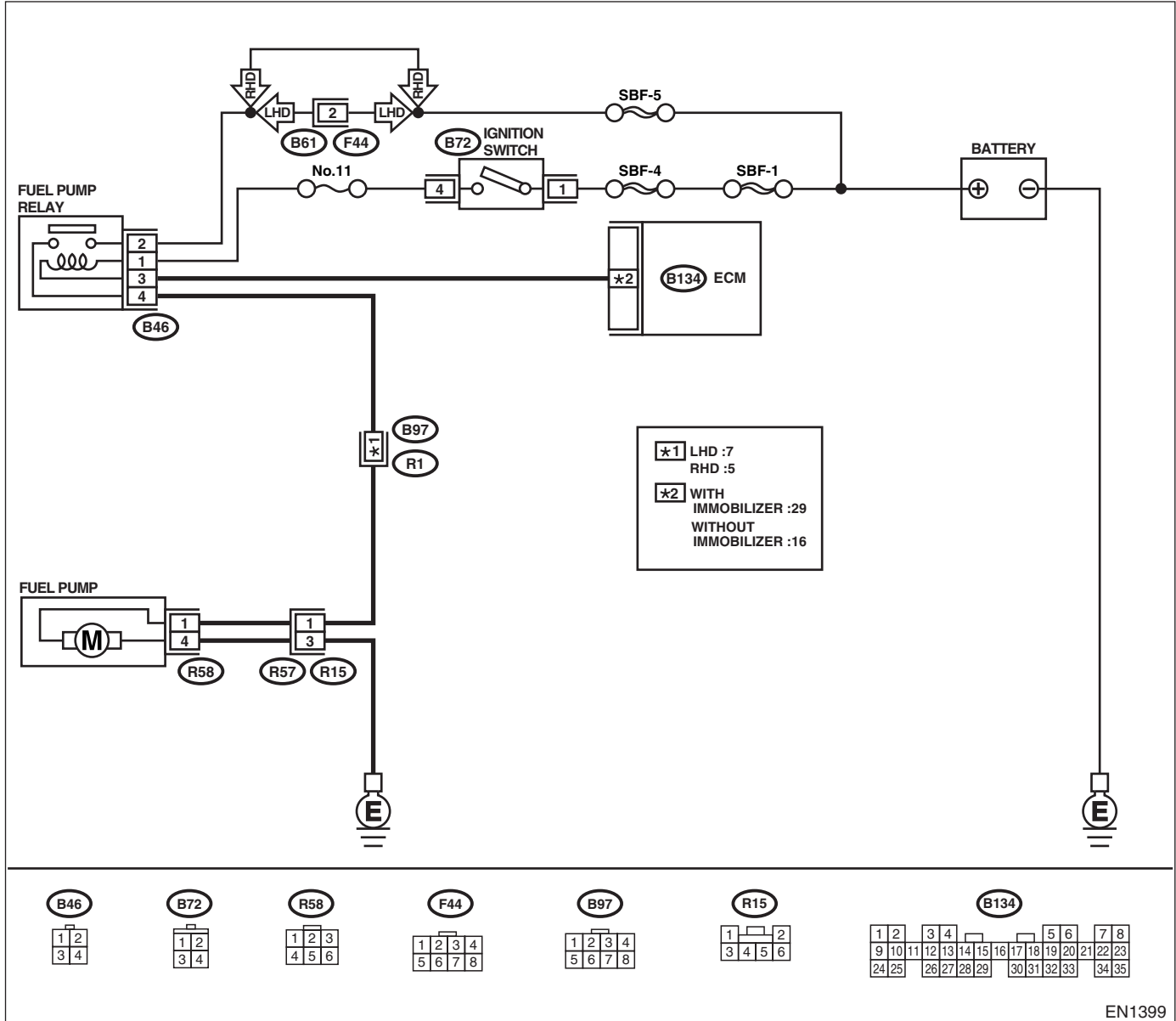
ENGINE (DIAGNOSTICS)

E: FUEL PUMP CIRCUIT

CAUTION:

After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES. <Ref. to EN(w/oOBD)-30, OPERATION, Clear Memory Mode.> and <Ref. to EN(w/oOBD)-28, OPERATION, Inspection Mode.>

• WIRING DIAGRAM:



EN1399

Step	Check	Yes	No	
1	<p>CHECK OPERATING SOUND OF FUEL PUMP.</p> <p>Make sure that the fuel pump is in operation for 2 seconds when turning ignition switch to ON.</p> <p>NOTE: Fuel pump operation check can also be executed using the Subaru Select Monitor. For the procedure, refer to "COMPULSORY VALVE OPERATION CHECK MODE".<Ref. to EN(w/oOBD)-31, OPERATION, Compulsory Valve Operation Check Mode.></p>	Does the fuel pump produce operating sound?	Check the fuel injector circuit. <Ref. to EN(w/oOBD)-60, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>	Go to step 2.

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>2 CHECK GROUND CIRCUIT OF FUEL PUMP. 1) Turn the ignition switch to OFF. 2) Raise the rear seat, and turn floor mat up. 3) Remove the service hole cover. 4) Disconnect the connector from fuel pump. 5) Measure the resistance of harness connector between fuel pump and chassis ground. Connector & terminal (R58) No. 4 — Chassis ground:</p>	<p>Is the resistance less than 5 Ω?</p>	<p>Go to step 3.</p>	<p>Repair the harness and connector. NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Open circuit in harness between fuel pump connector and chassis grounding terminal • Poor contact in coupling connector (R15) and (B97)
<p>3 CHECK POWER SUPPLY TO FUEL PUMP. 1) Turn the ignition switch to ON. 2) Measure the voltage of power supply circuit between fuel pump connector and chassis ground. Connector & terminal (R58) No. 1 (+) — Chassis ground (-):</p>	<p>Is the voltage more than 10 V?</p>	<p>Replace the fuel pump.</p>	<p>Go to step 4.</p>
<p>4 CHECK HARNESS BETWEEN FUEL PUMP AND FUEL PUMP RELAY CONNECTOR. 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between fuel pump and fuel pump relay connector. Connector & terminal (R58) No. 1 — (B46) No. 4:</p>	<p>Is the resistance less than 1 Ω?</p>	<p>Go to step 5.</p>	<p>Repair the harness and connector. NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Open circuit in harness between fuel pump and fuel pump relay connector • Poor contact in coupling connectors (R15) and (B97)
<p>5 CHECK HARNESS BETWEEN FUEL PUMP AND FUEL PUMP RELAY CONNECTOR. Measure the resistance of harness between fuel pump and fuel pump relay connector. Connector & terminal (R58) No. 1 — Chassis ground:</p>	<p>Is the resistance more than 1 MΩ?</p>	<p>Go to step 6.</p>	<p>Repair the ground short circuit in harness between fuel pump and fuel pump relay connector.</p>
<p>6 CHECK FUEL PUMP RELAY. 1) Disconnect the connector from fuel pump relay. 2) Remove the fuel pump relay from bracket. 3) Connect the battery to fuel pump relay connector terminals No. 1 and No. 3. 4) Measure the resistance between connector terminals of fuel pump relay. Terminals No. 2 — No. 4:</p>	<p>Is the resistance less than 10 Ω?</p>	<p>Go to step 7.</p>	<p>Replace the fuel pump relay.</p>

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
7 CHECK HARNESS BETWEEN ECM AND FUEL PUMP RELAY CONNECTOR. 1) Disconnect the connectors from ECM. 2) Measure the resistance of harness between ECM and fuel pump relay connector. <i>Connector & terminal</i> • <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 the 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 the poor contact in ECM connector.	Check the fuel injector circuit. <Ref. to EN(w/oOBD)-60, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

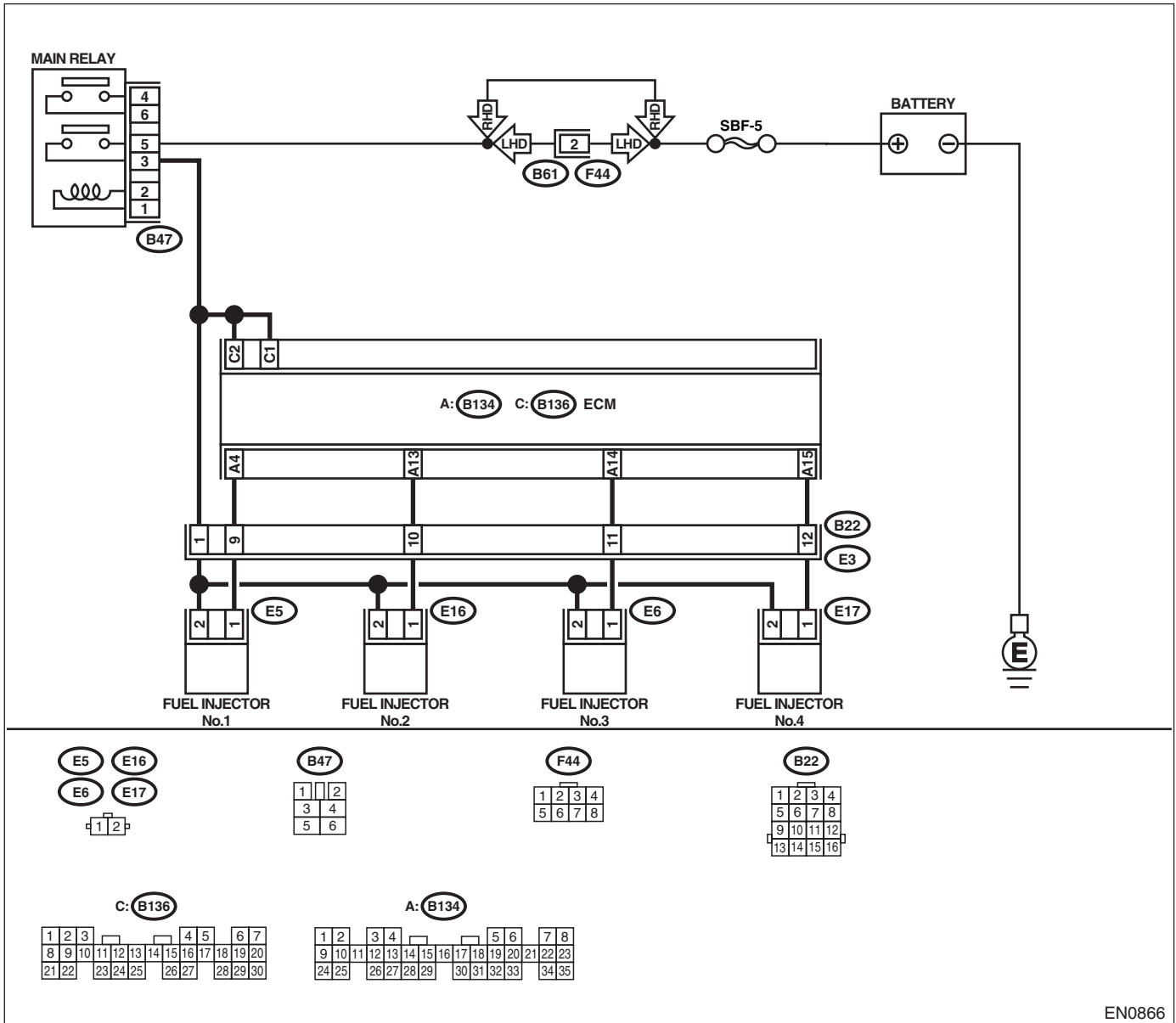
DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

F: FUEL INJECTOR CIRCUIT

CAUTION:

- Check or repair only the faulty parts.
- After repair or replacement of the faulty parts, conduct the CLEAR MEMORY and INSPECTION MODES. <Ref. to EN(w/oOBD)-30, OPERATION, Clear Memory Mode.> and <Ref. to EN(w/oOBD)-28, OPERATION, Inspection Mode.>
- WIRING DIAGRAM:



EN0866

Step	Check	Yes	No	
1	<p>CHECK OPERATION OF EACH FUEL INJECTOR.</p> <p>While cranking the engine, check that each fuel injector emits "operating" sound. Use a sound scope or attach a screwdriver to injector for this check.</p>	Does the fuel injector emit "operating" sound?	Check the fuel pressure. <Ref. to ME-29, INSPECTION, Fuel Pressure.>	Go to step 2.

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>2</p> <p>CHECK POWER SUPPLY TO EACH FUEL INJECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from #1 cylinder fuel injector. 3) Turn the ignition switch to ON. 4) Measure the power supply voltage between the fuel injector terminal and engine ground.</p> <p>Connector & terminal #1 (E5) No. 2 (+) — Engine ground (-): #2 (E16) No. 2 (+) — Engine ground (-): #3 (E6) No. 2 (+) — Engine ground (-): #4 (E17) No. 2 (+) — Engine ground (-):</p>	<p>Is the voltage more than 10 V?</p>	<p>Go to step 3.</p>	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Open circuit in harness between main relay and fuel injector connector • Poor contact in main relay connector • Poor contact in coupling connector (B22) • Poor contact in fuel injector connector
<p>3</p> <p>CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR. 1) Disconnect the connector from ECM. 2) Measure the resistance of harness between ECM and fuel injector connector.</p> <p>Connector & terminal (B134) No. 4 — (B136) No. 2:</p>	<p>Is the resistance between 5 and 20 Ω?</p>	<p>Go to step 4.</p>	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Open circuit in harness between ECM and fuel injector connector • Poor contact in coupling connector (B22)
<p>4</p> <p>CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR. Measure the resistance of harness between ECM and fuel injector connector.</p> <p>Connector & terminal (B134) No. 4 — Chassis ground:</p>	<p>Is the resistance less than 1 Ω?</p>	<p>Repair the ground short circuit in harness between ECM and fuel injector connector.</p>	<p>Go to step 5.</p>
<p>5</p> <p>CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR. Measure the resistance of harness between ECM and fuel injector connector.</p> <p>Connector & terminal (B134) No. 13 — (B136) No. 2:</p>	<p>Is the resistance between 5 and 20 Ω?</p>	<p>Go to step 6.</p>	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Open circuit in harness between ECM and fuel injector connector • Poor contact in coupling connector (B22)
<p>6</p> <p>CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR. Measure the resistance of harness between ECM and fuel injector connector.</p> <p>Connector & terminal (B134) No. 13 — Chassis ground:</p>	<p>Is the resistance less than 1 Ω?</p>	<p>Repair the ground short circuit in harness between ECM and fuel injector connector.</p>	<p>Go to step 7.</p>

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
7 CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR. Measure the 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 the harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between ECM and fuel injector connector • Poor contact in coupling connector (B22)
8 CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR. Measure the resistance of harness between ECM and fuel injector connector. Connector & terminal (B134) No. 14 — Chassis ground:	Is the resistance less than 1 Ω?	Repair the 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 the 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 the harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between ECM and fuel injector connector • Poor contact in coupling connector (B22)
10 CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR. Measure the resistance of harness between ECM and fuel injector connector. Connector & terminal (B134) No. 15 — Chassis ground:	Is the resistance less than 1 Ω?	Repair the ground short circuit in harness between ECM and fuel injector connector.	Go to step 11 .
11 CHECK EACH FUEL INJECTOR. 1) Turn the ignition switch to OFF. 2) Measure the resistance between each fuel injector terminals. Terminals No. 1 — No. 2:	Is the resistance between 5 and 20 Ω?	Go to step 12 .	Replace the faulty fuel injector.
12 CHECK POOR CONTACT. Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Inspection using "General Diagnostic Table". <Ref. to EN-292, INSPECTION, General Diagnostic Table.>

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

13. List of Diagnostic Trouble Code (DTC)

A: LIST

Trouble code	Item	Contents of diagnosis	Index
11	Crankshaft position sensor	<ul style="list-style-type: none"> No signal entered from crankshaft position sensor when starter switch is ON. Harness connector between ECM and crankshaft position sensor is in short or open. 	<Ref. to EN(w/oOBD)-66, DTC 11 CRANKSHAFT POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
12	Starter switch	<ul style="list-style-type: none"> Starter switch signal is abnormal. Harness connector between ECM and starter switch is in short or open. 	<Ref. to EN(w/oOBD)-68, DTC 12 STARTER SWITCH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
13	Camshaft position sensor	<ul style="list-style-type: none"> No signal entered from camshaft position sensor, but signal entered from crankshaft position sensor. Harness connector between ECM and camshaft position sensor is in short or open. 	<Ref. to EN(w/oOBD)-70, DTC 13 CAMSHAFT POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
21	Engine coolant temperature sensor	<ul style="list-style-type: none"> Engine coolant temperature sensor signal is abnormal. Harness connector between ECM and engine coolant temperature sensor is in short or open. 	<Ref. to EN(w/oOBD)-72, DTC 21 ENGINE COOLANT TEMPERATURE SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
22	Knock sensor	<ul style="list-style-type: none"> Knock sensor signal is abnormal. Harness connector between ECM and knock sensor is in short or open. 	<Ref. to EN(w/oOBD)-76, DTC 22 KNOCK SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
24	Idle air control solenoid valve	<ul style="list-style-type: none"> Idle air control solenoid valve is not in function. Harness connector between ECM and idle air control solenoid valve is in short or open. 	<Ref. to EN(w/oOBD)-78, DTC 24 IDLE AIR CONTROL SOLENOID VALVE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
26	Intake air temperature sensor	<ul style="list-style-type: none"> Intake air temperature sensor signal is abnormal. Harness connector between ECM and intake air temperature sensor is in short or open. 	<Ref. to EN(w/oOBD)-82, DTC 26 INTAKE AIR TEMPERATURE SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
31	Throttle position sensor	<ul style="list-style-type: none"> Throttle position sensor signal is abnormal. Throttle position sensor is installed abnormally. Harness connector between ECM and throttle position sensor is in short or open. 	<Ref. to EN(w/oOBD)-86, DTC 31 THROTTLE POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
32	Oxygen sensor	<ul style="list-style-type: none"> Oxygen sensor is not in function. Harness connector between ECM and oxygen sensor is in short or open. 	<Ref. to EN(w/oOBD)-88, DTC 32 OXYGEN SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
33	Vehicle speed signal	<ul style="list-style-type: none"> Vehicle speed signal is abnormal. Harness connector between ECM and vehicle speed sensor is in short or open. 	<Ref. to EN(w/oOBD)-92, DTC 33 VEHICLE SPEED SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
35	Purge control solenoid valve	<ul style="list-style-type: none"> Purge control solenoid valve is not in function. Harness connector between ECM and purge control solenoid valve is in short or open. 	<Ref. to EN(w/oOBD)-94, DTC 35 PURGE CONTROL SOLENOID VALVE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Trouble code	Item	Contents of diagnosis	Index
38	Torque control signal (AT)	<ul style="list-style-type: none"> • Abnormal signal is entered from TCM. • Harness connector between ECM and TCM is in short or open. 	<Ref. to EN(w/oOBD)-98, DTC 38 TORQUE CONTROL SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
45	Pressure sensor	<ul style="list-style-type: none"> • Pressure sensor signal is abnormal. • Harness connector between ECM and pressure sensor is in short or open. 	<Ref. to EN(w/oOBD)-100, DTC 45 PRESSURE SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
46	CO resistor (General spec. vehicles)	<ul style="list-style-type: none"> • CO resistor signal is abnormal. • Harness connector between ECM and CO resistor is in short or open. • CO valve is not adjusted to specification. 	<Ref. to EN(w/oOBD)-102, DTC 46 CO RESISTOR (GENERAL SPEC. VEHICLES), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
51	Neutral position switch (MT)	<ul style="list-style-type: none"> • Neutral position switch signal is abnormal. • Harness connector between ECM and neutral position switch is in short or open. 	<Ref. to EN(w/oOBD)-104, DTC 51 NEUTRAL POSITION SWITCH (MT VEHICLE), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	Park/Neutral position switch (AT)	<ul style="list-style-type: none"> • Park/neutral position switch signal is abnormal. • Shift cable is connected abnormally. • Harness connector between ECM and inhibitor switch is in short or open. 	<Ref. to EN(w/oOBD)-106, 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(w/oOBD)-108, DTC 85 CHARGE SYSTEM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

*: Immobilizer system equipped model only

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

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 open or shorted.

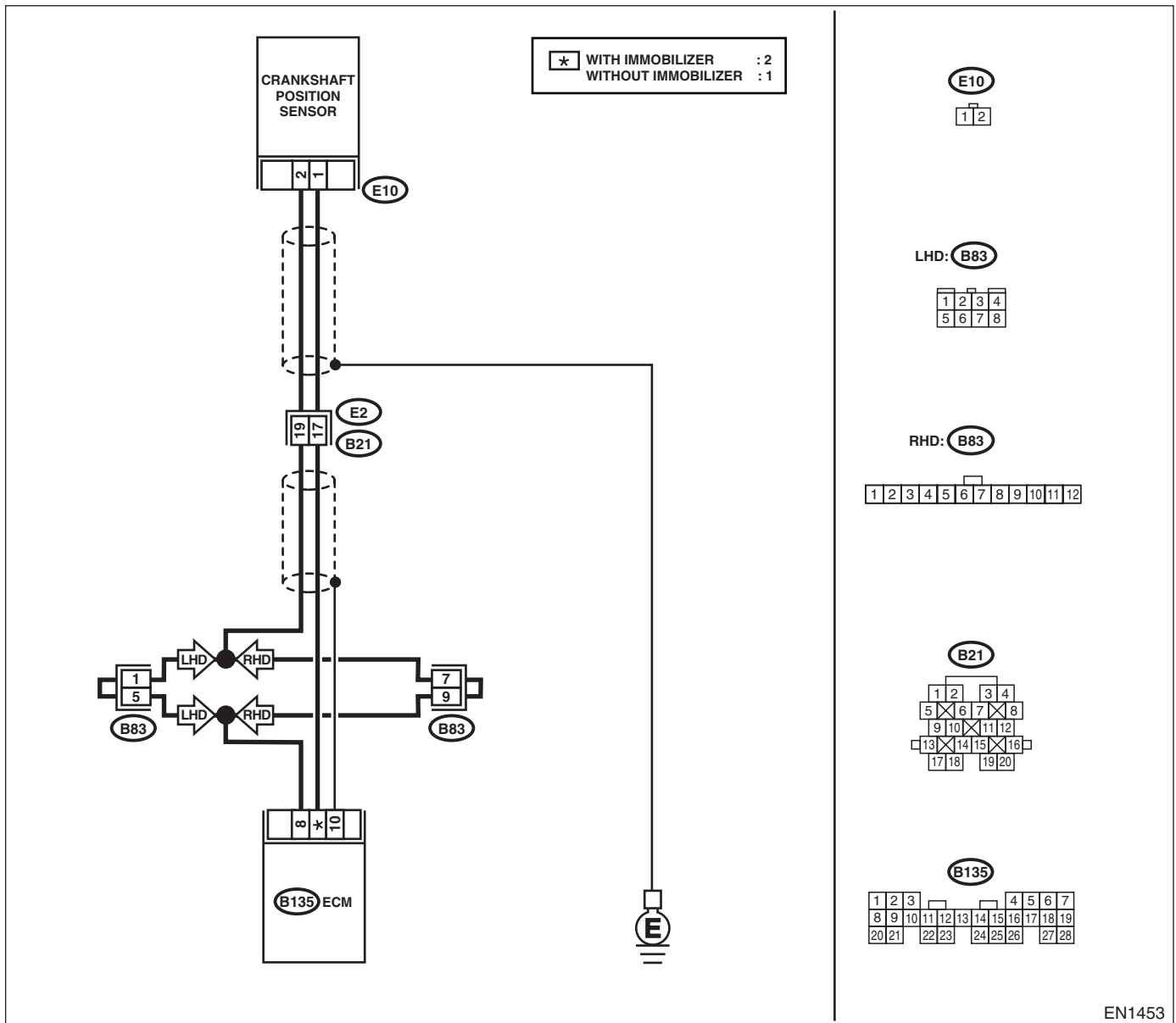
• **TROUBLE SYMPTOM:**

- Engine stalls.
- Restarting impossible

CAUTION:

After repair or replacement of faulty parts, conduct **CLEAR MEMORY** and **INSPECTION MODES**. <Ref. to EN(w/oOBD)-30, OPERATION, Clear Memory Mode.> and <Ref. to EN(w/oOBD)-28, OPERATION, Inspection Mode.>

• **WIRING DIAGRAM:**



DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1	CHECK CONDITION OF CRANKSHAFT POSITION SENSOR INSTALLATION.	Go to step 2.	Tighten the crankshaft position sensor installing bolts securely.
2	CHECK CRANKSHAFT POSITION SENSOR. 1)Remove the crankshaft position sensor. 2)Measure the resistance between connector terminals of crankshaft position sensor. Terminals No. 1 — No. 2:	Go to step 3.	Replace the crankshaft position sensor.
3	CHECK HARNESS BETWEEN ECM AND CRANKSHAFT POSITION SENSOR CONNECTOR. 1)Connect the connector to crankshaft position sensor. 2)Disconnect the connector from ECM. 3)Measure the 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	Go to step 4.	Repair the 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 the resistance of harness between ECM connector and chassis ground. Connector & terminal (B135) No. 8 — Chassis ground:	Repair the ground short circuit in harness between crankshaft position sensor and ECM connector.	Go to step 5.
5	CHECK INPUT SIGNAL FOR ECM. 1)Turn the ignition switch to OFF. 2)Set the positive (+) probe and ground lead of oscilloscope at ECM connector terminals. 3)Measure the voltage indicated on oscilloscope while cranking engine. Connector & terminal • With Immobilizer (B135) No. 2 (+) — (B135) No. 8 (-) • Without Immobilizer (B135) No. 1 (+) — (B135) No. 8 (-)	Go to step 6.	Replace the crankshaft position sensor.
6	CHECK POOR CONTACT. Check poor contact in ECM connector.	Repair the poor contact in ECM connector.	Go to step 7.
7	CHECK ECM. 1)Connect all connectors. 2)Erase the memory. <Ref. to EN(w/oOBD)-30, OPERATION, Clear Memory Mode.> 3)Perform the inspection mode. <Ref. to EN(w/oOBD)-28, OPERATION, Inspection Mode.> 4)Read any DTC on the display. <Ref. to EN(w/oOBD)-26, OPERATION, Read Diagnostic Trouble Code (DTC).>	Replace the generator.	Go to step 8.
8	CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.	Proceed with the diagnosis corresponding to the DTC.	A temporary poor contact.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

B: DTC 12 STARTER SWITCH

• DIAGNOSIS:

- The starter switch signal is abnormal.
- The harness connector between ECM and starter switch is open or shorted.

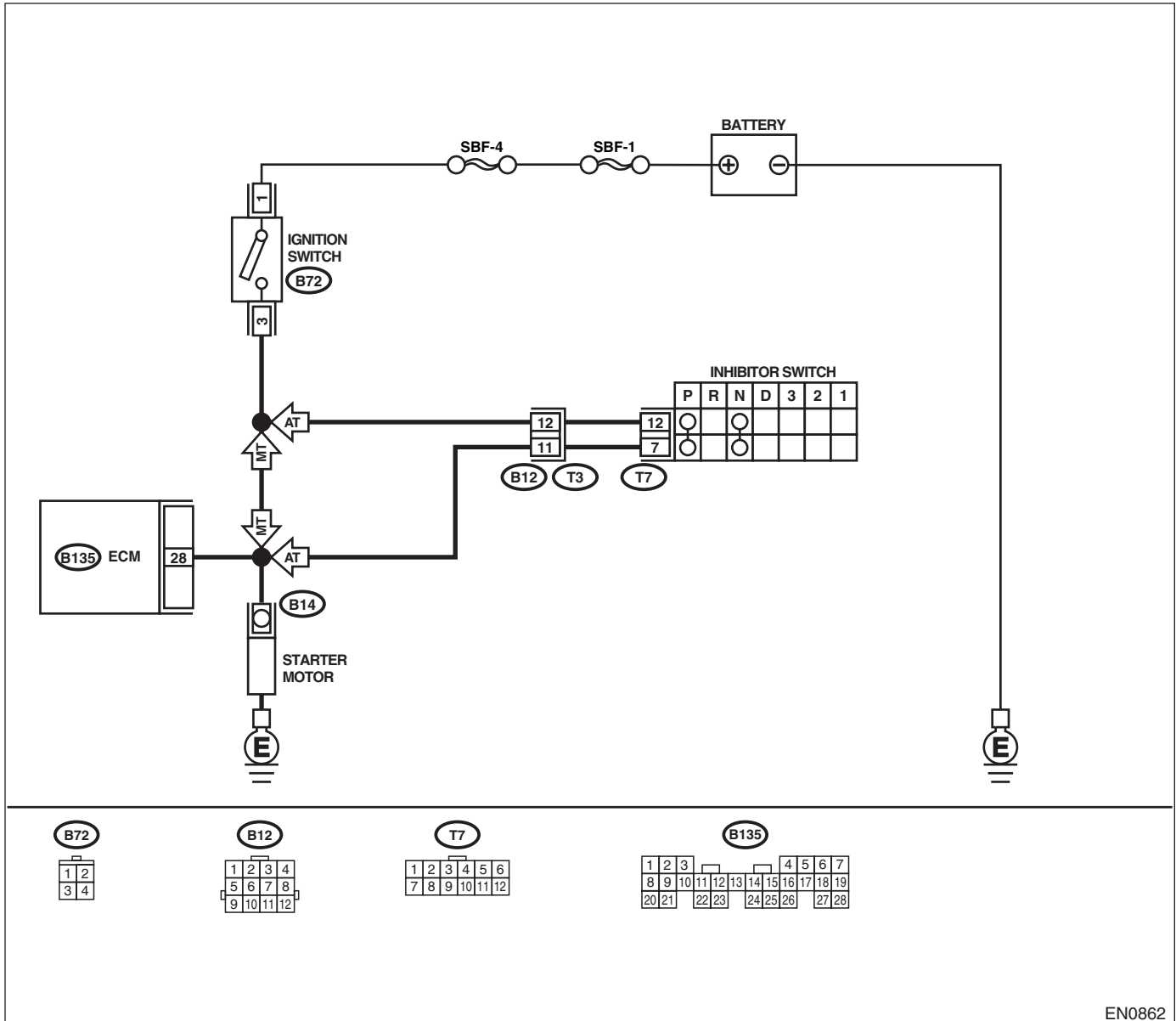
• TROUBLE SYMPTOM:

- Failure of engine to start

CAUTION:

After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES. <Ref. to EN(w/oOBD)-30, OPERATION, Clear Memory Mode.> and <Ref. to EN(w/oOBD)-28, OPERATION, Inspection Mode.>

• WIRING DIAGRAM:



EN0862

Step	Check	Yes	No
1	CHECK OPERATION OF STARTER MOTOR. Does the starter motor operate when ignition switch is turned to START?	Go to step 2.	Check the 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 the ignition switch to OFF. 2)Disconnect the connector from ECM. 3)Turn the ignition switch to START. 4)Measure the power supply voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 28 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Repair the poor contact in ECM connector.	Repair the 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 open or shorted.

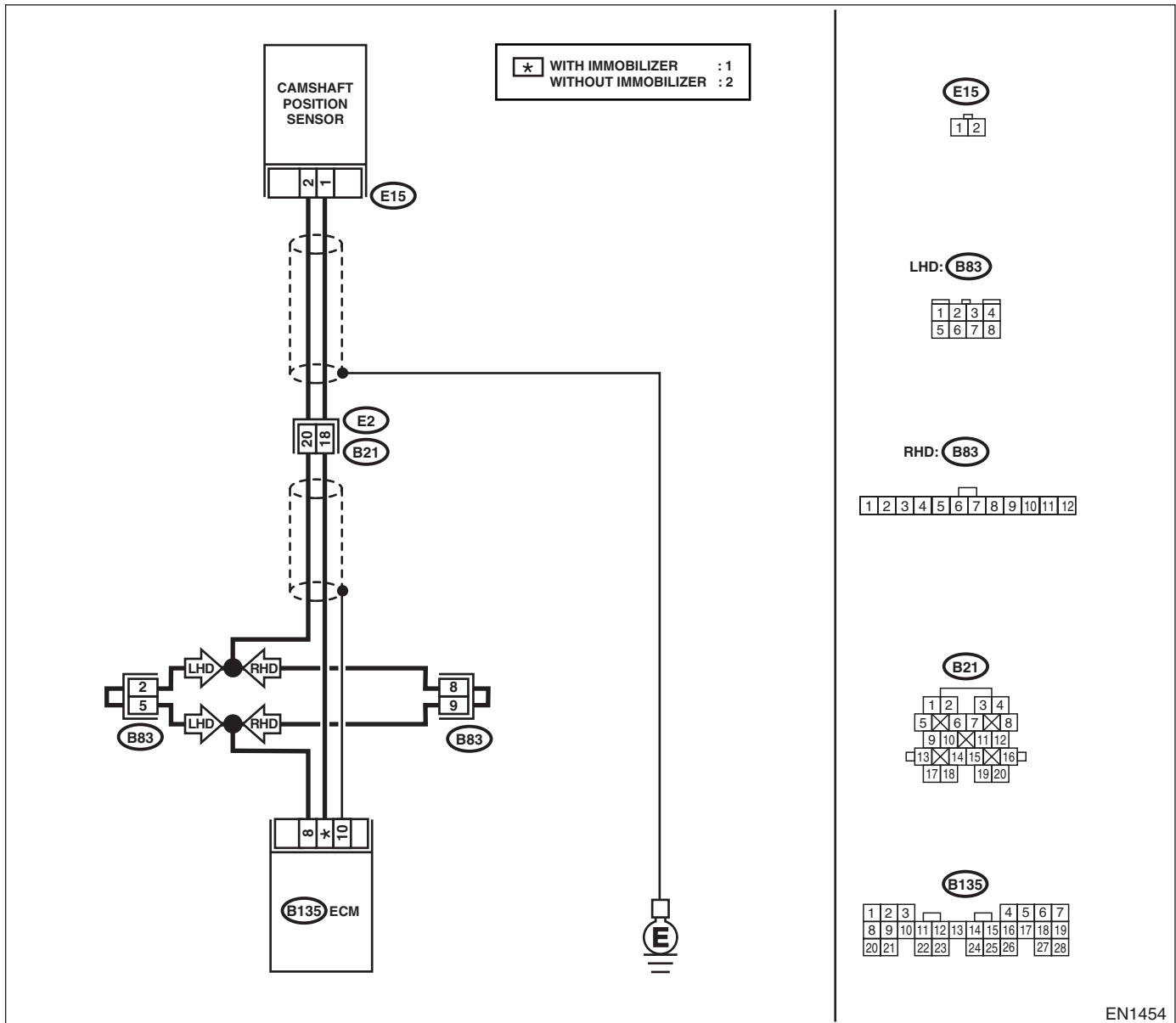
TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

CAUTION:

After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES. <Ref. to EN(w/oOBD)-30, OPERATION, Clear Memory Mode.> and <Ref. to EN(w/oOBD)-28, OPERATION, Inspection Mode.>

WIRING DIAGRAM:



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 the camshaft position sensor installing bolts securely.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
2 CHECK CAMSHAFT POSITION SENSOR. 1)Remove the camshaft position sensor. 2)Measure the 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 the camshaft position sensor.
3 CHECK HARNESS BETWEEN ECM AND CAMSHAFT POSITION SENSOR CONNECTOR. 1)Connect the connector to camshaft position sensor. 2)Disconnect the connector from ECM. 3)Measure the 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 the 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 the resistance of harness between ECM connector and chassis ground. Connector & terminal (B135) No. 8 — Chassis ground:	Is the resistance less than 5 Ω ?	Repair the ground short circuit in harness between camshaft position sensor and ECM connector.	Go to step 5.
5 CHECK INPUT SIGNAL FOR ECM. 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ECM. 3)Set the positive (+) probe and ground lead of oscilloscope at ECM connector terminals. 4)Measure the voltage indicated on oscilloscope while cranking 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 the camshaft position sensor.
6 CHECK POOR CONTACT. Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Go to step 7.
7 CHECK ECM. 1)Connect all connectors. 2)Erase the memory. <Ref. to EN(w/oOBD)-30, OPERATION, Clear Memory Mode.> 3)Perform the inspection mode. <Ref. to EN(w/oOBD)-28, OPERATION, Inspection Mode.> 4)Read any DTC on the display. <Ref. to EN(w/oOBD)-26, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is the same DTC as in the current diagnosis still being output?	Replace the generator.	Go to step 8.
8 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.	Is any other DTC displayed?	Proceed with the diagnosis corresponding to the DTC.	A temporary poor contact.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

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 open or shorted.

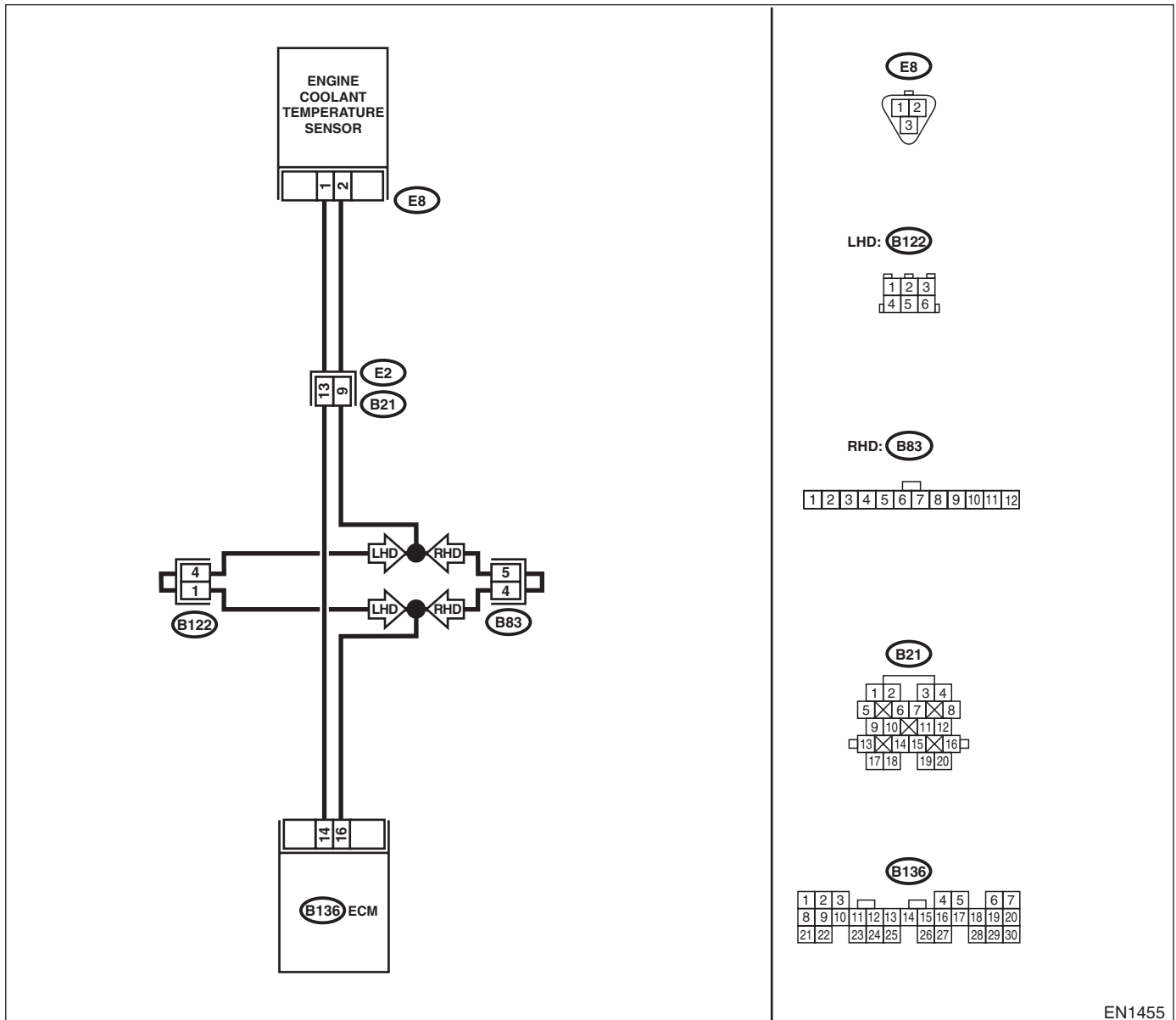
• **TROUBLE SYMPTOM:**

- 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(w/oOBD)-30, OPERATION, Clear Memory Mode.> and <Ref. to EN(w/oOBD)-28, OPERATION, Inspection Mode.>

• **WIRING DIAGRAM:**



EN1455

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>1</p> <p>CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.</p> <p>1) Turn the ignition switch to OFF. 2) Remove the generator. 3) Disconnect the connector from engine coolant temperature sensor. 4) Measure the voltage between engine coolant temperature sensor connector and engine ground.</p> <p>Connector & terminal (E8) No. 1 (+) — Engine ground (-):</p>	Is the voltage more than 10 V?	Repair the battery short circuit in harness between ECM and engine coolant temperature sensor connector.	Go to step 2.
<p>2</p> <p>CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.</p> <p>1) Turn the ignition switch to ON. 2) Measure the voltage between engine coolant temperature sensor connector and engine ground.</p> <p>Connector & terminal (E8) No. 1 (+) — Engine ground (-):</p>	Is the voltage more than 10 V?	Repair the battery short circuit in harness between ECM and engine coolant temperature sensor connector.	Go to step 3.
<p>3</p> <p>CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.</p> <p>Measure the voltage between engine coolant temperature sensor connector and engine ground.</p> <p>Connector & terminal (E8) No. 1 (+) — Engine ground (-):</p>	Is the voltage more than 4 V?	Go to step 4.	Repair the harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between 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
<p>4</p> <p>CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.</p> <p>1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between engine coolant temperature sensor connector and engine ground.</p> <p>Connector & terminal (E8) No. 2 — Engine ground:</p>	<p>Is the resistance less than 5 Ω?</p>	<p>Go to step 5.</p>	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Open circuit in harness between ECM and 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) or (B122)
<p>5</p> <p>CHECK ENGINE COOLANT TEMPERATURE SENSOR.</p> <p>Measure the resistance between engine coolant temperature sensor terminals.</p> <p>Terminals No. 1 — No. 2:</p>	<p>Is the resistance between 2 and 3 kΩ at 20°C (68°F)?</p>	<p>Go to step 6.</p>	<p>Replace the engine coolant temperature sensor.</p>
<p>6</p> <p>CHECK ENGINE COOLANT TEMPERATURE SENSOR.</p> <p>Measure the resistance between engine coolant temperature sensor terminals.</p> <p>Terminals No. 1 — No. 2:</p>	<p>Is the resistance between 0.35 and 0.4 kΩ at 80°C (176°F)?</p>	<p>Go to step 7.</p>	<p>Replace the engine coolant temperature sensor.</p>
<p>7</p> <p>CHECK ENGINE COOLANT TEMPERATURE SENSOR.</p> <p>Measure the resistance between engine coolant temperature sensor terminals.</p> <p>Terminals No. 1 — No. 2:</p>	<p>Is the resistance between 0.2 and 0.3 kΩ at 90°C (194°F)?</p>	<p>Replace the ECM.</p>	<p>Replace the engine coolant temperature sensor.</p>

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 open or shorted.

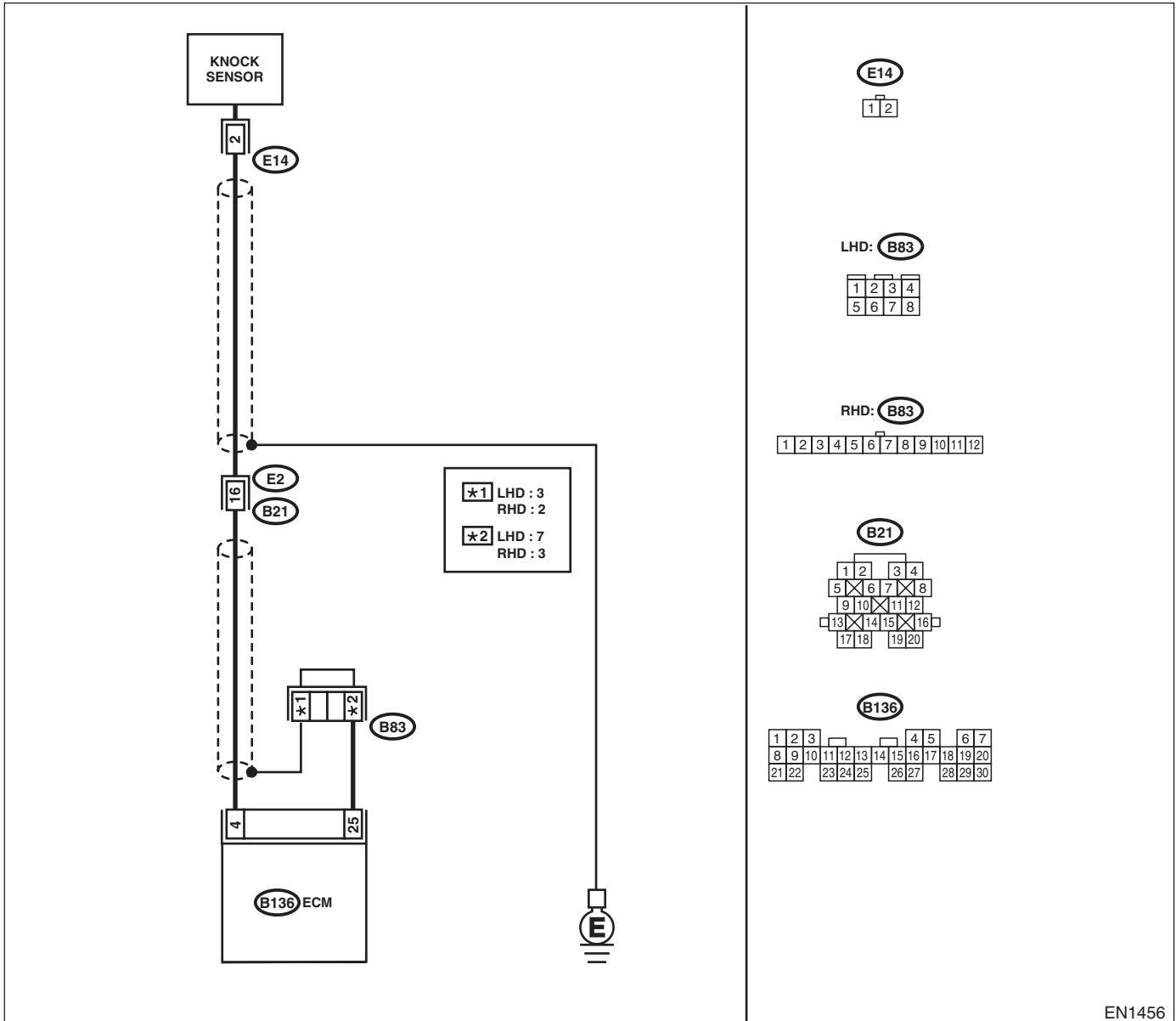
• TROUBLE SYMPTOM:

- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES. <Ref. to EN(w/oOBD)-30, OPERATION, Clear Memory Mode.> and <Ref. to EN(w/oOBD)-28, OPERATION, Inspection Mode.>

• WIRING DIAGRAM:



EN1456

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK INPUT SIGNAL FOR ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector and chassis ground. <i>Connector & terminal</i> <i>(B136) No. 4 (+) — Chassis ground (-):</i>	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 the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(w/oOBD)-48, Engine Control Module.>
3 CHECK KNOCK SENSOR. 1) Disconnect the connector from knock sensor. 2) Measure the resistance between knock sensor connector terminal and engine ground. <i>Terminal</i> <i>No. 2 — Engine ground:</i>	Is the resistance between 530 k Ω and 590 k Ω ?	Go to step 4.	Repair the harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between 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 the resistance of harness connector between ECM and knock sensor. <i>Connector & terminal</i> <i>(E14) No. 2 — Chassis ground:</i>	Is the resistance less than 1 Ω ?	Go to step 5.	Replace the knock sensor. <Ref. to FU(w/oOBD)-33, Knock Sensor.>
5 CHECK HARNESS CONNECTOR BETWEEN ECM AND KNOCK SENSOR. Measure the resistance of harness of harness connector between ECM connector and knock sensor. <i>Connector & terminal</i> <i>(B136) No. 4 — Chassis ground:</i>	Is the resistance more than 1 M Ω ?	Go to step 6.	Repair the 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 the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(w/oOBD)-48, Engine Control Module.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

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 open or shorted.

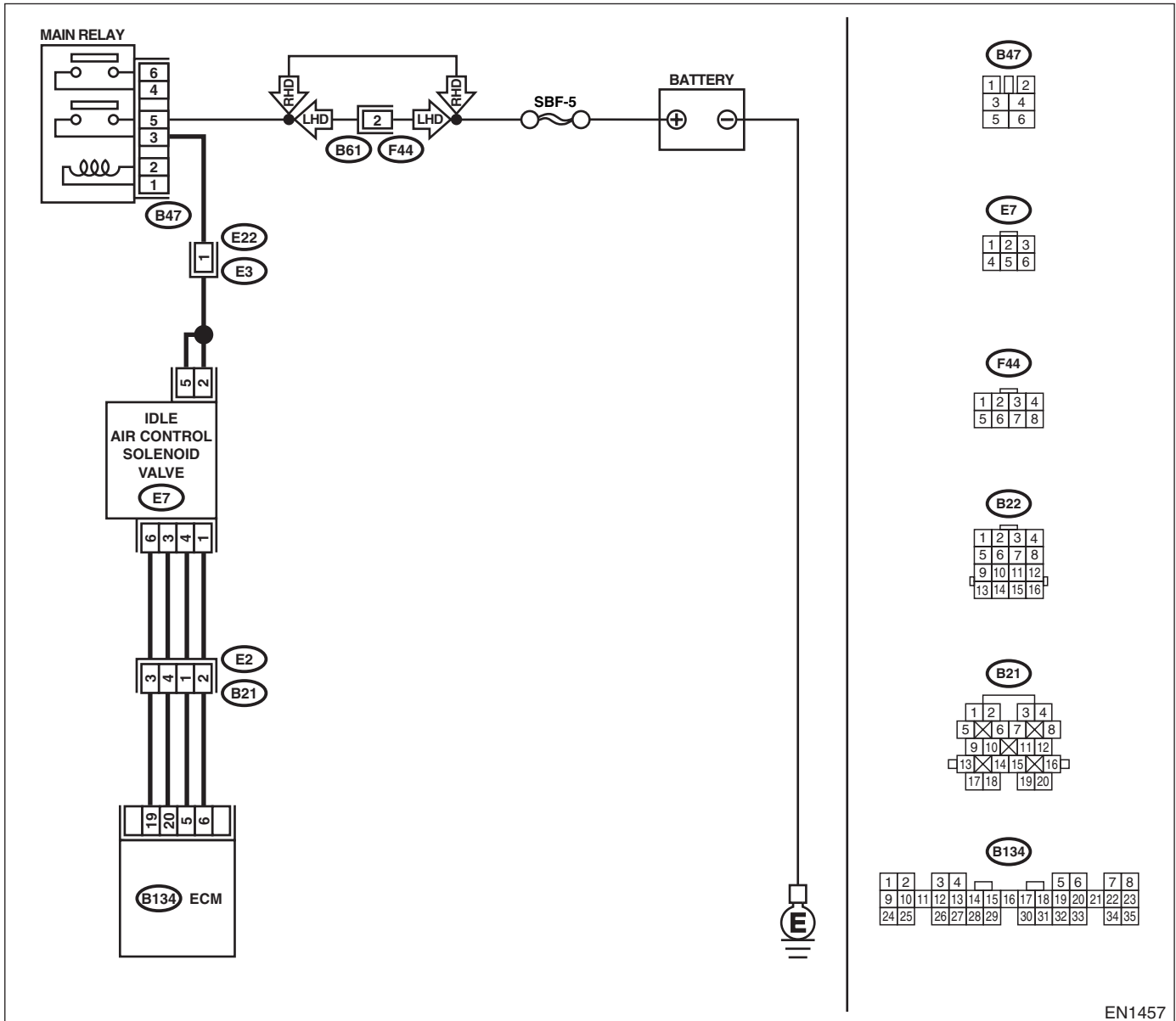
TROUBLE SYMPTOM:

- 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(w/oOBD)-30, OPERATION, Clear Memory Mode.> and <Ref. to EN(w/oOBD)-28, OPERATION, Inspection Mode.>

WIRING DIAGRAM:



DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>1 CHECK POWER SUPPLY TO IDLE AIR CONTROL SOLENOID VALVE.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connector from idle air control solenoid valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between idle air control solenoid valve connector and engine ground.</p> <p>Connector & terminal (E7) No. 2 (+) — Engine ground (-): (E7) No. 5 (+) — Engine ground (-):</p>	Is the voltage more than 10 V?	Go to step 2.	Repair the 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)
<p>2 CHECK HARNESS BETWEEN ECM AND IDLE AIR CONTROL SOLENOID VALVE CONNECTOR.</p> <p>1) Turn the ignition switch to OFF. 2) Measure the resistance between ECM and idle air control solenoid valve connector.</p> <p>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:</p>	Is the resistance less than 1 Ω?	Go to step 3.	Repair the 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)
<p>3 CHECK HARNESS BETWEEN ECM AND IDLE AIR CONTROL SOLENOID VALVE CONNECTOR.</p> <p>1) Disconnect the connector from ECM. 2) Measure the resistance between ECM connector and chassis ground.</p> <p>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:</p>	Is the resistance more than 1 MΩ?	Go to step 4.	Repair the ground short circuit in harness between ECM and idle air control solenoid valve connector.
<p>4 CHECK POOR CONTACT.</p> <p>Check poor contact in ECM connector and idle air control solenoid valve connector.</p>	Is there poor contact in ECM connector or idle air control solenoid valve connector?	Repair the poor contact in ECM connector or idle air control solenoid valve connector.	Go to step 5.
<p>5 CHECK IDLE SPEED.</p>	Is the idling speed higher than standard?	Go to step 6.	Go to step 8.
<p>6 CHECK AIR INTAKE SYSTEM.</p> <p>1) Turn the ignition switch to ON. 2) Start the engine, and idle it. 3) Check the following items.</p> <ul style="list-style-type: none"> • Loose installation of intake manifold, idle air control solenoid valve and throttle body • Cracks of intake manifold gasket, idle air control solenoid valve gasket and throttle body gasket • Disconnections of vacuum hoses 	Is there a fault in the air intake system?	Repair the 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 the ignition switch to OFF. 2) Remove the idle air control solenoid valve from throttle body. <Ref. to FU(w/oOBD)-39, Idle Air Control Solenoid Valve.> 3) Confirm that there are no foreign particles in the by-pass air line.	Are foreign particles in the by-pass air line?	Remove the foreign particles from by-pass air line.	Replace the idle air control solenoid valve. <Ref. to FU(w/oOBD)-39, Idle Air Control Solenoid Valve.>
8 CHECK AIR BY-PASS LINE. 1) Turn the ignition switch to OFF. 2) Remove the idle air control solenoid valve from throttle body. <Ref. to FU(w/oOBD)-39, Idle Air Control Solenoid Valve.> 3) Remove the throttle body from intake manifold. <Ref. to FU(w/oOBD)-16, Throttle Body.> 4) Confirm that there are no foreign particles in the throttle body. 5) Using an air gun, force air into the idle air control solenoid valve installation area. Confirm that forced air subsequently escapes from the throttle body interior.	Does air flow out?	Replace the idle air control solenoid valve. <Ref. to FU(w/oOBD)-39, Idle Air Control Solenoid Valve.>	Replace the throttle body. <Ref. to FU(w/oOBD)-16, Throttle Body.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

G: DTC 26 INTAKE AIR TEMPERATURE SENSOR

• DIAGNOSIS:

- The intake air temperature sensor signal is abnormal.
- The harness connector between ECM and intake air temperature sensor is open or shorted.

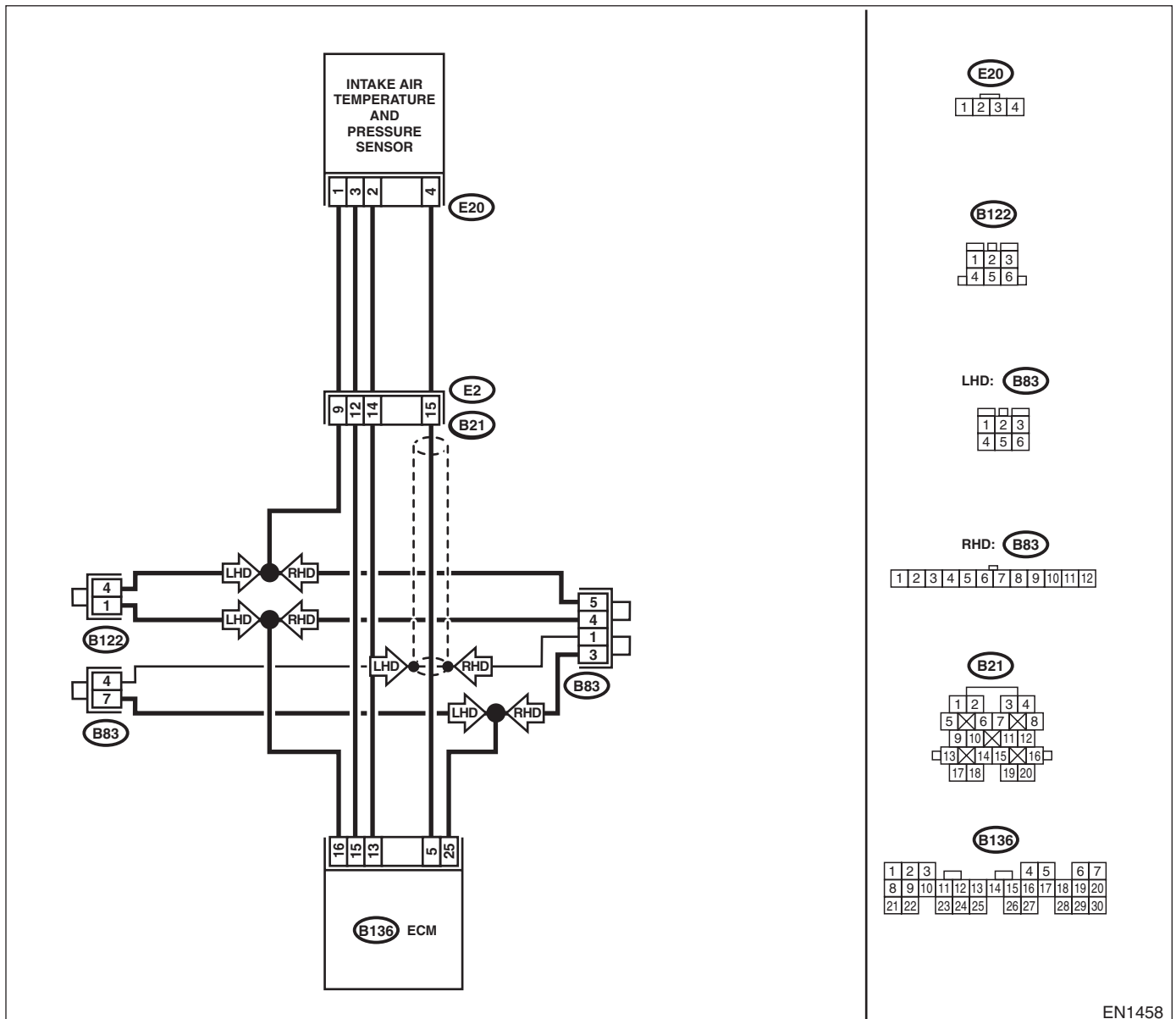
• TROUBLE SYMPTOM:

- 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(w/oOBD)-30, OPERATION, Clear Memory Mode.> and <Ref. to EN(w/oOBD)-28, OPERATION, Inspection Mode.>

• WIRING DIAGRAM:



DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>1</p> <p>CHECK INTAKE AIR TEMPERATURE SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from intake air temperature sensor. 3) Measure the resistance between intake air temperature sensor terminals.</p> <p>Terminals No. 2 — No. 3:</p>	<p>Is the resistance between 2 and 3 kΩ at 20°C (68°F)?</p>	<p>Go to step 2.</p>	<p>Replace the intake air temperature sensor. <Ref. to FU(w/oOBD)-38, Intake Air Temperature and Pressure Sensor.></p>
<p>2</p> <p>CHECK INTAKE AIR TEMPERATURE SENSOR. Measure the resistance between intake air temperature sensor terminals.</p> <p>Terminals No. 2 — No. 3:</p>	<p>Is the resistance between 0.66 and 1 kΩ at 50°C (122°F)?</p>	<p>Go to step 3.</p>	<p>Replace the intake air temperature sensor. <Ref. to FU(w/oOBD)-38, Intake Air Temperature and Pressure Sensor.></p>
<p>3</p> <p>CHECK HARNESS BETWEEN ECM AND INTAKE AIR TEMPERATURE SENSOR CONNECTOR. 1) Disconnect the connector from ECM. 2) Measure the resistance of harness connector between ECM and intake air temperature sensor connector.</p> <p>Connector & terminal (B136) No. 15 — (E20) No. 3:</p>	<p>Is the resistance less than 1 Ω?</p>	<p>Go to step 4.</p>	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Open circuit in harness between ECM and intake air temperature and pressure sensor connector • Poor contact in coupling connector (B21)
<p>4</p> <p>CHECK HARNESS BETWEEN ECM AND INTAKE AIR TEMPERATURE SENSOR CONNECTOR. Measure the resistance of harness connector between ECM and intake air temperature sensor connector.</p> <p>Connector & terminal (B136) No. 13 — (E20) No. 2:</p>	<p>Is the resistance less than 1 Ω?</p>	<p>Go to step 5.</p>	<p>Repair the harness and connector.</p>
<p>5</p> <p>CHECK HARNESS BETWEEN ECM AND INTAKE AIR TEMPERATURE SENSOR CONNECTOR. Measure the resistance of harness between ECM connector and chassis ground.</p> <p>Connector & terminal (B136) No. 15 — Chassis ground:</p>	<p>Is the resistance more than 1 MΩ?</p>	<p>Go to step 6.</p>	<p>Repair the ground short circuit in harness between ECM and idle air control solenoid valve connector.</p>
<p>6</p> <p>CHECK HARNESS BETWEEN ECM AND INTAKE AIR TEMPERATURE SENSOR CONNECTOR. Measure the resistance of harness between ECM connector and chassis ground.</p> <p>Connector & terminal (B136) No. 13 — Chassis ground:</p>	<p>Is the resistance more than 1 MΩ?</p>	<p>Go to step 7.</p>	<p>Repair the ground short circuit in harness between ECM and idle air control solenoid valve connector.</p>

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 the poor contact in ECM connector.	Contact with your Subaru distributor service. NOTE: Inspection by your Subaru distributor service is required, because probable cause is deterioration of multiple parts.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

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 open or shorted.

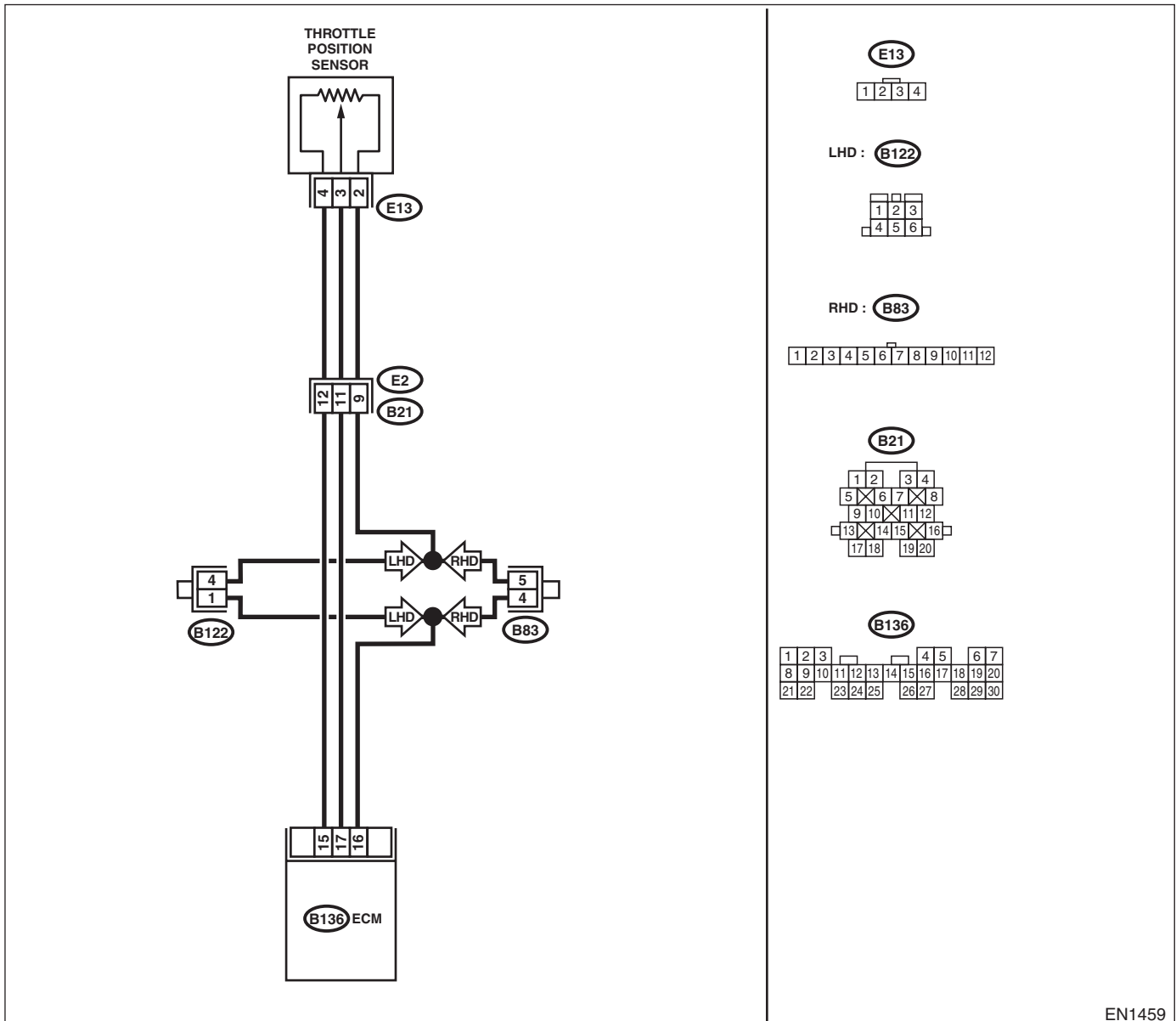
• TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES. <Ref. to EN(w/oOBD)-30, OPERATION, Clear Memory Mode.> and <Ref. to EN(w/oOBD)-28, OPERATION, Inspection Mode.>

• WIRING DIAGRAM:



EN1459

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS BETWEEN ECM AND THROTTLE POSITION SENSOR. 1) Disconnect the connector from ECM and throttle position sensor. 2) Measure the resistance between ECM and throttle position sensor. <i>Connector & terminal</i> (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 the open circuit between ECM and throttle position sensor.
2 CHECK HARNESS BETWEEN ECM AND THROTTLE POSITION SENSOR CONNECTOR. 1) Disconnect the connector from TCM. (AT vehicle) 2) Measure the resistance between ECM and chassis ground. <i>Connector & terminal</i> (B136) No. 16 — Chassis ground: (B136) No. 17 — Chassis ground: (B136) No. 15 — Chassis ground:	Is the resistance more than 1 M Ω ?	Go to step 3.	Repair the ground short circuit between ECM and chassis ground.
3 CHECK INPUT SIGNAL FOR ECM. 1) Connect the connector to ECM and throttle position sensor. 2) Ignition the switch to ON. 3) Measure the voltage between ECM terminals while throttle valve is fully closed. <i>Connector & terminal</i> (B136) No. 15 (+) — No. 17 (-):	Is the voltage less than 0.1 V?	Go to step 5.	Go to step 4.
4 CHECK INPUT SIGNAL FOR ECM. Measure the voltage between ECM terminals while throttle valve is fully opened. <i>Connector & terminal</i> (B136) No. 15 (+) — No. 17 (-):	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 the poor contact in throttle position sensor connector.	Replace the throttle position sensor.
6 CHECK CONDITION OF THROTTLE POSITION SENSOR INSTALLATION.	Are the throttle position sensor installing screw tightened securely?	Replace the throttle position sensor.	Adjust the throttle position sensor and tighten throttle position sensor installing screws securely.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

I: DTC 32 OXYGEN SENSOR

• DIAGNOSIS:

- The oxygen sensor is not in function.
- The harness connector between ECM and oxygen sensor is open or shorted.

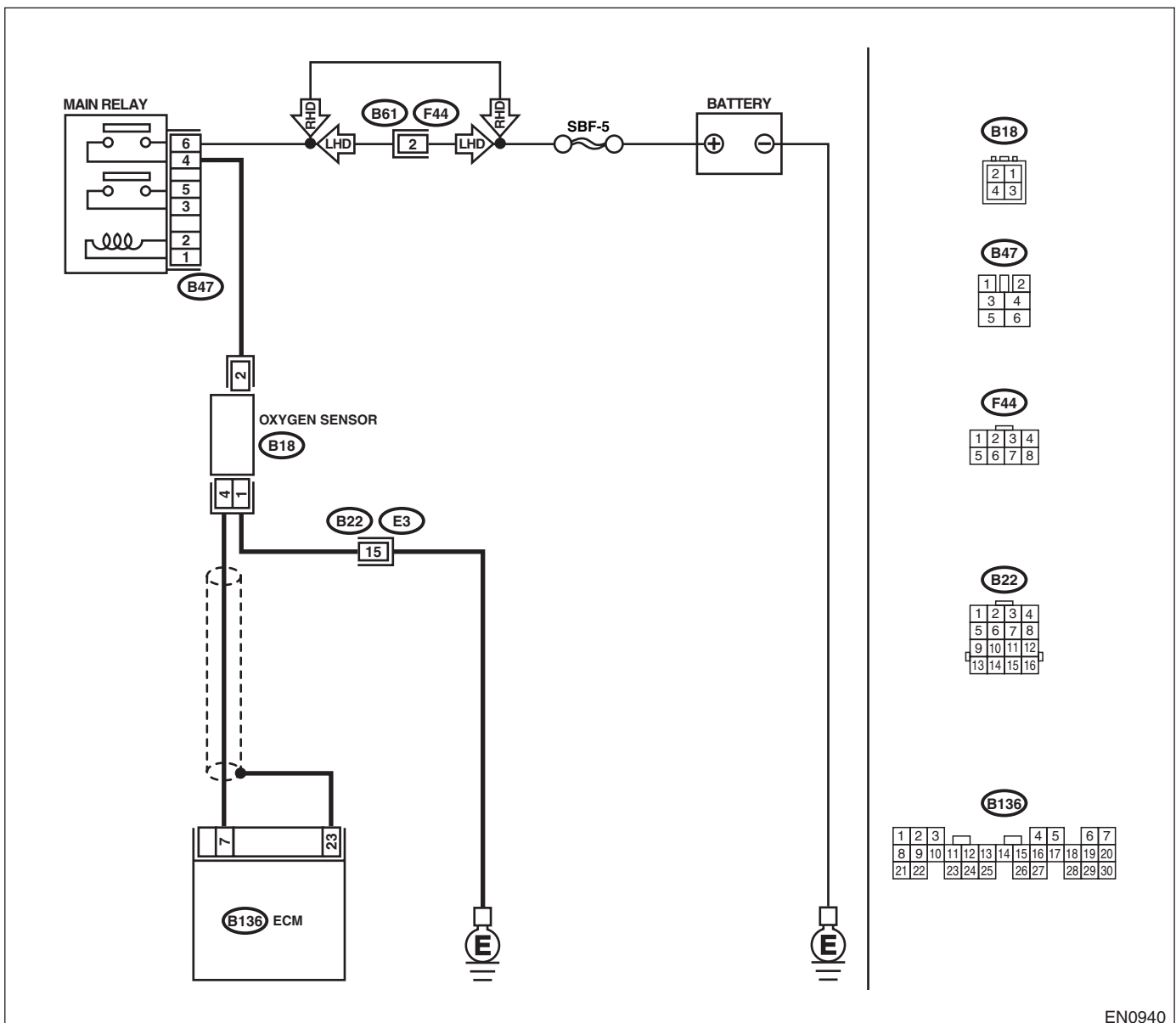
• TROUBLE SYMPTOM:

- 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(w/oOBD)-30, OPERATION, Clear Memory Mode.> and <Ref. to EN(w/oOBD)-28, OPERATION, Inspection Mode.>

• WIRING DIAGRAM:



EN0940

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No	
1	<p>CHECK FOR OTHER CAUSES AFFECTING EXHAUST GAS.</p> <p>NOTE:</p> <ul style="list-style-type: none"> •Check for use of improper fuel. •Check if engine oil or coolant level is extremely low. 	Is CO % more than 2 % after the engine warm up?	Check the fuel system.	Go to step 2.
2	<p>CHECK EXHAUST SYSTEM.</p>	Is there a fault in the exhaust system?	<p>Repair the exhaust system.</p> <p>NOTE:</p> <ul style="list-style-type: none"> • Loose installation of front portion of exhaust pipe onto cylinder heads • Loose connection between front exhaust pipe and front catalytic converter • Damage of exhaust pipe resulting in hole 	Go to step 3.
3	<p>CHECK INPUT VOLTAGE FOR OXYGEN SENSOR.</p> <p>1)Disconnect the connector from oxygen sensor connector. 2)Measure the voltage between main relay and oxygen sensor.</p> <p>Connector & terminal (B18) No. 2 (+) — Chassis ground (-):</p>	Is the voltage more than 10 V?	Go to step 4.	Repair the open circuit between main relay and oxygen sensor.
4	<p>CHECK HARNESS CONNECTOR BETWEEN OXYGEN SENSOR AND ENGINE GROUND CABLE.</p> <p>Measure the resistance between oxygen sensor and chassis ground.</p> <p>Connector & terminal (B18) No. 1 — Chassis ground:</p>	Is the resistance less than 1Ω?	Go to step 5.	Repair the open circuit between oxygen sensor and chassis ground.
5	<p>CHECK OXYGEN SENSOR.</p> <p>Measure the resistance between oxygen sensor terminals.</p> <p>Connector & terminal No. 1 — No. 2:</p>	Is the resistance less than 30 Ω?	Repair poor contact.	Go to step 6.
6	<p>CHECK HARNESS BETWEEN ECM AND OXYGEN SENSOR.</p> <p>1)Disconnect the connector from ECM. 2)Measure the resistance between ECM and chassis ground.</p> <p>Connector & terminal (B136) No. 7 — Chassis ground:</p>	Is the resistance more than 1 MΩ?	Go to step 7.	Repair the ground short circuit between ECM and chassis ground.
7	<p>CHECK HARNESS BETWEEN ECM AND OXYGEN SENSOR.</p> <p>1)Turn the ignition switch to ON. 2)Measure the voltage between ECM and chassis ground.</p> <p>Connector & terminal (B136) No. 7 (+) — Chassis ground (-):</p>	Is the voltage more than 0.2 V?	Go to step 8.	Repair the 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 the connector to ECM and oxygen sensor. 2)Measure the 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 the oxygen sensor.
9	CHECK POOR CONTACT. Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Replace the oxygen sensor connector.	Replace the ECM. <Ref. to FU(w/oOBD)-48, Engine Control Module.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

J: DTC 33 VEHICLE SPEED SIGNAL

DIAGNOSIS:

- The vehicle speed signal is abnormal.
- The harness connector between ECM and vehicle speed sensor is open or shorted.

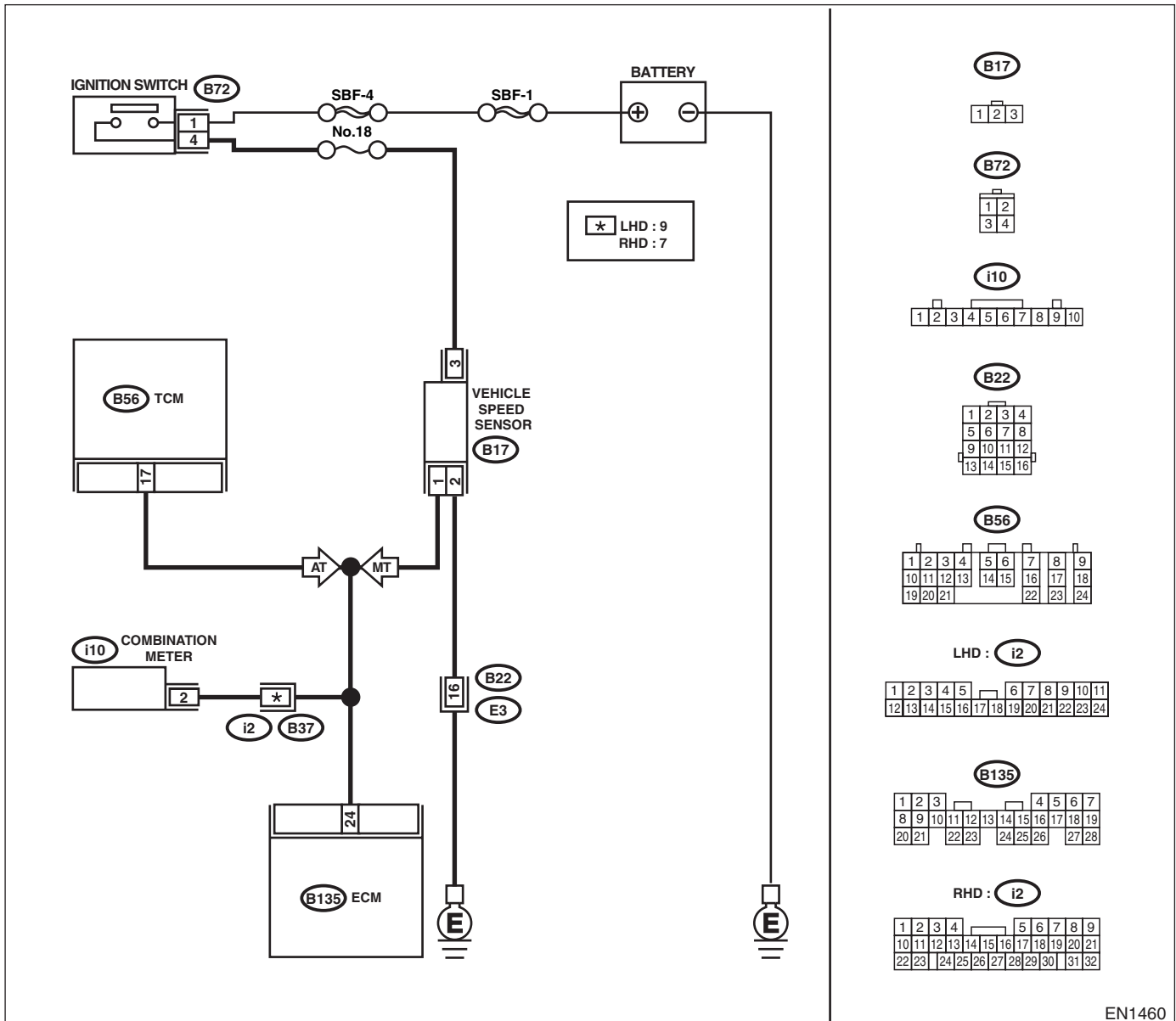
TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES. <Ref. to EN(w/oOBD)-30, OPERATION, Clear Memory Mode.> and <Ref. to EN(w/oOBD)-28, OPERATION, Inspection Mode.>

WIRING DIAGRAM:



EN1460

Step	Check	Yes	No	
1	CHECK SPEEDOMETER OPERATION IN COMBINATION METER.	Does the speedometer operate normally?	Go to step 2.	Check the speedometer and vehicle speed sensor.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
2 CHECK INPUT SIGNAL FOR ECM. 1)Lift-up the vehicle. 2)Set the positive (+) terminal and ground 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 the 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 the poor contact in ECM.	Replace the ECM. <Ref. to FU(w/oOBD)-48, Engine Control Module.>
4 CHECK HARNESS BETWEEN ECM AND COMBINATION METER CONNECTOR. Measure the voltage between ECM and chassis ground. Connector & terminal (B135) No. 24 (+) — Chassis ground (-):	Is the voltage more than 2 V?	Repair the 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 the ignition switch to OFF. 2)Measure the resistance of harness between ECM connector and chassis ground. Connector & terminal (B135) No. 24 — Chassis ground:	Is the resistance less than 10 Ω ?	Repair the 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 the poor contact in ECM.	Replace the ECM. <Ref. to FU(w/oOBD)-48, Engine Control Module.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

K: DTC 35 PURGE CONTROL SOLENOID VALVE

• DIAGNOSIS:

- The purge control solenoid valve is not in function.
- The harness connector between ECM and purge control solenoid valve is open or shorted.

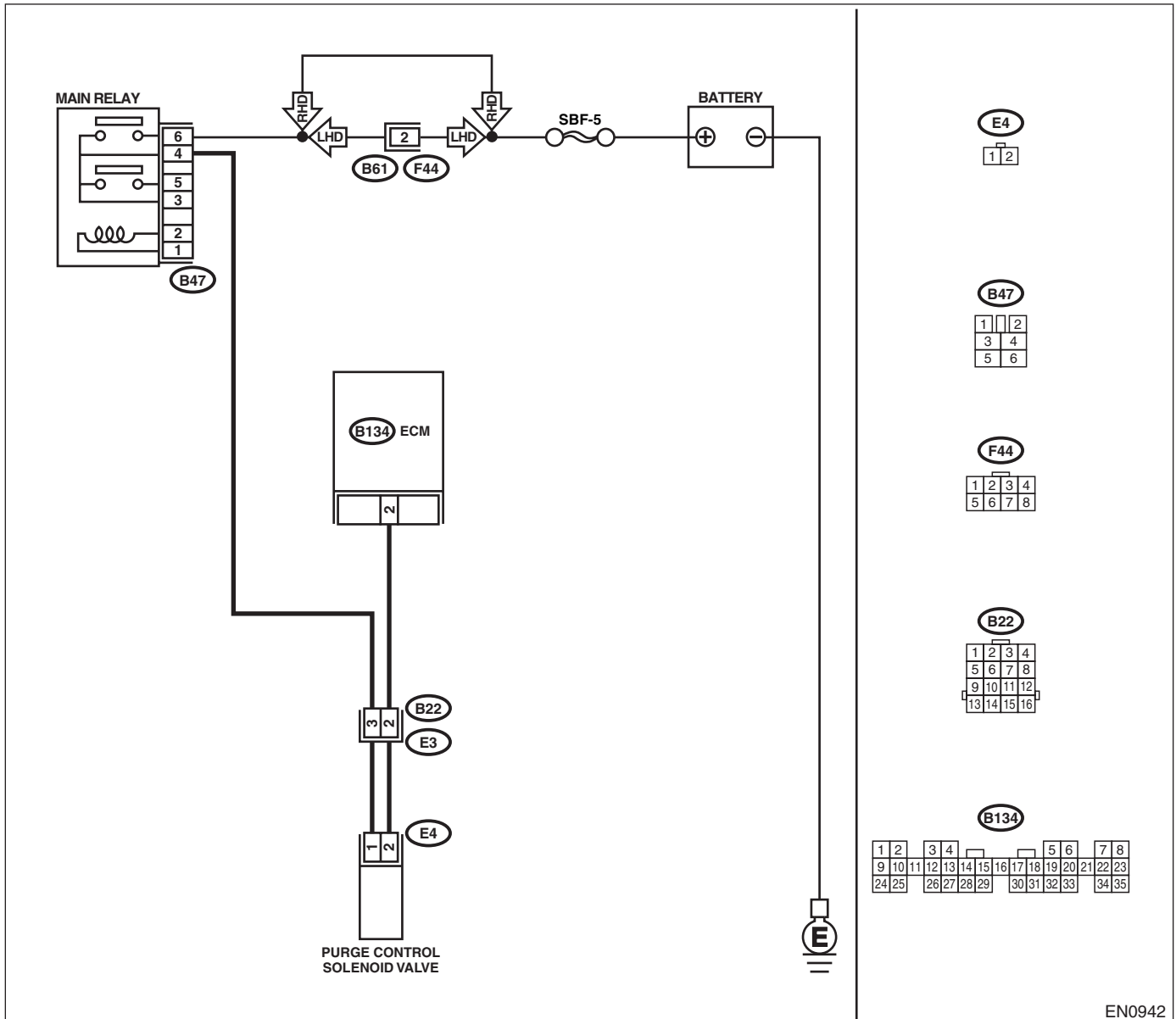
• TROUBLE SYMPTOM:

- Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES. <Ref. to EN(w/oOBD)-30, OPERATION, Clear Memory Mode.> and <Ref. to EN(w/oOBD)-28, OPERATION, Inspection Mode.>

• WIRING DIAGRAM:



DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OPERATION SOUND OF PURGE CONTROL SOLENOID VALVE. 1) Turn the ignition switch to OFF. 2) Connect the test mode connector at lower portion of instrument panel (on driver's side). 3) Turn the ignition switch to ON. 4) Make sure that the ON/OFF operating sound of purge control solenoid valve occurs at about 10 Hz.	Does the 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 the poor contact in ECM.	Replace the ECM. <Ref. to FU(w/oOBD)-48, Engine Control Module.>
3 CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the test mode connector. 3) Disconnect the connector from purge control solenoid valve. 4) Turn the ignition switch to ON. 5) Measure the voltage between ECM and chassis ground. <i>Connector & terminal</i> <i>(B134) No. 2 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Repair the battery short circuit in harness between ECM and purge control solenoid valve connector. After repair, replace the ECM.	Go to step 4.
4 CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM and purge control solenoid valve of harness connector. <i>Connector & terminal</i> <i>(B134) No. 2 — (E4) No. 2:</i>	Is the resistance less than 1 Ω ?	Go to step 5.	Repair the open circuit in harness between ECM and purge control solenoid valve connector.
5 CHECK PURGE CONTROL SOLENOID VALVE. 1) Remove the purge control solenoid valve. 2) Measure the resistance between purge control solenoid valve terminals. <i>Terminals</i> <i>No. 1 — No. 2:</i>	Is the resistance between 23 and 27 Ω ?	Go to step 6.	Replace the purge control solenoid valve. <Ref. to EC(w/oOBD)-8, Purge Control Solenoid Valve.>
6 CHECK POWER SUPPLY TO PURGE CONTROL SOLENOID VALVE. 1) Turn the ignition switch to ON. 2) Measure the voltage between purge control solenoid valve and engine ground. <i>Connector & terminal</i> <i>(E4) No. 1 (+) — Engine ground (-):</i>	Is the voltage more than 10 V?	Go to step 7.	Repair the harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between 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 the poor contact in purge control solenoid valve connector.	Contact with your Subaru distributor service. NOTE: Inspection by your Subaru distributor service is required, because probable cause is deterioration of multiple parts.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

L: DTC 38 TORQUE CONTROL SIGNAL

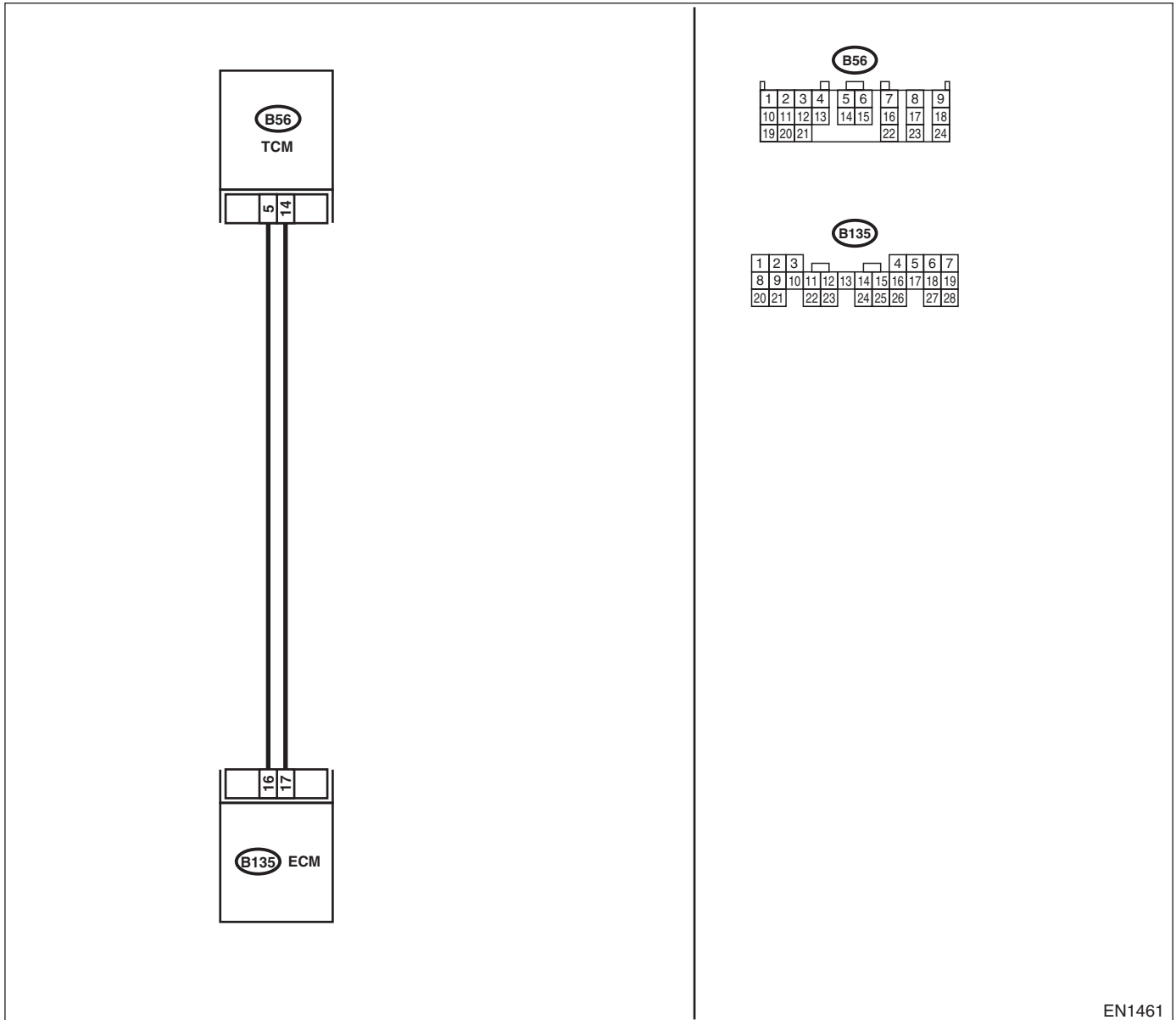
• DIAGNOSIS:

- Abnormal signal entered from TCM
- The harness connector between ECM and TCM is shorted.

CAUTION:

After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES. <Ref. to EN(w/oOBD)-30, OPERATION, Clear Memory Mode.> and <Ref. to EN(w/oOBD)-28, OPERATION, Inspection Mode.>

• WIRING DIAGRAM:



EN1461

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1	CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR. 1)Disconnect the connectors from ECM and TCM. 2)Measure the resistance of harness between ECM and chassis ground. Connector & terminal (B135) No. 17 — Chassis ground:	Is the resistance less than 10 Ω ?	Repair the ground short circuit in harness between ECM and TCM connector. Go to step 2.
2	CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR. Measure the resistance of harness between ECM and chassis ground. Connector & terminal (B135) No. 16 — Chassis ground:	Is there resistance less than 10 Ω ?	Repair the ground short circuit in harness between ECM and TCM connector. Replace the TCM. <Ref. to AT-46, Transmission Control Module (TCM).>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

M: DTC 45 PRESSURE SENSOR

DIAGNOSIS:

- The pressure sensor signal is abnormal.
- The harness connector between ECM and pressure sensor is open or shorted.

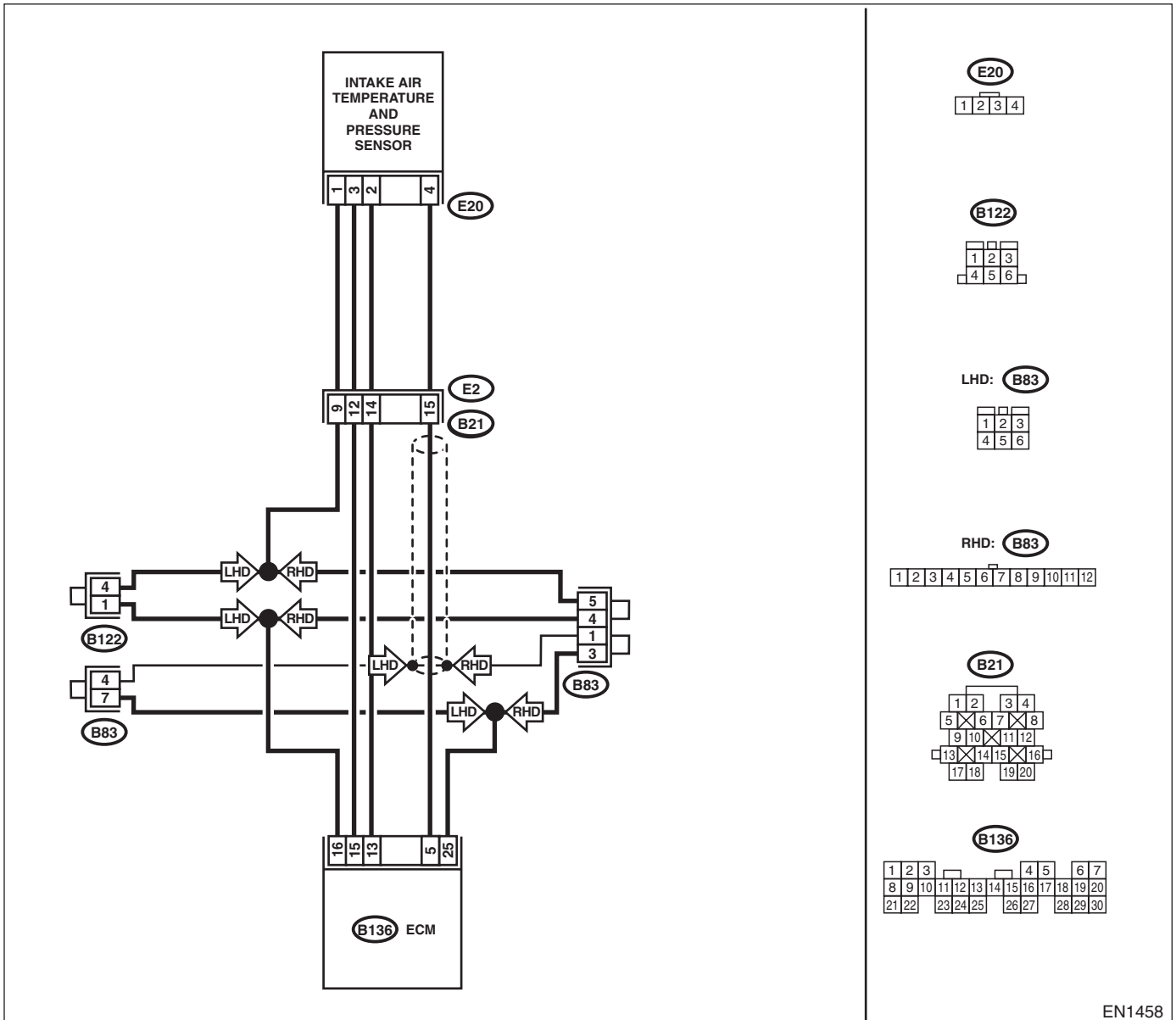
TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES. <Ref. to EN(w/oOBD)-30, OPERATION, Clear Memory Mode.> and <Ref. to EN(w/oOBD)-28, OPERATION, Inspection Mode.>

WIRING DIAGRAM:



EN1458

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS BETWEEN ECM AND PRESSURE SENSOR CONNECTOR. 1) Disconnect the connector from pressure sensor. 2) Turn the ignition switch to ON. 3) Measure the 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 the open or ground short circuit in harness between ECM and pressure sensor.
2 CHECK HARNESS BETWEEN ECM AND PRESSURE SENSOR CONNECTOR. 1) Disconnect the connector from ECM. 2) Measure the 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 the open circuit in harness between ECM and pressure sensor connector.
3 CHECK HARNESS BETWEEN ECM AND PRESSURE SENSOR CONNECTOR. Measure the 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 the ground short circuit in harness between ECM and pressure sensor connector.
4 CHECK INPUT SIGNAL FOR ECM. 1) Turn the ignition switch to OFF. 2) Connect the connector to ECM and pressure sensor. 3) Turn the ignition switch to ON. 4) Measure the 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 the pressure sensor. <Ref. to FU(w/oOBD)-38, Intake Air Temperature and Pressure Sensor.>
5 CHECK INPUT SIGNAL FOR ECM. 1) Start the engine, and idle it. 2) Measure the 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 the pressure sensor. <Ref. to FU(w/oOBD)-38, 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 the poor contact in pressure sensor connector.	Replace the pressure sensor. <Ref. to FU(w/oOBD)-38, Intake Air Temperature and Pressure Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

N: DTC 46 CO RESISTOR (GENERAL SPEC. VEHICLES)

• DIAGNOSIS:

- The CO resistor signal is abnormal.
- The harness connector between ECM and CO resistor is open or shorted.
- The CO value is not adjusted to specifications.

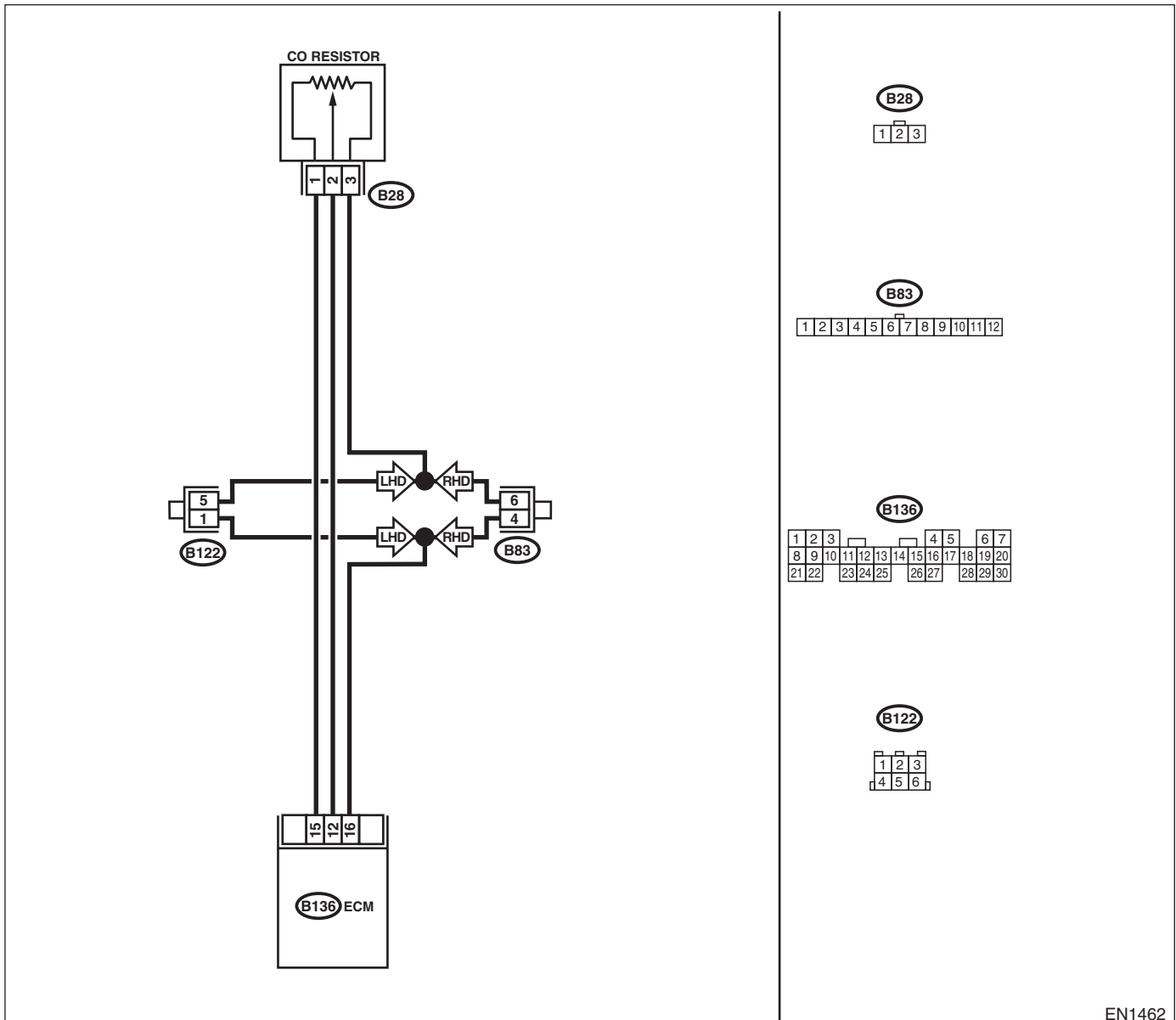
• TROUBLE SYMPTOM:

- 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(w/oOBD)-30, OPERATION, Clear Memory Mode.> and <Ref. to EN(w/oOBD)-28, OPERATION, Inspection Mode.>

• WIRING DIAGRAM:



EN1462

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK INPUT SIGNAL FOR ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. <i>Connector & terminal</i> <i>(B136) No. 12 (+) — Chassis ground (-):</i>	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 the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(w/oOBD)-48, Engine Control Module.>
3 CHECK HARNESS BETWEEN CO RESISTOR AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and CO resistor. 3) Measure the resistance of harness between ECM and CO resistor connector. <i>Connector & terminal</i> <i>(B136) No. 15 — (B155) No. 1:</i> <i>(B136) No. 12 — (B155) No. 2:</i> <i>(B136) No. 16 — (B155) No. 3:</i>	Is the resistance less than 1 Ω ?	Go to step 4.	Repair the open circuit in harness between ECM and CO resistor connector.
4 CHECK HARNESS BETWEEN CO RESISTOR AND ECM CONNECTOR. Measure the resistance of harness between ECM connector and chassis ground. <i>Connector & terminal</i> <i>(B136) No. 15 — Chassis ground:</i> <i>(B136) No. 12 — Chassis ground:</i> <i>(B136) No. 16 — Chassis ground:</i>	Is the resistance more than 1 M Ω ?	Go to step 5.	Repair the short circuit in harness between ECM and CO resistor connector.
5 CHECK CO RESISTOR. Measure the resistance between CO resistor terminals. <i>Terminals</i> <i>No. 1 — No. 3:</i>	Is the resistance between 4 and 6 k Ω ?	Go to step 6.	Replace the CO resistor.
6 CHECK CO RESISTOR. Measure the variable resistance between CO resistor terminals while rotating the screw of CO resistor. <i>Terminals</i> <i>No. 1 — No. 2:</i>	Is the resistance between 0 and 6 k Ω ?	Replace the ECM.	Replace the CO resistor. NOTE: Ensure resistance varies in response to screw rotation.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

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 open or shorted.

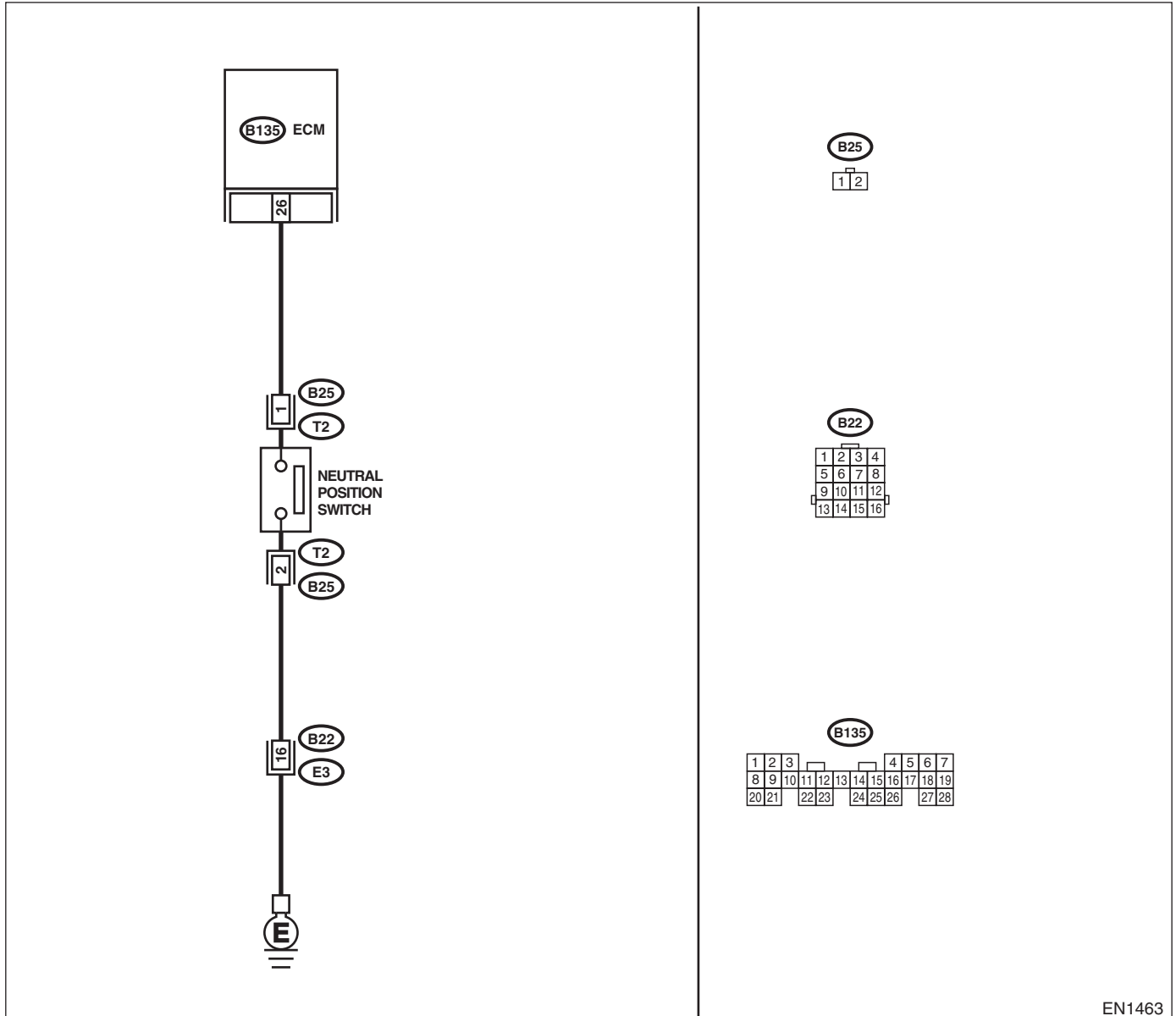
• TROUBLE SYMPTOM:

- Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES. <Ref. to EN(w/oOBD)-30, OPERATION, Clear Memory Mode.> and <Ref. to EN(w/oOBD)-28, OPERATION, Inspection Mode.>

• WIRING DIAGRAM:



EN1463

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK INPUT SIGNAL FOR ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. <i>Connector & terminal</i> <i>(B135) No. 26 (+) — Chassis ground (-):</i>	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 the voltage between ECM and chassis ground. <i>Connector & terminal</i> <i>(B135) No. 26 (+) — Chassis ground (-):</i>	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 the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(w/oOBD)-48, Engine Control Module.>
4 CHECK NEUTRAL POSITION SWITCH. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from transmission harness. 3) Measure the resistance between transmission harness and connector terminals. <i>Connector & terminal</i> <i>(T2) No. 1 — No. 2:</i>	Is the resistance more than 1 M Ω in neutral position?	Go to step 5 .	Repair the short circuit in transmission harness or replace neutral position switch.
5 CHECK NEUTRAL POSITION SWITCH. Measure the resistance between transmission harness connector terminals. <i>Connector & terminal</i> <i>(T2) No. 1 — No. 2:</i>	Is the resistance less than 10 Ω in other positions?	Go to step 6 .	Repair the open circuit in transmission harness or replace neutral position switch.
6 CHECK HARNESS BETWEEN ECM AND NEUTRAL POSITION SWITCH CONNECTOR. 1) Disconnect the connector from ECM. 2) Measure the resistance of harness between ECM and transmission harness connector. <i>Connector & terminal</i> <i>(B135) No. 26 — (B25) No. 1:</i>	Is the resistance less than 1 Ω ?	Go to step 7 .	Repair the open circuit in harness between ECM and transmission harness connector.
7 CHECK HARNESS BETWEEN ECM AND NEUTRAL POSITION SWITCH CONNECTOR. Measure the resistance between ECM and chassis ground. <i>Connector & terminal</i> <i>(B135) No. 26 — Chassis ground:</i>	Is the resistance less than 10 Ω ?	Repair the 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 the ECM. <Ref. to FU(w/oOBD)-48, Engine Control Module.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

P: DTC 51 PARK/NEUTRAL POSITION SWITCH (AT VEHICLE)

• DIAGNOSIS:

- The park/neutral position switch signal is abnormal.
- The shift cable is connected abnormally.
- The harness connector between ECM/TCM and inhibitor switch is open or shorted.

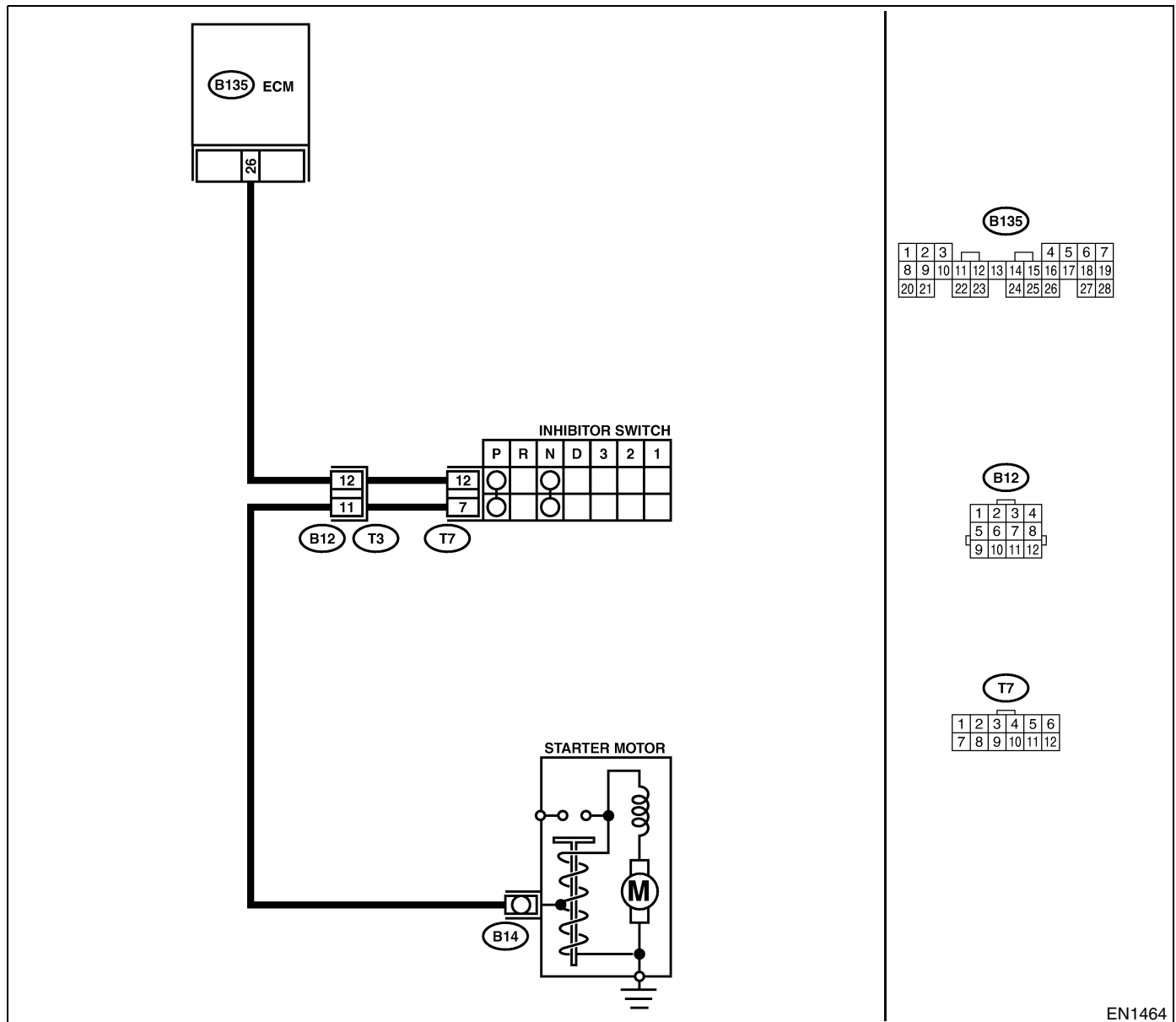
• TROUBLE SYMPTOM:

- Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES. <Ref. to EN(w/oOBD)-30, OPERATION, Clear Memory Mode.> and <Ref. to EN(w/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 the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground in selector lever "N" and "P" positions. <i>Connector & terminal</i> <i>(B135) No. 26 (+) — Chassis ground (-):</i>	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 the poor contact in ECM connector.	Go to step 3.
3 CHECK HARNESS BETWEEN ECM AND INHIBITOR SWITCH CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and inhibitor switch. 3) Measure the resistance of harness between ECM and inhibitor switch connector. <i>Connector & terminal</i> <i>(B135) No. 26 — (T7) No. 12:</i>	Is the resistance less than 1 Ω ?	Go to step 4.	Repair the harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between ECM and 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 the resistance of harness between inhibitor switch connector and engine ground. <i>Connector & terminal</i> <i>(T7) No. 12 — Engine ground:</i>	Is the resistance less than 5 Ω ?	Go to step 5.	Repair the open circuit in inhibitor switch ground line.
5 CHECK HARNESS BETWEEN ECM AND TRANSMISSION HARNESS CONNECTOR. Measure the resistance of harness between ECM connector and chassis ground. <i>Connector & terminal</i> <i>(B135) No. 26 — Chassis ground:</i>	Is the resistance less than 10 Ω ?	Repair the 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 the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(w/oOBD)-48, Engine Control Module.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

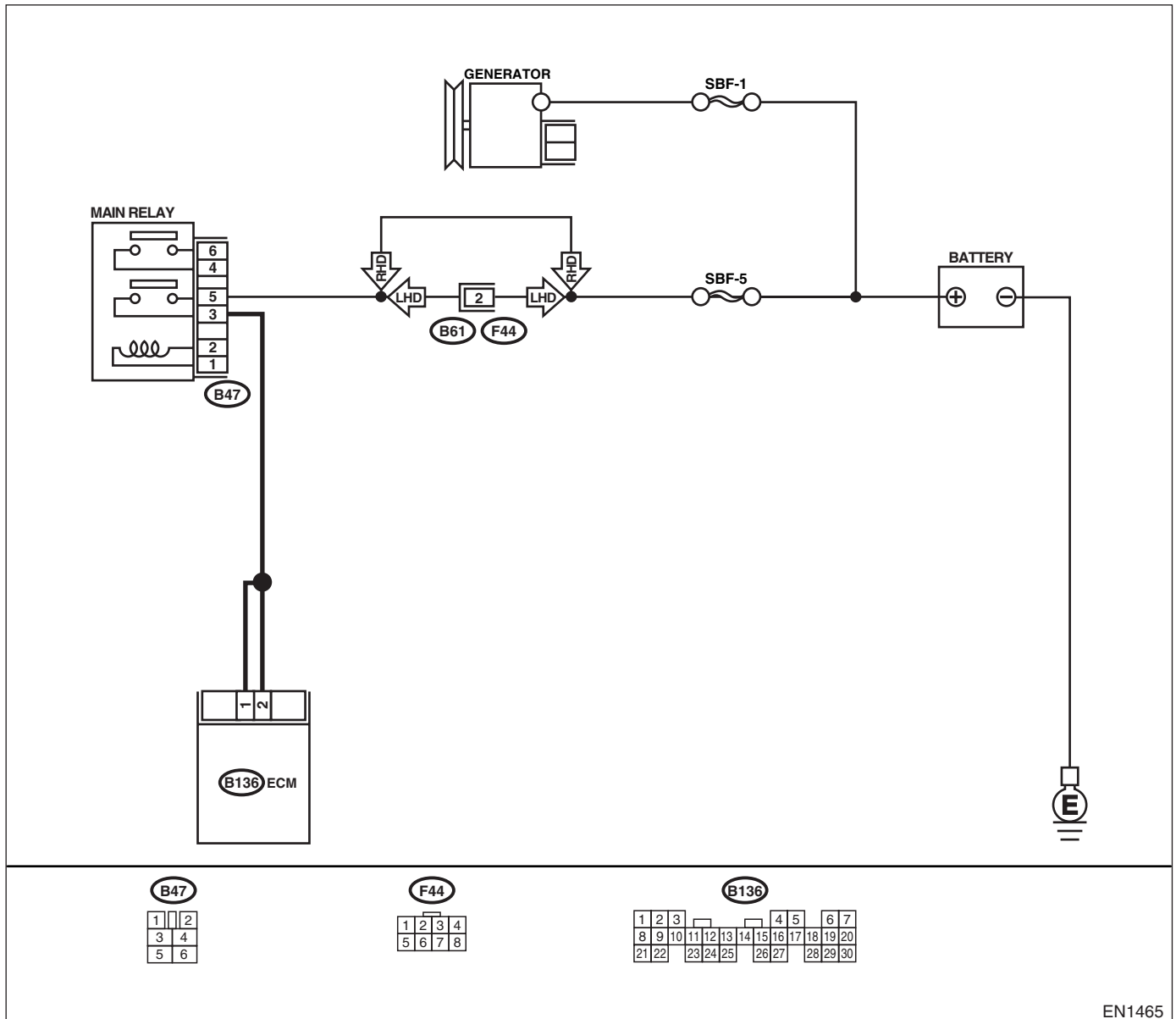
Q: DTC 85 CHARGE SYSTEM

- **DIAGNOSIS:**
 - Power source voltage of the ECM is low or high.
- **TROUBLE SYMPTOM:**
 - Charge warning light comes on.

CAUTION:

After repair or replacement of faulty parts, conduct CLEAR MEMORY and INSPECTION MODES. <Ref. to EN(w/oOBD)-30, OPERATION, Clear Memory Mode.> and <Ref. to EN(w/oOBD)-28, OPERATION, Inspection Mode.>

- **WIRING DIAGRAM:**



EN1465

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK GENERATOR. 1)Start the engine. 2)Idle after warm-up. 3)Measure the voltage between generator B terminal and chassis ground. <i>Terminal</i> <i>Generator B terminal (+) — Chassis ground (-):</i>	Is the voltage between 10.8 V and 16.2 V?	Go to step 2.	Repair the generator. <Ref. to SC-14, Generator.>
2 CHECK GENERATOR. 1)Run the engine at 5,000 rpm. 2)Measure the voltage between generator B terminal and chassis ground. <i>Terminal</i> <i>Generator B terminal (+) — Chassis ground (-):</i>	Is the voltage between 10.8 V and 16.2 V?	Go to step 3.	Repair the generator. <Ref. to SC-14, Generator.>
3 CHECK BATTERY TERMINAL. Turn the ignition switch to OFF.	Are the positive and ground 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 the voltage between ECM connector and chassis ground. <i>Connector & terminal</i> <i>(B136) No. 1 (+) — Chassis ground (-):</i> <i>(B136) No. 2 (+) — Chassis ground (-):</i>	Is the voltage between 10.8 V and 16.2 V?	Go to step 5.	Repair the harness connector between battery, main relay and ECM.
5 CHECK POOR CONTACT IN CONNECTORS.	Is there poor contact in the connectors between generator, battery and ECM?	Repair the connector.	Go to step 6.
6 CHECK ECM. 1)Connect all connectors. 2)Erase the memory. <Ref. to EN(w/oOBD)-30, OPERATION, Clear Memory Mode.> 3)Perform the inspection mode. <Ref. to EN(w/oOBD)-28, OPERATION, Inspection Mode.> 4)Read any DTC on the display. <Ref. to EN(w/oOBD)-26, OPERATION, Read Diagnostic Trouble Code (DTC).>	Is the same DTC as in the current diagnosis still being output?	Replace the generator.	Go to step 7.
7 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.	Is any other DTC displayed?	Proceed with the diagnosis corresponding to the DTC.	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 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 cable	A
	3) Crankshaft position sensor	B
	4) Camshaft position sensor	B
	5) Fuel pump	B
	6) Pressure regulator	B
	7) Ignition coil & ignitor	C
	8) Spark plug	C
	9) Fuel injector	C
2. Engine does not start. (Internal combustion occurs.)	1) ECM power supply	A
	2) Spark plug	A
	3) Engine coolant temperature sensor	B
	4) Pressure regulator	B
	5) Pressure sensor	C
	6) Fuel pump	C
	7) Fuel injector	C
	8) Camshaft position sensor	C
	9) Crankshaft position sensor	C
	10) Idle air control solenoid valve	C
3. Engine does not start. (Engine stalls after internal combustion.)	1) ECM power supply	A
	2) Pressure sensor	A
	3) Engine coolant temperature sensor	B
	4) Spark plug	B
	5) Ignition coil	C
	6) Fuel pump	C
	7) Pressure regulator	C
	8) Fuel injector	C
	9) Idle air control solenoid valve	C
4. Engine stalls.	1) Idle air control solenoid valve	A
	2) Pressure sensor	B
	3) Spark plug	B
	4) Accelerator cable is out of adjustment	B
	5) ECM power supply	C
	6) Throttle position sensor	C
	7) Crankshaft position sensor	C
	8) Vehicle speed sensor	C
	9) Ignition coil	C
	10) Fuel pump	C

GENERAL DIAGNOSTIC TABLE

ENGINE (DIAGNOSTICS)

Symptom	Problem parts	Priority
5. Rough idling	1) Spark plug	A
	2) Pressure sensor	B
	3) Engine coolant temperature sensor	B
	4) Pressure regulator	B
	5) Idle air control solenoid valve	B
	6) Air leak in air intake system	B
	7) ECM power supply	C
	8) Throttle position sensor	C
	9) Camshaft position sensor	C
	10) Crankshaft position sensor	C
	11) Oxygen sensor	C
	12) Fuel pump	C
	13) Fuel injector	C
	14) Test mode or read memory connectors are connected	C
	15) Intake air temperature sensor	C
6. Hard to drive at constant speed	1) Pressure regulator	A
	2) Fuel injector	B
	3) Pressure sensor	C
	4) Engine coolant temperature sensor	C
	5) Throttle position sensor	C
	6) Fuel pump	C
7. Poor acceleration/deceleration	1) Spark plug	A
	2) Throttle position sensor	B
	3) Ignition coil	B
	4) Fuel pump	B
	5) Pressure regulator	B
	6) Fuel injector	B
	7) Pressure sensor	C
	8) Engine coolant temperature sensor	C
	9) Idle air control solenoid valve	C
	10) Knock sensor	C
8. Poor return to idling	1) Accelerator cable is out of adjustment	A
	2) Throttle position sensor	B
	3) Idle air control solenoid valve	B
	4) Pressure sensor	C
	5) Engine coolant temperature sensor	C
9. Back fire	1) Spark plug	A
	2) Fuel injector	B
	3) Ignition coil and ignitor	C
	4) Fuel pump	C
	5) Pressure regulator	C
10. Knocking	1) Pressure sensor	A
	2) Fuel pump	B
	3) Knock sensor	B
	4) Pressure regulator	B
	5) Engine coolant temperature sensor	C
11. Excessive fuel consumption	1) Pressure sensor	A
	2) Pressure regulator	B
12. Shocks while driving	1) Pressure regulator	A
	2) ECM power supply	B
	3) Throttle position sensor	B

GENERAL DIAGNOSTIC TABLE

ENGINE (DIAGNOSTICS)

Symptom	Problem parts	Priority
13. Poor engine revving	1) Pressure regulator	A
	2) Pressure sensor	B
	3) Engine coolant temperature sensor	B
	4) Throttle sensor	B
	5) Fuel pump	B
14. Remarks	1) ECM power supply	A*
	2) Pressure sensor	B*
	3) Pressure regulator	B*
	4) Idle air control solenoid valve	B*
	5) Air leak in air intake system	B*

A*: Including ECM ground circuit

B*: Check hoses.

FUEL INJECTION (FUEL SYSTEMS)

FU(TURBO)

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GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

1. General Description

A: SPECIFICATIONS

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

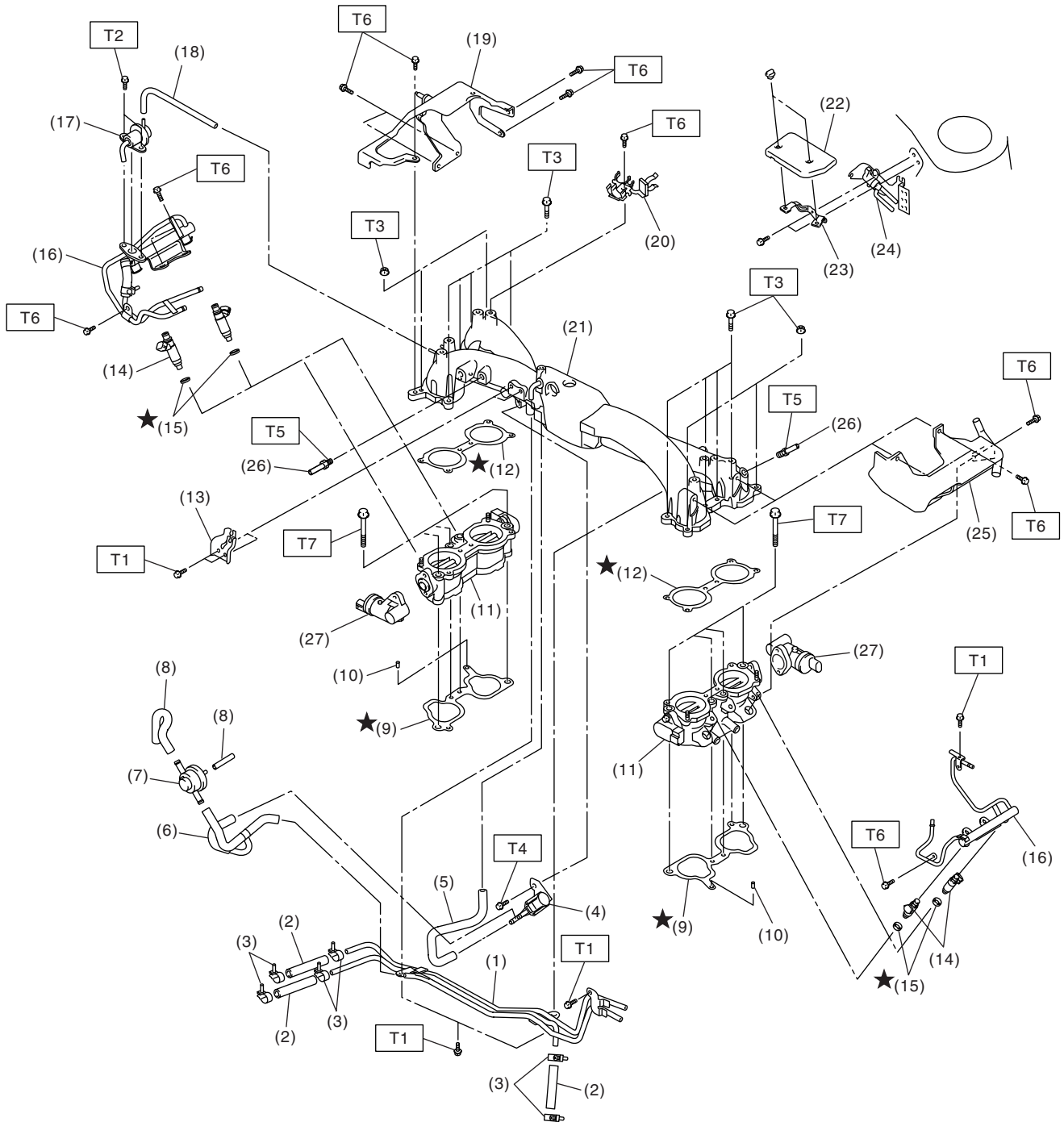
FUEL INJECTION (FUEL SYSTEMS)

GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

B: COMPONENT

1. INTAKE MANIFOLD



EN1389

GENERAL DESCRIPTION

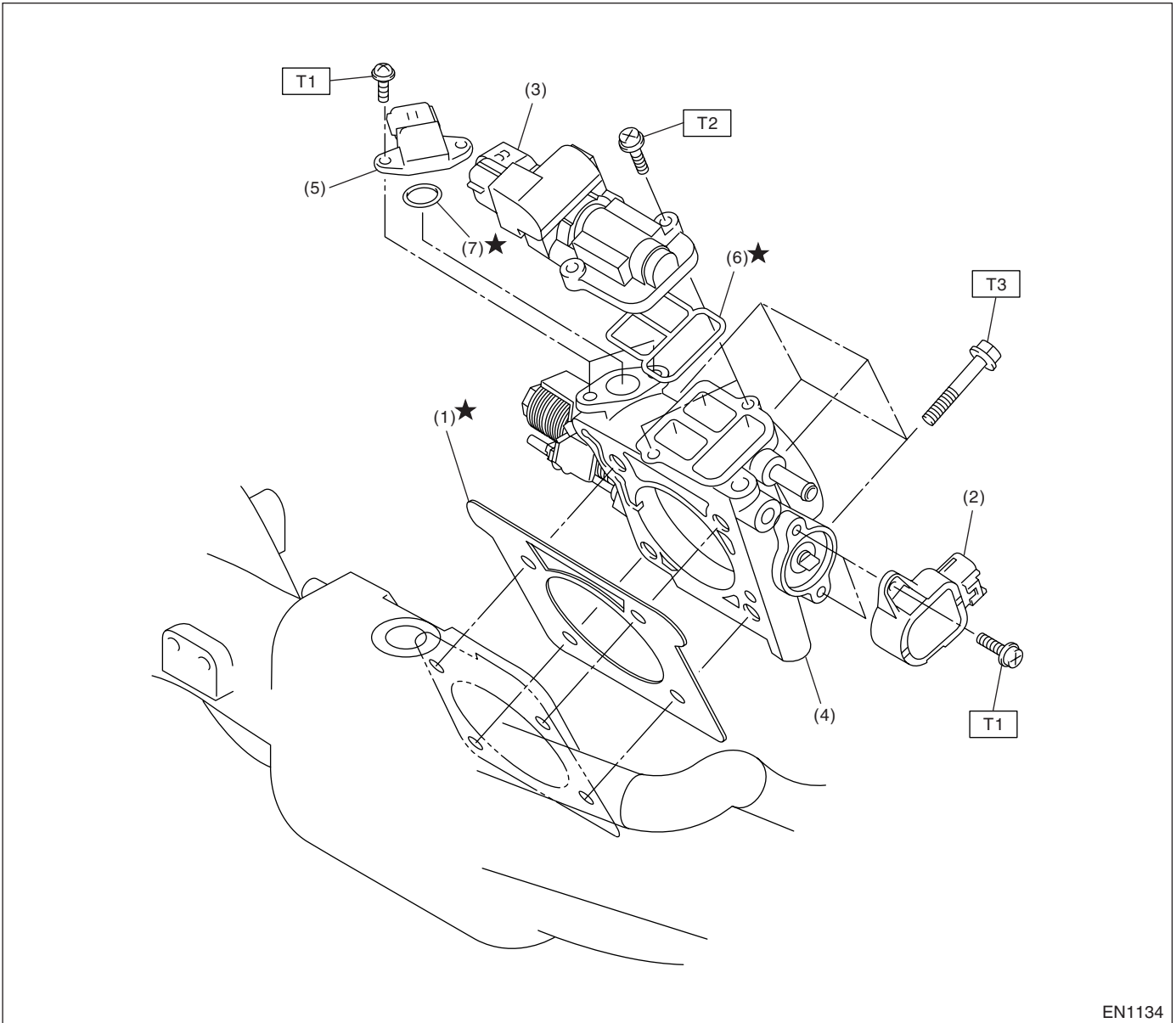
FUEL INJECTION (FUEL SYSTEMS)

(1) Fuel pipe ASSY	(13) Accelerator cable bracket	(25) Fuel pipe protector LH
(2) Fuel hose	(14) Fuel injector	(26) Nipple
(3) Clip	(15) Insulator	(27) Tumble generator valve actuator
(4) Purge control solenoid valve	(16) Fuel injector pipe	
(5) Vacuum hose	(17) Pressure regulator	<hr/> Tightening torque: N·m (kgf·m, ft·lb)
(6) Vacuum control hose	(18) Pressure regulator hose	T1: 4.9 (0.5, 3.6)
(7) Purge valve	(19) Fuel pipe protector RH	T2: 6.4 (0.65, 4.7)
(8) Purge hose	(20) Blow-by hose stay	T3: 8.25 (0.84, 6.1)
(9) Intake manifold gasket	(21) Intake manifold	T4: 16 (1.6, 11.8)
(10) Guide pin	(22) Solenoid valve cover	T5: 17 (1.7, 12.5)
(11) Tumble generator valve ASSY	(23) Solenoid valve cover stay	T6: 19 (1.9, 14.0)
(12) Tumble generator valve gasket	(24) Wastegate control solenoid valve ASSY	T7: 25 (2.5, 18.4)

GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

2. AIR INTAKE SYSTEM



EN1134

- | | |
|-------------------------------------|---------------------|
| (1) Gasket | (5) Pressure sensor |
| (2) Throttle position sensor | (6) Gasket |
| (3) Idle air control solenoid valve | (7) O-ring |
| (4) Throttle body | |

Tightening torque: N·m (kgf·m, ft·lb)

T1: 1.6 (0.16, 1.2)

T2: 2.8 (0.29, 2.1)

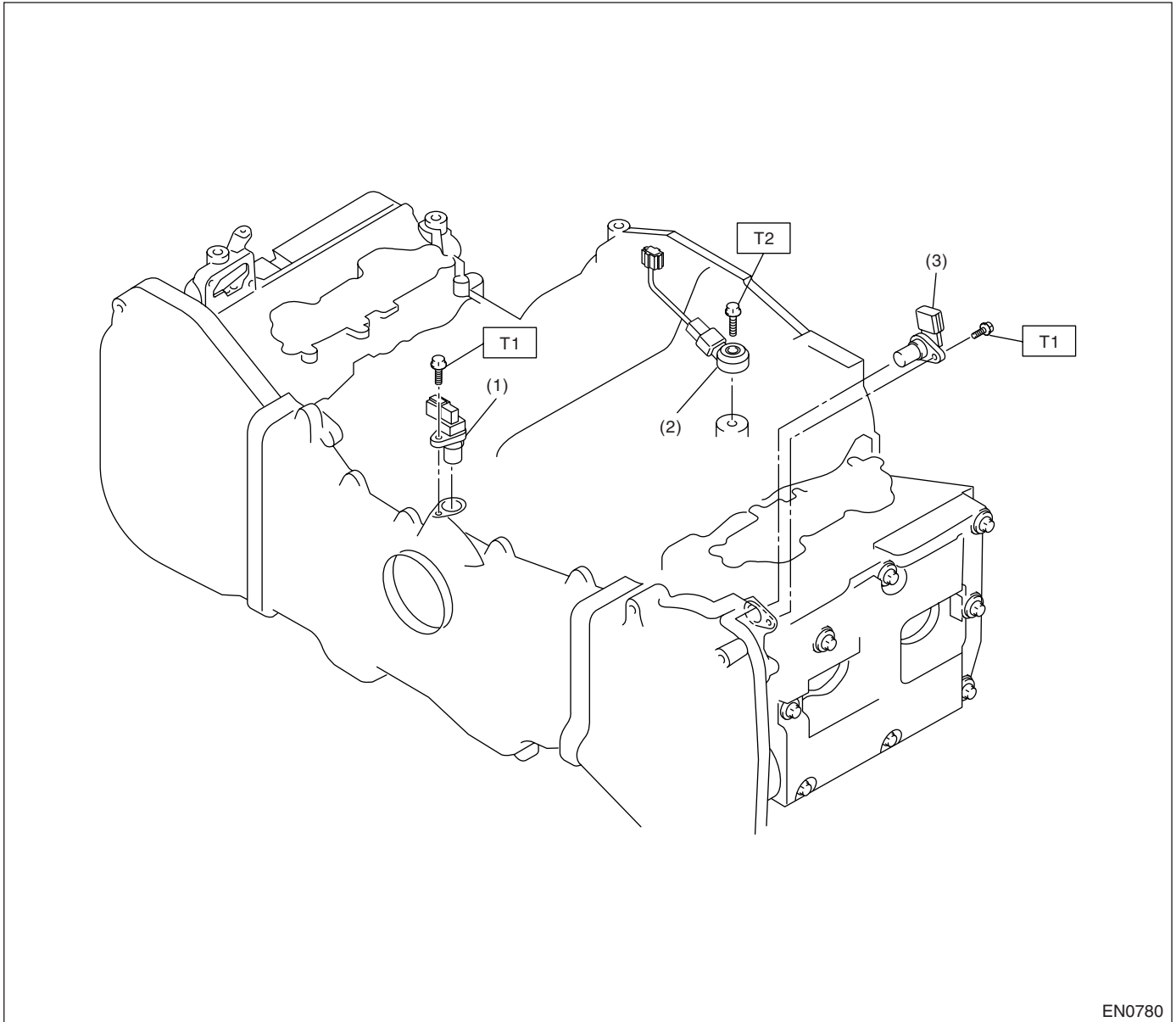
T3: 22 (2.2, 16.2)

FU(TURBO)-6

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

Tightening torque: N·m (kgf·m, ft·lb)

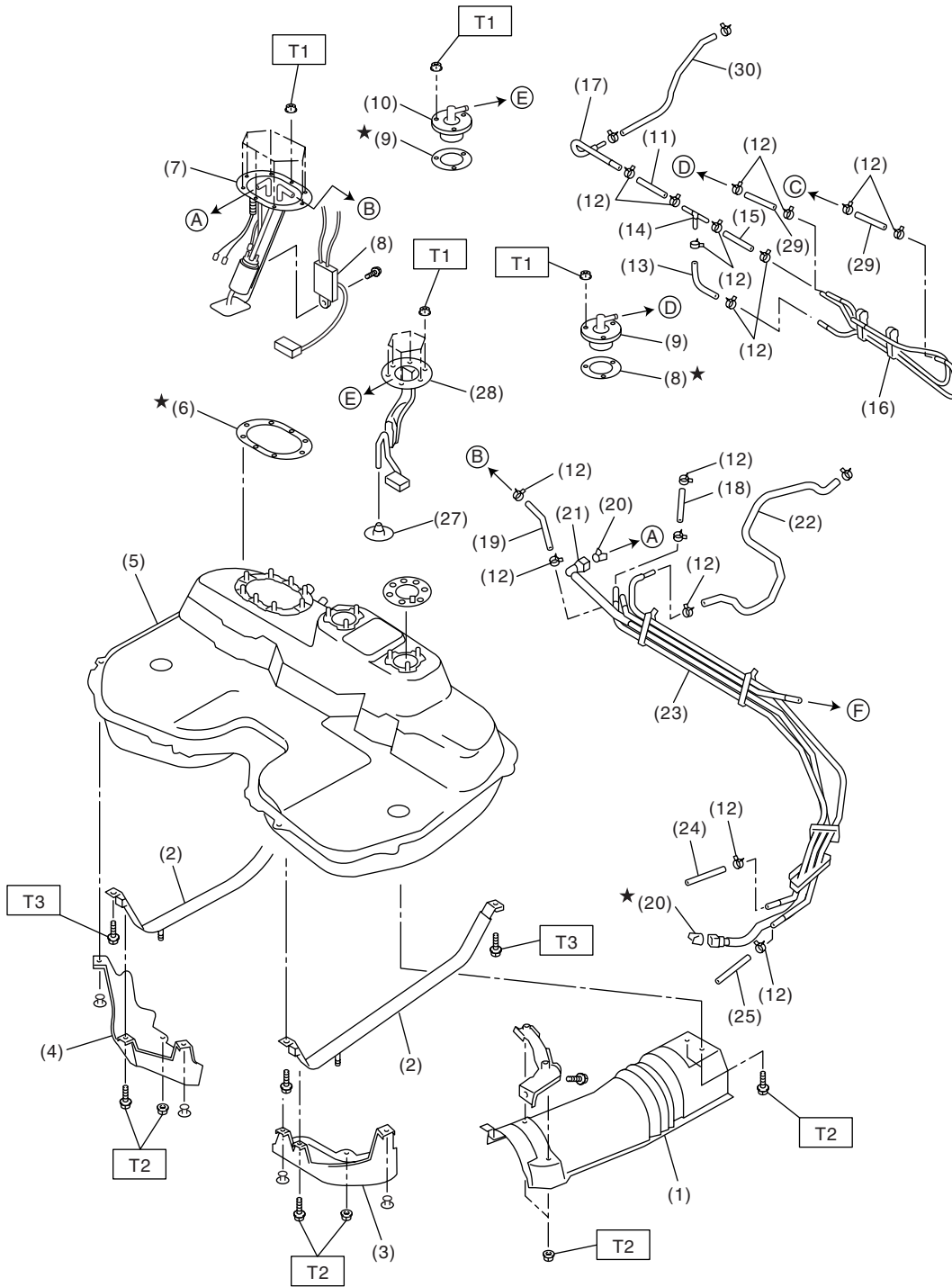
T1: 6.4 (0.65, 4.7)

T2: 24 (2.4, 17.4)

GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

4. FUEL TANK



EN0998

GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

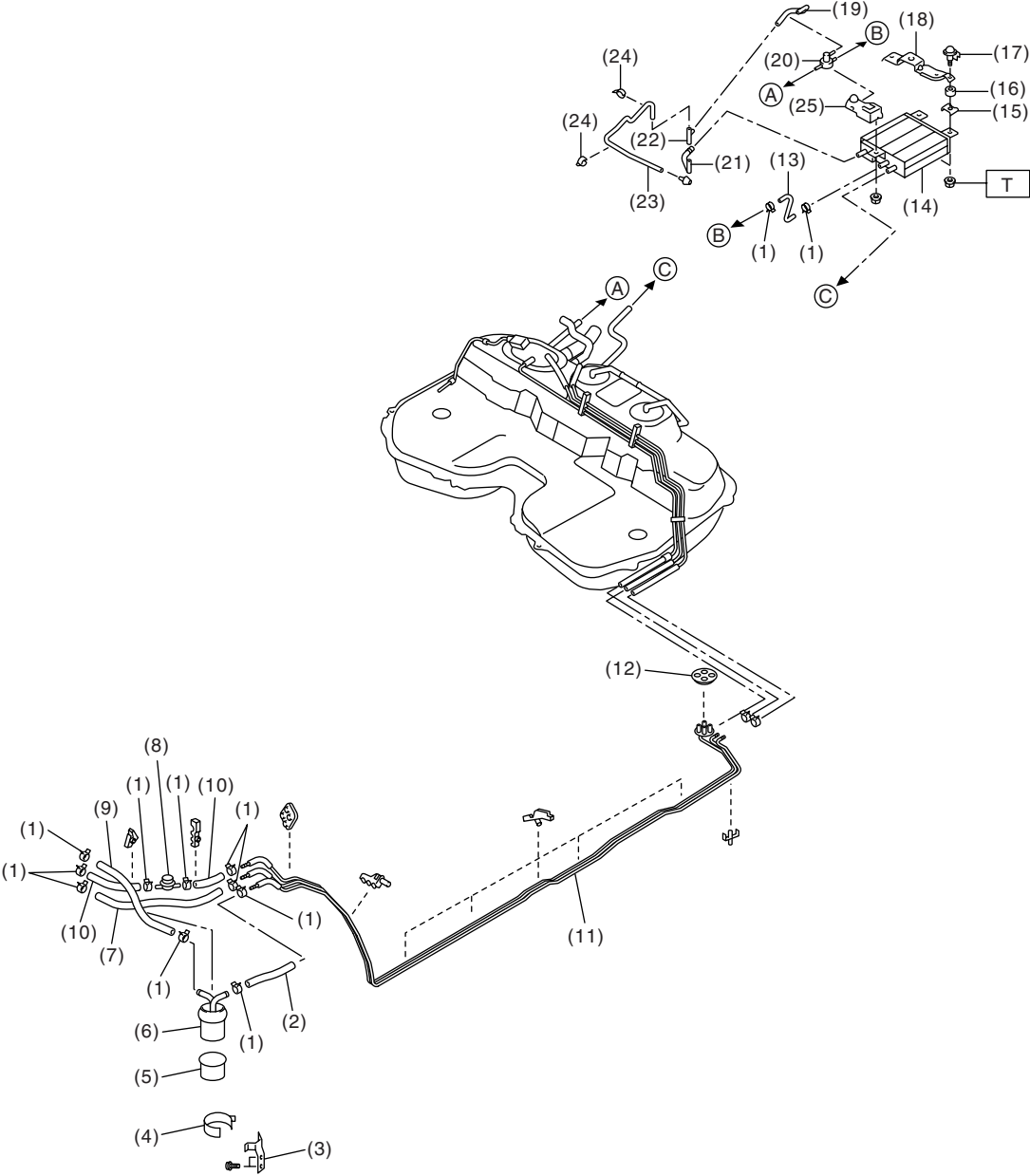
- | | | |
|---------------------------|----------------------------|----------------------------|
| (1) Heat shield cover | (13) Evaporation hose B | (25) Fuel return hose B |
| (2) Fuel tank band | (14) Joint pipe | (26) Fuel sub meter gasket |
| (3) Protector LH | (15) Evaporation hose C | (27) Jet 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, 24.3)**

GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

5. FUEL LINE



EN0440

GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

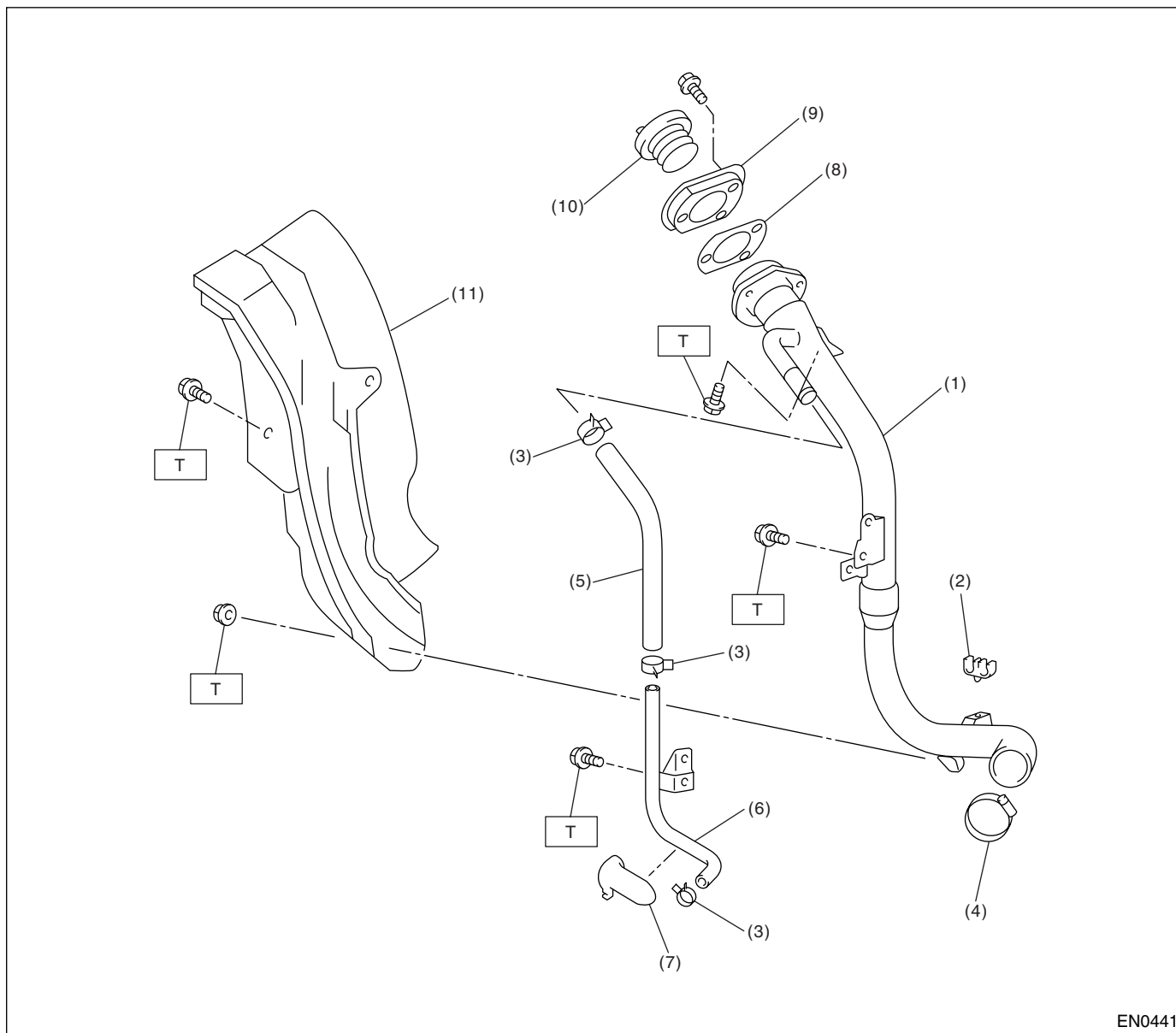
- | | | |
|--------------------------|--------------------------------|---------------------------------|
| (1) Clip | (11) Fuel pipe ASSY | (21) Two-way valve drain hose A |
| (2) Fuel delivery hose A | (12) Grommet | (22) Connector |
| (3) Fuel filter bracket | (13) Canister hose A | (23) Two-way valve 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 (2.3, 17.0)

GENERAL DESCRIPTION

FUEL INJECTION (FUEL SYSTEMS)

6. FUEL FILLER PIPE



EN0441

- (1) Fuel filler pipe ASSY
- (2) Evaporation hose holder
- (3) Clip
- (4) Clamp
- (5) Air vent hose

- (6) Air vent pipe
- (7) Air vent pipe holder
- (8) Filler pipe packing
- (9) Filler ring
- (10) Filler cap

- (11) Filler pipe protector

Tightening torque: N·m (kgf-m, ft-lb)

T: 7.5 (0.76, 5.5)

GENERAL DESCRIPTION

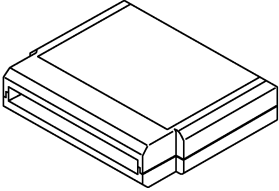

FUEL INJECTION (FUEL SYSTEMS)

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

D: PREPARATION TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: right;">B2M3876</p>	24082AA190 (Newly adopted tool)	CARTRIDGE	Troubleshooting for electrical system.
 <p style="text-align: right;">B2M3877</p>	22771AA030	SELECT MONITOR KIT	Troubleshooting for electrical systems. <ul style="list-style-type: none"> • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

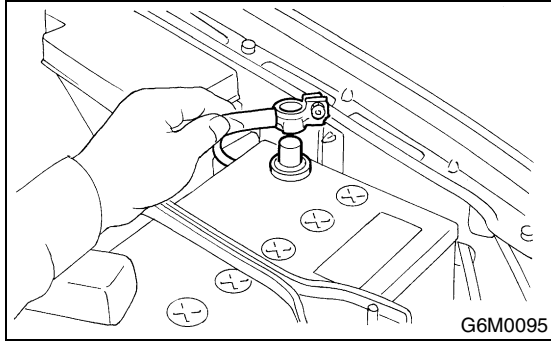
THROTTLE BODY

FUEL INJECTION (FUEL SYSTEMS)

2. Throttle Body

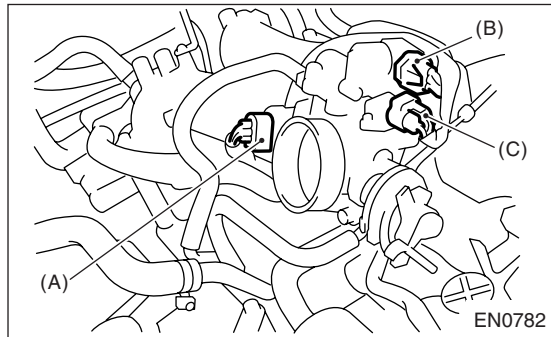
A: REMOVAL

1) Disconnect the ground cable from battery.

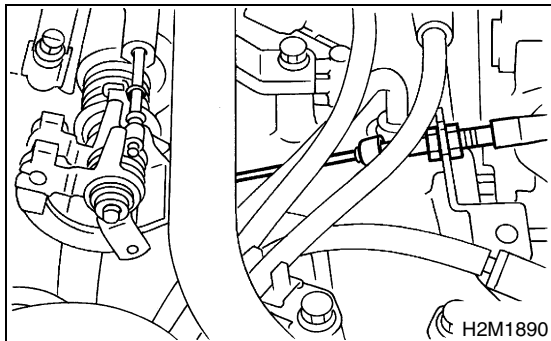


2) Remove the intercooler. <Ref. to IN(TURBO)-10, REMOVAL, Intercooler.>

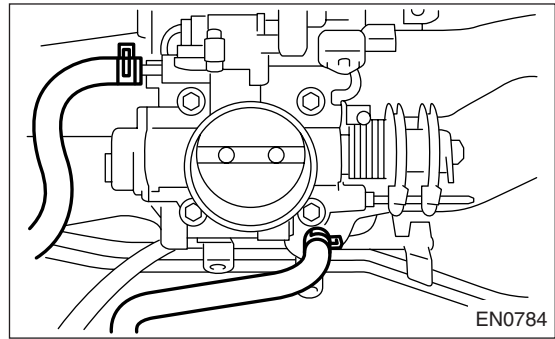
3) Disconnect the connector from the throttle position sensor (A) and idle air control solenoid valve (B) and pressure sensor (C).



4) Disconnect the accelerator cable.



5) Disconnect the engine coolant hoses from throttle body.



6) Remove the bolts which secure throttle body to intake manifold.

B: INSTALLATION

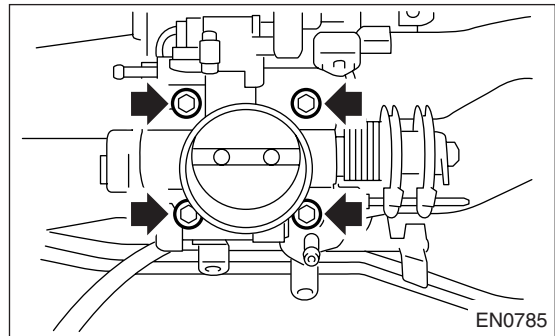
Install in the reverse order of removal.

NOTE:

Always use a new gasket.

Tightening torque:

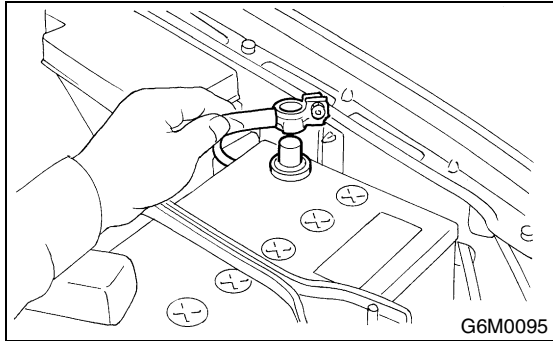
22 N·m (2.2 kgf-m, 16.2 ft-lb)



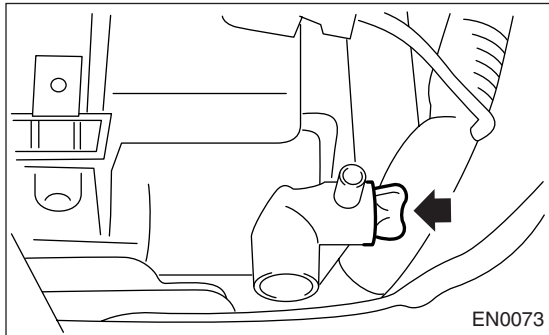
3. Intake Manifold

A: REMOVAL

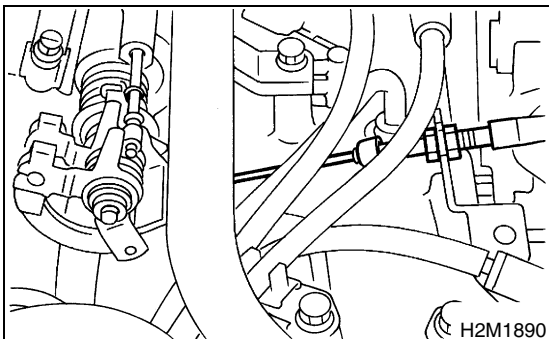
- 1) Release the fuel pressure. <Ref. to FU(TURBO)-53, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 2) Open the fuel filler flap lid and remove fuel filler cap.
- 3) Disconnect the ground cable from battery.



- 4) Lift-up the vehicle.
- 5) Remove the under cover.
- 6) Drain the coolant about 3.0 ℓ (3.2 US qt, 2.6 Imp qt).

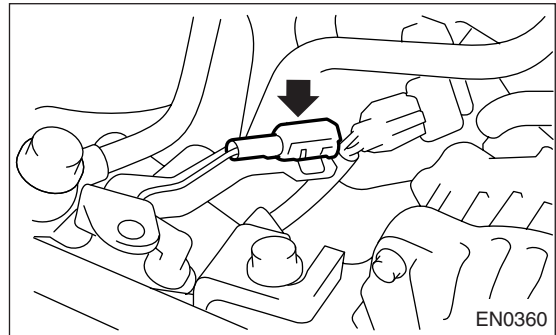


- 7) Remove the air cleaner upper cover and air intake boot. <Ref. to IN(TURBO)-7, REMOVAL, Air Cleaner.>
- 8) Remove the air cleaner element.
- 9) Remove the intercooler. <Ref. to IN(TURBO)-10, REMOVAL, Intercooler.>
- 10) Disconnect the accelerator cable.



- 11) Remove the coolant filler tank. <Ref. to CO-53, REMOVAL, Coolant Filler Tank.>

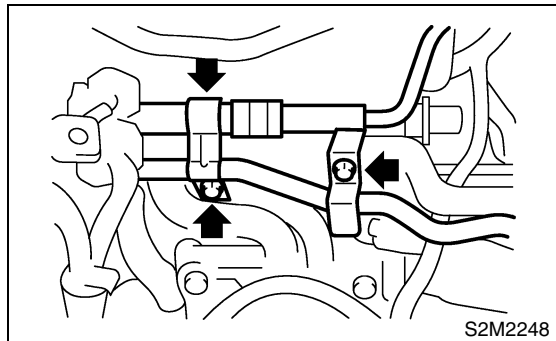
- 12) Remove the power steering pump.
 - (1) Remove the front side V-belt. <Ref. to ME(TURBO)-44, REMOVAL, V-belt.>
 - (2) Disconnect the power steering switch connector.



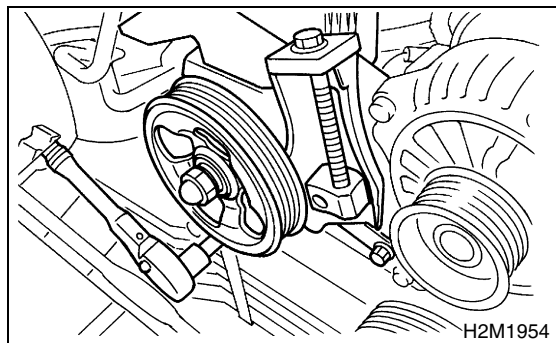
- (3) Remove the bolts which secure power steering pipe brackets to intake manifold.

NOTE:

Do not disconnect the power steering hose.



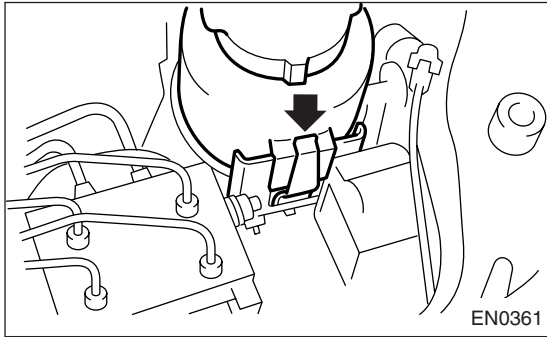
- (4) Remove the bolts which secure power steering pump bracket.



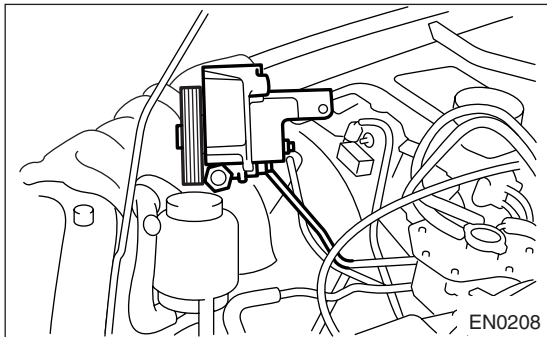
INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

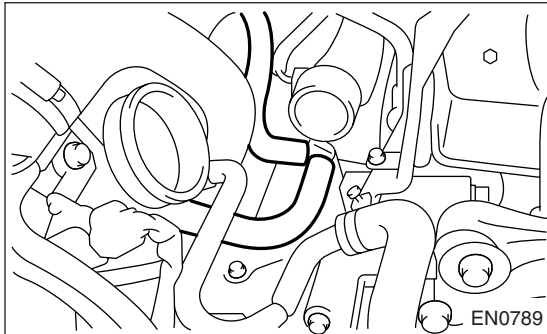
(5) Remove the power steering tank from the bracket by pulling it upward.



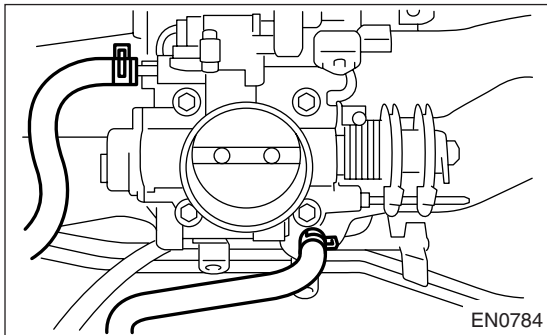
(6) Place the power steering pump on right side wheel apron.



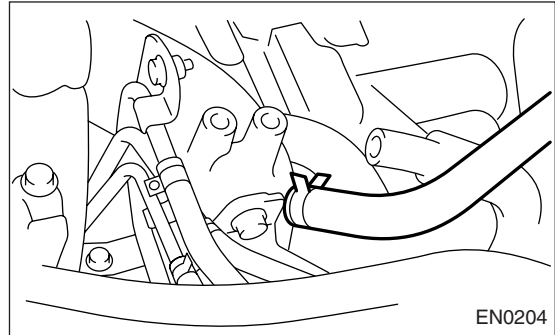
13) Disconnect the emission hose from PCV valve.



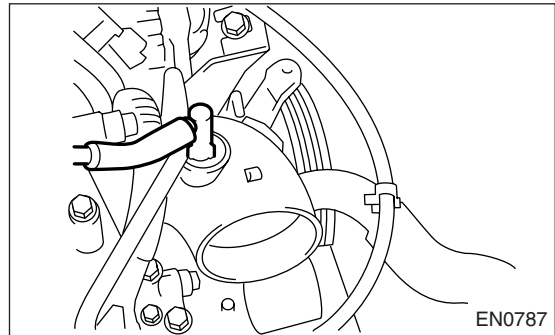
14) Disconnect the engine coolant hoses from throttle body.



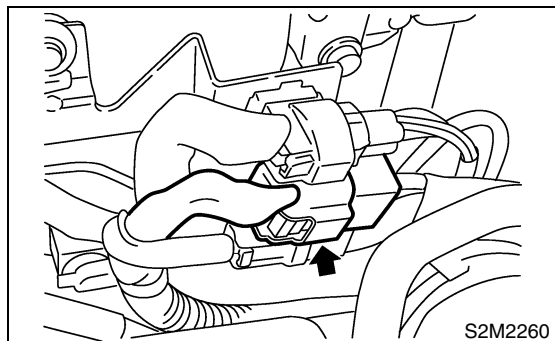
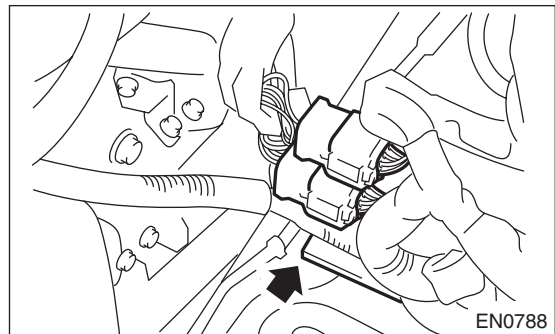
15) Disconnect the brake booster hose.



16) Disconnect the pressure hose from intake duct.



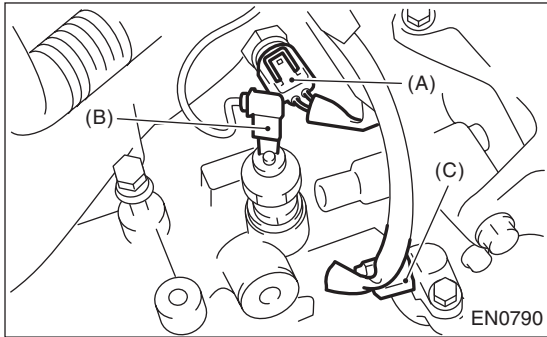
17) Disconnect the engine harness connectors from bulkhead harness connectors.



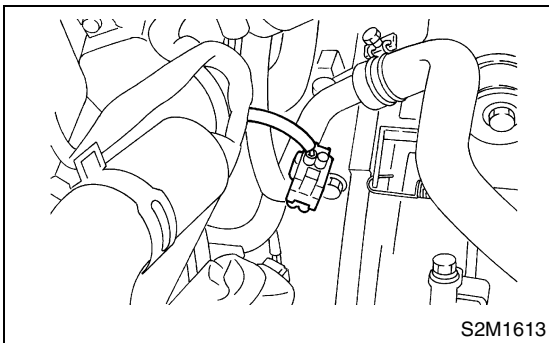
INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

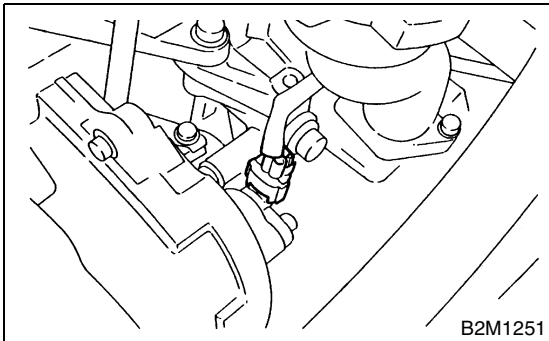
18) Disconnect the connectors from the engine coolant temperature sensor (A), oil pressure switch (B) and crankshaft position sensor (C).



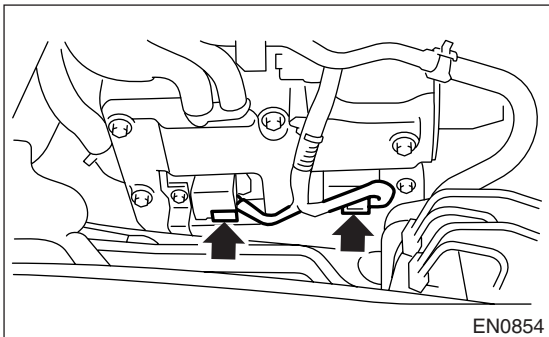
19) Disconnect the knock sensor connector.



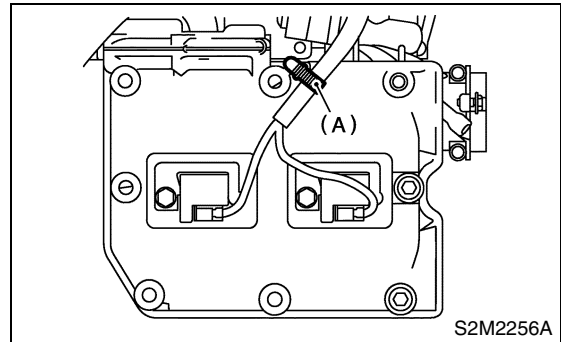
20) Disconnect the connector from camshaft position sensor.



21) Disconnect the connector from ignition coil.



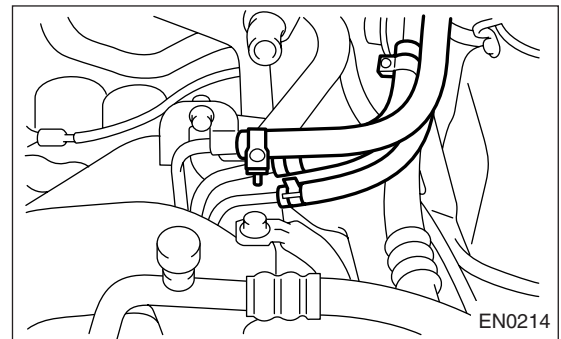
22) Disconnect the engine harness fixed by clip (A) from the bracket.



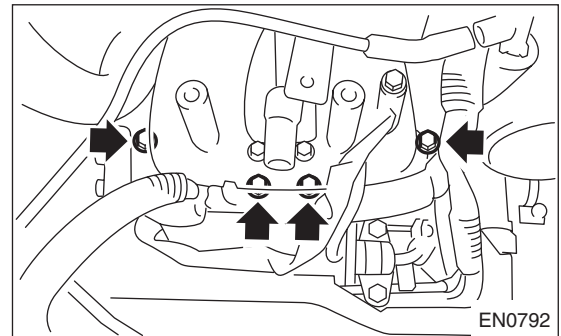
23) Disconnect the fuel delivery hose, return hose and evaporation hose.

WARNING:

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



24) Remove the bolts which secure intake manifold to the cylinder heads.



25) Remove the intake manifold.

INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

B: INSTALLATION

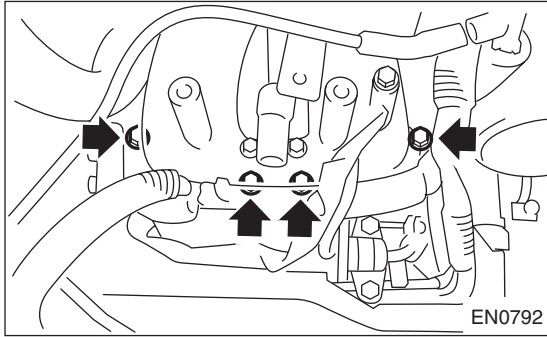
1) Install the intake manifold onto cylinder heads.

NOTE:

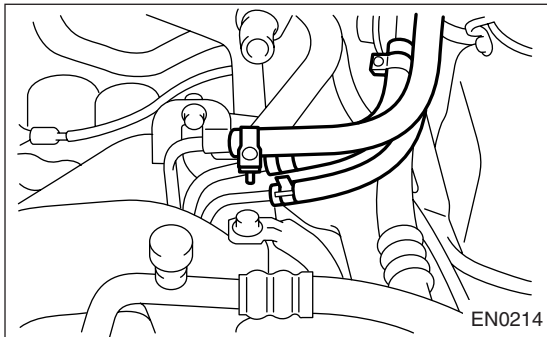
Always use new gaskets.

Tightening torque:

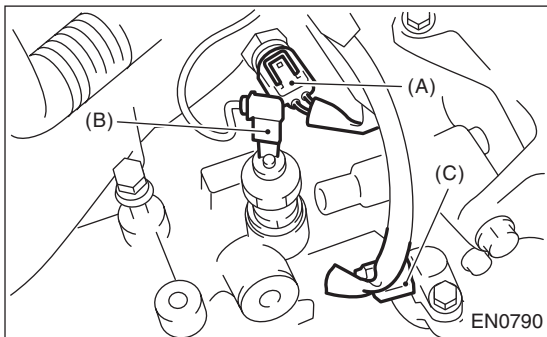
25 N·m (2.5 kgf-m, 18.4 ft-lb)



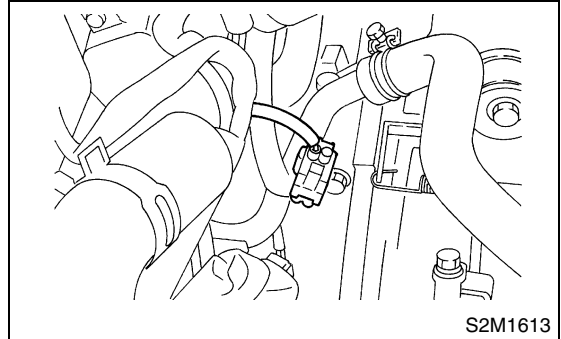
2) Connect the fuel delivery hose, return hose, and evaporation hose.



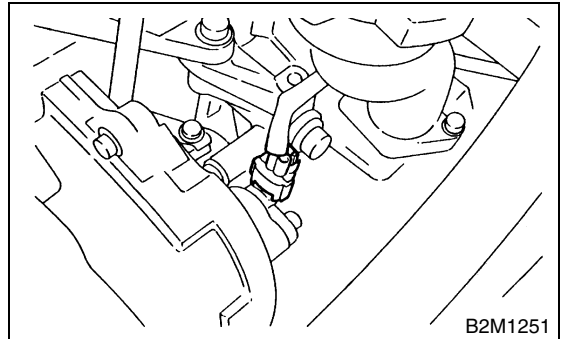
3) Connect the connector to the oil pressure switch (B), crankshaft position sensor (C) and engine coolant temperature sensor (A).



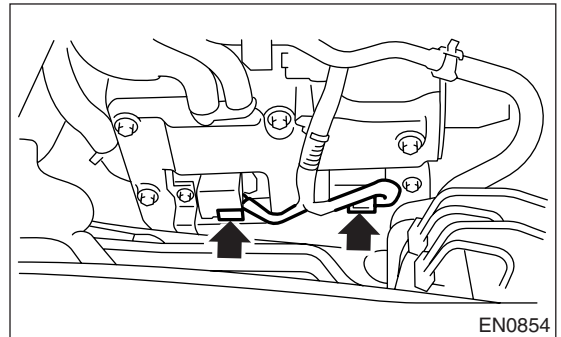
4) Connect the connector to knock sensor.



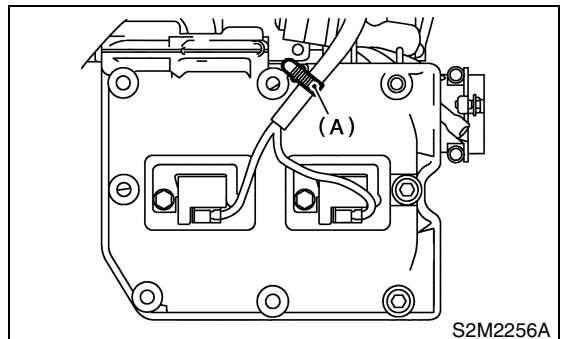
5) Connect the connector to camshaft position sensor.



6) Connect the connector to ignition coil.



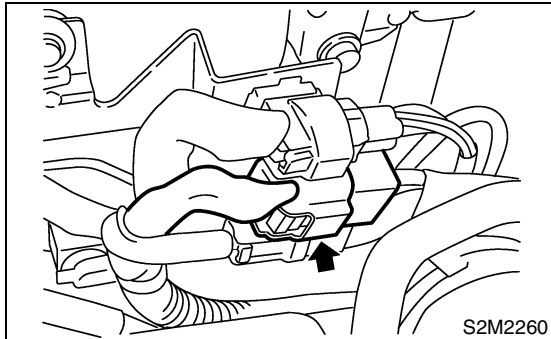
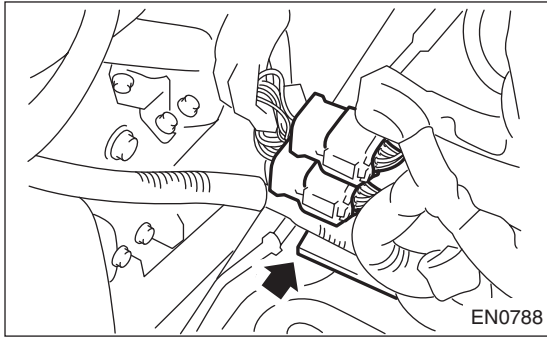
7) Connect the engine harness with clip (A) to the bracket.



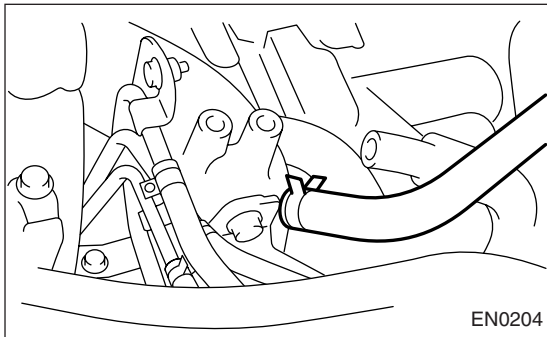
INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

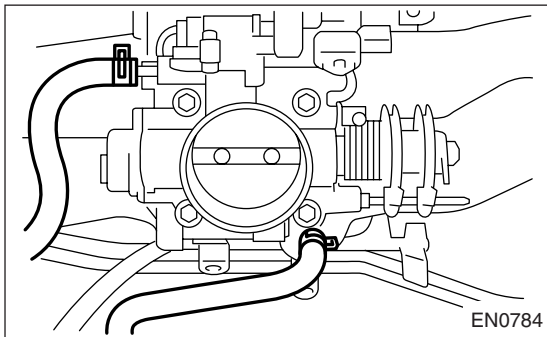
8) Connect the engine harness connector to bulk-head harness connectors.



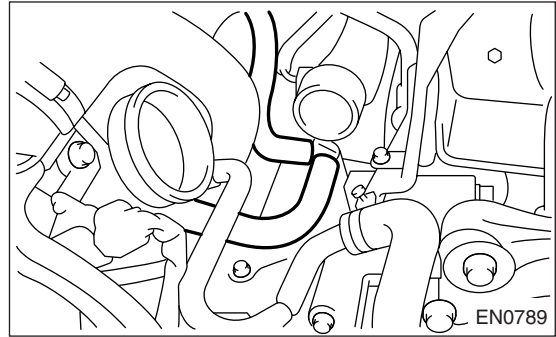
9) Connect the brake booster vacuum hose.



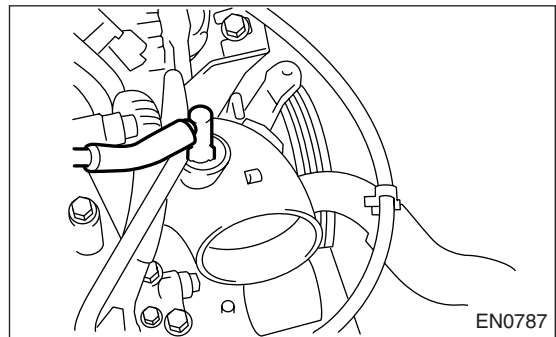
10) Connect the engine coolant hoses to throttle body.



11) Connect the emission hose to PCV valve.

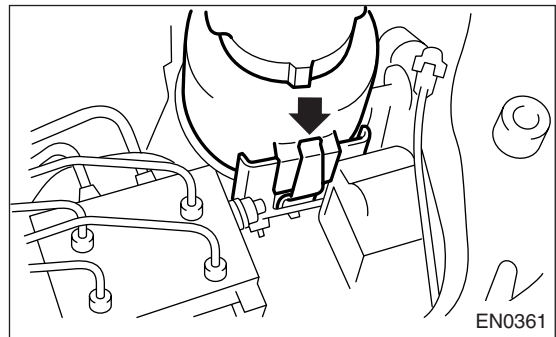


12) Connect the pressure hose to intake duct.

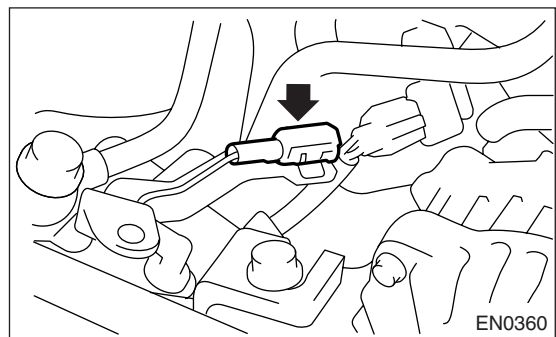


13) Install the power steering pump.

(1) Install the power steering tank on bracket.



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



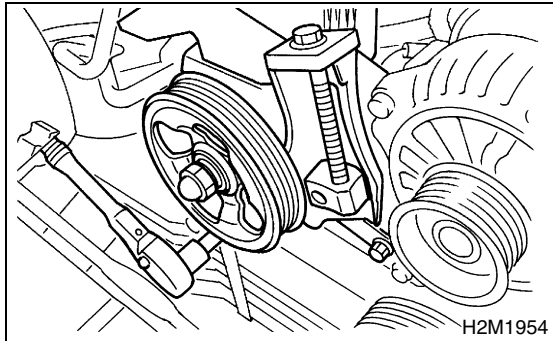
INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

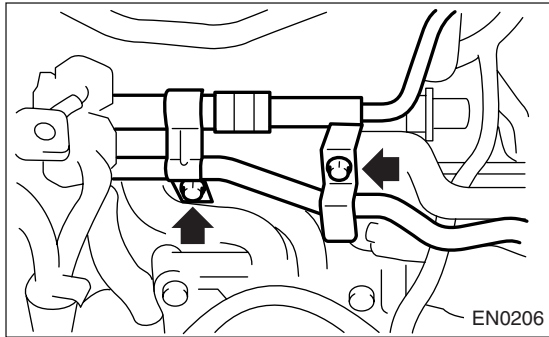
- (3) Install the power steering pump, and then tighten the bolts.

Tightening torque:

22 N·m (2.2 kgf·m, 16.2 ft·lb)



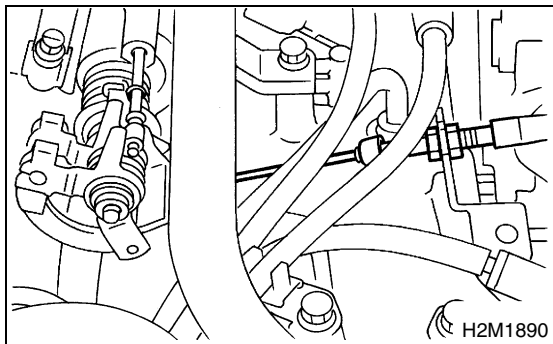
- (4) Install the power steering pipe brackets on right side intake manifold.



- (5) Install the front side V-belt.
<Ref. to ME(TURBO)-44, REMOVAL, V-belt.>

- 14) Install the cooler filler tank. <Ref. to CO-53, INSTALLATION, Cooler Filler Tank.>

- 15) Connect the accelerator cable.

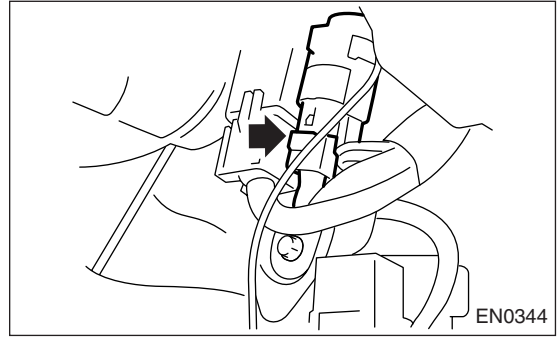


- 16) Install the intercooler. <Ref. to IN(TURBO)-11, INSTALLATION, Intercooler.>

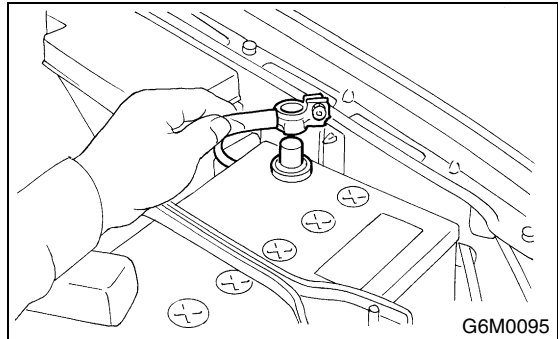
- 17) Install the air cleaner element.

- 18) Install the air cleaner upper cover and air intake duct as a unit. <Ref. to IN(TURBO)-7, INSTALLATION, Air Cleaner.>

- 19) Connect the connector to fuel pump relay.



- 20) Connect the battery ground cable to battery.



- 21) Lift-up the vehicle.

- 22) Install the under cover.

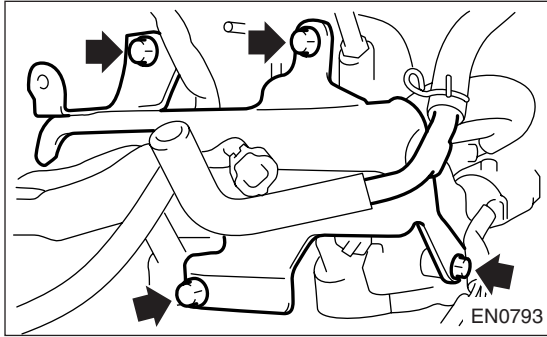
- 23) Fill the coolant. <Ref. to CO-26, FILLING OF ENGINE COOLANT, Engine Coolant.>

INTAKE MANIFOLD

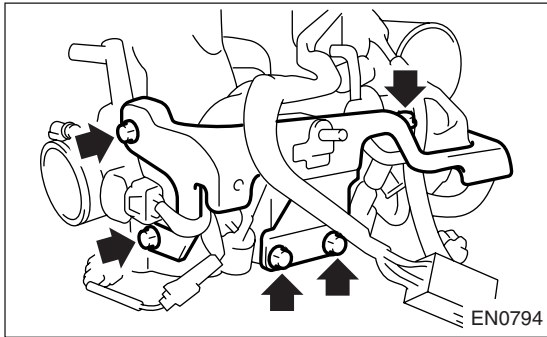
FUEL INJECTION (FUEL SYSTEMS)

C: DISASSEMBLY

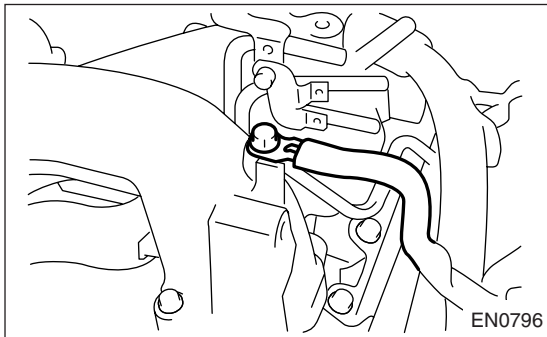
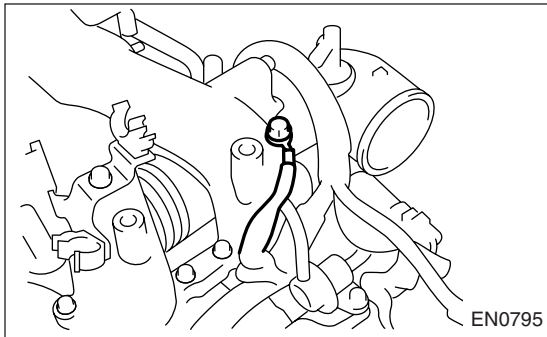
1) Remove the fuel pipe protector LH.



2) Remove the fuel pipe protector RH.

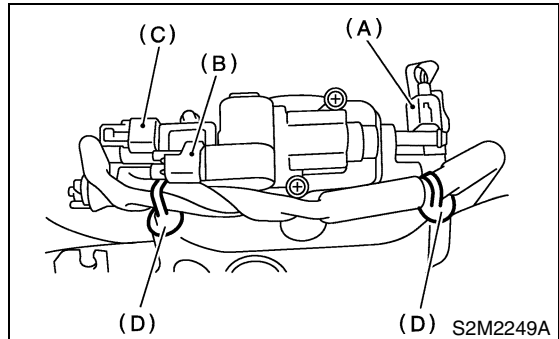


3) Remove the engine ground cable from intake manifold.

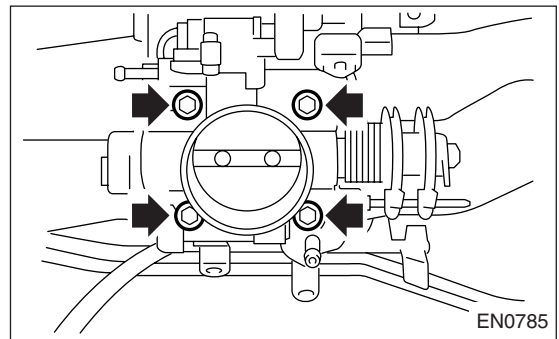


4) Disconnect the connector from the throttle position sensor (A), idle air control solenoid valve (B) and pressure sensor (C).

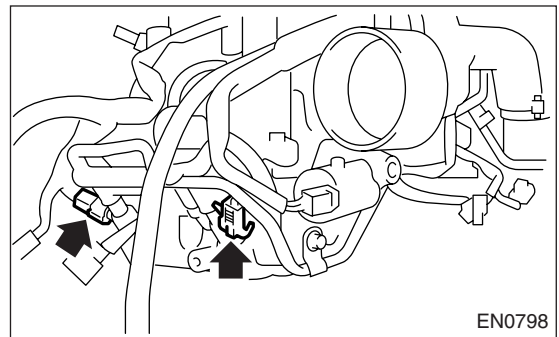
5) Disconnect the engine harness fixed by clip (D) from the intake manifold.



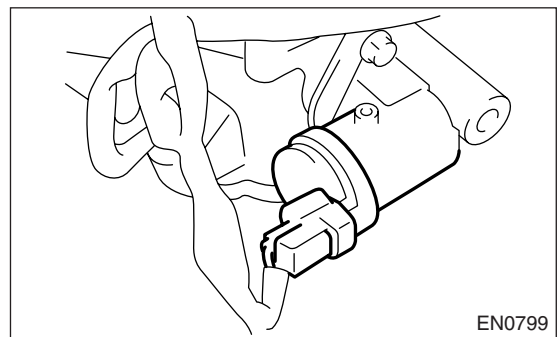
6) Remove the throttle body from intake manifold.



7) Disconnect the connector from fuel injector.



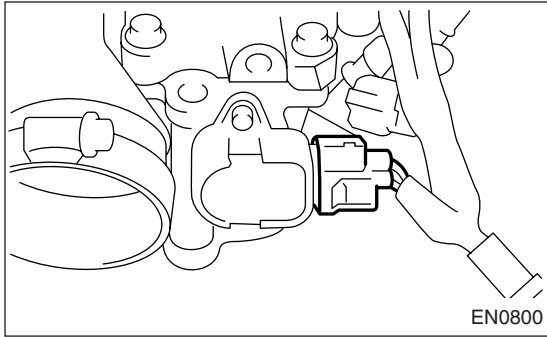
8) Disconnect the connector from tumble generator valve actuator.



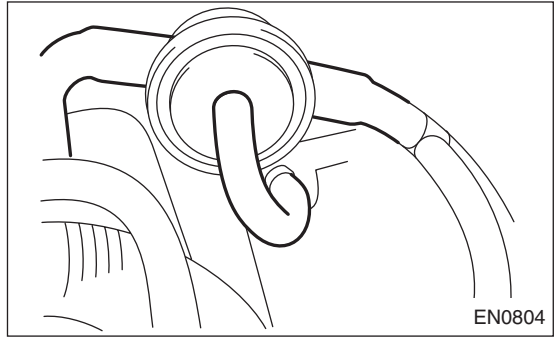
INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

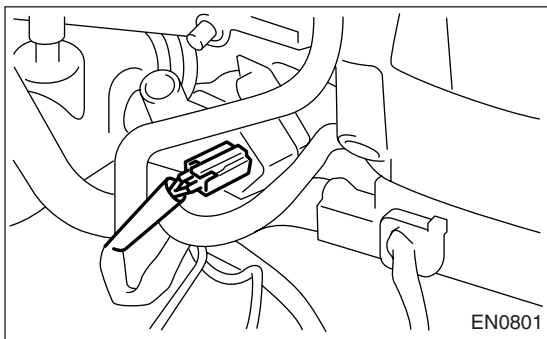
9) Disconnect the connector from tumble generator valve sensor.



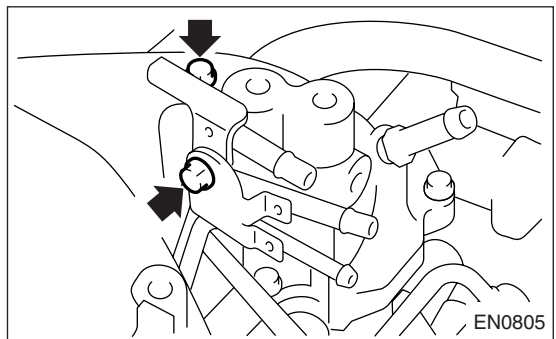
13) Disconnect the evaporation hoses from purge valve.



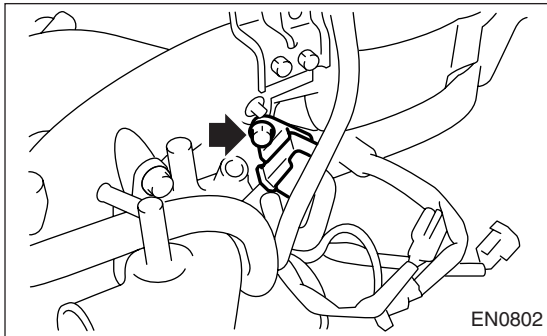
10) Disconnect the connector from purge control solenoid valve.



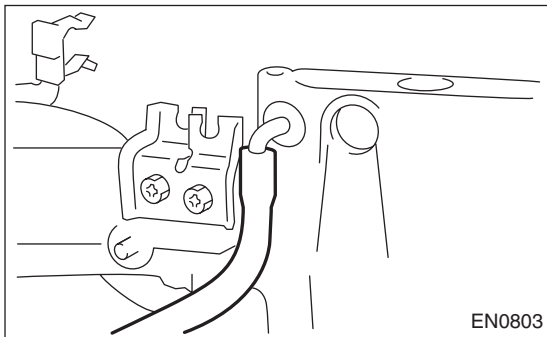
14) Remove the two bolts which hold fuel pipes on the left side of intake manifold.



11) Remove the purge control solenoid valve.



12) Disconnect the evaporation hose from intake manifold.

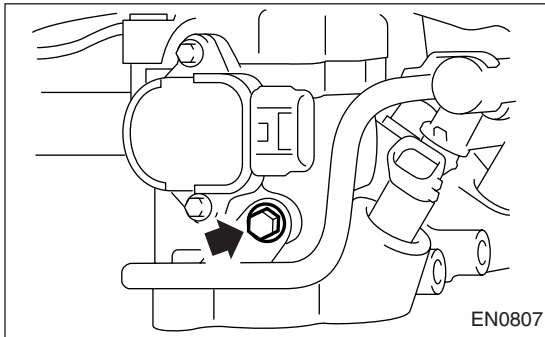
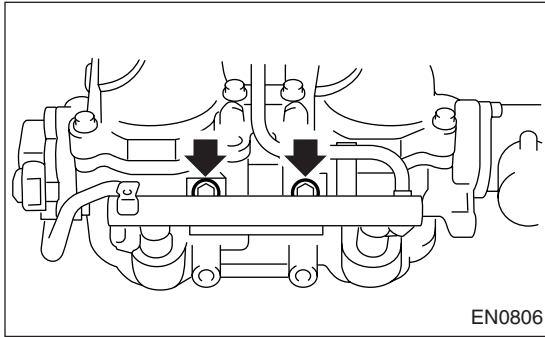


INTAKE MANIFOLD

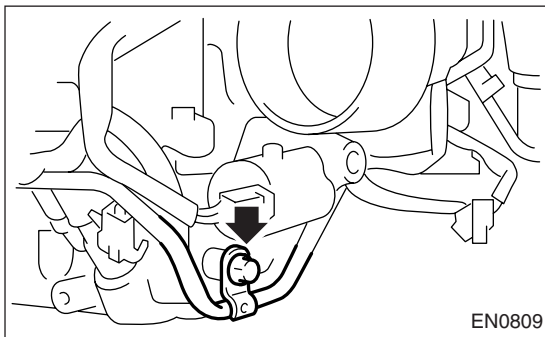
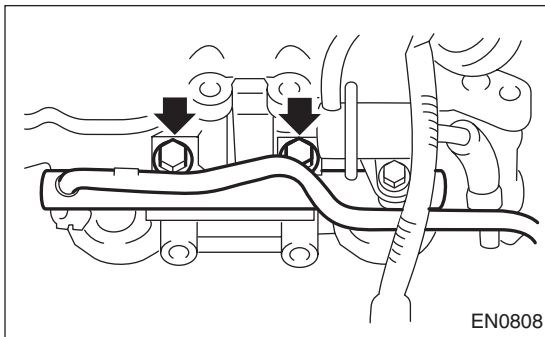
FUEL INJECTION (FUEL SYSTEMS)

15) Remove the bolts which hold fuel injector pipe onto intake manifold.

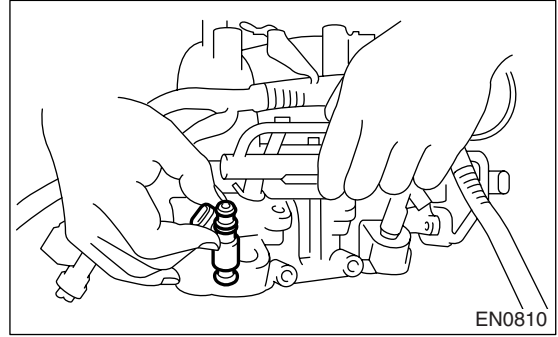
• LH SIDE



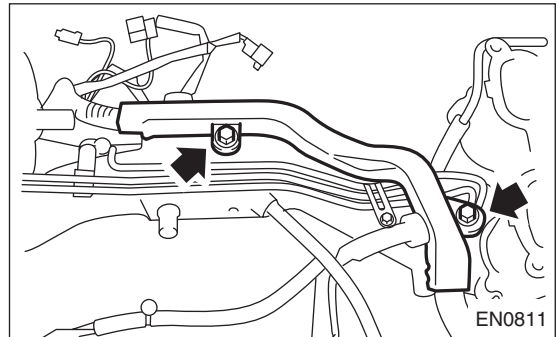
• RH SIDE



16) Remove the fuel injector.

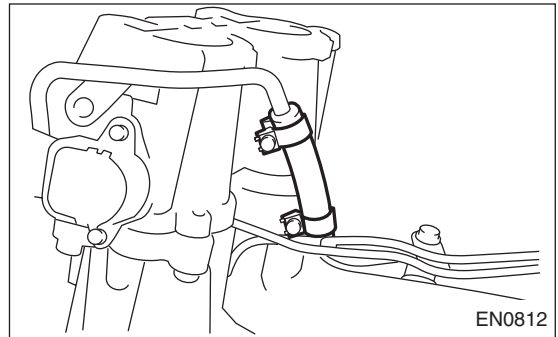


17) Remove the harness bracket which holds engine harness onto intake manifold.



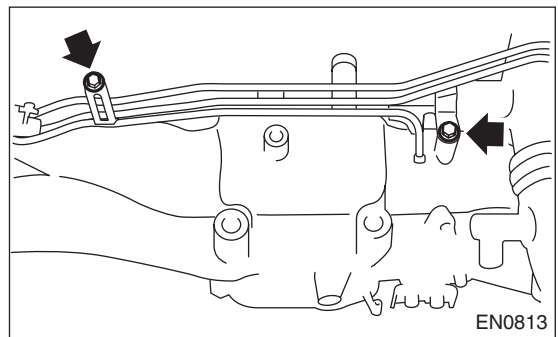
18) Remove the engine harness from intake manifold.

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



20) Remove the fuel injector pipe LH.

21) Remove the bolts which install fuel pipe on intake manifold.

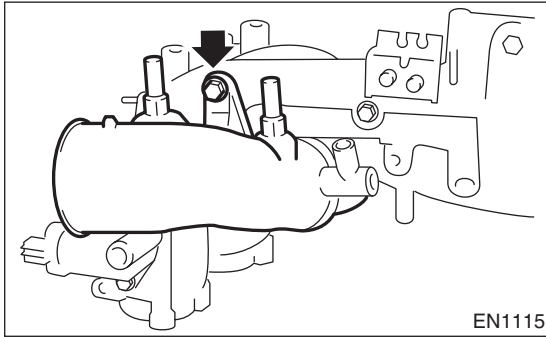


INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

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

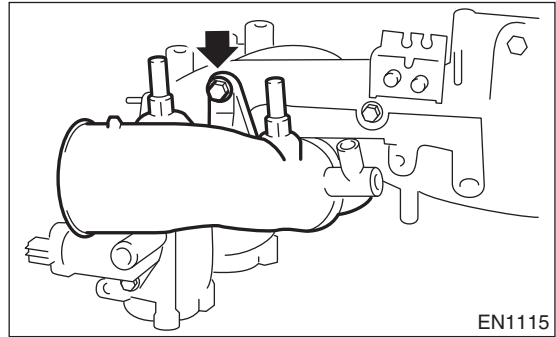
23) Remove the intake duct from intake manifold.



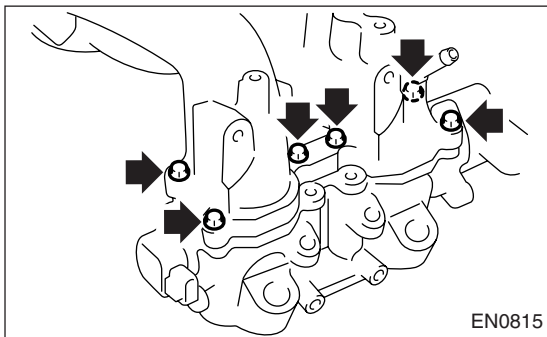
2) Install the air intake duct to intake manifold.

Tightening torque:

19 N·m (1.9 kgf·m, 14.0 ft·lb)



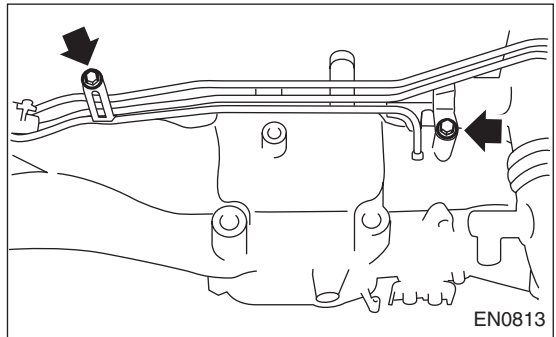
24) Remove the tumble generator valve assembly from intake manifold.



3) Install the fuel pipe assembly and pressure regulator to intake manifold.

Tightening torque:

4.9 N·m (0.5 kgf·m, 3.6 ft·lb)



D: ASSEMBLY

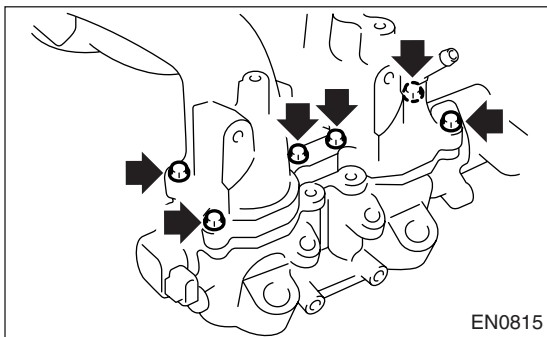
NOTE:

Replace the gasket with a new one.

1) Install the tumble generator valve assembly to intake manifold.

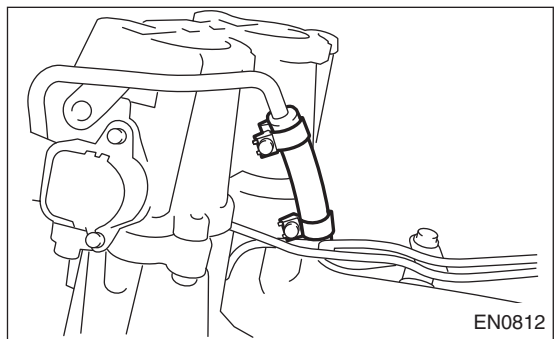
Tightening torque:

8.25 N·m (0.84 kgf·m, 6.1 ft·lb)



4) Install the fuel injector pipe LH.

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



6) Install the engine harness to intake manifold.

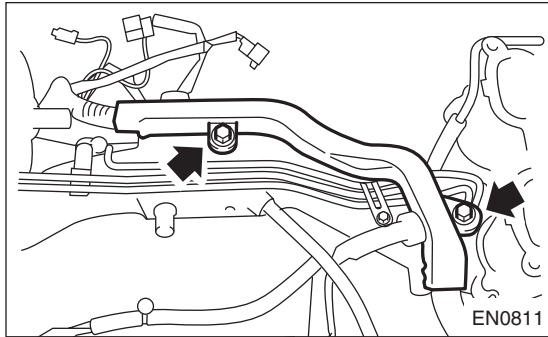
INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

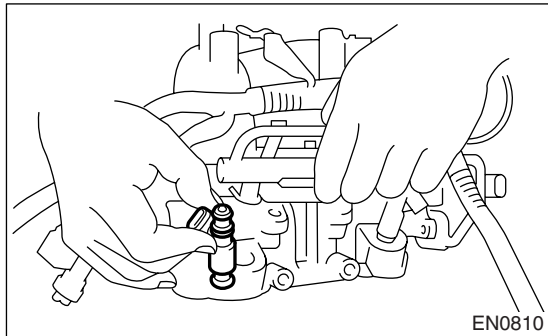
7) Install the harness bracket which holds engine harness onto intake manifold.

Tightening torque:

19 N·m (1.9 kgf·m, 14.0 ft·lb)



8) Install the fuel injector.

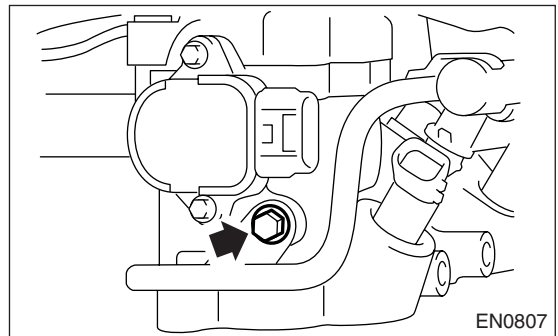
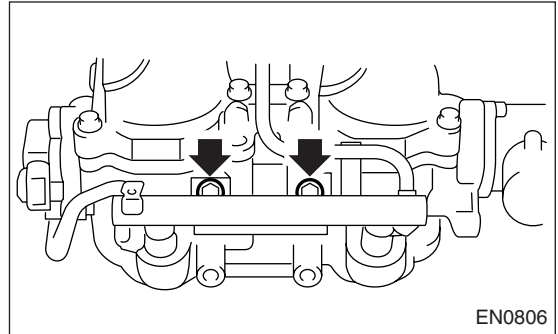


9) Tighten the bolts which install fuel injector pipe onto intake manifold.

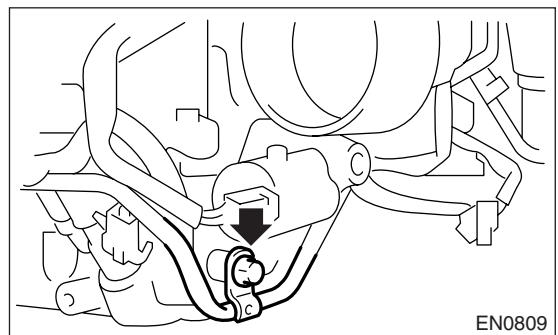
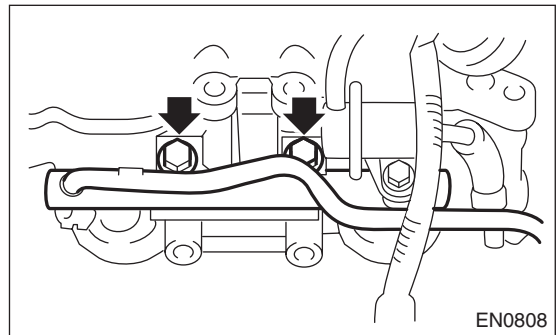
Tightening torque:

19 N·m (1.9 kgf·m, 14.0 ft·lb)

• LH SIDE



• RH SIDE



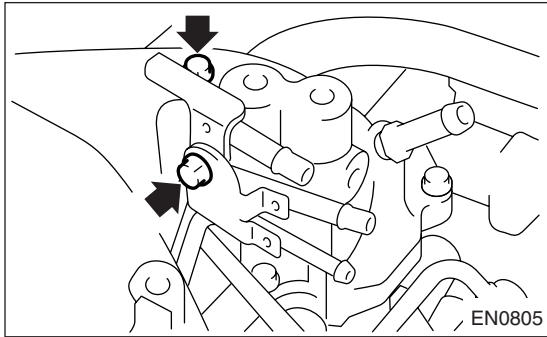
INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

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

Tightening torque:

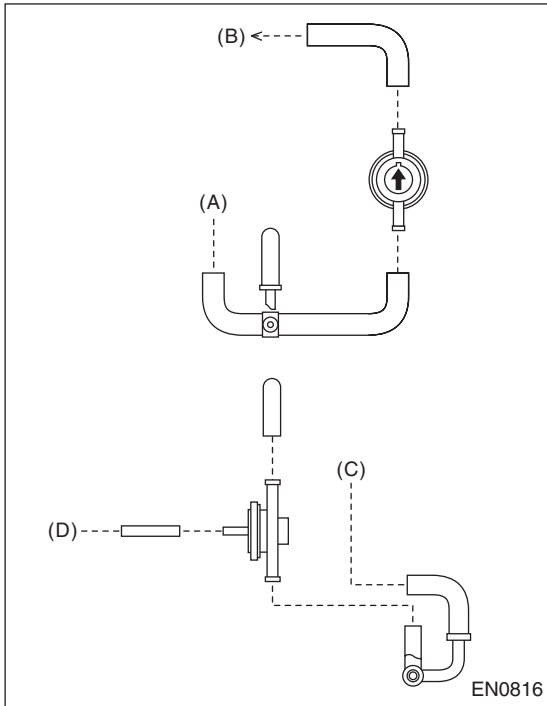
4.9 N·m (0.5 kgf·m, 3.6 ft·lb)



11) Connect the evaporation hoses to purge valve.

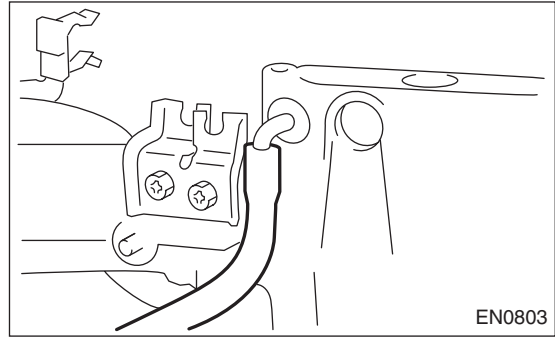
CAUTION:

Carefully connect the evaporation hoses.



- (A) To fuel pipe ASSY
- (B) To intake duct
- (C) To purge control solenoid valve
- (D) To intake manifold

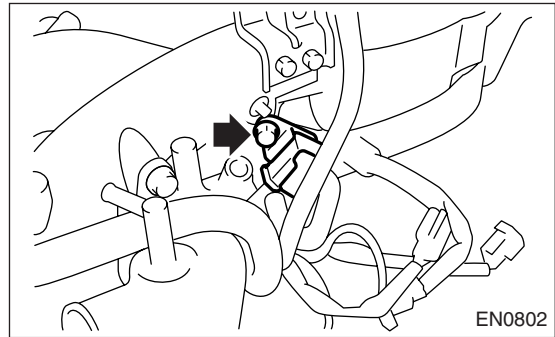
12) Connect the evaporation hose to intake manifold.



13) Install the purge control solenoid valve.

Tightening torque:

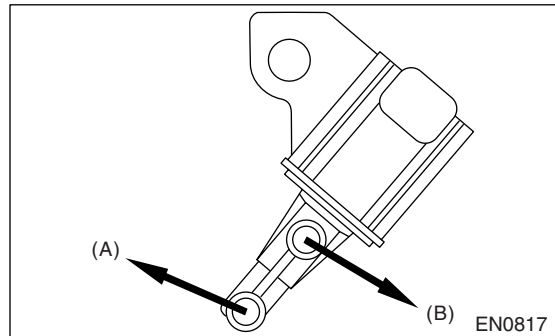
16 N·m (1.6 kgf·m, 11.8 ft·lb)



14) Connect the hoses to purge control solenoid valve.

CAUTION:

Carefully connect the evaporation hoses.

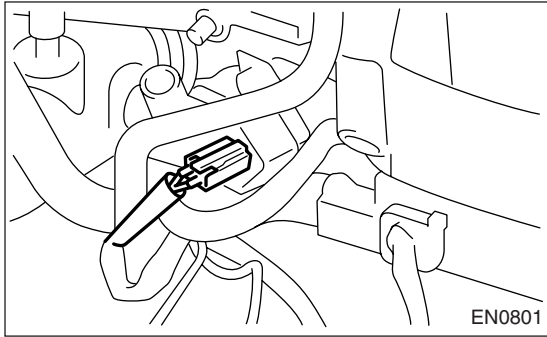


- (A) To intake manifold
- (B) To purge valve

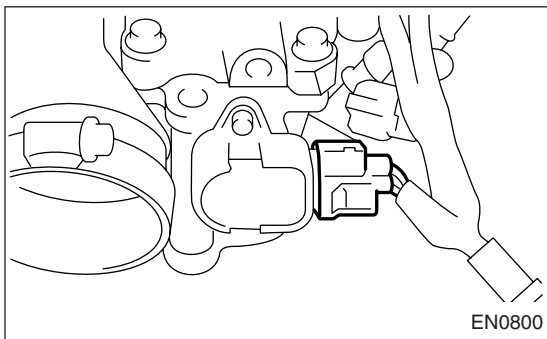
INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

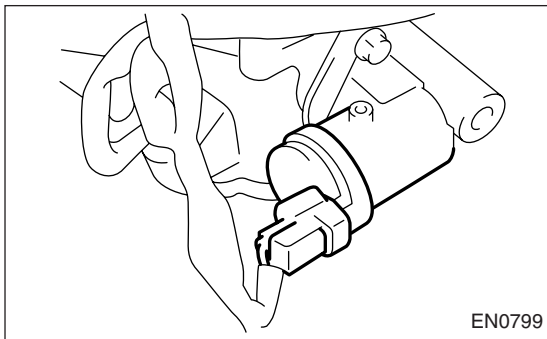
15) Connect the connector to purge control solenoid valve.



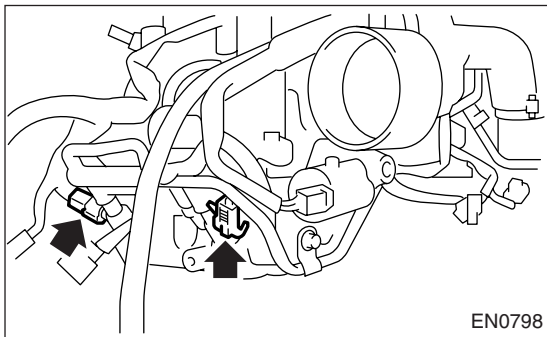
16) Connect the connector to tumble generator valve sensor.



17) Connect the connector to tumble generator valve actuator.



18) Connect the connector to fuel injector.



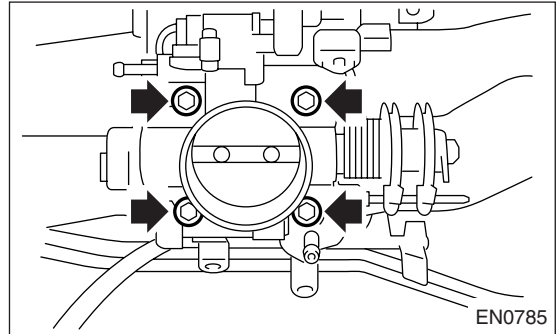
19) Install the throttle body to intake manifold.

NOTE:

Replace the gasket with a new one.

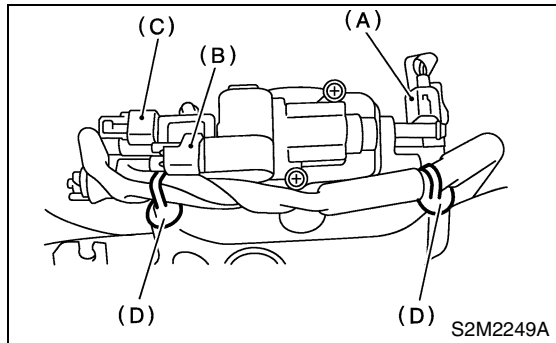
Tightening torque:

22 N·m (2.2 kgf-m, 16.2 ft-lb)



20) Connect the connector to the throttle position sensor (A), idle air control solenoid valve (B) and pressure sensor (C).

21) Connect the engine harness with clip (D) to the intake manifold.

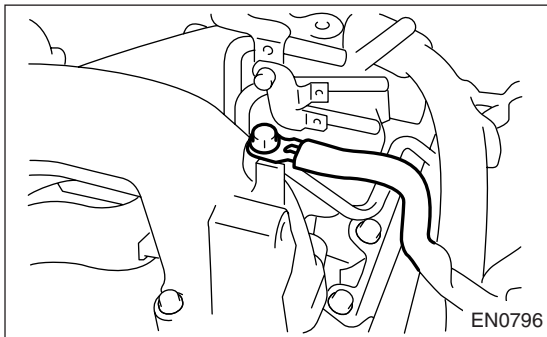
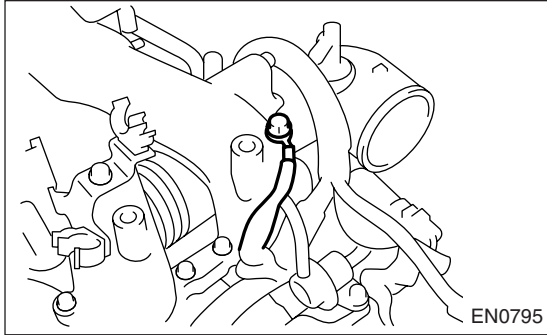


INTAKE MANIFOLD

FUEL INJECTION (FUEL SYSTEMS)

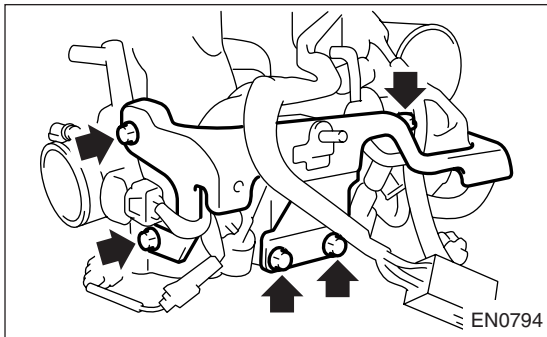
22) Install the engine ground cable to intake manifold.

Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)



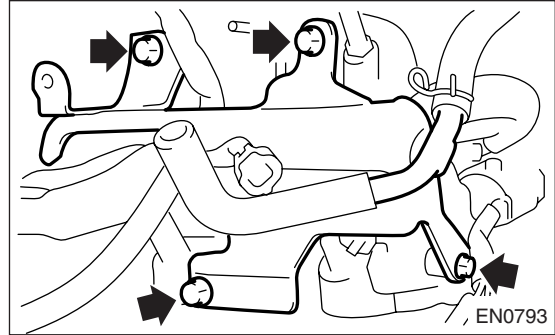
23) Install the fuel pipe protector RH.

Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)



24) Install the fuel pipe protector LH.

Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)



E: INSPECTION

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

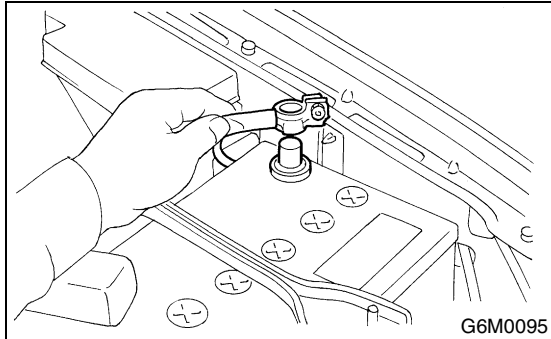
ENGINE COOLANT TEMPERATURE SENSOR

FUEL INJECTION (FUEL SYSTEMS)

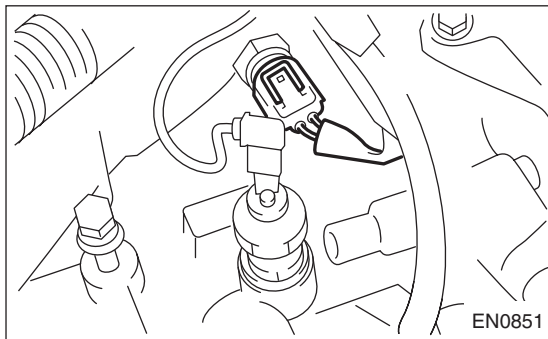
4. Engine Coolant Temperature Sensor

A: REMOVAL

- 1) Disconnect the ground cable from battery.



- 2) Remove the generator <Ref. to SC-14, REMOVAL, Generator.>
- 3) Disconnect the connector from engine coolant temperature sensor.



- 4) Remove the engine coolant temperature sensor.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

18 N·m (1.8 kgf-m, 13.3 ft-lb)

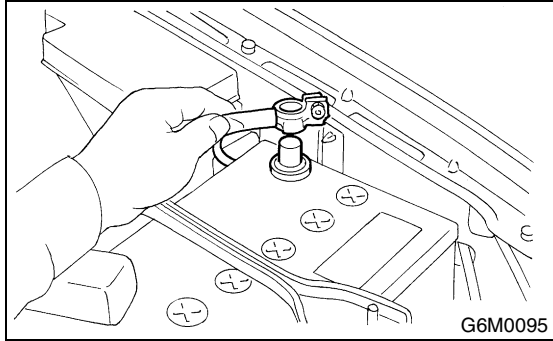
CRANKSHAFT POSITION SENSOR

FUEL INJECTION (FUEL SYSTEMS)

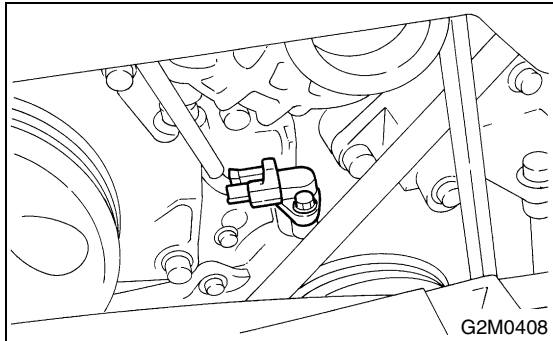
5. Crankshaft Position Sensor

A: REMOVAL

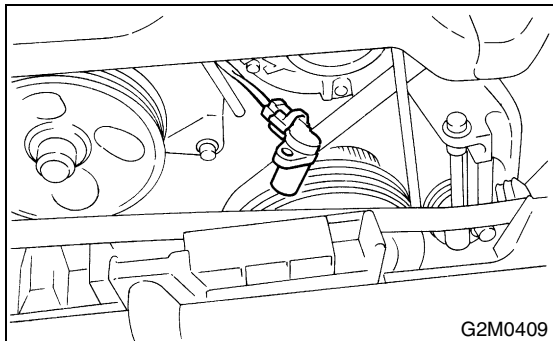
1) Disconnect the ground cable from battery.



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



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

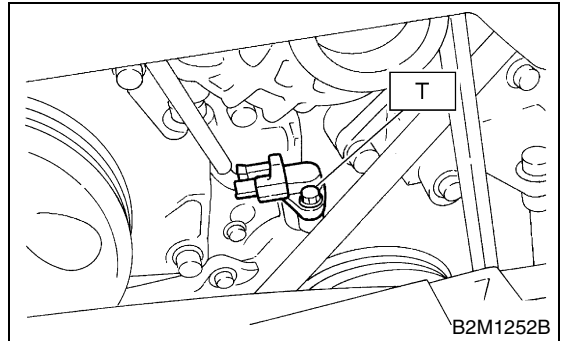


B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

T: 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



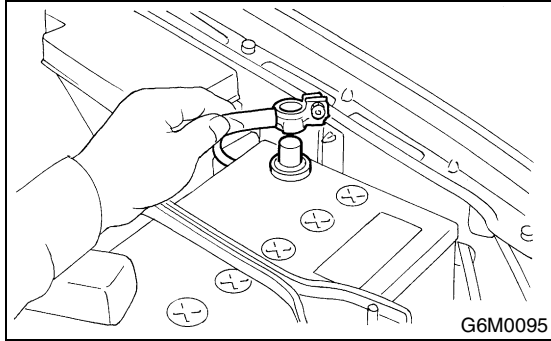
CAMSHAFT POSITION SENSOR

FUEL INJECTION (FUEL SYSTEMS)

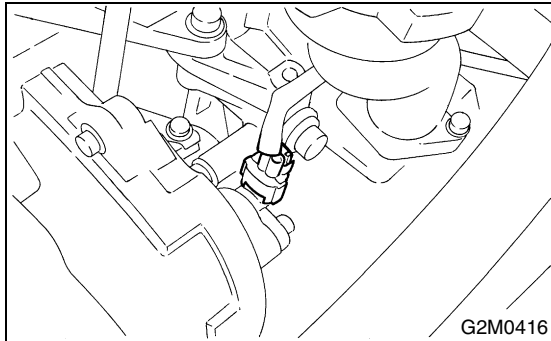
6. Camshaft Position Sensor

A: REMOVAL

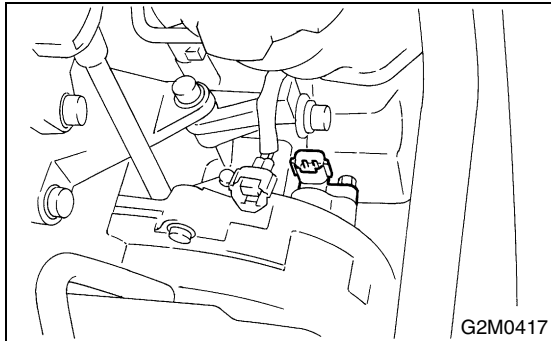
1) Disconnect the ground cable from battery.



2) Disconnect the connector from camshaft position sensor.



3) Remove the camshaft position sensor from camshaft support LH.

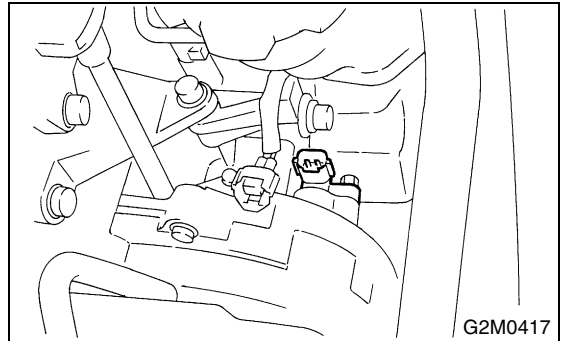


B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

T: 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



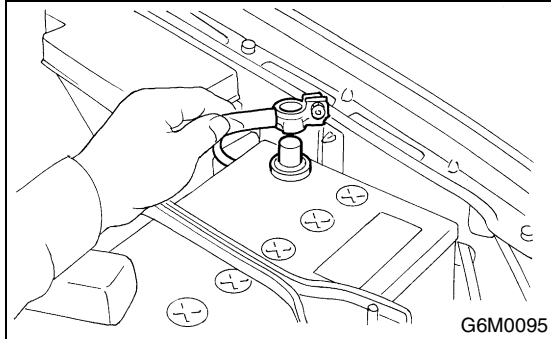
KNOCK SENSOR

FUEL INJECTION (FUEL SYSTEMS)

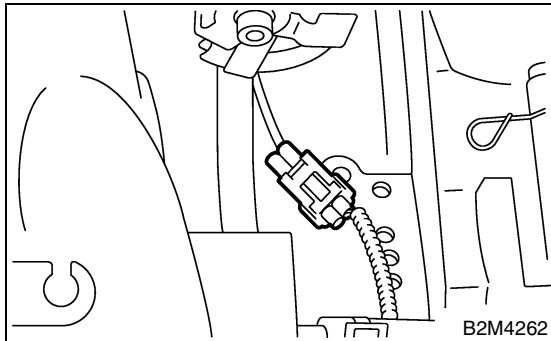
7. Knock Sensor

A: REMOVAL

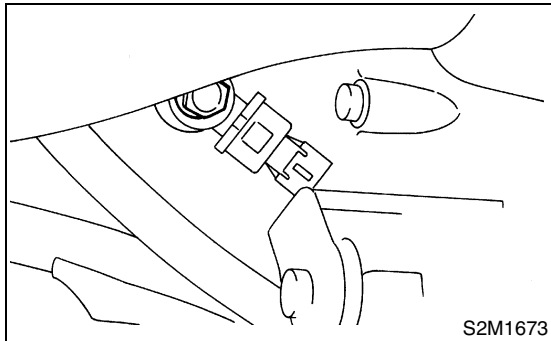
- 1) Disconnect the ground cable from battery.



- 2) Remove the intercooler. <Ref. to IN(TURBO)-10, REMOVAL, Intercooler.>
- 3) Disconnect the knock sensor connector.



- 4) Remove the knock sensor from cylinder block.



B: INSTALLATION

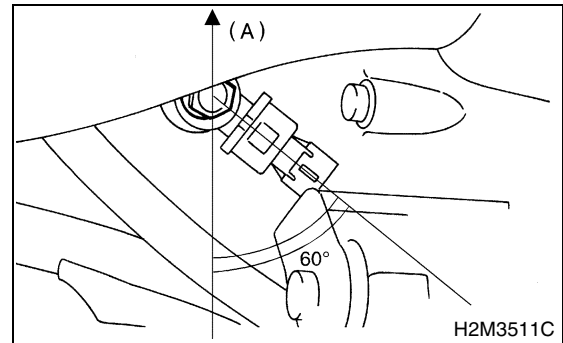
- 1) Install the knock sensor to cylinder block.

Tightening torque:

24 N·m (2.4 kgf-m, 17.4 ft-lb)

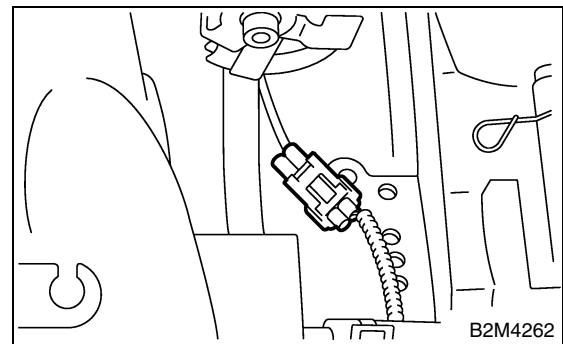
NOTE:

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

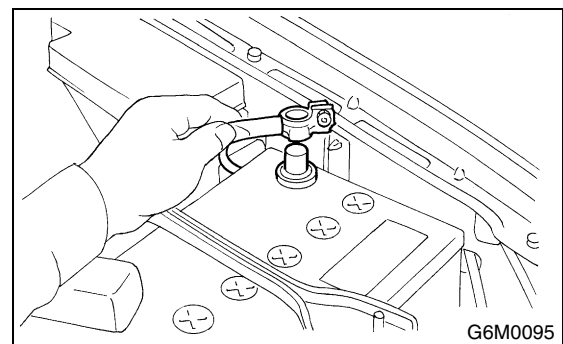


(A) Front side

- 2) Connect the knock sensor connector.



- 3) Install the intercooler. <Ref. to IN(TURBO)-11, INSTALLATION, Intercooler.>
- 4) Connect the battery ground cable to battery.



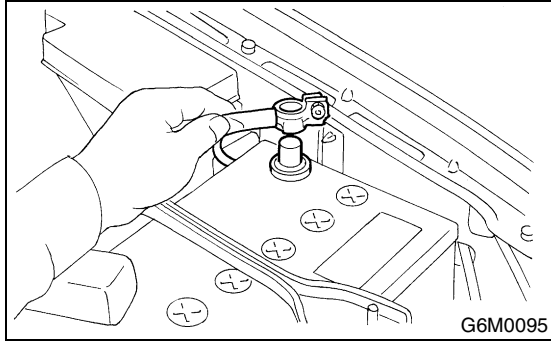
THROTTLE POSITION SENSOR

FUEL INJECTION (FUEL SYSTEMS)

8. Throttle Position Sensor

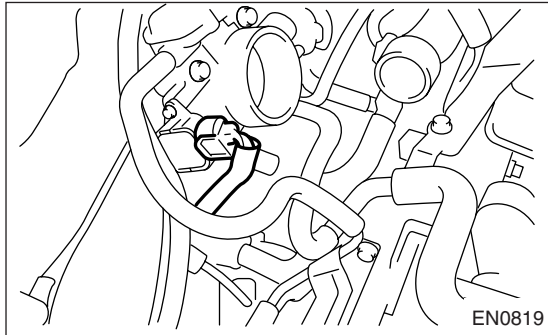
A: REMOVAL

1) Disconnect the ground cable from battery.

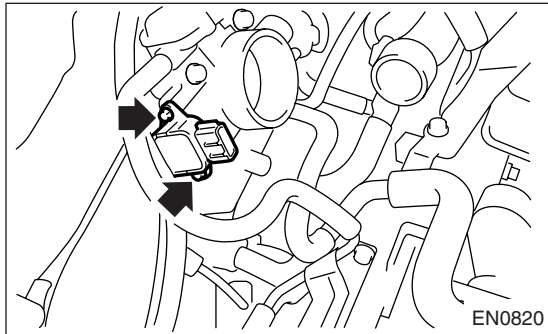


2) Remove the intercooler. <Ref. to IN(TURBO)-10, REMOVAL, Intercooler.>

3) Disconnect the connector from throttle position sensor.



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

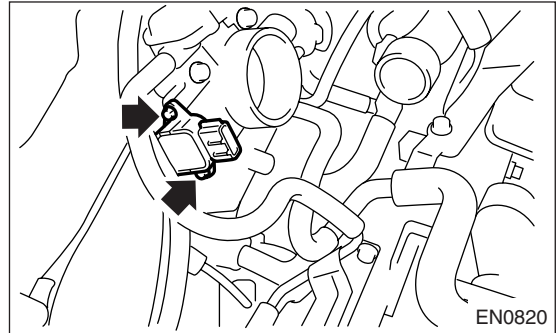


B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

1.6 N·m (0.16 kgf-m, 1.2 ft-lb)



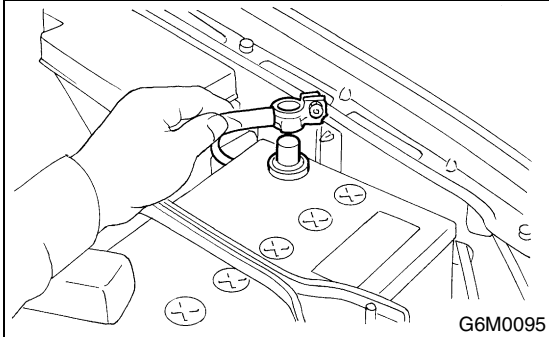
MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR

FUEL INJECTION (FUEL SYSTEMS)

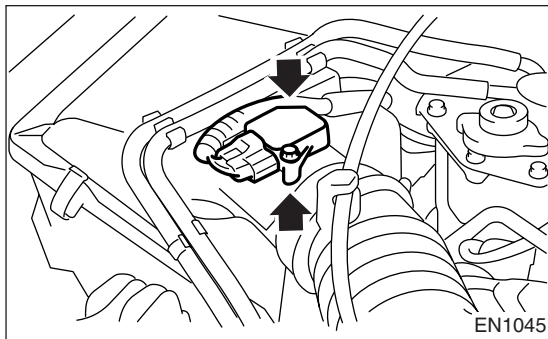
9. Mass Air Flow and Intake Air Temperature Sensor

A: REMOVAL

- 1) Disconnect the ground cable from battery.



- 2) Disconnect the connector mass air flow and intake air temperature sensor.
- 3) Remove the mass air flow and intake air temperature sensor.



B: INSTALLATION

Install in the reverse order of removal.

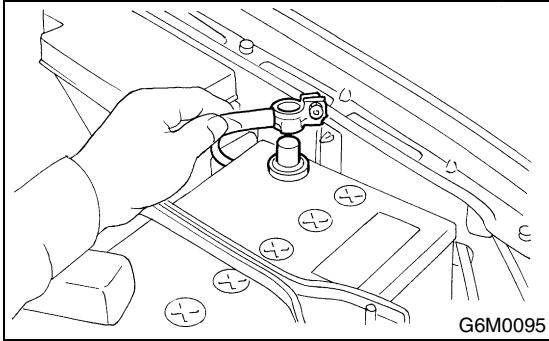
Tightening torque:

7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

10. Pressure Sensor

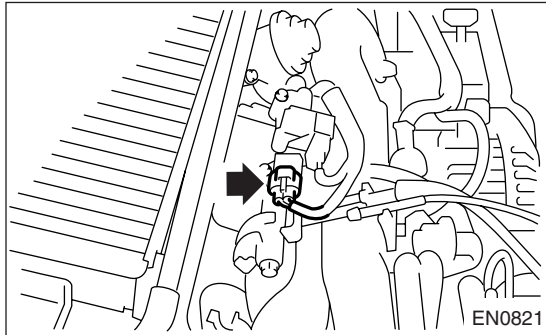
A: REMOVAL

1) Disconnect the ground cable from battery.



2) Remove the idle air control solenoid valve. <Ref. to FU(TURBO)-36, REMOVAL, Idle Air Control Solenoid Valve.>

3) Disconnect the connectors from pressure sensor.



4) Remove the pressure sensor from throttle body.

B: INSTALLATION

Install in the reverse order of removal.

NOTE:

Replace the O-ring for the pressure sensor with new ones.

Tightening torque:

1.6 N·m (0.16 kgf-m, 1.2 ft-lb)

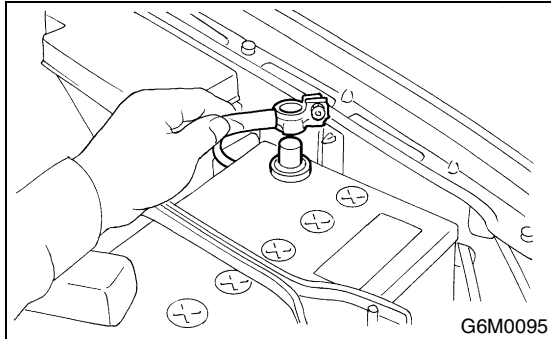
IDLE AIR CONTROL SOLENOID VALVE

FUEL INJECTION (FUEL SYSTEMS)

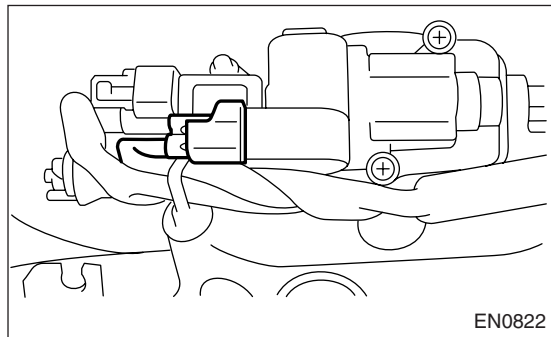
11. Idle Air Control Solenoid Valve

A: REMOVAL

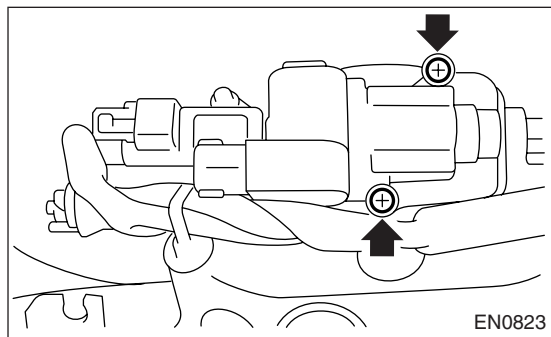
1) Disconnect the ground cable from battery.



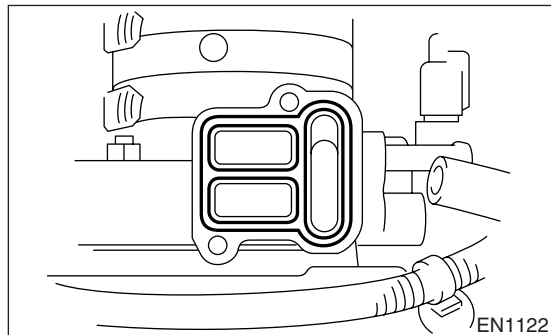
2) Disconnect the connector from idle air control solenoid valve.



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



4) Remove the gasket from throttle body.



B: INSTALLATION

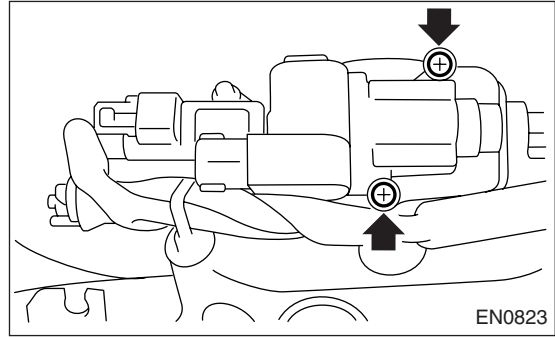
Install in the reverse order of removal.

NOTE:

Always use a new gasket.

Tightening torque:

2.8 N·m (0.29 kgf·m, 2.1 ft·lb)

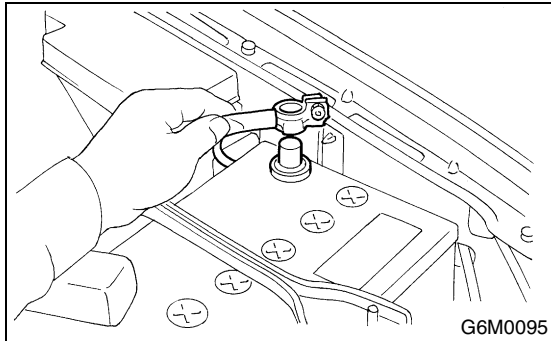


12. Fuel Injector

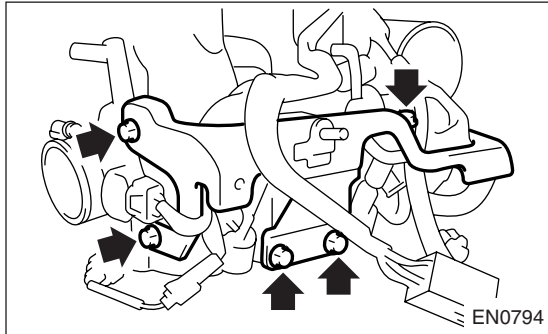
A: REMOVAL

1. RH SIDE

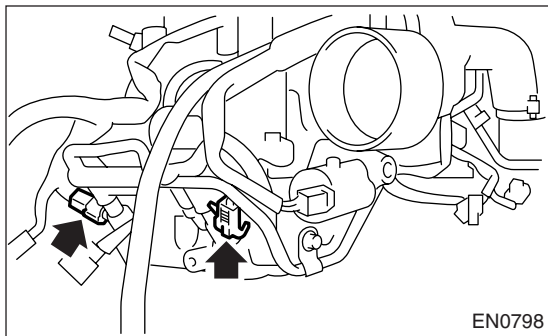
- 1) Release the fuel pressure. <Ref. to FU(TURBO)-53, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 2) Open the fuel filler flap lid and remove fuel filler cap.
- 3) Disconnect the ground cable from battery.



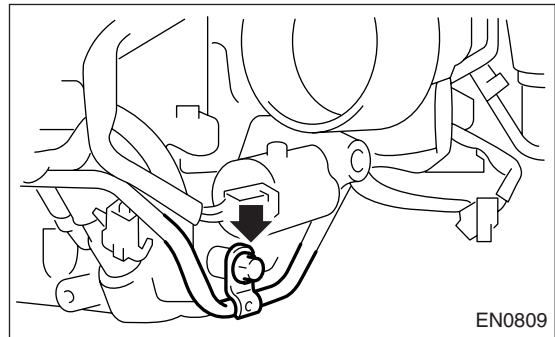
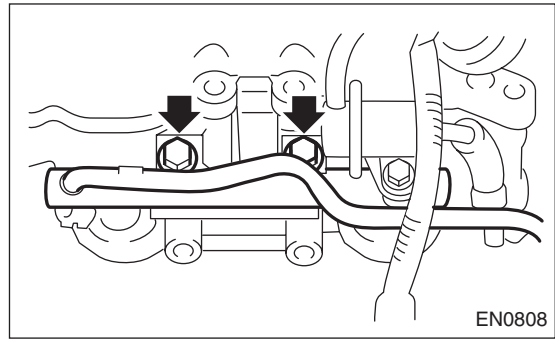
- 4) Remove the intake manifold. <Ref. to FU(TURBO)-15, REMOVAL, Intake Manifold.>
- 5) Remove the fuel pipe protector RH.



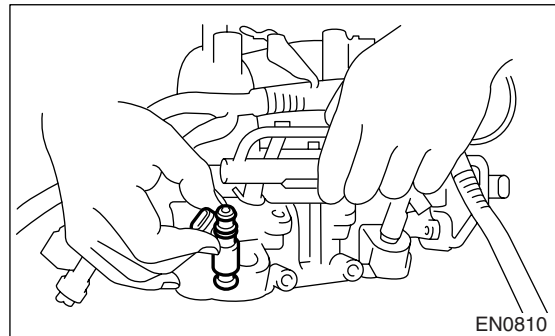
- 6) Disconnect the connector from fuel injector.



- 7) Remove the bolts which hold injector pipe to intake manifold.



- 8) Remove the fuel injector while lifting up the fuel injector pipe.

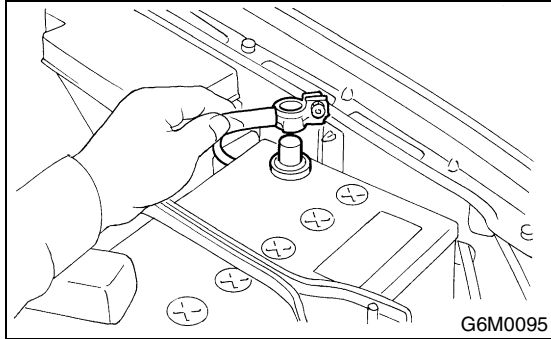


FUEL INJECTOR

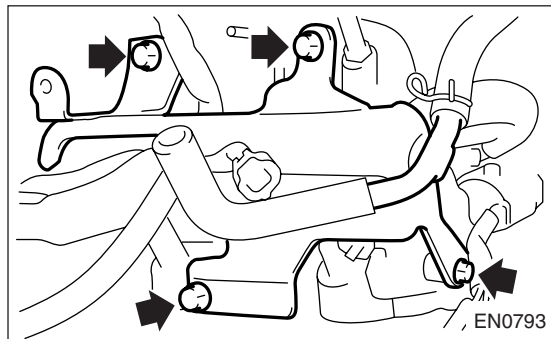
FUEL INJECTION (FUEL SYSTEMS)

2. LH SIDE

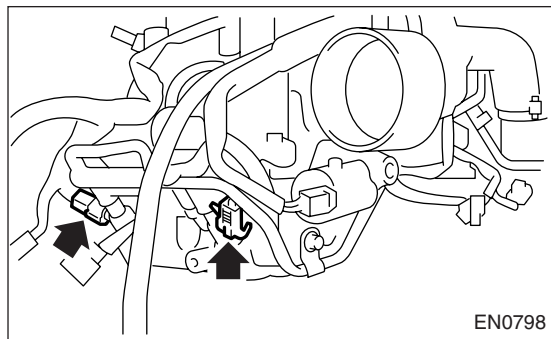
- 1) Release the fuel pressure. <Ref. to FU(TURBO)-53, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 2) Open the fuel filler flap lid and remove fuel filler cap.
- 3) Disconnect the ground cable from battery.



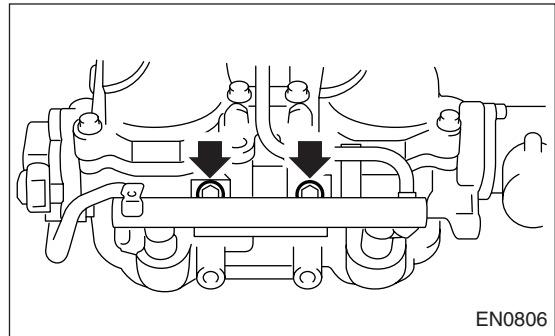
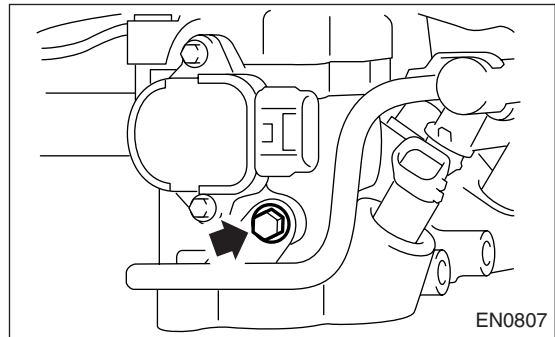
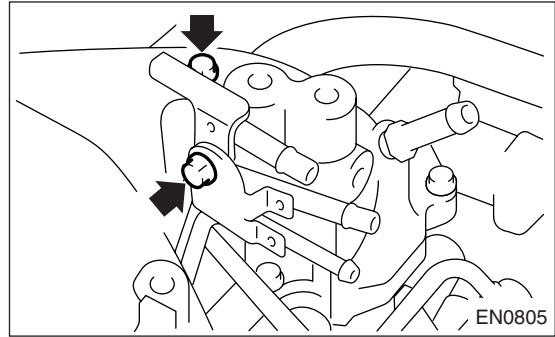
- 4) Remove the intake manifold. <Ref. to FU(TURBO)-15, REMOVAL, Intake Manifold.>
- 5) Remove the fuel pipe protector LH.



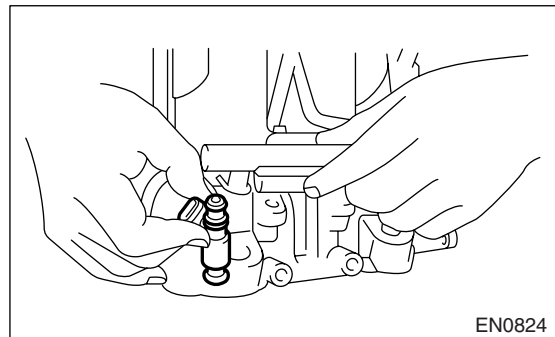
- 6) Disconnect the connector from fuel injector.



- 7) Remove the bolts which hold injector pipe to intake manifold.



- 8) Remove the fuel injector while lifting up the fuel injector pipe.



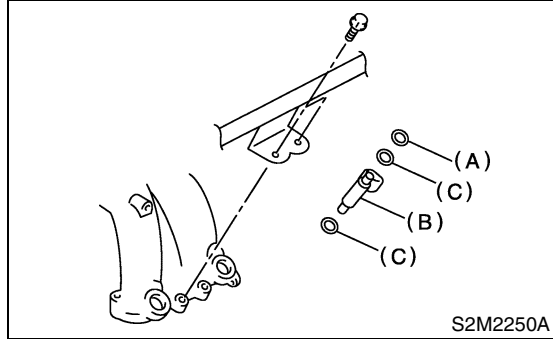
B: INSTALLATION

1. RH SIDE

Install in the reverse order of removal.

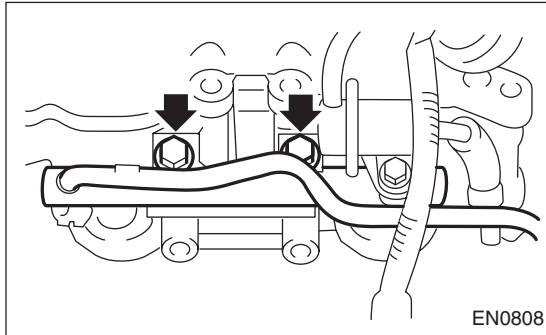
NOTE:

Replace the O-ring and insulators with new ones.

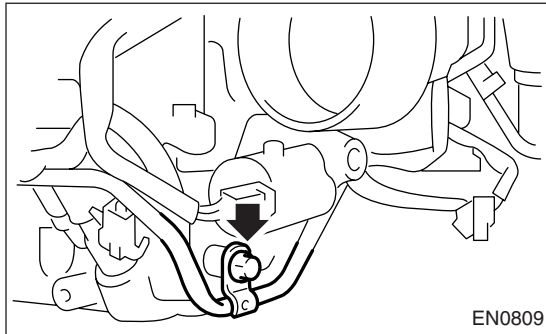


- (A) O-ring
- (B) Fuel injector
- (C) Insulator

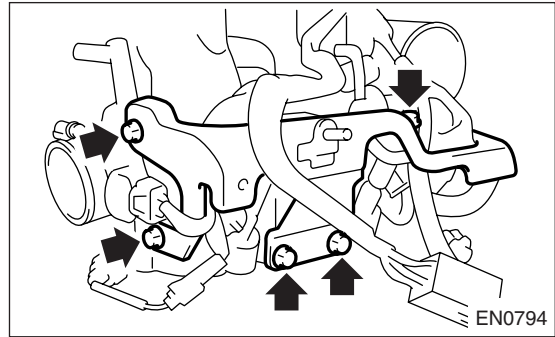
Tightening torque:
19 N·m (1.9 kgf·m, 14.0 ft·lb)



Tightening torque:
19 N·m (1.9 kgf·m, 14.0 ft·lb)



Tightening torque:
19 N·m (1.9 kgf·m, 14.0 ft·lb)

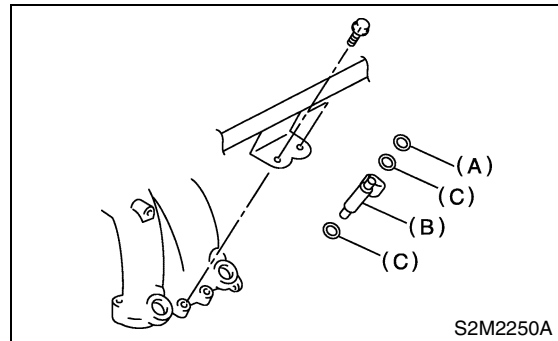


2. LH SIDE

Install in the reverse order of removal.

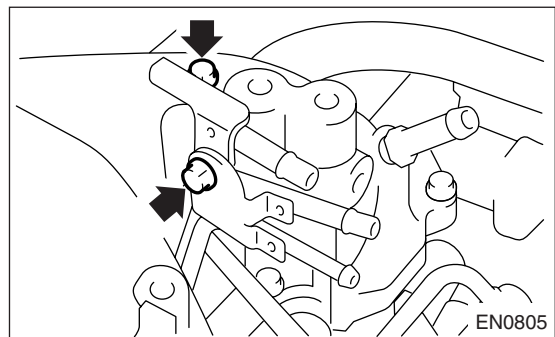
NOTE:

Replace the O-ring and insulators with new ones.



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

Tightening torque:
4.9 N·m (0.5 kgf·m, 3.6 ft·lb)

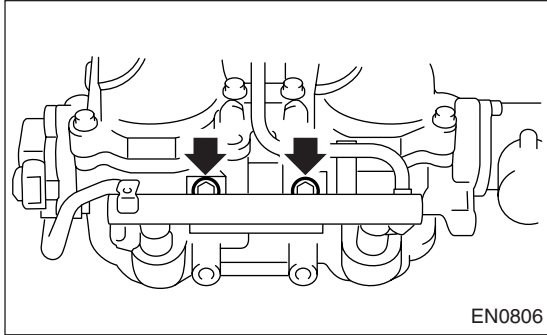


FUEL INJECTOR

FUEL INJECTION (FUEL SYSTEMS)

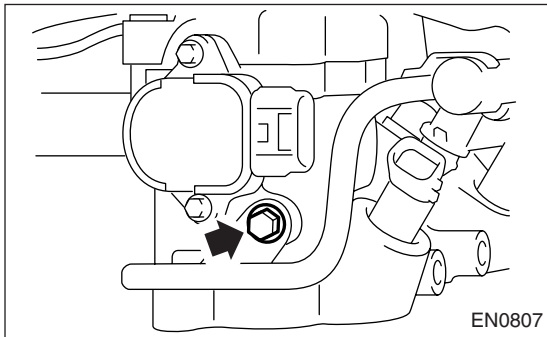
Tightening torque:

19 N·m (1.9 kgf·m, 14.0 ft·lb)



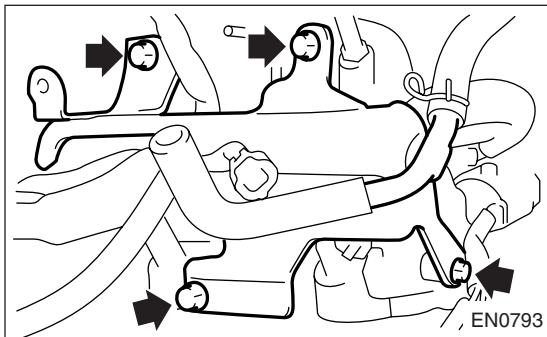
Tightening torque:

19 N·m (1.9 kgf·m, 14.0 ft·lb)



Tightening torque:

19 N·m (1.9 kgf·m, 14.0 ft·lb)



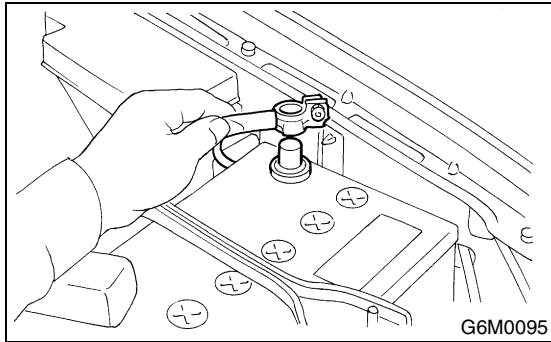
TUMBLE GENERATOR VALVE ASSEMBLY

FUEL INJECTION (FUEL SYSTEMS)

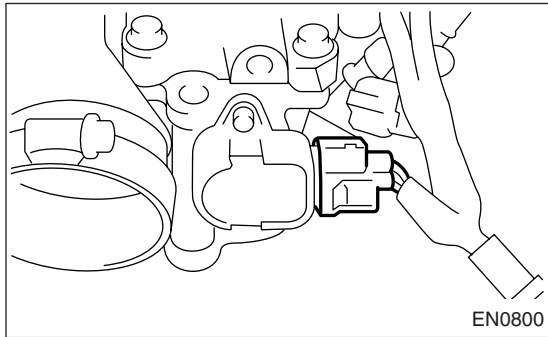
13. Tumble Generator Valve Assembly

A: REMOVAL

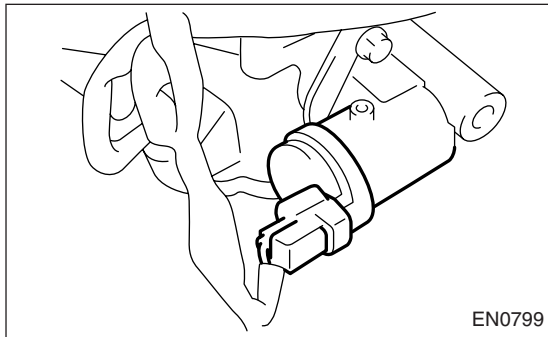
- 1) Release the fuel pressure. <Ref. to FU(TURBO)-53, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 2) Open the fuel filler flap lid and remove fuel filler cap.
- 3) Disconnect the ground cable from battery.



- 4) Remove the intake manifold. <Ref. to FU(TURBO)-15, REMOVAL, Intake Manifold.>
- 5) Disconnect the connector from tumble generator valve sensor.

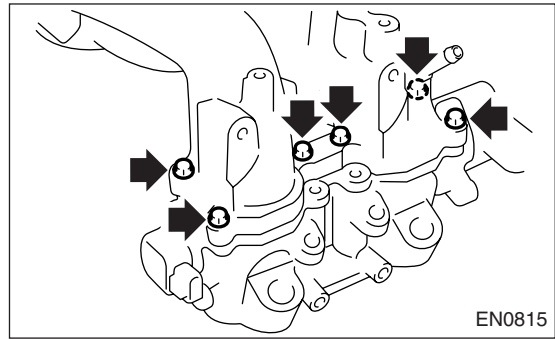


- 6) Disconnect the connector from tumble generator valve actuator.



- 7) Remove the fuel injector. <Ref. to FU(TURBO)-37, REMOVAL, Fuel Injector.>

- 8) Remove the tumble generator valve body from intake manifold.



B: INSTALLATION

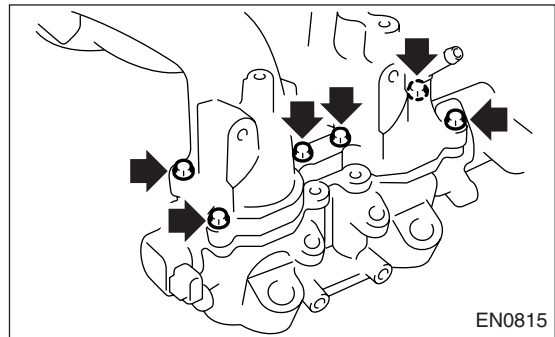
Install in the reverse order of removal.

NOTE:

Always use new gaskets.

Tightening torque:

8.25 N·m (0.84 kgf·m, 6.1 ft·lb)



TUMBLE GENERATOR VALVE ACTUATOR

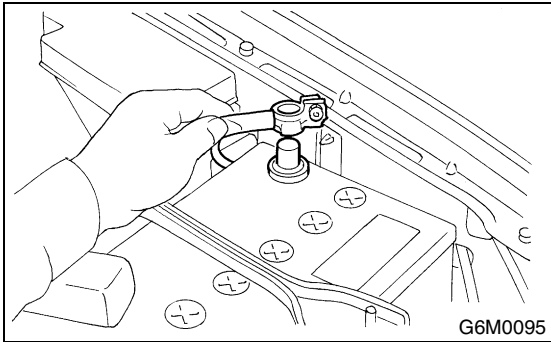
FUEL INJECTION (FUEL SYSTEMS)

14. Tumble Generator Valve Actuator

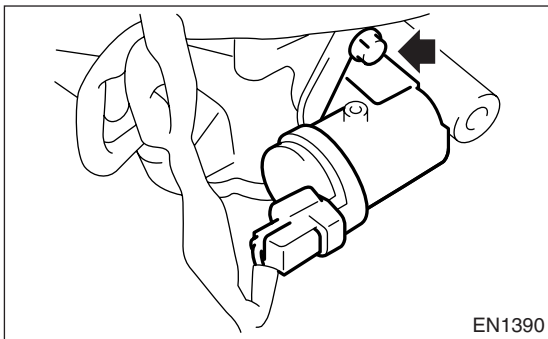
A: REMOVAL

1. RH SIDE

- 1) Release the fuel pressure. <Ref. to FU(TURBO)-53, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 2) Open the fuel filler flap lid and remove fuel filler cap.
- 3) Disconnect the ground cable from battery.

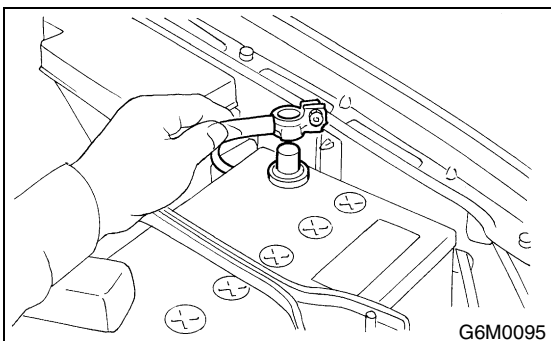


- 4) Remove the intake manifold. <Ref. to FU(TURBO)-15, REMOVAL, Intake Manifold.>
- 5) Disconnect the connector from tumble generator valve actuator RH.
- 6) Remove the tumble generator valve RH.



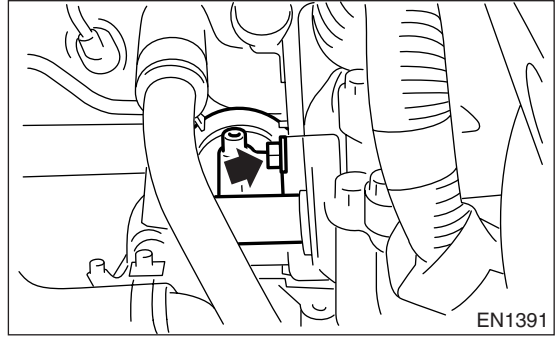
2. LH SIDE

- 1) Disconnect the ground cable from battery.



- 2) Disconnect the connector from tumble generator valve LH.

- 3) Remove the tumble generator valve actuator LH.



B: INSTALLATION

1. RH SIDE

Install in the reverse order of removal.

2. LH SIDE

Install in the reverse order of removal.

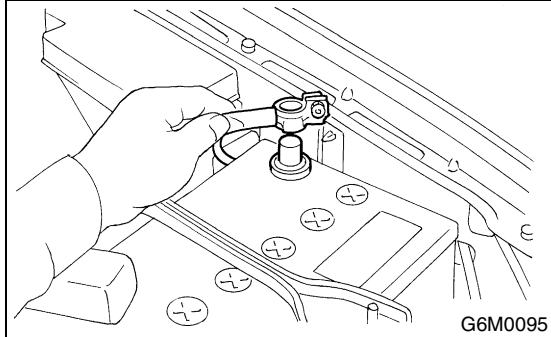
WASTEGATE CONTROL SOLENOID VALVE

FUEL INJECTION (FUEL SYSTEMS)

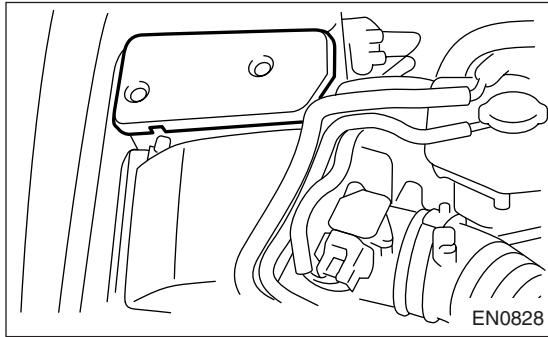
15. Wastegate Control Solenoid Valve

A: REMOVAL

1) Disconnect the ground cable from battery.

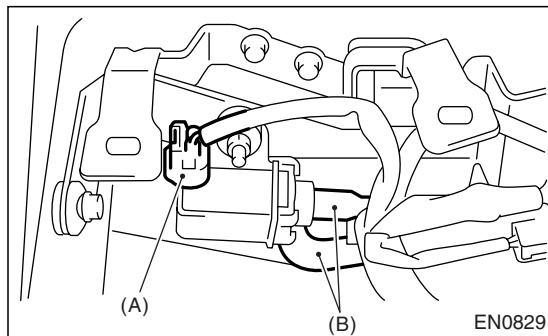


2) Remove the solenoid valve cover.

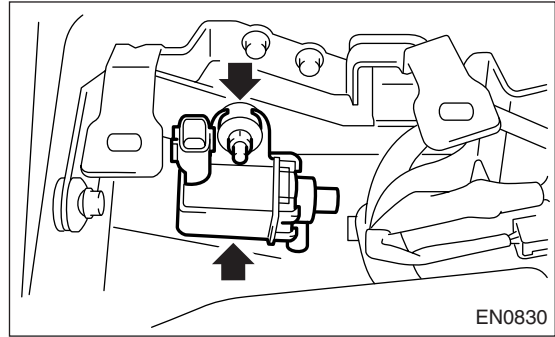


3) Disconnect the connector (A) from wastegate control solenoid valve.

4) Disconnect the pressure hoses (B) from wastegate control solenoid valve.



5) Remove the wastegate control solenoid valve from bracket.

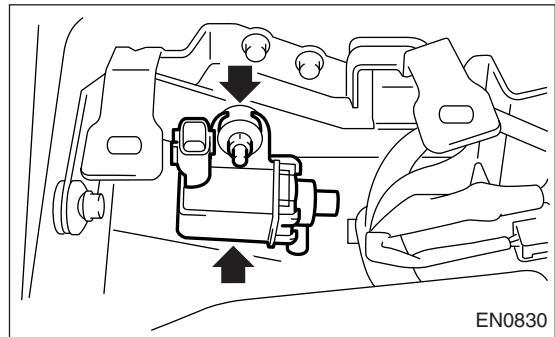


B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

6.4 N·m (0.65 kgf·m, 4.7 ft·lb)



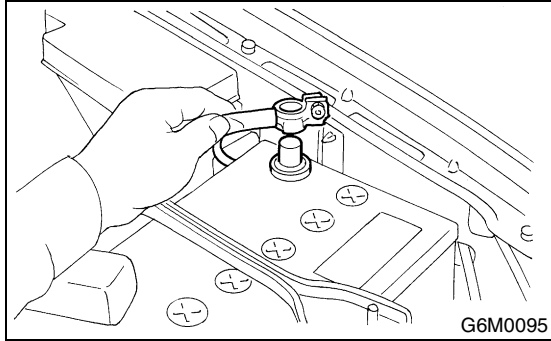
FRONT OXYGEN (A/F) SENSOR

FUEL INJECTION (FUEL SYSTEMS)

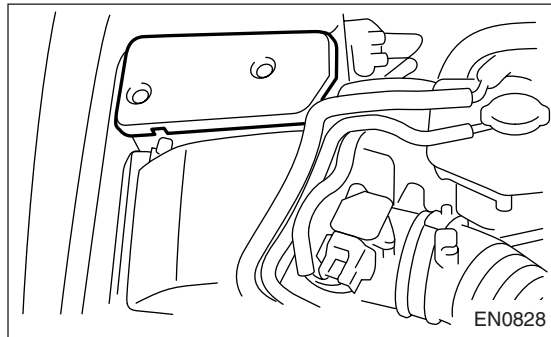
16. Front Oxygen (A/F) Sensor

A: REMOVAL

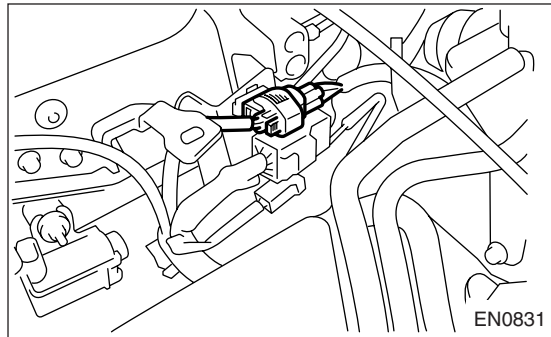
1) Disconnect the ground cable from battery.



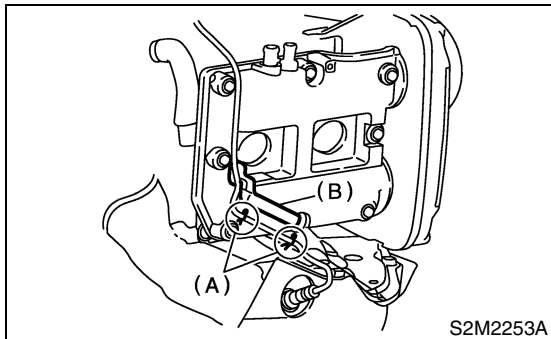
2) Remove the solenoid valve cover.



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



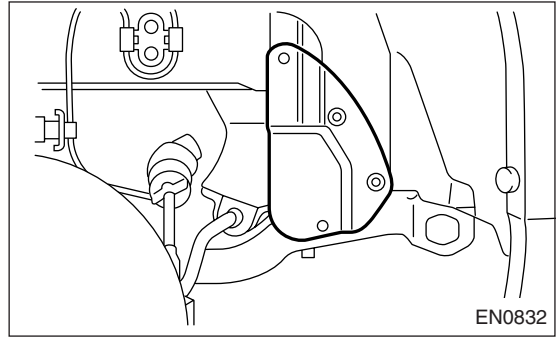
4) Disconnect the engine harness fixed by clip (A) from the bracket (B).



5) Remove the front right side wheel.

6) Lift-up the vehicle.

7) Remove the service hole cover.



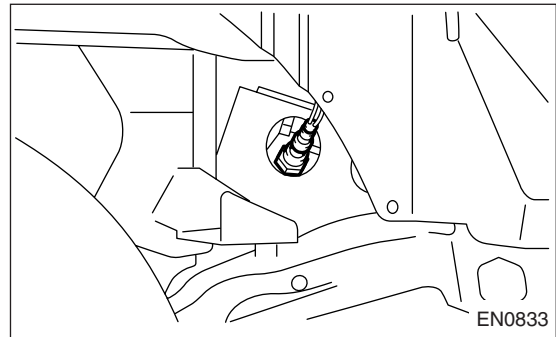
8) Apply SUBARU CRC or its equivalent to the threaded portion of front oxygen (A/F) sensor, and leave it for 1 minute or more.

SUBARU CRC (Part No. 004301003)

9) Remove the front oxygen (A/F) sensor.

CAUTION:

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



FRONT OXYGEN (A/F) SENSOR

FUEL INJECTION (FUEL SYSTEMS)

B: INSTALLATION

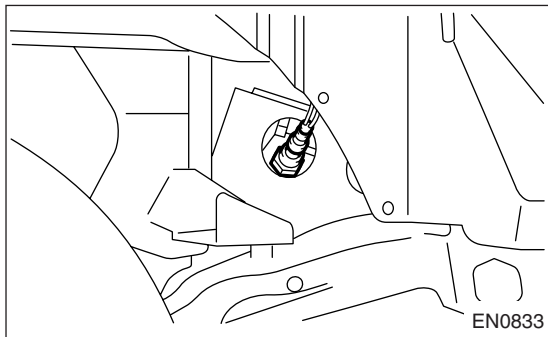
1) Before installing the front oxygen (A/F) sensor, apply anti-seize compound only to the threaded portion of front oxygen (A/F) sensor to make the next removal easier.

Anti-seize compound:
SS-30 by JET LUBE

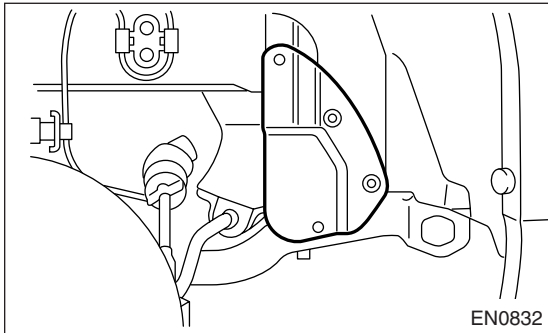
CAUTION:
Never apply anti-seize compound to the protector of front oxygen (A/F) sensor.

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

Tightening torque:
21 N·m (2.1 kgf-m, 15.2 ft-lb)



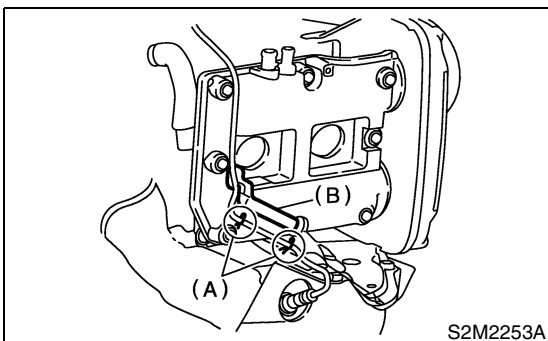
3) Install the service hole cover.



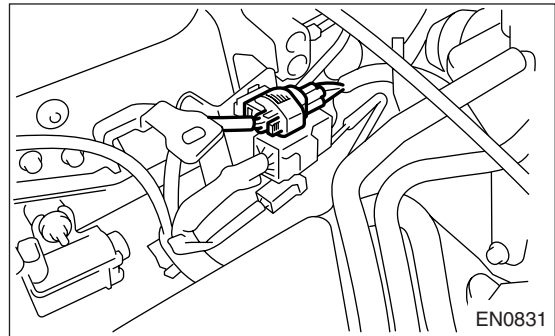
4) Lower the vehicle.

5) Install the front right side wheel.

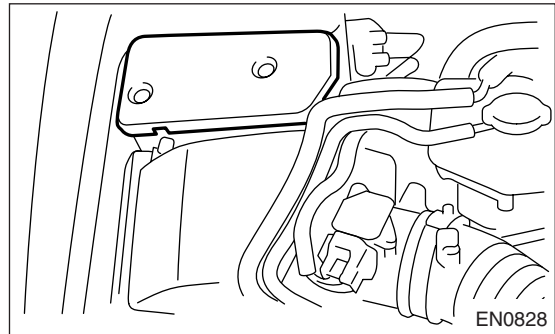
6) Connect the engine harness with clip (A) to the bracket (B).



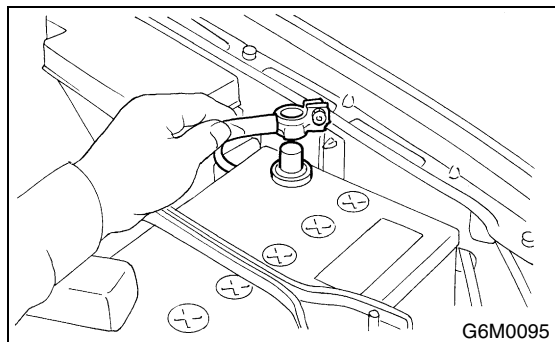
7) Connect the connector of front oxygen (A/F) sensor.



8) Install the solenoid valve cover.



9) Connect the battery ground cable to battery.



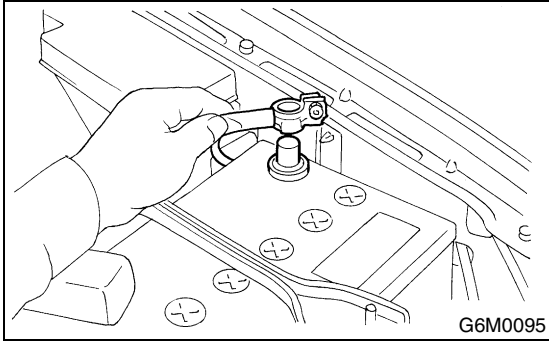
REAR OXYGEN SENSOR

FUEL INJECTION (FUEL SYSTEMS)

17.Rear Oxygen Sensor

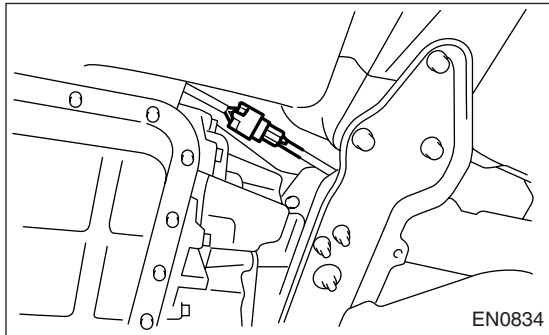
A: REMOVAL

1) Disconnect the ground cable from battery.

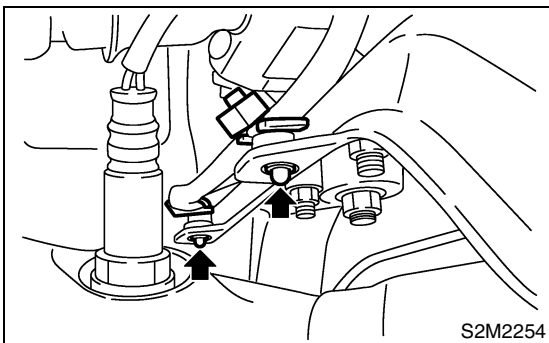


2) Lift-up the vehicle.

3) Disconnect the connector from rear oxygen sensor.



4) Remove the clip by pulling out from the upper side of crossmember.



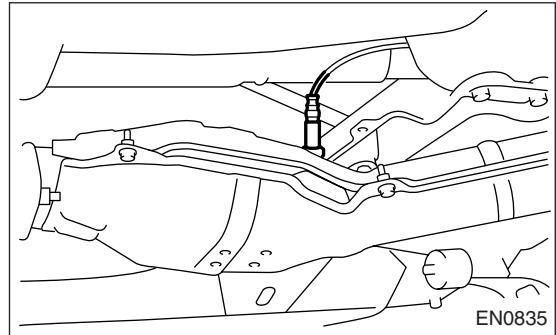
5) Apply SUBARU CRC or its equivalent to the threaded portion of rear oxygen sensor, and leave it for 1 minute or more.

SUBARU CRC (Part No. 004301003)

6) Remove the rear oxygen sensor.

CAUTION:

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



B: INSTALLATION

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

CAUTION:

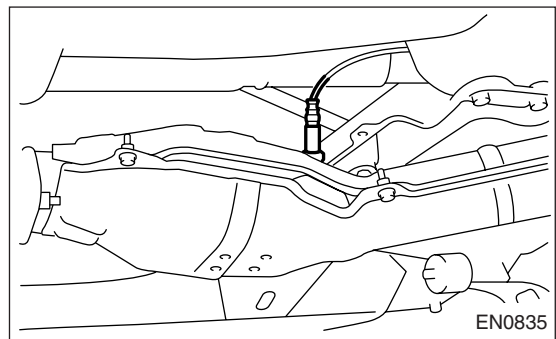
Never apply anti-seize compound to the protector of rear oxygen sensor.

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

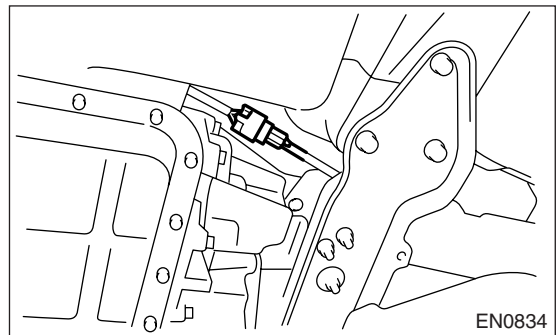
2) Install the rear oxygen sensor.

Tightening torque:

21 N·m (2.1 kgf-m, 15.2 ft-lb)



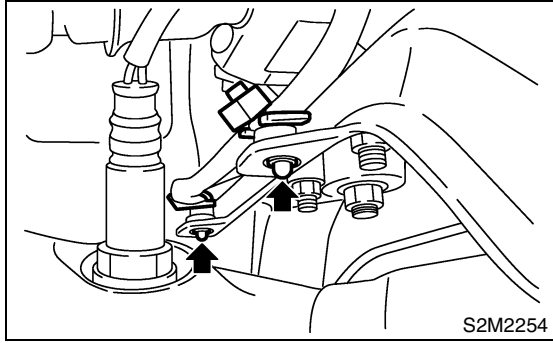
3) Connect the connector to rear oxygen sensor.



REAR OXYGEN SENSOR

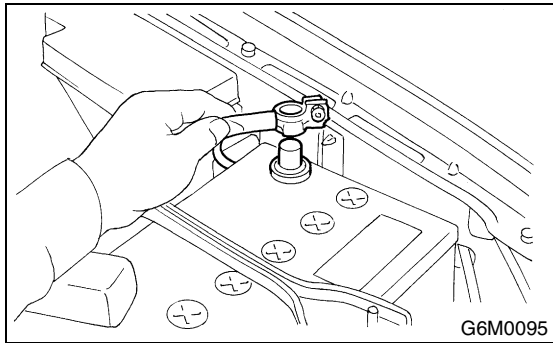
FUEL INJECTION (FUEL SYSTEMS)

4) Connect the clip to crossmember.



5) Lower the vehicle.

6) Connect the battery ground cable to battery.



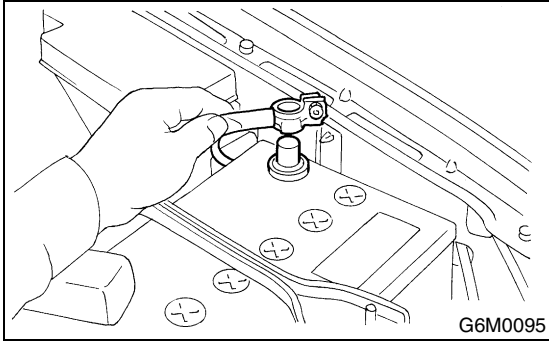
EXHAUST TEMPERATURE SENSOR

FUEL INJECTION (FUEL SYSTEMS)

18. Exhaust Temperature Sensor

A: REMOVAL

1) Disconnect the ground cable from battery.



2) Remove the joint pipe. <Ref. to EX(TURBO)-12, REMOVAL, Joint Pipe.>

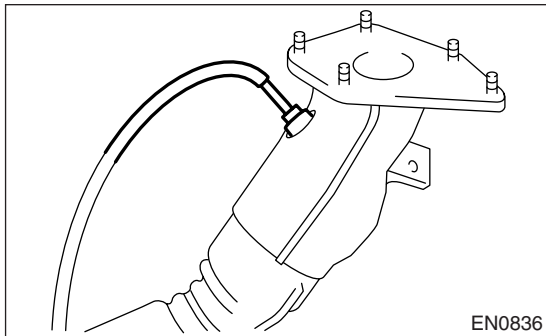
3) Apply SUBARU CRC or its equivalent to the threaded portion of exhaust temperature sensor, and leave it for 1 minute or more.

SUBARU CRC (Part No. 004301003)

4) Remove the exhaust temperature sensor.

CAUTION:

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



B: INSTALLATION

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

CAUTION:

Never apply anti-seize compound to the protector of exhaust temperature sensor.

Anti-seize compound:

SS-30 by JET LUBE

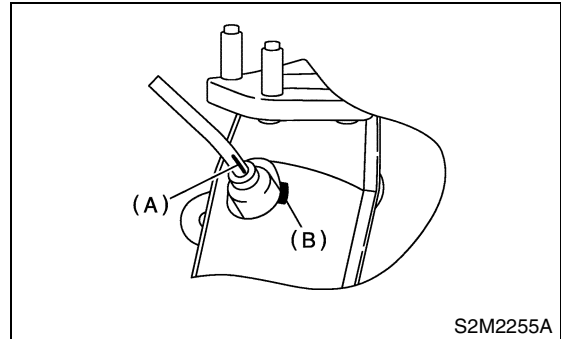
2) Install the exhaust temperature sensor.

NOTE:

Align the marking (A) of exhaust temperature sensor to the marking (B) of joint pipe, and tighten the screws.

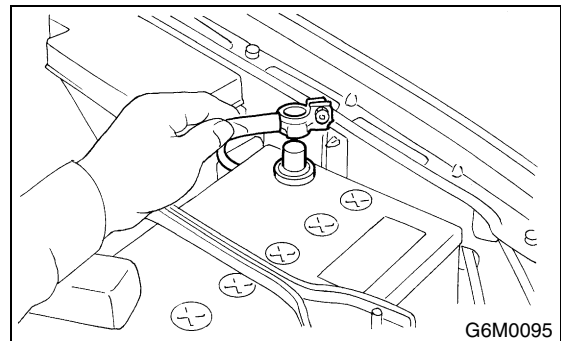
Tightening torque:

21 N·m (2.1 kgf-m, 15.2 ft-lb)



3) Install the joint pipe <Ref. to EX(TURBO)-12, INSTALLATION, Joint Pipe.>

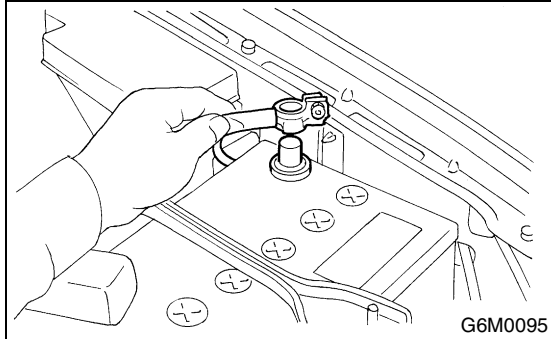
4) Connect the battery ground cable to battery.



19.Engine Control Module

A: REMOVAL

1) Disconnect the ground cable from battery.

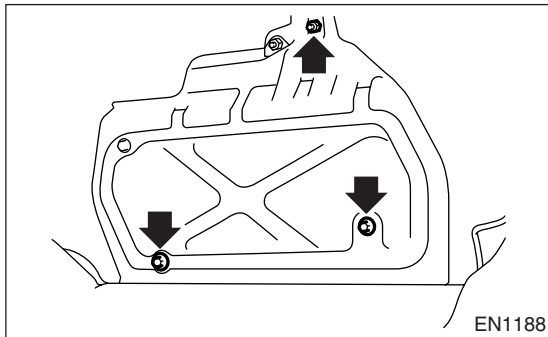


2) Remove the lower inner trim of passenger side.

<Ref. to EI-45, REMOVAL, Lower Inner Trim.>

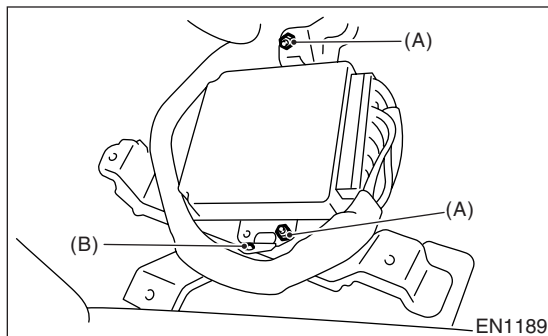
3) Detach the floor mat of front passenger seat.

4) Remove the protect cover.



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

6) Remove the clip (B) from bracket.



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

B: INSTALLATION

Install in the reverse order of removal.

CAUTION:

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

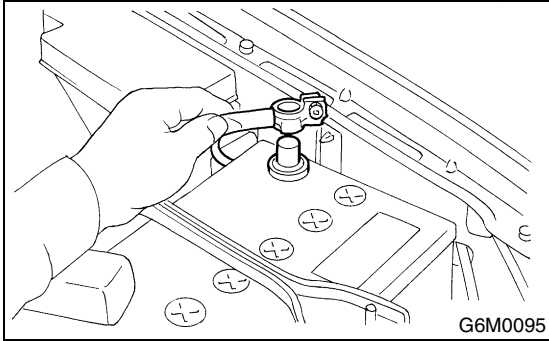
MAIN RELAY

FUEL INJECTION (FUEL SYSTEMS)

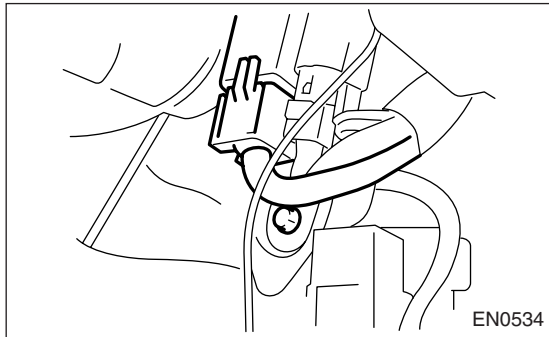
20.Main Relay

A: REMOVAL

- 1) Disconnect the ground cable from battery.



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



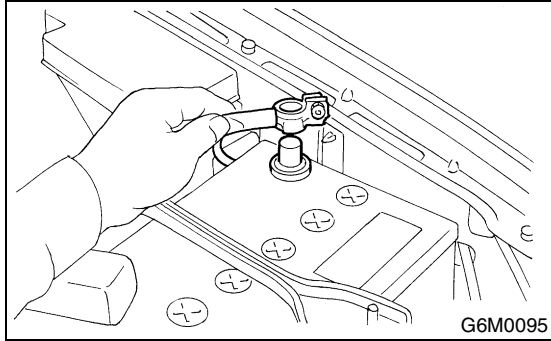
B: INSTALLATION

Install in the reverse order of removal.

21. Fuel Pump Relay

A: REMOVAL

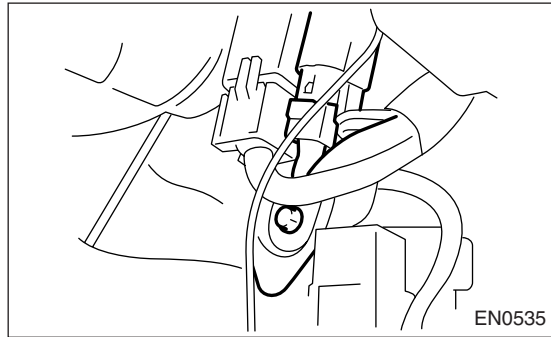
1) Disconnect the ground cable from battery.



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

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

4) Disconnect the connector from fuel pump relay.



5) Remove the fuel pump relay from mounting bracket.

B: INSTALLATION

Install in the reverse order of removal.

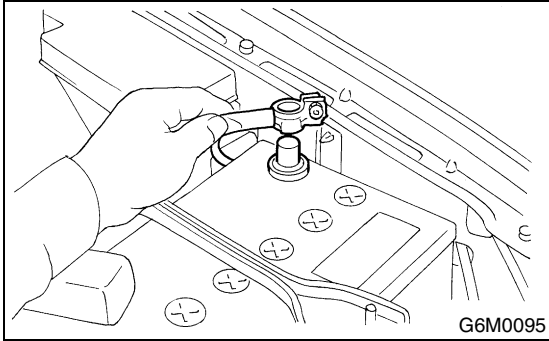
FUEL PUMP CONTROLLER

FUEL INJECTION (FUEL SYSTEMS)

22. Fuel Pump Controller

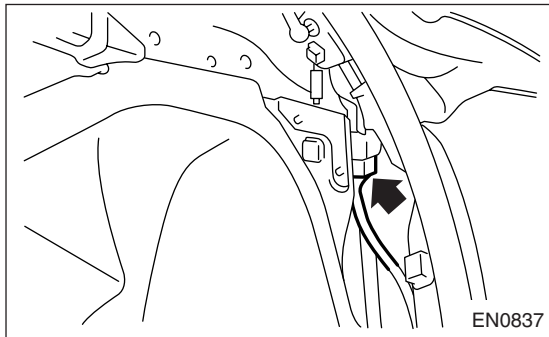
A: REMOVAL

1) Disconnect the ground cable from battery.

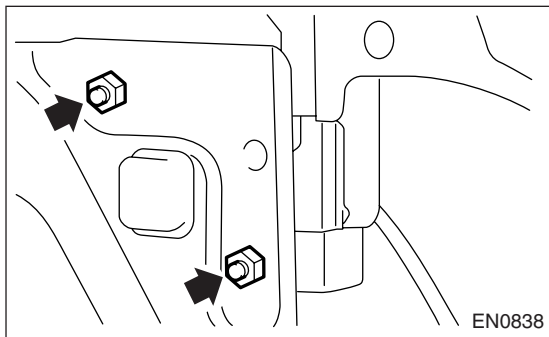


2) Remove the rear quarter trim. <Ref. to EI-46, REMOVAL, Rear Quarter Trim.>

3) Disconnect the connector from fuel pump control unit.



4) Remove the fuel pump control unit.



B: INSTALLATION

Install in the reverse order of removal.

23.Fuel

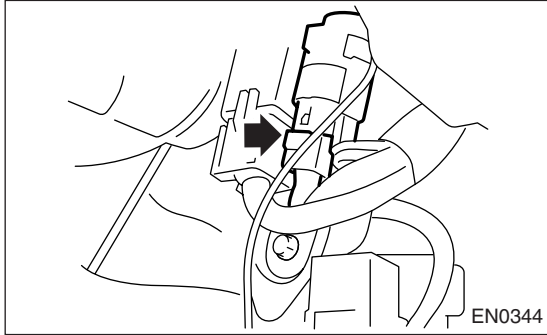
A: OPERATION

1. RELEASING OF FUEL PRESSURE

WARNING:

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

1) Disconnect the connector from fuel pump relay.



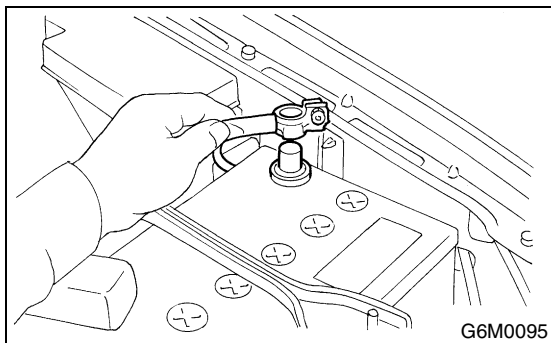
- 2) Start the engine and run it until it stalls.
- 3) After the engine stalls, crank it for 5 more seconds.
- 4) Turn the ignition switch to OFF.

2. DRAINING FUEL

WARNING:

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

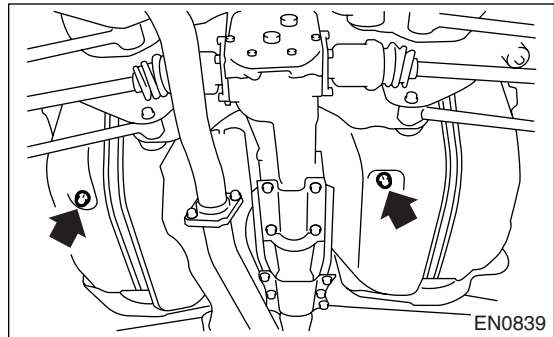
- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from battery.



- 3) Open the fuel filler flap lid and remove fuel filler cap.
- 4) Lift-up the vehicle.

5) Drain fuel from the fuel tank.

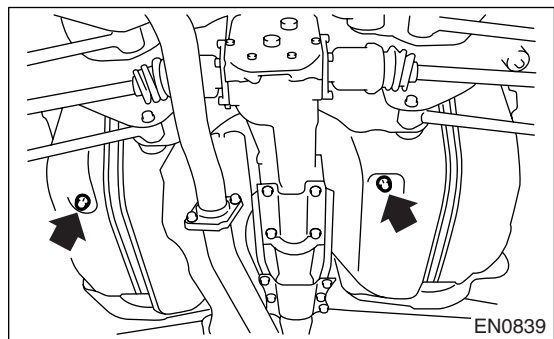
Set a container under the vehicle and remove the drain plug from fuel tank.



6) Tighten the fuel drain plug.

Tightening torque:

26 N·m (2.7 kgf-m, 19.2 ft-lb)



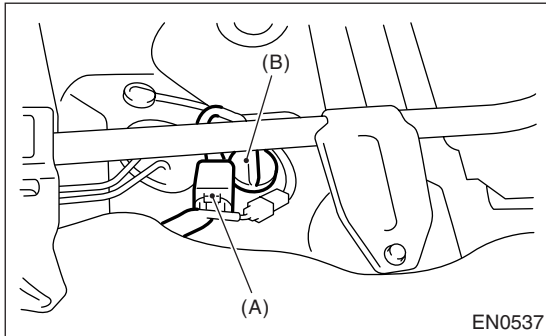
24. Fuel Tank

A: REMOVAL

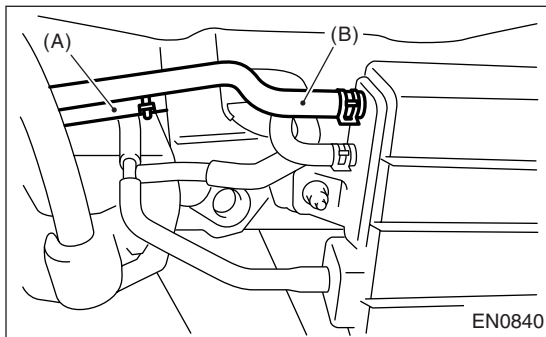
WARNING:

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

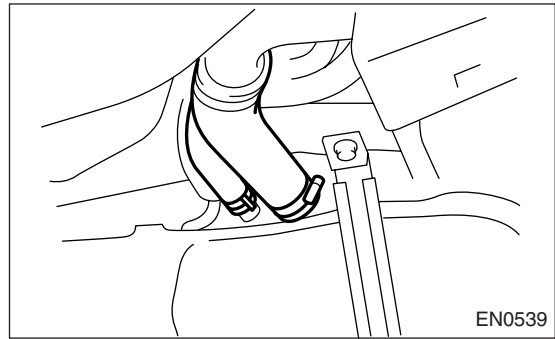
- 1) Set the vehicle on a lift.
- 2) Release the fuel pressure. <Ref. to FU(TURBO)-53, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 3) Drain fuel from the fuel tank. <Ref. to FU(TURBO)-53, DRAINING FUEL, OPERATION, Fuel.>
- 4) Remove the rear seat.
- 5) Disconnect the connector (A) of fuel tank cord to rear harness.
- 6) Push the grommet (B) which holds fuel tank cord on floor panel into under the body.



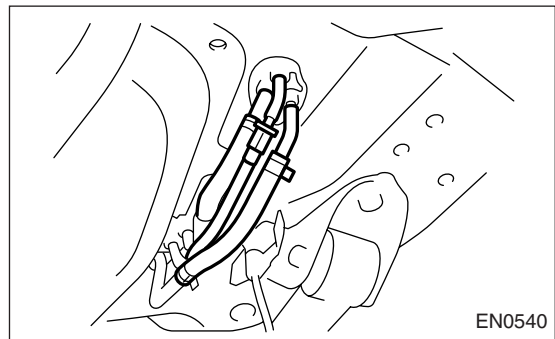
- 7) Remove the rear crossmember. <Ref. to RS-21, REMOVAL, Rear Crossmember.>
- 8) Disconnect the two-way valve hose (A) from two-way valve and disconnect the canister hose (B) from canister.



- 9) Loosen the clamp and disconnect the fuel filler hose and air vent hose from fuel filler pipe.



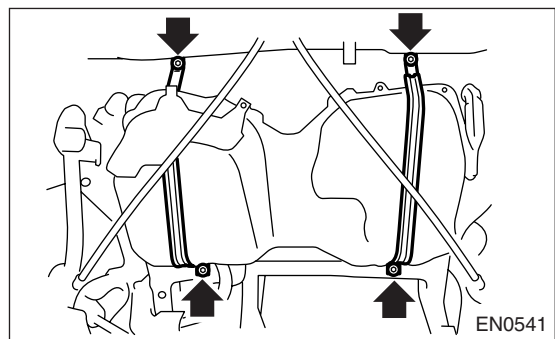
- 10) Move the clips, and disconnect quick connector. <Ref. to FU(TURBO)-68, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>
- 11) Disconnect the fuel hoses.



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

WARNING:

A helper is required to perform this work.



B: INSTALLATION

- 1) Support the fuel tank with transmission jack and push the fuel tank harness into access hole with grommet.

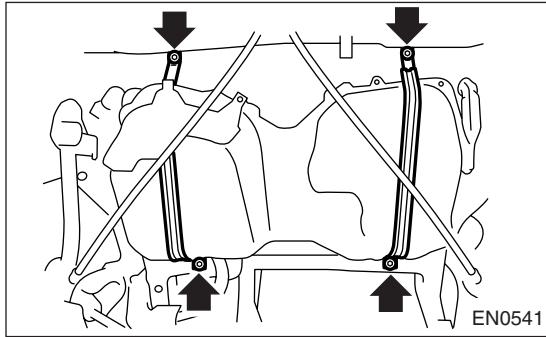
FUEL TANK

FUEL INJECTION (FUEL SYSTEMS)

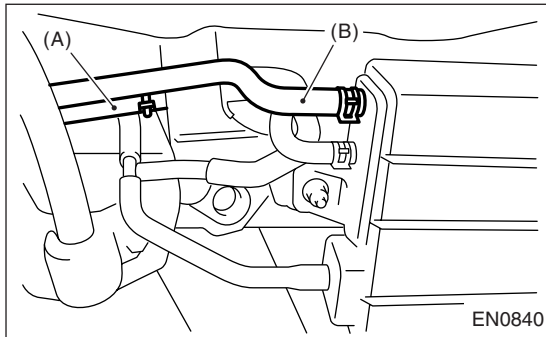
2) Set the fuel tank and temporarily tighten the bolts of fuel tank bands.

WARNING:

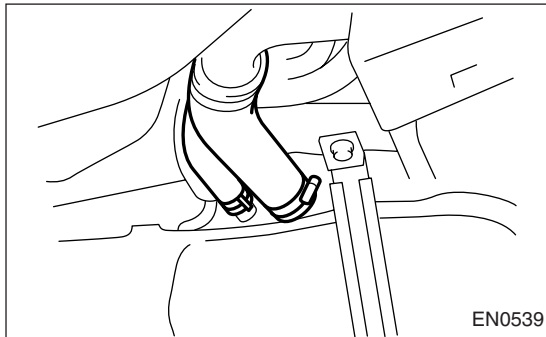
A helper is required to perform this work.



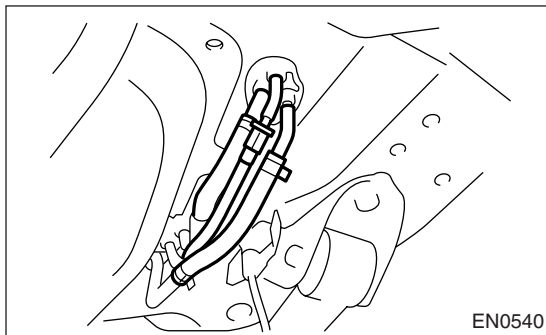
3) Connect the two-way valve hose (A) to two-way valve and connect the canister hose (B) to canister.



4) Connect the fuel filler hose and air vent hose.



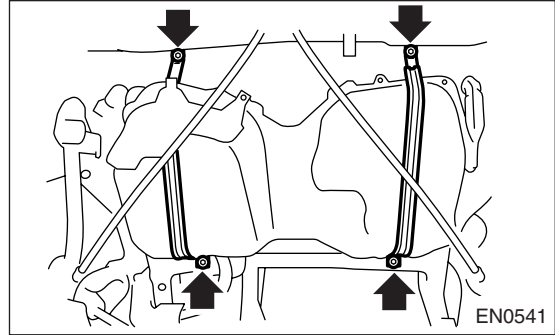
5) Connect the fuel hoses, and secure them with clips and quick connector. <Ref. to FU(TURBO)-69, INSTALLATION, Fuel Delivery, Return and Evaporation Lines.>



6) Tighten the band mounting bolts.

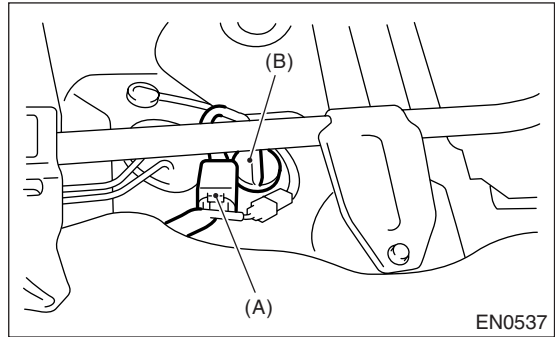
Tightening torque:

33 N·m (3.4 kgf·m, 24.3 ft·lb)



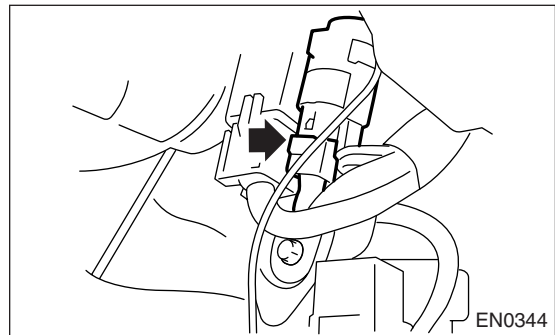
7) Install the rear crossmember. <Ref. to RS-21, INSTALLATION, Rear Crossmember.>

8) Connect the connector (A) to fuel tank cord and plug the service hole with grommet (B).



9) Set the rear seat and floor mat.

10) Connect the 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.

FUEL FILLER PIPE

FUEL INJECTION (FUEL SYSTEMS)

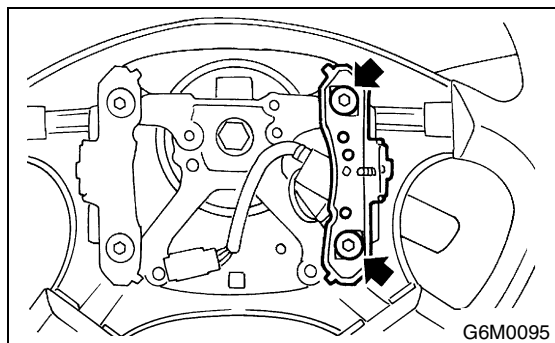
25. Fuel Filler Pipe

A: REMOVAL

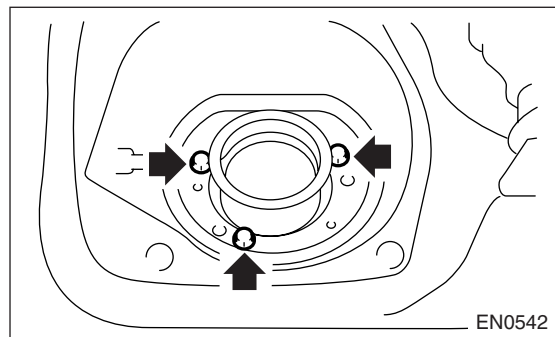
WARNING:

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

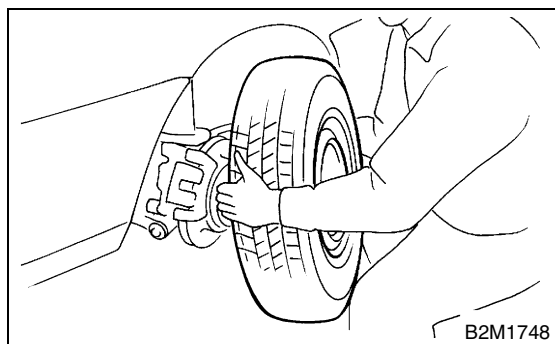
- 1) Set the vehicle on a lift.
- 2) Release the fuel pressure. <Ref. to FU(TURBO)-53, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 3) Open the fuel filler flap lid and remove fuel filler cap.
- 4) Disconnect the ground cable from battery.



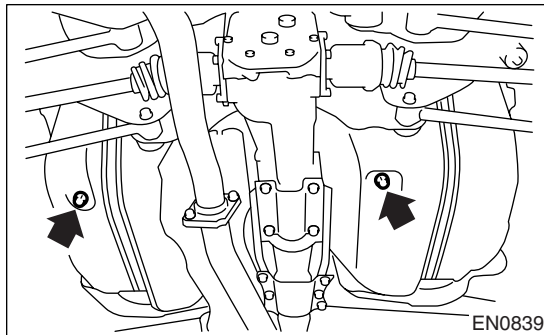
- 5) Remove the screws holding packing in place.



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



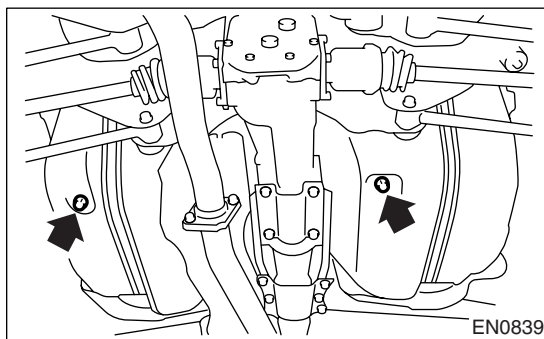
- 9) Drain fuel from the fuel tank. Set a container under the vehicle and remove the drain plug from fuel tank.



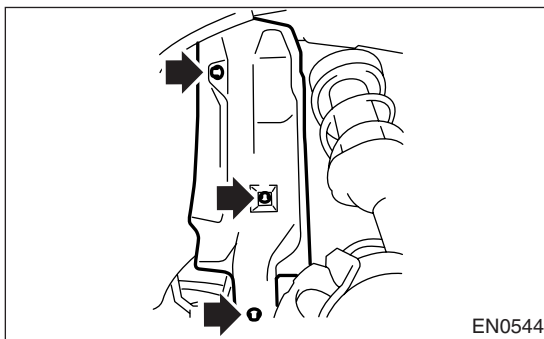
- 10) Tighten the fuel drain plug and then install the front right side tank cover.

Tightening torque:

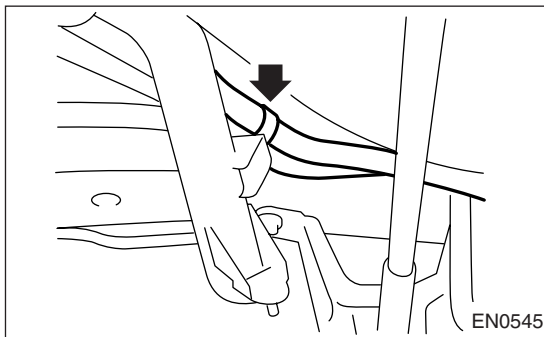
26 N·m (2.7 kgf·m, 19.2 ft·lb)



- 11) Remove the fuel filler pipe protector.



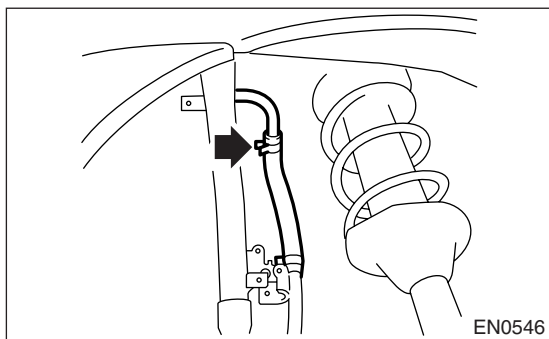
- 12) Separate the evaporation hoses from clip of fuel filler pipe.



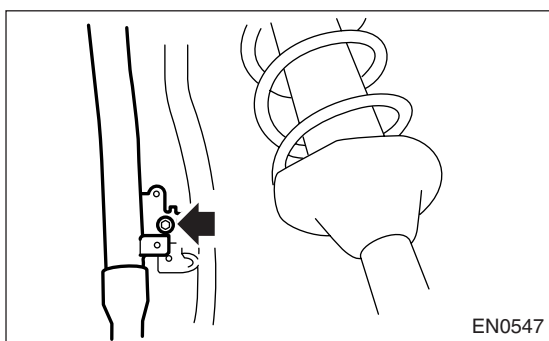
FUEL FILLER PIPE

FUEL INJECTION (FUEL SYSTEMS)

- 13) Disconnect the air vent hose from fuel filler pipe.

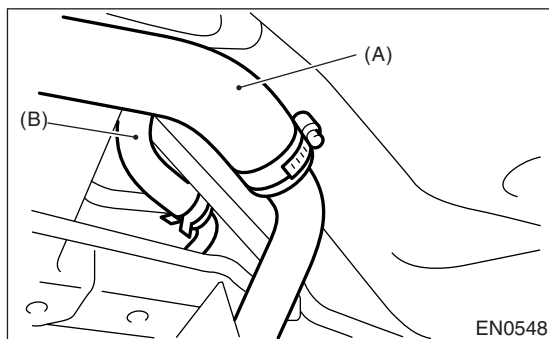


- 14) Remove the bolts which hold fuel filler pipe bracket on body.



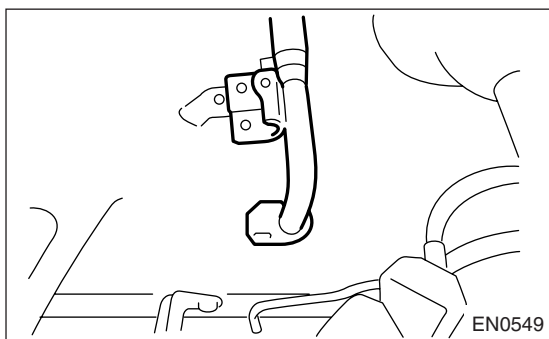
- 15) Loosen the clamp and separate fuel filler hose (A) from fuel filler pipe.

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



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

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

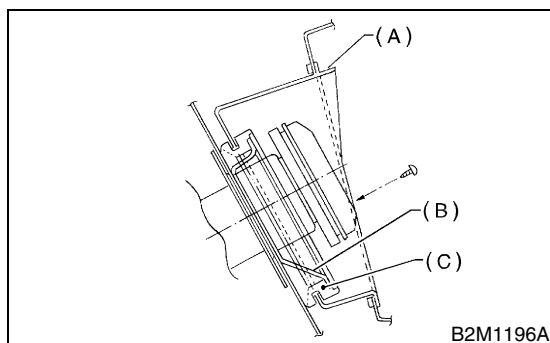


B: INSTALLATION

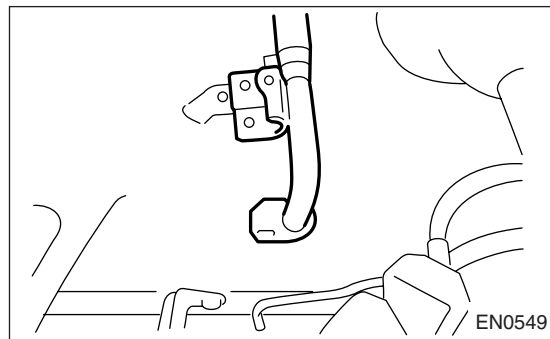
- 1) Hold the fuel filler flap open.
- 2) Set the fuel saucer (A) with rubber packing (C) and insert the fuel filler pipe into hole from the inner side of apron.
- 3) Align the holes in fuel filler pipe neck and set cup (B), and tighten the screws.

NOTE:

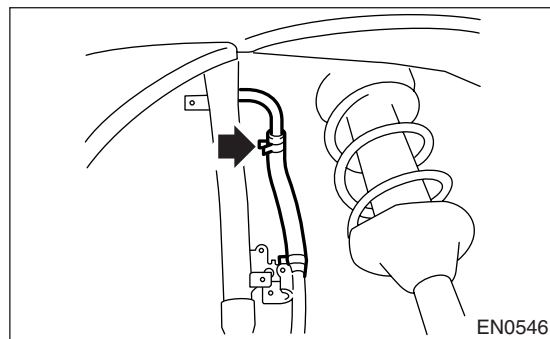
If the edges of rubber packing are folded toward inside, straighten it with a screwdriver.



- 4) Install the air vent pipe.



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



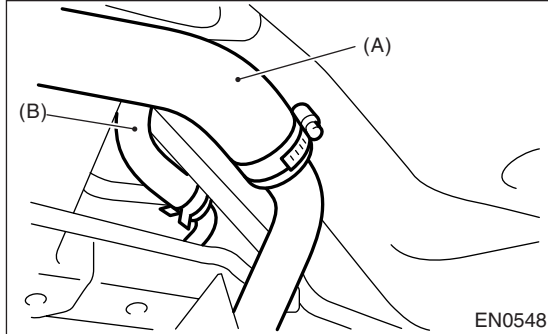
FUEL FILLER PIPE

FUEL INJECTION (FUEL SYSTEMS)

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

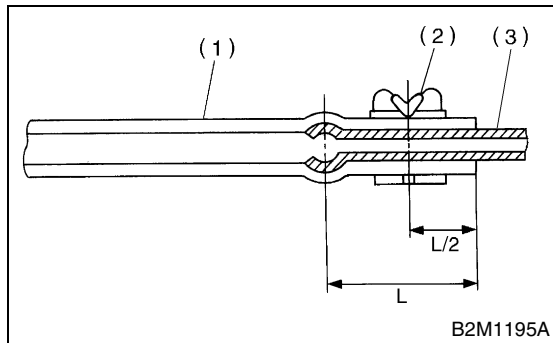
CAUTION:

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



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

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

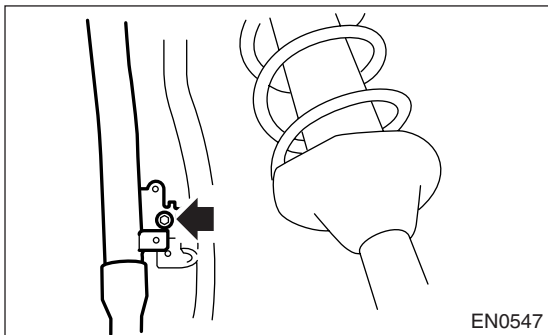


- (1) Hose
- (2) Clip
- (3) Pipe

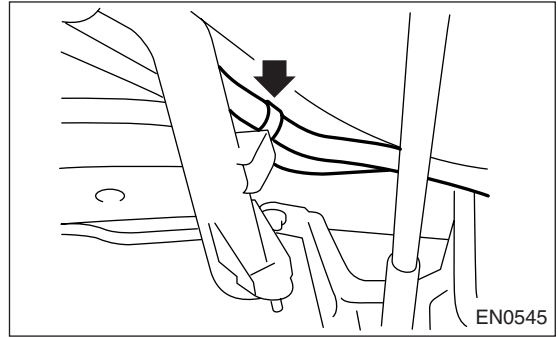
8) Tighten the bolt which holds fuel filler pipe bracket on body.

Tightening torque:

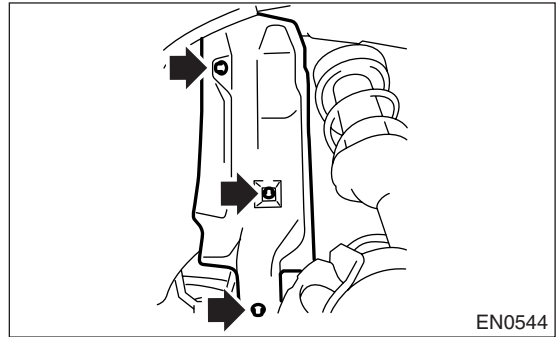
$7.4 \text{ N}\cdot\text{m (0.75 kgf}\cdot\text{m, 5.4 ft}\cdot\text{lb)}$



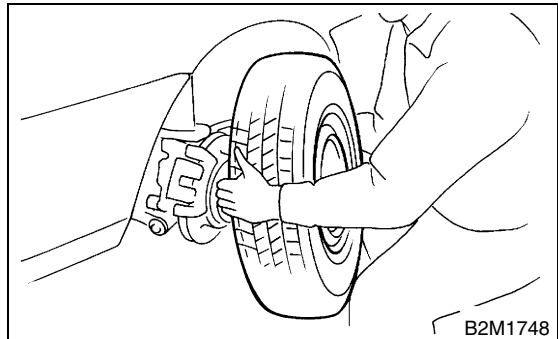
9) Tighten the bolts which hold evaporation hoses onto clip of fuel filler pipe.



10) Install the fuel filler pipe protector.



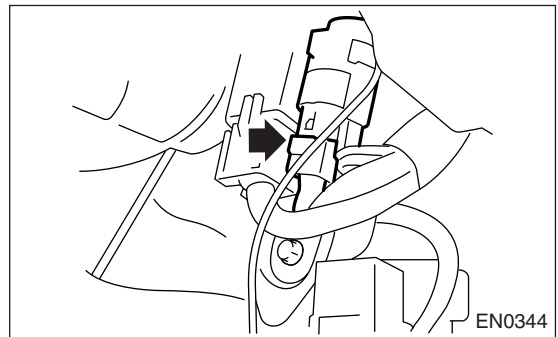
11) Install the rear right wheel.



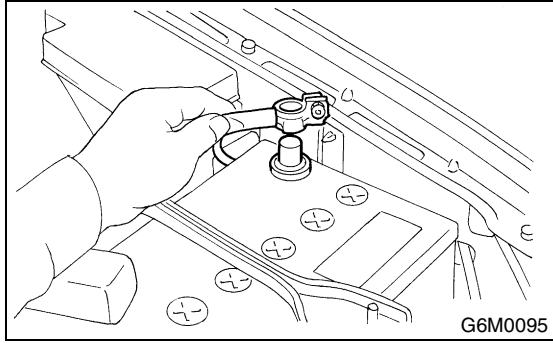
12) Lower the vehicle.

13) Tighten the wheel nuts.

14) Connect the connector to fuel pump relay.



15) Connect the battery ground cable to battery.



FUEL PUMP

FUEL INJECTION (FUEL SYSTEMS)

26. Fuel Pump

A: REMOVAL

WARNING:

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

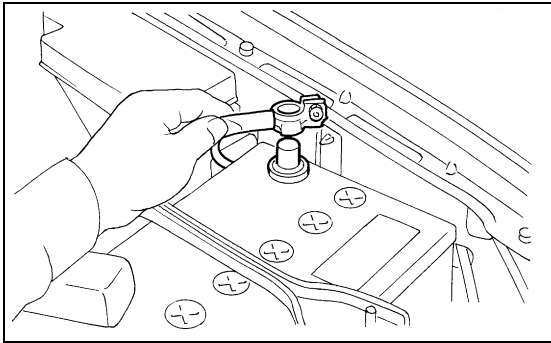
NOTE:

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

1) Release the fuel pressure. <Ref. to FU(TURBO)-53, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>

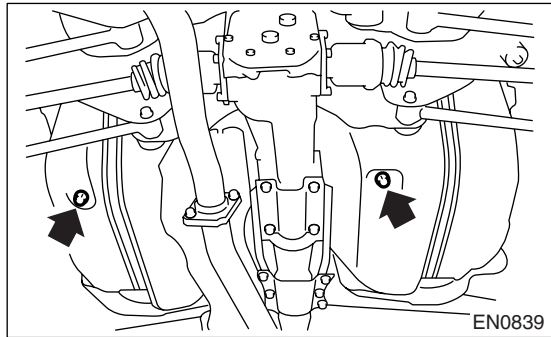
2) Open the fuel filler flap lid and remove fuel filler cap.

3) Disconnect the ground cable from battery.



4) Lift-up the vehicle.

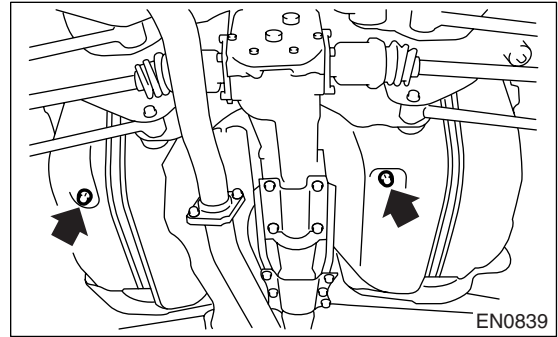
5) Drain fuel from the fuel tank. Set a container under the vehicle and remove the drain plug from fuel tank.



6) Tighten the fuel drain plug.

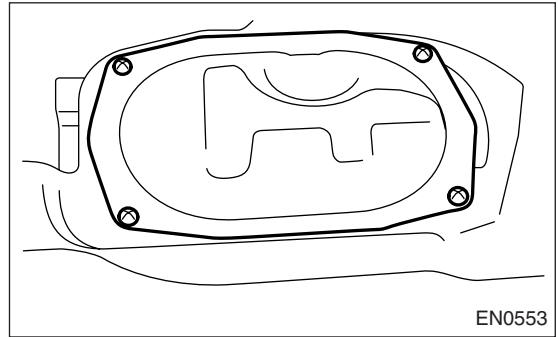
Tightening torque:

26 N·m (2.7 kgf·m, 19.2 ft·lb)

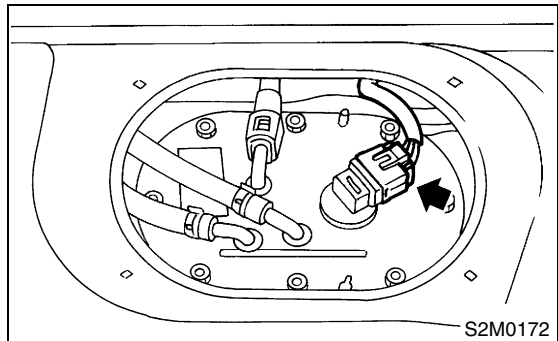


7) Raise the rear seat and turn floor mat up.

8) Remove the access hole lid.



9) Disconnect the connector from fuel pump.

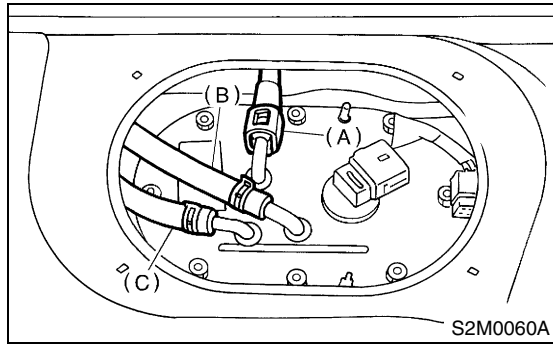


10) Disconnect the quick connector and then disconnect fuel delivery hose (A). <Ref. to FU(TURBO)-68, Fuel Delivery, Return and Evaporation Lines.>

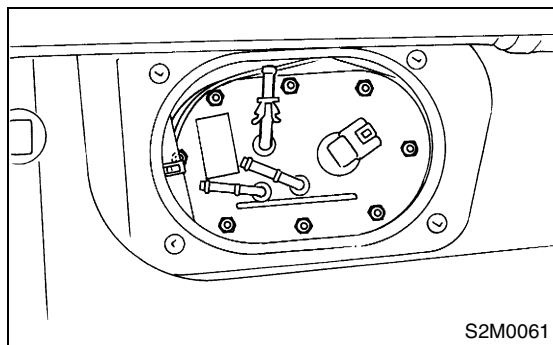
FUEL PUMP

FUEL INJECTION (FUEL SYSTEMS)

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



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



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

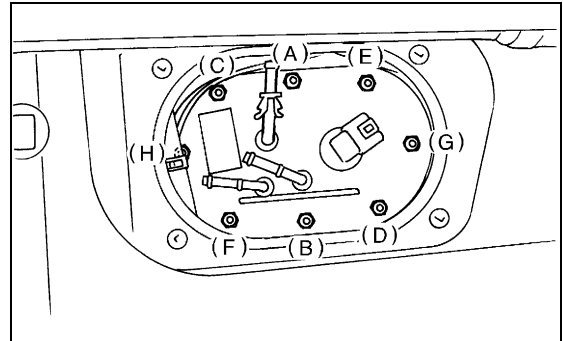
B: INSTALLATION

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

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

Tightening torque:

4.4 N·m (0.45 kgf·m, 3.3 ft·lb)

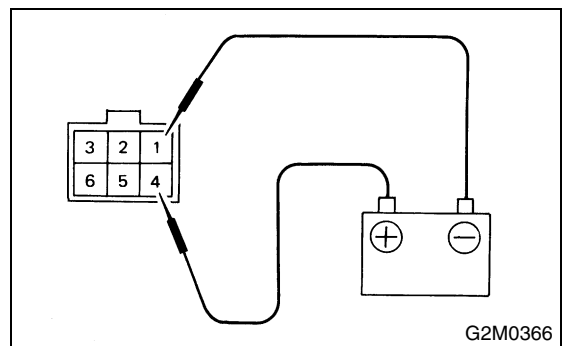


C: INSPECTION

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

WARNING:

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



FUEL LEVEL SENSOR

FUEL INJECTION (FUEL SYSTEMS)

27. Fuel Level Sensor

A: REMOVAL

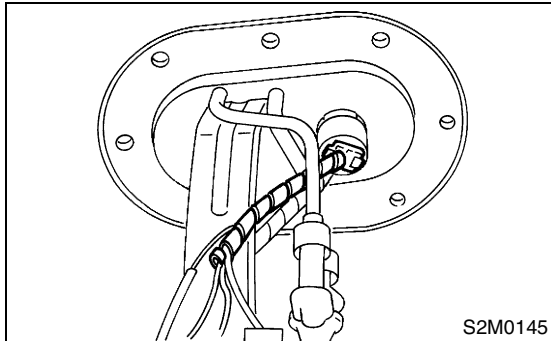
WARNING:

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

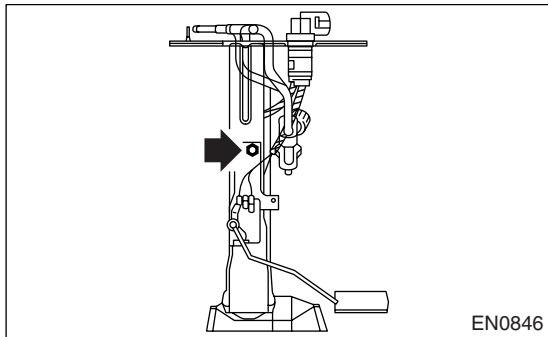
NOTE:

Fuel level sensor is built in fuel pump assembly.

- 1) Remove the fuel pump assembly. <Ref. to FU(TURBO)-60, REMOVAL, Fuel Pump.>
- 2) Disconnect the connector from fuel pump bracket.



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



B: INSTALLATION

Install in the reverse order of removal.

FUEL SUB LEVEL SENSOR

FUEL INJECTION (FUEL SYSTEMS)

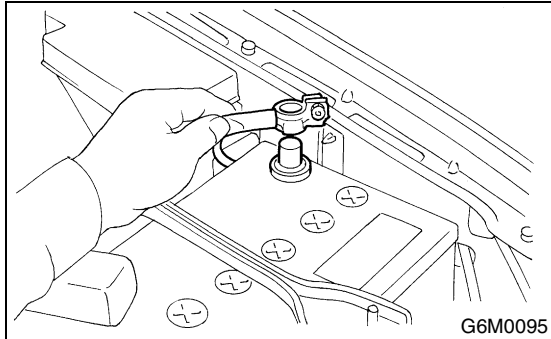
28. Fuel Sub Level Sensor

A: REMOVAL

WARNING:

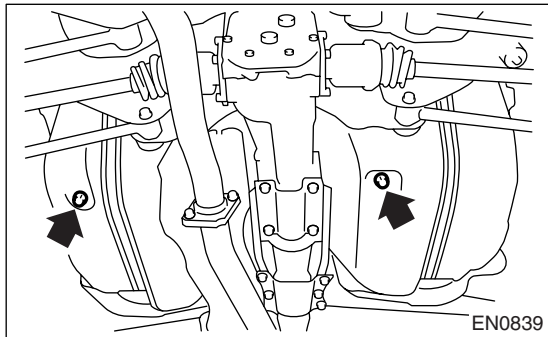
- Place "NO FIRE" signs near the working area.
- Be careful not to spill fuel on the floor.

1) Disconnect the ground cable from battery.



2) Lift-up the vehicle.

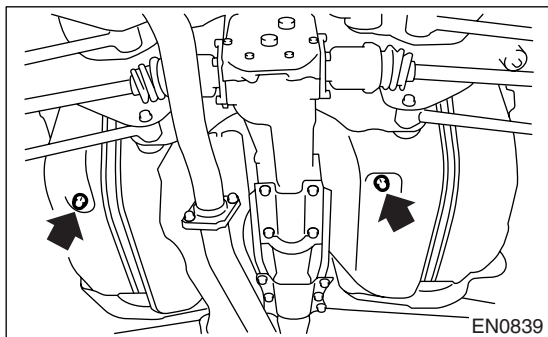
3) Drain fuel from the fuel tank. Set a container under the vehicle and remove the drain plug from fuel tank.



4) Tighten the fuel drain plug.

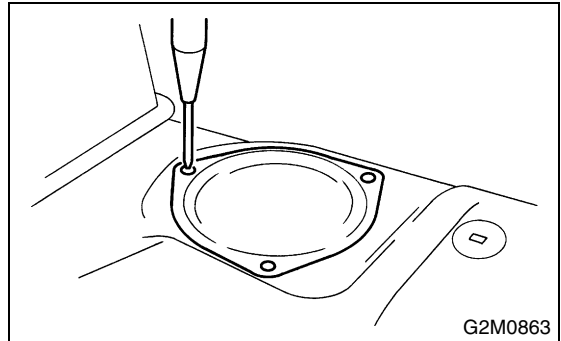
Tightening torque:

26 N·m (2.7 kgf-m, 19.2 ft-lb)



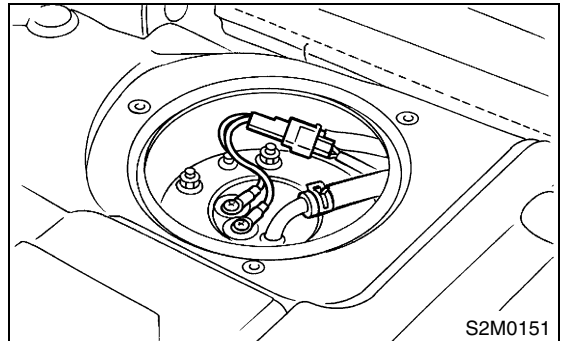
5) Remove the rear seat.

6) Remove the service hole cover.

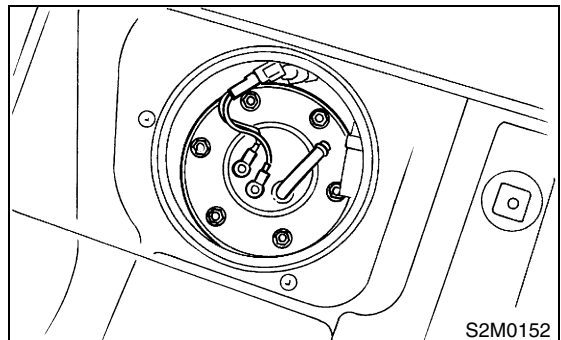


7) Disconnect the connector from fuel sub meter.

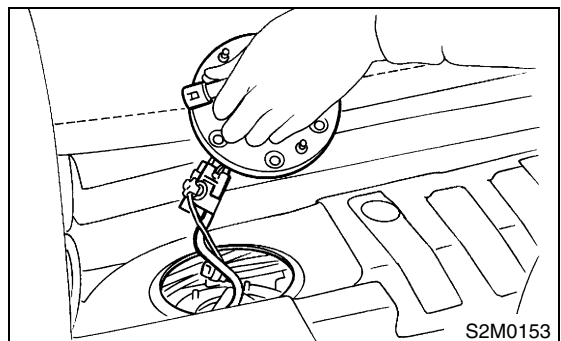
8) Disconnect the fuel jet pump hose.



9) Remove the bolts which install fuel sub meter unit on fuel tank.



10) Remove the fuel sub meter unit.



FUEL SUB LEVEL SENSOR

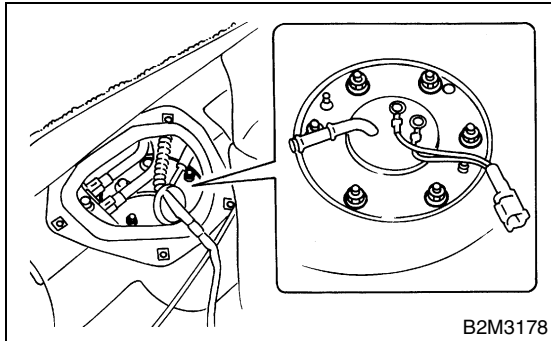
FUEL INJECTION (FUEL SYSTEMS)

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



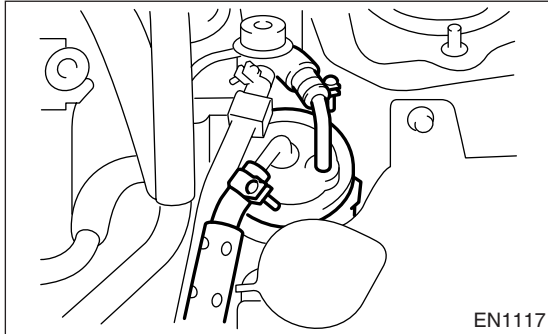
29. Fuel Filter

A: REMOVAL

WARNING:

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

- 1) Release the fuel pressure. <Ref. to FU(TURBO)-53, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 2) Disconnect the fuel delivery hoses from fuel filter.



- 3) Remove the filter from holder.

B: INSTALLATION

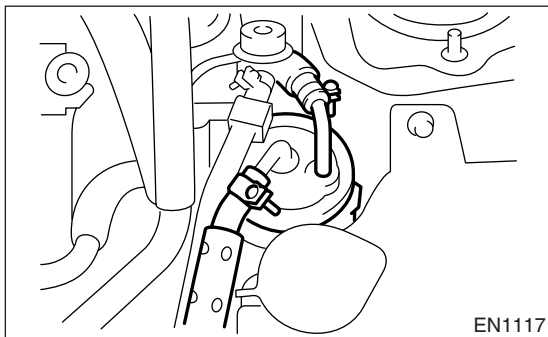
CAUTION:

- 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 the hose clamp screws.

Tightening torque:

1.25 N·m (0.13 kgf·m, 0.94 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)

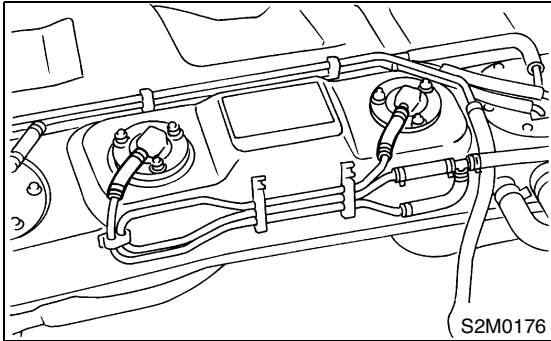
30. Fuel Cut Valve

A: REMOVAL

WARNING:

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

- 1) Remove the fuel tank. <Ref. to FU(TURBO)-54, REMOVAL, Fuel Tank.>
- 2) Move the clip and disconnect the evaporation hose from fuel cut valve.



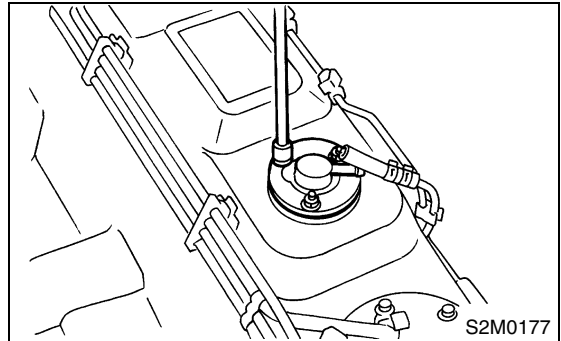
- 3) Remove the bolts which install fuel cut valve.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

4.4 N·m (0.45 kgf·m, 3.3 ft·lb)



31. Fuel Damper Valve

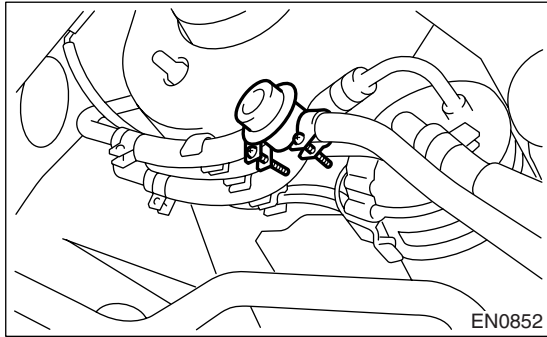
A: REMOVAL

1) Release the fuel pressure. <Ref. to FU(TURBO)-53, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>

2) Remove the 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)

32. Fuel Delivery, Return and Evaporation Lines

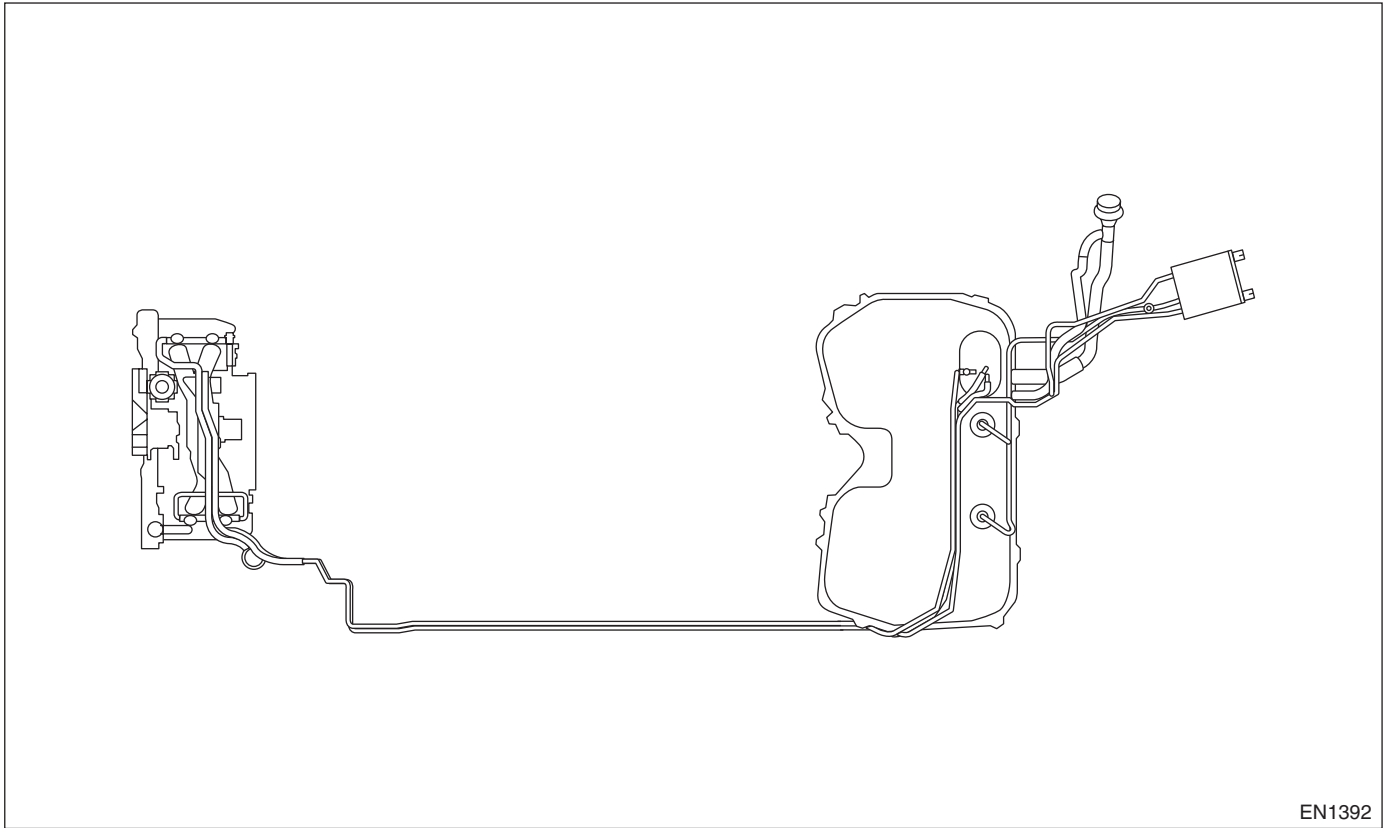
A: REMOVAL

- 1) Set the vehicle on a lift.
- 2) Release the fuel pressure. <Ref. to FU(TURBO)-53, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>

3) Open the fuel filler flap lid and remove fuel filler cap.

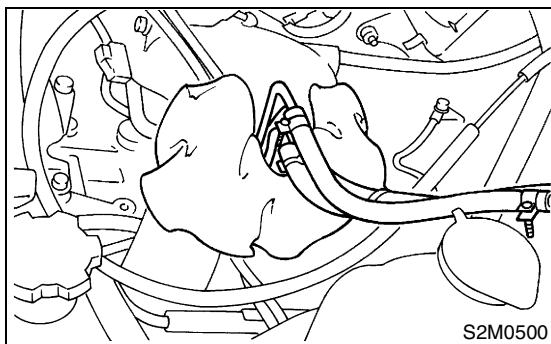
4) Remove the floor mat. <Ref. to EI-53, REMOVAL, Floor Mat.>

5) Remove the fuel delivery pipes and hoses, fuel return pipes and hoses, evaporation pipes and hoses.



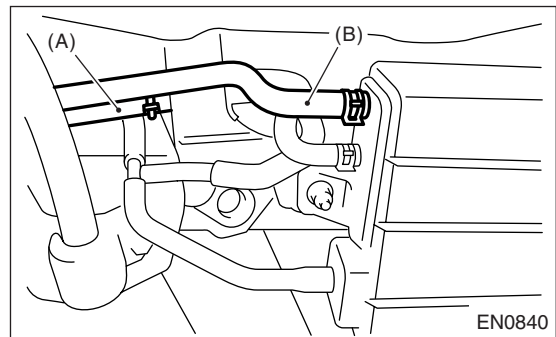
EN1392

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



7) Lift-up the vehicle.

8) Disconnect the two-way valve hose (A) from two-way valve and disconnect the canister hose (B) from canister.



FUEL DELIVERY, RETURN AND EVAPORATION LINES

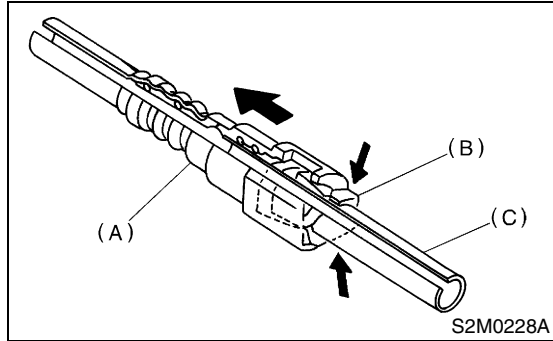
FUEL INJECTION (FUEL SYSTEMS)

9) Separate the quick connector on fuel delivery and return line.

- (1) Clean the pipe and connector, if they are covered with dust.
- (2) Hold the connector (A) and push retainer (B) down.
- (3) Pull out the connector (A) from retainer (B).

NOTE:

Replace the retainer with new ones.



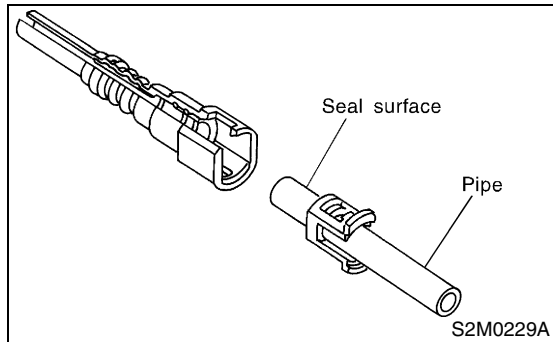
- (A) Connector
- (B) Retainer
- (C) Pipe

B: INSTALLATION

1) Connect the quick connector on fuel delivery and return line.

NOTE:

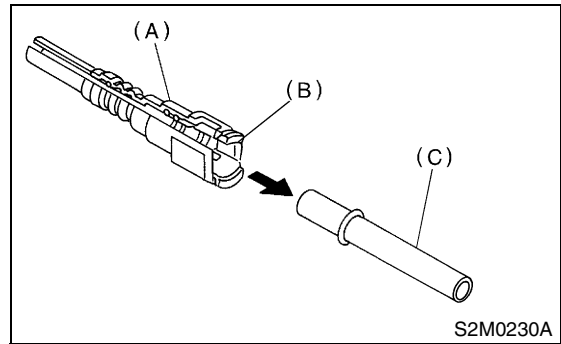
- Always use a new retainer.
- Make sure that the connected portion is not damaged or has dust. If necessary, clean the seal surface of pipe.



- (1) Set the new retainer (B) to connector (A).
- (2) Push the pipe into connector completely.

NOTE:

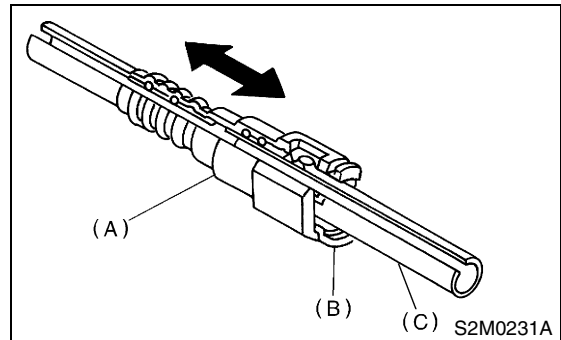
At this time, two clicking sounds are heard.



- (A) Connector
- (B) Retainer
- (C) Pipe

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 the hoses and their connections for any leakage of fuel.



- (A) Connector
- (B) Retainer
- (C) Pipe

FUEL DELIVERY, RETURN AND EVAPORATION LINES

FUEL INJECTION (FUEL SYSTEMS)

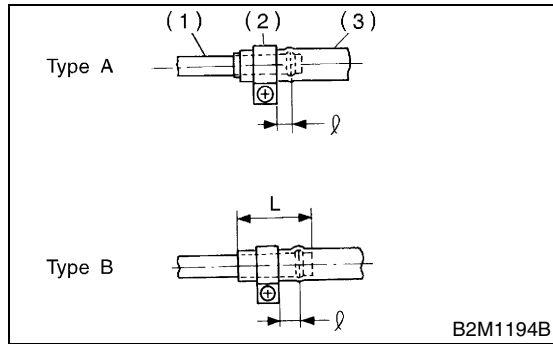
2) Connect the fuel delivery hose to pipe with an overlap of 20 to 25 mm (0.79 to 0.98 in).

Type A: When the fitting length is specified.

Type B: When the fitting length is not specified.

$\varnothing : 2.5 \pm 1.5 \text{ mm } (0.098 \pm 0.059 \text{ in})$

$L : 22.5 \pm 2.5 \text{ mm } (0.886 \pm 0.098 \text{ in})$



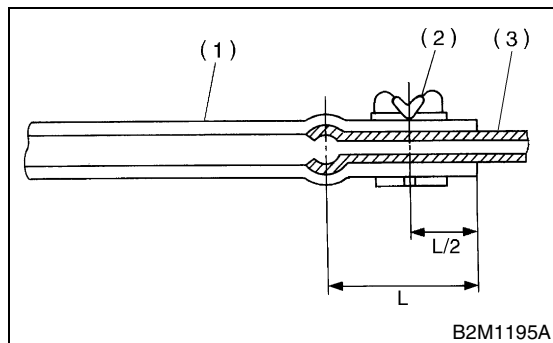
- (1) Fitting
- (2) Clamp
- (3) Hose

3) Connect the evaporation hose to pipe by approx. 15 mm (0.59 in) from the hose end.

$L = 17.5 \pm 2.5 \text{ mm } (0.689 \pm 0.098 \text{ in})$

CAUTION:

Be sure to inspect the hoses and their connections for any leakage of fuel.



- (1) Hose
- (2) Clip
- (3) Pipe

C: INSPECTION

1) Make sure that there are no cracks on the fuel pipes and fuel hoses.

2) Make sure that the fuel pipe and fuel hose connections are tight.

FUEL SYSTEM TROUBLE IN GENERAL

FUEL INJECTION (FUEL SYSTEMS)

33. Fuel System Trouble in General

A: INSPECTION

Trouble and possible cause		Corrective action
1. Insufficient fuel supply to the injector		
1)	Fuel pump will not operate.	
	○ Defective terminal contact.	Inspect connections, especially ground, and tighten securely.
	○ Trouble in electromagnetic or electronic circuit parts.	Replace the fuel pump.
2)	Lowering of fuel pump function.	Replace the fuel pump.
3)	Clogged dust or water in the fuel filter.	Replace the fuel filter, clean or replace fuel tank.
4)	Clogged or bent fuel pipe or hose.	Clean, correct or replace the fuel pipe or hose.
5)	Air is mixed in the fuel system.	Inspect or retighten each connection part.
6)	Clogged or bent breather tube or pipe.	Clean, correct or replace the air breather tube or pipe.
7)	Damaged diaphragm of pressure regulator.	Replace.
2. Leakage or blow out fuel		
1)	Loosened joints of the fuel pipe.	Retightening.
2)	Cracked fuel pipe, hose and fuel tank.	Replace.
3)	Defective welding part on the fuel tank.	Replace.
4)	Defective drain packing of the fuel tank.	Replace.
5)	Clogged or bent air breather tube or air vent tube.	Clean, correct or replace the air breather tube or air vent tube.
3. Gasoline smell inside of compartment		
1)	Loose joints at air breather tube, air vent tube and fuel filler pipe.	Retightening.
2)	Defective packing air tightness on the fuel saucer.	Correct or replace the packing.
3)	Cracked fuel separator.	Replace the separator.
4)	Inoperative fuel pump modulator or circuit.	Replace.
4. Defective fuel meter indicator		
1)	Defective operation of fuel level sensor.	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 the 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 the 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 the water condensation is notched in the fuel filter, drain the 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)

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES) *EC(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 the ground cable from battery.

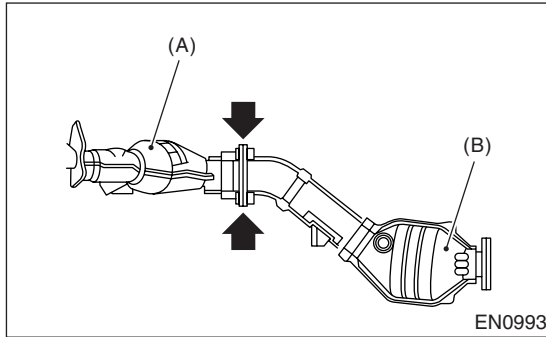
FRONT CATALYTIC CONVERTER

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

2. Front Catalytic Converter

A: REMOVAL

- 1) Remove the center exhaust pipe. <Ref. to EX(TURBO)-8, REMOVAL, Center Exhaust Pipe.>
- 2) Separate the front catalytic converter (A) from rear catalytic converter (B).



B: INSTALLATION

NOTE:

Replace the gaskets with new ones.
Install in the reverse order of removal.

C: INSPECTION

- 1) Make sure there are no exhaust leaks from connections and welds.
- 2) Make sure there are no holes or rusting.

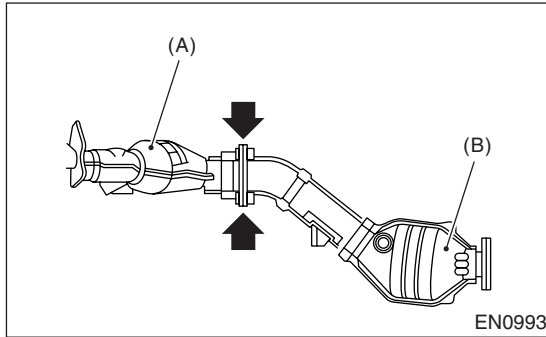
REAR CATALYTIC CONVERTER

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

3. Rear Catalytic Converter

A: REMOVAL

- 1) Remove the center exhaust pipe. <Ref. to EX(TURBO)-8, REMOVAL, Center Exhaust Pipe.>
- 2) Separate the rear catalytic converter (B) from front catalytic converter (A).



B: INSTALLATION

NOTE:

Replace the gaskets with new ones.
Install in the reverse order of removal.

C: INSPECTION

- 1) Make sure there are no exhaust leaks from connections and welds.
- 2) Make sure there are no holes or rusting.

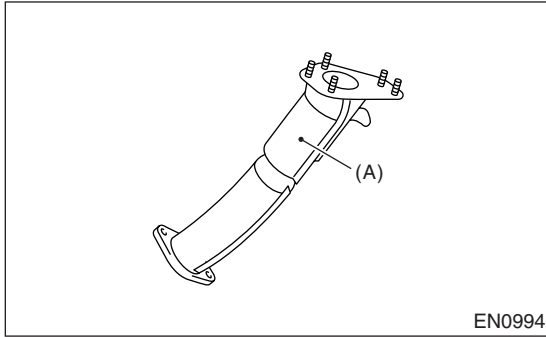
PRECATALYTIC CONVERTER

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

4. Precatalytic Converter

A: REMOVAL

Precatalytic converter (A) is built in the joint pipe. Refer to the removal of joint pipe for removal procedure. <Ref. to EX(TURBO)-12, REMOVAL, Joint Pipe.>



B: INSTALLATION

Precatalytic converter is built in the joint pipe. Refer to the installation of joint pipe for installation procedure. <Ref. to EX(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.

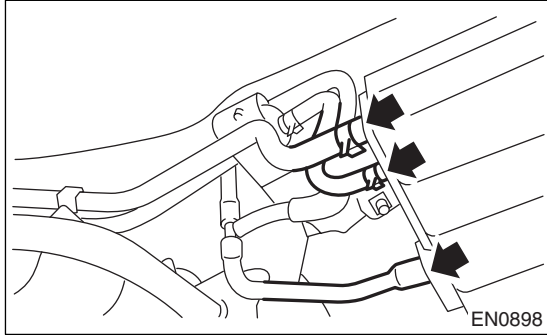
CANISTER

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

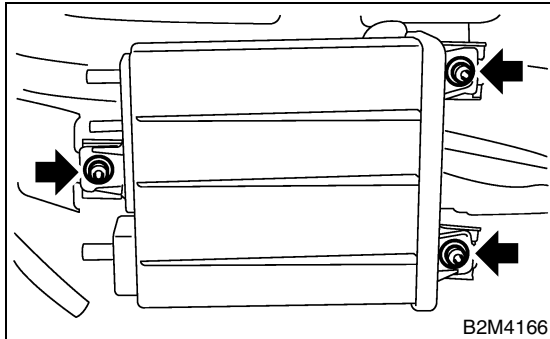
5. Canister

A: REMOVAL

- 1) Lift-up the vehicle.
- 2) Loosen the two clamps which hold two canister hoses, and disconnect the three evaporation hoses from canister.



- 3) Remove the canister from body.

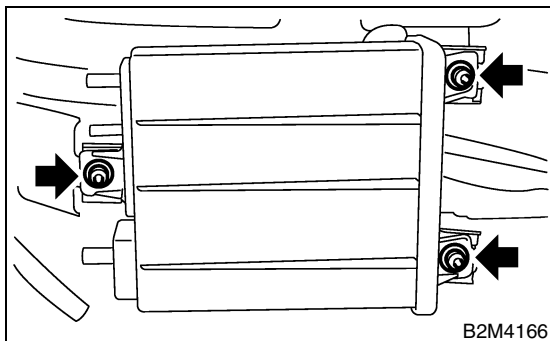


B: INSTALLATION

- 1) Install in the reverse order of removal.

Tightening torque:

23 N·m (2.3 kgf-m, 17 ft-lb)



C: INSPECTION

Make sure the canister and canister hoses are not cracked or loose.

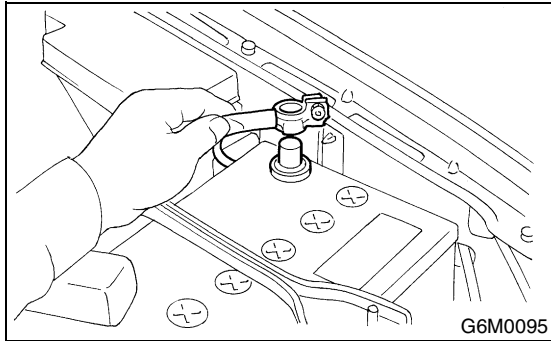
PURGE CONTROL SOLENOID VALVE

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

6. Purge Control Solenoid Valve

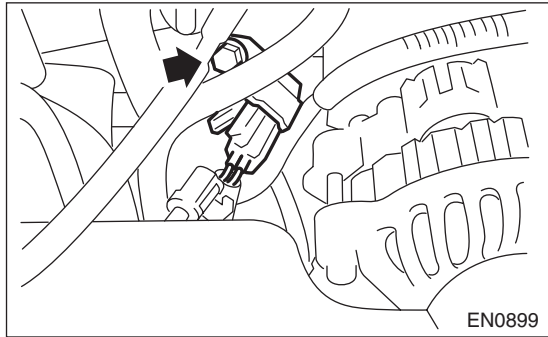
A: REMOVAL

1) Disconnect the ground cable from battery.



2) Disconnect the connector and hoses from purge control solenoid valve.

3) Remove the bolt which installs the purge control solenoid valve onto intake manifold.

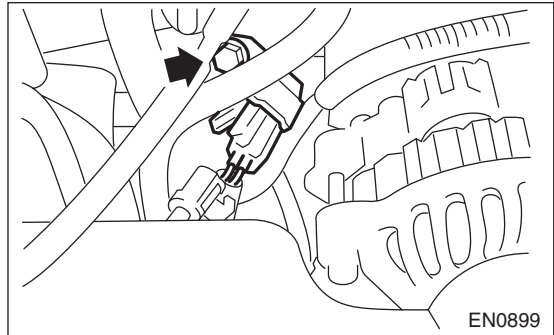


B: INSTALLATION

Install in the reverse order of removal.

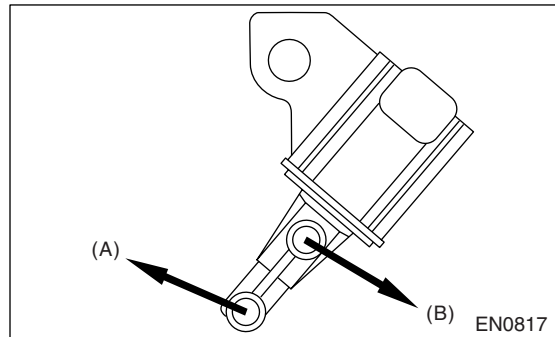
Tightening torque:

16 N·m (1.6 kgf-m, 11.6 ft-lb)



CAUTION:

Carefully connect the evaporation hoses.



(A) To intake manifold

(B) To purge valve

C: INSPECTION

Make sure the hoses are not cracked or loose.

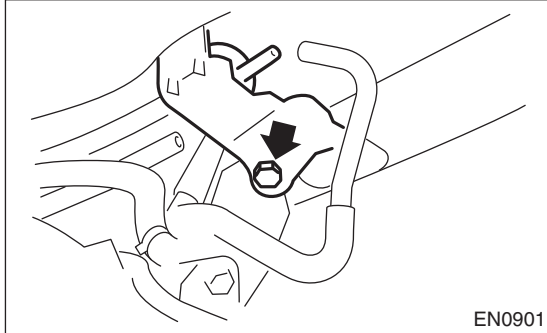
TWO-WAY VALVE

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

7. Two-way Valve

A: REMOVAL

- 1) Lift-up the vehicle.
- 2) Remove the canister from body. <Ref. to EC(TURBO)-6, REMOVAL, Canister.>
- 3) Remove the two-way valve with bracket as a single unit from body.



- 4) Remove the two-way valve from bracket.

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Make sure that the hoses are not cracked or loose.

INTAKE (INDUCTION)

IN(TURBO)

	Page
1. General Description	2
2. Air Cleaner	7
3. Air Intake Duct.....	8
4. Intake Duct	9
5. Intercooler	10
6. Turbocharger.....	12
7. Air By-pass Valve	14
8. Resonator Chamber	15

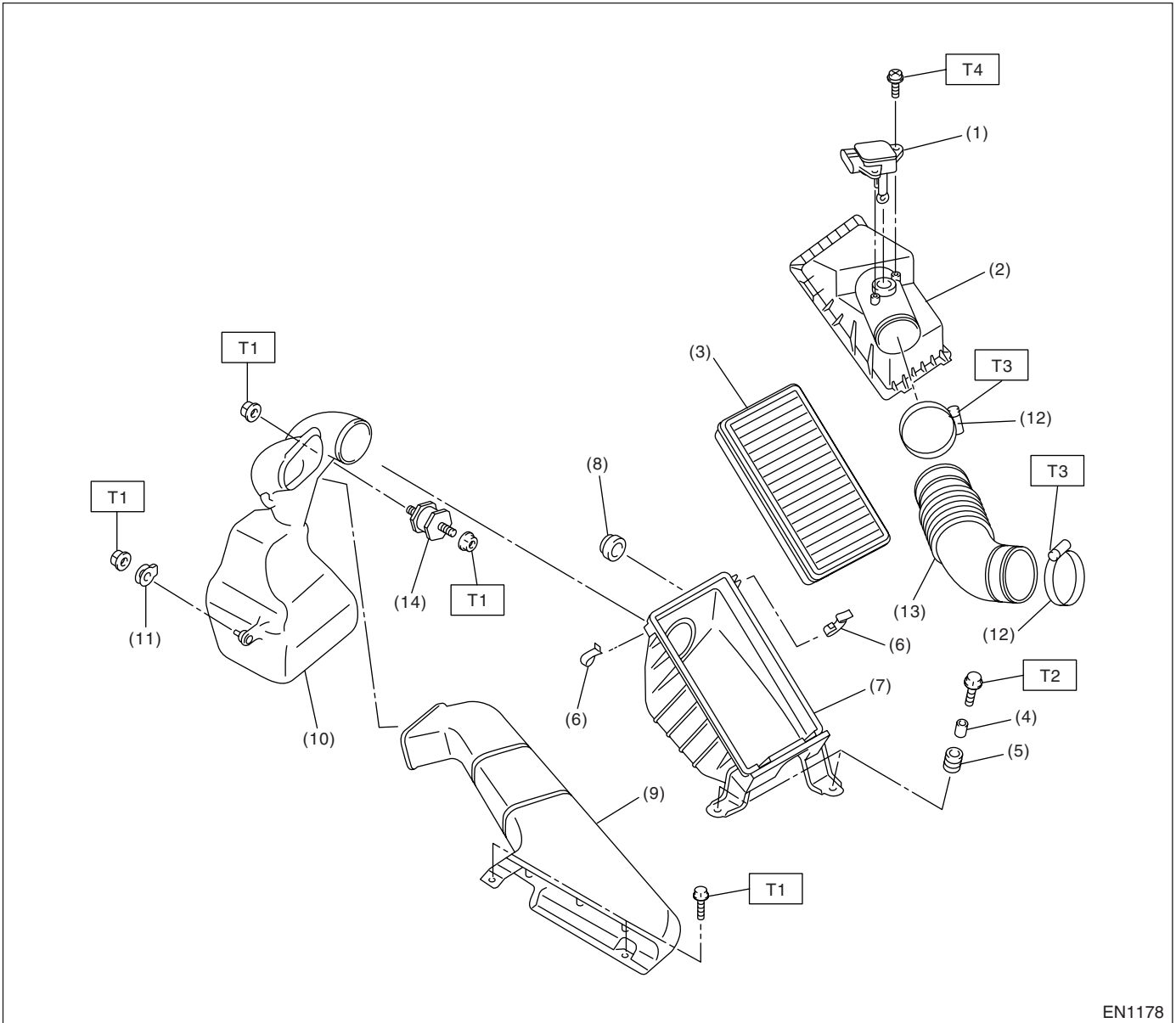
GENERAL DESCRIPTION

INTAKE (INDUCTION)

1. General Description

A: COMPONENT

1. AIR CLEANER



EN1178

- | | |
|---|-----------------------------|
| (1) Mass air flow and intake air temperature sensor | (8) Cushion rubber |
| (2) Air cleaner upper cover | (9) Air intake duct |
| (3) Air cleaner element | (10) Resonator chamber ASSY |
| (4) Spacer | (11) Cushion rubber |
| (5) Bush | (12) Clamp |
| (6) Clip | (13) Air intake boot |
| (7) Air cleaner lower case | (14) Cushion |

Tightening torque: N·m (kgf·m, ft·lb)

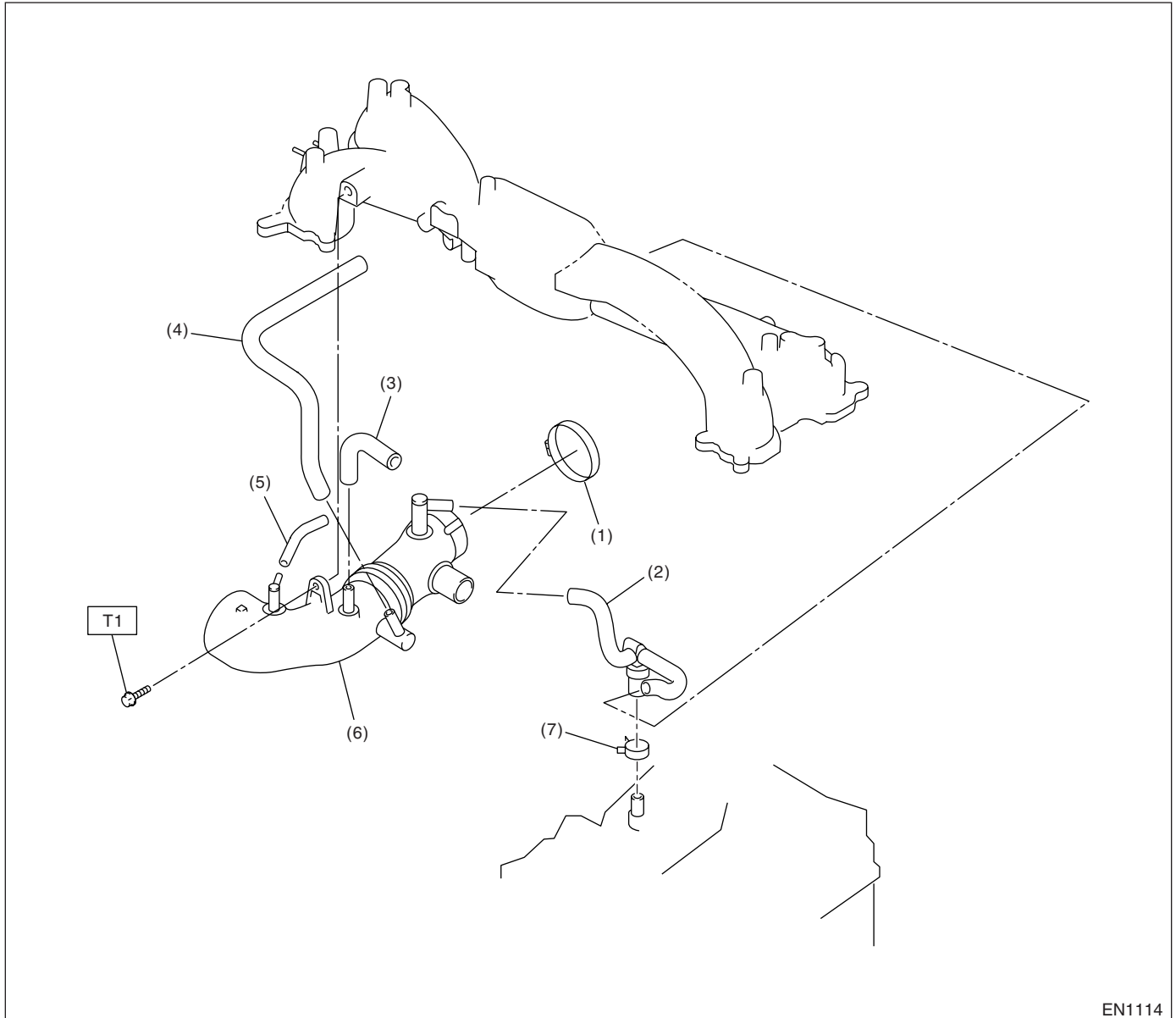
T1: 7.5 (0.76, 5.5)

T2: 33 (3.4, 24.6)

T3: 2.5 (0.25, 1.8)

T4: 1.7 (0.17, 1.2)

2. INTAKE DUCT



EN1114

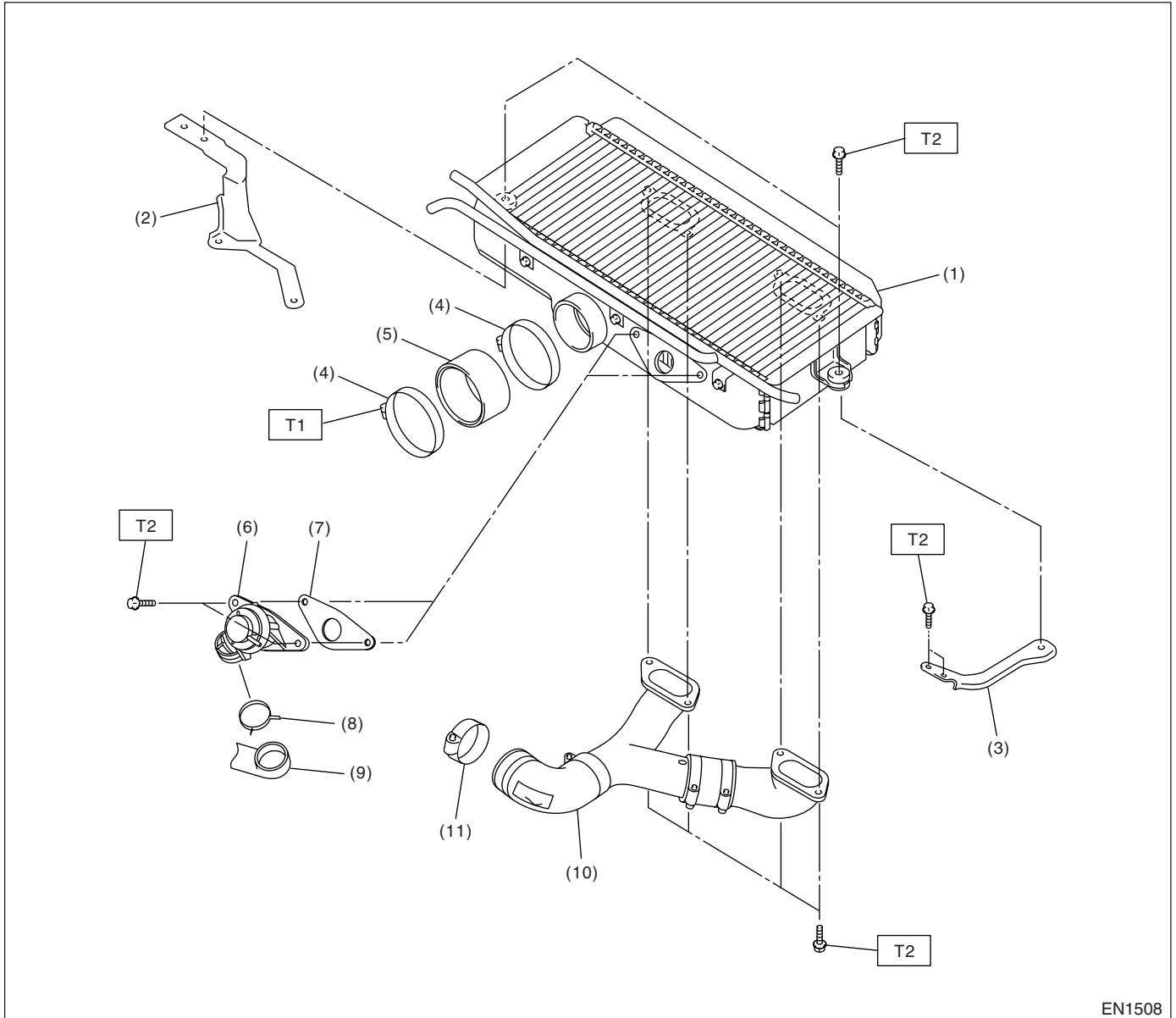
- | | |
|------------------------|------------------------|
| (1) Clamp | (5) Air by-pass hose C |
| (2) PCV hose ASSY | (6) Intake duct |
| (3) Air by-pass hose A | (7) Clamp |
| (4) Air by-pass hose B | |

Tightening torque: N·m (kgf·m, ft·lb)
T1: 16 (1.6, 11.7)

GENERAL DESCRIPTION

INTAKE (INDUCTION)

3. INTERCOOLER



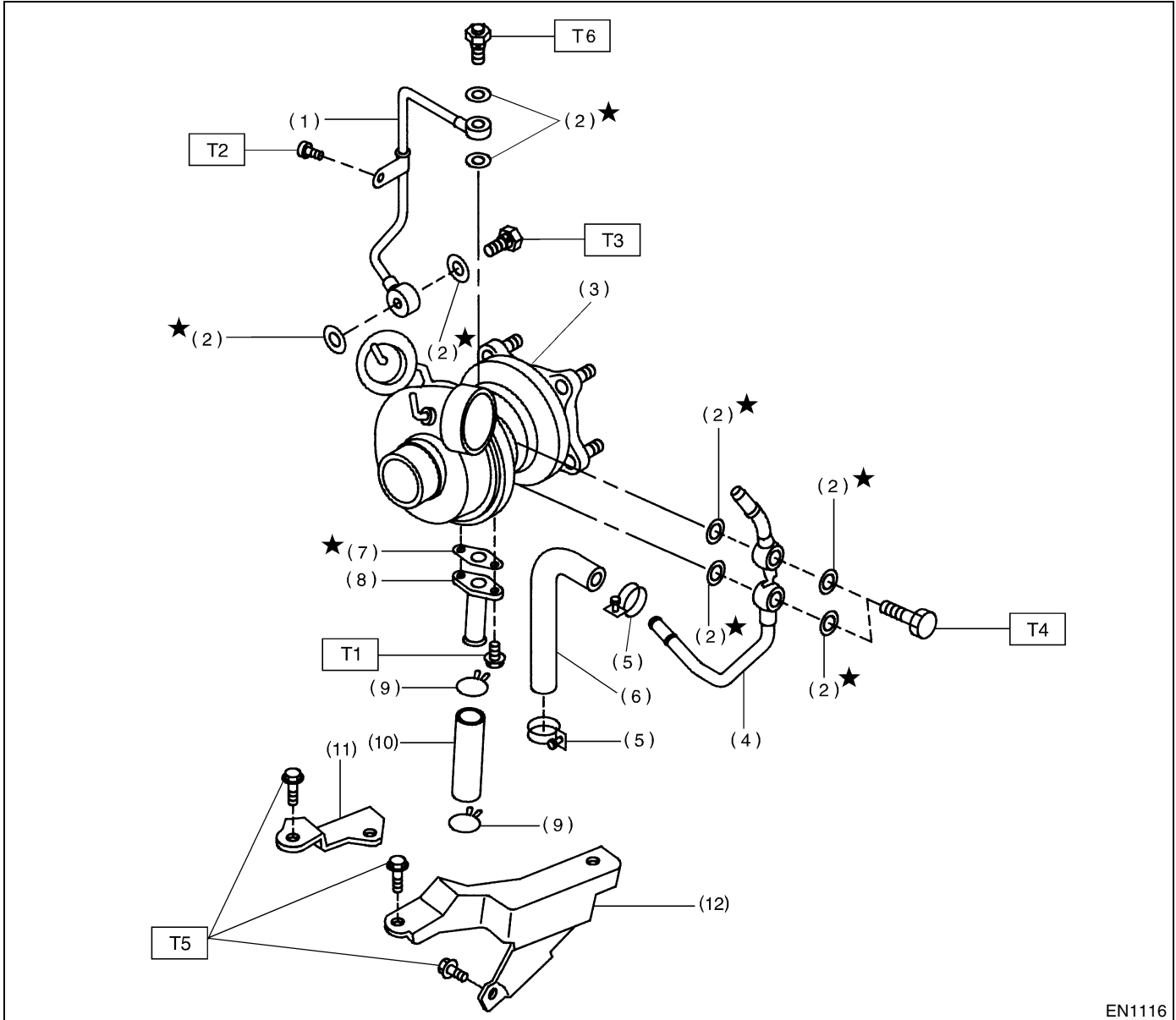
- | | |
|----------------------------|------------------------|
| (1) Intercooler | (7) Gasket |
| (2) Intercooler bracket RH | (8) Clamp |
| (3) Intercooler bracket LH | (9) Air by-pass hose A |
| (4) Clamp | (10) Intercooler duct |
| (5) Air intake duct | (11) Clamp |
| (6) Air by-pass valve | |

Tightening torque: N·m (kgf·m, ft·lb)

T1: 3 (0.3, 2.2)

T2: 16 (1.6, 11.6)

4. TURBOCHARGER



EN1116

- | | |
|-------------------------|------------------------------|
| (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)
T6:	16 (1.6, 11.6)

GENERAL DESCRIPTION

INTAKE (INDUCTION)

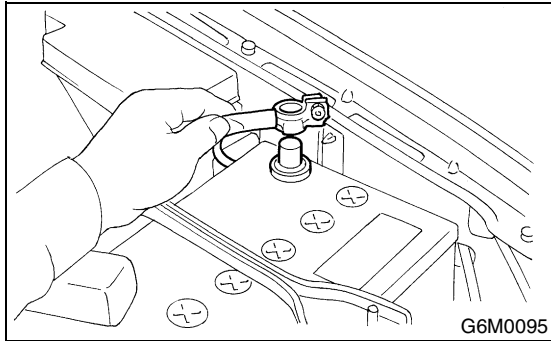
B: CAUTION

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn your hands, because each part on the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Before disconnecting electrical connectors of sensor or units, be sure to disconnect the ground cable from battery.

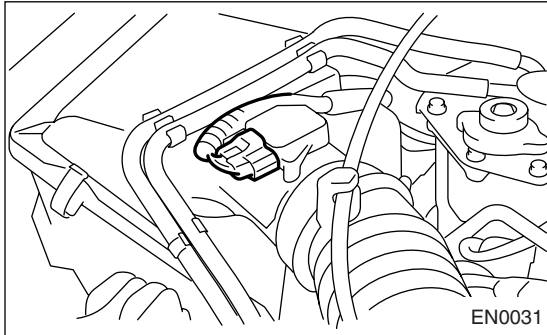
2. Air Cleaner

A: REMOVAL

1) Disconnect the ground cable from battery.

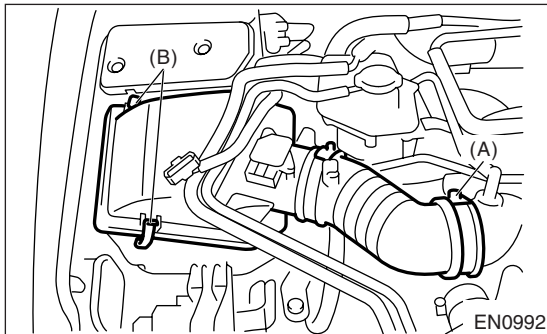


2) Disconnect the connector from mass air flow sensor.



3) Loosen the clamp (A) which connects air intake boot to intake duct.

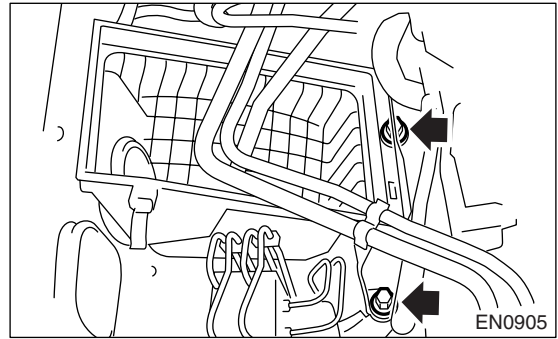
4) Remove the two clips (B) from air cleaner upper cover.



5) Remove the air cleaner upper cover.

6) Remove the air cleaner element.

7) Remove the air cleaner lower case.

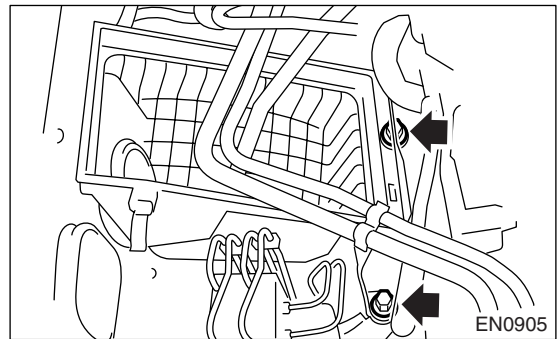


B: INSTALLATION

Install in the reverse order of removal.

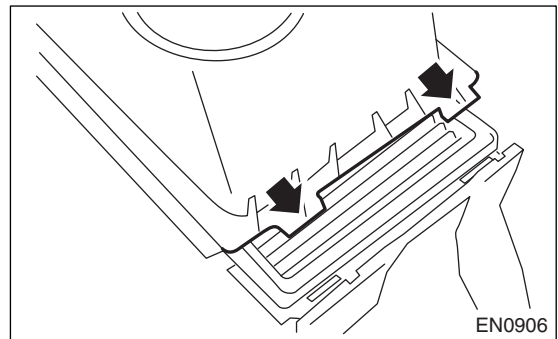
Tightening torque:

33 N·m (3.4 kgf·m, 24.6 ft·lb)



CAUTION:

Before installing the air cleaner upper cover, align the holes with protruding portions of air cleaner lower case, then secure the upper cover to lower case.



C: INSPECTION

Replace if excessively damaged or dirty.

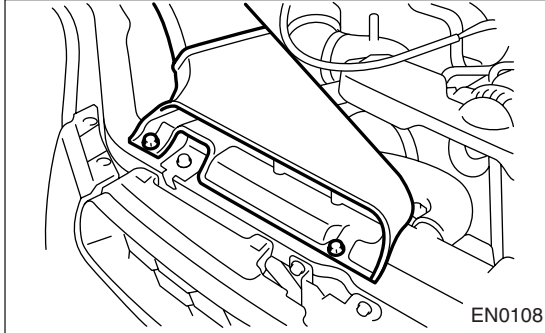
AIR INTAKE DUCT

INTAKE (INDUCTION)

3. Air Intake Duct

A: REMOVAL

1) Remove the bolts which install air intake duct on the front side of body.



B: INSTALLATION

Install in the reverse order of removal.

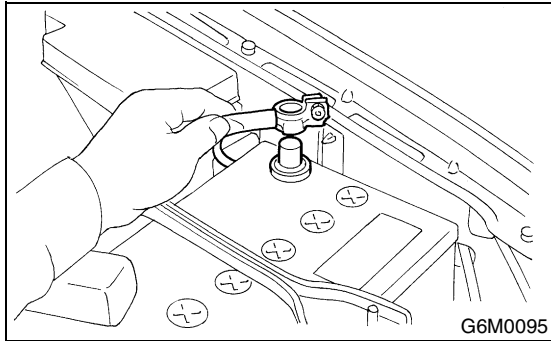
C: INSPECTION

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

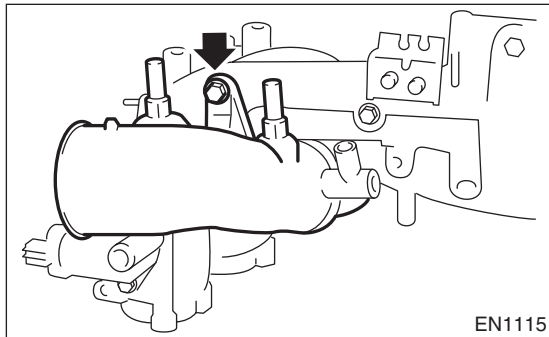
1) Disconnect the ground cable from battery.



2) Remove the intake manifold. <Ref. to FU(TURBO)-15, REMOVAL, Intake Manifold.>

3) Remove the sensor, engine harness, and fuel pipe attached to intake manifold. <Ref. to FU(TURBO)-21, DISASSEMBLY, Intake Manifold.>

4) Remove the intake duct from intake manifold.



B: INSTALLATION

Install in the reverse order of removal.

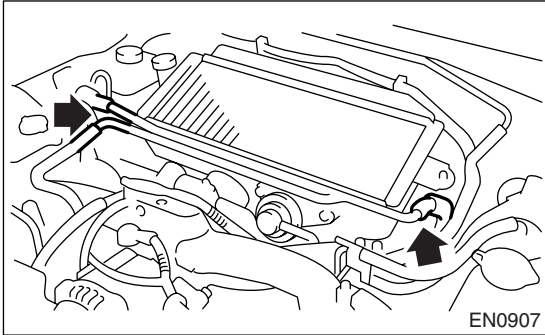
INTERCOOLER

INTAKE (INDUCTION)

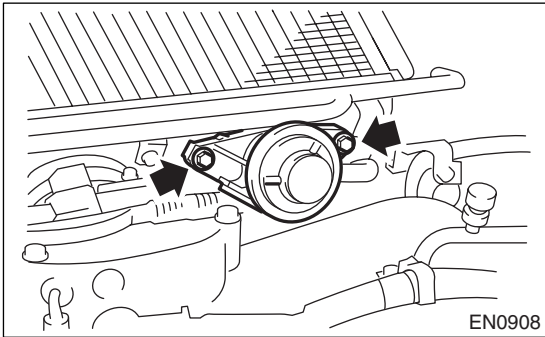
5. Intercooler

A: REMOVAL

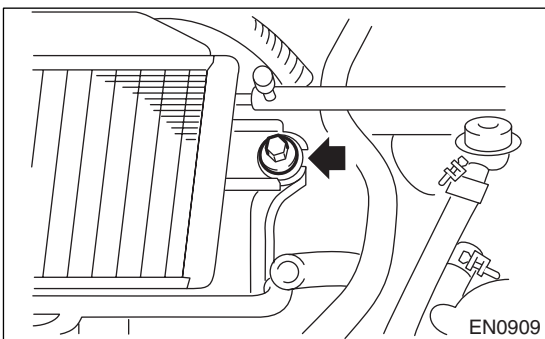
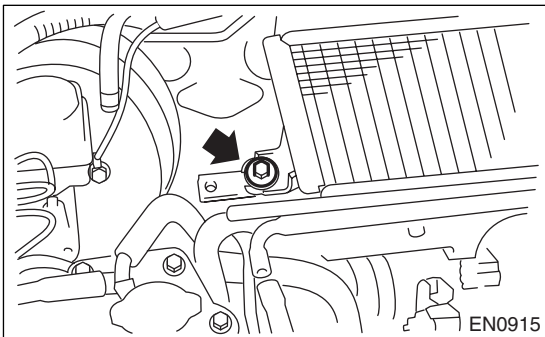
1) Disconnect the air by-pass hoses from intercooler.



2) Separate the air by-pass valve from intercooler.

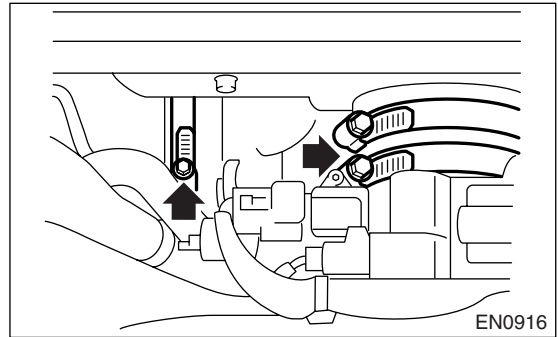


3) Remove the bolts which secure intercooler to bracket.



4) Separate the intercooler air duct from turbocharger.

5) Separate the intercooler from throttle body.

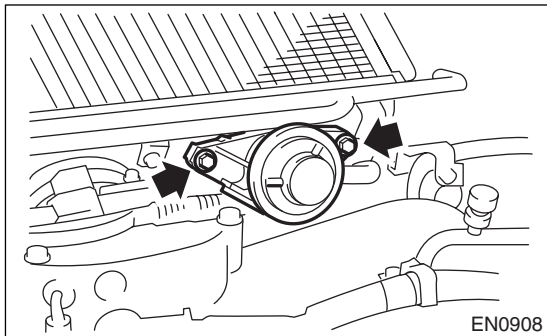
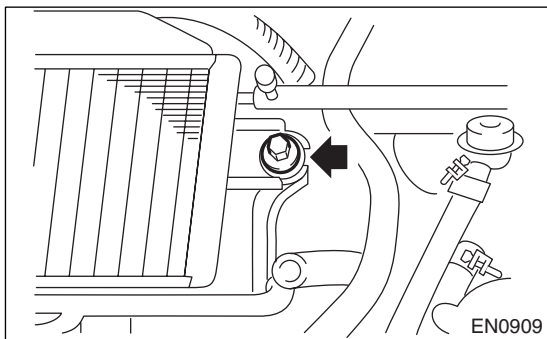
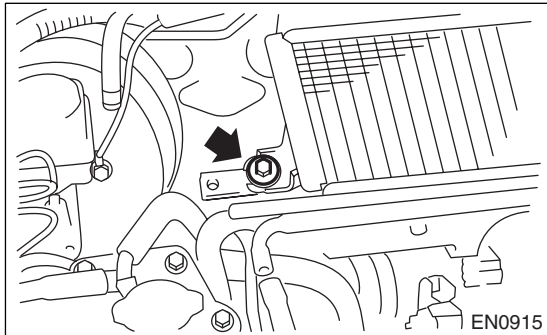


B: INSTALLATION

Install in the reverse order of removal.

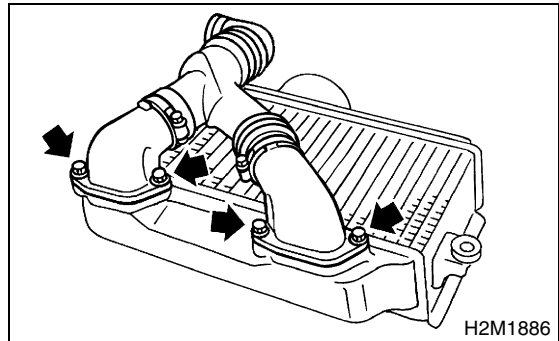
Tightening torque:

16 N·m (1.6 kgf·m, 11.6 ft·lb)



C: DISASSEMBLY

1) Remove the intercooler ducts from intercooler.

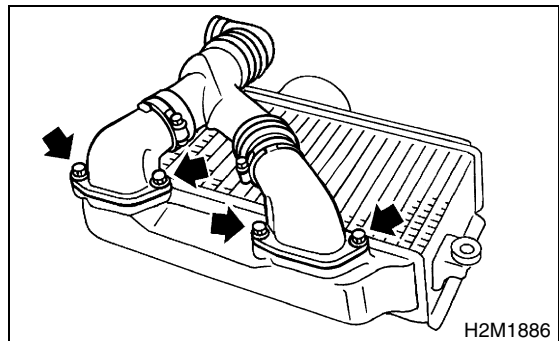


D: ASSEMBLY

Assemble in the reverse order of disassembly.

Tightening torque:

16 N·m (1.6 kgf·m, 11.7 ft·lb)



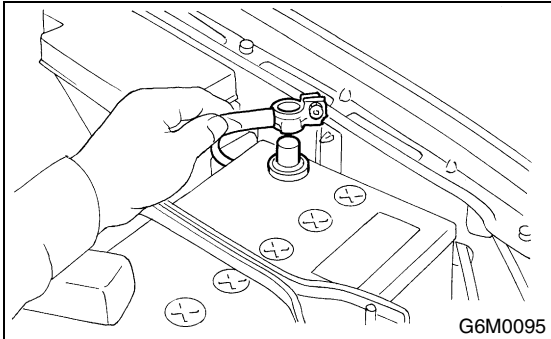
TURBOCHARGER

INTAKE (INDUCTION)

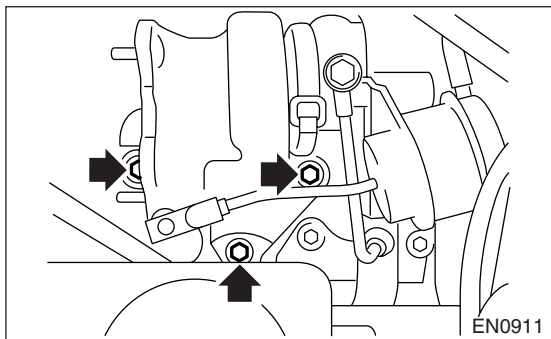
6. Turbocharger

A: REMOVAL

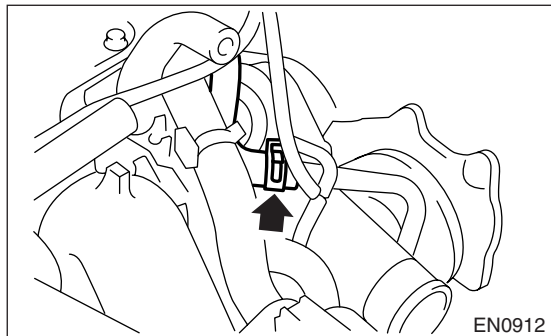
- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from battery.



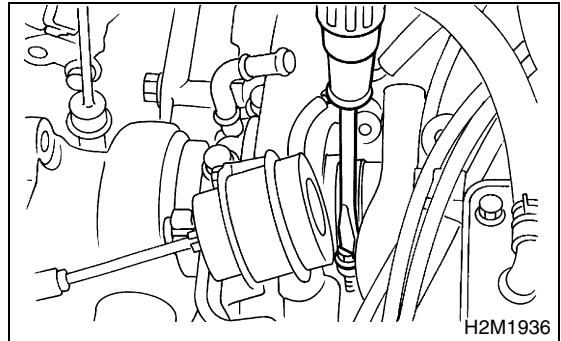
- 3) Remove the center exhaust pipe. <Ref. to EX(TURBO)-8, REMOVAL, Center Exhaust Pipe.>
- 4) Lower the vehicle.
- 5) Separate the turbocharger joint pipe from turbocharger.



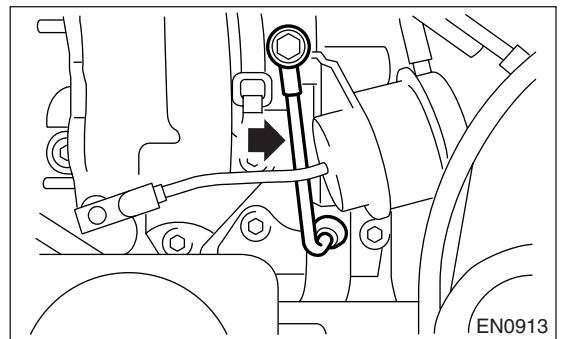
- 6) Disconnect the engine coolant hose which is connected to coolant filler tank.



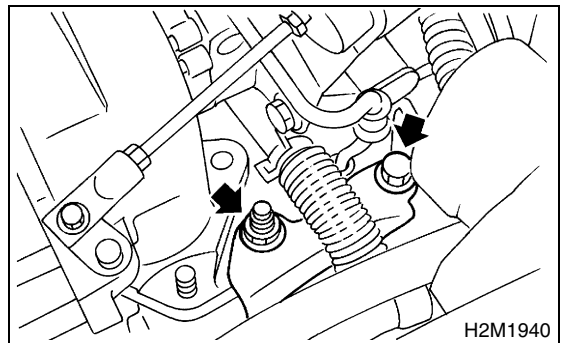
- 7) Loosen the clamp which secures turbocharger to air inlet duct.



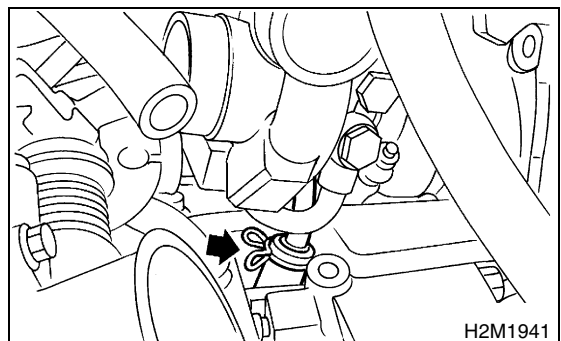
- 8) Remove the bolt which secures bracket of oil pipe to turbocharger.
- 9) Remove the oil pipe from turbocharger.



- 10) Remove the turbocharger bracket.



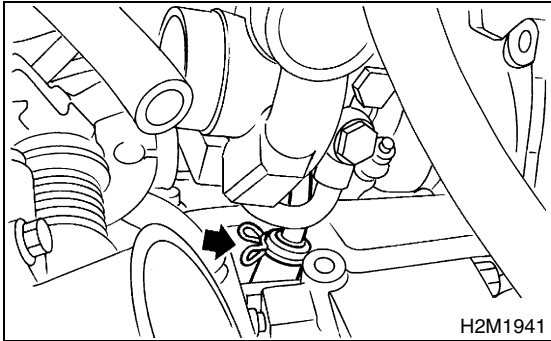
- 11) Disconnect the oil outlet hose from pipe.



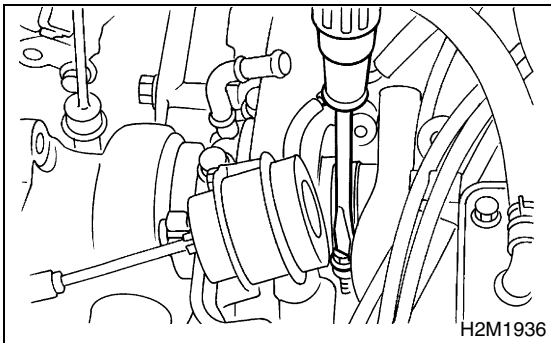
- 12) Take out the turbocharger from engine compartment.

B: INSTALLATION

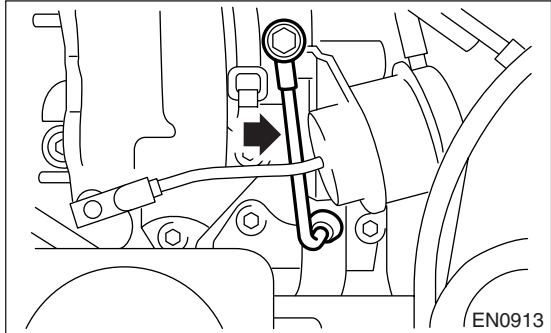
1) Connect the oil outlet hose to outlet pipe.



2) Install the turbocharger to air intake duct.



3) Install the oil pipe to turbocharger.



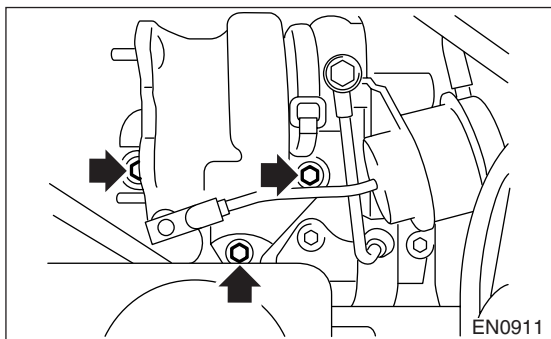
4) Install the joint pipe to turbocharger.

NOTE:

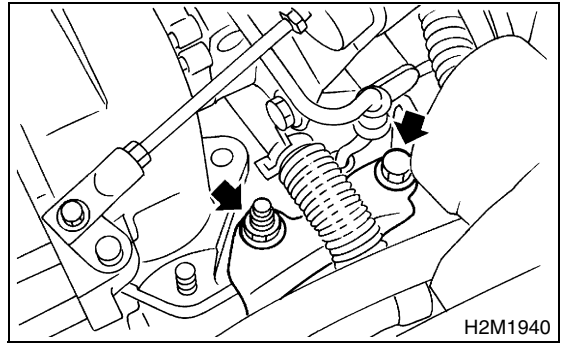
Replace the gasket with a new one.

Tightening torque:

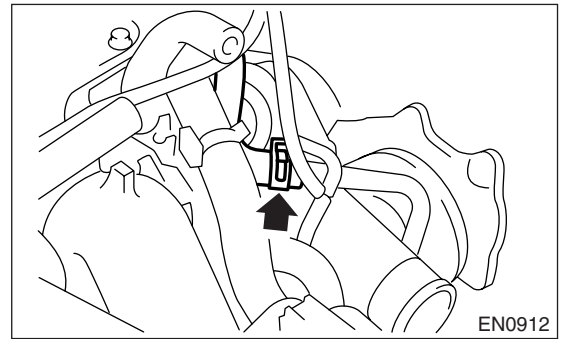
30 N·m (3.1 kgf·m, 22.4 ft·lb)



5) Install the turbocharger bracket.



6) Connect the engine coolant hose which is connected to coolant filler tank.



7) Lift-up the vehicle.

8) Install the center exhaust pipe. <Ref. to EX(TURBO)-9, INSTALLATION, Center Exhaust Pipe.>

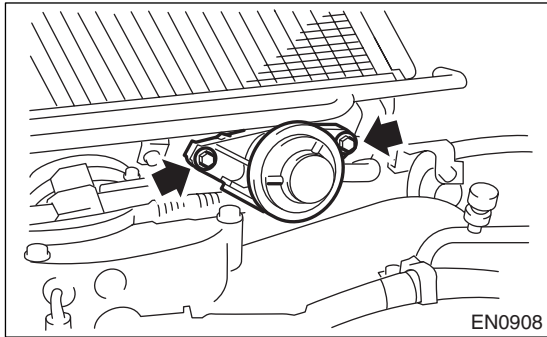
AIR BY-PASS VALVE

INTAKE (INDUCTION)

7. Air By-pass Valve

A: REMOVAL

1) Remove the air by-pass valve from intercooler.



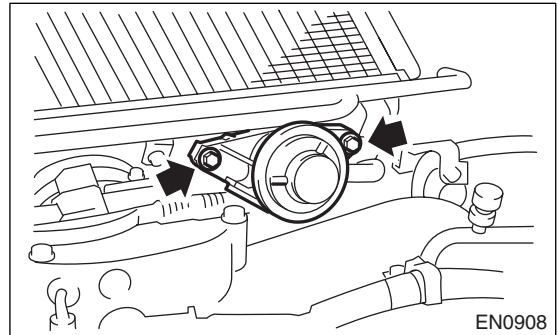
2) Disconnect the air by-pass hoses from air by-pass valve.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

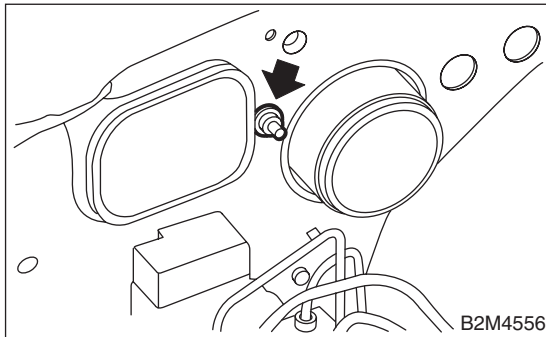
16 N·m (1.6 kgf-m, 11.6 ft-lb)



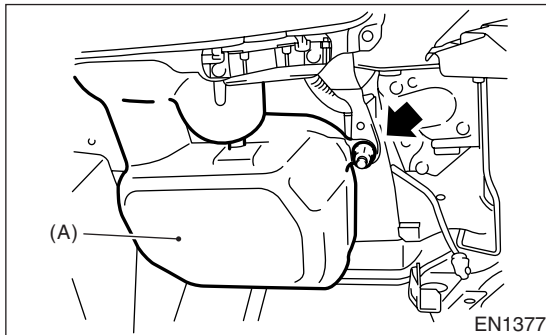
8. Resonator Chamber

A: REMOVAL

- 1) Set the vehicle on a lift.
- 2) Remove the air intake duct. <Ref. to IN(TURBO)-8, Removal.>
- 3) Remove the air cleaner lower case. <Ref. to IN(TURBO)-7, Removal.>
- 4) Remove the resonator chamber mounting bolt on the right of engine compartment.



- 5) Remove the front right tire, and lift the vehicle.
- 6) Remove the front mudguard RH.
- 7) Remove the resonator chamber (A) from the inside front fender.



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Inspect for cracks and loose connections. Check that no foreign objects are mixed in the resonator chamber.

RESONATOR CHAMBER

INTAKE (INDUCTION)

MECHANICAL

ME(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	MT	750±100 (No load) 800±150 (A/C switch ON)
				AT	750±100 (No load) 825±150 (A/C switch ON)
Firing order		1 → 3 → 2 → 4			
Ignition timing		BTDC/rpm	12°±3°/750 rpm		

GENERAL DESCRIPTION

MECHANICAL

NOTE:

STD: Standard I.D.: Inner Diameter O.D.: Outer Diameter OS: Oversize US: Undersize

Belt tension adjuster	Protrusion of adjuster rod		5.2 — 6.2 mm (0.205 — 0.244 in)		
Belt tensioner	Spacer O.D.		17.955 — 17.975 mm (0.7069 — 0.7077 in)		
	Tensioner 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)	
	Journal O.D.	STD	Front	37.946 — 37.963 mm (1.4939 — 1.4946 in)	
			Center rear	29.946 — 29.963 mm (1.1790 — 1.1796 in)	
	Oil clearance	STD	0.037 — 0.072 mm (0.0015 — 0.0028 in)		
Limit		0.10 mm (0.0039 in)			
Cylinder head	Surface warpage limit		0.05 mm (0.0020 in)		
	Surface grinding limit		0.3 mm (0.012 in)		
	Standard height		127.5 mm (5.02 in)		
Valve seat	Refacing angle		90°		
	Contacting width	Intake	STD	1.0 mm (0.039 in)	
			Limit	1.7 mm (0.067 in)	
		Exhaust	STD	1.5 mm (0.059 in)	
			Limit	2.2 mm (0.087 in)	
Valve guide	Inner diameter		6.000 — 6.012 mm (0.2362 — 0.2367 in)		
	Protrusion above head		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	5.945 — 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	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		205.0 — 236.4 N (20.9 — 24.1 kgf, 46.1 — 53.1 lb) /36.0 mm (1.417 in) 485.4 — 536.4 N (49.5 — 54.7 kgf, 109.2 — 120.6 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 — 0.25 mm (0.0079 — 0.0098 in)
			Limit	1.0 mm (0.039 in)
		Second ring	STD	0.35 — 0.50 mm (0.0138 — 0.0197 in)
			Limit	1.0 mm (0.039 in)
	Oil ring	STD	0.20 — 0.50 mm (0.0079 — 0.0197 in)	
		Limit	1.5 mm (0.059 in)	
	Clearance between piston ring and piston ring groove	Top ring	STD	0.055 — 0.090 mm (0.0022 — 0.0035 in)
			Limit	0.15 mm (0.0059 in)
Second ring		STD	0.030 — 0.070 mm (0.0012 — 0.0028 in)	
		Limit	0.15 mm (0.0059 in)	
Connecting rod	Bend twist per 100 mm (3.94 in) in length		Limit	0.10 mm (0.0039 in)
	Side clearance	STD		0.070 — 0.330 mm (0.0028 — 0.0130 in)
		Limit		0.4 mm (0.016 in)
Connecting rod bearing	Oil clearance		STD	0.020 — 0.046 mm (0.0008 — 0.0018 in)
			Limit	0.05 mm (0.0020 in)
	Thickness at center portion	STD		1.486 — 1.498 mm (0.0585 — 0.0590 in)
		0.03 mm (0.0012 in) US		1.504 — 1.512 mm (0.0592 — 0.0595 in)
		0.05 mm (0.0020 in) US		1.514 — 1.522 mm (0.0596 — 0.0599 in)
		0.25 mm (0.0098 in) US		1.614 — 1.622 mm (0.0635 — 0.0639 in)
Connecting rod bushing	Clearance between piston pin and bushing		STD	0 — 0.022 mm (0 — 0.0009 in)
			Limit	0.030 mm (0.0012 in)

GENERAL DESCRIPTION

MECHANICAL

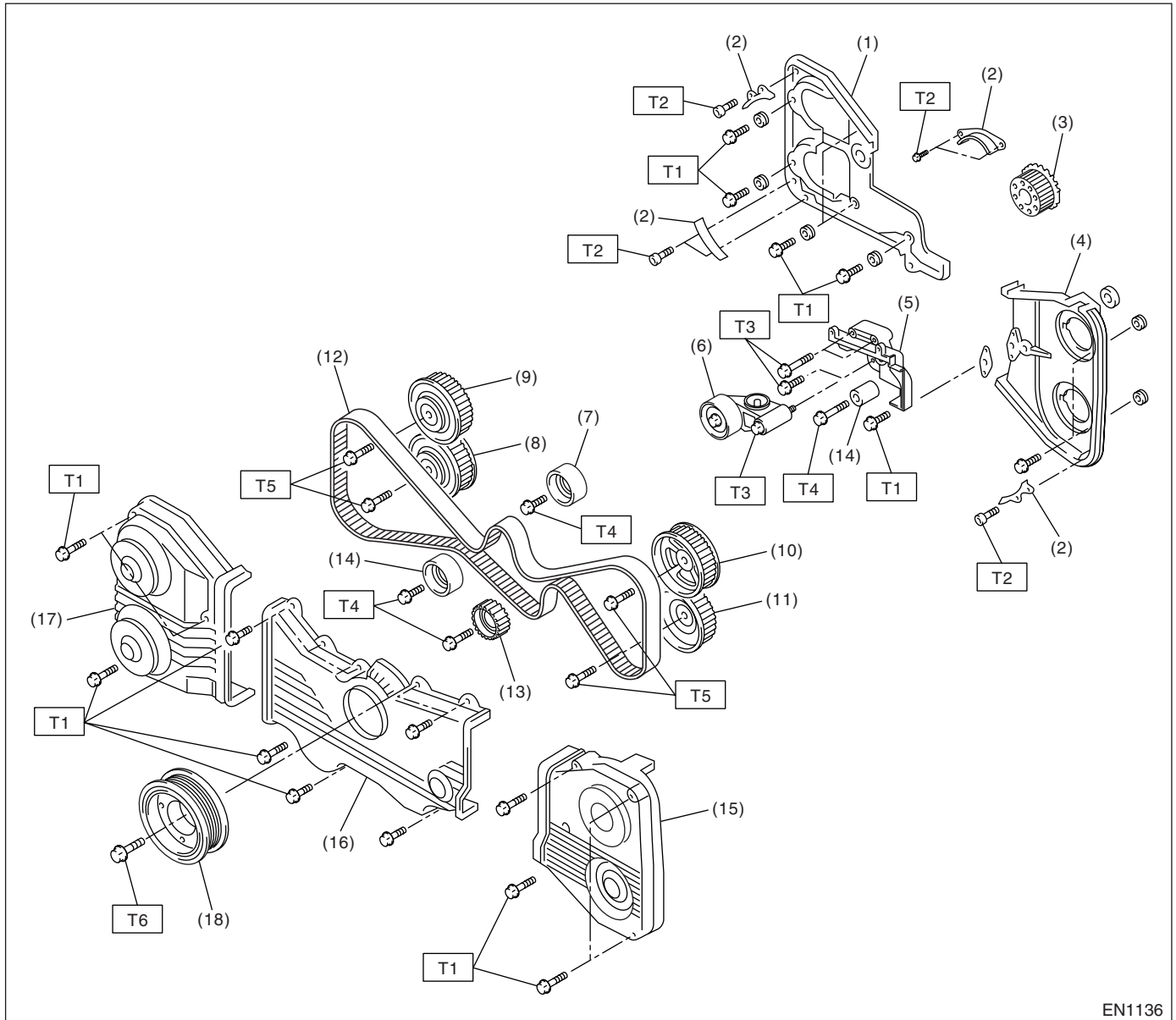
Crankshaft	Bend limit		0.035 mm (0.0014 in)	
	Crank pin and crank journal	Out-of-roundness		0.020 mm (0.0008 in) or less
		Grinding limit		0.25 mm (0.0098 in)
	Crank pin outer diameter	STD		51.984 — 52.000 mm (2.0466 — 2.0472)
		0.03 mm (0.0012 in) US		51.954 — 51.970 mm (2.0454 — 2.0461)
		0.05 mm (0.0020 in) US		51.934 — 51.950 mm (2.0447 — 2.0453)
		0.25 mm (0.0098 in) US		51.734 — 51.750 mm (2.0368 — 2.0374)
	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)	

GENERAL DESCRIPTION

MECHANICAL

B: COMPONENT

1. TIMING BELT



EN1136

- | | |
|--|-------------------------------------|
| (1) Belt cover No. 2 (RH) | (9) Intake camshaft sprocket (RH) |
| (2) Timing belt guide (MT vehicles only) | (10) Intake camshaft sprocket (LH) |
| (3) Crankshaft sprocket | (11) Exhaust camshaft sprocket (LH) |
| (4) Belt cover No. 2 (LH) | (12) Timing belt |
| (5) Tensioner bracket | (13) Belt idler No. 2 |
| (6) Automatic belt tension adjuster ASSY | (14) Belt idler |
| (7) Belt idler | (15) Belt cover (LH) |
| (8) Exhaust camshaft sprocket (RH) | (16) Front belt cover |
| | (17) Belt cover (RH) |
| | (18) Crankshaft pulley |

Tightening torque: N·m (kgf·m, ft·lb)

T1: 5 (0.5, 3.6)

T2: 10 (1.0, 7.2)

T3: 25 (2.5, 18.1)

T4: 39 (4.0, 28.9)

T5: 98 (10, 72.4)

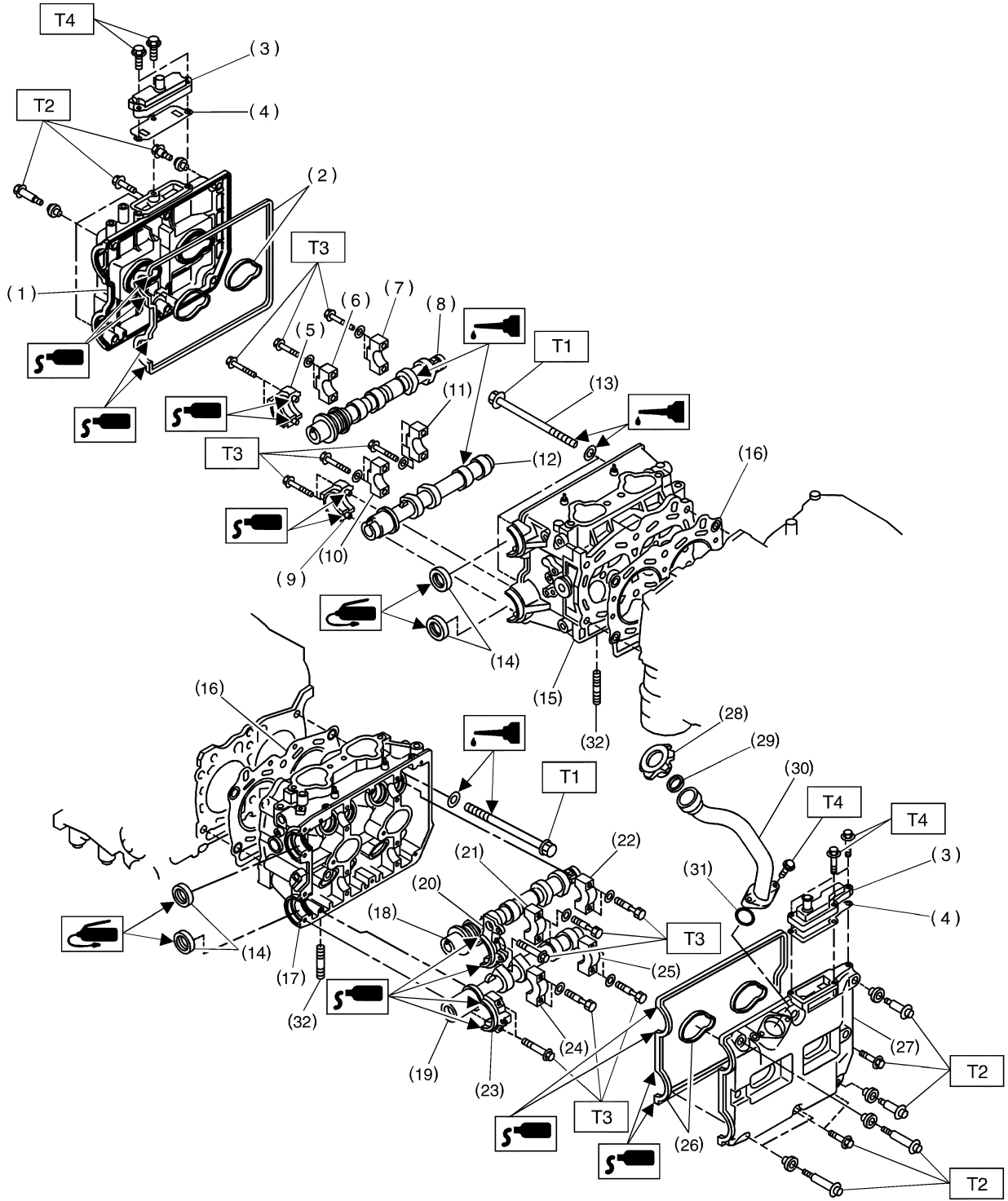
T6: <Ref. to ME(TURBO)-46, INSTALLATION, Crankshaft Pulley.>

ME(TURBO)-6

GENERAL DESCRIPTION

MECHANICAL

2. CYLINDER HEAD AND CAMSHAFT



EN1480

GENERAL DESCRIPTION

MECHANICAL

(1) Rocker cover (RH)	(15) Cylinder head (RH)	(29) Gasket
(2) Rocker cover gasket (RH)	(16) Cylinder head gasket (RH)	(30) Oil filler duct
(3) Oil separator cover	(17) Cylinder head (LH)	(31) O-ring
(4) Gasket	(18) Intake camshaft (LH)	(32) Stud bolt
(5) Intake camshaft cap (Front RH)	(19) Exhaust camshaft (LH)	
(6) Intake camshaft cap (Center RH)	(20) Intake camshaft cap (Front LH)	
(7) Intake camshaft cap (Rear RH)	(21) Intake camshaft cap (Center LH)	
(8) Intake camshaft (RH)	(22) Intake camshaft cap (Rear LH)	
(9) Exhaust camshaft cap (Front RH)	(23) Exhaust camshaft (Front LH)	
(10) Exhaust camshaft cap (Center RH)	(24) Exhaust camshaft cap (Center LH)	
(11) Exhaust camshaft cap (Rear RH)	(25) Exhaust camshaft cap (Rear LH)	
(12) Exhaust camshaft (RH)	(26) Rocker cover gasket (LH)	
(13) Cylinder head bolt	(27) Rocker cover (LH)	
(14) Oil seal	(28) Oil filler cap	

Tightening torque: N·m (kgf-m, ft-lb)

**T1: <Ref. to ME(TURBO)-64,
INSTALLATION, Cylinder Head
Assembly.>**

T2: 5 (0.5, 3.6)

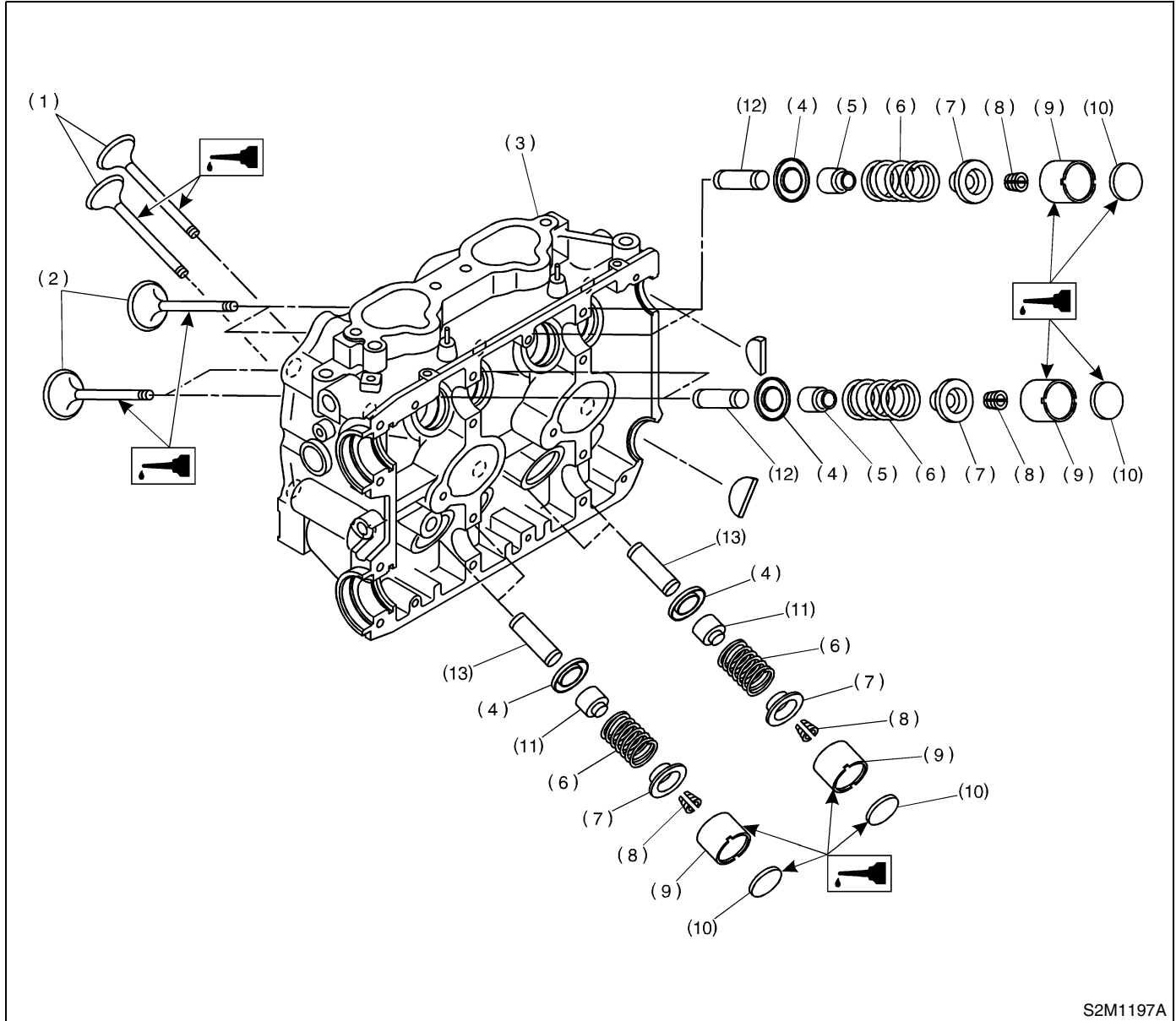
T3: 10 (1.0, 7.2)

T4: 6.4 (0.65, 4.7)

GENERAL DESCRIPTION

MECHANICAL

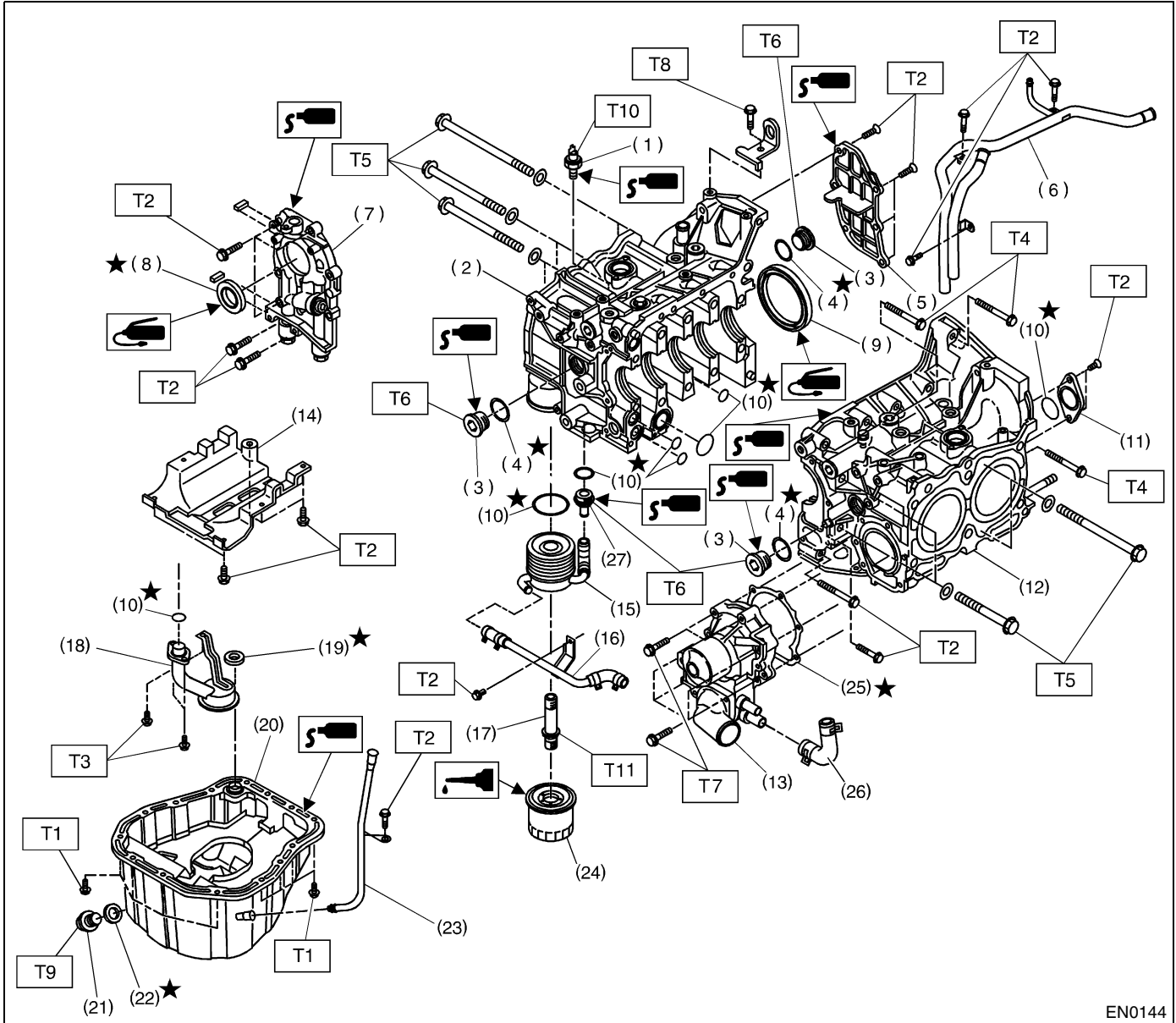
3. CYLINDER HEAD AND VALVE ASSEMBLY



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, 7.2)

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)

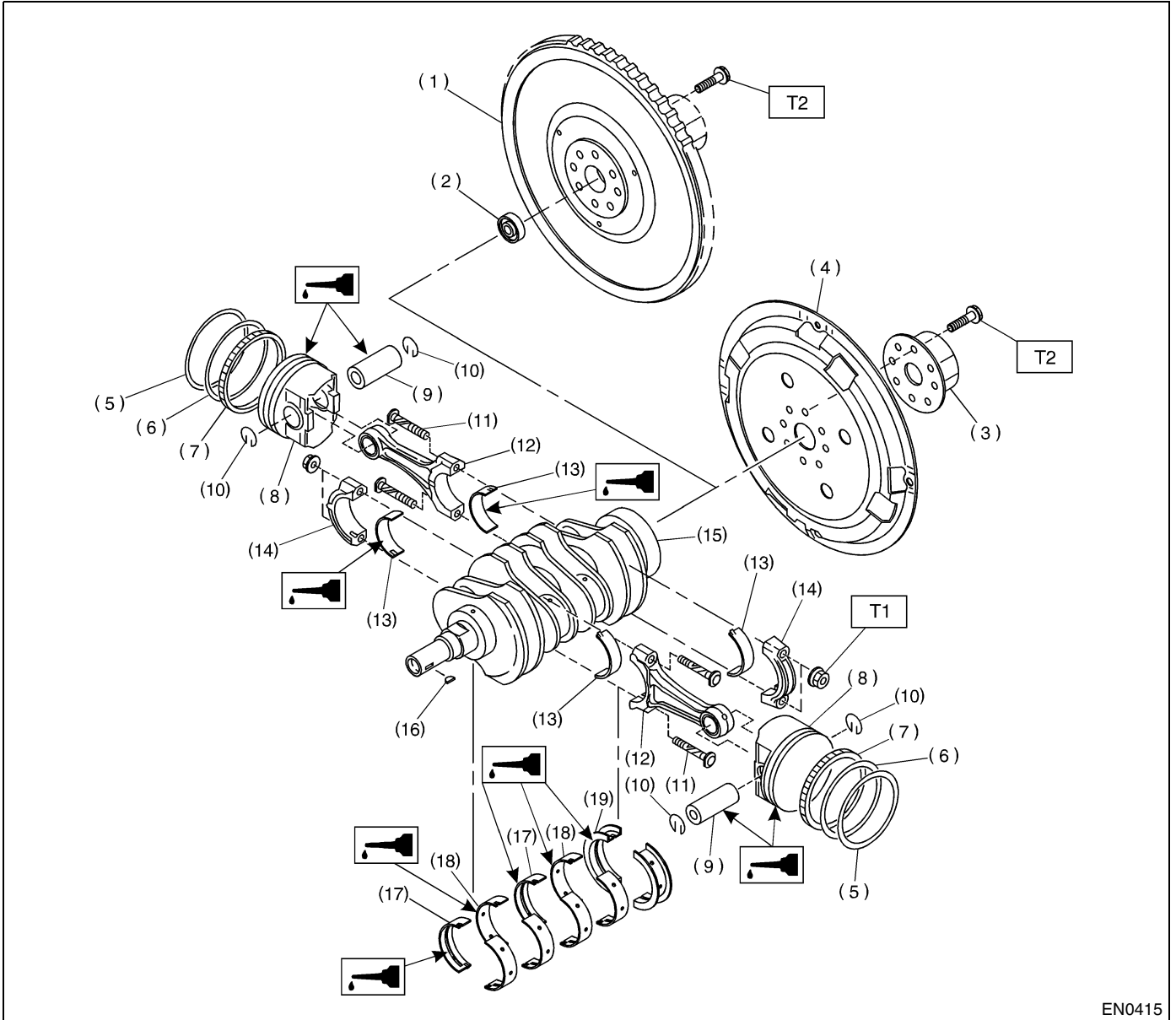
T10: 25 (2.5, 18.1)

T11: 55 (5.5, 40)

GENERAL DESCRIPTION

MECHANICAL

5. CRANKSHAFT AND PISTON



EN0415

- | | | |
|--------------------------------------|-----------------------------|--------------------------------|
| (1) Flywheel (MT vehicles only) | (9) Piston pin | (17) Crankshaft bearing #1, #3 |
| (2) Ball bearing (MT vehicles only) | (10) Circlip | (18) Crankshaft bearing #2, #4 |
| (3) Reinforcement (AT vehicles only) | (11) Connecting rod bolt | (19) Crankshaft bearing #5 |
| (4) Drive plate (AT vehicles only) | (12) Connecting rod | |
| (5) Top ring | (13) Connecting rod bearing | |
| (6) Second ring | (14) Connecting rod cap | |
| (7) Oil ring | (15) Crankshaft | |
| (8) Piston | (16) Woodruff key | |

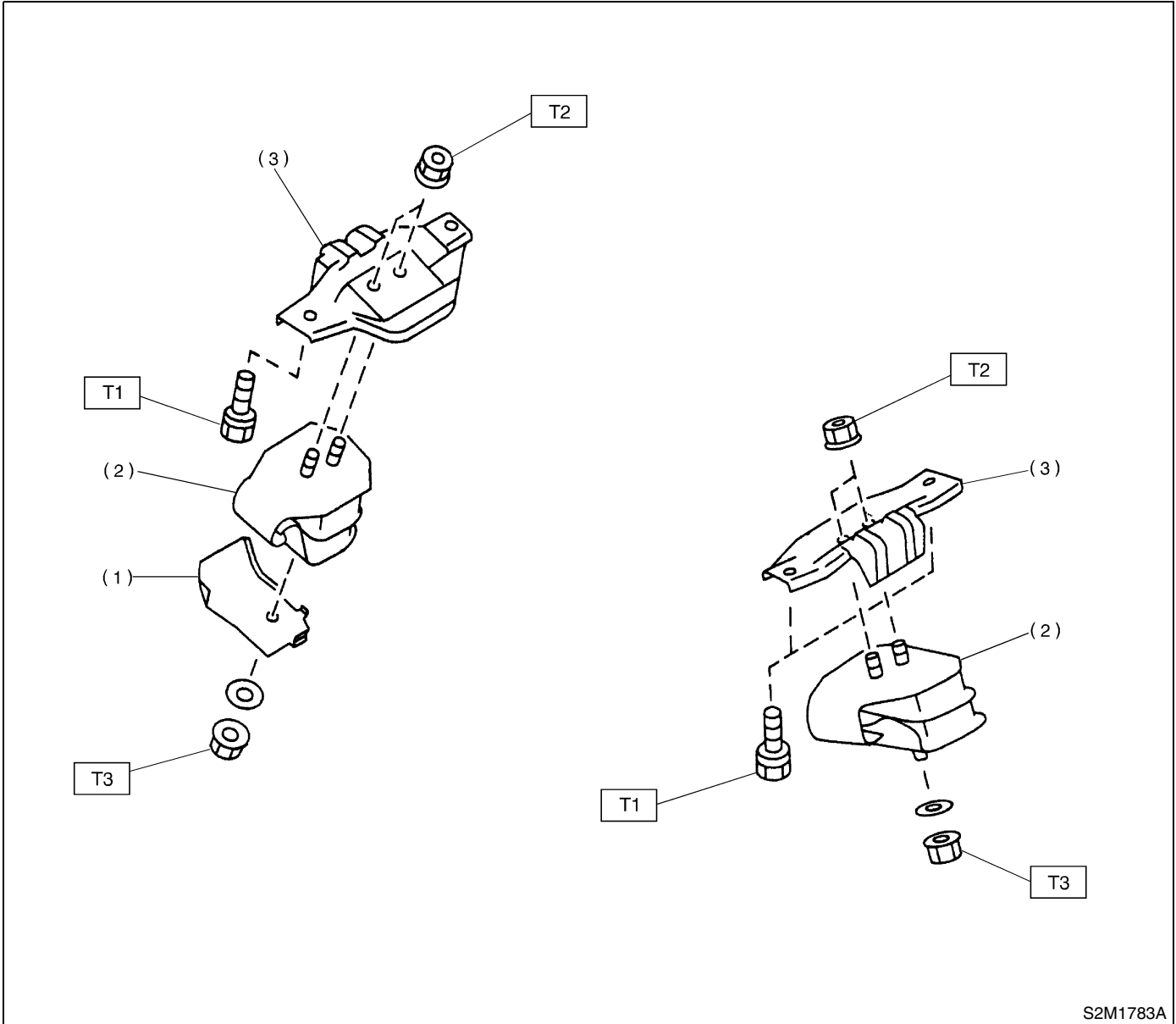
Tightening torque: N·m (kgf·m, ft·lb)

T1: 44.6 (4.55, 32.9)

T2: 72 (7.3, 52.8)

ME(TURBO)-12

6. ENGINE MOUNTING



- (1) Heat shield cover
- (2) Front cushion rubber

- (3) Front engine mounting bracket

Tightening torque: N-m (kgf-m, ft-lb)

T1: 34 (3.5, 25.3)

T2: 42 (4.3, 30.9)

T3: 85 (8.7, 62.7)

GENERAL DESCRIPTION

MECHANICAL

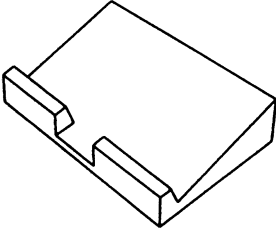
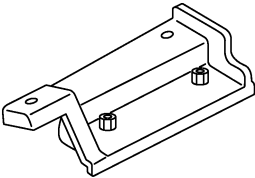
C: CAUTION

- 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 the ground cable from battery.
- All parts should be thoroughly cleaned, paying special attention to the engine oil passages, pistons and bearings.

- Rotating parts and sliding parts such as piston, bearing and gear should be coated with oil prior to assembly.
- Be careful not to let oil, grease or coolant contact the timing belt, clutch disc and flywheel.
- All removed parts, if to be reused, should be re-installed in the original positions and directions.
- Bolts, nuts and washers should be replaced with new ones as required.
- Even if necessary inspections have been made in advance, proceed with assembly work while making rechecks.
- Remove or install the engine in an area where chain hoists, lifting devices, etc. are available for ready use.
- Be sure not to damage coated surfaces of body panels with tools or stain seats and windows with coolant or oil. Place a cover over fenders, as required, for protection.
- Prior to starting work, prepare the following:
Service tools, clean cloth, containers to catch coolant and oil, wire ropes, chain hoist, transmission jacks, etc.
- Lift-up or lower the vehicle when necessary. Make sure to support the correct positions.

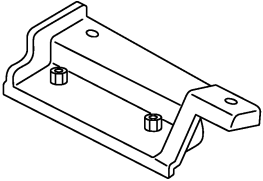
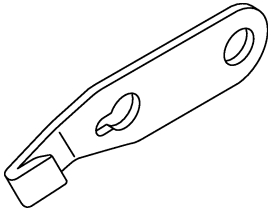
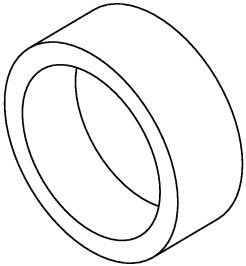
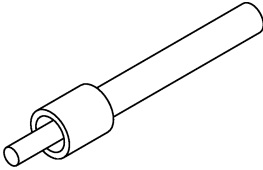
D: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p>EN0147</p>	498267600	CYLINDER HEAD TABLE	<ul style="list-style-type: none"> • Used for replacing valve guides. • Used for removing and installing valve springs.
 <p>B2M3851</p>	498457000	ENGINE STAND ADAPTER RH	Used with ENGINE STAND (499817000).

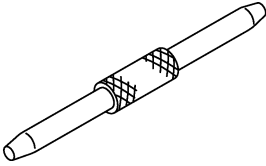
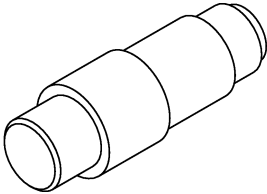
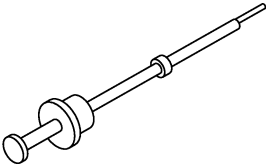
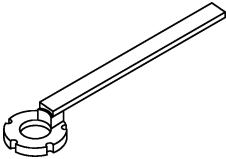
GENERAL DESCRIPTION

MECHANICAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: right;">B2M3852</p>	498457100	ENGINE STAND ADAPTER LH	Used with ENGINE STAND (499817000).
 <p style="text-align: right;">B2M3853</p>	498497100	CRANKSHAFT STOPPER	Used for stopping rotation of flywheel when loosening and tightening crankshaft pulley bolt, etc.
 <p style="text-align: right;">B2M3854</p>	398744300	PISTON GUIDE	Used for installing piston in cylinder for 2000 cc engine.
 <p style="text-align: right;">B2M3855</p>	498857100	VALVE OIL SEAL GUIDE	Used for press-fitting of intake and exhaust valve guide oil seals.

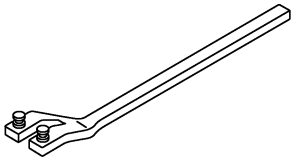
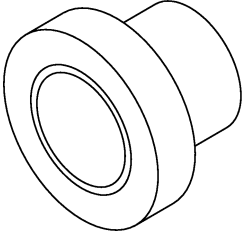
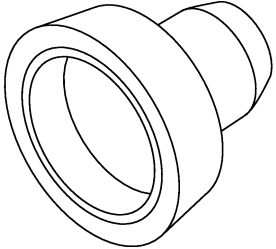
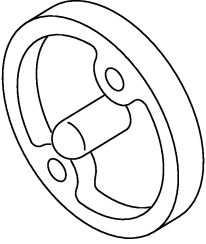
GENERAL DESCRIPTION

MECHANICAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: right;">B2M3856</p>	499017100	PISTON PIN GUIDE	Used for installing piston pin, piston and connecting rod.
 <p style="text-align: right;">B2M3857</p>	499037100	CONNECTING ROD BUSHING REMOVER & INSTALLER	Used for removing and installing connecting rod bushing.
 <p style="text-align: right;">B2M3858</p>	499097700	PISTON PIN REMOVER ASSY	Used for removing piston pin.
 <p style="text-align: right;">B2M4158</p>	499207400	CAMSHAFT SPROCKET WRENCH	Used for removing and installing camshaft sprocket. (Except intake camshaft sprocket LH)

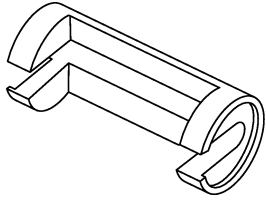
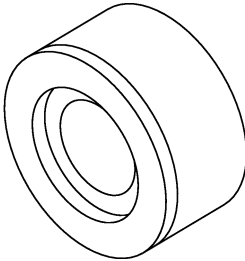
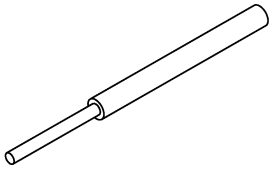
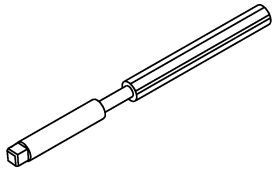
GENERAL DESCRIPTION

MECHANICAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: right;">B2M3859</p>	<p>18231AA010 (Newly adopted tool)</p>	<p>CAMSHAFT SPROCKET WRENCH</p>	<p>Used for removing and installing camshaft sprocket. (Intake camshaft sprocket LH)</p>
 <p style="text-align: right;">B2M3860</p>	<p>499587700</p>	<p>CAMSHAFT OIL SEAL INSTALLER</p>	<p>Used for installing cylinder head plug for DOHC engine.</p>
 <p style="text-align: right;">B2M3861</p>	<p>499587200</p>	<p>CRANKSHAFT OIL SEAL INSTALLER</p>	<ul style="list-style-type: none"> • Used for installing crankshaft oil seal. • Used with CRANKSHAFT OIL SEAL GUIDE (499597100).
 <p style="text-align: right;">B2M3863</p>	<p>499597100</p>	<p>CRANKSHAFT OIL SEAL GUIDE</p>	<ul style="list-style-type: none"> • Used for installing crankshaft oil seal. • Used with CRANKSHAFT OIL SEAL INSTALLER (499587200).

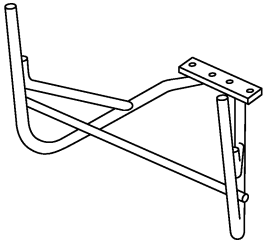
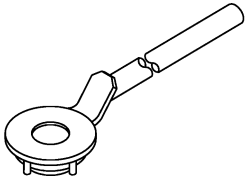
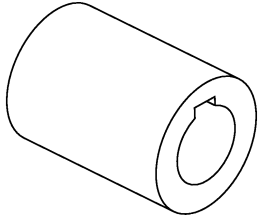
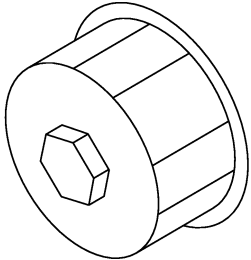
GENERAL DESCRIPTION

MECHANICAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: right;">B2M3864</p>	499718000	VALVE SPRING REMOVER	Used for removing and installing valve spring.
 <p style="text-align: right;">B2M3865</p>	498267700	VALVE GUIDE ADJUSTER	Used for installing intake and exhaust valve guides.
 <p style="text-align: right;">B2M3867</p>	499767200	VALVE GUIDE REMOVER	Used for removing valve guides.
 <p style="text-align: right;">B2M3868</p>	499767400	VALVE GUIDE REAMER	Used for reaming valve guides.

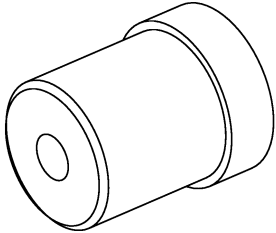
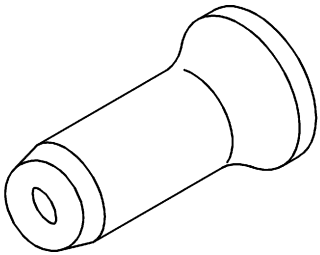
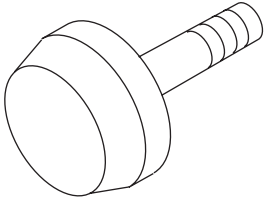
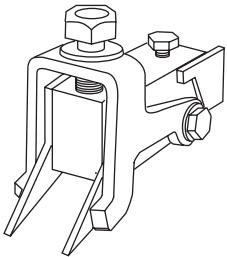
GENERAL DESCRIPTION

MECHANICAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">B2M3869</p>	499817000	ENGINE STAND	<ul style="list-style-type: none"> • Stand used for engine disassembly and assembly. • Used with ENGINE STAND ADAPTER RH (498457000) & LH (498457100).
 <p style="text-align: center;">B2M4157</p>	499977300	CRANK PULLEY WRENCH	Used for stopping rotation of crankshaft pulley when loosening and tightening crankshaft pulley bolts.
 <p style="text-align: center;">B2M3871</p>	499987500	CRANKSHAFT SOCKET	Used for rotating crankshaft.
 <p style="text-align: center;">B2M3872</p>	498547000	OIL FILTER WRENCH	Used for removing and installing oil filter.

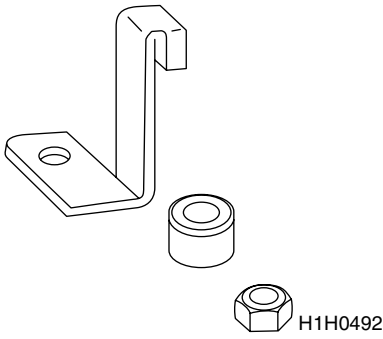
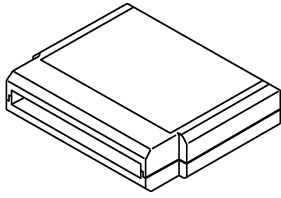

GENERAL DESCRIPTION

MECHANICAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">B2M3875</p>	499587100	OIL SEAL INSTALLER	Used for installing oil pump oil seal.
 <p style="text-align: center;">S1H0136</p>	499587600	OIL SEAL GUIDE	Used for installing camshaft oil seal for DOHC engine.
 <p style="text-align: center;">EN0168</p>	499597200	OIL SEAL GUIDE	<ul style="list-style-type: none"> • Used for installing camshaft oil seal for DOHC engine. • Used with OIL SEAL GUIDE (499587600).
 <p style="text-align: center;">EN0169</p>	498187200	SHIM REPLACER	Used for correct valve clearance.

GENERAL DESCRIPTION

MECHANICAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
	498277200	STOPPER SET	Used for installing automatic transmission assembly to engine.
	24082AA190 (Newly adopted tool)	CARTRIDGE	Troubleshooting for electrical systems.
	22771AA030	SELECT MONITOR KIT	Troubleshooting for electrical systems. <ul style="list-style-type: none"> • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

2. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Compression Gauge	Used for measuring compression.
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:

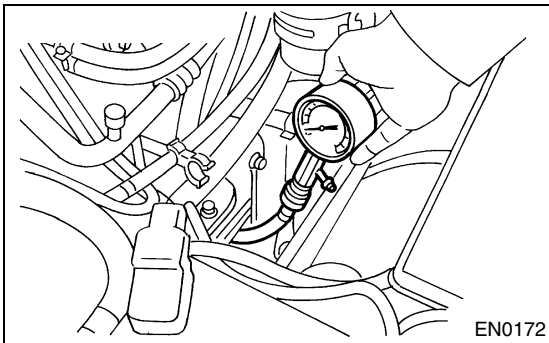
After warming-up, engine becomes very hot. Be careful not to burn yourself during measurement.

- 1) After warming-up the engine, turn the ignition switch to OFF.
- 2) Make sure that the battery is fully charged.
- 3) Release the fuel pressure. <Ref. to FU(TURBO)-53, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
- 4) Remove all the spark plugs. <Ref. to IG(TURBO)-4, REMOVAL, Spark Plug.>
- 5) Fully open the throttle valve.
- 6) Check the starter motor for satisfactory performance and operation.
- 7) Hold the compression gauge tight against spark plug hole.

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 starter motor, and then read the maximum value on the gauge when the pointer is steady.



- 9) Perform at least two measurements per cylinder, and make sure that the values are correct.

Compression (350 rpm and fully open throttle):

Standard;

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 the idle speed, check the following:

(1) Ensure the air cleaner element is free from clogging, ignition timing is correct, spark plugs are in good condition, and that the hoses are connected properly.

(2) Ensure the malfunction indicator light (CHECK ENGINE light) does not illuminate.

2) Warm-up the engine.

3) Stop the engine, and then turn the ignition switch to OFF.

4) Insert the cartridge to SUBARU SELECT MONITOR.

5) Connect the SUBARU SELECT MONITOR to data link connector.

6) Turn the ignition switch to ON, and SUBARU SELECT MONITOR switch to ON.

7) Select the {2. Each System Check} in Main Menu.

8) Select the {Engine Control System} in Selection Menu.

9) Select the {1. Current Data Display & Save} in Engine Control System Diagnosis.

10) Select the {1.12 Data Display} in Data Display Menu.

11) Start the engine, and then read the engine idle speed.

12) Check the idle speed when unloaded. (With headlights, heater fan, rear defroster, radiator fan, air conditioning, etc. OFF)

Idle speed [No load and gears in neutral]:

750±100 rpm

13) Check the idle speed when loaded. (Turn the air conditioning switch to “ON” and operate the compressor for at least 1 minute before measurement.)

Idle speed [A/C “ON”, no load and gears in neutral]:

800±150 rpm (MT models)

825±150 rpm (AT models)

CAUTION:

Never rotate the idle adjusting screw. If the idle speed is out of specifications, refer to General On-board Diagnosis Table under “Engine Control System”. <Ref. to EN(TURBO)-2, Basic Diagnostic Procedure.>

4. Ignition Timing

A: INSPECTION

- 1) Before checking the ignition timing speed, check the following:
 - (1) Ensure the air cleaner element is free from clogging, spark plugs are in good condition, and that hoses are connected properly.
 - (2) Ensure the malfunction indicator light (CHECK ENGINE light) does not illuminate.
- 2) Warm-up the engine.
- 3) Stop the engine, and then turn the ignition switch to OFF.
- 4) Insert the cartridge to SUBARU SELECT MONITOR.
- 5) Connect the SUBARU SELECT MONITOR to data link connector.
- 6) Turn the ignition switch to ON, and SUBARU SELECT MONITOR switch to ON.
- 7) Select the {2. Each System Check} in Main Menu.
- 8) Select the {Engine Control System} in Selection Menu.
- 9) Select the {1. Current Data Display & Save} in Engine Control System Diagnosis.
- 10) Select the {1.12 Data Display} in Data Display Menu.
- 11) Start the engine, at idle speed and check the ignition timing.

Ignition timing [BTDC/rpm]:

12°±3°/750

If the timing is not correct, check the ignition control system. Refer to Engine Control System. <Ref. to EN(TURBO)-2, Basic Diagnostic Procedure.>

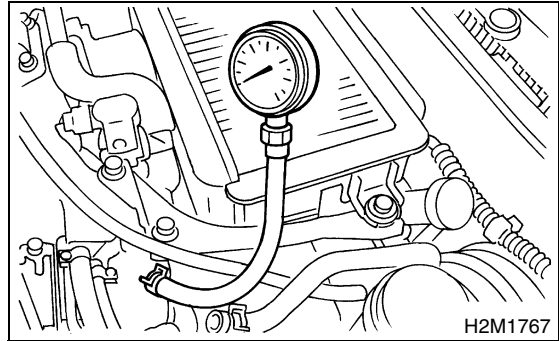
5. Intake Manifold Vacuum

A: INSPECTION

- 1) Warm-up the engine.
- 2) Disconnect the brake vacuum hose, and then install the vacuum gauge to hose fitting on manifold.

3) Keep the engine at the idle speed, and then read the vacuum gauge indication.

By observing the gauge needle movement, the internal condition of engine can be diagnosed as described below.



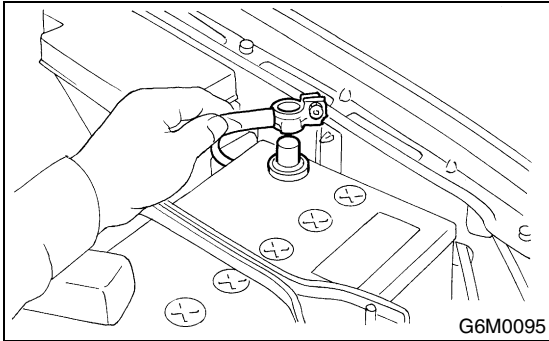
Vacuum pressure (at idling, A/C "OFF"):
Less than -60.0 kPa (-450 mmHg, -17.72 inHg)

Diagnosis of engine condition by measurement of manifold vacuum	
Vacuum gauge indication	Possible engine condition
1. Needle is steady but lower than normal position. This tendency becomes more evident as engine temperature rises.	Leakage around intake manifold gasket or disconnection or damaged vacuum hose
2. When engine speed is reduced slowly from higher speed, needle stops temporarily when it is lowering or becomes steady above normal position.	Back pressure too high, or exhaust system clogged
3. Needle intermittently drops to position lower than normal position.	Leakage around cylinder
4. Needle drops suddenly and intermittently from normal position.	Sticky valves
5. When engine speed is gradually increased, needle begins to vibrate rapidly at certain speed, and then vibration increases as engine speed increases.	Weak or broken valve springs
6. Needle vibrates above and below normal position in narrow range.	Defective ignition system or throttle chamber idle adjustment

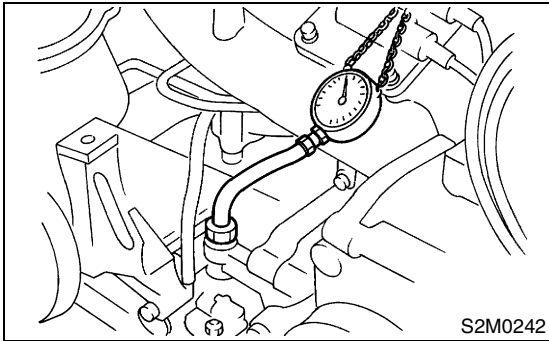
6. Engine Oil Pressure

A: INSPECTION

- 1) Remove the oil pressure switch from engine cylinder block. <Ref. to LU-21, REMOVAL, Oil Pressure Switch.>
- 2) Connect the oil pressure gauge hose to cylinder block.
- 3) Connect the battery ground cable to battery.



- 4) Start the engine, and then measure the oil pressure.



Oil pressure:

98 kPa (1.0 kg/cm², 14 psi) or more at 800 rpm
294 kPa (3.0 kg/cm², 43 psi) or more at 5,000 rpm

CAUTION:

- If the oil pressure is out of specification, check oil pump, oil filter and lubrication line. <Ref. to LU-25, INSPECTION, Engine Lubrication System Trouble in General.>
- If the oil pressure warning light is turned ON and oil pressure is in specification, replace the oil pressure switch. <Ref. to LU-25, INSPECTION, Engine Lubrication System Trouble in General.>

NOTE:

The specified data is based on an engine oil temperature of 80°C (176°F).

- 5) After measuring the oil pressure, install the oil pressure switch. <Ref. to LU-21, 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 the fuel pressure gauge, release the fuel pressure.

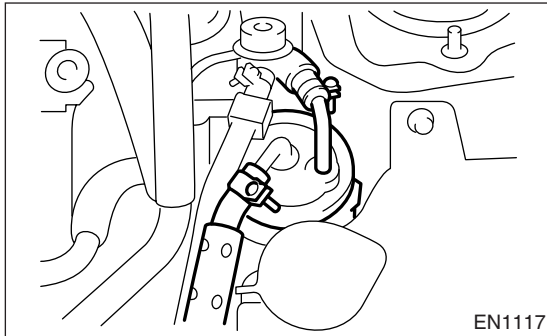
NOTE:

If out of specification, check or replace the pressure regulator and pressure regulator vacuum hose.

1) Release the fuel pressure. <Ref. to FU(TURBO)-53, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>

2) Open the fuel flap lid, and then remove the fuel filler cap.

3) Disconnect the fuel delivery hoses from fuel filter, and then connect the fuel pressure gauge.



4) Connect the connector of fuel pump relay.

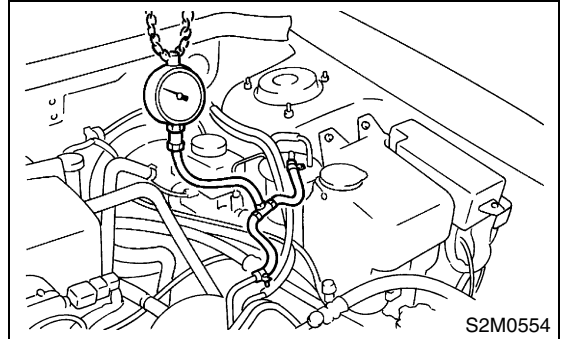


5) Start the engine.

6) Measure the fuel pressure while disconnecting the pressure regulator vacuum hose from intake manifold.

Fuel pressure:

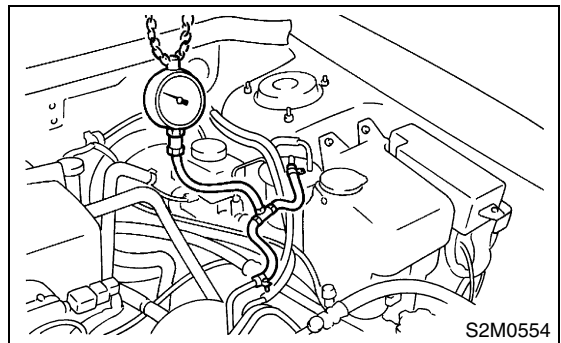
Standard; 284 — 314 kPa (2.9 — 3.2 kgf/cm², 41 — 46 psi)



7) After connecting the pressure regulator vacuum hose, measure the fuel pressure.

Fuel pressure:

Standard; 230 — 260 kPa (2.35 — 2.65 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.

VALVE CLEARANCE

MECHANICAL

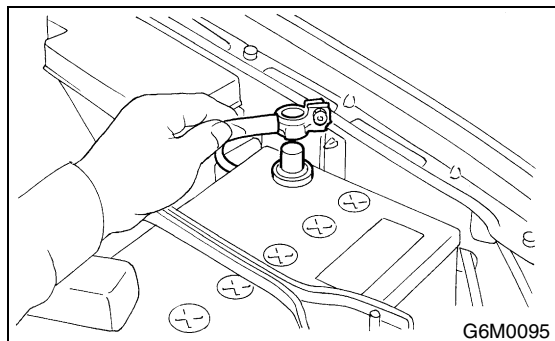
8. Valve Clearance

A: INSPECTION

CAUTION:

Inspection and adjustment of the valve clearance should be performed while engine is cold.

- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from battery.



- 3) Remove the air intake duct. <Ref. to IN(TURBO)-8, REMOVAL, Air Intake Duct.>

- 4) Remove the bolt which secures belt cover (RH).

- 5) Lift-up the vehicle.

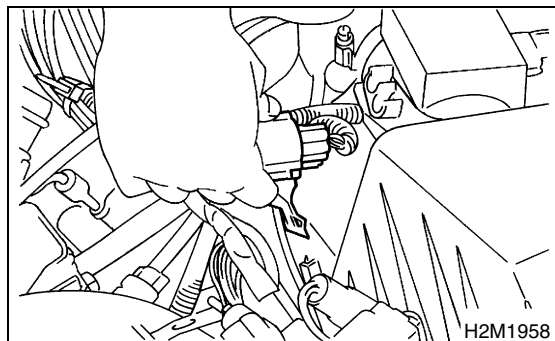
- 6) Remove the under cover.

- 7) Loosen the remaining bolts which secure belt cover (RH), and then remove the belt cover.

- 8) Lower the vehicle.

- 9) When inspecting the #1 and #3 cylinders:

- (1) Pull out the engine harness connector with bracket from air cleaner upper cover.



- (2) Remove the air cleaner case. <Ref. to IN(TURBO)-7, REMOVAL, Air Cleaner.>

- (3) Disconnect the spark plug cords from spark plugs (#1 and #3 cylinders).

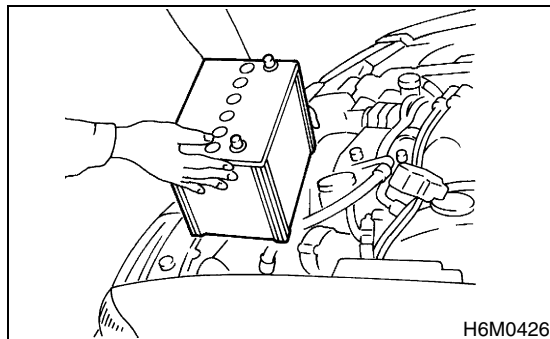
- (4) Place a suitable container under the vehicle.

- (5) Disconnect the PCV hose from rocker cover (RH).

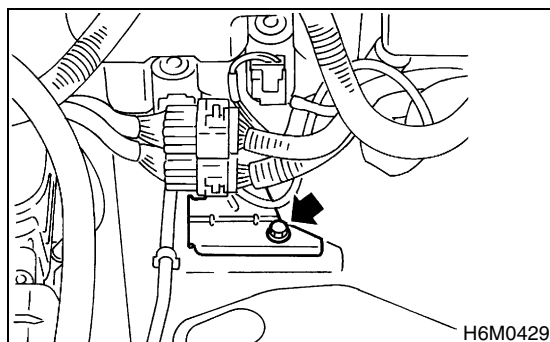
- (6) Remove the bolts, and then remove the rocker cover (RH).

- 10) When inspecting the #2 and #4 cylinders:

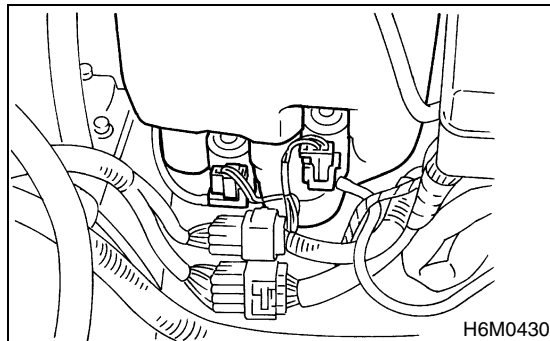
- (1) Disconnect the battery cable, and then remove the battery and battery carrier.



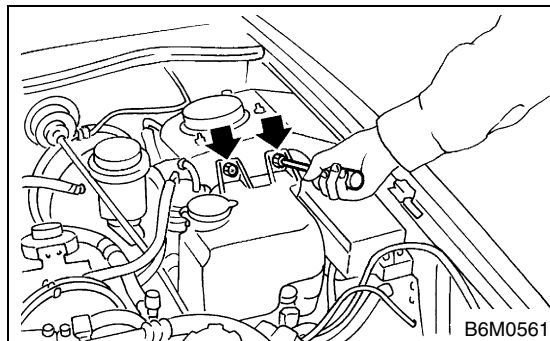
- (2) Remove the bolt which secures engine harness bracket onto body.



- (3) Disconnect the washer motor connectors.



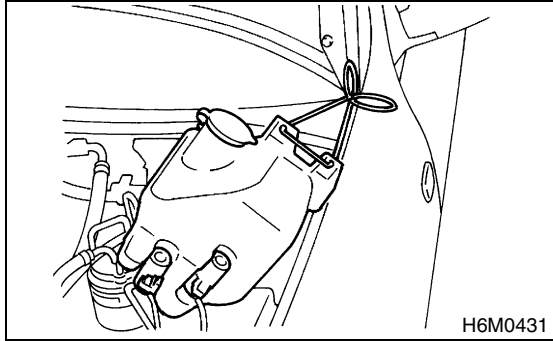
- (4) Remove the washer tank mounting bolts.



VALVE CLEARANCE

MECHANICAL

(5) Move the washer tank upward.



(6) Disconnect the spark plug cords from spark plugs (#2 and #4 cylinders).

(7) Place a suitable container under the vehicle.

(8) Disconnect the PCV hose from rocker cover (LH).

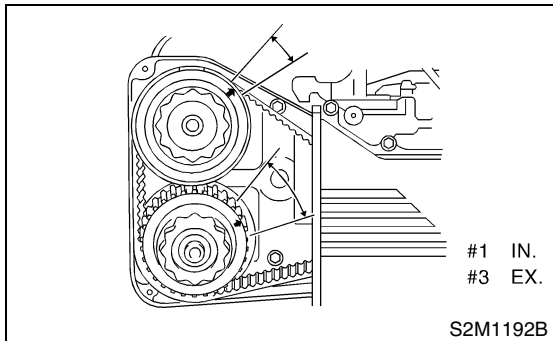
(9) Remove the bolts, and then remove the rocker cover (LH).

11) Turn the crankshaft pulley clockwise until arrow mark on the camshaft sprocket is set to position shown in the figure.

NOTE:

Turn the crankshaft using ST.

ST 499987500 CRANKSHAFT SOCKET



12) Measure the #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 the exhaust valve clearances while lifting-up the vehicle.

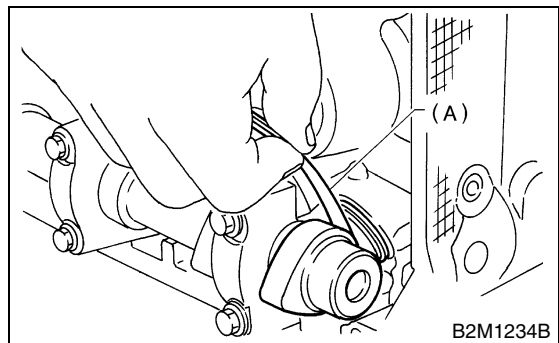
Valve clearance:

Intake: 0.20 ± 0.02 mm (0.0079 ± 0.0008 in)

Exhaust: 0.25 ± 0.02 mm (0.0098 ± 0.0008 in)

NOTE:

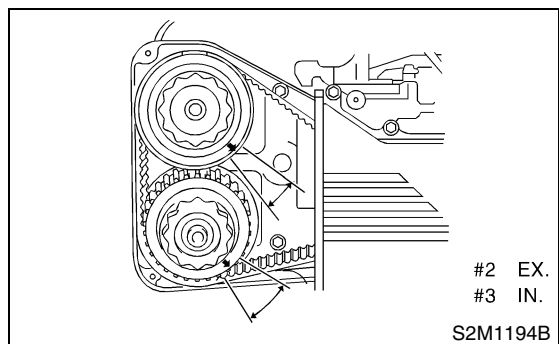
If the measured value is not within specification, take notes of the value in order to adjust the valve clearance later on.



13) If necessary, adjust the valve clearance. <Ref. to ME(TURBO)-30, ADJUSTMENT, Valve Clearance.>

14) Further turn the crankshaft pulley clockwise. Using the same procedures described previously, and then measure the valve clearances again.

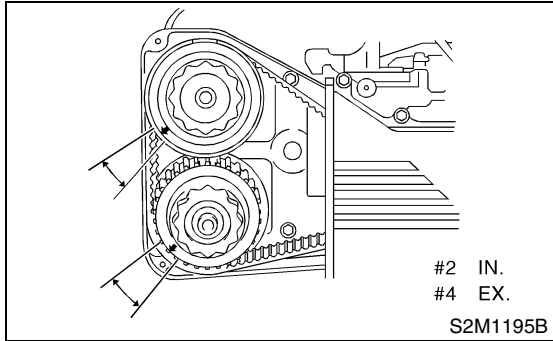
(1) Set the arrow mark on camshaft sprocket to position shown in the figure, and then measure the #2 cylinder exhaust valve and #3 cylinder intake valve clearances.



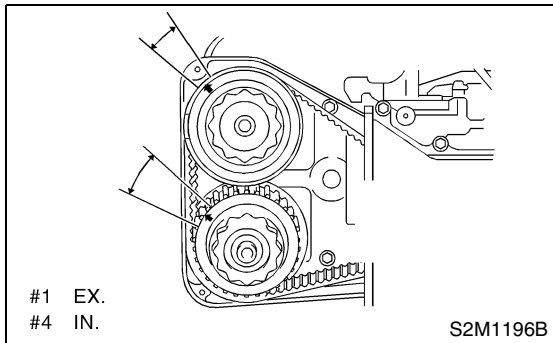
VALVE CLEARANCE

MECHANICAL

(2) Set the arrow mark on camshaft sprocket to position shown in the figure, and then measure the #2 cylinder intake valve and #4 cylinder exhaust valve clearances.



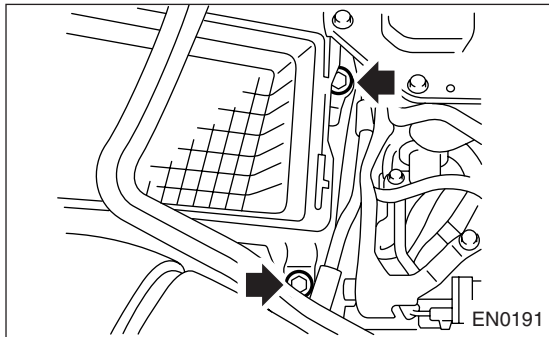
(3) Set the arrow mark on camshaft sprocket to position shown in the figure, and then measure the #1 cylinder exhaust valve and #4 cylinder intake valve clearances.



15) After inspection, install the related parts in the reverse order of removal.

Tightening torque:

32 N·m (3.3 kgf·m, 24 ft·lb)



B: ADJUSTMENT

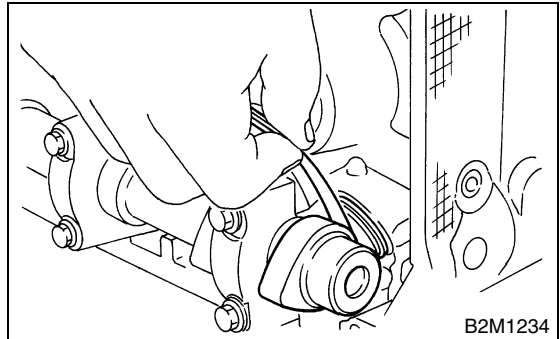
CAUTION:

Adjustment of the valve clearance should be performed while engine is cold.

1) Measure all valve clearances. <Ref. to ME(TURBO)-28, INSPECTION, Valve Clearance.>

NOTE:

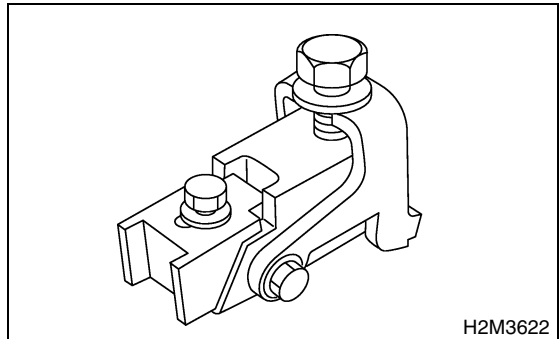
Record each valve clearance after it has been measured.



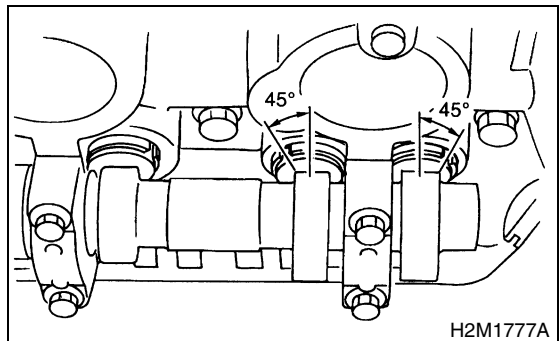
2) Remove the shim from valve lifter.

(1) Prepare the ST.

ST 498187200 SHIM REPLACER



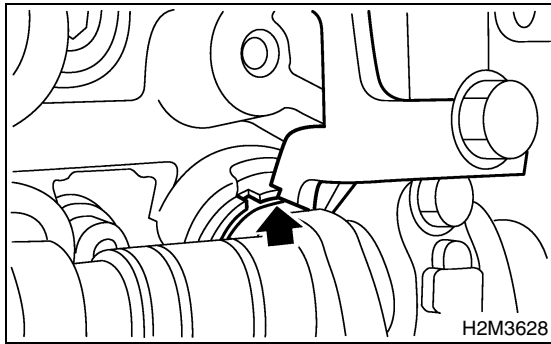
(2) Rotate the notch of the valve lifter outward by 45°.



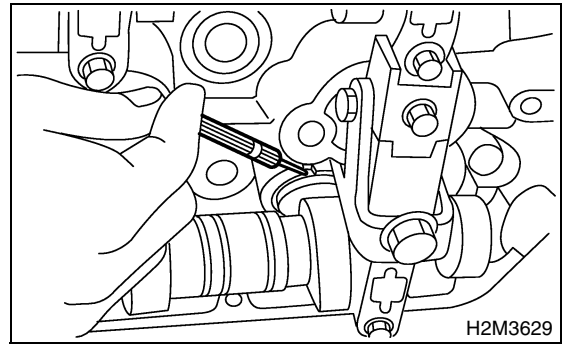
VALVE CLEARANCE

MECHANICAL

(3) Adjust the SHIM REPLACER notch to valve lifter and set it.



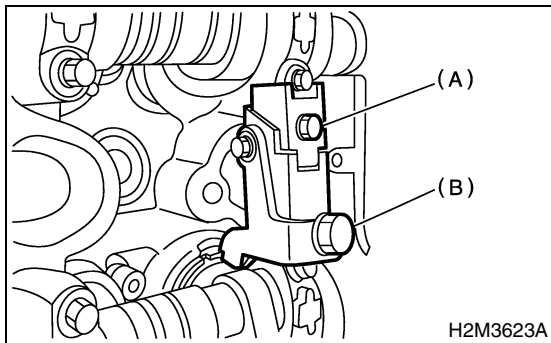
(6) Insert tweezers into the notch of valve lifter, and then take the shim out.



NOTE:

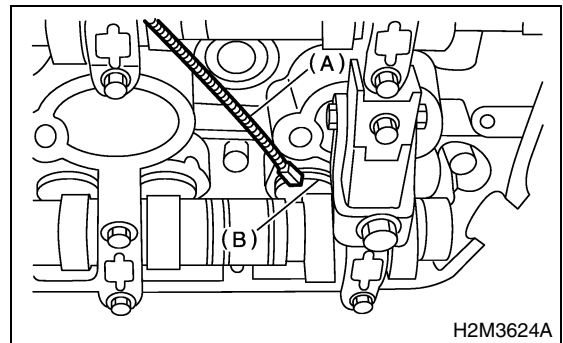
When setting, be careful the SHIM REPLACER edge does not touch shim.

- (4) Tighten the bolt (A), and then install it to the cylinder head.
- (5) Tighten the bolt (B), and then insert the valve lifter.

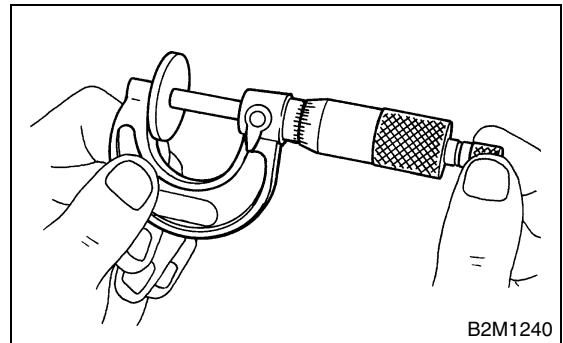


NOTE:

By using a magnet (A), the shim (B) can be taken out without dropping it.



3) Measure the thickness of shim with a micrometer.



- 4) Select a shim of suitable thickness using measured valve clearance and shim thickness, by referring to the following table.
- 5) Set the suitable shim selected in step 4) to valve lifter.

Unit: mm
Intake valve: $S = (V + T) - 0.20$ Exhaust valve: $S = (V + T) - 0.25$
S: 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 AE720	2.23 (0.0878)
13218 AE730	2.24 (0.0882)
13218 AE740	2.25 (0.0886)
13218 AE750	2.26 (0.0890)
13218 AE760	2.27 (0.0894)
13218 AE770	2.28 (0.0898)
13218 AE780	2.29 (0.0902)
13218 AE790	2.30 (0.0906)
13218 AE800	2.31 (0.0909)
13218 AE810	2.32 (0.0913)
13218 AE820	2.33 (0.0917)
13218 AE830	2.34 (0.0921)
13218 AE840	2.35 (0.0925)
13218 AE850	2.36 (0.0929)
13218 AE860	2.37 (0.0933)
13218 AE870	2.38 (0.0937)
13218 AE880	2.39 (0.0941)
13218 AE890	2.40 (0.0945)
13218 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 AF080	2.59 (0.1020)
13218 AF090	2.60 (0.1024)
13218 AF100	2.61 (0.1028)
13218 AF110	2.62 (0.1031)

Part No.	Thickness mm (in)
13218 AF120	2.63 (0.1035)
13218 AF130	2.64 (0.1039)
13218 AF140	2.65 (0.1043)
13218 AF150	2.66 (0.1047)
13218 AF160	2.67 (0.1051)
13218 AF170	2.68 (0.1055)
13218 AF180	2.69 (0.1059)
13218 AF190	2.70 (0.1063)
13218 AF200	2.71 (0.1067)
13218 AF210	2.72 (0.1071)
13218 AF220	2.73 (0.1075)
13218 AF230	2.74 (0.1079)
13218 AF240	2.75 (0.1083)
13218 AF250	2.76 (0.1087)
13218 AF260	2.77 (0.1091)
13218 AF270	2.78 (0.1094)
13218 AF280	2.79 (0.1098)
13218 AF290	2.80 (0.1102)
13218 AF300	2.81 (0.1106)
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)

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.

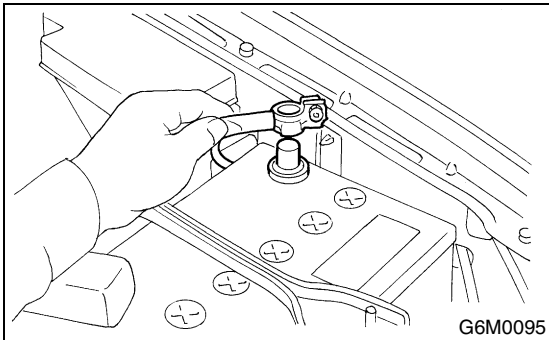
9. Engine Assembly

A: REMOVAL

- 1) Set the vehicle on lift arms.
- 2) Open the front hood fully, and then support with the hood stay.
- 3) Raise the rear seat, and then turn the floor mat up.
- 4) Release the fuel pressure.
 - (1) Disconnect the fuel pump relay connector.



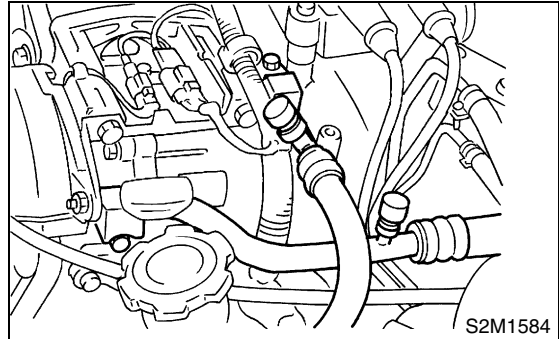
- (2) Start the engine, and run until stalls.
- (3) After the engine stalls, crank it for 5 seconds more.
- (4) Turn the ignition switch to OFF.
- 5) Remove the filler cap.
- 6) Disconnect the ground cable from battery.



- 7) Remove the radiator from vehicle. <Ref. to CO-39, REMOVAL, Radiator.>
- 8) Remove the coolant filler tank. <Ref. to CO-53, REMOVAL, Coolant Filler Tank.>

- 9) Collect refrigerant, and then remove the pressure hoses.

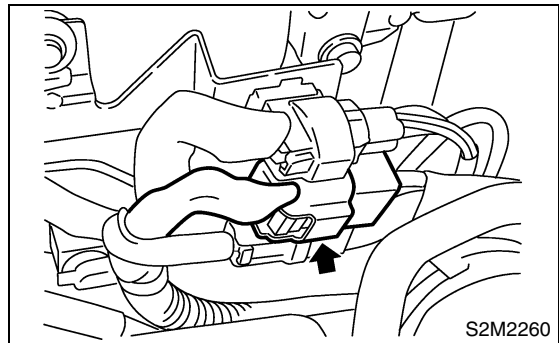
- (1) Place and connect the attachment hose to the refrigerant recycle system.
- (2) Collect the refrigerant from A/C system.
- (3) Disconnect the A/C pressure hoses from A/C compressor.



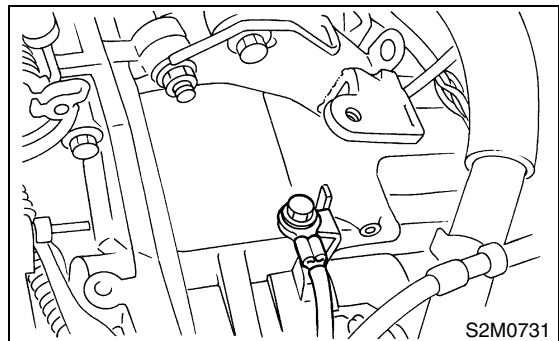
- 10) Remove the intercooler. <Ref. to IN(TURBO)-10, REMOVAL, Intercooler.>

- 11) Disconnect the following connectors and cable.

- (1) Engine harness connector



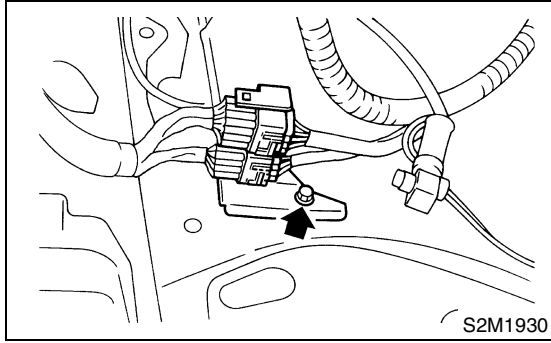
- (2) Engine ground terminal



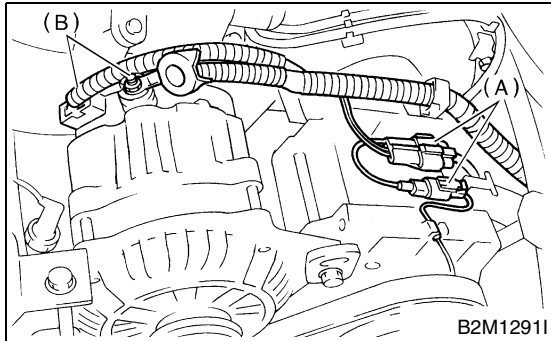
ENGINE ASSEMBLY

MECHANICAL

(3) Engine harness connector

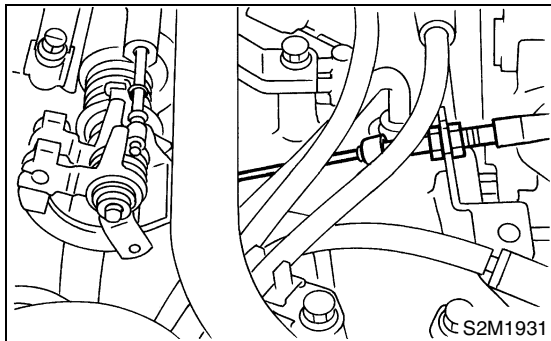


(4) Generator connector, terminal and A/C compressor connectors

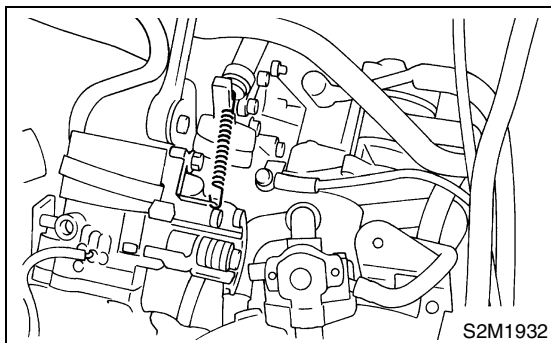


- (A) A/C compressor connector
- (B) Generator connector and terminal

(5) Accelerator cable

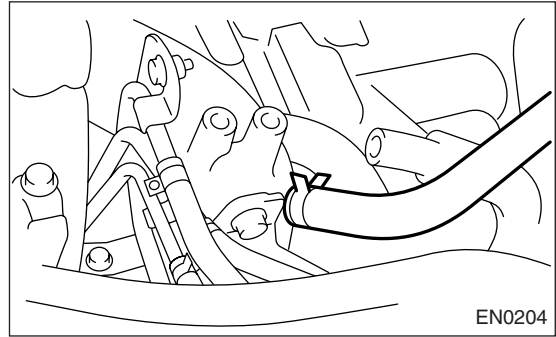


(6) Clutch release spring

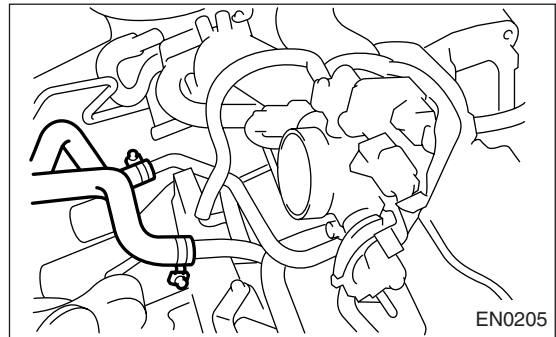


12) Disconnect the following hoses.

(1) Brake booster vacuum hose



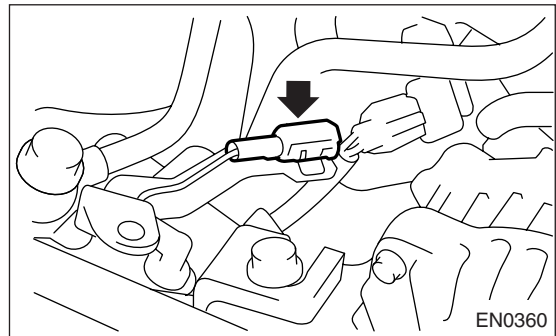
(2) Heater inlet outlet hose



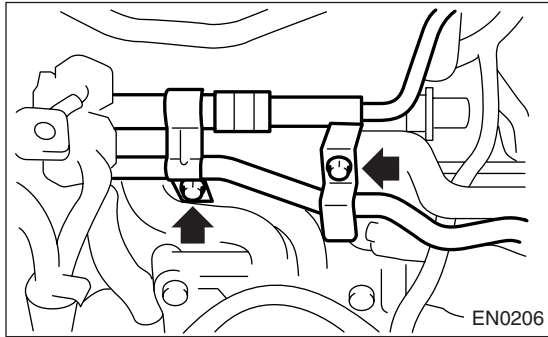
13) Remove the power steering pump from bracket.

(1) Loosen the lock bolt and slider bolt, and then remove the front side V-belt. <Ref. to ME(TURBO)-44, FRONT SIDE BELT, REMOVAL, V-belt.>

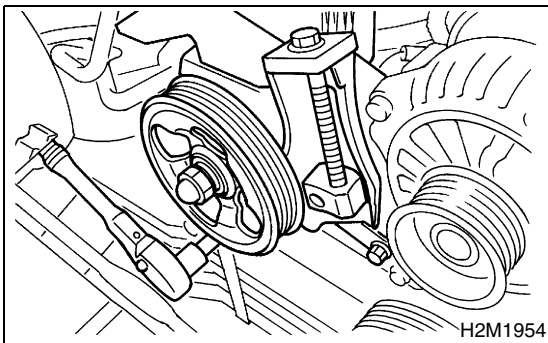
(2) Disconnect the power steering switch connector.



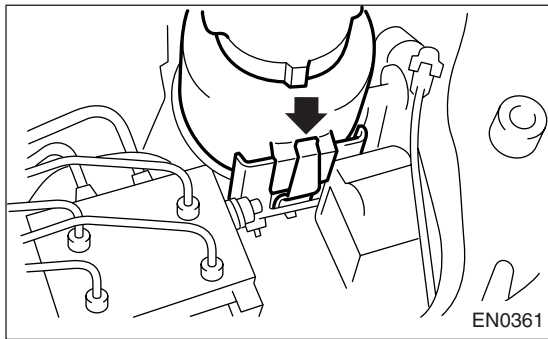
(3) Remove the pipe with bracket from intake manifold.



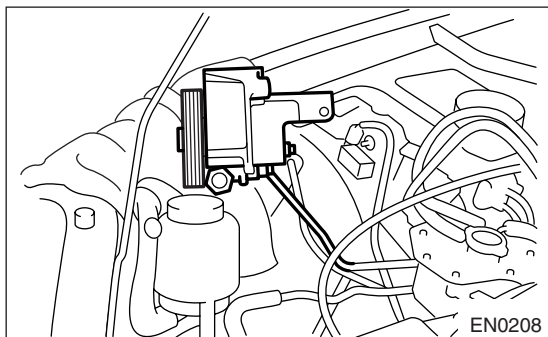
(4) Remove the power steering pump from engine.



(5) Remove the power steering tank from bracket by pulling it upward.

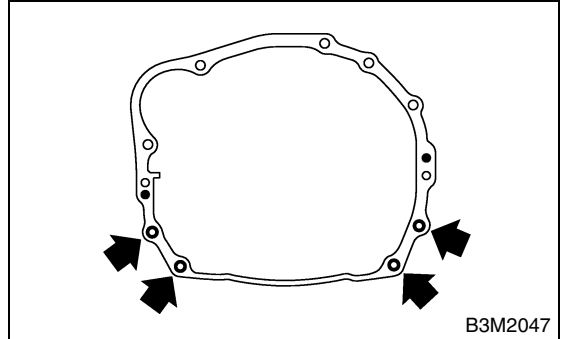


(6) Place the power steering pump on right side wheel apron.

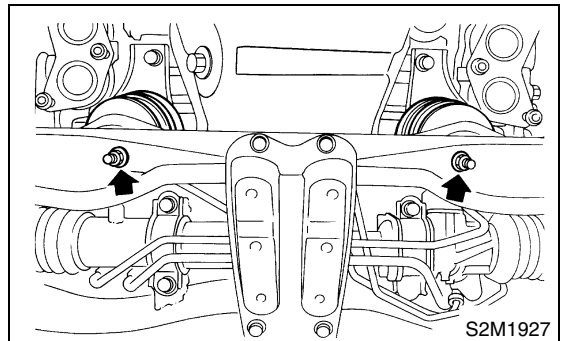


16) Remove the center exhaust pipe. <Ref. to EX(TURBO)-8, REMOVAL, Center Exhaust Pipe.>

17) Remove the nuts which hold lower side of transmission to engine.



18) Remove the nuts which install front cushion rubber onto front crossmember.

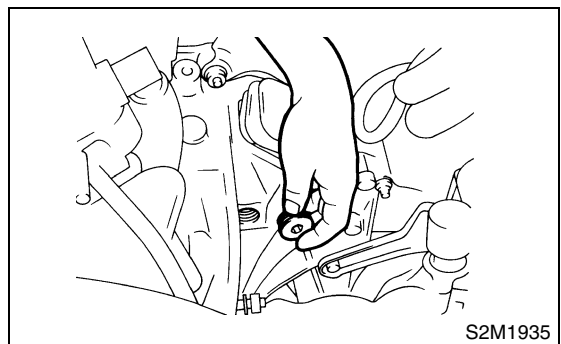


19) Lower the vehicle.

20) Separate the clutch release fork from release bearing. (MT vehicles)

(1) Remove the clutch operating cylinder from transmission.

(2) Remove the plug using a 10 mm hexagon wrench.



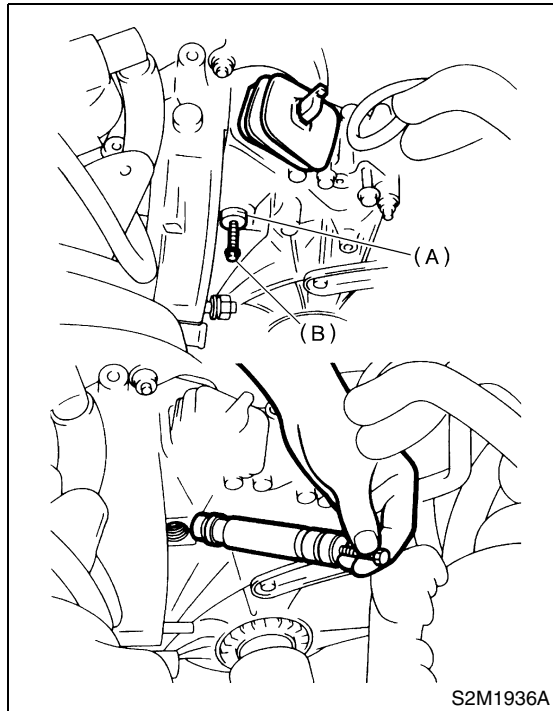
14) Lift-up the vehicle.

15) Remove the ATF cooler pipe from frame. (AT vehicles)

ENGINE ASSEMBLY

MECHANICAL

- (3) Screw the 6 mm dia. bolt into release fork shaft, and remove it.



- (A) Shaft
(B) Bolt

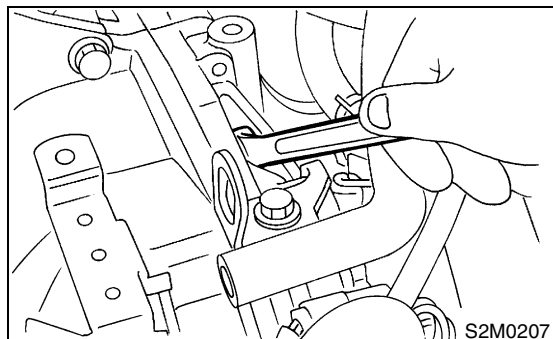
- (4) Raise the release fork, and then unfasten the release bearing tabs to free release fork.

CAUTION:
Step (4) is required to prevent interference with engine when removing the engine from transmission.

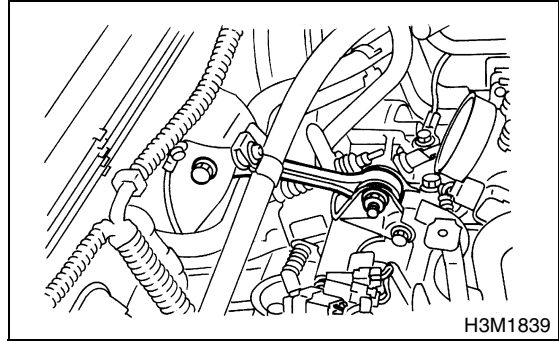
- 21) Separate the torque converter clutch from drive plate. (AT vehicles)

- (1) Lower the vehicle.
- (2) Remove the service hole plug.
- (3) Remove the bolts which hold torque converter clutch to drive plate.
- (4) Remove the other bolts while rotating the engine using ST.

ST 499977300 CRANK PULLEY WRENCH



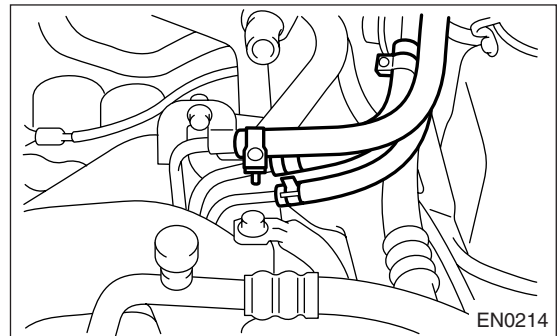
- 22) Remove the pitching stopper.



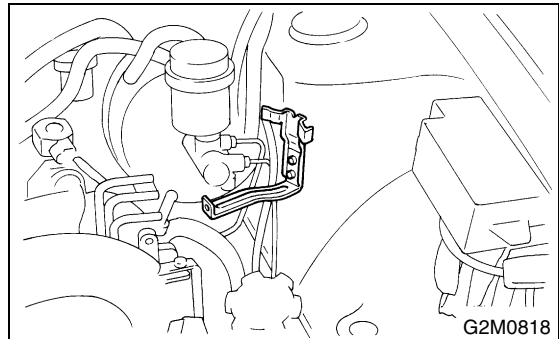
- 23) Disconnect the fuel delivery hose, return hose and evaporation hose.

CAUTION:

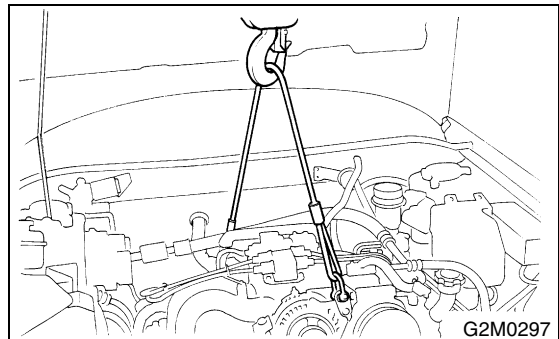
- Catch fuel from the hose into container.
- Disconnect the hose with its end wrapped with cloth to prevent fuel from splashing.



- 24) Remove the fuel filter and bracket.



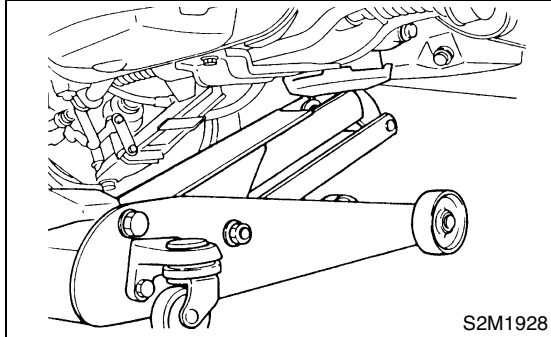
- 25) Support the engine with a lifting device and wire ropes.



26) Support the transmission with a garage jack.

CAUTION:

Before moving the engine away from transmission, check to be sure no work has been overlooked. Doing this is very important in order to facilitate re-installation and because transmission lowers under its own weight.



28) Remove the engine from vehicle.

- (1) Slightly raise the engine.
- (2) Raise the transmission with garage jack.
- (3) Move the engine horizontally until the mainshaft is withdrawn from clutch cover.
- (4) Slowly move the engine away from engine compartment.

CAUTION:

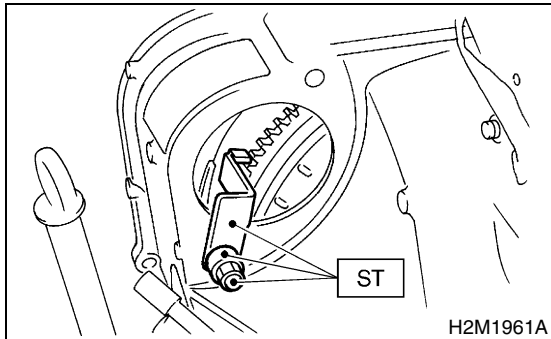
Be careful not to damage adjacent parts or body panels with crank pulley, oil pressure gauge, etc.

29) Remove the front cushion rubbers.

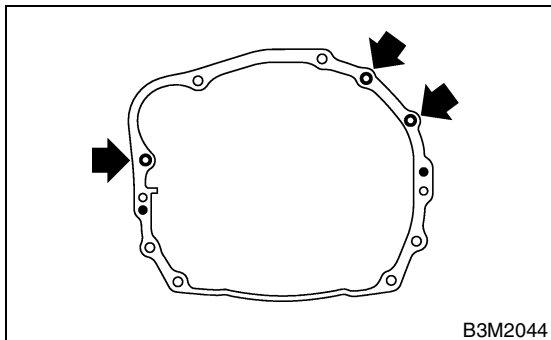
27) Separation of the engine and transmission.

- (1) Remove the starter. <Ref. to SC-5, REMOVAL, Starter.>
- (2) Install the ST to torque converter clutch case. (AT vehicles)

ST 498277200 STOPPER SET



(3) Remove the bolts which hold right upper side of transmission to engine.



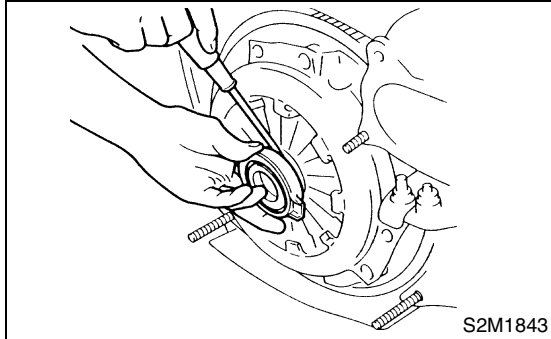
ENGINE ASSEMBLY

MECHANICAL

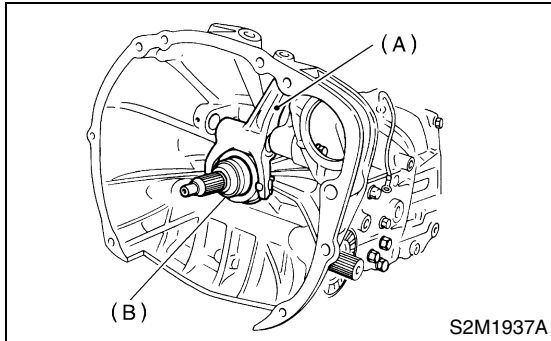
B: INSTALLATION

1) Install the clutch release fork and bearing onto transmission. (MT vehicles)

(1) Remove the release bearing from clutch cover with flat type screw driver.

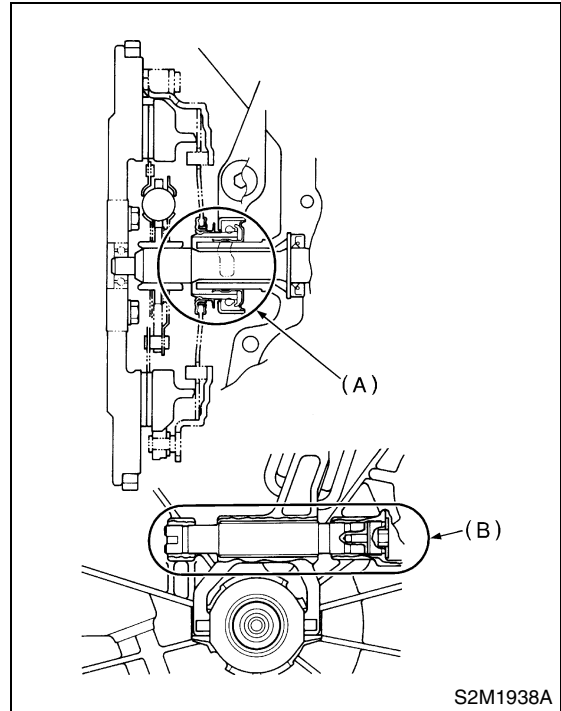


(2) Install the release bearing on transmission.
(3) Install the release fork into release bearing tab.



- (A) Release fork
- (B) Release bearing

- (4) Apply grease to the specified points.
- Spline FX2200
 - Shaft SUNLIGHT 2

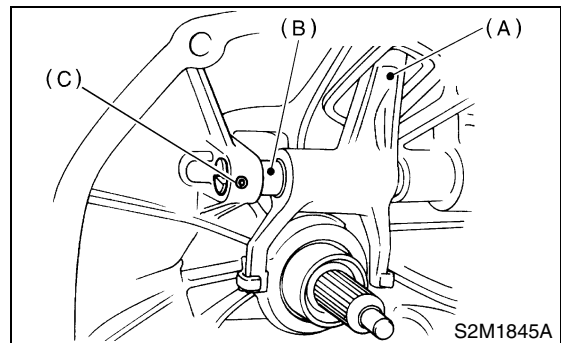


- (A) Spline (FX2200)
- (B) Shaft (SUNLIGHT 2)

(5) Insert the release fork shaft into release fork.

CAUTION:

Make sure the cutout portion of release fork shaft contacts spring pin.

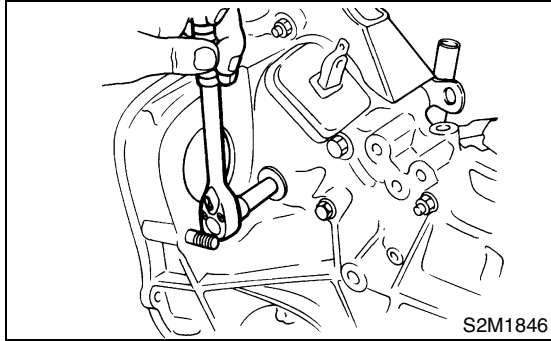


- (A) Release fork
- (B) Release shaft
- (C) Spring pin

(6) Tighten the plug.

Tightening torque:

44 N·m (4.5 kgf-m, 32.5 ft-lb)



2) Install the front cushion rubbers to engine.

Tightening torque:

34 N·m (3.5 kgf-m, 25.3 ft-lb)

3) Install the engine onto transmission.

(1) Position the engine in engine compartment, and then align it with the transmission.

CAUTION:

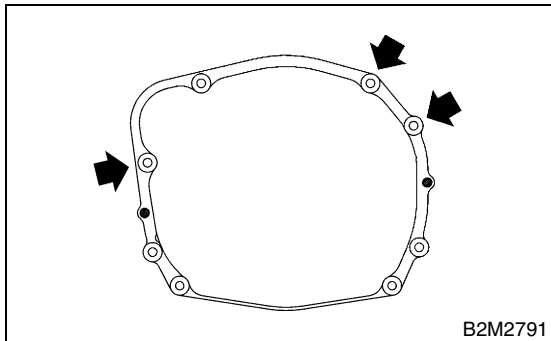
Be careful not to damage the adjacent parts or body panels with crank pulley, oil pressure gauge, etc.

(2) Apply a small amount of grease to the splines of mainshaft. (MT vehicles)

4) Tighten the bolts which hold right upper side of transmission to engine.

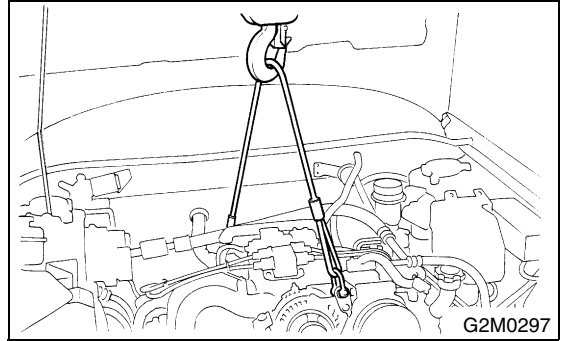
Tightening torque:

50 N·m (5.1 kgf-m, 36.9 ft-lb)



5) Remove the lifting device and wire ropes.

6) Remove the garage jack.

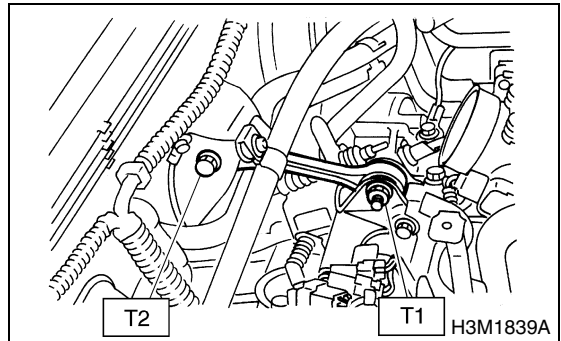


7) Install the pitching stopper.

Tightening torque:

T1: 50 N·m (5.1 kgf-m, 37 ft-lb)

T2: 58 N·m (5.9 kgf-m, 43 ft-lb)



8) Remove the ST from torque converter clutch case. (AT vehicles)

NOTE:

Be careful not to drop the ST into torque converter clutch case when removing ST.

ST 498277200 STOPPER SET

9) Install the starter. <Ref. to SC-6, INSTALLATION, Starter.>

ENGINE ASSEMBLY

MECHANICAL

10) Install the torque converter clutch onto drive plate. (AT vehicles)

- (1) Tighten the bolts which hold torque converter clutch to drive plate.
- (2) Tighten other bolts while rotating the engine by using ST.

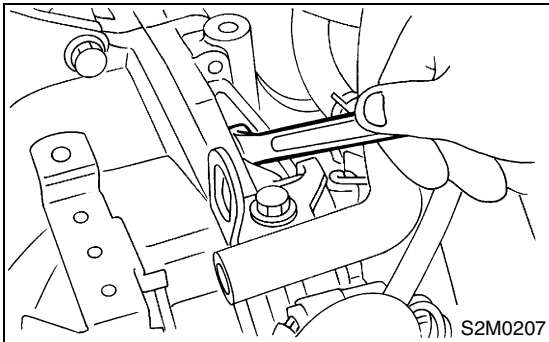
CAUTION:

Be careful not to drop bolts into the torque converter clutch housing.

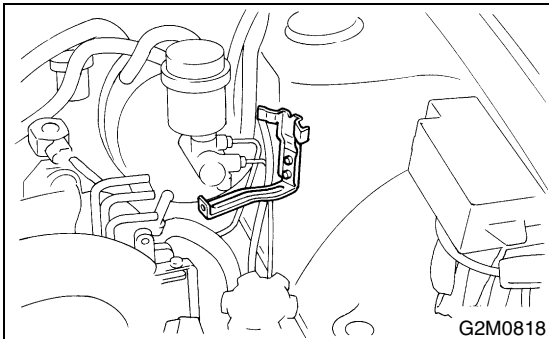
ST 499977300 CRANK PULLEY WRENCH

Tightening torque:

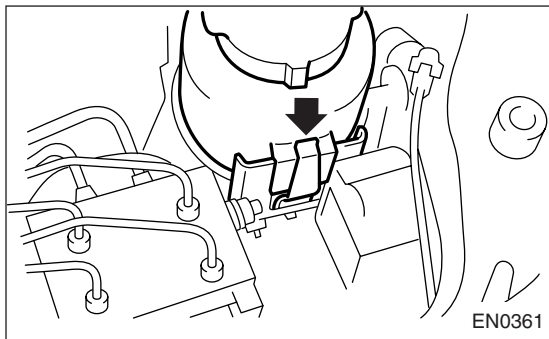
25 N-m (2.5 kgf-m, 18.1 ft-lb)



- (3) Clog the service hole with plug.
- 11) Install the fuel filter and bracket.



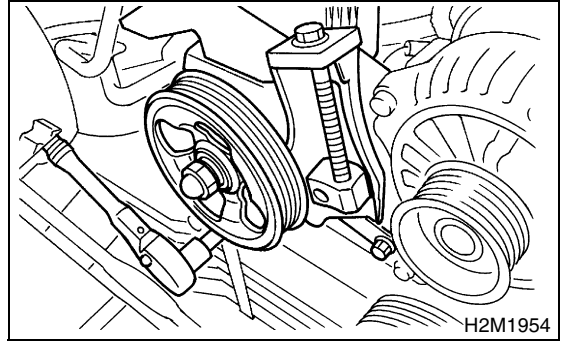
- 12) Install the power steering pump on bracket.
- (1) Install the power steering tank on bracket.



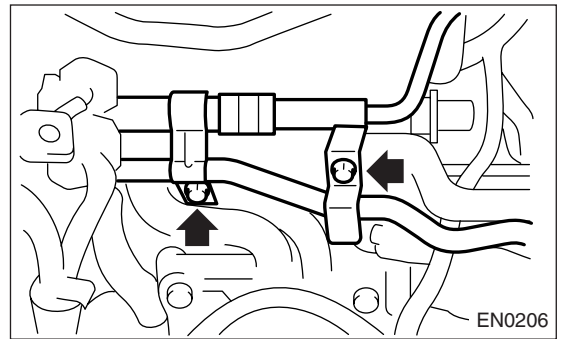
- (2) Install the power steering pump.

Tightening torque:

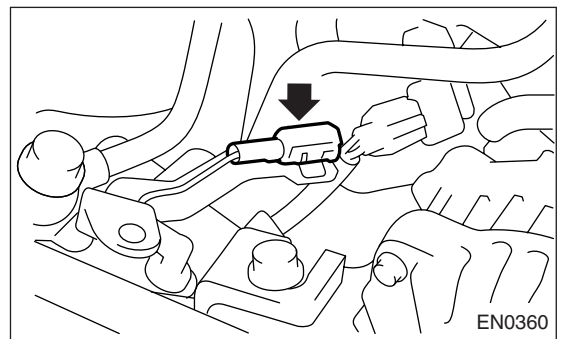
20.1 N-m (2.05 kgf-m, 14.8 ft-lb)



- (3) Install the power steering pipe bracket on right side intake manifold, and then install the spark plug cords.



- (4) Connect the power steering switch connector.



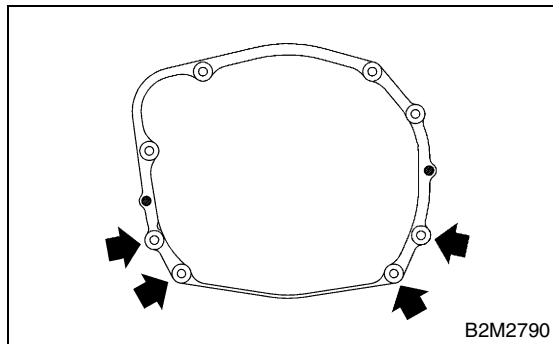
- (5) Install the front side V-belt, and adjust it. <Ref. to ME(TURBO)-45, FRONT SIDE BELT, INSTALLATION, V-belt.>

- 13) Lift-up the vehicle.

14) Tighten the nuts which hold lower side of transmission to engine.

Tightening torque:

50 N·m (5.1 kgf·m, 36.9 ft·lb)



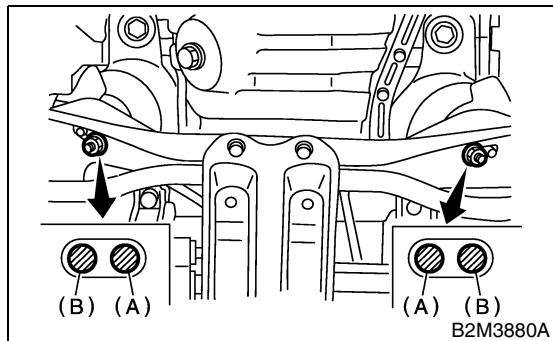
15) Tighten the nuts which install front cushion rubber onto crossmember.

Tightening torque:

83 N·m (8.5 kgf·m, 61 ft·lb)

CAUTION:

Make sure the front cushion rubber mounting bolts (A) and locator (B) are securely installed.



16) Install the ATF cooler pipe to frame. (AT vehicles)

17) Install the center exhaust pipe. <Ref. to EX(TURBO)-9, INSTALLATION, Center Exhaust Pipe.>

18) Lower the vehicle.

19) Connect the following hoses:

- (1) Fuel delivery hose, return hose and evaporation hose
- (2) Heater inlet and outlet hoses
- (3) Brake booster vacuum hose

20) Connect the following connectors and terminals:

- (1) Engine ground terminal
- (2) Engine harness connectors
- (3) Generator connector and terminal
- (4) A/C compressor connectors

21) Connect the following cables:

- (1) Accelerator cable
- (2) Clutch release spring

CAUTION:

After connecting each cable, adjust them.

22) Install the air intake system.

- (1) Install the intercooler. <Ref. to IN(TURBO)-11, INSTALLATION, Intercooler.>
- (2) Install the air cleaner element and air cleaner upper cover.
- (3) Install the engine harness connector bracket.
- (4) Install the filler hose to air cleaner case.

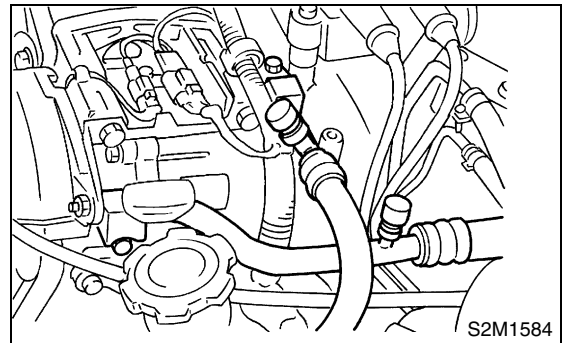
23) Install the A/C pressure hoses.

CAUTION:

Use new O-rings.

Tightening torque:

25 N·m (2.5 kgf·m, 18.1 ft·lb)



24) Install the radiator. <Ref. to CO-42, INSTALLATION, Radiator.>

25) Install the coolant filler tank. <Ref. to CO-53, INSTALLATION, Coolant Filler Tank.>

26) Install the window washer tank.

27) Install the battery in the vehicle, and connect cables.

28) Fill coolant.

<Ref. to CO-26, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

29) Charge the A/C system with refrigerant.

<Ref. to AC-22, OPERATION, Refrigerant Charging Procedure.>

30) Remove the front hood stay, and close the front hood.

31) Take off the vehicle from lift arms.

10.Engine Mounting

A: REMOVAL

- 1) Remove the engine assembly. <Ref. to ME(TURBO)-33, REMOVAL, Engine Assembly.>
- 2) Remove the engine mounting from engine assembly.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

Engine mounting;

34 N·m (3.5 kgf-m, 25.3 ft-lb)

C: INSPECTION

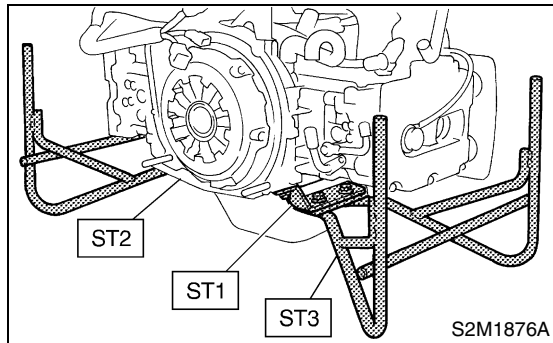
Make sure there are no cracks or other damage.

11.Preparation for Overhaul

A: PROCEDURE

1) After removing the engine from body, secure it in the ST shown below.

ST1	498457000	ENGINE STAND ADAPTER RH
ST2	498457100	ENGINE STAND ADAPTER LH
ST3	499817000	ENGINE STAND



2) In this section the procedures described under each index are all connected and stated in order. It will be the complete procedure for overhauling of the engine itself when you go through all steps in the process.

Therefore, in this section, to conduct the particular procedure within the flow of a section, you need to go back and conduct the procedure described previously in order to do that particular procedure.

V-BELT

MECHANICAL

12.V-belt

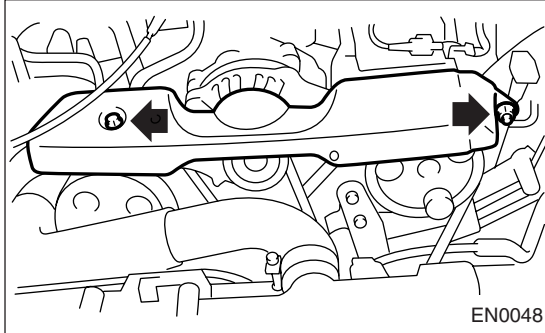
A: REMOVAL

1. FRONT SIDE BELT

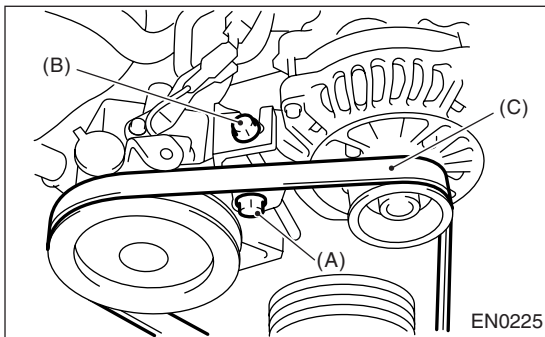
NOTE:

Perform the following procedures 1) to 4) with the engine installed to body.

1) Remove the V-belt cover.

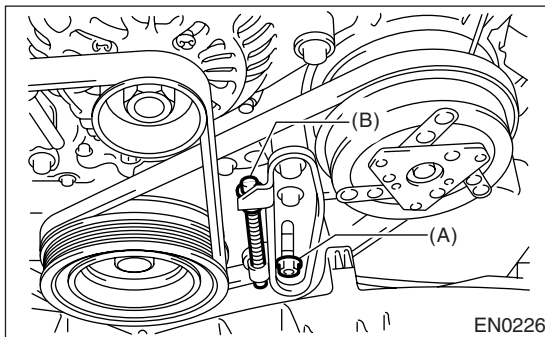


- 2) Loosen the lock bolt (A).
- 3) Loosen the slider bolt (B).
- 4) Remove the front side belt (C).



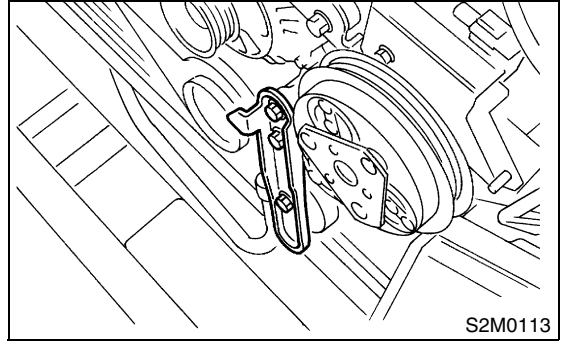
2. REAR SIDE BELT

- 1) Loosen the lock nut (A).
- 2) Loosen the slider bolt (B).



3) Remove the A/C belt.

4) Remove the A/C belt tensioner.



B: INSTALLATION

1. FRONT SIDE BELT

CAUTION:

Wipe off any oil or water on the belt and pulley.

- 1) Install the belt (C), and tighten the slider bolt so as to obtain the specified belt tension <Ref. to ME(TURBO)-45, INSPECTION, V-belt.>
- 2) Tighten the lock bolt (A)
- 3) Tighten the slider bolt (B).

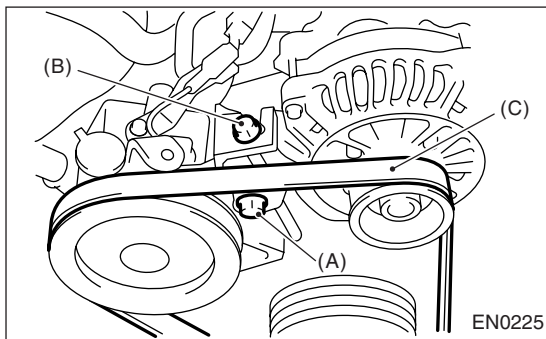
Tightening torque:

Lock bolt through bolt:

25 N·m (2.5 kgf·m, 18.1 ft·lb)

Slider bolt:

8 N·m (0.8 kgf·m, 5.5 ft·lb)



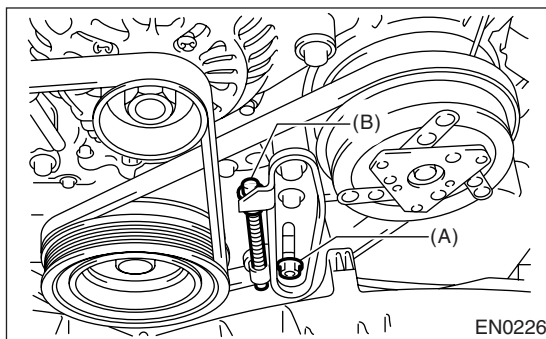
2. REAR SIDE BELT

- 1) Install the belt, and tighten the slider bolt (B) so as to obtain the specified belt tension. <Ref. to ME(TURBO)-45, INSPECTION, V-belt.>
- 2) Tighten the lock nut (A).

Tightening torque:

Lock nut (A);

22.6 N·m (2.3 kgf·m, 16.6 ft·lb)



C: INSPECTION

- 1) Replace the belts, if cracks, fraying or wear is found.
- 2) Check the drive belt tension and adjust it if necessary by changing generator installing position and/or idler pulley installing position.

Belt tension

(A)

replaced: 7 — 9 mm (0.276 — 0.354 in)

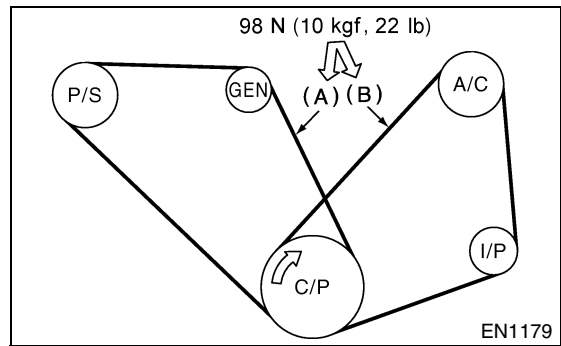
reused: 9 — 11 mm (0.354 — 0.433 in)

(B)*

replaced: 7.5 — 8.5 mm (0.295 — 0.335 in)

reused: 9.0 — 10.0 mm (0.354 — 0.394 in)

***: with air conditioner**



C/P Crankshaft pulley

GEN Generator

P/S Power steering oil pump pulley

A/C Air conditioning compressor pulley

I/P Idler pulley

CRANKSHAFT PULLEY

MECHANICAL

13. Crankshaft Pulley

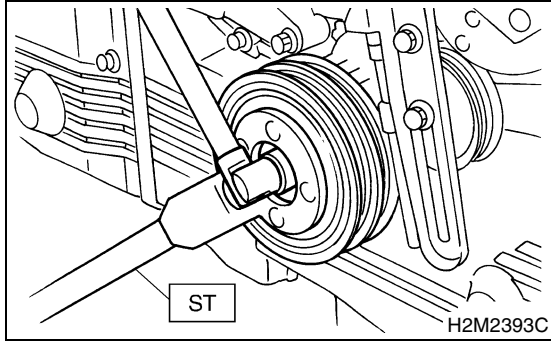
A: REMOVAL

1) Remove the V-belt. <Ref. to ME(TURBO)-44, REMOVAL, V-belt.>

2) Remove the crankshaft pulley bolt. To lock the crankshaft, use ST.

ST 499977300

CRANKSHAFT PULLEY WRENCH



3) Remove the crankshaft pulley.

B: INSTALLATION

1) Install the crankshaft pulley.

2) Install the pulley bolt.

To lock the crankshaft, use ST.

ST 499977300 CRANKSHAFT PULLEY WRENCH

(1) Clean the crankshaft pulley thread using an air gun.

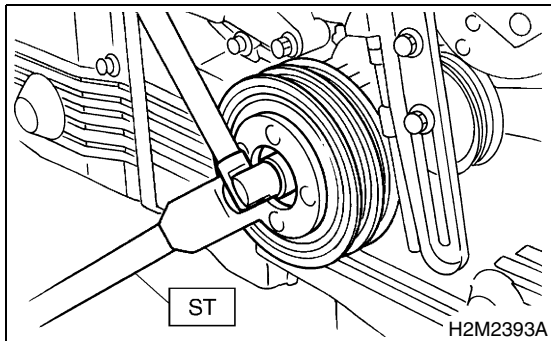
(2) Apply engine oil to the crankshaft pulley bolt seat and thread.

(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 kgf·m, 94.0 ft·lb)



3) Confirm that the tightening angle of crankshaft pulley bolt is 45 degrees or more. If not, conduct the following procedures (1) through (4).

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.

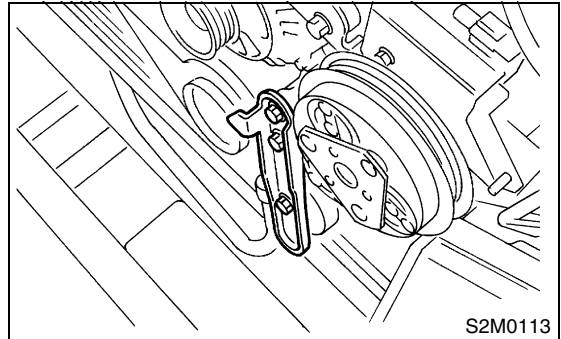
(3) Tighten the bolts temporarily with tightening torque of 44 N·m (4.5 kgf·m, 33 ft·lb).

(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 the A/C belt tensioner.



5) Install the V-belt. <Ref. to ME(TURBO)-45, INSTALLATION, V-belt.>

C: INSPECTION

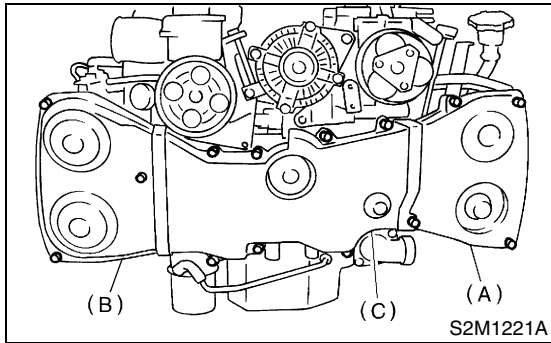
1) Make sure the V-belt is not worn or otherwise damaged.

2) Check the tension of the belt. <Ref. to ME(TURBO)-45, INSPECTION, V-belt.>

14. Belt Cover

A: REMOVAL

- 1) Remove the V-belt. <Ref. to ME(TURBO)-44, REMOVAL, V-belt.>
- 2) Remove the crankshaft pulley. <Ref. to ME(TURBO)-46, REMOVAL, Crankshaft Pulley.>
- 3) Remove the belt cover (LH) (A).
- 4) Remove the belt cover (RH) (B).
- 5) Remove the front belt cover (C).



B: INSTALLATION

- 1) Install the front belt cover (C).

Tightening torque:

5 N·m (0.5 kgf·m, 3.6 ft·lb)

- 2) Install the belt cover (RH) (B).

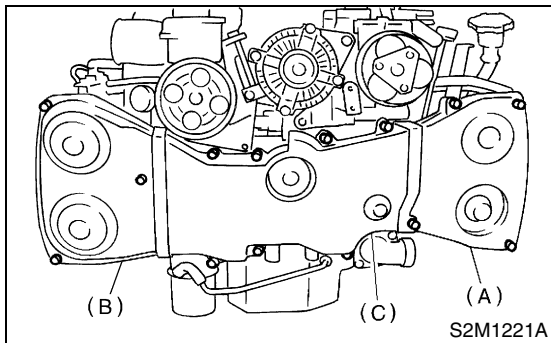
Tightening torque:

5 N·m (0.5 kgf·m, 3.6 ft·lb)

- 3) Install the belt cover (LH) (A).

Tightening torque:

5 N·m (0.5 kgf·m, 3.6 ft·lb)



- 4) Install the crankshaft pulley. <Ref. to ME(TURBO)-46, INSTALLATION, Crankshaft Pulley.>
- 5) Install the V-belt. <Ref. to ME(TURBO)-45, INSTALLATION, V-belt.>

C: INSPECTION

Make sure the cover is not damaged.

TIMING BELT ASSEMBLY

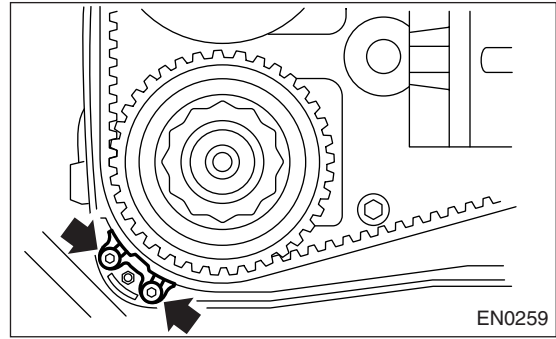
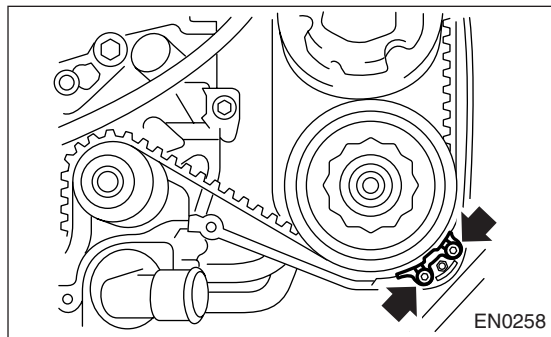
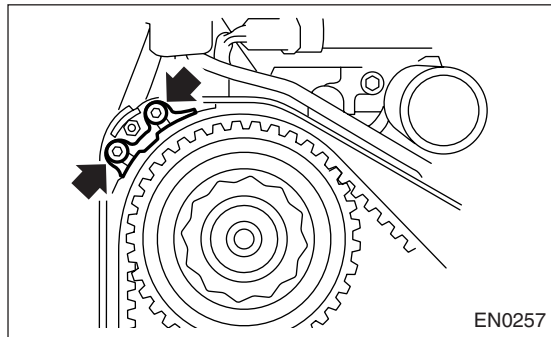
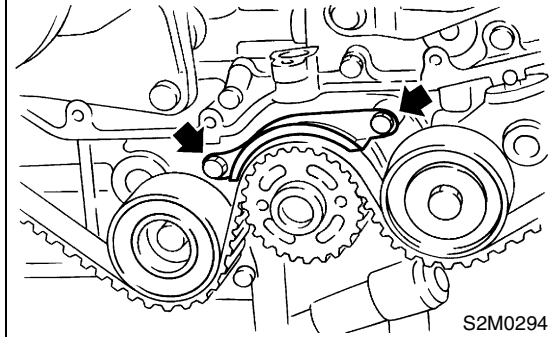
MECHANICAL

15. Timing Belt Assembly

A: REMOVAL

1. TIMING BELT

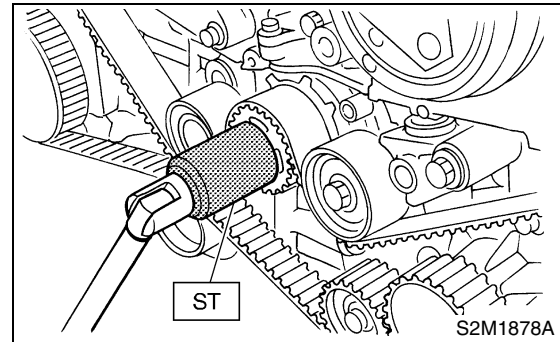
- 1) Remove the V-belt. <Ref. to ME(TURBO)-44, REMOVAL, V-belt.>
- 2) Remove the crankshaft pulley. <Ref. to ME(TURBO)-46, REMOVAL, Crankshaft Pulley.>
- 3) Remove the belt cover. <Ref. to ME(TURBO)-47, REMOVAL, Belt Cover.>
- 4) Remove the timing belt guides. (MT vehicles)



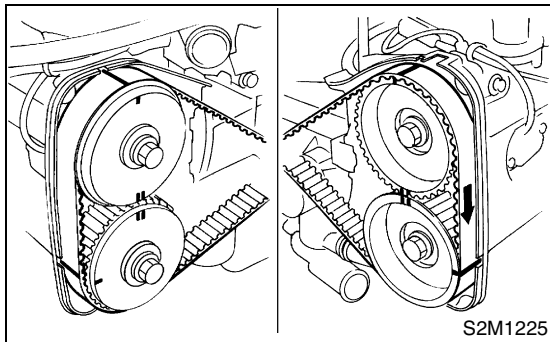
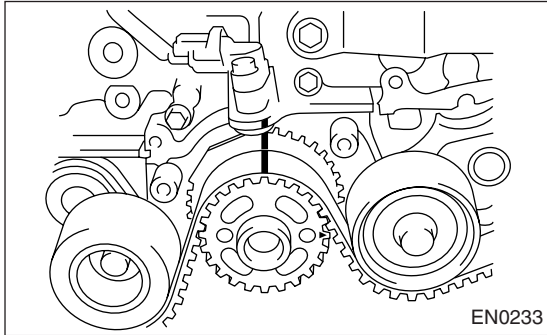
5) If the alignment mark and/or arrow mark (which indicates rotation direction) on timing belt fade away, put new marks before removing the timing belt as follows:

- (1) Turn the crankshaft using ST, and align the alignment marks on crankshaft sprocket, intake camshaft sprocket (LH), exhaust camshaft sprocket (LH), intake camshaft sprocket (RH) and exhaust camshaft sprocket (RH) with notches of belt cover and cylinder block.

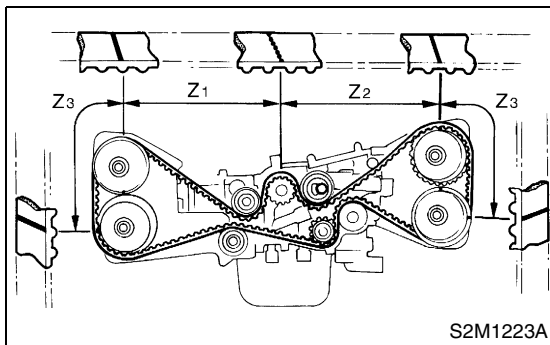
ST 499987500 CRANKSHAFT SOCKET



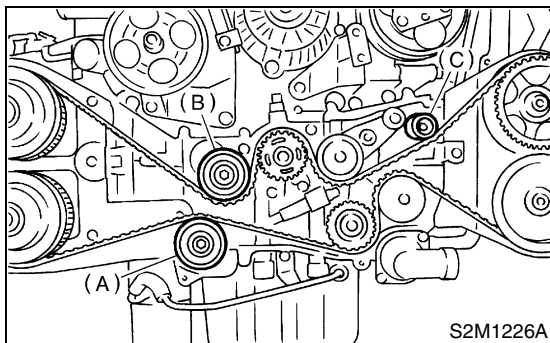
(2) Using white paint, put alignment and/or arrow marks on the timing belts in relation to the sprockets.



Z_1 : 54.5 tooth length
 Z_2 : 51 tooth length
 Z_3 : 28 tooth length



6) Remove the belt idler (A).



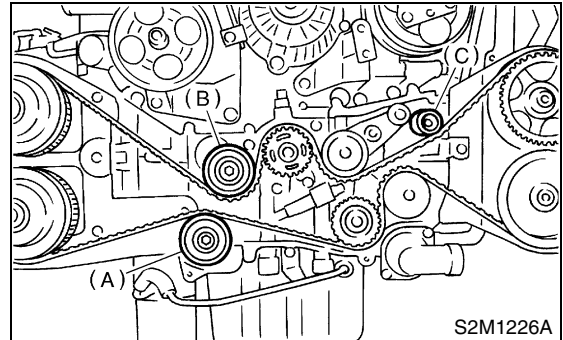
7) Remove the timing belt.

CAUTION:

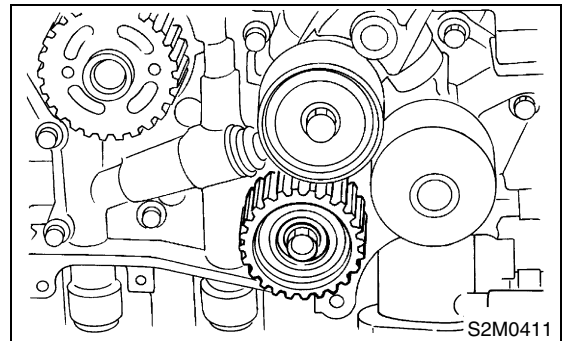
After the timing belt has been removed, never rotate the intake and exhaust, camshaft sprocket. If the camshaft sprocket is rotated, the intake and exhaust valve heads strike together and valve stems are bent.

2. BELT IDLER AND AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY

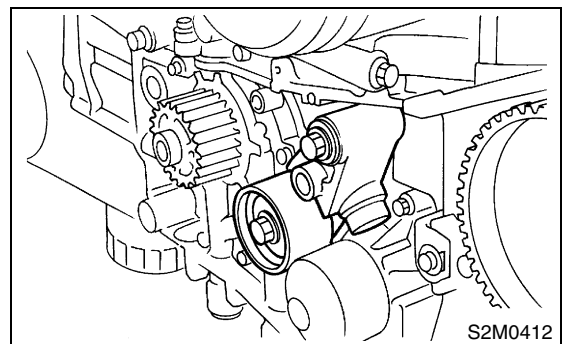
1) Remove the belt idler (B) and (C).



2) Remove the belt idler No. 2.



3) Remove the automatic belt tension adjuster assembly.



TIMING BELT ASSEMBLY

MECHANICAL

B: INSTALLATION

1. AUTOMATIC BELT TENSION ADJUST-ER ASSEMBLY AND BELT IDLER

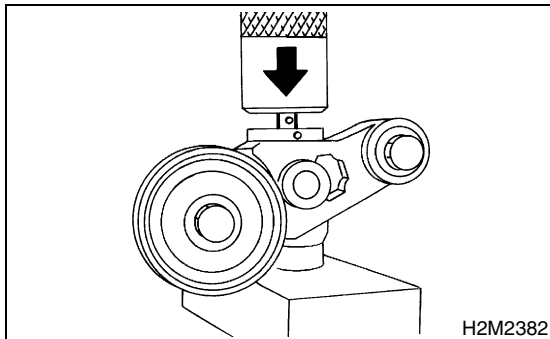
1) Preparation for installation of automatic belt tension adjuster assembly:

CAUTION:

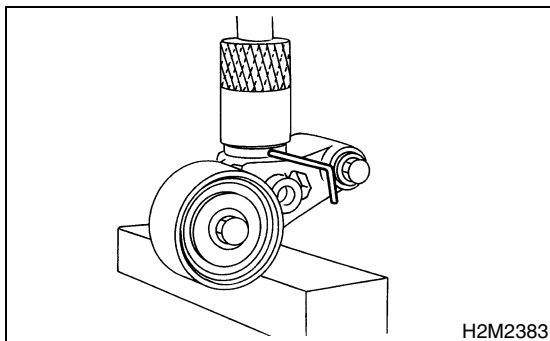
- Always use a vertical type pressing tool to move the adjuster rod down.
- Do not use a lateral type vise.
- Push the adjuster rod vertically.
- Be sure to slowly move the adjuster rod down applying a pressure of 294 N (30 kgf, 66 lb).
- Press-in the push adjuster rod gradually taking more than 3 minutes.
- Do not allow press pressure to exceed 9,807 N (1,000 kgf, 2,205 lb).
- Press the adjuster rod as far as the end surface of cylinder. Do not press the adjuster rod into the cylinder. Doing so may damage the cylinder.
- Do not release the press pressure until stopper pin is completely inserted.

(1) Attach the automatic belt tension adjuster assembly to the vertical pressing tool.

(2) Slowly move the adjuster rod down with a pressure of 294 N (30 kgf, 66 lb) until the adjuster rod is aligned with the stopper pin hole in the cylinder.



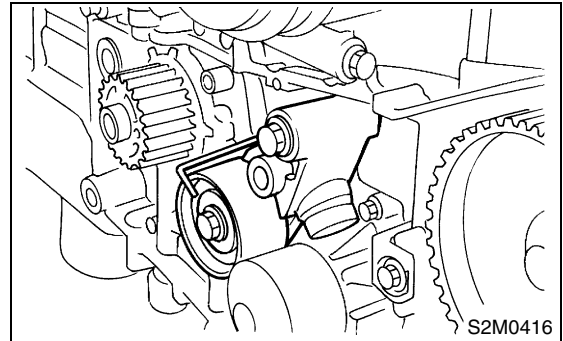
(3) With a 2 mm (0.08 in) dia. stopper pin or a 2 mm (0.08 in) (nominal) dia. hex bar wrench inserted into the stopper pin hole in the cylinder, secure the adjuster rod.



2) Install the automatic belt tension adjuster assembly.

Tightening torque:

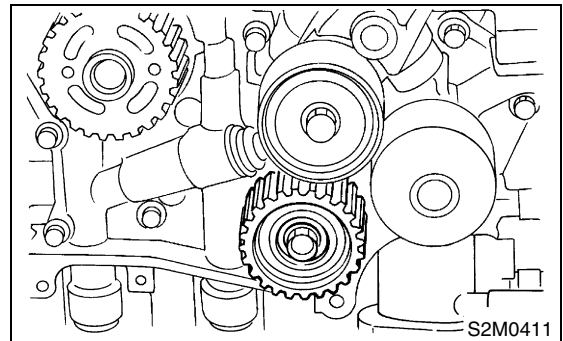
39 N·m (4.0 kgf·m, 28.9 ft·lb)



3) Install the belt idler No. 2.

Tightening torque:

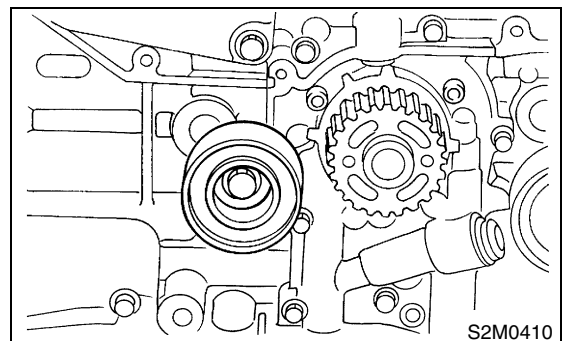
39 N·m (4.0 kgf·m, 28.9 ft·lb)



4) Install the belt idler.

Tightening torque:

39 N·m (4.0 kgf·m, 28.9 ft·lb)

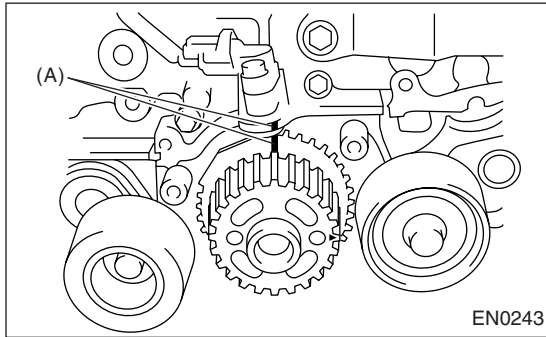


2. TIMING BELT

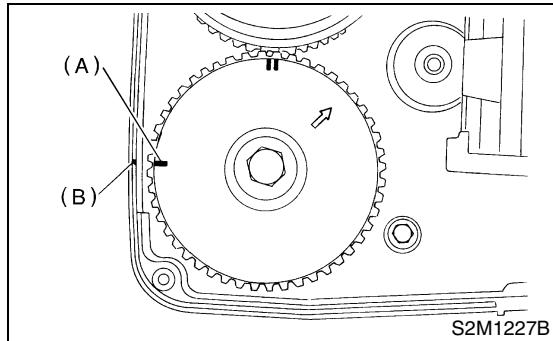
1) Preparation for installation of automatic belt tension adjuster assembly. <Ref. to ME(TURBO)-50, AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER, Timing Belt Assembly.>

2) Crankshaft and camshaft sprocket alignment.

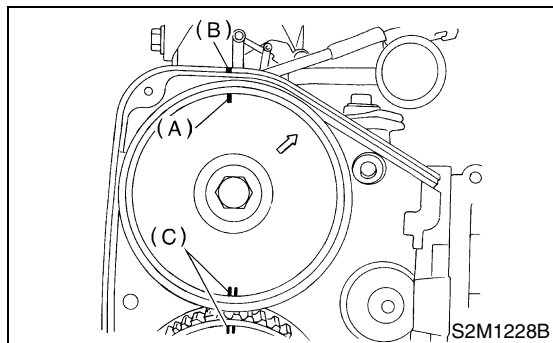
(1) Align mark (A) on the crankshaft sprocket with mark on the oil pump cover at cylinder block.



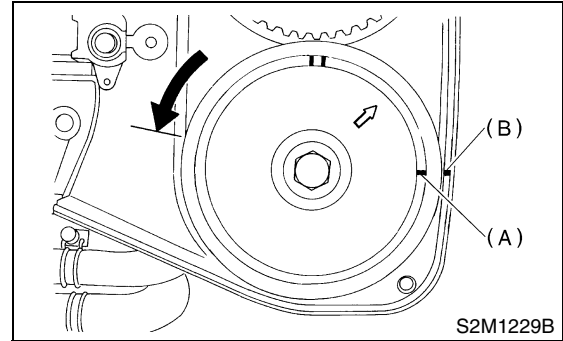
(2) Align single line mark (A) on the exhaust camshaft sprocket (RH) with notch (B) on belt cover.



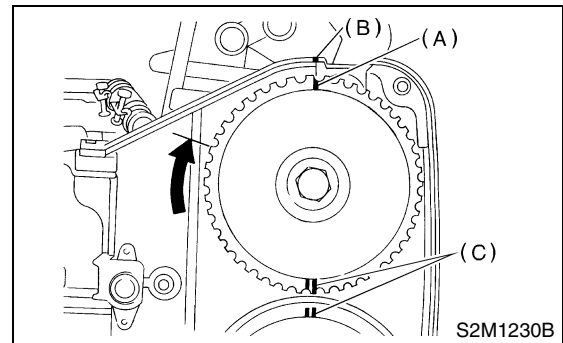
(3) Align single line mark (A) on the intake camshaft sprocket (RH) with notch (B) on belt cover. (Make sure double lines (C) on intake camshaft and exhaust camshaft sprockets are aligned.)



(4) Align single line mark (A) on exhaust camshaft sprocket (LH) with notch (B) on belt cover by turning the sprocket counterclockwise (as viewed from front of engine).



(5) Align the single line mark (A) on intake camshaft sprocket (LH) with notch (B) on belt cover by turning the sprocket clockwise (as viewed from front of engine). Ensure the double lines (C) on intake and exhaust camshaft sprockets are aligned.



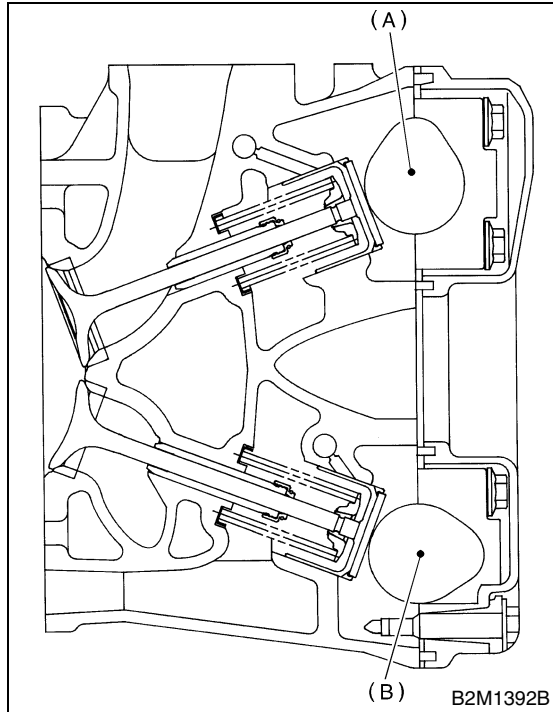
TIMING BELT ASSEMBLY

MECHANICAL

- (6) Ensure the camshaft and crankshaft sprockets are positioned properly.

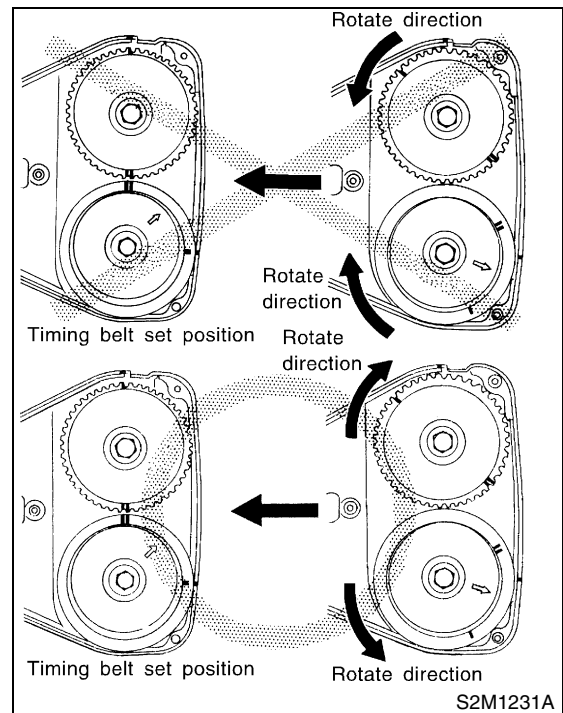
CAUTION:

• Intake and exhaust camshafts for this DOHC engine can be independently rotated with the timing belts removed. As can be seen from the figure, if the intake and exhaust valves are lifted simultaneously, their heads will interfere with each other, resulting in bent valves.

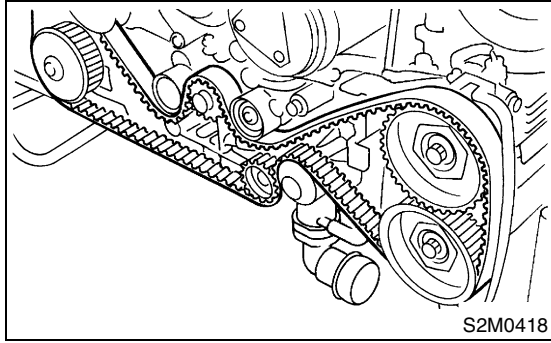


- (A) Intake camshaft
(B) Exhaust camshaft

- When the timing belts are not installed, four camshafts are held at the “zero-lift” position, where all cams on camshafts do not push the intake and exhaust valves down. (Under this condition, all valves remain unlifted.)
- When the camshafts are rotated to install the timing belts, #2 intake and #4 exhaust cam of left-hand camshafts are held to push their corresponding valves down. (Under this condition, these valves are held lifted.) Right-side camshafts are held so that their cams do not push valves down.
- Left-hand camshafts must be rotated from the “zero-lift” position to the position where the timing belt is to be installed at as small an angle as possible, in order to prevent mutual interference of intake and exhaust valve heads.
- Do not allow the camshafts to rotate in the direction shown in the figure as this causes both intake and exhaust valves to lift simultaneously, resulting in interference with their heads.



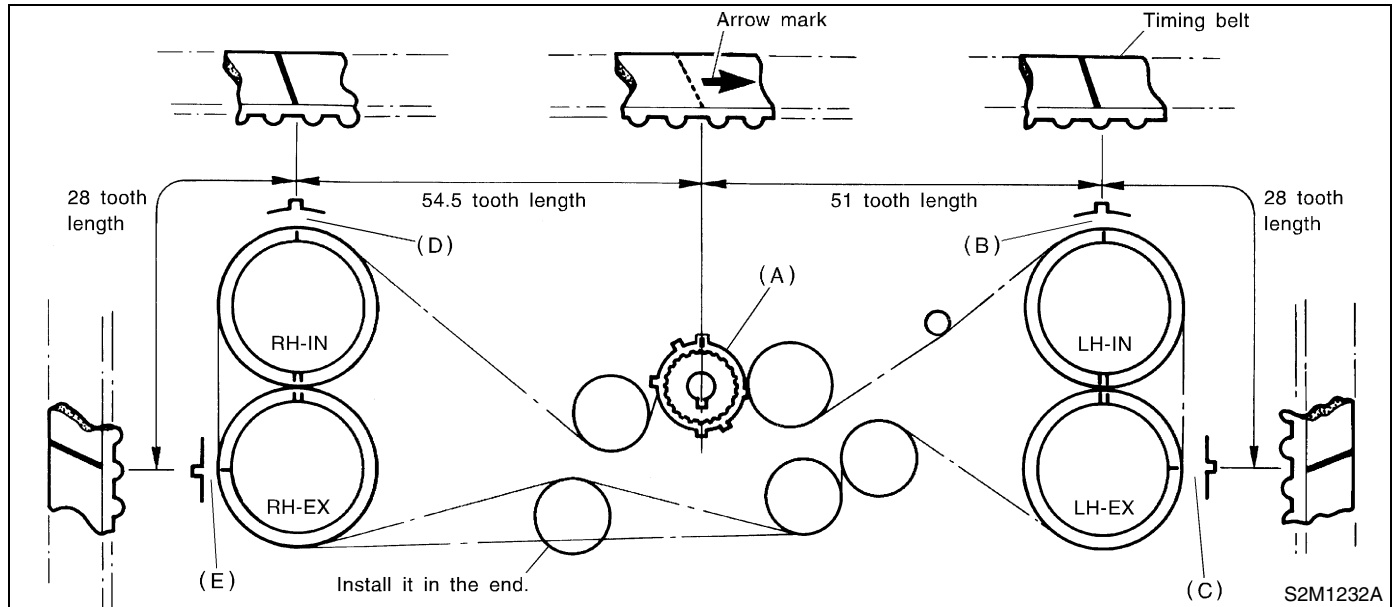
3) Installation of timing belt:



Align the alignment mark on timing belt with marks on sprockets in alphabetical order shown in the figure. While aligning marks, position the timing belt properly.

CAUTION:

- Disengagement of more than three timing belt teeth may result in interference between the valve and piston.
- Ensure the belt's rotating direction is correct.



TIMING BELT ASSEMBLY

MECHANICAL

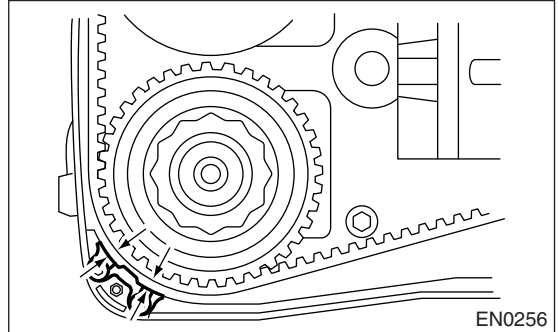
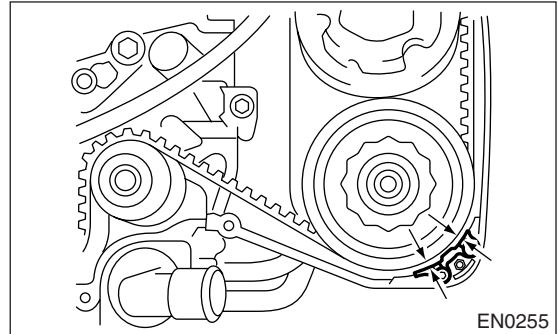
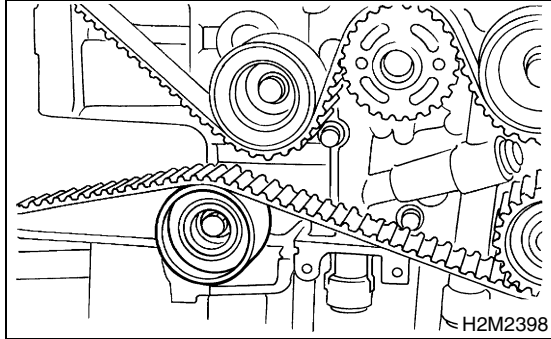
4) Install the belt idlers.

Tightening torque:

39 N·m (4.0 kgf·m, 28.9 ft·lb)

CAUTION:

Make sure that the marks on the timing belt and sprockets are aligned.



5) After ensuring that the marks on the timing belt and sprockets are aligned, remove the stopper pin from tensioner adjuster.

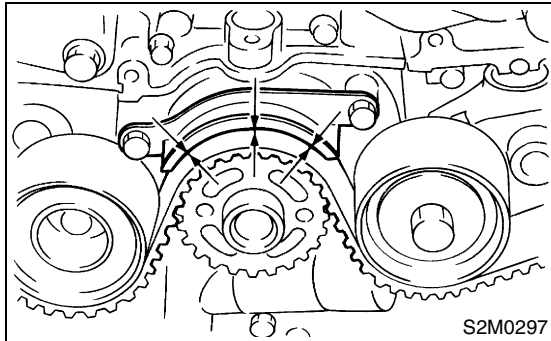
6) Install the timing belt guide. (MT vehicles)

(1) Temporarily tighten the remaining bolts.

(2) Check and adjust the clearance between timing belt and timing belt guide.

Clearance:

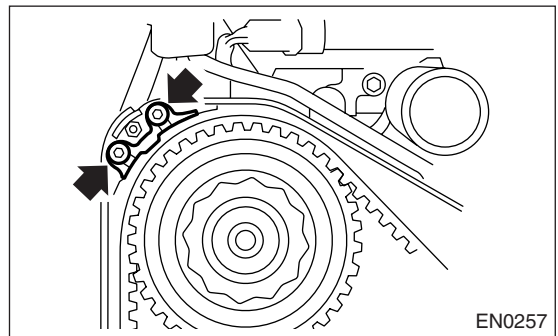
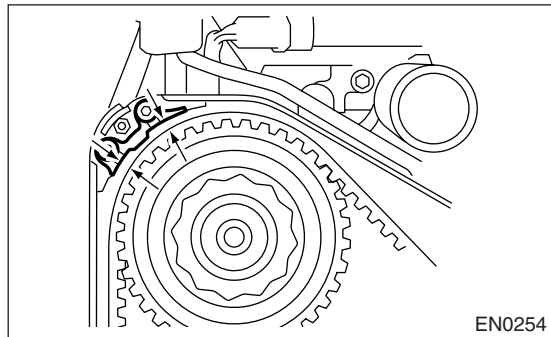
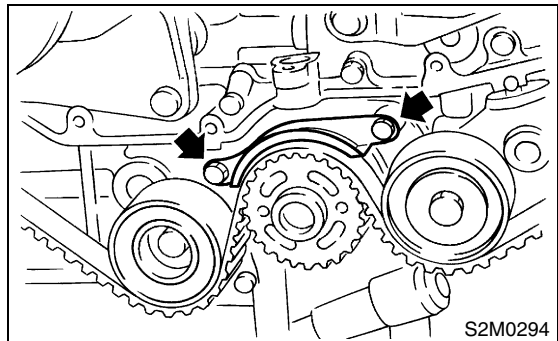
1.0±0.5 mm (0.039±0.020 in)

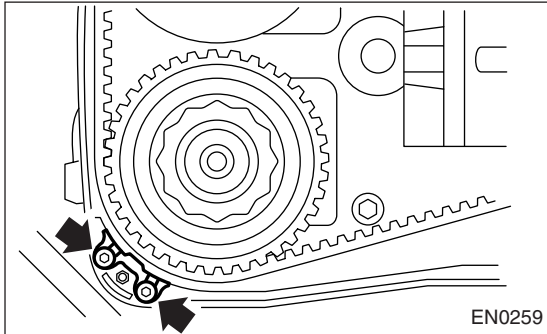
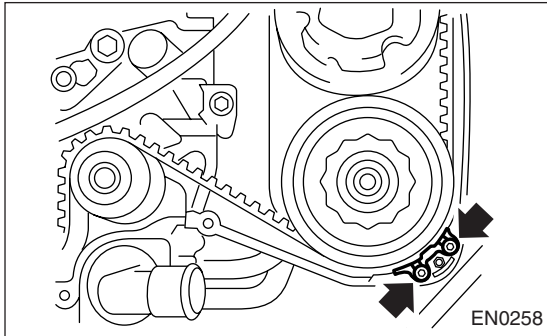


(3) Tighten the remaining bolts.

Tightening torque:

10 N·m (1.0 kgf·m, 7.2 ft·lb)





- 7) Install the belt cover. <Ref. to ME(TURBO)-47, INSTALLATION, Belt Cover.>
- 8) Install the crankshaft pulley. <Ref. to ME(TURBO)-46, REMOVAL, Crankshaft Pulley.>
- 9) Install the V-belt. <Ref. to ME(TURBO)-45, INSTALLATION, V-belt.>

C: INSPECTION

1. TIMING BELT

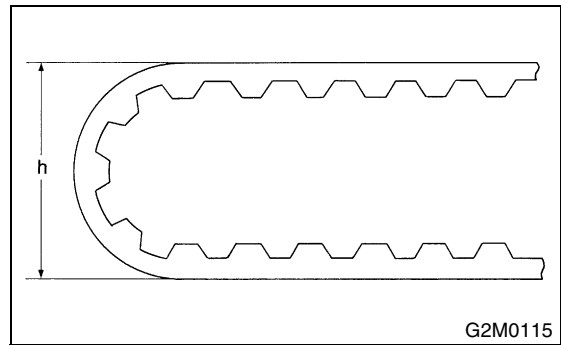
- 1) Check the timing belt teeth for breaks, cracks, and wear. If any fault is found, replace the belt.
- 2) Check the condition of back side of belt; if any crack is found, replace the belt.

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 the oil seals for leaks, and rod ends for abnormal wear or scratches. If necessary, replace the 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.

TIMING BELT ASSEMBLY

MECHANICAL

3) If the adjuster rod is not stiff and moves freely when applying 294 N (30 kgf, 66 lb), check it using the following procedures:

- (1) Slowly press the adjuster rod down to the end surface of the cylinder. Repeat this motion 2 or 3 times.
- (2) With the adjuster rod moved all the way up, apply a pressure of 294 N (30 kgf, 66 lb) to it. Check the adjuster rod stiffness.
- (3) If the the adjuster rod is not stiff and moves down, replace the automatic belt tension adjuster assembly with a new one.

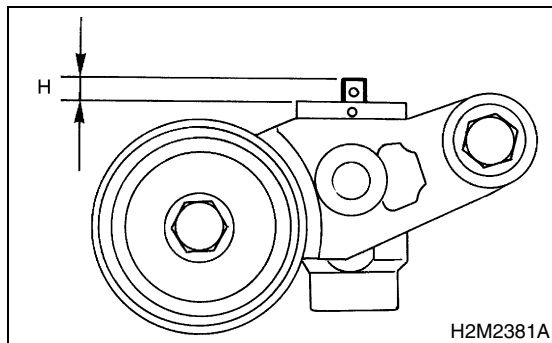
CAUTION:

- Always use a vertical type pressing tool to move the adjuster rod down.
- Do not use a lateral type vise.
- Push the adjuster rod vertically.
- Press-in the push adjuster rod gradually taking more than 3 minutes.
- Do not allow press pressure to exceed 9,807 N (1,000 kgf, 2,205 lb).
- Press the adjuster rod as far as the end surface of the cylinder. Do not press the adjuster rod into the cylinder. Doing so may damage the cylinder.

4) Measure the extension of rod beyond the body. If it is not within specifications, replace with a new one.

Rod extension: H

5.7 ± 0.5 mm (0.224 ± 0.020 in)



3. BELT TENSION PULLEY

- 1) Check the mating surfaces of timing belt and contact point of adjuster rod for abnormal wear or scratches. Replace the belt tension pulley if faulty.
- 2) Check the belt tension pulley for smooth rotation. Replace if noise or excessive play is noted.
- 3) Check the belt tension pulley for grease leakage.

4. BELT IDLER

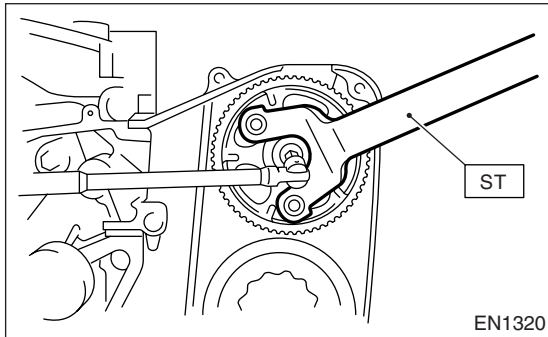
- 1) Check the idler for smooth rotation. Replace if noise or excessive play is noted.
- 2) Check the outer contacting surfaces of idler pulley for abnormal wear and scratches.
- 3) Check the idler for grease leakage.

16. Camshaft Sprocket

A: REMOVAL

- 1) Remove the V-belt. <Ref. to ME(TURBO)-44, REMOVAL, V-belt.>
- 2) Remove the crankshaft pulley. <Ref. to ME(TURBO)-46, REMOVAL, Crankshaft Pulley.>
- 3) Remove the belt cover. <Ref. to ME(TURBO)-47, REMOVAL, Belt Cover.>
- 4) Remove the timing belt assembly. <Ref. to ME(TURBO)-48, REMOVAL, Timing Belt Assembly.>
- 5) Remove the camshaft position sensor. <Ref. to FU(TURBO)-31, REMOVAL, Camshaft Position Sensor.>
- 6) Remove the camshaft sprockets. To lock the camshaft, use ST.

- | | |
|---------------|--|
| ST 18231AA010 | CAMSHAFT SPROCKET
WRENCH (Intake LH) |
| ST 499207400 | CAMSHAFT SPROCKET
WRENCH (Except Intake LH) |



B: INSTALLATION

- 1) Install the camshaft sprocket No. 1. and No. 2. To lock the camshaft, use ST.

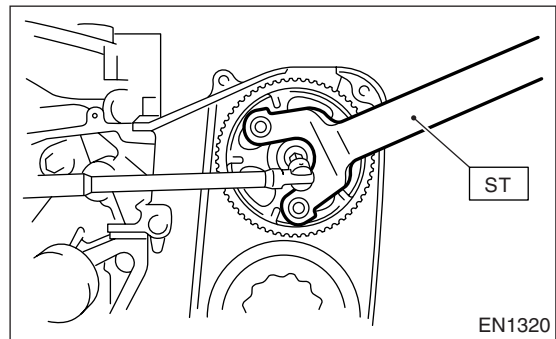
- | | |
|---------------|--|
| ST 18231AA010 | CAMSHAFT SPROCKET
WRENCH (Intake LH) |
| ST 499207400 | CAMSHAFT SPROCKET
WRENCH (Except Intake LH) |

Tightening torque:

98 N·m (10 kgf·m, 72.4 ft·lb)

CAUTION:

Do not confuse the right and left side camshaft sprockets during installation. The camshaft sprocket No. 2 is identified by a projection used to monitor camshaft position sensor.



- 2) Install the camshaft position sensor. <Ref. to FU(TURBO)-31, INSTALLATION, Camshaft Position Sensor.>
- 3) Install the timing belt assembly. <Ref. to ME(TURBO)-50, INSTALLATION, Timing Belt Assembly.>
- 4) Install the belt cover. <Ref. to ME(TURBO)-47, INSTALLATION, Belt Cover.>
- 5) Install the crankshaft pulley. <Ref. to ME(TURBO)-46, INSTALLATION, Crankshaft Pulley.>
- 6) Install the V-belt. <Ref. to ME(TURBO)-45, INSTALLATION, V-belt.>

C: INSPECTION

- 1) Check the sprocket teeth for abnormal wear and scratches.
- 2) Make sure there is no free play between sprocket and key.
- 3) Check the crankshaft sprocket notch used for sensor for damage and contamination of foreign matter.

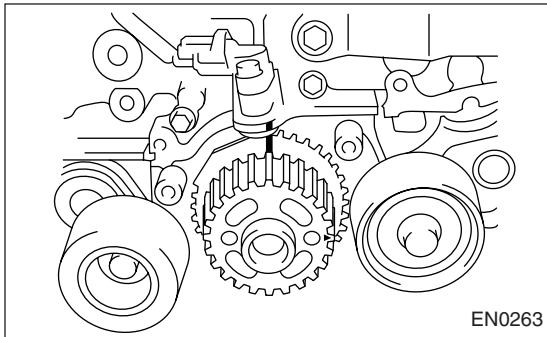
CRANKSHAFT SPROCKET

MECHANICAL

17. Crankshaft Sprocket

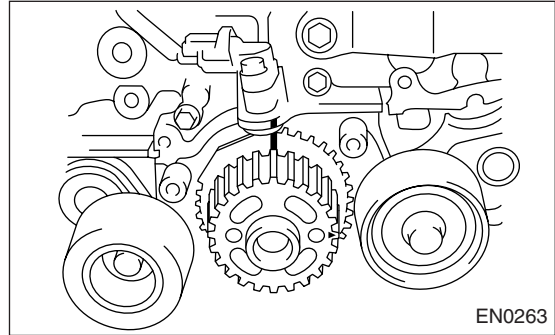
A: REMOVAL

- 1) Remove the V-belt. <Ref. to ME(TURBO)-44, REMOVAL, V-belt.>
- 2) Remove the crankshaft pulley. <Ref. to ME(TURBO)-46, REMOVAL, Crankshaft Pulley.>
- 3) Remove the belt cover. <Ref. to ME(TURBO)-47, REMOVAL, Belt Cover.>
- 4) Remove the timing belt assembly. <Ref. to ME(TURBO)-48, REMOVAL, Timing Belt Assembly.>
- 5) Remove the camshaft sprocket. <Ref. to ME(TURBO)-57, REMOVAL, Camshaft Sprocket.>
- 6) Remove the crankshaft sprocket.



B: INSTALLATION

- 1) Install the crankshaft sprocket.



- 2) Install the camshaft sprocket. <Ref. to ME(TURBO)-57, INSTALLATION, Camshaft Sprocket.>
- 3) Install the timing belt assembly. <Ref. to ME(TURBO)-50, INSTALLATION, Timing Belt Assembly.>
- 4) Install the belt cover. <Ref. to ME(TURBO)-47, INSTALLATION, Belt Cover.>
- 5) Install the crankshaft pulley. <Ref. to ME(TURBO)-46, INSTALLATION, Crankshaft Pulley.>
- 6) Install the V-belt. <Ref. to ME(TURBO)-45, INSTALLATION, V-belt.>

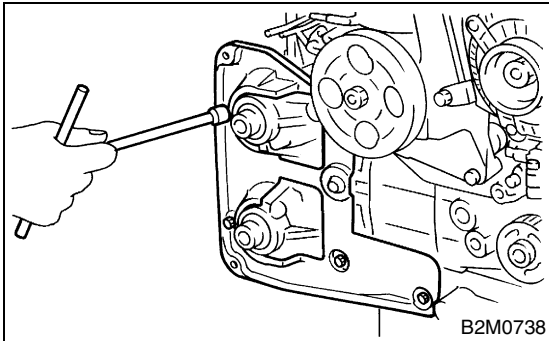
C: INSPECTION

- 1) Check the sprocket teeth for abnormal wear and scratches.
- 2) Make sure there is no free play between sprocket and key.
- 3) Check the crankshaft sprocket notch used for sensor for damage and contamination of foreign matter.

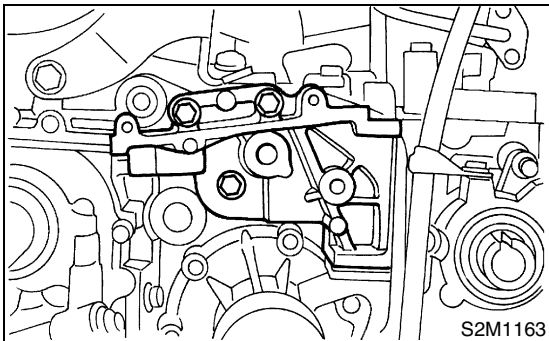
18. Camshaft

A: REMOVAL

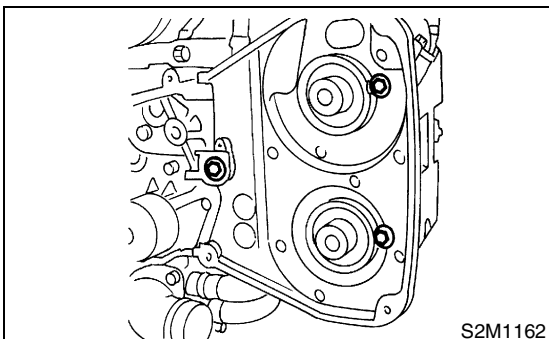
- 1) Remove the V-belt. <Ref. to ME(TURBO)-45, INSTALLATION, V-belt.>
- 2) Remove the crankshaft pulley. <Ref. to ME(TURBO)-46, REMOVAL, Crankshaft Pulley.>
- 3) Remove the belt cover. <Ref. to ME(TURBO)-47, REMOVAL, Belt Cover.>
- 4) Remove the timing belt assembly. <Ref. to ME(TURBO)-48, REMOVAL, Timing Belt Assembly.>
- 5) Remove the camshaft sprocket. <Ref. to ME(TURBO)-57, REMOVAL, Camshaft Sprocket.>
- 6) Remove the crankshaft sprocket. <Ref. to ME(TURBO)-58, REMOVAL, Crankshaft Sprocket.>
- 7) Remove the belt cover No.2 (RH).



- 8) Remove the tensioner bracket.

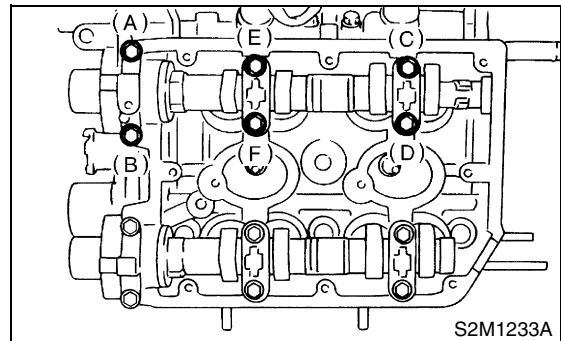


- 9) Remove the belt cover No. 2 (LH).

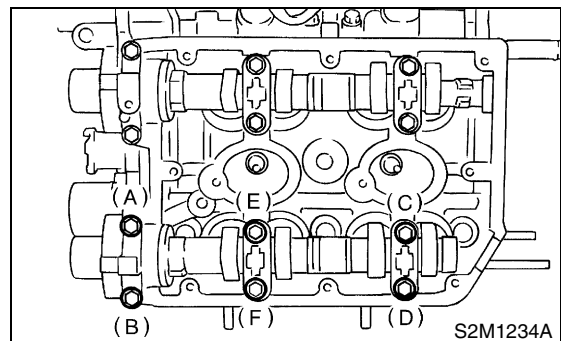


- 10) Remove the oil level gauge guide. (LH side only)

- 11) Remove the spark plug cord.
- 12) Remove the rocker cover and gasket.
- 13) Loosen the intake camshaft cap bolts equally, a little at a time in alphabetical sequence shown in the figure.



- 14) Remove the camshaft caps and intake camshaft.
- 15) Loosen the exhaust camshaft cap bolts equally, a little at a time in alphabetical sequence shown in the figure.



- 16) Remove the camshaft caps and exhaust camshaft.

CAUTION:

Arrange the camshaft caps in order so that they can be installed in their original positions.

- 17) Similarly, remove the camshafts (RH) and related parts.

CAMSHAFT

MECHANICAL

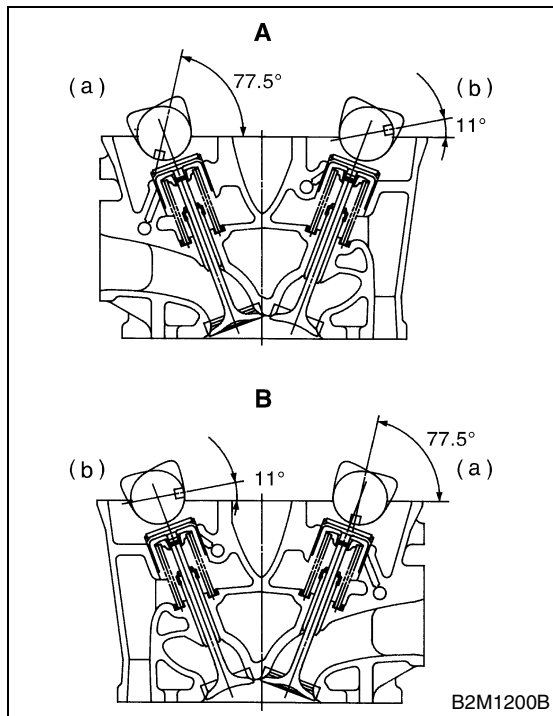
B: INSTALLATION

1) Camshaft installation:

Apply engine oil to the cylinder head at camshaft bearing location before installing the camshaft. Install the camshaft so that each valves is close to or in contact with "base circle" of cam lobe.

CAUTION:

- When the camshafts are positioned as shown in the figure, camshafts need to be rotated at a minimum to align with the timing belt during installation.
 - Camshaft (RH) need not be rotated when set at the position shown in the figure.
- Intake camshaft (LH): Rotate 80° clockwise.
Exhaust camshaft (LH): Rotate 45° counter-clockwise.



- A Left side cylinder head
- B Right side cylinder head
- (a) Intake camshaft
- (b) Exhaust camshaft

2) Camshaft cap installation:

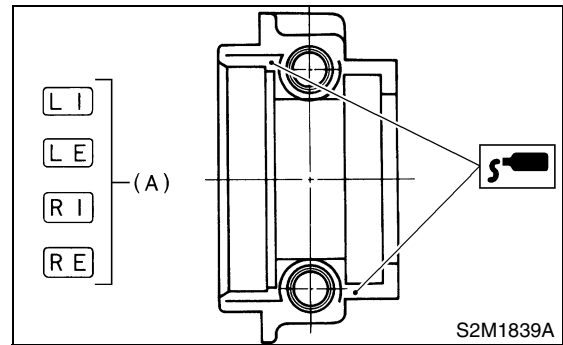
- (1) Apply fluid packing sparingly to the cap mating surface.

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



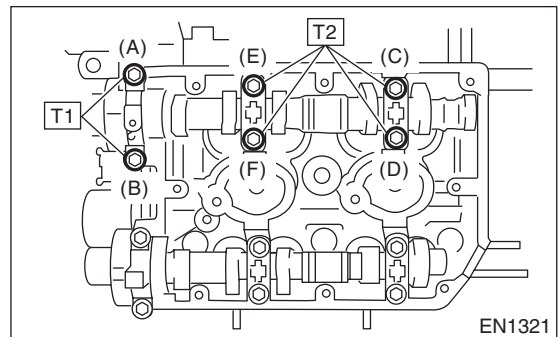
- (2) Apply engine oil to cap bearing surface and install the cap on camshaft as shown by identification mark (A).

- (3) Gradually tighten the cap in at least two stages in alphabetical sequence shown in the figure, and then tighten to specified torque.

Tightening torque:

T1: 10 N·m (1.0 kgf-m, 7.2 ft-lb)

T2: 20 N·m (2.0 kgf-m, 14.5 ft-lb)



- (4) Similarly, tighten the cap on exhaust side. After tightening the cap, ensure the camshaft rotates only slightly while holding it at "base" circle.

Tightening torque:

T1: 10 N·m (1.0 kgf-m, 7.2 ft-lb)

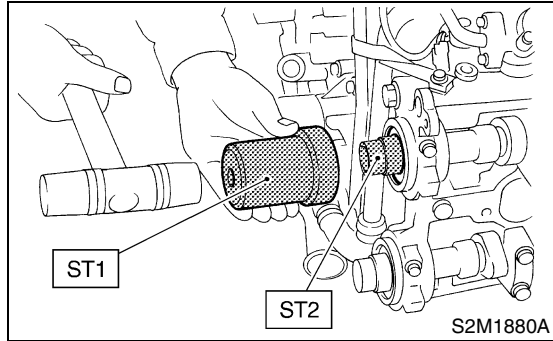
T2: 20 N·m (2.0 kgf-m, 14.5 ft-lb)

3) Camshaft oil seal installation:
Apply grease to the new oil seal lips and press onto the front end of camshaft by using ST1 and ST2.

CAUTION:

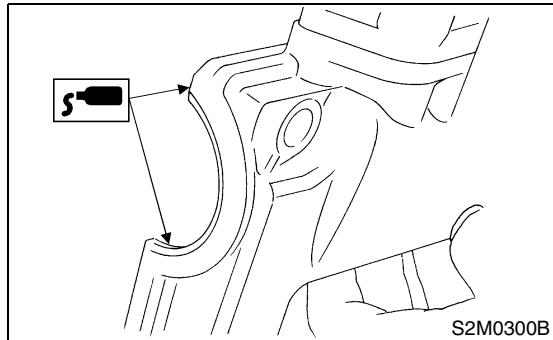
Use a new oil seal.

ST1 499587600 OIL SEAL INSTALLER
ST2 499597200 OIL SEAL GUIDE



4) Rocker cover installation:
(1) Install the gasket on rocker cover. Install the peripheral gasket and ignition coil gasket.
(2) Apply fluid packing to the four front open edges of peripheral gasket.

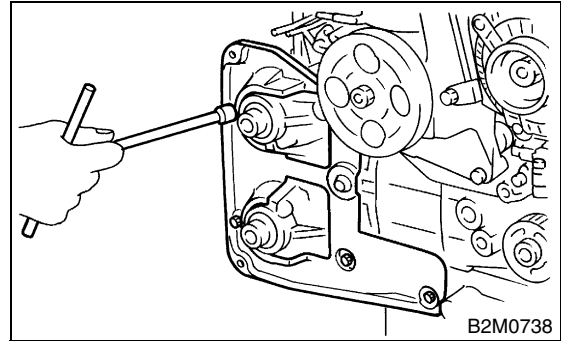
Fluid packing:
THREE BOND 1215 or equivalent



(3) Install the rocker cover on cylinder head. Ensure the gasket is properly positioned during installation.
5) Install the spark plug cord.
6) Similarly, install the parts on right-hand side.

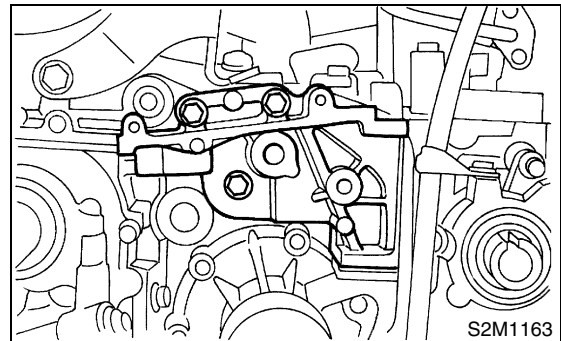
7) Install the belt cover No. 2 (RH).

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)



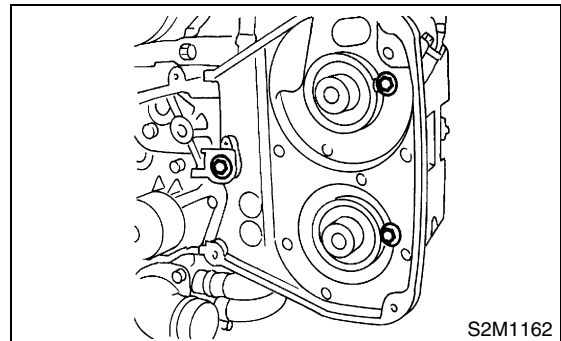
8) Install the tensioner bracket.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



9) Install the belt cover No. 2 (LH).

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)



10) Install the crankshaft sprocket. <Ref. to ME(TURBO)-58, INSTALLATION, Crankshaft Sprocket.>

11) Install the camshaft sprockets. <Ref. to ME(TURBO)-57, INSTALLATION, Camshaft Sprocket.>

12) Install the timing belt assembly. <Ref. to ME(TURBO)-50, INSTALLATION, Timing Belt Assembly.>

13) Install the belt cover. <Ref. to ME(TURBO)-47, INSTALLATION, Belt Cover.>

CAMSHAFT

MECHANICAL

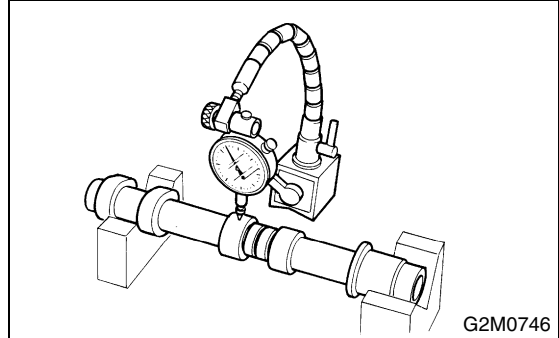
- 14) Install the crankshaft pulley. <Ref. to ME(TURBO)-46, INSTALLATION, Crankshaft Pulley.>
- 15) Install the V-belt. <Ref. to ME(TURBO)-45, INSTALLATION, V-belt.>

C: INSPECTION

- 1) Measure the bend, and repair or replace if necessary.

Limit:

0.020 mm (0.0008 in)



- 2) Check the journal for damage and wear. Replace if faulty.
- 3) Measure the outside diameter of camshaft journal. If the journal diameter is not as specified, check the oil clearance.

	Camshaft journal	
	Front	Center, rear
Standard	37.946 — 37.9635 mm (1.4939 — 1.4946 in)	29.946 — 29.963 mm (1.1790 — 1.1796 in)

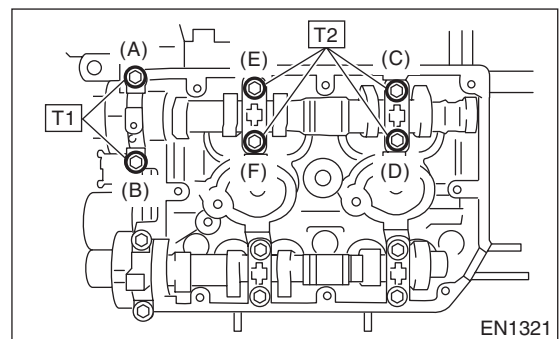
- 4) Measurement of the camshaft journal oil clearance:

- (1) Clean the bearing caps and camshaft journals.
- (2) Place the camshafts on cylinder head. (Without installing the valve rocker.)
- (3) Place a plastigauge across each of the camshaft journals.
- (4) Gradually tighten the cap in at least two stages in alphabetical sequence shown in the figure, and then tighten to specified torque.

Tightening torque:

T1: 10 N·m (1.0 kgf-m, 7.2 ft-lb)

T2: 20 N·m (2.0 kgf-m, 14.5 ft-lb)

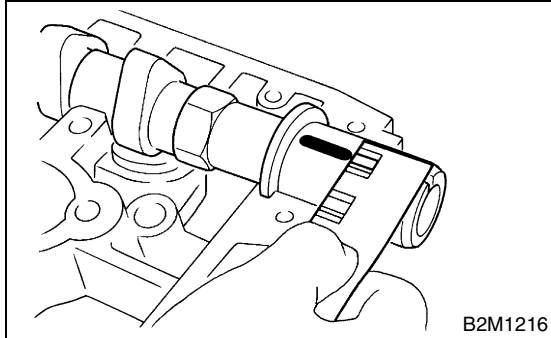


CAUTION:
Do not turn the camshaft.

- (5) Remove the bearing caps.
- (6) Measure the widest point of plastigauge on each journal.
If the oil clearance exceeds the limit, replace the camshaft. If necessary, replace the camshaft caps and cylinder head as a set.

Standard:
0.037 — 0.072 mm (0.0015 — 0.0028 in)

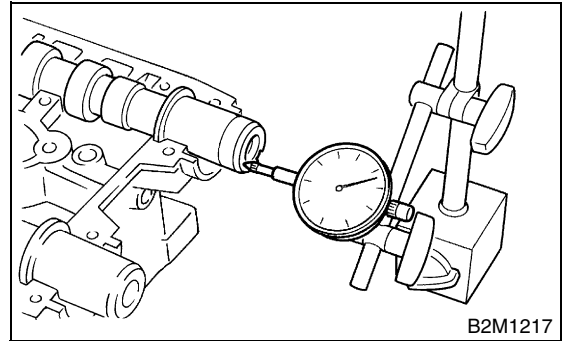
Limit:
0.10 mm (0.0039 in)



- 6) Measure the thrust clearance of camshaft with dial gauge. If the clearance exceeds the limit, replace the caps and cylinder head as a set. If necessary replace the camshaft.

Standard:
0.015 — 0.070 mm (0.0006 — 0.0028 in)

Limit:
0.1 mm (0.004 in)



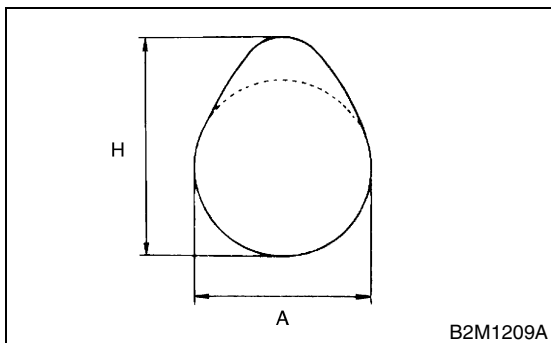
- (7) Completely remove the plastigauge.
- 5) Check the cam face condition; remove the minor faults by grinding with oil stone. Measure the cam height H; replace if the limit has been exceeded.

Cam height: H

Standard:
Intake:
46.25 — 46.35 mm (1.821 — 1.825 in)
Exhaust:
46.15 — 46.25 mm (1.817 — 1.821 in)

Limit:
Intake:
46.15 mm (1.817 in)
Exhaust:
46.05 mm (1.813 in)

Cam base circle diameter A:
37.0 mm (1.457 in)



CYLINDER HEAD ASSEMBLY

MECHANICAL

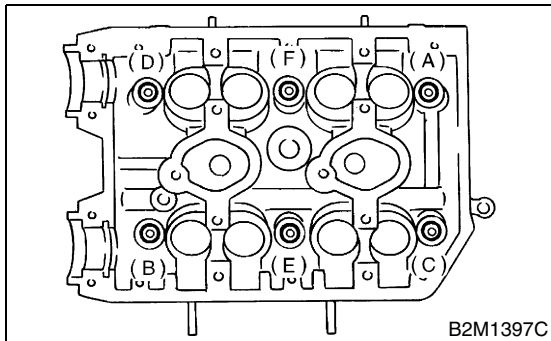
19. Cylinder Head Assembly

A: REMOVAL

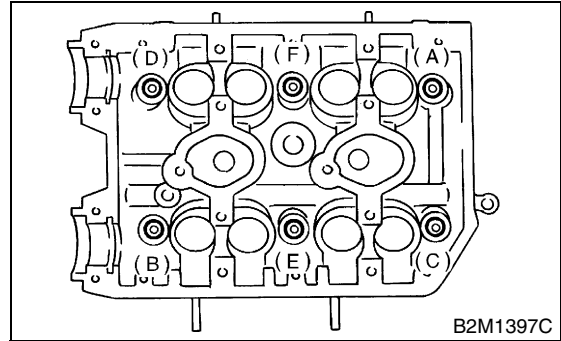
- 1) Remove the V-belt. <Ref. to ME(TURBO)-44, REMOVAL, V-belt.>
- 2) Remove the crankshaft pulley. <Ref. to ME(TURBO)-46, REMOVAL, Crankshaft Pulley.>
- 3) Remove the belt cover. <Ref. to ME(TURBO)-47, REMOVAL, Belt Cover.>
- 4) Remove the timing belt assembly. <Ref. to ME(TURBO)-48, REMOVAL, Timing Belt Assembly.>
- 5) Remove the camshaft sprocket. <Ref. to ME(TURBO)-57, REMOVAL, Camshaft Sprocket.>
- 6) Remove the intake manifold. <Ref. to FU(TURBO)-15, REMOVAL, Intake Manifold.>
- 7) Remove the bolt which installs A/C compressor bracket on cylinder head.
- 8) Remove the camshaft. <Ref. to ME(TURBO)-59, REMOVAL, Camshaft.>
- 9) Remove the cylinder head bolts in alphabetical sequence shown in the figure.

CAUTION:

Leave bolts (A) and (D) engaged by three or four threads to prevent the cylinder head from falling.



- 10) While tapping the cylinder head with a plastic hammer, separate it from cylinder block. Remove the bolts (A) and (D) to remove cylinder head.



- 11) Remove the cylinder head gasket.

CAUTION:

Do not scratch the mating surface of cylinder head and cylinder block.

- 12) Similarly, remove the right side cylinder head.

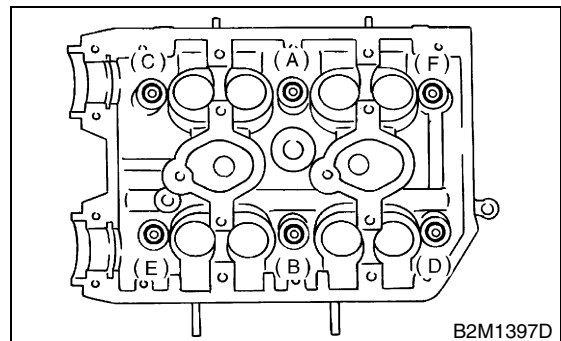
B: INSTALLATION

- 1) Install the cylinder head and gaskets on cylinder block.

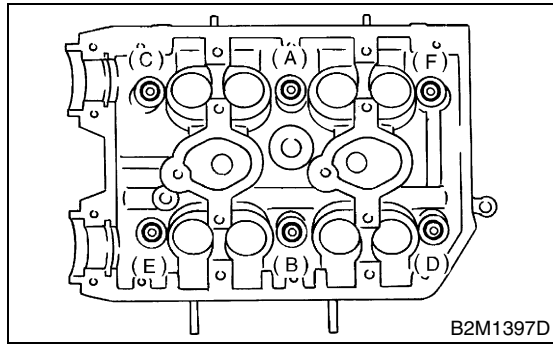
CAUTION:

- Use new cylinder head gaskets.
- Be careful not to scratch the mating surface of cylinder head and cylinder block.

- 2) Tighten the cylinder head bolts.
 - (1) Apply a coat of engine oil to the washers and bolt threads.
 - (2) Tighten all bolts to 29 N·m (3.0 kgf-m, 22 ft-lb) in alphabetical sequence. Then tighten all bolts to 69 N·m (7.0 kgf-m, 51 ft-lb) in alphabetical sequence.
 - (3) Back off all bolts by 180° first; back them off by 180° again.
 - (4) Tighten the bolts (A) and (B) to 34 N·m (3.5 kgf-m, 25 ft-lb).



(5) Tighten the bolts (C), (D), (E) and (F) to 15 N·m (1.5 kgf-m, 11 ft-lb).



(6) Tighten all bolts by 80 to 90° in alphabetical sequence.

CAUTION:

Do not tighten the bolts more than 90°.

(7) Further tighten all bolts by 80 to 90° in alphabetical sequence.

CAUTION:

Ensure the total “re-tightening angle” [in the two previous steps] do not exceed 180°.

3) Install the camshaft. <Ref. to ME(TURBO)-60, INSTALLATION, Camshaft.>

4) Install the A/C compressor bracket on cylinder head.

5) Install the intake manifold. <Ref. to FU(TURBO)-18, INSTALLATION, Intake Manifold.>

6) Install the camshaft sprocket. <Ref. to ME(TURBO)-57, INSTALLATION, Camshaft Sprocket.>

7) Install the timing belt assembly. <Ref. to ME(TURBO)-50, INSTALLATION, Timing Belt Assembly.>

8) Install the belt cover. <Ref. to ME(TURBO)-47, INSTALLATION, Belt Cover.>

9) Install the crankshaft pulley. <Ref. to ME(TURBO)-46, INSTALLATION, Crankshaft Pulley.>

10) Install the V-belt. <Ref. to ME(TURBO)-45, INSTALLATION, V-belt.>

C: DISASSEMBLY

1) Remove the valve shims and valve lifters.

2) Compress the valve spring and remove the valve spring retainer key. Remove each valve and valve spring.

ST1 498267600 CYLINDER HEAD TABLE

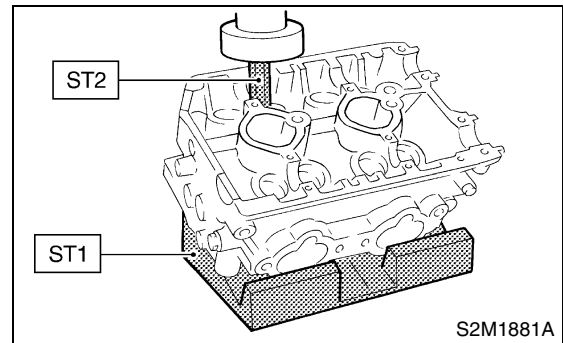
ST2 499718000 VALVE SPRING REMOVER

CAUTION:

- Keep the removed parts in order for re-installing in their original positions.

- Mark each valve to prevent confusion.

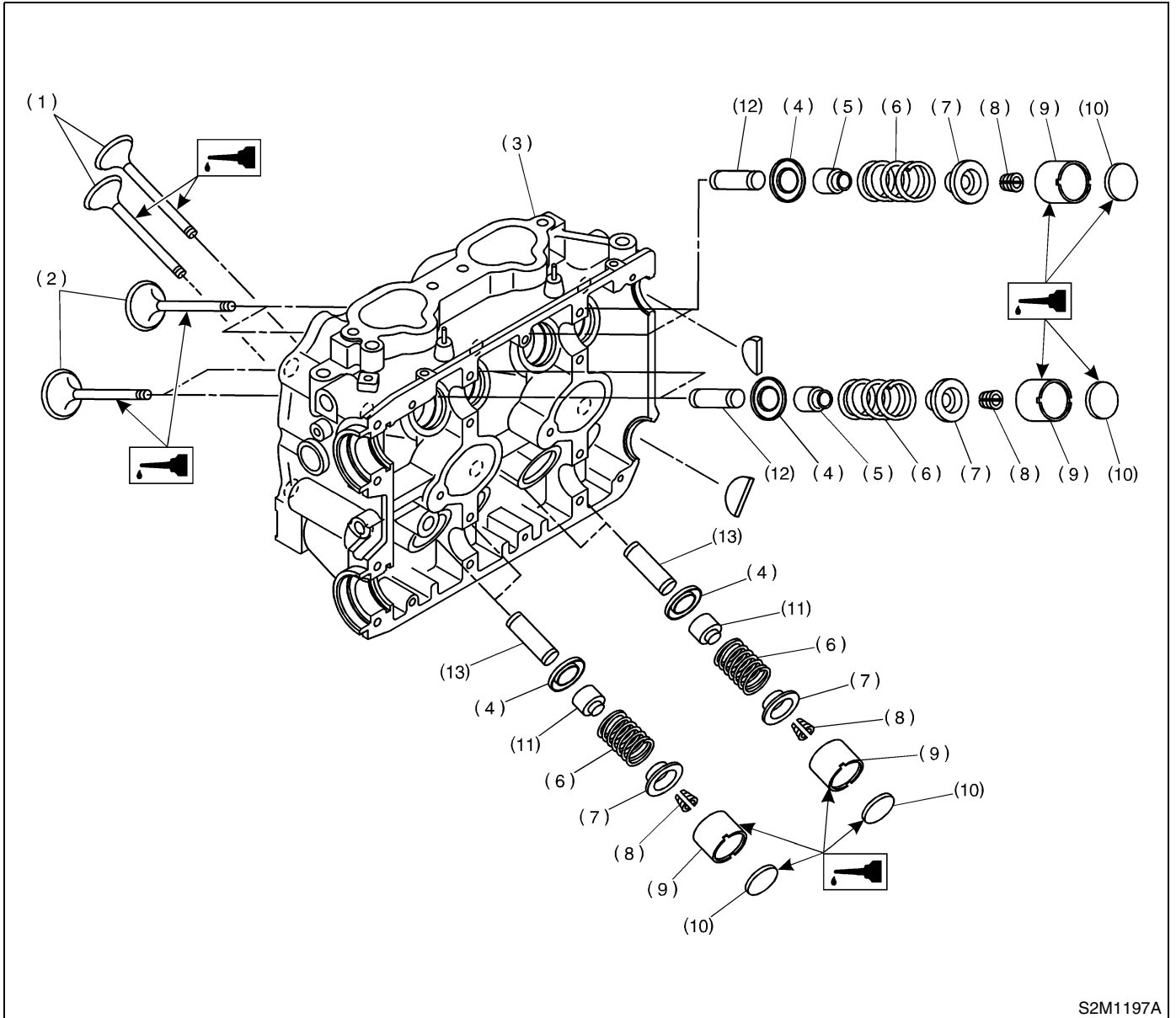
- Use extreme care not to damage the lips of the intake valve oil seals and exhaust valve oil seals.



CYLINDER HEAD ASSEMBLY

MECHANICAL

D: ASSEMBLY



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 | |

- 1) Installation of valve spring and valve:
 - (1) Coat the stem of each valve with engine oil and insert the valve into valve guide.

CAUTION:

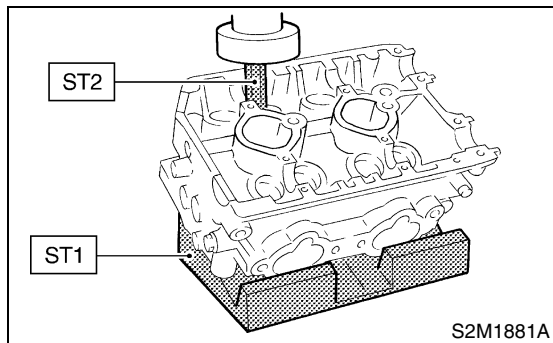
When inserting the valve into valve guide, use special care not to damage the oil seal lip.

- (2) Set the cylinder head on ST1.
- (3) Install the valve spring and retainer using ST2.

ST1 498267600 CYLINDER HEAD TABLE
 ST2 499718000 VALVE SPRING REMOVER

CAUTION:

Be sure to install the valve springs with their close-coiled end facing the seat on the cylinder head.



- (4) Compress the valve spring, and then fit the valve spring retainer key.
 - (5) After installing, tap the valve spring retainers lightly with wooden hammer for better seating.
- 2) Apply oil to the surface of the valve lifter and valve shim.
 - 3) Install the 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 the important areas by means of red check.
- 2) Measure the warping of the cylinder head surface that mates with crankcase by using a straight edge (A) and thickness gauge (B). If the warping exceeds 0.05 mm (0.0020 in), grind the surface with a surface grinder.

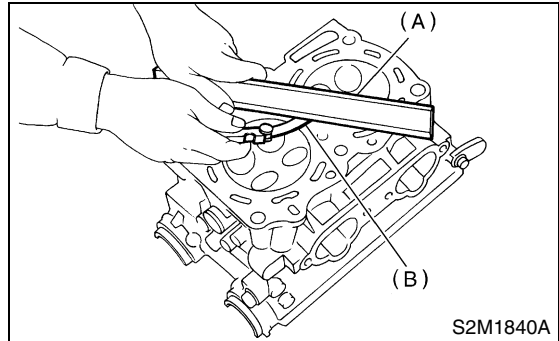
Warping limit:
0.05 mm (0.0020 in)

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 the intake and exhaust valve seats, and then correct the contact surfaces with valve seat cutter if they are defective or when valve guides are replaced.

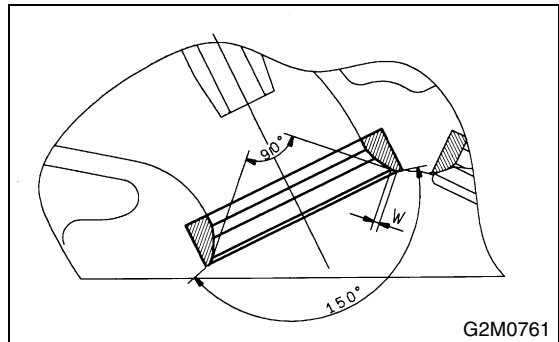
Valve seat width: W

Intake

Standard
1.0 mm (0.039 in)
Limit
1.7 mm (0.067 in)

Exhaust

Standard
1.5 mm (0.059 in)
Limit
2.2 mm (0.087 in)



CYLINDER HEAD ASSEMBLY

MECHANICAL

3. VALVE GUIDE

1) Check the clearance between valve guide and stem. The clearance can be checked by measuring the outside diameter of valve stem and the inside diameter of valve guide with outside and inside micrometers respectively.

Clearance between the valve guide and valve stem:

Standard

Intake

0.035 — 0.062 mm (0.0014 — 0.0024 in)

Exhaust

0.040 — 0.067 mm (0.0016 — 0.0026 in)

Limit

0.15 mm (0.0059 in)

2) If the clearance between valve guide and stem exceeds the limit, replace the valve guide or valve itself whichever shows greater amount of wear. See the following procedure for valve guide replacement.

Valve guide inner diameter:

6.000 — 6.012 mm (0.2362 — 0.2367 in)

Valve stem outer diameters:

Intake

5.950 — 5.965 mm (0.2343 — 0.2348 in)

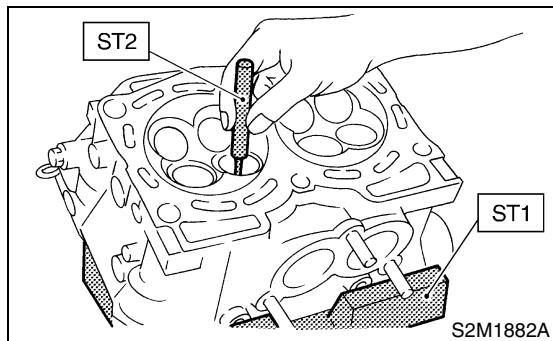
Exhaust

5.945 — 5.960 mm (0.2341 — 0.2346 in)

(1) Place the cylinder head on ST1 with the combustion chamber upward so that valve guides enter the holes in ST1.

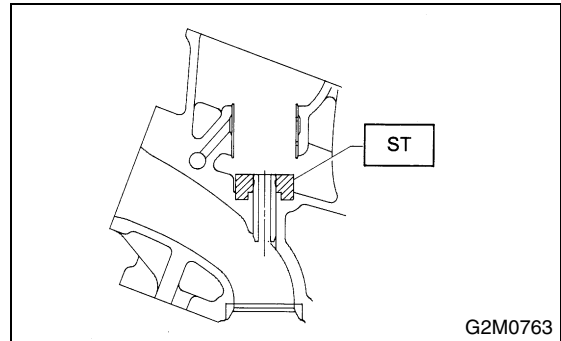
(2) Insert the ST2 into valve guide and press it down to remove the valve guide.

ST1 498267600 CYLINDER HEAD TABLE
ST2 499767200 VALVE GUIDE REMOVER



(3) Turn the cylinder head upside down and place ST as shown in the figure.

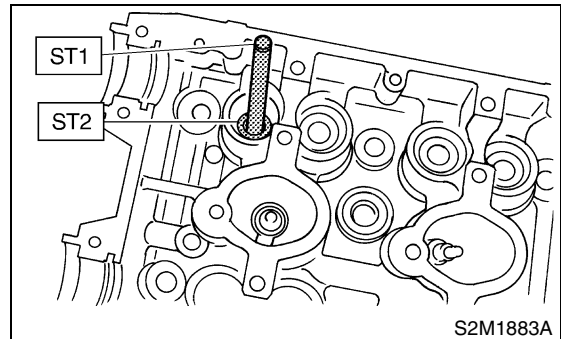
ST 498767700 VALVE GUIDE ADJUSTER



(4) Before installing a new valve guide, make sure that neither scratches nor damages exist on the inside surface of the valve guide holes in cylinder head.

(5) Put a new valve guide, coated with sufficient oil, in cylinder, and insert ST1 into valve guide. Press in until the valve guide upper end is flush with the upper surface of ST2.

ST1 499767200 VALVE GUIDE REMOVER
ST2 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 the valve guide, and return it also rotating clockwise. After reaming, clean the 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 the valve guide.

4. INTAKE AND EXHAUST VALVE

1) Inspect the flange and stem of valve, and replace if damaged, worn, or deformed, or if "H" is less than the specified limit.

H:

Intake

Standard

1.2 mm (0.047 in)

Limit

0.8 mm (0.031 in)

Exhaust

Standard

1.5 mm (0.059 in)

Limit

0.8 mm (0.031 in)

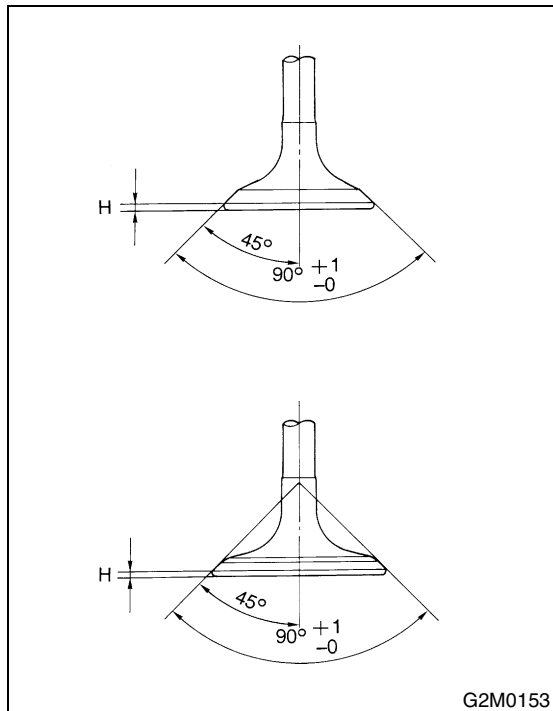
Valve overall length:

Intake

104.4 mm (4.110 in)

Exhaust

104.7 mm (4.122 in)

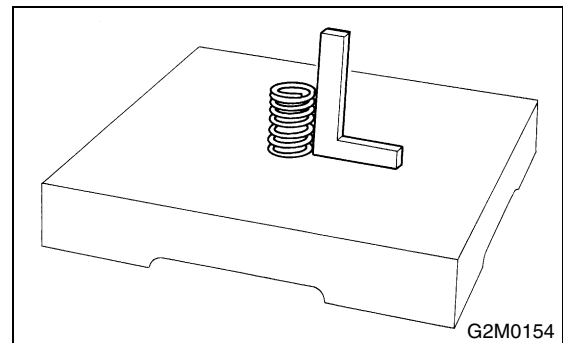


5. VALVE SPRINGS

1) Check the valve springs for damage, free length, and tension. Replace the valve spring if it is not within specifications presented in the table.

2) To measure the squareness of valve spring, stand the spring on a surface plate and measure its deflection at the top using a try square.

Valve spring	
Free length	44.67 mm (1.7587 in)
Tension/spring height	205.0 — 236.4 N (20.9 — 24.1 kgf, 46.1 — 53.1 lb) /36.0 mm (1.417 in)
	485.4 — 536.4 N (49.5 — 54.7 kgf, 109.2 — 120.6 lb) /26.6 mm (1.047 in)
Squareness	2.5°, 2.0 mm (0.079 in)



2) Put a small amount of grinding compound on the seat surface and lap the valve and seat surface. Install a new intake valve oil seal after lapping.

CYLINDER HEAD ASSEMBLY

MECHANICAL

6. INTAKE AND EXHAUST VALVE OIL SEAL

Replace the oil seal with a new one, if the lip is damaged or spring out of place, or when the surfaces of intake valve and valve seat are reconditioned or intake valve guide is replaced.

- 1) Place the cylinder head on ST1.
- 2) Press in the oil seal to the specified dimension indicated in the figure by using ST2.

ST1 498267600 CYLINDER HEAD TABLE
ST2 498857100 VALVE GUIDE REMOVER

CAUTION:

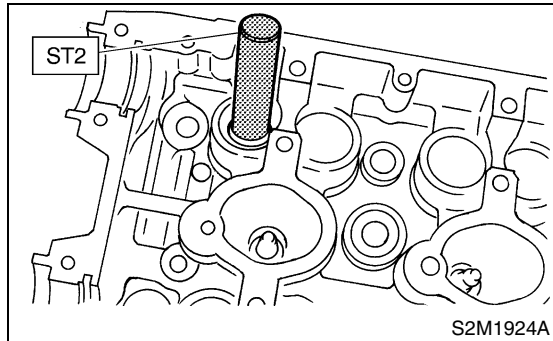
- Apply engine oil to oil seal before force-fitting.
- Differentiate between the intake valve oil seal and exhaust valve oil seal by noting their difference in color.

Color of rubber part:

Intake [Black]
Exhaust [Brown]

Color of spring part:

Intake [Silver]
Exhaust [Silver]

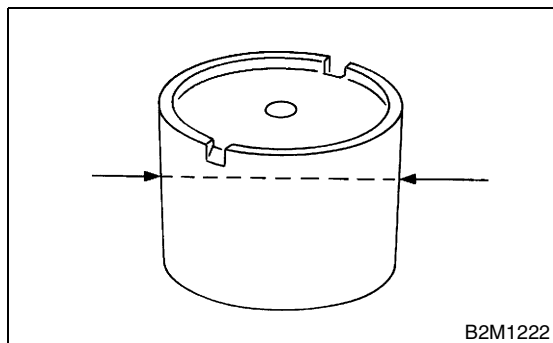


7. VALVE LIFTER

- 1) Check the valve lifter visually.
- 2) Measure the outer diameter of valve lifter.

Outer diameter:

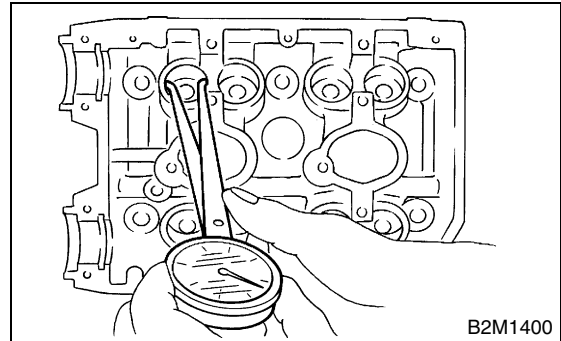
34.959 — 34.975 mm (1.3763 — 1.3770 in)



- 3) Measure the inner diameter of valve lifter mating part on cylinder head.

Inner diameter:

34.994 — 35.016 mm (1.3777 — 1.3786 in)



CAUTION:

If difference between outer diameter of valve lifter and inner diameter of valve lifter mating part is over the limit, replace the cylinder head.

Standard:

0.019 — 0.057 mm (0.0007 — 0.0022 in)

Limit:

0.100 mm (0.0039 in)

20. Cylinder Block

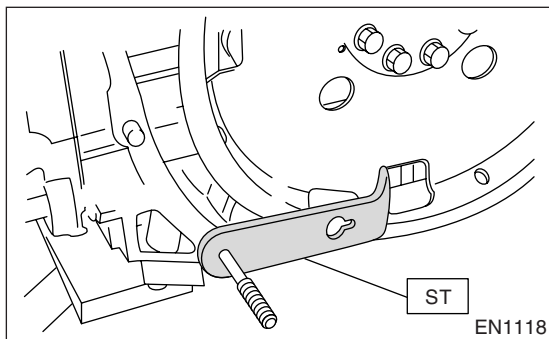
A: REMOVAL

NOTE:

Before conducting this procedure, drain the engine oil completely if applicable.

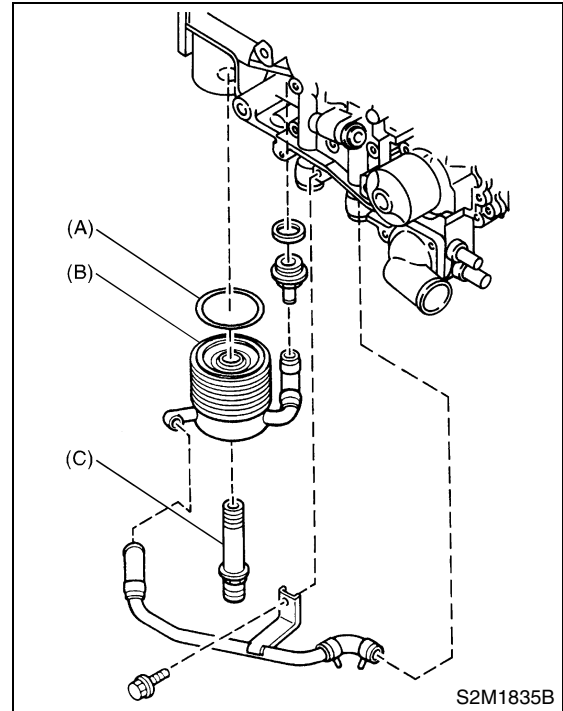
- 1) Remove the intake manifold. <Ref. to FU(TURBO)-15, REMOVAL, Intake Manifold.>
- 2) Remove the V-belt. <Ref. to ME(TURBO)-44, REMOVAL, V-belt.>
- 3) Remove the crankshaft pulley. <Ref. to ME(TURBO)-46, REMOVAL, Crankshaft Pulley.>
- 4) Remove the belt cover. <Ref. to ME(TURBO)-47, REMOVAL, Belt Cover.>
- 5) Remove the timing belt assembly. <Ref. to ME(TURBO)-48, REMOVAL, Timing Belt Assembly.>
- 6) Remove the camshaft sprocket. <Ref. to ME(TURBO)-57, REMOVAL, Camshaft Sprocket.>
- 7) Remove the crankshaft sprocket. <Ref. to ME(TURBO)-58, REMOVAL, Crankshaft Sprocket.>
- 8) Remove the generator and A/C compressor with their brackets.
- 9) Remove the cylinder head assembly. <Ref. to ME(TURBO)-64, REMOVAL, Cylinder Head Assembly.>
- 10) Remove the clutch disc and cover. (MT vehicles) <Ref. to CL-20, REMOVAL, Clutch Disc and Cover.>
- 11) Remove the flywheel. (MT vehicles) <Ref. to CL-24, REMOVAL, Flywheel.>
- 12) Remove the drive plate. (AT vehicles)
Using the ST, lock crankshaft.

ST 498497100 CRANKSHAFT STOPPER



- 13) Remove the oil separator cover.
- 14) Remove the water by-pass pipe for heater.
- 15) Remove the oil filter.

- 16) Remove the oil cooler.



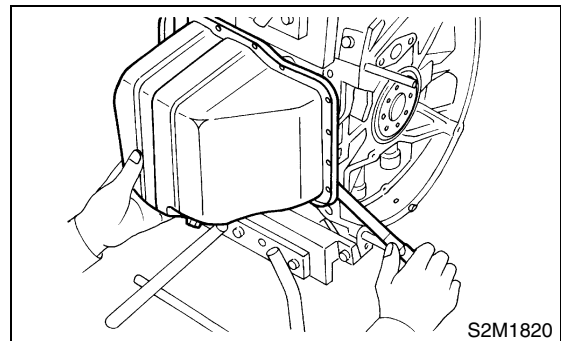
- (a) Gasket
- (b) Oil cooler
- (c) Connector

- 17) Removal of oil pan:

- (1) Turn the cylinder block with #2 and #4 piston sides facing upward.
- (2) Remove the bolts which secure oil pan to cylinder block.
- (3) Insert a oil pan cutter blade between cylinder block-to-oil pan clearance, and then remove the oil pan.

CAUTION:

Do not use a screwdriver or similar tool in place of oil pan cutter.



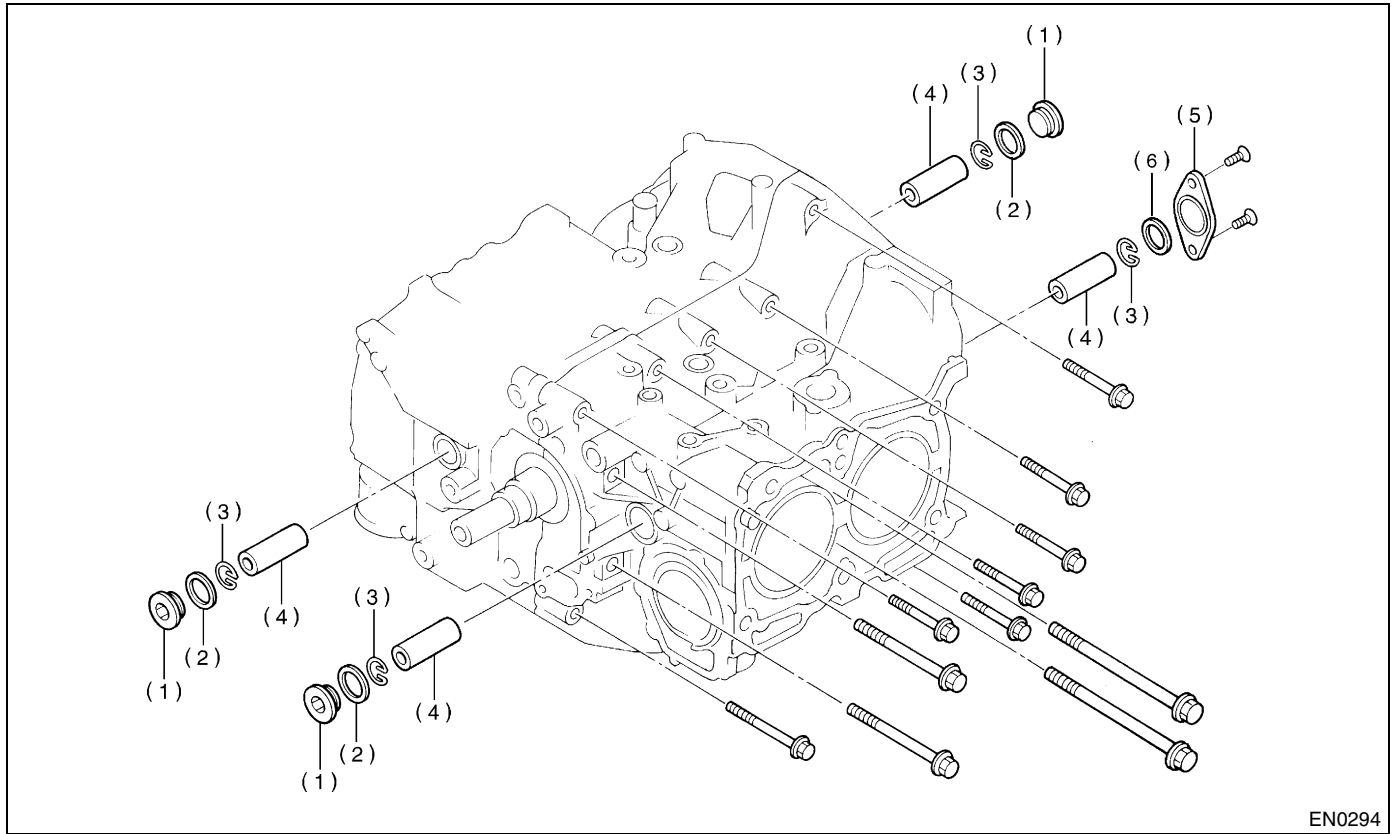
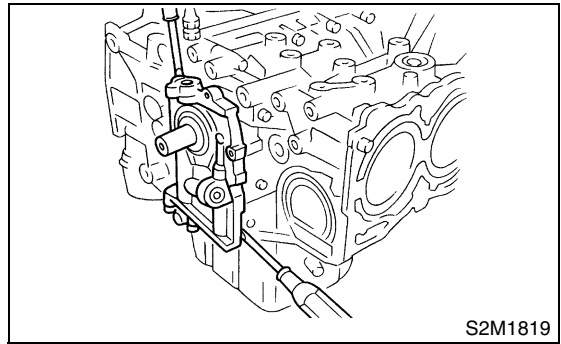
- 18) Remove the oil strainer stay.
- 19) Remove the oil strainer.
- 20) Remove the baffle plate.
- 21) Remove the water pipes.
- 22) Remove the water pump.

CYLINDER BLOCK

MECHANICAL

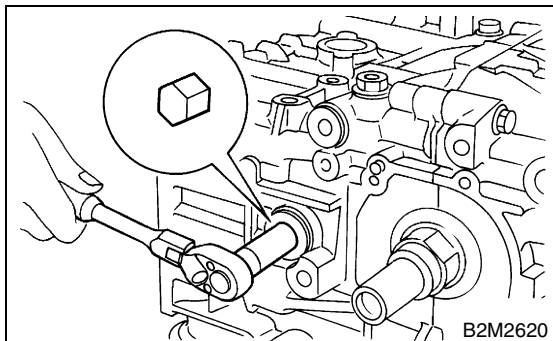
23) Remove the oil pump from cylinder block. Use a flat-bladed screwdriver as shown in the figure when removing the oil pump.

CAUTION:
Be careful not to scratch the mating surface of cylinder block and oil pump.

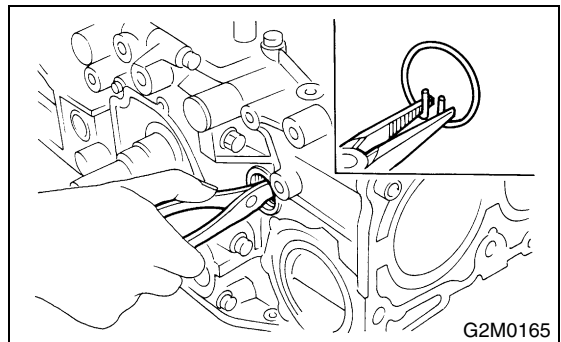


- | | | |
|-----------------------|----------------|------------------------|
| (1) Service hole plug | (3) Circlip | (5) Service hole cover |
| (2) Gasket | (4) Piston pin | (6) O-ring |

24) Remove the service hole cover and service hole plugs using hexagon wrench [14 mm (0.55 in)].



25) Rotate the crankshaft to bring #1 and #2 pistons to bottom dead center position, and then remove the piston circlip through service hole of #1 and #2 cylinders.



CYLINDER BLOCK

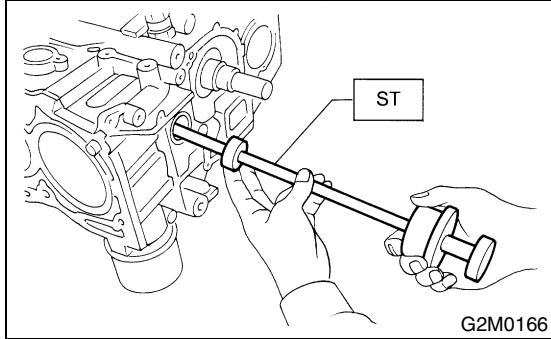
MECHANICAL

26) Draw out the piston pin from #1 and #2 pistons using ST.

ST 499097700 PISTON PIN REMOVER

CAUTION:

Be careful not to confuse the original combination of piston, piston pin and cylinder.



27) Similarly remove the piston pins from #3 and #4 pistons.

28) Remove the bolts which connect cylinder block on the side of #2 and #4 cylinders.

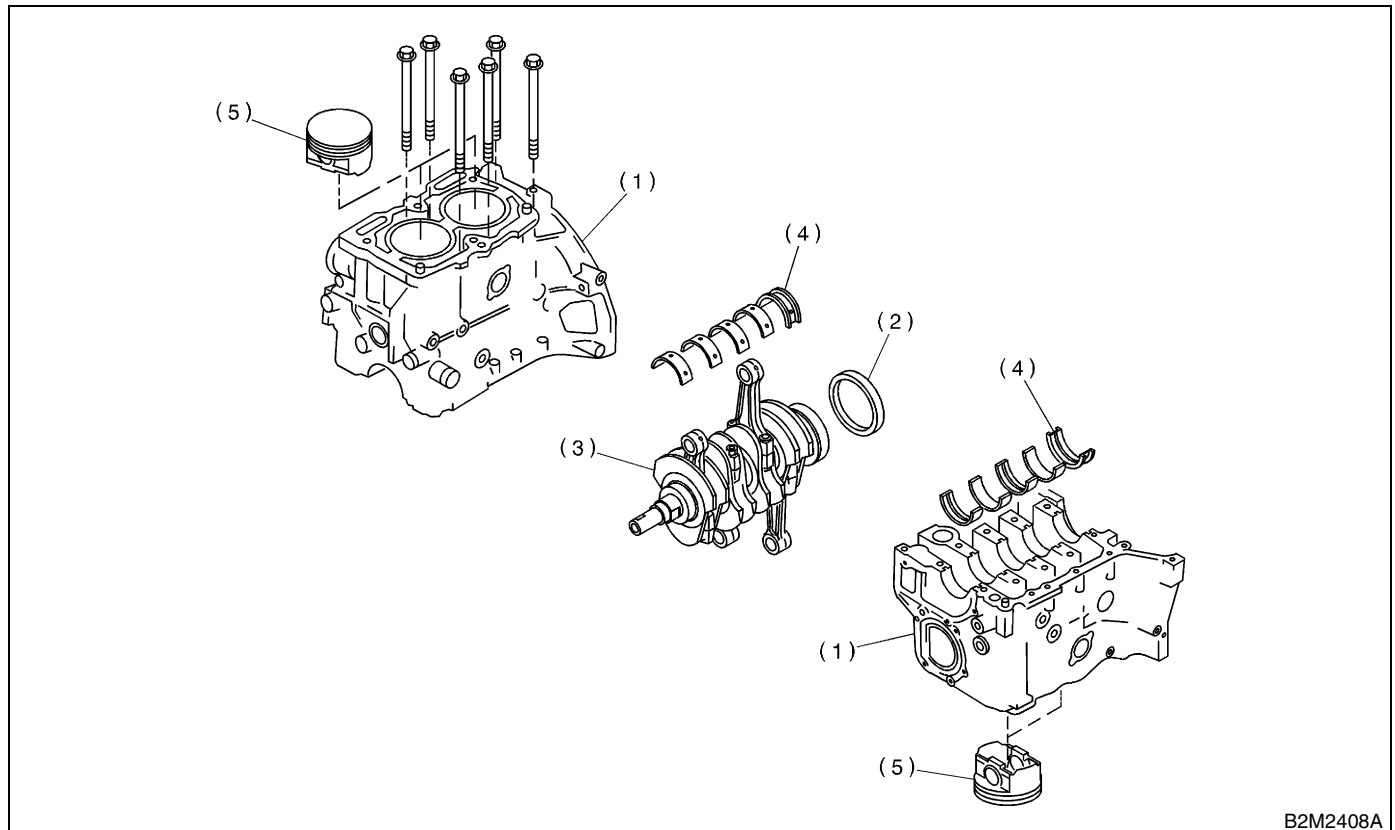
29) Back off the bolts which connect cylinder block on the side of #1 and #3 cylinders two or three turns.

30) Set up the cylinder block so that #1 and #3 cylinders are on the upper side, then remove the cylinder block connecting bolts.

31) Separate the cylinder blocks (LH) and (RH).

CAUTION:

When separating the 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

32) Remove the rear oil seal.

33) Remove the crankshaft together with connecting rod.

34) Remove the crankshaft bearings from cylinder block using a hammer handle.

CAUTION:

Do not confuse the combination of crankshaft bearings.

Press the bearing at the end opposite to locking

lip.

35) Draw out each piston from cylinder block using a wooden bar or hammer handle.

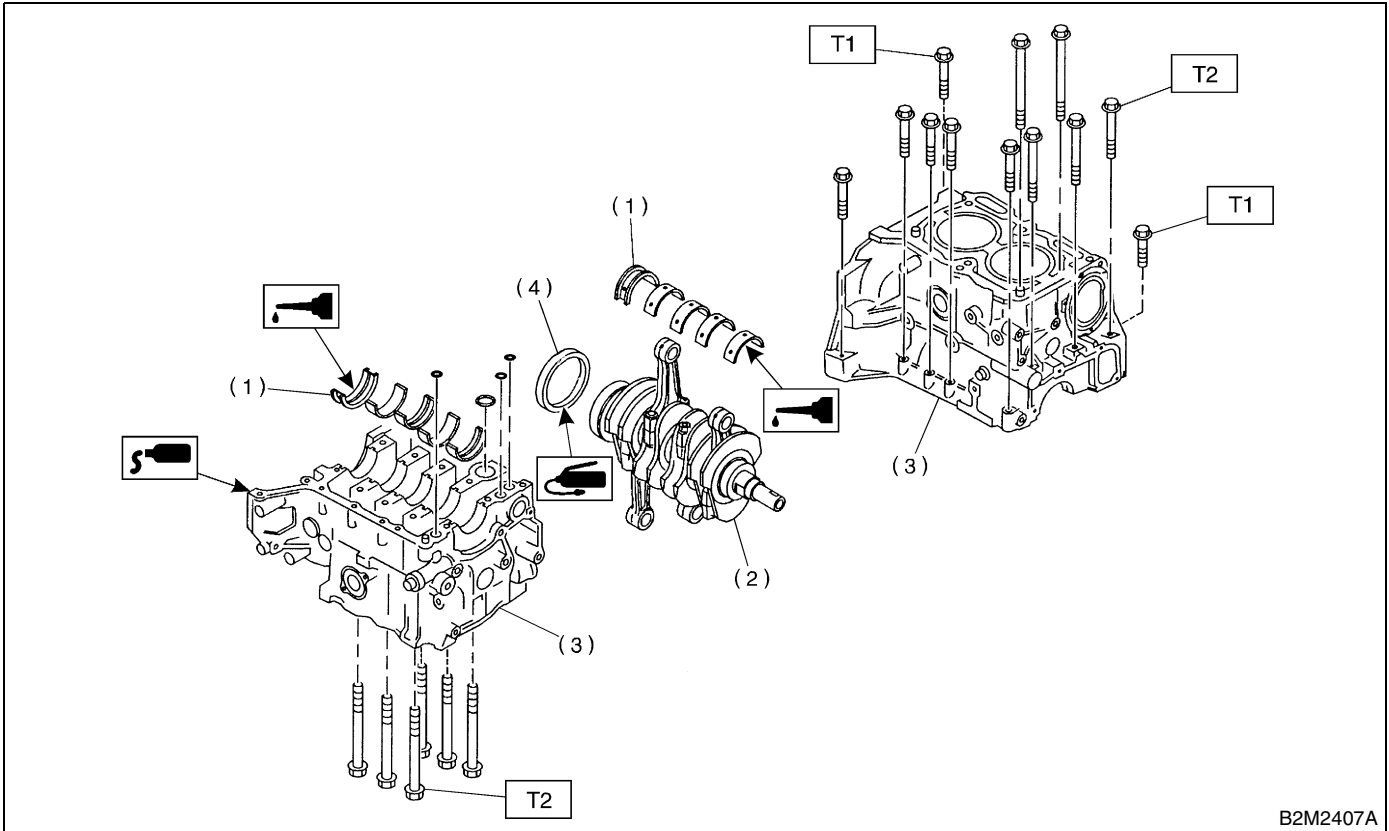
CAUTION:

Do not confuse the 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 the crankshaft on #2 and #4 cylinder block.

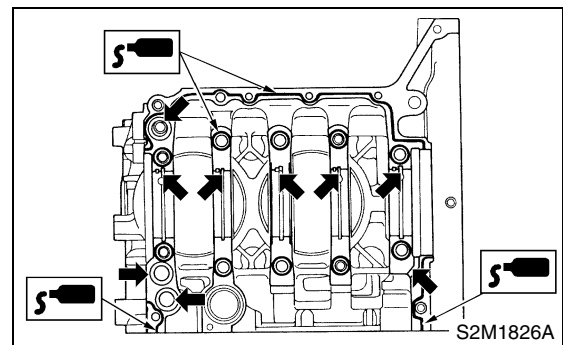
2) Apply fluid packing to the mating surface of #1 and #3 cylinder block, and position it on #2 and #4 cylinder block.

Fluid packing:

THREE BOND 1215 or equivalent

CAUTION:

Do not allow fluid packing to jut into O-ring grooves, oil passages, bearing grooves, etc.

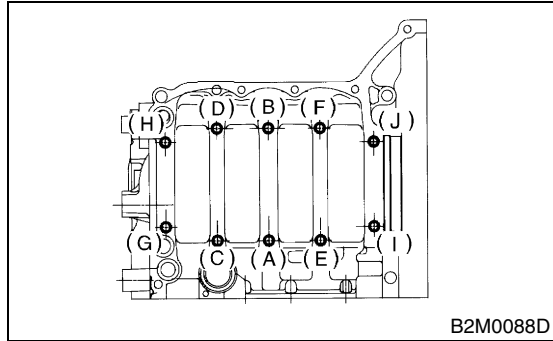


S2M1826A

CYLINDER BLOCK

MECHANICAL

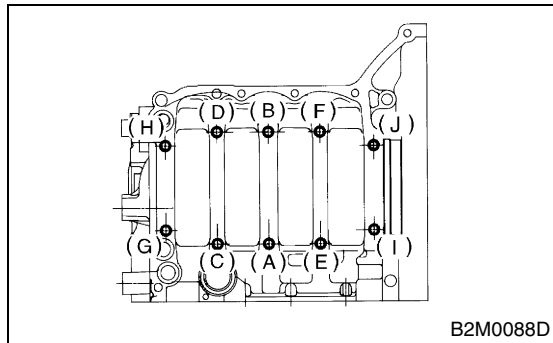
3) Temporarily tighten the 10 mm cylinder block connecting bolts in alphabetical sequence shown in the figure.



4) Tighten the 10 mm cylinder block connecting bolts in alphabetical sequence.

Tightening torque:

47 N·m (4.8 kgf·m, 34.7 ft·lb)

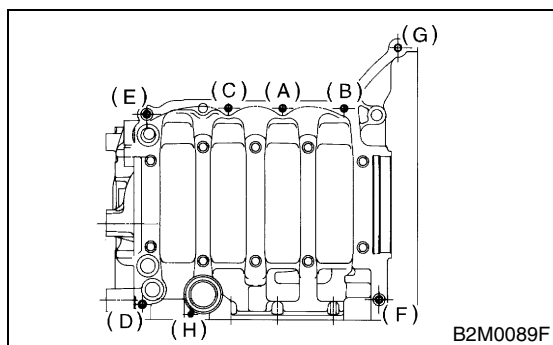


5) Tighten the 8 mm and 6 mm cylinder block connecting bolts in alphabetical sequence shown in the figure.

Tightening torque:

(A) — (G): 25 N·m (2.5 kgf·m, 18.1 ft·lb)

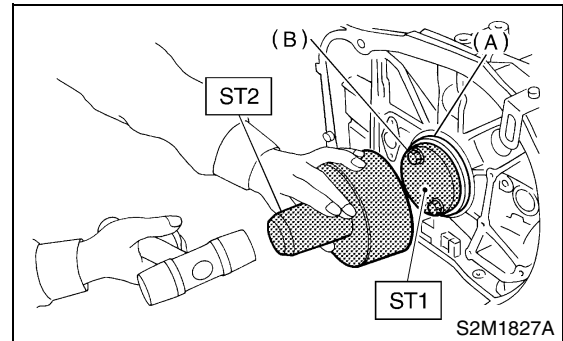
(H): 6.4 N·m (0.65 kgf·m, 4.7 ft·lb)



6) Install the rear oil seal using ST1 and ST2.

ST1 499597100 OIL SEAL GUIDE

ST2 499587200 OIL SEAL INSTALLER

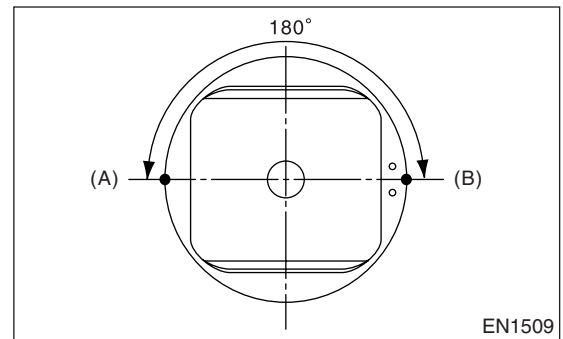


(A) Rear oil seal

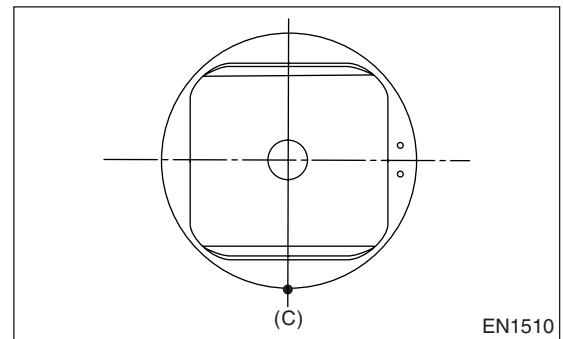
(B) Flywheel attaching bolt

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.



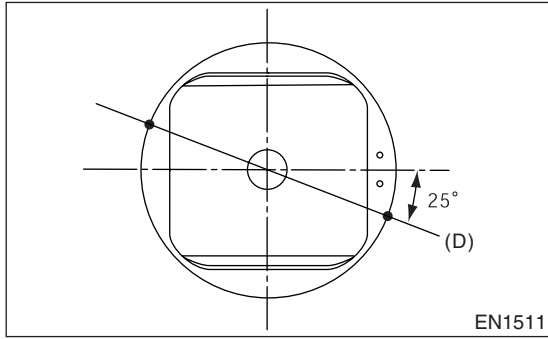
9) Position the expander gap at (C) in the figure.



CYLINDER BLOCK

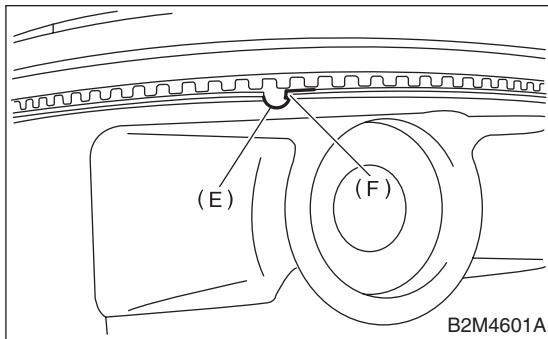
MECHANICAL

10) Position the lower rail gap at (D) in the figure.

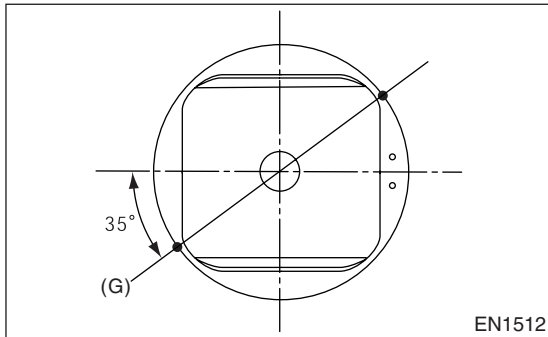


NOTE:

Align lower rail spin stopper (F) with piston side surface hole (E).



11) Position the upper rail gap at (G) in the figure.



CAUTION:

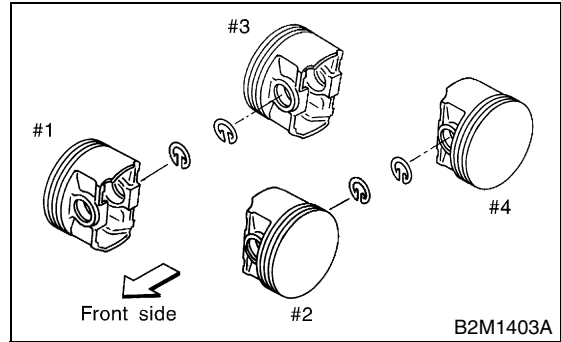
- Ensure ring gaps do not face the same direction.
- Ensure ring gaps are not within the piston skirt area.

12) Install the circlip.

Install the circlips in piston holes located opposite of service holes in cylinder block, when positioning all pistons in the corresponding cylinders.

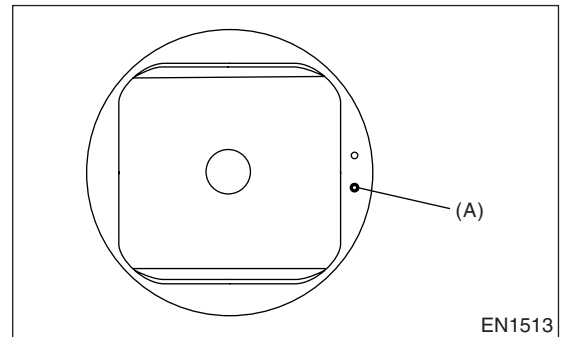
NOTE:

Use new circlips.



CAUTION:

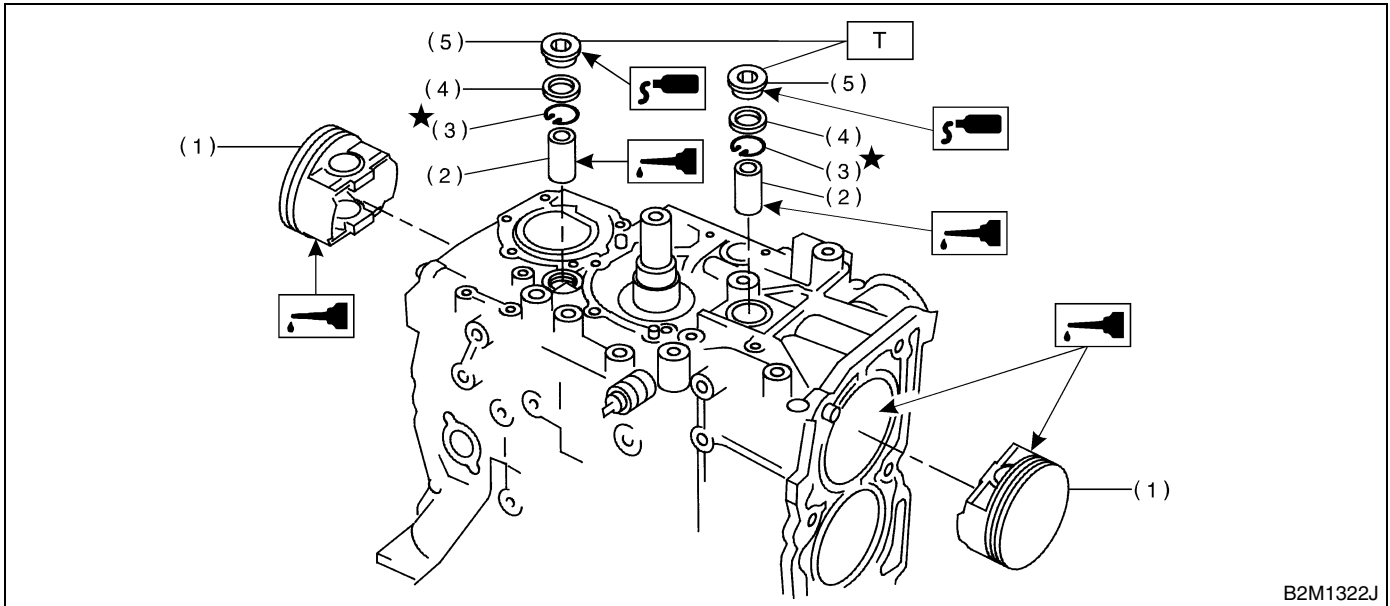
Piston front mark faces towards the front of the engine.



(A) Front mark

CYLINDER BLOCK

MECHANICAL



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)

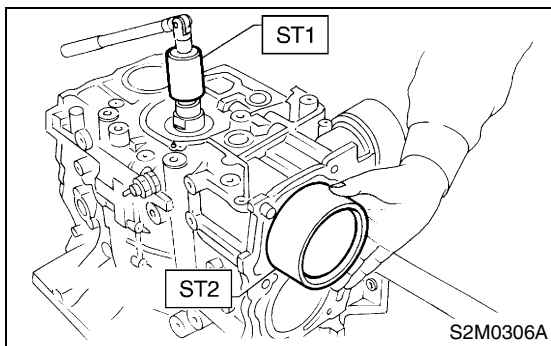
13) Installing the piston:

- (1) Turn the cylinder block so that #1 and #2 cylinders face upward.
- (2) Using the ST1, turn the crankshaft so that #1 and #2 connecting rods are set at bottom dead center.

ST1 499987500 CRANKSHAFT SOCKET

- (3) Apply a coat of engine oil to the pistons and cylinders and insert pistons in their cylinders using ST2.

ST2 398744300 PISTON GUIDE



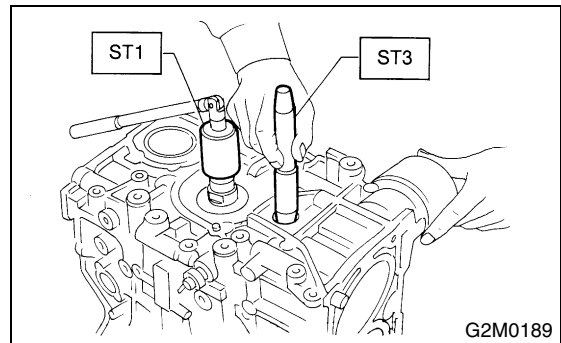
14) Installing piston pin:

- (1) Insert the 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 the piston pin and insert piston pin into piston and connecting rod through service hole.

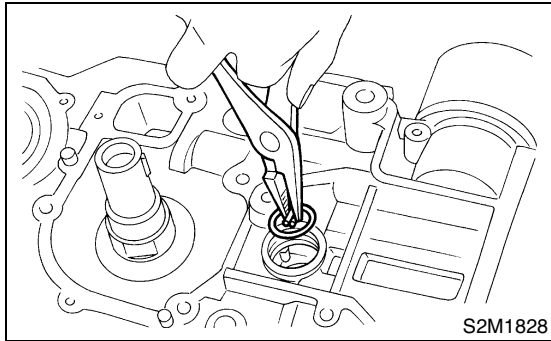
CYLINDER BLOCK

MECHANICAL

(3) Install the circlip.

CAUTION:

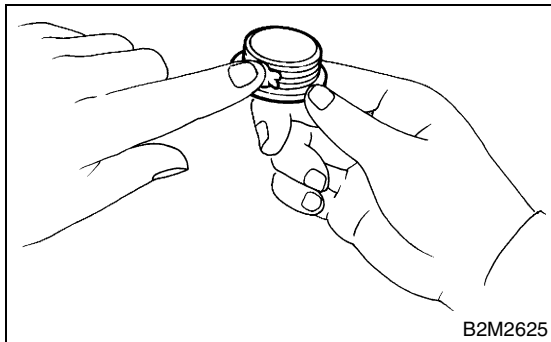
Use new circlips.



(4) Apply fluid packing around the service hole plug.

Fluid packing:

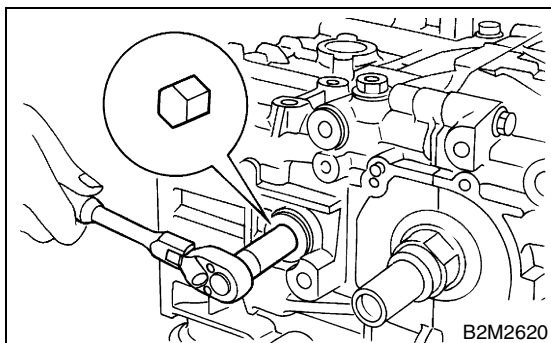
THREE BOND 1215 or equivalent



(5) Install the service hole plug and gasket.

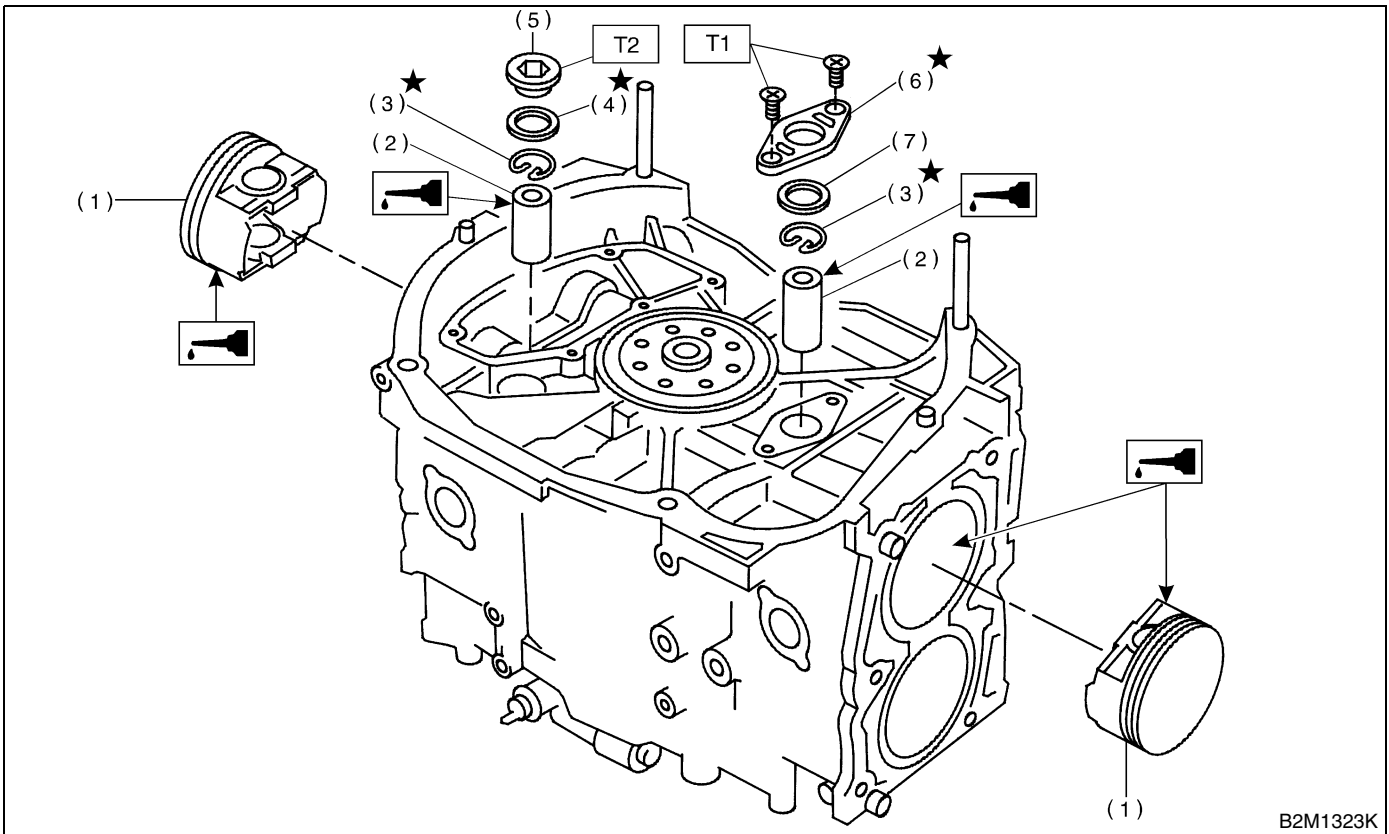
CAUTION:

Use a new gasket.



CYLINDER BLOCK

MECHANICAL



- | | |
|----------------|------------------------|
| (1) Piston | (5) Service hole plug |
| (2) Piston pin | (6) Service hole cover |
| (3) Circlip | (7) O-ring |
| (4) Gasket | |

Tightening torque: N·m (kgf·m, ft·lb)

T1: 6.4 (0.65, 4.7)

T2: 69 (7.0, 50.6)

(6) Turn the cylinder block so that #3 and #4 cylinders face upward. Using the same procedures as used for #1 and #2 cylinders, install the pistons and piston pins.

- 15) Install the water pipe.
- 16) Install the baffle plate.

Tightening torque:

6.4 N·m (0.65 kgf·m, 4.7 ft·lb)

- 17) Install the oil strainer and O-ring

Tightening torque:

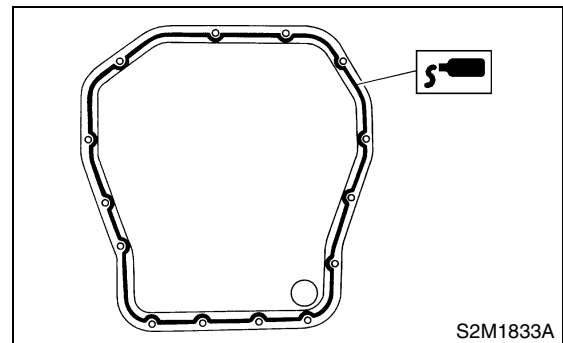
10 N·m (1.0 kgf·m, 7 ft·lb)

- 18) Install the oil strainer stay.

19) Apply fluid packing to the matching surfaces, and then install the oil pan.

Fluid packing:

THREE BOND 1215 or equivalent

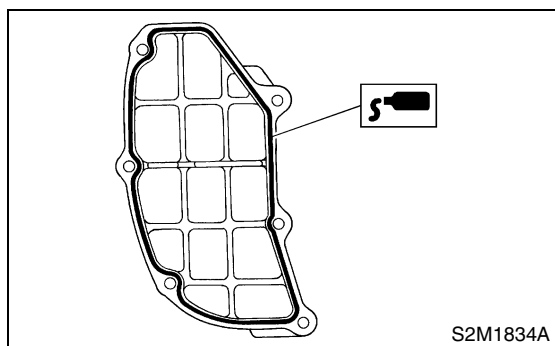


CYLINDER BLOCK

MECHANICAL

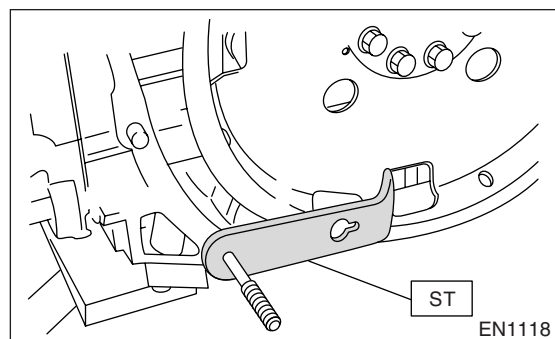
20) Apply fluid packing to the matching surfaces, and then install the oil separator cover.

Fluid packing:
THREE BOND 1215 or equivalent



21) Install the drive plate. (AT vehicles)
To lock the crankshaft, use ST.
ST 498497100 CRANKSHAFT STOPPER

Tightening torque:
72 N-m (7.3 kgf-m, 52.8 ft-lb)



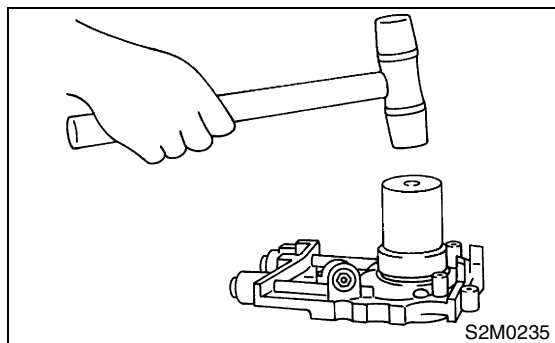
22) Install the flywheel. (MT vehicles) <Ref. to CL-24, INSTALLATION, Flywheel.>

23) Install the clutch disc and cover. (MT vehicles) <Ref. to CL-20, INSTALLATION, Clutch Disc and Cover.>

24) Installation of oil pump:

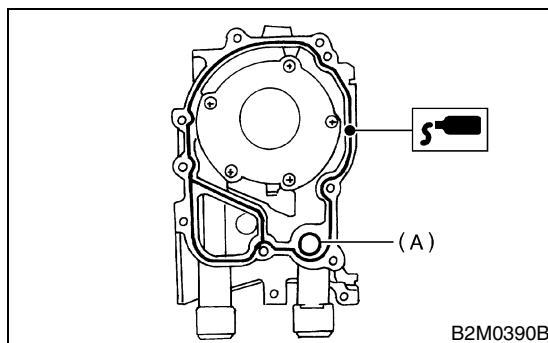
(1) Discard the front oil seal after removal. Replace with a new one using the ST.

ST 499587100 OIL SEAL INSTALLER



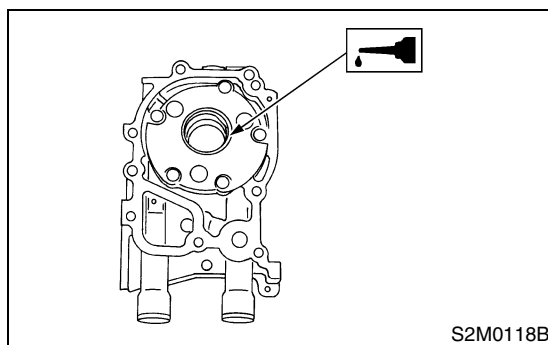
(2) Apply fluid packing to the matching surface of oil pump.

Fluid packing:
THREE BOND 1215 or equivalent



(A) O-ring

(3) Apply a coat of engine oil to the inside of the oil seal.



(4) Install the oil pump on cylinder block. Be careful not to damage the oil seal during installation.

Tightening torque:
6.4 N-m (0.65 kgf-m, 4.7 ft-lb)

CAUTION:

- Do not forget to install the O-ring and seal when installing the oil pump.
- Align the flat surface of oil pump's inner rotor with crankshaft before installation.

25) Install the water pump and gasket.

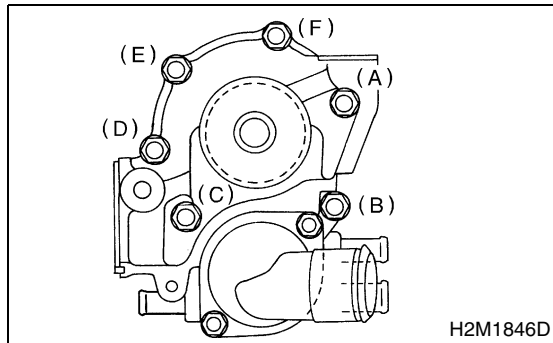
Tightening torque:

First; 12 N·m (1.2 kgf·m, 8.7 ft·lb)

Second; 12 N·m (1.2 kgf·m, 8.7 ft·lb)

CAUTION:

- Be sure to use a new gasket.
- When installing the water pump, tighten bolts in two stages in alphabetical sequence as shown in the figure.



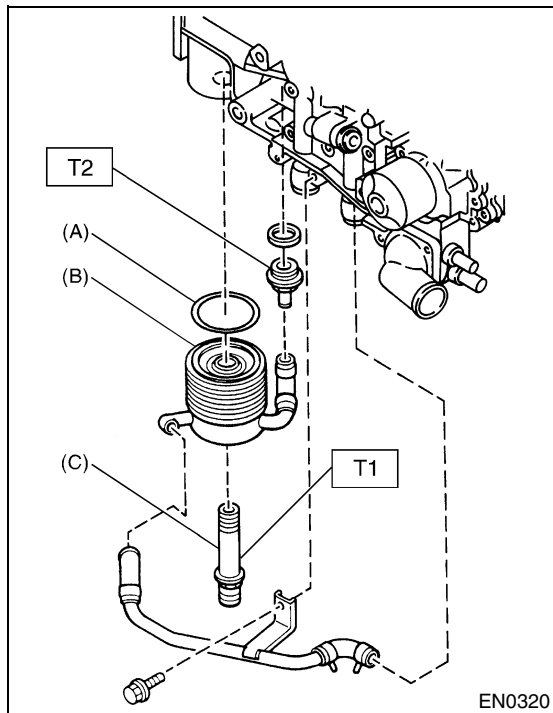
26) Install the water by-pass pipe for heater.

27) Install the oil cooler.

Tightening torque:

T1: 55 N·m (5.5 kgf·m, 40 ft·lb)

T2: 69 N·m (7.0 kgf·m, 50.6 ft·lb)

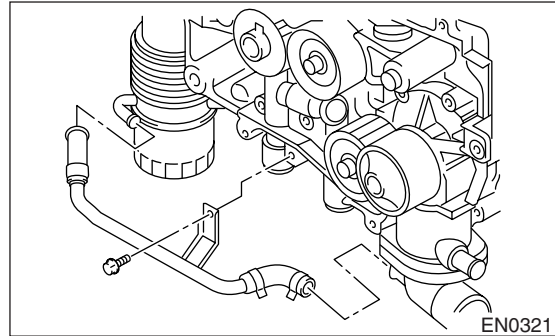


- (A) O-ring
- (B) Oil cooler
- (C) Connector

28) Install the oil filter using ST.

ST 498547000 OIL FILTER WRENCH

29) Install the water by-pass pipe between oil cooler and water pump.



30) Install the water pipe.

NOTE:

Always use a new O-ring.

31) Install the cylinder head assembly. <Ref. to ME(TURBO)-64, INSTALLATION, Cylinder Head Assembly.>

32) Install the oil level gauge guide and tighten the attaching bolt (left side only).

33) Install the rocker cover.

34) Install the crankshaft sprocket. <Ref. to ME(TURBO)-58, INSTALLATION, Crankshaft Sprocket.>

35) Install the camshaft sprocket. <Ref. to ME(TURBO)-57, INSTALLATION, Camshaft Sprocket.>

36) Install the timing belt assembly. <Ref. to ME(TURBO)-50, INSTALLATION, Timing Belt Assembly.>

37) Install the belt cover. <Ref. to ME(TURBO)-47, INSTALLATION, Belt Cover.>

38) Install the crankshaft pulley. <Ref. to ME(TURBO)-46, INSTALLATION, Crankshaft Pulley.>

39) Install the generator and A/C compressor brackets on cylinder head.

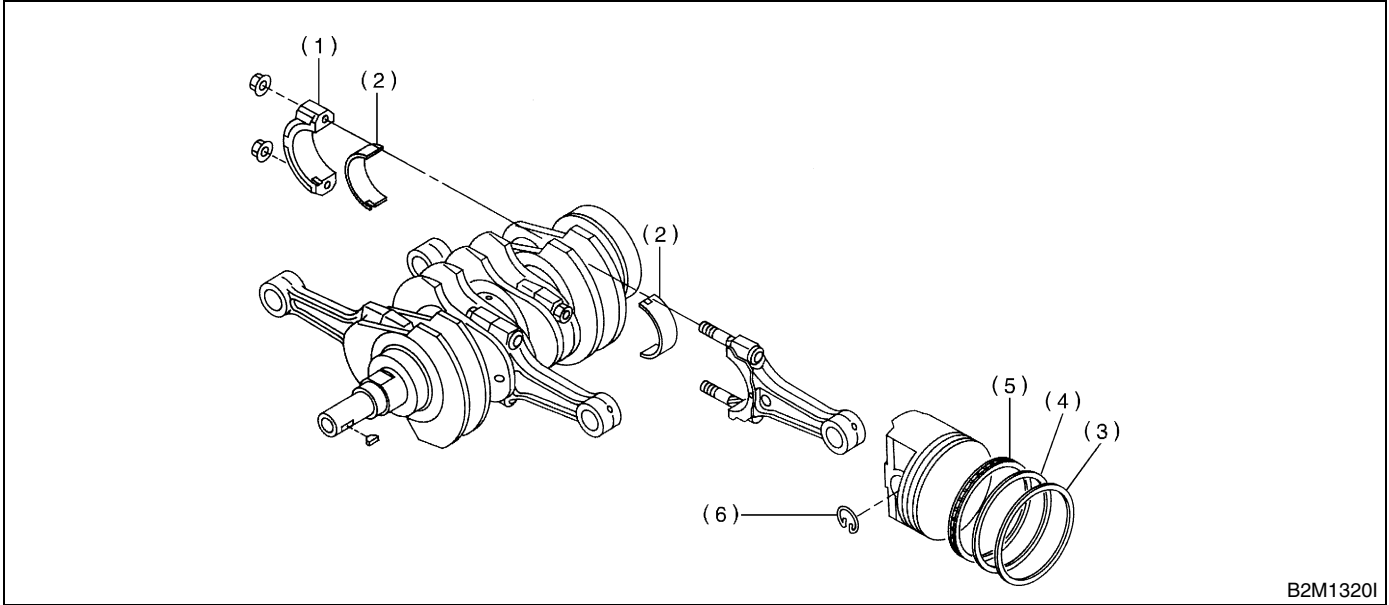
40) Install the V-belt. <Ref. to ME(TURBO)-45, INSTALLATION, V-belt.>

41) Install the intake manifold. <Ref. to FU(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 the connecting rod cap.
- 2) Remove the connecting rod bearing.

CAUTION:

Arrange the removed connecting rod, connecting rod cap and bearing in order to prevent confusion.

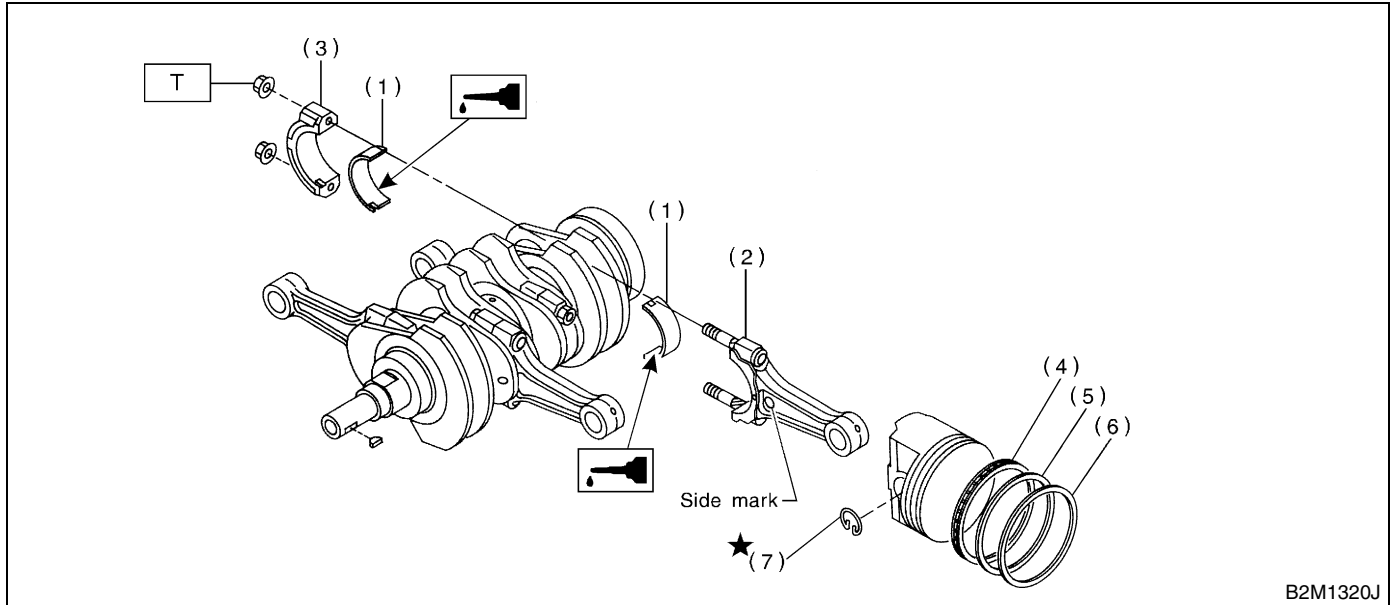
- 3) Remove the piston rings using the piston ring expander.
- 4) Remove the oil ring by hand.

CAUTION:

Arrange the removed piston rings in proper order to prevent confusion.

- 5) Remove the circlip.

D: ASSEMBLY



- | | |
|----------------------------|-----------------|
| (1) Connecting rod bearing | (5) Second ring |
| (2) Connecting rod | (6) Top ring |
| (3) Connecting rod cap | (7) Circlip |
| (4) Oil ring | |

Tightening torque: N·m (kgf·m, ft·lb)

T: 44.6 (4.55, 32.9)

1) Install the connecting rod bearings on connecting rods and connecting rod caps.

CAUTION:

Apply oil to the surfaces of the connecting rod bearings.

2) Install the connecting rod on crankshaft.

CAUTION:

Position each connecting rod with the side marked facing forward.

3) Install the connecting rod cap with connecting rod nut.

Ensure the arrow on connecting rod cap faces the front during installation.

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 the oil ring spacer, upper rail and lower rail in this order by hand. Then install the second ring and top ring with a piston ring expander.

E: INSPECTION

1. CYLINDER BLOCK

1) Visually check for cracks and damage. Especially, inspect the important parts by means of red lead check.

2) Check the oil passages for clogging.

3) Inspect the crankcase surface that mates with cylinder head for warping by using a straight edge, and correct by grinding if necessary.

Warping limit:

0.05 mm (0.0020 in)

Grinding limit:

0.1 mm (0.004 in)

Standard height of cylinder block:

201.0 mm (7.91 in)

CYLINDER BLOCK

MECHANICAL

2. CYLINDER AND PISTON

1) The cylinder bore size is stamped on cylinder block's front upper surface.

CAUTION:

Measurement should be performed at a temperature of 20°C (68°F).

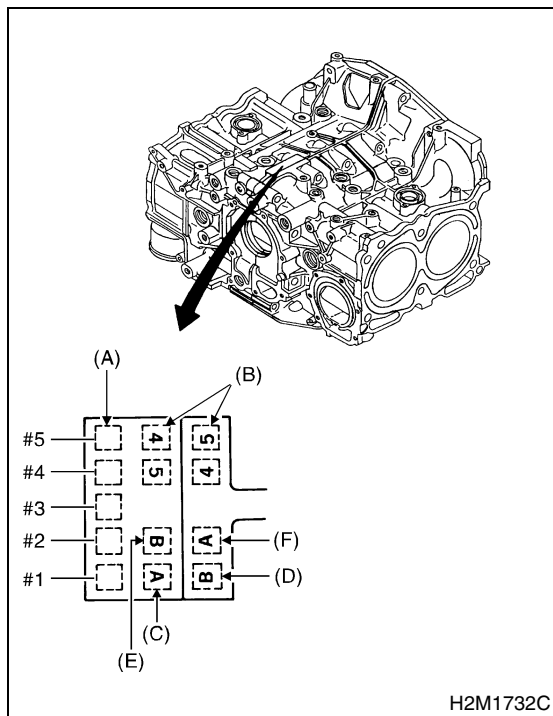
NOTE:

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 of 20°C (68°F).

Taper:

Standard

0.015 mm (0.0006 in)

Limit

0.050 mm (0.0020 in)

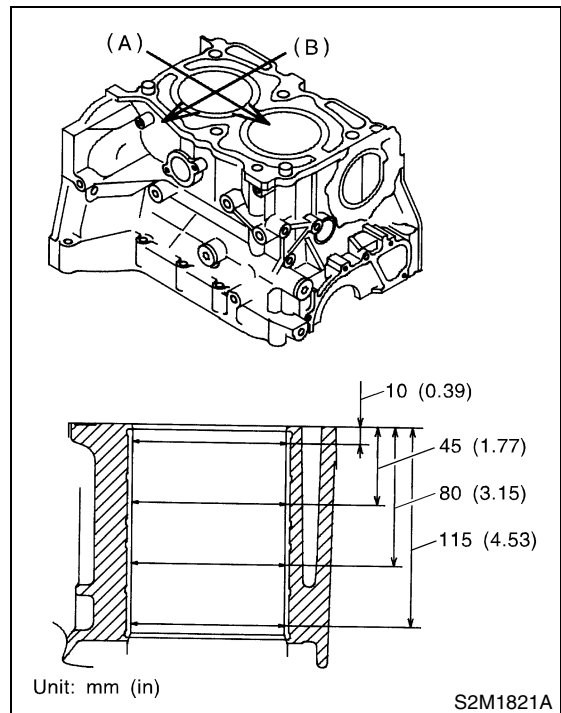
Out-of-roundness:

Standard

0.010 mm (0.0004 in)

Limit

0.050 mm (0.0020 in)



- (A) Piston pin direction
- (B) Thrust direction

3) When the piston is to be replaced due to general or cylinder wear, determine a suitable sized piston by measuring the piston clearance.

4) How to measure the outer diameter of each piston:

Measure the outer diameter of each piston at the height shown in the figure. (Thrust direction)

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)

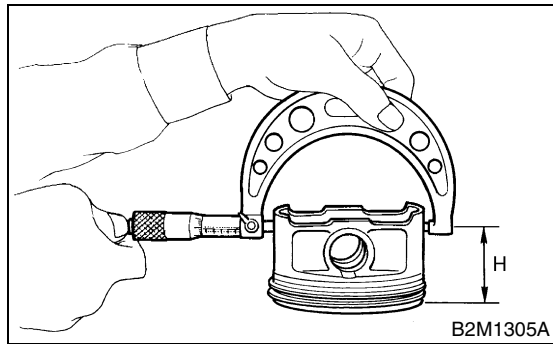
B: 91.975 — 91.985 mm
(3.6211 — 3.6214 in)

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 temperature rise. Thus, pay attention to this when measuring the cylinder diameter.

Limit of cylinder enlarging (boring):

0.5 mm (0.020 in)

3. PISTON AND PISTON PIN

1) Check the pistons and piston pins for damage, cracks, and wear and the piston ring grooves for wear and damage. Replace if defective.

2) Measure the piston-to-cylinder clearance at each cylinder. <Ref. to ME(TURBO)-84, CYLINDER AND PISTON, INSPECTION, Cylinder Block.> If any of the clearances is not within specification, replace the piston or bore the cylinder to use an oversize piston.

CYLINDER BLOCK

MECHANICAL

3) Make sure that the piston pin can be inserted into the piston pin hole with a thumb at 20°C (68°F). Replace if defective.

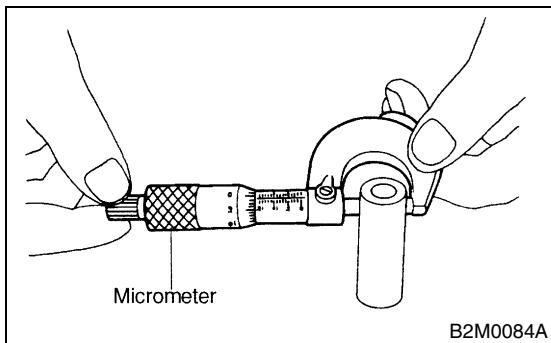
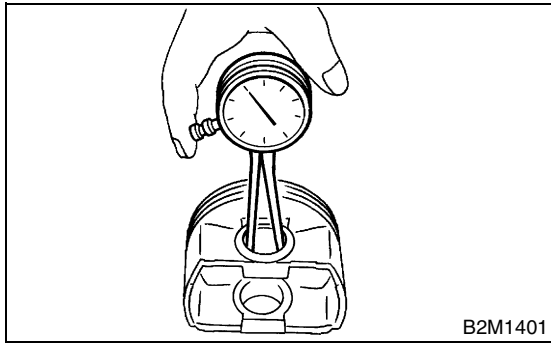
Standard clearance between piston pin and hole in piston:

Standard

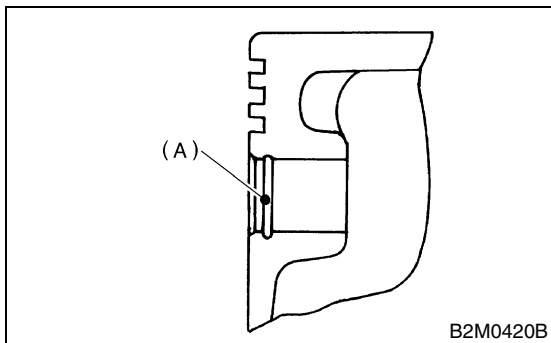
0.004 — 0.008 mm (0.0002 — 0.0003 in)

Limit

0.020 mm (0.0008 in)



4) Check the circlip installation groove on piston for burr (A). If necessary, remove the burr from groove so that the piston pin can lightly move.



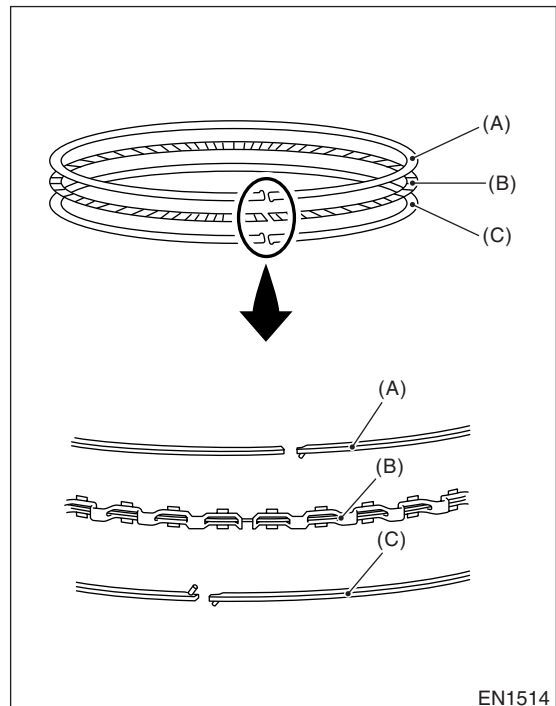
5) Check the piston pin circlip for distortion, cracks and wear.

4. PISTON RING

1) If the piston ring is broken, damaged, or worn, or if its tension is insufficient, or when the piston is replaced, replace the piston ring with a new one of the same size as the piston.

CAUTION:

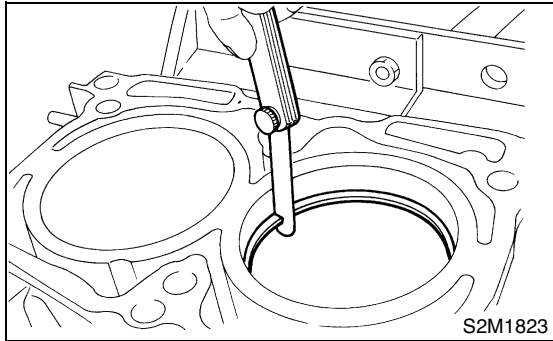
- Marks are shown on the end of top and second rings. When installing the rings to piston, face this mark upward.
- Oil ring consists of upper rail, expander and lower rail. When installing on piston, be careful of each rail's direction.



- (A) Upper rail
- (B) Expander
- (C) Lower rail

2) Squarely place the piston ring and oil ring in cylinder, and then measure the piston ring gap with a thickness gauge.

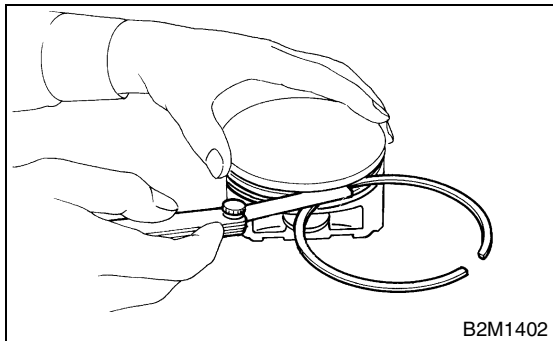
		Unit: mm (in)	
		Standard	Limit
Piston ring gap	Top ring	0.20 — 0.25 (0.0079 — 0.0098)	1.0 (0.039)
	Second ring	0.35 — 0.50 (0.0138 — 0.0197)	1.0 (0.039)
	Oil ring rail	0.20 — 0.50 (0.0079 — 0.0197)	1.5 (0.059)



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.

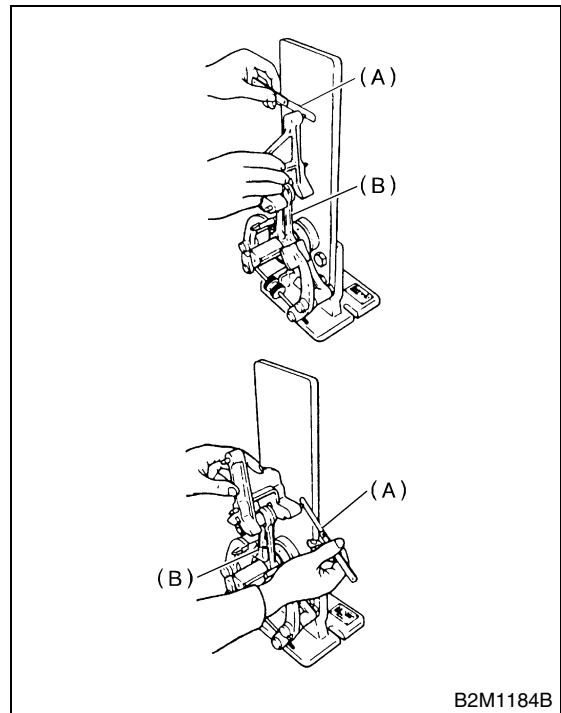
		Unit: mm (in)	
		Standard	Limit
Clearance between piston ring and piston ring groove	Top ring	0.055 — 0.090 (0.0022 — 0.0035)	0.15 (0.0059)
	Second ring	0.030 — 0.070 (0.0012 — 0.0028)	0.15 (0.0059)



5. CONNECTING ROD

- 1) Replace the connecting rod, if the large or small end thrust surface is damaged.
- 2) Check for bend or twist using a connecting rod aligner. Replace the connecting rod if the bend or twist exceeds the limit.

Limit of bend or twist per 100 mm (3.94 in) in length:
0.10 mm (0.0039 in)



- (A) Thickness gauge
- (B) Connecting rod

3) Install the connecting rod fitted with bearing to crankshaft, and then measure the side clearance (thrust clearance). Replace the connecting rod if the side clearance exceeds the specified limit.

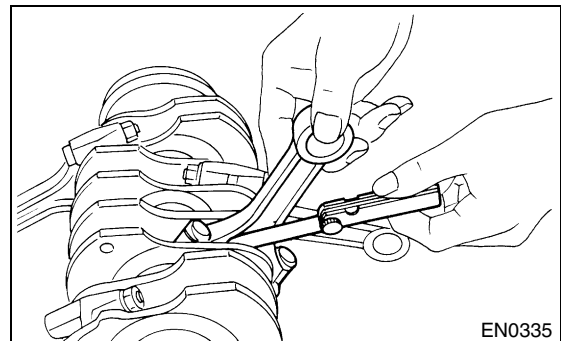
Connecting rod side clearance:

Standard

0.070 — 0.330 mm (0.0028 — 0.0130 in)

Limit

0.4 mm (0.016 in)



CYLINDER BLOCK

MECHANICAL

4) Inspect the connecting rod bearing for scar, peeling, seizure, melting, wear, etc.

5) Measure the oil clearance on individual connecting rod bearings by means of plastigauge. If any oil clearance is not within specification, replace the defective bearing with a new one of standard size or undersize as necessary. (See the table below.)

Connecting rod oil clearance:

Standard

0.020 — 0.046 mm (0.0008 — 0.0018 in)

Limit

0.05 mm (0.0020 in)

Unit: mm (in)		
Bearing	Bearing size (Thickness at center)	Outer diameter of crank pin
Standard	1.486 — 1.498 (0.0585 — 0.0590)	51.984 — 52.000 (2.0466 — 2.0472)
0.03 (0.0012) undersize	1.504 — 1.512 (0.0592 — 0.0595)	51.954 — 51.970 (2.0454 — 2.0461)
0.05 (0.0020) undersize	1.514 — 1.522 (0.0596 — 0.0599)	51.934 — 51.950 (2.0447 — 2.0453)
0.25 (0.0098) undersize	1.614 — 1.622 (0.0635 — 0.0639)	51.734 — 51.750 (2.0368 — 2.0374)

6) Inspect the bushing at connecting rod small end, and replace if worn or damaged. Also measure the piston pin clearance at connecting rod small end.

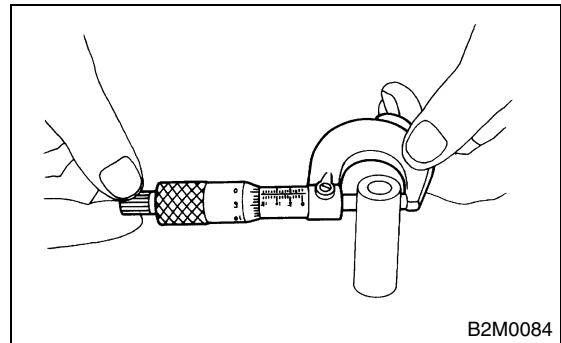
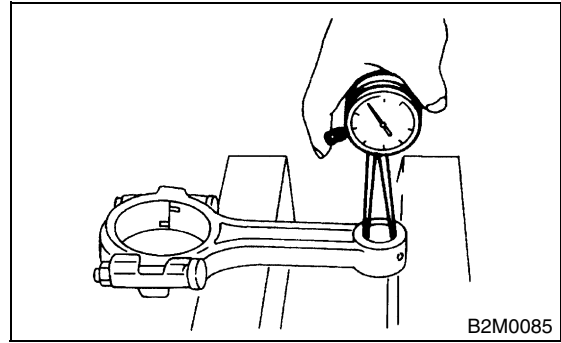
Clearance between piston pin and bushing:

Standard

0 — 0.022 mm (0 — 0.0009 in)

Limit

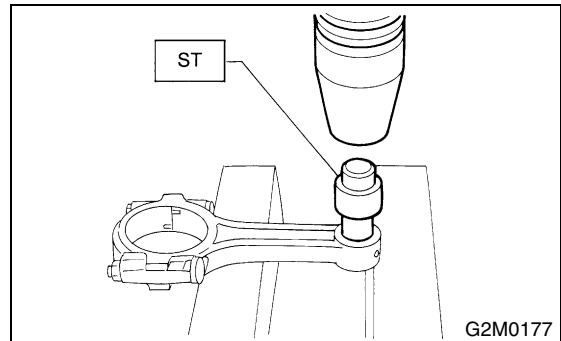
0.030 mm (0.0012 in)



7) Replacement procedure is as follows:

- (1) Remove the bushing from connecting rod with ST and press.
- (2) Press the bushing with ST after applying oil on the periphery of bushing.

ST 499037100 CONNECTING ROD BUSHING REMOVER AND INSTALLER



(3) Make two 3 mm (0.12 in) holes in bushing. Ream the inside of bushing.

(4) After the completion of reaming, clean the bushing to remove chips.

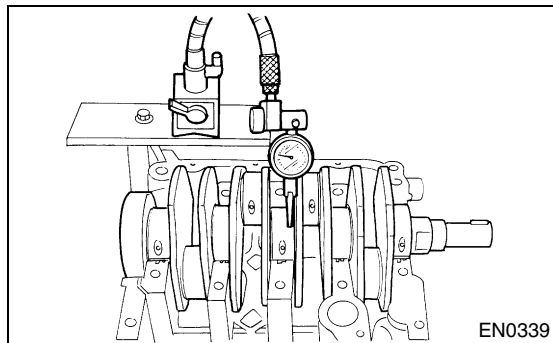
6. CRANKSHAFT AND CRANKSHAFT BEARING

- 1) Clean the crankshaft completely and check for cracks by means of red lead check etc., and replace if defective.
- 2) Measure the crankshaft bend, and correct or replace if it exceeds the limit.

CAUTION:

If a suitable V-block is not available, install the #1 and #5 crankshaft bearing on cylinder block, position the crankshaft on these bearings and measure the crankshaft bend using a dial gauge.

Crankshaft bend limit:
0.035 mm (0.0014 in)



- 3) Inspect the crank journal and crank pin for wear. If they are not within the specifications, replace the bearing with a suitable (undersize) one, and then replace or recondition the crankshaft as necessary. When grinding the crank journal or crank pin, finish them to specified dimensions according to the undersize bearing to be used.

Crank pin and crank journal:

Out-of-roundness

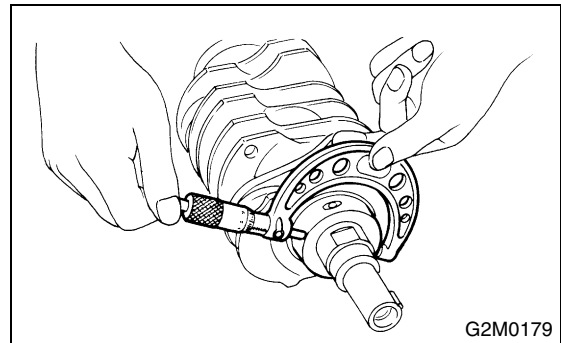
0.020 mm (0.0008 in) or less

Taper limit

0.07 mm (0.0028 in)

Grinding limit

0.250 mm (0.0098 in)



		Crank journal diameter		Unit: mm (in)
		#1, #3, #5	#2, #4	Crank pin diameter
Standard	Journal O.D.	59.992 — 60.008 (2.3619 — 2.3625)	59.992 — 60.008 (2.3619 — 2.3625)	51.984 — 52.000 (2.0466 — 2.0472)
	Bearing size (Thickness at center)	1.998 — 2.011 (0.0787 — 0.0792)	2.000 — 2.013 (0.0787 — 0.0793)	1.486 — 1.498 (0.0585 — 0.0590)
0.03 (0.0012) undersize	Journal O.D.	59.962 — 59.978 (2.3607 — 2.3613)	59.962 — 59.978 (2.3607 — 2.3613)	51.954 — 51.970 (2.0454 — 2.0461)
	Bearing size (Thickness at center)	2.017 — 2.020 (0.0794 — 0.0795)	2.019 — 2.022 (0.0795 — 0.0796)	1.504 — 1.512 (0.0592 — 0.0595)
0.05 (0.0020) undersize	Journal O.D.	59.942 — 59.958 (2.3599 — 2.3605)	59.942 — 59.958 (2.3599 — 2.3605)	51.934 — 51.950 (2.0447 — 2.0453)
	Bearing size (Thickness at center)	2.027 — 2.030 (0.0798 — 0.0799)	2.029 — 2.032 (0.0799 — 0.0800)	1.514 — 1.522 (0.0596 — 0.0599)
0.25 (0.0098) undersize	Journal O.D.	59.742 — 59.758 (2.3520 — 2.3527)	59.742 — 59.758 (2.3520 — 2.3527)	51.734 — 51.750 (2.0368 — 2.0374)
	Bearing size (Thickness at center)	2.127 — 2.130 (0.0837 — 0.0839)	2.129 — 2.132 (0.0838 — 0.0839)	1.614 — 1.622 (0.0635 — 0.0639)

O.D.: Outer Diameter

CYLINDER BLOCK

MECHANICAL

4) Measure the thrust clearance of crankshaft at center bearing. If the clearance exceeds the limit, replace the bearing.

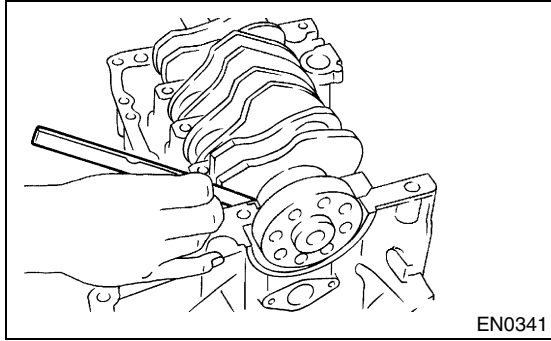
Crankshaft thrust clearance:

Standard

0.030 — 0.115 mm (0.0012 — 0.0045 in)

Limit

0.25 mm (0.0098 in)



5) Inspect individual crankshaft bearings for signs of flaking, seizure, melting, and wear.

6) Measure the oil clearance on each crankshaft bearing by means of plastigauge. If the measurement is not within the specification, replace the defective bearing with an undersize one, and replace or recondition the crankshaft as necessary.

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

21.Engine Trouble in General

A: INSPECTION

NOTE:

“RANK” shown in the chart refers to the possibility of reason for the trouble in order (“Very often” to “Rarely”)

A — Very often

B — Sometimes

C — Rarely

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
1. Engine will not start.			
1) Starter does not turn.	• Starter	• Defective battery-to-starter harness	B
		• Defective starter switch	C
		• Defective inhibitor switch or neutral switch	C
		• Defective starter	B
	• Battery	• Poor terminal connection	A
		• Run-down battery	A
		• Defective charging system	B
	• Friction	• Seizure of crankshaft and connecting rod bearing	C
		• Seized camshaft	C
		• Seized or stuck piston and cylinder	C
2) Initial combustion does not occur.	• Starter	• Defective starter	C
	• Engine control system <Ref. to EN(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(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(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(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 filler cap	B
		• Dirty air cleaner element	C
	• Fuel line	• Defective fuel pump and relay	C
		• Clogged fuel line	C
		• Lack of or insufficient fuel	B
	• Belt	• Defective timing	C
	• Compression	• Incorrect valve clearance	B
		• Loosened spark plugs or defective gasket	B
		• Loosened cylinder head bolts or defective gasket	B
		• Improper valve seating	B
		• Defective valve stem	C
		• Worn or broken valve spring	B
		• Worn or stuck piston rings, cylinder and piston	B
		• Incorrect valve timing	A
		• Improper engine oil (low viscosity)	B
	• Lubrication system	• Incorrect oil pressure	B
		• Defective rocker cover gasket	C
	• Cooling system	• Overheating	C
	• Others	• Malfunction of evaporative emission control system	A
		• Stuck or damaged throttle valve	B
		• Accelerator cable out of adjustment	C

ENGINE TROUBLE IN GENERAL

MECHANICAL

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
3. Low output, hesitation and poor acceleration	• Engine control system <Ref. to EN(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 filler cap	B
		• Dirty air cleaner element	A
	• Fuel line	• Defective fuel pump and relay	B
		• Clogged fuel line	B
		• Lack of or insufficient fuel	C
	• Belt	• Defective timing	B
	• Compression	• Incorrect valve clearance	B
		• Loosened spark plugs or defective gasket	B
		• Loosened cylinder head bolts or defective gasket	B
		• Improper valve seating	B
		• Defective valve stem	C
		• Worn or broken valve spring	B
		• Worn or stuck piston rings, cylinder and piston	C
		• Incorrect valve timing	A
	• Improper engine oil (low viscosity)	B	
• Lubrication system	• Incorrect oil pressure	B	
• Cooling system	• Overheating	C	
	• Over cooling	C	
• Others	• Malfunction of evaporative emission control system	A	
4. Surging	• Engine control system <Ref. to EN(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 filler cap	B
		• Dirty air cleaner element	B
	• Fuel line	• Defective fuel pump and relay	B
		• Clogged fuel line	B
		• Lack of or insufficient fuel	C
	• Belt	• Defective timing	B
	• Compression	• Incorrect valve clearance	B
		• Loosened spark plugs or defective gasket	C
		• Loosened cylinder head bolts or defective gasket	C
		• Improper valve seating	C
		• Defective valve stem	C
		• Worn or broken valve spring	C
		• Worn or stuck piston rings, cylinder and piston	C
		• Incorrect valve timing	A
	• Improper engine oil (low viscosity)	B	
• Cooling system	• Overheating	B	
• Others	• Malfunction of evaporative emission control system	C	

ENGINE TROUBLE IN GENERAL

MECHANICAL

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
5. Engine does not return to idle.	• Engine control system <Ref. to EN(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(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(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(TURBO)-2, Basic Diagnostic Procedure.>		A
	• Intake system	• Loosened oil filler cap	B
	• Belt	• Defective timing	B
	• Compression	• Incorrect valve clearance	C
		• Incorrect valve timing	B
	• Cooling system	• Overheating	A
9. Excessive engine oil consumption	• Intake system	• Loosened or cracked PCV hose	A
		• Defective PCV valve	B
		• Loosened oil filler cap	C
	• Compression	• Defective valve stem	A
		• Worn or stuck piston rings, cylinder and piston	A
	• Lubrication system	• Loosened oil pump attaching bolts and defective gasket	B
		• Defective oil filter o-ring	B
		• Defective crankshaft oil seal	B
		• Defective rocker cover gasket	B
		• Loosened oil drain plug or defective gasket	B
		• Loosened oil pan fitting bolts or defective oil pan	B

ENGINE TROUBLE IN GENERAL

MECHANICAL

TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK	
10. Excessive fuel consumption	• Engine control system <Ref. to EN(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	

ENGINE NOISE

MECHANICAL

22.Engine Noise

A: INSPECTION

Type of sound	Condition	Possible cause
Regular clicking sound	Sound increases as engine speed increases.	<ul style="list-style-type: none"> • Valve mechanism is defective. • Incorrect valve clearance • Worn valve rocker • Worn camshaft • Broken valve spring
Heavy and dull clank	Oil pressure is low.	<ul style="list-style-type: none"> • Worn crankshaft main bearing • Worn connecting rod bearing (big end)
	Oil pressure is normal.	<ul style="list-style-type: none"> • Loose flywheel mounting bolts • Damaged engine mounting
High-pitched clank (Spark knock)	Sound is noticeable when accelerating with an overload.	<ul style="list-style-type: none"> • Ignition timing advanced • Accumulation of carbon inside combustion chamber • Wrong spark plug • Improper gasoline
Clank when engine speed is medium (1,000 to 2,000 rpm).	Sound is reduced when fuel injector connector of noisy cylinder is disconnected. (NOTE*)	<ul style="list-style-type: none"> • Worn crankshaft main bearing • Worn bearing at crankshaft end of connecting rod
Knocking sound when engine is operating under idling speed and engine is warm	Sound is reduced when fuel injector connector of noisy cylinder is disconnected. (NOTE*)	<ul style="list-style-type: none"> • Worn cylinder liner and piston ring • Broken or stuck piston ring • Worn piston pin and hole at piston end of connecting rod
	Sound is not reduced if each fuel injector connector is disconnected in turn. (NOTE*)	<ul style="list-style-type: none"> • Unusually worn valve lifter • Worn cam gear • Worn camshaft journal bore in crankcase
Squeaky sound	—	<ul style="list-style-type: none"> • Insufficient generator lubrication
Rubbing sound	—	<ul style="list-style-type: none"> • Defective generator brush and rotor contact
Gear scream when starting engine	—	<ul style="list-style-type: none"> • Defective ignition starter switch • Worn gear and starter pinion
Sound like polishing glass with a dry cloth	—	<ul style="list-style-type: none"> • Loose drive belt • Defective water pump shaft
Hissing sound	—	<ul style="list-style-type: none"> • Loss of compression • Air leakage in air intake system, hoses, connections or manifolds
Timing belt noise	—	<ul style="list-style-type: none"> • Loose timing belt • Belt contacting case/adjacent part
Valve tappet noise	—	<ul style="list-style-type: none"> • Incorrect valve clearance

NOTE*:

When disconnecting the fuel injector connector, Malfunction Indicator Light (CHECK ENGINE light) illuminates and trouble code is stored in ECM memory.

Therefore, carry out the CLEAR MEMORY MODE <Ref. to EN(TURBO)-45, OPERATION, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(TURBO)-42, OPERATION, Inspection Mode.> after connecting the fuel injector connector.

EXHAUST

EX(TURBO)

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3. Center Exhaust Pipe	8
4. Joint Pipe	12
5. Rear Exhaust Pipe	13
6. Muffler	14

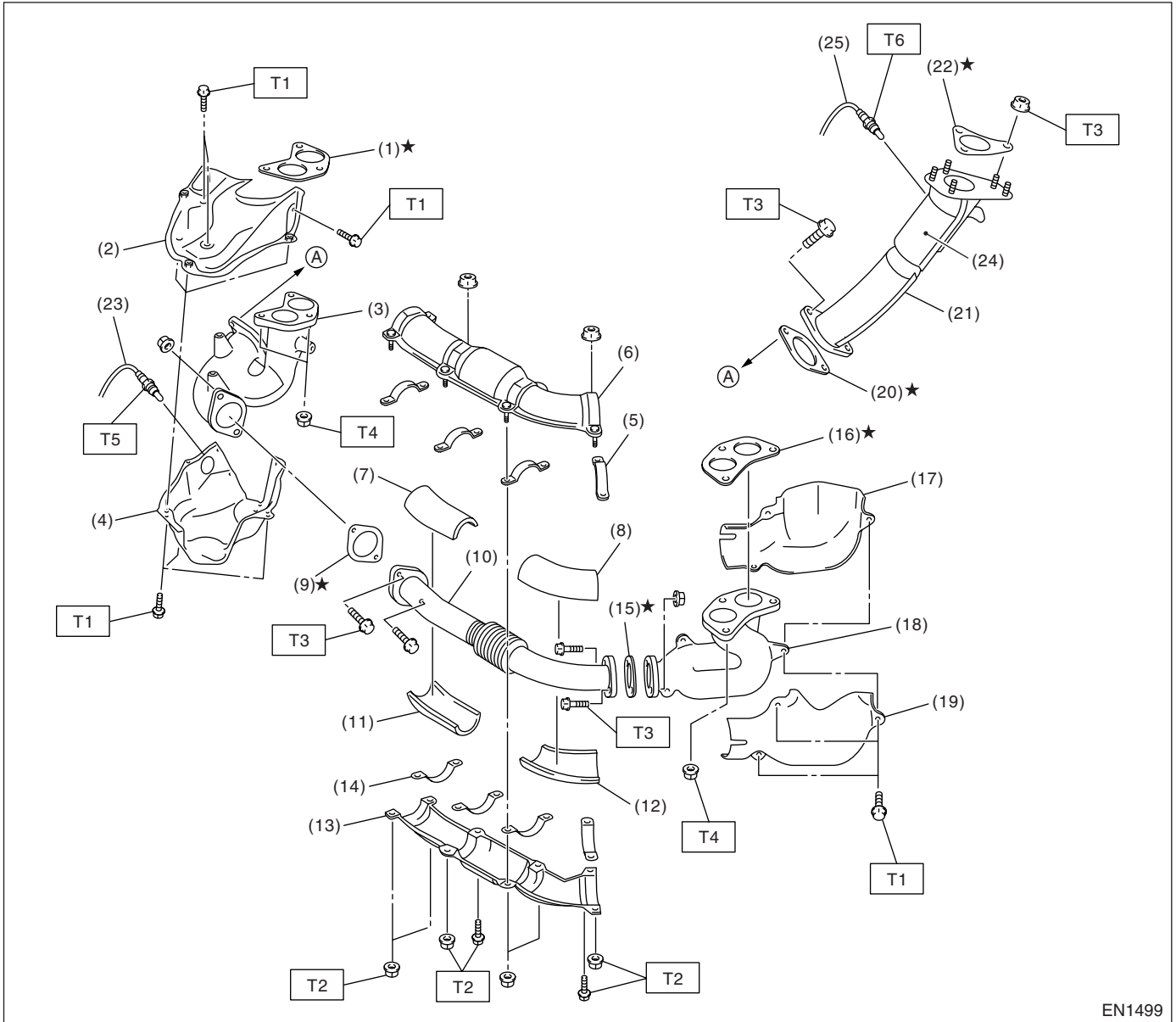
GENERAL DESCRIPTION

EXHAUST

1. General Description

A: COMPONENT

1. FRONT EXHAUST PIPE



EN1499

GENERAL DESCRIPTION

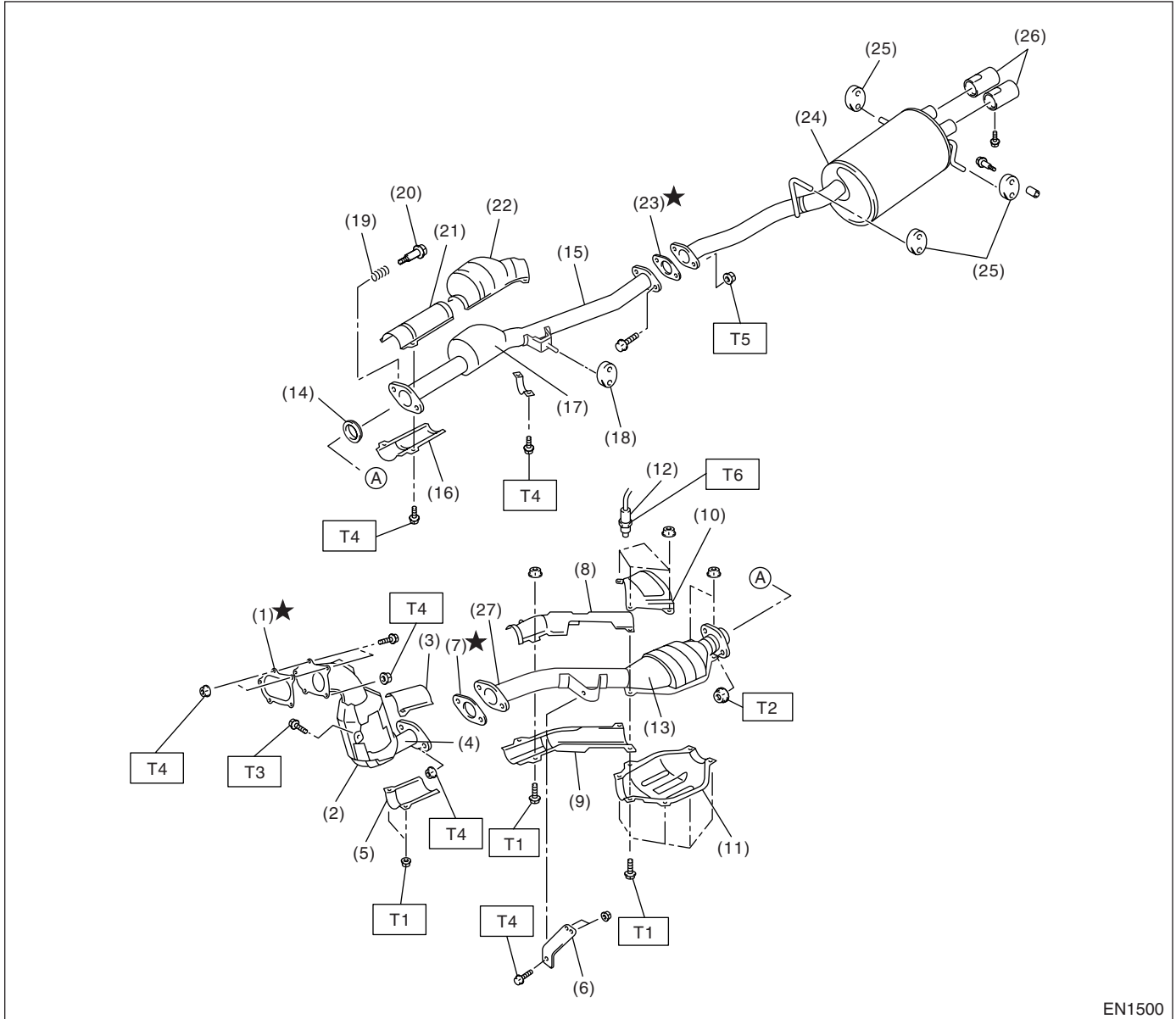
EXHAUST

(1) Gasket	(12) Front exhaust pipe lower insulator (LH)	(25) Exhaust temperature sensor
(2) Upper exhaust manifold cover (RH)	(13) Front exhaust pipe lower cover	
(3) Exhaust manifold (RH)	(14) Front exhaust pipe lower clamp	<i>Tightening torque: N·m (kgf·m, ft·lb)</i>
(4) Lower exhaust manifold cover (RH)	(15) Gasket	<i>T1: 19 (1.9, 13.7)</i>
(5) Front exhaust pipe upper clamp	(16) Gasket	<i>T2: 25 (2.5, 18.1)</i>
(6) Front exhaust pipe upper cover	(17) Upper exhaust manifold cover (LH)	<i>T3: 35 (3.6, 26.0)</i>
(7) Front exhaust pipe upper insulator (RH)	(18) Exhaust manifold (LH)	<i>T4: 40 (4, 28.9)</i>
(8) Front exhaust pipe upper insulator (LH)	(19) Lower exhaust manifold cover (LH)	<i>T5: <Ref. to FU(TURBO)-45, INSTALLATION, Front Oxygen (A/F) Sensor.></i>
(9) Gasket	(20) Gasket	
(10) Front exhaust pipe	(21) Turbocharger joint pipe	<i>T6: <Ref. to FU(TURBO)-48, INSTALLATION, Exhaust Temperature Sensor.></i>
(11) Front exhaust pipe lower insulator (RH)	(22) Gasket	
	(23) Front oxygen (A/F) sensor	
	(24) Precatalytic converter	

GENERAL DESCRIPTION

EXHAUST

2. CENTER AND REAR EXHAUST PIPE, AND MUFFLER



EN1500

(1) Gasket	(13) Rear catalytic converter	(24) Muffler
(2) Front catalytic converter	(14) Gasket	(25) Cushion
(3) Upper center pipe cover (Front)	(15) Rear exhaust pipe	(26) Muffler cutter
(4) Center exhaust pipe (Front)	(16) Lower rear exhaust pipe cover (Front)	(27) Center exhaust pipe (Rear)
(5) Lower center pipe cover (Front)	(17) Chamber	
(6) Bracket	(18) Cushion	
(7) Gasket	(19) Spring	
(8) Upper center pipe cover (Rear)	(20) Bolt	
(9) Lower center pipe cover (Rear)	(21) Upper rear exhaust pipe cover (Front)	
(10) Upper rear catalytic converter cover	(22) Upper rear exhaust pipe cover (Rear)	
(11) Lower rear catalytic converter cover	(23) Gasket	
(12) Rear oxygen sensor		

Tightening torque: N-m (kgf-m, ft-lb)

T1: 13 (1.3, 9.6)

T2: 18 (1.8, 13.0)

T3: 30 (3.1, 22.4)

T4: 35 (3.6, 26.0)

T5: 48 (4.9, 35.4)

T6: <Ref. to FU(TURBO)-46, INSTALLATION, Rear Oxygen Sensor.>

B: CAUTION

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn your hands, because each part on the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.

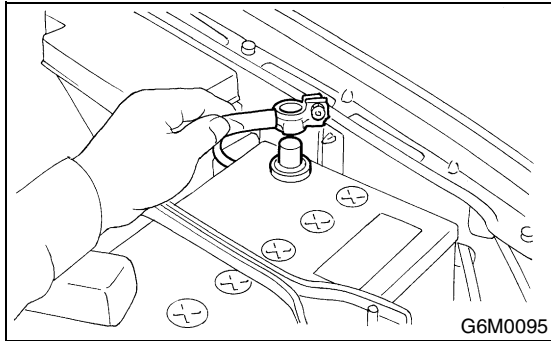
FRONT EXHAUST PIPE

EXHAUST

2. Front Exhaust Pipe

A: REMOVAL

1) Disconnect the ground cable from battery.

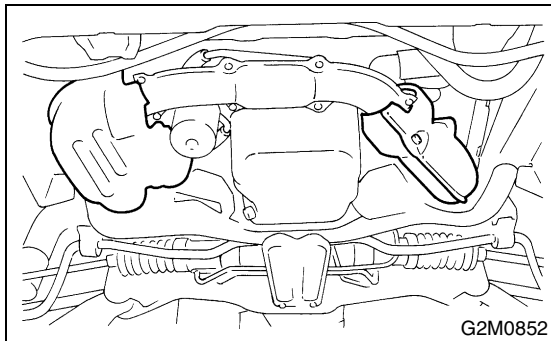


2) Remove the front oxygen (A/F) sensor. <Ref. to FU(TURBO)-44, REMOVAL, Front Oxygen (A/F) Sensor.>

3) Remove the under cover.

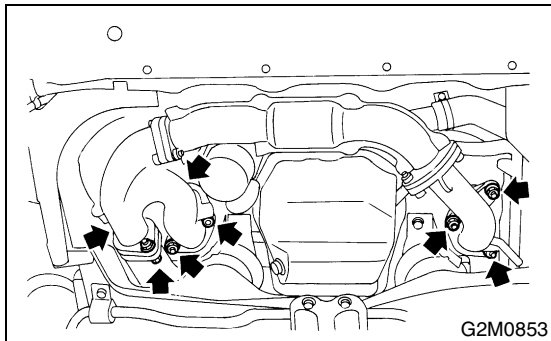
4) Remove the lower exhaust manifold cover (RH).

5) Remove the lower and upper exhaust manifold covers (LH).



6) Remove the bolts and nuts which hold front exhaust pipe assembly to turbocharger joint pipe.

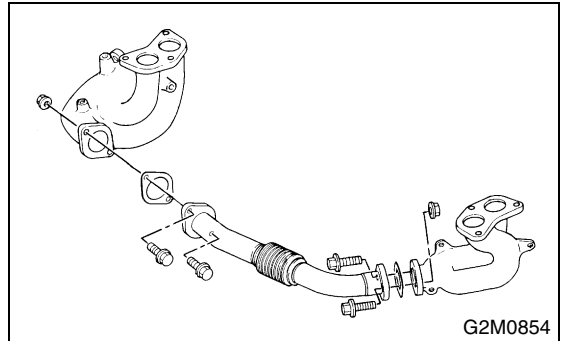
7) While holding the front exhaust pipe assembly with one hand, remove the nuts which hold front exhaust pipe assembly to cylinder head exhaust port.



8) Remove the front exhaust pipe assembly.

9) Remove the covers from exhaust manifold and front exhaust pipe.

10) Separate the front exhaust pipe from exhaust manifolds.



B: INSTALLATION

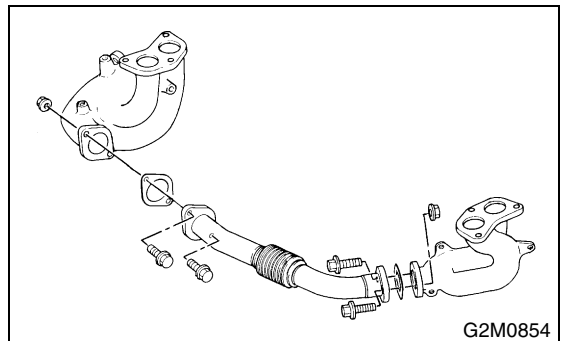
NOTE:

Replace the gaskets with new ones.

1) Assemble the front exhaust pipe and exhaust manifolds.

Tightening torque:

35 N·m (3.6 kgf-m, 26.0 ft-lb)



2) Install the front exhaust pipe covers.

Tightening torque:

25 N·m (2.5 kgf-m, 18.1 ft-lb)

3) Install the upper exhaust manifold cover (RH).

Tightening torque:

19 N·m (1.9 kgf-m, 13.7 ft-lb)

4) Install the front exhaust pipe assembly.

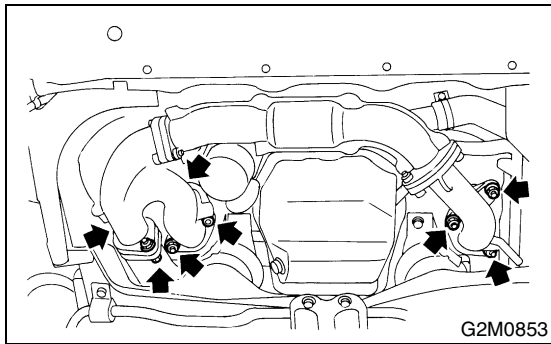
Tightening torque:

35 N·m (3.6 kgf-m, 26.0 ft-lb)

5) Connect the exhaust manifold (RH) to turbo-charger joint pipe.

Tightening torque:

35 N·m (3.6 kgf·m, 26.0 ft·lb)



6) Install the upper and lower exhaust manifold covers (LH).

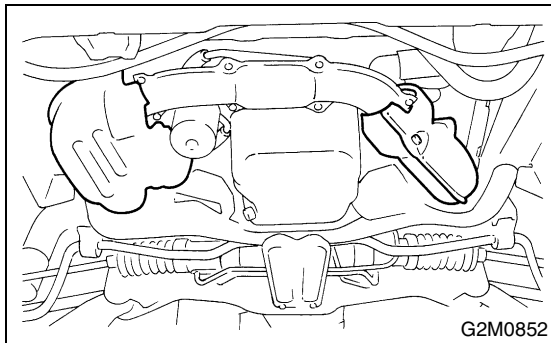
Tightening torque:

19 N·m (1.9 kgf·m, 13.7 ft·lb)

7) Install the lower exhaust manifold cover (RH).

Tightening torque:

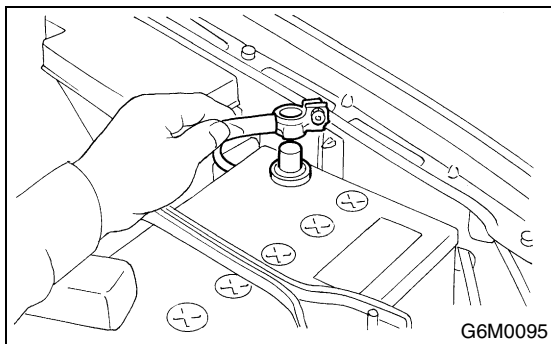
19 N·m (1.9 kgf·m, 13.7 ft·lb)



8) Install the front oxygen (A/F) sensor. <Ref. to FU(TURBO)-45, INSTALLATION, Front Oxygen (A/F) Sensor.>

9) Install the under cover.

10) Connect the battery ground cable to battery.



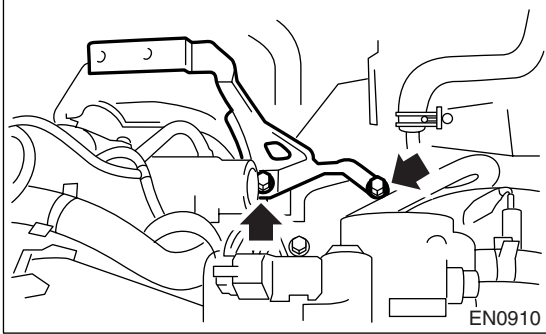
CENTER EXHAUST PIPE

EXHAUST

3. Center Exhaust Pipe

A: REMOVAL

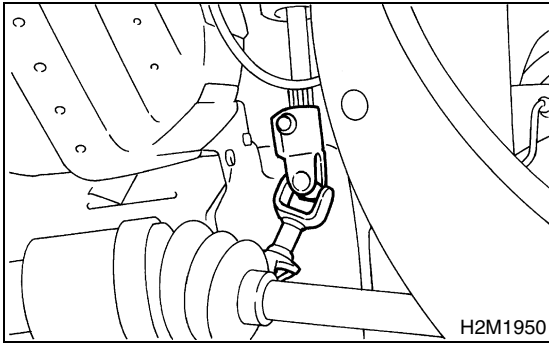
- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from battery.
- 3) Remove the intercooler. <Ref. to IN(TURBO)-10, REMOVAL, Intercooler.>
- 4) Remove the intercooler bracket.



- 5) Lift-up the vehicle.
- 6) Remove the under cover.
- 7) Remove the universal joint bolts and then remove the universal joint (RHD model only).

CAUTION:

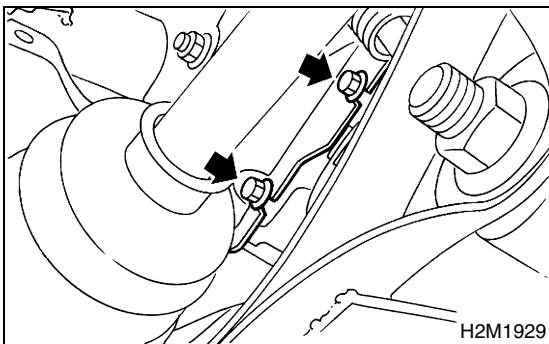
Scribe alignment marks on the universal joint so that it can be reassembled at the original serration.



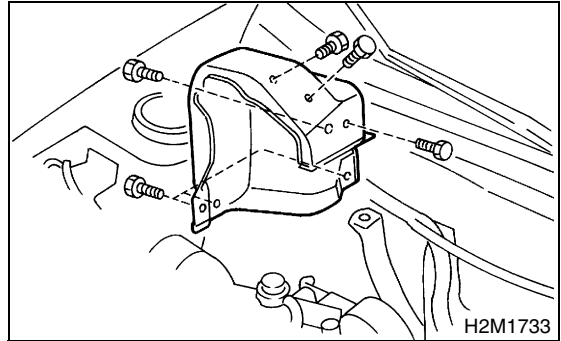
- 8) Remove the bolts which install lower side of turbocharger upper cover.

CAUTION:

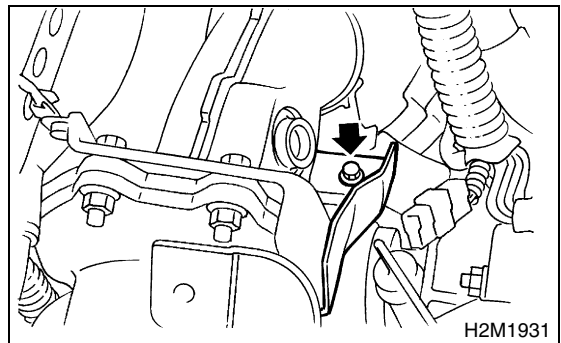
Be careful, the turbocharger and exhaust pipe are hot.



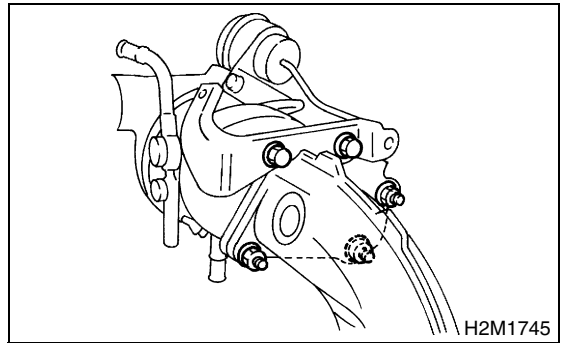
- 9) Lower the vehicle.
- 10) Remove the turbocharger upper cover.



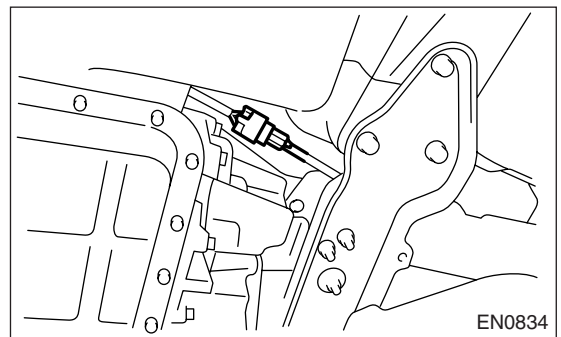
- 11) Remove the bolts which install lower upper side of turbocharger upper cover, and remove it.



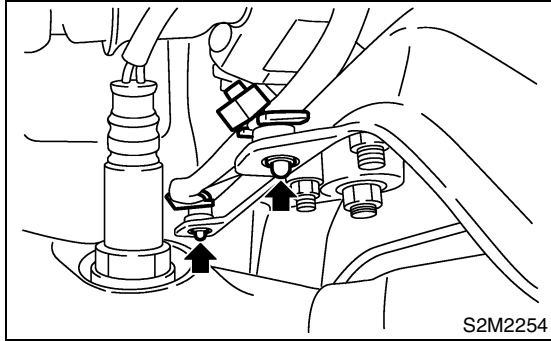
- 12) Separate the center exhaust pipe from turbocharger.



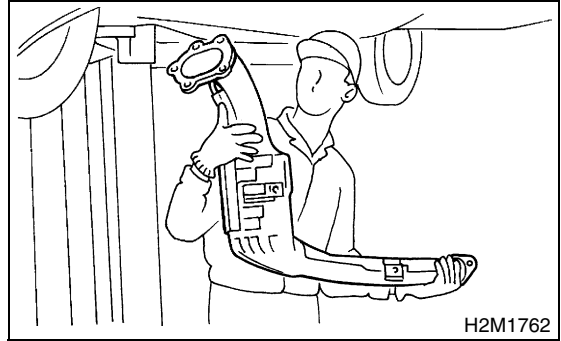
- 13) Lift-up the vehicle.
- 14) Disconnect the connector from rear oxygen sensor.



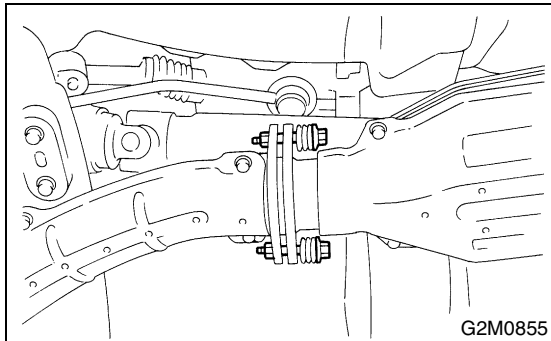
15) Vertically draw out the clip from crossmember.



20) Remove the center exhaust pipe.



16) Separate the center exhaust pipe from rear exhaust pipe.



B: INSTALLATION

NOTE:

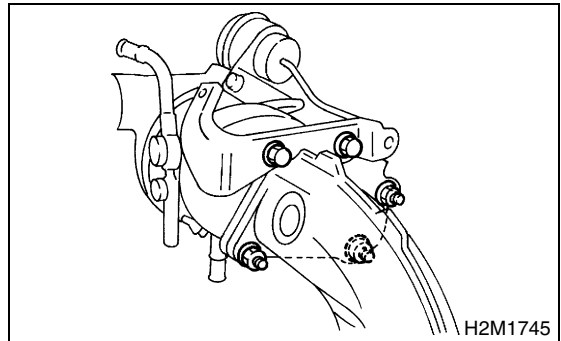
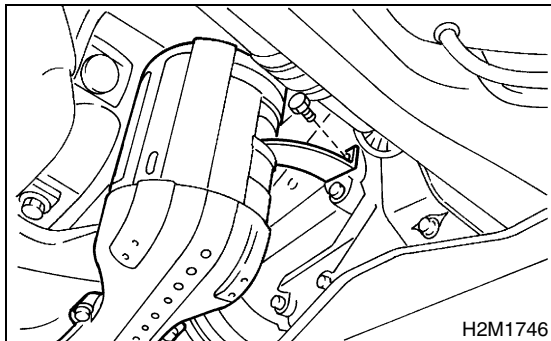
Replace the gaskets with new ones.

- 1) Install the center exhaust pipe and temporarily tighten the bolt which holds center exhaust pipe to hanger bracket.
- 2) Temporarily tighten the bolt which holds center pipe to transmission.
- 3) Connect the center exhaust pipe to turbocharger.

Tightening torque:

35 N·m (3.6 kgf·m, 26.0 ft·lb)

17) Remove the bolt which holds center exhaust pipe bracket to transmission.

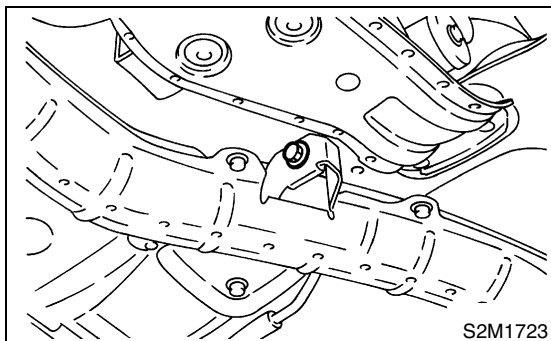


18) Remove the intercooler bracket.

19) Remove the bolt which holds center exhaust pipe to hanger bracket.

CAUTION:

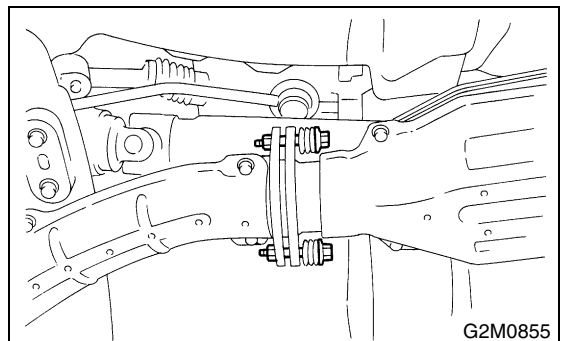
Be careful not to pull down the center exhaust pipe.



4) Install the center exhaust pipe to rear exhaust pipe.

Tightening torque:

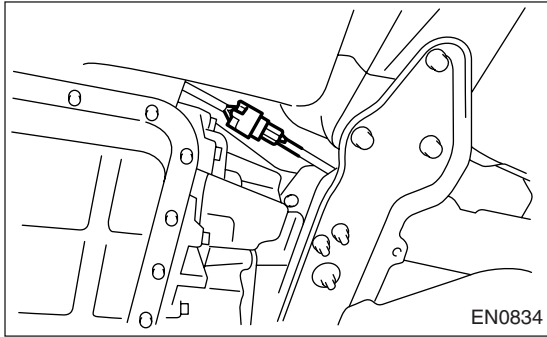
18 N·m (1.8 kgf·m, 13.0 ft·lb)



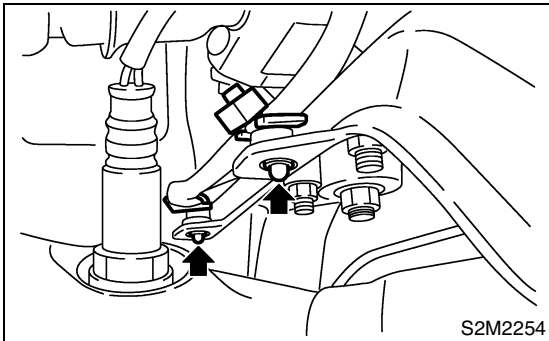
CENTER EXHAUST PIPE

EXHAUST

5) Connect the connector to rear oxygen sensor.

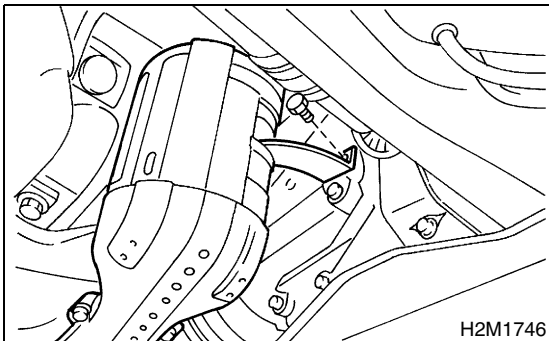


6) Secure the clip on crossmember.



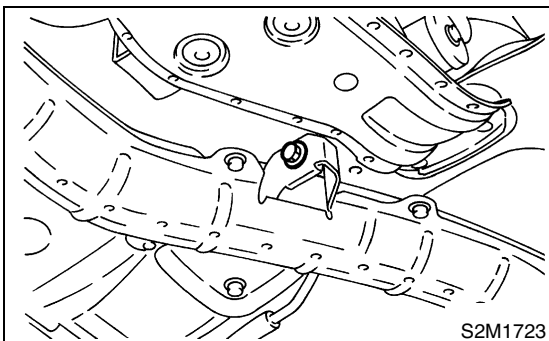
7) Tighten the bolt which holds center exhaust pipe bracket to transmission.

Tightening torque:
30 N-m (3.1 kgf-m, 22.4 ft-lb)



8) Tighten the bolt which holds center exhaust pipe to hanger bracket.

Tightening torque:
35 N-m (3.6 kgf-m, 26.0 ft-lb)



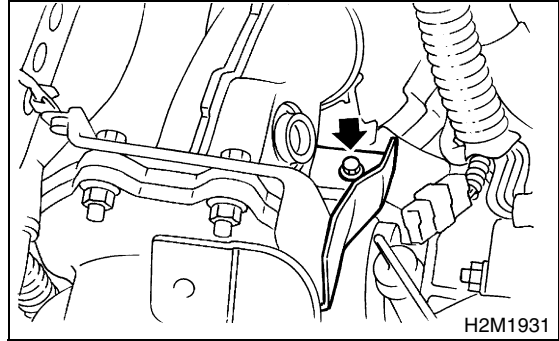
9) Tighten the bolts which hold intercooler bracket.

Tightening torque:
35 N-m (3.6 kgf-m, 26.0 ft-lb)

10) Lower the vehicle.

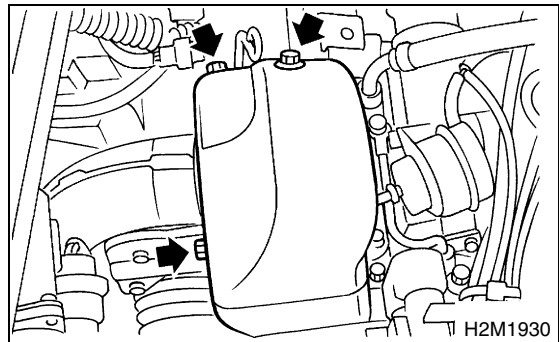
11) Place the turbocharger lower cover, and tighten the bolts which install upper side of lower cover.

Tightening torque:
7.4 N-m (0.75 kgf-m, 5.4 ft-lb)



12) Place the turbocharger upper cover, and tighten the bolts which install upper side of upper cover.

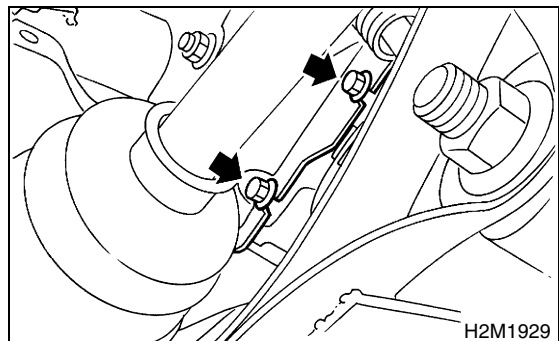
Tightening torque:
7.4 N-m (0.75 kgf-m, 5.4 ft-lb)



13) Lift-up the vehicle.

14) Tighten the bolts which install under side of turbocharger upper cover.

Tightening torque:
7.4 N-m (0.75 kgf-m, 5.4 ft-lb)



- 15) Install the universal joint (RHD model only).
 - (1) Align the bolt hole on long yoke side of universal joint with the cutout at serrated section of shaft end, and insert the universal joint.
 - (2) Align the bolt hole on short yoke side of universal joint with the cutout at serrated section of gearbox assembly. Lower the universal joint completely.
 - (3) Temporarily tighten the bolt on short yoke side. Raise the universal joint to make sure the bolt is properly passing through the cutout at serrated section.
 - (4) Tighten the bolt on long yoke side, then that on the short yoke side.

Tightening torque:

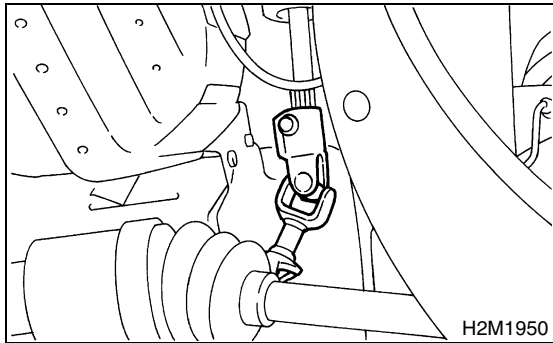
24 N·m (2.4 kgf·m, 17.4 ft·lb)

CAUTION:

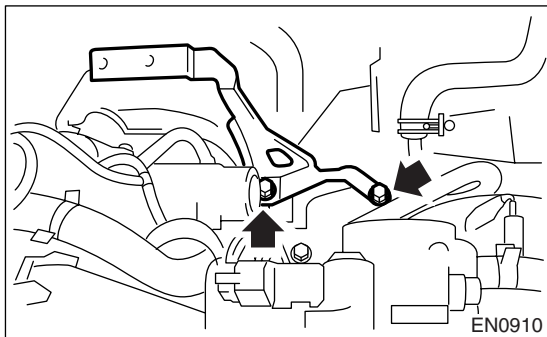
- Make sure that the universal joint bolts are tightened through notches in shaft serration.
- Excessively large tightening torque of universal joint bolts may lead to heavy steering wheel operation.

Standard clearance between gearbox to DOJ:

Over 15 mm (0.59 in)



- 16) Install the under cover.
- 17) Lower the vehicle.
- 18) Install the intercooler bracket.



- 19) Install the intercooler. <Ref. to IN(TURBO)-11, INSTALLATION, Intercooler.>
- 20) Align the center of roll connector. <Ref. to AB-11, ROLL CONNECTOR, INSPECTION, Inspection Locations After a Collision.>

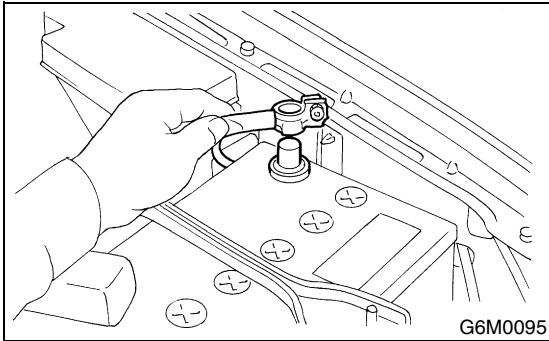
JOINT PIPE

EXHAUST

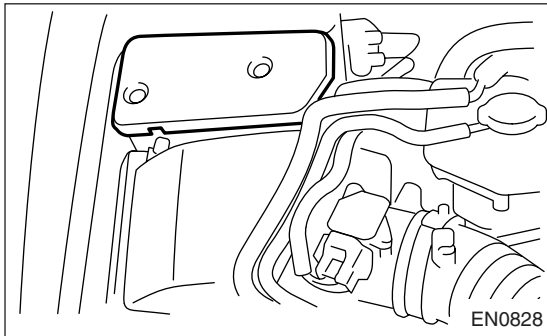
4. Joint Pipe

A: REMOVAL

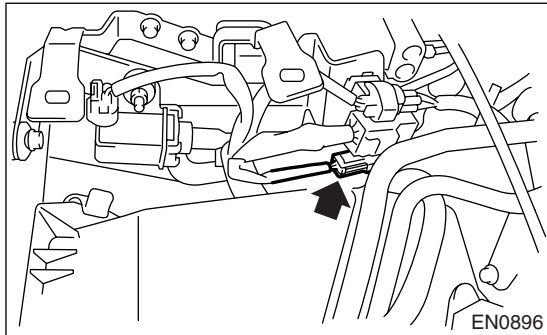
1) Disconnect the ground cable from battery.



2) Remove the solenoid valve cover.



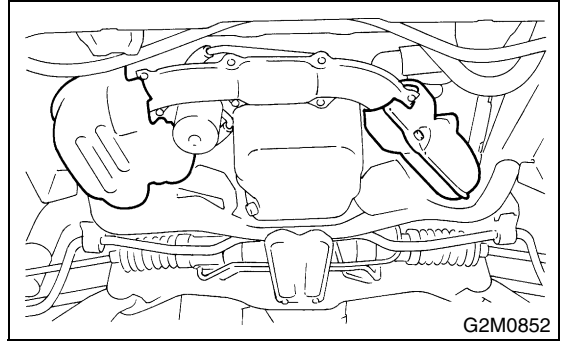
3) Disconnect the exhaust temperature sensor connector.



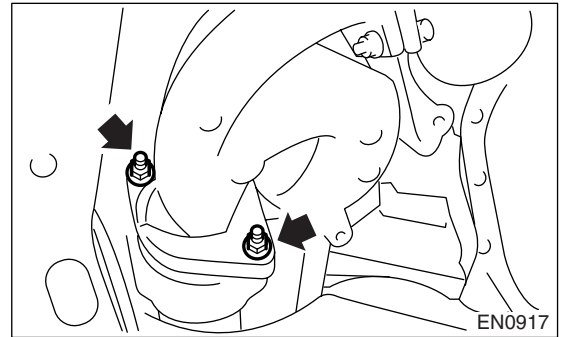
4) Remove the front oxygen (A/F) sensor. <Ref. to FU(TURBO)-44, REMOVAL, Front Oxygen (A/F) Sensor.>

5) Remove the under cover.

6) Remove the lower exhaust manifold cover (RH).



7) Remove the nuts which hold front exhaust manifold to joint pipe.



8) Remove the center exhaust pipe. <Ref. to EX(TURBO)-8, REMOVAL, Center Exhaust Pipe.>

9) Remove the turbocharger. <Ref. to IN(TURBO)-12, REMOVAL, Turbocharger.>

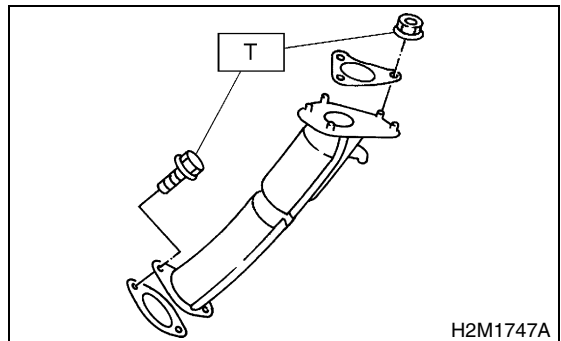
10) Take off the joint pipe in the upward direction.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

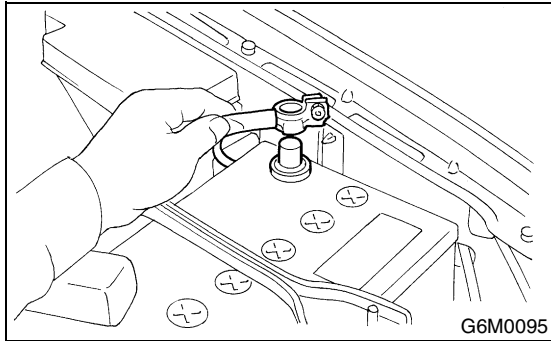
T: 35 N·m (3.6 kgf-m, 26.0 ft-lb)



5. Rear Exhaust Pipe

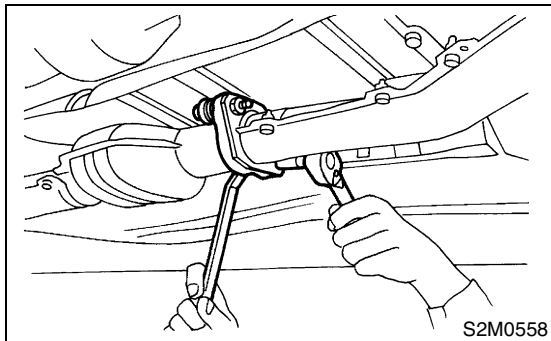
A: REMOVAL

- 1) Disconnect the ground cable from battery.



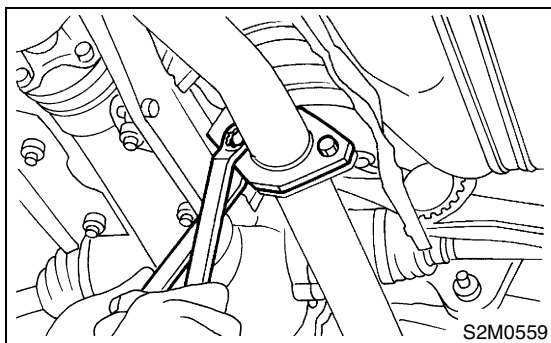
- 2) Lift-up the vehicle.
- 3) Separate the rear exhaust pipe from center exhaust pipe.

CAUTION:
Be careful, the exhaust pipe is hot.



- 4) Separate the rear exhaust pipe from muffler.

CAUTION:
Be careful not to pull down the rear exhaust pipe.



- 5) Remove the rear exhaust pipe.

B: INSTALLATION

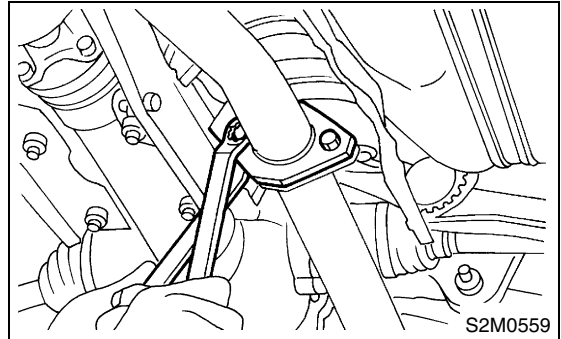
NOTE:

Replace the gaskets with new ones.

- 1) Install the rear exhaust pipe to muffler.

Tightening torque:

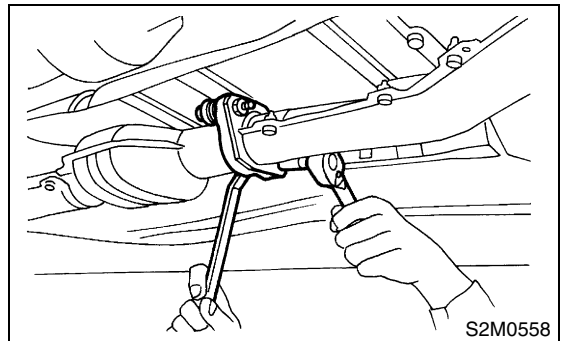
48 N·m (4.9 kgf-m, 35.4 ft-lb)



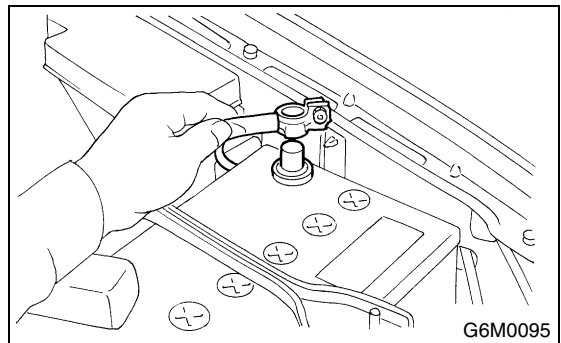
- 2) Install the rear exhaust pipe to center exhaust pipe.

Tightening torque:

18 N·m (1.8 kgf-m, 13.0 ft-lb)



- 3) Lower the vehicle.
- 4) Connect the battery ground cable to battery.



C: INSPECTION

- 1) Make sure there are no exhaust leaks from connections and welds.
- 2) Make sure there are no holes or rusting.
- 3) Make sure the cushion rubber is not worn or cracked.

MUFFLER

EXHAUST

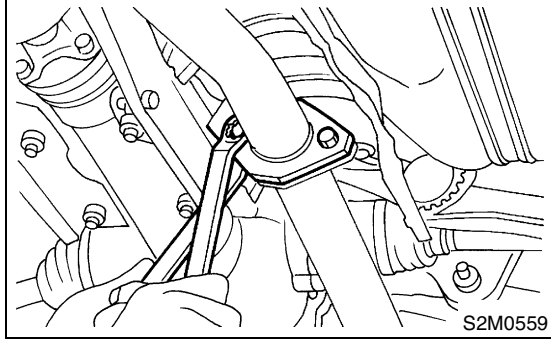
6. Muffler

A: REMOVAL

1) Separate the muffler from rear exhaust pipe.

CAUTION:

Be careful, the exhaust pipe is hot.



2) Remove the rubber cushions, and detach the muffler.

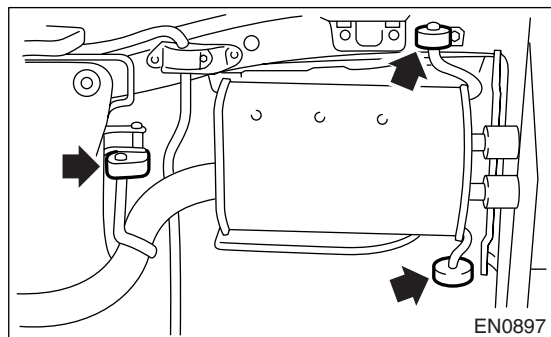
CAUTION:

Be careful not to drop the muffler during removal.

NOTE:

To facilitate removal, apply a coat of SUBARU CRC to the mating area of rubber cushions in advance.

SUBARU CRC (Part No. 004301003)



B: INSTALLATION

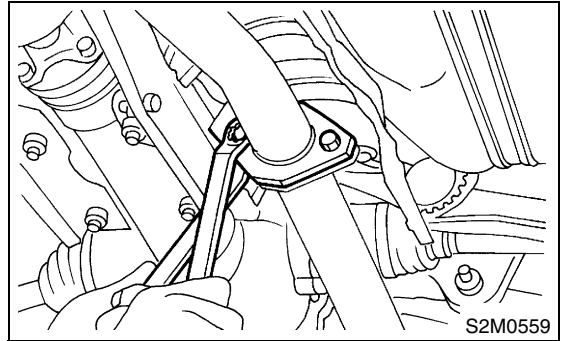
1) Install in the reverse order of removal.

NOTE:

Replace the gasket with a new one.

Tightening torque:

48 N·m (4.9 kgf-m, 35.4 ft-lb)



C: INSPECTION

1) Make sure there are no exhaust leaks from connections and welds.

2) Make sure there are no holes or rusting.

3) Make sure the cushion rubber is not worn or cracked.

IGNITION

IG(TURBO)

	Page
1. General Description	2
2. Spark Plug.....	4
3. Ignition Coil and Ignitor Assembly.....	8

GENERAL DESCRIPTION

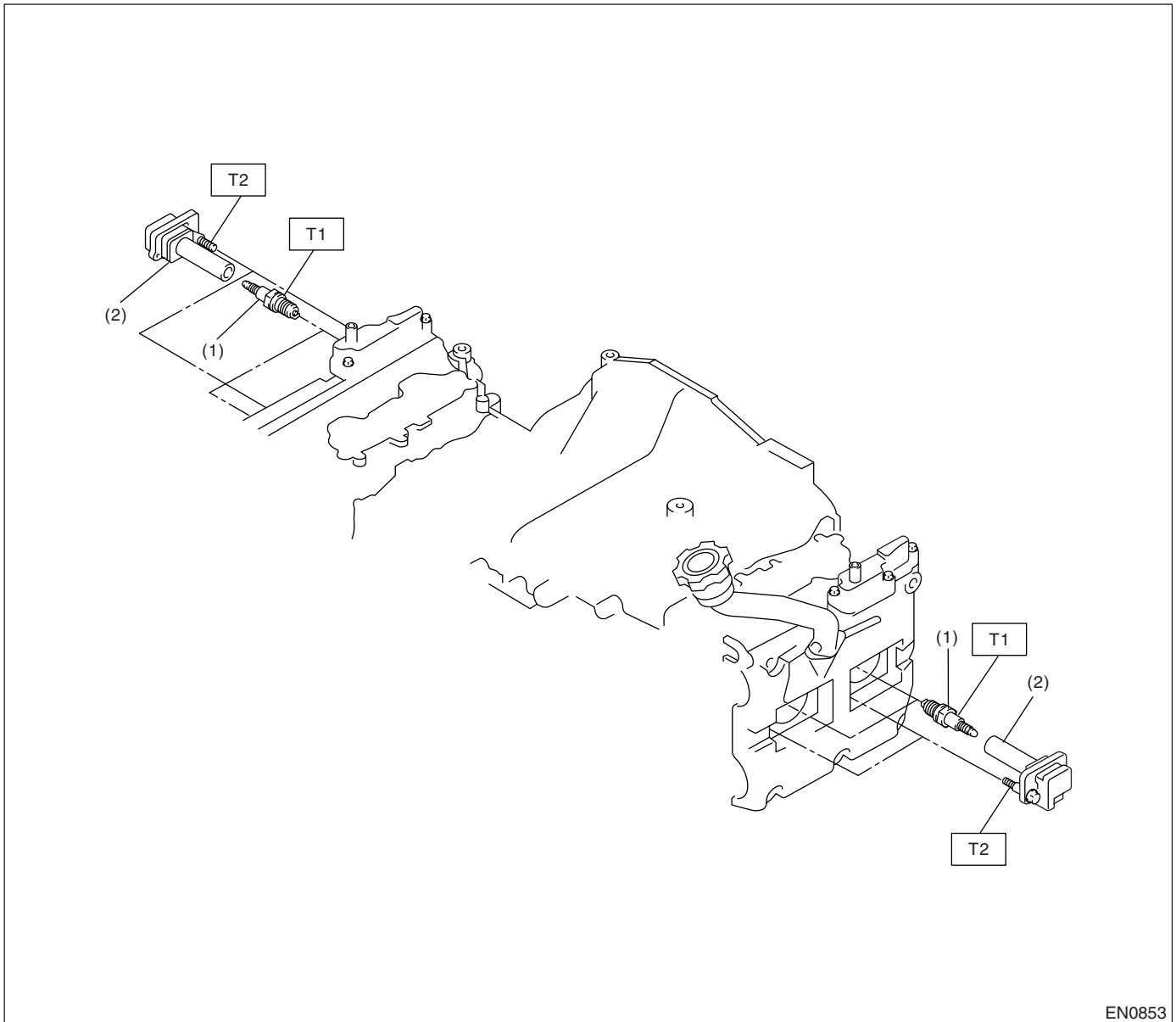
IGNITION

1. General Description

A: SPECIFICATIONS

Item		Designation
Ignition coil and ignitor assembly	Model	FK0140
	Manufacturer	DIAMOND
Spark plug	Type and manufacturer	NGK: PFR6G
	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, 15.2)

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 the ground cable from battery.

SPARK PLUG

IGNITION

2. Spark Plug

A: REMOVAL

CAUTION:

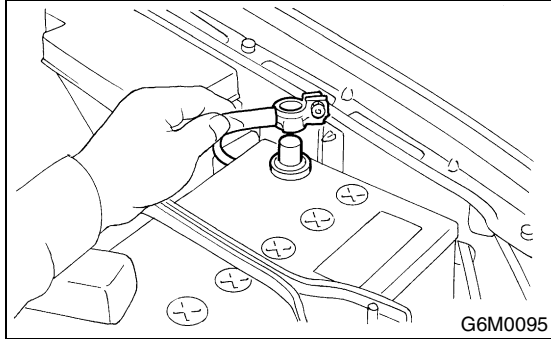
All spark plugs installed on an engine, must be of the same heat range.

Spark plug:

NGK: PFR6G

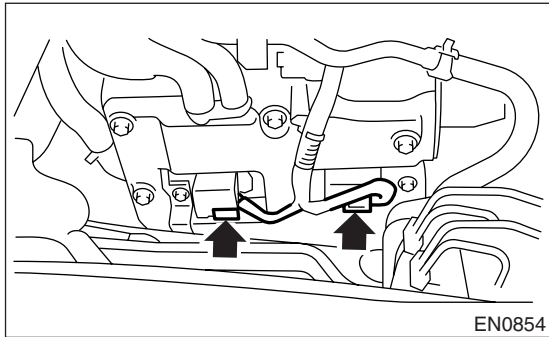
1. RH SIDE

1) Disconnect the ground cable from battery.

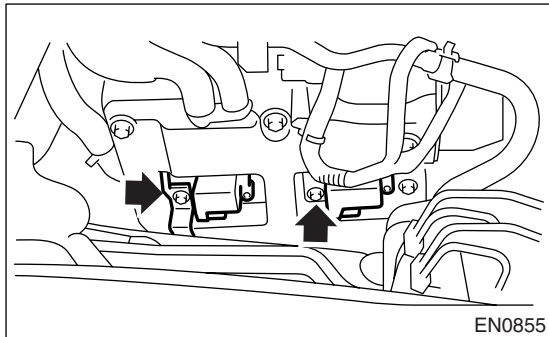


2) Remove the air cleaner lower case. <Ref. to IN(TURBO)-7, REMOVAL, Air Cleaner.>

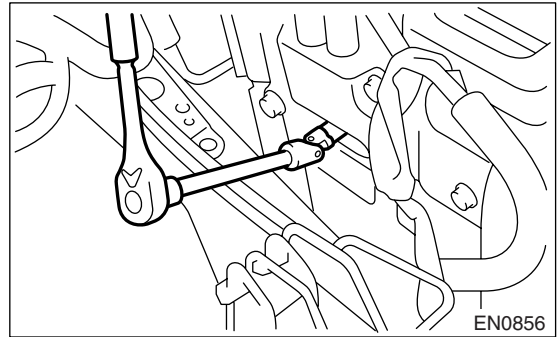
3) Disconnect the connector from ignition coil.



4) Remove the ignition coil.

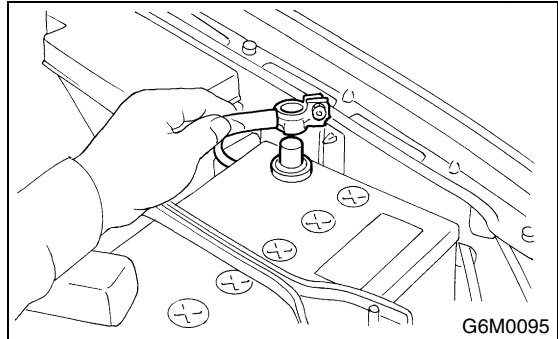


5) Remove the spark plugs with the spark plug sockets.

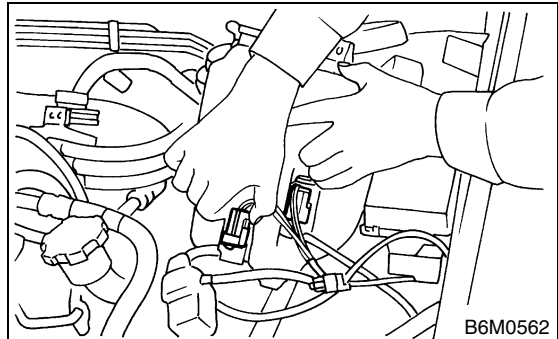


2. LH SIDE

1) Disconnect the battery cables, and then remove the battery and battery carrier.

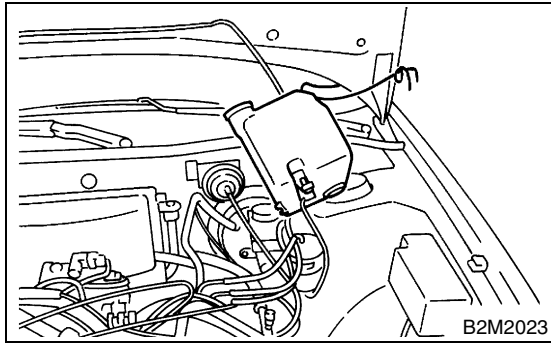


2) Disconnect the washer motor connector.

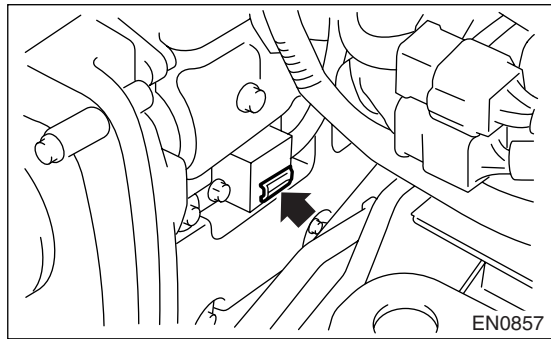


3) Disconnect the rear window glass washer hose from washer motor, then plug connection with a suitable cap.

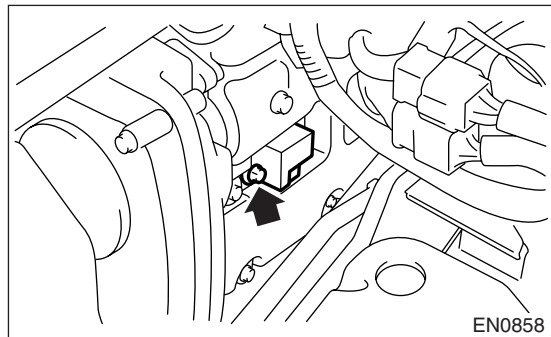
4) Remove the two bolts which hold washer tank, then take the tank away from working area.



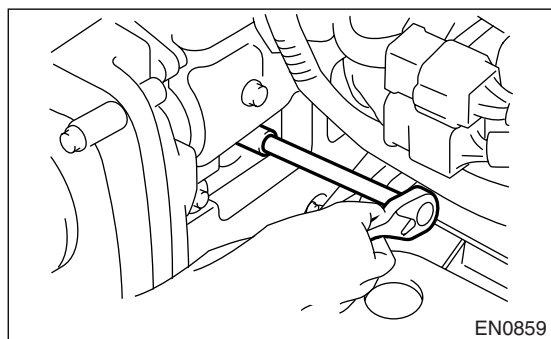
5) Disconnect the connector from ignition coil.



6) Remove the ignition coil.



7) Remove the spark plugs with the spark plug sockets.



B: INSTALLATION

1. RH SIDE

1) Install in the reverse order of removal.

Tightening torque (Spark plug):
 21 N·m (2.1 kgf-m, 15.2 ft-lb)

Tightening torque (Ignition coil):
 16 N·m (1.6 kgf-m, 11.7 ft-lb)

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 approx. 1/3 of the specified torque in order to avoid over-stressing.

2. LH SIDE

1) Install in the reverse order of removal.

Tightening torque (Spark plug):
 21 N·m (2.1 kgf-m, 15.2 ft-lb)

Tightening torque (Ignition coil):
 16 N·m (1.6 kgf-m, 11.7 ft-lb)

CAUTION:

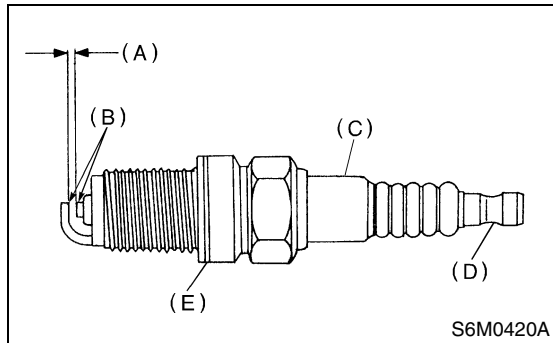
The above torque should be only applied to new spark plugs without oil on their threads. In case their threads are lubricated, the torque should be reduced by approx. 1/3 of the specified torque in order to avoid over-stressing.

SPARK PLUG

IGNITION

C: INSPECTION

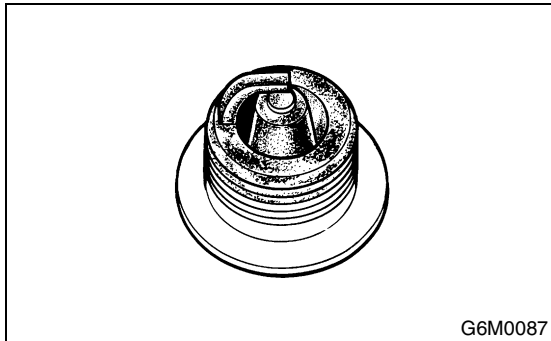
Check the electrodes and inner and outer porcelain of plugs, noting the type of deposits and the degree of electrode erosion.



- (A) Electrode gap
- (B) Carbon accumulation or wear
- (C) Cracks
- (D) Damage
- (E) Damaged gasket

1) Normal:

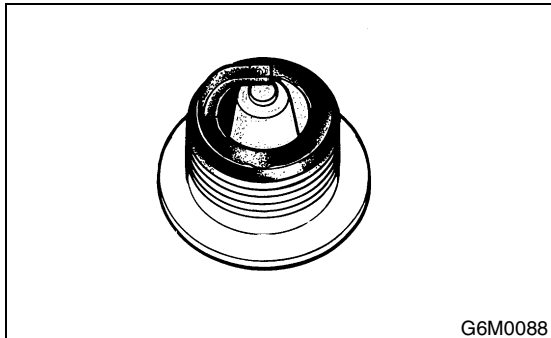
Brown to grayish-tan deposits and slight electrode wear indicates correct spark plug heat range.



2) Carbon fouled:

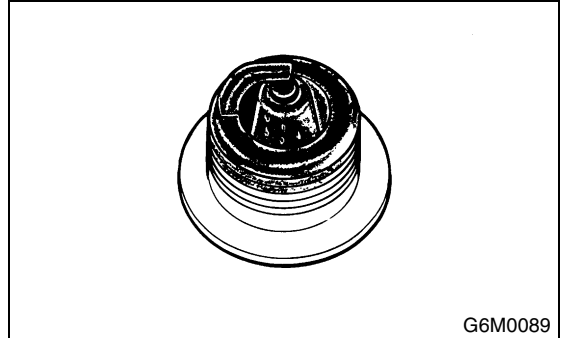
Dry fluffy carbon deposits on insulator and electrode are mostly caused by slow speed driving in city, weak ignition, too rich fuel mixture, dirty air cleaner, etc.

It is advisable to replace with plugs having hotter heat range.



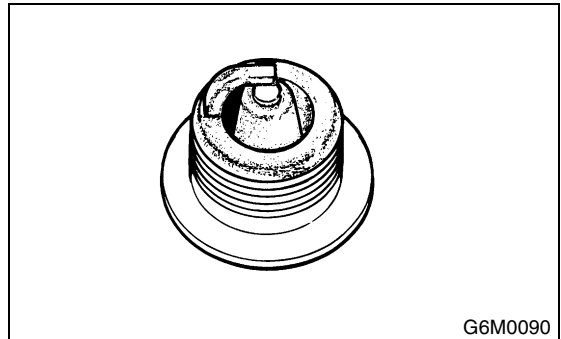
3) Oil fouled:

Wet black deposits show excessive oil entrance into combustion chamber through worn rings and pistons or excessive clearance between valve guides and stems. If the same condition remains after repair, use a hotter plug.



4) Overheating:

White or light gray insulator with black or gray brown spots and bluish burnt electrodes indicates engine overheating. Moreover, the appearance results from incorrect ignition timing, loose spark plugs, wrong selection of fuel, hotter range plug, etc. It is advisable to replace with plugs having colder heat range.



D: ADJUSTMENT

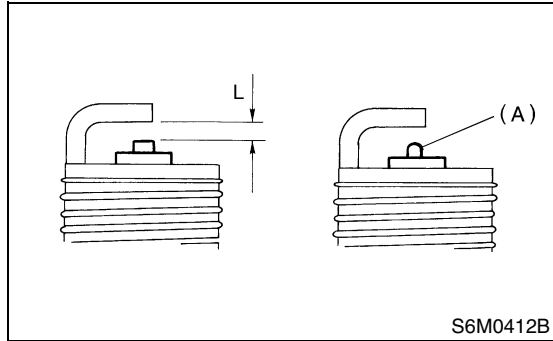
Clean the spark plugs in a sand blast type cleaner. Avoid excessive blasting. Clean and remove the carbon or oxide deposits, but do not wear away porcelain.

If deposits are too stubborn, replace the plugs.

After cleaning the spark plugs, recondition the 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:

Replace with a new spark plug if this area (A) is worn to "ball" shape.

IGNITION COIL AND IGNITOR ASSEMBLY

IGNITION

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(TURBO)-4, REMOVAL, Spark Plug.>

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

16 N·m (1.6 kgf-m, 11.7 ft-lb)

C: INSPECTION

Ignitor is integrated with the coil. Therefore resistance cannot be measured.

ENGINE (DIAGNOSTICS)

EN(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 trouble occurred using the interview check list. <Ref. to EN(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(TURBO)-58, Diagnostics for Engine Starting Failure.>
2 CHECK ILLUMINATION OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL).	Does the CHECK ENGINE malfunction indicator lamp illuminate?	Go to step 3.	Inspection using "General Diagnostics Table". <Ref. to EN(TURBO)-350, General Diagnostic Table.>
3 CHECK INDICATION OF DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY. 1)Turn the ignition switch to OFF. 2)Connect the Subaru Select Monitor or OBD-II general scan tool to data link connector. 3)Turn the ignition switch to ON and the Subaru Select Monitor or OBD-II general scan tool switch to ON. 4)Read the DTC on Subaru Select Monitor or OBD-II general scan tool.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC?	Record the DTC code. Repair the trouble cause. <Ref. to EN(TURBO)-75, List of Diagnostic Trouble Code (DTC).> Go to step 4.	Repair the related parts. NOTE: If a DTC is not shown on display although MIL illuminates, perform diagnostics of MIL (CHECK ENGINE malfunction indicator lamp) circuit or combination meter. <Ref. to EN(TURBO)-48, Engine Malfunction Indicator Lamp (MIL).>
4 PERFORM THE DIAGNOSIS. 1)Perform the clear memory mode. <Ref. to EN(TURBO)-45, Clear Memory Mode.> 2)Perform the inspection mode. <Ref. to EN(TURBO)-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(TURBO)-82, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Complete the diagnosis.

CHECK LIST FOR INTERVIEW

ENGINE (DIAGNOSTICS)

2. Check List for Interview

A: CHECK

1. CHECK LIST NO. 1

Check the following items when problem has occurred.

NOTE:

Use copies of this page for interviewing customers.

Customer's name		Engine No.	
Date of sale		Fuel brand	
Date of repair		Odometer reading	km
Vin No.			miles
Weather	<input type="checkbox"/> Fine <input type="checkbox"/> Cloudy <input type="checkbox"/> Rainy <input type="checkbox"/> Snowy <input type="checkbox"/> Various/Others:		
Outdoor temperature	°C (°F)		
	<input type="checkbox"/> Hot <input type="checkbox"/> Warm <input type="checkbox"/> Cool <input type="checkbox"/> Cold		
Place	<input type="checkbox"/> Highway <input type="checkbox"/> Suburbs <input type="checkbox"/> Inner city <input type="checkbox"/> Uphill <input type="checkbox"/> Downhill <input type="checkbox"/> Rough road <input type="checkbox"/> Others:		
Engine temperature	<input type="checkbox"/> Cold <input type="checkbox"/> Warming-up <input type="checkbox"/> After warming-up <input type="checkbox"/> Any temperature <input type="checkbox"/> Others:		
Engine speed	rpm		
Vehicle speed	MPH		
Driving conditions	<input type="checkbox"/> Not affected <input type="checkbox"/> At starting <input type="checkbox"/> While idling <input type="checkbox"/> At racing <input type="checkbox"/> While accelerating <input type="checkbox"/> While cruising <input type="checkbox"/> While decelerating <input type="checkbox"/> While turning (RH/LH)		
Headlight	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF	Rear defogger	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF
Blower	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF	Radio	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF
A/C compressor	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF	CD/Cassette	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF
Cooling fan	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF	Car phone	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF
Front wiper	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF	CB	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF
Rear wiper	<input type="checkbox"/> ON/ <input type="checkbox"/> OFF		

CHECK LIST FOR INTERVIEW

ENGINE (DIAGNOSTICS)

2. CHECK LIST NO. 2

Check the following items about the vehicle's state when MIL turns on.

NOTE:

Use copies of this page for interviewing customers.

a) Other warning lights or indicators turn on. <input type="checkbox"/> Yes/ <input type="checkbox"/> No
<input type="checkbox"/> Low fuel warning light <input type="checkbox"/> Charge indicator light <input type="checkbox"/> AT diagnostics indicator light <input type="checkbox"/> ABS warning light <input type="checkbox"/> Engine oil pressure warning light
b) Fuel level
<ul style="list-style-type: none">• Lack of gasoline: <input type="checkbox"/> Yes/<input type="checkbox"/> No• Indicator position of fuel gauge:
c) Intentional connecting or disconnecting of harness connectors or spark plug cords: <input type="checkbox"/> Yes/ <input type="checkbox"/> No
<ul style="list-style-type: none">• What:
d) Intentional connecting or disconnecting of hoses: <input type="checkbox"/> Yes/ <input type="checkbox"/> No
<ul style="list-style-type: none">• What:
e) Installing of parts other than genuine parts: <input type="checkbox"/> Yes/ <input type="checkbox"/> No
<ul style="list-style-type: none">• What:• Where:
f) Occurrence of noise: <input type="checkbox"/> Yes/ <input type="checkbox"/> No
<ul style="list-style-type: none">• From where:• What kind:
g) Occurrence of smell: <input type="checkbox"/> Yes/ <input type="checkbox"/> No
<ul style="list-style-type: none">• From where:• What kind:
h) Intrusion of water into engine compartment or passenger compartment: <input type="checkbox"/> Yes/ <input type="checkbox"/> No
i) Troubles occurred
<input type="checkbox"/> Engine does not start. <input type="checkbox"/> Engine stalls during idling. <input type="checkbox"/> Engine stalls while driving. <input type="checkbox"/> Engine speed decreases. <input type="checkbox"/> Engine speed does not decrease. <input type="checkbox"/> Rough idling <input type="checkbox"/> Poor acceleration <input type="checkbox"/> Back fire <input type="checkbox"/> After fire <input type="checkbox"/> No shift <input type="checkbox"/> Excessive shift shock

3. General Description

A: CAUTION

1) Airbag system wiring harness is routed near the engine control module (ECM), main relay and fuel pump relay.

CAUTION:

- All airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuit.
- Be careful not to damage the airbag system wiring harness when servicing the engine control module (ECM), transmission control module (TCM), main relay and fuel pump relay.

2) Never connect the battery in reverse polarity.

- The ECM will be destroyed instantly.
- The fuel injector and other part will be damaged in just a few minutes more.

3) Do not disconnect the battery cables while the engine is running.

- A large counter electromotive force will be generated in the alternator, and this voltage may damage electronic parts such as ECM, etc.

4) Before disconnecting the connectors of each sensor and the ECM, be sure to turn the ignition switch to OFF.

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 the ECM from located position, disconnect two cables on battery.

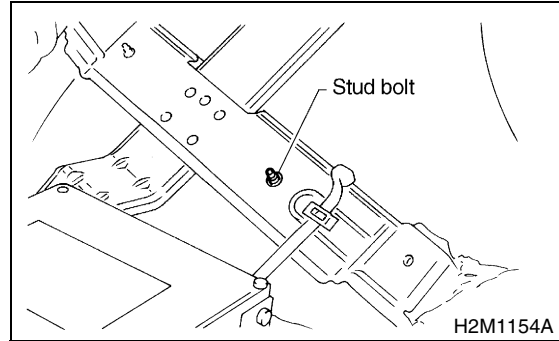
- Otherwise, the ECM may be damaged.

CAUTION:

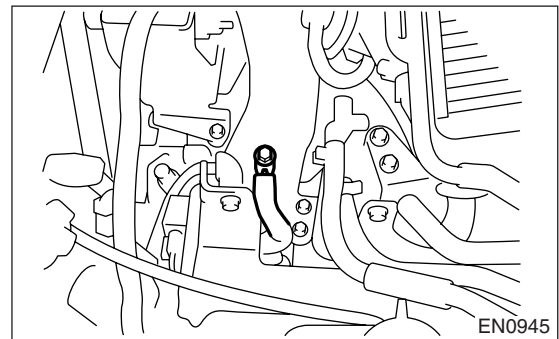
When replacing the ECM, be careful not to use the wrong spec. ECM to avoid any damage on the fuel injection system.

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.

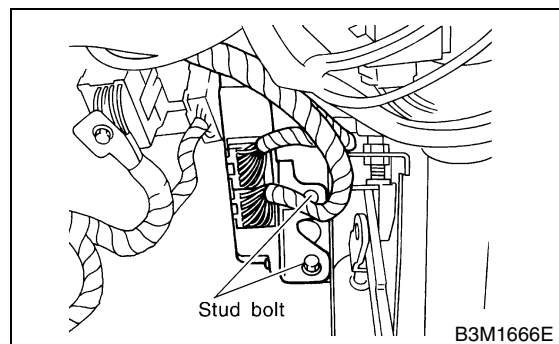
8) Use the ECM mounting stud bolt at the body head grounding points when measuring voltage and resistance inside the passenger compartment.



9) Use the engine grounding terminal or engine proper as the grounding point to the body, when measuring voltage and resistance in the engine compartment.



10) Use the 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.

GENERAL DESCRIPTION

ENGINE (DIAGNOSTICS)

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 5 seconds to release pressure in the fuel system. If the 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 the battery voltage and specific gravity of electrolyte.

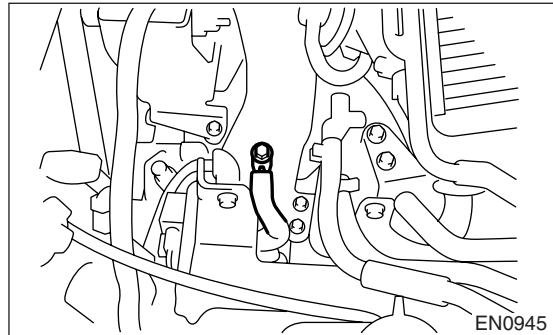
Standard voltage: 12 V

Specific gravity: Above 1.260

2) Check the condition of the main and other fuses, and harnesses and connectors. Also check for proper grounding.

2. ENGINE GROUNDING

Make sure the engine grounding terminal is properly connected to the engine.



C: NOTE

1. DESCRIPTION

- The on-board diagnostics (OBD) system detects and indicates a fault in various inputs and outputs of the complex electronic control. CHECK ENGINE malfunction indicator lamp (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

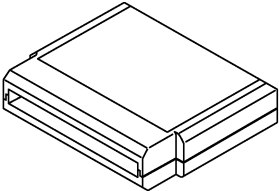

pulse applied to the fuel injector and this permits simple, yet highly precise metering of the fuel.

• 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	24082AA190 (Newly adapted tool)	CARTRIDGE	Troubleshooting for electrical systems.
 B2M3877	22771AA030	SELECT MONITOR KIT	Troubleshooting for electrical systems. <ul style="list-style-type: none"> • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

ELECTRICAL COMPONENTS LOCATION

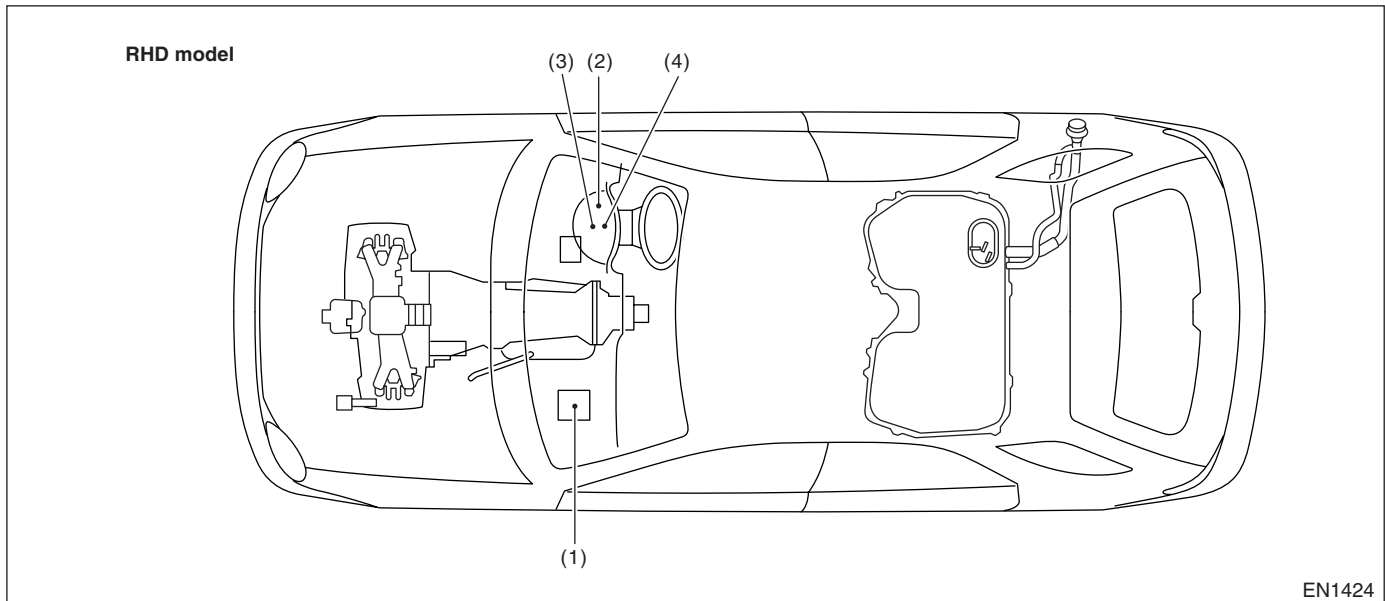
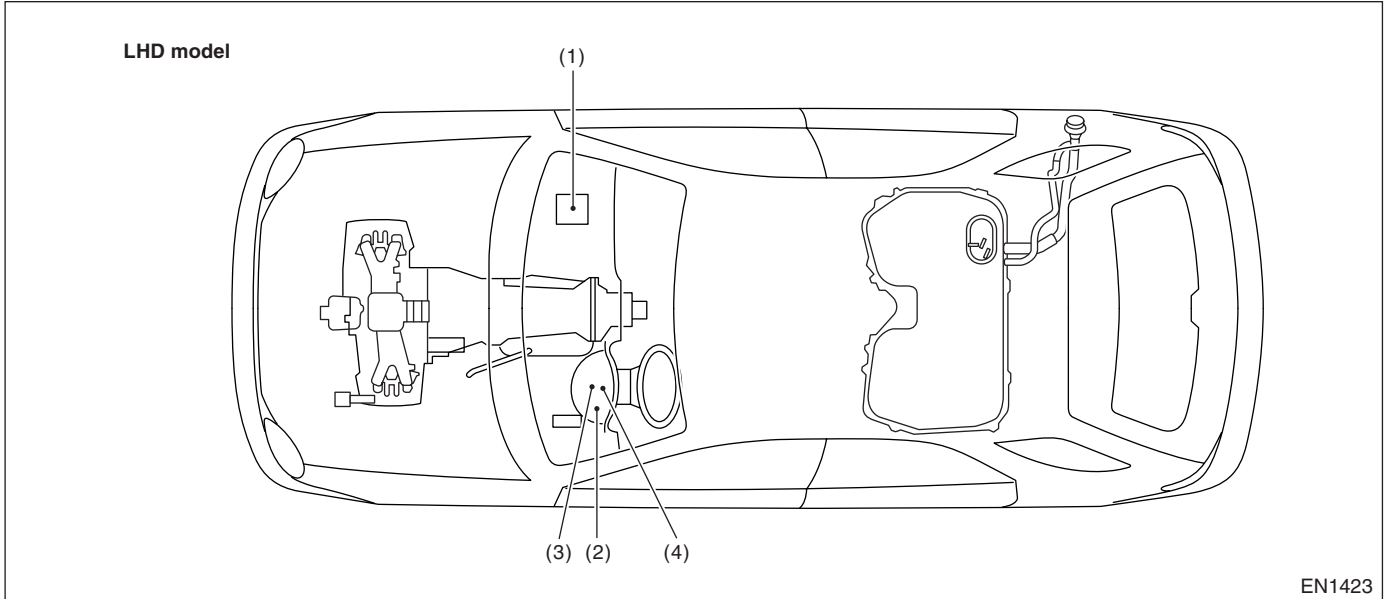
ENGINE (DIAGNOSTICS)

4. Electrical Components Location

A: LOCATION

1. ENGINE

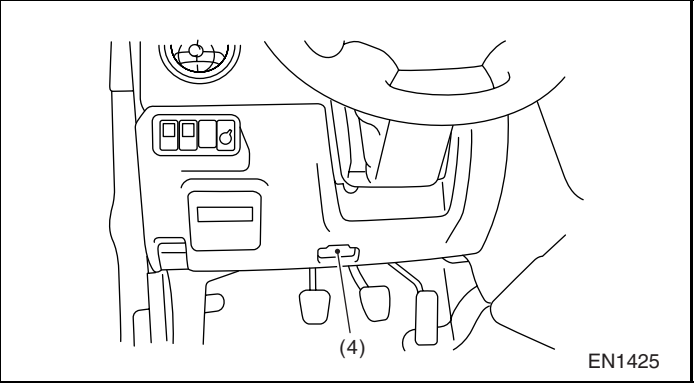
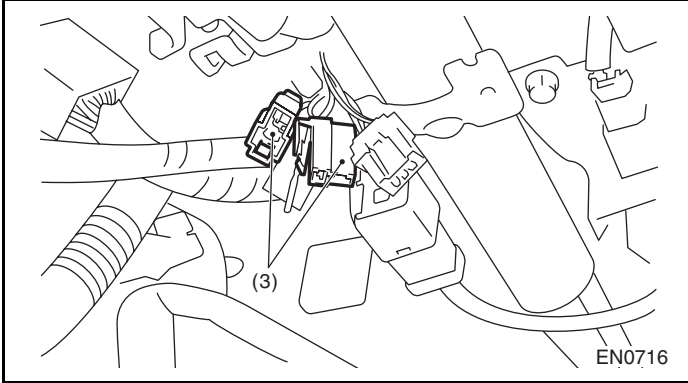
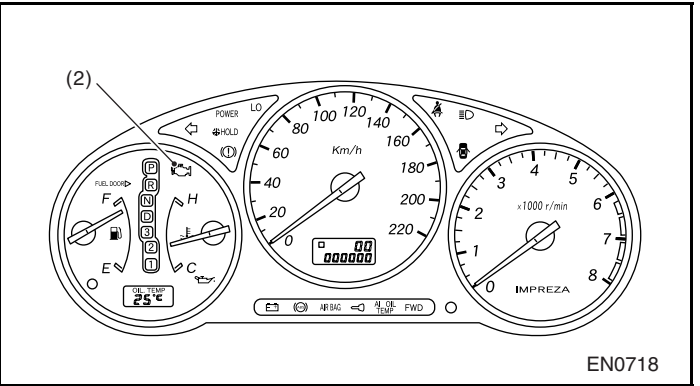
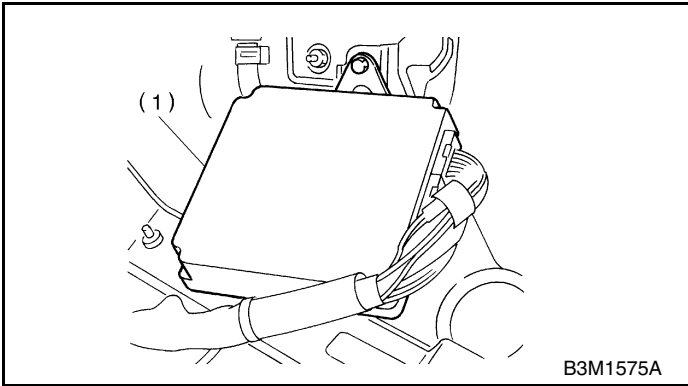
• Module



- | | |
|---|-------------------------|
| (1) Engine control module (ECM) | (3) Test mode connector |
| (2) CHECK ENGINE malfunction indicator lamp (MIL) | (4) Data link connector |

ELECTRICAL COMPONENTS LOCATION

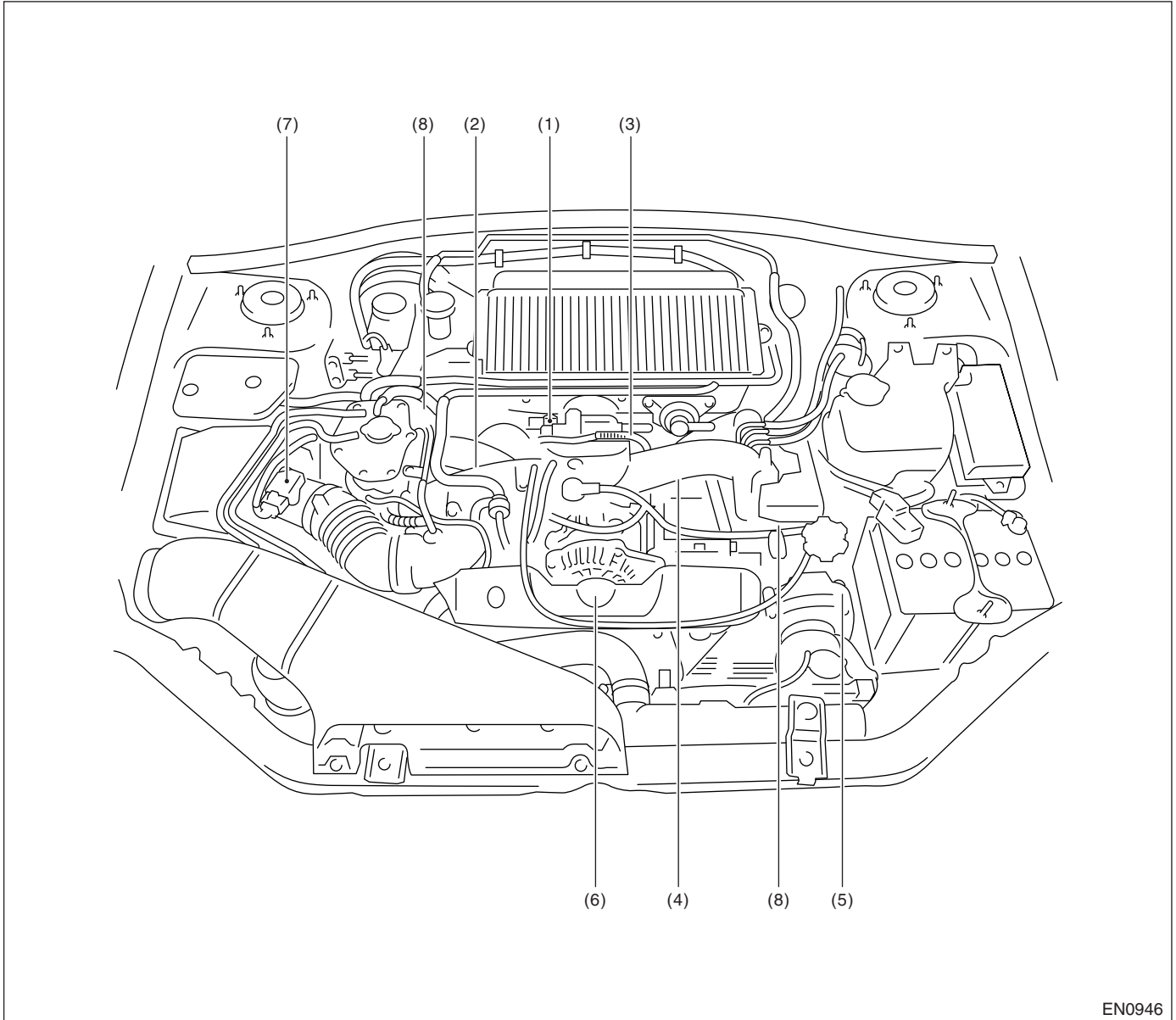
ENGINE (DIAGNOSTICS)



ELECTRICAL COMPONENTS LOCATION

ENGINE (DIAGNOSTICS)

• Sensor

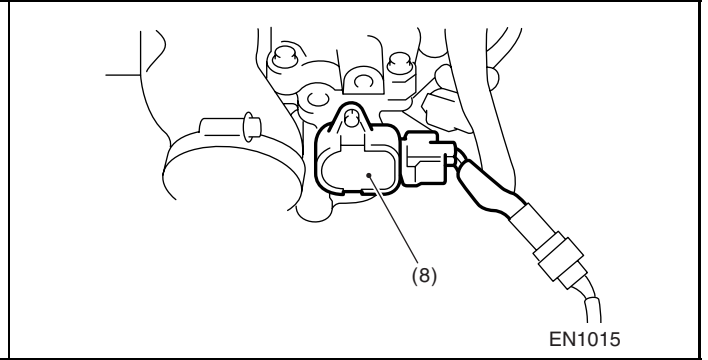
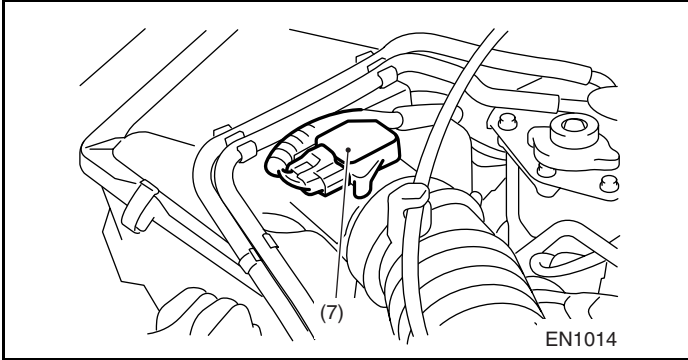
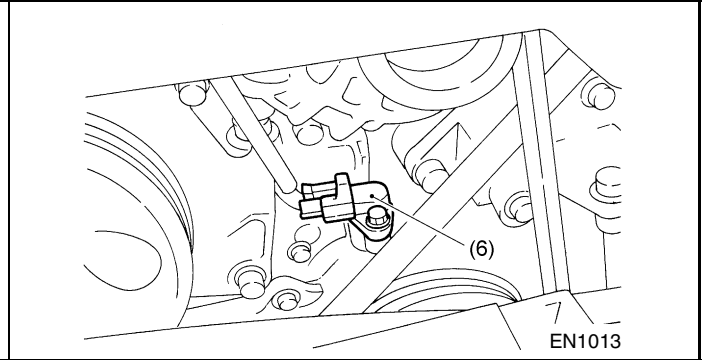
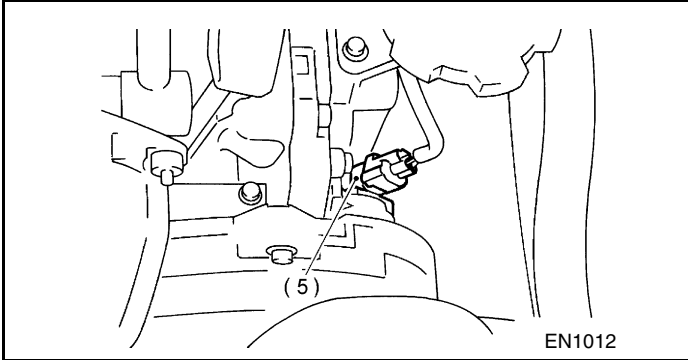
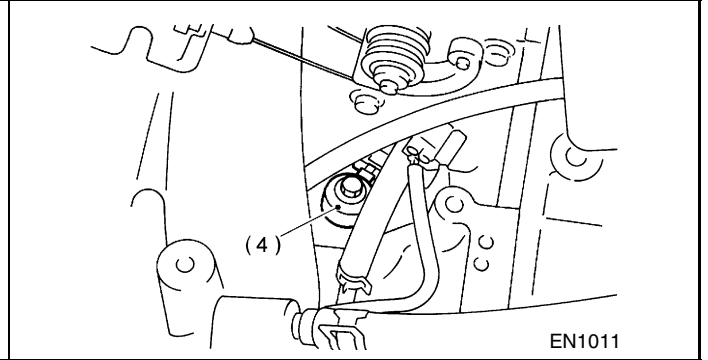
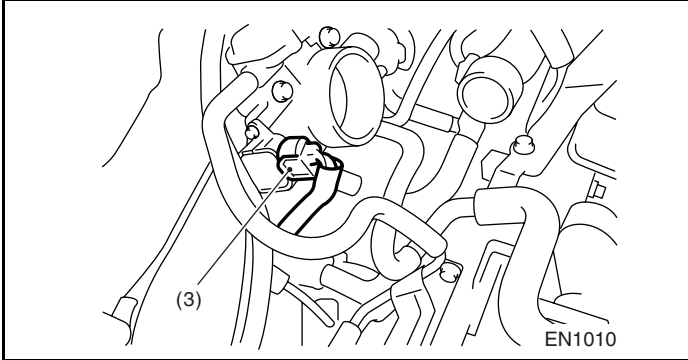
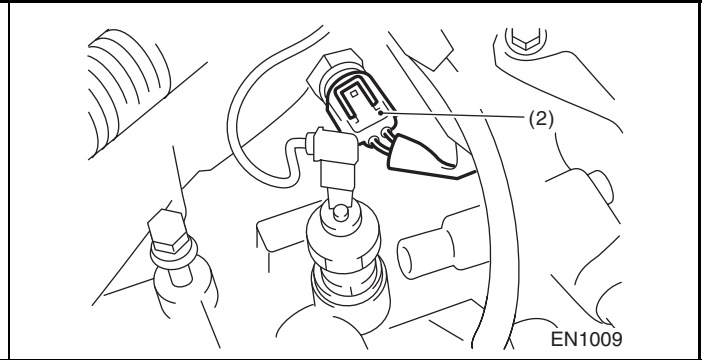
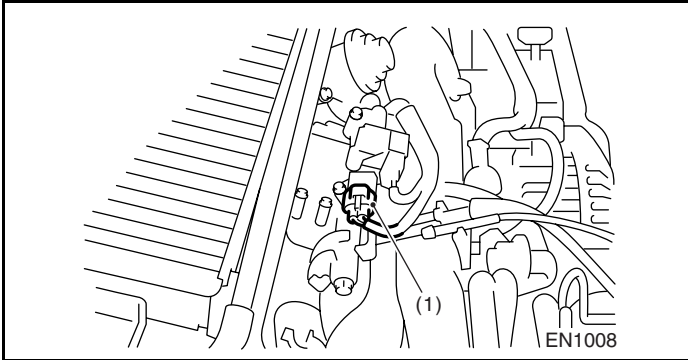


EN0946

- | | | |
|---------------------------------------|---|--|
| (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 | |

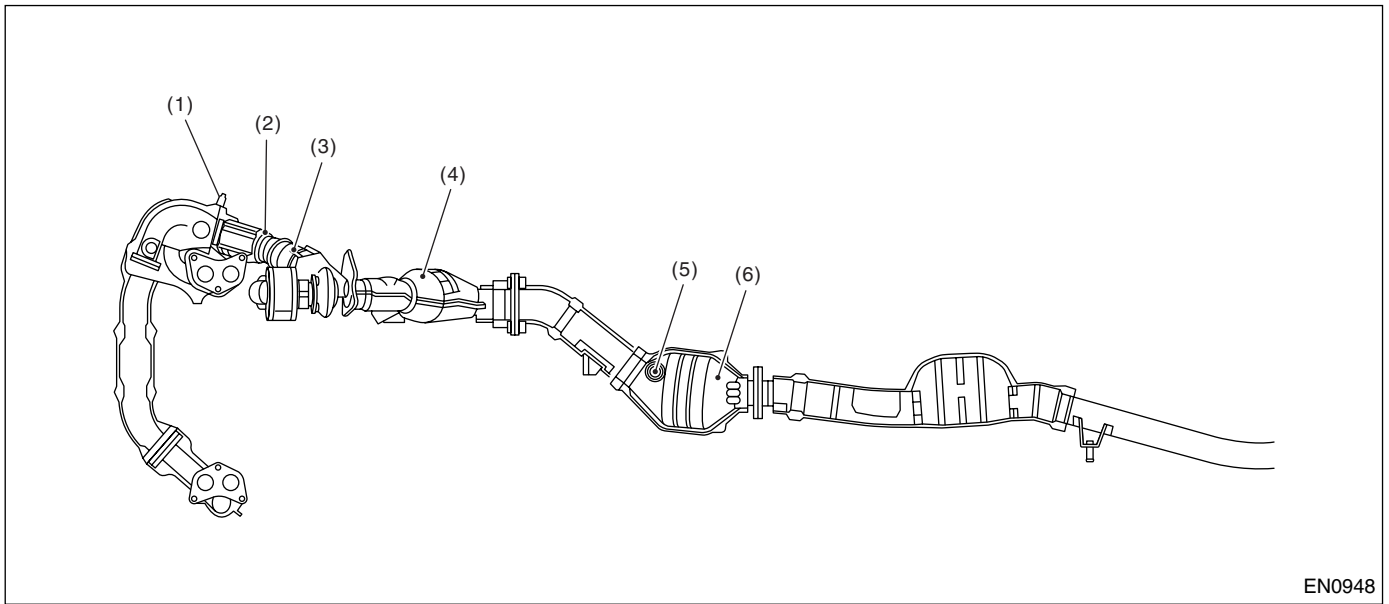
ELECTRICAL COMPONENTS LOCATION

ENGINE (DIAGNOSTICS)

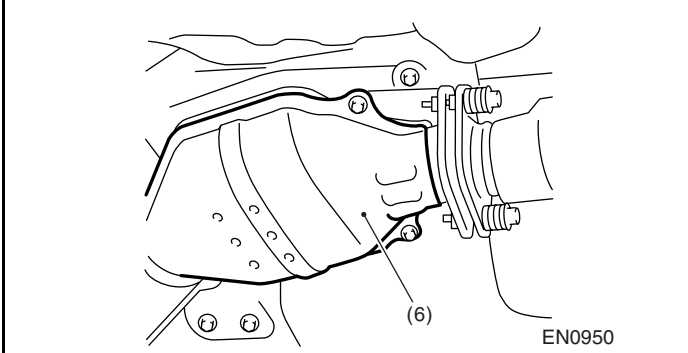
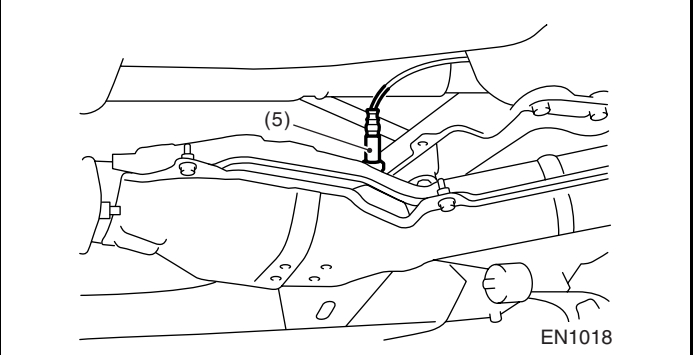
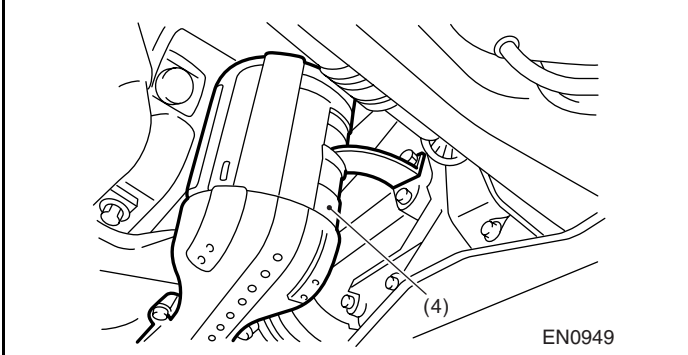
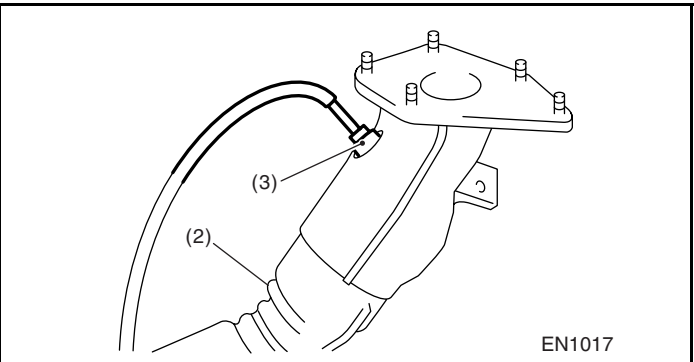
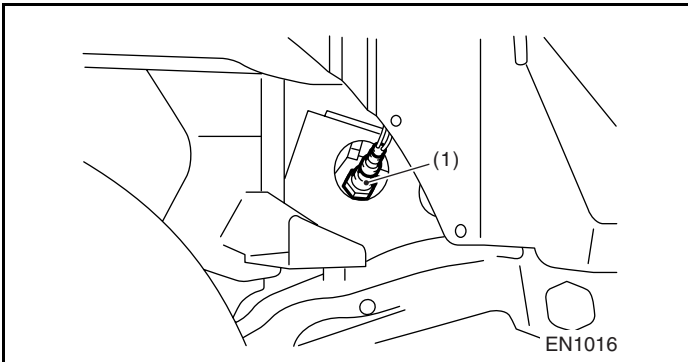


ELECTRICAL COMPONENTS LOCATION

ENGINE (DIAGNOSTICS)



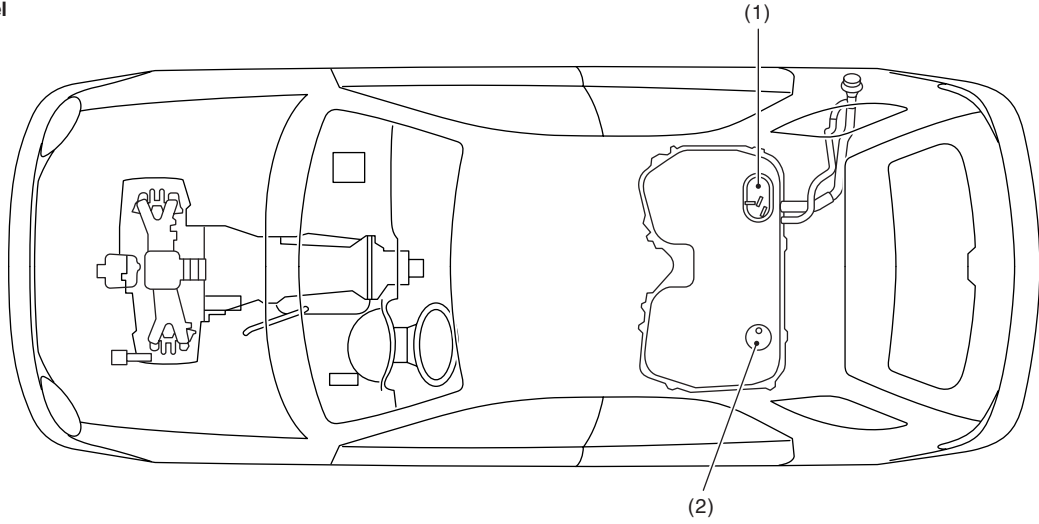
- | | | |
|-------------------------------|--------------------------------|------------------------------|
| (1) Front oxygen (A/F) sensor | (3) Exhaust temperature sensor | (5) Rear oxygen sensor |
| (2) Precatalytic converter | (4) Front catalytic converter | (6) Rear catalytic converter |



ELECTRICAL COMPONENTS LOCATION

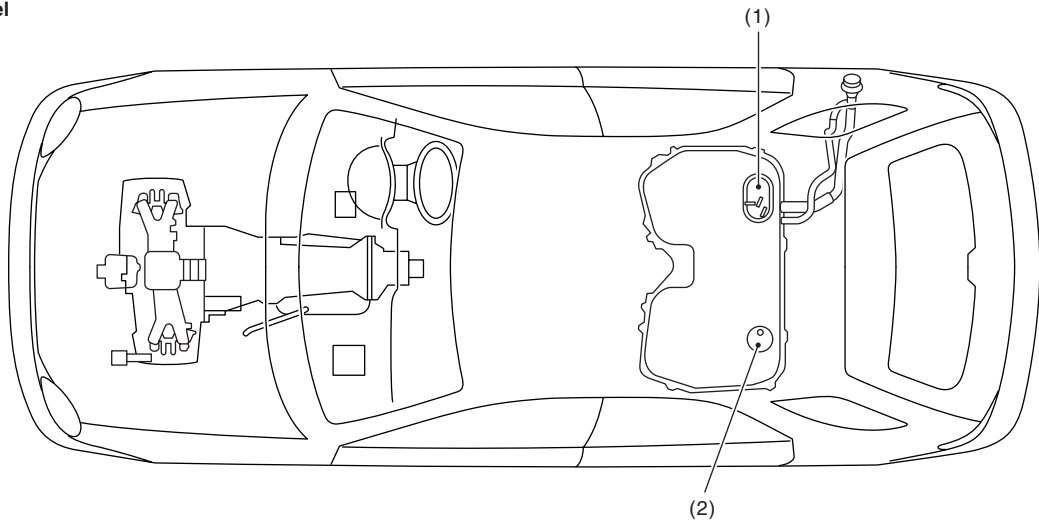
ENGINE (DIAGNOSTICS)

LHD model



EN1019

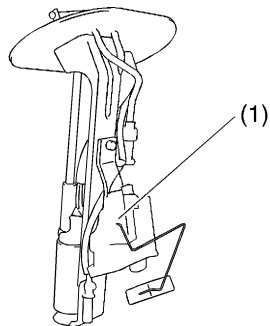
RHD model



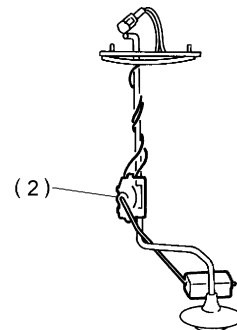
EN1020

(1) Fuel level sensor

(2) Fuel sub level sensor



EN1036

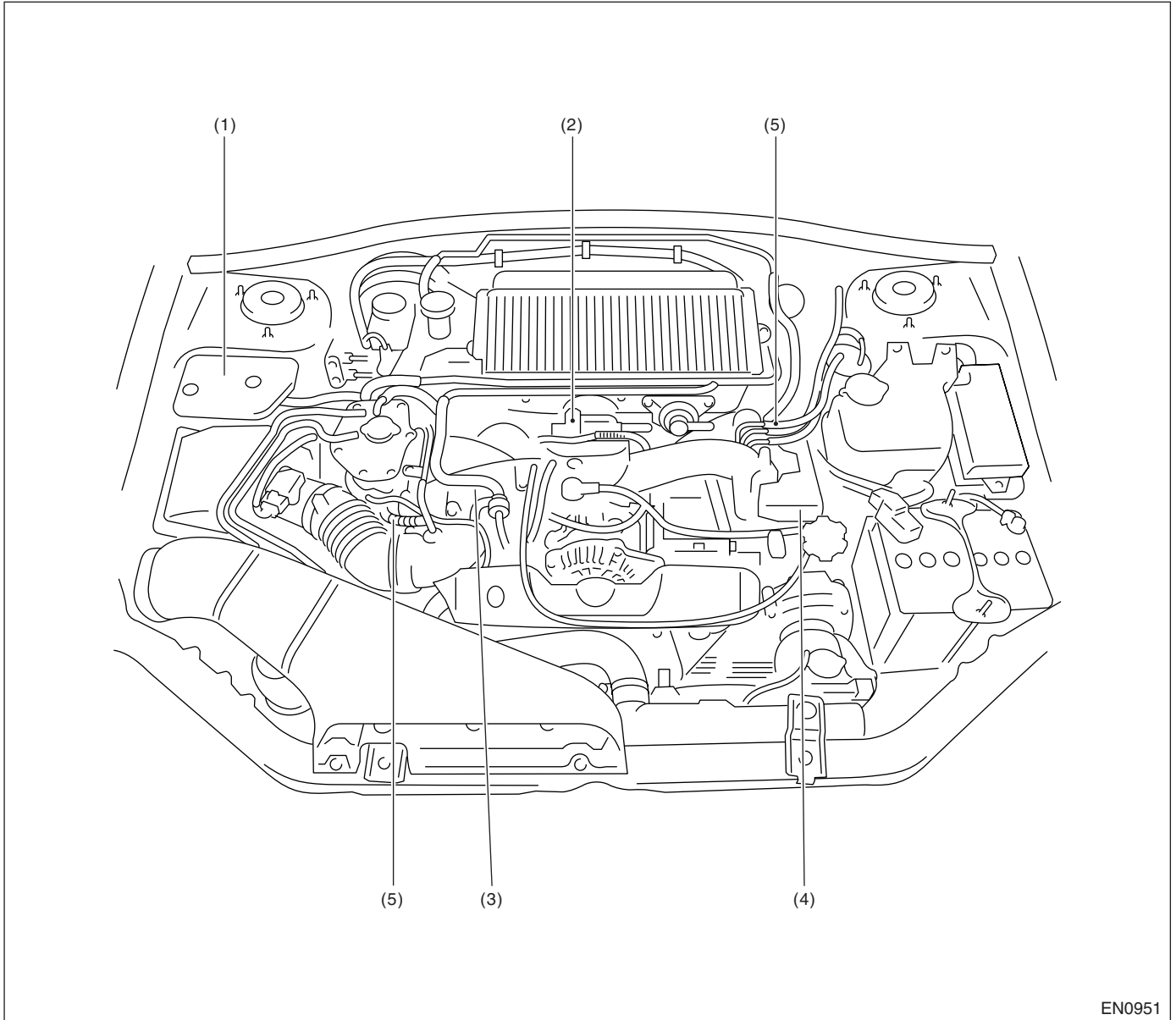


EN1037

ELECTRICAL COMPONENTS LOCATION

ENGINE (DIAGNOSTICS)

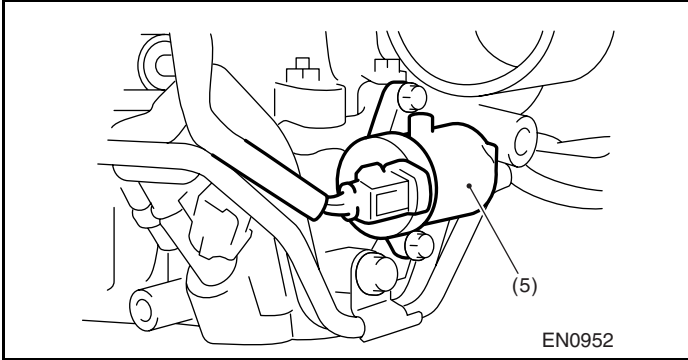
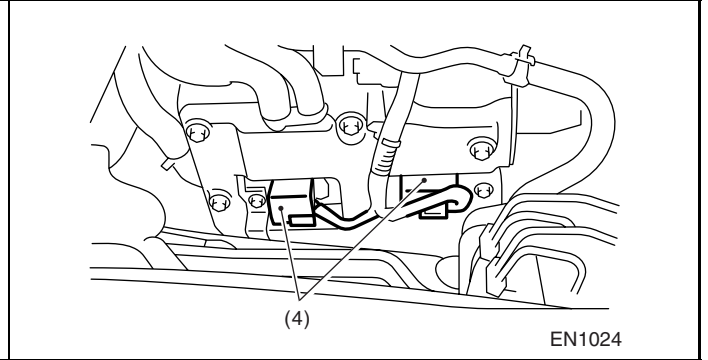
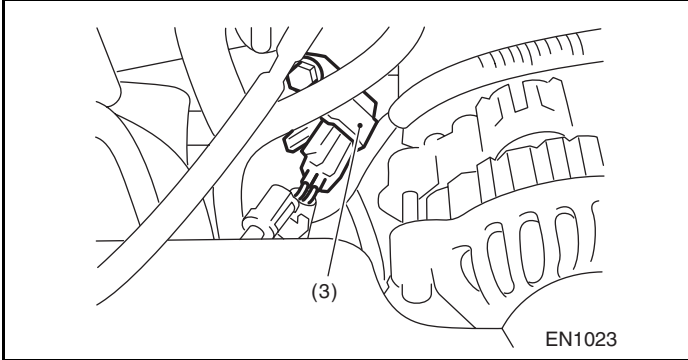
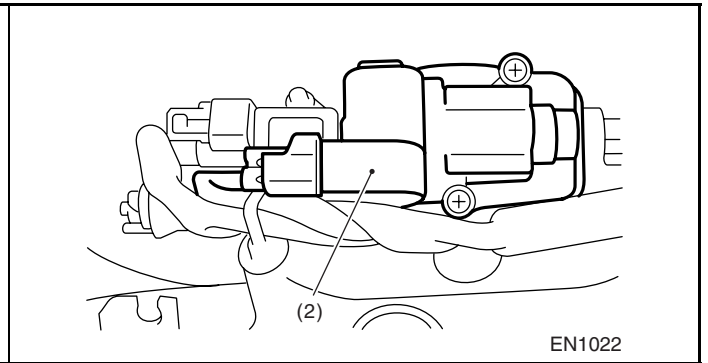
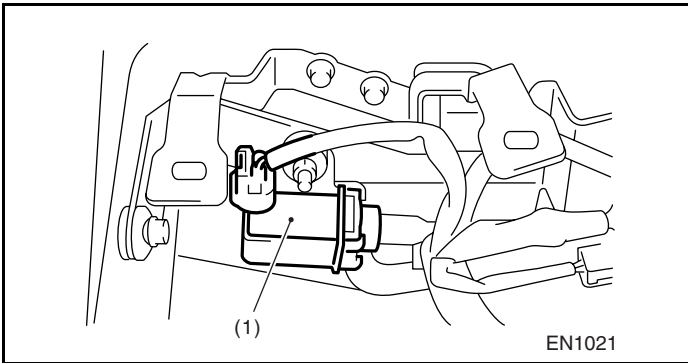
• Solenoid Valve, Actuator, Emission Control System Parts and Ignition System Parts



- | | | |
|--------------------------------------|----------------------------------|-------------------------------------|
| (1) Wastegate control solenoid valve | (3) Purge control solenoid valve | (5) Tumble generator valve actuator |
| (2) Idle air control solenoid valve | (4) Ignition coil | |

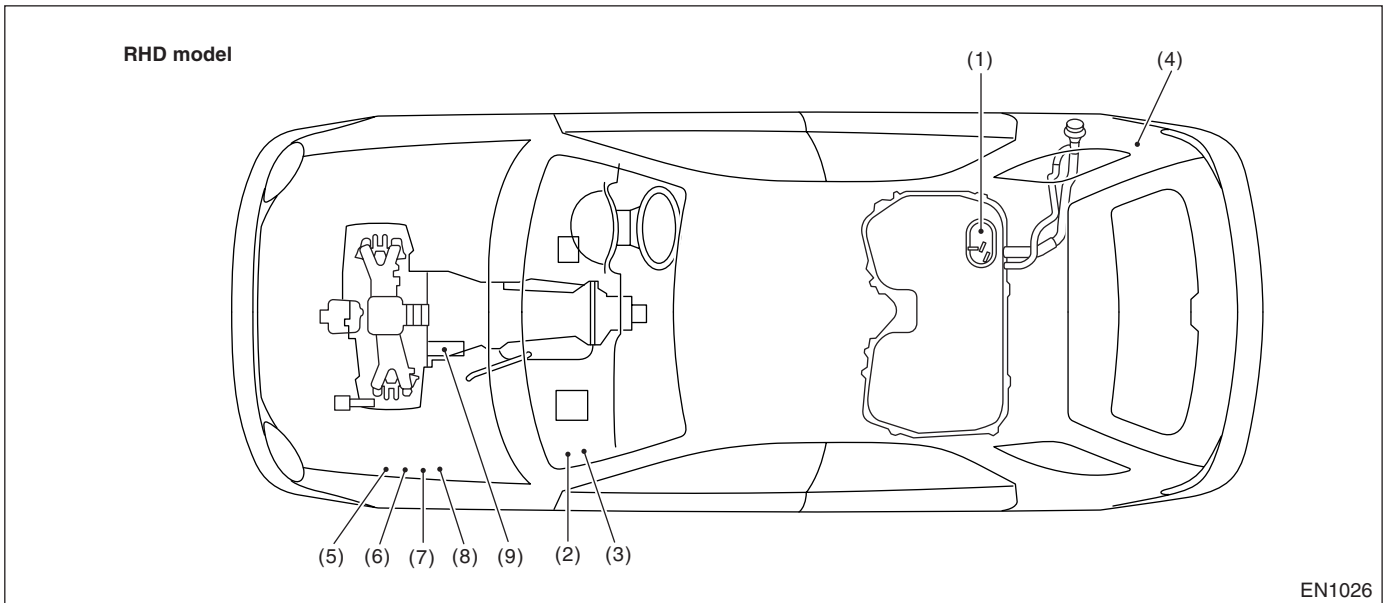
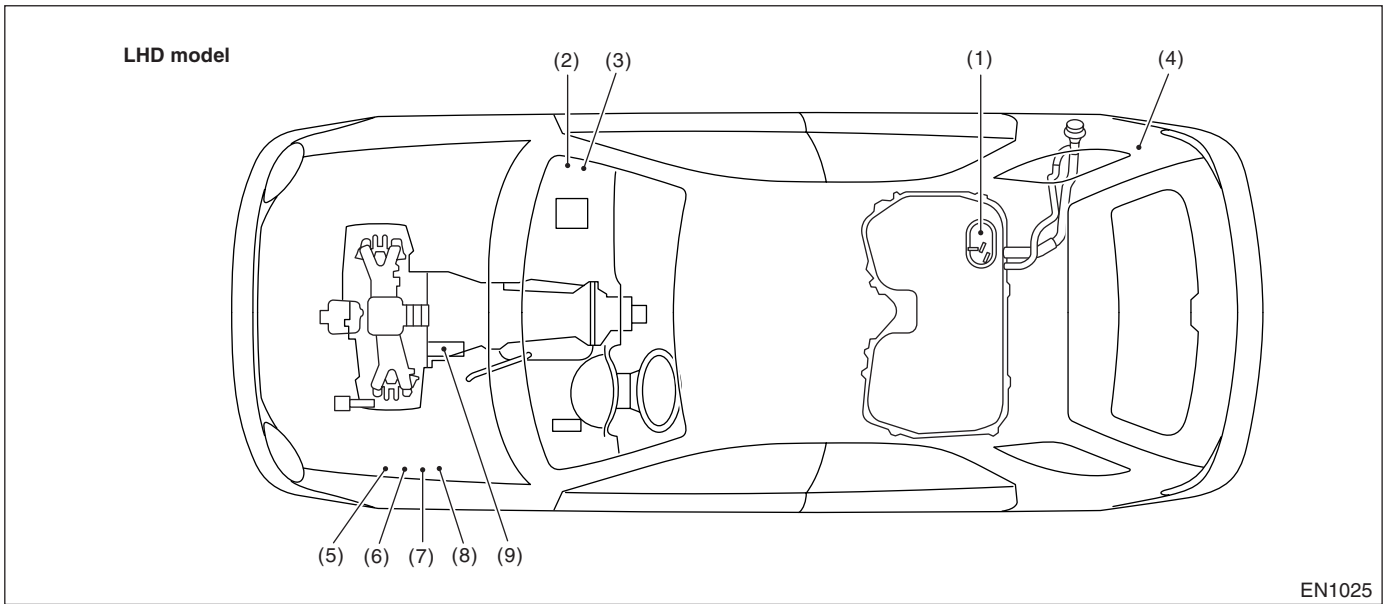
ELECTRICAL COMPONENTS LOCATION

ENGINE (DIAGNOSTICS)



ELECTRICAL COMPONENTS LOCATION

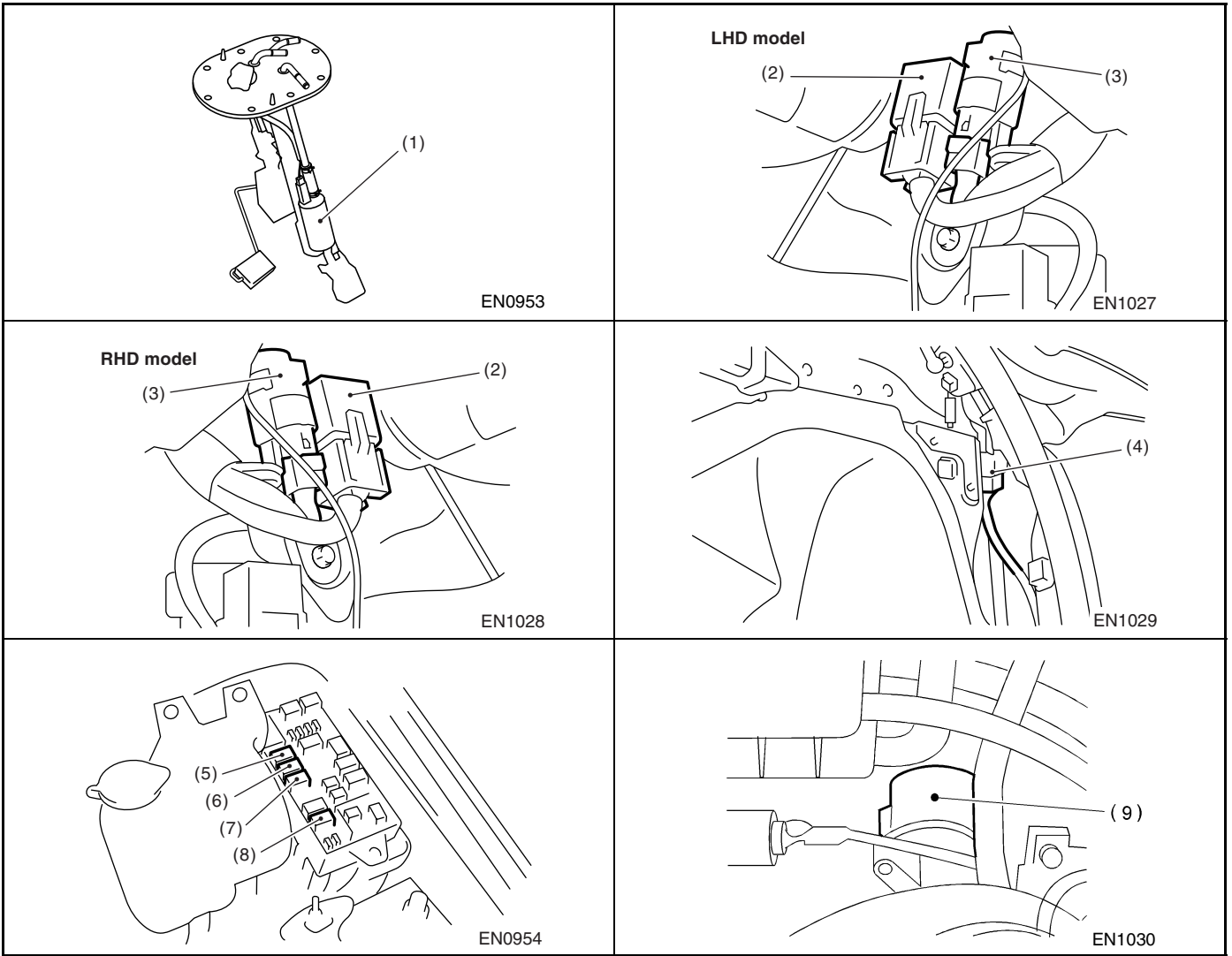
ENGINE (DIAGNOSTICS)



- | | | |
|---------------------|-------------------------------|------------------------------|
| (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)

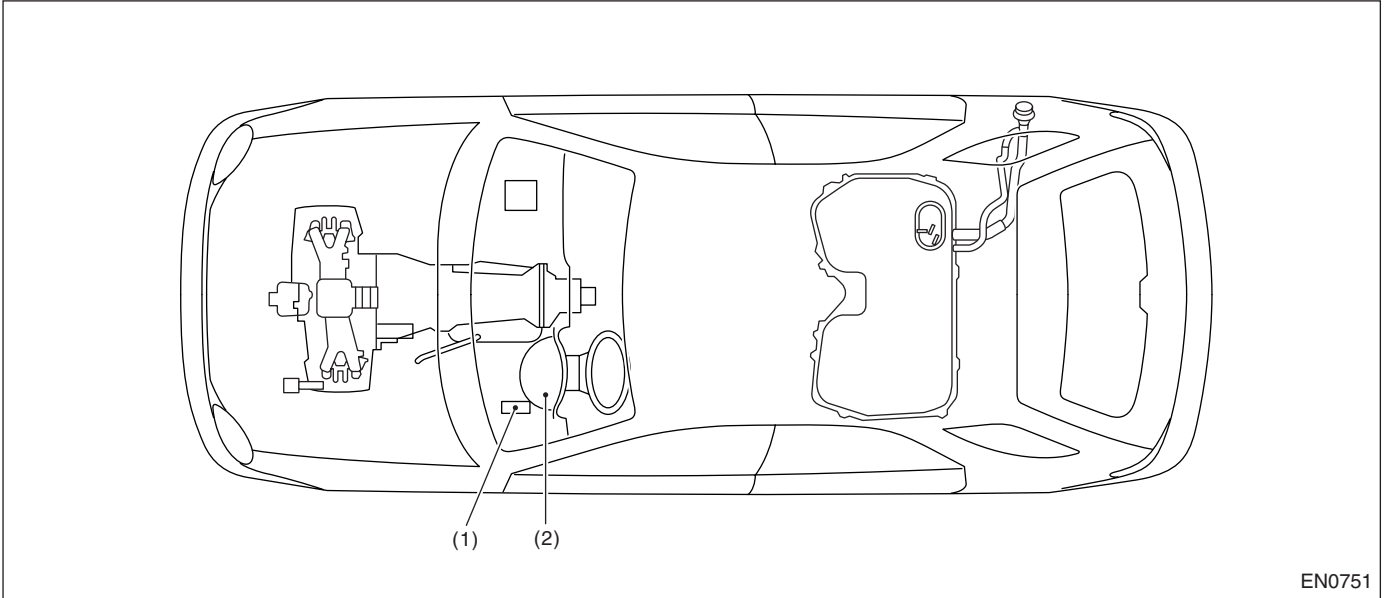


ELECTRICAL COMPONENTS LOCATION

ENGINE (DIAGNOSTICS)

2. TRANSMISSION

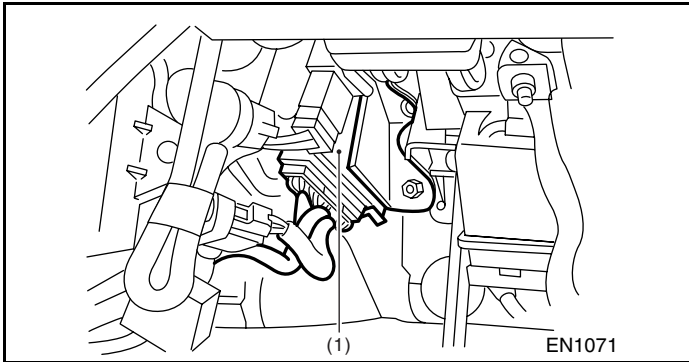
• Module



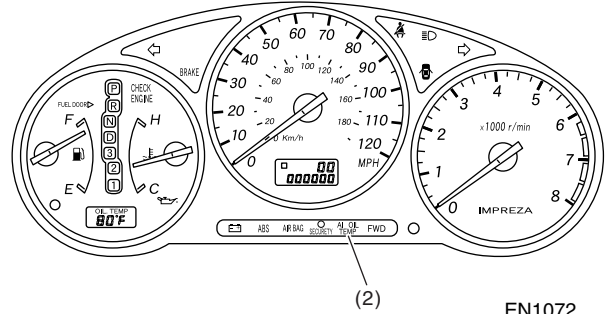
EN0751

(1) Transmission control module (TCM) (for AT vehicles)

(2) AT diagnostic indicator light (for AT vehicles)



EN1071

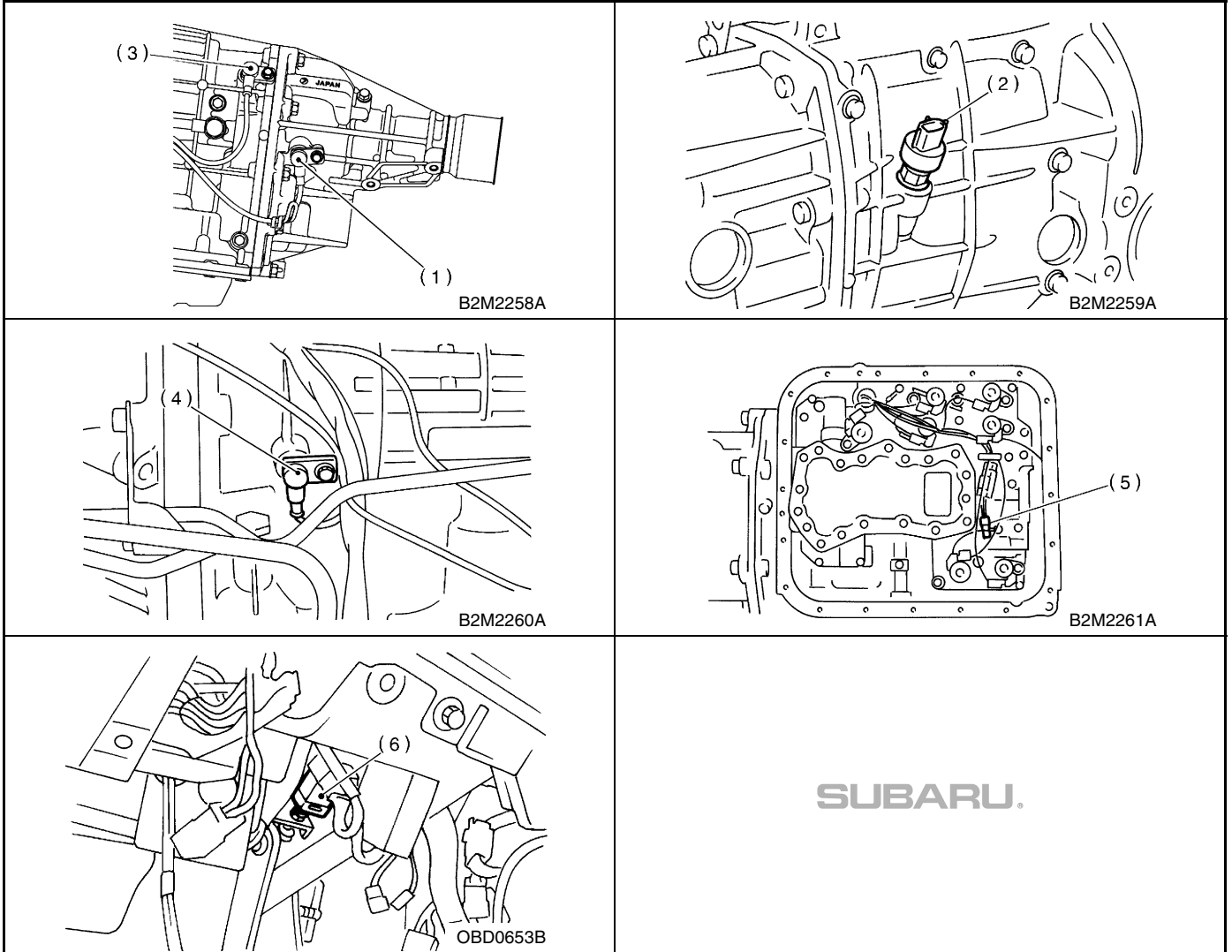


EN1072

ELECTRICAL COMPONENTS LOCATION

ENGINE (DIAGNOSTICS)

• Sensor

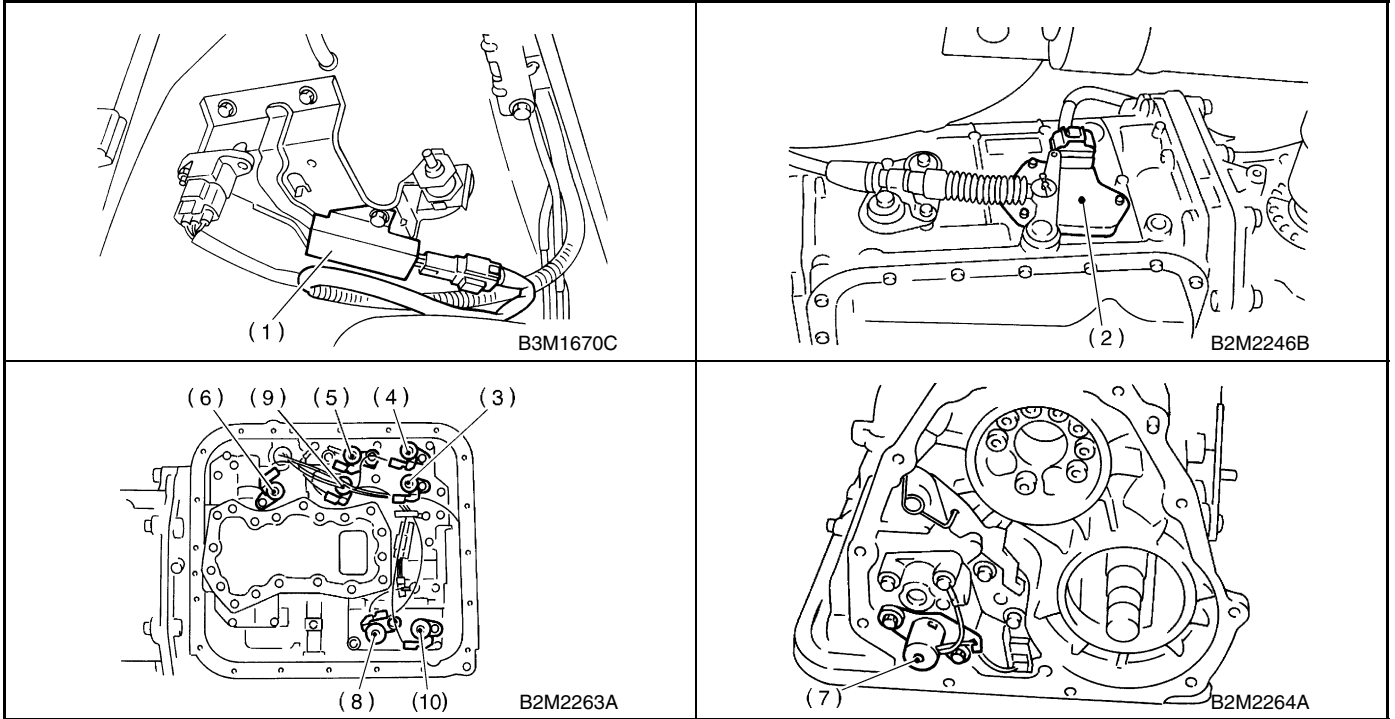


- (1) Vehicle speed sensor 1 (for AT vehicles)
- (2) Vehicle speed sensor 2 (for MT vehicles)
- (3) Vehicle speed sensor 2 (for AT vehicles)
- (4) Torque converter turbine speed sensor (for AT vehicles)
- (5) ATF temperature sensor (for AT vehicles)
- (6) Brake light switch

ELECTRICAL COMPONENTS LOCATION

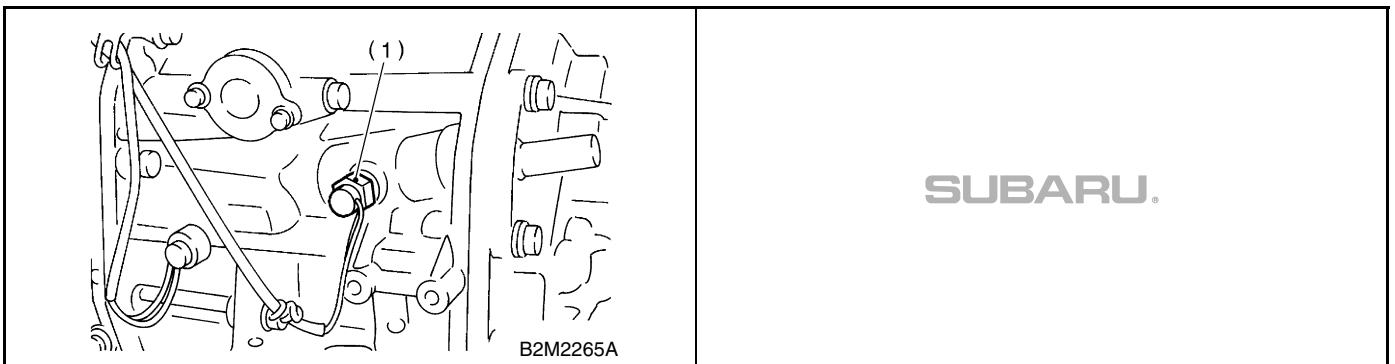
ENGINE (DIAGNOSTICS)

• Solenoid Valve and Switch (AT Vehicles)



- (1) Dropping resistor
- (2) Inhibitor switch
- (3) Shift solenoid valve 1
- (4) Shift solenoid valve 2
- (5) Line pressure duty solenoid
- (6) Lock-up duty solenoid
- (7) Transfer duty solenoid
- (8) 2-4 brake duty solenoid
- (9) Low clutch timing solenoid valve
- (10) 2-4 brake timing solenoid valve

• Solenoid Valve and Switch (MT Vehicles)



- (1) Neutral position switch

ELECTRICAL COMPONENTS LOCATION

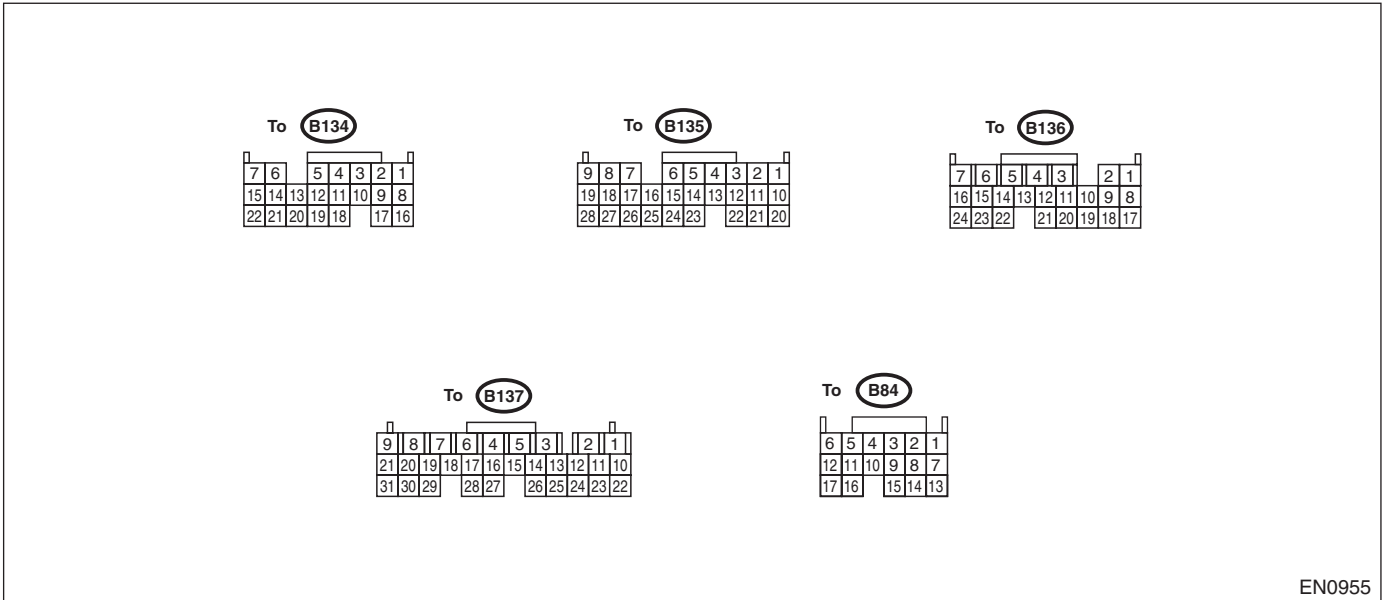
ENGINE (DIAGNOSTICS)

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 position sensor	Signal (+)	B135	2	0	-7 — +7	Sensor output waveform
	Signal (-)	B135	11	0	0	—
	Shield	B135	21	0	0	—
Camshaft position sensor	Signal (+)	B135	1	0	-7 — +7	Sensor output waveform
	Signal (-)	B135	10	0	0	—
	Shield	B135	21	0	0	—
Throttle position sensor	Signal	B135	7	Fully closed: 0.2 — 1.0 Fully opened: 4.2 — 4.7		—
	Power supply	B135	9	5	5	—
	GND (sensor)	B135	19	0	0	—
Rear oxygen sensor	Signal	B135	17	0	0 — 0.9	—
	Shield	B135	26	0	0	—
	GND (sensor)	B135	19	0	0	—
Front oxygen (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 temperature sensor	Signal	B135	18	1.0 — 1.4	1.0 — 1.4	After warm-up the engine.
	GND (sensor)	B135	19	0	0	After warm-up the engine.
Vehicle speed signal		B134	1	0 or 5	0 or 5	"5" and "0" are repeatedly displayed when vehicle is driven.

ENGINE CONTROL MODULE (ECM) I/O SIGNAL

ENGINE (DIAGNOSTICS)

Content		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (Engine OFF)	Engine ON (Idling)	
Mass air flow sensor	Signal	B84	13	—	0.3 — 4.5	—
	Shield	B84	8	0	0	—
	GND	B84	7	0	0	—
Intake air temperature sensor signal		B135	27	—	—	—
Exhaust gas temperature sensor	Signal	B135	16	—	—	—
	GND (sensor)	B135	19	0	0	—
Tumble generator valve position 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 position 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 solenoid valve		B137	24	10 — 13	13 — 14	—
Starter switch		B134	16	0	0	Cranking: 8 — 14
A/C switch		B134	6	ON: 10 — 13 OFF: 0	ON: 13 — 14 OFF: 0	—
Ignition switch		B134	14	10 — 13	13 — 14	—
Neutral position switch		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 supply		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	—
Torque control 1 signal		B134	19	More than 4	More than 4	—
Torque control 2 signal		B134	18	More than 4	More than 4	—
Torque control cut sig- nal		B136	14	8	8	—
AT diagnosis input sig- nal		B135	20	Less than 1 ↔ More than 4	Less than 1 ↔ More than 4	Waveform
AT load signal		B135	28	4.3 — 4.4	0.9 — 1.4	—
GND (sensors)		B135	19	0	0	—
GND (injectors)		B136	8	0	0	—
GND (ignition system)		B136	18	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 (power supply)	B136	17	0	0	—
	B134	22	0	0	—
GND (control systems)	B134	7	0	0	—
	B134	15	0	0	—
GND (oxygen sensor heater 1)	B137	9	0	0	—
GND (oxygen sensor heater 2)	B137	8	0	0	—

ENGINE CONDITION DATA

ENGINE (DIAGNOSTICS)

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:

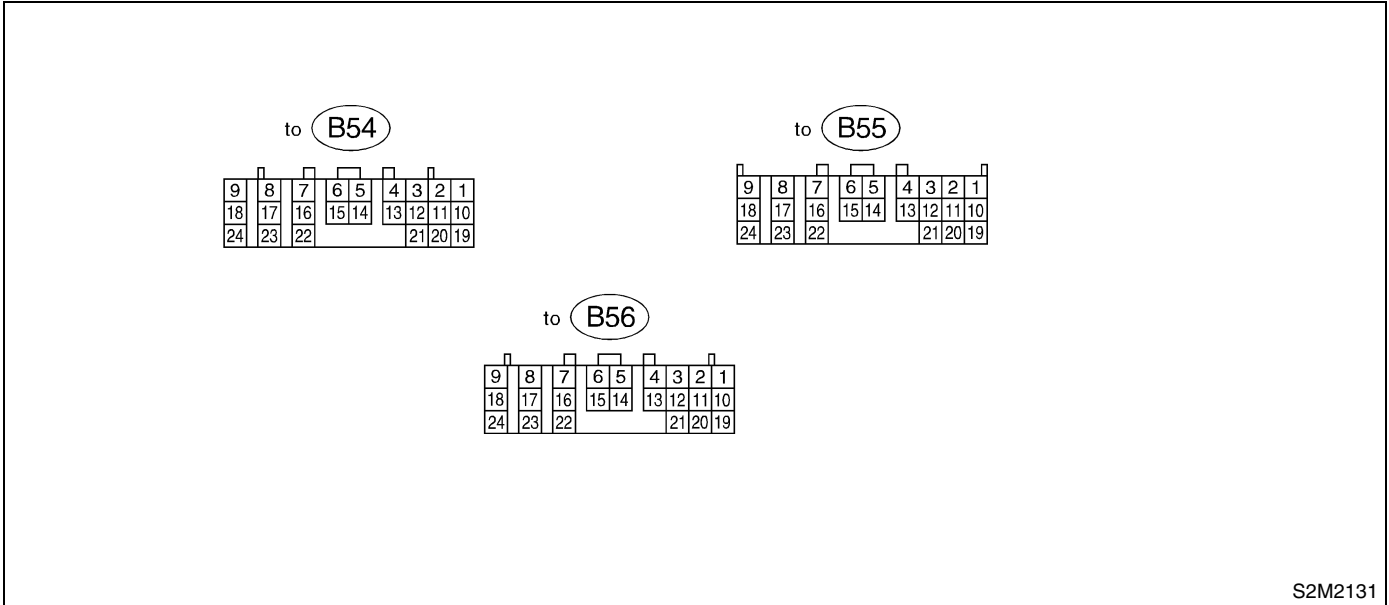
- After warm-up the engine.
- Gear position is in neutral position.
- A/C is turned to OFF.
- All accessory switches are turned to OFF.

TRANSMISSION CONTROL MODULE (TCM) I/O SIGNAL

ENGINE (DIAGNOSTICS)

7. Transmission Control Module (TCM) I/O Signal

A: ELECTRICAL SPECIFICATION



S2M2131

NOTE:

Check with ignition switch ON.

Content		Connector No.	Terminal No.	Measuring conditions	Voltage (V)	Resistance to body (ohms)
Back-up power supply		B56	1	Ignition switch OFF	10 — 13	—
Ignition power supply		B54	23	Ignition switch ON (with engine OFF)	10 — 13	—
		B54	24			
Inhibitor switch	“P” range switch	B55	1	Select lever in “P” range	Less than 1	—
				Select lever in any other than “P” range (except “N” range)	More than 8	
	“N” range switch	B55	14	Select lever in “N” range	Less than 1	—
				Select lever in any other than “N” range (except “P” range)	More than 8	
	“R” range switch	B55	3	Select lever in “R” range	Less than 1	—
				Select lever in any other than “R” range	More than 8	
	“D” range switch	B55	4	Select lever in “D” range	Less than 1	—
				Select lever in any other than “D” range	More than 8	
	“3” range switch	B55	5	Select lever in “3” range	Less than 1	—
				Select lever in any other than “3” range	More than 8	
	“2” range switch	B55	6	Select lever in “2” range	Less than 1	—
				Select lever in any other than “2” range	More than 8	
	“1” range switch	B55	7	Select lever in “1” range	Less than 1	—
				Select lever in any other than “1” range	More than 8	
Brake switch		B55	12	Brake pedal depressed.	More than 10.5	—
				Brake pedal released.	Less than 1	

TRANSMISSION CONTROL MODULE (TCM) I/O SIGNAL

ENGINE (DIAGNOSTICS)

Content	Connector No.	Terminal No.	Measuring conditions	Voltage (V)	Resistance to body (ohms)
AT OIL TEMP warning light	B56	11	Light ON	Less than 1	—
			Light OFF	More than 9	
Throttle position sensor	B54	3	Throttle fully closed.	Approx. 0.5	—
			Throttle fully open.	Approx. 4.3	
Throttle position sensor power supply	B54	2	Ignition switch ON (With engine OFF)	Approx. 5.0	—
ATF temperature sensor	B54	11	ATF temperature 20°C (68°F)	2.9 — 4.0	2.1 — 2.9 k
			ATF temperature 80°C (176°F)	0.5 — 0.8	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 5	—
Engine speed signal	B55	17	Ignition switch ON (with engine OFF)	0	—
			Ignition switch ON (with engine ON)	8 — 11	
Cruise set signal	B55	22	When cruise control is set. (SET lamp ON)	Less than 1	—
			When cruise control is not set. (SET lamp OFF)	More than 6.5	
Torque control signal 1	B56	5	Ignition switch ON (with engine ON)	More than 4.8	—
Torque control signal 2	B56	14	Ignition switch ON (with engine ON)	More than 4.8	—
Torque control cut signal	B55	10	Ignition switch ON	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	
Line pressure duty solenoid	B54	9	Throttle fully closed (with engine OFF) after warm-up.	1.5 — 5.0	2.0 — 4.5
			Throttle fully open (with engine OFF) 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	

TRANSMISSION CONTROL MODULE (TCM) I/O SIGNAL

ENGINE (DIAGNOSTICS)

Content	Connector No.	Terminal No.	Measuring conditions	Voltage (V)	Resistance to body (ohms)
2-4 brake duty solenoid	B54	18	Throttle fully closed (with engine OFF) after warm-up.	1.5 — 5.0	2.0 — 4.5
			Throttle fully open (with engine OFF) after warm-up.	Less than 0.5	
2-4 brake dropping resistor	B54	17	Throttle fully closed (with engine OFF) after warm-up.	More than 8.5	9 — 15
			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	
Sensor ground line 1	B54	19	—	0	Less than 1
Sensor ground line 2	B55	9	—	0	Less than 1
System ground line	B56	19	—	0	Less than 1
	B54	20			
AT diagnosis signal	B56	21	Ignition switch ON	Less than 1 ← → More than 4	—
Data link signal (Subaru Select Monitor)	B56	15	—	—	—
		6	—	—	

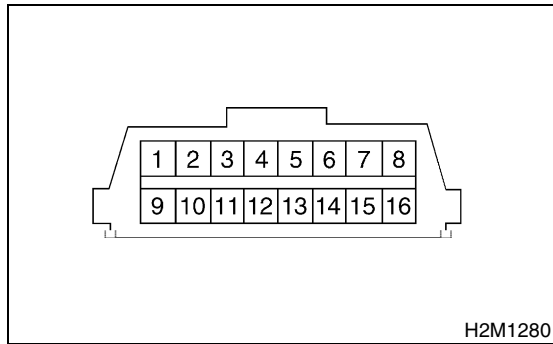
8. Data Link Connector

A: NOTE

- 1) This connector is used both for the OBD-II general scan tools and Subaru Select Monitor.
- 2) Terminal No. 4 to No. 6 of the data link connector is used for the Subaru Select Monitor signal.

CAUTION:

Do not connect any scan tools other than the OBD-II general scan tools and Subaru Select Monitor, because the circuit for 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

OBD-II GENERAL SCAN TOOL

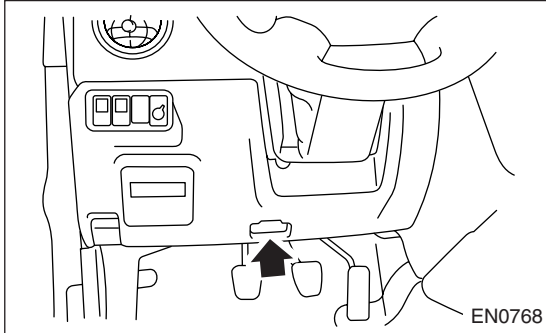
ENGINE (DIAGNOSTICS)

9. OBD-II General Scan Tool

A: OPERATION

1. HOW TO USE OBD-II GENERAL SCAN TOOL

- 1) Prepare a general scan tool (OBD-II general scan tool) required by SAE J1978.
- 2) Open the cover and connect the OBD-II general scan tool to data link connector located in the lower portion of instrument panel (on the driver's side).



2. MODE \$01 (CURRENT POWERTRAIN DIAGNOSTIC DATA)

Refers to data denoting the current operating condition of analog input/output, digital input/output and/or the powertrain system.

A list of the support data and PID (Parameter Identification) codes are shown in the following table.

PID	Data	Unit of measure
01	Number of emission-related powertrain trouble codes and 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) Using the OBD-II general scan tool, call up diagnostic trouble code(s) (DTC(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 the 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 (DTCs), refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(TURBO)-75, List of Diagnostic Trouble Code (DTC).>

3. MODE \$02 (POWERTRAIN FREEZE FRAME DATA)

Refers to data denoting the operating condition when trouble is sensed by the on-board diagnosis system. A list of the support data and PID (Parameter Identification) codes are shown in the following table.

PID	Data	Unit of measure
02	Trouble code that caused CARB required freeze frame data storage	—
03	Fuel system control status	—
04	Calculated engine load value	%
05	Engine coolant temperature	°C
06	Short term fuel trim	%
07	Long term fuel trim	%
0B	Intake manifold absolute pressure	kPa
0C	Engine revolution	rpm
0D	Vehicle speed	km/h

NOTE:

Refer to OBD-II general scan tool manufacturer's instruction manual to access freeze frame data (MODE \$02).

4. MODE \$03 (EMISSION-RELATED POWERTRAIN DIAGNOSTIC TROUBLE CODE)

Refer to Read Diagnostic Trouble Code for information about data denoting emission-related powertrain diagnostic trouble codes. <Ref. to EN(TURBO)-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).

SUBARU SELECT MONITOR

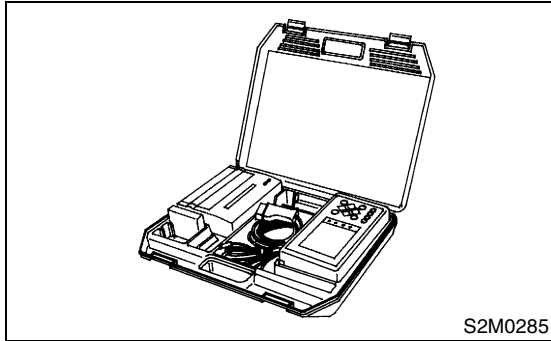
ENGINE (DIAGNOSTICS)

10. Subaru Select Monitor

A: OPERATION

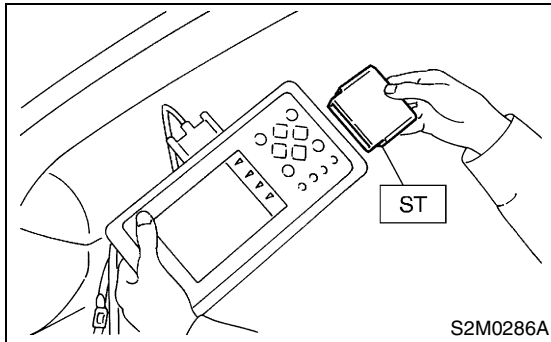
1. HOW TO USE SUBARU SELECT MONITOR

1) Prepare the Subaru Select Monitor kit. <Ref. to EN(TURBO)-7, PREPARATION TOOL, General Description.>



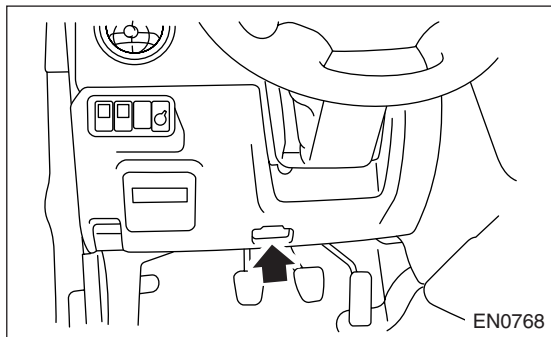
2) Connect the diagnosis cable to Subaru Select Monitor.

3) Insert the cartridge into Subaru Select Monitor. <Ref. to EN(TURBO)-7, PREPARATION TOOL, General Description.>



4) Connect the Subaru Select Monitor to data link connector.

(1) Data link connector located in the lower portion of instrument panel (on the driver's side).

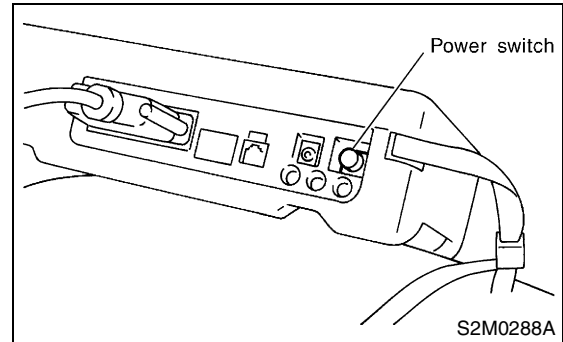


(2) Connect the diagnosis cable to data link connector.

CAUTION:

Do not connect the scan tools except for Subaru Select Monitor and OBD-II general scan tool.

5) Turn the ignition switch to ON (engine OFF) and Subaru Select Monitor switch to ON.



6) Using the Subaru Select Monitor, call up diagnostic trouble code(s) (DTC(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(TURBO)-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(TURBO)-41, Read Diagnostic Trouble Code.>

SUBARU SELECT MONITOR

ENGINE (DIAGNOSTICS)

4. READ CURRENT DATA FOR ENGINE. (NORMAL MODE)

- 1) On the «Main Menu» display screen, select the {Each System Check} and press [YES] key.
 - 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press [YES] key.
 - 3) Press the [YES] key after displayed the information of engine type.
 - 4) On the «Engine Diagnosis» display screen, select the {Current Data Display & Save} and press [YES] key.
 - 5) On the «Data Display Menu» display screen, select the {Data Display} and press [YES] key.
 - 6) Using the scroll key, move the display screen up or down until desired data is shown.
- A list of the support data is shown in the following table.

Contents	Display	Unit of measure
Battery voltage	Battery Voltage	V
Vehicle speed signal	Vehicle Speed	km/h or MPH
Engine speed signal	Engine Speed	rpm
Engine coolant temperature signal	Coolant Temp.	°C or °F
Ignition timing signal	Ignition Timing	deg
Throttle position signal	Throttle Opening Angle	%
Throttle position signal	Throttle Sensor Voltage	V
Injection pulse width	Fuel Injection #1 Pulse	ms
Idle air control signal	ISC Valve Duty Ratio	%
Alternator duty control signal	ALT Duty	%
Fuel pump duty control signal	Fuel Pump Duty	%
A/F sensor 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 [YES] key.
 - 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press [YES] key.
 - 3) Press the [YES] key after displayed the information of engine type.
 - 4) On the «Engine Diagnosis» display screen, select the {OBD System} and press [YES] key.
 - 5) On the «OBD Menu» display screen, select the {Current Data Display & Save} and press [YES] key.
 - 6) On the «Data Display Menu» display screen, select the {Data Display} and press [YES] key.
 - 7) Using the scroll key, move the display screen up or down until desired data is shown.
- A list of the support data is shown in the following table.

Contents	Display	Unit of measure
Number of diagnosis code	Number of Diagnosis Code	—
Malfunction indicator lamp status	MI (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 [YES] key.
 - 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press [YES] key.
 - 3) Press the [YES] key after displayed the information of engine type.
 - 4) On the «Engine Diagnosis» display screen, select the {OBD System} and press [YES] key.
 - 5) On the «OBD Menu» display screen, select the {Freeze Frame Data} and press [YES] key.
- A list of the support data is shown in the following table.

Contents	Display	Unit of measure
Diagnostic trouble code (DTC) for freeze frame data	Freeze frame data	DTC
Air fuel ratio control system for bank 1	Fuel system for Bank1	ON or OFF
Engine load data	Engine Load	%
Engine coolant temperature signal	Coolant Temp.	°C or °F
Short term fuel trim by front oxygen (A/F) sensor	Short term fuel trim B1	%
Long term fuel trim by front oxygen (A/F) sensor	Long term fuel trim B1	%
Intake manifold absolute pressure signal	Mani. Absolute Pressure	mmHg or kPa or inHg or 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 [YES] key.
 - 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press [YES] key.
 - 3) Press the [YES] key after displayed the information of engine type.
 - 4) On the «Engine Diagnosis» display screen, select the {OBD System} and press [YES] key.
 - 5) On the «OBD Menu» display screen, select the {O2 Sensor Monitor} and press [YES] key.
 - 6) On the «O2 Sensor Select» display screen, select the {Bank 1-Sensor1} or {Bank 1-Sensor2} and press [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 [YES] key.
- 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press [YES] key.
- 3) Press the [YES] key after displayed the information of engine type.
- 4) On the «Engine Diagnosis» display screen, select the {Current Data Display & Save} and press [YES] key.
- 5) On the «Data Display Menu» display screen, select the {Data & LED Display} and press [YES] key.
- 6) Using the scroll key, move the display screen up or down until the desired data is shown.
 - A list of the support data is shown in the following table.

Contents	Display	Message	LED "ON" requirements
Ignition switch signal	Ignition Switch	ON or OFF	When ignition switch is turned to 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.

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 [YES] key.
 - 2) On the «System Selection Menu» display screen, select the {Transmission Control System} and press [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 [YES] key.
 - 5) On the «Data Display Menu» display screen, select the {Data Display} and press [YES] key.
 - 6) Using the scroll key, move the display screen up or down until desired data is shown.
- A list of the support data is shown in the following table.

Contents	Display	Unit of measure
Battery voltage	Battery Voltage	V
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
Mass air flow sensor signal	Air Flow Sensor Voltage	V
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	%
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

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 [YES] key.
- 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press [YES] key.
- 3) Press the [YES] key after displayed the information of engine type.
- 4) On the «Engine Diagnosis» display screen, select the {Diagnostic Code(s) Display} and press [YES] key.
- 5) On the «Diagnostic Code(s) Display» display screen, select the {Current Diagnostic Code(s)} or {History Diagnostic Code(s)} and press [YES] key.

NOTE:

- For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
- For detailed concerning diagnostic trouble codes, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(TURBO)-75, List of Diagnostic Trouble Code (DTC).>

2. SUBARU SELECT MONITOR (OBD MODE)

- 1) On the «Main Menu» display screen, select the {2. Each System Check} and press [YES] key.
- 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press [YES] key.
- 3) Press the [YES] key after displayed the information of engine type.
- 4) On the «Engine Diagnosis» display screen, select the {OBD System} and press [YES] key.
- 5) On the «OBD Menu» display screen, select the {Diagnosis Code(s) Display} and press [YES] key.
- 6) Make sure that a diagnostic trouble code (DTC) is shown on the display screen.

NOTE:

- For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
- For detailed concerning diagnostic trouble codes (DTCs), refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(TURBO)-75, List of Diagnostic Trouble Code (DTC).>

3. OBD-II GENERAL SCAN TOOL

Refers to data denoting emission-related powertrain diagnostic trouble codes (DTCs).

For details concerning diagnostic trouble codes (DTCs), refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(TURBO)-75, 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 (DTCs) (MODE \$03).

12. Inspection Mode

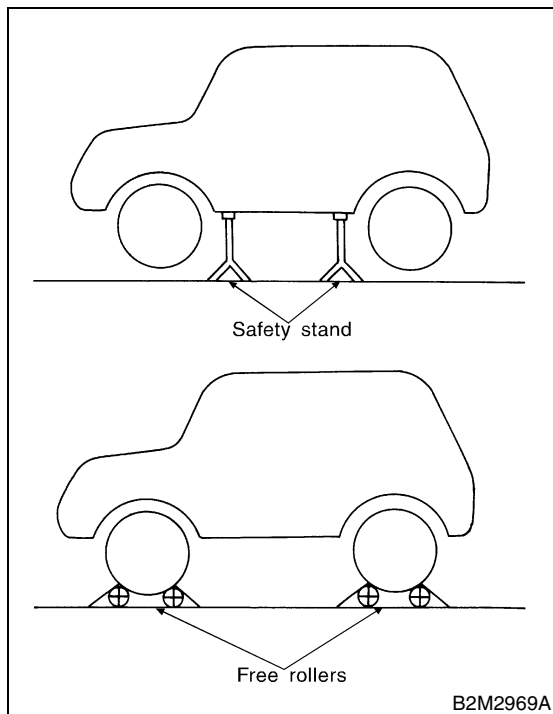
A: OPERATION

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:

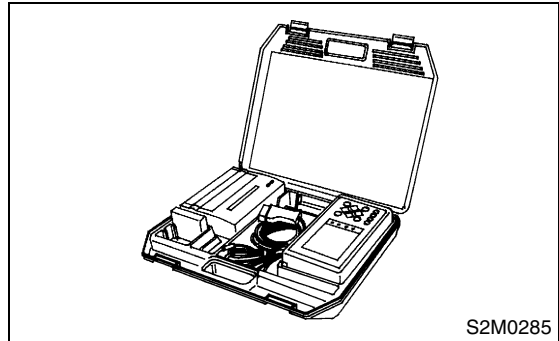
- Before raising the vehicle, ensure parking brake is applied.
- Do not use a pantograph jack in place of a safety stand.
- Secure a rope or wire to the front and rear towing or tie-down hooks to prevent the lateral runoff of front wheels.
- Do not abruptly depress/release the clutch pedal or accelerator 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.



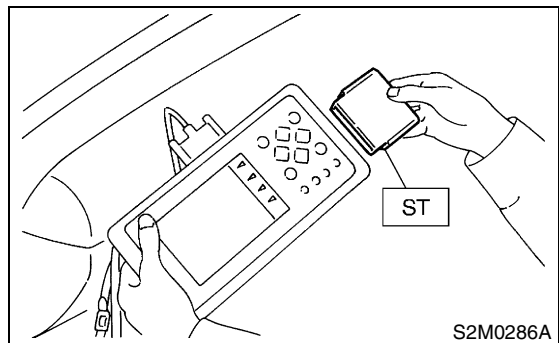
2. SUBARU SELECT MONITOR

After performing diagnostics and clearing the memory, check for any remaining unresolved trouble data.

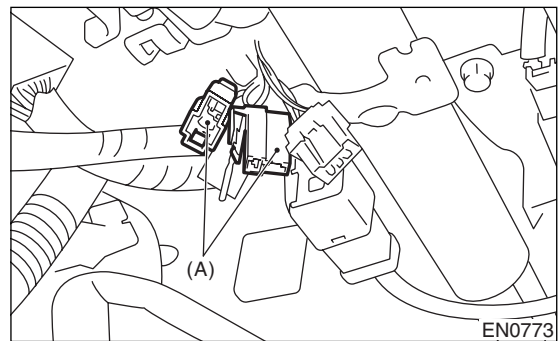
- 1) Prepare the Subaru Select Monitor kit. <Ref. to EN(TURBO)-7, PREPARATION TOOL, General Description.>



- 2) Connect the diagnosis cable to Subaru Select Monitor.
- 3) Insert the cartridge into Subaru Select Monitor. <Ref. to EN(TURBO)-7, PREPARATION TOOL, General Description.>

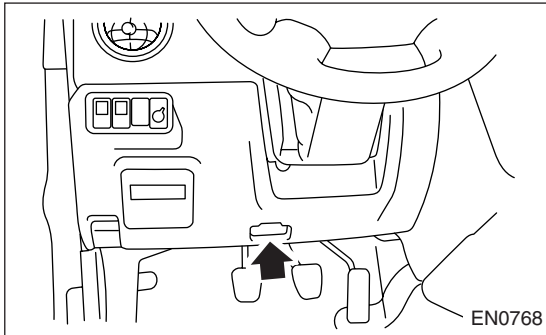


- 4) Connect the test mode connector (A) at the lower portion of instrument panel (on the driver's side).



5) Connect the Subaru Select Monitor to data link connector.

(1) Connect the Subaru Select Monitor to data link connector located in the lower portion of the instrument panel (on the driver's side).

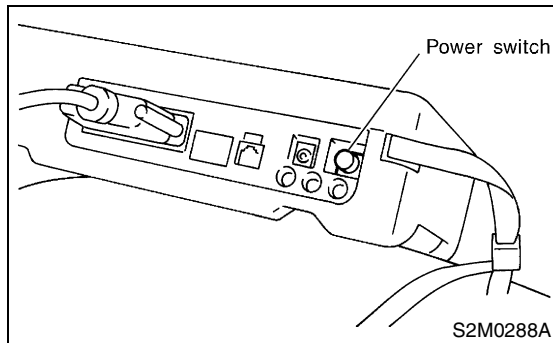


(2) Connect the diagnosis cable to data link connector.

CAUTION:

Do not connect scan tools except for the Subaru Select Monitor and OBD-II general scan tool.

6) Turn the ignition switch to ON (engine OFF) and Subaru Select Monitor switch to ON.



7) On the «Main Menu» display screen, select the {2. Each System Check} and press [YES] key.

8) On the «System Selection Menu» display screen, select the {Engine Control System} and press [YES] key.

9) Press the [YES] key after displayed the information of engine type.

10) On the «Engine Diagnosis» display screen, select the {Dealer Check Mode Procedure} and press [YES] key.

11) When the “Perform Inspection (Dealer Check Mode)?” is shown on the display screen, press [YES] key.

12) Perform subsequent procedures as instructed on the display screen.

- If trouble still remains in the memory, 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 (DTCs), refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(TURBO)-75, List of Diagnostic Trouble Code (DTC).>

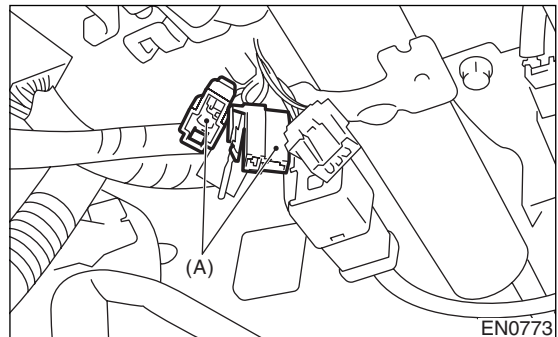
- Release the parking brake.

- The speed difference between front and rear wheels may light either the ABS warning light, but this indicates no malfunctions. When the 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 the test mode connector (A) at the lower side of instrument panel (on the driver's side).



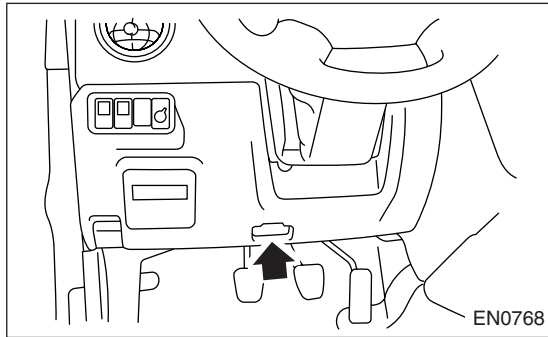
2) Connect the OBD-II general scan tool to its data link connector in the lower portion of the instrument panel (on the driver's side).

INSPECTION MODE

ENGINE (DIAGNOSTICS)

CAUTION:

Do not connect scan tools except for the Subaru Select Monitor and OBD-II general scan tool.



3) Start the engine.

NOTE:

Depress the 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 indicates no malfunctions. When the 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) (DTC(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 (DTCs), refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(TURBO)-75, 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 [YES] key.
- 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press [YES] key.
- 3) Press the [YES] key after displayed the information of engine type.
- 4) On the «Engine Diagnosis» display screen, select the {Clear Memory} and press [YES] key.
- 5) When the 'Done' and 'Turn Ignition Switch OFF' are shown on the display screen, turn the Subaru Select Monitor and ignition switch to OFF.

NOTE:

- For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

2. SUBARU SELECT MONITOR (OBD MODE)

- 1) On the «Main Menu» display screen, select the {2. Each System Check} and press [YES] key.
- 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press [YES] key.
- 3) Press the [YES] key after displayed the information of engine type.
- 4) On the «Engine Diagnosis» display screen, select the {OBD System} and press [YES] key.
- 5) On the «OBD Menu» display screen, select the {4. Diagnosis Code(s) Cleared} and press [YES] key.
- 6) When the 'Clear Diagnostic Code?' is shown on the display screen, press [YES] key.
- 7) Turn the Subaru Select Monitor and ignition switch to OFF.

NOTE:

- For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

3. OBD-II GENERAL SCAN TOOL

For clear memory procedures using the OBD-II general scan tool, refer to the OBD-II General Scan Tool Instruction Manual.

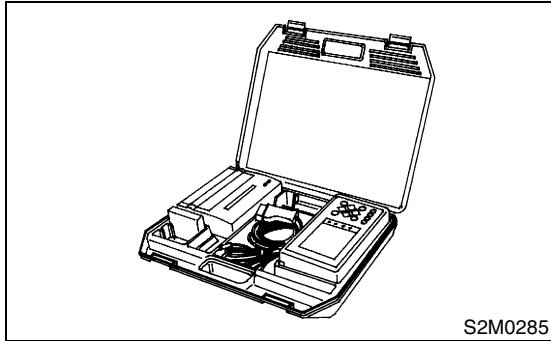
COMPULSORY VALVE OPERATION CHECK MODE

ENGINE (DIAGNOSTICS)

14. Compulsory Valve Operation Check Mode

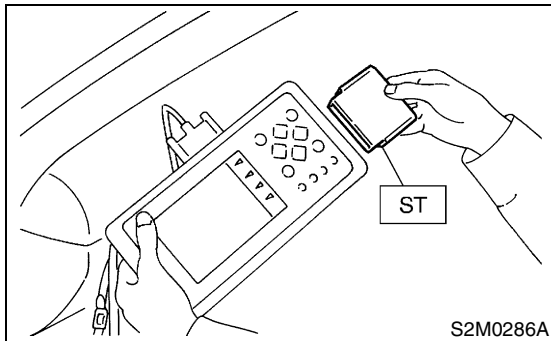
A: OPERATION

1) Prepare the Subaru Select Monitor kit. <Ref. to EN(TURBO)-7, PREPARATION TOOL, General Description.>

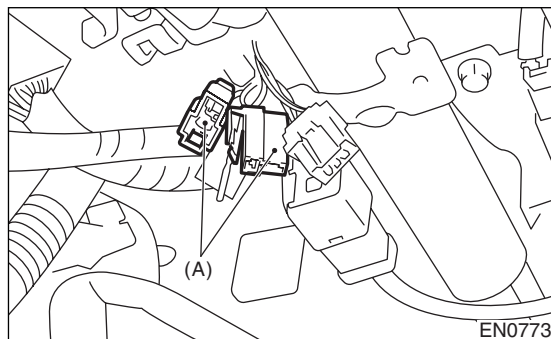


2) Connect the diagnosis cable to Subaru Select Monitor.

3) Insert the cartridge into Subaru Select Monitor. <Ref. to EN(TURBO)-7, PREPARATION TOOL, General Description.>

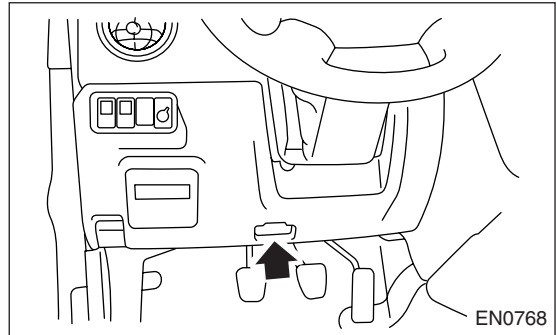


4) Connect the test mode connector (A) at the lower portion of instrument panel (on the driver's side).



5) Connect the Subaru Select Monitor to data link connector.

(1) Connect the Subaru Select Monitor to data link connector located in the lower portion of instrument panel (on the driver's side).

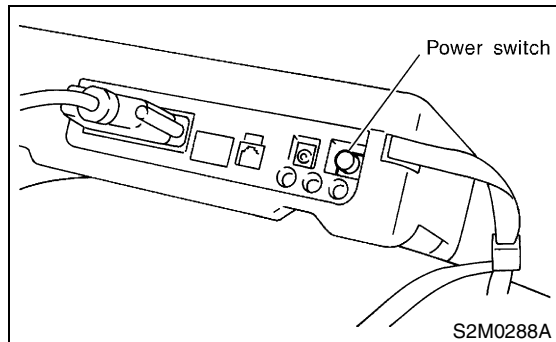


(2) Connect the diagnosis cable to data link connector.

CAUTION:

Do not connect scan tools except for the Subaru Select Monitor and OBD-II general scan tool.

6) Turn the ignition switch to ON (engine OFF) and Subaru Select Monitor switch to ON.



7) On the «Main Menu» display screen, select the {2. Each System Check} and press [YES] key.

8) On the «System Selection Menu» display screen, select the {Engine Control System} and press [YES] key.

9) Press the [YES] key after displayed the information of engine type.

10) On the «Engine Diagnosis» display screen, select the {System Operation Check Mode} and press [YES] key.

11) On the «System Operation Check Mode» display screen, select the {Actuator ON/OFF Operation} and press [YES] key.

12) Select the desired compulsory actuator on the «Actuator ON/OFF Operation» display screen and press [YES] key.

COMPULSORY VALVE OPERATION CHECK MODE

ENGINE (DIAGNOSTICS)

13) Pressing the [NO] key completes the compulsory operation check mode. The display will then return to the «Actuator ON/OFF Operation» screen.

- A list of the support data is shown in the following table.

Contents	Display
Compulsory fuel pump relay operation check	Fuel Pump Relay
Compulsory radiator fan relay operation check	Radiator Fan Relay
Compulsory air conditioning relay operation check	A/C Compressor Relay
Compulsory purge control solenoid valve operation check	CPC Solenoid Valve

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.

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(TURBO)-49, ACTIVATION OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL), Engine Malfunction Indicator Lamp (MIL).>
↓
2. Check that the engine malfunction indicator lamp (MIL) does not come on. <Ref. to EN(TURBO)-50, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT COME ON., Engine Malfunction Indicator Lamp (MIL).>
↓
3. Check that the engine malfunction indicator lamp (MIL) does not go off. <Ref. to EN(TURBO)-52, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT GO OFF., Engine Malfunction Indicator Lamp (MIL).>
↓
4. Check that the engine malfunction indicator lamp (MIL) does not blink at a cycle of 3 Hz. <Ref. to EN(TURBO)-53, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT BLINK AT A CYCLE OF 3 HZ., Engine Malfunction Indicator Lamp (MIL).>
↓
5. Check that the engine malfunction indicator lamp (MIL) remains blinking at a cycle of 3 Hz. <Ref. to EN(TURBO)-56, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) REMAINS BLINKING AT A CYCLE OF 3 HZ., Engine Malfunction Indicator Lamp (MIL).>

ENGINE MALFUNCTION INDICATOR LAMP (MIL)

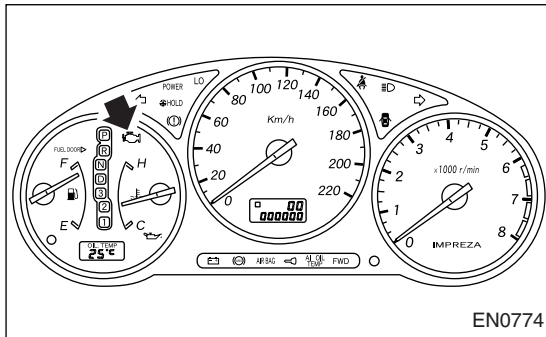
ENGINE (DIAGNOSTICS)

B: ACTIVATION OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL)

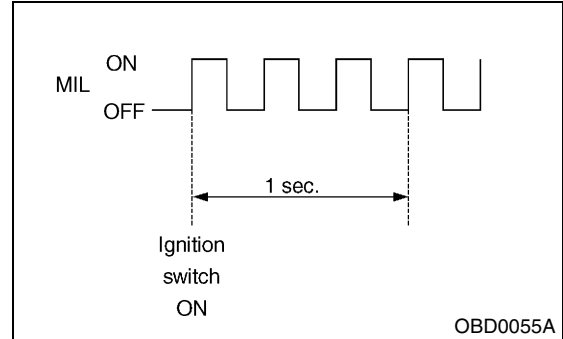
1) When the ignition switch is turned to ON (engine off), the CHECK ENGINE malfunction indicator lamp (MIL) in the combination meter illuminates.

NOTE:

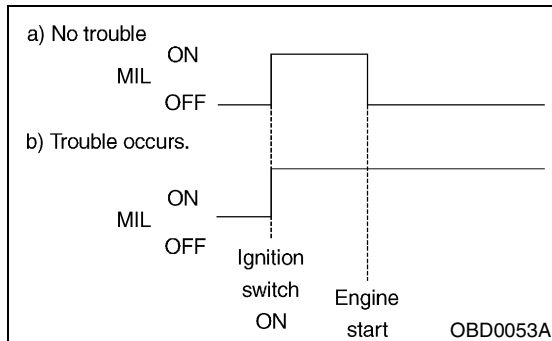
If the MIL does not illuminate, perform diagnostics of the CHECK ENGINE light circuit or the combination meter circuit. <Ref. to EN(TURBO)-50, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT COME ON., Engine Malfunction Indicator Lamp (MIL).>



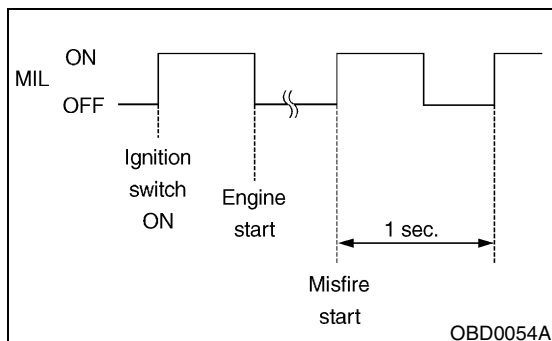
4) When the ignition switch is turned to ON (engine off) or to START with the test mode connector connected, the MIL blinks at a cycle of 3 Hz.



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.



ENGINE MALFUNCTION INDICATOR LAMP (MIL)

ENGINE (DIAGNOSTICS)

C: CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT COME ON.

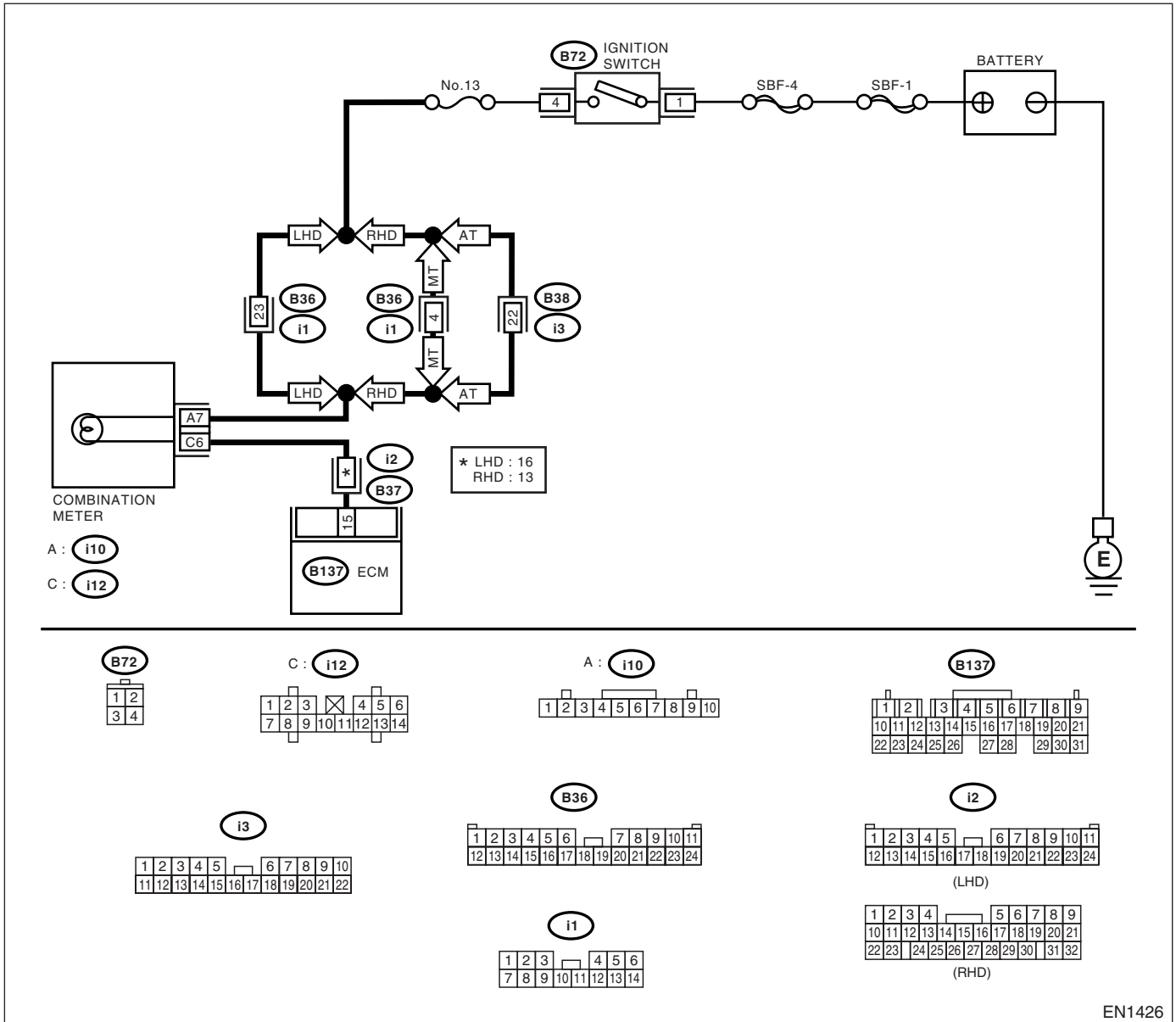
• DIAGNOSIS:

- The CHECK ENGINE malfunction indicator lamp (MIL) circuit is open or shorted.

• TROUBLE SYMPTOM:

- When the ignition switch is turned to ON (engine OFF), MIL does not come on.

• WIRING DIAGRAM:



Step	Check	Yes	No
1 CHECK OUTPUT SIGNAL FROM ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector and chassis ground. Connector & terminal (B137) No. 15 (+) — Chassis ground (-):	Is the 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 the 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 the ECM connector correctly connected?	Replace the ECM. <Ref. to FU(TURBO)-49, Engine Control Module.>	Repair the connection of ECM connector.
4 CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Remove the combination meter. <Ref. to IDI-15, Combination Meter Assembly.> 3) Disconnect the connector from ECM and combination meter. 4) Measure the resistance of harness between ECM and combination meter connector. Connector & terminal (B137) No. 15 — (i12) No. 6:	Is the resistance less than 1 Ω ?	Go to step 5.	Repair the harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between ECM and combination meter connector • Poor contact in coupling connector
5 CHECK POOR CONTACT. Check poor contact in combination meter connector.	Is there poor contact in combination meter connector?	Repair the poor contact in combination meter connector.	Go to step 6.
6 CHECK HARNESS BETWEEN COMBINATION METER AND IGNITION SWITCH CONNECTOR. 1) Turn the ignition switch to ON. 2) Measure the voltage between combination meter connector and chassis ground. Connector & terminal (i10) No. 7 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 7.	Check the following and repair if necessary. NOTE: <ul style="list-style-type: none"> • Broken down ignition relay • Blown out fuse (No. 5) • If replaced fuse (No. 5) blows easily, check the harness for short circuit of harness between fuse (No. 5) and ignition relay connector. • Open or short circuit in harness between fuse (No. 5) and battery terminal • Open circuit in harness between fuse (No. 5) and ignition relay connector • Poor contact in ignition relay connector • Poor contact in ignition switch connector
7 CHECK LAMP BULB. Remove the engine malfunction indicator lamp bulb.	Is the lamp bulb condition OK?	Repair the combination meter connector.	Replace the lamp bulb.

ENGINE MALFUNCTION INDICATOR LAMP (MIL)

ENGINE (DIAGNOSTICS)

D: CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT GO OFF.

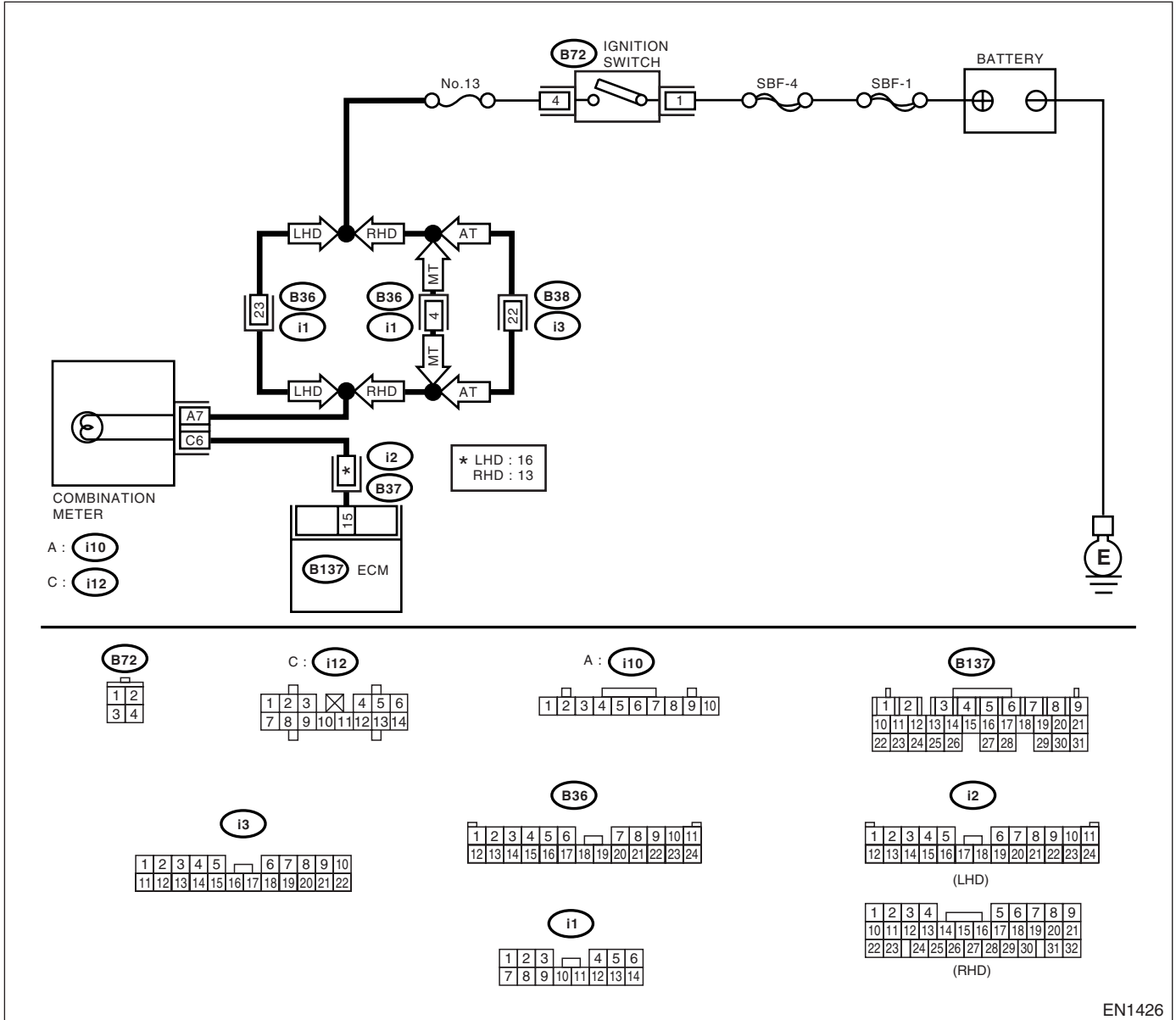
• DIAGNOSIS:

- The CHECK ENGINE malfunction indicator lamp (MIL) circuit is shorted.

• TROUBLE SYMPTOM:

- Although MIL comes on when engine runs, but trouble code is not shown on Subaru Select Monitor or OBD-II general scan tool display.

• WIRING DIAGRAM:



Step	Check	Yes	No	
1	CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Turn the ignition switch to ON.	Does the MIL come on?	Repair the short circuit in harness between combination meter and ECM connector.	Replace the ECM. <Ref. to FU(TURBO)-49, 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 open.

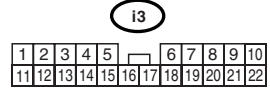
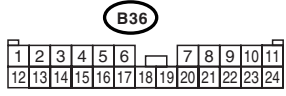
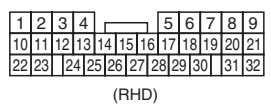
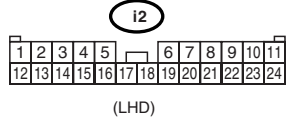
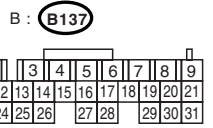
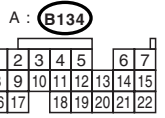
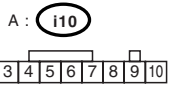
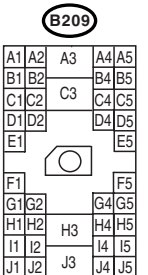
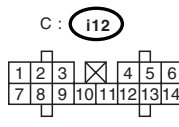
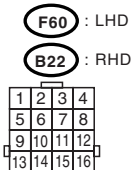
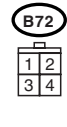
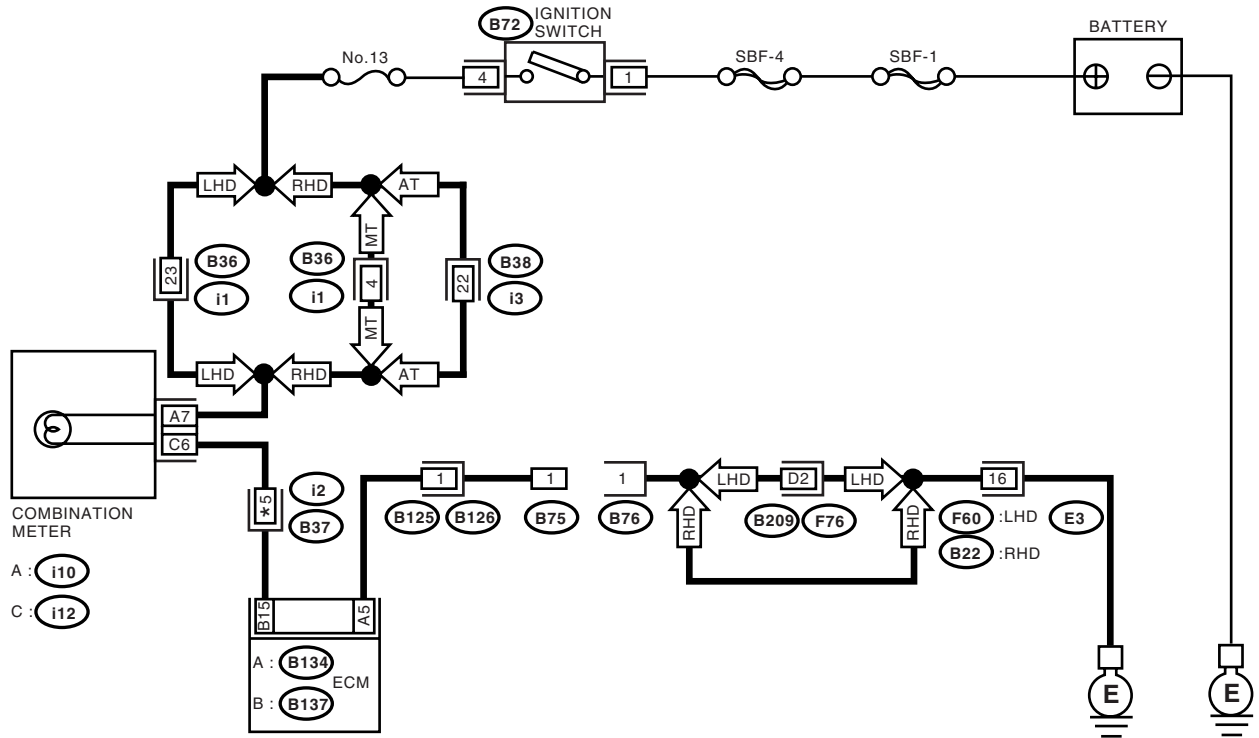
- **TROUBLE SYMPTOM:**

- During inspection mode, MIL does not blink at a cycle of 3 Hz.

ENGINE MALFUNCTION INDICATOR LAMP (MIL)

ENGINE (DIAGNOSTICS)

• WIRING DIAGRAM:



EN1427

ENGINE MALFUNCTION INDICATOR LAMP (MIL)

ENGINE (DIAGNOSTICS)

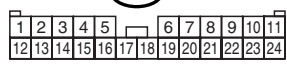
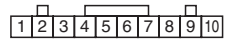
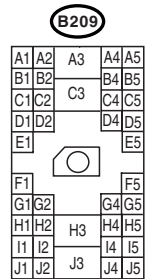
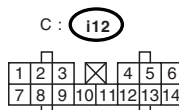
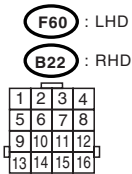
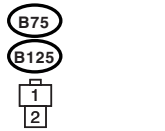
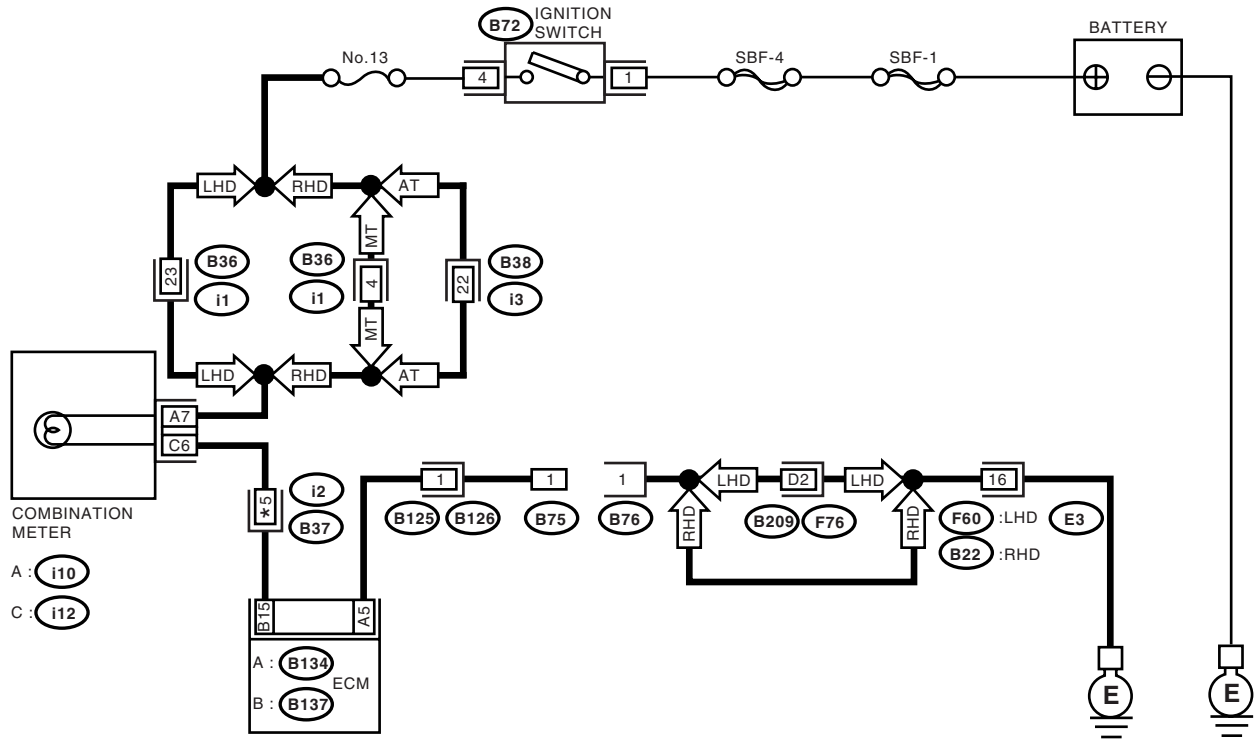
Step	Check	Yes	No
1 CHECK STATUS OF CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL). 1) Turn the ignition switch to OFF. 2) Disconnect the test mode connector. 3) Turn the ignition switch to ON. (engine OFF)	Does the MIL come on?	Go to step 2.	Repair the MIL circuit. <Ref. to EN(TURBO)-50, CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) DOES NOT COME ON., Engine Malfunction Indicator Lamp (MIL).>
2 CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Turn the ignition switch to ON.	Does the MIL come on?	Repair the ground short circuit in harness between combination meter and ECM connector.	Go to step 3.
3 CHECK HARNESS BETWEEN TEST MODE CONNECTOR AND CHASSIS GROUND. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between test mode connector and chassis ground. <i>Connector & terminal</i> <i>(B76) No. 1 — Chassis ground:</i>	Is the resistance less than 1 Ω ?	Go to step 4.	Repair the harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between test mode connector and chassis ground
4 CHECK POOR CONTACT. Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Go to step 5.
5 CHECK HARNESS BETWEEN ECM AND TEST MODE CONNECTOR. 1) Connect the test mode connector. 2) Measure the resistance of harness between ECM and chassis ground. <i>Connector & terminal</i> <i>(B134) No. 5 — Chassis ground:</i>	Is the resistance less than 1 Ω ?	Go to step 6.	Repair the open circuit in harness between ECM and test mode connector.
6 CHECK POOR CONTACT. Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(TURBO)-49, Engine Control Module.>

ENGINE MALFUNCTION INDICATOR LAMP (MIL)

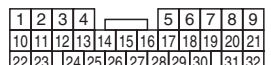
ENGINE (DIAGNOSTICS)

F: CHECK ENGINE MALFUNCTION INDICATOR LAMP (MIL) REMAINS BLINKING AT A CYCLE OF 3 HZ.

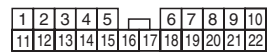
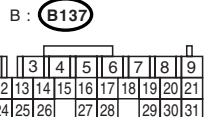
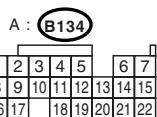
- **DIAGNOSIS:**
 - Test mode connector circuit is shorted.
- **TROUBLE SYMPTOM:**
 - MIL blinks at a cycle of 3 Hz when ignition switch is turned to ON.
- **WIRING DIAGRAM:**



(LHD)



(RHD)



ENGINE MALFUNCTION INDICATOR LAMP (MIL)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK TEST MODE CONNECTOR. 1)Disconnect the test mode connector. 2)Turn the ignition switch to ON.	Does the 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 the ignition switch to OFF. 2)Disconnect the connector from ECM. 3)Measure the resistance of harness between ECM connector and chassis ground. Connector & terminal (B134) No. 5 — Chassis ground:	Is the resistance less than 5 Ω ?	Repair the short circuit in harness between ECM and test mode connector.	Replace the ECM. <Ref. to FU(TURBO)-49, 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(TURBO)-60, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
2. Inspection of ECM power supply and ground line. <Ref. to EN(TURBO)-62, CONTROL MODULE POWER SUPPLY AND GROUND LINE, Diagnostics for Engine Starting Failure.>
↓
3. Inspection of ignition control system. <Ref. to EN(TURBO)-66, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>
↓
4. Inspection of fuel pump circuit. <Ref. to EN(TURBO)-70, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
5. Inspection of fuel injector circuit. <Ref. to EN(TURBO)-72, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

DIAGNOSTICS FOR ENGINE STARTING FAILURE

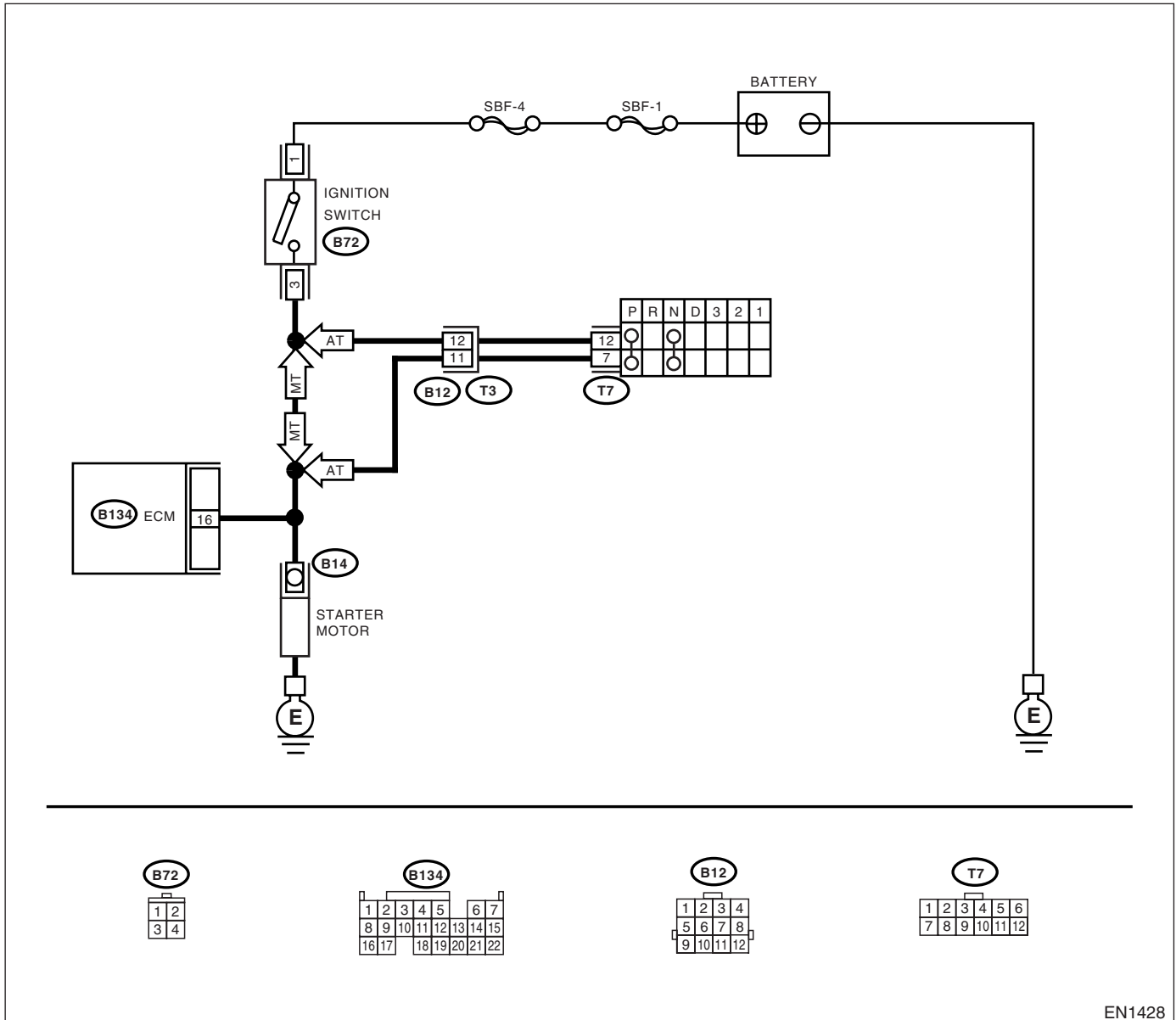
ENGINE (DIAGNOSTICS)

B: STARTER MOTOR CIRCUIT

CAUTION:

After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN(TURBO)-45, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(TURBO)-42, Inspection Mode.> .

• WIRING DIAGRAM:



EN1428

Step	Check	Yes	No
1	CHECK OPERATION OF STARTER MOTOR.	Go to step 2.	Go to step 3.
2	CHECK DIAGNOSTIC TROUBLE CODE (DTC). <Ref. to EN(TURBO)-41, OPERATION, Read Diagnostic Trouble Code.>	Record the DTC. Repair the trouble cause. <Ref. to EN(TURBO)-82, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Go to step 3.

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
3 CHECK INPUT SIGNAL FOR STARTER MOTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from starter motor. 3) Turn the ignition switch to START. 4) Measure the power supply voltage between starter motor connector terminal and engine ground. <i>Connector & terminal</i> <i>(B14) No. 1 (+) — Engine ground (-):</i>	Is the voltage more than 10 V?	Go to step 4.	Go to step 5.
4 CHECK GROUND CIRCUIT OF STARTER MOTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the terminal from starter motor. 3) Measure the resistance of ground cable between ground cable terminal and engine ground.	Is the resistance less than 5 Ω ?	Check the starter motor. <Ref. to SC-5, Starter.>	Repair the open circuit of ground cable.
5 CHECK HARNESS BETWEEN ECM AND STARTER MOTOR CIRCUIT. 1) Turn the ignition switch to OFF. 2) Measure the resistance between starter motor and ECM. <i>Connector & terminal</i> <i>(B14) No. 1 — Engine ground:</i>	Is the resistance less than 1 Ω ?	Repair the ground short circuit.	Go to step 6.
6 CHECK HARNESS BETWEEN ECM AND STARTER MOTOR CIRCUIT. 1) Turn the ignition switch to START. 2) Measure the resistance of fuse. <i>Connector & terminal</i> <i>(B14) No. 1 — Engine ground:</i>	Is the resistance less than 1 Ω ?	Go to step 7.	Repair the ground short circuit.
7 CHECK HARNESS BETWEEN BATTERY AND IGNITION SWITCH CONNECTOR. 1) Ignition the switch to OFF. 2) Disconnect the connector from ignition switch. 3) Measure the power supply voltage between ignition switch connector and chassis ground. <i>Connector & terminal</i> <i>(B72) No. 1 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Go to step 8.	Repair the open circuit in harness between ignition switch and battery.
8 CHECK HARNESS BETWEEN BATTERY AND IGNITION SWITCH CONNECTOR. 1) Connect the connector to ignition switch. 2) Turn the ignition switch to START. 3) Measure the voltage between ignition switch and chassis ground. <i>Connector & terminal</i> <i>(B72) No. 3 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Repair the 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 the poor contact in ignition switch connector.	Replace the ignition switch.

DIAGNOSTICS FOR ENGINE STARTING FAILURE

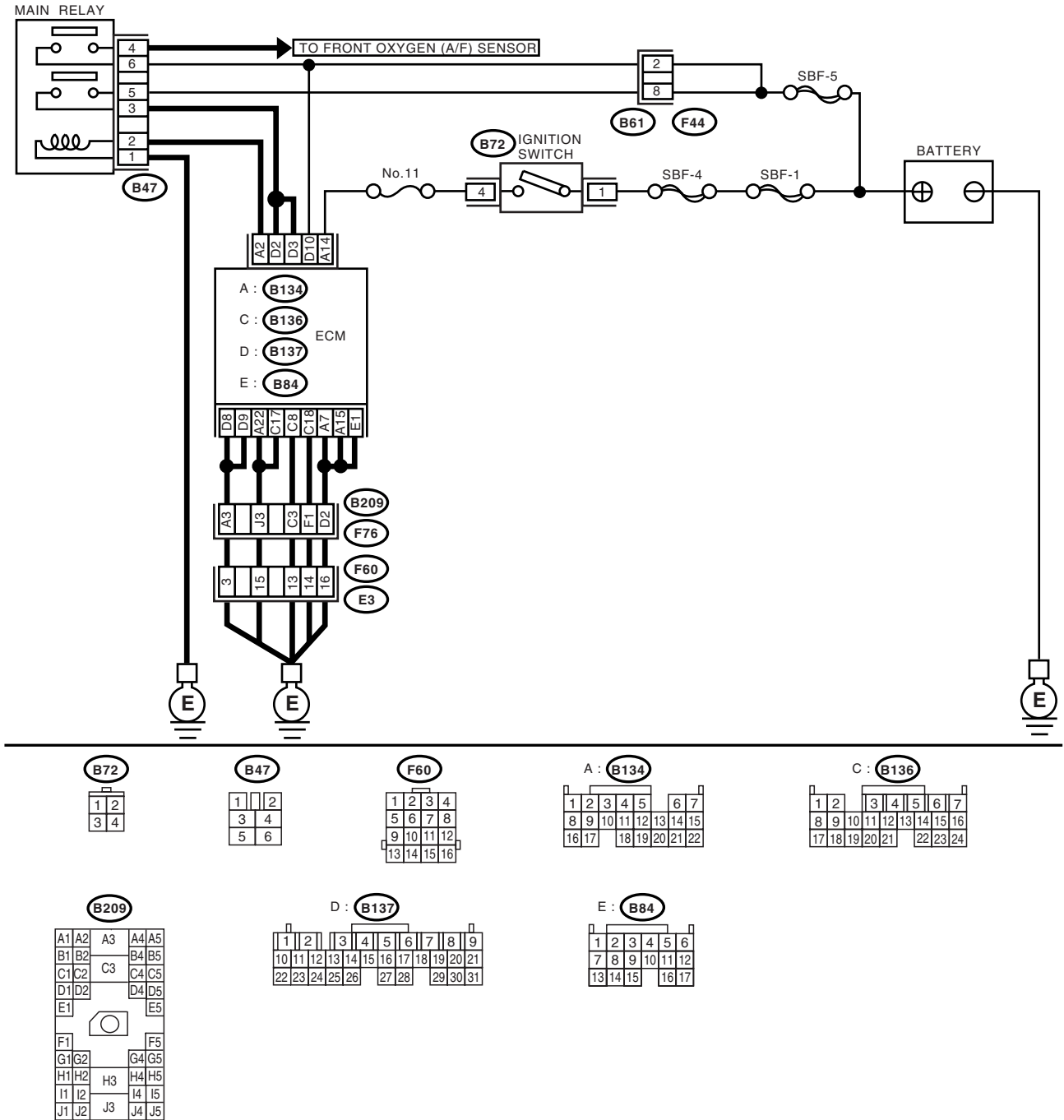
ENGINE (DIAGNOSTICS)

C: CONTROL MODULE POWER SUPPLY AND GROUND LINE

CAUTION:

After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN(TURBO)-45, Clear Memory Mode.> and INSPECTION MODE. <Ref. to EN(TURBO)-42, Inspection Mode.>

- WIRING DIAGRAM:
- LHD model

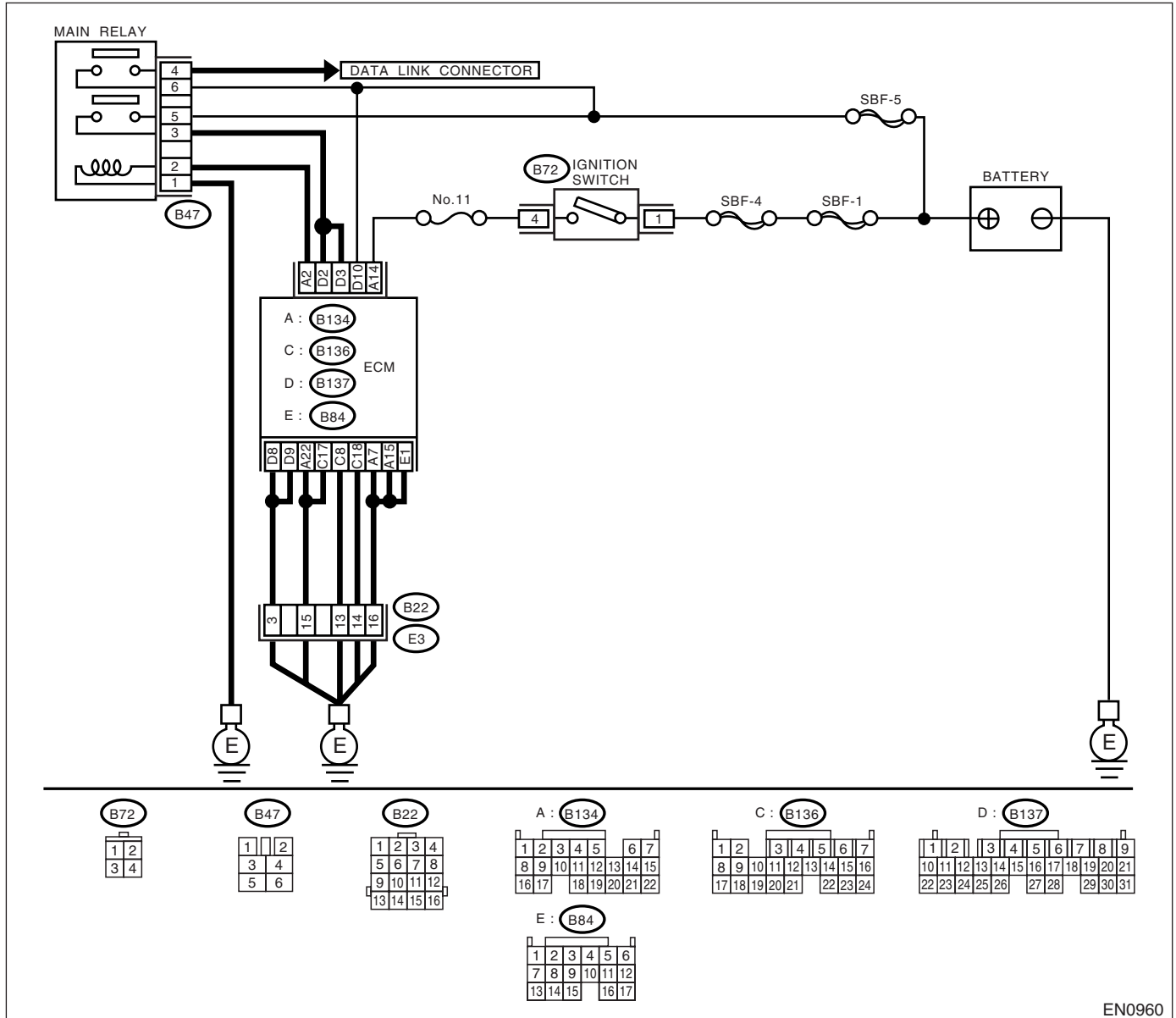


EN1429

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

• RHD model



EN0960

Step	Check	Yes	No
1 CHECK MAIN RELAY. 1) Turn the ignition switch to OFF. 2) Remove the main relay. 3) Connect the battery to main relay terminals No. 1 and No. 2. 4) Measure the resistance between main relay terminals. Terminals No. 3 — No. 5: No. 4 — No. 6:	Is the resistance less than 10 Ω?	Go to step 2.	Replace the main relay.

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
2 CHECK GROUND CIRCUIT OF ECM. 1)Disconnect the connector from ECM. 2)Measure the 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 the open circuit in harness between ECM connector and engine grounding terminal.
3 CHECK INPUT VOLTAGE OF ECM. Measure the 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 the open or ground short circuit of power supply circuit.
4 CHECK HARNESS BETWEEN ECM AND MAIN RELAY CONNECTOR. 1)Turn the ignition switch to OFF. 2)Measure the 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 the ground short circuit in harness between ECM connector and main relay connector, then replace ECM.
5 CHECK OUTPUT VOLTAGE FROM ECM. 1)Connect the connector to ECM. 2)Turn the ignition switch to ON. 3)Measure the voltage between ECM connector and chassis ground. Connector & terminal <i>(B134) No. 2 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Go to step 6.	Replace the ECM. <Ref. to FU(TURBO)-49, Engine Control Module.>
6 CHECK INPUT VOLTAGE OF MAIN RELAY. Check the 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 the open circuit in harness between ECM connector and main relay connector.
7 CHECK GROUND CIRCUIT OF MAIN RELAY. 1)Turn the ignition switch to OFF. 2)Measure the resistance between main relay connector and chassis ground. Connector & terminal <i>(B47) No. 1 — Chassis ground:</i>	Is the resistance less than 5 Ω ?	Go to step 8.	Repair the open circuit between main relay and chassis ground.
8 CHECK INPUT VOLTAGE OF MAIN RELAY. Measure the 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 the open or ground short circuit in harness of power supply circuit.

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>9 CHECK INPUT VOLTAGE OF ECM. 1)Connect the main relay connector. 2)Turn the ignition switch to ON. 3)Measure the voltage between ECM connector and chassis ground. Connector & terminal (B137) No. 2 (+) — Chassis ground (-): (B137) No. 3 (+) — Chassis ground (-):</p>	<p>Is the voltage more than 10 V?</p>	<p>Check the ignition control system. <Ref. to EN(TURBO)-66, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.></p>	<p>Repair the open or ground short circuit in harness between ECM connector and main relay connector.</p>

DIAGNOSTICS FOR ENGINE STARTING FAILURE

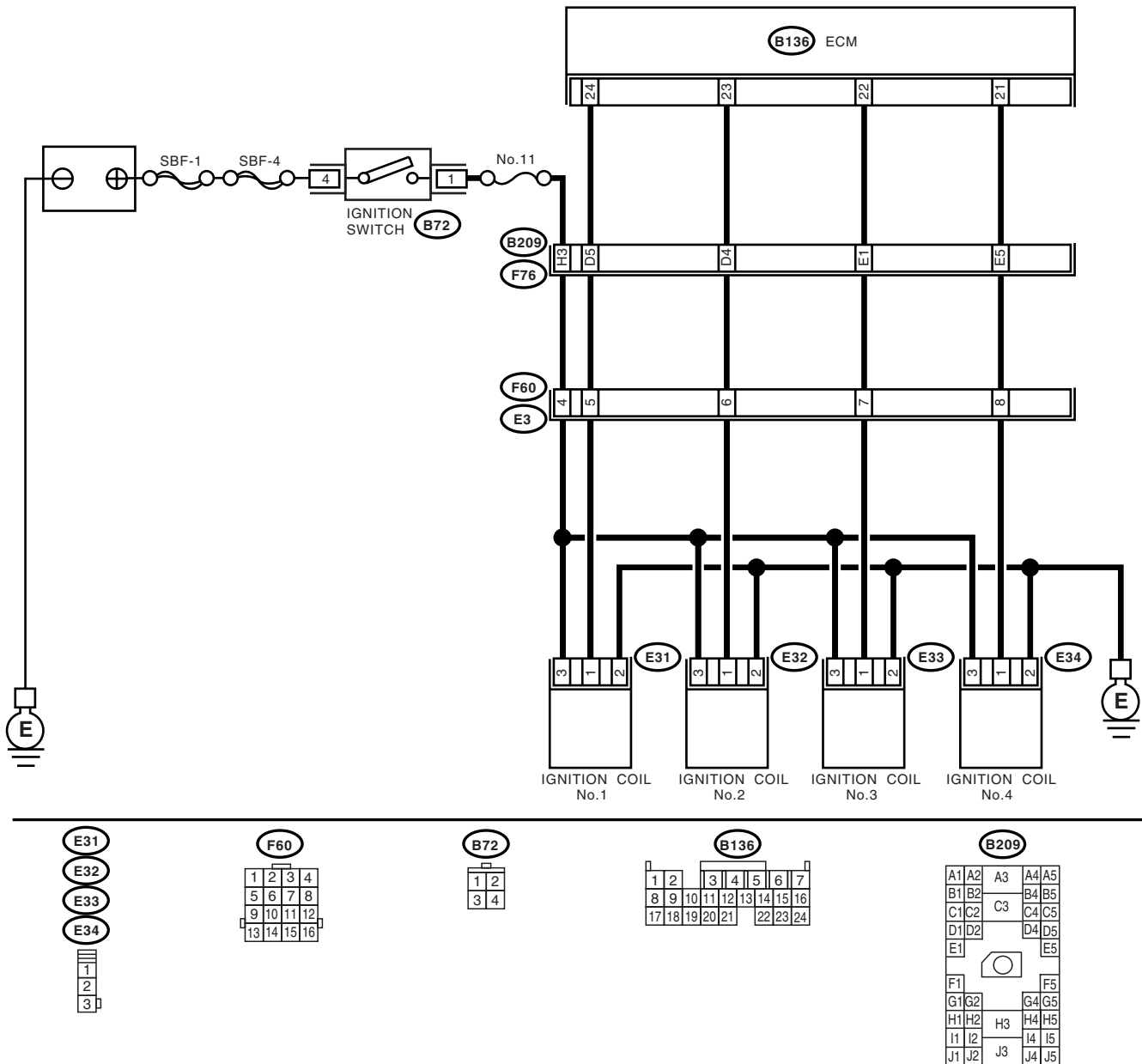
ENGINE (DIAGNOSTICS)

D: IGNITION CONTROL SYSTEM

CAUTION:

After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN(TURBO)-45, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(TURBO)-42, Inspection Mode.> .

- WIRING DIAGRAM:
- LHD model

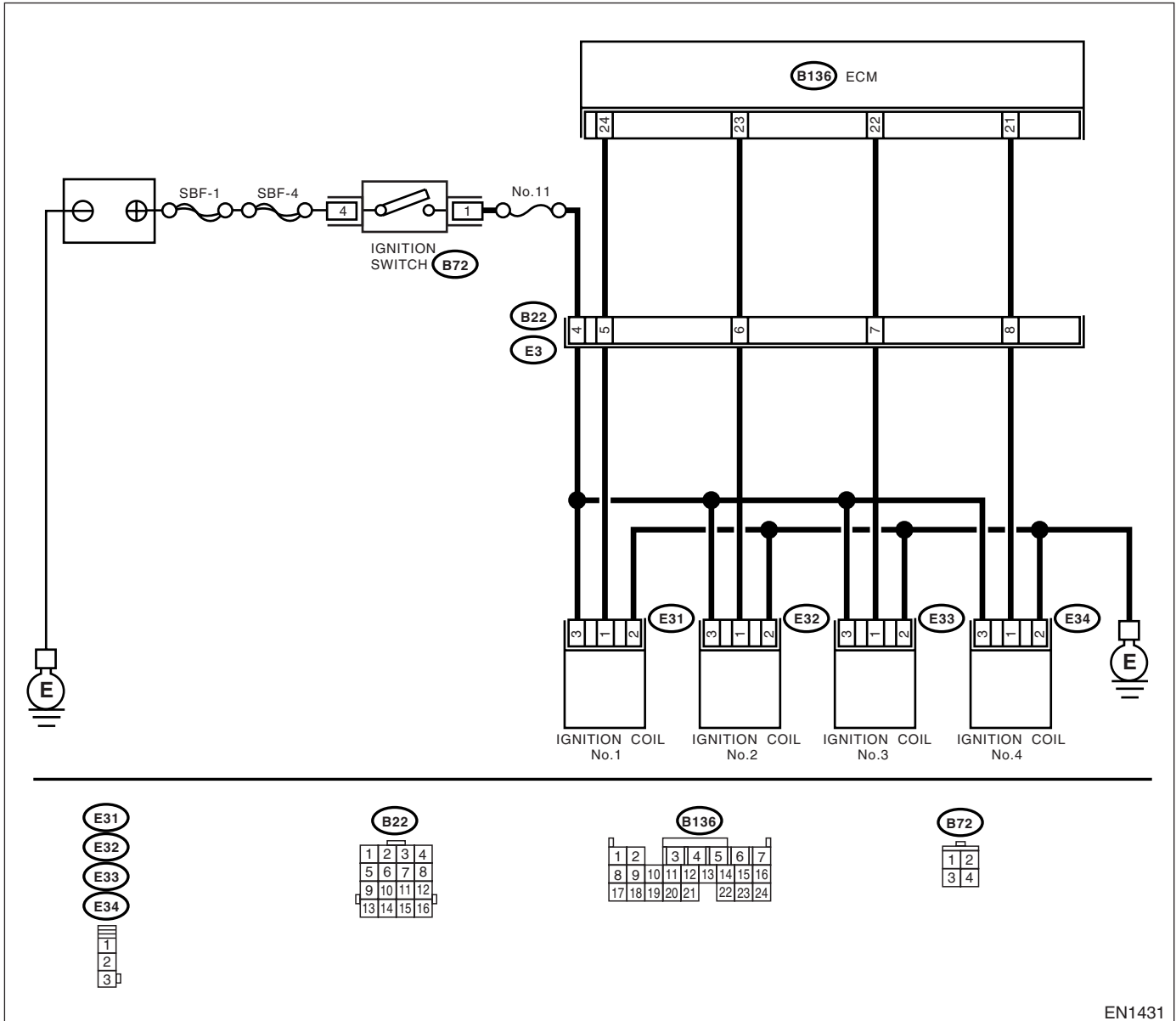


EN1430

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

• RHD model



EN1431

Step	Check	Yes	No
1 CHECK SPARK PLUG CONDITION. 1) Remove the spark plug. <Ref. to IG(TURBO)-5, INSTALLATION, Spark Plug.> 2) Check the spark plug condition. <Ref. to IG(TURBO)-6, INSPECTION, Spark Plug.>	Is the spark plug's status OK?	Go to step 2.	Replace the spark plug.
2 CHECK IGNITION SYSTEM FOR SPARKS. 1) Connect the spark plug to ignition coil. 2) Release the fuel pressure. <Ref. to FU(TURBO)-53, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.> 3) Contact the spark plug's thread portion on engine. 4) While opening the throttle valve fully, crank engine to check that spark occurs at each cylinder.	Does spark occur at each cylinder?	Check the fuel pump system. <Ref. to EN(TURBO)-70, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>	Go to step 3.

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>3 CHECK POWER SUPPLY CIRCUIT FOR IGNITION COIL & IGNITOR ASSEMBLY. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ignition coil & ignitor assembly. 3) Turn the ignition switch to ON. 4) Measure the power supply voltage between ignition coil & ignitor assembly connector and engine ground.</p> <p>Connector & terminal (E31) No. 3 (+) — Engine ground (-): (E32) No. 3 (+) — Engine ground (-): (E33) No. 3 (+) — Engine ground (-): (E34) No. 3 (+) — Engine ground (-):</p>	Is the voltage more than 10 V?	Go to step 4.	Repair the harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between ignition coil & ignitor assembly, and ignition switch connector • Poor contact in coupling connectors
<p>4 CHECK HARNESS OF IGNITION COIL & IGNITOR ASSEMBLY GROUND CIRCUIT. 1) Turn the ignition switch to OFF. 2) Measure the resistance between ignition coil & ignitor assembly connector and engine ground.</p> <p>Connector & terminal (E31) No. 2 — Engine ground: (E32) No. 2 — Engine ground: (E33) No. 2 — Engine ground: (E34) No. 2 — Engine ground:</p>	Is the resistance between less than 5 Ω?	Go to step 5.	Repair the harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between ignition coil & ignitor assembly connector and engine grounding terminal
<p>5 CHECK HARNESS BETWEEN ECM AND IGNITION COIL & IGNITOR ASSEMBLY CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from ignition coil & ignitor assembly. 4) Measure the resistance of harness between ECM and ignition coil & ignitor assembly connector.</p> <p>Connector & terminal (B136) No. 21 — (E34) No. 1: (B136) No. 22 — (E33) No. 1: (B136) No. 23 — (E32) No. 1: (B136) No. 24 — (E31) No. 1:</p>	Is the resistance less than 1 Ω?	Go to step 6.	Repair the harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between ECM and ignition coil & ignitor assembly connector • Poor contact in coupling connector
<p>6 CHECK HARNESS BETWEEN ECM AND IGNITION COIL & IGNITOR ASSEMBLY CONNECTOR. Measure the resistance of harness between ECM and engine ground.</p> <p>Connector & terminal: (B136) No. 21 — Engine ground: (B136) No. 22 — Engine ground: (B136) No. 23 — Engine ground: (B136) No. 24 — Engine ground:</p>	Is the resistance more than 1 MΩ?	Go to step 7.	Repair the ground short circuit in harness between ECM and ignition coil & ignitor assembly connector.
<p>7 CHECK POOR CONTACT. Check poor contact in ECM connector.</p>	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Replace the ignition coil and ignitor assembly.

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

DIAGNOSTICS FOR ENGINE STARTING FAILURE

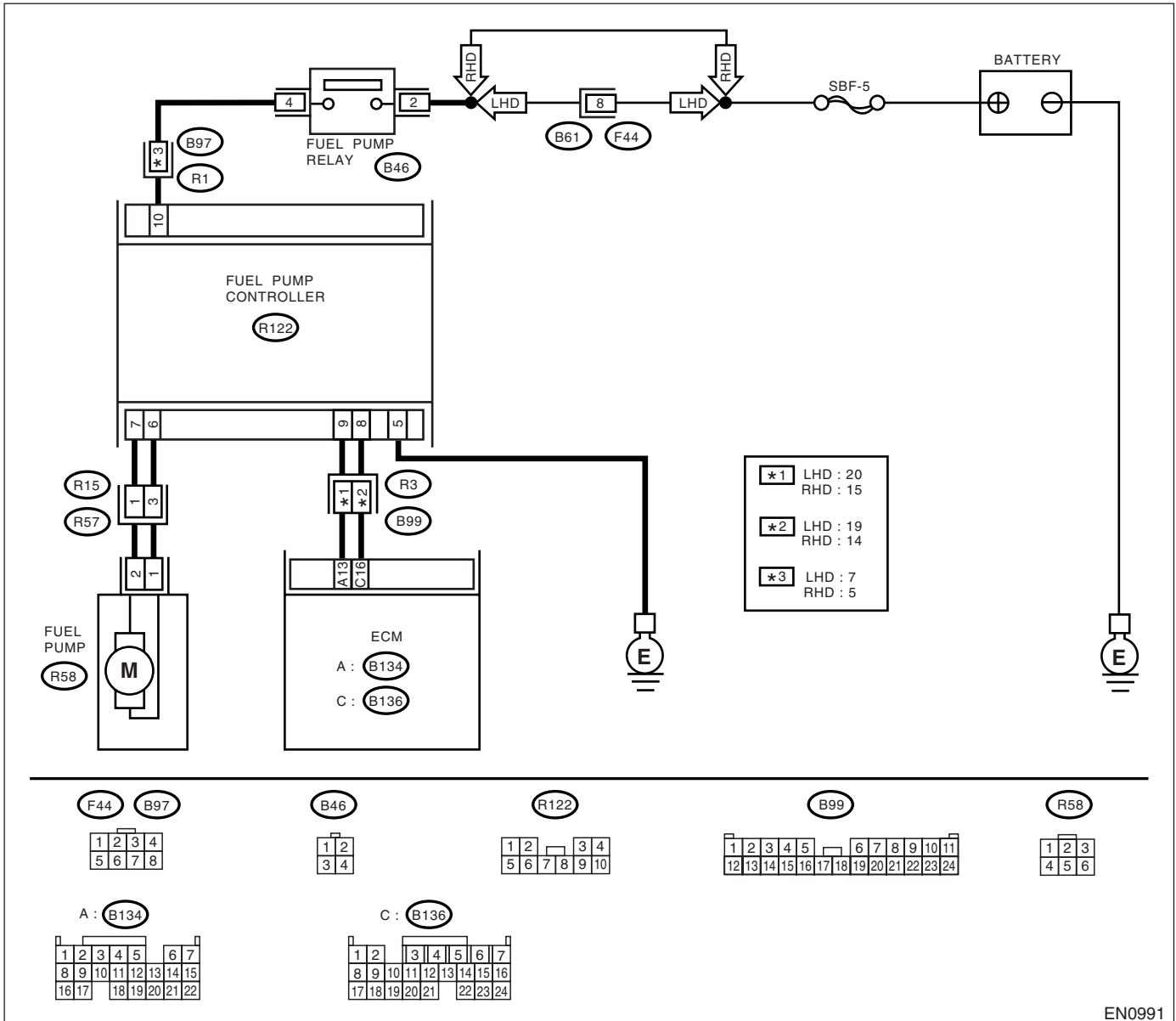
ENGINE (DIAGNOSTICS)

E: FUEL PUMP CIRCUIT

CAUTION:

After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN(TURBO)-45, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(TURBO)-42, Inspection Mode.> .

• WIRING DIAGRAM:



EN0991

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>1 CHECK OPERATING SOUND OF FUEL PUMP. Make sure that the fuel pump is in operation for 2 seconds when turning ignition switch to ON. NOTE: Fuel pump operation can also be executed using the Subaru Select Monitor (Function mode: FD01). For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(TURBO)-46, Compulsory Valve Operation Check Mode.></p>	<p>Does the fuel pump produce operating sound?</p>	<p>Check the fuel injector circuit. <Ref. to EN(TURBO)-72, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.></p>	<p>Record the DTC. Repair the trouble cause. <Ref. to EN(TURBO)-82, Diagnostic Procedure with Diagnostic Trouble Code (DTC).></p>

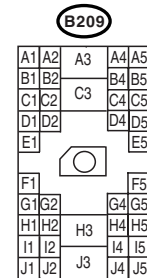
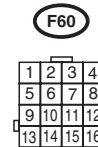
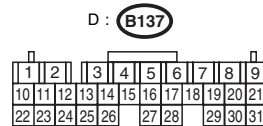
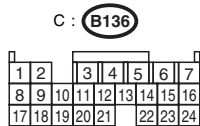
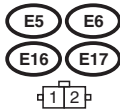
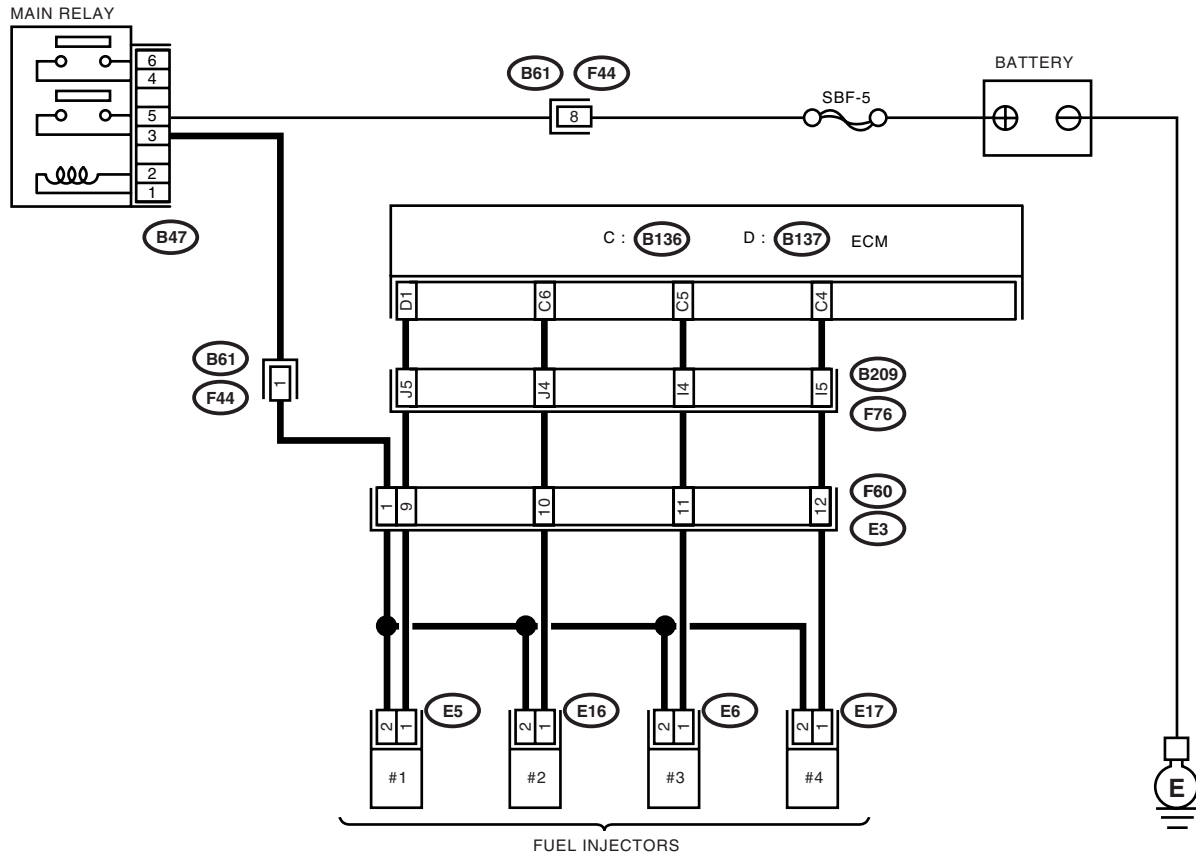
DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

F: FUEL INJECTOR CIRCUIT

CAUTION:

- Check or repair only faulty parts.
- After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN(TURBO)-45, Clear Memory Mode.> and INSPECTION MODE. <Ref. to EN(TURBO)-42, Inspection Mode.>
- WIRING DIAGRAM:
- LHD model

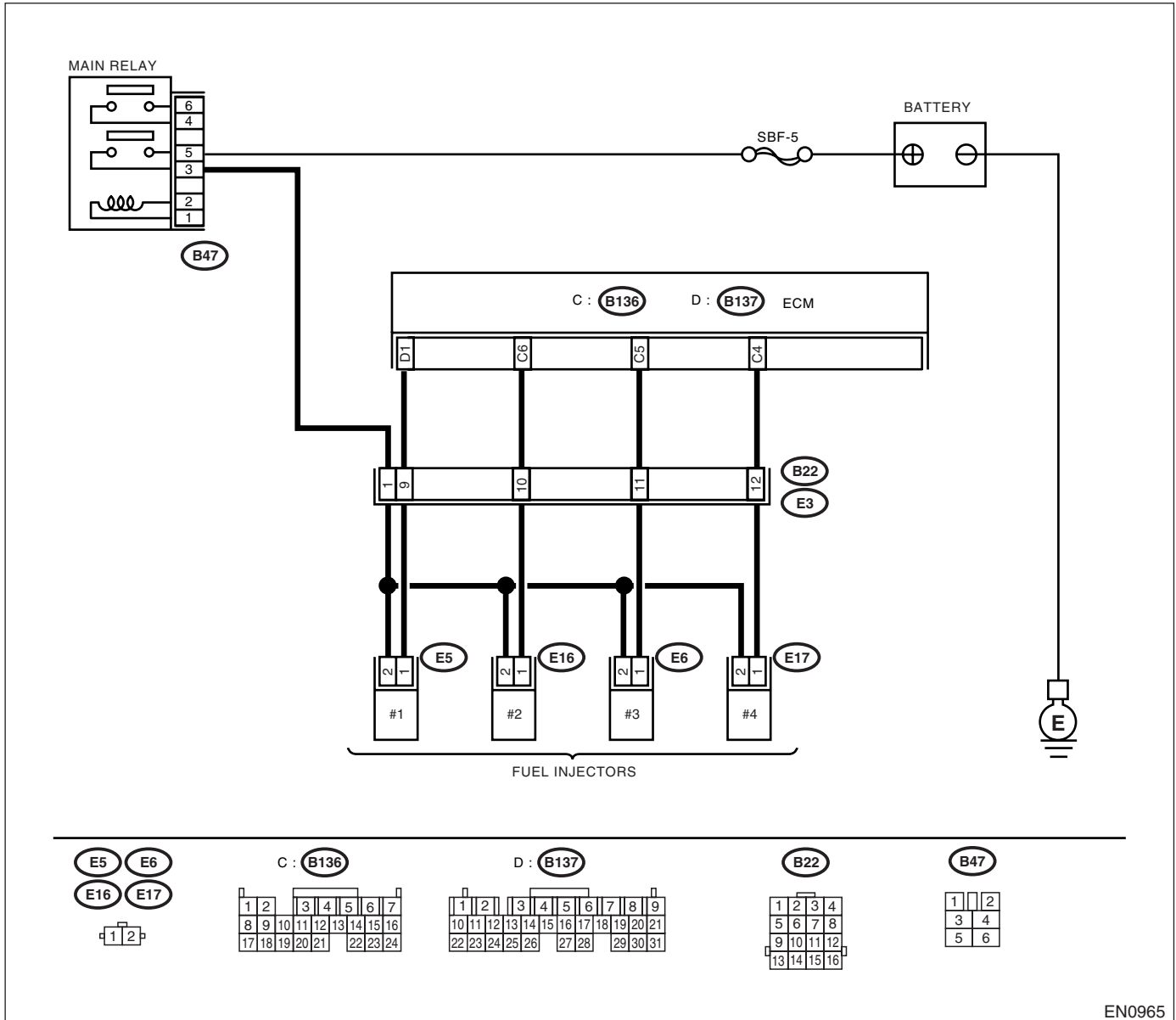


EN1432

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

• RHD model



Step	Check	Yes	No	
1	<p>CHECK OPERATION OF EACH FUEL INJECTOR.</p> <p>While cranking the engine, check that each fuel injector emits “operating” sound. Use a sound scope or attach a screwdriver to injector for this check.</p>	<p>Does the fuel injector emit “operating” sound?</p>	<p>Check the fuel pressure. <Ref. to ME(TURBO)-27, INSPECTION, Fuel Pressure.></p>	<p>Go to step 2.</p>

DIAGNOSTICS FOR ENGINE STARTING FAILURE

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>2 CHECK POWER SUPPLY TO EACH FUEL INJECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from #1 cylinder fuel injector. 3) Turn the ignition switch to ON. 4) Measure the power supply voltage between the fuel injector terminal and engine ground.</p> <p>Connector & terminal #1 (E5) No. 2 (+) — Engine ground (-): #2 (E16) No. 2 (+) — Engine ground (-): #3 (E6) No. 2 (+) — Engine ground (-): #4 (E17) No. 2 (+) — Engine ground (-):</p>	Is the voltage more than 10 V?	Go to step 3.	Repair the harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between main relay and fuel injector connector • Poor contact in main relay connector • Poor contact in coupling connector • Poor contact in fuel injector connector
<p>3 CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR. 1) Disconnect the connector from ECM. 2) Measure the resistance of harness between ECM and fuel injector connector.</p> <p>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:</p>	Is the resistance less than 1 Ω?	Go to step 4.	Repair the harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between ECM and fuel injector connector • Poor contact in coupling connector
<p>4 CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR. Measure the resistance of harness between ECM and fuel injector connector.</p> <p>Connector & terminal (B137) No. 1 — Chassis ground: (B136) No. 6 — Chassis ground: (B136) No. 5 — Chassis ground: (B136) No. 4 — Chassis ground:</p>	Is the resistance less than 1 Ω?	Repair the ground short circuit in harness between ECM and fuel injector connector.	Go to step 5.
<p>5 CHECK EACH FUEL INJECTOR. 1) Turn the ignition switch to OFF. 2) Measure the resistance between each fuel injector terminals.</p> <p>Terminals No. 1 — No. 2:</p>	Is the resistance between 5 and 20 Ω?	Go to step 6.	Replace the faulty fuel injector.
<p>6 CHECK POOR CONTACT. Check poor contact in ECM connector.</p>	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Inspection using "General Diagnostic Table". <Ref. to EN(TURBO)-350, 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(TURBO)-82, 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(TURBO)-86, 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(TURBO)-88, 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(TURBO)-92, 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(TURBO)-94, 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(TURBO)-96, 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(TURBO)-100, 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(TURBO)-102, 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(TURBO)-105, DTC P0107 — PRESSURE SENSOR CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0108	Pressure sensor circuit high input	<Ref. to EN(TURBO)-109, 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(TURBO)-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(TURBO)-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(TURBO)-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(TURBO)-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(TURBO)-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(TURBO)-127, 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(TURBO)-129, 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(TURBO)-133, 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(TURBO)-136, 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(TURBO)-138, 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(TURBO)-140, 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(TURBO)-142, DTC P0133 — FRONT OXYGEN (A/F) SENSOR CIRCUIT SLOW RESPONSE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0136	Rear oxygen sensor circuit malfunction [MT vehicles]	<Ref. to EN(TURBO)-144, DTC P0136 — REAR OXYGEN SENSOR CIRCUIT MALFUNCTION [MT VEHICLES] —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0137	Rear oxygen sensor circuit low input [AT vehicles]	<Ref. to EN(TURBO)-148, DTC P0137 — REAR OXYGEN SENSOR CIRCUIT LOW INPUT [AT VEHICLES] —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0138	Rear oxygen sensor circuit high input [AT vehicles]	<Ref. to EN(TURBO)-152, DTC P0138 — REAR OXYGEN SENSOR CIRCUIT HIGH INPUT [AT VEHICLES] —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0139	Rear oxygen sensor circuit slow response	<Ref. to EN(TURBO)-156, 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(TURBO)-158, 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(TURBO)-159, DTC P0172 — FUEL TRIM MALFUNCTION (A/F TOO RICH) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0244	Wastegate control solenoid valve malfunction (high input) [MT vehicles]	<Ref. to EN(TURBO)-162, DTC P0244 — WASTEGATE CONTROL SOLENOID VALVE MALFUNCTION (HIGH INPUT) [MT VEHICLES] —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0244	Wastegate control solenoid valve malfunction (fail-safe) [AT vehicles]	<Ref. to EN(TURBO)-164, DTC P0244 — WASTEGATE CONTROL SOLENOID VALVE MALFUNCTION (FAIL-SAFE) [AT VEHICLES] —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0245	Wastegate control solenoid valve circuit low input	<Ref. to EN(TURBO)-166, 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(TURBO)-170, DTC P0246 — WASTEGATE CONTROL SOLENOID VALVE CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0301	Cylinder 1 misfire detected	<Ref. to EN(TURBO)-172, DTC P0301 — CYLINDER 1 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0302	Cylinder 2 misfire detected	<Ref. to EN(TURBO)-172, DTC P0302 — CYLINDER 2 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0303	Cylinder 3 misfire detected	<Ref. to EN(TURBO)-172, DTC P0303 — CYLINDER 3 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0304	Cylinder 4 misfire detected	<Ref. to EN(TURBO)-173, DTC P0304 — CYLINDER 4 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

DTC No.	Item	Index
P0327	Knock sensor circuit low input	<Ref. to EN(TURBO)-182, DTC P0327 — KNOCK SENSOR CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0328	Knock sensor circuit high input	<Ref. to EN(TURBO)-184, DTC P0328 — KNOCK SENSOR CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0335	Crankshaft position sensor circuit malfunction	<Ref. to EN(TURBO)-186, 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(TURBO)-188, 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(TURBO)-190, 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(TURBO)-192, 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(TURBO)-196, 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 [MT vehicles]	<Ref. to EN(TURBO)-198, DTC P0444 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW INPUT [MT VEHICLES] —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0445	Evaporative emission control system purge control valve circuit high input [MT vehicles]	<Ref. to EN(TURBO)-202, DTC P0445 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH INPUT [MT VEHICLES] —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0458	Evaporative emission control system purge control valve circuit low input [AT vehicles]	<Ref. to EN(TURBO)-204, DTC P0458 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW INPUT [AT VEHICLES] —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0459	Evaporative emission control system purge control valve circuit high input [AT vehicles]	<Ref. to EN(TURBO)-208, DTC P0459 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH INPUT [AT VEHICLES] —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0461	Fuel level sensor circuit range/performance problem	<Ref. to EN(TURBO)-210, 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(TURBO)-212, 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(TURBO)-216, DTC P0463 — FUEL LEVEL SENSOR CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0464	Fuel level sensor intermittent input	<Ref. to EN(TURBO)-220, 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(TURBO)-223, DTC P0480 — COOLING FAN RELAY 1 CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0483	Cooling fan function problem	<Ref. to EN(TURBO)-227, DTC P0483 — COOLING FAN FUNCTION PROBLEM —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0500	Vehicle speed sensor malfunction	<Ref. to EN(TURBO)-230, DTC P0500 — VEHICLE SPEED SENSOR MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0506	Idle control system RPM lower than expected	<Ref. to EN(TURBO)-232, 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(TURBO)-234, DTC P0507 — IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

DTC No.	Item	Index
P0508	Idle control system circuit low input	<Ref. to EN(TURBO)-236, 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(TURBO)-238, DTC P0509 — IDLE CONTROL SYSTEM CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0512	Starter switch circuit high input	<Ref. to EN(TURBO)-240, DTC P0512 — STARTER SWITCH CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0513	Incorrect immobilizer key	<Ref. to IM-22, DTC P0153 INCORRECT IMMOBILIZER KEY (USE OF UNREGISTERED KEY), Diagnostics Chart with Diagnostic Trouble Code (DTC).>
P0545	Exhaust gas temperature sensor circuit low input	<Ref. to EN(TURBO)-242, DTC P0545 — EXHAUST GAS TEMPERATURE SENSOR CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0546	Exhaust gas temperature sensor circuit high input	<Ref. to EN(TURBO)-244, 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(TURBO)-247, DTC P0604 — INTERNAL CONTROL MODULE MEMORY CHECK SUM ERROR —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0703	Brake switch input malfunction	<Ref. to EN(TURBO)-250, DTC P0703 — BRAKE SWITCH INPUT MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0705	Transmission range sensor circuit malfunction	<Ref. to AT-119, CHECK INHIBITOR SWITCH., Diagnostic Procedure for No-diagnostic Trouble Code (DTC).>
P0710	Transmission fluid temperature sensor circuit malfunction	<Ref. to AT-46, DTC 27 ATF TEMPERATURE SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0715	Torque converter turbine speed sensor circuit malfunction	<Ref. to AT-62, DTC 36 TORQUE CONVERTER TURBINE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0720	Output speed sensor (vehicle speed sensor 2) circuit malfunction	<Ref. to AT-57, DTC 33 FRONT VEHICLE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0725	Engine speed input circuit malfunction	<Ref. to AT-42, DTC 11 ENGINE SPEED SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0731	Gear 1 incorrect ratio	<Ref. to EN(TURBO)-252, DTC P0731 — GEAR 1 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0732	Gear 2 incorrect ratio	<Ref. to EN(TURBO)-252, DTC P0732 — GEAR 2 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0733	Gear 3 incorrect ratio	<Ref. to EN(TURBO)-252, DTC P0733 — GEAR 3 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0734	Gear 4 incorrect ratio	<Ref. to EN(TURBO)-253, DTC P0734 — GEAR 4 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0741	Torque converter clutch system malfunction	<Ref. to EN(TURBO)-254, 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-94, DTC 77 LOCK-UP DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0748	Pressure control solenoid (Line pressure duty solenoid) electrical	<Ref. to AT-86, DTC 75 LINE PRESSURE DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0753	Shift solenoid A (Shift solenoid 1) electrical	<Ref. to AT-70, DTC 71 SHIFT SOLENOID 1, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0758	Shift solenoid B (Shift solenoid 2) electrical	<Ref. to AT-74, DTC 72 SHIFT SOLENOID 2, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0778	2-4 brake pressure control solenoid valve (2-4 brake duty solenoid) circuit malfunction	<Ref. to AT-90, DTC 76 2-4 BRAKE DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

DTC No.	Item	Index
P0785	2-4 brake timing control solenoid valve (2-4 brake timing solenoid) circuit malfunction	<Ref. to AT-82, DTC 74 2-4 BRAKE TIMING SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0851	Neutral position switch circuit high input [AT vehicles]	<Ref. to EN(TURBO)-256, DTC P0851 — NEUTRAL POSITION SWITCH CIRCUIT HIGH INPUT [AT VEHICLES] —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0852	Neutral position switch circuit low input [AT vehicles]	<Ref. to EN(TURBO)-260, DTC P0852 — NEUTRAL POSITION SWITCH CIRCUIT LOW INPUT [AT VEHICLES] —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0864	Automatic transmission diagnosis input signal circuit malfunction	<Ref. to EN(TURBO)-262, DTC P0864 — AUTOMATIC TRANSMISSION DIAGNOSIS INPUT SIGNAL CIRCUIT MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1086	Tumble generator valve #2 (LH) position sensor circuit low input	<Ref. to EN(TURBO)-264, 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(TURBO)-268, 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(TURBO)-271, 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(TURBO)-275, DTC P1089 — TUMBLE GENERATOR VALVE #1 (RH) POSITION SENSOR CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1090	Tumble generator valve system #1 (RH) malfunction (stuck open)	<Ref. to EN(TURBO)-278, DTC P1090 — TUMBLE GENERATOR VALVE SYSTEM #1 (RH) MALFUNCTION (STUCK OPEN) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1091	Tumble generator valve system #1 (RH) malfunction (stuck close)	<Ref. to EN(TURBO)-278, DTC P1091 — TUMBLE GENERATOR VALVE SYSTEM #1 (RH) MALFUNCTION (STUCK CLOSE) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1092	Tumble generator valve system #2 (LH) malfunction (stuck open)	<Ref. to EN(TURBO)-279, DTC P1092 — TUMBLE GENERATOR VALVE SYSTEM #2 (LH) MALFUNCTION (STUCK OPEN) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1093	Tumble generator valve system #2 (LH) malfunction (stuck close)	<Ref. to EN(TURBO)-279, DTC P1093 — TUMBLE GENERATOR VALVE SYSTEM #2 (LH) MALFUNCTION (STUCK CLOSE) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1094	Tumble generator valve circuit #1 (open circuit)	<Ref. to EN(TURBO)-280, 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(TURBO)-282, DTC P1095 — TUMBLE GENERATOR VALVE CIRCUIT #1 (OVERCURRENT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1096	Tumble generator valve circuit #2 (open circuit)	<Ref. to EN(TURBO)-284, 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(TURBO)-286, DTC P1097 — TUMBLE GENERATOR VALVE CIRCUIT #2 (OVERCURRENT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1110	Atmospheric pressure sensor circuit low input	<Ref. to EN(TURBO)-288, DTC P1110 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1111	Atmospheric pressure sensor circuit high input	<Ref. to EN(TURBO)-288, DTC P1111 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1112	Atmospheric pressure sensor circuit range/performance problem	<Ref. to EN(TURBO)-289, DTC P1112 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

DTC No.	Item	Index
P1130	Front oxygen (A/F) sensor circuit malfunction (open circuit) [MT vehicles]	<Ref. to EN(TURBO)-290, DTC P1130 — FRONT OXYGEN (A/F) SENSOR CIRCUIT MALFUNCTION (OPEN CIRCUIT) [MT VEHICLES] —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1131	Front oxygen (A/F) sensor circuit malfunction (short circuit) [MT vehicles]	<Ref. to EN(TURBO)-292, DTC P1131 — FRONT OXYGEN (A/F) SENSOR CIRCUIT MALFUNCTION (SHORT CIRCUIT) [MT VEHICLES] —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1134	Front oxygen (A/F) sensor micro-computer problem	<Ref. to EN(TURBO)-294, 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 range/performance problem	<Ref. to EN(TURBO)-296, 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(TURBO)-298, 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(TURBO)-300, 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(TURBO)-302, DTC P1146 — PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1152	Front oxygen (A/F) sensor circuit range/performance problem (low input) [AT vehicles]	<Ref. to EN(TURBO)-306, DTC P1152 — FRONT OXYGEN (A/F) SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (LOW INPUT) [AT VEHICLES] —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1153	Front oxygen (A/F) sensor circuit range/performance problem (high input) [AT vehicles]	<Ref. to EN(TURBO)-308, DTC P1153 — FRONT OXYGEN (A/F) SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (HIGH INPUT) [AT VEHICLES] —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1230	Fuel pump controller malfunction	<Ref. to EN(TURBO)-310, DTC P1230 — FUEL PUMP CONTROLLER MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1244	Wastegate control solenoid valve range/performance problem (low input) [MT vehicles]	<Ref. to EN(TURBO)-314, DTC P1244 — WASTEGATE CONTROL SOLENOID VALVE RANGE/PERFORMANCE PROBLEM (LOW INPUT) [MT VEHICLES] —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1245	Wastegate control solenoid valve malfunction (fail-safe) [MT vehicles]	<Ref. to EN(TURBO)-316, DTC P1245 — WASTEGATE CONTROL SOLENOID VALVE MALFUNCTION (FAIL-SAFE) [MT VEHICLES] —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1301	Fire due to increased exhaust temperature	<Ref. to EN(TURBO)-318, DTC P1301 — FIRE DUE TO INCREASED EXHAUST TEMPERATURE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1312	Exhaust gas temperature circuit malfunction	<Ref. to EN(TURBO)-320, 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(TURBO)-323, 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(TURBO)-326, DTC P1507 — IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1518	Starter switch circuit low input	<Ref. to EN(TURBO)-328, DTC P1518 — STARTER SWITCH CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1544	High exhaust temperature detected	<Ref. to EN(TURBO)-330, DTC P1544 — HIGH EXHAUST TEMPERATURE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1560	Back-up voltage circuit malfunction	<Ref. to EN(TURBO)-332, DTC P1560 — BACK-UP VOLTAGE CIRCUIT MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

DTC No.	Item	Index
P1570	Antenna	<Ref. to IM-24, DTC P1570 ANTENNA, Diagnostics Chart with Diagnostic Trouble Code (DTC).>
P1571	Reference code incompatibility	<Ref. to IM-17, DTC P1571 Reference Code Incompatibility, Diagnostics Chart with Diagnostic Trouble Code (DTC).>
P1572	IMM circuit failure except antenna circuit	<Ref. to IM-18, DTC P1572 IMM CIRCUIT FAILURE (EXCEPT ANTENNA CIRCUIT), Diagnostics Chart with Diagnostic Trouble Code (DTC).>
P1574	Key communication failure	<Ref. to IM-21, DTC P1574 KEY COMMUNICATION FAILURE, Diagnostics Chart with Diagnostic Trouble Code (DTC).>
P1576	EGI control module EEPROM	<Ref. to IM-22, DTC P1576 EGI CONTROL MODULE EEPROM, Diagnostics Chart with Diagnostic Trouble Code (DTC).>
P1577	IMM control module EEPROM	<Ref. to IM-22, DTC P1577 IMM CONTROL MODULE EEPROM, Diagnostics Chart with Diagnostic Trouble Code (DTC).>
P1595	Automatic transmission diagnosis input signal circuit low input	<Ref. to EN(TURBO)-336, 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(TURBO)-338, 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(TURBO)-340, 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(TURBO)-342, DTC P1699 — ENGINE TORQUE CONTROL CUT SIGNAL CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1700	Throttle position sensor circuit malfunction for automatic transmission	<Ref. to AT-50, DTC 31 THROTTLE POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1701	Cruise control set signal circuit malfunction for automatic transmission	<Ref. to EN(TURBO)-344, 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-78, DTC 73 LOW CLUTCH TIMING SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1711	Engine torque control signal 1 circuit malfunction	<Ref. to EN(TURBO)-346, 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(TURBO)-348, DTC P1712 — ENGINE TORQUE CONTROL SIGNAL 2 CIRCUIT MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

18. Diagnostic Procedure with Diagnostic Trouble Code (DTC)

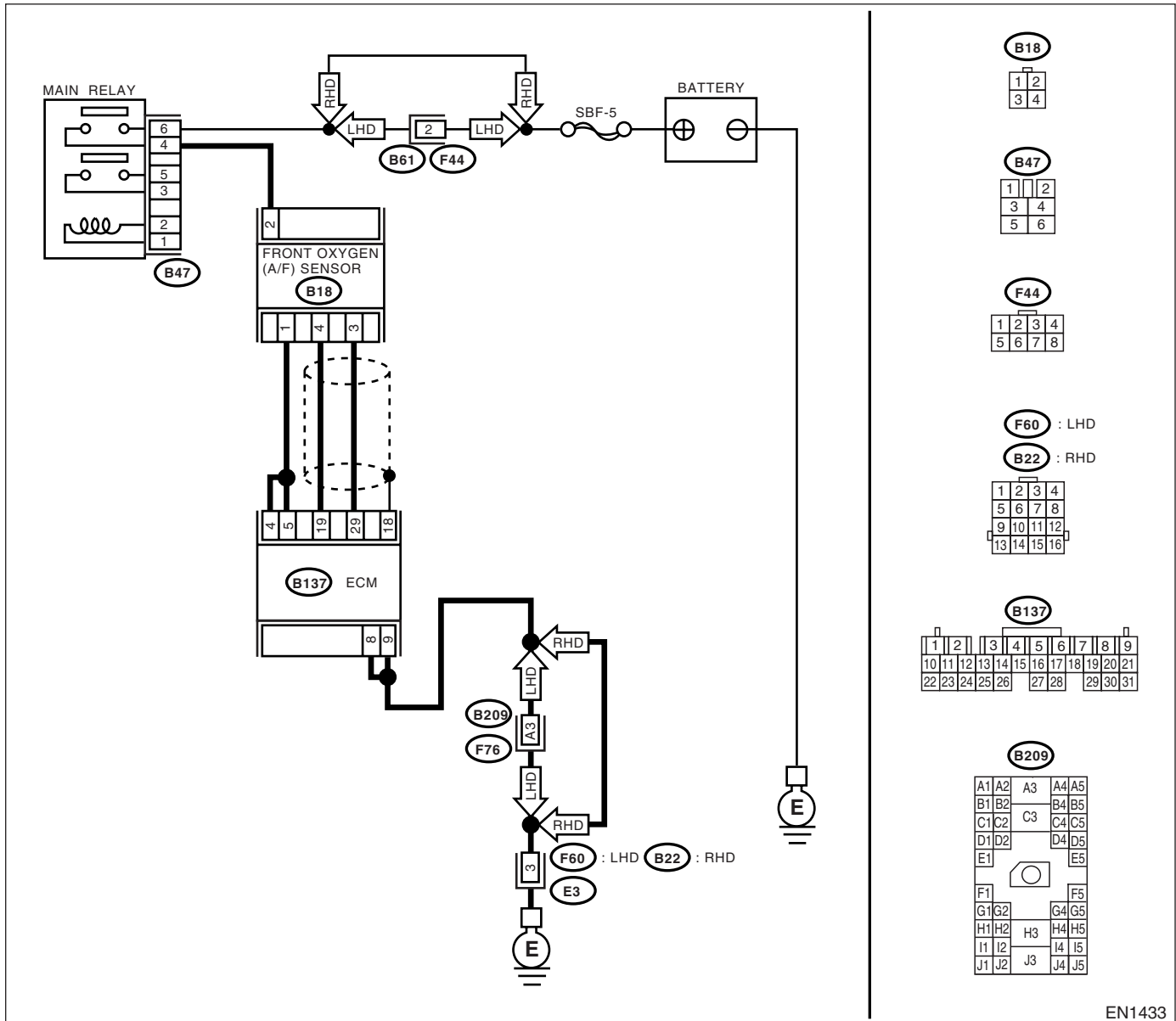
A: DTC P0031 — FRONT OXYGEN (A/F) SENSOR HEATER CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
 - Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

• **WIRING DIAGRAM:**



EN1433

Step	Check	Yes	No	
1	CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (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.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>2 CHECK POWER SUPPLY TO FRONT OXYGEN (A/F) SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from front oxygen (A/F) sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between front oxygen (A/F) sensor connector and engine ground. Connector & terminal (B18) No. 2 (+) — Engine ground (-):</p>	Is the voltage more than 10 V?	Go to step 3.	Repair the power supply line. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between main relay and front oxygen (A/F) sensor connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in main relay connector
<p>3 CHECK GROUND CIRCUIT OF ECM. Measure the resistance of harness between ECM connector and chassis ground. Connector & terminal (B137) No. 8 — Chassis ground: (B137) No. 9 — Chassis ground:</p>	Is the resistance less than 5 Ω?	Go to step 4.	Repair the harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between ECM and engine ground cable • Poor contact in ECM connector • Poor contact in coupling connector
<p>4 CHECK CURRENT DATA. 1) Start the engine. 2) Read the 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(TURBO)-34, Subaru Select Monitor.> • OBD-II scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.</p>	Is the value more than 0.2 A?	Repair the poor contact in connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector 	Go to step 5.
<p>5 CHECK OUTPUT SIGNAL FROM ECM. 1) Start and idle the engine. 2) Measure the voltage between ECM connector and chassis ground. Connector & terminal (B137) No. 4 (+) — Chassis ground (-):</p>	Is the voltage less than 1.0 V?	Go to step 7.	Go to step 6.
<p>6 CHECK OUTPUT SIGNAL FROM ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B137) No. 4 (+) — Chassis ground (-):</p>	Does the voltage change less than 1.0 V by shaking harness and connector of ECM while monitoring the value with voltage meter?	Repair the poor contact in ECM connector.	Go to step 7.
<p>7 CHECK OUTPUT SIGNAL FROM ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B137) No. 5 (+) — Chassis ground (-):</p>	Is the voltage less than 1.0 V?	Go to step 9.	Go to step 8.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
8 CHECK OUTPUT SIGNAL FROM ECM. Measure the voltage between ECM connector and chassis ground. <i>Connector & terminal</i> <i>(B137) No. 5 (+) — Chassis ground (-):</i>	Does the voltage change less than 1.0 V by shaking harness and connector of ECM while monitoring the value with voltage meter?	Repair the poor contact in ECM connector.	Go to step 9 .
9 CHECK FRONT OXYGEN (A/F) SENSOR. 1) Turn the ignition switch to OFF. 2) Measure the resistance between front oxygen (A/F) sensor connector terminals. <i>Terminals</i> <i>No. 2 — No. 1:</i>	Is the resistance less than 10 Ω ?	Repair the harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open or ground short circuit in harness between front oxygen (A/F) sensor and ECM connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector 	Replace the front oxygen (A/F) sensor. <Ref. to FU(TURBO)-44, Front Oxygen (A/F) Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

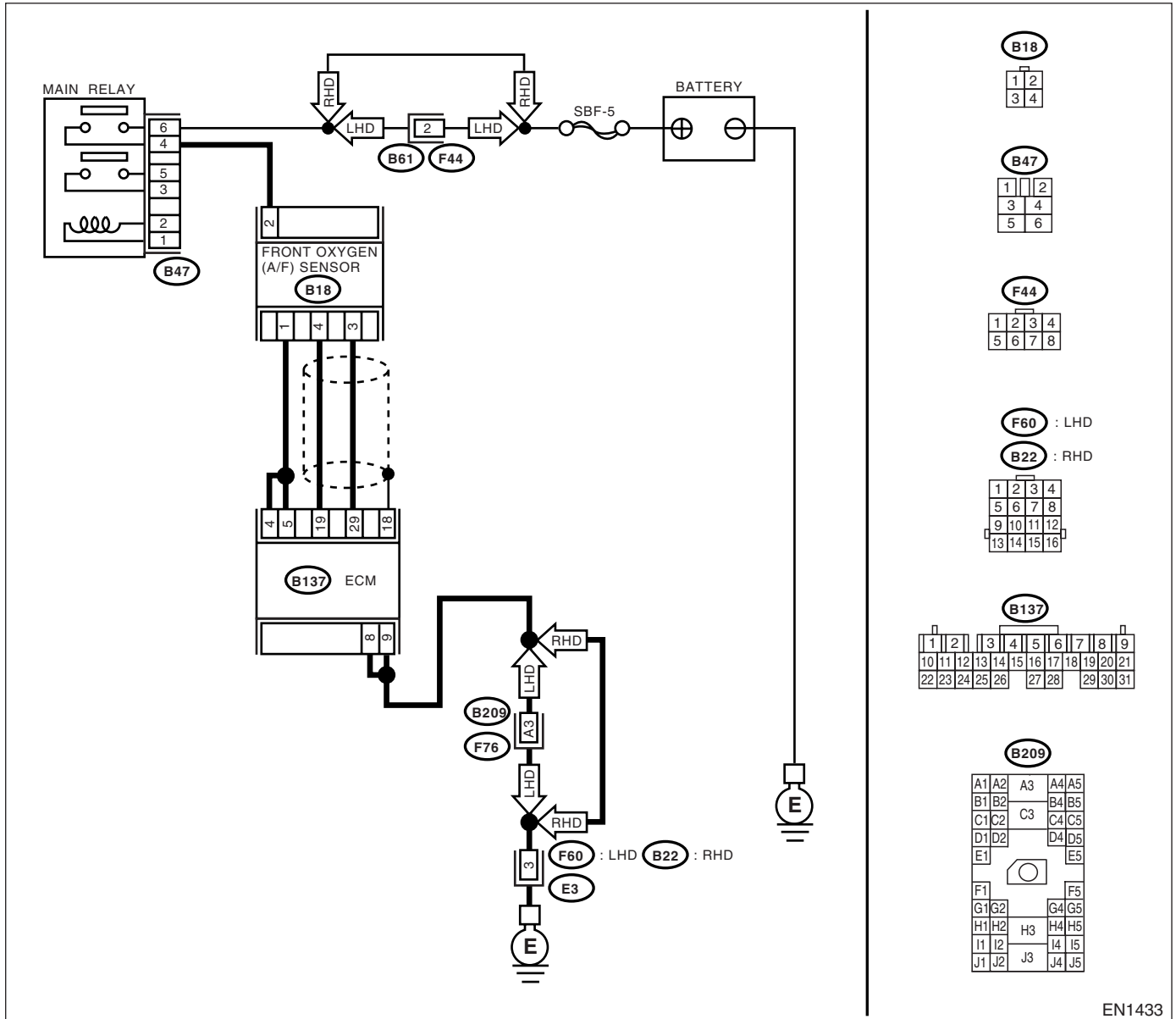
B: DTC P0032 — FRONT OXYGEN (A/F) SENSOR HEATER CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
 - Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

• **WIRING DIAGRAM:**



Step	Check	Yes	No
<p>1</p> <p>CHECK OUTPUT SIGNAL FROM ECM.</p> <p>1) Turn the ignition switch to ON.</p> <p>2) Measure the voltage between ECM connector and chassis ground.</p> <p>Connector & terminal</p> <p>(B137) No. 4 (+) — Chassis ground (-):</p> <p>(B137) No. 5 (+) — Chassis ground (-):</p>	<p>Is the voltage more than 8 V?</p>	<p>Go to step 3.</p>	<p>Go to step 2.</p>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>2 CHECK FRONT OXYGEN (A/F) SENSOR HEATER CURRENT. 1) Turn the ignition switch to OFF. 2) Repair the battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. 3) Turn the ignition switch to ON. 4) Read the data of front oxygen (A/F) sensor heater current using Subaru Select Monitor or the OBD-II general scan tool.</p> <p>NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(TURBO)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.</p>	<p>Is the value more than 2.3 A?</p>	<p>Replace the ECM. <Ref. to FU(TURBO)-49, Engine Control Module.></p>	<p>END</p>
<p>3 CHECK OUTPUT SIGNAL FROM ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B137) No. 4 (+) — Chassis ground (-): (B137) No. 5 (+) — Chassis ground (-):</p>	<p>Does the voltage change more than 8 V by shaking harness and connector of ECM while monitoring the value with voltage meter?</p>	<p>Repair the battery short circuit in harness between ECM and front oxygen (A/F) sensor connector.</p>	<p>END</p>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC) ENGINE (DIAGNOSTICS)

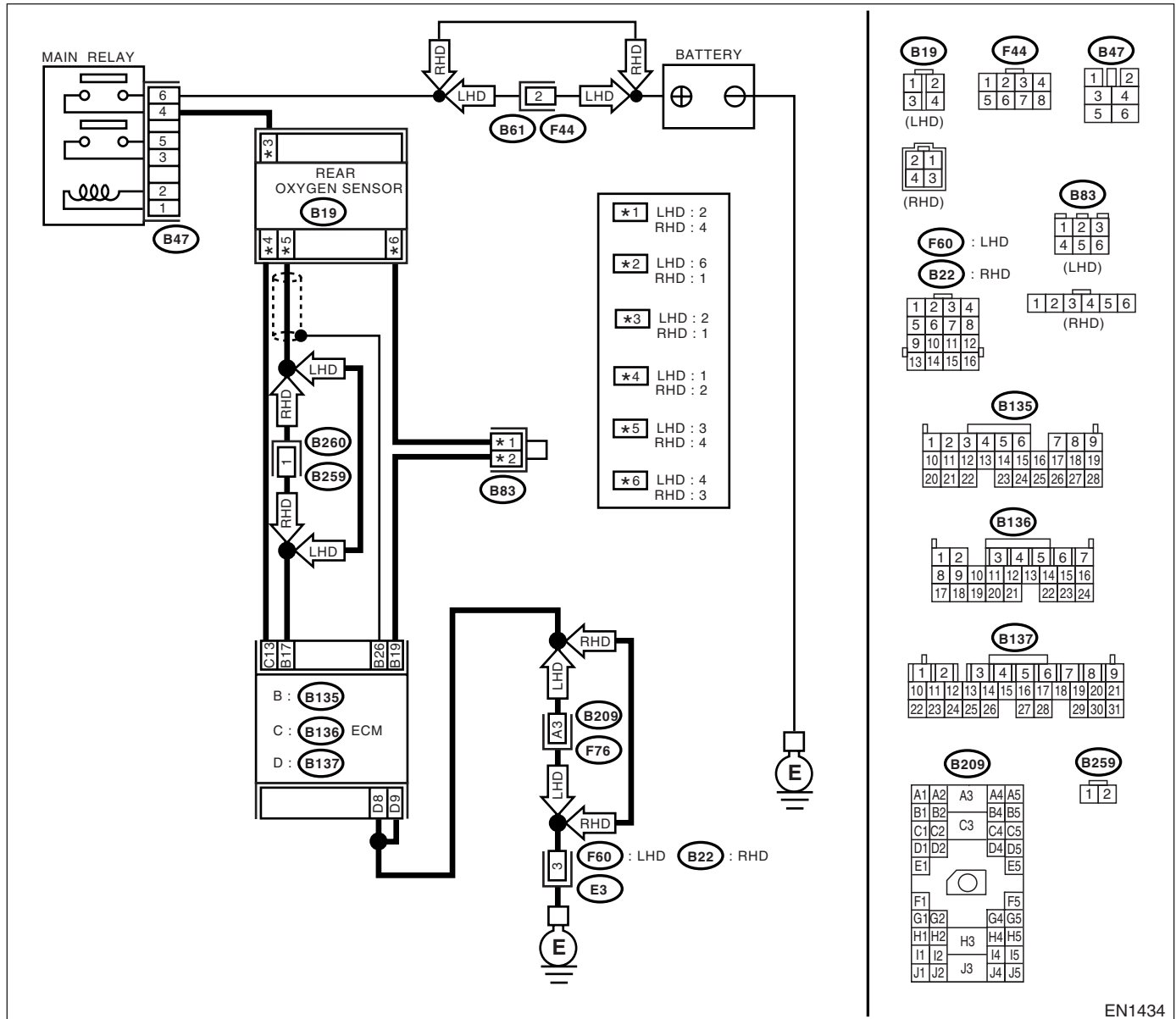
C: DTC P0037 — REAR OXYGEN SENSOR HEATER CIRCUIT MALFUNCTION

- **DTC DETECTING CONDITION:**
 - Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

• **WIRING DIAGRAM:**



EN1434

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>1</p> <p>CHECK GROUND CIRCUIT OF ECM. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM connector and chassis ground.</p> <p>Connector & terminal (B137) No. 8 — Chassis ground: (B137) No. 9 — Chassis ground:</p>	<p>Is the resistance less than 5 Ω?</p>	<p>Go to step 2.</p>	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Open circuit in harness between ECM and engine ground cable • Poor contact in ECM connector • Poor contact in coupling connector
<p>2</p> <p>CHECK CURRENT DATA. 1) Start the engine. 2) Read the data of rear oxygen sensor heater current using Subaru Select Monitor or OBD-II general scan tool.</p> <p>NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(TURBO)-34, Subaru Select Monitor.> • OBD-II scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.</p>	<p>Is the value more than 0.2 A?</p>	<p>Repair the connector.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Poor contact in rear oxygen sensor connector • Poor contact in rear oxygen sensor connecting harness connector • Poor contact in ECM connector 	<p>Go to step 3.</p>
<p>3</p> <p>CHECK OUTPUT SIGNAL FROM ECM. 1) Start and idle the engine. 2) Measure the voltage between ECM connector and chassis ground.</p> <p>Connector & terminal (B136) No. 13 (+) — Chassis ground (-):</p>	<p>Is the voltage less than 1.0 V?</p>	<p>Go to step 6.</p>	<p>Go to step 4.</p>
<p>4</p> <p>CHECK OUTPUT SIGNAL FROM ECM. Measure the voltage between ECM connector and chassis ground.</p> <p>Connector & terminal (B136) No. 13 (+) — Chassis ground (-):</p>	<p>Does the voltage change less than 1.0 V by shaking harness and connector of ECM while monitoring the value with voltage meter?</p>	<p>Repair the poor contact in ECM connector.</p>	<p>Go to step 5.</p>
<p>5</p> <p>CHECK OUTPUT SIGNAL FROM ECM. 1) Disconnect the connector from rear oxygen sensor. 2) Measure the voltage between ECM connector and chassis ground.</p> <p>Connector & terminal (B136) No. 13 (+) — Chassis ground (-):</p>	<p>Is the voltage less than 1.0 V?</p>	<p>Replace the ECM. <Ref. to FU(TURBO)-49, Engine Control Module.></p>	<p>Repair the battery short circuit in harness between ECM and rear oxygen sensor connector. After repair, replace the ECM. <Ref. to FU(TURBO)-49, Engine Control Module.></p>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>6 CHECK POWER SUPPLY TO REAR OXYGEN SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from rear oxygen sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between rear oxygen sensor connector and engine ground or chassis ground.</p> <p>Connector & terminal LHD model: (B19) No. 2 (+) — Chassis ground (-): RHD model: (B19) No. 1 (+) — Chassis ground (-):</p>	<p>Is the voltage more than 10 V?</p>	<p>Go to step 7.</p>	<p>Repair the power supply line.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Open circuit in harness between main relay and rear oxygen sensor connector • Poor contact in rear oxygen sensor connector • Poor contact in coupling connector
<p>7 CHECK REAR OXYGEN SENSOR. 1) Turn the ignition switch to OFF. 2) Measure the resistance between rear oxygen sensor connector terminals.</p> <p>Terminals No. 1 — No. 2:</p>	<p>Is the resistance less than 30 Ω?</p>	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Open circuit in harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor connector • Poor contact in ECM connector • Poor contact in coupling connector 	<p>Replace the rear oxygen sensor. <Ref. to FU(TURBO)-46, Rear Oxygen Sensor.></p>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

D: DTC P0038 — REAR OXYGEN SENSOR HEATER CIRCUIT HIGH INPUT —

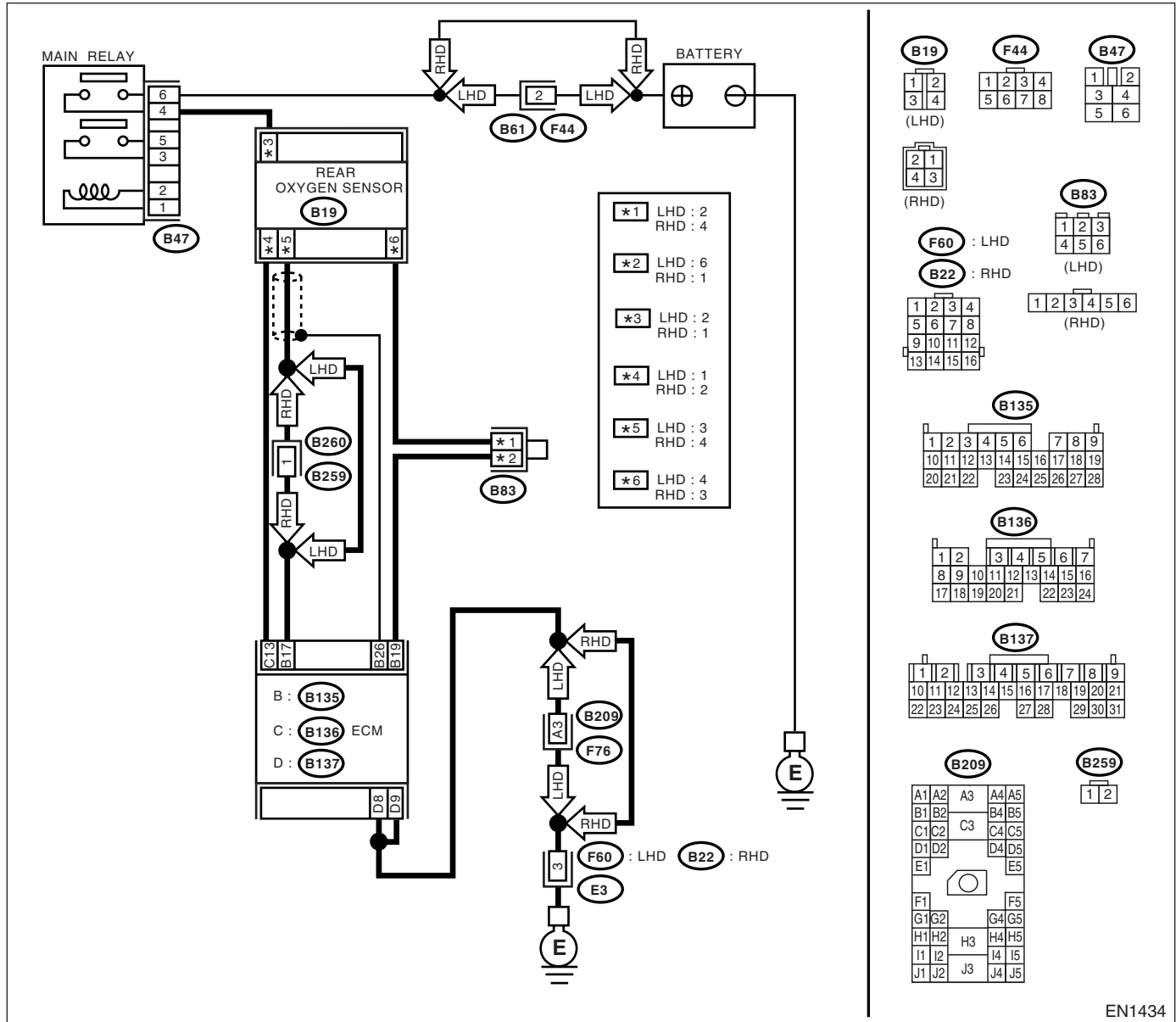
• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

• WIRING DIAGRAM:



EN1434

Step	Check	Yes	No	
1	CHECK INPUT SIGNAL FOR ECM. Measure the 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 3.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>2 CHECK CURRENT DATA. 1) Turn the ignition switch to OFF. 2) Repair the battery short circuit in harness between ECM and rear oxygen sensor connector. 3) Turn the ignition switch to ON. 4) Read the data of rear oxygen sensor heater current using Subaru Select Monitor or the OBD-II general scan tool.</p> <p>NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(TURBO)-34, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.</p>	<p>Is the value more than 7 A?</p>	<p>Replace the ECM. <Ref. to FU(TURBO)-49, Engine Control Module.></p>	<p>END</p>
<p>3 CHECK POOR CONTACT. Check poor contact in ECM connector.</p>	<p>Is there poor contact in ECM connector?</p>	<p>Repair the poor contact in ECM connector.</p>	<p>END</p>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

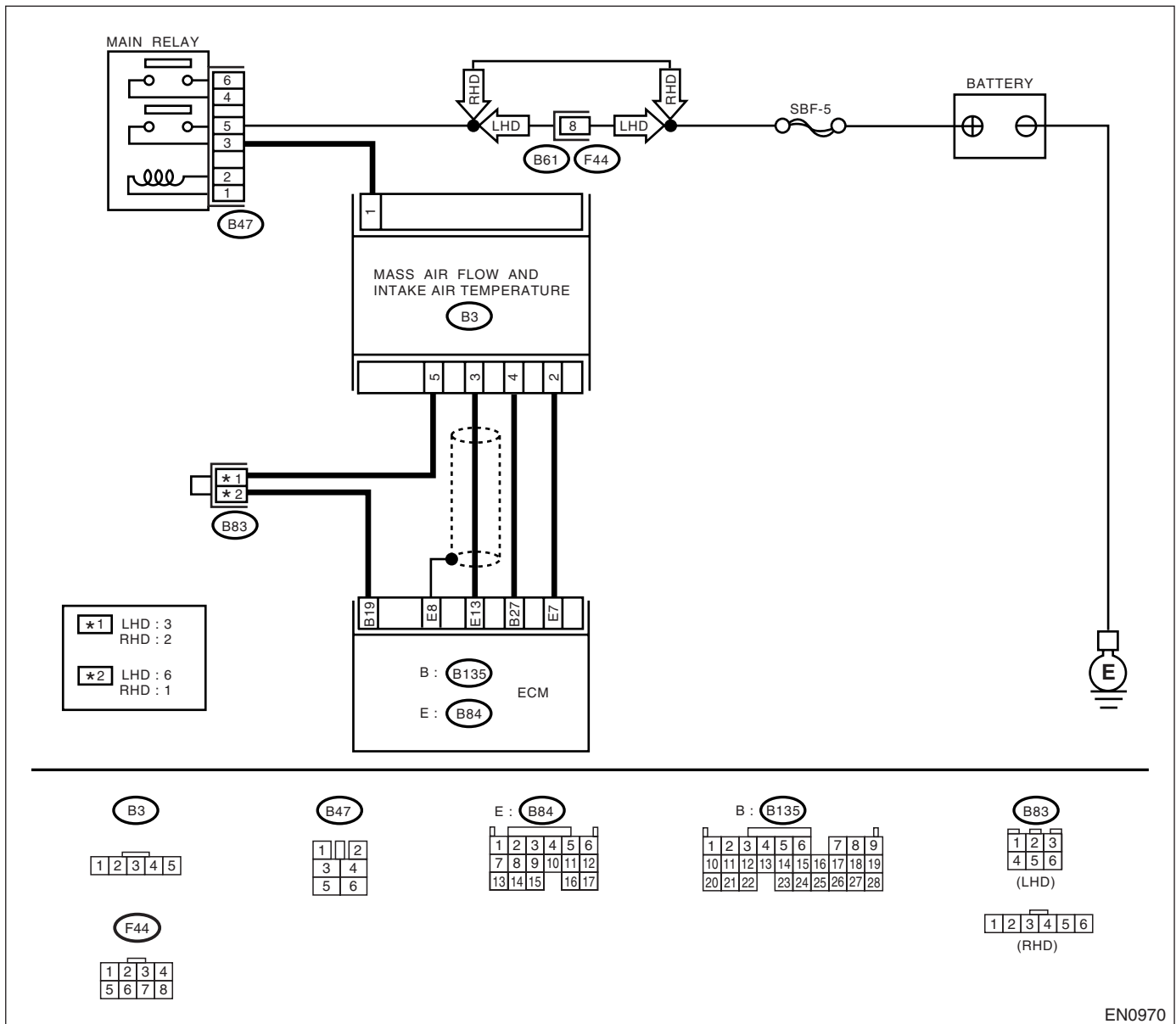
E: DTC P0101 — MASS AIR FLOW SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (HIGH INPUT) —

- **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(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

• WIRING DIAGRAM:



EN0970

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

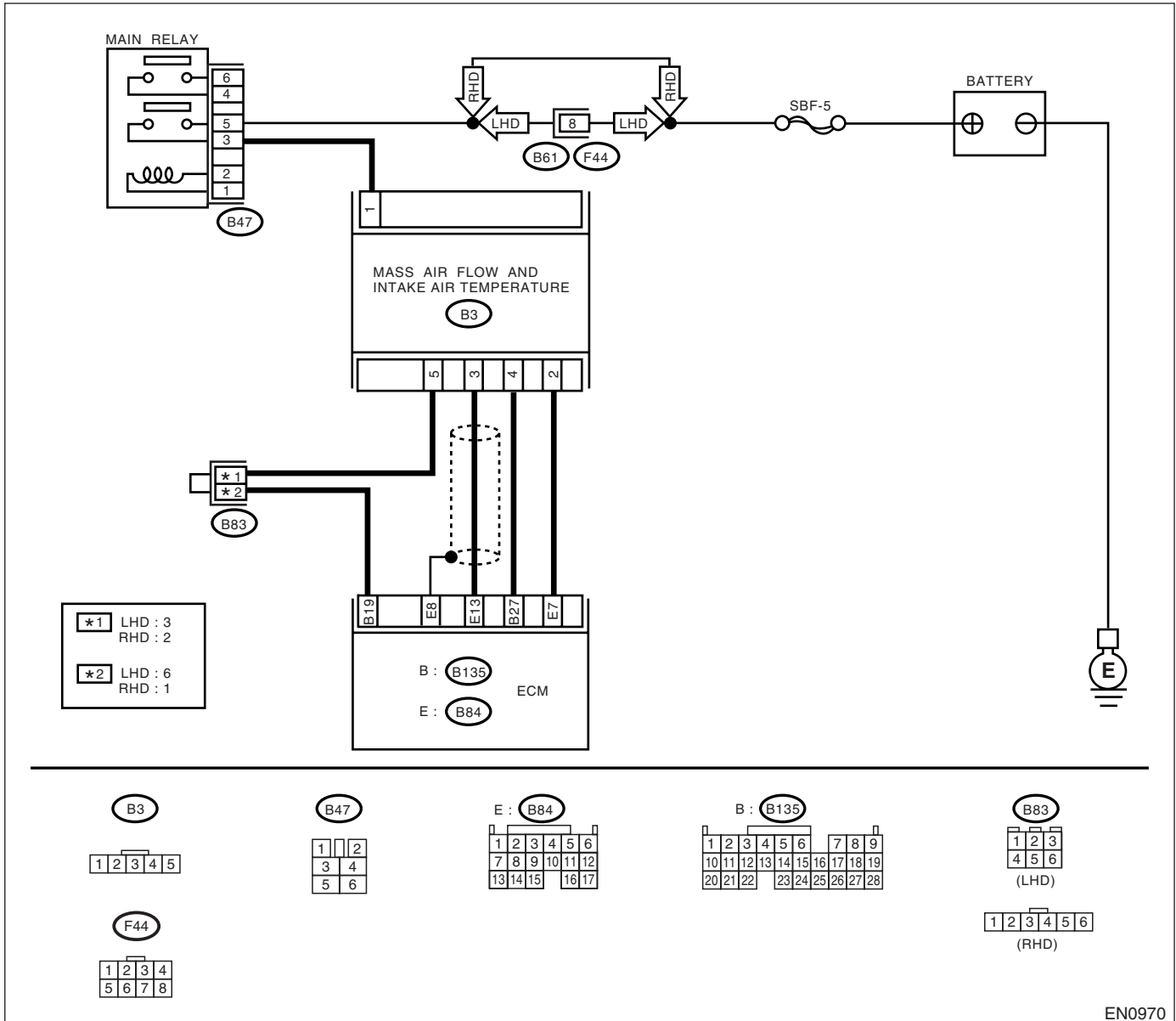
ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(TURBO)-75, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0101.	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(TURBO)-34, 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
<p>1 CONNECT SUBARU SELECT MONITOR OR THE OBD-II GENERAL SCAN TOOL, AND READ DATA.</p> <p>1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor or OBD-II general scan tool to data link connector. 3) Turn the ignition switch to ON and Subaru Select Monitor or the OBD-II general scan tool switch to ON. 4) Start the engine. 5) Read the data of mass air flow sensor signal using Subaru Select Monitor or OBD-II general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(TURBO)-34, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual. 	<p>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?</p>	<p>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 the harness or connector in the mass air flow sensor.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Open or ground short circuit in harness between mass air flow sensor and ECM connector • Poor contact in mass air flow sensor or ECM connector 	<p>Go to step 2.</p>
<p>2 CHECK INPUT SIGNAL FOR ECM.</p> <p>Measure the voltage between ECM connector and chassis ground while engine is idling.</p> <p>Connector & terminal (B84) No. 13 (+) — Chassis ground (-):</p>	<p>Is the voltage less than 0.2 V?</p>	<p>Go to step 4.</p>	<p>Go to step 3.</p>
<p>3 CHECK INPUT SIGNAL FOR ECM (USING SUBARU SELECT MONITOR).</p> <p>Measure the voltage between ECM connector and chassis ground while engine is idling.</p>	<p>Does the voltage change more than 0.2 V by shaking harness and connector of ECM while monitoring the value with Subaru Select Monitor?</p>	<p>Repair the poor contact in ECM connector.</p>	<p>Contact with your Subaru distributor service.</p> <p>NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.</p>
<p>4 CHECK POWER SUPPLY TO MASS AIR FLOW SENSOR.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connector from mass air flow sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between mass air flow sensor connector and chassis ground.</p> <p>Connector & terminal (B3) No. 1 (+) — Chassis ground (-):</p>	<p>Is the voltage more than 10 V?</p>	<p>Go to step 5.</p>	<p>Repair the open circuit between mass air flow sensor and main relay.</p>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
5 CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM and mass air flow sensor connector. 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 the open circuit between ECM and mass air flow sensor connector.
6 CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW SENSOR CONNECTOR Measure the 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 the 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 the poor contact in mass air flow sensor connector.	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(TURBO)-34, Mass Air Flow and Intake Air Temperature Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

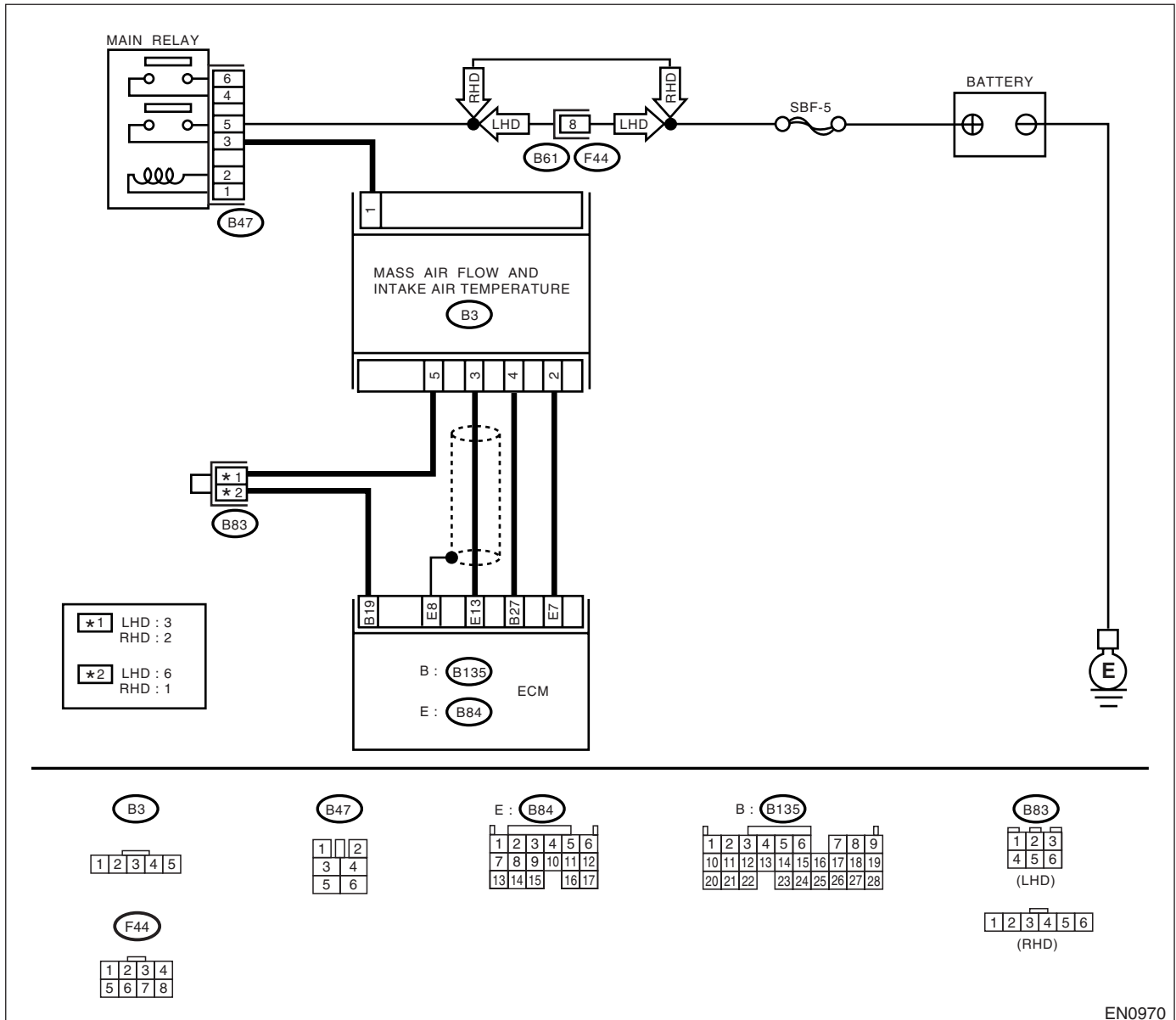
G: DTC P0103 — MASS AIR FLOW SENSOR CIRCUIT HIGH INPUT —

- **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(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

• WIRING DIAGRAM:



EN0970

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>1</p> <p>CONNECT SUBARU SELECT MONITOR OR THE OBD-II GENERAL SCAN TOOL, AND READ DATA.</p> <p>1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor or OBD-II general scan tool to data link connector. 3) Turn the ignition switch to ON and Subaru Select Monitor or OBD-II general scan tool switch to ON. 4) Start the engine. 5) Read the data of mass air flow sensor signal using Subaru Select Monitor or OBD-II general scan tool.</p> <p>NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(TURBO)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.</p>	<p>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?</p>	<p>Even if MIL lights up, the circuit has returned to a normal condition at this time.</p>	<p>Go to step 2.</p>
<p>2</p> <p>CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW SENSOR CONNECTOR.</p> <p>1) Turn the ignition switch to OFF and Subaru Select Monitor or the OBD-II general scan tool switch to OFF. 2) Disconnect the connector from mass air flow sensor. 3) Turn the ignition switch to ON and Subaru Select Monitor or the OBD-II general scan tool switch to ON. 4) Read the data of mass air flow sensor signal using Subaru Select Monitor or OBD-II general scan tool.</p> <p>NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(TURBO)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.</p>	<p>Is the value more than 240 g/sec (32 lb/min) or 4.58 V in function mode F06?</p>	<p>Repair the battery short circuit in harness between mass air flow sensor and ECM connector. After repair, replace the ECM.</p>	<p>Replace the mass air flow sensor.</p>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

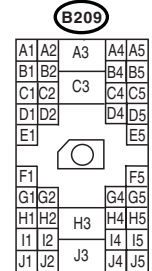
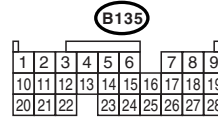
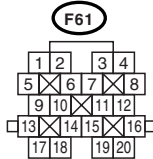
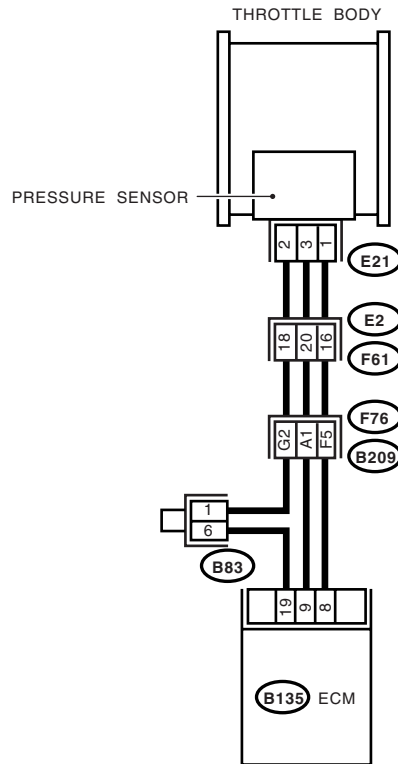
H: DTC P0106 — PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (LOW INPUT) —

- **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(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- LHD model:

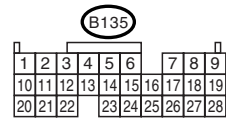
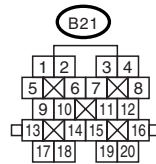
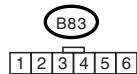
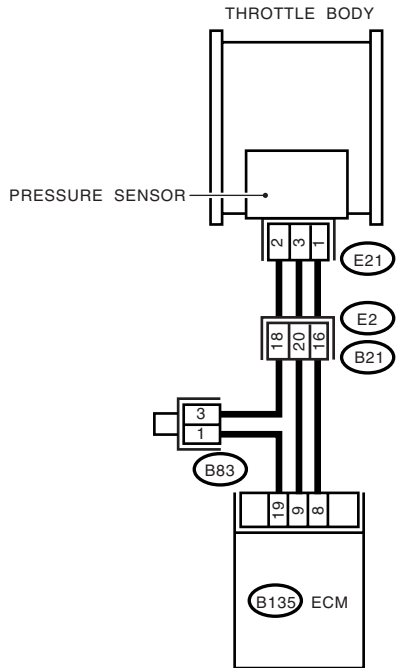


EN1435

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 the 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(TURBO)-34, Subaru Select Monitor.>	Does the LED of {Idle Switch Signal} come on?	Go to step 2.	Check the throttle position sensor circuit. <Ref. to EN(TURBO)-127, 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 DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC. "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(TURBO)-75, 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 the pressure sensor installation bolt securely.
4 CHECK CONDITION OF THROTTLE BODY.	Is the throttle body installation bolt tightened securely?	Replace the pressure sensor. <Ref. to FU(TURBO)-35, Pressure Sensor.>	Tighten the throttle body installation bolt securely.

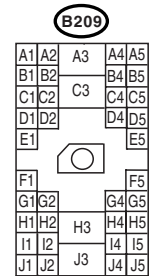
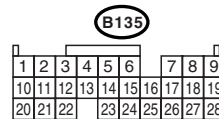
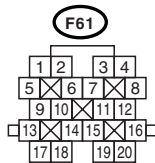
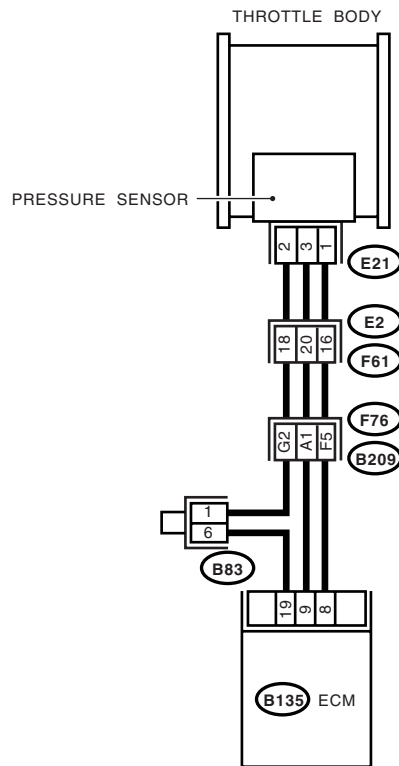
I: DTC P0107 — PRESSURE SENSOR CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
 - Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**
- LHD model

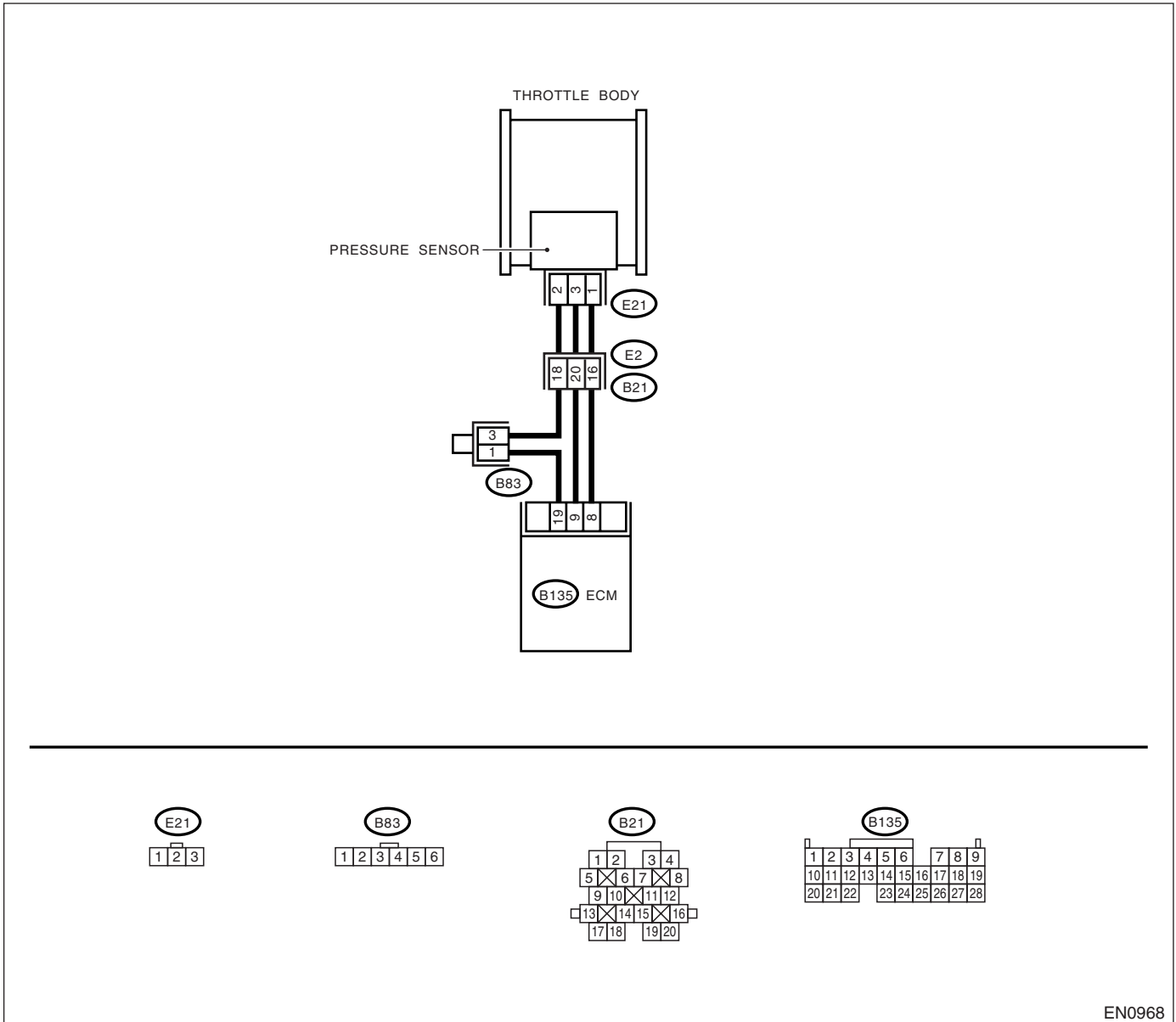


EN1435

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

• RHD model



EN0968

Step	Check	Yes	No
1 CHECK CURRENT DATA. 1) Start the 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(TURBO)-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 -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.	Is there poor contact in ECM or pressure sensor connector?	Repair the 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 the voltage between ECM connector and chassis ground. <i>Connector & terminal</i> <i>(B135) No. 9 (+) — Chassis ground (-):</i>	Is the voltage more than 4.5 V?	Go to step 5.	Go to step 4.
4	CHECK INPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground. <i>Connector & terminal</i> <i>(B135) No. 9 (+) — Chassis ground (-):</i>	Does the voltage change more than 4.5 V by shaking harness and connector of ECM while monitoring the value with voltage meter?	Repair the 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 the voltage between ECM and chassis ground. <i>Connector & terminal</i> <i>(B135) No. 8 (+) — Chassis ground (-):</i>	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 the ignition switch to OFF. 2) Disconnect the connector from pressure sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between pressure sensor connector and engine ground. <i>Connector & terminal</i> <i>(E21) No. 3 (+) — Engine ground (-):</i>	Is the voltage more than 4.5 V?	Go to step 7.	Repair the open circuit in harness between ECM and intake manifold pressure sensor connector.
7	CHECK HARNESS BETWEEN ECM AND PRESSURE SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM and intake manifold pressure sensor connector. <i>Connector & terminal</i> <i>(B135) No. 19 — (E21) No. 2:</i>	Is the resistance less than 1 Ω ?	Go to step 8.	Repair the open circuit in harness between ECM and intake manifold pressure sensor connector.
8	CHECK HARNESS BETWEEN ECM AND PRESSURE SENSOR CONNECTOR. Measure the resistance of harness between intake manifold pressure sensor connector and engine ground. <i>Connector & terminal</i> <i>(E21) No. 1 — Engine ground:</i>	Is the resistance more than 1 $M\Omega$?	Go to step 9.	Repair the 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 the poor contact in pressure sensor connector.	Replace the pressure sensor. <Ref. to FU(TURBO)-35, Pressure Sensor.>

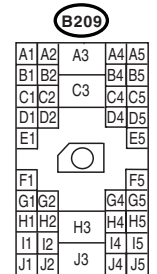
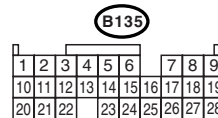
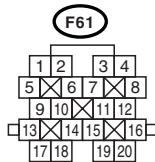
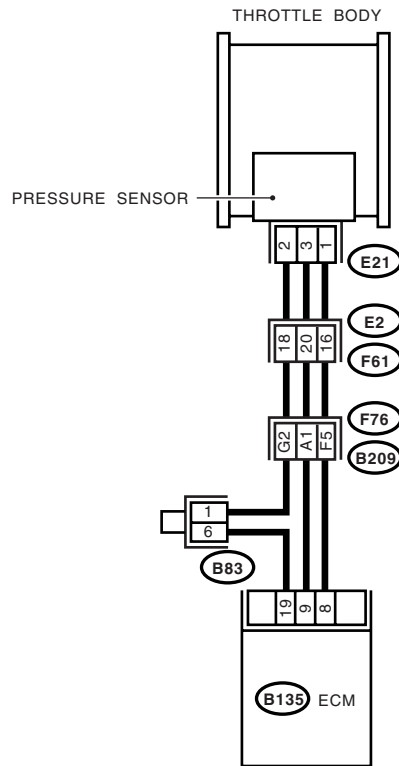
J: DTC P0108 — PRESSURE SENSOR CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
 - Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**
- LHD model

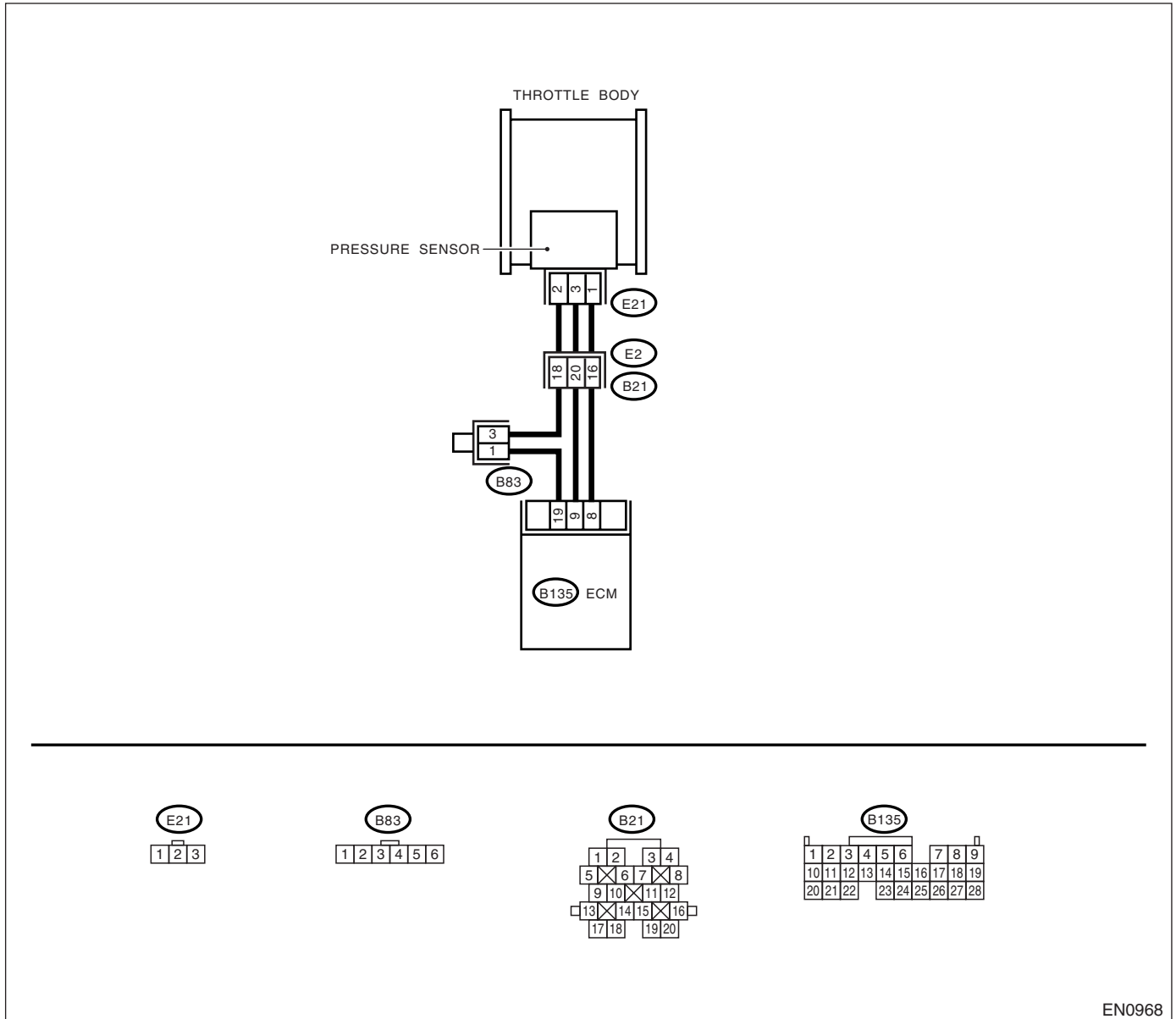


EN1435

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

• RHD model



Step	Check	Yes	No
1 CHECK CURRENT DATA. 1) Start the 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(TURBO)-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 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 the voltage between ECM connector and chassis ground. <i>Connector & terminal</i> <i>(B135) No. 9 (+) — Chassis ground (-):</i>	Is the voltage more than 4.5 V?	Go to step 4.	Go to step 3.
3 CHECK INPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground. <i>Connector & terminal</i> <i>(B135) No. 9 (+) — Chassis ground (-):</i>	Does the voltage change more than 4.5 V by shaking harness and connector of ECM while monitoring the value with voltage meter?	Repair the 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 the voltage between ECM connector and chassis ground. <i>Connector & terminal</i> <i>(B135) No. 8 (+) — Chassis ground (-):</i>	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 the ignition switch to OFF. 2) Disconnect the connector from pressure sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between pressure sensor connector and engine ground. <i>Connector & terminal</i> <i>(E21) No. 3 (+) — Engine ground (-):</i>	Is the voltage more than 4.5 V?	Go to step 6.	Repair the open circuit in harness between ECM and pressure sensor connector.
6 CHECK HARNESS BETWEEN ECM AND PRESSURE SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM and pressure sensor connector. <i>Connector & terminal</i> <i>(B135) No. 8 — (E21) No. 1:</i>	Is the resistance less than 1 Ω ?	Go to step 7.	Repair the open circuit in harness between ECM and pressure sensor connector.
7 CHECK HARNESS BETWEEN ECM AND INTAKE MANIFOLD PRESSURE SENSOR CONNECTOR. Measure the resistance of harness between ECM and pressure sensor connector. <i>Connector & terminal</i> <i>(B135) No. 19 — (E21) No. 2:</i>	Is the resistance less than 1 Ω ?	Go to step 8.	Repair the 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 the poor contact in pressure sensor connector.	Replace the intake manifold pressure sensor. <Ref. to FU(TURBO)-35, Pressure Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>9 CHECK HARNESS BETWEEN ECM AND PRESSURE SENSOR CONNECTOR.</p> <p>1) Turn the ignition switch to OFF and Subaru Select Monitor or the OBD-II general scan tool switch to OFF.</p> <p>2) Disconnect the connector from pressure sensor.</p> <p>3) Turn the ignition switch to ON and Subaru Select Monitor or the OBD-II general scan tool switch to ON.</p> <p>4) Read the data of intake manifold absolute pressure signal using Subaru Select Monitor or OBD-II general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none">• Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(TURBO)-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 282 kPa (2121 mmHg, 83.50 inHg)?	Repair the battery short circuit in harness between ECM and pressure sensor connector.	Replace the pressure sensor. <Ref. to FU(TURBO)-35, Pressure Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

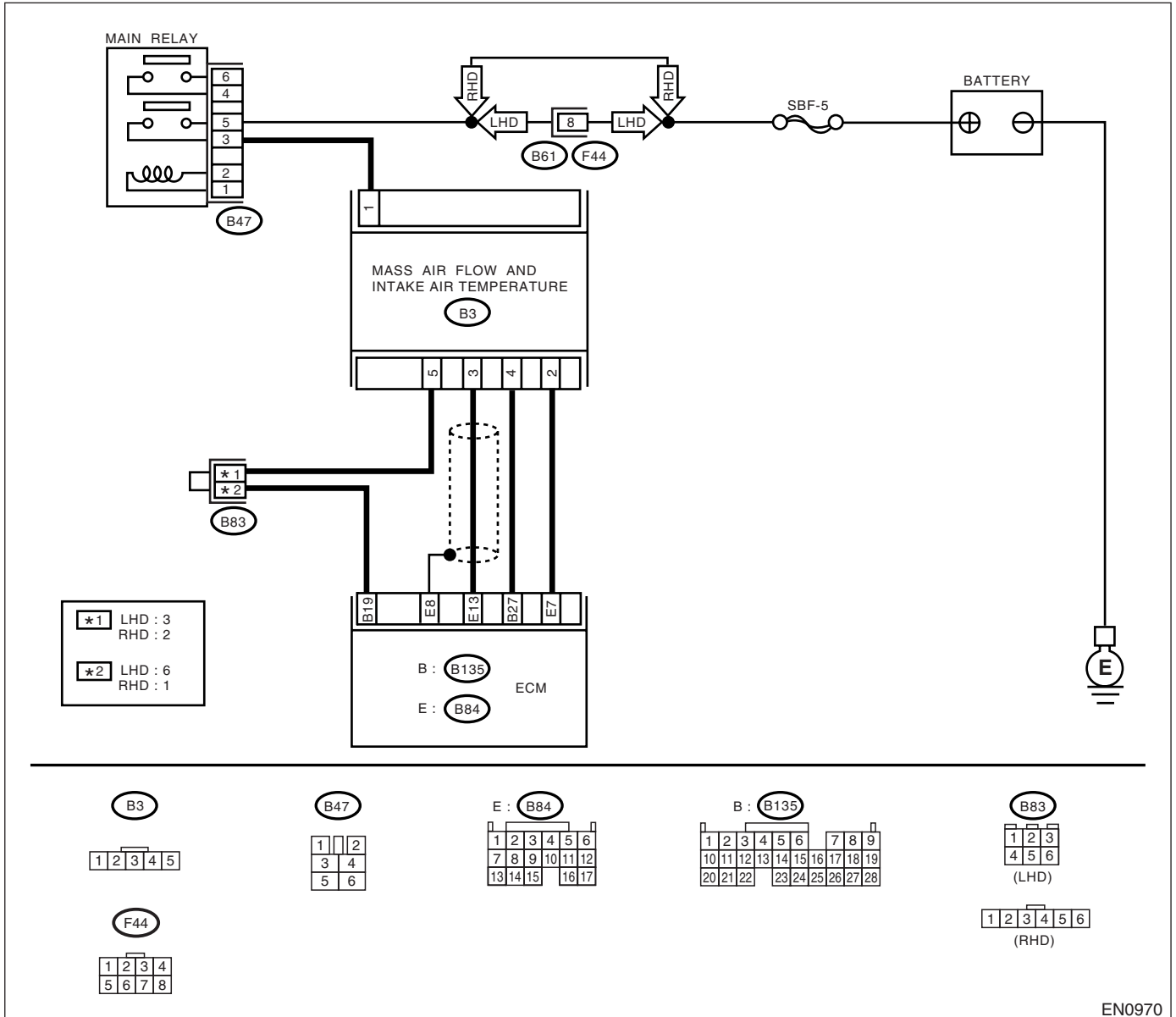
K: DTC P0111 — INTAKE AIR TEMPERATURE SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM —

- **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(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

• WIRING DIAGRAM:



EN0970

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(TURBO)-75, 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 the 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(TURBO)-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 the mass air flow and intake air temperature sensor. <Ref. to FU(TURBO)-34, Mass Air Flow and Intake Air Temperature Sensor.>	Inspect the DTC P0125 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(TURBO)-75, List of Diagnostic Trouble Code (DTC).>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

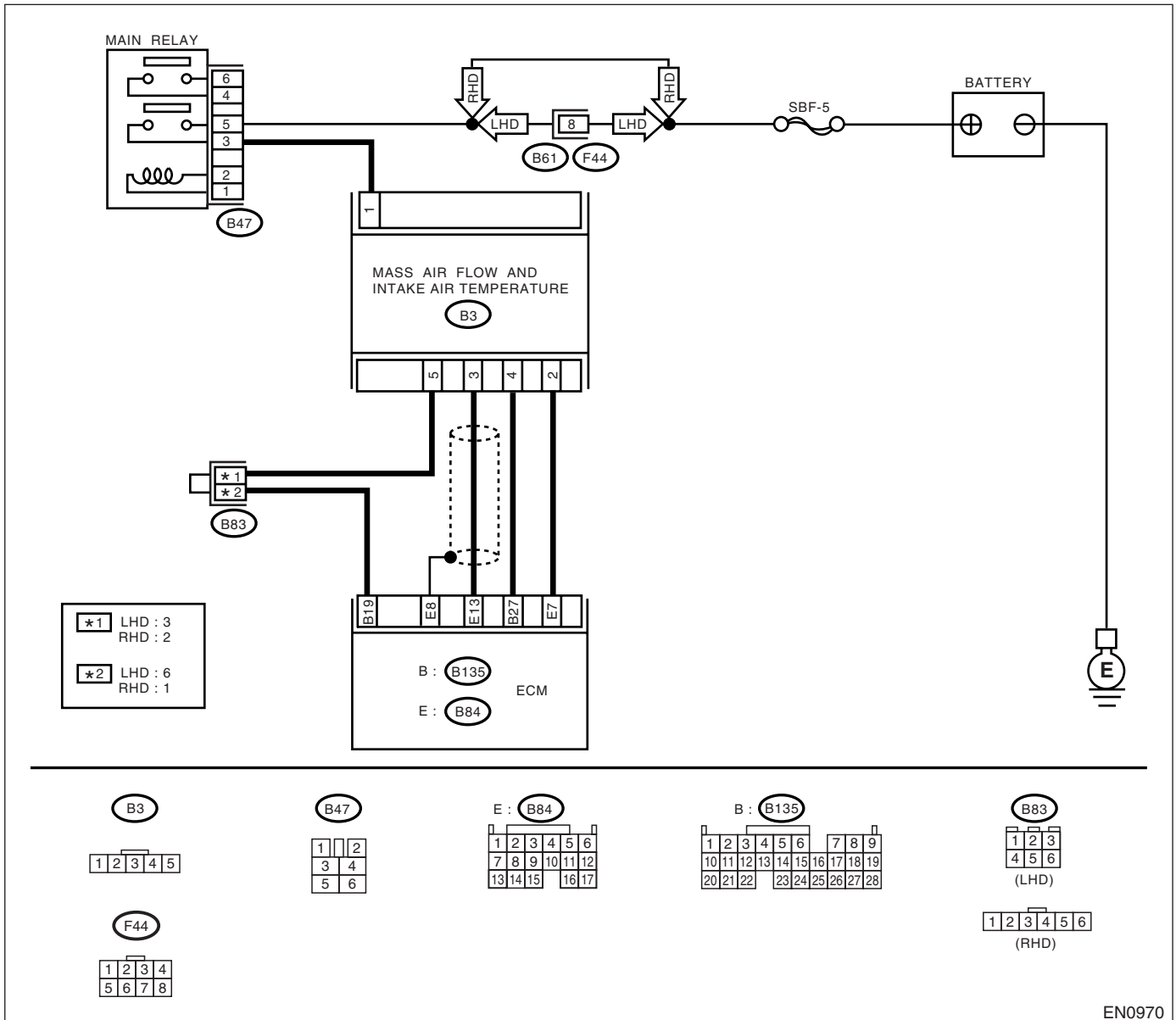
L: DTC P0112 — INTAKE AIR TEMPERATURE SENSOR CIRCUIT LOW INPUT

- **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(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

• **WIRING DIAGRAM:**



EN0970

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>1</p> <p>CHECK CURRENT DATA. 1)Start the engine. 2)Read the data of intake air temperature sensor signal using Subaru Select Monitor or the OBD-II general scan tool.</p> <p>NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(TURBO)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.</p>	<p>Is the value greater than 55°C (131°F)?</p>	<p>Go to step 2.</p>	<p>Repair the poor contact.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Poor contact mass air flow and intake air temperature sensor • Poor contact in ECM • Poor contact in joint connector
<p>2</p> <p>CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR. 1)Turn the ignition switch to OFF. 2)Disconnect the connector from mass air flow and intake air temperature sensor. 3)Turn the ignition switch to ON. 4)Read the data of intake air temperature sensor signal using Subaru Select Monitor or the OBD-II general scan tool.</p> <p>NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(TURBO)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.</p>	<p>Is the value less than -36°C (-97°F)?</p>	<p>Replace the mass air flow and intake air temperature sensor. <Ref. to FU(TURBO)-34, Mass Air Flow and Intake Air Temperature Sensor.></p>	<p>Repair the ground short circuit in harness between mass air flow and intake air temperature sensor and ECM connector.</p>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

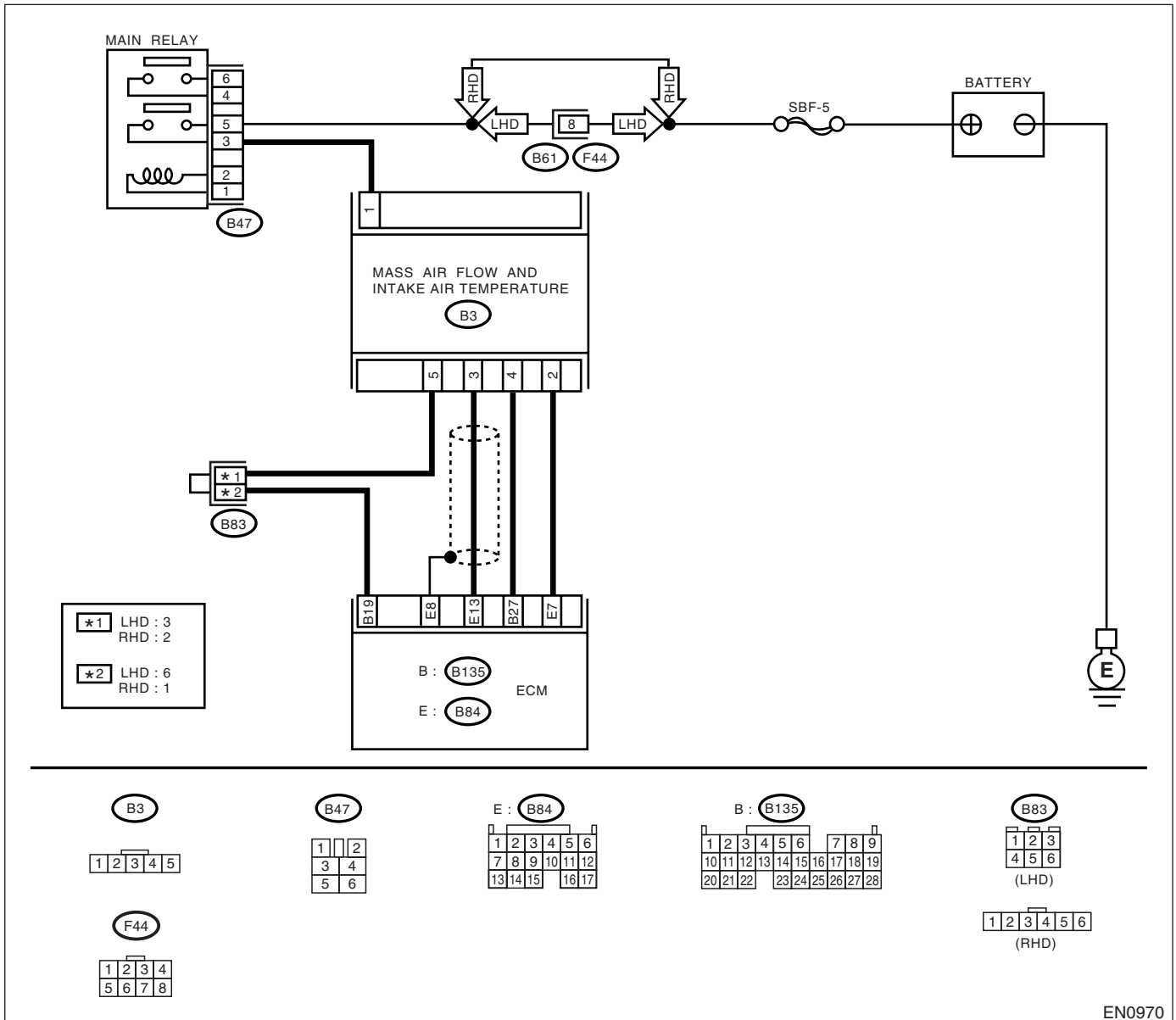
M: DTC P0113 — INTAKE AIR TEMPERATURE SENSOR CIRCUIT HIGH INPUT

- **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(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

• **WIRING DIAGRAM:**



EN0970

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>1</p> <p>CHECK CURRENT DATA. 1) Start the engine. 2) Read the data of intake air temperature sensor signal using Subaru Select Monitor or the OBD-II general scan tool.</p> <p>NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(TURBO)-34, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.</p>	<p>Is the value less than -36°C (-97°F)?</p>	<p>Go to step 2.</p>	<p>Repair the poor contact.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Poor contact in mass air flow and intake air temperature sensor • Poor contact in ECM • Poor contact in joint connector
<p>2</p> <p>CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from mass air flow and intake air temperature sensor. 3) Measure the voltage between mass air flow and intake air temperature sensor connector and engine ground.</p> <p>Connector & terminal <i>(B3) No. 2 (+) — Engine ground (-):</i></p>	<p>Is the voltage more than 10 V?</p>	<p>Repair the battery short circuit in harness between mass air flow and intake air temperature sensor and ECM connector.</p>	<p>Go to step 3.</p>
<p>3</p> <p>CHECK HARNESS BETWEEN INTAKE AIR TEMPERATURE AND PRESSURE SENSOR AND ECM CONNECTOR. 1) Turn the ignition switch to ON. 2) Measure the voltage between mass air flow and intake air temperature sensor connector and engine ground.</p> <p>Connector & terminal <i>(B3) No. 2 (+) — Engine ground (-):</i></p>	<p>Is the voltage more than 10 V?</p>	<p>Repair the battery short circuit in harness between mass air flow and intake air temperature sensor and ECM connector.</p>	<p>Go to step 4.</p>
<p>4</p> <p>CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR. Measure the voltage between mass air flow and intake air temperature sensor and pressure sensor connector and engine ground.</p> <p>Connector & terminal <i>(B3) No. 2 (+) — Engine ground (-):</i></p>	<p>Is the voltage more than 3 V?</p>	<p>Go to step 5.</p>	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Open circuit in harness between mass air flow and intake air temperature sensor and ECM connector • Poor contact in mass air flow and intake air temperature sensor • Poor contact in ECM • Poor contact in joint connector

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>5</p> <p>CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.</p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Measure the resistance of harness between mass air flow and intake air temperature sensor and engine ground.</p> <p>Connector & terminal (B3) No. 5 — Engine ground:</p>	<p>Is the resistance less than 5 Ω?</p>	<p>Replace the mass air flow and intake air temperature sensor. <Ref. to FU(TURBO)-34, Mass Air Flow and Intake Air Temperature Sensor.></p>	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Open circuit in harness between mass air flow and intake air temperature sensor and ECM connector • Poor contact in mass air flow and intake air temperature sensor • Poor contact in ECM • Poor contact in joint connector

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

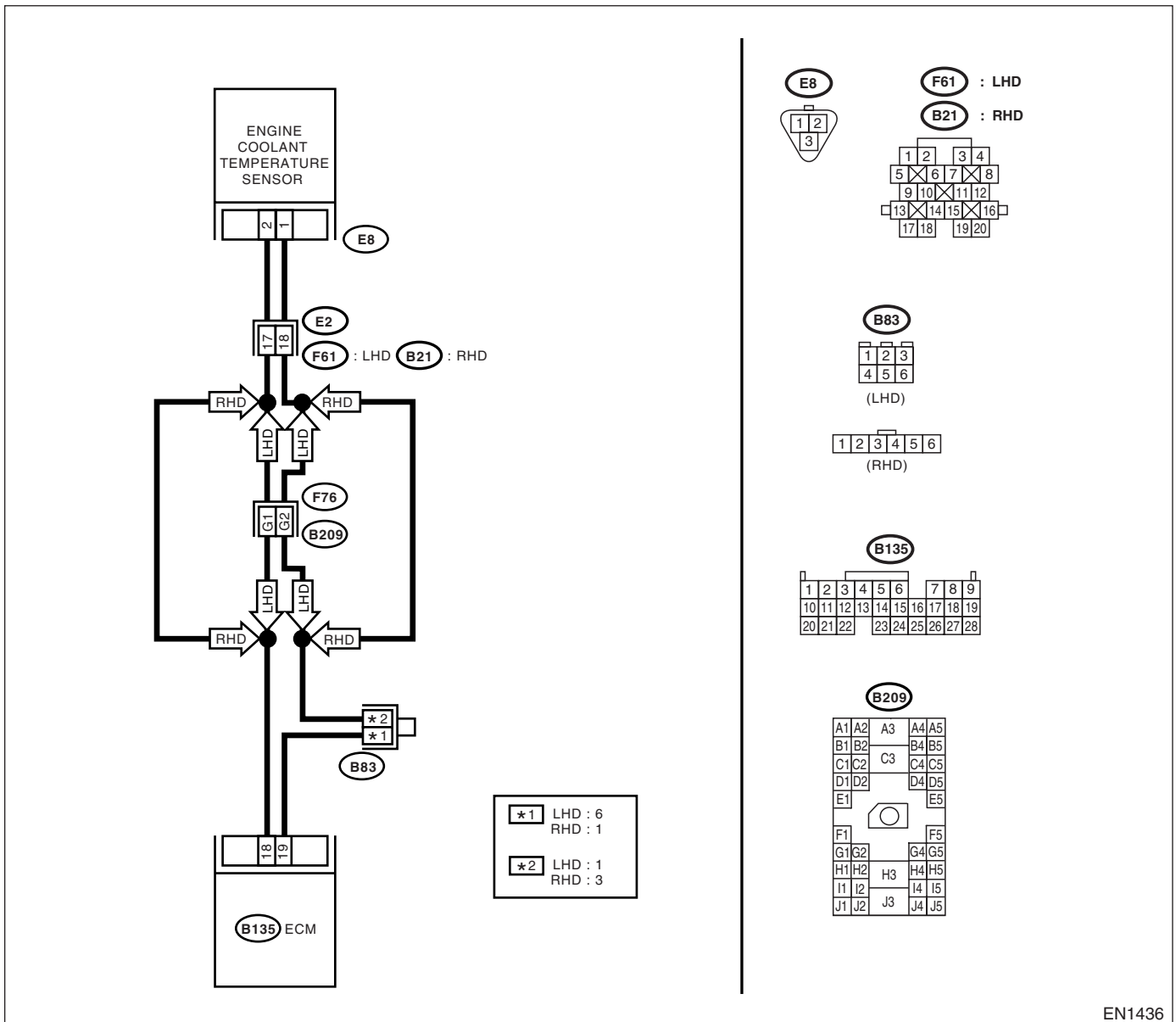
N: DTC P0117 — ENGINE COOLANT TEMPERATURE SENSOR CIRCUIT LOW INPUT —

- **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(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN1436

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>1</p> <p>CHECK CURRENT DATA.</p> <p>1)Start the engine.</p> <p>2)Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> •Subaru Select Monitor <p>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE".</p> <p><Ref. to EN(TURBO)-34, Subaru Select Monitor.></p> <ul style="list-style-type: none"> •OBD-II general scan tool <p>For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.</p>	<p>Is the value greater than 150°C (302°F)?</p>	<p>Go to step 2.</p>	<p>Repair the poor contact.</p> <p>NOTE:</p> <p>In this case, repair the following:</p> <ul style="list-style-type: none"> • Poor contact in engine coolant temperature sensor • Poor contact in ECM • Poor contact in coupling connector • Poor contact in joint connector
<p>2</p> <p>CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.</p> <p>1)Turn the ignition switch to OFF.</p> <p>2)Disconnect the connector from engine coolant temperature sensor.</p> <p>3)Turn the ignition switch to ON.</p> <p>4)Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> •Subaru Select Monitor <p>For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE".</p> <p><Ref. to EN(TURBO)-34, Subaru Select Monitor.></p> <ul style="list-style-type: none"> •OBD-II general scan tool <p>For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.</p>	<p>Is the value less than -40°C (-40°F)?</p>	<p>Replace the engine coolant temperature sensor. <Ref. to FU(TURBO)-29, Engine Coolant Temperature Sensor.></p>	<p>Repair the ground short circuit in harness between engine coolant temperature sensor and ECM connector.</p>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

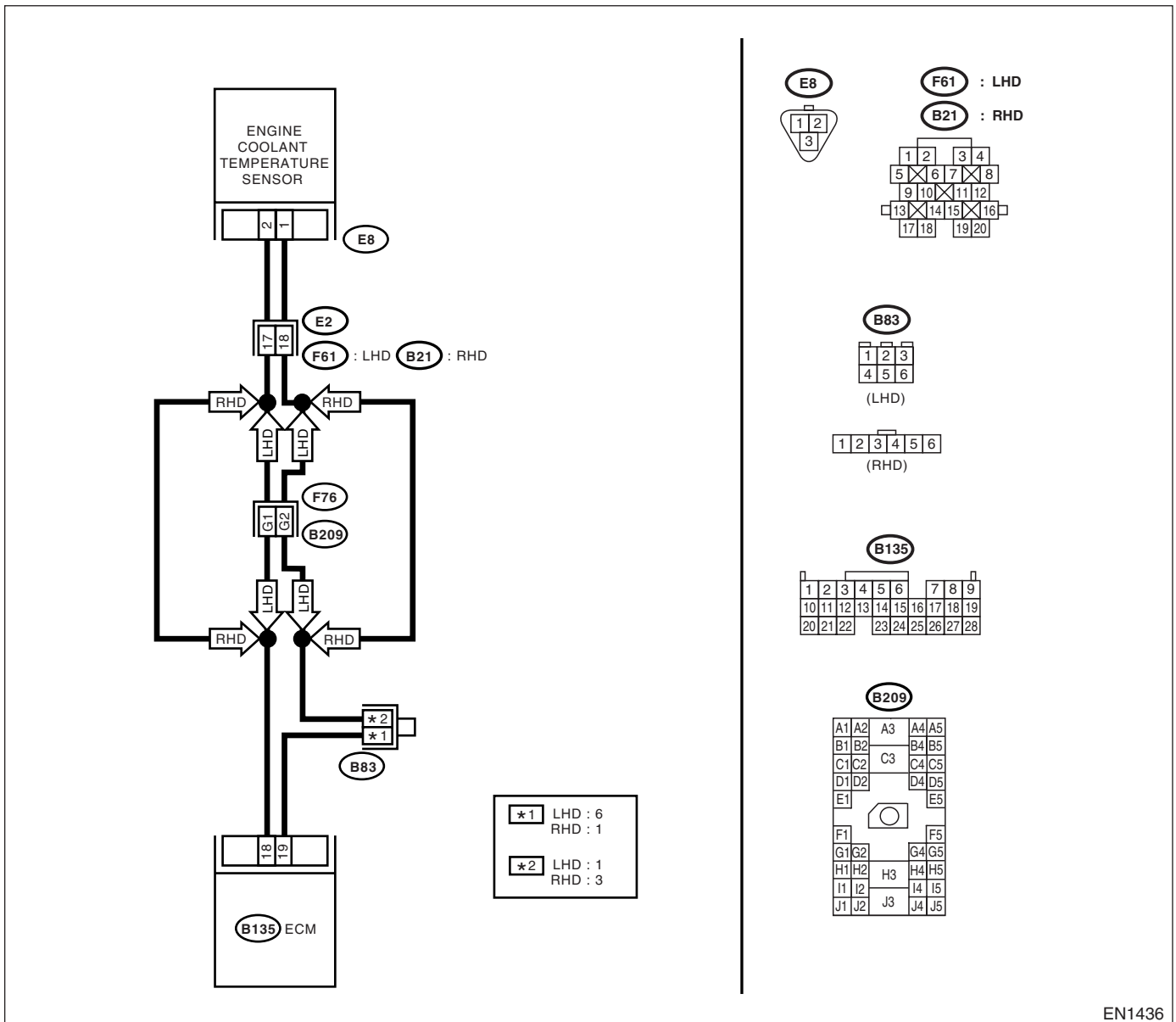
O: DTC P0118 — ENGINE COOLANT TEMPERATURE SENSOR CIRCUIT HIGH INPUT —

- **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(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN1436

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>1 CHECK CURRENT DATA. 1) Start the engine. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool.</p> <p>NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(TURBO)-34, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.</p>	<p>Is the value less than -40°C (-40°F)?</p>	<p>Go to step 2.</p>	<p>Repair the poor contact.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Poor contact in engine coolant temperature sensor • Poor contact in ECM • Poor contact in coupling connector • Poor contact in joint connector
<p>2 CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from engine coolant temperature sensor. 3) Measure the voltage between engine coolant temperature sensor connector and engine ground.</p> <p>Connector & terminal <i>(E8) No. 2 (+) — Engine ground (-):</i></p>	<p>Is the voltage more than 10 V?</p>	<p>Repair the battery short circuit in harness between ECM and engine coolant temperature sensor connector.</p>	<p>Go to step 3.</p>
<p>3 CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR. 1) Turn the ignition switch to ON. 2) Measure the voltage between engine coolant temperature sensor connector and engine ground.</p> <p>Connector & terminal <i>(E8) No. 2 (+) — Engine ground (-):</i></p>	<p>Is the voltage more than 10 V?</p>	<p>Repair the battery short circuit in harness between ECM and engine coolant temperature sensor connector.</p>	<p>Go to step 4.</p>
<p>4 CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR. Measure the voltage between engine coolant temperature sensor connector and engine ground.</p> <p>Connector & terminal <i>(E8) No. 2 (+) — Engine ground (-):</i></p>	<p>Is the voltage more than 4 V?</p>	<p>Go to step 5.</p>	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Open circuit in harness between ECM and 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
<p>5</p> <p>CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.</p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Measure the resistance of harness between engine coolant temperature sensor connector and engine ground.</p> <p>Connector & terminal (E8) No. 1 — Engine ground:</p>	<p>Is the resistance less than 5 Ω?</p>	<p>Replace the engine coolant temperature sensor. <Ref. to FU(TURBO)-29, Engine Coolant Temperature Sensor.></p>	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none">• Open circuit in harness between 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

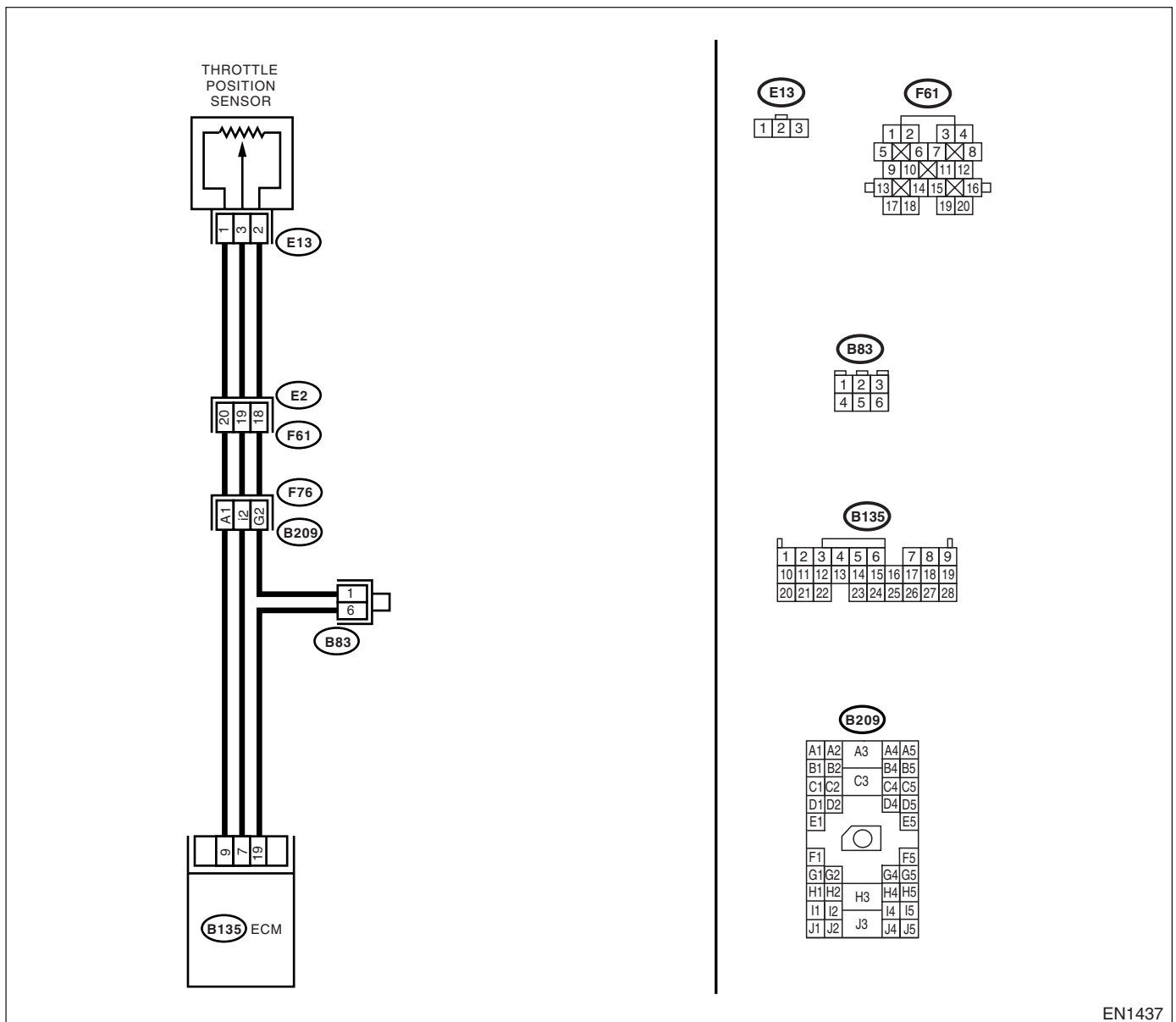
P: DTC P0121 — THROTTLE POSITION SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (HIGH INPUT) —

- **DTC DETECTING CONDITION:**
 - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
 - Erroneous idling
 - Engine stalls.
 - Poor driving performance
 - Fuel is cut.

CAUTION:

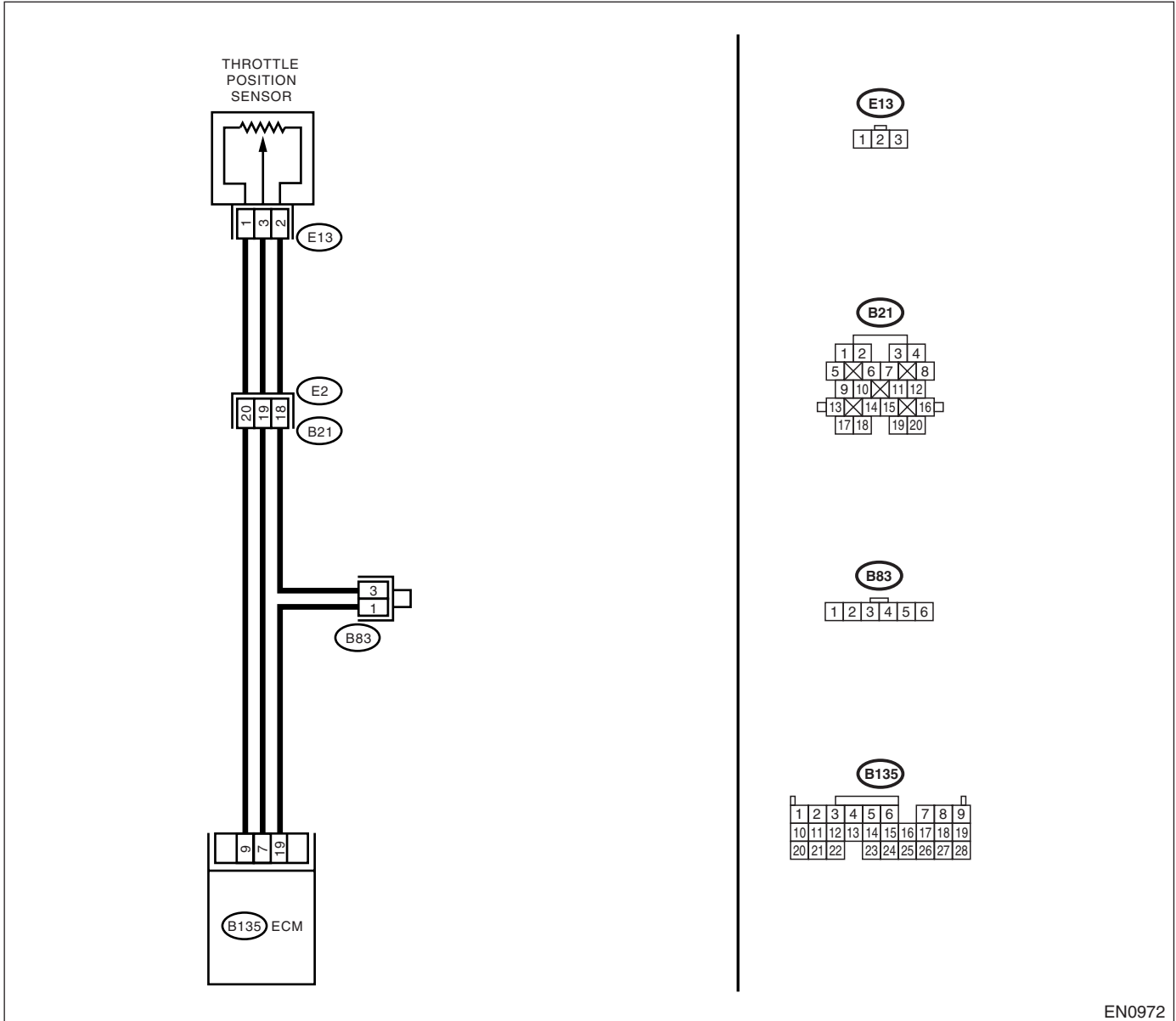
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**
- LHD model



DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC) ENGINE (DIAGNOSTICS)

• RHD model



EN0972

Step	Check	Yes	No	
1	CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(TURBO)-75, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0121.	Replace the throttle position sensor. <Ref. to FU(TURBO)-33, Throttle Position Sensor.>

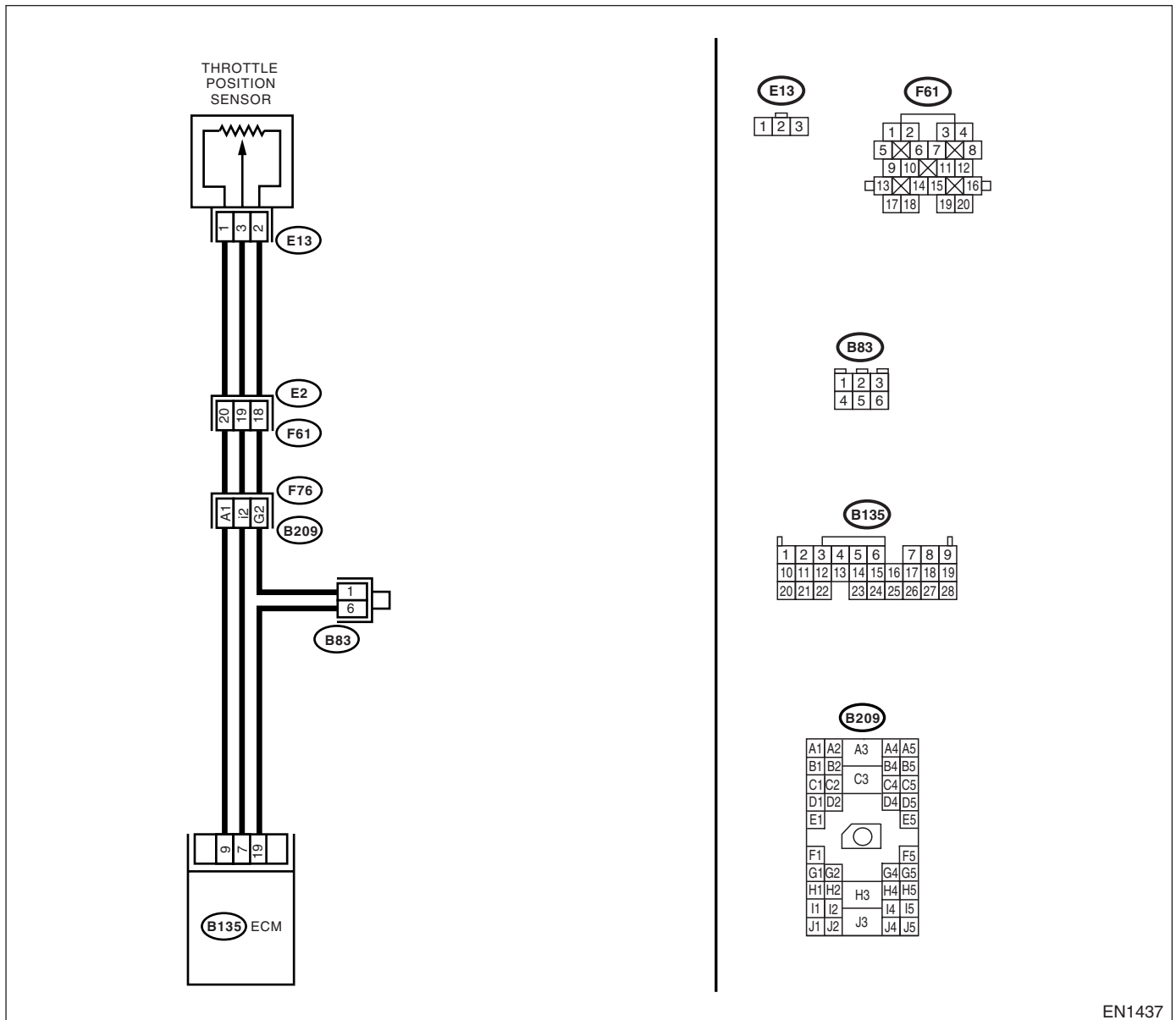
Q: DTC P0122 — THROTTLE POSITION SENSOR CIRCUIT LOW INPUT —

- **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(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

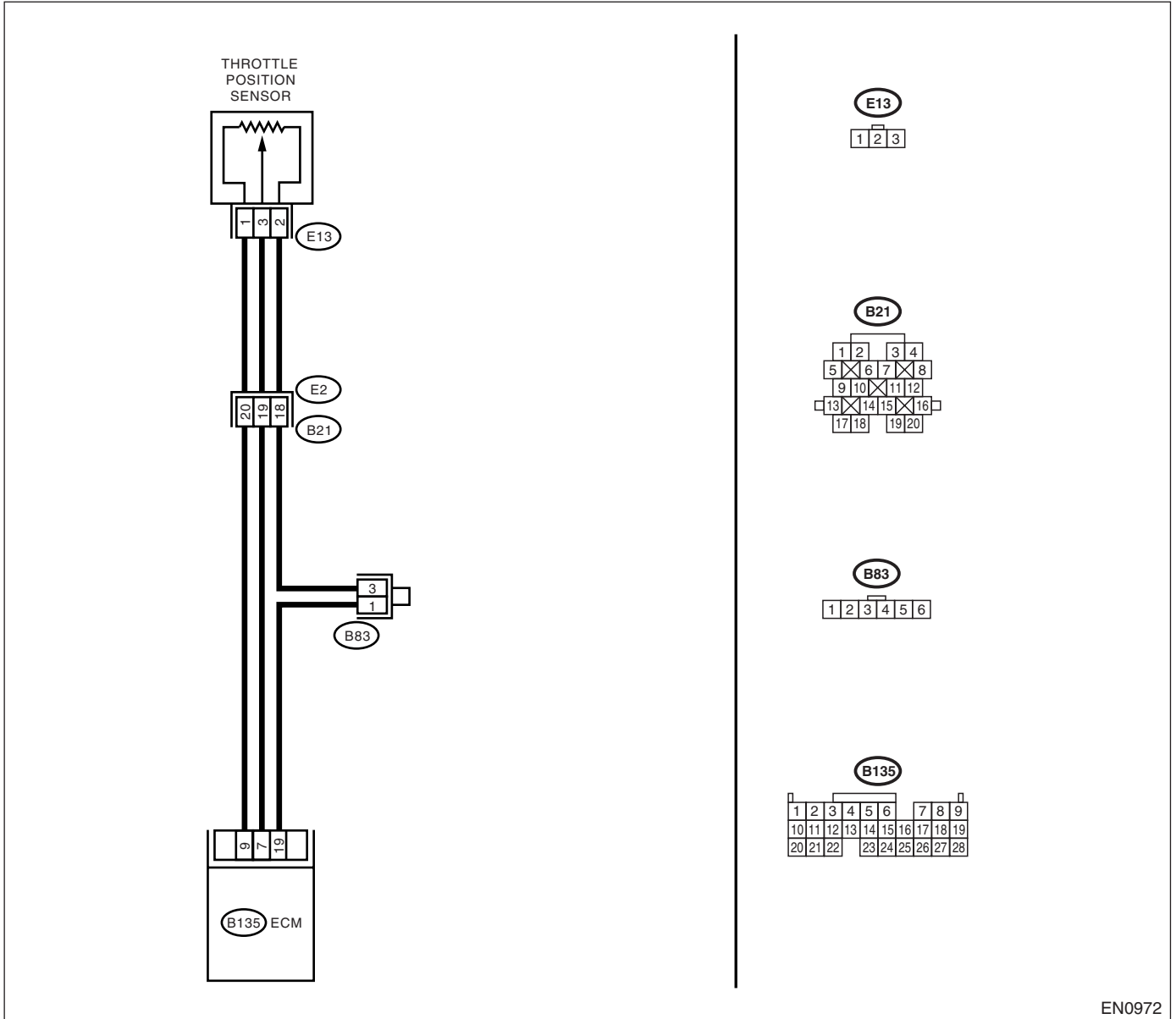
- **WIRING DIAGRAM:**
- LHD model



EN1437

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 the engine. 2) Read the 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(TURBO)-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
2 CHECK INPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground while throttle valve is fully closed. <i>Connector & terminal</i> <i>(B135) No. 9 (+) — Chassis ground (-):</i>	Is the voltage more than 4.5 V?	Go to step 4.	Go to step 3.
3 CHECK INPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground. <i>Connector & terminal</i> <i>(B135) No. 9 (+) — Chassis ground (-):</i>	Does the voltage change more than 4.5 V by shaking harness and connector of ECM while monitoring the value with voltage meter?	Repair the 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 the voltage between ECM connector and chassis ground. <i>Connector & terminal</i> <i>(B135) No. 7 (+) — Chassis ground (-):</i>	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 the 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 the poor contact in ECM connector.	Go to step 6.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>6 CHECK HARNESS BETWEEN ECM AND THROTTLE POSITION SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from throttle position sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between throttle position sensor connector and engine ground. <i>Connector & terminal</i> <i>(E13) No. 1 (+) — Engine ground (-):</i></p>	<p>Is the voltage more than 4.5 V?</p>	<p>Go to step 7.</p>	<p>Repair the harness and connector. NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Open circuit in harness between throttle position sensor and ECM connector • Poor contact in throttle position sensor connector • Poor contact in ECM connector • Poor contact in coupling connector • Poor contact in joint connector
<p>7 CHECK HARNESS BETWEEN ECM AND THROTTLE POSITION SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between ECM connector and throttle position sensor connector. <i>Connector & terminal</i> <i>(B135) No. 7 — (E13) No. 3:</i></p>	<p>Is the resistance less than 1 Ω?</p>	<p>Go to step 8.</p>	<p>Repair the harness and connector. NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Open circuit in harness between throttle position sensor and ECM connector • Poor contact in ECM connector • Poor contact in throttle position sensor connector • Poor contact in coupling connector
<p>8 CHECK HARNESS BETWEEN ECM AND THROTTLE POSITION SENSOR CONNECTOR. Measure the resistance of harness between throttle position sensor connector and engine ground. <i>Connector & terminal</i> <i>(E13) No. 3 — Engine ground:</i></p>	<p>Is the resistance less than 10 Ω?</p>	<p>Repair the ground short circuit in harness between throttle position sensor and ECM connector.</p>	<p>Go to step 9.</p>
<p>9 CHECK POOR CONTACT. Check poor contact in throttle position sensor connector.</p>	<p>Is there poor contact in throttle position sensor connector?</p>	<p>Repair the poor contact in throttle position sensor connector.</p>	<p>Replace the throttle position sensor. <Ref. to FU(TURBO)-33, Throttle Position Sensor.></p>

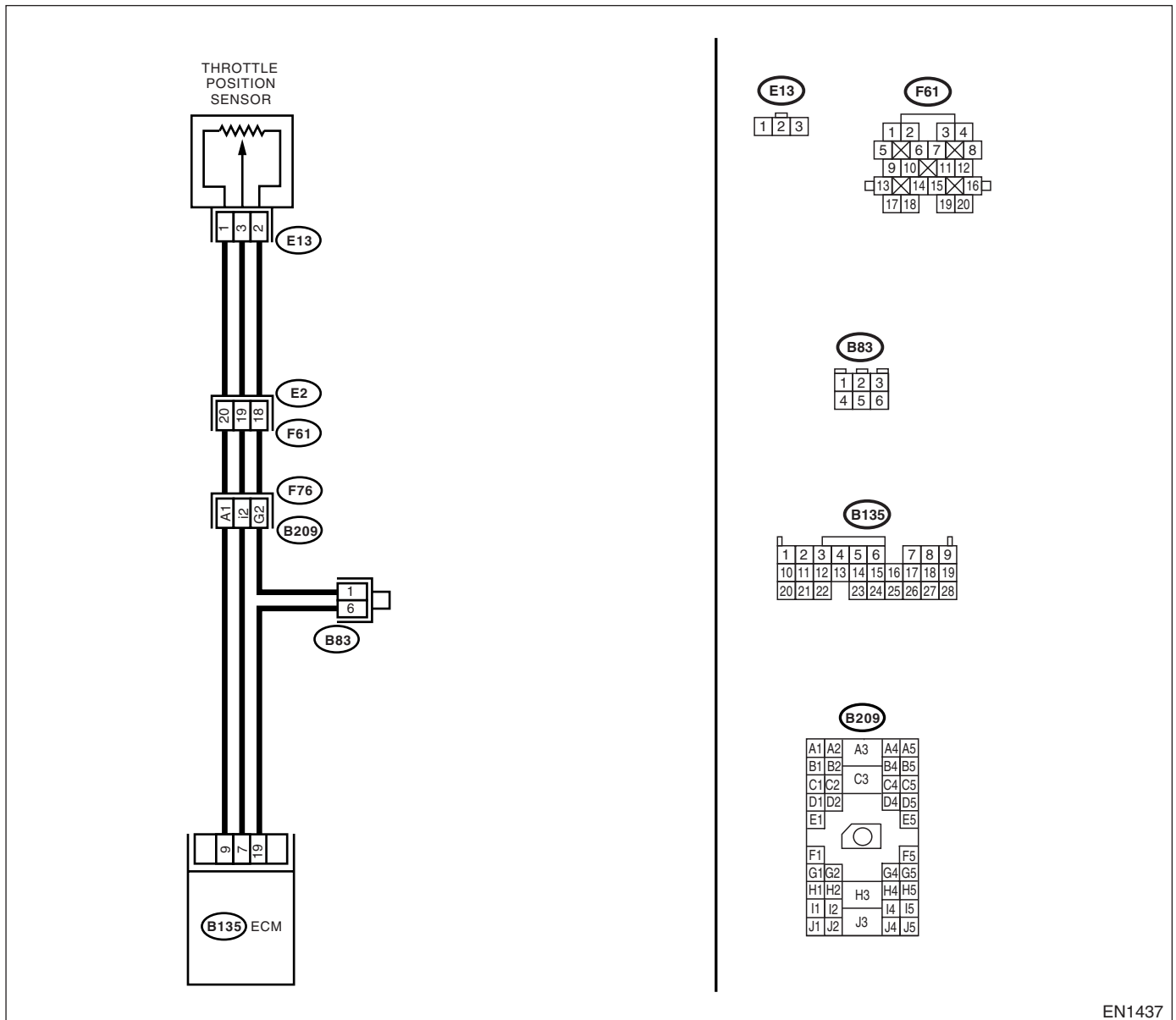
R: DTC P0123 — THROTTLE POSITION SENSOR CIRCUIT HIGH INPUT —

- **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(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

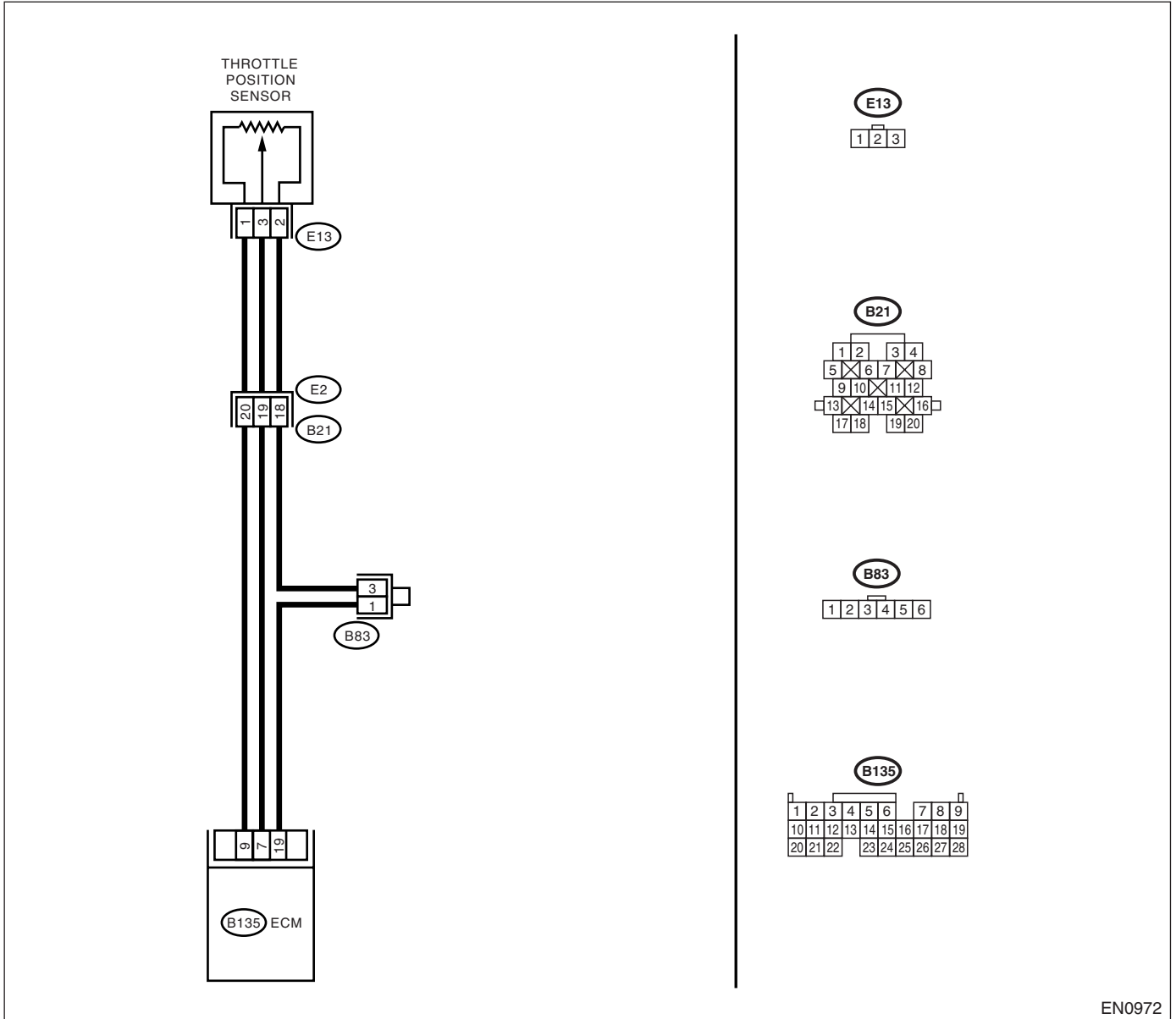
- **WIRING DIAGRAM:**
- LHD model



EN1437

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
<p>1</p> <p>CHECK CURRENT DATA.</p> <p>1)Start the engine. 2)Read the data of throttle position sensor signal using Subaru Select Monitor or OBD-II general scan tool.</p> <p>NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(TURBO)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.</p>	<p>Is the value more than 4.9 V?</p>	<p>Go to step 2.</p>	<p>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.</p> <p>NOTE: In this case, repair the following: • Poor contact in throttle position sensor connector • Poor contact in ECM connector • Poor contact in coupling connector</p>
<p>2</p> <p>CHECK HARNESS BETWEEN THROTTLE POSITION SENSOR AND ECM CONNECTOR.</p> <p>1)Turn the ignition switch to OFF. 2)Disconnect the connector from throttle position sensor. 3)Measure the resistance of harness between throttle position sensor connector and engine ground.</p> <p>Connector & terminal (E13) No. 2 — Engine ground:</p>	<p>Is the resistance less than 5 Ω?</p>	<p>Go to step 3.</p>	<p>Repair the harness and connector.</p> <p>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</p>
<p>3</p> <p>CHECK HARNESS BETWEEN THROTTLE POSITION SENSOR AND ECM CONNECTOR.</p> <p>1)Turn the ignition switch to ON. 2)Measure the voltage between throttle position sensor connector and engine ground.</p> <p>Connector & terminal (E13) No. 3 (+) — Engine ground (-):</p>	<p>Is the voltage more than 4.9 V?</p>	<p>Repair the battery short circuit in harness between throttle position sensor and ECM connector. After repair, replace the ECM. <Ref. to FU(TURBO)-49, Engine Control Module.></p>	<p>Replace the throttle position sensor. <Ref. to FU(TURBO)-33, Throttle Position Sensor.></p>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

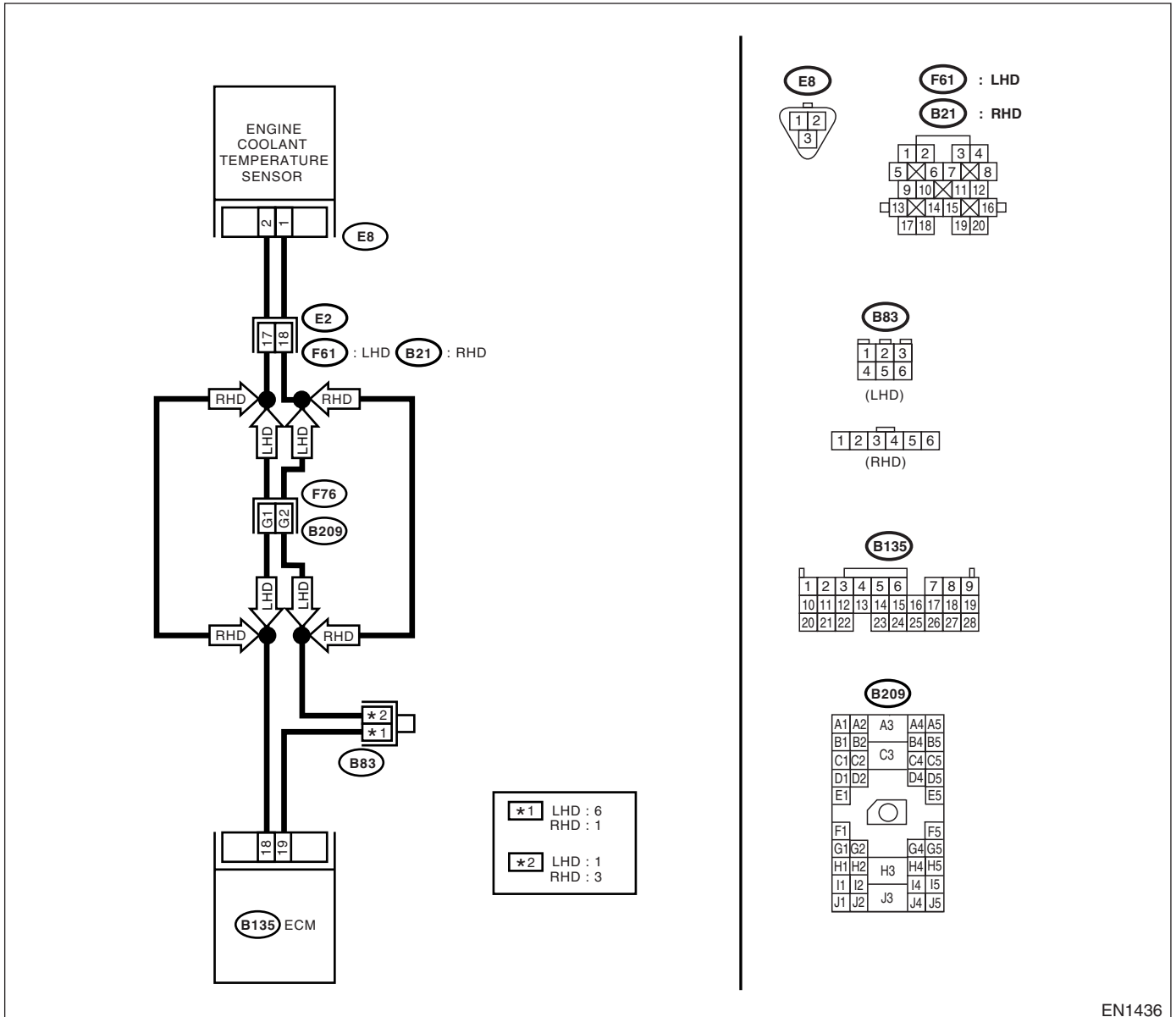
S: DTC P0125 — INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL —

- **DTC DETECTING CONDITION:**
 - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
 - Engine will not return to idling.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**



DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(TURBO)-75, 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. <ul style="list-style-type: none">•Thermostat open stuck•Coolant level•Coolant freeze•Tire diameter	Is there a fault in engine cooling system?	Replace the thermostat. <Ref. to CO-37, Thermostat.>	Replace the engine coolant temperature sensor. <Ref. to FU(TURBO)-29, 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(TURBO)-140, 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) —

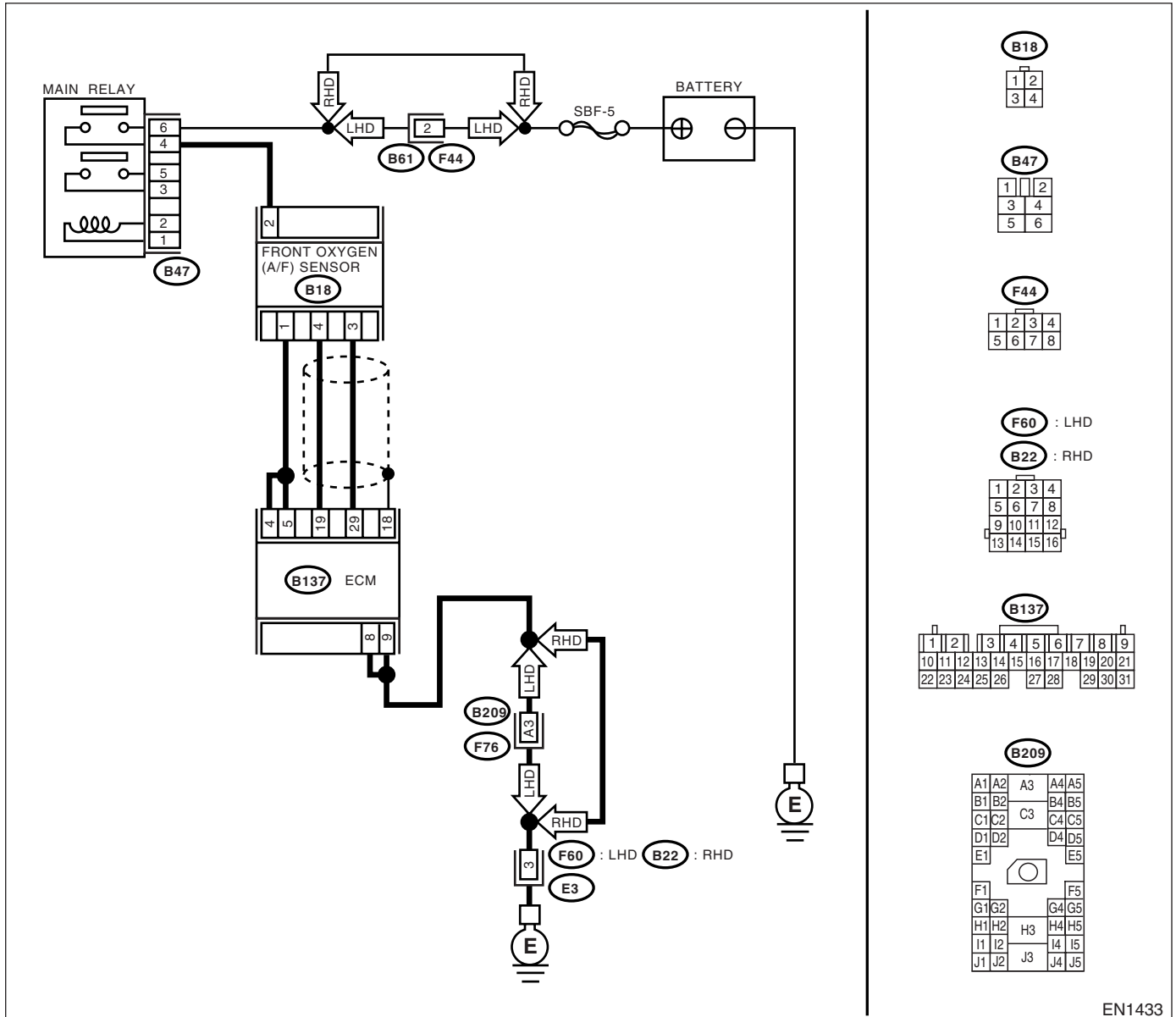
• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

• WIRING DIAGRAM:



EN1433

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No	
1	CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(TURBO)-75, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2	CHECK FRONT (A/F) OXYGEN SENSOR DATA. 1) Start the 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 the 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(TURBO)-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 REAR OXYGEN SENSOR SIGNAL. 1) Race the engine at speeds from idling to 5,000 rpm for a total of 5 cycles. NOTE: To increase the engine speed to 5,000 rpm, slowly depress accelerator pedal, taking approx. 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(TURBO)-34, Subaru Select Monitor.>	Does the LED of {Rear O2 Rich Signal} blink?	Repair the poor contact in front oxygen (A/F) sensor and rear oxygen sensor connector.	Check the rear oxygen sensor circuit. <Ref. to FU(TURBO)-46, Rear Oxygen Sensor.>
4	CHECK EXHAUST SYSTEM. Check the 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 the faulty parts.	Replace the front oxygen (A/F) sensor. <Ref. to FU(TURBO)-44, Front Oxygen (A/F) Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

V: DTC P0133 — FRONT OXYGEN (A/F) SENSOR CIRCUIT SLOW RESPONSE

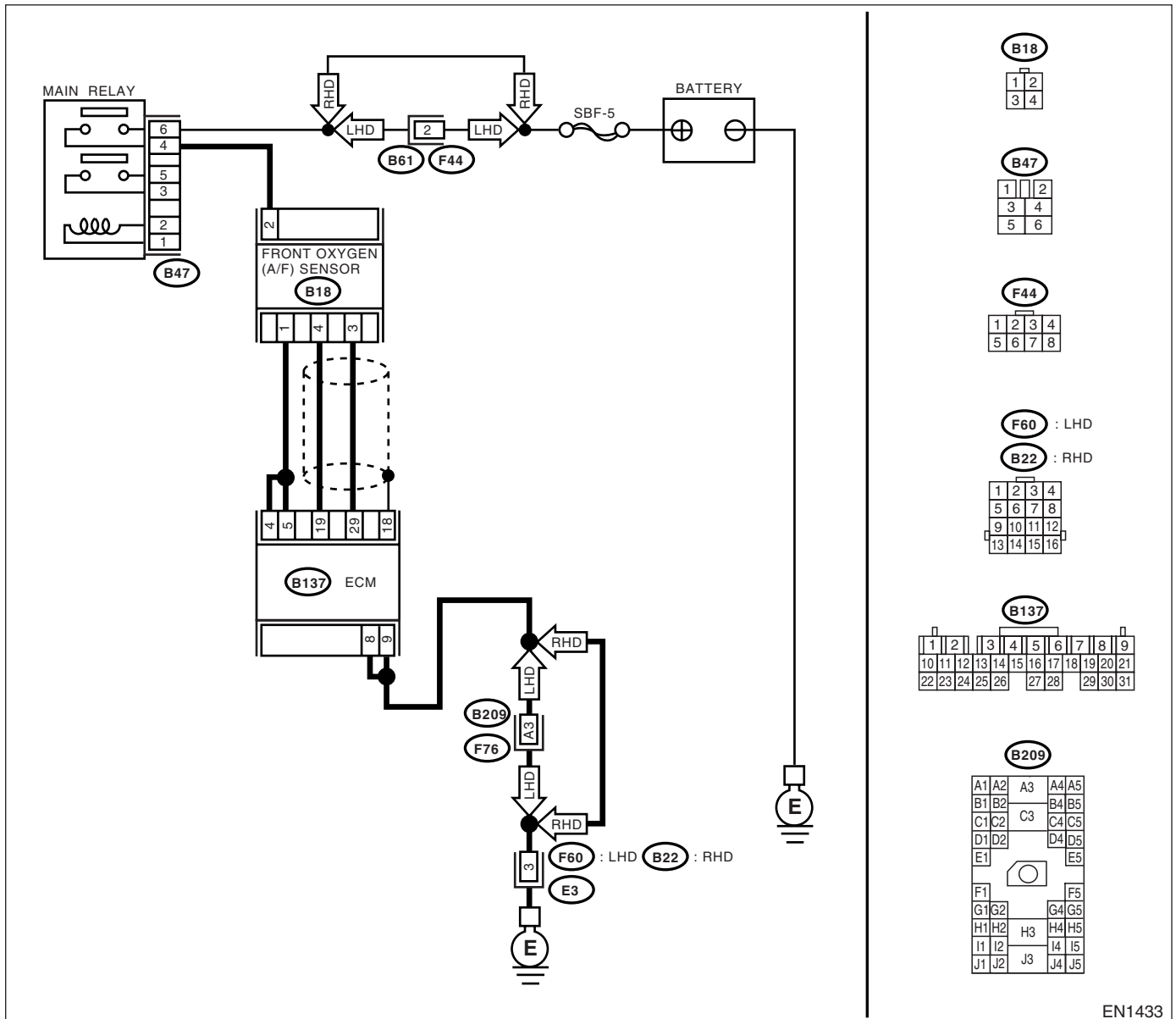
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

WIRING DIAGRAM:



EN1433

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(TURBO)-75, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0133.	Go to step 2.
2 CHECK EXHAUST SYSTEM. NOTE: Check the following items. <ul style="list-style-type: none">•Loose installation of front portion of exhaust pipe onto cylinder heads•Loose connection between front exhaust pipe and front catalytic converter•Damage of exhaust pipe resulting in a hole	Is there a fault in exhaust system?	Repair the exhaust system.	Replace the front oxygen (A/F) sensor. <Ref. to FU(TURBO)-44, Front Oxygen (A/F) Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

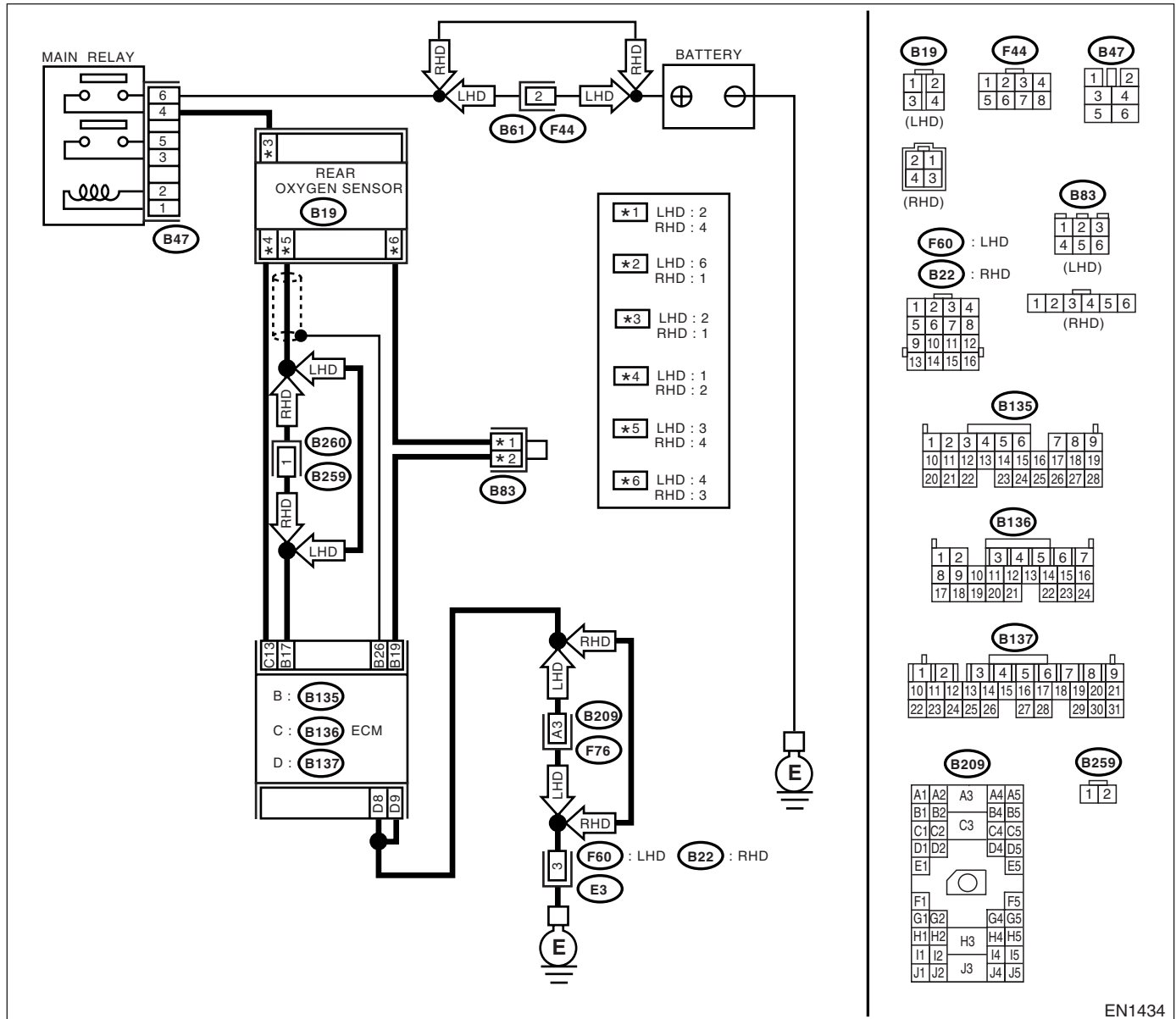
W: DTC P0136 — REAR OXYGEN SENSOR CIRCUIT MALFUNCTION [MT VEHICLES] —

- **DTC DETECTING CONDITION:**
 - Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

• **WIRING DIAGRAM:**



EN1434

Step	Check	Yes	No	
1	CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (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 the DTC P0131 or P0132 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(TURBO)-75, List of Diagnostic Trouble Code (DTC).>	Is the failure cause of P0131 or P0132 in the fuel system?	Check the 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 2 minutes. 2) Read the 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(TURBO)-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 the 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 the rear oxygen sensor. <Ref. to FU(TURBO)-46, Rear Oxygen Sensor.>
5 CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and rear oxygen sensor. 3) Measure the resistance of harness between ECM and rear oxygen sensor connector. Connector & terminal (B135) No. 26 — (B19) No. 4:	Is the resistance more than 3 Ω?	Repair the 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 the ignition switch to OFF. 2) Disconnect the connector from rear oxygen sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between rear oxygen sensor harness connector and engine ground or chassis ground. Connector & terminal (B19) No. 3 (+) — Engine ground (-):	Is the voltage more than 0.2 V?	Replace the rear oxygen sensor. <Ref. to FU(TURBO)-46, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor connector • Poor contact in ECM connector

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
7	CHECK EXHAUST SYSTEM. Check the exhaust system parts. NOTE: Check the following items. <ul style="list-style-type: none">•Loose installation of portions•Damage (crack, hole etc.) of parts•Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor	Is there a fault in exhaust system?	Repair or replace the faulty parts.	Replace the rear oxygen sensor. <Ref. to FU(TURBO)-46, Rear Oxygen Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC) ENGINE (DIAGNOSTICS)

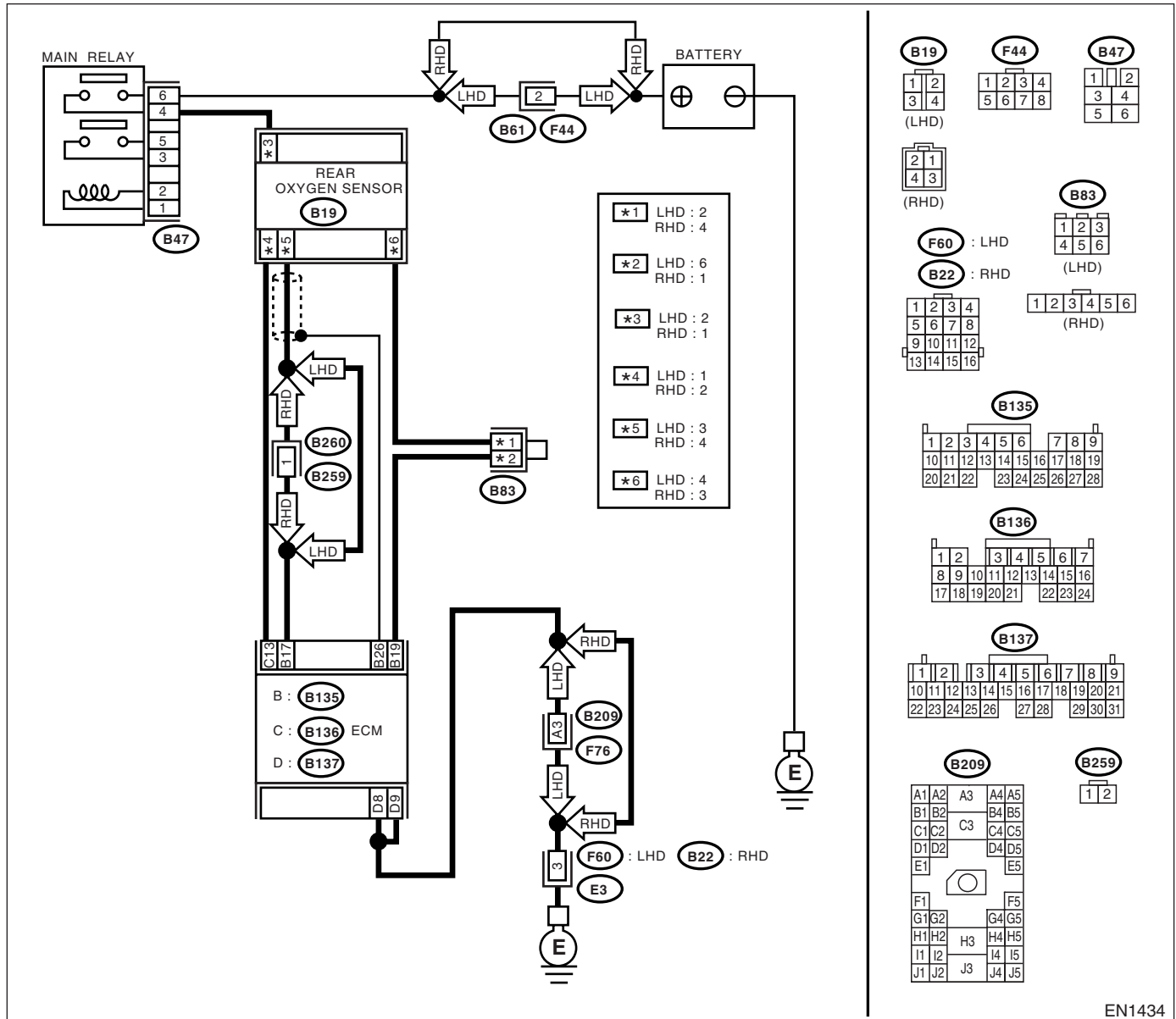
X: DTC P0137 — REAR OXYGEN SENSOR CIRCUIT LOW INPUT [AT VEHICLES] —

- DTC DETECTING CONDITION:
 - Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

• WIRING DIAGRAM:



EN1434

Step	Check	Yes	No	
1	CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (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 the DTC P0131 or P0132 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(TURBO)-75, List of Diagnostic Trouble Code (DTC).>	Is the failure cause of P0131 or P0132 in the fuel system?	Check the fuel system. NOTE: In this case, it is not necessary to inspect DTC P0137.	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 2 minutes. 2) Read the 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(TURBO)-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 the 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 the rear oxygen sensor. <Ref. to FU(TURBO)-46, Rear Oxygen Sensor.>
5 CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and rear oxygen sensor. 3) Measure the resistance of harness between ECM and rear oxygen sensor connector. Connector & terminal (B135) No. 26 — (B19) No. 4:	Is the resistance more than 3 Ω?	Repair the 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 the ignition switch to OFF. 2) Disconnect the connector from rear oxygen sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between rear oxygen sensor harness connector and engine ground or chassis ground. Connector & terminal (B19) No. 3 (+) — Engine ground (-):	Is the voltage more than 0.2 V?	Replace the rear oxygen sensor. <Ref. to FU(TURBO)-46, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor connector • Poor contact in ECM connector

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
7	CHECK EXHAUST SYSTEM. Check the exhaust system parts. NOTE: Check the following items. <ul style="list-style-type: none">•Loose installation of portions•Damage (crack, hole etc.) of parts•Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor	Is there a fault in exhaust system?	Repair or replace the faulty parts.	Replace the rear oxygen sensor. <Ref. to FU(TURBO)-46, Rear Oxygen Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC) ENGINE (DIAGNOSTICS)

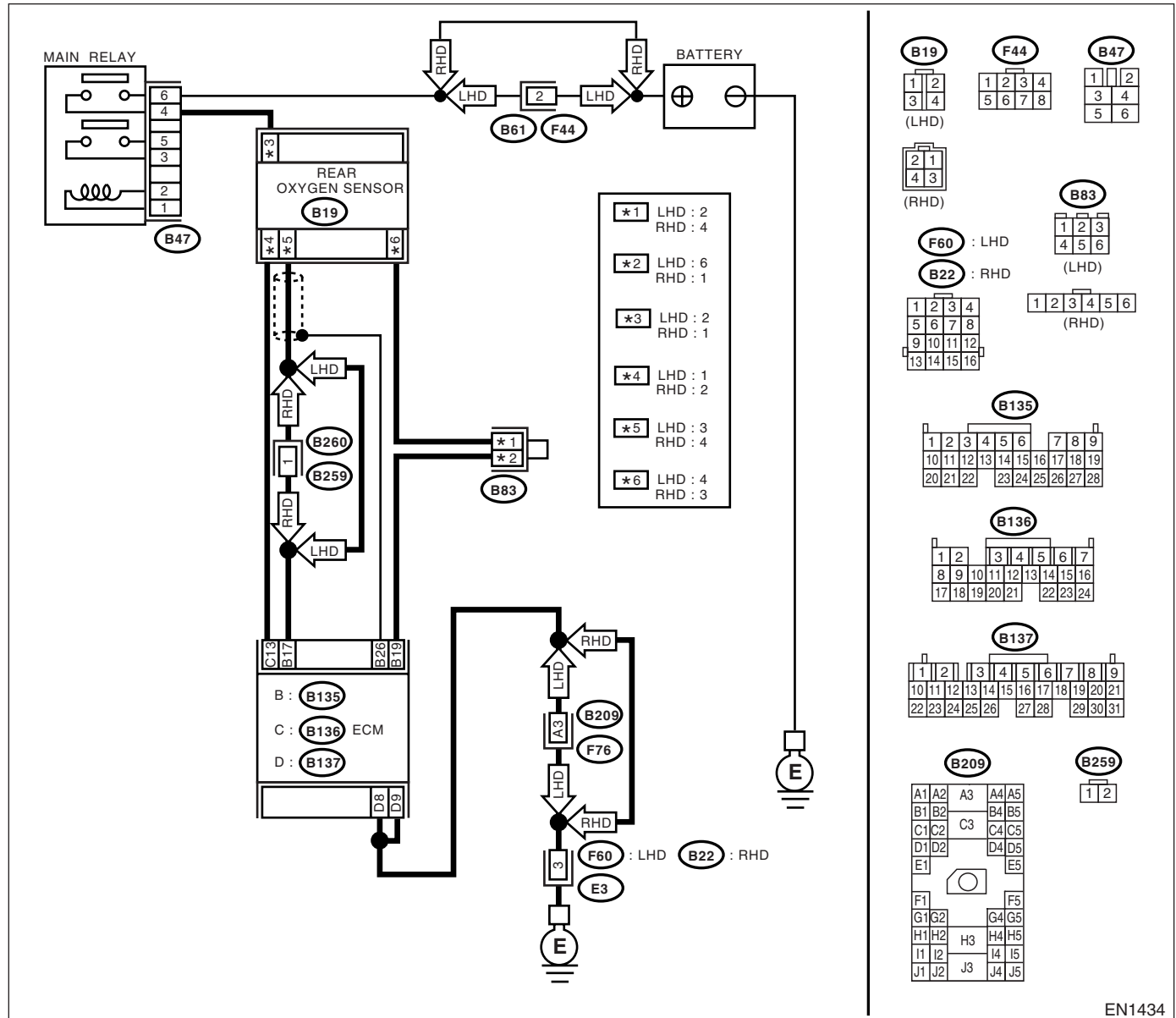
Y: DTC P0138 — REAR OXYGEN SENSOR CIRCUIT HIGH INPUT [AT VEHICLES] —

- DTC DETECTING CONDITION:
 - Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

• WIRING DIAGRAM:



EN1434

Step	Check	Yes	No	
1	CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (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 the DTC P0131 or P0132 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(TURBO)-75, List of Diagnostic Trouble Code (DTC).>	Is the failure cause of P0131 or P0132 in the fuel system?	Check the fuel system. NOTE: In this case, it is not necessary to inspect DTC P0138.	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 2 minutes. 2) Read the 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(TURBO)-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 the 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 the rear oxygen sensor. <Ref. to FU(TURBO)-46, Rear Oxygen Sensor.>
5 CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and rear oxygen sensor. 3) Measure the resistance of harness between ECM and rear oxygen sensor connector. Connector & terminal (B135) No. 26 — (B19) No. 4:	Is the resistance more than 3 Ω?	Repair the 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 the ignition switch to OFF. 2) Disconnect the connector from rear oxygen sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between rear oxygen sensor harness connector and engine ground or chassis ground. Connector & terminal (B19) No. 3 (+) — Engine ground (-):	Is the voltage more than 0.2 V?	Replace the rear oxygen sensor. <Ref. to FU(TURBO)-46, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor connector • Poor contact in ECM connector

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
7	CHECK EXHAUST SYSTEM. Check the exhaust system parts. NOTE: Check the following items. <ul style="list-style-type: none">•Loose installation of portions•Damage (crack, hole etc.) of parts•Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor	Is there a fault in exhaust system?	Repair or replace the faulty parts.	Replace the rear oxygen sensor. <Ref. to FU(TURBO)-46, Rear Oxygen Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

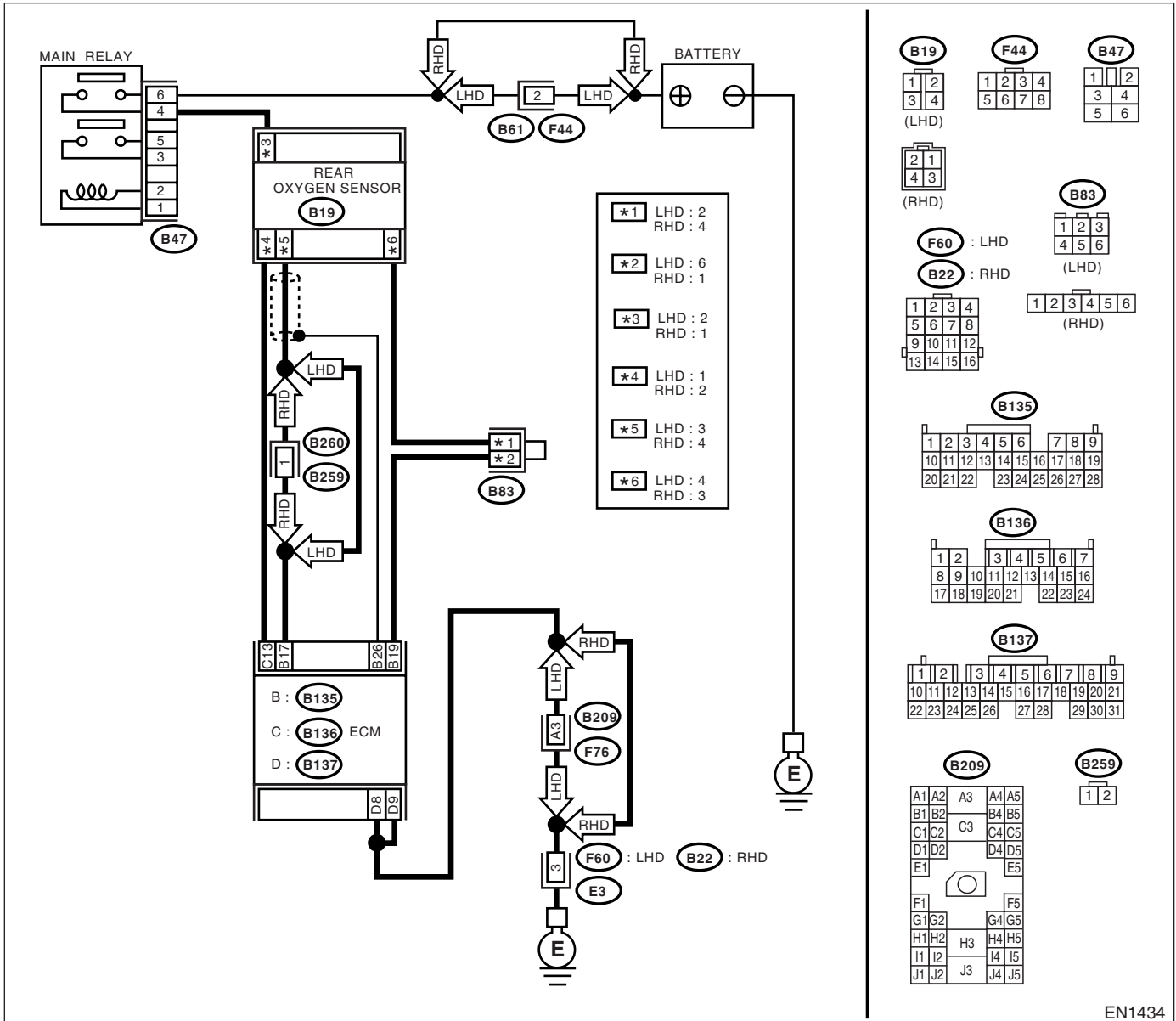
Z: DTC P0139 — REAR OXYGEN SENSOR CIRCUIT SLOW RESPONSE —

- DTC DETECTING CONDITION:
 - Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

• WIRING DIAGRAM:



EN1434

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.	In any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(TURBO)-75, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0139.	Replace the rear oxygen sensor. <Ref. to FU(TURBO)-46, Rear Oxygen Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

AA:DTC P0171 — FUEL TRIM MALFUNCTION (A/F TOO LEAN) —

NOTE:

For the diagnostic procedure, refer to DTC P0172. <Ref. to EN(TURBO)-159, DTC P0172 — FUEL TRIM MALFUNCTION (A/F TOO RICH) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

AB: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(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

Step	Check	Yes	No	
1	CHECK EXHAUST SYSTEM.	Are there holes or loose bolts on exhaust system?	Repair the 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 the 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 the fuel pressure. (1) Disconnect the connector from fuel pump relay. (2) Start the engine and run it until it stalls. (3) After the engine stalls, crank it for 5 more seconds. (4) Turn the ignition switch to OFF. 2)Connect the connector to fuel pump relay. 3)Disconnect the fuel delivery hose from fuel filter, and connect fuel pressure gauge. 4)Install the fuel filler cap. 5)Start the engine and idle while gear position is neutral. 6)Measure the fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold. Warning: Before removing the fuel pressure gauge, release fuel pressure. NOTE: If the fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again.	Is the fuel pressure between 284 — 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
<p>4</p> <p>CHECK FUEL PRESSURE. After connecting the pressure regulator vacuum hose, measure fuel pressure.</p> <p>Warning: Before removing the fuel pressure gauge, release fuel pressure.</p> <p>NOTE: •If the fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again. •If out of specification as measured at this step, check or replace the pressure regulator and pressure regulator vacuum hose.</p>	<p>Is the fuel pressure between 206 — 235 kPa (2.1 — 2.4 kg/cm², 30 — 34 psi)?</p>	<p>Go to step 5.</p>	<p>Repair the following items. Fuel pressure too high:</p> <ul style="list-style-type: none"> • Faulty pressure regulator • Clogged fuel return line or bent hose <p>Fuel pressure too low:</p> <ul style="list-style-type: none"> • Faulty pressure regulator • Improper fuel pump discharge • Clogged fuel supply line 	
<p>5</p> <p>CHECK ENGINE COOLANT TEMPERATURE SENSOR. 1)Start the engine and warm-up completely. 2)Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool.</p> <p>NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(TURBO)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.</p>	<p>Is the temperature greater than 60°C (140°F)?</p>	<p>Go to step 6.</p>	<p>Replace the engine coolant temperature sensor. <Ref. to FU(TURBO)-29, Engine Coolant Temperature Sensor.></p>	
<p>6</p> <p>CHECK INTAKE MANIFOLD PRESSURE SENSOR. 1)Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F). 2)Place the shift lever in neutral position. 3)Turn the A/C switch to OFF. 4)Turn all accessory switches to OFF. 5)Read the data of intake manifold pressure sensor signal using Subaru Select Monitor or OBD-II general scan tool.</p> <p>NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(TURBO)-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</p> <p>Ignition ON 73.3 — 106.6 kPa (550 — 800 mmHg, 21.65 — 31.50 inHg)</p> <p>Idling 24.0 — 41.3 kPa (180 — 310 mmHg, 7.09 — 12.20 inHg)</p>	<p>Is the value within the specifications?</p>	<p>Go to step 7.</p>	<p>Replace the mass air flow and intake manifold pressure sensor. <Ref. to FU(TURBO)-34, Mass Air Flow and Intake Air Temperature Sensor.></p>	

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
7	<p>CHECK INTAKE AIR TEMPERATURE SENSOR.</p> <p>1)Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F).</p> <p>2)Place the shift lever in neutral position.</p> <p>3)Turn the A/C switch to OFF.</p> <p>4)Turn all accessory switches to OFF.</p> <p>5)Open the front hood.</p> <p>6)Measure the ambient temperature.</p> <p>7)Read the data of intake manifold pressure sensor signal using Subaru Select Monitor or OBD-II general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none">•Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(TURBO)-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 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 the mass air flow and intake air temperature sensor. <Ref. to FU(TURBO)-34, Mass Air Flow and Intake Air Temperature Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

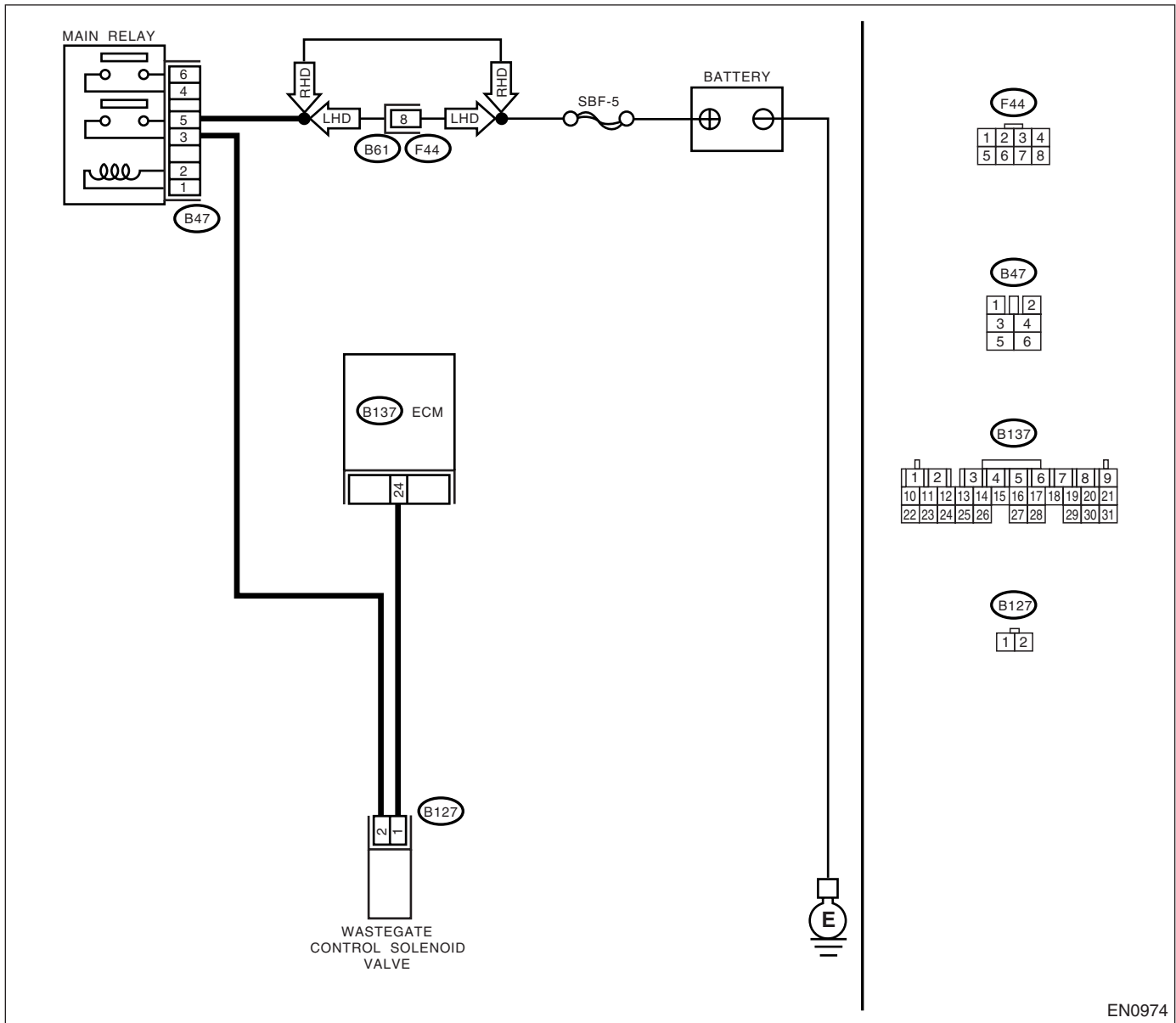
AC:DTC P0244 — WASTEGATE CONTROL SOLENOID VALVE MALFUNCTION (HIGH INPUT) [MT VEHICLES] —

- **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(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN0974

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(TURBO)-75, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0244.	Replace the wastegate control solenoid valve. <Ref. to FU(TURBO)-43, Wastegate Control Solenoid Valve.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

AD:DTC P0244 — WASTEGATE CONTROL SOLENOID VALVE MALFUNCTION (FAIL-SAFE) [AT VEHICLES] —

• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

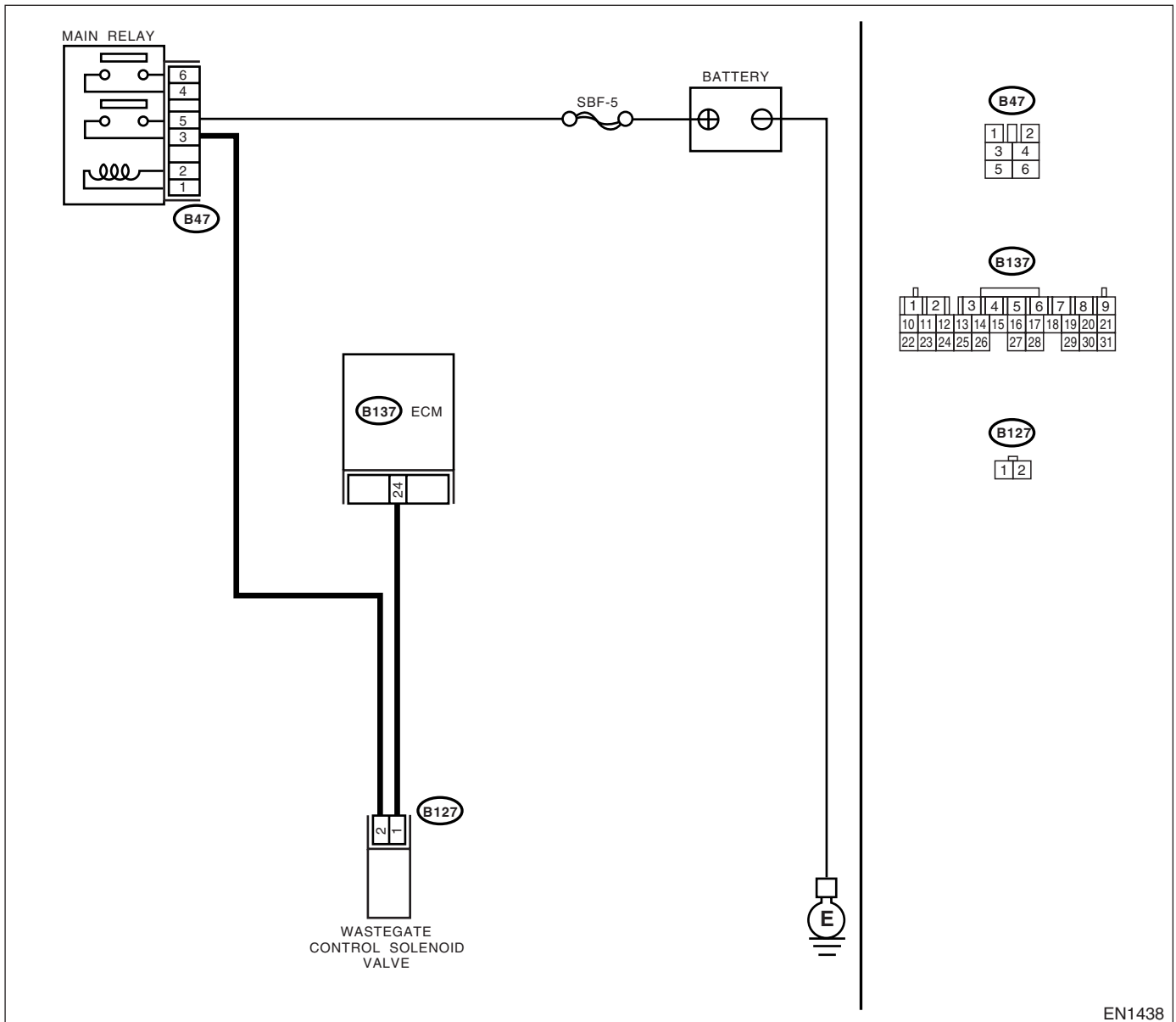
• TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

• WIRING DIAGRAM:



DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(TURBO)-75, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0244.	Replace the wastegate control solenoid valve. <Ref. to FU(TURBO)-43, Wastegate Control Solenoid Valve.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

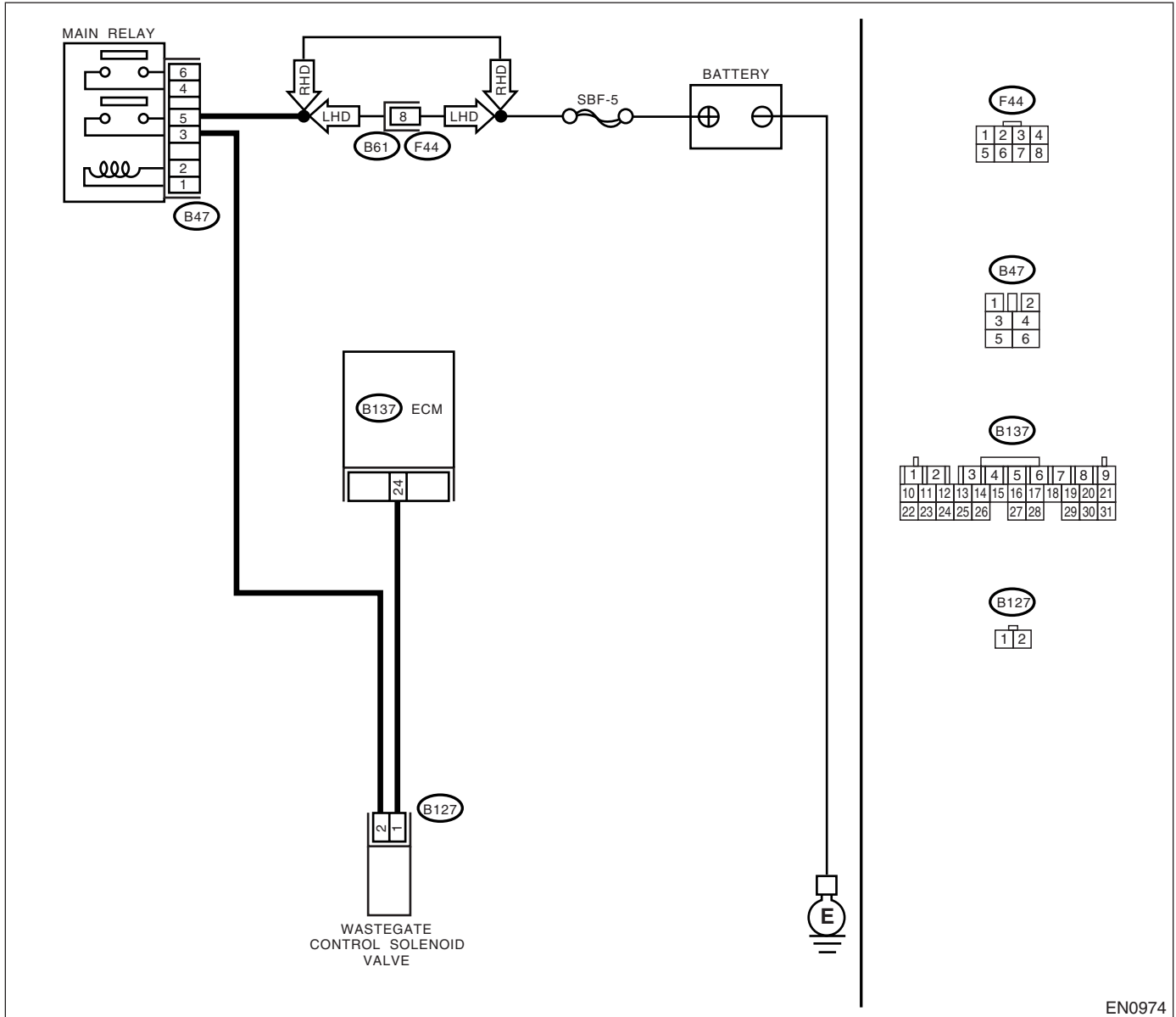
AE:DTC P0245 — WASTEGATE CONTROL SOLENOID VALVE CIRCUIT LOW INPUT —

- **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(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, 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 the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. <i>Connector & terminal</i> <i>(B137) No. 24 (+) — Chassis ground (-):</i>	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 service. 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 the ignition switch to OFF. 2) Disconnect the connectors from wastegate control solenoid valve and ECM. 3) Measure the resistance of harness between wastegate control solenoid valve connector and engine ground. <i>Connector & terminal</i> <i>(B127) No. 1 — Engine ground:</i>	Is the resistance less than 10 Ω ?	Repair the 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 the resistance of harness between ECM and wastegate control solenoid valve of harness connector. <i>Connector & terminal</i> <i>(B137) No. 24 — (B127) No. 1:</i>	Is the resistance less than 1 Ω ?	Go to step 4.	Repair the open circuit in harness between ECM and wastegate control solenoid valve connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between ECM and wastegate control solenoid valve connector
4 CHECK WASTEGATE CONTROL SOLENOID VALVE. 1) Remove the purge control solenoid valve. 2) Measure the resistance between purge control solenoid valve terminals. <i>Terminals</i> <i>No. 1 — No. 2:</i>	Is the resistance between 30 and 34 Ω ?	Go to step 5.	Replace the wastegate control solenoid valve. <Ref. to FU(TURBO)-43, Wastegate Control Solenoid Valve.>
5 CHECK POWER SUPPLY TO WASTEGATE CONTROL SOLENOID VALVE. 1) Turn the ignition switch to ON. 2) Measure the voltage between wastegate control solenoid valve and engine ground. <i>Connector & terminal</i> <i>(B127) No. 2 (+) — Engine ground (-):</i>	Is the voltage more than 10 V?	Go to step 6.	Repair the 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 the poor contact in wastegate control solenoid valve connector.	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)

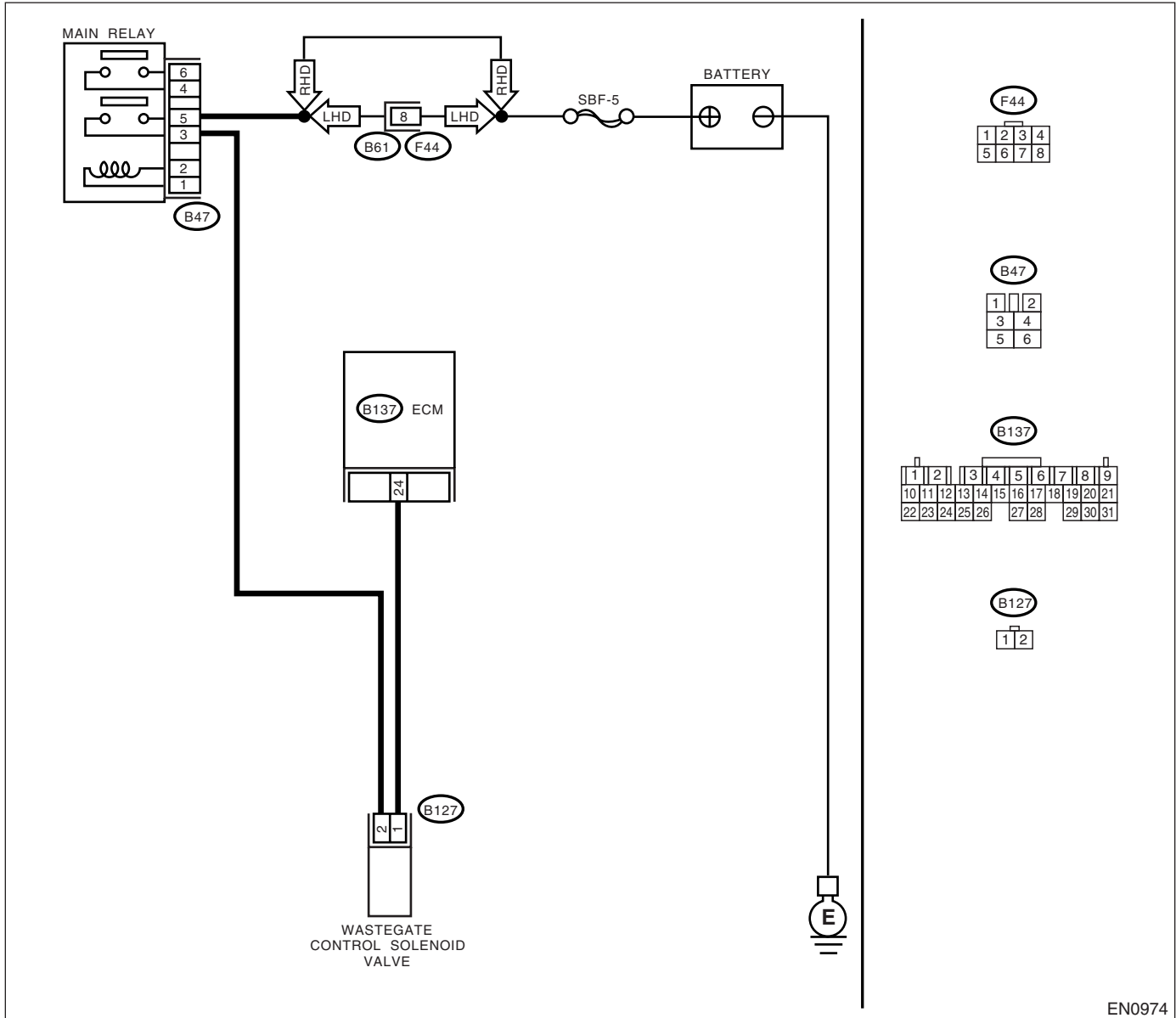
AF:DTC P0246 — WASTEGATE CONTROL SOLENOID VALVE CIRCUIT HIGH INPUT —

- **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(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

• **WIRING DIAGRAM:**



EN0974

Step	Check	Yes	No	
1	<p>CHECK OUTPUT SIGNAL FROM ECM.</p> <p>1) Turn the ignition switch to ON.</p> <p>2) Measure the voltage between ECM and chassis ground.</p> <p>Connector & terminal (B137) No. 24 (+) — Chassis ground (-):</p>	Is the voltage more than 10 V?	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 connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(TURBO)-49, Engine Control Module.>
3 CHECK HARNESS BETWEEN WASTEGATE CONTROL SOLENOID VALVE AND ECM CONNECTOR. 1)Turn the ignition switch to OFF. 2)Disconnect the connector from wastegate control solenoid valve. 3)Turn the ignition switch to ON. 4)Measure the voltage between ECM and chassis ground. Connector & terminal (B137) No. 24 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Repair the battery short circuit in harness between ECM and wastegate control solenoid valve connector. After repair, replace the ECM. <Ref. to FU(TURBO)-49, Engine Control Module.>	Go to step 4.
4 CHECK WASTEGATE CONTROL SOLENOID VALVE. 1)Turn the ignition switch to OFF. 2)Measure the resistance between wastegate control solenoid valve terminals. Terminals No. 1 — No. 2:	Is the resistance less than 1 Ω ?	Replace the wastegate control solenoid valve <Ref. to FU(TURBO)-43, Wastegate Control Solenoid Valve.> and ECM <Ref. to FU(TURBO)-49, 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 the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(TURBO)-49, Engine Control Module.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

AG:DTC P0301 — CYLINDER 1 MISFIRE DETECTED —

NOTE:

For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(TURBO)-173, DTC P0304 — CYLINDER 4 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AH:DTC P0302 — CYLINDER 2 MISFIRE DETECTED —

NOTE:

For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(TURBO)-173, DTC P0304 — CYLINDER 4 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AI: DTC P0303 — CYLINDER 3 MISFIRE DETECTED —

NOTE:

For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(TURBO)-173, DTC P0304 — CYLINDER 4 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AJ: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

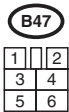
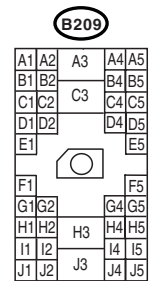
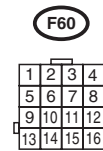
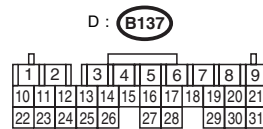
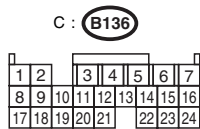
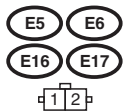
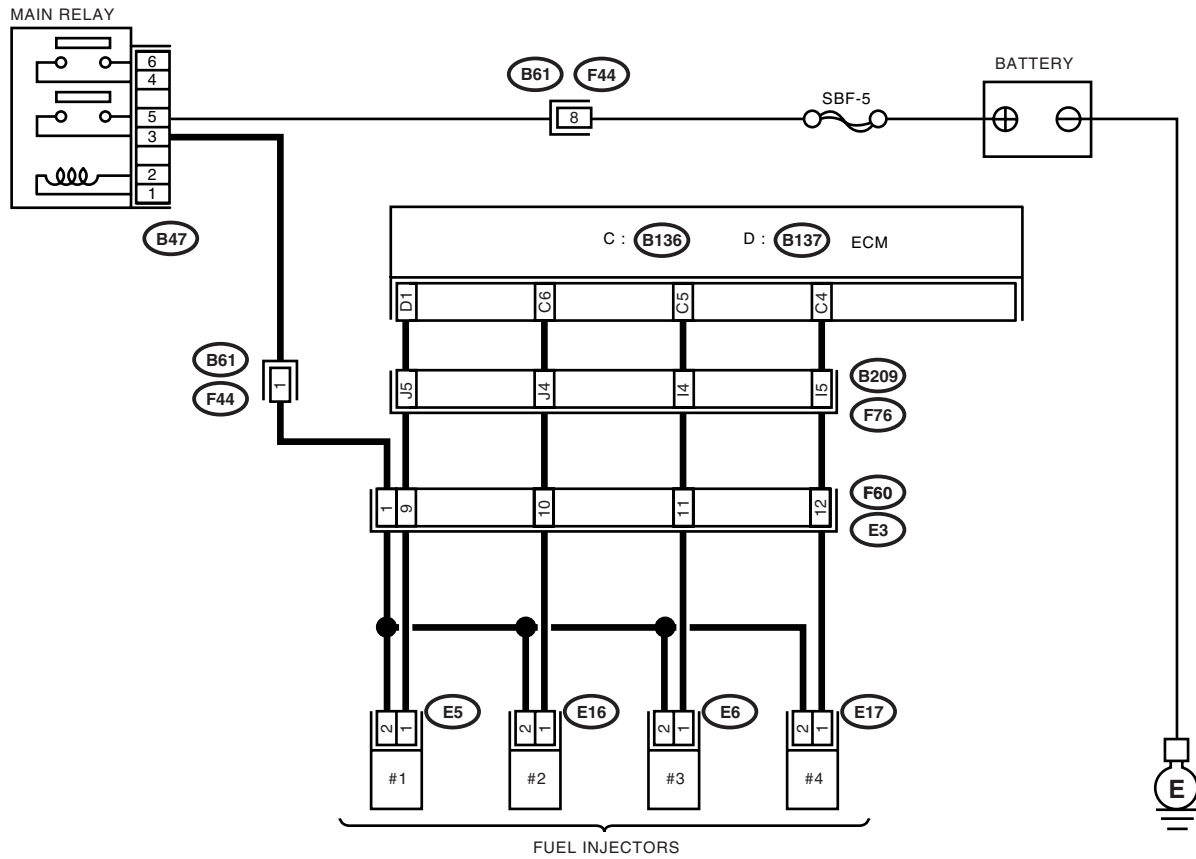
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

• **WIRING DIAGRAM:**

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC) ENGINE (DIAGNOSTICS)

- LHD model

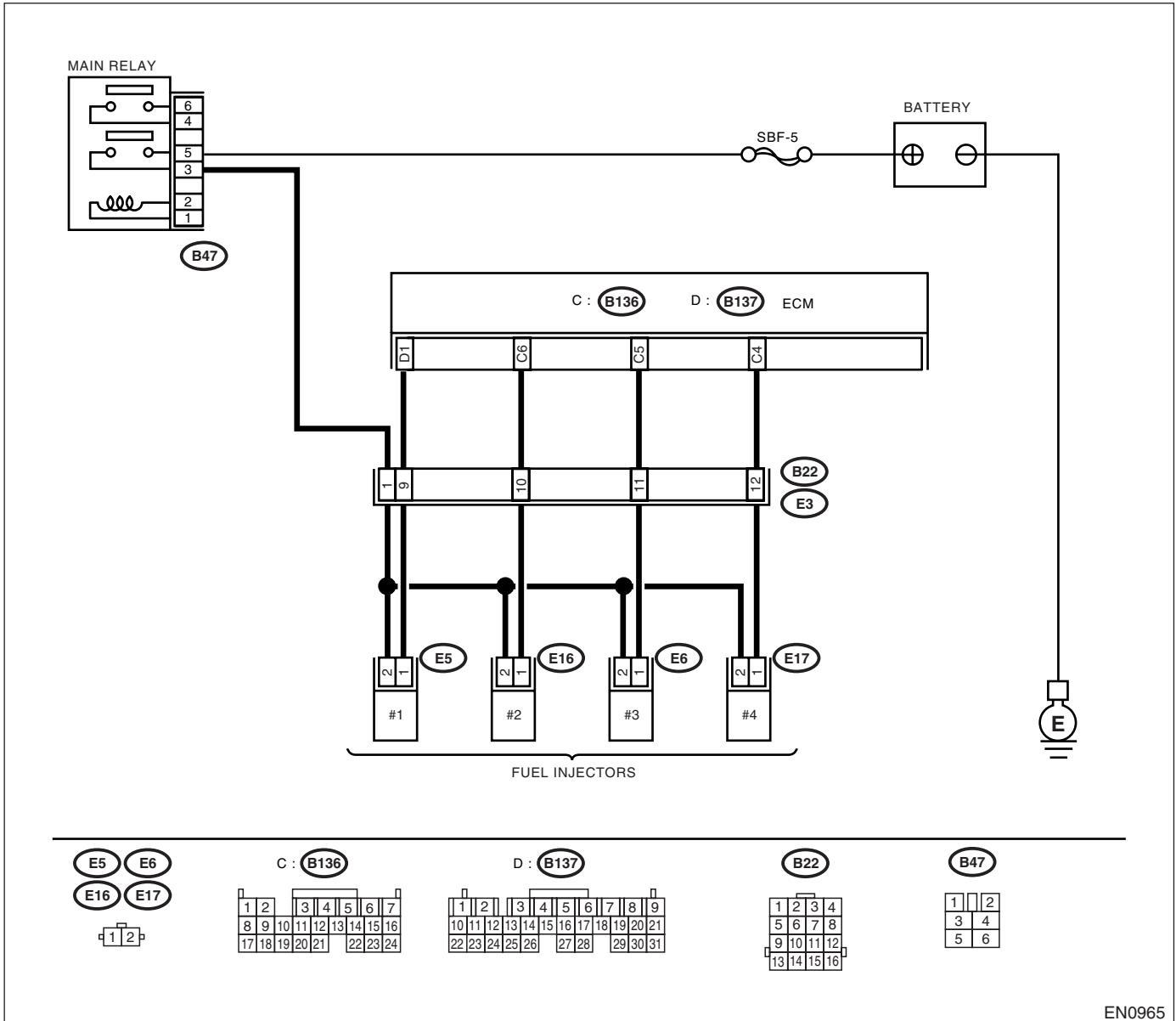


EN1432

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

• RHD model



EN0965

Step	Check	Yes	No
1	CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.	Is any other DTC displayed? Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(TURBO)-75, 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.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>2</p> <p>CHECK OUTPUT SIGNAL FROM ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector and chassis ground on faulty cylinders.</p> <p>Connector & terminal #1 (B137) No. 1 (+) — Chassis ground (-): #2 (B136) No. 6 (+) — Chassis ground (-): #3 (B136) No. 5 (+) — Chassis ground (-): #4 (B136) No. 4 (+) — Chassis ground (-):</p>	Is the voltage more than 10 V?	Go to step 7.	Go to step 3.
<p>3</p> <p>CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel injector on faulty cylinders. 3) Disconnect the connector from ECM. 4) Measure the resistance between ECM connector and engine ground on faulty cylinders.</p> <p>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:</p>	Is the resistance less than 10 Ω ?	Repair the ground short circuit in harness between fuel injector and ECM connector.	Go to step 4.
<p>4</p> <p>CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR. Measure the resistance of harness connector between ECM connector and fuel injector on faulty cylinders.</p> <p>Connector & terminal #1 (B137) No. 1 — (E5) No. 1: #2 (B136) No. 6 — (E16) No. 1: #3 (B136) No. 5 — (E6) No. 1: #4 (B136) No. 4 — (E17) No. 1:</p>	Is the resistance less than 1 Ω ?	Go to step 5.	Repair the 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
<p>5</p> <p>CHECK FUEL INJECTOR. Measure the resistance between fuel injector terminals on faulty cylinder.</p> <p>Terminals No. 1 — No. 2:</p>	Is the resistance between 5 and 20 Ω ?	Go to step 6.	Replace the faulty fuel injector. <Ref. to FU(TURBO)-37, Fuel Injector.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>6</p> <p>CHECK POWER SUPPLY LINE. 1) Turn the ignition switch to ON. 2) Measure the voltage between fuel injector and engine ground on faulty cylinders.</p> <p>Connector & terminal #1 (E5) No. 2 (+) — Engine ground (-): #2 (E16) No. 2 (+) — Engine ground (-): #3 (E6) No. 2 (+) — Engine ground (-): #4 (E17) No. 2 (+) — Engine ground (-):</p>	<p>Is the voltage more than 10 V?</p>	<p>Repair the poor contact in all connectors in fuel injector circuit.</p>	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Open circuit in harness between 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
<p>7</p> <p>CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel injector on faulty cylinder. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM connector and chassis ground on faulty cylinders.</p> <p>Connector & terminal #1 (B137) No. 1 (+) — Chassis ground (-): #2 (B136) No. 6 (+) — Chassis ground (-): #3 (B136) No. 5 (+) — Chassis ground (-): #4 (B136) No. 4 (+) — Chassis ground (-):</p>	<p>Is the voltage more than 10 V?</p>	<p>Repair the battery short circuit in harness between ECM and fuel injector. After repair, replace the ECM. <Ref. to FU(TURBO)-49, Engine Control Module.></p>	<p>Go to step 8.</p>
<p>8</p> <p>CHECK FUEL INJECTOR. 1) Turn the ignition switch to OFF. 2) Measure the resistance between fuel injector terminals on faulty cylinder.</p> <p>Terminals No. 1 — No. 2:</p>	<p>Is the resistance less than 1 Ω?</p>	<p>Replace the faulty fuel injector <Ref. to FU(TURBO)-37, Fuel Injector.> and ECM <Ref. to FU(TURBO)-49, Engine Control Module.></p>	<p>Go to step 9.</p>
<p>9</p> <p>CHECK INSTALLATION OF CAMSHAFT POSITION SENSOR/CRANKSHAFT POSITION SENSOR.</p>	<p>Is the camshaft position sensor or crankshaft position sensor loosely installed?</p>	<p>Tighten the camshaft position sensor or crankshaft position sensor.</p>	<p>Go to step 10.</p>
<p>10</p> <p>CHECK CRANKSHAFT SPROCKET. Remove the timing belt cover.</p>	<p>Is the crankshaft sprocket rusted or does it have broken teeth?</p>	<p>Replace the crankshaft sprocket. <Ref. to ME(TURBO)-58, Crankshaft Sprocket.></p>	<p>Go to step 11.</p>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
11 CHECK INSTALLATION CONDITION OF TIMING BELT. Turn the crankshaft using ST, and align alignment mark on crankshaft sprocket with alignment mark on cylinder block. ST 499987500 CRANKSHAFT SOCKET	Is the timing belt dislocated from its proper position?	Repair the installation condition of timing belt. <Ref. to ME(TURBO)-48, 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 the 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 the memory using Subaru Select Monitor. <Ref. to EN(TURBO)-45, Clear Memory Mode.> 2)Start the 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 the diagnostics operation, if the engine has no abnormality. NOTE: Ex. Remove spark plug cord, etc.	Repair the poor contact. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Poor contact in ignitor connector • Poor contact in ignition coil connector • Poor contact in fuel injector connector on faulty cylinders • Poor contact in ECM connector • Poor contact in coupling connector
15 CHECK AIR INTAKE SYSTEM.	Is there a fault in air intake system?	Repair the air intake system. NOTE: Check the following items: <ul style="list-style-type: none"> • Are there air leaks or air suction caused by loose or dislocated nuts and bolts? • Are there cracks or any disconnection of hoses? 	Go to step 16 .

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
16 CHECK MISFIRE SYMPTOM. 1) Turn the ignition switch to ON. 2) Read the diagnostic trouble code (DTC). • Subaru Select Monitor <Ref. to EN(TURBO)-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 .
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 the faulty parts. NOTE: Check the following items. <ul style="list-style-type: none"> • Spark plug • Spark plug cord • Fuel injector • Compression ratio 	Go to DTC P0171 and P0172. <Ref. to EN(TURBO)-158, 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 the faulty parts. NOTE: • Check the following items. <ul style="list-style-type: none"> • Spark plugs • Fuel injectors • Ignition coil • Compression ratio • If no abnormal is discovered, check for "IGNITION CONTROL SYSTEM" of #1 and #2 cylinders side. <Ref. to EN(TURBO)-66, Ignition Control System.>	Go to DTC P0171 and P0172. <Ref. to EN(TURBO)-158, 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 the 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(TURBO)-66, Ignition Control System.>	Go to DTC P0171 and P0172. <Ref. to EN(TURBO)-158, 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 the faulty parts. NOTE: Check the following items. • Spark plugs • Fuel injectors • Skipping timing belt teeth	Go to DTC P0171 and P0172. <Ref. to EN(TURBO)-158, 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 the 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(TURBO)-158, 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(TURBO)-158, DTC P0171 — FUEL TRIM MALFUNCTION (A/F TOO LEAN) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Repair or replace the faulty parts. NOTE: Check the following items. • Spark plugs • Fuel injectors • Compression ratio

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

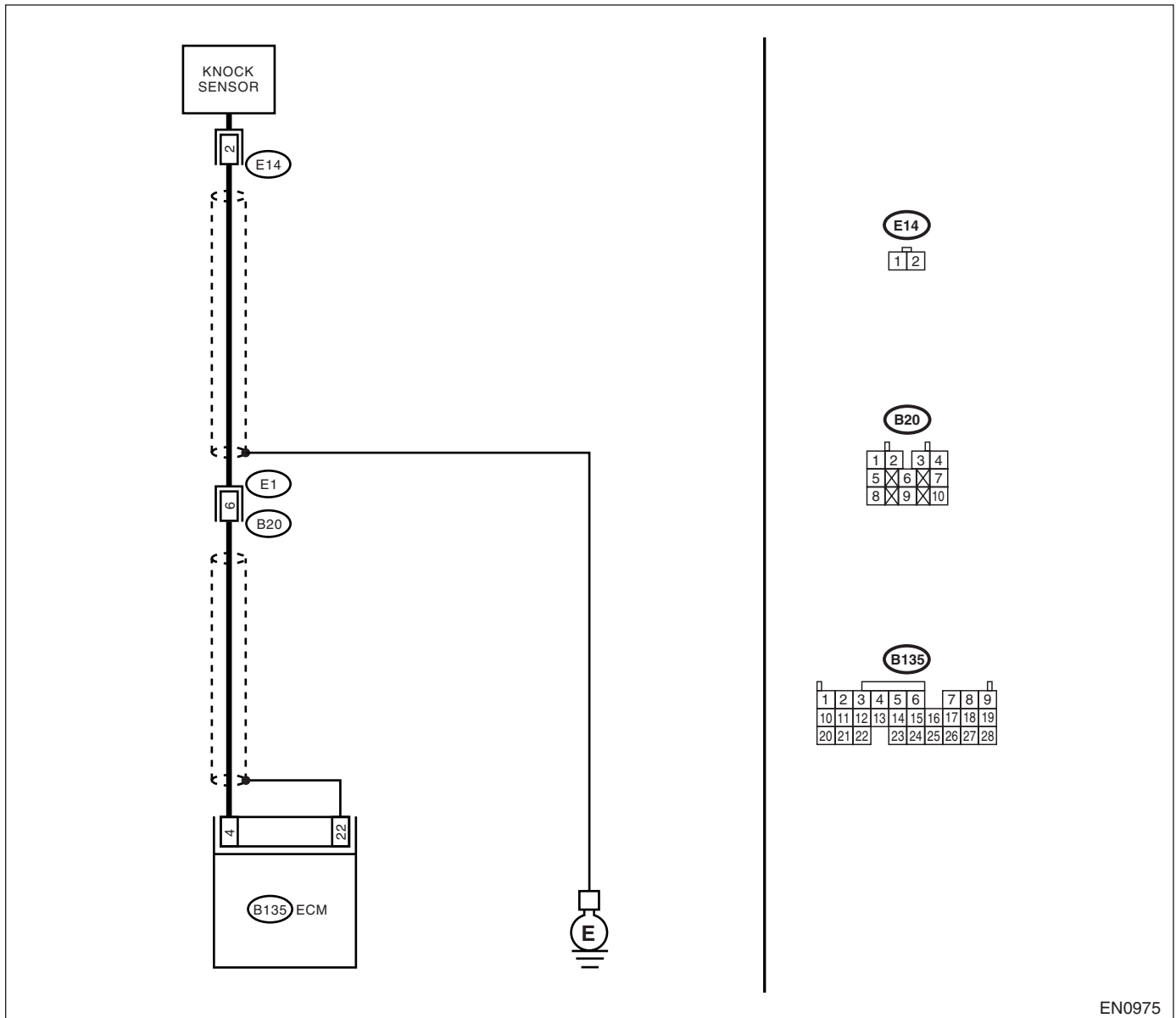
AK:DTC P0327 — KNOCK SENSOR CIRCUIT LOW INPUT —

- **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(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN0975

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>1</p> <p>CHECK HARNESS BETWEEN KNOCK SENSOR AND ECM CONNECTOR.</p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Disconnect the connector from ECM.</p> <p>3) Measure the resistance between ECM harness connector and chassis ground.</p> <p>Connector & terminal (B135) No. 4 — Chassis ground:</p>	<p>Is the resistance more than 700 kΩ?</p>	<p>Go to step 2.</p>	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Open circuit in harness between knock sensor and ECM connector • Poor contact in knock sensor connector • Poor contact in coupling connector
<p>2</p> <p>CHECK KNOCK SENSOR.</p> <p>1) Disconnect the connector from knock sensor.</p> <p>2) Measure the resistance between knock sensor connector terminal and engine ground.</p> <p>Terminal No. 2 — Engine ground:</p>	<p>Is the resistance more than 700 kΩ?</p>	<p>Go to step 3.</p>	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Open circuit in harness between knock sensor and ECM connector • Poor contact in knock sensor connector • Poor contact in coupling connector
<p>3</p> <p>CHECK CONDITION OF KNOCK SENSOR INSTALLATION.</p>	<p>Is the knock sensor installation bolt tightened securely?</p>	<p>Replace the knock sensor. <Ref. to FU(TURBO)-32, Knock Sensor.></p>	<p>Tighten the knock sensor installation bolt securely.</p>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

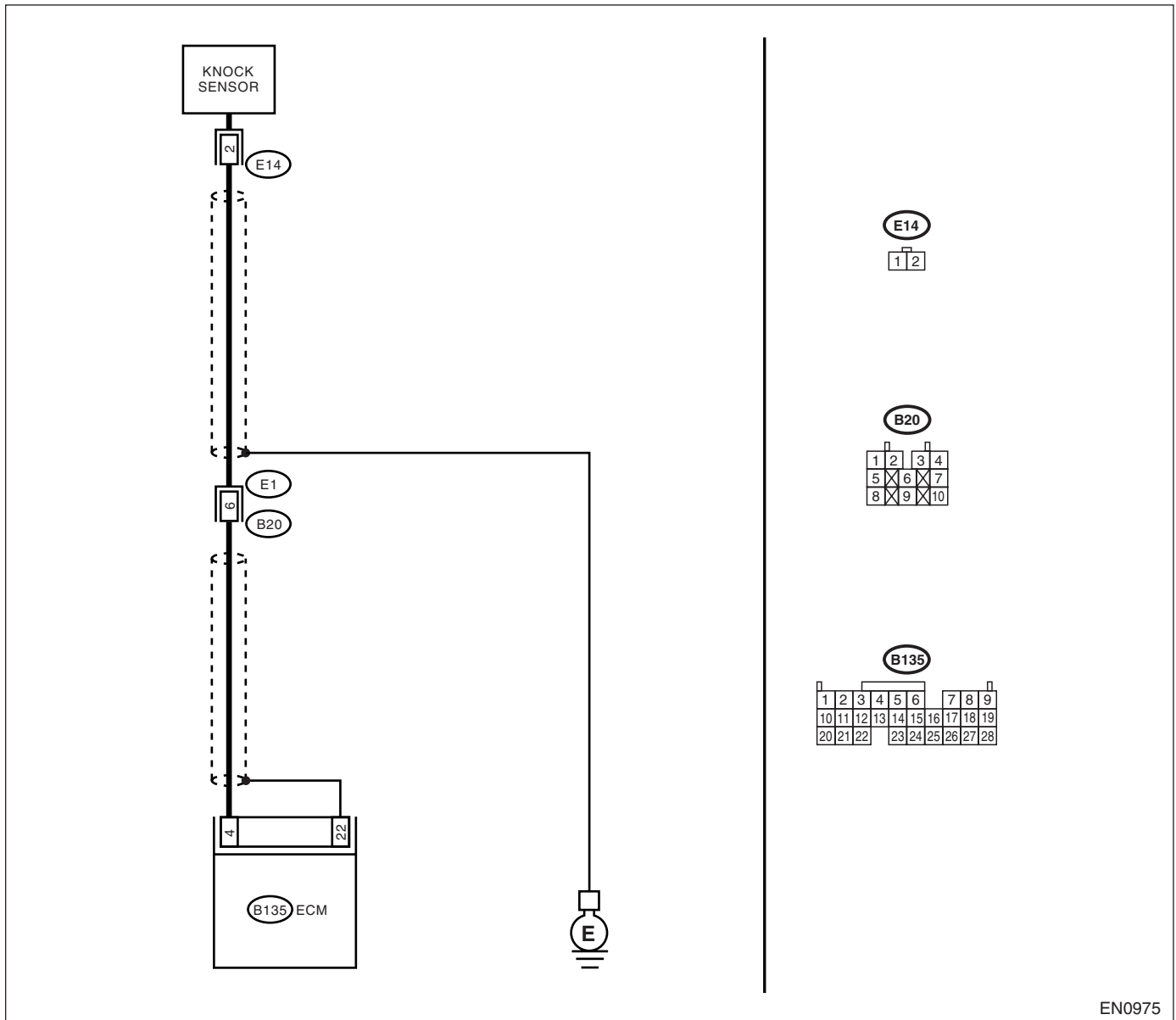
AL:DTC P0328 — KNOCK SENSOR CIRCUIT HIGH INPUT —

- **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(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

• **WIRING DIAGRAM:**



EN0975

Step	Check	Yes	No	
1	<p>CHECK HARNESS BETWEEN KNOCK SENSOR AND ECM CONNECTOR. Measure the resistance of harness between ECM connector and chassis ground. Connector & terminal (B135) No. 4 — Chassis ground:</p>	Is the resistance less than 400 kΩ?	Go to step 2.	Go to step 3.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>2</p> <p>CHECK KNOCK SENSOR.</p> <p>1)Disconnect the connector from knock sensor.</p> <p>2)Measure the resistance between knock sensor connector terminal and engine ground.</p> <p>Terminal No. 2 — Engine ground:</p>	<p>Is the resistance less than 400 kΩ?</p>	<p>Replace the knock sensor. <Ref. to FU(TURBO)-32, Knock Sensor.></p>	<p>Repair the ground short circuit in harness between knock sensor connector and ECM connector.</p> <p>NOTE: The harness between both connectors is shielded. Repair the short circuit of harness together with shield.</p>
<p>3</p> <p>CHECK INPUT SIGNAL FOR ECM.</p> <p>1)Connect the connectors to ECM and knock sensor.</p> <p>2)Turn the ignition switch to ON.</p> <p>3)Measure the voltage between ECM and chassis ground.</p> <p>Connector & terminal (B135) No. 4 (+) — Chassis ground (-):</p>	<p>Is the voltage more than 2 V?</p>	<p>Even if MIL lights up, the circuit has returned to a normal condition at this time. (However, the possibility of poor contact still remains.)</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Poor contact in knock sensor connector • Poor contact in ECM connector • Poor contact in coupling connector 	<p>Repair the poor contact in ECM connector.</p>

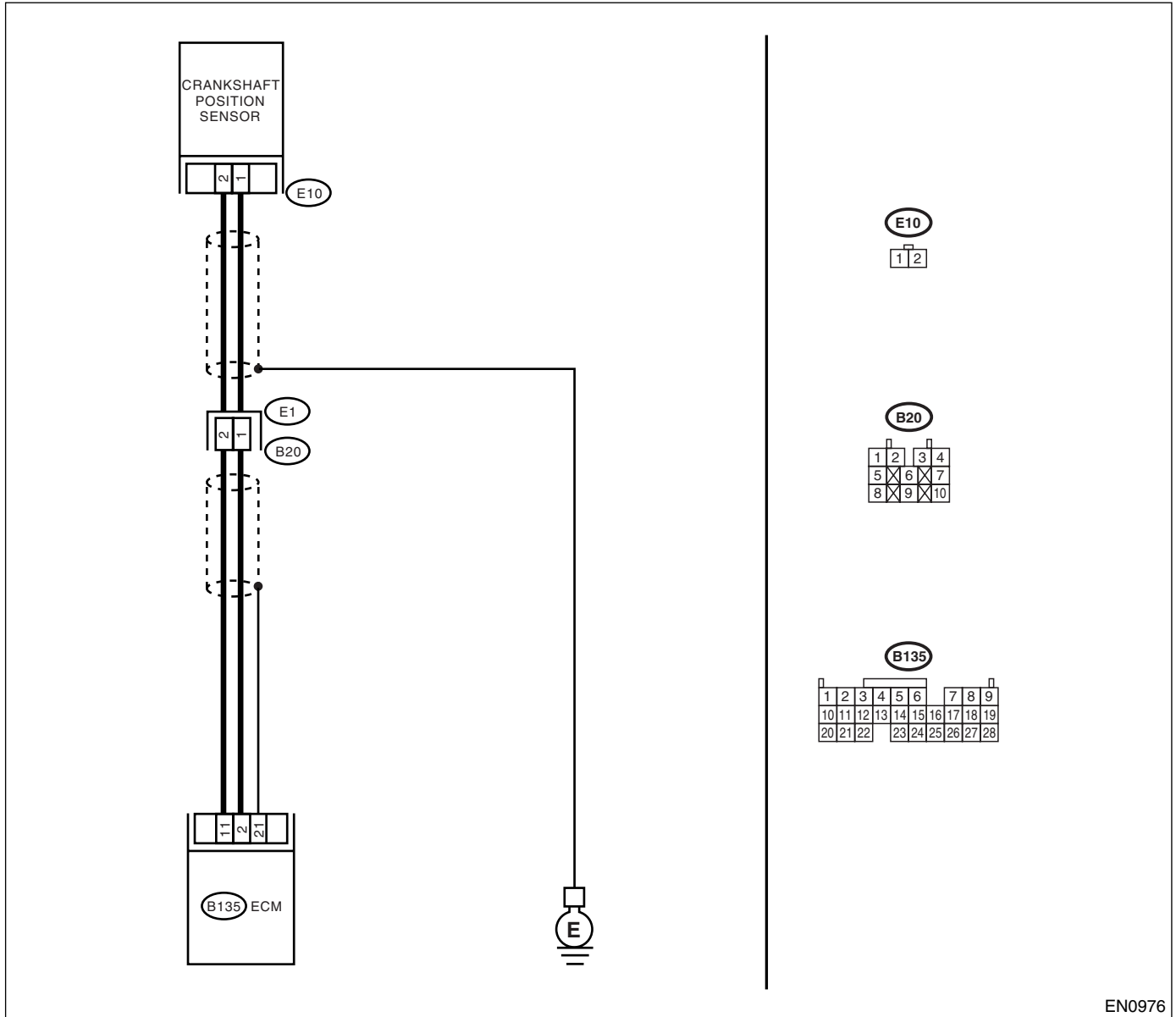
AM:DTC P0335 — CRANKSHAFT POSITION SENSOR CIRCUIT MALFUNCTION

- **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(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN0976

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>1</p> <p>CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connector from crankshaft position sensor. 3) Measure the resistance of harness between crankshaft position sensor connector and engine ground.</p> <p>Connector & terminal (E10) No. 1 — Engine ground:</p>	<p>Is the resistance more than 100 kΩ?</p>	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Open circuit in harness between crankshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector 	<p>Go to step 2.</p>
<p>2</p> <p>CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR.</p> <p>Measure the resistance of harness between crankshaft position sensor connector and engine ground.</p> <p>Connector & terminal (E10) No. 1 — Engine ground:</p>	<p>Is the resistance less than 10 Ω?</p>	<p>Repair the ground short circuit in harness between crankshaft position sensor and ECM connector.</p> <p>NOTE: The harness between both connectors are shielded. Repair ground short circuit in harness together with shield.</p>	<p>Go to step 3.</p>
<p>3</p> <p>CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR.</p> <p>Measure the resistance of harness between crankshaft position sensor connector and engine ground.</p> <p>Connector & terminal (E10) No. 2 — Engine ground:</p>	<p>Is the resistance less than 5 Ω?</p>	<p>Go to step 4.</p>	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Open circuit in harness between crankshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector
<p>4</p> <p>CHECK CONDITION OF CRANKSHAFT POSITION SENSOR.</p>	<p>Is the crankshaft position sensor installation bolt tightened securely?</p>	<p>Go to step 5.</p>	<p>Tighten the crankshaft position sensor installation bolt securely.</p>
<p>5</p> <p>CHECK CRANKSHAFT POSITION SENSOR.</p> <p>1) Remove the crankshaft position sensor. 2) Measure the resistance between connector terminals of crankshaft position sensor.</p> <p>Terminals No. 1 — No. 2:</p>	<p>Is the resistance between 1 and 4 kΩ?</p>	<p>Repair the poor contact in crankshaft position sensor connector.</p>	<p>Replace the crankshaft position sensor. <Ref. to FU(TURBO)-30, Crankshaft Position Sensor.></p>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

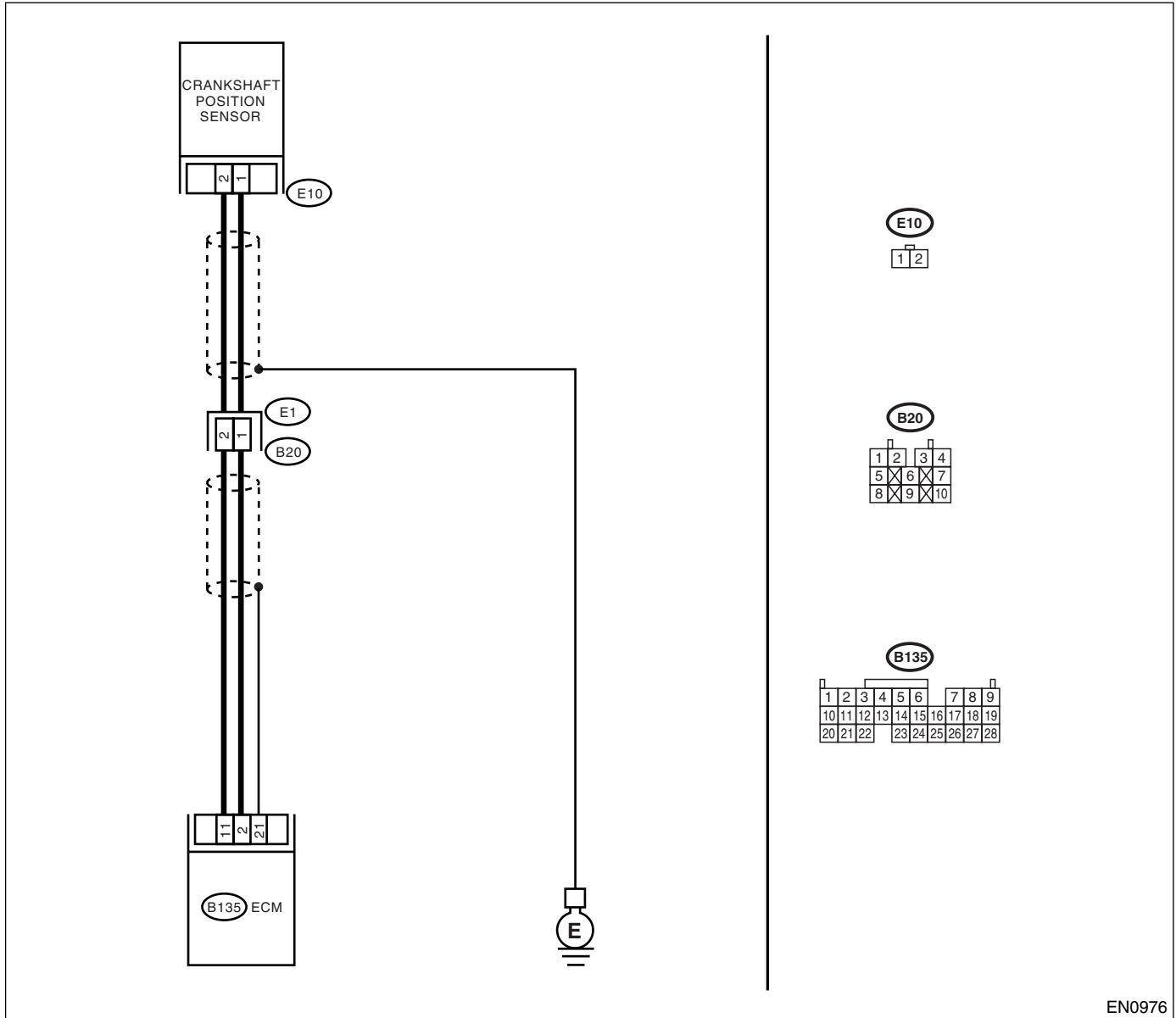
AN:DTC P0336 — CRANKSHAFT POSITION SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM —

- **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(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN0976

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(TURBO)-75, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK CONDITION OF CRANKSHAFT POSITION SENSOR. Turn the ignition switch to OFF.	Is the crankshaft position sensor installation bolt tightened securely?	Go to step 3.	Tighten the crankshaft position sensor installation bolt securely.
3 CHECK CRANKSHAFT SPROCKET. Remove the front belt cover.	Are the crankshaft sprocket teeth cracked or damaged?	Replace the crankshaft sprocket. <Ref. to FU(TURBO)-30, Crankshaft Position Sensor.>	Go to step 4.
4 CHECK INSTALLATION CONDITION OF TIMING BELT. Turn the crankshaft using ST, and align alignment mark on crankshaft sprocket with alignment mark on cylinder block. ST 499987500 CRANKSHAFT SOCKET	Is the timing belt dislocated from its proper position?	Repair the installation condition of timing belt. <Ref. to ME(TURBO)-48, Timing Belt Assembly.>	Replace the crankshaft position sensor. <Ref. to FU(TURBO)-30, Crankshaft Position Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

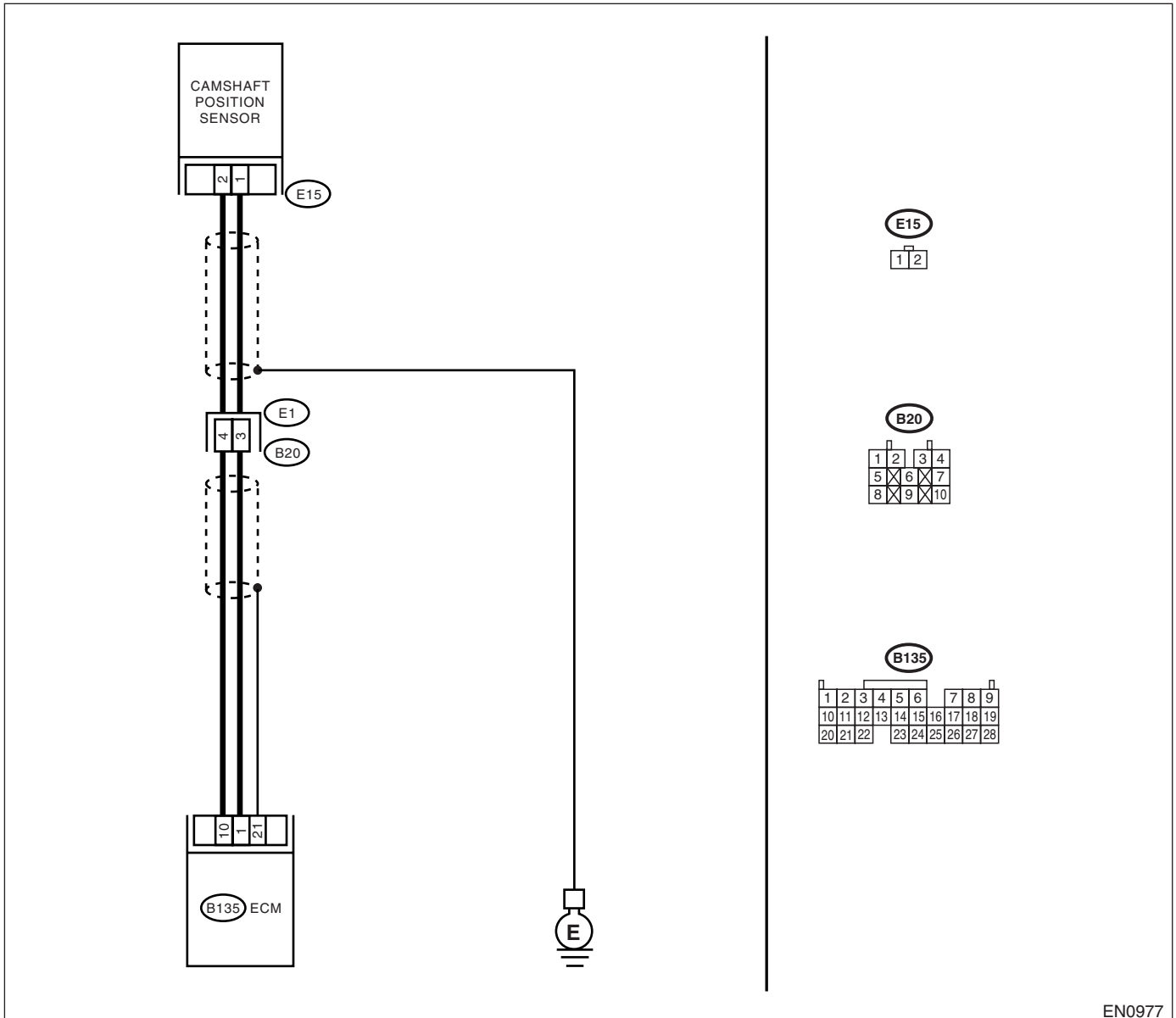
AO:DTC P0340 — CAMSHAFT POSITION SENSOR CIRCUIT MALFUNCTION —

- **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(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, 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 the ignition switch to OFF. 2) Disconnect the connector from camshaft position sensor. 3) Measure the resistance of harness between camshaft position sensor connector and engine ground. Connector & terminal (E15) No. 1 — Engine ground:	Is the resistance more than 100 k Ω ?	Repair the harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between camshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector 	Go to step 2.
2 CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR. Measure the 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 the ground short circuit in harness between camshaft position sensor and ECM connector. NOTE: The harness between both connectors are shielded. Repair the ground short circuit in harness together with shield.	Go to step 3.
3 CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR. Measure the 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 the harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between camshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector
4 CHECK CONDITION OF CAMSHAFT POSITION SENSOR.	Is the camshaft position sensor installation bolt tightened securely?	Go to step 5.	Tighten the camshaft position sensor installation bolt securely.
5 CHECK CAMSHAFT POSITION SENSOR. 1) Remove the camshaft position sensor. 2) Measure the resistance between connector terminals of camshaft position sensor. Terminals No. 1 — No. 2:	Is the resistance between 1 and 4 k Ω ?	Repair the poor contact in camshaft position sensor connector.	Replace the camshaft position sensor. <Ref. to FU(TURBO)-31, Camshaft Position Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

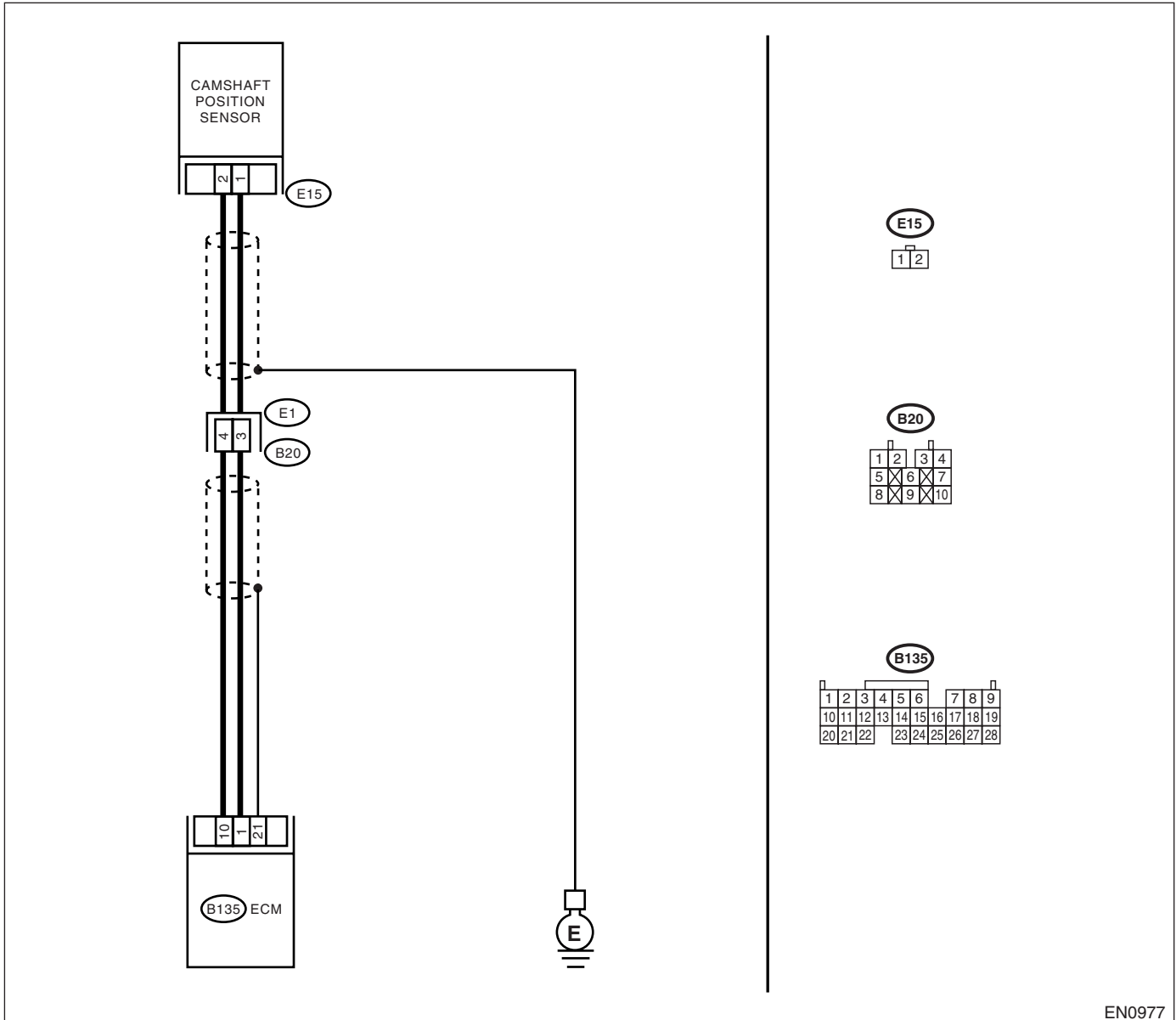
AP:DTC P0341 — CAMSHAFT POSITION SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM —

- **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(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN0977

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1	CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(TURBO)-75, List of Diagnostic Trouble Code (DTC).>
2	CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from camshaft position sensor. 3) Measure the resistance of harness between camshaft position sensor connector and engine ground. Connector & terminal (E15) No. 1 — Engine ground:	Is the resistance more than 100 kΩ?	Repair the 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
3	CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR. Measure the 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 the 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.
4	CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR. Measure the 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?	Repair the 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?	Tighten the 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 the camshaft position sensor. 2)Measure the 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 the camshaft position sensor. <Ref. to FU(TURBO)-31, Camshaft Position Sensor.>
7 CHECK CONDITION OF CAMSHAFT POSITION SENSOR. Turn the ignition switch to OFF.	Is the camshaft position sensor installation bolt tightened securely?	Go to step 8.	Tighten the camshaft position sensor installation bolt securely.
8 CHECK CAMSHAFT SPROCKET. Remove the front belt cover. <Ref. to ME-48, Belt Cover.>	Are the camshaft sprocket teeth cracked or damaged?	Replace the camshaft sprocket. <Ref. to ME(TURBO)-57, Camshaft Sprocket.>	Go to step 9.
9 CHECK INSTALLATION CONDITION OF TIMING BELT. Turn the camshaft using ST, and align alignment mark on camshaft sprocket with alignment mark on timing belt cover LH. ST 499207100 CAMSHAFT SPROCKET WRENCH	Is the timing belt dislocated from its proper position?	Repair the installation condition of timing belt. <Ref. to ME(TURBO)-48, Timing Belt Assembly.>	Replace the camshaft position sensor. <Ref. to FU(TURBO)-31, Camshaft Position Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

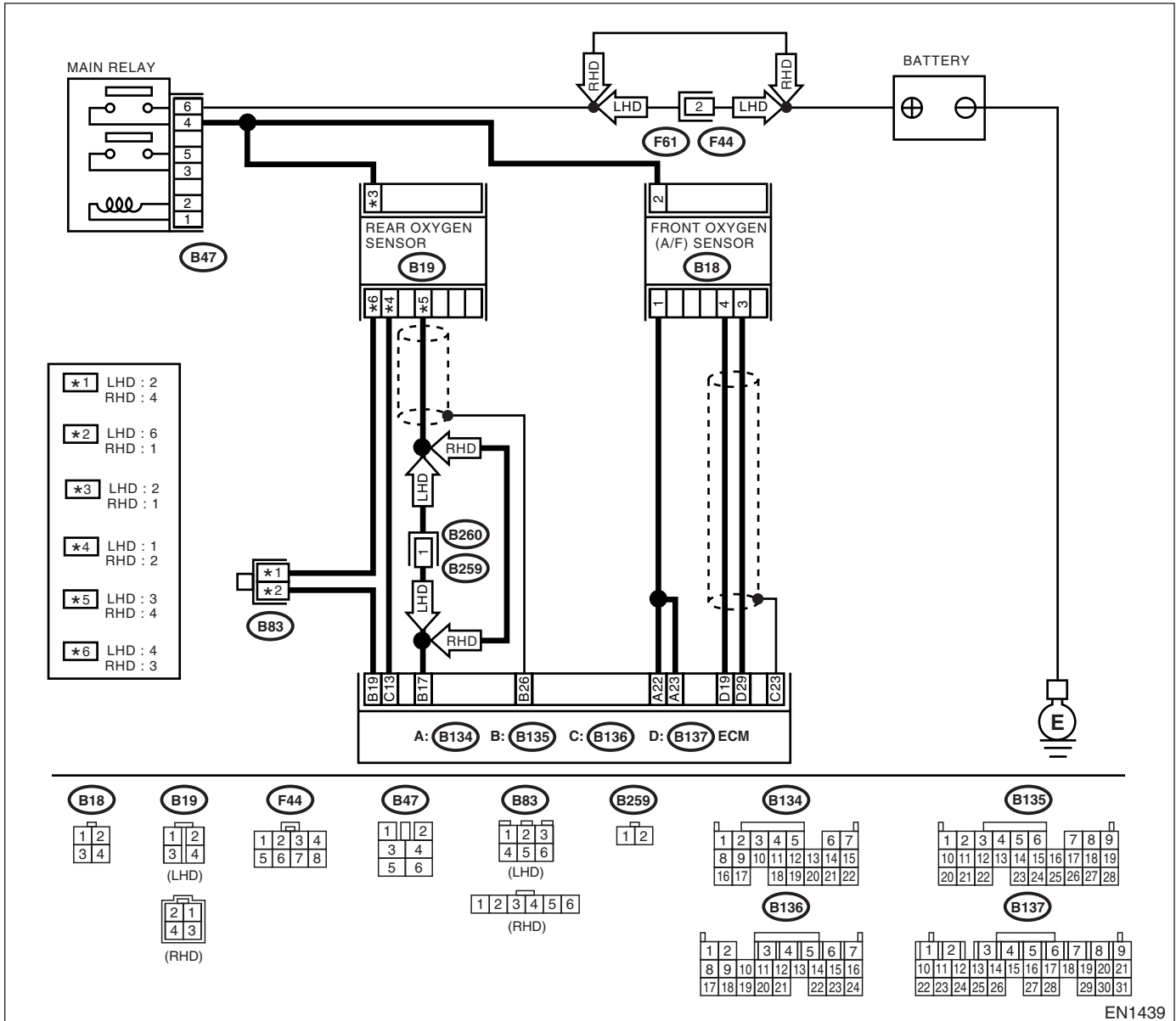
AQ:DTC P0420 — CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD —

- **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(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

• **WIRING DIAGRAM:**



EN1439

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(TURBO)-75, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0420.	Go to step 2.
2 CHECK EXHAUST SYSTEM. Check for gas leaks or air suction caused by loose or dislocated nuts and bolts, and open hole at exhaust pipes. NOTE: Check the following positions. <ul style="list-style-type: none"> •Between cylinder head and front exhaust pipe •Between front exhaust pipe and front catalytic converter •Between front catalytic converter and rear catalytic converter 	Is there a fault in exhaust system?	Repair or replace the exhaust system. <Ref. to EX(TURBO)-2, General Description.>	Go to step 3.
3 CHECK REAR CATALYTIC CONVERTER. Separate the rear catalytic converter from rear exhaust pipe.	Is there damage at rear face of rear catalyst?	Replace the front catalytic converter. <Ref. to EC(TURBO)-3, Front Catalytic Converter.> and rear catalytic converter <Ref. to EC(TURBO)-4, Rear Catalytic Converter.>	Go to step 4.
4 CHECK FRONT CATALYTIC CONVERTER. Remove the front catalytic converter.	Is there damage at rear face or front face of front catalyst?	Replace the front catalytic converter. <Ref. to EC(TURBO)-3, Front 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)

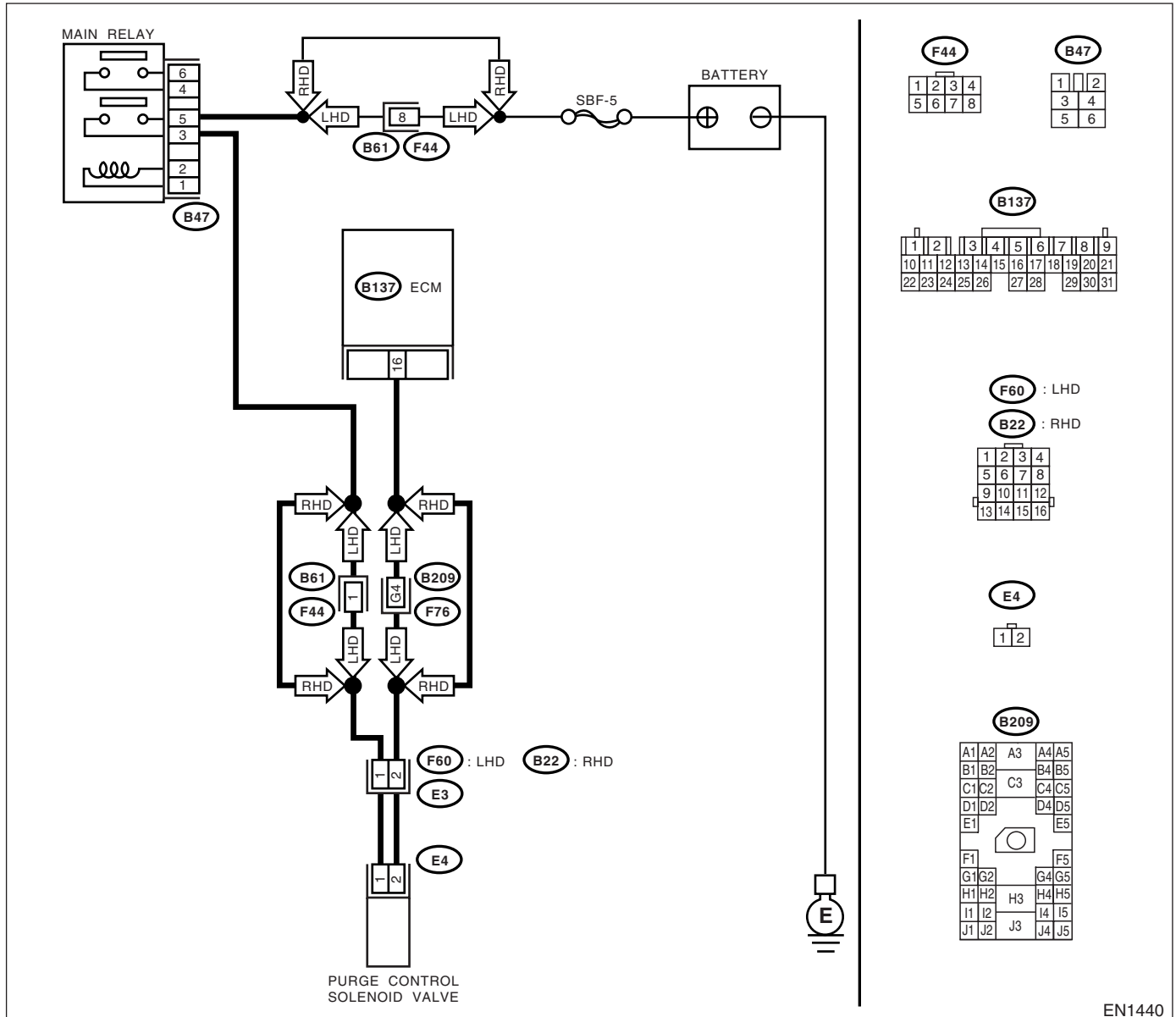
AR:DTC P0444 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW INPUT [MT VEHICLES] —

- **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(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

• **WIRING DIAGRAM:**



EN1440

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>1</p> <p>CHECK OUTPUT SIGNAL FROM ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. Connector & terminal (B137) No. 16 (+) — Chassis ground (-):</p>	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 service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.	Go to step 2.
<p>2</p> <p>CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from purge control solenoid valve and ECM. 3) Measure the resistance of harness between purge control solenoid valve connector and engine ground. Connector & terminal (E4) No. 2 — Engine ground:</p>	Is the resistance less than 10 Ω ?	Repair the ground short circuit in harness between ECM and purge control solenoid valve connector.	Go to step 3.
<p>3</p> <p>CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR. Measure the resistance of harness between ECM and purge control solenoid valve of harness connector. Connector & terminal (B137) No. 16 — (E4) No. 2:</p>	Is the resistance less than 1 Ω ?	Go to step 4.	Repair the open circuit in harness between ECM and purge control solenoid valve connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and purge control solenoid valve connector • Poor contact in coupling connector
<p>4</p> <p>CHECK PURGE CONTROL SOLENOID VALVE. 1) Remove the purge control solenoid valve. 2) Measure the resistance between purge control solenoid valve terminals. Terminals No. 1 — No. 2:</p>	Is the resistance between 10 and 100 Ω ?	Go to step 5.	Replace the purge control solenoid valve. <Ref. to EC(TURBO)-7, Purge Control Solenoid Valve.>
<p>5</p> <p>CHECK POWER SUPPLY TO PURGE CONTROL SOLENOID VALVE. 1) Turn the ignition switch to ON. 2) Measure the voltage between purge control solenoid valve and engine ground. Connector & terminal (E4) No. 1 (+) — Engine ground (-):</p>	Is the voltage more than 10 V?	Go to step 6.	Repair the 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 the poor contact in purge control solenoid valve connector.	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)

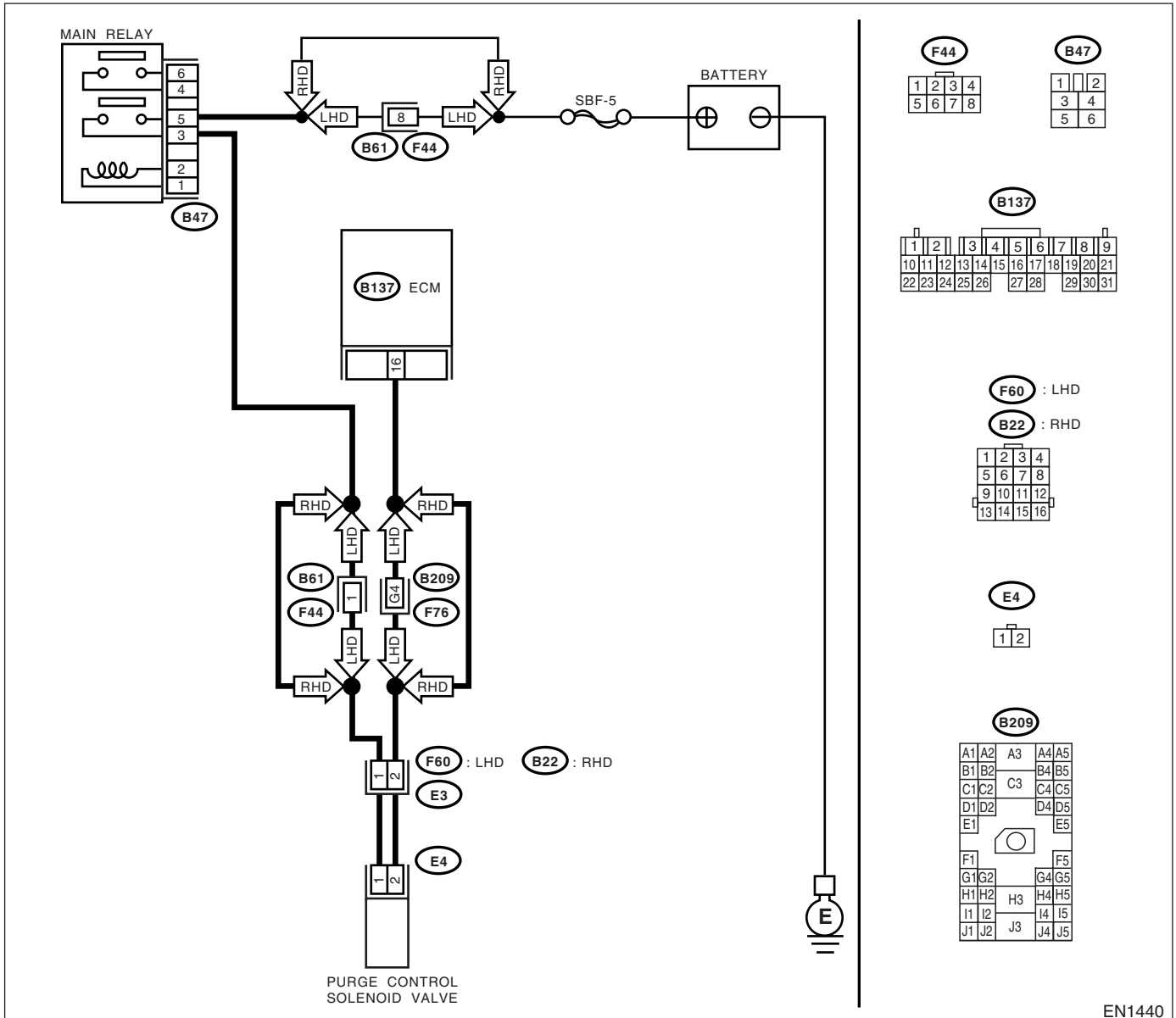
AS:DTC P0445 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH INPUT [MT VEHICLES] —

- **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(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

• **WIRING DIAGRAM:**



EN1440

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OUTPUT SIGNAL FROM ECM. 1) Turn the ignition switch to OFF. 2) Connect the test mode connector at the lower portion of instrument panel (on the driver's side). 3) Turn the ignition switch to ON. 4) While operating the purge control solenoid valve, measure the voltage between ECM and chassis ground. NOTE: Purge control solenoid valve operation can be executed using the Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(TURBO)-46, Compulsory Valve Operation Check Mode.> Connector & terminal (B137) No. 16 (+) — Chassis ground (-):	Does the voltage change between 0 and 10 V?	Go to step 2.	Even if MIL lights up, the circuit has returned to a normal condition at this time. In this case, repair the poor contact in ECM connector.
2 CHECK OUTPUT SIGNAL FROM ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. Connector & terminal (B137) No. 16 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 4.	Go to step 3.
3 CHECK POOR CONTACT. Check the poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(TURBO)-49, Engine Control Module.>
4 CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from purge control solenoid valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. Connector & terminal (B137) No. 16 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Repair the battery short circuit in harness between ECM and purge control solenoid valve connector. After repair, replace the ECM. <Ref. to FU(TURBO)-49, Engine Control Module.>	Go to step 5.
5 CHECK PURGE CONTROL SOLENOID VALVE. 1) Turn the ignition switch to OFF. 2) Measure the resistance between purge control solenoid valve terminals. Terminals No. 1 — No. 2:	Is the resistance less than 1 Ω ?	Replace the purge control solenoid valve <Ref. to EC(TURBO)-7, Purge Control Solenoid Valve.> and ECM <Ref. to FU(TURBO)-49, 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 the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(TURBO)-49, Engine Control Module.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

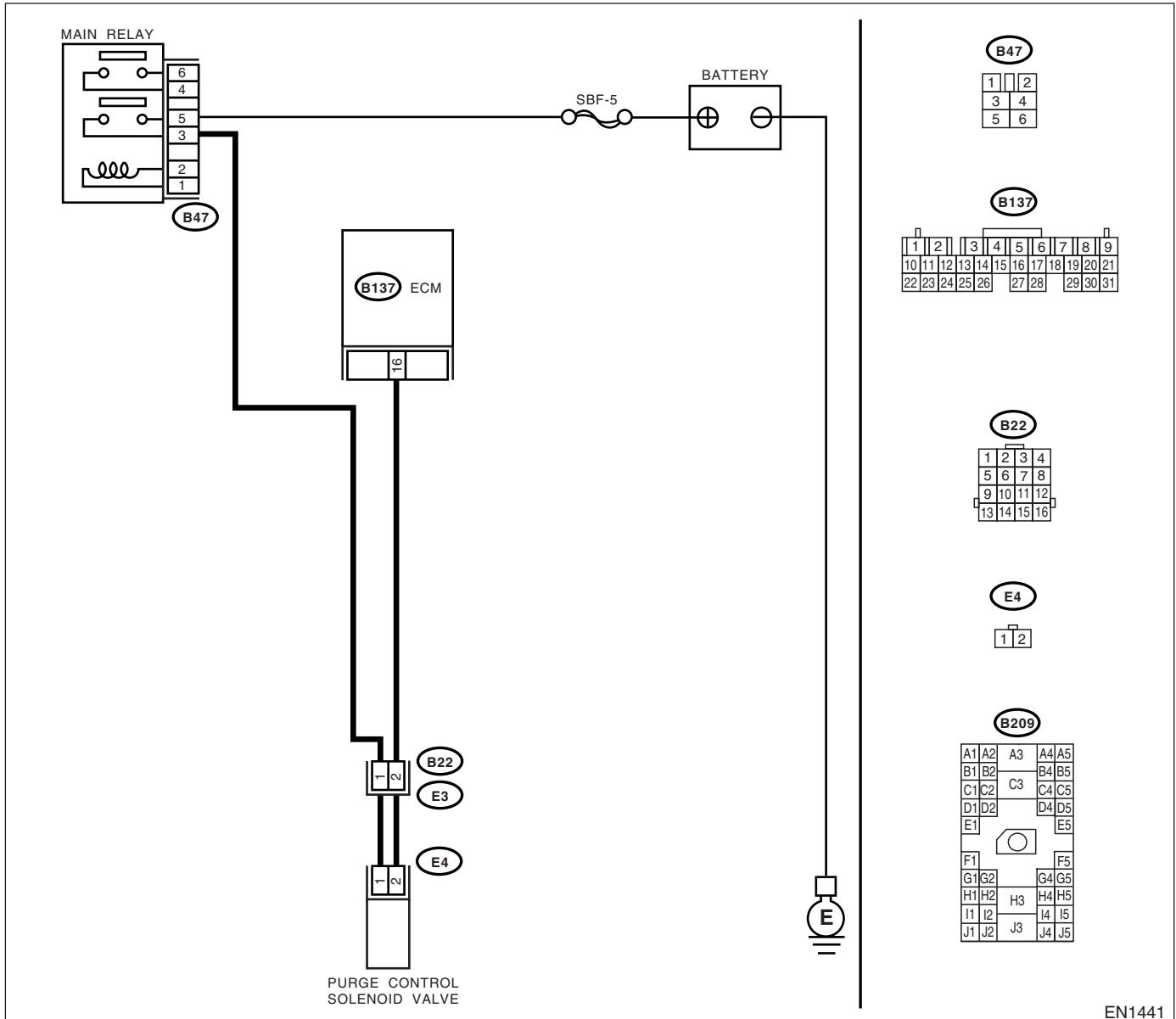
AT:DTC P0458 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW INPUT [AT VEHICLES] —

- **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(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

• **WIRING DIAGRAM:**



EN1441

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>1</p> <p>CHECK OUTPUT SIGNAL FROM ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. Connector & terminal (B137) No. 16 (+) — Chassis ground (-):</p>	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 service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.	Go to step 2.
<p>2</p> <p>CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from purge control solenoid valve and ECM. 3) Measure the resistance of harness between purge control solenoid valve connector and engine ground. Connector & terminal (E4) No. 2 — Engine ground:</p>	Is the resistance less than 10 Ω ?	Repair the ground short circuit in harness between ECM and purge control solenoid valve connector.	Go to step 3.
<p>3</p> <p>CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR. Measure the resistance of harness between ECM and purge control solenoid valve of harness connector. Connector & terminal (B137) No. 16 — (E4) No. 2:</p>	Is the resistance less than 1 Ω ?	Go to step 4.	Repair the open circuit in harness between ECM and purge control solenoid valve connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and purge control solenoid valve connector • Poor contact in coupling connector
<p>4</p> <p>CHECK PURGE CONTROL SOLENOID VALVE. 1) Remove the purge control solenoid valve. 2) Measure the resistance between purge control solenoid valve terminals. Terminals No. 1 — No. 2:</p>	Is the resistance between 10 and 100 Ω ?	Go to step 5.	Replace the purge control solenoid valve. <Ref. to EC(TURBO)-7, Purge Control Solenoid Valve.>
<p>5</p> <p>CHECK POWER SUPPLY TO PURGE CONTROL SOLENOID VALVE. 1) Turn the ignition switch to ON. 2) Measure the voltage between purge control solenoid valve and engine ground. Connector & terminal (E4) No. 1 (+) — Engine ground (-):</p>	Is the voltage more than 10 V?	Go to step 6.	Repair the 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 the poor contact in purge control solenoid valve connector.	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)

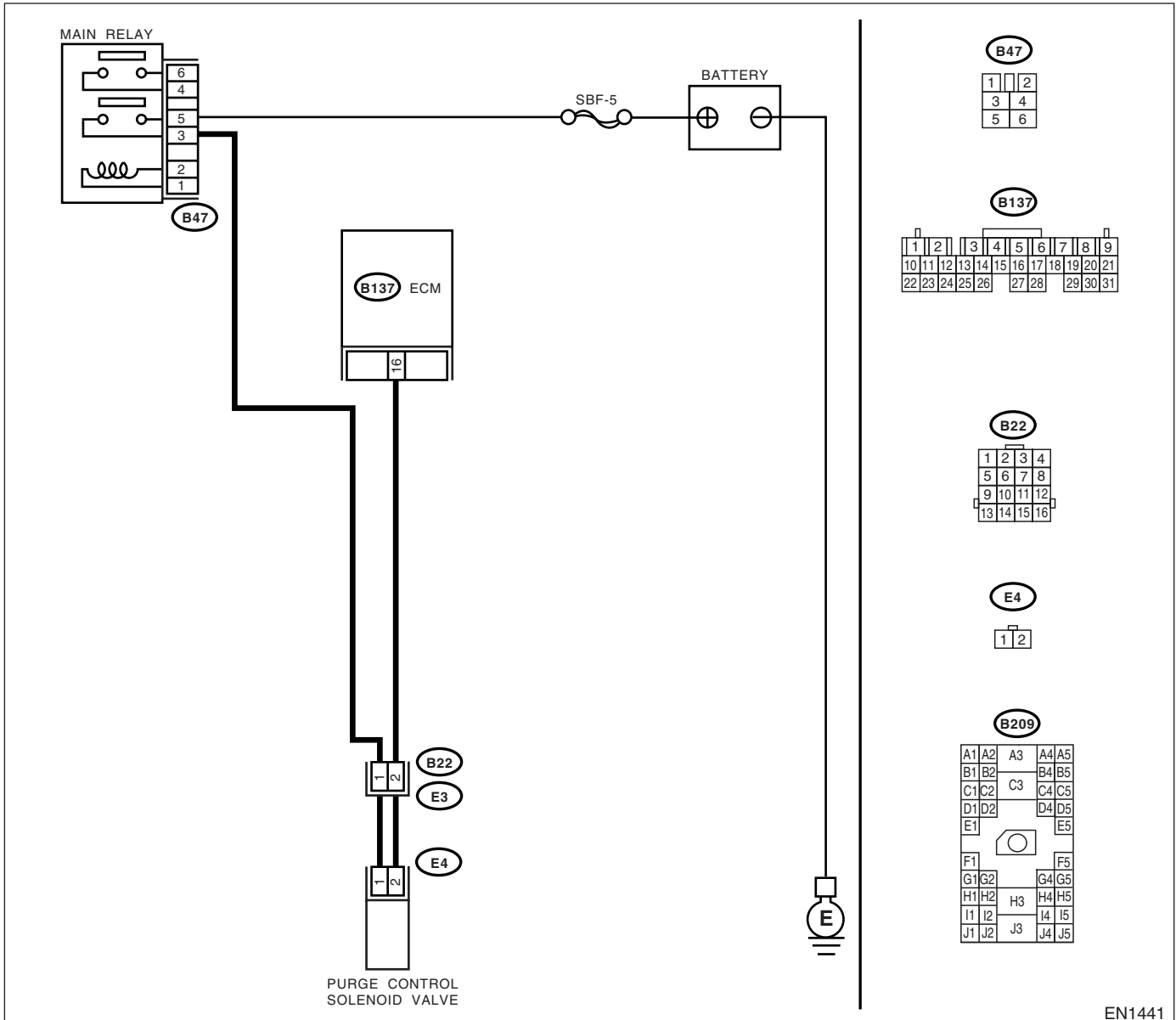
AU:DTC P0459 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH INPUT [AT VEHICLES] —

- **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(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

• **WIRING DIAGRAM:**



EN1441

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OUTPUT SIGNAL FROM ECM. 1) Turn the ignition switch to OFF. 2) Connect the test mode connector at the lower portion of instrument panel (on the driver's side). 3) Turn the ignition switch to ON. 4) While operating the purge control solenoid valve, measure the voltage between ECM and chassis ground. NOTE: Purge control solenoid valve operation can be executed using the Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(TURBO)-46, Compulsory Valve Operation Check Mode.> Connector & terminal (B137) No. 16 (+) — Chassis ground (-):	Does the voltage change between 0 and 10 V?	Go to step 2.	Even if MIL lights up, the circuit has returned to a normal condition at this time. In this case, repair the poor contact in ECM connector.
2 CHECK OUTPUT SIGNAL FROM ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. Connector & terminal (B137) No. 16 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 4.	Go to step 3.
3 CHECK POOR CONTACT. Check the poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(TURBO)-49, Engine Control Module.>
4 CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from purge control solenoid valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. Connector & terminal (B137) No. 16 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Repair the battery short circuit in harness between ECM and purge control solenoid valve connector. After repair, replace the ECM. <Ref. to FU(TURBO)-49, Engine Control Module.>	Go to step 5.
5 CHECK PURGE CONTROL SOLENOID VALVE. 1) Turn the ignition switch to OFF. 2) Measure the resistance between purge control solenoid valve terminals. Terminals No. 1 — No. 2:	Is the resistance less than 1 Ω ?	Replace the purge control solenoid valve <Ref. to EC(TURBO)-7, Purge Control Solenoid Valve.> and ECM <Ref. to FU(TURBO)-49, 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 the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(TURBO)-49, Engine Control Module.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

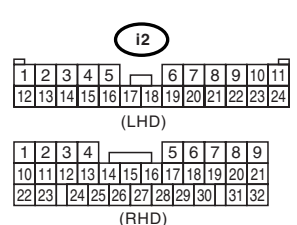
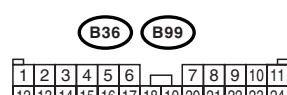
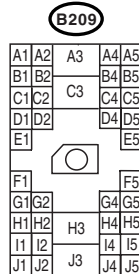
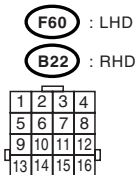
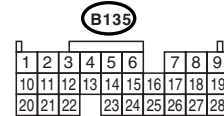
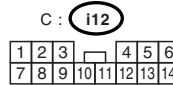
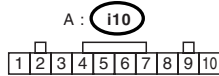
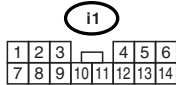
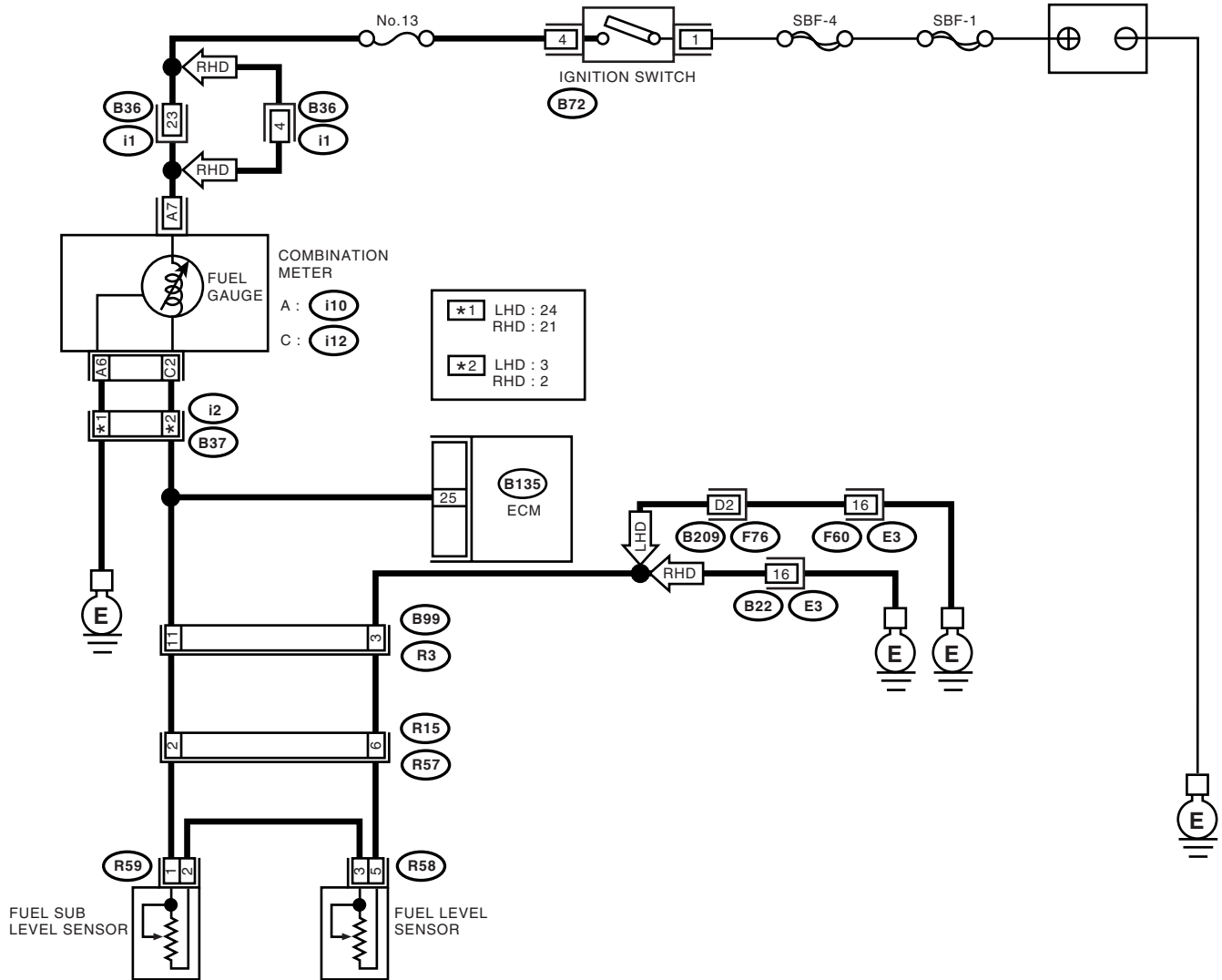
AV:DTC P0461 — FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM —

- DTC DETECTING CONDITION:
 - Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- WIRING DIAGRAM:



EN1442

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(TURBO)-75, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0461.	Replace the fuel level sensor. <Ref. to FU(TURBO)-62, Fuel Level Sensor.> and fuel sub level sensor <Ref. to FU(TURBO)-63, Fuel Sub Level Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

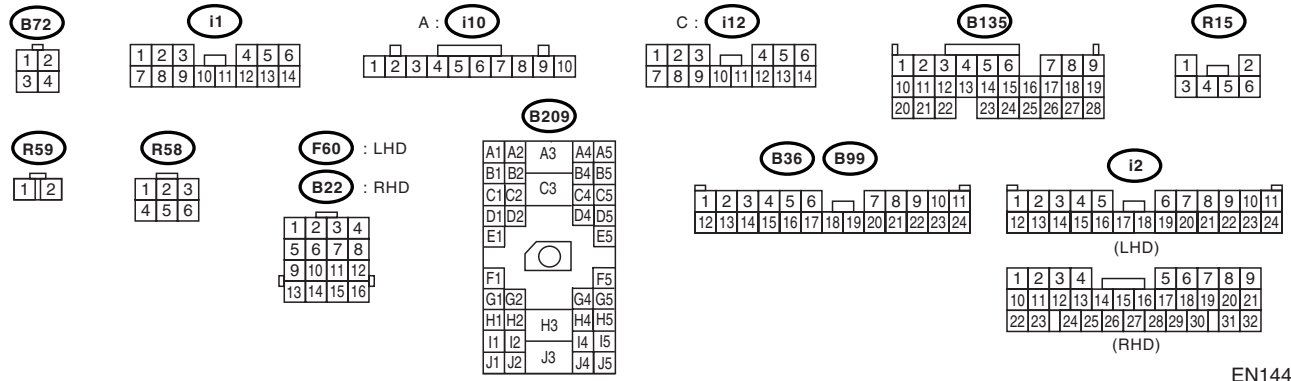
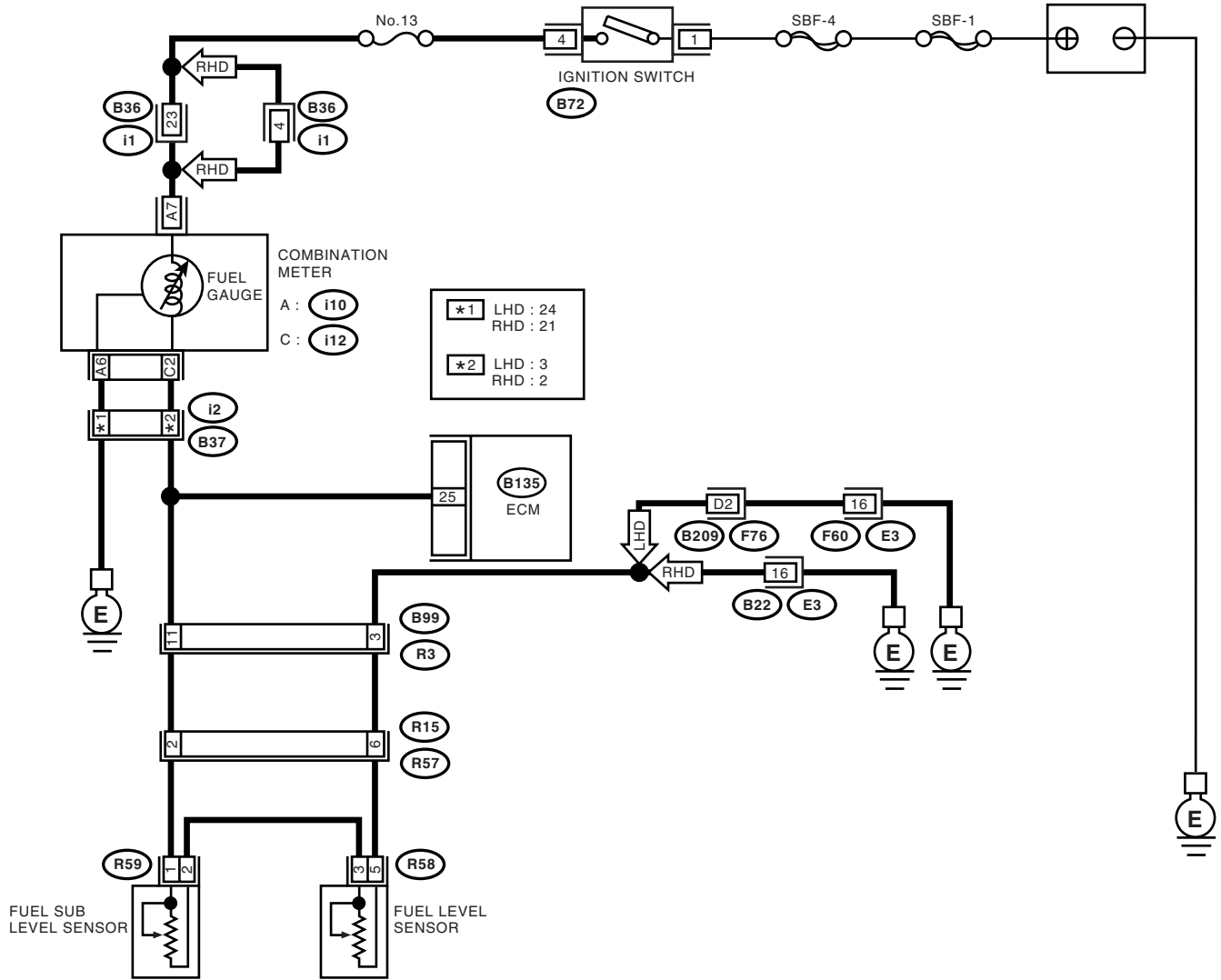
AW:DTC P0462 — FUEL LEVEL SENSOR CIRCUIT LOW INPUT —

- DTC DETECTING CONDITION:
 - Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

• WIRING DIAGRAM:



EN1442

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1	CHECK SPEEDOMETER AND TACHOMETER OPERATION IN COMBINATION METER.	Go to step 2.	Repair or replace the combination meter. <Ref. to IDI-4, Combination Meter System.>
2	CHECK INPUT SIGNAL FOR ECM. 1) Turn the ignition switch to ON. (engine OFF) 2) Measure the voltage between ECM connector and chassis ground. <i>Connector & terminal</i> <i>(B135) No. 25 (+) — Chassis ground (-):</i>	Go to step 6.	Go to step 3.
3	CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.) Read the 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(TURBO)-34, Subaru Select Monitor.>	Repair the 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 the ignition switch to OFF. 2) Separate the fuel tank cord connector (R57) and rear wiring harness connector (R15). 3) Turn the ignition switch to ON. 4) Measure the voltage of harness between ECM connector and chassis ground. <i>Connector & terminal</i> <i>(B135) No. 25 (+) — Chassis ground (-):</i>	Go to step 4.	Go to step 7.
5	CHECK HARNESS BETWEEN ECM AND COMBINATION METER. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from connector (i10), (i12) and ECM connector. 3) Measure the resistance between ECM and chassis ground. <i>Connector & terminal</i> <i>(B135) No. 25 — Chassis ground:</i>	Go to step 6.	Repair the ground short circuit in harness between ECM and combination meter connector.
6	CHECK HARNESS BETWEEN ECM AND COMBINATION METER. Measure the resistance between ECM and combination meter connector. <i>Connector & terminal</i> <i>(B135) No. 25 — (i12) No. 2:</i>	Repair or replace the combination meter. <Ref. to IDI-4, Combination Meter System.>	Repair the 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 the ignition switch to OFF. 2) Disconnect the connector from fuel sub level sensor. 3) Measure the 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 the ground short circuit in fuel tank cord.
8 CHECK FUEL TANK CORD. 1) Disconnect the connector from fuel pump assembly. 2) Measure the 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 the ground short circuit in fuel tank cord.
9 CHECK FUEL LEVEL SENSOR. 1) Remove the fuel pump assembly. <Ref. to FU(TURBO)-60, Fuel Pump.> 2) Measure the 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 the fuel level sensor.
10 CHECK FUEL SUB LEVEL SENSOR. 1) Remove the fuel sub level sensor. <Ref. to FU(TURBO)-63, Fuel Sub Level Sensor.> 2) Measure the 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 the poor contact in harness between ECM and combination meter connector.	Replace the fuel sub level sensor.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

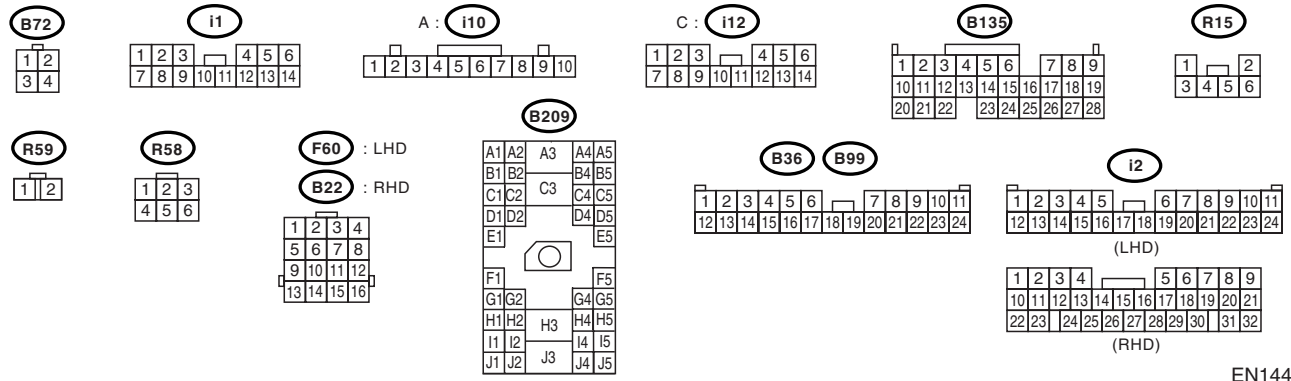
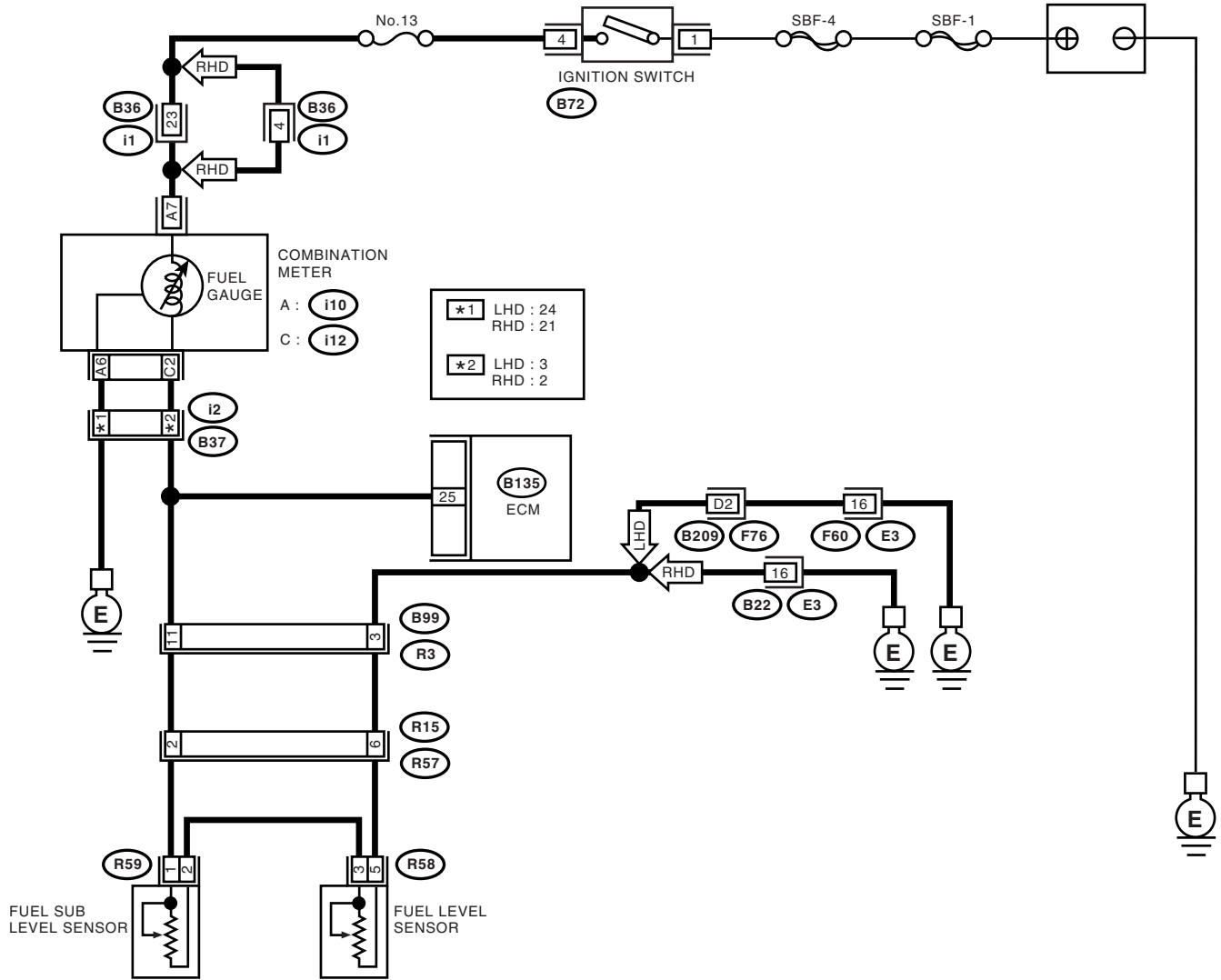
AX:DTC P0463 — FUEL LEVEL SENSOR CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
 - Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

• **WIRING DIAGRAM:**



EN1442

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1	CHECK SPEEDOMETER AND TACHOMETER OPERATION IN COMBINATION METER.	Go to step 2.	Repair or replace the combination meter. <Ref. to IDI-4, Combination Meter System.>
2	CHECK INPUT SIGNAL FOR ECM. 1) Turn the ignition switch to ON. (engine OFF) 2) Measure the voltage between ECM connector and chassis ground. <i>Connector & terminal</i> <i>(B135) No. 25 (+) — Chassis ground (-):</i>	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: <ul style="list-style-type: none"> • Poor contact in fuel pump connector • Poor contact in coupling connector
3	CHECK INPUT VOLTAGE OF ECM. 1) Turn the ignition switch to OFF. 2) Disconnect the combination meter connector (i10) and ECM connector. 3) Turn the ignition switch to ON. 4) Measure the voltage of harness between ECM and chassis ground. <i>Connector & terminal</i> <i>(B135) No. 25 (+) — Chassis ground (-):</i>	Go to step 4.	Repair the battery short circuit between ECM and combination meter connector.
4	CHECK HARNESS BETWEEN ECM AND FUEL TANK CORD. 1) Turn the ignition switch to OFF. 2) Separate the fuel tank cord connector (R57) and rear wiring harness connector (R15). 3) Measure the resistance between ECM and fuel tank cord. <i>Connector & terminal</i> <i>(B135) No. 25 — (R15) No. 2:</i>	Go to step 5.	Repair the open circuit between ECM and fuel tank cord.
5	CHECK HARNESS BETWEEN FUEL TANK CORD AND CHASSIS GROUND. Measure the resistance between fuel tank cord and chassis ground. <i>Connector & terminal</i> <i>(R15) No. 6 — Chassis ground:</i>	Go to step 6.	Repair the 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 the connector from fuel level sensor. 2) Measure the resistance between fuel level sensor and coupling connector. <i>Connector & terminal</i> <i>(R57) No. 6 — (R58) No. 5:</i>	Go to step 7.	Repair the 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 the connector from fuel sub level sensor. 2)Measure the resistance between fuel level sensor and fuel sub level sensor. <i>Connector & terminal</i> <i>(R58) No. 3 — (R59) No. 2:</i>	Is the resistance less than 10 Ω ?	Go to step 8 .	Repair the open circuit between fuel level sensor and fuel sub level sensor.
8 CHECK FUEL TANK CORD. Measure the resistance between fuel sub level sensor and coupling connector. <i>Connector & terminal</i> <i>(R57) No. 2 — (R59) No. 1:</i>	Is the resistance less than 10 Ω ?	Go to step 9 .	Repair the open circuit between coupling connector and fuel sub level sensor.
9 CHECK FUEL LEVEL SENSOR. 1)Remove the fuel pump assembly. <Ref. to FU(TURBO)-60, Fuel Pump.> 2)While moving the fuel level sensor float up and down, measure the resistance between fuel level sensor terminals. <i>Terminals</i> <i>No. 3 — No. 5:</i>	Is the resistance more than 53 Ω ?	Replace the fuel level sensor. <Ref. to FU(TURBO)-62, Fuel Level Sensor.>	Go to step 10 .
10 CHECK FUEL SUB LEVEL SENSOR. 1)Remove the fuel sub level sensor. <Ref. to FU(TURBO)-63, Fuel Sub Level Sensor.> 2)While moving the fuel sub level sensor float up and down, measure the resistance between fuel sub level sensor terminals. <i>Terminals</i> <i>No. 1 — No. 2:</i>	Is the resistance more than 45 Ω ?	Replace the fuel sub level sensor. <Ref. to FU(TURBO)-63, Fuel Sub Level Sensor.>	Replace the combination meter. <Ref. to IDI-15, Combination Meter Assembly.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

AY:DTC P0464 — FUEL LEVEL SENSOR INTERMITTENT INPUT—

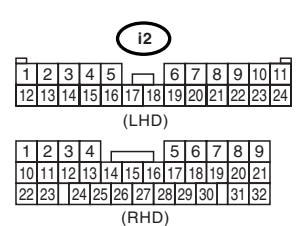
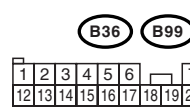
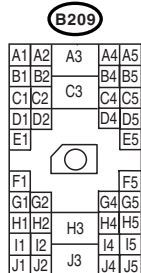
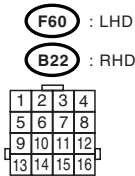
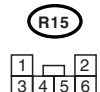
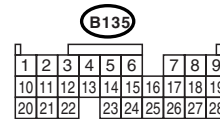
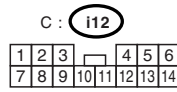
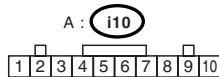
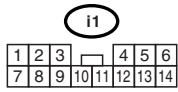
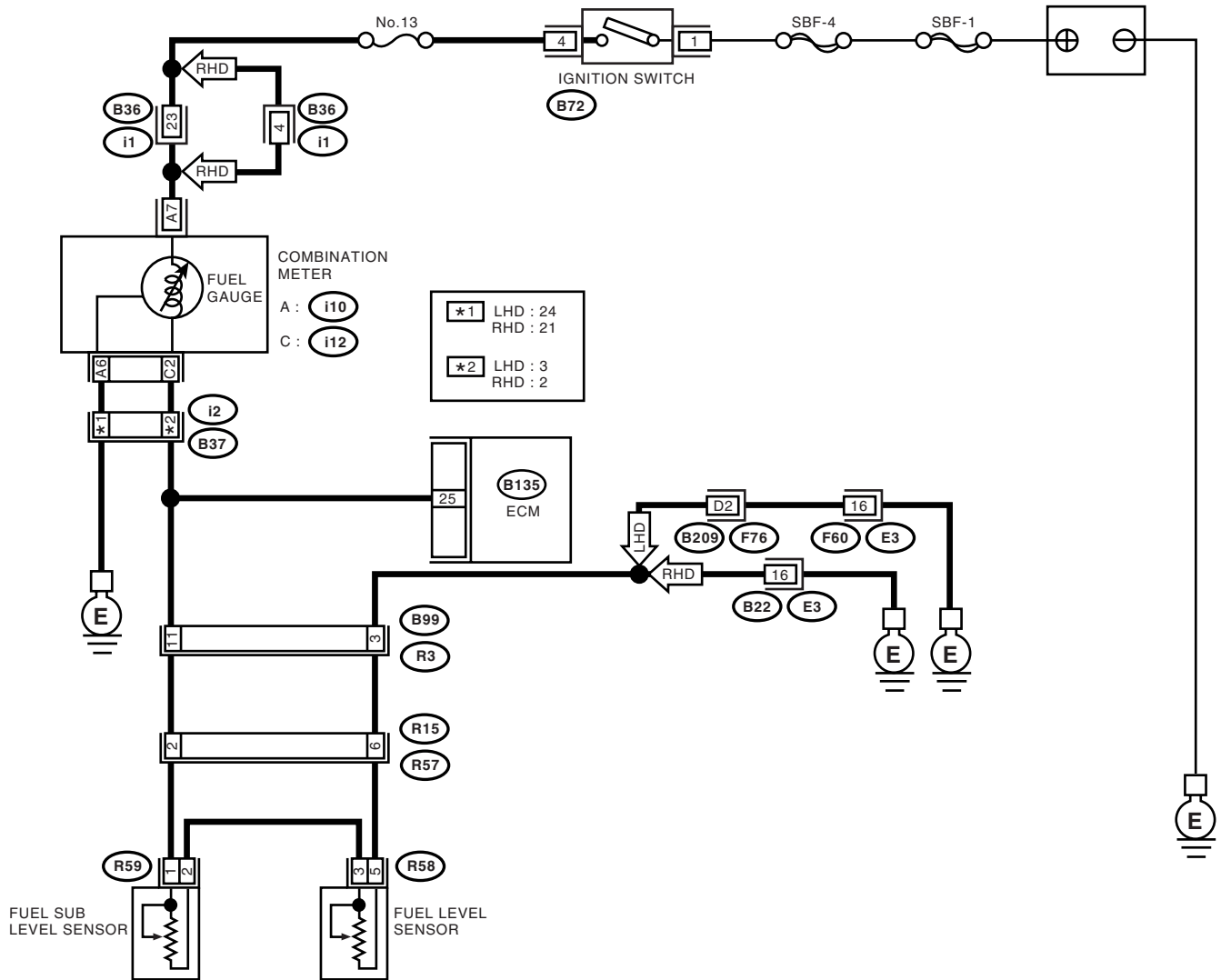
• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

• WIRING DIAGRAM:



EN1442

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(TURBO)-75, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK FUEL LEVEL SENSOR. 1)Remove the fuel pump assembly. <Ref. to FU(TURBO)-60, Fuel Pump.> 2)While moving the 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 the fuel level sensor. <Ref. to FU(TURBO)-62, Fuel Level Sensor.>
3 CHECK FUEL SUB LEVEL SENSOR. 1)Remove the fuel sub level sensor. <Ref. to FU(TURBO)-63, Fuel Sub Level Sensor.> 2)While moving the 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 the poor contact in ECM, combination meter and coupling connectors.	Replace the fuel sub level sensor. <Ref. to FU(TURBO)-63, Fuel Sub Level Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

AZ:DTC P0480 — COOLING FAN RELAY 1 CIRCUIT LOW INPUT —

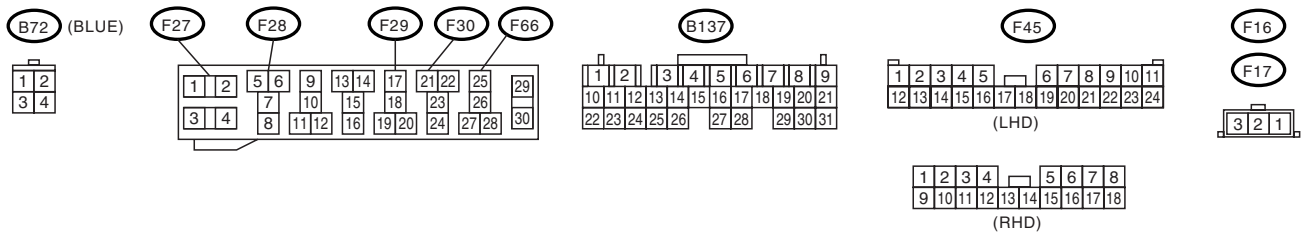
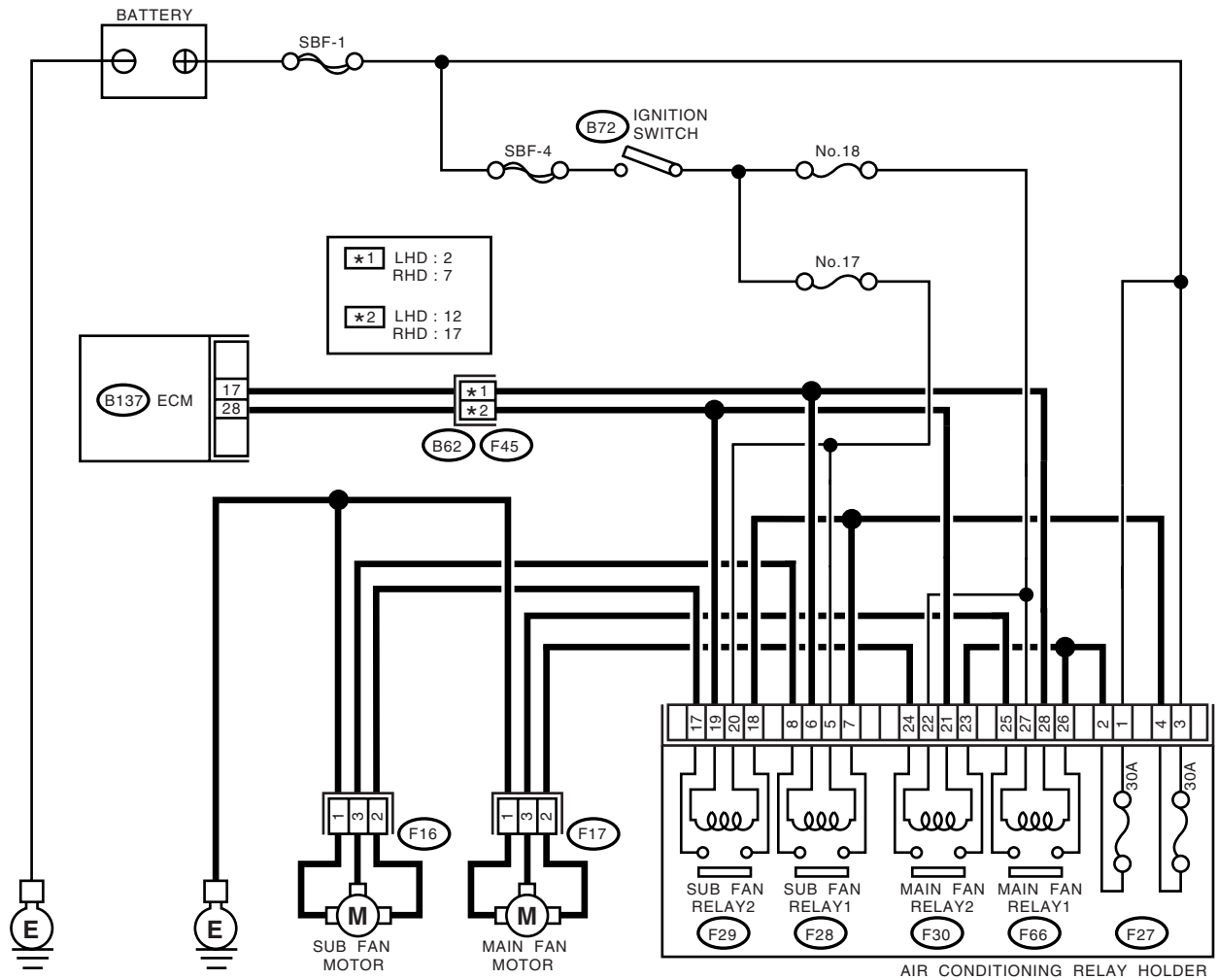
- **DTC DETECTING CONDITION:**
 - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
 - Radiator fan does not operate properly.
 - Overheating

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, 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
<p>1 CHECK OUTPUT SIGNAL FROM ECM. 1) Turn the ignition switch to OFF. 2) Connect the test mode connector at the lower portion of instrument panel (on the driver's side). 3) Turn the ignition switch to ON. 4) While operating the radiator fan relay, measure the voltage between ECM terminal and ground.</p> <p>NOTE: Radiator fan relay operation can be executed using the Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(TURBO)-34, Subaru Select Monitor.></p> <p>Connector & terminal (B137) No. 17 (+) — Chassis ground (-): (B137) No. 28 (+) — Chassis ground (-):</p>	<p>Does the voltage change between 0 and 10 V?</p>	<p>Repair the poor contact in ECM connector.</p>	<p>Go to step 2.</p>
<p>2 CHECK GROUND SHORT CIRCUIT IN RADIATOR MAIN FAN RELAY CONTROL CIRCUIT. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance of harness between ECM connector and chassis ground.</p> <p>Connector & terminal (B137) No. 17 — Chassis ground: (B137) No. 28 — Chassis ground:</p>	<p>Is the resistance less than 10 Ω?</p>	<p>Repair the ground short circuit in radiator main fan relay control circuit.</p>	<p>Go to step 3.</p>
<p>3 CHECK POWER SUPPLY FOR RELAY. 1) Remove the main fan relay 1 and 2 from A/C relay holder. 2) Turn the ignition switch to ON. 3) Measure the voltage between fuse and relay box (F/B) connector and chassis ground.</p> <p>Connector & terminal (F66) No. 27 (+) — Chassis ground (-): (F30) No. 22 (+) — Chassis ground (-):</p>	<p>Is the voltage more than 10 V?</p>	<p>Go to step 4.</p>	<p>Repair the open circuit in harness between ignition switch and fuse and relay box (F/B) connector.</p>
<p>4 CHECK MAIN FAN RELAY. 1) Turn the ignition switch to OFF. 2) Measure the resistance between main fan relay terminals.</p> <p>Terminal No. 27 — No. 28:(Main fan relay 1) No. 22 — No. 21:(Main fan relay 2)</p>	<p>Is the resistance between 87 and 107 Ω?</p>	<p>Go to step 5.</p>	<p>Replace the main fan relay.</p>
<p>5 CHECK OPEN CIRCUIT IN MAIN FAN RELAY CONTROL CIRCUIT. Measure the resistance of harness between ECM and main fan relay connector.</p> <p>Connector & terminal (B137) No. 17 — (F66) No. 28: (B137) No. 28 — (F30) No. 21:</p>	<p>Is the resistance less than 1 Ω?</p>	<p>Go to step 6.</p>	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Open circuit in harness between ECM and main fan relay connector • Poor contact in coupling connector
<p>6 CHECK POOR CONTACT. Check poor contact in ECM or main fan relay connector.</p>	<p>Is there poor contact in ECM or main fan relay connector?</p>	<p>Repair the poor contact in ECM or main fan relay connector.</p>	<p>Contact with your Subaru distributor service.</p>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

BA: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(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

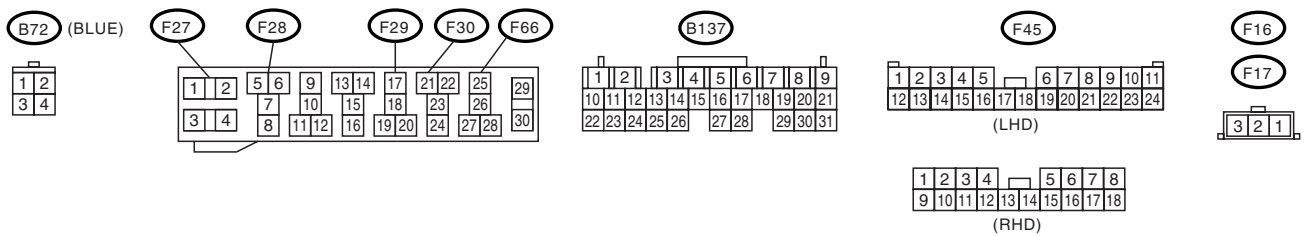
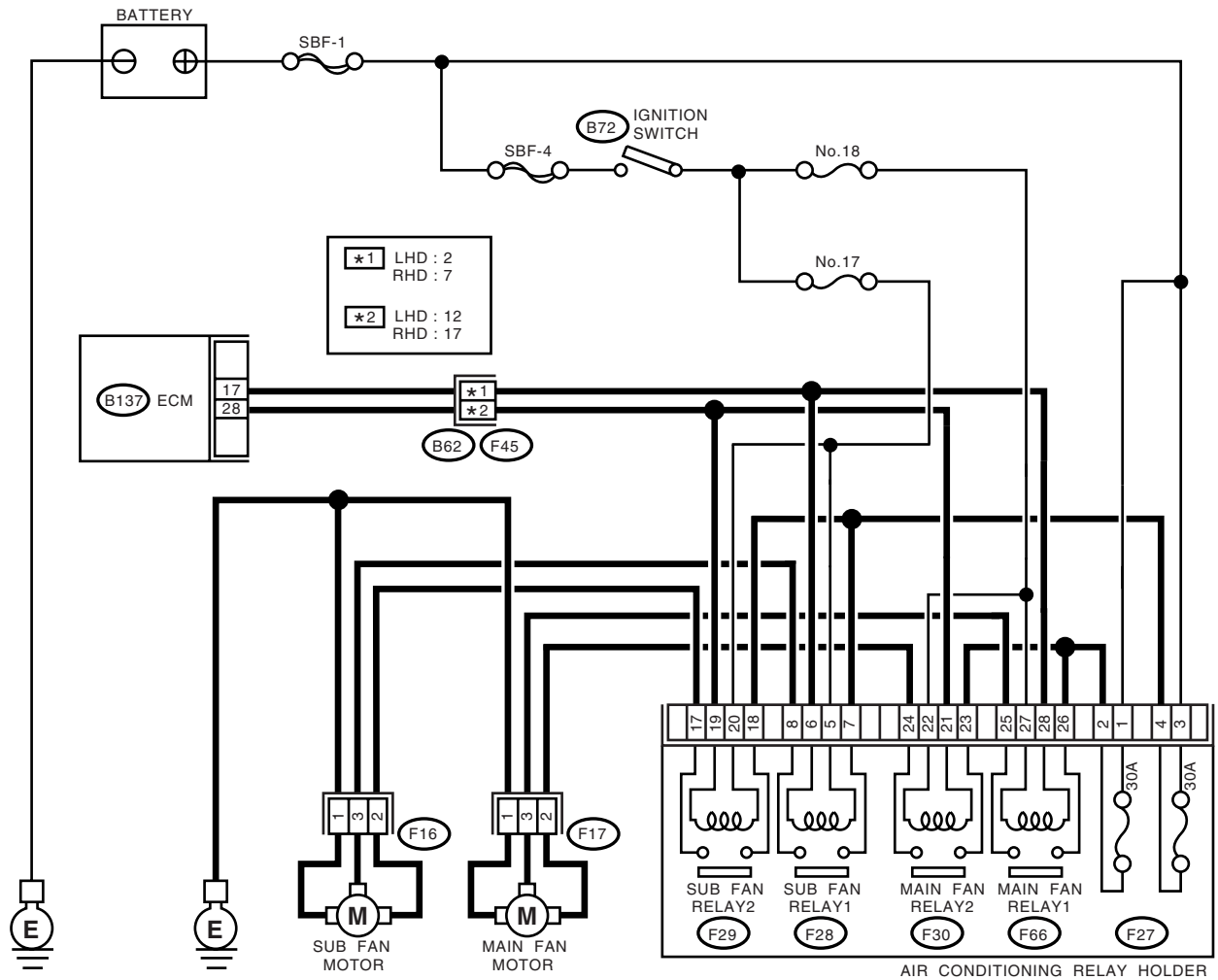
NOTE:

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 DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(TURBO)-75, List of Diagnostic Trouble Code (DTC).>	Check the radiator fan, fan motor and thermostat. <Ref. to CO-10, Radiator Main Fan System.> and <Ref. to CO-18, Radiator Sub Fan System.> If thermostat is stuck, replace thermostat.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

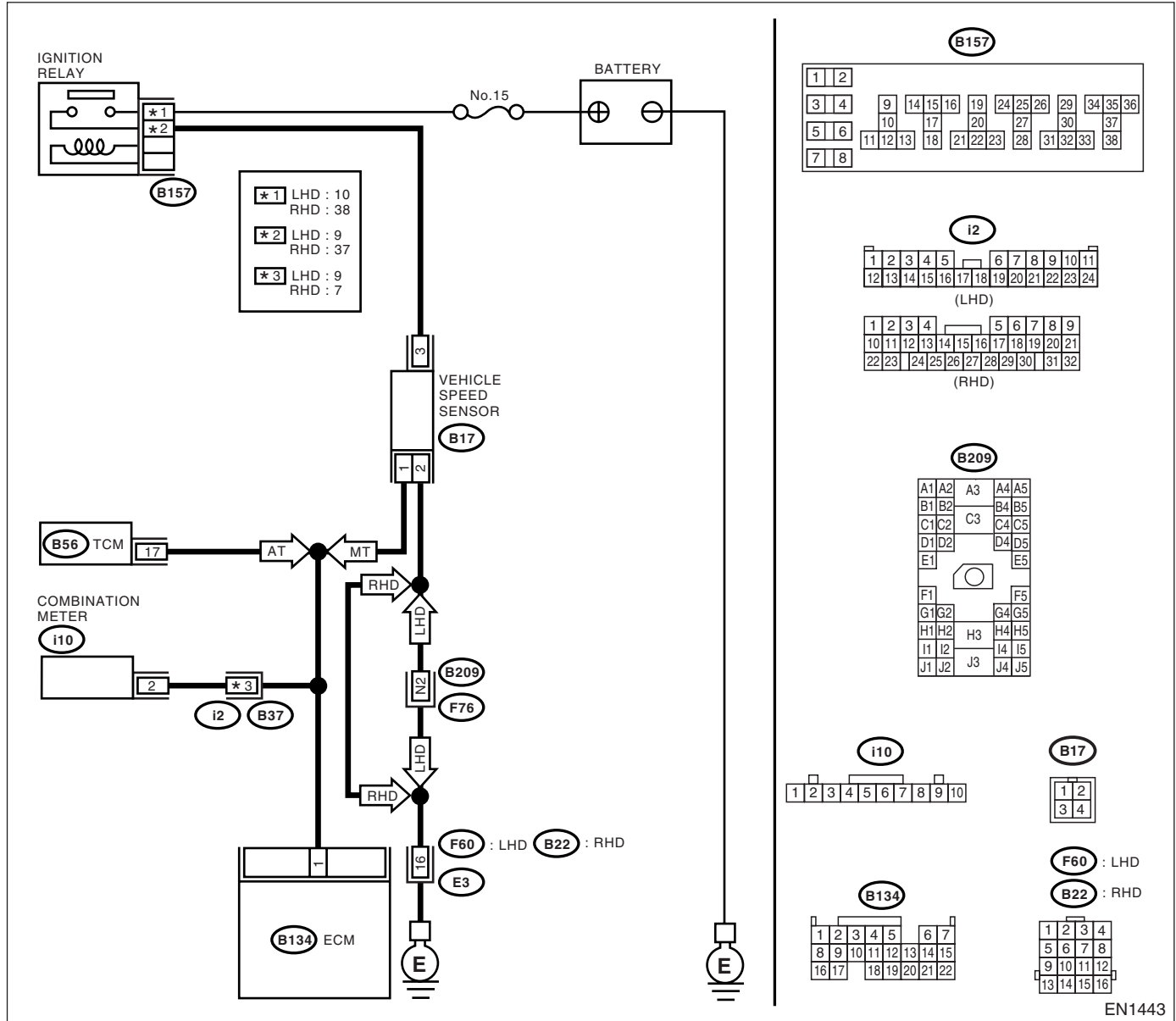
BB:DTC P0500 — VEHICLE SPEED SENSOR MALFUNCTION —

- **DTC DETECTING CONDITION:**
 - Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

• WIRING DIAGRAM:



EN1443

Step	Check	Yes	No
1	CHECK TRANSMISSION TYPE.	Is the transmission type AT?	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 the front vehicle speed sensor signal circuit. <Ref. to AT-57, DTC 33 FRONT VEHICLE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Go to step 3.
3 CHECK SPEEDOMETER OPERATION IN COMBINATION METER.	Does the speedometer operate normally?	Go to step 4.	Check the speedometer and vehicle speed sensor. <Ref. to IDI-17, Speedometer.> and <Ref. to AT-32, Front Vehicle Speed Sensor.>
4 CHECK HARNESS BETWEEN ECM AND COMBINATION METER CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from combination meter. 3) Measure the resistance between ECM and combination meter. Connector & terminal (B134) No. 1 — (i10) No. 2:	Is the resistance less than 10 Ω ?	Repair the poor contact in ECM connector.	Repair the harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between ECM and combination meter connector • Poor contact in ECM connector • Poor contact in combination meter connector • Poor contact in coupling connector

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

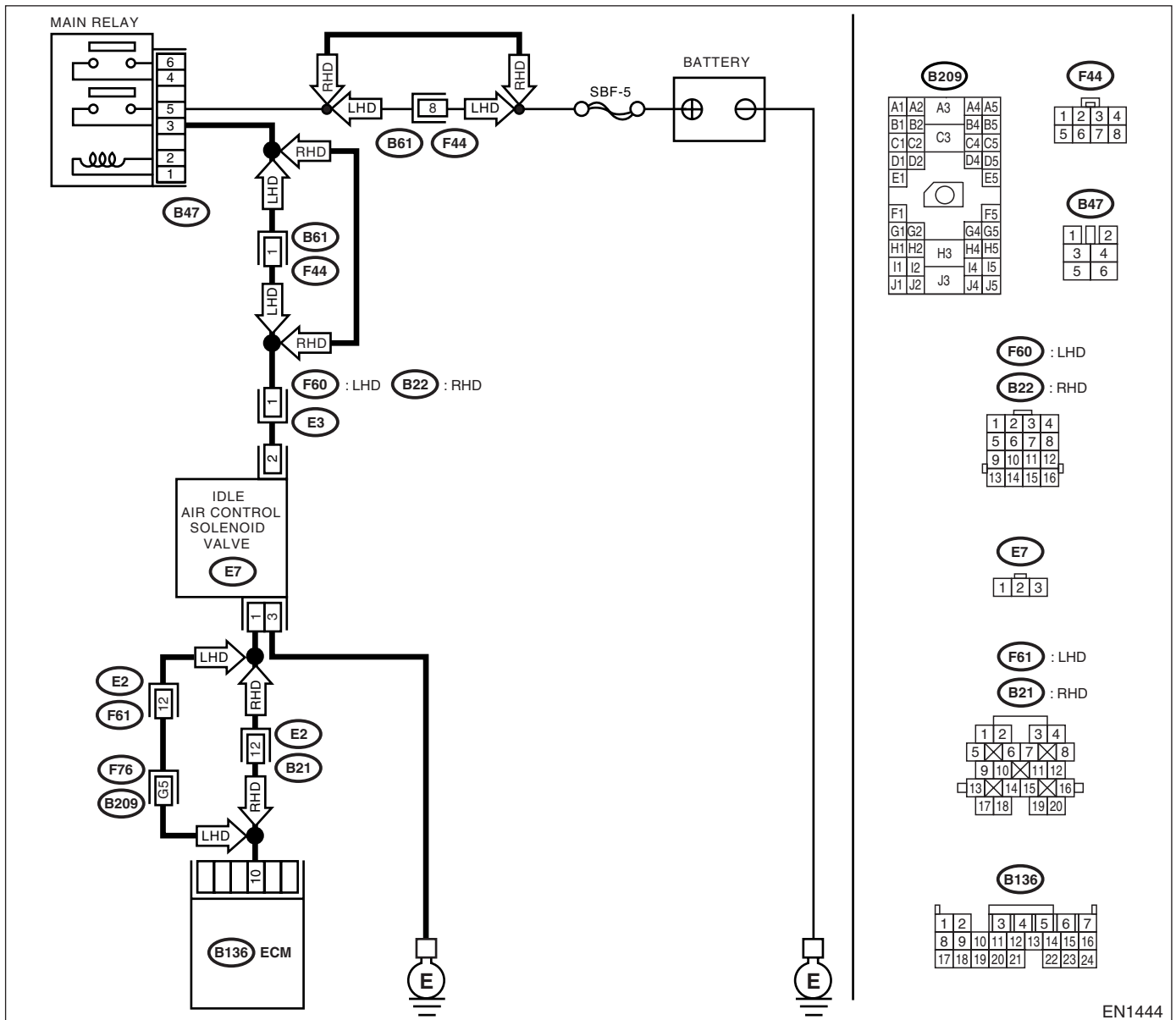
BC:DTC P0506 — IDLE CONTROL SYSTEM RPM LOWER THAN EXPECTED —

- **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(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

• **WIRING DIAGRAM:**



EN1444

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(TURBO)-75, 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 the ignition switch to OFF. 2)Remove the idle air control solenoid valve from throttle body. <Ref. to FU(TURBO)-36, REMOVAL, Idle Air Control Solenoid Valve.> 3)Using an air gun, force air into the 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 the idle air control solenoid valve. <Ref. to FU(TURBO)-36, Idle Air Control Solenoid Valve.> After replace, Go to step 3.
3 CHECK IDLE AIR CONTROL SOLENOID VALVE DUTY RATIO. 1)Turn the ignition switch to ON. 2)Start the engine, and warm-up the engine. 3)Turn all accessory switches to OFF. 4)Read the 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(TURBO)-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 60 %?	Go to step 4.	END.
4 CHECK BY-PASS AIR LINE. 1)Turn the ignition switch to OFF. 2)Remove the idle air control solenoid valve from throttle body. <Ref. to FU(TURBO)-36, REMOVAL, Idle Air Control Solenoid Valve.> 3)Remove the throttle body to intake manifold. <Ref. to FU(TURBO)-14, REMOVAL, Throttle Body.> 4)Using an air gun, force air into the solenoid valve installation area and throttle valve interior. Confirm that forced air subsequently escapes from both these areas.	Does air flow out?	Replace the idle air control solenoid valve. <Ref. to FU(TURBO)-36, Idle Air Control Solenoid Valve.>	Replace the throttle body. <Ref. to FU(TURBO)-14, Throttle Body.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

BD:DTC P0507 — IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED —

• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

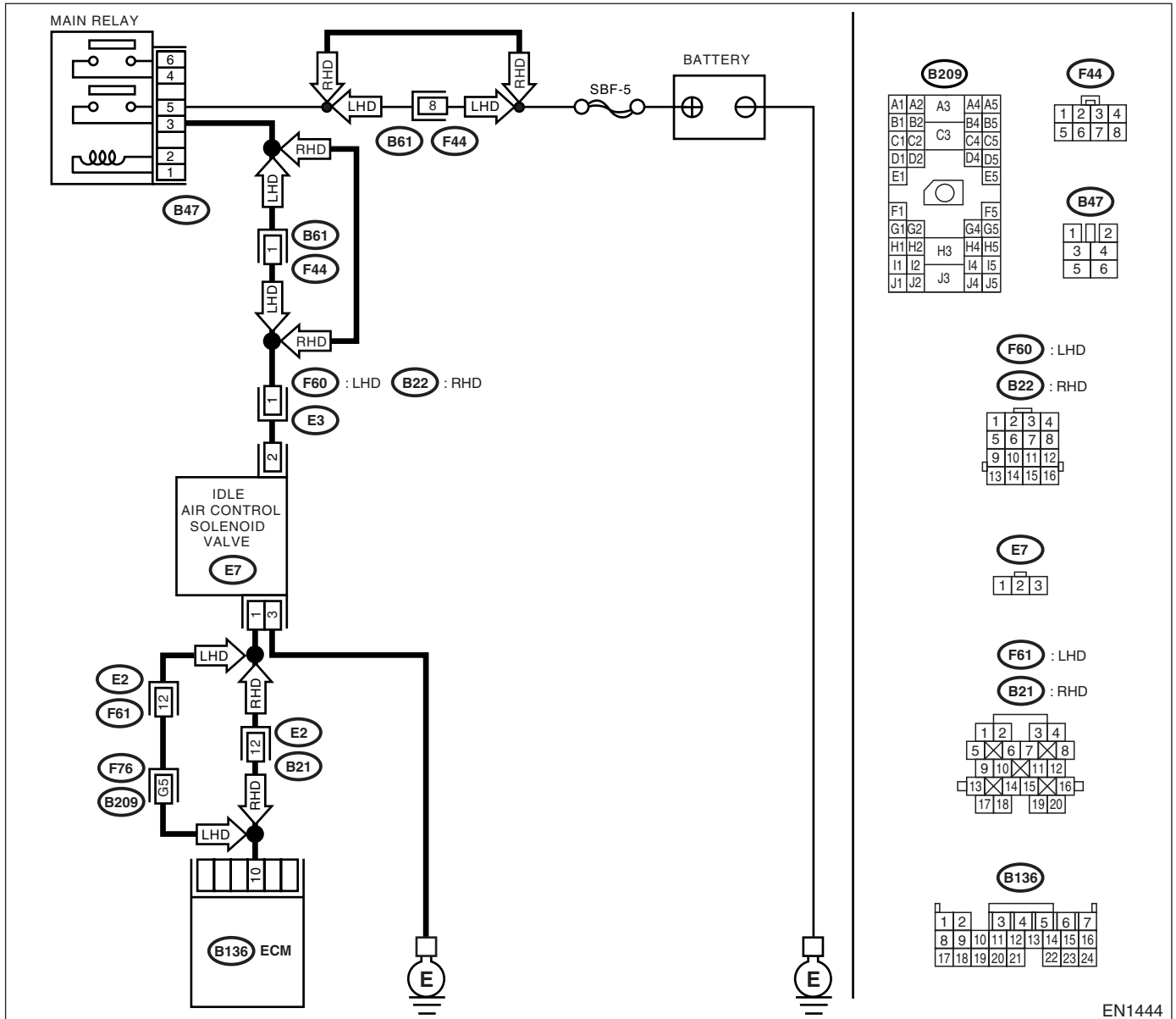
• TROUBLE SYMPTOM:

- 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(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

• WIRING DIAGRAM:



EN1444

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(TURBO)-75, 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 the throttle cable have play for adjustment?	Go to step 3.	Adjust the throttle cable. <Ref. to SP-9, INSTALLATION, Accelerator Control Cable.>
3 CHECK AIR INTAKE SYSTEM. 1)Turn the ignition switch to ON. 2)Start the engine, and idle it. 3)Check the following items. •Loose installation of intake manifold, idle air control solenoid valve and throttle body •Cracks of intake manifold gasket, idle air control solenoid valve gasket and throttle body gasket •Disconnections of vacuum hoses	Is there a fault in air intake system?	Repair the air suction and leaks.	Replace the idle air control solenoid valve. <Ref. to FU(TURBO)-36, Idle Air Control Solenoid Valve.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

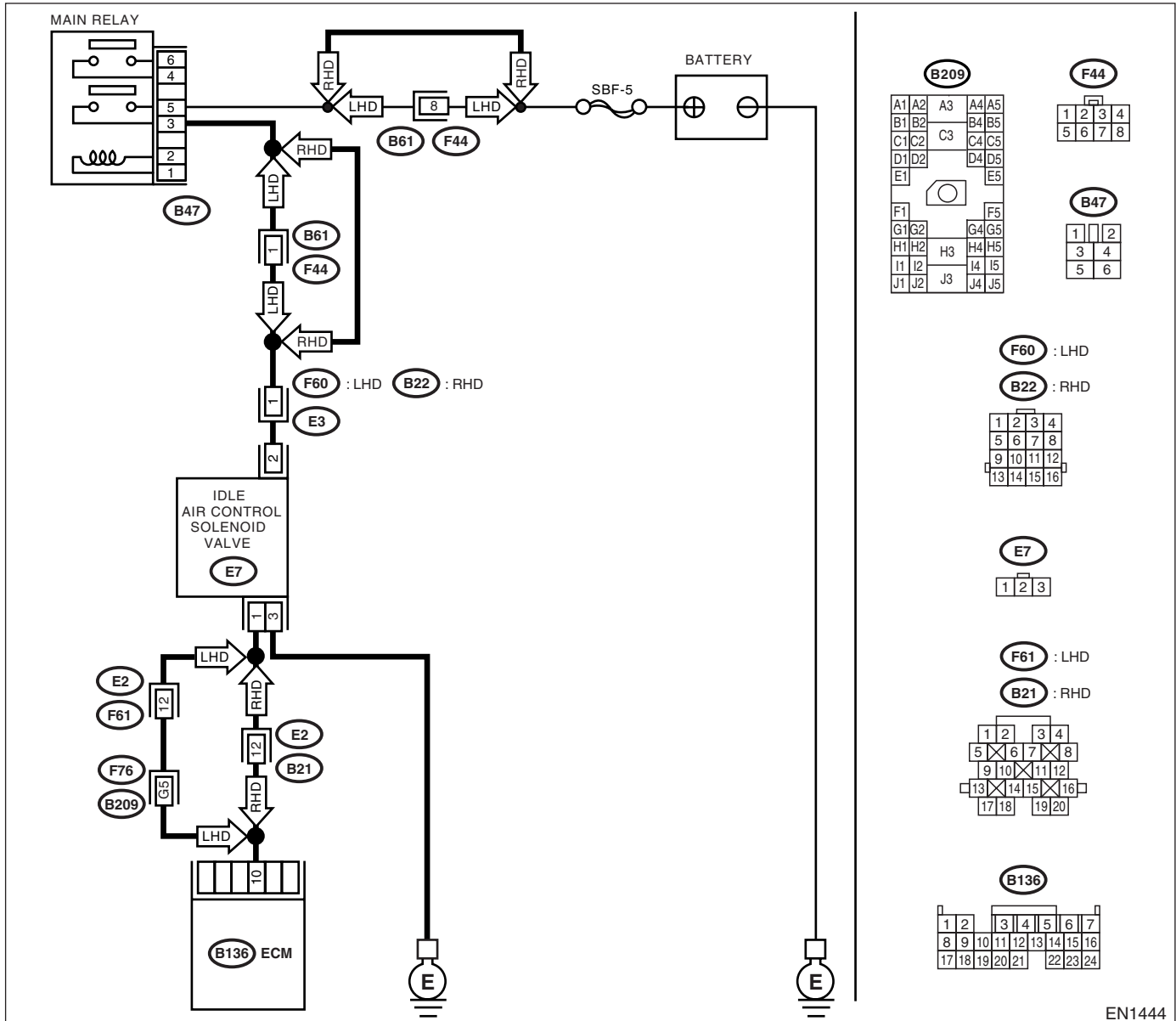
BE:DTC P0508 — IDLE CONTROL SYSTEM CIRCUIT LOW INPUT —

- **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(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

• WIRING DIAGRAM:



EN1444

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OUTPUT SIGNAL FROM ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. <i>Connector & terminal</i> <i>(B136) No. 10 (+) — Chassis ground (-):</i>	Is the voltage more than 3 V?	Repair the poor contact in ECM connector.	Go to step 2.
2 CHECK POWER SUPPLY TO IDLE AIR CONTROL SOLENOID VALVE. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from idle air control solenoid valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between idle air control solenoid valve and engine ground. <i>Connector & terminal</i> <i>(E7) No. 2 (+) — Engine ground (-):</i>	Is the voltage more than 10 V?	Go to step 3.	Repair the harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between idle air control solenoid valve and main relay connector • Poor contact in coupling connector
3 CHECK HARNESS BETWEEN ECM AND IDLE AIR CONTROL SOLENOID VALVE CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM and idle air control solenoid valve connector. <i>Connector & terminal</i> <i>(B136) No. 10 — (E7) No. 1:</i>	Is the resistance less than 1 Ω ?	Go to step 4.	Repair the harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between ECM and idle air control solenoid valve connector • Poor contact in coupling connector
4 CHECK HARNESS BETWEEN ECM AND IDLE AIR CONTROL SOLENOID VALVE CONNECTOR. Measure the resistance of harness between ECM and chassis ground. <i>Connector & terminal</i> <i>(B136) No. 10 — Chassis ground:</i>	Is the resistance less than 10 Ω ?	Repair the 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 the resistance of harness between idle air control solenoid valve connector and engine ground. <i>Connector & terminal</i> <i>(E7) No. 3 — Engine ground:</i>	Is the resistance less than 5 Ω ?	Go to step 6.	Repair the open circuit in harness between idle air control solenoid valve connector and engine ground cable.
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 the poor contact in ECM and idle air control solenoid valve connectors.	Replace the idle air control solenoid valve. <Ref. to FU(TURBO)-36, Idle Air Control Solenoid Valve.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

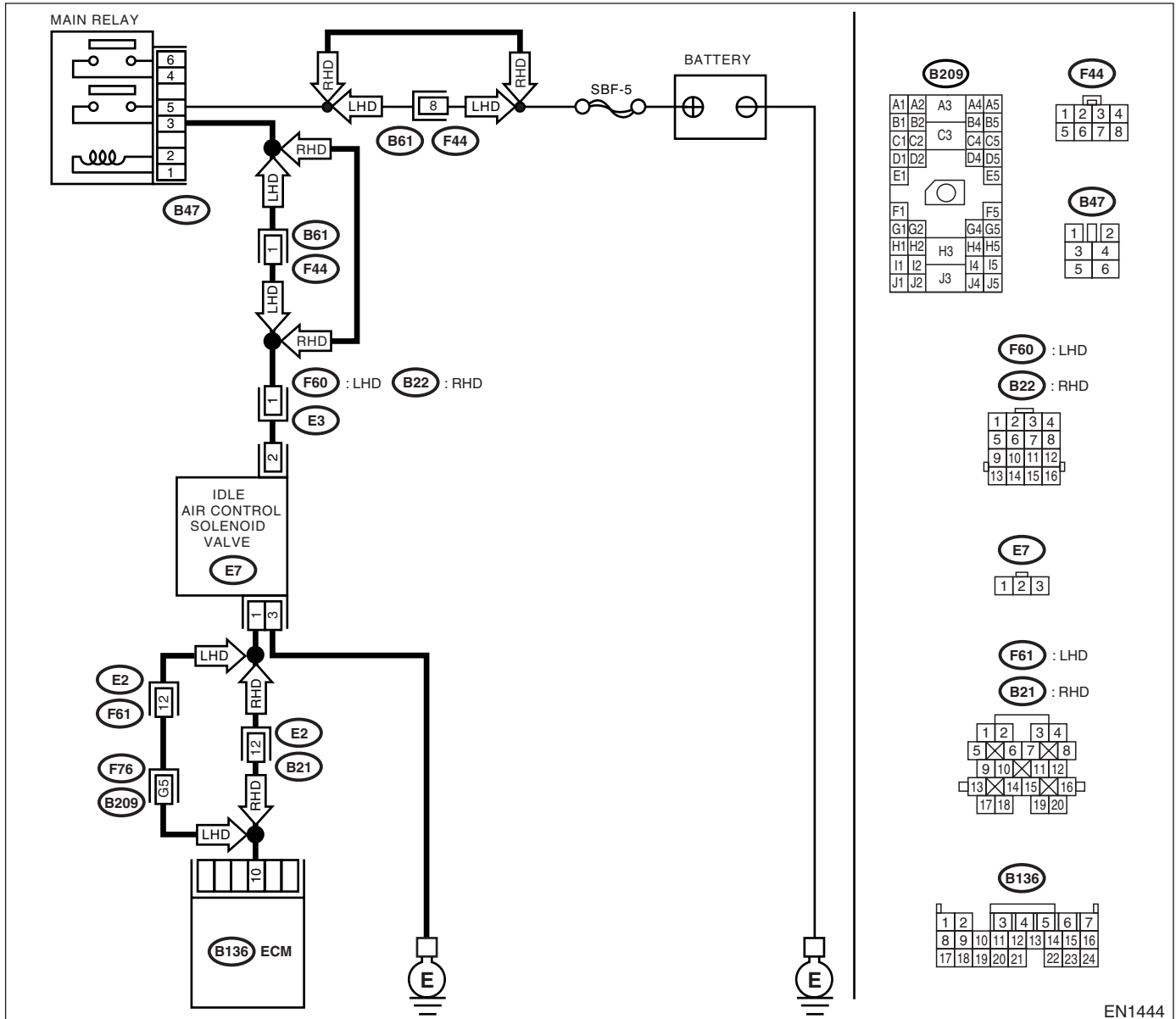
BF:DTC P0509 — IDLE CONTROL SYSTEM CIRCUIT HIGH INPUT —

- **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(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

• WIRING DIAGRAM:



EN1444

Step	Check	Yes	No
1	CHECK THROTTLE CABLE.	Does the throttle cable have play for adjustment?	Go to step 2.
			Adjust the throttle cable. <Ref. to SP-9, INSTALLATION, Accelerator Control Cable.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
2 CHECK OUTPUT SIGNAL FROM ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. Connector & terminal (B136) No. 10 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 3.	Go to step 4.
3 CHECK OUTPUT SIGNAL FROM ECM. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from idle air control solenoid valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. Connector & terminal (B136) No. 10 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Repair the battery short circuit in harness between ECM and idle air control solenoid valve connector. After repair, replace the ECM. <Ref. to FU(TURBO)-49, Engine Control Module.>	Replace the idle air control solenoid valve. <Ref. to FU(TURBO)-36, Idle Air Control Solenoid Valve.> and ECM <Ref. to FU(TURBO)-49, Engine Control Module.>
4 CHECK OUTPUT SIGNAL FROM ECM. Measure the voltage between ECM and chassis ground. Connector & terminal (B136) No. 10 (+) — Chassis ground (-):	Does the voltage change more than 10 V by shaking harness and connector of ECM while monitoring the value with voltage meter?	Repair the battery short circuit in harness between ECM and idle air control solenoid valve connector. After repair, replace the ECM. <Ref. to FU(TURBO)-49, Engine Control Module.>	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)

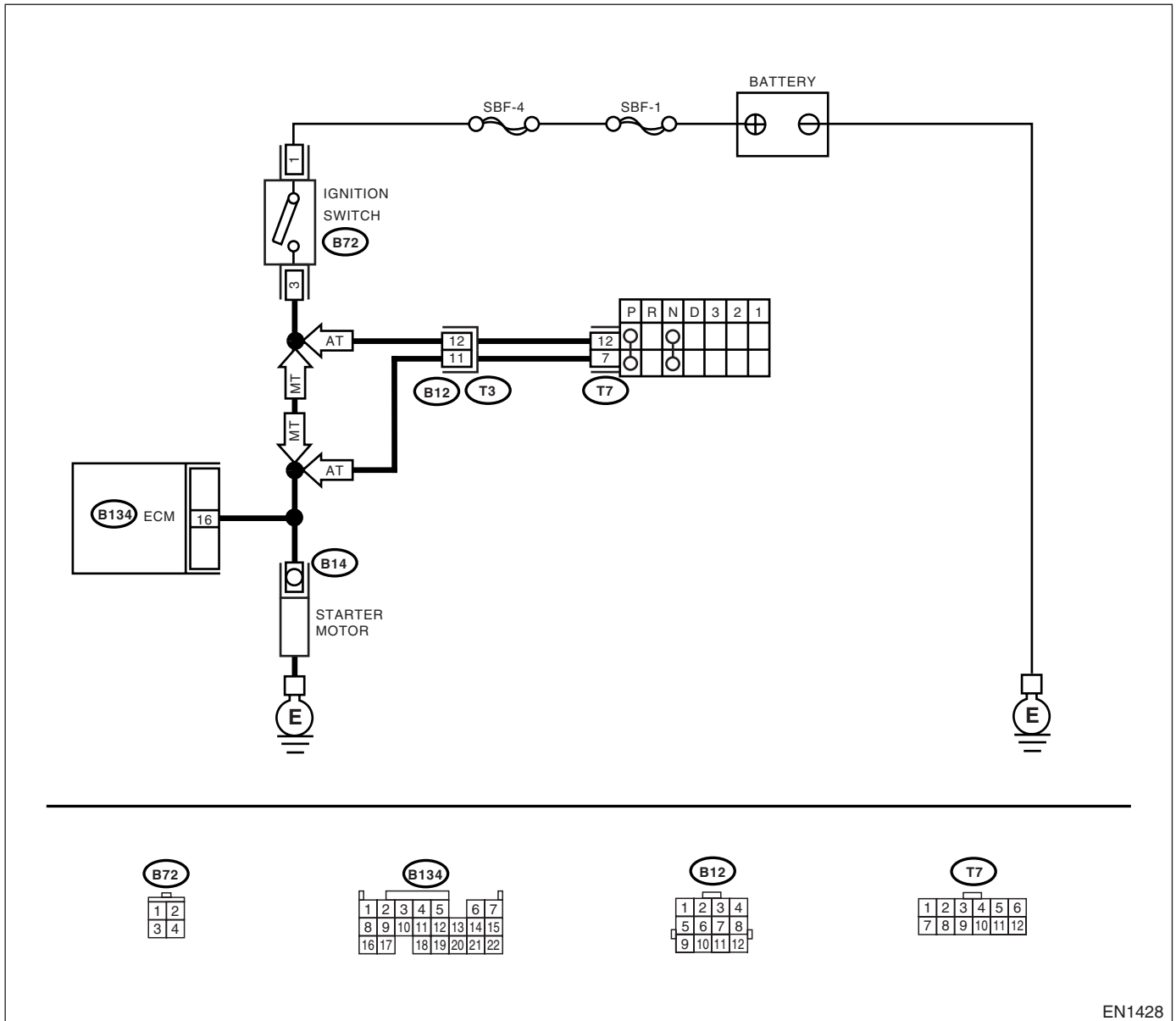
BG:DTC P0512 — STARTER SWITCH CIRCUIT HIGH INPUT —

- **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(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN1428

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 the starter motor operate when ignition switch is turned to ON?	Repair the battery short circuit in starter motor circuit. After repair, replace the ECM. <Ref. to FU(TURBO)-49, Engine Control Module.>	Check the starter motor circuit. <Ref. to EN(TURBO)-60, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

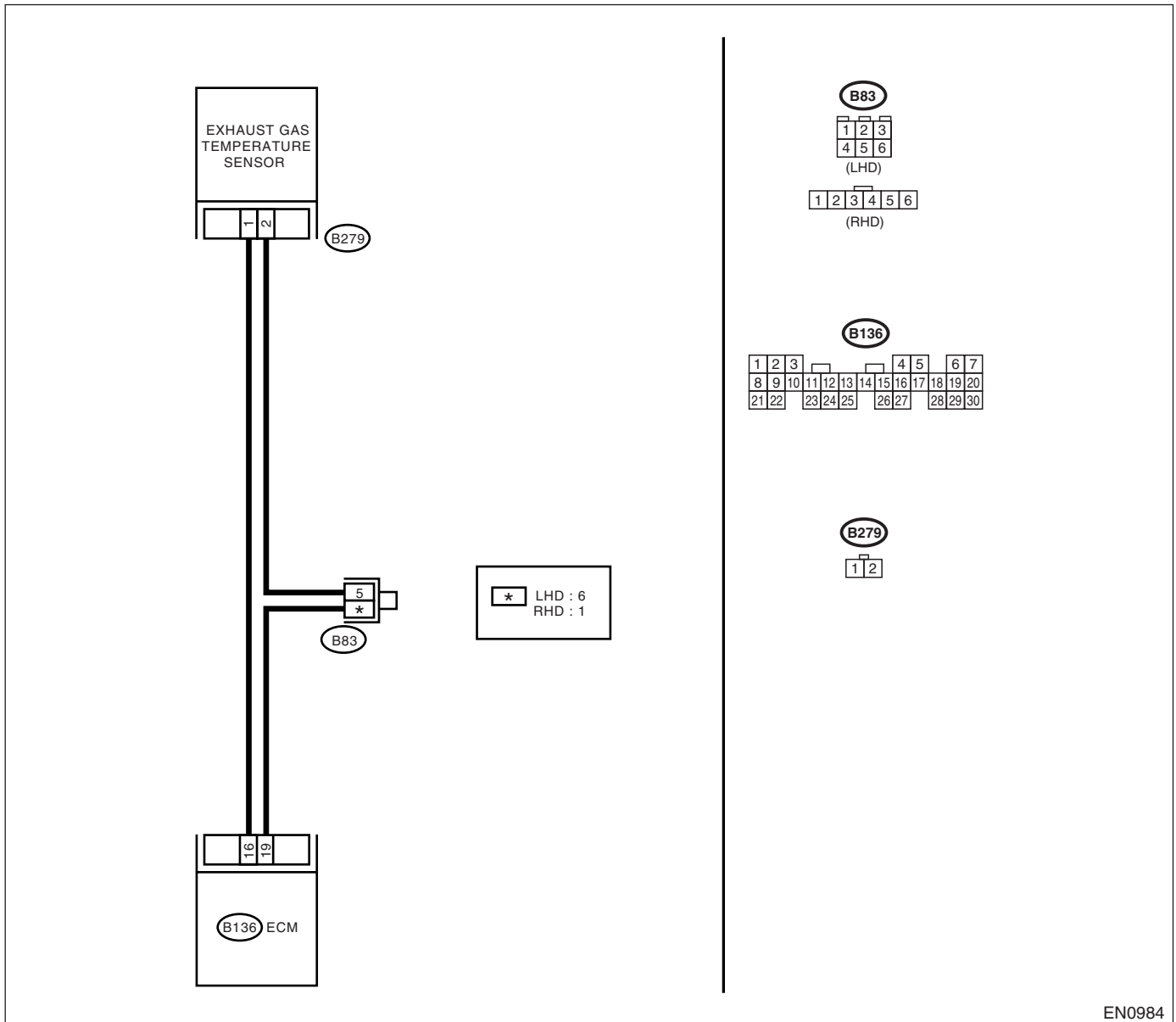
BH:DTC P0545 — EXHAUST GAS TEMPERATURE SENSOR CIRCUIT LOW INPUT —

- **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(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN0984

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK CURRENT DATA. 1)Start the engine. 2)Read the 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(TURBO)-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 1200°C (2192°F)?	Go to step 2.	Repair the 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 the ignition switch to OFF. 2)Disconnect the connector from exhaust gas temperature sensor. 3)Turn the ignition switch to ON. 4)Read the 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(TURBO)-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 372°C (702°F)?	Replace the exhaust gas temperature sensor. <Ref. to FU(TURBO)-48, Exhaust Temperature Sensor.>	Repair the ground short circuit in harness between exhaust gas temperature sensor and ECM connector.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

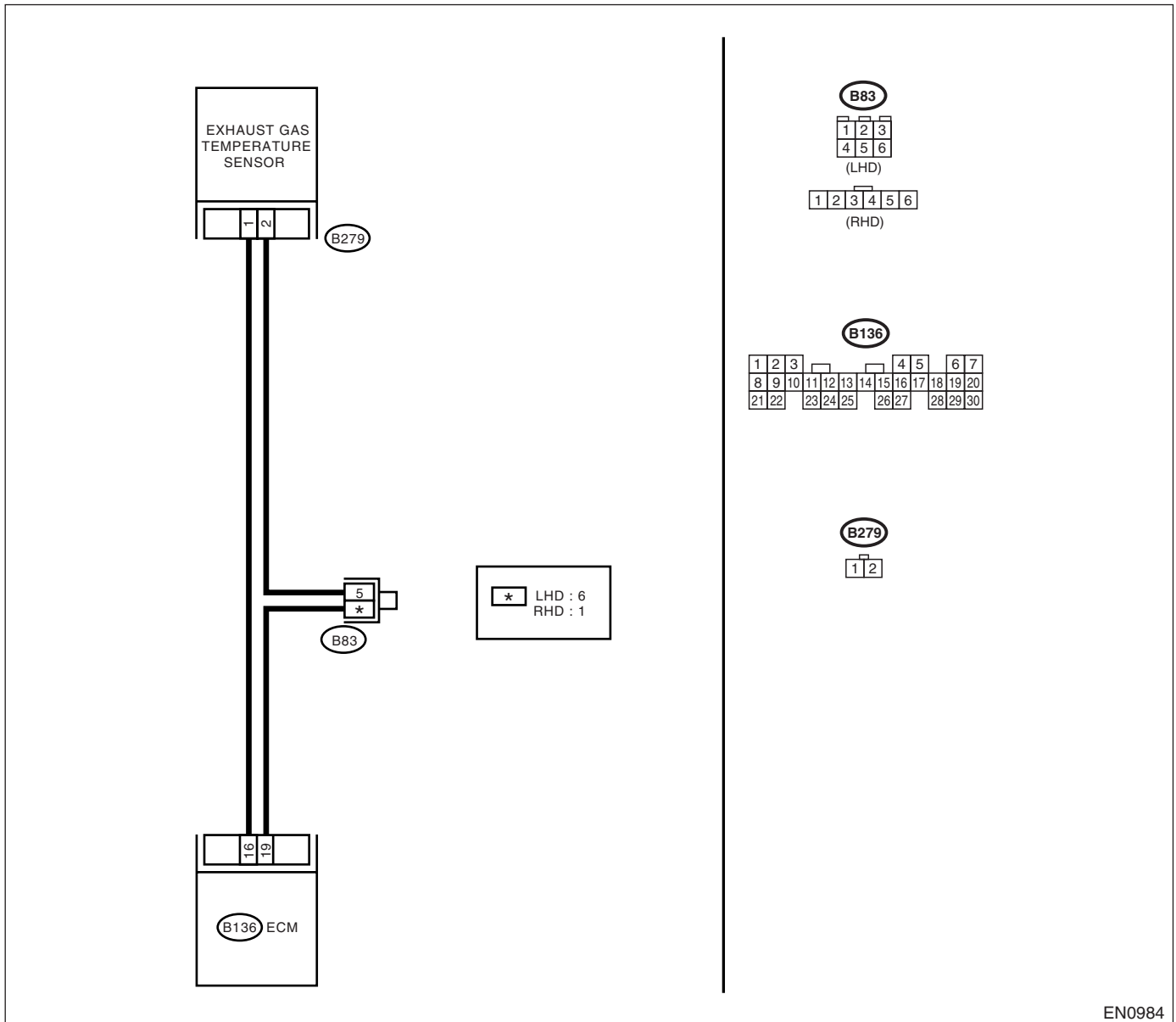
BI: DTC P0546 — EXHAUST GAS TEMPERATURE SENSOR CIRCUIT HIGH INPUT —

- **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(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN0984

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>1</p> <p>CHECK CURRENT DATA. 1)Start the engine. 2)Read the data of exhaust gas temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool.</p> <p>NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(TURBO)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.</p>	<p>Is the value less than 372°C (702°F)?</p>	<p>Go to step 2.</p>	<p>Repair the poor contact.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Poor contact in exhaust gas temperature sensor • Poor contact in ECM • Poor contact in joint connector
<p>2</p> <p>CHECK HARNESS BETWEEN EXHAUST GAS TEMPERATURE SENSOR AND ECM CONNECTOR. 1)Turn the ignition switch to OFF. 2)Disconnect the connector from exhaust gas temperature sensor. 3)Measure the voltage between exhaust gas temperature sensor connector and engine ground.</p> <p>Connector & terminal <i>(B279) No. 1 (+) — Engine ground (-):</i></p>	<p>Is the voltage more than 10 V?</p>	<p>Repair the battery short circuit in harness between ECM and exhaust gas temperature sensor connector.</p>	<p>Go to step 3.</p>
<p>3</p> <p>CHECK HARNESS BETWEEN EXHAUST GAS TEMPERATURE SENSOR AND ECM CONNECTOR. 1)Turn the ignition switch to ON. 2)Measure the voltage between exhaust gas temperature sensor connector and engine ground.</p> <p>Connector & terminal <i>(B279) No. 1 (+) — Engine ground (-):</i></p>	<p>Is the voltage more than 10 V?</p>	<p>Repair the battery short circuit in harness between ECM and exhaust gas temperature sensor connector.</p>	<p>Go to step 4.</p>
<p>4</p> <p>CHECK HARNESS BETWEEN EXHAUST GAS TEMPERATURE SENSOR AND ECM CONNECTOR. Measure the voltage between exhaust gas temperature sensor connector and engine ground.</p> <p>Connector & terminal <i>(B279) No. 1 (+) — Engine ground (-):</i></p>	<p>Is the voltage more than 4 V?</p>	<p>Go to step 5.</p>	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Open circuit in harness between ECM and 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
<p>5</p> <p>CHECK HARNESS BETWEEN EXHAUST GAS TEMPERATURE SENSOR AND ECM CONNECTOR.</p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Measure the resistance of harness between exhaust gas temperature sensor connector and engine ground.</p> <p>Connector & terminal (B279) No. 2 — Engine ground:</p>	<p>Is the resistance less than 5 Ω?</p>	<p>Replace the exhaust gas temperature sensor. <Ref. to FU(TURBO)-48, Exhaust Temperature Sensor.></p>	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none">• Open circuit in harness between 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

BJ:DTC P0604 — INTERNAL CONTROL MODULE MEMORY CHECK SUM ERROR —

- **DTC DETECTING CONDITION:**
 - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
 - Engine does not start.
 - Engine stalls.

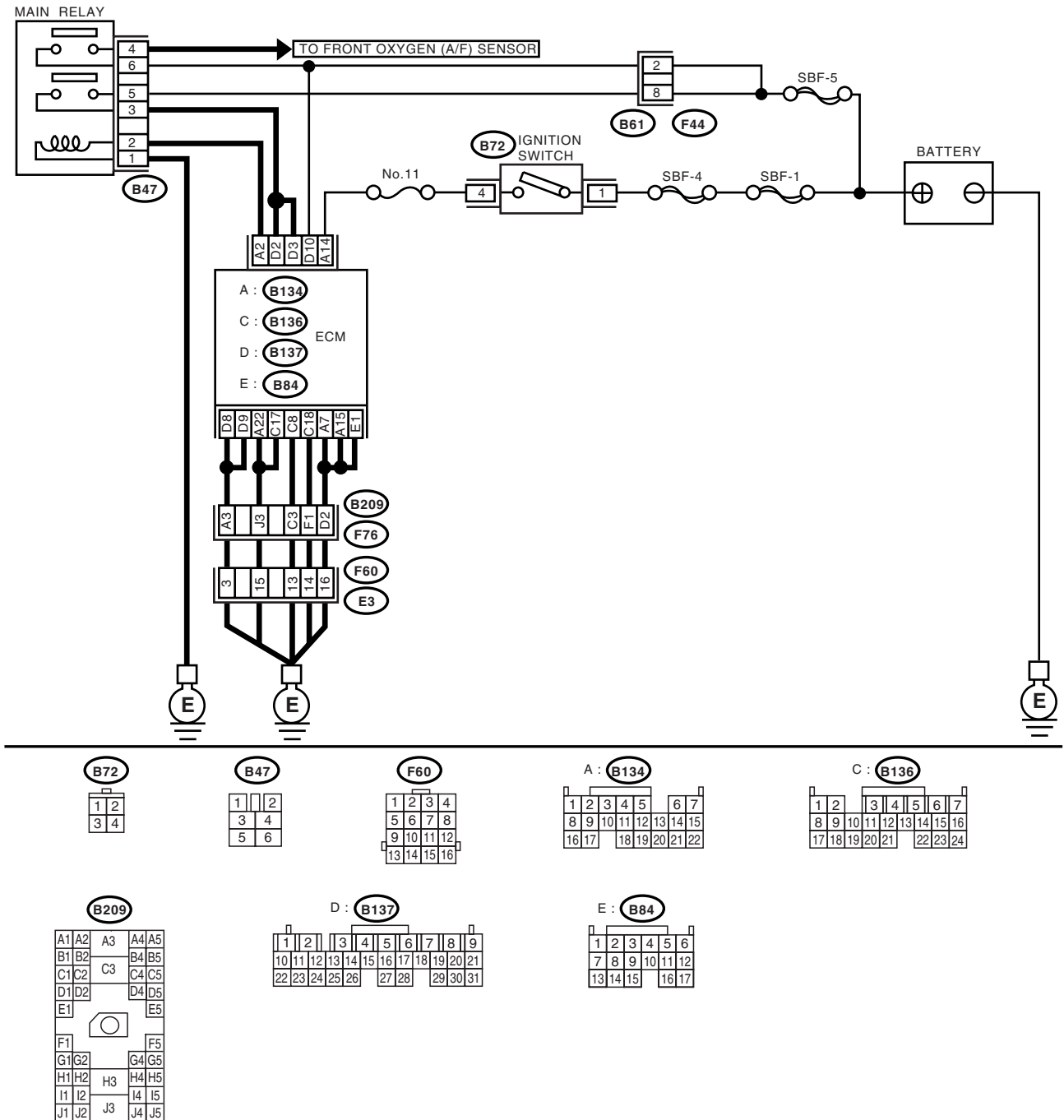
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC) ENGINE (DIAGNOSTICS)

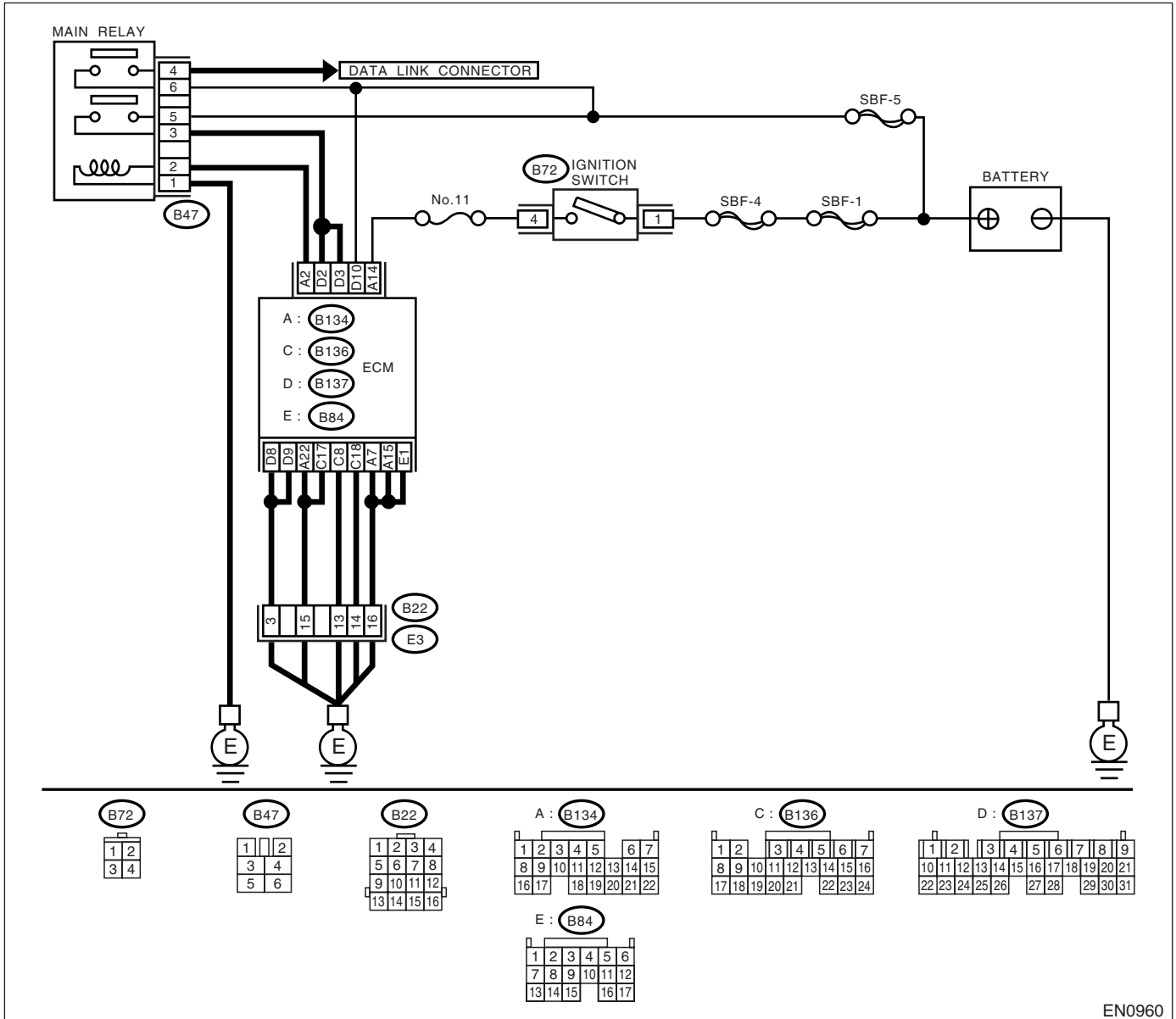
• LHD model



EN1429

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC) ENGINE (DIAGNOSTICS)

• RHD model



EN0960

Step	Check	Yes	No	
1	CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0604?	Replace the ECM. <Ref. to FU(TURBO)-49, Engine Control Module.>	It is not necessary to inspect DTC P0604.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

BK:DTC P0703 — BRAKE SWITCH INPUT MALFUNCTION —

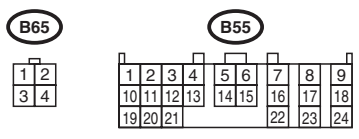
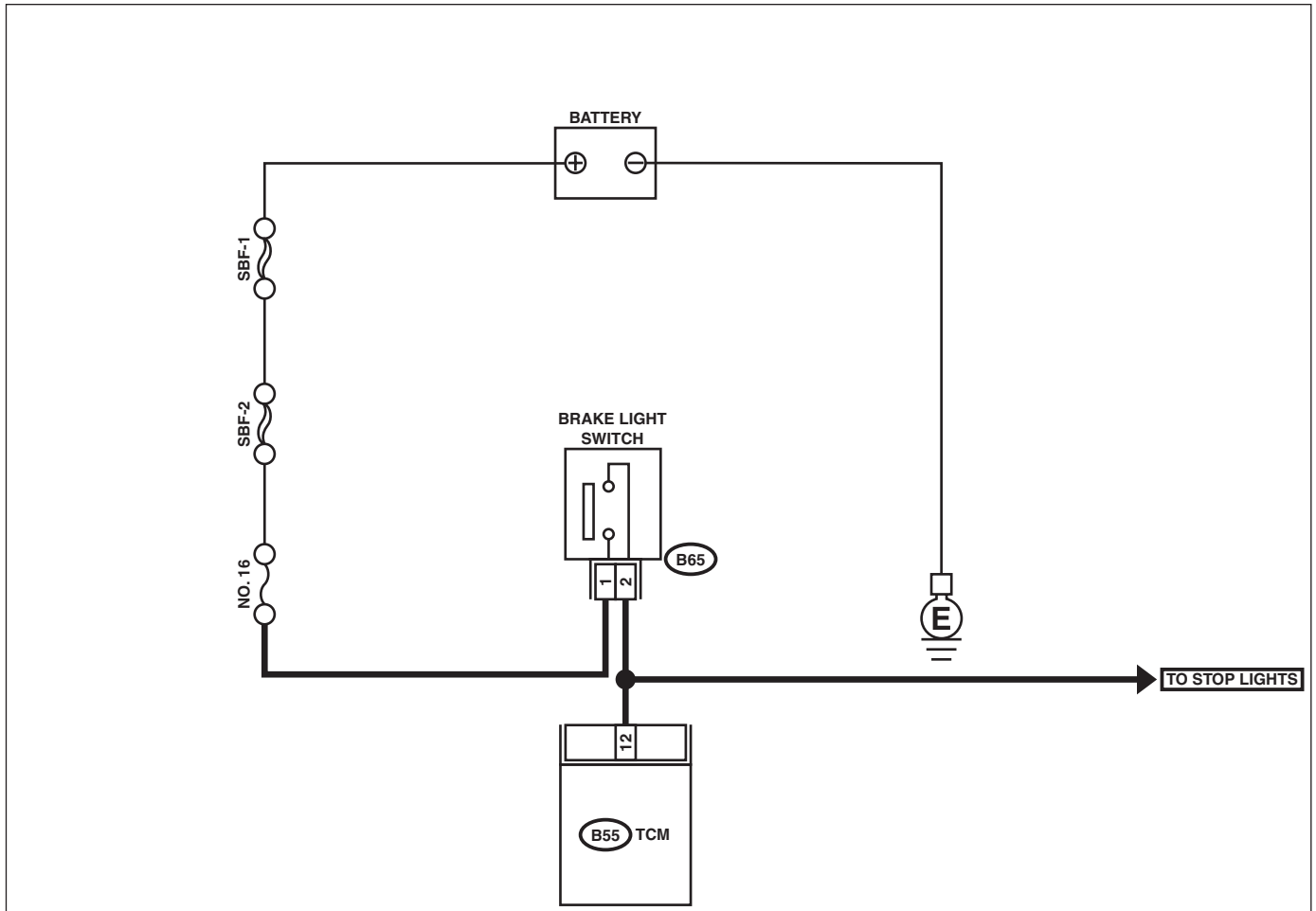
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.>.

WIRING DIAGRAM:



B2M4366

Step	Check	Yes	No
1	CHECK OPERATION OF BRAKE LIGHT. Does the brake light come on when depressing the brake pedal?	Go to step 2.	Repair or replace the 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 the connectors from TCM and brake light switch. 2)Measure the resistance of harness between TCM and brake light switch connector. <i>Connector & terminal</i> <i>(B55) No. 12 — (B65) No. 3:</i>	Is the resistance less than 1 Ω ?	Go to step 3 .	Repair or replace the harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between TCM and brake light switch connector • Poor contact in TCM connector • Poor contact in brake light switch connector
3 CHECK HARNESS BETWEEN TCM AND BRAKE LIGHT SWITCH CONNECTOR. Measure the resistance of harness between TCM and chassis ground. <i>Connector & terminal</i> <i>(B55) No. 12 — Chassis ground:</i>	Is the resistance more than 1 $M\Omega$?	Go to step 4 .	Repair the ground short circuit in harness between TCM and brake light switch connector.
4 CHECK INPUT SIGNAL FOR TCM. 1)Connect the connectors to TCM and brake light switch. 2)Measure the voltage between TCM and chassis ground. <i>Connector & terminal</i> <i>(B55) No. 12 (+) — Chassis ground (-):</i>	Is the voltage less than 1 V when releasing the brake pedal?	Go to step 5 .	Adjust or replace the brake light switch. <Ref. to LI-8, STOP LIGHT SWITCH, INSPECTION, Stop Light System.>
5 CHECK INPUT SIGNAL FOR TCM. Measure the voltage between TCM and chassis ground. <i>Connector & terminal</i> <i>(B55) No. 12 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V when depressing the brake pedal?	Go to step 6 .	Adjust or replace the brake light switch. <Ref. to LI-8, 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 the poor contact in TCM connector.	Replace the TCM. <Ref. to AT-46, Transmission Control Module (TCM).>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

BL:DTC P0731 — GEAR 1 INCORRECT RATIO —

NOTE:

For the diagnostic procedure, refer to DTC P0734. <Ref. to EN(TURBO)-253, DTC P0734 — GEAR 4 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BM:DTC P0732 — GEAR 2 INCORRECT RATIO —

NOTE:

For the diagnostic procedure, refer to DTC P0734. <Ref. to EN(TURBO)-253, DTC P0734 — GEAR 4 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BN:DTC P0733 — GEAR 3 INCORRECT RATIO —

NOTE:

For the diagnostic procedure, refer to DTC P0734. <Ref. to EN(TURBO)-253, DTC P0734 — GEAR 4 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

BO:DTC P0734 — GEAR 4 INCORRECT RATIO —

• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

• TROUBLE SYMPTOM:

- Shift point too high or too low; engine brake not effective in “3” range; excessive shift shock; excessive tight corner “braking”

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.>.

• WIRING DIAGRAM:

Step	Check	Yes	No	
1	CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(TURBO)-75, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2	CHECK THROTTLE POSITION SENSOR CIRCUIT. Check the throttle position sensor circuit. <Ref. to AT-50, DTC 31 THROTTLE POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble in throttle position sensor circuit?	Repair or replace the throttle position sensor circuit.	Go to step 3.
3	CHECK FRONT VEHICLE SPEED SENSOR CIRCUIT. Check the front vehicle speed sensor circuit. <Ref. to AT-57, DTC 33 FRONT VEHICLE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble in vehicle speed sensor 2 circuit?	Repair or replace the vehicle speed sensor 2 circuit.	Go to step 4.
4	CHECK TORQUE CONVERTER TURBINE SPEED SENSOR CIRCUIT. Check the torque converter turbine speed sensor circuit. <Ref. to AT-62, DTC 36 TORQUE CONVERTER TURBINE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble in torque converter turbine speed sensor circuit?	Repair or replace the 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 the 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 the automatic transmission. <Ref. to AT-12, INSPECTION, Road Test.>	Replace the TCM. <Ref. to AT-46, Transmission Control Module (TCM).>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

BP: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(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.>.

Step	Check	Yes	No
1	CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.	Inspect the relevant DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(TURBO)-75, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2	CHECK LOCK-UP DUTY SOLENOID CIRCUIT. Check the lock-up duty solenoid circuit. <Ref. to AT-94, DTC 77 LOCK-UP DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Repair or replace the lock-up duty solenoid circuit.	Go to step 3.
3	CHECK THROTTLE POSITION SENSOR CIRCUIT. Check the throttle position sensor circuit. <Ref. to AT-50, DTC 31 THROTTLE POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Repair or replace the throttle position sensor circuit.	Go to step 4.
4	CHECK TORQUE CONVERTER TURBINE SPEED SENSOR CIRCUIT. Check the torque converter turbine speed sensor circuit. <Ref. to AT-62, DTC 36 TORQUE CONVERTER TURBINE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Repair or replace the torque converter turbine speed sensor circuit.	Go to step 5.
5	CHECK ENGINE SPEED INPUT CIRCUIT. Check the engine speed input circuit. <Ref. to AT-42, DTC 11 ENGINE SPEED SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Repair or replace the engine speed input circuit.	Go to step 6.
6	CHECK INHIBITOR SWITCH CIRCUIT. Check the inhibitor switch circuit. <Ref. to AT-119, CHECK INHIBITOR SWITCH., Diagnostic Procedure for No-diagnostic Trouble Code (DTC).>	Repair or replace the inhibitor switch circuit.	Go to step 7.
7	CHECK BRAKE LIGHT SWITCH CIRCUIT. Check the brake light switch circuit. <Ref. to AT-110, CHECK BRAKE SWITCH., Diagnostic Procedure for No-diagnostic Trouble Code (DTC).>	Repair or replace the 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 the ATF temperature sensor circuit. <Ref. to AT-46, DTC 27 ATF TEMPERATURE SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble in ATF temperature sensor circuit?	Repair or replace the 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 the 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 the automatic transmission. <Ref. to AT-12, INSPECTION, Road Test.>	Replace the TCM. <Ref. to AT-46, Transmission Control Module (TCM).>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

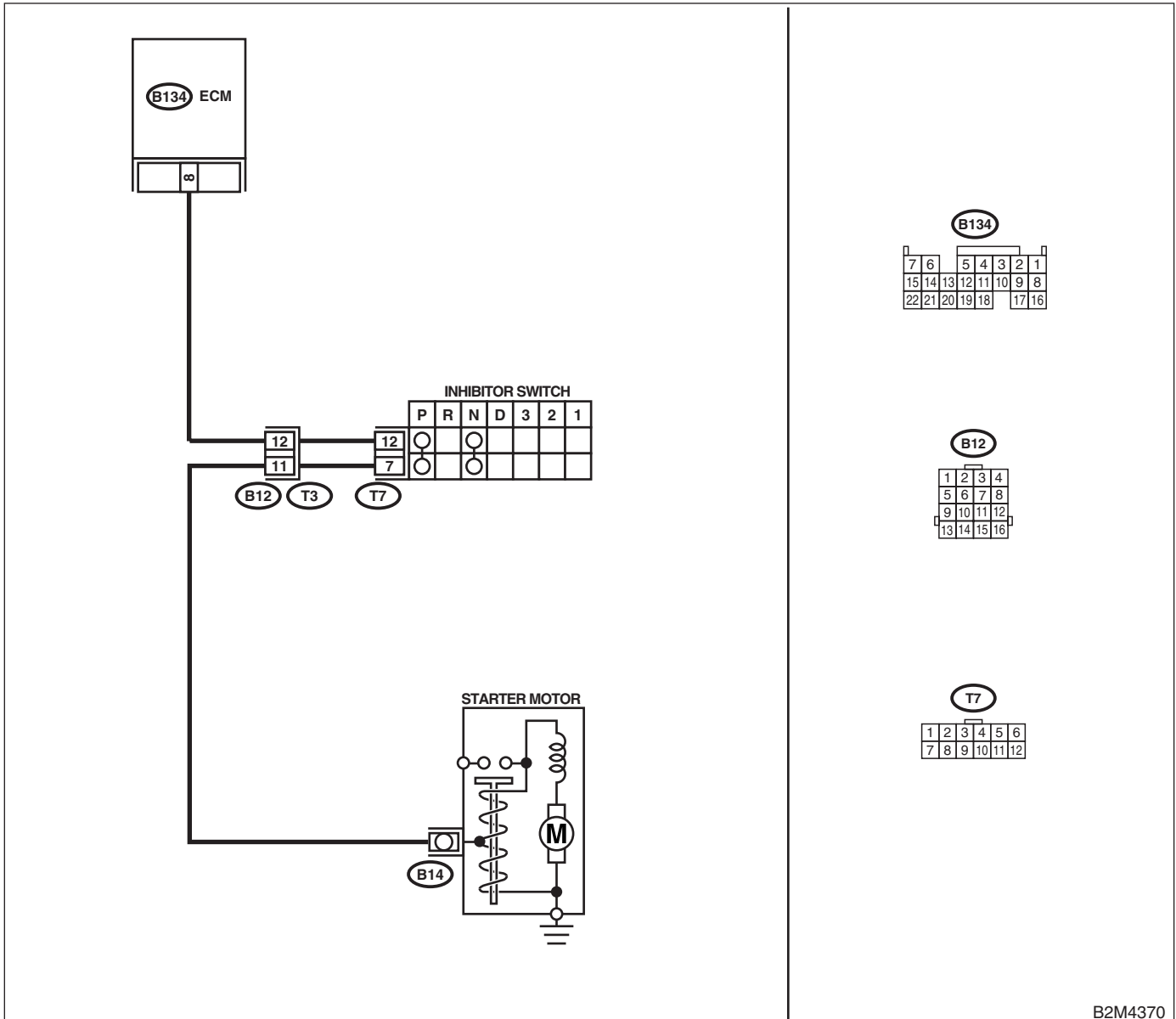
BQ:DTC P0851 — NEUTRAL POSITION SWITCH CIRCUIT HIGH INPUT [AT VEHICLES] —

- **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(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.>.

- **WIRING DIAGRAM:**



B2M4370

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 the DTC P0705 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(TURBO)-75, List of Diagnostic Trouble Code (DTC).>
2	CHECK INPUT SIGNAL FOR ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground in selector lever "N" and "P" positions. Connector & terminal (B134) No. 8 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Go to step 3.
3	CHECK INPUT SIGNAL FOR ECM. Measure the voltage between ECM and chassis ground in selector lever except for "N" and "P" positions. Connector & terminal (B134) No. 8 (+) — Chassis ground (-):	Is the voltage between 4.5 and 5.5 V?	Go to step 4.
4	CHECK POOR CONTACT. Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the 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 the voltage between ECM and chassis ground. Connector & terminal (B134) No. 8 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Repair the battery short circuit in harness between ECM and inhibitor switch connector.
6	CHECK HARNESS BETWEEN ECM AND INHIBITOR SWITCH CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and inhibitor switch. 3) Measure the resistance of harness between ECM and inhibitor switch connector. Connector & terminal (B134) No. 8 — (T7) No. 12:	Is the resistance less than 1 Ω ?	Go to step 7. Repair the 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 • Poor contact in inhibitor switch connector • Poor contact in ECM connector

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>7 CHECK INHIBITOR SWITCH GROUND LINE. Measure the resistance of harness between inhibitor switch connector and engine ground. Connector & terminal (T7) No. 7 — Engine ground:</p>	Is the resistance less than 5 Ω ?	Go to step 8 .	Repair the open circuit in harness between inhibitor switch connector and starter motor ground line. NOTE: In this case, repair the following: <ul style="list-style-type: none"> • Open circuit in harness between inhibitor switch connector and starter motor ground line • Poor contact in starter motor connector • Poor contact in starter motor ground • Starter motor
<p>8 CHECK INHIBITOR SWITCH. Measure the resistance between inhibitor switch connector receptacle's terminals in selector lever "N" and "P" positions. Terminals No. 7 — No. 12:</p>	Is the resistance less than 1 Ω ?	Go to step 9 .	Replace the inhibitor switch. <Ref. to AT-28, Inhibitor Switch.>
<p>9 CHECK SELECTOR CABLE CONNECTION.</p>	Is there any fault in selector cable connection to inhibitor switch?	Repair the 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.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

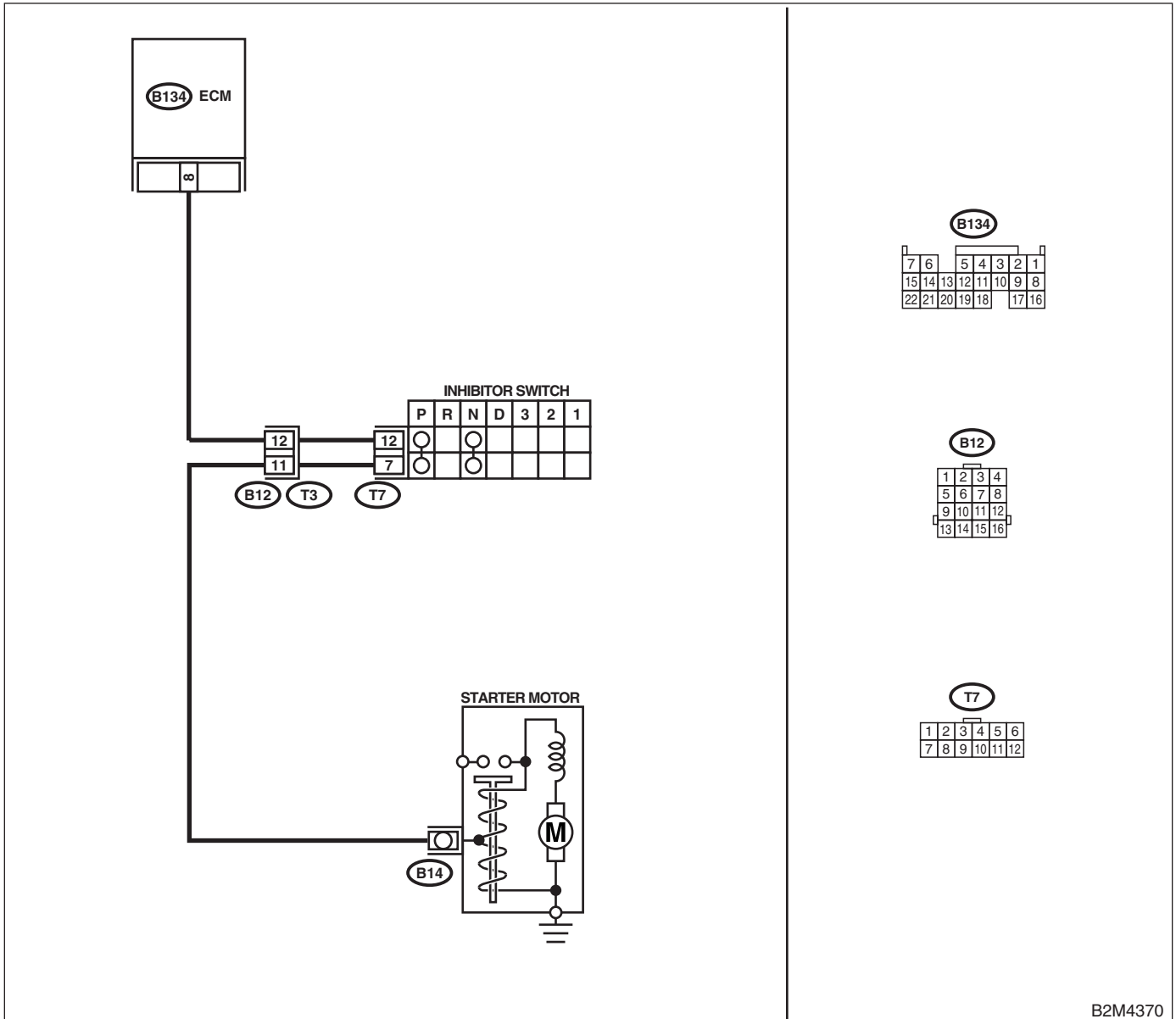
BR:DTC P0852 — NEUTRAL POSITION SWITCH CIRCUIT LOW INPUT [AT VEHICLES] —

- **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(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.>.

- **WIRING DIAGRAM:**



DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1	CHECK DTC P0705 ON DISPLAY.	Inspect the DTC P0705 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(TURBO)-75, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2	CHECK INPUT SIGNAL FOR ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. Connector & terminal (B134) No. 8 (+) — 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 the ignition switch to OFF. 2) Disconnect the connectors from ECM and transmission harness connector (T3). 3) Measure the resistance of harness between ECM connector and chassis ground. Connector & terminal (B134) No. 8 — Chassis ground:	Is the resistance less than 10 Ω? Repair the ground short circuit in harness between ECM and transmission harness connector.	Go to step 4.
4	CHECK TRANSMISSION HARNESS CONNECTOR. 1) Disconnect the connector from inhibitor switch. 2) Measure the 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 the ground short circuit in harness between transmission harness and inhibitor switch connector.	Go to step 5.
5	CHECK INHIBITOR SWITCH. Measure the 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 MΩ at except "N" and "P" positions? Go to step 6.	Replace the 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 the 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.

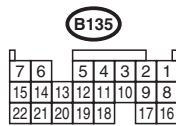
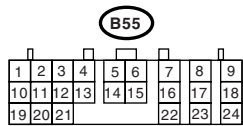
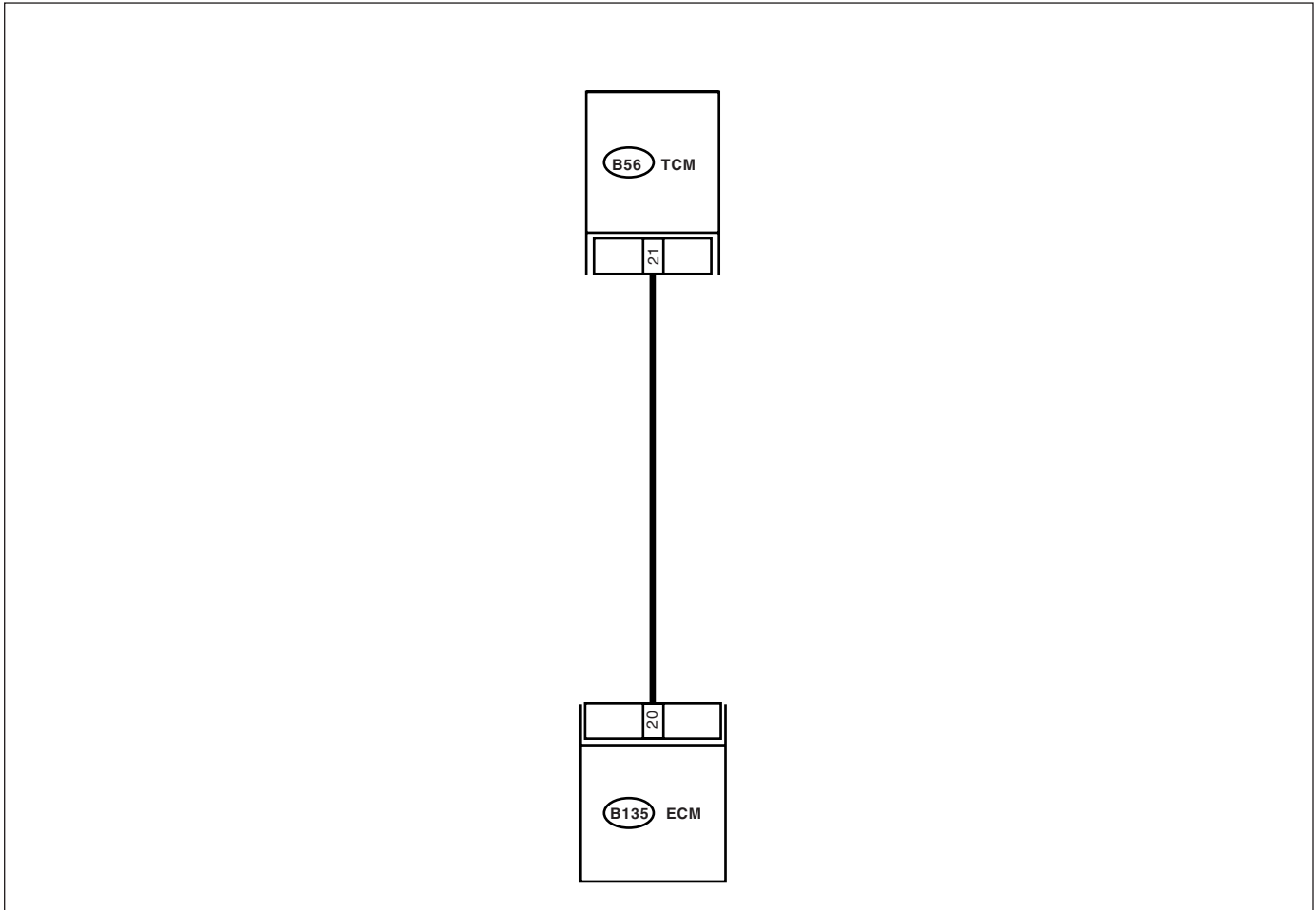
BS:DTC P0864 — AUTOMATIC TRANSMISSION DIAGNOSIS INPUT SIGNAL CIRCUIT MALFUNCTION —

- **DTC DETECTING CONDITION:**
 - Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.>.

- **WIRING DIAGRAM:**



B2M4371

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 the AT shift control functioning properly?	Go to step 2.	Replace the TCM. <Ref. to AT-46, 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 the grounding line of car phone or CB system.	Replace the TCM. <Ref. to AT-46, Transmission Control Module (TCM).>

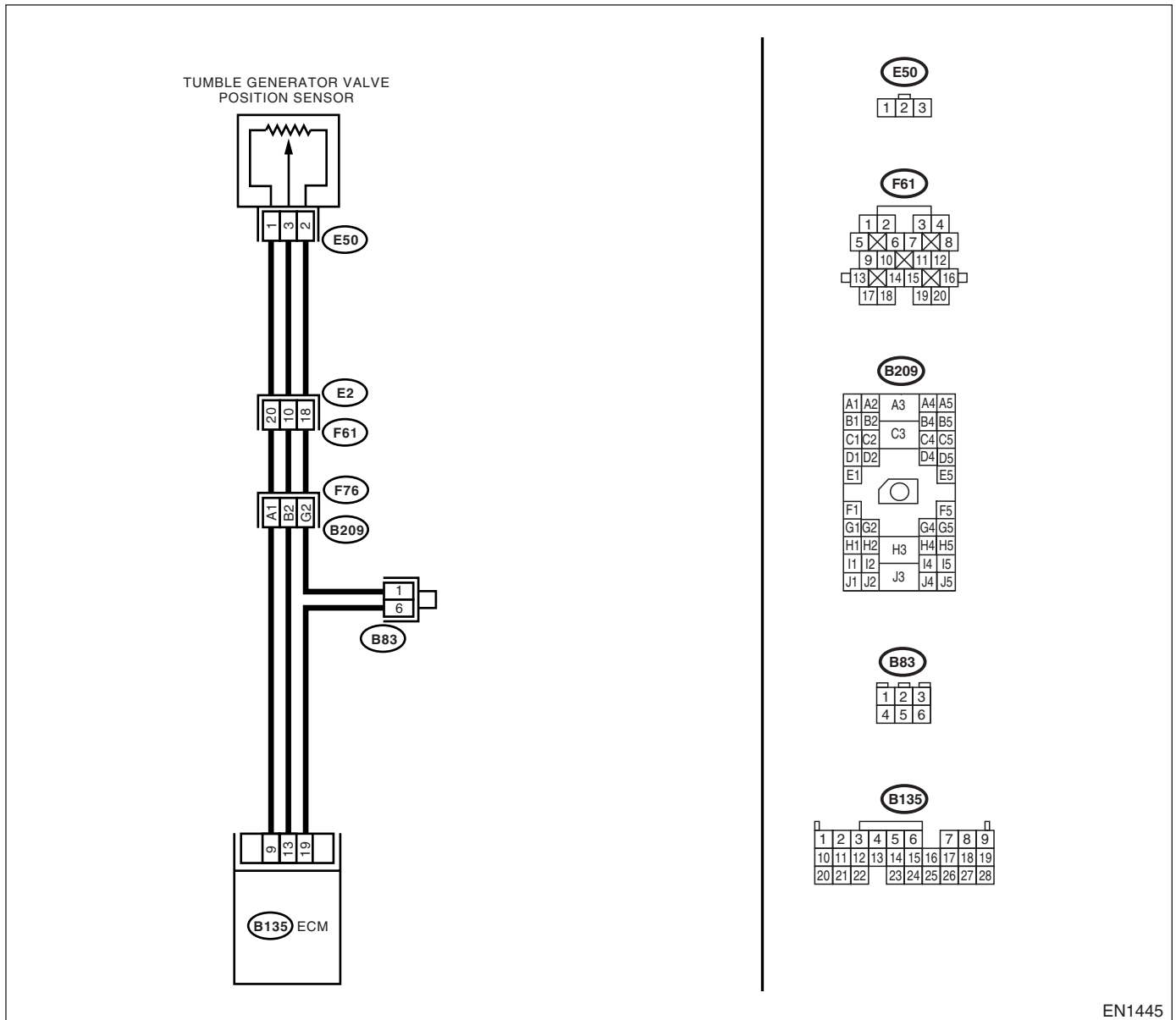
**BT: DTC P1086 — TUMBLE GENERATOR VALVE #2 (LH) POSITION SENSOR
 CIRCUIT LOW INPUT —**

- **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(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

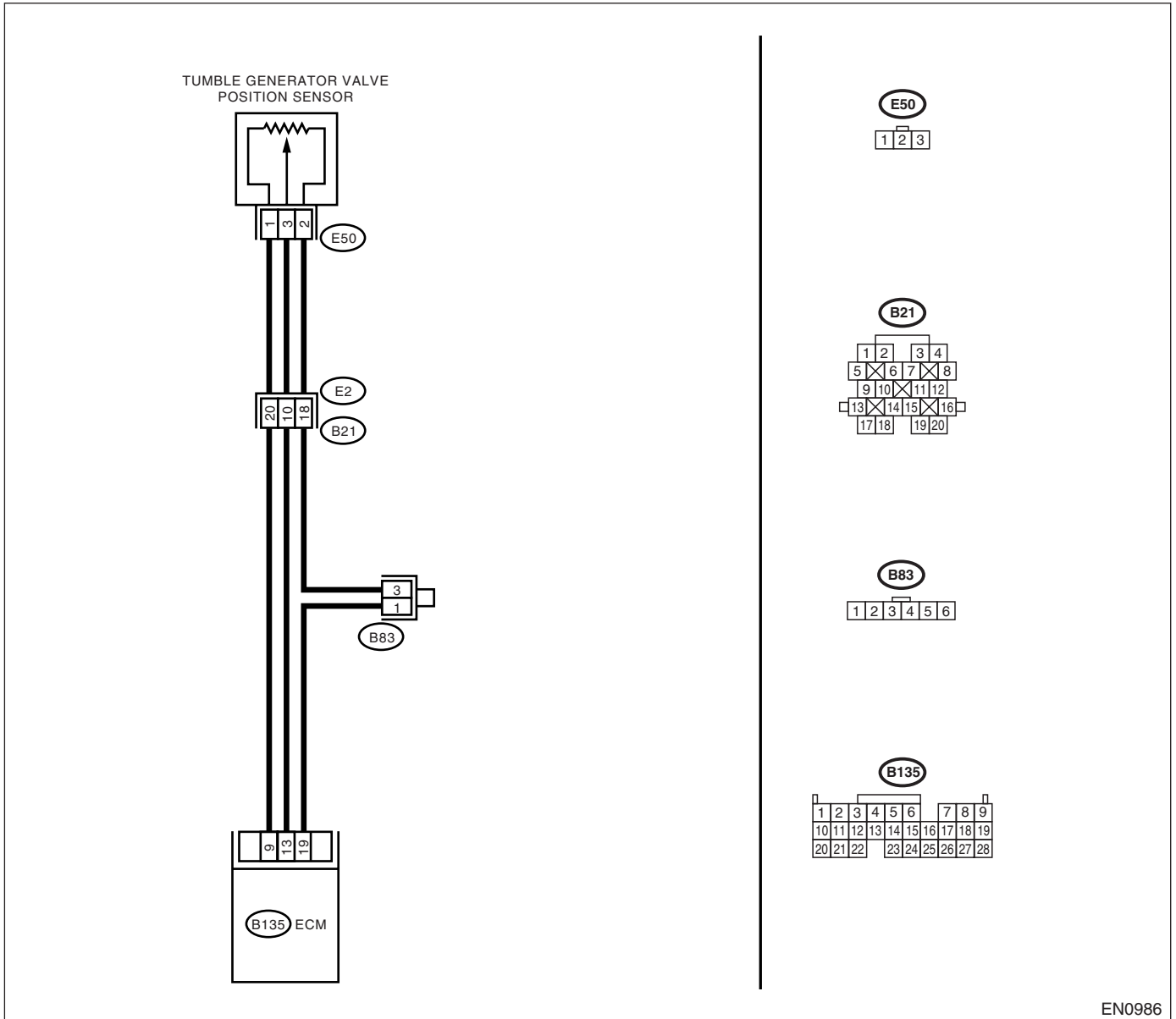
- **WIRING DIAGRAM:**
- LHD model



DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

- RHD model



EN0986

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK CURRENT DATA. 1)Start the engine. 2)Read the 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(TURBO)-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
2 CHECK INPUT SIGNAL FOR ECM. Measure the 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 the 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 the 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 the 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 the 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 the poor contact in ECM connector.	Go to step 6.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>6</p> <p>CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connectors from tumble generator valve position sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between tumble generator valve position sensor connector and engine ground.</p> <p>Connector & terminal (E50) No. 1 (+) — Engine ground (-):</p>	<p>Is the voltage more than 4.5 V?</p>	<p>Go to step 7.</p>	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Open circuit in harness between 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
<p>7</p> <p>CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR.</p> <p>1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between ECM connector and tumble generator valve position sensor connector.</p> <p>Connector & terminal (B135) No. 13 — (E50) No. 3:</p>	<p>Is the resistance less than 1 Ω?</p>	<p>Go to step 8.</p>	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Open circuit in harness between 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
<p>8</p> <p>CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR.</p> <p>Measure the resistance of harness between tumble generator valve position sensor connector and engine ground.</p> <p>Connector & terminal (E50) No. 3 — Engine ground:</p>	<p>Is the resistance less than 10 Ω?</p>	<p>Repair the ground short circuit in harness between tumble generator valve position sensor and ECM connector.</p>	<p>Go to step 9.</p>
<p>9</p> <p>CHECK POOR CONTACT.</p> <p>Check poor contact in tumble generator valve position sensor connector.</p>	<p>Is there poor contact in tumble generator valve position sensor connector?</p>	<p>Repair the poor contact in tumble generator valve position sensor connector.</p>	<p>Replace the tumble generator valve assembly. <Ref. to FU(TURBO)-41, Tumble Generator Valve Assembly.></p>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

BU:DTC P1087 — TUMBLE GENERATOR VALVE #2 (LH) POSITION SENSOR CIRCUIT HIGH INPUT —

• **DTC DETECTING CONDITION:**

- Immediately at fault recognition

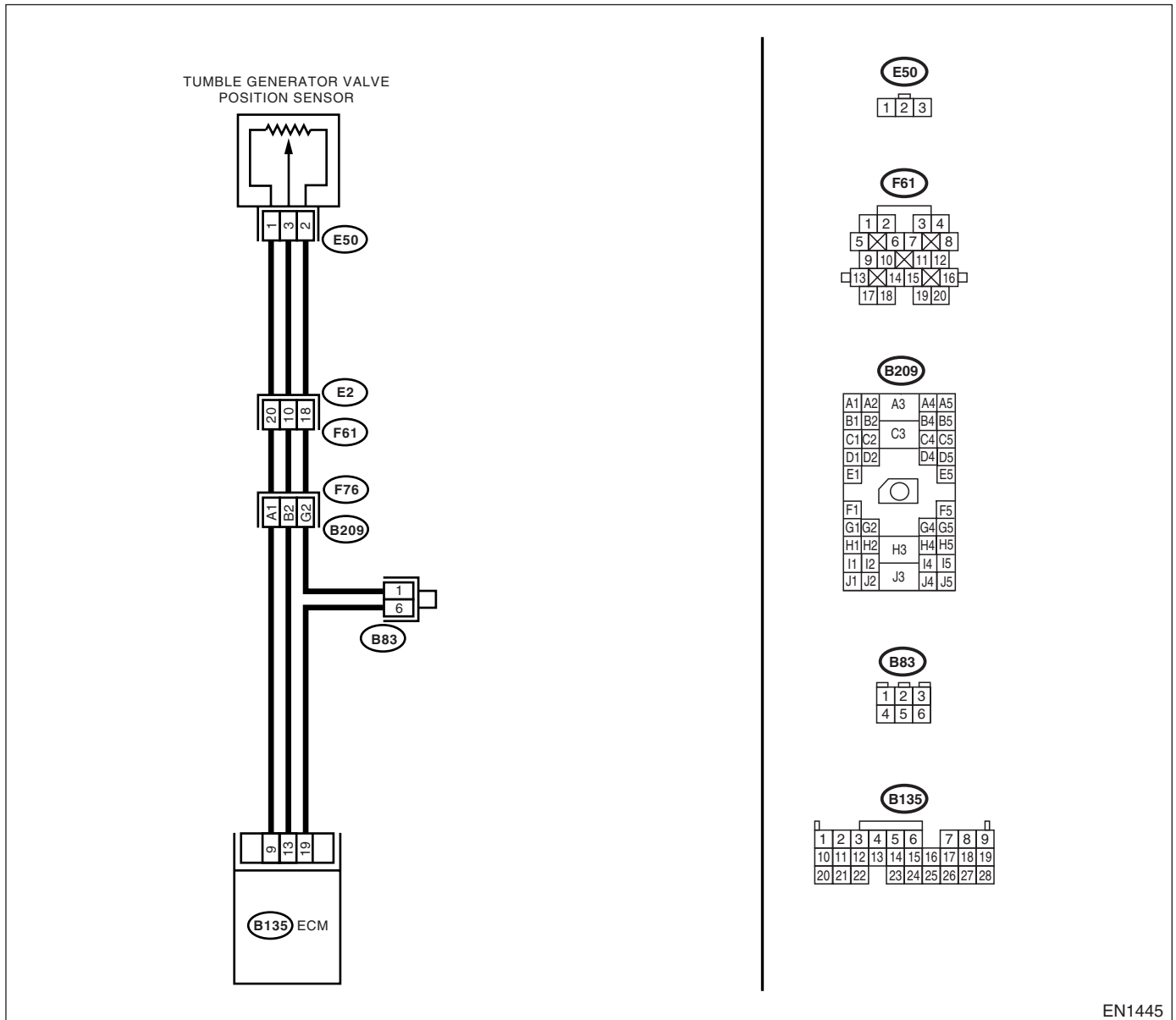
• **TROUBLE SYMPTOM:**

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

• **WIRING DIAGRAM:**

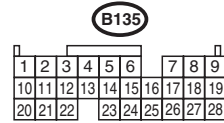
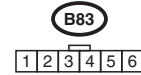
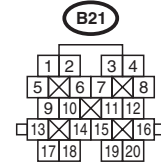
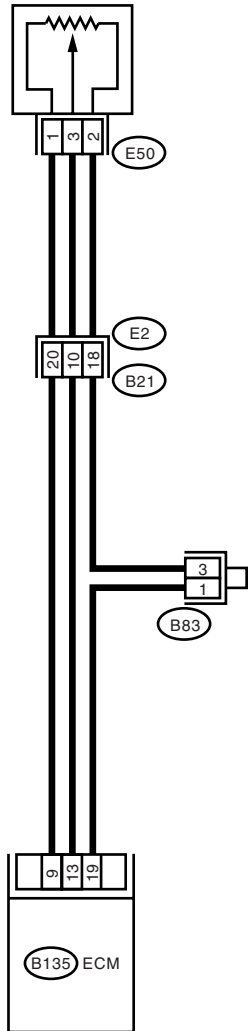


EN1445

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

TUMBLE GENERATOR VALVE
POSITION SENSOR



EN0986

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>1</p> <p>CHECK CURRENT DATA.</p> <p>1)Start the engine. 2)Read the data of throttle position sensor signal using Subaru Select Monitor or OBD-II general scan tool.</p> <p>NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(TURBO)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.</p>	<p>Is the value more than 4.9 V?</p>	<p>Go to step 2.</p>	<p>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.</p> <p>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</p>
<p>2</p> <p>CHECK HARNESS BETWEEN TUMBLE GENERATOR VALVE POSITION SENSOR AND ECM CONNECTOR.</p> <p>1)Turn the ignition switch to OFF. 2)Disconnect the connector from throttle position sensor. 3)Measure the resistance of harness between throttle position sensor connector and engine ground.</p> <p>Connector & terminal (E50) No. 2 — Engine ground:</p>	<p>Is the resistance less than 5 Ω?</p>	<p>Go to step 3.</p>	<p>Repair the harness and connector.</p> <p>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</p>
<p>3</p> <p>CHECK HARNESS BETWEEN THROTTLE POSITION SENSOR AND ECM CONNECTOR.</p> <p>1)Turn the ignition switch to ON. 2)Measure the voltage between throttle position sensor connector and engine ground.</p> <p>Connector & terminal (E50) No. 3 (+) — Engine ground (-):</p>	<p>Is the voltage more than 4.9 V?</p>	<p>Repair the battery short circuit in harness between tumble generator valve position sensor and ECM connector. After repair, replace the ECM. <Ref. to FU(TURBO)-49, Engine Control Module.></p>	<p>Replace the tumble generator valve assembly. <Ref. to FU(TURBO)-41, Tumble Generator Valve Assembly.></p>

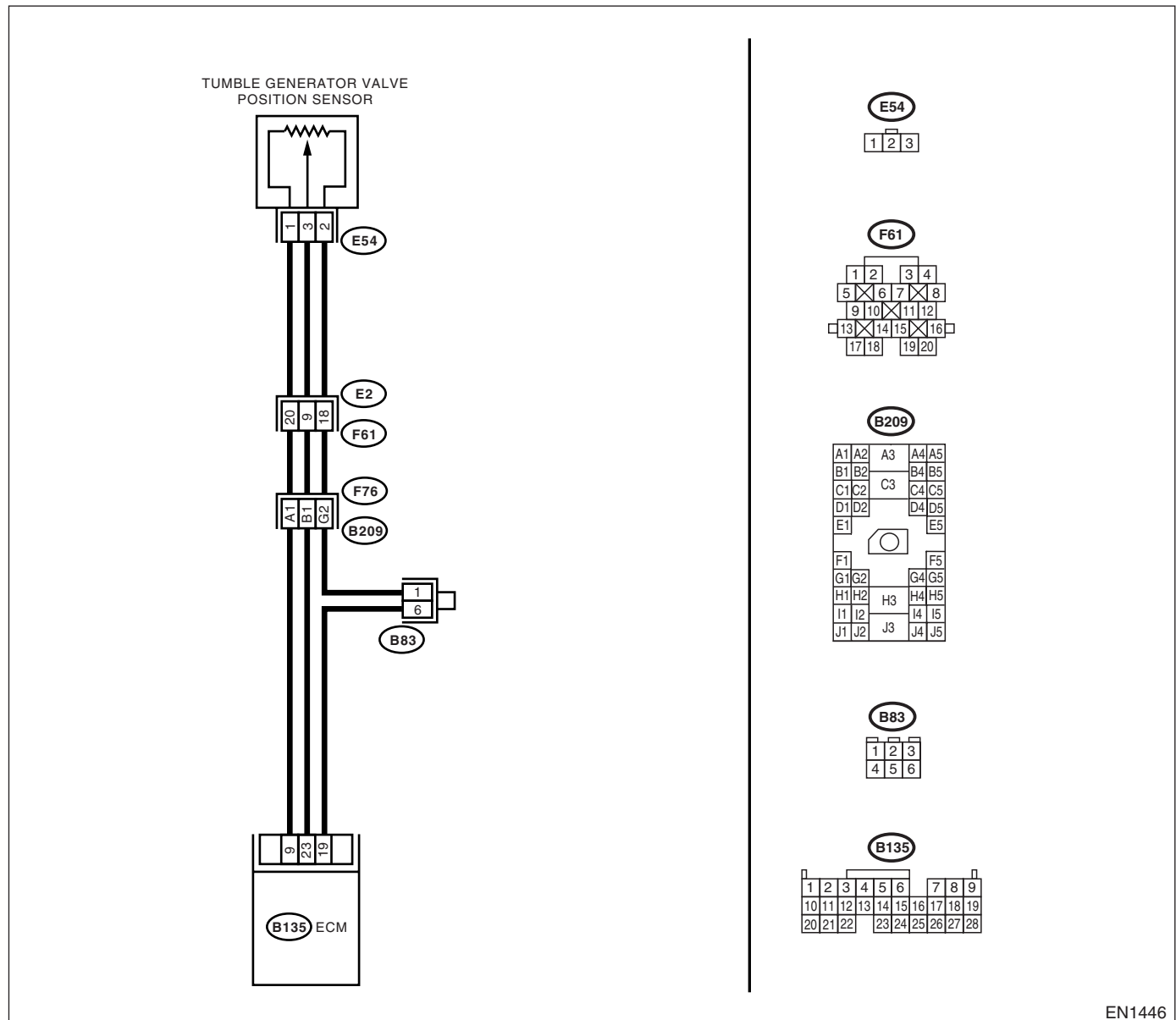
**BV: DTC P1088 — TUMBLE GENERATOR VALVE #1 (RH) POSITION SENSOR
CIRCUIT LOW INPUT —**

- **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(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**
- LHD model

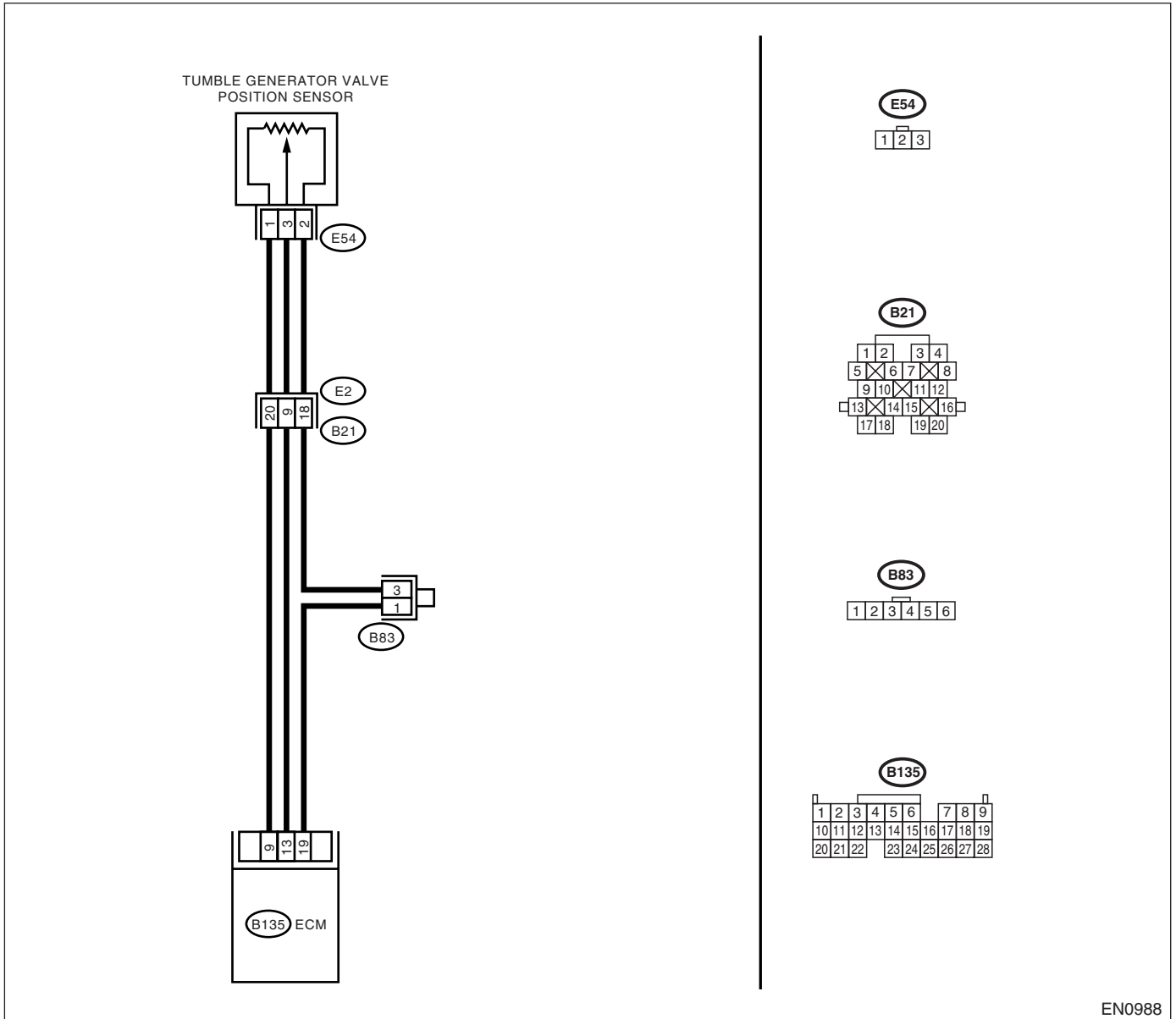


EN1446

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

- RHD model



EN0988

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>1</p> <p>CHECK CURRENT DATA. 1) Start the engine. 2) Read the data of tumble generator valve position sensor signal using Subaru Select Monitor or OBD-II general scan tool.</p> <p>NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(TURBO)-34, Subaru Select Monitor.> • OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.</p>	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
<p>2</p> <p>CHECK INPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground while throttle valve is fully closed.</p> <p>Connector & terminal (B135) No. 9 (+) — Chassis ground (-):</p>	Is the voltage more than 4.5 V?	Go to step 4.	Go to step 3.
<p>3</p> <p>CHECK INPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground.</p> <p>Connector & terminal (B135) No. 9 (+) — Chassis ground (-):</p>	Does the voltage change more than 4.5 V by shaking harness and connector of ECM while monitoring the value with voltage meter?	Repair the 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.
<p>4</p> <p>CHECK INPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground.</p> <p>Connector & terminal (B135) No. 23 (+) — Chassis ground (-):</p>	Is the voltage less than 0.1 V?	Go to step 6.	Go to step 5.
<p>5</p> <p>CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR.) Measure the voltage between ECM connector and chassis ground.</p>	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 the poor contact in ECM connector.	Go to step 6.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>6</p> <p>CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connectors from throttle position sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between throttle position sensor connector and engine ground.</p> <p>Connector & terminal (E54) No. 1 (+) — Engine ground (-):</p>	<p>Is the voltage more than 4.5 V?</p>	<p>Go to step 7.</p>	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Open circuit in harness between 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
<p>7</p> <p>CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR.</p> <p>1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between ECM connector and throttle position sensor connector.</p> <p>Connector & terminal (B135) No. 23 — (E54) No. 3:</p>	<p>Is the resistance less than 1 Ω?</p>	<p>Go to step 8.</p>	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Open circuit in harness between 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
<p>8</p> <p>CHECK HARNESS BETWEEN ECM AND THROTTLE POSITION SENSOR CONNECTOR.</p> <p>Measure the resistance of harness between tumble generator valve position sensor connector and engine ground.</p> <p>Connector & terminal (E54) No. 3 — Engine ground:</p>	<p>Is the resistance less than 10 Ω?</p>	<p>Repair the ground short circuit in harness between tumble generator valve position sensor and ECM connector.</p>	<p>Go to step 9.</p>
<p>9</p> <p>CHECK POOR CONTACT.</p> <p>Check poor contact in tumble generator valve position sensor connector.</p>	<p>Is there poor contact in tumble generator valve position sensor connector?</p>	<p>Repair the poor contact in tumble generator valve position sensor connector.</p>	<p>Replace the tumble generator valve assembly. <Ref. to FU(TURBO)-41, Tumble Generator Valve Assembly.></p>

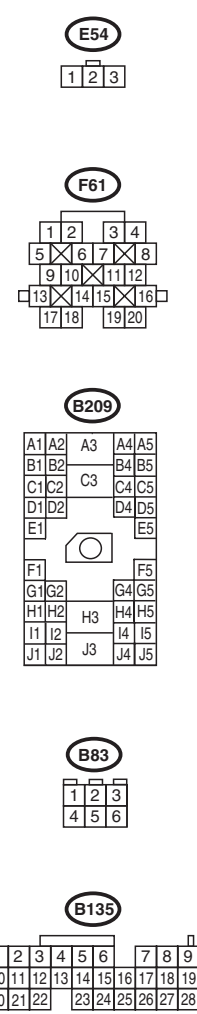
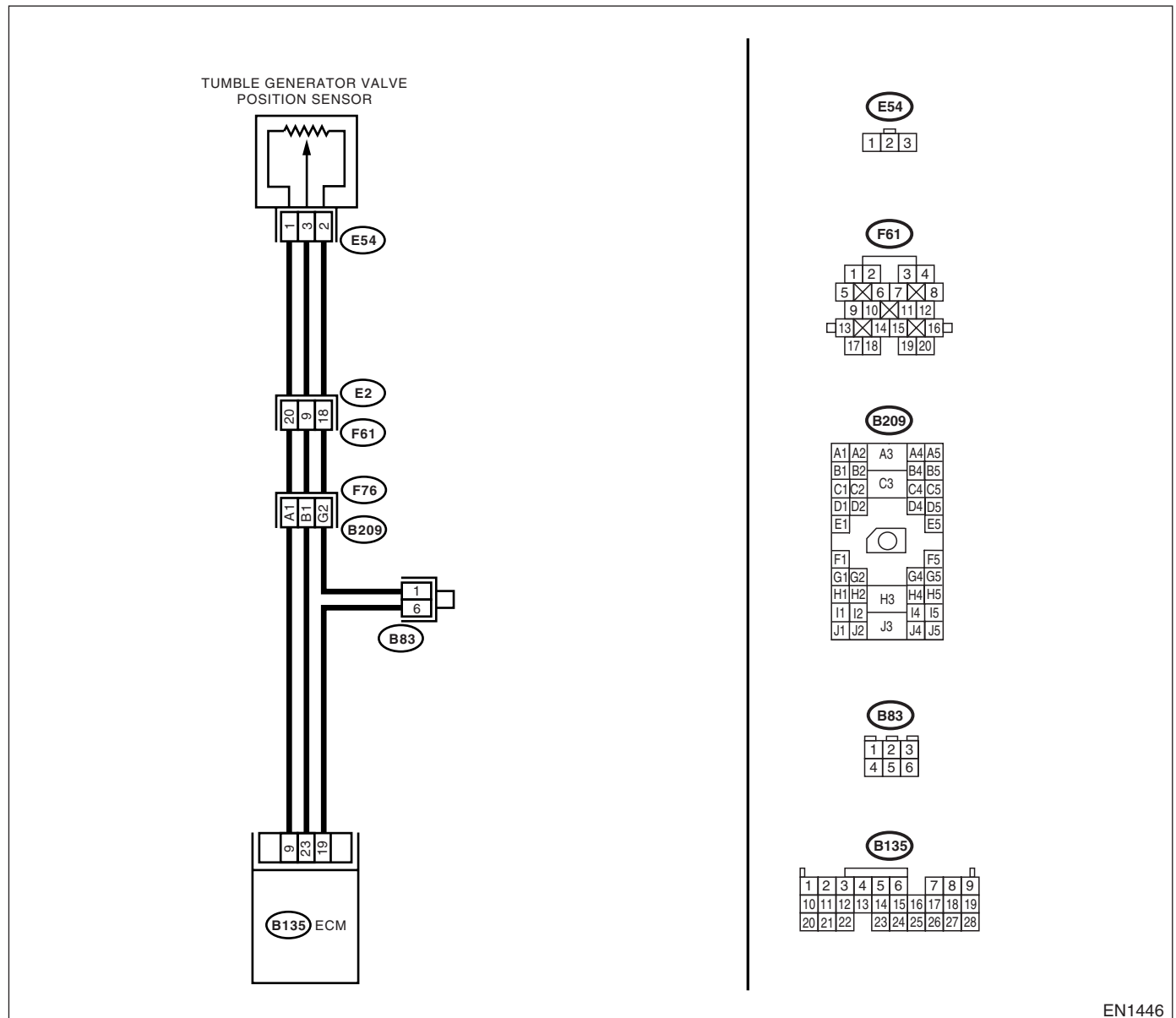
**BW:DTC P1089 — TUMBLE GENERATOR VALVE #1 (RH) POSITION SENSOR
CIRCUIT HIGH INPUT —**

- **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(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

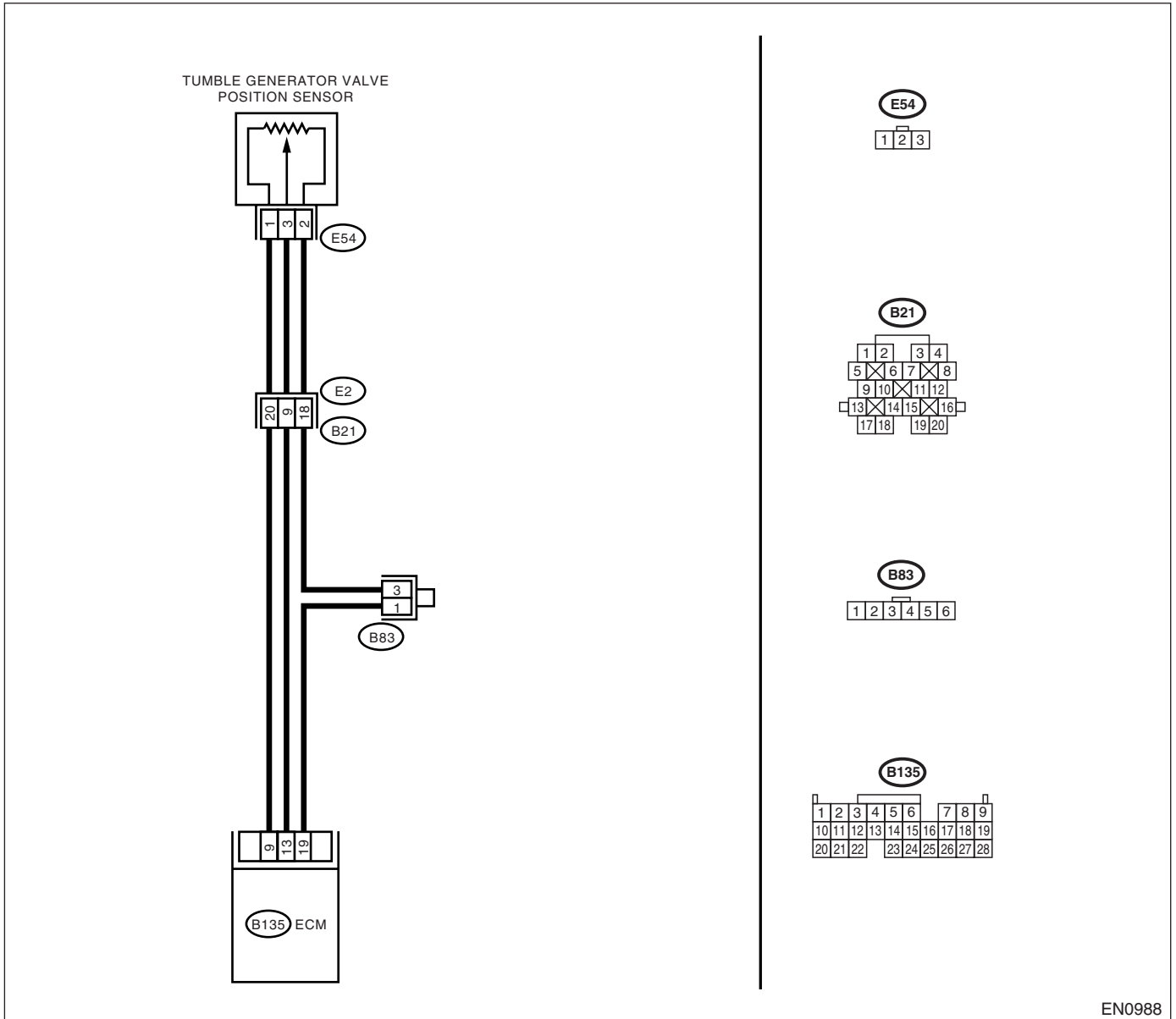
- **WIRING DIAGRAM:**
- LHD model



DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

- RHD model



EN0988

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>1</p> <p>CHECK CURRENT DATA.</p> <p>1)Start the engine. 2)Read the data of tumble generator valve position sensor signal using Subaru Select Monitor or OBD-II general scan tool.</p> <p>NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(TURBO)-34, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.</p>	<p>Is the value more than 4.9 V?</p>	<p>Go to step 2.</p>	<p>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.</p> <p>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</p>
<p>2</p> <p>CHECK HARNESS BETWEEN TUMBLE GENERATOR VALVE POSITION SENSOR AND ECM CONNECTOR.</p> <p>1)Turn the ignition switch to OFF. 2)Disconnect the connector from throttle position sensor. 3)Measure the resistance of harness between tumble generator valve position sensor connector and engine ground.</p> <p>Connector & terminal (E54) No. 2 — Engine ground:</p>	<p>Is the resistance less than 5 Ω?</p>	<p>Go to step 3.</p>	<p>Repair the harness and connector.</p> <p>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</p>
<p>3</p> <p>CHECK HARNESS BETWEEN TUMBLE GENERATOR VALVE POSITION SENSOR AND ECM CONNECTOR.</p> <p>1)Turn the ignition switch to ON. 2)Measure the voltage between throttle position sensor connector and engine ground.</p> <p>Connector & terminal (E54) No. 3 (+) — Engine ground (-):</p>	<p>Is the voltage more than 4.9 V?</p>	<p>Repair the battery short circuit in harness between tumble generator valve position sensor and ECM connector. After repair, replace the ECM. <Ref. to FU(TURBO)-49, Engine Control Module.></p>	<p>Replace the tumble generator valve assembly. <Ref. to FU(TURBO)-41, Tumble Generator Valve Assembly.></p>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

BX: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(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

Step	Check	Yes	No
1 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)" <Ref. to EN(TURBO)-75, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK TUMBLE GENERATOR VALVE RH 1)Remove the tumble generator valve assembly. 2)Check the tumble generator valve body.	Does the tumble generator valve move smoothly? (No dirt or foreign materials clogged)	Replace the tumble generator valve assembly. <Ref. to FU(TURBO)-41, Tumble Generator Valve Assembly.>	Clean the tumble generator valve.

BY: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(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

Step	Check	Yes	No
1 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)" <Ref. to EN(TURBO)-75, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK TUMBLE GENERATOR VALVE RH 1)Remove the tumble generator valve assembly. 2)Check the tumble generator valve body.	Does the tumble generator valve move smoothly? (No dirt or foreign materials clogged)	Replace the tumble generator valve assembly. <Ref. to FU(TURBO)-41, Tumble Generator Valve Assembly.>	Clean the tumble generator valve.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

BZ: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(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

Step	Check	Yes	No
1 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)" <Ref. to EN(TURBO)-75, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK TUMBLE GENERATOR VALVE RH 1)Remove the tumble generator valve assembly. 2)Check the tumble generator valve body.	Does the tumble generator valve move smoothly? (No dirt or foreign materials clogged)	Replace the tumble generator valve assembly. <Ref. to FU(TURBO)-41, Tumble Generator Valve Assembly.>	Clean the tumble generator valve.

CA: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(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

Step	Check	Yes	No
1 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)" <Ref. to EN(TURBO)-75, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK TUMBLE GENERATOR VALVE RH 1)Remove the tumble generator valve assembly. 2)Check the tumble generator valve body.	Does the tumble generator valve move smoothly? (No dirt or foreign materials clogged)	Replace the tumble generator valve assembly. <Ref. to FU(TURBO)-41, Tumble Generator Valve Assembly.>	Clean the tumble generator valve.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

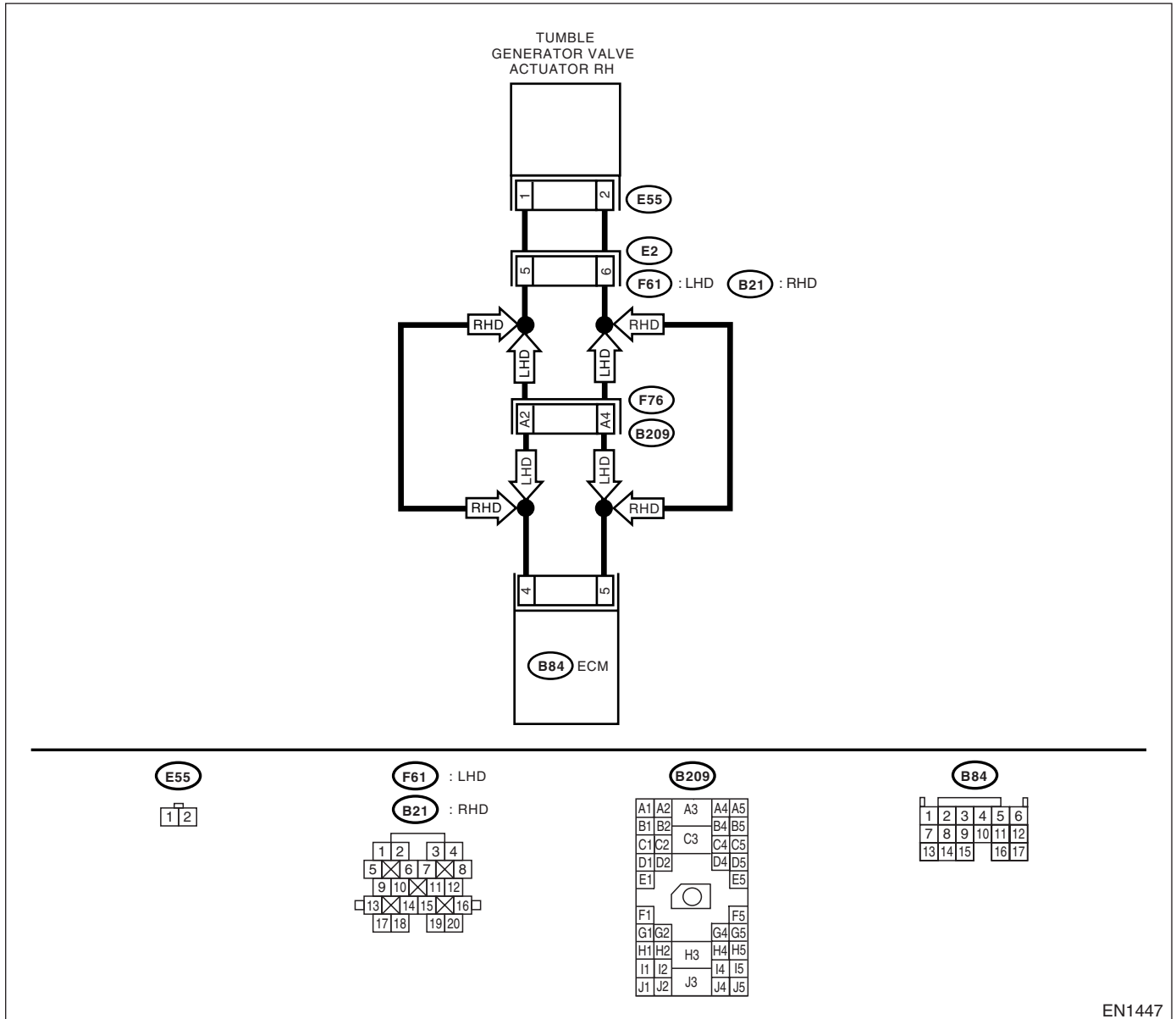
CB:DTC P1094 — TUMBLE GENERATOR VALVE CIRCUIT #1 (OPEN CIRCUIT)

- **DTC DETECTING CONDITION:**
 - Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN1447

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>1</p> <p>CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ACTUATOR CONNECTOR.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connector from tumble generator valve and ECM connector. 3) Measure the resistance between tumble generator valve actuator and ECM connector.</p> <p>Connector & terminal (E55) No. 1 — (B84) No.4: (E55) No. 2 — (B84) No.5:</p>	<p>Is the resistance less than 1Ω?</p>	<p>Go to step 2.</p>	<p>Repair the open circuit between ECM and tumble generator valve connector.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Open circuit in harness between ECM and tumble generator valve actuator connector. • Poor contact in coupling connector.
<p>2</p> <p>CHECK POOR CONTACT.</p> <p>Check poor contact in tumble generator valve actuator connector.</p>	<p>Is there poor contact in tumble generator valve actuator connector.</p>	<p>Repair the poor contact in tumble generator valve actuator connector.</p>	<p>Replace the tumble generator valve assembly. <Ref. to FU(TURBO)-41, Tumble Generator Valve Assembly.></p>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

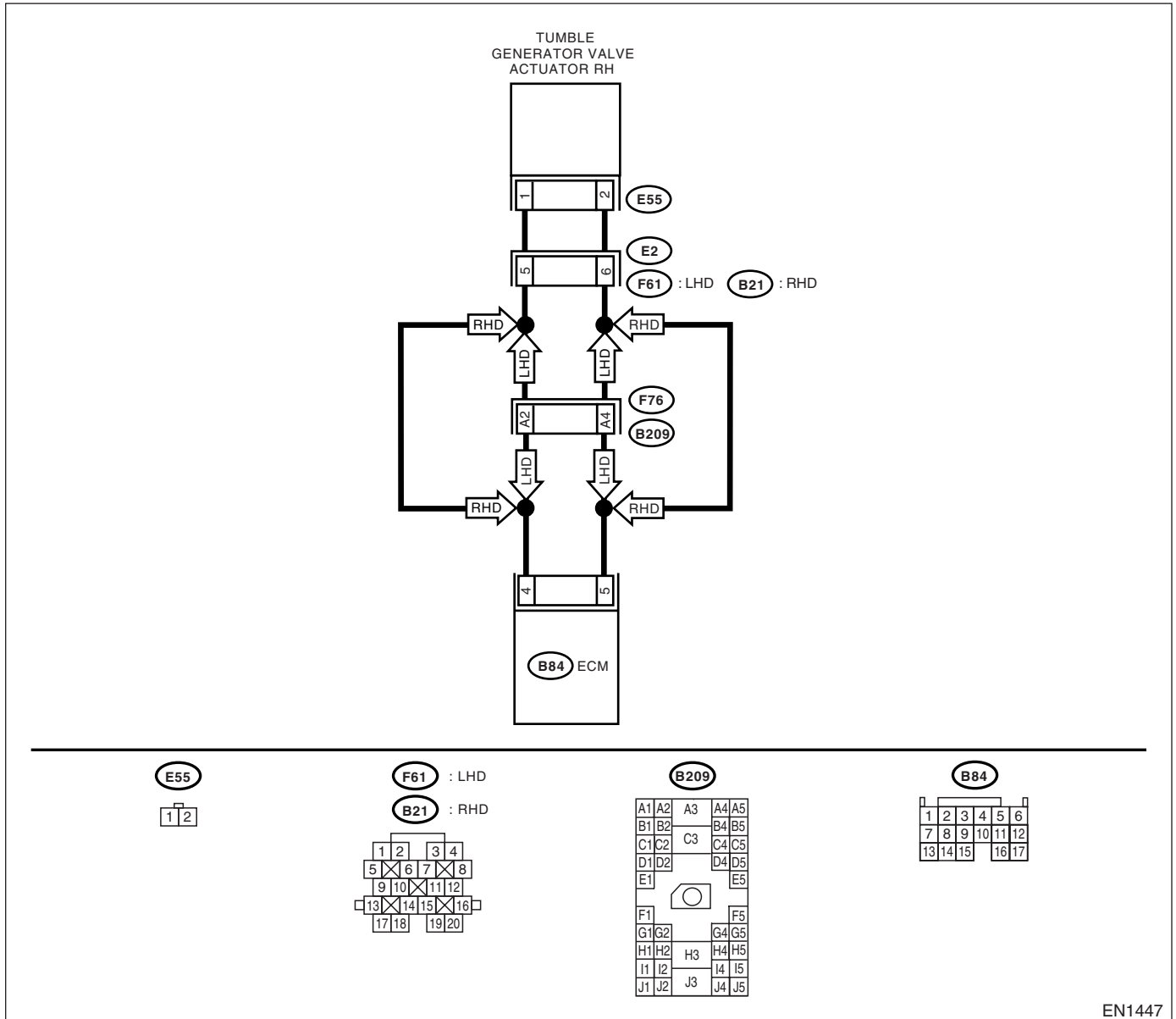
CC:DTC P1095 — TUMBLE GENERATOR VALVE CIRCUIT #1 (OVERCURRENT)

- **DTC DETECTING CONDITION:**
 - Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN1447

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>1</p> <p>CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ACTUATOR CONNECTOR.</p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Disconnect the connector from tumble generator valve connector.</p> <p>3) Measure the voltage between tumble generator valve actuator and chassis ground.</p> <p>Connector & terminal</p> <p>(E55) No. 1 (+) — Chassis ground (-):</p> <p>(E55) No. 2 (+) — Chassis ground (-):</p>	Is the voltage less than 5 V?	Replace the tumble generator valve assembly. <Ref. to FU(TURBO)-41, Tumble Generator Valve Assembly.>	Repair the battery short circuit between ECM and tumble generator valve actuator.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

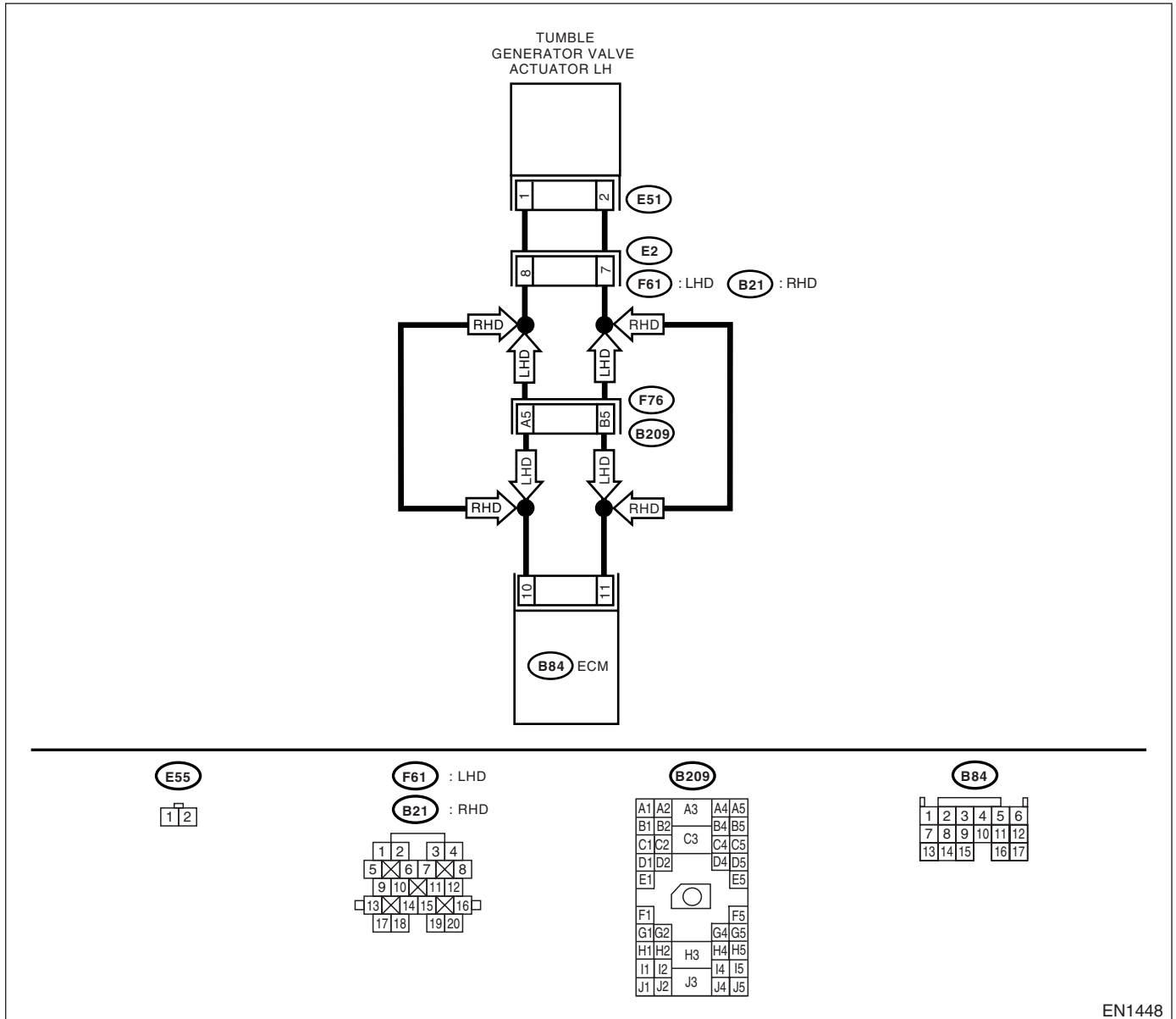
CD:DTC P1096 — TUMBLE GENERATOR VALVE CIRCUIT #2 (OPEN CIRCUIT)

- **DTC DETECTING CONDITION:**
 - Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN1448

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>1</p> <p>CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ACTUATOR CONNECTOR.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connector from tumble generator valve and ECM connector. 3) Measure the resistance between tumble generator valve actuator and ECM connector.</p> <p>Connector & terminal (E51) No. 1 — (B84) No. 10: (E51) No. 2 — (B84) No. 11:</p>	<p>Is the resistance less than 1Ω?</p>	<p>Go to step 2.</p>	<p>Repair the open circuit between ECM and tumble generator valve connector.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Open circuit in harness between ECM and tumble generator valve actuator connector. • Poor contact in coupling connector.
<p>2</p> <p>CHECK POOR CONTACT.</p> <p>Check poor contact in tumble generator valve actuator connector.</p>	<p>Is there poor contact in tumble generator valve actuator connector.</p>	<p>Repair the poor contact in tumble generator valve actuator connector.</p>	<p>Replace the tumble generator valve assembly. <Ref. to FU(TURBO)-41, Tumble Generator Valve Assembly.></p>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

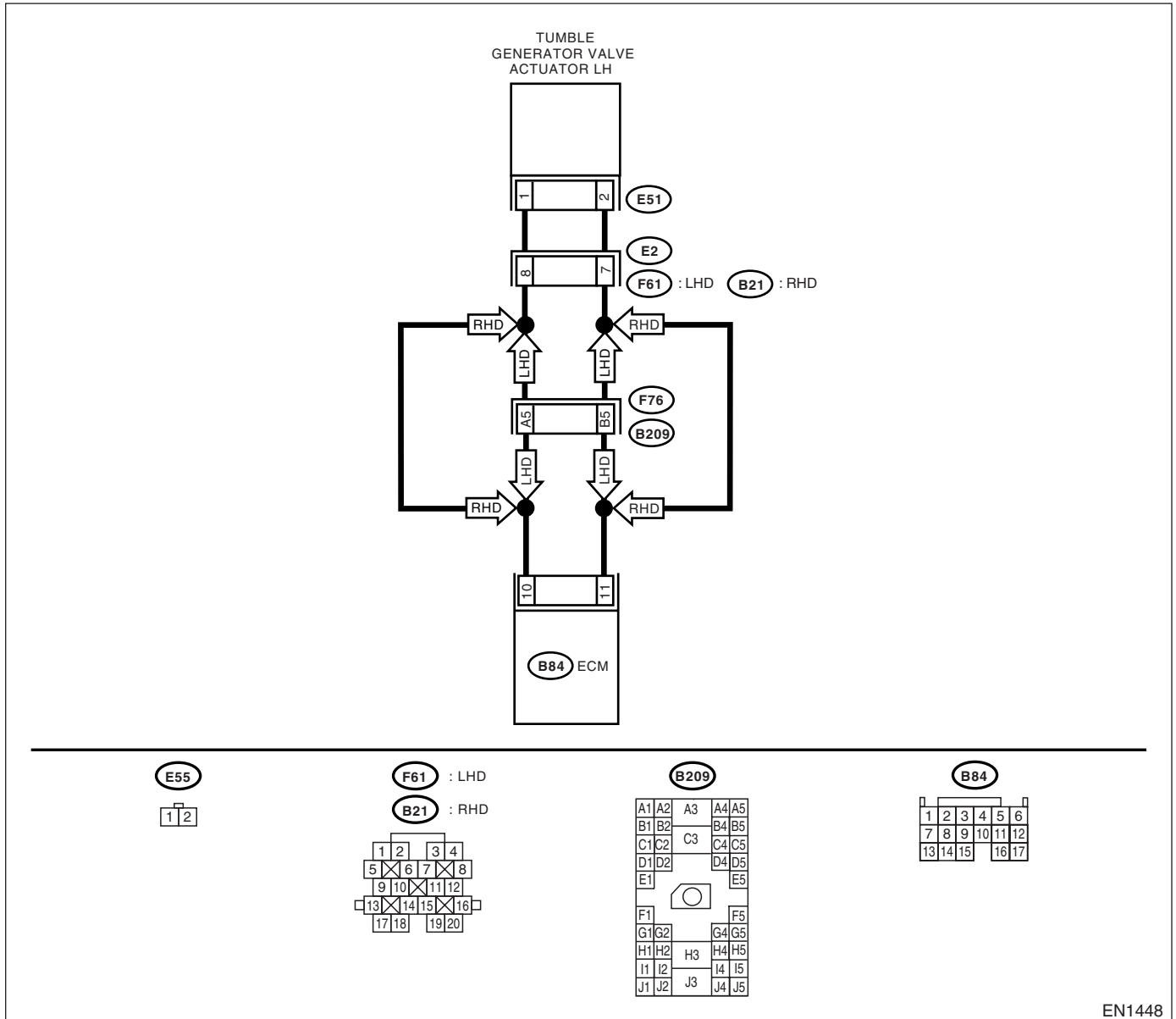
CE:DTC P1097 — TUMBLE GENERATOR VALVE CIRCUIT #2 (OVERCURRENT)

- **DTC DETECTING CONDITION:**
 - Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN1448

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>1</p> <p>CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ACTUATOR CONNECTOR.</p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Disconnect the connector from tumble generator valve connector.</p> <p>3) Measure the voltage between tumble generator valve actuator and chassis ground.</p> <p>Connector & terminal</p> <p>(E51) No. 1 (+) — Chassis ground (-):</p> <p>(E51) No. 2 (+) — Chassis ground (-):</p>	Is the voltage less than 5 V?	Replace the tumble generator valve assembly. <Ref. to FU(TURBO)-41, Tumble Generator Valve Assembly.>	Repair the battery short circuit between ECM and tumble generator valve actuator.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

CF: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(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

Step	Check	Yes	No
1 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P1110?	Replace the ECM. <Ref. to FU(TURBO)-49, Engine Control Module.> NOTE: Atmospheric pressure sensor is built into ECM.	It is not necessary to inspect DTC P1110.

CG: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(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

Step	Check	Yes	No
1 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P1111?	Replace the ECM. <Ref. to FU(TURBO)-49, 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)

CH: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(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

Step	Check	Yes	No
1 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)".<Ref. to EN(TURBO)-75, List of Diagnostic Trouble Code (DTC).>	Replace the ECM. <Ref. to FU(TURBO)-49, Engine Control Module.> NOTE: Atmospheric pressure sensor is built into ECM.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
 ENGINE (DIAGNOSTICS)

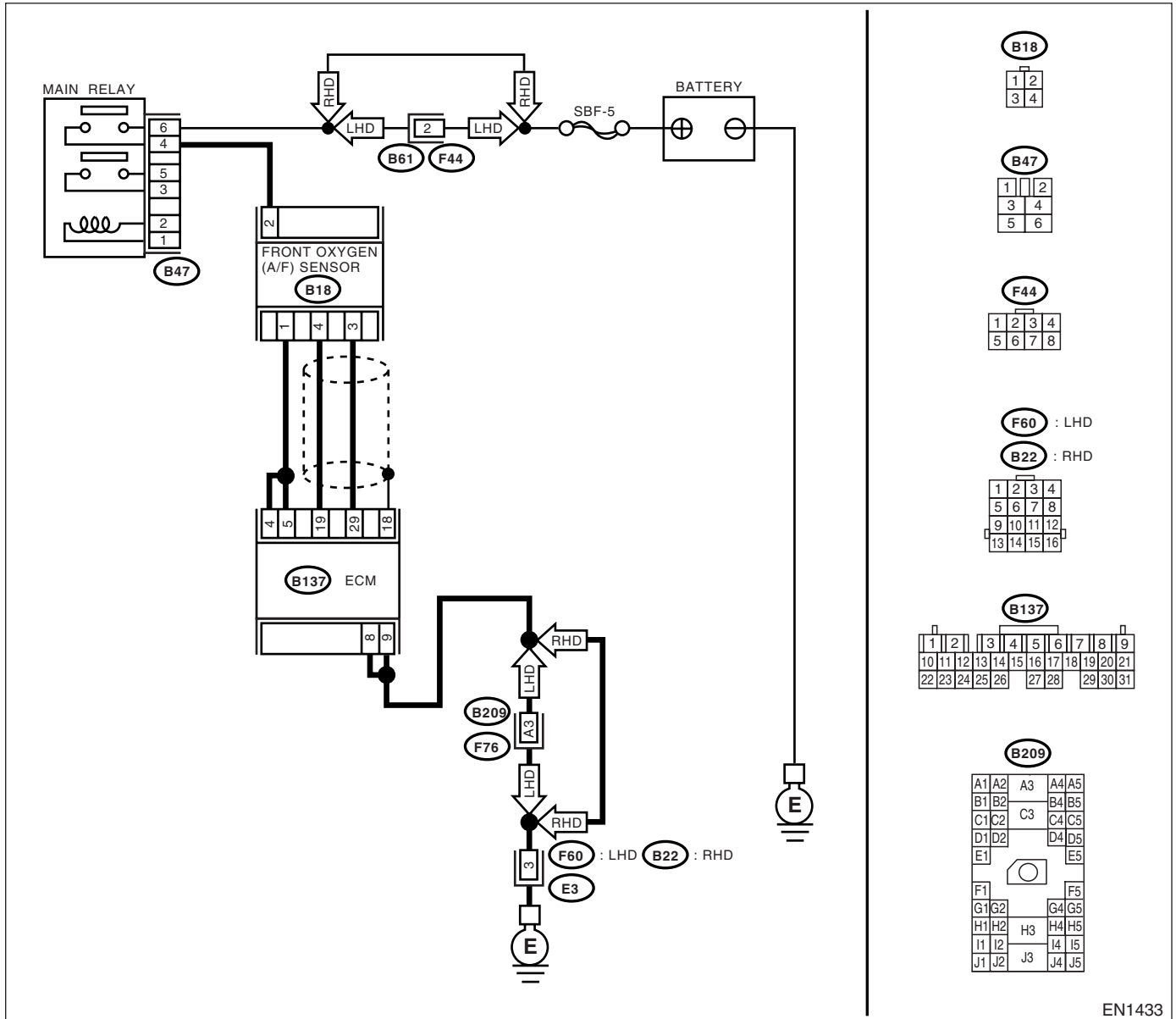
CI: DTC P1130 — FRONT OXYGEN (A/F) SENSOR CIRCUIT MALFUNCTION (OPEN CIRCUIT) [MT VEHICLES] —

- **DTC DETECTING CONDITION:**
 - Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN1433

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>1</p> <p>CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and front oxygen (A/F) sensor connector. 3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector.</p> <p>Connector & terminal (B137) No. 29 — (B18) No. 3: (B137) No. 19 — (B18) No. 4:</p>	<p>Is the resistance less than 1 Ω?</p>	<p>Go to step 2.</p>	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Open circuit in harness between ECM and front oxygen (A/F) sensor connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector
<p>2</p> <p>CHECK POOR CONTACT.</p> <p>Check poor contact in front oxygen (A/F) sensor connector.</p>	<p>Is there poor contact in front oxygen (A/F) sensor connector?</p>	<p>Repair the poor contact in front oxygen (A/F) sensor connector.</p>	<p>Replace the front oxygen (A/F) sensor. <Ref. to FU(TURBO)-44, Front Oxygen (A/F) Sensor.></p>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
 ENGINE (DIAGNOSTICS)

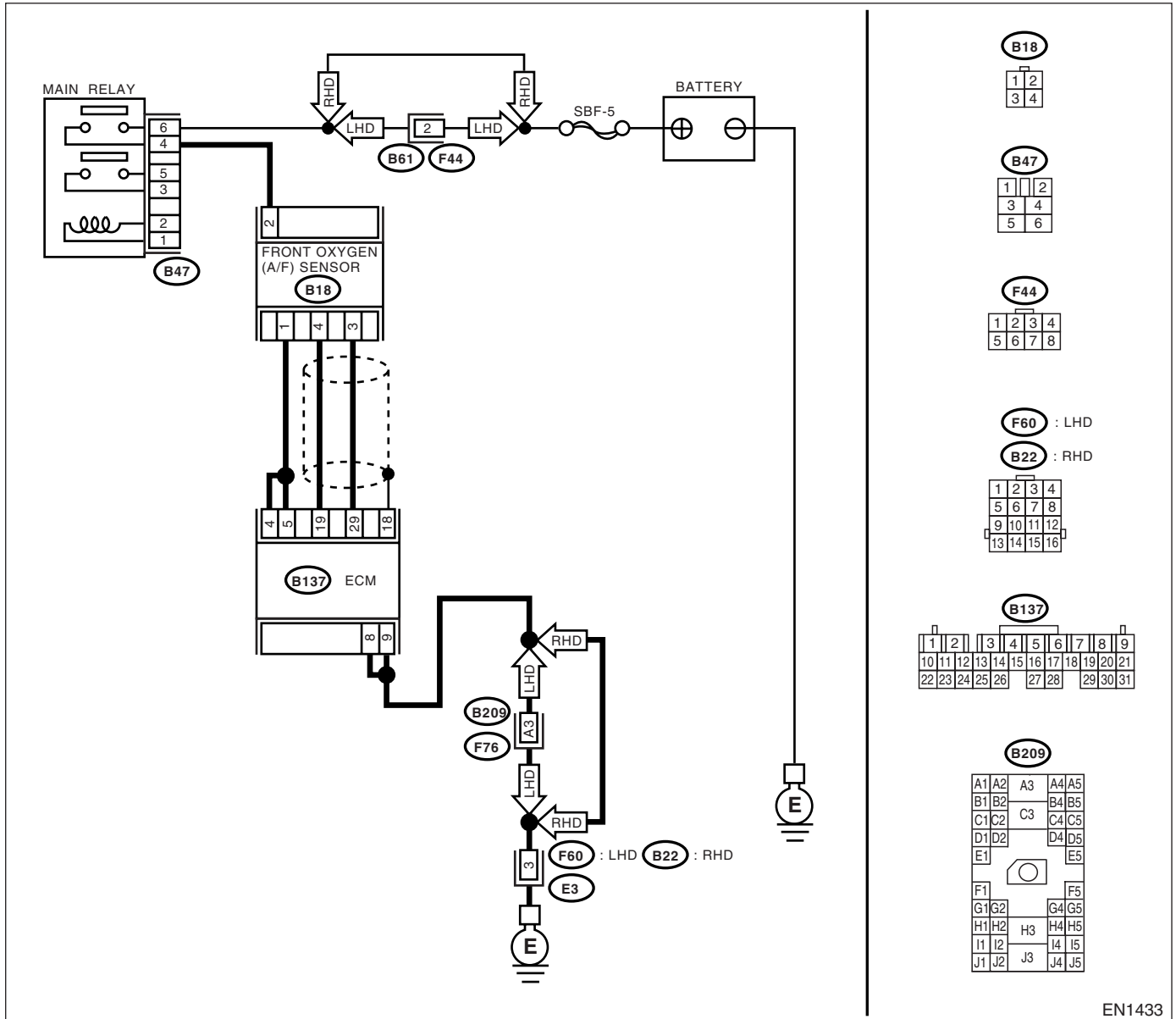
CJ: DTC P1131 — FRONT OXYGEN (A/F) SENSOR CIRCUIT MALFUNCTION (SHORT CIRCUIT) [MT VEHICLES] —

- DTC DETECTING CONDITION:
 - Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- WIRING DIAGRAM:



EN1433

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 the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM connector and chassis ground. <i>Connector & terminal</i> <i>(B137) No. 19 — Chassis ground:</i>	Is the resistance more than 10 Ω ?	Go to step 2.	Repair the 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 the resistance of harness between ECM connector and chassis ground. <i>Connector & terminal</i> <i>(B137) No. 29 — Chassis ground:</i>	Is the resistance more than 10 Ω ?	Go to step 3.	Repair the ground short circuit in harness between ECM and front oxygen (A/F) sensor connector.
3 CHECK OUTPUT SIGNAL FOR ECM. 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM connector and chassis ground. <i>Connector & terminal</i> <i>(B137) No. 19 (+) — Chassis ground (-):</i>	Is the voltage more than 4.5 V?	Go to step 4.	Go to step 5.
4 CHECK OUTPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground. <i>Connector & terminal</i> <i>(B137) No. 19 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Repair the battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. After repair, replace the ECM. <Ref. to FU(TURBO)-49, Engine Control Module.>	Repair the poor contact in ECM connector.
5 CHECK OUTPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground. <i>Connector & terminal</i> <i>(B137) No. 29 (+) — Chassis ground (-):</i>	Is the voltage more than 4.95 V?	Go to step 6.	Replace the front oxygen (A/F) sensor. <Ref. to FU(TURBO)-44, Front Oxygen (A/F) Sensor.>
6 CHECK OUTPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground. <i>Connector & terminal</i> <i>(B137) No. 29 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Repair the battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. After repair, replace the ECM. <Ref. to FU(TURBO)-49, Engine Control Module.>	Repair the poor contact in ECM connector.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

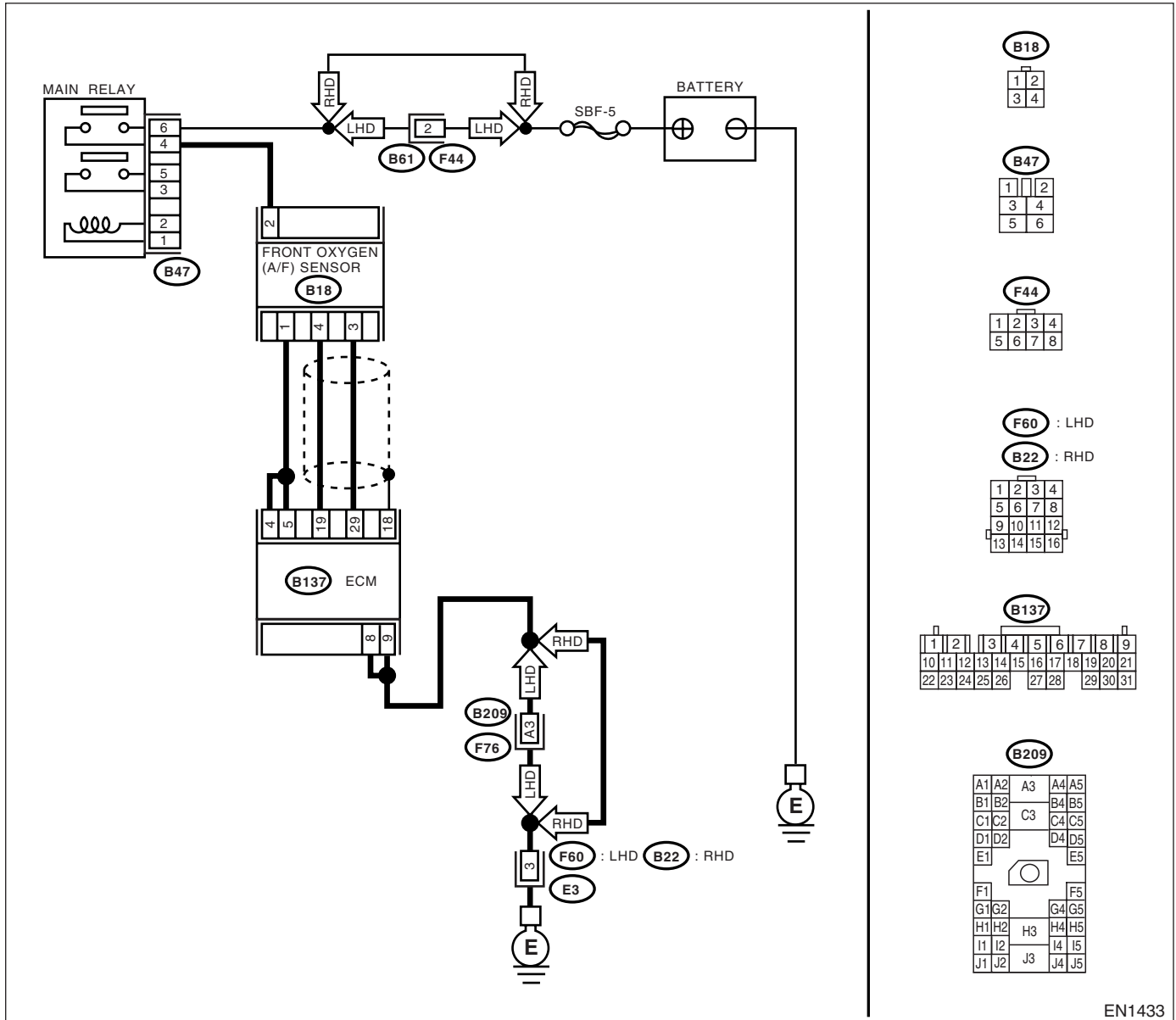
CK:DTC P1134 — FRONT OXYGEN (A/F) SENSOR MICRO-COMPUTER PROBLEM —

- DTC DETECTING CONDITION:
 - Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

• WIRING DIAGRAM:



EN1433

Step	Check	Yes	No	
1	CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P1134?	Replace the ECM. <Ref. to FU(TURBO)-49, Engine Control Module.>	It is not necessary to inspect DTC P1134.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

CL: DTC P1139 — FRONT OXYGEN (A/F) SENSOR #1 HEATER CIRCUIT RANGE/PERFORMANCE PROBLEM —

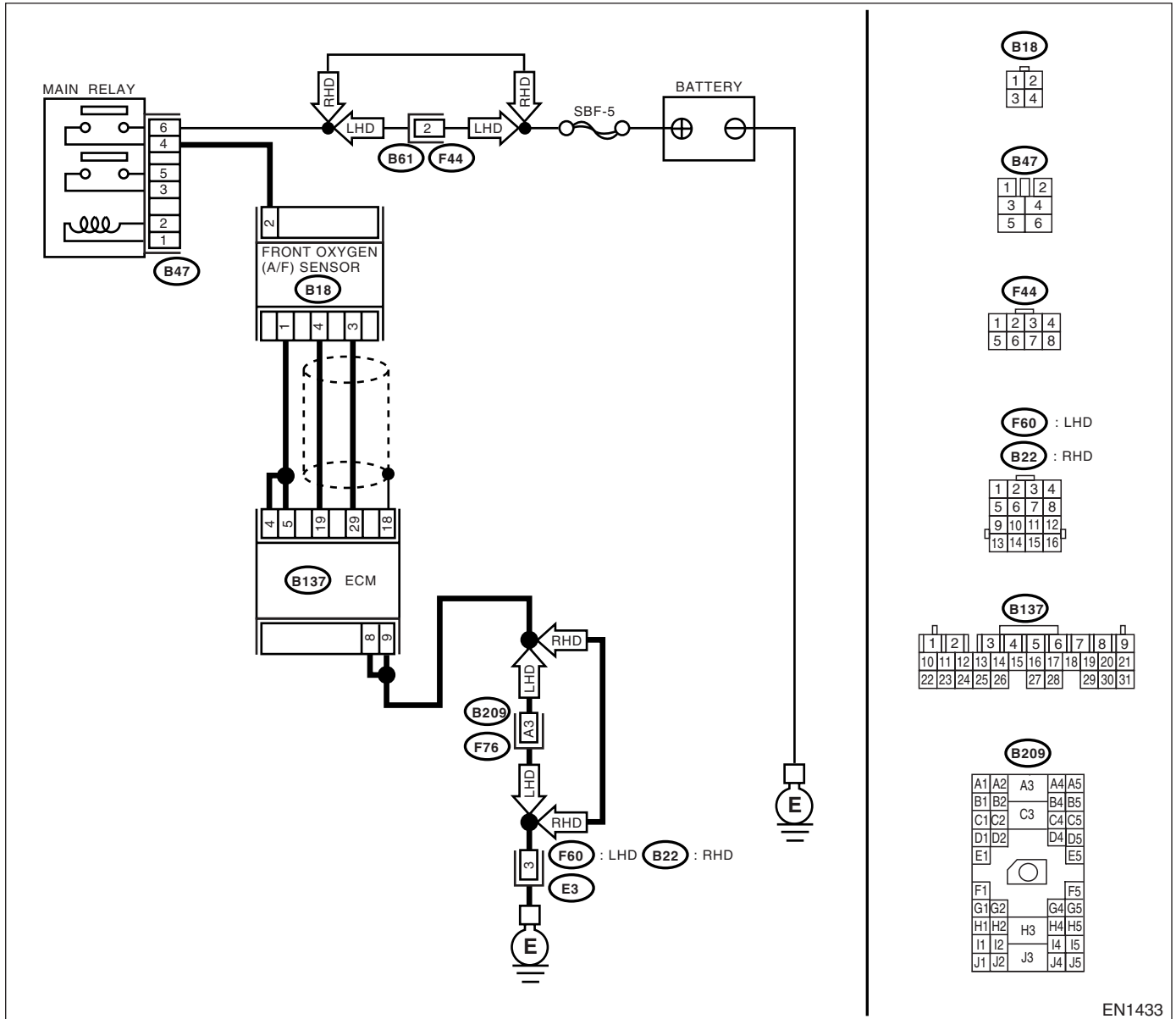
• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

• WIRING DIAGRAM:



EN1433

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 the engine and warm-up engine. 2)Turn the ignition switch to OFF. 3)Disconnect the connectors from ECM and front oxygen (A/F) sensor. 4)Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. <i>Connector & terminal</i> <i>(B137) No. 5 — (B18) No. 1:</i> <i>(B137) No. 4 — (B18) No. 1:</i>	Is the resistance less than 1 Ω ?	Go to step 2.	Repair the 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 the resistance of harness between ECM and front oxygen (A/F) sensor connector. <i>Connector & terminal</i> <i>(B137) No. 19 — (B18) No. 4:</i> <i>(B137) No. 29 — (B18) No. 3:</i>	Is the resistance less than 1 Ω ?	Go to step 3.	Repair the 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 the resistance of harness between main relay and front oxygen (A/F) sensor connector. <i>Connector & terminal</i> <i>(B47) No. 4 — (B18) No. 2:</i>	Is the resistance less than 1 Ω ?	Go to step 4.	Repair the open circuit in harness between ECM and front oxygen (A/F) sensor connector.
4 CHECK FRONT OXYGEN (A/F) SENSOR. Measure the resistance between front oxygen (A/F) sensor connector terminals. <i>Terminals</i> <i>No. 2 — No. 1:</i>	Is the resistance less than 5 Ω ?	Go to step 5.	Replace the front oxygen (A/F) sensor. <Ref. to FU(TURBO)-44, Front Oxygen (A/F) Sensor.>
5 CHECK POOR CONTACT. Check the 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 the poor contact in ECM or front oxygen (A/F) sensor connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(TURBO)-44, Front Oxygen (A/F) Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

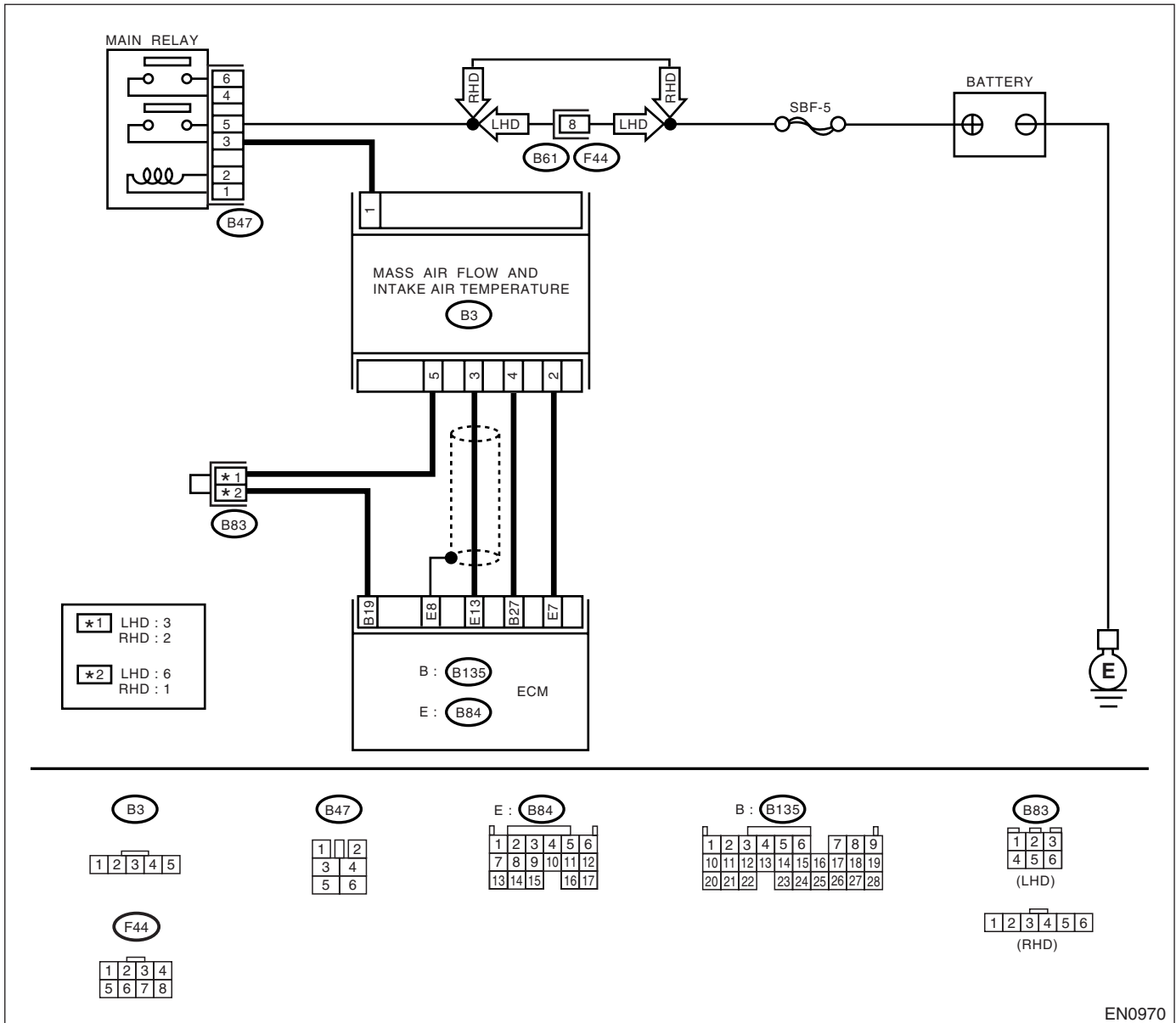
CM:DTC P1141 — MASS AIR FLOW SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (LOW INPUT) —

- **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(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

• WIRING DIAGRAM:



EN0970

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "Diagnostics Chart with Trouble Code" <Ref. to EN(TURBO)-75, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P1141.	Replace the mass air flow and intake air temperature sensor.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

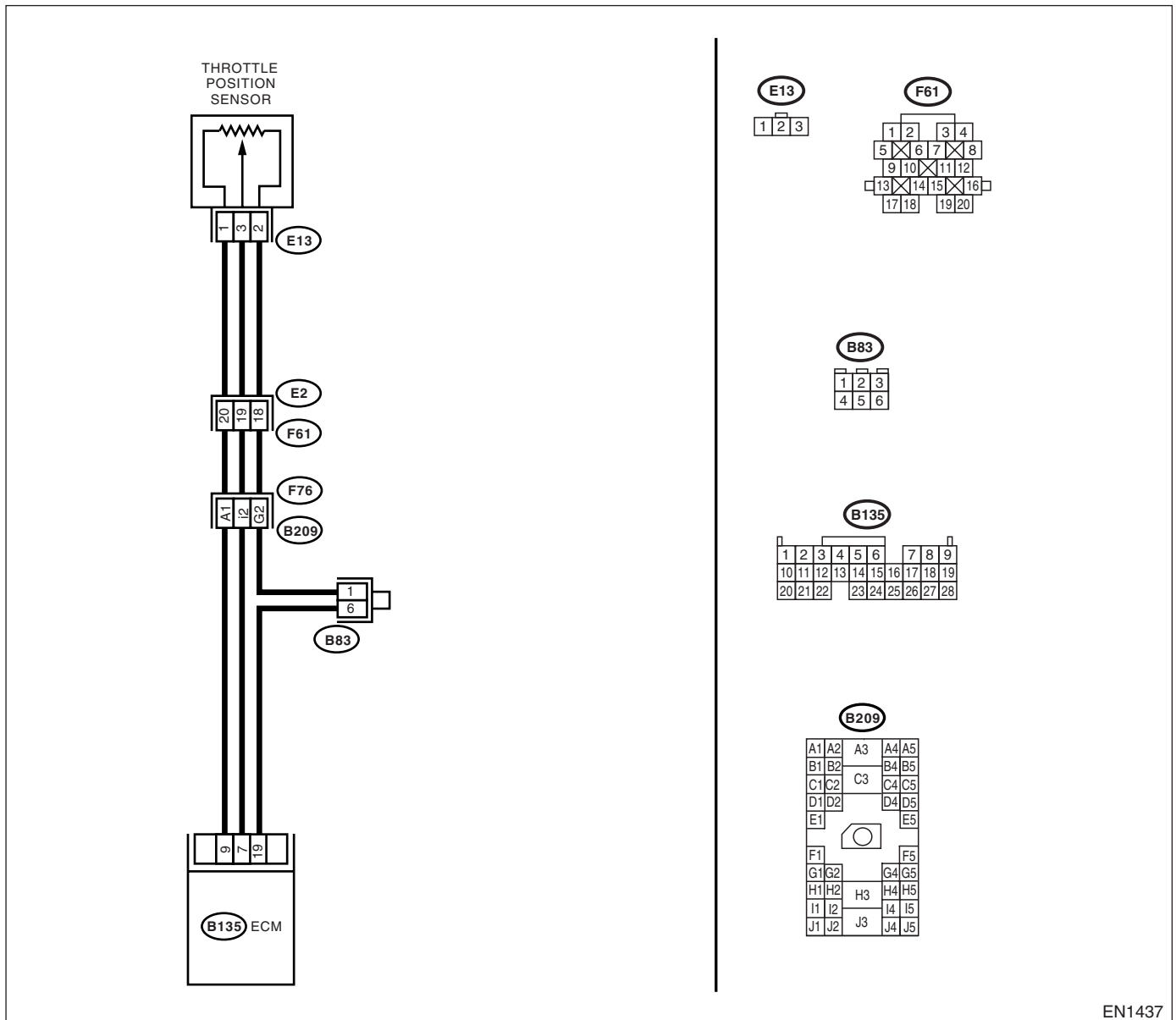
CN:DTC P1142 — THROTTLE POSITION SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (LOW INPUT) —

- **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(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

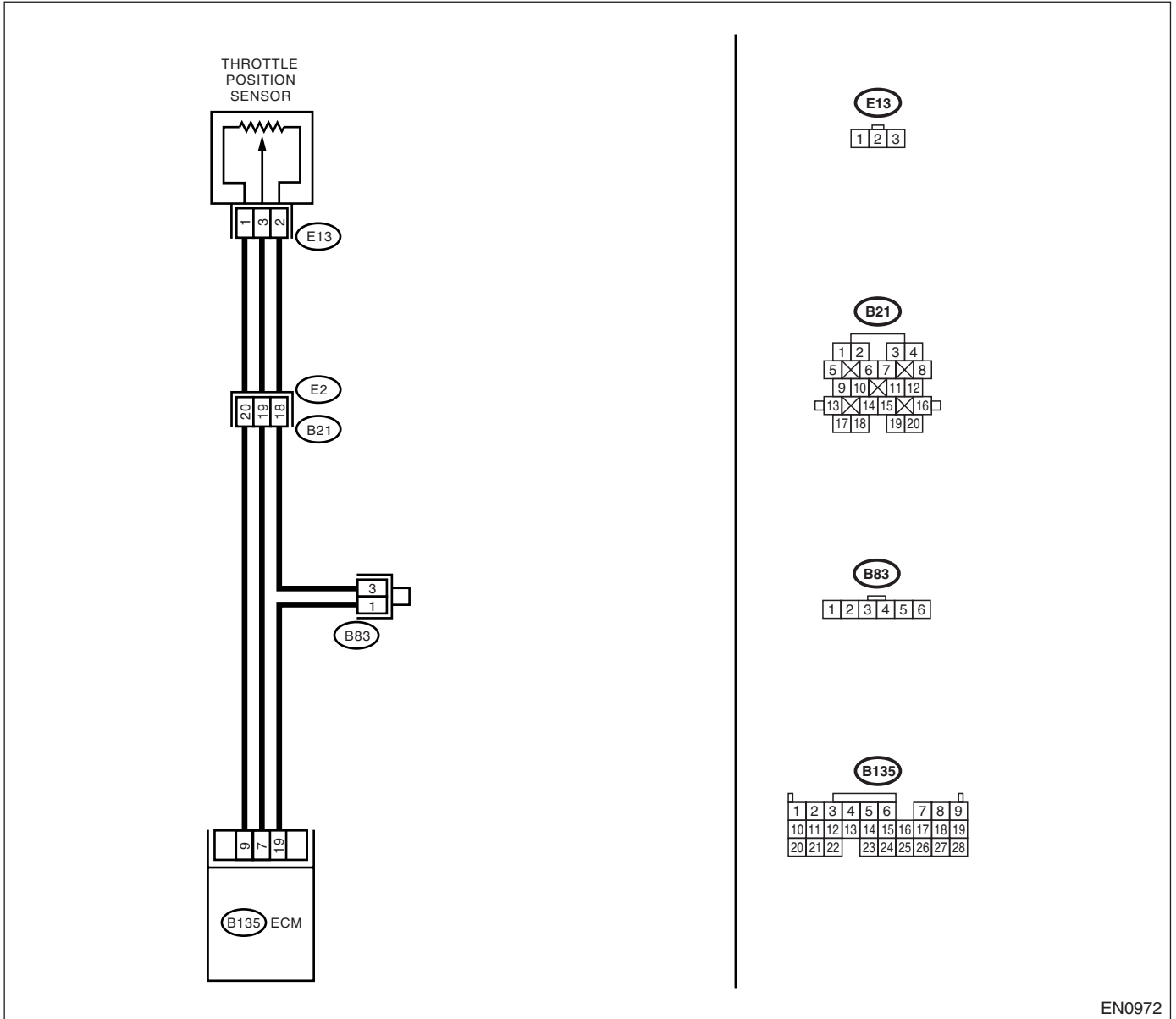
- **WIRING DIAGRAM:**
- LHD model



DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

• RHD model



EN0972

Step	Check	Yes	No
1	CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.	Is any other DTC displayed? Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(TURBO)-75, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P1142.	Replace the throttle position sensor. <Ref. to FU(TURBO)-33, Throttle Position Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

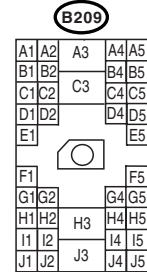
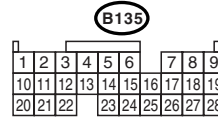
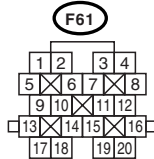
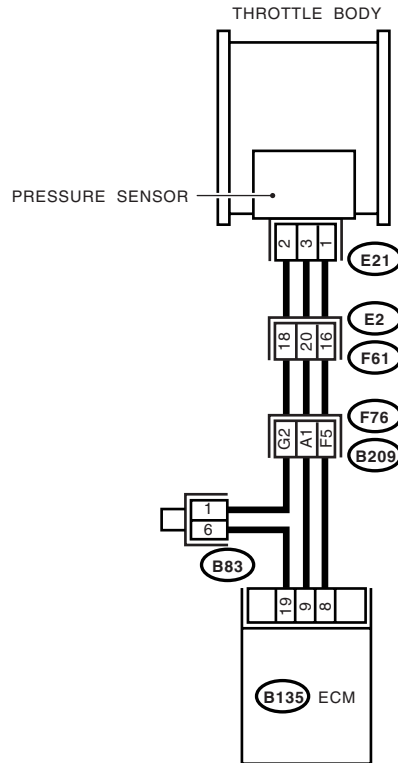
CO:DTC P1146 — PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (HIGH INPUT) —

- DTC DETECTING CONDITION:
 - Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- WIRING DIAGRAM:
- LHD model

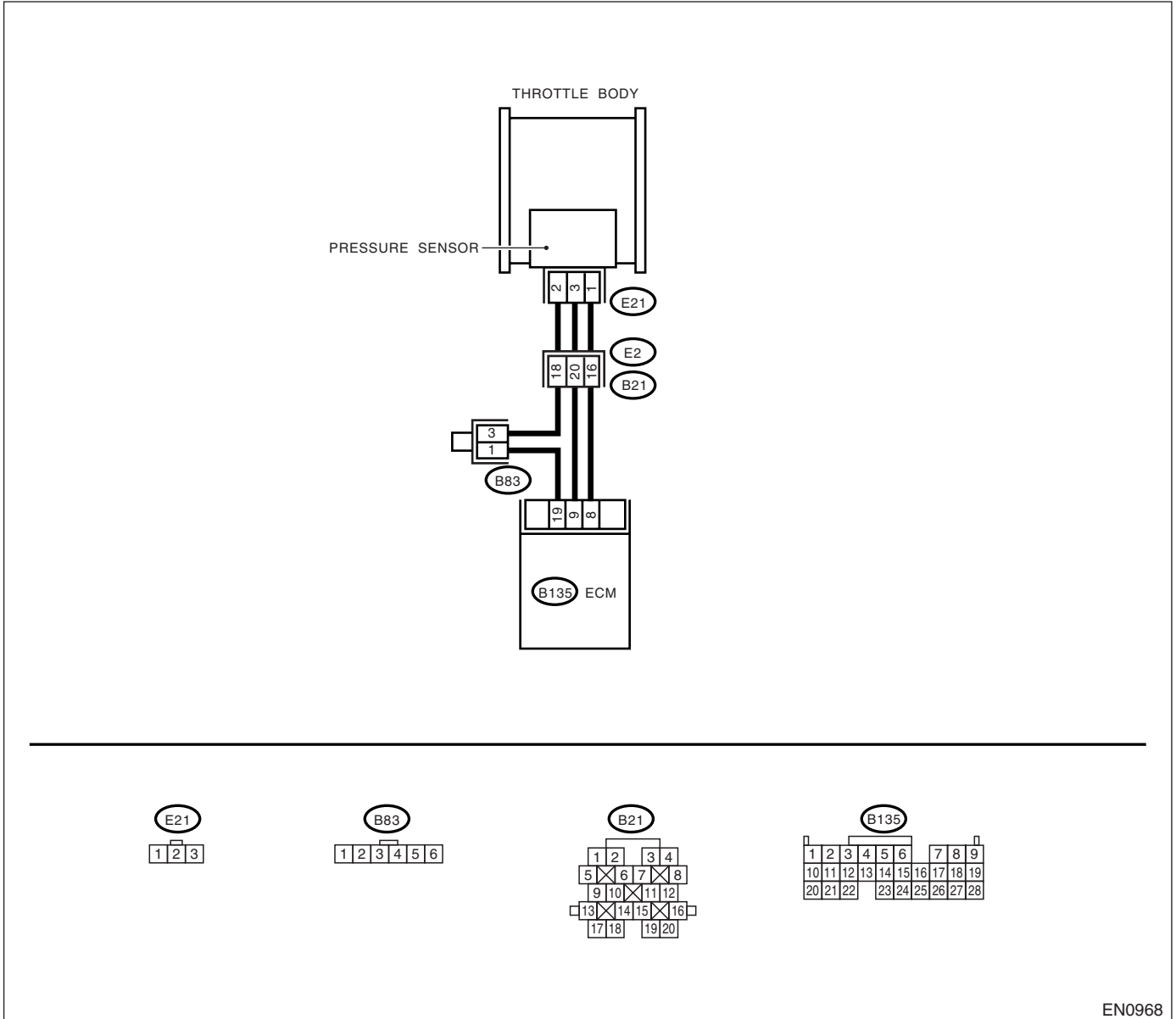


EN1435

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

- RHD model



EN0968

Step	Check	Yes	No
1 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY. NOTE: In this case, it is not necessary to inspect DTC P1146.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(TURBO)-75, 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 the air intake system.	Go to step 3.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>3 CHECK PRESSURE SENSOR.</p> <p>1)Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F).</p> <p>2)Place the shift lever in the selector lever in “N” or “P” position.</p> <p>3)Turn the A/C switch to OFF.</p> <p>4)Turn all accessory switches to OFF.</p> <p>5)Read the data of intake manifold pressure sensor signal using Subaru Select Monitor or OBD-II general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> •Subaru Select Monitor <p>For detailed operation procedure, refer to the “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(TURBO)-34, Subaru Select Monitor.></p> <ul style="list-style-type: none"> •OBD-II general scan tool <p>For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.</p> <p>Specification:</p> <ul style="list-style-type: none"> •Intake manifold absolute pressure <p>Ignition ON 73.3 — 106.6 kPa (550 — 800 mmHg, 21.65 — 31.50 inHg)</p> <p>Idling 20.0 — 46.7 kPa (150 — 350 mmHg, 5.91 — 13.78 inHg)</p>	<p>Is the value within the specifications?</p>	<p>Go to step 4.</p>	<p>Replace the intake air temperature sensor and pressure sensor. <Ref. to FU(TURBO)-35, Pressure Sensor.></p>
<p>4 CHECK THROTTLE POSITION.</p> <p>Read the data of throttle position signal using Subaru Select Monitor or OBD-II general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> •Subaru Select Monitor <p>For detailed operation procedure, refer to the “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(TURBO)-34, Subaru Select Monitor.></p> <ul style="list-style-type: none"> •OBD-II general scan tool <p>For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.</p>	<p>Is the throttle positioning ratio equal to or less than 5% when throttle is fully closed?</p>	<p>Go to step 5.</p>	<p>Adjust or replace the throttle position sensor. <Ref. to FU(TURBO)-33, Throttle Position Sensor.></p>
<p>5 CHECK THROTTLE POSITION.</p>	<p>Is the throttle positioning ratio equal to or more than 85% when throttle is fully open?</p>	<p>Replace the intake air temperature and pressure sensor. <Ref. to FU(TURBO)-35, Pressure Sensor.></p>	<p>Replace the throttle position sensor. <Ref. to FU(TURBO)-33, Throttle Position Sensor.></p>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

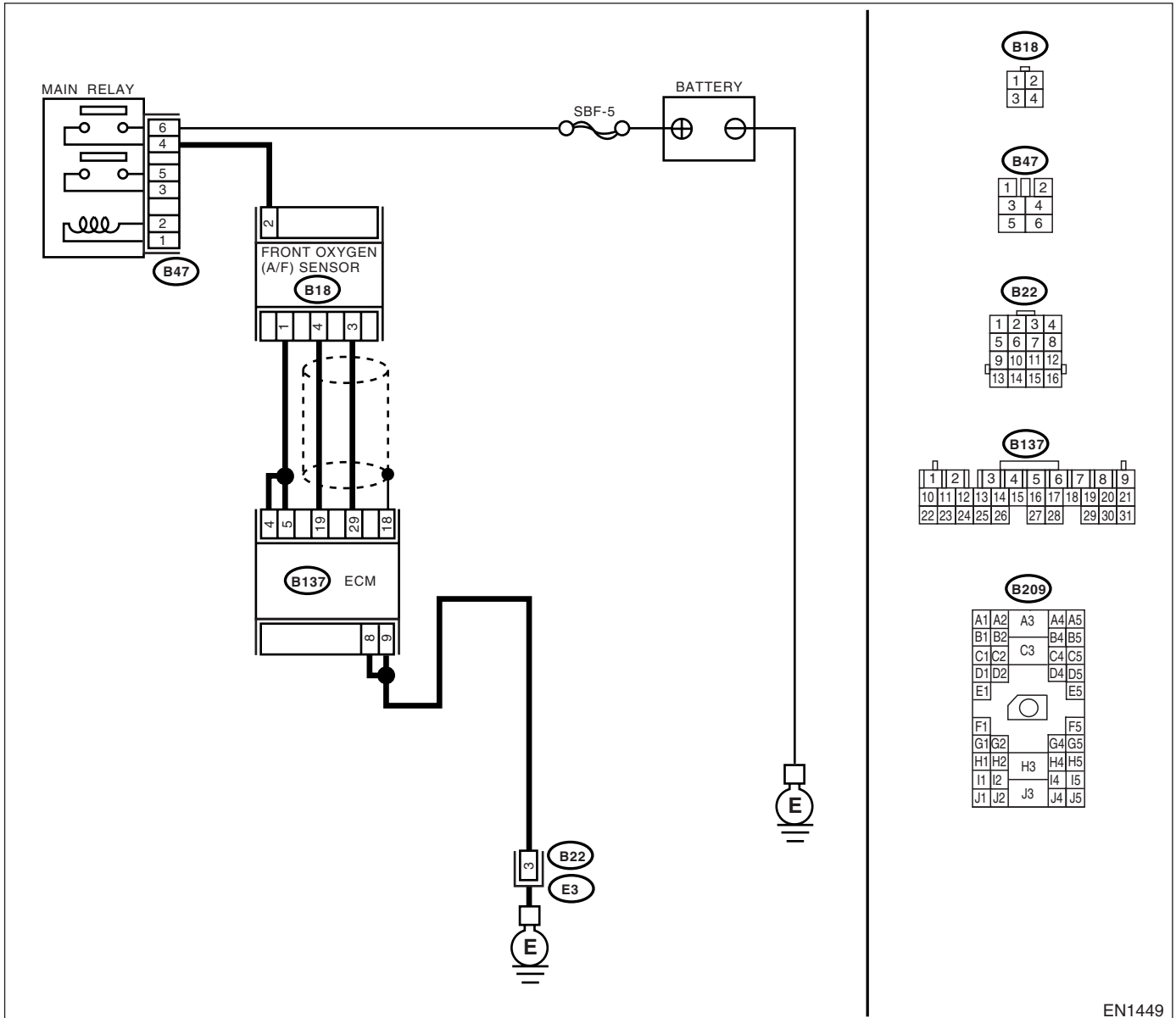
CP: DTC P1152 — FRONT OXYGEN (A/F) SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (LOW INPUT) [AT VEHICLES] —

- DTC DETECTING CONDITION:
 - Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- WIRING DIAGRAM:



EN1449

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>1</p> <p>CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and front oxygen (A/F) sensor connector. 3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector.</p> <p>Connector & terminal (B137) No. 29 — (B18) No. 3: (B137) No. 19 — (B18) No. 4:</p>	<p>Is the resistance less than 1 Ω?</p>	<p>Go to step 2.</p>	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Open circuit in harness between ECM and front oxygen (A/F) sensor connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector
<p>2</p> <p>CHECK POOR CONTACT.</p> <p>Check poor contact in front oxygen (A/F) sensor connector.</p>	<p>Is there poor contact in front oxygen (A/F) sensor connector?</p>	<p>Repair the poor contact in front oxygen (A/F) sensor connector.</p>	<p>Replace the front oxygen (A/F) sensor. <Ref. to FU(TURBO)-44, Front Oxygen (A/F) Sensor.></p>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

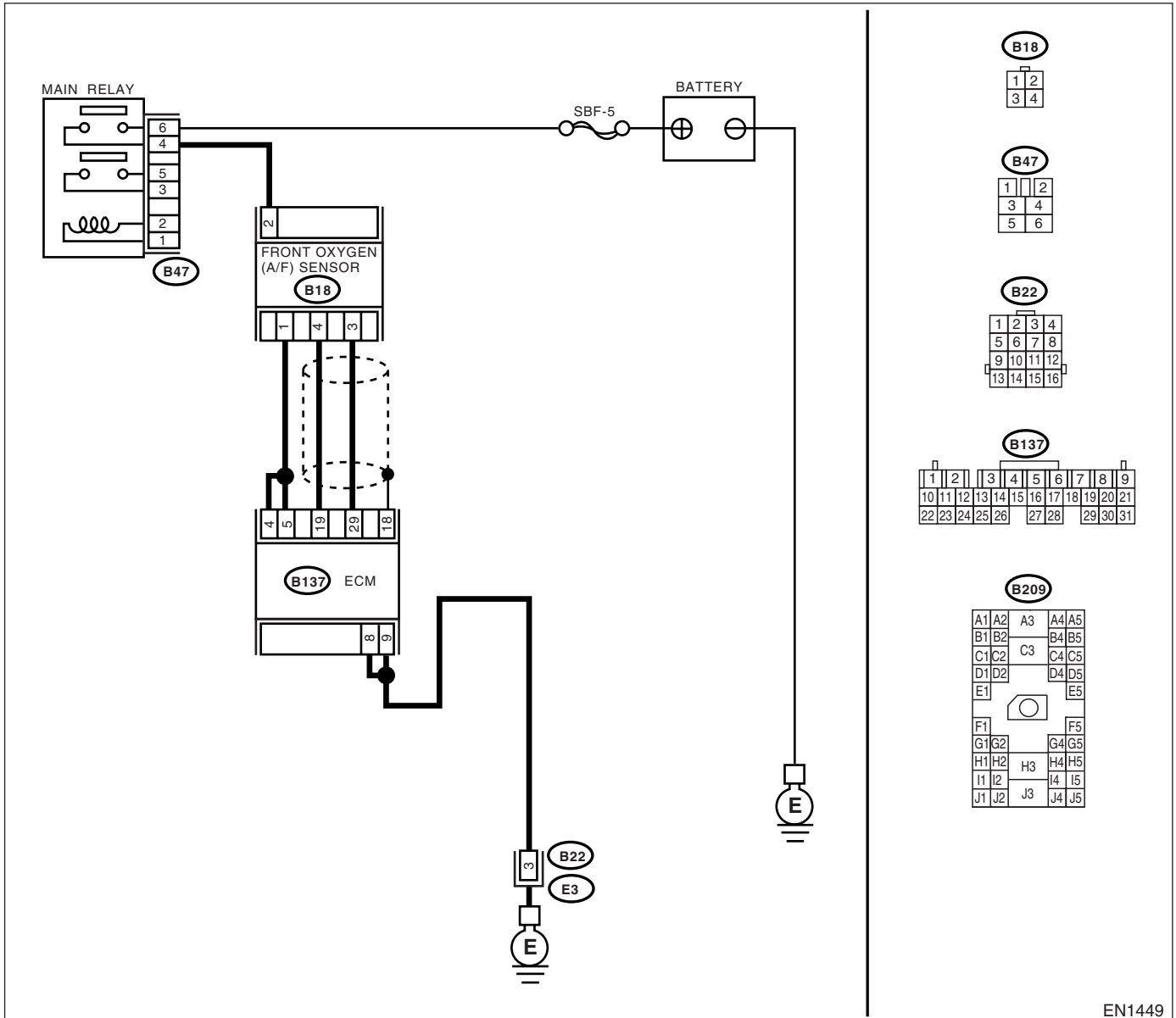
CQ: DTC P1153 — FRONT OXYGEN (A/F) SENSOR CIRCUIT RANGE/PERFORMANCE PROBLEM (HIGH INPUT) [AT VEHICLES] —

- DTC DETECTING CONDITION:
 - Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- WIRING DIAGRAM:



EN1449

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 the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM connector and chassis ground. <i>Connector & terminal</i> <i>(B137) No. 19 — Chassis ground:</i>	Is the resistance more than 10 Ω ?	Go to step 2.	Repair the 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 the resistance of harness between ECM connector and chassis ground. <i>Connector & terminal</i> <i>(B137) No. 29 — Chassis ground:</i>	Is the resistance more than 10 Ω ?	Go to step 3.	Repair the ground short circuit in harness between ECM and front oxygen (A/F) sensor connector.
3 CHECK OUTPUT SIGNAL FOR ECM. 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM connector and chassis ground. <i>Connector & terminal</i> <i>(B137) No. 19 (+) — Chassis ground (-):</i>	Is the voltage more than 4.5 V?	Go to step 4.	Go to step 5.
4 CHECK OUTPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground. <i>Connector & terminal</i> <i>(B137) No. 19 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Repair the battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. After repair, replace the ECM. <Ref. to FU(TURBO)-49, Engine Control Module.>	Repair the poor contact in ECM connector.
5 CHECK OUTPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground. <i>Connector & terminal</i> <i>(B137) No. 29 (+) — Chassis ground (-):</i>	Is the voltage more than 4.95 V?	Go to step 6.	Replace the front oxygen (A/F) sensor. <Ref. to FU(TURBO)-44, Front Oxygen (A/F) Sensor.>
6 CHECK OUTPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground. <i>Connector & terminal</i> <i>(B137) No. 29 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Repair the battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. After repair, replace the ECM. <Ref. to FU(TURBO)-49, Engine Control Module.>	Repair the poor contact in ECM connector.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

CR:DTC P1230 — FUEL PUMP CONTROLLER MALFUNCTION —

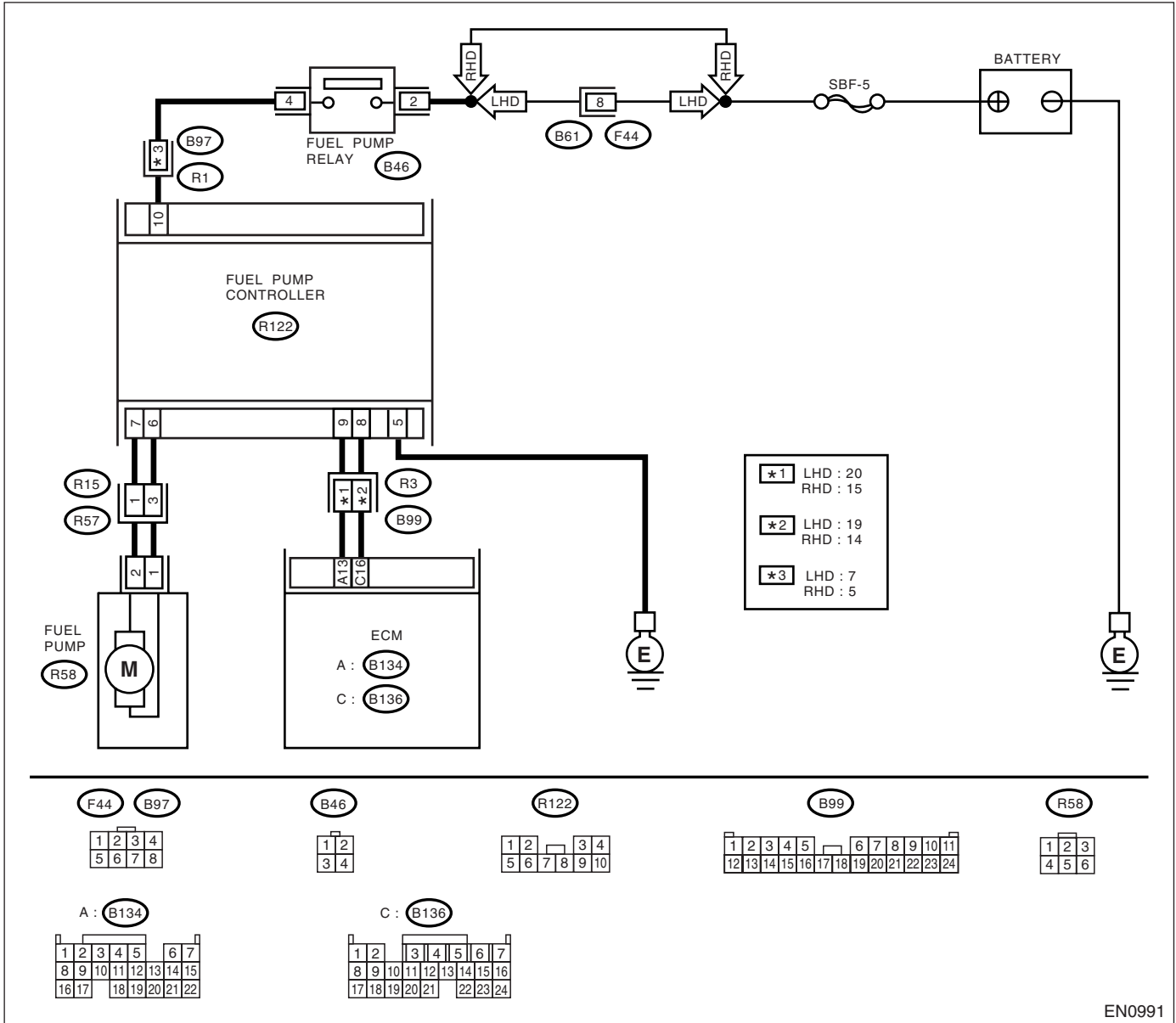
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

WIRING DIAGRAM:



EN0991

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>1</p> <p>CHECK POWER SUPPLY CIRCUIT TO FUEL PUMP CONTROLLER.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel pump controller. 3) Turn the ignition switch to ON. 4) Measure the voltage between fuel pump controller and chassis ground.</p> <p>Connector & terminal <i>(R122) No. 10 (+) — Chassis ground (-):</i></p>	<p>Is the voltage more than 10V?</p>	<p>Go to step 2.</p>	<p>Repair the power supply circuit.</p> <p>NOTE: In this case repair the following:</p> <ul style="list-style-type: none"> • Open or ground short circuit in harness between fuel pump relay and fuel pump controller • Poor contact in fuel pump controller connector • Poor contact in fuel pump relay connector
<p>2</p> <p>CHECK GROUND CIRCUIT OF FUEL PUMP CONTROLLER.</p> <p>1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between fuel pump controller and chassis ground.</p> <p>Connector & terminal <i>(R122) No. 5 — Chassis ground:</i></p>	<p>Is the resistance less than 5 Ω?</p>	<p>Go to step 3.</p>	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Open circuit between fuel pump controller and chassis ground • Poor contact in fuel pump controller connector
<p>3</p> <p>CHECK HARNESS BETWEEN FUEL PUMP CONTROLLER AND FUEL PUMP CONNECTOR.</p> <p>1) Disconnect the connector from fuel pump. 2) Measure the resistance of harness between fuel pump controller and fuel pump connector.</p> <p>Connector & terminal <i>(R122) No. 7 — (R58) No. 2:</i> <i>(R122) No. 6 — (R58) No. 1:</i></p>	<p>Is the resistance less than 1 Ω?</p>	<p>Go to step 4.</p>	<p>Repair the open circuit between fuel pump controller and fuel pump.</p>
<p>4</p> <p>CHECK HARNESS BETWEEN FUEL PUMP CONTROLLER AND FUEL PUMP CONNECTOR.</p> <p>Measure the resistance of harness between fuel pump controller and chassis ground.</p> <p>Connector & terminal <i>(R122) No. 7 — Chassis ground:</i> <i>(R122) No. 6 — Chassis ground:</i></p>	<p>Is the resistance more than 1M Ω?</p>	<p>Go to step 5.</p>	<p>Repair the ground short circuit between fuel pump controller and fuel pump.</p>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>5</p> <p>CHECK HARNESS BETWEEN FUEL PUMP CONTROLLER AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between fuel pump controller and ECM connector.</p> <p>Connector & terminal (R122) No. 9 — (B134) No. 13: (R122) No. 8 — (B136) No. 16:</p>	<p>Is the resistance less than 1 Ω?</p>	<p>Go to step 6.</p>	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following:</p> <ul style="list-style-type: none"> • Open circuit between fuel pump controller and ECM • Poor contact in fuel pump controller and ECM connector
<p>6</p> <p>CHECK HARNESS BETWEEN FUEL PUMP CONTROLLER AND ECM CONNECTOR. Measure the resistance of harness between fuel pump controller and chassis ground.</p> <p>Connector & terminal (R122) No. 9 — Chassis ground: (R122) No. 8 — Chassis ground:</p>	<p>Is the resistance more than 1M Ω?</p>	<p>Go to step 7.</p>	<p>Repair the ground short circuit between fuel pump controller and ECM.</p>
<p>7</p> <p>CHECK POOR CONTACT. Check poor contact in ECM and fuel pump controller connector.</p>	<p>Is there poor contact in ECM and fuel pump controller connector.</p>	<p>Repair the poor contact in ECM and fuel pump controller.</p>	<p>Replace the fuel pump controller. <Ref. to FU(TURBO)-52, Fuel Pump Controller.></p>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

CS:DTC P1244 — WASTEGATE CONTROL SOLENOID VALVE RANGE/PERFORMANCE PROBLEM (LOW INPUT) [MT VEHICLES] —

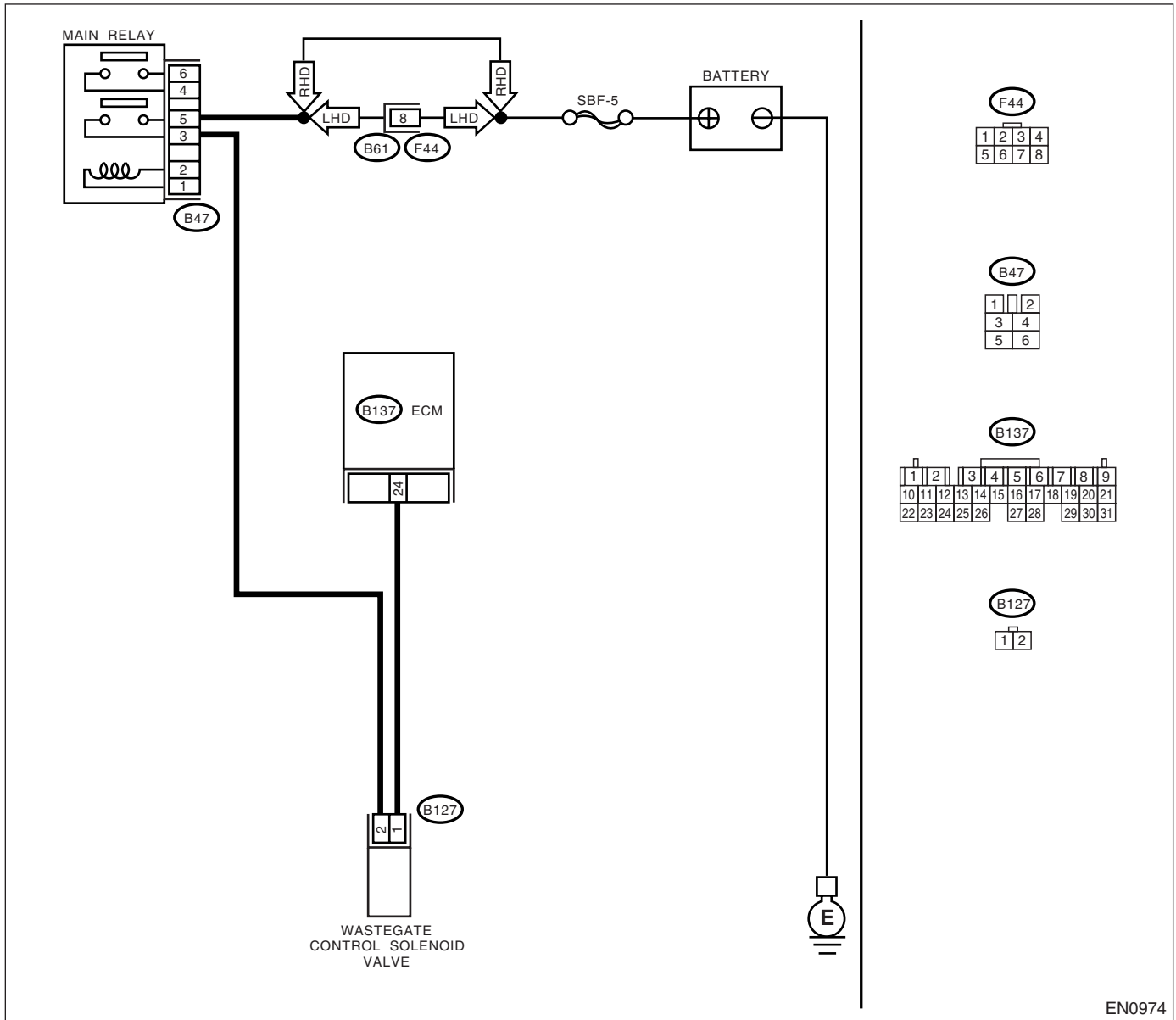
• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

• WIRING DIAGRAM:



EN0974

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1	CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.	Is any other DTC displayed?	<p>Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(TURBO)-75, List of Diagnostic Trouble Code (DTC).></p> <p>NOTE: In this case, it is not necessary to inspect DTC P1244.</p>
			<p>Replace the wastegate control solenoid valve. <Ref. to FU(TURBO)-43, Wastegate Control Solenoid Valve.></p>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

CT:DTC P1245 — WASTEGATE CONTROL SOLENOID VALVE MALFUNCTION (FAIL-SAFE) [MT VEHICLES] —

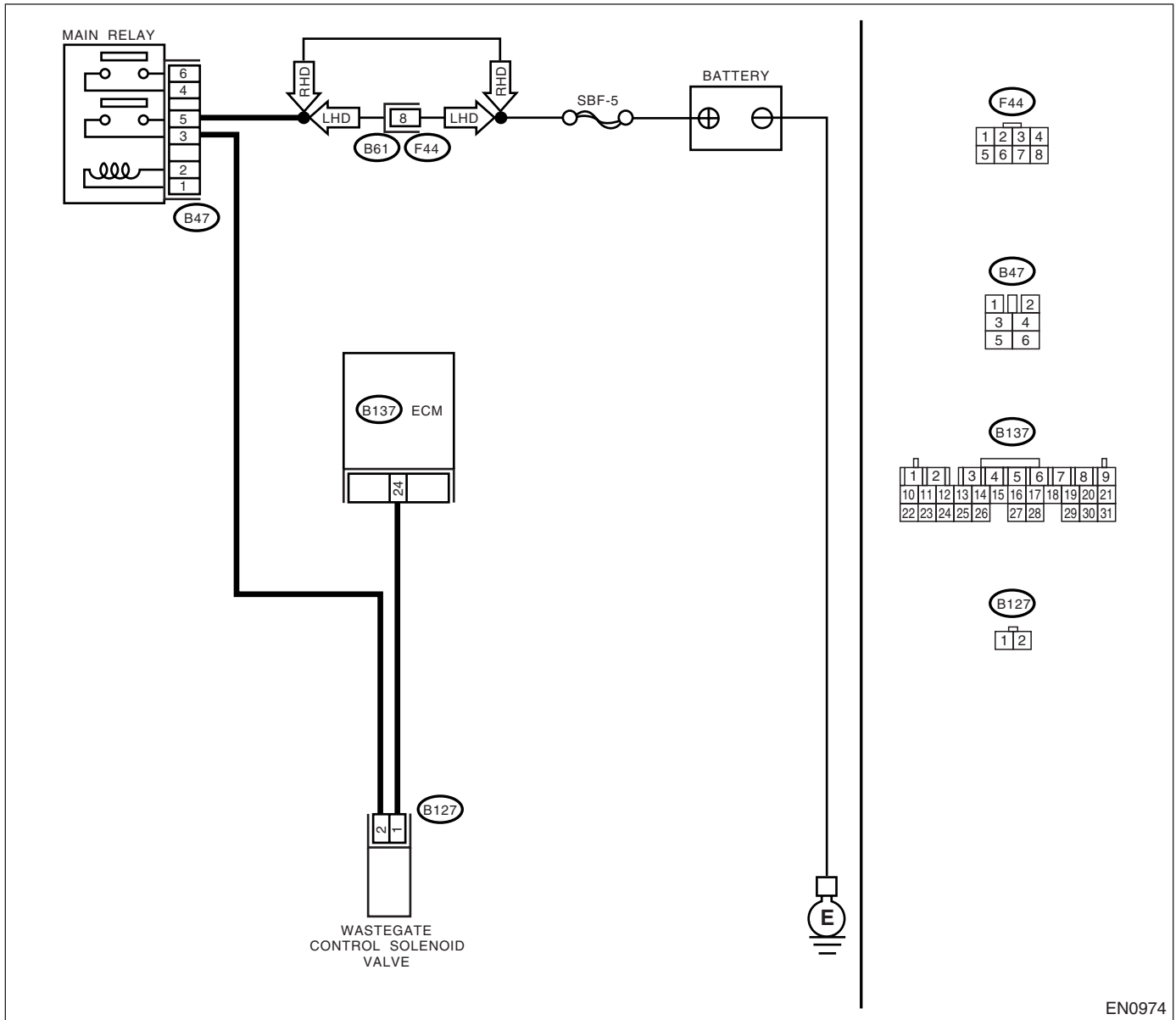
• DTC DETECTING CONDITION:

- Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-45, Operation.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

• WIRING DIAGRAM:



EN0974

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(TURBO)-75, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P1245.	Replace the wastegate control solenoid valve. <Ref. to FU(TURBO)-43, Wastegate Control Solenoid Valve.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

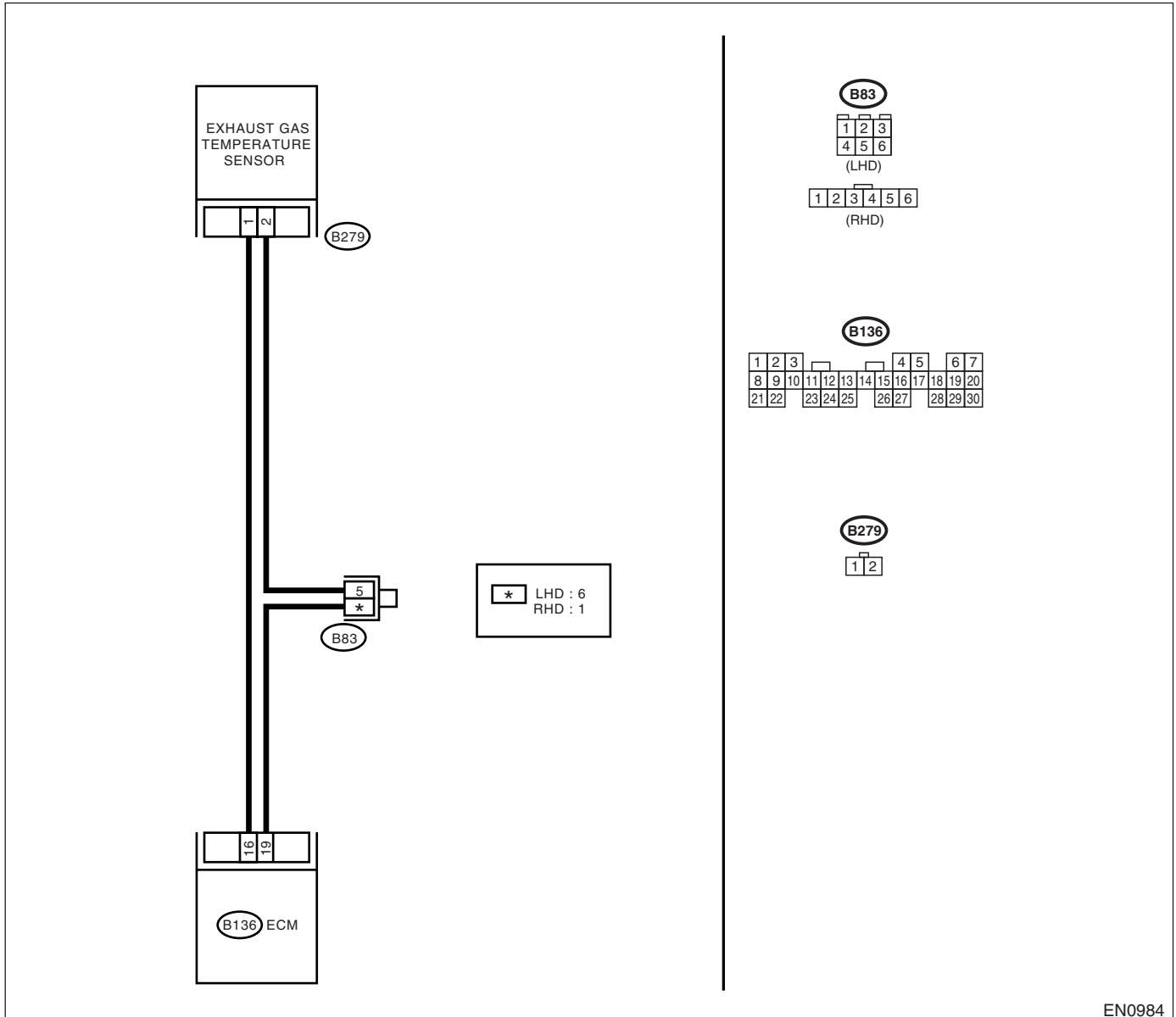
CU:DTC P1301 — FIRE DUE TO INCREASED EXHAUST TEMPERATURE —

- **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(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN0984

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC). Conduct the troubleshooting for all DTC P0301, P0302, P0303 and P0304. <Ref. to EN(TURBO)-75, List of Diagnostic Trouble Code (DTC).>	Does failure for repair or replacement exist?	Repair or replace the 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)

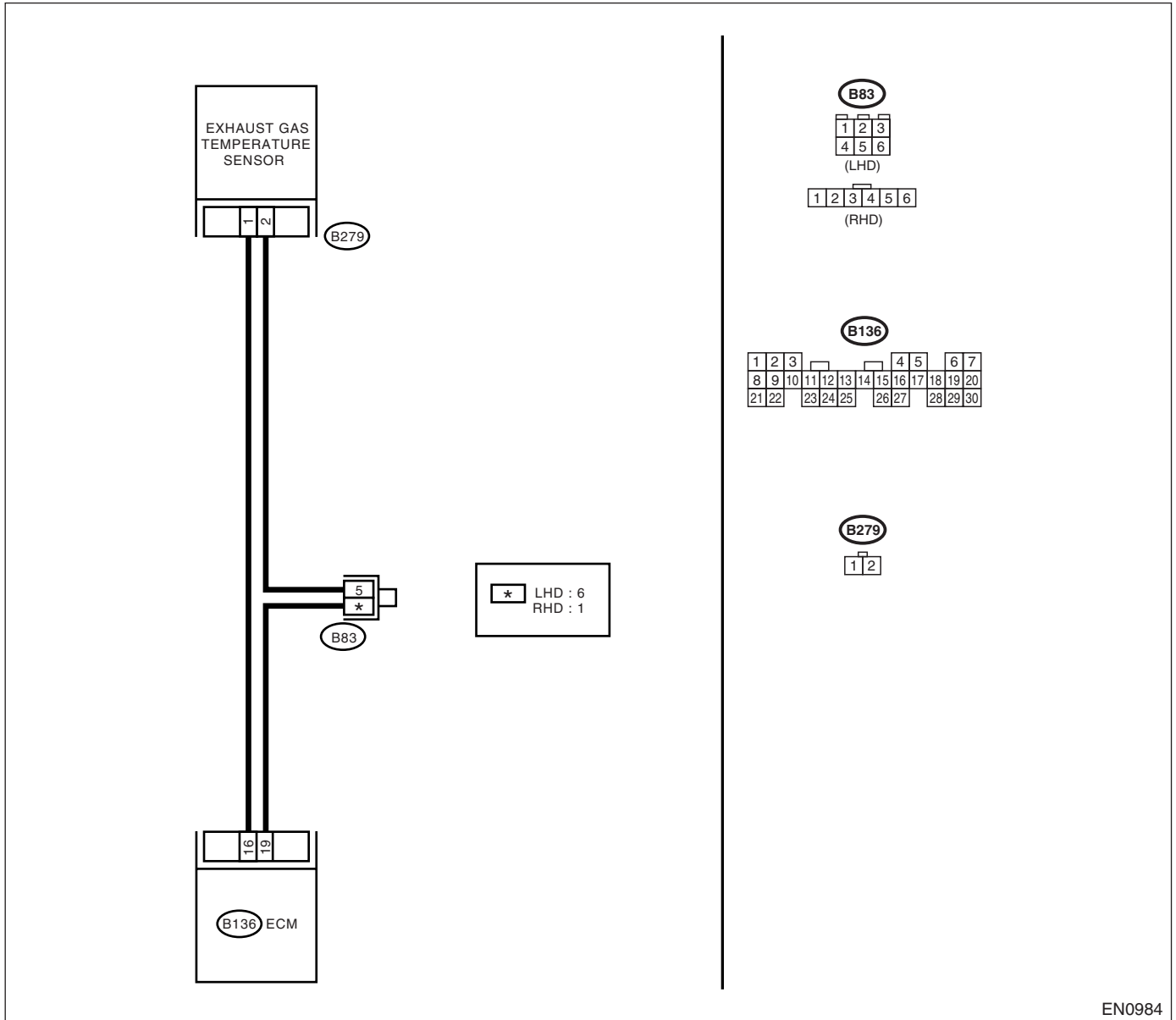
CV:DTC P1312 — EXHAUST GAS TEMPERATURE CIRCUIT MALFUNCTION —

- DTC DETECTING CONDITION:
 - Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- WIRING DIAGRAM:



EN0984

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(TURBO)-75, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P1312.	Replace the exhaust gas temperature sensor. <Ref. to FU(TURBO)-48, Exhaust Temperature Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
ENGINE (DIAGNOSTICS)

CW:DTC P1480 — COOLING FAN RELAY 1 CIRCUIT HIGH INPUT —

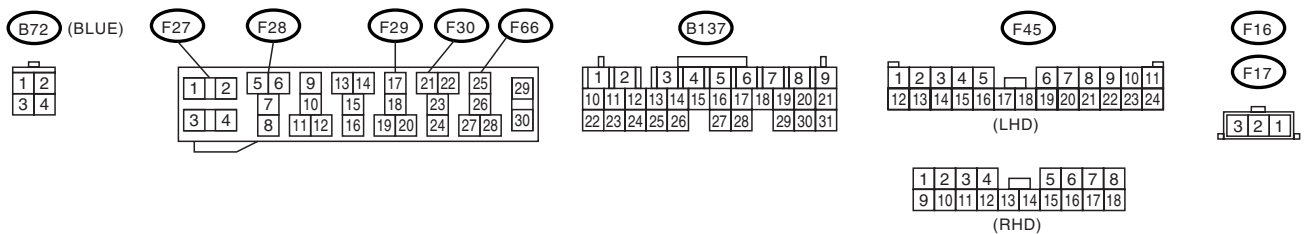
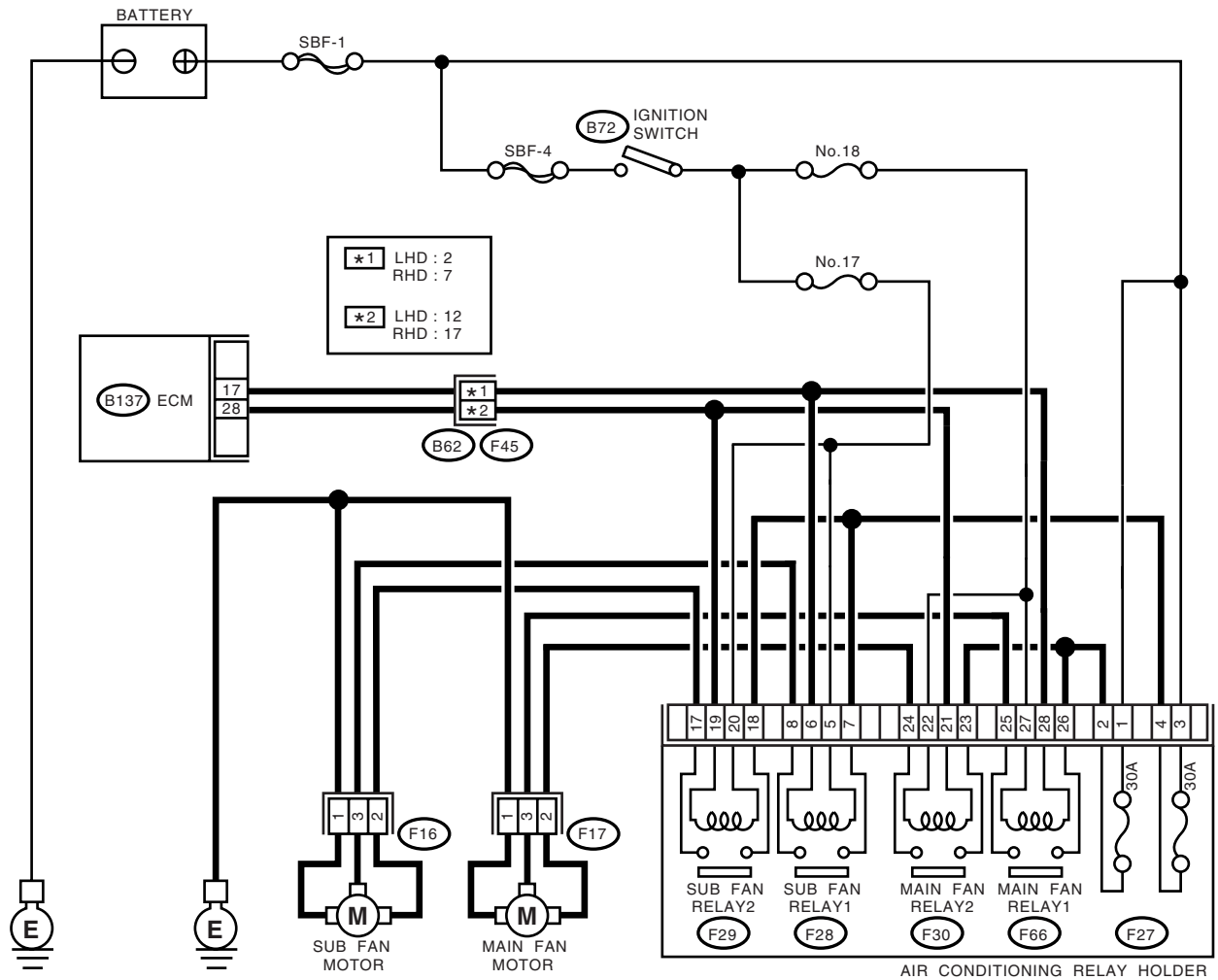
- **DTC DETECTING CONDITION:**
 - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
 - Radiator fan does not operate properly.
 - Overheating

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-45, Operation.> and Inspection Mode <Ref. to EN(TURBO)-42, 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
<p>1 CHECK OUTPUT SIGNAL FROM ECM. 1) Turn the ignition switch to OFF. 2) Connect the test mode connector at the lower portion of instrument panel (on the driver's side). 3) Turn the ignition switch to ON. 4) While operating the radiator fan relay, measure the voltage between ECM and chassis ground.</p> <p>NOTE: Radiator fan relay operation can be executed using the Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(TURBO)-46, Compulsory Valve Operation Check Mode.></p> <p>Connector & terminal (B137) No. 17 (+) — Chassis ground (-): (B137) No. 28 (+) — Chassis ground (-):</p>	<p>Does the voltage change between 0 and 10 V?</p>	<p>Even if MIL lights up, the circuit has returned to a normal condition at this time. In this case, repair the poor contact in ECM connector.</p>	<p>Go to step 2.</p>
<p>2 CHECK SHORT CIRCUIT IN RADIATOR FAN RELAY CONTROL CIRCUIT. 1) Turn the ignition switch to OFF. 2) Remove the main fan relay and sub fan relay. (with A/C models) 3) Disconnect the test mode connector. 4) Turn the ignition switch to ON. 5) Measure the voltage between ECM and chassis ground.</p> <p>Connector & terminal (B137) No. 17 (+) — Chassis ground (-): (B137) No. 28 (+) — Chassis ground (-):</p>	<p>Is the voltage more than 10 V?</p>	<p>Repair the battery short circuit in radiator fan relay control circuit. After repair, replace the ECM. <Ref. to FU(TURBO)-49, Engine Control Module.></p>	<p>Go to step 3.</p>
<p>3 CHECK MAIN FAN RELAY. 1) Turn the ignition switch to OFF. 2) Remove the main fan relay 1 and 2. 3) Measure the resistance between main fan relay terminals.</p> <p>Terminal No. 25 — No. 26 (Main fan relay 1) No. 23 — No. 24 (Main fan relay 2)</p>	<p>Is the resistance less than 1 Ω?</p>	<p>Replace the main fan relay and ECM. <Ref. to FU(TURBO)-49, Engine Control Module.></p>	<p>Go to step 4.</p>
<p>4 CHECK SUB FAN RELAY. 1) Remove the sub fan relay. 2) Measure the resistance between sub fan relay terminals.</p> <p>Terminal No. 7 — No. 8 (Sub fan relay 1) No. 17 — No. 18 (Sub fan relay 2)</p>	<p>Is the resistance less than 1 Ω?</p>	<p>Replace the sub fan relay and ECM. <Ref. to FU(TURBO)-49, Engine Control Module.></p>	<p>Go to step 5.</p>
<p>5 CHECK POOR CONTACT. Check poor contact in ECM connector.</p>	<p>Is there poor contact in ECM connector?</p>	<p>Repair the poor contact in ECM connector.</p>	<p>Replace the ECM. <Ref. to FU(TURBO)-49, Engine Control Module.></p>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

CX:DTC P1507 — IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE) —

• **DTC DETECTING CONDITION:**

- Immediately at fault recognition

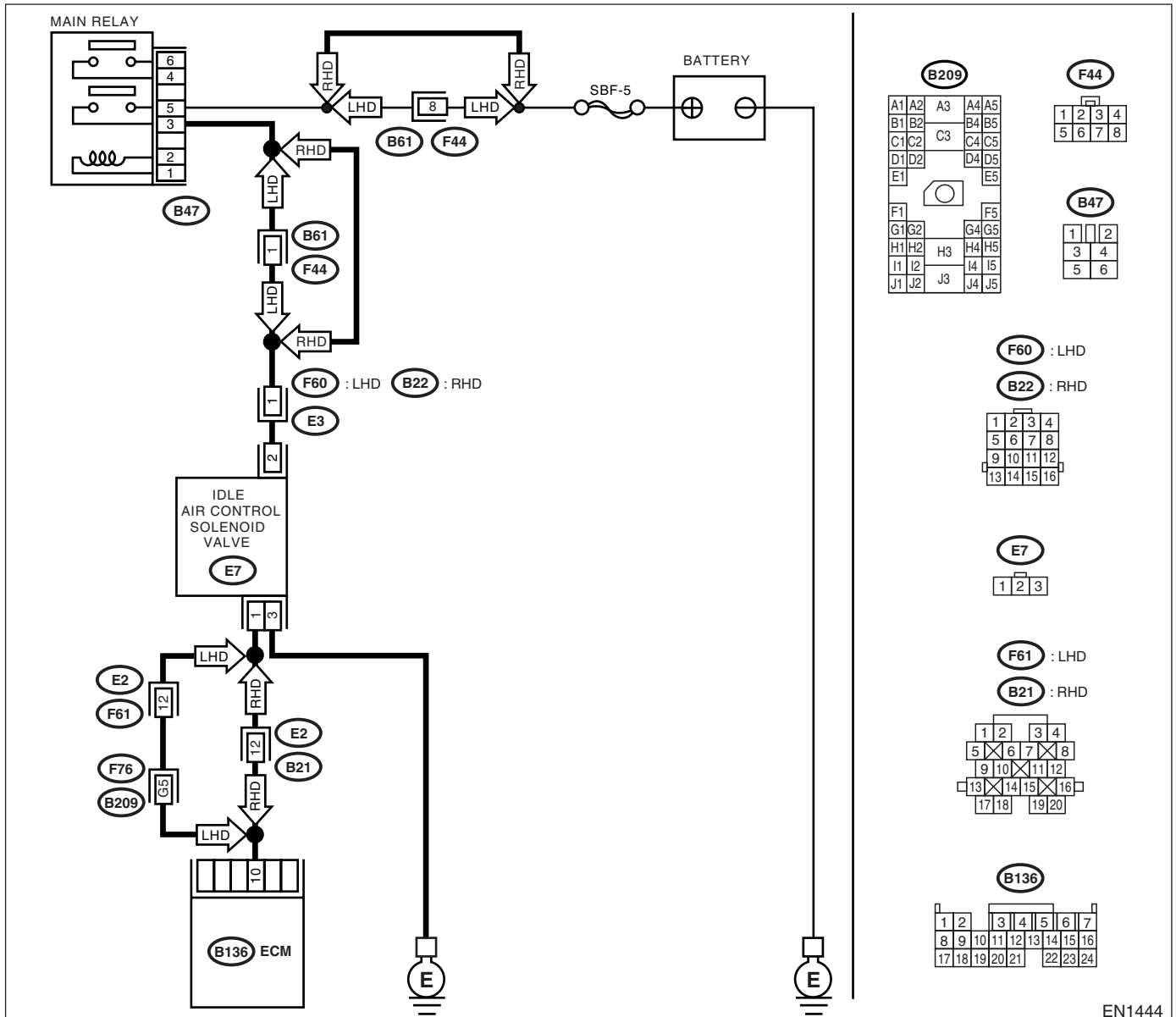
• **TROUBLE SYMPTOM:**

- 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(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

• **WIRING DIAGRAM:**



EN1444

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No	
1	CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(TURBO)-75, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P1507.	Go to step 2.
2	CHECK AIR INTAKE SYSTEM. 1)Turn the ignition switch to ON. 2)Start the engine, and idle it. 3)Check the following items. •Loose installation of intake manifold, idle air control solenoid valve and throttle body •Cracks of intake manifold gasket, idle air control solenoid valve gasket and throttle body gasket •Disconnections of vacuum hoses	Is there a fault in air intake system?	Repair the air suction and leaks.	Go to step 3.
3	CHECK THROTTLE CABLE.	Does the throttle cable have play for adjustment?	Go to step 4.	Adjust the throttle cable. <Ref. to SP-9, INSTALLATION, Accelerator Control Cable.>
4	CHECK AIR BY-PASS LINE. 1)Turn the ignition switch to OFF. 2)Remove the idle air control solenoid valve from throttle body. <Ref. to FU(TURBO)-36, Idle Air Control Solenoid Valve.> 3)Confirm that there are no foreign particles in by-pass air line.	Are foreign particles in by-pass air line?	Remove the foreign particles from by-pass air line.	Replace the idle air control solenoid valve. <Ref. to FU(TURBO)-36, Idle Air Control Solenoid Valve.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

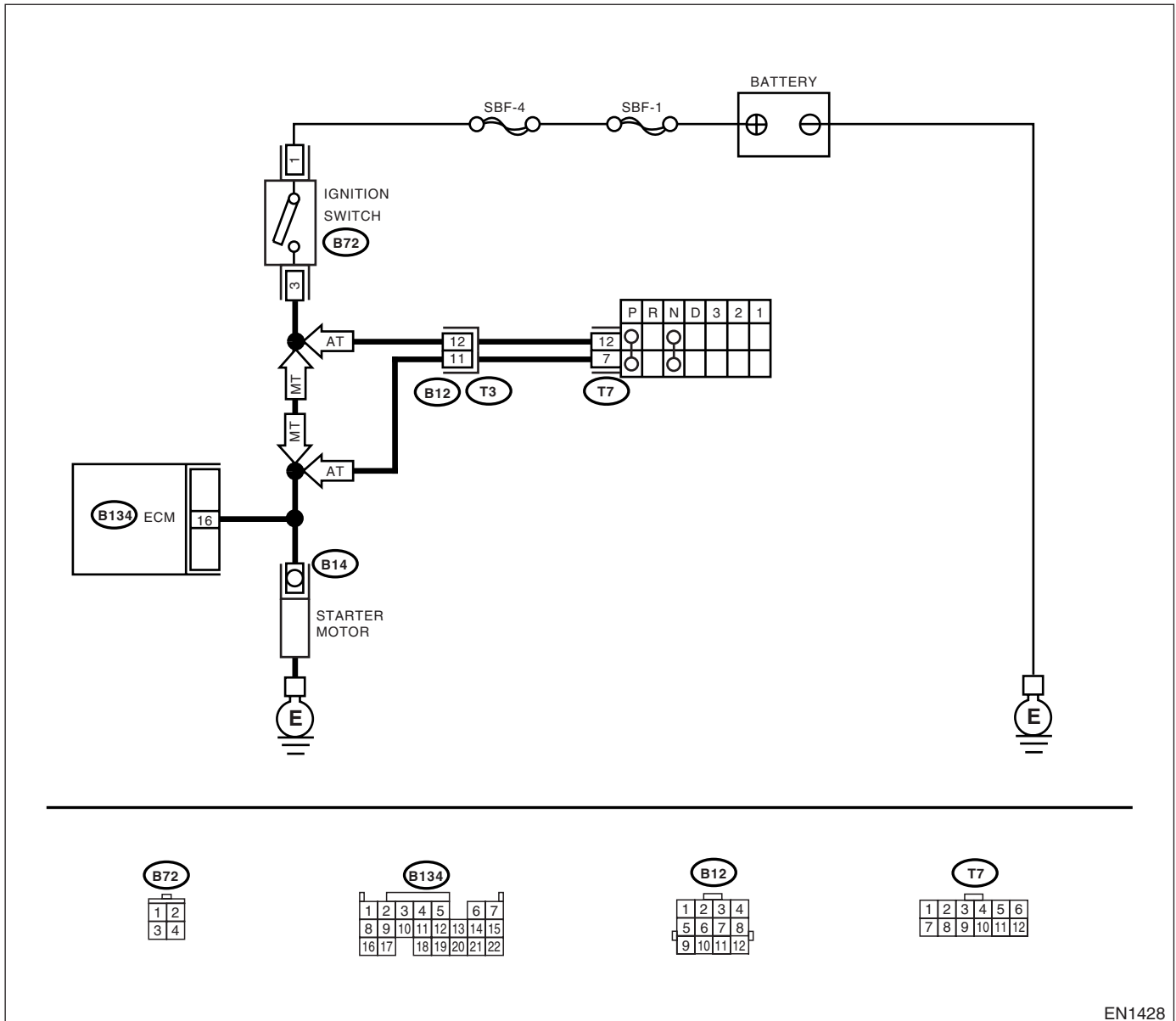
CY:DTC P1518 — STARTER SWITCH CIRCUIT LOW INPUT —

- **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(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN1428

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OPERATION OF STARTER MOTOR.	Does the starter motor operate when ignition switch is turned to START?	Repair the harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none">• Open or ground short circuit in harness between ECM and starter motor connector• Poor contact in ECM connector	Check the starter motor circuit. <Ref. to EN(TURBO)-60, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

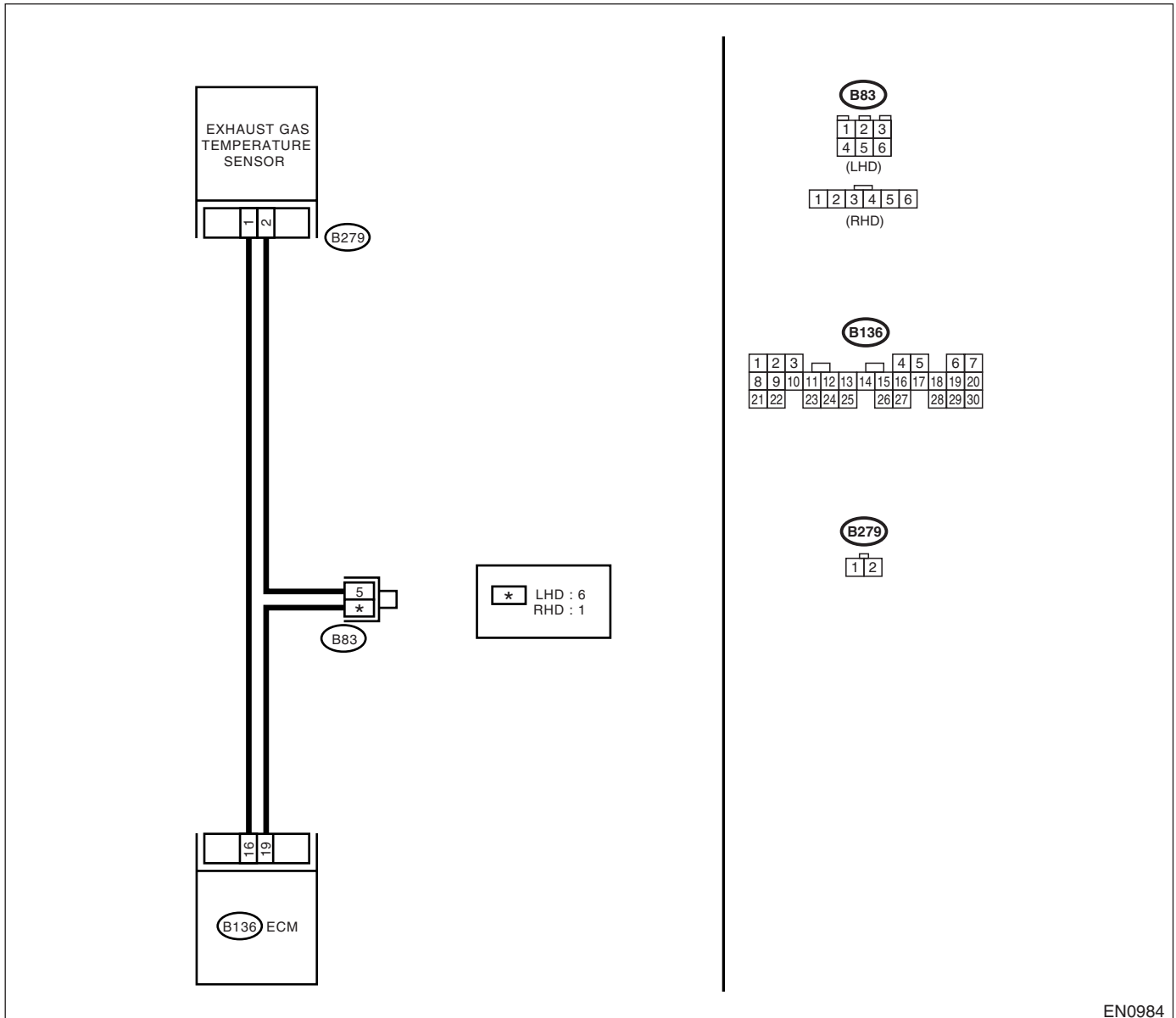
CZ:DTC P1544 — HIGH EXHAUST TEMPERATURE DETECTED —

- **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(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

- **WIRING DIAGRAM:**



EN0984

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1	CHECK ANY OTHER DIAGNOSTIC TROUBLE CODE (DTC) ON DISPLAY.	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(TURBO)-75, 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 the exhaust system parts. NOTE: Check the following items. <ul style="list-style-type: none">•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 the 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)

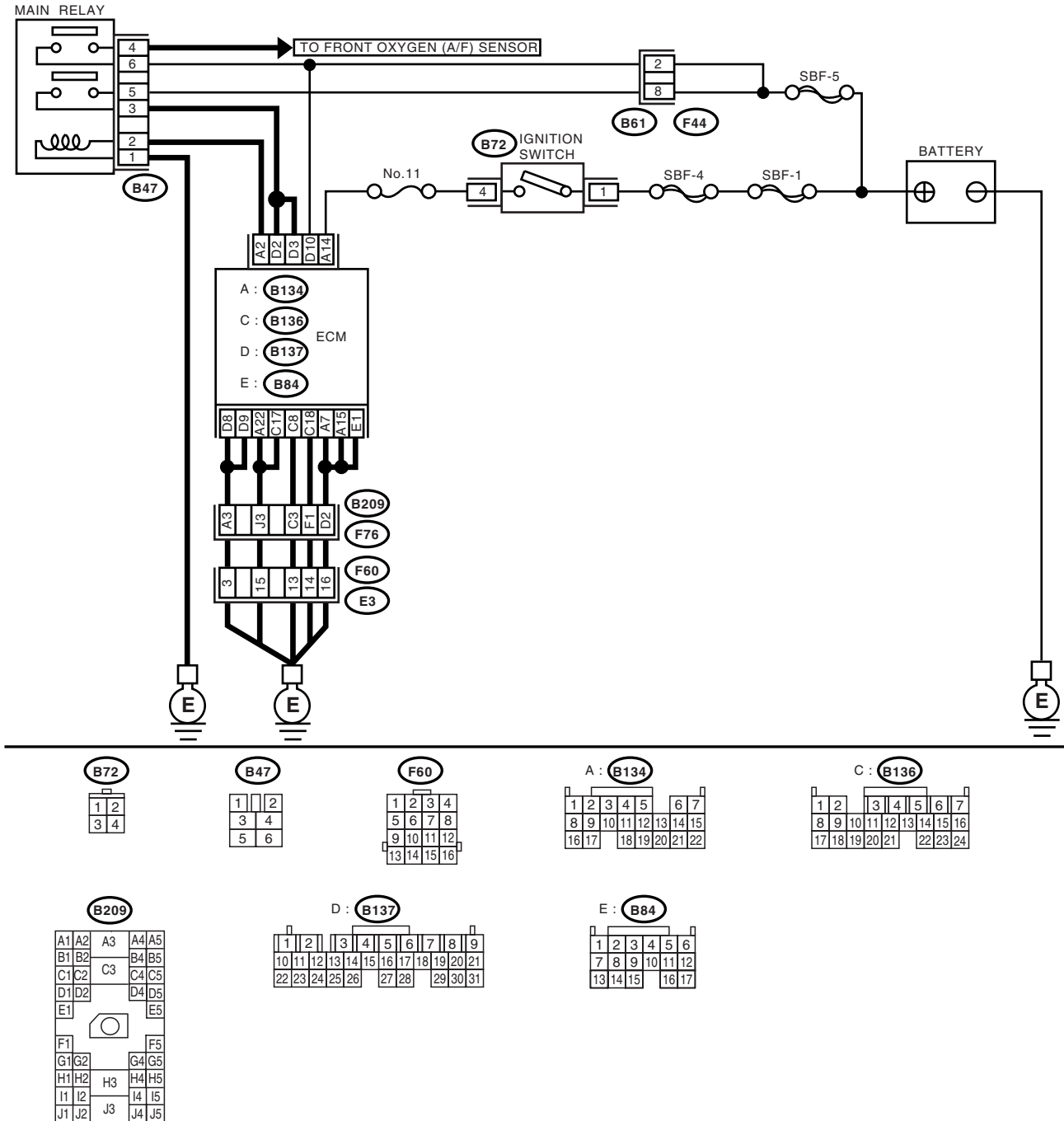
DA:DTC P1560 — BACK-UP VOLTAGE CIRCUIT MALFUNCTION —

- DTC DETECTING CONDITION:
 - Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.> .

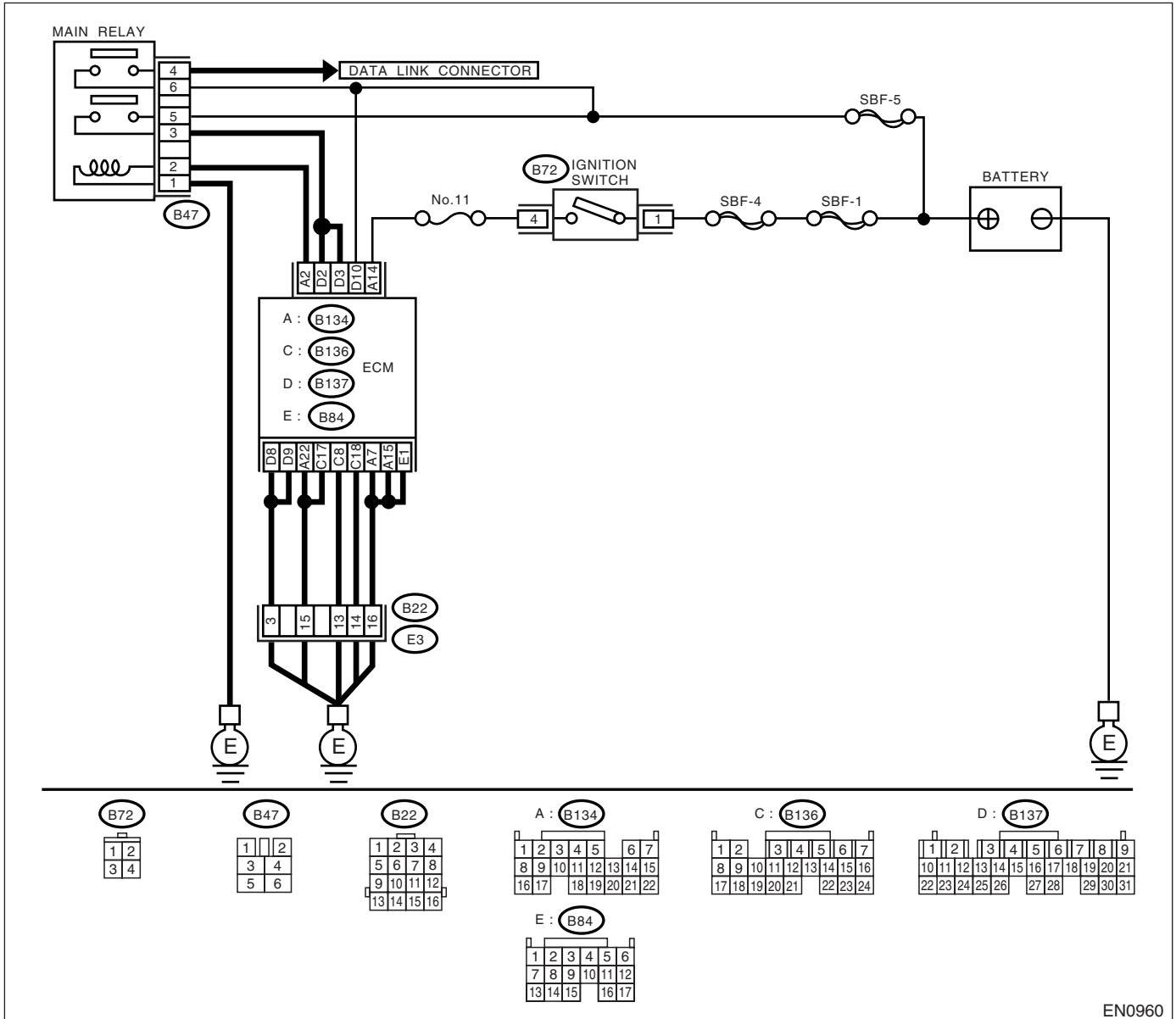
- WIRING DIAGRAM:
- LHD model



DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

• RHD model



EN0960

Step	Check	Yes	No
1 CHECK INPUT SIGNAL FOR ECM. 1) Turn the ignition switch to OFF. 2) Measure the voltage between ECM and chassis ground. <i>Connector & terminal</i> <i>(B137) No. 10 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Repair the poor contact in ECM connector.	Go to step 2.
2 CHECK HARNESS BETWEEN ECM AND MAIN FUSE BOX CONNECTOR. 1) Disconnect the connector from ECM. 2) Measure the resistance of harness between ECM and chassis ground. <i>Connector & terminal</i> <i>(B137) No. 10 — Chassis ground:</i>	Is the resistance less than 10 Ω?	Repair the 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 the fuse blown?	Replace the fuse.	Repair the harness and connector. NOTE: In this case, repair the following: <ul style="list-style-type: none">• Open circuit in harness between ECM and battery• Poor contact in ECM connector• Poor contact in battery terminal

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

DB:DTC P1595 — AUTOMATIC TRANSMISSION DIAGNOSIS INPUT SIGNAL CIRCUIT LOW INPUT —

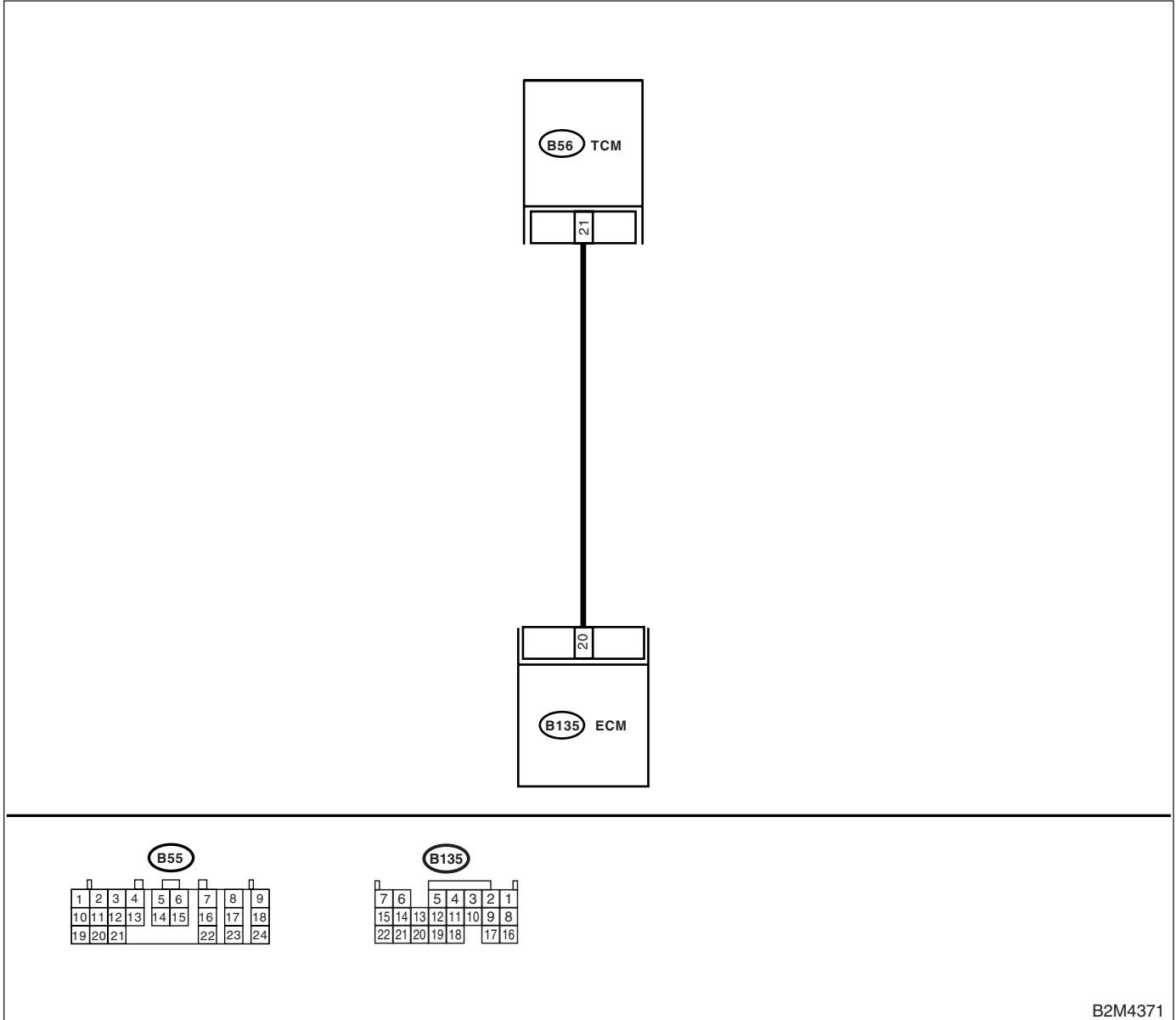
• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.>.

• WIRING DIAGRAM:



B2M4371

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. <i>Connector & terminal</i> <i>(B135) No. 20 (+) — Chassis ground (-):</i>	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: <ul style="list-style-type: none"> • Poor contact in ECM connector • Poor contact in TCM connector
2 CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and TCM. 3) Measure the resistance of harness between ECM and chassis ground. <i>Connector & terminal</i> <i>(B135) No. 20 — Chassis ground:</i>	Is the resistance less than 10 Ω?	Repair the ground short circuit in harness between ECM and TCM connector.	Go to step 3.
3 CHECK OUTPUT SIGNAL FOR ECM. 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM and chassis ground. <i>Connector & terminal</i> <i>(B135) No. 20 (+) — Chassis ground (-):</i>	Is the voltage more than 5 V?	Go to step 4.	Repair the poor contact in ECM connector.
4 CHECK TROUBLE CODE FOR AUTOMATIC TRANSMISSION. Read the DTC for automatic transmission. <Ref. to AT-22, Read Diagnostic Trouble Code (DTC).>	Does the DTC appear for automatic transmission?	Inspect the DTC for automatic transmission. <Ref. to AT-42, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Replace the TCM. <Ref. to AT-46, Transmission Control Module (TCM).>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC) ENGINE (DIAGNOSTICS)

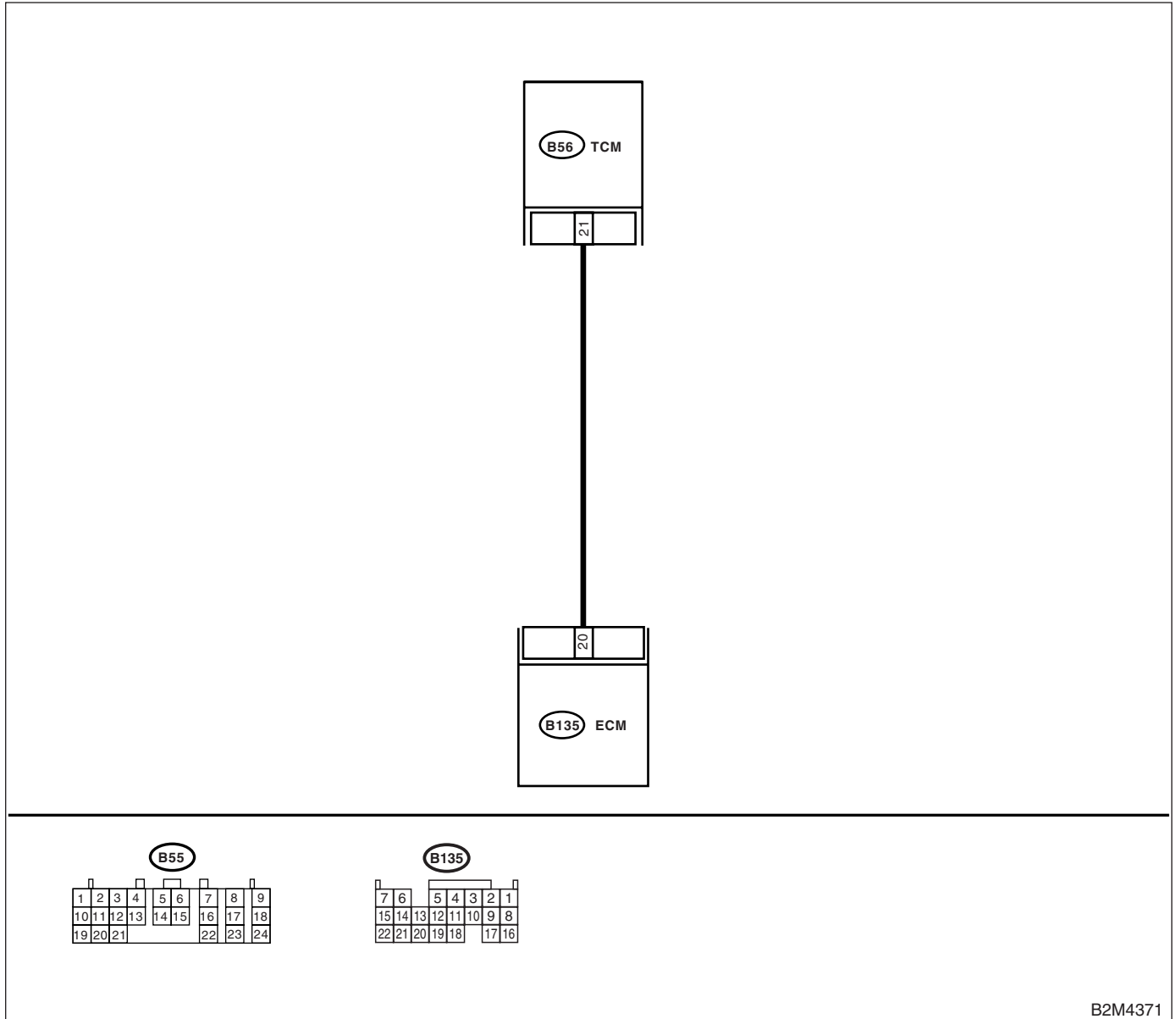
DC:DTC P1596 — AUTOMATIC TRANSMISSION DIAGNOSIS INPUT SIGNAL CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
 - Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.>.

- **WIRING DIAGRAM:**



B2M4371

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. <i>Connector & terminal</i> <i>(B135) No. 20 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Repair the battery short circuit in harness between ECM and TCM connector. After repair, replace the ECM. <Ref. to FU(TURBO)-49, Engine Control Module.>	Go to step 2.
2 CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR. Measure the voltage between ECM connector and chassis ground. <i>Connector & terminal</i> <i>(B135) No. 20 (+) — 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 the voltage between ECM connector and chassis ground. <i>Connector & terminal</i> <i>(B135) No. 20 (+) — Chassis ground (-):</i>	Is the voltage less than 1 V?	Repair the poor contact in ECM connector.	Go to step 4.
4 CHECK OUTPUT SIGNAL FROM ECM. Measure the voltage between ECM and chassis ground. <i>Connector & terminal</i> <i>(B135) No. 20 (+) — 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 the voltage between TCM and chassis ground. <i>Connector & terminal</i> <i>(B54) No. 20 (+) — Chassis ground (-):</i>	Is the voltage more than 4 V?	Go to step 6.	Repair the 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 the poor contact in TCM connector.	Check the TCM power supply line and grounding line.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

DD:DTC P1698 — ENGINE TORQUE CONTROL CUT SIGNAL CIRCUIT LOW INPUT —

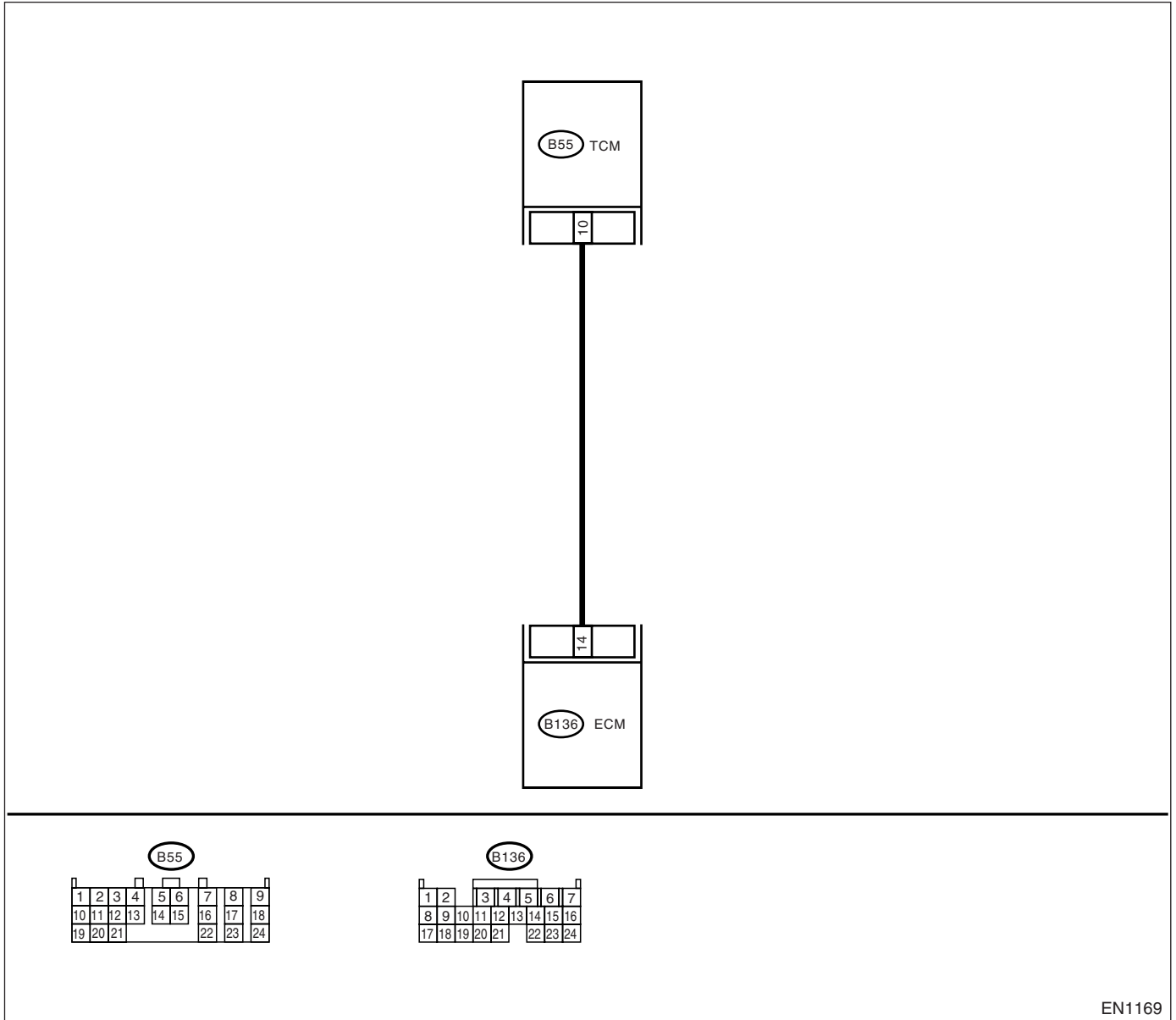
• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.>.

• WIRING DIAGRAM:



EN1169

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OUTPUT SIGNAL FROM ECM. 1)Start the engine and warm-up engine. 2)Turn the ignition switch to OFF. 3)Turn the ignition switch to ON. 4)Measure the voltage between ECM and chassis ground. Connector & terminal (B136) No. 14 (+) — Chassis ground (-):	Is the voltage more than 3 V?	Repair the poor contact in ECM connector.	Go to step 2.
2 CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR. 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from ECM and TCM. 3)Measure the resistance of harness between ECM and chassis ground. Connector & terminal (B136) No. 14 — Chassis ground:	Is the resistance less than 10 Ω ?	Repair the ground short circuit in harness between ECM and TCM connector.	Go to step 3.
3 CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR. Measure the resistance of harness between ECM and TCM connector. Connector & terminal (B136) No. 14 — (B55) No. 20:	Is the resistance less than 1 Ω ?	Repair the poor contact in ECM or TCM connector.	Repair the open circuit in harness between ECM and TCM connector.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

DE:DTC P1699 — ENGINE TORQUE CONTROL CUT SIGNAL CIRCUIT HIGH INPUT —

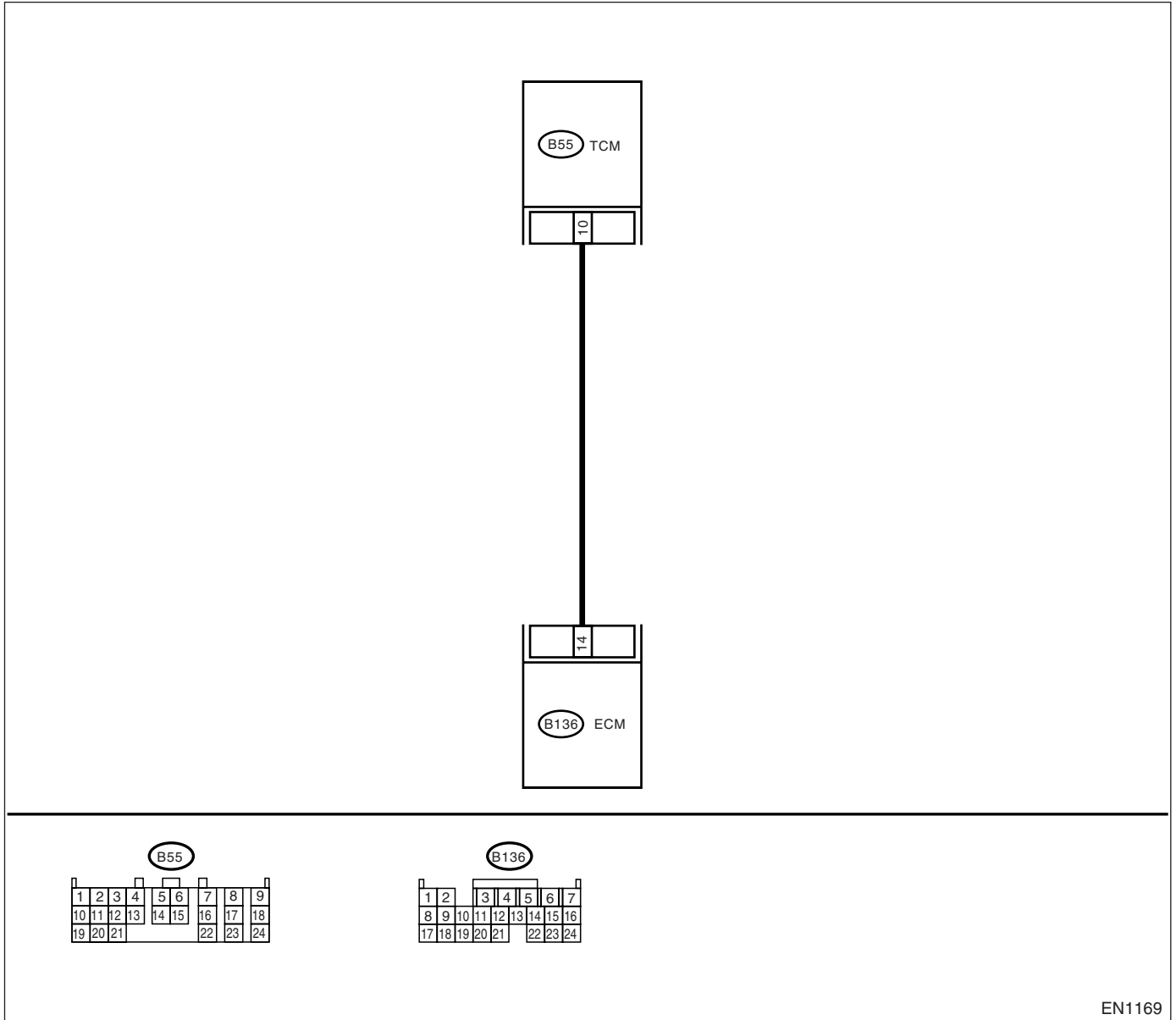
• DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.>.

• WIRING DIAGRAM:



EN1169

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OUTPUT SIGNAL FROM ECM. 1)Start the engine and warm-up engine. 2)Turn the ignition switch to OFF. 3)Disconnect the connector from TCM. 4)Turn the ignition switch to ON. 5)Measure the voltage between ECM and chassis ground. <i>Connector & terminal</i> <i>(B136) No. 14 (+) — Chassis ground (-):</i>	Is the voltage less than 3 V?	Go to step 2.	Repair the battery short circuit in harness between ECM and TCM connector. After repair, replace the ECM. <Ref. to FU(TURBO)-49, Engine Control Module.>
2 CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR. 1)Turn the ignition switch to OFF. 2)Measure the voltage between ECM and chassis ground. <i>Connector & terminal</i> <i>(B136) No. 14 (+) — 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 the battery short circuit in harness between ECM and TCM connector. After repair, replace the ECM. <Ref. to FU(TURBO)-49, Engine Control Module.>	Contact with your Subaru distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

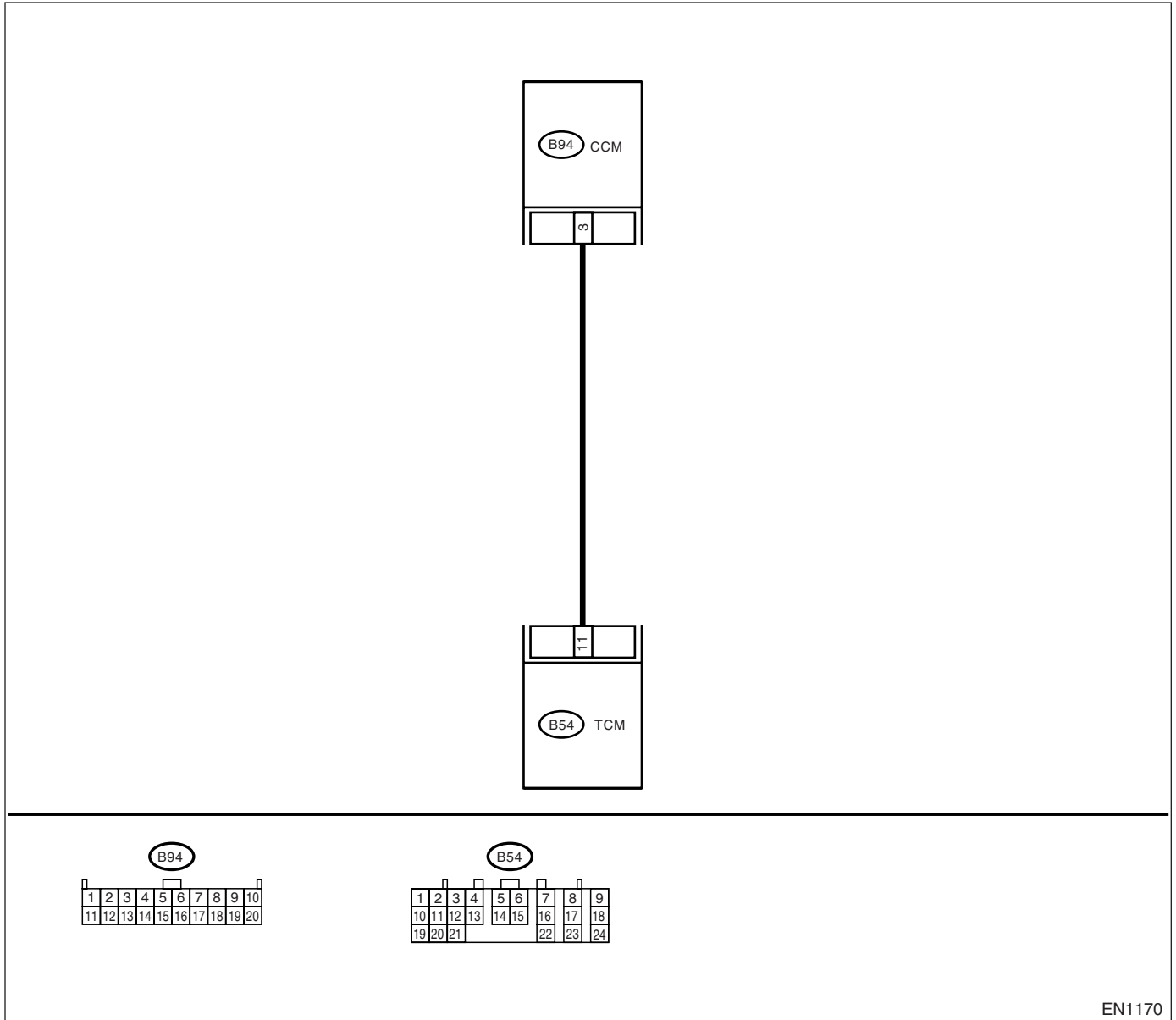
**DF:DTC P1701 — CRUISE CONTROL SET SIGNAL CIRCUIT MALFUNCTION
FOR AUTOMATIC TRANSMISSION —**

- **DTC DETECTING CONDITION:**
 - Two consecutive driving cycles with fault

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.>.

- **WIRING DIAGRAM:**



EN1170

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS BETWEEN TCM AND CCM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM and CCM. 3) Measure the resistance of harness between TCM and CCM connector. Connector & terminal (B55) No. 22 — (B94) No. 3:	Is the resistance less than 1 Ω ?	Go to step 2.	Repair the open circuit in harness between TCM and CCM connector.
2 CHECK HARNESS BETWEEN TCM AND CCM CONNECTOR. Measure the resistance of harness between TCM and chassis ground. Connector & terminal (B55) No. 22 — Chassis ground:	Is the resistance less than 10 Ω ?	Repair the short circuit in harness between TCM and CCM connector.	Go to step 3.
3 CHECK INPUT SIGNAL FOR TCM. 1) Connect the 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) Turn the cruise control main switch to ON. 5) Move the selector lever to "D" range and slowly increase vehicle speed to 50 km/h (31 MPH). 6) Turn the cruise control command switch to ON. 7) Measure the voltage between TCM and chassis ground. Connector & terminal (B55) No. 11 (+) — Chassis ground (-):	Is the resistance less than 1 V?	Go to step 4.	Check the 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 the poor contact in TCM connector.	Replace the TCM. <Ref. to AT-46, Transmission Control Module (TCM).>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

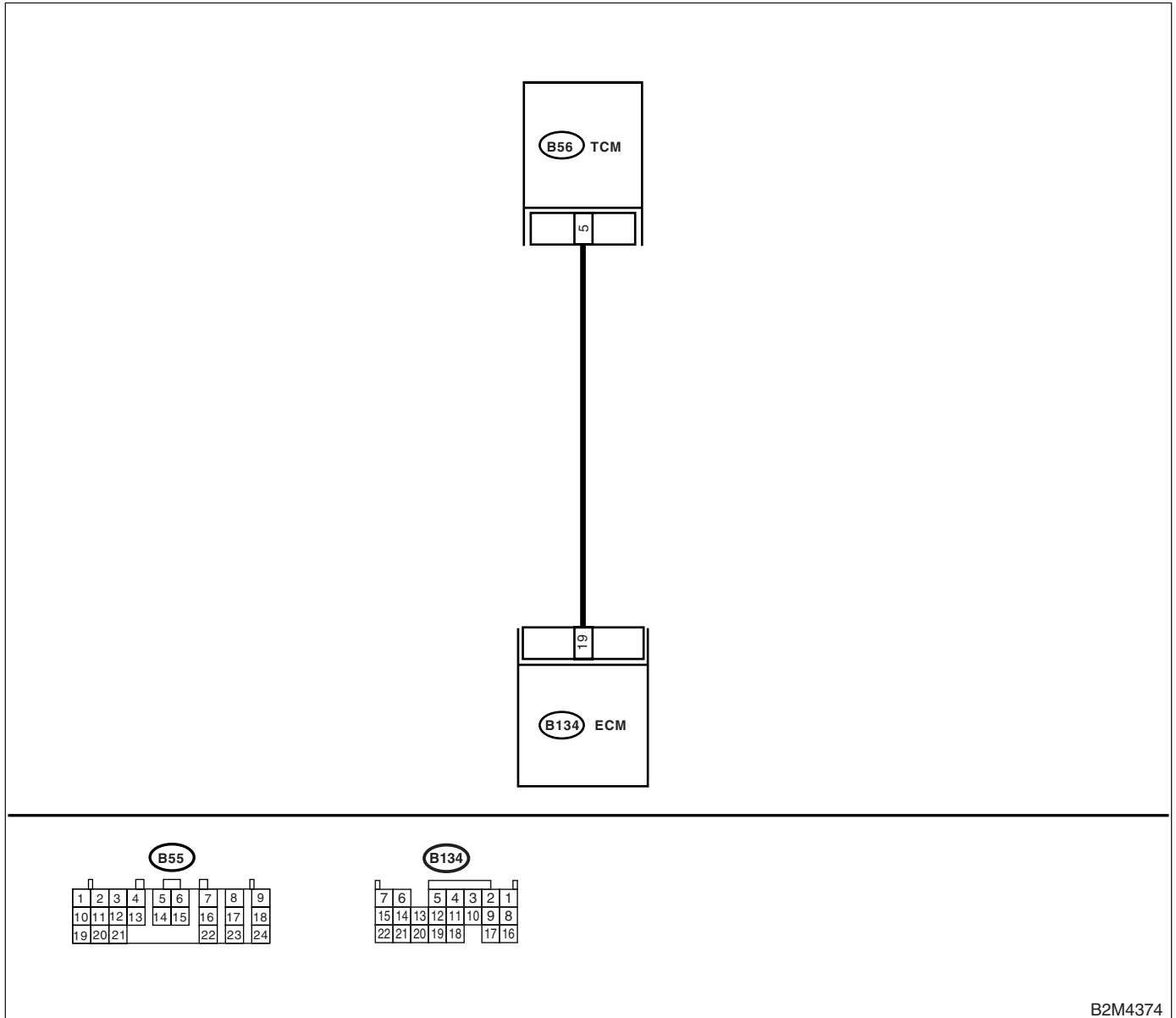
DG:DTC P1711 — ENGINE TORQUE CONTROL SIGNAL 1 CIRCUIT MALFUNCTION —

- **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(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, Inspection Mode.>.

- **WIRING DIAGRAM:**



B2M4374

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK INPUT SIGNAL FOR ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. Connector & terminal (B135) No. 19 (+) — 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 the voltage between ECM and chassis ground. Connector & terminal (B135) No. 19 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Repair the 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 the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(TURBO)-49, Engine Control Module.>
4 CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and TCM. 3) Measure the resistance of harness between ECM and TCM connector. Connector & terminal (B135) No. 19 — (B54) No. 13:	Is the resistance less than 1 Ω ?	Go to step 5.	Repair the open circuit in harness between ECM and TCM connector.
5 CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR. Measure the resistance of harness between ECM and chassis ground. Connector & terminal (B135) No. 19 — Chassis ground:	Is the resistance less than 10 Ω ?	Repair the 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 the poor contact in TCM connector.	Replace the TCM. <Ref. to AT-46, Transmission Control Module (TCM).>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

ENGINE (DIAGNOSTICS)

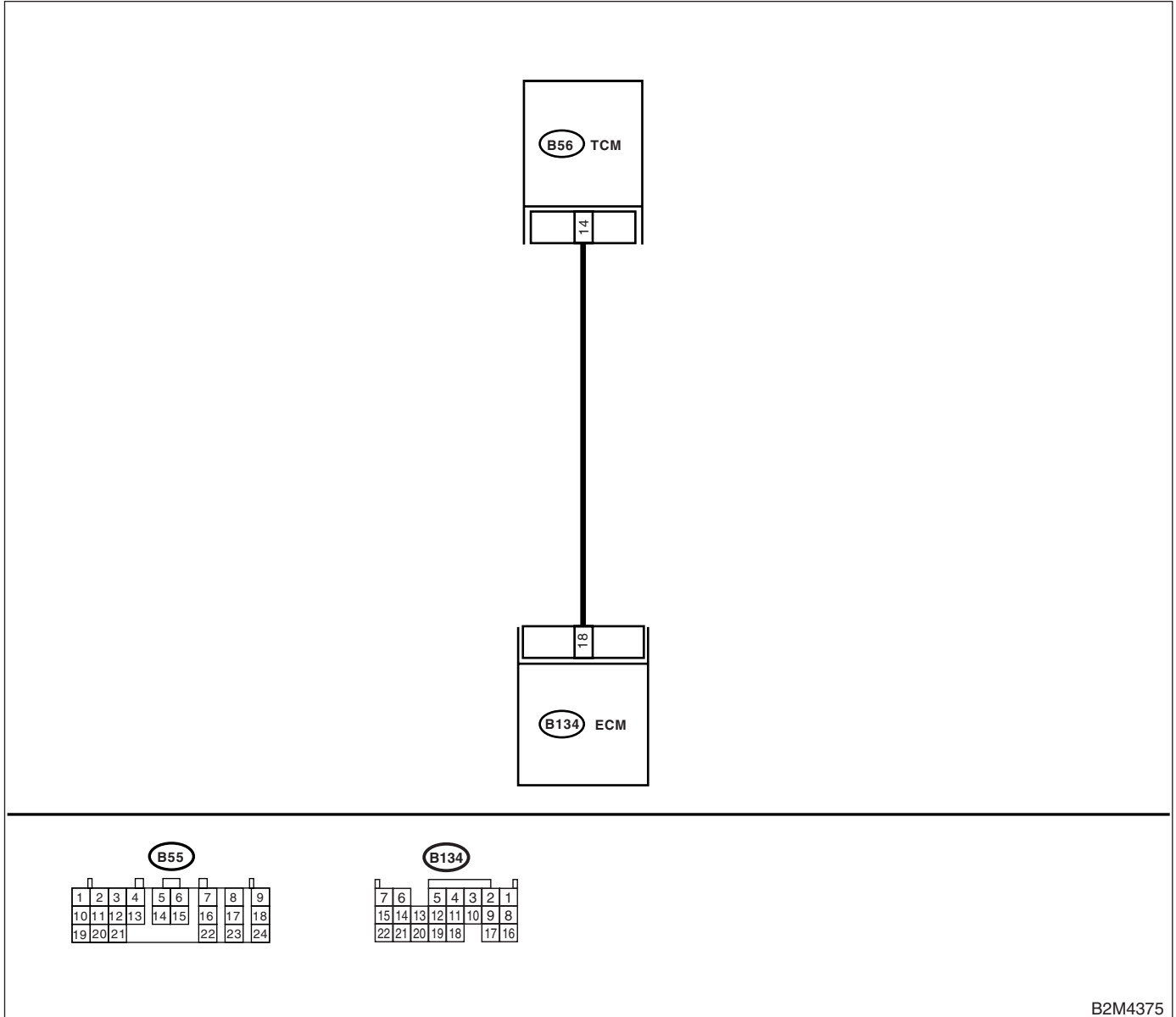
DH:DTC P1712 — ENGINE TORQUE CONTROL SIGNAL 2 CIRCUIT MALFUNCTION —

- **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(TURBO)-45, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(TURBO)-42, 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 the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. Connector & terminal (B134) No. 18 (+) — 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 the voltage between ECM and chassis ground. Connector & terminal (B134) No. 18 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Repair the 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 the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(TURBO)-49, Engine Control Module.>
4 CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and TCM. 3) Measure the resistance of harness between ECM and TCM connector. Connector & terminal (B134) No. 18 — (B56) No. 4:	Is the resistance less than 1 Ω ?	Go to step 5.	Repair the open circuit in harness between ECM and TCM connector.
5 CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR. Measure the resistance of harness between ECM and chassis ground. Connector & terminal (B134) No. 18 — Chassis ground:	Is the resistance less than 10 Ω ?	Repair the 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 the poor contact in TCM connector.	Replace the TCM. <Ref. to AT-46, 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(TURBO)-91, 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.

GENERAL DIAGNOSTIC TABLE

ENGINE (DIAGNOSTICS)

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	18
6. Drive Select Cable	20
7. General Diagnostic	21

GENERAL DESCRIPTION

CONTROL SYSTEMS

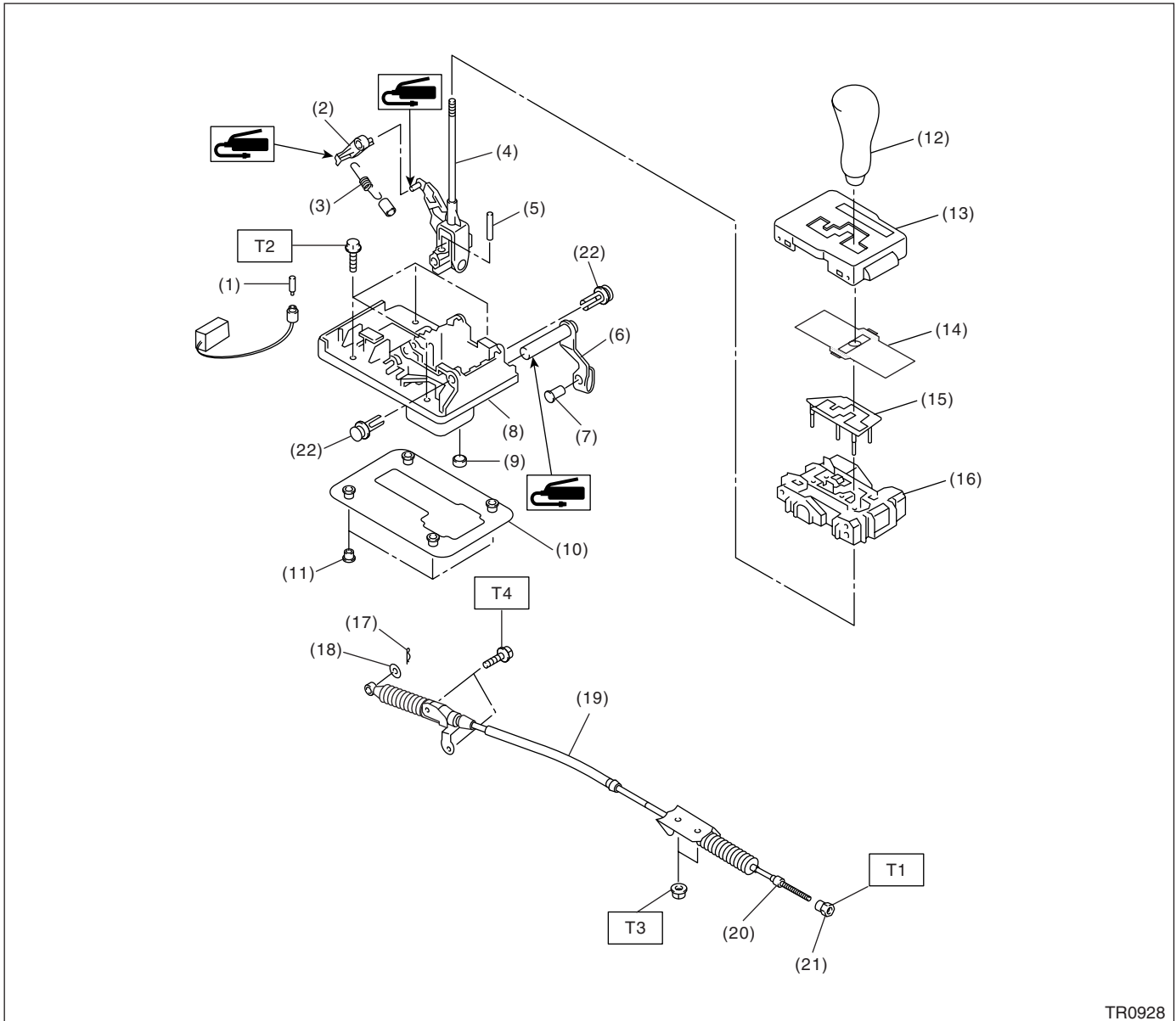
1. General Description

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



TR0928

- | | | |
|--------------------------|----------------------|------------|
| (1) Indicator light bulb | (11) Spacer | (21) Nut A |
| (2) Detent arm | (12) Grip | (22) Clip |
| (3) Detent spring | (13) Indicator cover | |
| (4) Select lever COMPL | (14) Blind | |
| (5) Spring pin | (15) Cushion plate | |
| (6) Arm COMPL | (16) Guide plate | |
| (7) Bush | (17) Snap pin | |
| (8) Plate | (18) Washer | |
| (9) Grommet | (19) Select cable | |
| (10) Packing | (20) Nut B | |

Tightening torque: N-m (kgf-m, ft-lb)

T1: 7.5 (0.76, 5.5)

T2: 13 (1.3, 9.4)

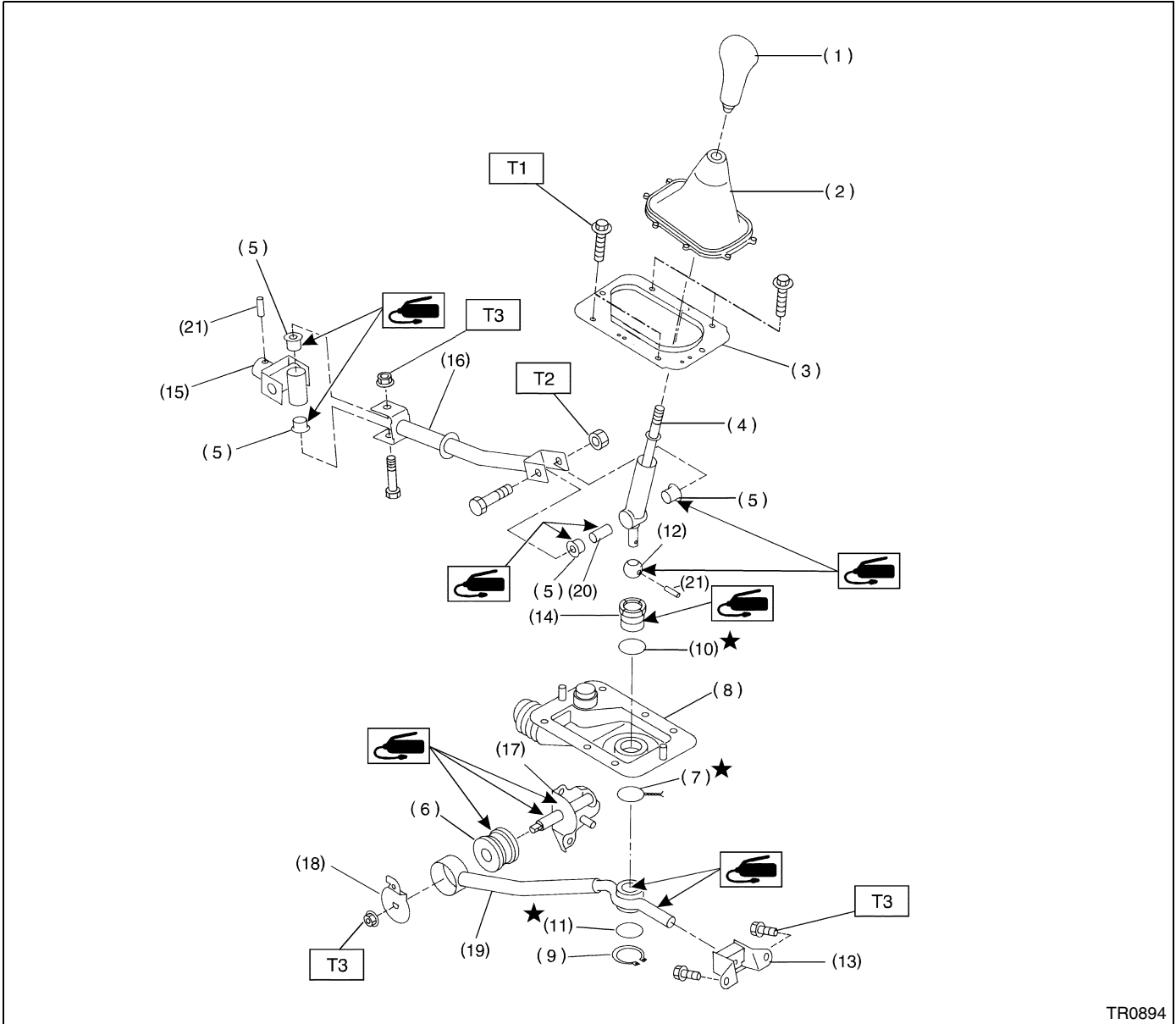
T3: 18 (1.8, 13.0)

T4: 33 (3.4, 25)

GENERAL DESCRIPTION

CONTROL SYSTEMS

2. MT GEAR SHIFT LEVER



TR0894

- (1) Gear shift knob
- (2) Console boot
- (3) Plate COMPL
- (4) Lever
- (5) Bush
- (6) Bush
- (7) Lock wire
- (8) Boot
- (9) Snap ring

- (10) O-ring
- (11) O-ring
- (12) Bush A
- (13) Cushion rubber
- (14) Bush B
- (15) Joint
- (16) Rod
- (17) Bracket
- (18) Washer

- (19) Stay
- (20) Spacer
- (21) Spring pin

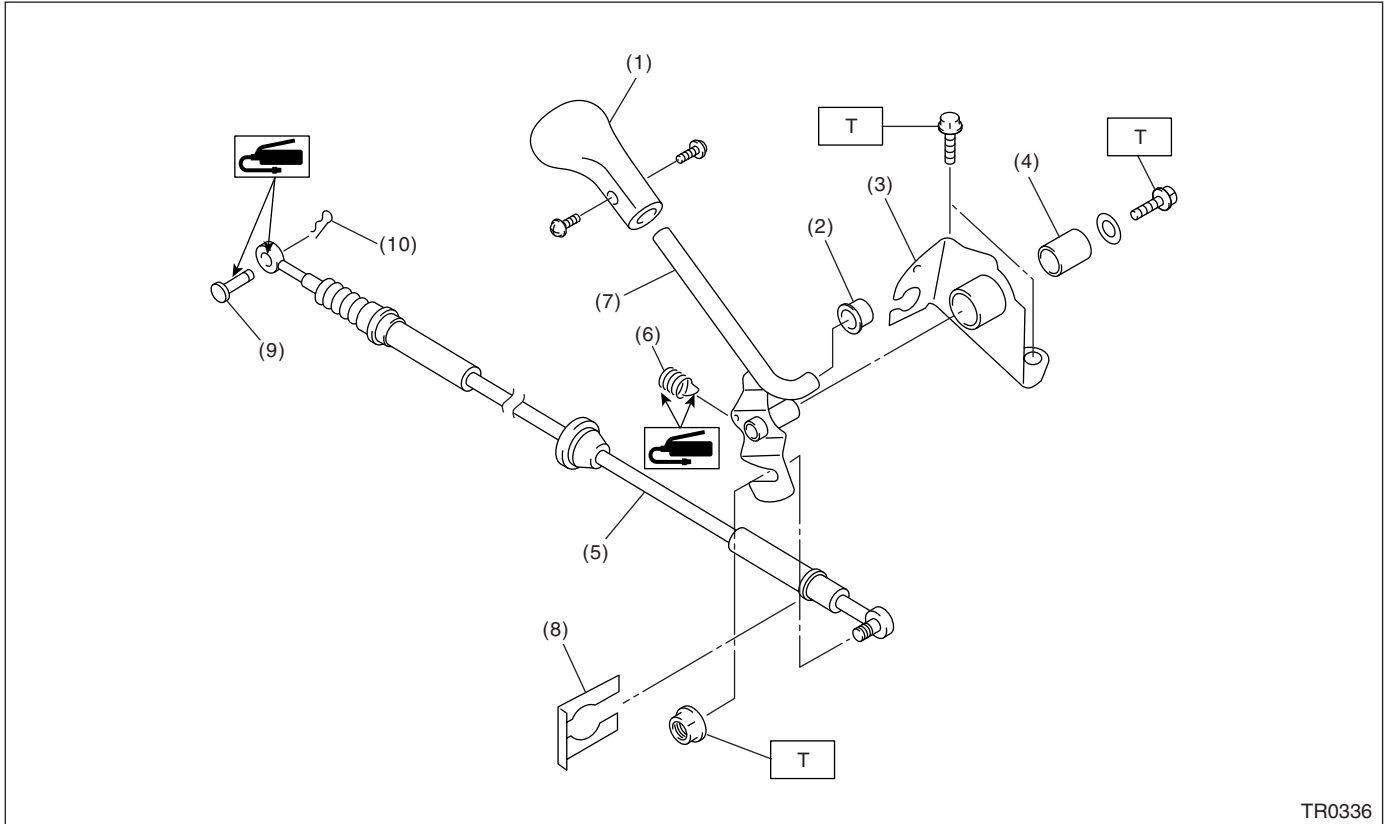
Tightening torque: N·m (kgf·m, ft·lb)

T1: 7.5 (0.76, 5.5)

T2: 12 (1.2, 8.7)

T3: 18 (1.8, 13.0)

3. DRIVE SELECT LEVER



- | | |
|-----------------|-----------------|
| (1) Knob | (6) Spring |
| (2) Cushion | (7) Lever COMPL |
| (3) Plate COMPL | (8) Clip |
| (4) Bush | (9) Clevis pin |
| (5) Cable | (10) Snap pin |

Tightening torque: N·m (kgf·m, ft·lb)
T: 18 (1.8, 13.0)

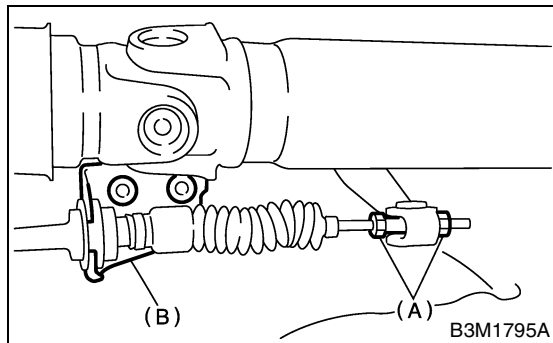
C: CAUTION

- 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 vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.
- Before disconnecting electrical connectors, be sure to disconnect the ground cable from battery.

2. Select Lever

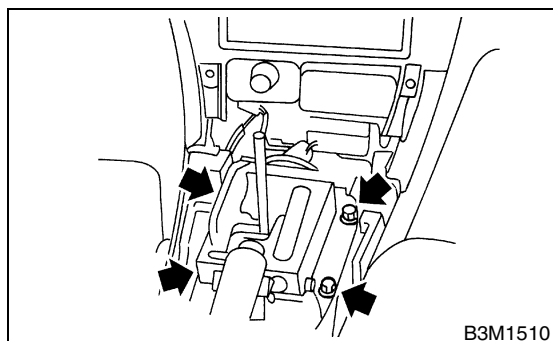
A: REMOVAL

- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from battery.
- 3) Move the select lever to "N" position.
- 4) Lift-up the vehicle.
- 5) Remove the rear exhaust pipe and muffler.
Non-turbo model with OBD
<Ref. to EX-11, REMOVAL, Rear Exhaust Pipe.>, <Ref. to EX-12, REMOVAL, Muffler.>
Non-turbo model without OBD
<Ref. to EX(w/oOBD)-13, REMOVAL, Rear Exhaust Pipe.>, <Ref. to EX(w/oOBD)-14, REMOVAL, Muffler.>
Turbo model
<Ref. to EX(TURBO)-13, REMOVAL, Rear Exhaust Pipe.>, <Ref. to EX(TURBO)-14, REMOVAL, Muffler.>
- 6) Remove the heat shield cover. (If equipped)
- 7) Disconnect the cable from select lever, and then remove the cable bracket.



- (A) Adjusting nuts
- (B) Cable bracket

- 8) Lower the vehicle.
- 9) Remove the console box. <Ref. to EI-40, REMOVAL, Console Box.>
- 10) Disconnect the connectors, then remove the four bolts to take out the select lever assembly from body.

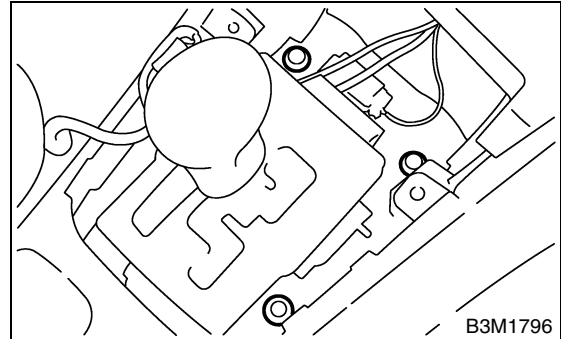


B: INSTALLATION

- 1) Mount the select lever onto the vehicle body.
- 2) Tighten the four bolts to install the select lever to vehicle body, then connect the connector.

Tightening torque:

13 N·m (1.3 kgf-m, 9.4 ft-lb)



- 3) Install the console box. <Ref. to EI-38, INSTALLATION, Glove Box.>
- 4) Set the location of select lever at "N" position.
- 5) Lift-up the vehicle.
- 6) Set the location of range select lever to "N" position.
- 7) Insert the thread portion of the other inner cable and into connector hole of the select lever, and fix the other outer cable end to bracket.

Tightening torque:

18 N·m (1.8kgf-m, 13.0 ft-lb)

- 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 the heat shield cover. (If equipped)

SELECT LEVER

CONTROL SYSTEMS

12) Install the rear exhaust pipe and muffler.

Non-turbo model with OBD

<Ref. to EX-11, INSTALLATION, Rear Exhaust Pipe.>, <Ref. to EX-12, INSTALLATION, Muffler.>

Non-turbo model without OBD

<Ref. to EX(w/oOBD)-13, INSTALLATION, Rear Exhaust Pipe.>, <Ref. to EX(w/oOBD)-14, INSTALLATION, Muffler.>

Turbo model

<Ref. to EX(TURBO)-13, INSTALLATION, Rear Exhaust Pipe.>, <Ref. to EX(TURBO)-14, INSTALLATION, Muffler.>

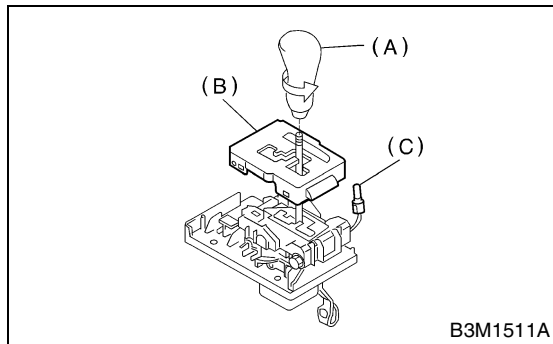
C: DISASSEMBLY

1) Remove the grip.

2) Remove the indicator light, and then remove the indicator cover.

NOTE:

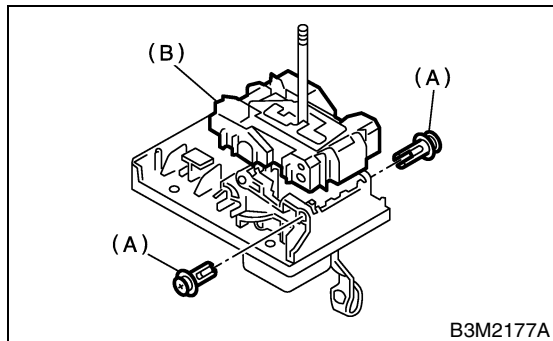
Be careful not to break the indicator light during removal.



- (A) Grip
- (B) Indicator cover
- (C) Indicator light

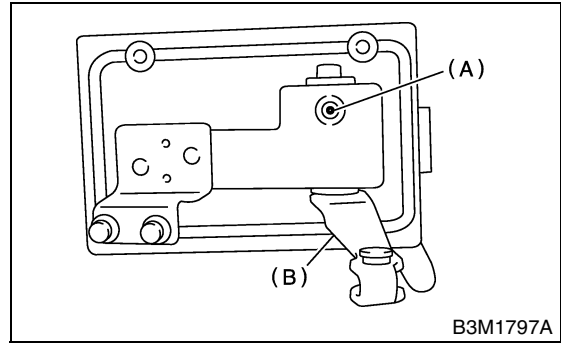
3) Remove the blind.

4) Remove the clips, and then remove the guide plate.



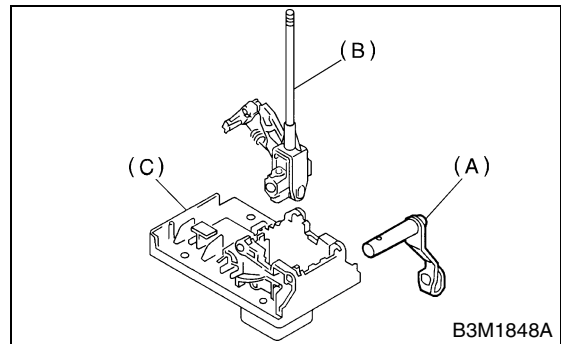
- (A) Clips
- (B) Guide plate

5) Remove the cap, and then extract the spring pin.



- (A) Spring pin
- (B) Arm COMPL

6) Remove the select lever lower, and then take away the 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 the select lever to range "P" — "1", then check whether the indicator and select lever agree, whether the pointer and position mark agree and what the operating force is.

E: INSPECTION

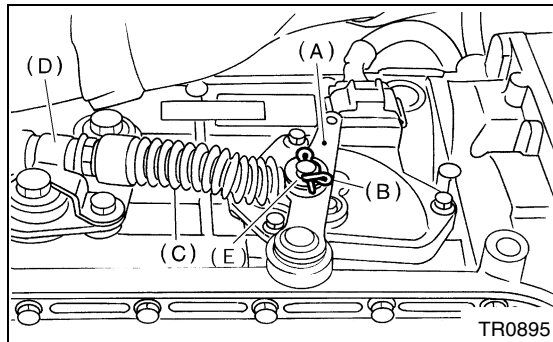
1) Inspect the removed parts by comparing with new ones for deformation, damage and wear. Correct or replace if defective.

2) Confirm the following parts for operating condition before assembly. Moving condition of the selector lever upper, it should move smoothly.

3. Select Cable

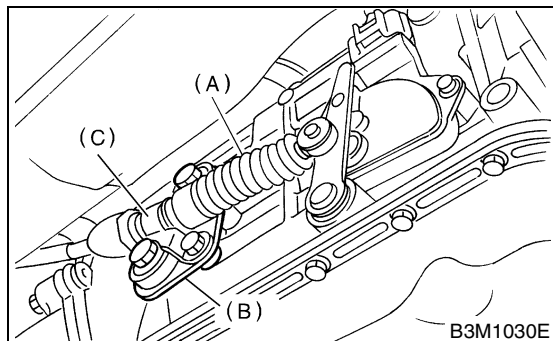
A: REMOVAL

- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from battery.
- 3) Prior to removal, set the lever to "N" position.
- 4) Lift-up the vehicle.
- 5) Remove the front and center exhaust pipe.
Non-turbo model with OBD
<Ref. to EX-7, REMOVAL, Front Exhaust Pipe.>
Non-turbo model without OBD
<Ref. to EX(w/oOBD)-9, REMOVAL, Front Exhaust Pipe.>
Turbo model
<Ref. to EX(w/oOBD)-12, REMOVAL, Center Exhaust Pipe.>
- 6) Remove the heat shield cover. (If equipped)
- 7) Remove the snap pin from range select lever.



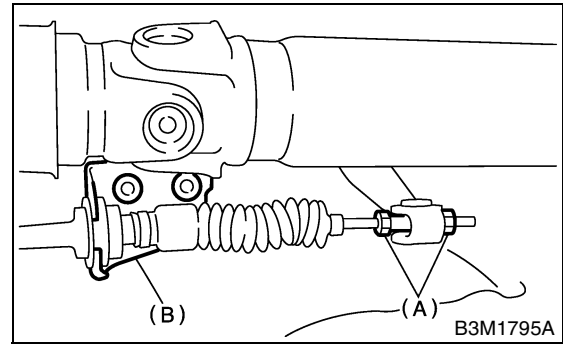
- (A) Range select lever
- (B) Snap pin
- (C) Select cable
- (D) Clamp
- (E) Washer

- 8) Remove the plate assembly from transmission case.



- (A) Select cable
- (B) Plate ASSY
- (C) Clamp

- 9) Disconnect the cable from select lever, and then remove the cable bracket.



- (A) Adjusting nuts
- (B) Cable bracket

- 10) Remove the select cable from plate assembly.

B: INSTALLATION

- 1) Install the select cable to plate assembly.

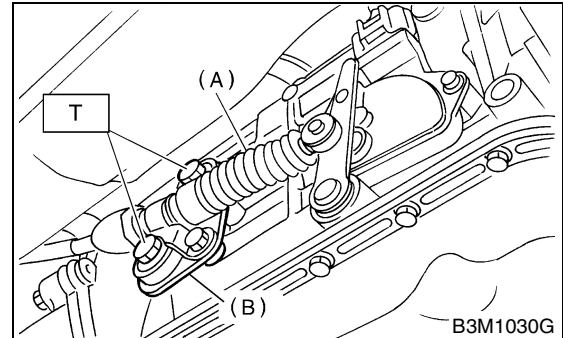
Tightening torque:

32 N·m (3.3 kgf-m, 24 ft-lb)

- 2) Install the select cable to range select lever.
- 3) Install the plate assembly to transmission.

Tightening torque:

T: 24.5 N·m (2.5 kgf-m, 18.1 ft-lb)

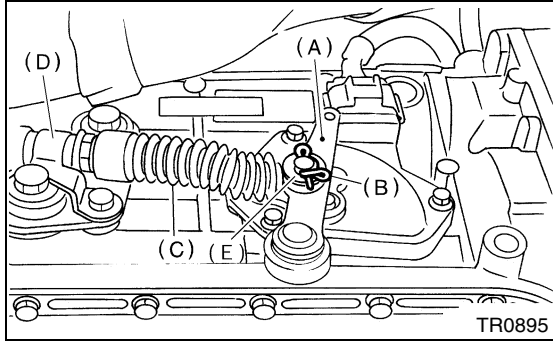


- (A) Select cable
- (B) Plate ASSY

SELECT CABLE

CONTROL SYSTEMS

4) Install the snap pin to range select lever.



- (A) Range select lever
- (B) Snap pin
- (C) Select cable
- (D) Clamp
- (E) Washer

5) Move the select lever to “N” position, then adjust the select cable position. <Ref. to CS-10, ADJUSTMENT, Select Cable.>

6) Install the heat shield cover. (If equipped)

7) Install the front and center exhaust pipe.

Non-turbo model with OBD

<Ref. to EX-8, INSTALLATION, Front Exhaust Pipe.>

Non-turbo model without OBD

<Ref. to EX(w/oOBD)-10, INSTALLATION, Front Exhaust Pipe.>

Turbo model

<Ref. to EX(TURBO)-9, INSTALLATION, Center Exhaust Pipe.>

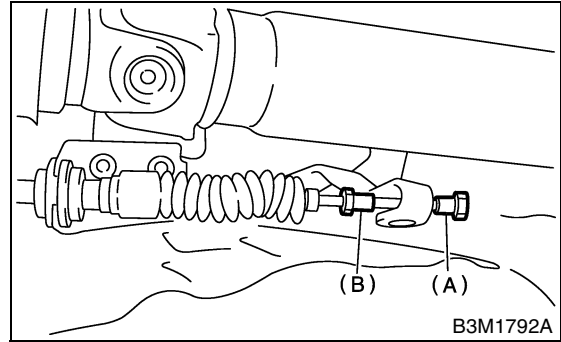
C: INSPECTION

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 the 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.

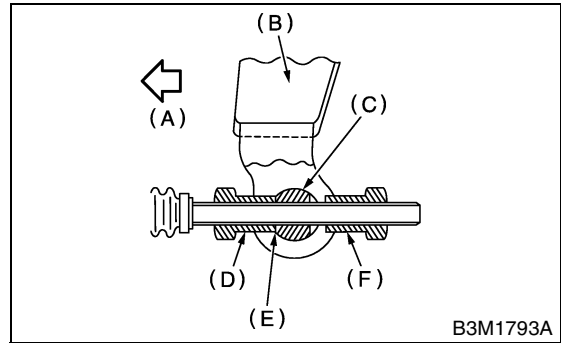
D: ADJUSTMENT

- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from battery.
- 3) Set the lever to “N” position.
- 4) Lift-up the vehicle.
- 5) Remove the rear exhaust pipe and muffler.
- 6) Remove the heat shield cover. (If equipped)
- 7) Loosen the adjusting nut on each side.



- (A) Adjusting nut A
- (B) Adjusting nut B

8) Turn the adjusting nut B until it lightly touches the connector.

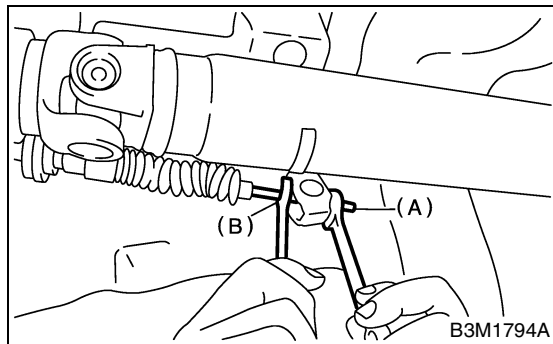


- (A) Front side
- (B) Select lever
- (C) Connector
- (D) Adjusting nut B
- (E) Contact point
- (F) Adjusting nut A

9) While preventing the adjusting nut B from moving with a wrench, tighten the 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

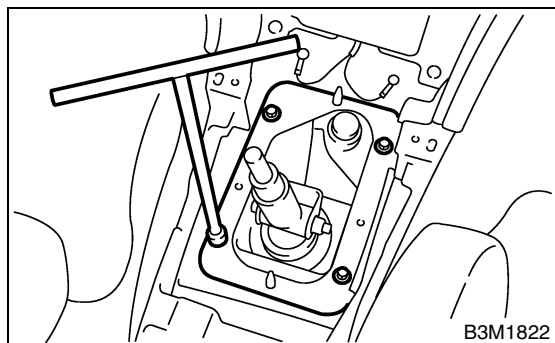
10) After completion of fitting, make sure that the select lever operates smoothly all across the operating range.

11) Install in the reverse order of removal.

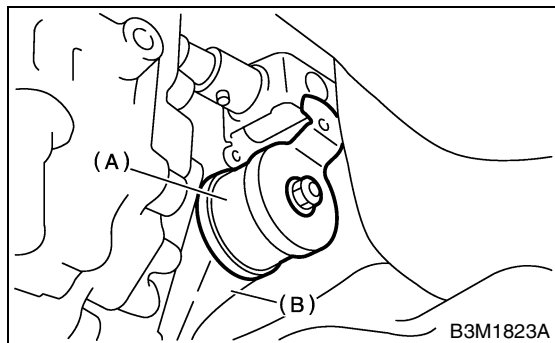
4. MT Gear Shift Lever

A: REMOVAL

- 1) Set the vehicle on a lift.
- 2) Remove the gear shift knob.
- 3) Disconnect the ground cable from battery.
- 4) Remove the console box. <Ref. to EI-40, REMOVAL, Console Box.>
- 5) Remove the boot plate from body.

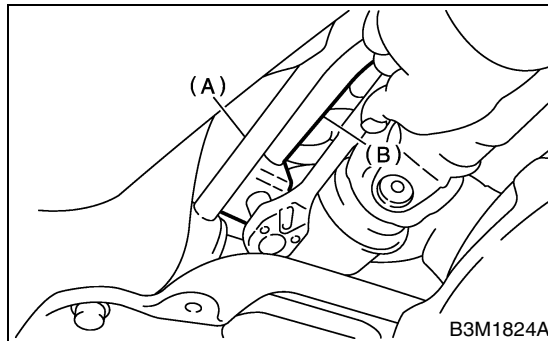


- 6) Lift-up the vehicle.
- 7) Remove the rear exhaust pipe and muffler.
Non-turbo model with OBD
<Ref. to EX-11, REMOVAL, Rear Exhaust Pipe.>, <Ref. to EX-12, REMOVAL, Muffler.>
Non-turbo model without OBD
<Ref. to EX(w/oOBD)-13, REMOVAL, Rear Exhaust Pipe.>, <Ref. to EX(w/oOBD)-14, REMOVAL, Muffler.>
Turbo model
<Ref. to EX(TURBO)-13, REMOVAL, Rear Exhaust Pipe.>, <Ref. to EX(TURBO)-14, REMOVAL, Muffler.>
- 8) Remove the heat shield cover. (If equipped)
- 9) Remove the stay from transmission bracket.



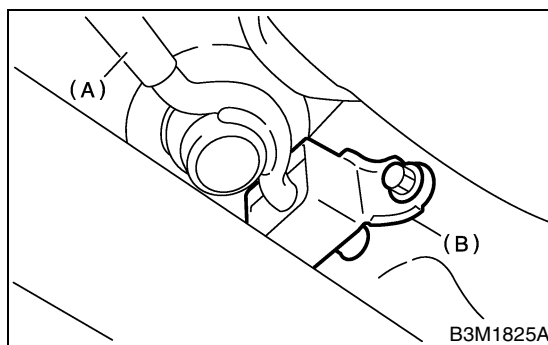
- (A) Stay
- (B) Transmission bracket

- 10) Remove the rod from joint.



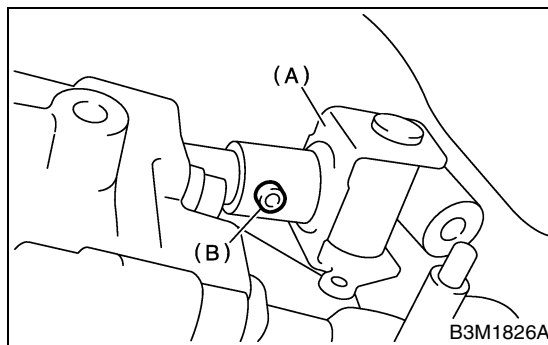
- (A) Stay
- (B) Rod

- 11) Remove the cushion rubber from body.



- (A) Stay
- (B) Cushion rubber

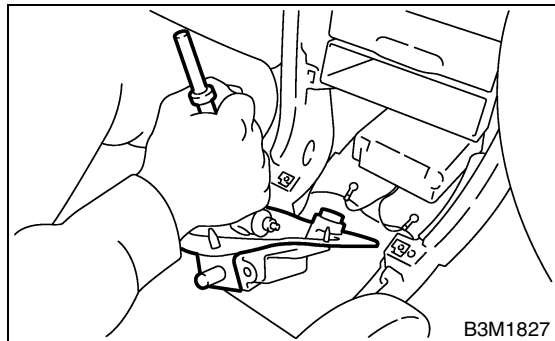
- 12) Remove the joint, and then extract the spring pin.



- (A) Joint
- (B) Spring pin

- 13) Lower the vehicle.

14) Remove the gear shift lever.



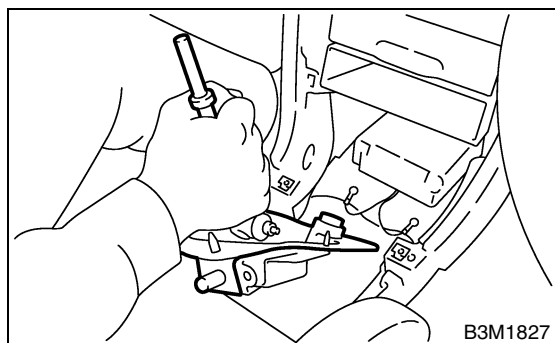
B: INSTALLATION

1) Install the joint to transmission and secure with the spring pin.

2) Insert the gear shift lever from room side.

NOTE:

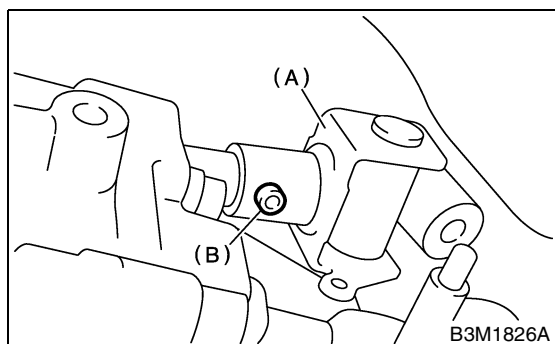
After inserting the rod and stay, temporarily put them onto transmission mount.



3) Lift-up the vehicle.

4) Install the joint to shifter arm.

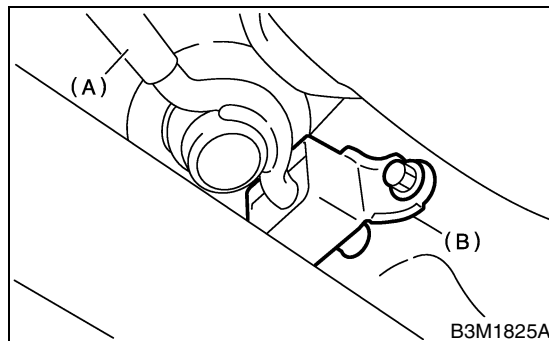
5) Insert the straight pin.



6) Mount the cushion rubber on the body.

Tightening torque:

18 N·m (1.8 kgf-m, 13.0 ft-lb)



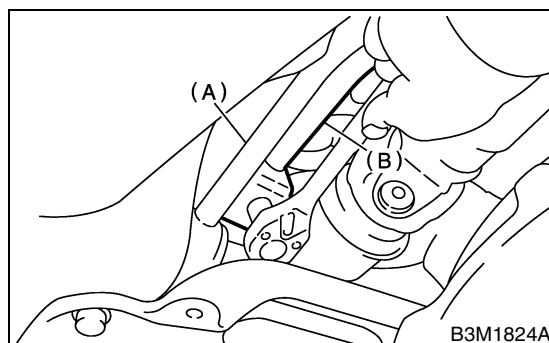
(A) Stay

(B) Cushion rubber

7) Connect the rod to the joint.

Tightening torque:

18 N·m (1.8 kgf-m, 13.0 ft-lb)



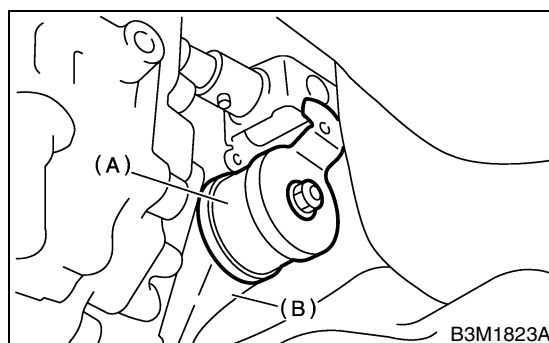
(A) Stay

(B) Rod

8) Connect the stay to transmission bracket.

Tightening torque:

18 N·m (1.8 kgf-m, 13.0 ft-lb)



(A) Stay

(B) Transmission bracket

9) Install the heat shield cover. (If equipped)

MT GEAR SHIFT LEVER

CONTROL SYSTEMS

10) Install the rear exhaust pipe and muffler.

Non-turbo model with OBD

<Ref. to EX-11, INSTALLATION, Rear Exhaust Pipe.>, <Ref. to EX-12, INSTALLATION, Muffler.>

Non-turbo model without OBD

<Ref. to EX(w/oOBD)-13, INSTALLATION, Rear Exhaust Pipe.>, <Ref. to EX(w/oOBD)-14, INSTALLATION, Muffler.>

Turbo model

<Ref. to EX(TURBO)-13, INSTALLATION, Rear Exhaust Pipe.>, <Ref. to EX(TURBO)-14, INSTALLATION, Muffler.>

11) Lower the vehicle.

12) Install the boot plate to body.

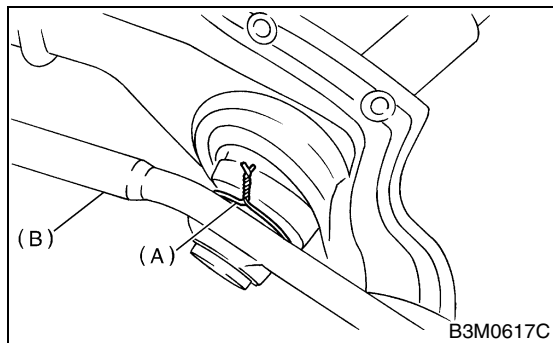
Tightening torque:

7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

13) Install the console box. <Ref. to EI-40, INSTALLATION, Console Box.>

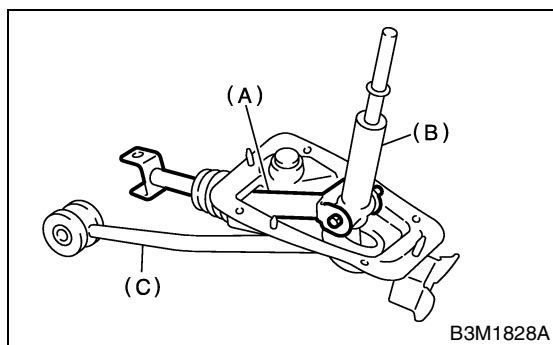
C: DISASSEMBLY

1) Disassemble the lock wire.



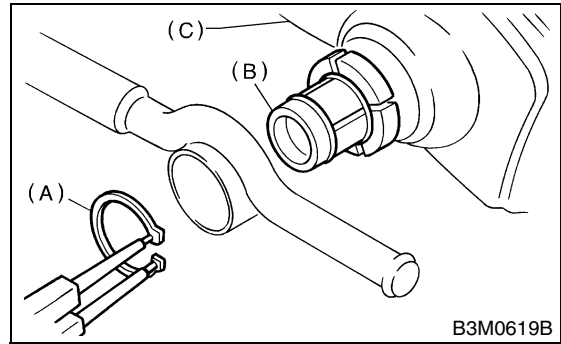
- (A) Lock wire
- (B) Stay

2) Remove the rod from lever.



- (A) Rod
- (B) Lever
- (C) Stay

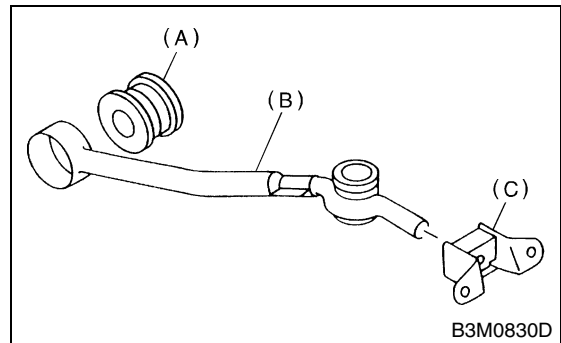
3) Remove the snap ring from bush B, then disconnect the stay.



- (A) Snap ring
- (B) Bush B
- (C) Boot

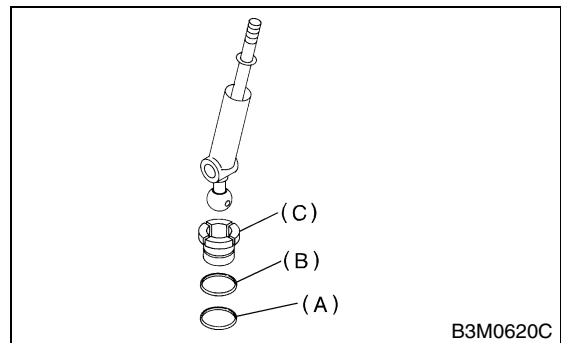
4) Remove the boot from gear shift lever.

5) Remove the bush and cushion rubber from stay.



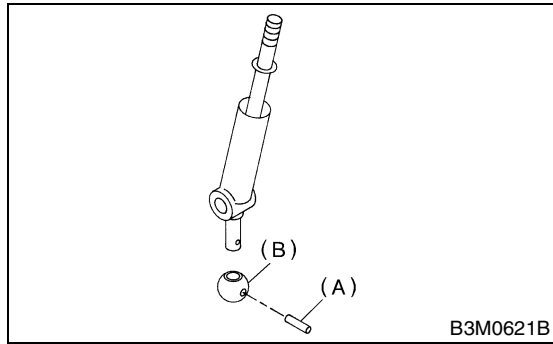
- (A) Bush
- (B) Stay
- (C) Cushion rubber

6) Remove the O-ring, then disconnect the bush B.



- (A) O-ring
- (B) O-ring
- (C) Bush B

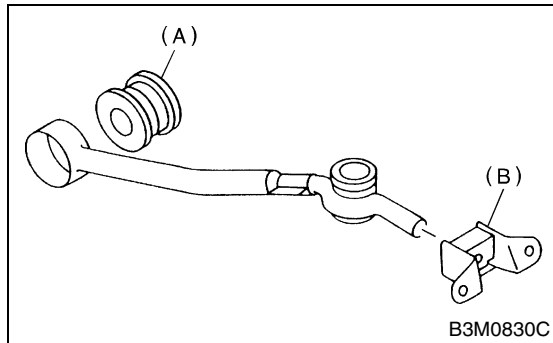
7) Draw out the spring pin, then remove the bush A from gear shift lever.



- (A) Spring pin
- (B) Bush A

D: ASSEMBLY

- 1) Clean all parts before assembly.
- 2) Mount the bush and cushion rubber on the stay.

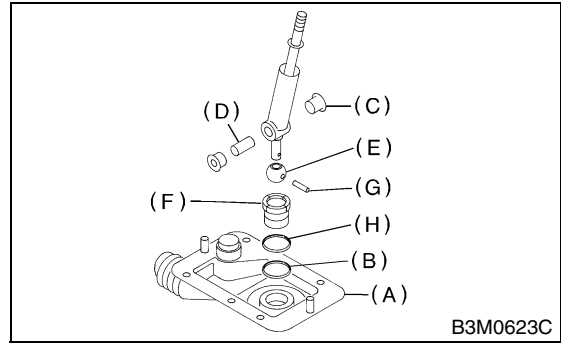


- (A) Bush
- (B) Cushion rubber

3) Mount each part; boot, O-ring, bush A, spacer, bush B, bush and spring pin on the gear shift lever.

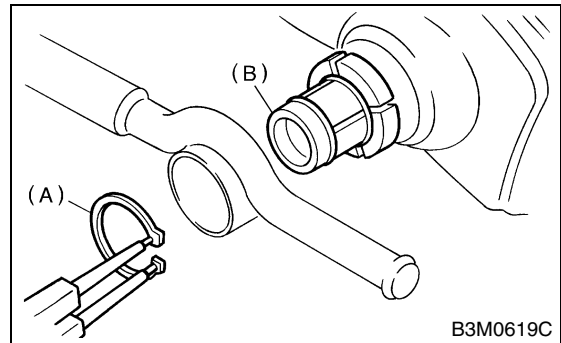
NOTE:

- Always use new O-rings.
- Apply grease [DNIGHTIGHT LYW No. 2 or equivalent] to the inner and side surfaces of the bush when installing the spacer.



- (A) Boot
- (B) O-ring
- (C) Bush
- (D) Spacer
- (E) Bush A
- (F) Bush B
- (G) Spring pin
- (H) O-ring

- 4) Insert the gear shift lever into boot hole.
- 5) Install the snap ring and stay to bush B.



- (A) Snap ring
- (B) Bush B

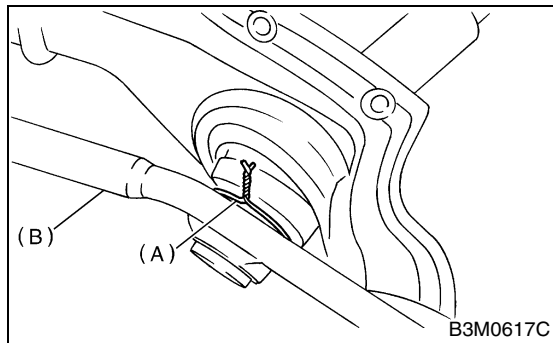
MT GEAR SHIFT LEVER

CONTROL SYSTEMS

6) Tighten with lock wire to the extent that the boot will not come off.

NOTE:

Always use a new lock wire.



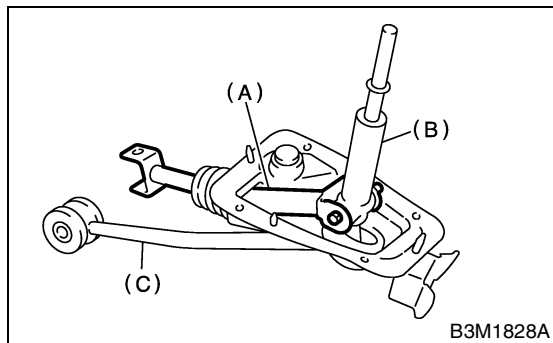
- (A) Lock wire
- (B) Stay

7) Insert the rod into boot hole.

8) Connect the rod to gear shift lever.

Tightening torque:

11.8 N·m (1.2 kgf-m, 8.7 ft-lb)



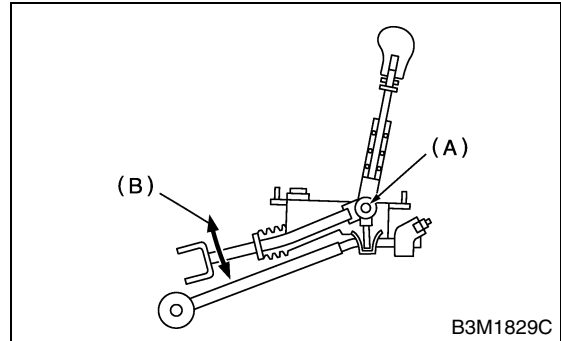
- (A) Rod
- (B) Lever
- (C) Stay

9) Check the swing torque of the rod in relation to gear shift lever.

If the torque exceeds specification, replace the bush or retighten nuts.

Rocking torque:

0.7 N·m (0.07 kgf-m, 0.5 ft-lb) or less

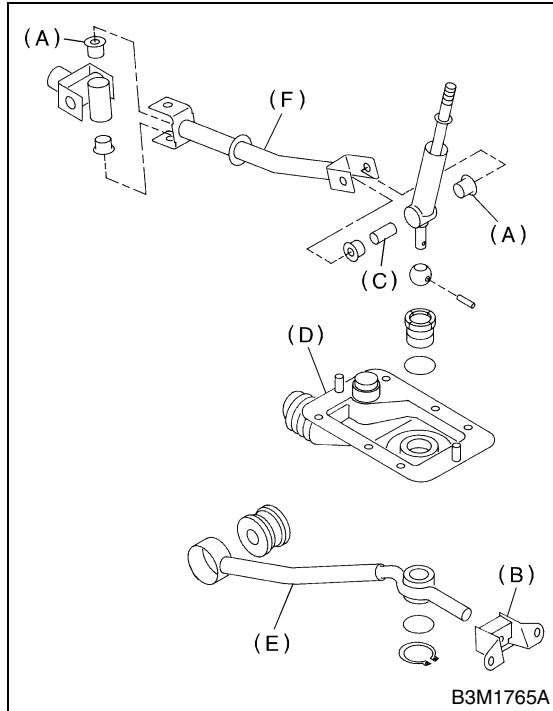


- (A) Center of rotation
- (B) Swing torque

10) Check that there is no excessive play and that parts move smoothly.

E: INSPECTION

1) Check each part (bush, 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.



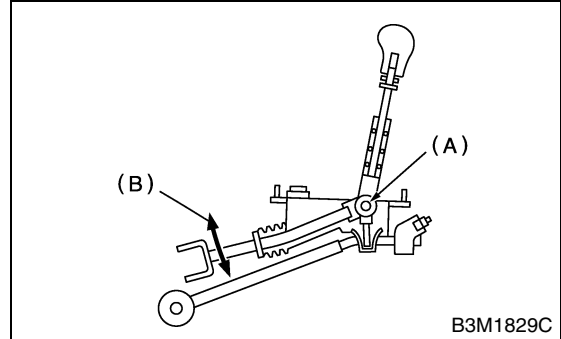
- (A) Bush
- (B) Cushion rubber
- (C) Spacer
- (D) Boot
- (E) Stay
- (F) Rod

2) Check the swing torque of the rod in relation of gear shift lever.

If the torque exceeds specification, replace the bush 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

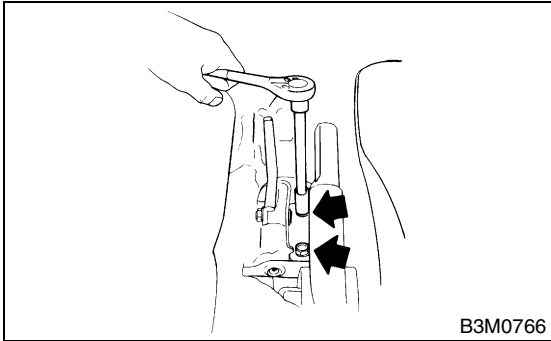
MT DRIVE SELECT LEVER

CONTROL SYSTEMS

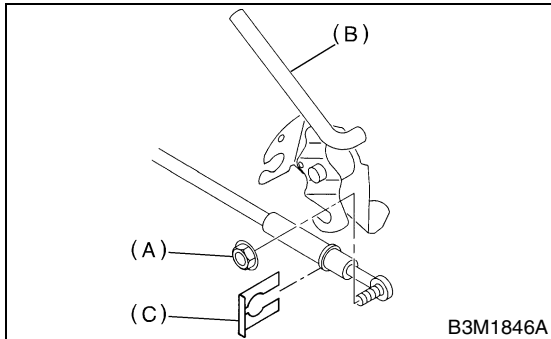
5. MT Drive Select Lever

A: REMOVAL

- 1) Apply parking brake and place chocks to hold the wheels.
- 2) Disconnect the ground cable from battery.
- 3) Set the drive select lever to HI position.
- 4) Remove the knob.
- 5) Remove the console box. <Ref. to EI-40, Console Box.>
- 6) Remove the bolt installing drive select lever assembly on body.



- 7) Remove the flange nut, clip and then disconnect the cable from lever assembly.



- (A) Flange nut
- (B) Lever COMPL
- (C) Clip

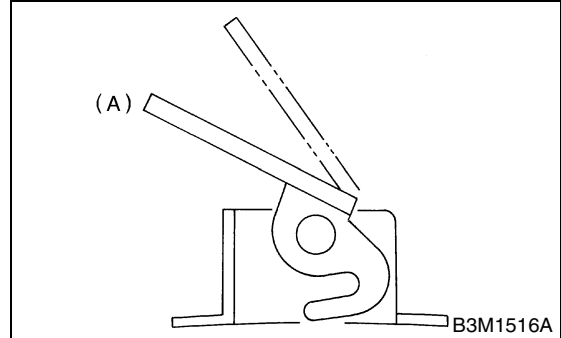
B: INSTALLATION

- 1) Install the drive select lever.

Tightening torque:

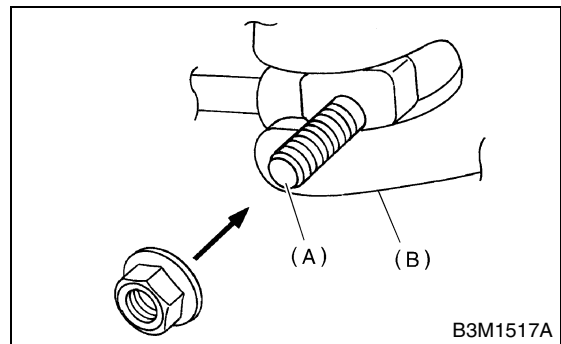
18 N·m (1.8 kgf-m, 13.0 ft-lb)

- 2) Set the drive select lever to HI position.



- (A) HI position

- 3) Be sure to insert the cable eye end bolt into lever arm slit.



- (A) Cable eye end bolt
- (B) Lever arm

- 4) Tighten the nut where cable end bolt comes to a stop.

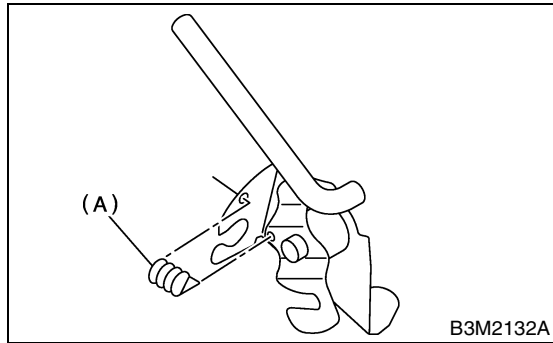
Tightening torque:

18 N·m (1.8 kgf-m, 13.0 ft-lb)

- 5) Install in the reverse order of removal.

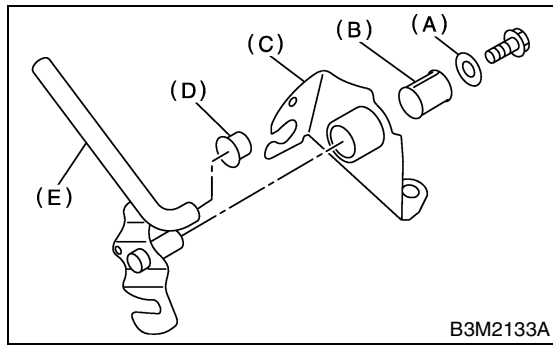
C: DISASSEMBLY

1) Remove the spring.



(A) Spring

2) Remove the lever, cushion and bush.



- (A) Washer
- (B) Bush
- (C) Plate COMPL
- (D) Cushion
- (E) Lever COMPL

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.

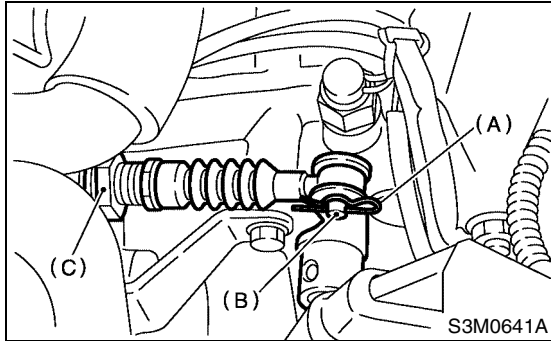
DRIVE SELECT CABLE

CONTROL SYSTEMS

6. Drive Select Cable

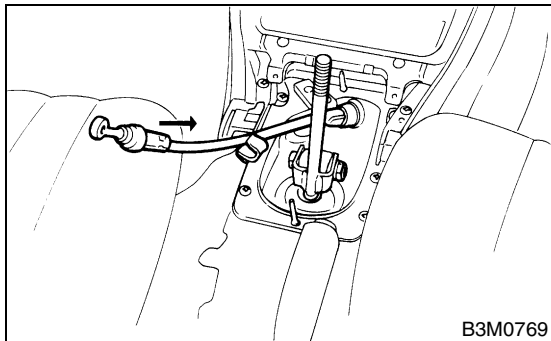
A: REMOVAL

- 1) Remove the drive select lever. <Ref. to CS-18, REMOVAL, MT Drive Select Lever.>
- 2) Remove the intake duct. <Ref. to IN-7, Air Intake Duct.>
- 3) Remove the air cleaner case. <Ref. to IN-6, Air Cleaner Case.>
- 4) Remove the snap ring and clevis pin.
- 5) Loosen the nut and disconnect the cable from cable bracket.



- (A) Snap pin
- (B) Clevis pin
- (C) Nut

- 6) Remove the 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 the transmission to HI or LO position by moving the drive select lever. If it doesn't, adjust the cable.<Ref. to CS-20, ADJUSTMENT, Drive Select Cable.>
- 2) Make sure the cable operates smoothly. If it catches or fails to work properly, repair or replace it.
- 3) Check the cable for damage.

D: ADJUSTMENT

- 1) Set the drive select lever to HI position.
- 2) Remove the drive select lever knob.
- 3) Remove the console box. <Ref. to EI-40, Console Box.>
- 4) Loosen the nut.
- 5) Make sure the transmission is in HI position. If isn't, pull on the cable to put transmission in HI position.
- 6) Tighten the nut in the location where cable end bolt stops naturally.

Tightening torque:

18 N·m (1.8 kgf-m, 13.0 ft-lb)

- 7) Make sure to move the transmission to HI or LO position by moving the drive select lever. If it doesn't, readjust the cable.

7. General Diagnostic**A: INSPECTION**

Symptom	Possible cause	Remedy
1. Select lever	(1) Starter does not run.	Adjust the select cable and inhibitor switch, or inspect circuit.
	(2) Back-up light does not light up.	Adjust the select cable and inhibitor switch, or inspect circuit.

GENERAL DIAGNOSTIC

CONTROL SYSTEMS

AUTOMATIC TRANSMISSION

AT

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GENERAL DESCRIPTION

AUTOMATIC TRANSMISSION

1. General Description

A: SPECIFICATIONS

1. TORQUE CONVERTER CLUTCH

Model	1.6 L	2.0 L Non-turbo	2.5 L	2.0 L Turbo
Type	Symmetric, 3 element, single stage, 2 phase torque converter			
Stall torque ratio	2.2 — 2.4	2.0 — 2.2	1.9 — 2.1	1.85 — 2.15
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	2,100 — 2,600 rpm	2,600 — 3,300 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

Model	1.6 L	2.0 L Non-turbo	2.5 L	2.0 L Turbo
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	5	
Drive & driven plate number of low clutch	4		6	7
Drive & driven plate number of reverse clutch	1	2		
Drive & driven plate number of 2-4 brake	2	3	4	
Drive & driven plate number of low & reverse brake	4		6	7

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 ← → 2nd ← → 3rd ← → 4th
3 (3rd)	Automatic gear change 1st ← → 2nd ← → 3rd ← 4th
2 (2nd)	Automatic gear change 1st ← → 2nd ← 3rd ← 4th
1 (1st)	1st gear locked (Deceleration possible 1st ← 2nd ← 3rd ← 4th)
Control method	Hydraulic remote control

7. HYDRAULIC CONTROL AND LUBRICATION

Type	Electronic/hydraulic control [Four forward speed changes by electrical signals of vehicle speed and accelerator (throttle) opening]	
Fluid	Dexron III type Automatic transmission fluid	
Fluid capacity	1.6 L and 2.0 L Non-turbo model	8.4 — 8.7 ℓ (8.9 — 9.2 US qt, 7.4 — 7.7 Imp qt)
	2.5 L and 2.0 L Turbo model	9.3 — 9.6 ℓ (9.8 — 10.1 US qt, 8.2 — 8.4 Imp qt)
Lubrication system	Forced feed lubrication with oil pump	
Oil	Automatic transmission fluid (above mentioned)	

10.FINAL REDUCTION

Model	EXCEPT 1.6 L	1.6 L																		
Front final gear ratio	4.111 (37/9)	4.444 (40/9)																		
Lubrication oil	<p>ITEM</p> <ul style="list-style-type: none"> • Front differential gear oil <p>API Classification GL - 5</p> <p>SAE Viscosity No. and Applicable Temperature</p> <table border="1"> <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> <p>H3M1235A</p>		(°C)	-30	-26	-15	-5	0	15	25	30	(°F)	-22	-15	5	23	32	59	77	86
(°C)	-30	-26	-15	-5	0	15	25	30												
(°F)	-22	-15	5	23	32	59	77	86												
Front differential oil capacity	1.1 — 1.3 ℓ (1.2 — 1.4 US qt, 1.0 — 1.1 Imp qt)																			

8. COOLING AND HARNESS

Cooling system	Liquid-cooled cooler incorporated in radiator
Inhibitor switch	12 poles
Transmission harness	20 poles

9. TRANSFER

Model	1.6 L and 2.0 L Non-turbo	2.5 L	2.0 L Turbo
Transfer type	Multi-plate transfer (MPT)		Variable torque distribution (VTD)
Drive & driven plate number of transfer clutch	4	5	3
Control method	Electronic, hydraulic type		
Lubricant	The same Automatic transmission fluid used in automatic transmission		
1st reduction gear ratio	1.000 (53/53)		

GENERAL DESCRIPTION

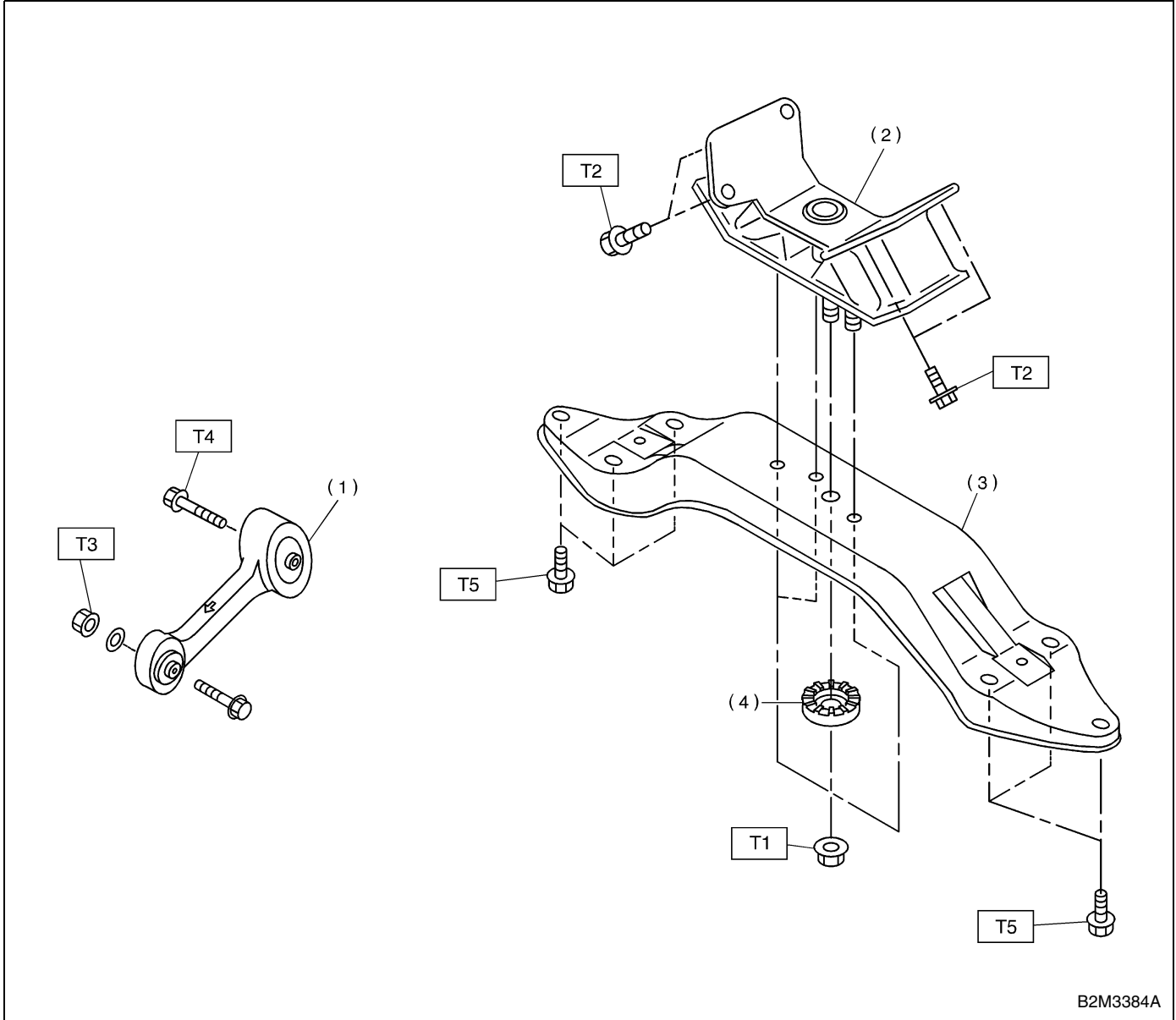
AUTOMATIC TRANSMISSION

B: COMPONENT

NOTE:

For information about other transmission mounting components, refer to "AUTOMATIC TRANSMISSION" <Pub. No. G0864ZE> a separate publication.

1. TRANSMISSION MOUNTING



- (1) Pitching stopper
- (2) Rear cushion rubber
- (3) Transmission rear crossmember
- (4) Stopper

Tightening torque: N-m (kgf-m, ft-lb)

T1: 35 (3.6, 26)

T2: 39 (4.0, 29)

T3: 50 (5.1, 37)

T4: 58 (5.9, 43)

T5: 70 (7.1, 51)

GENERAL DESCRIPTION

AUTOMATIC TRANSMISSION

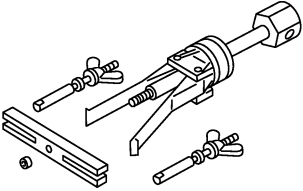
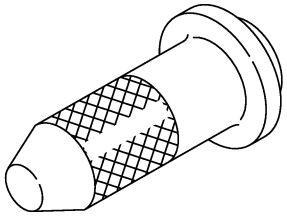
C: CAUTION

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation, and disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Until the oil pan is removed, do not place with the oil pan side facing up to prevent foreign matter from entering the valve body.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- When disassembling the case and other light alloy parts, use a plastic hammer to force it apart. Do not pry it apart with a screwdriver or other tool.
- Be careful not to burn your hands, because each part on the vehicle is hot after running.

- Use SUBARU genuine gear oil, grease etc. or the equivalent. Do not mix gear oil, grease etc. with that of another grade or from other manufacturers.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Apply gear oil onto sliding or revolution surfaces before installation.
- Replace deformed or otherwise damaged snap rings with new ones.
- Before installing O-rings or oil seals, apply sufficient amount of ATF fluid to avoid damage and deformation.
- Be careful not to incorrectly install or fail to install O-rings, snap rings and other such parts.
- Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.
- Avoid damaging the mating surface of the case.
- Before applying sealant, completely remove the old seal.

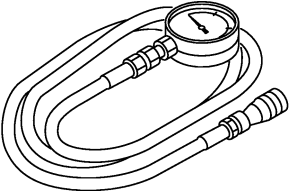
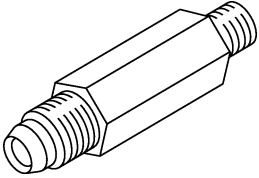
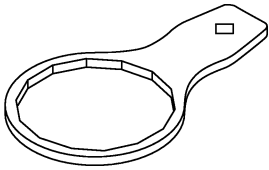
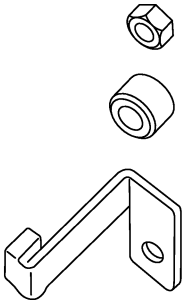
D: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p>B3M1977</p>	398527700	PULLER ASSY	Used for removing extension case oil seal.
 <p>B3M1972</p>	498057300	INSTALLER	Used for installing extension oil seal.

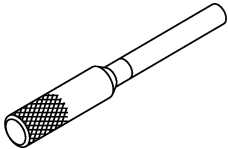
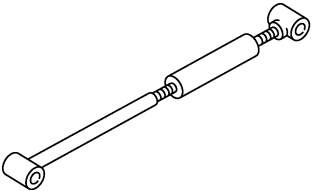
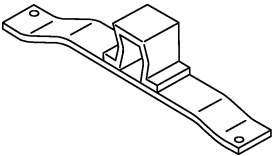
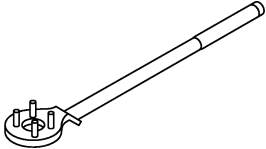
GENERAL DESCRIPTION

AUTOMATIC TRANSMISSION

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">B3M2040</p>	498575400	OIL PRESSURE GAUGE ASSY	Used for measuring oil pressure.
 <p style="text-align: center;">B3M2041</p>	498897200	ADAPTER	Used oil pump housing when measuring reverse clutch pressure and line pressure.
 <p style="text-align: center;">B3M2042</p>	498545400	FILTER WRENCH	Used for removing and installing ATF filter.
 <p style="text-align: center;">B3M2043</p>	498277200	STOPPER SET	Used for removing and installing automatic transmission assembly to engine.

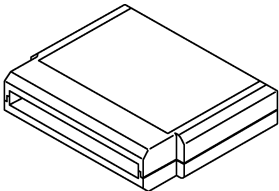

GENERAL DESCRIPTION

AUTOMATIC TRANSMISSION

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">B3M2008</p>	<p style="text-align: center;">499267300</p>	<p style="text-align: center;">STOPPER PIN</p>	<p>Used for installing and adjusting inhibitor switch.</p>
 <p style="text-align: center;">B3M1976</p>	<p style="text-align: center;">41099AA020</p>	<p style="text-align: center;">ENGINE SUPPORT</p>	<p>Used for supporting engine.</p>
 <p style="text-align: center;">B3M1975</p>	<p style="text-align: center;">41099AA010</p>	<p style="text-align: center;">ENGINE SUPPORT BRACKET</p>	<p>Used for supporting engine.</p>
 <p style="text-align: center;">B2M3870</p>	<p>Except 2.5 L model 499977300 2.5 L model 499977100</p>	<p style="text-align: center;">CRANK PULLEY WRENCH</p>	<p>Used for stopping rotating of crankshaft pulley when loosening and tightening crankshaft pulley bolts.</p>

GENERAL DESCRIPTION

AUTOMATIC TRANSMISSION

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: right;">B2M3876</p>	24082AA190 <Newly adopted tool>	CARTRIDGE	Troubleshooting for electrical systems.
 <p style="text-align: right;">B2M3877</p>	22771AA030	SELECT MONITOR KIT	Troubleshooting for electrical systems. <ul style="list-style-type: none"> • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

2. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance, voltage and ampere.

2. Automatic Transmission Fluid

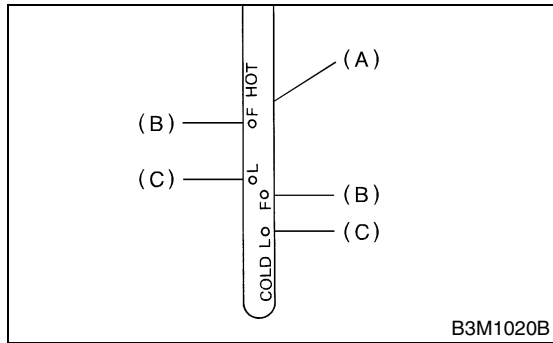
A: INSPECTION

1) Check the level of ATF.

(1) Raise the ATF temperature to 70 to 80°C (158 to 176°F) from 20 to 30°C (68 to 86°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 the 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 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.

NOTE:

- 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 overfilling of fluid.

- (4) Fluid temperature rising speed
 - By idling the engine
 - Time for temperature rise to 70°C (158°F) with atmospheric temperature of 0°C (32°F): More than 25 minutes
 - <Reference>
 - Time for temperature rise to 30°C (86°F) with atmospheric temperature of 0°C (32°F): Approx. 8 minutes
 - By running the vehicle
 - Time for temperature rise to 70°C (158°F) with atmospheric temperature of 0°C (32°F): More than 10 minutes

(5) Method for checking fluid level upon delivery or at periodic inspection
 Check fluid level after a warm-up run of approx. 10 minutes. During the warm-up period, the automatic transmission functions can also be checked.

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 the ATF completely.

CAUTION:

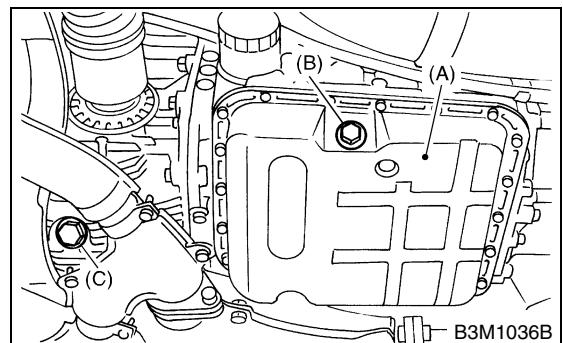
Directly after the engine has been running, the ATF is hot. Be careful not to burn yourself.

NOTE:

Tighten the ATF drain plug after draining the ATF.

Tightening torque:

25 N·m (2.5 kgf·m, 18.1 ft·lb)



- (A) Oil pan
- (B) Drain plug (ATF)
- (C) Differential oil drain plug

3) Lower the vehicle.

AUTOMATIC TRANSMISSION FLUID

AUTOMATIC TRANSMISSION

4) Pour ATF into the oil charge pipe.

Recommended fluid:

Dexron III type automatic transmission fluid

Capacity:

Fill the same amount of fluid drained from drain plug hole.

Capacity when transmission is overhauled:

1.6 L and 2.0 L Non-turbo models

8.4 — 8.7 ℓ (8.9 — 9.2 US qt, 7.4 — 7.7 Imp qt)

2.5 L and 2.0 L Turbo models

9.3 — 9.6 ℓ (9.8 — 10.1 US qt, 8.2 — 8.4 Imp qt)

5) Check the level and leaks of ATF.

<Ref. to AT-9, REPLACEMENT, Automatic Transmission Fluid.>

3. Differential Gear Oil

A: INSPECTION

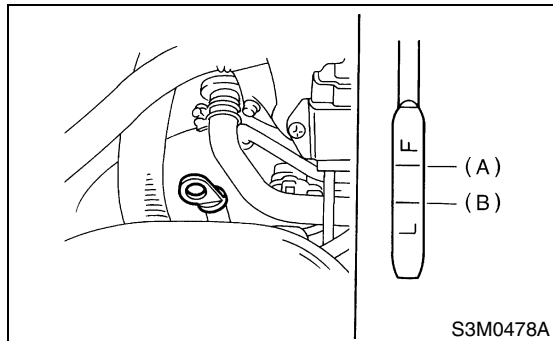
- 1) Park the vehicle on a level surface.
- 2) Remove the oil level gauge and wipe it clean.
- 3) Reinsert the level gauge all the way. Be sure that the level gauge is correctly inserted and in the proper orientation.
- 4) Remove it again and note the reading. If the differential gear oil level is below the "L" line, add oil to bring the level up to the "F" line.
- 5) To prevent overfilling the differential gear oil, do not add oil above the "F" line.

- 3) Lower the vehicle.
- 4) Pour gear oil into the gauge hole.

Recommended fluid:
Use GL-5 or equivalent.

Gear oil capacity:
1.1 — 1.3 ℓ (1.2 — 1.4 US qt, 1.0 — 1.1 Imp qt)

- 5) Check the level of 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 the differential gear oil completely.

CAUTION:

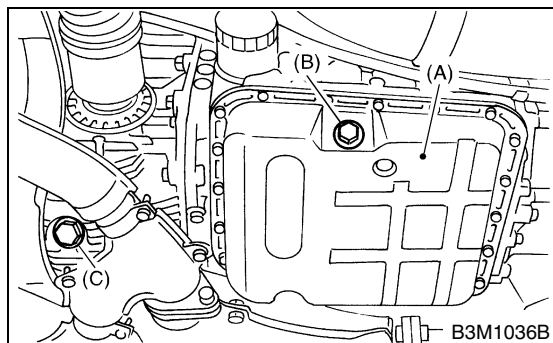
Directly after the engine has been running, the differential gear oil is hot. Be careful not to burn yourself.

NOTE:

Tighten the differential gear oil drain plug after draining the 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.

NOTE:

When performing the test, do not exceed posted speed limit.

2. D RANGE SHIFT FUNCTION

Check shifting between 1st ↔ 2nd ↔ 3rd ↔ 4th while driving on normal city streets.

3. D RANGE SHIFT SHOCK

Check the shock level when shifting up during normal driving.

4. KICK-DOWN FUNCTION

Check kick-down for each gear. Also check the kick-down shock level.

5. ENGINE BRAKE OPERATION

- Check the 3rd gear engine brake when shifting between D ↔ 3rd range while driving in 4th gear of D range [50 to 60 km/h (31 to 37 MPH)].
- Check the 2nd gear engine brake when shifting between 3 ↔ 2 range while driving in the 3 range 3rd gear [40 to 50 km/h (25 to 31 MPH)].
- Check the 1st gear engine brake when shifting between 2 ↔ 1 range while driving in the 2 range 2nd gear [20 to 30 km/h (12 to 19 MPH)].

6. LOCK-UP FUNCTION

Check that rpm does not change sharply when the accelerator pedal is lightly depressed when driving on flat roads at normal speed in the lock-up range.

7. P RANGE OPERATION

Stop the vehicle on an uphill grade of 5% or more and shift to "P" range. Check that the vehicle does not move when the parking brake is released.

8. UNUSUAL SOUNDS AND VIBRATION

Check for unusual sounds and vibration while driving and during shifting.

9. CLIMBING CONTROL FUNCTION

- Check that the gear remains in 3rd when going up a grade.
- Check that the gear remains in 3rd when applying the brakes while going down a grade.

10. 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:

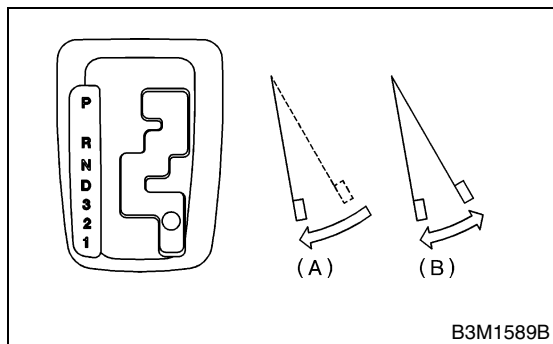
- (1) Check that throttle valve opens fully.
- (2) Check that engine oil level is correct.
- (3) Check that coolant level is correct.
- (4) Check that ATF level is correct.
- (5) Check that differential gear oil level is correct.
- (6) Increase ATF temperature to 50 to 80°C (122 to 176°F) by idling the engine for approx. 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 "N" range, and cool down the engine by idling it for more than one minute.
- 8) Record the stall speed.

9) If the 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 "R" range.

NOTE:

- Do not continue the stall test for MORE THAN 5 SECONDS at a time (from closed throttle, fully open throttle to stall speed reading). Failure to follow this instruction causes the engine oil and ATF to deteriorate and the clutch and brake to be adversely affected.

Be sure to cool down the engine for at least 1 minute after each stall test with the select lever set in the "P" or "N" range and with the idle speed lower than 1,200 rpm.

- If the stall speed is higher than the specified range, attempt to finish the stall test in as short a time as possible, in order to prevent the automatic transmission from sustaining damage.

Stall speed (at sea level):

1.6 L model: 2,200 — 2,700 rpm

2.0 L Non-turbo model: 2,000 — 2,500 rpm

2.0 L Turbo model: 2,600 — 3,300 rpm

2.5 L model: 2,100 — 2,600 rpm

STALL TEST

AUTOMATIC TRANSMISSION

3. EVALUATION

Stall speed (at sea level)	Position	Cause
Less than specifications	2, R	<ul style="list-style-type: none">• Throttle valve not fully open• Erroneous engine operation• Torque converter clutch's one-way clutch slipping
Greater than specifications	D	<ul style="list-style-type: none">• Line pressure too low• Low clutch slipping• One-way clutch malfunctioning
	R	<ul style="list-style-type: none">• Line pressure too low• Reverse clutch slipping• Low & reverse brake slipping
	2	<ul style="list-style-type: none">• Line pressure too low• Low clutch slipping• 2-4 brake slipping

6. Time Lag Test

A: INSPECTION

1. GENERAL INFORMATION

If the select lever is shifted while the engine is idling, there will be a certain time elapse or lag before the shock can be felt. This is used for checking the condition of the low clutch, reverse clutch, low & reverse brake and one-way clutch.

NOTE:

- Perform the test at normal operating fluid temperature 60 to 80°C (140 to 176°F).
- Be sure to allow a 1 minute interval between tests.
- Make three measurements and take the average value.

2. TEST METHODS

1) Fully apply the parking brake.

2) Start the engine.

Check the idling speed (A/C OFF).

3) Shift the select lever from "N" to "D" range.

Using a stop watch, measure the time it takes from shifting the lever until the shock is felt.

Time lag: Less than 1.2 seconds

4) In the same manner, measure the time lag for "N" → "R".

Time lag: Less than 1.5 seconds

3. EVALUATION

1) If "N" → "D" time lag is longer than specified:

- Line pressure too low
- Low clutch worn
- One-way clutch not operating properly

2) If "N" → "R" time lag is longer than specified:

- Line pressure too low
- Reverse clutch worn
- Low & reverse brake worn

LINE PRESSURE TEST

AUTOMATIC TRANSMISSION

7. Line Pressure Test

A: MEASUREMENT

1. GENERAL INFORMATION

If the clutch or the brake shows a sign of slippage or shifting sensation is not correct, the line pressure should be checked.

- Excessive shocks during upshifting or shifting takes place at a higher point than under normal circumstances, may be due to the line pressure being too high.
- Slippage or inability to operate the vehicle may, in most cases, be due to loss of oil pressure for the operation of the clutch, brake or control valve.

1) Line pressure measurement (under no load)

NOTE:

- Before measuring the line pressure, jack-up all wheels.
- Maintain the temperature of ATF at approx. 50°C (122°F) during measurement. (ATF will reach the above temperature after idling the engine for approx. 30 minutes with select lever in "N" or "P".)

2) Line pressure measurement (under heavy load)

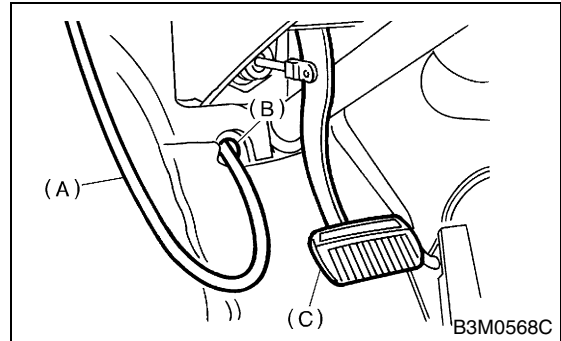
NOTE:

- Before measuring the line pressure, apply both foot and parking brakes with all wheels chocked (Same as for "stall" test conditions).
- Measure the line pressure when select lever is in "R", "2" with engine under stall conditions.
- Measure the line pressure within 5 seconds after shifting the select lever to each position. (If line pressure needs to be measured again, allow the engine to idle and then stop. Wait for at least 1 minute before measurement.)
- Maintain the temperature of ATF at approx. 50°C (122°F) during measurement (ATF will reach the above temperature after idling the engine for approx. 30 minutes with the select lever in "N" or "P".)

2. TEST METHODS

1) Temporarily attach the ST to a suitable place in the driver's compartment, remove the blind plug located in front of the toe board and pass the hose of the ST to engine compartment.

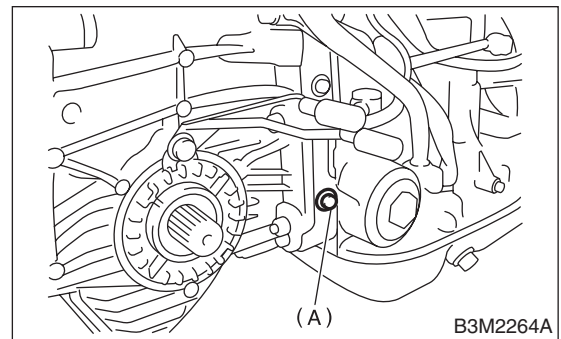
ST 498575400 OIL PRESSURE GAUGE ASSY



- (A) Pressure gauge hose
- (B) Hole in toe board (blank cap hole)
- (C) Brake pedal

2) Remove the test plug and install the ST instead.

ST 498897200 OIL PRESSURE GAUGE ADAPTER



- (A) Test plug

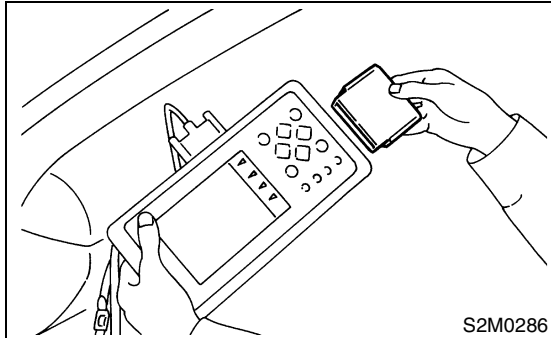
3) Connect the ST1 with ST2.

ST1 498897200 OIL PRESSURE GAUGE ADAPTER

ST2 498575400 OIL PRESSURE GAUGE ASSY

4) Check for duty ratio changes by opening and closing the throttle valve using Subaru Select Monitor.

(1) Insert the cartridge to Subaru Select Monitor. <Ref. to AT-5, PREPARATION TOOL, General Description.>



(2) Connect the Subaru Select Monitor to data link connector.

5) Check the line pressure in accordance with the following chart.

3. EVALUATION

Standard line pressure			
Range position	Line pressure duty ratio (%)	Throttle position	Line pressure kPa (kg/cm ² , psi)
2	5	Full open	1,128 — 1,304 (11.5 — 13.3, 164 — 189)
R	5	Full open	1,520 — 1,716 (15.5 — 17.5, 220 — 249)
D	95	Full closed	304 — 412 (3.1 — 4.2, 44 — 60)

TRANSFER CLUTCH PRESSURE TEST

AUTOMATIC TRANSMISSION

8. Transfer Clutch Pressure Test

A: INSPECTION

1. TEST METHODS

• MPT model

Check the transfer clutch pressure in accordance with the following chart in the same manner as with line pressure. <Ref. to AT-16, Line Pressure Test.>

ST 498897700 OIL PRESSURE ADAPTER SET

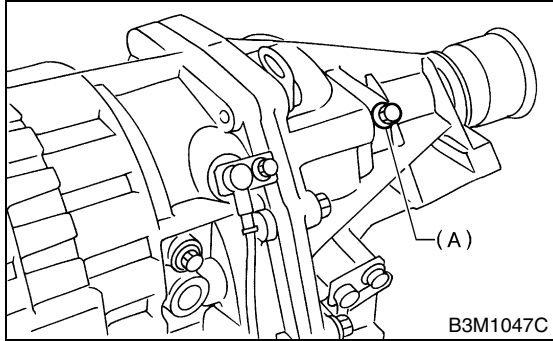
ST 498575400 OIL PRESSURE GAUGE ASSY

AWD mode: "D" range

FWD mode: "P" range, engine speed 2,000 rpm

NOTE:

Before setting in FWD mode, install the spare fuse on FWD mode switch.



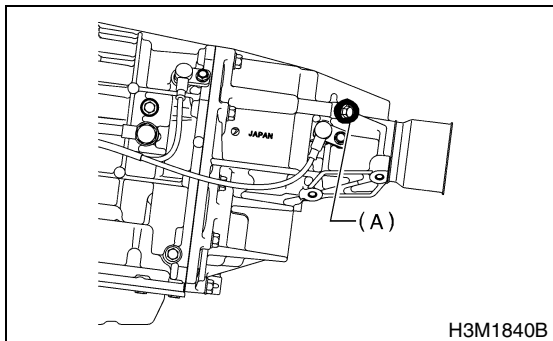
(A) Test plug

• VTD model

Check the 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



(A) Test plug

2. EVALUATION

• MPT model

NOTE:

If oil pressure is not produced or if it does not change in the AWD mode, the transfer duty solenoid or transfer valve assembly may be malfunctioning. If oil pressure is produced in the FWD mode, the problem is similar to that in the AWD mode.

Standard transfer clutch pressure kPa (kg/cm ² , psi)			
ON Duty ratio (%)	Throttle position	AWD mode	FWD mode
95	Full open	932 — 1,089 (9.5 — 11.1, 135 — 158)	—
60	2/3 throttle	216 — 294 (2.2 — 3.0, 31 — 43)	—
5	Full closed	—	0 (0, 0)

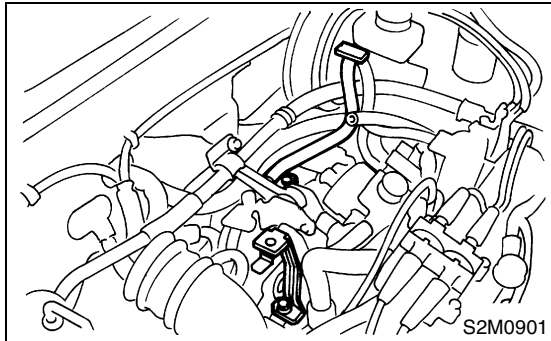
• VTD model

OFF Duty ratio (%)	Throttle position	Standard transfer clutch pressure kPa (kg/cm ² , psi)
95	Full open	932 — 1,089 (9.5 — 11.1, 135 — 158)
40	2/3 throttle	216 — 294 (2.2 — 3.0, 31 — 43)

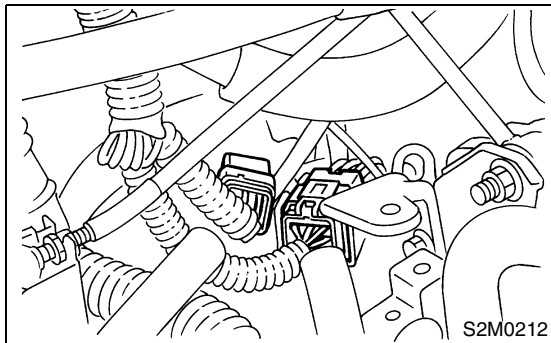
9. Automatic Transmission Assembly

A: REMOVAL

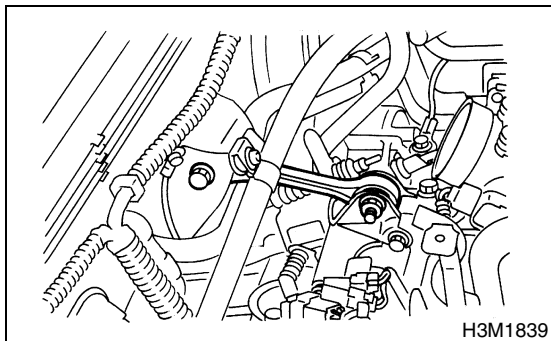
- 1) Set the vehicle on a lift.
- 2) Open the front hood fully, and support with stay.
- 3) Disconnect the ground cable from battery.
- 4) Remove the air intake duct. (Non-turbo model)
<Ref. to IN-7, REMOVAL, Air Intake Duct.>
- 5) Remove the air cleaner case. (Non-turbo model)
<Ref. to IN-6, REMOVAL, Air Cleaner Case.>
- 6) Remove the air cleaner case stay. (Non-turbo model)



- 7) Remove the intercooler. (Turbo model)
<Ref. to IN(TURBO)-10, REMOVAL, Intercooler.>
- 8) Disconnect the following connectors.
 - (1) Transmission harness connector



- (2) Transmission ground cable
- 9) Remove the starter.
<Ref. to SC-5, REMOVAL, Starter.>
- 10) Remove the pitching stopper.

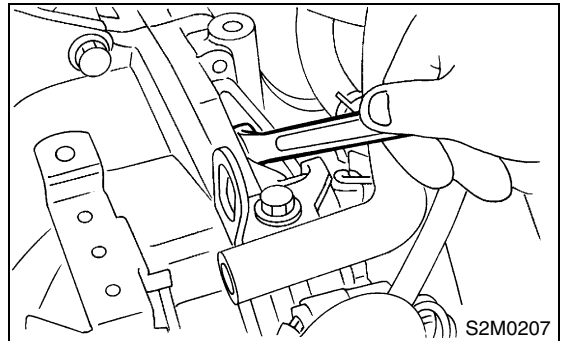


- 11) Separate the torque converter clutch from drive plate.
 - (1) Remove the service hole plug.
 - (2) Remove the bolts which hold torque converter clutch to drive plate.
 - (3) While rotating the engine, remove the other bolts using ST.

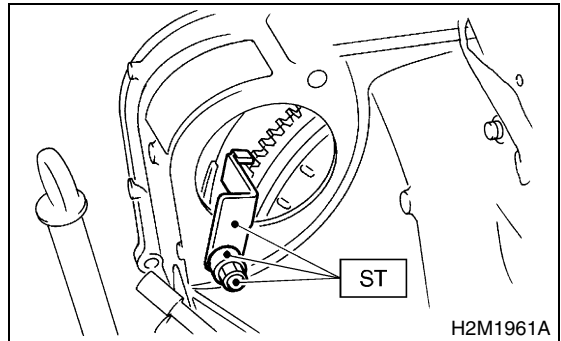
CAUTION:

Be careful not to drop bolts into torque converter clutch housing.

- Except 2.5 L model
ST 499977300 CRANK PULLEY WRENCH
- 2.5 L model
ST 499977100 CRANK PULLEY WRENCH



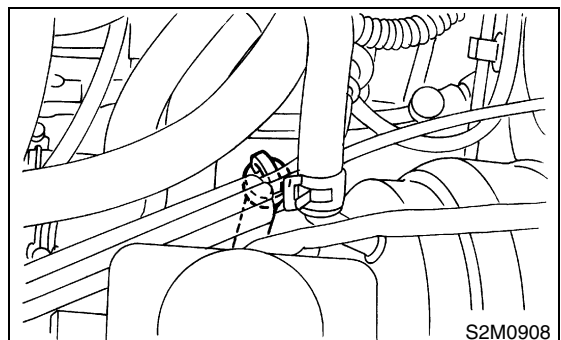
- 12) Install the ST to torque converter clutch case.
ST 498277200 STOPPER SET



- 13) Remove the ATF level gauge.

NOTE:

Plug the opening to prevent entry of foreign particles into transmission fluid.



AUTOMATIC TRANSMISSION ASSEMBLY

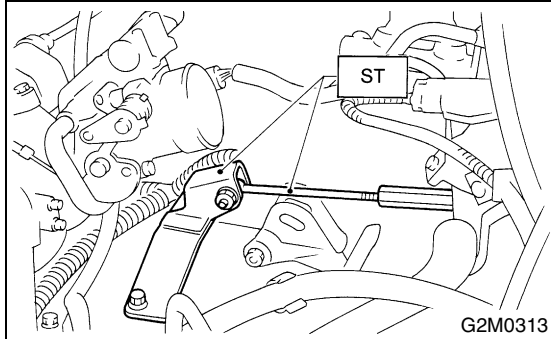
AUTOMATIC TRANSMISSION

14) Set the ST.

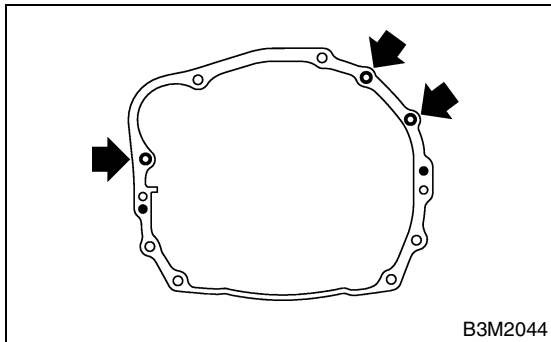
NOTE:

Also the ENGINE SUPPORT BRACKET 41099AA010 can be used.

ST 41099AA020 ENGINE SUPPORT ASSY



15) Remove the bolt which holds right upper side of transmission to engine.



16) Lift-up the vehicle.

17) Remove the under cover.

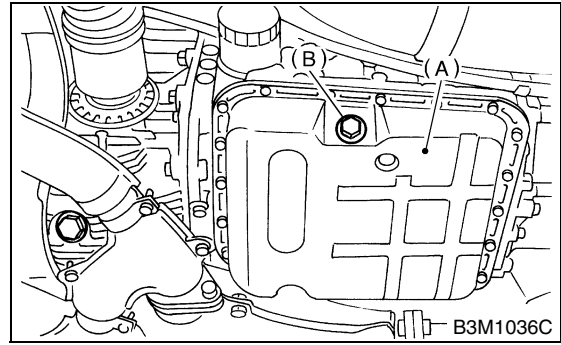
18) Remove the front, center, rear exhaust pipe and muffler. (Non-turbo model) <Ref. to EX(w/oOBD)-9, REMOVAL, Front Exhaust Pipe.>, <Ref. to EX(w/oOBD)-13, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(w/oOBD)-14, REMOVAL, Muffler.> or <Ref. to EX-7, REMOVAL, Front Exhaust Pipe.>, <Ref. to EX-11, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX-12, REMOVAL, Muffler.>

19) Remove the center, rear exhaust pipe and muffler. (Turbo model)

<Ref. to EX(TURBO)-8, REMOVAL, Center Exhaust Pipe.>, <Ref. to EX(TURBO)-13, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(TURBO)-14, REMOVAL, Muffler.>

20) Remove the heat shield cover. (If equipped)

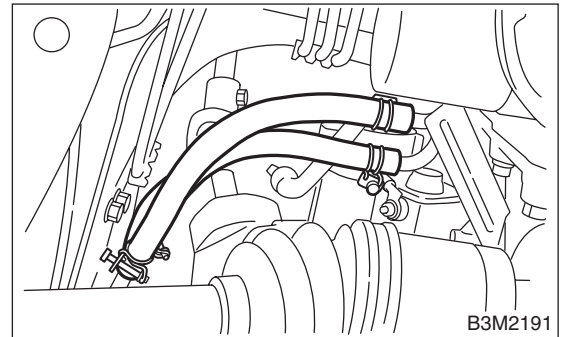
21) Drain the ATF to remove the ATF drain plug.



(A) Oil pan

(B) Drain plug

22) Disconnect the ATF cooler hoses from pipes of transmission side, and remove the ATF level gauge guide.



23) Remove the propeller shaft. <Ref. to DS-15, REMOVAL, Propeller Shaft.>

24) Remove the shift select cable. <Ref. to CS-9, REMOVAL, Select Cable.>

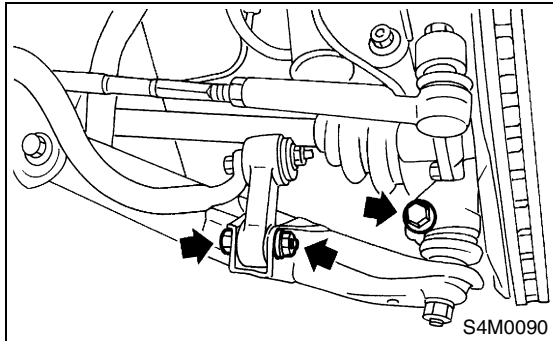
25) Disconnect the stabilizer link from transverse link.

AUTOMATIC TRANSMISSION ASSEMBLY

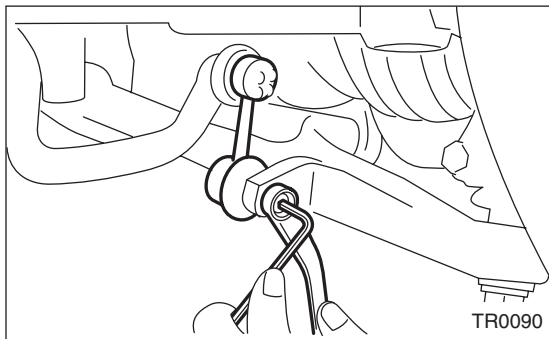
AUTOMATIC TRANSMISSION

26) Remove the bolt securing ball joint of transverse link to housing.

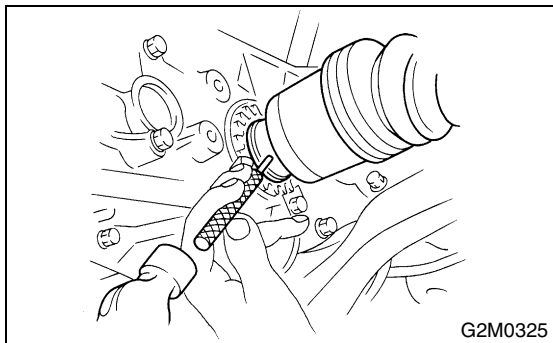
- Except sedan turbo MODEL



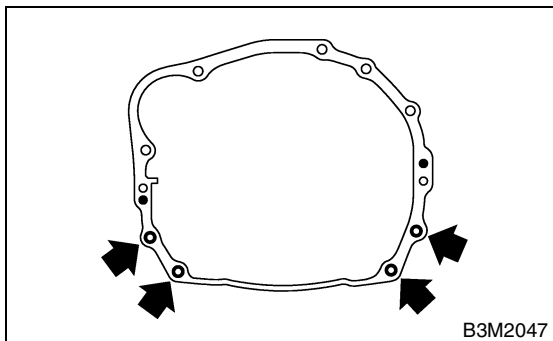
- Sedan turbo MODEL



27) Remove the spring pins and separate the front drive shafts from each side of transmission.



28) Remove the nuts which hold lower side of transmission to engine.

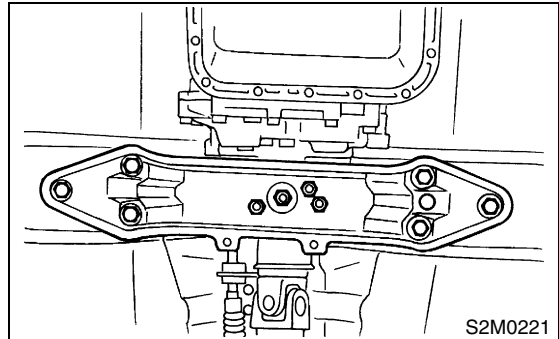


29) Place the transmission jack under transmission.

NOTE:

Make sure that the support plates of transmission jack don't touch the oil pan.

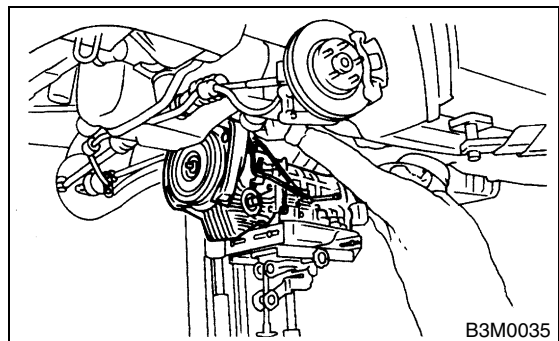
30) Remove the transmission rear crossmember from vehicle.



31) Remove the transmission.

CAUTION:

Move the transmission and torque converter as a unit away from engine.



32) Separate the transmission assembly and rear cushion rubber.

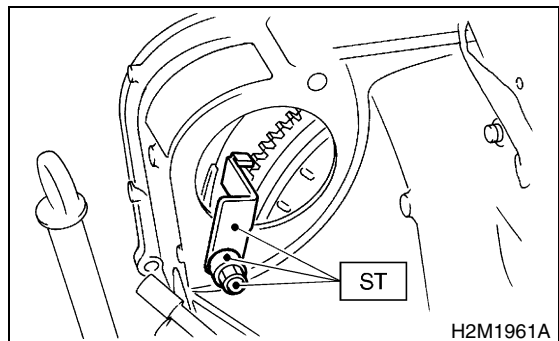
B: INSTALLATION

1) Install the rear cushion rubber to transmission assembly.

Tightening torque:

39 N·m (4.0 kgf·m, 29 ft·lb)

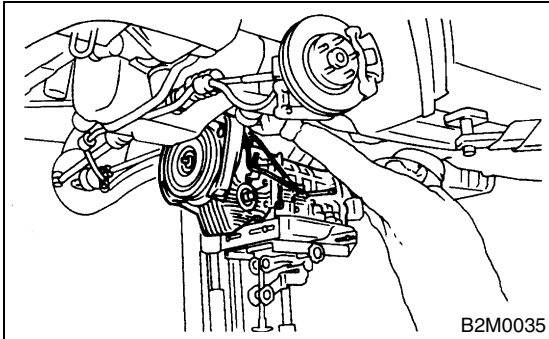
2) Install the ST to torque converter clutch case.
ST 498277200 STOPPER SET



AUTOMATIC TRANSMISSION ASSEMBLY

AUTOMATIC TRANSMISSION

- 3) Install the transmission onto engine.
 - (1) Gradually raise the transmission with transmission jack.

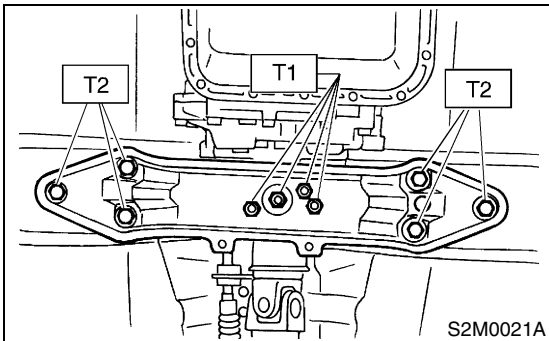


- (2) Engage them at splines.
- 4) Install the transmission rear crossmember.

Tightening torque:

T1: 35 N·m (3.6 kgf-m, 26 ft-lb)

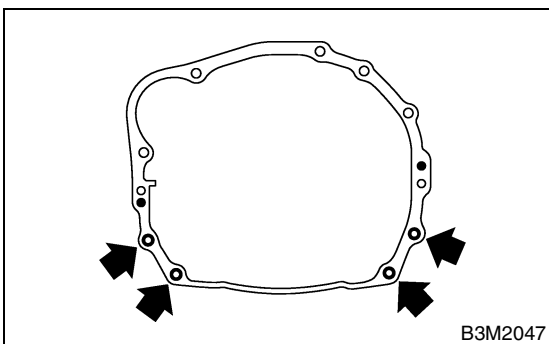
T2: 70 N·m (7.1 kgf-m, 51 ft-lb)



- 5) Take off the transmission jack.
- 6) Tighten the 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 the engine and transmission.
 - (1) Remove the ST from torque converter clutch case.

NOTE:

Be careful not to drop the ST into torque converter clutch case when removing the ST.

ST 498277200 STOPPER SET

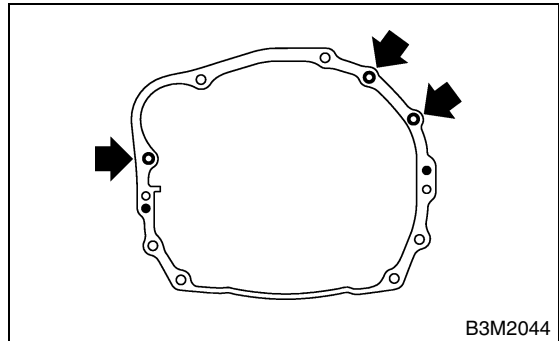
- (2) Install the starter.

<Ref. to SC-6, INSTALLATION, Starter.>

- (3) Tighten the bolt which holds right upper side of transmission to engine.

Tightening torque:

50 N·m (5.1 kgf-m, 36.9 ft-lb)



- 9) Install the torque converter clutch to drive plate.
 - (1) Tighten the bolts which hold torque converter clutch to drive plate.
 - (2) Tighten the other bolts while rotating the engine by using ST.

NOTE:

Be careful not to drop bolts into torque converter clutch housing.

Except 2.5 L model

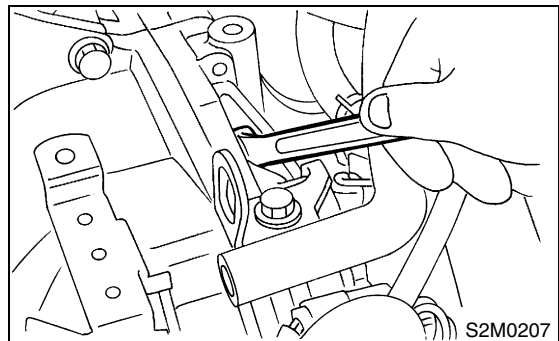
ST 499977300 CRANK PULLEY WRENCH

2.5 L model

ST 499977100 CRANK PULLEY WRENCH

Tightening torque:

25 N·m (2.5 kgf-m, 18.1 ft-lb)

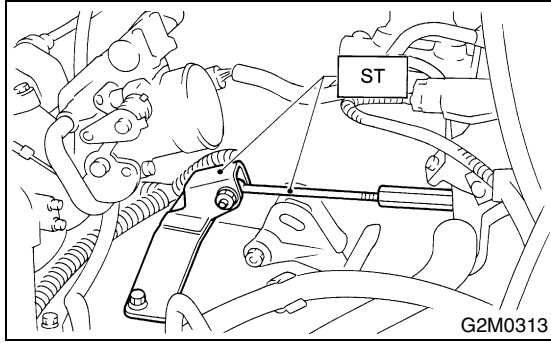


- (3) Clog the plug onto service hole.

AUTOMATIC TRANSMISSION ASSEMBLY

AUTOMATIC TRANSMISSION

10) Remove the ST.

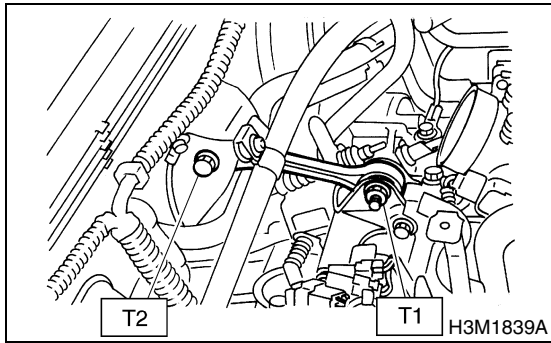


11) Install the pitching stopper.

Tightening torque:

T1: 50 N·m (5.1 kgf-m, 37 ft-lb)

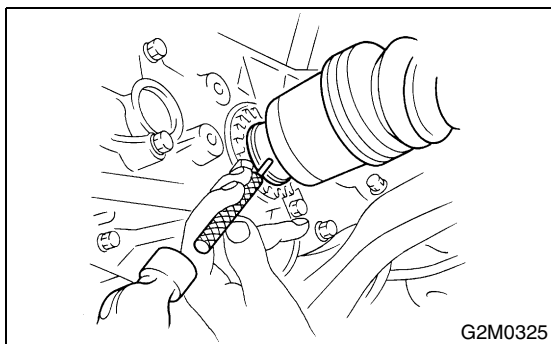
T2: 58 N·m (5.9 kgf-m, 43 ft-lb)



12) Lift-up the vehicle.

Install the front drive shafts into transmission.

- (1) Lift-up the vehicle.
- (2) Install the front drive shaft into transmission.
- (3) Drive a new spring pin into chamfered hole of drive shaft.

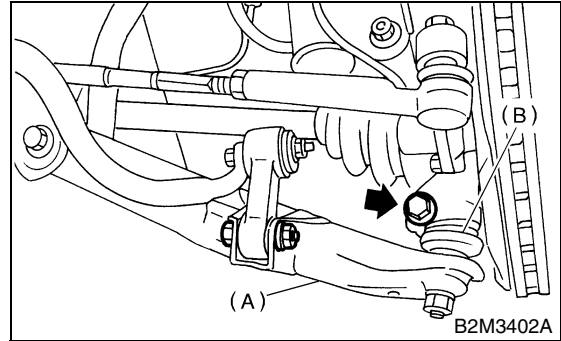


13) Connect the ball joint into housing.

14) Tighten the installing bolts.

Tightening torque:

49 N·m (5.0 kgf-m, 36 ft-lb)



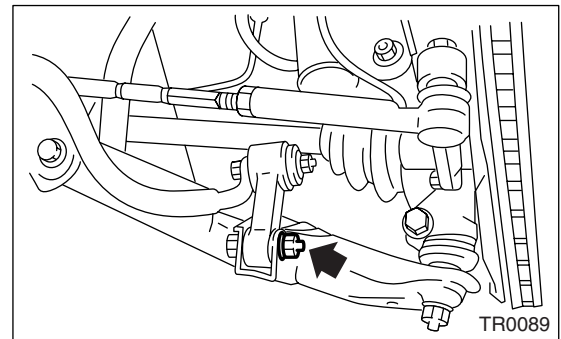
(A) Transverse link

(B) Ball joint

15) Install the stabilizer link from transverse link.
• Except sedan turbo MODEL

Tightening torque:

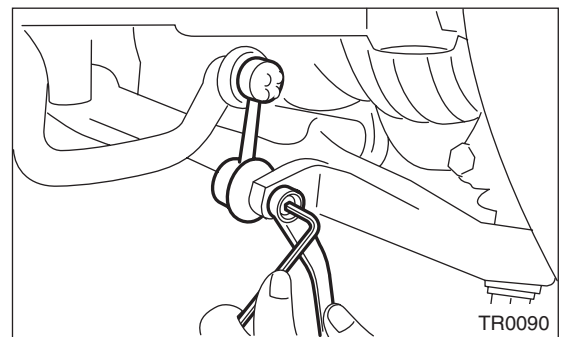
30 N·m (3.1 kgf-m, 22.1 ft-lb)



• Sedan turbo MODEL

Tightening torque:

45 N·m (4.6 kgf-m, 33.2 ft-lb)

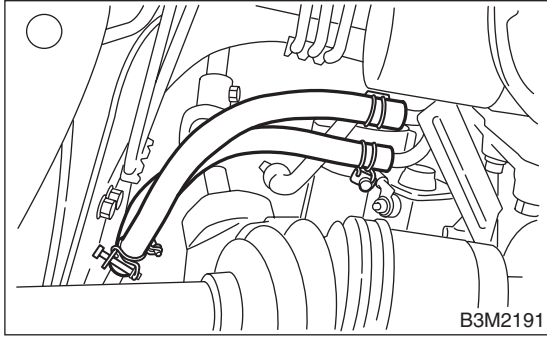


16) Install the shift select cable onto select lever.
<Ref. to CS-9, INSTALLATION, Select Cable.>

AUTOMATIC TRANSMISSION ASSEMBLY

AUTOMATIC TRANSMISSION

- 17) Install the ATF level gauge guide, and connect the ATF cooler hoses to pipe.



- 18) Install the propeller shaft. <Ref. to DS-16, INSTALLATION, Propeller Shaft.>

- 19) Install the heat shield cover. (If equipped)

- 20) Install the rear exhaust pipe and muffler assembly.

Non-turbo model

<Ref. to EX(w/oOBD)-13, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(w/oOBD)-14, INSTALLATION, Muffler.> or <Ref. to EX-11, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX-12, INSTALLATION, Muffler.>

Turbo model

<Ref. to EX(TURBO)-13, INSTALLATION, Rear Exhaust Pipe.>, <Ref. to EX(TURBO)-14, INSTALLATION, Muffler.>

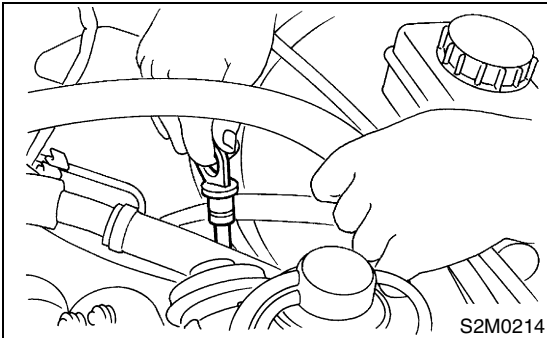
- 21) Install the front and center exhaust pipe. (Non-turbo model) <Ref. to EX(w/oOBD)-10, INSTALLATION, Front Exhaust Pipe.> or <Ref. to EX-8, INSTALLATION, Front Exhaust Pipe.>

- 22) Install the center exhaust pipe. (Turbo model) <Ref. to EX(TURBO)-9, INSTALLATION, Center Exhaust Pipe.>

- 23) Install the under cover.

- 24) Lower the vehicle.

- 25) Install the ATF level gauge.



- 26) Connect the following connectors.

- (1) Transmission harness connectors
- (2) Transmission ground cable

- 27) Connect the following cables.

- (1) Cruise control cable (With cruise control vehicles)

- 28) Install the air cleaner case stay. (Non-turbo model)

Tightening torque:

16 N·m (1.6 kgf·m, 11.6 ft·lb)

- 29) Install the air cleaner case and intake duct. (Non-turbo model) <Ref. to IN-6, INSTALLATION, Air Cleaner Case.>, <Ref. to IN-7, INSTALLATION, Air Intake Duct.>

- 30) Install the intercooler. (Turbo model) <Ref. to IN(TURBO)-11, INSTALLATION, Intercooler.>

- 31) Connect the battery ground cable to battery.

- 32) Fill ATF up to the middle of the "COLD" side on level gauge by using the gauge hole. <Ref. to AT-9, Automatic Transmission Fluid.>

- 33) Take off the vehicle from lift arms.

- 34) Check the select lever operation.

<Ref. to AT-28, INSPECTION, Inhibitor Switch.>

- 35) Check the ATF level. <Ref. to AT-9, Automatic Transmission Fluid.>

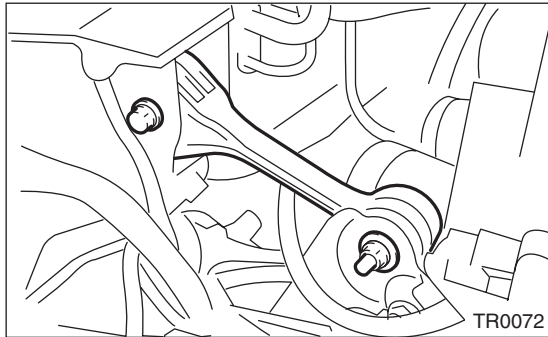
- 36) Check the vehicle on the road tester. <Ref. to AT-12, Road Test.>

10. Transmission Mounting System

A: REMOVAL

1. PITCHING STOPPER

- 1) Disconnect the ground cable from battery.
- 2) Remove the air cleaner case. (Non-turbo model)
<Ref. to IN-6, REMOVAL, Air Cleaner Case.>
- 3) Remove the intercooler. (Turbo model)
<Ref. to IN(TURBO)-10, REMOVAL, Intercooler.>
- 4) Remove the pitching stopper.



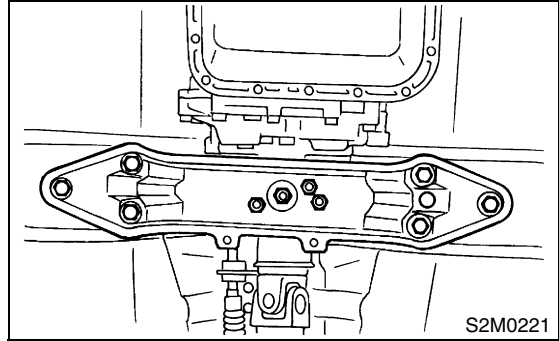
2. CROSSMEMBER AND CUSHION RUBBER

- 1) Disconnect the ground cable from battery.
- 2) Jack-up the vehicle and support it with sturdy racks.
- 3) Remove the front, center, rear exhaust pipes and muffler. (Non-turbo model) <Ref. to EX(w/oOBD)-9, REMOVAL, Front Exhaust Pipe.>, <Ref. to EX(w/oOBD)-13, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(w/oOBD)-14, REMOVAL, Muffler.> or <Ref. to EX-7, REMOVAL, Front Exhaust Pipe.>, <Ref. to EX-11, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX-12, REMOVAL, Muffler.>
- 4) Remove the center, rear exhaust pipe and muffler. (Turbo model)
<Ref. to EX(TURBO)-8, REMOVAL, Center Exhaust Pipe.>, <Ref. to EX(TURBO)-13, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(TURBO)-14, REMOVAL, Muffler.>
- 5) Remove the heat shield cover. (If equipped)
- 6) Set the transmission jack under the transmission.

CAUTION:

Make sure that the support plates of transmission jack don't touch the oil pan.

- 7) Remove the transmission rear crossmember.



- 8) Remove the rear cushion rubber.

B: INSTALLATION

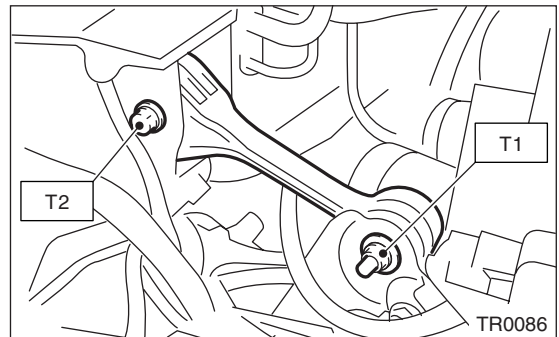
1. PITCHING STOPPER

- 1) Install the pitching stopper.

Tightening torque:

T1: 50 N·m (5.1 kgf-m, 37 ft-lb)

T2: 58 N·m (5.9 kgf-m, 43 ft-lb)



- 2) Install the air cleaner case. (Non-turbo model)
<Ref. to IN-6, INSTALLATION, Air Cleaner Case.>
- 3) Install the intercooler. (Turbo model).
<Ref. to IN(TURBO)-11, INSTALLATION, Intercooler.>

TRANSMISSION MOUNTING SYSTEM

AUTOMATIC TRANSMISSION

2. CROSSMEMBER AND CUSHION RUBBER

1) Install the rear cushion rubber.

Tightening torque:

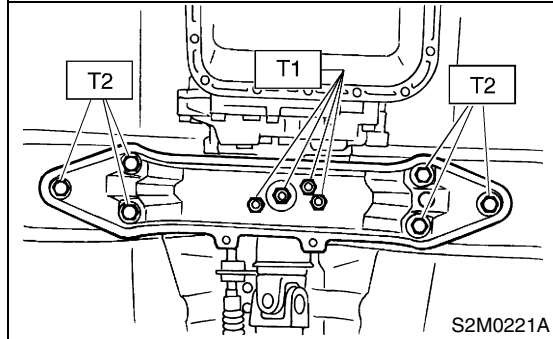
39 N·m (4.0 kgf-m, 29 ft-lb)

2) Install the crossmember.

Tightening torque:

T1: 35 N·m (3.6 kgf-m, 26 ft-lb)

T2: 70 N·m (7.1 kgf-m, 51 ft-lb)



3) Remove the transmission jack.

4) Install the heat shield cover. (If equipped)

5) Install the front, center, rear exhaust pipes and the muffler. (Non-turbo model) <Ref. to EX(w/oOBD)-10, INSTALLATION, Front Exhaust Pipe.>, <Ref. to EX(w/oOBD)-13, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(w/oOBD)-14, INSTALLATION, Muffler.> or <Ref. to EX-8, INSTALLATION, Front Exhaust Pipe.>, <Ref. to EX-11, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX-12, INSTALLATION, Muffler.>

6) Install the center, rear exhaust pipe and muffler. (Turbo model)

<Ref. to EX(TURBO)-9, INSTALLATION, Center Exhaust Pipe.>, <Ref. to EX(TURBO)-13, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(TURBO)-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 the ATF does not leak from the joint of transmission and propeller shaft. If so, replace the oil seal. <Ref. to AT-27, REPLACEMENT, Extension Case Oil Seal.>

B: REPLACEMENT

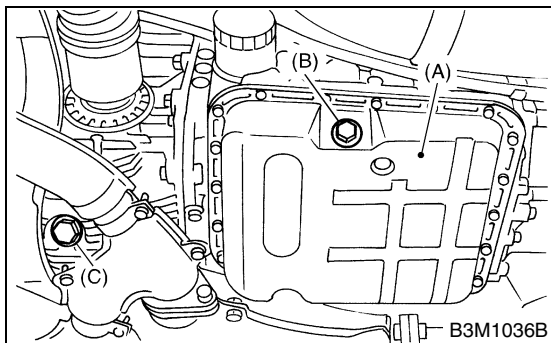
- 1) Clean the transmission exterior.
- 2) Drain the ATF completely.

NOTE:

Tighten the ATF drain plug after draining the 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) Remove the rear exhaust pipe and muffler.

Non-turbo model

<Ref. to EX(w/oOBD)-13, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(w/oOBD)-14, REMOVAL, Muffler.> or <Ref. to EX-11, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX-12, REMOVAL, Muffler.>

Turbo model

<Ref. to EX(TURBO)-13, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(TURBO)-14, REMOVAL, Muffler.>

- 4) Remove the heat shield cover. (If equipped)
- 5) Remove the propeller shaft. <Ref. to DS-15, REMOVAL, Propeller Shaft.>
- 6) Using the ST, remove the oil seal.
ST 398527700 PULLER ASSY
- 7) Using the ST, install the oil seal.
ST 498057300 INSTALLER
- 8) Install the propeller shaft. <Ref. to DS-16, INSTALLATION, Propeller Shaft.>
- 9) Install the heat shield cover. (If equipped)

- 10) Install the rear exhaust pipe and muffler.

Non-turbo model

<Ref. to EX(w/oOBD)-13, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(w/oOBD)-14, INSTALLATION, Muffler.> or <Ref. to EX-11, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX-12, INSTALLATION, Muffler.>

Turbo model

<Ref. to EX(TURBO)-13, Installation, Rear Exhaust Pipe.> and <Ref. to EX(TURBO)-14, INSTALLATION, Muffler.>

- 11) Pour ATF and check the ATF level. <Ref. to AT-9, Automatic Transmission Fluid.>

INHIBITOR SWITCH

AUTOMATIC TRANSMISSION

12. Inhibitor Switch

A: INSPECTION

When the driving condition or starter motor operation is erroneous, first check the shift linkage for improper operation. If the shift linkage is functioning properly, check the inhibitor switch.

- 1) Disconnect the inhibitor switch connector.
- 2) Check continuity in inhibitor switch circuits with the select lever moved to each position.

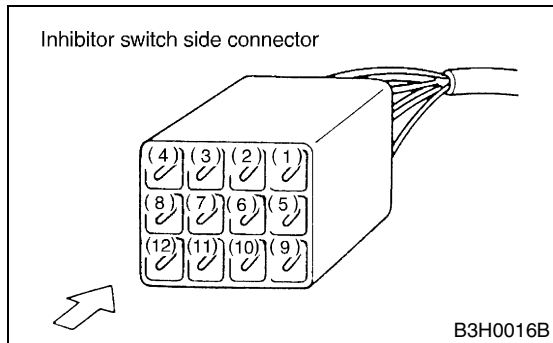
NOTE:

Also check that continuity in ignition circuit does not exist when the select lever is in "R", "D", "3", "2" and "1" ranges.

NOTE:

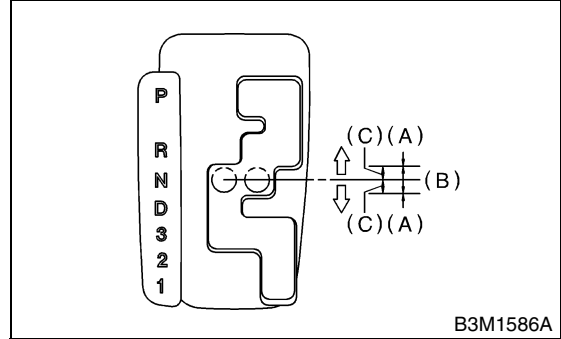
If the inhibitor switch is inoperative, check for poor contact of connector on transmission side.

	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
Ignition circuit	P/N	12 — 11
Back-up light circuit	R	10 — 9



- 3) Check if there is continuity at equal points when the select lever is turned 1.5° in both directions from "N" range.

If there is continuity in one direction and the continuity in the other or if there is continuity at unequal points, adjust the inhibitor switch. <Ref. to AT-28, ADJUSTMENT, Inhibitor Switch.>

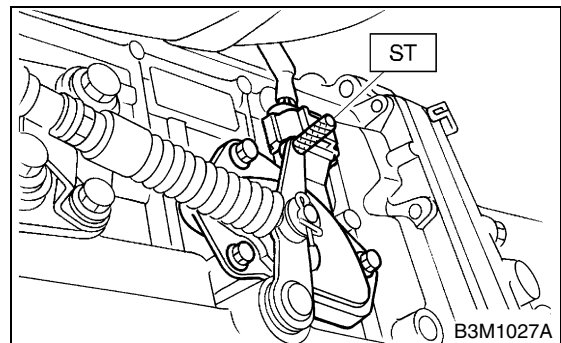


- (A) Continuity does not exist.
- (B) Continuity exists.
- (C) 1.5°

- 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 "N" range.
- 2) Loosen the three inhibitor switch securing bolts.
- 3) Insert the ST as vertical as possible into the holes in inhibitor switch lever and switch body.
ST 499267300 STOPPER PIN



- 4) Tighten the three inhibitor switch bolts.

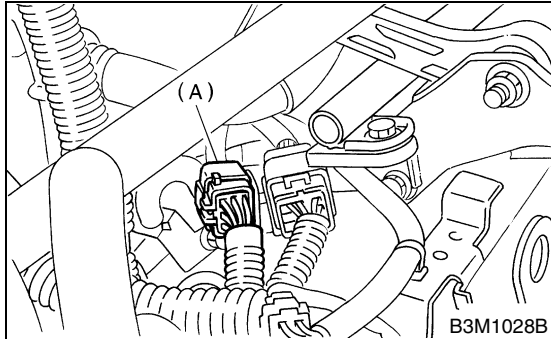
Tightening torque:

3.5 N·m (0.35 kgf·m, 2.5 ft·lb)

- 5) Repeat the above checks. If the inhibitor switch is determined to be "faulty", replace it.

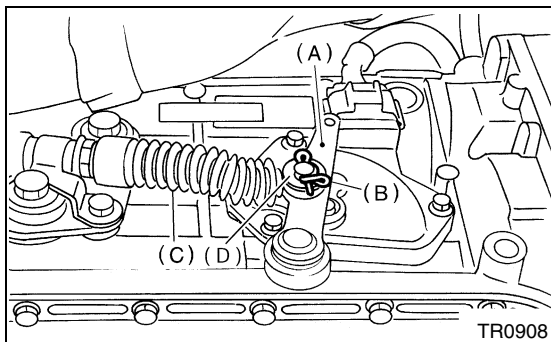
C: REMOVAL

- 1) Set up the vehicle on a lift.
- 2) Move the select lever to "N" range.
- 3) Remove the air cleaner case. (Non-turbo model)
<Ref. to IN-6, REMOVAL, Air Cleaner Case.>
- 4) Remove the intercooler. (Turbo model)
<Ref. to IN(TURBO)-10, REMOVAL, Intercooler.>
- 5) Disconnect the inhibitor switch connector.



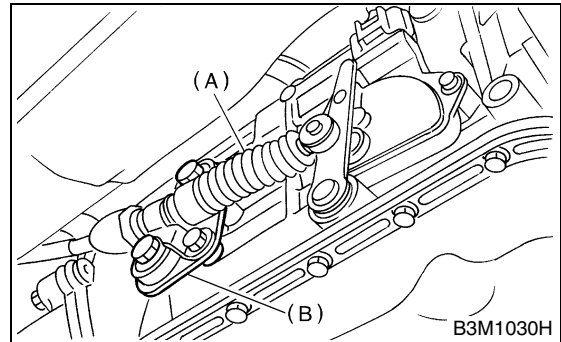
(A) Inhibitor switch

- 6) Remove the inhibitor switch connector from stay.
- 7) Lift-up the vehicle.
- 8) Remove the front and center exhaust pipes.
<Ref. to EX(w/oOBD)-9, REMOVAL, Front Exhaust Pipe.> or <Ref. to EX-7, REMOVAL, Front Exhaust Pipe.>
- 9) Remove the snap pin and washer from range select lever.



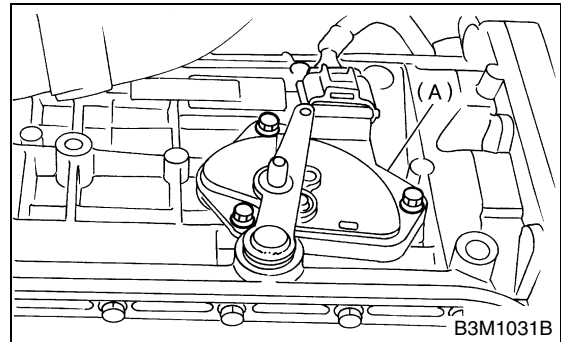
- (A) Snap pin
- (B) Select cable
- (C) Range select lever
- (D) Washer

- 10) Remove the plate assembly from transmission case.



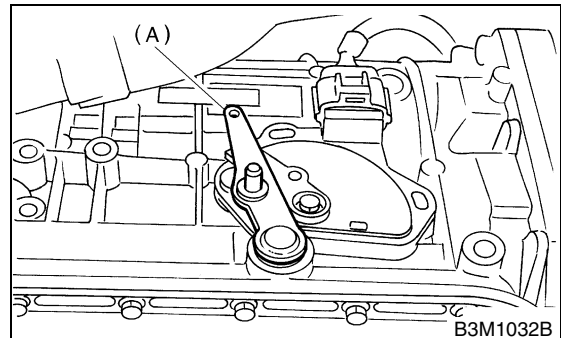
- (A) Select cable
- (B) Plate ASSY

- 11) Remove the bolts.



(A) Inhibitor switch

- 12) Move the range select lever to parking position (left side).

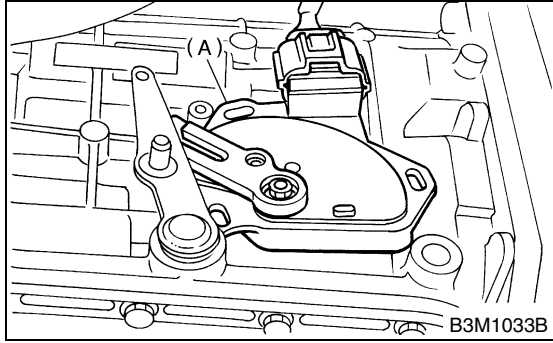


(A) Range select lever

INHIBITOR SWITCH

AUTOMATIC TRANSMISSION

13) Remove the inhibitor switch from transmission.



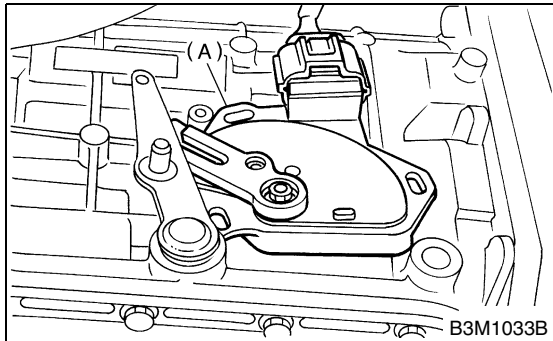
(A) Inhibitor switch

14) Disconnect the inhibitor switch harness connector from inhibitor switch.

D: INSTALLATION

1) Connect the inhibitor switch harness connector to inhibitor switch.

2) Install the inhibitor switch to transmission case.



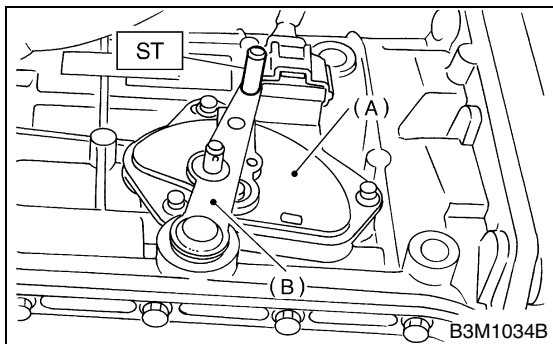
(A) Inhibitor switch

3) Move the range select lever to neutral position.

4) Using the ST, tighten the bolts of inhibitor switch.
ST 499267300 STOPPER PIN

Tightening torque:

3.5 N·m (0.36 kgf-m, 2.6 ft-lb)



(A) Inhibitor switch

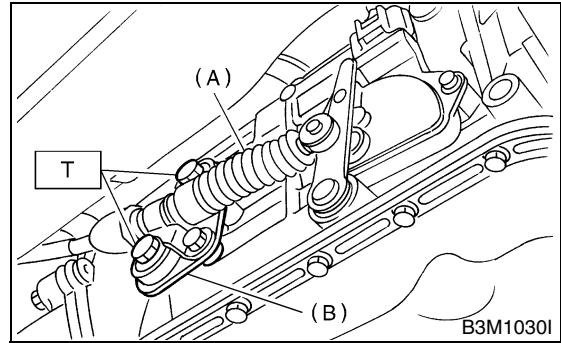
(B) Range select lever

5) Install the select cable to range select lever.

6) Install the plate assembly to transmission.

Tightening torque:

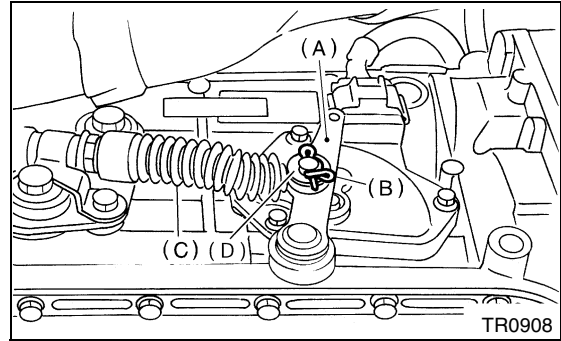
T: 25 N·m (2.5 kgf-m, 18.1 ft-lb)



(A) Select cable

(B) Plate ASSY

7) Install the washer and snap pin to range select lever.



(A) Snap ring

(B) Select cable

(C) Range select lever

(D) Washer

8) Install the front and center exhaust pipes. (Non-turbo model)

Except 3.0 L model

<Ref. to EX(w/oOBD)-10, INSTALLATION, Front Exhaust Pipe.> or <Ref. to EX-8, INSTALLATION, Front Exhaust Pipe.>

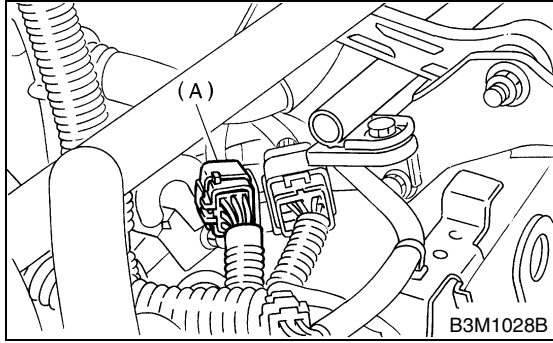
9) Install the center exhaust pipe. (Turbo model)

<Ref. to EX(TURBO)-9, INSTALLATION, Center Exhaust Pipe.>

10) Lower the vehicle.

11) Install the inhibitor switch connector from stay.

12) Connect the inhibitor switch connector.



(A) Inhibitor switch

13) Install the air cleaner case. (Non-turbo model)
<Ref. to IN-6, INSTALLATION, Air Cleaner Case.>

14) Install the intercooler. (Turbo model)
<Ref. to IN(TURBO)-11, INSTALLATION, Intercooler.>

15) Inspect the inhibitor switch. <Ref. to AT-28, INSPECTION, Inhibitor Switch.>

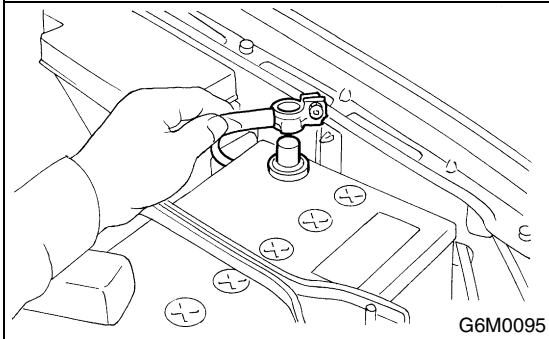
FRONT VEHICLE SPEED SENSOR

AUTOMATIC TRANSMISSION

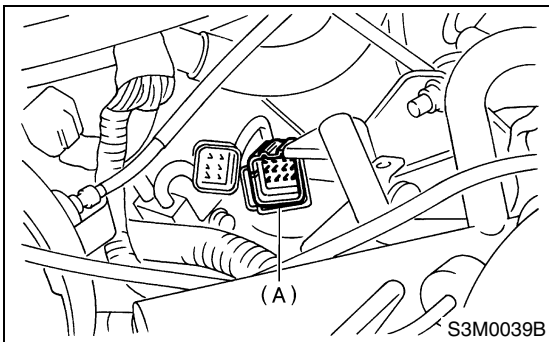
13. Front Vehicle Speed Sensor

A: REMOVAL

- 1) Set up the vehicle on a lift.
- 2) Disconnect the ground cable from battery.



- 3) Remove the air cleaner case. (Non-turbo model)
<Ref. to IN-6, REMOVAL, Air Cleaner Case.>
- 4) Remove the intercooler. (Turbo model)
<Ref. to IN(TURBO)-10, REMOVAL, Intercooler.>
- 5) Disconnect the transmission connector.



(A) Transmission connector

- 6) Remove the pitching stopper. <Ref. to AT-25, REMOVAL, Transmission Mounting System.>
- 7) Remove the transmission connector from stay.
- 8) Lift-up the vehicle.
- 9) Clean the transmission exterior.

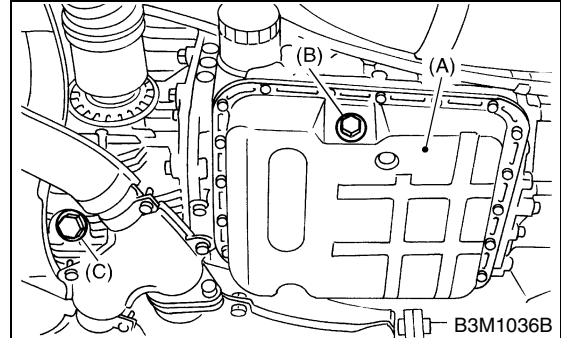
- 10) Drain the ATF completely.

NOTE:

Tighten the ATF drain plug after draining the 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

- 11) Remove the front, center, exhaust pipes and muffler. (Non-turbo model)
<Ref. to EX(w/oOBD)-9, REMOVAL, Front Exhaust Pipe.>, <Ref. to EX(w/oOBD)-13, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(w/oOBD)-14, REMOVAL, Muffler.> or <Ref. to EX-7, REMOVAL, Front Exhaust Pipe.>, <Ref. to EX-11, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX-12, REMOVAL, Muffler.>
- 12) Remove the center, rear exhaust pipe and muffler. (Turbo model)
<Ref. to EX(TURBO)-8, REMOVAL, Center Exhaust Pipe.>, <Ref. to EX(TURBO)-13, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(TURBO)-14, REMOVAL, Muffler.>
- 13) Remove the shield cover. (If equipped)
- 14) Remove the propeller shaft. <Ref. to DS-15, REMOVAL, Propeller Shaft.>
- 15) Place the transmission jack under transmission.

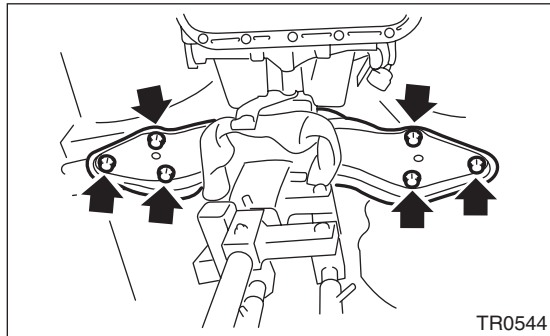
NOTE:

Make sure that the support plates of transmission jack don't touch the crossmember.

FRONT VEHICLE SPEED SENSOR

AUTOMATIC TRANSMISSION

16) Remove the transmission rear crossmember bolts.



17) Lower the AT jack.

NOTE:

Do not separate the AT jack and transmission.

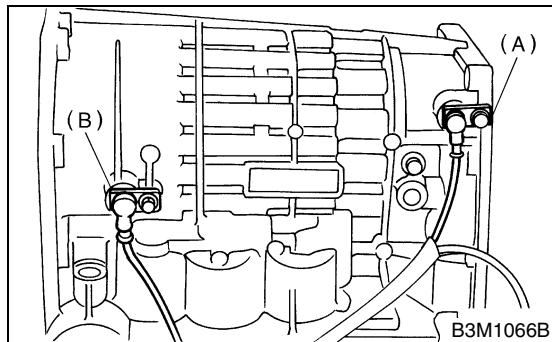
18) Remove the oil cooler inlet and outlet pipe.

NOTE:

When removing the outlet pipe, be careful not to lose balls and springs used with retaining screws.

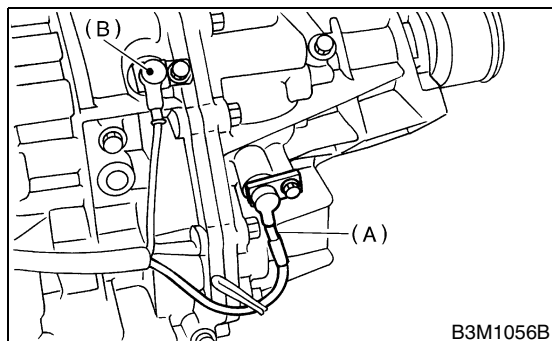
19) Remove the front and rear vehicle speed sensor and torque converter turbine speed sensor.

• **Front vehicle speed sensor and torque converter turbine speed sensor**



- (A) Front vehicle speed sensor
- (B) Torque converter turbine speed sensor

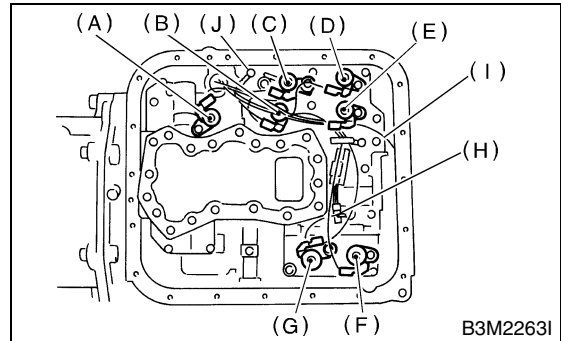
• **Rear vehicle speed sensor**



- (A) Rear vehicle speed sensor
- (B) Front vehicle speed sensor

20) Remove the oil pan.

21) Disconnect the duty solenoids and ATF temperature sensor connectors. Remove the connectors from clip and disconnect the connectors.

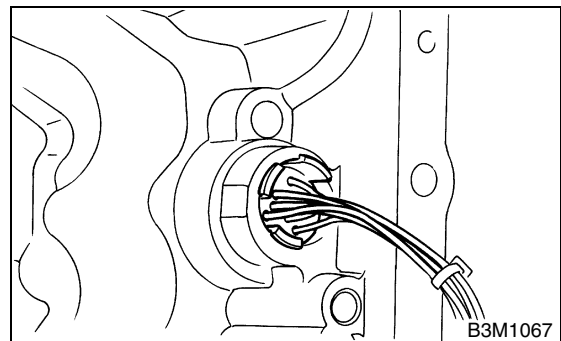


- (A) Lock-up duty solenoid (Blue)
- (B) Low clutch timing solenoid (Gray)
- (C) Line pressure duty solenoid (Red)
- (D) Shift solenoid 2 (Yellow)
- (E) Shift solenoid 1 (Green)
- (F) 2-4 brake timing solenoid (Black)
- (G) 2-4 brake duty solenoid (Red)
- (H) ATF temperature sensor
- (I) Transfer duty solenoid (Brown)
- (J) Transmission ground

22) Remove the harness assembly.

B: INSTALLATION

1) Pass the harness assembly through the hole in the transmission case.

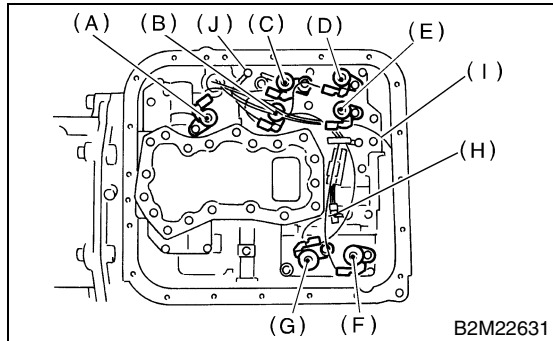


FRONT VEHICLE SPEED SENSOR

AUTOMATIC TRANSMISSION

2) Connect the harness connectors.
Connect the connectors of same color, and secure the connectors to valve body using clips.

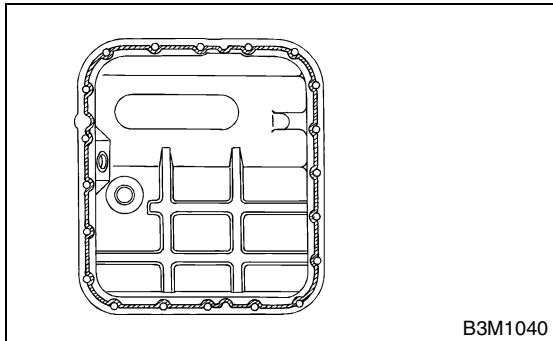
Tightening torque (Transmission ground cable)
8 N·m (0.8 kgf·m, 5.8 ft·lb)



- (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
- (I) Transfer duty solenoid (Brown)
- (J) Transmission ground

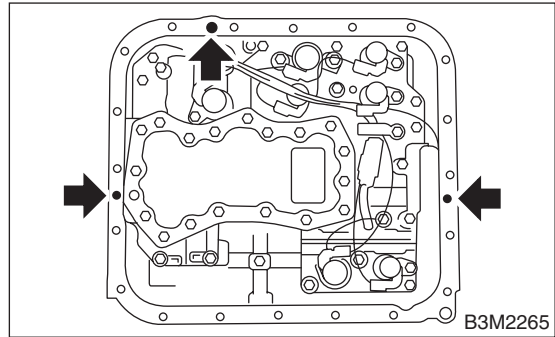
3) Apply proper amount of liquid gasket to the entire oil pan mating surface.

Fluid packing:
THREE BOND 1217B



4) Apply liquid gasket fully to three holes other than screw holes on transmission case.

Fluid packing:
THREE BOND 1217B



5) Install the oil pan.

Tightening torque:
5 N·m (0.5 kgf·m, 3.6 ft·lb)

6) Install the front and rear vehicle speed sensor, and also the torque converter turbine speed sensor, and then fasten the harness.

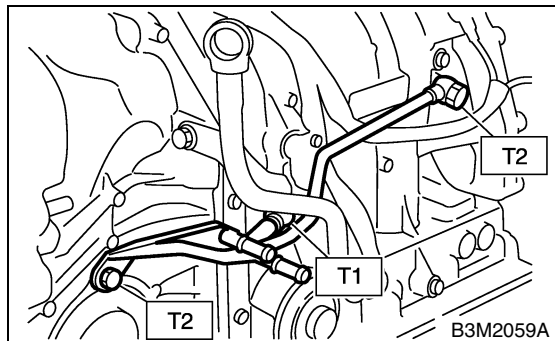
Tightening torque:
7 N·m (0.7 kgf·m, 5.1 ft·lb)

7) Install the oil cooler pipes.

NOTE:

Be sure to use a new aluminum washer.

Tightening torque:
T1: 44 N·m (4.5 kgf·m, 32.5 ft·lb)
T2: 25 N·m (2.5 kgf·m, 18.1 ft·lb)



8) Install the transmission rear crossmember bolts.

Tightening torque:
70 N·m (7.1 kgf·m, 51 ft·lb)

9) Install the propeller shaft. <Ref. to DS-16, INSTALLATION, Propeller Shaft.>

10) Install the shield cover. (If equipped)

11) Install the front, center, rear exhaust pipes and muffler. (Non-turbo model)

<Ref. to EX(w/oOBD)-10, INSTALLATION, Front Exhaust Pipe.>, <Ref. to EX(w/oOBD)-13, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(w/oOBD)-14, INSTALLATION, Muffler.> or <Ref. to EX-8, INSTALLATION, Front Exhaust Pipe.>, <Ref. to EX-11, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX-12, INSTALLATION, Muffler.>

12) Install the center, rear exhaust pipes and muffler. (Turbo model)

<Ref. to EX(TURBO)-9, INSTALLATION, Center Exhaust Pipe.>, <Ref. to EX(TURBO)-13, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(TURBO)-14, INSTALLATION, Muffler.>

13) Lower the vehicle.

14) Install the transmission connector to the stay.

15) Install the pitching stopper. <Ref. to AT-25, INSTALLATION, Transmission Mounting System.>

16) Install the air cleaner case. (Non-turbo model)

<Ref. to IN-6, INSTALLATION, Air Cleaner Case.>

17) Install the intercooler. (Turbo model)

<Ref. to IN(TURBO)-11, INSTALLATION, Intercooler.>

14.Rear Vehicle Speed Sensor

A: REMOVAL

When removing the rear vehicle speed sensor, refer to “Front Vehicle Speed Sensor.” <Ref. to AT-32, REMOVAL, Front Vehicle Speed Sensor.>

B: INSTALLATION

When installing the rear vehicle speed sensor, refer to “Front Vehicle Speed Sensor.” <Ref. to AT-33, 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-32, REMOVAL, Front Vehicle Speed Sensor.>

B: INSTALLATION

When installing the torque converter turbine speed sensor, refer to "Front Vehicle Speed Sensor."
<Ref. to AT-33, INSTALLATION, Front Vehicle Speed Sensor.>

CONTROL VALVE BODY

AUTOMATIC TRANSMISSION

16. Control Valve Body

A: REMOVAL

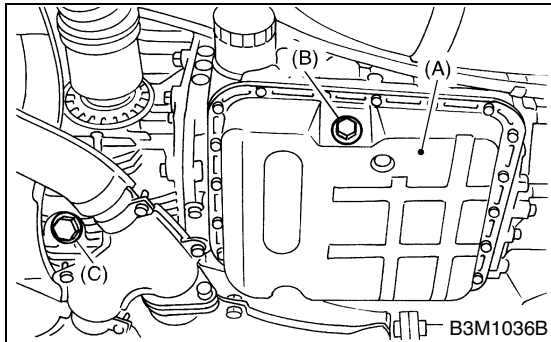
- 1) Lift-up the vehicle.
- 2) Clean the transmission exterior.
- 3) Drain the ATF completely.

NOTE:

Tighten the ATF drain plug after draining the ATF.

Tightening torque:

25 N·m (2.5 kgf·m, 18.1 ft·lb)



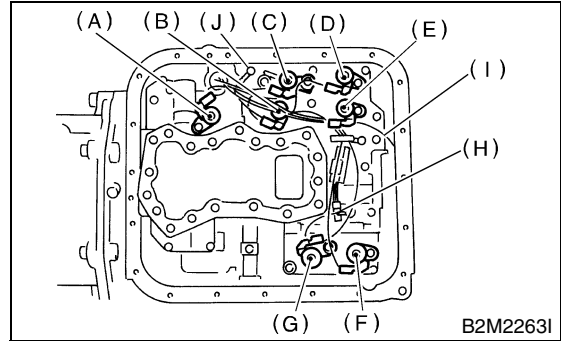
- (A) Oil pan
- (B) Drain plug
- (C) Differential oil drain plug

- 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 the duty solenoids and ATF temperature sensor connectors. Remove the connectors from clip and disconnect the connectors.

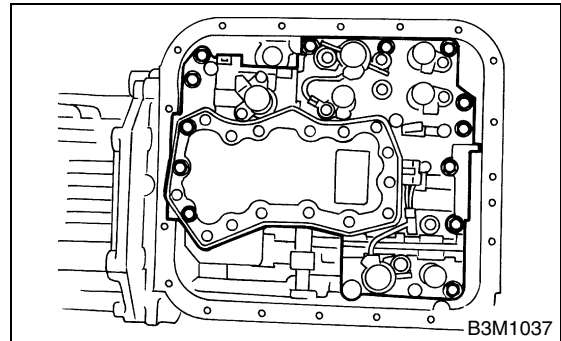


- (A) Lock-up duty solenoid (Blue)
- (B) Low clutch timing solenoid (Gray)
- (C) Line pressure duty solenoid (Red)
- (D) Shift solenoid 2 (Yellow)
- (E) Shift solenoid 1 (Green)
- (F) 2-4 brake timing solenoid (Black)
- (G) 2-4 brake duty solenoid (Red)
- (H) ATF temperature sensor
- (I) Transfer duty solenoid (Brown)
- (J) Transmission ground

- 6) Remove the control valve.

NOTE:

When removing the control valve body, be careful not to interfere with transfer duty solenoid wiring.

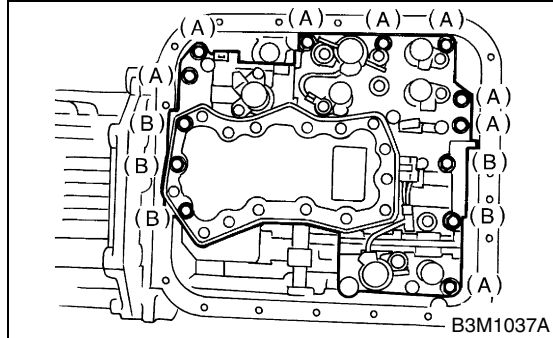


B: INSTALLATION

- 1) Set the range select lever in "N" range.
- 2) Install the control valve and ground connectors.

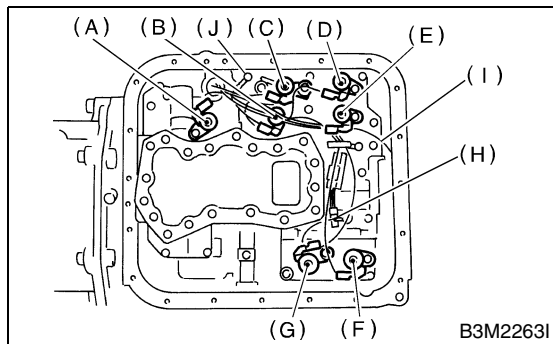
Tightening torque:

8 N·m (0.8 kgf-m, 5.8 ft-lb)



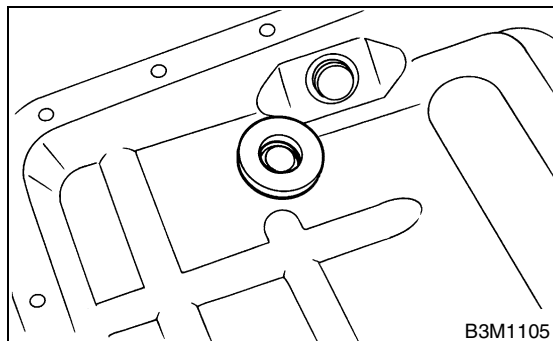
- (A) Short bolts
- (B) Long bolts

- 3) Connect all connectors.



- (A) Lock-up duty solenoid (Blue)
- (B) Low clutch timing solenoid (Gray)
- (C) Line pressure duty solenoid (Red)
- (D) Shift solenoid 2 (Yellow)
- (E) Shift solenoid 1 (Green)
- (F) 2-4 brake timing solenoid (Black)
- (G) 2-4 brake duty solenoid (Red)
- (H) ATF temperature sensor
- (I) Transfer duty solenoid (Brown)
- (J) Transmission ground

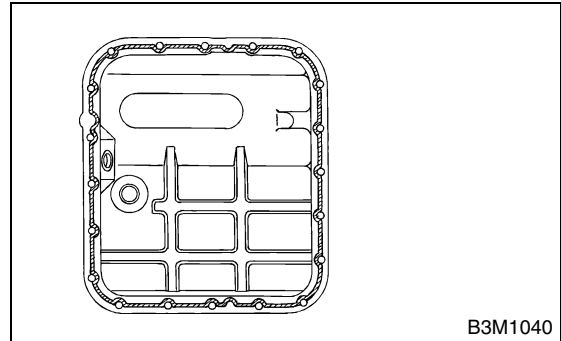
- 4) Attach the magnet at the specified position.



- 5) Apply proper amount of liquid gasket to the entire oil pan mating surface.

Fluid packing:

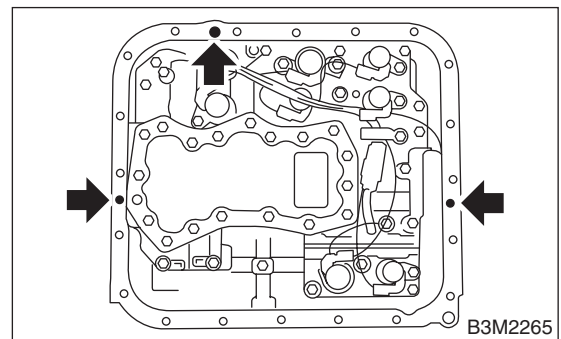
THREE BOND 1217B



- 6) Apply liquid gasket fully to three holes other than screw holes on transmission case.

Fluid packing:

THREE BOND 1217B



- 7) Install the oil pan.

Tightening torque:

5 N·m (0.5 kgf-m, 3.6 ft-lb)

- 8) Pour ATF into the oil charge pipe.

Recommended fluid:

Dexron III type automatic transmission fluid

Fluid capacity:

Fill the same amount of fluid drained from drain plug hole.

- 9) Check the level of ATF.

<Ref. to AT-9, Automatic Transmission Fluid.>

C: DISASSEMBLY

Refer to "AUTOMATIC TRANSMISSION" <Pub. No. G0864ZE> a separate publication.

D: ASSEMBLY

Refer to "AUTOMATIC TRANSMISSION" <Pub. No. G0864ZE> a separate publication.

E: INSPECTION

Refer to "AUTOMATIC TRANSMISSION" <Pub. No. G0864ZE> a separate publication.

17. Shift Solenoids, Duty Solenoids and ATF Temperature Sensor

A: REMOVAL

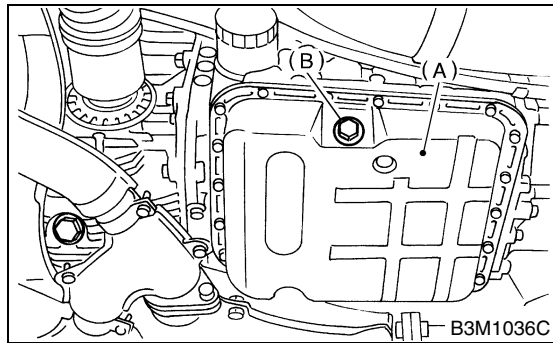
- 1) Lift-up the vehicle.
- 2) Clean the transmission exterior.
- 3) Drain the ATF completely.

NOTE:

Tighten the ATF drain plug after draining the ATF.

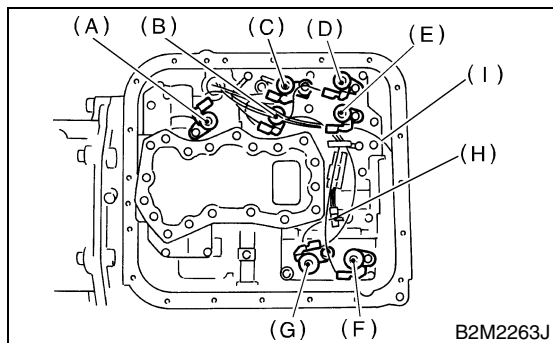
Tightening torque:

25 N·m (2.5 kgf-m, 18.1 ft-lb)



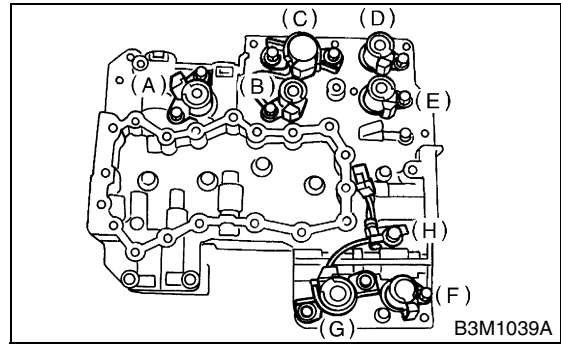
- (A) Oil pan
- (B) Drain plug

- 4) Remove the oil pan.
- 5) Disconnect the solenoid and sensor connectors. Remove the connectors from clip and disconnect the 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)

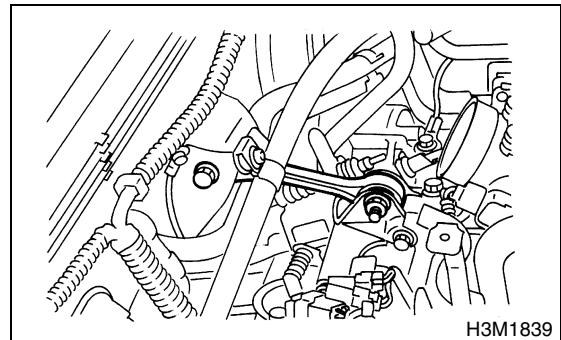
- 6) Remove the solenoids, duty solenoids and ATF temperature sensor.



- (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 the vehicle on a lift.
- 2) Disconnect the ground cable from battery.
- 3) Remove the air cleaner case. (Non-turbo model)
<Ref. to IN-6, INSTALLATION, Air Cleaner Case.>
- 4) Remove the intercooler. (Turbo model)
<Ref. to IN(TURBO)-10, REMOVAL, Intercooler.>
- 5) Remove the pitching stopper.



- 6) Remove the front exhaust pipe with center exhaust pipe. (Non-turbo model)
<Ref. to EX(w/oOBD)-9, REMOVAL, Front Exhaust Pipe.> or <Ref. to EX-7, REMOVAL, Front Exhaust Pipe.>
- 7) Remove the center exhaust pipe. (Turbo model)
<Ref. to EX(TURBO)-8, REMOVAL, Center Exhaust Pipe.>

SHIFT SOLENOIDS, DUTY SOLENOIDS AND ATF TEMPERATURE SENSOR

AUTOMATIC TRANSMISSION

8) Remove the rear exhaust pipe and muffler.

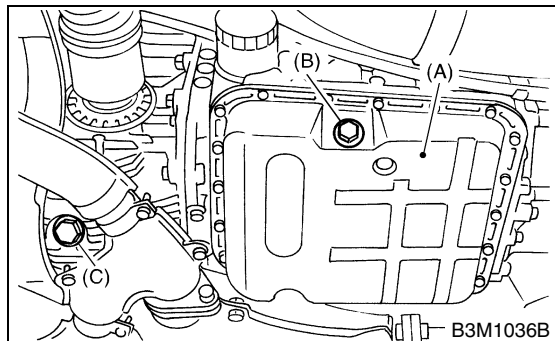
Non-turbo model

<Ref. to EX(w/oOBD)-13, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(w/oOBD)-14, REMOVAL, Muffler.> or <Ref. to EX-11, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX-12, REMOVAL, Muffler.>

Turbo model

<Ref. to EX(TURBO)-13, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(TURBO)-14, REMOVAL, Muffler.>

9) Raise the vehicle and drain the ATF.



- (A) Oil pan
- (B) Drain plug
- (C) Differential oil drain plug

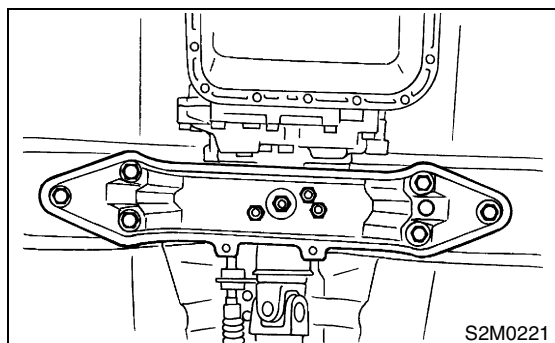
10) Remove the heat shield cover.

11) Remove the propeller shaft. <Ref. to DS-15, REMOVAL, Propeller Shaft.>

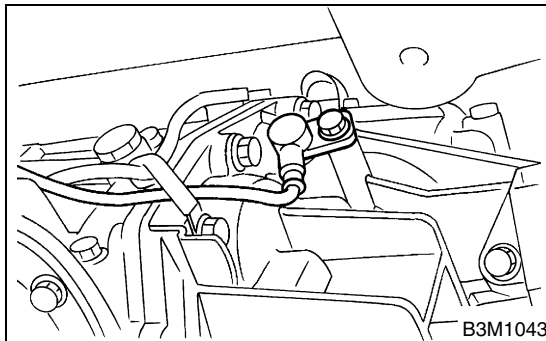
12) Remove the transmission rear crossmember.

(1) Support the transmission using a transmission jack and raise slightly.

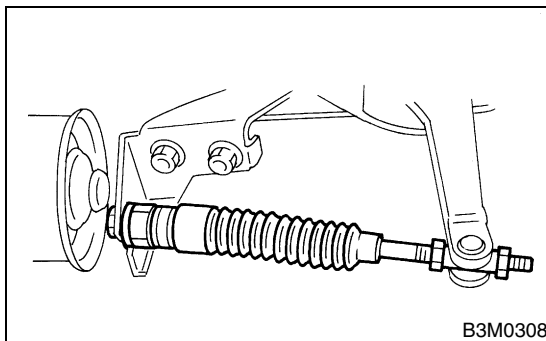
(2) Remove the bolts and nuts as shown in the figure.



13) Remove the rear vehicle speed sensor.



14) Remove the select cable nut.



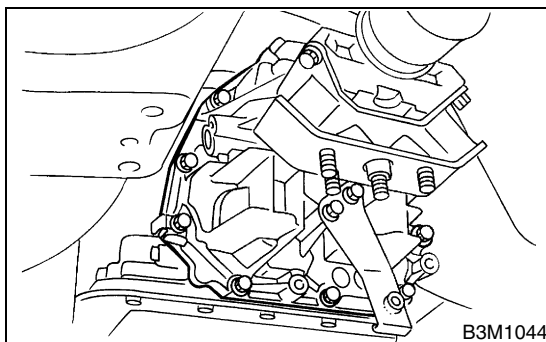
15) Move the gear select cable so that extension bolts can be removed.

16) Remove the bolts.

17) Remove the extension case.

NOTE:

Use a container to catch oil flowing from extension.

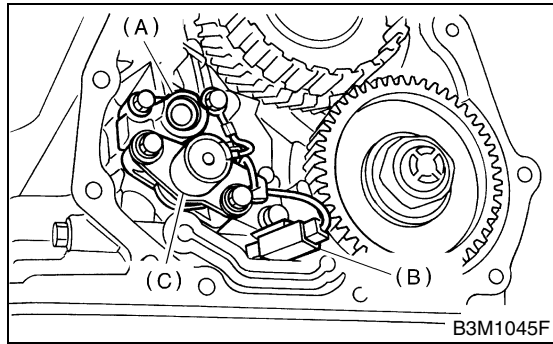


18) Disconnect the transfer duty solenoid connector.

SHIFT SOLENOIDS, DUTY SOLENOIDS AND ATF TEMPERATURE SENSOR

AUTOMATIC TRANSMISSION

19) Remove the transfer duty solenoid and transfer valve body.



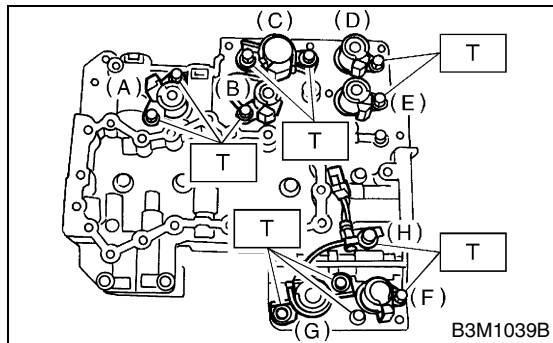
- (A) Transfer valve body
- (B) Transfer duty solenoid connector
- (C) Transfer duty solenoid

B: INSTALLATION

1) Install the solenoids and ATF temperature sensor.

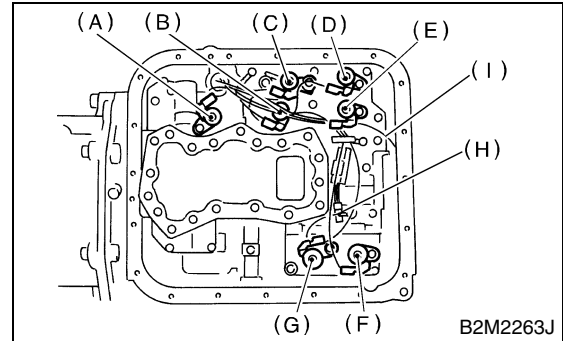
Tightening torque:

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 the harness connectors. Connect the connectors of same color, and secure the connectors to valve body using clips.

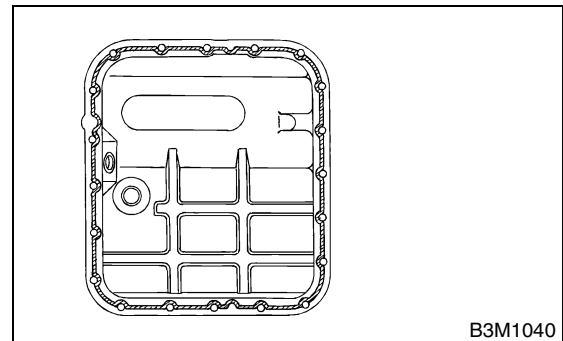


- (A) Lock-up duty solenoid (Blue)
- (B) Low clutch timing solenoid (Gray)
- (C) Line pressure duty solenoid (Red)
- (D) Shift solenoid 2 (Yellow)
- (E) Shift solenoid 1 (Green)
- (F) 2-4 brake timing solenoid (Black)
- (G) 2-4 brake duty solenoid (Red)
- (H) ATF temperature sensor
- (I) Transfer duty solenoid (Brown)

3) Apply proper amount of liquid gasket to the entire oil pan mating surface.

Fluid packing:

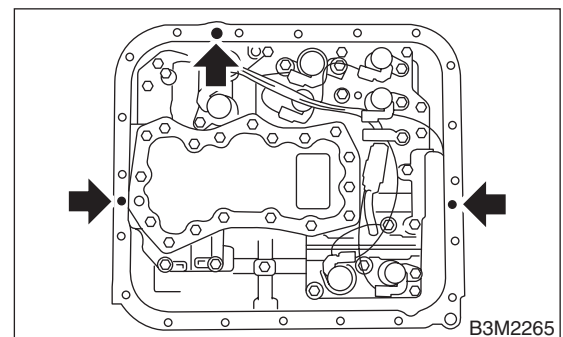
THREE BOND 1217B



4) Apply liquid gasket fully to three holes other than screw holes on transmission case.

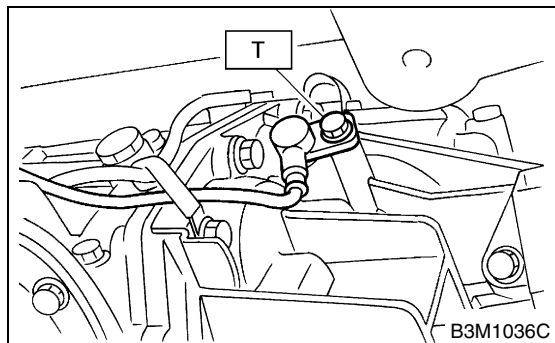
Fluid packing:

THREE BOND 1217B



5) Install the oil pan.

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)



- (A) Oil pan
- (B) Drain plug

6) Fill ATF up to the middle of the “COLD” side on level gauge by using the gauge hole. <Ref. to AT-9, Automatic Transmission Fluid.>

7) Check the ATF level. <Ref. to AT-9, Automatic Transmission Fluid.>

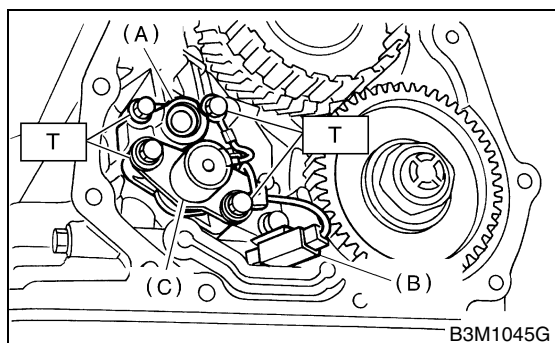
1. TRANSFER DUTY SOLENOID AND TRANSFER VALVE BODY

1) Install the transfer duty solenoid and transfer valve body.

- (1) Install the transfer duty solenoid and transfer valve body.

Tightening torque:
T: 8 N·m (0.8 kgf-m, 5.8 ft-lb)

- (2) Connect the transfer duty solenoid connector.



- (A) Transfer valve body
- (B) Transfer duty solenoid connector
- (C) Transfer duty solenoid

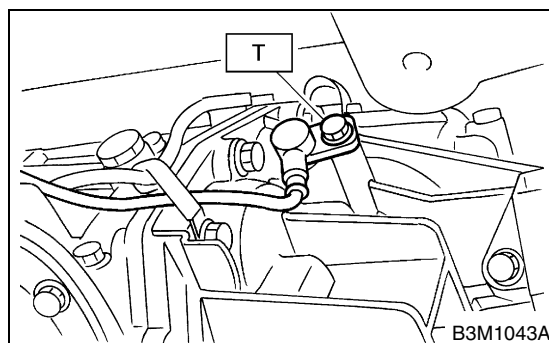
2) Install the extension case to transmission case.
 (1) Tighten eleven bolts.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)

(2) Adjust the select cable. <Ref. to CS-10, ADJUSTMENT, Select Cable.>

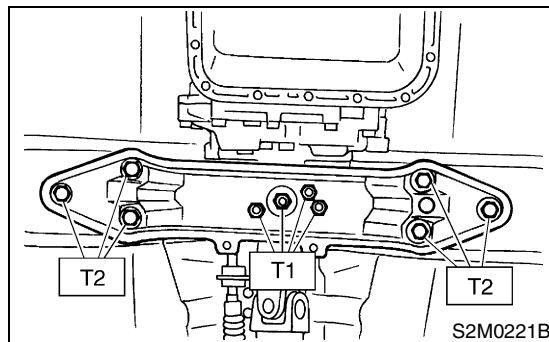
3) Install the rear vehicle speed sensor.

Tightening torque:
T: 7 N·m (0.7 kgf-m, 5.1 ft-lb)



4) Install the transmission rear crossmember.
 (1) Tighten the bolts.

Tightening torque:
T1: 35 N·m (3.6 kgf-m, 26 ft-lb)
T2: 70 N·m (7.1 kgf-m, 51 ft-lb)



(2) Lower and remove the transmission jack.
 5) Install the propeller shaft. <Ref. to DS-16, INSTALLATION, Propeller Shaft.>

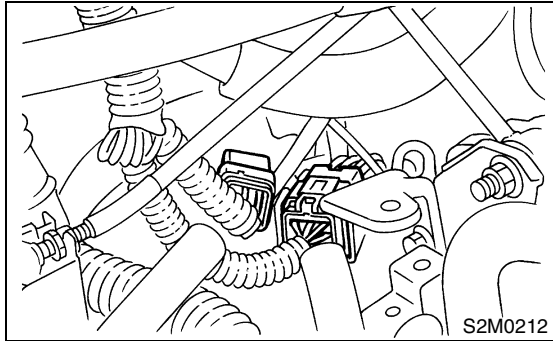
6) Install the front, center rear exhaust pipe and muffler. (Turbo model) <Ref. to EX(w/oOBD)-10, INSTALLATION, Front Exhaust Pipe.>, <Ref. to EX(w/oOBD)-13, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(w/oOBD)-14, INSTALLATION, Muffler.> or <Ref. to EX-8, INSTALLATION, Front Exhaust Pipe.>, <Ref. to EX-11, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX-12, INSTALLATION, Muffler.>

7) Install the center, rear exhaust pipes and muffler. (Turbo model)
 <Ref. to EX(TURBO)-9, INSTALLATION, Center Exhaust Pipe.>, <Ref. to EX(TURBO)-13, INSTALLATION, Rear Exhaust Pipe.> and <Ref. to EX(TURBO)-14, INSTALLATION, Muffler.>

SHIFT SOLENOIDS, DUTY SOLENOIDS AND ATF TEMPERATURE SENSOR

AUTOMATIC TRANSMISSION

- 8) Lower and remove the jack.
- 9) Connect the transmission harness connector.

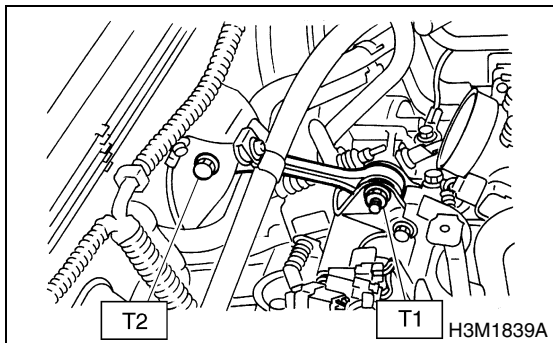


- 10) Install the pitching stopper.

Tightening torque:

T1: 50 N·m (5.1 kgf-m, 37 ft-lb)

T2: 58 N·m (5.9 kgf-m, 43 ft-lb)



- 11) Install the air cleaner case. <Ref. to IN-6, INSTALLATION, Air Cleaner Case.>
- 12) Install the intercooler. (Turbo model)
<Ref. to IN(TURBO)-11, INSTALLATION, Intercooler.>
- 13) Fill ATF up to the middle of the “COLD” side on level gauge by using the gauge hole. <Ref. to AT-9, Automatic Transmission Fluid.>
- 14) Check the ATF level. <Ref. to AT-9, Automatic Transmission Fluid.>

18.ATF Filter

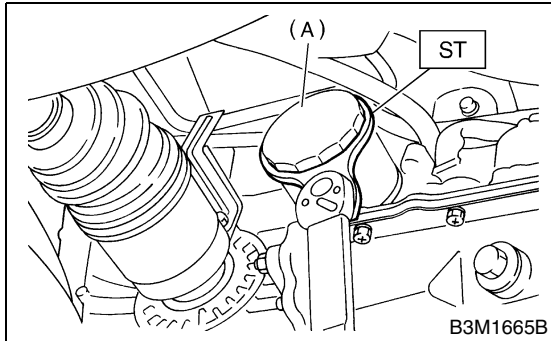
A: REMOVAL

NOTE:

The ATF filter is maintenance free.

- 1) Lift-up the vehicle.
- 2) Using the ST, remove the ATF filter.

ST 498545400 OIL FILTER WRENCH



(A) ATF filter

- 3) Use a new ATF filter and apply a thin coat of ATF to the oil seal.

B: INSTALLATION

- 1) Install the ATF filter. Turn it by hand, being careful not to damage the oil seal.
- 2) Using the ST, tighten the ATF filter to transmission case.

Calculate the ATF filter torque specifications using the following formula.

$$T2 = L2 / (L1 + L2) \times T1$$

T1: 14 N·m (1.4 kgf·m, 10.1 ft·lb)

[Required torque setting]

T2: Tightening torque

L1: ST length 0.078 m (3.07 in)

L2: Torque wrench length

Example:

Torque wrench length mm (in)	Tightening torque N·m (kgf·m, ft·lb)
100 (3.94)	7.7 (0.79, 5.7)
150 (5.91)	9.0 (0.92, 6.7)
200 (7.87)	10 (1.0, 7.2)

NOTE:

Align the ST with torque wrench while tightening ATF filter.

ST 498545400 OIL FILTER WRENCH

- 3) Add ATF.
- 4) Inspect the level of ATF. <Ref. to AT-9, Automatic Transmission Fluid.>

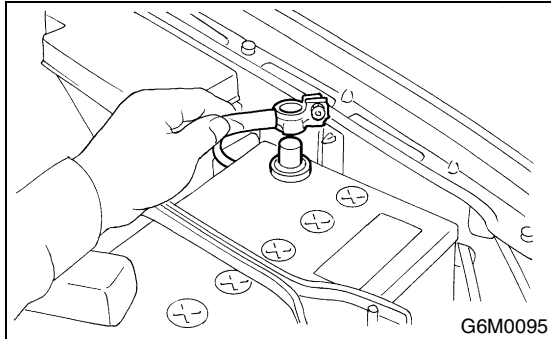
TRANSMISSION CONTROL MODULE (TCM)

AUTOMATIC TRANSMISSION

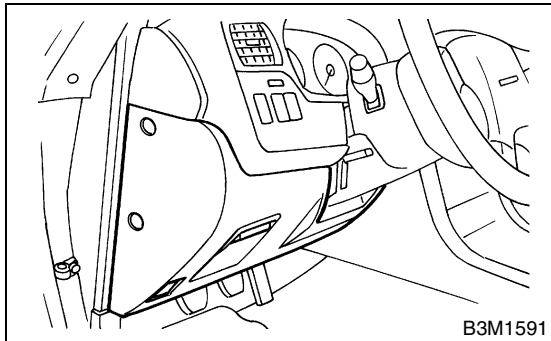
19. Transmission Control Module (TCM)

A: REMOVAL

1) Disconnect the ground cable from battery.

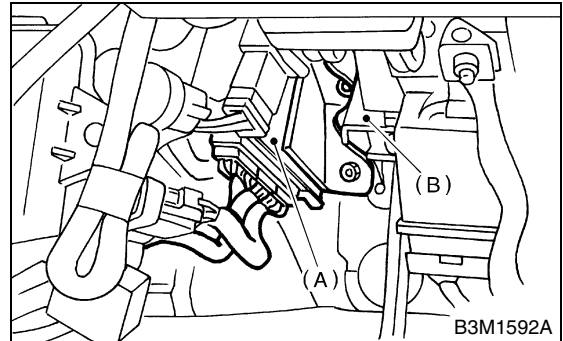


2) Remove the lower cover and then disconnect the connector.



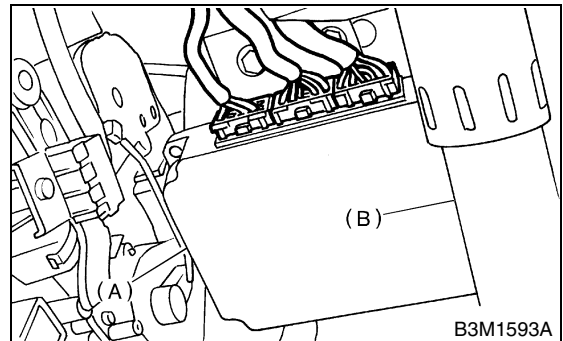
3) Disconnect the connectors from transmission control module.

• LHD MODEL



- (A) Transmission control module
- (B) Brake pedal bracket

• RHD MODEL



- (A) Transmission control module
- (B) Column shaft

4) Remove the transmission control module.

B: INSTALLATION

1) Install the transmission control module.

Tightening torque:

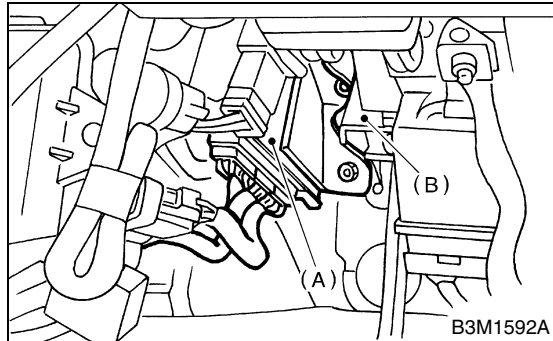
LHD model

7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

RHD model

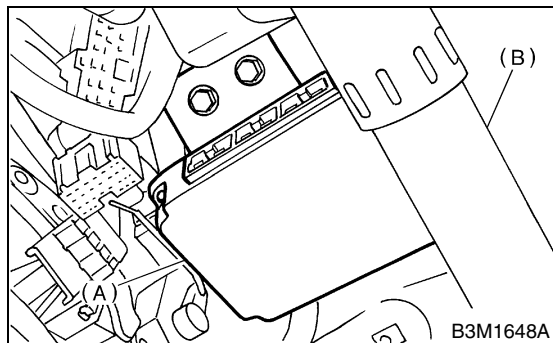
25 N·m (2.5 kgf-m, 18.1 ft-lb)

- LHD MODEL



- (A) Transmission control module
- (B) Brake pedal bracket

- RHD MODEL



- (A) Transmission control module
- (B) Column shaft

2) Connect the connectors to transmission control module.

3) Install in the reverse order of removal.

ATF COOLER PIPE AND HOSE

AUTOMATIC TRANSMISSION

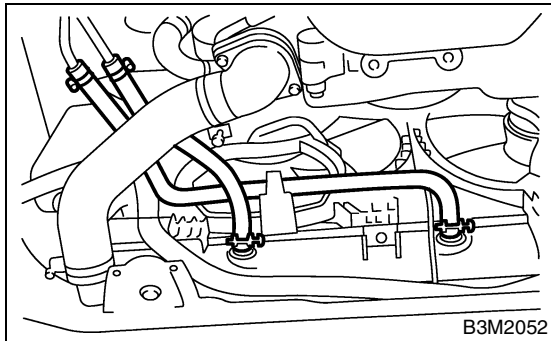
20.ATF Cooler Pipe and Hose

A: REMOVAL

- 1) Set the vehicle on a lift.
- 2) Remove the battery and washer tank.
- 3) Lift-up the vehicle.
- 4) Remove the under cover.
- 5) Disconnect the ATF cooler hose from radiator.

NOTE:

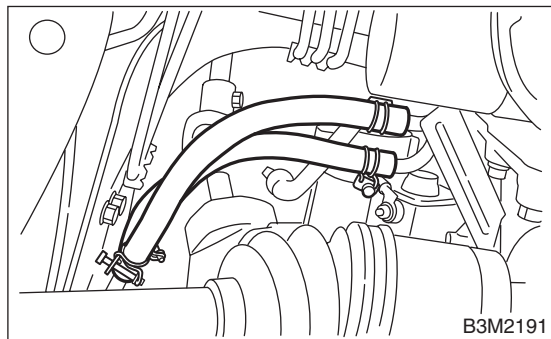
- Do not remove with a screwdriver or other pointed tools.
- When the hose is difficult to remove, wrap a shop cloth around the hose to protect it. Turn it with pliers, and then pull directly out with your hand.



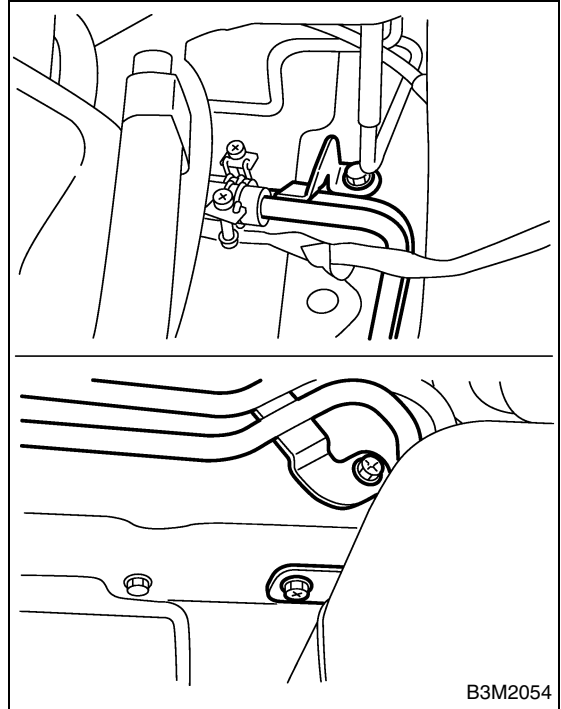
- 6) Disconnect the ATF cooler hoses from pipes.

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.



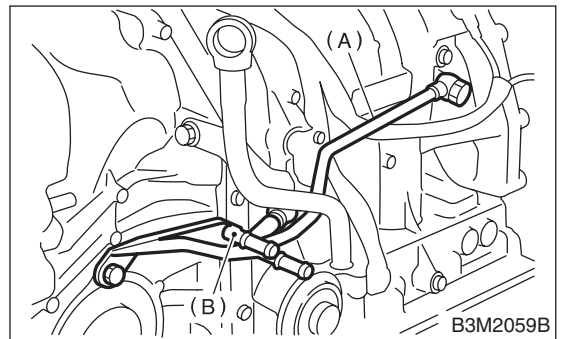
- 7) Remove the ATF cooler pipe from frame.



- 8) Remove the oil cooler inlet and outlet pipes.

NOTE:

When removing the outlet pipe, be careful not to lose ball and spring used with retaining screw.



- (A) Inlet pipe
- (B) Outlet pipe

B: INSTALLATION

1) Install the oil cooler outlet and inlet pipes.

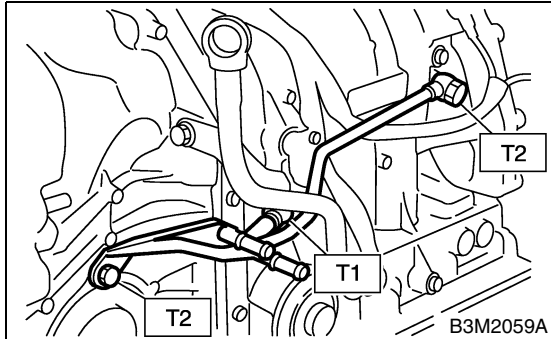
NOTE:

Be sure to use a new aluminum washer.

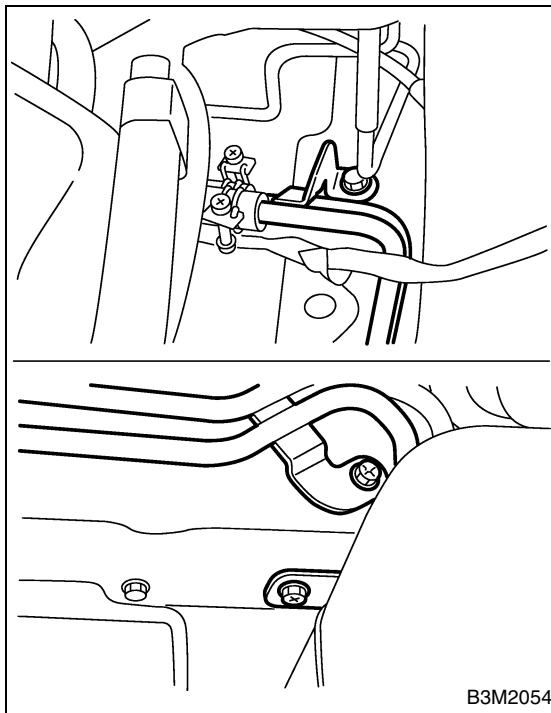
Tightening torque:

T1: 44 N·m (4.5 kgf-m, 32.5 ft-lb)

T2: 25 N·m (2.5 kgf-m, 18.1 ft-lb)



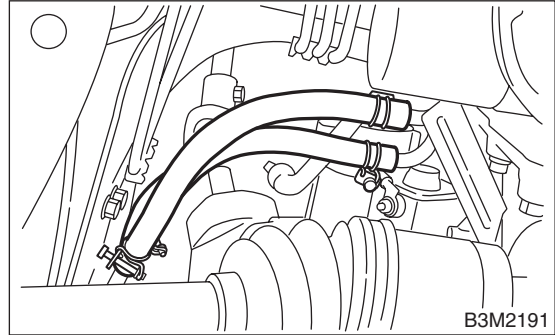
2) Install the ATF cooler pipe to frame.



3) Connect the ATF cooler hose to pipe transmission side.

NOTE:

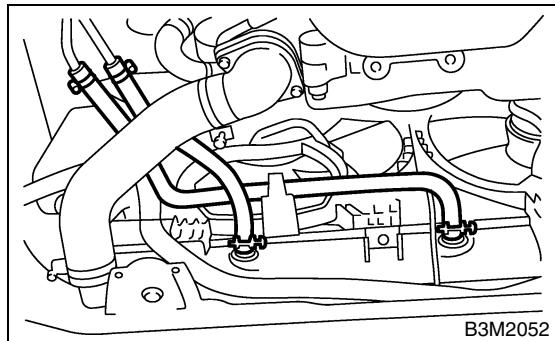
- Install so that the hose is not folded over, excessively bent, or twisted.
- Be careful to insert the hose to the specified position.



4) Connect the ATF cooler hose to the 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 the 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.

ATF COOLER PIPE AND HOSE

AUTOMATIC TRANSMISSION

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.

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

AT

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2. Check List for Interview	4
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5. Transmission Control Module (TCM) I/O Signal	14
6. Subaru Select Monitor.....	20
7. Read Diagnostic Trouble Code (DTC)	22
8. Inspection Mode	24
9. Clear Memory Mode.....	25
10. POWER Indicator Light Display	26
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15. Diagnostic Procedure for No-diagnostic Trouble Code (DTC)	105
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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 trouble occurred using interview checklist. <Ref. to AT-4, Check List for Interview.> 2)Before performing the diagnosis, inspect 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 the unit that might influence AT problem normal?	Go to step 2.	Repair or replace each item.
2 CHECK POWER INDICATOR LIGHT. Turn the ignition switch to ON.	Does not the POWER indicator light up?	Go to step 3.	Go to step 4.
3 CHECK POWER INDICATOR LIGHT. 1)Turn the ignition switch to OFF. 2)Repair the POWER indicator light circuit or power supply and ground line circuit. <Ref. to AT-28, Diagnostic Procedure for POWER Indicator Light.> 3)Turn the ignition switch to ON.	Is the POWER indicator light flashing?	Go to step 4.	Go to step 5.
4 CHECK INDICATION OF DIAGNOSTIC TROUBLE CODE (DTC). Calling up the DTC. Without SUBARU SELECT MONITOR <Ref. to AT-22, WITHOUT SUBARU SELECT MONITOR, Read Diagnostic Trouble Code (DTC).> With SUBARU SELECT MONITOR <Ref. to AT-23, WITH SUBARU SELECT MONITOR, Read Diagnostic Trouble Code (DTC).> NOTE: If the communication function of select monitor cannot be executed normally, check the communication circuit. <Ref. to AT-37, COMMUNICATION FOR INITIALIZING IMPOSSIBLE, Diagnostic Procedure for Select Monitor Communication.>	Is the DTC displayed?	Go to step 6. NOTE: Record all DTC.	Go to step 5.

BASIC DIAGNOSTIC PROCEDURE

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
<p>5 PERFORM THE GENERAL DIAGNOSTICS. 1)Inspect using “Diagnostic Procedure for No-diagnostic trouble code (DTC)”.<Ref. to AT-105, Diagnostic Procedure for No-diagnostic Trouble Code (DTC).> 2)Inspect using “Symptom Related Diagnostic”. <Ref. to AT-133, Symptom Related Diagnostic.> 3)Perform the clear memory mode. Without SUBARU SELECT MONITOR <Ref. to AT-25, WITH SUBARU SELECT MONITOR, Clear Memory Mode.> With SUBARU SELECT MONITOR <Ref. to AT-25, WITHOUT SUBARU SELECT MONITOR, Clear Memory Mode.> 4)Perform the inspection mode. <Ref. to AT-24, Inspection Mode.> Calling up the DTC. Without SUBARU SELECT MONITOR <Ref. to AT-22, WITHOUT SUBARU SELECT MONITOR, Read Diagnostic Trouble Code (DTC).> With SUBARU SELECT MONITOR <Ref. to AT-23, WITH SUBARU SELECT MONITOR, OPERATION, Read Diagnostic Trouble Code (DTC).></p>	<p>Is the DTC displayed?</p>	<p>Complete the diagnosis.</p>	<p>Go to step 6.</p>
<p>6 PERFORM THE DIAGNOSIS. 1)Inspect using “Diagnostics Chart with Diagnostic Trouble Code (DTC)”.<Ref. to AT-42, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> NOTE: For trouble code table, refer to “List of Diagnostic Trouble Code (DTC)”.<Ref. to AT-27, List of Diagnostic Trouble Code (DTC).> 2)Repair the trouble cause. 3)Perform the clear memory mode. Without SUBARU SELECT MONITOR <Ref. to AT-25, WITH SUBARU SELECT MONITOR, OPERATION, Clear Memory Mode.> With SUBARU SELECT MONITOR <Ref. to AT-25, WITHOUT SUBARU SELECT MONITOR, Clear Memory Mode.> 4)Perform the inspection mode. <Ref. to AT-24, Inspection Mode.> 5)Calling up the DTC. Without SUBARU SELECT MONITOR <Ref. to AT-22, WITHOUT SUBARU SELECT MONITOR, OPERATION, Read Diagnostic Trouble Code (DTC).> With SUBARU SELECT MONITOR <Ref. to AT-23, WITH SUBARU SELECT MONITOR, OPERATION, Read Diagnostic Trouble Code (DTC).></p>	<p>Is the DTC displayed?</p>	<p>Complete the diagnosis.</p>	<p>Inspect using “Diagnostics Chart with Diagnostic Connector”. <Ref. to AT-42, Diagnostic Procedure with Diagnostic Trouble Code (DTC).></p>

CHECK LIST FOR INTERVIEW

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

2. Check List for Interview

A: CHECK

Check the following items when problem has occurred.

NOTE:

Use copies of this page for interviewing customers.

Customer's name		
Data vehicle brought in		
Data of repair		
Trans. model	TRANSMISSION	VIN
Odometer reading	km/h or mile	
Frequency	<input type="checkbox"/> Continuous <input type="checkbox"/> Intermittent (times a day)	
Weather	<input type="checkbox"/> Fine <input type="checkbox"/> Cloudy <input type="checkbox"/> Rainy <input type="checkbox"/> Snowy <input type="checkbox"/> Various/Others ()	
Place	<input type="checkbox"/> High <input type="checkbox"/> Suburbs <input type="checkbox"/> Inner city <input type="checkbox"/> Uphill <input type="checkbox"/> Rough road <input type="checkbox"/> Others ()	
Outdoor temperature	<input type="checkbox"/> Hot <input type="checkbox"/> Warm <input type="checkbox"/> Cool <input type="checkbox"/> Cold	
Vehicle speed	km/h (MPH)	
Malfunction indicator lamp (MIL)	<input type="checkbox"/> Continuously lit	<input type="checkbox"/> Not lit
Select lever position	<input type="checkbox"/> P <input type="checkbox"/> R <input type="checkbox"/> N <input type="checkbox"/> D <input type="checkbox"/> 3 <input type="checkbox"/> 2 <input type="checkbox"/> 1	
Driving condition	<input type="checkbox"/> Not affected <input type="checkbox"/> At racing <input type="checkbox"/> While decelerating	<input type="checkbox"/> At starting <input type="checkbox"/> While accelerating <input type="checkbox"/> While turning (<input type="checkbox"/> RH/ <input type="checkbox"/> LH)
		<input type="checkbox"/> While idling <input type="checkbox"/> While cruising
POWER switch	<input type="checkbox"/> ON <input type="checkbox"/> OFF	
HOLD switch	<input type="checkbox"/> ON <input type="checkbox"/> OFF	
Symptoms	<input type="checkbox"/> No up-shift	
	<input type="checkbox"/> No down-shift	
	<input type="checkbox"/> No kick down	
	<input type="checkbox"/> Vehicle does not move (<input type="checkbox"/> Any position <input type="checkbox"/> Particular position)	
	<input type="checkbox"/> Lock-up malfunction	
	<input type="checkbox"/> Noise or vibration	
	<input type="checkbox"/> Shift shock or slip	
	<input type="checkbox"/> Select lever does not move	
	<input type="checkbox"/> Others ()	

GENERAL DESCRIPTION

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

3. General Description

A: CAUTION

- **Supplemental Restraint System “Airbag”**

The 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 an electrical test equipment on these circuit.
- Be careful not to damage the airbag system wiring harness when performing diagnostics and servicing the TCM.

- **Measurement**

When measuring the voltage and resistance of ECM, TCM or each sensor, use a tapered pin with 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 the battery voltage and specific gravity of electrolyte.

Standard voltage: 12V or more

Specific gravity: Above 1.260

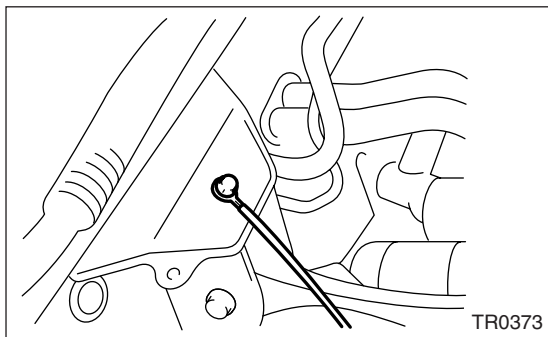
2. TRANSMISSION GROUND

Make sure that the ground terminal bolt is tightened securely.

- **Chassis side**

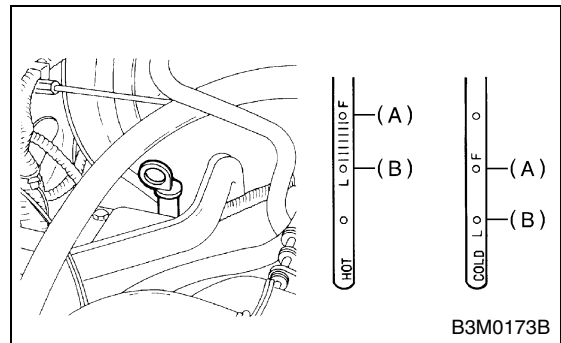
Tightening torque:

13 N·m (1.3 kgf·m, 9.4 ft·lb)



3. ATF LEVEL

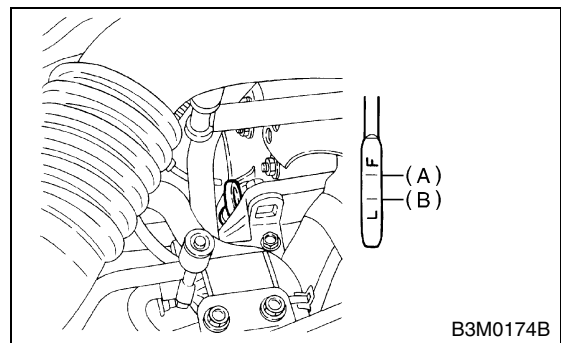
Make sure that ATF level is in the specification. <Ref. to AT-9, INSPECTION, Automatic Transmission Fluid.>



- (A) Upper level
- (B) Lower level

4. FRONT DIFFERENTIAL OIL LEVEL

Make sure that front differential oil level is in the specification. <Ref. to AT-11, INSPECTION, Differential Gear Oil.>



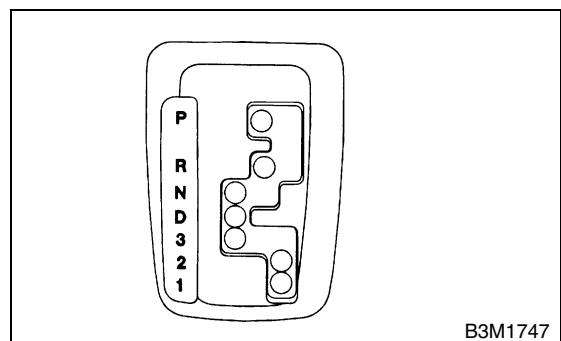
- (A) Upper level
- (B) Lower level

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.

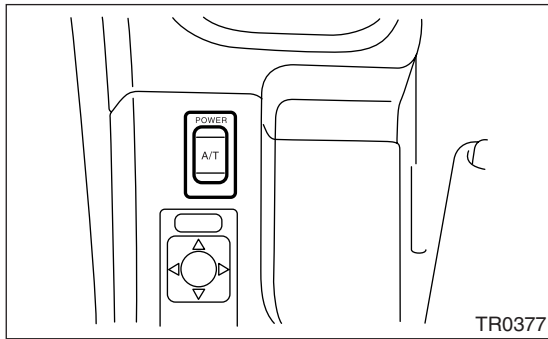


GENERAL DESCRIPTION

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

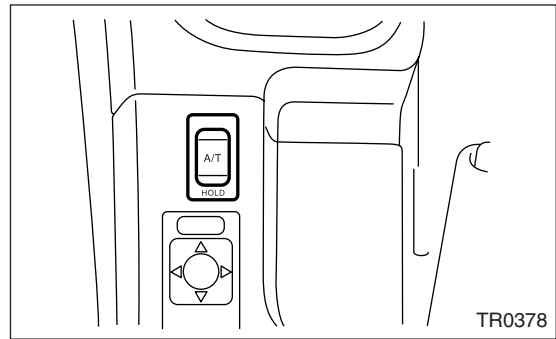
6. POWER SWITCH

Make sure that the POWER indicator light in combination meter comes ON, when turning the power switch to ON.



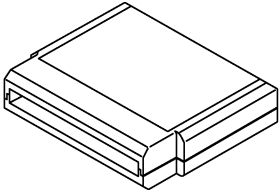

7. HOLD SWITCH

Make sure that the HOLD indicator light in combination meter comes ON, when turning the hold switch to ON.



C: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p>B2M3876</p>	24082AA190 (Newly adopted tool)	CARTRIDGE	Troubleshooting for electrical systems.
 <p>B2M3877</p>	22771AA030	SELECT MONITOR KIT	Troubleshooting for electrical systems. <ul style="list-style-type: none"> • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

2. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance, voltage and ampere.
Oscilloscope	Used for measuring sensor.

GENERAL DESCRIPTION

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

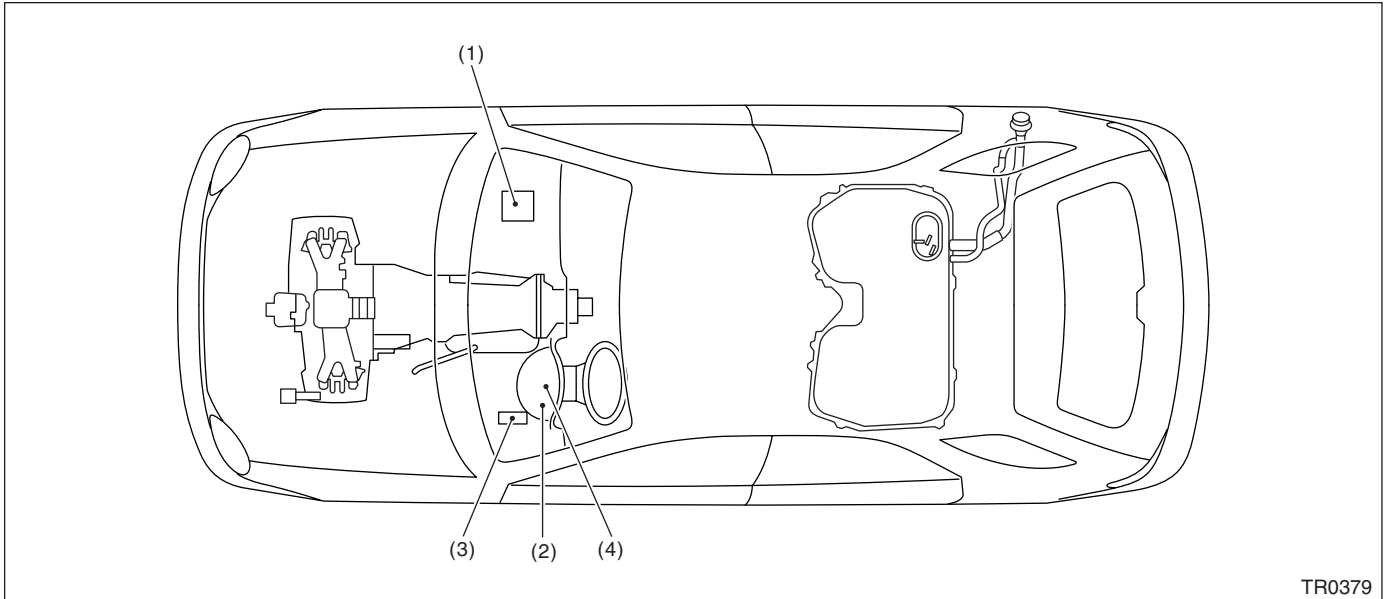
ELECTRICAL COMPONENTS LOCATION

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

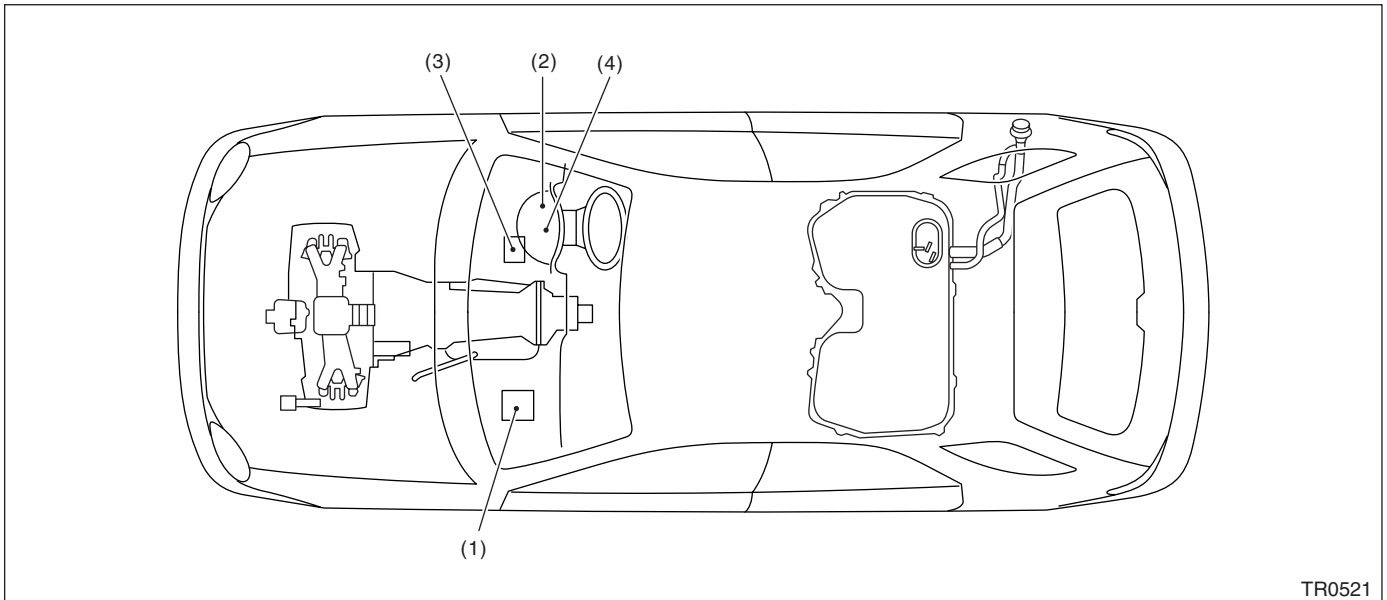
4. Electrical Components Location

A: LOCATION

1. CONTROL MODULE



TR0379

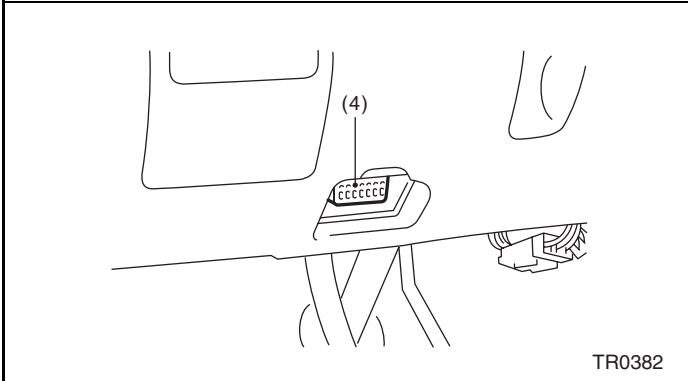
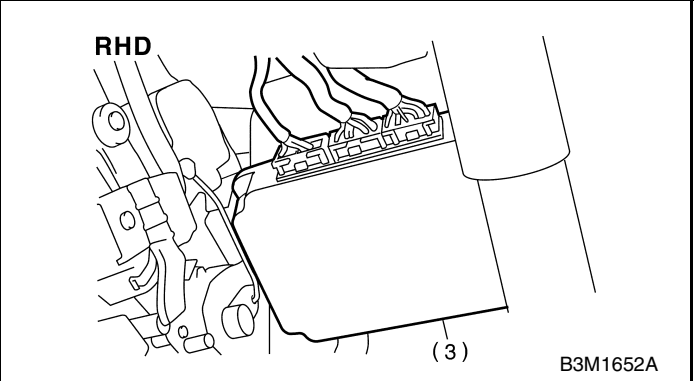
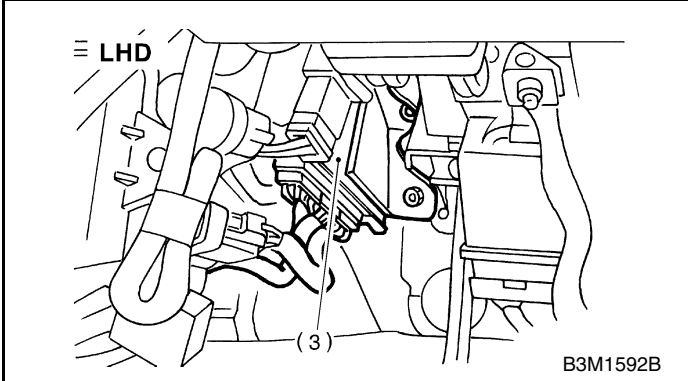
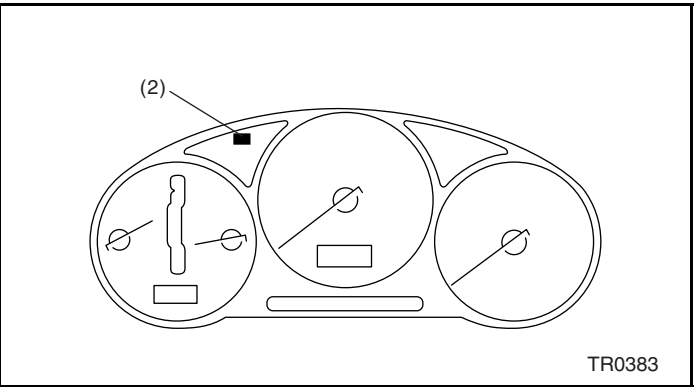
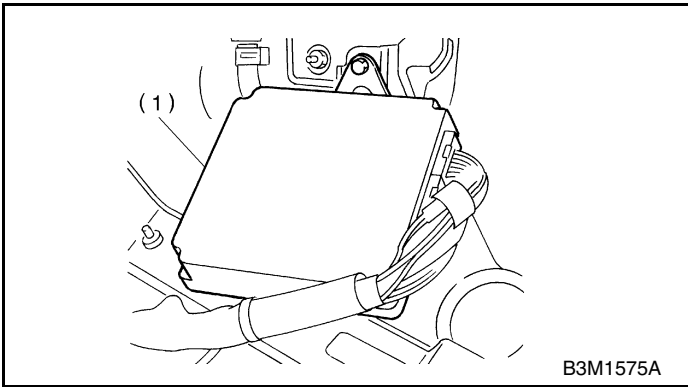


TR0521

- | | |
|---|---------------------------------------|
| (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

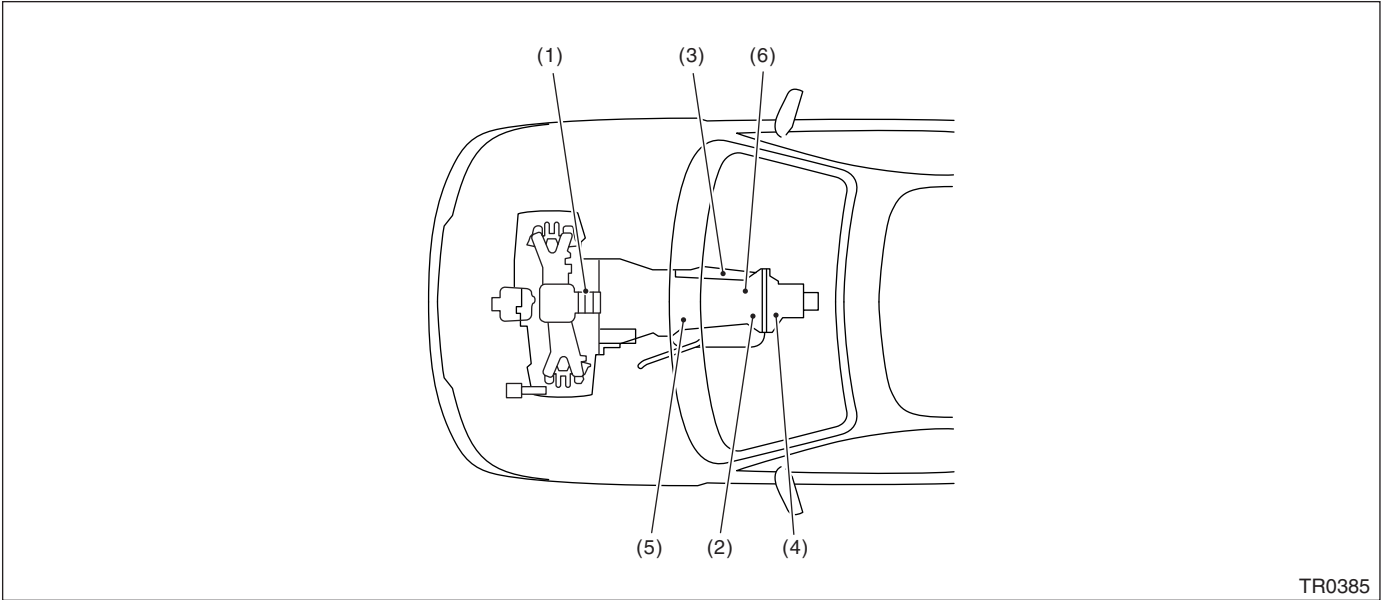
AUTOMATIC TRANSMISSION (DIAGNOSTICS)



ELECTRICAL COMPONENTS LOCATION

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

2. SENSOR

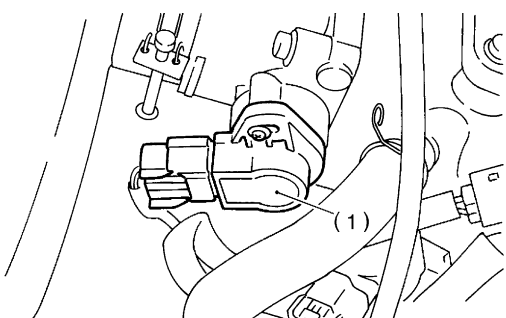
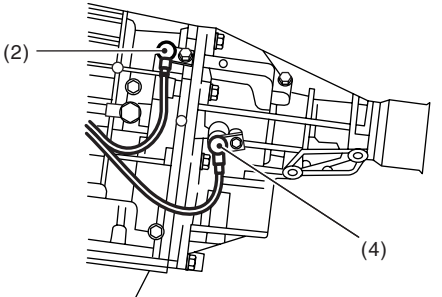
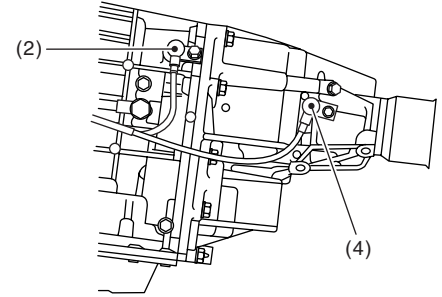
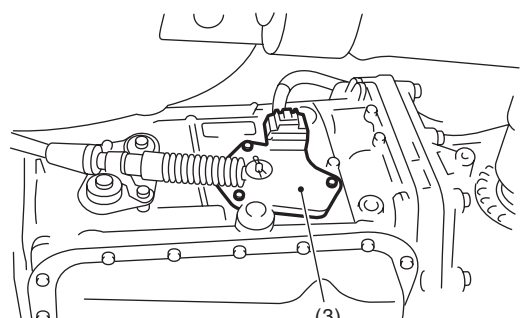
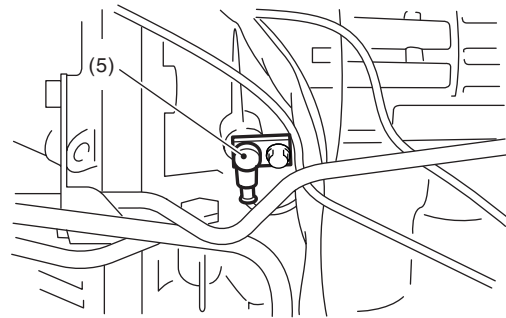
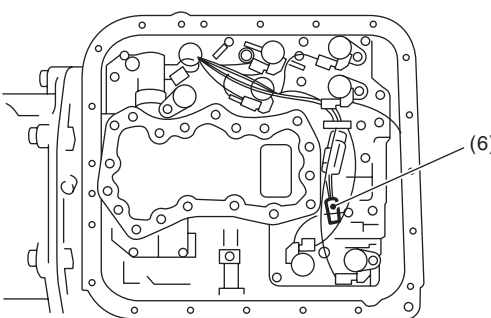


TR0385

- | | | |
|--------------------------------|---|----------------------------|
| (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

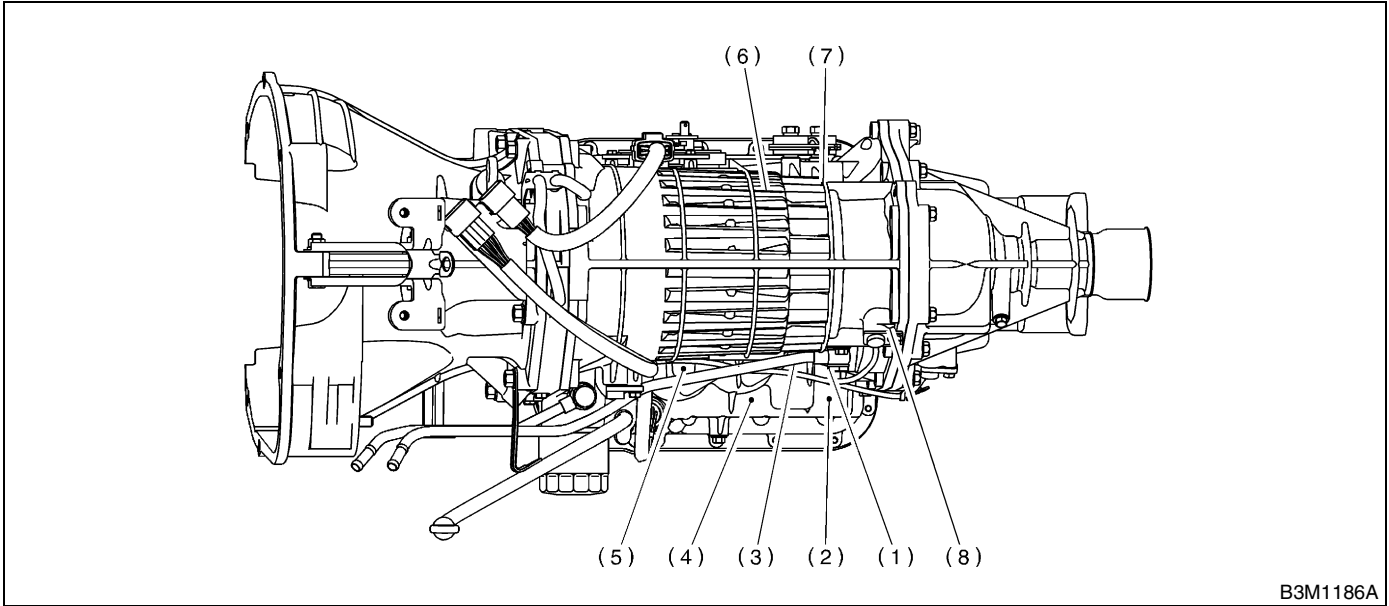
AUTOMATIC TRANSMISSION (DIAGNOSTICS)

 <p>S2M0262B</p>	<p>Non-turbo model</p>  <p>TR0387</p>
<p>Turbo model</p>  <p>TR0592</p>	 <p>TR0388</p>
 <p>TR0390</p>	 <p>TR0389</p>

ELECTRICAL COMPONENTS LOCATION

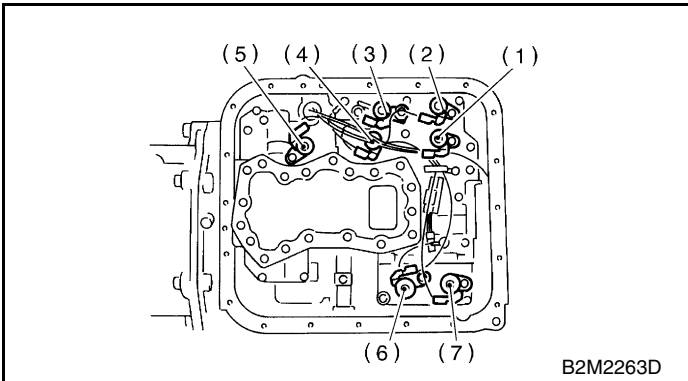
AUTOMATIC TRANSMISSION (DIAGNOSTICS)

3. SOLENOID

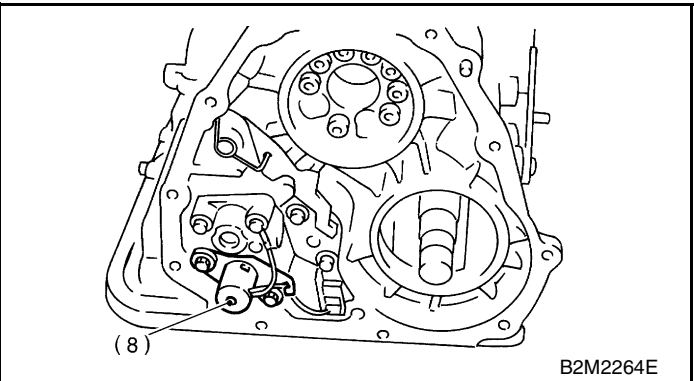


B3M1186A

- | | | |
|---------------------------------|--------------------------------|-------------------------------|
| (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 | |



B2M2263D



B2M2264E

ELECTRICAL COMPONENTS LOCATION

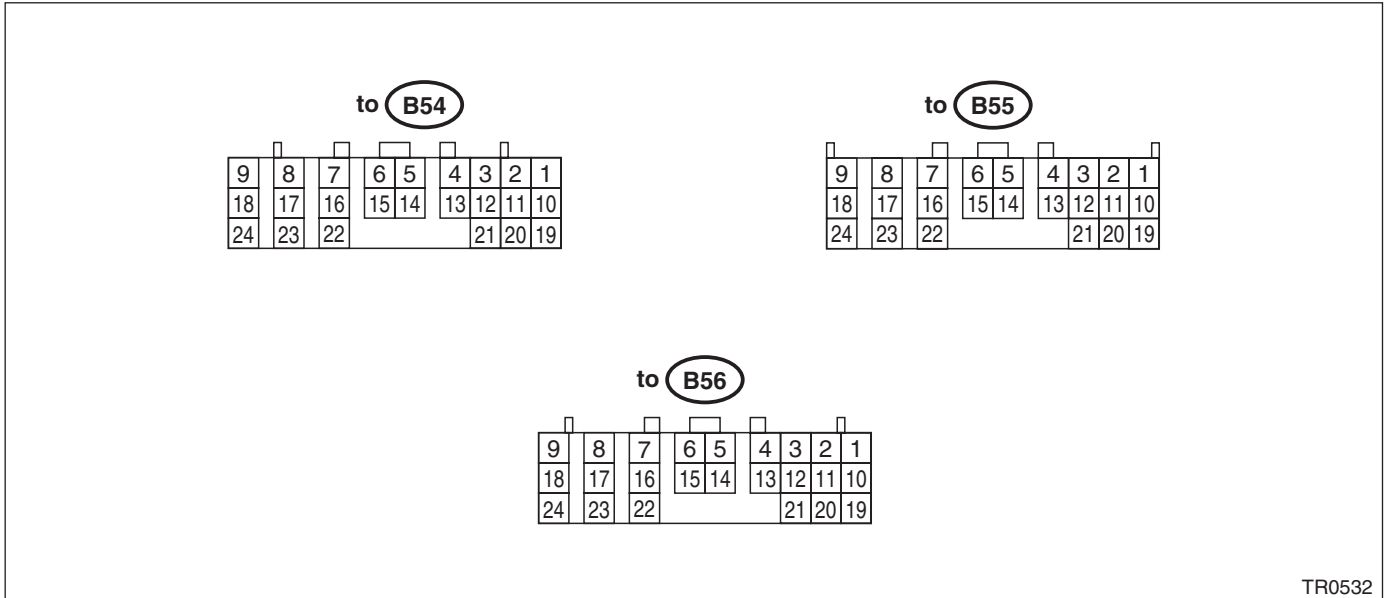
AUTOMATIC TRANSMISSION (DIAGNOSTICS)

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 — 13	—	
Ignition power supply	B54	23	Ignition switch ON (with engine OFF)	10 — 13	—	
	B54	24				
Inhibitor switch	“P” range switch	B55	1	Select lever in “P” range	Less than 1	—
				Select lever in any other than “P” range (except “N” range)	More than 8	
	“N” range switch	B55	14	Select lever in “N” range	Less than 1	—
				Select lever in any other than “N” range (except “P” range)	More than 8	
	“R” range switch	B55	3	Select lever in “R” range	Less than 1	—
				Select lever in any other than “R” range	More than 8	
	“D” range switch	B55	4	Select lever in “D” range	Less than 1	—
				Select lever in any other than “D” range	More than 8	
	“3” range switch	B55	5	Select lever in “3” range	Less than 1	—
				Select lever in any other than “3” range	More than 8	
	“2” range switch	B55	6	Select lever in “2” range	Less than 1	—
				Select lever in any other than “2” range	More than 8	
	“1” range switch	B55	7	Select lever in “1” range	Less than 1	—
				Select lever in any other than “1” range	More than 8	
Brake switch	B55	12	Brake pedal depressed.	More than 10.5	—	
			Brake pedal released.	Less than 1		

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)
Kick-down switch	B55	11	Throttle fully opened.	Less than 1	—
			Throttle fully closed.	More than 6.5	
AT OIL TEMP warning light	B56	10	Light ON	Less than 1	—
			Light OFF	More than 9	
Throttle position sensor	B54	3	Throttle fully closed.	0.2 — 1.0	—
			Throttle fully open.	4.2 — 4.7	
Throttle position sensor power supply	B54	2	Ignition switch ON (with engine OFF)	4.8 — 5.3	—
ATF temperature sensor	B54	11	ATF temperature 20°C (68°F)	1.6 — 2.0	2.1 k — 2.9 k
			ATF temperature 80°C (176°F)	0.4 — 0.9	275 — 375
Rear vehicle speed sensor	B55	24	Vehicle stopped.	0	450 — 650
			Vehicle speed at least 20 km/h (12 MPH)	More than 1 (AC range)	
Front vehicle speed sensor	B55	18	Vehicle stopped.	0	450 — 650
			Vehicle speed at least 20 km/h (12 MPH)	More than 1 (AC range)	
Torque converter turbine speed sensor	B55	8	Engine idling after warm-up. (D range)	0	450 — 650
			Engine idling after warm-up. (N range)	More than 1 (AC range)	
Vehicle speed output signal	B56	17	Vehicle speed at most 10 km/h (6 MPH)	Less than 1 ← → More than 4	—
Engine speed signal	B55	17	Ignition switch ON (with engine OFF)	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 (Non-turbo model)	B54	1	Engine idling after warm-up.	0.4 — 1.6	—
Mass air flow signal (Turbo model)	B54	1	Engine idling after warm-up.	0.9 — 1.4	—
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

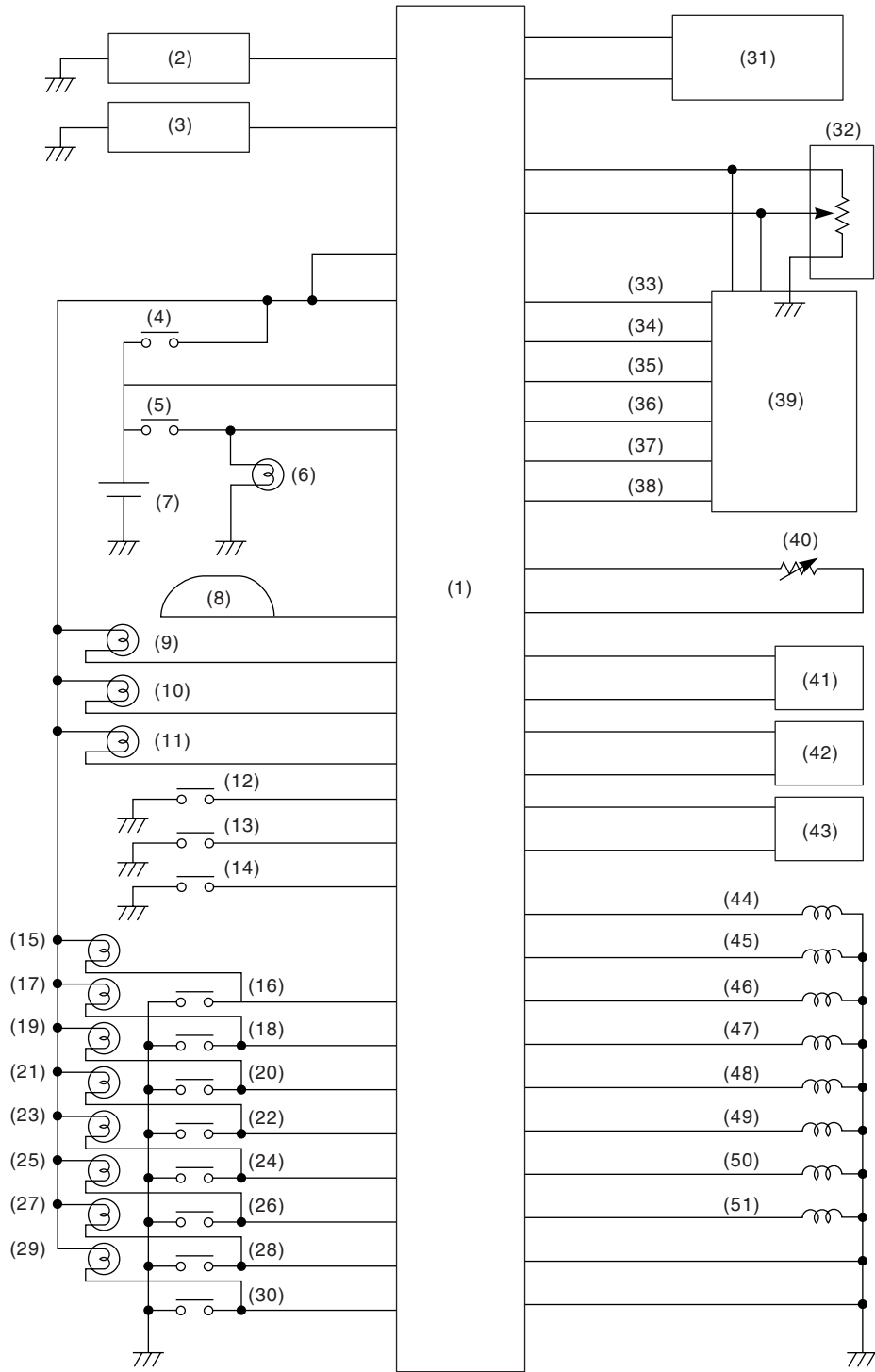
AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Check with ignition switch ON.					
Content	Connector 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 (Non-turbo model)	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	
Transfer duty solenoid (Turbo model)	B56	6	Throttle fully closed.	More than 8.5	10 — 17
			Throttle fully open.	Less than 0.5	
2-4 brake duty solenoid	B54	18	Throttle fully closed (with engine OFF) after warm-up.	1.5 — 5.0	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	—	—	—

TRANSMISSION CONTROL MODULE (TCM) I/O SIGNAL

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

B: SCHEMATIC



TR0395

TRANSMISSION CONTROL MODULE (TCM) I/O SIGNAL

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

- | | | |
|---|--------------------------------|--|
| (1) Transmission control module | (18) "P" range switch | (37) Non-turbo model:
Intake manifold pressure signal |
| (2) Cruise control module | (19) "R" range indicator light | Turbo model:
Mass air flow 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 | (42) Rear vehicle speed sensor |
| (8) Combination meter (Speedometer circuit) | (25) "3" range indicator light | (43) Front vehicle speed sensor |
| (9) AT OIL TEMP light | (26) "3" range switch | (44) Shift solenoid 1 |
| (10) FWD indicator light (Non-turbo model) | (27) "2" range indicator light | (45) Shift solenoid 2 |
| (11) POWER indicator light | (28) "2" range switch | (46) 2-4 brake timing solenoid |
| (12) FWD switch (Non-turbo model) | (29) "1" range indicator light | (47) Line pressure duty solenoid |
| (13) Power switch | (30) "1" range switch | (48) 2-4 brake duty solenoid |
| (14) Kick-down switch | (31) Data link connector | (49) Lock-up duty solenoid |
| (15) Hold indicator light | (32) Throttle position sensor | (50) Low clutch timing solenoid |
| (16) Hold switch | (33) Engine speed signal | (51) Transfer duty solenoid |
| (17) "P" range indicator light | (34) Torque control cut signal | |
| | (35) Torque control signal 2 | |
| | (36) Torque control signal 1 | |

SUBARU SELECT MONITOR

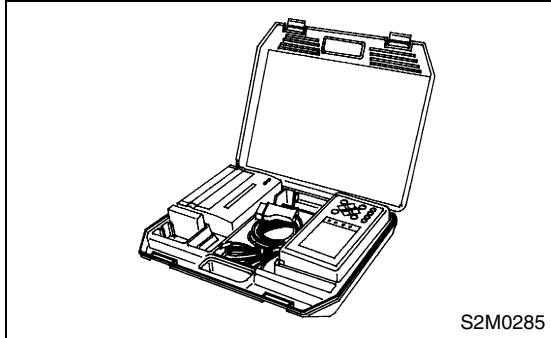
AUTOMATIC TRANSMISSION (DIAGNOSTICS)

6. Subaru Select Monitor

A: OPERATION

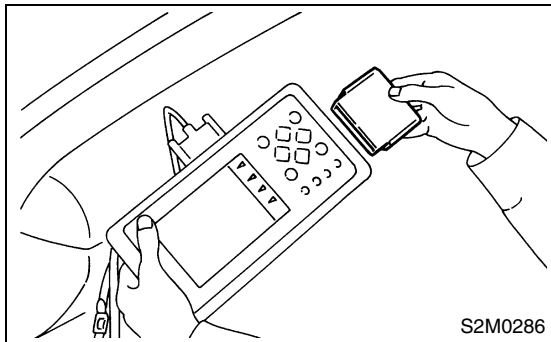
1. READ DIAGNOSTIC TROUBLE CODE

1) Prepare the Subaru Select Monitor kit.



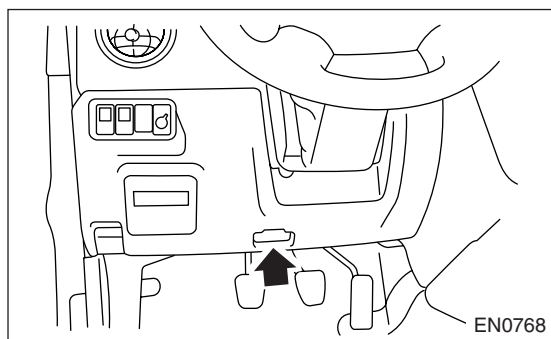
2) Connect the diagnosis cable to Subaru Select Monitor.

3) Insert the cartridge into Subaru Select Monitor.
<Ref. to AT-6, PREPARATION TOOL, General Description.>



4) Connect the Subaru Select Monitor to data link connector.

(1) Data link connector located in the lower portion of instrument panel (on driver's side).

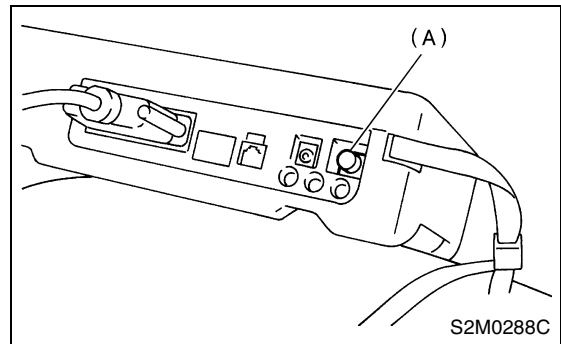


(2) Connect the diagnosis cable to data link connector.

NOTE:

Do not connect scan tools except for Subaru Select Monitor and OBD-II general scan tool.

5) Turn the 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 [YES] key.

7) On the «System Selection Menu» display screen, select the {Transmission Control System} and press [YES] key.

8) Press the [YES] key after displayed information of transmission type.

9) On the «Transmission Diagnosis» display screen, select the {Diagnostic Code(s) Display} and press [YES] key.

10) On the «Diagnostic Code(s) Display» display screen, select the {Latest Diagnostic Code(s)} or {Memorized Diagnostic Code(s)} and press [YES] key.

NOTE:

- For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

- For detailed concerning the diagnostic trouble codes (DTC), refer to the DIAGNOSTIC TROUBLE CODE LIST. <Ref. to AT-27, List of Diagnostic Trouble Code (DTC).>

2. READ CURRENT DATA

1) On the «Main Menu» display screen, select the {Each System Check} and press [YES] key.

2) On the «System Selection Menu» display screen, select the {Transmission Control System} and press [YES] key.

3) Press the [YES] key after displayed information of transmission type.

4) On the «Transmission Diagnosis» display screen, select the {Current Data Display & Save} and press [YES] key.

5) On the «Data Display Menu» display screen, select the {Data Display} and press [YES] key.

6) Using the scroll key, move the display screen up or down until desired data is shown.

- A list of the support data is shown in the following table.

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	%
Mass air flow sensor signal (Turbo model)	Air Flow Sensor Voltage	V
Intake manifold pressure sensor voltage (Non-turbo model)	Mani. Pressure Voltage	V
2 wheel drive switch signal (Non-turbo model)	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
Parking range signal	P Range Signal	ON or OFF
Neutral range signal	N Range Signal	ON or OFF
Reverse range signal	R Range Signal	ON or OFF
Drive range signal	D Range Signal	ON or OFF
3rd range signal	3rd Range Signal	ON or OFF
2nd range signal	2nd Range Signal	ON or OFF
1st range signal	1st Range Signal	ON or OFF
Shift control solenoid A	Shift Solenoid #1	ON or OFF
Shift control solenoid B	Shift Solenoid #2	ON or OFF
Torque control output signal #1	Torque Control Signal 1	ON or OFF
Torque control output signal #2	Torque Control Signal 2	ON or OFF
Torque control cut signal	Torque Control Cut Sig.	ON or OFF
2-4 brake timing control solenoid valve	2-4 Brake Timing Sol.	ON or OFF
Low clutch timing control solenoid valve	Low Clutch Timing Sol.	ON or OFF
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 [YES] key.
- 2) On the «System Selection Menu» display screen, select the {Transmission Control System} and press [YES] key.
- 3) Press the [YES] key after displayed information of transmission type.

4) On the «Transmission Diagnosis» display screen, select the {Clear Memory} and press [YES] key.

5) When the `Done' and `Turn Ignition Switch OFF' are shown on display screen, turn the Subaru Select Monitor and ignition switch to OFF.

NOTE:

For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

READ DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

7. Read Diagnostic Trouble Code (DTC)

A: OPERATION

1. WITHOUT SUBARU SELECT MONITOR

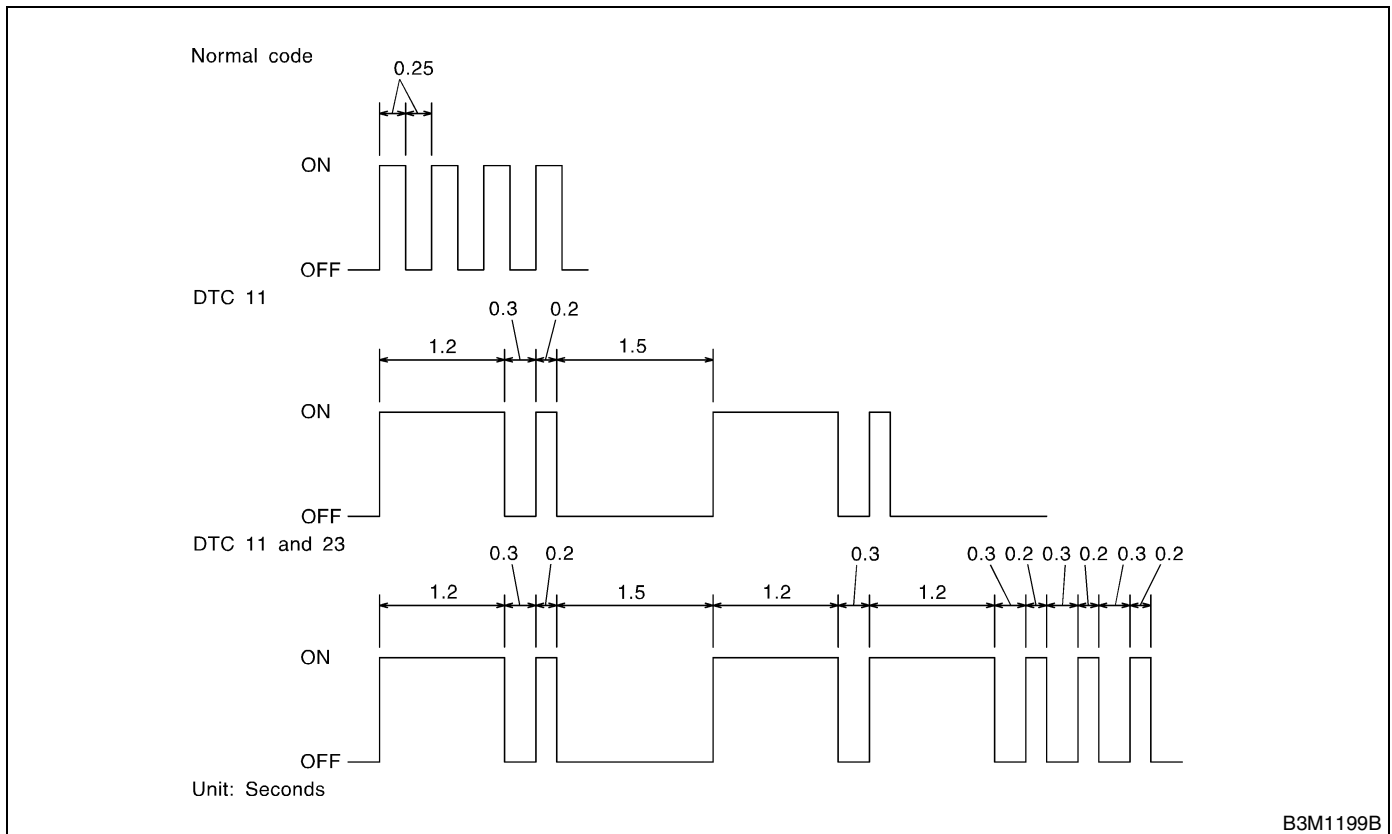
Step	Check	Yes	No
1 PERFORM READ DIAGNOSTIC TROUBLE CODE. 1)Warm-up the engine. 2)Turn the ignition switch to OFF. 3)Turn the ignition switch to ON. 4)Start the engine. 5)Drive the vehicle at speeds greater than 20 km/h (12 MPH). 6)Stop the vehicle. 7)The brake pedal depressed and move select lever to 1 range. 8)Turn the ignition switch to OFF. 9)Turn the ignition switch to ON. 10)Move the select lever 2 range. 11)Move the select lever 1 range. 12)Move the select lever 2 range. 13)Move the select lever 3 range. 14)Move the select lever D range.	Does the indicator light blink at 4 Hz intervals? NOTE: Blinks every 0.125 (1/8) seconds (until the ignition switch is turned OFF).	Repair the power supply and ground circuit.<Ref. to AT-34, CHECK POWER SUPPLY AND GROUND LINE, Diagnostic Procedure for POWER Indicator Light.>	Go to step 2.
2 CHECK INDICATOR LIGHT.	Does the indicator light blink at 2 Hz intervals? NOTE: Blinks every 0.25 (1/4) seconds (until ignition switch is turned to OFF).	The AT system is normal.	Go to step 3.
3 CHECK INDICATOR LIGHT.	Is the DTC outputted?	Inspect the problem corresponding with DTC. NOTE: Record all DTCs.	Go to step 4.
4 CHECK INDICATOR LIGHT.	Does the indicator light remain illuminated?	Repair the power indicator light circuit <Ref. to AT-28, Diagnostic Procedure for POWER Indicator Light.>, or Inspect inhibitor switch, wiring, TCM, etc.	Calling up the DTC again.

READ DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

The power indicator light flashes the code corresponding to 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 diagnostic trouble codes (DTC). <Ref. to AT-20, OPERATION, Subaru Select Monitor.>

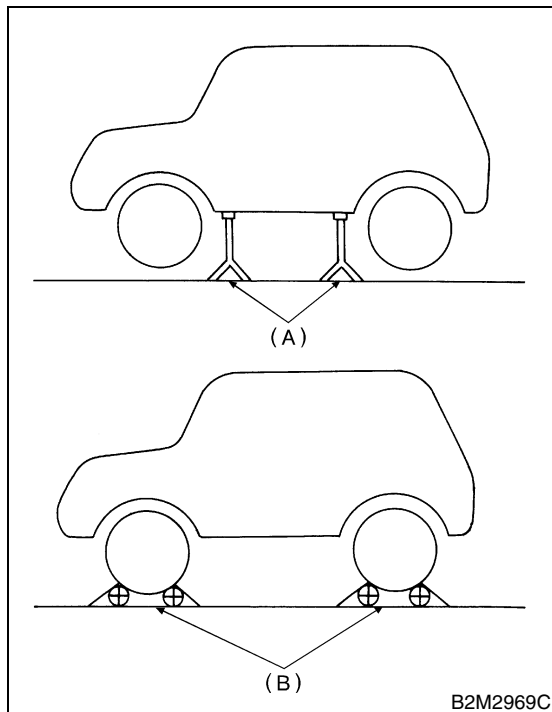
8. Inspection Mode

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 brake is 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 the 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 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 diagnostic trouble codes (DTC) shown on display are cleared by turning the ignition switch to OFF after conducting on-board diagnostics operation. Previous diagnostic trouble codes (DTC), however, cannot be cleared since they are stored in the TCM memory which is operating on back-up power supply. These diagnostic trouble codes (DTC) can be cleared by removing the specified fuse (located under 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 memory back-up power supply of TCM. Removal of this fuse clears the previous diagnostic trouble codes (DTC) stored in TCM memory.
- Be sure to remove the No. 4 fuse for at least the specified length of time. Otherwise, the diagnostic trouble codes (DTC) 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-21, CLEAR MEMORY MODE, OPERATION, Subaru Select Monitor.>

POWER INDICATOR LIGHT DISPLAY

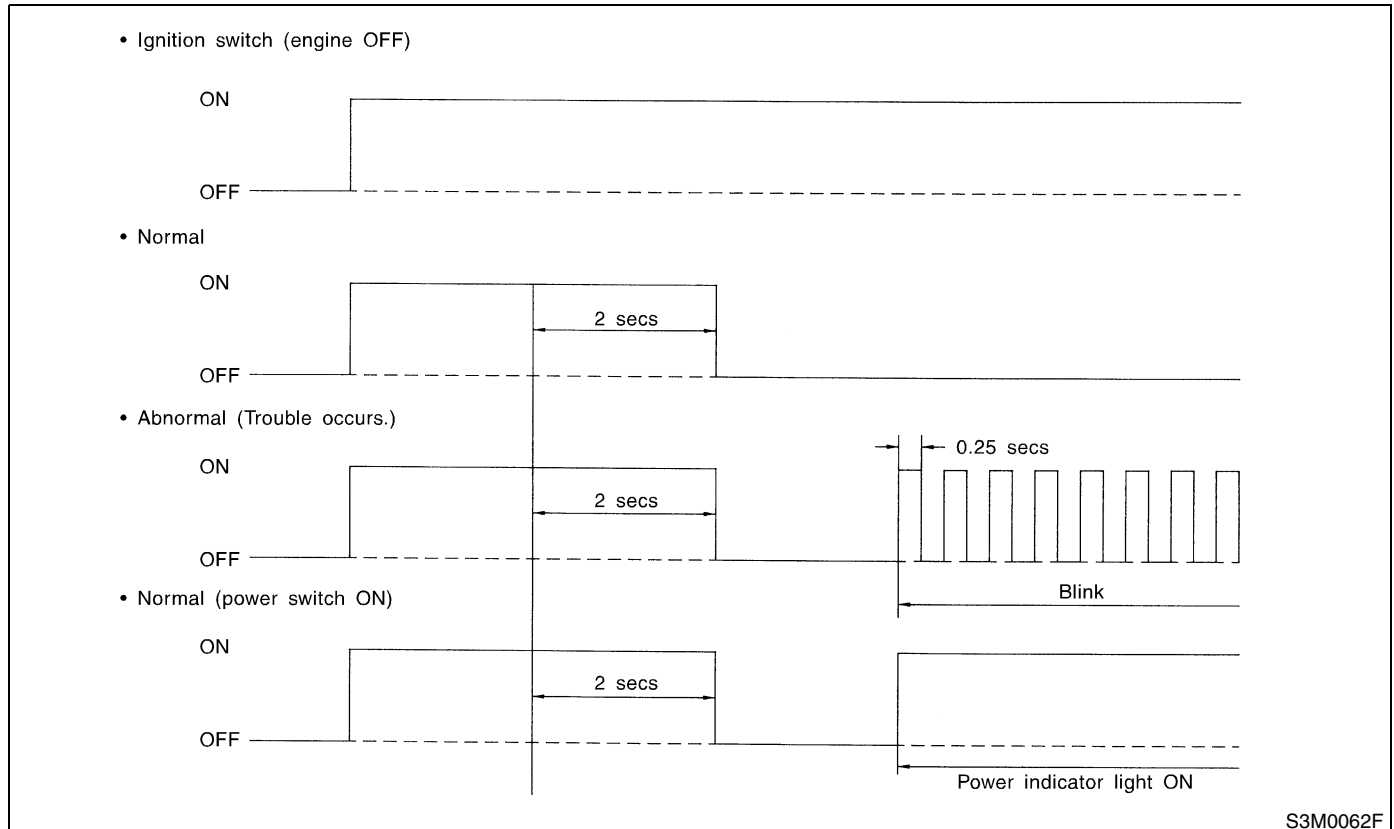
AUTOMATIC TRANSMISSION (DIAGNOSTICS)

10. POWER Indicator Light Display

A: INSPECTION

When any on-board diagnostics item is malfunctioning, the display on POWER indicator light blinks from the time malfunction is detected after starting the engine until ignition switch is turned to OFF. The malfunctioning part or unit can be determined

by a diagnostic trouble code (DTC) during on-board diagnostics operation. Problems which occurred previously can also be identified through the memory function. If the POWER indicator does not show a problem (although a problem is occurring), the problem can be determined by checking the performance characteristics of each sensor using select monitor. The indicator signal is as shown in the figure.



S3M0062F

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

11. List of Diagnostic Trouble Code (DTC)

A: LIST

DTC No.	Item	Content of diagnosis	Index
11	Engine speed signal	Detects open or shorted input signal circuit.	<Ref. to AT-42, DTC 11 ENGINE SPEED SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
23	Mass air flow signal (Turbo model)	Detects open or shorted input signal circuit.	<Ref. to AT-44, DTC 23 MASS AIR FLOW SIGNAL (TURBO MODEL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
27	ATF temperature sensor	Detects open or shorted input signal circuit.	<Ref. to AT-46, DTC 27 ATF TEMPERATURE SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
31	Throttle position sensor	Detects open or shorted input signal circuit.	<Ref. to AT-50, DTC 31 THROTTLE POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
33	Front vehicle speed sensor	Detects open or shorted input signal circuit.	<Ref. to AT-57, DTC 33 FRONT VEHICLE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
36	Torque converter turbine speed sensor	Detects open or shorted input signal circuit.	<Ref. to AT-62, DTC 36 TORQUE CONVERTER TURBINE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
38	Torque control signal	Detects open or shorted input signal circuit.	<Ref. to AT-66, DTC 38 TORQUE CONTROL SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
45	Intake manifold pressure signal (Non-turbo model)	Detects open or shorted input signal circuit.	<Ref. to AT-68, DTC 45 INTAKE MANIFOLD PRESSURE SIGNAL (NON-TURBO MODEL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
71	Shift solenoid 1	Detects open or shorted output signal circuit.	<Ref. to AT-70, DTC 71 SHIFT SOLENOID 1, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
72	Shift solenoid 2	Detects open or shorted output signal circuit.	<Ref. to AT-74, DTC 72 SHIFT SOLENOID 2, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
73	Low clutch timing solenoid	Detects open or shorted output signal circuit.	<Ref. to AT-78, DTC 73 LOW CLUTCH TIMING SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
74	2-4 brake timing solenoid	Detects open or shorted output signal circuit.	<Ref. to AT-82, DTC 74 2-4 BRAKE TIMING SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
75	Line pressure duty solenoid	Detects open or shorted output signal circuit.	<Ref. to AT-86, DTC 75 LINE PRESSURE DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
76	2-4 brake duty solenoid	Detects open or shorted output signal circuit.	<Ref. to AT-90, DTC 76 2-4 BRAKE DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
77	Lock-up duty solenoid	Detects open or shorted output signal circuit.	<Ref. to AT-94, DTC 77 LOCK-UP DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
79	Transfer duty solenoid	Detects open or shorted output signal circuit.	<Ref. to AT-98, DTC 79 TRANSFER DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
93	Rear vehicle speed sensor	Detects open or shorted input signal circuit.	<Ref. to AT-102, DTC 93 REAR VEHICLE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DIAGNOSTIC PROCEDURE FOR POWER INDICATOR LIGHT

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

12. Diagnostic Procedure for POWER Indicator Light

A: POWER INDICATOR LIGHT DOES NOT COME ON OR GO OFF

DIAGNOSIS:

The POWER Indicator light circuit is open or shorted.

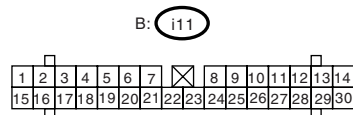
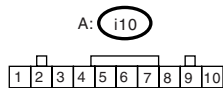
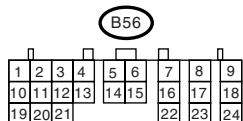
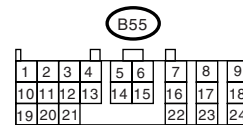
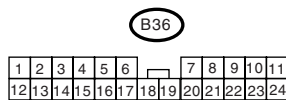
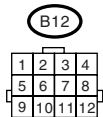
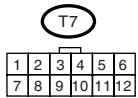
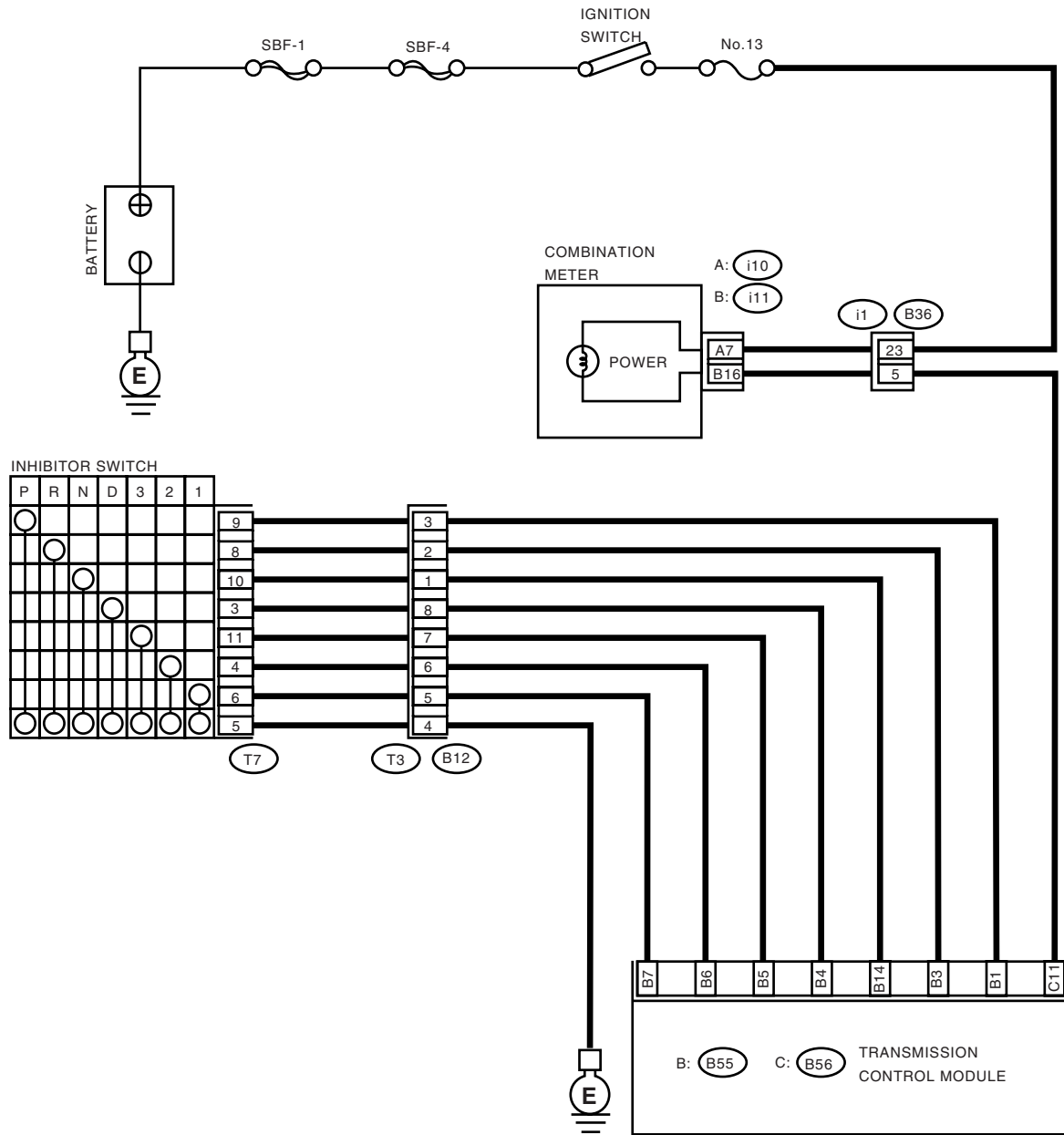
TROUBLE SYMPTOM:

- When the ignition switch is turned to ON (engine OFF), POWER indicator light does not illuminate.
- When the on-board diagnostics is performed, POWER indicator light remains illuminated.

DIAGNOSTIC PROCEDURE FOR POWER INDICATOR LIGHT

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

WIRING DIAGRAM: LHD MODEL

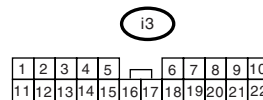
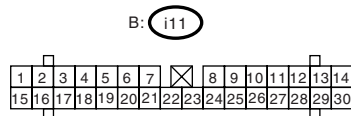
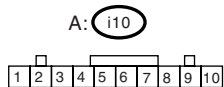
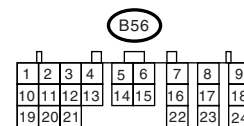
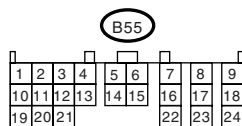
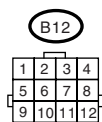
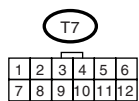
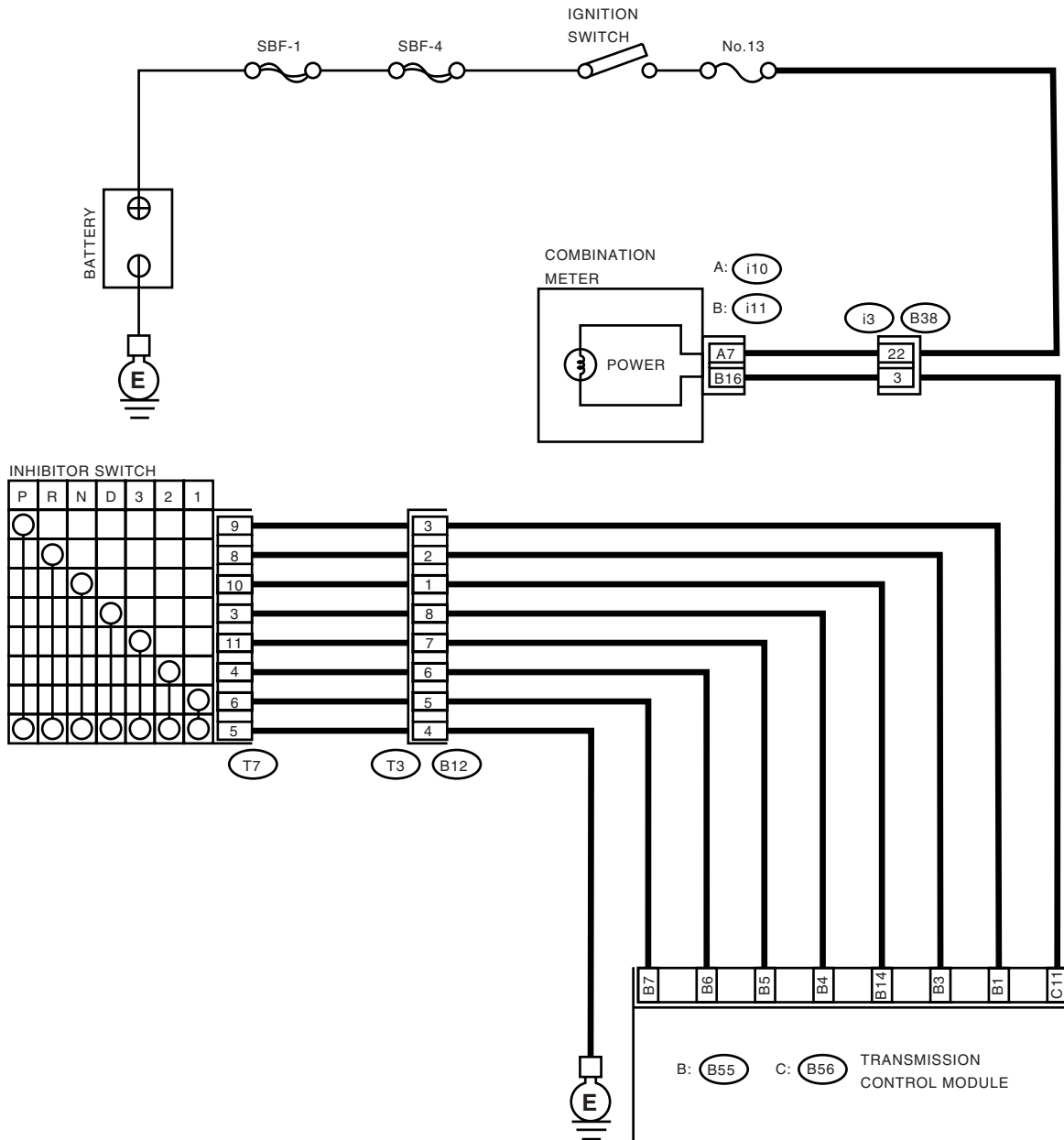


TR0400

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 the ignition switch to ON (engine OFF).	Does the POWER indicator light illuminate?	Go to step 3.	Go to step 2.
2 CHECK POWER INDICATOR LIGHT. 1) Turn the ignition switch to OFF. 2) Remove the combination meter. 3) Remove the POWER indicator light bulb from combination meter.	Is the POWER indicator light bulb OK?	Go to step 4.	Replace the POWER indicator light bulb.
3 CHECK POWER INDICATOR LIGHT. Perform "Read Diagnostic Trouble Code (DTC)". <Ref. to AT-22, Read Diagnostic Trouble Code (DTC).>	Does the POWER indicator light blink?	A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in TCM, inhibitor switch and combination meter.	Go to step 9.
4 CHECK FUSE (No. 13). Remove the fuse (No. 13).	Is the fuse (No. 13) blown out?	Replace the 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 the ignition switch to ON (engine OFF). 2) Measure the voltage between combination meter connector and chassis ground. <i>Connector & terminal (i10) No. 7 (+) — Chassis ground (-):</i>	Is the voltage more than 9 V?	Go to step 6.	Repair the open circuit in harness between combination meter and battery.
6 CHECK COMBINATION METER. Measure the voltage between combination meter connector and chassis ground. <i>Connector & terminal (i11) No. 16 (+) — Chassis ground (-):</i>	Is the voltage less than 1 V?	Repair the combination meter. <Ref. to IDI-15, Combination Meter Assembly.>	Go to step 7.
7 CHECK OPEN CIRCUIT OF HARNESS. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from combination meter connector. 3) Measure the resistance of harness between combination meter. <i>Connector & terminal (B56) No. 11 — (i11) No. 16:</i>	Is the resistance less than 1 Ω ?	Go to step 8.	Repair the open circuit in harness between TCM and combination meter, and poor contact in coupling connector.
8 CHECK INPUT SIGNAL FOR TCM. 1) Connect the connector to TCM and combination meter. 2) Turn the ignition switch to ON (engine OFF). 3) Measure the voltage between TCM connector and chassis ground. <i>Connector & terminal (B56) No. 11 (+) — Chassis ground (-):</i>	Is the voltage less than 1 V?	Even if the 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 the harness or connector in TCM.	Replace the TCM. <Ref. to AT-46, Transmission Control Module (TCM).>

DIAGNOSTIC PROCEDURE FOR POWER INDICATOR LIGHT

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
9 CHECK INHIBITOR SWITCH. 1)Connect the Subaru Select Monitor to data link connector. 2)Turn the ignition switch to ON. 3)Turn the Subaru Select Monitor to ON. 4)Read the data of range switch using Subaru Select Monitor. •Range switch is indicated in ON ⇔ OFF.	When each range is selected, does the LED of Subaru Select Monitor light up?	Go to step 10 .	Check the inhibitor switch circuit. <Ref. to AT-119, CHECK INHIBITOR SWITCH., Diagnostic Procedure for No-diagnostic Trouble Code (DTC).>
10 CHECK SHORT CIRCUIT OF HARNESS. 1)Disconnect the connector from TCM. 2)Remove the combination meter. 3)Disconnect the connector from combination meter. 4)Measure the 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 the TCM. <Ref. to AT-46, Transmission Control Module (TCM).>	Repair the short circuit in harness between combination meter connector and TCM connector.

DIAGNOSTIC PROCEDURE FOR POWER INDICATOR LIGHT

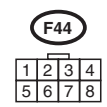
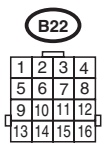
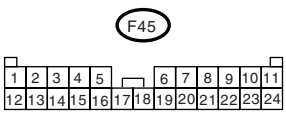
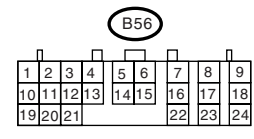
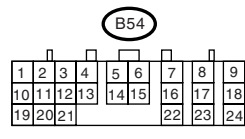
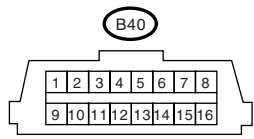
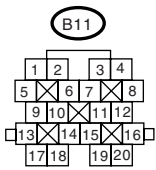
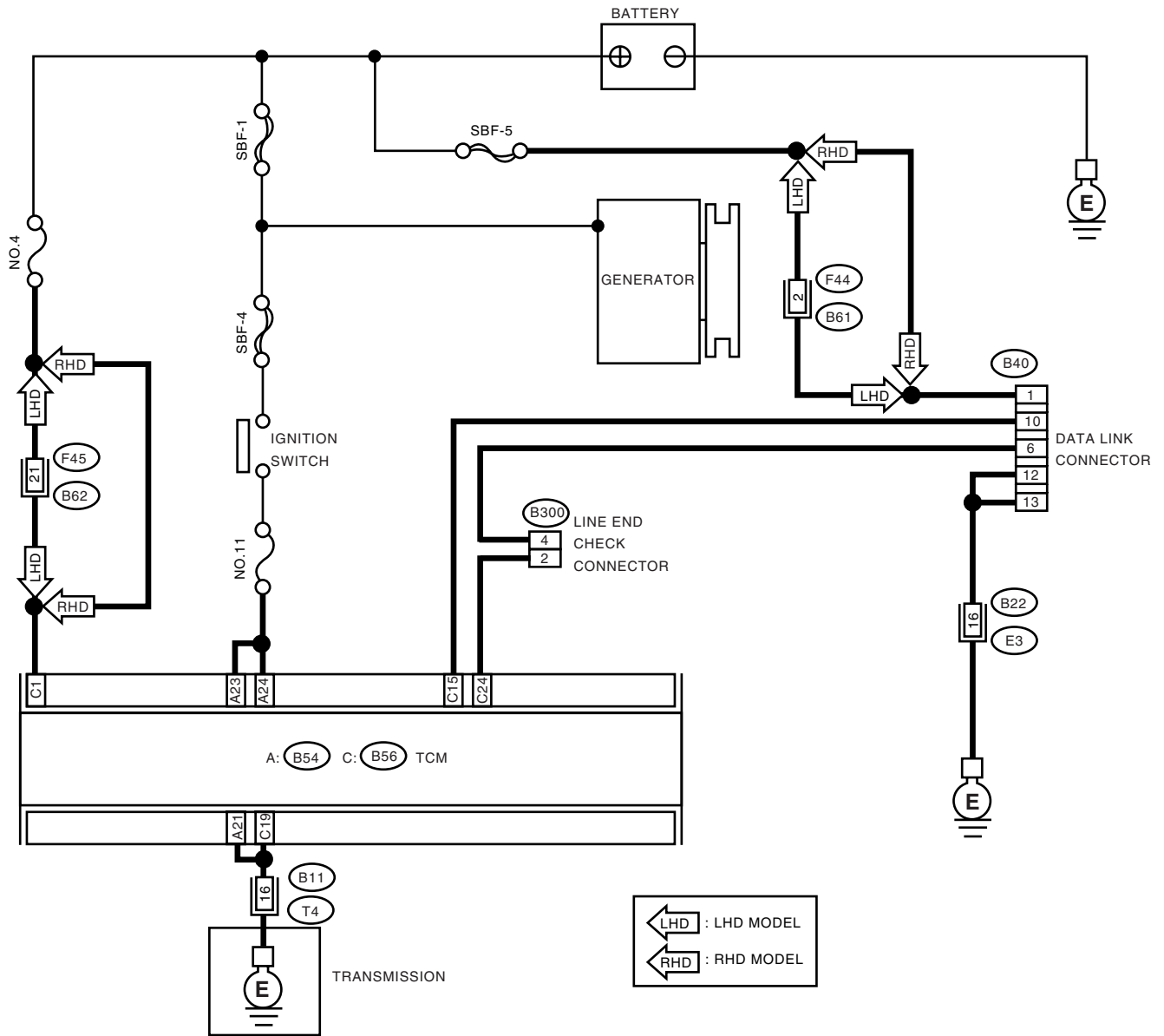
AUTOMATIC TRANSMISSION (DIAGNOSTICS)

DIAGNOSTIC PROCEDURE FOR POWER INDICATOR LIGHT

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

B: CHECK POWER SUPPLY AND GROUND LINE

WIRING DIAGRAM:



DIAGNOSTIC PROCEDURE FOR POWER INDICATOR LIGHT

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
1	CHECK IGNITION SWITCH.	Go to step 2.	Turn the ignition switch to ON.
2	CHECK GENERATOR. 1)Start the engine. 2)Idle the engine. 3)Measure the voltage between generator and chassis ground. Terminal Generator B terminal (+) — Chassis ground (-):	Go to step 3.	Repair the generator. <Ref. to SC-14, Generator.>
3	CHECK BATTERY TERMINAL. Turn the ignition switch to OFF.	Repair or tighten the battery terminal.	Go to step 4.
4	CHECK POWER SUPPLY OF TCM. 1)Disconnect the connector from TCM. 2)Turn the ignition switch to ON. 3)Measure the voltage between TCM connector and chassis ground. Connector & terminal (B56) No. 1 (+) — Chassis ground (-):	Go to step 6.	Go to step 5.
5	CHECK FUSE (NO. 4). Remove the fuse (No. 4).	Replace the fuse (No. 4). If replaced fuse (No. 4) has blown out easily, repair short circuit in harness between fuse (No. 4) and TCM.	Repair the 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 the ignition switch to ON (engine OFF). 2)Measure the ignition power supply voltage between TCM connector and chassis ground. Connector & terminal (B54) No. 23 (+) — Chassis ground (-): (B54) No. 24 (+) — Chassis ground (-):	Go to step 8.	Go to step 7.
7	CHECK FUSE (NO. 11). Remove the fuse (No. 11).	Replace the fuse (No. 11). If replaced fuse (No. 11) has blown out easily, repair short circuit in harness between fuse (No. 11) and TCM.	Repair the 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 the ignition switch to OFF. 2)Disconnect the connector from TCM and transmission. 3)Measure the resistance of harness between TCM and transmission connector. Connector & terminal (B56) No. 19 — (B11) No. 16: (B54) No. 21 — (B11) No. 16:	Go to step 9.	Repair the 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 the 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 the 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 the connector.	Replace the TCM. <Ref. to AT-46, Transmission Control Module (TCM).>

13. Diagnostic Procedure for Select Monitor Communication

A: COMMUNICATION FOR INITIALIZING IMPOSSIBLE

DIAGNOSIS:

- Faulty harness connector

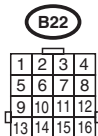
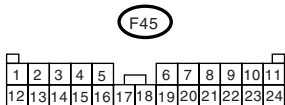
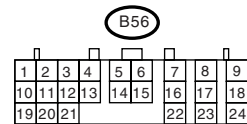
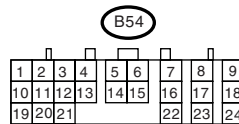
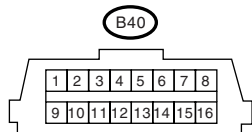
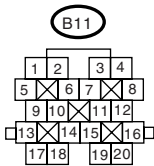
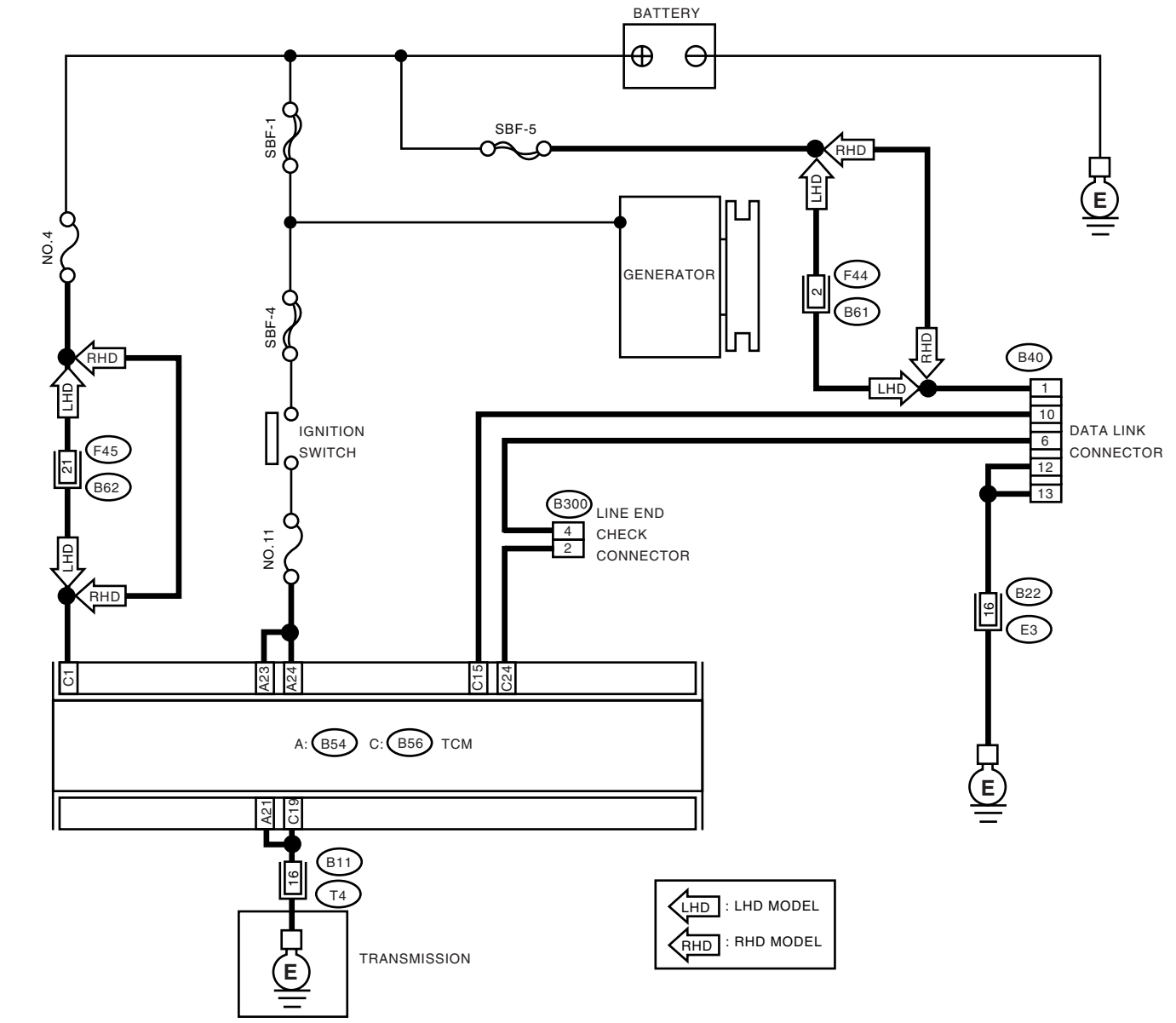
TROUBLE SYMPTOM:

- 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 the voltage between data link connector and chassis ground. <i>Connector & terminal</i> <i>(B40) No. 1 (+) — Chassis ground (-):</i>	Is the voltage more than 10V?	Go to step 2.	Repair the harness and connector between battery and data link connector, and poor contact in coupling connector.
2 CHECK SUBARU SELECT MONITOR GROUND CIRCUIT. Measure the resistance of harness between data link connector and chassis ground. <i>Connector & terminal</i> <i>(B40) No. 12 — Chassis ground:</i> <i>(B40) No. 13 — Chassis ground:</i>	Is the resistance less than 1Ω?	Go to step 3.	Repair the 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 the ignition switch to ON. 2) Using the Subaru Select Monitor, check whether communication to engine systems can be executed normally.	Are the name and year of system displayed on Subaru Select Monitor?	Go to step 8.	Go to step 4.
4 CHECK COMMUNICATION OF SELECT MONITOR. 1) Turn the ignition switch to OFF. 2) Disconnect the TCM connector. 3) Check whether communication to engine systems can be executed normally.	Are the name and year of system displayed on Subaru Select Monitor?	Go to step 6.	Go to step 5.
5 CHECK COMMUNICATION OF SELECT MONITOR. 1) Turn the ignition switch to OFF. 2) Connect the TCM connector. 3) Disconnect the ECM connector. 4) Check whether communication to transmission systems can be executed normally.	Are the name and year of system displayed on Subaru Select Monitor?	Inspect the ECM.	Go to step 6.
6 CHECK HARNESS CONNECTOR BETWEEN EACH CONTROL MODULE AND DATA LINK CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the TCM, ECM, ABSCM&H/U, cruise control module and immobilizer control module connectors. 3) Measure the resistance between TCM connector and chassis ground. <i>Connector & terminal</i> <i>(B40) No. 10 — Chassis ground:</i> <i>(B40) No. 6 — Chassis ground:</i>	Is the resistance more than 1MΩ?	Go to step 7.	Repair the harness and connector between each control module and data link connector.
7 CHECK OUTPUT SIGNAL FOR TCM. 1) Turn the ignition switch to ON. 2) Measure the voltage between TCM and chassis ground. <i>Connector & terminal</i> <i>(B40) No. 10 (+) — Chassis ground (-):</i> <i>(B40) No. 6 (+) — Chassis ground (-):</i>	Is the voltage more than 1 V?	Repair the harness and connector between each control module and data link connector.	Go to step 8.
8 CHECK HARNESS/CONNECTOR BETWEEN TCM AND DATA LINK CONNECTOR. Measure the resistance between TCM connector and data link connector. <i>Connector & terminal</i> <i>(B56) No. 15 — (B40) No. 10:</i>	Is the resistance less than 0.5Ω?	Go to step 9.	Repair the harness and connector between TCM and data link connector.

DIAGNOSTIC PROCEDURE FOR SELECT MONITOR COMMUNICATION

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
9 CHECK HARNESS/CONNECTOR BETWEEN TCM AND DATA LINK CONNECTOR. Measure the resistance between TCM and data link connector. Connector & terminal (B56) No. 24 — (B40) No. 6:	Is the resistance more than 1M Ω ?	Go to step 10 .	Repair the harness and connector between TCM and data link connector.
10 CHECK INSTALLATION OF TCM CONNECTOR. Turn the ignition switch to OFF.	Is the TCM connector inserted into TCM?	Go to step 11 .	Insert the TCM connector into TCM.
11 CHECK POOR CONTACT IN CONNECTORS.	Is there poor contact in control module and data link connector?	Repair the poor contact.	Replace the TCM. <Ref. to AT-46, Transmission Control Module (TCM).>

DIAGNOSTIC PROCEDURE FOR SELECT MONITOR COMMUNICATION
AUTOMATIC TRANSMISSION (DIAGNOSTICS)

14. Diagnostic Procedure with Diagnostic Trouble Code (DTC)

A: DTC 11 ENGINE SPEED SIGNAL

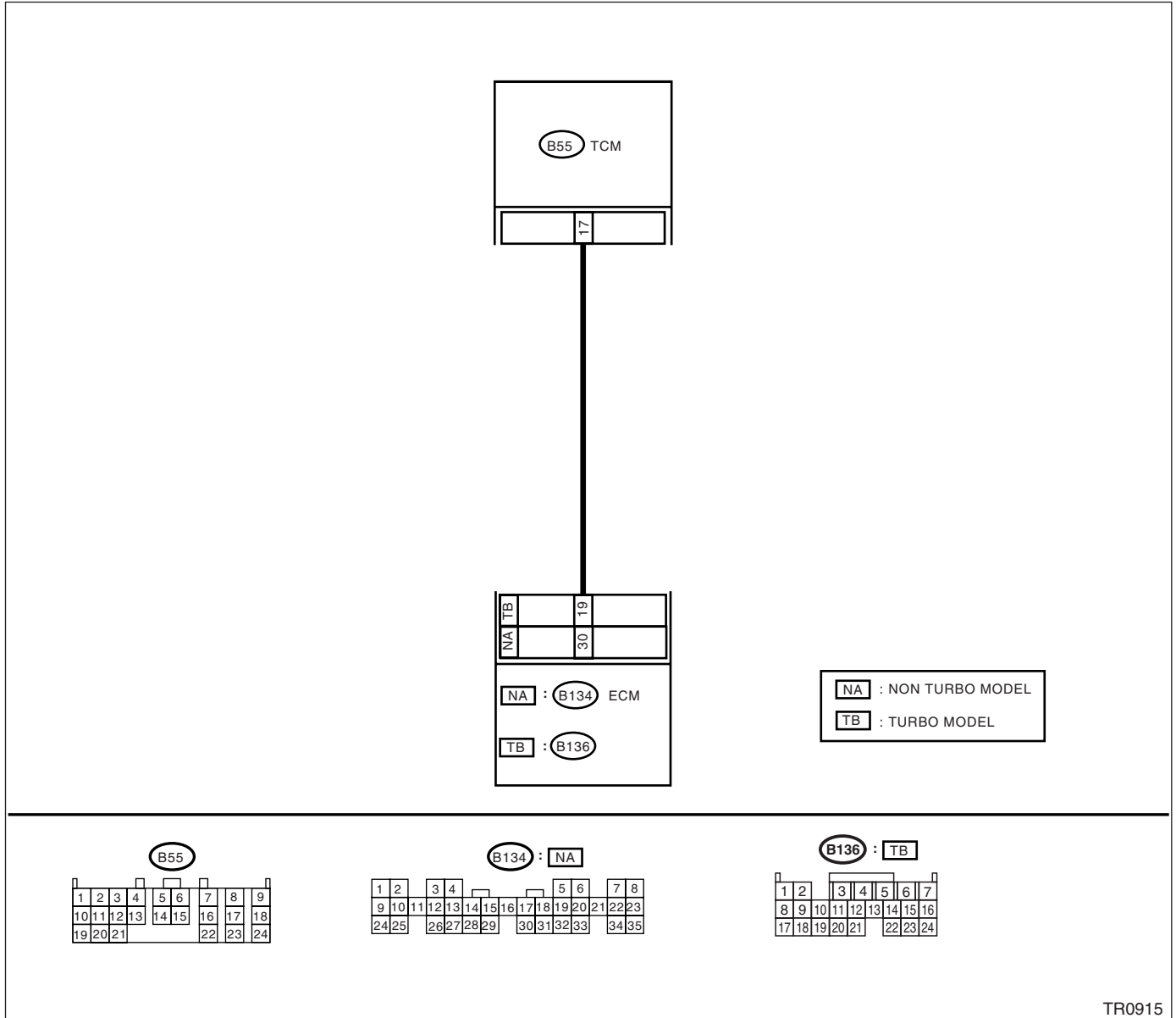
DIAGNOSIS:

The engine speed input signal circuit is open or shorted.

TROUBLE SYMPTOM:

- No lock-up (after engine warm-up).
- The POWER indicator light remains on when vehicle speed is "0".

WIRING DIAGRAM:



TR0915

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM and ECM. 3) Measure the resistance of harness between TCM and ECM connector. <i>Connector & terminal</i> <i>Non-turbo model</i> <i>(B55) No. 17 — (B134) No. 30:</i> <i>Turbo model</i> <i>(B55) No. 17 — (B136) No. 9:</i>	Is the resistance less than 1 Ω ?	Go to step 2.	Repair the open circuit in harness between TCM and ECM connector.
2 CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM. Measure the resistance of harness between TCM connector and chassis ground. <i>Connector & terminal</i> <i>(B55) No. 17 — Chassis ground:</i>	Is the resistance more than 1 $M\Omega$?	Go to step 3.	Repair the 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 the connectors to TCM and ECM. 2) Turn the ignition switch to ON (engine OFF). 3) Measure the voltage between TCM connector and chassis ground. <i>Connector & terminal</i> <i>(B55) No. 17 (+) — Chassis ground (-):</i>	Is the voltage more than 10.5 V?	Even if the 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 the harness or connector in TCM and ECM.	Go to step 6.
5 CHECK INPUT SIGNAL FOR TCM USING SUBARU SELECT MONITOR. 1) Connect the connectors to TCM and ECM. 2) Connect the Subaru Select Monitor to data link connector. 3) Start the engine and turn Subaru Select Monitor switch to ON. 4) Warm-up the engine until engine coolant temperature is above 80°C (176°F). 5) Idle the engine. 6) Read the data of engine speed using Subaru Select Monitor. • Display shows the engine speed signal value sent from ECM.	Is the revolution value same as tachometer reading shown on combination meter?	Even if the 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 the harness or connector in TCM and ECM.	Go to step 6.
6 CHECK POOR CONTACT.	Is there poor contact in engine speed signal circuit?	Repair the poor contact.	Go to step 7.
7 CONFIRM DTC 11.	Replace the ECM with a new one. Does the DTC appear again, after memory has been cleared?	Replace the TCM. <Ref. to AT-46, Transmission Control Module (TCM).>	Replace the ECM.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

B: DTC 23 MASS AIR FLOW SIGNAL (TURBO MODEL)

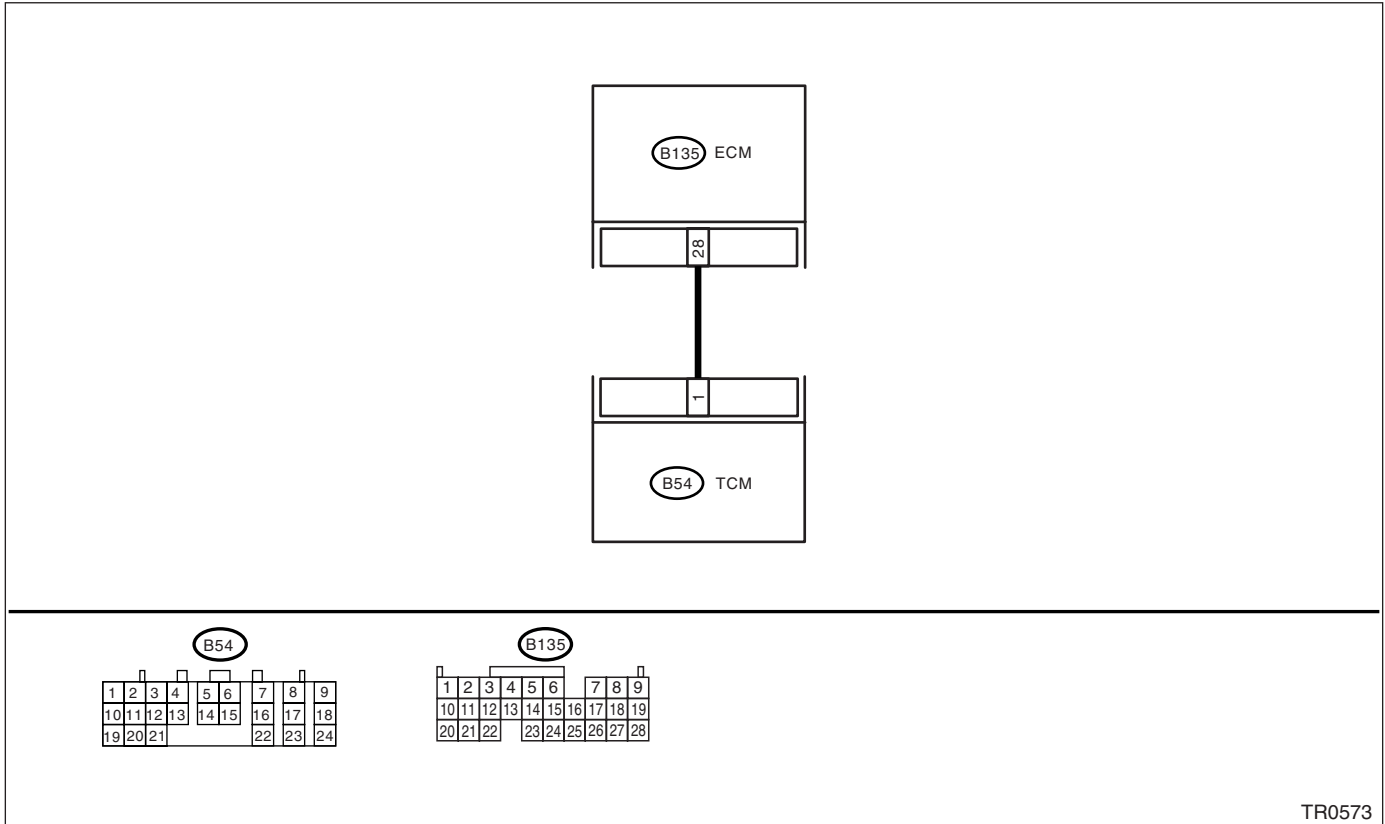
DIAGNOSIS:

The input signal circuit of TCM from ECM is open or shorted.

TROUBLE SYMPTOM:

Excessive shift shock.

WIRING DIAGRAM:



TR0573

Step	Check	Yes	No
1	CHECK ENGINE GROUND TERMINALS AND GROUND CIRCUIT OF ECM. <Ref. to AT-50, DTC 31 THROTTLE POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble?	Repair the ground terminal and/or ground circuit of ECM. Go to step 2.
2	CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM and ECM. 3) Measure the resistance of harness between TCM and ECM connector. Connector & terminal (B54) No. 1 — (B135) No. 28:	Is the resistance less than 1 Ω?	Go to step 3. Repair the open circuit in harness between TCM and ECM connector.
3	CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM. Measure the resistance of harness between TCM connector and chassis ground. Connector & terminal (B54) No. 1 — Chassis ground:	Is the resistance more than 1 MΩ?	Go to step 4. Repair the short circuit in harness between TCM and ECM connector.
4	PREPARE SUBARU SELECT MONITOR.	Do you have a Subaru Select Monitor?	Go to step 6. Go to step 5.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
5 CHECK INPUT SIGNAL FOR TCM. 1)Connect the connectors to TCM and ECM. 2)Start the engine and warm-up the transmission until ATF temperature is above 80°C (176°F). NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until ATF reaches its operating temperature. 3)Idle the engine. 4)Measure the voltage between TCM connector and chassis ground. Connector & terminal (B54) No. 1 (+) — Chassis ground (-):	Is the voltage between 0.9 and 1.4 V?	Even if the AT OIL TEMP warning lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair harness or connector in the TCM and ECM.	Go to step 7.
6 CHECK INPUT SIGNAL FOR TCM USING SUBARU SELECT MONITOR. 1)Connect the connectors to TCM and ECM. 2)Connect the Subaru Select Monitor to data link connector. 3)Start the engine and turn the Subaru Select Monitor switch to ON. 4)Warm-up the engine until engine coolant temperature is above 80°C (176°F). 5)Idle the engine. 6)Read the data of mass air flow sensor signal using Subaru Select Monitor. •Display shows the mass air flow sensor signal value sent from ECM.	Is the value voltage between 0.9 and 1.4 V?	Even if the AT OIL TEMP warning 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 the poor contact.	Replace the TCM. <Ref. to AT-46, Transmission Control Module (TCM).>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

C: DTC 27 ATF TEMPERATURE SENSOR

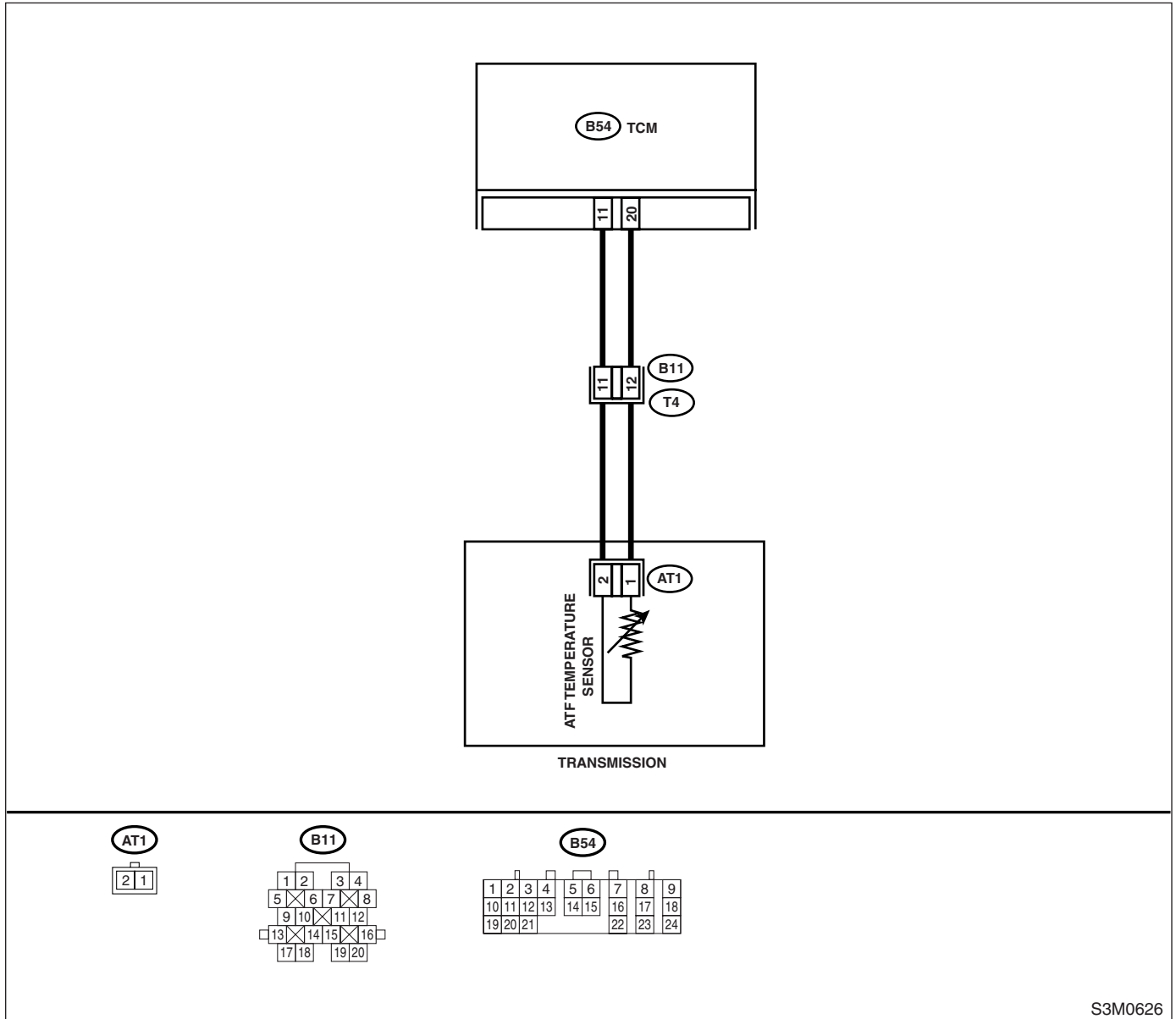
DIAGNOSIS:

The input signal circuit of TCM to ATF temperature sensor is open or shorted.

TROUBLE SYMPTOM:

Excessive shift shock.

WIRING DIAGRAM:



S3M0626

Step	Check	Yes	No
1 CHECK HARNESS CONNECTOR BETWEEN TCM AND ATF TEMPERATURE SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from transmission and TCM. 3) Measure the 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 the open circuit in harness between TCM and transmission connector.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
2 CHECK HARNESS CONNECTOR BETWEEN TCM AND ATF TEMPERATURE SENSOR. Measure the resistance of harness between TCM and transmission connector. <i>Connector & terminal</i> <i>(B54) No. 11 — (B11) No. 11:</i>	Is the resistance less than 1 Ω ?	Go to step 3.	Repair the open circuit in harness between TCM and transmission connector.
3 CHECK HARNESS CONNECTOR BETWEEN TCM AND ATF TEMPERATURE SENSOR. Measure the resistance of harness between TCM connector and chassis ground. <i>Connector & terminal</i> <i>(B54) No. 20 — Chassis ground:</i>	Is the resistance more than 1 $M\Omega$?	Go to step 4.	Repair the short circuit in harness between TCM and transmission connector.
4 CHECK HARNESS CONNECTOR BETWEEN TCM AND ATF TEMPERATURE SENSOR. Measure the resistance of harness between TCM connector and chassis ground. <i>Connector & terminal</i> <i>(B54) No. 11 — Chassis ground:</i>	Is the resistance more than 1 $M\Omega$?	Go to step 5.	Repair the short circuit in harness between TCM and transmission connector.
5 CHECK ATF TEMPERATURE SENSOR. 1) Turn the ignition switch to OFF. 2) Connect the connectors to transmission and TCM. 3) Turn the 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 ATF reaches its operating temperature. 5) Disconnect the connector from transmission. 6) Measure the resistance between transmission connector terminals. <i>Connector & terminal</i> <i>(T4) No. 11 — No. 12:</i>	Is the resistance between 275 and 375 Ω ?	Go to step 6.	Go to step 11.
6 CHECK ATF TEMPERATURE SENSOR. 1) Turn the ignition switch to ON (engine OFF). 2) Measure the resistance between transmission connector terminals. <i>Connector & terminal</i> <i>(T4) No. 11 — No. 12:</i>	Does the resistance value increase while 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.
8 CHECK INPUT SIGNAL FOR TCM. 1) Connect the 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 ATF reaches its operating temperature. 3) Measure the voltage between TCM connector terminal. <i>Connector & terminal</i> <i>(B54) No. 11 (+) — No. 20 (-):</i>	Is the voltage between 0.4 and 0.9 V?	Even if the 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 cause. Repair the harness or contact in ATF temperature sensor and transmission connector.	Go to step 10.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
9 CHECK INPUT SIGNAL FOR TCM USING SUBARU SELECT MONITOR. 1)Connect the connector to transmission. 2)Turn the ignition switch to ON (engine OFF).	Does the ATF temperature gradually decrease?	Even if the 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 cause. Repair the harness or contact in ATF temperature sensor and transmission connector.	Go to step 10.
10 CHECK POOR CONTACT.	Is there poor contact in ATF temperature sensor circuit?	Repair the poor contact.	Replace the TCM. <Ref. to AT-46, Transmission Control Module (TCM).>
11 CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND ATF TEMPERATURE SENSOR. 1)Turn the ignition switch to OFF. 2)Disconnect the connector from transmission. 3)Remove the transmission connector from bracket. 4)Lift-up the vehicle and place safety stand. NOTE: On AWD models, raise all wheels off ground. 5)Drain the ATF. CAUTION: Do not drain the ATF until it cools down. 6)Remove the oil pan, and disconnect the connector from ATF temperature sensor connector. 7)Measure the 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 the open circuit in harness between ATF temperature sensor and transmission connector.
12 CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND ATF TEMPERATURE SENSOR. Measure the resistance of harness between ATF temperature sensor and transmission connector. Connector & terminal (T4) No. 12 — (AT1) No. 1:	Is the resistance less than 1 Ω ?	Go to step 13.	Repair the open circuit in harness between ATF temperature sensor and transmission connector.
13 CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND ATF TEMPERATURE SENSOR. Measure the resistance of harness between transmission connector and transmission ground. Connector & terminal (T4) No. 11 — Transmission ground:	Is the resistance more than 1 M Ω ?	Go to step 14.	Repair the short circuit in harness between ATF temperature sensor and transmission connector.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
14 CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND ATF TEMPERATURE SENSOR. Measure the resistance of harness between transmission connector and transmission ground. <i>Connector & terminal (T4) No. 12 — Transmission ground:</i>	Is the resistance more than 1 M Ω ?	Replace the ATF temperature sensor. <Ref. to AT-40, Shift Solenoids, Duty Solenoids and ATF Temperature Sensor.>	Repair the short circuit in harness between ATF temperature sensor and transmission connector.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

D: DTC 31 THROTTLE POSITION SENSOR

DIAGNOSIS:

The input signal circuit of throttle position sensor is open or shorted.

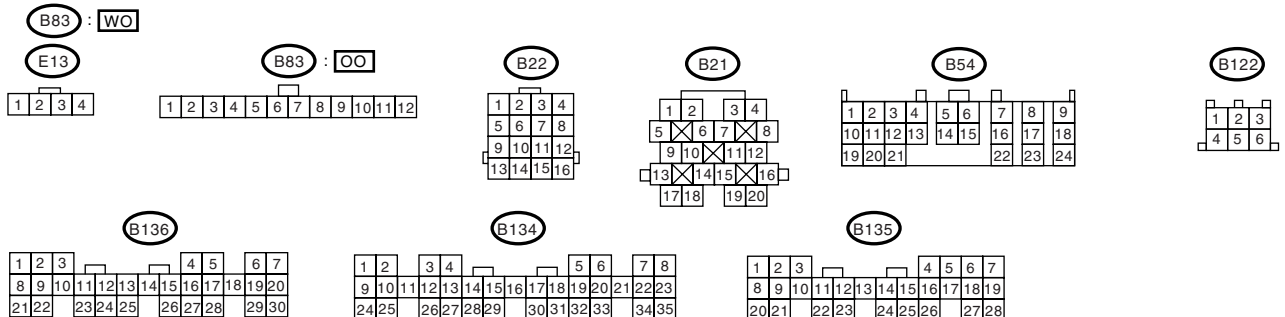
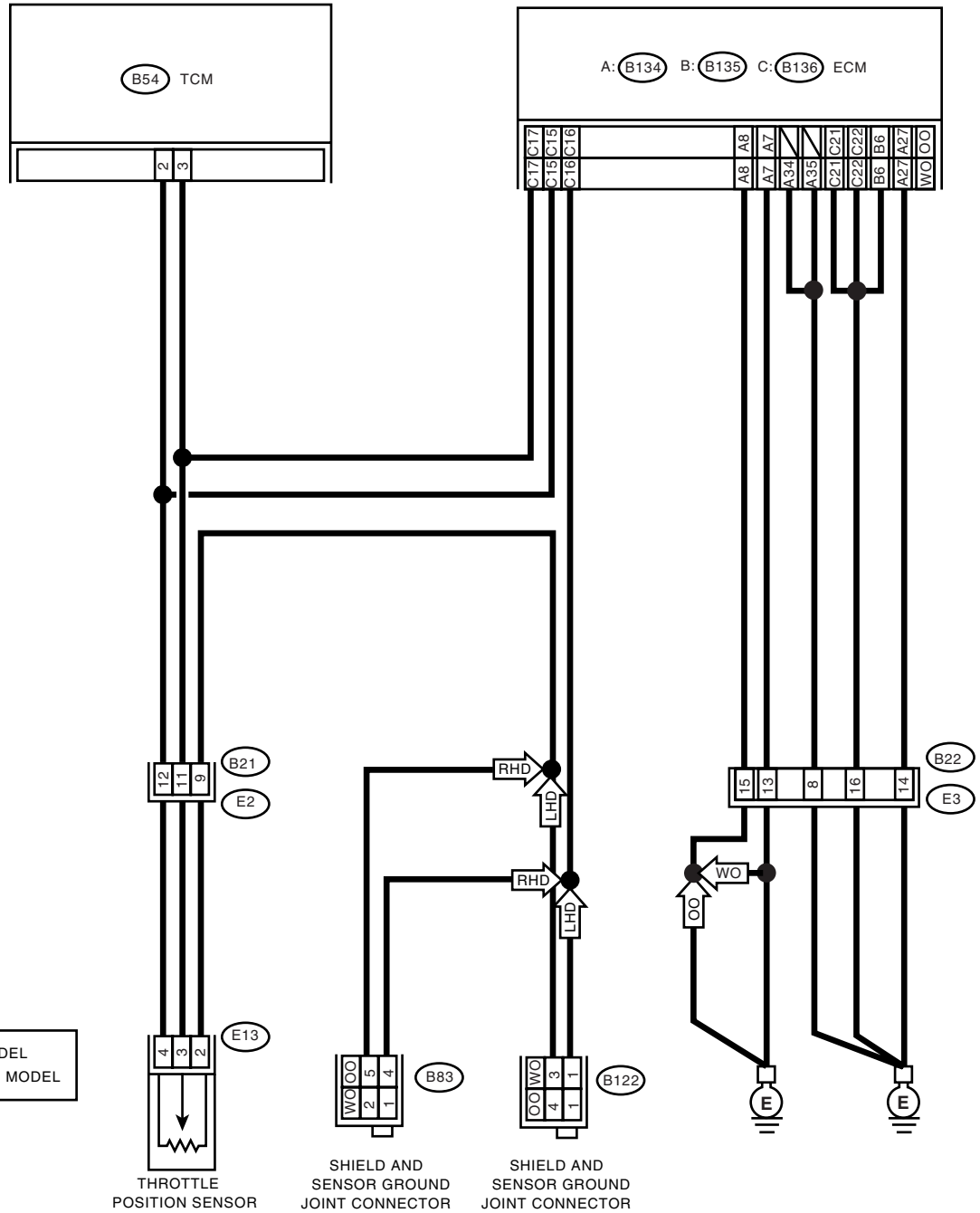
TROUBLE SYMPTOM:

Shift point too high or too low; excessive shift shock; excessive tight corner “braking”.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

WIRING DIAGRAM: NON-TURBO MODEL

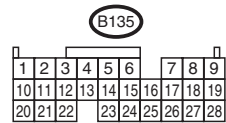
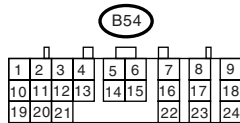
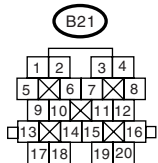
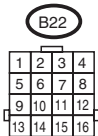
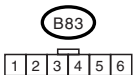
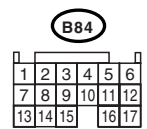
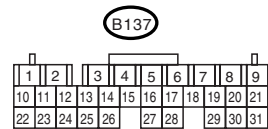
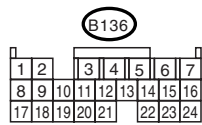
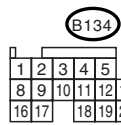
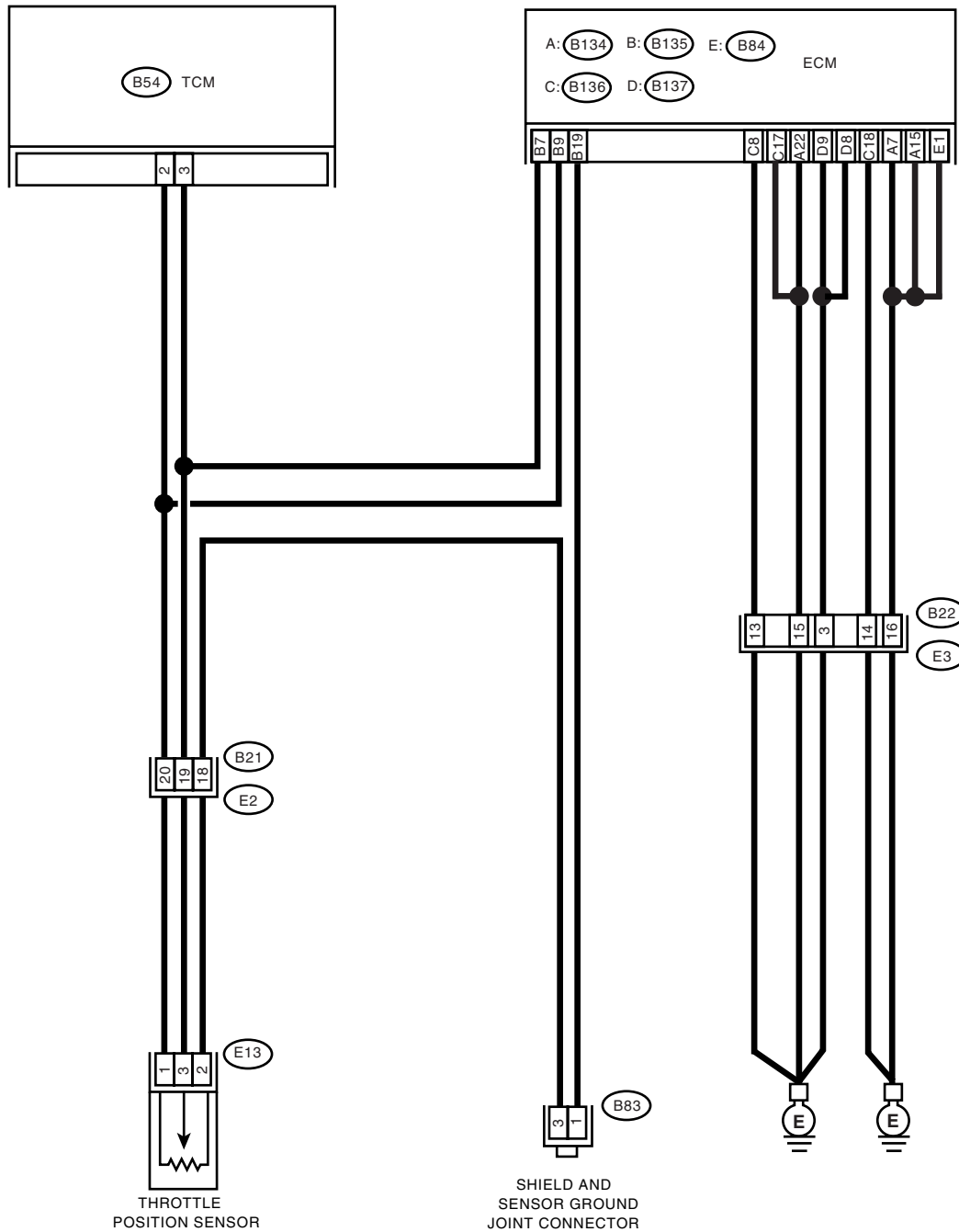


TR0916

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

TURBO MODEL



TR0917

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No	
1	CHECK ENGINE GROUND TERMINALS.	Go to step 2.	Tighten the engine ground terminals.	
2	CHECK GROUND CIRCUIT OF ECM. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM and engine ground. Connector & terminal NON-TURBO MODEL 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: NON-TURBO MODEL 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: TURBO MODEL (B134) No. 7 — Engine ground: (B134) No. 15 — Engine ground: (B134) No. 22 — Engine ground: (B136) No. 8 — Engine ground: (B136) No. 17 — Engine ground: (B136) No. 18 — Engine ground: (B137) No. 8 — Engine ground: (B137) No. 9 — Engine ground: (B84) No. 1 — Engine ground:	Is the resistance less than 5 Ω ?	Go to step 3.	Repair the open circuit in harness between ECM connector and engine grounding terminal.
3	CHECK THROTTLE POSITION SENSOR. 1) Disconnect the connector from throttle position sensor. 2) Measure the resistance between throttle position sensor connector receptacle's terminals. Terminals NON-TURBO MODEL No. 4 — No. 2: TURBO MODEL No. 1 — No. 2:	Is the resistance between 3.0 and 4.2 k Ω ?	Go to step 4.	Replace the throttle position sensor.
4	CHECK THROTTLE POSITION SENSOR. Measure the resistance between throttle position sensor connector receptacle's terminals. Terminals No. 2 — No. 3:	Is the resistance between 0.35 and 0.5 k Ω ?	Go to step 5.	Replace the throttle position sensor.
5	CHECK HARNESS CONNECTOR BETWEEN TCM AND THROTTLE POSITION SENSOR. 1) Disconnect the connector from TCM. 2) Measure the resistance of harness between TCM and throttle position sensor connector. Connector & terminal (B55) No. 3 — (E13) No. 3:	Is the resistance less than 1 Ω ?	Go to step 6.	Repair the open circuit in harness between TCM and throttle position sensor connector, and poor contact in coupling connector.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
6 CHECK HARNESS CONNECTOR BETWEEN TCM AND THROTTLE POSITION SENSOR. Measure the resistance of harness between TCM and throttle position sensor connector. <i>Connector & terminal</i> NON-TURBO MODEL (B54) No. 2 — (E13) No. 4: TURBO MODEL (B54) No. 2 — (E12) No. 1:	Is the resistance less than 1 Ω ?	Go to step 7.	Repair the 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 the resistance of harness between TCM connector and chassis ground. <i>Connector & terminal</i> (B54) No. 3 — Chassis ground:	Is the resistance more than 1 M Ω ?	Go to step 8.	Repair the short circuit in harness between TCM and throttle position sensor connector.
8 CHECK HARNESS CONNECTOR BETWEEN TCM AND THROTTLE POSITION SENSOR. Measure the resistance of harness between TCM connector and chassis ground. <i>Connector & terminal</i> (B54) No. 2 — Chassis ground:	Is the resistance more than 1 M Ω ?	Go to step 9.	Repair the short circuit in harness between TCM and throttle position sensor connector.
9 CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM. Measure the resistance of harness between TCM and ECM connector. <i>Connector & terminal</i> NON-TURBO MODEL (B54) No. 3 — (B136) No. 17: TURBO MODEL (B54) No. 3 — (B135) No. 7:	Is the resistance less than 1 Ω ?	Go to step 10.	Repair the open circuit in harness between TCM and ECM connector.
10 CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM. Measure the resistance of harness between TCM and ECM connector. <i>Connector & terminal</i> NON-TURBO MODEL (B54) No. 2 — (B136) No. 15: TURBO MODEL (B54) No. 2 — (B135) No. 9:	Is the resistance less than 1 Ω ?	Go to step 11.	Repair the 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 the connectors to TCM, throttle position sensor and ECM. 2)Turn the ignition switch to ON (engine OFF). 3)Close the throttle completely. 4)Measure the voltage between TCM connector and chassis ground. <i>Connector & terminal</i> (B54) No. 3 (+) — Chassis ground (-):	Is the voltage between 0.2 and 1.0 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 the voltage between TCM connector and chassis ground. <i>Connector & terminal</i> (B54) No. 3 (+) — Chassis ground (-):	Is the voltage between 4.2 and 4.7 V with throttle fully open?	Go to step 16.	Go to step 18.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
14 CHECK INPUT SIGNAL FOR TCM USING SUBARU SELECT MONITOR. 1)Connect the connectors to TCM, throttle position sensor and ECM. 2)Connect the Subaru Select Monitor to data link connector. 3)Turn the ignition switch to ON (engine OFF). 4)Turn the Subaru Select Monitor switch to ON. 5)Throttle fully closed. 6)Read the data of throttle position sensor using Subaru Select Monitor. •Throttle position sensor input signal is indicated.	Is the value voltage between 0.2 and 1.0 V?	Go to step 15.	Go to step 18.
15 CHECK INPUT SIGNAL FOR TCM USING SUBARU SELECT MONITOR. Throttle fully open. NOTE: Must be changed correspondingly with the accelerator pedal operation (from “released” to “depressed” position).	Is the value voltage between 4.2 and 4.7 V?	Go to step 18.	Go to step 17.
16 CHECK INPUT SIGNAL FOR TCM (THROTTLE POSITION SENSOR POWER SUPPLY). Measure the voltage between TCM connector and chassis ground. <i>Connector & terminal</i> <i>(B54) No. 2 (+) — Chassis ground (-):</i>	Is the voltage between 4.8 and 5.3 V?	Even if the 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 the 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 the 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 the 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 the 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 the poor contact.	Replace the TCM. <Ref. to AT-46, Transmission Control Module (TCM).>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
AUTOMATIC TRANSMISSION (DIAGNOSTICS)

E: DTC 33 FRONT VEHICLE SPEED SENSOR

DIAGNOSIS:

- The vehicle speed signal is abnormal.
- The circuit in combination meter is faulty.
- The harness connector between TCM and vehicle speed sensor is in short or open.

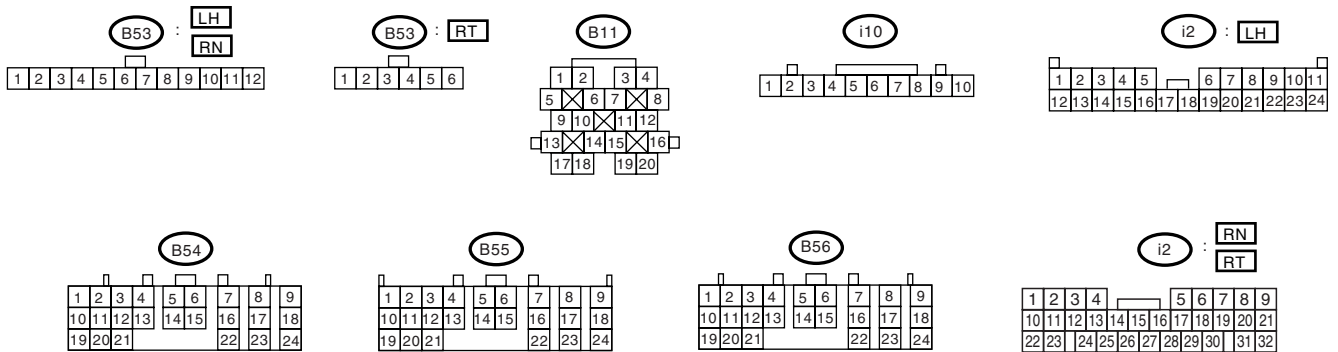
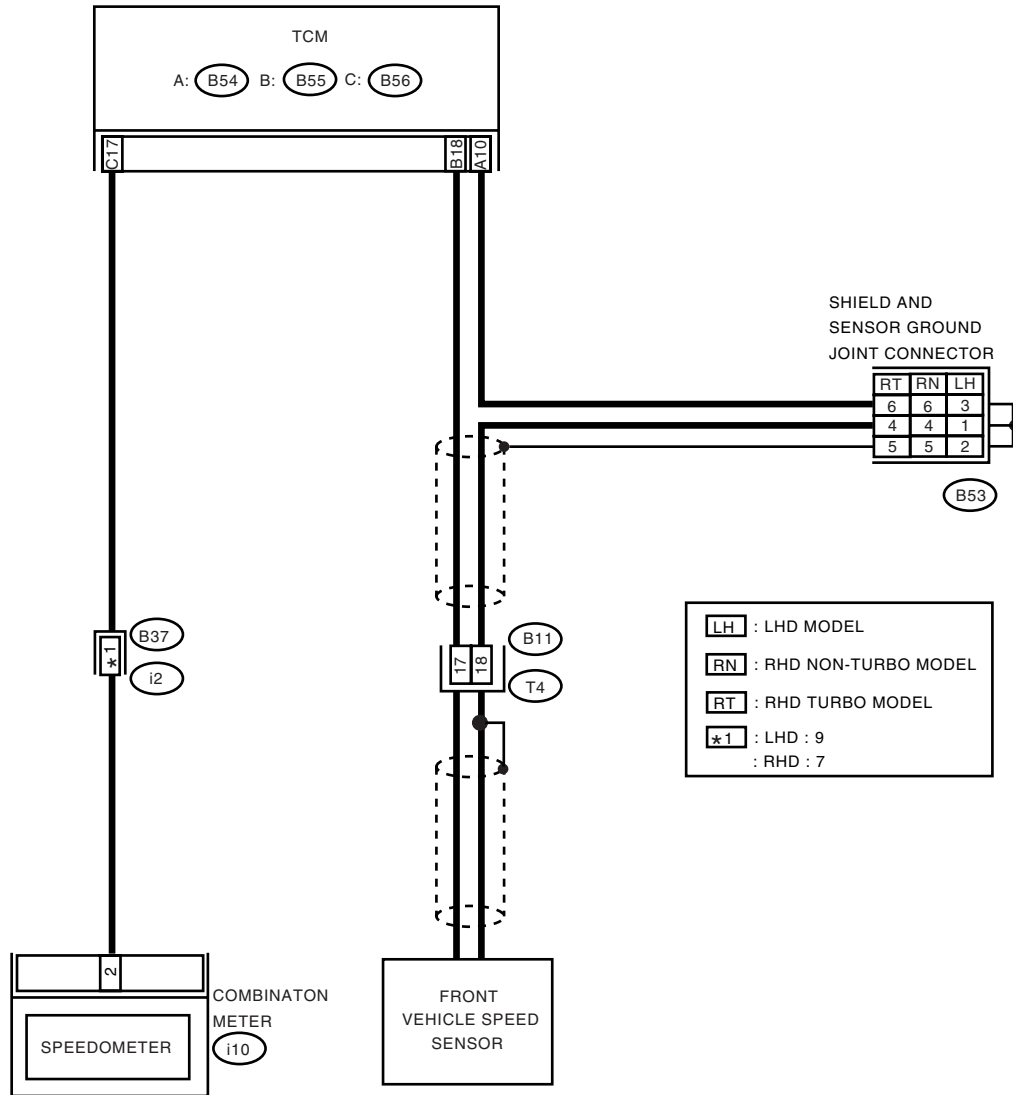
TROUBLE SYMPTOM:

- Erroneous idling.
- Engine stalls.
- Poor driving performance.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

WIRING DIAGRAM:



TR0918

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and transmission. 3) Measure the resistance of harness between TCM and transmission connector. <i>Connector & terminal</i> <i>(B55) No. 18 — (B11) No. 17:</i>	Is the resistance less than 1 Ω ?	Go to step 2.	Repair the open circuit in harness between TCM and transmission connector.
2 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION. Measure the resistance of harness between TCM and transmission connector. <i>Connector & terminal</i> <i>(B54) No. 10 — (B11) No. 18:</i>	Is the resistance less than 1 Ω ?	Go to step 3.	Repair the open circuit in harness between TCM and transmission connector, and poor contact in coupling connector.
3 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION. Measure the resistance of harness between TCM and transmission connector. <i>Connector & terminal</i> <i>(B54) No. 10 — Chassis ground:</i>	Is the resistance more than 1 $M\Omega$?	Go to step 4.	Repair the short circuit in harness between TCM and transmission connector.
4 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION. Measure the resistance of harness between TCM and transmission connector. <i>Connector & terminal</i> <i>(B55) No. 18 — Chassis ground:</i>	Is the resistance more than 1 $M\Omega$?	Go to step 5.	Repair the short circuit in harness between TCM and transmission connector, and poor contact in coupling connector.
5 CHECK FRONT VEHICLE SPEED SENSOR. Measure the resistance between transmission connector receptacle's terminals. <i>Connector & terminal</i> <i>(T4) No. 17 — No. 18:</i>	Is the resistance between 450 and 650 Ω ?	Go to step 6.	Replace the front vehicle speed sensor. <Ref. to AT-32, Front Vehicle Speed Sensor.>
6 PREPARE OSCILLOSCOPE.	Do you have an 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. NOTE: 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 the voltage between TCM connector terminals. <i>Connector & terminal</i> <i>(B55) No. 18 (+) — (B54) No. 10 (-):</i>	Is the voltage more than AC 1 V?	Even if the POWER indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor contact or harness may be the cause. Repair the harness or connector in the front vehicle speed sensor circuit.	Go to step 11.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
<p>9 CHECK FRONT VEHICLE SPEED SENSOR USING OSCILLOSCOPE.</p> <p>1)Connect all connectors. 2)Lift-up the vehicle and place safety stand.</p> <p>NOTE: On AWD models, raise all wheels off ground.</p> <p>3)Set the oscilloscope to TCM connector terminals.</p> <p style="text-align: center;">Connector & terminal</p> <p style="text-align: center;">Positive probe; (B55) No. 18</p> <p style="text-align: center;">Earth lead; (B54) No. 10</p> <p>1)Start the engine, and drive the wheels slowly.</p> <p>NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunctions. When AT control diagnosis is finished, perform the ABS memory clearance procedure of self-diagnosis system. <Ref. to ABS-22, Clear Memory Mode.></p> <p>2)Measure the signal voltage indicated on oscilloscope.</p>	<p>Is the voltage more than AC 4 V?</p>	<p>Even if the POWER indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor contact or harness may be the cause. Repair the harness or connector in front vehicle speed sensor circuit.</p>	<p>Go to step 11.</p>
<p>10 CHECK INPUT SIGNAL FOR TCM USING SUBARU SELECT MONITOR.</p> <p>1)Connect all connectors. 2)Connect the Subaru Select Monitor to data link connector. 3)Lift-up or raise the vehicle and place safety stands.</p> <p>NOTE: On AWD models, raise all wheels off floor.</p> <p>4)Turn the ignition switch to ON and turn Subaru Select Monitor switch to ON. 5)Start the engine. 6)Read the data of vehicle speed using Subaru Select Monitor.</p> <ul style="list-style-type: none"> •Compare the speedometer with Subaru Select Monitor indications. •Vehicle speed is indicated in “km/h” or “MPH”. <p>7)Slowly increase the vehicle speed to 60 km/h or 37 MPH.</p> <p>NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS-22, Clear Memory Mode.></p>	<p>Does the speedometer indication increase as Subaru Select Monitor data increases?</p>	<p>Even if the POWER indicator lights up, the circuit has returned to a normal condition at this time. A temporary poor connector or harness may be the cause. Repair the harness or connector in front vehicle speed sensor circuit.</p>	<p>Go to step 11.</p>
<p>11 CHECK POOR CONTACT.</p>	<p>Is there poor contact in front vehicle speed sensor circuit?</p>	<p>Repair the poor contact.</p>	<p>Replace the TCM. <Ref. to AT-46, Transmission Control Module (TCM).></p>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
AUTOMATIC TRANSMISSION (DIAGNOSTICS)

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

F: DTC 36 TORQUE CONVERTER TURBINE SPEED SENSOR

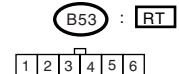
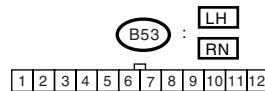
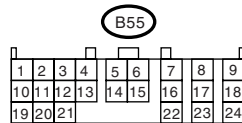
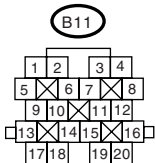
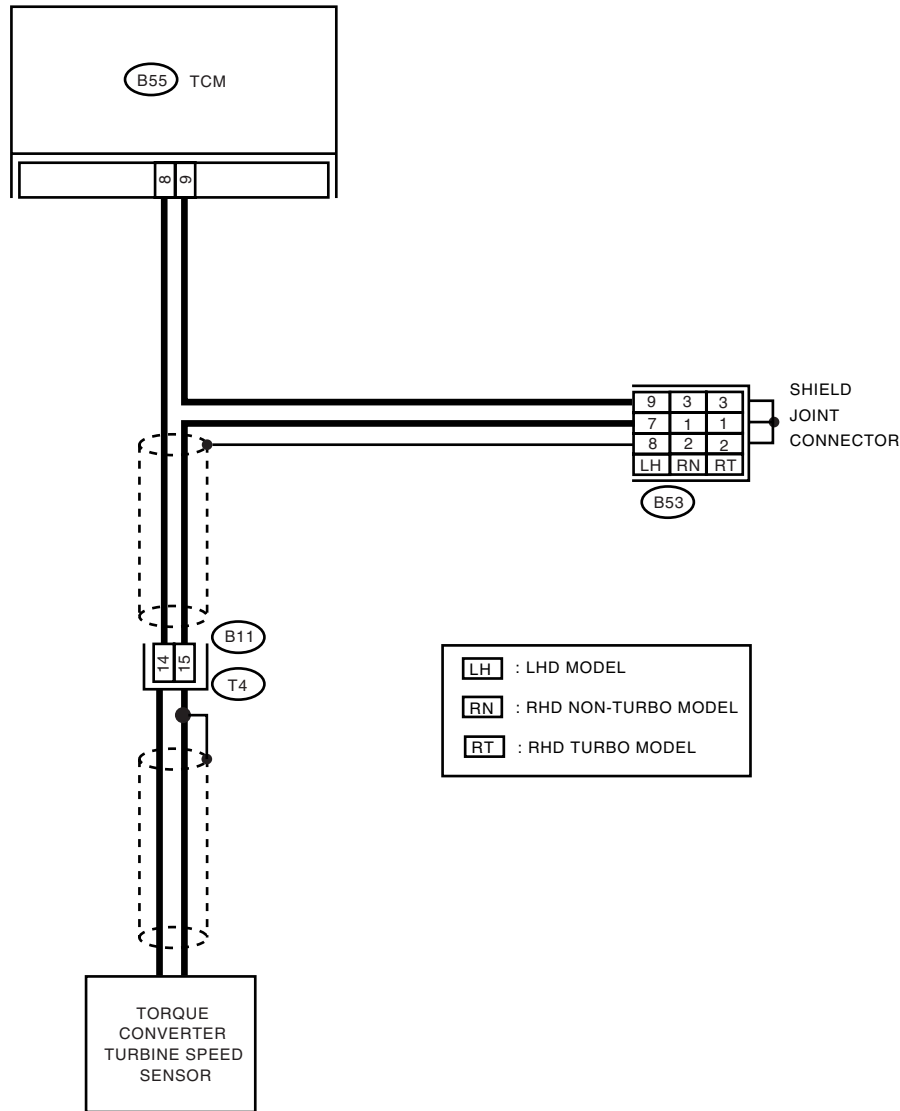
DIAGNOSIS:

The input signal circuit of TCM is open or shorted.

TROUBLE SYMPTOM:

Excessive shift shock.

WIRING DIAGRAM:



TR0919

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK TORQUE CONVERTER TURBINE SPEED SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from transmission. 3) Measure the 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 the turbine speed sensor. <Ref. to AT-37, Torque Converter Turbine Speed Sensor.>
2 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION. 1) Disconnect the connector from TCM. 2) Measure the 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 the open circuit in harness between TCM and transmission connector.
3 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION. Measure the 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 the open circuit in harness between TCM and transmission connector, and poor contact in coupling connector.
4 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION. Measure the 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 the short circuit in harness between TCM and transmission connector.
5 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION. Measure the 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 the short circuit in harness between TCM and transmission connector, and poor contact in coupling connector.
6 PREPARE OSCILLOSCOPE.	Do you have an 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 the connectors to TCM and transmission. 2) Start the engine and move select lever to "P" or "N" range. 3) Measure the 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 the 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 the harness or connector in TCM and transmission.	Go to step 11.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
9 CHECK INPUT SIGNAL FOR TCM USING SUBARU SELECT MONITOR. 1)Connect the connectors to TCM and transmission. 2)Connect the Subaru Select Monitor to data link connector. 3)Turn the ignition switch to ON and turn Subaru Select Monitor switch to ON. 4)Start the engine. 5)Move the select lever to "P" or "N" range. 6)Read the data of turbine speed using Subaru Select Monitor. •Compare the tachometer with Subaru Select Monitor indications.	Is the revolution value same as the tachometer reading shown on the combination meter?	Even if the 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 the harness or connector in TCM and transmission.	Go to step 11.
10 CHECK INPUT SIGNAL FOR TCM USING OSCILLOSCOPE. 1)Connect the connectors to TCM and transmission. 2)Set the oscilloscope to TCM connector terminals. <i>Connector & terminal</i> <i>Positive probe; (B55) No. 8</i> <i>Earth lead; (B55) No. 9</i> 3)Start the engine and move select lever to "P" or "N" range.	Is the signal voltage more than AC 1 V?	Even if the 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 the harness or connector in TCM and transmission.	Go to step 11.
11 CHECK POOR CONTACT.	Is there poor contact in torque converter turbine speed sensor circuit?	Repair the poor contact.	Replace the TCM. <Ref. to AT-46, Transmission Control Module (TCM).>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

G: DTC 38 TORQUE CONTROL SIGNAL

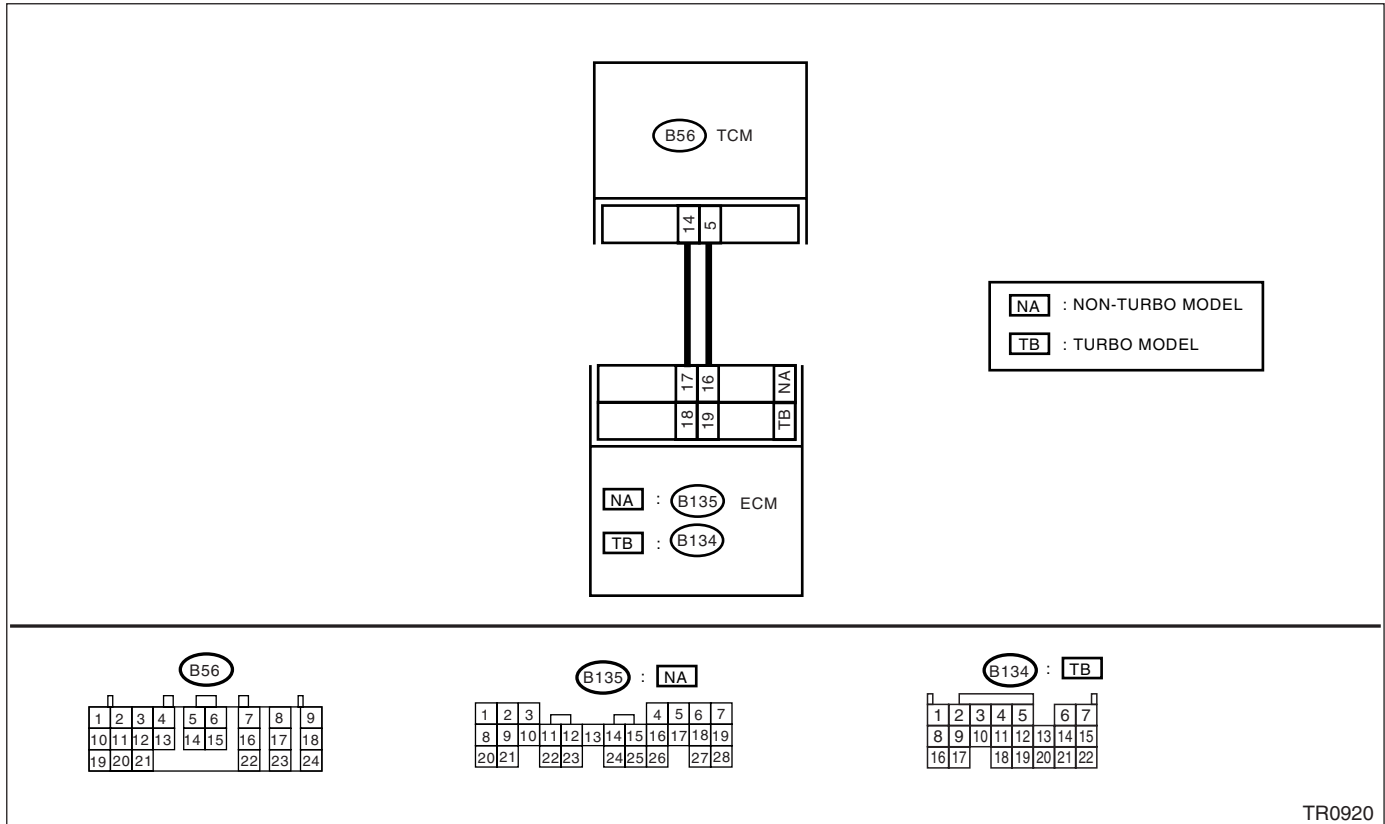
DIAGNOSIS:

- The signal circuit is open or shorted.

TROUBLE SYMPTOM:

Excessive shift shock.

WIRING DIAGRAM:



Step	Check	Yes	No
1 CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM and ECM. 3) Measure the resistance of harness between TCM and ECM connector. Connector & terminal NON-TURBO MODEL (B56) No. 14 — (B135) No. 17: (B56) No. 5 — (B135) No. 16: TURBO MODEL (B56) No. 14 — (B134) No. 18: (B56) No. 5 — (B134) No. 19:	Is the resistance less than 1 Ω?	Go to step 2.	Repair the open circuit in harness between TCM and ECM connector.
2 CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM. Measure the 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 the short circuit in harness between TCM and ECM connector.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
3 CHECK OUTPUT SIGNAL EMITTED FROM TCM. 1)Connect the connectors to TCM and ECM. 2)Turn the ignition switch to ON (engine OFF). 3)Measure the voltage between TCM connector terminals. <i>Connector & terminal</i> <i>(B56) No. 14 (+) — Chassis ground (-):</i> <i>(B56) No. 5 (+) — Chassis ground (-):</i>	Is the voltage more than 4.8 V?	Even if the 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 the harness or connector in TCM and ECM.	Go to step 4.
4 CHECK POOR CONTACT.	Is there poor contact in torque control signal circuit?	Repair the poor contact.	Go to step 5.
5 CHECK GROUND LINE BETWEEN TRANSMISSION AND BODY. Check installing condition of the ground line in transmission and body.	Is there any dirt or rust at the ground line installing point?	Remove dirt and rust.	Go to step 6.
6 CHECK GROUND LINE BETWEEN TRANSMISSION AND BODY. Check installing condition of the ground line in transmission and body. <i>Tightening torque:</i> <i>13 N·m (1.3 kgf·m, 9.4 ft·lb)</i>	Is the tightening torque value within specification?	Go to step 7.	Tighten to the specified torque.
7 CHECK GROUND LINE INSIDE TRANSMISSION. 1)Drain the ATF and remove oil pan. 2)Check the tightening torque value of ground line installing bolt. <i>Tightening torque:</i> <i>T: 8 N·m (0.8 kgf·m, 5.8 ft·lb)</i>	Is the tightening torque value within specification?	Go to step 9.	Tighten to the specified torque.
8 CHECK GROUND CIRCUIT OF ECM. <Ref. to AT-50, DTC 31 THROTTLE POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble?	Repair the ground terminal and/or ground circuit of ECM.	Go to step 9.
9 RECHECK OUTPUT SIGNAL EMITTED FROM TCM. Measure the voltage between TCM connector and chassis ground. <i>Connector & terminal</i> <i>(B56) No. 14 (+) — Chassis ground (-):</i> <i>(B56) No. 5 (+) — Chassis ground (-):</i>	Is each voltage more than 4 V?	Replace the TCM. <Ref. to AT-46, Transmission Control Module (TCM).>	Replace the ECM.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

H: DTC 45 INTAKE MANIFOLD PRESSURE SIGNAL (NON-TURBO MODEL)

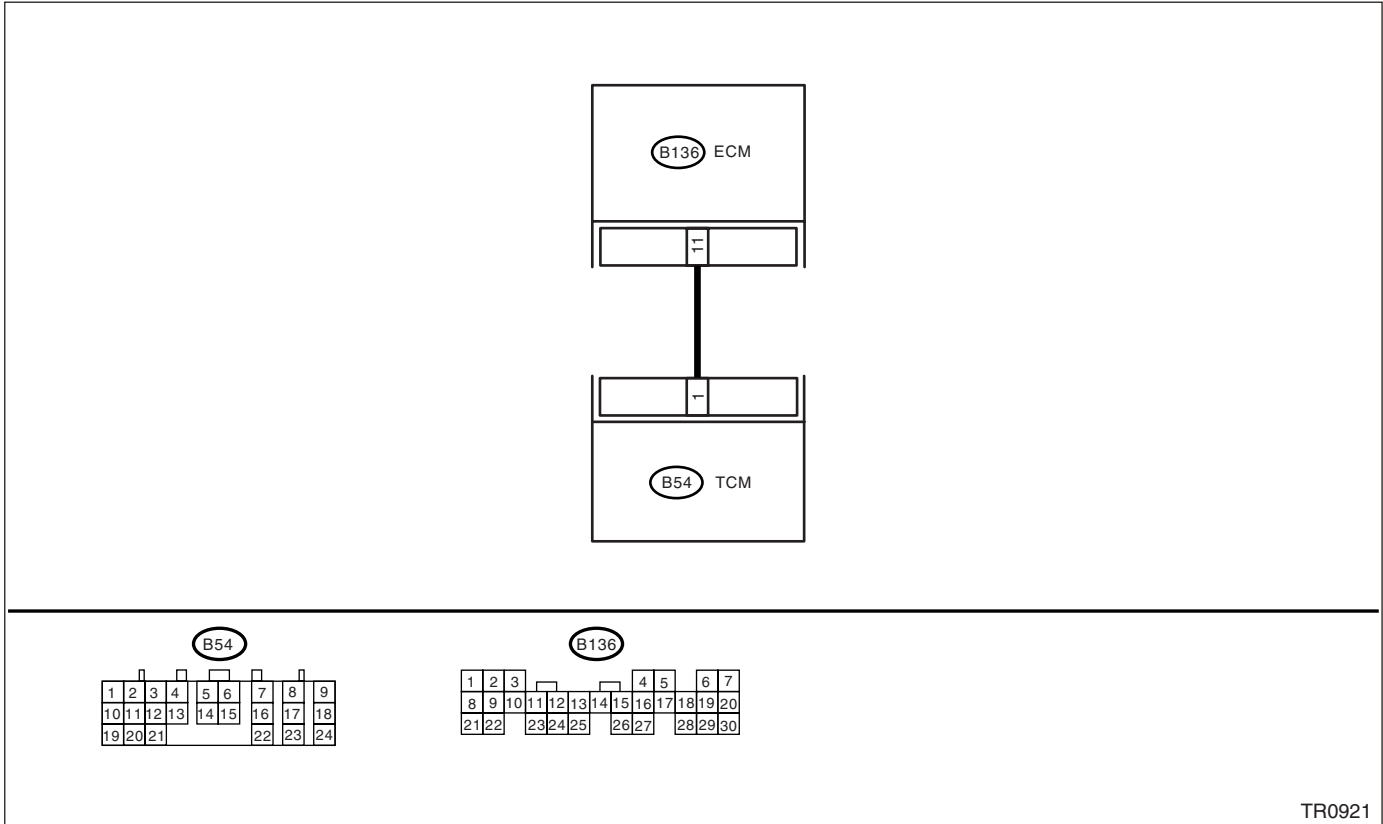
DIAGNOSIS:

The input signal circuit of TCM from ECM is open or shorted.

TROUBLE SYMPTOM:

Excessive shift shock.

WIRING DIAGRAM:



TR0921

Step	Check	Yes	No
1	CHECK ENGINE GROUND TERMINALS AND GROUND CIRCUIT OF ECM <Ref. to AT-50, DTC 31 THROTTLE POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble?	Repair the ground terminal and/or ground circuit of ECM. Go to step 2.
2	CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM and ECM. 3) Measure the resistance of harness between TCM and ECM connector. Connector & terminal (B54) No. 1 — (B136) No. 11:	Is the resistance less than 1 Ω?	Go to step 3. Repair the open circuit in harness between TCM and ECM connector.
3	CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM. Measure the resistance of harness between TCM connector and chassis ground. Connector & terminal (B54) No. 1 — Chassis ground:	Is the resistance more than 1 MΩ?	Go to step 4. Repair the short circuit in harness between TCM and ECM connector.
4	PREPARE SUBARU SELECT MONITOR.	Do you have a Subaru Select Monitor?	Go to step 6. Go to step 5.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
5 CHECK INPUT SIGNAL FOR TCM. 1)Connect the connectors to TCM and ECM. 2)Start the engine, and warm-up the transmission until ATF temperature is above 80°C (176°F). NOTE: If ambient temperature is below 0°C (32°F), drive the vehicle until ATF reaches its operating temperature. 3)Idle the engine. 4)Measure the voltage between TCM connector and chassis ground. Connector & terminal (B54) No. 1 (+) — Chassis ground (-):	Is the voltage between 0.4 and 1.6 V?	Even if the 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 the harness or connector in TCM and ECM.	Go to step 7.
6 CHECK INPUT SIGNAL FOR TCM USING SUBARU SELECT MONITOR. 1)Connect the connectors to TCM and ECM. 2)Connect the Subaru Select Monitor to data link connector. 3)Start the engine, and turn Subaru Select Monitor switch to ON. 4)Warm-up the engine until engine coolant temperature is above 80°C (176°F). 5)Idle the engine. 6)Read the data of intake manifold pressure signal using Subaru Select Monitor. •Display shows the intake manifold pressure signal value sent from ECM.	Is the value voltage between 0.4 and 1.6 V?	Even if the 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 the harness or connector in TCM and ECM.	Go to step 7.
7 CHECK POOR CONTACT.	Is there poor contact in intake manifold pressure signal circuit?	Repair the poor contact.	Replace the TCM. <Ref. to AT-46, Transmission Control Module (TCM).>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

I: DTC 71 SHIFT SOLENOID 1

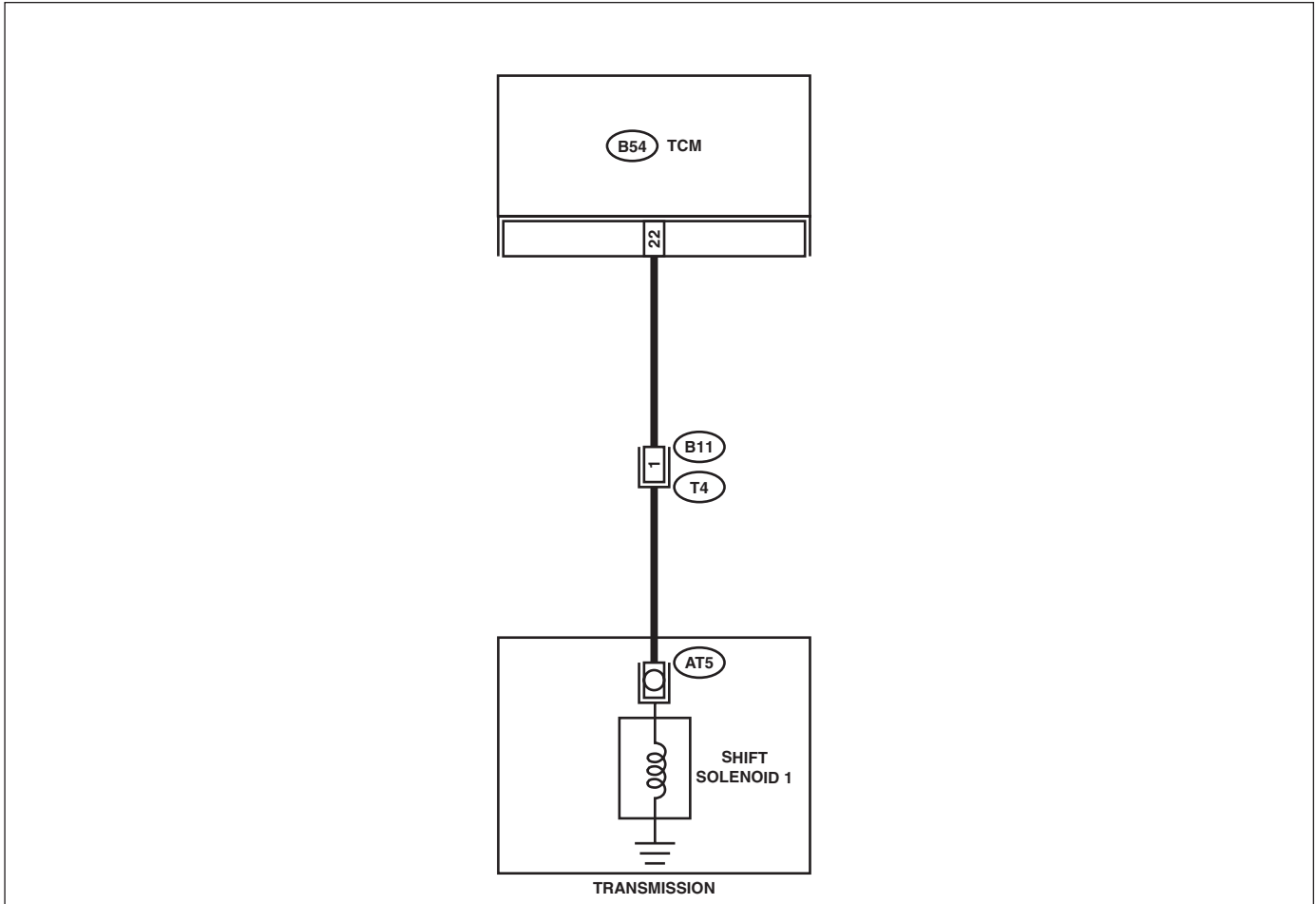
DIAGNOSIS:

The output signal circuit of shift solenoid 1 is open or shorted.

TROUBLE SYMPTOM:

Does not shift.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	<p>CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.</p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Disconnect the connector from TCM and transmission.</p> <p>3) Measure the resistance of harness between TCM and shift solenoid 1 connector.</p> <p>Connector & terminal (B54) No. 22 — (B11) No. 1:</p>	Is the resistance less than 1 Ω?	Go to step 2.	Repair the open circuit in harness between TCM and transmission connector.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
2 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION. Measure the resistance of harness between TCM connector and chassis ground. <i>Connector & terminal</i> <i>(B54) No. 22 — Chassis ground:</i>	Is the resistance more than 1 M Ω ?	Go to step 3.	Repair the short circuit in harness between TCM and transmission connector.
3 CHECK SHIFT SOLENOID 1. Measure the resistance between transmission connector terminals. <i>Connector & terminal</i> <i>(T4) No. 1 — No. 16:</i>	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 the connectors to TCM and transmission. 2)Turn the ignition switch to ON (engine OFF). 3)Move the select lever to "D" range. 4)Measure the voltage between TCM connector and chassis ground. <i>Connector & terminal</i> <i>(B54) No. 22 (+) — Chassis ground (-):</i>	Is the voltage more than 9V?	Go to step 5.	Go to step 6.
5 CHECK OUTPUT SIGNAL EMITTED FROM TCM. 1)Turn the HOLD mode switch to ON. 2)Measure the voltage between TCM connector and chassis ground. <i>Connector & terminal</i> <i>(B54) No. 22 (+) — Chassis ground (-):</i>	Is the voltage less than 1V?	Even if the 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 the harness or contact in TCM.	Go to step 6.
6 CHECK POOR CONTACT.	Is there poor contact in shift solenoid 1 circuit?	Repair poor contact.	Replace the TCM. <Ref. to AT-46, Transmission Control Module (TCM).>
7 CHECK SHIFT SOLENOID 1 (IN TRANSMISSION). 1)Remove the transmission connector from bracket. 2)Lift-up or raise the vehicle and support with safety stand. NOTE: On AWD models, raise all wheels off ground. 3)Drain the ATF. CAUTION: Do not drain the ATF until it cools down. 4)Remove the oil pan, and disconnect connector from shift solenoid 1. 5)Measure the resistance between shift solenoid 1 connector and transmission ground. <i>Terminal</i> <i>No. 1 — Transmission ground:</i>	Is the resistance between 10 and 16 Ω ?	Go to step 8.	Replace the shift solenoid 1. <Ref. to AT-40, Shift Solenoids, Duty Solenoids and ATF Temperature Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
8 CHECK HARNESS CONNECTOR BETWEEN SHIFT SOLENOID 1 AND TRANSMISSION. Measure the 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 the open circuit in harness between shift solenoid 1 and transmission connector.
9 CHECK HARNESS CONNECTOR BETWEEN SHIFT SOLENOID 1 AND TRANSMISSION. Measure the 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 the 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 the harness or connector in shift solenoid 1 and transmission.	Repair the short circuit harness between shift solenoid 1 and transmission connector.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

J: DTC 72 SHIFT SOLENOID 2

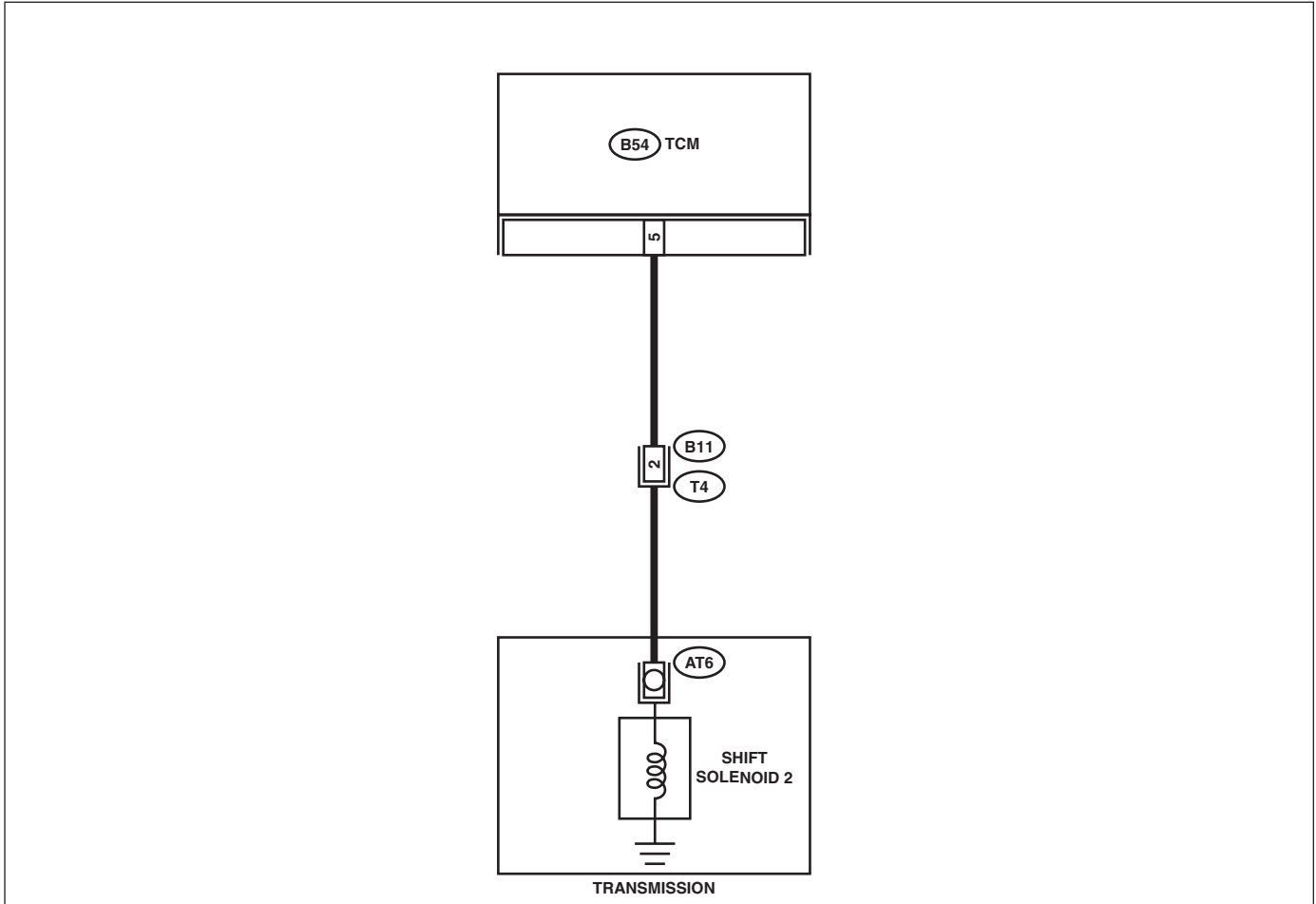
DIAGNOSIS:

The output signal circuit of shift solenoid 2 is open or shorted.

TROUBLE SYMPTOM:

Does not shift.

WIRING DIAGRAM:



TR0411

Step	Check	Yes	No
1 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and transmission. 3) Measure the 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 the open circuit in harness between TCM and transmission connector.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
<p>2 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION. Measure the resistance of harness between TCM connector and transmission ground. Connector & terminal (B54) No. 5 — Chassis ground:</p>	Is the resistance more than 1 MΩ?	Go to step 3.	Repair the short circuit in harness between TCM and transmission connector.
<p>3 CHECK SHIFT SOLENOID 2. Measure the resistance between transmission connector terminals. Connector & terminal (T4) No. 2 — No. 16:</p>	Is the resistance between 10 and 16 Ω?	Go to step 4.	Go to step 6.
<p>4 CHECK OUTPUT SIGNAL EMITTED FROM TCM. 1)Connect the connectors to TCM and transmission. 2)Lift-up or raise the vehicle and support with safety stand. NOTE: 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 ATF reaches its operating temperature. 4)Move the selector lever to "D" range, 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 the voltage between TCM connector and chassis ground. Connector & terminal (B54) No. 22 (+) — Chassis ground (-):</p>	Is the voltage less than 1 V?	Even if the 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 the harness or connector in TCM and transmission.	Go to step 5.
<p>5 CHECK POOR CONTACT.</p>	Is there poor contact in shift solenoid 2 circuit?	Repair the poor contact.	Replace the TCM. <Ref. to AT-46, Transmission Control Module (TCM).>
<p>6 CHECK SHIFT SOLENOID 2 (IN TRANSMISSION). 1)Remove the transmission connector from bracket. 2)Drain the ATF. CAUTION: Do not drain the ATF until it cools down. 3)Remove the oil pan, and disconnect connector from shift solenoid 2. 4)Measure the resistance between shift solenoid 2 connector and transmission ground. Connector & terminal No. 1 — Transmission ground:</p>	Is the resistance between 10 and 16 Ω?	Go to step 7.	Replace the shift solenoid 2 assembly. <Ref. to AT-40, Shift Solenoids, Duty Solenoids and ATF Temperature Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
7 CHECK HARNESS CONNECTOR BETWEEN SHIFT SOLENOID 2 AND TRANSMISSION. Measure the 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 the open circuit in harness between shift solenoid 2 and transmission connector.
8 CHECK HARNESS CONNECTOR BETWEEN SHIFT SOLENOID 2 AND TRANSMISSION. Measure the resistance of harness between shift solenoid 2 connector and transmission ground. Connector & terminal (T4) No. 2 — Transmission ground:	Is the resistance more than 1 $M\Omega$?	Even if the 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 the harness or connector in shift solenoid 2 and transmission.	Repair the short circuit harness between shift solenoid 2 and transmission connector.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

K: DTC 73 LOW CLUTCH TIMING SOLENOID

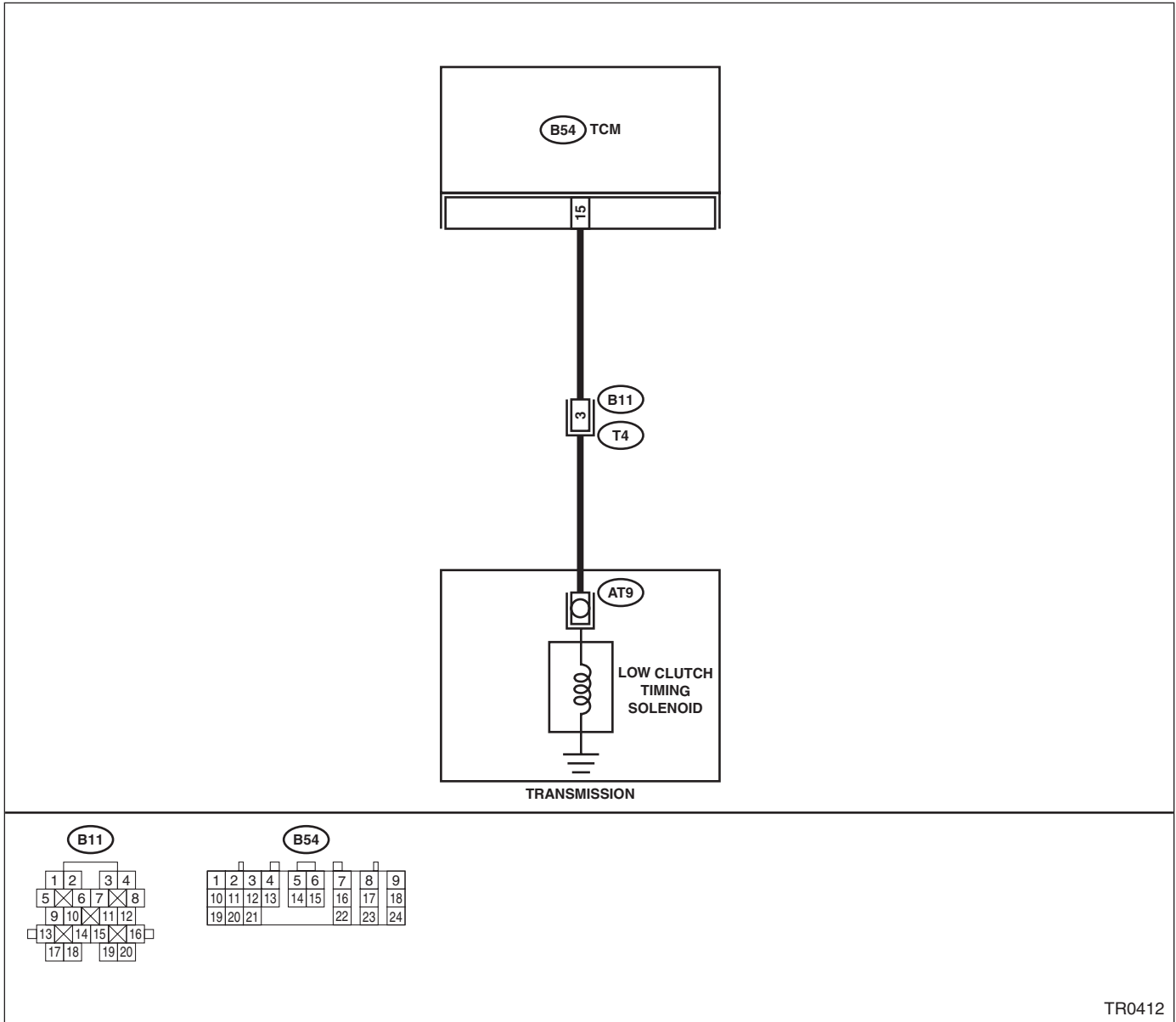
DIAGNOSIS:

The output signal circuit of low clutch timing solenoid is open or shorted.

TROUBLE SYMPTOM:

Excessive shift shock.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	<p>CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.</p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Disconnect the connector from TCM and transmission.</p> <p>3) Measure the resistance of harness between TCM and transmission connector.</p> <p>Connector & terminal (B54) No. 15 — (B11) No. 3:</p>	<p>Is the resistance less than 1 Ω?</p>	<p>Go to step 2.</p>	<p>Repair the open circuit in harness between TCM and transmission connector.</p>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
2 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION. Measure the resistance of harness between TCM connector and transmission ground. Connector & terminal (B54) No. 15 — Chassis ground:	Is the resistance more than 1 M Ω ?	Go to step 3.	Repair the short circuit in harness between TCM and transmission connector.
3 CHECK LOW CLUTCH TIMING SOLENOID. Measure the 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 the connectors to TCM and transmission. 2)Turn the ignition switch to ON (engine OFF). 3)Move the select lever to "D" range. 4)Measure the voltage between TCM connector and chassis ground. Connector & terminal (B54) No. 15 (+) — Chassis ground (-):	Is the voltage more than 9 V?	Go to step 5.	Go to step 6.
5 CHECK OUTPUT SIGNAL EMITTED FROM TCM. 1)Turn the HOLD mode switch to ON. 2)Measure the voltage between TCM connector and chassis ground. Connector & terminal (B54) No. 15 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Even if the 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 the harness or contact in TCM and transmission.	Go to step 6.
6 CHECK POOR CONTACT.	Is there poor contact in low clutch timing solenoid circuit?	Repair the poor contact.	Replace the TCM. <Ref. to AT-46, Transmission Control Module (TCM).>
7 CHECK LOW CLUTCH TIMING SOLENOID (IN TRANSMISSION). 1)Remove the transmission connector from bracket. 2)Lift-up or raise the vehicle and support with safety stand. NOTE: On AWD models, raise all wheels off ground. 3)Drain the ATF. CAUTION: Do not drain the ATF until it cools down. 4)Remove the oil pan, and disconnect connector from low clutch timing solenoid. 5)Measure the 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 the low clutch timing solenoid. <Ref. to AT-40, Shift Solenoids, Duty Solenoids and ATF Temperature Sensor.>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
8 CHECK HARNESS CONNECTOR BETWEEN LOW CLUTCH TIMING SOLENOID AND TRANSMISSION. Measure the resistance of harness between low clutch timing solenoid and transmission connector. Connector & terminal (AT9) No. 1 — (T4) No. 3:	Is the resistance less than 1 Ω ?	Go to step 9 .	Repair the open circuit in harness between low clutch timing solenoid and transmission connector.
9 CHECK HARNESS CONNECTOR BETWEEN LOW CLUTCH TIMING SOLENOID AND TRANSMISSION. Measure the resistance of harness between low clutch timing solenoid connector and transmission ground. Connector & terminal (T4) No. 3 — Transmission ground:	Is the resistance more than 1 $M\Omega$?	Even if the 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 the harness or connector in low clutch timing solenoid and transmission.	Repair the short circuit harness between low clutch timing solenoid and transmission connector.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
AUTOMATIC TRANSMISSION (DIAGNOSTICS)

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
AUTOMATIC TRANSMISSION (DIAGNOSTICS)

L: DTC 74 2-4 BRAKE TIMING SOLENOID

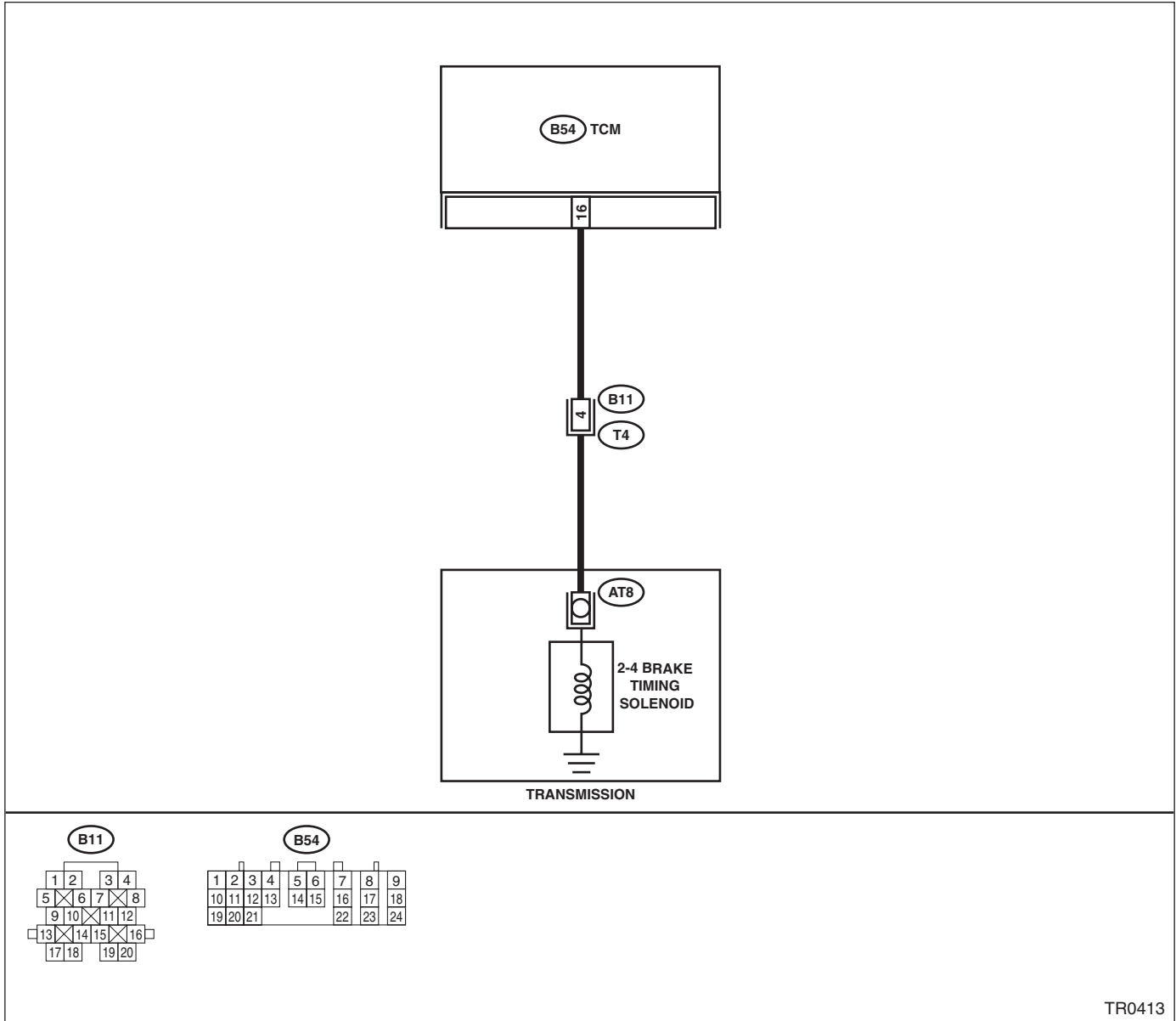
DIAGNOSIS:

The 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
<p>1</p> <p>CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.</p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Disconnect the connector from TCM and transmission.</p> <p>3) Measure the resistance of harness between TCM and transmission connector.</p> <p>Connector & terminal (B54) No. 16 — (B11) No. 4:</p>	<p>Is the resistance less than 1 Ω?</p>	<p>Go to step 2.</p>	<p>Repair the open circuit in harness between TCM and transmission connector.</p>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
<p>2</p> <p>CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION. Measure the resistance of harness between TCM connector and transmission ground. Connector & terminal (B54) No. 16 — Transmission ground:</p>	Is the resistance more than 1 M Ω ?	Go to step 3.	Repair the short circuit in harness between TCM and transmission connector.
<p>3</p> <p>CHECK 2-4 BRAKE TIMING SOLENOID. Measure the resistance between transmission connector terminals. Connector & terminal (T4) No. 4 — No. 16:</p>	Is the resistance between 10 and 16 Ω ?	Go to step 4.	Go to step 7.
<p>4</p> <p>CHECK OUTPUT SIGNAL EMITTED FROM TCM. 1)Connect the connectors to TCM and transmission. 2)Lift-up or raise the vehicle and support with safety stand. NOTE: 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 ATF reaches its operating temperature. 4)Move the selector lever to "1" range, 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 the voltage between TCM connector and chassis ground. Connector & terminal (B54) No. 16 (+) — Chassis ground (-):</p>	Is the voltage less than 1 V?	Go to step 5.	Go to step 6.
<p>5</p> <p>CHECK OUTPUT SIGNAL EMITTED FROM TCM. 1)Move the selector lever to "D" range, 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 the voltage between TCM connector and chassis ground. Connector & terminal (B54) No. 16 (+) — Chassis ground (-):</p>	Is the voltage more than 9 V?	Even if the 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 the harness or contact in transmission.	Go to step 6.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
6 CHECK POOR CONTACT.	Is there poor contact in 2-4 brake timing solenoid circuit?	Repair the poor contact.	Replace the TCM. <Ref. to AT-46, Transmission Control Module (TCM).>
7 CHECK 2-4 BRAKE TIMING SOLENOID (IN TRANSMISSION). 1)Remove the transmission connector from bracket. 2)Lift-up or raise the vehicle and support with safety stand. NOTE: On AWD models, raise all wheels off ground. 3)Drain the ATF. CAUTION: Do not drain the ATF until it cools down. 4)Remove the oil pan, and disconnect connector from 2-4 brake timing solenoid. 5)Measure the 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 the 2-4 brake timing solenoid. <Ref. to AT-40, Shift Solenoids, Duty Solenoids and ATF Temperature Sensor.>
8 CHECK HARNESS CONNECTOR BETWEEN 2-4 BRAKE TIMING SOLENOID AND TRANSMISSION. Measure the 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 the 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 the 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 MΩ?	Even if the 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 the harness or connector in 2-4 brake timing solenoid and transmission.	Repair the short circuit harness between 2-4 brake timing solenoid and transmission connector.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)
AUTOMATIC TRANSMISSION (DIAGNOSTICS)

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

M: DTC 75 LINE PRESSURE DUTY SOLENOID

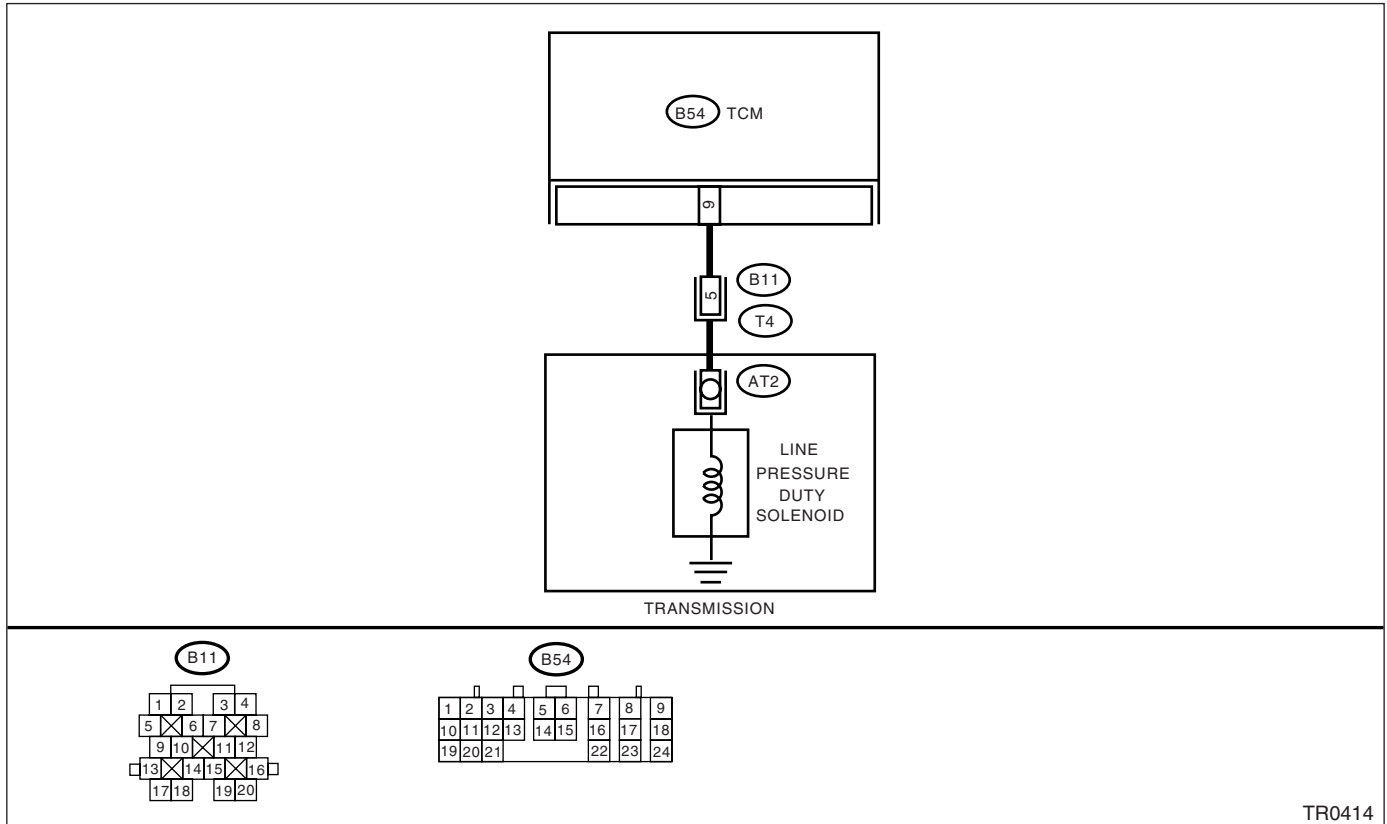
DIAGNOSIS:

The 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 the ignition switch to OFF. 2) Disconnect the connector from transmission and TCM. 3) Measure the resistance of harness between TCM and transmission connector. <i>Connector & terminal</i> <i>(B54) No. 9 — (B11) No. 5:</i>	Is the resistance less than 1 Ω ?	Go to step 2.	Repair the open circuit in harness between TCM and transmission connector.
2 CHECK HARNESS CONNECTOR BETWEEN TCM AND CHASSIS GROUND. Measure the resistance of harness between TCM and chassis ground. <i>Connector & terminal</i> <i>(B54) No. 9 — Chassis ground:</i>	Is the resistance more than 1 M Ω ?	Go to step 3.	Repair the short circuit in harness between TCM and transmission connector.
3 CHECK LINE PRESSURE DUTY SOLENOID. Measure the resistance between transmission connector receptacle's terminals. <i>Terminal</i> <i>(T4) No. 5 — No. 16:</i>	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 DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
<p>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 ATF reaches its operating temperature. 3)Turn the ignition switch to ON (engine OFF). 4)Move the select lever to "N" range. 5)Measure the voltage between TCM connector and chassis ground. <i>Connector & terminal</i> <i>(B54) No. 9 (+) — Chassis ground (-):</i></p>	<p>Is the voltage between 1.5 and 5.0 V with throttle fully closed?</p>	<p>Go to step 6.</p>	<p>Go to step 9.</p>
<p>6 CHECK OUTPUT SIGNAL EMITTED FROM TCM. Measure the voltage between TCM connector and chassis ground. <i>Connector & terminal</i> <i>(B54) No. 9 (+) — Chassis ground (-):</i></p>	<p>Is the voltage less than 1 V with throttle fully open?</p>	<p>Even if the 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 the harness or connector in transmission.</p>	<p>Go to step 9.</p>
<p>7 CHECK OUTPUT SIGNAL EMITTED FROM TCM USING SUBARU SELECT MONITOR. 1)Connect the connectors to TCM and transmission. 2)Connect the 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 ATF reaches its operating temperature. 5)Stop the engine and turn ignition switch to ON (engine OFF). 6)Move the select lever to "N" range. 7)Read the data of line pressure duty solenoid using Subaru Select Monitor. •Line pressure duty solenoid is indicated in "%". 8)Throttle is fully closed.</p>	<p>Is the value 100 %?</p>	<p>Go to step 8.</p>	<p>Go to step 9.</p>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
8 CHECK OUTPUT SIGNAL EMITTED FROM TCM USING SUBARU SELECT MONITOR. 1) Turn the ignition switch to ON (engine OFF). 2) Throttle is fully open.	Is the value less than 25 %?	Even if the 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 the harness or connector in transmission.	Go to step 9.
9 CHECK POOR CONTACT.	Is there poor contact in line pressure duty solenoid circuit?	Repair the poor contact.	Replace the TCM. <Ref. to AT-46, Transmission Control Module (TCM).>
10 CHECK LINE PRESSURE DUTY SOLENOID (IN TRANSMISSION). 1) Remove the transmission connector from bracket. 2) Drain the ATF. CAUTION: Do not drain the ATF until it cools down. 3) Remove the oil pan, and disconnect connector from line pressure duty solenoid. 4) Measure the resistance between line pressure duty solenoid connector and transmission ground. <i>Terminal</i> <i>No. 1 — Transmission ground:</i>	Is the resistance between 2.0 and 4.5 Ω?	Go to step 11.	Replace the line pressure duty solenoid. <Ref. to AT-40, Shift Solenoids, Duty Solenoids and ATF Temperature Sensor.>
11 CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND LINE PRESSURE DUTY SOLENOID. Measure the resistance of harness between line pressure duty solenoid and transmission connector. <i>Connector & terminal</i> <i>(T4) No. 5 — (AT2) No. 1:</i>	Is the resistance less than 1 Ω?	Go to step 12.	Repair the open circuit in harness between line pressure duty solenoid and transmission connector.
12 CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND LINE PRESSURE DUTY SOLENOID. Measure the resistance of harness between transmission connector and transmission ground. <i>Connector & terminal</i> <i>(T4) No. 5 — Transmission ground:</i>	Is the resistance more than 1 MΩ?	Even if the 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 the harness or connector in line pressure duty solenoid and transmission.	Repair the short circuit in harness between line pressure duty solenoid and transmission connector.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

N: DTC 76 2-4 BRAKE DUTY SOLENOID

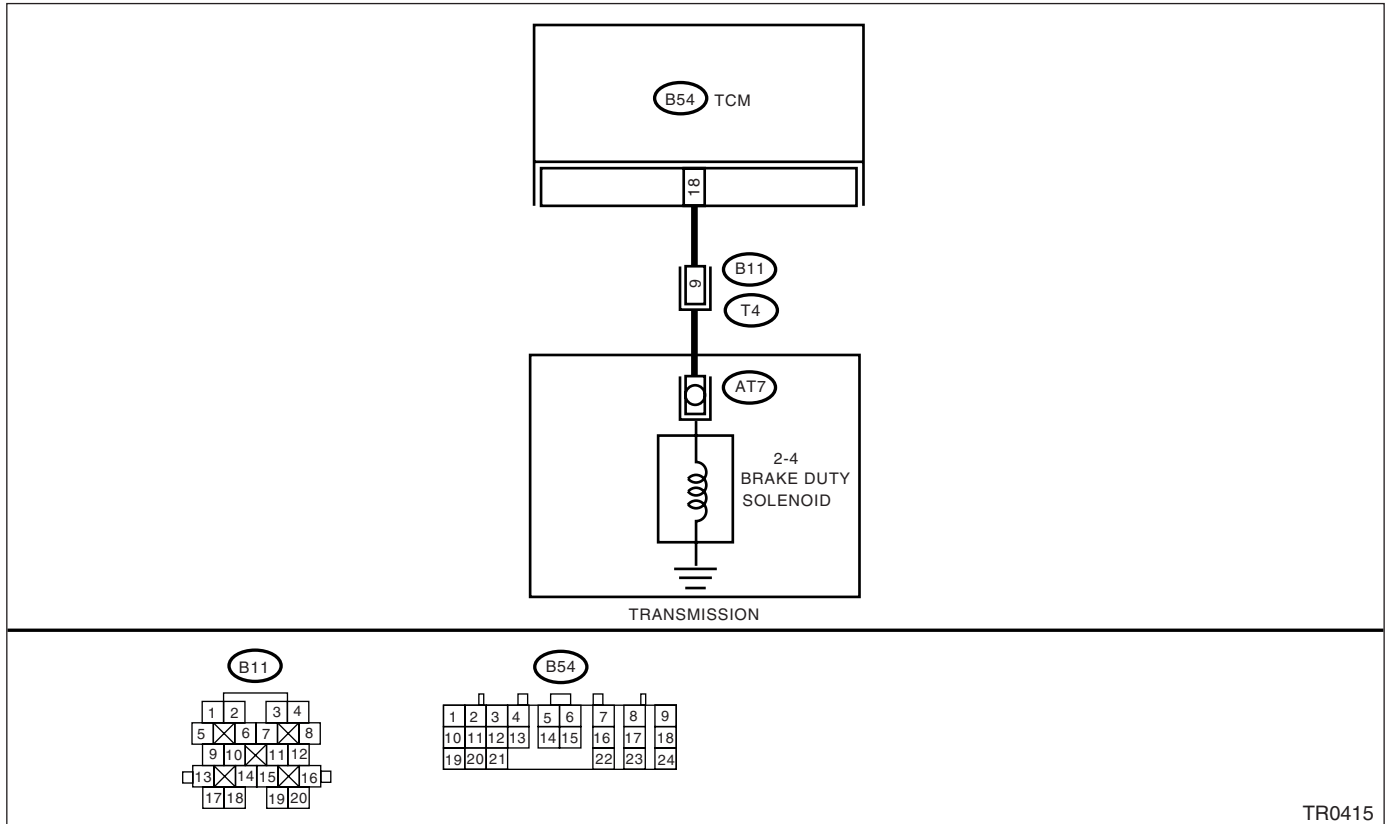
DIAGNOSIS:

The 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 the ignition switch to OFF. 2) Disconnect the connector from transmission and TCM. 3) Measure the 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 the open circuit in harness between TCM and transmission connector.
2	CHECK HARNESS CONNECTOR BETWEEN TCM AND CHASSIS GROUND. Measure the 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 the short circuit in harness between TCM and transmission connector.
3	CHECK 2-4 BRAKE DUTY SOLENOID. Measure the 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 DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
<p>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 ATF reaches its operating temperature. 3)Turn the ignition switch to ON (engine OFF). 4)Move the select lever to "N" range. 5)Measure the voltage between TCM connector and chassis ground. <i>Connector & terminal</i> <i>(B54) No. 18 (+) — Chassis ground (-):</i></p>	<p>Is the voltage between 1.5 and 5.0 V with throttle fully closed?</p>	<p>Go to step 6.</p>	<p>Go to step 9.</p>
<p>6 CHECK OUTPUT SIGNAL EMITTED FROM TCM. Measure the voltage between TCM connector and chassis ground. <i>Connector & terminal</i> <i>(B54) No. 18 (+) — Chassis ground (-):</i></p>	<p>Is the voltage less than 1 V with throttle fully open?</p>	<p>Even if the 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 the harness or connector in TCM and transmission.</p>	<p>Go to step 9.</p>
<p>7 CHECK OUTPUT SIGNAL EMITTED FROM TCM USING SUBARU SELECT MONITOR. 1)Connect all connectors. 2)Connect the 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 ATF reaches its operating temperature. 5)Stop the engine and turn ignition switch to ON (engine OFF). 6)Move the select lever to "N" range. 7)Read the data of 2-4 brake duty solenoid using Subaru Select Monitor. •2-4 brake duty solenoid is indicated in "%". 8)Throttle is fully closed.</p>	<p>Is the value 100 %?</p>	<p>Go to step 8.</p>	<p>Go to step 9.</p>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
8 CHECK OUTPUT SIGNAL EMITTED FROM TCM USING SUBARU SELECT MONITOR. 1) Turn the ignition switch to ON (engine OFF). 2) Throttle is fully open.	Is the value less than 25 %?	Even if the 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 the 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 the poor contact.	Replace the TCM. <Ref. to AT-46, Transmission Control Module (TCM).>
10 CHECK 2-4 BRAKE DUTY SOLENOID (IN TRANSMISSION). 1) Remove the transmission connector from bracket. 2) Drain the ATF. CAUTION: Do not drain the ATF until it cools down. 3) Remove the oil pan, and disconnect connector from 2-4 brake duty solenoid. 4) Measure the 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 the 2-4 brake duty solenoid. <Ref. to AT-40, Shift Solenoids, Duty Solenoids and ATF Temperature Sensor.>
11 CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND 2-4 BRAKE DUTY SOLENOID. Measure the 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 the 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 the 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 the 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 the harness or connector in line pressure duty solenoid and transmission.	Repair the short circuit in harness between 2-4 brake duty solenoid and transmission connector.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

O: DTC 77 LOCK-UP DUTY SOLENOID

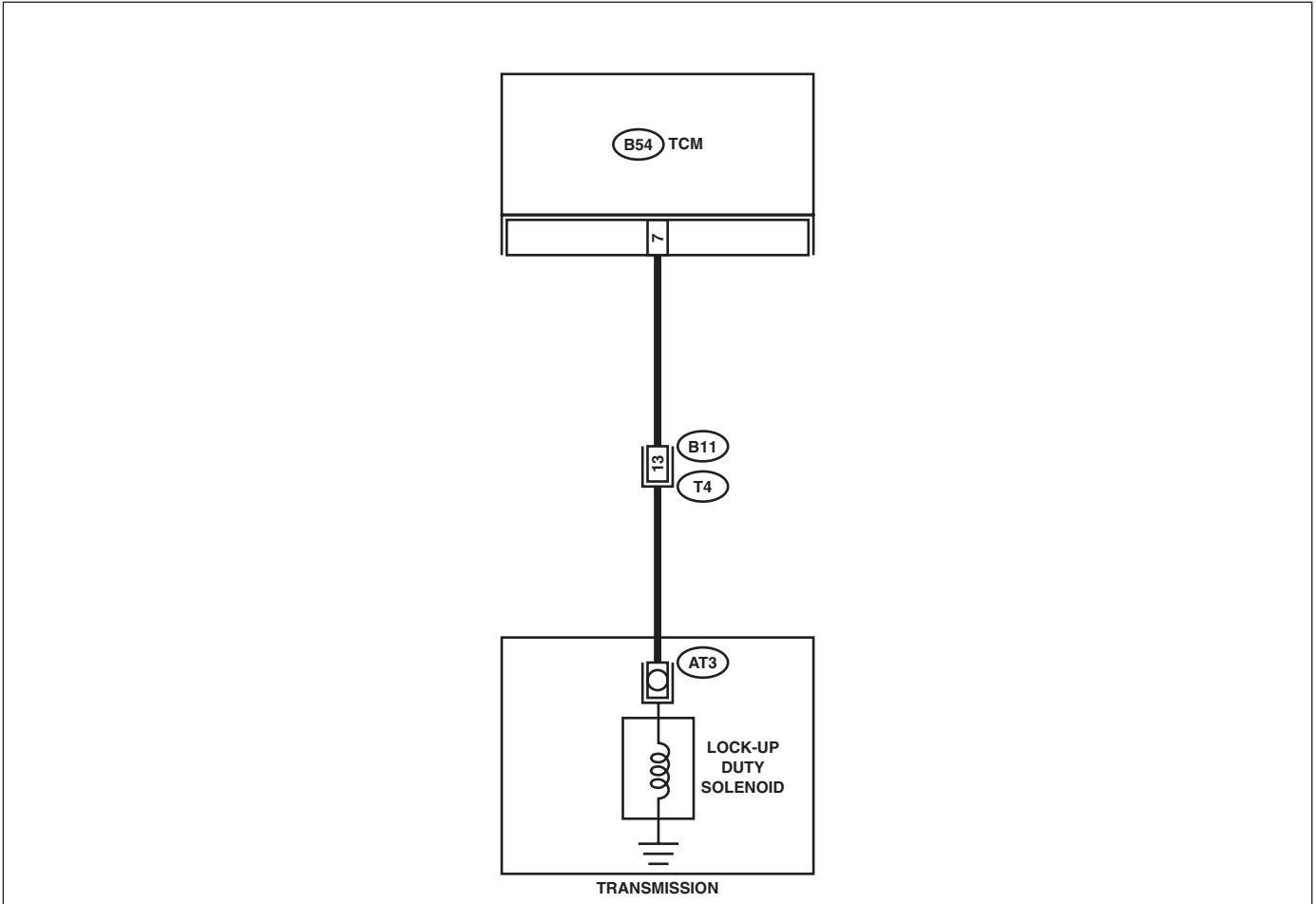
DIAGNOSIS:

The 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 DIAGNOSTIC TROUBLE CODE (DTC).	Do multiple DTCs appear in the on-board diagnostics test mode?	Go to another DTC.	Go to step 2.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
2 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and transmission. 3) Measure the resistance of harness between TCM and transmission connector. <i>Connector & terminal</i> <i>(B54) No. 7 — (B11) No. 13:</i>	Is the resistance less than 1 Ω ?	Go to step 3.	Repair the open circuit in harness between TCM and transmission connector.
3 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION. Measure the resistance of harness connector between TCM and chassis ground. <i>Connector & terminal</i> <i>(B54) No. 7 — Chassis ground:</i>	Is the resistance more than 1 M Ω ?	Go to step 4.	Repair the short circuit in harness between TCM and transmission connector.
4 CHECK LOCK-UP DUTY SOLENOID. Measure the resistance between transmission connector receptacle's terminals. <i>Connector & terminal</i> <i>(T4) No. 13 — No. 16:</i>	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 the connectors to TCM and transmission. 2) Lift-up the vehicle and place safety stand. NOTE: 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 ATF reaches its operating temperature. 4) Move the selector lever to "D" range 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 the voltage between TCM connector and chassis ground. <i>Connector & terminal</i> <i>(B54) No. 7 (+) — Chassis ground (-):</i>	Is the voltage more than 8.5 V?	Go to step 7.	Go to step 10.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
<p>7 CHECK OUTPUT SIGNAL EMITTED FROM TCM. 1)Return the engine to idling speed and move select lever to “N” range. 2)Measure the voltage between TCM connector and chassis ground. Connector & terminal (B54) No. 7 (+) — Chassis ground (-):</p>	Is the voltage less than 0.5 V?	Even if the 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 the harness or connector in TCM and transmission.	Go to step 10.
<p>8 CHECK OUTPUT SIGNAL EMITTED FROM TCM USING SUBARU SELECT MONITOR. 1)Connect the connectors to TCM and transmission. 2)Lift-up the vehicle and place safety stand. NOTE: On AWD models, raise all wheels off ground. 3)Connect the 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 ATF reaches its operating temperature. 6)Read the data of lock-up duty solenoid using Subaru Select Monitor. •Lock-up duty solenoid is indicated in “%”. 7)Move the selector lever to “D” range 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.></p>	Is the value 95 %?	Go to step 9.	Go to step 10.
<p>9 CHECK OUTPUT SIGNAL EMITTED FROM TCM USING SUBARU SELECT MONITOR. Return the engine to idling speed and move selector lever to “N” range. 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.></p>	Is the value 5 %?	Even if the 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 the harness or connector in TCM and transmission.	Go to step 10.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

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 the TCM. <Ref. to AT-46, Transmission Control Module (TCM).>
11 CHECK LOCK-UP DUTY SOLENOID (IN TRANSMISSION). 1)Remove the transmission connector from bracket. 2)Drain the ATF. CAUTION: Do not drain the ATF until it cools down. 3)Remove the oil pan and disconnect connector from lock-up duty solenoid. 4)Measure the 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 the lock-up duty solenoid. <Ref. to AT-40, Shift Solenoids, Duty Solenoids and ATF Temperature Sensor.>
12 CHECK HARNESS CONNECTOR BETWEEN LOCK-UP DUTY SOLENOID AND TRANSMISSION. Measure the 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 the open circuit in harness between TCM and transmission connector.
13 CHECK HARNESS CONNECTOR BETWEEN LOCK-UP DUTY SOLENOID AND TRANSMISSION. Measure the resistance of harness between transmission connector and transmission ground. Connector & terminal (T4) No. 13 — Transmission ground:	Is the resistance more than 1 M Ω ?	Even if the 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 the harness or connector in lock-up duty solenoid and transmission.	Repair the short circuit in harness between lock-up duty solenoid and transmission connector.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

P: DTC 79 TRANSFER DUTY SOLENOID

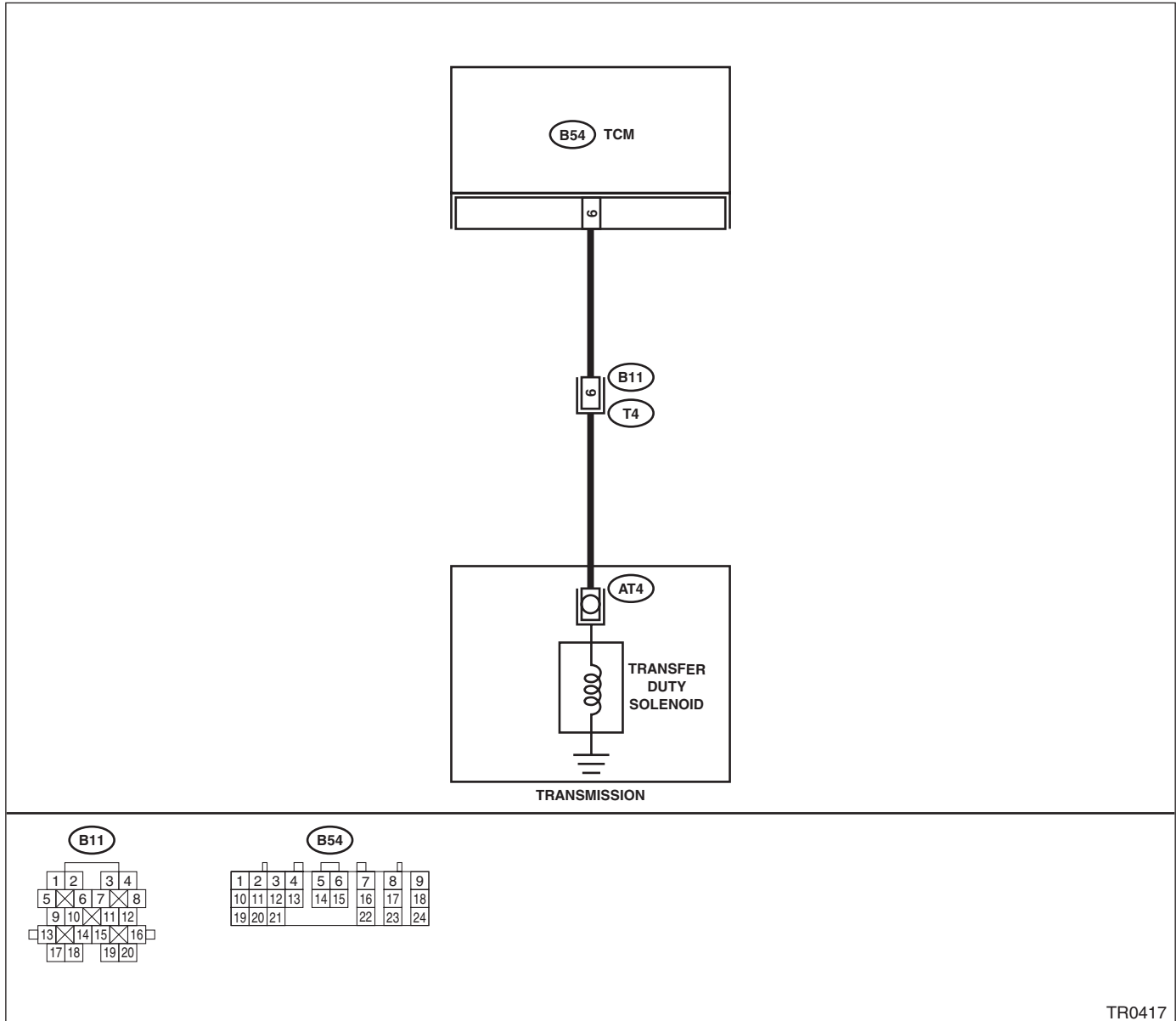
DIAGNOSIS:

The output signal circuit of transfer duty solenoid is open or shorted.

TROUBLE SYMPTOM:

Excessive "braking" in tight corners.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	<p>CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.</p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Disconnect the connector from TCM and transmission.</p> <p>3) Measure the resistance of harness between TCM and transmission connector.</p> <p>Connector & terminal (B54) No. 6 — (B11) No. 6:</p>	Is the resistance less than 1 Ω?	Go to step 2.	Repair the open circuit in harness between TCM and transmission connector.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
2 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION. Measure the resistance harness connector between TCM and chassis ground. Connector & terminal (B54) No. 6 — Chassis ground:	Is the resistance more than 1 M Ω ?	Go to step 3.	Repair the short circuit in harness between TCM and transmission connector.
3 CHECK TRANSFER DUTY SOLENOID. Measure the 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 13.
4 PREPARE SUBARU SELECT MONITOR.	Do you have a Subaru Select Monitor?	Go to step 8.	Go to step 5.
5 CHECK OUTPUT SIGNAL EMITTED FROM TCM. 1)Connect the connectors to TCM and transmission. 2)Turn the ignition switch to ON (engine OFF). 3)Throttle is fully closed. 4)Measure the 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 12.
6 CHECK OUTPUT SIGNAL EMITTED FROM TCM. Measure the voltage between TCM connector and chassis ground. Connector & terminal (B54) No. 6 (+) — Chassis ground (-):	Is the voltage more than 8.5 V in "D" range?	Even if the 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 the harness or connector in TCM and transmission.	Go to step 12.
7 CHECK VEHICLE	Is the target Non-turbo vehicle?	Go to step 8.	Go to step 10.
8 CHECK OUTPUT SIGNAL EMITTED FROM TCM USING SUBARU SELECT MONITOR. 1)Connect the connectors to TCM and transmission. 2)Connect the Subaru Select Monitor to data link connector. 3)Turn the ignition switch to ON (engine OFF) and turn Subaru Select Monitor switch to ON. 4)Move the select lever to "D" range 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 9.	Go to step 12.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
9 CHECK OUTPUT SIGNAL EMITTED FROM TCM USING SUBARU SELECT MONITOR. 1) Move the select lever to "N" range with throttle fully closed (vehicle speed 0 km/h or 0 MPH). 2) Read the 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 the 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 the harness or connector in TCM and transmission.	Go to step 12.
10 CHECK OUTPUT SIGNAL EMITTED FROM TCM USING SUBARU SELECT MONITOR. 1) Connect the connectors to TCM and transmission. 2) Connect the Subaru Select Monitor to data link connector. 3) Turn the ignition switch to ON (engine OFF) and turn Subaru Select Monitor switch to ON. 4) Move the select lever to "D" range with throttle fully open (vehicle speed 0 km/h or 0 MPH). 5) Read the data of transfer duty solenoid using Subaru Select Monitor. • Transfer duty solenoid is indicated in "%".	Is the value between 80 and 95 %?	Go to step 11.	Go to step 12.
11 CHECK OUTPUT SIGNAL EMITTED FROM TCM USING SUBARU SELECT MONITOR. 1) Move the select lever to "N" range with throttle fully close (vehicle speed 0 km/h or 0 MPH). 2) Read the data of transfer duty solenoid using Subaru Select Monitor. • Transfer duty solenoid is indicated in "%".	Is the value approx. 40 %?	Even if the AT OIL TEMP warning 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 the harness or connector in transfer duty solenoid and TCM connector.	Go to step 12.
12 CHECK POOR CONTACT.	Is there poor contact in transfer duty solenoid circuit?	Repair the poor contact.	Replace the TCM. <Ref. to AT-46, Transmission Control Module (TCM).>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
<p>13 CHECK TRANSFER DUTY SOLENOID (IN TRANSMISSION). 1)Lift-up the vehicle and place safety stand. NOTE: On AWD models, raise all wheels off ground. 2)Drain the automatic transmission fluid. CAUTION: Do not drain the automatic transmission fluid until it cools down. 3)Remove the extension case and disconnect connector from transfer duty solenoid. 4)Measure the resistance between transfer duty solenoid connector and transmission ground. Connector & terminal (AT4) No. 1 — Transmission ground:</p>	<p>Is the resistance between 10 and 17 Ω?</p>	<p>Go to step 14.</p>	<p>Replace the transfer duty solenoid.</p>
<p>14 CHECK HARNESS CONNECTOR BETWEEN TRANSFER DUTY SOLENOID AND TRANSMISSION. Measure the resistance of harness between transfer duty solenoid and transmission connector. Connector & terminal (T4) No. 6 — (AT4) No. 1:</p>	<p>Is the resistance less than 1 Ω?</p>	<p>Go to step 15.</p>	<p>Repair the open circuit in harness between transfer duty solenoid and transmission connector.</p>
<p>15 CHECK HARNESS CONNECTOR BETWEEN TRANSFER DUTY SOLENOID AND TRANSMISSION. Measure the resistance of harness between transmission connector and transmission ground. Connector & terminal (T4) No. 6 — Transmission ground:</p>	<p>Is the resistance more than 1 MΩ?</p>	<p>Even if the 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 the harness or contact in transfer duty solenoid and transmission.</p>	<p>Repair the short circuit in harness between transfer duty solenoid and transmission connector.</p>

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Q: DTC 93 REAR VEHICLE SPEED SENSOR

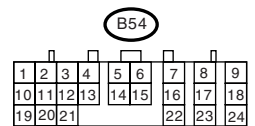
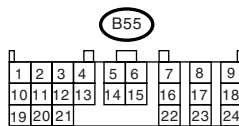
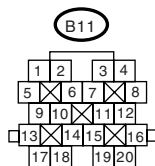
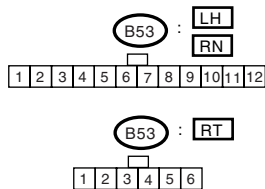
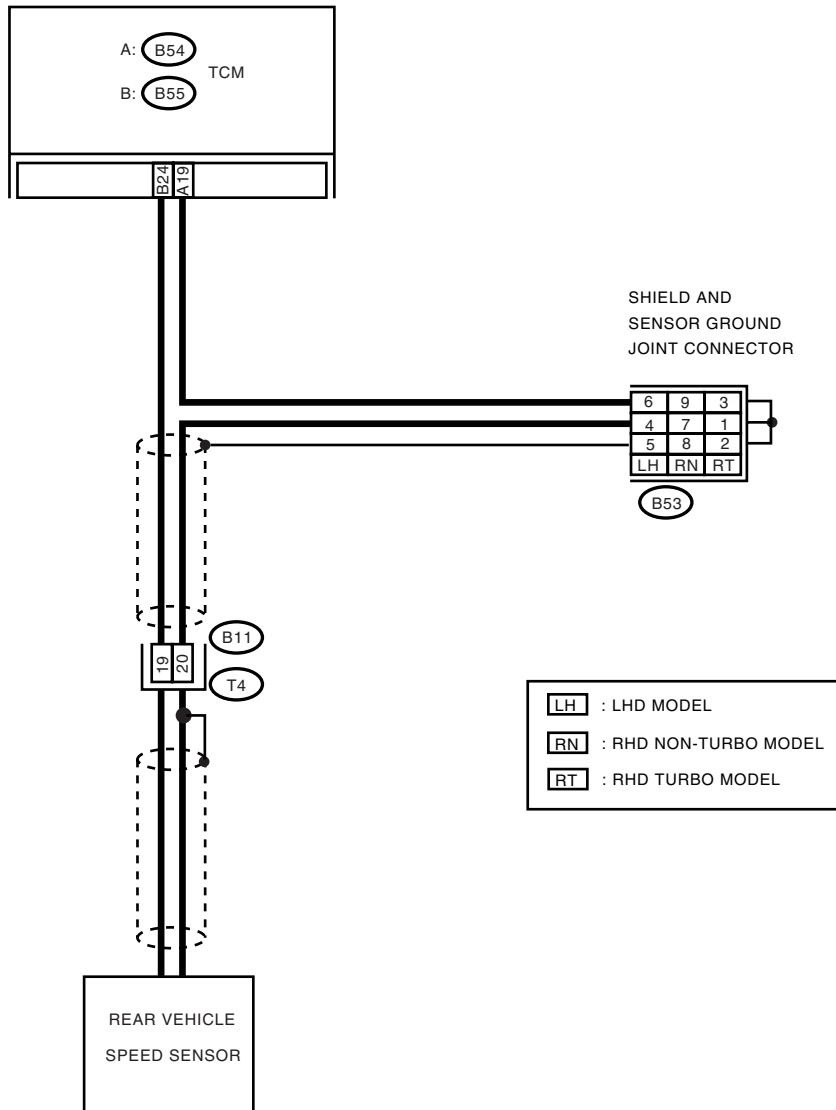
DIAGNOSIS:

The input signal circuit of TCM is open or shorted.

TROUBLE SYMPTOM:

No lock-up or excessive tight corner "braking".

WIRING DIAGRAM:



TR0922

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and transmission. 3) Measure the resistance of harness between TCM and transmission connector. <i>Connector & terminal</i> <i>(B55) No. 24 — (B11) No. 19:</i>	Is the resistance less than 1 Ω ?	Go to step 2.	Repair the open circuit in harness between TCM and transmission connector.
2 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION. Measure the resistance of harness between TCM and transmission connector. <i>Connector & terminal</i> <i>(B54) No. 19 — (B11) No. 20:</i>	Is the resistance less than 1 Ω ?	Go to step 3.	Repair the open circuit in harness between TCM and transmission, and poor contact in coupling connector.
3 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION. Measure the resistance of harness between TCM and chassis ground. <i>Connector & terminal</i> <i>(B55) No. 24 — Chassis ground:</i>	Is the resistance more than 1 $M\Omega$?	Go to step 4.	Repair the short circuit in harness between TCM and transmission connector.
4 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION. Measure the resistance of harness between TCM and chassis ground. <i>Connector & terminal</i> <i>(B54) No. 19 — Chassis ground:</i>	Is the resistance more than 1 $M\Omega$?	Go to step 5.	Repair the short circuit in harness between TCM and transmission connector.
5 CHECK REAR VEHICLE SPEED SENSOR. Measure the resistance between transmission connector receptacle's terminals. <i>Connector & terminal</i> <i>(T4) No. 19 — No. 20:</i>	Is the resistance between 450 and 650 Ω ?	Go to step 6.	Replace the rear vehicle speed sensor. <Ref. to AT-36, Rear Vehicle Speed Sensor.>
6 PREPARE OSCILLOSCOPE.	Do you have an 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 the connectors to TCM and transmission. 2) Lift-up or raise the vehicle and place safety stands. NOTE: 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 the voltage between TCM connector terminals. <i>Connector & terminal</i> <i>(B55) No. 24 (+) — (B54) No. 19 (-):</i>	Is the voltage more than AC 1 V?	Even if the 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 the harness or connector in TCM and transmission.	Go to step 11.

DIAGNOSTIC PROCEDURE WITH DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
<p>9 CHECK INPUT SIGNAL FOR TCM USING SUBARU SELECT MONITOR.</p> <p>1)Connect the connectors to TCM and transmission.</p> <p>2)Connect the Subaru Select Monitor to data link connector.</p> <p>3)Lift-up or raise the vehicle and place safety stands.</p> <p>NOTE: On AWD models, raise all wheels off floor.</p> <p>4)Turn the ignition switch to ON and turn Subaru Select Monitor switch to ON.</p> <p>5)Start the engine.</p> <p>6)Read the data of vehicle speed using Subaru Select Monitor.</p> <ul style="list-style-type: none"> •Compare the speedometer with Subaru Select Monitor indications. •Vehicle speed is indicated in “km/h” or “MPH”. <p>7)Slowly increase the vehicle speed to 60 km/h or 37 MPH.</p> <p>NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS-22, Clear Memory Mode.></p>	<p>Does the speedometer indication increase as the Subaru Select Monitor data increases?</p>	<p>Even if the 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 the harness or connector in TCM and transmission.</p>	<p>Go to step 11.</p>
<p>10 CHECK INPUT SIGNAL FOR TCM USING OSCILLOSCOPE.</p> <p>1)Connect the connectors to TCM and transmission.</p> <p>2)Lift-up or raise the vehicle and place safety stands.</p> <p>NOTE: On AWD models, raise all wheels off floor.</p> <p>3)Set the oscilloscope to TCM connector terminals.</p> <p style="text-align: center;">Connector & terminal</p> <p style="text-align: center;">Positive probe; (B55) No. 24</p> <p style="text-align: center;">Earth lead; (B54) No. 19</p> <p>4)Start the engine and set vehicle in 20 km/h (12 MPH) condition.</p> <p>NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS-22, Clear Memory Mode.></p> <p>5)Measure the signal voltage indicated on oscilloscope.</p>	<p>Is the signal voltage more than AC 1 V?</p>	<p>Even if the 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 the harness or connector in TCM and transmission.</p>	<p>Go to step 11.</p>
<p>11 CHECK POOR CONTACT.</p>	<p>Is there poor contact in rear vehicle speed sensor circuit?</p>	<p>Repair the poor contact.</p>	<p>Replace the TCM. <Ref. to AT-46, Transmission Control Module (TCM).></p>

DIAGNOSTIC PROCEDURE FOR NO-DIAGNOSTIC TROUBLE CODE (DTC)
AUTOMATIC TRANSMISSION (DIAGNOSTICS)

15. Diagnostic Procedure for No-diagnostic Trouble Code (DTC)

A: CHECK GEAR POSITION.

	Step	Check	Yes	No
1	<p>CHECK GEAR POSITION.</p> <p>1)Lift-up the vehicle and place safety stand.</p> <p>NOTE: On AWD models, raise all wheels off ground.</p> <p>2)Start the engine.</p> <p>3)Move the select lever to “D” range and drive vehicle.</p> <p>4)Read the data of gear position using Subaru Select Monitor.</p> <p>•Gear position is indicated.</p> <p>NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS memory clearance procedure of on-board diagnostics system. <Ref. to ABS-22, Clear Memory Mode.></p>	<p>Does the transmission gear correspond to the gear which is shown on display?</p>	<p>Go to step 2.</p>	<p>Check the shift solenoid 1 and shift solenoid 2 signal circuit. <Ref. to AT-70, DTC 71 SHIFT SOLENOID 1, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> and <Ref. to AT-74, DTC 72 SHIFT SOLENOID 2, Diagnostic Procedure with Diagnostic Trouble Code (DTC).></p>
2	<p>CHECK VEHICLE.</p>	<p>Is the target Non-turbo vehicle?</p>	<p>Go to step CHECK FWD SWITCH.<Ref. to AT-106, CHECK FWD SWITCH., Diagnostic Procedure for No-diagnostic Trouble Code (DTC).></p>	<p>Go to step CHECK BRAKE SWITCH.<Ref. to AT-110, CHECK BRAKE SWITCH., Diagnostic Procedure for No-diagnostic Trouble Code (DTC).></p>

DIAGNOSTIC PROCEDURE FOR NO-DIAGNOSTIC TROUBLE CODE (DTC)
AUTOMATIC TRANSMISSION (DIAGNOSTICS)

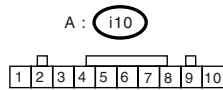
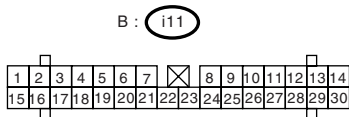
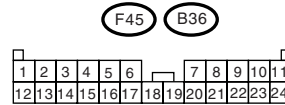
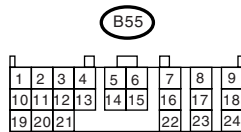
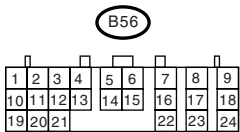
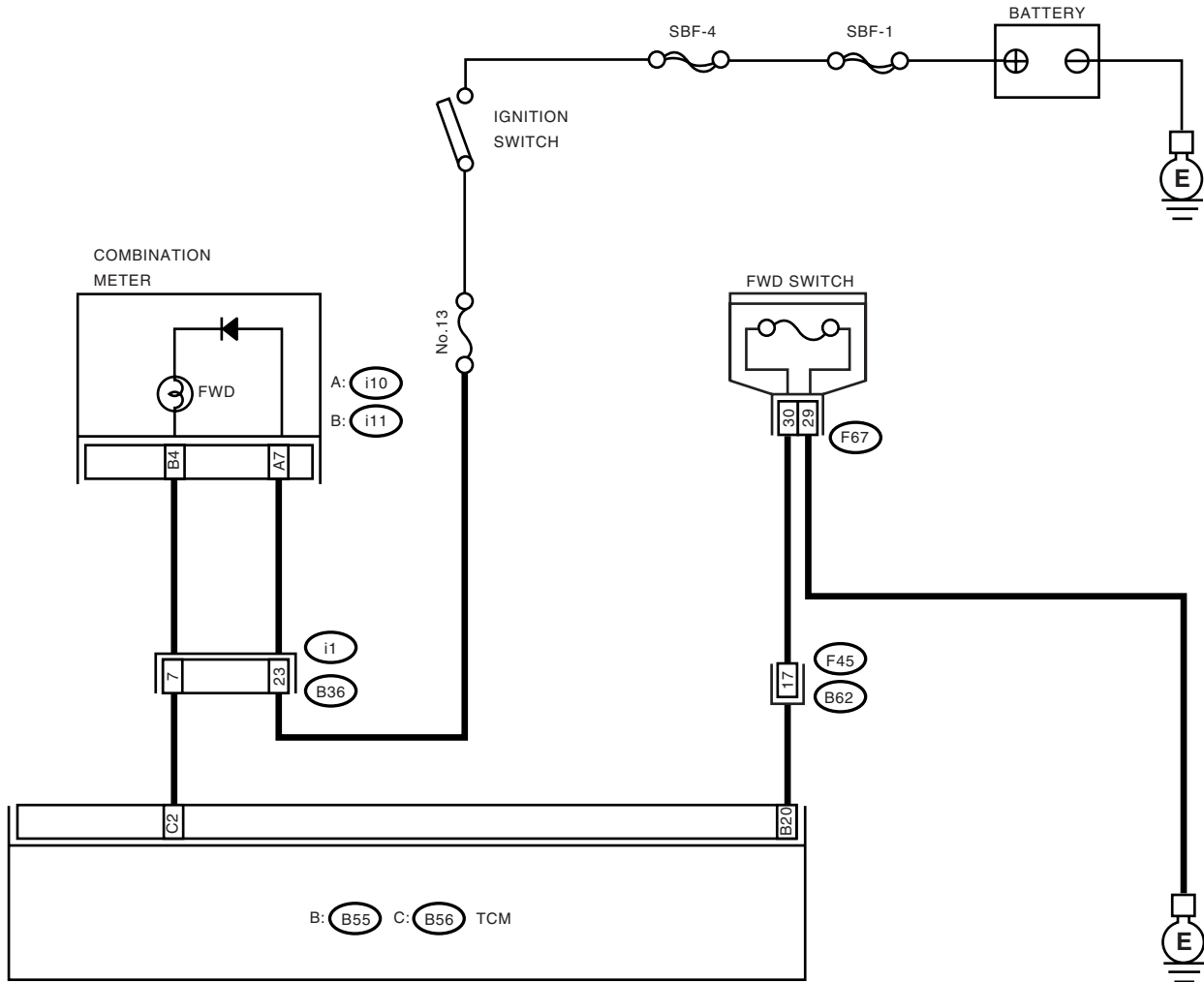
B: CHECK FWD SWITCH.

DIAGNOSIS:

- The LED does not come on even if FWD switch is ON.
- The FWD switch circuit is open or short.

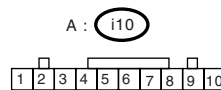
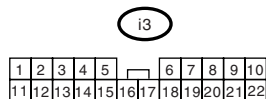
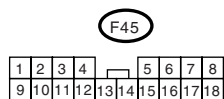
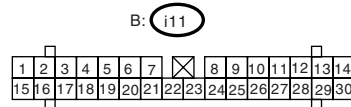
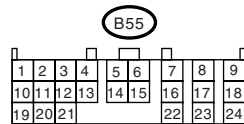
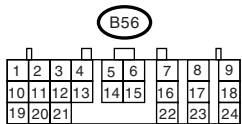
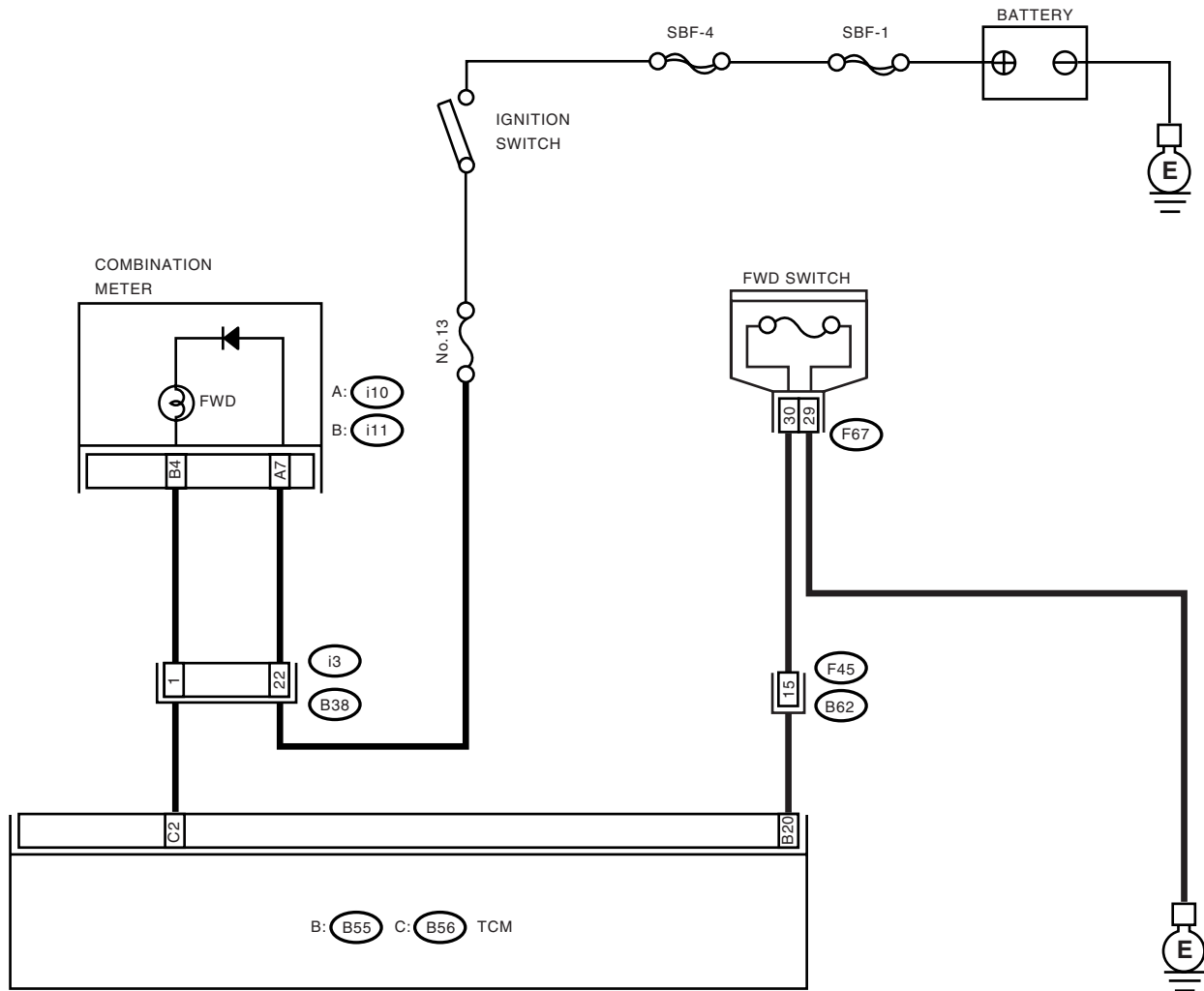
DIAGNOSTIC PROCEDURE FOR NO-DIAGNOSTIC TROUBLE CODE (DTC) AUTOMATIC TRANSMISSION (DIAGNOSTICS)

WIRING DIAGRAM: LHD MODEL



DIAGNOSTIC PROCEDURE FOR NO-DIAGNOSTIC TROUBLE CODE (DTC) AUTOMATIC TRANSMISSION (DIAGNOSTICS)

RHD MODEL



DIAGNOSTIC PROCEDURE FOR NO-DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
1	CHECK FWD SWITCH.	Go to step CHECK BRAKE SWITCH.<Ref. to AT-110, CHECK BRAKE SWITCH., Diagnostic Procedure for No-diagnostic Trouble Code (DTC).>	Go to step 2.
2	CHECK FWD INDICATOR LIGHT. 1)Turn the ignition switch to OFF. 2)Remove the combination meter. 3)Remove the FWD indicator light bulb from combination meter.	Go to step 3.	Replace the FWD indicator light bulb.<Ref. to IDI-15, Combination Meter Assembly.>
3	CHECK HARNESS CONNECTOR BETWEEN TCM AND FWD SWITCH. 1)Turn the ignition switch to OFF. 2)Disconnect the connector from TCM and FWD switch. 3)Measure the resistance of harness between TCM and FWD switch connector. Connector & terminal (B55) No. 20 — (F67) No. 30:	Go to step 4.	Repair the open circuit in harness between TCM and FWD switch connector.
4	CHECK HARNESS CONNECTOR BETWEEN FWD SWITCH AND CHASSIS GROUND. Measure the resistance of harness between FWD switch and chassis ground. Connector & terminal (F67) No. 29 — Chassis ground:	Go to step 5.	Repair the open circuit in harness between FWD switch connector and chassis ground.
5	CHECK HARNESS CONNECTOR BETWEEN TCM AND FWD SWITCH. Measure the resistance of harness connector between TCM and body to make sure that circuit does not short. Connector & terminal (B55) No. 20 — Chassis ground:	Go to step 6.	Repair the short circuit in harness between TCM and FWD switch connector.
6	CHECK INPUT SIGNAL FOR TCM. 1)Turn the ignition switch to OFF. 2)Connect the connector to TCM and FWD switch. 3)Turn the ignition switch to ON. 4)Measure the signal voltage for TCM while installing the fuse to FWD switch connector. Connector & terminal (B55) No. 20 (+) — Chassis ground (-):	Go to step 7.	Go to step 11.
7	CHECK INPUT SIGNAL FOR TCM. Measure the signal voltage for TCM while removing the fuse from FWD switch connector. Connector & terminal (B55) No. 20 (+) — Chassis ground (-):	Go to step 8.	Replace the TCM.<Ref. to AT-46, Transmission Control Module (TCM).>
8	CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER. 1)Turn the ignition switch to OFF. 2)Disconnect the connector from TCM and combination meter. 3)Measure the resistance of harness between TCM and diagnosis connector. Connector & terminal (B56) No. 2 — (i11) No. 4:	Go to step 9.	Repair the open circuit in harness between TCM and combination meter and poor contact in coupling connector.

DIAGNOSTIC PROCEDURE FOR NO-DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
9 CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER. Measure the 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 the short circuit in harness between TCM and combination meter connector.
10 CHECK OUTPUT SIGNAL EMITTED FROM TCM. 1) Turn the ignition switch to OFF. 2) Connect the connector to TCM and combination meter. 3) Turn the ignition switch to ON. 4) Measure the 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 the 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 between 6 and 9.1 V in FWD switch while removing?	Go to step 12.	Replace the TCM. <Ref. to AT-46, Transmission Control Module (TCM).>
12 CHECK POOR CONTACT.	Is there poor contact in FWD switch circuit?	Repair the poor contact.	Replace the TCM. <Ref. to AT-46, 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-111, CHECK ABS SWITCH., Diagnostic Procedure for No-diagnostic Trouble Code (DTC).>	Check the brake switch circuit. <Ref. to EN-224, DTC P0703 — BRAKE SWITCH INPUT MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DIAGNOSTIC PROCEDURE FOR NO-DIAGNOSTIC TROUBLE CODE (DTC)
AUTOMATIC TRANSMISSION (DIAGNOSTICS)

D: CHECK ABS SWITCH.

Step	Check	Yes	No
1 CHECK ABS SWITCH.	Does the LED of ABS switch light up?	Check the ABS switch circuit. <Ref. to ABS-136, DTC 44 — ABS-AT CONTROL (NON CONTROLLED) —, Diagnostics Chart with Subaru Select Monitor.> and <Ref. to ABS-138, DTC 44 — ABS-AT CONTROL (CONTROLLED) —, Diagnostics Chart with Subaru Select Monitor.>	Go to step CHECK CRUISE CONTROL SWITCH. <Ref. to AT-111, CHECK CRUISE CONTROL SWITCH., Diagnostic Procedure for No-diagnostic Trouble Code (DTC).>

E: CHECK CRUISE CONTROL SWITCH.

Step	Check	Yes	No
1 CHECK CRUISE CONTROL SWITCH.	When the cruise control is set, does LED light up?	Go to step CHECK KICK-DOWN SWITCH. <Ref. to AT-112, CHECK KICK-DOWN SWITCH., Diagnostic Procedure for No-diagnostic Trouble Code (DTC).>	Check the cruise control. <Ref. to CC-29, Diagnostics Chart with Trouble Code.>

DIAGNOSTIC PROCEDURE FOR NO-DIAGNOSTIC TROUBLE CODE (DTC) AUTOMATIC TRANSMISSION (DIAGNOSTICS)

F: CHECK KICK-DOWN SWITCH.

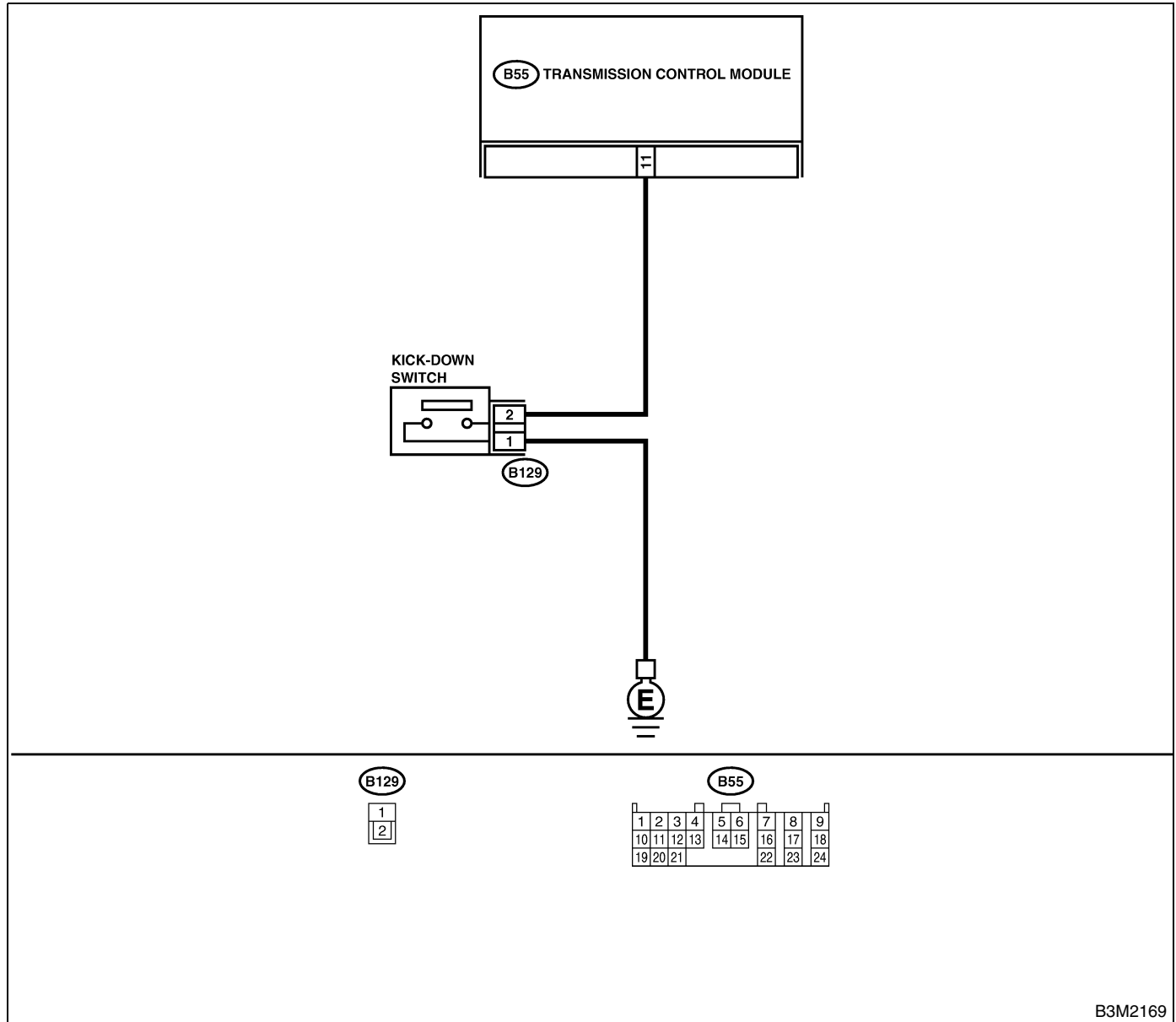
DIAGNOSIS:

- 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

DIAGNOSTIC PROCEDURE FOR NO-DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

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-115, CHECK POWER MODE SWITCH., Diagnostic Procedure for No-diagnostic Trouble Code (DTC).>	Go to step 2.	
2	CHECK KICK-DOWN SWITCH GROUND LINE. 1)Disconnect the connector from kick-down switch. 2)Measure the 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 the open circuit in harness between kick-down switch and TCM.
3	CHECK KICK-DOWN SWITCH. Measure the 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 the kick-down switch. <Ref. to SP-4, Accelerator Pedal.>
4	CHECK KICK-DOWN SWITCH. Measure the 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 the kick-down switch.
5	CHECK HARNESS CONNECTOR BETWEEN TCM AND KICK-DOWN SWITCH. 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from kick-down switch. 3)Measure the 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 the open circuit in harness between TCM and kick-down switch.
6	CHECK HARNESS CONNECTOR BETWEEN TCM AND KICK-DOWN SWITCH. Measure the 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 the short circuit in harness between TCM and chassis ground.
7	CHECK INPUT SIGNAL FOR TCM. 1)Turn the ignition switch to OFF. 2)Connect the connector to kick-down switch. 3)Turn the ignition switch to ON (engine OFF). 4)Measure the 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 the 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 the harness and connector in TCM.	Go to step 9.

DIAGNOSTIC PROCEDURE FOR NO-DIAGNOSTIC TROUBLE CODE (DTC)
AUTOMATIC TRANSMISSION (DIAGNOSTICS)

	Step	Check	Yes	No
9	CHECK POOR CONTACT.	Is there poor contact?	Repair the poor contact.	Replace the TCM. <Ref. to AT-46, Transmission Control Module (TCM).>

DIAGNOSTIC PROCEDURE FOR NO-DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

G: CHECK POWER MODE SWITCH.

DIAGNOSIS:

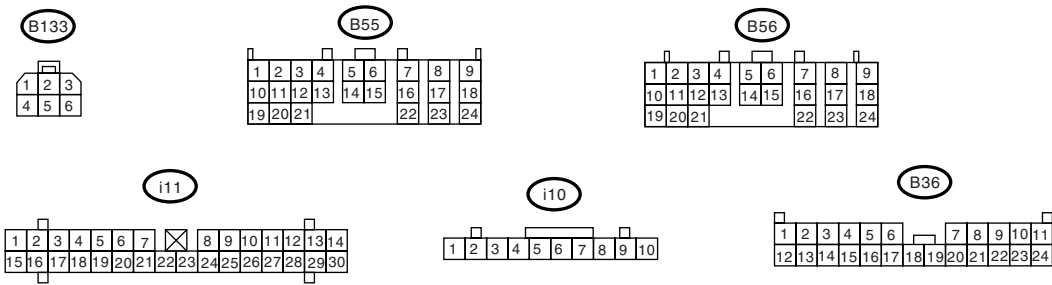
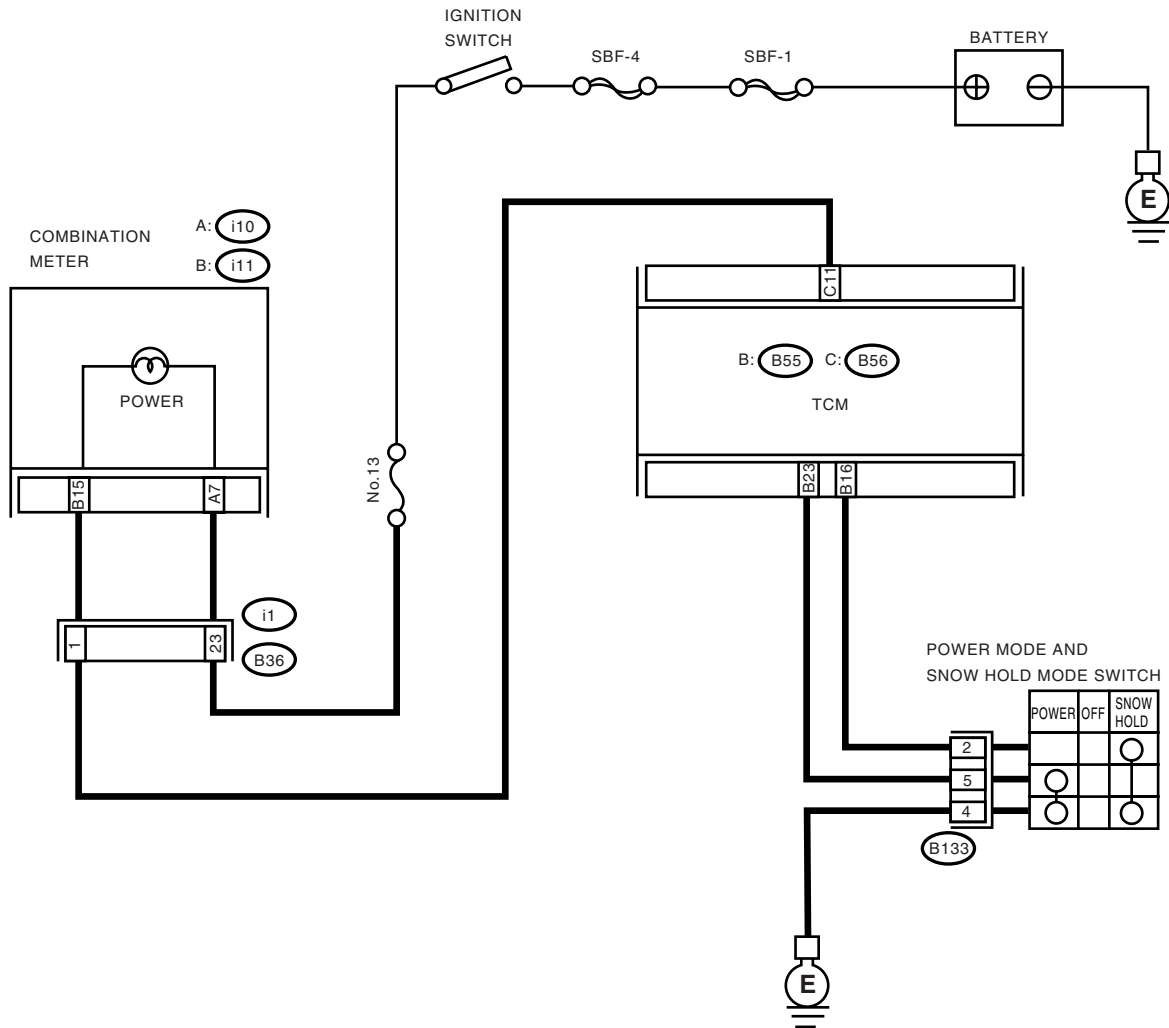
- The LED does not come on when power switch is ON.
- The power switch circuit is open or shorted.

TROUBLE SYMPTOM:

No power mode occurs.

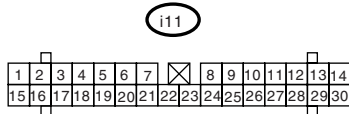
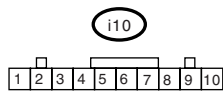
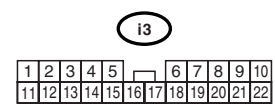
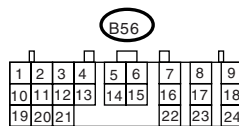
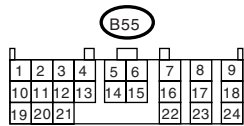
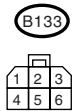
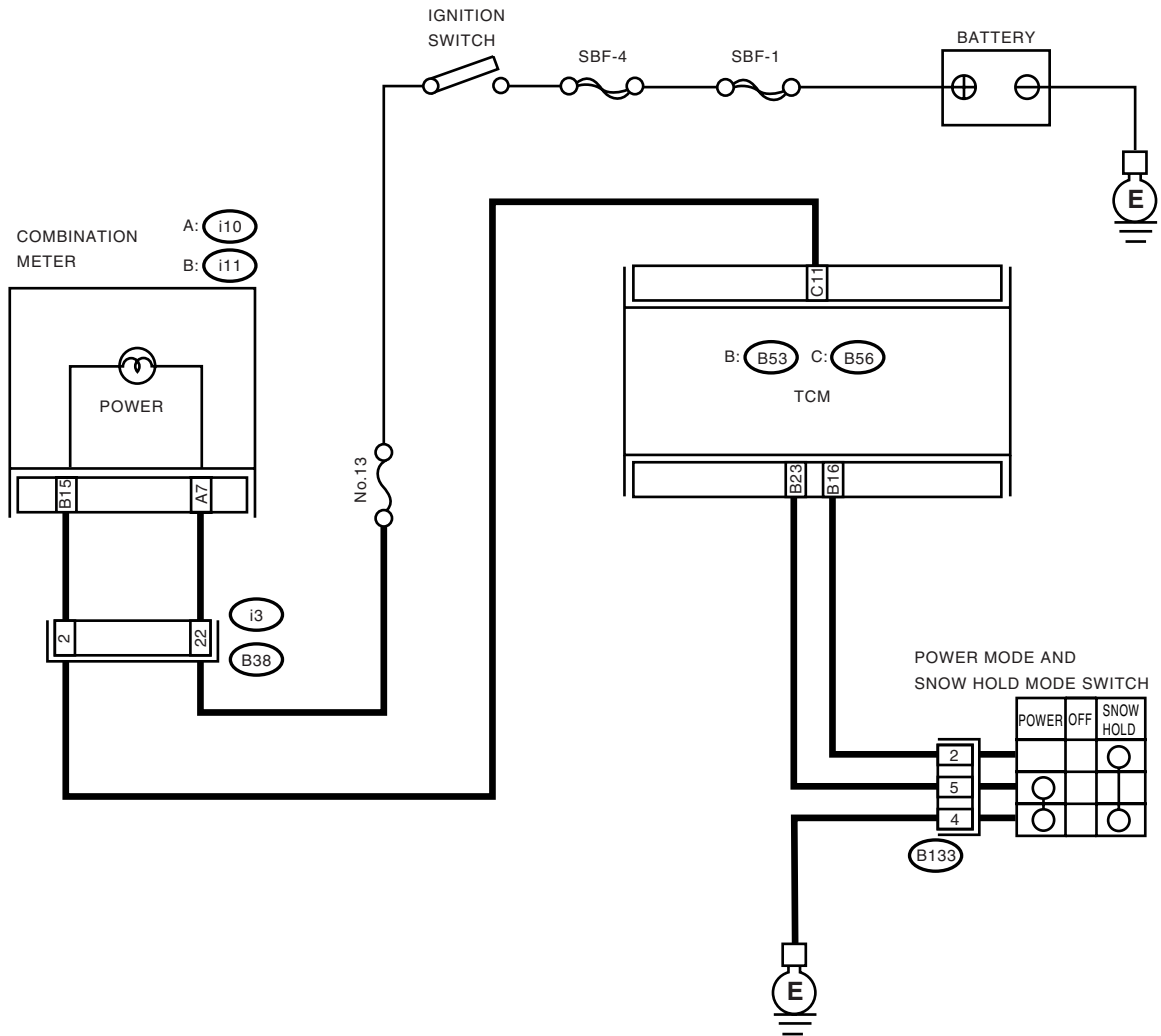
WIRING DIAGRAM:

LHD MODEL



DIAGNOSTIC PROCEDURE FOR NO-DIAGNOSTIC TROUBLE CODE (DTC) AUTOMATIC TRANSMISSION (DIAGNOSTICS)

RHD MODEL



TR0924

DIAGNOSTIC PROCEDURE FOR NO-DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No	
1	CHECK POWER SWITCH OPERATION.	When the power switch is turned to OFF, does LED light up?	Go to step 5.	Go to step 2.
2	CHECK POWER SWITCH OPERATION.	When the power switch is turned to ON, does LED light up?	Go to step CHECK INHIBITOR SWITCH. <Ref. to AT-119, CHECK INHIBITOR SWITCH., Diagnostic Procedure for No-diagnostic Trouble Code (DTC).>	Go to step 3.
3	CHECK POWER INDICATOR LIGHT. 1)Turn the ignition switch to OFF. 2)Remove the combination meter. 3)Remove the POWER indicator light bulb from combination meter.	Is the POWER indicator light bulb OK?	Go to step 4.	Replace the POWER indicator light bulb. <Ref. to IDI-15, Combination Meter Assembly.>
4	CHECK POWER SWITCH GROUND LINE. 1)Turn the ignition switch to OFF. 2)Disconnect the connector from power switch. 3)Measure the 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 the open circuit in harness between power switch and chassis ground.
5	CHECK POWER SWITCH. 1)Turn the power switch to ON. 2)Measure the resistance between terminals of power switch. Terminals No. 5 — No. 4:	Is the resistance less than 1 Ω ?	Go to step 6.	Repair the power switch.
6	CHECK POWER SWITCH. 1)Turn the power switch to OFF. 2)Measure the resistance between terminals of power switch. Terminals No. 5 — No. 4:	Is the resistance more than 1 $M\Omega$?	Go to step 7.	Repair the power switch.
7	CHECK HARNESS CONNECTOR BETWEEN TCM AND POWER SWITCH. Measure the 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 the open circuit in harness between TCM and power switch connector.
8	CHECK HARNESS CONNECTOR BETWEEN TCM AND POWER SWITCH. Measure the resistance of harness connector between TCM and chassis ground. Connector & terminal (B55) No. 23 — Chassis ground:	Is the resistance more than 1 $M\Omega$?	Go to step 9.	Repair the short circuit in harness between TCM and power switch connector.
9	CHECK INPUT SIGNAL FOR TCM. 1)Connect the connectors to TCM and power switch. 2)Turn the ignition switch to ON (engine OFF). 3)Measure the signal voltage for TCM while turning power switch to OFF. Connector & terminal (B55) No. 23 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 10.	Replace the TCM. <Ref. to AT-46, Transmission Control Module (TCM).>

DIAGNOSTIC PROCEDURE FOR NO-DIAGNOSTIC TROUBLE CODE (DTC)
AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
10 CHECK INPUT SIGNAL FOR TCM. Measure the signal voltage for TCM while turning power switch to ON. <i>Connector & terminal</i> <i>(B55) No. 23 (+) — Chassis ground (-):</i>	Is the voltage less than 1 V?	Go to step 11.	Replace the TCM. <Ref. to AT-46, Transmission Control Module (TCM).>
11 CHECK POOR CONTACT.	Is there poor contact?	Repair the poor contact.	A temporary poor contact of the connector or harness or connector in power switch circuit.

H: CHECK INHIBITOR SWITCH.

DIAGNOSIS:

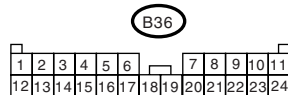
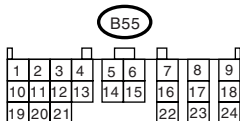
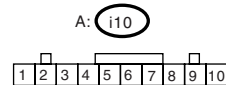
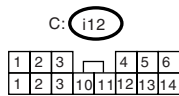
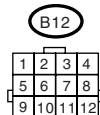
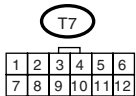
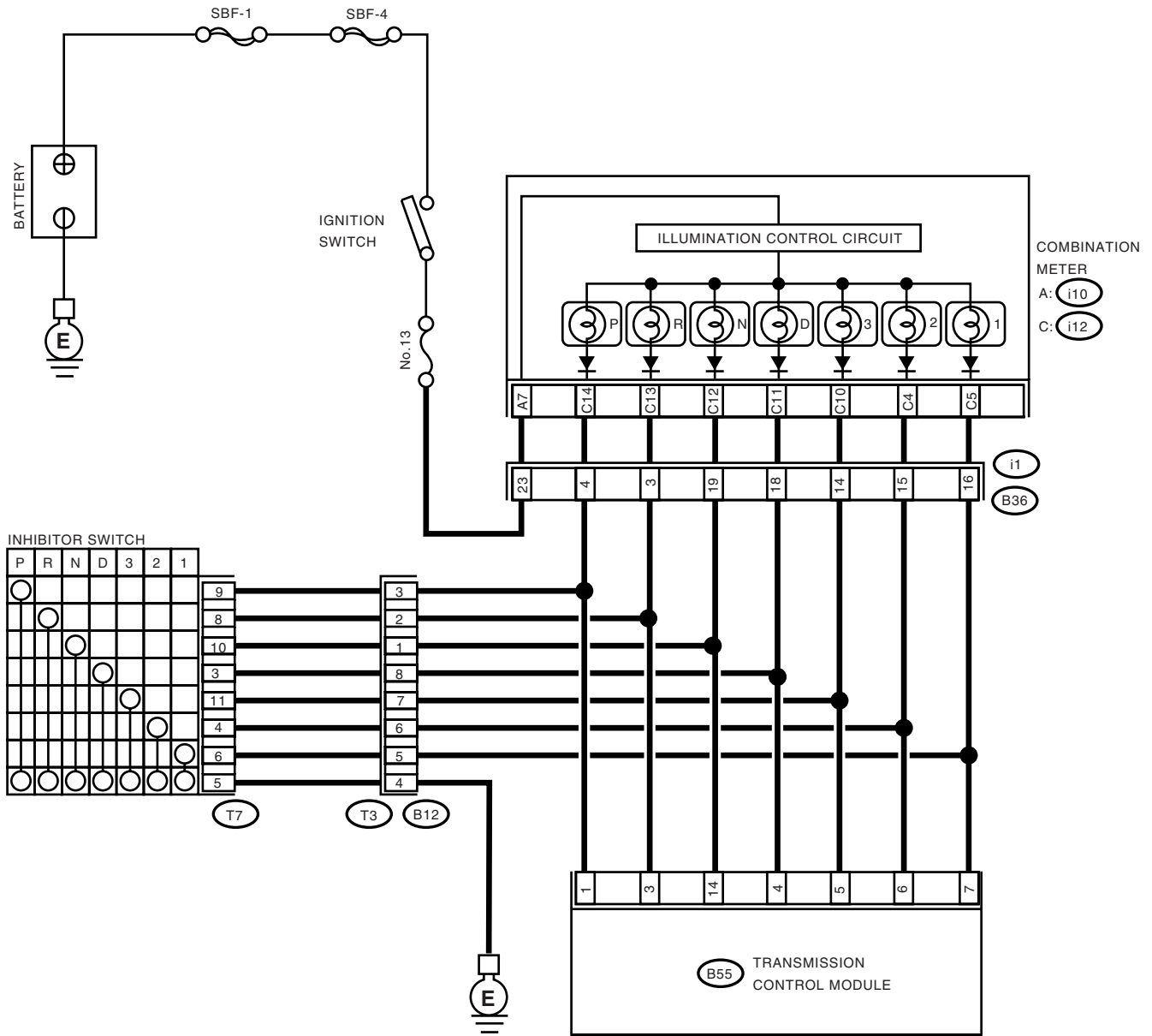
The input signal circuit of inhibitor switch is open or shorted.

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.

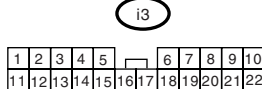
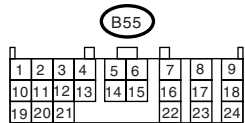
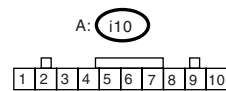
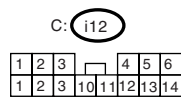
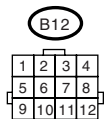
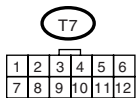
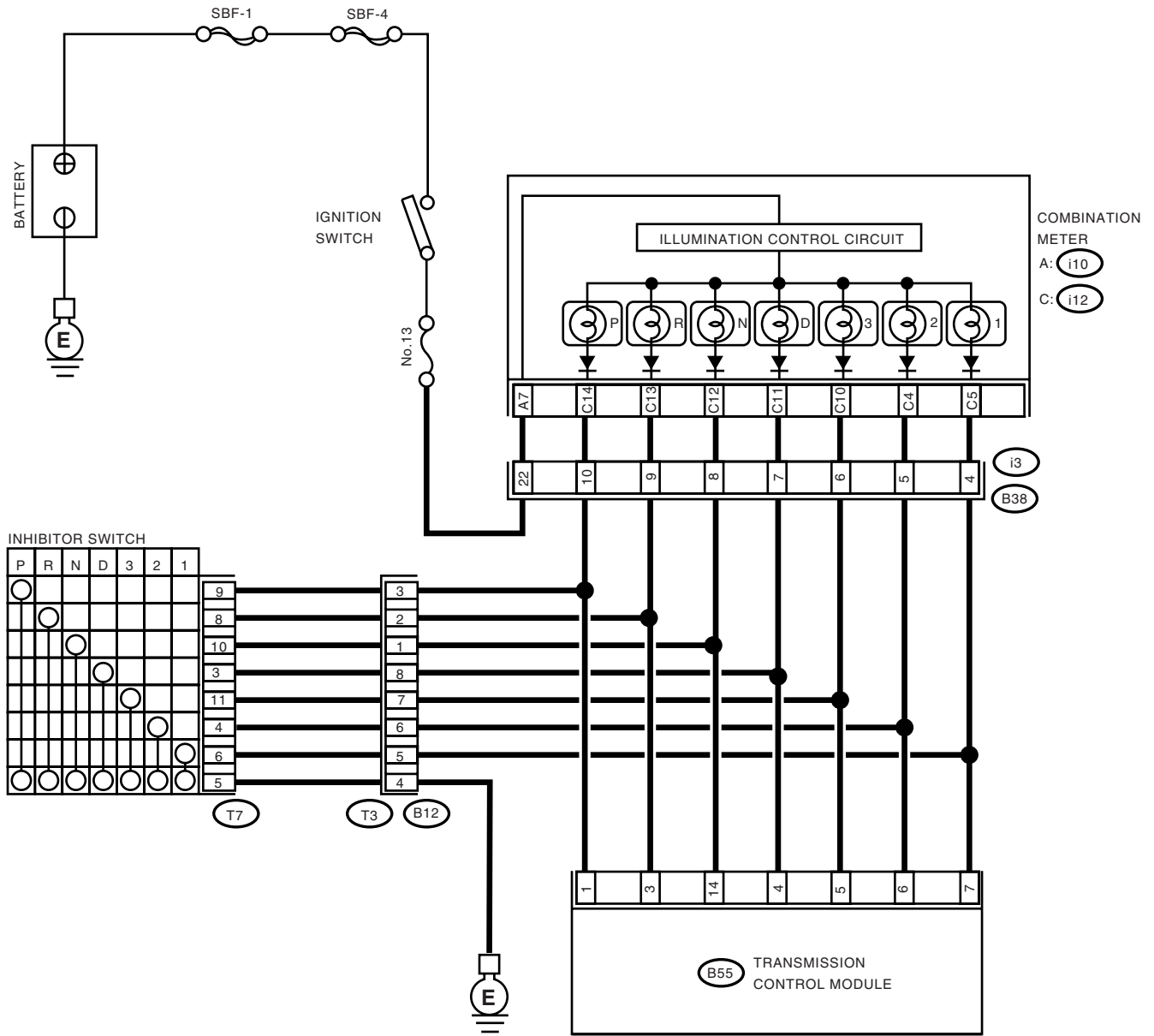
DIAGNOSTIC PROCEDURE FOR NO-DIAGNOSTIC TROUBLE CODE (DTC) AUTOMATIC TRANSMISSION (DIAGNOSTICS)

WIRING DIAGRAM: LHD MODEL



DIAGNOSTIC PROCEDURE FOR NO-DIAGNOSTIC TROUBLE CODE (DTC) AUTOMATIC TRANSMISSION (DIAGNOSTICS)

RHD MODEL



DIAGNOSTIC PROCEDURE FOR NO-DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No	
1	CHECK "P" RANGE SWITCH.	When the "P" range is selected, does LED light up?	Go to step 2.	Go to step 22.
2	CHECK INDICATOR LIGHT.	Does the 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 the 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 the 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 the 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 the 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 the 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 the 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-129, CHECK HOLD SWITCH., Diagnostic Procedure for No-diagnostic Trouble Code (DTC).>

DIAGNOSTIC PROCEDURE FOR NO-DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
22 CHECK HARNESS CONNECTOR BETWEEN INHIBITOR SWITCH AND CHASSIS GROUND. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from inhibitor switch. 3) Measure the resistance of harness between inhibitor switch and chassis ground. <i>Connector & terminal</i> <i>(T7) No. 5 — Chassis ground:</i>	Is the resistance less than 1 Ω ?	Go to step 23.	Repair the 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 the ignition switch to OFF. 2) Disconnect the connectors from TCM and inhibitor switch. 3) Measure the resistance of harness between TCM and inhibitor switch connector. <i>Connector & terminal</i> <i>(B55) No. 1 — (T7) No. 9</i>	Is the resistance less than 1 Ω ?	Go to step 24.	Repair the open circuit in harness between TCM and inhibitor switch connector, and poor contact in coupling connector.
24 CHECK INPUT SIGNAL FOR TCM. 1) Turn the ignition switch to OFF. 2) Connect the connector to TCM and inhibitor switch. 3) Turn the ignition switch to ON. 4) Measure the voltage between TCM and chassis ground. <i>Connector & terminal</i> <i>(B55) No. 1 (+) — Chassis ground (-):</i>	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 the voltage between TCM and chassis ground. <i>Connector & terminal</i> <i>(B55) No. 1 (+) — Chassis ground (-):</i>	Is the voltage more than 8 V in other ranges?	Go to step 65.	Replace the TCM. <Ref. to AT-46, Transmission Control Module (TCM).>
26 CHECK "P" RANGE INDICATOR LIGHT BULB. 1) Turn the ignition switch to OFF. 2) Remove the combination meter. 3) Remove the "P" range indicator light bulb from combination meter.	Is the "P" range indicator light bulb OK?	Go to step 27.	Replace the "P" range indicator light bulb. <Ref. to ID1-15, Combination Meter Assembly.>
27 CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER. 1) Disconnect the connectors from TCM and combination meter. 2) Measure the resistance of harness between TCM and combination meter. <i>Connector & terminal</i> <i>(B55) No. 1 — (i12) No. 14:</i>	Is the resistance more than 1 Ω ?	Go to step 65.	Repair the 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 the ignition switch to OFF. 2) Disconnect the connectors from TCM, inhibitor switch and combination meter. 3) Measure the resistance of harness between TCM and chassis ground. <i>Connector & terminal</i> <i>(B55) No. 1 — Chassis ground:</i>	Is the resistance less than 1 M Ω ?	Go to step 29.	Repair the ground short circuit in "P" range circuit.

DIAGNOSTIC PROCEDURE FOR NO-DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
29 CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM and inhibitor switch. 3) Measure the 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 the open circuit in harness between TCM and inhibitor switch connector, and poor contact in coupling connector.
30 CHECK INPUT SIGNAL FOR TCM. 1) Turn the ignition switch to OFF. 2) Connect the connector to TCM and inhibitor switch. 3) Turn the ignition switch to ON. 4) Measure the 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 the 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 the TCM. <Ref. to AT-46, Transmission Control Module (TCM).>
32 CHECK "R" RANGE INDICATOR LIGHT BULB. 1) Turn the ignition switch to OFF. 2) Remove the combination meter. 3) Remove the "R" range indicator light bulb from combination meter.	Is "R" range indicator light bulb OK?	Go to step 33 .	Replace the "R" range indicator light bulb. <Ref. to IDI-15, Combination Meter Assembly.>
33 CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER. 1) Disconnect the connectors from TCM and combination meter. 2) Measure the 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 the 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 the ignition switch to OFF. 2) Disconnect the connectors from TCM, inhibitor switch and combination meter. 3) Measure the resistance of harness between TCM and chassis ground. Connector & terminal (B55) No. 3 — Chassis ground:	Is the resistance more than 1 $M\Omega$?	Go to step 35 .	Repair the ground short circuit in "R" range circuit.
35 CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM and inhibitor switch. 3) Measure the 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 the open circuit in harness between TCM and inhibitor switch connector, and poor contact in coupling connector.

DIAGNOSTIC PROCEDURE FOR NO-DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
36 CHECK INPUT SIGNAL FOR TCM. 1) Turn the ignition switch to OFF. 2) Connect the connector to TCM and inhibitor switch. 3) Turn the ignition switch to ON. 4) Measure the voltage between TCM and chassis ground. <i>Connector & terminal</i> <i>(B55) No. 14 (+) — Chassis ground (-):</i>	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 the voltage between TCM and chassis ground. <i>Connector & terminal</i> <i>(B55) No. 14 (+) — Chassis ground (-):</i>	Is the voltage more than 8 V in other ranges?	Go to step 65.	Replace the TCM. <Ref. to AT-46, Transmission Control Module (TCM).>
38 CHECK "N" RANGE INDICATOR LIGHT BULB. 1) Turn the ignition switch to OFF. 2) Remove the combination meter. 3) Remove the "N" range indicator light bulb from combination meter.	Is the "N" range indicator light bulb OK?	Go to step 39.	Replace the "N" range indicator light bulb. <Ref. to IDI-15, Combination Meter Assembly.>
39 CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER. 1) Disconnect the connectors from TCM and combination meter. 2) Measure the resistance of harness between TCM and combination meter. <i>Connector & terminal</i> <i>(B55) No. 14 — (i12) No. 12:</i>	Is the resistance less than 1 Ω ?	Go to step 65.	Repair the 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 the ignition switch to OFF. 2) Disconnect the connectors from TCM, inhibitor switch and combination meter. 3) Measure the resistance of harness between TCM and chassis ground. <i>Connector & terminal</i> <i>(B55) No. 14 — Chassis ground:</i>	Is the resistance more than 1 M Ω ?	Go to step 41.	Repair the ground short circuit in "N" range circuit.
41 CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM and inhibitor switch. 3) Measure the resistance of harness between TCM and inhibitor switch connector. <i>Connector & terminal</i> <i>(B55) No. 4 — (T7) No. 3:</i>	Is the resistance less than 1 Ω ?	Go to step 42.	Repair the open circuit in harness between TCM and inhibitor switch connector, and poor contact in coupling connector.
42 CHECK INPUT SIGNAL FOR TCM. 1) Turn the ignition switch to OFF. 2) Connect the connector to TCM and inhibitor switch. 3) Turn the ignition switch to ON. 4) Measure the voltage between TCM and chassis ground. <i>Connector & terminal</i> <i>(B55) No. 4 (+) — Chassis ground (-):</i>	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 the voltage between TCM and chassis ground. <i>Connector & terminal</i> <i>(B55) No. 4 (+) — Chassis ground (-):</i>	Is the voltage more than 8 V in other ranges?	Go to step 65.	Replace the TCM. <Ref. to AT-46, Transmission Control Module (TCM).>

DIAGNOSTIC PROCEDURE FOR NO-DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
44 CHECK "D" RANGE INDICATOR LIGHT BULB. 1) Turn the ignition switch to OFF. 2) Remove the combination meter. 3) Remove the "D" range indicator light bulb from combination meter.	Is the "D" range indicator light bulb OK?	Go to step 45.	Replace the "D" range indicator light bulb. <Ref. to IDI-15, Combination Meter Assembly.>
45 CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER. 1) Disconnect the connectors from TCM and combination meter. 2) Measure the 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 the open circuit in harness between TCM connector and combination meter, and TCM connector.
46 CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM, inhibitor switch and combination meter. 3) Measure the 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 the ground short circuit in "D" range circuit.
47 CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and inhibitor switch. 3) Measure the 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 the open circuit in harness between TCM and inhibitor switch connector, and poor contact in coupling connector.
48 CHECK INPUT SIGNAL FOR TCM. 1) Turn the ignition switch to OFF. 2) Connect the connector to TCM and inhibitor switch. 3) Turn the ignition switch to ON. 4) Measure the 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 the 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 the TCM. <Ref. to AT-46, Transmission Control Module (TCM).>
50 CHECK "3" RANGE INDICATOR LIGHT BULB. 1) Turn the ignition switch to OFF. 2) Remove the combination meter. 3) Remove the "3" range indicator light bulb from combination meter.	Is the "3" range indicator light bulb OK?	Go to step 51.	Replace the "3" range indicator light bulb. <Ref. to IDI-15, Combination Meter Assembly.>
51 CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER. 1) Disconnect the connectors from TCM and combination meter. 2) Measure the 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 the open circuit in harness between TCM connector and combination meter, and poor contact in TCM connector.

DIAGNOSTIC PROCEDURE FOR NO-DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
52 CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM, inhibitor switch and combination meter. 3) Measure the resistance of harness between TCM and chassis ground. <i>Connector & terminal</i> <i>(B55) No. 5 — Chassis ground:</i>	Is the resistance more than 1 M Ω ?	Go to step 53.	Repair the ground short circuit in "3" range circuit.
53 CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and inhibitor switch. 3) Measure the resistance of harness between TCM and inhibitor switch connector. <i>Connector & terminal</i> <i>(B55) No. 6 — (T7) No. 4:</i>	Is the resistance less than 1 Ω ?	Go to step 54.	Repair the open circuit in harness between TCM and inhibitor switch connector, and poor contact in coupling connector.
54 CHECK INPUT SIGNAL FOR TCM. 1) Turn the ignition switch to OFF. 2) Connect the connector to TCM and inhibitor switch. 3) Turn the ignition switch to ON. 4) Measure the voltage between TCM and chassis ground. <i>Connector & terminal</i> <i>(B55) No. 6 (+) — Chassis ground (-):</i>	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 the voltage between TCM and chassis ground. <i>Connector & terminal</i> <i>(B55) No. 6 (+) — Chassis ground (-):</i>	Is the voltage more than 8 V in other ranges?	Go to step 65.	Replace the TCM. <Ref. to AT-46, Transmission Control Module (TCM).>
56 CHECK "2" RANGE INDICATOR LIGHT BULB. 1) Turn the ignition switch to OFF. 2) Remove the combination meter. 3) Remove the "2" range indicator light bulb from combination meter.	Is the "2" range indicator light bulb OK?	Go to step 57.	Replace the "2" range indicator light bulb. <Ref. to IDI-15, Combination Meter Assembly.>
57 CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER. 1) Disconnect the connectors from TCM and combination meter. 2) Measure the resistance of harness between TCM and combination meter. <i>Connector & terminal</i> <i>(B55) No. 6 — (i12) No. 4:</i>	Is the resistance less than 1 Ω ?	Go to step 65.	Repair the 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 the ignition switch to OFF. 2) Disconnect the connectors from TCM, inhibitor switch and combination meter. 3) Measure the resistance of harness between TCM and chassis ground. <i>Connector & terminal</i> <i>(B55) No. 6 — Chassis ground:</i>	Is the resistance more than 1 M Ω ?	Go to step 59.	Repair the ground short circuit in "2" range circuit.

DIAGNOSTIC PROCEDURE FOR NO-DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
59 CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM and inhibitor switch. 3) Measure the resistance of harness between TCM and inhibitor switch connector. <i>Connector & terminal</i> <i>(B55) No. 7 — (T7) No. 6:</i>	Is the resistance less than 1 Ω ?	Go to step 60 .	Repair the open circuit in harness between TCM and inhibitor switch connector, and poor contact in coupling connector.
60 CHECK INPUT SIGNAL FOR TCM. 1) Turn the ignition switch to OFF. 2) Connect the connector to TCM and inhibitor switch. 3) Turn the ignition switch to ON. 4) Measure the voltage between TCM and chassis ground. <i>Connector & terminal</i> <i>(B55) No. 7 (+) — Chassis ground (-):</i>	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 the voltage between TCM and chassis ground. <i>Connector & terminal</i> <i>(B55) No. 7 (+) — Chassis ground (-):</i>	Is the voltage more than 8 V in other ranges?	Go to step 65 .	Replace the TCM. <Ref. to AT-46, Transmission Control Module (TCM).>
62 CHECK "1" RANGE INDICATOR LIGHT BULB. 1) Turn the ignition switch to OFF. 2) Remove the combination meter. 3) Remove the "1" range indicator light bulb from combination meter.	Is the "1" range indicator light bulb OK?	Go to step 63 .	Replace the "1" range indicator light bulb. <Ref. to IDI-15, Combination Meter Assembly.>
63 CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER. 1) Disconnect the connectors from TCM and combination meter. 2) Measure the resistance of harness between TCM and combination meter. <i>Connector & terminal</i> <i>(B55) No. 7 — (i12) No. 5:</i>	Is the resistance less than 1 Ω ?	Go to step 65 .	Repair the 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 the ignition switch to OFF. 2) Disconnect the connectors from TCM, inhibitor switch and combination meter. 3) Measure the resistance of harness between TCM and chassis ground. <i>Connector & terminal</i> <i>(B55) No. 7 — Chassis ground:</i>	Is the resistance more than 1 $M\Omega$?	Go to step 65 .	Repair the ground short circuit in "1" range circuit.
65 CHECK POOR CONTACT.	Is there poor contact in inhibitor switch circuit?	Repair the poor contact.	Adjust the inhibitor switch and select cable. <Ref. to AT-28, ADJUSTMENT, Inhibitor Switch.> and <Ref. to CS-9, Select Cable.>

DIAGNOSTIC PROCEDURE FOR NO-DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

I: CHECK HOLD SWITCH.

DIAGNOSIS:

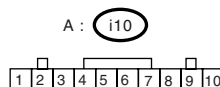
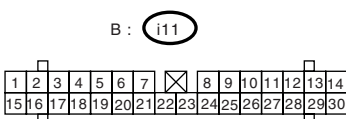
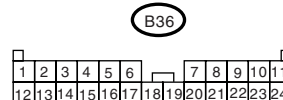
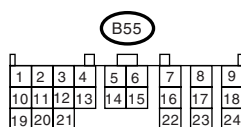
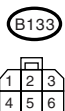
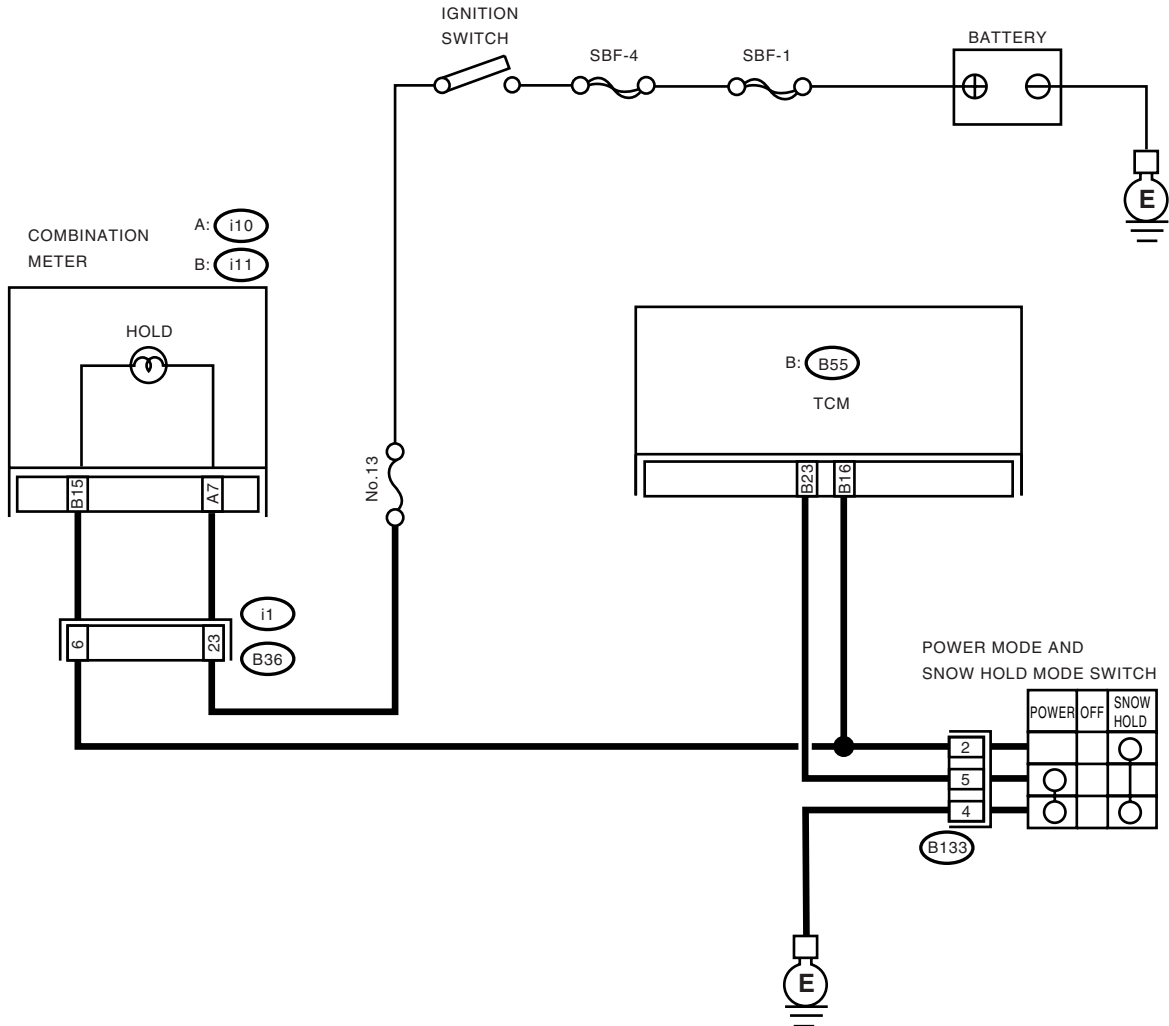
- The LED does not come on when hold switch is ON.
- The hold switch circuit is open or shorted.

TROUBLE SYMPTOM:

- The 2nd gear is not held.
- Failure of vehicle to start in 2nd gear except 1st range.

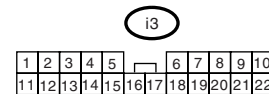
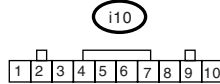
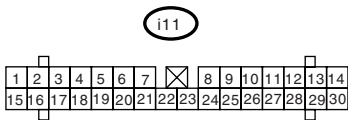
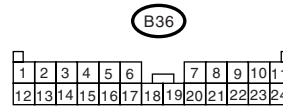
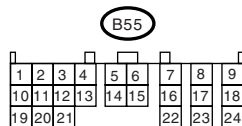
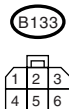
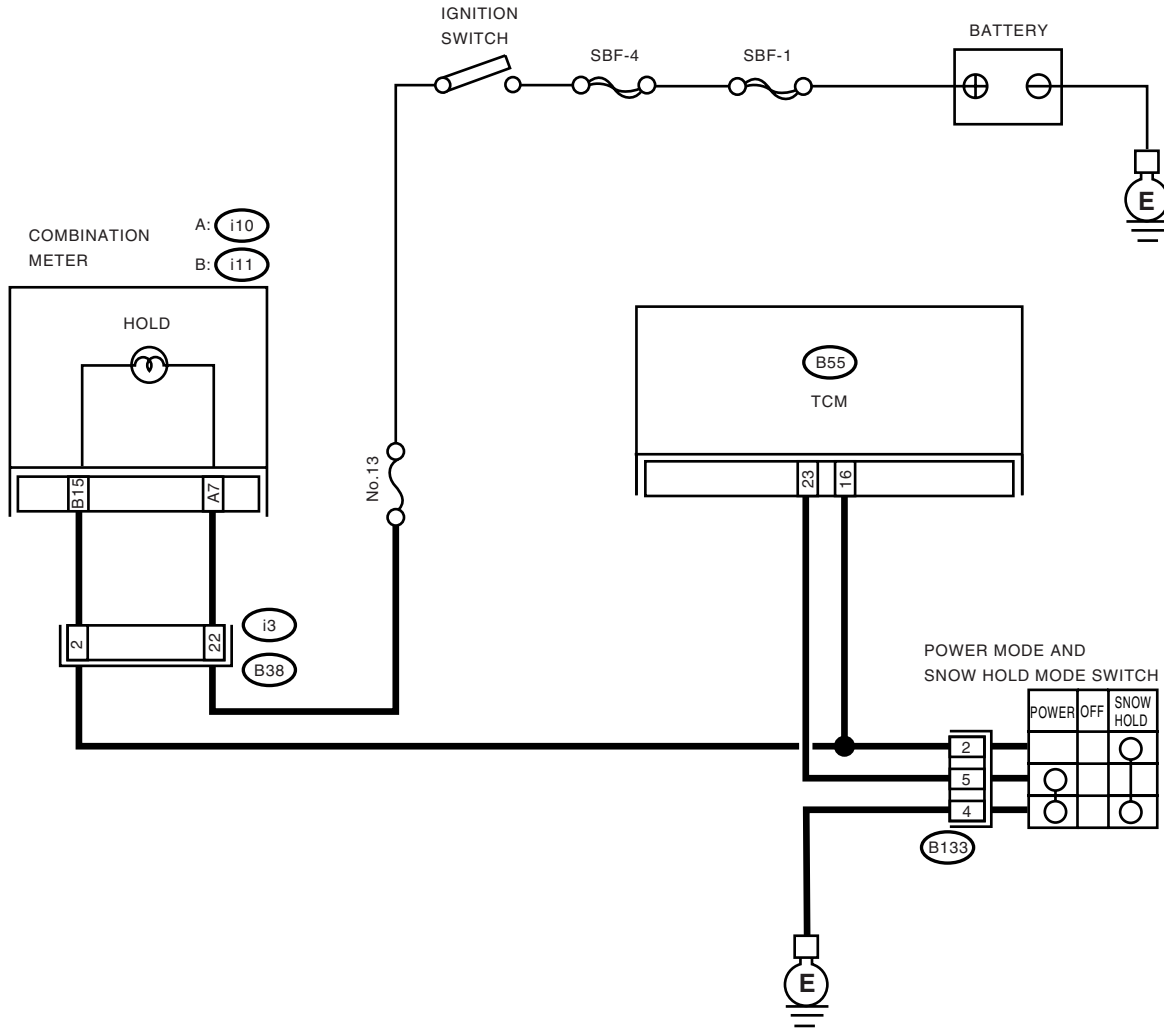
WIRING DIAGRAM:

LHD MODEL



DIAGNOSTIC PROCEDURE FOR NO-DIAGNOSTIC TROUBLE CODE (DTC) AUTOMATIC TRANSMISSION (DIAGNOSTICS)

RHD MODEL



TR0927

Step	Check	Yes	No
1	CHECK HOLD SWITCH OPERATION. When the hold switch is turned off, does LED light up?	Go to step 5.	Go to step 2.

DIAGNOSTIC PROCEDURE FOR NO-DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
2	CHECK HOLD SWITCH OPERATION.	When the hold switch is turned to ON, does LED light up?	Go to step Symptom Related Diagnostic. <Ref. to AT-133, Symptom Related Diagnostic.>
3	CHECK HOLD INDICATOR LIGHT. 1) Turn the ignition switch to OFF. 2) Remove the combination meter. 3) Remove the HOLD indicator light bulb from combination meter.	Is the HOLD indicator light bulb OK?	Go to step 4. Replace the HOLD indicator light bulb. <Ref. to IDI-15, Combination Meter Assembly.>
4	CHECK HOLD SWITCH GROUND LINE. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from hold switch. 3) Measure the 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 the open circuit in harness between hold switch and chassis ground.
5	CHECK HOLD SWITCH. 1) Turn the hold switch to ON. 2) Measure the resistance between terminals of hold switch. Terminals No. 4 — No. 2:	Is the resistance less than 1 Ω ?	Go to step 6. Repair the hold switch.
6	CHECK HOLD SWITCH. 1) Turn the hold switch to OFF. 2) Measure the resistance between terminals of hold switch. Terminals No. 4 — No. 2:	Is the resistance more than 1 M Ω ?	Go to step 7. Repair the hold switch.
7	CHECK HARNESS CONNECTOR BETWEEN TCM AND HOLD SWITCH. 1) Disconnect the connector TCM and combination meter. 2) Measure the 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 the 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 the 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 the 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 the 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 the short circuit in harness between TCM and hold switch connector.

DIAGNOSTIC PROCEDURE FOR NO-DIAGNOSTIC TROUBLE CODE (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
10 CHECK INPUT SIGNAL FOR TCM. 1)Connect the connectors to TCM and hold switch. 2)Turn the ignition switch to ON (engine OFF). 3)Measure the signal voltage for TCM while turning hold switch to OFF. Connector & terminal (B55) No. 16 (+) — Chassis ground (-):	Is the voltage more than 8 V?	Go to step 11.	Replace the TCM. <Ref. to AT-46, Transmission Control Module (TCM).>
11 CHECK INPUT SIGNAL FOR TCM. Measure the signal voltage for TCM while turning hold switch to ON. Connector & terminal (B55) No. 16 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Go to step 12.	Replace the TCM. <Ref. to AT-46, Transmission Control Module (TCM).>
12 CHECK POOR CONTACT.	Is there poor contact?	Repair the poor contact.	A temporary poor contact of the connector or harness or connector in hold switch circuit.

SYMPTOM RELATED DIAGNOSTIC

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

16.Symptom Related Diagnostic

A: INSPECTION

Symptom	Problem parts
Starter does not rotate when select lever is in "P" or "N" range; starter rotates when select lever is in "R", "D", "3" or "2" range.	<ul style="list-style-type: none"> • Inhibitor switch • Select cable • Select lever • Starter motor and harness
Abnormal noise when select lever is in "P" or "N" range.	<ul style="list-style-type: none"> • Strainer • Transfer duty solenoid • Oil pump • Drive plate • ATF level too high or too low
Hissing noise occurs during standing start.	<ul style="list-style-type: none"> • Strainer • ATF level too high or too low
Noise occurs while driving in "D1".	<ul style="list-style-type: none"> • Final gear • Planetary gear • Reduction gear • Differential gear oil level too high or too low
Noise occurs while driving in "D2".	
Noise occurs while driving in "D3".	<ul style="list-style-type: none"> • Final gear • Low & reverse brake • Reduction gear • Differential gear oil level too high or too low
Noise occurs while driving in "D4".	<ul style="list-style-type: none"> • Final gear • Low & reverse brake • Planetary gear • Reduction gear • Differential gear oil level too high or too low
Engine stalls while shifting from one range to another.	<ul style="list-style-type: none"> • Control valve • Lock-up damper • Engine performance • Input shaft
Vehicle moves when select lever is in "N" range.	<ul style="list-style-type: none"> • TCM • Low clutch
Shock occurs when select lever is moved from "N" to "D" range.	<ul style="list-style-type: none"> • TCM • Harness • Control valve • ATF deterioration
Excessive time lag occurs when select lever is moved from "N" to "D" range.	<ul style="list-style-type: none"> • Control valve • Low clutch • Line pressure duty solenoid • Seal ring • Front gasket transmission case
Shock occurs when select lever is moved from "N" to "R" range.	<ul style="list-style-type: none"> • TCM • Harness • Control valve • ATF deterioration
Excessive time lag occurs when select lever is moved from "N" to "R" range.	<ul style="list-style-type: none"> • Control valve • Low & reverse clutch • Reverse clutch • Line pressure duty solenoid • Seal ring • Front gasket transmission case
Vehicle does not start in any shift range (engine stalls).	<ul style="list-style-type: none"> • Parking brake mechanism • Planetary gear

SYMPTOM RELATED DIAGNOSTIC

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Symptom	Problem parts
Vehicle does not start in any shift range (engine revving up).	<ul style="list-style-type: none"> • Strainer • Line pressure duty solenoid • Control valve • Drive pinion • Hypoid gear • Axle shaft • Differential gear • Oil pump • Input shaft • Output shaft • Planetary gear • Drive plate • ATF level too low • Front gasket transmission case
Vehicle does not start in "R" range only (engine revving up).	<ul style="list-style-type: none"> • Select cable • Select lever • Control valve • Low & reverse clutch • Reverse clutch
Vehicle does not start in "R" range only (engine stalls).	<ul style="list-style-type: none"> • Low clutch • 2-4 brake • Planetary gear • Parking brake mechanism
Vehicle does not start in "D", "3" range only (engine revving up).	<ul style="list-style-type: none"> • Low clutch • One-way clutch
Vehicle does not start in "D", "3" or "2" range only (engine revving up).	<ul style="list-style-type: none"> • Low clutch
Vehicle does not start in "D", "3" or "2" range only (engine stalls).	<ul style="list-style-type: none"> • Reverse clutch
Vehicle starts in "R" range only (engine revving up).	<ul style="list-style-type: none"> • Control valve
Acceleration during standing starts is poor (high stall rpm).	<ul style="list-style-type: none"> • Control valve • Low clutch • Reverse clutch • ATF level too low • Front gasket transmission case • Differential gear oil level too high or too low
Acceleration during standing starts is poor (low stall rpm).	<ul style="list-style-type: none"> • Oil pump • Torque converter one-way clutch • Engine performance
Acceleration is poor when select lever is in "D", "3" or "2" range (normal stall rpm).	<ul style="list-style-type: none"> • TCM • Control valve • High clutch • 2-4 brake • Planetary gear
Acceleration is poor when select lever is in "R" (normal stall rpm).	<ul style="list-style-type: none"> • Control valve • High clutch • 2-4 brake • Planetary gear
No shift occurs from 1st to 2nd gear.	<ul style="list-style-type: none"> • TCM • Rear vehicle speed sensor • Front vehicle speed sensor • Throttle position sensor • Shift solenoid 1 • Control valve • 2-4 brake
No shift occurs from 2nd to 3rd gear.	<ul style="list-style-type: none"> • TCM • Control valve • High clutch • Shift solenoid 2

SYMPTOM RELATED DIAGNOSTIC

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Symptom	Problem parts
No shift occurs from 3rd to 4th gear.	<ul style="list-style-type: none"> • TCM • Shift solenoid 1 • ATF temperature sensor • Control valve • 2-4 brake
Engine brake is not effected when select lever is in "3" range.	<ul style="list-style-type: none"> • Inhibitor switch • TCM • Throttle position sensor • Control valve
Engine brake is not effected when select lever is in "3" or "2" range.	<ul style="list-style-type: none"> • Control valve
Engine brake is not effected when select lever is in "1" range.	<ul style="list-style-type: none"> • Control valve • Low & reverse brake
Shift characteristics are erroneous.	<ul style="list-style-type: none"> • Inhibitor switch • TCM • Front vehicle speed sensor • Rear vehicle speed sensor • Throttle position sensor • Control valve • Ground earth
No lock-up occurs.	<ul style="list-style-type: none"> • TCM • Throttle position sensor • ATF temperature sensor • Control valve • Lock-up facing • Engine speed signal
Parking brake is not effected.	<ul style="list-style-type: none"> • Select cable
Shift lever cannot be moved or is hard to move from "P" range.	<ul style="list-style-type: none"> • Select lever • Parking mechanism
ATF spurts out.	<ul style="list-style-type: none"> • ATF level too high
Differential oil spurts out.	<ul style="list-style-type: none"> • Differential gear oil too high
Differential oil level changes excessively.	<ul style="list-style-type: none"> • Seal pipe • Double oil seal
Odor is produced from ATF supply pipe.	<ul style="list-style-type: none"> • High clutch • 2-4 brake • Low & reverse clutch • Reverse clutch • Lock-up facing • ATF deterioration
Shock occurs from 1st to 2nd gear.	<ul style="list-style-type: none"> • TCM • Throttle position sensor • 2-4 brake duty solenoid • ATF temperature sensor • Line pressure duty solenoid • Control valve • 2-4 brake • ATF deterioration • Engine performance • 2-4 brake timing solenoid
Slippage occurs from 1st to 2nd gear.	<ul style="list-style-type: none"> • TCM • Throttle position sensor • 2-4 brake duty solenoid • ATF temperature sensor • Line pressure duty solenoid • Control valve • 2-4 brake • 2-4 brake timing solenoid • High clutch

SYMPTOM RELATED DIAGNOSTIC

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Symptom	Problem parts
Shock occurs from 2nd to 3rd gear.	<ul style="list-style-type: none"> • TCM • Throttle position sensor • 2-4 brake duty solenoid • ATF temperature sensor • Line pressure duty solenoid • Control valve • High clutch • 2-4 brake • ATF deterioration • Engine performance • 2-4 brake timing solenoid
Slippage occurs from 2nd to 3rd gear.	<ul style="list-style-type: none"> • TCM • Throttle position sensor • 2-4 brake duty solenoid • ATF temperature sensor • Line pressure duty solenoid • Control valve • High clutch • 2-4 brake • 2-4 brake timing solenoid
Shock occurs from 3rd to 4th gear.	<ul style="list-style-type: none"> • TCM • Throttle position sensor • 2-4 brake duty solenoid • ATF temperature sensor • Line pressure duty solenoid • Control valve • 2-4 brake timing solenoid • 2-4 brake • ATF deterioration • Engine performance • Low clutch timing solenoid • Low clutch
Slippage occurs from 3rd to 4th gear.	<ul style="list-style-type: none"> • TCM • Throttle position sensor • 2-4 brake duty solenoid • ATF temperature sensor • Line pressure duty solenoid • Control valve • 2-4 brake • 2-4 brake timing solenoid
Shock occurs when select lever is moved from "3" to "2" range.	<ul style="list-style-type: none"> • TCM • Throttle position sensor • ATF temperature sensor • Line pressure duty solenoid • Control valve • 2-4 brake duty solenoid • 2-4 brake • ATF deterioration • 2-4 brake timing solenoid
Shock occurs when select lever is moved from "D" to "1" range.	<ul style="list-style-type: none"> • TCM • Throttle position sensor • ATF temperature sensor • Line pressure duty solenoid • Control valve • ATF deterioration • 2-4 brake duty solenoid • 2-4 brake timing solenoid • Low clutch timing solenoid

SYMPTOM RELATED DIAGNOSTIC

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Symptom	Problem parts
Shock occurs when select lever is moved from "2" to "1" range.	<ul style="list-style-type: none"> • TCM • Throttle position sensor • ATF temperature sensor • Line pressure duty solenoid • Control valve • Low & reverse clutch • ATF deterioration • 2-4 brake duty solenoid • 2-4 brake timing solenoid • Low clutch timing solenoid
Shock occurs when accelerator pedal is released at medium speeds.	<ul style="list-style-type: none"> • TCM • Throttle position sensor • ATF temperature sensor • Line pressure duty solenoid • Control valve • Lock-up damper • Engine performance • 2-4 brake duty solenoid • 2-4 brake timing solenoid • Low clutch timing solenoid
Vibration occurs during straight-forward operation.	<ul style="list-style-type: none"> • TCM • Lock-up duty solenoid • Lock-up facing • Lock-up damper
Vibration occurs during turns (tight corner "braking" phenomenon).	<ul style="list-style-type: none"> • TCM • Front vehicle speed sensor • Rear vehicle speed sensor • Throttle position sensor • ATF temperature sensor • Transfer clutch • Transfer valve • Transfer duty solenoid • ATF deterioration • Harness
Front wheel slippage occurs during standing starts.	<ul style="list-style-type: none"> • TCM • Front vehicle speed sensor • FWD switch • Throttle position sensor • ATF temperature sensor • Control valve • Transfer clutch • Transfer valve • Transfer pipe • Transfer duty solenoid
Vehicle is not set in FWD mode.	<ul style="list-style-type: none"> • TCM • FWD switch • Transfer clutch • Transfer valve • Transfer duty solenoid
Select lever is hard to move.	<ul style="list-style-type: none"> • Select cable • Select lever • Detente spring • Manual plate
Select lever is too high to move (unreasonable resistance).	<ul style="list-style-type: none"> • Detente spring • Manual plate
Select lever slips out of operation during acceleration or while driving on rough terrain.	<ul style="list-style-type: none"> • Select cable • Select lever • Detente spring • Manual plate

SYMPTOM RELATED DIAGNOSTIC

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

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

Model		1.6L	2.0L Non-turbo	2.0L Turbo		2.5L	
				Except Australia	Australia	Except Australia	Australia
Type		5-forward speeds with synchromesh and 1-reverse 5x2-forward speeds with synchromesh and 2-reverse*					
Transmission gear ratio	1st	3.454		3.454	3.166	3.454	
	2nd	2.062		1.947	1.882	2.062	
	3rd	1.448		1.366	1.296	1.448	
	4th	1.088		0.972		1.088	
	5th	0.825		0.738		0.871	0.780
	Reverse	3.333					
Auxiliary transmission gear ratio*		High		—			
		Low		—			
Front reduction gear	Final	Type of gear		Hypoid			
		Gear ratio		4.111	3.900	3.900	4.444
Rear reduction gear	Transfer	Type of gear		Helical			
		Gear ratio		1.000		1.100	1.000
	Final	Type of gear		Hypoid			
		Gear ratio		4.111	3.900	3.545	4.444
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 oil capacity		3.5 ℓ (3.7 US qt, 3.1 Imp qt) 4.0 ℓ (4.2 US qt, 3.5 Imp qt)*					

*: Dual-range model only

2. TRANSMISSION GEAR OIL

Recommended oil

ITEM										
• Transmission gear oil										
API Classification										
GL - 5										
SAE Viscosity No. and Applicable Temperature										
(°C)	-30	-26	-15	-5	0	15	25	30		
(°F)	-22	-15	5	23	32	59	77	86		
									90	
									85W	
									80W	
									75W - 90	
B1H0024										

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

Preload adjustment of thrust bearing

Starting torque

0.3 — 0.8 N·m (0.03 — 0.08 kgf-m, 0.2 — 0.6 ft-lb)

Adjusting washer No. 1	
Part No.	Thickness mm (in)
803025051	3.925 (0.1545)
803025052	3.950 (0.1555)
803025053	3.975 (0.1565)
803025054	4.000 (0.1575)
803025055	4.025 (0.1585)
803025056	4.050 (0.1594)
803025057	4.075 (0.1604)

Adjusting washer No. 2	
Part No.	Thickness mm (in)
803025059	3.850 (0.1516)
803025054	4.000 (0.1575)
803025058	4.150 (0.1634)

5. INPUT SHAFT ASSEMBLY

Snap ring (Outer-28) to ball bearing clearance

0 — 0.12 mm (0 — 0.0047 in)

Snap ring (Outer-28)	
Part No.	Thickness mm (in)
805028050	2.48 (0.0976)
805028060	2.56 (0.1008)
805028070	2.64 (0.1039)

Snap ring (Inner-68) to bearing clearance

0 — 0.12 mm (0 — 0.0047 in)

Snap ring (Inner-68)	
Part No.	Thickness mm (in)
805168020	1.84 (0.0724)
805168030	1.92 (0.0756)
805168040	2.00 (0.0787)

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)

GENERAL DESCRIPTION

MANUAL TRANSMISSION AND DIFFERENTIAL

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 the 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 the 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

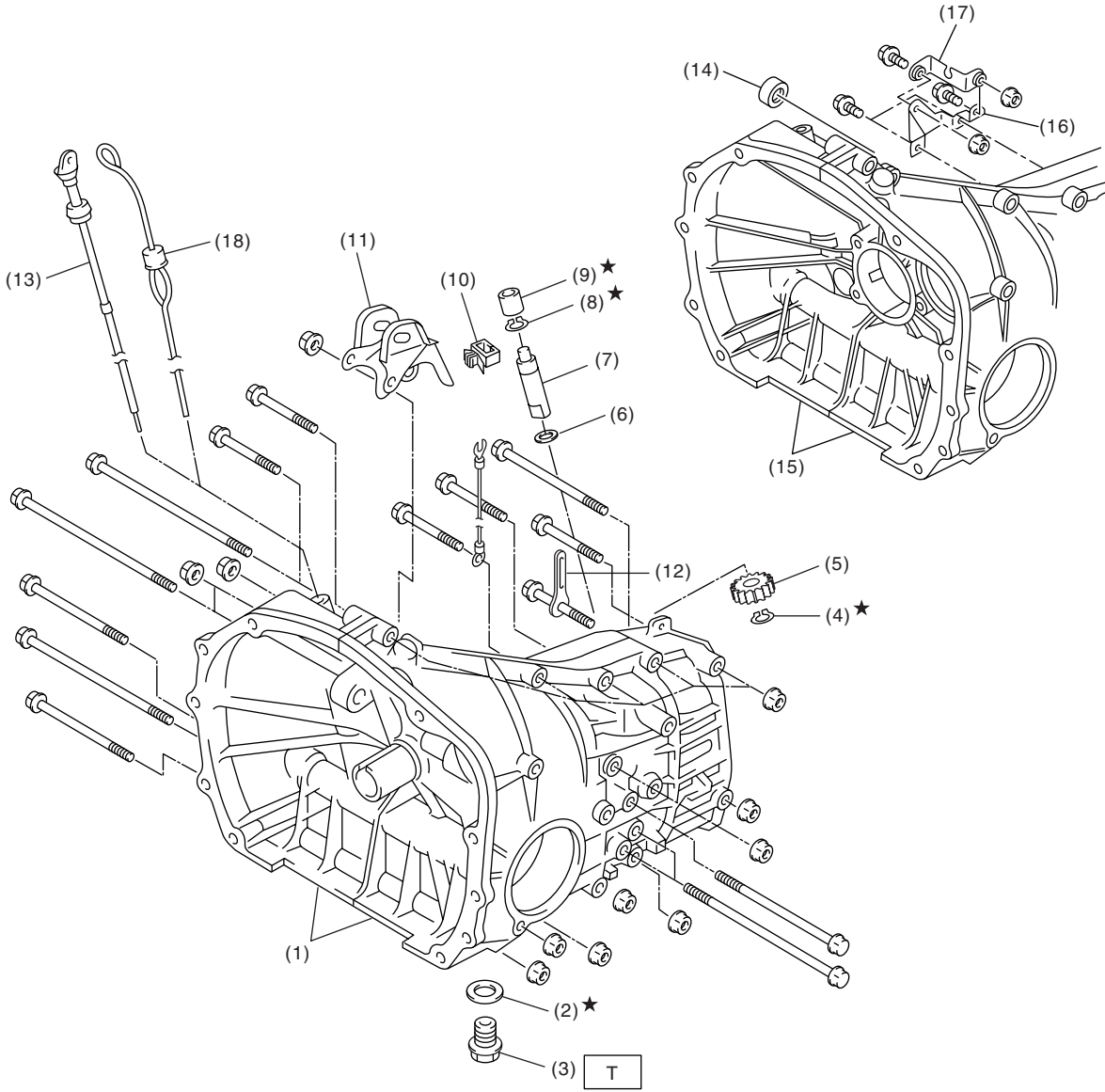
MANUAL TRANSMISSION AND DIFFERENTIAL

GENERAL DESCRIPTION

MANUAL TRANSMISSION AND DIFFERENTIAL

B: COMPONENT

1. TRANSMISSION CASE



TR0906

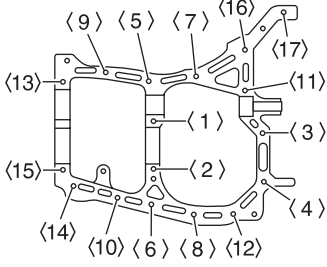
GENERAL DESCRIPTION

MANUAL TRANSMISSION AND DIFFERENTIAL

- | | | |
|-----------------------------|--|--|
| (1) Transmission case ASSY | (9) Oil seal | (16) High-low cable bracket A (Dual-range) |
| (2) Gasket | (10) Clamp | (17) High-low cable bracket B (Dual-range) |
| (3) Drain plug | (11) Pitching stopper bracket | (18) Oil level gauge (Turbo model) |
| (4) Snap ring (Outer) | (12) Clip | |
| (5) Speedometer driven gear | (13) Oil level gauge (Non-turbo model) | |
| (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)

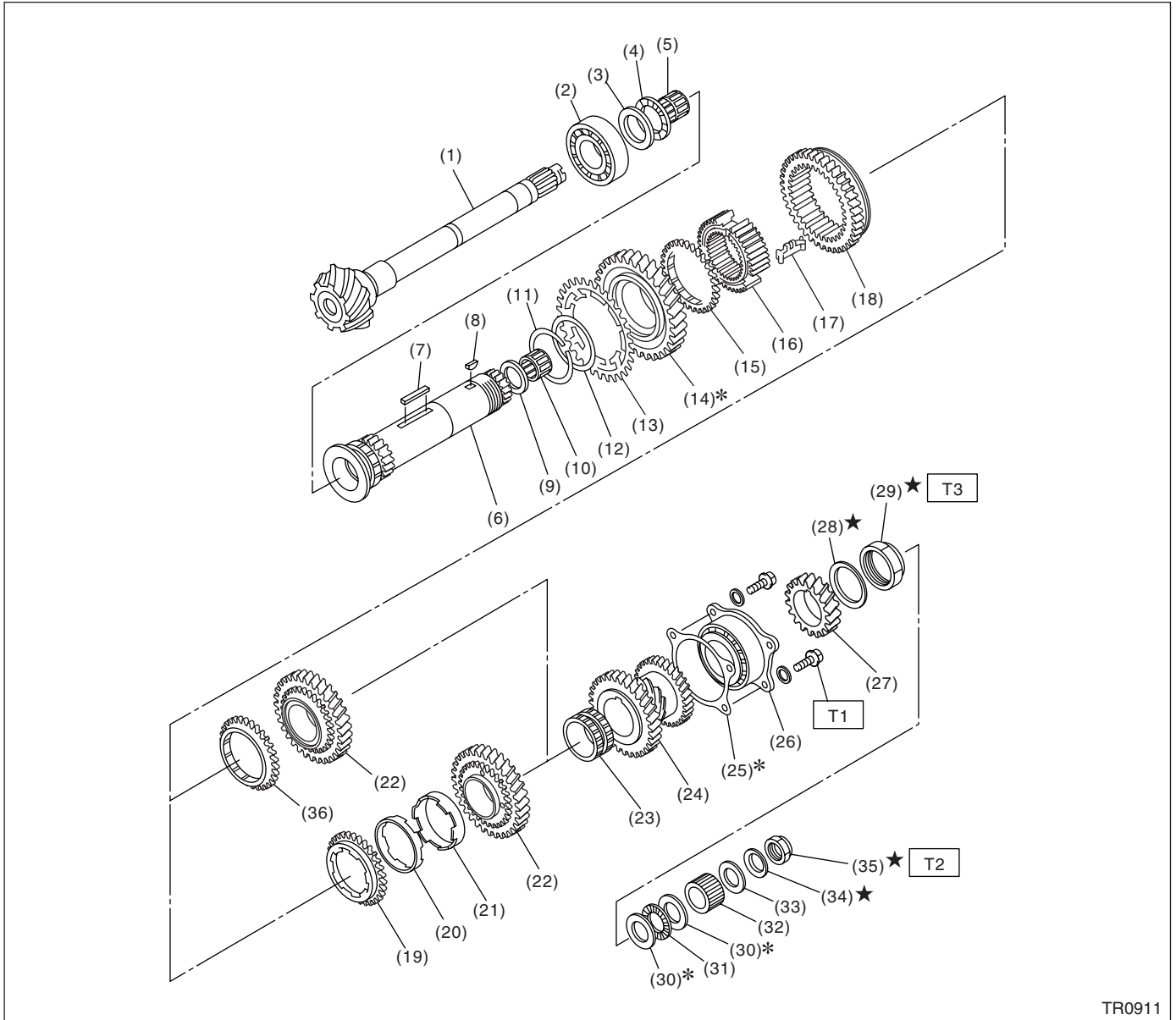
• Transmission case tightening torque

 <p>B3M2243A</p>	Bolt No.	Bolt size	Tightening torque: N·m (kgf·m, ft·lb)
	<5> to <15>	8 mm	25 (2.5, 18.1)
	<1> to <4> <16>, <17>	10 mm	39 (4.0, 28.9)

GENERAL DESCRIPTION

MANUAL TRANSMISSION AND DIFFERENTIAL

2. DRIVE PINION ASSEMBLY



TR0911

(1) Drive pinion shaft	(16) 1st-2nd synchronizer hub	(28) Lock washer
(2) Roller bearing	(17) Insert key	(29) Lock nut
(3) Washer	(18) Reverse driven gear	(30) Washer
(4) Thrust bearing	(19) Outer baulk ring (Except 1.6 L model)	(31) Thrust bearing
(5) Needle bearing	(20) Synchro cone (Except 1.6 L model)	(32) Differential bevel gear sleeve
(6) Driven shaft	(21) Inner baulk ring (Except 1.6 L model)	(33) Washer
(7) Key	(22) 2nd driven gear	(34) Lock washer
(8) Woodruff key	(23) 2nd driven gear bush	(35) Lock nut
(9) Drive pinion collar	(24) 3rd-4th driven gear	(36) 2nd baulk ring (1.6 L model)
(10) Needle bearing	(25) Driven pinion shim	
(11) Snap ring (Outer)	(26) Roller bearing	
(12) Washer	(27) 5th driven gear	
(13) Sub gear		
(14) 1st driven gear		
(15) Baulk ring		

Tightening torque: N-m (kgf-m, ft-lb)

T1: 29 (3.0, 21.7)

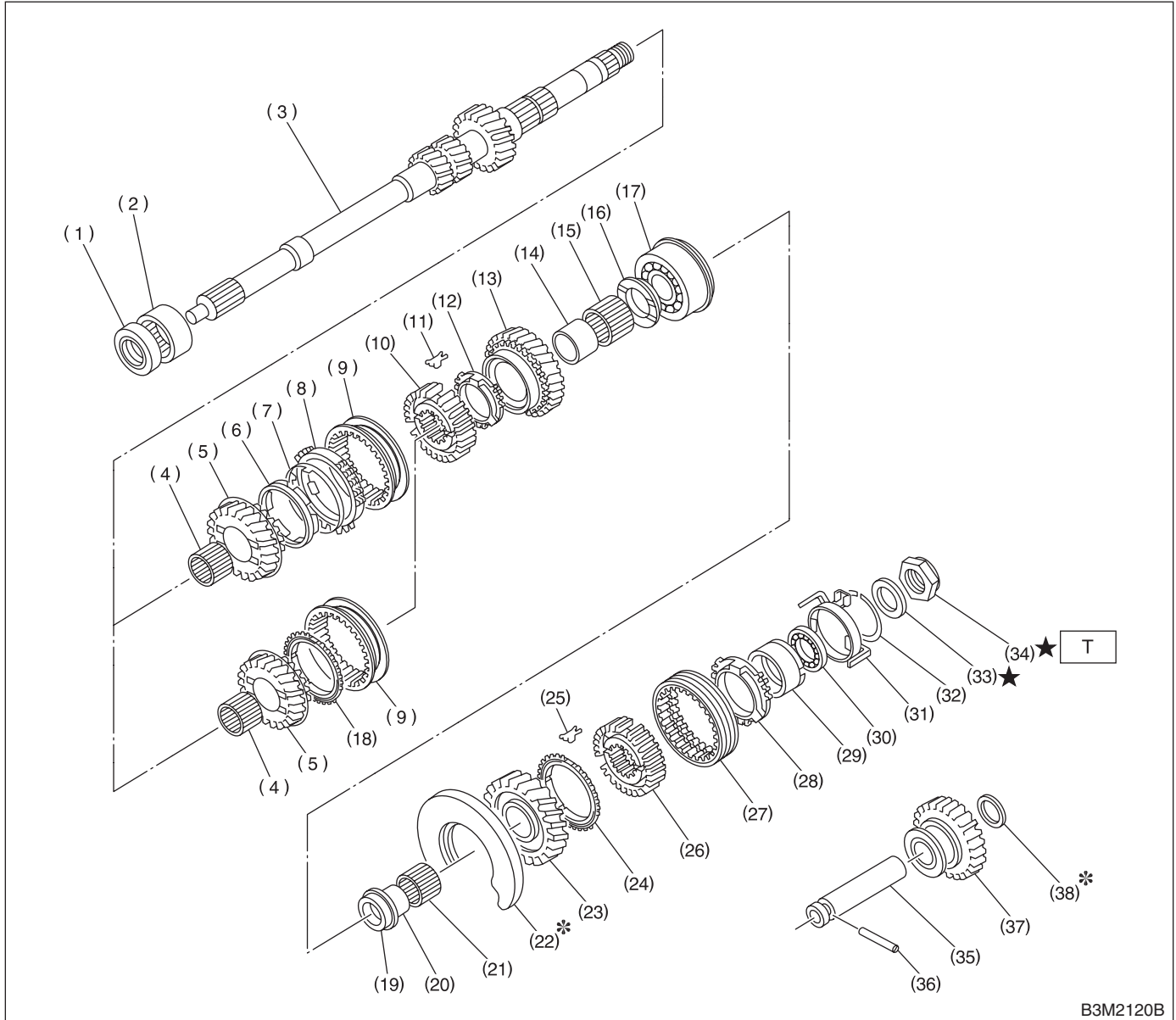
T2: 118 (12.0, 86.8)

T3: 265 (27, 195)

GENERAL DESCRIPTION

MANUAL TRANSMISSION AND DIFFERENTIAL

3. MAIN SHAFT ASSEMBLY



B3M2120B

- | | | |
|--|--|-------------------------------|
| (1) Oil seal | (13) 4th drive gear | (27) 5th-Rev coupling sleeve |
| (2) Needle bearing | (14) 4th needle bearing race | (28) Rev baulk ring |
| (3) Transmission main shaft | (15) Needle bearing | (29) Rev synchro cone |
| (4) Needle bearing | (16) 4th gear thrust washer | (30) Ball bearing |
| (5) 3rd drive gear | (17) Ball bearing | (31) Synchro cone stopper |
| (6) Inner baulk ring (Turbo and 2.5 L model) | (18) Baulk ring (Except turbo and 2.5 L model) | (32) Snap ring |
| (7) 3rd synchro cone (Turbo and 2.5 L model) | (19) 5th gear thrust washer | (33) Lock washer |
| (8) Outer baulk ring (Turbo and 2.5 L model) | (20) 5th needle bearing race | (34) Lock nut |
| (9) 3rd-4th coupling sleeve | (21) Needle bearing | (35) Reverse idler gear shaft |
| (10) 3rd-4th synchronizer hub | (22) Main shaft rear plate | (36) Straight pin |
| (11) 3rd-4th shifting insert key | (23) 5th drive gear | (37) Reverse idler gear |
| (12) 4th baulk ring | (24) 5th baulk ring | (38) Washer |
| | (25) 5th-Rev shifting insert key | |
| | (26) 5th-Rev synchronizer hub | |

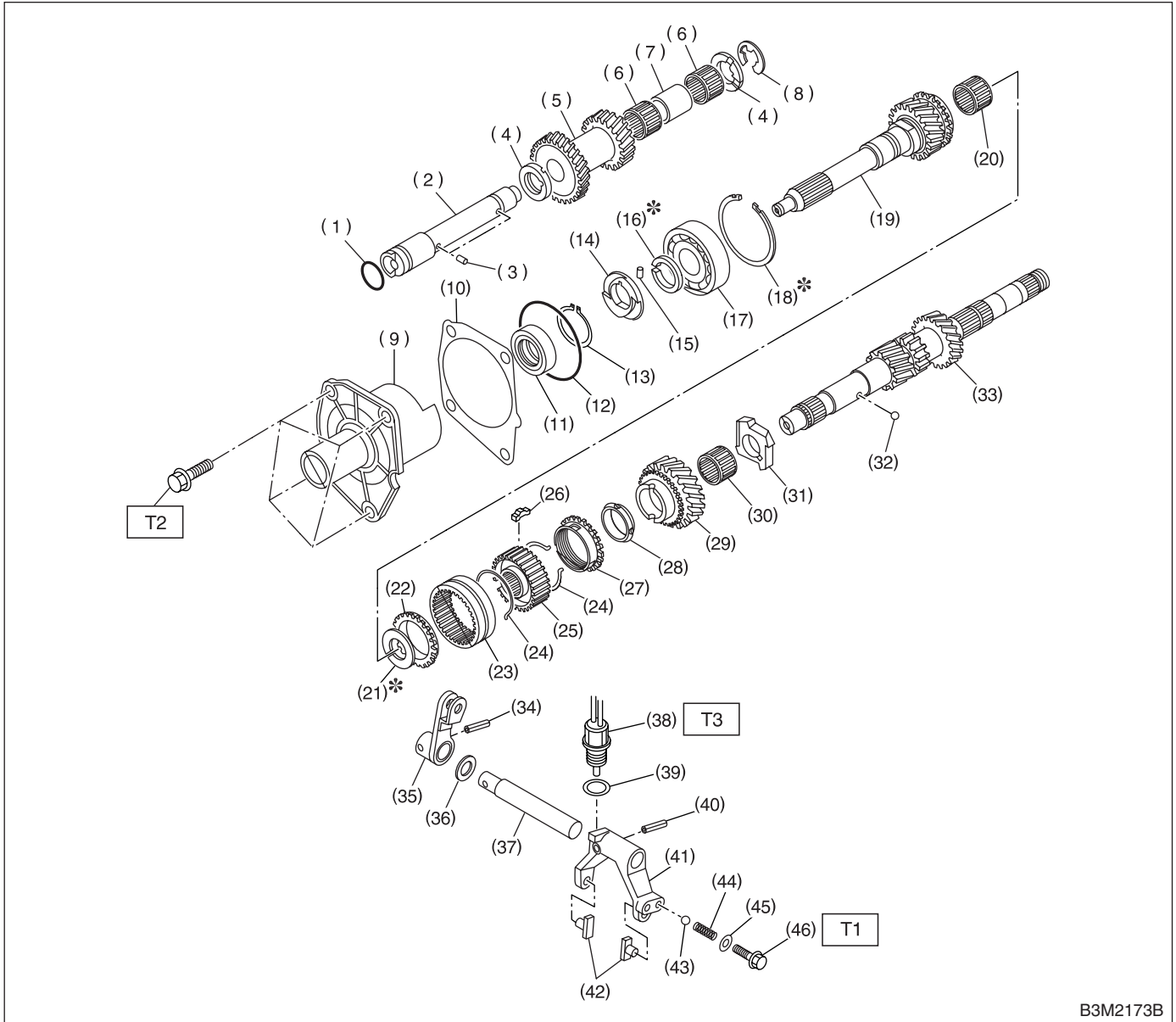
Tightening torque: N·m (kgf·m, ft·lb)

T: 118 (12.0, 86.8)

GENERAL DESCRIPTION

MANUAL TRANSMISSION AND DIFFERENTIAL

4. AUXILIARY TRANSMISSION GEARS



B3M2173B

GENERAL DESCRIPTION

MANUAL TRANSMISSION AND DIFFERENTIAL

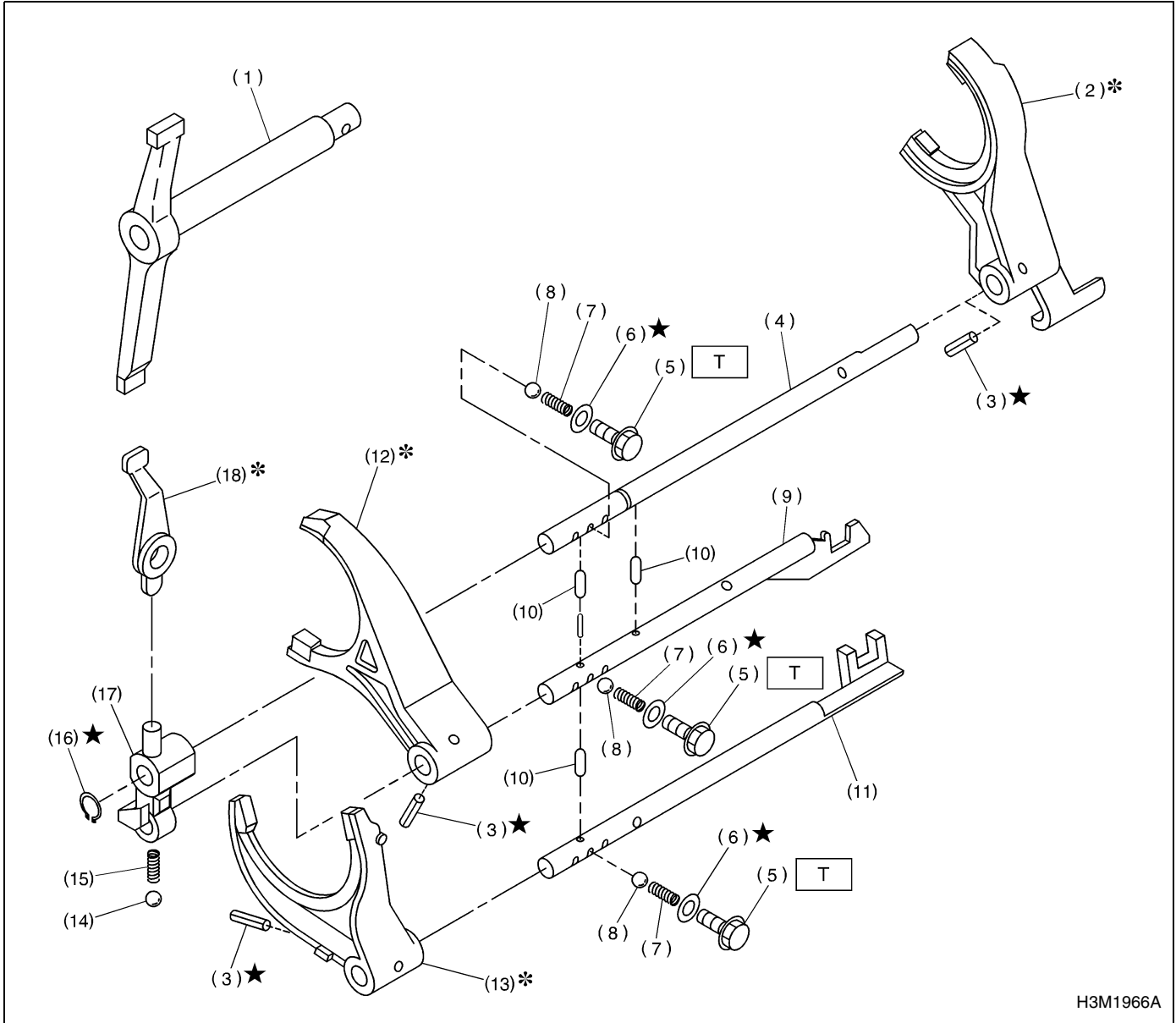
- | | | |
|-----------------------------|-----------------------------------|-----------------------------|
| (1) O-ring | (19) Input shaft | (37) High-low shifter shaft |
| (2) High-low counter shaft | (20) Needle bearing | (38) Low switch |
| (3) Straight pin | (21) Snap ring (Outer-25) | (39) Gasket |
| (4) High-low counter washer | (22) High-low baulk ring | (40) Straight pin |
| (5) Counter gear | (23) High-low coupling sleeve | (41) High-low shifter fork |
| (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 key | (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 (2.0, 14.5)****T3: 25 (2.5, 18.1)**

GENERAL DESCRIPTION

MANUAL TRANSMISSION AND DIFFERENTIAL

5. SHIFTER FORK AND SHIFTER ROD



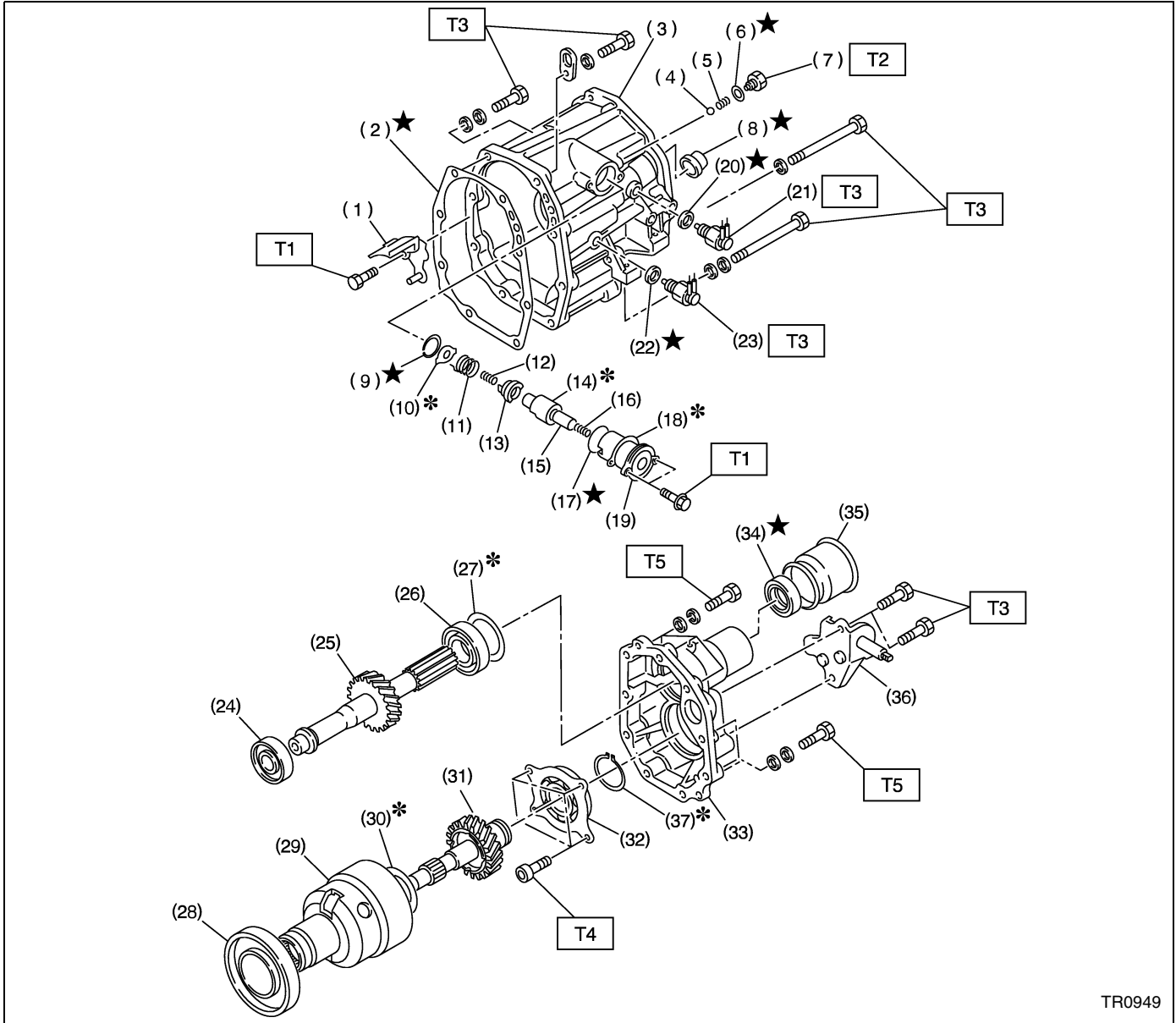
- | | | |
|--------------------------|---------------------------|----------------------------|
| (1) Shifter arm | (9) 3rd-4th fork rod | (17) Reverse fork rod arm |
| (2) 5th shifter fork | (10) Interlock plunger | (18) Reverse shifter lever |
| (3) Straight pin | (11) 1st-2nd fork rod | |
| (4) Reverse fork rod | (12) 3rd-4th shifter fork | |
| (5) Checking ball plug | (13) 1st-2nd shifter fork | |
| (6) Gasket | (14) Ball | |
| (7) Checking ball spring | (15) Spring | |
| (8) Ball | (16) Snap ring (Outer) | |

Tightening torque: N-m (kgf-m, ft-lb)
T: 20 (2.0, 14.5)

GENERAL DESCRIPTION

MANUAL TRANSMISSION AND DIFFERENTIAL

6. TRANSFER CASE AND EXTENSION



TR0949

- | | | |
|----------------------------|----------------------------|--------------------------|
| (1) Oil guide | (16) Return spring | (31) Transfer drive gear |
| (2) Gasket | (17) O-ring | (32) Ball bearing |
| (3) Transfer case | (18) Adjusting select shim | (33) Extension case |
| (4) Ball | (19) Reverse check sleeve | (34) Oil seal |
| (5) Reverse accent spring | (20) Gasket | (35) Dust cover |
| (6) Gasket | (21) Neutral switch | (36) Shift bracket |
| (7) Plug | (22) Gasket | (37) Snap ring |
| (8) Oil seal | (23) Back-up light switch | |
| (9) Snap ring (Inner) | (24) Roller bearing | |
| (10) Reverse check plate | (25) Transfer driven gear | |
| (11) Reverse check spring | (26) Roller bearing | |
| (12) Reverse return spring | (27) Adjusting washer | |
| (13) Reverse check cam | (28) Ball bearing | |
| (14) Reverse accent shaft | (29) Center differential | |
| (15) Return spring cap | (30) Adjusting washer | |

Tightening torque: N·m (kgf·m, ft·lb)

T1: 6.4 (0.65, 4.7)

T2: 10 (1.0, 7.2)

T3: 25 (2.5, 18.1)

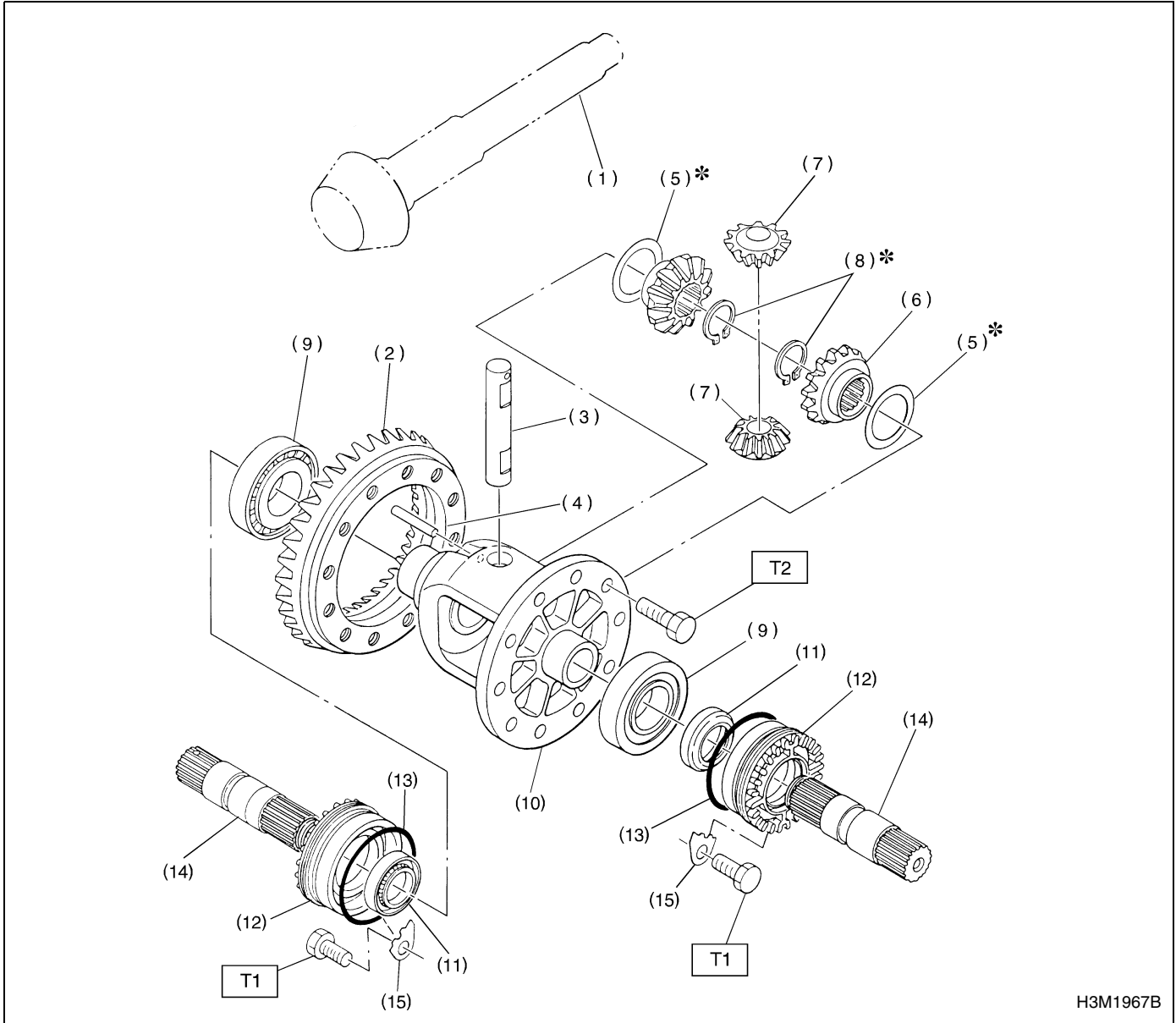
T4: 26 (2.7, 20)

T5: 40 (4.1, 29.7)

GENERAL DESCRIPTION

MANUAL TRANSMISSION AND DIFFERENTIAL

7. FRONT DIFFERENTIAL



H3M1967B

- | | | |
|-------------------------------|---------------------------------|--------------------------|
| (1) Drive pinion shaft | (8) Snap ring (Outer) | (15) Retainer lock plate |
| (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 | |

Tightening torque: N·m (kgf·m, ft·lb)

T1: 25 (2.5, 18.1)

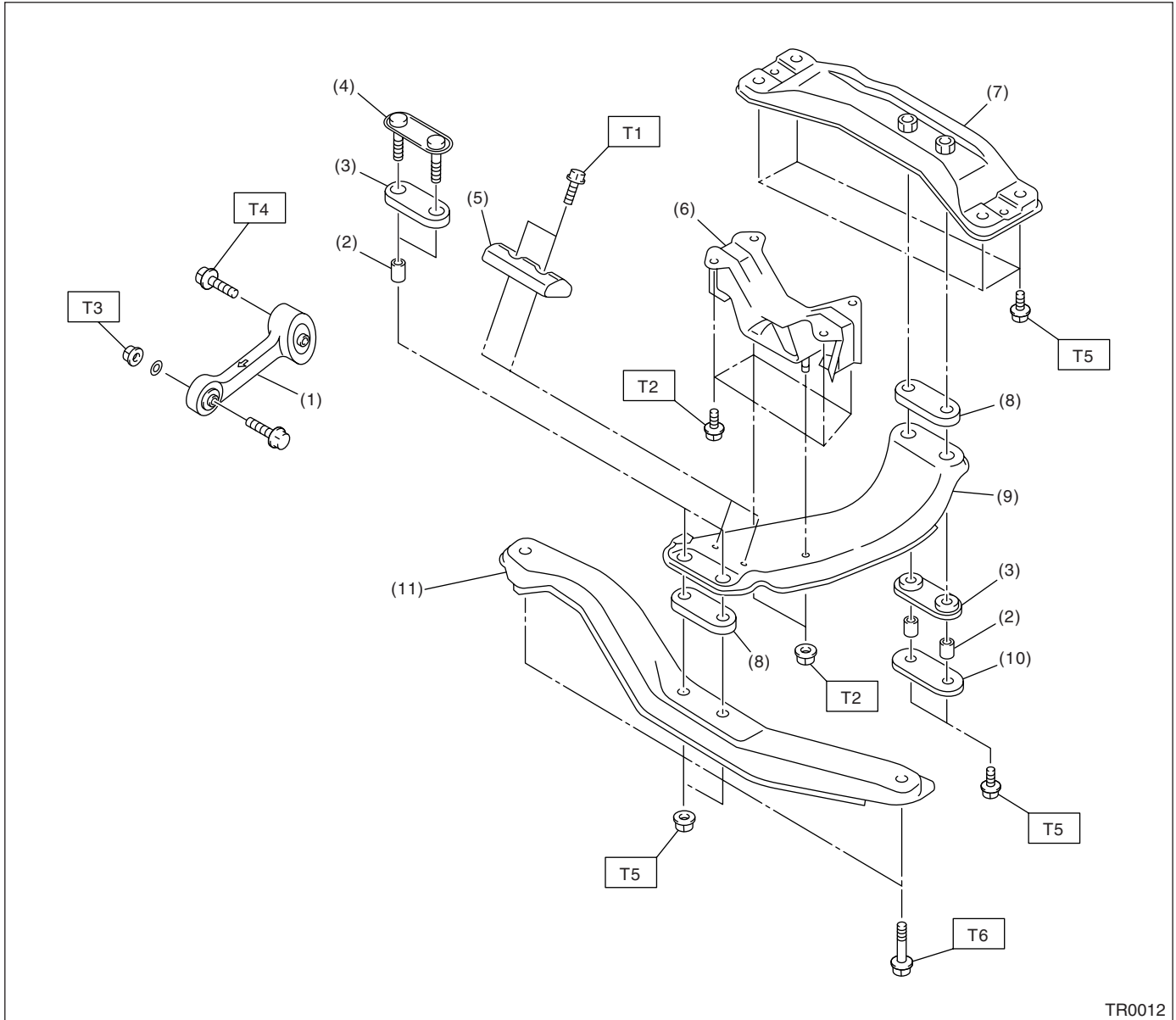
T2: 62 (6.3, 45.6)

GENERAL DESCRIPTION

MANUAL TRANSMISSION AND DIFFERENTIAL

8. TRANSMISSION MOUNTING

• Except 1.6 L MODEL



TR0012

- | | |
|-------------------------|------------------------|
| (1) Pitching stopper | (8) Cushion D |
| (2) Spacer | (9) Center crossmember |
| (3) Cushion C | (10) Rear plate |
| (4) Front plate | (11) Front crossmember |
| (5) Dynamic damper | |
| (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

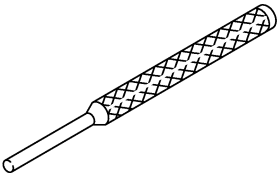
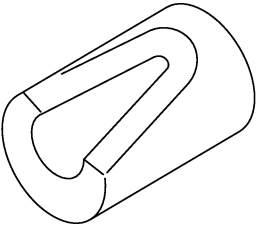
C: CAUTION

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation, and disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- When disassembling the case and other light alloy parts, use a plastic hammer to force it apart. Do not pry it apart with a screwdriver or other tool.
- Be careful not to burn your hands, because each part on the vehicle is hot after running.
- Use SUBARU genuine gear oil, grease etc. or the equivalent. Do not mix gear oil, grease etc. with that of another grade or from other manufacturers.

- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Apply gear oil onto sliding or revolution surfaces before installation.
- Replace deformed or otherwise damaged snap rings with new ones.
- Before installing O-rings or oil seals, apply sufficient amount of gear oil to avoid damage and deformation.
- Be careful not to incorrectly install or fail to install O-rings, snap rings and other such parts.
- Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.
- Avoid damaging the mating surface of the case.
- Before applying sealant, completely remove the old seal.

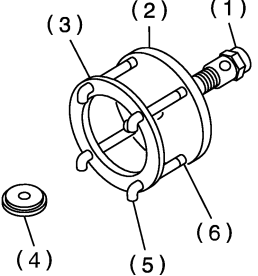
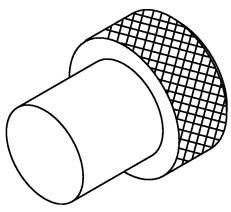
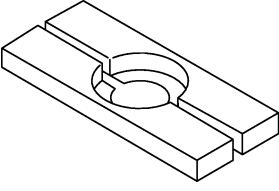
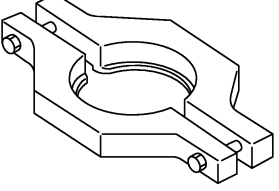
D: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p>B3M1938</p>	398791700	REMOVER	Used for removing and installing spring pin (6 mm).
 <p>B3M1939</p>	399411700	ACCENT BALL INSTALLER	Used for installing reverse shifter rail arm.

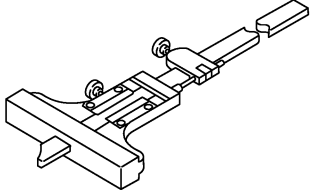
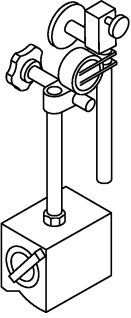
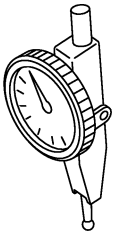
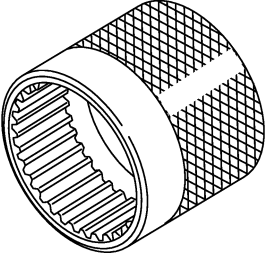
GENERAL DESCRIPTION

MANUAL TRANSMISSION AND DIFFERENTIAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">B3M1940A</p>	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)
 <p style="text-align: center;">B3M1941</p>	399780104	WEIGHT	Used for measuring preload on roller bearing.
 <p style="text-align: center;">B3M1942</p>	498077000	REMOVER	Used for removing roller bearing of drive pinion shaft.
 <p style="text-align: center;">B3M1943</p>	498077300	CENTER DIFFERENTIAL BEARING REMOVER	Used for removing the center differential cover ball bearing.

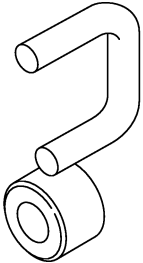
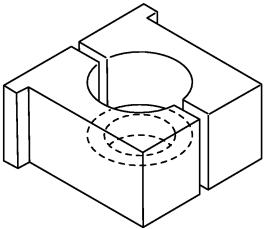
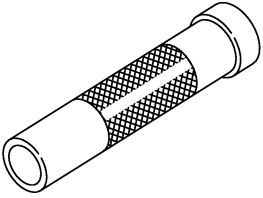
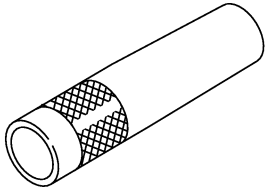
GENERAL DESCRIPTION

MANUAL TRANSMISSION AND DIFFERENTIAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: right;">B3M1944</p>	498147000	DEPTH GAUGE	Used for adjusting main shaft axial end play.
 <p style="text-align: right;">B3M1945</p>	498247001	MAGNET BASE	<ul style="list-style-type: none"> • Used for measuring backlash between side gear and pinion, and hypoid gear. • Used with DIAL GAUGE (498247100).
 <p style="text-align: right;">B3M1946</p>	498247100	DIAL GAUGE	<ul style="list-style-type: none"> • Used for measuring backlash between side gear and pinion, and hypoid gear. • Used with MAGNET BASE (498247001).
 <p style="text-align: right;">B3M1947</p>	498427100	STOPPER	Used for securing the drive pinion shaft assembly and driven gear assembly when removing the drive pinion shaft assembly lock nut.

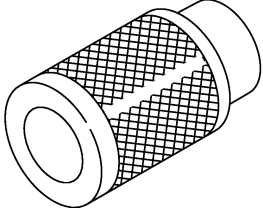
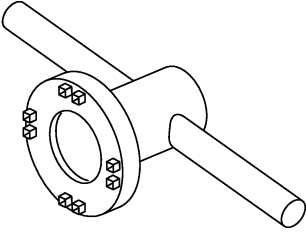
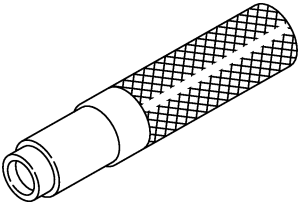
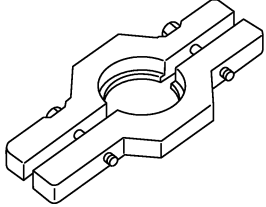
GENERAL DESCRIPTION

MANUAL TRANSMISSION AND DIFFERENTIAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: right;">B3M1948</p>	498787100	MAIN SHAFT STOPPER	Used for removing and installing transmission main shaft lock nut.
 <p style="text-align: right;">B3M1949</p>	498937000	TRANSMISSION HOLDER	Used for removing and installing transmission main shaft lock nut.
 <p style="text-align: right;">B3M1950</p>	499277100	BUSH 1-2 INSTALLER	<ul style="list-style-type: none"> • Used for installing 1st driven gear thrust plate and 1st-2nd driven gear bush. • Used for installing roller bearing outer races to differential case.
 <p style="text-align: right;">B3M1951</p>	499277200	INSTALLER	Used for press-fitting the 2nd driven gear, roller bearings, and 5th driven gear onto the driven shaft.

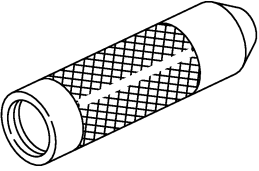
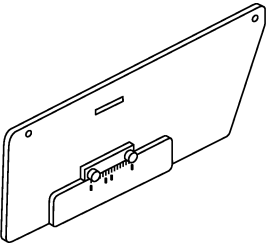
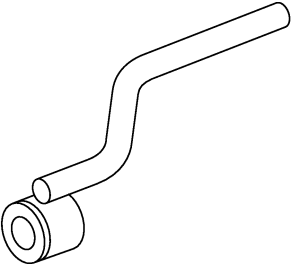
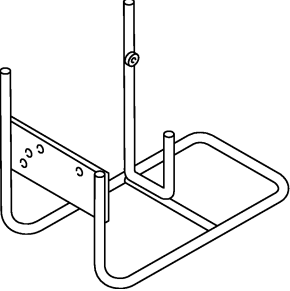
GENERAL DESCRIPTION

MANUAL TRANSMISSION AND DIFFERENTIAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">B3M1952</p>	499757002	INSTALLER	<ul style="list-style-type: none"> • Used for installing snap ring (OUT 25), and ball bearing (25 x 26 x 17). • Used for installing bearing cone of transfer driven gear (extension core side).
 <p style="text-align: center;">B3M1953</p>	499787000	WRENCH ASSY	Used for removing and installing differential side retainer.
 <p style="text-align: center;">B3M1954</p>	499827000	PRESS	Used for installing speedometer oil seal when installing speedometer cable to transmission.
 <p style="text-align: center;">B3M1955</p>	499857000	5TH DRIVEN GEAR REMOVER	Used for removing 5th driven gear.

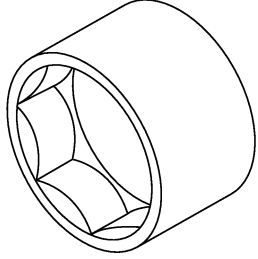
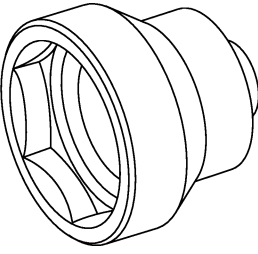
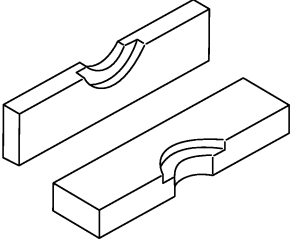
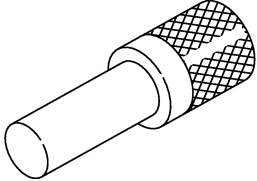
GENERAL DESCRIPTION

MANUAL TRANSMISSION AND DIFFERENTIAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">B3M1956</p>	<p style="text-align: center;">499877000</p>	<p>RACE 4-5 INSTALLER</p>	<ul style="list-style-type: none"> • Used for installing 4th needle bearing race and ball bearing onto transmission main shaft. • Used with REMOVER (899714110).
 <p style="text-align: center;">B3M1957</p>	<p style="text-align: center;">499917500</p>	<p>DRIVE PINION GAUGE ASSY</p>	<p>Used for adjusting drive pinion shim.</p>
 <p style="text-align: center;">B3M1958</p>	<p style="text-align: center;">499927100</p>	<p>HANDLE</p>	<p>Used for fitting transmission main shaft.</p>
 <p style="text-align: center;">B3M1959</p>	<p style="text-align: center;">499937100</p>	<p>TRANSMISSION STAND SET</p>	<p>Stand used for transmission disassembly and assembly.</p>

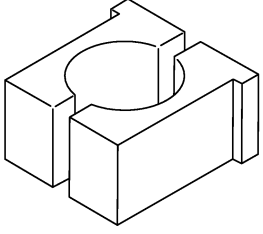
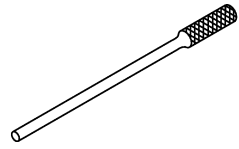
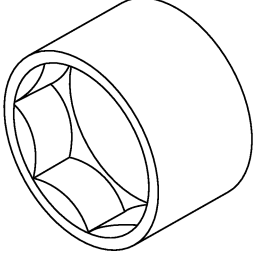
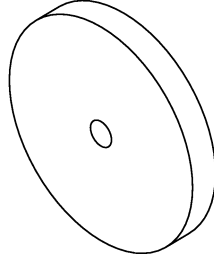
GENERAL DESCRIPTION

MANUAL TRANSMISSION AND DIFFERENTIAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">B3M1960</p>	499987003	SOCKET WRENCH (35)	Used for removing and installing driven pinion lock nut and main shaft lock nut.
 <p style="text-align: center;">B3M1961</p>	499987300	SOCKET WRENCH (50)	Used for removing and installing driven gear assembly lock nut.
 <p style="text-align: center;">B3M1962</p>	899714110	REMOVER	Used for fixing transmission main shaft, drive pinion, rear drive shaft.
 <p style="text-align: center;">B3M1963</p>	899864100	REMOVER	Used for removing parts on transmission main shaft and drive pinion.

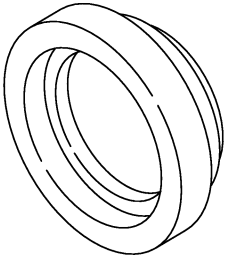
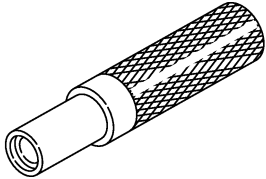
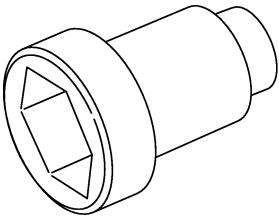
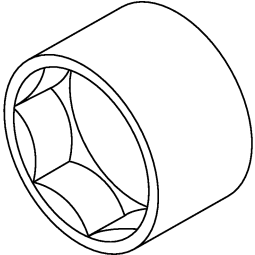
GENERAL DESCRIPTION

MANUAL TRANSMISSION AND DIFFERENTIAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">B3M1964</p>	899884100	HOLDER	Used for tightening lock nut on sleeve.
 <p style="text-align: center;">B3M1965</p>	899904100	REMOVER	Used for removing and installing straight pin.
 <p style="text-align: center;">B3M1966</p>	899988608	SOCKET WRENCH (27)	Used for removing and installing drive pinion lock nut.
 <p style="text-align: center;">B3M1967</p>	398497701	ADAPTER	<ul style="list-style-type: none"> • Used for installing roller bearing onto differential case. • Used with INSTALLER (499277100).

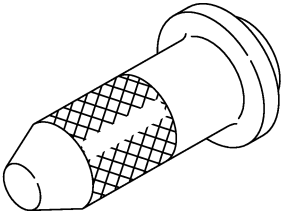
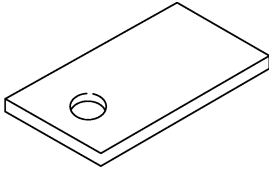
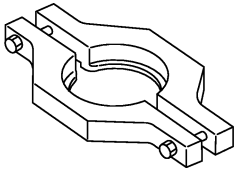
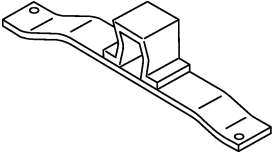
GENERAL DESCRIPTION

MANUAL TRANSMISSION AND DIFFERENTIAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">B3M1968</p>	<p style="text-align: center;">499587000</p>	<p style="text-align: center;">INSTALLER</p>	<p>Used for installing driven gears to driven shaft.</p>
 <p style="text-align: center;">B3M1969</p>	<p style="text-align: center;">899824100</p>	<p style="text-align: center;">PRESS</p>	<p>Used for installing speedometer shaft oil seal.</p>
 <p style="text-align: center;">B3M1970</p>	<p style="text-align: center;">499987100</p>	<p style="text-align: center;">SOCKET WRENCH (35)</p>	<p>Used for removing and installing drive pinion lock nut.</p>
 <p style="text-align: center;">B3M1971</p>	<p style="text-align: center;">899984103</p>	<p style="text-align: center;">SOCKET WRENCH (35)</p>	<p>Used for removing and installing drive pinion lock nut.</p>

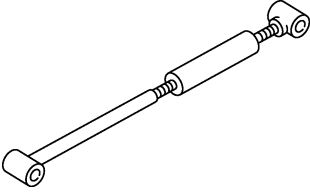
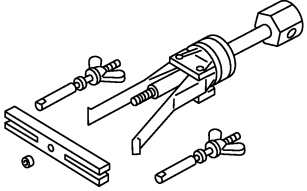
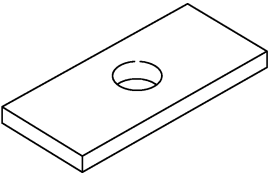
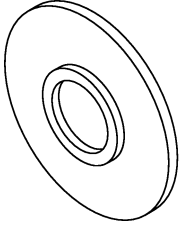
GENERAL DESCRIPTION

MANUAL TRANSMISSION AND DIFFERENTIAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">B3M1972</p>	498057300	INSTALLER	Used for installing extension oil seal.
 <p style="text-align: center;">B3M1973</p>	498255400	PLATE	Used for measuring backlash.
 <p style="text-align: center;">B3M1974</p>	498077400	SYNCHRONIZER CONE REMOVER	<ul style="list-style-type: none"> • Used for removing synchronizer cone of main shaft. • Used for removing 5th driven gear of drive pinion shaft.
 <p style="text-align: center;">B3M1975</p>	41099AA010	ENGINE SUPPORT BRACKET	Used for supporting engine.

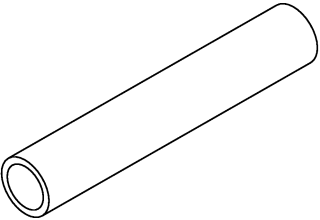
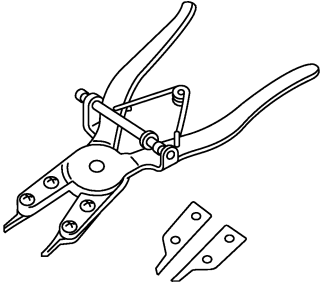
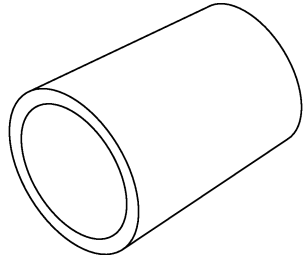
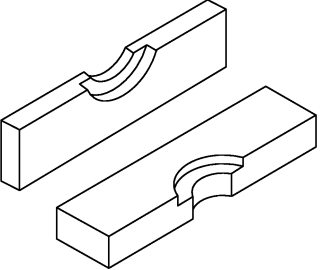
GENERAL DESCRIPTION

MANUAL TRANSMISSION AND DIFFERENTIAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">B3M1976</p>	41099AA020	ENGINE SUPPORT	Used for supporting engine.
 <p style="text-align: center;">B3M1977</p>	398527700	PULLER ASSY	<ul style="list-style-type: none"> • Used for removing extension case roller bearing. • Used for removing front differential side retainer bearing cup.
 <p style="text-align: center;">B3M1978</p>	398643600	GAUGE	Used for measuring total end play, extension end play and drive pinion height.
 <p style="text-align: center;">B3M1905</p>	38177700	INSTALLER	<ul style="list-style-type: none"> • Used for installing bearing cone of transfer driven gear (transfer case side). • Used for installing ball bearing of transfer drive gear.

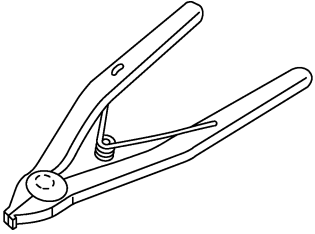
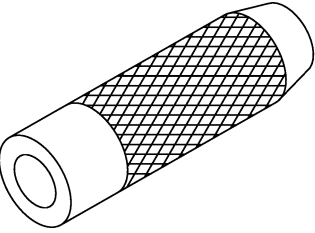
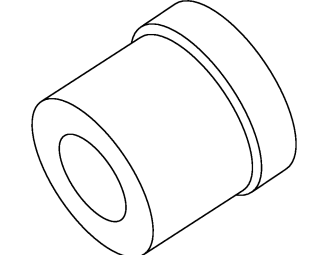
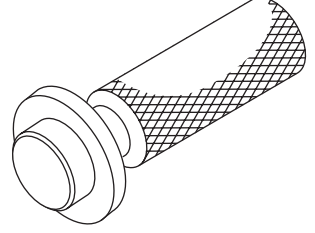
GENERAL DESCRIPTION

MANUAL TRANSMISSION AND DIFFERENTIAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: right;">B3M2122</p>	398507703	DUMMY COLLAR	<ul style="list-style-type: none"> • Used for installing input shaft holder oil seal. • For dual-range model.
 <p style="text-align: right;">B3M2123</p>	398663600	PLIERS	<ul style="list-style-type: none"> • Used for removing and installing input shaft snap ring. • For dual-range model.
 <p style="text-align: right;">B3M2124</p>	499757001	SNAP RING GUIDE	<ul style="list-style-type: none"> • Used for installing snap ring (OUT 25). • For dual-range model.
 <p style="text-align: right;">B3M2125</p>	899858600	RETAINER	<ul style="list-style-type: none"> • Used for removing ball bearing. • For dual-range model.

GENERAL DESCRIPTION

MANUAL TRANSMISSION AND DIFFERENTIAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">B3M2126</p>	899474100	EXPANDER	<ul style="list-style-type: none"> • Used for removing and installing snap ring. • For dual-range model.
 <p style="text-align: center;">B3M2127</p>	899580100	INSTALLER	<ul style="list-style-type: none"> • Used when pressing ball bearings into input shaft. • For dual-range model.
 <p style="text-align: center;">B3M2129</p>	399513600	INSTALLER	<ul style="list-style-type: none"> • Used when pressing ball bearings into input shaft. • For dual-range model.
 <p style="text-align: center;">B3M2197</p>	499797000	INSTALLER	Used for installing differential side retainer oil seal.

GENERAL DESCRIPTION

MANUAL TRANSMISSION AND DIFFERENTIAL

2. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance, voltage and ampere.

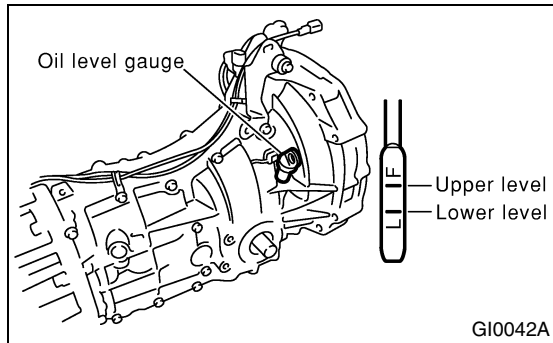
TRANSMISSION GEAR OIL

MANUAL TRANSMISSION AND DIFFERENTIAL

2. Transmission Gear Oil

A: INSPECTION

- 1) Park the vehicle on a level surface.
- 2) Turn the ignition switch to OFF, and wait until the engine cools.
- 3) Remove the 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 the oil level gauge.
- 2) Lift-up the vehicle.
- 3) Drain the transmission gear oil completely.

CAUTION:

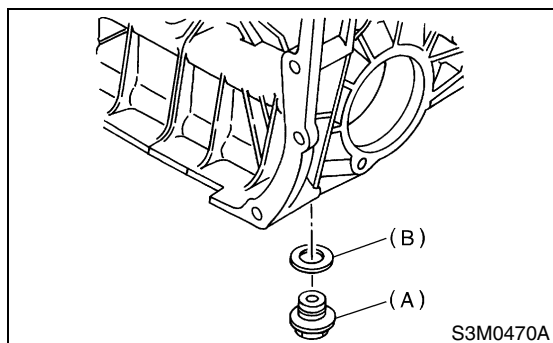
Directly after the engine has been running, the transmission gear oil is hot. Be careful not to burn yourself.

NOTE:

Tighten the transmission gear oil drain plug after draining the transmission gear oil.

Tightening torque:

44 N·m (4.5 kgf·m, 32.5 ft·lb)



- (A) Drain plug
- (B) Gasket

- 4) Lower the vehicle.

- 5) Pour gear oil into the gauge hole.

Recommended gear oil:

Use GL-5 or equivalent.

Gear oil capacity:

Single-range model;

3.5 ℓ (3.7 US qt, 3.1 Imp qt)

Dual-range model;

4.0 ℓ (4.2 US qt, 3.5 Imp qt)

- 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 level gauge with the notch in the gauge hole.

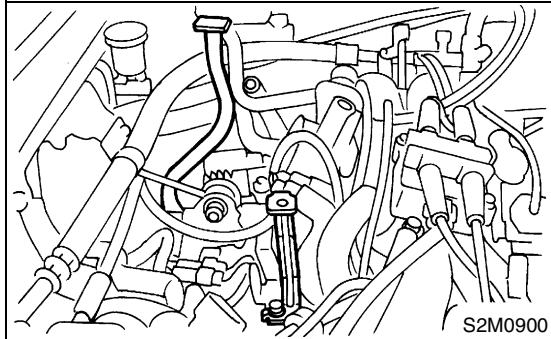
NOTE:

The level should be within the specified range marked on the gauge.

3. Manual Transmission Assembly

A: REMOVAL

- 1) Open the front hood fully, and support with stay.
- 2) Disconnect the ground cable from battery.
- 3) Remove the air intake duct and cleaner case. (Non-turbo model) <Ref. to IN-7, REMOVAL, Air Intake Duct.> and <Ref. to IN-6, REMOVAL, Air Cleaner Case.>
- 4) Remove the air cleaner case stay. (Non-turbo model)

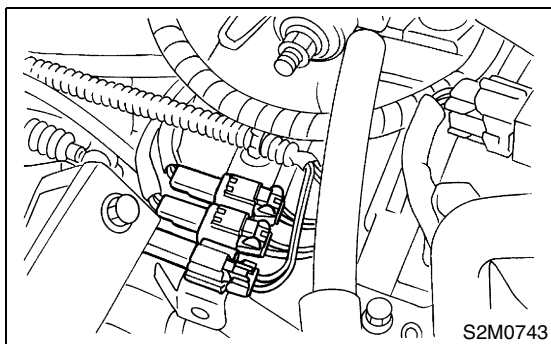


- 5) Remove the intercooler (Turbo model) <Ref. to IN(TURBO)-10, REMOVAL, Intercooler.>

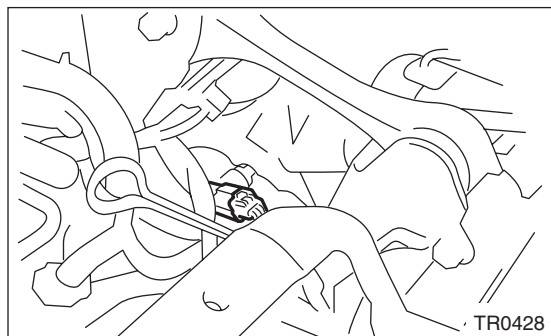
- 6) Disconnect the following connectors:

- (1) Neutral position switch connector
- (2) Back-up light switch connector
- (3) High-low switch connector (Dual-range model)

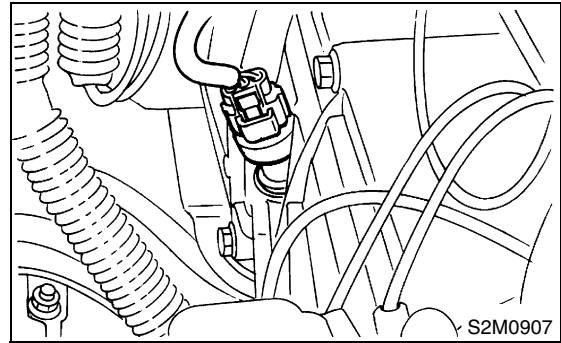
- Non-turbo MODEL



- Turbo MODEL

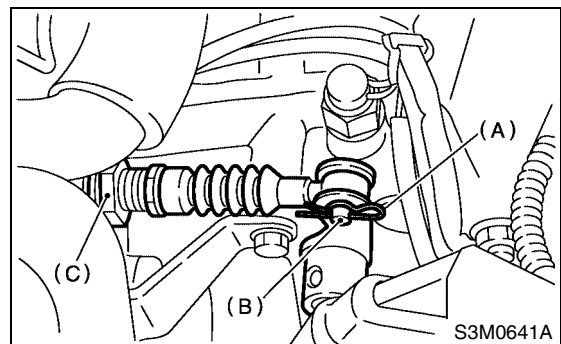


- (4) Vehicle speed sensor



- 7) Remove the snap pin and pin from drive select cable.

- 8) Remove the drive select cable on transmission. (Dual-range model)

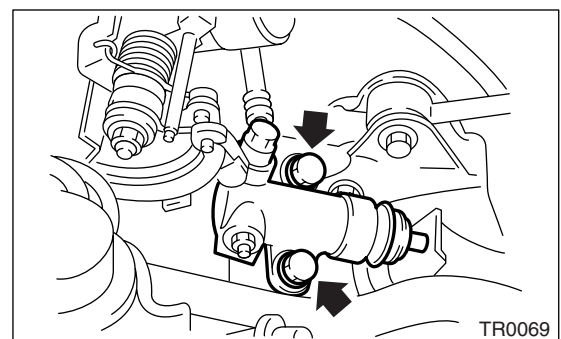


- (A) Snap pin
- (B) Clevis pin
- (C) Drive select cable

- 9) Remove the starter. <Ref. to SC-5, REMOVAL, Starter.>

- 10) Remove the operating cylinder from transmission. (2.0 L and 2.5 L model)

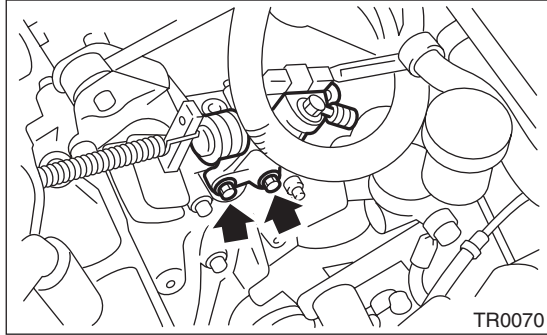
- Non-turbo MODEL



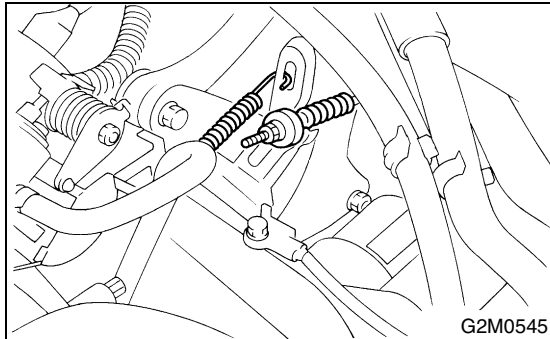
MANUAL TRANSMISSION ASSEMBLY

MANUAL TRANSMISSION AND DIFFERENTIAL

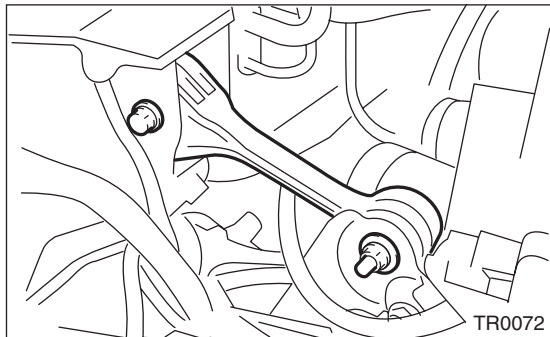
• Turbo MODEL



11) Disconnect the return spring and clutch cable.
(1.6 L model)



12) Remove the pitching stopper.

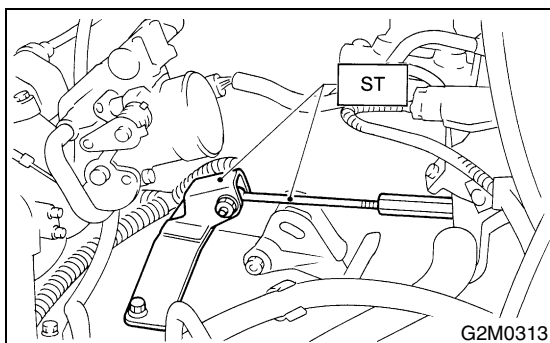


13) Set the ST.

NOTE:

Also is available Part No. 41099AA010.

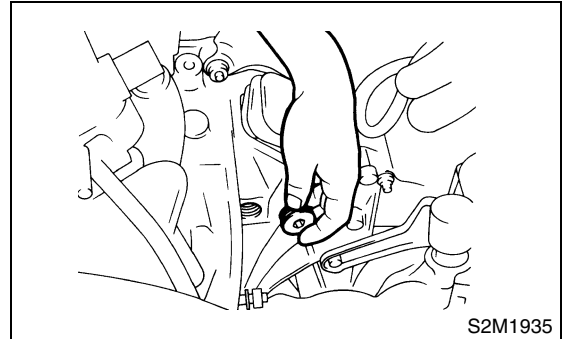
ST 41099AA020 ENGINE SUPPORT ASSY



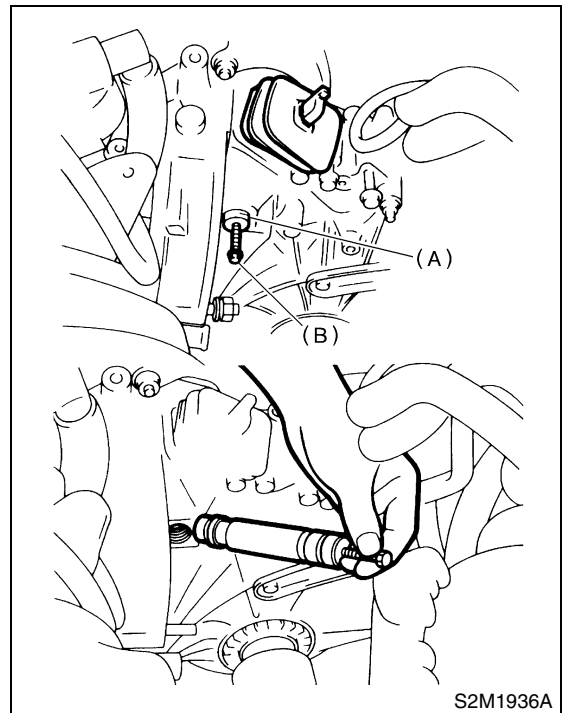
14) Separate the clutch release fork from release bearing. (Turbo model)

(1) Remove the clutch operating cylinder from transmission.

(2) Remove the plug using 10 mm hexagon wrench.



(3) Screw the 6 mm dia. bolt into release fork shaft, and remove it.



(A) Shaft

(B) Bolt

(4) Raise the release fork and unfasten the release bearing tabs to free release fork.

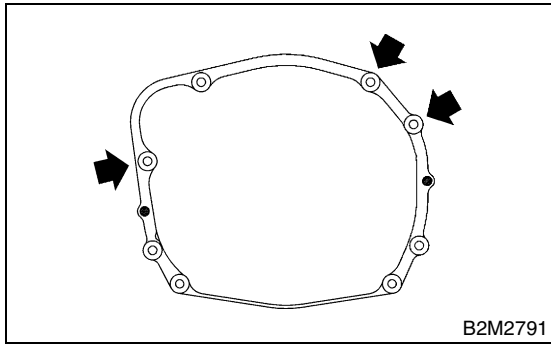
NOTE:

Step (4) is required to prevent interference with engine when removing the engine from transmission.

MANUAL TRANSMISSION ASSEMBLY

MANUAL TRANSMISSION AND DIFFERENTIAL

15) Remove the bolt which holds right upper side of transmission to engine.



16) Remove the front and center exhaust pipes. (Non-turbo model) with OBD <Ref. to EX-7, REMOVAL, Front Exhaust Pipe.> without OBD <Ref. to EX(w/oOBD)-9, REMOVAL, Front Exhaust Pipe.>

17) Remove the center exhaust pipe. (Turbo model). <Ref. to EX(TURBO)-8, REMOVAL, Center Exhaust Pipe.>

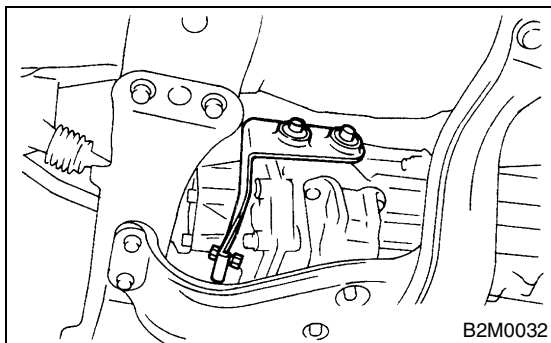
18) Remove the rear exhaust pipe and muffler.

CAUTION:

When removing the exhaust pipes, be careful each exhaust pipe does not drop out.

19) Remove the heat shield cover. (If equipped)

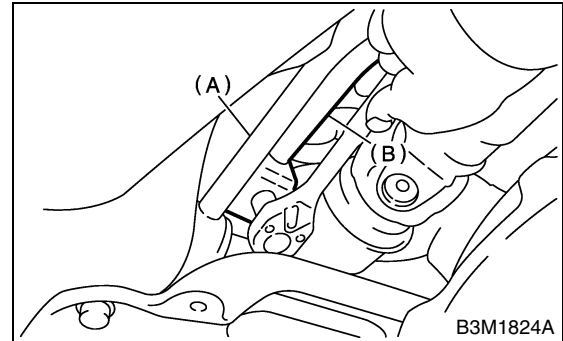
20) Remove the hanger bracket from right side of transmission.



21) Remove the propeller shaft. <Ref. to DS-15, REMOVAL, Propeller Shaft.>

22) Remove the gear shift rod and stay from transmission.

- (1) Disconnect the stay from transmission.
- (2) Disconnect the rod from transmission.

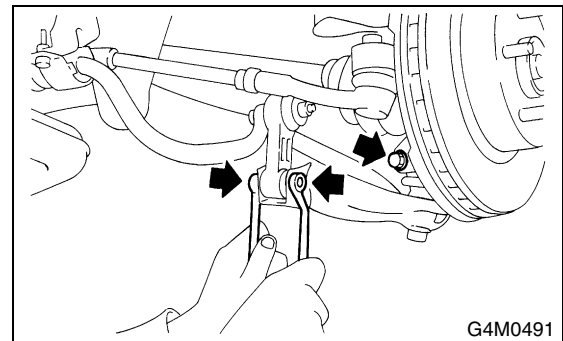


- (A) Stay
(B) Rod

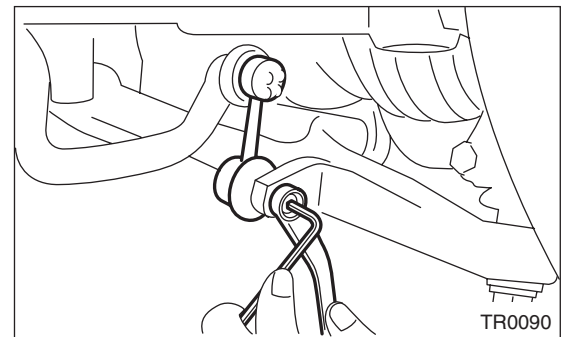
23) Disconnect the stabilizer link from transverse link.

24) Remove the bolt securing ball joint of transverse link to housing.

- Except sedan turbo MODEL



- Sedan turbo MODEL



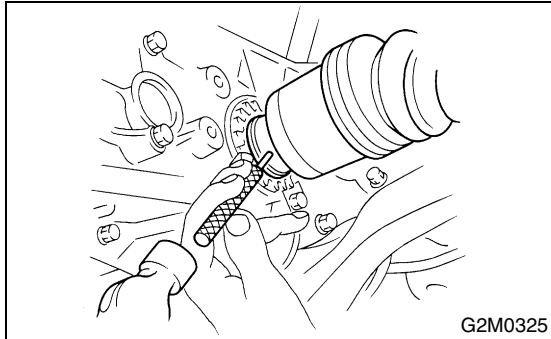
MANUAL TRANSMISSION ASSEMBLY

MANUAL TRANSMISSION AND DIFFERENTIAL

25) Remove the spring pins and separate the front drive shafts from each side of transmission.

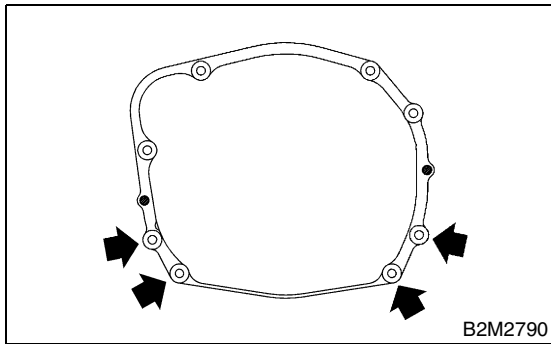
NOTE:

Discard the removing spring pin. Replace with a new one.



G2M0325

26) Remove the nuts which hold lower side of transmission to engine.

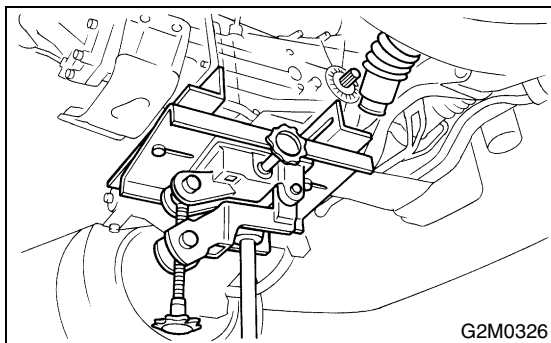


B2M2790

27) Place the transmission jack under transmission.

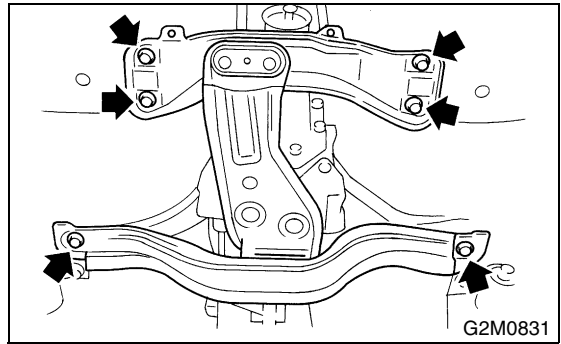
CAUTION:

Always support the transmission case with a transmission jack.



G2M0326

28) Remove the transmission rear crossmember from vehicle.



G2M0831

29) Remove the transmission.

NOTE:

Move the transmission jack toward rear until main shaft is withdrawn from clutch cover.

30) Separate the transmission assembly and rear cushion rubber.

MANUAL TRANSMISSION ASSEMBLY

MANUAL TRANSMISSION AND DIFFERENTIAL

B: INSTALLATION

1) Install the rear cushion rubber to transmission assembly.

Tightening torque:

35 N·m (3.57 kgf-m, 25.8 ft-lb)

2) Install the clutch release lever and bearing onto transmission. (Turbo model) <Ref. to CL-26, INSTALLATION, Release Bearing and Lever.>

3) Install the transmission onto engine.

(1) Gradually raise the transmission with transmission jack.

(2) Engage them at splines.

NOTE:

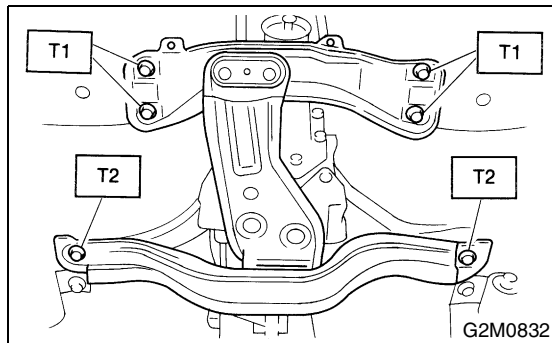
Be careful not to strike the main shaft against clutch cover.

4) Install the transmission rear crossmember.

Tightening torque:

T1: 70 N·m (7.1 kgf-m, 51 ft-lb)

T2: 140 N·m (14.3 kgf-m, 103 ft-lb)

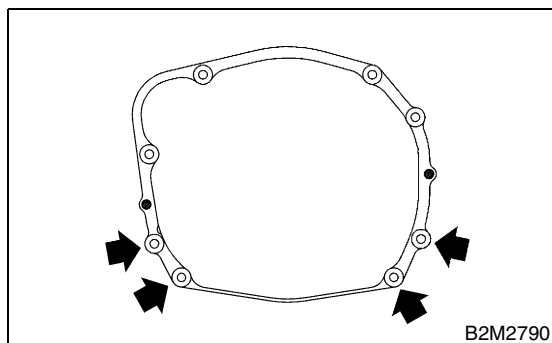


5) Take off the transmission jack.

6) Tighten the nuts which hold lower side of transmission to engine.

Tightening torque:

50 N·m (5.1 kgf-m, 36.9 ft-lb)



7) Connect the engine and transmission.

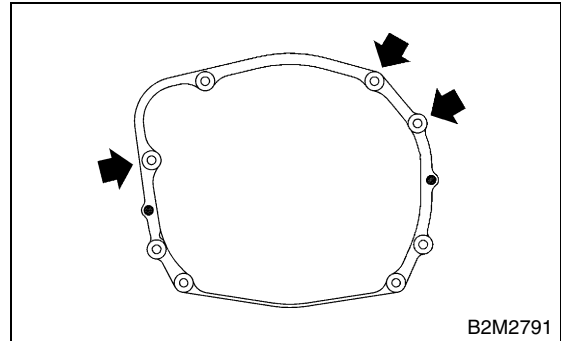
(1) Install the starter.

<Ref. to SC-6, INSTALLATION, Starter.>

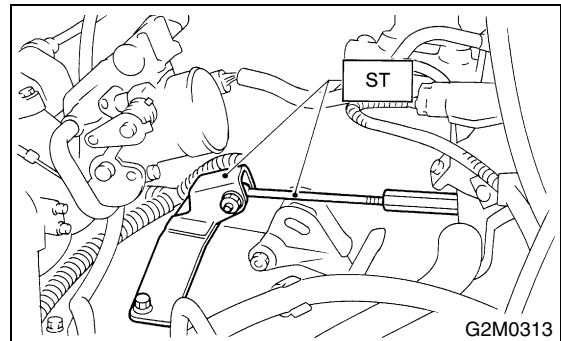
(2) Tighten the bolt which holds right upper side of transmission to engine.

Tightening torque:

50 N·m (5.1 kgf-m, 36.9 ft-lb)



8) Remove the ST.

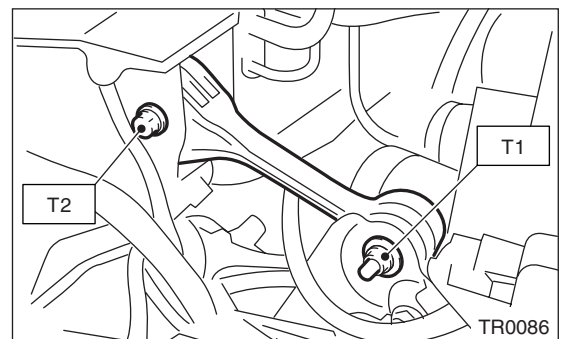


9) Install the pitching stopper.

Tightening torque:

T1: 50 N·m (5.1 kgf-m, 37 ft-lb)

T2: 58 N·m (5.9 kgf-m, 43 ft-lb)



10) Lift-up the vehicle.

11) Install the front drive shaft into transmission.

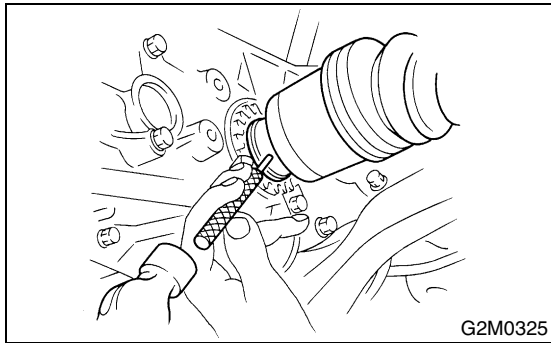
MANUAL TRANSMISSION ASSEMBLY

MANUAL TRANSMISSION AND DIFFERENTIAL

12) Drive the spring pin into chamfered hole of drive shaft.

NOTE:

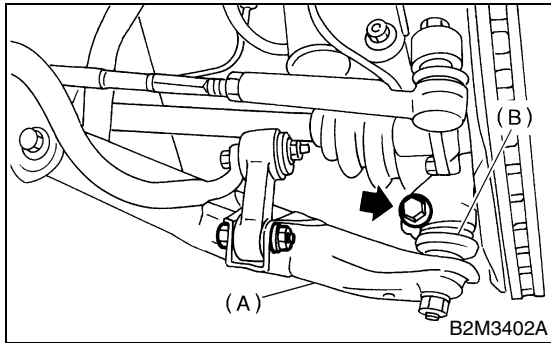
Always use a new spring pin.



13) Install the ball joints of lower arm into knuckle arm of housing, and tighten the installing bolts.

Tightening torque:

49 N·m (5.0 kgf·m, 36 ft·lb)



(A) Transverse link

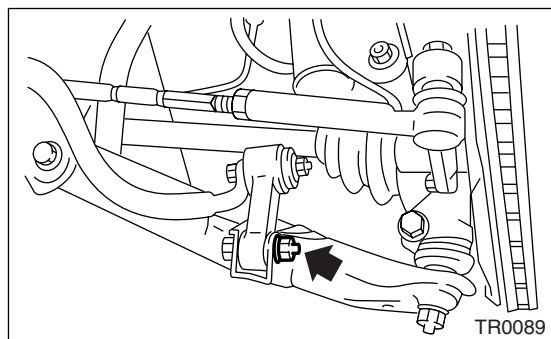
(B) Ball joint

14) Install the stabilizer link from transverse link.

• Except sedan turbo MODEL

Tightening torque:

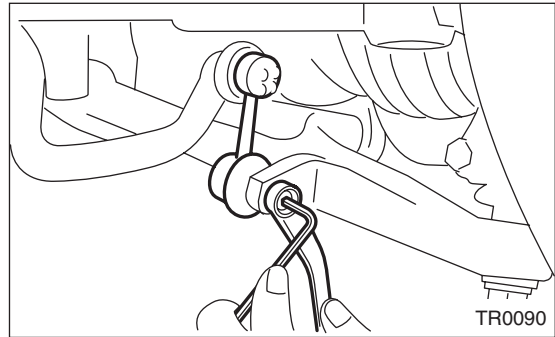
30 N·m (3.1 kgf·m, 22.1 ft·lb)



• Sedan turbo MODEL

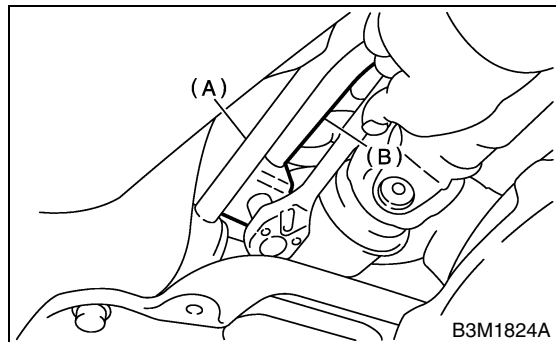
Tightening torque:

45 N·m (4.6 kgf·m, 33.2 ft·lb)



15) Install the gear shift rod and stay.

(1) Install the gear shift rod onto transmission.



(A) Stay

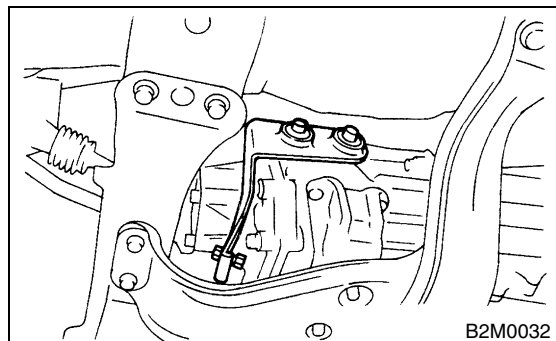
(B) Rod

(2) Install the stay onto transmission.

16) Install the propeller shaft. <Ref. to DS-16, INSTALLATION, Propeller Shaft.>

17) Install the heat shield cover. (If equipped)

18) Install the hanger bracket on right side of transmission.



19) Install the rear exhaust pipe and muffler.

MANUAL TRANSMISSION ASSEMBLY

MANUAL TRANSMISSION AND DIFFERENTIAL

20) Install the front exhaust pipe and center exhaust pipe. (Non-turbo model)

Without OBD

<Ref. to EX(w/oOBD)-10, INSTALLATION, Front Exhaust Pipe.>

With OBD

<Ref. to EX-8, INSTALLATION, Front Exhaust Pipe.>

21) Install the center exhaust pipe. (Turbo model)

<Ref. to EX(TURBO)-9, INSTALLATION, Center Exhaust Pipe.>

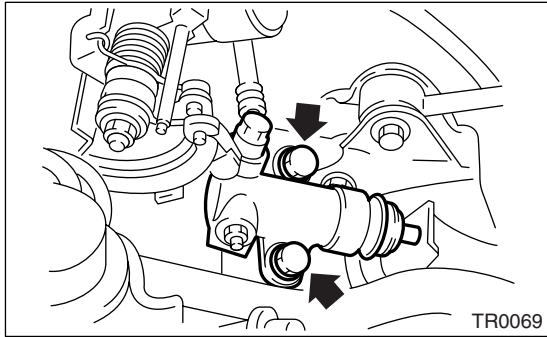
22) Install the under cover.

23) Install the operating cylinder. (2.0 L and 2.5 L model)

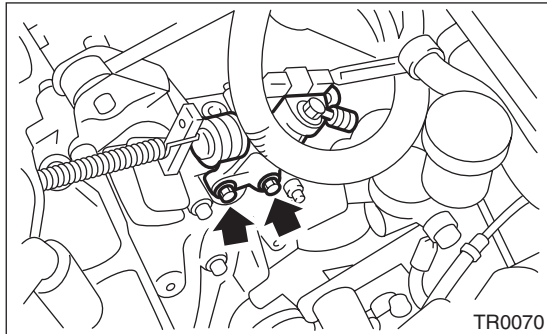
Tightening torque:

37 N·m (3.8 kgf·m, 27.5 ft·lb)

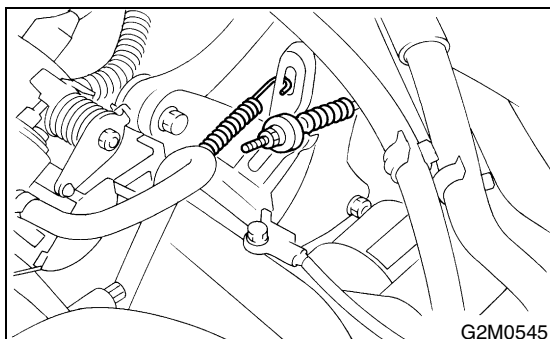
- Non-turbo MODEL



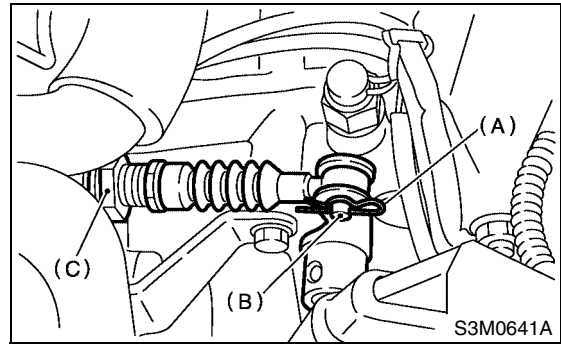
- Turbo MODEL



24) Connect the return spring and clutch cable. (1.6 L model)



25) Install the drive select cable on transmission. (Dual-range model)



- (A) Snap pin
- (B) Clevis pin
- (C) Drive select cable

26) Connect the following connectors:
(1) Transmission ground cable

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)

27) Install the air cleaner case stay.

Tightening torque:

16 N·m (1.6 kgf·m, 11.6 ft·lb)

28) Install the air cleaner case and duct.

29) Connect the battery ground cable to battery.

30) Take off the vehicle from lift arms.

TRANSMISSION MOUNTING SYSTEM

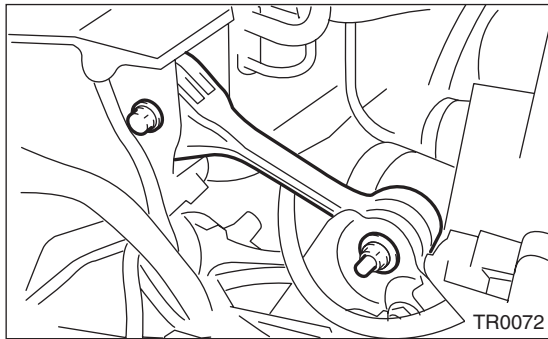
MANUAL TRANSMISSION AND DIFFERENTIAL

4. Transmission Mounting System

A: REMOVAL

1. PITCHING STOPPER

- 1) Disconnect the ground cable from battery.
- 2) Remove the air intake duct and cleaner case.
- 3) Remove the air intake duct (Non-turbo model).
<Ref. to IN-7, REMOVAL, Air Intake Duct.>
- 4) Remove the air cleaner case (Non-turbo model).
<Ref. to IN-6, REMOVAL, Air Cleaner Case.>
- 5) Remove the intercooler (Turbo model). <Ref. to IN(TURBO)-10, REMOVAL, Intercooler.>
- 6) Remove the pitching stopper.



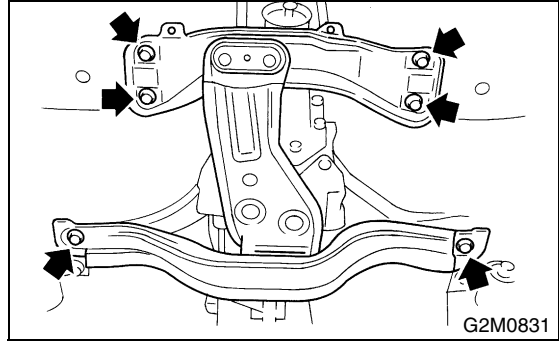
2. CROSSMEMBER AND CUSHION RUBBER

- 1) Disconnect the ground cable from battery.
- 2) Jack-up the vehicle and support it with sturdy racks.
- 3) Remove the front and center exhaust pipes. (Non-turbo model)
Without OBD
<Ref. to EX(w/oOBD)-9, REMOVAL, Front Exhaust Pipe.>
With OBD
<Ref. to EX-7, REMOVAL, Front Exhaust Pipe.>
- 4) Remove the center exhaust pipe. (Turbo model)
<Ref. to EX(TURBO)-8, REMOVAL, Center Exhaust Pipe.>
- 5) Remove the rear exhaust pipe and muffler.
- 6) Remove the heat shield cover. (If equipped)
- 7) Set the transmission jack under the transmission body.

CAUTION:

Always support the transmission case with a transmission jack.

- 8) Remove the rear crossmember.



- 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-6, INSTALLATION, Air Cleaner Case.>
and <Ref. to IN-7, INSTALLATION, Air Intake Duct.>
- 3) Install the intercooler. (Turbo model)
<Ref. to IN(TURBO)-11, INSTALLATION, Intercooler.>
- 4) Connect the battery ground cable to battery.

TRANSMISSION MOUNTING SYSTEM

MANUAL TRANSMISSION AND DIFFERENTIAL

2. CROSSMEMBER AND CUSHION RUBBER

1) Install the rear cushion rubber.

Tightening torque:

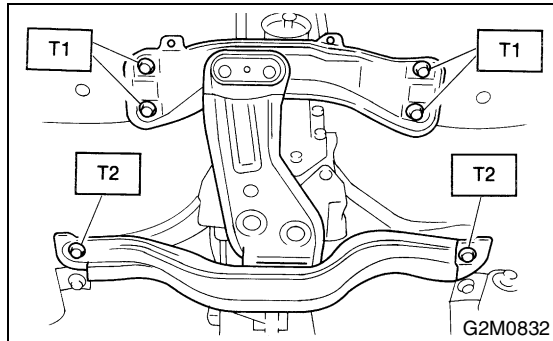
35 N·m (3.6 kgf-m, 26 ft-lb)

2) Install the rear crossmember.

Tightening torque:

T1: 70 N·m (7.1 kgf-m, 51 ft-lb)

T2: 140 N·m (14.3 kgf-m, 103 ft-lb)



3) Remove the transmission jack.

4) Install the heat shield cover. (If equipped)

5) Install the front and center exhaust pipes. (Non-turbo model)

Without OBD

<Ref. to EX(w/oOBD)-10, INSTALLATION, Front Exhaust Pipe.>

With OBD

<Ref. to EX-8, INSTALLATION, Front Exhaust Pipe.>

6) Install the center exhaust pipe. (Turbo model)

<Ref. to EX(TURBO)-9, INSTALLATION, Center Exhaust Pipe.>

7) Install the 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.

OIL SEAL

MANUAL TRANSMISSION AND DIFFERENTIAL

5. Oil Seal

A: INSPECTION

Check the oil seal portion for leakage. If leakage is found, replace the oil seal with a new one.

B: REPLACEMENT

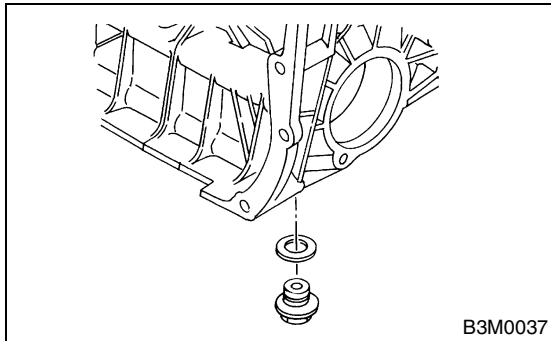
- 1) Clean the transmission exterior.
- 2) Drain the gear oil completely.

NOTE:

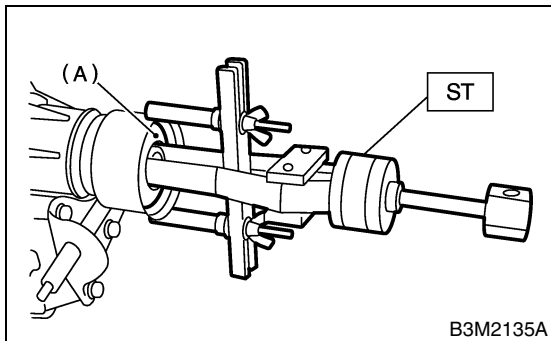
Tighten the drain plug after draining gear oil.

Tightening torque:

44 N·m (4.5 kgf-m, 32.5 ft-lb)

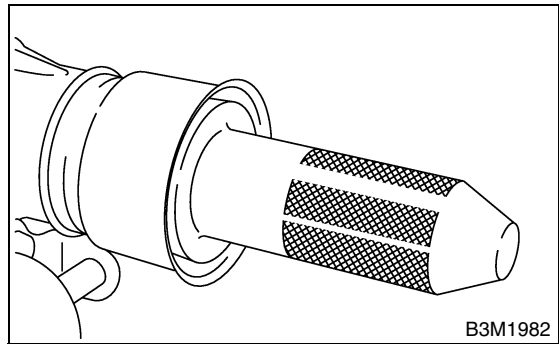


- 3) Remove the rear exhaust pipe and muffler.
 - 4) Remove the heat shield cover. (If equipped)
 - 5) Remove the propeller shaft. <Ref. to DS-15, REMOVAL, Propeller Shaft.>
 - 6) Using the ST, remove the oil seal.
- ST 398527700 PULLER ASSY



(A) Oil seal

- 7) Using the ST, install the oil seal.
- ST 498057300 INSTALLER



- 8) Install the propeller shaft. <Ref. to DS-16, INSTALLATION, Propeller Shaft.>
- 9) Install the heat shield cover.
- 10) Install the rear exhaust pipe and muffler.
- 11) Pour gear oil and check the oil level. <Ref. to MT-32, REPLACEMENT, Transmission Gear Oil.>

SWITCHES AND HARNESS

MANUAL TRANSMISSION AND DIFFERENTIAL

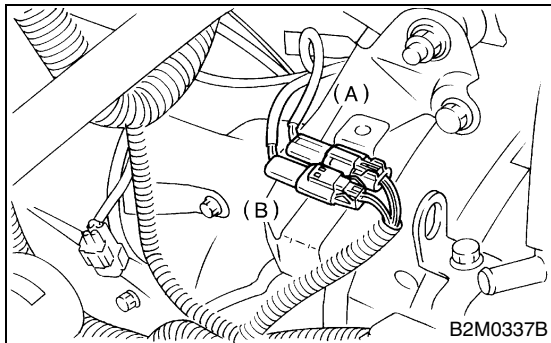
6. Switches and Harness

A: REMOVAL

1. BACK-UP LIGHT AND NEUTRAL POSITION SWITCH

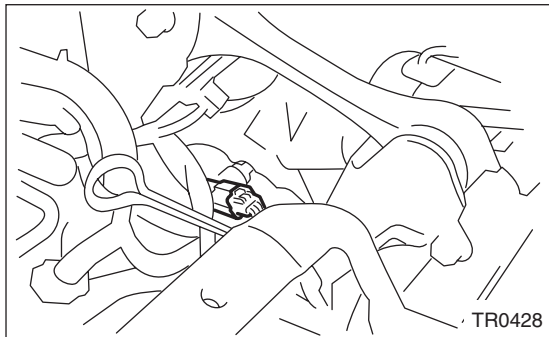
- 1) Disconnect the ground cable from battery.
- 2) Remove the air intake duct and cleaner case. (Non-turbo model) <Ref. to IN-6, REMOVAL, Air Cleaner Case.> and <Ref. to IN-7, REMOVAL, Air Intake Duct.>
- 3) Remove the intercooler (Turbo model). <Ref. to IN(TURBO)-10, REMOVAL, Intercooler.>
- 4) Disconnect the connector of back-up light switch and neutral position switch.

• Non-turbo MODEL



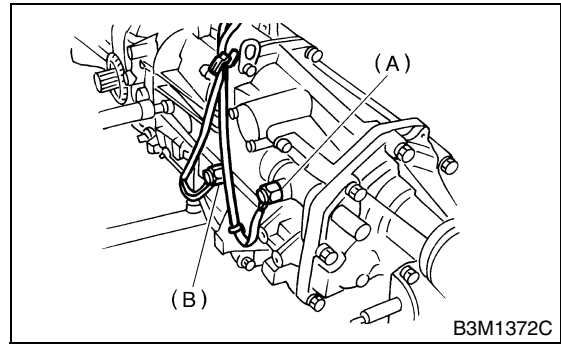
- (A) Neutral switch (Brown)
- (B) Back-up light switch (Gray)

• Turbo MODEL



- 5) Lift-up the vehicle.

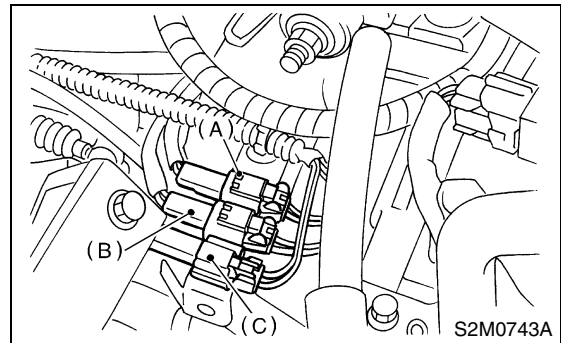
- 6) Remove the back-up light switch and neutral position switch with harness.



- (A) Neutral switch (Brown connector)
- (B) Back-up light switch (Gray connector)

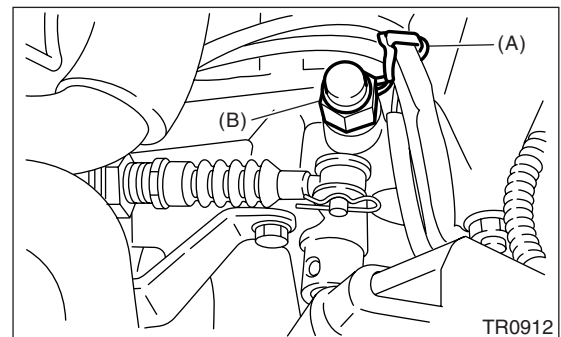
2. HIGH-LOW SWITCH

- 1) Disconnect the ground cable from battery.
- 2) Remove the air intake duct and cleaner case. <Ref. to IN-6, REMOVAL, Air Cleaner Case.> and <Ref. to IN-7, REMOVAL, Air Intake Duct.>
- 3) Disconnect the connector of high-low switch.



- (A) Neutral switch (Brown)
- (B) Back-up light switch (Gray)
- (C) High-low switch (Black)

- 4) Remove the high-low switch cable from clamp.
- 5) Remove the high-low switch.



- (A) Clamp
- (B) High-low switch

SWITCHES AND HARNESS

MANUAL TRANSMISSION AND DIFFERENTIAL

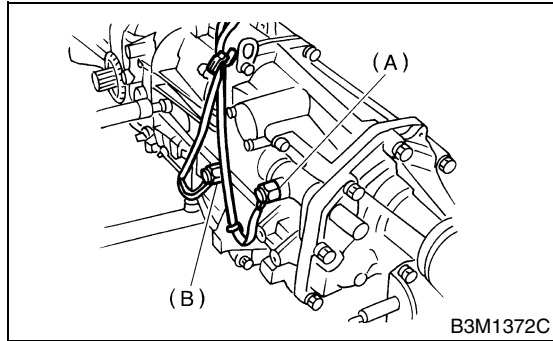
B: INSTALLATION

1. BACK-UP LIGHT SWITCH AND NEUTRAL POSITION SWITCH

1) Install the 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 the connector of back-up light switch and neutral position switch.
- 3) Install the air intake duct and cleaner case. (Non-turbo model) <Ref. to IN-6, INSTALLATION, Air Cleaner Case.> and <Ref. to IN-7, INSTALLATION, Air Intake Duct.>
- 4) Install the intercooler. (Turbo model) <Ref. to IN(TURBO)-11, INSTALLATION, Intercooler.>
- 5) Connect the battery ground cable to battery.

2. HIGH-LOW SWITCH

1) Install the high-low switch.

Tightening torque:

24.5 N·m (2.5 kgf-m, 18.1 ft-lb)

- 2) Install the high-low switch cable to clamp.
- 3) Connect the connector of high-low switch.
- 4) Install the air intake duct and cleaner case. <Ref. to IN-6, INSTALLATION, Air Cleaner Case.> and <Ref. to IN-7, INSTALLATION, Air Intake Duct.>
- 5) Connect the battery ground cable to battery.

C: INSPECTION

1. BACK-UP LIGHT SWITCH

Inspect the back-up light switch. <Ref. to LI-7, INSPECTION, Back-up Light System.>

2. NEUTRAL POSITION SWITCH

- 1) Turn the ignition switch to OFF.
- 2) Disconnect the connector of neutral position switch.
- 3) Measure the resistance between neutral position switch terminals.

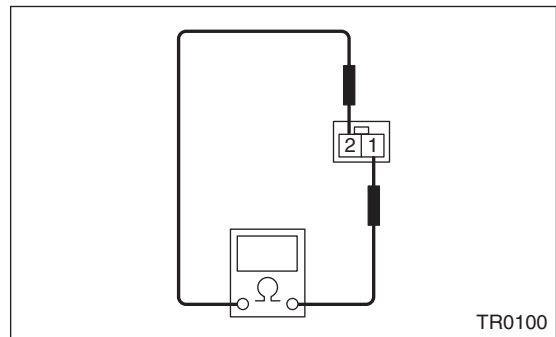
Non-turbo model:

Gear shift position	Terminal No.	Specified resistance
Neutral position	1 and 2	Less than 1Ω
Other positions		More than 1MΩ

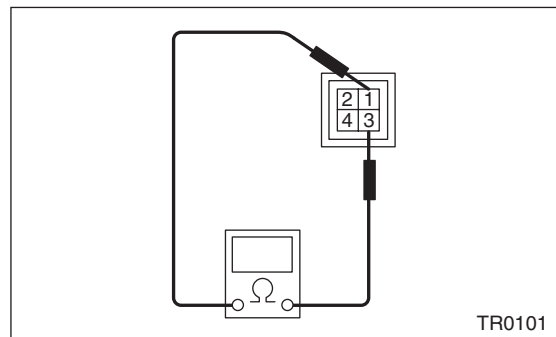
Turbo model:

Gear shift position	Terminal No.	Specified resistance
Neutral position	1 and 3	Less than 1Ω
Other positions		More than 1MΩ

• Non-turbo MODEL



• Turbo MODEL



4) Replace defective parts.

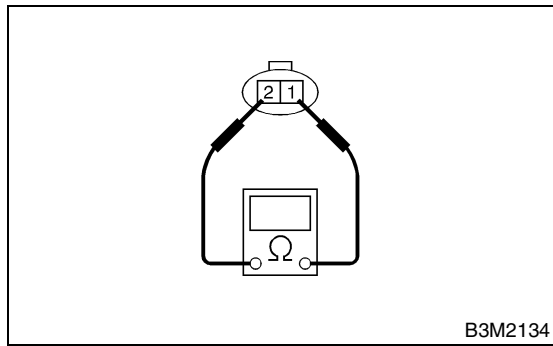
SWITCHES AND HARNESS

MANUAL TRANSMISSION AND DIFFERENTIAL

3. HIGH-LOW SWITCH

- 1) Turn ignition switch to OFF.
- 2) Disconnect connector high-low switch.
- 3) Measure the resistance between high-low switch terminals.

Gear shift position	Terminal No.	Specified resistance
LO position	1 and 2	Less than 1Ω
HIGH position		More than $1M\Omega$



- 4) Replace defective parts.

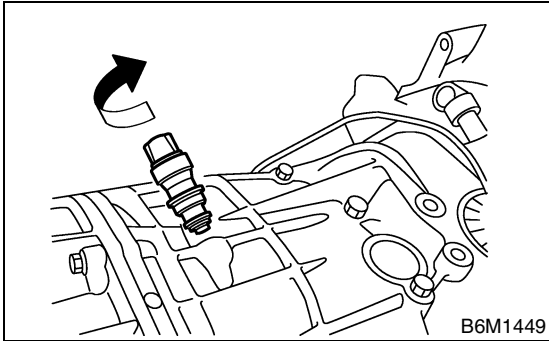
VEHICLE SPEED SENSOR

MANUAL TRANSMISSION AND DIFFERENTIAL

7. Vehicle Speed Sensor

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Lift-up the vehicle.
- 3) Remove the front, center rear exhaust pipes and muffler.
- 4) Disconnect the connector from vehicle speed sensor.
- 5) Turn and remove the vehicle speed sensor.



B: INSTALLATION

NOTE:

- Discard the vehicle speed sensor and after removal, replace with a new one.
- Ensure the sensor mounting hole is clean and free of foreign matter.
- Align the tip end of key with key groove on end of speedometer shaft during installation.

- 1) Hand tighten the vehicle speed sensor.
- 2) Tighten the vehicle speed sensor using suitable tool.

Tightening torque:

5.9 N·m (0.6 kgf-m, 4.3 ft-lb)

- 3) Connect the connector to vehicle speed sensor.
- 4) Install the front, center exhaust pipes and muffler.
- 5) Lower the vehicle.
- 6) Connect the battery ground cable to battery.

C: INSPECTION

Inspect the vehicle speed sensor.

Without OBD

<Ref. to EN(w/oOBD)-92, DTC 33 VEHICLE SPEED SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

With OBD Non-Turbo model

<Ref. to EN-210, DTC P0500 — VEHICLE SPEED SENSOR MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Turbo model

<Ref. to EN(TURBO)-230, DTC P0500 — VEHICLE SPEED SENSOR MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

8. Preparation for Overhaul

A: PROCEDURE

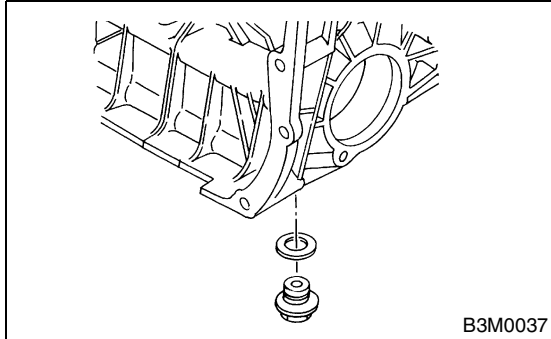
- 1) Clean oil, grease, dirt and dust from transmission.
- 2) Remove the drain plug to drain oil. After draining, retighten it as before.

NOTE:

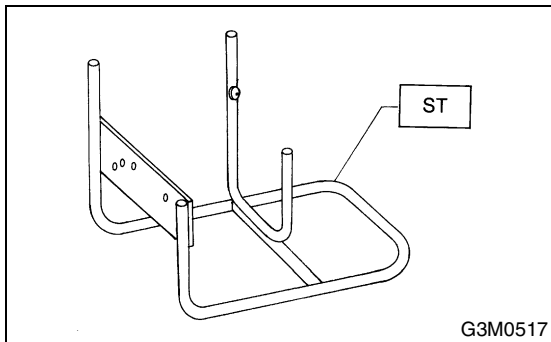
Replace the gasket with a new one.

Tightening torque:

44 N-m (4.5 kgf-m, 32.5 ft-lb)



- 3) Attach the 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.

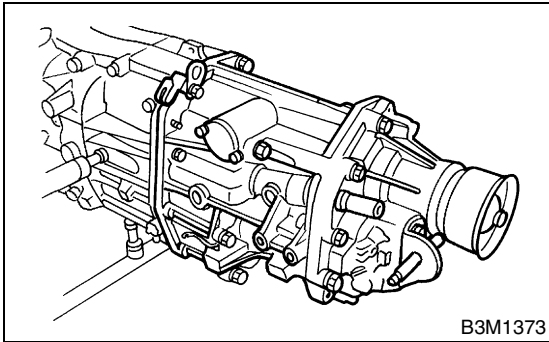
TRANSFER CASE AND EXTENSION CASE ASSEMBLY

MANUAL TRANSMISSION AND DIFFERENTIAL

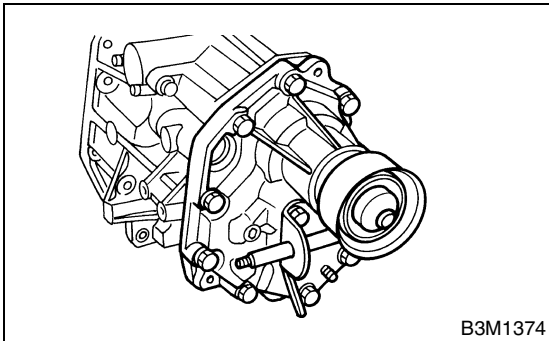
9. Transfer Case and Extension Case Assembly

A: REMOVAL

- 1) Remove the manual transmission assembly from vehicle. <Ref. to MT-33, REMOVAL, Manual Transmission Assembly.>
- 2) Remove the back-up light switch and neutral position switch. <Ref. to MT-43, REMOVAL, Switches and Harness.>
- 3) Remove the transfer case with extension case assembly.

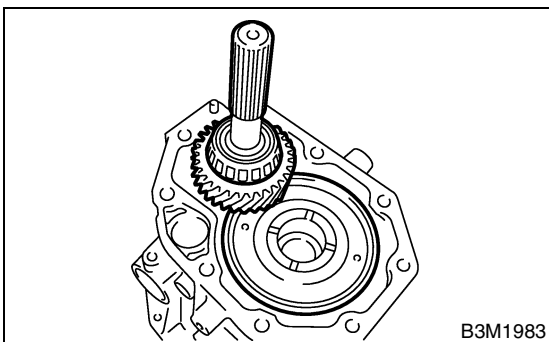


- 4) Remove the shifter arm.
- 5) Remove the extension case assembly.

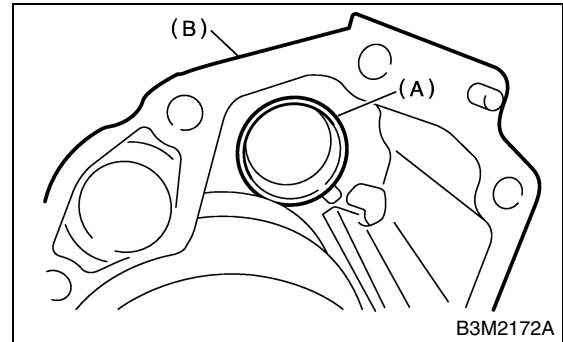


B: INSTALLATION

- 1) Install the center differential and transfer driven gear into transfer case.

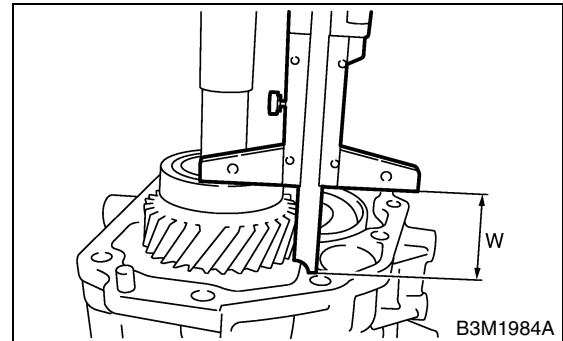


- 2) Remove the bearing cone from bearing of the transfer driven gear.



- (A) Bearing cone (Extension case)
(B) Extension case

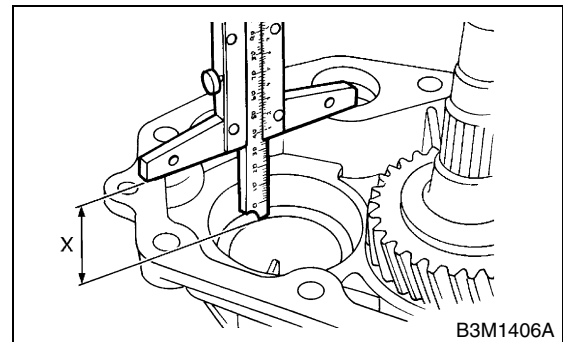
- 3) While pressing the bearing cone horizontally, turn the driven shaft ten rotations.
- 4) Measure the height "W" between transfer case and taper roller bearing on the transfer driven gear.



- 5) Measure the depth "X".

NOTE:

Measure with bearing cone and thrust washer removed.



- 6) Calculate the space "t" using the following equation: $t = X - W + 0.2$ to 0.3 mm (0.008 to 0.012 in)

TRANSFER CASE AND EXTENSION CASE ASSEMBLY

MANUAL TRANSMISSION AND DIFFERENTIAL

7) Select the 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)

NOTE:

T: Tight

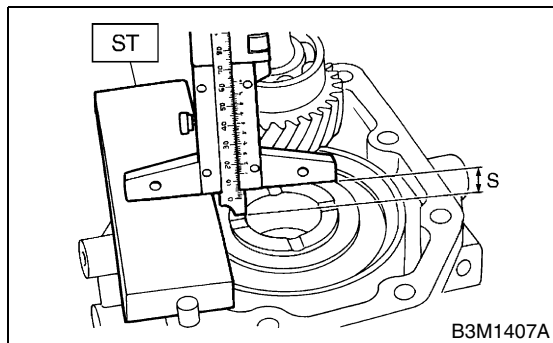
Thrust washer (50 × 61 × t)	
Part No.	Thickness mm (in)
803050060	0.50 (0.0197)
803050061	0.55 (0.0217)
803050062	0.60 (0.0236)
803050063	0.65 (0.0256)
803050064	0.70 (0.0276)
803050065	0.75 (0.0295)
803050066	0.80 (0.0315)
803050067	0.85 (0.0335)
803050068	0.90 (0.0354)
803050069	0.95 (0.0374)
803050070	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 the thrust washers on transfer drive shaft.

9) Install the bearing cone into extension case.

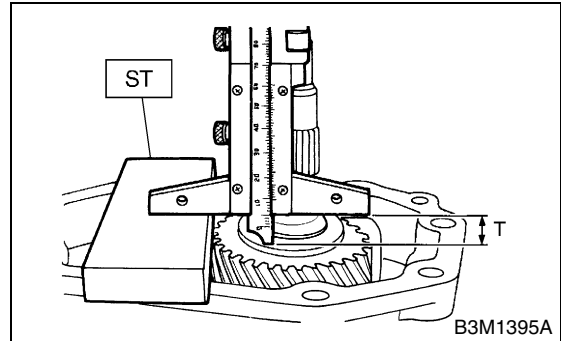
10) Measure the depth "S" between transfer case and center differential.

ST 398643600 GAUGE



11) Measure the depth "T" between extension case and transfer drive gear.

ST 398643600 GAUGE



12) Calculate the space "U" using the following equation: $U = S - T - 30 \text{ mm (1.18 in)}$ [Thickness of ST]

13) Select the suitable washer in the following table:

Standard clearance:

0.15 — 0.35 mm (0.0059 — 0.0138 in)

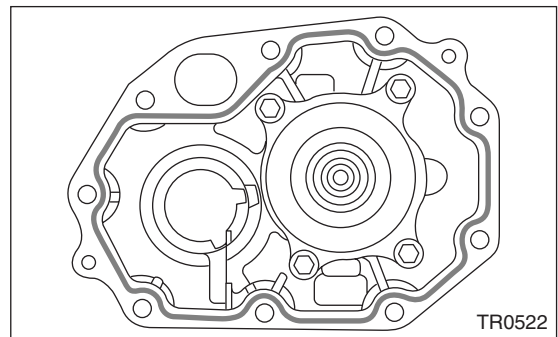
Thrust washer	
Part No.	Thickness mm (in)
803036050	0.9 (0.035)
803036054	1.0 (0.039)
803036051	1.1 (0.043)
803036055	1.2 (0.047)
803036052	1.3 (0.051)
803036056	1.4 (0.055)
803036053	1.5 (0.059)
803036057	1.6 (0.063)
803036058	1.7 (0.067)

14) Fit the thrust washer on center differential.

15) Apply proper amount of liquid gasket to the transfer case mating surface.

Liquid gasket:

THREE BOND 1215



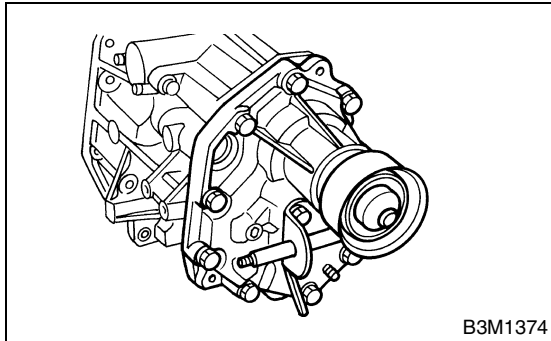
TRANSFER CASE AND EXTENSION CASE ASSEMBLY

MANUAL TRANSMISSION AND DIFFERENTIAL

16) Install the extension assembly into transfer case.

Tightening torque:

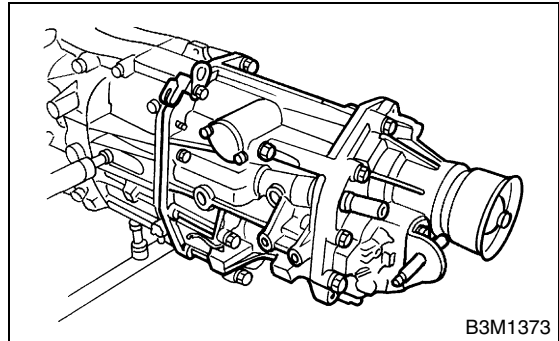
40 N·m (4.1 kgf·m, 29.7 ft·lb)



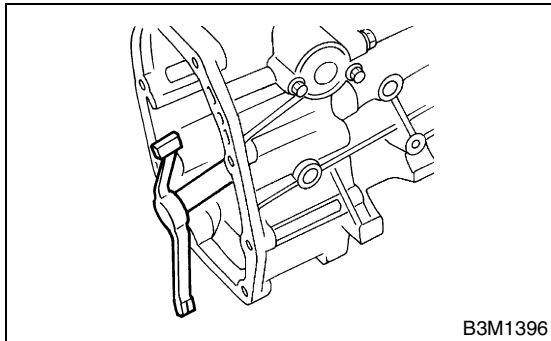
19) Install the transfer case with extension case assembly to transmission case.

Tightening torque:

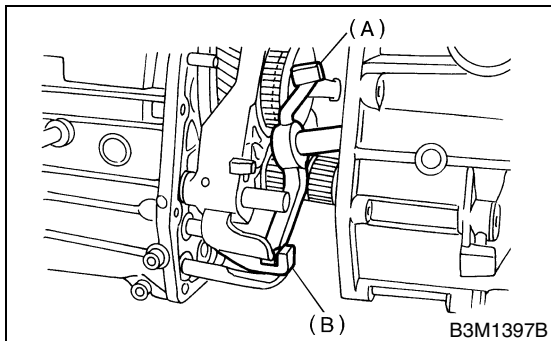
25 N·m (2.5 kgf·m, 18.1 ft·lb)



17) Install the shifter arm to transfer case.



18) Hang the shifter arm on 3rd-4th fork rod.



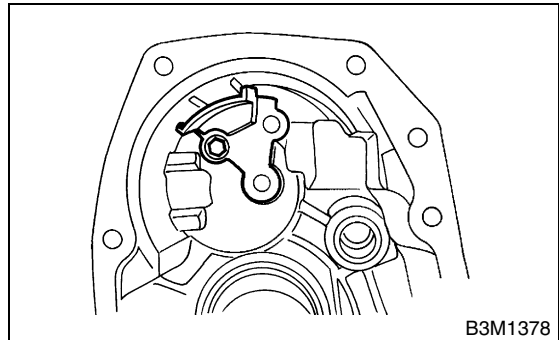
(A) Shifter arm

(B) 3rd-4th fork rod

C: DISASSEMBLY

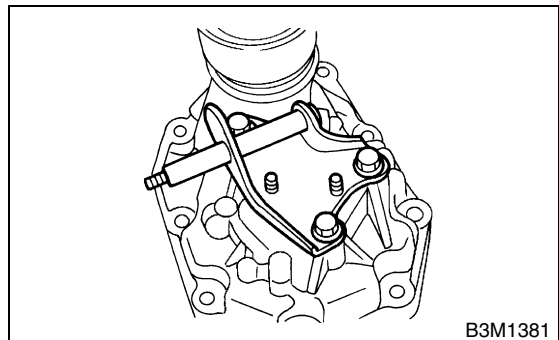
1. TRANSFER CASE

- 1) Remove the reverse check assembly. <Ref. to MT-57, REMOVAL, Reverse Check Sleeve.>
- 2) Remove the oil guide.



2. EXTENSION CASE

- 1) Remove the transfer drive gear assembly. <Ref. to MT-52, REMOVAL, Transfer Drive Gear.>
- 2) Remove the shift bracket.



- 3) Remove the oil seal from extension case. <Ref. to MT-42, Oil Seal.>

D: ASSEMBLY

1. EXTENSION CASE

1) Using the ST, install the oil seal to extension case. <Ref. to MT-42, Oil Seal.>

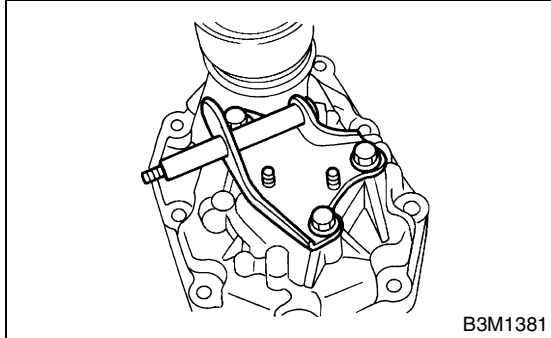
NOTE:

Use a new oil seal.

2) Install the shift bracket to extension case.

Tightening torque:

25 N·m (2.5 kgf·m, 18.1 ft·lb)



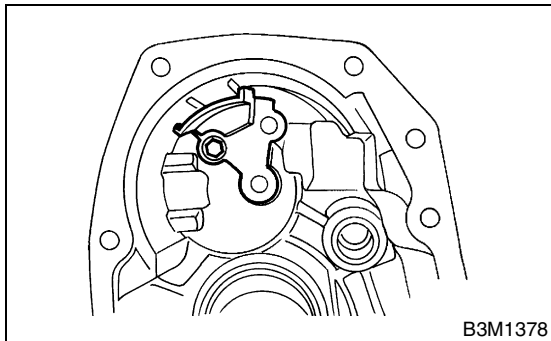
3) Install the transfer drive gear to extension case. <Ref. to MT-52, INSTALLATION, Transfer Drive Gear.>

2. TRANSFER CASE

1) Install the oil guide to transfer case.

Tightening torque:

6.4 N·m (0.65 kgf·m, 4.7 ft·lb)



2) Install the reverse check sleeve assembly to transfer case. <Ref. to MT-57, INSTALLATION, Reverse Check Sleeve.>

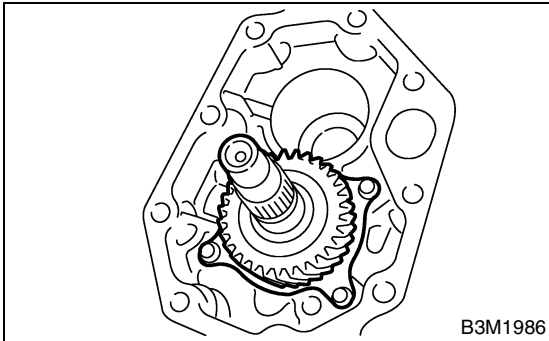
TRANSFER DRIVE GEAR

MANUAL TRANSMISSION AND DIFFERENTIAL

10. Transfer Drive Gear

A: REMOVAL

- 1) Remove the manual transmission assembly from vehicle. <Ref. to MT-33, REMOVAL, Manual Transmission Assembly.>
- 2) Remove the back-up light switch and neutral position switch. <Ref. to MT-43, REMOVAL, Switches and Harness.>
- 3) Remove the transfer case with extension case assembly. <Ref. to MT-48, REMOVAL, Transfer Case and Extension Case Assembly.>
- 4) Remove the extension case assembly.
- 5) Remove the transfer driven gear.
- 6) Remove the transfer drive gear.

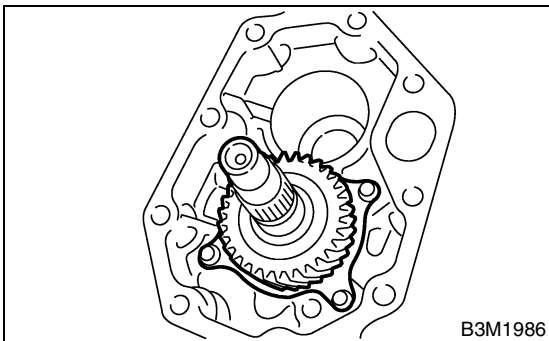


B: INSTALLATION

- 1) Install the transfer drive gear.

Tightening torque:

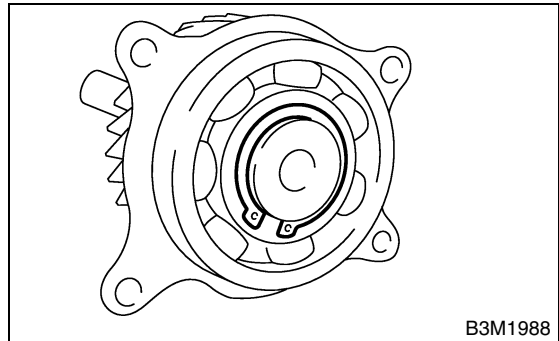
26 N·m (2.7 kgf·m, 20 ft·lb)



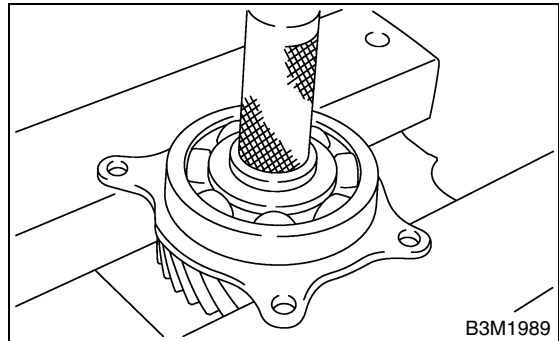
- 2) Install the transfer driven gear.
- 3) Install the extension case assembly.
- 4) Install the transfer case and extension case assembly. <Ref. to MT-48, INSTALLATION, Transfer Case and Extension Case Assembly.>
- 5) Install the back-up light switch and neutral position switch. <Ref. to MT-44, INSTALLATION, Switches and Harness.>
- 6) Install the manual transmission assembly from vehicle. <Ref. to MT-37, INSTALLATION, Manual Transmission Assembly.>

C: DISASSEMBLY

- 1) Remove the snap ring.



- 2) Remove the ball bearing.



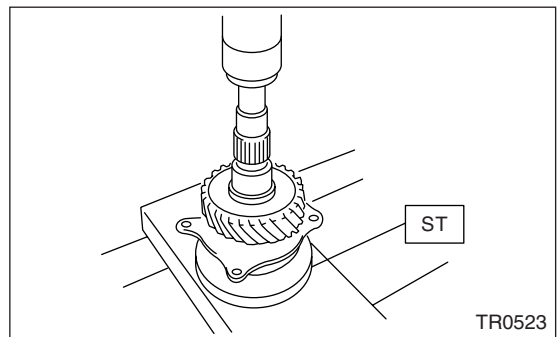
D: ASSEMBLY

- 1) Set the ST applying to inner race of bearing and install 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 the snap ring on transfer drive shaft.
- 3) Check the clearance between snap ring and ball bearing. <Ref. to MT-53, INSPECTION, Transfer Drive Gear.>

E: INSPECTION

1) Bearings

Replace the 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

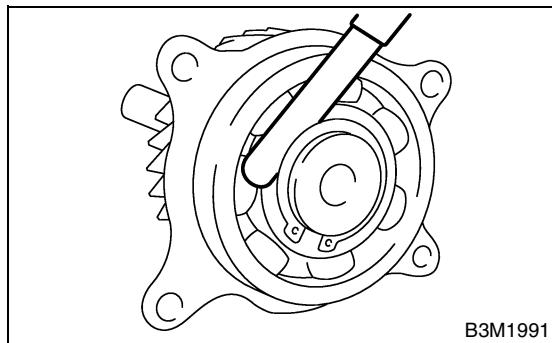
Replace the drive gear in the following cases:

- If their tooth surfaces and shaft are excessively broken or damaged.

3) Measure the clearance between snap ring and inner race of ball bearing with a thickness gauge.

Clearance:

0.01 — 0.15 mm (0.0004 — 0.0059 in)



If the measurement is not within specification, select a 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)

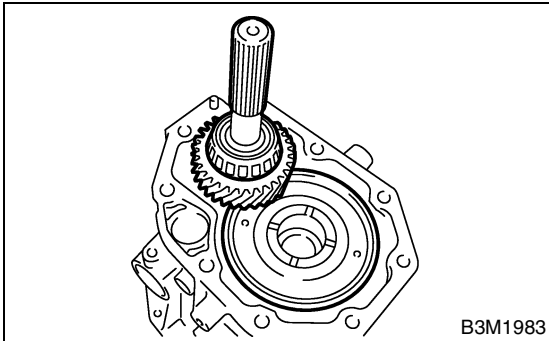
TRANSFER DRIVEN GEAR

MANUAL TRANSMISSION AND DIFFERENTIAL

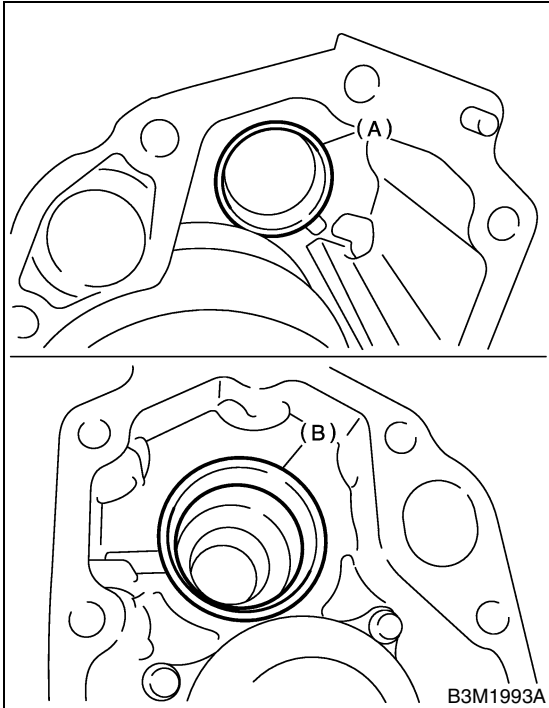
11. Transfer Driven Gear

A: REMOVAL

- 1) Remove the manual transmission assembly from vehicle. <Ref. to MT-33, REMOVAL, Manual Transmission Assembly.>
- 2) Remove the back-up light switch and neutral position switch. <Ref. to MT-43, REMOVAL, Switches and Harness.>
- 3) Remove the transfer case with extension case assembly. <Ref. to MT-48, REMOVAL, Transfer Case and Extension Case Assembly.>
- 4) Remove the extension case assembly.
- 5) Remove the transfer driven gear.



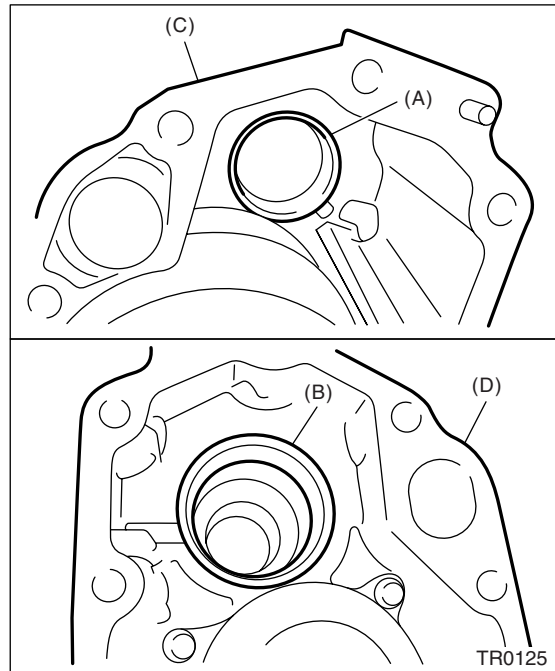
- 6) Remove the bearing cup from extension case and transfer case.



- (A) Bearing cup (transfer case)
(B) Bearing cup (extension case)

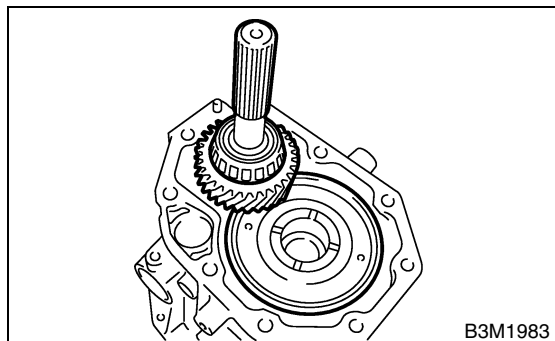
B: INSTALLATION

- 1) Install the bearing cup to extension case and transfer case.



- (A) Bearing cup
(B) Bearing cup
(C) Transfer case
(D) Extension case

- 2) Install the transfer driven gear.



- 3) Install the transfer case and extension case assembly. <Ref. to MT-48, INSTALLATION, Transfer Case and Extension Case Assembly.>
- 4) Install the back-up light switch and neutral position switch. <Ref. to MT-44, INSTALLATION, Switches and Harness.>
- 5) Install the manual transmission assembly to vehicle. <Ref. to MT-37, INSTALLATION, Manual Transmission Assembly.>

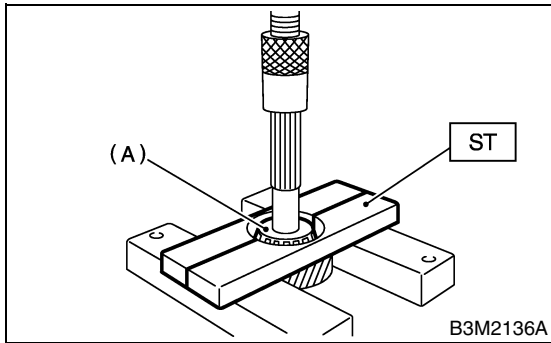
TRANSFER DRIVEN GEAR

MANUAL TRANSMISSION AND DIFFERENTIAL

C: DISASSEMBLY

1) Using the ST, remove the roller bearing (extension case side).

ST 498077000 REMOVER

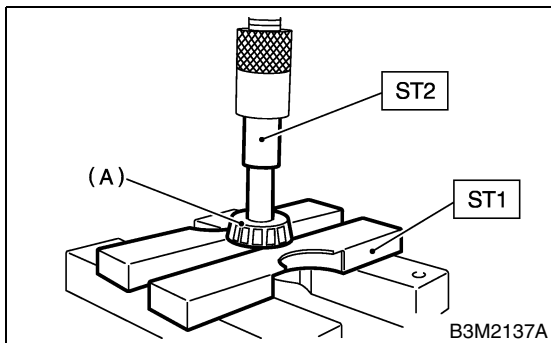


(A) Roller bearing

2) Using the ST1 and ST2, remove the roller bearing (transfer case side).

ST1 498077000 REMOVER

ST2 899864100 REMOVER



(A) Roller bearing

D: ASSEMBLY

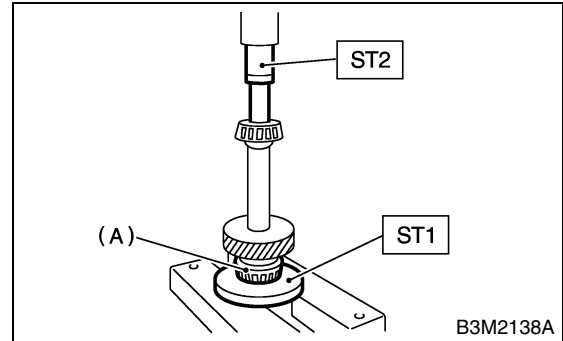
1) Using the ST, install the roller bearing (extension case side).

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)



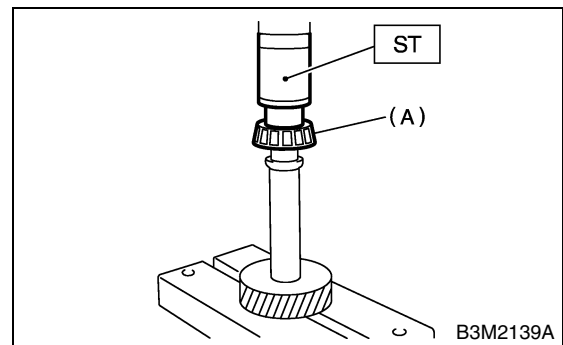
(A) Roller bearing

2) Using the ST, install the 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 the 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 the drive gear in the following cases:

- If their tooth surfaces and shaft are excessively broken or damaged.

CENTER DIFFERENTIAL

MANUAL TRANSMISSION AND DIFFERENTIAL

12.Center Differential

A: REMOVAL

- 1) Remove the manual transmission assembly from vehicle. <Ref. to MT-33, REMOVAL, Manual Transmission Assembly.>
- 2) Remove the transfer case with extension case assembly.<Ref. to MT-48, REMOVAL, Transfer Case and Extension Case Assembly.>
- 3) Remove the extension case assembly. <Ref. to MT-48, REMOVAL, Transfer Case and Extension Case Assembly.>
- 4) Remove the transfer driven gear. <Ref. to MT-54, 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-54, INSTALLATION, Transfer Driven Gear.>
- 3) Install the extension case assembly. <Ref. to MT-48, INSTALLATION, Transfer Case and Extension Case Assembly.>
- 4) Install the transfer case with extension case assembly. <Ref. to MT-48, REMOVAL, Transfer Case and Extension Case Assembly.>
- 5) Install the back-up light switch and neutral position switch. <Ref. to MT-43, REMOVAL, Switches and Harness.>
- 6) Install the manual transmission assembly to vehicle. <Ref. to MT-37, INSTALLATION, Manual Transmission Assembly.>

C: DISASSEMBLY

NOTE:

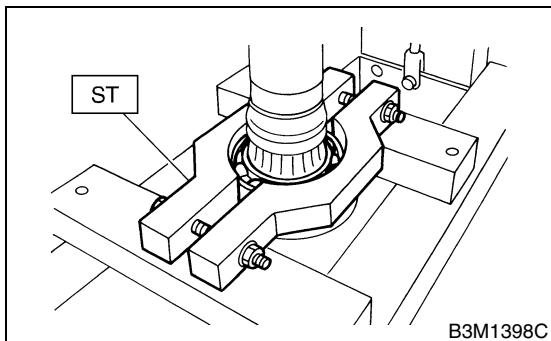
Do not disassemble the center differential because it is a non-disassemble part.

Remove the ball bearing using ST.

NOTE:

Do not reuse the ball bearing.

ST 498077300 CENTER DIFFERENTIAL BEARING REMOVER

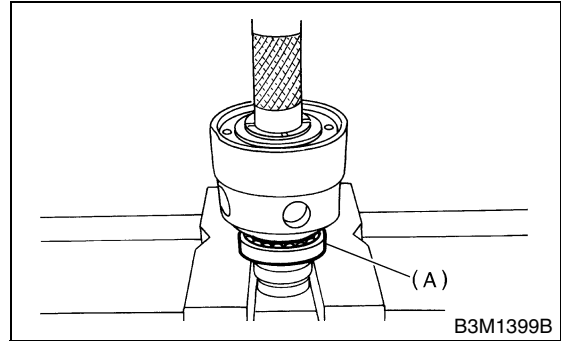


D: ASSEMBLY

Install the 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 the 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 the center differential assembly in the following case:

- Worn or damaged

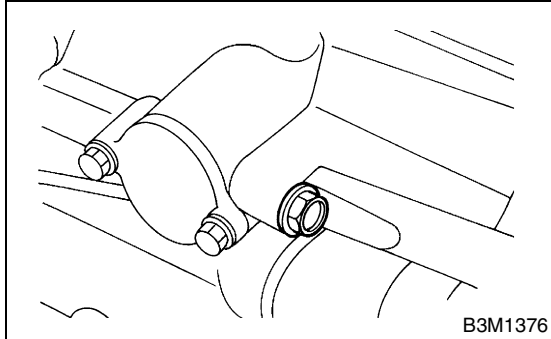
REVERSE CHECK SLEEVE

MANUAL TRANSMISSION AND DIFFERENTIAL

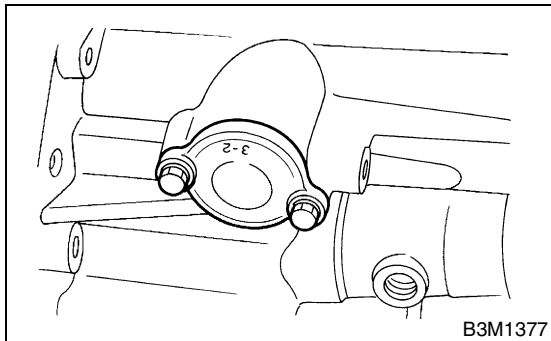
13. Reverse Check Sleeve

A: REMOVAL

- 1) Remove the manual transmission assembly from vehicle. <Ref. to MT-33, REMOVAL, Manual Transmission Assembly.>
- 2) Remove the transfer case with extension case assembly. <Ref. to MT-48, REMOVAL, Transfer Case and Extension Case Assembly.>
- 3) Remove the shifter arm.
- 4) Remove the plug, spring washer and reverse check ball.



- 5) Remove the reverse check sleeve.

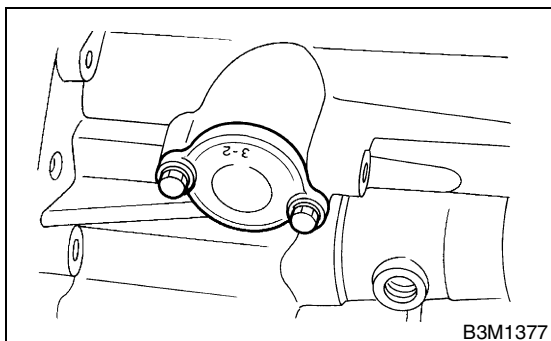


B: INSTALLATION

- 1) Install the reverse check sleeve.

Tightening torque:

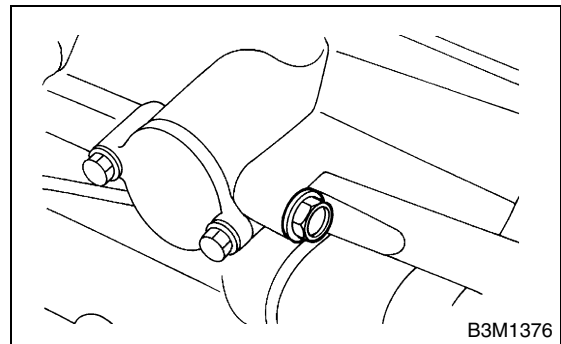
6.4 N-m (0.65 kgf-m, 4.7 ft-lb)



- 2) Install the ball, spring, washer and plug to transfer case.

Tightening torque:

10 N-m (1.0 kgf-m, 7.2 ft-lb)



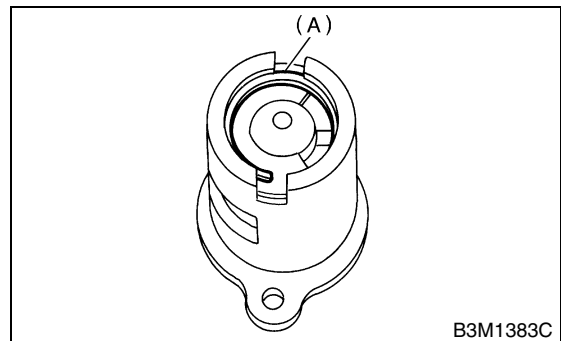
- 3) Install the shifter arm to transfer case assembly.
- 4) Install the transfer case with extension case assembly. <Ref. to MT-48, INSTALLATION, Transfer Case and Extension Case Assembly.>
- 5) Install the manual transmission assembly to vehicle. <Ref. to MT-37, INSTALLATION, Manual Transmission Assembly.>

C: DISASSEMBLY

- 1) Cover the reverse check sleeve with a rag, and remove the snap ring using a screwdriver.

NOTE:

Replace the snap ring with a new one if deformed or weakened.

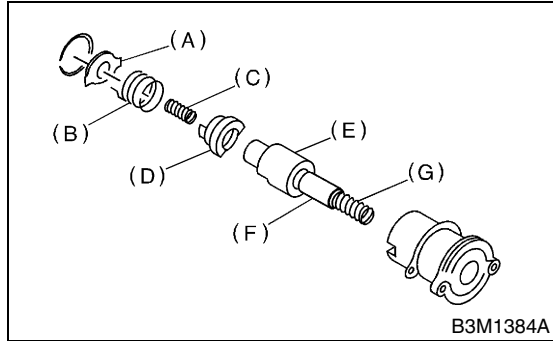


(A) Snap ring

REVERSE CHECK SLEEVE

MANUAL TRANSMISSION AND DIFFERENTIAL

2) Remove the 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 the O-ring.

NOTE:

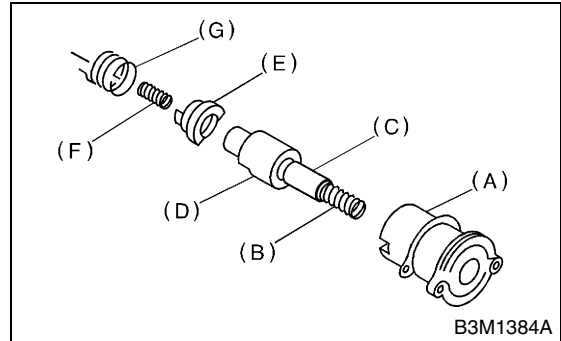
- Reverse check sleeve assembly uses an O-ring which should not be scratched.
- Be careful not to break the adjustment shim placed between reverse check sleeve assembly and case.

D: ASSEMBLY

1) Install the 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 spring
- (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 sleeve

2) Hook the bent section of reverse check spring over reverse check plate.

3) Rotate the cam so that the protrusion of reverse check cam is at the opening in plate.

4) With the cam held in that position, install the plate onto reverse check sleeve and hold with snap ring.

5) Position the O-ring in groove in sleeve.

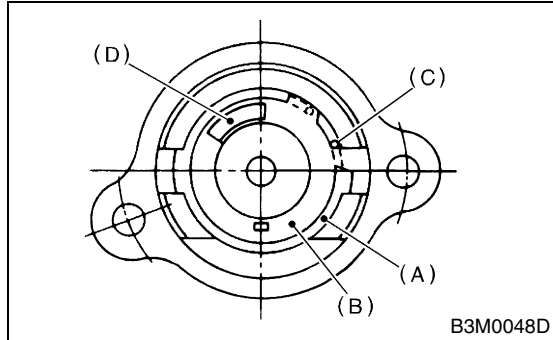
REVERSE CHECK SLEEVE

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 the cam by hand for smooth rotation.
- Move the cam and shaft all the way toward plate and release.

If the cam does not return properly, replace the reverse check spring; if shaft does not, check for scratches on the inner surface of sleeve. If sleeve is in good order, replace the 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-59, ADJUSTMENT, Reverse Check Sleeve.>

F: ADJUSTMENT

1. NEUTRAL POSITION ADJUSTMENT

- 1) Shift the 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 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 the bolts holding reverse check sleeve assembly to the case, move the 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 the O-ring when placing shim(s).

NOTE:

- When the 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 the shims alone cannot adjust clearance, replace the 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.

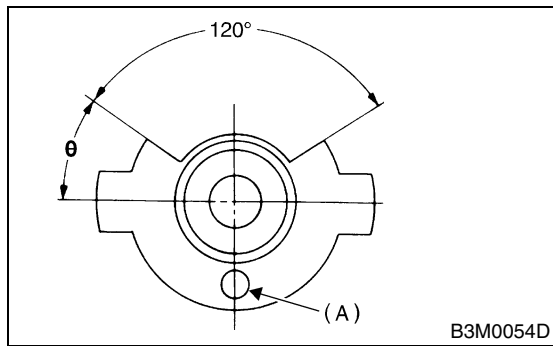
REVERSE CHECK SLEEVE

MANUAL TRANSMISSION AND DIFFERENTIAL

2. REVERSE CHECK PLATE ADJUSTMENT

- 1) Shift the shifter arm to "5th" and then to reverse to see if reverse check mechanism operates properly.
- 2) Also check to see if the arm returns to neutral when released from reverse position. If the arm does not return properly, replace the reverse check plate.

Reverse check plate			
Part No.	(A): No.	Angle θ	Remarks
32189AA000	0	28°	Arm stops closer to 5th gear.
32189AA010	1	31°	Arm stops closer to 5th gear.
32189AA020	2	34°	Arm stops in the center.
32189AA030	3	37°	Arm stops closer to reverse gear.
32189AA040	4	40°	Arm stops closer to reverse gear.



TRANSMISSION CASE

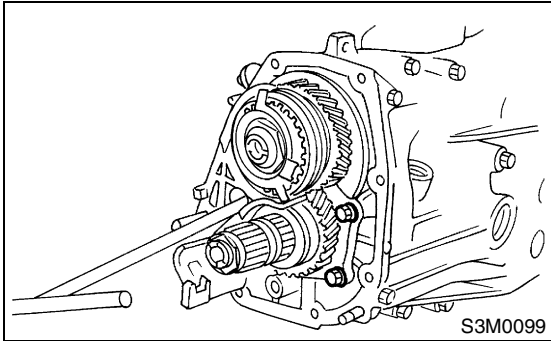
MANUAL TRANSMISSION AND DIFFERENTIAL

14. Transmission Case

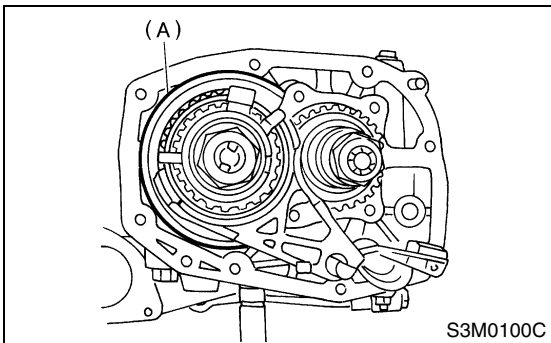
A: REMOVAL

1. SINGLE-RANGE

- 1) Remove the manual transmission assembly from vehicle. <Ref. to MT-33, REMOVAL, Manual Transmission Assembly.>
- 2) Remove the clutch release lever. <Ref. to CL-26, REMOVAL, Release Bearing and Lever.>
- 3) Remove the transfer case with extension case assembly. <Ref. to MT-48, REMOVAL, Transfer Case and Extension Case Assembly.>
- 4) Remove the bearing mounting bolts.

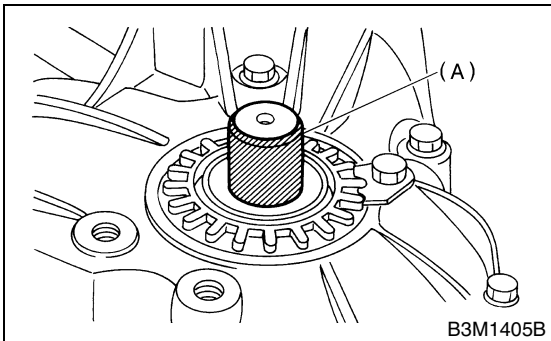


- 5) Remove the main shaft rear plate.



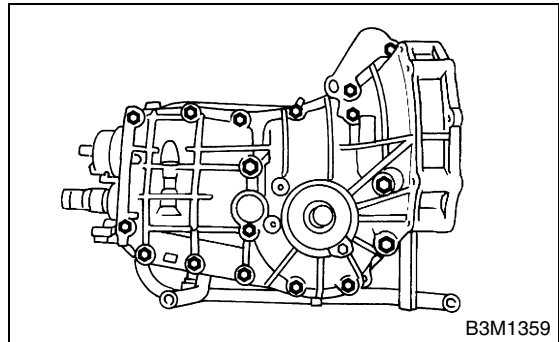
(A) Main shaft rear plate

- 6) Put vinyl tape around the splines of right and left axle drive shafts to prevent damage to oil seal.



(A) Vinyl tape

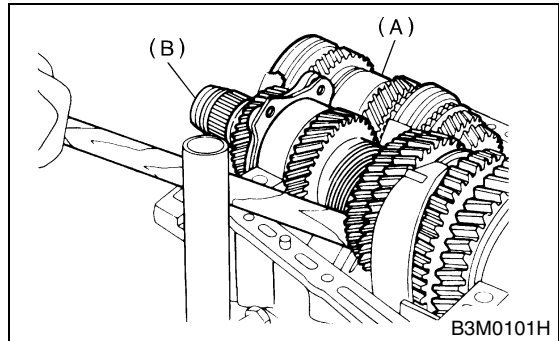
- 7) Separate the transmission case into right and left cases by loosening the coupling bolts and nuts.



- 8) Remove the drive pinion shaft assembly from left side transmission case.

NOTE:

Use a hammer handle, etc. to remove if too tight.



(A) Main shaft assembly

(B) Drive pinion shaft assembly

- 9) Remove the main shaft assembly.

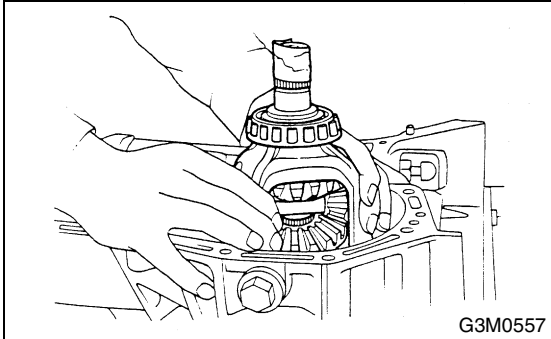
TRANSMISSION CASE

MANUAL TRANSMISSION AND DIFFERENTIAL

10) Remove the differential assembly.

NOTE:

- Be careful not to confuse the right and left roller bearing outer races.
- Be careful not to damage the retainer oil seal.



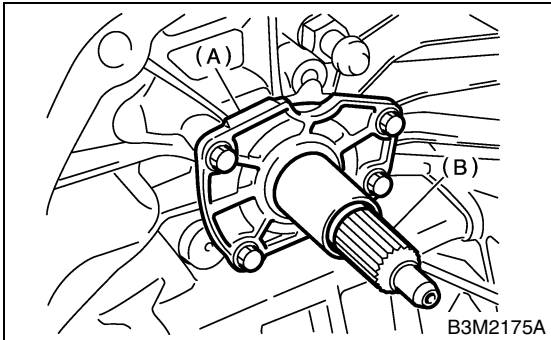
2. DUAL-RANGE

1) Remove the manual transmission assembly from vehicle. <Ref. to MT-33, REMOVAL, Manual Transmission Assembly.>

2) Remove the clutch release lever. <Ref. to CL-26, REMOVAL, Release Bearing and Lever.>

3) Remove the transfer case with extension case assembly. <Ref. to MT-48, REMOVAL, Transfer Case and Extension Case Assembly.>

4) Remove the input shaft holder.



- (A) Input shaft holder
- (B) Input shaft

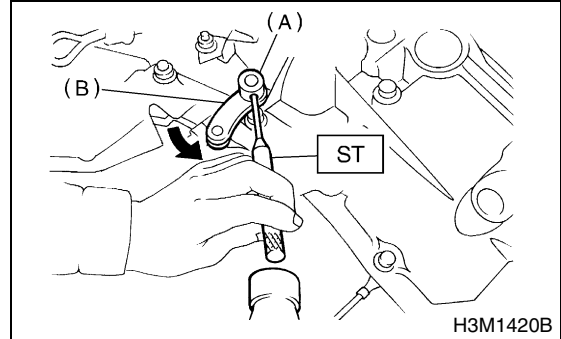
5) Remove the high-low switch. <Ref. to MT-43, REMOVAL, Switches and Harness.>

6) Using the ST, drive out the straight pin, and remove high-low shifter lever.

ST 398791700 STRAIGHT PIN REMOVER 2

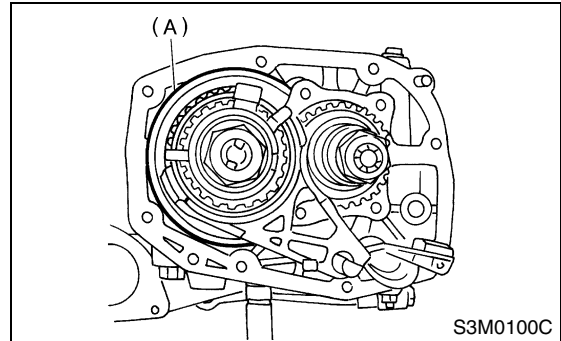
NOTE:

When driving out the straight pin, remove it in the direction that it does not butt against transmission case.



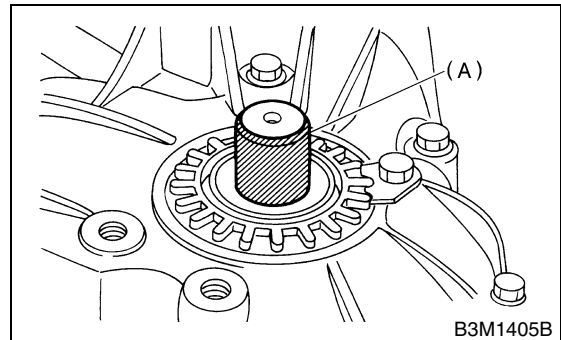
- (A) Straight pin
- (B) High-low shifter lever

7) Remove the main shaft rear plate.



- (A) Main shaft rear plate

8) Put vinyl tape around the splines of right and left axle drive shafts to prevent damage to oil seals.

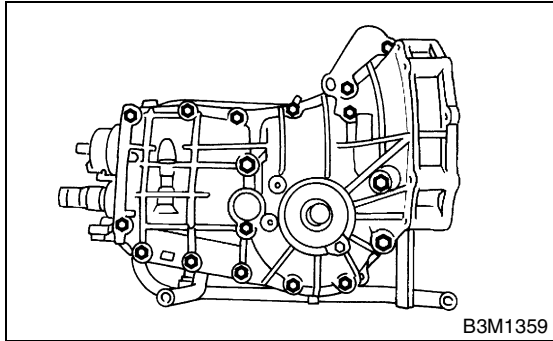


- (A) Vinyl tape

TRANSMISSION CASE

MANUAL TRANSMISSION AND DIFFERENTIAL

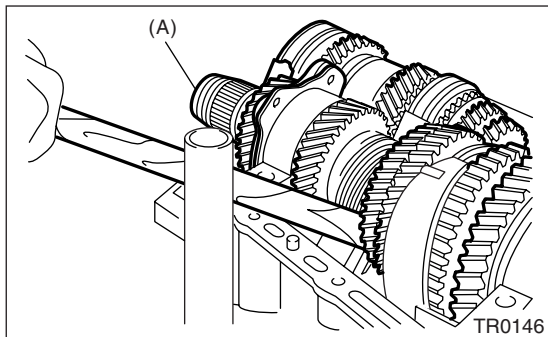
9) Separate the transmission case into right and left cases by loosening the seventeen coupling bolts and nuts.



10) Remove the drive pinion shaft assembly from left side transmission case.

NOTE:

Use a hammer handle, etc. to remove if too tight.



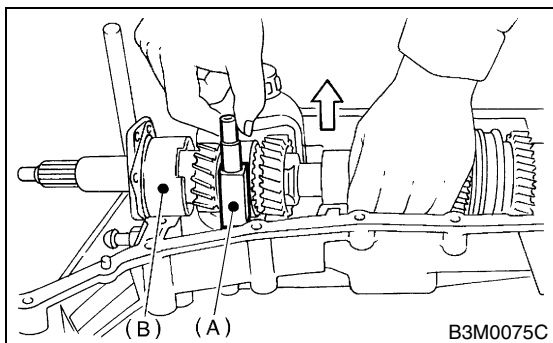
(A) Drive pinion shaft assembly

11) Removing high-low shifter fork:

Raise the main shaft assembly slightly, and remove the high-low shifter fork together with high-low shifter shaft and washer.

NOTE:

Be careful not to drop the two high-low shifter pieces.



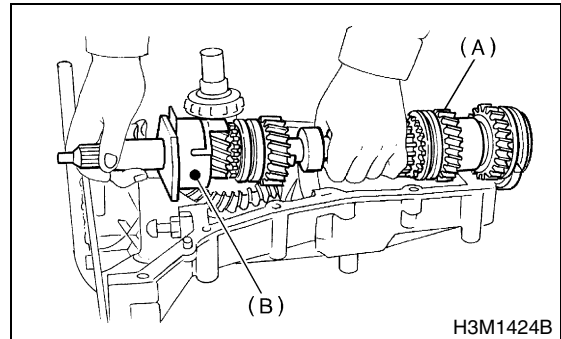
(A) High-low shifter fork

(B) Input shaft ASSY

12) Remove the main shaft assembly and input shaft assembly.

CAUTION:

Be careful not to drop the input shaft and main shaft as they are separable.



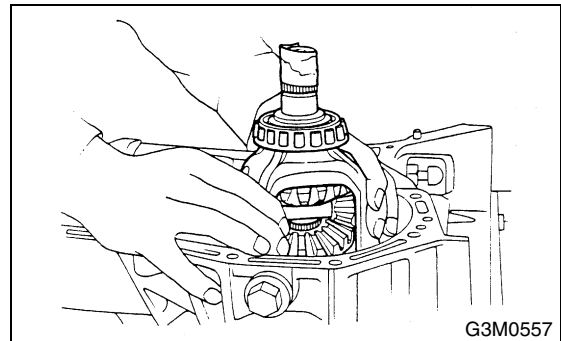
(A) Main shaft ASSY

(B) Input shaft ASSY

13) Remove the differential assembly.

NOTE:

- Be careful not to confuse the right and left roller bearing outer races.
- Be careful not to damage the retainer oil seal.



B: INSTALLATION

1. SINGLE-RANGE

- 1) Wipe off grease, oil and dust on the mating surfaces of transmission cases with white gasoline.
- 2) Install the front differential assembly.
- 3) Install the main shaft assembly.
Install the needle bearing knock pin hole into transmission case knock pin.
- 4) Install the drive pinion shaft assembly.
Install the roller bearing knock pin hole into transmission case knock pin.
- 5) Apply liquid gasket, and then put the case right side and left side together.

Liquid gasket:

THREE BOND 1215 or equivalent

TRANSMISSION CASE

MANUAL TRANSMISSION AND DIFFERENTIAL

6) Tighten the seventeen bolts with bracket, clip, etc. as shown in the figure.

NOTE:

- Insert the bolts from bottom and tighten the nuts at top.
- Put the cases together so that drive pinion shim and input shaft holder shim are not caught up in between.
- Confirm that the speedometer gear is meshed.

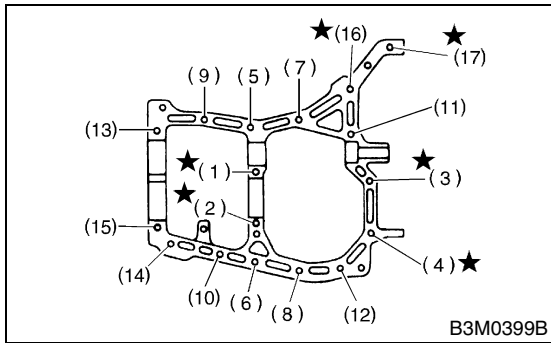
Tightening torque:

8 mm bolt

25 N·m (2.5 kgf·m, 18.1 ft-lb)

★ 10 mm bolt

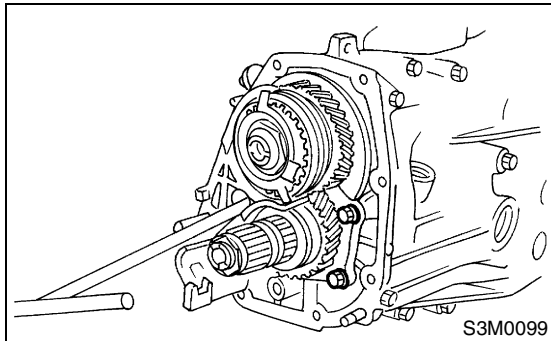
39 N·m (4.0 kgf·m, 28.9 ft-lb)



7) Tighten the ball bearing attachment bolts.

Tightening torque:

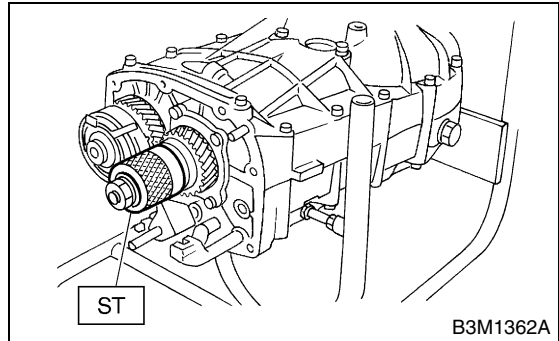
29 N·m (3.0 kgf·m, 21.7 ft-lb)



8) Backlash adjustment of hypoid gear and preload adjustment of roller bearing:

NOTE:

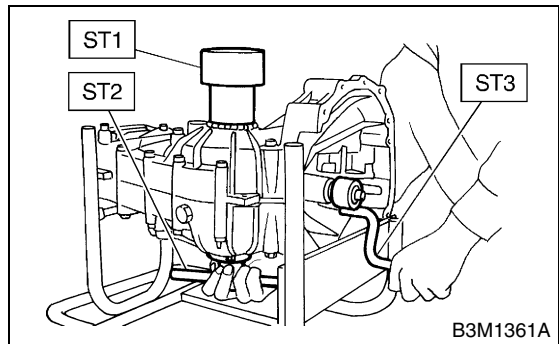
Support the drive pinion assembly with ST.
ST 498427100 STOPPER



9) Place the transmission with case left side facing downward and put ST1 on bearing cup.

10) Screw the retainer assembly into left case from the bottom with ST2. Fit the ST3 on transmission main shaft. Shift the 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

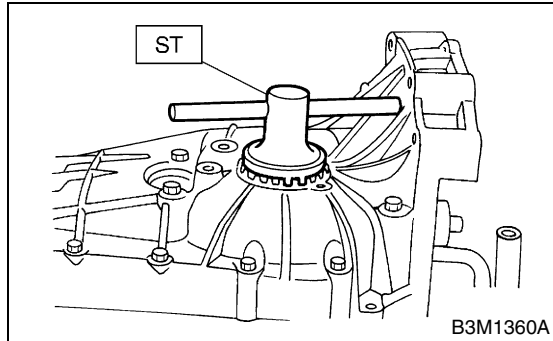
MANUAL TRANSMISSION AND DIFFERENTIAL

11) Remove the weight and screw in the retainer without O-ring on upper side and stop at the point where slight resistance is felt.

NOTE:

At this point, the backlash between hypoid gear and drive pinion shaft is zero.

ST 499787000 WRENCH ASSY



12) Fit the lock plate. Loosen the retainer on the lower side by 1-1/2 notches of lock plate and turn in the retainer on 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 the transmission main shaft several times while tapping around the retainer lightly with plastic hammer.

16) Inspect and adjust the backlash and tooth contact of hypoid gear. <Ref. to MT-99, INSPECTION, Front Differential Assembly.>

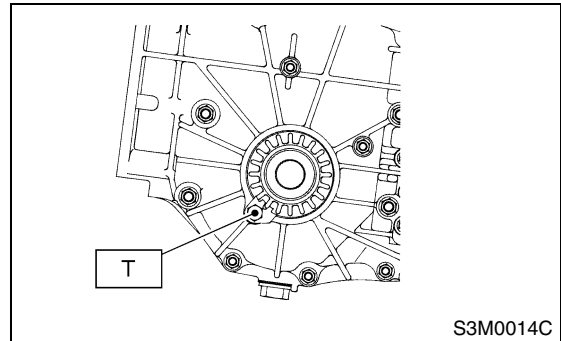
17) After checking the tooth contact of hypoid gears, remove the lock plate. Then loosen the retainer until the O-ring groove appears. Fit the O-ring into groove and tighten the retainer into the position where retainer has been tightened in. Tighten the lock plate.

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-75, ADJUSTMENT, Main Shaft Assembly for Single-Range.>

19) Install the clutch release lever and bearing. <Ref. to CL-26, INSTALLATION, Release Bearing and Lever.>

20) Install the transfer case with extension case assembly. <Ref. to MT-48, INSTALLATION, Transfer Case and Extension Case Assembly.>

21) Install the manual transmission assembly into the vehicle. <Ref. to MT-37, 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 the main shaft assembly and input the shaft assembly, and install needle bearing knock pin hole into transmission case knock pin.

4) Install the drive pinion shaft assembly.

Install the roller bearing knock pin hole into transmission case knock pin.

5) Apply liquid gasket, and then put the case right side and left side together.

Liquid gasket:

THREE BOND 1215 or equivalent

TRANSMISSION CASE

MANUAL TRANSMISSION AND DIFFERENTIAL

6) Tighten the seventeen bolts with bracket, clip, etc. as shown in the figure.

NOTE:

- Insert the bolts from bottom and tighten the nuts at top.
- Put the cases together so that the drive pinion shim and input shaft holder shim are not caught up in between.
- Confirm that the speedometer gear is meshed.

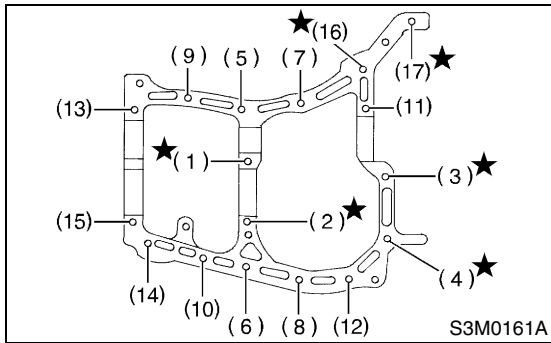
Tightening torque:

8 mm bolt

25 N·m (2.5 kgf·m, 18.1 ft-lb)

★ 10 mm bolt

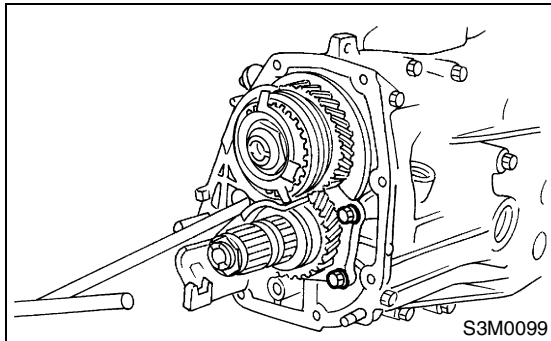
39 N·m (4.0 kgf·m, 28.9 ft-lb)



7) Tighten the ball bearing attachment bolts.

Tightening torque:

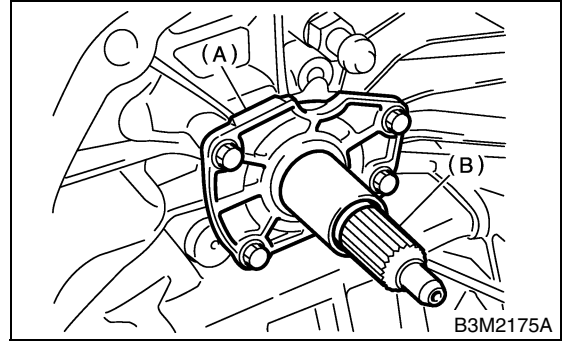
29 N·m (3.0 kgf·m, 21.7 ft-lb)



8) Tighten the input shaft holder attaching bolts.

Tightening torque:

20 N·m (2.0 kgf·m, 14.5 ft-lb)



(A) Input shaft holder

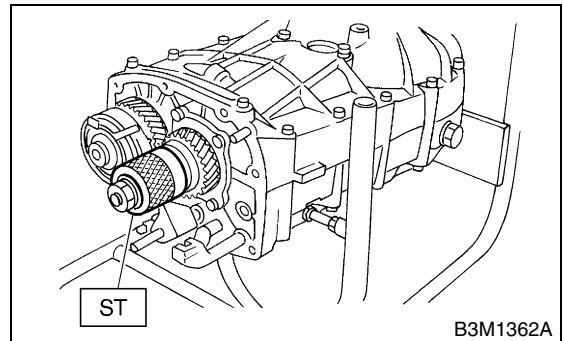
(B) Input shaft

9) Backlash adjustment of hypoid gear and preload adjustment of roller bearing

NOTE:

Support the drive pinion assembly with ST.

ST 498427100 STOPPER



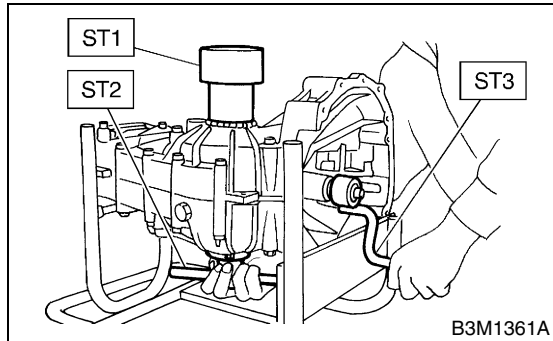
10) Place the transmission with case left side facing downward and put ST1 on bearing cup.

TRANSMISSION CASE

MANUAL TRANSMISSION AND DIFFERENTIAL

11) Screw the retainer assembly into left case from the bottom with ST2. Fit the ST3 on transmission main shaft. Shift the 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

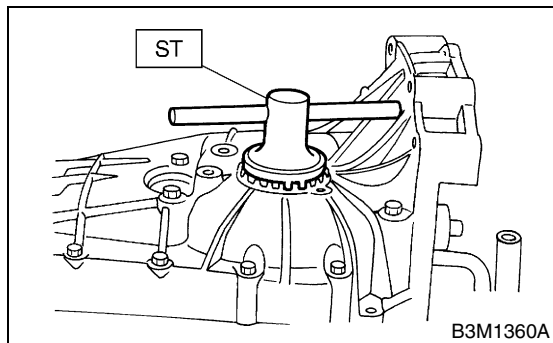


12) Remove the weight and screw in the retainer without O-ring on upper side and stop at the point where slight resistance is felt.

NOTE:

At this point, the backlash between hypoid gear and drive pinion shaft is zero.

ST 499787000 WRENCH ASSY



13) Fit the lock plate. Loosen the retainer on the lower side by 1-1/2 notches of lock plate and turn in the retainer on 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 the transmission main shaft several times while tapping around the retainer lightly with plastic hammer.

17) Inspect and adjust the backlash and tooth contact of hypoid gear. <Ref. to MT-99, INSPECTION, Front Differential Assembly.>

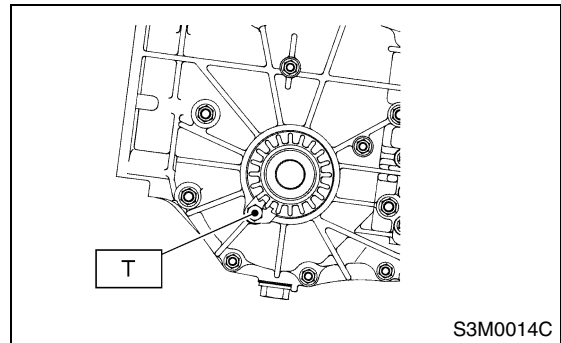
18) After checking the tooth contact of hypoid gears, remove the lock plate. Then loosen the retainer until the O-ring groove appears. Fit the O-ring into groove and tighten the retainer into the position where retainer has been tightened in. Tighten the lock plate.

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-75, ADJUSTMENT, Main Shaft Assembly for Single-Range.>

20) Install the transfer case with extension case assembly. <Ref. to MT-48, INSTALLATION, Transfer Case and Extension Case Assembly.>

21) Install the clutch release lever and bearing. <Ref. to CL-26, INSTALLATION, Release Bearing and Lever.>

22) Install the manual transmission assembly into the vehicle. <Ref. to MT-37, INSTALLATION, Manual Transmission Assembly.>

C: INSPECTION

Check the transmission case for cracks, damage, and oil leaks.

MAIN SHAFT ASSEMBLY FOR SINGLE-RANGE

MANUAL TRANSMISSION AND DIFFERENTIAL

15. Main Shaft Assembly for Single-Range

A: REMOVAL

- 1) Remove the manual transmission assembly from vehicle. <Ref. to MT-33, REMOVAL, Manual Transmission Assembly.>
- 2) Remove the transfer case with extension case assembly. <Ref. to MT-48, REMOVAL, Transfer Case and Extension Case Assembly.>
- 3) Remove the transmission case. <Ref. to MT-48, REMOVAL, Transfer Case and Extension Case Assembly.>
- 4) Remove the drive pinion shaft assembly. <Ref. to MT-86, REMOVAL, Drive Pinion Shaft Assembly.>
- 5) Remove the main shaft assembly.

B: INSTALLATION

- 1) Install the needle bearing and oil seal onto the front of transmission main shaft assembly.

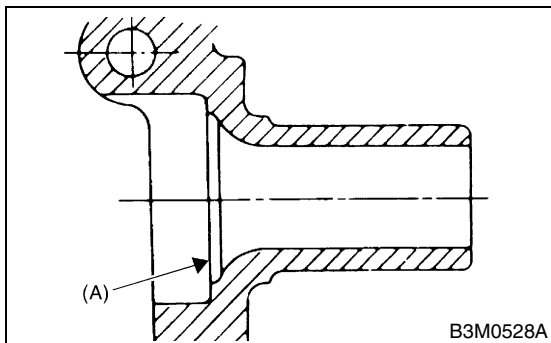
NOTE:

- Wrap the 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 the 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-86, INSTALLATION, Drive Pinion Shaft Assembly.>
- 4) Install the transmission case. <Ref. to MT-63, INSTALLATION, Transmission Case.>
- 5) Install the transfer case with extension case assembly. <Ref. to MT-48, INSTALLATION, Transfer Case and Extension Case Assembly.>
- 6) Install the manual transmission assembly to vehicle. <Ref. to MT-37, INSTALLATION, Manual Transmission Assembly.>

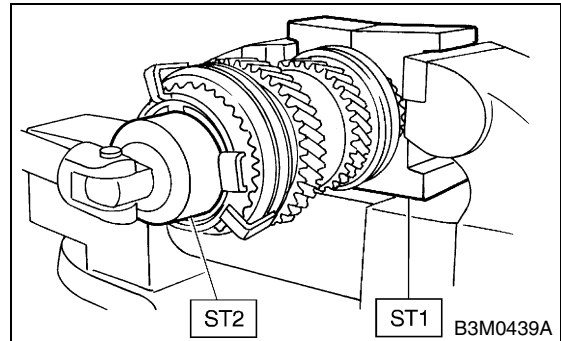
C: DISASSEMBLY

- 1) Put vinyl tape around the main shaft splines to protect oil seal from damage. Then pull out the oil seal and needle bearing by hand.
- 2) Remove the lock nut from transmission main shaft assembly.

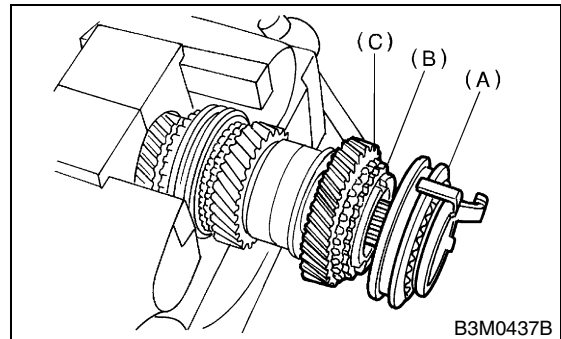
NOTE:

Remove the caulking before removing lock nut.

- ST1 499987000 TRANSMISSION HOLDER
ST2 498937003 SOCKET WRENCH (35)

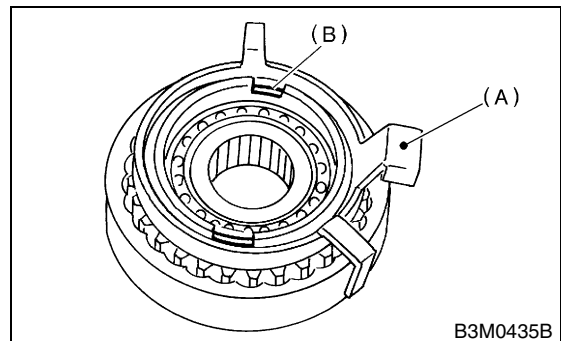


- 3) Remove the 5th-Rev sleeve and hub assembly, baulk ring, 5th drive gear and needle bearing.



- (A) 5th-Rev sleeve and hub ASSY
(B) Baulk ring
(C) 5th drive gear

- 4) Remove the snap ring and synchro cone stopper from 5th-Rev sleeve and hub assembly.



- (A) Synchro cone stopper
(B) Snap ring

MAIN SHAFT ASSEMBLY FOR SINGLE-RANGE

MANUAL TRANSMISSION AND DIFFERENTIAL

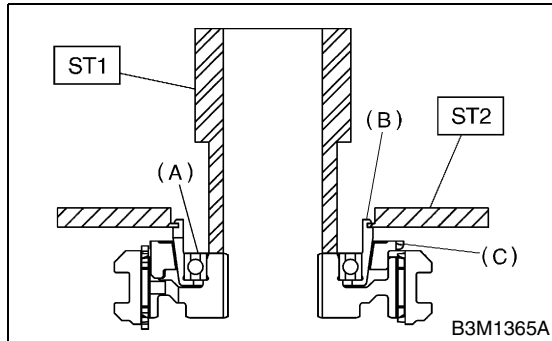
5) Using the ST1, ST2 and a press, remove the ball bearing, synchro cone and baulk ring (Rev).

NOTE:

- Replace the 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 the ball bearing.

ST1 499757002 INSTALLER

ST2 498077400 SYNCHRO CONE REMO-
VER



- (A) Ball bearing
- (B) Synchro cone
- (C) Baulk ring

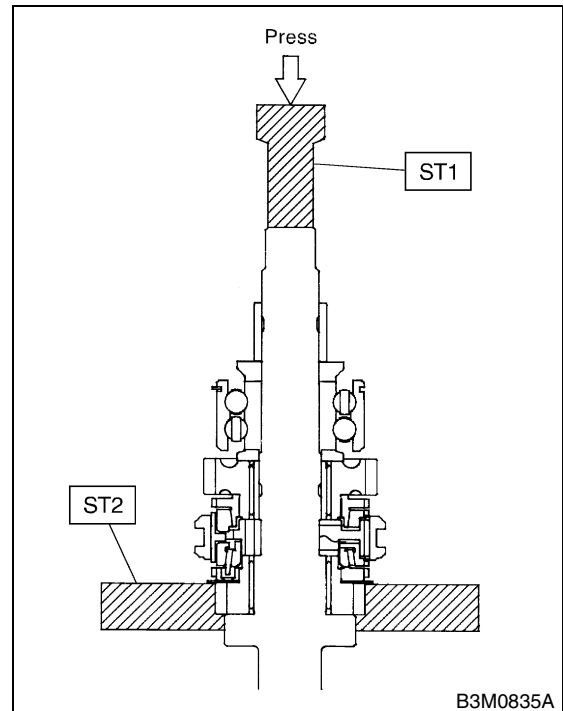
6) Using the ST1 and ST2, remove rest of the parts.

NOTE:

- Replace the 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.

ST1 899864100 REMOVER

ST2 899714110 REMOVER



MAIN SHAFT ASSEMBLY FOR SINGLE-RANGE

MANUAL TRANSMISSION AND DIFFERENTIAL

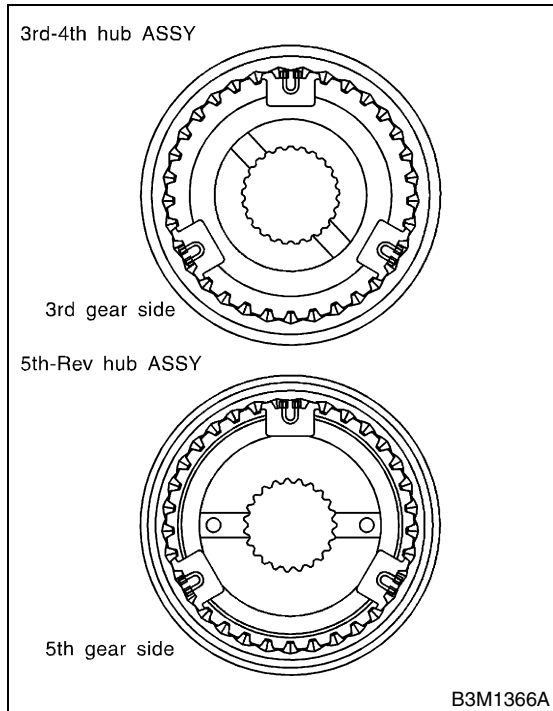
D: ASSEMBLY

1. EXCEPT 2.5 L AND TURBO MODEL

1) Assemble when each sleeve and hub assembly are disassembled.

NOTE:

Position the open ends of spring 120° apart.



2) Install the 3rd drive gear, baulk ring, sleeve and hub assembly for 3rd needle bearing on transmission main shaft.

NOTE:

Align the groove in baulk ring with shifting insert.

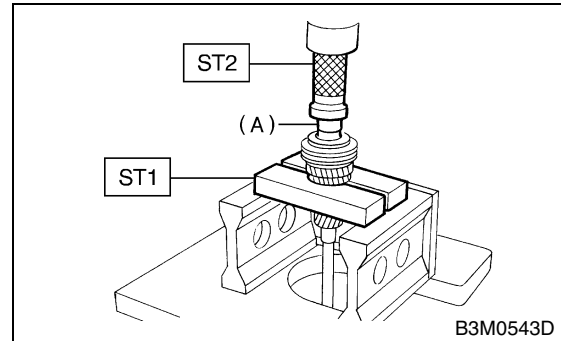
3) Install the 4th needle bearing race onto transmission main shaft using ST1, ST2 and a press.

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

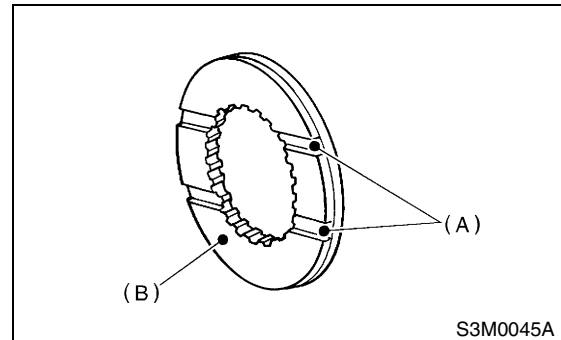


(A) 4th needle bearing race

4) Install the baulk ring, needle bearing, 4th drive gear and 4th gear thrust washer to transmission main shaft.

NOTE:

Align the 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

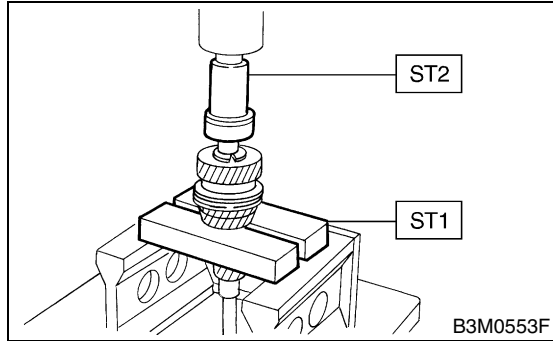
5) Drive the ball bearing onto the rear section of transmission main shaft using ST1, ST2 and a press.

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 the ST1 and ST2, install the 5th gear thrust washer and 5th needle bearing race onto the rear section of transmission main shaft.

CAUTION:

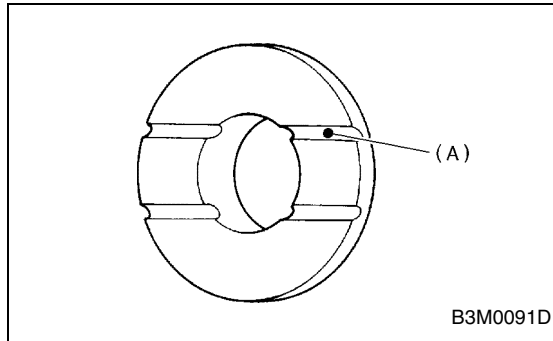
Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).

NOTE:

Face the thrust washer in correct direction.

ST1 899714110 REMOVER

ST2 499877000 RACE 4-5 INSTALLER



(A) Face this surface to 5th gear side.

7) Install the bearing onto synchro cone.

8) Install the baulk ring and synchro cone onto 5th-Rev sleeve and hub assembly using ST and a press.

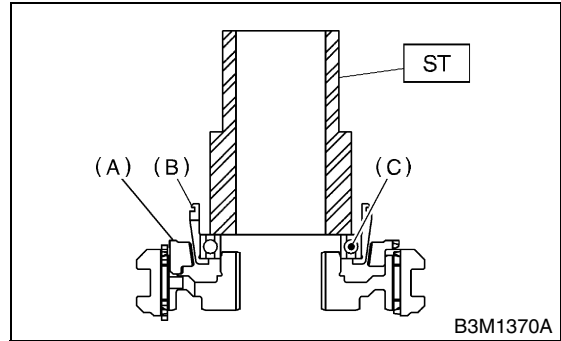
CAUTION:

Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).

NOTE:

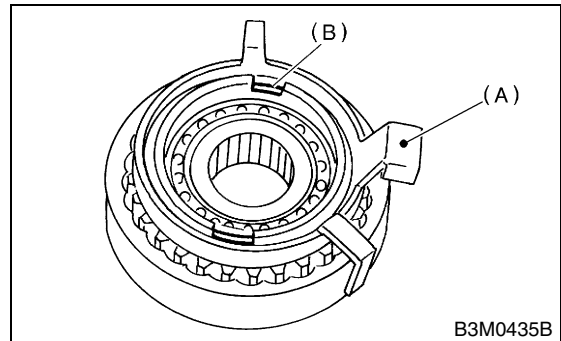
- Use a new ball bearing.
- After press fitting, make sure the synchro cone rotates freely.

ST 499757002 INSTALLER



- (A) Baulk ring
- (B) Synchro cone
- (C) Ball bearing

9) Install the synchro cone stopper and snap ring to 5th-Rev sleeve and hub assembly.



- (A) Synchro cone stopper
- (B) Snap ring

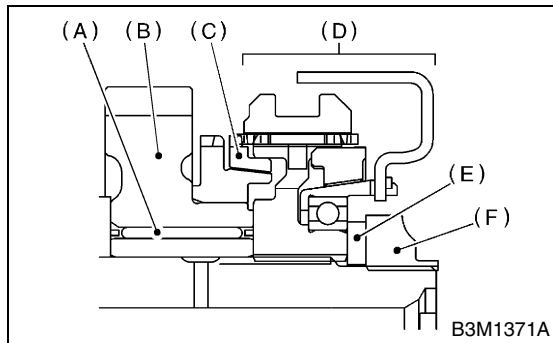
MAIN SHAFT ASSEMBLY FOR SINGLE-RANGE

MANUAL TRANSMISSION AND DIFFERENTIAL

10) Install rest of the parts to the rear section of transmission main shaft.

NOTE:

Align the 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 the lock nuts to the specified torque using ST1 and ST2.

NOTE:

Secure the lock nuts in two places after tightening.

- ST1 499987003 SOCKET WRENCH
- ST2 498937000 TRANSMISSION HOLDER

Tightening torque:

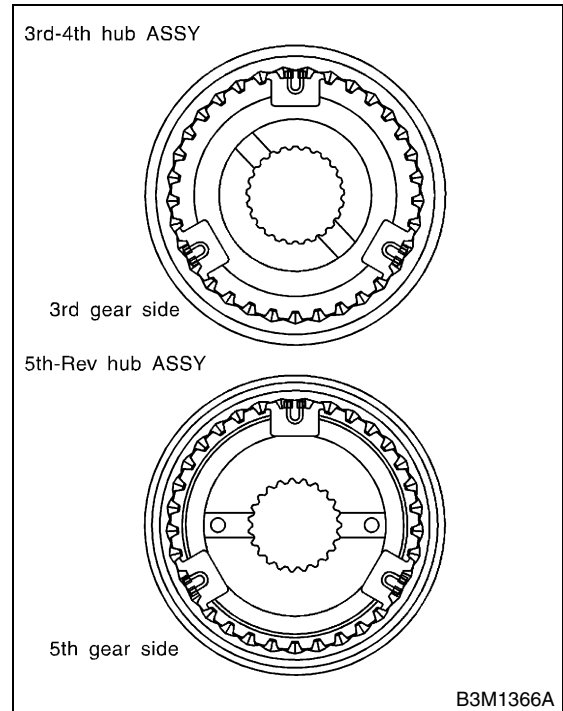
118 N-m (12.0 kgf-m, 86.8 ft-lb)

2. 2.5 L AND TURBO MODEL

1) Assemble each sleeve and hub assembly.

NOTE:

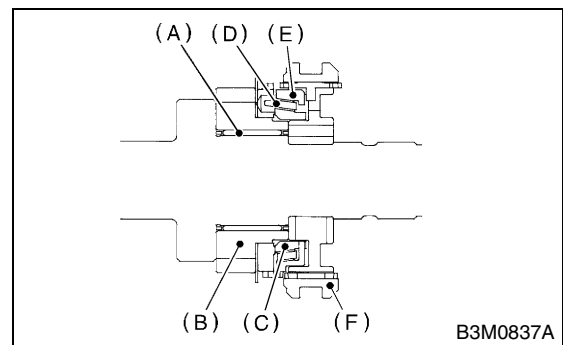
Position the open ends of spring 120° apart.



2) Install the 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 the 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

MAIN SHAFT ASSEMBLY FOR SINGLE-RANGE

MANUAL TRANSMISSION AND DIFFERENTIAL

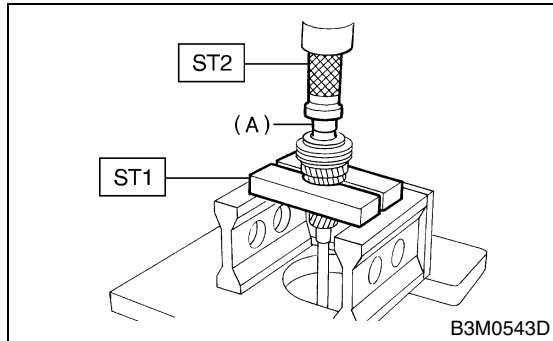
3) Install the 4th needle bearing race onto transmission main shaft using ST1, ST2 and a press.

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

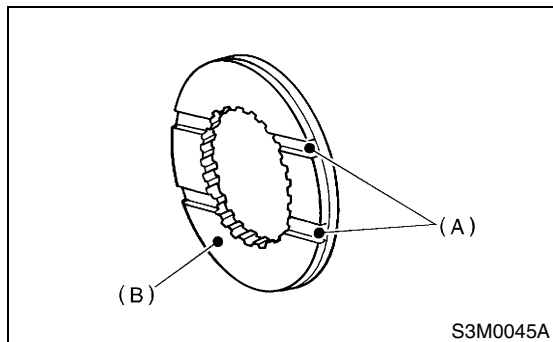


(A) 4th needle bearing race

4) Install the baulk ring, needle bearing, 4th drive gear and 4th gear thrust washer to transmission main shaft.

NOTE:

Align the baulk ring and gear & hub assembly with key groove.



(A) Groove

(B) 4th gear side

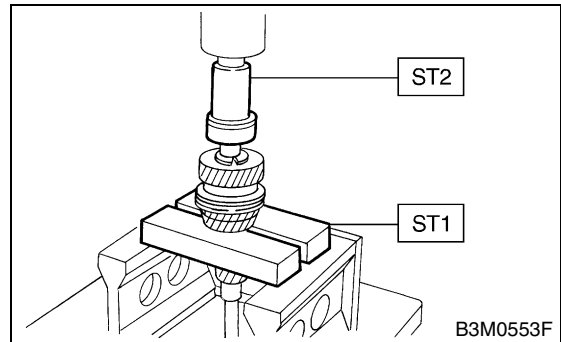
5) Drive the ball bearing onto the rear section of transmission main shaft using ST1, ST2 and a press.

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 the ST1 and ST2, install the 5th gear thrust washer and 5th needle bearing race onto the rear section of transmission main shaft.

CAUTION:

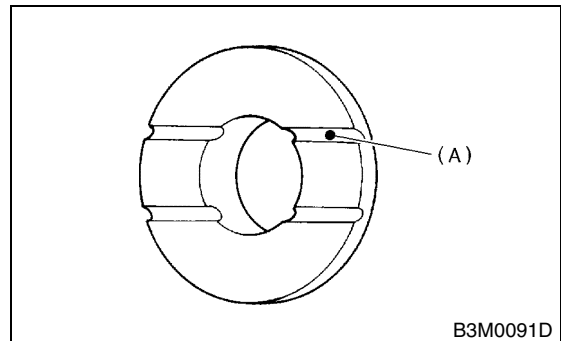
Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).

NOTE:

Face the thrust washer in correct direction.

ST1 899714110 REMOVER

ST2 499877000 RACE 4-5 INSTALLER



(A) Face this surface to 5th gear side.

7) Install the bearing onto synchro cone.

MAIN SHAFT ASSEMBLY FOR SINGLE-RANGE

MANUAL TRANSMISSION AND DIFFERENTIAL

8) Install the baulk ring and synchro cone onto 5th-Rev sleeve and hub assembly using ST and a press.

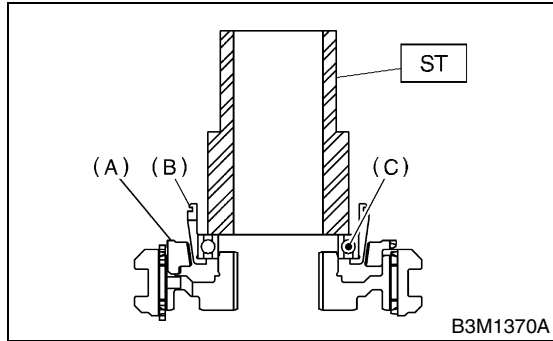
CAUTION:

Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).

NOTE:

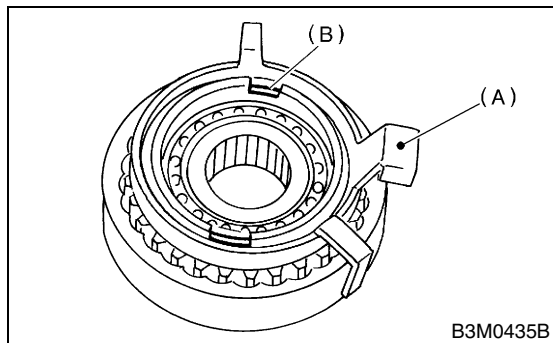
- Use a new ball bearing.
- After press fitting, make sure the synchro cone rotates freely.

ST 499757002 INSTALLER



- (A) Baulk ring
- (B) Synchro cone
- (C) Ball bearing

9) Install the synchro cone stopper and snap ring to 5th-Rev sleeve and hub assembly.

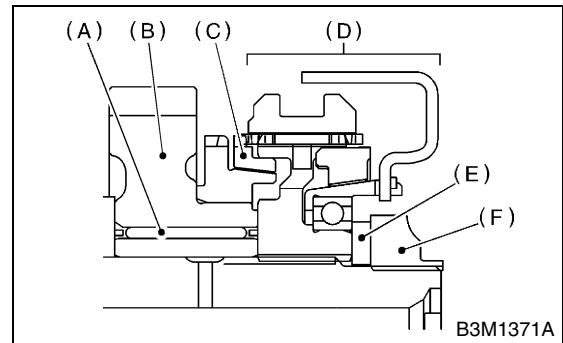


- (A) Synchro cone stopper
- (B) Snap ring

10) Install the rest parts to the rear section of transmission main shaft.

NOTE:

Align the 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 the lock nuts to the specified torque using ST1 and ST2.

NOTE:

Secure the 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

E: INSPECTION

Disassembled parts should be washed clean first and then inspected carefully.

1) Bearings

Replace the 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 the 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.

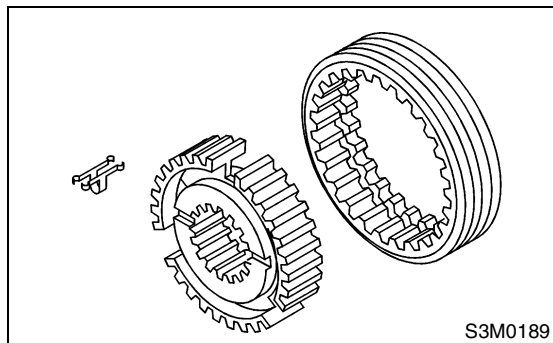
4) Baulk ring

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:

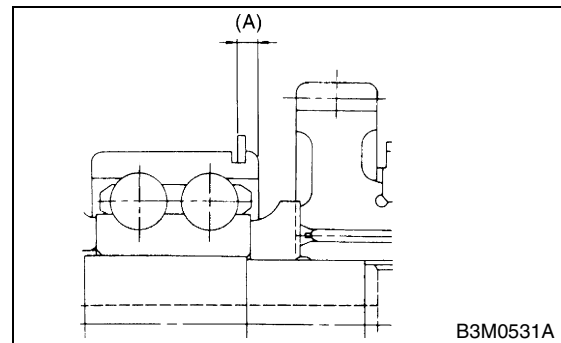
Using the ST, measure the amount (A) of ball bearing protrusion from transmission main case surface and select the proper plate in the following table:

NOTE:

Before measuring, tap the end of main shaft with a plastic hammer lightly in order to make the clearance zero between the main case surface and the moving flange of bearing.

ST 498147000 DEPTH GAUGE

Dimension (A) mm (in)	Part No.	Mark
4.00 — 4.13 (0.1575 — 0.1626)	32294AA041	1
3.87 — 3.99 (0.1524 — 0.1571)	32294AA051	2



MAIN SHAFT ASSEMBLY FOR DUAL-RANGE

MANUAL TRANSMISSION AND DIFFERENTIAL

16. Main Shaft Assembly for Dual-Range

A: REMOVAL

- 1) Remove the manual transmission assembly from vehicle. <Ref. to MT-33, REMOVAL, Manual Transmission Assembly.>
- 2) Remove the transfer case with extension case assembly. <Ref. to MT-48, REMOVAL, Transfer Case and Extension Case Assembly.>
- 3) Remove the transmission case. <Ref. to MT-61, REMOVAL, Transmission Case.>
- 4) Remove the drive pinion shaft assembly. <Ref. to MT-86, REMOVAL, Drive Pinion Shaft Assembly.>
- 5) Remove the main shaft assembly and input shaft assembly.

B: INSTALLATION

- 1) Install the needle bearing onto the front of transmission main shaft assembly.
- 2) Connect the main shaft assembly and input shaft assembly.
- 3) Install the needle bearing outer race knock pin into transmission case knock pin.
- 4) Install the drive pinion assembly. <Ref. to MT-86, INSTALLATION, Drive Pinion Shaft Assembly.>
- 5) Install the transmission case. <Ref. to MT-63, INSTALLATION, Transmission Case.>
- 6) Install the transfer case with extension case assembly. <Ref. to MT-48, INSTALLATION, Transfer Case and Extension Case Assembly.>
- 7) Install the manual transmission assembly to vehicle. <Ref. to MT-37, INSTALLATION, Manual Transmission Assembly.>

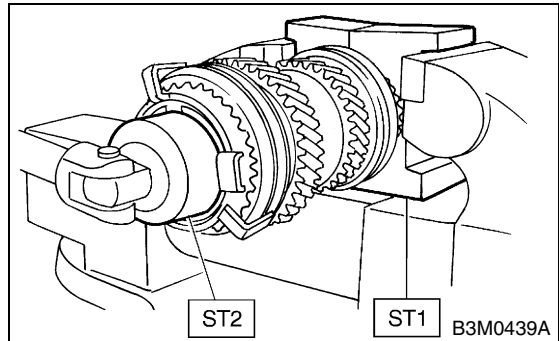
C: DISASSEMBLY

- 1) Put vinyl tape around the main shaft splines to protect oil seal from damage. Then pull out the oil seal and needle bearing by hand.
- 2) Remove the lock nut from transmission main shaft assembly.

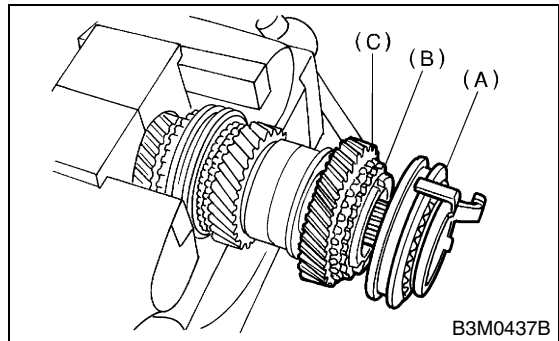
NOTE:

Remove the caulking before taking off lock nut.

- ST1 498937000 TRANSMISSION HOLDER
ST2 499987003 SOCKET WRENCH (35)

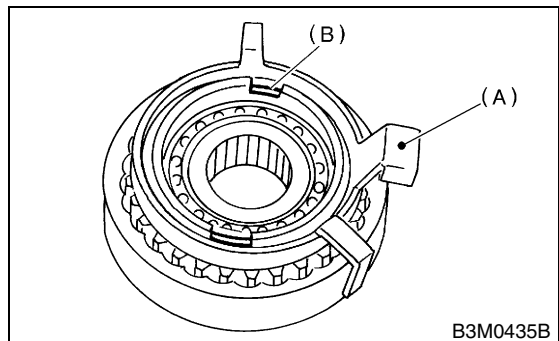


- 3) Remove the 5th-Rev sleeve and hub assembly, baulk ring, 5th drive gear and needle bearing.



- (A) 5th-Rev sleeve and hub ASSY
(B) Baulk ring
(C) 5th drive gear

- 4) Remove the 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

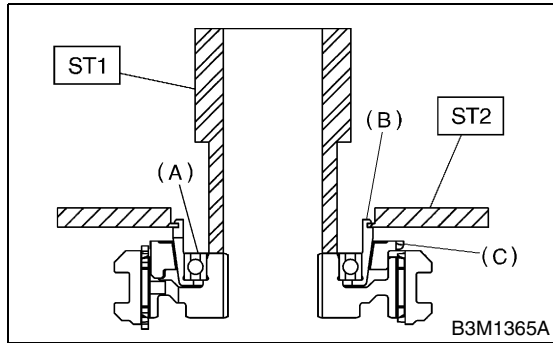
5) Using the ST1, ST2 and a press, remove the ball bearing, synchro cone and baulk ring (Rev).

NOTE:

- Replace the 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 the ball bearing.

ST1 499757002 INSTALLER

ST2 498077400 SYNCHRO CONE REMO-
VER



- (A) Ball bearing
- (B) Synchro cone
- (C) Baulk ring

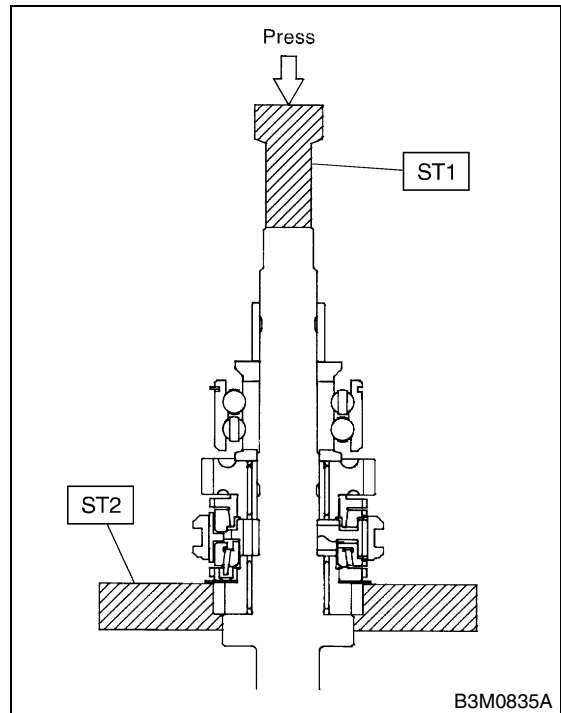
6) Using the ST1 and ST2, remove rest of the parts.

NOTE:

- Replace the 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.

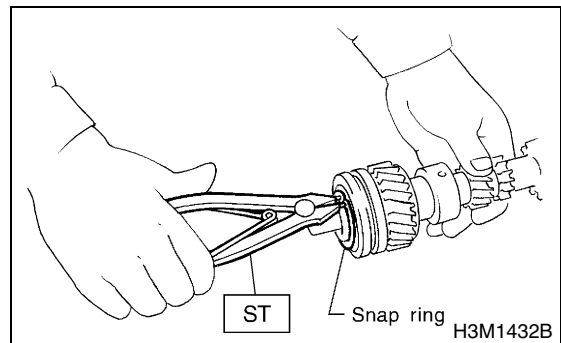
ST1 899864100 REMOVER

ST2 899714110 REMOVER



7) Remove the snap ring from main shaft.

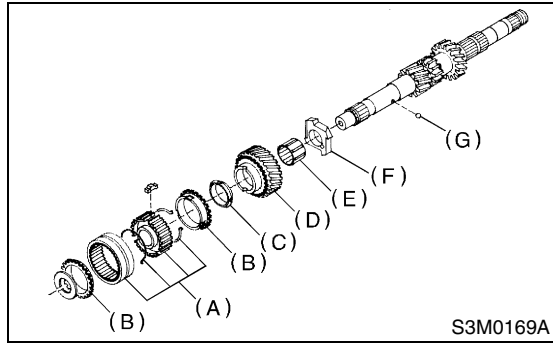
ST 899474100 EXPANDER



MAIN SHAFT ASSEMBLY FOR DUAL-RANGE

MANUAL TRANSMISSION AND DIFFERENTIAL

8) Remove rest of the parts.



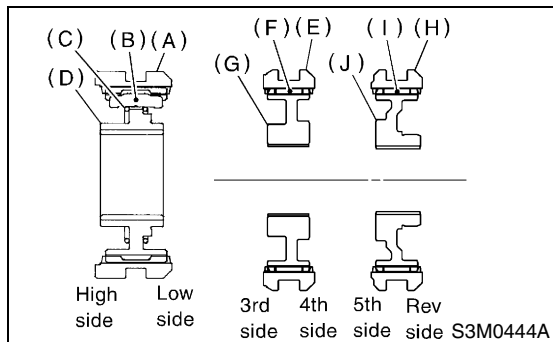
- (A) Sleeve and hub ASSY
- (B) High-low baulk ring
- (C) Friction damper
- (D) Low input gear
- (E) Needle bearing
- (F) Input low gear spacer
- (G) Ball

D: ASSEMBLY

1) Assemble when each sleeve and hub assembly are disassembled.

NOTE:

Position the 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 the 3rd drive gear, baulk ring, sleeve and hub assembly for 3rd-4th needle bearing on transmission main shaft.

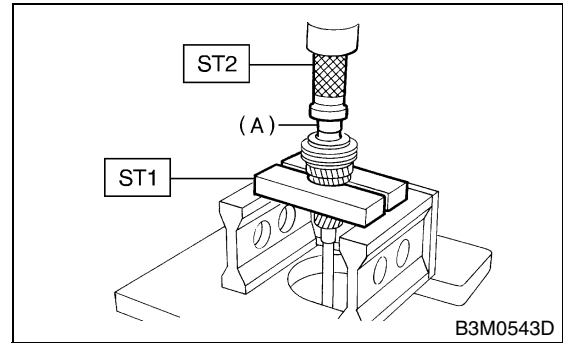
NOTE:

Align the groove in baulk ring with shifting insert.

3) Install the 4th needle bearing race onto transmission main shaft using ST1, ST2 and a press.

ST1 899714110 REMOVER

ST2 499877000 RACE 4-5 INSTALLER

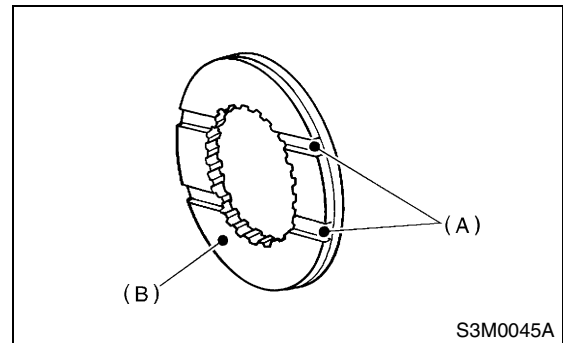


- (A) 4th needle bearing race

4) Install the baulk ring, needle bearing, 4th drive gear and 4th gear thrust washer to transmission main shaft.

NOTE:

Face the thrust washer in correct direction.



- (A) Groove
- (B) 4th gear side

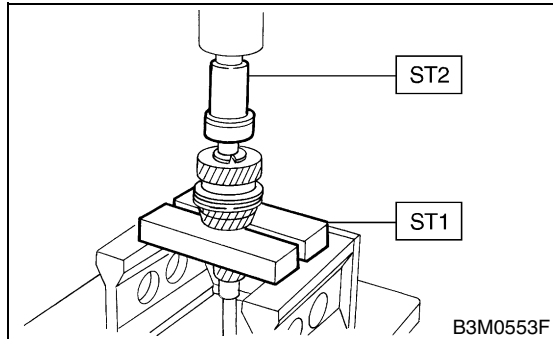
MAIN SHAFT ASSEMBLY FOR DUAL-RANGE

MANUAL TRANSMISSION AND DIFFERENTIAL

5) Drive the 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



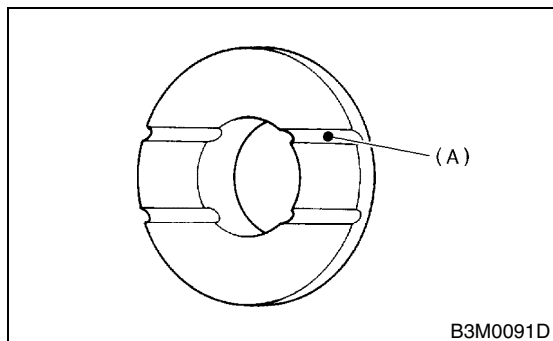
6) Using the ST1 and ST2, install the 5th gear thrust washer and 5th needle bearing race onto the rear section of transmission main shaft.

NOTE:

Face the thrust washer in correct direction.

ST1 899714110 REMOVER

ST2 499877000 RACE 4-5 INSTALLER



(A) Face this surface to 5th gear side.

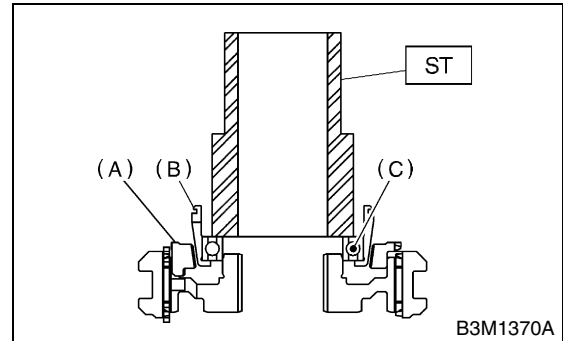
7) Install the bearing onto synchro cone.

8) Install the baulk ring and synchro cone onto 5th-Rev sleeve and hub assembly using ST and a press.

NOTE:

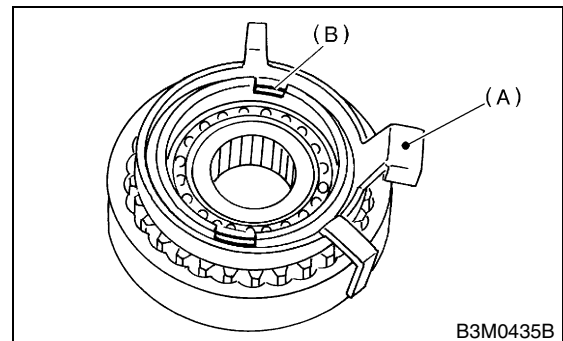
- Use a new ball bearing.
- After press fitting, make sure the synchro cone rotates freely.

ST 499757002 INSTALLER



- (A) Baulk ring
- (B) Synchro cone
- (C) Ball bearing

9) Install the synchro cone stopper and snap ring to 5th-Rev sleeve and hub assembly.



- (A) Synchro cone stopper
- (B) Snap ring

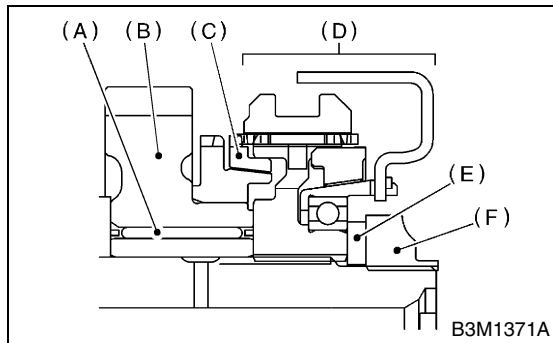
MAIN SHAFT ASSEMBLY FOR DUAL-RANGE

MANUAL TRANSMISSION AND DIFFERENTIAL

10) Install rest of the parts to the rear section of transmission main shaft.

NOTE:

Align the 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 the lock nuts to the specified torque using ST1 and ST2.

NOTE:

Secure the 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 the needle bearing on main shaft.

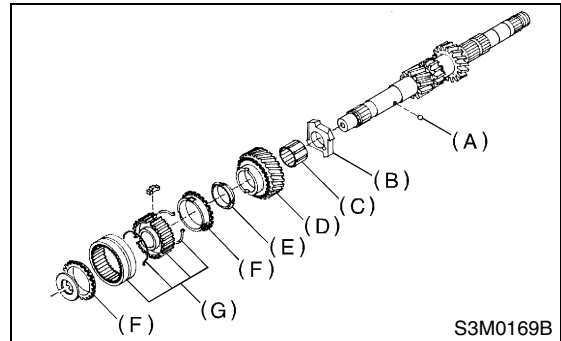
13) Install the parts to the front section of transmission main shaft.

NOTE:

Be careful not to damage the graded section of transmission main shaft when installing the needle bearing.

NOTE:

- Face the grooved side toward input gear.
- Align the 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 a new snap ring to the rod section of transmission main shaft using ST1 and ST2.

NOTE:

Select a suitable outer snap ring so that axial clearance between snap ring and hub is held within 0.060 to 0.100 mm (0.0024 to 0.0039 in).

ST1 499757002 INSTALLER

ST2 499757001 SNAP RING GUIDE

Snap ring	
Part No.	Thickness mm (in)
805025051	2.42 (0.0953)
805025052	2.47 (0.0972)
805025053	2.52 (0.0992)
805025054	2.57 (0.1012)
805025055	2.62 (0.1031)
805025056	2.67 (0.1051)
805025057	2.72 (0.1071)
805025058	2.37 (0.0933)

E: INSPECTION

Disassembled parts should be washed clean first and then inspected carefully.

1) Bearings

Replace the 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 the 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 the main shaft rear plate. <Ref. to MT-75, ADJUSTMENT, Main Shaft Assembly for Single-Range.>

INPUT SHAFT ASSEMBLY

MANUAL TRANSMISSION AND DIFFERENTIAL

17. Input Shaft Assembly

A: REMOVAL

- 1) Remove the manual transmission assembly from vehicle. <Ref. to MT-33, REMOVAL, Manual Transmission Assembly.>
- 2) Remove the transfer case with extension case assembly. <Ref. to MT-48, REMOVAL, Transfer Case and Extension Case Assembly.>
- 3) Remove the transmission case. <Ref. to MT-61, REMOVAL, Transmission Case.>
- 4) Remove the drive pinion shaft assembly. <Ref. to MT-86, REMOVAL, Drive Pinion Shaft Assembly.>
- 5) Remove the main shaft assembly and input shaft assembly.

B: INSTALLATION

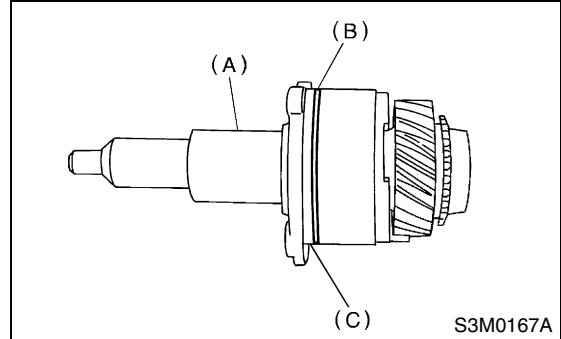
- 1) Install the needle bearing onto the front of transmission main shaft assembly.
- 2) Connect the main shaft assembly and input shaft assembly.
- 3) Install the needle bearing outer race knock pin hole into transmission case knock pin.
- 4) Install the drive pinion assembly. <Ref. to MT-86, INSTALLATION, Drive Pinion Shaft Assembly.>
- 5) Install the transmission case. <Ref. to MT-63, INSTALLATION, Transmission Case.>
- 6) Install the transfer case with extension case assembly. <Ref. to MT-48, INSTALLATION, Transfer Case and Extension Case Assembly.>
- 7) Install the manual transmission assembly on vehicle. <Ref. to MT-37, INSTALLATION, Manual Transmission Assembly.>

C: DISASSEMBLY

- 1) Remove the O-ring from input shaft holder. Also, remove the input shaft holder shim.

NOTE:

- Use a new O-ring.
- Number of shims used varies from none to two.

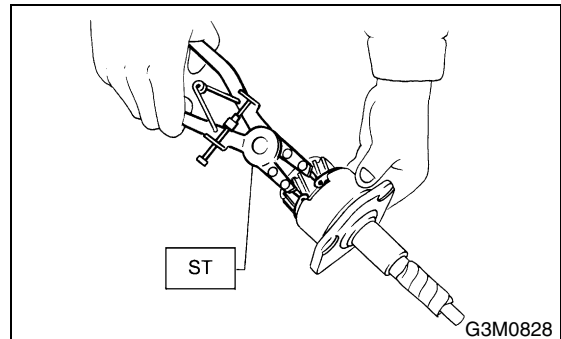


- (A) Input shaft holder
(B) O-ring
(C) Input shaft holder shim

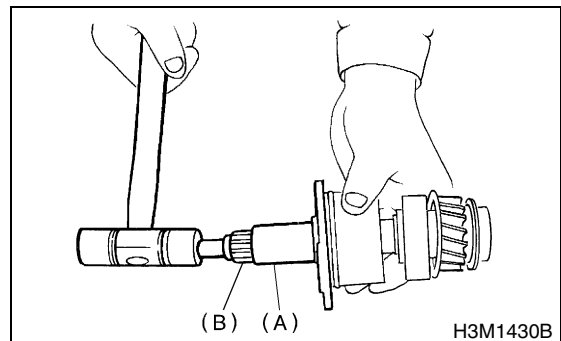
- 2) Put vinyl tape around the input shaft splines to protect oil seal from damage.

- 3) Remove the inner snap ring.

ST 398663600 PLIERS



- 4) Hold the input shaft holder stationary and remove the input shaft by tapping its end with a plastic hammer.

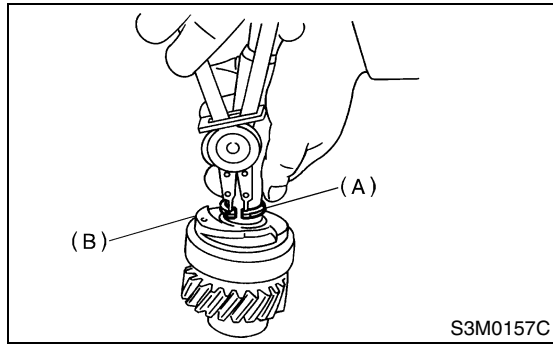


- (A) Input shaft holder
(B) Input shaft

INPUT SHAFT ASSEMBLY

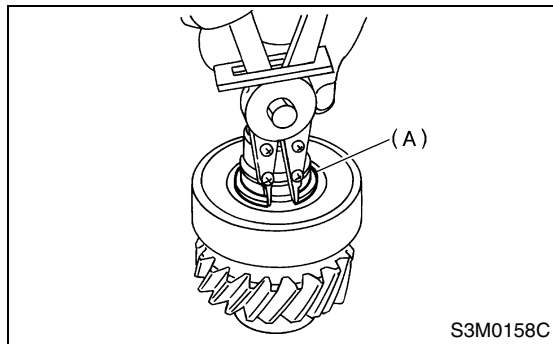
MANUAL TRANSMISSION AND DIFFERENTIAL

5) Remove the outer snap ring. Then remove the oil squeeze plate and straight pin.



- (A) Snap ring
- (B) Oil squeeze plate

6) Remove the snap ring.



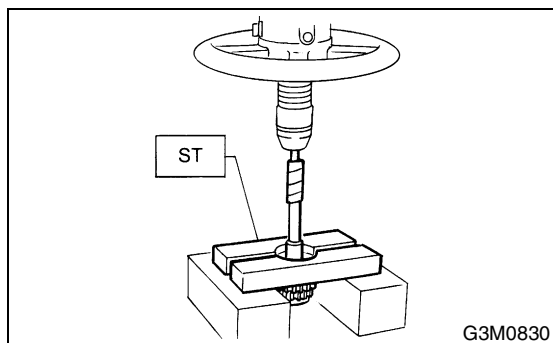
- (A) Snap ring

7) Using a press and ST, remove the ball bearing.

NOTE:

Remove the inner snap ring before pressing.

ST 498077000 REMOVER



8) Remove the oil seal from input shaft holder.

D: ASSEMBLY

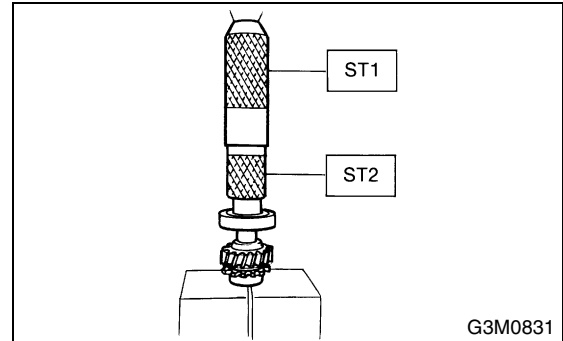
1) Install the ball bearing onto input shaft.

NOTE:

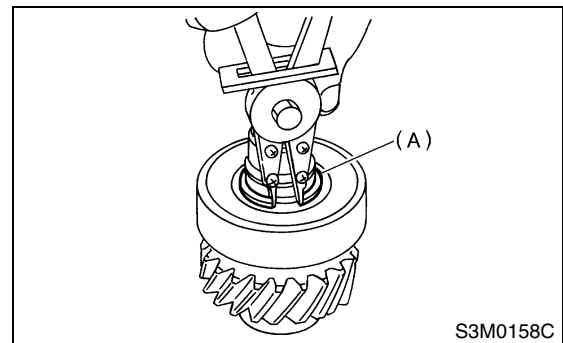
Place the snap ring between input shaft gear and ball bearing beforehand. Use the table at 5) as a guide in selecting a suitable snap ring.

ST1 899580100 INSTALLER

ST2 399513600 INSTALLER



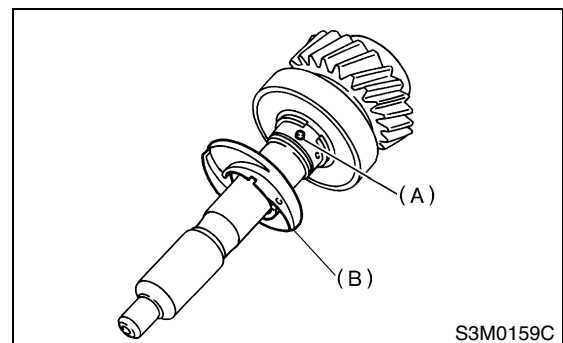
2) Install the snap ring on input shaft.



- (A) Snap ring

3) Inspect the clearance between ball bearing and snap ring. <Ref. to MT-85, INSPECTION, Input Shaft Assembly.>

4) Install the straight pin and oil squeeze plate to input shaft.



- (A) Straight pin
- (B) Oil squeeze plate

5) Install the snap ring.

INPUT SHAFT ASSEMBLY

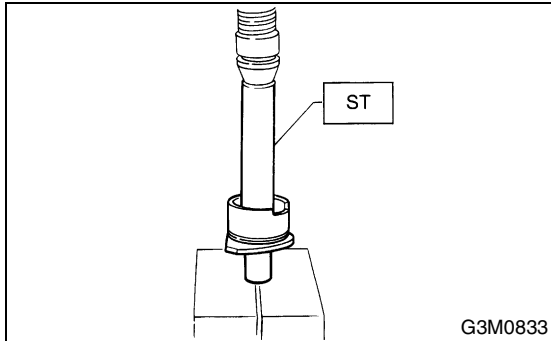
MANUAL TRANSMISSION AND DIFFERENTIAL

6) Drive the oil seal into input shaft holder.

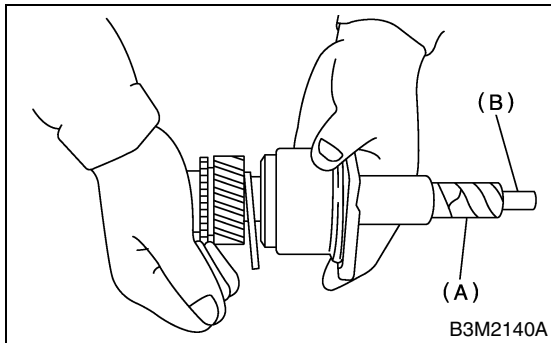
NOTE:

Apply a coat of grease to sealing lips before installing oil seal.

ST 398507703 DUMMY COLLAR



7) Wind vinyl tape around the shaft splines and insert input shaft into holder by lightly tapping it by hand.



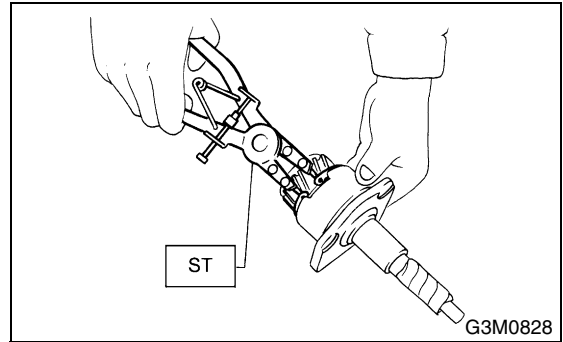
- (A) Vinyl tape
- (B) Input shaft

8) Install the snap ring to input shaft holder.

NOTE:

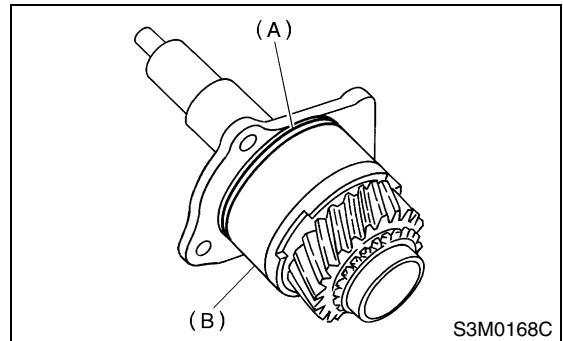
Select a suitable snap ring so that clearance between snap ring and bearing is held within 0 to 0.12 mm (0 to 0.0047 in).

ST 398663600 PLIERS



Snap ring	
Part No.	Thickness mm (in)
805168020	1.84 (0.0724)
805168030	1.92 (0.0756)
805168040	2.00 (0.0787)

9) Install the O-ring to input shaft holder.



- (A) O-ring
- (B) Input shaft holder

INPUT SHAFT ASSEMBLY

MANUAL TRANSMISSION AND DIFFERENTIAL

E: INSPECTION

Disassembled parts should be washed clean first and then inspected carefully.

1) Bearings

Replace the 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 the 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.

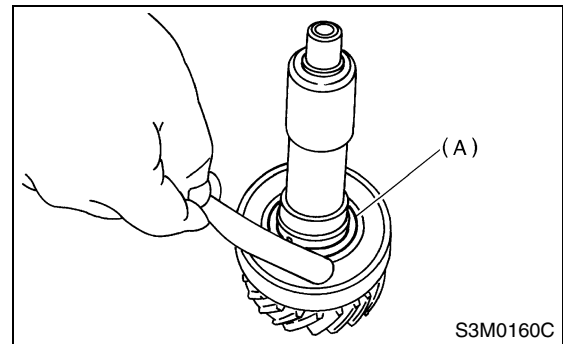
8) Gearshift mechanism

Repair or replace the gearshift mechanism if excessively worn, bent, or defective in any way.

9) Measure the clearance between snap ring and ball bearing using thickness gauge.

Clearance:

0 — 0.12 mm (0 — 0.0047 in)



(A) Snap ring

If the measurement is not within specification, select a suitable snap ring.

Snap ring	
Part No.	Thickness mm (in)
805028050	2.48 (0.0976)
805028060	2.56 (0.1008)
805028070	2.64 (0.1039)

DRIVE PINION SHAFT ASSEMBLY

MANUAL TRANSMISSION AND DIFFERENTIAL

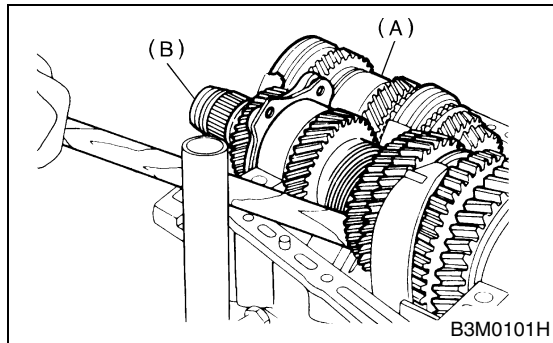
18. Drive Pinion Shaft Assembly

A: REMOVAL

- 1) Remove the manual transmission assembly from vehicle. <Ref. to MT-33, REMOVAL, Manual Transmission Assembly.>
- 2) Remove the transfer case with extension case assembly. <Ref. to MT-48, REMOVAL, Transfer Case and Extension Case Assembly.>
- 3) Remove the transmission case. <Ref. to MT-61, REMOVAL, Transmission Case.>
- 4) Remove the drive pinion shaft assembly.

NOTE:

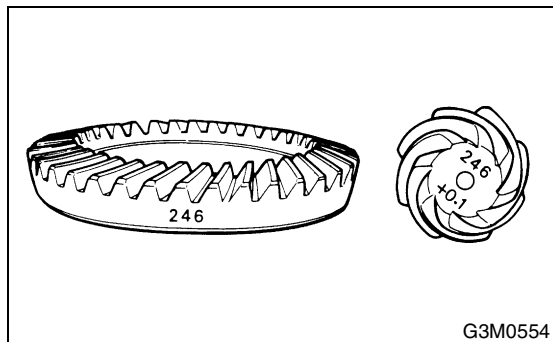
Use a hammer handle, etc. to remove if too tight.



- (A) Main shaft assembly
(B) Drive pinion shaft assembly

B: INSTALLATION

- 1) Remove the 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.



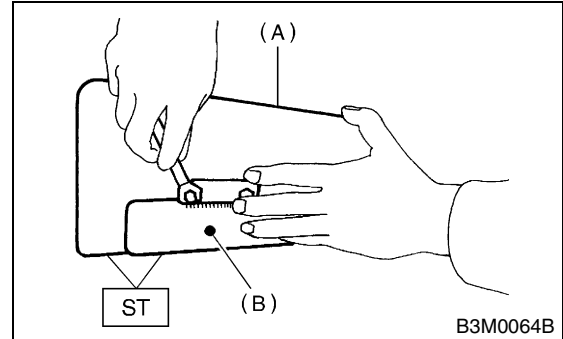
- 3) Place the drive pinion shaft assembly on right hand transmission main case without shim and tighten the bearing mounting bolts.

- 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



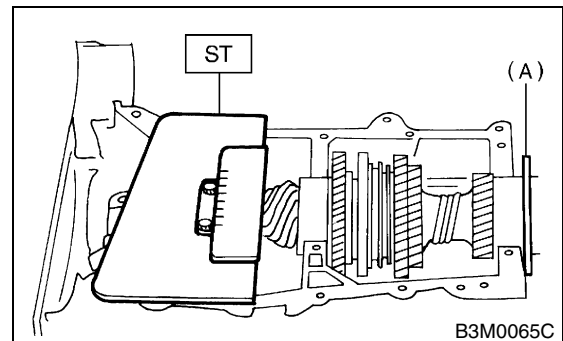
- (A) Plate
(B) Scale

- 5) Position the ST by inserting the knock pin of ST into the knock hole in 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 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 indicated 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 the differential assembly. <Ref. to MT-95, INSTALLATION, Front Differential Assembly.>

10) Set the 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 the suitable 1st — 2nd, 3rd — 4th and 5th shifter fork so that coupling sleeve and reverse driven gear are positioned in the center of their synchronizing mechanisms. <Ref. to MT-92, INSPECTION, Drive Pinion Shaft Assembly.>

11) Install the transmission case. <Ref. to MT-63, INSTALLATION, Transmission Case.>

12) Install the transfer case with extension case assembly. <Ref. to MT-48, INSTALLATION, Transfer Case and Extension Case Assembly.>

13) Install the manual transmission assembly to vehicle. <Ref. to MT-33, Manual Transmission Assembly.>

C: DISASSEMBLY

NOTE:

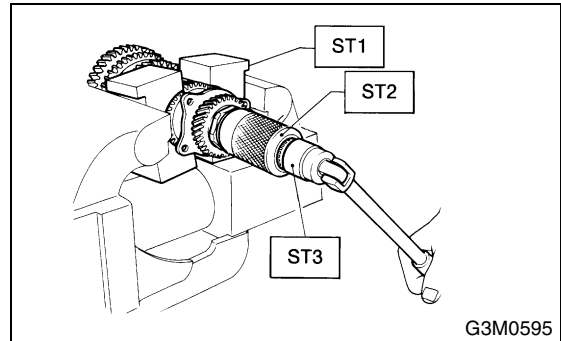
Attach a cloth to the end of driven shaft (on the frictional side of thrust needle bearing) during disassembly or reassembly to prevent damage.

1) Straighten the lock nut at staked portion. Remove the lock nut using ST1, ST2 and ST3.

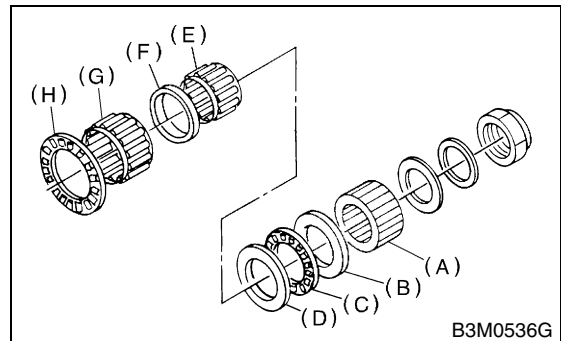
ST1 899884100 HOLDER

ST2 498427100 STOPPER

ST3 899988608 SOCKET WRENCH (27)



2) Withdraw the drive pinion from driven shaft. Remove the 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)

DRIVE PINION SHAFT ASSEMBLY

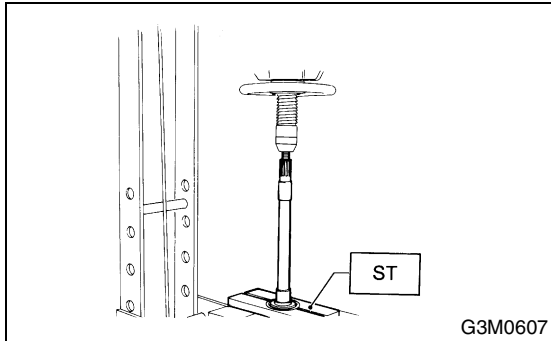
MANUAL TRANSMISSION AND DIFFERENTIAL

3) Remove the roller bearing and washer using ST and press.

NOTE:

Do not reuse the roller bearing.

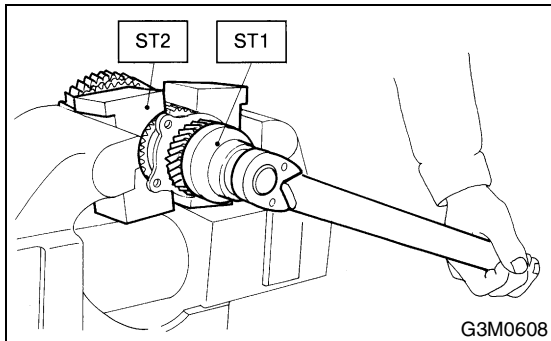
ST 498077000 REMOVER



4) Straighten the lock nut at staked portion. Remove the lock nut using ST1 and ST2.

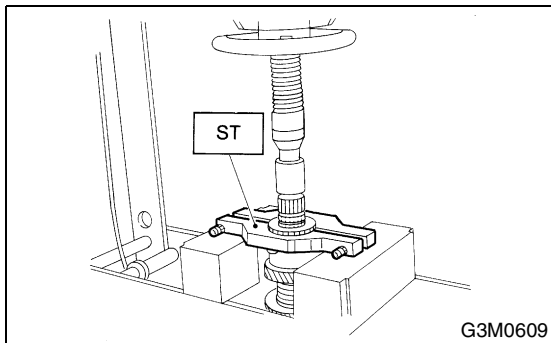
ST1 499987300 SOCKET WRENCH (50)

ST2 899884100 HOLDER



5) Remove the 5th driven gear using ST.

ST 499857000 5TH DRIVEN GEAR REMOVER

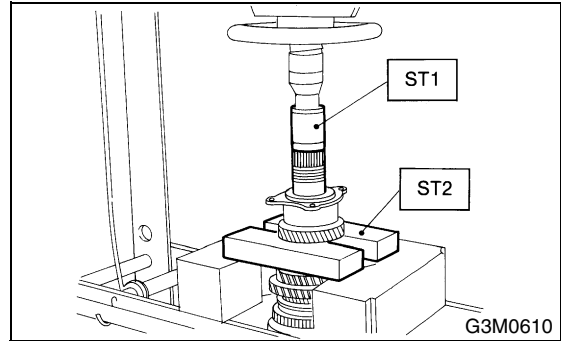


6) Remove the woodruff key.

7) Remove the roller bearing, 3rd-4th driven gear using ST1 and ST2.

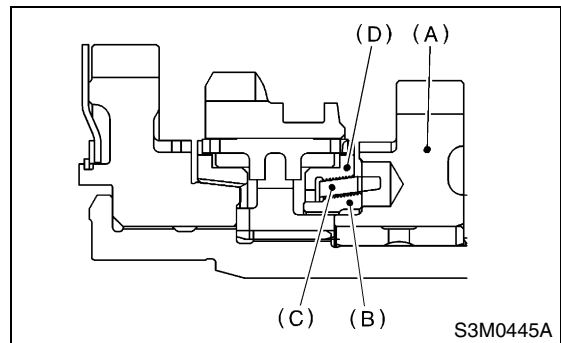
ST1 499757002 INSTALLER

ST2 899714110 REMOVER



8) Remove the key.

9) Remove the 2nd driven gear, inner baulk ring, synchro cone and outer baulk ring. (Except 1.6 L model)



(A) 2nd driven gear

(B) Inner baulk ring

(C) Synchro cone

(D) Outer baulk ring

10) Remove the 2nd driven gear assembly. (1.6 L model)

DRIVE PINION SHAFT ASSEMBLY

MANUAL TRANSMISSION AND DIFFERENTIAL

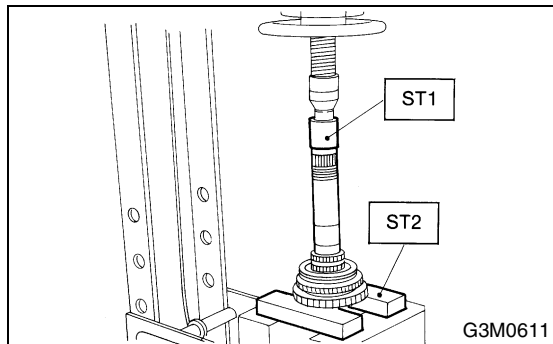
11) Remove the 1st driven gear, 2nd gear bushing, gear and hub using ST1 and ST2.

NOTE:

Replace the gear and hub if necessary. Do not attempt to disassemble if at all possible because they must engage at a specified point. If they should be disassembled, mark engagement point beforehand.

ST1 499757002 INSTALLER

ST2 899714110 REMOVER



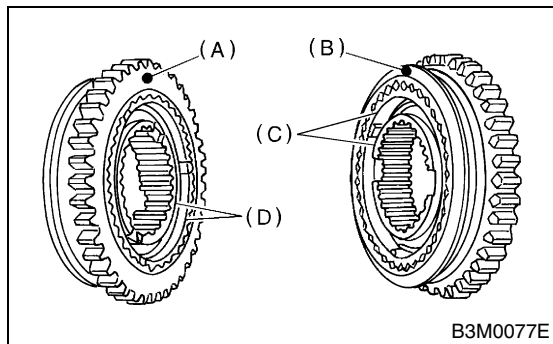
12) Remove the sub gear for 1st driven gear.

D: ASSEMBLY

1) Install the sleeve and assembly by matching alignment marks.

NOTE:

- Use a new gear and hub assembly, if gear or hub have been replaced.



- (A) 1st gear side
- (B) 2nd gear side
- (C) Flush surface
- (D) Stepped surface

2) Install the washer, snap ring and sub gear to 1st driven gear.

3) Install the 1st driven gear, 1st bulk ring, gear and hub assembly onto driven shaft.

NOTE:

- Take care to install the gear and hub assembly in proper direction.
- Align the bulk ring and gear & hub assembly with key groove.

4) Install the 2nd driven gear bushing onto driven shaft using ST1, ST2 and press.

CAUTION:

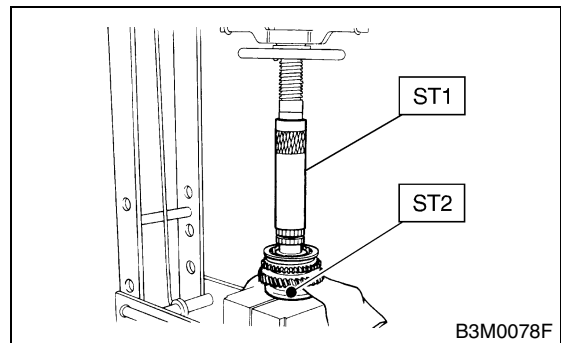
Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).

NOTE:

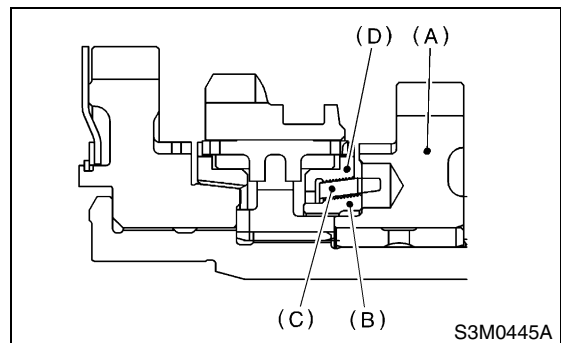
- Attach a cloth to the end of driven shaft to prevent damage.
- When press fitting, align the oil holes of shaft and bush.

ST1 499277200 INSTALLER

ST2 499587000 INSTALLER



5) Install the 2nd driven gear, inner bulk ring, synchro cone, outer bulk ring and insert onto driven shaft. (Except 1.6 L model)



- (A) 2nd driven gear
- (B) Inner bulk ring
- (C) Synchro cone
- (D) Outer bulk ring

6) Install the 2nd driven gear, 1st-2nd bulk ring and insert onto driven shaft. (1.6 L model)

DRIVE PINION SHAFT ASSEMBLY

MANUAL TRANSMISSION AND DIFFERENTIAL

7) After installing the key on driven shaft, install the 3rd-4th driven gear using ST and press.

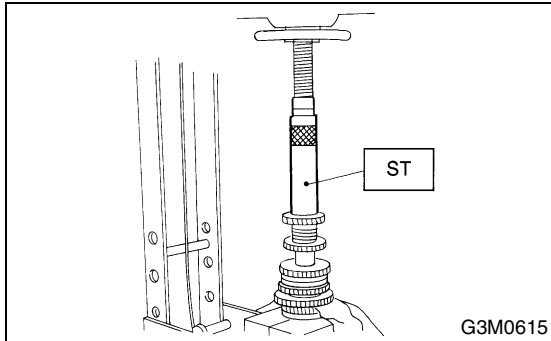
CAUTION:

Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).

NOTE:

Align the groove in baulk ring with insert.

ST 499277200 INSTALLER

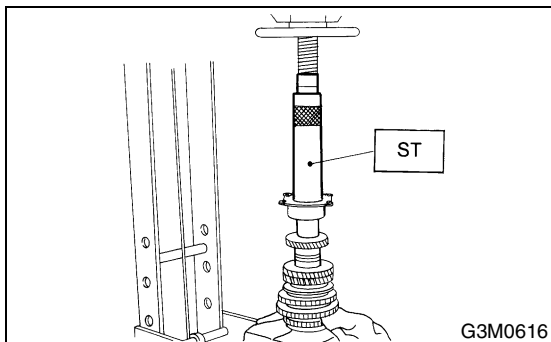


8) Install a set of roller bearings onto the driven shaft using ST and press.

CAUTION:

Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).

ST 499277200 INSTALLER

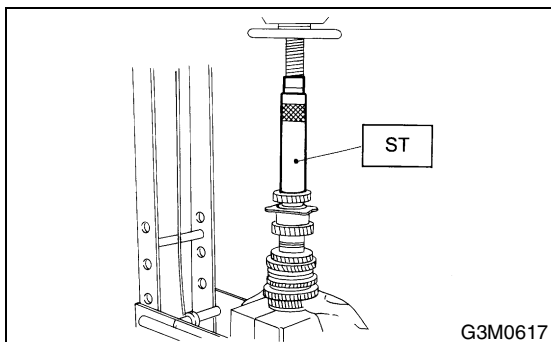


9) Position the woodruff key in groove on the rear of driven shaft. Install the 5th driven gear onto drive shaft using ST and press.

CAUTION:

Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).

ST 499277200 INSTALLER

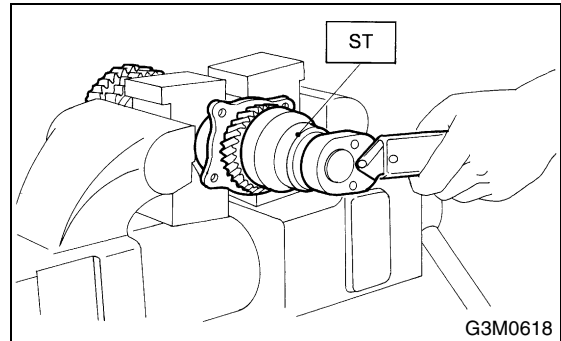


10) Install the lock washer. Install the lock nut and tighten to the specified torque using ST.

ST 499987300 SOCKET WRENCH (50)

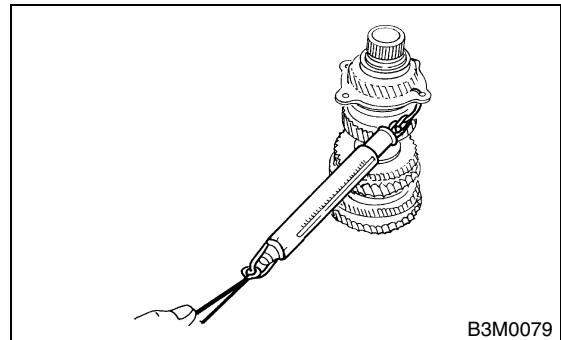
Tightening torque:

265 N·m (27 kgf·m, 195 ft·lb)



NOTE:

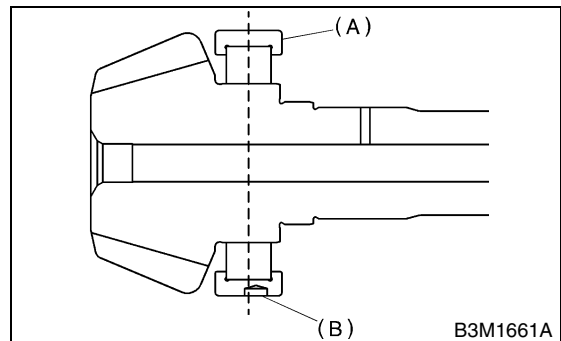
- Stake the lock nut at two points.
- Using the spring balancer, check that starting torque of roller bearing is 0.1 to 1.5 N (0.01 to 0.15 kgf, 0.02 to 0.33 ft).



11) Install the roller bearing onto drive pinion.

NOTE:

When installing the roller bearing, note its directions (front and rear) because the knock pin hole in outer race is offset.



- (A) Roller bearing
- (B) Knock pin hole

DRIVE PINION SHAFT ASSEMBLY

MANUAL TRANSMISSION AND DIFFERENTIAL

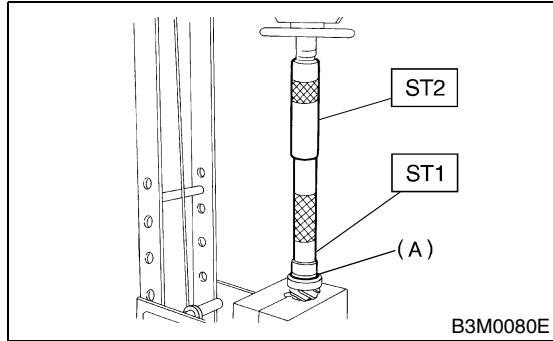
12) Install the washer using ST1, ST2 and press.

NOTE:

- Discard the old lock nuts, replace with new ones.
- Secure the lock nut in four places.

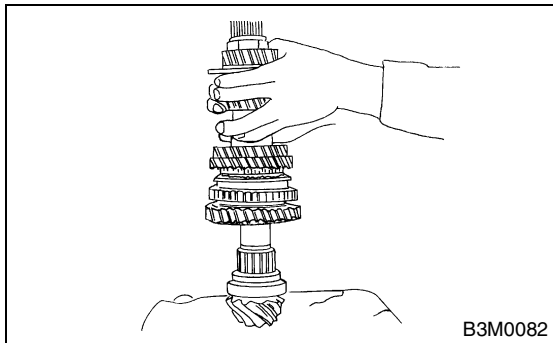
ST1 499277100 BUSH 1-2 INSTALLER

ST2 499277200 INSTALLER



(A) Washer

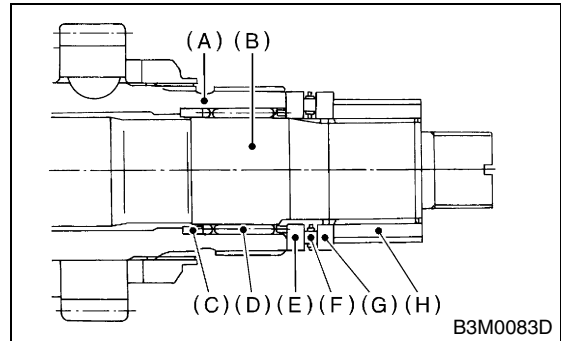
13) Install the thrust bearing and needle bearing. Install the driven shaft assembly.



14) Install the 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 the 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

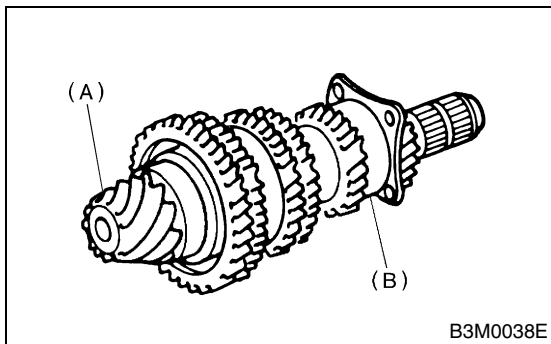
E: INSPECTION

Disassembled parts should be washed clean first and then inspected carefully.

1) Bearings

Replace the bearings in the following cases:

- Bearings whose balls, outer races and inner races are broken or rusty.
- Worn bearings
- Bearings that fail to turn smoothly or make abnormal noise when turned after gear oil lubrication.
- The ball bearing on the rear side of the drive pinion shaft should be checked for smooth rotation before the drive pinion assembly is disassembled. In this case, because a preload is working on the bearing, its rotation feels like it is slightly dragging unlike the other bearings.



- (A) Drive pinion shaft
(B) Ball bearing

- Bearings having other defects

2) Bushing (each gear)

Replace the bushing in the following cases:

- When the sliding surface is damaged or abnormally worn.
- When the inner wall is abnormally worn.

3) Gears

- Replace the 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.

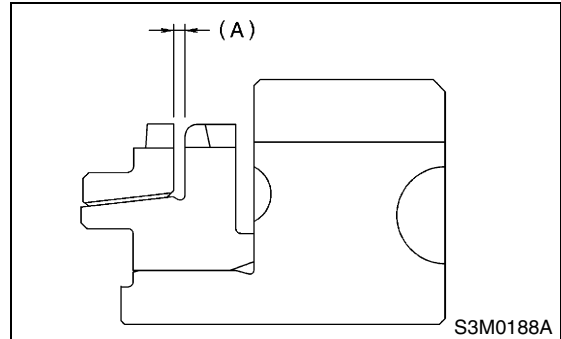
4) Baulk ring

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):

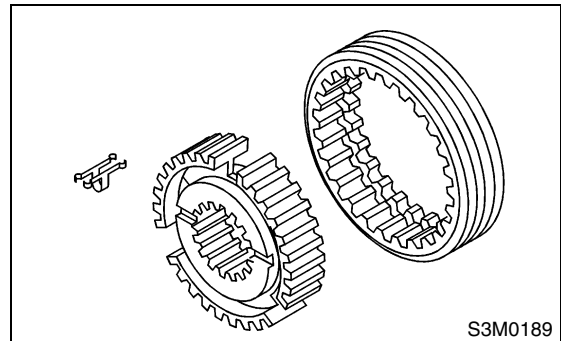
0.5 — 1.0 mm (0.020 — 0.040 in)



- 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.

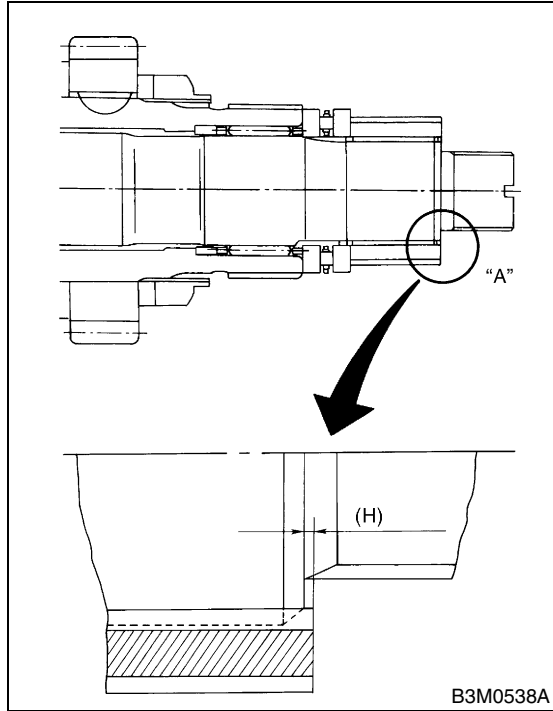
DRIVE PINION SHAFT ASSEMBLY

MANUAL TRANSMISSION AND DIFFERENTIAL

F: ADJUSTMENT

1. THRUST BEARING PRELOAD

1) After completing the preceding steps 1) through 3), select the adjusting washer No. 1 so that dimension (H) is zero through visual check. Position the washer (18.3 × 30 × 4) and lock washer (18 × 30 × 2) and install the lock nut (18 × 13.5).

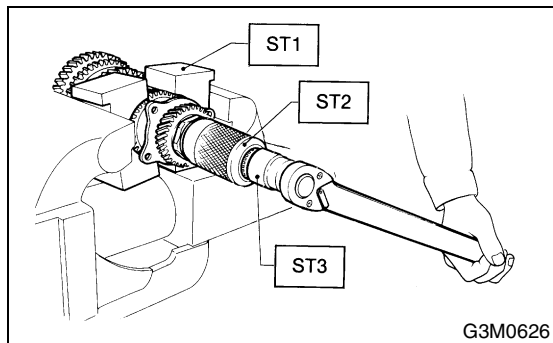


2) Using the ST1, ST2 and ST3, tighten the lock nut to specified torque.

ST1 899884100 HOLDER
 ST2 498427100 STOPPER
 ST3 899988608 SOCKET WRENCH (27)

Tightening torque:

118 N·m (12 kgf·m, 86.8 ft·lb)



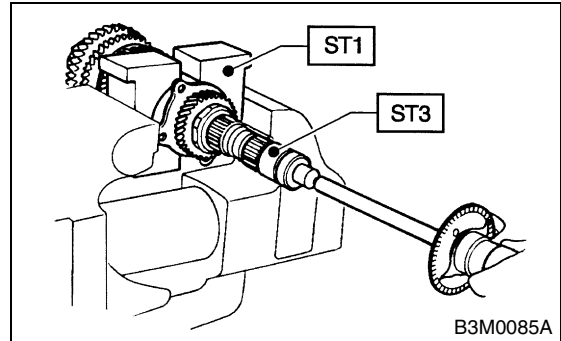
3) After removing the ST2, measure the starting torque using torque driver.

ST1 899884100 HOLDER
 ST3 899988608 SOCKET WRENCH (27)

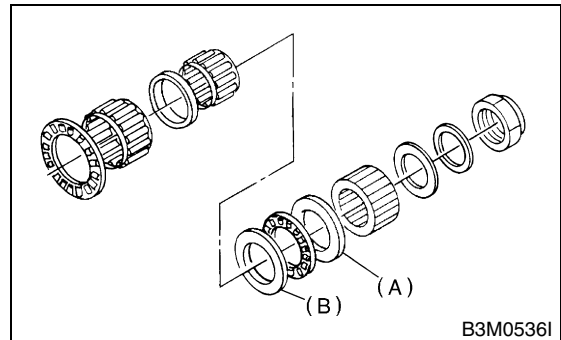
Starting torque:

0.3 — 0.8 N·m

(0.03 — 0.08 kgf·m, 0.2 — 0.6 ft·lb)



4) If the starting torque is not within specified limit, select a new adjusting washer No. 1 and recheck starting torque.



(A) Adjusting washer No.1

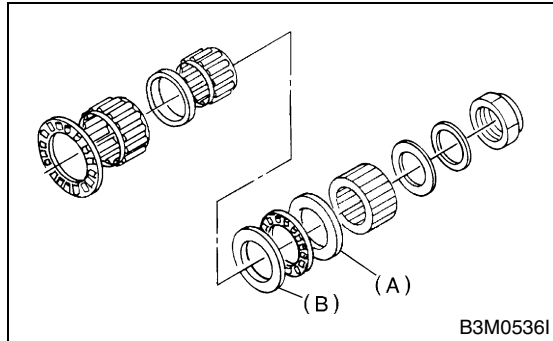
(B) Adjusting washer No.2

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 the 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 the starting torque is within specified range, then clinch the lock nut at four positions.

FRONT DIFFERENTIAL ASSEMBLY

MANUAL TRANSMISSION AND DIFFERENTIAL

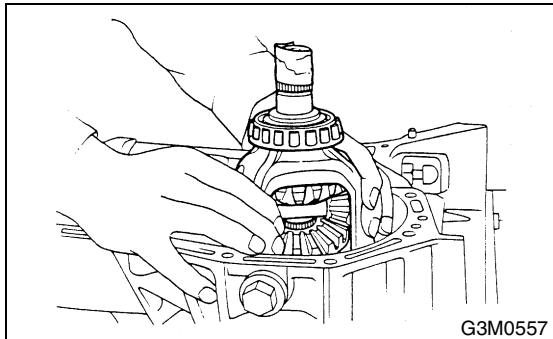
19. Front Differential Assembly

A: REMOVAL

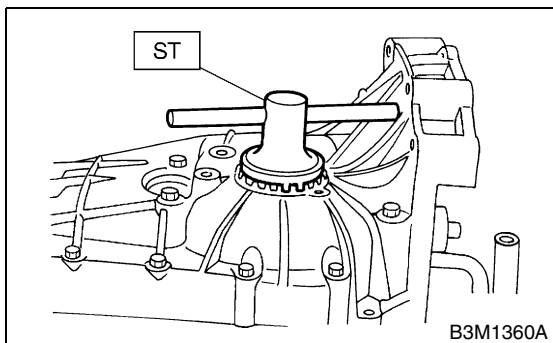
- 1) Remove the manual transmission assembly from vehicle. <Ref. to MT-33, REMOVAL, Manual Transmission Assembly.>
- 2) Remove the transfer case with extension case assembly. <Ref. to MT-48, REMOVAL, Transfer Case and Extension Case Assembly.>
- 3) Remove the transmission case. <Ref. to MT-61, REMOVAL, Transmission Case.>
- 4) Remove the drive pinion shaft assembly. <Ref. to MT-86, REMOVAL, Drive Pinion Shaft Assembly.>
- 5) Remove the main shaft assembly.
Single-range model
<Ref. to MT-68, REMOVAL, Main Shaft Assembly for Single-Range.>
Dual-range model
<Ref. to MT-76, REMOVAL, Main Shaft Assembly for Dual-Range.>
- 6) Remove the differential assembly.

NOTE:

- Be careful not to confuse the right and left roller bearing outer races.
- Be careful not to damage the retainer oil seal.



- 7) Remove the differential side retainers using ST.
ST 499787000 WRENCH ASSY

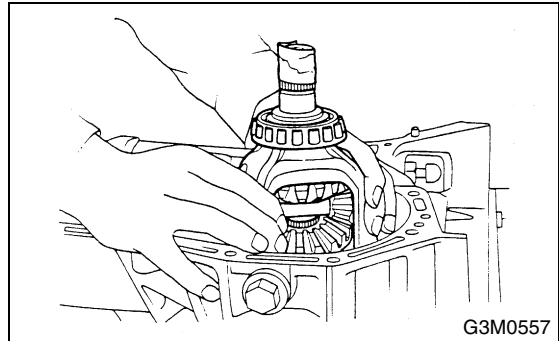


B: INSTALLATION

- 1) Install the differential side retainers using ST.
ST 499787000 WRENCH ASSY
- 2) Install the differential assembly.

NOTE:

- Be careful not to fold the sealing lip of oil seal.
- Wrap the right and left spline sections of axle shaft with vinyl tape to prevent scratches.



- 3) Install the main shaft assembly. <Ref. to MT-76, INSTALLATION, Main Shaft Assembly for Dual-Range.>
- 4) Install the drive pinion assembly. <Ref. to MT-86, INSTALLATION, Drive Pinion Shaft Assembly.>
- 5) Install the transmission case. <Ref. to MT-63, INSTALLATION, Transmission Case.>
- 6) Install the transfer case with extension case assembly. <Ref. to MT-48, INSTALLATION, Transfer Case and Extension Case Assembly.>
- 7) Install the manual transmission assembly to vehicle. <Ref. to MT-37, INSTALLATION, Manual Transmission Assembly.>

FRONT DIFFERENTIAL ASSEMBLY

MANUAL TRANSMISSION AND DIFFERENTIAL

C: DISASSEMBLY

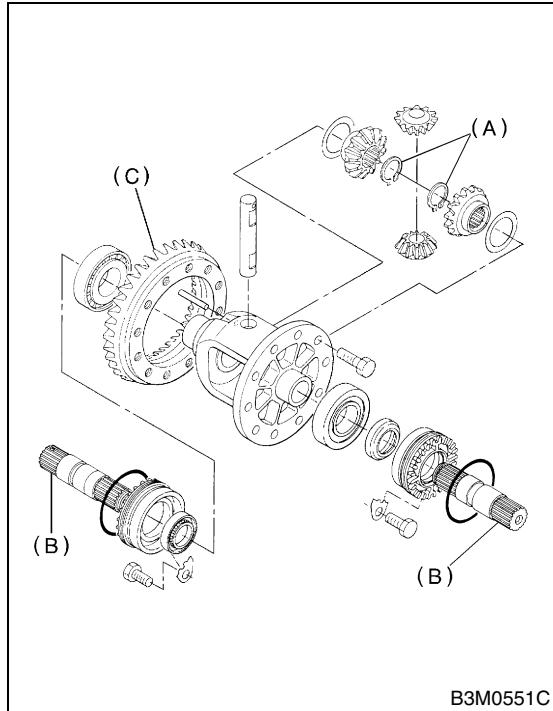
1. DIFFERENTIAL CASE ASSEMBLY

1) Remove the right and left snap rings from differential, and then remove the two axle drive shafts.

NOTE:

During reassembly, reinstall each axle drive shaft in the same place from which it was removed.

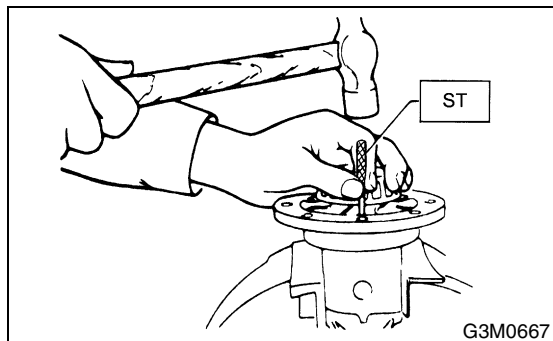
2) Loosen the twelve bolts and remove the hypoid driven gear.



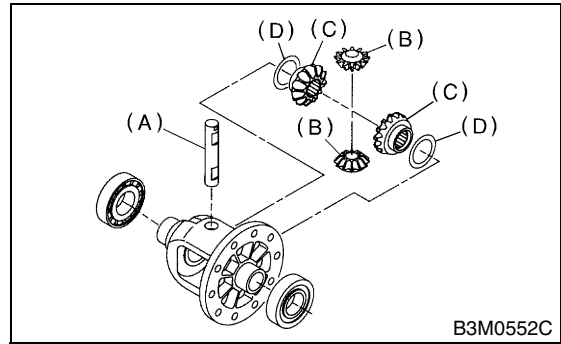
- (A) Snap ring
- (B) Axle drive shaft
- (C) Hypoid driven gear

3) Drive out the straight pin from differential assembly toward hypoid driven gear.

ST 899904100 REMOVER

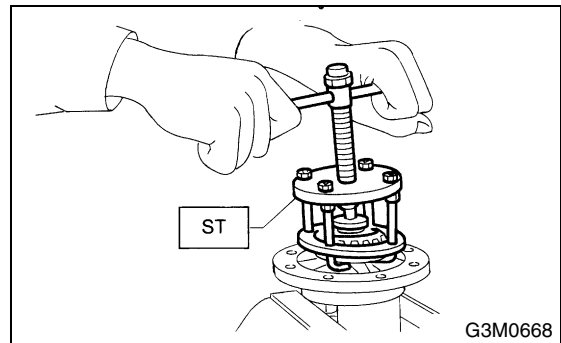


4) Pull out the pinion shaft, and remove the differential bevel pinion and gear and washer.



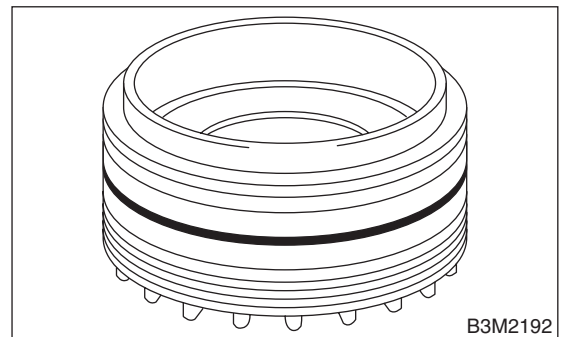
- (A) Pinion shaft
- (B) Bevel pinion
- (C) Bevel gear
- (D) Washer

5) Remove the roller bearing using ST.
ST 399527700 PULLER SET



2. SIDE RETAINER

1) Remove the O-ring.



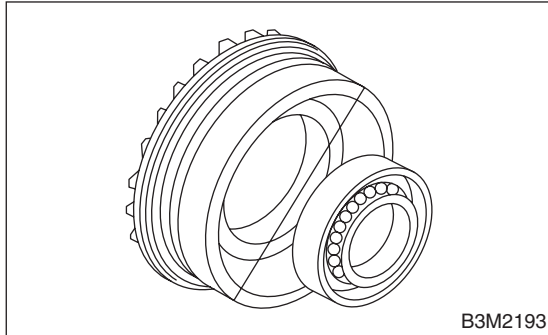
FRONT DIFFERENTIAL ASSEMBLY

MANUAL TRANSMISSION AND DIFFERENTIAL

2) Remove the oil seal.

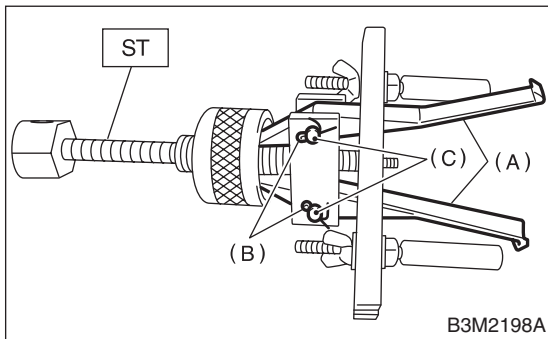
NOTE:

Do not reuse the oil seal. Prepare a new oil seal.



3) Remove either side of split pin and pin, and remove the claw.

ST 398527700 PULLER ASSY



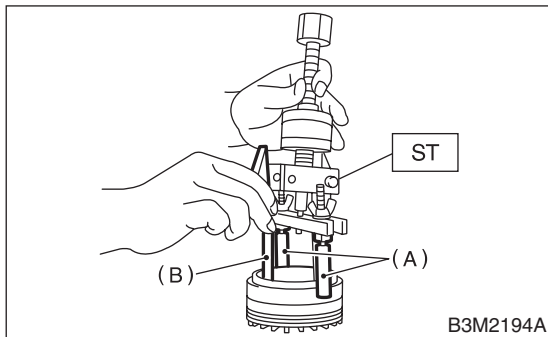
- (A) Claw
- (B) Split pin
- (C) Pin

4) Attach two claws to the outer race securely, and set ST to side retainer.

ST 398527700 PULLER ASSY

NOTE:

- Attach notch portions of the two shafts securely to side retainer.
- Restore the removed claws to original position, and install the pin and split pin.



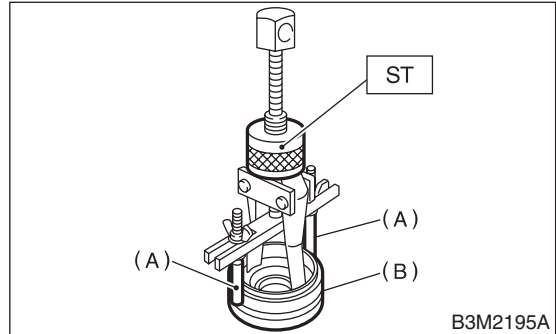
- (A) Shaft
- (B) Claw

5) Remove the bearing outer race from side retainer.

ST 398527700 PULLER ASSY

NOTE:

- Fix the shaft of ST secure enough that it will not loosen and fall from side retainer.
- When replacing the bearing outer race, replace it with inner race as a set.



- (A) Shaft
- (B) Side retainer

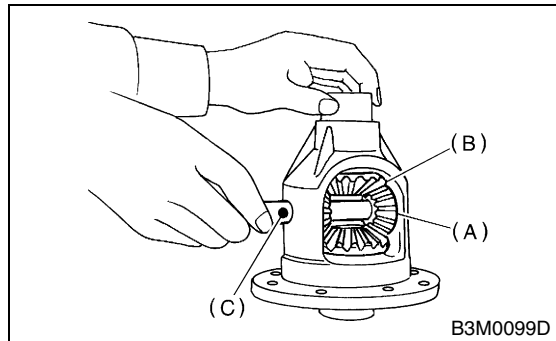
D: ASSEMBLY

1. DIFFERENTIAL CASE ASSEMBLY

1) Install the 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 the backlash between bevel gear and pinion. If it is not within specifications, install a suitable washer to adjust it. <Ref. to MT-100, ADJUSTMENT, Front Differential Assembly.>

NOTE:

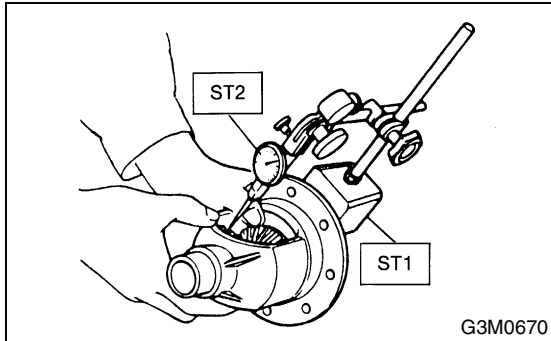
Be sure the pinion gear tooth contacts adjacent gear teeth during measurement.

ST1 498247001 MAGNET BASE

ST2 498247100 DIAL GAUGE

Standard backlash:

0.13 — 0.18 mm (0.0051 — 0.0071 in)

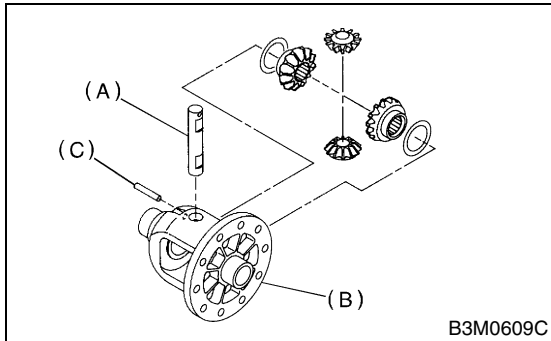


3) Align the pinion shaft and differential case at their holes, and drive the straight pin into holes from the hypoid driven gear side, using ST.

NOTE:

Lock the straight pin after installing.

ST 899904100 REMOVER



- (A) Pinion shaft
- (B) Differential case
- (C) Straight pin

4) Install the roller bearing to differential case.

CAUTION:

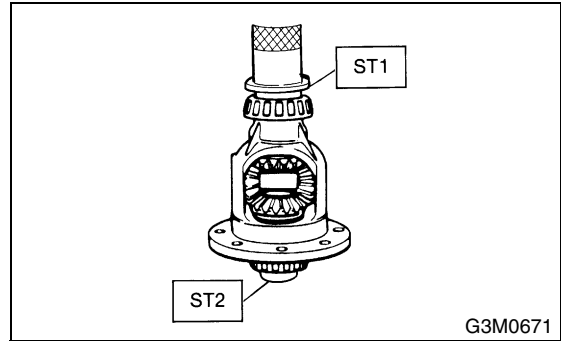
Do not apply pressure in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).

NOTE:

Be careful because the roller bearing outer races are used as a set.

ST1 499277100 BUSH 1-2 INSTALLER

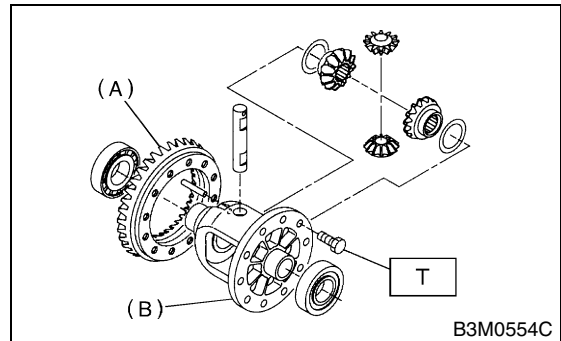
ST2 398497701 ADAPTER



5) Install the 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

FRONT DIFFERENTIAL ASSEMBLY

MANUAL TRANSMISSION AND DIFFERENTIAL

2. SIDE RETAINER

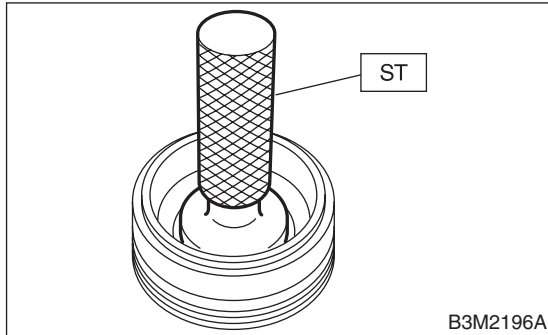
1) Install the bearing outer race to side retainer.

NOTE:

Press-in while being careful not to scratch the side retainer and bearing outer race.

2) Install a new oil seal.

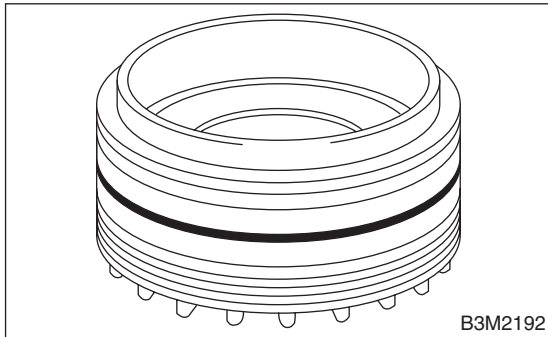
ST 49979700 INSTALLER



3) Install a new O-ring.

NOTE:

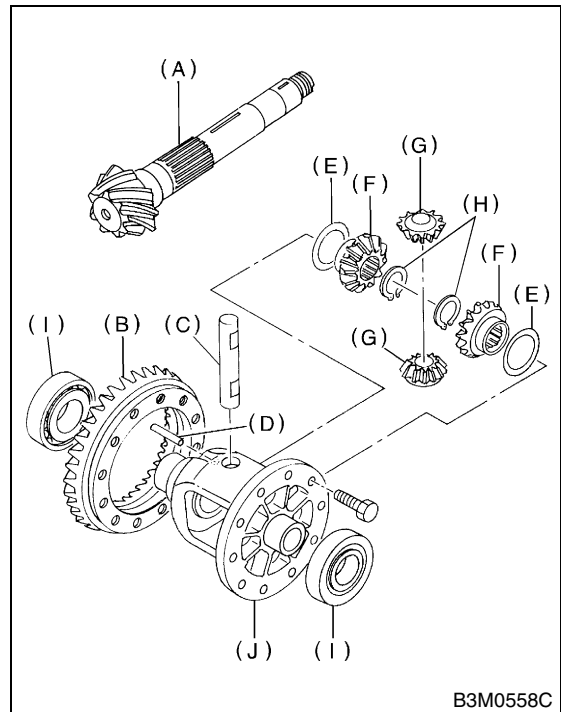
Do not stretch or damage the O-ring.



E: INSPECTION

Repair or replace the differential gear in the following cases:

- The hypoid drive gear and drive pinion shaft tooth surface are damaged, excessively worn, or seized.
- The roller bearing on the drive pinion shaft has a worn or damaged roller path.
- There is damage, wear, or seizure of the differential bevel pinion, differential bevel gear, washer, pinion shaft, and straight pin.
- The differential case has worn or damaged sliding surfaces.



- (A) Drive pinion shaft
- (B) Hypoid driven gear
- (C) Pinion shaft
- (D) Straight pin
- (E) Washer
- (F) Differential bevel gear
- (G) Differential bevel pinion
- (H) Snap ring
- (I) Roller bearing
- (J) Differential case

FRONT DIFFERENTIAL ASSEMBLY

MANUAL TRANSMISSION AND DIFFERENTIAL

1. BEVEL PINION GEAR BACKLASH

Measure the backlash between bevel gear and pinion. If it is not within specifications, install a suitable washer to adjust it.

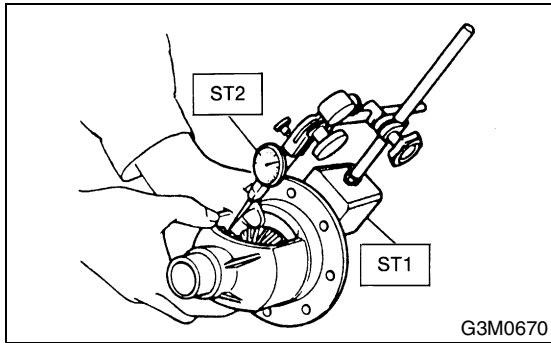
NOTE:

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)



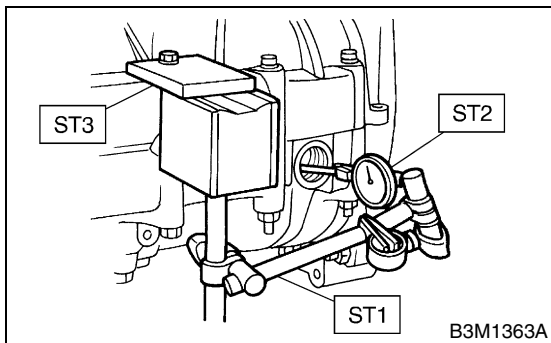
2. HYPOID GEAR BACKLASH

Set the 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)



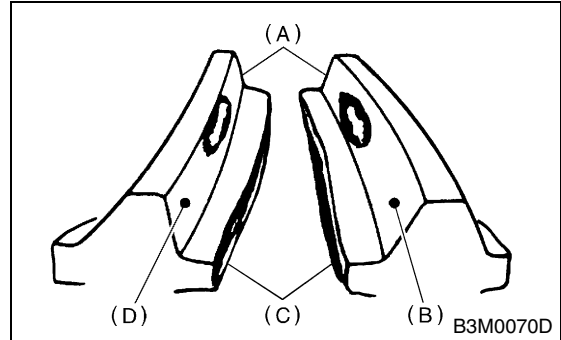
NOTE:

If the backlash is outside specified range, adjust it by turning the holder in right side case.

3. TOOTH CONTACT OF HYPOID GEAR

Check the tooth contact of hypoid gear as follows: Apply a uniform thin coat of red lead on both tooth surfaces of 3 or 4 teeth of the hypoid gear. Move the hypoid gear back and forth by turning the transmission main shaft until a definite contact pattern is developed on hypoid gear, and judge whether face contact is correct. If it is inaccurate, make adjustment. <Ref. to MT-100, ADJUSTMENT, Front Differential Assembly.>

- Tooth contact is correct.



- (A) Toe
- (B) Coast side
- (C) Heel
- (D) Drive side

F: ADJUSTMENT

1. BEVEL PINION GEAR BACKLASH

- 1) Disassemble the front differential. <Ref. to MT-95, REMOVAL, Front Differential Assembly.>
- 2) Select a different washer from the table and install.

Washer	
Part No.	Thickness mm (in)
803038021	0.925 — 0.950 (0.0364 — 0.0374)
803038022	0.975 — 1.000 (0.0384 — 0.0394)
803038023	1.025 — 1.050 (0.0404 — 0.0413)

- 3) Adjust until the specified value is obtained.

Standard backlash:

0.13 — 0.18 mm (0.0051 — 0.0071 in)

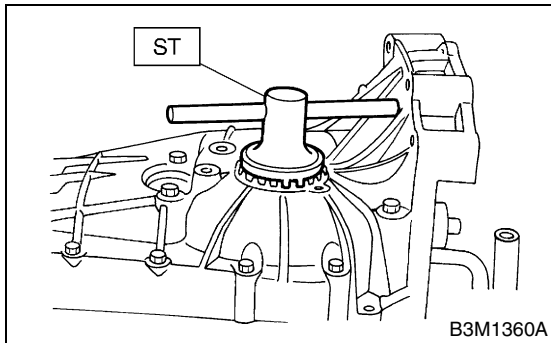
FRONT DIFFERENTIAL ASSEMBLY

MANUAL TRANSMISSION AND DIFFERENTIAL

2. HYPOID GEAR BACKLASH

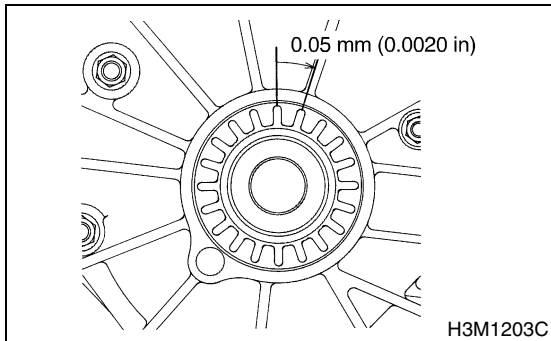
Adjust backlash by turning the holder in right side case.

ST 499787000 WRENCH ASSY



NOTE:

Each time holder rotates one tooth, backlash changes by 0.05 mm (0.020 in).

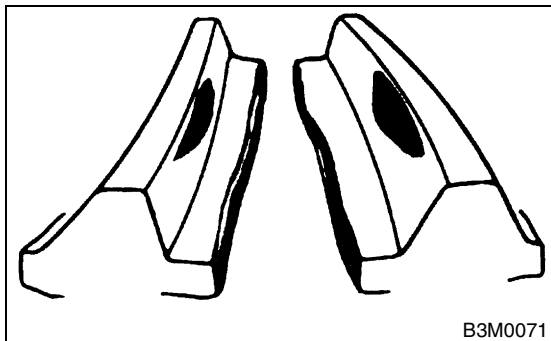


3. TOOTH CONTACT OF HYPOID GEAR

Adjust until the teeth contact is correct.

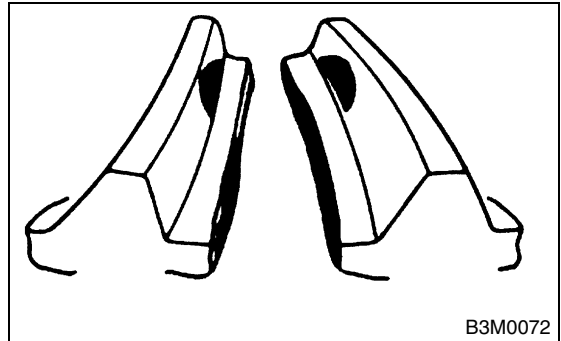
- Backlash is excessive.

To reduce backlash, loosen the holder on upper side (case right side) and turn in the holder on lower side (case left side) by the same amount.



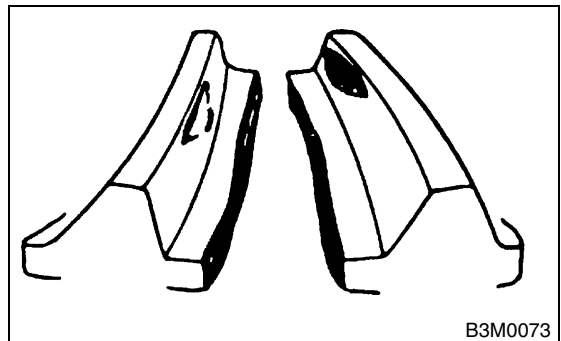
- Backlash is insufficient.

To increase backlash, loosen the holder on lower side (case left side) and turn in the holder on upper side (case right side) by the same amount.



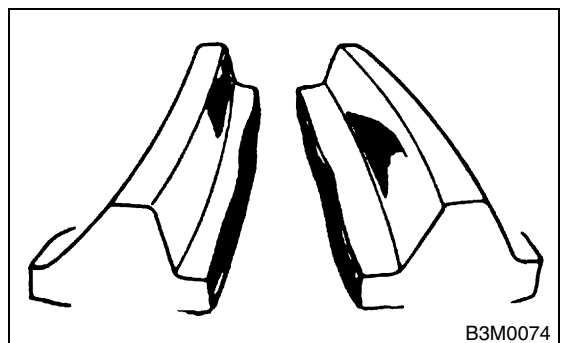
- The drive pinion shim selected before is too thick.

Reduce its thickness.



- The drive pinion shim selected before is too thin.

Increase its thickness.



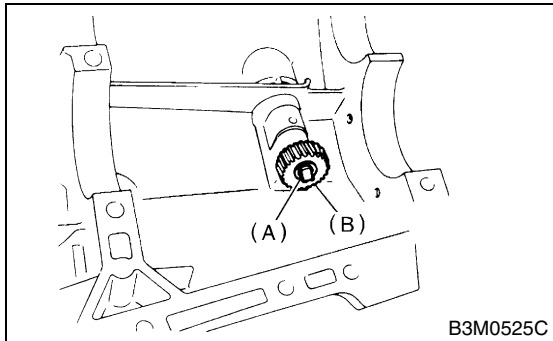
SPEEDOMETER GEAR

MANUAL TRANSMISSION AND DIFFERENTIAL

20.Speedometer Gear

A: REMOVAL

- 1) Remove the manual transmission assembly from vehicle. <Ref. to MT-33, REMOVAL, Manual Transmission Assembly.>
- 2) Remove the back-up light switch and neutral position switch. <Ref. to MT-43, REMOVAL, Switches and Harness.>
- 3) Remove the transfer case with extension case assembly. <Ref. to MT-48, REMOVAL, Transfer Case and Extension Case Assembly.>
- 4) Remove the transmission case. <Ref. to MT-61, REMOVAL, Transmission Case.>
- 5) Remove the vehicle speed sensor. <Ref. to MT-46, REMOVAL, Vehicle Speed Sensor.>
- 6) Remove the outer snap ring and pull out speedometer driven gear. Next, remove the oil seal, speedometer shaft and washer.



- (A) Outer snap ring
- (B) Speedometer driven gear

B: INSTALLATION

- 1) Install the washer and speedometer shaft, and press fit the oil seal with ST.

NOTE:

Use a new oil seal, if it has been removed.

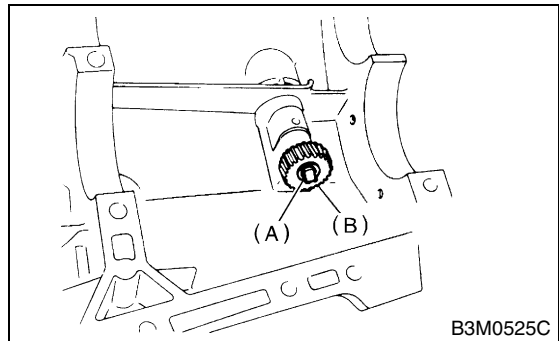
ST 899824100 or 499827000PRESS

- 2) Install the vehicle speed sensor. <Ref. to MT-46, INSTALLATION, Vehicle Speed Sensor.>

- 3) Install the speedometer driven gear and snap ring.

NOTE:

Use a new snap ring, if it has been removed.



- (A) Outer snap ring
- (B) Speedometer driven gear

- 4) Install the transmission case. <Ref. to MT-63, INSTALLATION, Transmission Case.>

- 5) Install the transfer case with extension case assembly. <Ref. to MT-48, INSTALLATION, Transfer Case and Extension Case Assembly.>

- 6) Install the back-up light switch and neutral position switch. <Ref. to MT-44, INSTALLATION, Switches and Harness.>

- 7) Install the manual transmission assembly to vehicle. <Ref. to MT-37, INSTALLATION, Manual Transmission Assembly.>

C: INSPECTION

Check the speedometer gear, oil seal and speedometer shaft for damage. Replace if damaged.

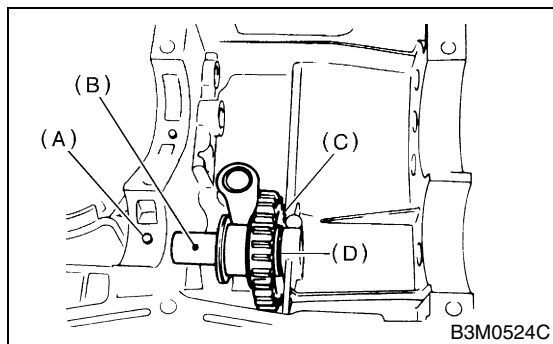
REVERSE IDLER GEAR

MANUAL TRANSMISSION AND DIFFERENTIAL

21.Reverse Idler Gear

A: REMOVAL

- 1) Remove the manual transmission assembly from vehicle. <Ref. to MT-33, REMOVAL, Manual Transmission Assembly.>
- 2) Remove the back-up light switch and neutral position switch. <Ref. to MT-43, REMOVAL, Switches and Harness.>
- 3) Remove the transfer case with extension case assembly. <Ref. to MT-48, REMOVAL, Transfer Case and Extension Case Assembly.>
- 4) Remove the transmission case. <Ref. to MT-86, REMOVAL, Drive Pinion Shaft Assembly.>
- 5) Remove the drive pinion shaft assembly. <Ref. to MT-86, REMOVAL, Drive Pinion Shaft Assembly.>
- 6) Remove the main shaft assembly.
Single-range model
<Ref. to MT-68, REMOVAL, Main Shaft Assembly for Single-Range.>
Dual-range model
<Ref. to MT-76, REMOVAL, Main Shaft Assembly for Dual-Range.>
- 7) Remove the differential assembly. <Ref. to MT-95, REMOVAL, Front Differential Assembly.>
- 8) Remove the shifter forks and rods. <Ref. to MT-105, REMOVAL, Shifter Fork and Rod.>
- 9) Pull out the straight pin, and remove the idler gear shaft, reverse idler gear and washer.



- (A) Straight pin
- (B) Idler gear shaft
- (C) Idler gear
- (D) Washer

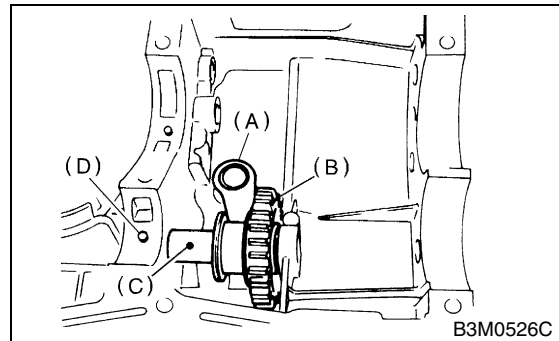
- 10) Remove the reverse shifter lever.

B: INSTALLATION

- 1) Install the reverse shifter lever, reverse idler gear and reverse idler gear shaft, and secure with straight pin.

NOTE:

Be sure to install the reverse idler shaft from rear side.



- (A) Reverse shifter lever
- (B) Reverse idler gear
- (C) Reverse idler gear shaft
- (D) Straight pin

- 2) Inspect and adjust the clearance between reverse idler gear and transmission case wall. <Ref. to MT-103, INSTALLATION, Reverse Idler Gear.> and <Ref. to MT-104, ADJUSTMENT, Reverse Idler Gear.>
- 3) Install the shifter forks and rods. <Ref. to MT-105, INSTALLATION, Shifter Fork and Rod.>
- 4) Install the differential assembly. <Ref. to MT-95, INSTALLATION, Front Differential Assembly.>
- 5) Install the main shaft assembly.
Single-range model
<Ref. to MT-68, INSTALLATION, Main Shaft Assembly for Single-Range.>
Dual-range model
<Ref. to MT-76, INSTALLATION, Main Shaft Assembly for Dual-Range.>
- 6) Install the drive pinion shaft assembly. <Ref. to MT-86, INSTALLATION, Drive Pinion Shaft Assembly.>
- 7) Install the transmission case. <Ref. to MT-63, INSTALLATION, Transmission Case.>
- 8) Install the transfer case with extension case assembly. <Ref. to MT-48, INSTALLATION, Transfer Case and Extension Case Assembly.>
- 9) Install the back-up light switch and neutral position switch. <Ref. to MT-44, INSTALLATION, Switches and Harness.>
- 10) Install the manual transmission assembly to vehicle. <Ref. to MT-37, INSTALLATION, Manual Transmission Assembly.>

REVERSE IDLER GEAR

MANUAL TRANSMISSION AND DIFFERENTIAL

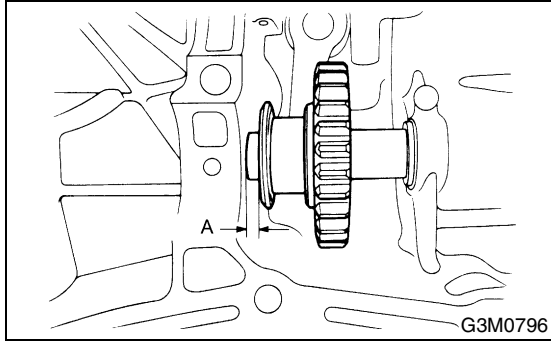
C: INSPECTION

1) Move the reverse shifter rod toward the reverse side. Inspect the clearance between reverse idler gear and transmission case wall.

If out of specification, select the appropriate reverse shifter lever and adjust.

Clearance A:

6.0 — 7.5 mm (0.236 — 0.295 in)

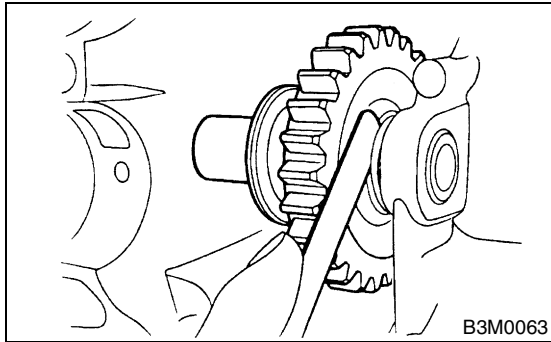


2) After installing a suitable reverse shifter lever, shift into neutral. Inspect the clearance between reverse idler gear and transmission case wall.

If out of specification, select the appropriate washer and adjust.

Clearance:

0 — 0.5 mm (0 — 0.020 in)



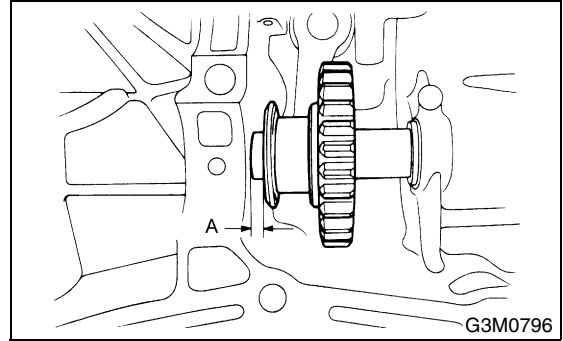
3) Check the reverse idler gear and shaft for damage. Replace if damaged.

D: ADJUSTMENT

1) Select the appropriate reverse shifter lever from the table below, and adjust until the gap between the reverse idler gear and transmission case wall is within specification.

Clearance A:

6.0 — 7.5 mm (0.236 — 0.295 in)

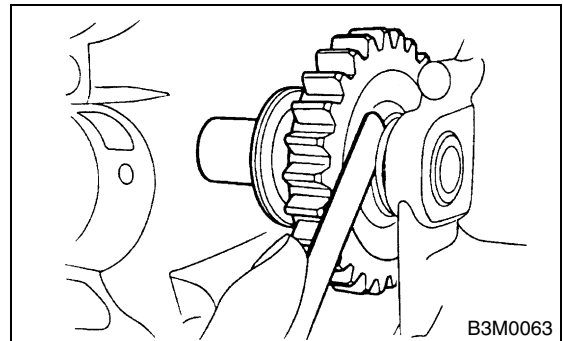


Reverse shifter lever		
Part No.	Mark	Remarks
32820AA070	7	Further from case wall
32820AA080	8	Standard
32820AA090	9	Closer to case wall

2) Select the appropriate washer from the table below, and adjust until the gap between the reverse idler gear and transmission case wall is within specification.

Clearance:

0 — 0.5 mm (0 — 0.020 in)



Washer	
Part No.	Thickness mm (in)
803020151	0.4 (0.016)
803020152	1.1 (0.043)
803020153	1.5 (0.059)
803020154	1.9 (0.075)
803020155	2.3 (0.091)

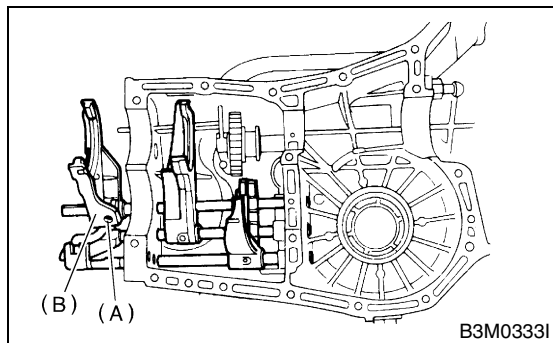
SHIFTER FORK AND ROD

MANUAL TRANSMISSION AND DIFFERENTIAL

22. Shifter Fork and Rod

A: REMOVAL

- 1) Remove the manual transmission assembly from vehicle. <Ref. to MT-33, REMOVAL, Manual Transmission Assembly.>
- 2) Remove the back-up light switch and neutral position switch. <Ref. to MT-43, REMOVAL, Switches and Harness.>
- 3) Remove the transfer case with extension case assembly. <Ref. to MT-48, REMOVAL, Transfer Case and Extension Case Assembly.>
- 4) Remove the transmission case. <Ref. to MT-61, REMOVAL, Transmission Case.>
- 5) Remove the drive pinion shaft assembly. <Ref. to MT-86, REMOVAL, Drive Pinion Shaft Assembly.>
- 6) Remove the main shaft assembly.
Single-range model
<Ref. to MT-68, REMOVAL, Main Shaft Assembly for Single-Range.>
Dual-range model
<Ref. to MT-76, REMOVAL, Main Shaft Assembly for Dual-Range.>
- 7) Remove the differential assembly. <Ref. to MT-95, REMOVAL, Front Differential Assembly.>
- 8) Drive out the straight pin with ST, and 5th shifter fork.
ST 398791700 STRAIGHT PIN REMOVER



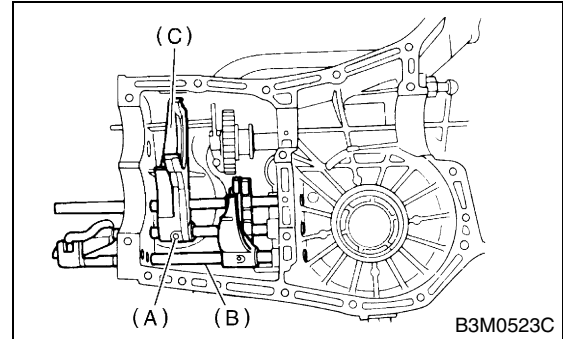
- (A) Straight pin
(B) 5th shifter fork

- 9) Remove the plugs, springs and checking balls.

- 10) Drive out the straight pin, and pull out 3-4 fork rod and shifter fork.

NOTE:

When removing the rod, keep other rods in neutral. Also, when pulling out the straight pin, remove it toward the inside of case so that it does not hit against the case.



- (A) Straight pin
(B) 3-4 fork rod
(C) Shifter fork

- 11) Drive out the straight pin, and pull out 1-2 fork rod and shifter fork.
- 12) Remove the outer snap ring, and pull out the reverse shifter rod arm from reverse fork rod. Then take out the ball, spring and interlock plunger from rod.
And then remove the rod.

NOTE:

When pulling out the reverse shifter rod arm, be careful not to let the ball pop out of arm.

- 13) Remove the reverse shifter lever.

B: INSTALLATION

- 1) Install the reverse arm fork spring, ball and interlock plunger to reverse fork rod arm. Insert the reverse fork rod into hole in reverse fork rod arm, and hold it with outer snap ring using ST.

NOTE:

Apply grease to plunger to prevent it from falling.

ST 399411700 ACCENT BALL INSTALLER

- 2) Position the ball, spring and new gasket in reverse shifter rod hole, on left side transmission case, and tighten the checking ball plug.
- 3) Install the 1-2 fork rod into 1-2 shifter fork via the hole on the rear of transmission case.
- 4) Align the holes in rod and fork, and new drive straight pin into these holes using ST.

NOTE:

- Set other rods to neutral.
- Make sure the interlock plunger is on the 3-4 fork rod side.

ST 398791700 STRAIGHT PIN REMOVER

SHIFTER FORK AND ROD

MANUAL TRANSMISSION AND DIFFERENTIAL

5) Install the interlock plunger onto 3-4 fork rod.

NOTE:

Apply a coat of grease to plunger to prevent it from falling.

6) Install the 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 new drive straight pin into these holes.

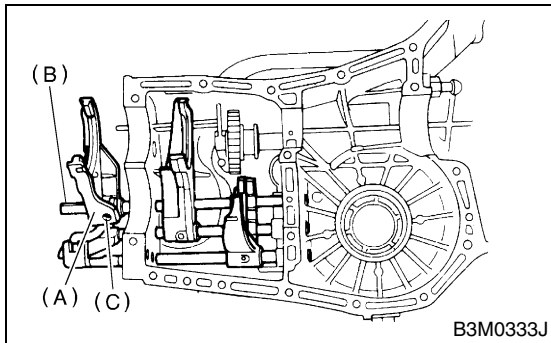
NOTE:

- Set the reverse fork rod to neutral.
- Make sure the interlock plunger (installing before) is on the reverse fork rod side.

ST 398791700 STRAIGHT PIN REMOVER

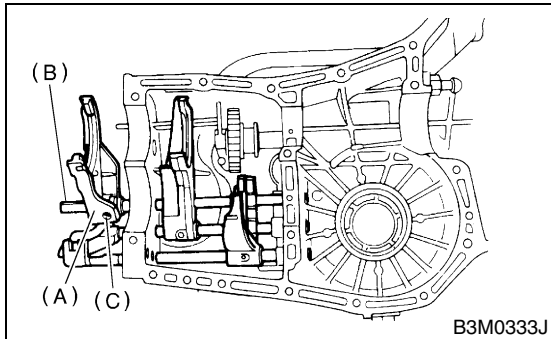
8) Install the 5th shifter fork onto the rear of reverse fork rod. Align holes in the two parts and new drive straight pin into place.

ST 398791700 STRAIGHT PIN REMOVER



- (A) 5th shifter fork
- (B) Reverse fork rod
- (C) Straight pin

9) Position the balls, checking ball springs and new gaskets into 3-4 and 1-2 rod holes, and install plugs.



- (A) 5th shifter fork
- (B) Reverse fork rod
- (C) Straight pin

10) Install the differential assembly. <Ref. to MT-95, INSTALLATION, Front Differential Assembly.>

11) Install the main shaft assembly.

Single-range model

<Ref. to MT-68, INSTALLATION, Main Shaft Assembly for Single-Range.>

Dual-range model

<Ref. to MT-76, INSTALLATION, Main Shaft Assembly for Dual-Range.>

12) Install the drive pinion shaft assembly. <Ref. to MT-86, INSTALLATION, Drive Pinion Shaft Assembly.>

13) Install the transmission case. <Ref. to MT-63, INSTALLATION, Transmission Case.>

14) Install the transfer case with extension case assembly. <Ref. to MT-48, INSTALLATION, Transfer Case and Extension Case Assembly.>

15) Install the back-up light switch and neutral position switch. <Ref. to MT-44, INSTALLATION, Switches and Harness.>

16) Install the manual transmission assembly to vehicle. <Ref. to MT-37, INSTALLATION, Manual Transmission Assembly.>

SHIFTER FORK AND ROD

MANUAL TRANSMISSION AND DIFFERENTIAL

C: INSPECTION

1) Check the shift shaft and shift rod for damage. Replace if damaged.

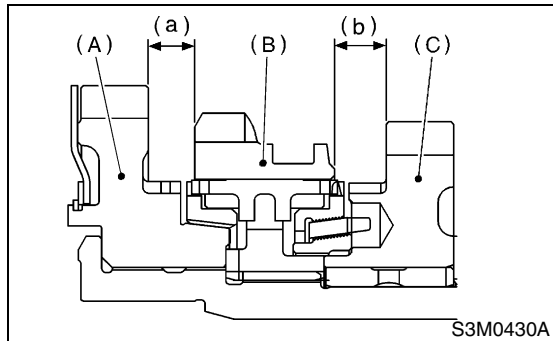
2) Gearshift mechanism:

Repair or replace the gearshift mechanism if excessively worn, bent, or defective in any way.

3) Inspect the clearance between 1st, 2nd driven gear and reverse driven gear. If any clearance is not within specifications, replace the shifter fork as required.

Clearance (a) and (b):

9.5 mm (0.374 in)



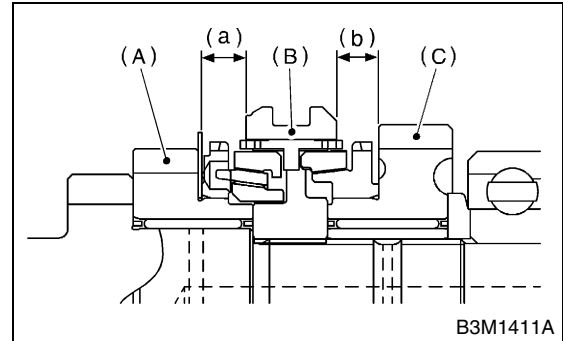
- (A) 1st driven gear
- (B) Reverse driven gear
- (C) 2nd driven gear

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 the clearance between 3rd, 4th drive gear and coupling sleeve. If any clearance is not within specifications, replace the 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

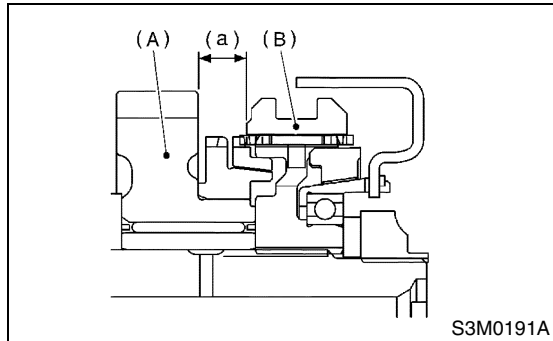
3rd-4th shifter fork		
Part No.	Mark	Remarks
32810AA061	1	Approach to 4th gear by 0.2 mm (0.008 in).
32810AA071	—	Standard
32810AA101	3	Become distant from 3rd gear by 0.2 mm (0.008 in).

SHIFTER FORK AND ROD

MANUAL TRANSMISSION AND DIFFERENTIAL

5) Inspect the clearance between 5th drive gear and coupling sleeve. If any clearance is not within specifications, replace the shifter fork as required.

Clearance (a):
9.3 mm (0.366 in)

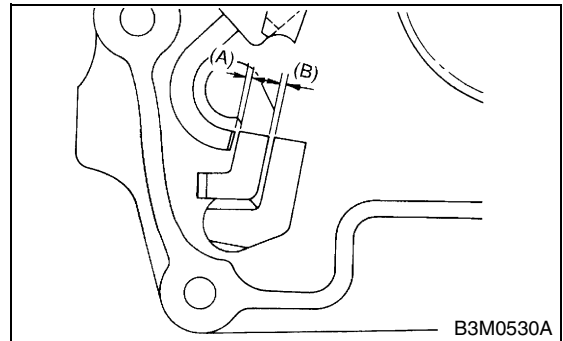


- (A) 5th drive gear
- (B) Coupling sleeve

6) Inspect the rod end clearances (A) and (B). If any clearance is not within specifications, replace the rod or fork as required.

Clearance (A):
1st — 2nd to 3rd — 4th:
0.4 — 1.4 mm (0.016 — 0.055 in)

Clearance (B):
3rd — 4th to 5th:
0.5 — 1.3 mm (0.020 — 0.051 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	—	Standard
32812AA251	9	Become distant from 5th gear by 0.2 mm (0.008 in).

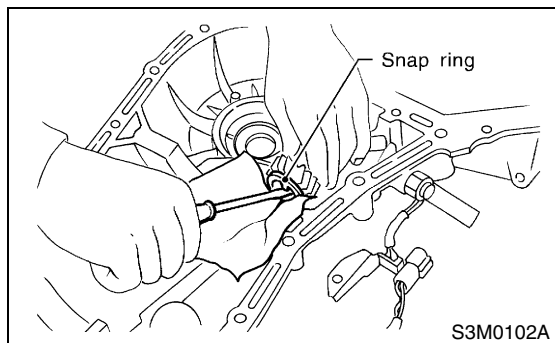
COUNTER GEAR

MANUAL TRANSMISSION AND DIFFERENTIAL

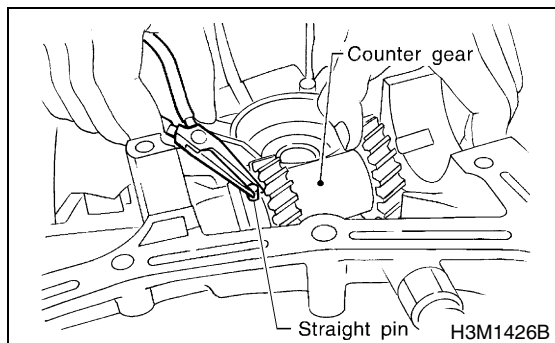
23. Counter Gear

A: REMOVAL

- 1) Remove the manual transmission assembly from vehicle. <Ref. to MT-33, REMOVAL, Manual Transmission Assembly.>
- 2) Remove the transfer case with extension case assembly. <Ref. to MT-48, REMOVAL, Transfer Case and Extension Case Assembly.>
- 3) Remove the transmission case. <Ref. to MT-61, REMOVAL, Transmission Case.>
- 4) Move the counter gear shaft until it touches transmission case, and remove the snap ring with a suitable tool.



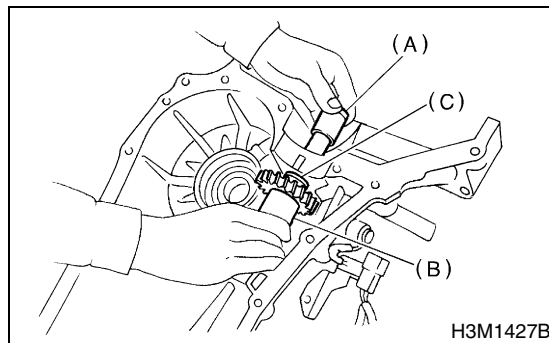
- 5) Slide the washer at rear of high-low counter shaft, and remove the straight pin from counter shaft.



- 6) Remove the counter shaft from transmission case, taking care not to drop the counter gear and two washers.

NOTE:

- Be careful not to damage the O-ring.
- Be careful not to drop the straight pin on front side.
- Be careful not to drop the two needle bearings and collar contained in counter gear.



- (A) Counter shaft
- (B) Counter gear
- (C) Washers

B: INSTALLATION

- 1) Install the 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-63, INSTALLATION, Transmission Case.>
- 4) Install the transfer case with extension case assembly. <Ref. to MT-48, INSTALLATION, Transfer Case and Extension Case Assembly.>
- 5) Install the manual transmission assembly on vehicle. <Ref. to MT-37, INSTALLATION, Manual Transmission Assembly.>

NOTE:

- Make sure that the 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 the snap ring, measure the clearance between snap ring and counter washer.

Clearance:

0.05 — 0.35 mm (0.0020 — 0.0138 in)

2) If the clearance is out of measured value, select a snap ring and install to put clearance within measured value. <Ref. to MT-110, ADJUSTMENT, Counter Gear.>

D: ADJUSTMENT

Selection of snap ring:

If the measurement is not within specification, select suitable snap ring.

Snap ring	
Part No.	Thickness mm (in)
031319000	1.50 (0.0591)
805019010	1.72 (0.0677)

GENERAL DIAGNOSTIC

MANUAL TRANSMISSION AND DIFFERENTIAL

24. General Diagnostic

A: INSPECTION

1. MANUAL TRANSMISSION

Symptom	Possible cause	Remedy
1. Gears are difficult to intermesh. NOTE: The cause for difficulty in shifting gears can be classified into two kinds: one is malfunction of the gear shift system and the other is malfunction of the transmission. However, if the operation is heavy and engagement of the gears is difficult, defective clutch disengagement may also be responsible. Check whether the clutch is correctly functioning, before checking the gear shift system and transmission.	(a) Worn, damaged or burred chamfer of internal spline of sleeve and reverse driven gear	Replace.
	(b) Worn, damaged or burred chamfer of spline of gears	Replace.
	(c) Worn or scratched bushings	Replace.
	(d) Incorrect contact between synchronizer ring and gear cone or wear	Correct or replace.
2. Gear slips out. • Gear slips out when coasting on rough road. • Gear slips out during acceleration.	(a) Defective pitching stopper 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.
	(k) Worn reverse idler gear and bushing	Replace.
3. Unusual noise comes from transmission. NOTE: If an unusual noise is heard when the vehicle is parked with its engine idling and if the noise ceases when the clutch is disengaged, it may be considered that the noise comes from the transmission.	(a) Insufficient or improper lubrication	Lubricate or replace with specified oil.
	(b) Worn or damaged gears and bearings 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
<p>1. Broken differential (case, gear, bearing, etc.)</p> <p>NOTE: Abnormal noise will develop and finally it will become impossible to continue to run due to broken pieces obstructing the gear revolution.</p>	(a) Insufficient or improper oil	Disassemble the 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 the 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 the vehicle under severe operating conditions.
	(f) Loose hypoid driven gear clamping bolts	Tighten.
<p>2. Differential and hypoid gear noises</p> <p>Troubles of the differential and hypoid gear always appear as noise problems. Therefore noise is the first indication of the trouble. However noises from the engine, muffler, tire, exhaust gas, bearing, body, etc. are easily mistaken for the differential noise. Pay special attention to the hypoid gear noise because it is easily confused with other gear noises. There are the following four kinds of noises.</p> <ul style="list-style-type: none"> • Gear noise when driving: If noise increases as vehicle speed increases it may be due to insufficient gear oil, incorrect gear engagement, damaged gears, etc. • Gear noise when coasting: Damaged gears due to maladjusted bearings and incorrect shim adjustment • Bearing noise when driving or when coasting: Cracked, broken or damaged bearings • Noise which mainly occurs when turning: Unusual noise from differential side gear, differential pinion, differential pinion shaft, etc. 	(a) Insufficient oil	Lubricate.
	(b) Improper adjustment of hypoid driven gear and drive pinion	Check tooth contact.
	(c) Worn teeth of hypoid driven gear and drive pinion	Replace as a set. Readjust the bearing preload.
	(d) Loose roller bearing	Readjust the hypoid driven gear to drive pinion backlash and check tooth contact.
	(e) Distorted hypoid driven gear or differential case	Replace.
	(f) Worn washer and differential pinion shaft	Replace.

CLUTCH SYSTEM

CL

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GENERAL DESCRIPTION

CLUTCH SYSTEM

1. General Description

A: SPECIFICATIONS

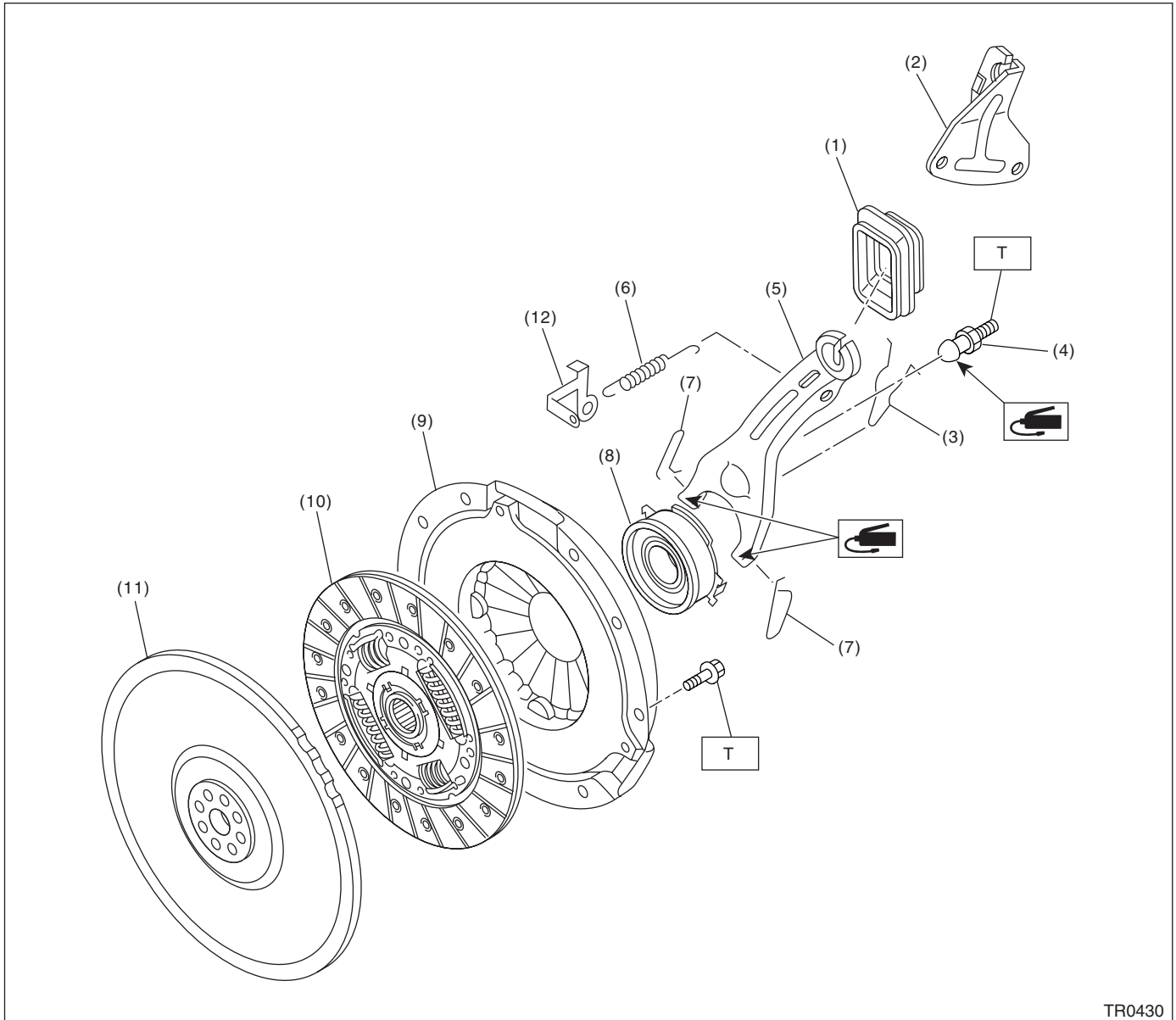
Model		1.6 L	2.0 L NON-TURBO	2.0 L TURBO	2.5 L
Clutch cover	Type	Push type		Pull type	Push type
	Diaphragm set load	kgf (lb)	450 (992)	830 (1,830)	550 (1,213)
Clutch disc	Facing material	Woven (Non asbestos)			
	O.D. x I.D. x thickness	mm (in)	225 x 150 x 3.5 (8.86 x 5.91 x 0.138)	230 x 150 x 3.5 (9.06 x 5.91 x 0.138)	228.6 x 155 x 6.6 (9.00 x 6.10 x 0.260)
	Spline O.D.	mm (in)	25.2 (0.992), (No. of teeth: 24)		
Clutch release lever ratio		3.0	1.6	1.7	1.6
Release bearing		Grease-packed self-aligning			
Clutch pedal	Full stroke	mm (in)	130 — 135 (5.12 — 5.31)		
	Free play	mm (in)	10 — 20 (0.39 — 0.79)	3 — 13 (0.12 — 0.51)	10 — 12 (0.39 — 0.79)
Clutch disc	Stroke	mm (in)	24 — 26 (0.94 — 1.02)	13.3 — 14.7 (0.524 — 0.579)	24 — 26 (0.94 — 1.02)
	Play at release lever center	mm (in)	3 — 4 (0.12 — 0.16)	—	3 — 4 (0.12 — 0.16)
	Depth of rivet head mm (in)	Standard	1.3 — 1.9 (0.051 — 0.075)		
		Limit of sinking	0.3 (0.012)		
Limit for deflection	mm (in)	0.8 (0.031) at R = 107 (4.21)	0.8 (0.031) at R = 110 (4.33)		1.0 (0.039) at R = 110 (4.33)

I.D.: Inner diameter

O.D.: Outer diameter

B: COMPONENT

1. CLUTCH ASSEMBLY FOR 1.6 L NON-TURBO MODEL



TR0430

- | | |
|----------------------------------|-----------------------------------|
| (1) Clutch release lever sealing | (9) Clutch cover |
| (2) Clutch cable bracket | (10) Clutch disk |
| (3) Retainer spring | (11) Flywheel |
| (4) Pivot | (12) Clutch return spring bracket |
| (5) Clutch release lever | |
| (6) Return spring | |
| (7) Clip | |
| (8) Clutch release bearing | |

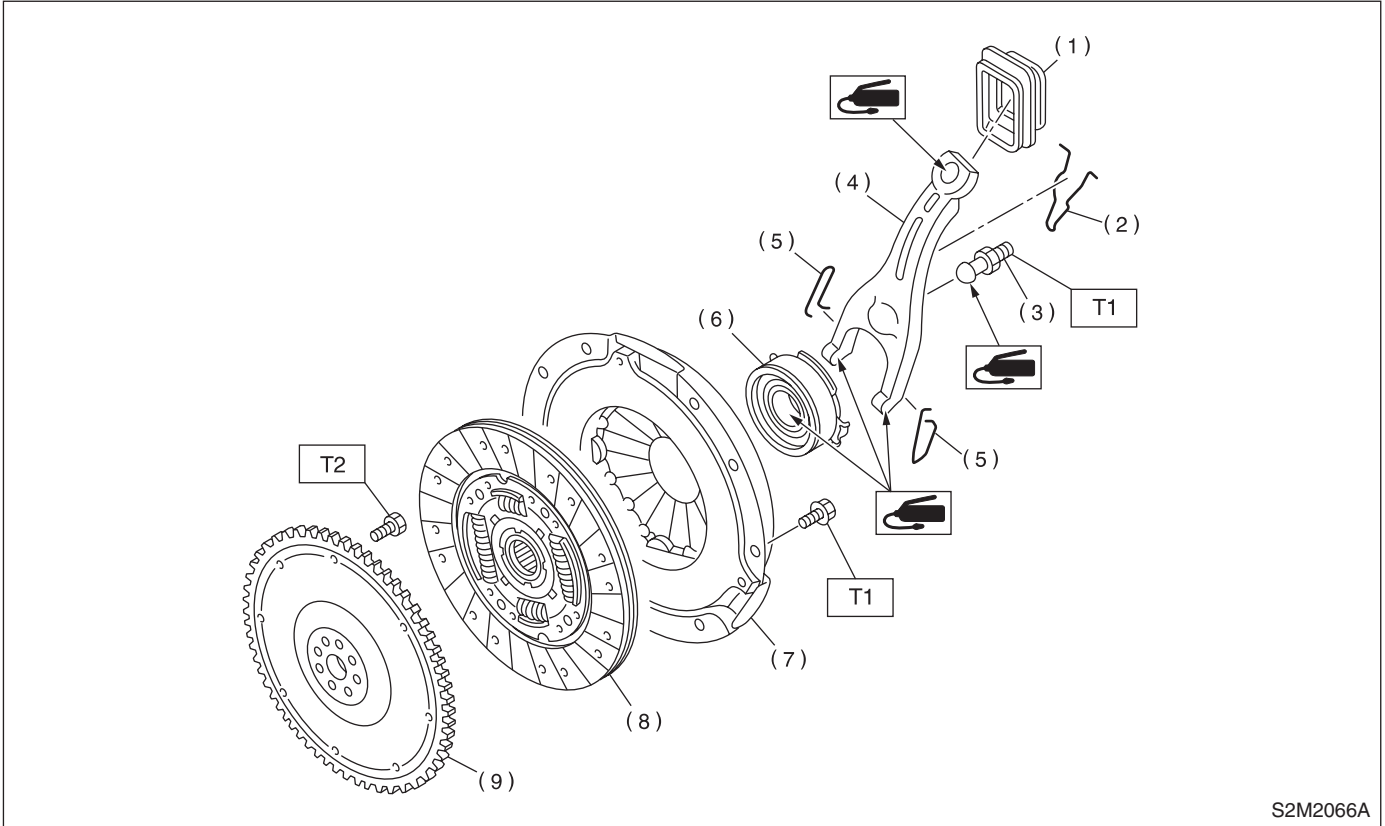
Tightening torque: N·m (kgf·m, ft·lb)

T: 15.7 (1.6, 11.6)

GENERAL DESCRIPTION

CLUTCH SYSTEM

2. CLUTCH ASSEMBLY FOR 2.0 L NON-TURBO MODEL



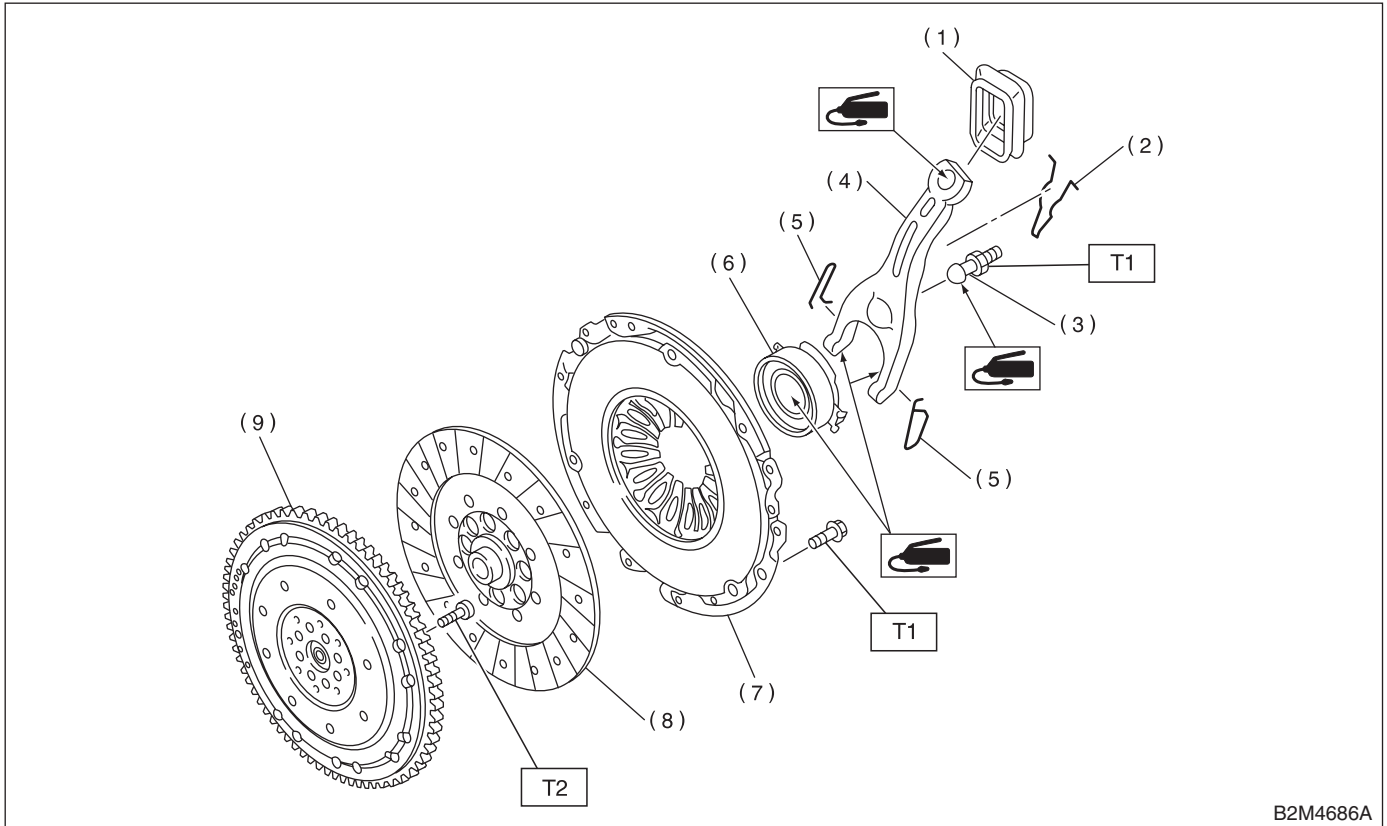
- | | |
|----------------------------------|----------------------------|
| (1) Clutch release lever sealing | (6) Clutch release bearing |
| (2) Retainer spring | (7) Clutch cover |
| (3) Pivot | (8) Clutch disc |
| (4) Clutch release lever | (9) Flywheel |
| (5) Clip | |

Tightening torque: N·m (kgf·m, ft·lb)

T1: 15.7 (1.6, 11.6)

T2: 72 (7.3, 52.8)

3. CLUTCH ASSEMBLY FOR 2.5 L MODEL



- | | |
|-------------------------------|--------------------------|
| (1) Clutch release lever seal | (6) Release bearing |
| (2) Retainer spring | (7) Clutch cover |
| (3) Pivot | (8) Clutch disc |
| (4) Release lever | (9) Double mass flywheel |
| (5) Clip | |

Tightening torque: N·m (kgf·m, ft·lb)

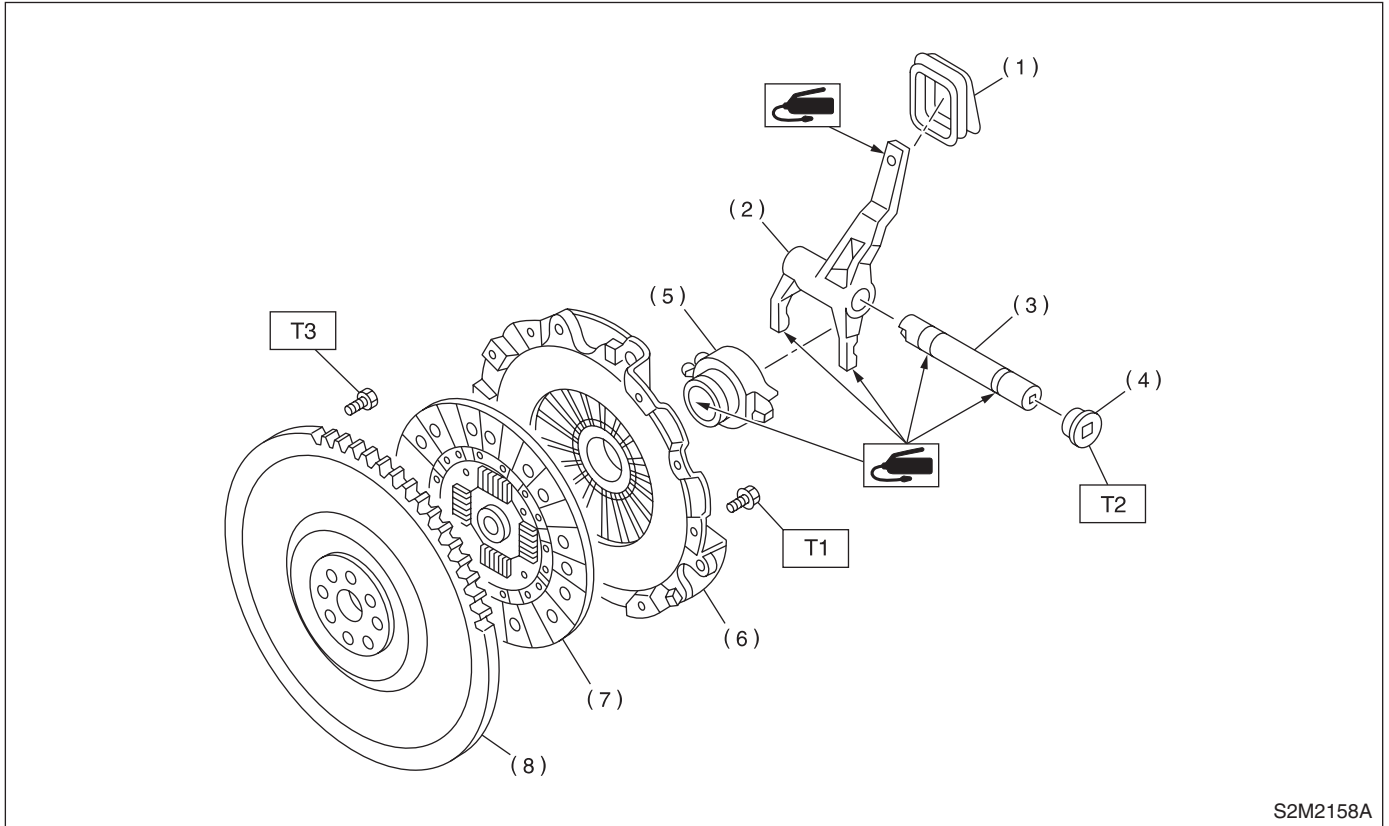
T1: 15.7 (1.6, 11.6)

T2: 72 (7.3, 52.8)

GENERAL DESCRIPTION

CLUTCH SYSTEM

4. CLUTCH ASSEMBLY FOR TURBO MODEL

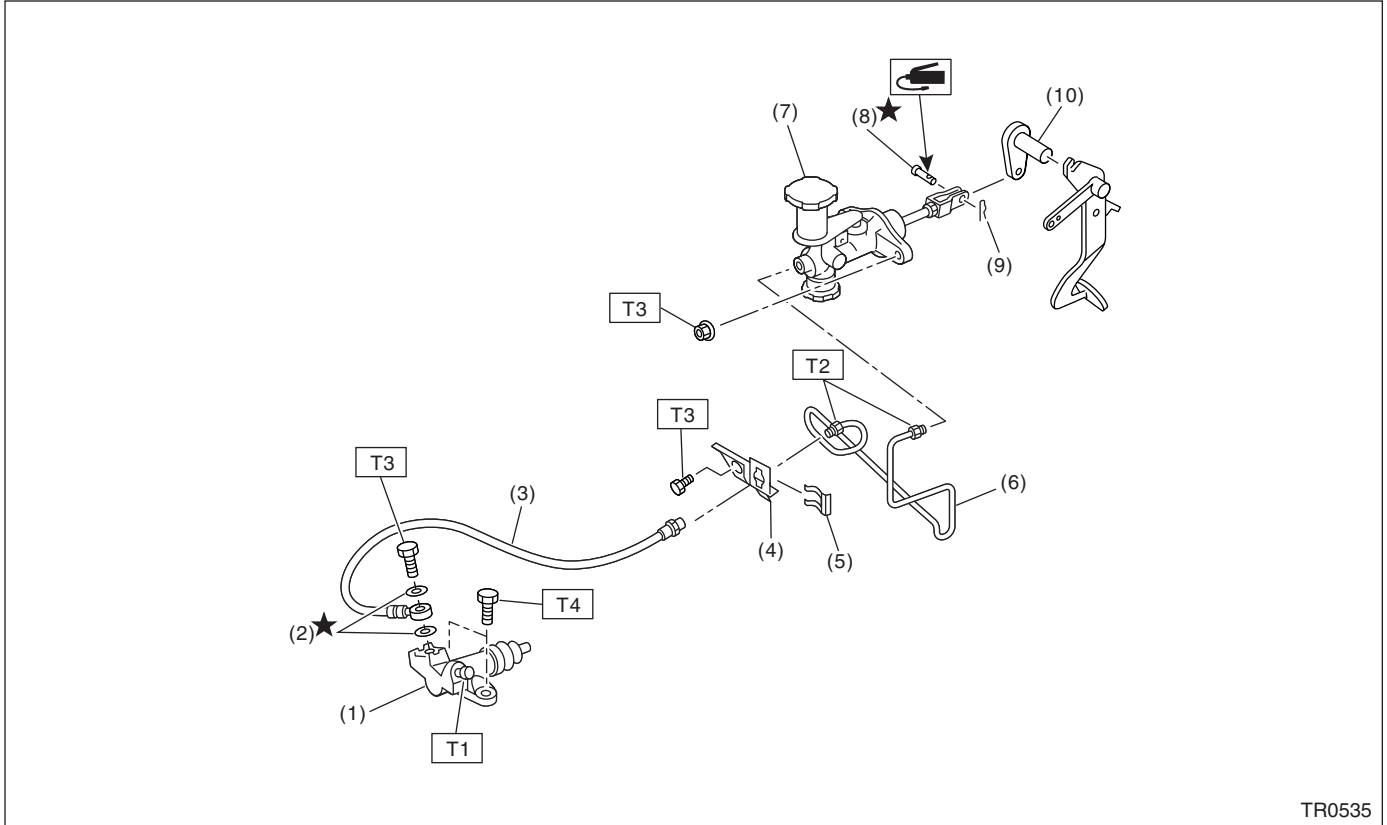


- | | |
|----------------------------------|------------------|
| (1) Clutch release lever sealing | (6) Clutch cover |
| (2) Clutch release lever | (7) Clutch disc |
| (3) Clutch release lever shaft | (8) Flywheel |
| (4) Plug | |
| (5) Clutch release bearing | |

Tightening torque: N·m (kgf·m, ft·lb)**T1: 15.7 (1.6, 11.6)****T2: 44 (4.5, 32.5)****T3: 72 (7.3, 52.8)**

5. CLUTCH PIPE AND HOSE FOR NON-TURBO MODEL

• LHD MODEL



TR0535

- | | |
|------------------------|--------------------------|
| (1) Operating cylinder | (6) Pipe |
| (2) Washer | (7) Master cylinder ASSY |
| (3) Clutch hose | (8) Clevis pin |
| (4) Bracket | (9) Snap pin |
| (5) Clip | (10) Lever |

Tightening torque: N·m (kgf-m, ft-lb)

T1: 8 (0.8, 5.8)

T2: 15 (1.5, 10.8)

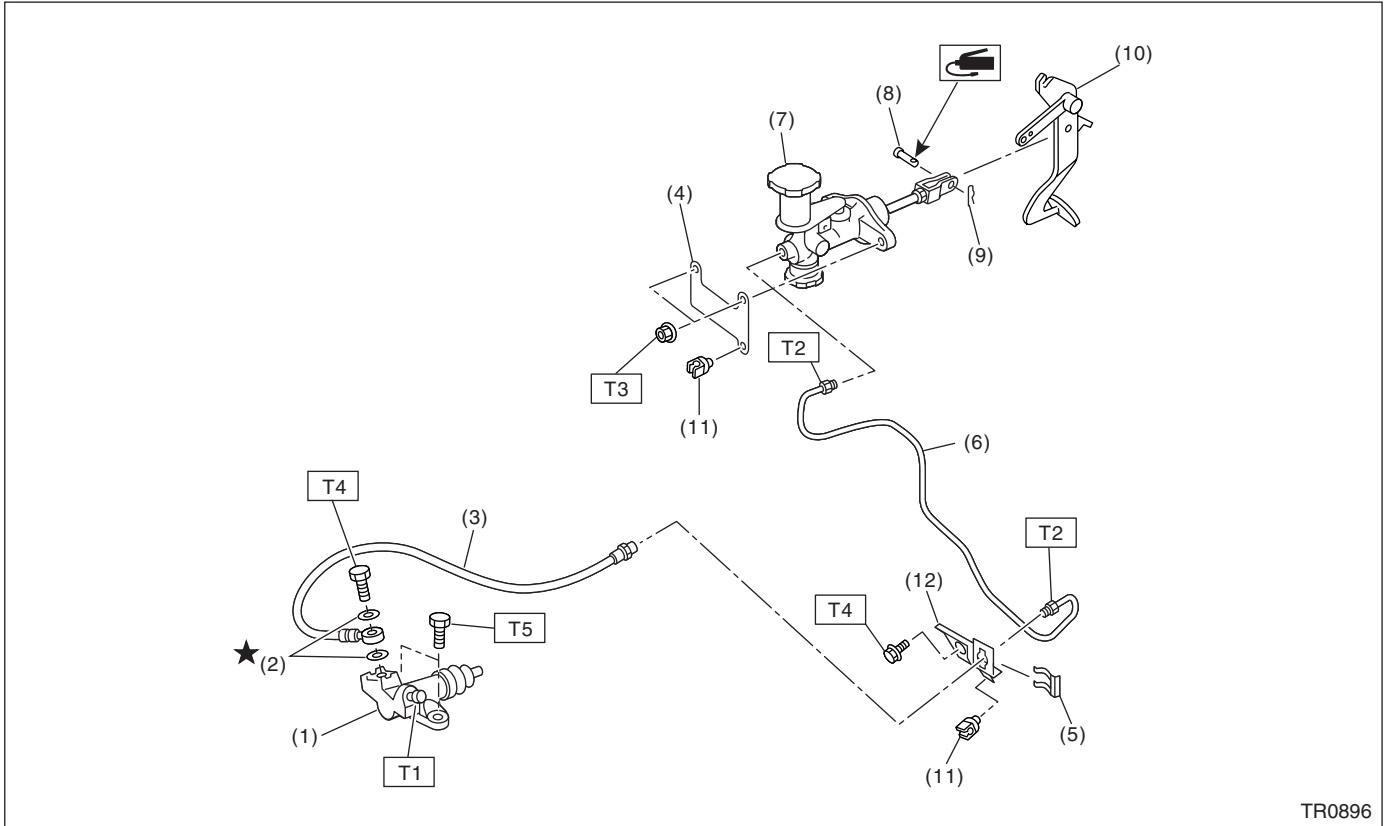
T3: 18 (1.8, 13.0)

T4: 37 (3.8, 27.5)

GENERAL DESCRIPTION

CLUTCH SYSTEM

• RHD MODEL



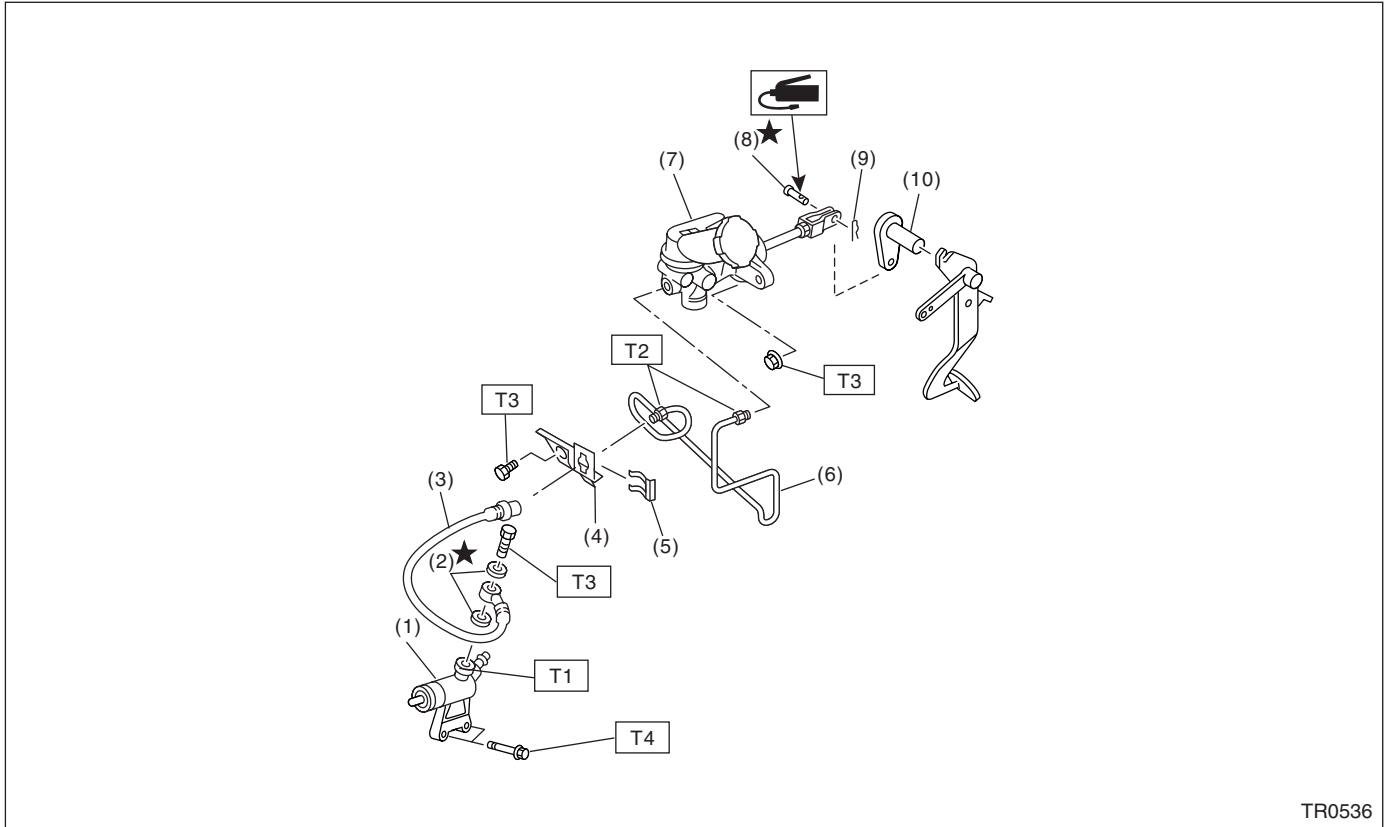
- | | |
|------------------------|--------------------------|
| (1) Operating cylinder | (7) Master cylinder ASSY |
| (2) Washer | (8) Clevis pin |
| (3) Clutch hose | (9) Snap pin |
| (4) Bracket | (10) Pedal |
| (5) Clip | (11) Clamp |
| (6) Clutch pipe | (12) Bracket |

Tightening torque: N·m (kgf·m, ft·lb)

- T1: 8 (0.8, 5.8)**
T2: 15 (1.5, 10.8)
T3: 18 (1.8, 13.0)
T4: 25 (2.5, 18.1)
T5: 37 (3.8, 27.5)

6. CLUTCH PIPE AND HOSE FOR TURBO MODEL

• LHD MODEL



TR0536

- | | |
|------------------------|--------------------------|
| (1) Operating cylinder | (6) Pipe |
| (2) Washer | (7) Master cylinder ASSY |
| (3) Clutch hose | (8) Clevis pin |
| (4) Bracket | (9) Snap pin |
| (5) Clip | (10) Lever |

Tightening torque: N·m (kgf-m, ft-lb)

T1: 8 (0.8, 5.8)

T2: 15 (1.5, 10.8)

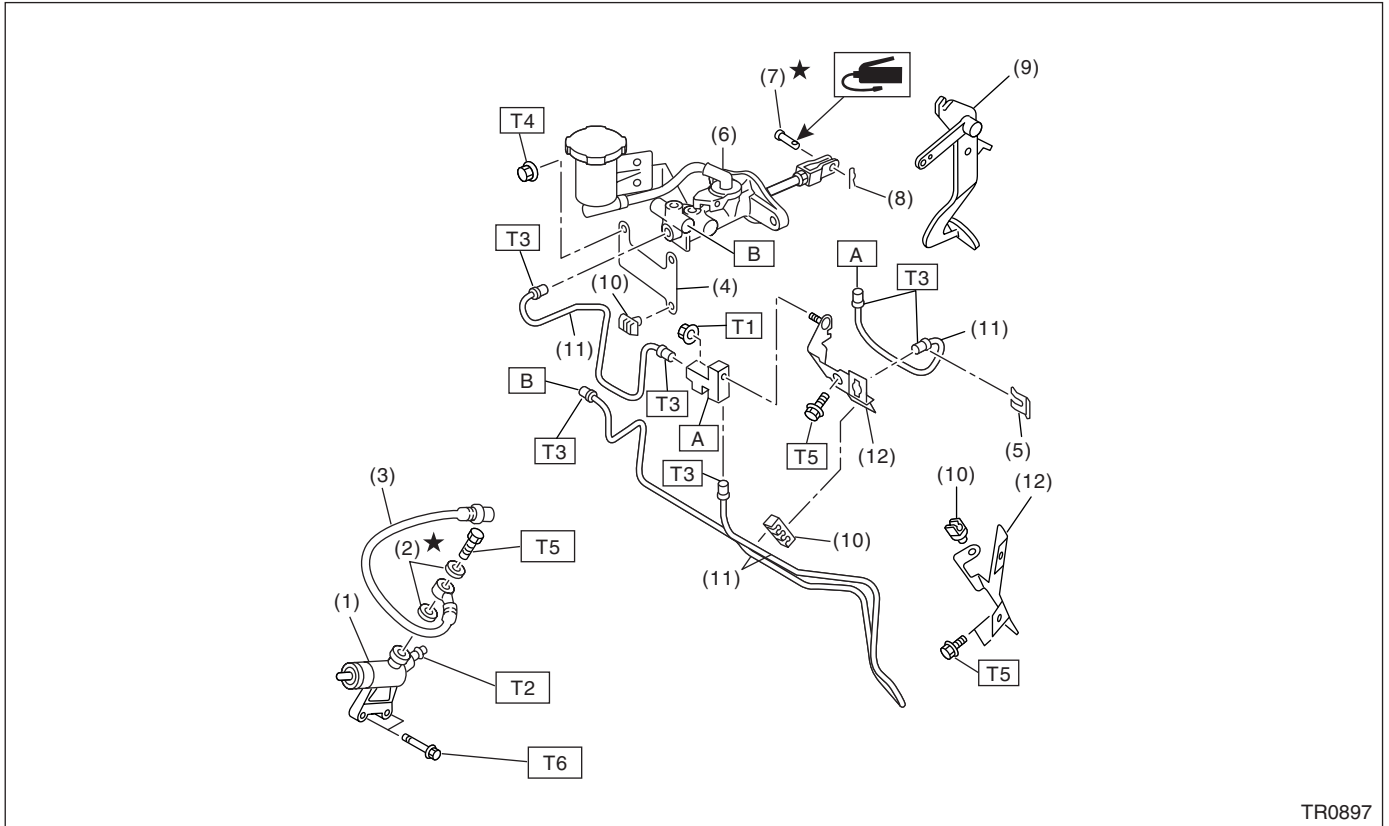
T3: 18 (1.8, 13.0)

T4: 37 (3.8, 27.5)

GENERAL DESCRIPTION

CLUTCH SYSTEM

• RHD MODEL



TR0897

- | | |
|--------------------------|------------------|
| (1) Operating cylinder | (7) Clevis pin |
| (2) Washer | (8) Snap pin |
| (3) Clutch hose | (9) Pedal |
| (4) Bracket | (10) Clamp |
| (5) Clip | (11) Clutch pipe |
| (6) Master cylinder ASSY | (12) Bracket |

Tightening torque: N·m (kgf·m, ft·lb)

T1: 7.5 (0.76, 5.53)

T2: 8 (0.8, 5.8)

T3: 15 (1.5, 10.8)

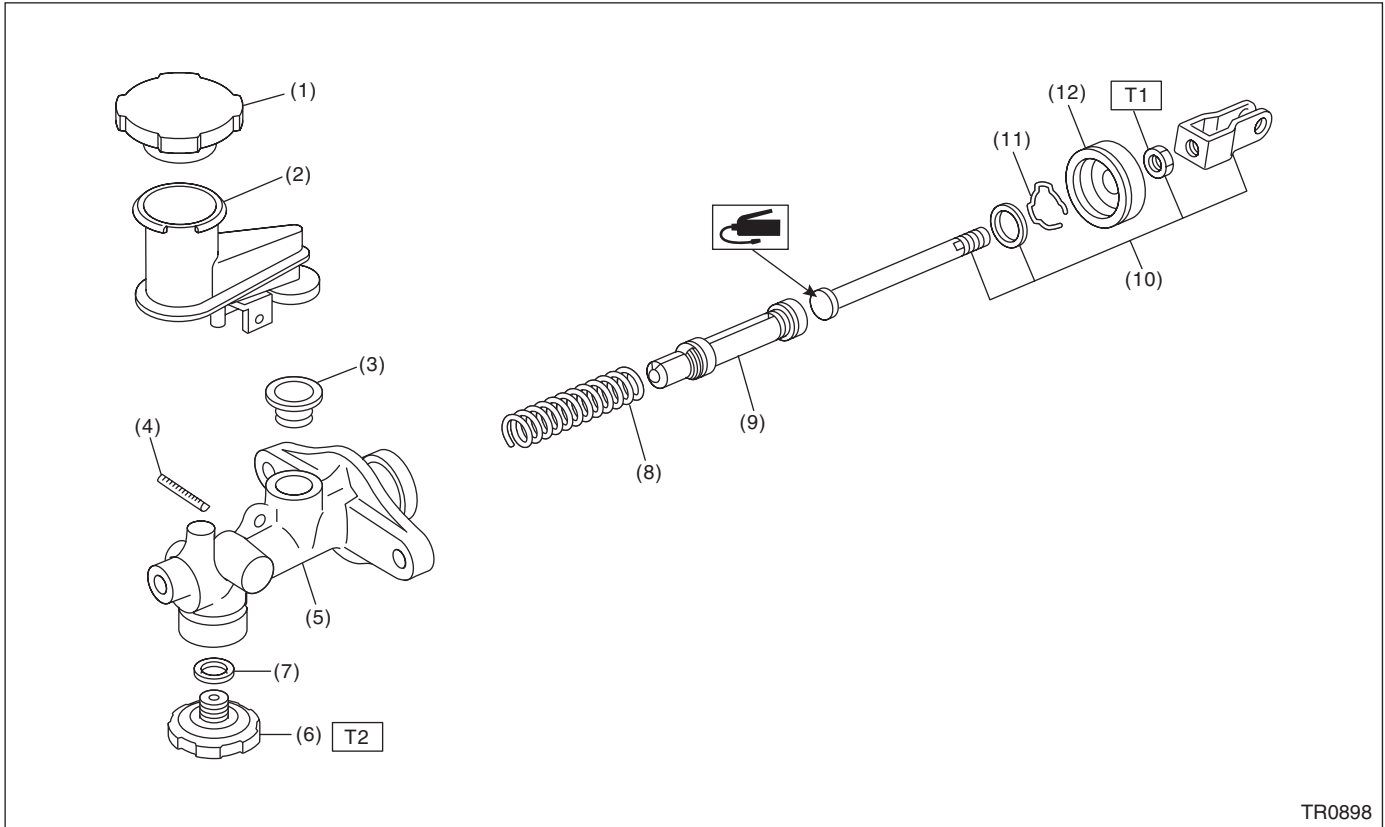
T4: 18 (1.8, 13.0)

T5: 25 (2.5, 18.1)

T6: 37 (3.8, 27.5)

7. MASTER CYLINDER

• NON-TURBO MODEL



TR0898

- | | |
|---------------------|-----------------------|
| (1) Reservoir cap | (7) Gasket |
| (2) Reservoir tank | (8) Return spring |
| (3) Oil seal | (9) Piston |
| (4) Straight pin | (10) Push rod |
| (5) Master cylinder | (11) Piston stop ring |
| (6) Clutch damper | (12) Cylinder boot |

Tightening torque: N·m (kgf·m, ft·lb)

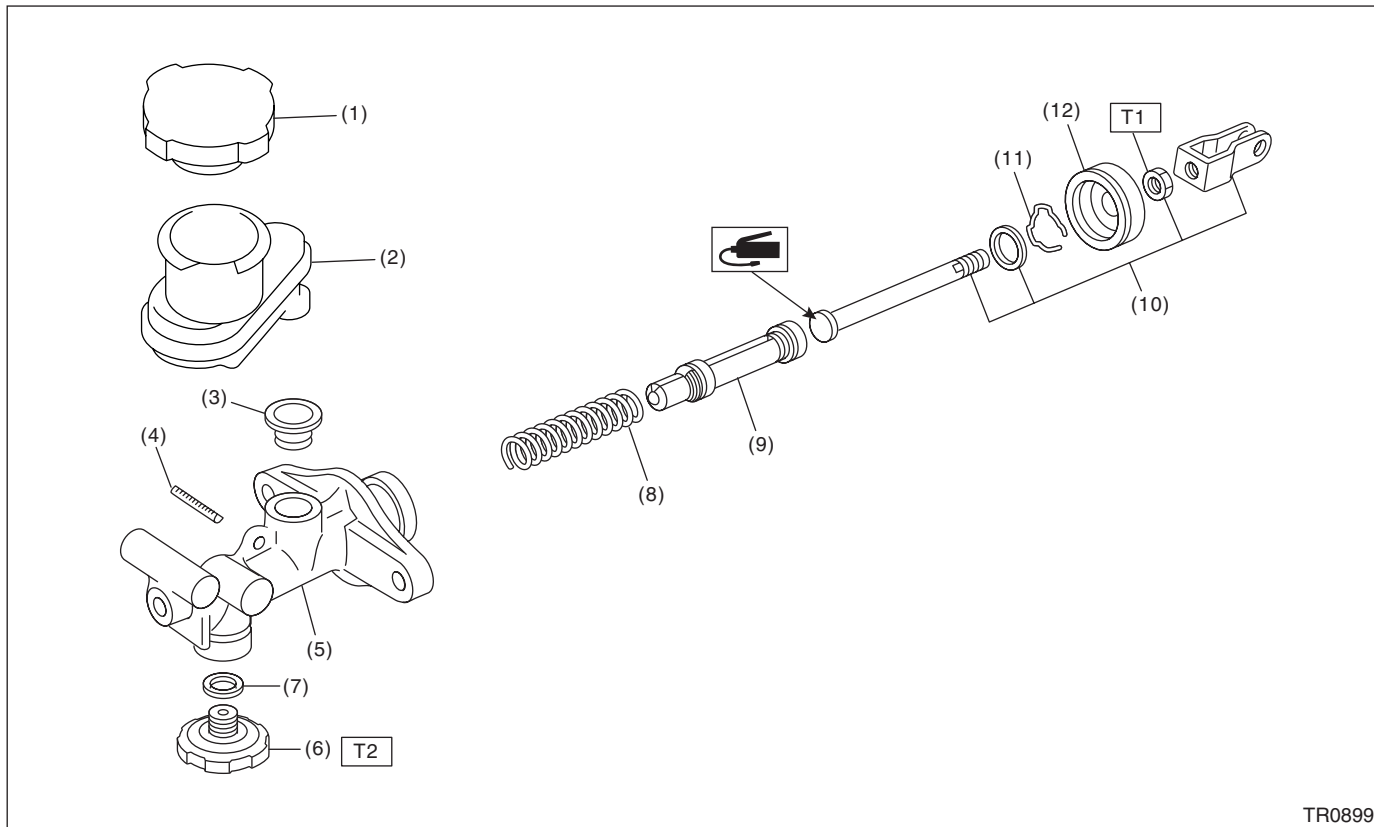
T1: 10 (1.0, 7)

T2: 46.6 (4.75, 34.4)

GENERAL DESCRIPTION

CLUTCH SYSTEM

• LHD TURBO MODEL



TR0899

- | | |
|---------------------|-----------------------|
| (1) Reservoir cap | (7) Gasket |
| (2) Reservoir tank | (8) Return spring |
| (3) Oil seal | (9) Piston |
| (4) Straight pin | (10) Push rod |
| (5) Master cylinder | (11) Piston stop ring |
| (6) Clutch damper | (12) Cylinder boot |

Tightening torque: N·m (kgf·m, ft·lb)

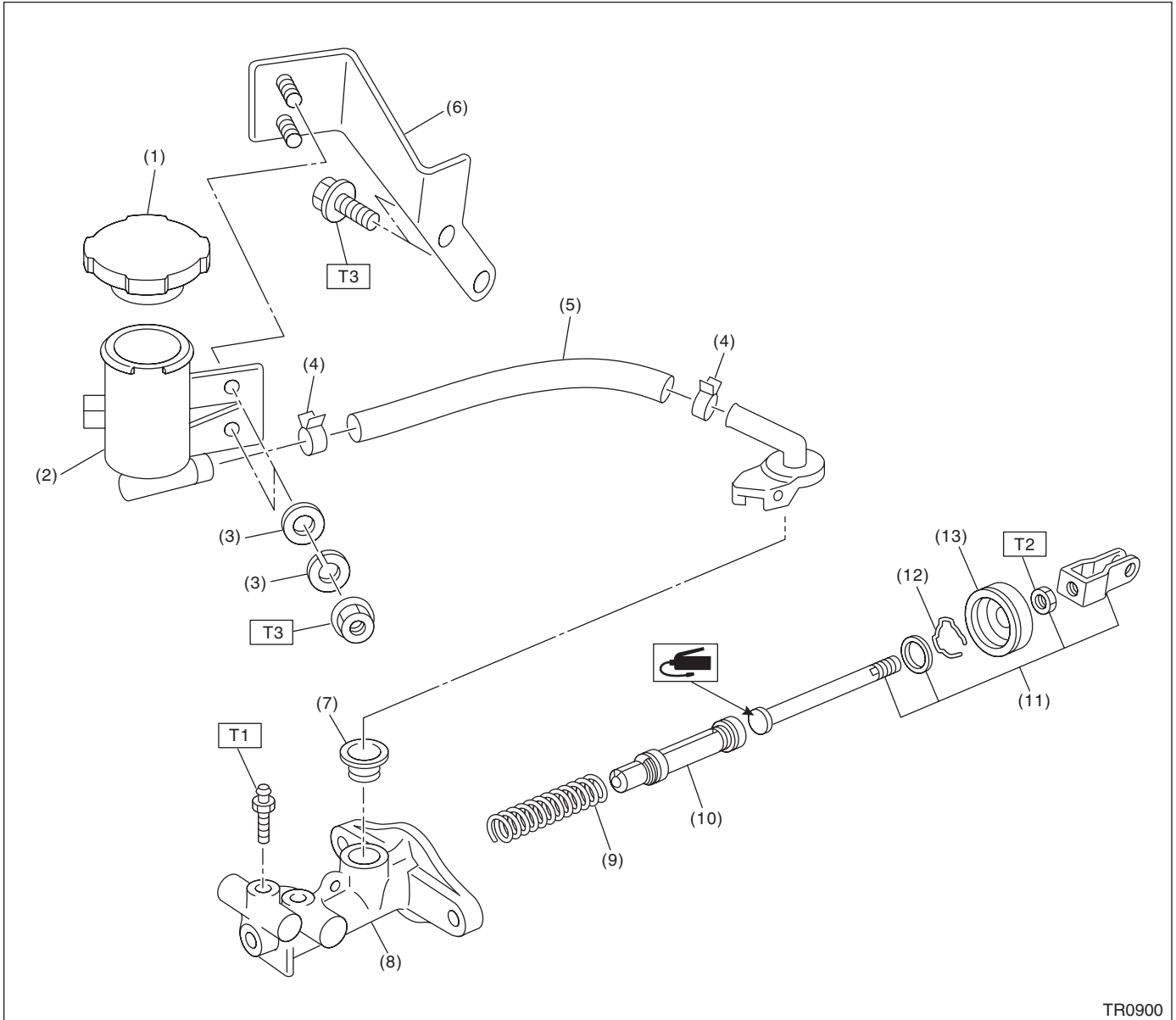
T1: 10 (1.0, 7)

T2: 46.6 (4.75, 34.4)

GENERAL DESCRIPTION

CLUTCH SYSTEM

• RHD TURBO MODEL



TR0900

- (1) Reservoir cap
- (2) Reservoir tank
- (3) Washer
- (4) Clip
- (5) Hose
- (6) Reservoir tank bracket

- (7) Oil seal
- (8) Master cylinder
- (9) Return spring
- (10) Piston
- (11) Push rod
- (12) Piston stop ring

- (13) Cylinder boot

Tightening torque: N·m (kgf·m, ft·lb)

T1: 8 (0.8, 5.8)

T2: 10 (1.0, 7)

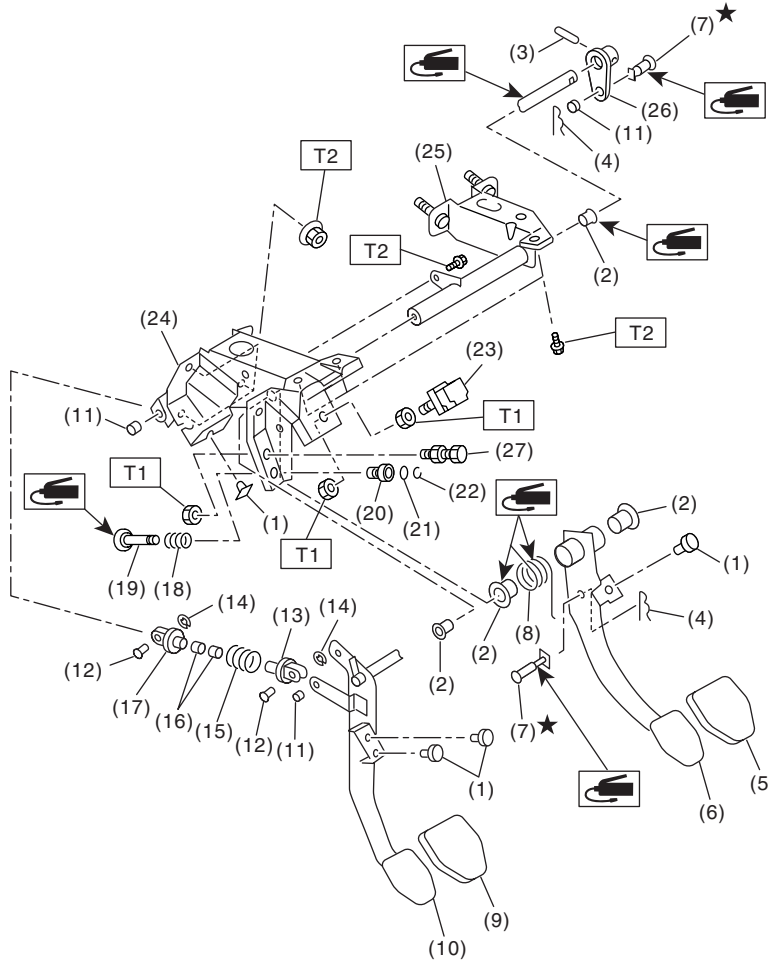
T3: 18 (1.8, 13.3)

GENERAL DESCRIPTION

CLUTCH SYSTEM

8. CLUTCH PEDAL FOR 2.0 L AND 2.5 L MODEL

• LHD MODEL



TR0901

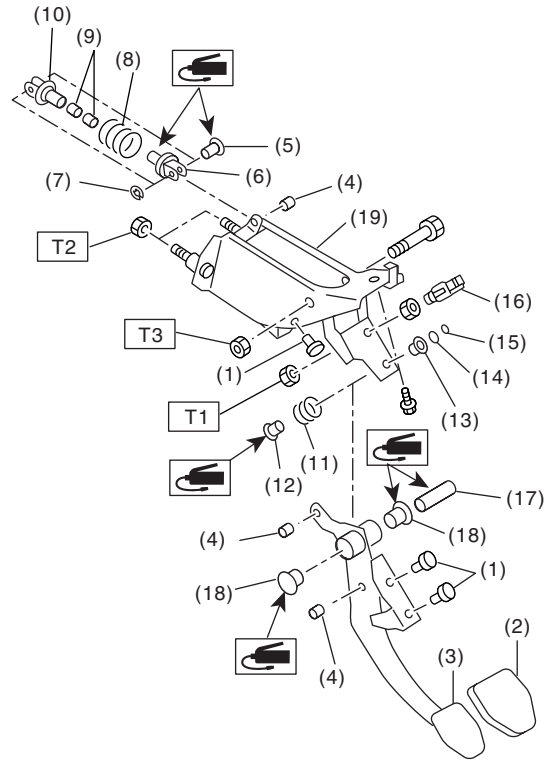
- | | | |
|------------------------|------------------------|-------------------------------------|
| (1) Stopper | (12) Clutch clevis pin | (23) Stop light switch |
| (2) Bushing | (13) Assist rod A | (24) Pedal bracket |
| (3) Spring pin | (14) Clip | (25) Clutch master cylinder bracket |
| (4) Snap pin | (15) Assist spring | (26) Lever |
| (5) Brake pedal pad | (16) Assist bushing | (27) Adjust bolt |
| (6) Brake pedal | (17) Assist rod B | |
| (7) Clevis pin | (18) Spring A | |
| (8) Brake pedal spring | (19) Rod | |
| (9) Clutch pedal pad | (20) Bushing B | |
| (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)

• RHD MODEL



TR0902

- | | | |
|-----------------------|--|---------------------------|
| (1) Stopper | (9) Assist bushing | (17) Spacer |
| (2) Clutch pedal pad | (10) Assist rod B | (18) Bushing |
| (3) Clutch pedal | (11) Spring A | (19) Clutch pedal bracket |
| (4) Bushing | (12) Rod S | |
| (5) Clutch clevis pin | (13) Bushing B | |
| (6) Assist rod A | (14) O-ring | |
| (7) Clip | (15) Clip | |
| (8) Assist spring | (16) Clutch switch (With cruise control) | |

Tightening torque: N·m (kgf·m, ft·lb)

T1: 8 (0.8, 5.8)

T2: 18 (1.8, 13.0)

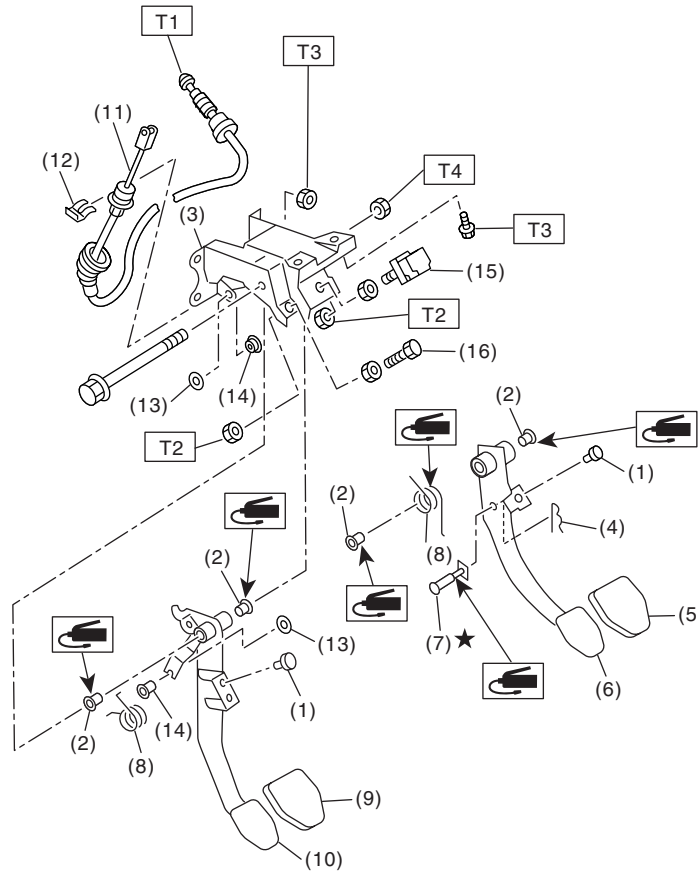
T3: 30 (3.1, 22.4)

GENERAL DESCRIPTION

CLUTCH SYSTEM

9. CLUTCH PEDAL FOR 1.6 L MODEL

• LHD MODEL



TR0903

- | | |
|--------------------------|-------------------------|
| (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) Adjust bolt |

Tightening torque: N-m (kgf-m, ft-lb)

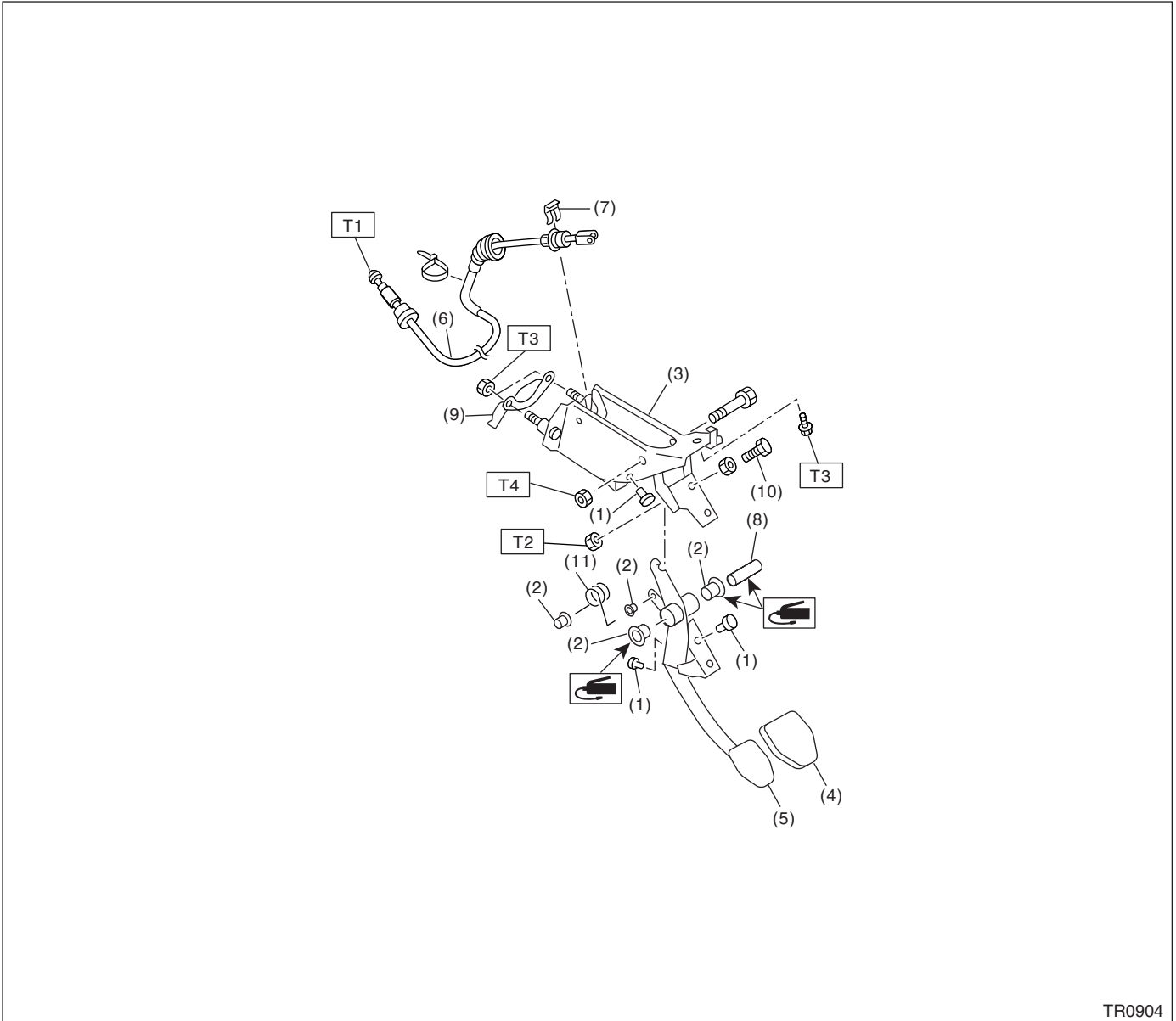
T1: 5.9 (0.60, 4.3)

T2: 8 (0.8, 5.8)

T3: 18 (1.8, 13.0)

T4: 29 (3.0, 21.7)

• RHD MODEL



TR0904

- | | |
|--------------------------|------------------------|
| (1) Stopper | (7) Clutch cable clamp |
| (2) Bushing | (8) Spacer |
| (3) Clutch pedal bracket | (9) Bracket |
| (4) Clutch pedal pad | (10) Adjust bolt |
| (5) Clutch pedal | (11) Spring |
| (6) Clutch cable | |

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

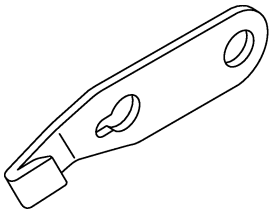
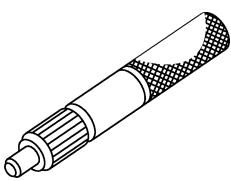
C: CAUTION

- 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 vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.
- Keep fluid away from the vehicle body. If any fluid contacts the vehicle body, immediately flush the area with water.

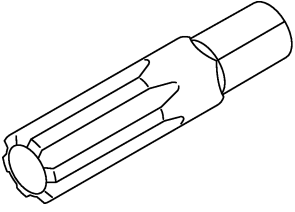
D: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p>B2M3853</p>	498497100	CRANKSHAFT STOPPER	Used for stopping rotation of flywheel when loosening tightening bolt, etc.
 <p>B2M4112</p>	499747100	CLUTCH DISC GUIDE	Used when installing clutch disc to flywheel.

GENERAL DESCRIPTION

CLUTCH SYSTEM

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B2M4213	499057000	TORX PLUS	<ul style="list-style-type: none">• Used for removing flywheel (Dual mass fly-wheel type).• For 2.5 L model.

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.

CLUTCH DISC AND COVER

CLUTCH SYSTEM

2. Clutch Disc and Cover

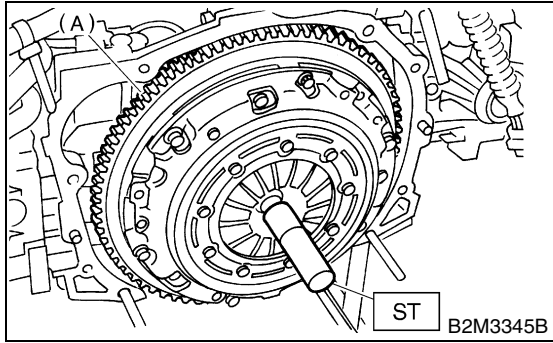
A: REMOVAL

1. 2.5 L MODEL

1) Remove the transmission assembly from vehicle body. <Ref. to MT-33, REMOVAL, Manual Transmission Assembly.>

2) Insert the ST on flywheel.

ST 499747100 CLUTCH DISC GUIDE

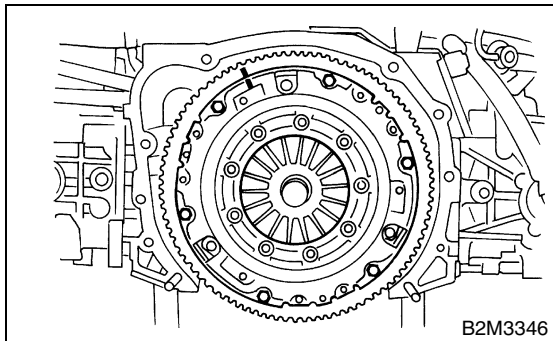


(A) Double mass flywheel

3) Remove the clutch cover and clutch disc.

NOTE:

- Take care not to allow oil on the clutch disc facing.
- Do not disassemble either the clutch cover or clutch disc.
- Put matching marks to the flywheel and clutch cover before removing the clutch cover.

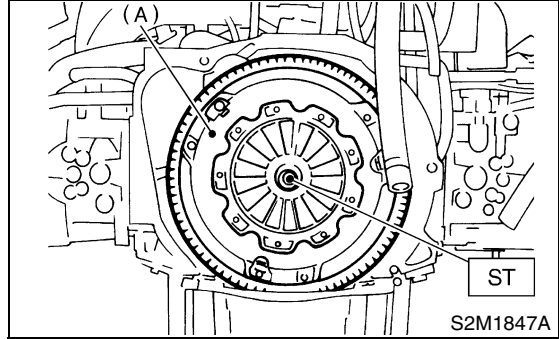


2. EXCEPT 2.5 L MODEL

1) Remove the transmission assembly from vehicle body. <Ref. to MT-33, REMOVAL, Manual Transmission Assembly.>

2) Install the ST on flywheel.

ST 499747100 CRANKSHAFT STOPPER



(A) Clutch cover

3) Remove the clutch cover and clutch disc.

NOTE:

- Take care not to allow oil on the clutch disc facing.
- Do not disassemble either the clutch cover or clutch disc.

B: INSTALLATION

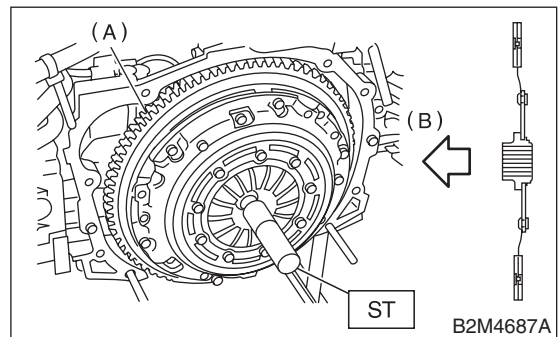
1. 2.5 L MODEL

1) Insert the ST into clutch disc and install them on the flywheel by inserting the ST end into pilot bearing.

NOTE:

When installing the clutch disc, be careful to its direction.

ST 499747100 CLUTCH DISC GUIDE



(A) Flywheel

(B) Flywheel side

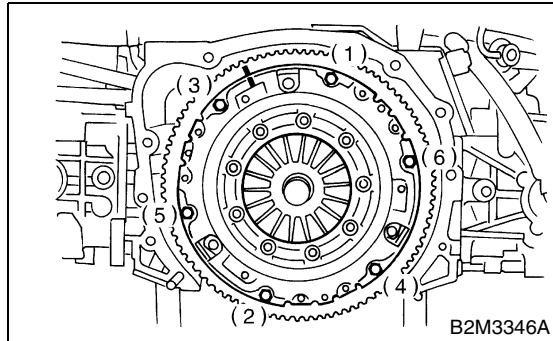
2) Install the clutch cover on flywheel and tighten the bolts to specified torque.

NOTE:

- Align matching marks.
- Note the front and rear of the clutch disc when installing.
- Tighten the clutch cover installing bolts gradually. Each bolt should be tightened to the specified torque in a crisscross fashion.

Tightening torque:

15.7 N·m (1.6 kgf·m, 11.6 ft·lb)



3) Remove the ST.

ST 499747100 CLUTCH DISC GUIDE

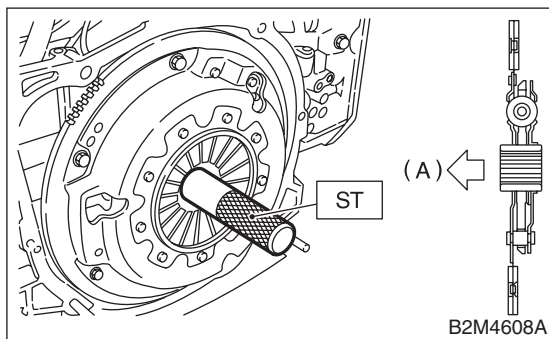
2. EXCEPT 2.5 L MODEL

1) Insert the ST into clutch disc and install them on the flywheel by inserting the ST end into pilot bearing.

NOTE:

When installing the clutch disc, be careful to its direction.

ST 499747100 CLUTCH DISC GUIDE



(A) Flywheel side

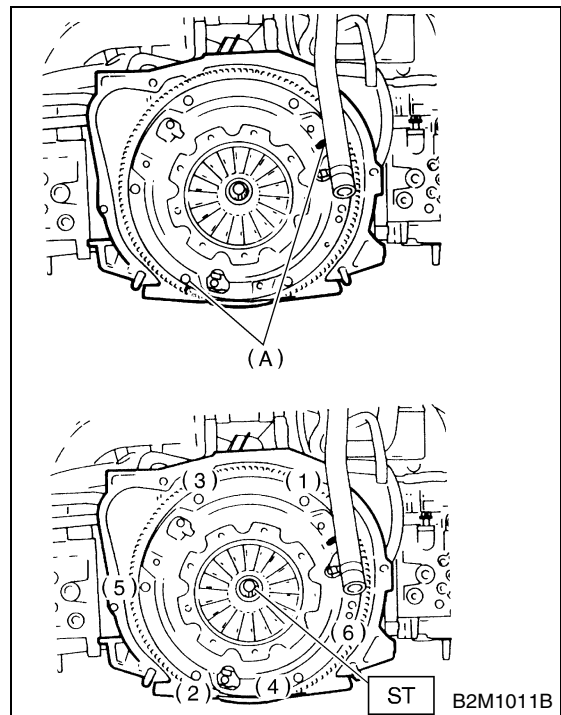
2) Install the clutch cover on flywheel and tighten the bolts to specified torque.

NOTE:

- When installing the clutch cover on 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 the 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 the ST.

ST 499747100 CLUTCH DISC GUIDE

4) Install the transmission assembly. <Ref. to MT-37, 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:

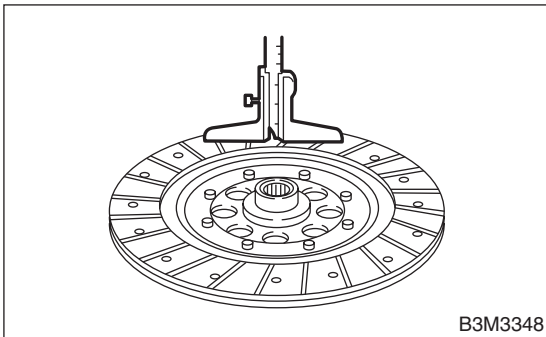
Limit of sinking

0.3 mm (0.012 in)

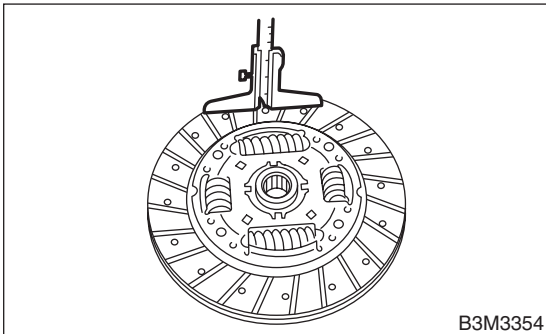
NOTE:

Do not wash the clutch disc with any cleaning fluid.

- 2.5 L MODEL



- Except 2.5 L MODEL



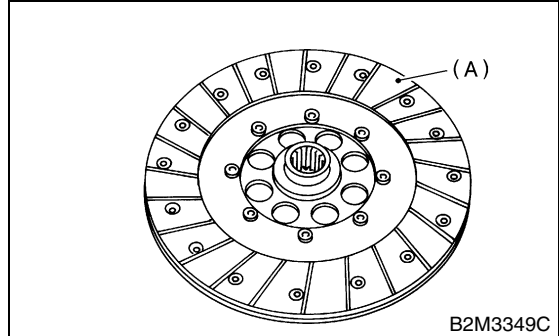
2) Hardened facing

Correct by using emery paper or replace.

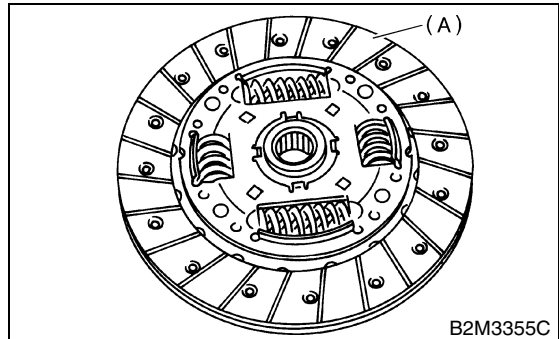
3) Oil soakage on facing

Replace the clutch disc and inspect the transmission front oil seal, transmission case mating surface, engine rear oil seal and other points for oil leakage.

- 2.5 L MODEL



- Except 2.5 L MODEL



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:

1.6 L model

0.8 mm (0.031 in) at R = 107 mm (4.21 in)

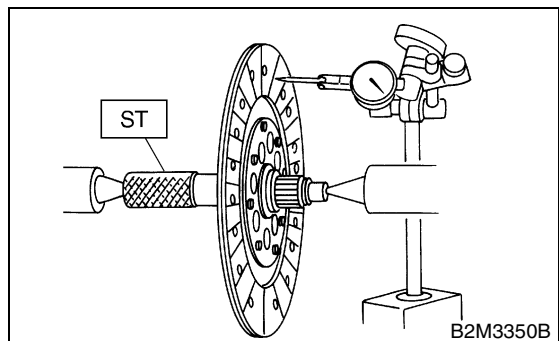
2.0 L model

0.8 mm (0.031 in) at R = 110 mm (4.33 in)

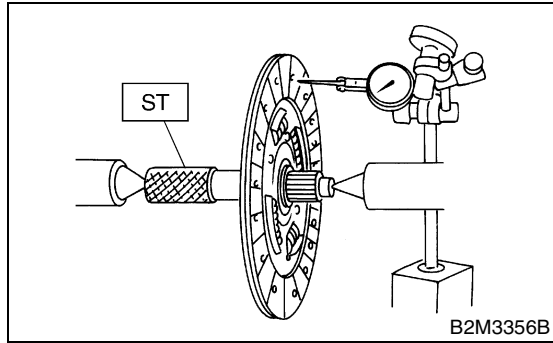
2.5 L model

1.0 mm (0.039 in) at R = 110 mm (4.33 in)

- 2.5 L MODEL

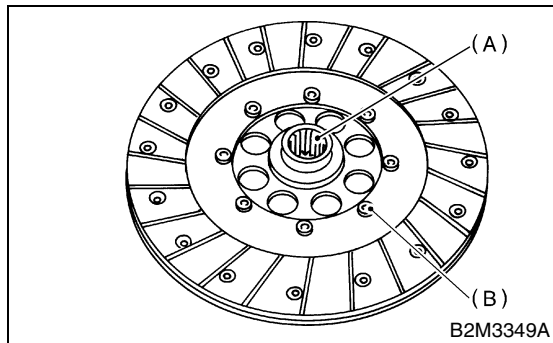


- Except 2.5 L MODEL

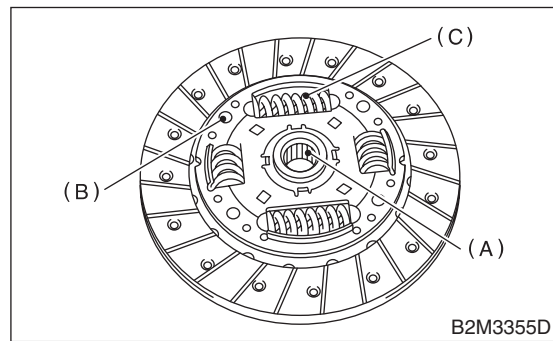


5) Worn spline, loose rivets and torsion spring failure
Replace defective parts.

- 2.5 L MODEL



- Except 2.5 L MODEL



- (A) Spline
- (B) Rivet
- (C) Torsion spring

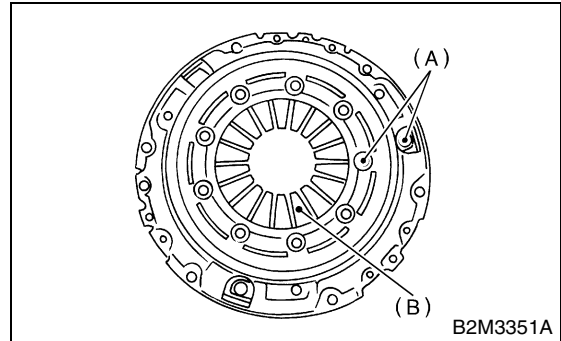
2. CLUTCH COVER

NOTE:

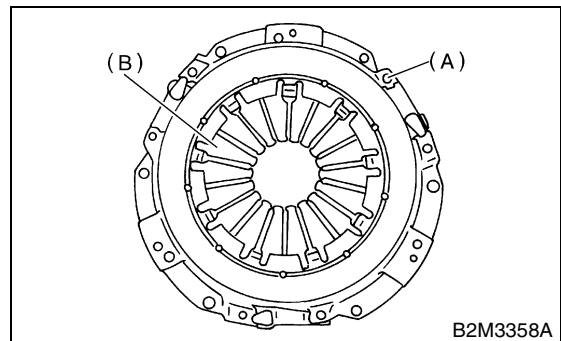
Visually check for the following items without disassembling, and replace or repair if defective.

- 1) Loose thrust rivet.
- 2) Damaged or worn bearing contact area at center of diaphragm spring.

- 2.5 L MODEL



- Except 2.5 L MODEL



- (A) Thrust rivet
- (B) Diaphragm spring

FLYWHEEL

CLUTCH SYSTEM

3. Flywheel

A: REMOVAL

1. 2.5 L MODEL

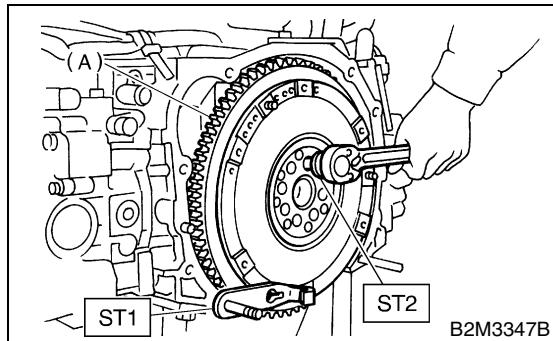
1) Remove the transmission assembly. <Ref. to MT-33, REMOVAL, Manual Transmission Assembly.>

2) Remove the clutch cover and clutch disc. <Ref. to CL-20, REMOVAL, Clutch Disc and Cover.>

3) Remove the flywheel using ST1 and ST2.

ST1 498497100 CRANKSHAFT STOPPER

ST2 499057000 TORX PLUS



(A) Flywheel

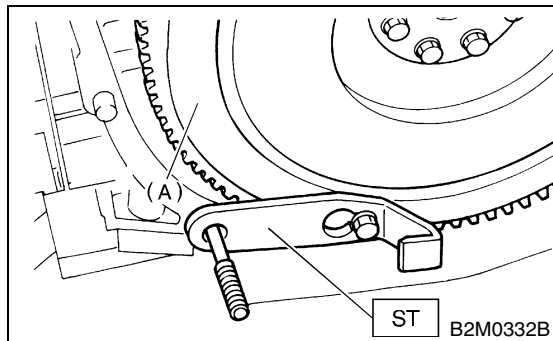
2. EXCEPT 2.5 L MODEL

1) Remove the transmission assembly. <Ref. to MT-33, REMOVAL, Manual Transmission Assembly.>

2) Remove the clutch cover and clutch disc. <Ref. to CL-20, REMOVAL, Clutch Disc and Cover.>

3) Using the ST, remove the flywheel.

ST 498497100 CRANKSHAFT STOPPER



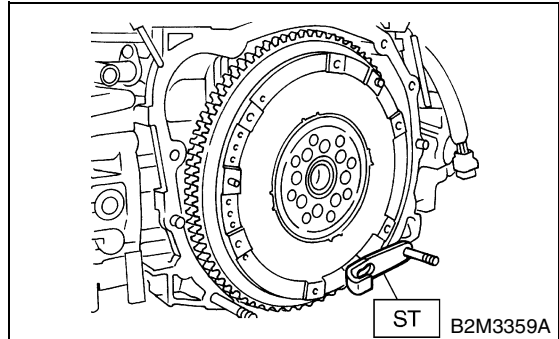
(A) Flywheel

B: INSTALLATION

1. 2.5 L MODEL

1) Install the flywheel and ST.

ST 498497100 CRANKSHAFT STOPPER



2) Tighten the flywheel attaching bolts to the specified torque.

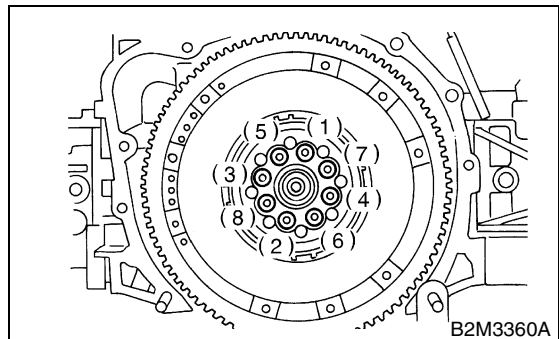
ST 499057000 TORX PLUS

NOTE:

Tighten the 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)

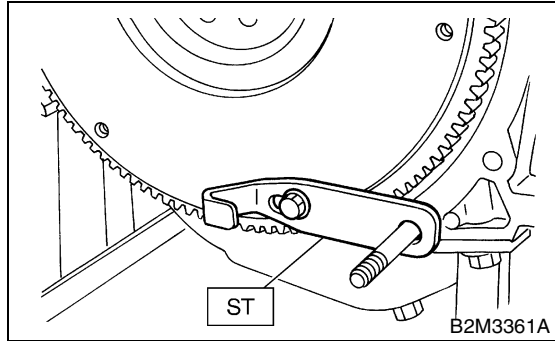


3) Install the clutch disc and cover. <Ref. to CL-20, 2.5 L MODEL, INSTALLATION, Clutch Disc and Cover.>

4) Install the transmission assembly. <Ref. to MT-37, INSTALLATION, Manual Transmission Assembly.>

2. EXCEPT 2.5 L MODEL

- 1) Install the flywheel and ST.
ST 498497100 CRANKSHAFT STOPPER



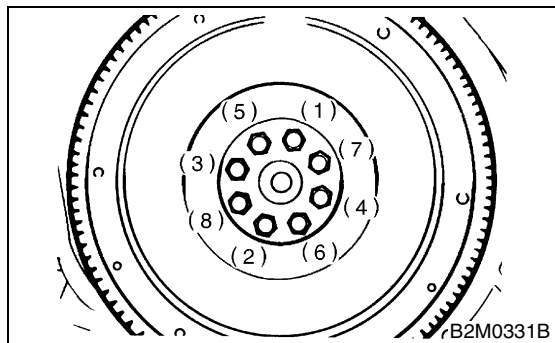
- 2) Tighten the flywheel attaching bolts to the specified torque.

NOTE:

Tighten the 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 the clutch disc and cover. <Ref. to CL-21, EXCEPT 2.5 L MODEL, INSTALLATION, Clutch Disc and Cover.>

- 4) Install the transmission assembly. <Ref. to MT-37, INSTALLATION, Manual Transmission Assembly.>

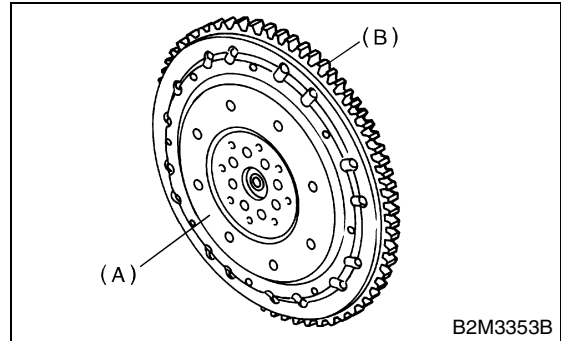
C: INSPECTION

CAUTION:

Since this bearing is grease sealed and is of a non-lubrication type, do not wash with gasoline or any solvent.

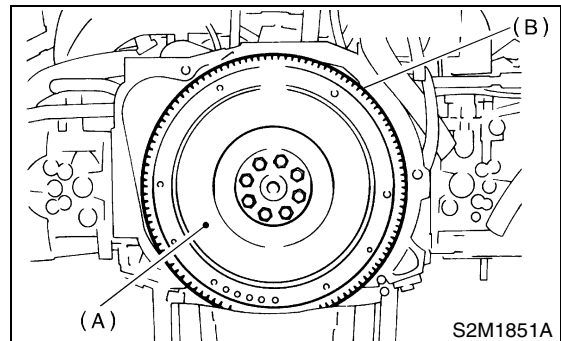
- 1) Damage of facing and ring gear
If defective, replace the flywheel.

- 2.5 L MODEL



- (A) Flywheel
- (B) Ring gear

- Except 2.5 L MODEL



- (A) Flywheel
- (B) Ring gear

- 2) Smoothness of rotation

Rotate the ball bearing applying pressure in thrust direction.

- 3) If noise or excessive play is noted, replace the flywheel.

RELEASE BEARING AND LEVER

CLUTCH SYSTEM

4. Release Bearing and Lever

A: REMOVAL

1. NON-TURBO MODEL

1) Remove the transmission assembly from vehicle body.

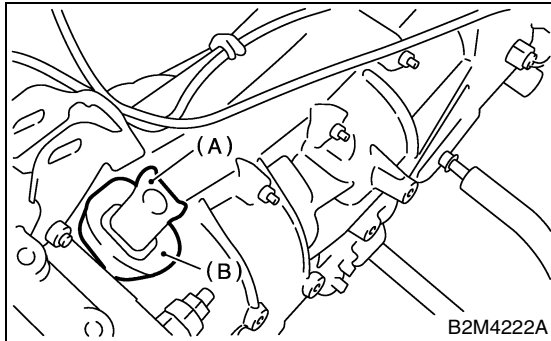
<Ref. to MT-33, REMOVAL, Manual Transmission Assembly.>

2) Remove the two clips from clutch release lever and remove the release bearing.

CAUTION:

Be careful not to deform clips.

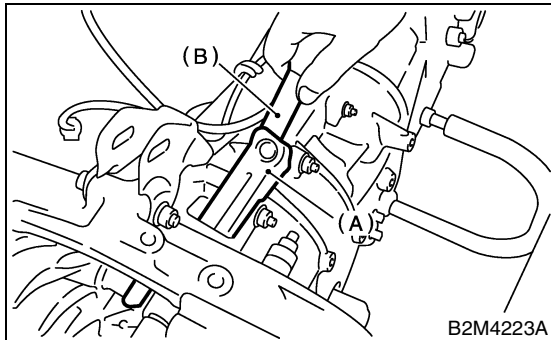
3) Remove the release lever seal.



(A) Clutch release lever

(B) Release lever seal

4) Remove the release lever retainer spring from release lever pivot with a screwdriver by accessing it through clutch housing release lever hole. Then remove the release lever.



(A) Clutch release lever

(B) Screwdriver

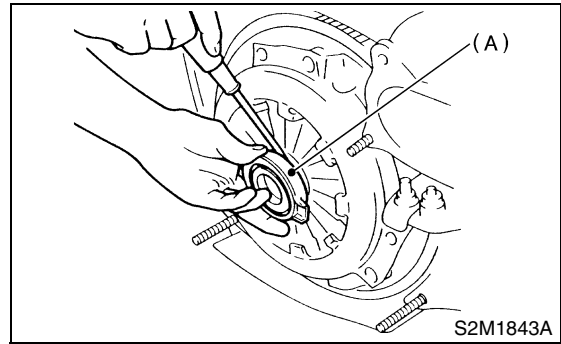
2. TURBO MODEL

1) Remove the transmission assembly from vehicle body. <Ref. to MT-33, REMOVAL, Manual Transmission Assembly.>

2) Remove the clutch release lever from transmission.

3) Put the clutch release bearing in engine side.

4) Remove the clutch release bearing from the clutch cover using flat-type screwdriver.



(A) Clutch release bearing

B: INSTALLATION

1. NON-TURBO MODEL

NOTE:

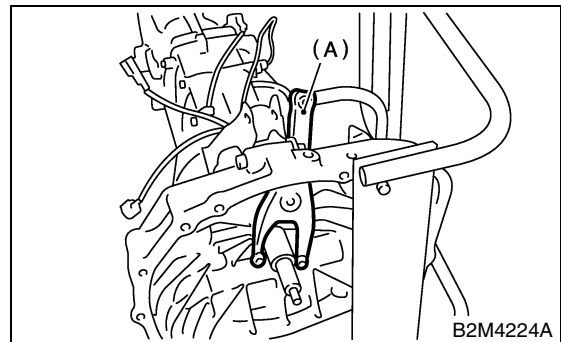
Before or during assembling, lubricate the following points with a light coat of grease.

- Contact surface of lever and pivot
- Contact surface of lever and bearing
- Transmission main shaft spline (Use grease containing molybdenum disulphide.)
- Contact surface of lever and operating cylinder

1) While pushing the release lever to pivot and twisting it to both sides, fit the retainer spring onto the constricted portion of pivot.

NOTE:

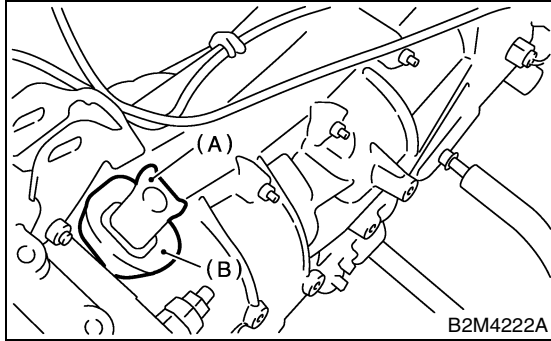
- Apply grease (SUNLIGHT 2: P/N 003602010) to the contact point of release lever and operating cylinder.
- Confirm that the retainer spring is securely fitted by observing it through the main case hole.



(A) Release lever

2) Install the release bearing and fasten it with two clips.

3) Install the release lever seal.

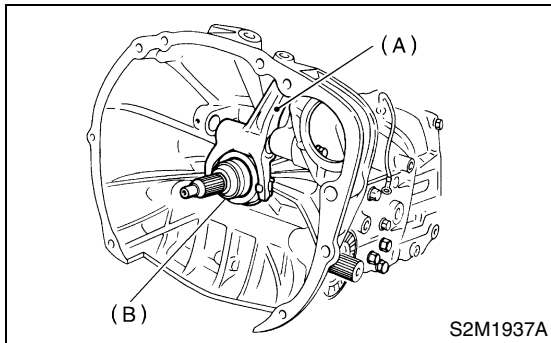


- (A) Release lever
- (B) Release lever seal

4) Install the transmission assembly.
 <Ref. to MT-37, INSTALLATION, Manual Transmission Assembly.>

2. TURBO MODEL

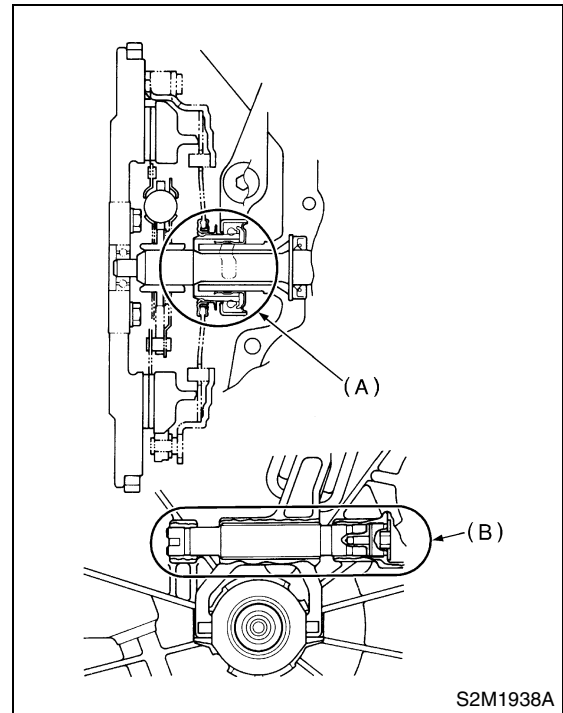
- 1) Install the release bearing on transmission.
- 2) Insert the release fork into release bearing tab.



- (A) Release fork
- (B) Release bearing

3) Apply grease to the specified points:

- Spline FX2200
- Shaft SUNLIGHT 2

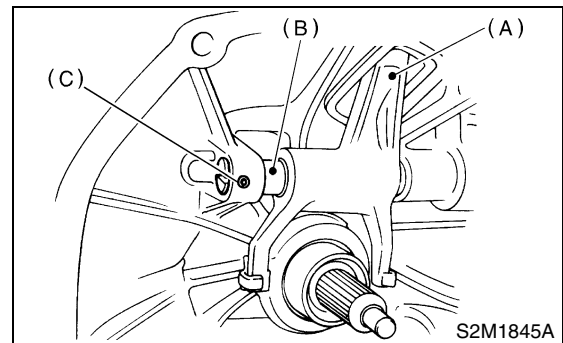


- (A) Spline (FX2200)
- (B) Shaft (SUNLIGHT 2)

4) Insert the release fork shaft into release fork.

NOTE:

Make sure the cutout portion of release fork shaft contacts spring pin.



- (A) Release fork
- (B) Release shaft
- (C) Spring pin

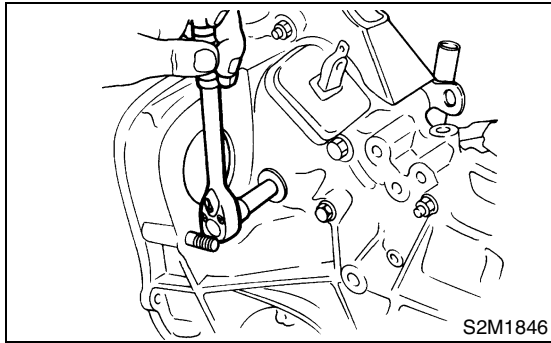
RELEASE BEARING AND LEVER

CLUTCH SYSTEM

5) Tighten the plug.

Tightening torque:

44 N·m (4.5 kgf·m, 32.5 ft·lb)



6) Install the transmission assembly. <Ref. to MT-37, INSTALLATION, Manual Transmission Assembly.>

C: INSPECTION

1. RELEASE BEARING

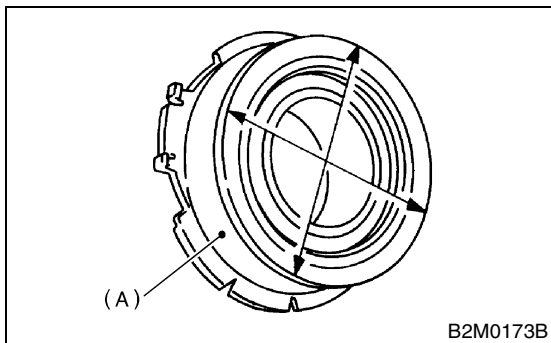
NOTE:

Since this bearing is grease sealed and is of a non-lubrication type, do not wash with gasoline or any solvent when servicing the clutch.

1) Check the bearing for smooth movement by applying force in the radial direction.

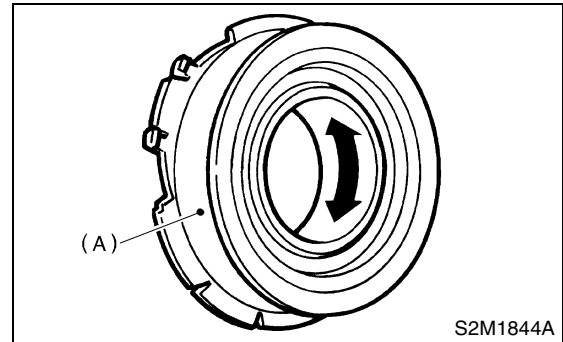
Radial direction stroke:

1.4 mm (0.055 in)



(A) Bearing case

2) Check the bearing for smooth rotation by applying pressure in the thrust direction.

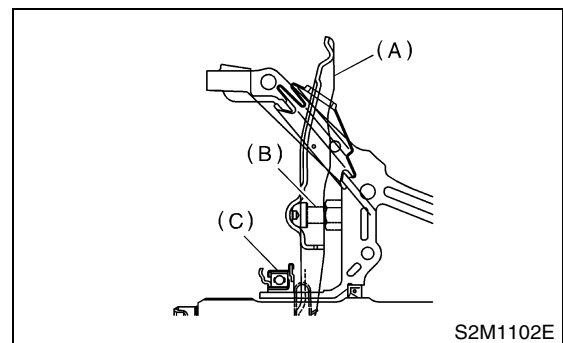


(A) Bearing case

3) Check wear and damage of the bearing case surface contacting with lever.

2. RELEASE LEVER

1) Check the 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

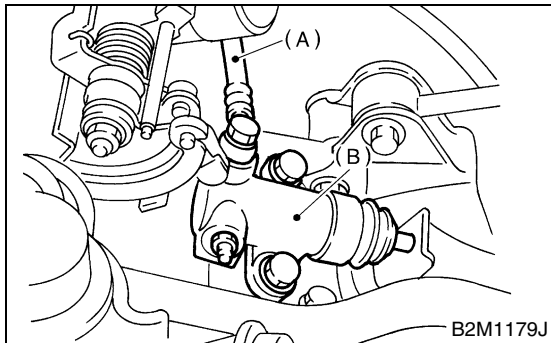
A: REMOVAL

- 1) Remove the air cleaner case and air intake duct (Non-turbo model). <Ref. to IN-6, REMOVAL, Air Cleaner Case.> and <Ref. to IN-7, REMOVAL, Air Intake Duct.>
- 2) Remove the intercooler (Turbo model). <Ref. to IN(TURBO)-10, REMOVAL, Intercooler.>
- 3) Remove the clutch hose from operating cylinder.

CAUTION:

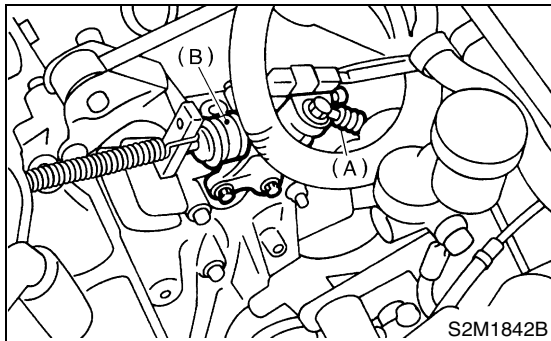
Cover the hose joint to prevent clutch fluid from flowing out.

- Non-turbo MODEL



- (A) Clutch hose
- (B) Operating cylinder

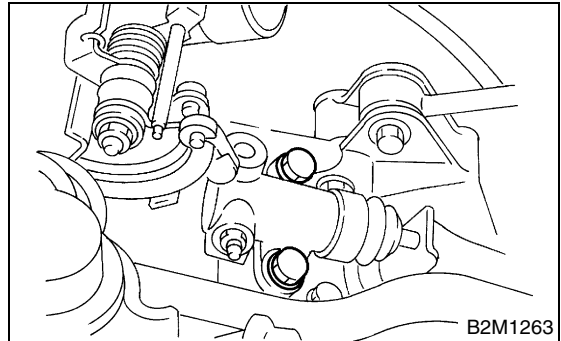
- Turbo MODEL



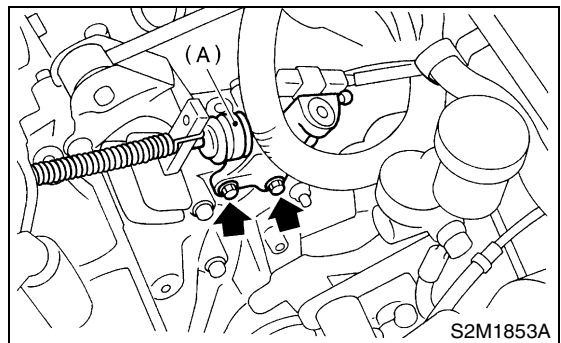
- (A) Clutch hose
- (B) Operating cylinder

- 4) Remove the operating cylinder from transmission.

- Non-turbo MODEL



- Turbo MODEL



- (A) Operating cylinder

OPERATING CYLINDER

CLUTCH SYSTEM

B: INSTALLATION

1) Install in the reverse order of removal.

NOTE:

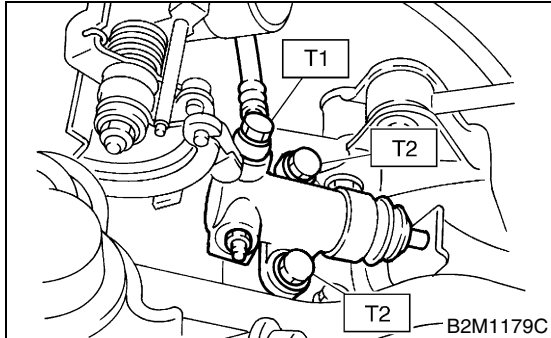
Before installing the operating cylinder, apply grease (SUNLIGHT 2: P/N 003602010) to contact point of the release lever and operating cylinder.

Tightening torque:

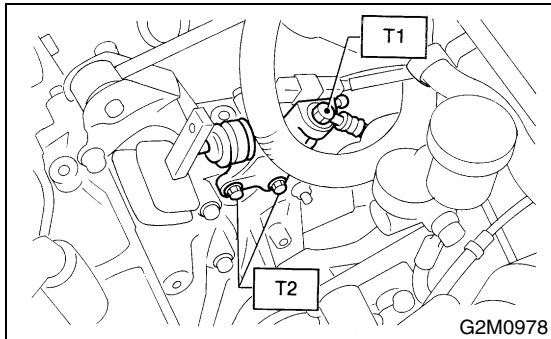
T1: 18 N·m (1.8 kgf-m, 13.0 ft-lb)

T2: 37 N·m (3.8 kgf-m, 27.5 ft-lb)

• Non-turbo MODEL

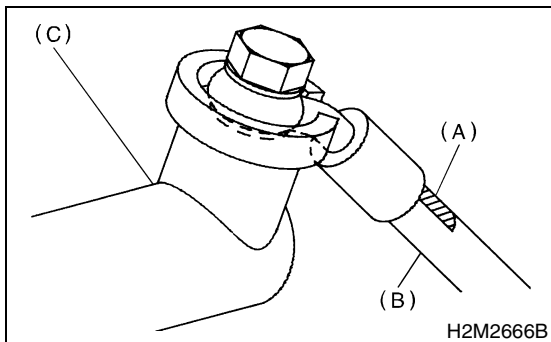


• Turbo MODEL



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 the operating cylinder, ensure that clutch operates properly.

<Ref. to CL-38, Clutch Fluid Air Bleeding.>

C: INSPECTION

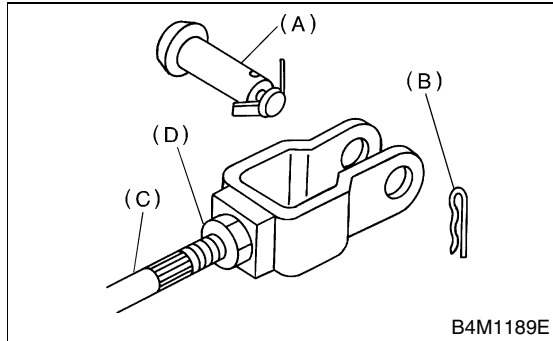
1) Check the operating cylinder for damage. If operating cylinder is damaged, replace it.

2) Check the operating cylinder for fluid leakage or damage on boot. If any leakage or damage is found, replace the operating cylinder.

6. Master Cylinder

A: REMOVAL

- 1) Thoroughly drain the brake fluid from reservoir tank.
- 2) Remove the snap pin, clevis pin and separate the push rod of master cylinder from clutch pedal.

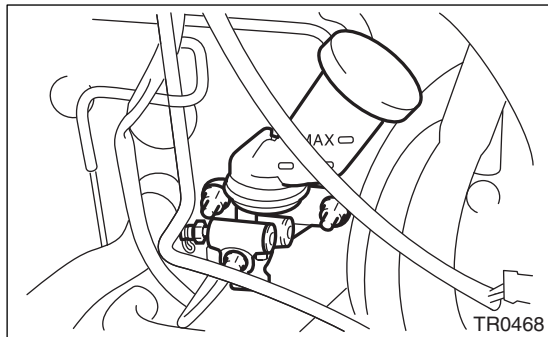


- (A) Clevis pin
- (B) Snap pin
- (C) Push rod
- (D) Lock nut

- 3) Remove the air cleaner case and air intake duct (Non-turbo model). <Ref. to IN-6, REMOVAL, Air Cleaner Case.> and <Ref. to IN-7, REMOVAL, Air Intake Duct.>
- 4) Remove the intercooler (Turbo model). <Ref. to IN(TURBO)-10, REMOVAL, Intercooler.>
- 5) Remove the clutch pipe from master cylinder.
- 6) Remove the 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.



B: INSTALLATION

- 1) Install the master cylinder to body, and install the clutch pipe to master cylinder.

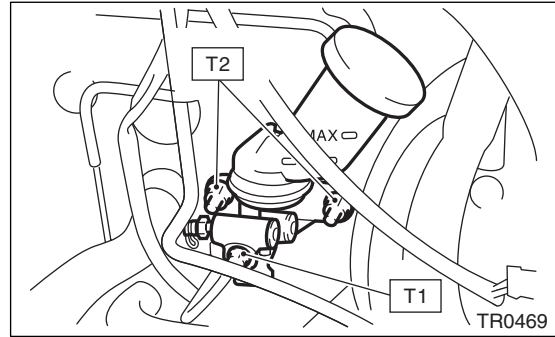
CAUTION:

Check that the pipe is routed properly.

Tightening torque:

T1: 15 N·m (1.5 kgf-m, 10.8 ft-lb)

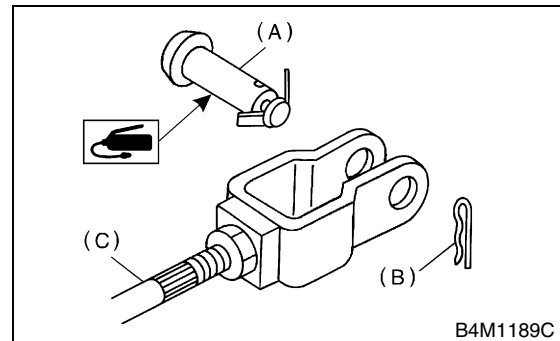
T2: 18 N·m (1.8 kgf-m, 13.0 ft-lb)



- 2) Connect the push rod of master cylinder to clutch pedal, and install the clevis pin and snap pin.

NOTE:

Apply grease to the clevis pin.



- (A) Clevis pin
- (B) Snap pin
- (C) Push rod

- 3) After bleeding air from the system, ensure that clutch operates properly.

<Ref. to CL-38, Clutch Fluid Air Bleeding.>

- 4) Install the air cleaner case and air intake duct (Non-turbo model). <Ref. to IN-6, INSTALLATION, Air Cleaner Case.> and <Ref. to IN-7, INSTALLATION, Air Intake Duct.>

- 5) Install the intercooler (Turbo model). <Ref. to IN(TURBO)-11, INSTALLATION, Intercooler.>

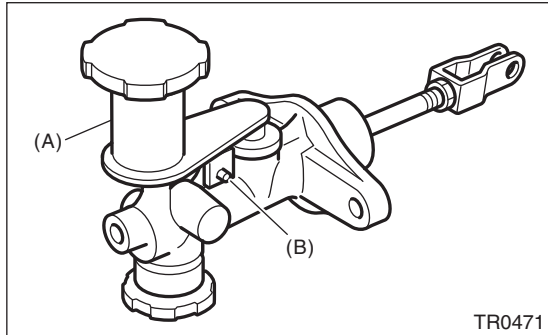
MASTER CYLINDER

CLUTCH SYSTEM

C: DISASSEMBLY

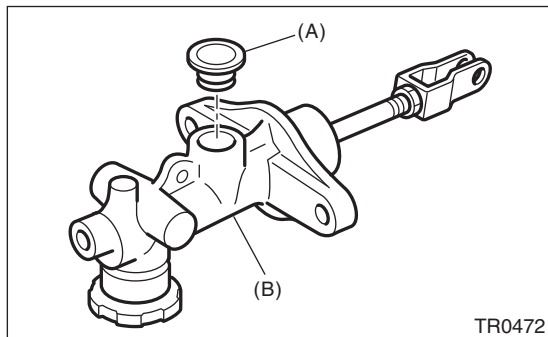
1. EXCEPT RHD TURBO MODEL

1) Remove the straight pin and reservoir tank.



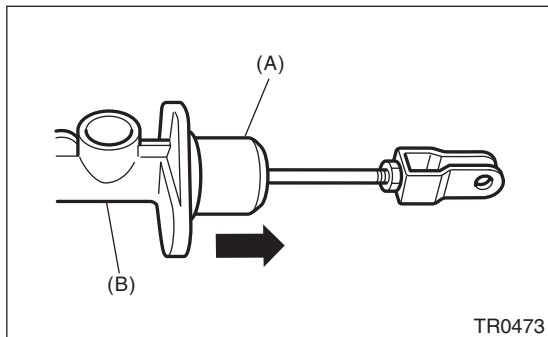
- (A) Reservoir tank
- (B) Straight pin

2) Remove the oil seal.



- (A) Oil seal
- (B) Master cylinder

3) Move the cylinder boot backward.



- (A) Cylinder boot
- (B) Master cylinder

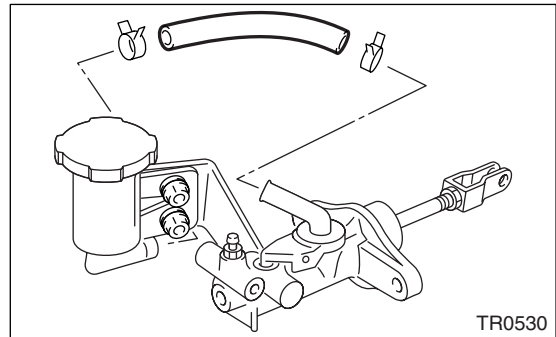
4) Remove the stop ring.

CAUTION:
Be careful when removing the snap ring to prevent the rod, washer, piston and return spring from flying out.

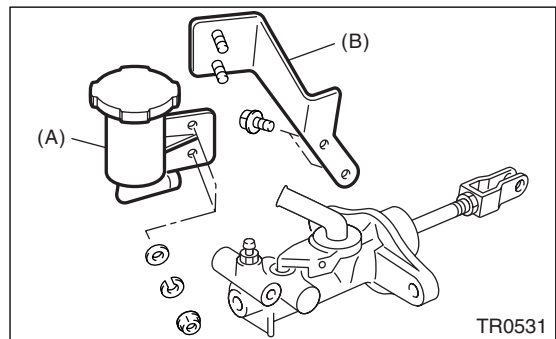
5) Remove the clutch damper.

2. RHD TURBO MODEL

1) Remove the hose.

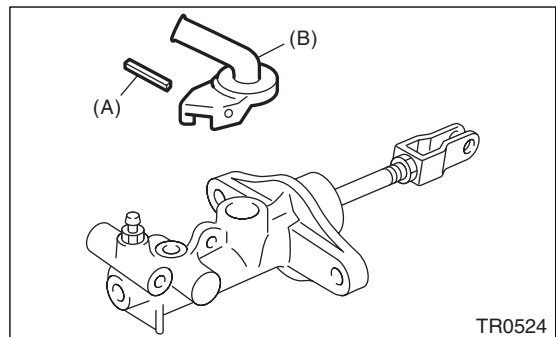


2) Remove the reservoir tank and bracket.



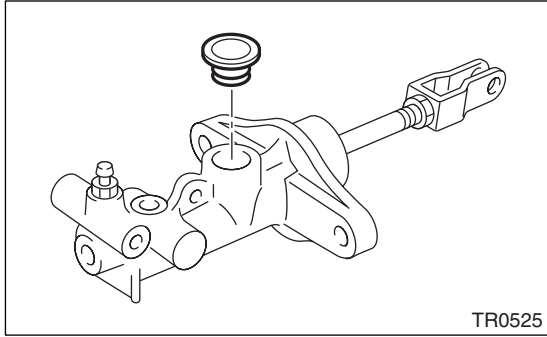
- (A) Reservoir tank
- (B) Bracket

3) Remove the straight pin and adapter.

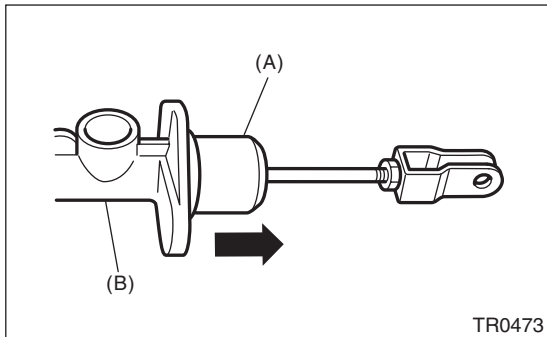


- (A) Straight pin
- (B) Adapter

4) Remove the oil seal.



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 the air bleeder.

D: ASSEMBLY

1. EXCEPT RHD TURBO MODEL

1) Install the clutch damper.

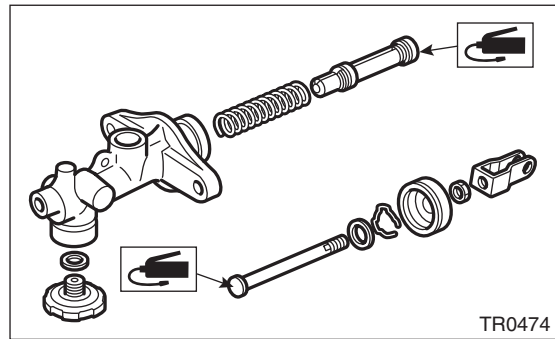
Tightening torque:

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)

MASTER CYLINDER

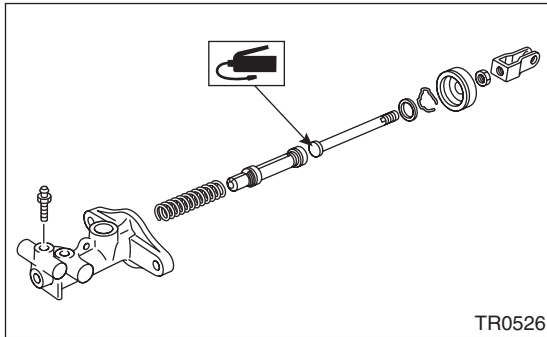
CLUTCH SYSTEM

2. RHD TURBO MODEL

1) Apply a coat of grease to the contacting surfaces of the push rod and piston before installation.

Grease:

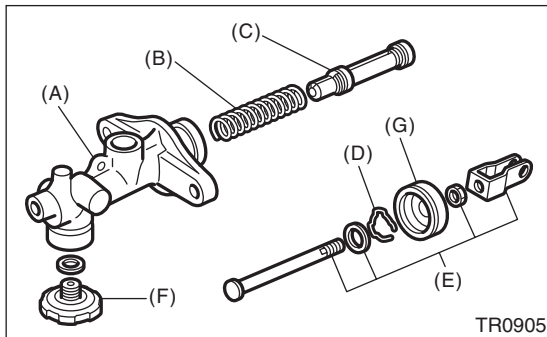
SILICONE GREASE G40M (Part No. 004404003)



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, cylinder boot and hose replace the faulty part.



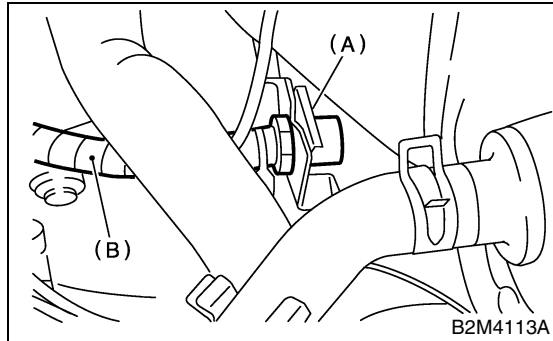
- (A) Master cylinder body
- (B) Return spring
- (C) Piston
- (D) Stop ring
- (E) Rod ASSY
- (F) Clutch damper
- (G) Cylinder boot

7. Clutch Pipe and Hose

A: REMOVAL

1. EXCEPT RHD TURBO MODEL

- 1) Remove the air cleaner case and air intake duct.
- 2) Drain the clutch fluid. <Ref. to CL-37, Clutch Fluid.>
- 3) Remove the clutch pipe from the clutch hose and master cylinder.
- 4) Pull out the clamp, then remove the clutch hose from bracket.

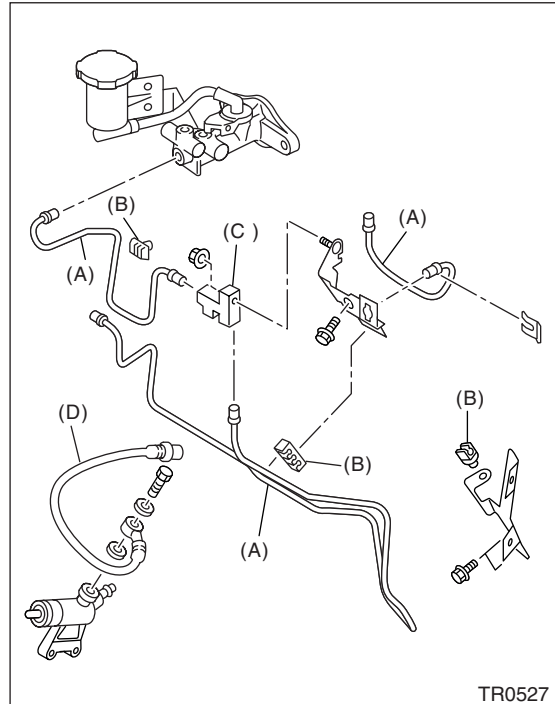


- (A) Clamp
- (B) Clutch hose

- 5) Remove the hose from operating cylinder.
- 6) Remove the bracket.

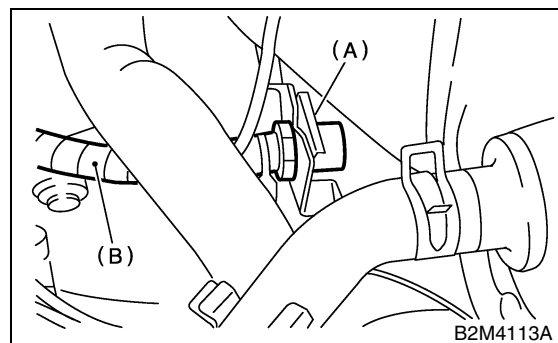
2. RHD TURBO MODEL

- 1) Remove the intercooler. <Ref. to IN(TURBO)-10, REMOVAL, Intercooler.>
- 2) Drain the clutch fluid. <Ref. to CL-37, Clutch Fluid.>
- 3) Remove the clutch pipe from the master cylinder, connector and clutch hose.



- (A) Clutch pipe
- (B) Clip
- (C) Connector
- (D) Clutch hose

- 4) Pull out the clamp, then remove the clutch hose from bracket.



- (A) Clamp
- (B) Clutch hose

- 5) Remove the connector.
- 6) Remove the bracket.

CLUTCH PIPE AND HOSE

CLUTCH SYSTEM

B: INSTALLATION

1. EXCEPT RHD TURBO MODEL

Install in the reverse order of removal.

NOTE:

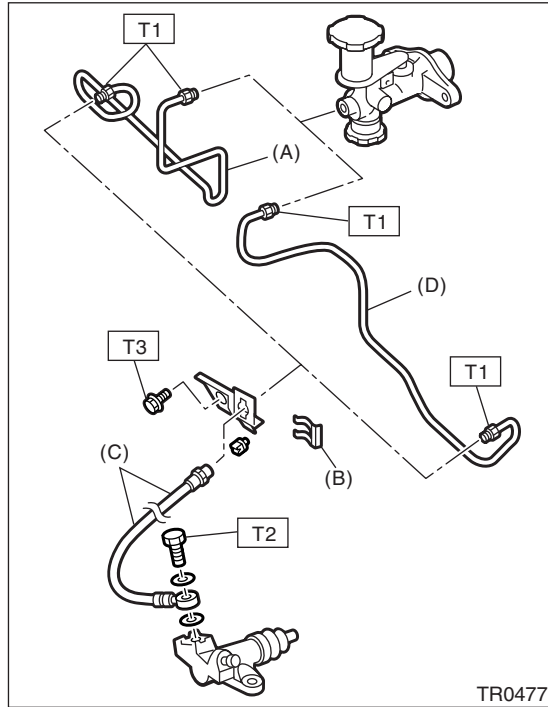
Bleed the clutch fluid. <Ref. to CL-38, Clutch Fluid Air Bleeding.>

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 the clutch fluid. <Ref. to CL-38, Clutch Fluid Air Bleeding.>

Tightening torque:

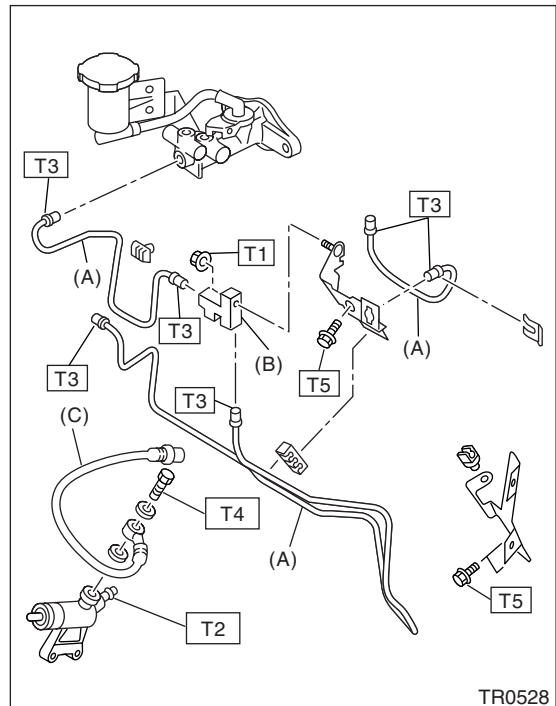
T1: 7.5 N·m (0.76 kgf-m, 5.53 ft-lb)

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

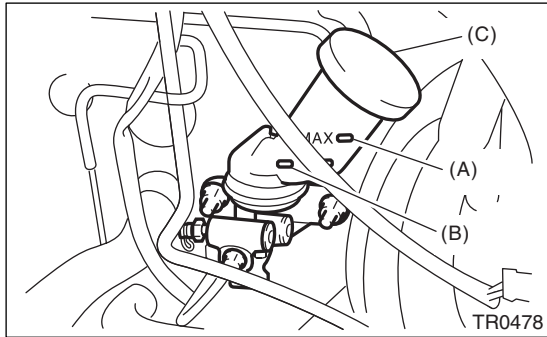
C: INSPECTION

Check the pipes and hoses for cracks, breakage, or damage. Check the 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 the vehicle on a level surface.
- 2) Inspect the fluid level using scale on the outside of the reservoir tank. If the level is below "MIN", add fluid to bring it up to "MAX", and also inspect for leakage.



- (A) Max. level
- (B) Min. level
- (C) Reservoir tank

B: REPLACEMENT

CAUTION:

- The FMVSS No. 116, fresh DOT3 or 4 brake fluid must be used.
- Cover the 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 approx. 70 mℓ (2.4 US fl oz, 2.5 Imp fl oz) for total clutch system.

- 1) Remove the air cleaner case and air duct.
- 2) Either jack-up the vehicle and place a safety stand under it, or lift-up the vehicle.
- 3) Draw out the brake fluid from reservoir tank with syringe.
- 4) Refill the reservoir tank with recommended brake fluid.

Recommended brake fluid:

FMVSS No. 116, fresh DOT3 or 4 brake fluid

- 5) Drain fluid in the same method as air bleeding.

- 6) Refill the brake fluid before reservoir tank becomes empty, and drain contaminated fluid again.
- 7) Repeat the above procedure until the contaminated fluid is completely drained.

CLUTCH FLUID AIR BLEEDING

CLUTCH SYSTEM

9. Clutch Fluid Air Bleeding

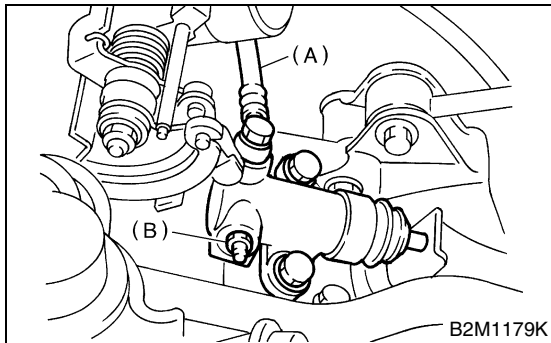
A: PROCEDURE

1. NON-TURBO MODEL

NOTE:

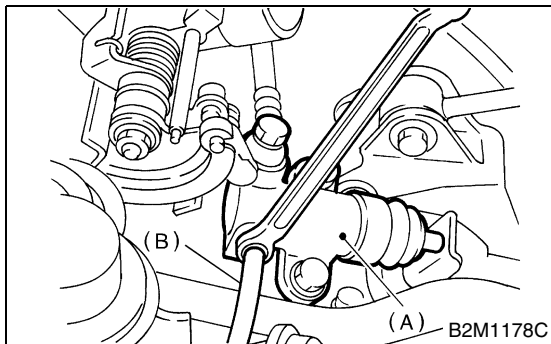
Bleed air from the oil line with help of a co-worker.

- 1) Remove the air cleaner case and air intake duct. <Ref. to IN-6, REMOVAL, Air Cleaner Case.> and <Ref. to IN-7, REMOVAL, Air Intake Duct.>
- 2) Fit one end of a vinyl tube into the air bleeder of operating cylinder and put the other end into a brake fluid container.



- (A) Clutch hose
- (B) Air bleeder

- 3) Slowly depress the clutch pedal and keep it depressed. Then open the air bleeder to discharge air together with the fluid. Release the air bleeder for 1 or 2 seconds. Next, with the bleeder closed, slowly release the clutch pedal.



- (A) Operating cylinder
- (B) Vinyl tube

- 4) Repeat these steps until there are no more air bubbles in the vinyl tube.

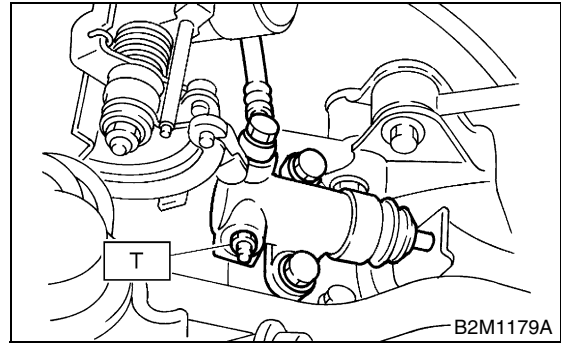
NOTE:

Cover the bleeder with waste cloth when loosening it, to prevent brake fluid from being splashed over surrounding parts.

- 5) Tighten the air bleeder.

Tightening torque:

T: 8 N·m (0.8 kgf·m, 5.8 ft·lb)



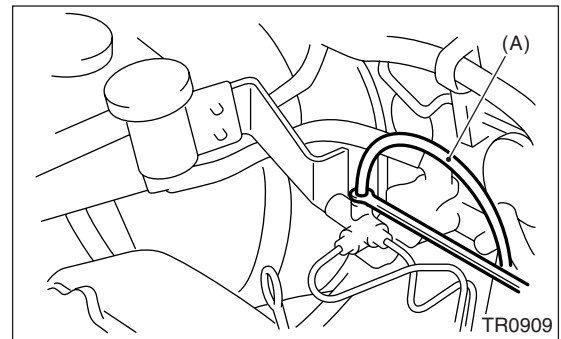
- 6) After depressing the clutch pedal, make sure that there are no leaks evident in the entire system.
- 7) After bleeding air from the system, ensure that clutch operates properly.

2. TURBO MODEL

NOTE:

Bleed air from the oil line with help of a co-worker.

- 1) Remove the intercooler. <Ref. to IN(TURBO)-10, REMOVAL, Intercooler.>
- 2) Fit one end of a vinyl tube into the air bleeder of master cylinder and put the air bleeder of other end into a brake fluid container. (RHD turbo model)
- 3) Slowly depress the clutch pedal and keep it depressed. Then open the air bleeder to discharge air together with the fluid. Release the air bleeder for 1 or 2 seconds. Next, with the bleeder closed, slowly release the clutch pedal. (RHD turbo model)



- (A) Vinyl tube

- 4) Repeat these steps until there are no more air bubbles in the vinyl tube. (RHD turbo model)

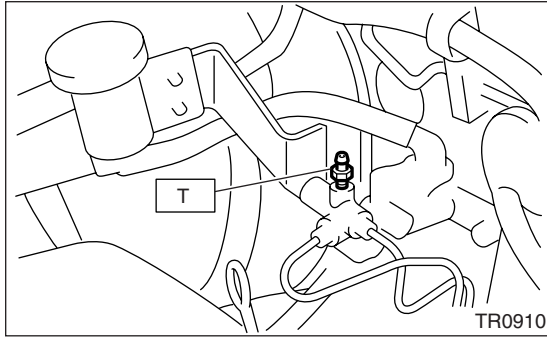
CAUTION:

Cover the bleeder with waste cloth when loosening to prevent brake fluid from being splashed over surrounding parts.

5) Tighten the air bleeder. (RHD turbo model)

Tightening torque:

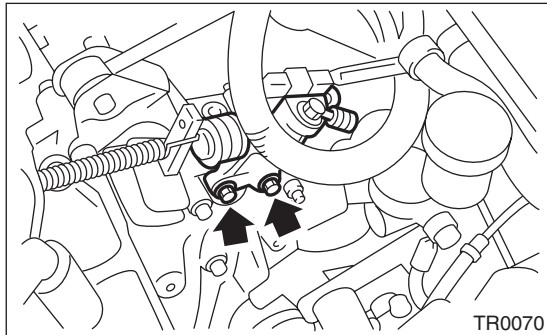
T: 8 N·m (0.8 kgf-m, 5.8 ft-lb)



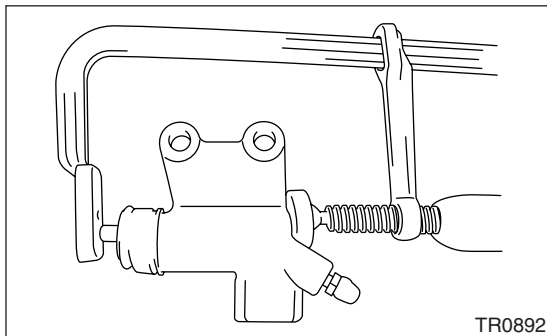
6) Remove the operating cylinder.

NOTE:

Do not remove the clutch hose.



7) Fix the piston with clamp to avoid the piston from jumping out.



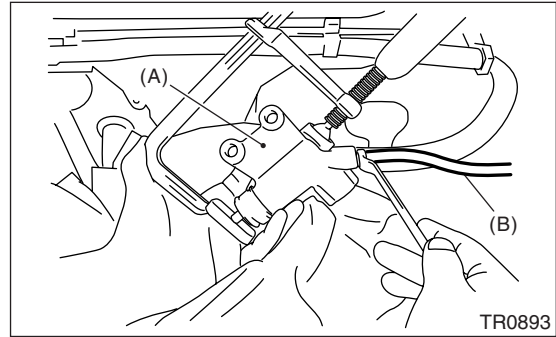
8) Fit one end of a vinyl tube into the air bleeder of operating cylinder and put the other end into a brake fluid container.

9) Slowly depress the clutch pedal and keep it depressed. Then open the air bleeder to discharge air together with the fluid.

Release the air bleeder for 1 or 2 seconds. Next, with the bleeder closed, slowly release the clutch pedal.

NOTE:

Set the air breather screw part higher than tip of operating cylinder when performing this procedure.



(A) Operating cylinder

(B) Vinyl tube

10) Repeat these steps until there are no more air bubbles in the vinyl tube.

CAUTION:

Cover the bleeder with waste cloth when loosening it, to prevent brake fluid from being splashed over surrounding parts.

CLUTCH FLUID AIR BLEEDING

CLUTCH SYSTEM

11) Tighten the air bleeder.

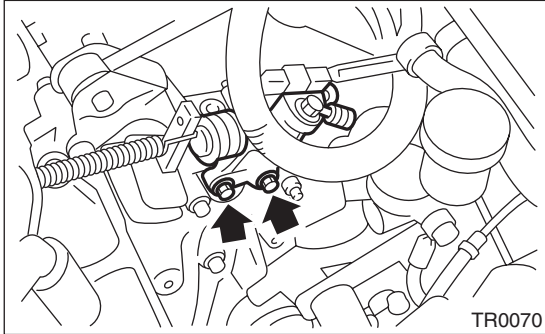
Tightening torque:

T: 8 N·m (0.8 kgf-m, 5.8 ft-lb)

12) Install the operating cylinder.

Tightening torque:

T: 37 N·m (3.8 kgf-m, 27.5 ft-lb)



13) After depressing the clutch pedal, make sure that there are no leaks evident in the entire system.

14) After bleeding air from the system, ensure that clutch operates properly.

15) Install the intercooler. <Ref. to IN(TURBO)-11, INSTALLATION, Intercooler.>

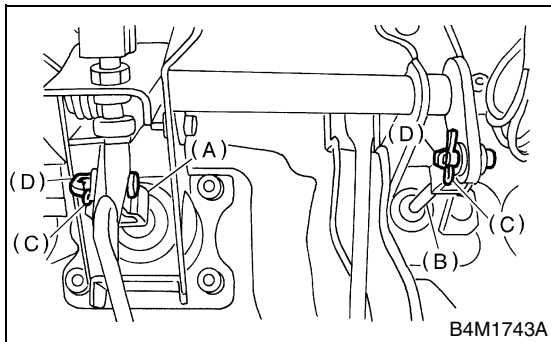
10. Clutch Pedal

A: REMOVAL

1. LHD MODEL

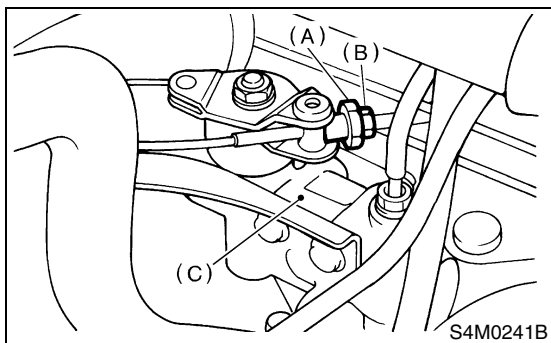
• Except 1.6 L MODEL

- 1) Remove the steering column. <Ref. to PS-29, REMOVAL, Tilt Steering Column.>
- 2) Disconnect the connectors from stop light and clutch switches.
- 3) Remove the snap pins which secure lever to push rod and operating rod.
- 4) Remove the 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 the air cleaner case and intake duct. <Ref. to IN-6, REMOVAL, Air Cleaner Case.> and <Ref. to IN-7, REMOVAL, Air Intake Duct.>
- 6) Remove the PHV adjusting nut and lock nut. (with hill holder)

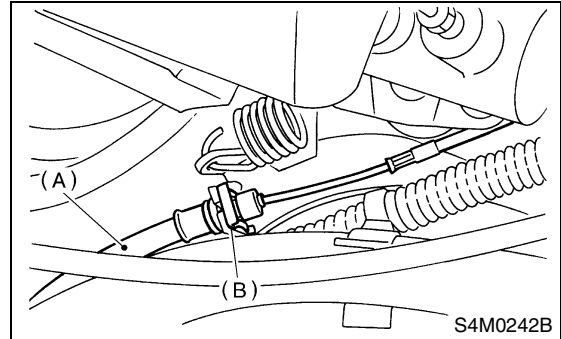


- (A) Adjusting nut
- (B) Lock nut
- (C) PHV

- 7) Remove the cable clamp, and disconnect the PHV cable from PHV. (with hill holder)

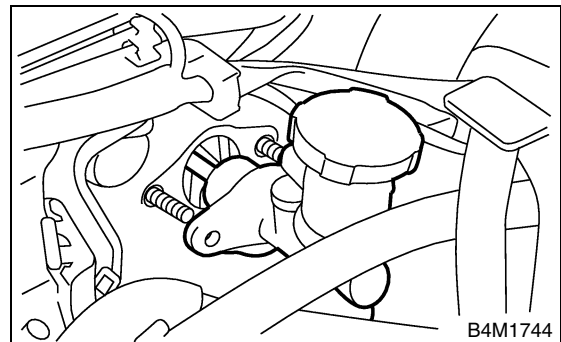
CAUTION:

Carefully protect the boot and inner cable from damage when disconnecting the PHV cable.



- (A) PHV cable
- (B) Clamp

- 8) Remove the nut which secures clutch master cylinder.



- 9) Remove the bolts and nuts which secure brake and clutch pedals, and remove the pedal assembly.

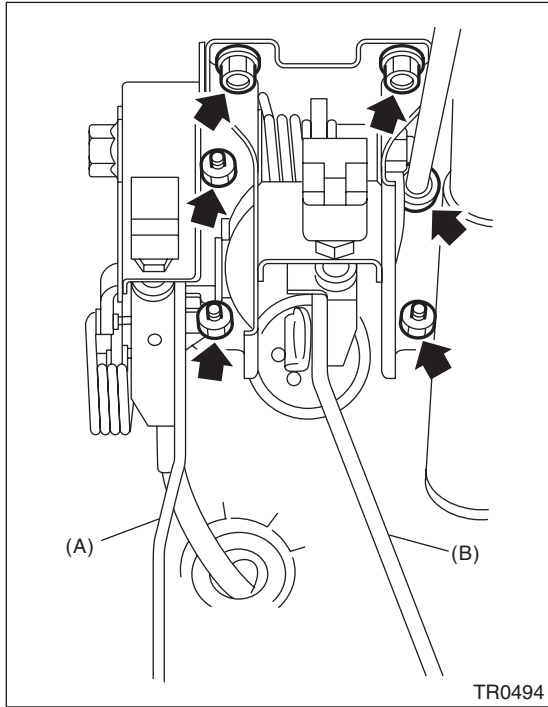
• 1.6 L MODEL

- 1) Disconnect the ground cable from battery.
- 2) Remove the air cleaner case and intake duct. <Ref. to IN-6, REMOVAL, Air Cleaner Case.> and <Ref. to IN-7, REMOVAL, Air Intake Duct.>
- 3) Disconnect the clutch cable from release lever.
- 4) Remove the instrument panel lower cover.
- 5) Disconnect the operating rod of brake pedal.
- 6) Remove the electrical connectors (for stop light switch, etc.)

CLUTCH PEDAL

CLUTCH SYSTEM

7) Remove the bolts and nuts which secure brake and clutch pedals, and remove pedal bracket and clutch cable as a unit.

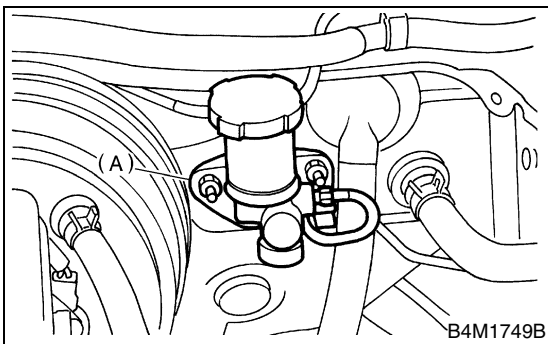


- (A) Clutch pedal
- (B) Brake pedal

8) Depress the clutch pedal, then disconnect the clutch cable from clutch pedal.

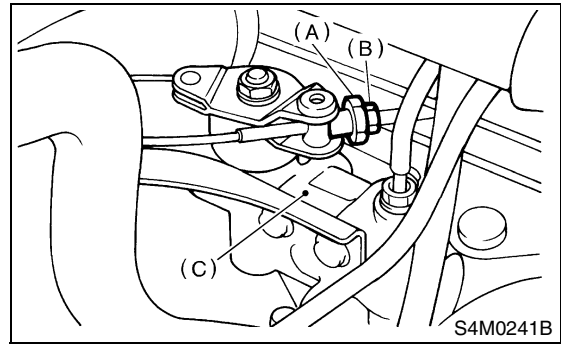
2. RHD MODEL

- 1) Disconnect the ground cable from battery.
- 2) Disconnect the connector from clutch. (With cruise control)
- 3) Remove the instrument panel lower cover.
- 4) Remove the snap pin and clevis pin that join push rod and clutch pedal. (Except 1.6 L model)
- 5) Remove the master cylinder mounting nuts. (Except 1.6 L model)



- (A) Master cylinder

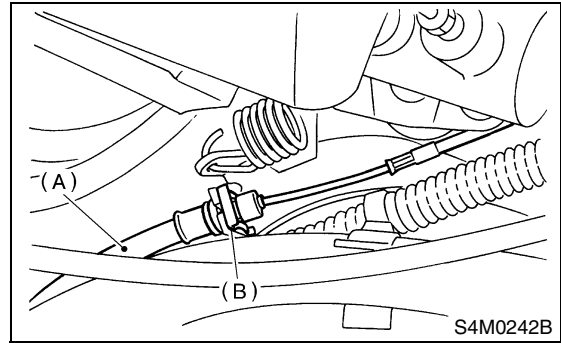
6) Remove the PHV adjusting nut and lock nut. (with hill holder)



- (A) Adjusting nut
- (B) Lock nut
- (C) PHV

7) Remove the cable clamp and disconnect the PHV cable from PHV. (with hill holder)

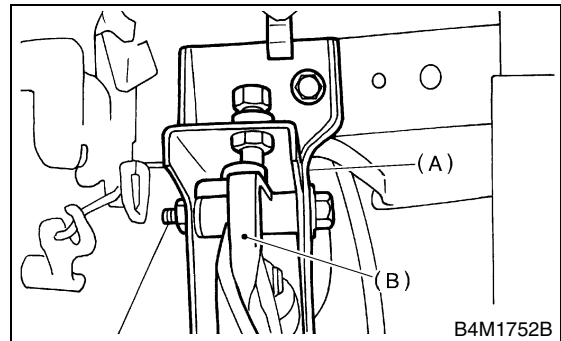
CAUTION:
Carefully protect the boot and inner cable from damage when disconnecting the PHV cable.



- (A) PHV cable
- (B) Clamp

8) Disconnect the clutch cable from release lever. (1.6 L model)

9) Remove the clutch pedal and bracket as a unit.



- (A) Clutch pedal bracket
- (B) Clutch pedal

10) Depress the clutch pedal, then disconnect the clutch cable from clutch pedal. (1.6 L model)

B: INSTALLATION

1) Install in the reverse order of removal.

CAUTION:

- If the cable clamp is damaged, replace it with a new one.
- Never fail to cover the outer cable end with boot.
- Be careful not to kink the accelerator cable.
- Always use new clevis pins.

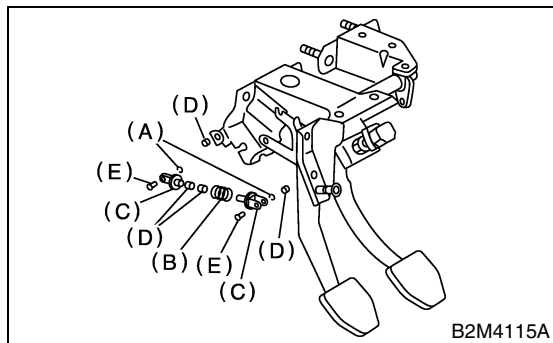
2) Adjust the clutch pedal after installation. <Ref. to CL-46, ADJUSTMENT, Clutch Pedal.>

C: DISASSEMBLY

1. LHD MODEL

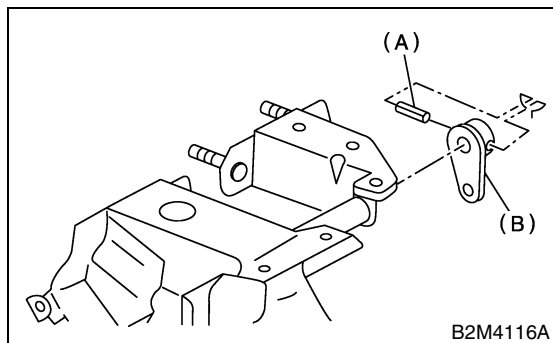
• Except 1.6 L MODEL

1) Remove the clips, assist spring, rod and bushing.



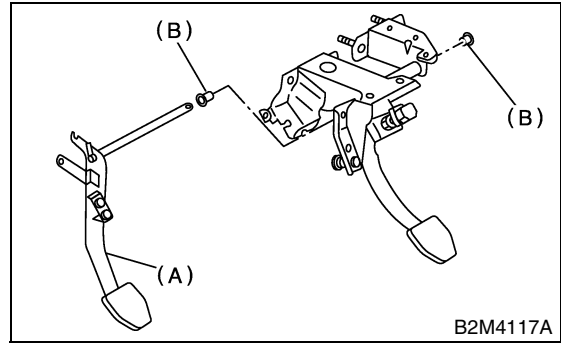
- (A) Clip
- (B) Assist spring
- (C) Assist rod
- (D) Bushing
- (E) Clevis pin

2) Remove the spring pin and lever.



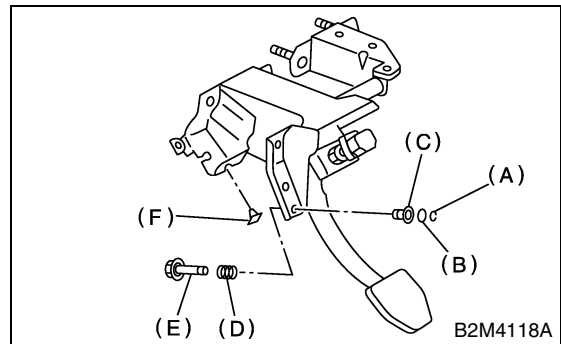
- (A) Pin
- (B) Lever

3) Remove the clutch pedal and bushings.



- (A) Clutch pedal
- (B) Bushing

4) Remove the stopper, clip, O-ring, rod S, and then remove the spring and bushing S.



- (A) Clip
- (B) O-ring
- (C) Bushing S
- (D) Spring S
- (E) Rod S
- (F) Stopper

5) Remove the stoppers from clutch pedal.

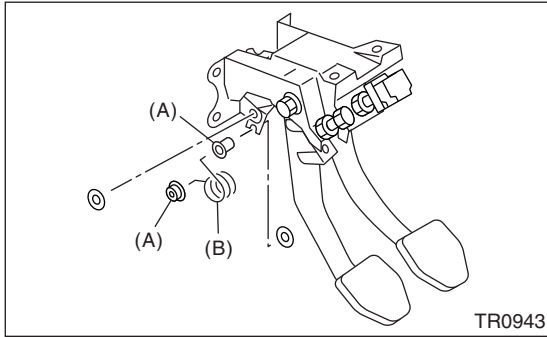
6) Remove the clutch pedal pad. (Non-turbo model)

CLUTCH PEDAL

CLUTCH SYSTEM

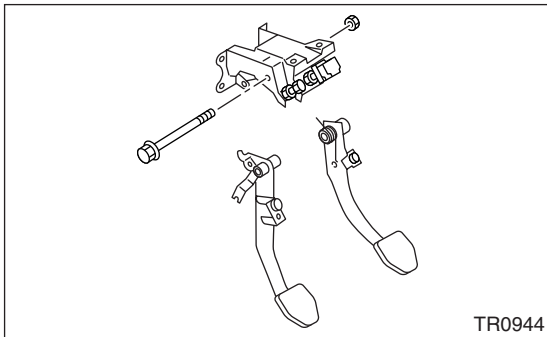
• 1.6 L MODEL

1) Remove the clip, and then remove the spring assist and spring.

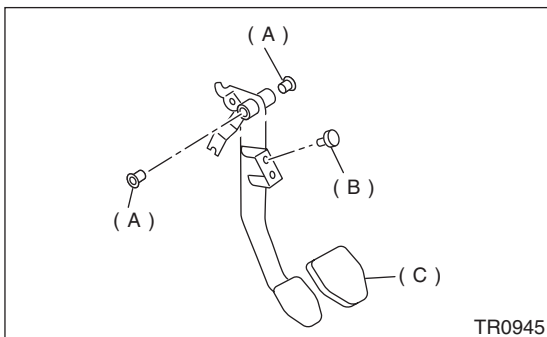


- (A) Spring assist
- (B) Spring

2) Remove the clutch pedal and brake pedal.



3) Remove the bushing, stopper and clutch pedal pad.



- (A) Bushing
- (B) Stopper
- (C) Clutch pedal pad

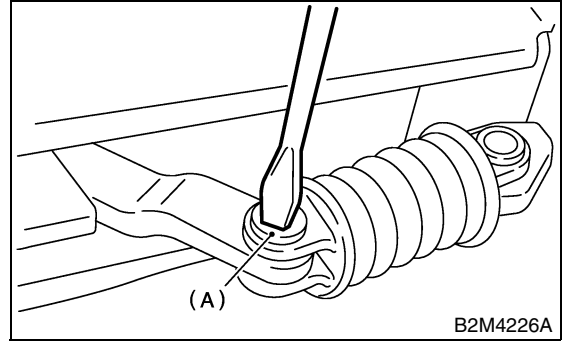
4) Remove the adjuster bolt.

2. RHD MODEL

• Except 1.6 L MODEL

1) Remove the clutch switch. (With cruise control)

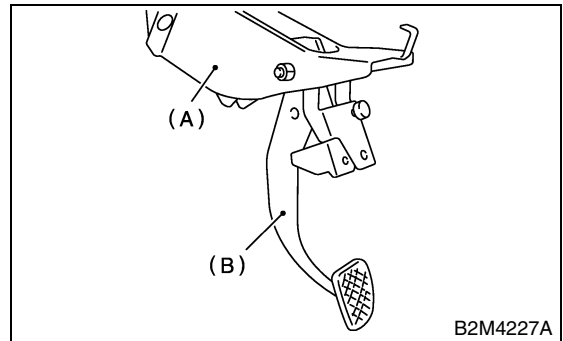
2) Remove the clip, then pull out the clevis pin.



- (A) Clevis pin

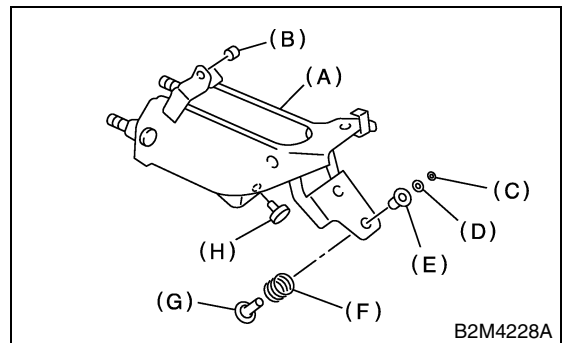
3) Remove the assist rod, spring and bushing.

4) Remove the clutch pedal from clutch pedal bracket.



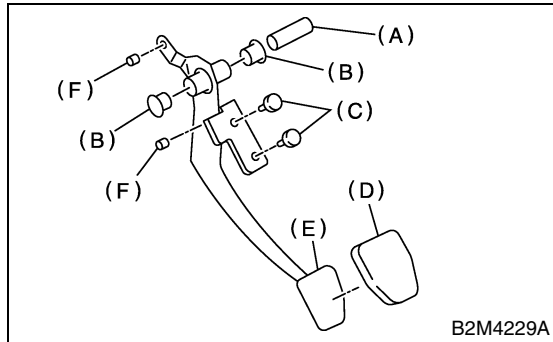
- (A) Clutch pedal bracket
- (B) Clutch pedal

5) Remove the following parts (B to H) from clutch pedal bracket (A) as shown in the figure.



- (A) Clutch pedal bracket
- (B) Bushing C
- (C) Clip
- (D) O-ring
- (E) Bushing S
- (F) Spring S
- (G) Rod S
- (H) Bushing

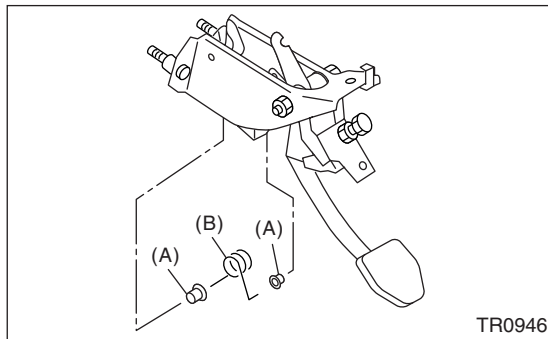
6) Remove the spacer, bushing and pedal pad from clutch pedal.



- (A) Spacer
- (B) Bushing
- (C) Bushing
- (D) Pedal pad
- (E) Clutch pedal
- (F) Bushing C

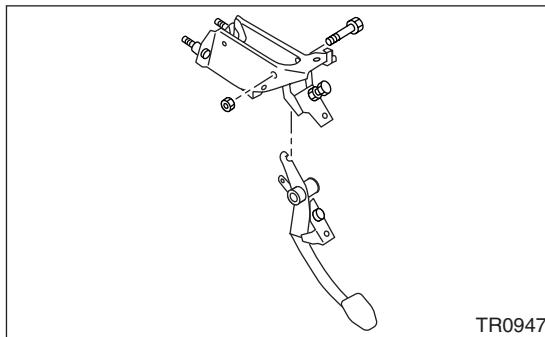
• 1.6 L MODEL

1) Remove the spring and bushing.

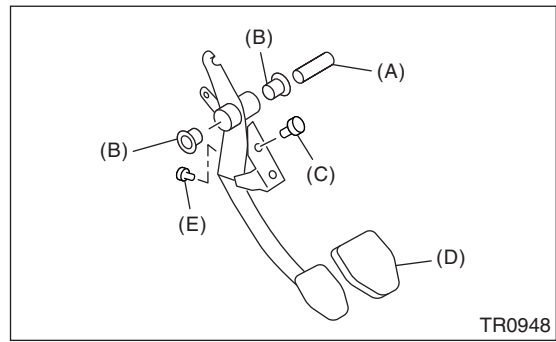


- (A) Bushing
- (B) Spring

2) Remove the clutch pedal.



3) Remove the spacer, bushing, stopper and clutch pedal pad.



- (A) Spacer
- (B) Bushing
- (C) Stopper
- (D) Clutch pedal pad

4) Remove the adjust bolt and stopper.

D: ASSEMBLY

1. LHD MODEL

1) Attach the stopper, 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 the brake pedal return spring, assist rods, spring, and bushing. (Except 1.6L model)

NOTE:

Clean up inside of bushings and apply grease before installing the spacer.

4) Align the bores of pedal bracket, clutch pedal and brake pedal, then attach the brake pedal, bushings, spring and clutch cable. (1.6L model)

5) Install the hill holder cable to clutch pedal. (Vehicle with hill holder)

2. RHD MODEL

1) Clean and apply grease to the hole of sliding portion between clutch pedal and bushing.

2) Install the pad, stopper, spacer and bushings to clutch pedal.

NOTE:

Clean up inside of bushings and apply grease before installing the spacer.

3) Install the rod S, spring S, bushing S, O-ring, clip, bushing, clutch switch and bushing C to clutch pedal bracket. (Except 1.6L model)

4) Install the pedal assembly, stopper, adjust rod, clutch cable, bushings and spring to clutch pedal bracket.

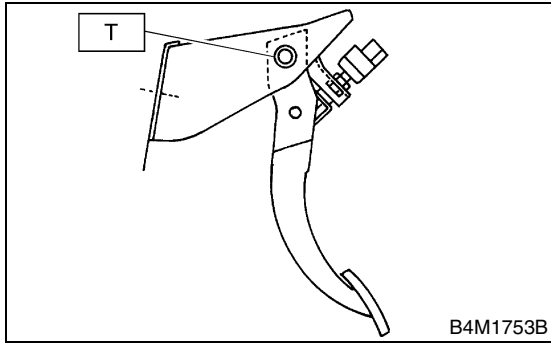
CLUTCH PEDAL

CLUTCH SYSTEM

5) Install the clutch pedal to pedal bracket.

Tightening torque:

T: 29 N·m (3.0 kgf-m, 21.7 ft-lb)



6) Install the assist rod, bushing and assist spring to clutch pedal and pedal bracket.

7) Install the PHV cable to clutch pedal. (Vehicle with hill holder).

E: INSPECTION

1. CLUTCH PEDAL

Move the 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.

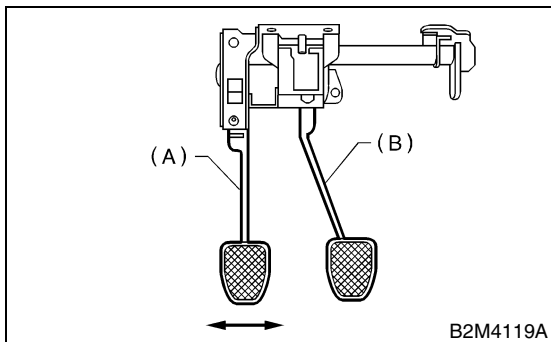
CAUTION:

If excessive deflection is noted, replace the 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

• Except 1.6 L MODEL

1) Turn the lock nuts until clutch pedal full stroke length is within specifications.

CAUTION:

Do not attempt to turn the clutch switch to adjust clutch pedal full stroke length.

NOTE:

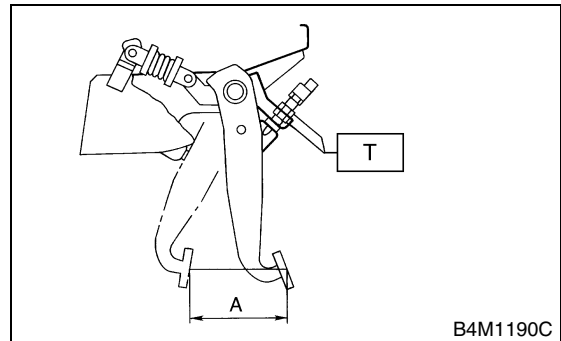
If lock nuts cannot adjust the clutch pedal full stroke length to specifications, turn the master cylinder push rod to adjust it.

Specified clutch pedal full stroke: A

130 — 135 mm (5.12 — 5.31 in)

Tightening torque (Clutch switch lock nut):

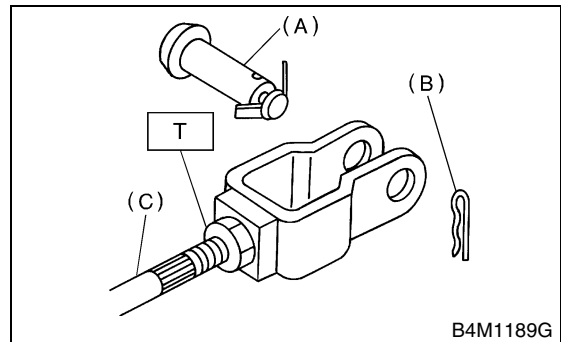
T: 8 N·m (0.8 kgf-m, 5.8 ft-lb)



2) Turn the 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

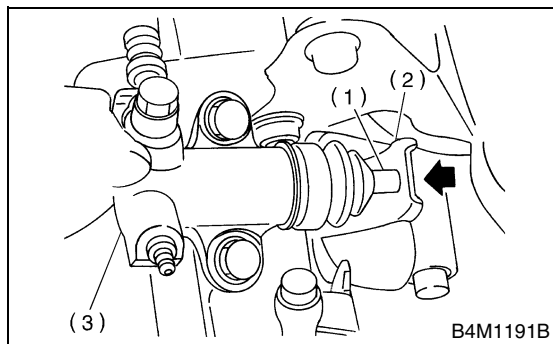
3) Depress and release the clutch pedal two to three times to ensure that clutch pedal and release fork operates smoothly. If the clutch pedal and release fork do not operate smoothly, bleed air from the clutch hydraulic system. <Ref. to CL-38, Clutch Fluid Air Bleeding.>

4) Measure the 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)

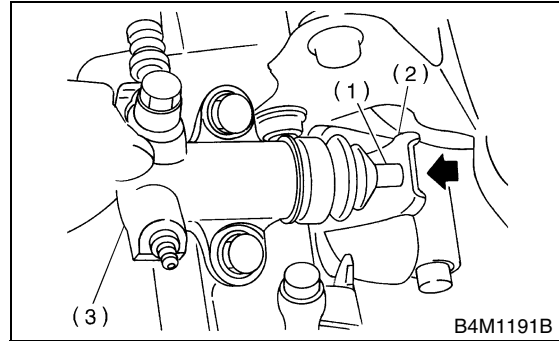
5) Move the clevis pin to the left and then to the right. It should move without resistance while it is rattling. If resistance is felt, repeat adjustment procedures again from the beginning.

6) Push the release lever until operating cylinder push rod retracts. Ensure that clutch fluid level in reservoir tank increases. If the clutch fluid level increases, hydraulic the clutch is properly adjusted; if fluid level does not increase or push rod does not retract, replace the master cylinder with a new one. <Ref. to CL-31, Master Cylinder.>



- (1) Push rod
- (2) Release lever
- (3) Operating cylinder

7) Push the release lever until operating cylinder push rod retracts. Check that the clutch fluid level in reservoir tank increases.



- (1) Push rod
- (2) Release lever
- (3) Operating cylinder

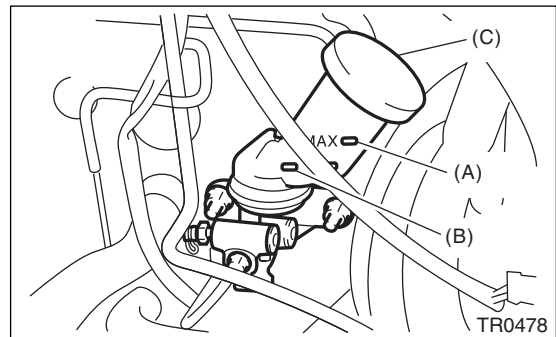
8) If the clutch fluid level increases, hydraulic clutch play is correct.

9) If the 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

• 1.6 L MODEL

- 1) Disconnect the ground cable from battery.
- 2) Remove the air cleaner case and intake duct. <Ref. to IN-6, REMOVAL, Air Cleaner Case.> and <Ref. to IN-7, REMOVAL, Air Intake Duct.>
- 3) Remove the release lever return spring from lever.
- 4) Loosen the lock nut.

CLUTCH PEDAL

CLUTCH SYSTEM

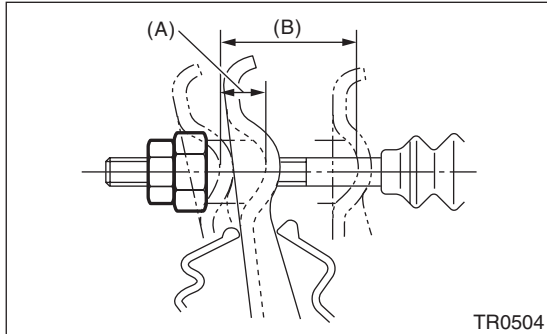
5) Adjust the spherical nut of the lever end so that the play and full stroke is within the specified value, (center of spherical nut).

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)

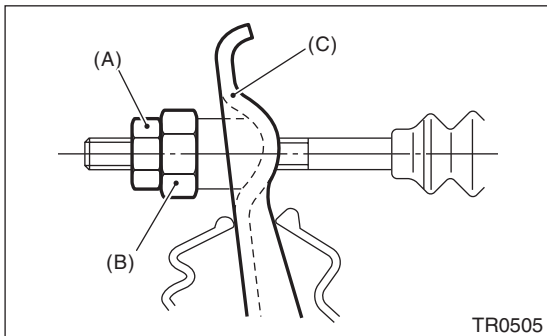


- (A) Play
- (B) Full stroke

6) Upon completion of adjustment, securely lock the 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 the return spring on lever.

NOTE:

Hook the long hook side of the return spring with the lever.

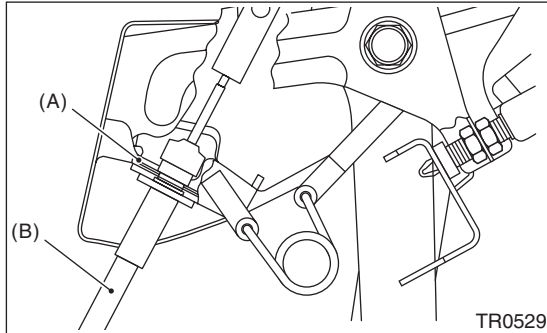
8) Depress the clutch pedal to assure there is no abnormality in the clutch system.

9) Install the air cleaner case and intake duct. <Ref. to IN-6, INSTALLATION, Air Cleaner Case.> and <Ref. to IN-7, INSTALLATION, Air Intake Duct.>

11. Clutch Cable

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the air cleaner case and intake duct. <Ref. to IN-6, REMOVAL, Air Cleaner Case.> and <Ref. to IN-7, REMOVAL, Air Intake Duct.>
- 3) Disconnect the clutch cable from release lever.
- 4) Depress the clutch pedal to the floor.
- 5) Remove the clutch cable clamp from pedal bracket.



- (A) Clamp
(B) Clutch cable

- 6) Remove the clutch cable from body.

B: INSTALLATION

- 1) Clean the clutch pedal fitting hole, and apply grease. Connect the clutch cable to body.
- 2) Fit the clutch pedal to pedal bolt, and connect the clutch cable to bracket with clamp.
- 3) Connect the clutch cable end to pedal end.
- 4) Connect the clutch cable to release lever.
- 5) Install the grommet to toe board.
- 6) Adjust the cable after installation. <Ref. to CL-46, ADJUSTMENT, Clutch Pedal.>
- 7) Install the air cleaner case and intake duct. <Ref. to IN-6, INSTALLATION, Air Cleaner Case.> and <Ref. to IN-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.

CLUTCH SWITCH

CLUTCH SYSTEM

12. Clutch Switch

A: REMOVAL

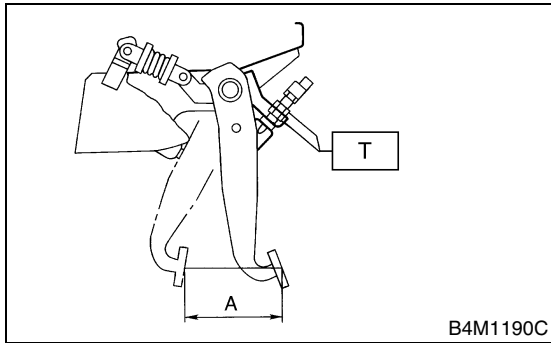
- 1) Disconnect the ground cable from battery.
- 2) Disconnect the connector from clutch switch.
- 3) Remove the clutch switch.

B: INSTALLATION

- 1) Move the 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)



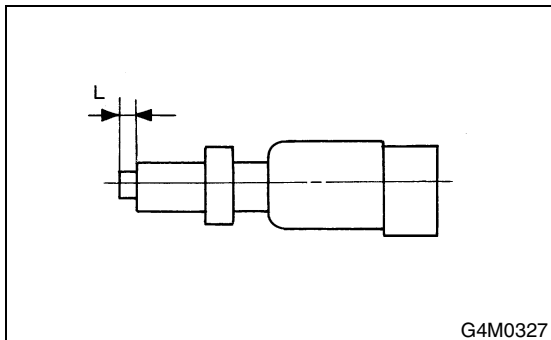
- 2) If the clutch pedal stroke is out of specification, adjust the stroke. <Ref. to CL-46, ADJUSTMENT, Clutch Pedal.>

- 3) Connect clutch switch connector.

C: INSPECTION

- 1) If the clutch switch does not operate properly (or if it does not stop at the specified position), replace with a new one.

Specified position: L
 $2^{+1.5}/_0$ mm ($0.079^{+0.059}/_0$ in)



- 2) Check the clutch switch continuity. If continuity is not as specified, replace the switch.

- (1) Disconnect the clutch switch connector.
- (2) Measure the resistance between 1 and 2 of switch terminal.

Terminals/Specified resistance

When clutch pedal depressed:

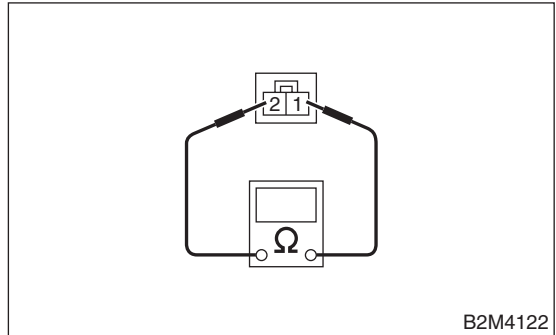
1 — 2/Less than 1 Ω

Terminals/Specified resistance

When clutch pedal not depressed:

1 — 2/More than 1 M Ω

Clutch switch (With cruise control)



13. General Diagnostic Table

A: INSPECTION

1. CLUTCH

Symptom	Possible cause	Corrective
<p>1. Clutch slippage. It is hard to perceive clutch slippage in the early stage, but pay attention to the following symptoms</p> <ul style="list-style-type: none"> • Engine speed up when shifting. • High speed driving is impossible; especially rapid acceleration impossible and vehicle speed does not increase in proportion to an increase in engine speed. • Power falls, particularly when ascending a slope, and there is a smell of burning of the clutch facing. • Method of testing: Put the vehicle in stationary condition with parking brake fully applied. Disengage the clutch and shift the transmission gear into the first. Gradually allow the clutch to engage while gradually increasing the engine speed. The clutch function is satisfactory if the engine stalls. However, the clutch is slipping if the vehicle does not start off and the engine does not stall. 	(a) Clutch facing smeared by oil	Replace.
	(b) Worn clutch facing	Replace.
	(c) Deteriorated diaphragm spring	Replace.
	(d) Distorted pressure plate or flywheel	Correct or replace.
	(e) Defective release bearing holder	Correct or replace.
<p>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.</p> <ul style="list-style-type: none"> • Method of testing: <Ref. to CL-52, DIAGNOSTIC DIAGRAM OF CLUTCH DRAG, INSPECTION, General Diagnostic Table.> <p>It may be judged as insufficient disengagement of clutch if any noise occurs during this test.</p>	(a) Worn or rusty clutch disc hub spline	Replace the clutch disc.
	(b) Excessive deflection of clutch disc facing	Correct or replace.
	(c) Seized crankshaft pilot needle bearing	Replace.
	(d) Cracked clutch disc facing	Replace.
	(e) Sticked clutch disc (smeared by oil or water)	Replace.
<p>3. Clutch chatters. Clutch chattering is an unpleasant vibration to the whole body when the vehicle is just started with clutch partially engaged.</p>	(a) Adhesion of oil on the facing	Replace the clutch disc.
	(b) Weak or broken torsion spring	Replace the clutch disc.
	(c) Defective facing contact or excessive disc	Replace the clutch disc deflection.
	(d) Warped pressure plate or flywheel	Correct or replace.
	(e) Loose disc rivets	Replace the clutch disc.
	(f) Loose engine mounting	Retighten or replace the 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 the release bearing.
	(b) Insufficient lubrication of pilot bearing	Apply grease.
	(c) Loose clutch disc hub	Replace the clutch disc.
	(d) Loose torsion spring retainer	Replace the clutch disc.
	(e) Deteriorated or broken torsion spring	Replace the 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 the clutch disc.
	(b) Deteriorated cushioning spring	Replace the clutch disc.
	(c) Worn or rusted spline of clutch disc or main shaft	Take off rust, apply grease or replace the clutch disc or main shaft.
	(d) Deteriorated or broken torsion spring	Replace the clutch disc.
	(e) Loose engine mounting	Retighten or replace the 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 the bushing and/or shaft with a 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 the 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 the clutch disc, clutch cover, clutch release, and clutch pedal free play.	Clutch and fly-wheel seizure. Inspect the 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



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1. General Description	2
2. Wheel Alignment	8
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5. Front Strut	19
6. Front Stabilizer	23
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GENERAL DESCRIPTION

FRONT SUSPENSION

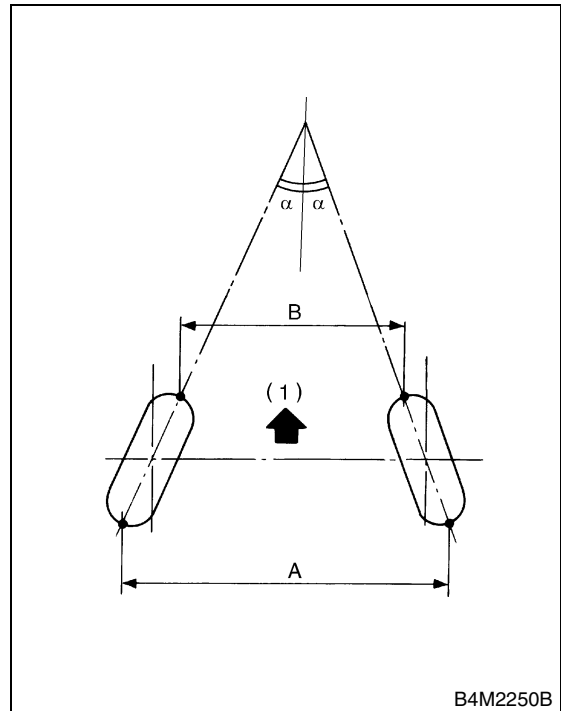
1. General Description

A: SPECIFICATIONS

	Model	Sedan		Wagon		OUTBACK
		Turbo	Non-turbo	Turbo	Non-turbo	
Front	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 (15.28 in)	402 mm (15.83 in)
	Diameter of stabilizer	20 mm (0.79 in)	20 mm (0.79 in)	20 mm (0.79 in)	20 mm (0.79 in)	20 mm (0.79 in)
Rear	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 angle: $\pm 0^{\circ}07'30''$				
	Thrust angle	$0^{\circ} \pm 20'$				
	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)
	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

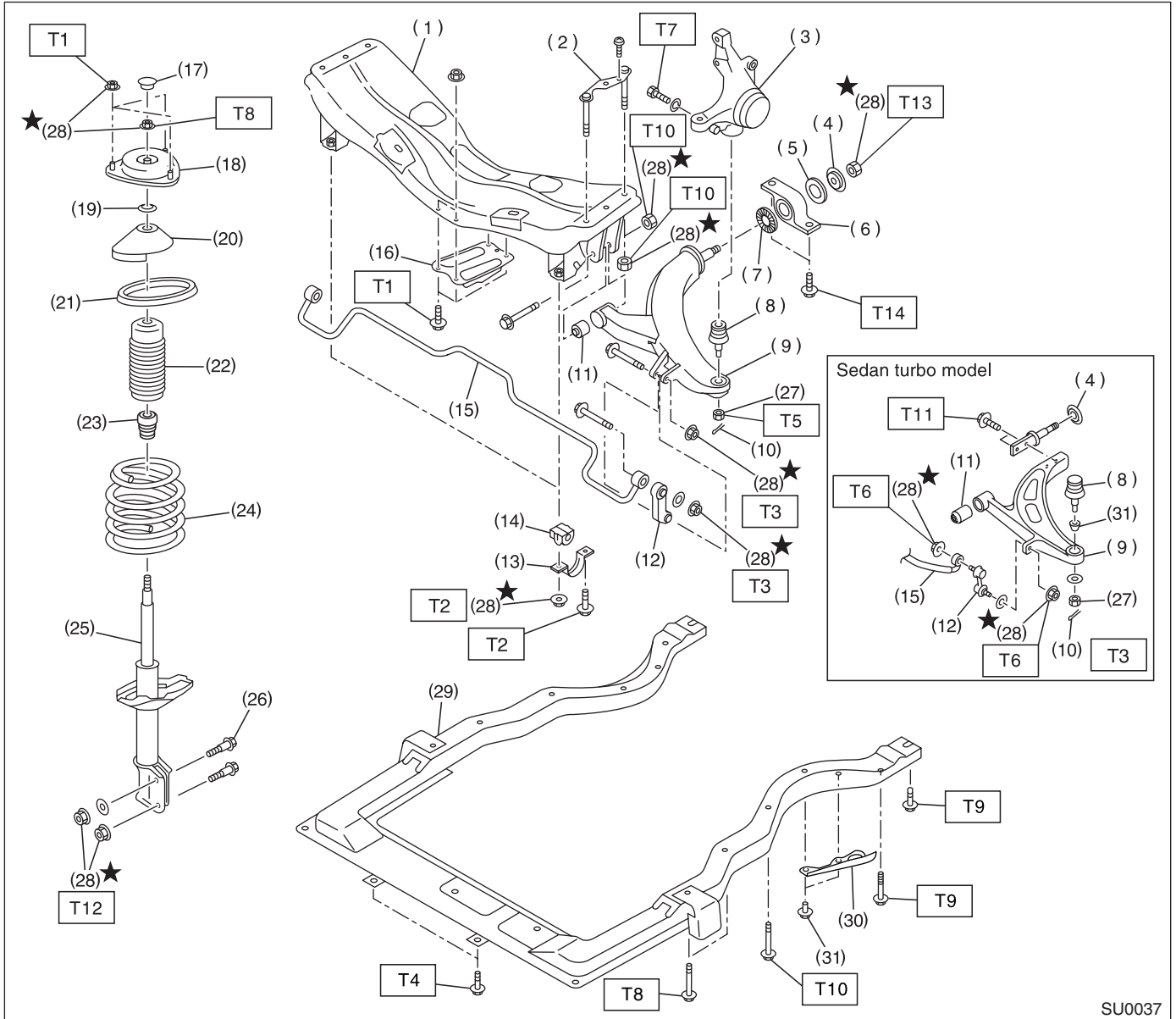
A – B = Positive: Toe-in, Negative: Toe-out

α = Each toe angle

GENERAL DESCRIPTION

FRONT SUSPENSION

B: COMPONENT



SU0037

GENERAL DESCRIPTION

FRONT SUSPENSION

(1) Front crossmember	(17) Dust seal	<i>Tightening torque: N-m (kgf-m, ft-lb)</i>
(2) Bolt ASSY	(18) Strut mount	<i>T1: 20 (2.0, 14.5)</i>
(3) Housing	(19) Spacer	<i>T2: 25 (2.5, 18.1)</i>
(4) Washer	(20) Upper spring seat	<i>T3: 30 (3.1, 22)</i>
(5) Stopper rubber (Rear)	(21) Rubber seat	<i>T4: 34 (3.5, 25)</i>
(6) Rear bushing	(22) Dust cover	<i>T5: 40 (4.1, 30)</i>
(7) Stopper rubber (Front)	(23) Helper	<i>T6: 45 (4.6, 33)</i>
(8) Ball joint	(24) Coil spring	<i>T7: 50 (5.1, 37)</i>
(9) Transverse link	(25) Damper strut	<i>T8: 55 (5.6, 41)</i>
(10) Cotter pin	(26) Adjusting bolt	<i>T9: 71 (7.2, 52)</i>
(11) Front bushing	(27) Castle nut	<i>T10: 100 (10.2, 74)</i>
(12) Stabilizer link	(28) Self-locking nut	<i>T11: 155 (15.8, 114)</i>
(13) Clamp	(29) Sub frame	<i>T12: 175 (17.8, 129)</i>
(14) Bushing	(30) Cover	<i>T13: 190 (19.4, 140)</i>
(15) Stabilizer	(31) Boss	<i>T14: 250 (25.5, 184)</i>
(16) Jack-up plate	(32) Clip	

GENERAL DESCRIPTION

FRONT SUSPENSION

C: CAUTION

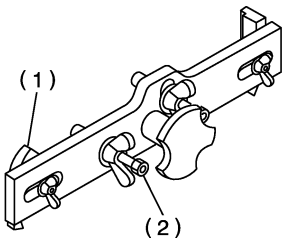
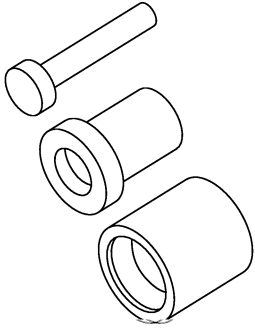
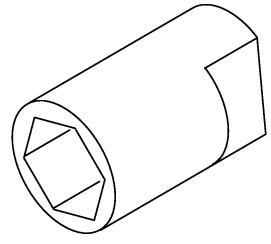
- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Use SUBARU genuine grease etc. or the equivalent. Do not mix grease etc. with that of another grade or from other manufacturers.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Apply grease onto sliding or revolution surfaces before installation.
- Before installing O-rings or snap rings, apply sufficient amount of grease to avoid damage and deformation.
- Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.

GENERAL DESCRIPTION

FRONT SUSPENSION

D: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">B4M2378A</p>	927380002	ADAPTER	Used as an adapter for camber & caster gauge when measuring camber and caster. (1) 28199AC000 PLATE (2) 28199AC010 BOLT
 <p style="text-align: center;">B4M2385</p>	927680000	INSTALLER & REMOVER SET	Used for replacing transverse link bushing.
 <p style="text-align: center;">B4M2384</p>	927760000	STRUT MOUNT SOCKET	Used for disassembling and assembling strut and shock mount.

2. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Alignment gauge	Used for wheel alignment measurement.
Turning radius gauge	Used for wheel alignment measurement.
Toe-in gauge	Used for toe-in measurement.
Dial gauge	Used for damper strut measurement.

WHEEL ALIGNMENT

FRONT SUSPENSION

2. Wheel Alignment

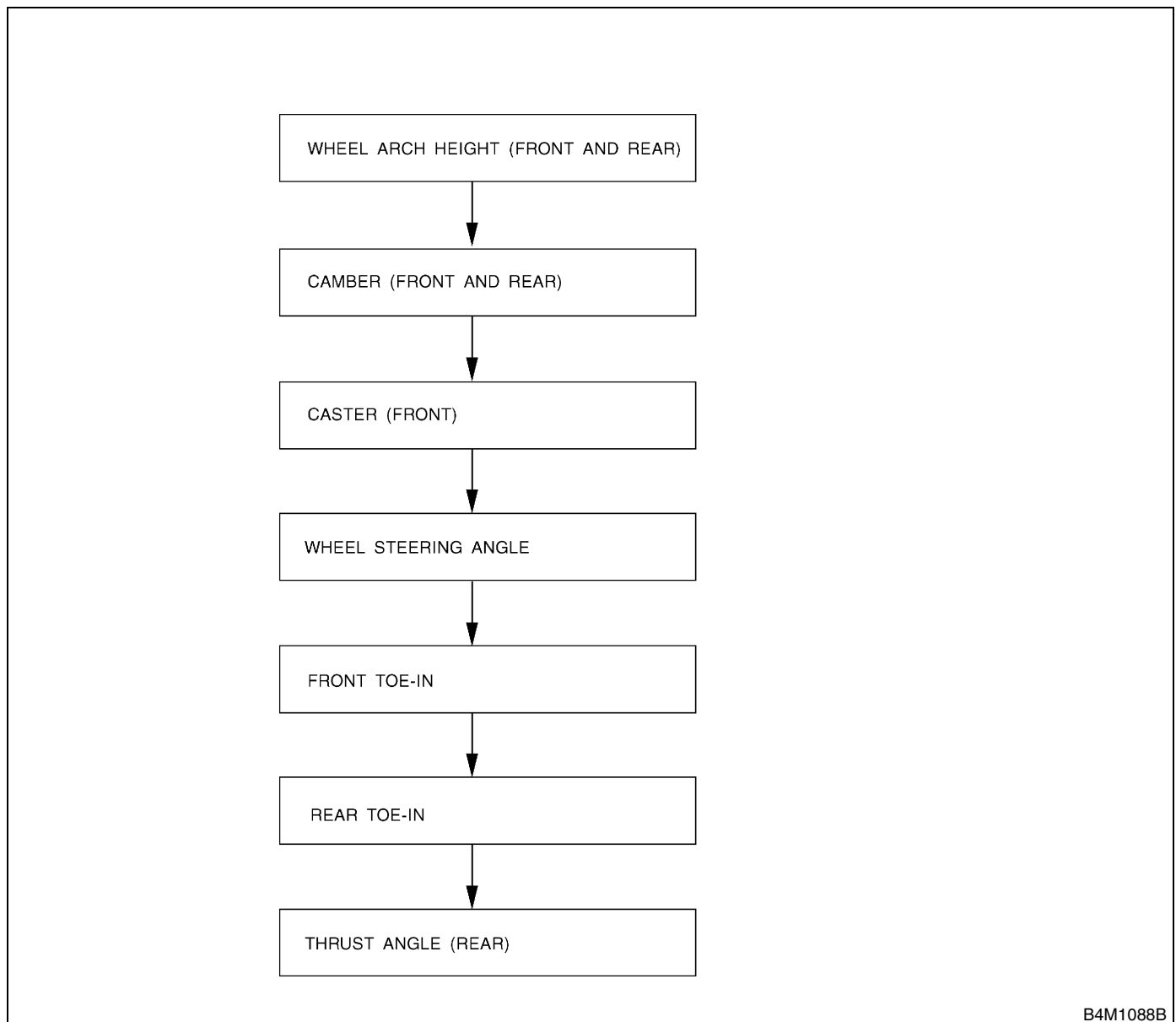
A: INSPECTION

Check the following items before taking wheel alignment measurement.

Check items before taking wheel alignment measurement:

- tire air pressure
- unbalanced right and left tire wear, size difference
- tire run-out
- ball joint excessive play, wear
- tie rod end excessive play, wear
- wheel bearing excessive play
- right and left wheel base imbalance
- steering link part deformed, excessive play
- suspension part deformed, excessive play

Check, adjust and/or measure the wheel alignment in accordance with procedures indicated in the figure:

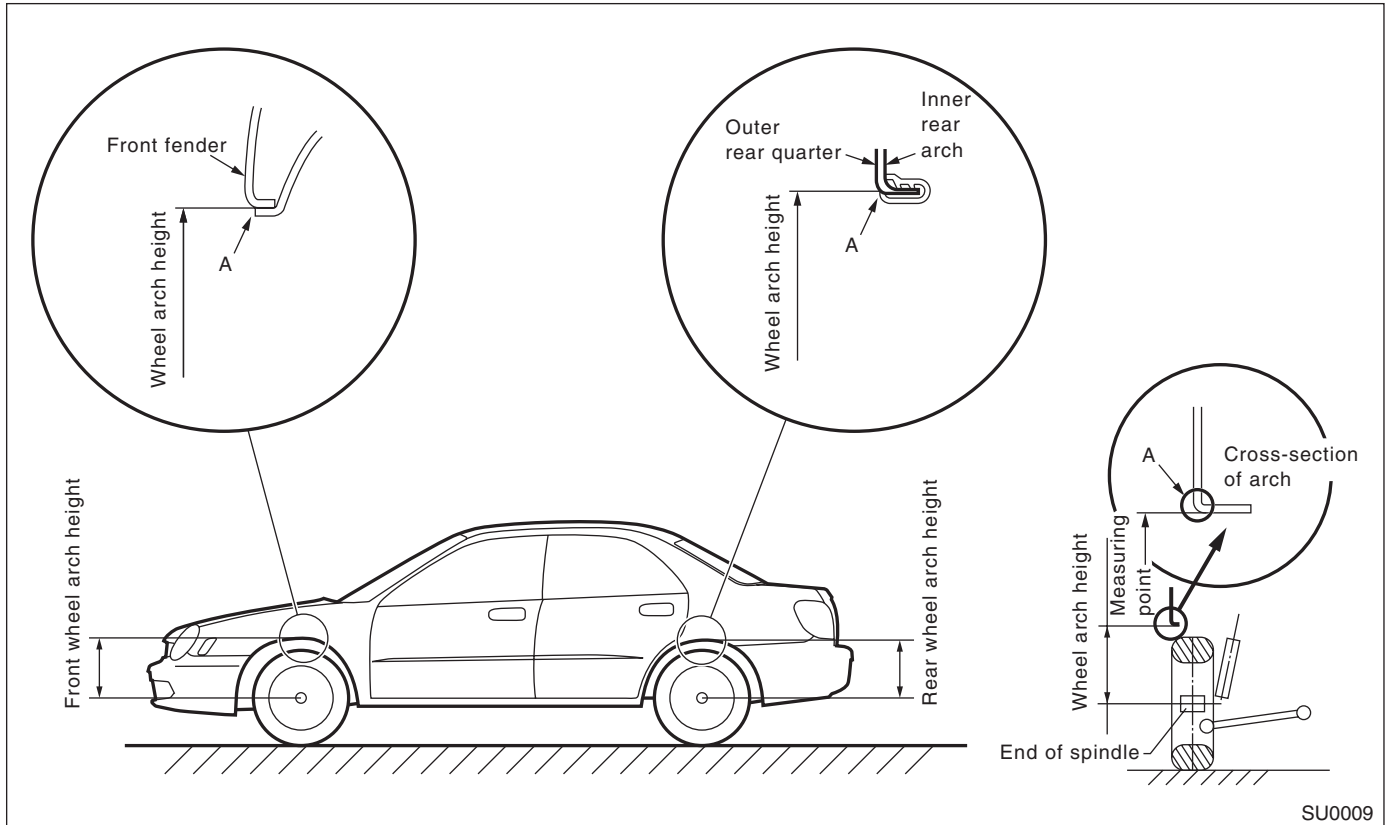


WHEEL ALIGNMENT

FRONT SUSPENSION

1. WHEEL ARCH HEIGHT

- 1) Set the vehicle on a level surface.
- 2) Set the vehicle to “curb weight” conditions. (Empty luggage compartment, install spare tire, jack, service tools, and top up fuel tank.)
- 3) Set the steering wheel in a straight line, then remove the vehicle straight ahead more than 5 m (16 ft) to settle the suspension.
- 4) Suspend the thread from wheel arch (point “A” in figure below) to determine a point directly above center of wheel.
- 5) Measure the distance between measuring point “A” and center of wheel.



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

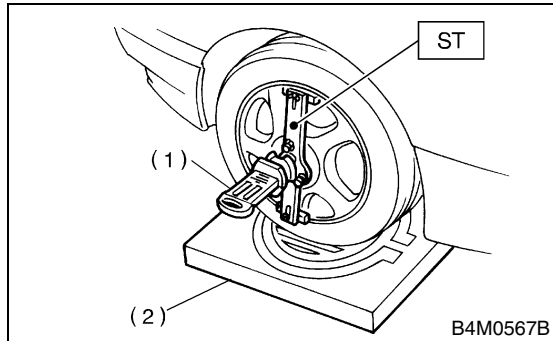
2. CAMBER

• Inspection

1) Place the front wheel on turning radius gauge. Make sure ground contacting surfaces of front and rear wheels are set at the same height.

2) Set the ST into the center of wheel, and then install the wheel alignment gauge.

ST 927380002 ADAPTER



- (1) Alignment gauge
- (2) Turning radius gauge

3) Follow the wheel alignment gauge operation manual to measure camber angle.

NOTE:

Refer to the "SPECIFICATIONS" for camber values.

Front: <Ref. to FS-2, SPECIFICATIONS, General Description.>

Rear: <Ref. to RS-2, SPECIFICATIONS, General Description.>

• Front Camber Adjustment

1) Loosen the two self-locking nuts located at lower front portion of strut.

CAUTION:

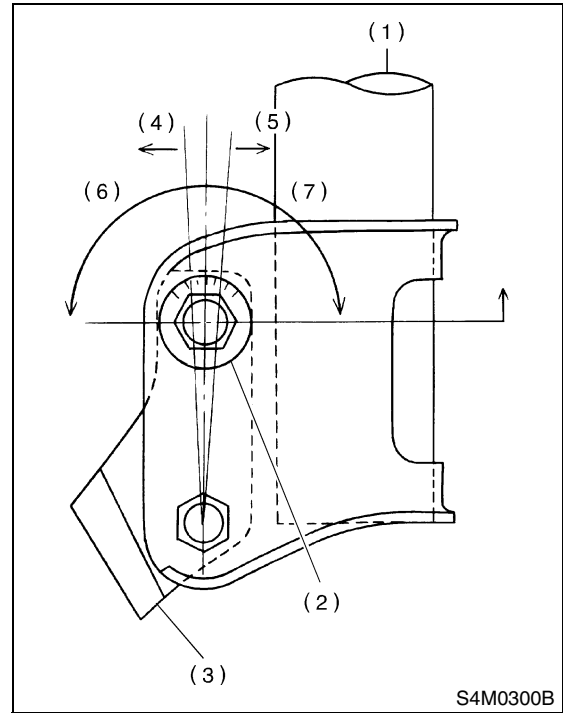
• When adjusting bolt needs to be loosened or tightened, hold its head with a wrench and turn self-locking nut.

• Discard the loosened self-locking nut and replace with a new one.

2) Turn the camber adjusting bolt so that camber is set at the specification.

NOTE:

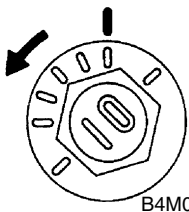
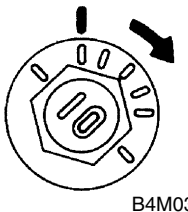
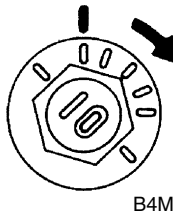
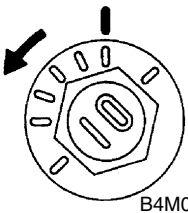
Moving the adjusting bolt by one scale graduation changes camber by approx. $0^{\circ}10'$.



- (1) Strut
- (2) Adjusting bolt
- (3) Housing
- (4) Outer
- (5) Inner
- (6) Camber is increased.
- (7) Camber is decreased.

WHEEL ALIGNMENT

FRONT SUSPENSION

	Left side	Right side
Camber is increased.	 <p>Rotate counterclockwise.</p> <p>B4M0190</p>	 <p>Rotate clockwise.</p> <p>B4M0350</p>
Camber is decreased.	 <p>Rotate clockwise.</p> <p>B4M0350</p>	 <p>Rotate counterclockwise.</p> <p>B4M0190</p>

3) Tighten the two self-locking nuts.

Tightening torque:

175 N·m (17.8 kgf·m, 129 ft·lb)

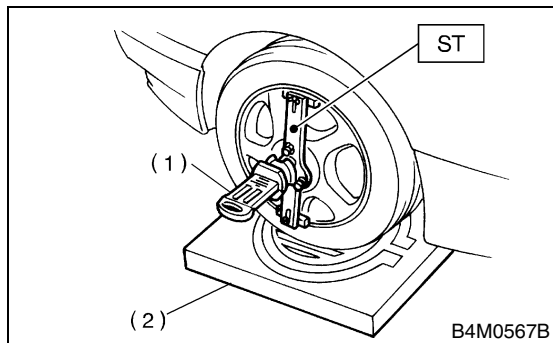
3. CASTER

• Inspection

1) Place the front wheel on turning radius gauge. Make sure ground contacting surfaces of front and rear wheels are set at the same height.

2) Set the ST into the center of wheel, and then install the wheel alignment gauge.

ST 927380002 ADAPTER



- (1) Alignment gauge
- (2) Turning radius gauge

3) Follow the wheel alignment gauge operation manual to measure caster angle.

NOTE:

Refer to the "SPECIFICATIONS" for caster values.
<Ref. to FS-2, SPECIFICATIONS, General Description.>

4. STEERING ANGLE

• Inspection

- 1) Place the vehicle on a turning radius gauge.
- 2) While depressing the brake pedal, turn the steering wheel fully to the right and left. With the steering wheel held at each fully turned position, measure both the inner and outer wheel steering angle.

Steering angle:

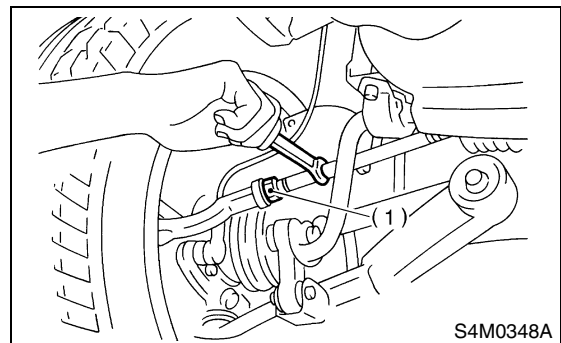
Model	Turbo and OUT-BACK	Others
Inner wheel	$34^{\circ}30' \pm 1.5^{\circ}$	$37^{\circ}20' \pm 1.5^{\circ}$
Outer wheel	$34^{\circ}30' \pm 1.5^{\circ}$	$32^{\circ}25' \pm 1.5^{\circ}$

• Adjustment

Turn the tie-rod to adjust steering angle of both inner and outer wheels.

CAUTION:

- Check the toe-in.
- Correct the boot if it is twisted.



- (1) Lock nut

WHEEL ALIGNMENT

FRONT SUSPENSION

5. FRONT WHEEL TOE-IN

• Inspection

1) Using a toe gauge, measure the front wheel toe-in.

Toe-in:

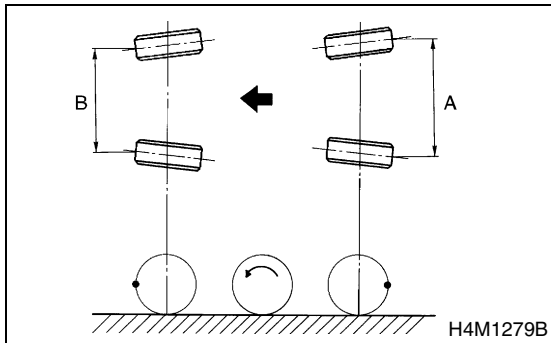
$0 \pm 3 \text{ mm } (0 \pm 0.12 \text{ in})$

2) Mark the rear sides of right and left tires at height corresponding to center of spindles and measure the distance "A" between marks.

3) Move the vehicle forward so that marks line up with front sides at height corresponding to center of spindles.

4) Measure the distance "B" between right and left marks. Toe-in can then be obtained by the following equation:

$$A - B = \text{Toe-in}$$

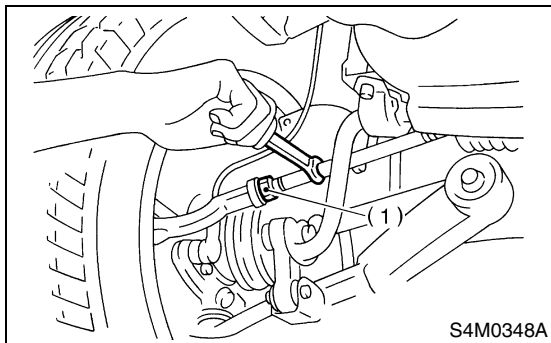


• Adjustment

1) Loosen the right and left side steering tie-rods lock nuts.

2) Turn the right and left tie rods equal amounts until the toe-in is at the specification.

Both the right and left tie-rods are right-hand threaded. To increase toe-in, turn both tie-rods clockwise equal amounts (as viewed from inside of the vehicle).



(1) Lock nut

3) Tighten the tie-rod lock nut.

Tightening torque:

$83 \text{ N}\cdot\text{m } (8.5 \text{ kgf}\cdot\text{m}, 61.5 \text{ ft}\cdot\text{lb})$

CAUTION:

Correct the tie-rod boot, if it is twisted.

NOTE:

Check the right and left wheel steering angle is within specifications.

6. REAR WHEEL TOE-IN

• Inspection

1) Using a toe-in gauge, measure the rear wheel toe-in.

Toe-in:

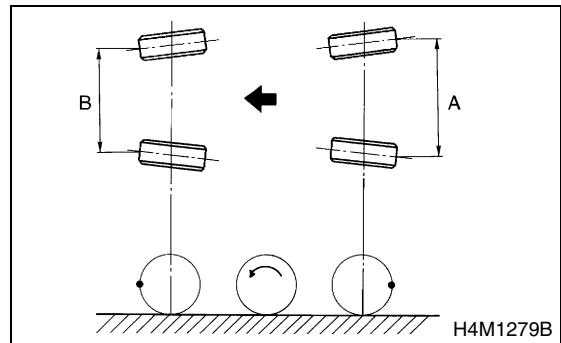
$-1 \pm 2 \text{ mm } (-0.039 \pm 0.079 \text{ in})$

2) Mark the rear sides of right and left tires at height corresponding to center of wheels and measure the distance "A" between marks.

3) Move the vehicle forward so that marks line up with front sides at height corresponding to center of spindles.

4) Measure the distance "B" between right and left marks. Toe-in can then be obtained by the following equation:

$$A - B = \text{Toe-in}$$



WHEEL ALIGNMENT

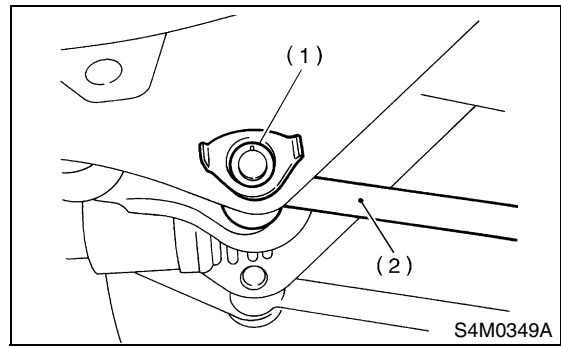
FRONT SUSPENSION

• Adjustment

1) Loosen the self-locking nut on inner side of link rear.

CAUTION:

- When loosening or tightening the adjusting bolt, hold the bolt head and turn self-locking nut.
- Discard the loosened self-locking nut and replace with a new one.



- (1) Adjusting bolt
(2) Link rear

2) Turn the adjusting bolt head until toe-in is at the specification.

NOTE:

When right and left wheels are adjusted for toe-in at the same time, the movement of one scale graduation changes toe-in by approx. 1.5 mm (0.6 in).

	Left side	Right side
Toe-in is increased.	<p>Rotate clockwise.</p> <p>B4M0192</p>	<p>Rotate counterclockwise.</p> <p>B4M0352</p>
Toe-in is decreased.	<p>Rotate counterclockwise.</p> <p>B4M0352</p>	<p>Rotate clockwise.</p> <p>B4M0192</p>

3) Tighten the self-locking nut.

Tightening torque:

100 N·m (10.2 kgf·m, 74 ft·lb)

WHEEL ALIGNMENT

FRONT SUSPENSION

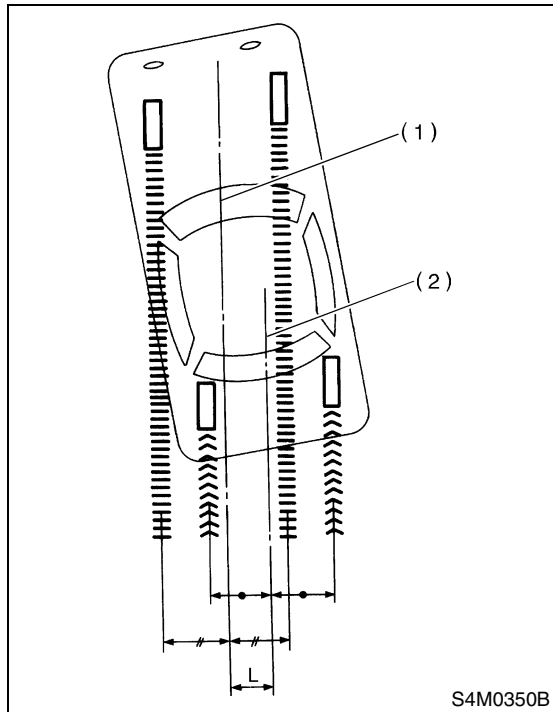
7. THRUST ANGLE

• Inspection

- 1) Position the vehicle on a level surface.
- 2) Move the vehicle 3 to 4 m (10 to 13 ft) directly forward.
- 3) Determine the locus of both front and rear axles.
- 4) Measure the 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)

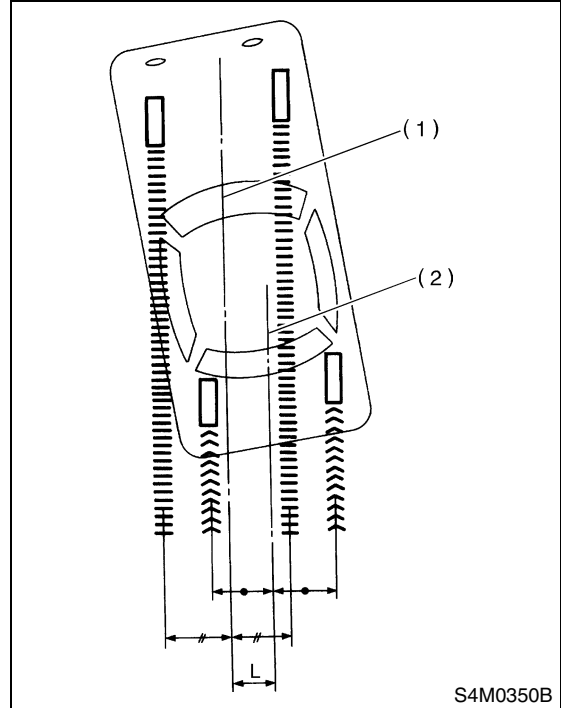
• Adjustment

- 1) Make the 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 the right and left adjusting bolts are turned incrementally by one graduation in the same direction, the thrust angle will change approx. 16' ["L" is almost equal to 12 mm (0.472 in)].

Thrust angle:

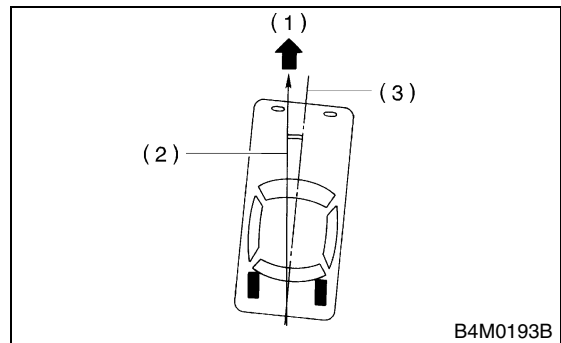
0°±20'



- (1) Center line of loci (front axle)
- (2) Center line of loci (rear axle)

NOTE:

Thrust angle refers to a mean value of right and left rear wheel toe angles in relation to the vehicle body center line. Vehicle is driven straight in the thrust angle direction while swinging in the oblique direction depending on the degree of the mean thrust angle.



- (1) Front
- (2) Thrust angle
- (3) Body center line

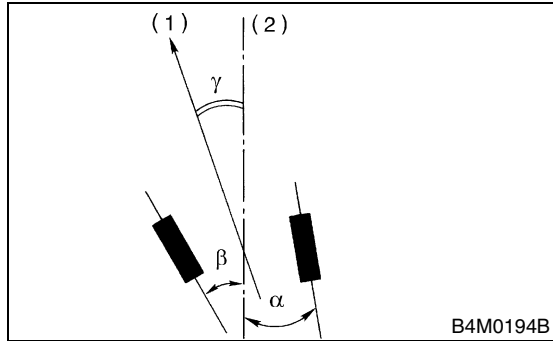
Thrust angle: $r = (\alpha - \beta)/2$

α : Right rear wheel toe-in angle

β : Left rear wheel toe-in angle

NOTE:

Here, use only positive toe-in values from each wheel to substitute for α and β in the equation.



(1) Front

(2) Body center line

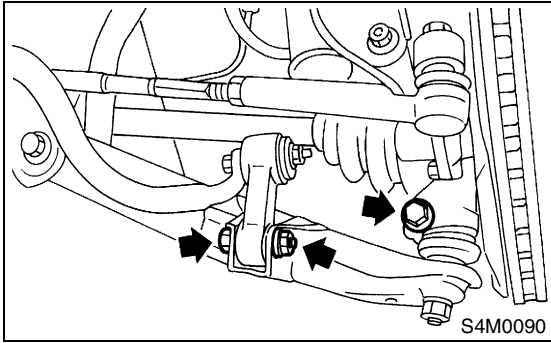
FRONT TRANSVERSE LINK

FRONT SUSPENSION

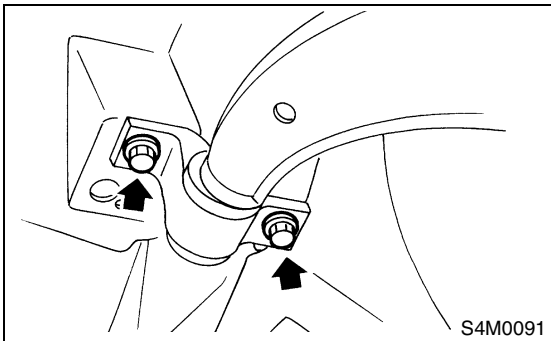
3. Front Transverse Link

A: REMOVAL

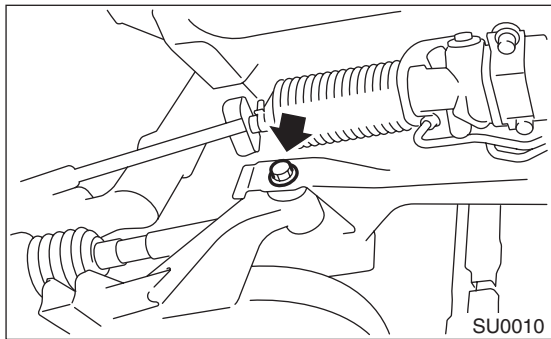
- 1) Set the vehicle on the lift.
- 2) Lift-up the vehicle and remove the wheel.
- 3) Remove the sub frame.
- 4) Disconnect the stabilizer link from transverse link.
- 5) Remove the bolt securing ball joint of transverse link to housing.



- 6) Remove the nut (do not remove bolt) securing transverse link to crossmember.
- 7) Remove the two bolts securing bushing bracket of transverse link to the vehicle body at rear bushing location.



- 8) Extract the ball joint from housing.
- 9) Remove the bolt securing transverse link to crossmember, and then extract the transverse link from crossmember.



B: INSTALLATION

- 1) Temporarily tighten the two bolts used to secure rear bushing of 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 the bolts used to connect transverse link to crossmember and temporarily tighten with nut.

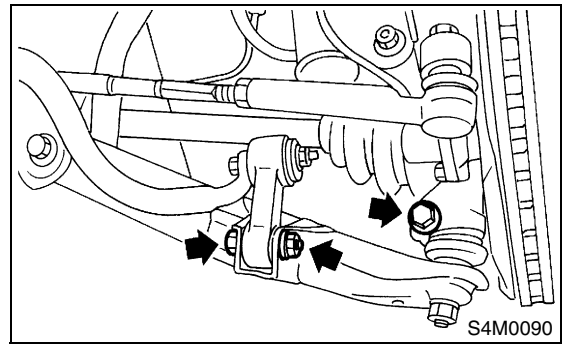
CAUTION:

Discard the loosened self-locking nut and replace with a new one.

- 3) Insert the ball joint into housing.
- 4) Connect the stabilizer link to transverse link, and temporarily tighten the bolts.

CAUTION:

Discard the 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)

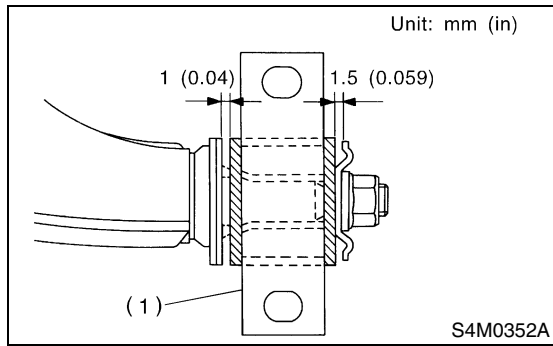
(3) Transverse link rear bushing and body

Tightening torque:

250 N·m (25.5 kgf·m, 184 ft·lb)

NOTE:

- Move the rear bushing back and forth until transverse link-to-rear bushing clearance is established (as indicated in the figure) before tightening.
- Check the wheel alignment and adjust if necessary.

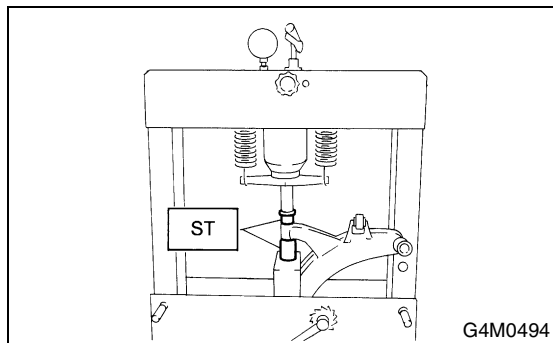


(1) Rear bushing

C: DISASSEMBLY

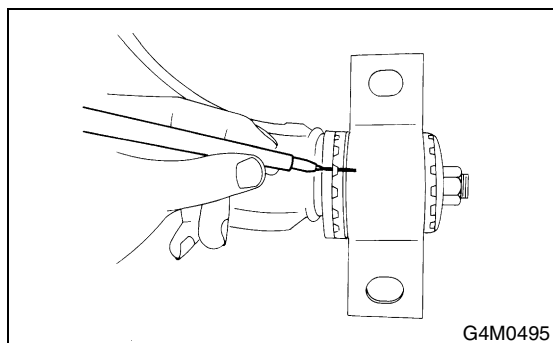
1. FRONT BUSHING

Using the ST, press the front bushing out of place.
ST 927680000 INSTALLER & REMOVER SET



2. REAR BUSHING

- 1) Scribe an aligning mark on the transverse link and rear bushing.
- 2) Loosen the nut and remove rear bushing.



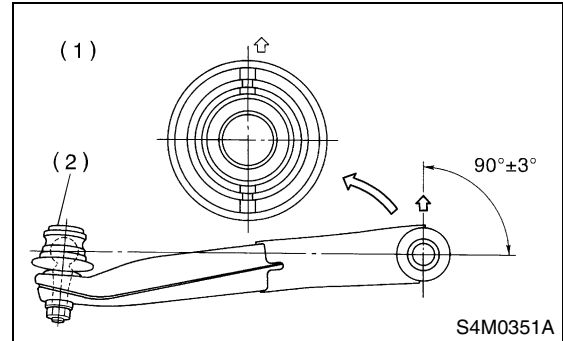
D: ASSEMBLY

1. FRONT BUSHING

Assemble in the reverse order of disassembly.

CAUTION:

Install the front bushing in correct direction, as shown in the figure.



- (1) Face bushing toward center of ball joint
- (2) Ball joint

2. REAR BUSHING

- 1) Install the rear bushing to transverse link and align aligning marks scribed on the two.
- 2) Tighten the self-locking nut.

CAUTION:

- Discard the loosened self-locking nut and replace with a new one.
- While holding the rear bushing so as not to change position of aligning marks, tighten the self-locking nut.

Tightening torque:

190 N·m (19.4 kgf·m, 140 ft·lb)

E: INSPECTION

- 1) Check the transverse link for wear, damage and cracks, and correct or replace if defective.
- 2) Check the bushings for cracks, fatigue or damage.
- 3) Check the rear bushing for oil leaks.

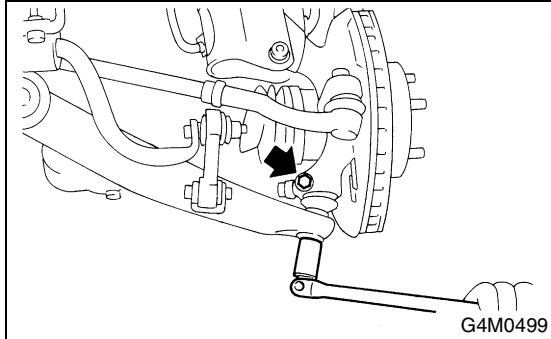
FRONT BALL JOINT

FRONT SUSPENSION

4. Front Ball Joint

A: REMOVAL

- 1) Remove the wheel.
- 2) Pull out the cotter pin from ball stud, remove the castle nut, and extract the ball stud from transverse link.
- 3) Remove the bolt securing ball joint to housing.



- 4) Extract the ball joint from housing.

B: INSTALLATION

- 1) Install the ball joint onto housing.

Tightening torque (Bolt):

50 N·m (5.1 kgf·m, 37 ft·lb)

CAUTION:

Do not apply grease to tapered portion of ball stud.

- 2) Connect the ball joint to transverse link.

Tightening torque (Castle nut):

Sedan turbo model:

30 N·m (3.1 kgf·m, 22 ft·lb)

Except sedan turbo model:

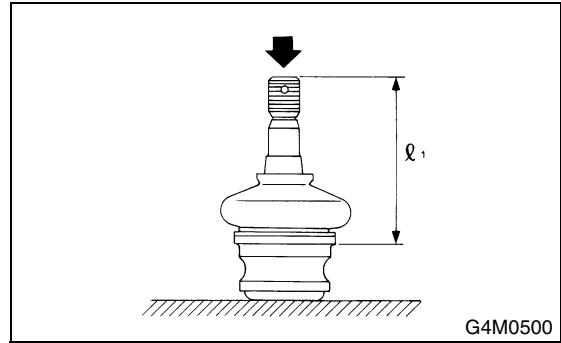
40 N·m (4.1 kgf·m, 30 ft·lb)

- 3) Retighten the castle nut further within 60° until a slot in castle nut is aligned with the hole in ball stud end, then insert a new cotter pin and bend it around castle nut.
- 4) Install the front wheel.

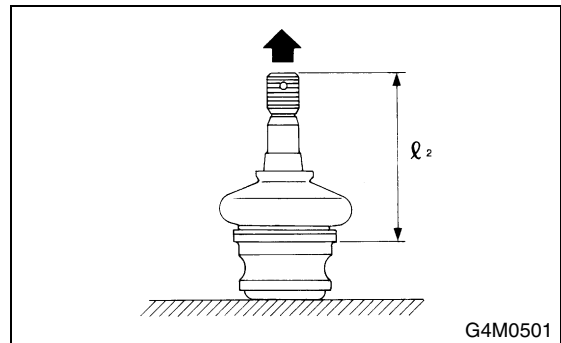
C: INSPECTION

1) Measure the play of ball joint by the following procedures. Replace with a new one when the play exceeds specified value.

- (1) With 686 N (70 kgf, 154 lb) loaded in direction shown in the figure, measure the dimension l_1 .



- (2) With 686 N (70 kgf, 154 lb) loaded in opposite direction shown in the figure, measure the dimension l_2 .



- (3) Calculate plays from the following formula.
 $S = l_2 - l_1$
- (4) When plays are larger than the following value, replace with a new one.

FRONT BALL JOINT

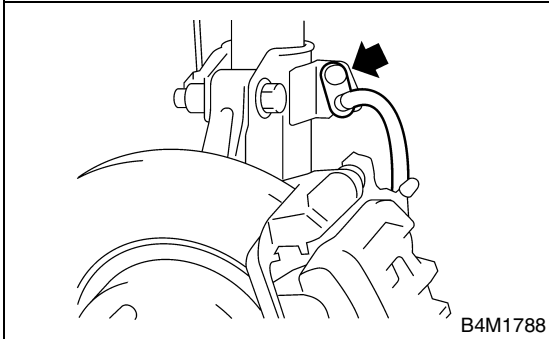
Specified play for replacement: S
Less than 0.3 mm (0.012 in)

- 2) When the play is smaller than 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 a new ball joint.

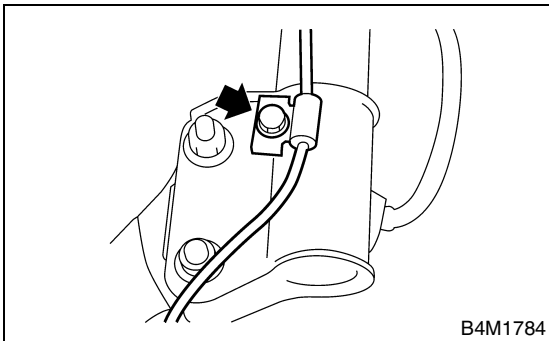
5. Front Strut

A: REMOVAL

- 1) Remove the wheel.
- 2) Remove the bolt securing brake hose from strut.



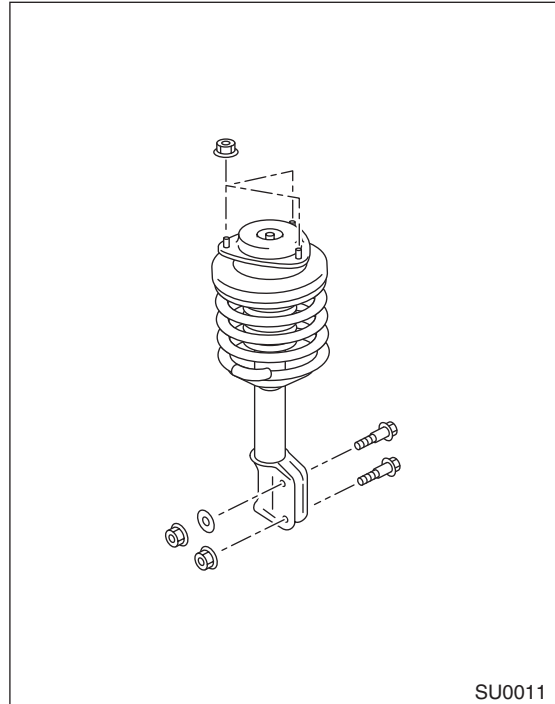
- 3) Scribe an alignment mark on the camber adjusting bolt which secures strut to housing.
- 4) Remove the bolt securing ABS sensor harness.



- 5) Remove the two bolts securing housing to strut.

CAUTION:
While holding the 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 the strut mount at upper side of strut to body, and then tighten with nuts.

Tightening torque:

20 N·m (2.0 kgf-m, 14.5 ft-lb)

2) Position the aligning mark on camber adjustment bolt with aligning mark on lower side of strut.

CAUTION:

- While holding the head of adjusting bolt, tighten self-locking nut.
- Be sure to use a new self-locking nut.

Tightening torque:

175 N·m (17.8 kgf-m, 129 ft-lb)

3) Install the ABS sensor harness to strut.

Tightening torque:

33 N·m (3.4 kgf-m, 24.3 ft-lb)

4) Install the bolts which secure brake hose to strut.

Tightening torque:

33 N·m (3.4 kgf-m, 24.3 ft-lb)

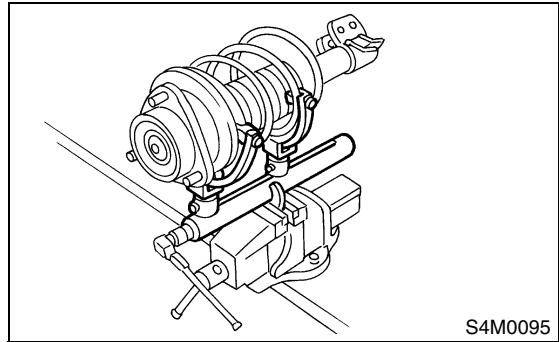
5) Install the wheels.

NOTE:

Check the wheel alignment and adjust if necessary.

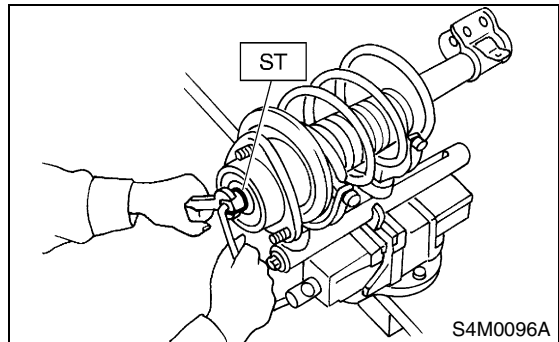
C: DISASSEMBLY

1) Using a coil spring compressor, compress the coil spring.



2) Using the ST, remove the self-locking nut.

ST 927760000 STRUT MOUNT SOCKET



3) Remove the strut mount, upper spring seat and rubber seat from strut.

4) Gradually decreasing the compression force, and then remove the coil spring.

5) Remove the dust cover and helper spring.

D: ASSEMBLY

1) Before installing the coil spring, strut mount, etc., on the strut, check for the presence of air in the damping force generating mechanism of the strut since air prevents proper damping force from being produced.

2) Checking for the presence of air

- (1) Place the strut vertically with piston rod facing up.
- (2) Move the piston rod to 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 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 three or four times from the first step.

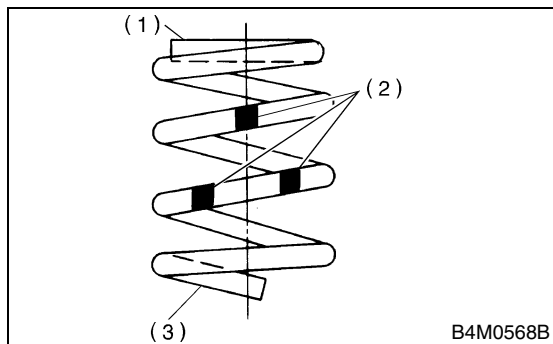
NOTE:

After completely purging air from the strut, be sure to place the strut with 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.

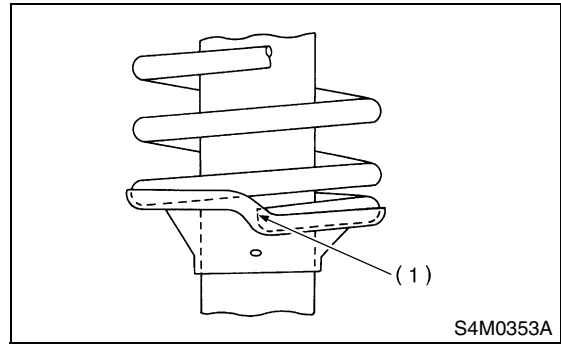
NOTE:

Make sure that the vertical installing direction of coil spring is as shown in the 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 in the figure.



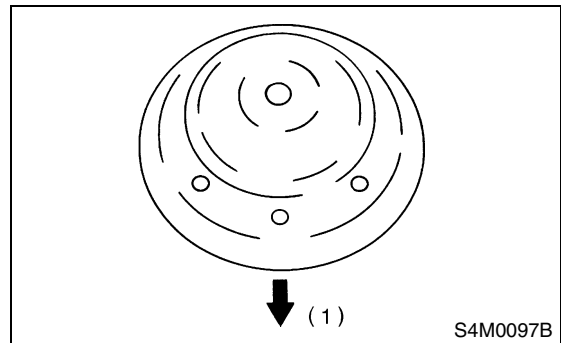
- (1) Coil spring end face

6) Install the helper and dust cover to the piston rod.

7) Pull the piston rod fully upward, and install the rubber seat and spring seat.

NOTE:

Ensure that upper spring seat is positioned as shown in the figure.



- (1) Outside of body

8) Install the strut mount to the piston rod, and then tighten the self-locking nut temporarily.

CAUTION:

Be sure to use a new self-locking nut.

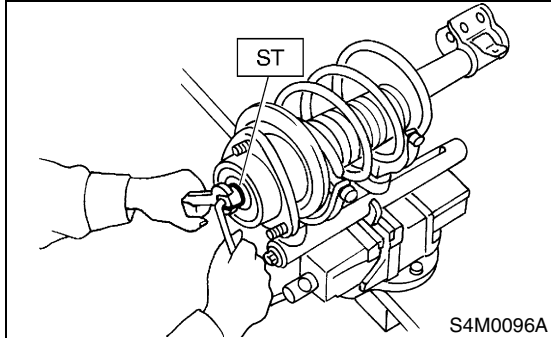
FRONT STRUT

FRONT SUSPENSION

9) Using a hexagon wrench to prevent strut rod from turning, tighten the 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.

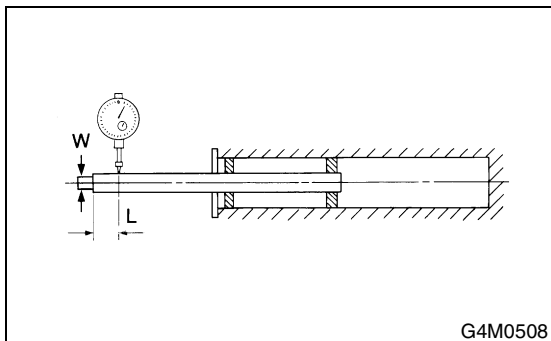
E: INSPECTION

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 that 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 rod: L [10 mm (0.39 in)], then apply a force of W [20 N (2 kgf, 4 lb)] to threaded portion. With the force of 20 N (2 kgf, 4 lb) applied, read dial gauge indication: P₁. Apply a force of 20 N (2 kgf, 4 lb) in the opposite direction of "W", then read dial gauge indication: P₂.



The free play is determined by the following equation:

$$\text{Play} = P_1, P_2$$

Limit of play:

Less than 0.8 mm (0.031 in)

If the play is greater, replace the strut.

2. STRUT MOUNT

Check the rubber part for creep, cracks and deterioration, and replace it with a 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 the vehicle posture is uneven, although there are no considerable reasons like tire puncture, uneven loading, etc., check the coil spring for its free length referring to specifications, cracks, etc., and replace it with a new one if defective.

5. HELPER

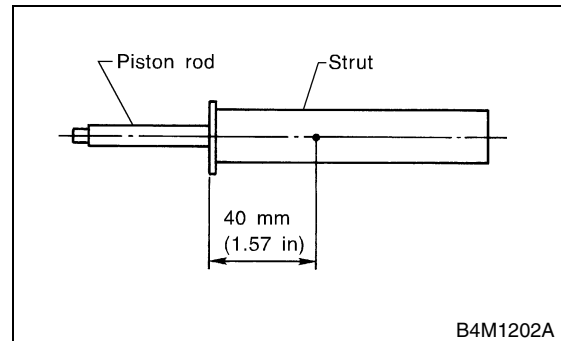
Replace it with a new one if cracked or damaged.

F: DISPOSAL

CAUTION:

- Before handling gas filled struts, be sure to wear goggles to protect eyes from gas, oil and/or filings.
- Do not disassemble the strut damper or place into a fire.
- Drill holes before disposing of gas filled struts.

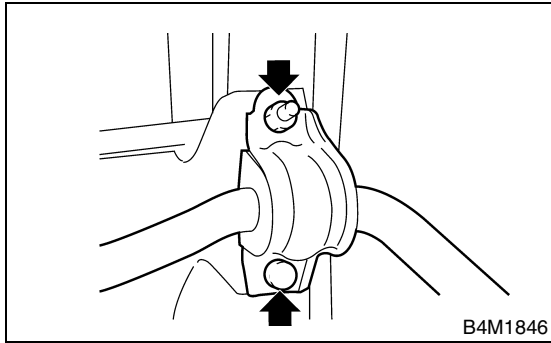
- 1) Place the gas filled strut on a flat and level surface with piston rod fully extended.
- 2) Using a 2 to 3 mm (0.08 to 0.12 in) dia. drill, make holes in areas shown in the figure.



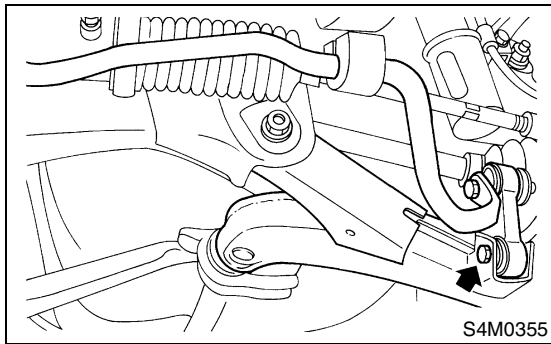
6. Front Stabilizer

A: REMOVAL

- 1) Jack-up the front part of the vehicle and support it with safety stands (rigid racks).
- 2) Remove the jack-up plate from lower part of crossmember.
- 3) Remove the sub frame.
- 4) Remove the bolts which secure stabilizer to crossmember.



- 5) Remove the bolt which secures stabilizer link to front transverse link.

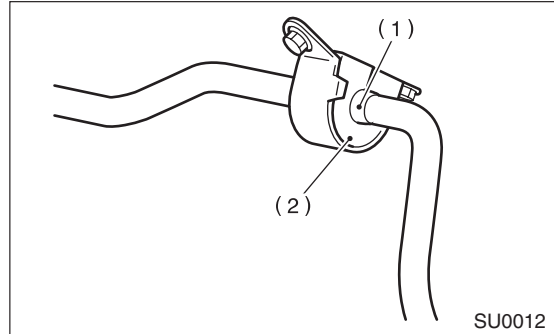


B: INSTALLATION

- 1) Install in the reverse order of removal.

NOTE:

- Install the 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 the 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 the bushing for cracks, fatigue or damage.
- 2) Check the stabilizer link for deformities, cracks, or damage, and bushing for protrusions from the hole of stabilizer link.

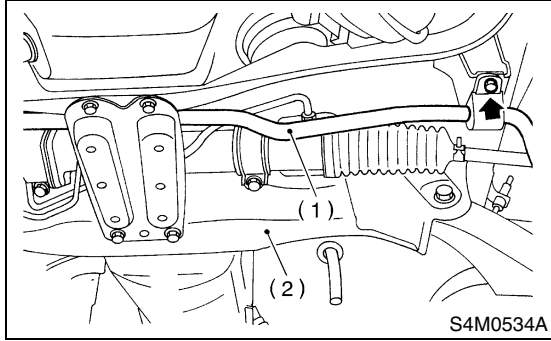
FRONT CROSSMEMBER

FRONT SUSPENSION

7. Front Crossmember

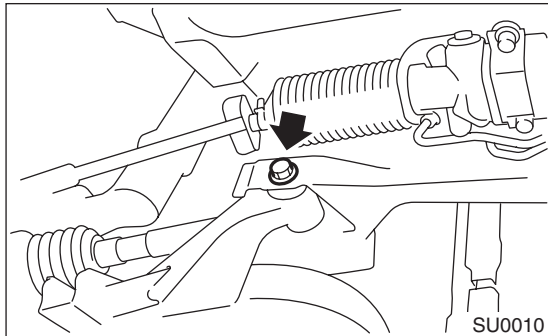
A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Lift-up the vehicle, and then remove the front tires and wheels.
- 3) Remove the sub frame.
- 4) Remove both the stabilizer and jack-up plate.



- (1) Front stabilizer
- (2) Front crossmember

- 5) Disconnect the tie-rod end from housing.
- 6) Remove the front exhaust pipe.
- 7) Remove the front transverse link from front crossmember and body.



- 8) Remove the nuts attaching engine mount cushion rubber to crossmember.
- 9) Remove the steering universal joint.
- 10) Disconnect the power steering pipe from steering gear box.
- 11) Lift the engine by approx. 10 mm (0.39 in) by using chain block.
- 12) Support the crossmember with a jack, remove nuts securing crossmember to body and lower the crossmember gradually along with steering gear-box.

CAUTION:

When removing the 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 the 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 the power steering system.

NOTE:

Check the wheel alignment and adjust if necessary.

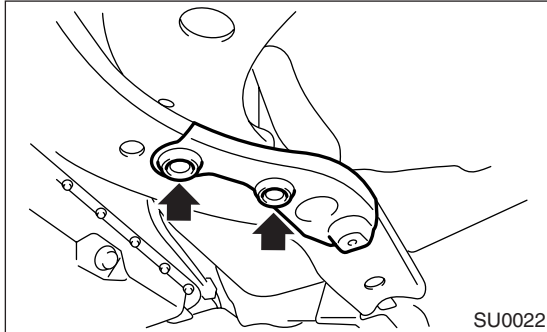
C: INSPECTION

Check the crossmember for wear, damage and cracks, and correct or replace if defective.

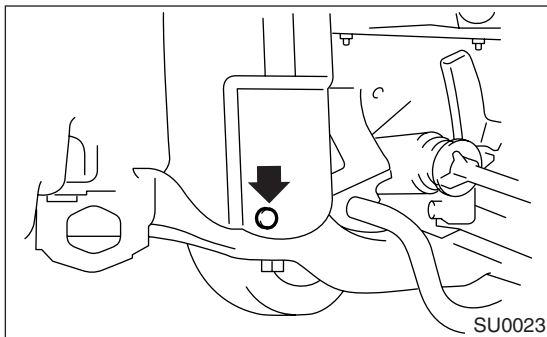
8. Sub Frame

A: REMOVAL

- 1) Lift-up the vehicle.
- 2) Remove the under cover.
- 3) Remove the bolt cover.



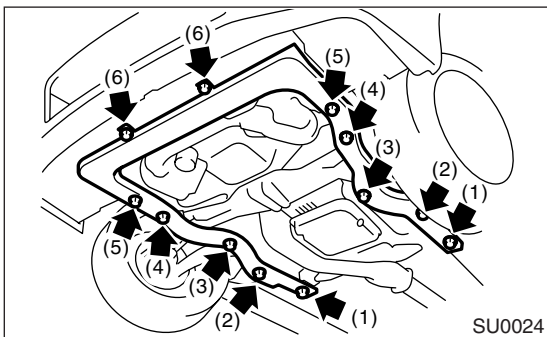
- 4) Remove the clip.



- 5) Remove the sub frame.

NOTE:

Loosen bolt (1) and leave a few threads caught, then remove the bolts in the order of (2), (3), (4), (5), and (6).



B: INSTALLATION

Install in the reverse order of removal.

NOTE:

Replace the M12 bolt with a new one.

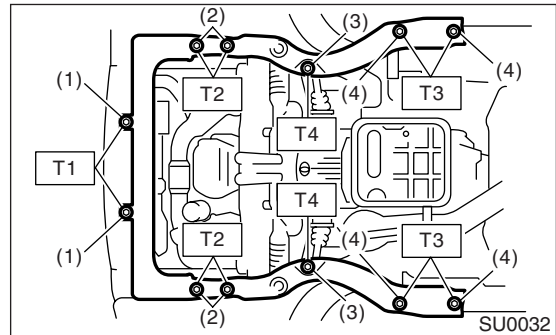
Tightening torque:

T1: 34 N·m (3.5 kgf-m, 25 ft-lb)

T2: 55 N·m (5.6 kgf-m, 41 ft-lb)

T3: 71 N·m (7.2 kgf-m, 52 ft-lb)

T4: 105 N·m (10.7 kgf-m, 77 ft-lb)



- (1) M8 bolt
- (2) M12 bolt (with max)
- (3) M12 bolt (with oil)
- (4) M10 bolt

SUB FRAME

FRONT SUSPENSION

C: INSPECTION

- 1) Check that there is no damage and distortion at the sub frame.
- 2) Check that the bolts are tightened with the specified torque. If there is looseness, tighten to the specified torque.

NOTE:

The tightening torque differs by the color for bolt (3). Always verify the bolt color before checking tightening torque.

Tightening torque:

T1: 34 N·m (3.5 kgf-m, 25 ft-lb)

T2: 55 N·m (5.6 kgf-m, 41 ft-lb)

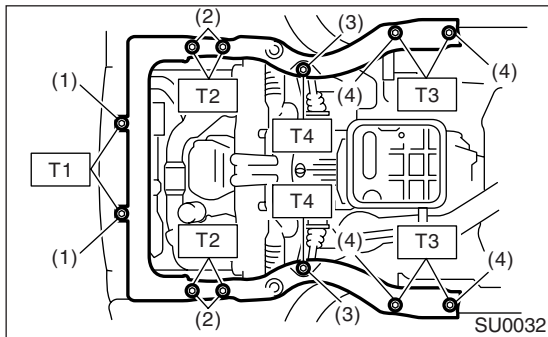
T3: 71 N·m (7.2 kgf-m, 52 ft-lb)

T4: Dark green bolt

105 N·m (10.7 kgf-m, 77 ft-lb)

T4: Except dark green bolt

55 N·m (5.6 kgf-m, 41 ft-lb)



- (1) M8 bolt
- (2) M12 bolt
- (3) M12 bolt
- (4) M10 bolt

9. General Diagnostic Table

A: INSPECTION

1. IMPROPER VEHICLE POSTURE OR IMPROPER WHEEL ARCH HEIGHT

Possible causes	Countermeasures
(1) Permanent distortion or breakage of coil spring	Replace.
(2) Unsmooth operation of damper strut and/or shock absorber	Replace.
(3) Installation of wrong strut and/or shock absorber	Replace with proper parts.
(4) Installation of wrong coil spring	Replace with proper parts.

2. POOR RIDE COMFORT

- 1) Large rebound shock
- 2) Rocking of the 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 the 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

REAR SUSPENSION

RS

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1. General Description	2
2. Wheel Alignment	9
3. Rear Stabilizer	10
4. Rear Trailing Link	11
5. Rear Strut	15
6. Lateral link	17
7. Rear Crossmember	21
8. General Diagnostic Table	22

GENERAL DESCRIPTION

REAR SUSPENSION

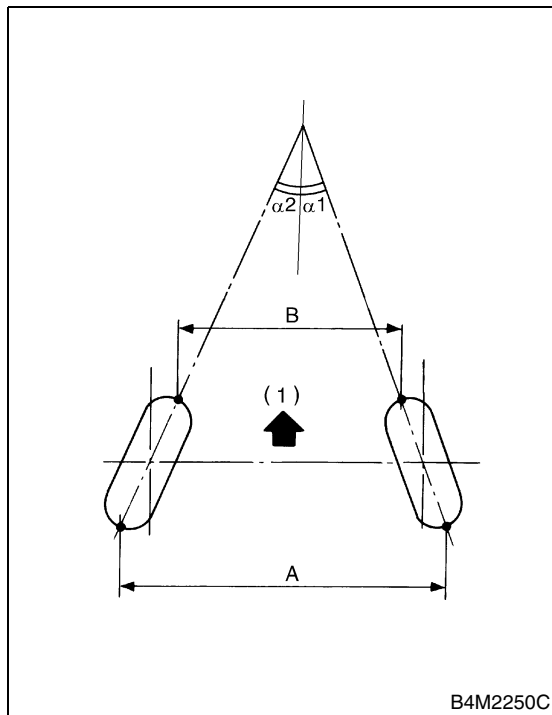
1. General Description

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

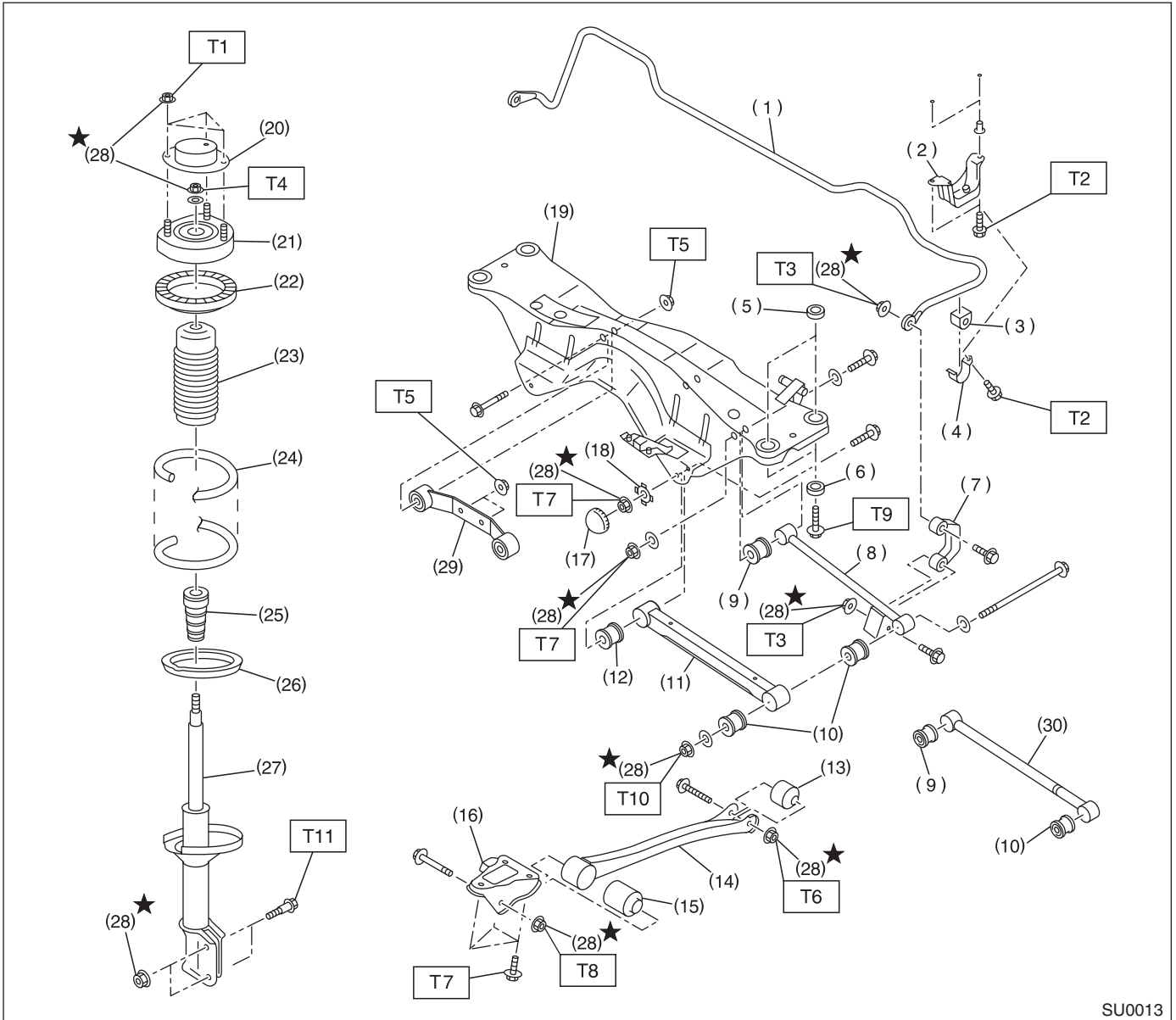
$\alpha 1, \alpha 2$: Each toe-in angle

GENERAL DESCRIPTION

REAR SUSPENSION

B: COMPONENT

1. REAR SUSPENSION



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

C: CAUTION

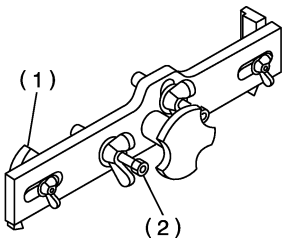
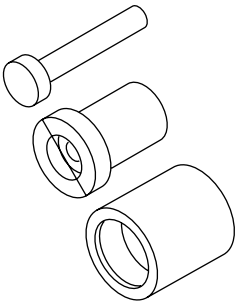
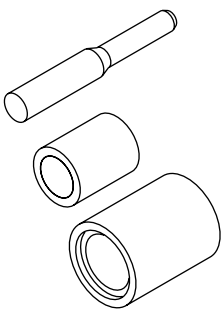
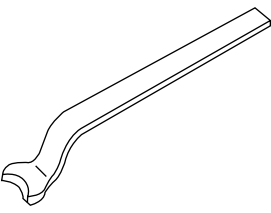
- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Use SUBARU genuine grease etc. or the equivalent. Do not mix grease etc. with that of another grade or from other manufacturers.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Apply grease onto sliding or revolution surfaces before installation.
- Before installing O-rings or snap rings, apply sufficient amount of grease to avoid damage and deformation.
- Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.
- Before disposing shock absorbers, be sure to bleed gas completely. Also, do not throw away in fire.

GENERAL DESCRIPTION

REAR SUSPENSION

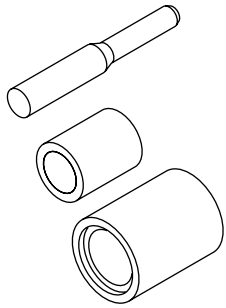
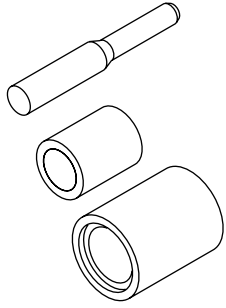
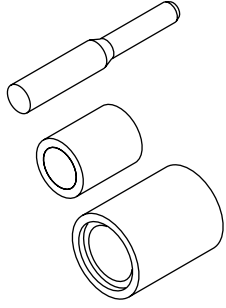
D: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">B4M2378A</p>	927380002	ADAPTER	Used as an adapter for camber & caster gauge when measuring camber and caster. (1) 28199AC000 PLATE (2) 28199AC010 BOLT
 <p style="text-align: center;">SU0014</p>	927720000	INSTALLER & REMOVER	Used for replacing front bushing.
 <p style="text-align: center;">SU0015</p>	927730000	INSTALLER & REMOVER	Used for replacing rear bushing.
 <p style="text-align: center;">SU0016</p>	28099PA100	REMOVER	Used for removing DOJ.

GENERAL DESCRIPTION

REAR SUSPENSION

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: right;">SU0015</p>	927710000	INSTALLER & REMOVER	Used for replacing lateral link bushing.
 <p style="text-align: right;">SU0015</p>	92770000	INSTALLER & REMOVER	Used for replacing lateral link bushing.
 <p style="text-align: right;">SU0015</p>	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.>

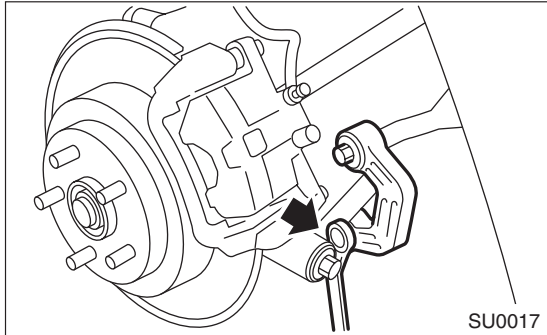
REAR STABILIZER

REAR SUSPENSION

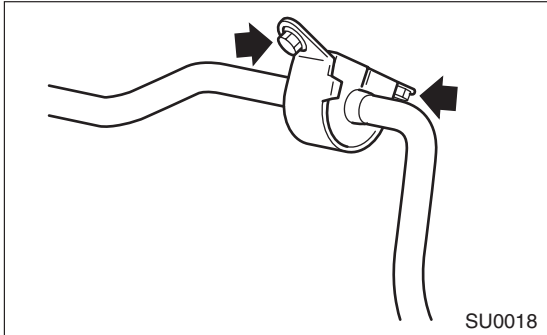
3. Rear Stabilizer

A: REMOVAL

- 1) Jack-up the rear part of the vehicle, support it with safety stands (rigid racks).
- 2) Remove the bolt which secures stabilizer link to rear lateral link.



- 3) Remove the bolt and nut which secure stabilizer to stabilizer bracket.

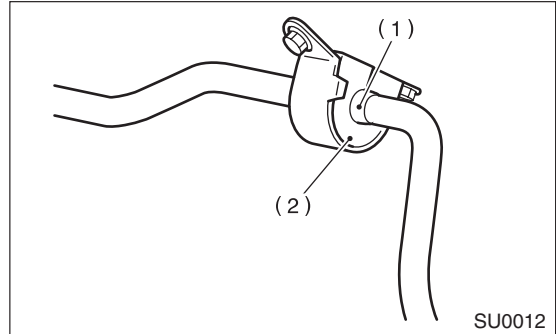


B: INSTALLATION

- 1) Install in the reverse order of removal.

NOTE:

- Install the 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 the 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)

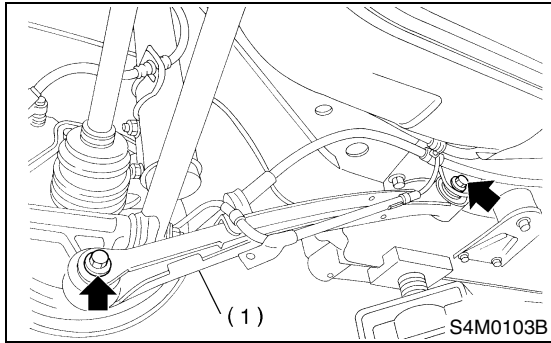
C: INSPECTION

- 1) Check the bushing for cracks, fatigue or damage.
- 2) Check the 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 the rear wheel nuts.
- 2) Jack-up the vehicle, support it with safety stands (rigid racks), and then remove the rear wheels.
- 3) Remove both the rear parking brake clamp and ABS sensor harness. (Models equipped with ABS)
- 4) Remove the bolt which secures trailing link to trailing link bracket.



(1) Trailing link

- 5) Remove the bolt which secures trailing link to rear housing.

B: INSTALLATION

Install in the reverse order of removal.

CAUTION:

Always tighten the rubber bushing location when wheels are in full contact with the ground and vehicle is at curb weight condition.

NOTE:

Check the wheel alignment and adjust if necessary.

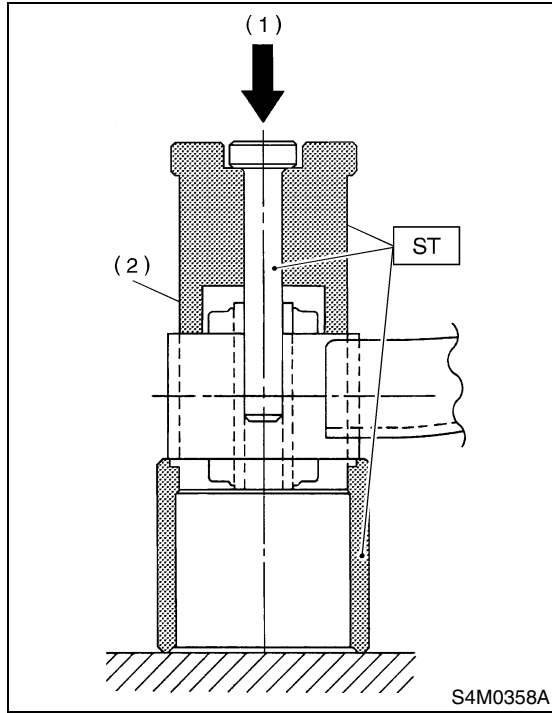
REAR TRAILING LINK

REAR SUSPENSION

C: DISASSEMBLY

1. FRONT BUSHING

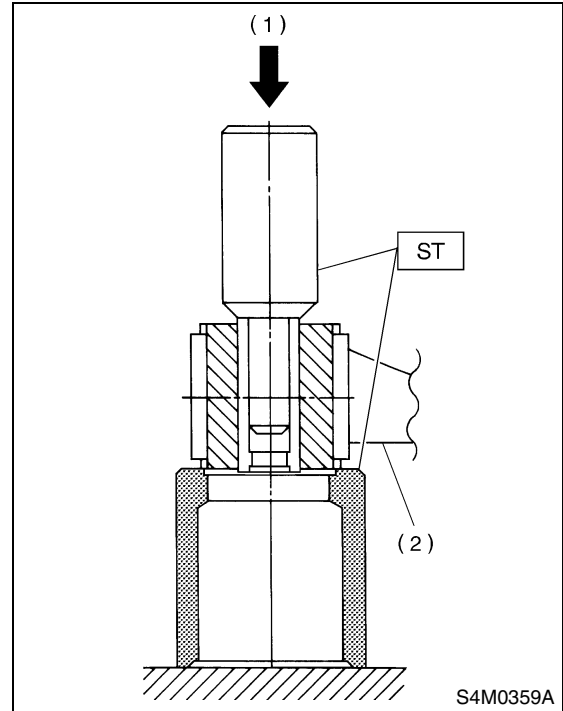
Using the ST, press the front bushing out of place.
ST 927720000 INSTALLER & REMOVER SET



- (1) Press
- (2) Trailing link

2. REAR BUSHING

1) Remove the housing. <Ref. to DS-24, REMOVAL, Rear Axle.>
2) Using the ST, press the rear bushing out of place.
ST 927730000 INSTALLER & REMOVER SET



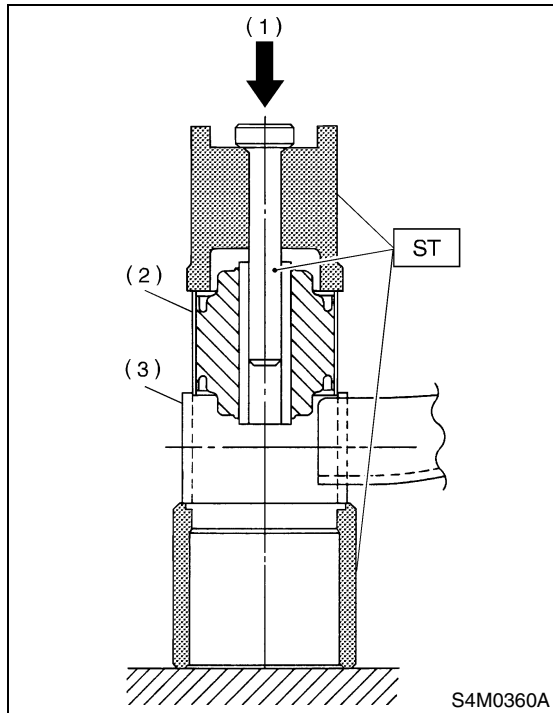
- (1) Press
- (2) Housing

D: ASSEMBLY

1. FRONT BUSHING

Using the ST, press the bushing into trailing link.
 ST 927720000 INSTALLER & REMOVER SET

CAUTION:
 When installing the bushing, turn the ST plunger upside down and press it until the plunger end surface contacts trailing link end surface.



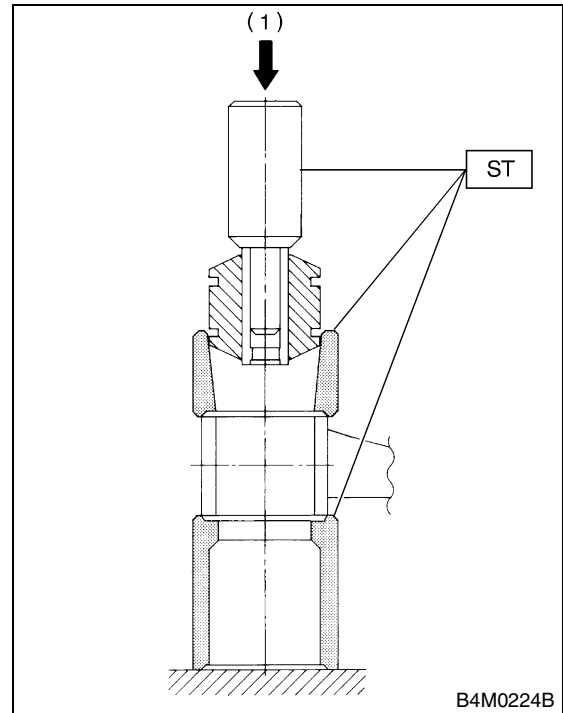
- (1) Press
- (2) Front bushing
- (3) Trailing link

2. REAR BUSHING

1) Using the ST, press the bushing into trailing link.
 ST 927730000 INSTALLER & REMOVER SET

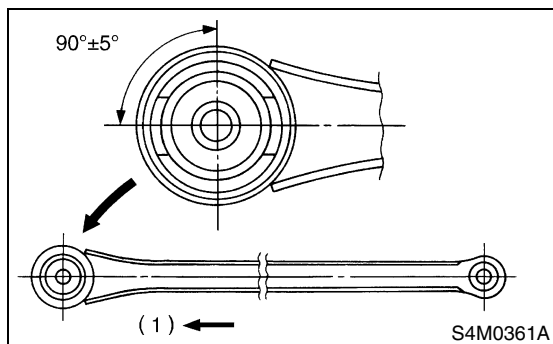
NOTE:
 If it is difficult to press the bushing into trailing link, apply water-diluted TIRE LUBE to the inner surface of ST as a lubricant.

SPECIFIED lubricant:
TIRE LUBE: water = 1 : 3



- (1) Press

CAUTION:
 Install the front bushing in the proper direction, as shown in the figure.



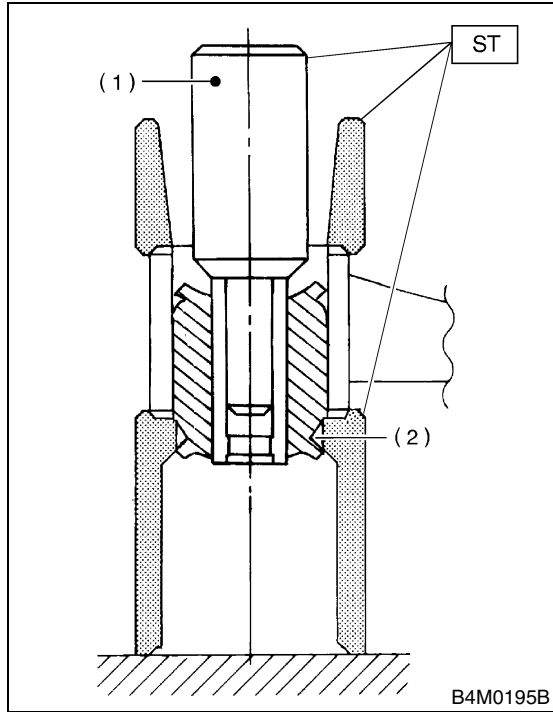
- (1) Front

REAR TRAILING LINK

REAR SUSPENSION

2) Press the ST plunger until bushing flange protrudes beyond trailing link.

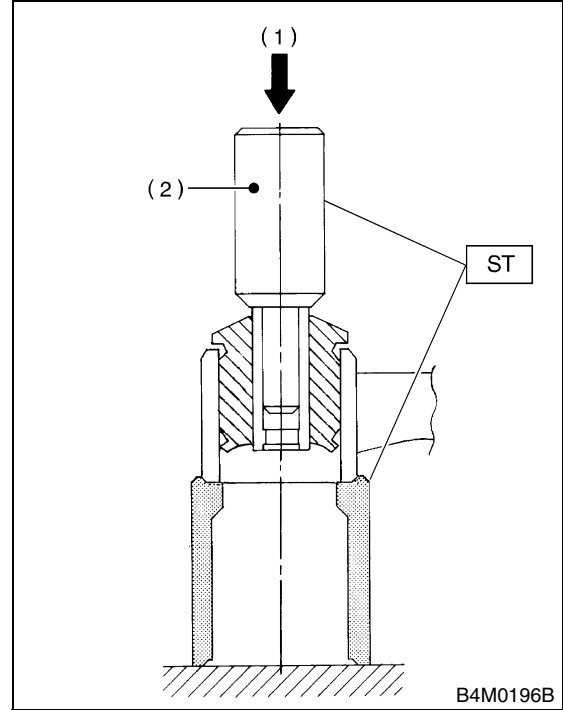
ST 927730000 INSTALLER & REMOVER SET



- (1) Plunger
- (2) Flange

3) Turn the trailing link upside down. Press the ST plunger in the opposite direction 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 the housing. <Ref. to DS-27, INSTALLATION, Rear Axle.>

E: INSPECTION

Check the trailing links for bends, corrosion or damage.

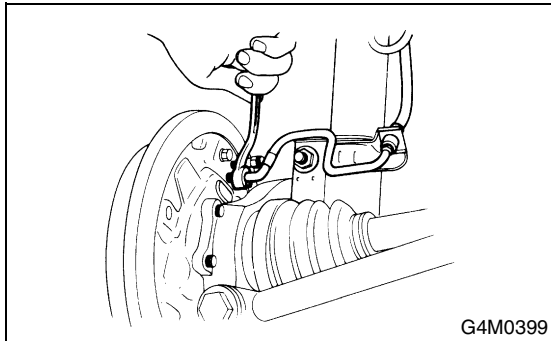
5. Rear Strut

A: REMOVAL

- 1) Depress the brake pedal and secure it in that position using a wooden block, etc. (Drum brake only)
- 2) Remove the rear seat cushion and backrest. (Sedan model)
- 3) Remove the strut cap of quarter trim. (Wagon model)
- 4) Loosen the rear wheel nuts.
- 5) Jack-up the vehicle, support it with safety stands (rigid racks) and remove rear wheels.
- 6) Drum brake models:

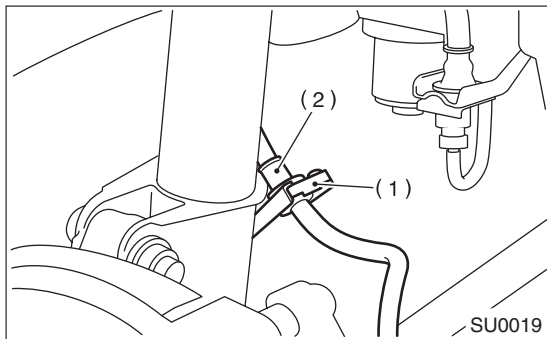
Remove the brake hose clip.

Disconnect the brake hose from brake pipe from strut, and then disconnect the brake pipe from drum brake.



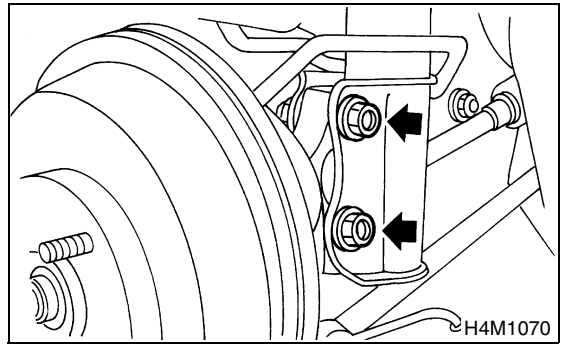
- 7) Disc brake models:

Remove the brake hose clip, and then remove the brake hose from rear strut.



- (1) Brake hose clip
- (2) Brake hose

- 8) Remove the bolts which secure rear strut to housing.



- 9) Remove the nuts securing strut mount to body.

REAR STRUT

REAR SUSPENSION

B: INSTALLATION

1) Tighten the self-locking nut used to secure strut mount to vehicle body.

CAUTION:

Discard the 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 the bolts which secure rear strut to housing.

Tightening torque:

220 N·m (22.4 kgf-m, 162 ft-lb)

CAUTION:

Discard the loosened self-locking nut, and replace with a new one.

3) Disc brake model:

Install the brake hose to lower side of strut, then insert brake hose clip.

Drum brake model:

Connect the brake hose to brake pipe.

Tightening torque:

15 N·m (1.5 kgf-m, 10.8 ft-lb)

Insert the brake hose clip between brake hose and lower side of strut.

CAUTION:

- **Check that the hose clip is positioned properly.**
- **Check the brake hose for twisting, or excessive tension.**
- **Do not subject the ABS sensor harness to excessive tension. (Model equipped with ABS)**

4) Be sure to bleed air from the brake system.

5) Lower the vehicle and tighten wheel nut.

Tightening torque:

90 N·m (9.2 kgf-m, 66 ft-lb)

6) Sedan model:

Install the rear seat backrest and rear seat cushion.

Wagon model:

Install the strut cap to rear quarter trim.

NOTE:

Check the 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.>

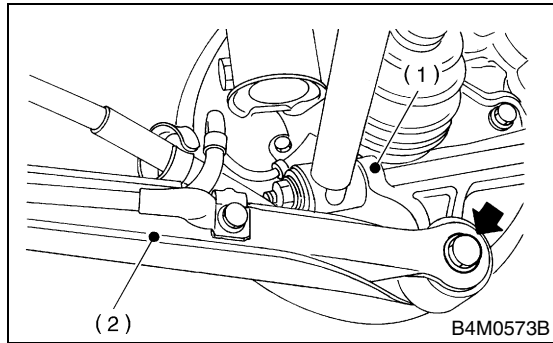
F: DISPOSAL

Refer to Front Strut as a guide for disposal procedures. <Ref. to FS-22, DISPOSAL, Front Strut.>

6. Lateral link

A: REMOVAL

- 1) Loosen the wheel nuts. Lift-up the vehicle and remove wheel.
- 2) Remove the stabilizers. (Turbo model)
- 3) Remove the ABS sensor harness from trailing link.
(Models equipped with ABS)
- 4) Remove the bolt securing trailing link to housing.



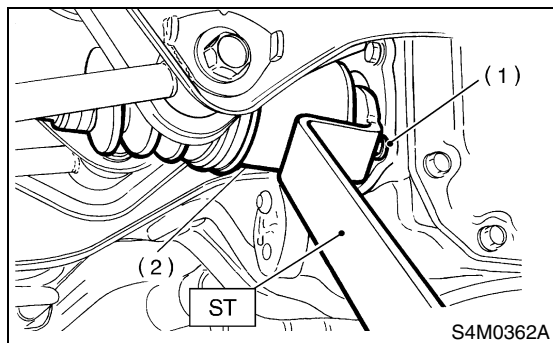
- (1) Rear housing
- (2) Trailing link

- 5) Remove the bolts which secure lateral link assembly to rear housing.
- 6) Remove the 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:

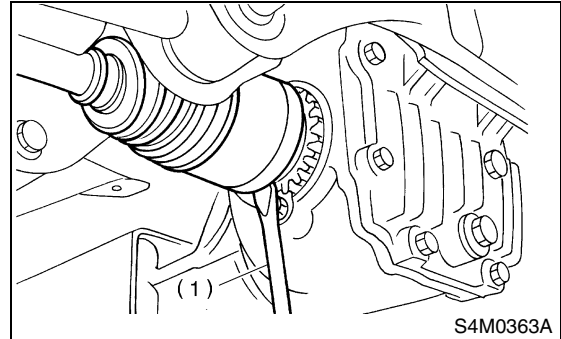
Be careful not to damage the side bearing retainer. Always use bolt shown in the figure, as supporting point for ST during removal.

- 7) Remove the DOJ from rear differential using tire lever.

(Except for 2.0 L MT model)

NOTE:

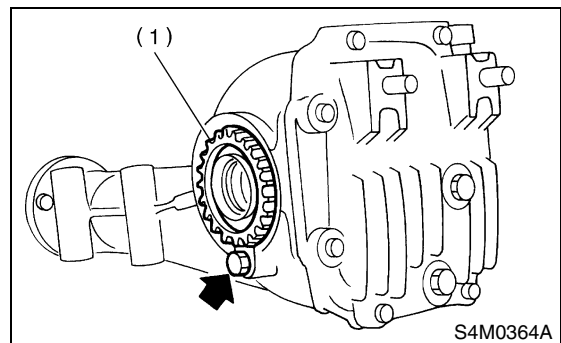
The side spline shaft circlip comes out together with the shaft.



- (1) Tire lever

CAUTION:

When removing the DOJ from rear differential, fit tire lever to the bolt as shown in the figure so as not to damage axle shaft holder.



- (1) Axle shaft holder

- 8) Scribe an alignment mark on the rear lateral link adjusting bolt and crossmember.

- 9) Remove the bolts securing front and rear lateral links to crossmember, detach lateral links.

CAUTION:

To loosen the adjusting bolt, always loosen the nut while holding head of adjusting bolt.

LATERAL LINK

REAR SUSPENSION

B: INSTALLATION

Install in the reverse order of removal. Observe the following instructions.

- Installation of DOJ to differential: <Ref. to DS-39, INSTALLATION, Rear Drive Shaft.>

CAUTION:

- Do not allow the DOJ splines to damage side oil seal.
- Always tighten the rubber bushing location when wheels are in full contact with the ground and vehicle is curb weight.
- Tighten the nut when installing adjusting bolt.
- Replace the self-locking nut and DOJ circlip with new ones.

NOTE:

Check the wheel alignment and adjust if necessary.

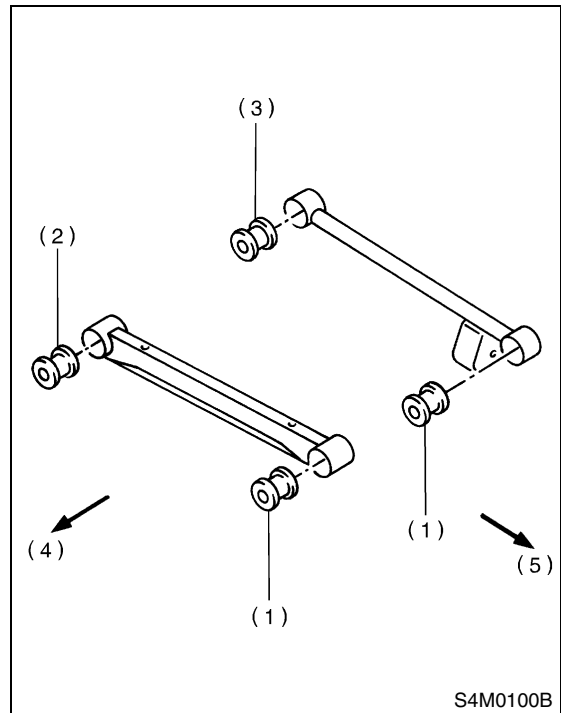
C: DISASSEMBLY

Using the ST, press the bushing out of place.

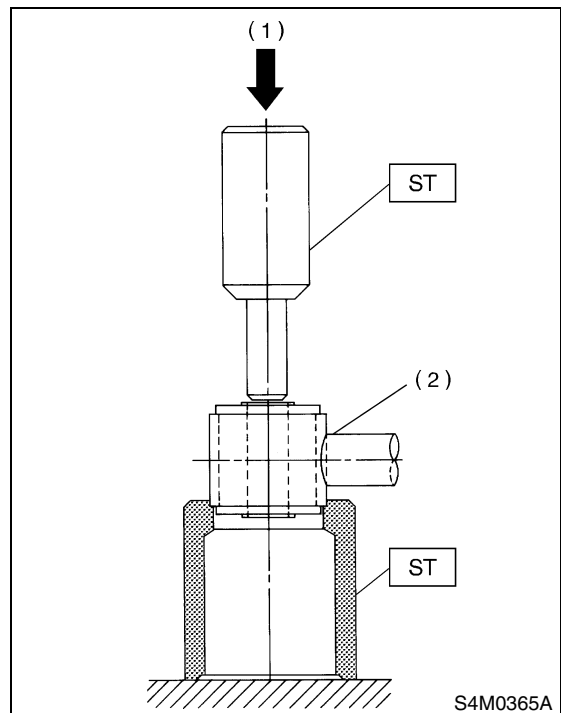
NOTE:

- Using the following table as a guide, verify the type of bushings.
- Select the ST according to type of bushings used.

Bushing	ST: INSTALLER & REMOVER SET
Bushing A	927700000
Bushing B	927690000
Bushing C	927700000



- (1) Bushing A
- (2) Bushing B
- (3) Bushing C
- (4) Front
- (5) Outside of body



- (1) Press
- (2) Lateral link

D: ASSEMBLY

1) Using the ST, press the bushing into place.

CAUTION:

Select the ST according to type of bushings used.

NOTE:

- Using the same ST as that used during disassembly.
- If it is difficult to press the bushing into trailing link, apply water-diluted TIRE LUBE to the inner surface of ST as a lubricant.

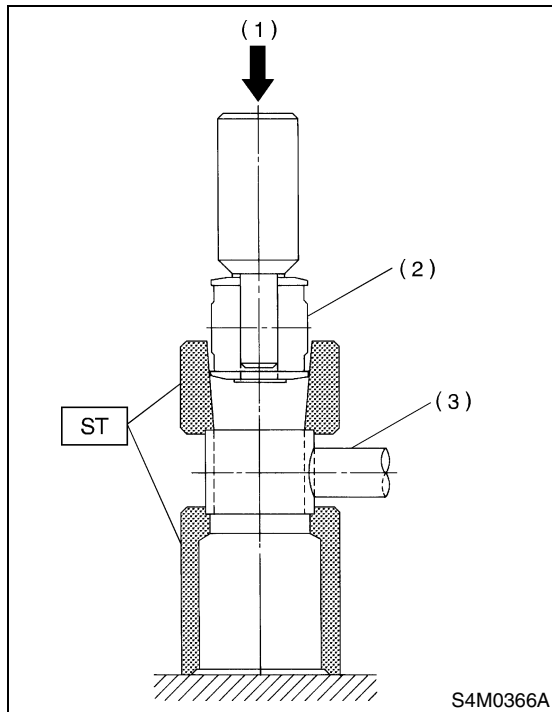
Specified lubricant:

TIRE LUBE: water = 1 : 3

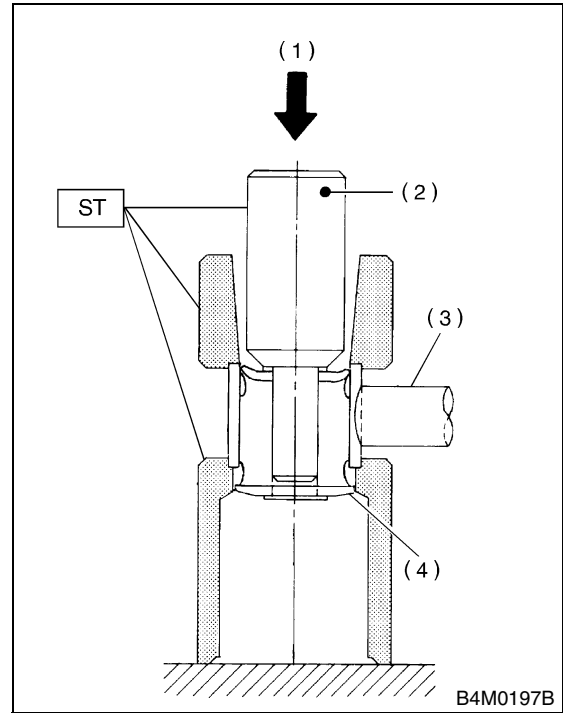
2) Press the ST plunger until bushing flange protrudes beyond lateral link.

NOTE:

Using the same ST as that used during disassembly.



- (1) Press
- (2) Bushing
- (3) Lateral link



- (1) Press
- (2) Plunger
- (3) Lateral link
- (4) Flange

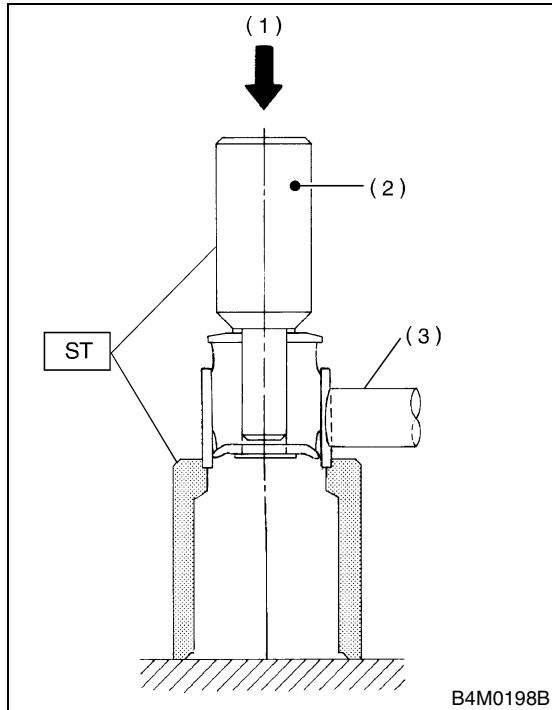
LATERAL LINK

REAR SUSPENSION

3) Turn the lateral link upside down. Press the ST plunger in opposite direction that outlined in the former procedure until bushing is correctly positioned in trailing link.

NOTE:

Using the same ST as that used during disassembly.



- (1) Press
- (2) Plunger
- (3) Lateral link

E: INSPECTION

Visually check the lateral links for damage or bends.

7. Rear Crossmember

A: REMOVAL

CAUTION:

Do not subject the ABS sensor harness to excessive tension. (Models equipped with ABS)

- 1) Separate the front exhaust pipe and rear exhaust pipe.
- 2) Remove the rear exhaust pipe and muffler.
- 3) Remove the rear differential.

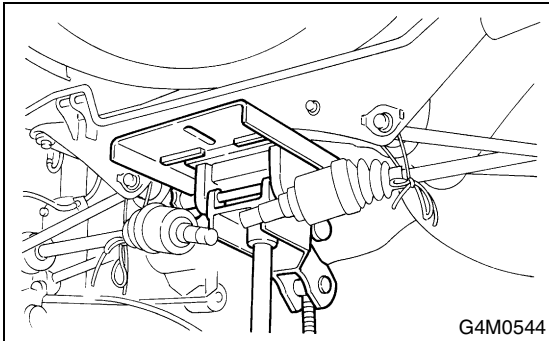
T-type

<Ref. to DI-25, REMOVAL, Rear Differential for T-type.>

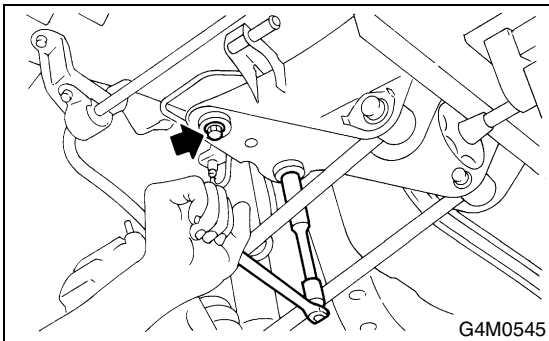
VA-type

<Ref. to DI-41, REMOVAL, Rear Differential for VA-type.>

- 4) Place the transmission jack under rear crossmember.



- 5) Remove the bolts securing crossmember to vehicle body, and then remove the crossmember.



- 6) Scribe an alignment mark on the rear lateral link cam bolt and crossmember.
- 7) Remove the front and rear lateral links by loosening nuts.

B: INSTALLATION

CAUTION:

- Discard the loosened self-locking nut and replace it with a new one.
- Always tighten the nut (not adjusting bolt), when tightening adjusting bolt.

- 1) Install in the reverse order of removal.

- 2) For installation and tightening torque of rear differential;

T-type

<Ref. to DI-26, INSTALLATION, Rear Differential for T-type.>

VA-type

<Ref. to DI-42, INSTALLATION, Rear Differential for VA-type.>

- 3) Always tighten the rubber bushing when wheels are in full contact with the ground and vehicle is curb weight.

NOTE:

Check the wheel alignment and adjust if necessary.

C: INSPECTION

Check the 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 the 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 the coil springs with new ones.
(4) Fault in operation of damper strut and/or shock absorber	Replace.
(5) Damage or deformation of strut mount and/or shock absorber mount	Replace.
(6) Unsuitability of maximum and/or minimum length of damper strut and/or shock absorber	Replace with proper parts.
(7) Deformation or loss of bushing	Replace.
(8) Deformation or damage of helper in strut assembly and/or shock absorber	Replace.
(9) Oil leakage of damper strut and/or shock absorber	Replace.

3. NOISE

Possible causes	Countermeasures
(1) Wear or damage of damper strut and/or shock absorber component parts	Replace.
(2) Loosening of suspension link installing bolt	Retighten to the specified torque.
(3) Deformation or loss of bushing	Replace.
(4) Unsuitability of maximum and/or minimum length of damper strut and/or shock absorber	Replace with proper parts.
(5) Breakage of coil spring	Replace.
(6) Wear or damage of ball joint	Replace.
(7) Deformation of stabilizer clamp	Replace.

WHEEL AND TIRE SYSTEM

WT

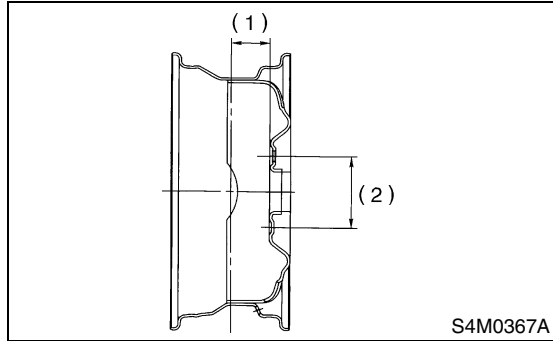
	Page
1. General Description	2
2. Tire	4
3. Steel Wheel	5
4. Aluminum Wheel	6
5. Wheel Balancing	7
6. "T-type" Tire	8
7. Full Wheel Cap.....	9
8. General Diagnostics Table	10

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	185/70R14 88H	14 × 5 1/2JJ	55 (2.17)	100 (3.94) dia.
		195/60R15 88H	15 × 6JJ		
		205/50 R16 87V	16 × 6 1/2JJ		
		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	16 × 4T	50 (1.97)	

		Tire size	Tire inflation pressure kPa (kg/cm ² , psi)	
			Light load	Full load
Front and rear	Except OUTBACK	185/70 R14 88H	Fr: 220 (2.2, 32) Rr: 200 (2.0, 29)	Fr: 220 (2.2, 32) Rr: 220 (2.2, 32)
		195/60 R15 88H		
		205/50 R16 87V	Fr: 220 (2.2, 32) Rr: 200 (2.0, 29)	
		215/45 R17 87W	Fr: 230 (2.3, 33) Rr: 220 (2.2, 32)	
	OUTBACK	P205/55 R16 89V	Fr: 220 (2.2, 32) Rr: 200 (2.0, 29)	
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

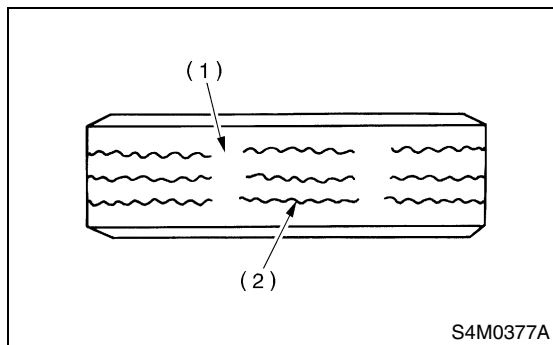
A: INSPECTION

- 1) Take stone, glass, nail etc. off the tread groove.
- 2) Replace the 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 the side wall, damage or crack on tread is found.
- (2) When the “tread wear indicator” appears as a solid band across the tread.



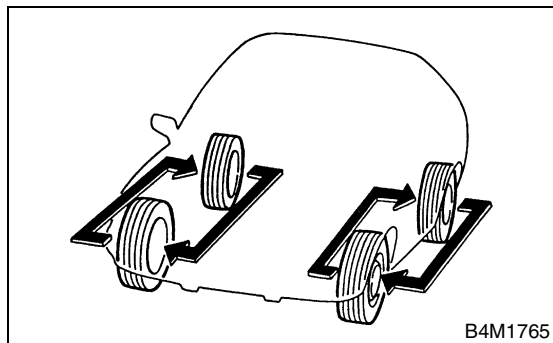
- (1) Tread wear indicator
- (2) Tire tread

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 the tires, replace unevenly worn or damaged tires with new ones.



3. Steel Wheel

A: REMOVAL

- 1) Apply parking brake, and position the 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 the wheel nuts.
- 4) Raise the vehicle until its wheels take off the ground using a jack or a lift.
- 5) Remove the wheel nuts and wheels.

NOTE:

- While removing the wheels, prevent hub bolts from damage.

NOTE:

- Place the wheels with their outer sides facing upward to prevent wheels from damage.

B: INSTALLATION

- 1) Attach the wheel to hub by aligning the wheel bolt hole with hub bolt.
- 2) Temporarily attach the wheel nuts to 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 guide portion of hub.
- 4) Tighten the wheel nuts in a diagonal selection to specified torque. Use a wheel nut wrench.

Wheel nut tightening torque:

90 N·m (9.1 kgf·m, 65.7 ft·lb)

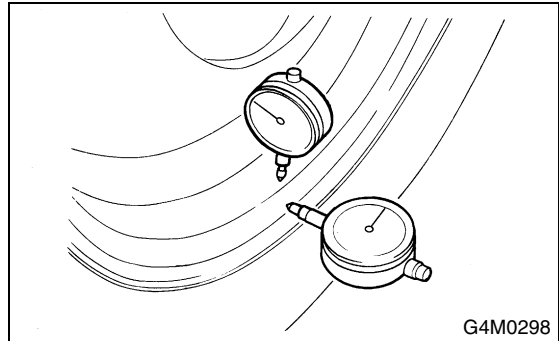
CAUTION:

- **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 foot; Always use both hands when tightening.**
- **Make sure the bolt, nut and nut seating surface of the wheel are free from oils.**

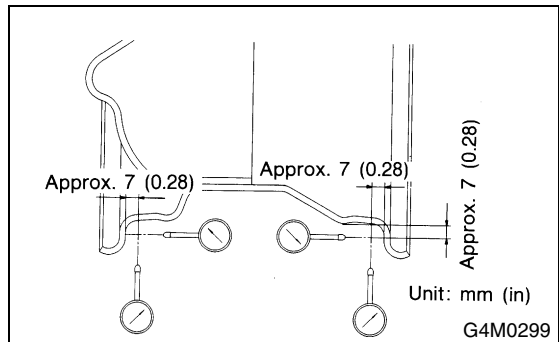
- 5) If a wheel is removed for replacement or for repair of a puncture, retighten the wheel nuts to the specified torque after running 1,000 km (600 miles).

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 the vehicle until wheels clear the floor.
- 3) Slowly rotate the wheel to check rim "runout" using a dial gauge.



Axial runout limit	Radial runout limit
1.5 mm (0.059 in)	



- 4) If the rim runout exceeds specifications, remove the tire from rim and check runout while attaching dial gauge to positions shown in the 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 the aluminum wheels during removal, disassembly, installation, wheel balancing, etc. After removing the aluminum wheels, place them on a rubber mat, etc.
- 2) While the vehicle is being driven, be careful not to ride over sharp obstacles or allow the aluminum wheels to contact the shoulder of the road.
- 3) When installing a tire chain, be sure to install it properly not to have slack; otherwise it may hit the wheel while driving.
- 4) When washing the 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 the balance weights.
- 2) Using dynamic balancing, measure the 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)

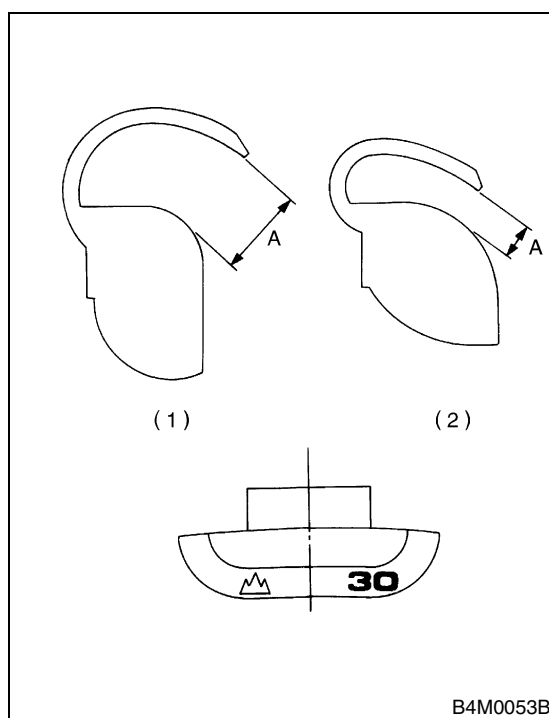
- 4) Install the selected weight to the point designated by dynamic balancing.
- 5) Using dynamic balancing, measure the wheel balance again. Check that the wheel balance is correctly adjusted.

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 the 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 the 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 the tires for deformation, cracks, partial wear, or wear.

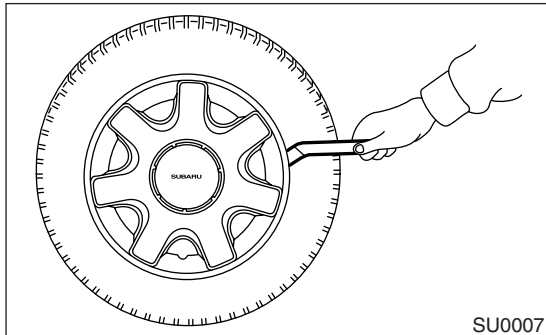
CAUTION:

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 on the cap.



B: INSTALLATION

Align the valve hole in wheel cap with the valve on wheel and secure the wheel cap by tapping four points by hand.

C: INSPECTION

- 1) Check the wheels for missing wheel caps.
- 2) Check the pawls of wheel caps for damage or bend.
- 3) Check the 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

DIFFERENTIALS

DI

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GENERAL DESCRIPTION

DIFFERENTIALS

1. General Description

A: SPECIFICATIONS

When replacing a rear differential assembly, select the correct one according to the following table.

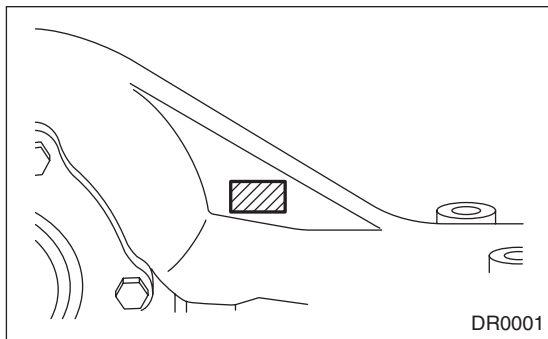
NOTE:

Using the different rear differential assembly causes the drive line and tires to “drag” or emit abnormal noise when AWD is selected.

MODEL	1.6 L		2.0 L	
	AT	MT	AT	MT
Rear differential type	VA type without LSD			T type without LSD
Identification	XP	XN		EG
Type of gear	Hypoid gear			
Gear ratio (Number of gear teeth)	4.444 (40/9)	4.111 (37/9)		3.900 (39/10)
Oil capacity	0.8 ℓ (0.8 US qt, 0.7 Imp qt)			
Rear differential gear oil	GL-5			

MODEL	2.5 L			2.0 L Turbo		
	AT	MT		AT	MT	
		Except Australia	Australia		Except Australia	Australia
Rear differential type	T type with LSD					
LSD type	Viscous coupling					SURETRAC®
Identification	EJ	ER	EJ		EF	EM
Type of gear	Hypoid gear					
Gear ratio (Number of gear teeth)	4.111 (37/9)	3.700 (37/10)	4.111 (37/9)		3.545 (39/11)	4.444 (40/9)
Oil capacity	0.8 ℓ (0.8 US qt, 0.7 Imp qt)					
Rear differential gear oil	GL-5					

• **Identification**



• **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 — 26 (1.9 — 2.6, 4.3 — 5.8)
		VA-type	12.7 — 32.4 (1.3 — 3.3, 2.9 — 7.3)
Side gear backlash mm (in)	Used bearing	T-type	8 — 16 (0.8 — 1.6, 1.8 — 3.6)
		VA-type	0.10 — 0.20 (0.0039 — 0.0079)
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 backlash	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 — 26 N (1.9 — 2.6 kgf, 4.3 — 5.8 lb)
	Used bearing	8 — 16 N (0.8 — 1.6 kgf, 1.8 — 3.6 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

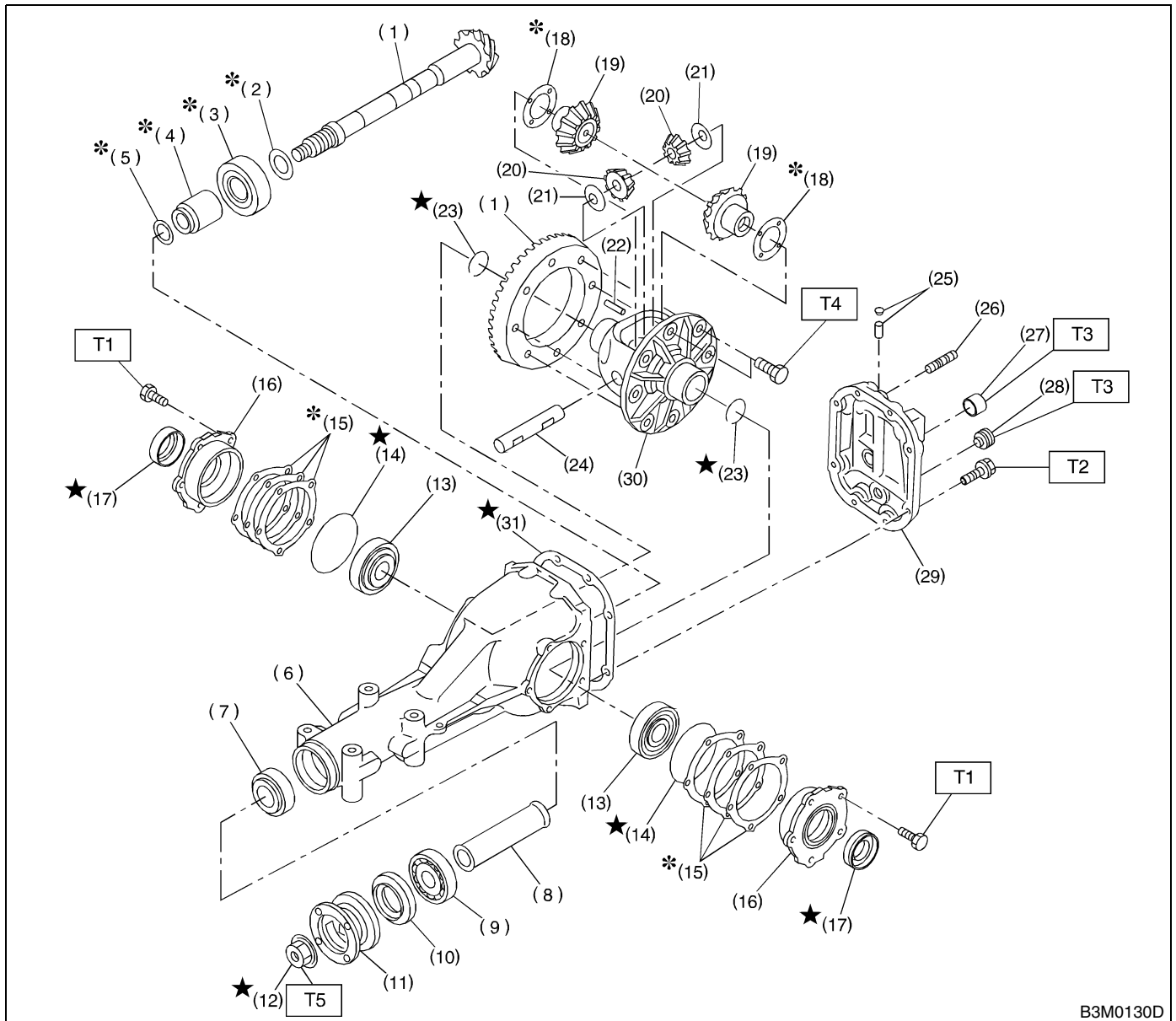
Pinion height adjusting shim	Part No.	Thickness
	383495200	3.09 mm (0.1217 in)
	383505200	3.12 mm (0.1228 in)
	383515200	3.15 mm (0.1240 in)
	383525200	3.18 mm (0.1252 in)
	383535200	3.21 mm (0.1264 in)
	383545200	3.24 mm (0.1276 in)
	383555200	3.27 mm (0.1287 in)
	383565200	3.30 mm (0.1299 in)
	383575200	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 (Model without LSD)	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)
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



B3M0130D

- | | | |
|--|---------------------------------|------------------------|
| (1) Pinion crown gear and drive pinion set | (13) Side bearing | (26) Stud bolt |
| (2) Pinion height adjusting washer | (14) O-ring | (27) Oil filler plug |
| (3) Rear bearing | (15) Side bearing retainer shim | (28) Oil drain plug |
| (4) Bearing preload adjusting spacer | (16) Side bearing retainer | (29) Rear cover |
| (5) Bearing preload adjusting washer | (17) Side oil seal | (30) Differential case |
| (6) Differential carrier | (18) Side gear thrust washer | (31) Gasket |
| (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 | |
| | (25) Air breather cap | |

Tightening torque: N-m (kgf-m, ft-lb)

T1: 10.3 (1.05, 7.6)

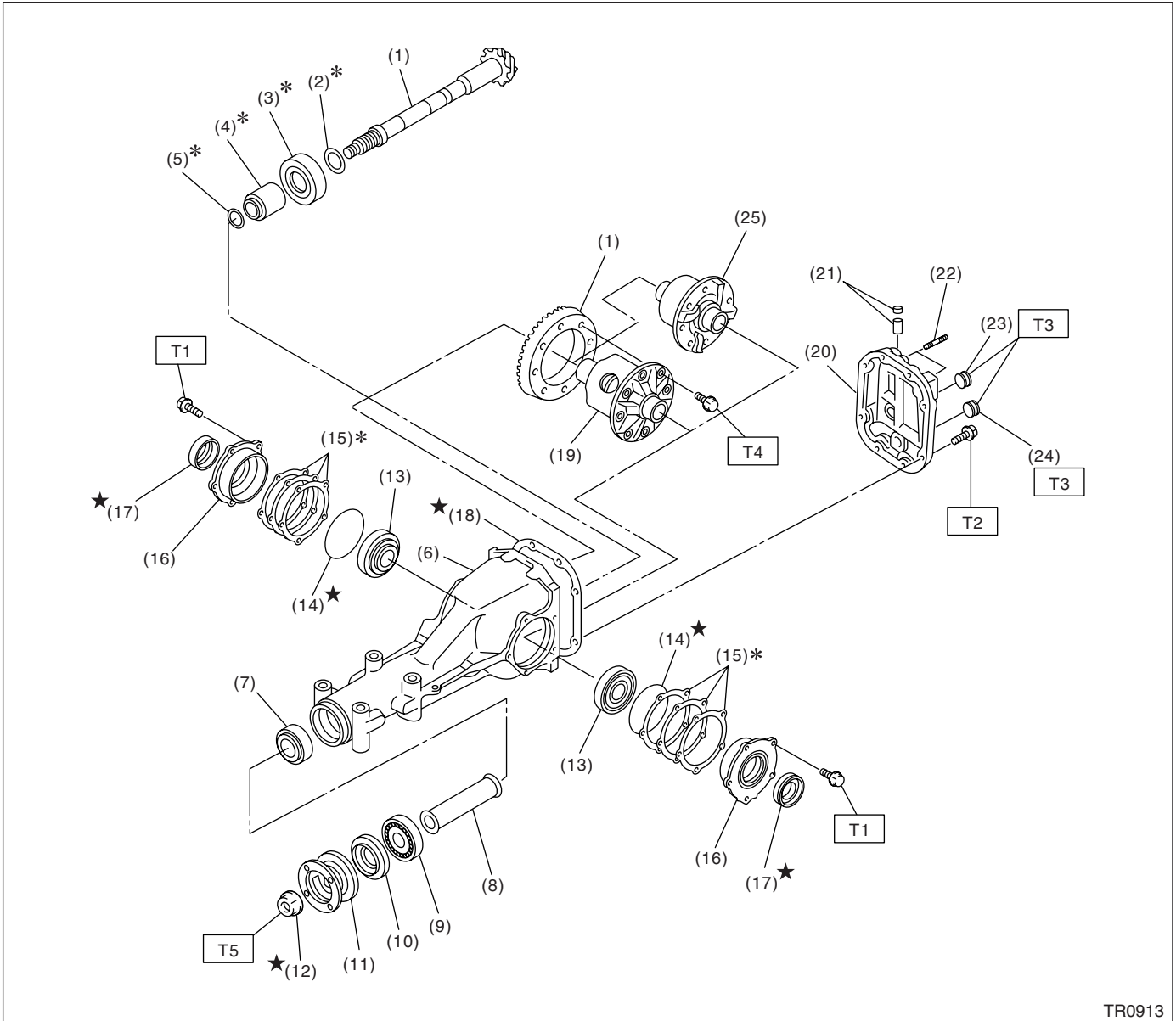
T2: 29 (3.0, 21.7)

T3: 49 (5.0, 36.2)

T4: 105 (10.7, 77.4)

T5: 181 (18.5, 134)

2. REAR DIFFERENTIAL FOR T-TYPE WITH LSD



TR0913

(1) Pinion crown gear and drive pinion set	(12) Self-locking nut	(23) Oil filler plug
(2) Pinion height adjusting shim	(13) Side bearing	(24) Oil drain plug
(3) Rear bearing	(14) O-ring	(25) Differential case (SURETRAC® type)
(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 (Viscous coupling type)	
(9) Pilot bearing	(20) Rear cover	
(10) Front oil seal	(21) Air breather cap	
(11) Companion flange	(22) Stud bolt	

Tightening torque: N-m (kgf-m, ft-lb)

T1: 10.3 (1.05, 7.6)

T2: 29 (3.0, 21.7)

T3: 49 (5.0, 36.2)

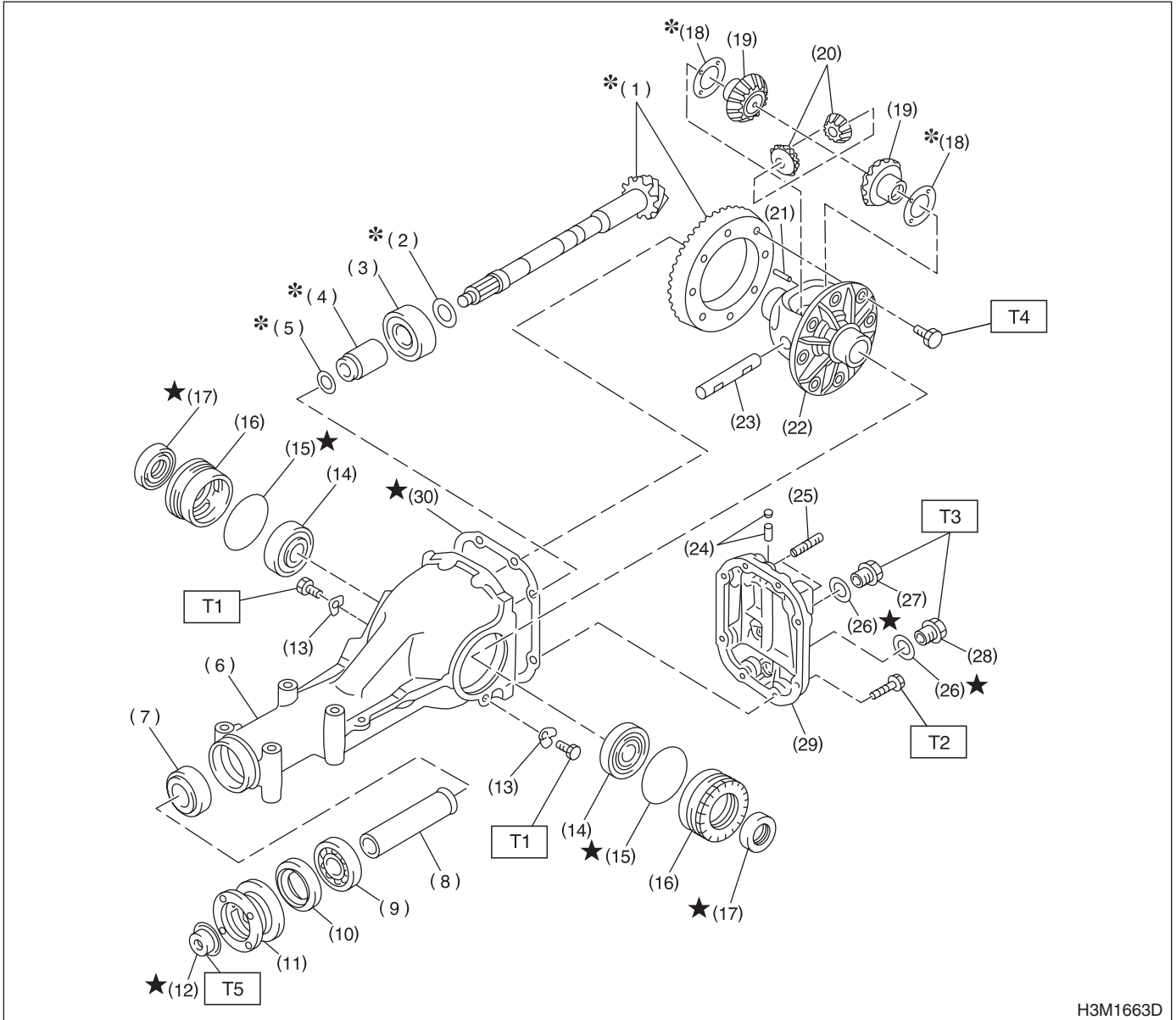
T4: 105 (10.7, 77.4)

T5: 181 (18.5, 134)

GENERAL DESCRIPTION

DIFFERENTIALS

3. REAR DIFFERENTIAL FOR VA-TYPE



H3M1663D

- | | | |
|--|------------------------------|----------------------|
| (1) Pinion crown gear and drive pinion set | (13) Lock plate | (26) Gasket |
| (2) Pinion height adjusting shim | (14) Side bearing | (27) Oil filler plug |
| (3) Rear bearing | (15) O-ring | (28) Oil drain plug |
| (4) Bearing preload adjusting spacer | (16) Axle shaft holder | (29) Rear cover |
| (5) Bearing preload adjusting washer | (17) Side oil seal | (30) Gasket |
| (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 | |
| | (25) Stud bolt | |

Tightening torque: N-m (kgf-m, ft-lb)

T1: 25 (2.5, 18.1)

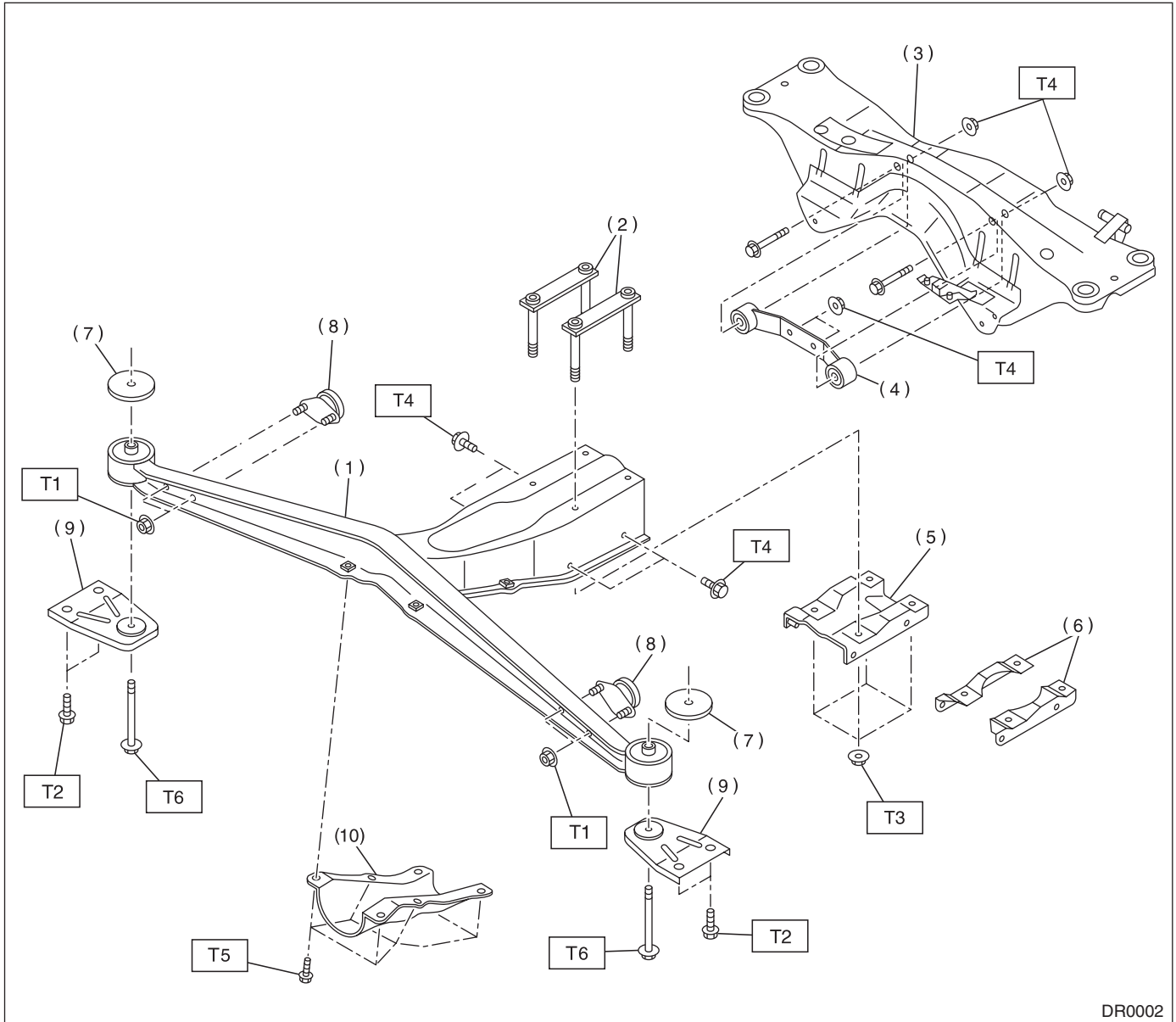
T2: 25 (2.5, 18.1)

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
(2.5 L and Turbo model) | |
| (6) Differential mount lower bracket
(1.6 L and 2.0 L Non-turbo model) | |

Tightening torque: N-m (kgf-m, ft-lb)

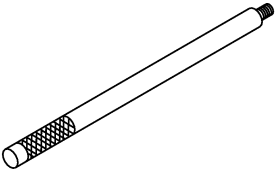
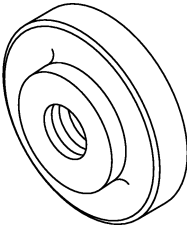
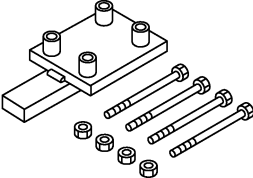
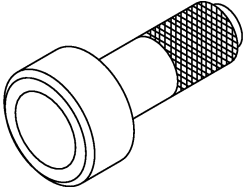
- | |
|-----------------------------|
| T1: 20 (2.0, 14.5) |
| T2: 33 (3.4, 24.3) |
| T3: 65 (6.6, 47.9) |
| T4: 70 (7.1, 51.6) |
| T5: 90 (9.2, 66.4) |
| T6: 100 (10.2, 73.8) |

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 vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.
- Avoid damaging the mating face of the case.

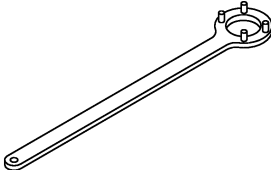
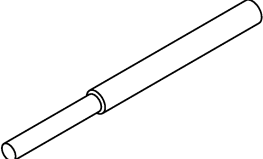
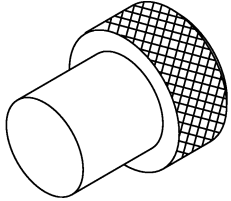
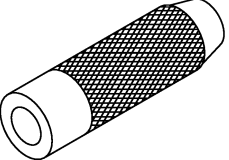
D: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">B3M1893</p>	398477701	HANDLE	Used for installing front and rear bearing cone.
 <p style="text-align: center;">B3M1894</p>	398477702	DRIFT	Used press-fitting the bearing cone of differential carrier (rear).
 <p style="text-align: center;">B3M1895</p>	398217700	ATTACHMENT SET	Stand for rear differential carrier disassembly and assembly.
 <p style="text-align: center;">B3M1896</p>	498447120	DRIFT	Used for installing front oil seal.

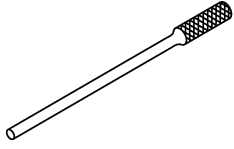
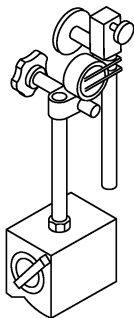
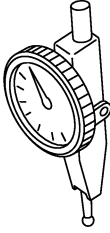
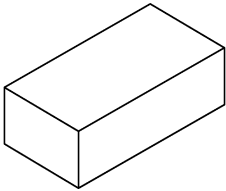
GENERAL DESCRIPTION

DIFFERENTIALS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">B3M1897</p>	498427200	FLANGE WRENCH	Used for stopping rotation of companion flange when loosening and tightening self-lock nut.
 <p style="text-align: center;">B3M1898</p>	398467700	DRIFT	Used for removing pinion, pilot bearing and front bearing cone.
 <p style="text-align: center;">B3M1899</p>	399780104	WEIGHT	Used for installing front bearing cone, pilot bearing companion flange.
 <p style="text-align: center;">B3M1900</p>	899580100	INSTALLER	Used for press-fitting the front bearing cone, pilot bearing.

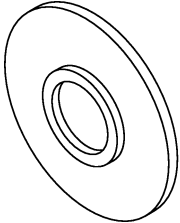
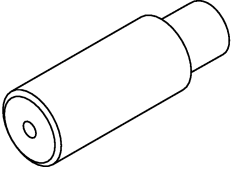
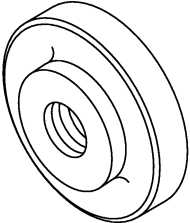
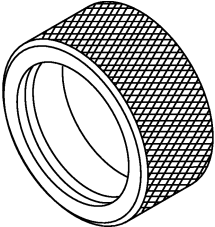
GENERAL DESCRIPTION

DIFFERENTIALS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: right;">B3M1901</p>	899904100	STRAIGHT PIN REMOVER	Used for driving out differential pinion shaft lock pin.
 <p style="text-align: right;">B3M1902</p>	498247001	MAGNET BASE	<ul style="list-style-type: none"> • Used for measuring backlash between side gear and pinion, and hypoid gear. • Used with DIAL GAUGE (498247100).
 <p style="text-align: right;">B3M1903</p>	498247100	DIAL GAUGE	<ul style="list-style-type: none"> • Used measuring backlash between side gear and pinion, hypoid gear. • Used with MAGNET BASE (498247001).
 <p style="text-align: right;">B3M1904</p>	398507704	BLOCK	Used for adjusting pinion height and preload.

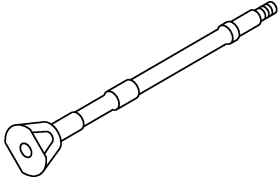
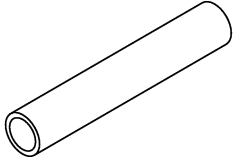
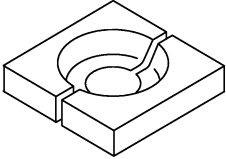
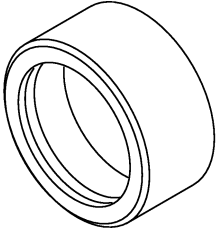
GENERAL DESCRIPTION

DIFFERENTIALS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: right;">B3M1905</p>	398177700	INSTALLER	<ul style="list-style-type: none"> • Used for installing rear bearing cone. • For T-type.
 <p style="text-align: right;">B3M1906</p>	398457700	ATTACHMENT	<ul style="list-style-type: none"> • Used for removing side bearing retainer. • For T-type.
 <p style="text-align: right;">B3M1907</p>	398477703	DRIFT2	<ul style="list-style-type: none"> • Used for press-fitting the bearing race (rear) of differential carrier. • For T-type.
 <p style="text-align: right;">B3M1908</p>	398437700	DRIFT	<ul style="list-style-type: none"> • Used for installing side oil seal. • For T-type.

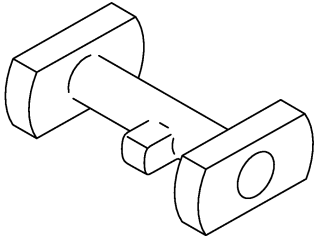
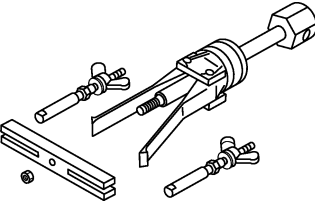
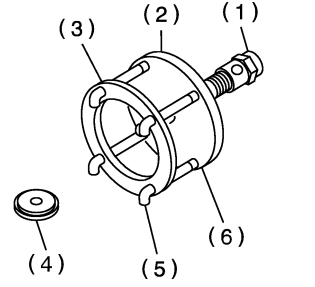
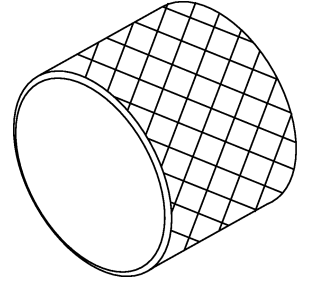
GENERAL DESCRIPTION

DIFFERENTIALS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">B3M1909</p>	398507702	DUMMY SHAFT	<ul style="list-style-type: none"> • Used for adjusting pinion height and preload. • For T-type.
 <p style="text-align: center;">B3M1910</p>	398507703	DUMMY COLLAR	<ul style="list-style-type: none"> • Used for adjusting pinion height and preload. • For T-type.
 <p style="text-align: center;">B3M1911</p>	398517700	REPLACER	<ul style="list-style-type: none"> • Used for removing rear bearing cone. • For T-type.
 <p style="text-align: center;">B3M1912</p>	398487700	DRIFT	<ul style="list-style-type: none"> • Used for press-fitting the side bearing cone. • For T-type.

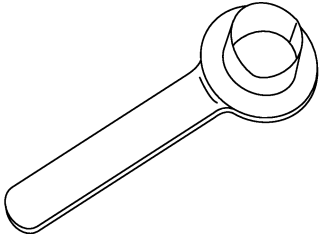
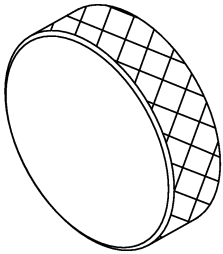
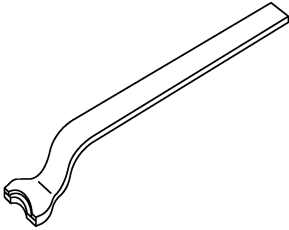
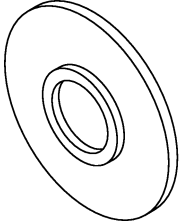
GENERAL DESCRIPTION

DIFFERENTIALS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">B3M1913</p>	398507701	DIFFERENTIAL CARRIER GAUGE	<ul style="list-style-type: none"> • Used for adjusting pinion height. • For T-type.
 <p style="text-align: center;">B3M1914</p>	398527700	PULLEY ASSY	<ul style="list-style-type: none"> • Used for removing front oil seal. • Used for removing side bearing cup. (T-type)
 <p style="text-align: center;">B3M1915A</p>	398527700	PULLER SET	<ul style="list-style-type: none"> • 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.
 <p style="text-align: center;">B3M1916</p>	398227700	WEIGHT	<ul style="list-style-type: none"> • Used for installing side bearing. • For T-type.

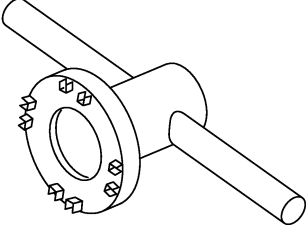
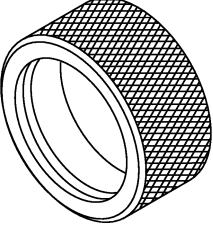
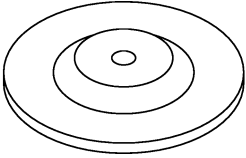
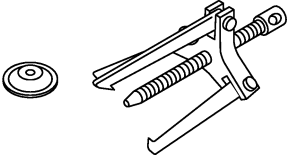
GENERAL DESCRIPTION

DIFFERENTIALS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">B3M1917</p>	<p style="text-align: center;">28099PA090</p>	<p>OIL SEAL PROTECTOR</p>	<ul style="list-style-type: none"> • Used for installing rear drive shaft into rear differential. • For protecting oil seal.
 <p style="text-align: center;">B3M1918</p>	<p style="text-align: center;">398237700</p>	<p>GAUGE</p>	<ul style="list-style-type: none"> • Used for installing side bearing. • For T-type.
 <p style="text-align: center;">B3M1919</p>	<p style="text-align: center;">28099PA100</p>	<p>DRIVE SHAFT REMOVER</p>	<ul style="list-style-type: none"> • Used for removing rear drive shaft from rear differential. • For T-type.
 <p style="text-align: center;">B3M1920</p>	<p style="text-align: center;">498175500</p>	<p>INSTALLER</p>	<ul style="list-style-type: none"> • Used for installing rear bearing cone. • For VA-type.

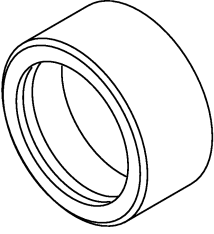
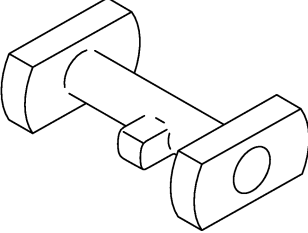
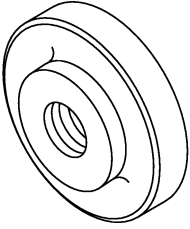
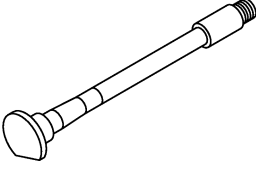
GENERAL DESCRIPTION

DIFFERENTIALS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">B3M1921</p>	499785500	WRENCH ASSY	<ul style="list-style-type: none"> • Used for removing and installing side oil seal holder. • For VA-type.
 <p style="text-align: center;">B3M1922</p>	498447100	DRIFT	<ul style="list-style-type: none"> • Used for installing oil seal. • For VA-type.
 <p style="text-align: center;">B3M1923</p>	399520105	SEAT	<ul style="list-style-type: none"> • Used for removing side bearing cone. • Used with PULLER SET (899524100). • For VA-type.
 <p style="text-align: center;">B3M1930</p>	399703602	PULLEY ASSY	<ul style="list-style-type: none"> • Used for removing companion flange

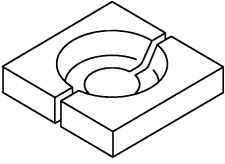
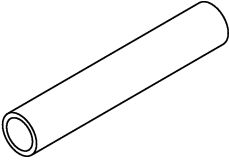
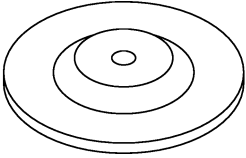
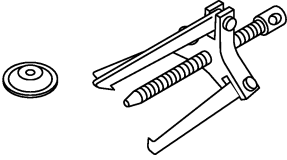
GENERAL DESCRIPTION

DIFFERENTIALS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">B3M1924</p>	<p style="text-align: center;">498485400</p>	<p>DRIFT</p>	<ul style="list-style-type: none"> • Used for installing side bearing cone. • For VA-type.
 <p style="text-align: center;">B3M1925</p>	<p style="text-align: center;">498505501</p>	<p>DIFFERENTIAL CARRIER GAUGE</p>	<ul style="list-style-type: none"> • Used for adjusting pinion height. • For VA-type.
 <p style="text-align: center;">B3M1926</p>	<p style="text-align: center;">498447110</p>	<p>DRIFT</p>	<ul style="list-style-type: none"> • Used for press-fitting the bearing race (front) of differential carrier. • For VA-type.
 <p style="text-align: center;">B3M1927</p>	<p style="text-align: center;">498447150</p>	<p>DUMMY SHAFT</p>	<ul style="list-style-type: none"> • Used for adjusting pinion height and Pre-load. • For VA-type.

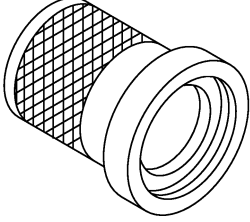
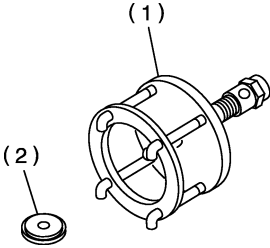
GENERAL DESCRIPTION

DIFFERENTIALS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">B3M1911</p>	498515500	REPLACER	<ul style="list-style-type: none"> • Used for removing rear bearing cone. • For VA-type.
 <p style="text-align: center;">B3M1977</p>	32285AA000	DUMMY COLLAR	<ul style="list-style-type: none"> • Used for adjusting pinion height and Pre-load. • For VA-type.
 <p style="text-align: center;">B3M1928</p>	499705404	SEAT	<ul style="list-style-type: none"> • Used for removing side bearing race. • Used with PULLEY ASSY (499705401). • For VA-type.
 <p style="text-align: center;">B3M1930</p>	499705401	PULLEY ASSY	<ul style="list-style-type: none"> • Used for removing side bearing race. • Used with SEAT (499705404). • For VA-type.

GENERAL DESCRIPTION

DIFFERENTIALS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p>B3M1931</p>	899874100	INSTALLER	<ul style="list-style-type: none">• Used for installing companion flange.
 <p>B3M1932A</p>	899524100	PULLER SET	<ul style="list-style-type: none">• Used for removing side bearing cone of differential.• For VA-type.(1) Puller(2) Cap

GENERAL DESCRIPTION

DIFFERENTIALS

2. GENERAL PURPOSE TOOLS

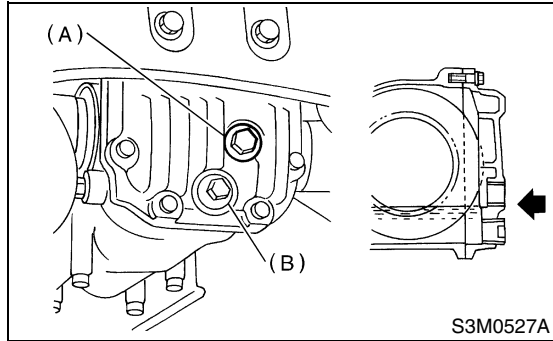
TOOL NAME	REMARKS
Transmission jack	Used for assembly/disassembly of rear differential.
Puller	Used for removal of side bearing retainer. (T-type)
Thickness gauge	Used for measuring clearance.
Tire lever	Used for removal of rear drive shaft. (VA-type)

2. Differential Gear Oil

A: INSPECTION

1) Take out the filler plug, and replace the gear oil if it is contaminated or deteriorated. <Ref. to DI-23, REPLACEMENT, Differential Gear Oil.>

2) Check the 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

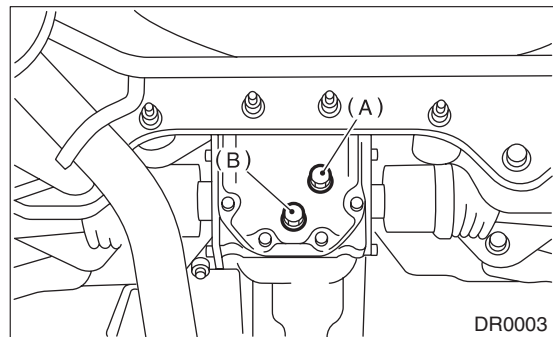
B: REPLACEMENT

1) Jack-up the vehicle and support it with sturdy racks.

2) 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

3) Tighten the oil drain plug.

NOTE:

- Apply fluid packing to the drain plug for T-type.
- Use a new aluminum gasket for VA-type.

Fluid packing:

THREE BOND 1105 or equivalent

Tightening torque:

T-type;

49 N·m (5.0 kgf-m, 36.2 ft-lb)

VA-type;

34 N·m (3.5 kgf-m, 25.3 ft-lb)

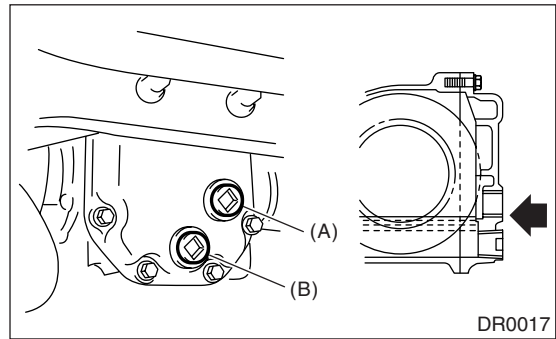
4) Fill the differential carrier with gear oil to the upper plug level.

NOTE:

Carefully refill oil while watching the level. Excess or insufficient oil must be avoided.

Oil capacity:

0.8 ℓ (0.8 US qt, 0.7 Imp qt)



- (A) Filler plug
- (B) Drain plug

5) Install the filler plug.

NOTE:

- Apply fluid packing to the filler plug for T-type.
- Use a new aluminum gasket for VA-type.

Fluid packing:

THREE BOND 1105 or equivalent

Tightening torque:

T-type;

49 N·m (5.0 kgf-m, 36.2 ft-lb)

VA-type;

34 N·m (3.5 kgf-m, 25.3 ft-lb)

3. Front Differential

A: NOTE

1. AT MODEL

Refer to AUTOMATIC TRANSMISSION in separate publication "AUTOMATIC TRANSMISSION for Front Differential. (Pub No. G0864ZE)

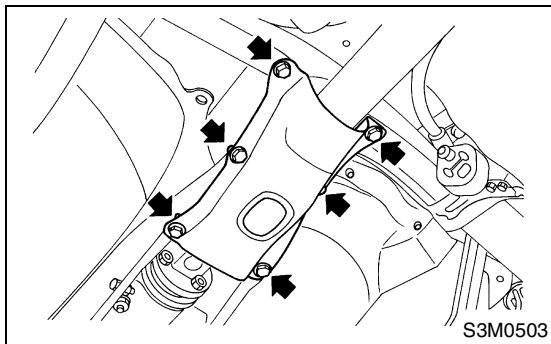
2. MT MODEL

For front differential of manual transmission, refer to "MT" section. <Ref. to MT-95, Front Differential Assembly.>

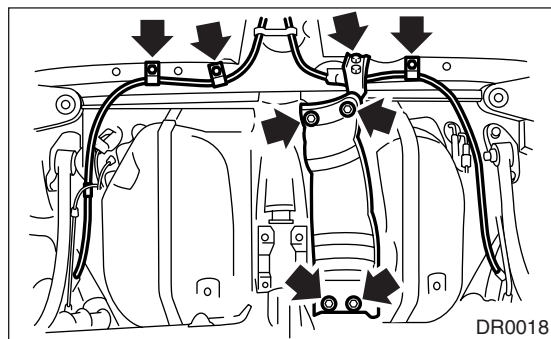
4. Rear Differential for T-type

A: REMOVAL

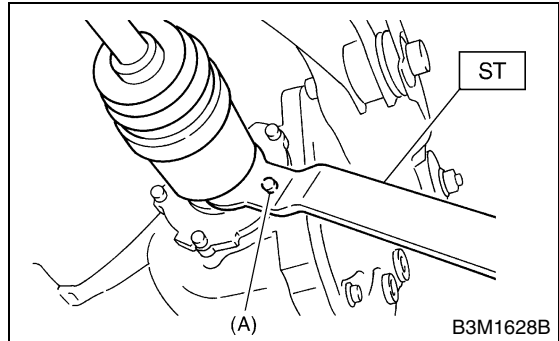
- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from battery.
- 3) Move the select lever or gear shift lever to "N".
- 4) Release the parking brake.
- 5) Loosen the wheel nuts.
- 6) Jack-up the vehicle and support it with sturdy racks.
- 7) Remove the wheels.
- 8) Remove the rear exhaust pipe and muffler.
Non-turbo model without OBD
<Ref. to EX(w/oOBD)-13, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(w/oOBD)-14, REMOVAL, Muffler.>
Non-turbo model with OBD
<Ref. to EX-11, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX-12, REMOVAL, Muffler.>
Turbo model
<Ref. to EX(TURBO)-13, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(TURBO)-14, REMOVAL, Muffler.>
- 9) Remove the heat shield cover. (If equipped)
- 10) Remove the front cover of rear differential mount.



- 11) Remove the propeller shaft. <Ref. to DS-15, REMOVAL, Propeller Shaft.>
- 12) Remove the clamps and bracket of parking brake cable.

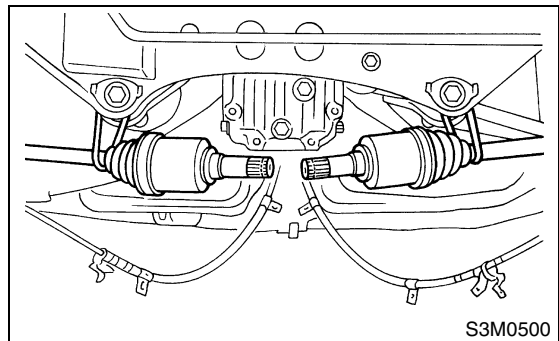


- 13) Remove the DOJ of rear drive shaft from rear differential using ST. <Ref. to DI-58, REPLACEMENT, Rear Differential Side Oil Seal.>
ST 28099PA100 DRIVE SHAFT REMOVER

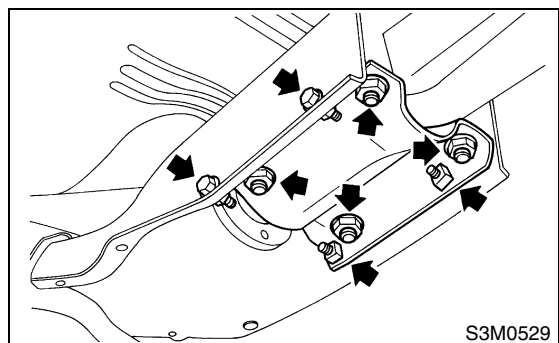


(A) Bolt

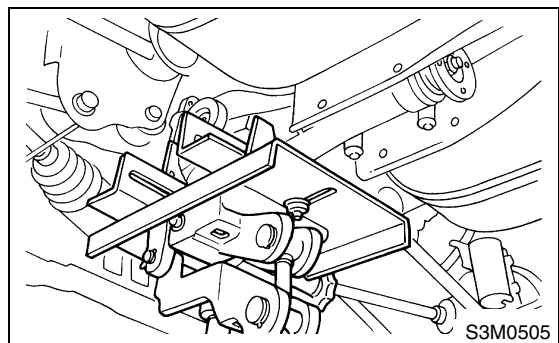
- 14) Secure the rear drive shaft to rear crossmember using wire.



- 15) Remove the lower differential bracket.



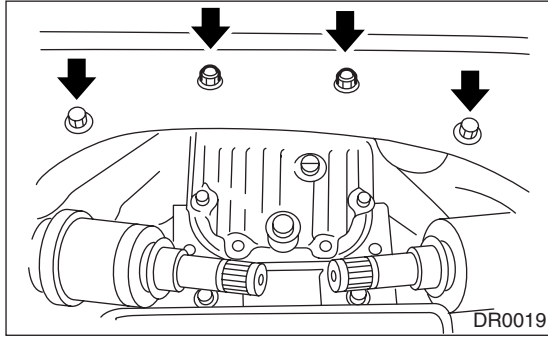
- 16) Support the rear differential with transmission jack.



REAR DIFFERENTIAL FOR T-TYPE

DIFFERENTIALS

17) Remove the self-locking nuts and bolts.

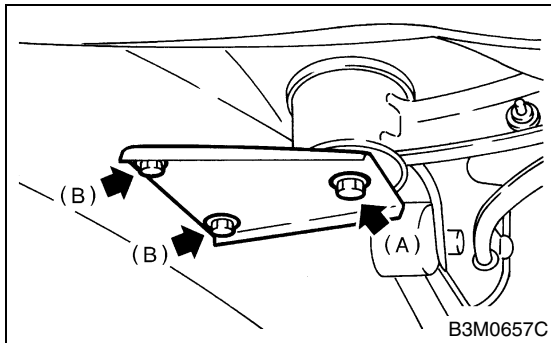


18) Remove the bolts which secure rear differential front member to body.

Loosen the bolt A first, then remove the bolts B.

NOTE:

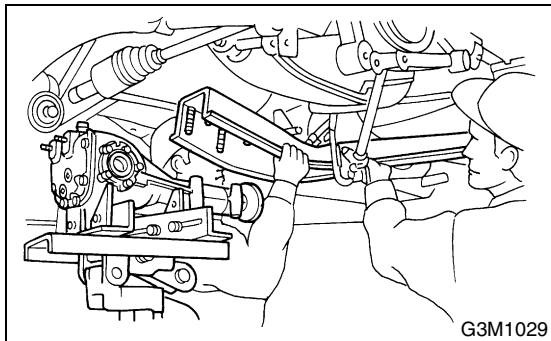
Support the front member with use of a helper to prevent it from dropping.



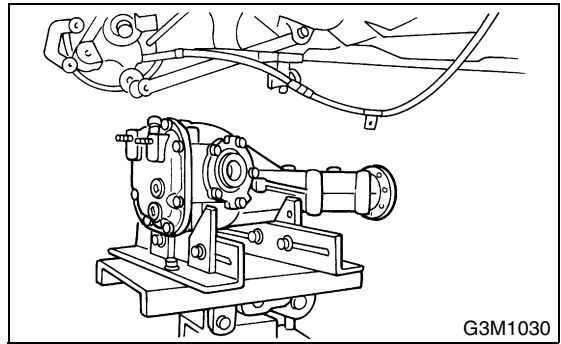
- (A) Bolt A
- (B) Bolt B

19) Remove the bolt A.

20) While slowly lowering the transmission jack, move the rear differential forward and remove front member and rear differential from body.



21) Remove the rear differential from front member.



B: INSTALLATION

Install in the reverse order of removal.

1) Install the air breather cap tapping with a plastic hammer.

NOTE:

Be sure to install a new air breather cap.

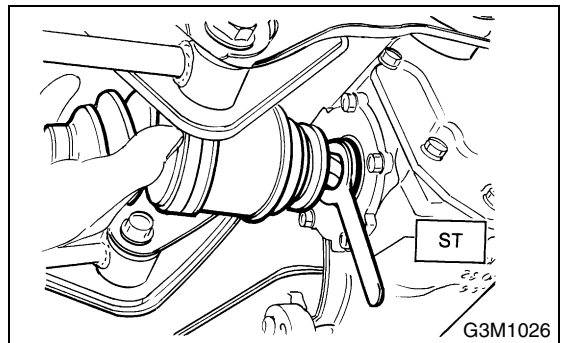
2) Position the front member on body by passing it under the parking brake cable and securing to rear differential.

NOTE:

When installing the rear differential front member, do not confuse the installation sequence of the upper and lower stoppers.

3) Install the DOJ of drive shaft into rear differential. <Ref. to DI-58, REPLACEMENT, Rear Differential Side Oil Seal.>

ST 28099PA090 SIDE OIL SEAL PROTECTOR



4) Installing procedure hereafter is in the reverse order of removal.

5) After installation, fill the differential carrier with gear oil to the filler plug level. <Ref. to DI-23, Differential Gear Oil.>

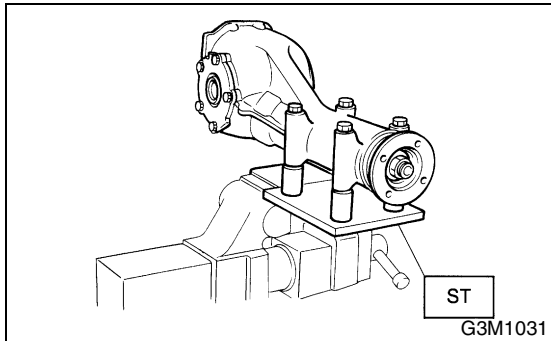
C: DISASSEMBLY

To detect the 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 the ST on vise and install the differential assembly to ST.

ST 398217700 ATTACHMENT

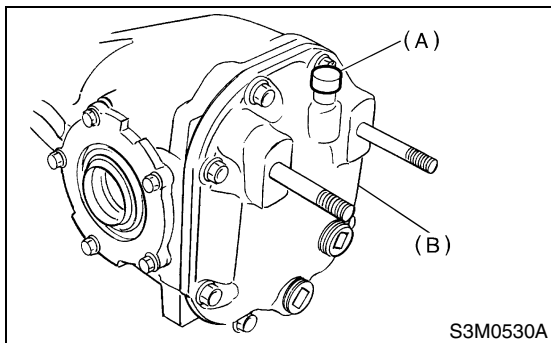


2) Drain the gear oil by removing the plug.

3) Remove the air breather cap.

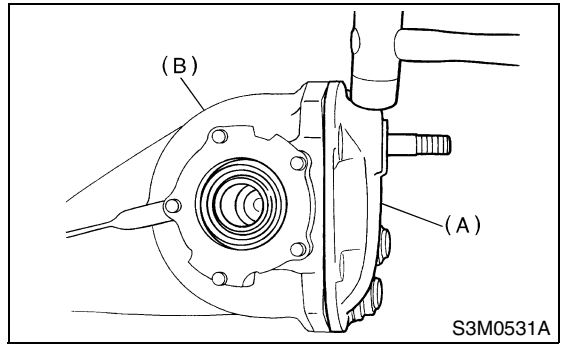
NOTE:

Do not attempt to replace the air breather cap unless necessary.



- (A) Air breather cap
- (B) Rear cover

4) Remove the rear cover by loosening the retaining bolts.



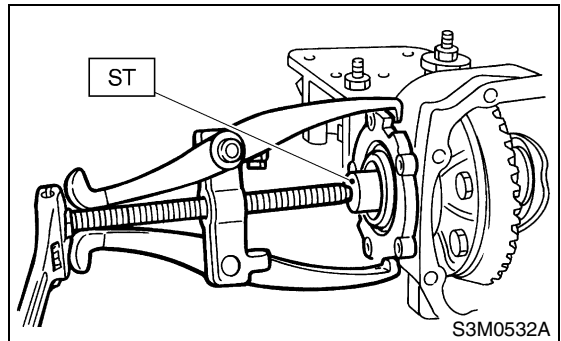
- (A) Rear cover
- (B) Differential carrier

5) Make right and left side bearing retainers in order to identify them at reassembly. Remove the side bearing retainer attaching bolts, set the ST to differential case, and extract right and left side bearing retainers with a puller.

NOTE:

Each shim, which is installed to adjust the side bearing preload, should be kept together with its mating retainer.

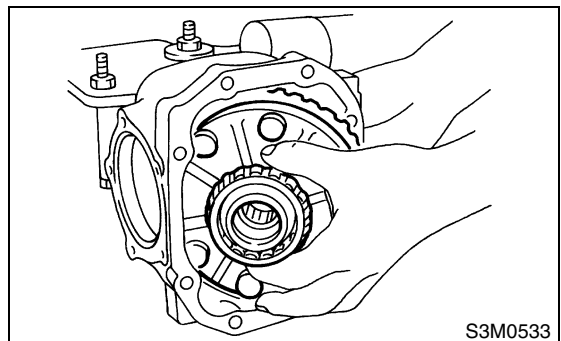
ST 398457700 ATTACHMENT



6) Pull out the differential case assembly from differential carrier.

NOTE:

Be careful not to hit the teeth against the case.

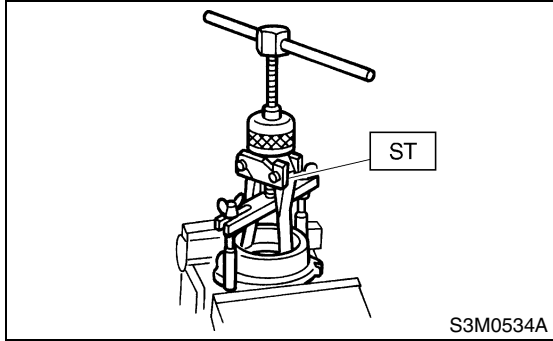


REAR DIFFERENTIAL FOR T-TYPE

DIFFERENTIALS

7) When replacing the side bearing, pull the bearing cup from side bearing retainer using ST.

ST 398527700 PULLER ASSY

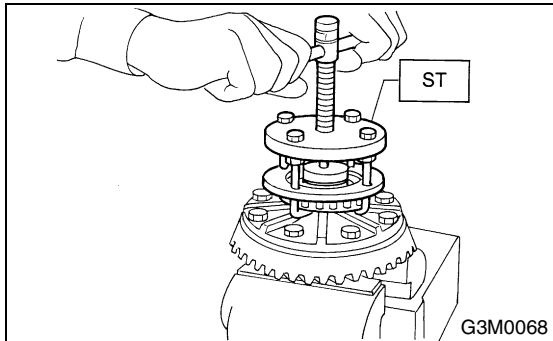


8) Extract the bearing cone with ST.

NOTE:

- Do not attempt to disassemble the parts unless necessary.
- Set the puller so that its claws catch the edge of bearing cone.
- Never mix up the right and left hand bearing races and cones.

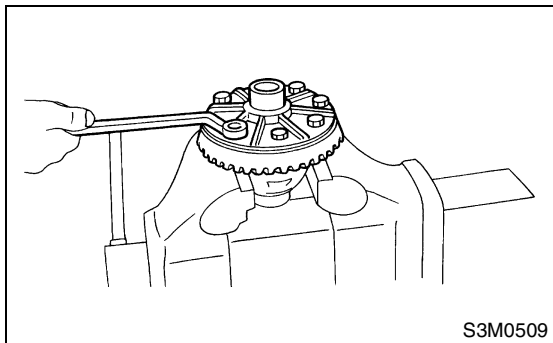
ST 398527700 PULLER SET



9) Remove the crown gear by loosening the crown gear bolts.

NOTE:

Further disassembling is not allowed.

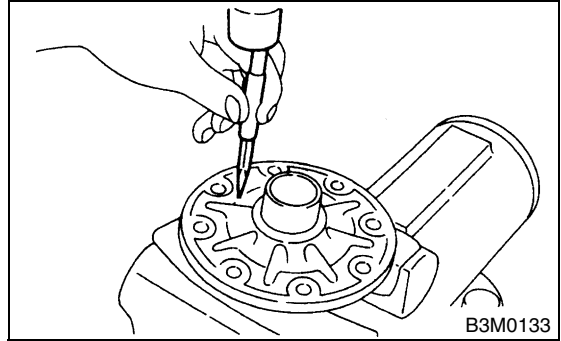


10) Drive out the pinion shaft lock pin from crown gear side. (Without LSD)

NOTE:

The lock pin is staked at the pin hole end on the differential carrier; do not drive it out forcibly before unstaking it.

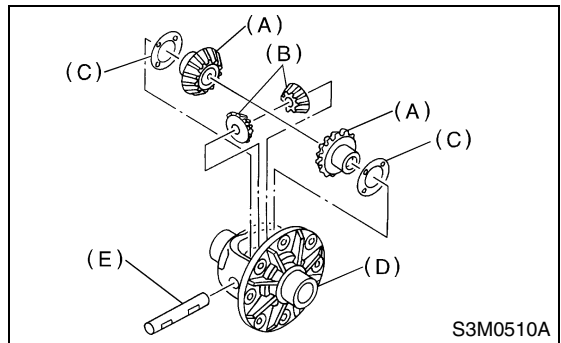
ST 899904100 STRAIGHT PIN REMOVER



11) Draw out the pinion mate shaft and remove the pinion mate gears, side gears and thrust washers. (Without LSD)

NOTE:

The gears as well as thrust washers should be marked or kept separated right and left, front and rear.

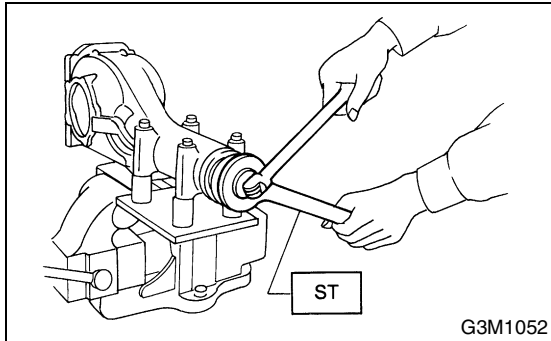


- (A) Side gear
- (B) Pinion mate gear
- (C) Thrust washer
- (D) Differential case
- (E) Pinion mate shaft

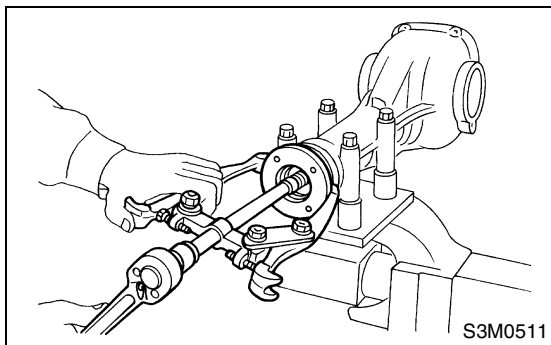
REAR DIFFERENTIAL FOR T-TYPE

12) Hold the companion flange with ST and remove the drive pinion nut.

ST 498427200 FLANGE WRENCH



13) Extract the companion flange with a puller.

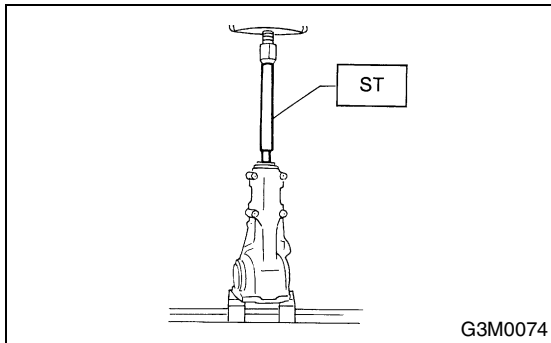


14) Press the end of drive pinion shaft and extract it together with the rear bearing cone, preload adjusting spacer and washer.

NOTE:

Hold the drive pinion so as not to drop it.

ST 398467700 DRIFT

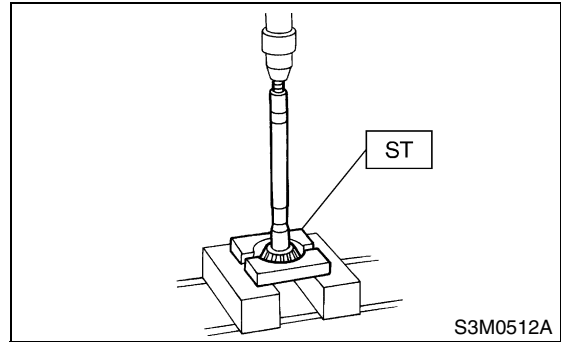


15) Remove the rear bearing cone from drive pinion by supporting the cone with ST.

NOTE:

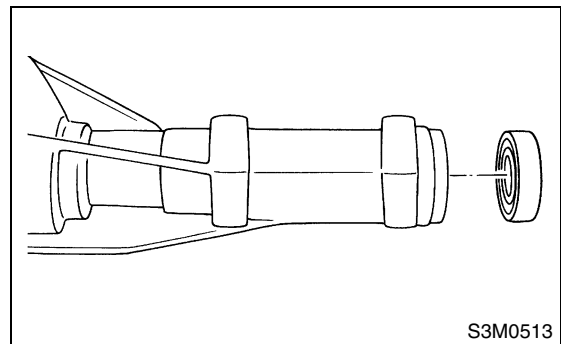
Place the replacer so that its center-recessed side faces the pinion gear.

ST 398517700 REPLACER



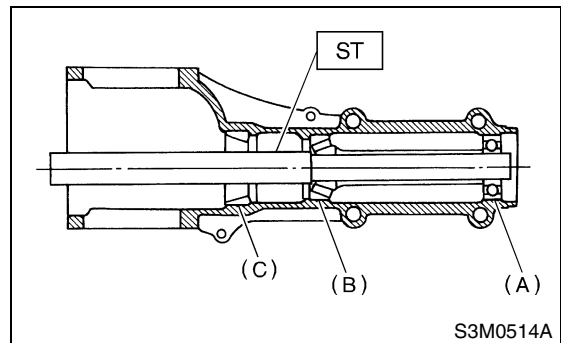
16) Remove the front oil seal from differential carrier using ST.

ST 398527700 PULLER ASSY



17) Remove the pilot bearing together with front bearing cone using ST.

ST 398467700 DRIFT

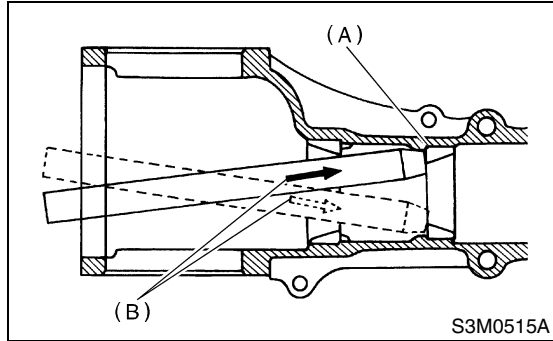


- (A) Pinion bearing
- (B) Front bearing
- (C) Rear bearing cup

REAR DIFFERENTIAL FOR T-TYPE

DIFFERENTIALS

18) When replacing the bearings, tap the front bearing cup and rear bearing cup in this order out of case by using a brass bar.

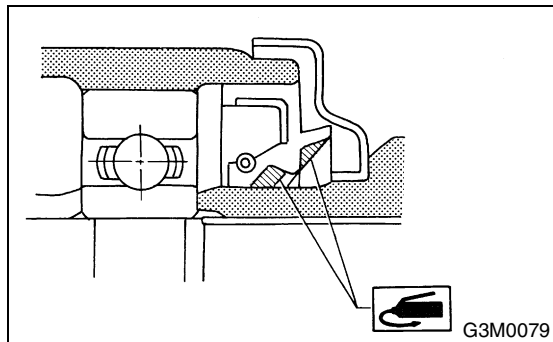


- (A) 2 cutouts along diagonal lines
- (B) Tap alternately with brass bar.

D: ASSEMBLY

1) Precautions for assembling

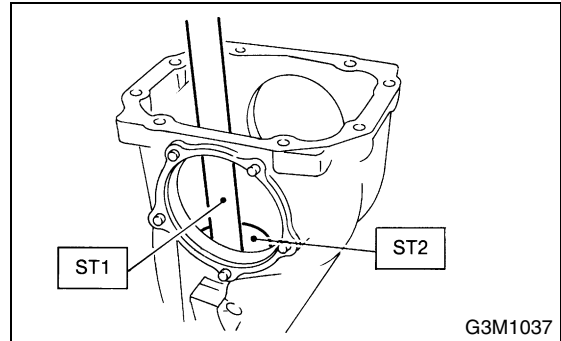
- Assemble in the reverse order of disassembling.
- Check and adjust each part during assembly.
- Keep the shims and washers in order, so that they are not improperly installed.
- Thoroughly clean the surfaces on which the shims, washers and bearings are to be installed.
- Apply gear oil when installing 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 a 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 the rear bearing race into differential carrier using ST1 and ST2.

- ST1 398477701 HANDLE
- ST2 398477703 DRIFT 2



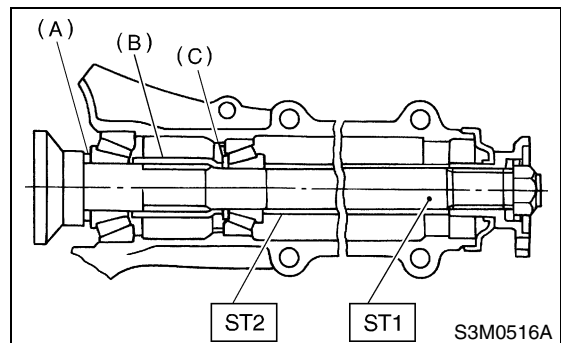
(2) Insert the ST1 into carrier with pinion height adjusting washer and rear bearing cone fitted onto it.

NOTE:

- Re-use the used washer if not deformed.
- Use a new rear bearing cone.

(3) Then install the 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 the ST1 with hand to make it seated, and tighten the drive pinion nut while measuring the preload with spring balance. Select the preload adjusting washer and spacer so that the specified preload is obtained when nut is tightened to the specified torque.

NOTE:

Use a new lock nut.

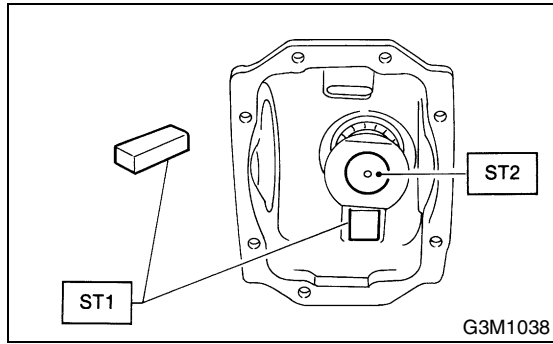
NOTE:

- Be careful not to give excessive preload.
- When tightening the drive pinion nut, lock ST1 with ST2 as shown in the figure.

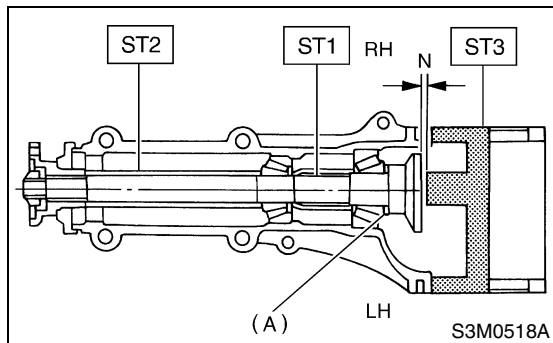
ST1 398507704 BLOCK
ST2 398507702 DUMMY SHAFT

Tightening torque:

181 N·m (18.5 kgf·m, 134 ft·lb)



Front and rear bearing preload
For new bearing: 19 — 26 N (1.9 — 2.6 kgf, 4.3 — 5.8 lb) at companion flange bolt hole
For used bearing: 8 — 16 N (0.8 — 1.6 kgf, 1.8 — 3.6 lb) at companion flange bolt hole



	Part No.	Thickness mm (in)
Preload adjusting washer	383705200	2.59 (0.1020)
	383715200	2.57 (0.1012)
	383725200	2.55 (0.1004)
	383735200	2.53 (0.0996)
	383745200	2.51 (0.0988)
	383755200	2.49 (0.0980)
	383765200	2.47 (0.0972)
	383775200	2.45 (0.0965)
	383785200	2.43 (0.0957)
	383795200	2.41 (0.0949)
	383805200	2.39 (0.0941)
	383815200	2.37 (0.0933)
	383825200	2.35 (0.0925)
	383835200	2.33 (0.0917)
383845200	2.31 (0.0909)	
Preload adjusting spacer	Part No.	Length mm (in)
Preload adjusting spacer	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 the drive pinion height with shim installed between the rear bearing cone and back of pinion gear.

- (1) Install the ST1, ST2 and ST3, as shown in the figure, and apply specified preload on the bearings.

Front and rear bearing preload
For new bearing: 19 — 26 N (1.9 — 2.6 kgf, 4.3 — 5.8 lb) at companion flange bolt hole
For used bearing: 8 — 16 N (0.8 — 1.6 kgf, 1.8 — 3.6 lb) at companion flange bolt hole

Adjusting preload for front and rear bearings

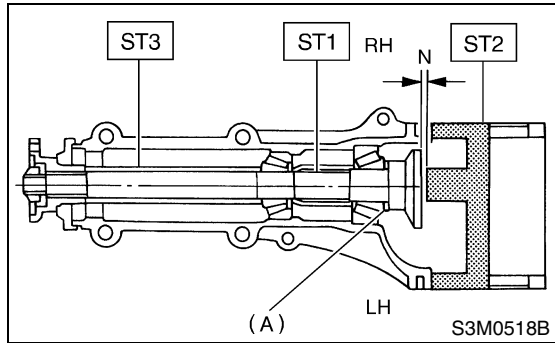
NOTE:

At this time, install a pinion height adjusting shim which is temporarily selected or the same as that used before. Measure and record the thickness.

REAR DIFFERENTIAL FOR T-TYPE

DIFFERENTIALS

- ST1 398507702 DUMMY SHAFT
- ST2 398507701 DIFFERENTIAL CARRIER GAUGE
- ST3 398507703 DUMMY COLLAR



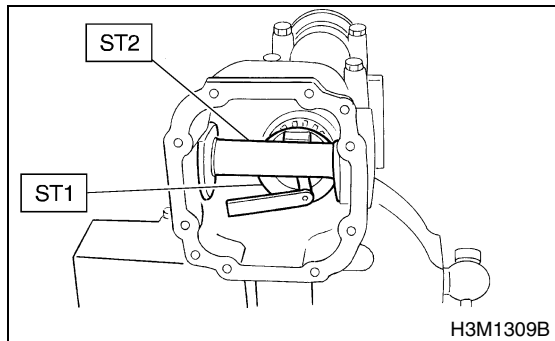
(A) Pinion height adjusting shim

(2) Measure the clearance N between the end of ST2 and 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)	
T _o	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)

$$T_o = 2.20 + 1.20 = 3.40 \text{ mm}$$

$$N = 0.23 \text{ mm } H = + 1,$$

$$T = 3.40 + 0.23 - 0.01 - 0.20 = 3.42$$

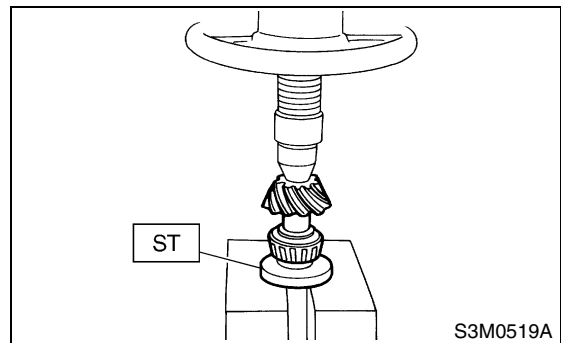
Result: Thickness = 3.42 mm

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)

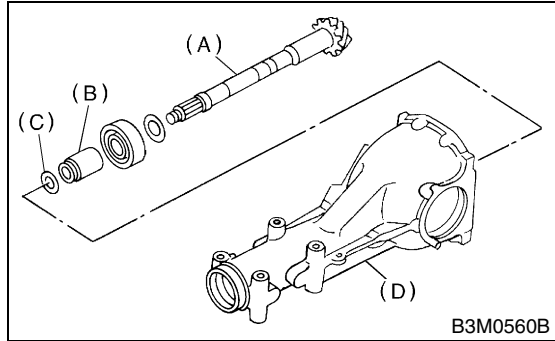
4) Install the selected pinion height adjusting shim on drive pinion, and press the rear bearing cone into position with ST.

ST 398177700 INSTALLER



REAR DIFFERENTIAL FOR T-TYPE

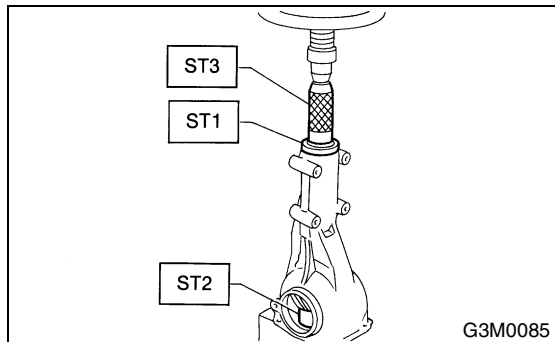
5) Insert the drive pinion into differential carrier, install the previously selected bearing preload adjusting spacer and washer.



- (A) Drive pinion
- (B) Bearing adjusting spacer
- (C) Washer
- (D) Differential carrier

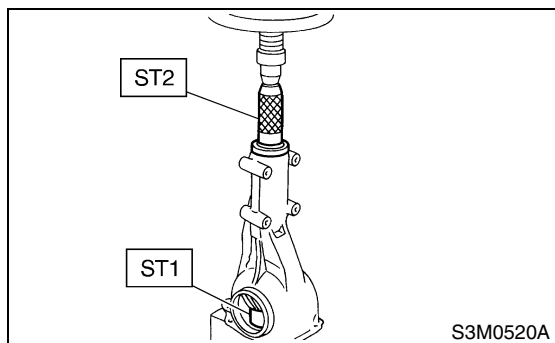
6) Press-fit the front bearing cone into case with ST1, ST2 and ST3.

- ST1 398507703 DUMMY COLLAR
- ST2 399780104 WEIGHT
- ST3 899580100 INSTALLER



7) Insert the spacer, then press-fit the pilot bearing with ST1 and ST2.

- ST1 399780104 WEIGHT
- ST2 899580100 INSTALLER

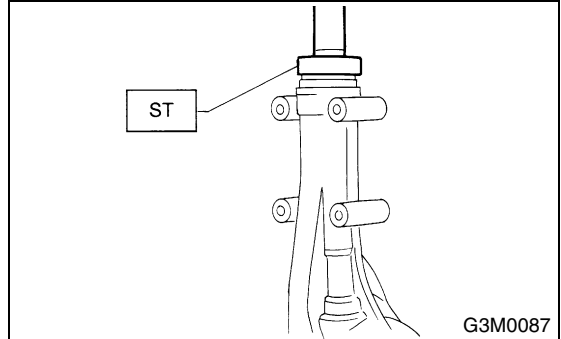


8) Fit a new oil seal with ST.

NOTE:

- Press-fit until the 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

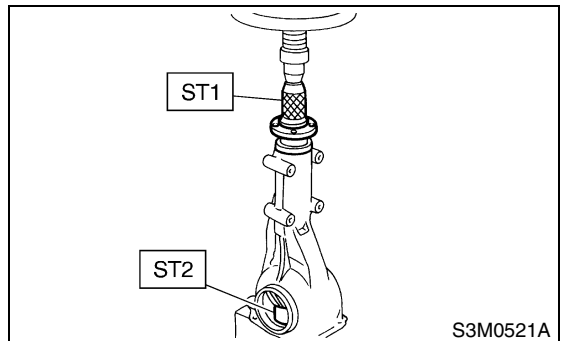


9) Press-fit the companion flange with ST1 and ST2.

NOTE:

Be careful not to damage the bearing.

- ST1 899874100 INSTALLER
- ST2 399780104 WEIGHT

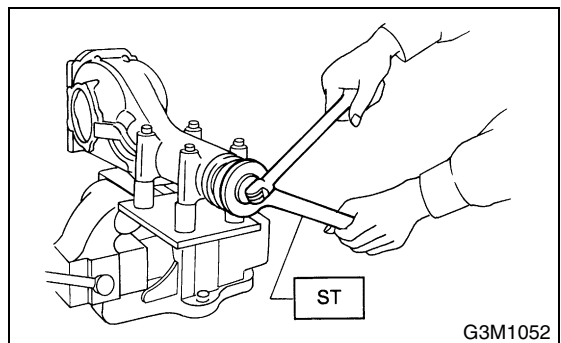


10) Install the self-locking nut. Then tighten it with the ST.

- ST 498427200 FLANGE WRENCH

Tightening torque:

181 N·m (18.5 kgf-m, 134 ft-lb)



REAR DIFFERENTIAL FOR T-TYPE

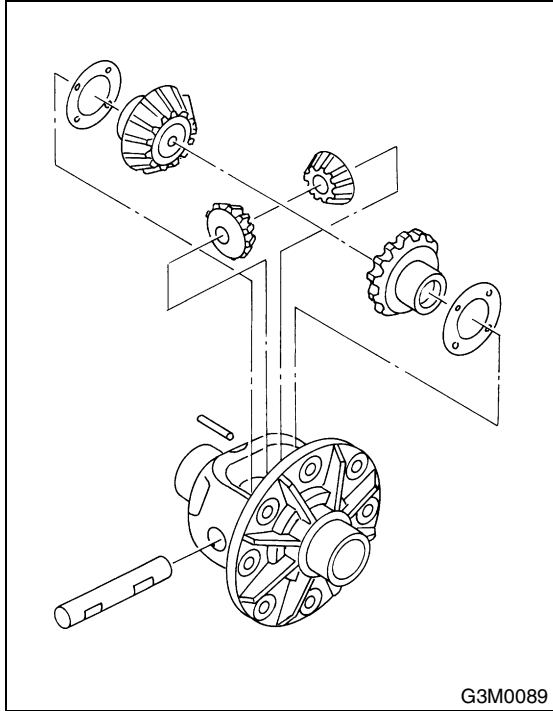
DIFFERENTIALS

11) Assembling differential case

Install the side gears and pinion mate gears, with their thrust washers and pinion mate shaft, into differential case. (Without LSD)

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.

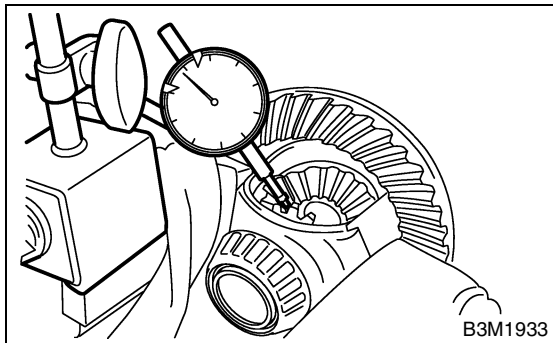


G3M0089

(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 the 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)

(3) Check the condition of rotation after applying oil to the gear tooth surfaces and thrust surfaces.

(4) After inserting the pinion shaft lock pin into differential case, stake both sides of the hole to prevent pin from falling off.

12) Install the crown gear on differential case.

NOTE:

Before installing the bolts, apply Lock Tite to bolt threads.

Lock Tite:

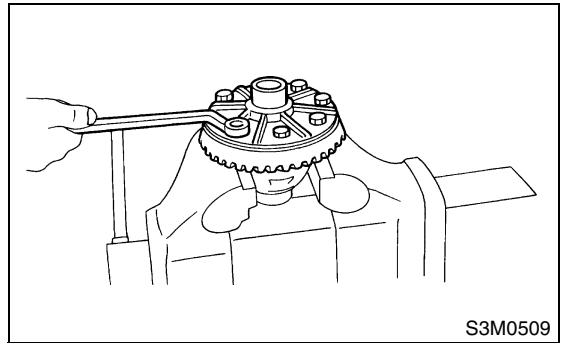
THREE BOND 1324 or equivalent

NOTE:

Tighten diagonally while tapping the bolt heads.

Tightening torque:

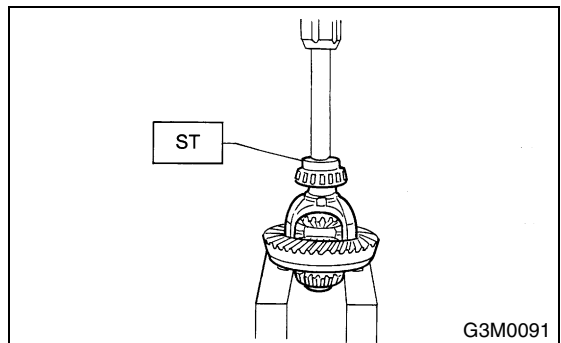
105 N·m (10.7 kgf·m, 77.4 ft·lb)



S3M0509

13) Press the side bearing cone onto differential case with ST.

ST 398487700 DRIFT

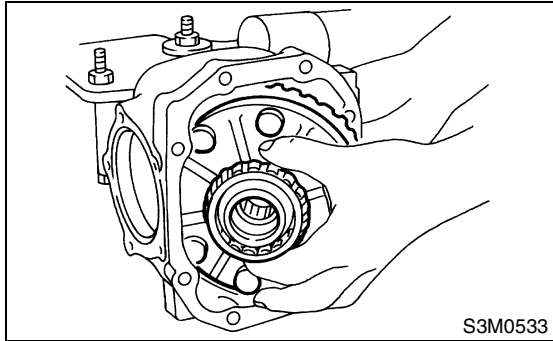


G3M0091

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.



(3) Install the side retainer shims and O-rings to the right and left retainers from which they were removed.

NOTE:

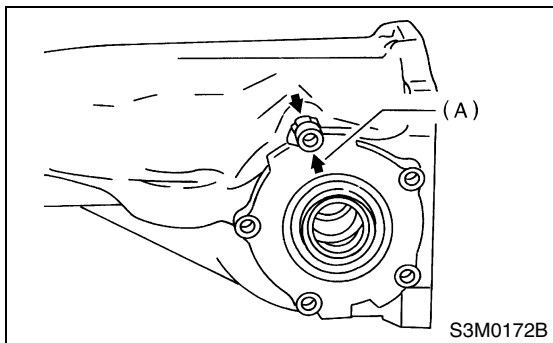
- Replace the broken or cracked O-ring with new one.
- Replace the broken or corroded side retainer shim with a new one of same thickness.

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 the arrow mark on differential carrier with the mark on side retainer during installation.

NOTE:

Be careful that side bearing outer race is not damaged by bearing roller.



(A) Arrow mark

(5) Tighten the side bearing retainer bolts.

NOTE:

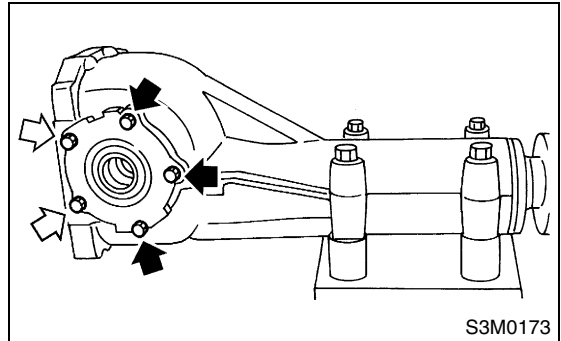
Before tightening the two side bearing retainer bolts, apply Lock Tite to bolt threads.

Lock Tite:

THREE BOND 1105 or equivalent

Tightening torque:

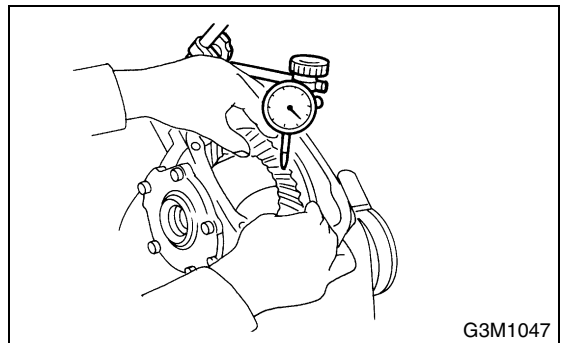
10.3 N·m (1.05 kgf-m, 7.6 ft-lb)



(6) Measure the crown gear-to-drive pinion backlash. Set the magnet base on differential carrier. Align the contact point of dial gauge with tooth face of crown gear, and move the crown gear while holding drive pinion still. Read the 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 the side bearing retainer shims.

Turning resistance increase:

2.9 — 10.8 N (0.3 — 1.1 kgf, 0.7 — 2.4 lb)

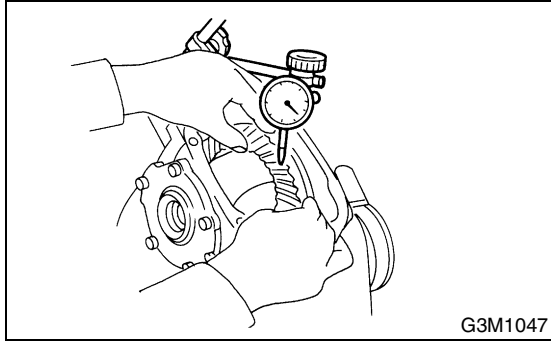
REAR DIFFERENTIAL FOR T-TYPE

DIFFERENTIALS

15) Re-check the crown gear-to-pinion backlash.

Backlash:

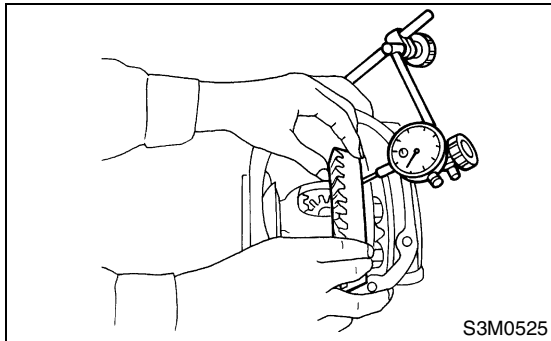
0.10 — 0.20 mm (0.0039 — 0.0079 in)



16) Check the crown gear runout on its back surface, and make sure that pinion and crown gear rotate smoothly.

Limit of runout:

Less than 0.05 mm (0.0020 in)



17) Checking and adjusting tooth contact of crown gear

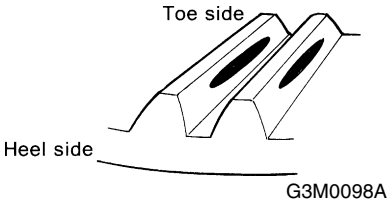
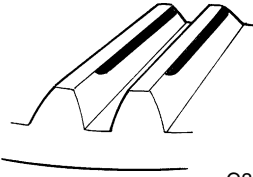
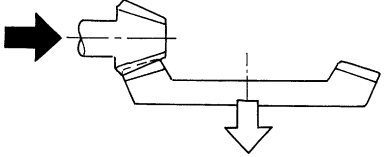
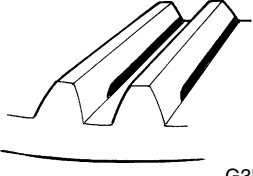
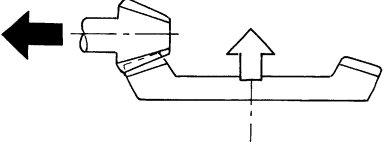
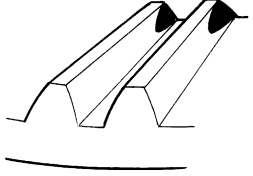
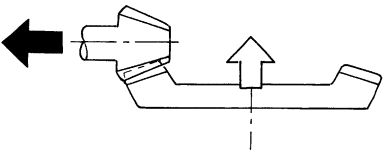
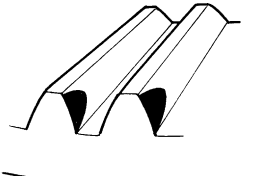
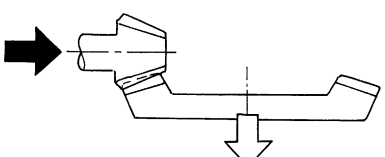
(1) Apply an even coat of red lead on both sides of three or four teeth on the crown gear. Check the contact pattern after rotating the crown gear several revolutions back and forth until a definite contact pattern appears on the crown gear.



(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.

REAR DIFFERENTIAL FOR T-TYPE

TOOTH CONTACT PATTERN		
Condition	Contact pattern	Adjustment
<p>Correct tooth contact Tooth contact pattern slightly shifted towards toe under no load rotation. (When loaded, contact pattern moves toward heel.)</p>	 <p style="text-align: center;">G3M0098A</p>	—
<p>Face contact Backlash is too large.</p>	<p>This may cause noise and chipping at tooth ends.</p>  <p style="text-align: center;">G3M0098B</p>	<p>Increase thickness of drive pinion height adjusting shim in order to bring drive pinion closer to crown gear center.</p>  <p style="text-align: right;">G3M0098F</p>
<p>Flank contact Backlash is too small.</p>	<p>This may cause noise and stepped wear on surfaces.</p>  <p style="text-align: center;">G3M0098C</p>	<p>Reduce thickness of drive pinion height adjusting shim in order to move drive pinion away from crown gear center.</p>  <p style="text-align: right;">G3M0098G</p>
<p>Toe contact Contact area is small.</p>	<p>This may cause chipping at toe ends.</p>  <p style="text-align: center;">G3M0098D</p>	<p>Adjust as for flank contact.</p>  <p style="text-align: right;">G3M0098G</p>
<p>Heel contact Contact area is small.</p>	<p>This may cause chipping at heel ends.</p>  <p style="text-align: center;">G3M0098E</p>	<p>Adjust as for face contact.</p>  <p style="text-align: right;">G3M0098F</p>

 : Adjusting direction of drive pinion
 : Adjusting direction of crown gear

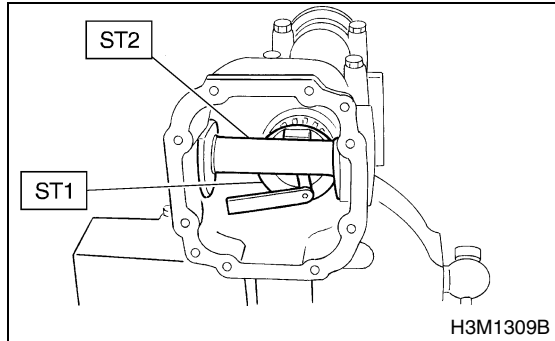
REAR DIFFERENTIAL FOR T-TYPE

DIFFERENTIALS

18) If proper tooth contact is not obtained, once again adjust the drive pinion height by 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



$$T = To + N - (H \times 0.01) - 0.20 \text{ (mm)}$$

Where:

T = Thickness of pinion height adjusting shim (mm)

To = Thickness of shim temporarily inserted (mm)

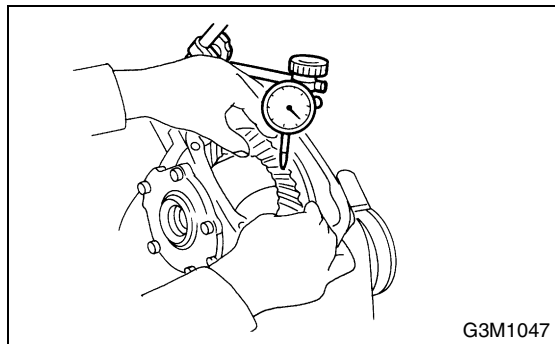
N = Reading of thickness gauge (mm)

H = Figure marked on drive pinion head

(2) Hypoid gear backlash

Backlash:

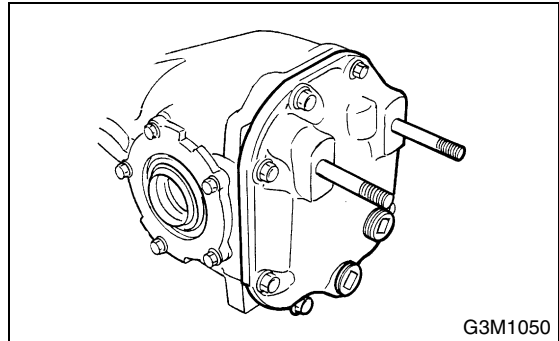
0.10 — 0.20 mm (0.0039 — 0.0079 in)



19) Install the rear cover and tighten the bolts to specified torque.

Tightening torque:

29 N·m (3.0 kgf·m, 21.7 ft·lb)



E: INSPECTION

Wash all the disassembled parts clean, and examine them for wear, damage, or other defects. Repair or replace defective parts as necessary.

1) Crown gear and drive pinion

- If abnormal tooth contact is evident, find out the cause and adjust to give correct tooth contact at assembly. Replace the gear if excessively worn or incapable of adjustment.

- If crack, score, or seizure is evident, replace as a set. Slight damage of tooth can be corrected by oil stone or the like.

2) Side gear and pinion mate gear

- Replace if crack, score, or other defects are evident on tooth surface.

- Replace if thrust washer contacting surface is worn or seized. Slight damage of the surface can be corrected by oil stone or the like.

3) Bearing

Replace if seizure, peeling, wear, rust, dragging during rotation, abnormal noise or other defect is evident.

4) Thrust washers of side gear and pinion mate gear

Replace if seizure, flaw, abnormal wear or other defect is evident.

5) Oil seal

Replace if deformed or damaged, and at every disassembling.

6) Differential carrier

Replace if the bearing bores are worn or damaged.

7) Differential case

Replace if its sliding surfaces are worn or cracked.

8) Companion flange

Replace if the oil seal lip contacting surfaces have flaws.

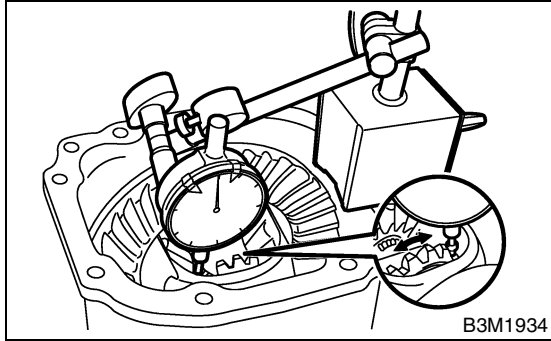
1. SIDE GEAR BACKLASH

Using a dial gauge, check the backlash of the side gear.

Side gear backlash:

0.1 — 0.2 mm (0.004 — 0.008 in)

If the side gear backlash is not within the specification, adjust clearance as specified by selecting the side gear thrust washer.



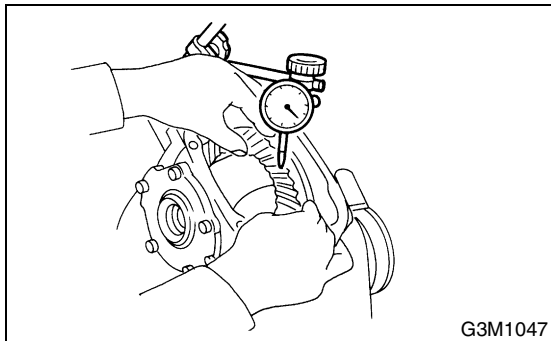
2. CROWN GEAR BACKLASH

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 the crown gear backlash is not within the specification, adjust the side bearing preload or repair if necessary.



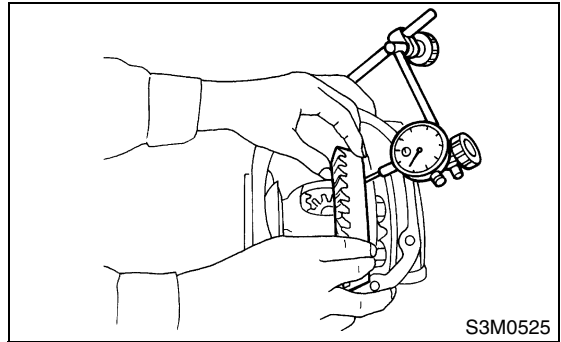
3. CROWN GEAR RUNOUT

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 the tooth contact between crown gear and driven pinion. <Ref. to DI-30, ASSEMBLY, Rear Differential for T-type.>

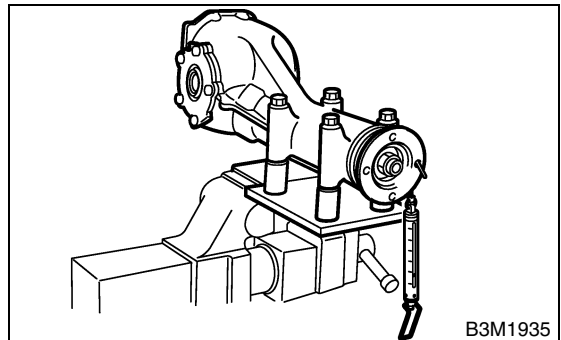
5. TOTAL PRELOAD

Using a gauge, check the turning resistance increase.

Turning resistance increase:

2.9 — 10.8 N·m (0.3 — 1.1 kgf, 0.7 — 2.4 lb)

If the increase of resistance is not within the specification, adjust the side bearing retainer shims.



F: ADJUSTMENT

1. SIDE GEAR BACKLASH

Adjust the side gear backlash.

<Ref. to DI-30, ASSEMBLY, Rear Differential for T-type.>

2. CROWN GEAR BACKLASH

Adjust the 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

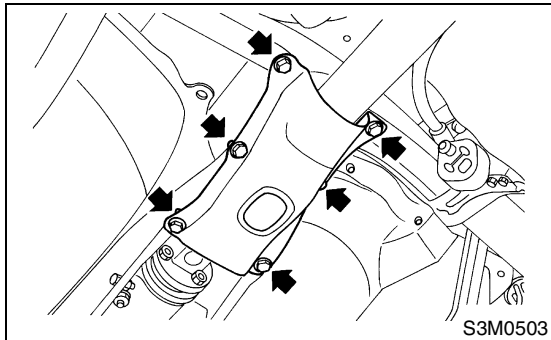
Adjust the side bearing shim.

<Ref. to DI-30, ASSEMBLY, Rear Differential for T-type.>

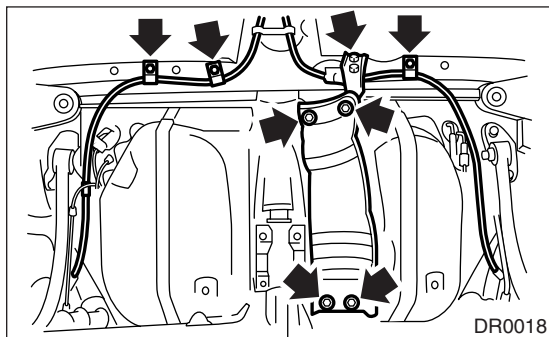
5. Rear Differential for VA-type

A: REMOVAL

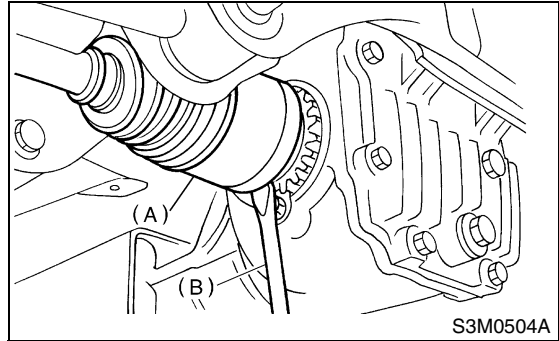
- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from battery.
- 3) Move the select lever or gear shift lever to "N".
- 4) Release the parking brake.
- 5) Loosen the wheel nuts.
- 6) Jack-up the vehicle and support it with sturdy racks.
- 7) Remove the wheels.
- 8) Remove the rear exhaust pipe and muffler.
Non-turbo model without OBD
<Ref. to EX(w/oOBD)-13, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(w/oOBD)-14, REMOVAL, Muffler.>
Non-turbo model with OBD
<Ref. to EX-11, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX-12, REMOVAL, Muffler.>
- 9) Remove the heat shield cover.
- 10) Remove the front cover of rear differential mount.



- 11) Remove the propeller shaft. <Ref. to DS-15, REMOVAL, Propeller Shaft.>
- 12) Remove the clamps and bracket of parking brake cable.

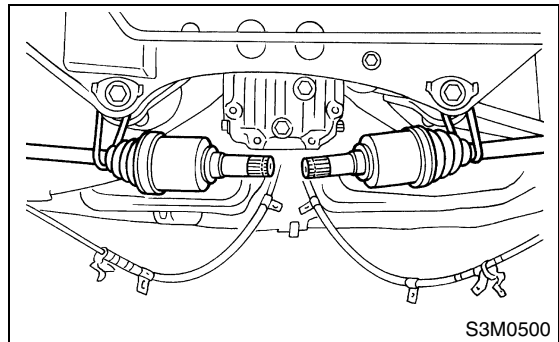


- 13) Remove the DOJ of rear drive shaft from rear differential. <Ref. to DI-58, REPLACEMENT, Rear Differential Side Oil Seal.>

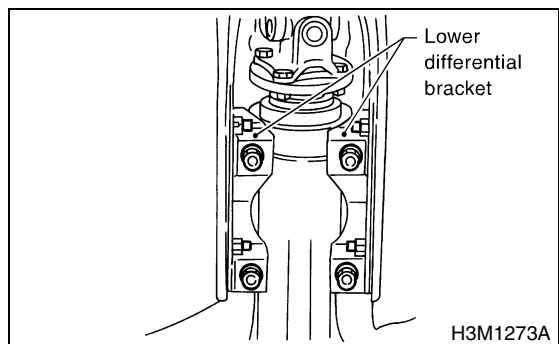


- (A) DOJ
(B) Tire lever

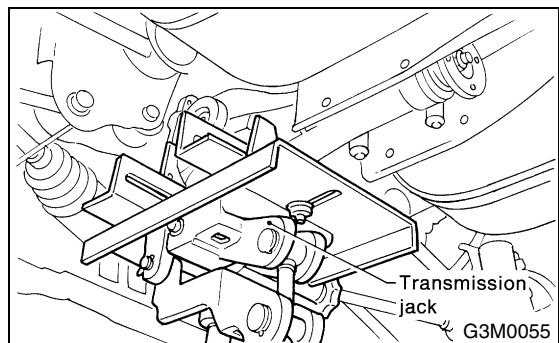
- 14) Secure the rear drive shaft to rear crossmember using wire.



- 15) Remove the lower differential bracket.



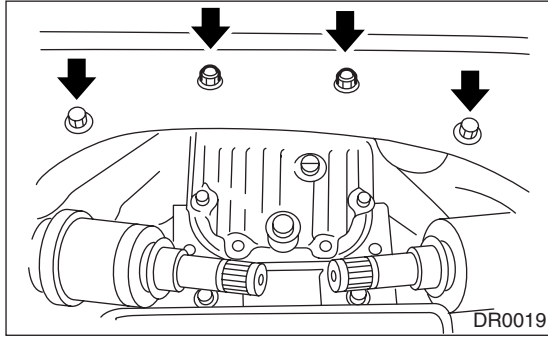
- 16) Support the rear differential with transmission jack.



REAR DIFFERENTIAL FOR VA-TYPE

DIFFERENTIALS

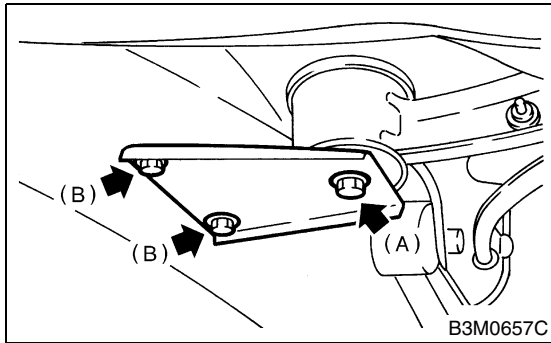
17) Remove the self-locking nuts and bolts.



18) Remove the bolts which secure rear differential front member to bolts B.

NOTE:

Support the front member with use of a helper to prevent it from dropping.

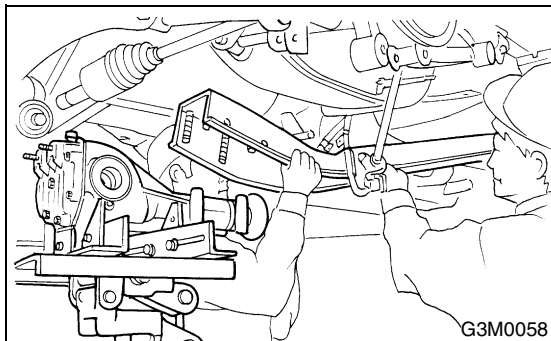


- (A) Bolt A
- (B) Bolt B

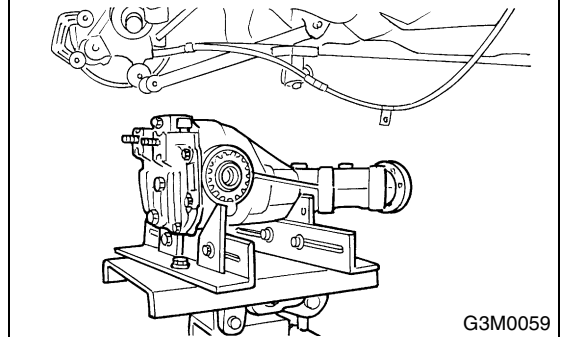
19) Remove the bolt A.

20) While slowly lowering the transmission jack, move the rear differential forward and remove bolts from rear crossmember.

21) Remove the front member from body.



22) Remove the rear differential from body.



B: INSTALLATION

Install in the reverse order of removal.

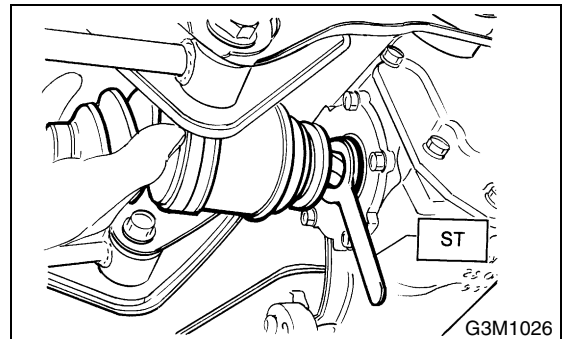
1) Position the front member on body by passing it under the parking brake cable and securing to rear differential.

NOTE:

When installing the rear differential front member, do not confuse the installation sequence of the upper and lower stoppers.

2) Install the DOJ of rear drive shaft into rear differential. <Ref. to DI-58, REPLACEMENT, Rear Differential Side Oil Seal.>

ST 28099PA090 SIDE OIL SEAL PROTECTOR



3) Install in the reverse order of removal.

4) After installation, fill the differential carrier with gear oil to the upper plug level. <Ref. to DI-24, Front Differential.>

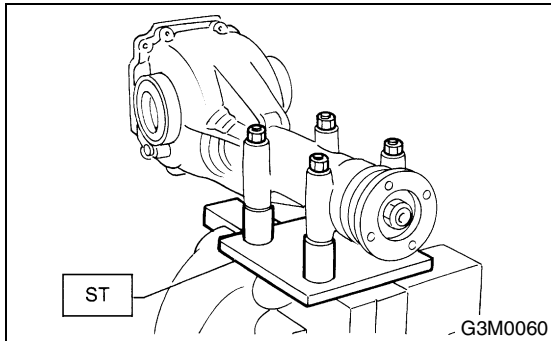
C: DISASSEMBLY

To detect the real cause of trouble, inspect the following items before disassembling.

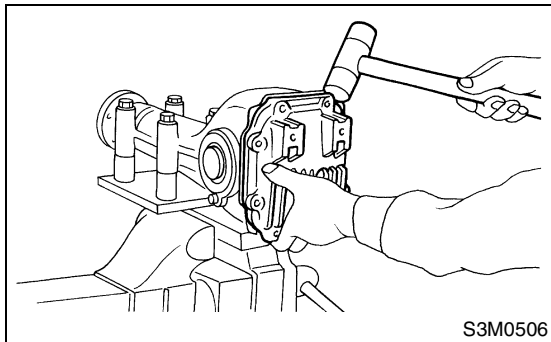
- Tooth contact of crown gear and pinion, and backlash
- Runout of crown gear at its back surface
- Turning resistance of drive pinion

1) Set the ST on vise and install the differential assembly to ST.

ST 398217700 ATTACHMENT



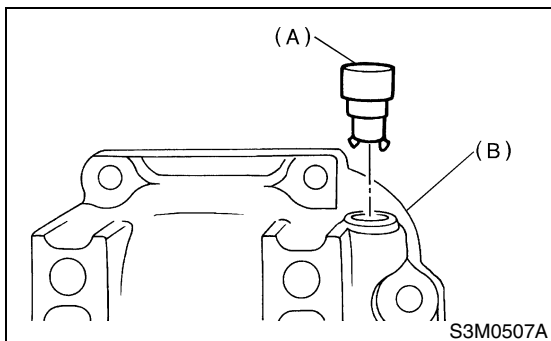
- 2) Drain the gear oil by removing the plug.
 3) Remove the rear cover by loosening the retaining bolts.



4) Replace the air breather cap.

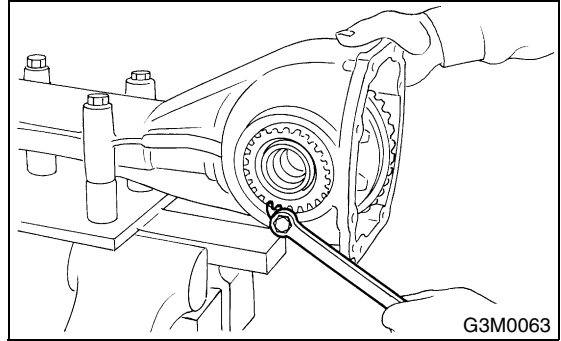
NOTE:

Do not attempt to replace the air breather cap unless necessary.

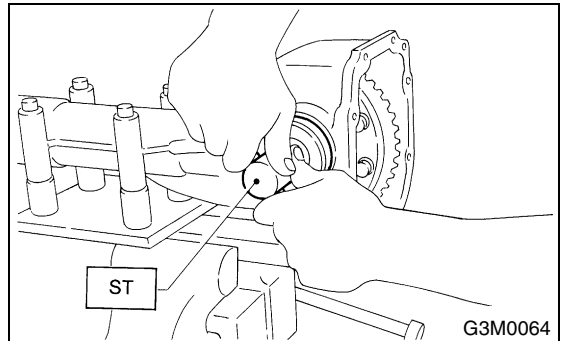


- (A) Air breather cap
 (B) Rear cover

5) Remove the right and left lock plates.



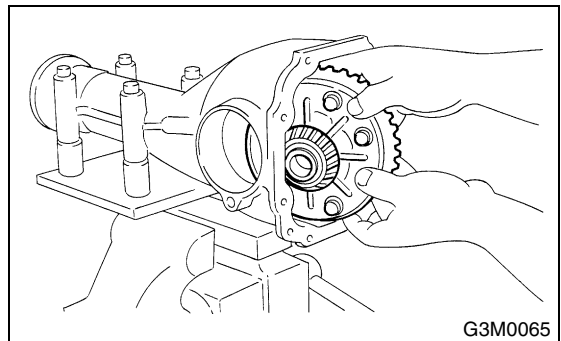
6) Remove the right and left holders with ST.
 ST 499785500 WRENCH



7) Pull out the differential assembly from differential case.

NOTE:

Be careful not to hit the teeth against the case.

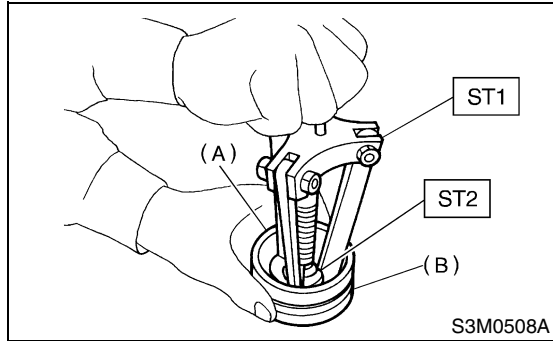


REAR DIFFERENTIAL FOR VA-TYPE

DIFFERENTIALS

8) Remove the bearing race from right and left holders with ST1 and ST2.

ST1 499705401 PULLER ASSY
ST2 499705404 SEAT

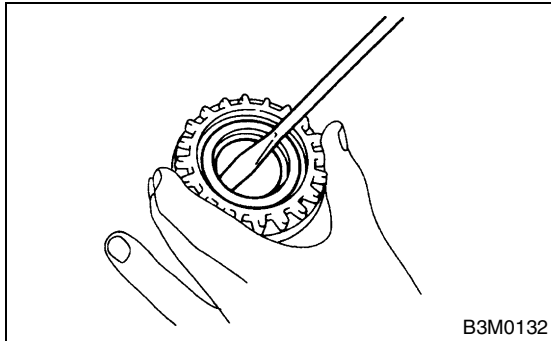


- (A) Bearing race
- (B) Holder

9) Remove the oil seal from right and left holders using screwdriver.

NOTE:

Perform this operation only when changing oil seal.

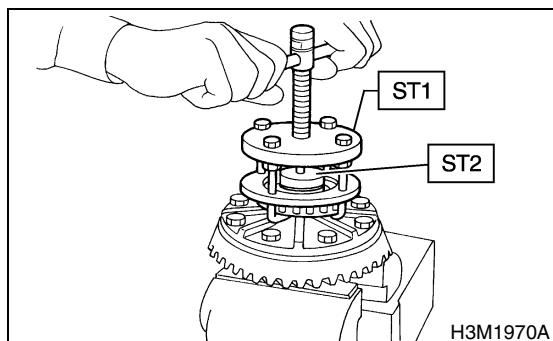


10) Extract the bearing cone with ST1 and ST2.

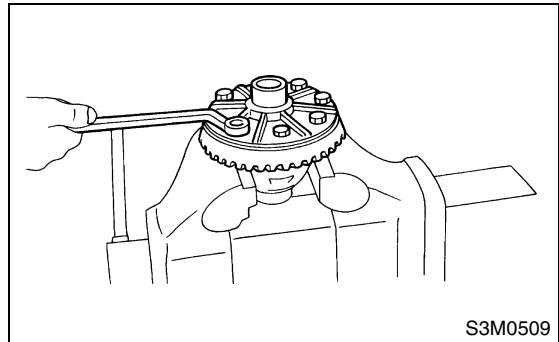
NOTE:

- Do not attempt to disassemble the parts unless necessary.
- Set the Puller so that its claws catch the edge of bearing cone.
- Never mix up the right and left hand bearing races and cones.

ST1 899524100 PULLER SET
ST2 399520105 SEAT



11) Remove the crown gear by loosening the crown gear bolts.

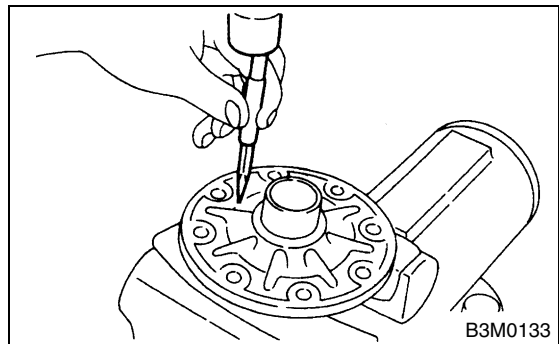


12) Drive out the pinion shaft lock pin from crown gear side.

NOTE:

The lock pin is staked at the pin hole end on the differential case; do not drive it out forcibly before unstaking it.

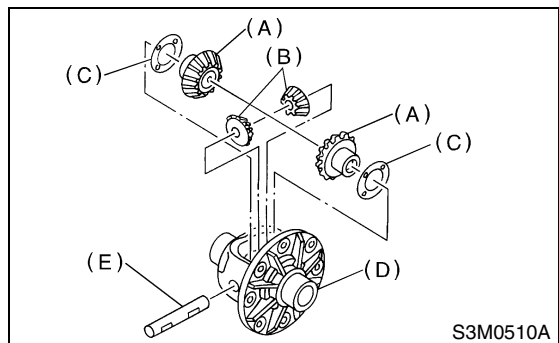
ST 899904100 STRAIGHT PIN REMOVER



13) Draw out the pinion mate shaft and remove the pinion mate gears, side gears and thrust washers.

NOTE:

The gears as well as thrust washers should be marked or kept separated right and left, front and rear.

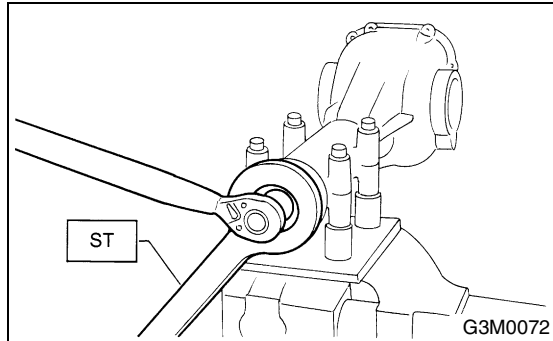


- (A) Side gear
- (B) Pinion mate gear
- (C) Thrust washer
- (D) Differential case
- (E) Pinion mate shaft

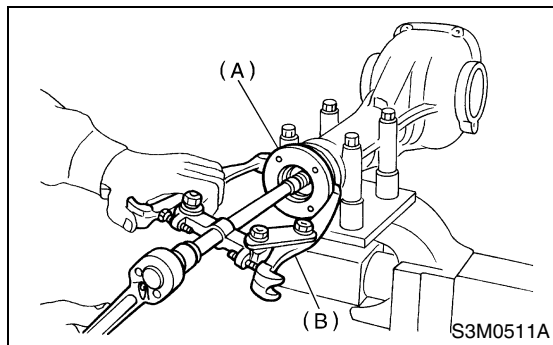
REAR DIFFERENTIAL FOR VA-TYPE

14) Hold the companion flange with ST and remove the self-locking nut.

ST 498427200 FLANGE WRENCH



15) Extract the companion flange with a puller.



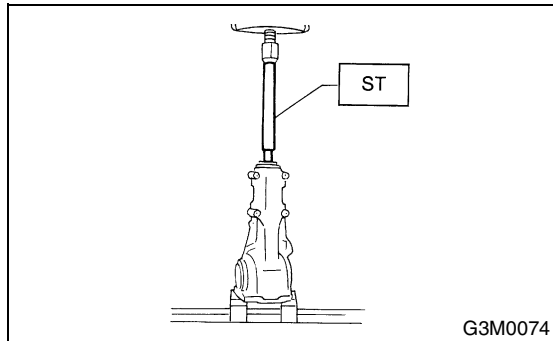
- (A) Companion
- (B) Puller

16) Press the end of drive pinion shaft and extract it together with the rear bearing cone, preload adjusting spacer and washer.

NOTE:

Hold the drive pinion so as not to drop it.

ST 398467700 DRIFT

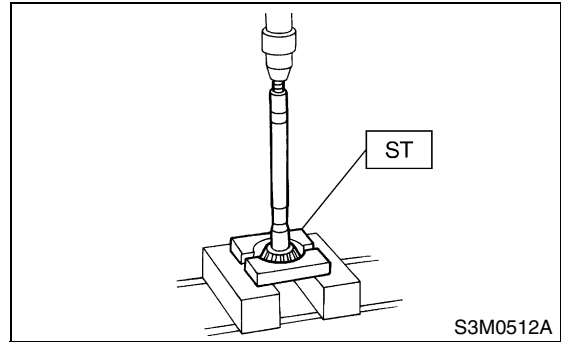


17) Remove the rear bearing cone from drive pinion by supporting the cone with ST.

NOTE:

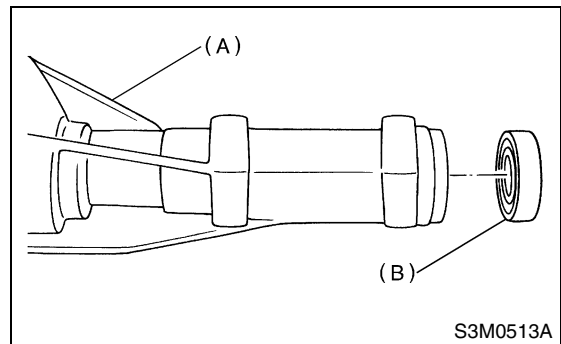
Place the replacer so that its center-recessed side faces the pinion gear.

ST 498515500 REPLACER



18) Remove the front oil seal from differential carrier using ST.

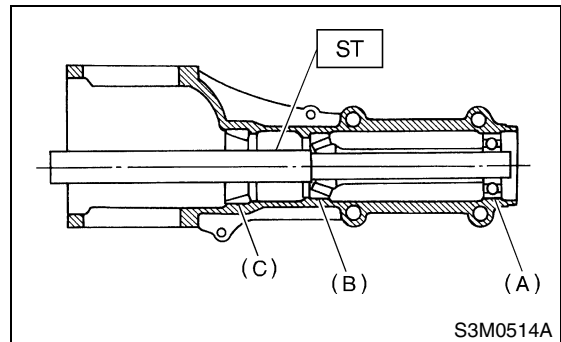
ST 398527700 PULLER SET



- (A) Differential carrier
- (B) Front oil seal

19) Remove the pilot bearing together with front bearing cone using ST.

ST 398467700 DRIFT

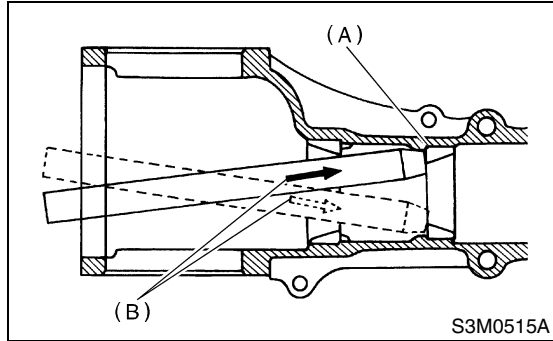


- (A) Pilot bearing
- (B) Front bearing
- (C) Rear bearing cup

REAR DIFFERENTIAL FOR VA-TYPE

DIFFERENTIALS

20) When replacing the bearings, tap the front bearing cup and rear bearing cup in this order out of case by using a brass bar.

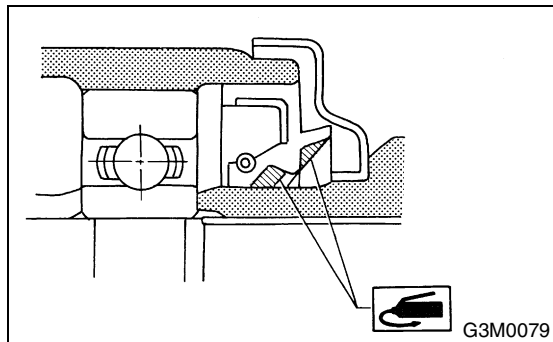


- (A) 2 cutouts along diagonal lines
- (B) Tap alternately with brass bar.

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 improperly installed.
- 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 a new one at every disassembly. Apply chassis grease between the lips when installing the oil seal.



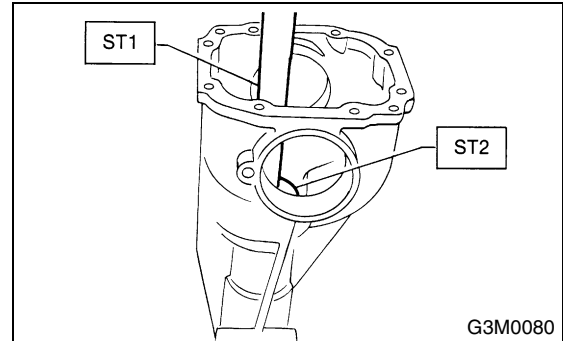
2) Adjust preload for front and rear bearings. Adjust the bearing preload with spacer and washer between front and rear bearings. Pinion height adjusting washer are not affected by this adjustment. The adjustment must be carried out without oil seal inserted.

(1) Press the rear bearing race into differential carrier using ST1 and ST2.

- ST1 398477701 HANDLE
- ST2 398477702 DRIFT

(2) Press the front bearing race into differential carrier using ST1 and ST2.

- ST1 398477701 HANDLE
- ST2 498447110 DRIFT



(3) Insert the front bearing cone.

NOTE:

Use a new front bearing cone.

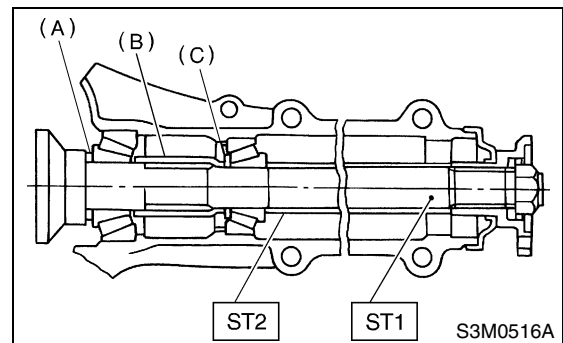
(4) Insert the ST1 into case with pinion height adjusting shim and rear bearing cone fitted onto it.

NOTE:

- Re-use the used washer if not deformed.
- Use a new rear bearing cone.

(5) Then install the 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

REAR DIFFERENTIAL FOR VA-TYPE

(6) Turn the ST1 with hand to make it seated, and tighten the drive pinion nut while measuring the preload with spring balance. Select the preload adjusting washer and spacer so that the specified preload is obtained when nut is tightened to the specified torque.

NOTE:

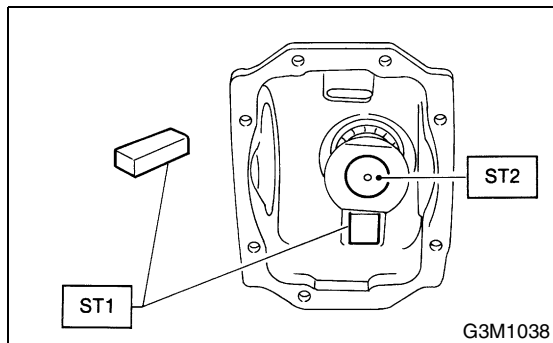
Use a new self-locking nut.

- Be careful not to give excessive preload.
- When tightening the drive pinion nut, lock ST1 with ST2 as shown in the figure.

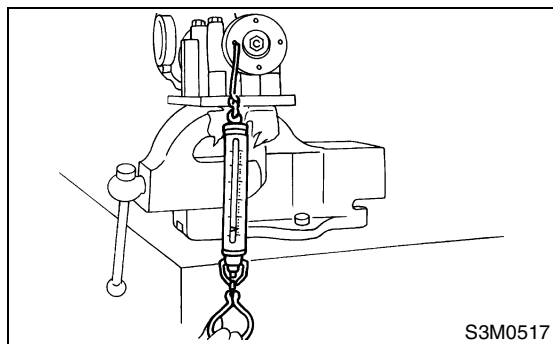
ST1 398507704 BLOCK
 ST2 498447150 DUMMY SHAFT

Tightening torque:

188 N·m (19.2 kgf·m, 139 ft·lb)



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



	Part No.	Thickness mm (in)
Preload adjusting washer	38336AA000	1.500 (0.0591)
	38336AA120	1.513 (0.0596)
	38336AA010	1.525 (0.0600)
	38336AA130	1.538 (0.0606)
	38336AA020	1.550 (0.0610)
	38336AA140	1.563 (0.0615)
	38336AA030	1.575 (0.0620)
	38336AA150	1.588 (0.0625)
	38336AA040	1.600 (0.0630)
	38336AA160	1.613 (0.0635)
	38336AA050	1.625 (0.0640)
	38336AA170	1.638 (0.0645)
	38336AA060	1.650 (0.0650)
	38336AA180	1.663 (0.0655)
	38336AA070	1.675 (0.0659)
	38336AA190	1.688 (0.0665)
	38336AA080	1.700 (0.0669)
	38336AA200	1.713 (0.0674)
	38336AA090	1.725 (0.0679)
	38336AA210	1.738 (0.0684)
38336AA100	1.750 (0.0689)	
38336AA220	1.763 (0.0694)	
38336AA110	1.775 (0.0699)	
	Part No.	Length mm (in)
Preload adjusting spacer	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 the drive pinion height with shim installed between the rear bearing cone and back of pinion gear.

- (1) Install the ST1, ST2 and ST3, as shown in the figure, and apply specified preload on the bearings.

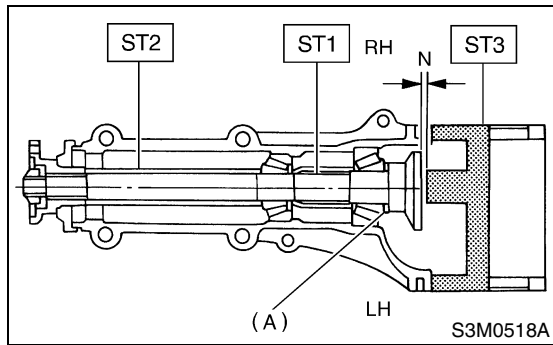
Front and rear bearing preload
For new bearing: 12.7 — 32.4 N (1.3 — 3.3 kgf, 2.9 — 7.3 lb) at companion flange bolt hole

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



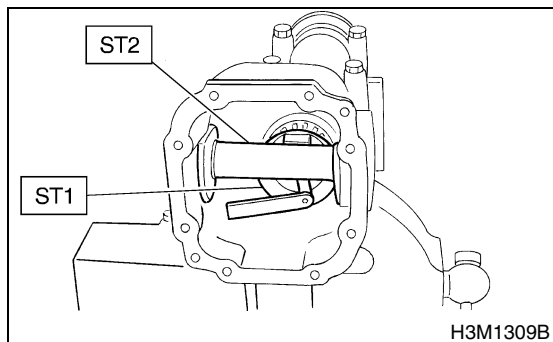
(A) Pinion height adjusting shim

- (2) Measure the clearance N between the end of ST3 and 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)

$$T_o = 0.15 \text{ mm}$$

$$N = 0.1 \text{ mm}$$

$$T = 0.15 + 0.1 - 0.05 = 0.2 \text{ mm}$$

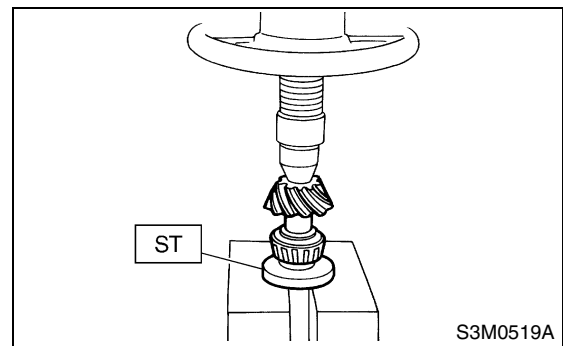
Result: Thickness = 0.2 mm

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)

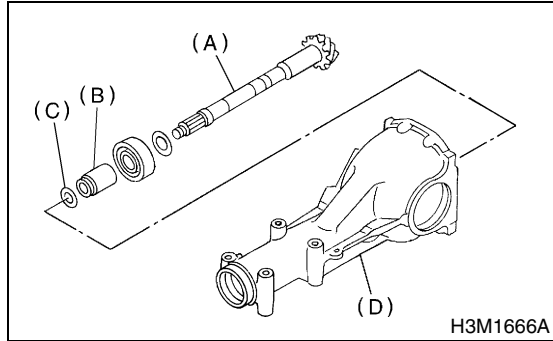
- (4) Install the selected pinion height adjusting shim on drive pinion, and press the rear bearing cone into position with ST.

ST 498175500 INSTALLER



REAR DIFFERENTIAL FOR VA-TYPE

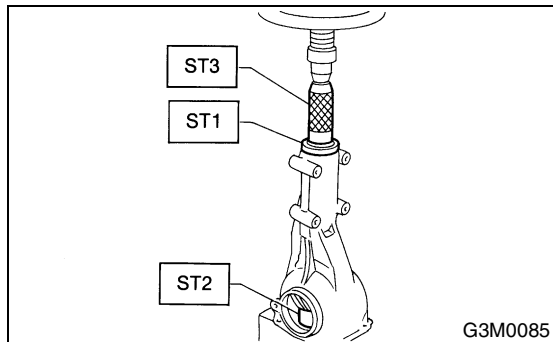
5) Insert the drive pinion into differential carrier, install the previously selected bearing preload adjusting spacer and washer.



- (A) Drive pinion
- (B) Bearing preload adjusting spacer
- (C) Bearing preload adjusting washer
- (D) Differential carrier

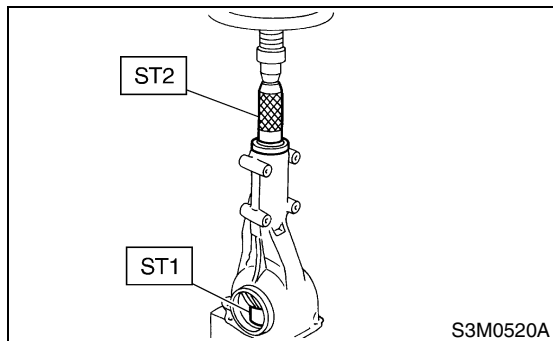
6) Press-fit the front bearing cone into carrier with ST1, ST2 and ST3.

- ST1 32285AA000 DUMMY COLLAR
- ST2 399780104 WEIGHT
- ST3 899580100 INSTALLER



7) Insert the spacer, then press-fit the pilot bearing with ST1 and ST2.

- ST1 399780104 WEIGHT
- ST2 899580100 INSTALLER

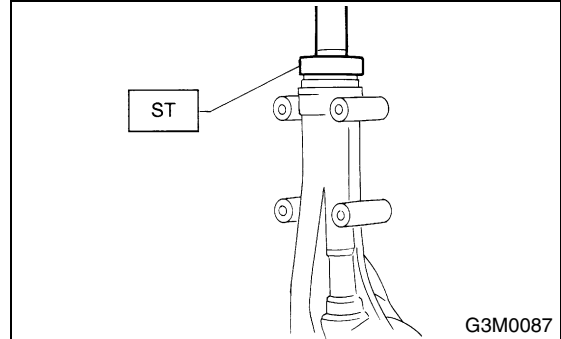


8) Fit a new oil seal with ST.

NOTE:

- Press-fit until the 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

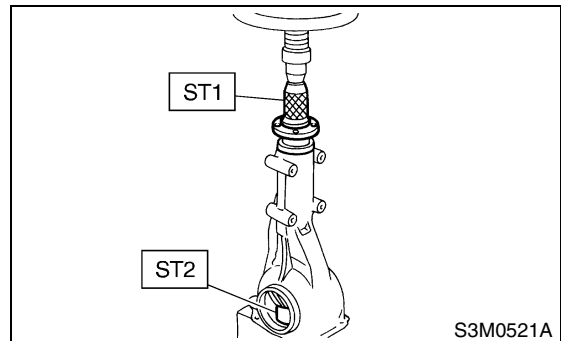


9) Press-fit the companion flange with ST1 and ST2.

NOTE:

Be careful not to damage the bearing.

- ST1 899874100 INSTALLER
- ST2 399780104 WEIGHT

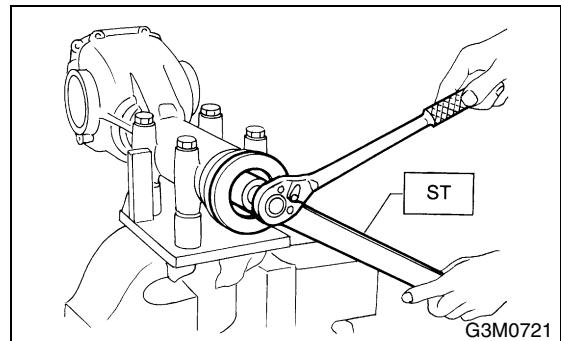


10) Install the self-locking nut. Then tighten it with the ST.

- ST 498427200 FLANGE WRENCH

Tightening torque:

188 N·m (19.2 kgf·m, 139 ft·lb)



REAR DIFFERENTIAL FOR VA-TYPE

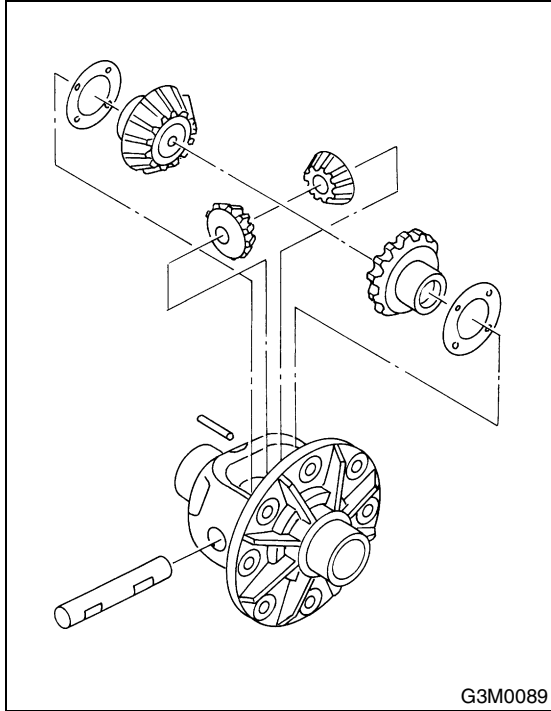
DIFFERENTIALS

11) Assembling differential case

Install the 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.

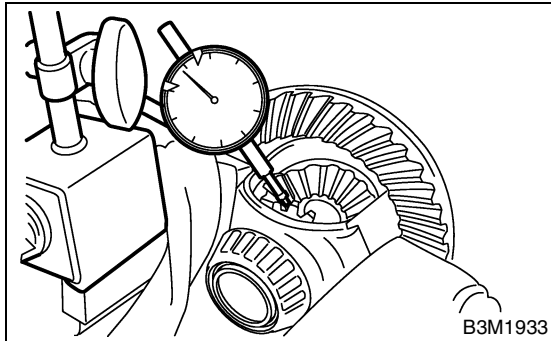


G3M0089

(1) Measure the side gear backlash.

Side gear back clearance:

0.05 — 0.15 mm (0.0020 — 0.0059 in)



B3M1933

(2) Adjust the side gear backlash as specified by selecting the 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 the pinion shaft lock pin, stake both sides of the hole to prevent pin from falling off.

(5) Install the crown gear on differential case.

NOTE:

Before installing the bolts, apply Lock Tite to bolt threads.

Lock Tite:

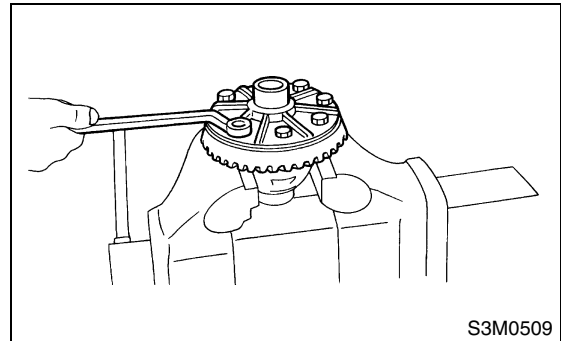
THREE BOND 1324 or equivalent

NOTE:

Tighten diagonally while tapping the bolt heads.

Tightening torque:

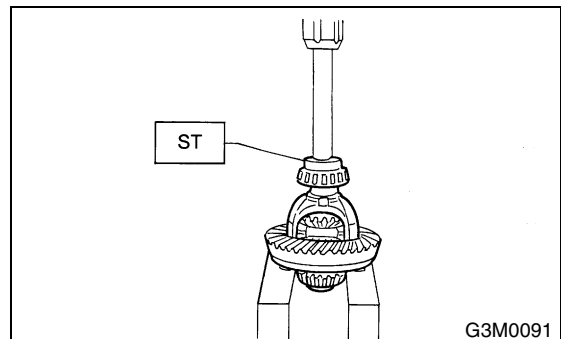
62 N·m (6.3 kgf-m, 45.6 ft-lb)



S3M0509

12) Press the side bearing cone onto differential case with ST.

ST 498485400 DRIFT



G3M0091

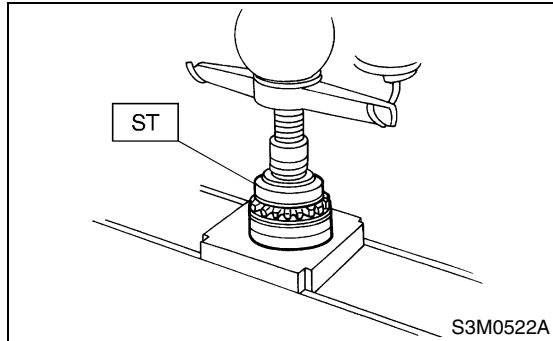
REAR DIFFERENTIAL FOR VA-TYPE

DIFFERENTIALS

13) Assemble holders.

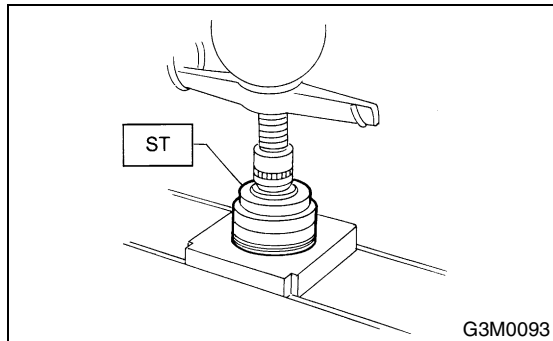
(1) Install the oil seal into right and left holders.

ST 498447100 DRIFT

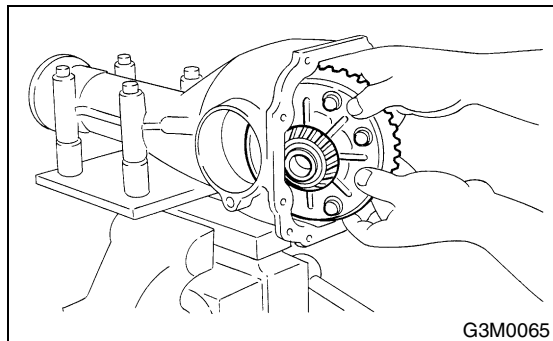


(2) Install the bearing race into right and left holders.

ST 398477702 BEARING OUTER RACE DRIFT



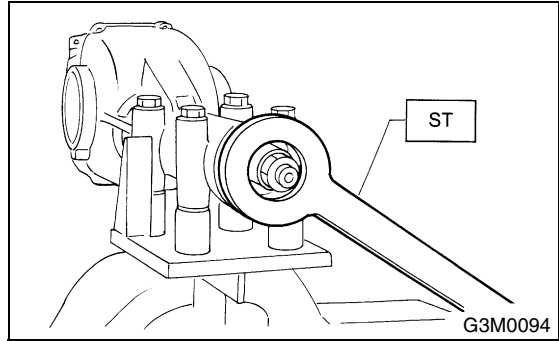
(3) Install the differential case assembly into differential carrier in the reverse order of disassembly.



14) Perform the backlash adjustment of pinion crown gear set and preload adjustment of differential side bearing.

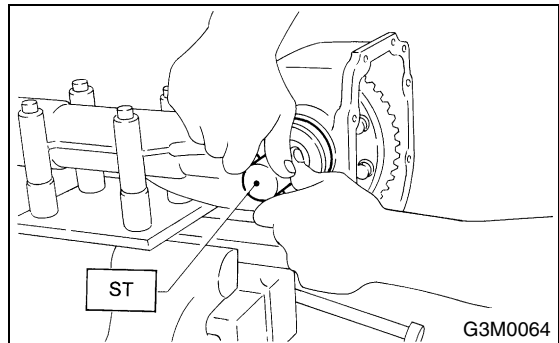
(1) Turn the drive pinion with ST for better fitting of differential side bearing.

ST 498427200 FLANGE WRENCH



(2) Screw in the side (left-side) holder until light contact is made with ST.

ST 499785500 WRENCH



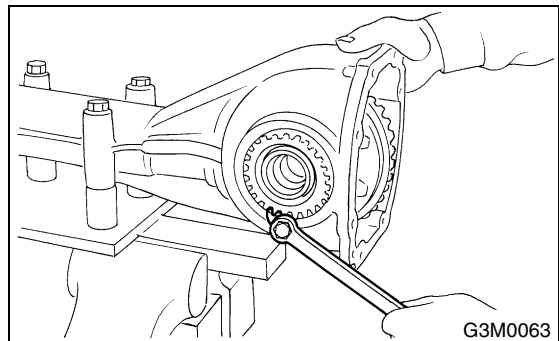
(3) Back off the side (left-side) holder approx. 1 1/2 teeth of holder, and tighten the left-side holder by approx. 2 teeth (approx. 1 1/2 + 1/2 teeth). [Back off amount of side (left-side) holder + 1/2 tooth.]

This + 1/2 tooth gives preload.

(4) Temporarily tighten the lock plate.

NOTE:

Turn over the lock plate to displace the holder 1/2 tooth.



(5) Measure the crown gear-to-drive pinion backlash. Set the magnet base on differential carrier. Align the contact point of dial gauge with tooth face of crown gear, and move the crown gear while holding drive pinion still. Read the value indicated on dial gauge.

REAR DIFFERENTIAL FOR VA-TYPE

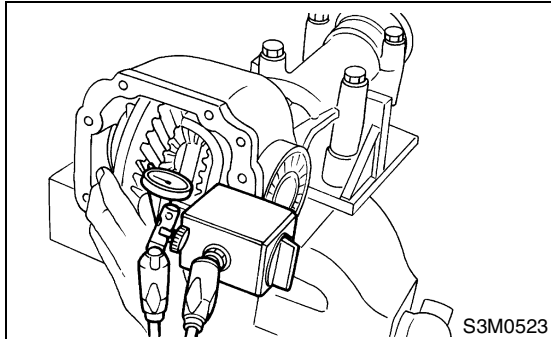
DIFFERENTIALS

NOTE:

If measured backlash is not within specified range, repeat the procedures for pinion crown gear set backlash adjustment and differential side bearing preload adjustment.

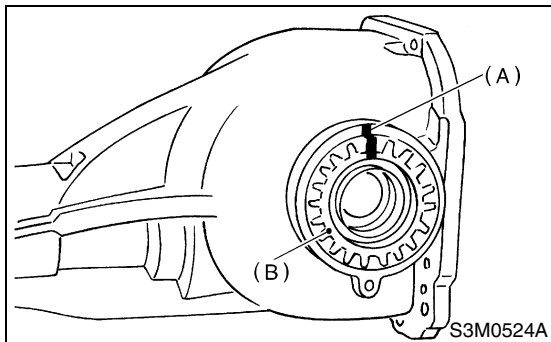
Backlash:

0.10 — 0.15 mm (0.0039 — 0.0059 in)



15) Draw a matching mark on both differential carrier and holder. Remove the holder one side at a time.

Replace in the original position after inserting an O-ring and applying grease to threaded portion.



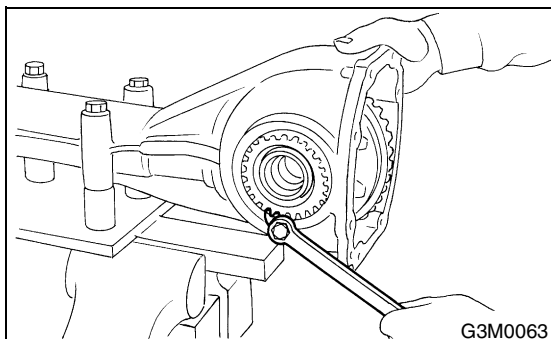
(A) Matching mark

(B) Holder

16) Tighten the bolt of lock plate to specified torque.

Tightening torque:

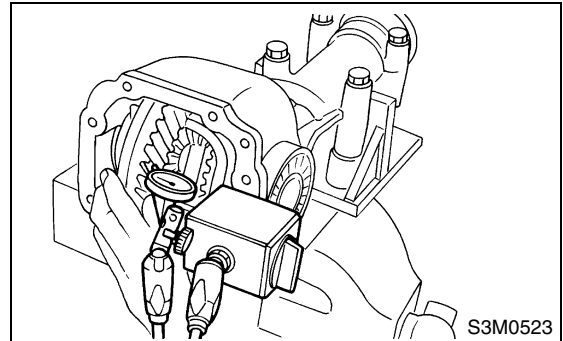
25 N·m (2.5 kgf·m, 18.1 ft·lb)



17) Re-check the crown gear-to-pinion backlash.

Backlash:

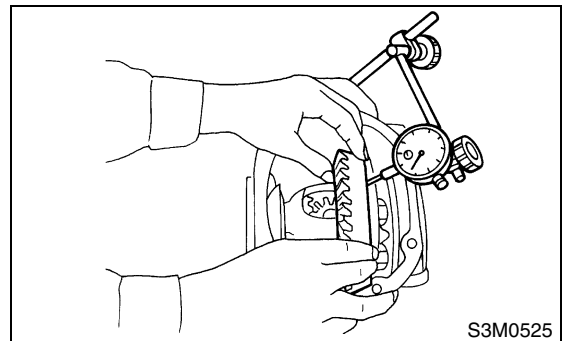
0.10 — 0.15 mm (0.0039 — 0.0059 in)



18) Check the crown gear runout on its back surface, and make sure that pinion and crown gear rotate smoothly.

Limit of runout:

0.05 mm (0.0020 in)



19) Checking and adjusting tooth contact of crown gear.

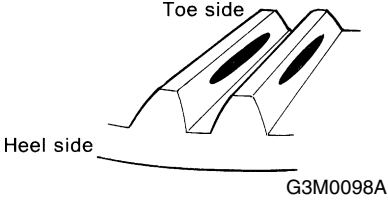
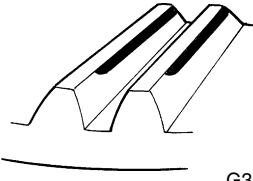
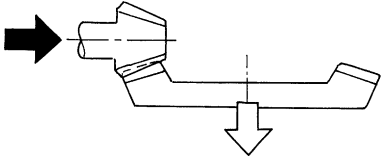
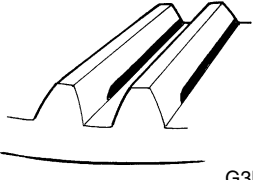
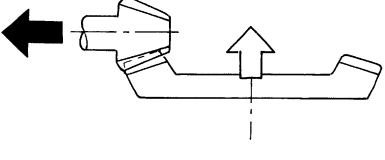
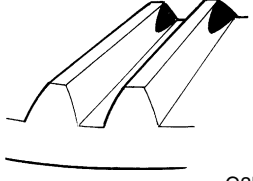
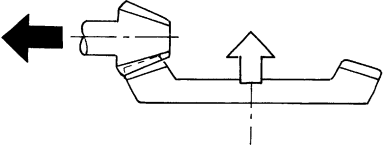
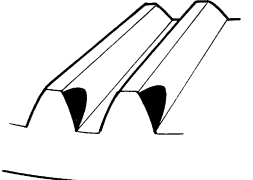
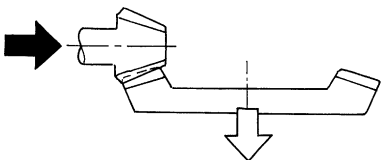
(1) Apply an even coat of red lead on both sides of three or four teeth on the crown gear. Check the contact pattern after rotating the crown gear several revolutions back and forth until a definite contact pattern appears on the crown gear.



(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.

REAR DIFFERENTIAL FOR VA-TYPE

TOOTH CONTACT PATTERN		
Condition	Contact pattern	Adjustment
<p>Correct tooth contact Tooth contact pattern slightly shifted towards toe under no load rotation. (When loaded, contact pattern moves toward heel.)</p>	 <p style="text-align: center;">G3M0098A</p>	—
<p>Face contact Backlash is too large.</p>	 <p style="text-align: center;">G3M0098B</p>	<p>Increase thickness of drive pinion height adjusting washer in order to bring drive pinion closer to crown gear center.</p>  <p style="text-align: right;">G3M0098F</p>
<p>Flank contact Backlash is too small.</p>	 <p style="text-align: center;">G3M0098C</p>	<p>Reduce thickness of drive pinion height adjusting washer in order to move drive pinion away from crown gear.</p>  <p style="text-align: right;">G3M0098G</p>
<p>Toe contact</p>	<p>Contact area is small. This may cause chipping at toe ends.</p>  <p style="text-align: center;">G3M0098D</p>	<p>Adjust as for flank contact.</p>  <p style="text-align: right;">G3M0098G</p>
<p>Heel contact</p>	<p>Contact area is small. This may cause chipping at heel ends.</p>  <p style="text-align: center;">G3M0098E</p>	<p>Adjust as for face contact.</p>  <p style="text-align: right;">G3M0098F</p>

 : Adjusting direction of drive pinion
 : Adjusting direction of crown gear

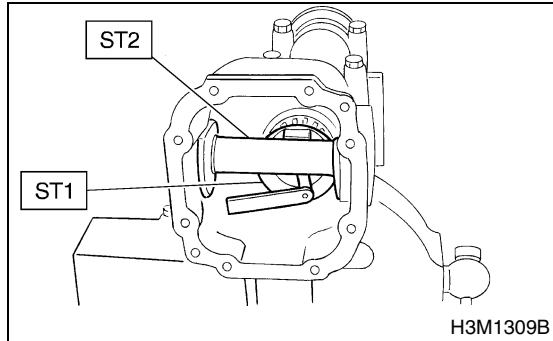
REAR DIFFERENTIAL FOR VA-TYPE

DIFFERENTIALS

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



$$T = To + N - 0.05 \text{ (mm)}$$

where

T = Thickness of pinion height adjusting shim (mm)

To = Thickness of shim originally installed (mm)

N = Reading of thickness gauge (mm)

(2) Differential side bearing preload

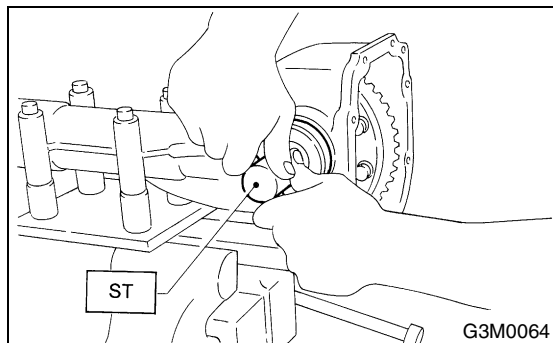
Screw in side (left-side) holder until light contact is made with ST.

Back off the side (left-side) holder approx. 1 1/2 teeth of holder, and tighten the left-side holder by approx. 2 teeth (approx. 1 1/2 + 1/2 teeth).

[Back off amount of side (left-side) holder + 1/2 tooth.]

This + 1/2 tooth gives preload.

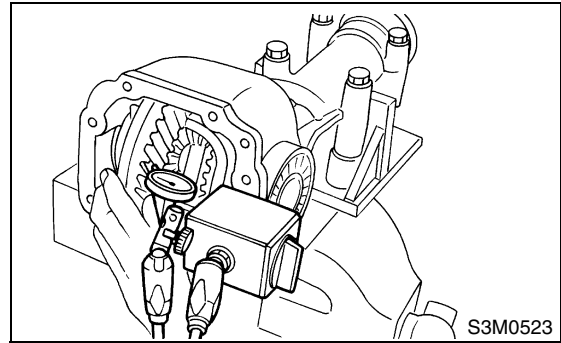
ST 499785500 WRENCH



(3) Hypoid gear backlash

Backlash:

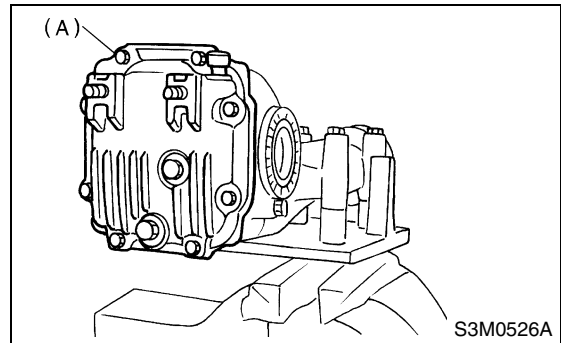
0.10 — 0.15 mm (0.0039 — 0.0059 in)



21) Install the rear cover and tighten the 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.

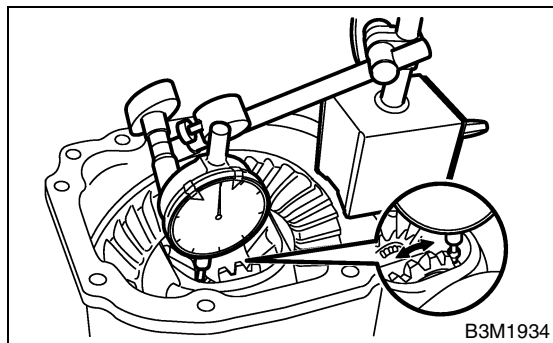
8) Companion flange
 Replace if the oil seal lip contacting surfaces have flaws.

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 the side gear backlash is not within the specification, adjust clearance as specified by selecting the side gear thrust washer.



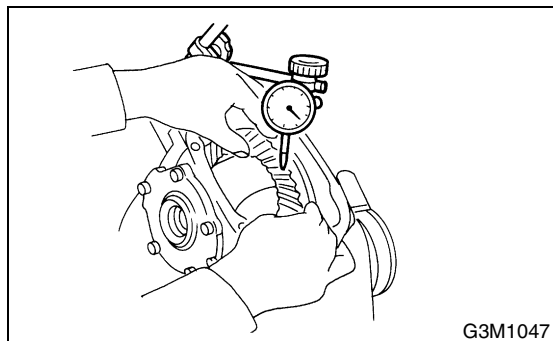
B3M1934

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 the crown gear backlash is not within the specification, adjust the side bearing preload or repair if necessary.



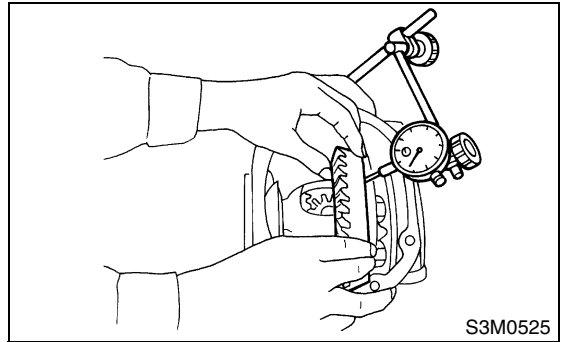
G3M1047

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.



S3M0525

4. TOOTH CONTACT BETWEEN CROWN GEAR AND DRIVE PINION

Inspect the 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 the side gear backlash.
 <Ref. to DI-46, ASSEMBLY, Rear Differential for VA-type.>

2. CROWN GEAR BACKLASH

Adjust the 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.>

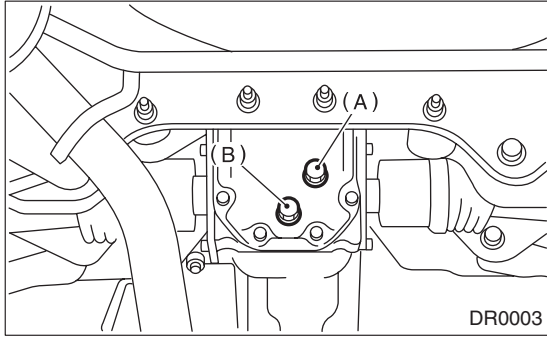
REAR DIFFERENTIAL FRONT OIL SEAL

DIFFERENTIALS

6. Rear Differential Front Oil Seal

A: REPLACEMENT

- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from battery.
- 3) Move the select lever or gear shift lever to "N".
- 4) Release the parking brake.
- 5) Remove the oil drain plug, and drain the gear oil.



- (A) Filler plug
- (B) Drain plug

- 6) Install the oil drain plug.

NOTE:

- Apply fluid packing to the drain plug for T-type.
- Use a new aluminum gasket for VA-type.

Tightening torque:

T-type;

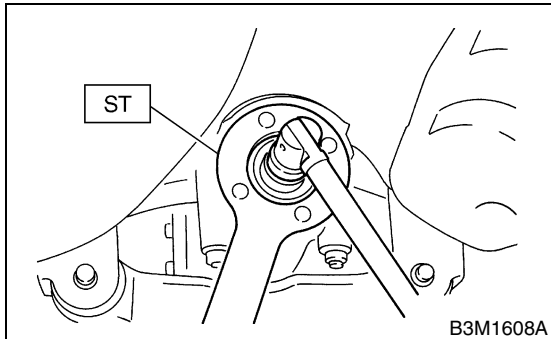
49 N·m (5.0 kgf·m, 36.2 ft·lb)

VA-type;

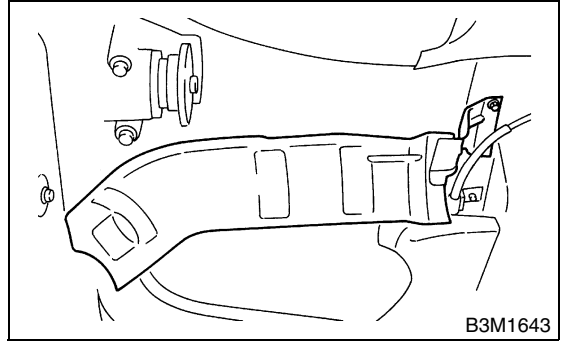
34 N·m (3.5 kgf·m, 25.3 ft·lb)

- 7) Jack-up the rear wheels and support the vehicle body with sturdy racks.
- 8) Remove the rear exhaust pipe and muffler.
- 9) Remove the propeller shaft from body. <Ref. to DS-15, REMOVAL, Propeller Shaft.>
- 10) Remove the self-locking nut while holding the companion flange with ST.

ST 498427200 FLANGE WRENCH

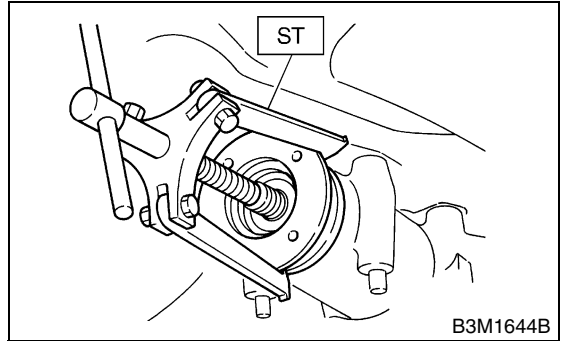


- 11) Remove the tank cover.



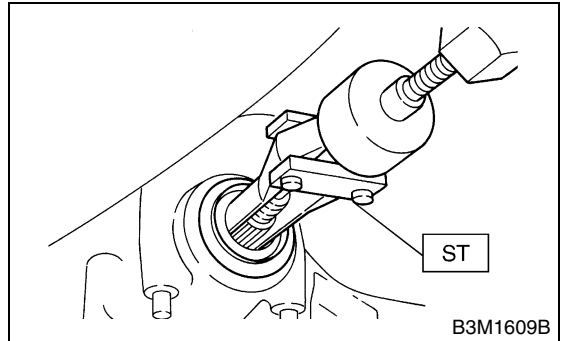
- 12) Extract the companion flange using ST.

ST 399703602 PULLEY ASSY



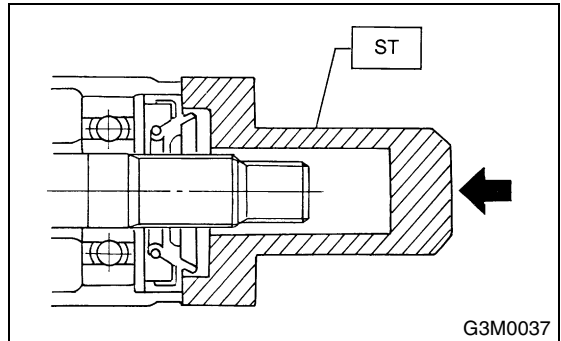
- 13) Remove the oil seal using ST.

ST 499705401 PULLER ASSY



- 14) Fit a new oil seal using ST.

ST 498447120 DRIFT



15) Install the companion flange.

NOTE:

Use a plastic hammer to install the companion flange.

16) Tighten the 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.

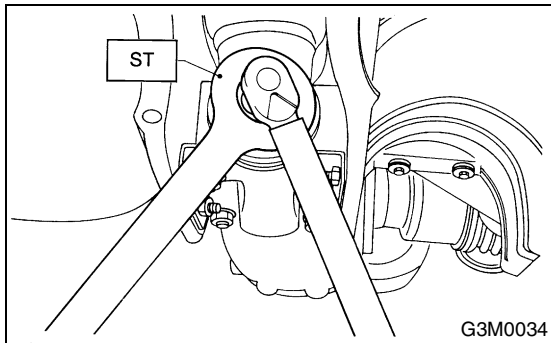
ST 498427200 FLANGE WRENCH

NOTE:

Use a new self-locking nut.

Tightening torque:

181 N·m (18.5 kgf·m, 134 ft·lb)



17) Hereafter, reassemble in the reverse order of disassembly.

REAR DIFFERENTIAL SIDE OIL SEAL

DIFFERENTIALS

7. Rear Differential Side Oil Seal

A: INSPECTION

Make sure that there is no oil leakage from side oil seal.

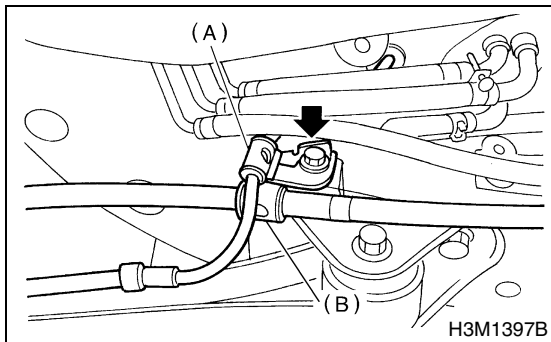
If there is any oil leakage, replace the oil seal.

B: REPLACEMENT

1. T-TYPE

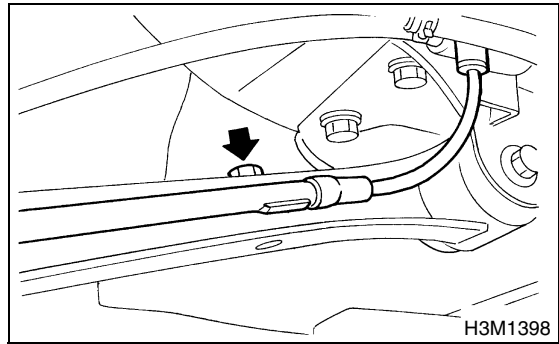
- 1) Disconnect the ground cable from battery.
- 2) Move the select lever or gear shift lever to "N".
- 3) Release the parking brake.
- 4) Loosen both wheel nuts.
- 5) Jack-up the vehicle and support it with rigid racks.
- 6) Remove the wheels.
- 7) Remove the rear exhaust pipe and muffler.
Non-turbo model without OBD
<Ref. to EX(w/oOBD)-13, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(w/oOBD)-14, REMOVAL, Muffler.>
Non-turbo model with OBD
<Ref. to EX-11, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX-12, REMOVAL, Muffler.>
Turbo model
<Ref. to EX(TURBO)-13, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(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.

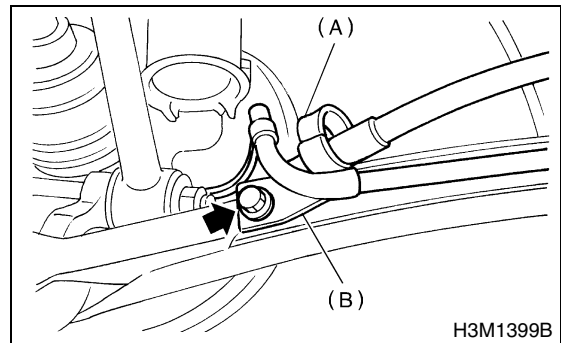


- (A) ABS sensor cable clamp
- (B) Parking brake cable guide

- (2) Remove the ABS sensor cable clamp from trailing link.

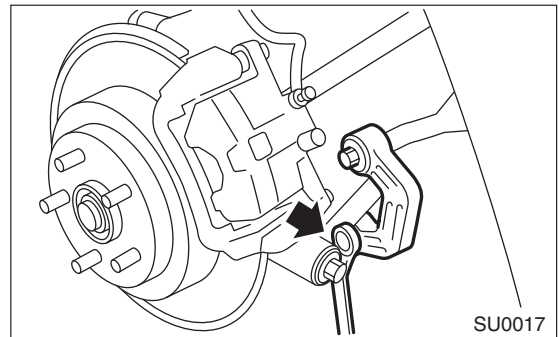


- (3) Remove the ABS sensor cable clamp and parking brake cable guide from trailing link.

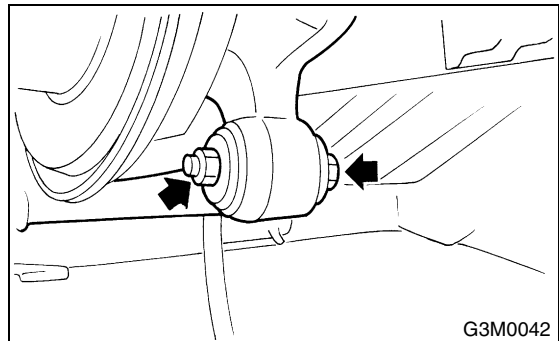


- (A) Parking brake cable guide
- (B) ABS sensor cable clamp

- (4) Remove the rear stabilizer link.

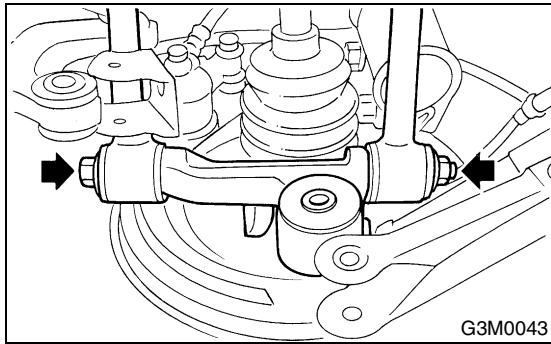


- (5) Remove the bolts which secure trailing link to housing.



REAR DIFFERENTIAL SIDE OIL SEAL

(6) Remove the bolts which secure front and rear lateral link to rear housing.

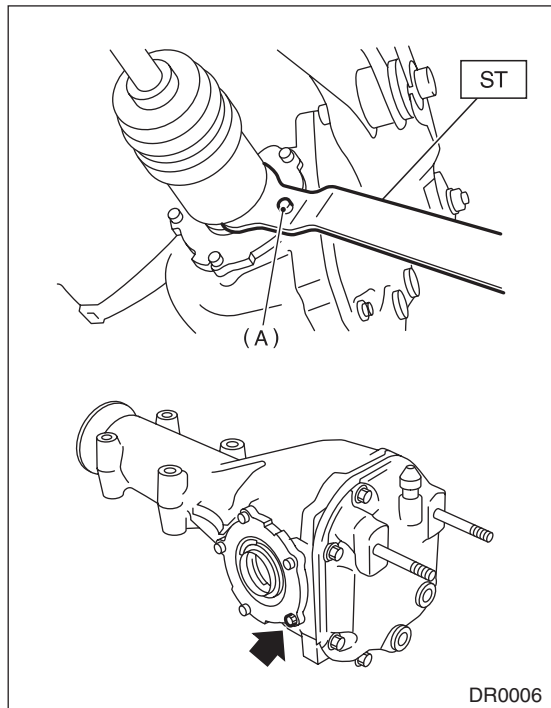


(7) Remove the DOJ from the rear differential by using ST.

NOTE:

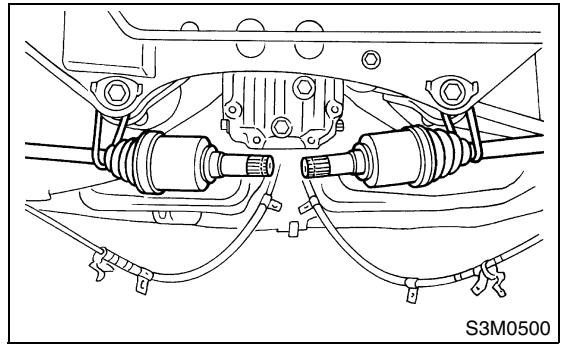
When removing the DOJ from rear differential, fit ST to the bolts as shown in the figure so as not to damage the side bearing retainer.

ST 208099PA100 DRIVE SHAFT REMOVER

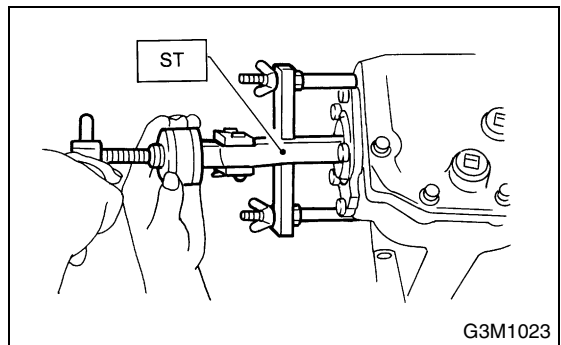


(A) Bolt

9) Remove the rear drive shaft to the rear cross-member using wire.



10) Remove the nut of protector.
ST 398527700 PULLER ASSY

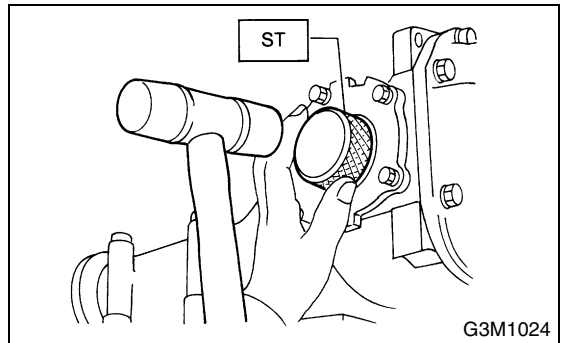


11) Drive in a new side oil seal using ST.

CAUTION:

Apply chassis grease between the oil seal lips.

ST 398437700 DRIFT



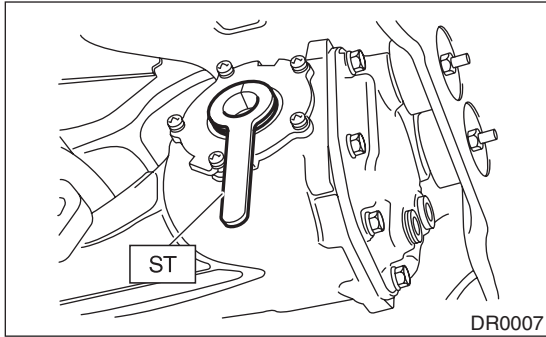
REAR DIFFERENTIAL SIDE OIL SEAL

DIFFERENTIALS

12) Insert the DOJ into rear differential.

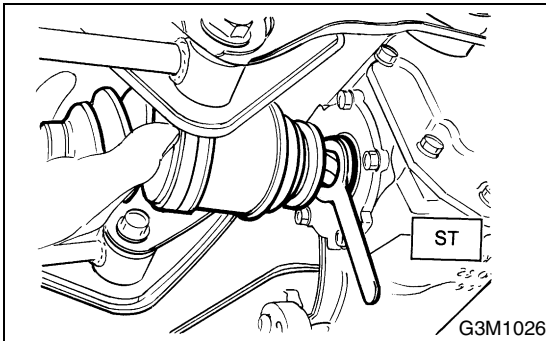
(1) Install the ST to rear differential.

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 the ST.

ST 28099PA090 SIDE OIL SEAL PROTECTOR

13) Hereafter, reassemble in the reverse order of disassembly.

2. VA-TYPE

1) Disconnect the ground cable from battery.

2) Move the 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 the wheels.

7) Remove the rear exhaust pipe and muffler.

Non-turbo model without OBD

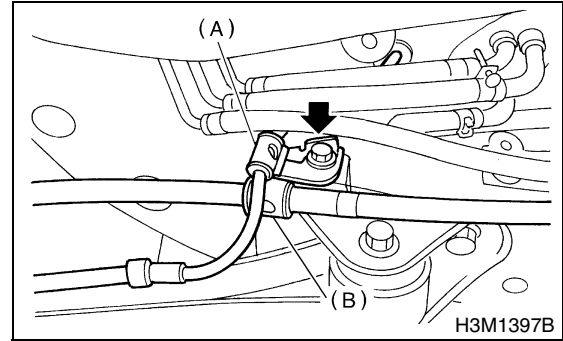
<Ref. to EX(w/oOBD)-13, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(w/oOBD)-14, REMOVAL, Muffler.>

Non-turbo model with OBD

<Ref. to EX-11, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX-12, REMOVAL, Muffler.>

8) Remove the DOJ of rear drive shaft from rear differential.

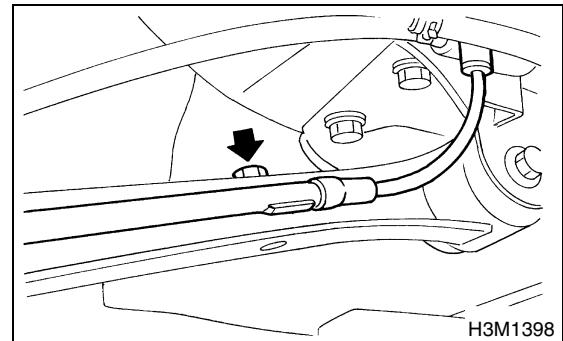
(1) Remove the ABS sensor cable clamp and parking brake cable clamp from bracket.



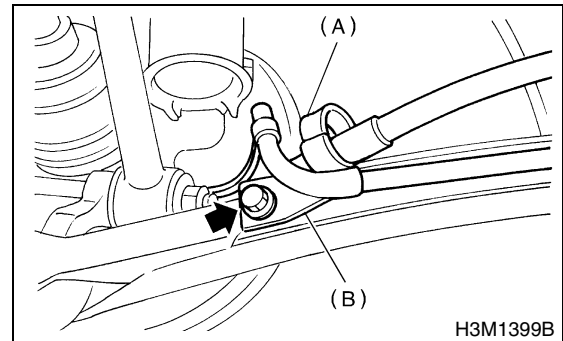
(A) ABS sensor cable clamp

(B) Parking brake cable guide

(2) Remove the ABS sensor cable clamp from trailing link.



(3) Remove the ABS sensor cable clamp and parking brake cable guide from trailing link.

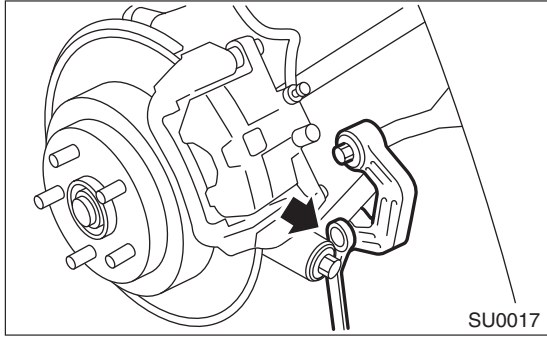


(A) Parking brake cable guide

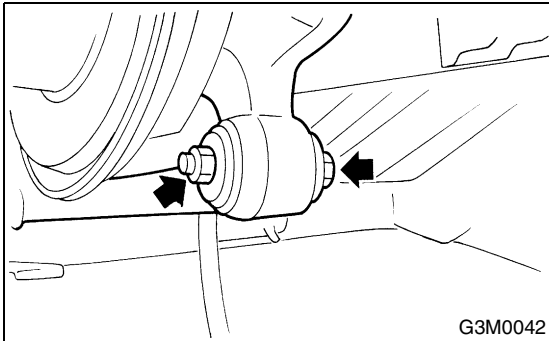
(B) ABS sensor cable clamp

REAR DIFFERENTIAL SIDE OIL SEAL

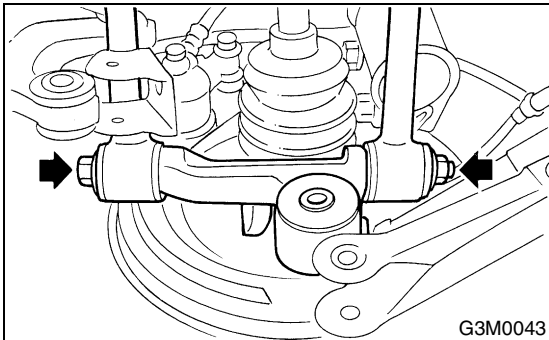
(4) Remove the rear stabilizer link.



(5) Remove the bolts which secure trailing link to housing.



(6) Remove the bolts which secure front and rear lateral link to rear housing.



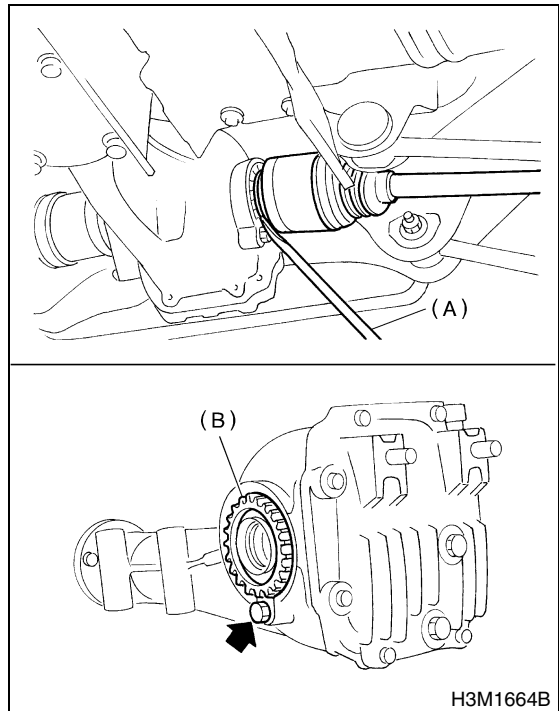
(7) Remove the DOJ from the rear differential using tire lever.

NOTE:

When removing the DOJ from rear differential, fit tire lever to the bolt as shown in the figure so as not to damage the axle shaft holder.

NOTE:

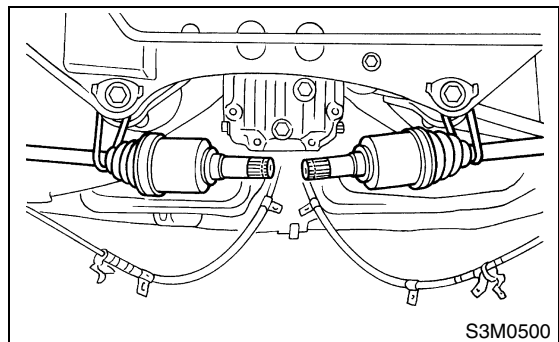
The side spline shaft circlip comes out together with the shaft.



(A) Tire lever

(B) Axle shaft holder

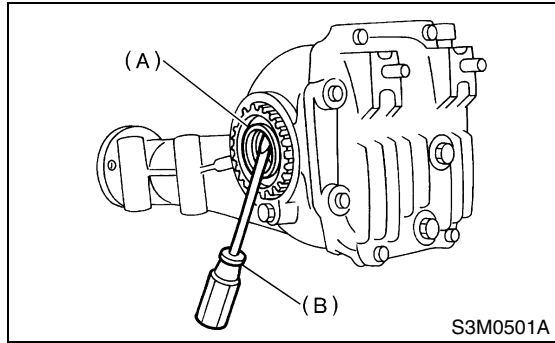
9) Secure the rear drive shaft to rear crossmember using wire.



REAR DIFFERENTIAL SIDE OIL SEAL

DIFFERENTIALS

10) Remove the oil seal with screwdriver.



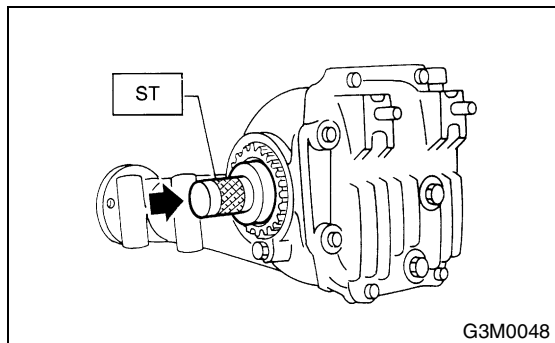
- (A) Side oil seal
- (B) Screwdriver

11) Drive in a new side oil seal using ST.

NOTE:

Apply chassis grease between the oil seal lips.

ST 498447100 OIL SEAL INSTALLER



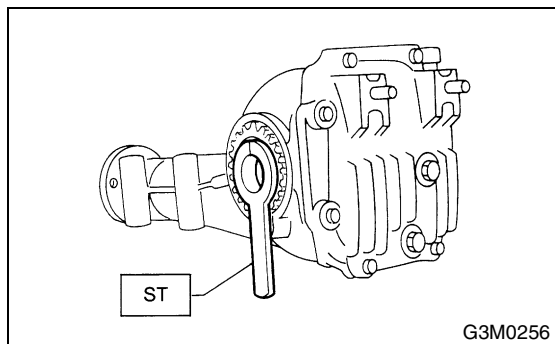
12) Insert the DOJ into rear differential.

NOTE:

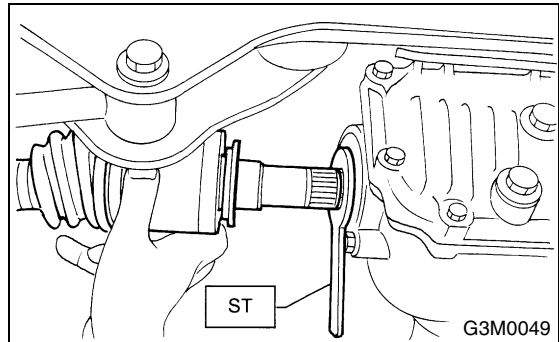
Before inserting, replace the circlip at the end of spline shaft with a new one.

(1) Install the 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.



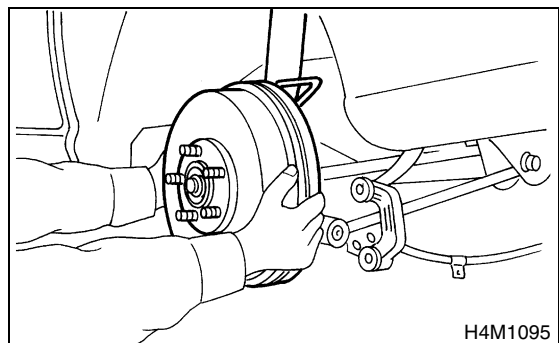
(3) Remove the ST.

ST 28099PA090 SIDE OIL SEAL PROTECTOR

(4) Completely insert the DOJ into rear differential by pressing rear housing.

NOTE:

Make sure that the oil seal lip is not folded over inward.



13) Hereafter, reassemble in the reverse order of disassembly.

8. Rear Differential Member

A: REMOVAL

- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from battery.
- 3) Move the selector lever or gear shift lever to "N".
- 4) Release the parking brake.
- 5) Loosen the wheel nuts.
- 6) Jack-up the vehicle and support it with study racks.
- 7) Remove the wheels.
- 8) Remove the rear exhaust pipe and muffler.
Non-turbo model without OBD
<Ref. to EX(w/oOBD)-13, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(w/oOBD)-14, REMOVAL, Muffler.>
Non-turbo model with OBD
<Ref. to EX-11, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX-12, REMOVAL, Muffler.>
Turbo model
<Ref. to EX(TURBO)-13, REMOVAL, Rear Exhaust Pipe.> and <Ref. to EX(TURBO)-14, REMOVAL, Muffler.>
- 9) Remove the rear differential front member.

NOTE:

When removing the 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-41, REMOVAL, Rear Differential for VA-type.>

- 10) Remove the differential rear member.

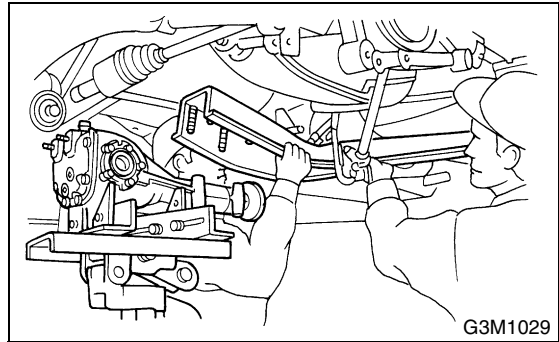
B: INSTALLATION

Install in the reverse order of removal.

- 1) Position the front member on body by passing it under the parking brake cable and securing to rear differential.

NOTE:

When installing the rear differential front member, do not confuse the installation sequence of the stopper.

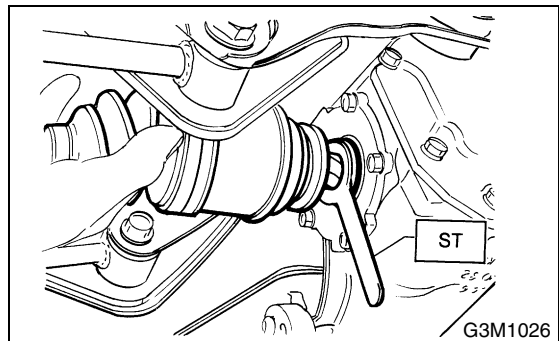


- 2) Insert the DOJ of rear drive shaft into rear differential.<Ref. to DI-58, REPLACEMENT, Rear Differential Side Oil Seal.>

NOTE:

Before inserting, replace the differential side oil seal with a new one.

ST 28099PA090 SIDE OIL SEAL PROTECTOR



- 3) Hereafter, install in the reverse order of removal.

C: INSPECTION

- 1) Check the rear differential member for damage, bend, or corrosion.
If damage, bend, or corrosion is excessive, replace the rear differential member.
- 2) Check the bushings of rear differential member for cracking, hardening, or damage.
If cracking, hardening, or damage is excessive, replace the rear differential member.

GENERAL DIAGNOSTIC TABLE

DIFFERENTIALS

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 the bolts to specified torque. Replace the O-ring.
	(4) Loose rear cover attaching bolts or damaged gasket.	Tighten the bolts to specified torque. Replace the 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 the 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 the 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 the 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 the hypoid gear set.
	(2) Improper backlash for hypoid gear.	Readjust.
	(3) Scored or chipped teeth of hypoid gear.	Replace the hypoid gear set.
	(4) Seized hypoid gear.	Replace the 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.

GENERAL DIAGNOSTIC TABLE

DIFFERENTIALS

TRANSFER CASE

TC

	Page
1. General Description	2
2. Transfer Case and Extension for MT	3
3. Transfer Clutch and Extension for AT	4
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5. Transfer Drive Gear (MT).....	6
6. Transfer Driven Gear (MT).....	7
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11. Center Differential	12
12. Transfer Clutch Pressure Test	13
13. Transfer Duty Solenoid and Valve Body	14

GENERAL DESCRIPTION

TRANSFER CASE

1. General Description

A: NOTE

For general description refer to "AUTOMATIC TRANSMISSION" (a separate publication: Pub. No. G0864ZE) 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-48, 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. G0864ZE).

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-42, Oil Seal.>

5. Transfer Drive Gear (MT)

A: NOTE

For removal, installation and inspection work, refer to "MT" section. <Ref. to MT-52, Transfer Drive Gear.>

6. Transfer Driven Gear (MT)

A: NOTE

For removal, installation and inspection work, refer to "MT" section. <Ref. to MT-54, 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. G0864ZE).

8. Reduction Drive Gear with VTD

A: NOTE

For removal, installation and inspection work, refer to "AUTOMATIC TRANSMISSION" (a separate publication: Pub. No. G0864ZE)

9. Reduction Driven Gear without VTD

A: NOTE

For removal, installation and inspection work, refer to "AUTOMATIC TRANSMISSION" (a separate publication: Pub. No. G0864ZE).

10.Reduction Driven Gear with VTD

A: NOTE

For removal, installation and inspection work, refer to "AUTOMATIC TRANSMISSION" (a separate publication: Pub. No. G0864ZE)

11.Center Differential

A: NOTE

For removal, installation and inspection work, refer to "MT" section. <Ref. to MT-56, Center Differential.>

12. Transfer Clutch Pressure Test

A: NOTE

For inspection work, refer to "AT" section. <Ref. to AT-18, Transfer Clutch Pressure Test.>

13. Transfer Duty Solenoid and Valve Body

A: NOTE

For removal, installation and inspection work, refer to "AT" section. <Ref. to AT-40, Shift Solenoids, Duty Solenoids and ATF Temperature Sensor.>

DRIVE SHAFT SYSTEM

DS

	Page
1. General Description	2
2. Propeller Shaft	15
3. Front Axle	18
4. Rear Axle	24
5. Front Drive Shaft	33
6. Rear Drive Shaft.....	39
7. General Diagnostic Table.....	43

GENERAL DESCRIPTION

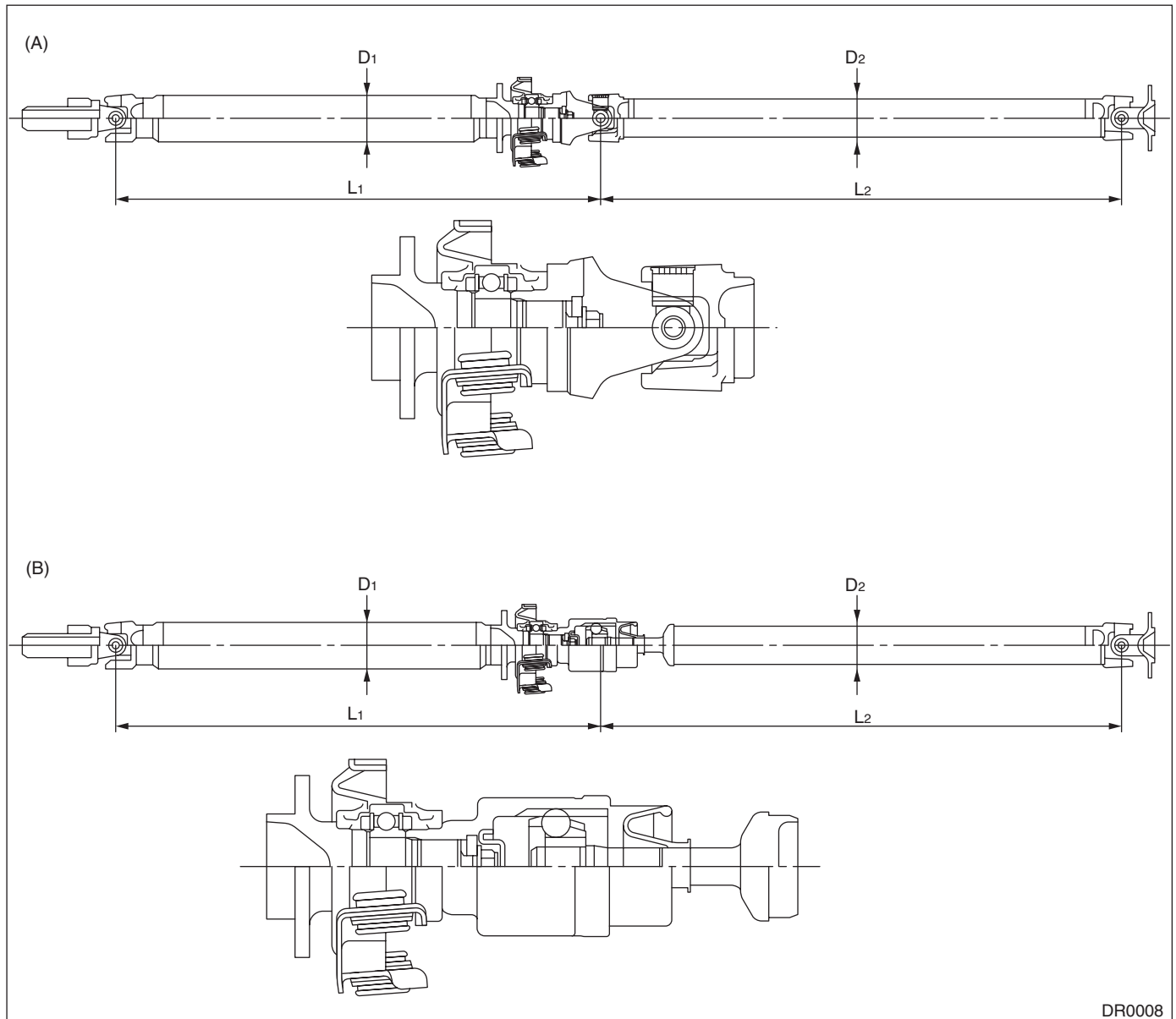
DRIVE SHAFT SYSTEM

1. General Description

A: SPECIFICATIONS

1. PROPELLER SHAFT

Model			Turbo	Non-turbo
Propeller shaft type			DOJ type	UJ type
Front propeller shaft Joint-to-joint length: L_1	mm (in)	AT	579 (22.79)	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)	



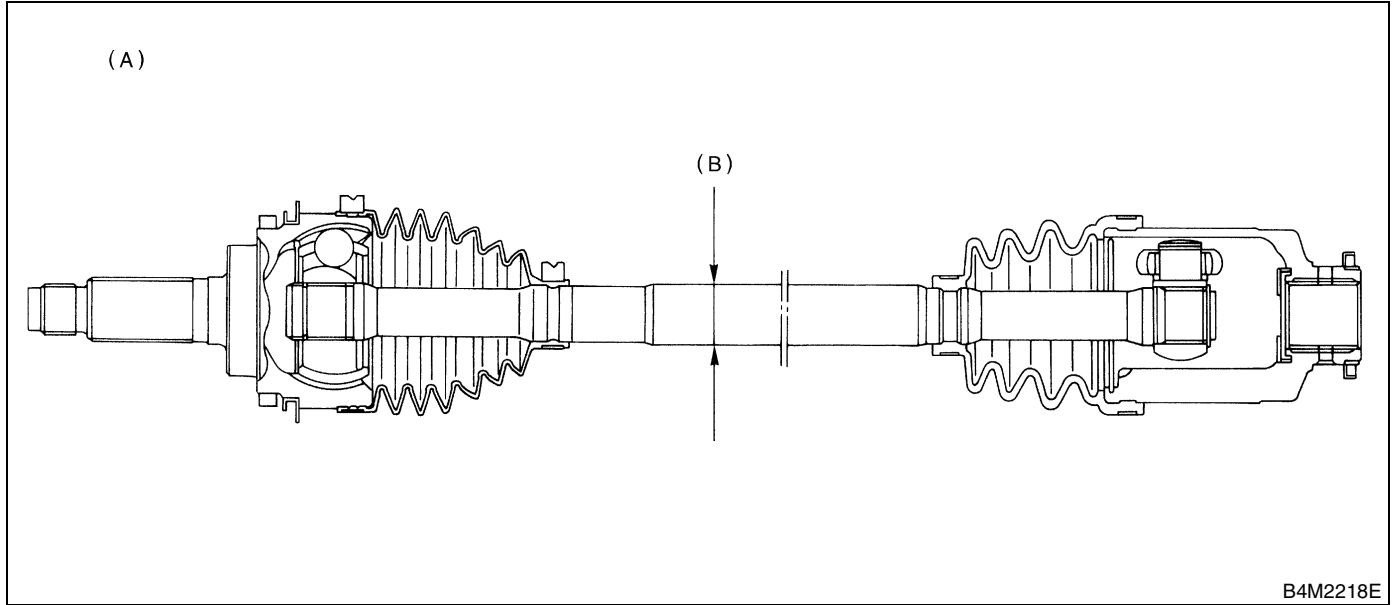
DR0008

(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)



B4M2218E

(A) EBJ87+SFJ82

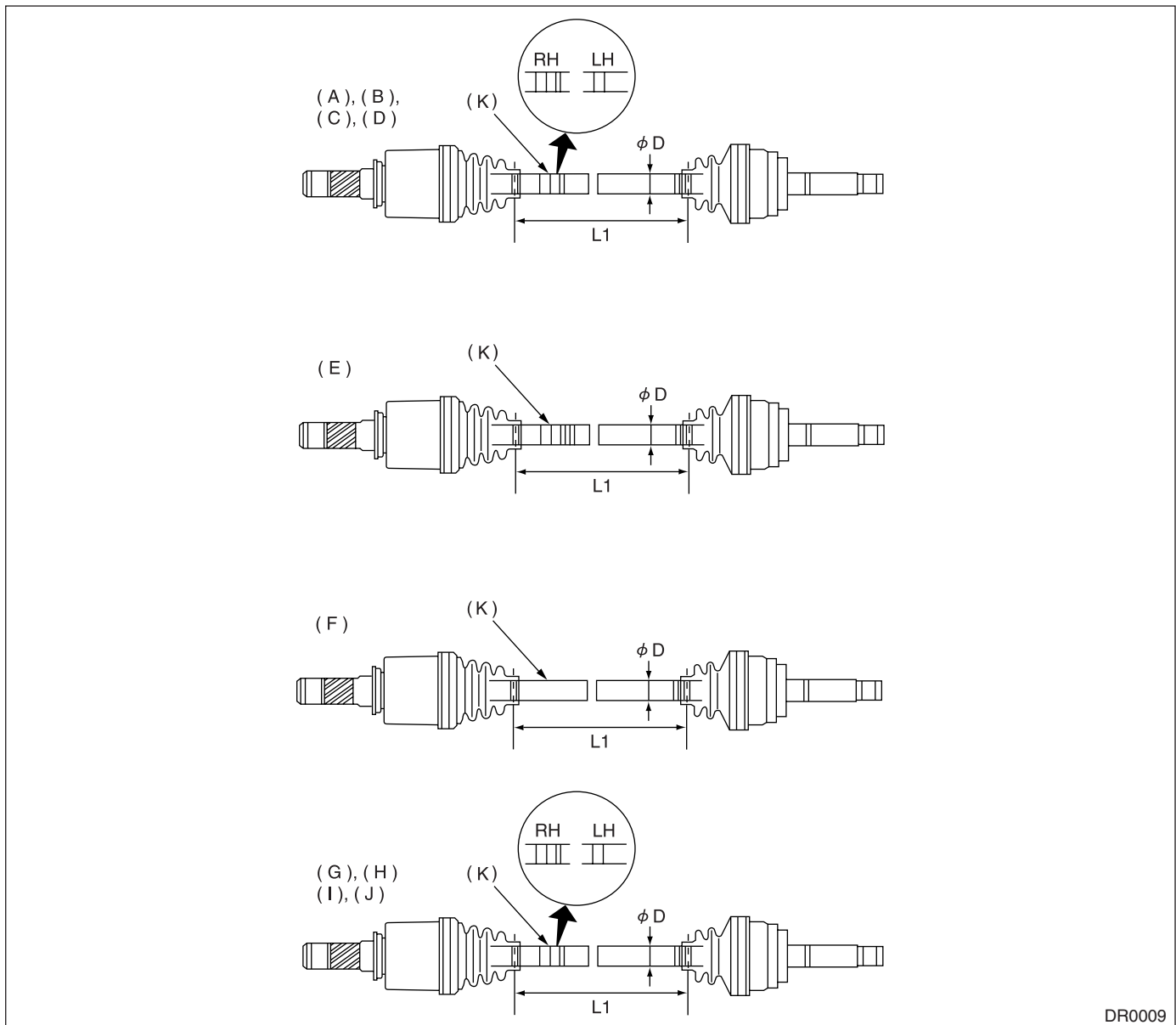
(B) Measuring point

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)		
C	BJ79/DOJ79 Sedan R160RH	Sedan 2.0 L NA MT	2 (Two)	368	23
D	BJ79/DOJ79 Sedan R160LH		1 (One)		
E	BJ79/DOJ79 Sedan R152R/L	Sedan 1.6 L, 2.0 L NA AT	3 (Three)	363	23
F	BJ79/DOJ79 Wagon R152R/L	Wagon 1.6 L, 2.0 L NA AT	None	355	23
G	EBJ82/DOJ82 Wagon RH	Wagon Turbo	2 (Two)	353	24
H	EBJ82/DOJ82 Wagon LH		1 (One)		
I	BJ79/DOJ79 Wagon R160RH	Wagon 2.0 L NA MT	2 (Two)	358	23
J	BJ79/DOJ79 Wagon R160LH		1 (One)		



DR0009

GENERAL DESCRIPTION

DRIVE SHAFT SYSTEM

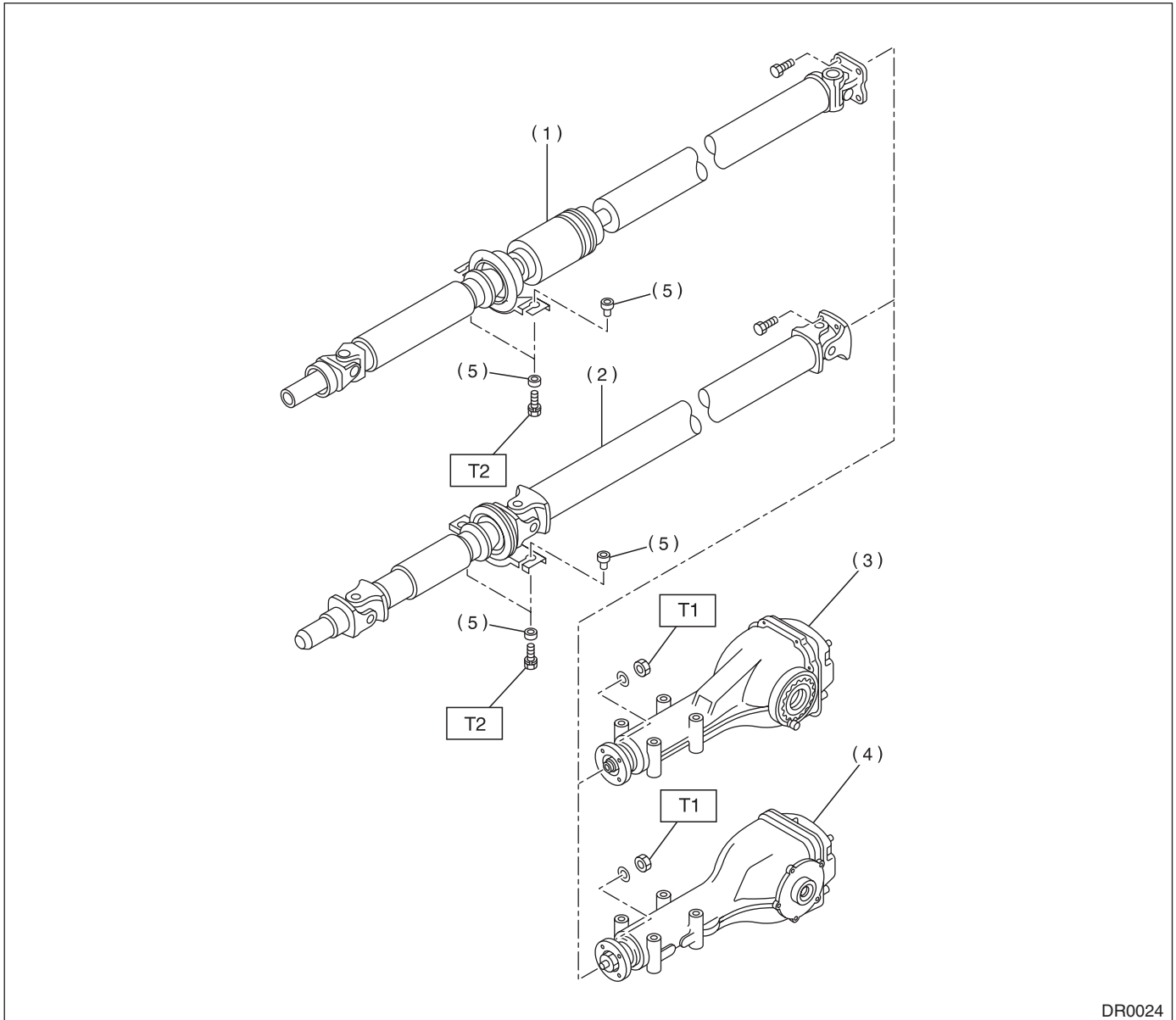
- | | | |
|-----------------------------|------------------------------|-------------------------------|
| (A) EBJ82/DOJ82 Sedan RH | (E) BJ79/DOJ79 Sedan R152R/L | (I) BJ79/DOJ79 Wagon R160RH |
| (B) EBJ82/DOJ82 Sedan LH | (F) BJ79/DOJ79 Wagon R152R/L | (J) BJ79/DOJ79 Wagon R160LH |
| (C) BJ79/DOJ79 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



DR0024

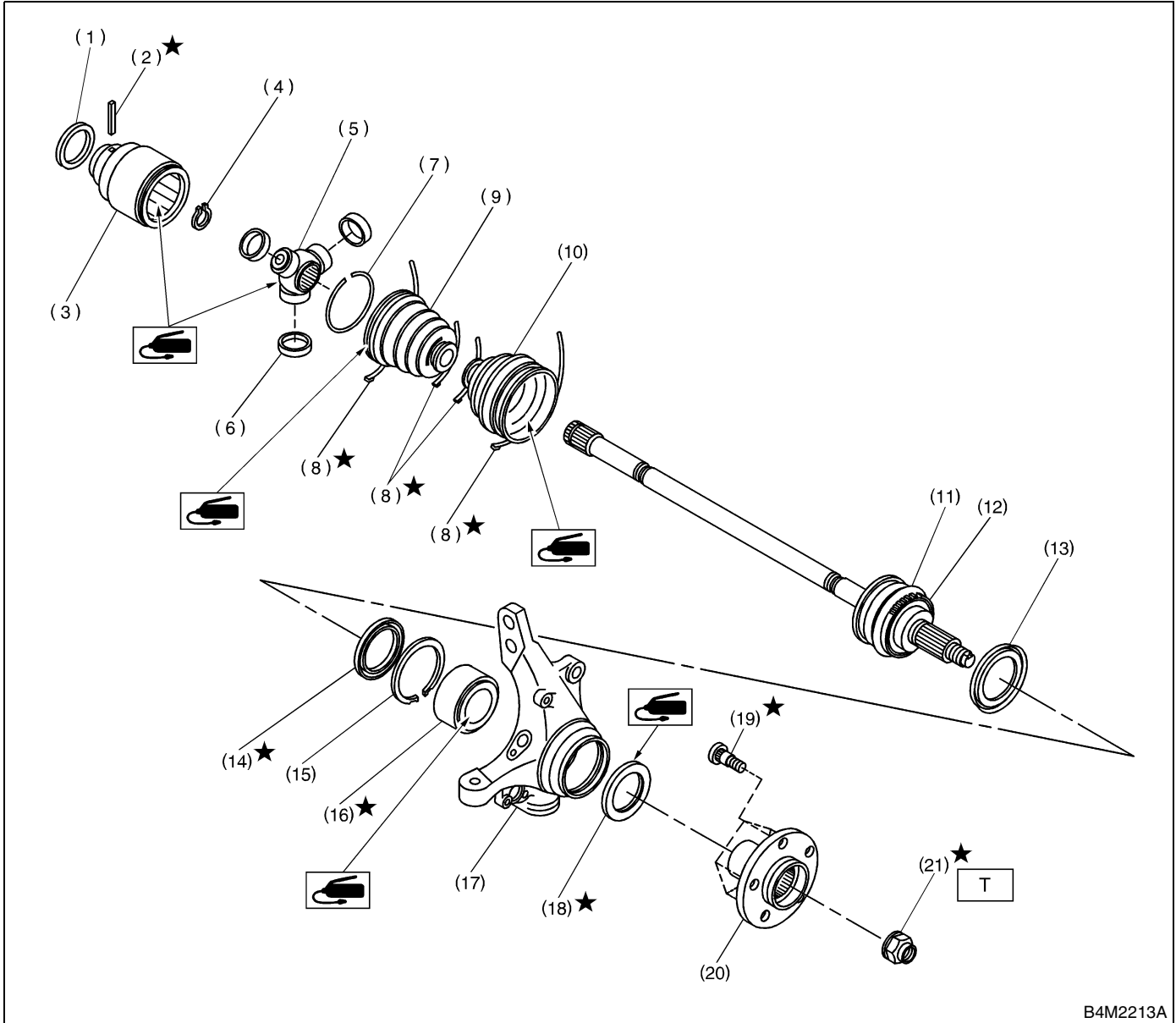
- | | |
|---------------------------------------|--------------------------------|
| (1) Propeller shaft (Turbo model) | (4) Rear differential (T-type) |
| (2) Propeller shaft (Non-Turbo model) | (5) Bush |
| (3) Rear differential (VA-type) | |

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) | (9) Boot (SFJ) | (17) Housing |
| (2) Spring pin ★ | (10) Boot (EBJ) | (18) Oil seal (OUT) |
| (3) Outer race (SFJ) | (11) EBJ ASSY | (19) Hub bolt |
| (4) Snap ring | (12) Tone wheel (With ABS) | (20) Hub |
| (5) Trunnion | (13) Baffle plate | (21) Axle nut |
| (6) Free ring | (14) Oil seal (IN) ★ | |
| (7) Circlip | (15) Snap ring | |
| (8) Boot band | (16) Bearing ★ | |

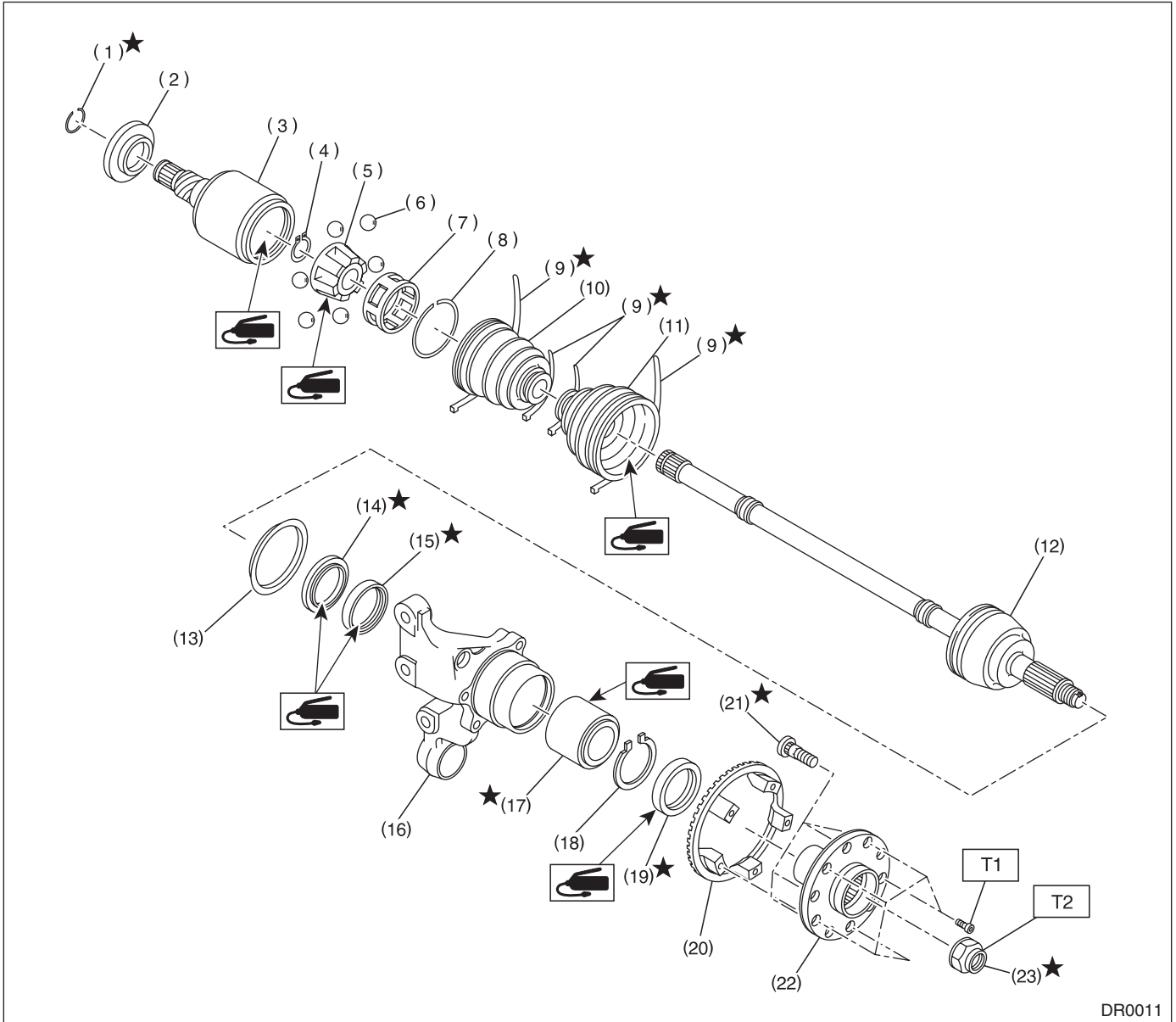
Tightening torque: N-m (kgf-m, ft-lb)

T: 186 (19, 137)

GENERAL DESCRIPTION

DRIVE SHAFT SYSTEM

3. REAR AXLE



DR0011

- | | |
|------------------------|--|
| (1) Circlip | (12) Non-Turbo: BJ ASSY
Turbo: EBJ ASSY |
| (2) Baffle plate (DOJ) | (13) Baffle plate (*) |
| (3) Outer race (DOJ) | (14) Oil seal (IN. No. 2) |
| (4) Snap ring | (15) Oil seal (IN. No. 3) |
| (5) Inner race | (16) Housing |
| (6) Ball | (17) Bearing |
| (7) Cage | (18) Snap ring |
| (8) Circlip | (19) Oil seal (OUT) |
| (9) Boot band | (20) Tone wheel (With ABS) |
| (10) Boot (DOJ) | (21) Hub bolt |
| (11) Boot (*) | |

- | |
|---------------|
| (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

C: CAUTION

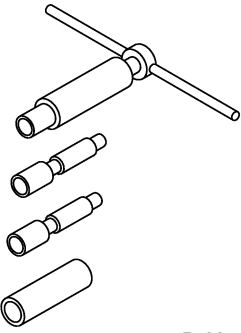
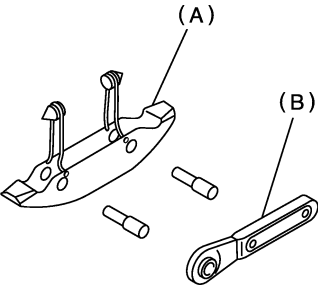
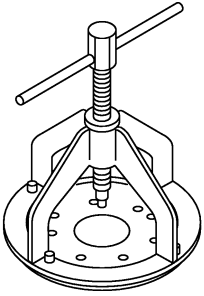
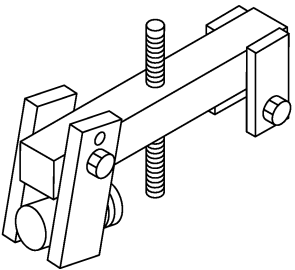
- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn your hands, because each part on the vehicle is hot after running.
- Use SUBARU genuine grease etc. or the equivalent. Do not mix grease etc. with that of another grade or from other manufacturers.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Apply grease onto sliding or revolution surfaces before installation.
- Before installing O-rings or snap rings, apply sufficient amount of grease to avoid damage and deformation.
- Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.

GENERAL DESCRIPTION

DRIVE SHAFT SYSTEM

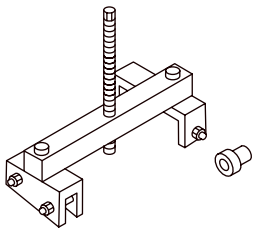
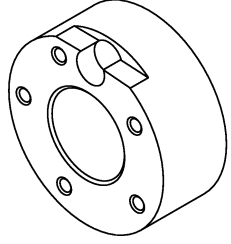
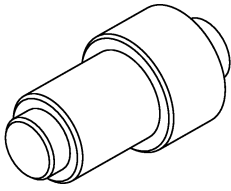
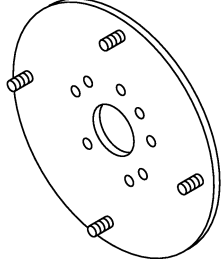
D: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: right;">B4M2386</p>	922431000	AXLE SHAFT INSTALLER	<ul style="list-style-type: none"> • Used for installing axle shaft into housing. • Used with ADAPTER (927390000).
 <p style="text-align: right;">B4N2387A</p>	925091000	BAND TIGHTENING TOOL	<ul style="list-style-type: none"> • Used for tightening boot band. (A) Jig for band (B) Ratchet wrench
 <p style="text-align: right;">B4M2388</p>	926470000	AXLE SHAFT PULLER	Used for removing axle shaft.
 <p style="text-align: right;">B4M2389</p>	927060000	HUB REMOVER	<ul style="list-style-type: none"> • Used for removing front hub. • Used with HUB STAND (927080000).

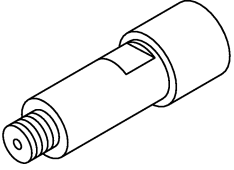
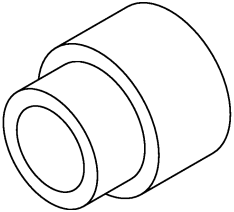
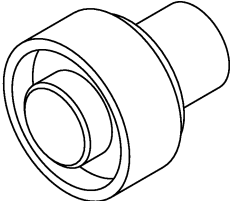
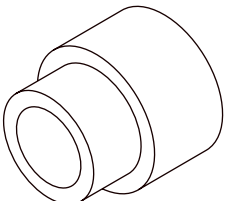
GENERAL DESCRIPTION

DRIVE SHAFT SYSTEM

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">H5M0981</p>	927420000	HUB REMOVER	<ul style="list-style-type: none"> • Used for removing rear hub. • Used with HUB STAND (927080000).
 <p style="text-align: center;">B4M2390</p>	927080000	HUB STAND	Used for disassembling and assembling hub bolt in hub.
 <p style="text-align: center;">B4M2391</p>	927100000	BEARING PULLER	<ul style="list-style-type: none"> • Used for disassembling and assembling front housing bearing. • Used with HOUSING STAND (927400000).
 <p style="text-align: center;">B4M2392</p>	927140000	AXLE SHAFT PULLER PLATE	Same as plate 2 included in AXLE SHAFT PULLER (926470000).

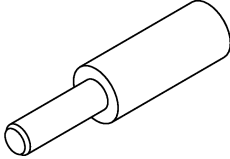
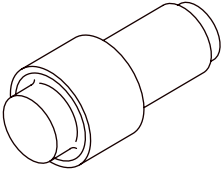
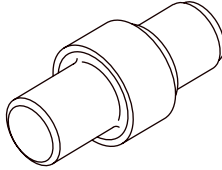
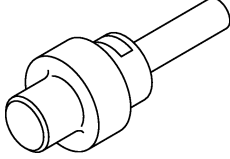
GENERAL DESCRIPTION

DRIVE SHAFT SYSTEM

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">B4M2393</p>	927390000	ADAPTER	Used as an adapter for AXLE SHAFT INSTALLER (922431000).
 <p style="text-align: center;">B4M2394</p>	927400000	HOUSING STAND	<ul style="list-style-type: none"> • Used for disassembling and assembling front housing bearing. • Used with BEARING PULLER (927100000).
 <p style="text-align: center;">B4M2395</p>	927410000	OIL SEAL INSTALLER	<ul style="list-style-type: none"> • Used for installing oil seal into front housing. • Used with HOUSING STAND (927400000).
 <p style="text-align: center;">H5M0982</p>	927430000	HOUSING STAND	<ul style="list-style-type: none"> • Used for disassembling and assembling rear housing bearing. • Used with BEARING PULLER (927440000).

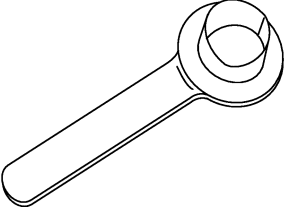
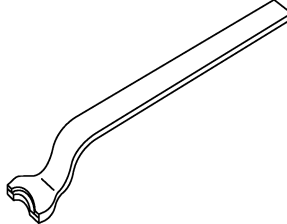
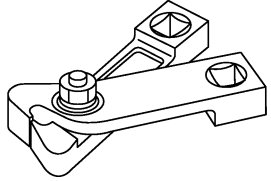
GENERAL DESCRIPTION

DRIVE SHAFT SYSTEM

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">B4M2399</p>	927120000	HUB INSTALLER	Used for installing hub.
 <p style="text-align: center;">H5M0983</p>	927440000	BEARING REMOVER	<ul style="list-style-type: none"> • Used for disassembling and assembling rear housing bearing. • Used with HOUSING STAND (927430000).
 <p style="text-align: center;">H5M0984</p>	927460000	OIL SEAL INSTALLER	<ul style="list-style-type: none"> • Used for installing outer bearing and sub bearing into holding. • Used with HOUSING STAND (927430000).
 <p style="text-align: center;">B4M2400</p>	927450000	HUB INSTALLER	<ul style="list-style-type: none"> • Used for installing hub unit into hub ASSY. • Used with BEARING SPACER (28499AE000) and HUB STAND (927080000).

GENERAL DESCRIPTION

DRIVE SHAFT SYSTEM

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B4M2401	28099PA090	OIL SEAL PROTECTOR	<ul style="list-style-type: none"> • 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

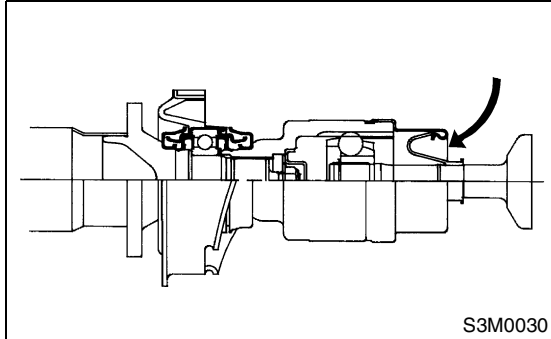
TOOL NAME	REMERKS
Puller	Used for removing ball joint from knuckle arm.
Dial gauge	Used for inspecting propeller shaft run-out.
Snap ring pliers	Used for installing and removing snap ring.

2. Propeller Shaft

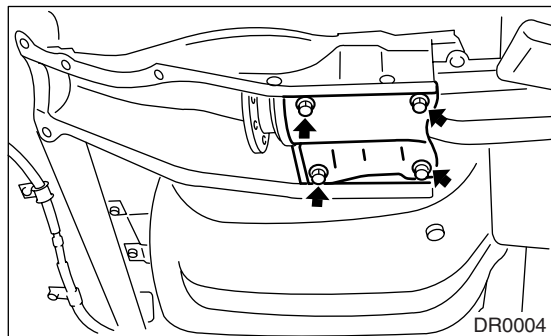
A: REMOVAL

NOTE:

- Before removing the propeller shaft, wrap the metal parts with a cloth or rubber material.
- In case of DOJ type, before removing the propeller shaft, wrap the 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.



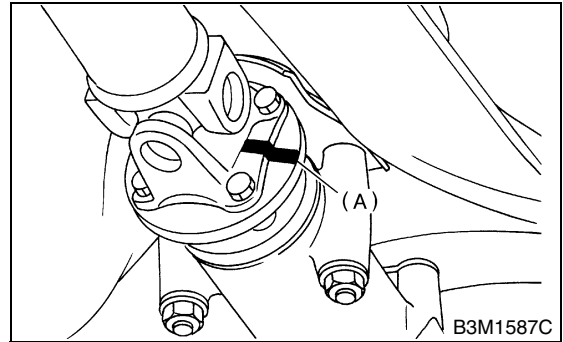
- 1) Disconnect the ground cable from battery.
- 2) Move the select lever or gear shift lever to "N".
- 3) Release the parking brake.
- 4) Jack-up the vehicle and support it with sturdy racks.
- 5) Remove the center exhaust pipes.
- 6) Remove the rear exhaust pipe and muffler.
- 7) Remove the differential mount front cover.



- 8) Remove the four bolts which hold propeller shaft to rear differential.

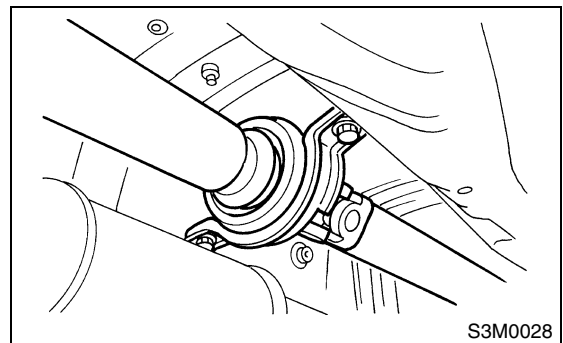
NOTE:

- Put matching marks 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.



PROPELLER SHAFT

DRIVE SHAFT SYSTEM

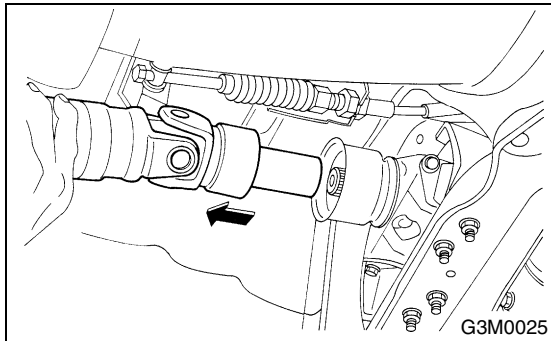
10) Remove the propeller shaft from transmission.

CAUTION:

- Be careful not to damage the 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 the propeller shaft.

NOTE:

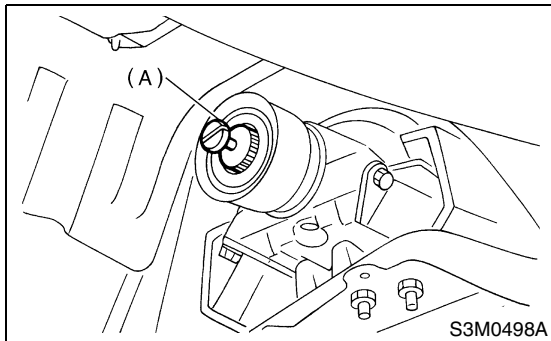
- Be sure to use an empty oil can to catch oil flowing out when removing the propeller shaft.
- Be sure to plug the opening in transmission after removal of propeller shaft.



11) Install the extension cap to transmission.

NOTE:

If the extension cap is not available, place a vinyl bag over opening and fasten with string to prevent gear oil or ATF from leaking.



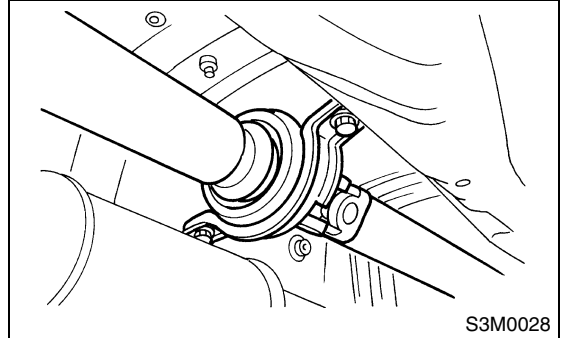
(A) Extension cap

B: INSTALLATION

1) Insert the sleeve yoke into transmission, and then attach the center bearing to body.

Tightening torque:

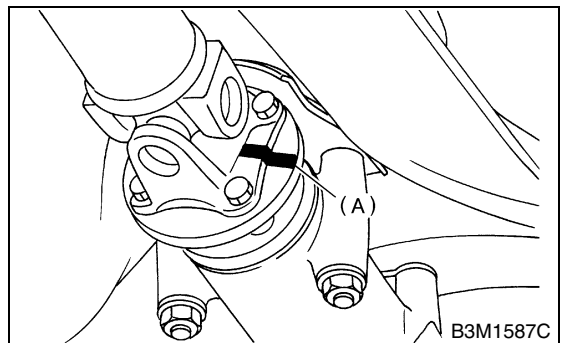
52 N·m (5.3 kgf-m, 38.3 ft-lb)



2) Align the matching marks, and then connect the flange yoke and rear differential.

Tightening torque:

31 N·m (3.2 kgf-m, 23.1 ft-lb)

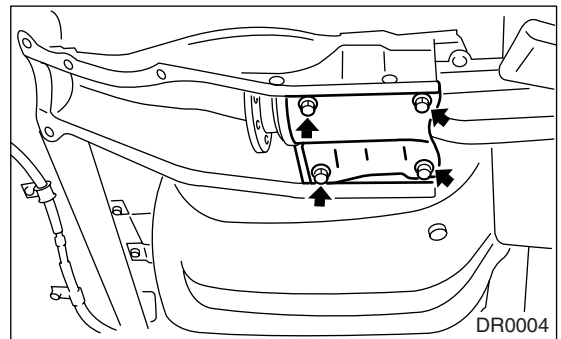


(A) Matching mark

3) Install the differential mount front cover.

Tightening torque:

88 N·m (9.0 kgf-m, 65 ft-lb)



4) Install the center exhaust pipes.

5) Install the rear exhaust pipe and muffler.

C: INSPECTION

NOTE:

Do not disassemble the 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

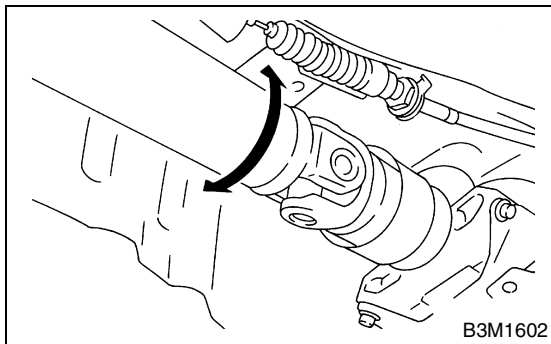
Check the following points with propeller shaft installed in vehicle.

1. JOINTS AND CONNECTIONS

- 1) Remove the center exhaust pipes.
- 2) Remove the heat shield cover.
- 3) Check for any looseness of the yoke flange connecting bolts and center bearing retaining bolts.

2. SPLINES AND BEARING LOCATIONS

- 1) Remove the center exhaust pipes.
- 2) Remove the rear exhaust pipe and muffler.
- 3) Remove the heat shield cover.
- 4) Turn the propeller shaft by hand to see if abnormal free play exists at splines. Also move the yokes to see if abnormal free play exists at spiders and bearings.



3. RUNOUT OF PROPELLER SHAFT

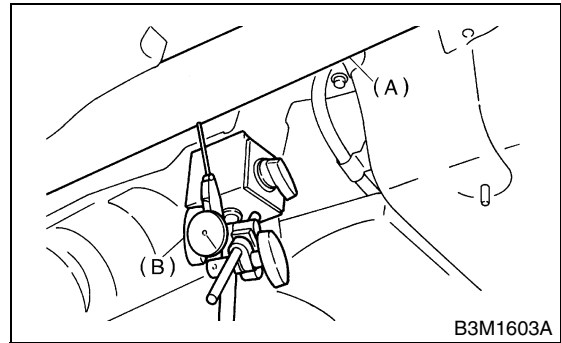
- 1) Remove the center exhaust pipes.
- 2) Remove the rear exhaust pipe and muffler.
- 3) Remove the heat shield cover.
- 4) Turn the rear wheels by hand to check for "runout" of propeller shaft.

NOTE:

Measure the runout with a dial gauge at the center of front and rear propeller shaft tubes.

Runout:

Limit 0.6 mm (0.024 in)

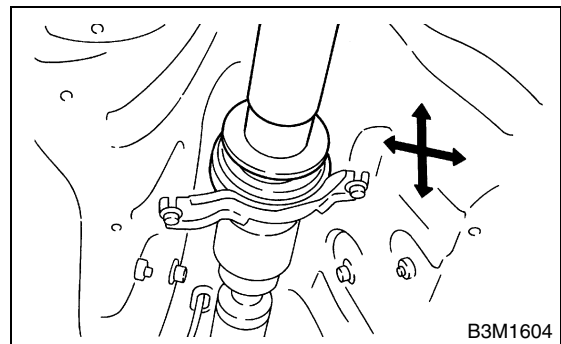


(A) Propeller shaft

(B) Dial gauge

4. CENTER BEARING FREE PLAY

- 1) Remove the front and center exhaust pipes.
- 2) Remove the rear exhaust pipe and muffler.
- 3) Remove the heat shield cover.
- 4) While holding the 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.



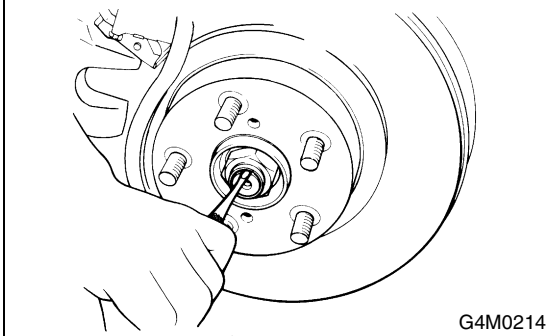
FRONT AXLE

DRIVE SHAFT SYSTEM

3. Front Axle

A: REMOVAL

- 1) Jack-up the vehicle, support it with safety stands, and remove the front wheels.
- 2) Unlock the axle nut.

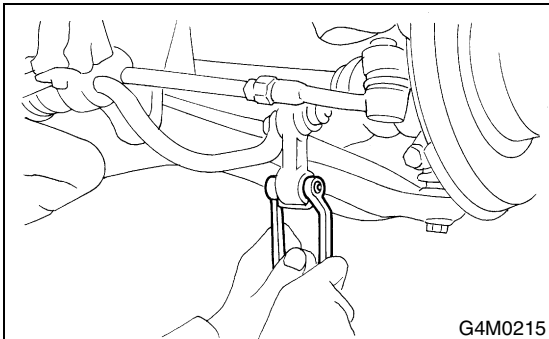


- 3) Remove the axle nut using a socket wrench.

CAUTION:

Be sure to loose and retighten the axle nut after removing wheel from the vehicle. Failure to follow this rule may damage the wheel bearings.

- 4) Remove the stabilizer link.



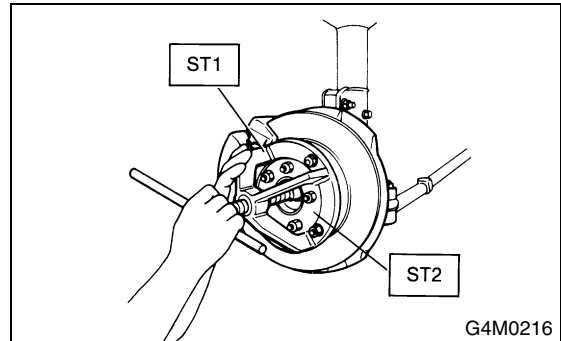
- 5) Remove the disc brake caliper from housing, and suspend it from strut using a wire.

- 6) Remove the front drive shaft assembly from hub. If it is hard to remove, use the STs.

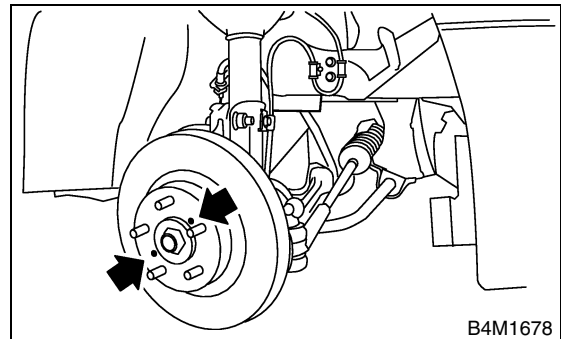
ST1 926470000 AXLE SHAFT PULLER
ST2 927140000 AXLE SHAFT PULLER PLATE

CAUTION:

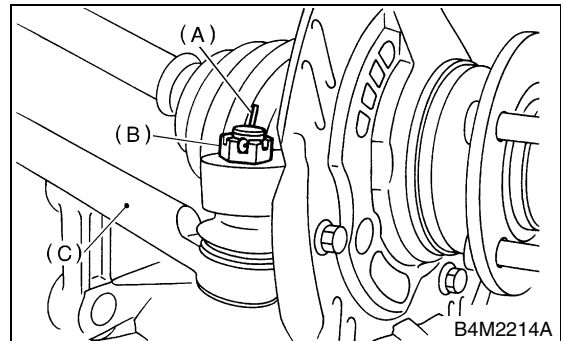
- Be careful not to damage the oil seal lip when removing front drive shaft.
- When replacing the front drive shaft, also replace inner oil seal.



- 7) Remove the disc rotor from hub. If the disc rotor seizes up within hub, drive disc rotor out by installing an 8-mm bolt in screw hole on the rotor.

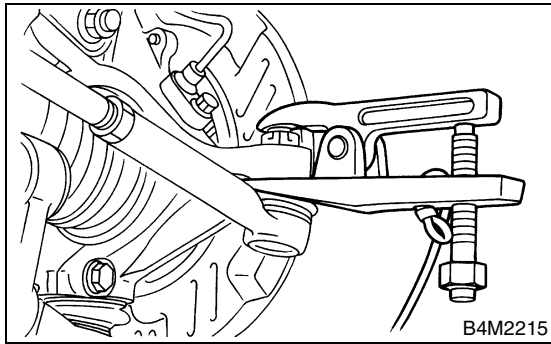


- 8) Remove the cotter pin and castle nut which secure tie-rod end to housing knuckle arm.

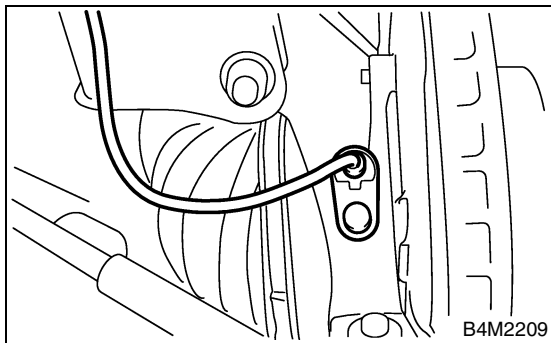


- (A) Cotter pin
- (B) Castle nut
- (C) Tie-rod

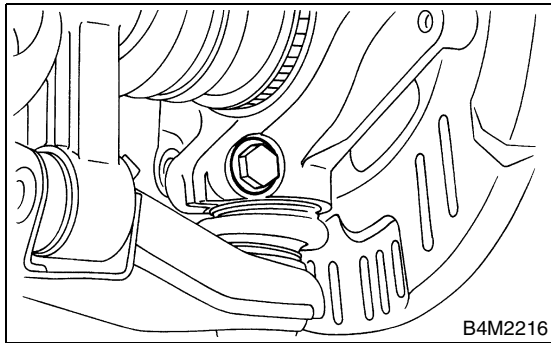
9) Using a puller, remove the tie-rod ball joint from knuckle arm.



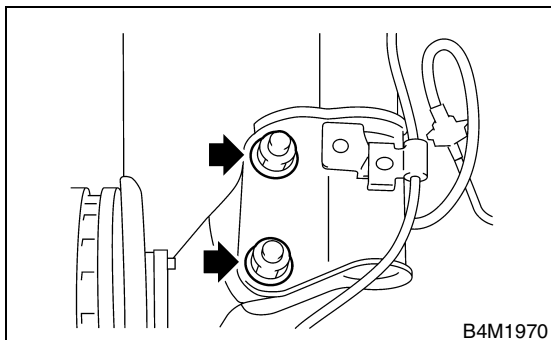
10) On ABS equipped models, remove the ABS sensor assembly and harness in advance.



11) Remove the transverse link ball joint from housing.



12) After scribing an alignment mark on the camber adjusting bolt head, remove the bolts which connect housing and strut, and disconnect housing from strut.



B: INSTALLATION

1) Install the transverse link ball joint to housing.

Tightening torque:
49 N·m (5.0 kgf-m, 36 ft-lb)

2) While aligning the alignment mark on the 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 the ABS sensor on housing (only vehicle equipped with ABS).

Tightening torque:
32 N·m (3.3 kgf-m, 23.9 ft-lb)

4) Install the disc rotor on hub.

5) Install the disc brake caliper on housing.

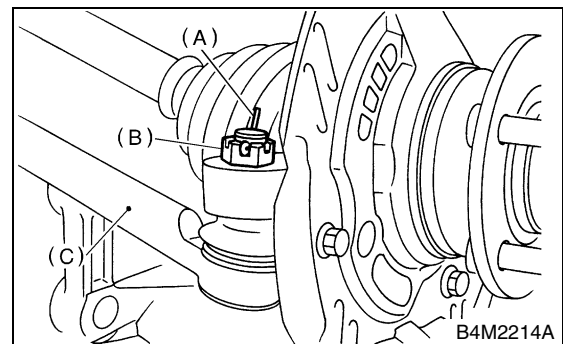
Tightening torque:
78 N·m (8 kgf-m, 57.9 ft-lb)

6) Install the front drive shaft. <Ref. to DS-33, INSTALLATION, Front Drive Shaft.>

7) Connect the stabilizer link.

8) Connect the tie-rod end ball joint and knuckle arm with a castle nut, and then insert the 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

FRONT AXLE

DRIVE SHAFT SYSTEM

9) While depressing the brake pedal, tighten the axle nut and lock it securely.

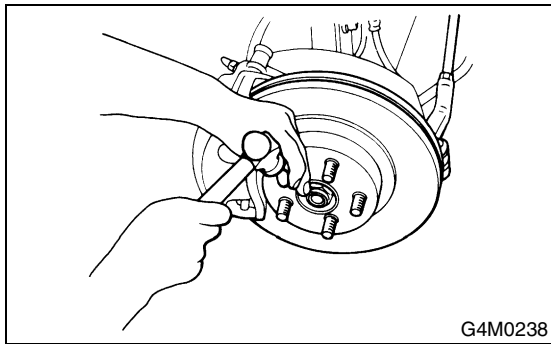
Tightening torque:

186 N·m (19 kgf-m, 137 ft-lb)

CAUTION:

- Use a new axle nut.
- Always tighten the axle nut before installing wheel on the vehicle. If the wheel is installed and comes in contact with ground when axle nut is loose, wheel bearings may be damaged.
- Be sure to tighten the axle nut to specified torque. Do not overtighten it as this may damage wheel bearing.

10) After tightening the axle nut, lock it securely.



11) Install the wheel and tighten wheel nuts to specified torque.

Tightening torque:

88 N·m (9 kgf-m, 65 ft-lb)

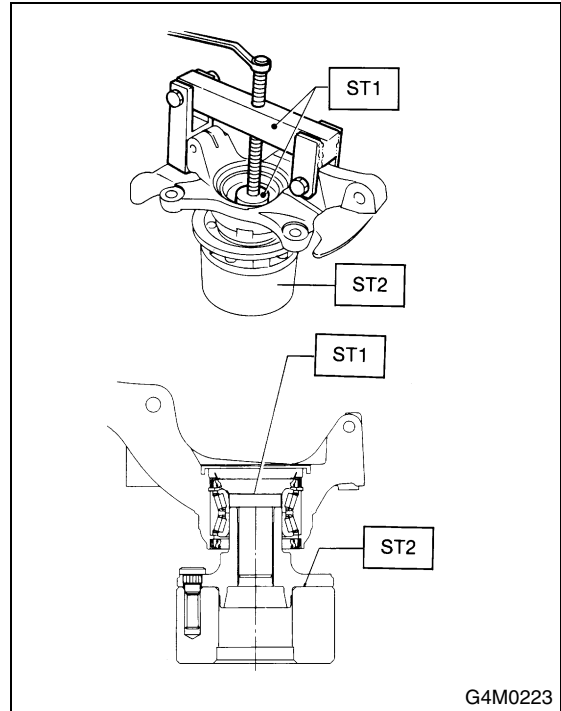
C: DISASSEMBLY

1) Using the ST1, support the housing and hub securely.

2) Attach the ST2 to housing and drive hub out.

ST1 927060000 HUB REMOVER

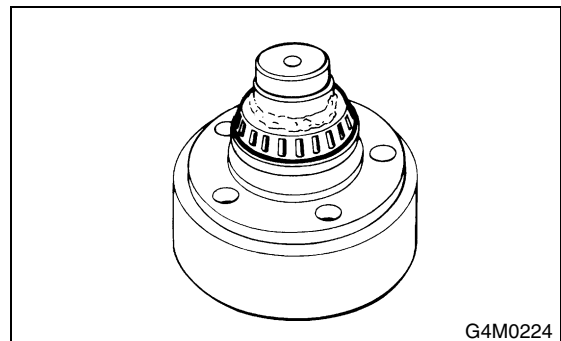
ST2 927080000 HUB STAND



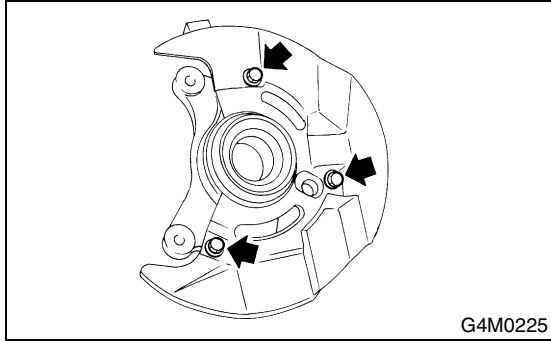
If inner bearing race remains in the hub, remove it with a suitable tool (commercially available).

CAUTION:

- Be careful not to scratch the polished area of hub.
- Be sure to install the inner race on the side of outer race from which it was removed.



3) Remove the disc cover from housing.



4) Using a standard screwdriver, remove the outer and inner oil seals.

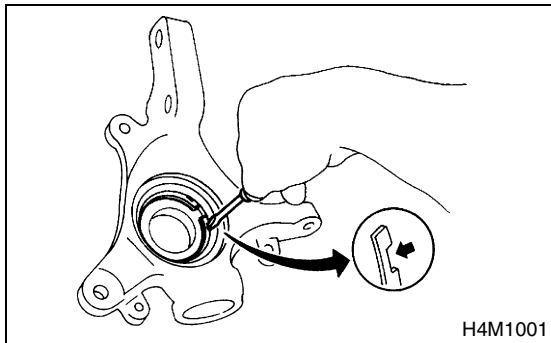
CAUTION:

Do not use old oil seals.

5) Using a flat bladed screwdriver, remove the snap ring.

CAUTION:

Be careful not to damage the housing at removal.



6) Using the ST1, support the housing securely.

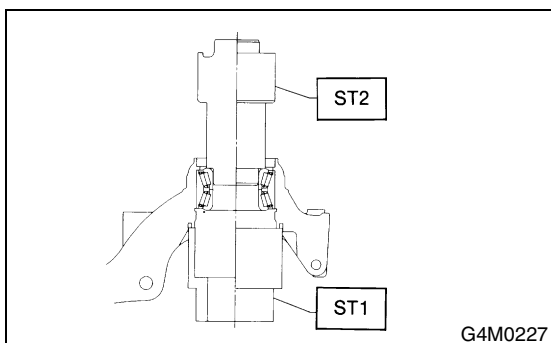
7) Using the ST2, press the inner race to drive out outer bearing.

ST1 927400000 HOUSING STAND

ST2 927100000 BEARING PULLER

CAUTION:

- Do not remove the outer race unless it is faulty.
- Discard the outer race after removal.
- Do not replace the inner or outer race separately; always replace as a unit.

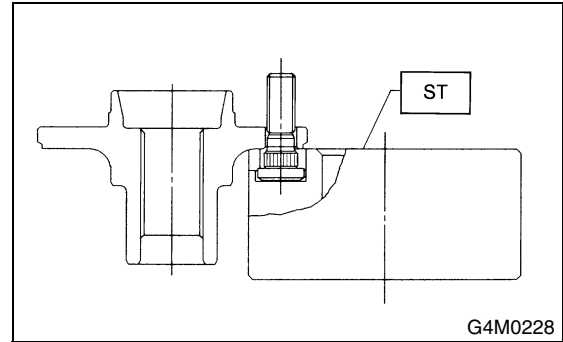


8) Using the ST and a hydraulic press, drive the hub bolts out.

ST 927080000 HUB STAND

CAUTION:

Be careful not to hammer the hub bolts. This may deform the hub.



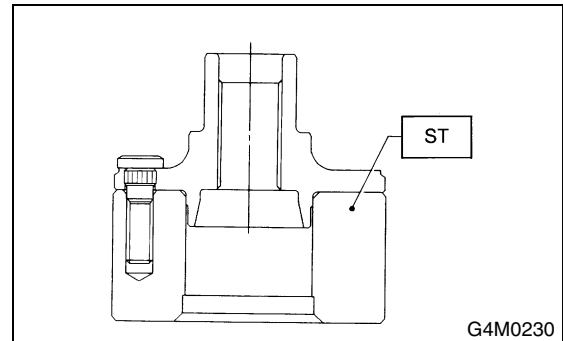
D: ASSEMBLY

CAUTION:

When the hub is to be removed from housing, replace the bearing set and oil seal with new ones.

1) Attach the hub to ST securely.

ST 927080000 HUB STAND



2) Using a hydraulic press, press the new hub bolts into place.

CAUTION:

Be sure to press the 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.

FRONT AXLE

DRIVE SHAFT SYSTEM

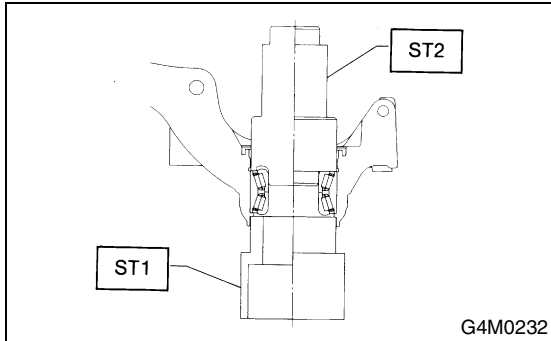
4) Using the ST1 and ST2, press a new bearing into place.

ST1 927400000 HOUSING STAND
ST2 927100000 BEARING PULLER

CAUTION:

- Always press the outer race when installing bearing.
- Be careful not to remove the plastic lock from inner race when installing bearing.
- Charge the bearing with new grease when outer race is not removed.

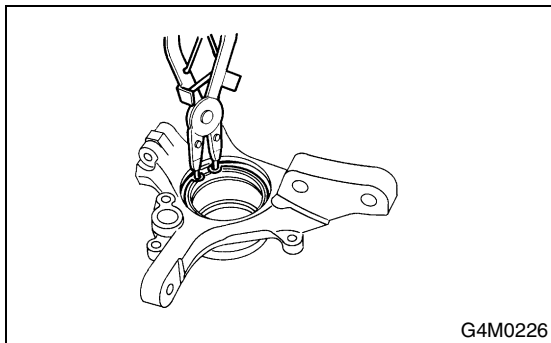
Specified grease:
SHELL 6459N



5) Using pliers, install the snap ring in its groove.

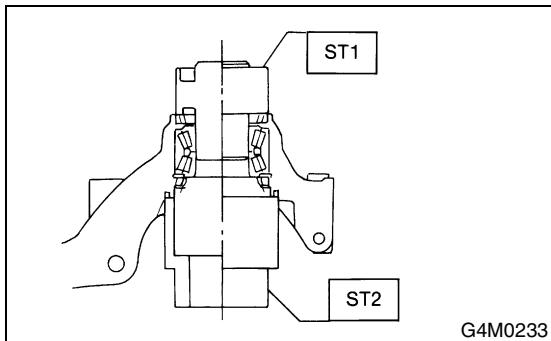
CAUTION:

Make sure to install it firmly to groove.



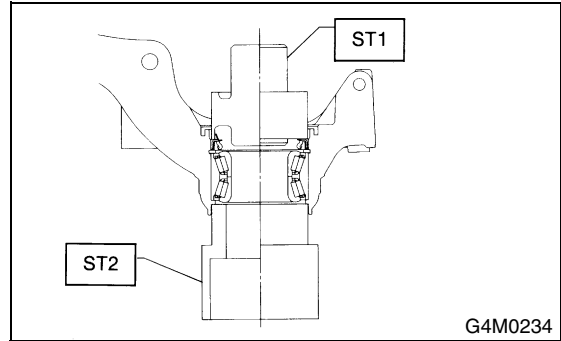
6) Using the ST1 and ST2, press the outer oil seal until it contacts the bottom of housing.

ST1 927410000 OIL SEAL INSTALLER
ST2 927400000 HOUSING STAND



7) Using the ST1 and ST2, press the inner oil seal until it contacts circlip.

ST1 927410000 OIL SEAL INSTALLER
ST2 927400000 HOUSING STAND



8) Invert the ST and housing.

ST 927400000 HOUSING STAND

9) Apply sufficient grease to the oil seal lip.

Specified grease:
SHELL 6459N

CAUTION:

- If specified grease is not available, remove the bearing grease and apply Auto Rex A instead.
- Do not mix different types of grease.

10) Install the disc cover to housing the three bolts.

Tightening torque:

18 N·m (1.8 kgf·m, 13.0 ft·lb)

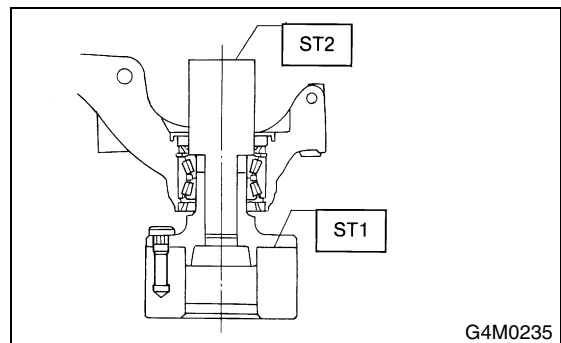
11) Attach the hub to ST1 securely.

12) Clean dust or foreign particles from the polished surface of hub.

13) Using the ST2, press the bearing into hub by driving inner race.

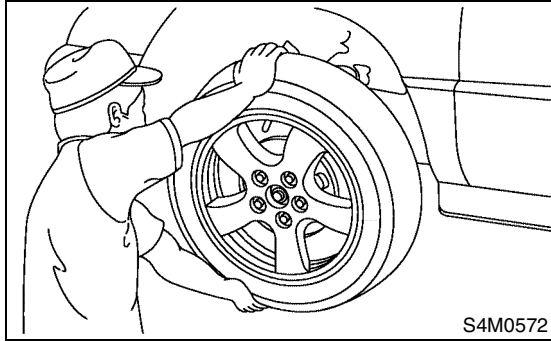
ST1 927080000 HUB STAND

ST2 927120000 HUB INSTALLER



E: INSPECTION

1) Moving the front tire up and down by hand, check that there is no backlash in the bearing, and check that the wheel rotates smoothly.



2) Inspect the removed parts for wear and damage. If defective, replace with new ones.

4. Rear Axle

A: REMOVAL

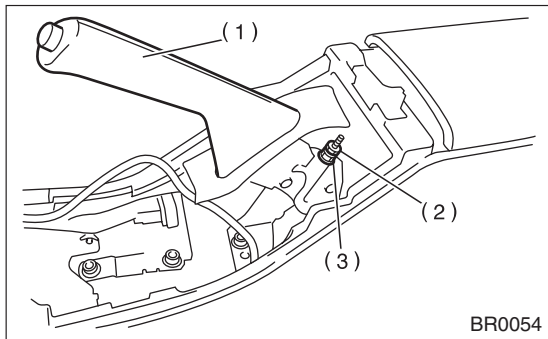
1. DISC BRAKE

- 1) Disconnect the ground cable from battery.
- 2) Jack-up the vehicle, and remove the rear wheel cap and wheels.

CAUTION:

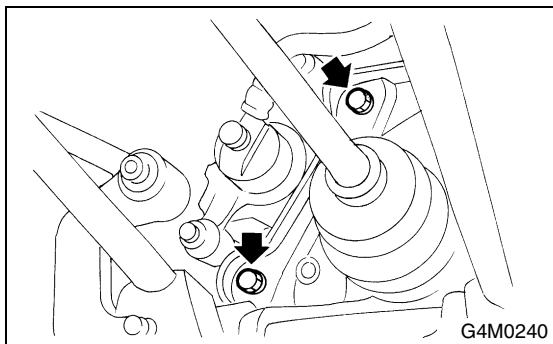
Be sure to loosen and retighten the axle nut after removing the wheel from vehicle. Failure to follow this rule may damage the wheel bearings.

- 3) Unlock the axle nut.
- 4) Remove the axle nut using a socket wrench.
- 5) Return the parking brake lever and loosen adjusting nut.



- (1) Parking brake lever
- (2) Lock nut
- (3) Adjusting nut

- 6) Remove the disc brake caliper from back plate, and suspend it from strut using a piece of wire.

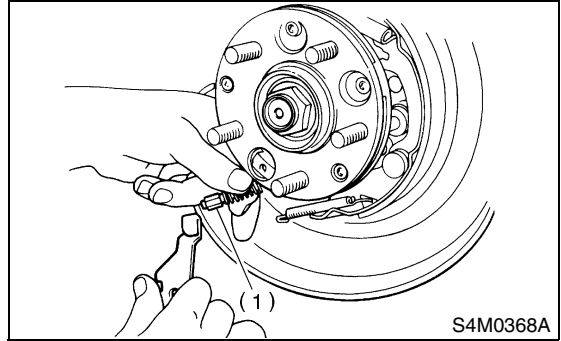


- 7) Remove the disc rotor from hub.

NOTE:

If the disc rotor seizes up within hub, drive it out by installing an 8-mm bolt into bolt hole in disc rotor.

- 8) Disconnect the parking brake cable end.



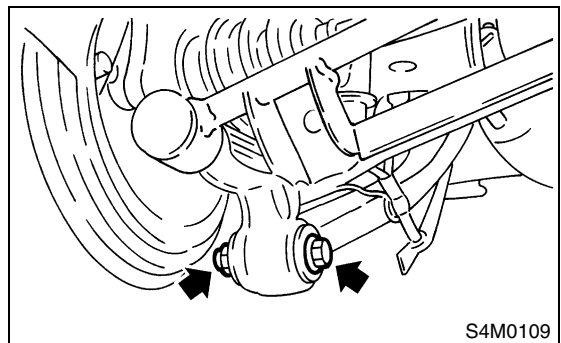
- (1) Cable end

- 9) Disconnect the rear stabilizer from rear lateral link.

- 10) Remove the bolts which secure trailing link assembly to rear housing.

CAUTION:

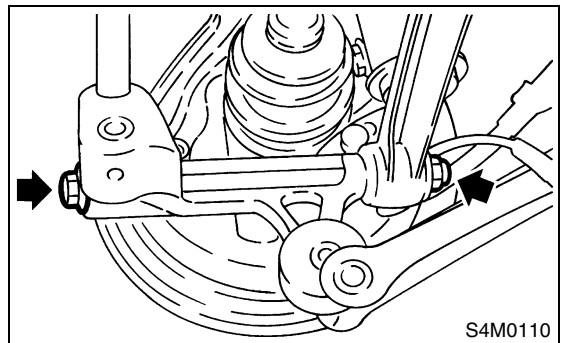
Discard the old self-locking nut. Replace with a new one.



- 11) Remove the bolts which secure lateral assembly to rear housing.

CAUTION:

Discard the old self-locking nut. Replace with a new one.



12) Disengage the BJ from housing splines, and then remove the rear drive shaft assembly.

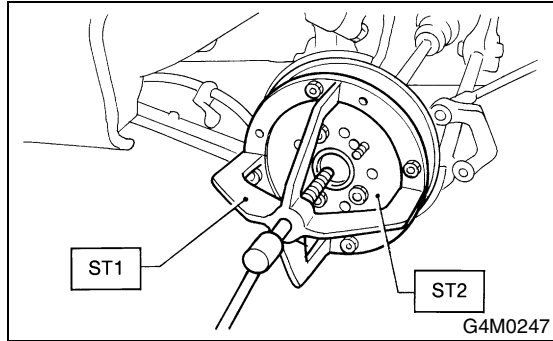
If it is hard to remove, use the STs.

ST1 926470000 AXLE SHAFT PULLER

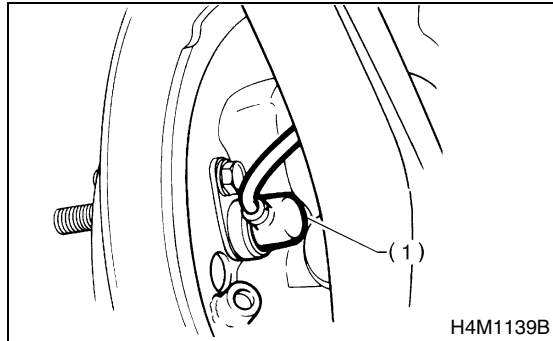
ST2 927140000 AXLE SHAFT PULLER
PLATE

CAUTION:

- Be careful not to damage the oil seal lip when removing rear drive shaft.
- When the rear drive shaft is to be replaced, also replace the inner oil seal with a new one.

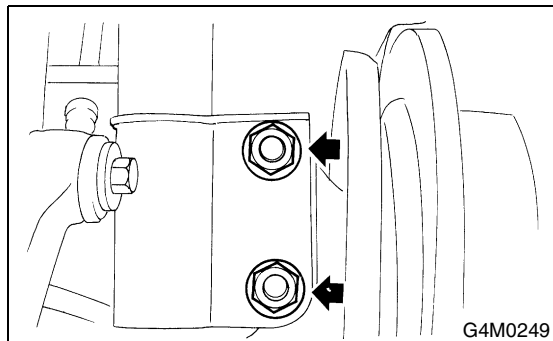


13) Remove the rear ABS sensor from back plate (only vehicle equipped with ABS).



(1) ABS sensor

14) Remove the bolts which secure rear housing to strut, and separate the two.



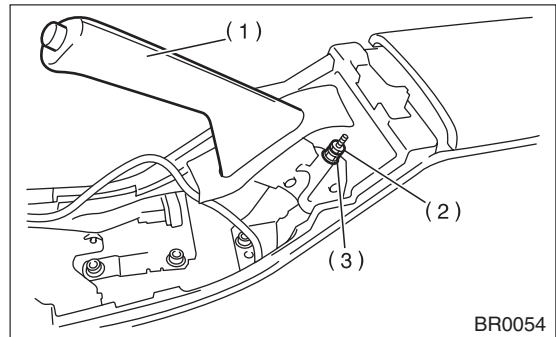
2. DRUM BRAKE

- 1) Disconnect the ground cable from battery.
- 2) Jack-up the vehicle, and remove rear wheel cap and wheels.

CAUTION:

Be sure to loosen and retighten the axle nut after removing the wheel from vehicle. Failure to follow this rule may damage the wheel bearings.

- 3) Unlock the axle nut.
- 4) Remove the axle nut using a socket wrench.
- 5) Return the parking brake lever and loosen adjusting nut.



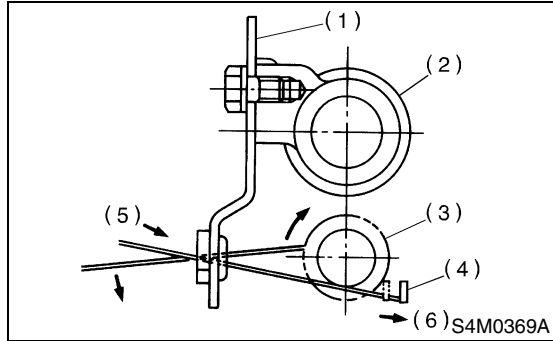
- (1) Parking brake lever
- (2) Lock nut
- (3) Adjusting nut

6) Remove the brake drum from hub.

REAR AXLE

DRIVE SHAFT SYSTEM

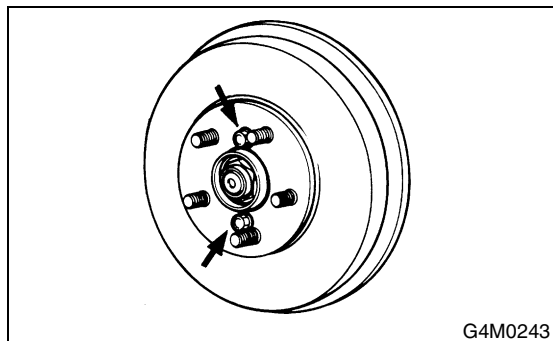
7) If it is difficult to remove the brake drum, remove the adjusting hole cover from back plate, and then turn the adjusting screw using a slot-type screwdriver until brake shoe separates from the drum.



- (1) Back plate
- (2) Wheel cylinder
- (3) Adjuster ASSY pawls
- (4) Adjusting lever
- (5) Tightening direction
- (6) Push

NOTE:

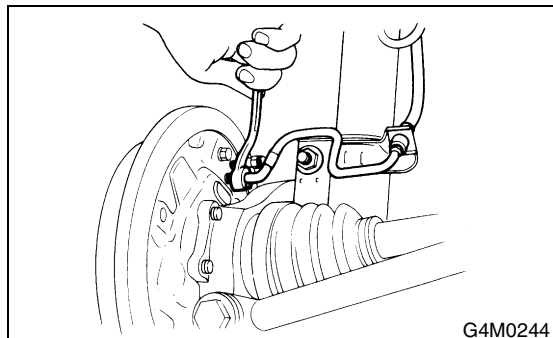
If the brake drum is difficult to remove, drive it out by installing an 8-mm bolt into bolt hole in brake drum.



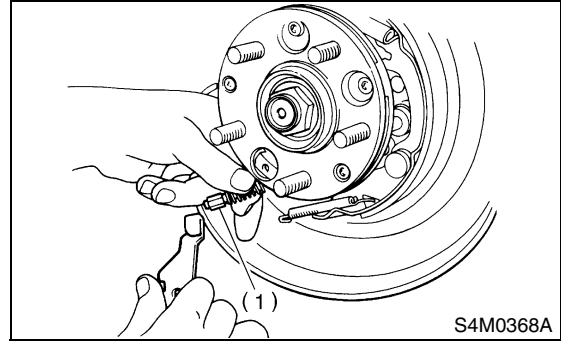
8) Using a flare-nut wrench, disconnect the brake pipe from wheel cylinder.

CAUTION:

Cover the open end of wheel cylinder to prevent entry of foreign particles.



9) Disconnect the parking brake cable end.



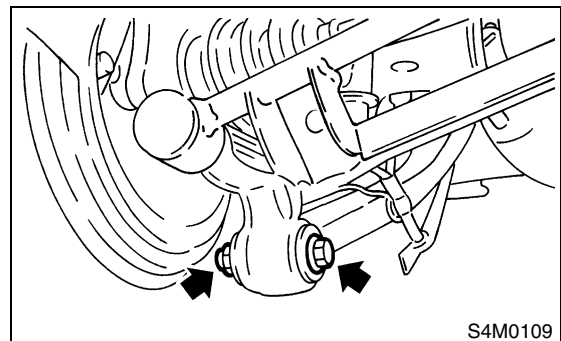
- (1) Cable end

10) Disconnect the rear stabilizer from rear lateral link.

11) Remove the bolts which secure trailing link assembly to rear housing.

CAUTION:

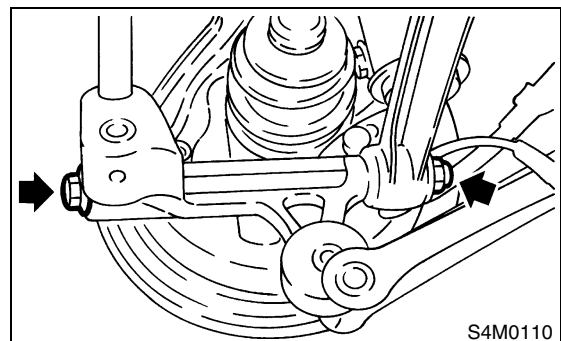
Discard the old self-locking nut. Replace with a new one.



12) Remove the bolts which secure lateral link assembly to rear housing.

CAUTION:

Discard the old self-locking nut. Replace with a new one.



13) Disengage the BJ from housing splines, and remove the rear drive shaft assembly.

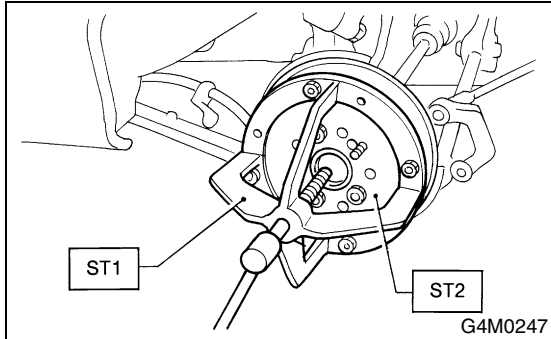
If it is hard to remove, use the STs.

ST1 926470000 AXLE SHAFT PULLER

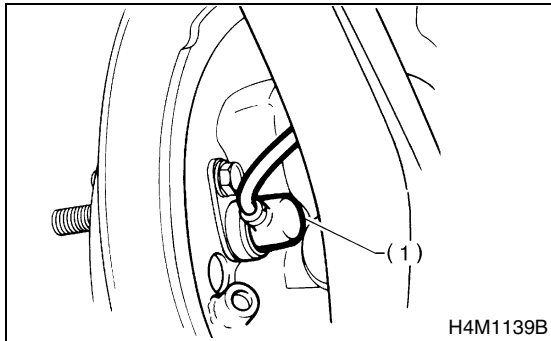
ST2 927140000 AXLE SHAFT PULLER
PLATE

CAUTION:

- Be careful not to damage the oil seal lip when removing rear drive shaft.
- When the rear drive shaft is to be replaced, also replace the inner oil seal with a new one.

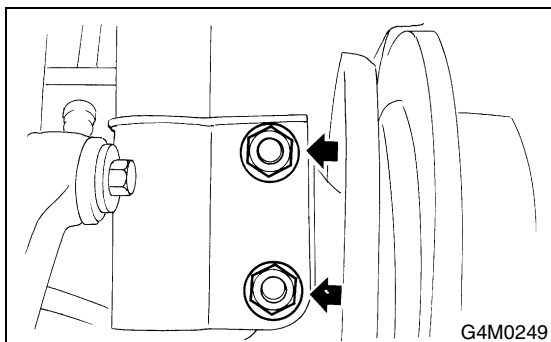


14) Remove the rear ABS sensor from back plate (only vehicle equipped with ABS).



(1) ABS sensor

15) Remove the bolts which secure rear housing to strut, and separate the two.



B: INSTALLATION

1. DISC BRAKE

1) Connect the 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 the BJ (bell joint) to rear housing splines.

CAUTION:

Be careful not to damage the inner oil seal lip.

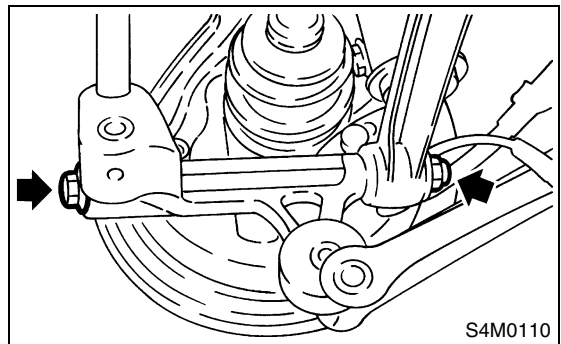
3) Connect the rear housing assembly to lateral link assembly.

CAUTION:

Use a new self-locking nut.

Tightening torque:

137 N·m (14 kgf·m, 101 ft·lb)



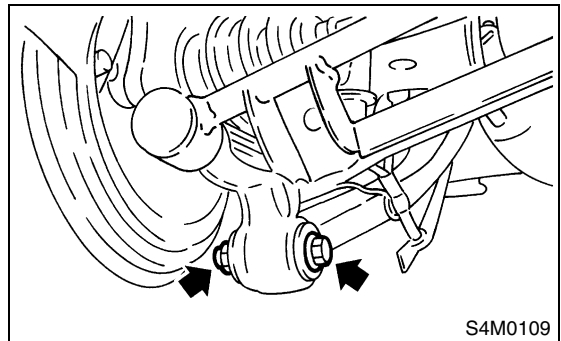
4) Connect the rear housing assembly to trailing link assembly.

CAUTION:

Use a new self-locking nut.

Tightening torque:

113 N·m (11.5 kgf·m, 83 ft·lb)



5) Connect the 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)

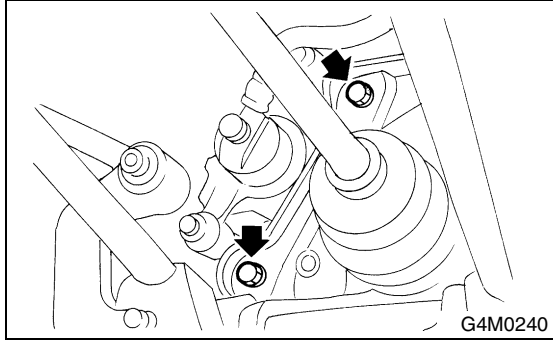
REAR AXLE

DRIVE SHAFT SYSTEM

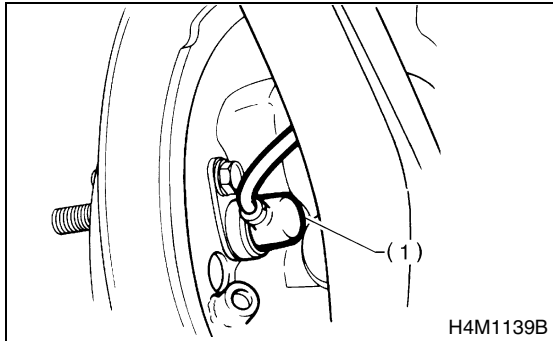
- 6) Connect the parking brake cable to parking brake.
- 7) Install the disc rotor on rear housing assembly.
- 8) Install the disc brake caliper on back plate.

Tightening torque:

52 N·m (5.3 kgf-m, 38.3 ft-lb)



- 9) Install the rear ABS sensor and brake cable bracket (only vehicle equipped with ABS).



(1) ABS sensor

- 10) Bleed the air from brake system. <Ref. to BR-55, REPLACEMENT, Brake Fluid.>
- 11) Adjust the parking brake lever stroke by turning adjuster.
- 12) Move the brake lever back to apply brakes. While depressing the brake pedal, tighten axle nut using a socket wrench. Lock the axle nut after tightening.

Tightening torque:

186 N·m (19 kgf-m, 137 ft-lb)

CAUTION:

- Use a new axle nut.
- Always tighten the axle nut before installing wheel on the vehicle. If the wheel is installed and comes in contact with ground when axle nut is loose, wheel bearings may be damaged.
- Be sure to tighten the axle nut to specified torque. Do not overtighten it as this may damage the wheel bearing.

- 13) Install the wheel, and then tighten the wheel nuts to specified torque.

Tightening torque:

88 N·m (9.0 kgf-m, 65 ft-lb)

2. DRUM BRAKE

- 1) Connect the 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 the BJ (bell joint) to rear housing splines.

CAUTION:

Be careful not to damage the inner oil seal lip.

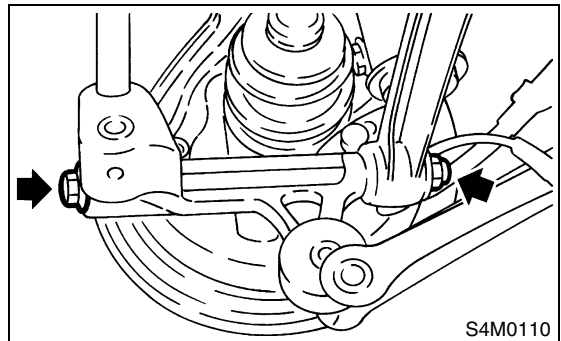
- 3) Connect the rear housing assembly to lateral link assembly.

CAUTION:

Use a new self-locking nut.

Tightening torque:

137 N·m (14 kgf-m, 101 ft-lb)



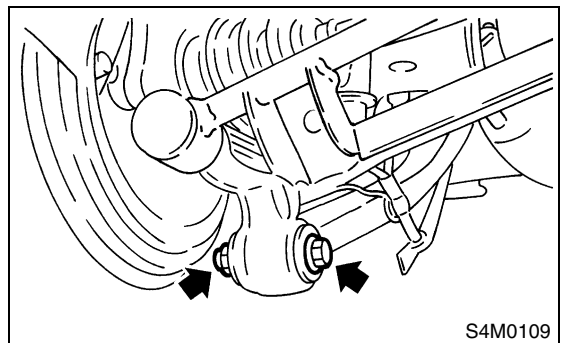
- 4) Connect the rear housing assembly to trailing link assembly.

CAUTION:

Use a new self-locking nut.

Tightening torque:

113 N·m (11.5 kgf-m, 83 ft-lb)



5) Connect the rear stabilizer to rear lateral link.

CAUTION:

Use a new self-locking nut.

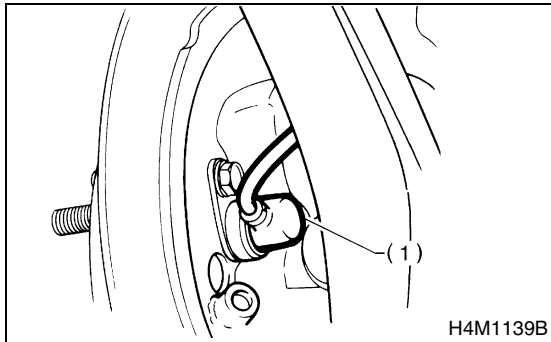
Tightening torque:

44 N·m (4.5 kgf·m, 32.5 ft·lb)

6) Connect the parking brake cable to parking brake.

7) Clean the brake pipe connection. Using a flare-nut wrench, connect the brake pipe to wheel cylinder.

8) Connect the rear ABS sensor to back plate (only vehicle equipped with ABS).



(1) ABS sensor

9) Connect the parking brake cable to lever.

10) Install the brake drum on rear housing assembly.

11) Bleed the air from brake system. <Ref. to BR-55, REPLACEMENT, Brake Fluid.>

12) Adjust the parking brake lever stroke by turning adjuster.

13) Move the brake lever back to apply brakes. While depressing the brake pedal, tighten axle nut using a socket wrench. Lock the axle nut after tightening.

Tightening torque:

186 N·m (19 kgf·m, 137 ft·lb)

CAUTION:

- Use a new axle nut.
- Always tighten the axle nut before installing wheel on the vehicle. If the wheel is installed and comes in contact with ground when axle nut is loose, wheel bearings may be damaged.
- Be sure to tighten the axle nut to specified torque. Do not overtighten it as this may damage the wheel bearing.

14) Install the wheel, and then tighten the wheel nuts to specified torque.

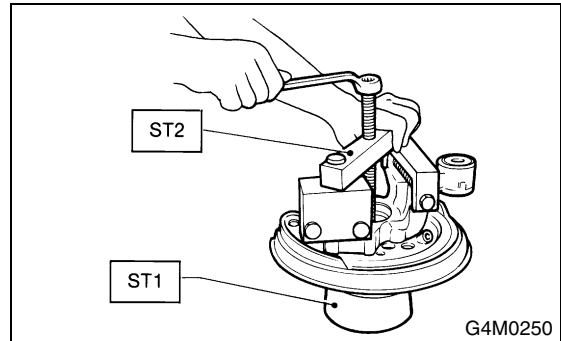
Tightening torque:

88 N·m (9.0 kgf·m, 65 ft·lb)

C: DISASSEMBLY

1) Using the ST1 and ST2, remove the hub from rear housing.

- | | |
|--------------|-------------|
| ST 927080000 | HUB STAND |
| ST 927420000 | HUB REMOVER |



2) Remove the back plate from rear housing

3) Using a standard screwdriver, remove the outer and inner oil seals.

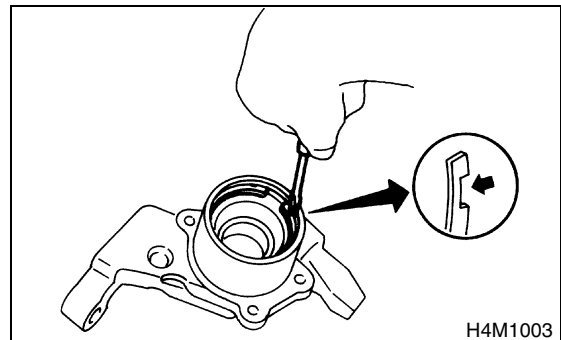
CAUTION:

Use new oil seals.

4) Using a flat bladed screwdriver, remove the snap ring.

CAUTION:

Be careful not to damage the housing at removal.



REAR AXLE

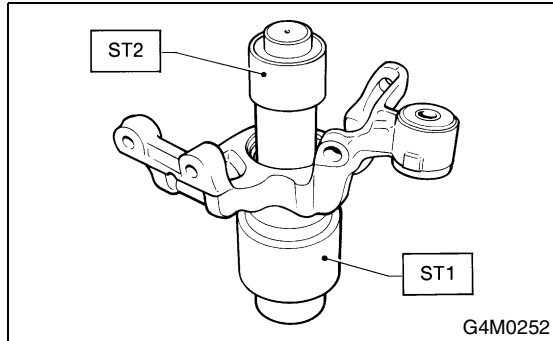
DRIVE SHAFT SYSTEM

5) Using the ST1 and ST2, remove the bearing by pressing inner race.

ST1 927430000 HOUSING STAND
ST2 927440000 BEARING REMOVER

CAUTION:

- Do not remove the bearing unless damaged.
- Do not re-use the bearing after removal.

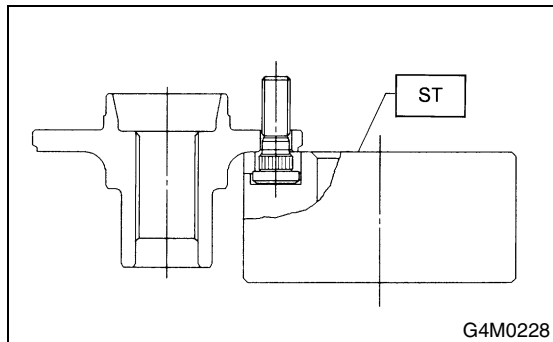


6) Remove the tone wheel bolts, and then remove the tone wheel from hub (only vehicle equipped with ABS).

7) Using the ST, press the hub bolt out.
ST 927080000 HUB STAND

CAUTION:

Be careful not to hammer the hub bolts. This may deform the hub.



D: ASSEMBLY

CAUTION:

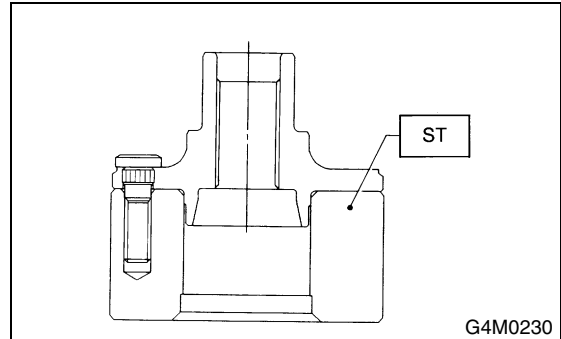
When the hub is to be removed from housing, replace the bearing set and oil seal with new ones.

1) Using the ST, press the new hub bolt into place.

CAUTION:

- Ensure the hub bolt closely contacts hub.
- Use a 12 mm (0.47 in) hole in the ST to prevent the hub bolt from tilting during installation.

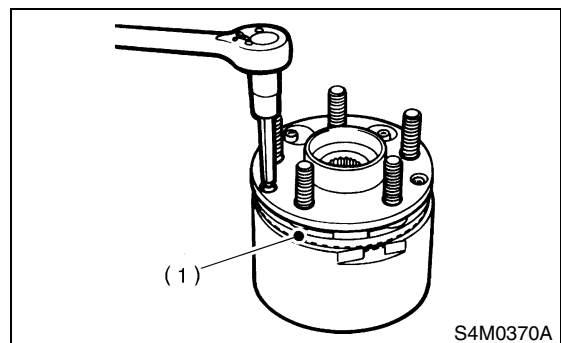
ST 927080000 HUB STAND



2) Remove foreign particles (dust, rust, etc.) from mating surfaces of the hub tone wheel, and then install the tone wheel to hub (only vehicle equipped with ABS).

CAUTION:

- Ensure the tone wheel closely contacts hub.
- Be careful not to damage the tone wheel teeth.



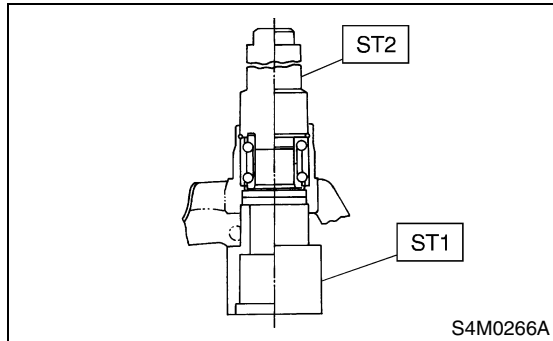
(1) Tone wheel

3) Clean the housing interior completely. Using the ST1 and ST2, press the bearing into housing.

ST1 927430000 HOUSING STAND
ST2 927440000 BEARING REMOVER

CAUTION:

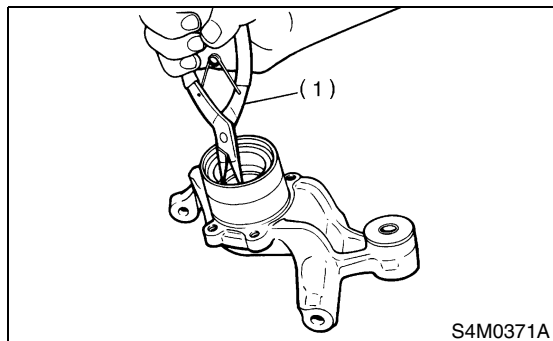
- Always press the outer race when installing bearing.
- Be careful not to remove the plastic lock from inner race when installing bearing.
- Charge bearing with new grease when outer race is not removed.



4) Using pliers, install the snap ring.

CAUTION:

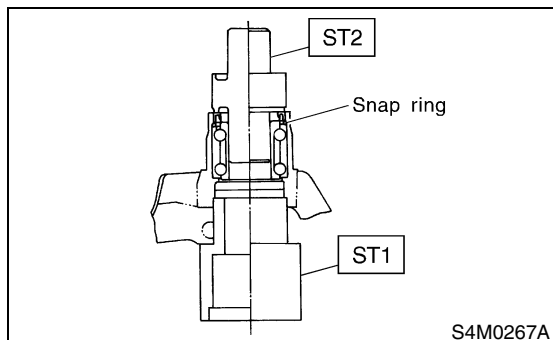
Ensure the snap ring fits in groove properly.



(1) Pliers

5) Using the ST1 and ST2, press the outer oil seal unit it comes in contact with snap ring.

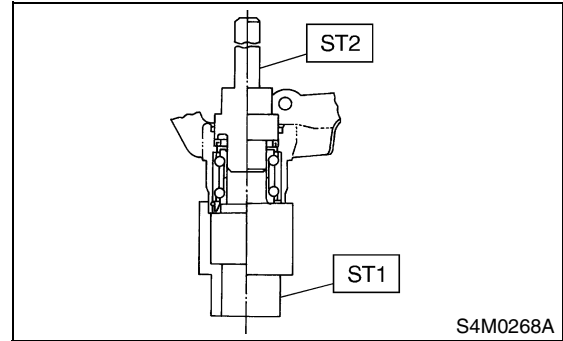
ST1 927430000 HOUSING STAND
ST2 927460000 OIL SEAL INSTALLER



6) Invert both ST1 and housing.

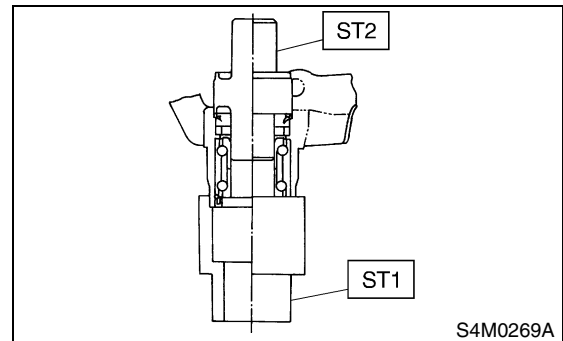
7) Using the ST2, press the inner oil seal into housing until it touches bottom.

ST1 927430000 HOUSING STAND
ST2 927460000 OIL SEAL INSTALLER



8) Using the ST1 and ST2, press the 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 specified grease is not available, remove the bearing grease and apply Auto Rex A instead.
- Do not mix different types of grease.

10) Install the back plate to rear housing.

Tightening torque:

52 N·m (5.3 kgf·m, 38.3 ft·lb)

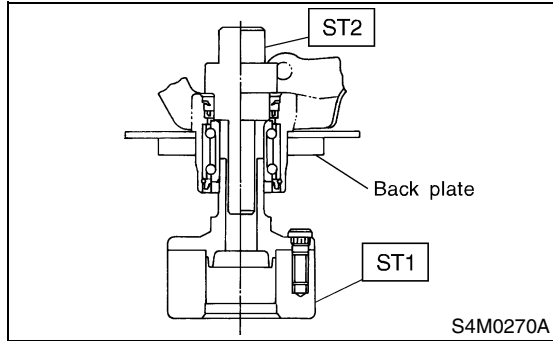
REAR AXLE

DRIVE SHAFT SYSTEM

11) Using the ST1 and ST2, press the bearing into hub.

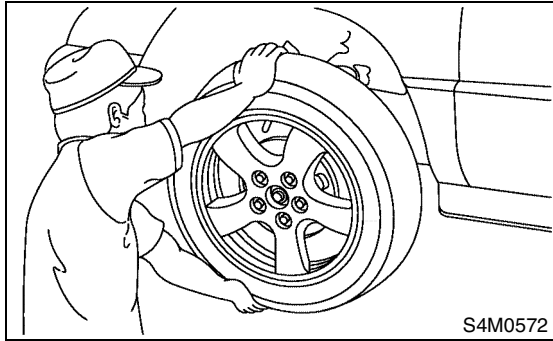
ST1 927080000 HUB STAND

ST2 927450000 HUB INSTALLER



E: INSPECTION

1) Moving the front tire up and down by hand, check that there is no backlash in the bearing, and check that the wheel rotates smoothly.



2) Inspect the removed parts for wear and damage. If defective, replace with new ones.

5. Front Drive Shaft

A: REMOVAL

- 1) Jack-up the vehicle, support it with safety stands (rigid racks), and then remove the front wheel cap and wheels.
- 2) Unlock the axle nut.
- 3) Depress the brake pedal and remove axle nut using a socket wrench.

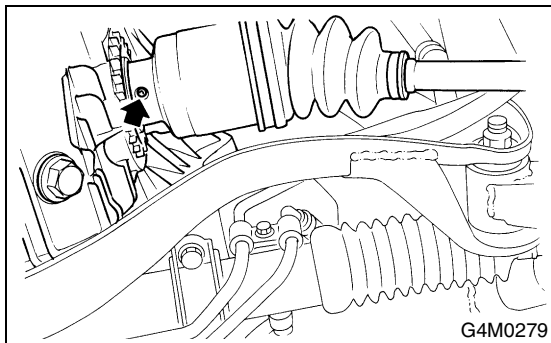
CAUTION:

Be sure to loosen and retighten the axle nut after removing the wheel from vehicle. Failure to follow this rule may damage the wheel bearings.

- 4) Remove the stabilizer link from transverse link.
- 5) Disconnect the transverse link from housing.
- 6) Remove the spring pin which secures transmission spindle to SFJ.

CAUTION:

Use a new spring pin.

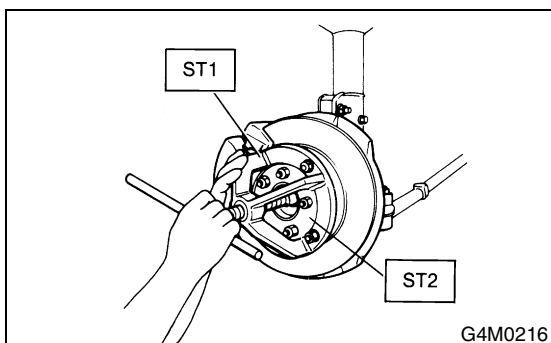


- 7) Remove the front drive shaft assembly. If it is hard to remove, use the ST1 and ST2.

- | | | |
|-----|-----------|-------------------------|
| ST1 | 926470000 | AXLE SHAFT PULLER |
| ST2 | 927140000 | AXLE SHAFT PULLER PLATE |

CAUTION:

- Be careful not to damage the oil seal lip and tone wheel when removing front drive shaft.
- When the front drive shaft is to be replaced, also replace inner oil seal.



B: INSTALLATION

- 1) Insert the BJ into hub splines.

CAUTION:

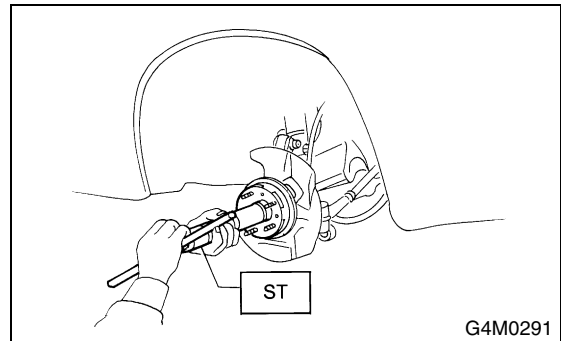
Be careful not to damage the inner oil seal lip and tone wheel.

- 2) Using the ST1 and ST2, pull the drive shaft into place.

- | | | |
|-----|-----------|----------------------|
| ST1 | 922431000 | AXLE SHAFT INSTALLER |
| ST2 | 927390000 | ADAPTER |

CAUTION:

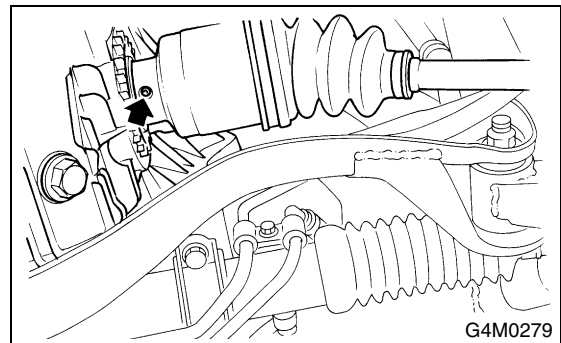
Do not hammer the drive shaft when installing it.



- 3) Tighten the axle nut temporarily.
- 4) Install the SFJ on transmission spindle and drive spring pin into place.

CAUTION:

Always use a new spring pin.



- 5) Connect the 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 the stabilizer bracket.

FRONT DRIVE SHAFT

DRIVE SHAFT SYSTEM

7) While depressing the brake pedal, tighten the axle nut to the specified torque.

Tightening torque:

186 N·m (19 kgf-m, 137 ft-lb)

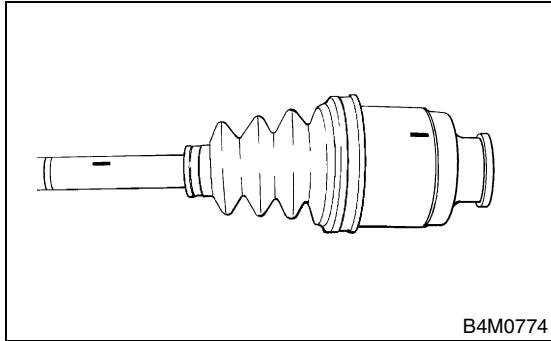
CAUTION:

- Use a new axle nut.
- Always tighten the axle nut before installing wheel on the vehicle. If the wheel is installed and comes in contact with ground when axle nut is loose, wheel bearings may be damaged.
- Be sure to tighten the axle nut to specified torque. Do not overtighten it as this may damage the wheel bearing.

8) After tightening the axle nut, lock it securely.

C: DISASSEMBLY

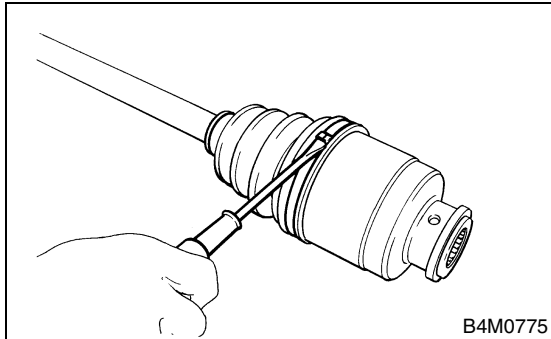
1) Place alignment marks on the shaft and outer race.



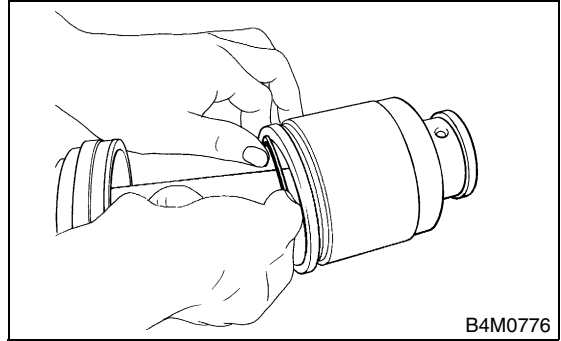
2) Remove the SFJ boot band and boot.

CAUTION:

Be careful not to damage the boot.



3) Remove the circlip from SFJ outer race using screwdriver.



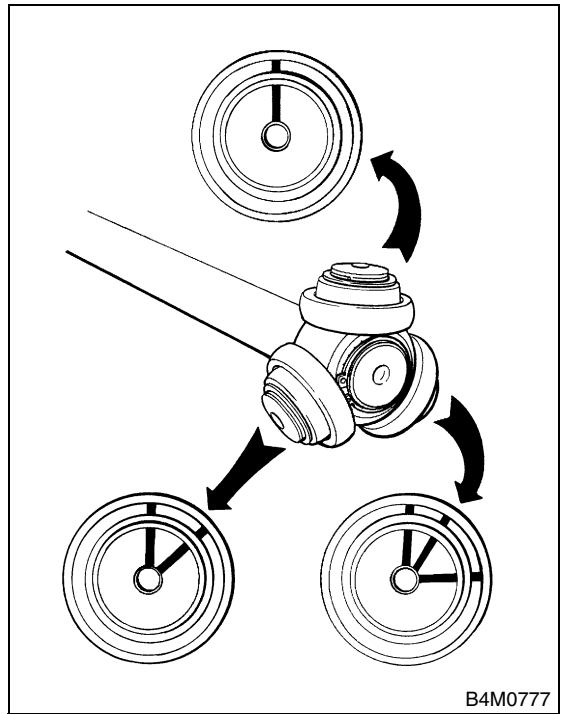
4) Remove the SFJ outer race from shaft assembly.

5) Wipe off the grease.

CAUTION:

The grease is a special grease. Do not confuse with other greases.

6) Place alignment marks on the free ring and trunnion.



7) Remove the free ring from trunnion.

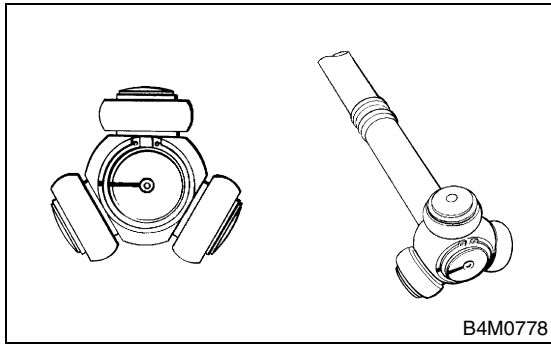
CAUTION:

Be careful with the free ring position.

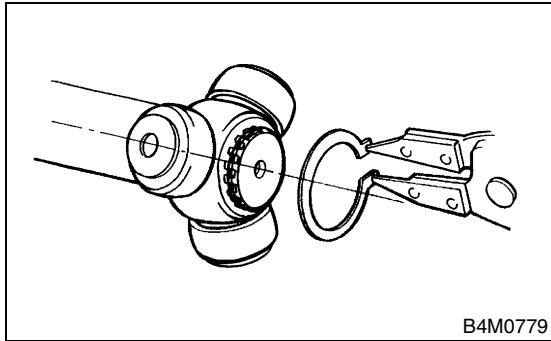
FRONT DRIVE SHAFT

DRIVE SHAFT SYSTEM

8) Place an alignment mark on the trunnion and shaft.



9) Remove the snap ring and trunnion.



CAUTION:

Be sure to wrap the shaft splines with vinyl tape to prevent boot from scratches.

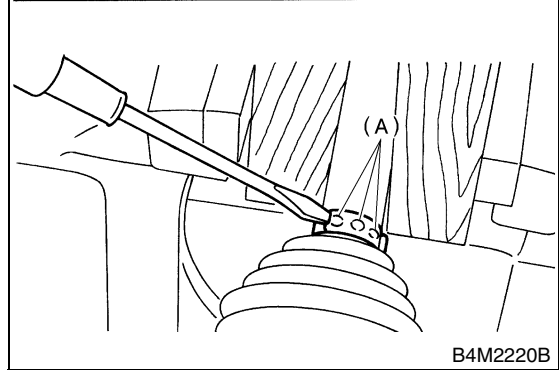
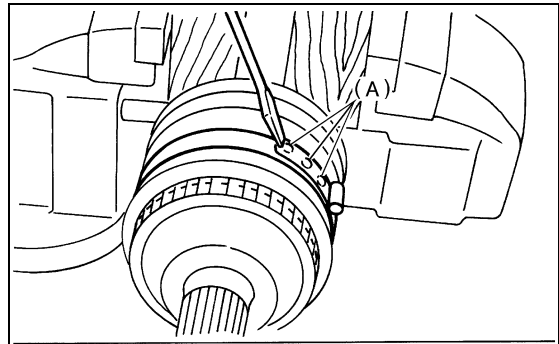
10) Remove the SFJ boot.

11) Place the drive shaft in a vise between wooden blocks.

CAUTION:

Do not place the drive shaft directly in the vise; use wooden block.

12) Raise the boot band claws by means of screwdriver and hammer.

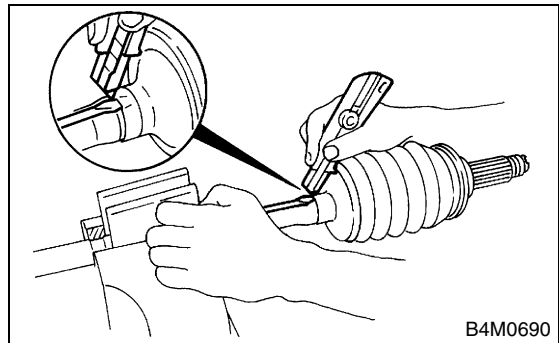


(A) Boot band claws

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 the BJ cannot be disassembled.

FRONT DRIVE SHAFT

DRIVE SHAFT SYSTEM

D: ASSEMBLY

CAUTION:

Use specified grease.

BJ side:

NTG2218 (Part No. 28093AA000)

SFJ side:

SSG6003 (Part No. 28093TA000)

1) Place the BJ boot and small boot band on BJ side of shaft.

CAUTION:

Be sure to wrap the shaft splines with vinyl tape to prevent boot from scratches.

2) Place the drive shaft in a vise.

CAUTION:

Do not place the drive shaft directly in the vise; use wooden blocks.

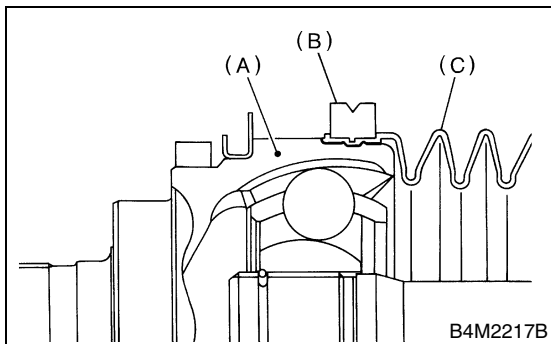
3) Apply a coat of specified grease [60 to 70 g (2.12 to 2.47 oz)] to BJ.

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 the shaft.

NOTE:

The inside of the larger end of BJ boot and boot groove shall be cleaned so as to be free from grease and other substances.

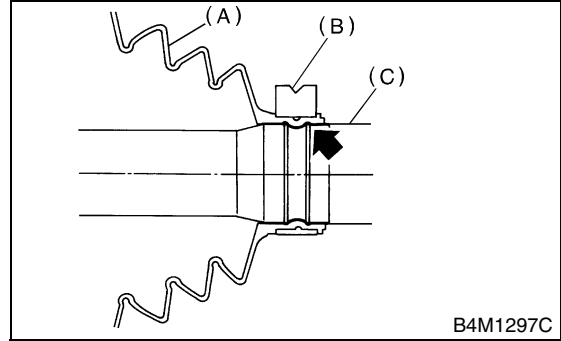
5) Install the boot projecting portion to BJ groove.



- (A) BJ
- (B) Large boot band
- (C) Boot

6) Set the large boot band in place.

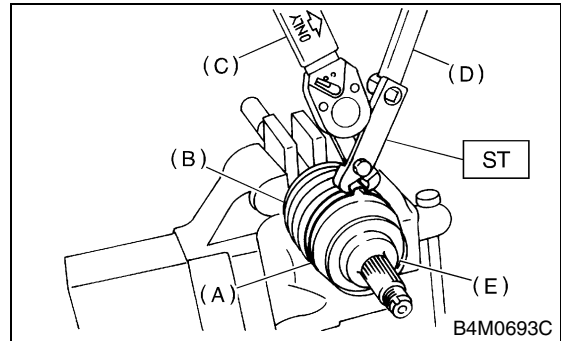
7) Install the boot projecting portion to shaft groove.



- (A) Boot
- (B) Small boot band
- (C) Shaft

8) Tighten the 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

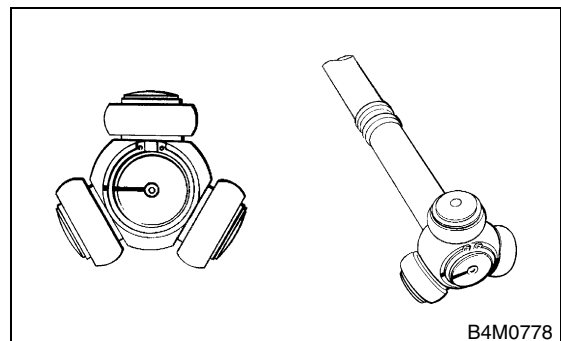
157 N·m (16.0 kgf·m, 116 ft·lb) or more

Small boot band

133 N·m (13.6 kgf·m, 98 ft·lb) or more

9) Place the SFJ boot at the center of shaft.

10) Align the alignment marks, and then install the trunnion on shaft.



11) Install the snap ring to shaft.

CAUTION:

Confirm that the snap ring is completely fitted in the shaft groove.

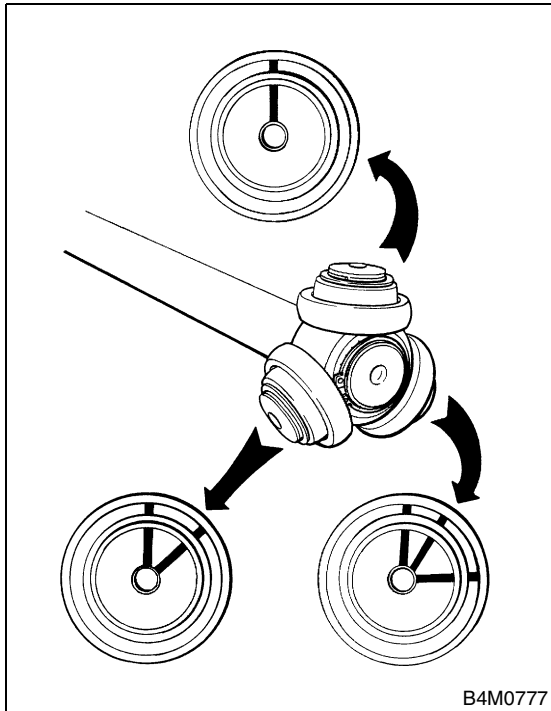
12) Fill 100 to 110 g (3.53 to 3.88 oz) of specified grease into the interior of SFJ outer race.

13) Apply a coat of specified grease to the free ring and trunnion.

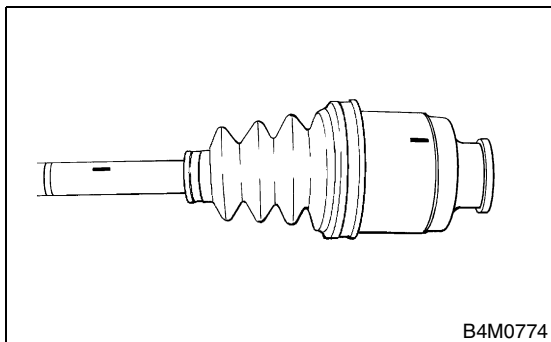
14) Align the alignment marks on free ring and trunnion, and then install the free ring.

CAUTION:

Be careful with the free ring position.



15) Align the alignment marks on shaft and outer race, and then install the outer race.



16) Install the 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 the SFJ boot taking care not to twist it.

CAUTION:

• **The inside of the larger end of SFJ boot and boot groove shall be cleaned so as to be free from grease and other substances.**

• **When installing the SFJ boot, position the outer race of SFJ at center of its travel.**

19) Put a band through the clip and wind twice in alignment with band groove of boot.

CAUTION:

Use a new band.

20) Pinch the end of band with pliers. Hold the clip and tighten securely.

NOTE:

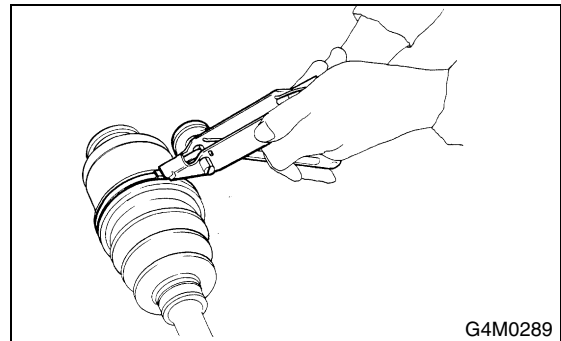
When tightening the boot, exercise care so that air within the boot is appropriate.

21) Tighten the band by using ST.

ST 925091000 BAND TIGHTENING TOOL

NOTE:

Tighten the band until it cannot be moved by hand.

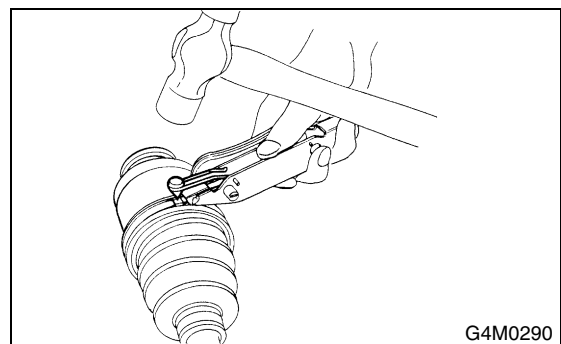


22) Tap on the clip with punch provided at the end of ST.

ST 925091000 BAND TIGHTENING TOOL

CAUTION:

Tap to an extent that the boot underneath is not damaged.



FRONT DRIVE SHAFT

DRIVE SHAFT SYSTEM

23) Cut off the 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 the boot on BJ in the same manner.

NOTE:

Extend and retract the 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 the ground cable from battery.
- 2) Lift-up the vehicle, and remove the rear wheel cap and wheels.

CAUTION:

Be sure to loosen and retighten the axle nut after removing the wheel from vehicle. Failure to follow this rule may damage the wheel bearings.

- 3) Unlock the axle nut.
- 4) Remove the axle nut using a socket wrench.
- 5) Remove the rear differential assembly.

With T-type

<Ref. to DI-25, REMOVAL, Rear Differential for T-type.>

With VA-type

<Ref. to DI-41, REMOVAL, Rear Differential for VA-type.>

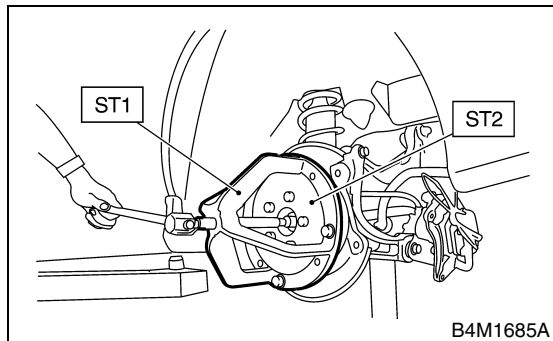
- 6) Remove the axle nut and drive shaft. If it is hard to remove, use the ST1 and ST2.

ST1 926470000 AXLE SHAFT PULLER

ST2 927140000 AXLE SHAFT PULLER PLATE

CAUTION:

Be careful not to damage the tone wheel when removing rear drive shaft.



B: INSTALLATION

- 1) Insert the BJ into rear hub splines.

CAUTION:

Be careful not to damage the tone wheel.

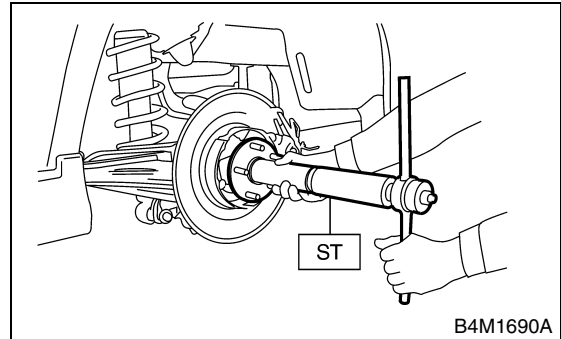
- 2) Using the ST1 and ST2, pull the drive shaft into place.

ST1 922431000 AXLE SHAFT INSTALLER

ST2 927390000 ADAPTER

CAUTION:

Do not hammer the drive shaft when installing it.



- 3) Tighten the axle nut temporarily.

- 4) Install the rear differential.

With T-type

<Ref. to DI-26, INSTALLATION, Rear Differential for T-type.>

With VA-type

<Ref. to DI-42, INSTALLATION, Rear Differential for VA-type.>

- 5) While depressing the brake pedal, tighten the 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 the axle nut before installing wheel on the vehicle. If the wheel is installed and comes in contact with ground when axle nut is loose, wheel bearings may be damaged.
- Be sure to tighten the axle nut to specified torque. Do not overtighten it as this may damage the wheel bearing.

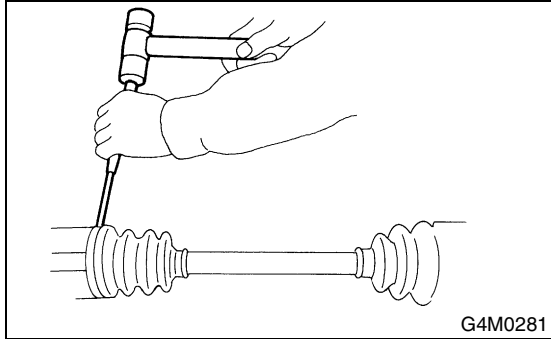
- 6) After tightening the axle nut, lock it securely.

REAR DRIVE SHAFT

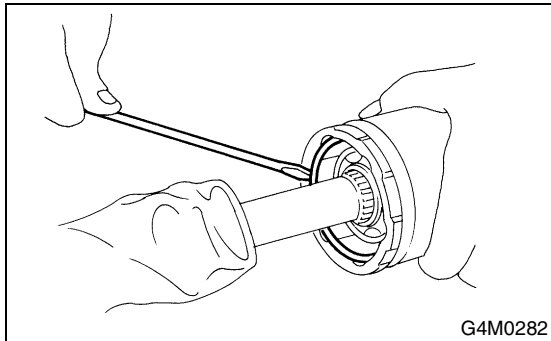
DRIVE SHAFT SYSTEM

C: DISASSEMBLY

- 1) Straighten the bent claw of larger end of DOJ boot.
- 2) Loosen the band by means of screwdriver or pliers with care of not damaging boot.



- 3) Remove the 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 the round circlip located at neck of DOJ outer race with a screwdriver.



- 6) Take out the DOJ outer race from shaft assembly.

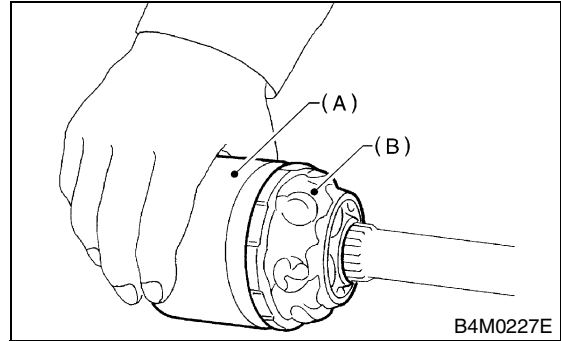
- 7) Wipe off the grease, and then take out the balls.

CAUTION:

The grease is a special grease (grease for constant velocity joint). Do not confuse with other greases.

NOTE:

Disassemble with exercising care not to lose balls (6 pcs).



- (A) Outer race
- (B) Grease

- 8) To remove the cage from inner race, turn the cage by a half pitch to the track groove of inner race and shift the cage.
- 9) Remove the snap ring, which fixes inner race to shaft, by using pliers.
- 10) Take out the DOJ inner race.
- 11) Take off the DOJ cage from shaft and remove DOJ boot.

CAUTION:

Be sure to wrap the shaft splines with vinyl tape to prevent boot from scratches.

- 12) Remove the BJ boot in same procedure as DOJ boot.
- 13) Thus, disassembly of axle is completed, but the 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 the BJ boot in specified position, and fill it with 60 to 70 g (2.12 to 2.47 oz) of specified grease.
- 2) Place the DOJ boot at the center of shaft.

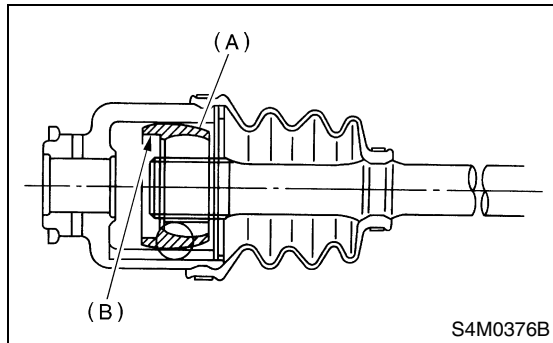
CAUTION:

Be sure to wrap the shaft splines with vinyl tape to prevent boot from scratches.

- 3) Insert the DOJ cage onto shaft.

NOTE:

Insert the cage with cut-out portion facing the shaft end, since the cage has an orientation.

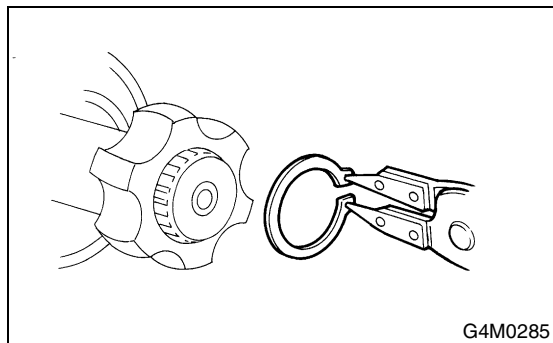


- (A) Cage
- (B) Cut-out portion

- 4) Install the DOJ inner race on shaft and fit snap ring with pliers.

NOTE:

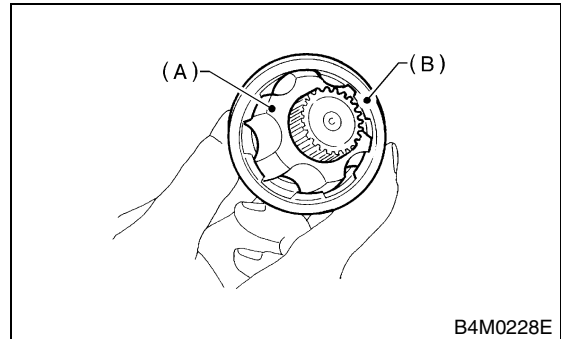
Confirm that the snap ring is completely fitted in shaft groove.



- 5) Install the cage, which was previously fitted, to inner race fixed upon shaft.

NOTE:

Fit the cage with protruded part aligned with the track on inner race, and then turn by a half pitch.



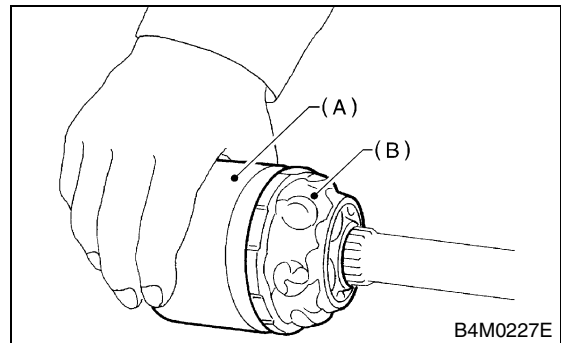
- (A) Inner race
- (B) Cage

- 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

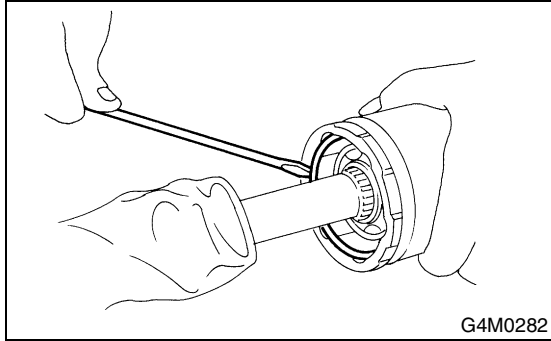
REAR DRIVE SHAFT

DRIVE SHAFT SYSTEM

10) Install the 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 the DOJ boot taking care not to twist it.

NOTE:

- The inside of the larger end of DOJ boot and boot groove shall be cleaned so as to be free from grease and other substances.
- When installing the DOJ boot, position the 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:

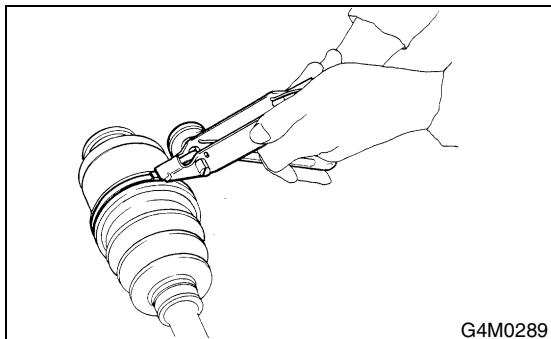
When tightening the boot, exercise care so that air within the boot is appropriate.

15) Tighten the band by using ST.

ST 925091000 BAND TIGHTENING TOOL

NOTE:

Tighten the band until it cannot be moved by hand.

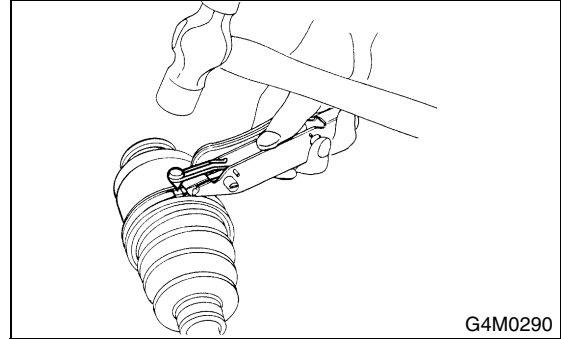


16) Tap on the clip with the punch provided at the end of ST.

ST 925091000 BAND TIGHTENING TOOL

CAUTION:

Tap to an extent that the boot underneath is not damaged.



17) Cut off the 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 the boot on BJ in the same manner.

NOTE:

Extend and retract the 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

ABS

ABS

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1. General Description	2
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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

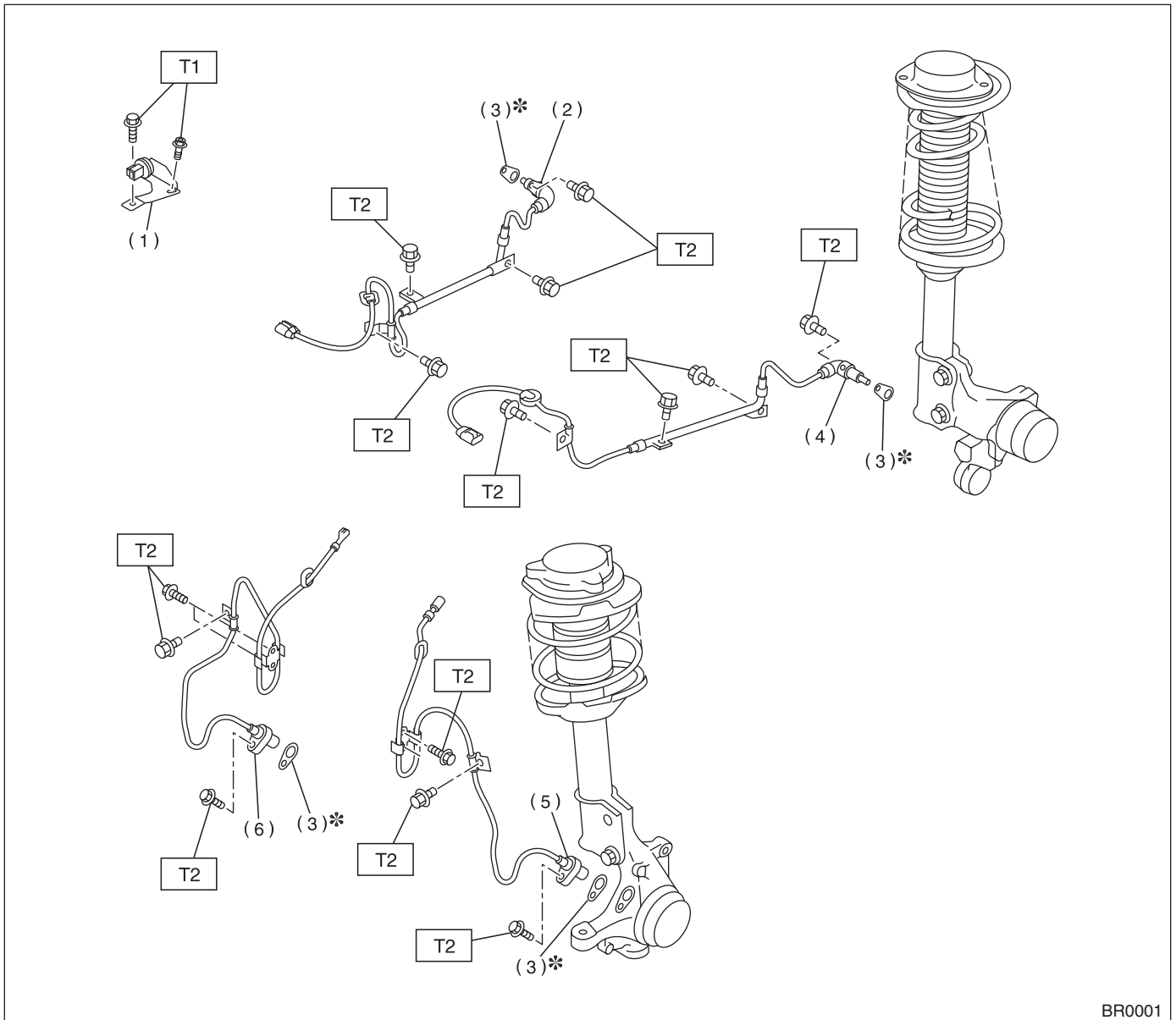
1. General Description

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	Rear drum brake model	AT	CC	
		MT	CD	
	Rear disc brake model	AT	CM	
		MT	CN	

B: COMPONENT

1. SENSOR



- | | |
|------------------------|-------------------------|
| (1) G sensor | (4) Rear ABS sensor LH |
| (2) Rear ABS sensor RH | (5) Front ABS sensor LH |
| (3) ABS spacer | (6) Front ABS sensor RH |

Tightening torque: N·m (kgf·m, ft·lb)

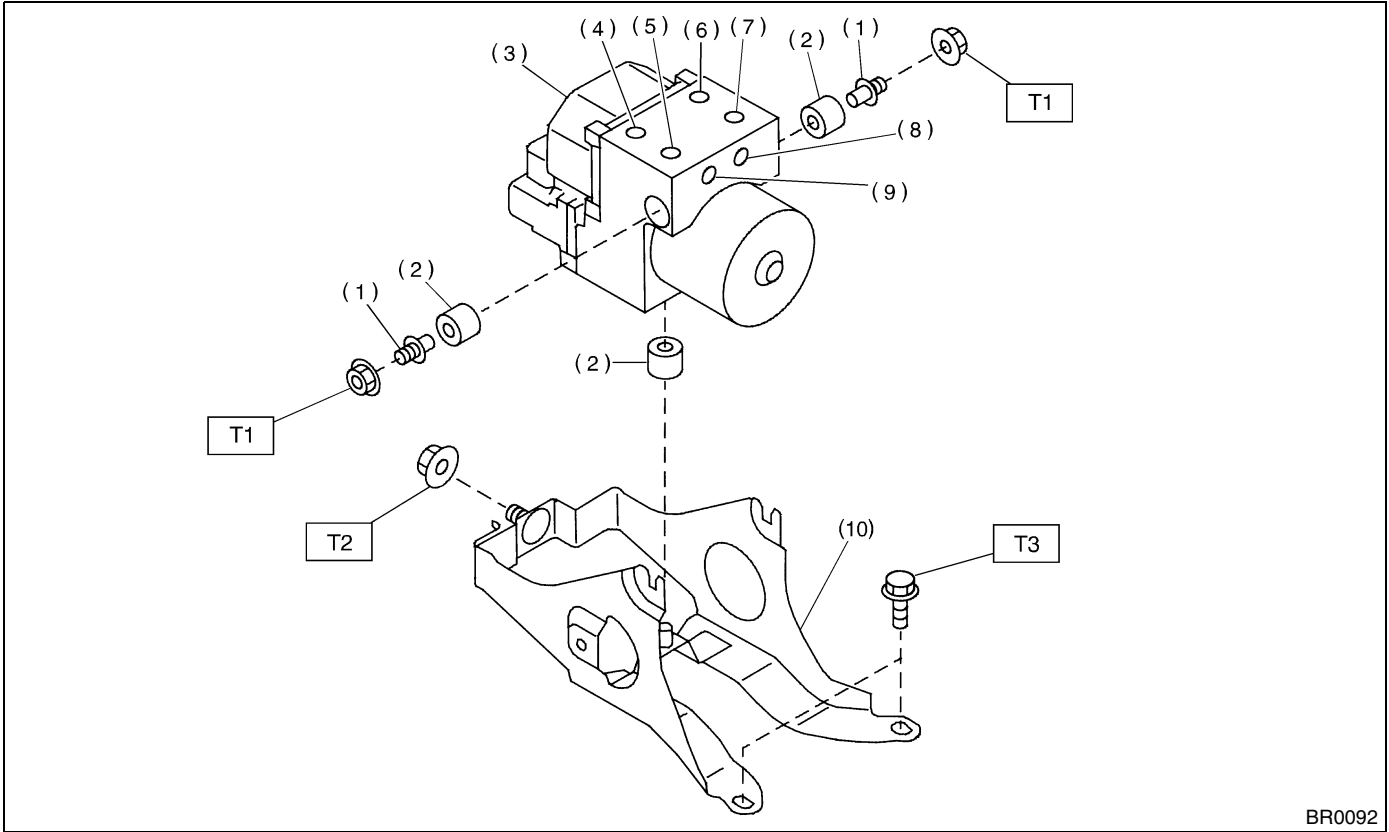
T1: 7.4 (0.75, 5.4)

T2: 32 (3.3, 24)

GENERAL DESCRIPTION

ABS

2. ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U)



- | | |
|---|---------------------|
| (1) Stud bolt | (6) Front-RH outlet |
| (2) Damper | (7) Primary inlet |
| (3) ABS control module and hydraulic control unit | (8) Rear-LH outlet |
| (4) Front-LH outlet | (9) Rear-RH outlet |
| (5) Secondary inlet | (10) Bracket |

Tightening torque: N·m (kgf·m, ft·lb)

T1: 18 (1.8, 13.0)

T2: 29 (3.0, 21.7)

T3: 32 (3.3, 24)

C: CAUTION

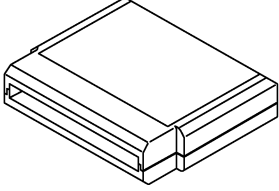

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation 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 the ground cable from battery.

GENERAL DESCRIPTION

ABS

D: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B2M3876	24082AA190	CARTRIDGE	Troubleshooting for electrical systems.
 B2M3877	22771AA030	SELECT MONITOR KIT	Troubleshooting for electrical systems. <ul style="list-style-type: none"> • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

2. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance, voltage and ampere.
Pressure gauge	Used for measuring oil pressure.
Oscilloscope	Used for measuring sensor.

2. ABS Control Module and Hydraulic Control Unit (ABSCM&H/U)

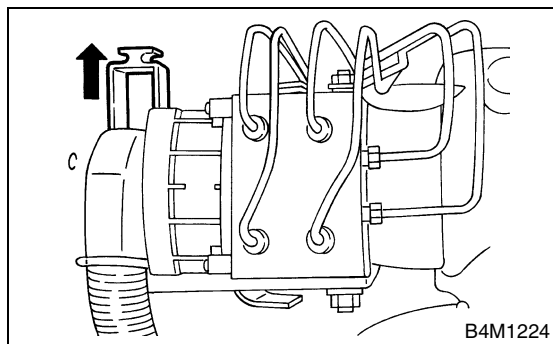
A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the 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:

Contact will be insufficient if the terminal gets wet.

- 4) Pull off the lock of ABSCM&H/U connector to remove it.



- 5) Disconnect the connector from ABSCM&H/U.

CAUTION:

Be careful not to let water or other foreign matter contact the ABSCM&H/U terminal.

- 6) Unlock the cable clip.
- 7) Disconnect the brake pipes from ABSCM&H/U.

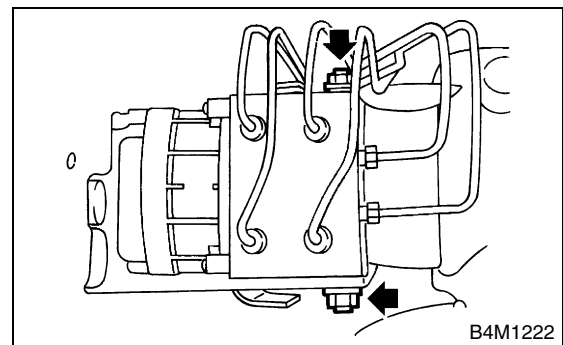
CAUTION:

Wrap brake pipes with vinyl bag to avoid spilling brake fluid on vehicle body.

- 8) Remove the 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 the 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 the bracket attaching bolt after tightening.
- Do not pull the harness when disconnecting the connector.



ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U)

ABS

B: INSTALLATION

1) Install the ABSCM&H/U bracket.

Tightening torque:

32 N·m (3.3 kgf-m, 24 ft-lb)

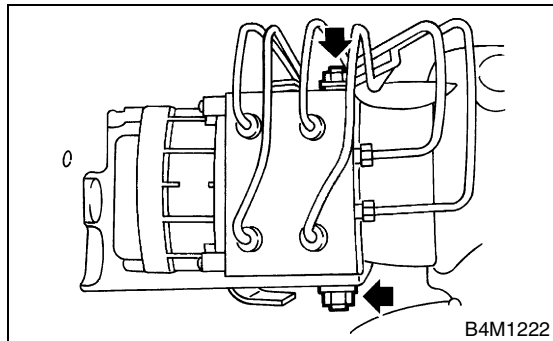
2) Install the ABSCM&H/U.

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 the brake pipes to their correct ABSCM&H/U connections.

Tightening torque:

15 N·m (1.5 kgf-m, 10.8 ft-lb)

4) Using the cable clip, secure the ABSCM&H/U harness to bracket.

5) Connect the connector to ABSCM&H/U.

CAUTION:

- Be sure to remove all foreign matter from inside of the connector before connecting.
- Ensure that the ABSCM&H/U connector is securely locked.

6) Install the air intake duct.

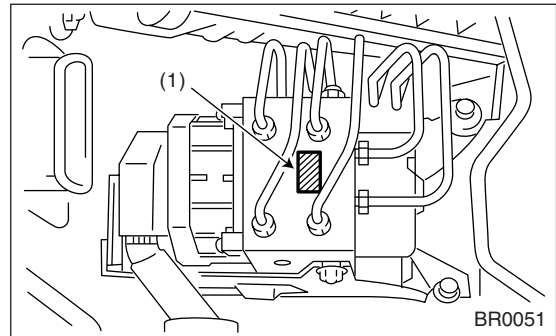
7) Bleed air from the brake system.

C: INSPECTION

1) Check the connected and fixed condition of connector.

2) Check specifications of the mark with ABSCM&H/U.

Mark	Model
CC	AT (Rear drum brake)
CD	MT (Rear drum brake)
CM	AT (Rear disc brake)
CN	MT (Rear disc brake)



(1) Mark

1. CHECKING THE HYDRAULIC UNIT ABS OPERATION BY PRESSURE GAUGE

1) Lift-up the vehicle and remove the wheels.

2) Disconnect the air bleeder screws from the FL and FR caliper bodies.

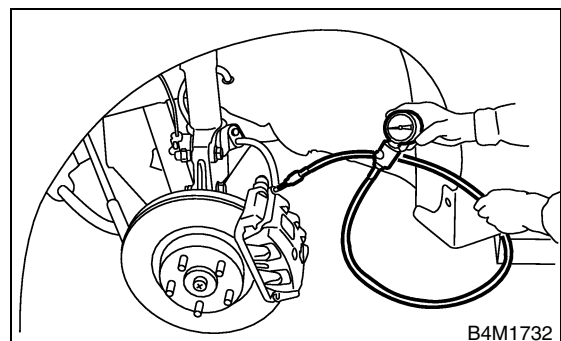
3) Connect two pressure gauges to the FL and FR caliper bodies.

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.



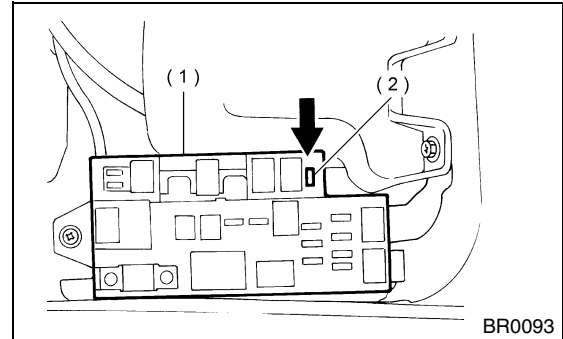
- 4) Bleed air from the pressure gauges.
- 5) Perform the ABS sequence control.
<Ref. to ABS-11, ABS Sequence Control.>
- 6) When the hydraulic unit begins to work, and first the FL side performs decompression, holding, and compression, and then the FR side performs decompression, holding, and compression.
- 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 the pressure gauges from FL and FR caliper bodies.
- 9) Remove the 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 the 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 the brake line.

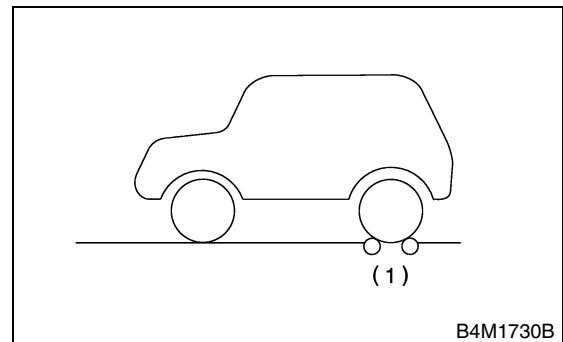
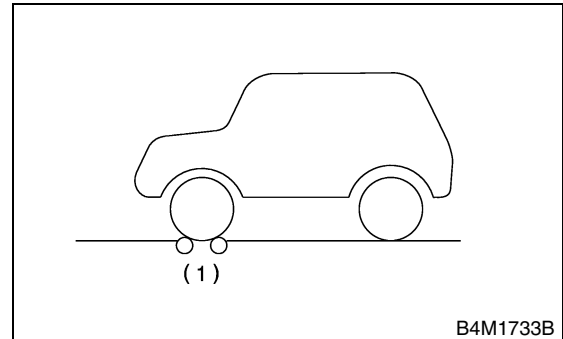
2. CHECKING THE HYDRAULIC UNIT ABS OPERATION WITH BRAKE TESTER

- 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) Main fuse box
- (2) FWD connector

- 2) Prepare for operating the 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 "N" range.



- (1) Brake tester

- 4) Operate the brake tester.
- 5) Perform the ABS sequence control.
<Ref. to ABS-11, ABS Sequence Control.>
- 6) Hydraulic unit begins to work; and check the following working sequence.

ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U)

ABS

(1) The FL wheel performs decompression, holding, and compression in sequence, and subsequently the FR wheel repeats the cycle.

(2) The RR wheel performs decompression, holding, and compression in sequence, and subsequently the RL wheel repeats the cycle.

7) Read values indicated on the brake tester and check if the fluctuation of values, when decompressed and compressed, meet the standard values.

	Front wheel	Rear wheel
Initial value	981 N (100 kgf, 221 lb)	981 N (100 kgf, 221 lb)
When decompressed	490 N (50 kgf, 110 lb) or less	490 N (50 kgf, 110 lb) or less
When compressed	981 N (100 kgf, 221 lb) or more	981 N (100 kgf, 221 lb) or more

8) After checking, also check if any irregular brake pedal tightness is felt.

3. ABS Sequence Control

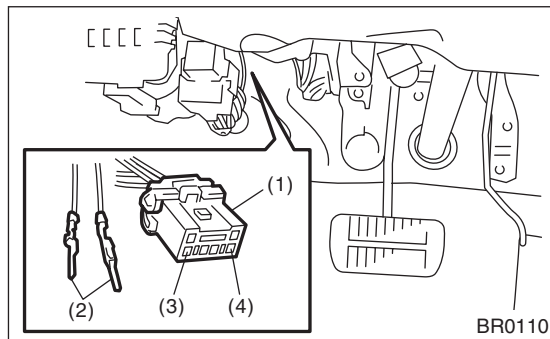
A: OPERATION

1) Under the ABS sequence control, after the hydraulic unit solenoid valve is driven, the operation of the hydraulic unit can be checked by means of the brake tester or pressure gauge.

2) ABS sequence control can be started by diagnosis connector or select monitor.

1. ABS SEQUENCE CONTROL WITH DIAGNOSIS CONNECTOR

1) Connect the diagnosis terminals to terminals No. 3 and No. 6 of the diagnosis connector beside driver's seat.



- (1) Diagnosis connector
- (2) Diagnosis terminals
- (3) Terminal 3
- (4) Terminal 6

2) Set the speed of all wheels at 4 km/h (2 MPH) or less.

3) Turn the ignition switch to 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 the ignition switch to 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 the select monitor to data link connector under driver's seat instrument panel lower cover.

2) Turn the ignition switch to ON.

3) Turn the select monitor switch to ON.

4) Put the 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 the brake pedal with braking force of 981 N (100 kgf, 221 lb).

(2) When using the pressure gauge, depress the 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.

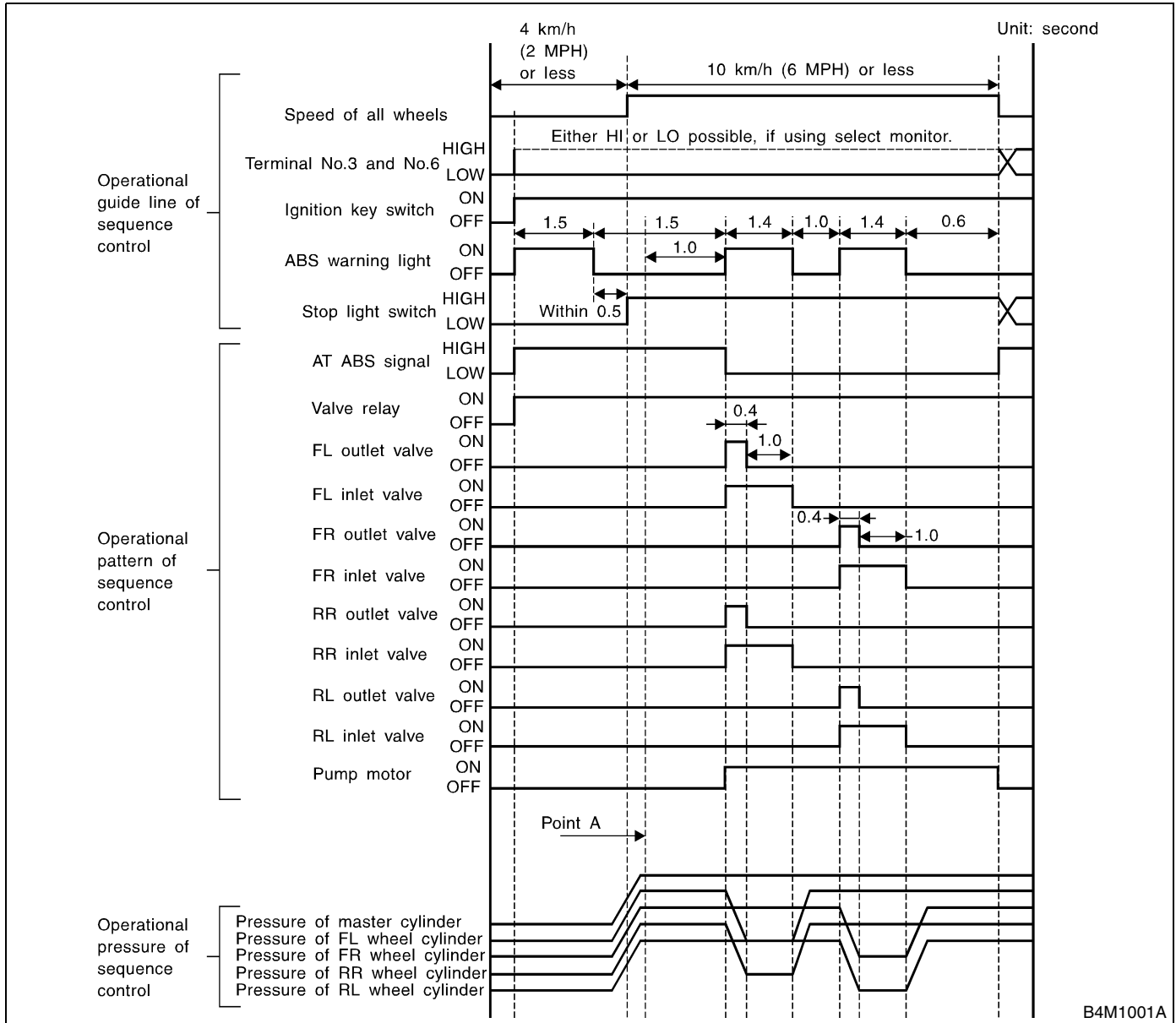
7) When the message "Press YES" is displayed, press the YES key.

8) Operation points will be displayed on select monitor.

ABS SEQUENCE CONTROL

ABS

3. CONDITIONS FOR ABS SEQUENCE CONTROL



NOTE:

- When the 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

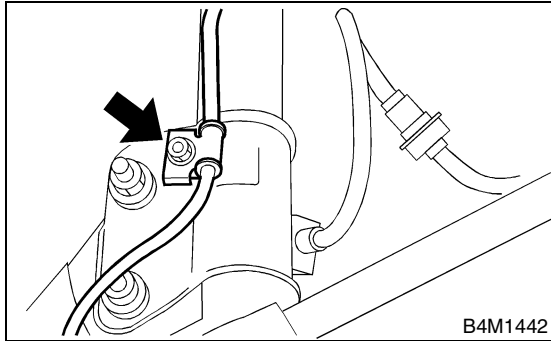
When the following conditions develop, the ABS sequence control stops and ABS operation is returned to the normal control mode.

- 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 the 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 the brake pedal is depressed after ignition key is turned to ON, and before ABS warning light goes out. (When the select monitor is not used.)
- 5) When the brake pedal is not depressed after ignition key is turned to ON, and within 0.5 seconds after ABS warning light goes out. (When the select monitor is not used.)
- 6) After completion of the sequence control.
- 7) When malfunction is detected. (When the select monitor is used.)

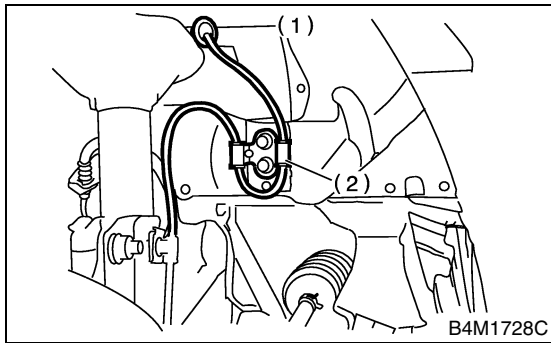
4. Front ABS Sensor

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Disconnect the front ABS sensor connector located next to the front strut mounting house in engine compartment.
- 3) Remove the bolts which secure sensor harness to strut.



- 4) Remove the bolts which secure sensor harness to body.

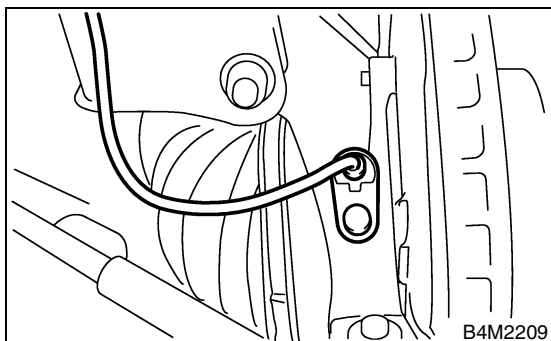


- (1) To front ABS sensor connector
- (2) Bracket

- 5) Remove the bolts which secure front ABS sensor to housing, and remove the front ABS sensor.

CAUTION:

- Be careful not to damage the pole piece located at tip of the sensor and teeth faces during removal.
- Do not pull the sensor harness during removal.

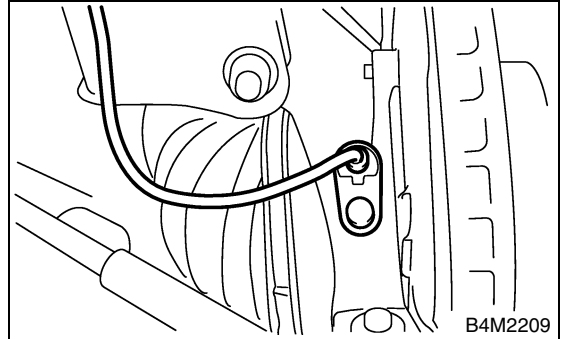


B: INSTALLATION

- 1) Temporarily install the front ABS sensor on housing.

CAUTION:

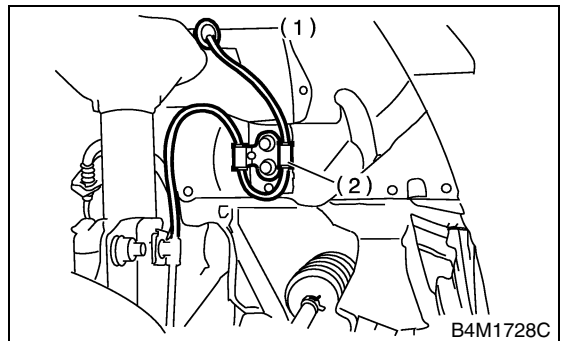
- Be careful not to strike the ABS sensor's pole piece and tone wheel's teeth against adjacent metal parts during installation.**



- 2) Install the front ABS sensor on strut and wheel apron bracket.

Tightening torque:

32 N·m (3.3 kgf-m, 24 ft-lb)

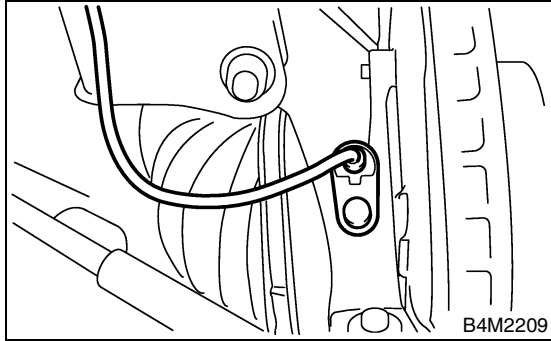


- (1) To front ABS sensor connector
- (2) Bracket

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 the 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.

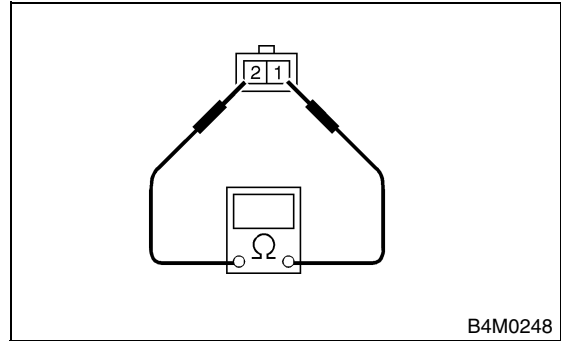
RH: White
LH: Yellow

NOTE:
 If the clearance is outside specifications, readjust.
 4) After confirmation of the ABS sensor clearance, connect the connector to ABS sensor.
 5) Connect the battery ground cable to battery.

C: INSPECTION

1. ABS SENSOR

- 1) Check the pole piece of ABS sensor for foreign particles or damage. If necessary, clean the pole piece or replace ABS sensor.
- 2) Measure the ABS sensor resistance.



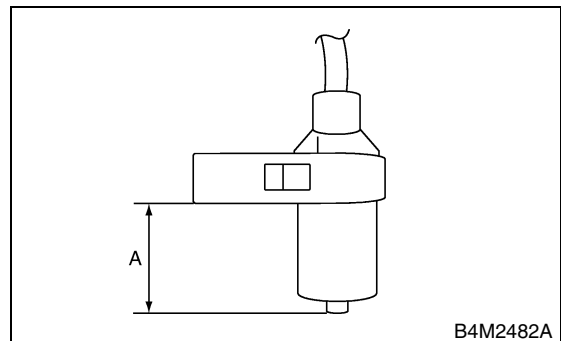
Terminal No.	Standard
1 and 2	1.25±0.25 kΩ

CAUTION:
If resistance is outside the standard value, replace the ABS sensor with a new one.

NOTE:
 Check the 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.



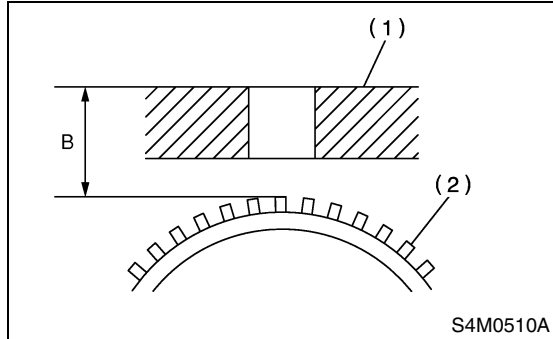
FRONT ABS SENSOR

ABS

2) Measure the distance “B” between surface where the front axle housing meets the ABS sensor, and the tone wheel.

NOTE:

Measure so that the gauge touches the tone wheel teeth top.



- (1) Axle housing
- (2) Tone wheel

3) Find the gap between the ABS sensor pole face and the surface of the tone wheel teeth by putting the measured values in the formula below and calculating.

$$\text{ABS sensor clearance} = B - A$$

ABS sensor standard clearance:

0.3 — 0.8 mm (0.012 — 0.031 in)

NOTE:

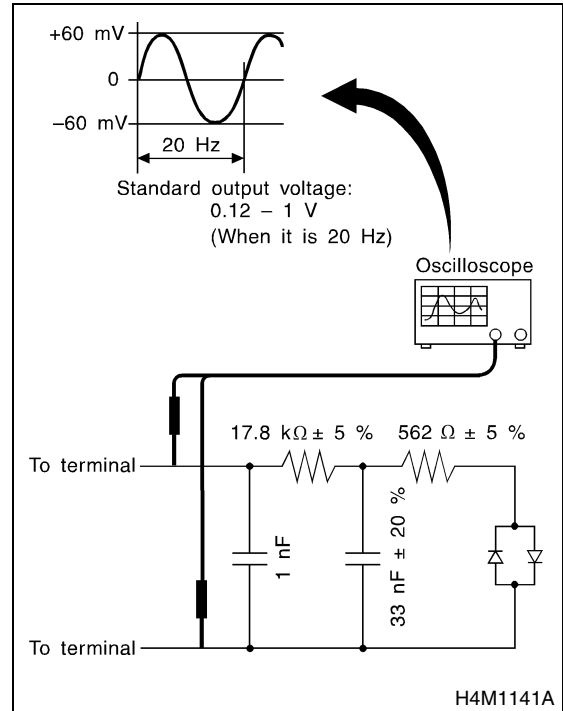
If the clearance is outside specifications, readjust.

3. OUTPUT VOLTAGE

Output voltage can be checked by the following method. Install the resistor and condenser, then rotate the wheel about 2.75 km/h (2 MPH) or equivalent.

NOTE:

Regarding terminal No., please refer to item 1. ABS SENSOR.



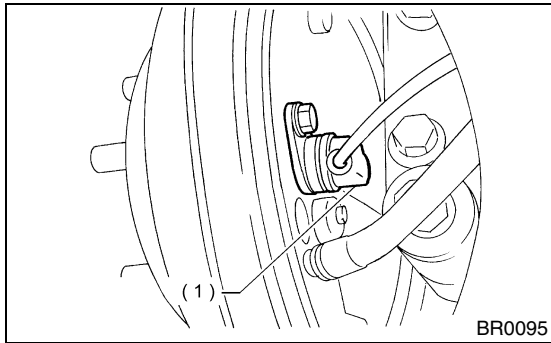
D: ADJUSTMENT

Adjust the gap using spacer (Part No. 26755A000).

5. Rear ABS Sensor

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Lift-up the vehicle.
- 3) Remove the rear seat and disconnect the rear ABS sensor connector.
- 4) Remove the rear sensor harness bracket from the rear trailing link and bracket.
- 5) Remove the rear ABS sensor from back plate.



(1) Rear ABS sensor

- 6) Remove the rear tone wheel while removing the hub from housing and hub assembly.<Ref. to DS-24, REMOVAL, Rear Axle.>

CAUTION:

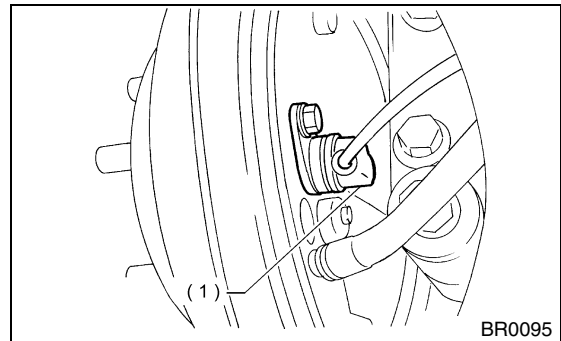
- Be careful not to damage the pole piece located at tip of the sensor and teeth faces during removal.
- Do not pull the sensor harness during removal.

B: INSTALLATION

- 1) Install the rear tone wheel on hub, then rear housing on hub.<Ref. to DS-30, ASSEMBLY, Rear Axle.>
- 2) Temporarily install the rear ABS sensor on back plate.

CAUTION:

Be careful not to strike the ABS sensor's pole piece and tone wheel's teeth against adjacent metal parts during installation.

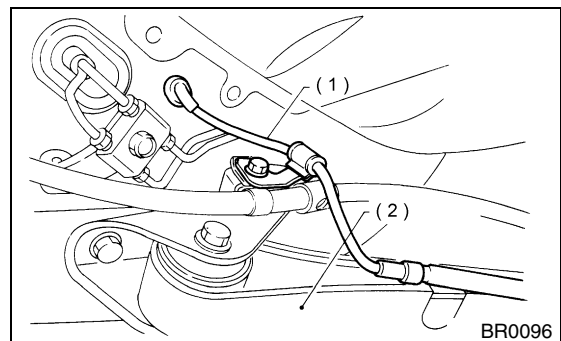


(1) Rear ABS sensor

- 3) Install the rear drive shaft to rear housing and rear differential spindle.<Ref. to DS-27, INSTALLATION, Rear Axle.>
- 4) Install the rear sensor harness on rear trailing link.

Tightening torque:

32 N·m (3.3 kgf-m, 24 ft-lb)



(1) Rear sensor harness
(2) Trailing link

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 the 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)

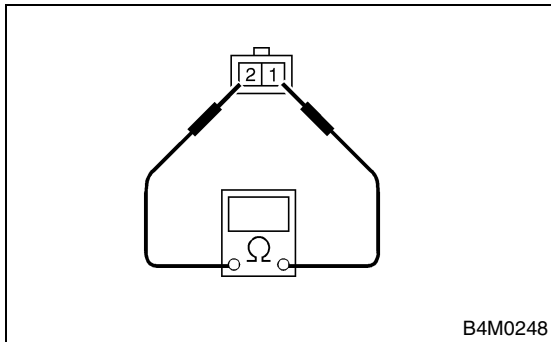
CAUTION:
 Check the marks on the harness to make sure that no distortion exists. (RH: white, LH: yellow)

NOTE:
 If the clearance is outside specifications, readjust.
 6) After confirmation of the ABS sensor clearance, connect the connector to ABS sensor.
 7) Connect the battery ground cable to battery.

C: INSPECTION

1. ABS SENSOR

- 1) Check the pole piece of ABS sensor for foreign particles or damage. If necessary, clean the pole piece or replace ABS sensor.
- 2) Measure the ABS sensor resistance.



Terminal No.	Standard
1 and 2	1.0±0.2 kΩ

CAUTION:

- If resistance is outside the standard value, replace the ABS sensor with a new one.
- Check the marks on the harness to make sure that no distortion exists.

RH: Light blue
LH: Brown

NOTE:
 Check the ABS sensor cable for discontinuity. If necessary, replace with a new one.

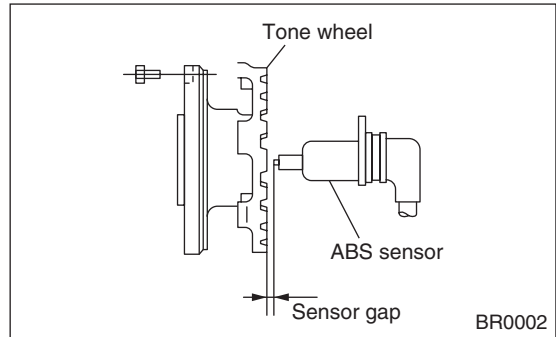
2. SENSOR GAP

Clearances (sensor gaps) should be measured one by one to ensure that 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 the ABS sensor or tone wheel if the outputted voltage is outside specification.

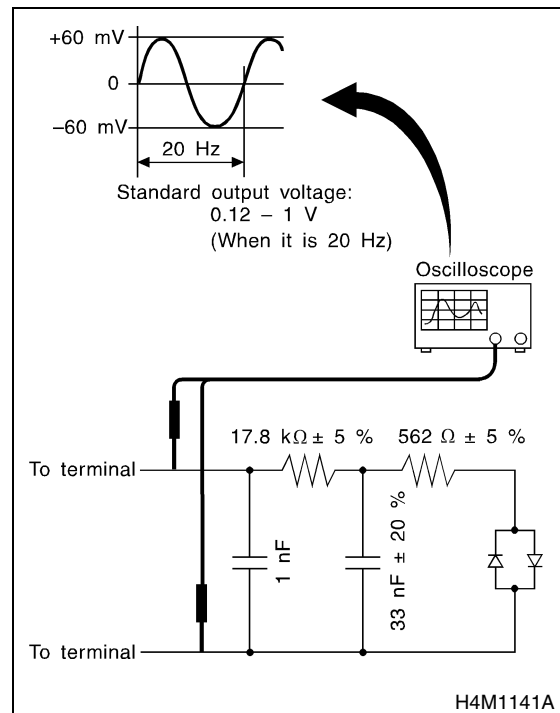
ABS sensor clearance:
 0.7 — 1.2 mm (0.028 — 0.047 in)



3. OUTPUT VOLTAGE

Output voltage can be checked by the following method. Install the resistor and condenser, then rotate the 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-33, REMOVAL, Front Drive Shaft.>

B: INSTALLATION

Refer to Front Drive Shaft, because front tone wheel is integrated with front drive shaft.

<Ref. to DS-33, INSTALLATION, Front Drive Shaft.>

C: INSPECTION

Visually check the tone wheel's teeth (44 pieces) for cracks or dents. If necessary, replace the tone wheel with a new one.

NOTE:

Replace the BJ assembly with a 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-39, REMOVAL, Rear Drive Shaft.>

B: INSTALLATION

Refer to Rear Drive Shaft, because rear tone wheel is integrated with hub.

<Ref. to DS-39, INSTALLATION, Rear Drive Shaft.>

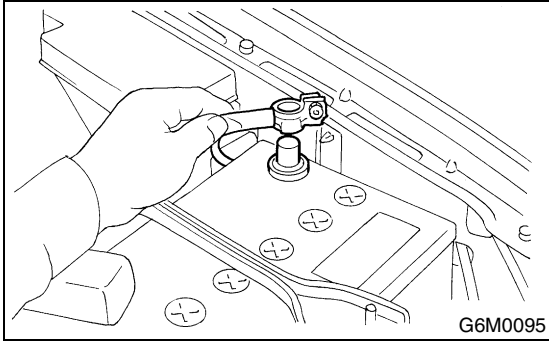
C: INSPECTION

Visually check the tone wheel's teeth (44 pieces) for cracks or dents. If necessary, replace the tone wheel with a new one.

8. G Sensor

A: REMOVAL

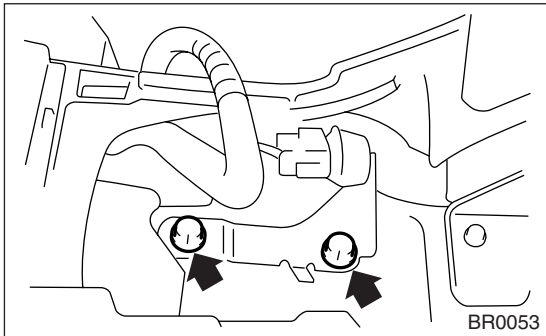
- 1) Disconnect the ground cable from battery.



- 2) Remove the console cover.
<Ref. to EI-40, Console Box.>
- 3) Disconnect the connector from G sensor.
- 4) Remove the G sensor from body.

CAUTION:

Do not drop or bump the G sensor.



B: INSTALLATION

- 1) Install in the reverse order of removal.

CAUTION:

Do not drop or bump the G sensor.

C: INSPECTION

Step	Check	Yes	No
1	CHECK SUBARU SELECT MONITOR.	Go to step 5.	Go to step 2.
2	CHECK G SENSOR. 1) Turn the ignition switch to OFF. 2) Remove the G sensor from vehicle. 3) Connect the connector to G sensor. 4) Turn the ignition switch to ON. 5) Measure the voltage between G sensor connector terminals. Connector & terminal: (R70) No. 2 (+) — No. 3 (-)	Go to step 3.	Replace the G sensor.
3	CHECK G SENSOR. Measure the voltage between G sensor connector terminals. Connector & terminal: (R70) No. 2 (+) — No. 3 (-)	Go to step 4.	Replace the G sensor.
4	CHECK G SENSOR. Measure the voltage between G sensor connector terminals. Connector & terminal: (R70) No. 2 (+) — No. 3 (-)	G sensor is normal.	Replace the G sensor.
5	CHECK G SENSOR. 1) Turn the ignition switch to OFF. 2) Connect the select monitor connector to data link connector. 3) Turn the select monitor into {BRAKE CONTROL} mode. 4) Set the display in the {Current Data Display & Save} mode. 5) Read the G sensor output voltage.	Go to step 6.	Replace the G sensor.
6	CHECK G SENSOR. 1) Remove the console box. 2) Remove the G sensor from vehicle. (Do not disconnect the connector.) 3) Read the select monitor display.	Go to step 7.	Replace the G sensor.
7	CHECK G SENSOR. Read the select monitor display.	G sensor is normal.	Replace the G sensor.

ABS (DIAGNOSTICS)

ABS

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BASIC DIAGNOSTIC PROCEDURE

ABS (DIAGNOSTICS)

1. Basic Diagnostic Procedure

A: PROCEDURE

1. WITHOUT SUBARU SELECT MONITOR

CAUTION:

Remove foreign matter (dust, water, etc.) from the ABSCM&H/U connector during removal and installation.

NOTE:

- To check the harness for broken wires or short circuits, shake it while holding it or the connector.
- When the ABS warning light illuminates, read and record the diagnostic trouble code (DTC) indicated by ABS warning light.

Step	Check	Yes	No
1 CHECK PRE-INSPECTION. 1)Ask the customer when and how trouble occurred using interview checklist. <Ref. to ABS-6, Check List for Interview.> 2)Before performing diagnosis, inspect the unit which might influence ABS problem. <Ref. to ABS-9, INSPECTION, General Description.>	Is the unit that might influence the ABS problem normal?	Go to step 2.	Repair or replace each unit.
2 CHECK INDICATION OF DIAGNOSTIC TROUBLE CODE (DTC). Calling up the DTC. <Ref. to ABS-20, Read Diagnostic Trouble Code (DTC).>	Is any DTC 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 DTC again after inspecting ABS warning light. <Ref. to ABS-20, Read Diagnostic Trouble Code (DTC).>
3 CHECK DIAGNOSTIC TROUBLE CODE (DTC). NOTE: Record all DTCs.	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-179, 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 DTC. <Ref. to ABS-20, Read Diagnostic Trouble Code (DTC).>	Is only the start code issued?	Complete the diagnosis.	Go to step 5.

BASIC DIAGNOSTIC PROCEDURE

ABS (DIAGNOSTICS)

Step	Check	Yes	No
<p>5 PERFORM THE DIAGNOSIS. 1)Inspect using “Diagnostics Chart with Diagnostic Connector”.<Ref. to ABS-28, Diagnostics Chart with Diagnosis Connector.> NOTE: For DTC list, refer to “List of Diagnostics Trouble Code (DTC)”.<Ref. to ABS-24, WITHOUT SUBARU SELECT MONITOR, LIST, List of Diagnostics Trouble Code (DTC).> 2)Repair trouble cause. 3)Perform the clear memory mode. <Ref. to ABS-22, WITHOUT SUBARU SELECT MONITOR, OPERATION, Clear Memory Mode.> 4)Perform the inspection mode. <Ref. to ABS-21, Inspection Mode.> 5)Calling up the DTC. <Ref. to ABS-20, Read Diagnostic Trouble Code (DTC).></p>	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 the harness for broken wires or short circuits, shake it while holding it or the connector.
- Check list for interview. <Ref. to ABS-6, Check List for Interview.>

Step	Check	Yes	No
1 CHECK PRE-INSPECTION. 1)Ask the customer when and how trouble occurred using interview checklist. <Ref. to ABS-6, Check List for Interview.> 2)Before performing diagnosis, inspect the unit which might influence the ABS problem. <Ref. to ABS-9, INSPECTION, General Description.>	Is the unit that might influence the ABS problem normal?	Go to step 2.	Repair or replace each unit.
2 CHECK INDICATION OF DIAGNOSTIC TROUBLE CODE (DTC) DISPLAY. 1)Turn the ignition switch to OFF. 2)Connect the SUBARU SELECT MONITOR to data link connector. 3)Turn the ignition switch to ON and SUBARU SELECT MONITOR to ON. NOTE: If the communication function of select monitor cannot be executed normally, check communication circuit. <Ref. to ABS-92, COMMUNICATION FOR INITIALIZING IMPOSSIBLE, Diagnostics Chart with Subaru Select Monitor.> 4)Read the DTC. <Ref. to ABS-19, READ CURRENT DATA, OPERATION, Subaru Select Monitor.> 5)Record all DTCs 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-179, 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 DTC. <Ref. to ABS-18, READ DIAGNOSTIC TROUBLE CODE (DTC), OPERATION, Subaru Select Monitor.>	Is no DTC designated and does the ABS warning light go out after turning on?	Complete the diagnosis.	Go to step 4.

BASIC DIAGNOSTIC PROCEDURE

ABS (DIAGNOSTICS)

Step	Check	Yes	No
<p>4</p> <p>PERFORM THE DIAGNOSIS.</p> <p>1)Inspect using “Diagnostics Chart with Subaru Select Monitor”.<Ref. to ABS-92, Diagnostics Chart with Subaru Select Monitor.></p> <p>NOTE: For DTC list, refer to “List of Diagnostics Trouble Code (DTC)”.<Ref. to ABS-24, WITHOUT SUBARU SELECT MONITOR, LIST, List of Diagnostics Trouble Code (DTC).></p> <p>2)Repair trouble cause.</p> <p>3)Perform the clear memory mode. <Ref. to ABS-19, CLEAR MEMORY MODE, OPERATION, Subaru Select Monitor.></p> <p>4)Perform the inspection mode. <Ref. to ABS-21, Inspection Mode.></p> <p>5)Calling up the DTC. <Ref. to ABS-18, READ DIAGNOSTIC TROUBLE CODE (DTC), OPERATION, Subaru Select Monitor.></p>	<p>Is no DTC designated and does the ABS warning light go out after turning on?</p>	<p>Complete the diagnosis.</p>	<p>Inspect using “Diagnostics Chart with Subaru Select Monitor”. <Ref. to ABS-92, Diagnostics Chart with Subaru Select Monitor.></p>

CHECK LIST FOR INTERVIEW

ABS (DIAGNOSTICS)

2. Check List for Interview

A: CHECK

Check the following items about the vehicle's state.

1. STATE OF ABS WARNING LIGHT

ABS warning light comes on.	<input type="checkbox"/> Always <input type="checkbox"/> Sometimes <input type="checkbox"/> Only once <input type="checkbox"/> Does not come on • When / how long does it come on?:		
Ignition key position	<input type="checkbox"/> LOCK <input type="checkbox"/> ACC <input type="checkbox"/> ON (before starting engine) <input type="checkbox"/> START <input type="checkbox"/> On after starting (Engine is running) <input type="checkbox"/> On after starting (Engine is stop)		
Timing	<input type="checkbox"/> Immediately after ignition is ON. <input type="checkbox"/> Immediately after ignition starts.		
	<input type="checkbox"/> When advancing	km/h to	km/h
		MPH to	MPH
	<input type="checkbox"/> While traveling at a constant speed	km/h	MPH
	<input type="checkbox"/> When decelerating	km/h to	km/h
		MPH to	MPH
	<input type="checkbox"/> When turning to right	Steering angle :	deg
		Steering time :	sec
	<input type="checkbox"/> When turning to left	Steering angle :	deg
		Steering time :	sec
<input type="checkbox"/> When moving other electrical parts • Parts name : • Operating condition :			

CHECK LIST FOR INTERVIEW

ABS (DIAGNOSTICS)

2. SYMPTOMS

ABS operating condition	<input type="checkbox"/> Performs no work.		
	<input type="checkbox"/> Operates only when abruptly applying brakes.	Vehicle speed :	<input type="text"/> km/h
	MPH		
	• How to step on brake pedal :		
	a) Operating time :	sec	
	b) Operating noise : <input type="checkbox"/> Produce / <input type="checkbox"/> Does not produce		
	• What kind of noise?	<input type="checkbox"/> Knock <input type="checkbox"/> Gong gong <input type="checkbox"/> Bong <input type="checkbox"/> Buzz <input type="checkbox"/> Gong gong buzz <input type="checkbox"/> Others :	
c) Reaction force of brake pedal			
	<input type="checkbox"/> Stick <input type="checkbox"/> Press down once with a clunk <input type="checkbox"/> Press and released <input type="checkbox"/> Others :		
Behavior of vehicle	a) Directional stability cannot be obtained or steering arm refuses to work when applying brakes : <input type="checkbox"/> Yes / <input type="checkbox"/> No		
	• When :	<input type="checkbox"/> Vehicle turns to right <input type="checkbox"/> Vehicle turns to left <input type="checkbox"/> Spins <input type="checkbox"/> Others :	
	b) Directional stability cannot be obtained or steering arm refuses to work when accelerating : <input type="checkbox"/> Yes / <input type="checkbox"/> No		
	• When :	<input type="checkbox"/> Vehicle turns to right <input type="checkbox"/> Vehicle turns to left <input type="checkbox"/> Spins <input type="checkbox"/> Others :	
	c) Brakes are out of order : <input type="checkbox"/> Yes / <input type="checkbox"/> No		
	• What :	<input type="checkbox"/> Braking distance is long <input type="checkbox"/> Brakes lock or drag <input type="checkbox"/> Pedal stroke is long <input type="checkbox"/> Pedal sticks <input type="checkbox"/> Others :	
	d) Poor acceleration : <input type="checkbox"/> Yes / <input type="checkbox"/> No		
	• What :	<input type="checkbox"/> Fails to accelerate <input type="checkbox"/> Engine stalls <input type="checkbox"/> Others :	
	e) Occurrence of vibration : <input type="checkbox"/> Yes / <input type="checkbox"/> No		
	• Where		
	• What kind :		
	f) Occurrence of abnormal noise : <input type="checkbox"/> Yes / <input type="checkbox"/> No		
	• Where		
• What kind :			
g) Occurrence of other phenomena : <input type="checkbox"/> Yes / <input type="checkbox"/> No			
• What kind :			

CHECK LIST FOR INTERVIEW

ABS (DIAGNOSTICS)

3. CONDITIONS UNDER WHICH TROUBLE OCCURS

Environment	a) Weather	<input type="checkbox"/> Fine <input type="checkbox"/> Cloudy <input type="checkbox"/> Rainy <input type="checkbox"/> Snowy <input type="checkbox"/> Various/Others :		
	b) Ambient temperature	°F (°C)		
	c) Road	<input type="checkbox"/> Urban area <input type="checkbox"/> Suburbs <input type="checkbox"/> Highway <input type="checkbox"/> General road <input type="checkbox"/> Ascending slope <input type="checkbox"/> Descending slope <input type="checkbox"/> Paved road <input type="checkbox"/> Gravel road <input type="checkbox"/> Muddy road <input type="checkbox"/> Sandy place <input type="checkbox"/> Others :		
	d) Road surface	<input type="checkbox"/> Dry <input type="checkbox"/> Wet <input type="checkbox"/> New-fallen snow <input type="checkbox"/> Compressed snow <input type="checkbox"/> Frozen slope <input type="checkbox"/> Others :		
Condition	a) Brakes	Deceleration : g		
		<input type="checkbox"/> Continuous / <input type="checkbox"/> Intermittent		
	b) Accelerator	Acceleration : g		
		<input type="checkbox"/> Continuous / <input type="checkbox"/> Intermittent		
	c) Vehicle speed	km/h	MPH	
		<input type="checkbox"/> Advancing <input type="checkbox"/> Accelerating <input type="checkbox"/> Reducing speed <input type="checkbox"/> Low speed <input type="checkbox"/> Turning <input type="checkbox"/> Others :		
	d) Tire inflation pressure	Front RH tire :	kPa	
		Front LH tire :	kPa	
		Rear RH tire :	kPa	
		Rear LH tire :	kPa	
	e) Degree of wear	Front RH tire :		
		Front LH tire :		
		Rear RH tire :		
		Rear LH tire :		
f) Genuine parts are used. :	<input type="checkbox"/> Yes / <input type="checkbox"/> No			
g) Chain is passed around tires. :	<input type="checkbox"/> Yes / <input type="checkbox"/> No			
h) T tire is used. :	<input type="checkbox"/> Yes / <input type="checkbox"/> No			
i) Condition of suspension alignment :				
j) Loading state :				
k) Repair parts are used. :	<input type="checkbox"/> Yes / <input type="checkbox"/> No			
• What :				
l) Others :				

3. General Description

A: CAUTION

1. SUPPLEMENTAL RESTRAINT SYSTEM “AIRBAG”

Airbag system wiring harness is routed near the ABS sensor, ABS control module and hydraulic control unit.

CAUTION:

- All airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuit.
- Be careful not to damage the 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 the battery voltage and specific gravity of electrolyte.

Standard voltage: 12 V, or more

Specific gravity: Above 1.260

2. BRAKE FLUID

- 1) Check the brake fluid level.
- 2) Check the 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 for brake drag.

5. BRAKE PAD AND ROTOR

Check the brake pad and rotor.

- Front <Ref. to BR-23, INSPECTION, Front Brake Pad.> and <Ref. to BR-26, INSPECTION, Front Disc Rotor.>
- Rear <Ref. to BR-34, INSPECTION, Rear Brake Pad.> and <Ref. to BR-35, INSPECTION, Rear Disc Rotor.> or <Ref. to BR-42, INSPECTION, Rear Drum Brake Shoe.> and <Ref. to BR-43, INSPECTION, Rear Drum Brake Drum.>

6. TIRE

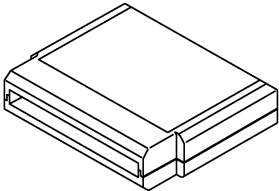

Check the tire specifications, tire wear and air pressure. <Ref. to WT-2, SPECIFICATIONS, General Description.>

GENERAL DESCRIPTION

ABS (DIAGNOSTICS)

C: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B2M3876	24082AA190	CARTRIDGE	Troubleshooting for electrical systems.
 B2M3877	22771AA030	SELECT MONITOR KIT	Troubleshooting for electrical systems. <ul style="list-style-type: none"> • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

2. GENERAL PURPOSE TOOLS

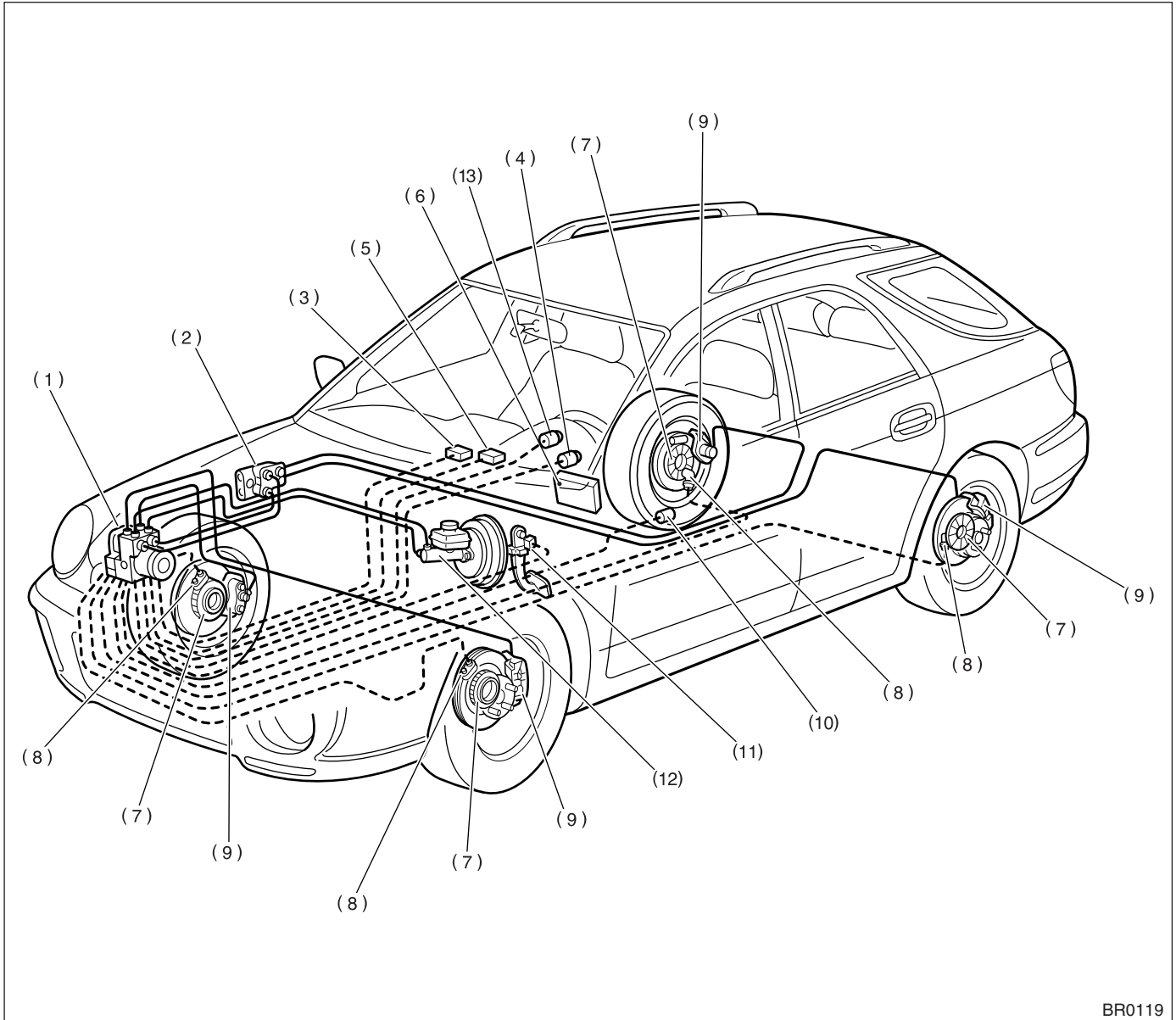
TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance, voltage and ampere.
Oscilloscope	Used for measuring sensor.

ELECTRICAL COMPONENTS LOCATION

ABS (DIAGNOSTICS)

4. Electrical Components Location

A: LOCATION

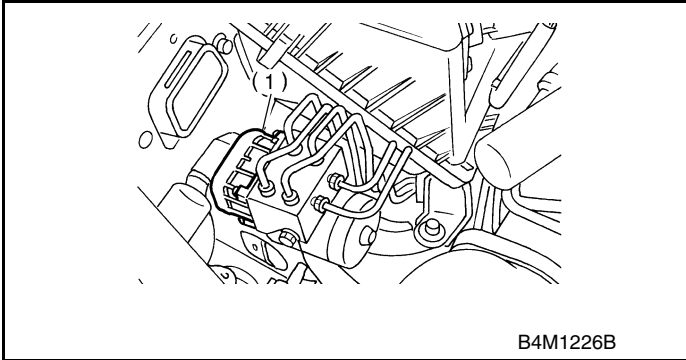


BR0119

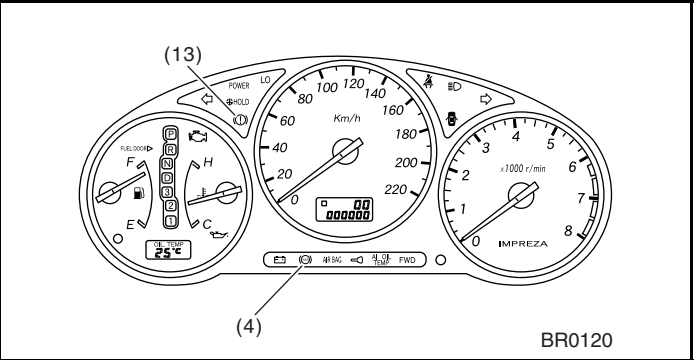
- | | | |
|---|---|--------------------------|
| (1) ABS control module and hydraulic control unit (ABSCM&H/U) | (6) Transmission control module (only AT vehicle) | (11) Stop light switch |
| (2) Proportioning valve | (7) Tone wheel | (12) Master cylinder |
| (3) Diagnosis connector | (8) ABS sensor | (13) Brake warning light |
| (4) ABS warning light | (9) Wheel cylinder | |
| (5) Data link connector (for Subaru Select Monitor) | (10) G sensor | |

ELECTRICAL COMPONENTS LOCATION

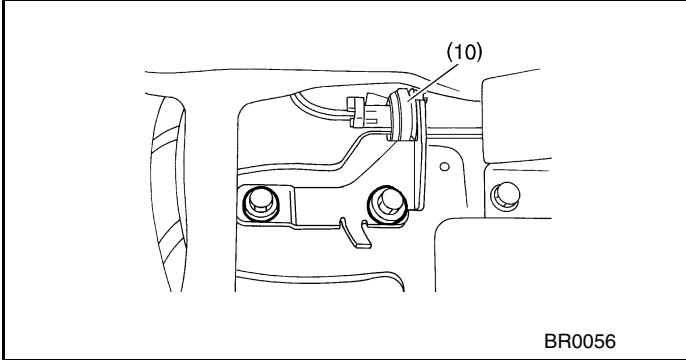
ABS (DIAGNOSTICS)



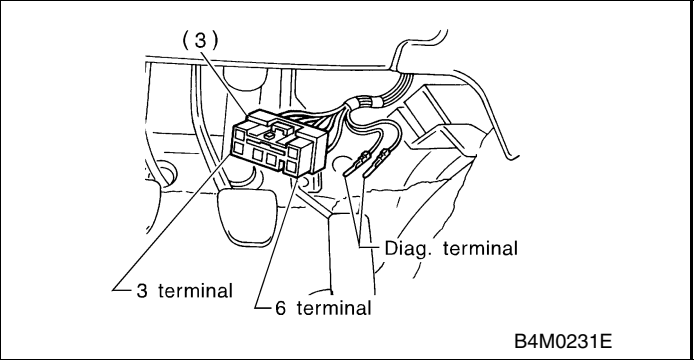
B4M1226B



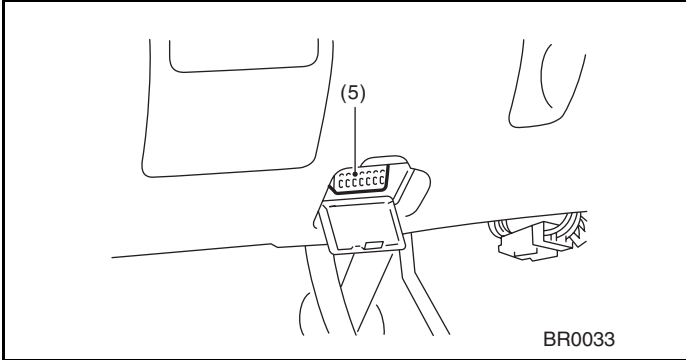
BR0120



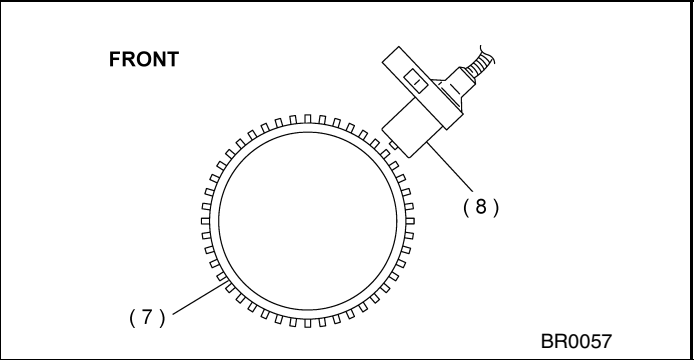
BR0056



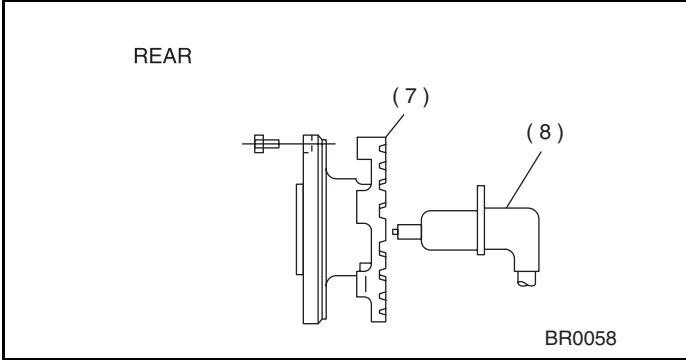
B4M0231E



BR0033



BR0057



BR0058

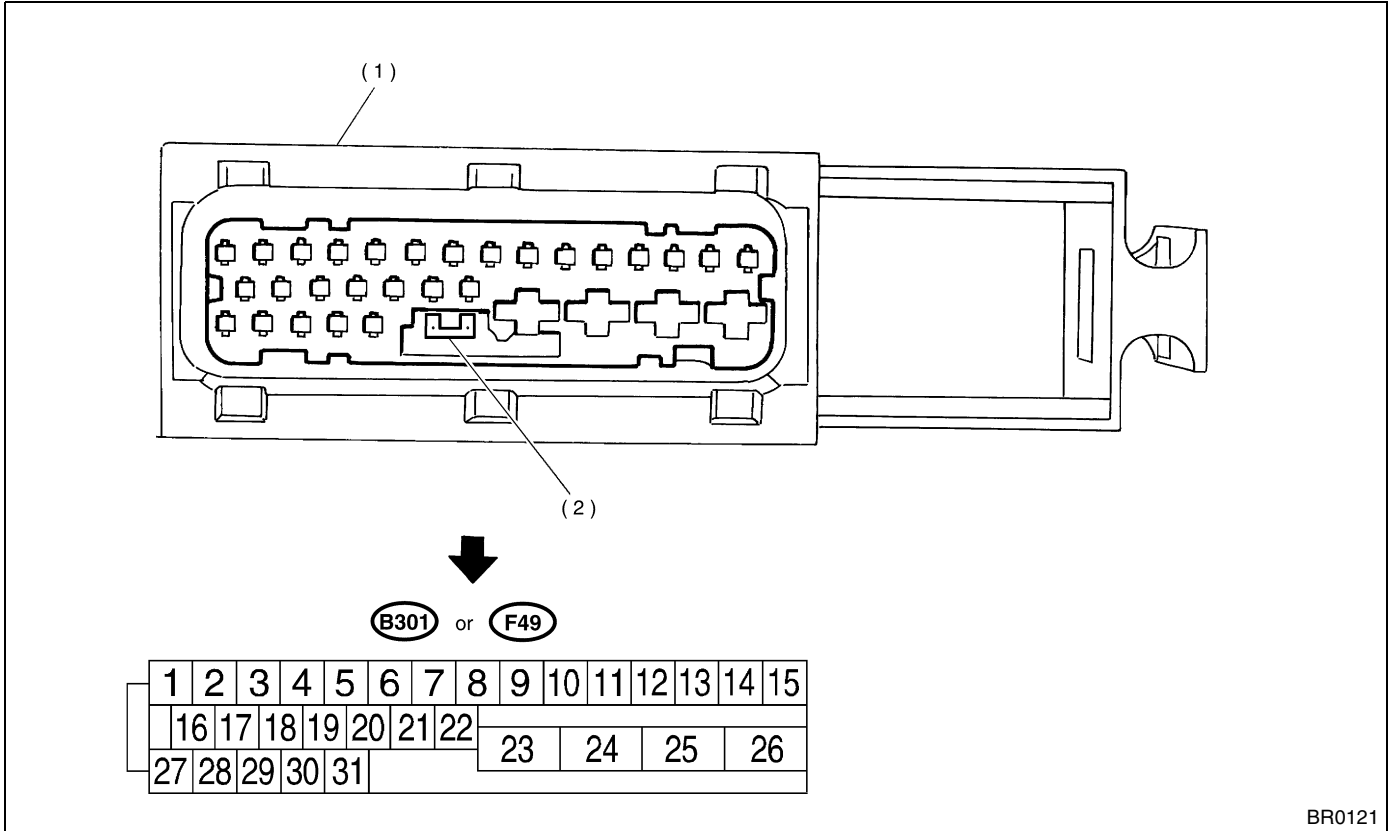


CONTROL MODULE I/O SIGNAL

ABS (DIAGNOSTICS)

5. Control Module I/O Signal

A: ELECTRICAL SPECIFICATION



1) ABS control module and hydraulic control unit connector

2) Connector switch

NOTE:

- The terminal numbers in ABS control module and hydraulic control unit connector are as shown in the figure.
- When the connector is removed from ABSCM&H/U, the connector switch closes the circuit between terminal No. 22 and No. 23. The ABS warning light illuminates.

CONTROL MODULE I/O SIGNAL

ABS (DIAGNOSTICS)

Contents		Terminal No. (+)-()	Input/Output signal
			Measured value and measuring conditions
ABS sensor*2 (Wheel speed sensor)	Front left wheel	9-10	0.12 — 1 V (When it is 20 Hz.)
	Front right wheel	11-12	
	Rear left wheel	7-8	
	Rear right wheel	14-15	
Valve relay power supply		24-23	10 — 15 V
Motor relay power supply		25-23	10 — 15 V
G sensor*2 (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	—

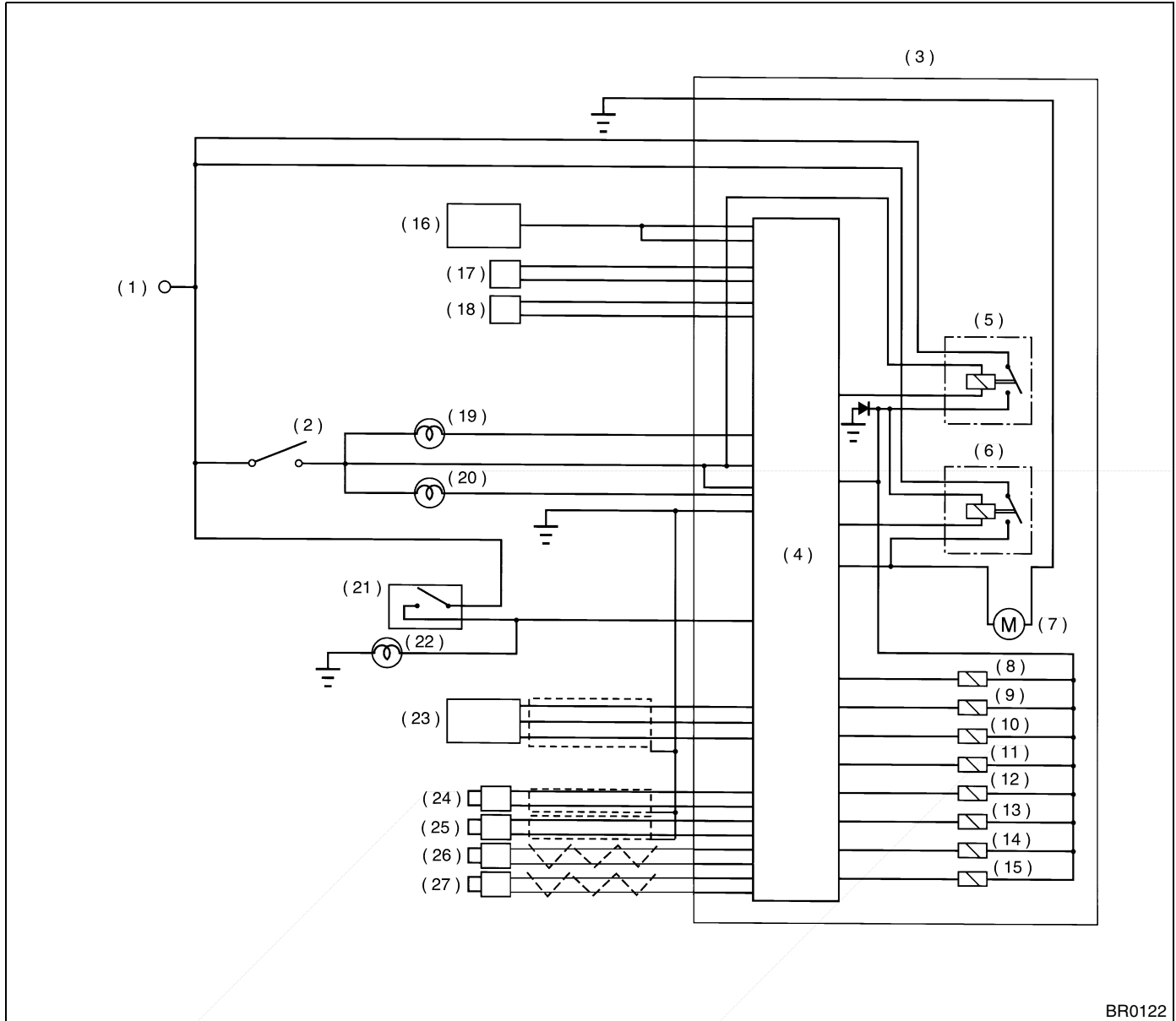
*1: Measure the I/O signal voltage after removing the connector from the ABSCM&H/U terminal.

*2: Measure the I/O signal voltage at connector (B200) or (F74).

CONTROL MODULE I/O SIGNAL

ABS (DIAGNOSTICS)

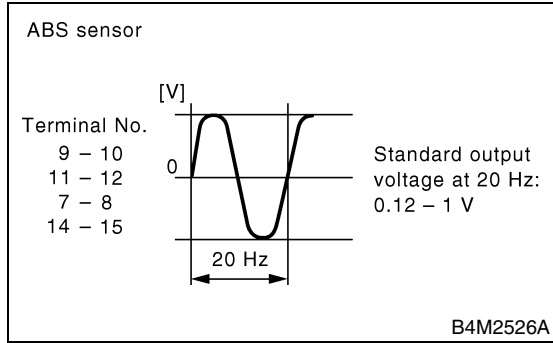
B: SCHEMATIC



BR0122

- | | | |
|---|--|-----------------------------|
| (1) Battery | (10) Front right inlet solenoid valve | (19) Brake warning light |
| (2) IGN | (11) Front right outlet solenoid valve | (20) ABS warning light |
| (3) ABS control module and hydraulic control unit (ABSCM&H/U) | (12) Rear left inlet solenoid valve | (21) Stop light switch |
| (4) ABS control module area | (13) Rear left outlet solenoid valve | (22) Stop light |
| (5) Valve relay | (14) Rear right inlet solenoid valve | (23) G sensor |
| (6) Motor relay | (15) Rear right outlet solenoid valve | (24) Front left ABS sensor |
| (7) Motor | (16) Transmission control module (only AT model) | (25) Front right ABS sensor |
| (8) Front left inlet solenoid valve | (17) Diagnosis connector | (26) Rear left ABS sensor |
| (9) Front left outlet solenoid valve | (18) Data link connector | (27) Rear right ABS sensor |

C: WAVEFORM

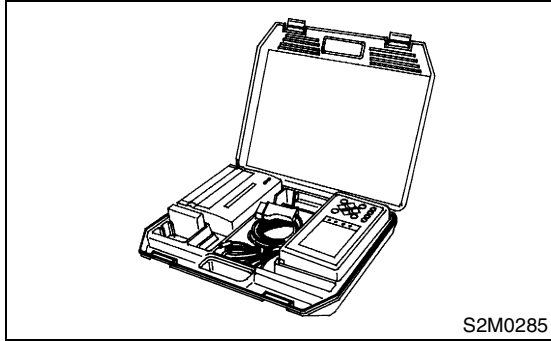


6. Subaru Select Monitor

A: OPERATION

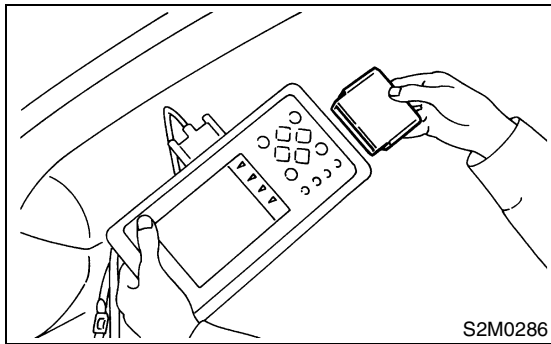
1. READ DIAGNOSTIC TROUBLE CODE (DTC)

1) Prepare the Subaru Select Monitor kit.



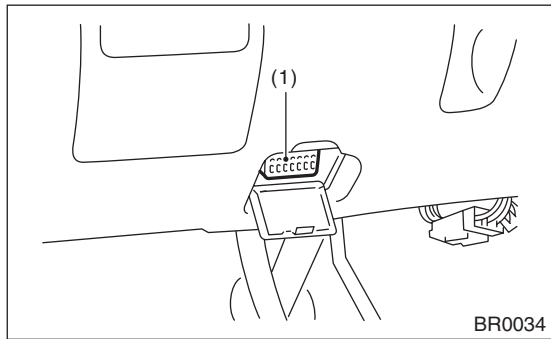
2) Connect the diagnosis cable to Subaru Select Monitor.

3) Insert the cartridge into Subaru Select Monitor.
<Ref. to ABS-10, SPECIAL TOOLS, PREPARATION TOOL, General Description.>



4) Connect the Subaru Select Monitor to data link connector.

(1) Data link connector located in the lower portion of instrument panel (on the driver's side).



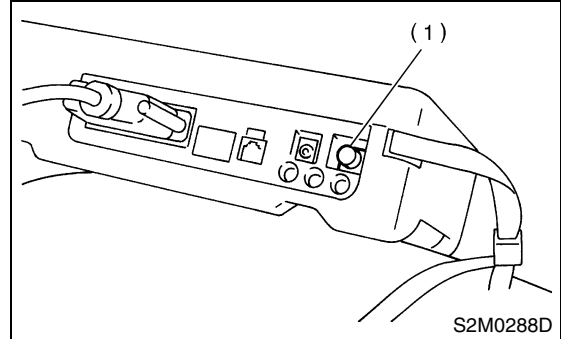
(1) Data link connector

(2) Connect the diagnosis cable to data link connector.

CAUTION:

Do not connect the scan tools except for Subaru Select Monitor and OBD-II general scan tool.

5) Turn the ignition switch to ON (engine OFF) and Subaru Select Monitor switch to ON.



(1) Power switch

6) On the «Main Menu» display screen, select the {Each System Check} and press [YES] key.

7) On the «System Selection Menu» display screen, select the {Brake Control System} and press [YES] key.

8) Press the [YES] key after displayed information of engine type.

9) On the «ABS Diagnosis» display screen, select the {Diagnostic Code(s) Display} and press [YES] key.

10) On the «Diagnostic Code(s) Display» display screen, select the {Current Diagnostic Code(s)} or {History Diagnostic Code(s)} and press [YES] key.

NOTE:

- For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

- For detailed concerning the DTC, refer to the LIST OF DIAGNOSTICS TROUBLE CODE (DTC). <Ref. to ABS-24, List of Diagnostics Trouble Code (DTC).>

2. READ CURRENT DATA

- 1) On the «Main Menu» display screen, select the {Each System Check} and press «YES» key.
- 2) On the «System Selection Menu» display screen, select the {Brake Control System} and press «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 «YES» key.
- 5) On the «Data Display Menu» display screen, select the {Data Display} and press «YES» key.
- 6) Using the scroll key, move the display screen up or down until desired data is shown.
 - A list of the support data is shown in the following table.

Display screen	Contents to be monitored	Unit of measure
FR Wheel Speed	Wheel speed detected by Front Right ABS sensor is displayed	km/h or MPH
FL Wheel Speed	Wheel speed detected by Front Left ABS sensor is displayed	km/h or MPH
RR Wheel Speed	Wheel speed detected by Rear Right ABS sensor is displayed	km/h or MPH
RL Wheel Speed	Wheel speed detected by 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 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 ABS warning light is displayed.	ON or OFF
Motor Relay Monitor	Operating condition of 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 «YES» key.
- 2) On the «System Select Menu» display screen, select the {Brake System} and press «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 «YES» key.
- 5) When the “Done” and “turn ignition switch to OFF” are shown on display screen, turn the Subaru Select Monitor and ignition switch to OFF.

NOTE:

For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

READ DIAGNOSTIC TROUBLE CODE (DTC)

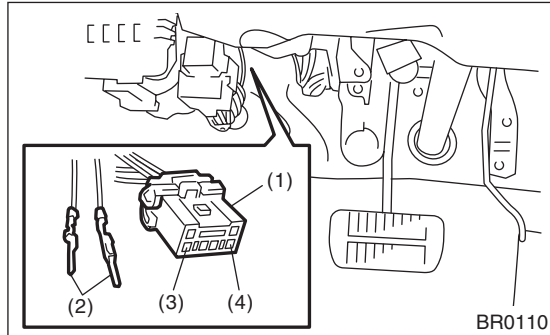
ABS (DIAGNOSTICS)

7. Read Diagnostic Trouble Code (DTC)

A: OPERATION

1. WITHOUT SUBARU SELECT MONITOR

1) Take out the diagnosis connector from side of driver's seat.



- (1) Diagnosis connector
- (2) Diagnosis terminal
- (3) Terminal 3
- (4) Terminal 6

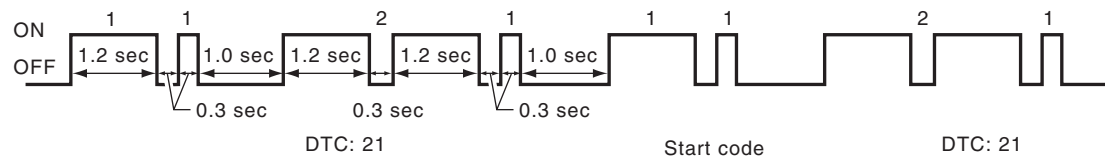
- 2) Turn the ignition switch to OFF.
- 3) Connect the diagnosis connector terminal 6 to diagnosis terminal.
- 4) Turn the ignition switch to ON.
- 5) ABS warning light is set in the diagnostic mode and blinks to identify DTC.
- 6) After the start code (11) is shown, the DTCs will be shown in order of the last information first. These repeat for a maximum of 3 minutes.

NOTE:

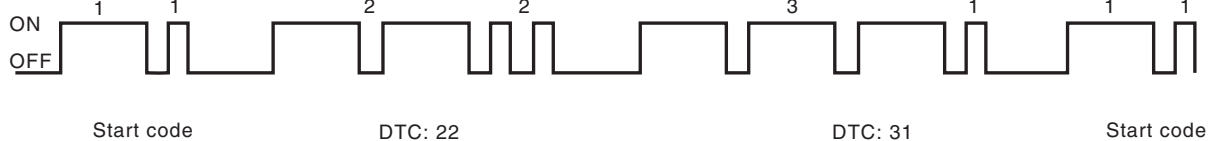
- When there are no DTCs in memory, only the start code (11) is shown.
- When on-board diagnosis of the ABS control module detects a problem, the information (up to a maximum of three) will be stored in EEPROM as a DTC. When there are more than three, the most recent three will be stored. (Stored codes will stay in memory until they are cleared.)

Example of DTC indication

DTC: 21



DTC: 22,31



BR0081

2. WITH SUBARU SELECT MONITOR

Refer to SUBARU SELECT MONITOR for information about how to obtain and understand DTCs. <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 1 minute.

CLEAR MEMORY MODE

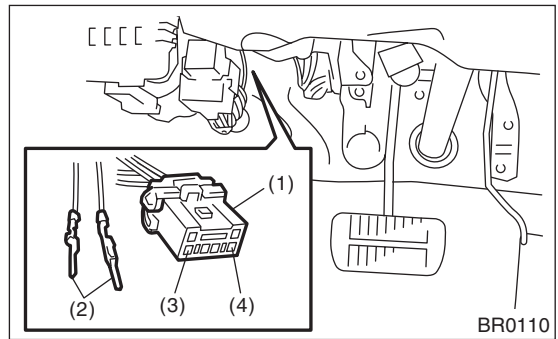
ABS (DIAGNOSTICS)

9. Clear Memory Mode

A: OPERATION

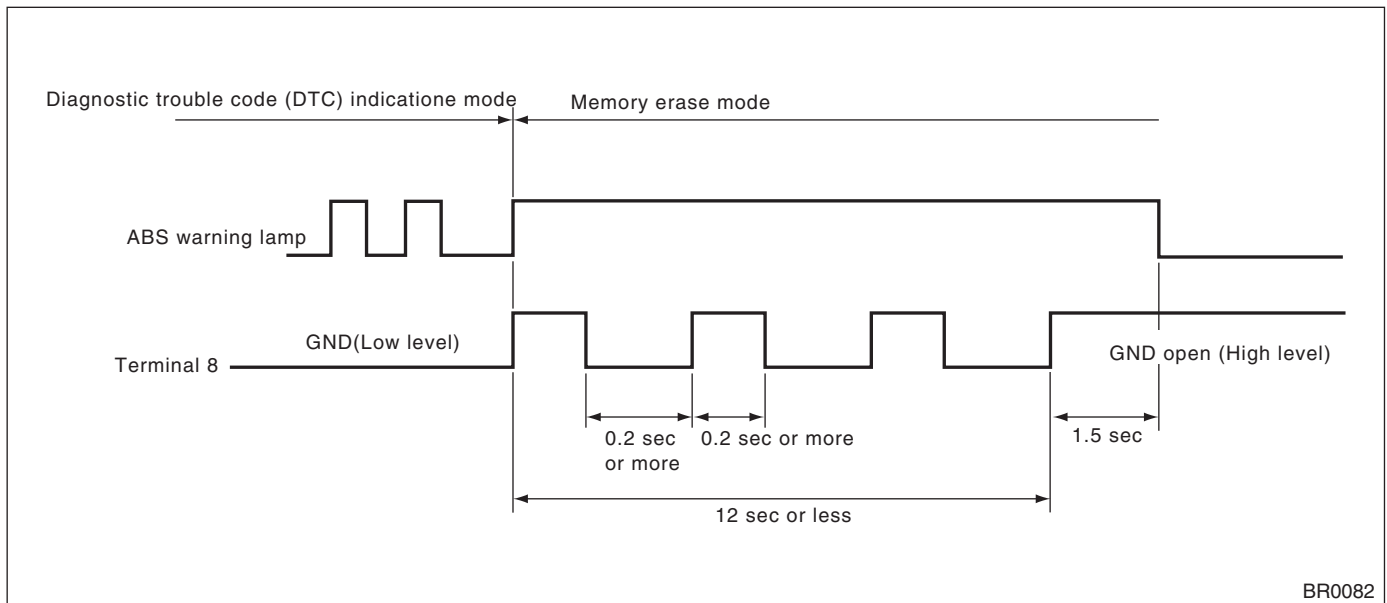
1. WITHOUT SUBARU SELECT MONITOR

1) After calling up a DTC, disconnect the diagnosis connector terminal 6 from diagnosis terminal.



- (1) Diagnosis connector
- (2) Diagnosis terminal
- (3) Terminal 3
- (4) Terminal 6

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:

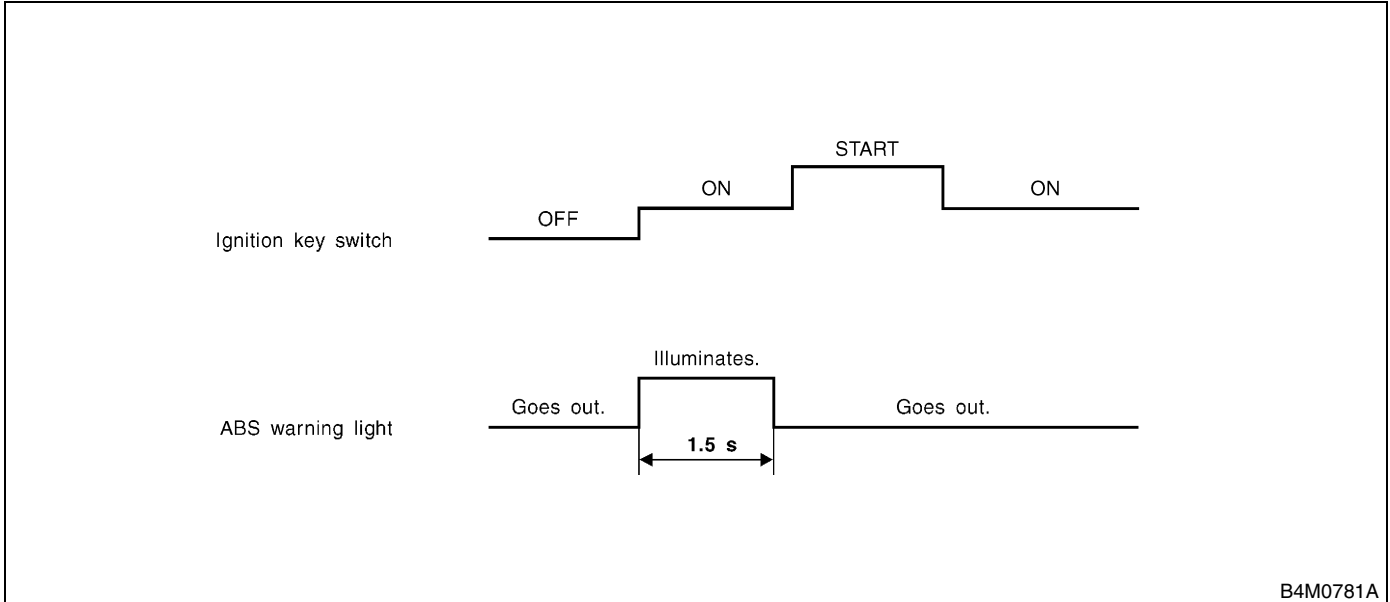
After the diagnostics is completed, make sure to clear memory. Make sure only start code (11) is shown after memory is cleared.

2. WITH SUBARU SELECT MONITOR

Refer to SUBARU SELECT MONITOR for information about how to clear DTC. <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 approx. 12 km/h (7 MPH). However, the Anti-lock brakes do not work while ABS warning light is illuminated.

LIST OF DIAGNOSTICS TROUBLE CODE (DTC)

ABS (DIAGNOSTICS)

11. List of Diagnostics Trouble Code (DTC)

A: LIST

1. WITHOUT SUBARU SELECT MONITOR

DTC No.	Contents of diagnosis		Index No.
11	Start code • DTC is shown after start code. • Only start code is shown in normal condition.		—
21	Abnormal ABS sensor (Open circuit or input voltage too high)	Front right ABS sensor	<Ref. to ABS-39, DTC 21 — ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (FRONT RH) —, Diagnostics Chart with Diagnosis Connector.>
23		Front left ABS sensor	<Ref. to ABS-39, DTC 23 — ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (FRONT LH) —, Diagnostics Chart with Diagnosis Connector.>
25		Rear right ABS sensor	<Ref. to ABS-39, DTC 25 — ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (REAR RH) —, Diagnostics Chart with Diagnosis Connector.>
27		Rear left ABS sensor	<Ref. to ABS-40, DTC 27 — ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (REAR LH) —, Diagnostics Chart with Diagnosis Connector.>
22	Abnormal ABS sensor (Abnormal ABS sensor signal)	Front right ABS sensor	<Ref. to ABS-46, DTC 22 — ABNORMAL ABS SENSOR (ABNORMAL ABS SENSOR SIGNAL) (FRONT RH) —, Diagnostics Chart with Diagnosis Connector.>
24		Front left ABS sensor	<Ref. to ABS-46, DTC 24 — ABNORMAL ABS SENSOR (ABNORMAL ABS SENSOR SIGNAL) (FRONT LH) —, Diagnostics Chart with Diagnosis Connector.>
26		Rear right ABS sensor	<Ref. to ABS-46, DTC 26 — ABNORMAL ABS SENSOR (ABNORMAL ABS SENSOR SIGNAL) (REAR RH) —, Diagnostics Chart with Diagnosis Connector.>
28		Rear left ABS sensor	<Ref. to ABS-47, DTC 28 — ABNORMAL ABS SENSOR (ABNORMAL ABS SENSOR SIGNAL) (REAR LH) —, Diagnostics Chart with Diagnosis Connector.>
29		Any one of four	<Ref. to ABS-52, DTC 29 — ABNORMAL ABS SENSOR (ABNORMAL ABS SENSOR SIGNAL) (ANY ONE OF FOUR) —, Diagnostics Chart with Diagnosis Connector.>

LIST OF DIAGNOSTICS TROUBLE CODE (DTC)

ABS (DIAGNOSTICS)

DTC No.	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-57, DTC 31 — ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (FRONT RH) —, Diagnostics Chart with Diagnosis Connector.>
32		Front right outlet valve <Ref. to ABS-61, DTC 32 — ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (FRONT RH) —, Diagnostics Chart with Diagnosis Connector.>
33		Front left inlet valve <Ref. to ABS-57, DTC 33 — ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (FRONT LH) —, Diagnostics Chart with Diagnosis Connector.>
34		Front left outlet valve <Ref. to ABS-61, DTC 34 — ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (FRONT LH) —, Diagnostics Chart with Diagnosis Connector.>
35		Rear right inlet valve <Ref. to ABS-57, DTC 35 — ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR RH) —, Diagnostics Chart with Diagnosis Connector.>
36		Rear right outlet valve <Ref. to ABS-61, DTC 36 — ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR RH) —, Diagnostics Chart with Diagnosis Connector.>
37		Rear left inlet valve <Ref. to ABS-58, DTC 37 — ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR LH) —, Diagnostics Chart with Diagnosis Connector.>
38		Rear left outlet valve <Ref. to ABS-62, DTC 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-66, DTC 41 — ABNORMAL ABS CONTROL MODULE —, Diagnostics Chart with Diagnosis Connector.>
42	Source voltage is abnormal.	<Ref. to ABS-68, DTC 42 — SOURCE VOLTAGE IS ABNORMAL. —, Diagnostics Chart with Diagnosis Connector.>
44	A combination of AT control abnormal	<Ref. to ABS-72, DTC 44 — A COMBINATION OF AT CONTROL ABNORMAL —, Diagnostics Chart with Diagnosis Connector.>
51	Abnormal valve relay	<Ref. to ABS-75, DTC 51 — ABNORMAL VALVE RELAY —, Diagnostics Chart with Diagnosis Connector.>
52	Abnormal motor and/or motor relay	<Ref. to ABS-79, DTC 52 — ABNORMAL MOTOR AND/OR MOTOR RELAY —, Diagnostics Chart with Diagnosis Connector.>
54	Abnormal stop light switch	<Ref. to ABS-84, DTC 54 — ABNORMAL STOP LIGHT SWITCH —, Diagnostics Chart with Diagnosis Connector.>
56	Abnormal G sensor output voltage	<Ref. to ABS-86, DTC 56 — ABNORMAL G SENSOR OUTPUT VOLTAGE —, Diagnostics Chart with Diagnosis Connector.>

LIST OF DIAGNOSTICS TROUBLE CODE (DTC)

ABS (DIAGNOSTICS)

2. WITH SUBARU SELECT MONITOR

DTC No.	Display screen	Contents of diagnosis	Index No.
—	Communication for initializing impossible	Select monitor communication failure	<Ref. to ABS-92, 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-96, 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-100, DTC 21 — OPEN OR SHORT CIRCUIT IN FRONT RIGHT ABS SENSOR CIRCUIT —, Diagnostics Chart with Subaru Select Monitor.>
22	Front right ABS sensor abnormal signal	Front right ABS sensor abnormal signal	<Ref. to ABS-107, DTC 22 — FRONT RIGHT ABNORMAL ABS SENSOR SIGNAL —, Diagnostics Chart with Subaru Select Monitor.>
23	Open or short circuit in front left ABS sensor circuit	Open or short circuit in front left ABS sensor circuit	<Ref. to ABS-100, DTC 23 — OPEN OR SHORT CIRCUIT IN FRONT LEFT ABS SENSOR CIRCUIT —, Diagnostics Chart with Subaru Select Monitor.>
24	Front left ABS sensor abnormal signal	Front left ABS sensor abnormal signal	<Ref. to ABS-107, DTC 24 — FRONT LEFT ABNORMAL ABS SENSOR SIGNAL —, Diagnostics Chart with Subaru Select Monitor.>
25	Open or short circuit in rear right ABS sensor circuit	Open or short circuit in rear right ABS sensor circuit	<Ref. to ABS-100, DTC 25 — OPEN OR SHORT CIRCUIT IN REAR RIGHT ABS SENSOR CIRCUIT —, Diagnostics Chart with Subaru Select Monitor.>
26	Rear right ABS sensor abnormal signal	Rear right ABS sensor abnormal signal	<Ref. to ABS-107, DTC 26 — REAR RIGHT ABNORMAL ABS SENSOR SIGNAL —, Diagnostics Chart with Subaru Select Monitor.>
27	Open or short circuit in rear left ABS sensor circuit	Open or short circuit in rear left ABS sensor circuit	<Ref. to ABS-101, DTC 27 — OPEN OR SHORT CIRCUIT IN REAR LEFT ABS SENSOR CIRCUIT —, Diagnostics Chart with Subaru Select Monitor.>
28	Rear left ABS sensor abnormal signal	Rear left ABS sensor abnormal signal	<Ref. to ABS-108, DTC 28 — REAR LEFT ABNORMAL ABS SENSOR SIGNAL —, Diagnostics Chart with Subaru Select Monitor.>
29	Abnormal ABS sensor signal on any one of four sensor	Abnormal ABS sensor signal on any one of four	<Ref. to ABS-114, DTC 29 — ABNORMAL ABS SENSOR SIGNAL ON ANY ONE OF FOUR SENSOR —, Diagnostics Chart with Subaru Select Monitor.>
31	Front right inlet valve malfunction	Front right inlet valve malfunction	<Ref. to ABS-118, DTC 31 — FRONT RIGHT INLET VALVE MALFUNCTION —, Diagnostics Chart with Subaru Select Monitor.>
32	Front right outlet valve malfunction	Front right outlet valve malfunction	<Ref. to ABS-123, DTC 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-118, DTC 33 — FRONT LEFT INLET VALVE MALFUNCTION —, Diagnostics Chart with Subaru Select Monitor.>
34	Front left outlet valve malfunction	Front left outlet valve malfunction	<Ref. to ABS-123, DTC 34 — FRONT LEFT OUTLET VALVE MALFUNCTION —, Diagnostics Chart with Subaru Select Monitor.>
35	Rear right inlet valve malfunction	Rear right inlet valve malfunction	<Ref. to ABS-118, DTC 35 — REAR RIGHT INLET VALVE MALFUNCTION —, Diagnostics Chart with Subaru Select Monitor.>
36	Rear right outlet valve malfunction	Rear right outlet valve malfunction	<Ref. to ABS-123, DTC 36 — REAR RIGHT OUTLET VALVE MALFUNCTION —, Diagnostics Chart with Subaru Select Monitor.>
37	Rear left inlet valve malfunction	Rear left inlet valve malfunction	<Ref. to ABS-120, DTC 37 — REAR LEFT INLET VALVE MALFUNCTION —, Diagnostics Chart with Subaru Select Monitor.>
38	Rear left outlet valve malfunction	Rear left outlet valve malfunction	<Ref. to ABS-124, DTC 38 — REAR LEFT OUTLET VALVE MALFUNCTION —, Diagnostics Chart with Subaru Select Monitor.>
41	ABS control module malfunction	ABS control module and hydraulic control unit malfunction	<Ref. to ABS-128, DTC 41 — ABS CONTROL MODULE MALFUNCTION —, Diagnostics Chart with Subaru Select Monitor.>
42	Power supply voltage too low	Power supply voltage too low	<Ref. to ABS-130, DTC 42 — POWER SUPPLY VOLTAGE TOO LOW —, Diagnostics Chart with Subaru Select Monitor.>
42	Power supply voltage too high	Power supply voltage too high	<Ref. to ABS-132, DTC 42 — POWER SUPPLY VOLTAGE TOO HIGH —, Diagnostics Chart with Subaru Select Monitor.>

LIST OF DIAGNOSTICS TROUBLE CODE (DTC)

ABS (DIAGNOSTICS)

DTC No.	Display screen	Contents of diagnosis	Index No.
44	ABS-AT control (Non Controlled)	ABS-AT control (Non Controlled)	<Ref. to ABS-136, DTC 44 — ABS-AT CONTROL (NON CONTROLLED) —, Diagnostics Chart with Subaru Select Monitor.>
44	ABS-AT control (Controlled)	ABS-AT control (Controlled)	<Ref. to ABS-138, DTC 44 — ABS-AT CONTROL (CONTROLLED) —, Diagnostics Chart with Subaru Select Monitor.>
51	Valve relay malfunction	Valve relay malfunction	<Ref. to ABS-141, DTC 51 — VALVE RELAY MALFUNCTION —, Diagnostics Chart with Subaru Select Monitor.>
51	Valve relay ON failure	Valve relay ON failure	<Ref. to ABS-145, DTC 51 — VALVE RELAY ON FAILURE —, Diagnostics Chart with Subaru Select Monitor.>
52	Open circuit in motor relay circuit	Open circuit in motor relay circuit	<Ref. to ABS-149, DTC 52 — OPEN CIRCUIT IN MOTOR RELAY CIRCUIT —, Diagnostics Chart with Subaru Select Monitor.>
52	Motor relay ON failure	Motor relay ON failure	<Ref. to ABS-153, DTC 52 — MOTOR RELAY ON FAILURE —, Diagnostics Chart with Subaru Select Monitor.>
52	Motor malfunction	Motor malfunction	<Ref. to ABS-157, DTC 52 — MOTOR MALFUNCTION —, Diagnostics Chart with Subaru Select Monitor.>
54	Stop light switch signal circuit malfunction	Stop light switch signal circuit malfunction	<Ref. to ABS-160, DTC 54 — STOP LIGHT SWITCH SIGNAL CIRCUIT MALFUNCTION —, Diagnostics Chart with Subaru Select Monitor.>
56	Open or short circuit in G sensor circuit	Open or short circuit in G sensor circuit	<Ref. to ABS-162, DTC 56 — OPEN OR SHORT CIRCUIT IN G SENSOR CIRCUIT —, Diagnostics Chart with Subaru Select Monitor.>
56	Battery short in G sensor circuit	Battery short in G sensor circuit	<Ref. to ABS-166, DTC 56 — BATTERY SHORT IN G SENSOR CIRCUIT —, Diagnostics Chart with Subaru Select Monitor.>
56	Abnormal G sensor high μ output	Abnormal G sensor high μ output	<Ref. to ABS-171, DTC 56 — ABNORMAL G SENSOR HIGH M OUTPUT —, Diagnostics Chart with Subaru Select Monitor.>
56	Detection of G sensor stick	Detection of G sensor stick	<Ref. to ABS-175, DTC 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 AND BRAKE WARNING LIGHT DOES NOT COME ON.

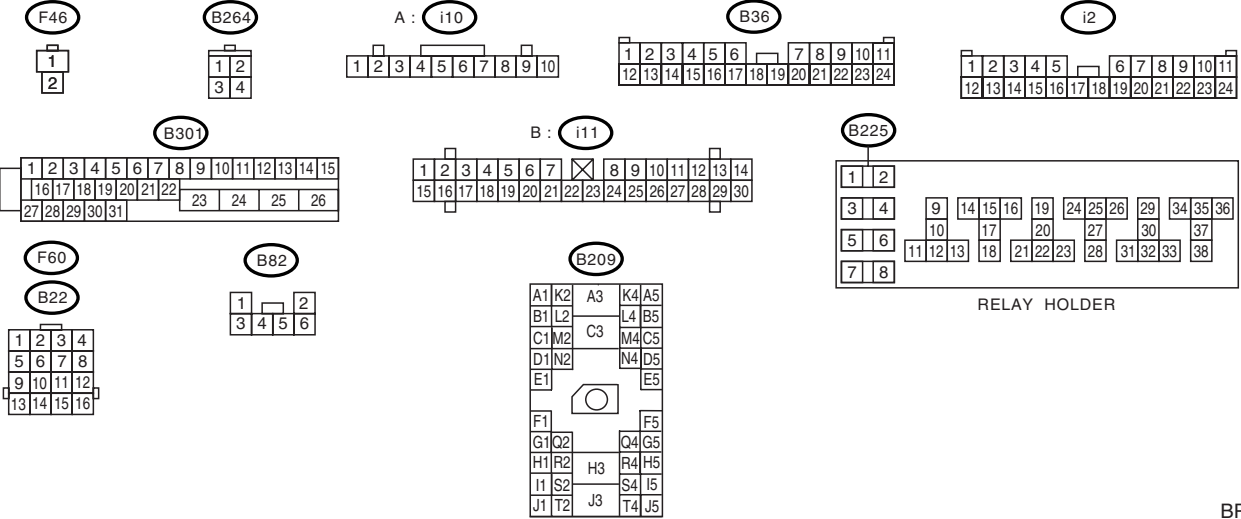
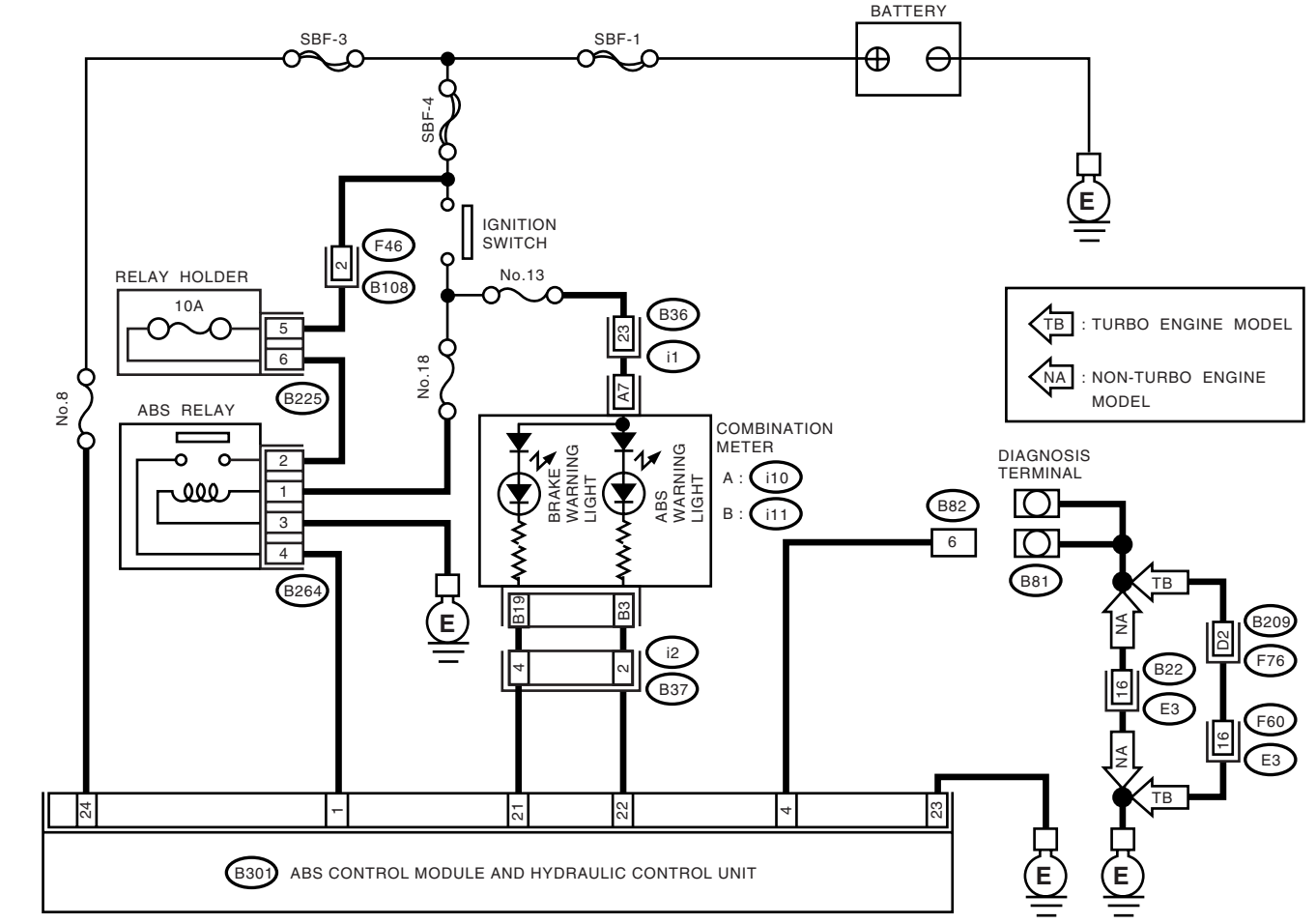
DIAGNOSIS:

- ABS warning light circuit is open or shorted.
- Brake warning light circuit is open or shorted.

TROUBLE SYMPTOM:

- When the ignition switch is turned to ON (engine OFF), ABS and brake warning light does not come on.

WIRING DIAGRAM: LHD MODEL

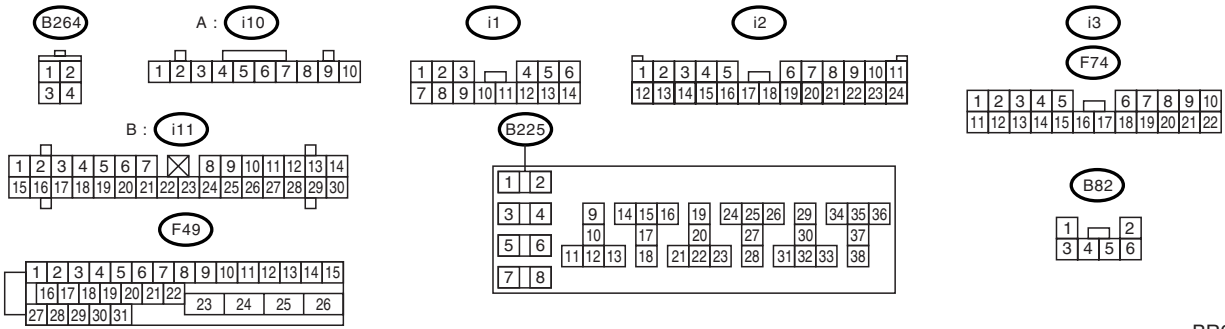
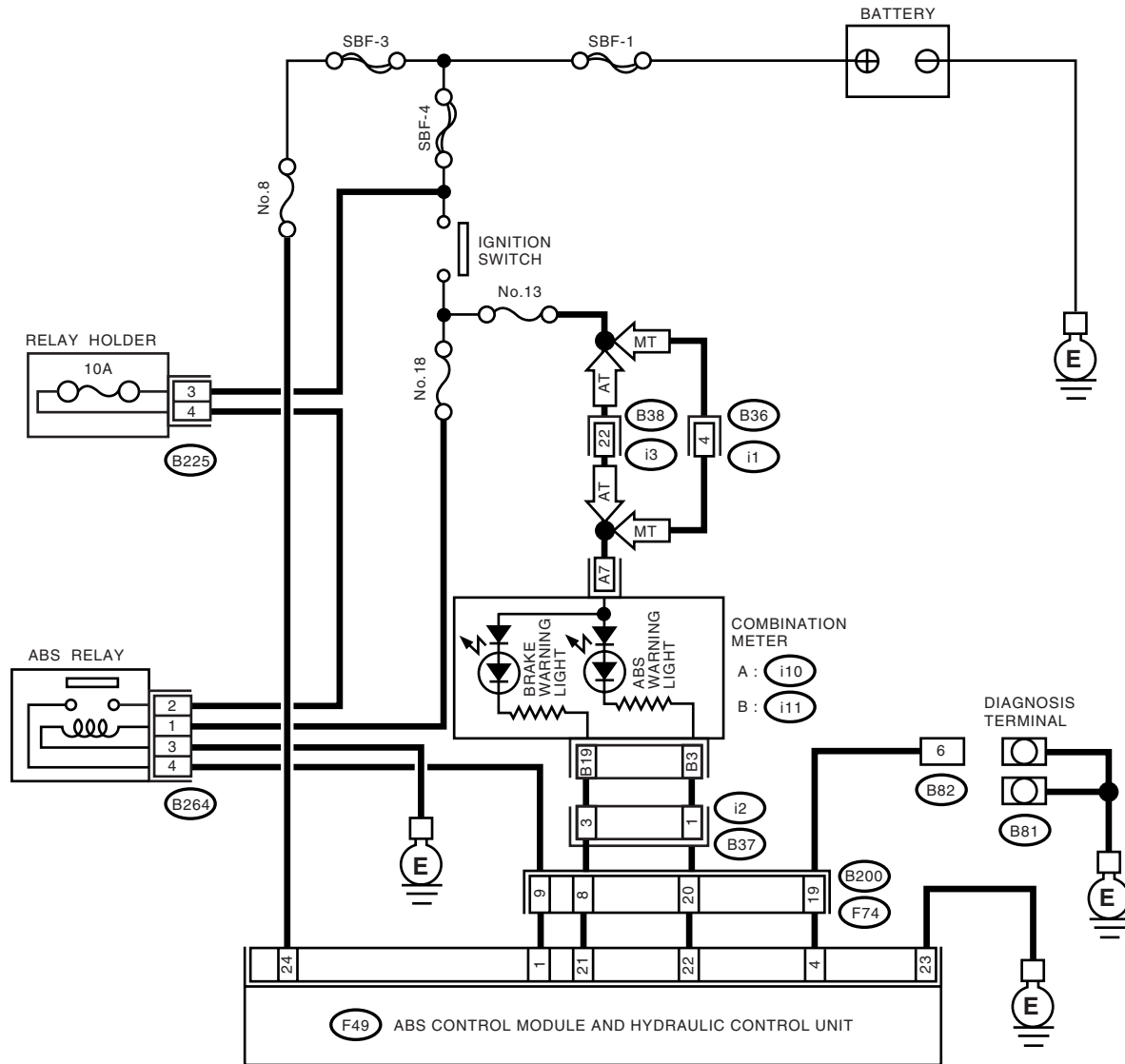


BR0123

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

WIRING DIAGRAM: RHD MODEL



BR0124

Step	Check	Yes	No
1	CHECK IF OTHER WARNING LIGHTS TURN ON. Turn the ignition switch to ON (engine OFF).	Go to step 2.	Repair the combination meter. <Ref. to IDI-15, Combination Meter Assembly.>

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
<p>2 CHECK ABS AND BRAKE WARNING LIGHT BULB. 1) Turn the ignition switch to OFF. 2) Remove the combination meter. 3) Remove the ABS and brake warning light bulb from combination meter.</p>	Are the ABS and brake warning light bulb OK?	Go to step 3.	Replace the ABS and brake warning light bulb. <Ref. to IDI-15, Combination Meter Assembly.>
<p>3 CHECK BATTERY SHORT OF ABS AND BRAKE WARNING LIGHT HARNESS. 1) Disconnect the connector (i2) from connector (B37). 2) Measure the voltage between connector (i2) and chassis ground. <i>Connector & terminal</i> <i>LHD: (i2) No. 2 (+) and No. 4 (+) — Chassis ground (-):</i> <i>RHD: (i2) No. 1 (+) and No. 3 (+) — Chassis ground (-):</i></p>	Is the voltage less than 3 V?	Go to step 4.	Repair the warning light harness.
<p>4 CHECK BATTERY SHORT OF ABS AND BRAKE WARNING LIGHT HARNESS. 1) Turn the ignition switch to ON. 2) Measure the voltage between connector (i2) and chassis ground. <i>Connector & terminal</i> <i>LHD: (i2) No. 2 (+) and No. 4 (+) — Chassis ground (-):</i> <i>RHD: (i2) No. 1 (+) and No. 3 (+) — Chassis ground (-):</i></p>	Is the voltage less than 3 V?	Go to step 5.	Repair the warning light harness.
<p>5 CHECK WIRING HARNESS. 1) Turn the ignition switch to OFF. 2) Install the ABS and brake warning light bulb to combination meter. 3) Install the combination meter. 4) Turn the ignition switch to ON. 5) Measure the voltage between connector (i2) and chassis ground. <i>Connector & terminal</i> <i>LHD: (i2) No. 2 (+) and No. 4 (+) — Chassis ground (-):</i> <i>RHD: (i2) No. 1 (+) and No. 3 (+) — Chassis ground (-):</i></p>	Is the voltage between 10 and 15 V?	Go to step 6.	Repair the wiring harness.
<p>6 CHECK BATTERY SHORT OF ABS AND BRAKE WARNING LIGHT HARNESS. 1) Turn the ignition switch to OFF. 2) Measure the voltage between connector (B37) and chassis ground. <i>Connector & terminal</i> <i>LHD: (B37) No. 2 (+) and No. 4 (+) — Chassis ground (-):</i> <i>RHD: (B37) No. 1 (+) and No. 3 (+) — Chassis ground (-):</i></p>	Is the voltage less than 3 V?	Go to step 7.	Repair the wiring harness.
<p>7 CHECK BATTERY SHORT OF ABS AND BRAKE WARNING LIGHT HARNESS. 1) Turn the ignition switch to ON. 2) Measure the voltage between connector (B37) and chassis ground. <i>Connector & terminal</i> <i>LHD: (B37) No. 2 (+) and No. 4 (+) — Chassis ground (-):</i> <i>RHD: (B37) No. 1 (+) and No. 3 (+) — Chassis ground (-):</i></p>	Is the voltage less than 3 V?	Go to step 8.	Repair the wiring harness.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
8 CHECK GROUND CIRCUIT OF ABSCM&H/U. Measure the resistance between ABSCM&H/U and chassis ground. <i>Connector & terminal</i> <i>LHD: (B301) No. 23 — Chassis ground:</i> <i>RHD: (F49) No. 23 — Chassis ground:</i>	Is the resistance less than 0.5 Ω ?	Go to step 9 .	Repair the ABSCM&H/U ground harness.
9 CHECK WIRING HARNESS. Measure the resistance between connector (B37) and chassis ground. <i>Connector & terminal</i> <i>LHD: (B37) No. 2 and No. 4 — Chassis ground:</i> <i>RHD: (B37) No. 1 and No. 3 — Chassis ground:</i>	Is the resistance less than 0.5 Ω ?	Go to step 10 .	Repair the harness/connector.
10 CHECK POOR CONTACT IN CONNECTORS. Turn the ignition switch to OFF.	Is there poor contact in connectors between combination meter and ABSCM&H/U?	Repair the connector.	Replace the 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 AND BRAKE WARNING LIGHT DOES NOT GO OFF.

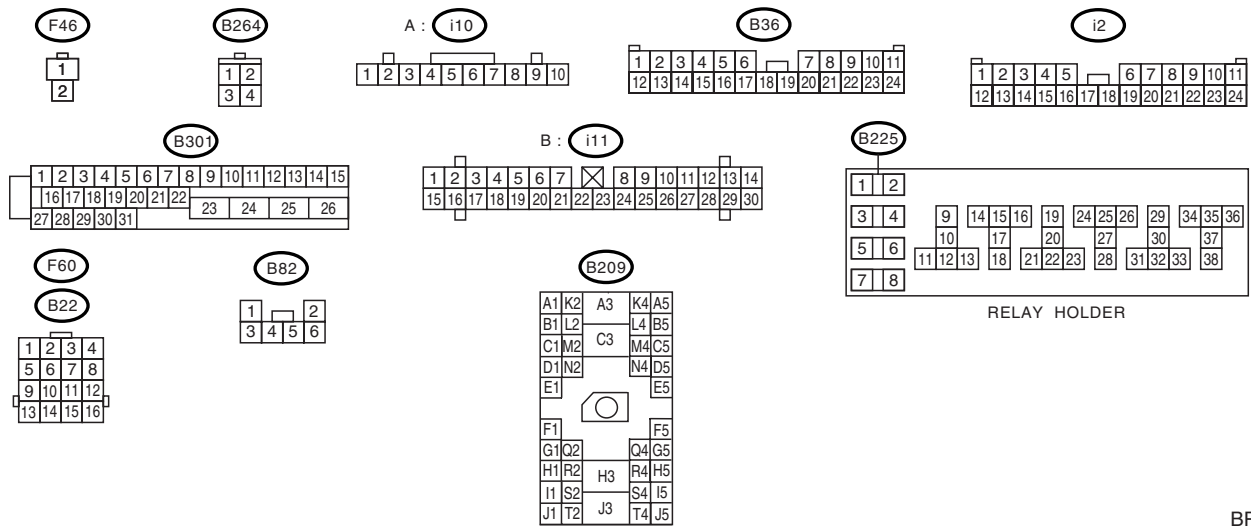
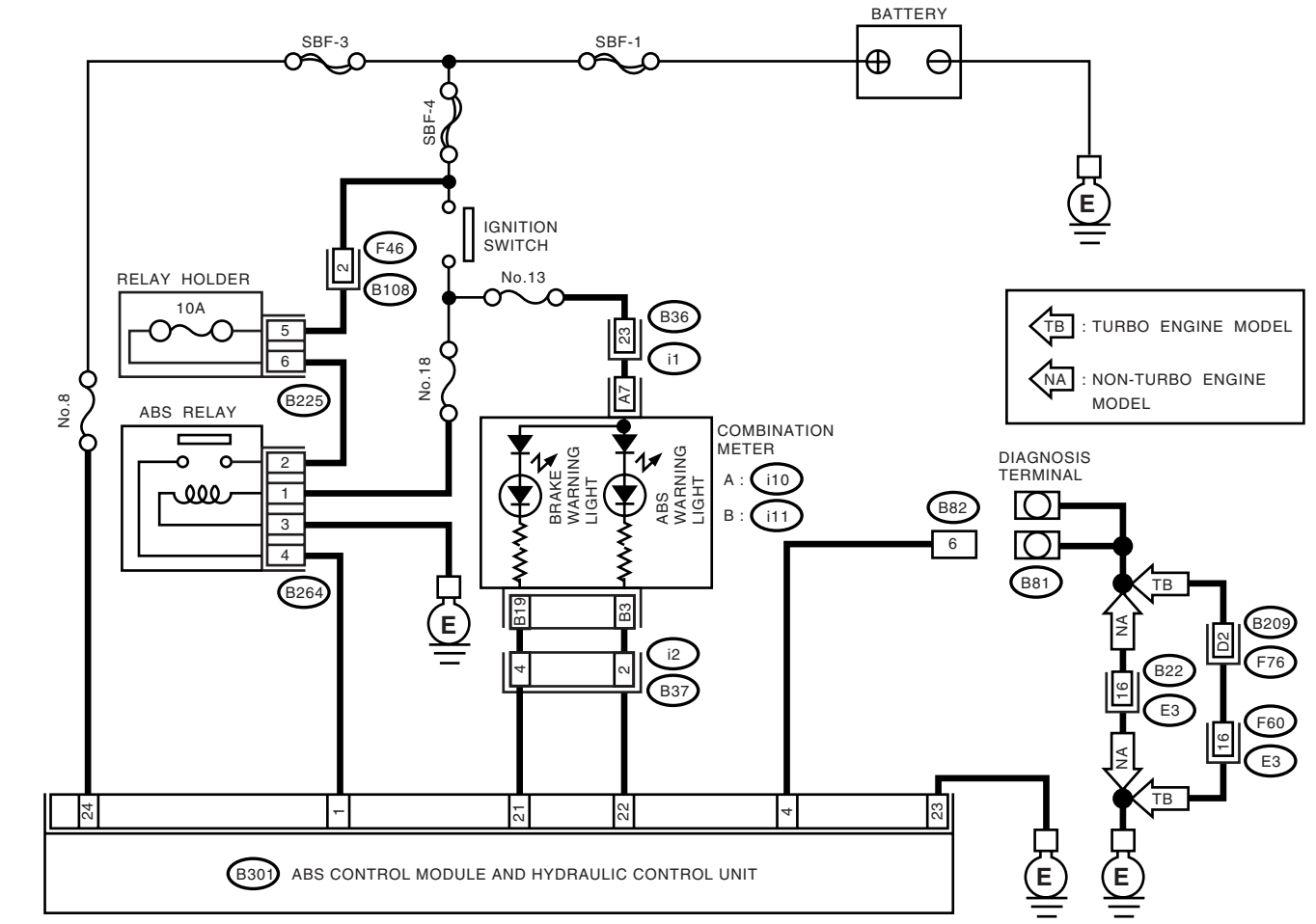
DIAGNOSIS:

- ABS warning light circuit is open or shorted.
- Brake 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

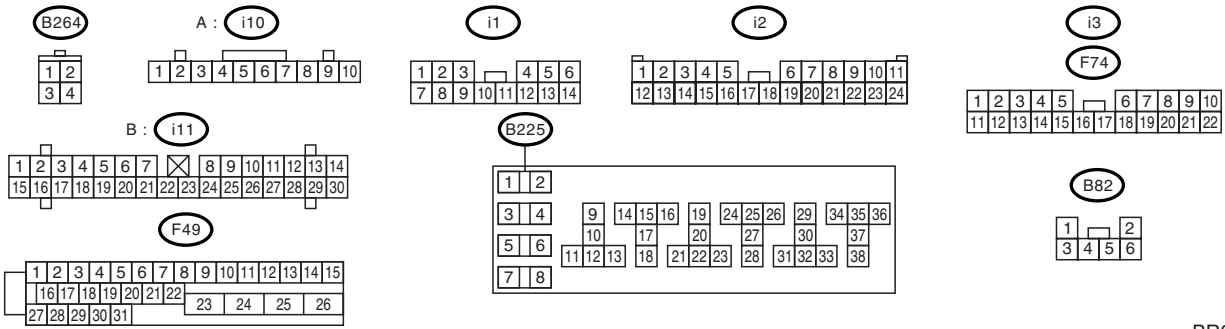
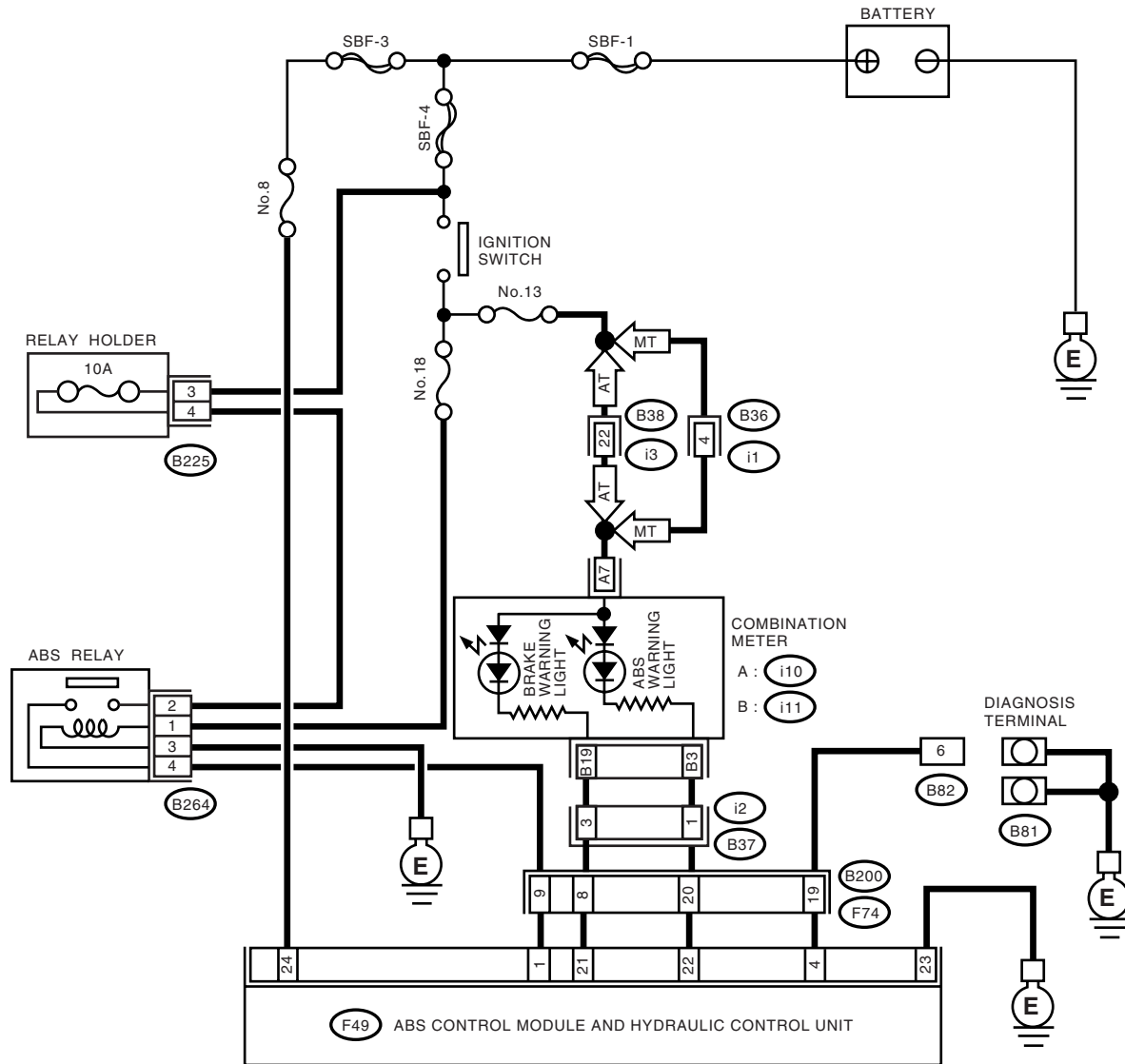


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DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

WIRING DIAGRAM: RHD MODEL



BR0124

Step	Check	Yes	No
1	<p>CHECK INSTALLATION OF ABSCM&H/U CONNECTOR. Turn the ignition switch to OFF.</p>	Go to step 2.	Insert the ABSCM&H/U connector into ABSCM&H/U until the clamp locks onto it.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
<p>2 CHECK DIAGNOSIS TERMINAL. Measure the resistance between diagnosis terminals (B81) and chassis ground. Terminals Diagnosis terminal (A) — Chassis ground: Diagnosis terminal (B) — Chassis ground:</p>	Is the resistance less than 0.5 Ω ?	Go to step 3.	Repair the diagnosis terminal harness.
<p>3 CHECK DIAGNOSIS LINE. 1) Turn the ignition switch to OFF. 2) Connect the diagnosis terminal (B81) to diagnosis connector (B82) No. 6. 3) Disconnect the connector from ABSCM&H/U. 4) Measure the resistance between ABSCM&H/U connector and chassis ground. Connector & terminal LHD: (B301) No. 4 — Chassis ground: RHD: (F49) No. 4 — Chassis ground:</p>	Is the resistance less than 0.5 Ω ?	Go to step 4.	Repair the harness connector between ABSCM&H/U and diagnosis connector.
<p>4 CHECK GENERATOR. 1) Start the engine. 2) Idle the engine. 3) Measure the voltage between generator and chassis ground. Terminal Generator B terminal (+) — Chassis ground (-):</p>	Is the voltage between 10 and 15 V?	Go to step 5.	Repair the generator. <Ref. to SC-14, Generator.>
<p>5 CHECK BATTERY TERMINAL. Turn the ignition switch to OFF.</p>	Is there poor contact at battery terminal?	Repair or tighten the battery terminal.	Go to step 6.
<p>6 CHECK POWER SUPPLY OF ABSCM. 1) Disconnect the connector from ABSCM&H/U. 2) Start the engine. 3) Idle the engine. 4) Measure the voltage between ABSCM&H/U connector and chassis ground. Connector & terminal LHD: (B301) No. 1 (+) — Chassis ground (-): RHD: (F49) No. 1 (+) — Chassis ground (-):</p>	Is the voltage between 10 and 15 V?	Go to step 7.	Repair the ABSCM&H/U power supply circuit.
<p>7 CHECK WIRING HARNESS. 1) Disconnect the connector (i2) from connector (B37). 2) Turn ignition switch to ON.</p>	Does the ABS warning light remain off?	Go to step 8.	Repair the front or body wiring harness.
<p>8 CHECK PROJECTION AT ABSCM&H/U. 1) Turn the ignition switch to OFF. 2) Check for broken projection at the ABSCM&H/U terminal.</p>	Are the projection broken?	Go to step 9.	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
<p>9 CHECK ABSCM&H/U. Measure the resistance between ABSCM&H/U terminals. Terminal No. 22 — No. 23:</p>	Is the resistance more than 1 $M\Omega$?	Go to step 10.	Replace the 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 the resistance between connector (B37) and chassis ground. <i>Connector & terminal</i> <i>LHD: (B37) No. 2 and No.4 — Chassis ground:</i> <i>RHD: (B37) No. 1 and No. 3 — Chassis ground:</i>	Is the resistance less than 0.5 Ω ?	Go to step 11.	Repair the harness.
11 CHECK WIRING HARNESS. 1)Connect the connector to ABSCM&H/U. 2)Measure the resistance between connector (B37) and chassis ground. <i>Connector & terminal</i> <i>LHD: (B37) No. 2 and No.4 — Chassis ground:</i> <i>RHD: (B37) No. 1 and No. 3 — Chassis ground:</i>	Is the resistance more than 1 M Ω ?	Go to step 12.	Repair the harness.
12 CHECK POOR CONTACT IN ABSCM&H/U CONNECTOR.	Is there poor contact in ABSCM&H/U connector?	Repair the connector.	Replace the 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.

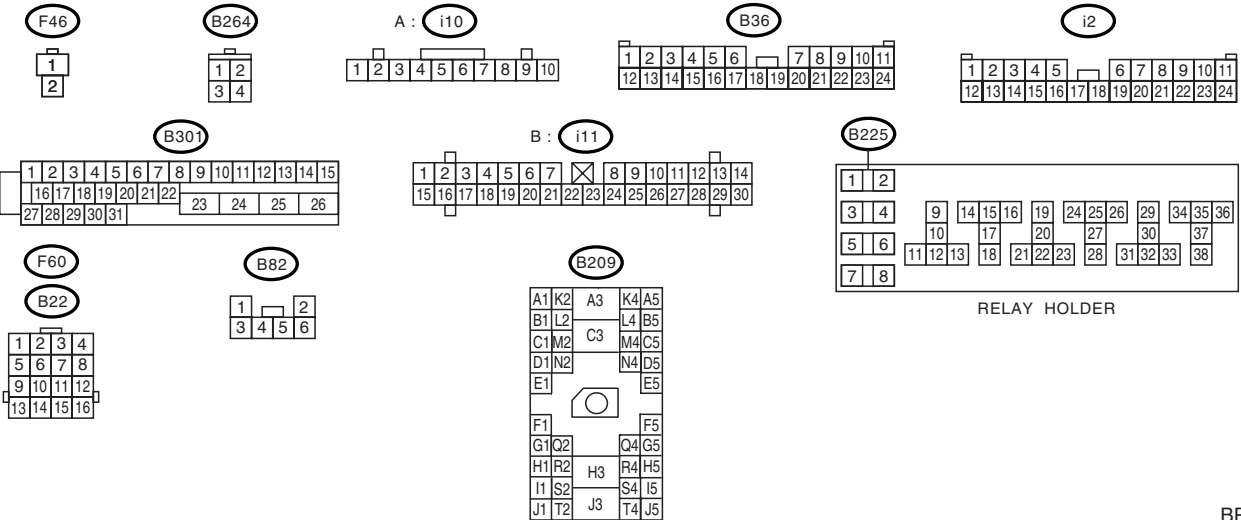
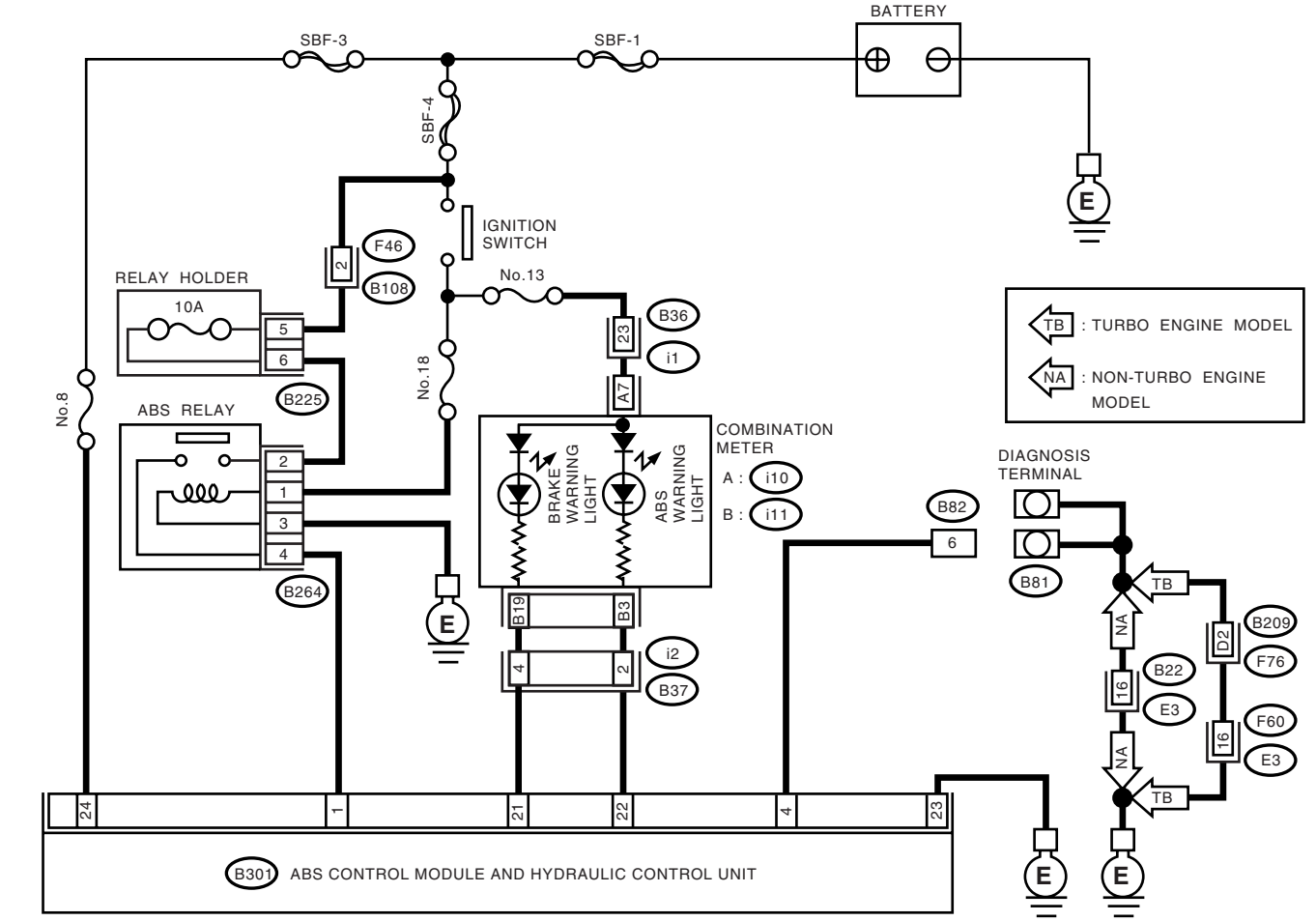
DIAGNOSIS:

- Diagnosis circuit is open.

TROUBLE SYMPTOM:

- The ABS warning light turns on or off normally but the start code cannot be read out in diagnostic mode.

WIRING DIAGRAM: LHD MODEL

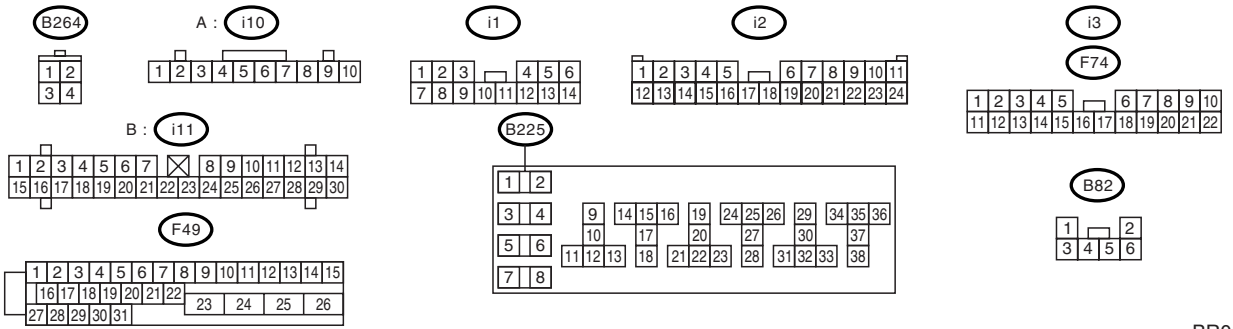
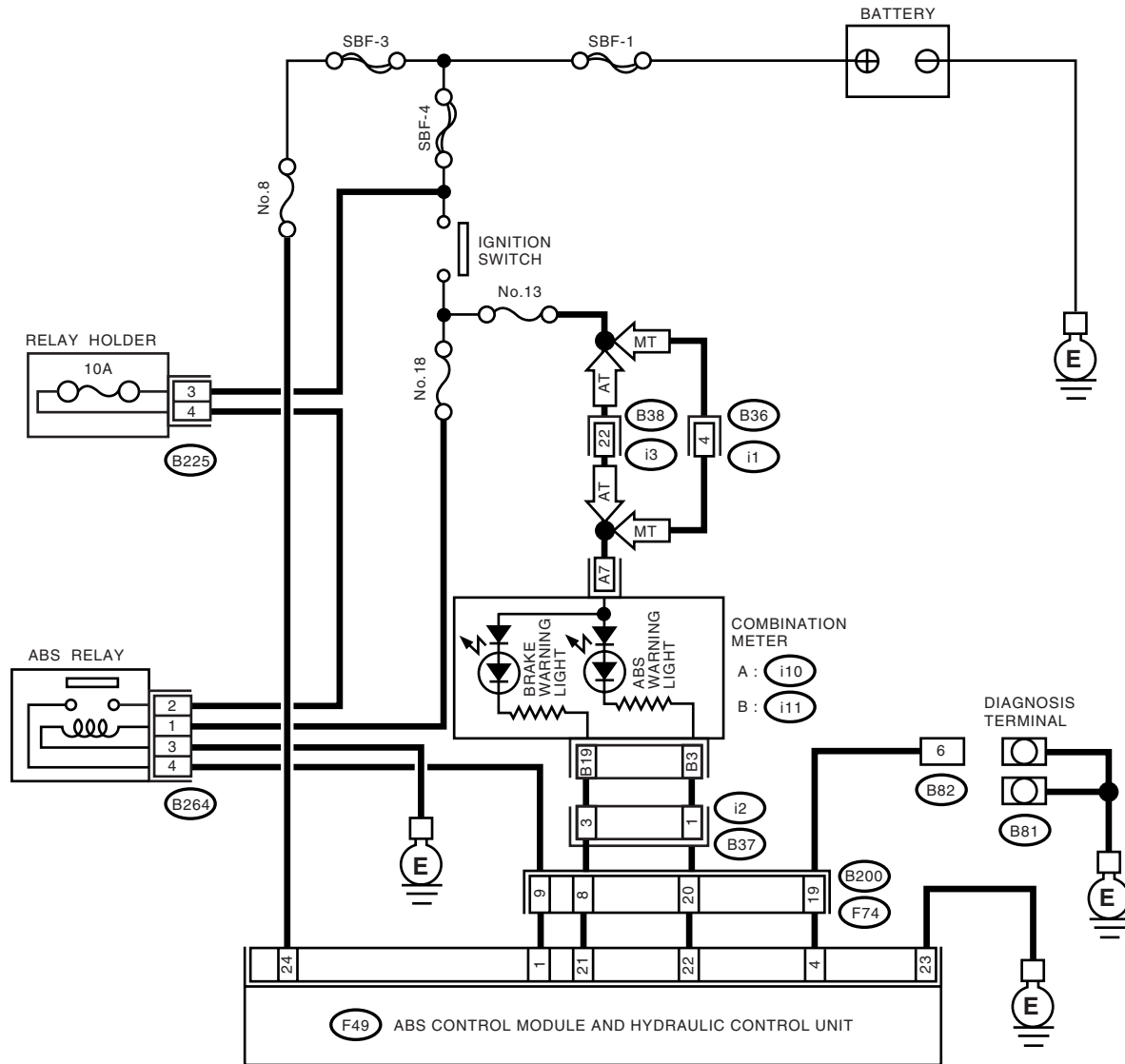


BR0123

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

WIRING DIAGRAM: RHD MODEL



BR0124

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK DIAGNOSIS TERMINAL. 1) Turn the ignition switch to OFF. 2) Measure the resistance between diagnosis terminals (B81) and chassis ground. Terminals <i>Diagnosis terminal (A) — Chassis ground:</i> <i>Diagnosis terminal (B) — Chassis ground:</i>	Is the resistance less than 0.5 Ω ?	Go to step 2.	Repair the diagnosis terminal harness.
2 CHECK DIAGNOSIS LINE. 1) Turn the ignition switch to OFF. 2) Connect the diagnosis terminal (B81) to diagnosis connector (B82) No. 6. 3) Disconnect the connector from ABSCM&H/U. 4) Measure the resistance between ABSCM&H/U connector and chassis ground. Connector & terminal <i>LHD: (B301) No. 4 — Chassis ground:</i> <i>RHD: (F49) No. 4 — Chassis ground:</i>	Is the resistance less than 0.5 Ω ?	Go to step 3.	Repair the 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 the connector.	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

D: DTC 21

— ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (FRONT RH) —

NOTE:

For the diagnostic procedure, refer to DTC 27. <Ref. to ABS-40, DTC 27 — ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (REAR LH) —, Diagnostics Chart with Diagnosis Connector.>

E: DTC 23

— ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (FRONT LH) —

NOTE:

For the diagnostic procedure, refer to DTC 27. <Ref. to ABS-40, DTC 27 — ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (REAR LH) —, Diagnostics Chart with Diagnosis Connector.>

F: DTC 25

— ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (REAR RH) —

NOTE:

For the diagnostic procedure, refer to DTC 27. <Ref. to ABS-40, DTC 27 — ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (REAR LH) —, Diagnostics Chart with Diagnosis Connector.>

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

G: DTC 27

— ABNORMAL ABS SENSOR (OPEN CIRCUIT OR INPUT VOLTAGE TOO HIGH) (REAR LH) —

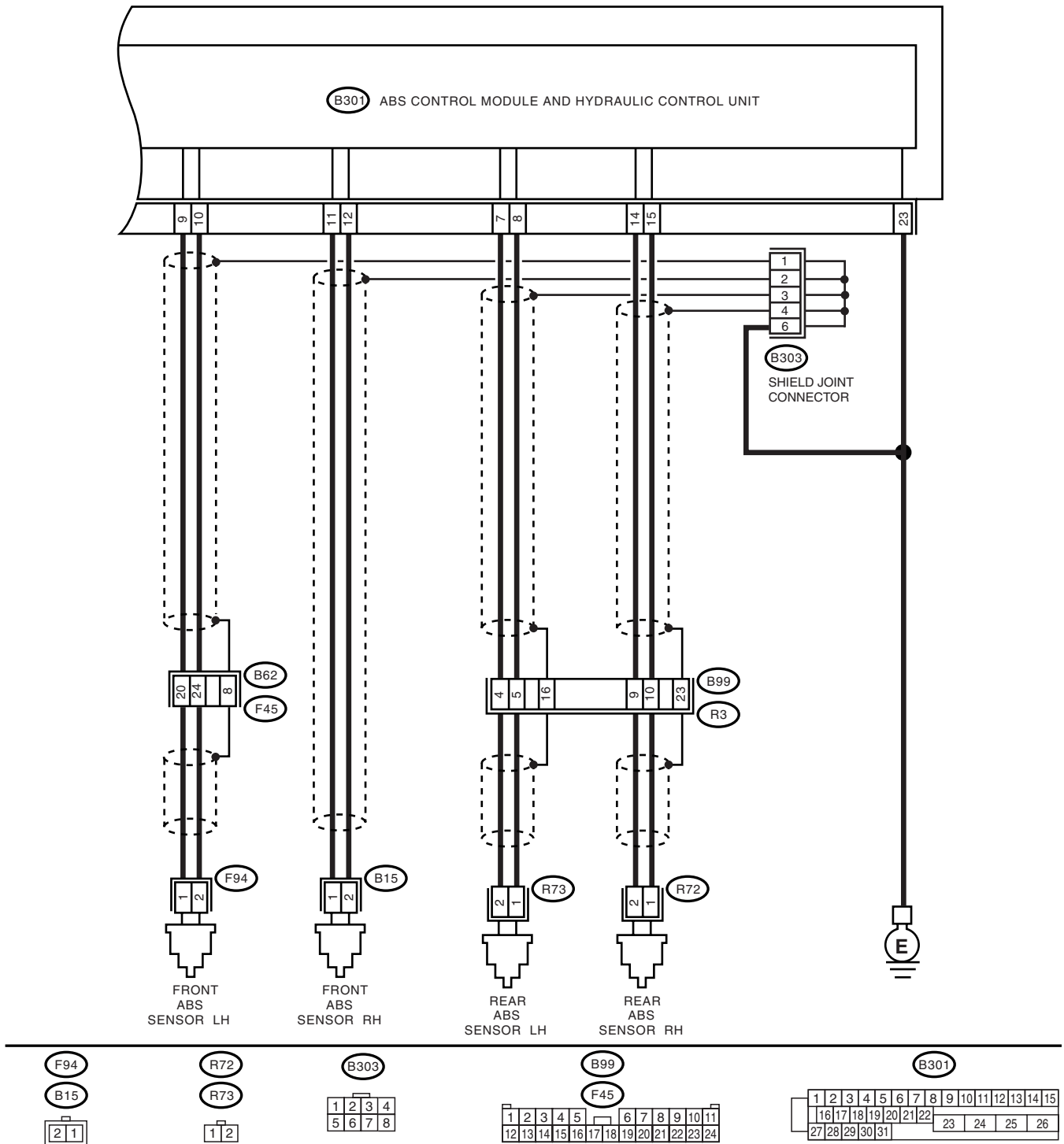
DIAGNOSIS:

- Faulty ABS sensor (Broken wire, input voltage too high)
- Faulty harness connector

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM: LHD MODEL

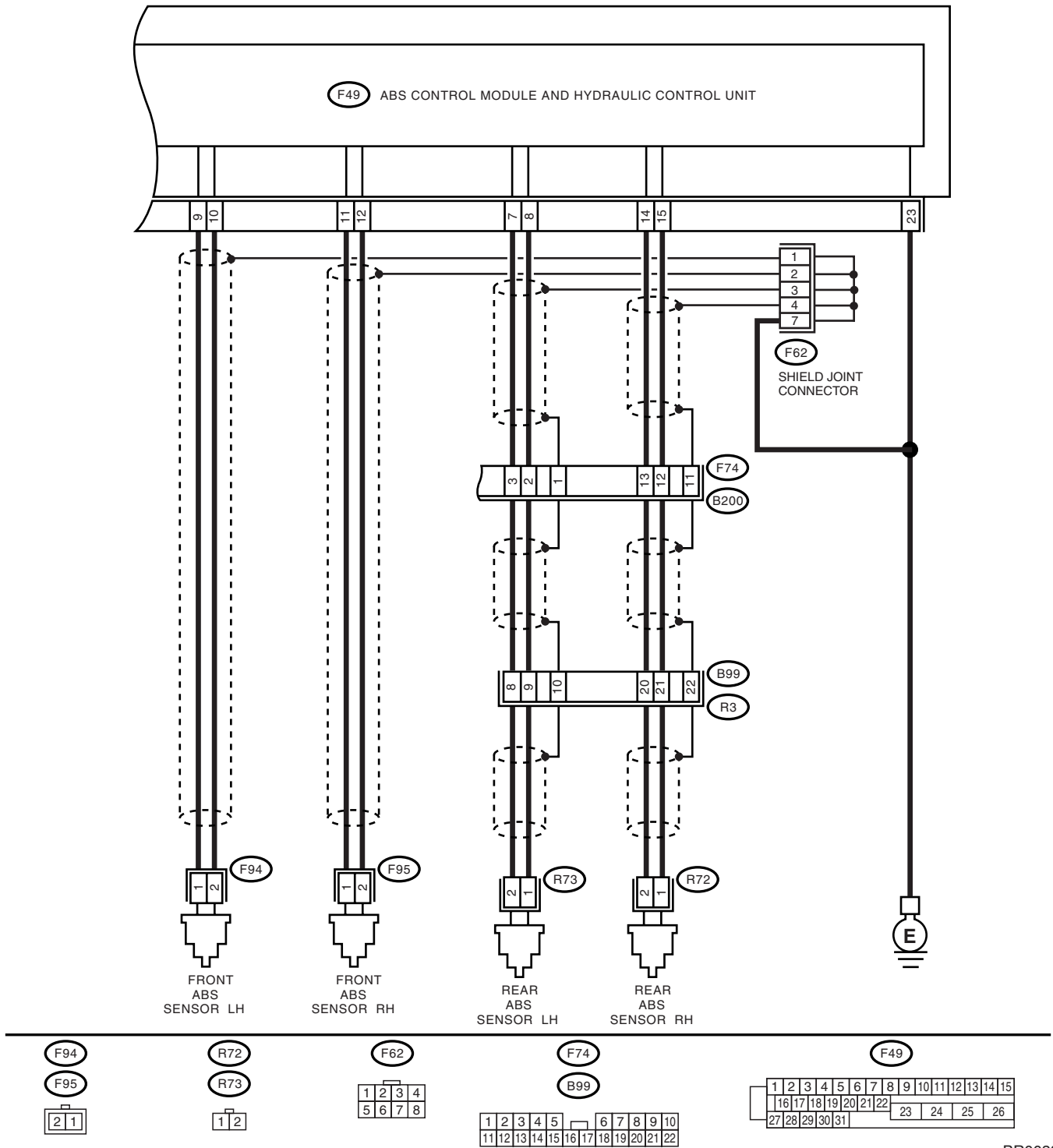


BR0125

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 the ignition switch to OFF. 2) Disconnect the connector from ABS sensor. 3) Measure the resistance of 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 2.	Replace the 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 the connector from ABSCM&H/U. 2) Measure the voltage between ABS sensor and chassis ground. Terminal Front RH No. 1 (+) — Chassis ground (-): Front LH No. 1 (+) — Chassis ground (-): Rear RH No. 2 (+) — Chassis ground (-): Rear LH No. 2 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Go to step 3.	Replace the 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 the ignition switch to ON. 2) Measure the voltage between ABS sensor and chassis ground. Terminal Front RH No. 1 (+) — Chassis ground (-): Front LH No. 1 (+) — Chassis ground (-): Rear RH No. 2 (+) — Chassis ground (-): Rear LH No. 2 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Go to step 4.	Replace the 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 the ignition switch to OFF. 2) Connect the connector to ABS sensor. 3) Measure the resistance between ABSCM&H/U connector terminals. Connector & terminal DTC 21 / LHD: (B301) No. 11 — No. 12: RHD: (F49) No. 11 — No. 12: DTC 23 / LHD: (B301) No. 9 — No. 10: RHD: (F49) No. 9 — No. 10: DTC 25 / LHD: (B301) No. 14 — No. 15: RHD: (F49) No. 14 — No. 15: DTC 27 / LHD: (B301) No. 7 — No. 8: RHD: (F49) No. 7 — No. 8:	Is the resistance between 1 and 1.5 kΩ?	Go to step 5.	Repair the harness/connector between ABSCM&H/U and ABS sensor.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
<p>5</p> <p>CHECK BATTERY SHORT OF HARNESS. Measure the voltage between ABSCM&H/U connector and chassis ground.</p> <p>Connector & terminal DTC 21 / LHD: (B301) No. 11 (+) — Chassis ground (-): RHD: (F49) No. 11 (+) — Chassis ground (-): DTC 23 / LHD: (B301) No. 9 (+) — Chassis ground (-): RHD: (F49) No. 9 (+) — Chassis ground (-): DTC 25 / LHD: (B301) No. 14 (+) — Chassis ground (-): RHD: (F49) No. 14 (+) — Chassis ground (-): DTC 27 / LHD: (B301) No. 7 (+) — Chassis ground (-): RHD: (F49) No. 7 (+) — Chassis ground (-):</p>	Is the voltage less than 1 V?	Go to step 6.	Repair the harness between ABSCM&H/U and ABS sensor.
<p>6</p> <p>CHECK BATTERY SHORT OF HARNESS. 1)Turn the ignition switch to ON. 2)Measure the voltage between ABSCM&H/U connector and chassis ground.</p> <p>Connector & terminal DTC 21 / LHD: (B301) No. 11 (+) — Chassis ground (-): RHD: (F49) No. 11 (+) — Chassis ground (-): DTC 23 / LHD: (B301) No. 9 (+) — Chassis ground (-): RHD: (F49) No. 9 (+) — Chassis ground (-): DTC 25 / LHD: (B301) No. 14 (+) — Chassis ground (-): RHD: (F49) No. 14 (+) — Chassis ground (-): DTC 27 / LHD: (B301) No. 7 (+) — Chassis ground (-): RHD: (F49) No. 7 (+) — Chassis ground (-):</p>	Is the voltage less than 1 V?	Go to step 7.	Repair the harness between ABSCM&H/U and ABS sensor.
<p>7</p> <p>CHECK INSTALLATION OF ABS SENSOR. Turn the ignition switch to OFF.</p> <p>Tightening torque: 32 N·m (3.3 kgf·m, 24 ft·lb)</p>	Are the ABS sensor installation bolts tightened securely?	Go to step 8.	Tighten the ABS sensor installation bolts securely.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
8 CHECK ABS SENSOR GAP. Measure the tone wheel to ABS sensor piece gap over entire perimeter of the wheel. <i>Front wheel</i> <i>0.3 — 0.8 mm (0.012 — 0.031 in)</i> <i>Rear wheel</i> <i>0.7 — 1.2 mm (0.028 — 0.047 in)</i>	Is the gap within the specifications?	Go to step 9 .	Adjust the gap. NOTE: Adjust the gap using spacers (Part No. 26755AA000). If the spacers cannot correct gap, replace worn sensor or worn tone wheel.
9 CHECK TONE WHEEL RUNOUT. Measure the tone wheel runout.	Is the runout less than 0.05 mm (0.0020 in)?	Go to step 10 .	Replace the 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 the ignition switch to ON. 2)Measure the 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 M Ω ?	Go to step 11 .	Replace the 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).>
11 CHECK GROUND SHORT OF HARNESS. 1)Turn the ignition switch to OFF. 2)Connect the connector to ABS sensor. 3)Measure the resistance between ABSCM&H/U connector terminal and chassis ground. <i>Connector & terminal</i> <i>DTC 21 / LHD: (B301) No. 11 — Chassis ground:</i> <i>RHD: (F49) No. 11 — Chassis ground:</i> <i>DTC 23 / LHD: (B301) No. 9 — Chassis ground:</i> <i>RHD: (F49) No. 9 — Chassis ground:</i> <i>DTC 25 / LHD: (B301) No. 14 — Chassis ground:</i> <i>RHD: (F49) No. 14 — Chassis ground:</i> <i>DTC 27 / LHD: (B301) No. 7 — Chassis ground:</i> <i>RHD: (F49) No. 7 — Chassis ground:</i>	Is the resistance more than 1 M Ω ?	Go to step 12 .	Repair the harness between ABSCM&H/U and ABS sensor. Replace the 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 the connector.	Go to step 13 .

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
13 CHECK ABSCM&H/U. 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the 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 DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to the DTC.	A temporary poor contact. NOTE: Check the harness and connectors between AB-SCM&H/U and ABS sensor.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

H: DTC 22

— ABNORMAL ABS SENSOR (ABNORMAL ABS SENSOR SIGNAL) (FRONT RH) —

NOTE:

For the diagnostic procedure, refer to DTC 28. <Ref. to ABS-47, DTC 28 — ABNORMAL ABS SENSOR (ABNORMAL ABS SENSOR SIGNAL) (REAR LH) —, Diagnostics Chart with Diagnosis Connector.>

I: DTC 24

— ABNORMAL ABS SENSOR (ABNORMAL ABS SENSOR SIGNAL) (FRONT LH) —

NOTE:

For the diagnostic procedure, refer to DTC 28. <Ref. to ABS-47, DTC 28 — ABNORMAL ABS SENSOR (ABNORMAL ABS SENSOR SIGNAL) (REAR LH) —, Diagnostics Chart with Diagnosis Connector.>

J: DTC 26

— ABNORMAL ABS SENSOR (ABNORMAL ABS SENSOR SIGNAL) (REAR RH) —

NOTE:

For the diagnostic procedure, refer to DTC 28. <Ref. to ABS-47, DTC 28 — ABNORMAL ABS SENSOR (ABNORMAL ABS SENSOR SIGNAL) (REAR LH) —, Diagnostics Chart with Diagnosis Connector.>

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

K: DTC 28

— ABNORMAL ABS SENSOR (ABNORMAL ABS SENSOR SIGNAL) (REAR LH) —

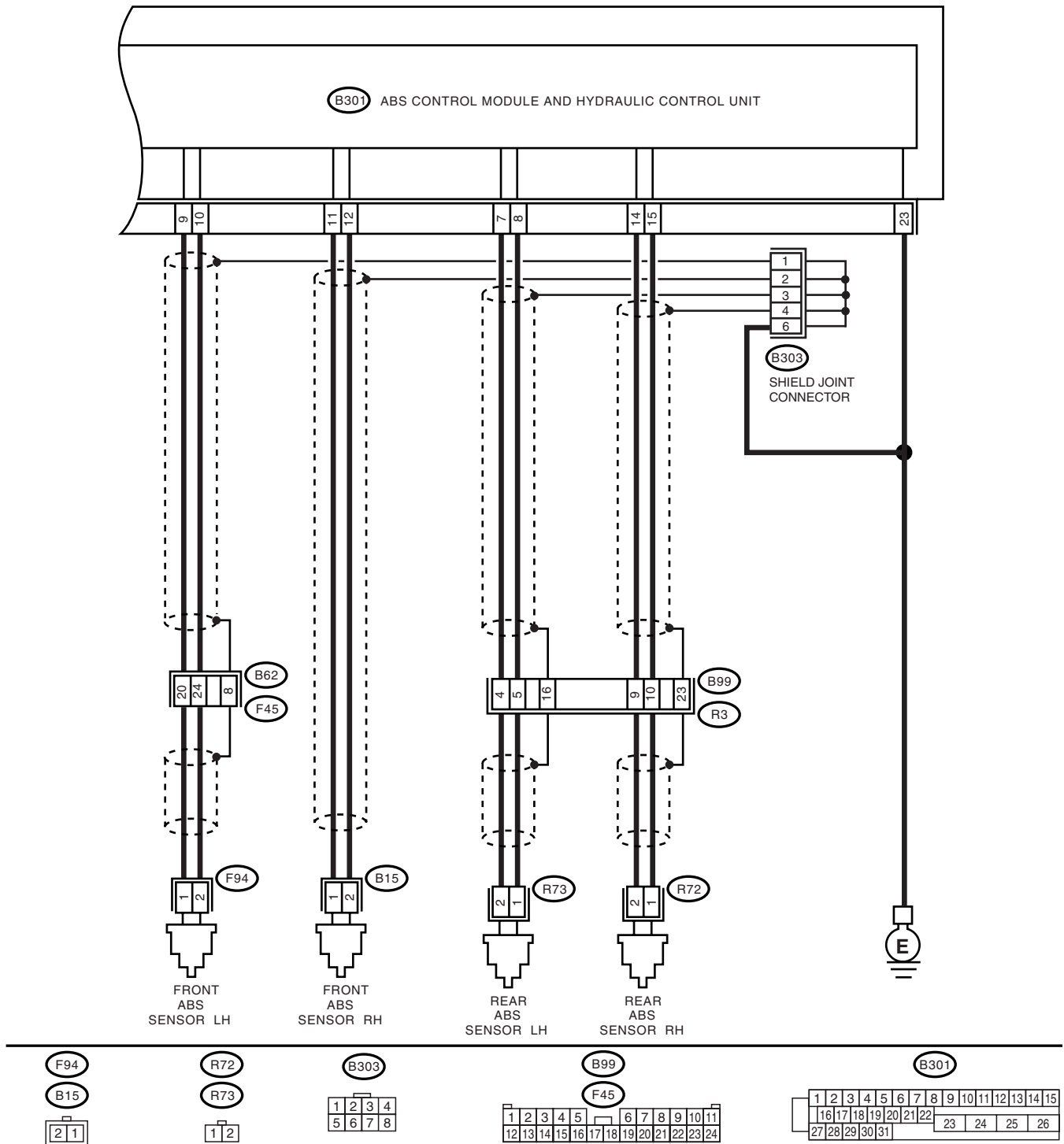
DIAGNOSIS:

- Faulty ABS sensor signal (noise, irregular signal, etc.)
- Faulty harness/connector

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM: LHD MODEL

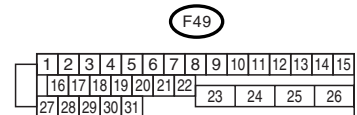
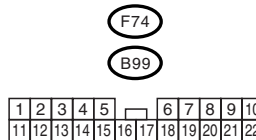
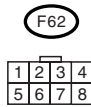
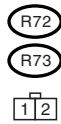
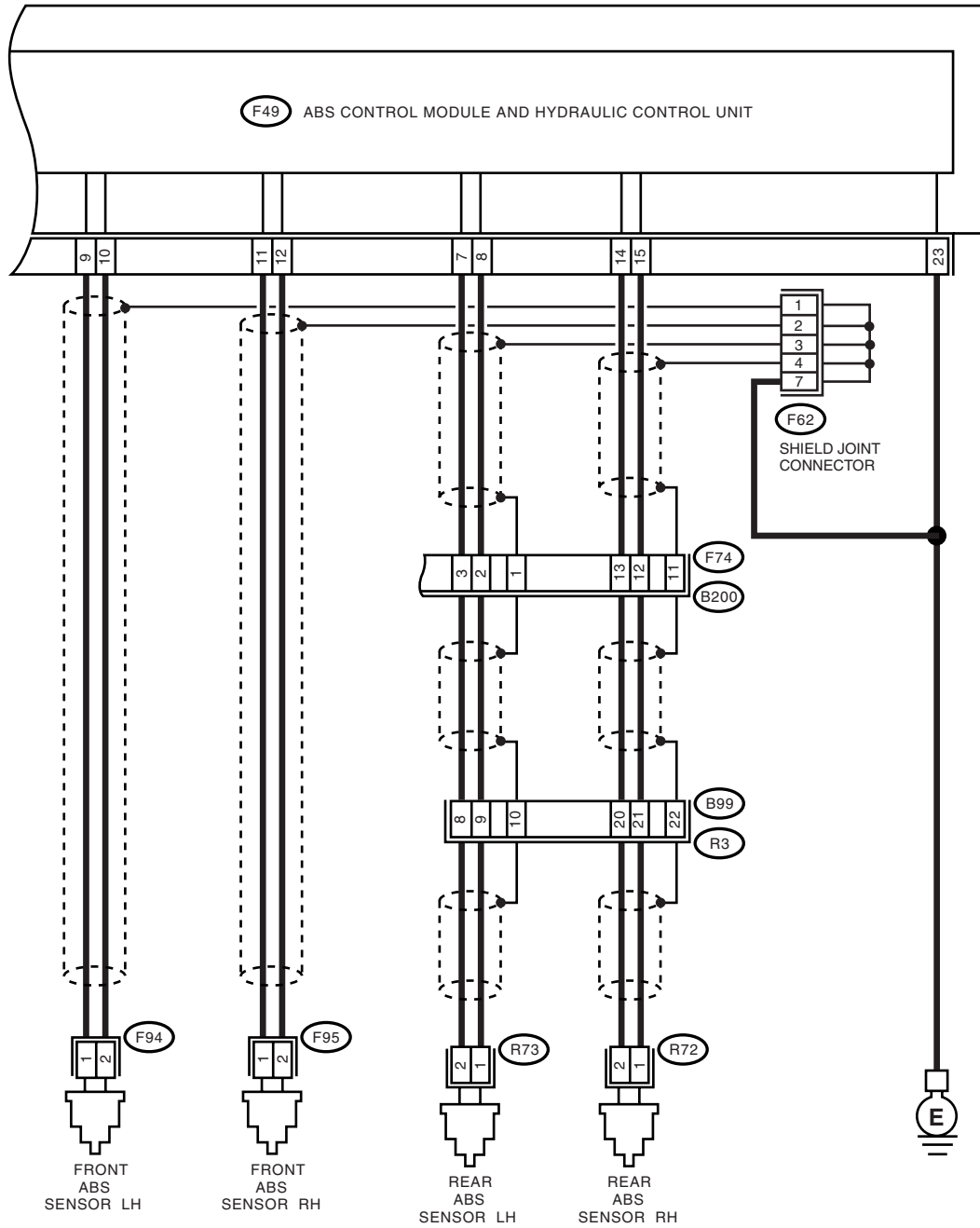


BR0125

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

WIRING DIAGRAM: RHD MODEL



BR0038

Step	Check	Yes	No	
1	CHECK INSTALLATION OF ABS SENSOR. Turn the 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 2.	Tighten the ABS sensor installation bolts securely.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
2 CHECK ABS SENSOR GAP. Measure the 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 3.	Adjust the gap. NOTE: Adjust the gap using spacer (Part No. 26755AA000). If the spacer cannot correct 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 off ground. 2) Turn the ignition switch to OFF. 3) Connect the oscilloscope to the connector. 4) Turn the ignition switch to ON. 5) Rotate the 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 DTC 29. <i>Connector & terminal</i> <i>DTC 22 /</i> <i>LHD: (B15) No. 1 (+) — No. 2 (-):</i> <i>RHD: (F95) No. 1 (+) — No. 2 (-):</i> <i>DTC 24 /</i> <i>LHD: (F45) No. 20 (+) — No. 24 (-):</i> <i>RHD: (F94) No. 1 (+) — No. 2 (-):</i> <i>DTC 26 /</i> <i>LHD: (B99) No. 9 (+) — No. 10 (-):</i> <i>RHD: (B99) No. 20 (+) — No. 21 (-):</i> <i>DTC 28 /</i> <i>LHD: (B99) No. 4 (+) — No. 5 (-):</i> <i>RHD: (B99) No. 8 (+) — No. 9 (-):</i>	Is the 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 the disc rotor or drum from hub in accordance with DTC.	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 the 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 the tone wheel runout.	Is the runout less than 0.05 mm (0.0020 in)?	Go to step 8.	Replace the 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 the ignition switch to OFF. 2) Disconnect the connector from ABS sensor. 3) Measure the 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 the 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 the 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 the 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 the connector to ABS sensor. 2) Disconnect the connector from ABSCM&H/U. 3) Measure the resistance at ABSCM&H/U connector terminals. Connector & terminal DTC 22 / LHD: (B301) No. 11 — No. 12: RHD: (F49) No. 11 — No. 12: DTC 24 / LHD: (B301) No. 9 — No. 10: RHD: (F49) No. 9 — No. 10: DTC 26 / LHD: (B301) No. 14 — No. 15: RHD: (F49) No. 14 — No. 15: DTC 28 / LHD: (B301) No. 7 — No. 8: RHD: (F49) No. 7 — No. 8:	Is the resistance between 1 and 1.5 kΩ?	Go to step 11.	Repair the harness/connector between ABSCM&H/U and ABS sensor.
11	CHECK GROUND SHORT OF HARNESS. Measure the resistance between ABSCM&H/U connector and chassis ground. Connector & terminal DTC 22 / LHD: (B301) No. 11 — Chassis ground: RHD: (F49) No. 11 — Chassis ground: DTC 24 / LHD: (B301) No. 9 — Chassis ground: RHD: (F49) No. 9 — Chassis ground: DTC 26 / LHD: (B301) No. 14 — Chassis ground: RHD: (F49) No. 14 — Chassis ground: DTC 28 / LHD: (B301) No. 7 — Chassis ground: RHD: (F49) No. 7 — Chassis ground:	Is the resistance more than 1 MΩ?	Go to step 12.	Repair the harness/connector between ABSCM&H/U and ABS sensor.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
12 CHECK GROUND CIRCUIT OF ABSCM&H/U. Measure the resistance between ABSCM&H/U and chassis ground. <i>Connector & terminal</i> <i>LHD: (B301) No. 23 — Chassis ground:</i> <i>RHD: (F49) No. 23 — Chassis ground:</i>	Is the resistance less than 0.5 Ω?	Go to step 13.	Repair the 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 the connector.	Go to step 14.
14 CHECK SOURCES OF SIGNAL NOISE.	Is the car telephone or wireless transmitter properly installed?	Go to step 15.	Properly install the car telephone or 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 sensor harness.	Go to step 16.
16 CHECK SHIELD CIRCUIT. 1)Connect all connectors. 2)Measure the resistance between shield connector and chassis ground. <i>Connector & terminal</i> <i>DTC 24 / LHD: (F45) No. 8 — Chassis ground:</i> <i>DTC 26 / LHD: (B99) No. 23 — Chassis ground:</i> <i>DTC 26 / RHD: (B99) No. 22 — Chassis ground:</i> <i>DTC 28 / LHD: (B99) No. 16 — Chassis ground:</i> <i>DTC 28 / RHD: (B99) No. 10 — Chassis ground:</i> NOTE: For the DTC 22 and 24: (RHD) Go to step 17.	Is the resistance less than 0.5 Ω?	Go to step 17.	Repair the shield harness.
17 CHECK ABSCM&H/U. 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the DTC.	Is the same DTC as in the current diagnosis still being output?	Replace the 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 DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary noise interference.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

L: DTC 29

— ABNORMAL ABS SENSOR (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

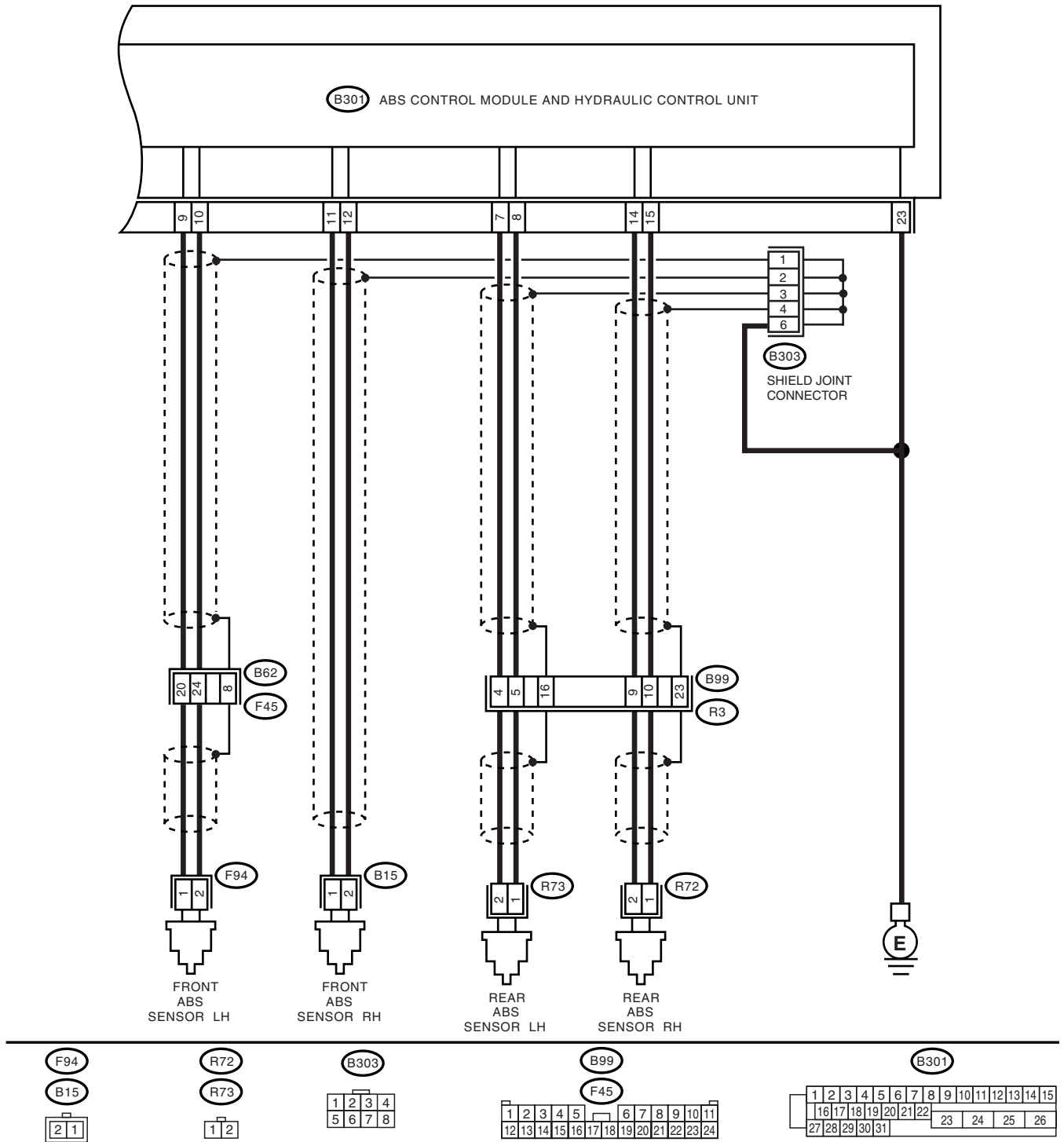
TROUBLE SYMPTOM:

- ABS does not operate.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

WIRING DIAGRAM: LHD MODEL

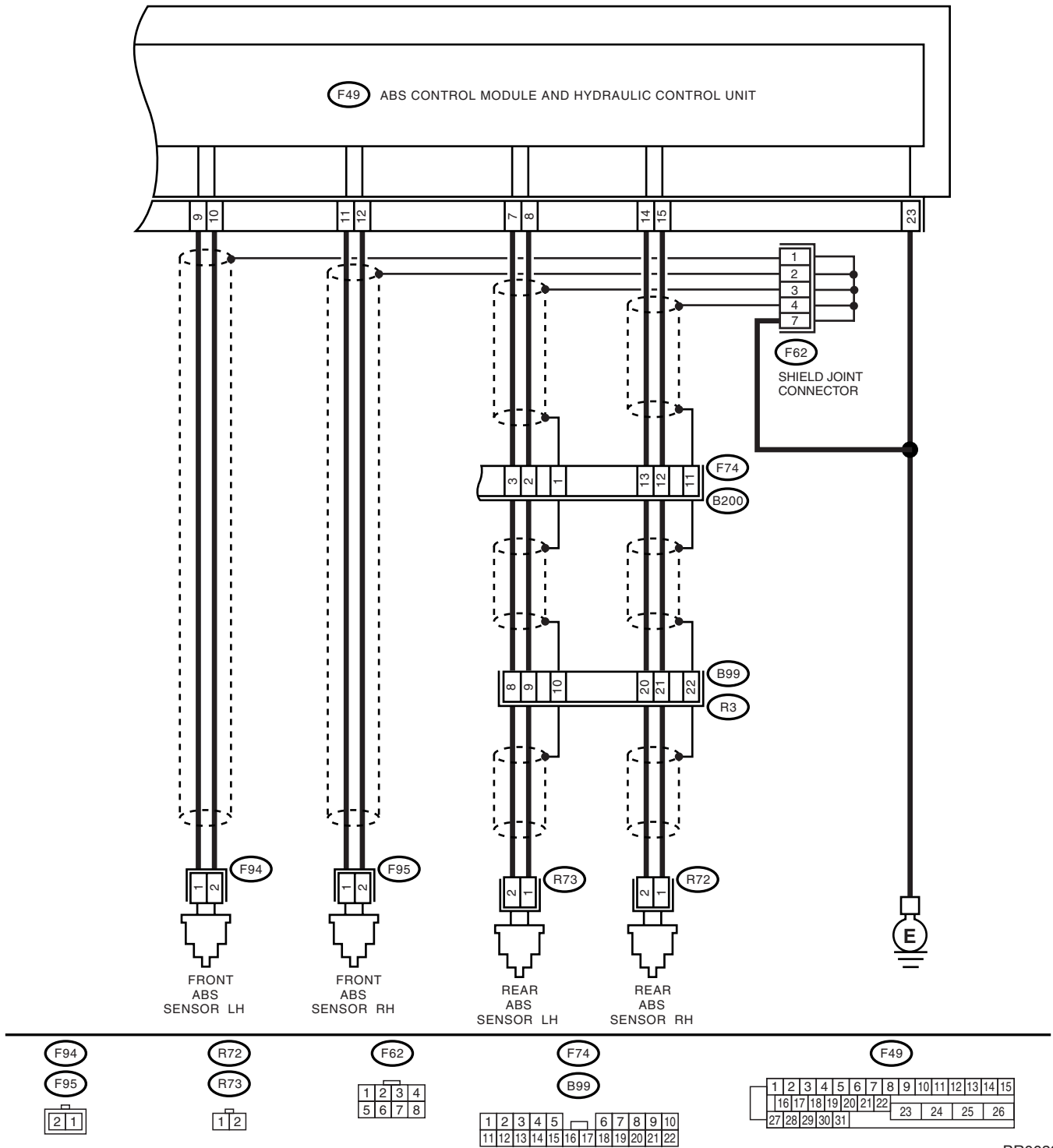


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DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

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 1 minute, such as when vehicle is jacked-up, under full-lock cornering or when tire is not in contact with road surface.	The ABS is normal. Erase the DTC. 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 DTC may sometimes occur.
2	CHECK TIRE SPECIFICATIONS. Turn the 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 N·m (3.3 kgf·m, 24 ft·lb)	Are the ABS sensor installation bolts tightened securely?	Go to step 6.
6	CHECK ABS SENSOR GAP. Measure the 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.
7	PREPARE OSCILLOSCOPE.	Is an oscilloscope available?	Adjust the gap. NOTE: Adjust the gap using spacer (Part No. 26755AA000). If the spacer cannot correct gap, replace worn sensor or worn tone wheel.
8	CHECK ABS SENSOR SIGNAL. 1) Raise all four wheels off ground. 2) Turn the ignition switch to OFF. 3) Connect the oscilloscope to the connector. 4) Turn the ignition switch to ON. 5) Rotate the 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 DTC 29. Connector & terminal Front RH LHD: (B15) No. 1 (+) — No. 2 (-): RHD: (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 the oscilloscope pattern smooth, as shown in the figure?	Go to step 8.
9			Go to step 9.
10			Go to step 12.
11			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 the 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 the 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 the tone wheel runout.	Is the runout less than 0.05 mm (0.0020 in)?	Go to step 12 .	Replace the 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 the ignition switch to OFF. 2)Connect all connectors. 3)Erase the memory. 4)Perform the inspection mode. 5)Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the 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 DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

M: DTC 31

— ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (FRONT RH) —

NOTE:

For the diagnostic procedure, refer to DTC 37. <Ref. to ABS-58, DTC 37 — ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR LH) —, Diagnostics Chart with Diagnosis Connector.>

N: DTC 33

— ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (FRONT LH) —

NOTE:

For the diagnostic procedure, refer to DTC 37. <Ref. to ABS-58, DTC 37 — ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR LH) —, Diagnostics Chart with Diagnosis Connector.>

O: DTC 35

— ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR RH) —

NOTE:

For the diagnostic procedure, refer to DTC 37. <Ref. to ABS-58, DTC 37 — ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR LH) —, Diagnostics Chart with Diagnosis Connector.>

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

P: DTC 37

— ABNORMAL INLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR LH) —

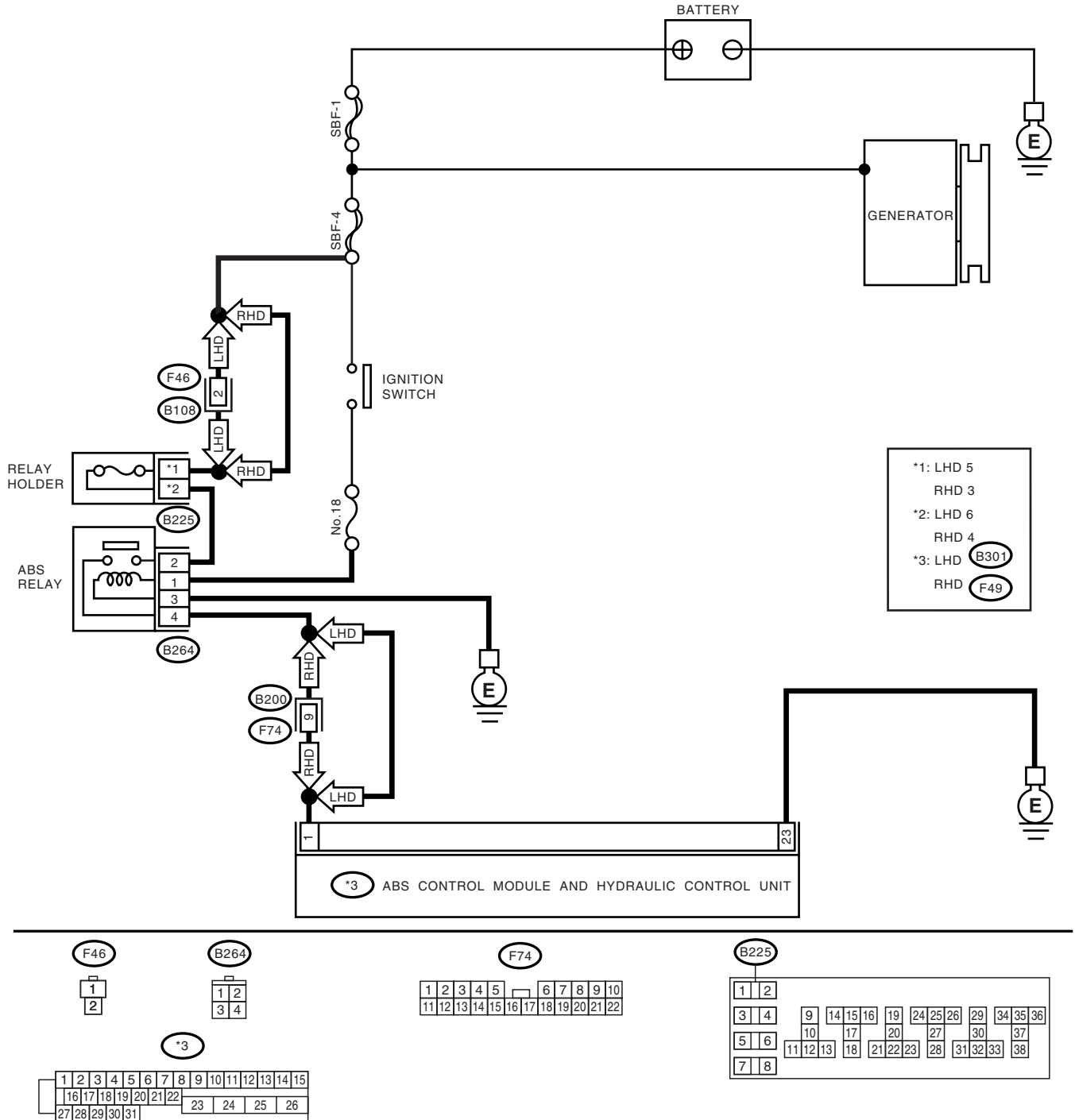
DIAGNOSIS:

- Faulty harness/connector
- Faulty inlet solenoid valve in ABSCM&H/U

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No	
1	CHECK RELAY HOLDER.	Is the fuse blown out?	Replace the fuse.	Go to step 2.
2	CHECK INPUT VOLTAGE OF RELAY HOLDER. 1) Turn the ignition switch to OFF. 2) Remove the relay holder fuse. 3) Measure the 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 3.	Repair the open circuit in harness between battery and relay holder connector.
3	CHECK INPUT VOLTAGE OF ABS RELAY. 1) Install the fuse. 2) Remove the ABS relay. 3) Turn the ignition switch to ON. 4) Measure the 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 the open circuit in harness between battery and relay holder connector.
4	CHECK INPUT VOLTAGE OF ABS RELAY. Measure the 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 the harness connector between battery, ignition switch and ABS relay.
5	CHECK GROUND CIRCUIT OF ABS RELAY. 1) Turn the ignition switch to OFF. 2) Measure the 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 the open circuit between ABS relay and chassis ground.
6	CHECK ABS RELAY. 1) Connect the battery to ABS relay terminal No. 1 and 3. 2) Measure the resistance between ABS relay terminals.	Is the resistance less than 10 Ω ?	Go to step 7.	Replace the ABS relay.
7	CHECK INPUT VOLTAGE OF ABSCM&H/U. 1) Disconnect the connector from ABSCM&H/U. 2) Run the engine at idle. 3) Measure the voltage between ABSCM&H/U connector and chassis ground. Connector & terminal LHD: (B301) No. 1 (+) — Chassis ground (-): RHD: (F49) No. 1 (+) — Chassis ground (-):	Is the voltage between 10 and 15 V?	Go to step 8.	Repair the harness connector between ABS relay and ABSCM&H/U.
8	CHECK GROUND CIRCUIT OF ABSCM&H/U. 1) Turn the ignition switch to OFF. 2) Measure the resistance between ABSCM&H/U connector and chassis ground. Connector & terminal LHD: (B301) No. 23 — Chassis ground: RHD: (F49) No. 23 — Chassis ground:	Is the resistance less than 0.5 Ω ?	Go to step 9.	Repair the 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 the connector.	Go to step 10.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
10 CHECK ABSCM&H/U. 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the DTC.	Is the same DTC as in the current diagnosis still being output?	Replace the 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 DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

Q: DTC 32
— ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (FRONT RH) —

NOTE:

For the diagnostic procedure, refer to DTC 38. <Ref. to ABS-62, DTC 38 — ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR LH) —, Diagnostics Chart with Diagnosis Connector.>

R: DTC 34
— ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (FRONT LH) —

NOTE:

For the diagnostic procedure, refer to DTC 38. <Ref. to ABS-62, DTC 38 — ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR LH) —, Diagnostics Chart with Diagnosis Connector.>

S: DTC 36
— ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR RH) —

NOTE:

For the diagnostic procedure, refer to DTC 38. <Ref. to ABS-62, DTC 38 — ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR LH) —, Diagnostics Chart with Diagnosis Connector.>

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

T: DTC 38

— ABNORMAL OUTLET SOLENOID VALVE CIRCUIT(S) IN ABSCM&H/U (REAR LH) —

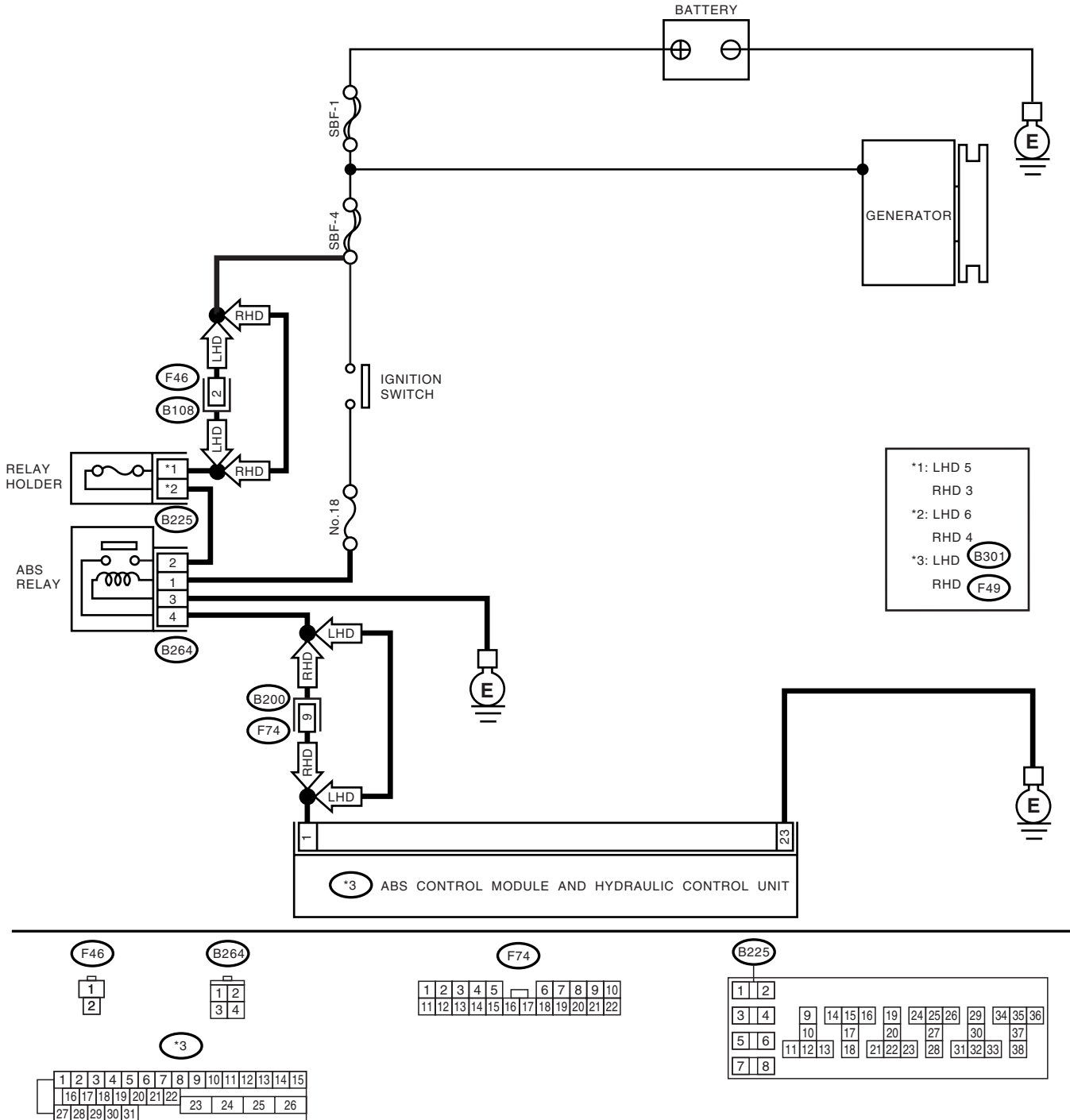
DIAGNOSIS:

- Faulty harness/connector
- Faulty outlet solenoid valve in ABSCM&H/U

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No	
1	CHECK RELAY HOLDER.	Is the fuse blown out?	Replace the fuse.	Go to step 2.
2	CHECK INPUT VOLTAGE OF RELAY HOLDER. 1) Turn the ignition switch to OFF. 2) Remove the relay holder fuse. 3) Measure the voltage between ABS relay connector and chassis ground. Connector & terminal LHD: (B225) No. 5 (+) — Chassis ground (-): RHD: (B225) No. 3 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 3.	Repair the open circuit in harness between battery and relay holder connector.
3	CHECK INPUT VOLTAGE OF ABS RELAY. 1) Install the fuse. 2) Remove the ABS relay. 3) Turn the ignition switch to ON. 4) Measure the 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 the open circuit in harness between battery and relay holder connector.
4	CHECK INPUT VOLTAGE OF ABS RELAY. Measure the 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 the harness connector between battery, ignition switch and ABS relay.
5	CHECK GROUND CIRCUIT OF ABS RELAY. 1) Turn the ignition switch to OFF. 2) Measure the 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 the open circuit between ABS relay and chassis ground.
6	CHECK ABS RELAY. 1) Connect the battery to ABS relay terminal No. 1 and 3. 2) Measure the resistance between ABS relay terminals.	Is the resistance less than 10 Ω ?	Go to step 7.	Replace the ABS relay.
7	CHECK INPUT VOLTAGE OF ABSCM&H/U. 1) Disconnect the connector from ABSCM&H/U. 2) Run the engine at idle. 3) Measure the voltage between ABSCM&H/U connector and chassis ground. Connector & terminal LHD: (B301) No. 1 (+) — Chassis ground (-): RHD: (F49) No. 1 (+) — Chassis ground (-):	Is the voltage between 10 and 15 V?	Go to step 8.	Repair the harness connector between battery, ignition switch and ABSCM&H/U.
8	CHECK GROUND CIRCUIT OF ABSCM&H/U. 1) Turn the ignition switch to OFF. 2) Measure the resistance between ABSCM&H/U connector and chassis ground. Connector & terminal LHD: (B301) No. 23 — Chassis ground: RHD: (F49) No. 23 — Chassis ground:	Is the resistance less than 0.5 Ω ?	Go to step 9.	Repair the 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 the connector.	Go to step 10.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
10 CHECK ABSCM&H/U. 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the DTC.	Is the same DTC as in the current diagnosis still being output?	Replace the 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 DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

U: DTC 41 — ABNORMAL ABS CONTROL MODULE —

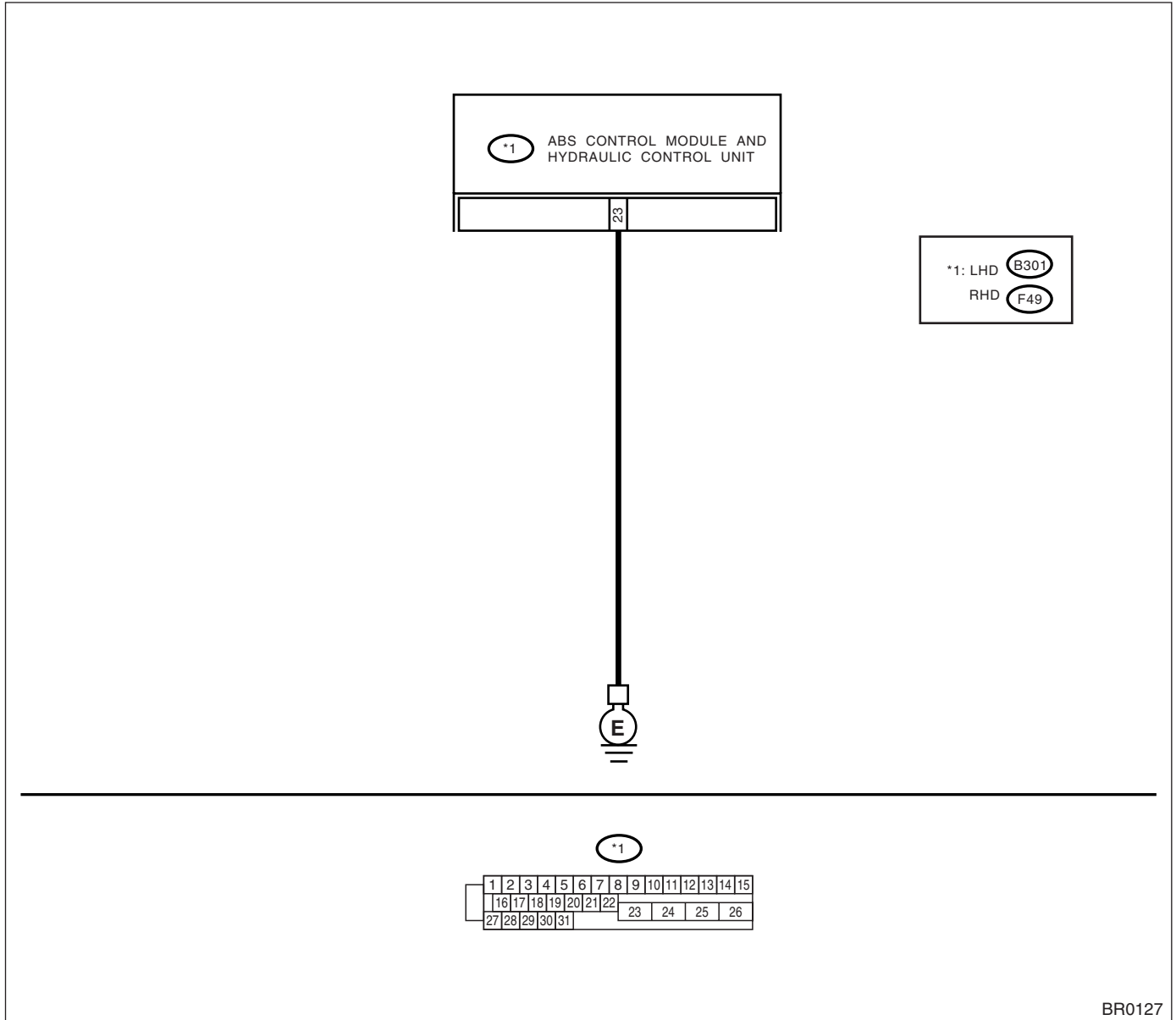
DIAGNOSIS:

- Faulty ABSCM&H/U.

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



Step	Check	Yes	No
1	<p>CHECK GROUND CIRCUIT OF ABSCM&H/U.</p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Disconnect the connector from ABSCM&H/U.</p> <p>3) Measure the resistance between ABSCM&H/U and chassis ground.</p> <p><i>Connector & terminal</i></p> <p>LHD: (B301) No. 23 — Chassis ground:</p> <p>RHD: (F49) No. 23 — Chassis ground:</p>	Is the resistance less than 0.5 Ω?	Go to step 2.
			Repair the ABSCM&H/U ground harness.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No	
2	CHECK POOR CONTACT IN CONNECTORS.	Is there poor contact in connectors between battery, ignition switch and ABSCM&H/U?	Repair the 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 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 the inspection mode. 4)Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the 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 DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

V: DTC 42 — SOURCE VOLTAGE IS ABNORMAL. —

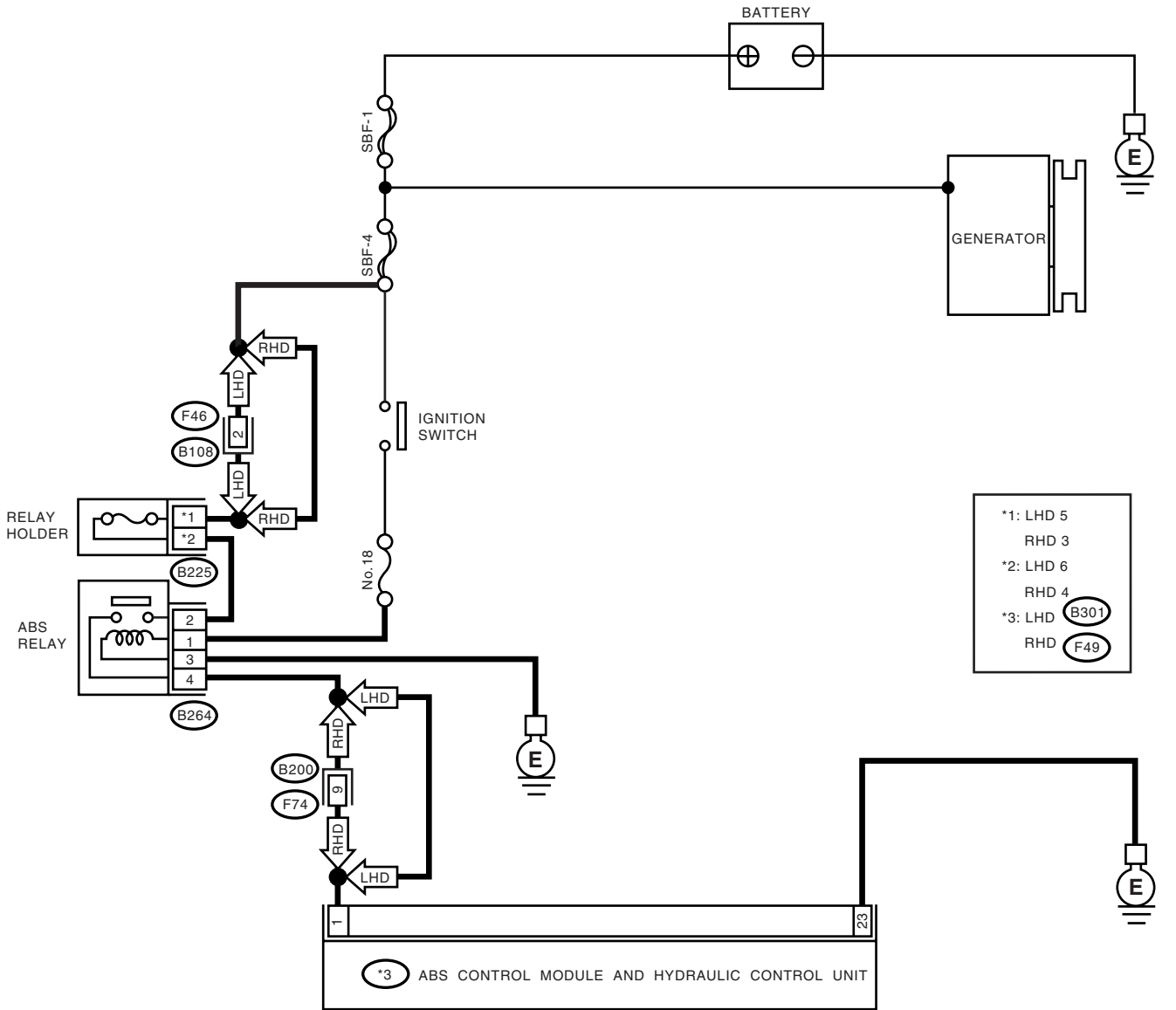
DIAGNOSIS:

- Power source voltage of the ABSCM&H/U is low or high.

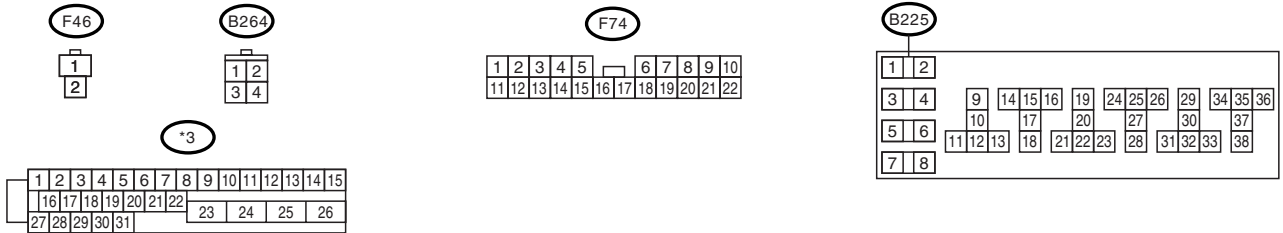
TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



*1: LHD 5
RHD 3
*2: LHD 6
RHD 4
*3: LHD (B301)
RHD (F49)



BR0126

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK GENERATOR. 1)Start the engine. 2)Idle after warm-up. 3)Measure the voltage between generator B terminal and chassis ground. <i>Terminal</i> Generator B terminal (+) — Chassis ground (-):	Is the voltage between 10 and 17 V?	Go to step 2.	Repair the generator. <Ref. to SC-14, Generator.>
2 CHECK BATTERY TERMINAL. Turn the ignition switch to OFF.	Are the positive and negative battery terminals tightly clamped?	Go to step 4.	Tighten the clamp of terminal.
3 CHECK RELAY HOLDER.	Is the fuse blown out?	Replace the fuse.	Go to step 4.
4 CHECK INPUT VOLTAGE OF RELAY HOLDER. 1)Turn the ignition switch to OFF. 2)Remove the relay holder fuse. 3)Measure the voltage between ABS relay connector and chassis ground. <i>Connector & terminal</i> LHD: (B225) No. 5 (+) — Chassis ground (-): RHD: (B225) No. 3 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 5.	Repair the open circuit in harness between battery and relay holder connector.
5 CHECK INPUT VOLTAGE OF ABS RELAY. 1)Install the fuse. 2)Remove the ABS relay. 3)Turn the ignition switch to ON. 4)Measure the voltage between ABS relay connector and chassis ground. <i>Connector & terminal</i> (B264) No. 2 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 6.	Repair the open circuit in harness between battery and relay holder connector.
6 CHECK INPUT VOLTAGE OF ABS RELAY. Measure the voltage between ABS relay connector and chassis ground. <i>Connector & terminal</i> (B264) No. 1 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 7.	Repair the harness connector between battery, ignition switch and ABS relay.
7 CHECK GROUND CIRCUIT OF ABS RELAY. 1)Turn the ignition switch to OFF. 2)Measure the resistance between ABS relay connector and chassis ground. <i>Connector & terminal</i> (B264) No. 3 — Chassis ground:	Is the resistance less than 5 Ω ?	Go to step 8.	Repair the open circuit between ABS relay and chassis ground.
8 CHECK ABS RELAY. 1)Connect the battery to ABS relay terminal No. 1 and 3. 2)Measure the resistance between ABS relay terminals.	Is the resistance less than 10 Ω ?	Go to step 9.	Replace the ABS relay.
9 CHECK INPUT VOLTAGE OF ABSCM&H/U. 1)Disconnect the connector from ABSCM&H/U. 2)Run the engine at idle. 3)Measure the voltage between ABSCM&H/U connector and chassis ground. <i>Connector & terminal</i> LHD: (B301) No. 1 (+) — Chassis ground (-): RHD: (F49) No. 1 (+) — Chassis ground (-):	Is the voltage between 10 and 17 V?	Go to step 10.	Repair the 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 the ignition switch to OFF. 2) Measure the resistance between ABSCM&H/U connector and chassis ground. Connector & terminal LHD: (B301) No. 23 — Chassis ground: RHD: (F49) No. 23 — Chassis ground:	Is the resistance less than 0.5 Ω ?	Go to step 11.	Repair the ABSCM&H/U ground harness.
11 CHECK POOR CONTACT IN CONNECTORS.	Is there poor contact in connectors between generator, battery and ABSCM&H/U?	Repair the connector.	Go to step 12.
12 CHECK ABSCM&H/U. 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the 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 DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

W: DTC 44

— A COMBINATION OF AT CONTROL ABNORMAL —

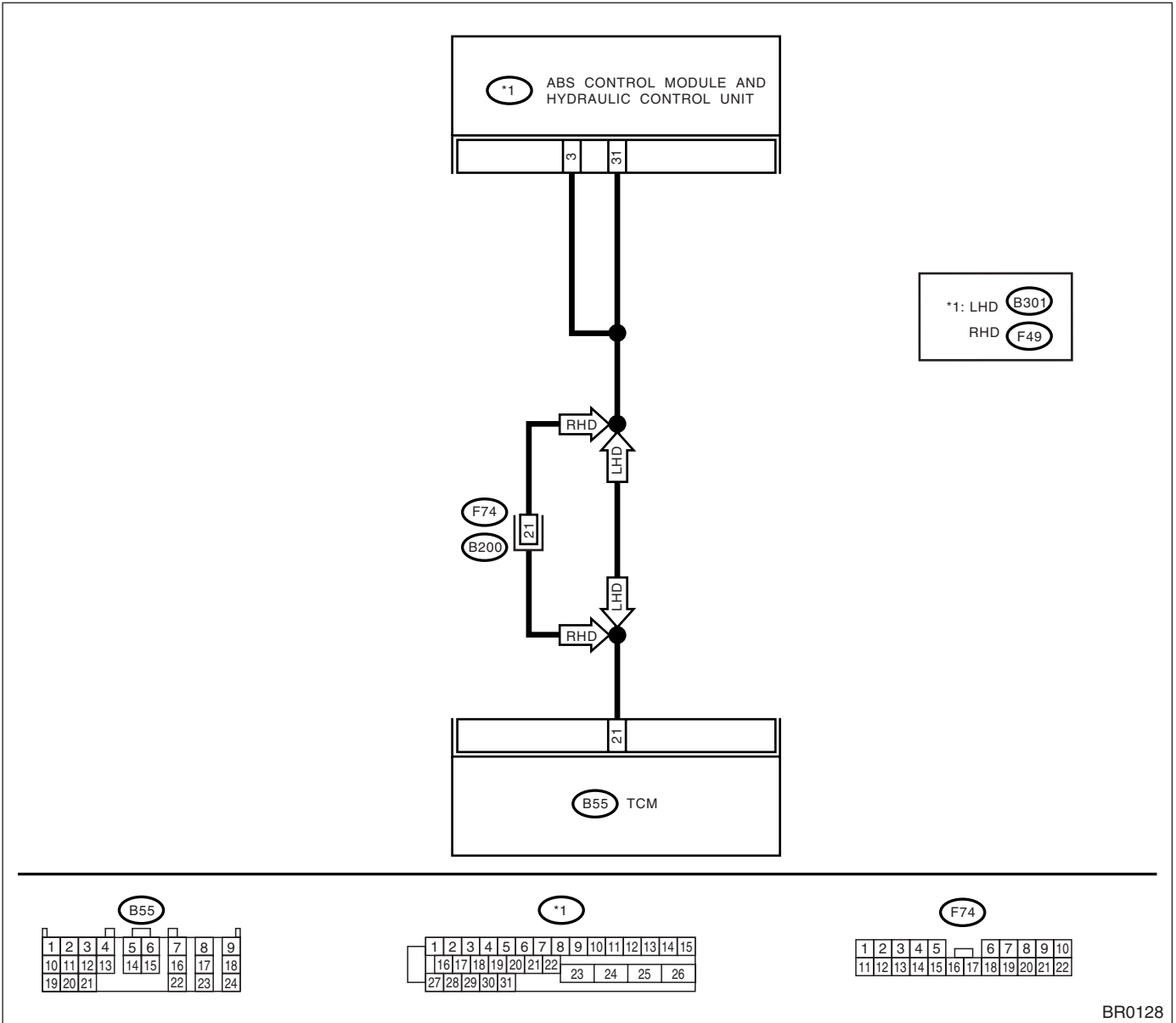
DIAGNOSIS:

- Combination of AT control faults

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



BR0128

	Step	Check	Yes	No
1	<p>CHECK SPECIFICATIONS OF THE AB-SCM&H/U. Check specifications of the mark to on ABSCM&H/U. <i>CM: AT (Rear disc brake)</i> <i>CN: MT (Rear disc brake)</i> <i>CC: AT (Rear drum brake)</i> <i>CD: MT (Rear drum brake)</i></p>	<p>Is an ABSCM&H/U for AT model installed on a MT model?</p>	<p>Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).></p>	<p>Go to step 2.</p>

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
2 CHECK GROUND SHORT OF HARNESS. 1) Turn the ignition switch to OFF. 2) Disconnect all connectors from TCM. 3) Disconnect the connector from ABSCM&H/U. 4) Measure the resistance between ABSCM&H/U connector and chassis ground. <i>Connector & terminal</i> <i>LHD: (B301) No. 3 — Chassis ground:</i> <i>RHD: (F49) No. 3 — Chassis ground:</i>	Is the resistance more than 1 MΩ?	Go to step 3.	Repair the harness between TCM and ABSCM&H/U.
3 CHECK BATTERY SHORT OF HARNESS. Measure the voltage between ABSCM&H/U connector and chassis ground. <i>Connector & terminal</i> <i>LHD: (B301) No. 3 (+) — Chassis ground (-):</i> <i>RHD: (F49) No. 3 (+) — Chassis ground (-):</i>	Is the voltage less than 1 V?	Go to step 4.	Repair the harness between TCM and ABSCM&H/U.
4 CHECK BATTERY SHORT OF HARNESS. 1) Turn the ignition switch to ON. 2) Measure the voltage between ABSCM&H/U connector and chassis ground. <i>Connector & terminal</i> <i>LHD: (B301) No. 3 (+) — Chassis ground (-):</i> <i>RHD: (F49) No. 3 (+) — Chassis ground (-):</i>	Is the voltage less than 1 V?	Go to step 5.	Repair the harness between TCM and ABSCM&H/U.
5 CHECK TCM. 1) Turn the ignition switch to OFF. 2) Connect all connectors to TCM. 3) Turn the ignition switch to ON. 4) Measure the voltage between TCM connector terminal and chassis ground. <i>Connector & terminal</i> <i>(B55) No. 21 (+) — Chassis ground (-):</i>	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 the TCM.	Repair the AT.
7 CHECK OPEN CIRCUIT OF HARNESS. Measure the voltage between ABSCM&H/U connector and chassis ground. <i>Connector & terminal</i> <i>LHD: (B301) No. 3 (+) — Chassis ground (-):</i> <i>LHD: (B301) No. 31 (+) — Chassis ground (-):</i> <i>RHD: (F49) No. 3 (+) — Chassis ground (-):</i> <i>RHD: (F49) No. 31 (+) — Chassis ground (-):</i>	Is the voltage between 10 and 15 V?	Go to step 8.	Repair the 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 the connector.	Go to step 9.
9 CHECK ABSCM&H/U. 1) Turn the ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform the inspection mode. 5) Read out the DTC.	Is the same DTC as in the current diagnosis still being output?	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 10.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
10 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

X: DTC 51

— ABNORMAL VALVE RELAY —

DIAGNOSIS:

- Faulty valve relay

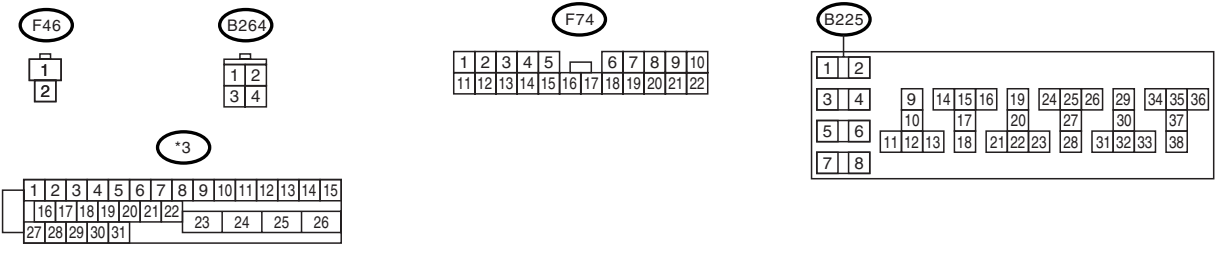
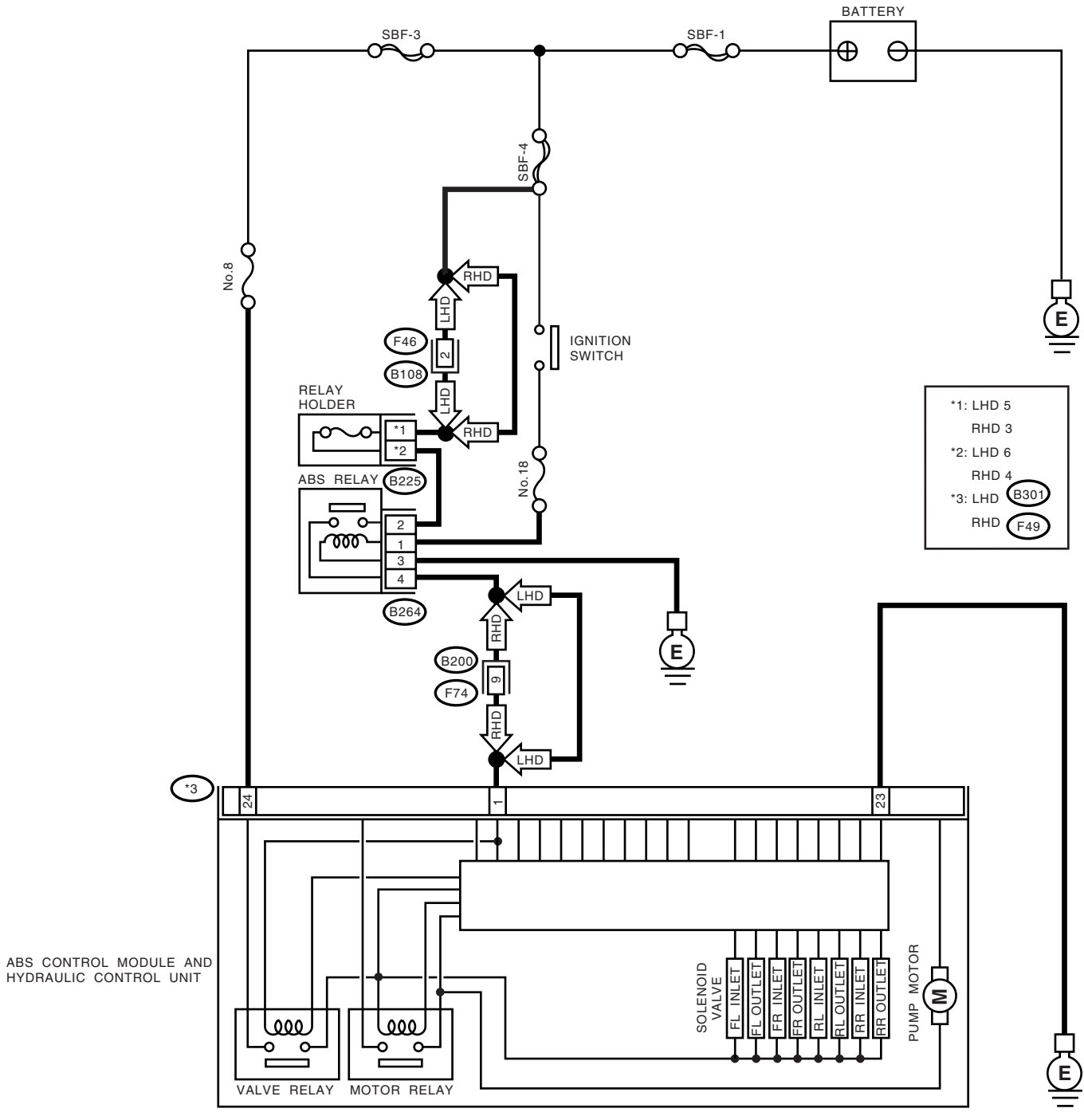
TROUBLE SYMPTOM:

- ABS does not operate.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

WIRING DIAGRAM:



BR0129

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No	
1	CHECK RELAY HOLDER.	Is the fuse blown out?	Replace the fuse.	Go to step 2.
2	CHECK INPUT VOLTAGE OF RELAY HOLDER. 1) Turn the ignition switch to OFF. 2) Remove the relay holder fuse. 3) Measure the voltage between ABS relay connector and chassis ground. Connector & terminal LHD: (B225) No. 5 (+) — Chassis ground (-): RHD: (B225) No. 3 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 3.	Repair the open circuit in harness between battery and relay holder connector.
3	CHECK INPUT VOLTAGE OF ABS RELAY. 1) Install the fuse. 2) Remove the ABS relay. 3) Turn the ignition switch to ON. 4) Measure the 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 the open circuit in harness between battery and relay holder connector.
4	CHECK INPUT VOLTAGE OF ABS RELAY. Measure the 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 the harness connector between battery, ignition switch and ABS relay.
5	CHECK GROUND CIRCUIT OF ABS RELAY. 1) Turn the ignition switch to OFF. 2) Measure the 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 the open circuit between ABS relay and chassis ground.
6	CHECK ABS RELAY. 1) Connect the battery to ABS relay terminal No. 1 and 3. 2) Measure the resistance between ABS relay terminals.	Is the resistance less than 10 Ω ?	Go to step 7.	Replace the ABS relay.
7	CHECK INPUT VOLTAGE OF ABSCM&H/U. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U. 3) Run the engine at idle. 4) Measure the voltage between ABSCM&H/U connector and chassis ground. Connector & terminal LHD: (B301) No. 1 (+) — Chassis ground (-): LHD: (B301) No. 24 (+) — Chassis ground (-): RHD: (F49) No. 1 (+) — Chassis ground (-): RHD: (F49) No. 24 (+) — Chassis ground (-):	Is the voltage between 10 and 15 V?	Go to step 8.	Repair the harness connector between battery, ABS relay and ABSCM&H/U.
8	CHECK GROUND CIRCUIT OF ABSCM&H/U. 1) Turn the ignition switch to OFF. 2) Measure the resistance between ABSCM&H/U connector and chassis ground. Connector & terminal LHD: (B301) No. 23 — Chassis ground: RHD: (F49) No. 23 — Chassis ground:	Is the resistance less than 0.5 Ω ?	Go to step 9.	Repair the ABSCM&H/U ground harness.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
9 CHECK VALVE RELAY IN ABSCM&H/U. Measure the resistance between ABSCM&H/U and terminals. <i>Terminals</i> No. 23 — No. 24:	Is the resistance more than 1 MΩ?	Go to step 10.	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
10 CHECK POOR CONTACT IN CONNECTORS.	Is there poor contact in connectors between generator, battery and ABSCM&H/U?	Repair the connector.	Go to step 11.
11 CHECK ABSCM&H/U. 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the DTC.	Is the same DTC as in the current diagnosis still being output?	Replace the 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 DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

Y: DTC 52

— ABNORMAL MOTOR AND/OR MOTOR RELAY —

DIAGNOSIS:

- Faulty motor
- Faulty motor relay
- Faulty harness connector

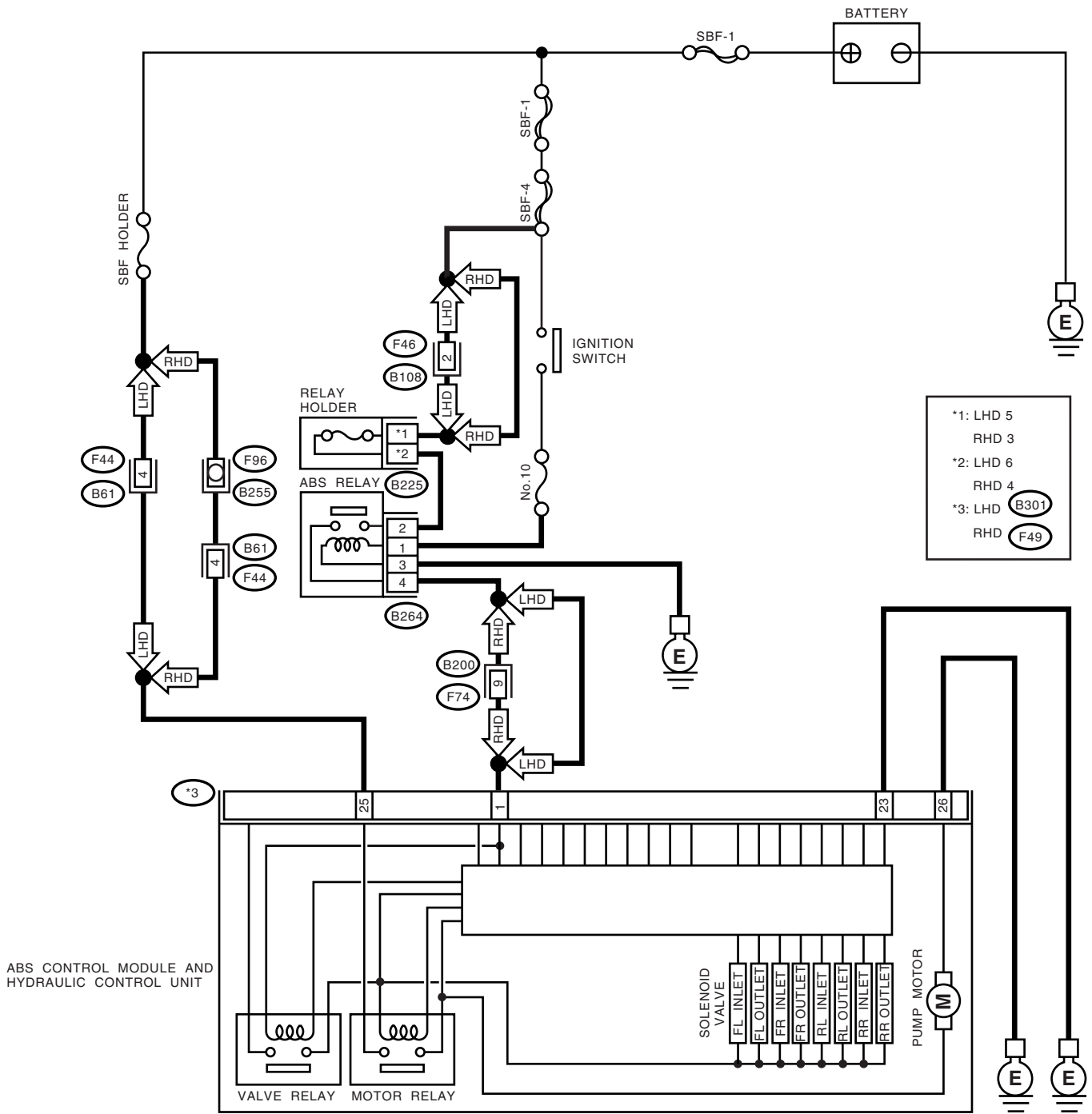
TROUBLE SYMPTOM:

- ABS does not operate.

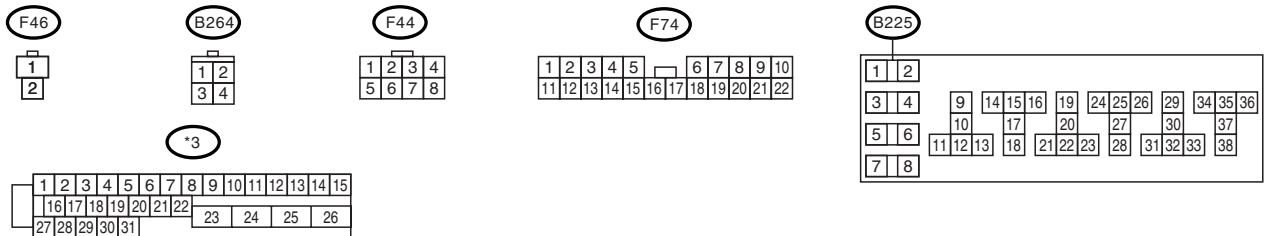
DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

WIRING DIAGRAM:



ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT



BR0130

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK INPUT VOLTAGE OF ABSCM&H/U. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U. 3) Turn the ignition switch to ON. 4) Measure the voltage between ABSCM&H/U connector and chassis ground. Connector & terminal LHD: (B301) No. 25 (+) — Chassis ground (-): RHD: (F49) No. 25 (+) — Chassis ground (-):	Is the voltage between 10 and 15 V?	Go to step 2.	Repair the harness/connector between battery and ABSCM&H/U and check fuse SBF-holder.
2 CHECK GROUND CIRCUIT OF MOTOR. 1) Turn the ignition switch to OFF. 2) Measure the resistance between ABSCM&H/U connector and chassis ground. Connector & terminal LHD: (B301) No. 26 — Chassis ground: RHD: (F49) No. 26 — Chassis ground:	Is the resistance less than 0.5 Ω ?	Go to step 4.	Repair the ABSCM&H/U ground harness.
3 CHECK RELAY HOLDER.	Is the fuse blown out?	Replace the fuse.	Go to step 4.
4 CHECK INPUT VOLTAGE OF RELAY HOLDER. 1) Turn the ignition switch to OFF. 2) Remove the relay holder fuse. 3) Measure the voltage between ABS relay connector and chassis ground. Connector & terminal LHD: (B225) No. 5 (+) — Chassis ground (-): RHD: (B225) No. 3 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 5.	Repair the open circuit in harness between battery and relay holder connector.
5 CHECK INPUT VOLTAGE OF ABS RELAY. 1) Install the fuse. 2) Remove the ABS relay. 3) Turn the ignition switch to ON. 4) Measure the 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 the open circuit in harness between battery and relay holder connector.
6 CHECK INPUT VOLTAGE OF ABS RELAY. Measure the 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 the harness connector between battery, ignition switch and ABS relay.
7 CHECK GROUND CIRCUIT OF ABS RELAY. 1) Turn the ignition switch to OFF. 2) Measure the 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 the open circuit between ABS relay and chassis ground.
8 CHECK ABS RELAY. 1) Connect the battery to ABS relay terminal No. 1 and 3. 2) Measure the resistance between ABS relay terminals.	Is the resistance less than 10 Ω ?	Go to step 9.	Replace the ABS relay.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
9 CHECK INPUT VOLTAGE OF ABSCM&H/U. 1)Run the engine at idle. 2)Measure the voltage between ABSCM&H/U connector and chassis ground. Connector & terminal LHD: (B301) No. 1 (+) — Chassis ground (-): RHD: (F49) No. 1 (+) — Chassis ground (-):	Is the voltage between 10 and 15 V?	Go to step 10.	Repair the harness connector between battery, ignition switch and ABSCM&H/U.
10 CHECK GROUND CIRCUIT OF ABSCM&H/U. 1)Turn the ignition switch to OFF. 2)Measure the resistance between ABSCM&H/U connector and chassis ground. Connector & terminal LHD: (B301) No. 23 — Chassis ground: RHD: (F49) No. 23 — Chassis ground:	Is the resistance less than 0.5 Ω?	Go to step 11.	Repair the 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 the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
12 CHECK POOR CONTACT IN CONNECTORS. Turn the ignition switch to OFF.	Is there poor contact in connector between generator, battery and ABSCM&H/U?	Repair the connector.	Go to step 13.
13 CHECK ABSCM&H/U. 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the DTC.	Is the same DTC as in the current diagnosis still being output?	Replace the 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 DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

Z: DTC 54 — ABNORMAL STOP LIGHT SWITCH —

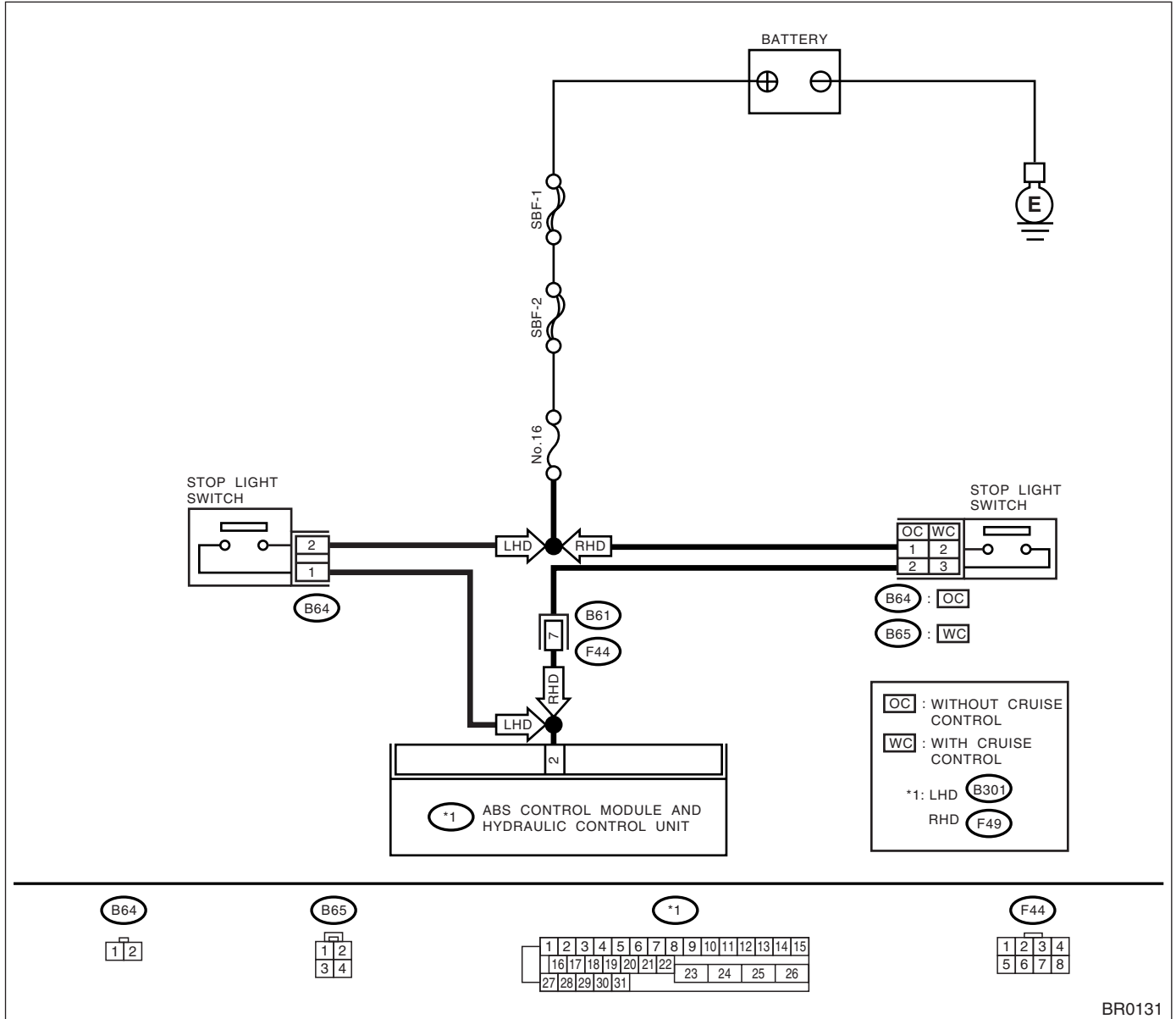
DIAGNOSIS:

- Faulty stop light switch

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	CHECK STOP LIGHTS COME ON. Depress the brake pedal.	Do the stop lights come on?	Go to step 2.	Repair the stop lights circuit.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
2 CHECK OPEN CIRCUIT IN HARNESS. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U. 3) Depress the brake pedal. 4) Measure the voltage between ABSCM&H/U connector and chassis ground. Connector & terminal LHD: (B301) No. 2 (+) — Chassis ground (-): RHD: (F49) No. 2 (+) — Chassis ground (-):	Is the voltage between 10 and 15 V?	Go to step 3.	Repair the 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 the connector.	Go to step 4.
4 CHECK ABSCM&H/U. 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in the current diagnosis still being output?	Replace the 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 DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

AA:DTC 56

— ABNORMAL G SENSOR OUTPUT VOLTAGE —

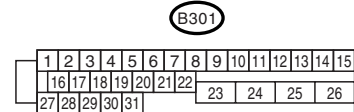
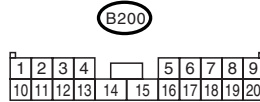
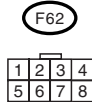
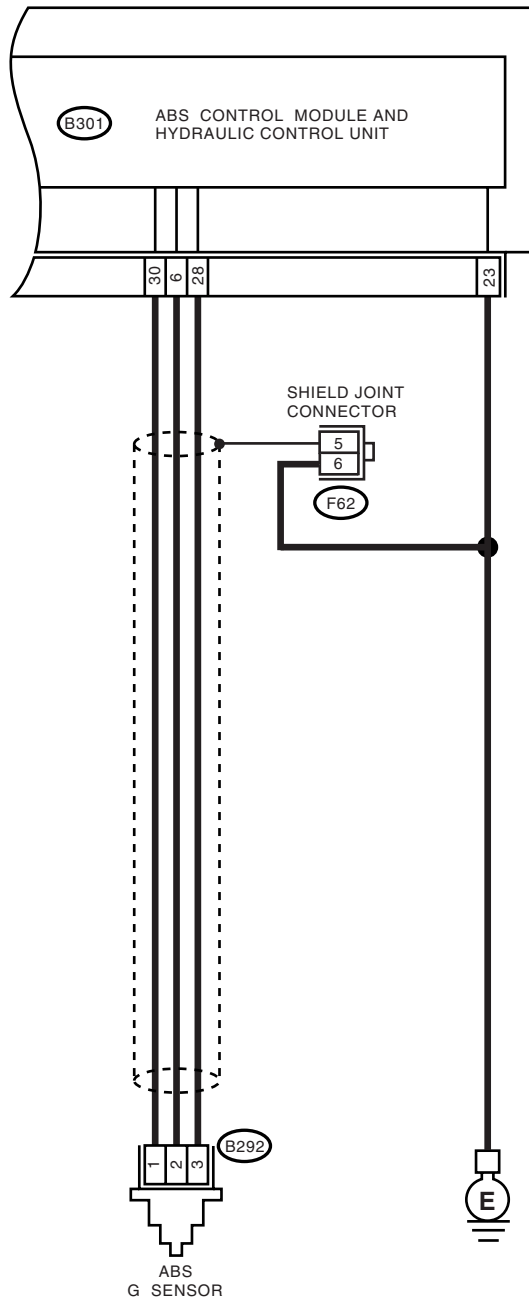
DIAGNOSIS:

- Faulty G sensor output voltage

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM: LHD MODEL

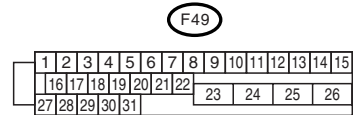
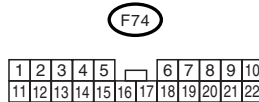
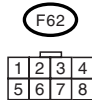
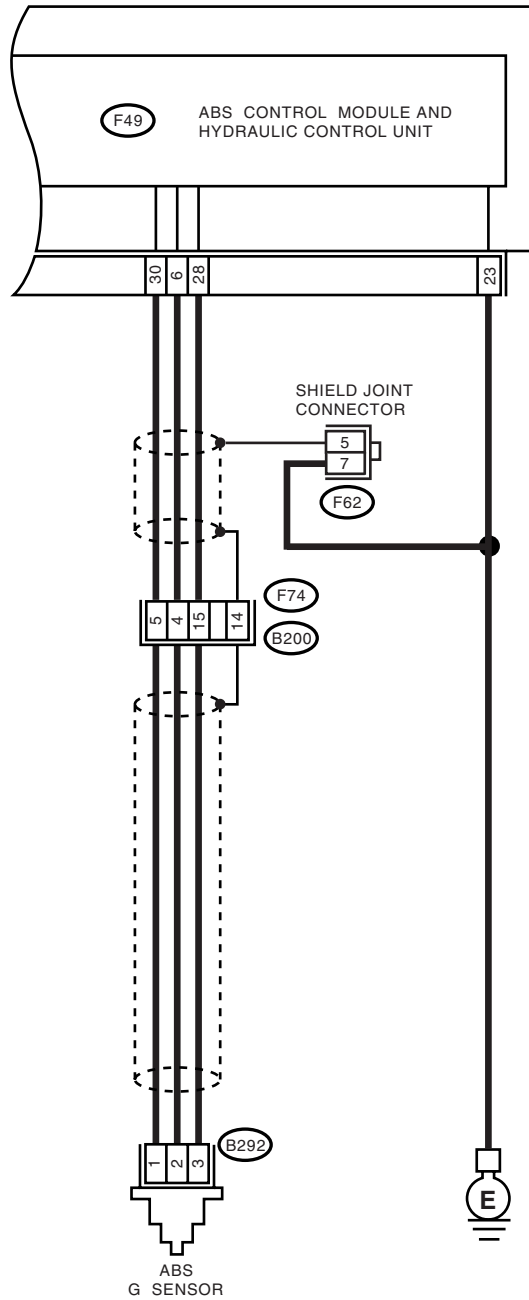


BR0132

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

WIRING DIAGRAM: RHD MODEL



BR0045

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 DTC.	Go to step 2.

DIAGNOSTICS CHART WITH DIAGNOSIS CONNECTOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
2 CHECK SPECIFICATIONS OF ABSCM&H/U. Check the specifications of the mark to the ABSCM&H/U. <i>CM: AT (Rear disc brake)</i> <i>CN: MT (Rear disc brake)</i> <i>CC: AT (Rear drum brake)</i> <i>CD: MT (Rear drum brake)</i>	Does the vehicle specification and ABSCM&H/U specification match?	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).> CAUTION: Be sure to turn the ignition switch to OFF when removing ABSCM&H/U.	Go to step 3.
3 CHECK INPUT VOLTAGE OF G SENSOR. 1)Turn the ignition switch to OFF. 2)Remove the console box. 3)Remove the G sensor from vehicle. (Do not disconnect the connector.) 4)Turn the ignition switch to ON. 5)Measure the voltage between G sensor connector terminals. <i>Connector & terminal</i> <i>(B292) No. 1 (+) — No. 3 (-):</i>	Is the voltage between 4.75 and 5.25 V?	Go to step 4.	Repair the harness/connector between G sensor and ABSCM&H/U.
4 CHECK OPEN CIRCUIT IN G SENSOR OUTPUT HARNESS AND GROUND HARNESS. 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ABSCM&H/U. 3)Measure the resistance between ABSCM&H/U connector terminals. <i>Connector & terminal</i> <i>LHD: (B301) No. 6 — No. 28:</i> <i>RHD: (F49) No. 6 — No. 28:</i>	Is the resistance between 5.0 and 5.6 kΩ?	Go to step 5.	Repair the harness/connector between G sensor and ABSCM&H/U.
5 CHECK GROUND SHORT IN G SENSOR OUTPUT HARNESS. 1)Disconnect the connector from G sensor. 2)Measure the resistance between ABSCM&H/U connector and chassis ground. <i>Connector & terminal</i> <i>LHD: (B301) No. 6 — Chassis ground:</i> <i>RHD: (F49) No. 6 — Chassis ground:</i>	Is the resistance more than 1 MΩ?	Go to step 6.	Repair the harness between G sensor and ABSCM&H/U.
6 CHECK BATTERY SHORT OF HARNESS. Measure the voltage between ABSCM&H/U connector and chassis ground. <i>Connector & terminal</i> <i>LHD: (B301) No. 6 (+) — Chassis ground (-):</i> <i>RHD: (F49) No. 6 (+) — Chassis ground (-):</i>	Is the voltage less than 1 V?	Go to step 7.	Repair the harness between G sensor and ABSCM&H/U.
7 CHECK BATTERY SHORT OF HARNESS. 1)Turn the ignition switch to ON. 2)Measure the voltage between ABSCM&H/U connector and chassis ground. <i>Connector & terminal</i> <i>LHD: (B301) No. 6 (+) — Chassis ground (-):</i> <i>RHD: (F49) No. 6 (+) — Chassis ground (-):</i>	Is the voltage less than 1 V?	Go to step 8.	Repair the 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 the resistance between ABSCM&H/U connector and chassis ground. <i>Connector & terminal</i> <i>LHD: (B301) No. 28 — Chassis ground:</i> <i>RHD: (F49) No. 28 — Chassis ground:</i>	Is the resistance more than 1 MΩ?	Go to step 9.	Repair the harness between G sensor and ABSCM&H/U. Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
9 CHECK G SENSOR. 1) Turn the ignition switch to OFF. 2) Remove the G sensor from vehicle. 3) Connect the connector to G sensor. 4) Connect the connector to ABSCM&H/U. 5) Turn the ignition switch to ON. 6) Measure the voltage between G sensor connector terminals. <i>Connector & terminal</i> <i>(B292) No. 2 (+) — No. 3 (-):</i>	Is the voltage between 2.1 and 2.4 V when G sensor is horizontal?	Go to step 10.	Replace the G sensor. <Ref. to ABS-22, G Sensor.>
10 CHECK G SENSOR. Measure the voltage between G sensor connector terminals. <i>Connector & terminal</i> <i>(B292) No. 2 (+) — No. 3 (-):</i>	Is the voltage between 3.7 and 4.1 V when G sensor is inclined forwards to 90°?	Go to step 11.	Replace the G sensor. <Ref. to ABS-22, G Sensor.>
11 CHECK G SENSOR. Measure the voltage between G sensor connector terminals. <i>Connector & terminal</i> <i>(B292) No. 2 (+) — No. 3 (-):</i>	Is the voltage between 0.5 and 0.9 V when G sensor is inclined backwards to 90°?	Go to step 12.	Replace the 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 the 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 DTC.	Is the same DTC as in the current diagnosis still being output?	Replace the 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 DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	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.>

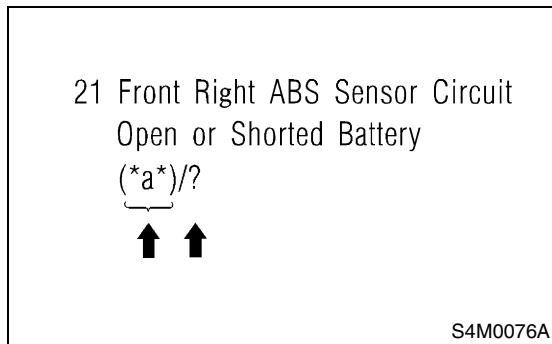
NOTE:

For basic handling of the select monitor, refer to its Operation Manual.

AC:DIAGNOSTIC TROUBLE CODES (DTCs) ARE DISPLAYED.

A maximum of 3 DTCs are displayed in order of occurrence.

- If a particular DTC is not properly stored in memory (due to a drop in ABSCM&H/U power supply, etc.) when a problem occurs, the DTC, followed by a question mark “?”, appears on the select monitor display. This shows it may be an unreliable reading.



- *a* refers to the troubles in order of occurrence (Latest, Old, Older and Reference).

Display screen	Contents to be monitored
Latest	The most recent DTC appears on select monitor display.
Old	The second most recent DTC appears on select monitor display.
Older	The third most recent DTC appears on select monitor display.
Reference	A specified period of time preceding DTC appears on select monitor display.

AD:CLEAR MEMORY

Display screen	Contents to be monitored
Clear memory?	Function of clearing DTC and freeze frame data.

AE:ANALOG DATA ARE DISPLAYED.

Display screen	Contents to be monitored
FR wheel speed	Wheel speed detected by Front Right ABS sensor is displayed in km/h or mile/h.
FL wheel speed	Wheel speed detected by Front Left ABS sensor is displayed in km/h or mile/h.
RR wheel speed	Wheel speed detected by Rear Right ABS sensor is displayed in km/h or mile/h.
RL wheel speed	Wheel speed detected by 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 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 DTC, 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 Front Right ABS sensor is displayed in km/h or mile/h.
FL wheel speed	Wheel speed detected by Front Left ABS sensor is displayed in km/h or mile/h.
RR wheel speed	Wheel speed detected by Rear Right ABS sensor is displayed in km/h or mile/h.
RL wheel speed	Wheel speed detected by 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 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

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

13. Diagnostics Chart with Subaru Select Monitor

A: COMMUNICATION FOR INITIALIZING IMPOSSIBLE

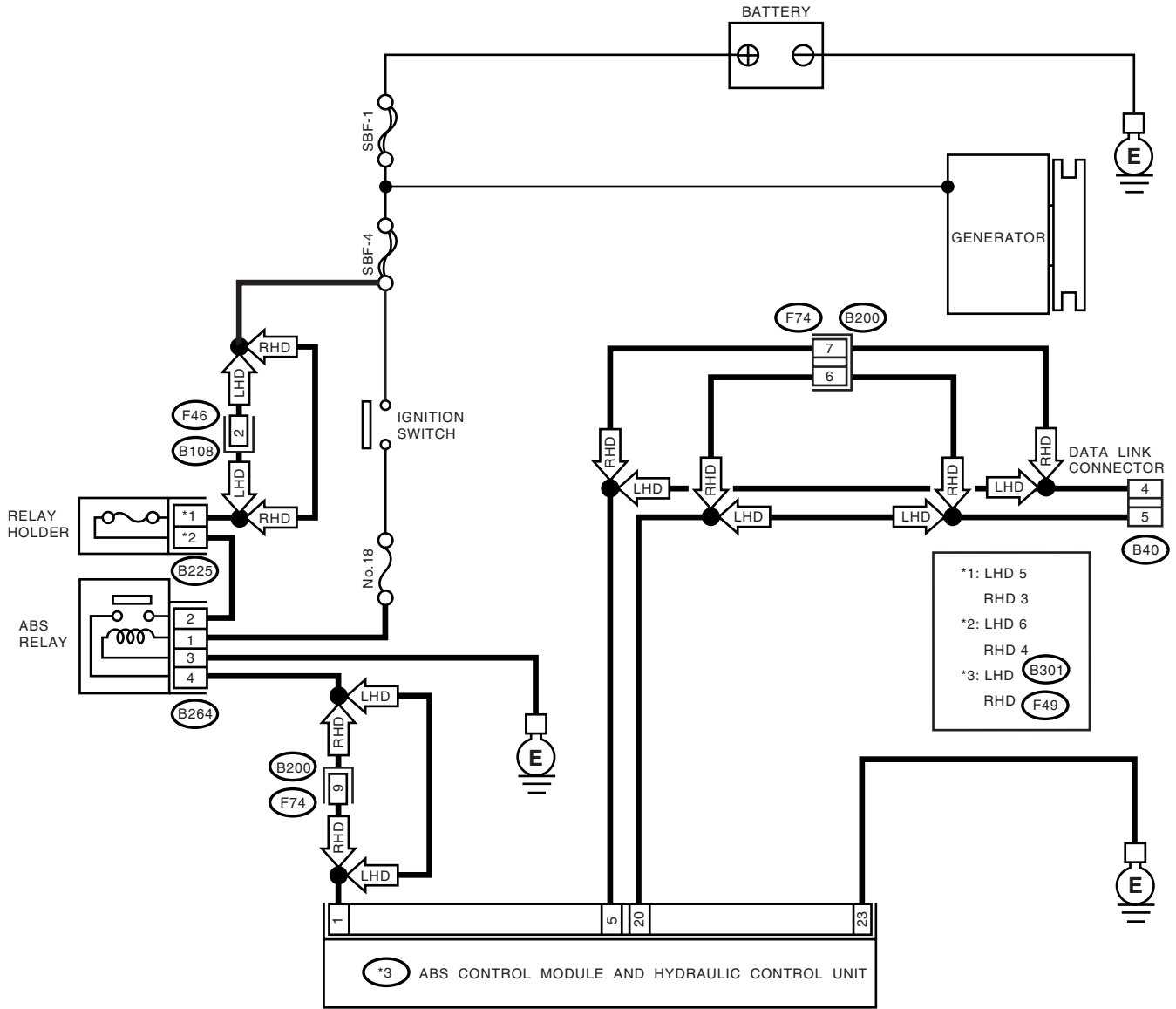
DIAGNOSIS:

- Faulty harness connector

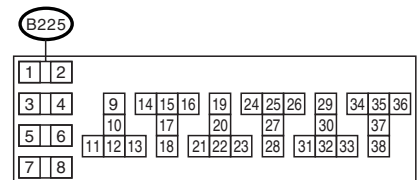
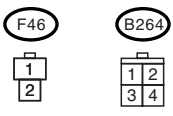
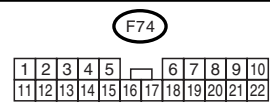
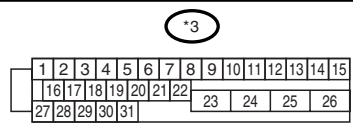
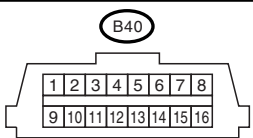
TROUBLE SYMPTOM:

- ABS warning light remains on.

WIRING DIAGRAM:



*1: LHD 5
RHD 3
*2: LHD 6
RHD 4
*3: LHD B301
RHD F49



BR0133

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No	
1	CHECK IGNITION SWITCH.	Is the ignition switch turned to ON?	Go to step 2 .	Turn the ignition switch to ON, and select ABS mode using select monitor.
2	CHECK BATTERY. 1)Turn the ignition switch to OFF. 2)Measure the battery voltage.	Is the voltage more than 11 V?	Go to step 3 .	Charge or replace the battery.
3	CHECK BATTERY TERMINAL.	Is there poor contact at battery terminal?	Repair or tighten the battery terminal.	Go to step 4 .
4	CHECK COMMUNICATION OF SELECT MONITOR. 1)Turn the ignition switch to ON. 2)Using the select monitor, check whether communication to other system can be executed normally.	Are the name and year of system displayed on select monitor?	Go to step 9 .	Go to step 5 .
5	CHECK COMMUNICATION OF SELECT MONITOR. 1)Turn the ignition switch to OFF. 2)Disconnect the ABSCM&H/U connector. 3)Check whether communication to other systems can be executed normally.	Are the name and year of system displayed on select monitor?	Go to step 9 .	Go to step 6 .
6	CHECK COMMUNICATION OF SELECT MONITOR. 1)Turn the ignition switch to OFF. 2)Connect the ABSCM&H/U connector. 3)Disconnect the cruise control module connector. 4)Check whether communication to other systems can be executed normally. NOTE: If the vehicle is not equipped with cruise control: Go to step 8 .	Are the name and year of system displayed on select monitor?	Inspect the cruise control module.	Go to step 7 .
7	CHECK COMMUNICATION OF SELECT MONITOR. 1)Turn the ignition switch to OFF. 2)Connect the cruise control module connector. 3)Disconnect the immobilizer control module connector. 4)Check whether communication to other systems can be executed normally. NOTE: If the vehicle is not equipped with immobilizer control: Go to step 8 .	Are the name and year of system displayed on select monitor?	Inspect the immobilizer control module.	Go to step 8 .
8	CHECK HARNESS CONNECTOR BETWEEN EACH CONTROL MODULE AND DATA LINK CONNECTOR. 1)Turn the ignition switch to OFF. 2)Disconnect the ABSCM&H/U, cruise control module and immobilizer control module connectors. 3)Measure the resistance between data link connector and chassis ground. Connector & terminal (B40) No. 5 — Chassis ground: (B40) No. 4 — Chassis ground:	Is the resistance more than 1 MΩ?	Go to step 9 .	Repair the harness and connector between each control module and data link connector.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
9 CHECK OUTPUT SIGNAL FOR ABSCM&H/U. 1) Turn the ignition switch to ON. 2) Measure the 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 the harness and connector between each control module and data link connector.	Go to step 10.
10 CHECK HARNESS/CONNECTOR BETWEEN ABSCM&H/U AND DATA LINK CONNECTOR. Measure the resistance between ABSCM&H/U connector and data link connector. <i>Connector & terminal</i> <i>LHD: (B301) No. 20 — (B40) No. 5:</i> <i>LHD: (B301) No. 5 — (B40) No. 4:</i> <i>RHD: (F49) No. 20 — (B40) No. 5:</i> <i>RHD: (F49) No. 5 — (B40) No. 4:</i>	Is the resistance less than 0.5 Ω ?	Repair the harness and connector between ABSCM&H/U and data link connector.	Go to step 11.
11 CHECK INSTALLATION OF ABSCM&H/U CONNECTOR. Turn the ignition switch to OFF.	Is the ABSCM&H/U connector inserted into ABSCM&H/U until the clamp locks onto it?	Go to step 12.	Insert the ABSCM&H/U connector into ABSCM&H/U.
12 CHECK INPUT VOLTAGE OF RELAY HOLDER. 1) Turn the ignition switch to OFF. 2) Remove the relay holder fuse. 3) Measure the 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 13.	Repair the open circuit in harness between battery and relay holder connector.
13 CHECK RELAY HOLDER.	Is the fuse blown out?	Replace the fuse.	Go to step 14.
14 CHECK INPUT VOLTAGE OF ABS RELAY. 1) Install the fuse. 2) Remove the ABS relay. 3) Turn the ignition switch to ON. 4) Measure the 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 15.	Repair open circuit in harness between battery and relay holder connector.
15 CHECK INPUT VOLTAGE OF ABS RELAY. Measure the 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 16.	Repair the harness connector between battery, ignition switch and ABS relay.
16 CHECK GROUND CIRCUIT OF ABS RELAY. 1) Turn the ignition switch to OFF. 2) Measure the resistance between ABS relay connector and chassis ground. <i>Connector & terminal</i> <i>(B264) No. 3 — Chassis ground:</i>	Is the resistance less 5 Ω ?	Go to step 17.	Repair the open circuit between ABS relay and chassis ground.
17 CHECK ABS RELAY. 1) Connect the battery to ABS relay terminal No. 1 and 3. 2) Measure the resistance between ABS relay terminals.	Is the resistance less than 10 Ω ?	Go to step 18.	Replace the ABS relay.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
18 CHECK POWER SUPPLY CIRCUIT. 1) Turn the ignition switch to ON (engine OFF). 2) Measure the ignition power supply voltage between ABSCM&H/U connector and chassis ground. <i>Connector & terminal</i> <i>LHD: (B301) No. 1 (+) — Chassis ground (-):</i> <i>RHD: (F49) No. 1 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Go to step 19.	Repair the open circuit in harness between ABSCM&H/U and battery.
19 CHECK HARNESS CONNECTOR BETWEEN ABSCM&H/U AND CHASSIS GROUND. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U and transmission. 3) Measure the resistance of harness between ABSCM&H/U and chassis ground. <i>Connector & terminal</i> <i>LHD: (B301) No. 23 — Chassis ground:</i> <i>RHD: (F49) No. 23 — Chassis ground:</i>	Is the resistance less than 1 Ω ?	Go to step 20.	Repair the open circuit in harness between ABSCM&H/U and inhibitor side connector, and poor contact in coupling connector.
20 CHECK POOR CONTACT IN CONNECTORS.	Is there poor contact in control module power supply, ground line and data link connector?	Repair the connector.	Replace the 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.

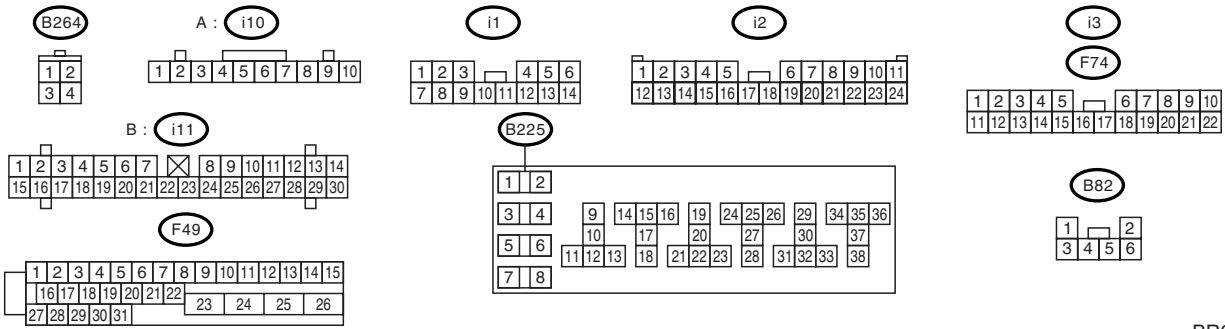
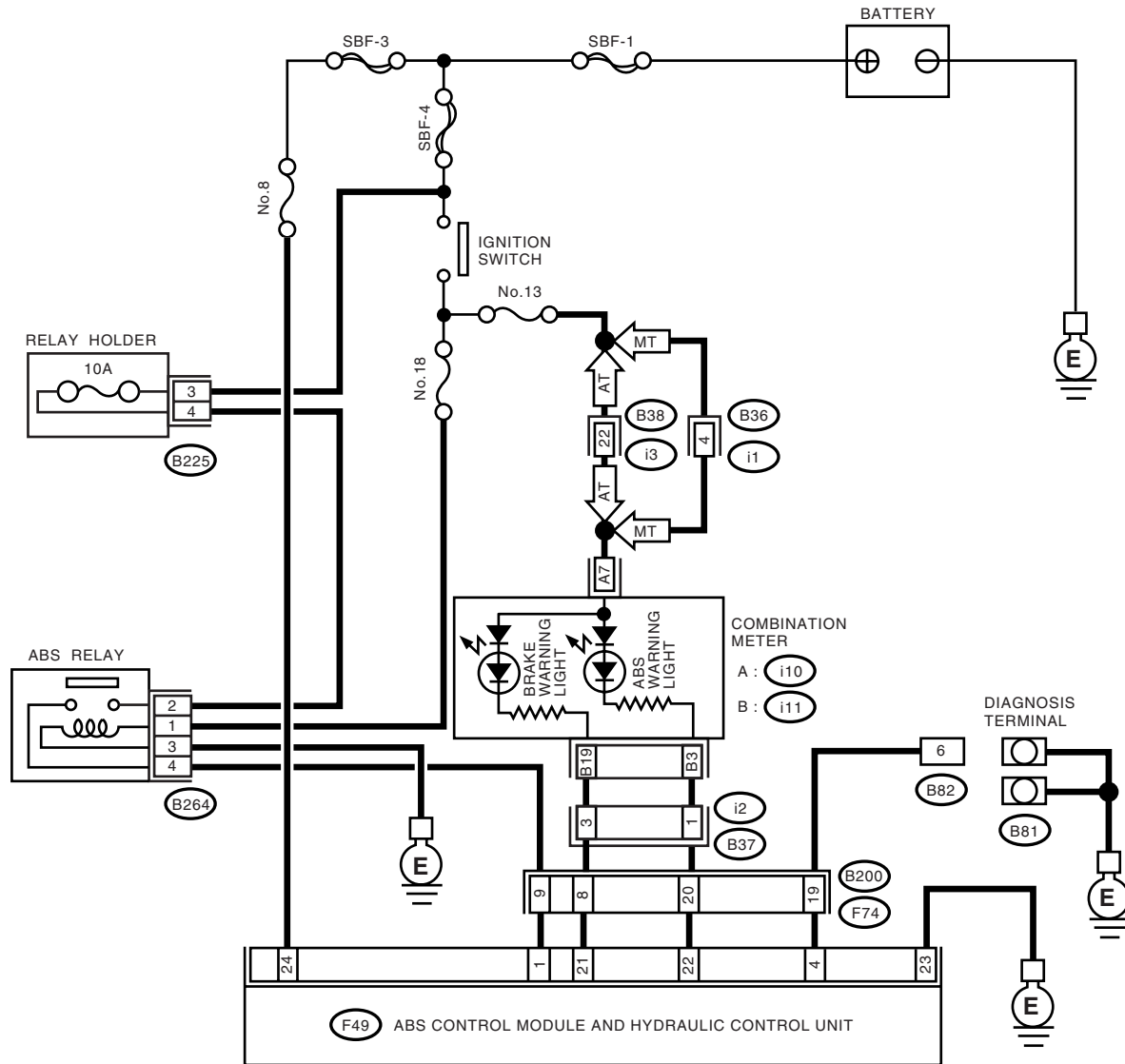
NOTE:

When the ABS warning light is OFF and “NO TROUBLE CODE” is displayed on select monitor, the system is in normal condition.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

WIRING DIAGRAM: RHD MODEL



BR0124

Step	Check	Yes	No
1 CHECK WIRING HARNESS. 1) Turn the ignition switch to OFF. 2) Disconnect the connector (i2) from connector (B37). 3) Turn ignition switch to ON.	Does the ABS warning light remain off?	Go to step 2.	Repair the front wiring harness.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
2 CHECK PROJECTION AT ABSCM&H/U. 1) Turn the ignition switch to OFF. 2) Disconnect the 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 the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
3 CHECK ABSCM&H/U. Measure the resistance between ABSCM&H/U terminals. <i>Terminals</i> <i>No. 22 — No. 23:</i>	Is the resistance more than 1 M Ω ?	Go to step 4 .	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
4 CHECK WIRING HARNESS. Measure the resistance between connector (B301 or F49) and chassis ground. <i>Connector & terminal</i> <i>LHD: (B301) No. 22 — Chassis ground:</i> <i>RHD: (F49) No. 22 — Chassis ground:</i>	Is the resistance less than 0.5 Ω ?	Go to step 5 .	Repair the harness.
5 CHECK WIRING HARNESS. 1) Connect the connector to ABSCM&H/U. 2) Measure the resistance between connector (B301 or F49) and chassis ground. <i>Connector & terminal</i> <i>LHD: (B301) No. 22 — Chassis ground:</i> <i>RHD: (F49) No. 22 — Chassis ground:</i>	Is the resistance more than 1 M Ω ?	Go to step 6 .	Repair the harness.
6 CHECK POOR CONTACT IN ABSCM&H/U CONNECTOR.	Is there poor contact in ABSCM&H/U connector?	Repair the connector.	Replace the 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: DTC 21

— OPEN OR SHORT CIRCUIT IN FRONT RIGHT ABS SENSOR CIRCUIT —

NOTE:

For the diagnostic procedure, refer to DTC 27. <Ref. to ABS-101, DTC 27 — OPEN OR SHORT CIRCUIT IN REAR LEFT ABS SENSOR CIRCUIT —, Diagnostics Chart with Subaru Select Monitor.>

D: DTC 23

— OPEN OR SHORT CIRCUIT IN FRONT LEFT ABS SENSOR CIRCUIT —

NOTE:

For the diagnostic procedure, refer to DTC 27. <Ref. to ABS-101, DTC 27 — OPEN OR SHORT CIRCUIT IN REAR LEFT ABS SENSOR CIRCUIT —, Diagnostics Chart with Subaru Select Monitor.>

E: DTC 25

— OPEN OR SHORT CIRCUIT IN REAR RIGHT ABS SENSOR CIRCUIT —

NOTE:

For the diagnostic procedure, refer to DTC 27. <Ref. to ABS-101, DTC 27 — OPEN OR SHORT CIRCUIT IN REAR LEFT ABS SENSOR CIRCUIT —, Diagnostics Chart with Subaru Select Monitor.>

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

F: DTC 27

— OPEN OR SHORT CIRCUIT IN REAR LEFT ABS SENSOR CIRCUIT —

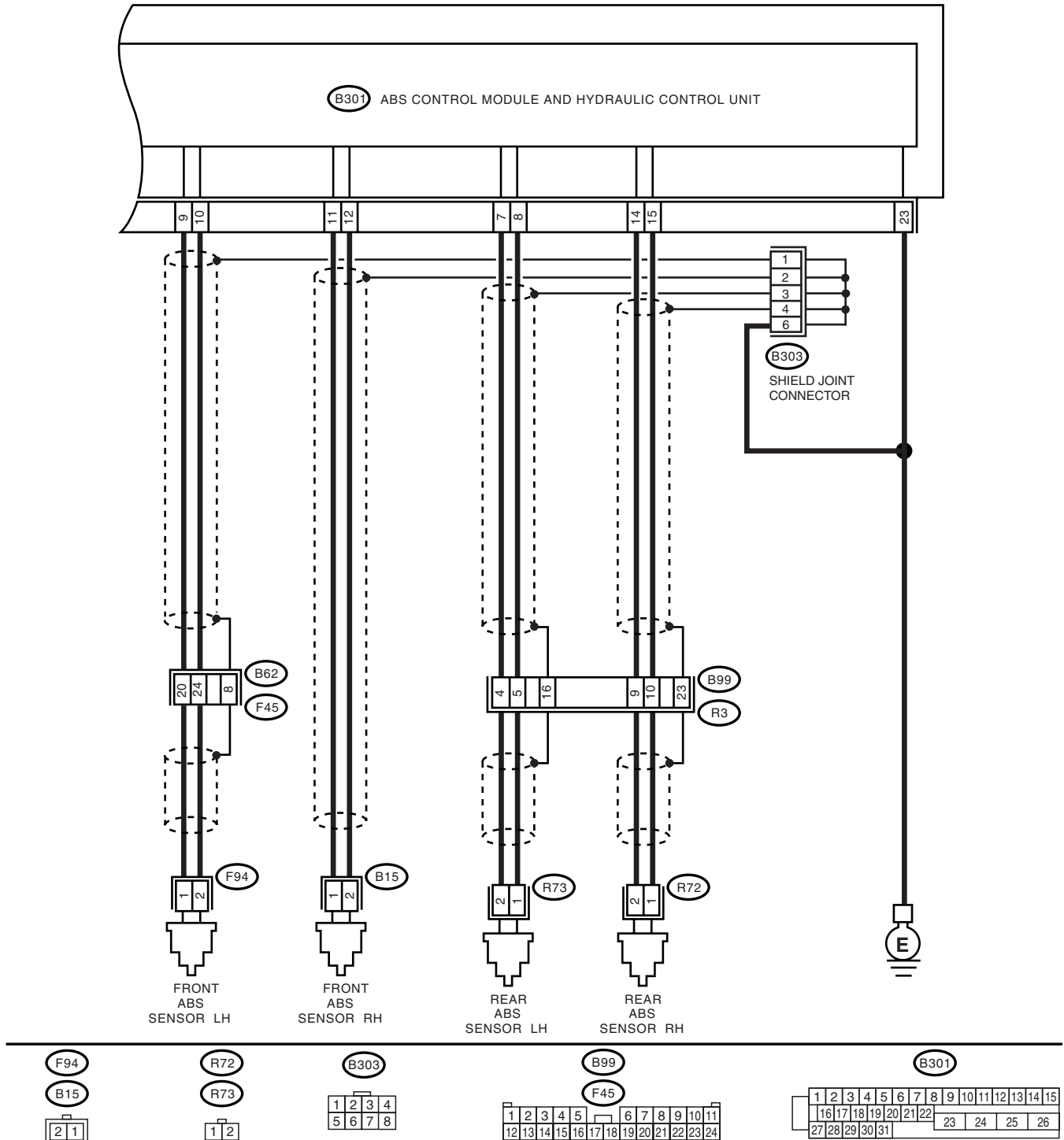
DIAGNOSIS:

- Faulty ABS sensor (Broken wire, input voltage too high)
- Faulty harness connector

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM: LHD MODEL

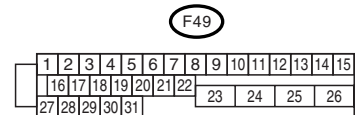
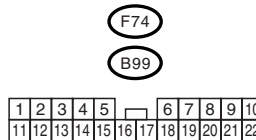
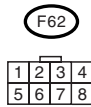
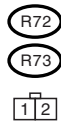
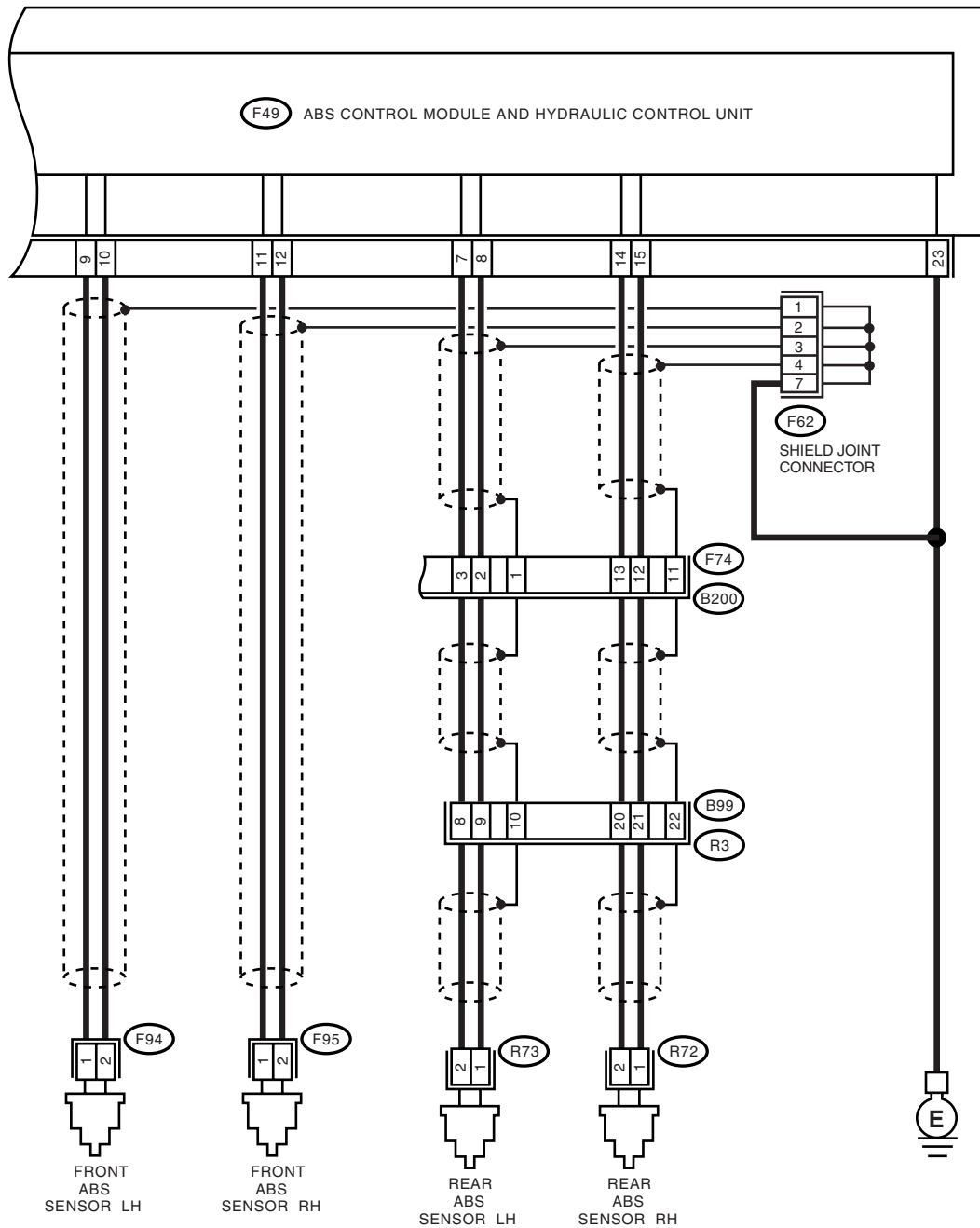


BR0125

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

WIRING DIAGRAM: RHD MODEL



BR0038

Step	Check	Yes	No	
1	<p>CHECK OUTPUT OF ABS SENSOR USING SELECT MONITOR.</p> <p>1) Select "Current data display & Save" on the select monitor.</p> <p>2) Read the ABS sensor output corresponding to faulty system in the select monitor data display mode.</p>	Does the speed indicated on display change in response to speedometer reading during acceleration/deceleration when the steering wheel is in straight-ahead position?	Go to step 2.	Go to step 8.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
2 CHECK INSTALLATION OF ABS SENSOR. <i>Tightening torque:</i> 32 N·m (3.3 kgf·m, 24 ft·lb)	Are the ABS sensor installation bolts tightened securely?	Go to step 3.	Tighten the ABS sensor installation bolts securely.
3 CHECK ABS SENSOR GAP. Measure the 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 the spacers cannot correct gap, replace worn sensor or worn tone wheel.
4 CHECK TONE WHEEL RUNOUT. Measure the tone wheel runout.	Is the runout less than 0.05 mm (0.0020 in)?	Go to step 5.	Replace the 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 the ignition switch to OFF.	Is there poor contact in connectors between ABSCM&H/U and ABS sensor?	Repair the connector.	Go to step 6.
6 CHECK ABSCM&H/U. 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the DTC.	Is the same DTC as in the current diagnosis still being output?	Replace the 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 DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact. NOTE: Check the harness and connectors between ABSCM&H/U and ABS sensor.
8 CHECK ABS SENSOR. 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ABS sensor. 3)Measure the 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 the 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
<p>9 CHECK BATTERY SHORT OF ABS SENSOR. 1) Disconnect the connector from ABSCM&H/U. 2) Measure the 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></p>	Is the voltage less than 1 V?	Go to step 10.	Replace the ABS sensor. Front: <Ref. to ABS-14, Front ABS Sensor.> Rear: <Ref. to ABS-17, Rear ABS Sensor.>
<p>10 CHECK BATTERY SHORT OF ABS SENSOR. 1) Turn the ignition switch to ON. 2) Measure the 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></p>	Is the voltage less than 1 V?	Go to step 11.	Replace the ABS sensor. Front: <Ref. to ABS-14, Front ABS Sensor.> Rear: <Ref. to ABS-17, Rear ABS Sensor.>
<p>11 CHECK HARNESS/CONNECTOR BETWEEN ABSCM&H/U AND ABS SENSOR. 1) Turn the ignition switch to OFF. 2) Connect the connector to ABS sensor. 3) Measure the resistance between ABSCM&H/U connector terminals. Connector & terminal <i>DTC 21 / LHD: (B301) No. 11 — No. 12:</i> <i>RHD: (F49) No. 11 — No. 12:</i> <i>DTC 23 / LHD: (B301) No. 9 — No. 10:</i> <i>RHD: (F49) No. 9 — No. 10:</i> <i>DTC 25 / LHD: (B301) No. 14 — No. 15:</i> <i>RHD: (F49) No. 14 — No. 15:</i> <i>DTC 27 / LHD: (B301) No. 7 — No. 8:</i> <i>RHD: (F49) No. 7 — No. 8:</i></p>	Is the resistance between 1 and 1.5 kΩ?	Go to step 12.	Repair the harness/connector between ABSCM&H/U and ABS sensor.
<p>12 CHECK BATTERY SHORT OF HARNESS. Measure the voltage between ABSCM&H/U connector and chassis ground. Connector & terminal <i>DTC 21 / LHD: (B301) No. 11 (+) — Chassis ground (-):</i> <i>RHD: (F49) No. 11 (+) — Chassis ground (-):</i> <i>DTC 23 / LHD: (B301) No. 9 (+) — Chassis ground (-):</i> <i>RHD: (F49) No. 9 (+) — Chassis ground (-):</i> <i>DTC 25 / LHD: (B301) No. 14 (+) — Chassis ground (-):</i> <i>RHD: (F49) No. 14 (+) — Chassis ground (-):</i> <i>DTC 27 / LHD: (B301) No. 7 (+) — Chassis ground (-):</i> <i>RHD: (F49) No. 7 (+) — Chassis ground (-):</i></p>	Is the voltage less than 1 V?	Go to step 13.	Repair the harness between ABSCM&H/U and ABS sensor.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
<p>13 CHECK BATTERY SHORT OF HARNESS. 1) Turn the ignition switch to ON. 2) Measure the voltage between ABSCM&H/U connector and chassis ground. Connector & terminal DTC 21 / LHD: (B301) No. 11 (+) — Chassis ground (-): RHD: (F49) No. 11 (+) — Chassis ground (-): DTC 23 / LHD: (B301) No. 9 (+) — Chassis ground (-): RHD: (F49) No. 9 (+) — Chassis ground (-): DTC 25 / LHD: (B301) No. 14 (+) — Chassis ground (-): RHD: (F49) No. 14 (+) — Chassis ground (-): DTC 27 / LHD: (B301) No. 7 (+) — Chassis ground (-): RHD: (F49) No. 7 (+) — Chassis ground (-):</p>	Is the voltage less than 1 V?	Go to step 14.	Repair the harness between ABSCM&H/U and ABS sensor.
<p>14 CHECK INSTALLATION OF ABS SENSOR. Tightening torque: 32 N·m (3.3 kgf·m, 24 ft·lb)</p>	Are the ABS sensor installation bolts tightened securely?	Go to step 15.	Tighten the ABS sensor installation bolts securely.
<p>15 CHECK ABS SENSOR GAP. Measure the 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)</p>	Is the gap within the specifications?	Go to step 16.	Adjust the gap. NOTE: Adjust the gap using spacers (Part No. 26755AA000). If the spacers cannot correct gap, replace worn sensor or worn tone wheel.
<p>16 CHECK TONE WHEEL RUNOUT. Measure the tone wheel runout.</p>	Is the runout less than 0.05 mm (0.0020 in)?	Go to step 17.	Replace the tone wheel. Front: <Ref. to ABS-20, Front Tone Wheel.> Rear: <Ref. to ABS-21, Rear Tone Wheel.>
<p>17 CHECK GROUND SHORT OF ABS SENSOR. 1) Turn the ignition switch to ON. 2) Measure the 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:</p>	Is the resistance more than 1 MΩ?	Go to step 18.	Replace the 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 SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
18 CHECK GROUND SHORT OF HARNESS. 1) Turn the ignition switch to OFF. 2) Connect the connector to ABS sensor. 3) Measure the resistance between ABSCM&H/U connector terminal and chassis ground. <i>Connector & terminal</i> <i>DTC 21 /</i> <i>LHD: (B301) No. 11 — Chassis ground:</i> <i>RHD: (F49) No. 11 — Chassis ground:</i> <i>DTC 23 /</i> <i>LHD: (B301) No. 9 — Chassis ground:</i> <i>RHD: (F49) No. 9 — Chassis ground:</i> <i>DTC 25 /</i> <i>LHD: (B301) No. 14 — Chassis ground:</i> <i>RHD: (F49) No. 14 — Chassis ground:</i> <i>DTC 27 /</i> <i>LHD: (B301) No. 7 — Chassis ground:</i> <i>RHD: (F49) No. 7 — Chassis ground:</i>	Is the resistance more than 1 MΩ?	Go to step 19.	Repair the harness between ABSCM&H/U and ABS sensor. And replace the 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 the connector.	Go to step 20.
20 CHECK ABSCM&H/U. 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the ABSCM&H/U.	Go to step 21.
21 CHECK ANY OTHER DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact. NOTE: Check the harness and connectors between ABSCM&H/U and ABS sensor.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

G: DTC 22

— FRONT RIGHT ABNORMAL ABS SENSOR SIGNAL —

NOTE:

For the diagnostic procedure, refer to DTC 28. <Ref. to ABS-108, DTC 28 — REAR LEFT ABNORMAL ABS SENSOR SIGNAL —, Diagnostics Chart with Subaru Select Monitor.>

H: DTC 24

— FRONT LEFT ABNORMAL ABS SENSOR SIGNAL —

NOTE:

For the diagnostic procedure, refer to DTC 28. <Ref. to ABS-108, DTC 28 — REAR LEFT ABNORMAL ABS SENSOR SIGNAL —, Diagnostics Chart with Subaru Select Monitor.>

I: DTC 26

— REAR RIGHT ABNORMAL ABS SENSOR SIGNAL —

NOTE:

For the diagnostic procedure, refer to DTC 28. <Ref. to ABS-108, DTC 28 — REAR LEFT ABNORMAL ABS SENSOR SIGNAL —, Diagnostics Chart with Subaru Select Monitor.>

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

J: DTC 28 — REAR LEFT ABNORMAL ABS SENSOR SIGNAL —

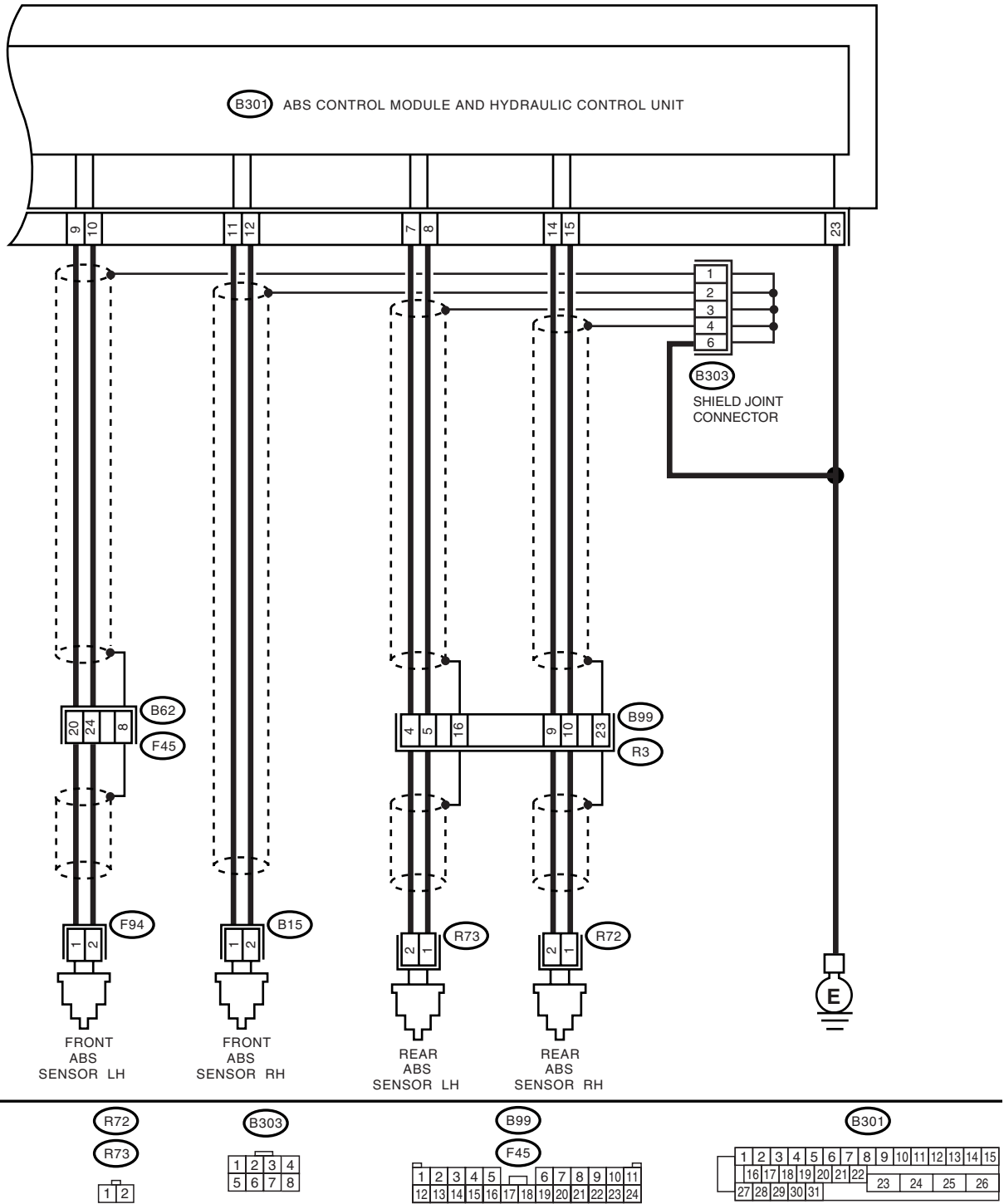
DIAGNOSIS:

- Faulty ABS sensor signal (noise, irregular signal, etc.)
- Faulty harness/connector

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM: LHD MODEL

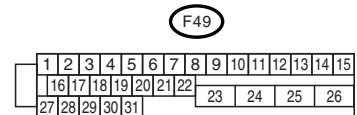
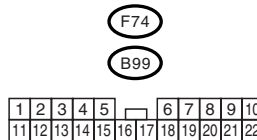
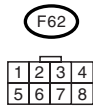
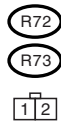
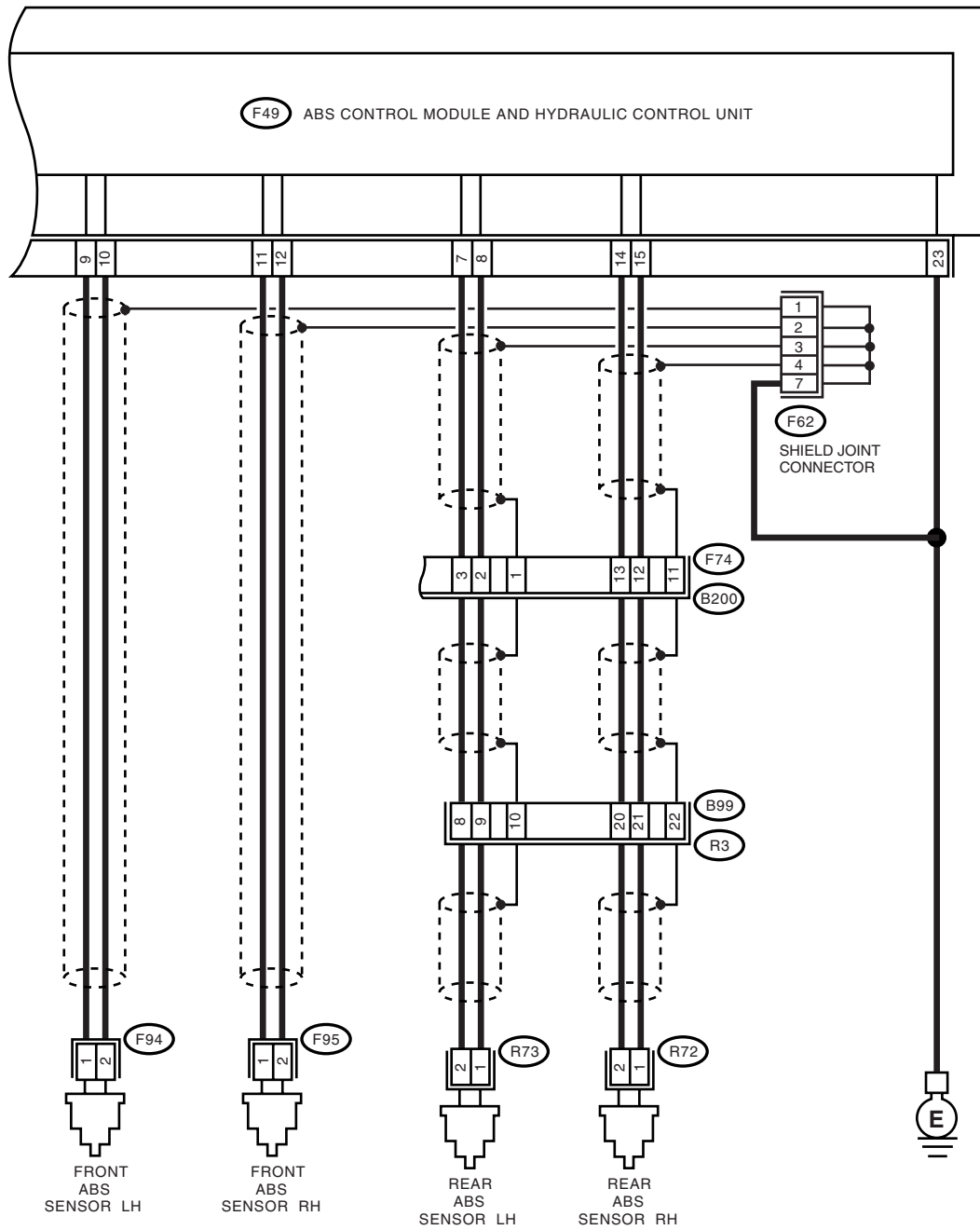


BR0125

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

WIRING DIAGRAM: RHD MODEL



BR0038

Step	Check	Yes	No	
1	<p>CHECK OUTPUT OF ABS SENSOR USING SELECT MONITOR.</p> <p>1) Select "Current data display & Save" on the select monitor.</p> <p>2) Read the ABS sensor output corresponding to faulty system in the select monitor data display mode.</p>	Does the speed indicated on display change in response to speedometer reading during acceleration/deceleration when the steering wheel is in straight-ahead position?	Go to step 2.	Go to step 8.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
2	CHECK POOR CONTACT IN CONNECTORS. Turn the ignition switch to OFF.	Is there poor contact in connectors between ABSCM&H/U and ABS sensor?	Repair the connector. Go to step 3 .
3	CHECK SOURCES OF SIGNAL NOISE.	Is the car telephone or wireless transmitter properly installed?	Go to step 4 . Properly install the car telephone or 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 sensor harness. Go to step 5 .
5	CHECK SHIELD CIRCUIT. 1)Turn the ignition switch to OFF. 2)Connect all connectors. 3)Measure the resistance between shield connector and chassis ground. Connector & terminal DTC 24 / LHD: (F45) No. 8 — Chassis ground: DTC 26 / LHD: (B99) No. 23 — Chassis ground: DTC 26 / RHD: (B99) No. 22 — Chassis ground: DTC 28 / LHD: (B99) No. 16 — Chassis ground: DTC 28 / RHD: (B99) No. 10 — Chassis ground: NOTE: For the DTC 22 and 24 : (RHD) Go to step 6 .	Is the resistance less than 0.5 Ω?	Go to step 6 . Repair the shield harness.
6	CHECK ABSCM&H/U. 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the DTC.	Is the same DTC as in the current diagnosis still being output?	Replace the 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 DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC. A temporary noise interference.
8	CHECK INSTALLATION OF ABS SENSOR. Tightening torque: 32 N·m (3.3 kgf·m, 24 ft·lb)	Are the ABS sensor installation bolts tightened securely?	Go to step 9 . Tighten the ABS sensor installation bolts securely.
9	CHECK ABS SENSOR GAP. Measure the tone wheel to ABS sensor piece gap over entire perimeter of 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 specifications?	Go to step 10 . Adjust the gap. NOTE: Adjust the gap using spacer (Part No. 26755AA000). If the spacers cannot correct 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
<p>11 CHECK ABS SENSOR SIGNAL. 1) Raise all four wheels off ground. 2) Turn the ignition switch to OFF. 3) Connect the oscilloscope to the connector. 4) Turn the ignition switch to ON. 5) Rotate the wheels and measure voltage at specified frequency. <Ref. to ABS-17, WAVEFORM, Control Module I/O Signal.></p> <p>NOTE: When this inspection is completed, the ABSCM&H/U sometimes stores DTC 29.</p> <p>Connector & terminal DTC 22 / LHD: (B15) No. 1 (+) — No. 2 (-): RHD: (F95) No. 1 (+) — No. 2 (-): DTC 24 / (F94) No. 1 (+) — No. 2 (-): DTC 26 / LHD: (B99) No. 9 (+) — No. 10 (-): RHD: (B99) No. 20 (+) — No. 21 (-): DTC 28 / LHD: (B99) No. 4 (+) — No. 5 (-): RHD: (B99) No. 8 (+) — No. 9 (-):</p>	<p>Is the oscilloscope pattern smooth, as shown in the figure?</p>	<p>Go to step 15.</p>	<p>Go to step 12.</p>
<p>12 CHECK CONTAMINATION OF ABS SENSOR OR TONE WHEEL. Remove the disc rotor or drum from hub in accordance with DTC.</p>	<p>Is the ABS sensor piece or tone wheel contaminated by dirt or other foreign matter?</p>	<p>Thoroughly remove dirt or other foreign matter.</p>	<p>Go to step 13.</p>
<p>13 CHECK DAMAGE OF ABS SENSOR OR TONE WHEEL.</p>	<p>Are there broken or damaged in the ABS sensor piece or tone wheel?</p>	<p>Replace the 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.></p>	<p>Go to step 14.</p>
<p>14 CHECK TONE WHEEL RUNOUT. Measure the tone wheel runout.</p>	<p>Is the runout less than 0.05 mm (0.0020 in)?</p>	<p>Go to step 15.</p>	<p>Replace the tone wheel. Front: <Ref. to ABS-20, Front Tone Wheel.> Rear: <Ref. to ABS-21, Rear Tone Wheel.></p>
<p>15 CHECK RESISTANCE OF ABS SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABS sensor. 3) Measure the resistance between ABS sensor connector terminals.</p> <p>Terminal Front RH No. 1 — No. 2: Front LH No. 1 — No. 2: Rear RH No. 1 — No. 2: Rear LH No. 1 — No. 2:</p>	<p>Is the resistance between 1 and 1.5 kΩ?</p>	<p>Go to step 16.</p>	<p>Replace the ABS sensor. Front: <Ref. to ABS-14, Front ABS Sensor.> Rear: <Ref. to ABS-17, Rear ABS Sensor.></p>

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
16 CHECK GROUND SHORT OF ABS SENSOR. Measure the 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 M Ω ?	Go to step 17.	Replace the 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 the connector to ABS sensor. 2)Disconnect the connector from ABSCM&H/U. 3)Measure the resistance at ABSCM&H/U connector terminals. <i>Connector & terminal</i> <i>DTC 22 /</i> <i>LHD: (B301)No. 11 — No. 12:</i> <i>RHD: (F49) No. 11 — No. 12:</i> <i>DTC 24 /</i> <i>LHD: (B301) No. 9 — No. 10:</i> <i>RHD: (F49) No. 9 — No. 10:</i> <i>DTC 26 /</i> <i>LHD: (B301) No. 14 — No. 15:</i> <i>RHD: (F49) No. 14 — No. 15:</i> <i>DTC 28 /</i> <i>LHD: (B301) No. 7 — No. 8:</i> <i>RHD: (F49) No. 7 — No. 8:</i>	Is the resistance between 1 and 1.5 k Ω ?	Go to step 18.	Repair the harness/connector between ABSCM&H/U and ABS sensor.
18 CHECK GROUND SHORT OF HARNESS. Measure the resistance between ABSCM&H/U connector and chassis ground. <i>Connector & terminal</i> <i>DTC 22 /</i> <i>LHD: (B301) No. 11 — Chassis ground:</i> <i>RHD: (F49) No. 11 — Chassis ground:</i> <i>DTC 24 /</i> <i>LHD: (B301) No. 9 — Chassis ground:</i> <i>RHD: (F49) No. 9 — Chassis ground:</i> <i>DTC 26 /</i> <i>LHD: (B301) No. 14 — Chassis ground:</i> <i>RHD: (F49) No. 14 — Chassis ground:</i> <i>DTC 28 /</i> <i>LHD: (B301) No. 7 — Chassis ground:</i> <i>RHD: (F49) No. 7 — Chassis ground:</i>	Is the resistance more than 1 M Ω ?	Go to step 19.	Repair the harness/connector between ABSCM&H/U and ABS sensor.
19 CHECK GROUND CIRCUIT OF ABSCM&H/U. Measure the resistance between ABSCM&H/U and chassis ground. <i>Connector & terminal</i> <i>LHD: (B301) No. 23 — Chassis ground:</i> <i>RHD: (F49) No. 23 — Chassis ground:</i>	Is the resistance less than 0.5 Ω ?	Go to step 20.	Repair the 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 the 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 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 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 the resistance between shield connector and chassis ground. Connector & terminal <i>DTC 24 / LHD: (F45) No. 8 — Chassis ground:</i> <i>DTC 26 / LHD: (B99) No. 23 — Chassis ground:</i> <i>DTC 26 / RHD: (B99) No. 22 — Chassis ground:</i> <i>DTC 28 / LHD: (B99) No. 16 — Chassis ground:</i> <i>DTC 28 / RHD: (B99) No. 10 — Chassis ground:</i> NOTE: For the DTC 22 and 24: (RHD) Go to step 24.	Is the resistance less than 0.5 Ω ?	Go to step 24.	Repair the shield harness.
24 CHECK ABSCM&H/U. 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the DTC.	Is the same DTC as in the current diagnosis still being output?	Replace the 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 DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary noise interference.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

K: DTC 29

— ABNORMAL ABS SENSOR SIGNAL ON ANY ONE OF FOUR SENSOR —

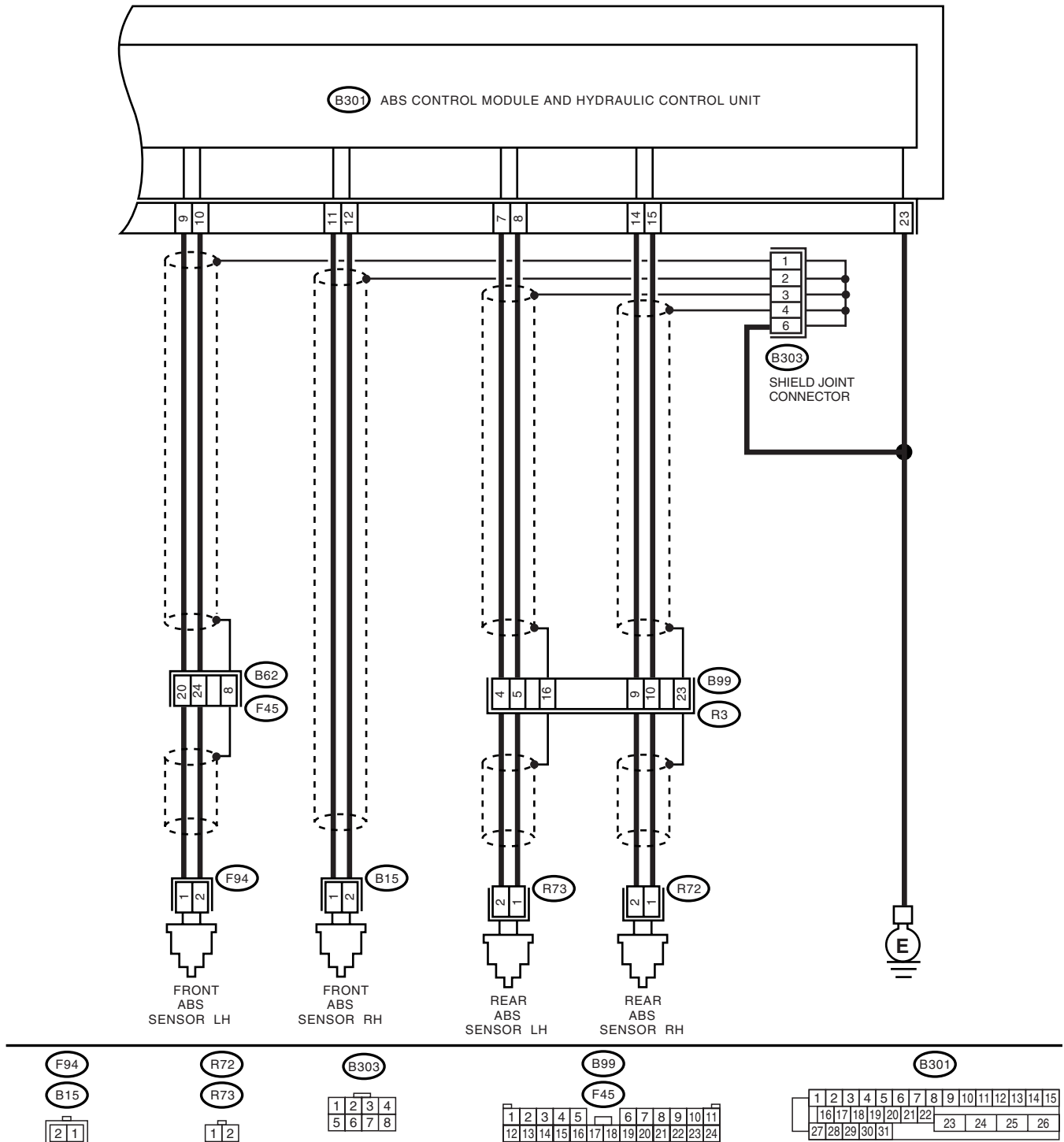
DIAGNOSIS:

- Faulty ABS sensor signal (noise, irregular signal, etc.)
- Faulty tone wheel
- Wheels turning freely for a long time

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM: LHD MODEL

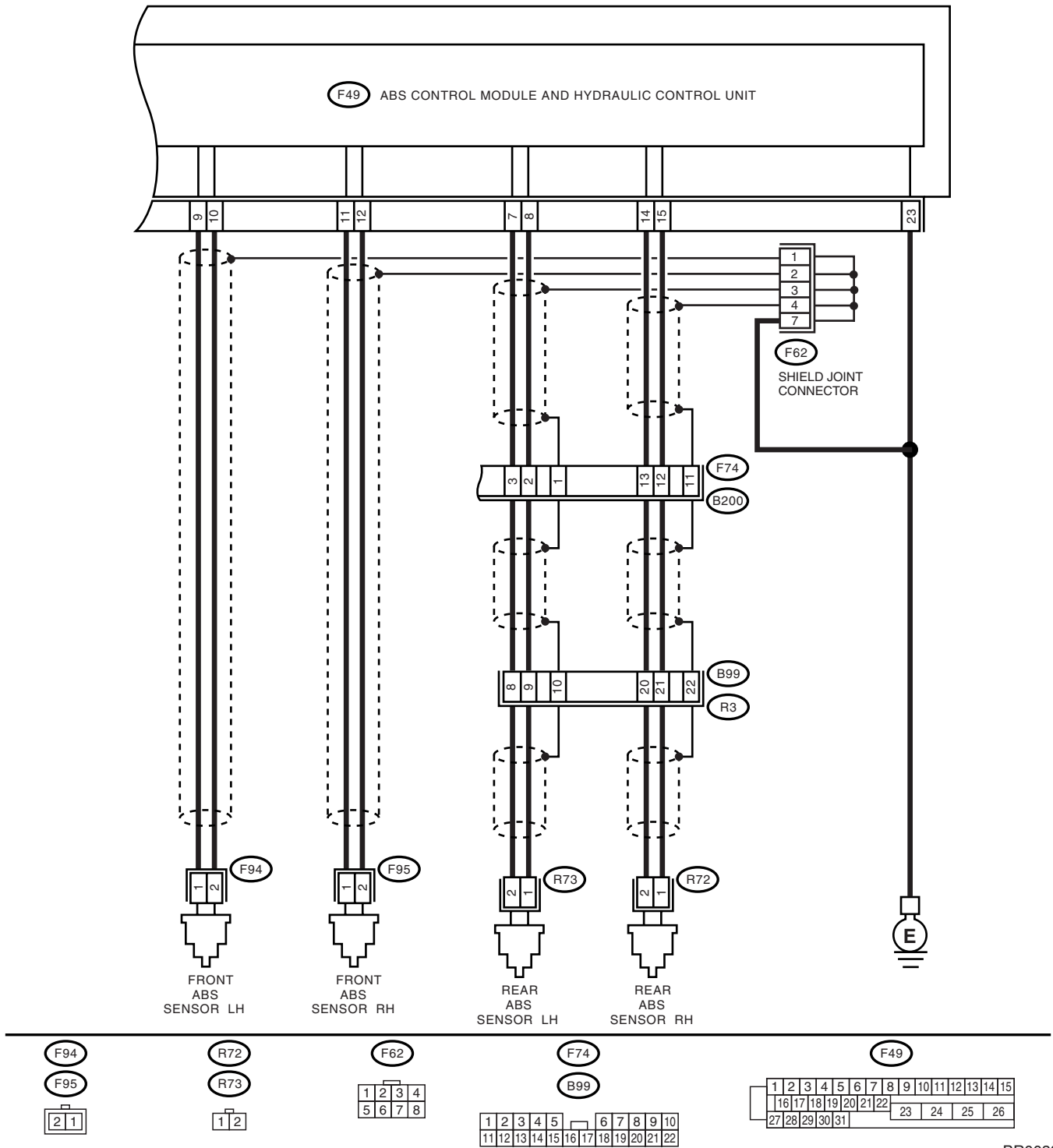


BR0125

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 vehicle is jacked-up, under full-lock cornering or when tire is not in contact with road surface.	The ABS is normal. Erase the DTC. NOTE: When the wheels turn freely for a long time, such as when vehicle is towed or jacked-up, or when steering wheel is continuously turned all way, this trouble code may sometimes occur.
2	CHECK TIRE SPECIFICATIONS. Turn the ignition switch to OFF.	Are the tire specifications correct?	Go to step 3.
3	CHECK WEAR OF TIRE.	Is the tire worn excessively?	Replace the 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 N·m (3.3 kgf·m, 24 ft·lb)	Are the ABS sensor installation bolts tightened securely?	Go to step 6.
6	CHECK ABS SENSOR GAP. Measure the 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 specifications?	Go to step 7.
7	PREPARE OSCILLOSCOPE.	Is an oscilloscope available?	Adjust the gap. NOTE: Adjust the gap using spacer (Part No. 26755AA000). If the spacers cannot correct gap, replace worn sensor or worn tone wheel.
8	CHECK ABS SENSOR SIGNAL. 1) Raise all four wheels off ground. 2) Turn the ignition switch to OFF. 3) Connect the oscilloscope to connector (B15), (B99), (F95) or (F94) in accordance with DTC. 4) Turn the ignition switch to ON. 5) Rotate the wheels and measure voltage at specified frequency. <Ref. to ABS-17, WAVEFORM, Control Module I/O Signal.> NOTE: When this inspection is completed, ABSCM& H/U sometimes stores the DTC 29. Connector & terminal <i>Front RH</i> LHD: (B15) No. 1 (+) — No. 2 (-): RHD: (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 the oscilloscope pattern smooth, as shown in the figure?	Go to step 8.
			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 the disc rotor from hub.	Is the ABS sensor piece or 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 tone wheel?	Replace the 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 the tone wheel runout.	Is the runout less than 0.05 mm (0.0020 in)?	Go to step 12 .	Replace the 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 the ignition switch to OFF. 2)Connect all connectors. 3)Erase the memory. 4)Perform the inspection mode. 5)Read out the DTC.	Is the same DTC as in the current diagnosis still being output?	Replace the 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 DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

L: DTC 31

— FRONT RIGHT INLET VALVE MALFUNCTION —

NOTE:

For the diagnostic procedure, refer to DTC 37. <Ref. to ABS-120, DTC 37 — REAR LEFT INLET VALVE MALFUNCTION —, Diagnostics Chart with Subaru Select Monitor.>

M: DTC 33

— FRONT LEFT INLET VALVE MALFUNCTION —

NOTE:

For the diagnostic procedure, refer to DTC 37. <Ref. to ABS-120, DTC 37 — REAR LEFT INLET VALVE MALFUNCTION —, Diagnostics Chart with Subaru Select Monitor.>

N: DTC 35

— REAR RIGHT INLET VALVE MALFUNCTION —

NOTE:

For the diagnostic procedure, refer to DTC 37. <Ref. to ABS-120, DTC 37 — REAR LEFT INLET VALVE MALFUNCTION —, Diagnostics Chart with Subaru Select Monitor.>

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

O: DTC 37

— REAR LEFT INLET VALVE MALFUNCTION —

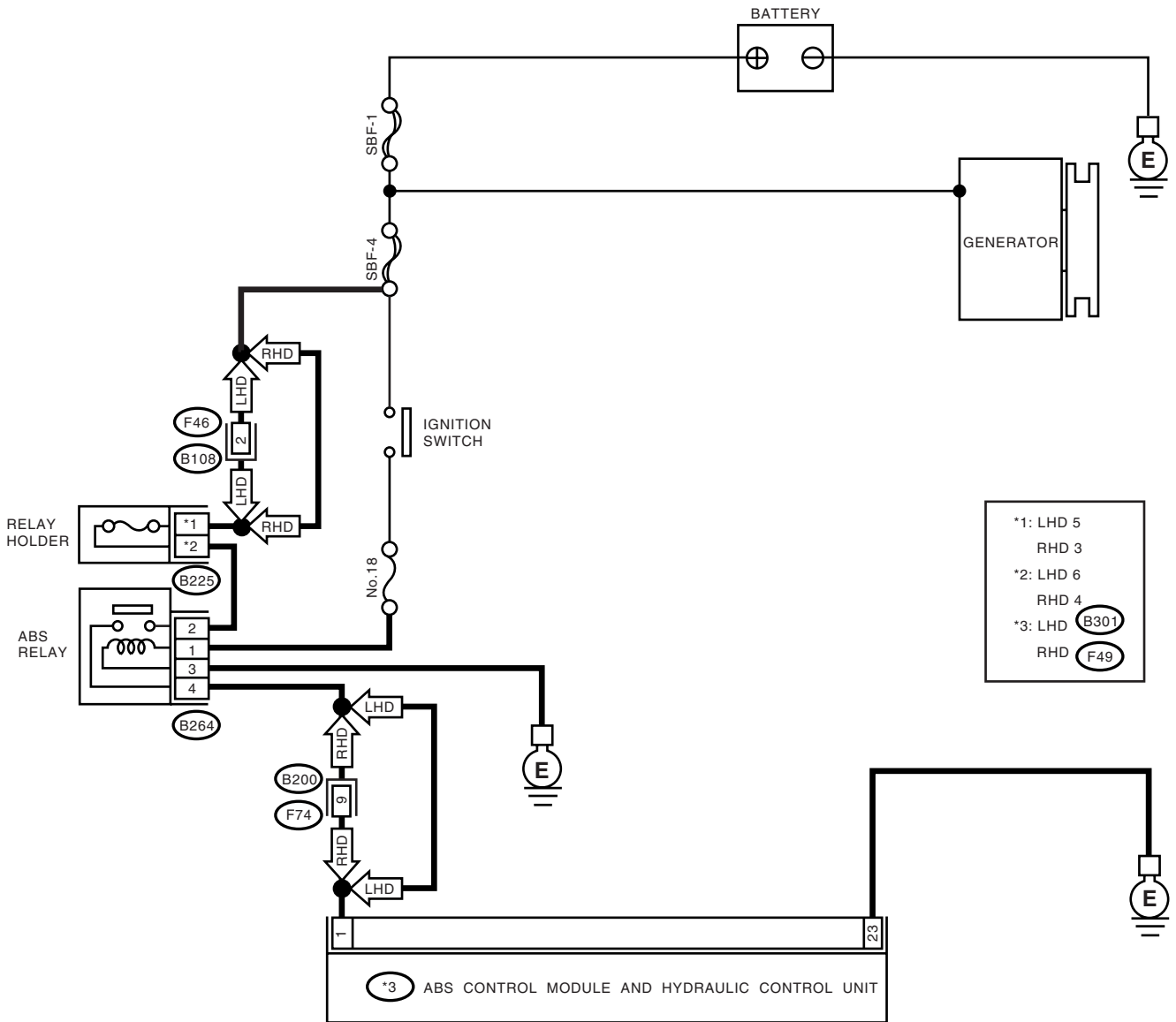
DIAGNOSIS:

- Faulty harness/connector
- Faulty inlet solenoid valve

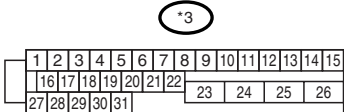
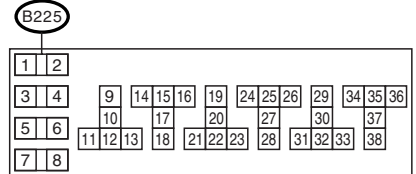
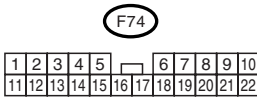
TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



- *1: LHD 5
RHD 3
- *2: LHD 6
RHD 4
- *3: LHD (B301)
RHD (F49)



DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No	
1	CHECK RELAY HOLDER.	Is the fuse blown out?	Replace the fuse.	Go to step 2.
2	CHECK INPUT VOLTAGE OF RELAY HOLDER. 1) Turn the ignition switch to OFF. 2) Remove the relay holder fuse. 3) Measure the voltage between ABS relay connector and chassis ground. Connector & terminal LHD: (B225) No. 5 (+) — Chassis ground (-): RHD: (B225) No. 3 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 3.	Repair the open circuit in harness between battery and relay holder connector.
3	CHECK INPUT VOLTAGE OF ABS RELAY. 1) Install the fuse. 2) Remove the ABS relay. 3) Turn the ignition switch to ON. 4) Measure the 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 the open circuit in harness between battery and relay holder connector.
4	CHECK INPUT VOLTAGE OF ABS RELAY. Measure the 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 the harness connector between battery, ignition switch and ABS relay.
5	CHECK GROUND CIRCUIT OF ABS RELAY. 1) Turn the ignition switch to OFF. 2) Measure the 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 the open circuit between ABS relay and chassis ground.
6	CHECK ABS RELAY. 1) Connect the battery to ABS relay terminal No. 1 and 3. 2) Measure the resistance between ABS relay terminals.	Is the resistance less than 10 Ω ?	Go to step 7.	Replace the ABS relay.
7	CHECK INPUT VOLTAGE OF ABSCM&H/U. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U. 3) Run the engine at idle. 4) Measure the voltage between ABSCM&H/U connector and chassis ground. Connector & terminal LHD: (B301) No. 1 (+) — Chassis ground (-): RHD: (F49) No. 1 (+) — Chassis ground (-):	Is the voltage between 10 and 15 V?	Go to step 8.	Repair the harness connector between battery, ignition switch and ABSCM&H/U.
8	CHECK GROUND CIRCUIT OF ABSCM&H/U. 1) Turn the ignition switch to OFF. 2) Measure the resistance between ABSCM&H/U connector and chassis ground. Connector & terminal LHD: (B301) No. 23 — Chassis ground: RHD: (F49) No. 23 — Chassis ground:	Is the resistance less than 0.5 Ω ?	Go to step 9.	Repair the 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 the 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 the inspection mode. 4)Read out the DTC.	Is the same DTC as in the current diagnosis still being output?	Replace the 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 DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

P: DTC 32
— FRONT RIGHT OUTLET VALVE MALFUNCTION —

NOTE:

For the diagnostic procedure, refer to DTC 38. <Ref. to ABS-124, DTC 38 — REAR LEFT OUTLET VALVE MALFUNCTION —, Diagnostics Chart with Subaru Select Monitor.>

Q: DTC 34
— FRONT LEFT OUTLET VALVE MALFUNCTION —

NOTE:

For the diagnostic procedure, refer to DTC 38. <Ref. to ABS-124, DTC 38 — REAR LEFT OUTLET VALVE MALFUNCTION —, Diagnostics Chart with Subaru Select Monitor.>

R: DTC 36
— REAR RIGHT OUTLET VALVE MALFUNCTION —

NOTE:

For the diagnostic procedure, refer to DTC 38. <Ref. to ABS-124, DTC 38 — REAR LEFT OUTLET VALVE MALFUNCTION —, Diagnostics Chart with Subaru Select Monitor.>

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

S: DTC 38 — REAR LEFT OUTLET VALVE MALFUNCTION —

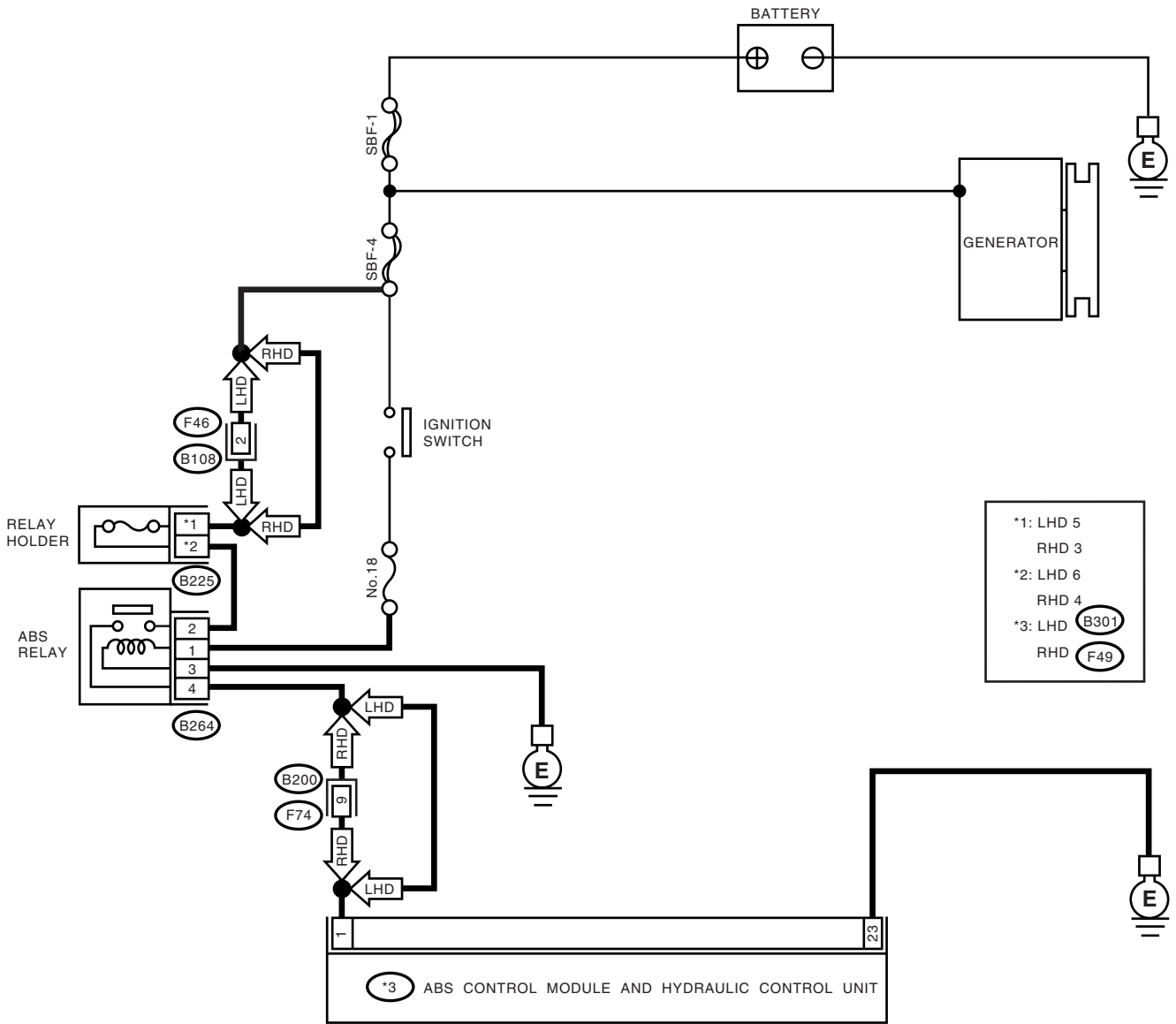
DIAGNOSIS:

- Faulty harness/connector
- Faulty outlet solenoid valve

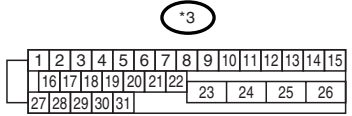
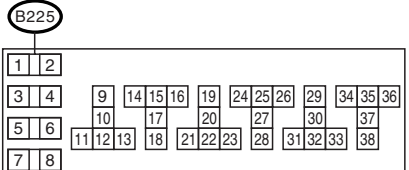
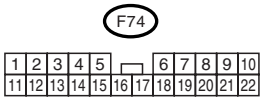
TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



- *1: LHD 5
RHD 3
- *2: LHD 6
RHD 4
- *3: LHD (B301)
RHD (F49)



DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No	
1	CHECK RELAY HOLDER.	Is the fuse blown out?	Replace the fuse.	Go to step 2.
2	CHECK INPUT VOLTAGE OF RELAY HOLDER. 1) Turn the ignition switch to OFF. 2) Remove the relay holder fuse. 3) Measure the voltage between ABS relay connector and chassis ground. Connector & terminal LHD: (B225) No. 5 (+) — Chassis ground (-): RHD: (B225) No. 3 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 3.	Repair the open circuit in harness between battery and relay holder connector.
3	CHECK INPUT VOLTAGE OF ABS RELAY. 1) Install the fuse. 2) Remove the ABS relay. 3) Turn the ignition switch to ON. 4) Measure the 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 the open circuit in harness between battery and relay holder connector.
4	CHECK INPUT VOLTAGE OF ABS RELAY. Measure the 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 the harness connector between battery, ignition switch and ABS relay.
5	CHECK GROUND CIRCUIT OF ABS RELAY. 1) Turn the ignition switch to OFF. 2) Measure the 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 the open circuit between ABS relay and chassis ground.
6	CHECK ABS RELAY. 1) Connect the battery to ABS relay terminal No. 1 and 3. 2) Measure the resistance between ABS relay terminals.	Is the resistance less than 10 Ω ?	Go to step 7.	Replace the ABS relay.
7	CHECK INPUT VOLTAGE OF ABSCM&H/U. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U. 3) Run the engine at idle. 4) Measure the voltage between ABSCM&H/U connector and chassis ground. Connector & terminal LHD: (B301) No. 1 (+) — Chassis ground (-): RHD: (F49) No. 1 (+) — Chassis ground (-):	Is the voltage between 10 and 15 V?	Go to step 8.	Repair the harness connector between battery, ignition switch and ABSCM&H/U.
8	CHECK GROUND CIRCUIT OF ABSCM&H/U. 1) Turn the ignition switch to OFF. 2) Measure the resistance between ABSCM&H/U connector and chassis ground. Connector & terminal LHD: (B301) No. 23 — Chassis ground: RHD: (F49) No. 23 — Chassis ground:	Is the resistance less than 0.5 Ω ?	Go to step 9.	Repair the 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 the 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 the inspection mode. 4)Read out the DTC.	Is the same DTC as in the current diagnosis still being output?	Replace the 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 DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

T: DTC 41

— ABS CONTROL MODULE MALFUNCTION —

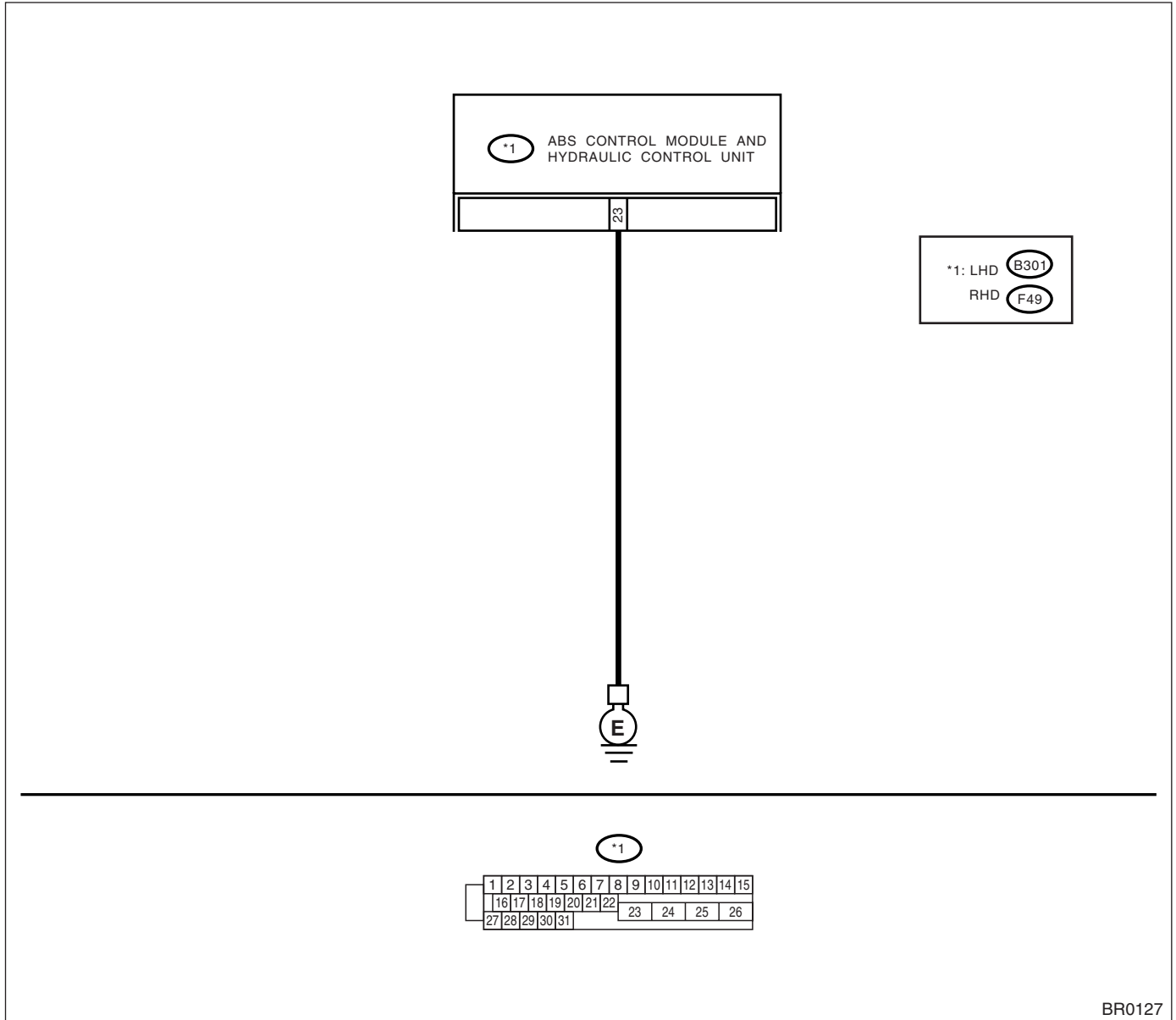
DIAGNOSIS:

- Faulty ABSCM&H/U

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



BR0127

Step	Check	Yes	No	
1	CHECK GROUND CIRCUIT OF ABSCM&H/U. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U. 3) Measure the resistance between ABSCM&H/U and chassis ground. <i>Connector & terminal</i> <i>LHD: (B301) No. 23 — Chassis ground:</i> <i>RHD: (F49) No. 23 — Chassis ground:</i>	Is the resistance less than 0.5 Ω?	Go to step 2.	Repair the ABSCM&H/U ground harness.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No	
2	CHECK POOR CONTACT IN CONNECTORS.	Is there poor contact in connectors between battery, ignition switch and ABSCM&H/U?	Repair the connector.	Go to step 3 .
3	CHECK SOURCES OF SIGNAL NOISE.	Is the car telephone or wireless transmitter properly installed?	Go to step 4 .	Properly install the car telephone or 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 sensor harness.	Go to step 5 .
5	CHECK ABSCM&H/U. 1)Turn the ignition switch to OFF. 2)Connect all connectors. 3)Erase the memory. 4)Perform the inspection mode. 5)Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the 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 DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

U: DTC 42 — POWER SUPPLY VOLTAGE TOO LOW —

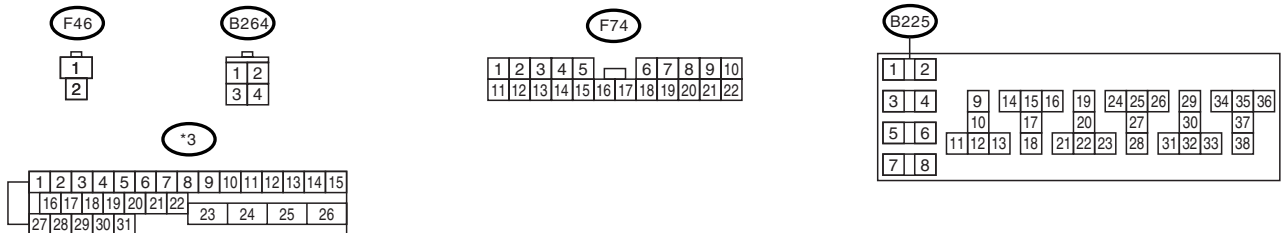
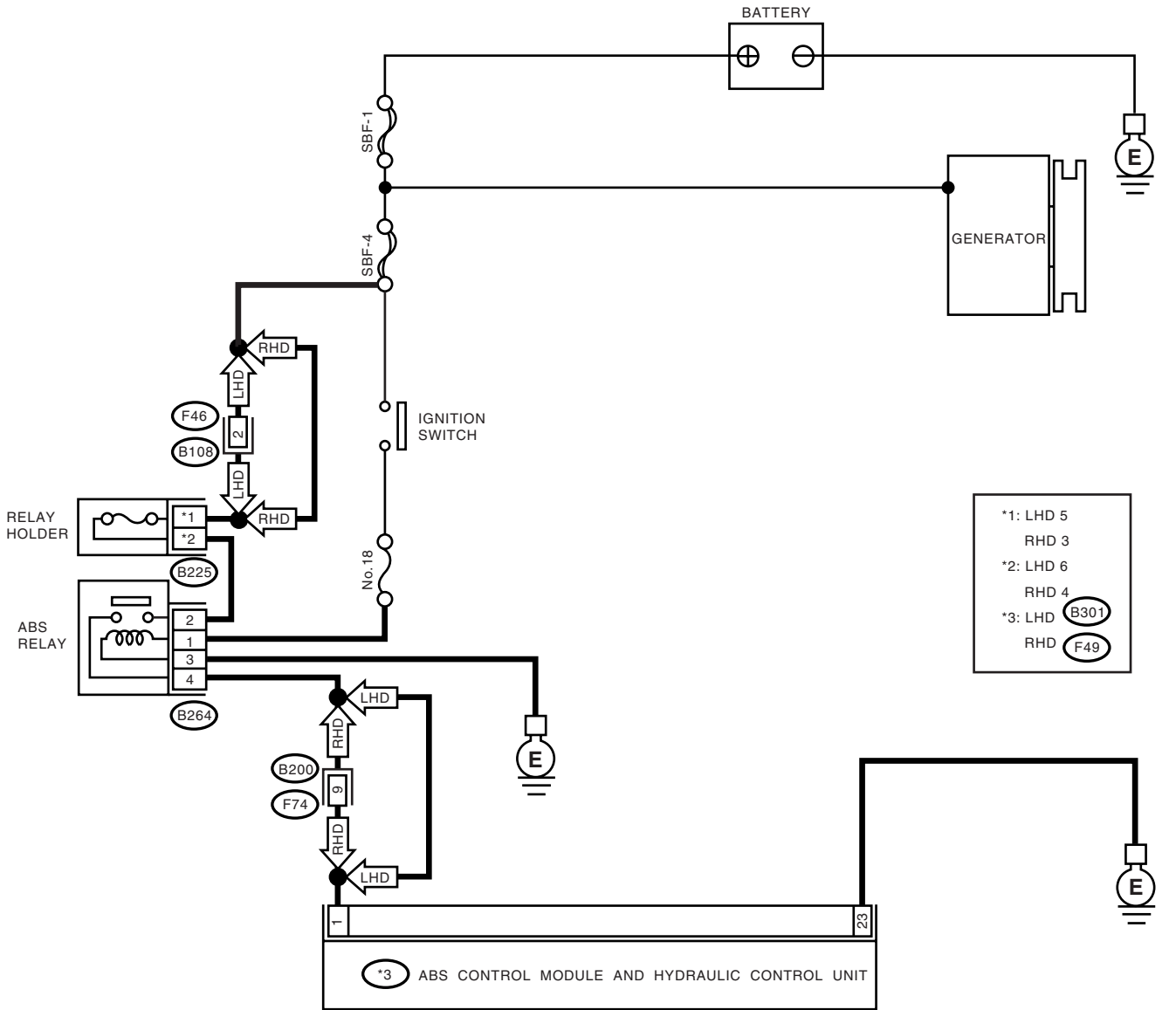
DIAGNOSIS:

- Power source voltage of the ABSCM&H/U is low.

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



BR0126

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK GENERATOR. 1)Start the engine. 2)Idle after warm-up. 3)Measure the 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 the generator. <Ref. to SC-14, Generator.>
2 CHECK BATTERY TERMINAL. Turn the 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 the connector from ABSCM&H/U. 2)Run the engine at idle. 3)Measure the voltage between ABSCM&H/U connector and chassis ground. <i>Connector & terminal</i> <i>LHD: (B301) No. 1 (+) — Chassis ground (-):</i> <i>RHD: (F49) No. 1 (+) — Chassis ground (-):</i>	Is the voltage between 10 and 15 V?	Go to step 4.	Repair the harness connector between battery, ignition switch and ABSCM&H/U.
4 CHECK GROUND CIRCUIT OF ABSCM&H/U. 1)Turn the ignition switch to OFF. 2)Measure the resistance between ABSCM&H/U connector and chassis ground. <i>Connector & terminal</i> <i>LHD: (B301) No. 23 — Chassis ground:</i> <i>RHD: (F49) No. 23 — Chassis ground:</i>	Is the resistance less than 0.5 Ω ?	Go to step 5.	Repair the 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 the connector.	Go to step 6.
6 CHECK ABSCM&H/U. 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the DTC.	Is the same DTC as in the current diagnosis still being output?	Replace the 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 DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

V: DTC 42 — POWER SUPPLY VOLTAGE TOO HIGH —

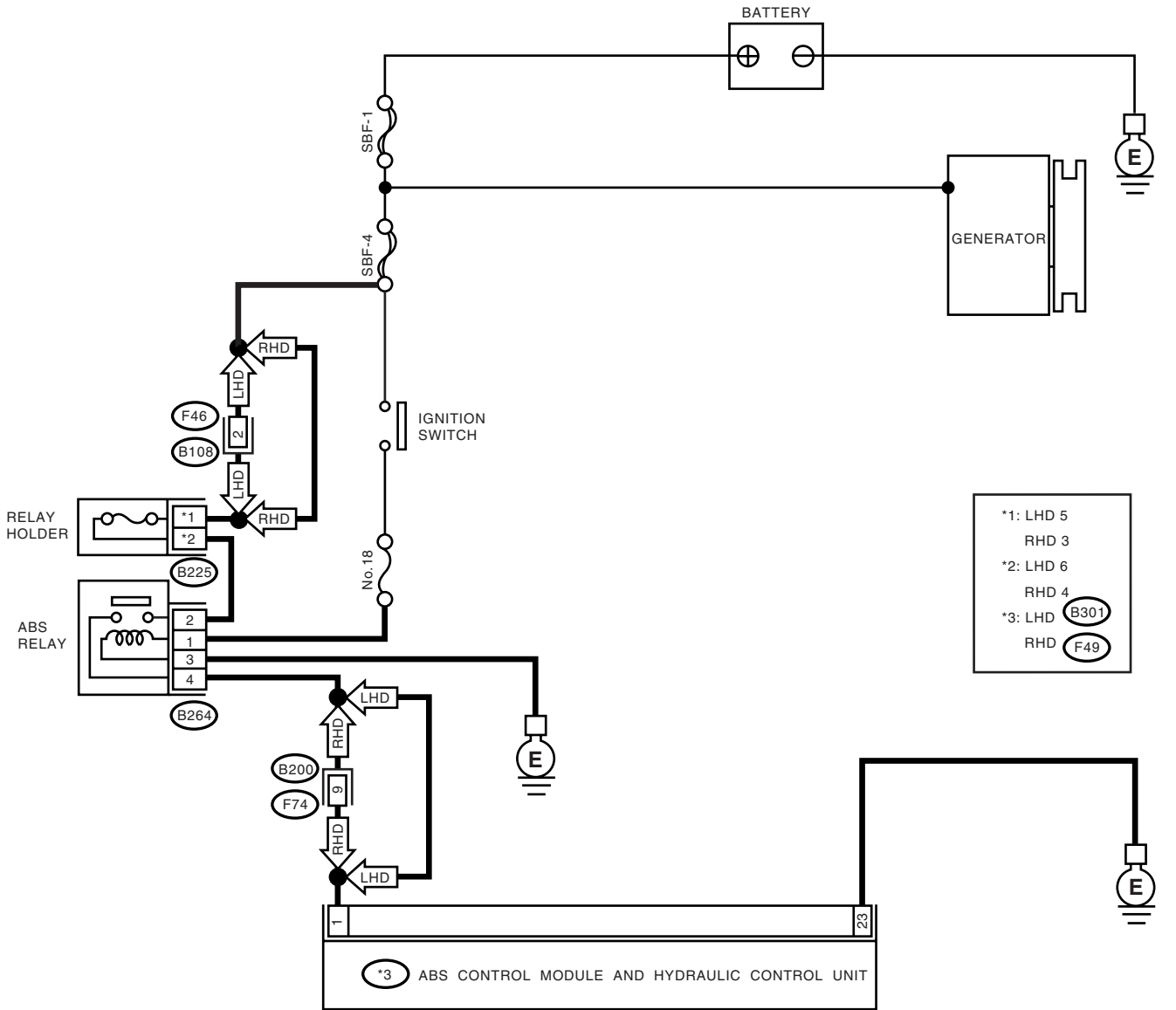
DIAGNOSIS:

- Power source voltage of the ABSCM&H/U is high.

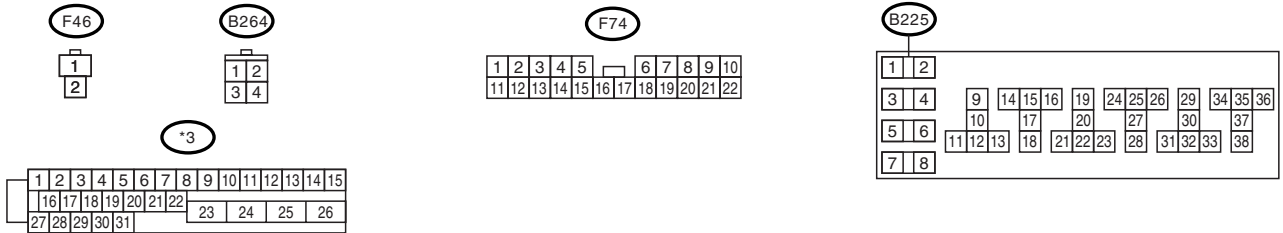
TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



- *1: LHD 5
RHD 3
- *2: LHD 6
RHD 4
- *3: LHD (B301)
RHD (F49)



BR0126

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK GENERATOR. 1)Start the engine. 2)Idle after warm-up. 3)Measure the voltage between generator B terminal and chassis ground. Terminal Generator B terminal — Chassis ground:	Is the voltage between 10 and 17 V?	Go to step 2.	Repair the generator. <Ref. to SC-14, Generator.>
2 CHECK BATTERY TERMINAL. Turn the ignition switch to OFF.	Are the positive and negative battery terminals tightly clamped?	Go to step 4.	Tighten the clamp of terminal.
3 CHECK RELAY HOLDER.	Is the fuse blown out?	Replace the fuse.	Go to step 4.
4 CHECK INPUT VOLTAGE OF RELAY HOLDER. 1)Turn the ignition switch to OFF. 2)Remove the fuse. 3)Measure the voltage between ABS relay connector and chassis ground. Connector & terminal LHD: (B225) No. 5 (+) — Chassis ground (-): RHD: (B225) No. 3 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 5.	Repair the open circuit in harness between battery and relay holder connector.
5 CHECK INPUT VOLTAGE OF ABS RELAY. 1)Install the fuse. 2)Remove the ABS relay. 3)Turn the ignition switch to ON. 4)Measure the 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 the open circuit in harness between battery and relay holder connector.
6 CHECK INPUT VOLTAGE OF ABS RELAY. Measure the 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 the harness connector between battery, ignition switch and ABS relay.
7 CHECK GROUND CIRCUIT OF ABS RELAY. 1)Turn the ignition switch to OFF. 2)Measure the 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 the open circuit between ABS relay and chassis ground.
8 CHECK ABS RELAY. 1)Connect the battery to ABS relay terminal No. 1 and 3. 2)Measure the resistance between ABS relay terminals.	Is the resistance less than 10 Ω ?	Go to step 9.	Replace the ABS relay.
9 CHECK INPUT VOLTAGE OF ABSCM&H/U. 1)Disconnect the connector from ABSCM&H/U. 2)Run the engine at idle. 3)Measure the voltage between ABSCM&H/U connector and chassis ground. Connector & terminal LHD: (B301) No. 1 (+) — Chassis ground (-): RHD: (F49) No. 1 (+) — Chassis ground (-):	Is the voltage between 10 and 17 V?	Go to step 10.	Repair the harness connector between battery, ignition switch and ABSCM&H/U.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
10 CHECK GROUND CIRCUIT OF ABSCM&H/U. 1) Turn the ignition switch to OFF. 2) Measure the resistance between ABSCM&H/U connector and chassis ground. Connector & terminal LHD: (B301) No. 23 — Chassis ground: RHD: (F49) No. 23 — Chassis ground:	Is the resistance less than 0.5 Ω ?	Go to step 11.	Repair the ABSCM&H/U ground harness.
11 CHECK POOR CONTACT IN CONNECTORS.	Is there poor contact in connectors between generator, battery and ABSCM&H/U?	Repair the connector.	Go to step 12.
12 CHECK ABSCM&H/U. 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in the current diagnosis still being output?	Replace the 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 DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

W: DTC 44

— ABS-AT CONTROL (NON CONTROLLED) —

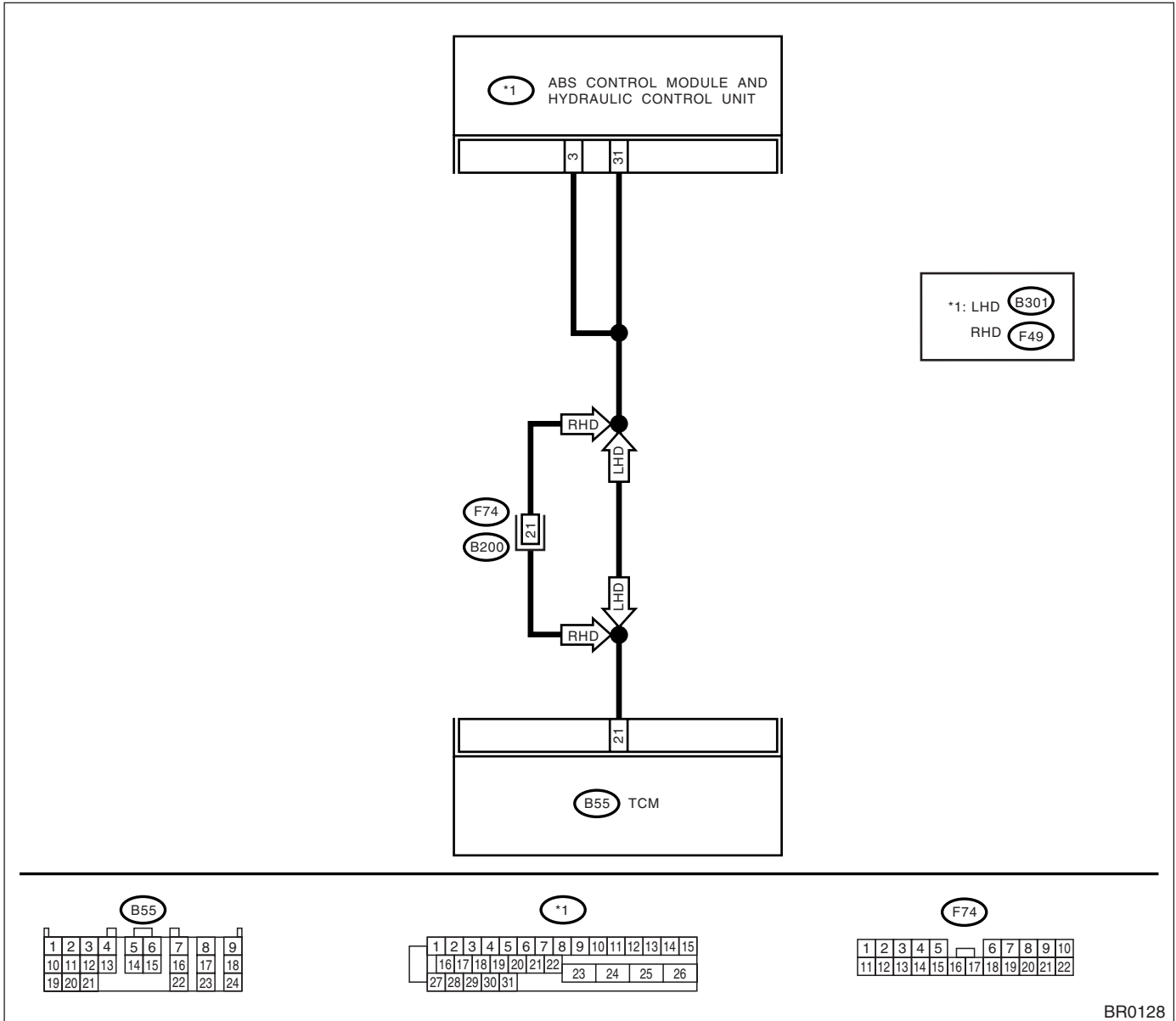
DIAGNOSIS:

- Combination of AT control faults

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



BR0128

Step	Check	Yes	No	
1	<p>CHECK SPECIFICATIONS OF THE AB-SCM&H/U. Check specifications of the mark on the ABSCM&H/U. <i>CM: AT (Rear disc brake)</i> <i>CN: MT (Rear disc brake)</i> <i>CC: AT (Rear drum brake)</i> <i>CD: MT (Rear drum brake)</i></p>	<p>Is an ABSCM&H/U for AT model installed on a MT model?</p>	<p>Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).></p>	<p>Go to step 2.</p>

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
2 CHECK GROUND SHORT OF HARNESS. 1) Turn the ignition switch to OFF. 2) Disconnect the two connectors from TCM. 3) Disconnect the connector from ABSCM&H/U. 4) Measure the resistance between ABSCM&H/U connector and chassis ground. <i>Connector & terminal</i> <i>LHD: (B301) No. 3 — Chassis ground:</i> <i>RHD: (F49) No. 3 — Chassis ground:</i>	Is the resistance more than 1 MΩ?	Go to step 3.	Repair the harness between TCM and ABSCM&H/U.
3 CHECK TCM. 1) Connect all connectors to TCM. 2) Turn the ignition switch to ON. 3) Measure the voltage between TCM connector terminal and chassis ground. <i>Connector & terminal</i> <i>(B55) No. 21 (+) — Chassis ground (-):</i>	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 the TCM.	Repair the AT.
5 CHECK OPEN CIRCUIT OF HARNESS. Measure the voltage between ABSCM&H/U connector and chassis ground. <i>Connector & terminal</i> <i>LHD: (B301) No. 3 (+) — Chassis ground (-):</i> <i>LHD: (B301) No. 31 (+) — Chassis ground (-):</i> <i>RHD: (F49) No. 3 (+) — Chassis ground (-):</i> <i>RHD: (F49) No. 31 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Go to step 6.	Repair the 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 the connector.	Go to step 7.
7 CHECK ABSCM&H/U. 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in the current diagnosis still being output?	Replace the 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 DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

X: DTC 44 — ABS-AT CONTROL (CONTROLLED) —

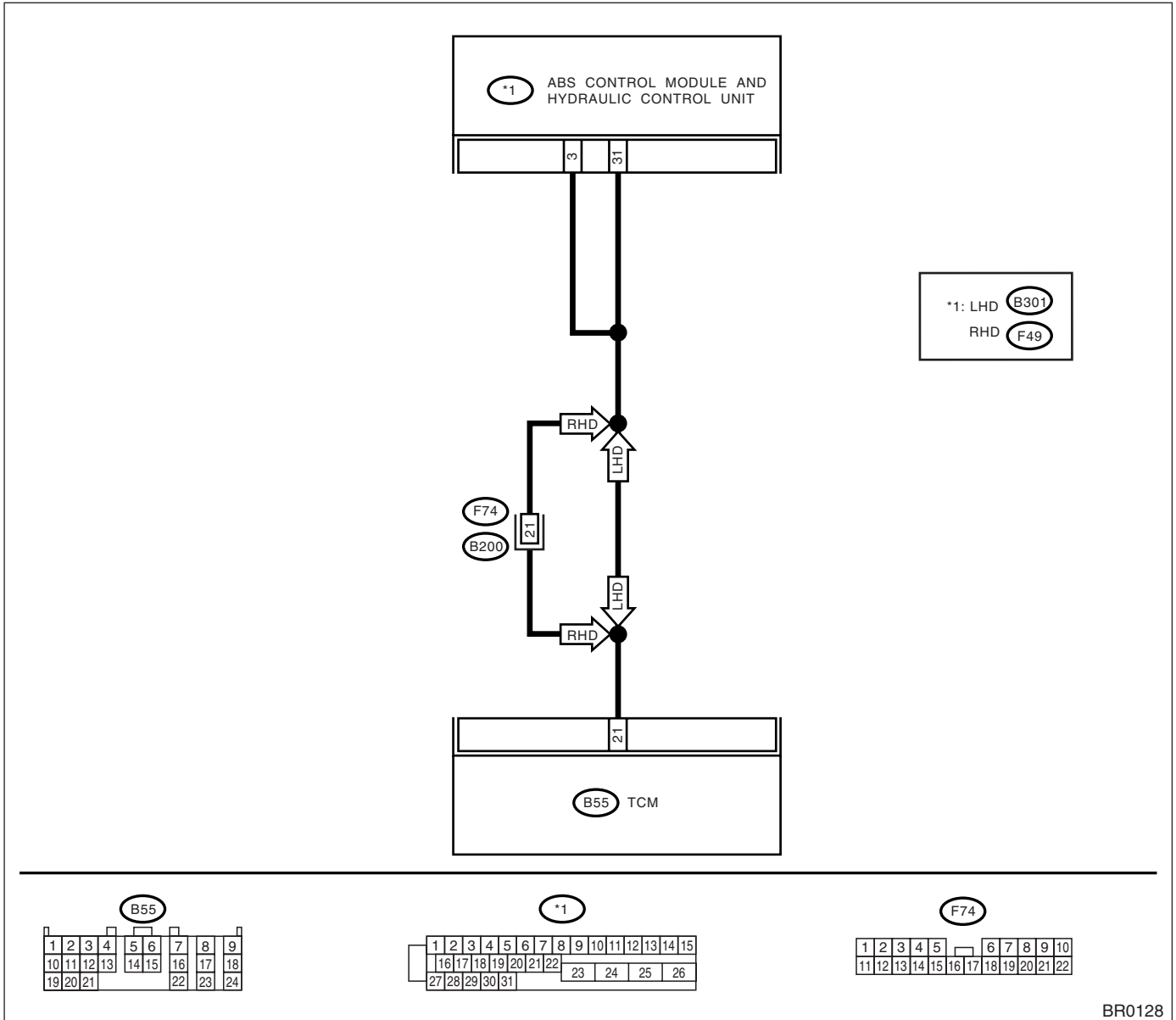
DIAGNOSIS:

- Combination of AT control faults

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



BR0128

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK BATTERY SHORT OF HARNESS. 1) Turn the ignition switch to OFF. 2) Disconnect all connectors from TCM. 3) Disconnect the connector from ABSCM&H/U. 4) Measure the voltage between ABSCM&H/U connector and chassis ground. Connector & terminal LHD: (B301) No. 3 (+) — Chassis ground (-): RHD: (F49) No. 3 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Go to step 2.	Repair the harness between TCM and ABSCM&H/U.
2 CHECK BATTERY SHORT OF HARNESS. 1) Turn the ignition switch to ON. 2) Measure the voltage between ABSCM&H/U connector and chassis ground. Connector & terminal LHD: (B301) No. 3 (+) — Chassis ground (-): RHD: (F49) No. 3 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Go to step 3.	Repair the harness between TCM and ABSCM&H/U.
3 CHECK OPEN CIRCUIT OF HARNESS. 1) Turn the ignition switch to OFF. 2) Connect all connectors to TCM. 3) Turn the ignition switch to ON. 4) Measure the voltage between ABSCM&H/U connector and chassis ground. Connector & terminal LHD: (B301) No. 3 (+) — Chassis ground (-): LHD: (B301) No. 31 (+) — Chassis ground (-): RHD: (F49) No. 3 (+) — Chassis ground (-): RHD: (F49) No. 31 (+) — Chassis ground (-):	Is the voltage between 10 and 13 V?	Go to step 4.	Repair the harness/connector between TCM and ABSCM&H/U.
4 CHECK POOR CONTACT IN CONNECTORS. Turn the ignition switch to OFF.	Is there poor contact in connectors between TCM and ABSCM&H/U?	Repair the connector.	Go to step 5.
5 CHECK ABSCM&H/U. 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the 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 DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Y: DTC 51

— VALVE RELAY MALFUNCTION —

DIAGNOSIS:

- Faulty valve relay

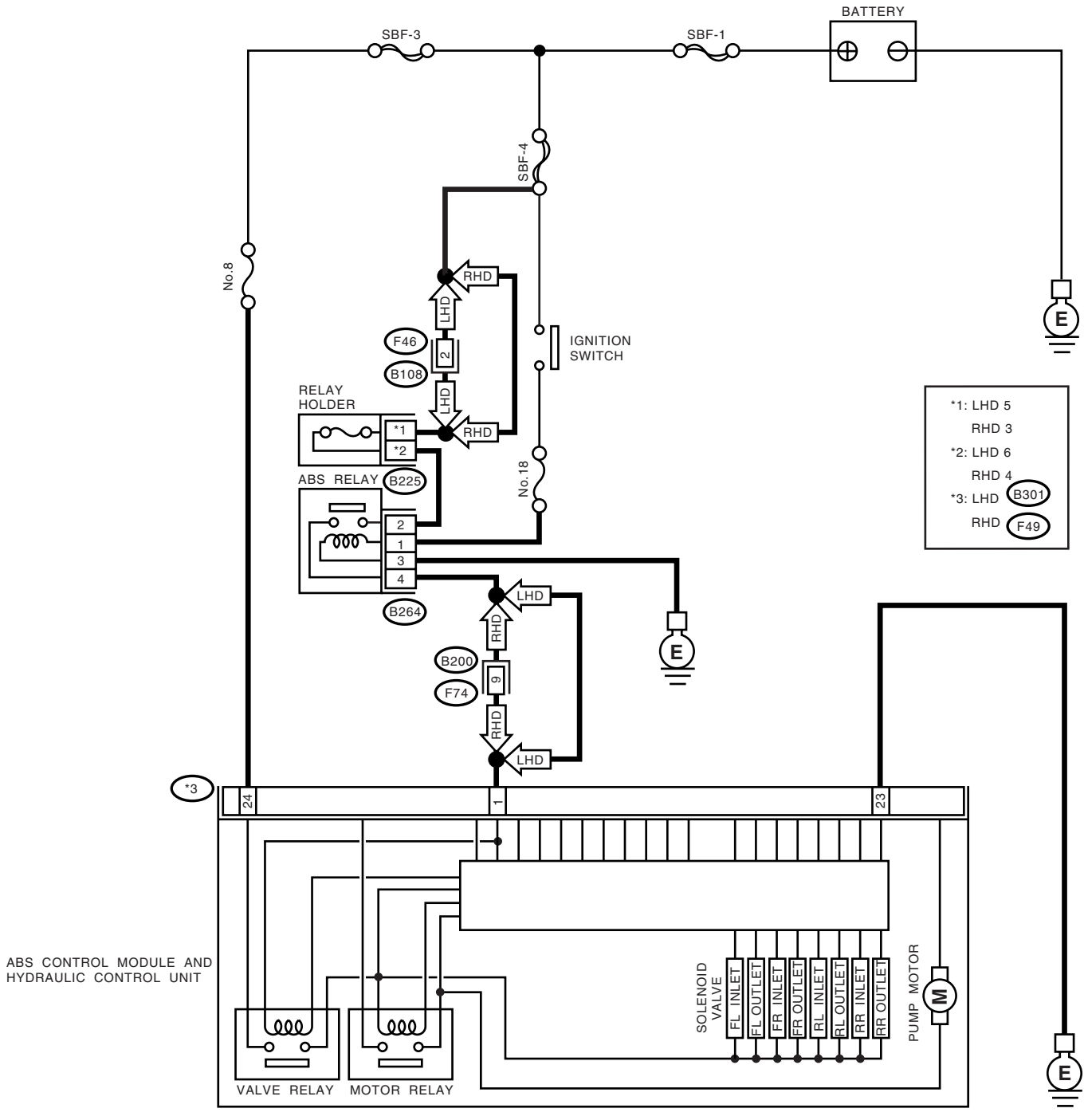
TROUBLE SYMPTOM:

- ABS does not operate.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

WIRING DIAGRAM:



BR0129

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
1	CHECK RELAY HOLDER.	Is the fuse blown out?	Replace the fuse. Go to step 2.
2	CHECK INPUT VOLTAGE OF RELAY HOLDER. 1) Turn the ignition switch to OFF. 2) Remove the relay holder fuse. 3) Measure the voltage between ABS relay connector and chassis ground. Connector & terminal LHD: (B225) No. 5 (+) — Chassis ground (-): RHD: (B225) No. 3 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 3. Repair the open circuit in harness between battery and relay holder connector.
3	CHECK INPUT VOLTAGE OF ABS RELAY. 1) Install the fuse. 2) Remove the ABS relay. 3) Turn the ignition switch to ON. 4) Measure the 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 the open circuit in harness between battery and relay holder connector.
4	CHECK INPUT VOLTAGE OF ABS RELAY. Measure the 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 the harness connector between battery, ignition switch and ABS relay.
5	CHECK GROUND CIRCUIT OF ABS RELAY. 1) Turn the ignition switch to OFF. 2) Measure the 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 the open circuit between ABS relay and chassis ground.
6	CHECK ABS RELAY. 1) Connect the battery to ABS relay terminal No. 1 and 3. 2) Measure the resistance between ABS relay terminals.	Is the resistance less than 10 Ω ?	Go to step 7. Replace the ABS relay.
7	CHECK INPUT VOLTAGE OF ABSCM&H/U. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U. 3) Run the engine at idle. 4) Measure the voltage between ABSCM&H/U connector and chassis ground. Connector & terminal LHD: (B301) No. 1 (+) — Chassis ground (-): LHD: (B301) No. 24 (+) — Chassis ground (-): RHD: (F49) No. 1 (+) — Chassis ground (-): RHD: (F49) No. 24 (+) — Chassis ground (-):	Is the voltage between 10 and 15 V?	Go to step 8. Repair the harness connector between battery and ABSCM&H/U.
8	CHECK GROUND CIRCUIT OF ABSCM&H/U. 1) Turn the ignition switch to OFF. 2) Measure the resistance between ABSCM&H/U connector and chassis ground. Connector & terminal LHD: (B301) No. 23 — Chassis ground: RHD: (F49) No. 23 — Chassis ground:	Is the resistance less than 0.5 Ω ?	Go to step 9. Repair the ABSCM&H/U ground harness.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
9 CHECK POOR CONTACT IN CONNECTORS.	Is there poor contact in connectors between generator, battery and ABSCM&H/U?	Repair the connector.	Go to step 10 .
10 CHECK ABSCM&H/U. 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the 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 DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

Z: DTC 51

— VALVE RELAY ON FAILURE —

DIAGNOSIS:

- Faulty valve relay

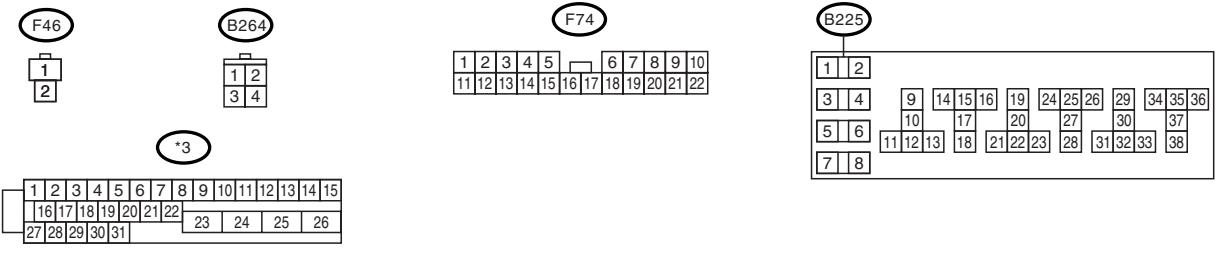
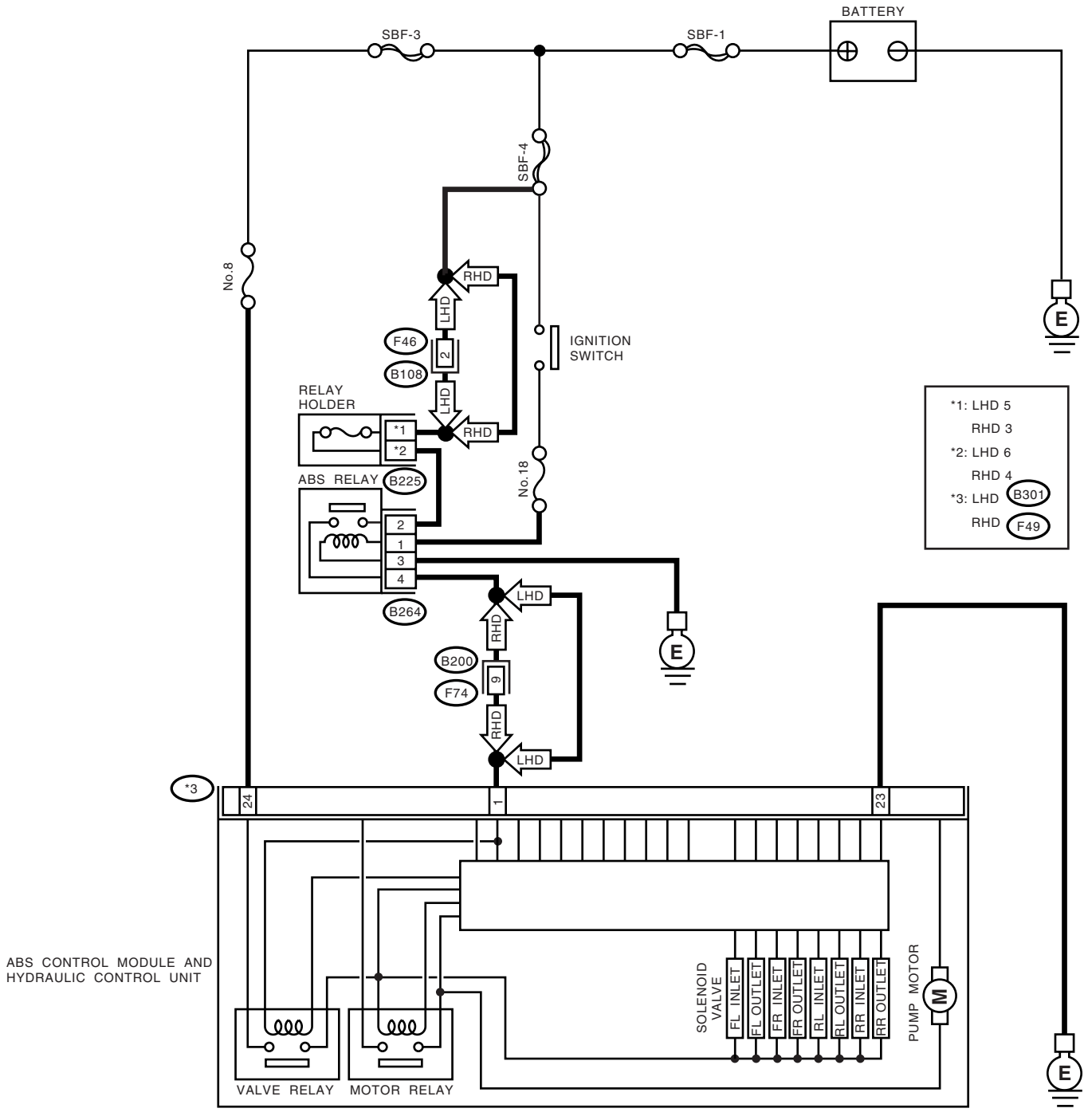
TROUBLE SYMPTOM:

- ABS does not operate.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

WIRING DIAGRAM:



BR0129

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK VALVE RELAY IN ABSCM&H/U. 1)Disconnect the connector from ABSCM&H/U. 2)Measure the resistance between ABSCM&H/U terminals. <i>Terminals</i> <i>No. 23 — No. 24:</i>	Is the resistance more than 1 MΩ?	Go to step 2.	Replace the 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 the connector.	Go to step 3.
3 CHECK ABSCM&H/U. 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the 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 DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

AA:DTC 52

— OPEN CIRCUIT IN MOTOR RELAY CIRCUIT —

DIAGNOSIS:

- Faulty motor
- Faulty motor relay
- Faulty harness connector

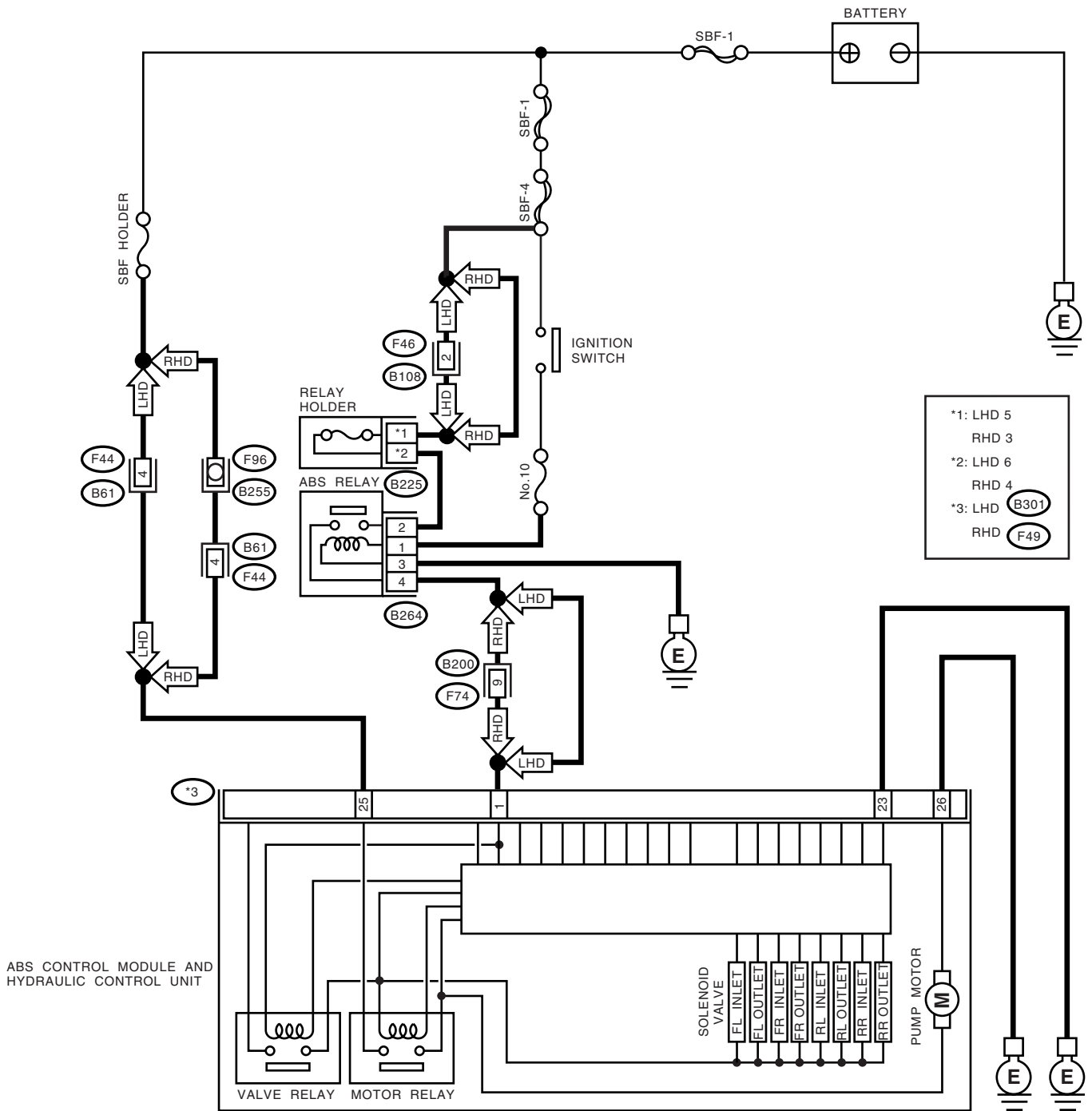
TROUBLE SYMPTOM:

- ABS does not operate.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

WIRING DIAGRAM:



BR0130

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK INPUT VOLTAGE OF ABSCM&H/U. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U. 3) Turn the ignition switch to ON. 4) Measure the voltage between ABSCM&H/U connector and chassis ground. Connector & terminal LHD: (B301) No. 25 (+) — Chassis ground (-): RHD: (F49) No. 25 (+) — Chassis ground (-):	Is the voltage between 10 and 13 V?	Go to step 2.	Repair the harness/connector between battery and ABSCM&H/U and check fuse SBF6.
2 CHECK GROUND CIRCUIT OF MOTOR. 1) Turn the ignition switch to OFF. 2) Measure the resistance between ABSCM&H/U connector and chassis ground. Connector & terminal LHD: (B301) No. 26 — Chassis ground: RHD: (F49) No. 26 — Chassis ground:	Is the resistance less than 0.5 Ω?	Go to step 3.	Repair the 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 sequence control.	Can motor revolution noise (buzz) be heard when carrying out the check sequence?	Go to step 4.	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
4 CHECK POOR CONTACT IN CONNECTORS. Turn the ignition switch to OFF.	Is there poor contact in connector between hydraulic unit, relay box and ABSCM&H/U?	Repair the connector.	Go to step 5.
5 CHECK ABSCM&H/U. 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the 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 DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

AB:DTC 52

— MOTOR RELAY ON FAILURE —

DIAGNOSIS:

- Faulty motor
- Faulty motor relay
- Faulty harness connector

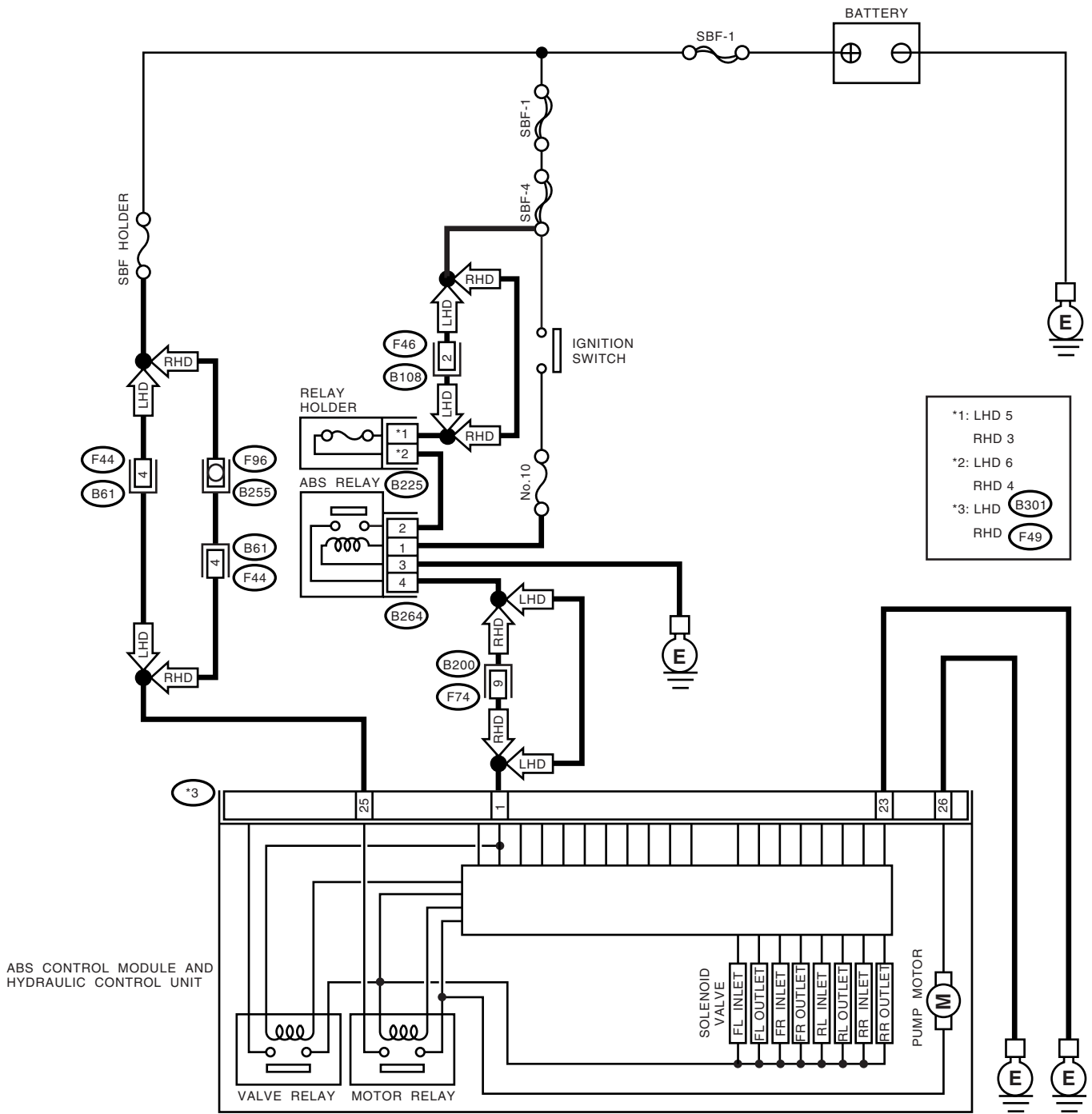
TROUBLE SYMPTOM:

- ABS does not operate.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

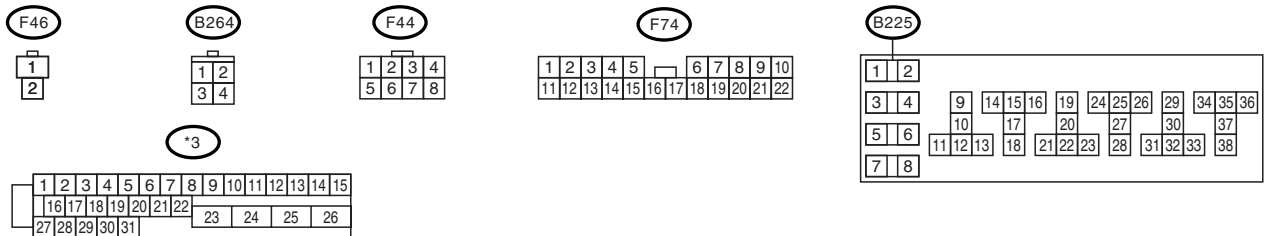
ABS (DIAGNOSTICS)

WIRING DIAGRAM:



- *1: LHD 5
RHD 3
- *2: LHD 6
RHD 4
- *3: LHD (B301)
RHD (F49)

ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT



BR0130

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK MOTOR RELAY IN ABSCM&H/U. 1)Disconnect the connector from ABSCM&H/U. 2)Measure the resistance between ABSCM&H/U terminals. Terminals No. 25 — No. 26:	Is the resistance more than 1 MΩ?	Go to step 2.	Replace the 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 sequence control.	Can motor revolution noise (buzz) be heard when carrying out the sequence control?	Go to step 3.	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
3 CHECK POOR CONTACT IN CONNECTORS. Turn the ignition switch to OFF.	Is there poor contact in connector between hydraulic unit, relay box and ABSCM&H/U?	Repair the connector.	Go to step 4.
4 CHECK ABSCM&H/U. 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the 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 DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

AC:DTC 52

— MOTOR MALFUNCTION —

DIAGNOSIS:

- Faulty motor
- Faulty motor relay
- Faulty harness connector

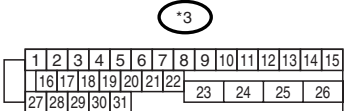
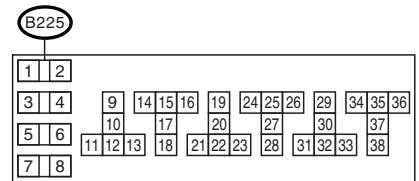
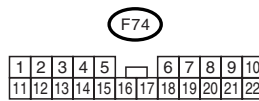
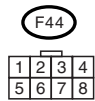
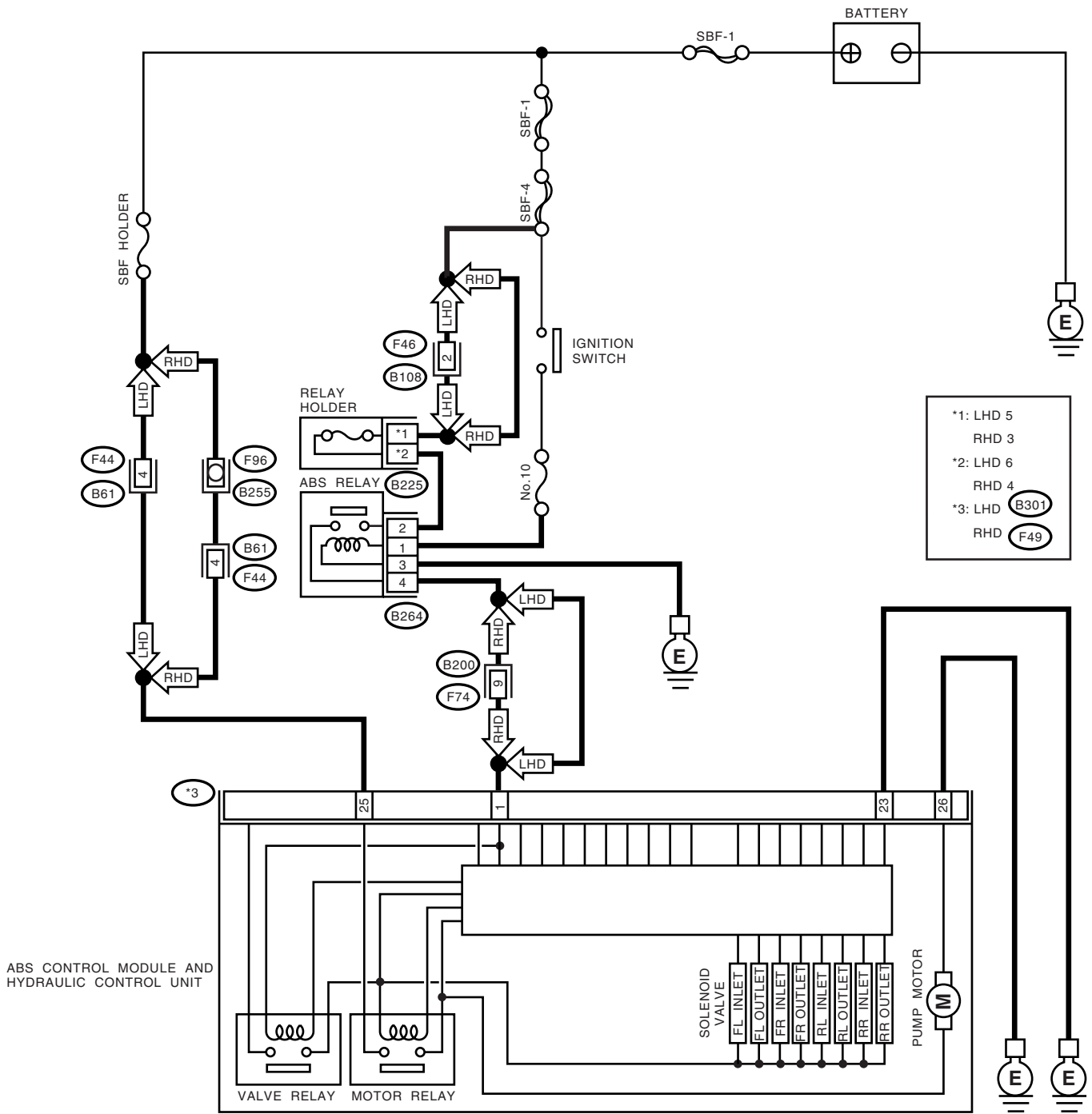
TROUBLE SYMPTOM:

- ABS does not operate.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

WIRING DIAGRAM:



BR0130

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK INPUT VOLTAGE OF ABSCM&H/U. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U. 3) Turn the ignition switch to ON. 4) Measure the voltage between ABSCM&H/U connector and chassis ground. Connector & terminal LHD: (B301) No. 25 (+) — Chassis ground (-): RHD: (F49) No. 25 (+) — Chassis ground (-):	Is the voltage between 10 and 13 V?	Go to step 2.	Repair the harness/connector between battery and ABSCM&H/U and check fuse SBF6.
2 CHECK GROUND CIRCUIT OF MOTOR. 1) Turn the ignition switch to OFF. 2) Measure the resistance between ABSCM&H/U connector and chassis ground. Connector & terminal LHD: (B301) No. 26 — Chassis ground: RHD: (F49) No. 26 — Chassis ground:	Is the resistance less than 0.5 Ω ?	Go to step 3.	Repair the ABSCM&H/U ground harness.
3 CHECK INPUT VOLTAGE OF ABSCM&H/U. 1) Run the engine at idle. 2) Measure the voltage between ABSCM&H/U connector and chassis ground. Connector & terminal LHD: (B301) No. 1 (+) — Chassis ground (-): RHD: (F49) No. 1 (+) — Chassis ground (-):	Is the voltage between 10 and 15 V?	Go to step 4.	Repair the harness connector between battery, ignition switch and ABSCM&H/U.
4 CHECK GROUND CIRCUIT OF ABSCM&H/U. 1) Turn the ignition switch to OFF. 2) Measure the resistance between ABSCM&H/U connector and chassis ground. Connector & terminal LHD: (B301) No. 23 — Chassis ground: RHD: (F49) No. 23 — Chassis ground:	Is the resistance less than 0.5 Ω ?	Go to step 5.	Repair the 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 sequence control.	Can motor revolution noise (buzz) be heard when carrying out the sequence control?	Go to step 6.	Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
6 CHECK POOR CONTACT IN CONNECTORS. Turn the ignition switch to OFF.	Is there poor contact in connector between generator, battery and ABSCM&H/U?	Repair the connector.	Go to step 7.
7 CHECK ABSCM&H/U. 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the 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 DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

AD:DTC 54

— STOP LIGHT SWITCH SIGNAL CIRCUIT MALFUNCTION —

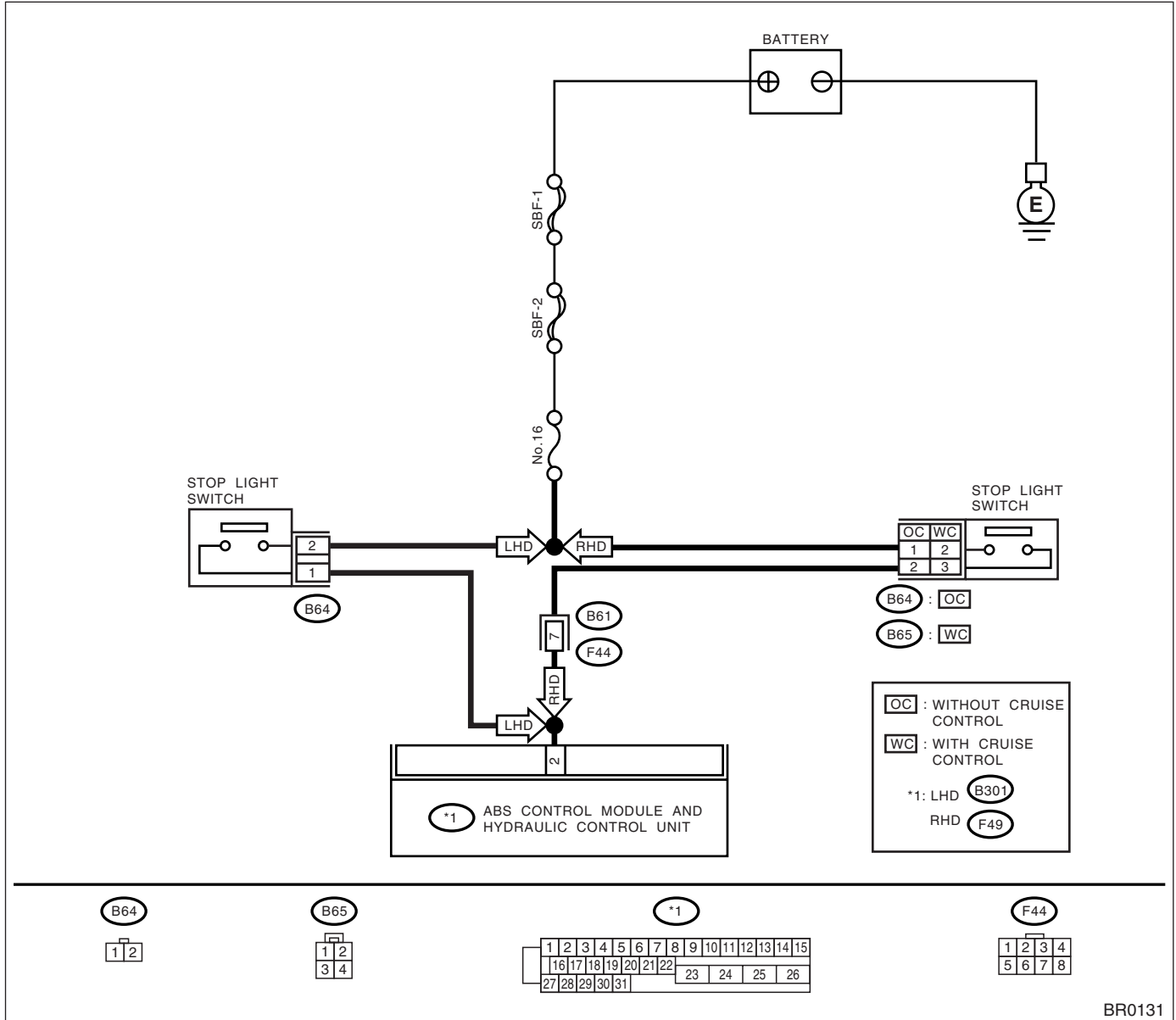
DIAGNOSIS:

- Faulty stop light switch

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM:



BR0131

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 select monitor data display.	Is the reading indicated on monitor display less than 1.5 V?	Go to step 2.	Go to step 3.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
2 CHECK OUTPUT OF STOP LIGHT SWITCH USING SELECT MONITOR. 1)Depress the brake pedal. 2)Read the stop light switch output in 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 the stop lights turn on?	Go to step 4.	Repair the stop lights circuit.
4 CHECK OPEN CIRCUIT IN HARNESS. 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ABSCM&H/U. 3)Depress the brake pedal. 4)Measure the voltage between ABSCM&H/U connector and chassis ground. Connector & terminal LHD: (B301) No. 2 — Chassis ground: RHD: (F49) No. 2 — Chassis ground:	Is the voltage between 10 and 15 V?	Go to step 5.	Repair the 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 the connector.	Go to step 6.
6 CHECK ABSCM&H/U. 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the 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 DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

AE:DTC 56

— OPEN OR SHORT CIRCUIT IN G SENSOR CIRCUIT —

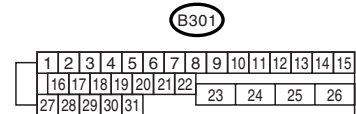
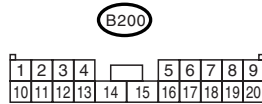
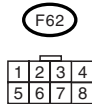
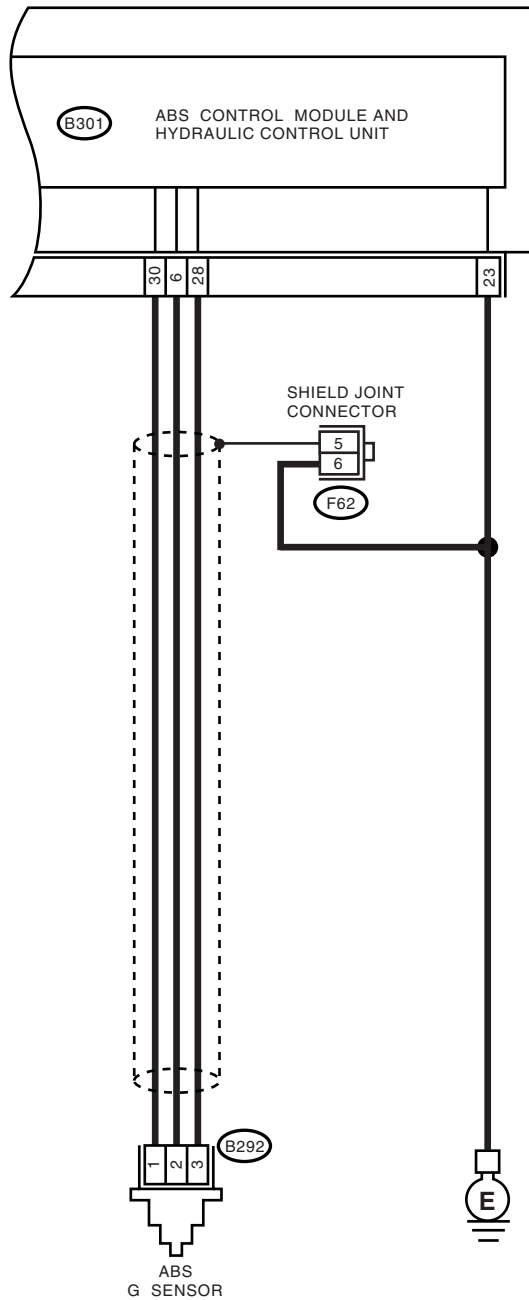
DIAGNOSIS:

- Faulty G sensor output voltage

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM: LHD MODEL

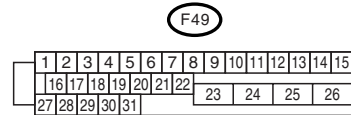
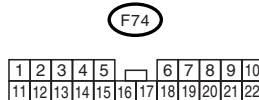
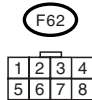
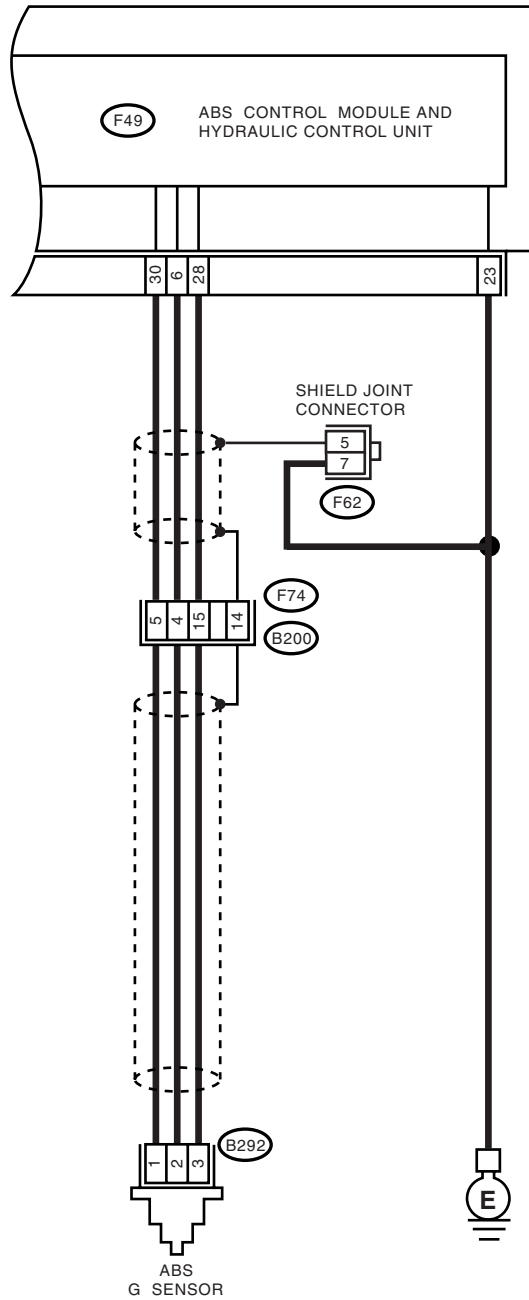


BR0132

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

WIRING DIAGRAM: RHD MODEL



BR0045

Step	Check	Yes	No	
1	<p>CHECK OUTPUT OF G SENSOR USING SELECT MONITOR.</p> <p>1) Select "Current data display & Save" on the select monitor.</p> <p>2) Read the G sensor output in select monitor data display.</p>	Is the G sensor output on monitor display between 2.1 and 2.5 V when G sensor is in horizontal position?	Go to step 2.	Go to step 5.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
2	CHECK POOR CONTACT IN CONNECTORS.	Is there poor contact in connector between ABSCM&H/U and G sensor?	Repair the connector. Go to step 3.
3	CHECK ABSCM&H/U. 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the DTC.	Is the same DTC as in the current diagnosis still being output?	Replace the 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 DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC. A temporary poor contact.
5	CHECK INPUT VOLTAGE OF G SENSOR. 1)Turn the ignition switch to OFF. 2)Remove the console box. 3)Remove the G sensor from vehicle. (Do not disconnect connector.) 4)Turn the ignition switch to ON. 5)Measure the 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 the harness/connector between G sensor and ABSCM&H/U.
6	CHECK OPEN CIRCUIT IN G SENSOR OUTPUT HARNESS AND GROUND HARNESS. 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ABSCM&H/U. 3)Measure the resistance between ABSCM&H/U connector terminals. Connector & terminal LHD: (B301) No. 6 — No. 28: RHD: (F49) No. 6 — No. 28:	Is the resistance between 5.0 and 5.6 kΩ?	Go to step 7. Repair the harness/connector between G sensor and ABSCM&H/U.
7	CHECK GROUND SHORT IN G SENSOR OUTPUT HARNESS. 1)Disconnect the connector from G sensor. 2)Measure the resistance between ABSCM&H/U connector and chassis ground. Connector & terminal LHD: (B301) No. 6 — Chassis ground: RHD: (F49) No. 6 — Chassis ground:	Is the resistance more than 1 MΩ?	Go to step 8. Repair the harness between G sensor and ABSCM&H/U.
8	CHECK G SENSOR. 1)Connect the connector to G sensor. 2)Connect the connector to ABSCM&H/U. 3)Turn the ignition switch to ON. 4)Measure the 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 the G sensor. <Ref. to ABS-22, G Sensor.>
9	CHECK G SENSOR. Measure the 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 the G sensor. <Ref. to ABS-22, G Sensor.>
10	CHECK G SENSOR. Measure the 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 the G sensor. <Ref. to ABS-22, G Sensor.>

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
11 CHECK POOR CONTACT IN CONNECTORS. Turn the ignition switch to OFF.	Is there poor contact in connector between ABSCM&H/U and G sensor?	Repair the connector.	Go to step 12 .
12 CHECK ABSCM&H/U. 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the 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 DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

AF:DTC 56

— BATTERY SHORT IN G SENSOR CIRCUIT —

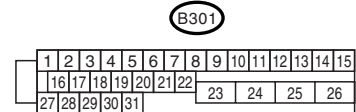
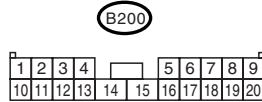
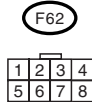
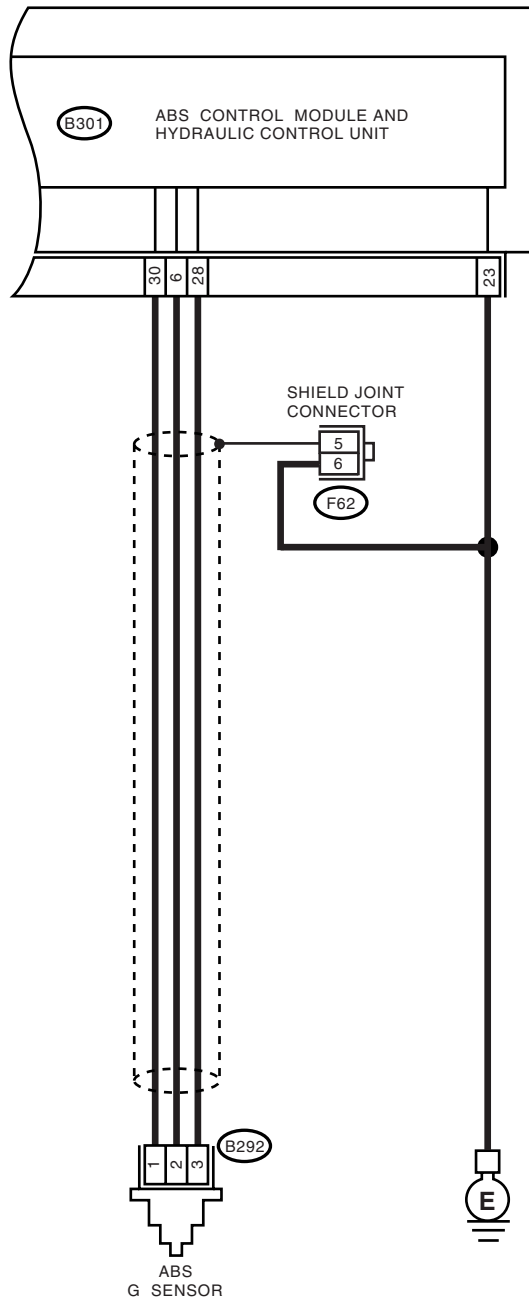
DIAGNOSIS:

- Faulty G sensor output voltage

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM: LHD MODEL

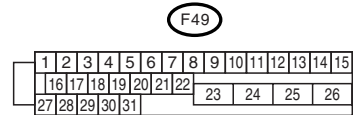
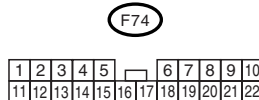
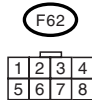
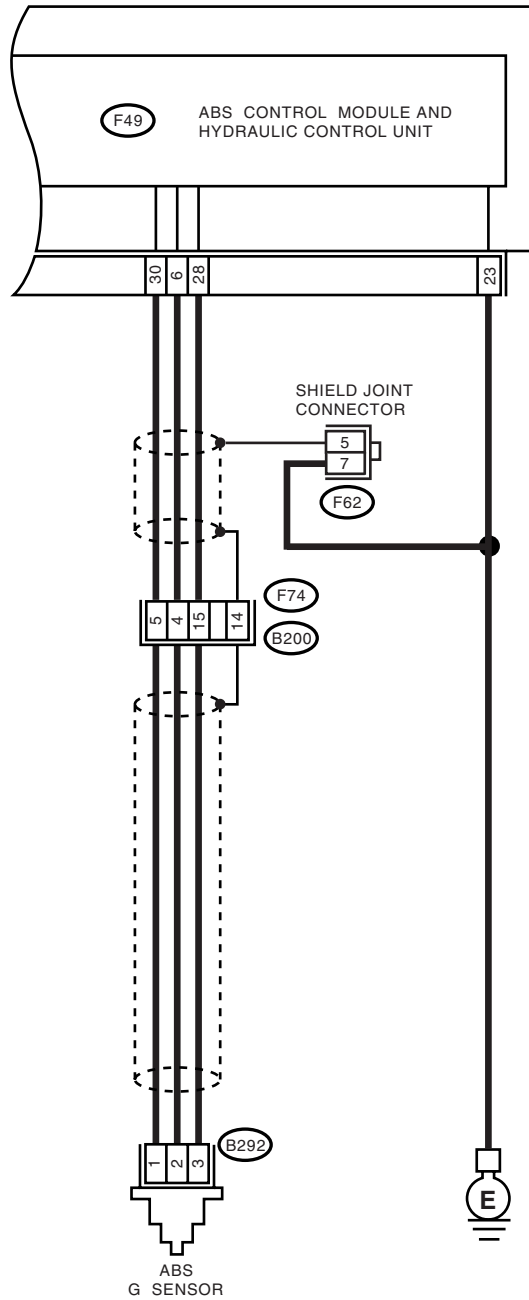


BR0132

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

WIRING DIAGRAM: RHD MODEL



BR0045

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 monitor display between 2.1 and 2.5 V when G sensor is in horizontal position?	Go to step 2.	Go to step 5.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No	
2	CHECK POOR CONTACT IN CONNECTORS.	Is there poor contact in connector between ABSCM&H/U and G sensor?	Repair the connector.	Go to step 3 .
3	CHECK ABSCM&H/U. 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the 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 DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	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 the ignition switch to OFF. 2)Disconnect the connector from ABSCM&H/U. 3)Measure the resistance between ABSCM&H/U connector terminals. Connector & terminal LHD: (B301) No. 6 — No. 28: RHD: (F49) No. 6 — No. 28:	Is the resistance between 4.3 and 4.9 kΩ?	Go to step 11 .	Repair the harness/connector between G sensor and ABSCM&H/U.
11	CHECK BATTERY SHORT OF HARNESS. 1)Turn the ignition switch to OFF. 2)Remove the console box. 3)Disconnect the connector from G sensor. 4)Disconnect the connector from ABSCM&H/U. 5)Measure the voltage between ABSCM&H/U connector and chassis ground. Connector & terminal LHD: (B301) No. 6 (+) — Chassis ground (-): RHD: (F49) No. 6 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Go to step 12 .	Repair the 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 the ignition switch to ON. 2) Measure the voltage between ABSCM&H/U connector and chassis ground. <i>Connector & terminal</i> <i>LHD: (B301) No. 6 (+) — Chassis ground (-):</i> <i>RHD: (F49) No. 6 (+) — Chassis ground (-):</i>	Is the voltage less than 1 V?	Go to step 13.	Repair the 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 the connector.	Go to step 14.
14 CHECK ABSCM&H/U. 1) Connect all connectors. 2) Erase the memory. 3) Perform the inspection mode. 4) Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the 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 DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.
16 CHECK INPUT VOLTAGE OF G SENSOR. 1) Turn the ignition switch to OFF. 2) Remove the console box. 3) Remove the G sensor from vehicle. (Do not disconnect connector.) 4) Turn the ignition switch to ON. 5) Measure the voltage between G sensor connector terminals. <i>Connector & terminal</i> <i>(B292) No. 1 (+) — No. 3 (-):</i>	Is the voltage between 4.75 and 5.25 V?	Go to step 17.	Repair the harness/connector between G sensor and ABSCM&H/U.
17 CHECK OPEN CIRCUIT IN G SENSOR OUTPUT HARNESS AND GROUND HARNESS. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ABSCM&H/U. 3) Measure the resistance between ABSCM&H/U connector terminals. <i>Connector & terminal</i> <i>LHD: (B301) No. 6 — No. 28:</i> <i>RHD: (F49) No. 6 — No. 28:</i>	Is the resistance between 5.0 and 5.6 kΩ?	Go to step 18.	Repair the harness/connector between G sensor and ABSCM&H/U.
18 CHECK G SENSOR. 1) Connect the connector to G sensor. 2) Connect the connector to ABSCM&H/U. 3) Turn the ignition switch to ON. 4) Measure the voltage between G sensor connector terminals. <i>Connector & terminal</i> <i>(B292) No. 2 (+) — No. 3 (-):</i>	Is the voltage between 2.1 and 2.5 V when G sensor is horizontal?	Go to step 19.	Replace the G sensor. <Ref. to ABS-22, G Sensor.>
19 CHECK G SENSOR. Measure the voltage between G sensor connector terminals. <i>Connector & terminal</i> <i>(B292) No. 2 (+) — No. 3 (-):</i>	Is the voltage between 3.7 and 4.1 V when G sensor is inclined forwards to 90°?	Go to step 20.	Replace the G sensor. <Ref. to ABS-22, G Sensor.>

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
20 CHECK G SENSOR. Measure the 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 the G sensor. <Ref. to ABS-22, G Sensor.>
21 CHECK POOR CONTACT IN CONNECTORS. Turn the ignition switch to OFF.	Is there poor contact in connector between ABSCM&H/U and G sensor?	Repair the connector.	Go to step 22 .
22 CHECK ABSCM&H/U. 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the 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 DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

AG:DTC 56

— ABNORMAL G SENSOR HIGH μ OUTPUT —

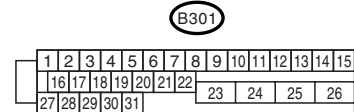
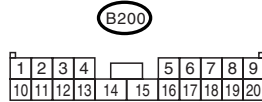
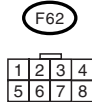
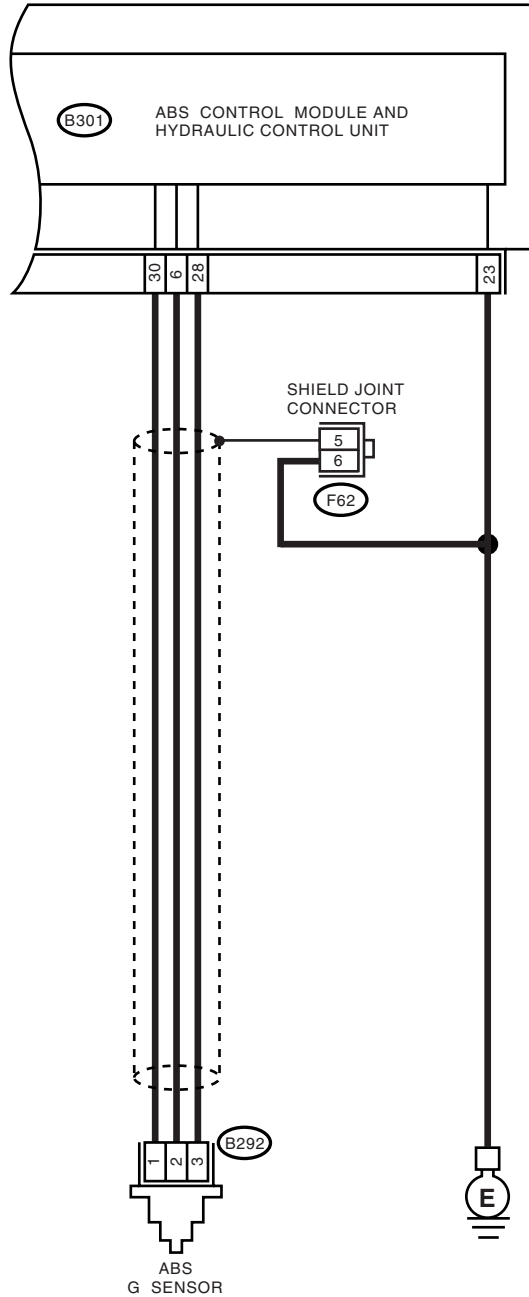
DIAGNOSIS:

- Faulty G sensor output voltage

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM: LHD MODEL

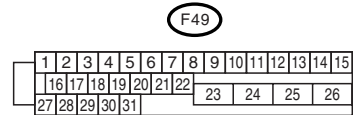
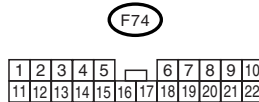
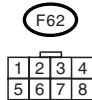
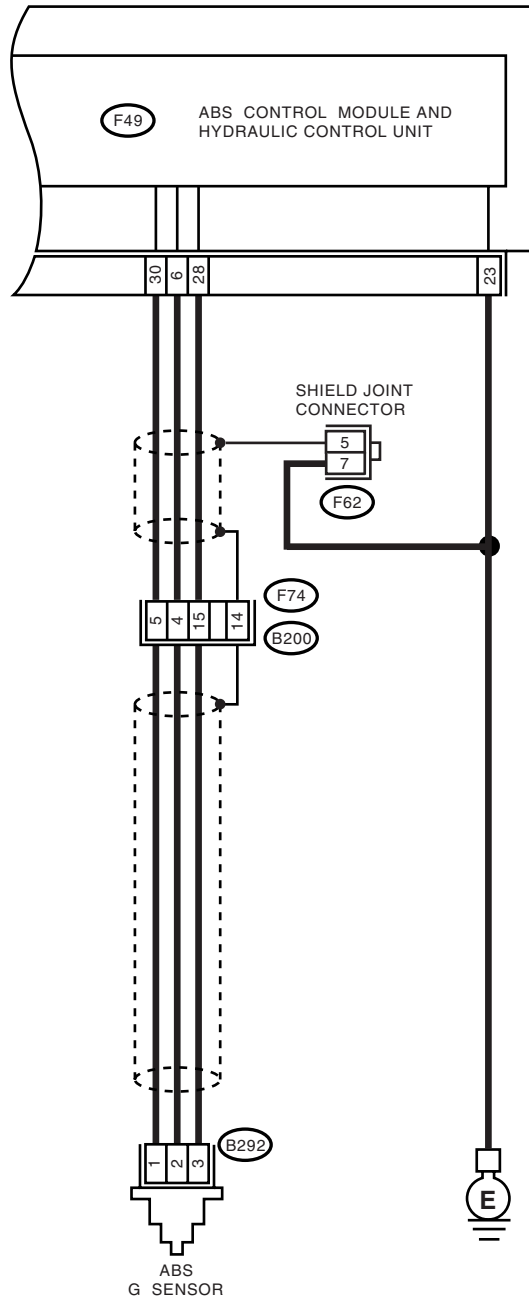


BR0132

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

WIRING DIAGRAM: RHD MODEL



BR0045

Step	Check	Yes	No	
1	<p>CHECK OUTPUT OF G SENSOR USING SELECT MONITOR.</p> <p>1) Select "Current data display & Save" on the select monitor.</p> <p>2) Read G sensor output on the select monitor display.</p>	Is the G sensor output on monitor display 2.3 ± 0.2 V when G sensor is in horizontal position?	Go to step 2.	Go to step 6.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
2	CHECK POOR CONTACT IN CONNECTORS. Turn the ignition switch to OFF.	Is there poor contact in connector between ABSCM&H/U and G sensor?	Repair the connector. Go to step 3 .
3	CHECK ABSCM&H/U. 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the 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 DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC. A temporary poor contact.
5	CHECK OPEN CIRCUIT IN G SENSOR OUTPUT HARNESS AND GROUND HARNESS. 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ABSCM&H/U. 3)Measure the resistance between ABSCM&H/U connector terminals. Connector & terminal LHD: (B301) No. 6 — No. 28: RHD: (F49) No. 6 — No. 28:	Is the resistance between 5.0 and 5.6 kΩ?	Go to step 6 . Repair the harness/connector between G sensor and ABSCM&H/U.
6	CHECK GROUND SHORT OF HARNESS. Measure the resistance between ABSCM&H/U connector and chassis ground. Connector & terminal LHD: (B301) No. 28 — Chassis ground: RHD: (F49) No. 28 — Chassis ground:	Is the resistance more than 1 MΩ?	Go to step 7 . Repair the harness between G sensor and ABSCM&H/U. Replace the ABSCM&H/U. <Ref. to ABS-7, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
7	CHECK G SENSOR. 1)Remove the console box. 2)Remove the G sensor from vehicle. 3)Connect the connector to G sensor. 4)Connect the connector to ABSCM&H/U. 5)Turn the ignition switch to ON. 6)Measure the 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 the G sensor. <Ref. to ABS-22, G Sensor.>
8	CHECK G SENSOR. Measure the 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 the G sensor. <Ref. to ABS-22, G Sensor.>
9	CHECK G SENSOR. Measure the 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 the 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 the ignition switch to OFF. 2)Connect all connectors. 3)Erase the memory. 4)Perform the inspection mode. 5)Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the 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 DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

AH:DTC 56

— DETECTION OF G SENSOR STICK —

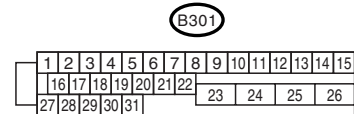
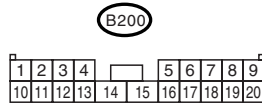
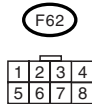
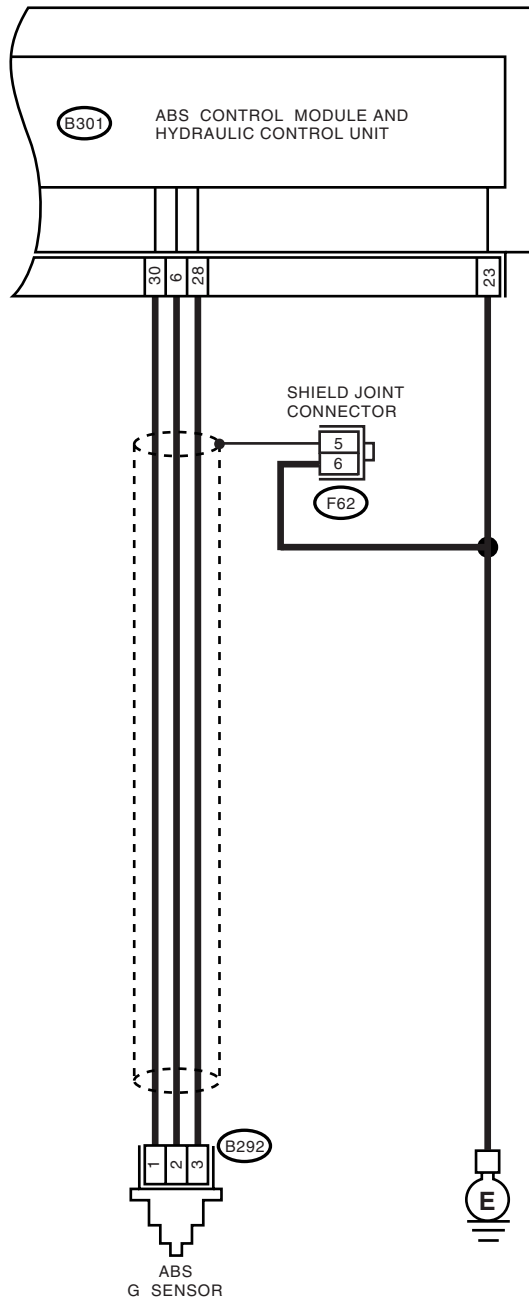
DIAGNOSIS:

- Faulty G sensor output voltage

TROUBLE SYMPTOM:

- ABS does not operate.

WIRING DIAGRAM: LHD MODEL

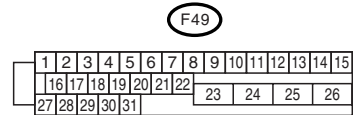
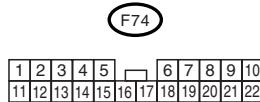
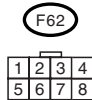
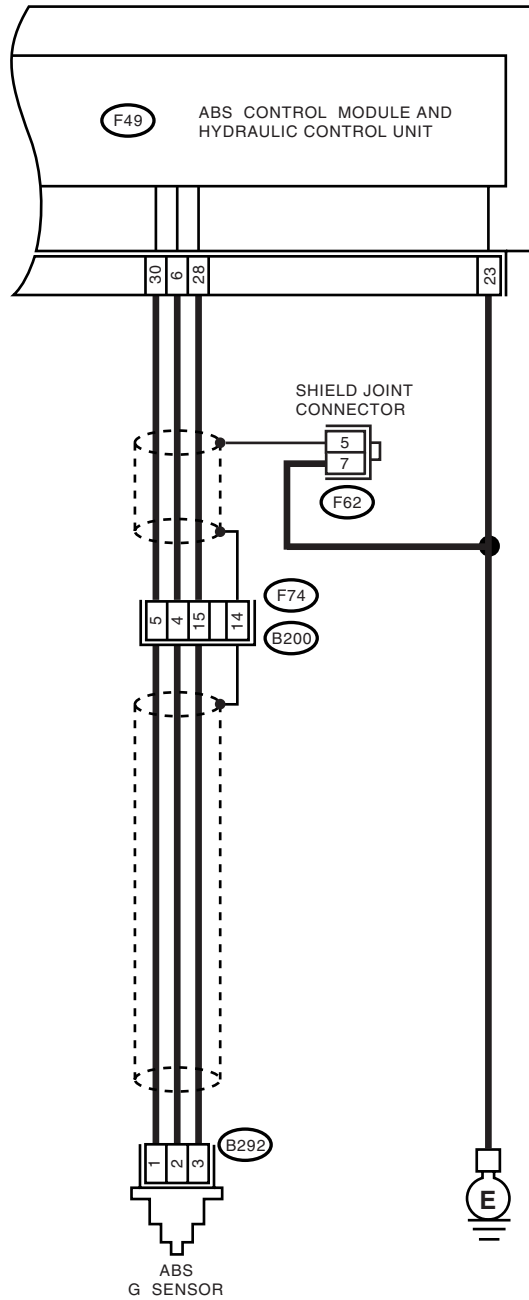


BR0132

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

WIRING DIAGRAM: RHD MODEL



BR0045

Step	Check	Yes	No	
1	CHECK ALL FOUR WHEELS FOR FREE TURNING.	Have the wheels been turned freely such as when vehicle is lifted up, or operated on a rolling road?	The ABS is normal. Erase the DTC.	Go to step 2.

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
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 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 the ignition switch to OFF. 2)Remove the console box. 3)Remove the G sensor from vehicle. (Do not disconnect the connector.) 4)Turn the 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 monitor display between 3.7 and 4.1 V when G sensor is inclined forwards to 90°?	Go to step 4.	Replace the 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 the G sensor. <Ref. to ABS-22, G Sensor.>
5 CHECK POOR CONTACT IN CONNECTORS. Turn the ignition switch to OFF.	Is there poor contact in connector between ABSCM&H/U and G sensor?	Repair the connector.	Go to step 6.
6 CHECK ABSCM&H/U. 1)Connect all connectors. 2)Erase the memory. 3)Perform the inspection mode. 4)Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the 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 DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.
8 CHECK OPEN CIRCUIT IN G SENSOR OUTPUT HARNESS AND GROUND HARNESS. 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ABSCM&H/U. 3)Measure the resistance between ABSCM&H/U connector terminals. Connector & terminal LHD: (B301) No. 6 — No. 28: RHD: (F49) No. 6 — No. 28:	Is the resistance between 5.0 and 5.6 kΩ?	Go to step 9.	Repair the harness/connector between G sensor and ABSCM&H/U.
9 CHECK G SENSOR. 1)Remove the console box. 2)Remove the G sensor from vehicle. 3)Connect the connector to G sensor. 4)Connect the connector to ABSCM&H/U. 5)Turn the ignition switch to ON. 6)Measure the 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 the G sensor. <Ref. to ABS-22, G Sensor.>
10 CHECK G SENSOR. Measure the 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 the G sensor. <Ref. to ABS-22, G Sensor.>

DIAGNOSTICS CHART WITH SUBARU SELECT MONITOR

ABS (DIAGNOSTICS)

Step	Check	Yes	No
11 CHECK G SENSOR. Measure the voltage between G sensor connector terminals. <i>Connector & terminal</i> <i>(B292) No. 2 (+) — No. 3 (-):</i>	Is the voltage between 0.5 and 0.9 V when G sensor is inclined backwards to 90°?	Go to step 12 .	Replace the G sensor. <Ref. to ABS-22, G Sensor.>
12 CHECK ABSCM&H/U. 1)Turn the ignition switch to OFF. 2)Connect all connectors. 3)Erase the memory. 4)Perform the inspection mode. 5)Read out the DTC.	Is the same DTC as in current diagnosis still being output?	Replace the 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 DIAGNOSTIC TROUBLE CODES (DTCs) APPEARANCE.	Are other DTCs being output?	Proceed with the diagnosis corresponding to DTC.	A temporary poor contact.

14. General Diagnostics Table

A: INSPECTION

Symptom		Probable faulty units/parts
Vehicle instability during braking	Vehicle pulls to either side.	<ul style="list-style-type: none"> • ABSCM&H/U (solenoid valve) • ABS sensor • Brake (caliper & piston, pads) • Wheel alignment • Tire specifications, tire wear and air pressures • Incorrect wiring or piping connections • Road surface (uneven, camber)
	Vehicle spins.	<ul style="list-style-type: none"> • ABSCM&H/U (solenoid valve) • ABS sensor • Brake (pads) • Tire specifications, tire wear and air pressures • Incorrect wiring or piping connections
Poor braking	Long braking/stopping distance	<ul style="list-style-type: none"> • ABSCM&H/U (solenoid valve) • Brake (pads) • Air in brake line • Tire specifications, tire wear and air pressures • Incorrect wiring or piping connections
	Wheel locks.	<ul style="list-style-type: none"> • ABSCM&H/U (solenoid valve, motor) • ABS sensor • Incorrect wiring or piping connections
	Brake dragging	<ul style="list-style-type: none"> • ABSCM&H/U (solenoid valve) • ABS sensor • Master cylinder • Brake (caliper & piston) • Parking brake • Axle & wheels • Brake pedal play
	Long brake pedal stroke	<ul style="list-style-type: none"> • Air in brake line • Brake pedal play
	Vehicle pitching	<ul style="list-style-type: none"> • Suspension play or fatigue (reduced damping) • Incorrect wiring or piping connections • Road surface (uneven)
	Unstable or uneven braking	<ul style="list-style-type: none"> • ABSCM&H/U (solenoid valve) • ABS sensor • Brake (caliper & piston, pads) • Tire specifications, tire wear and air pressures • Incorrect wiring or piping connections • Road surface (uneven)
	Excessive pedal vibration	<ul style="list-style-type: none"> • Incorrect wiring or piping connections • Road surface (uneven)
Vibration and/or noise (while driving on slippery roads)	Noise from ABSCM&H/U	<ul style="list-style-type: none"> • ABSCM&H/U (mount bushing) • ABS sensor • Brake piping
	Noise from front of vehicle	<ul style="list-style-type: none"> • ABSCM&H/U (mount bushing) • ABS sensor • Master cylinder • Brake (caliper & piston, pads, rotor) • Brake piping • Brake booster & check valve • Suspension play or fatigue
	Noise from rear of vehicle	<ul style="list-style-type: none"> • ABS sensor • Brake (caliper & piston, pads, rotor) • Parking brake • Brake piping • Suspension play or fatigue

GENERAL DIAGNOSTICS TABLE

ABS (DIAGNOSTICS)

BRAKE

BR

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GENERAL DESCRIPTION

BRAKE

1. General Description

A: SPECIFICATIONS

	Size	14 inch type	15 inch type	16 inch type
Front disc brake	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 × 0.394 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	0.4	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 (0.67 in)
		16"	14.5 mm (0.571 in)
	Disc thickness		24 mm (0.94 in)
	Disc runout		—
Rear brake (Disc type)	Pad thickness (including back metal)	14"	14 mm (0.55 in)
		15"	16 mm (0.63 in)
	Disc thickness	14"	10 mm (0.39 in)
		15"	18 mm (0.71 in)
	Disc runout		—
Rear brake (Drum type)	Inside diameter		228.6 mm (9 in)
	Lining thickness		4.1 mm (0.161 in)
Rear brake (Disc type parking)	Inside diameter		170 mm (6.69 in)
	Lining thickness		3.2 mm (0.126 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)	

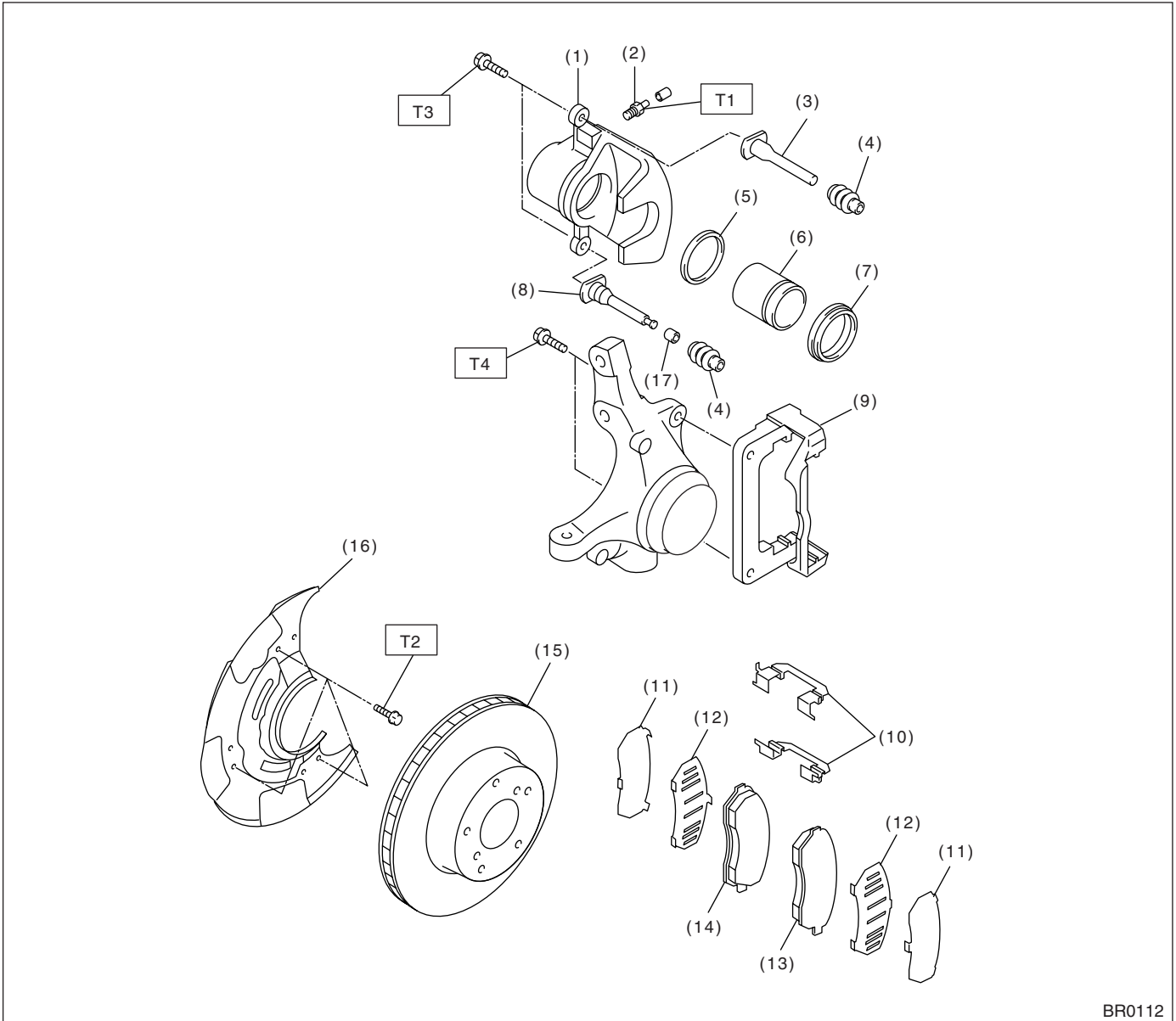
Brake pedal	Free play	1 — 3 mm (0.04 — 0.12 in) [Depress brake pedal pad with a force of less than 10 N (1 kgf, 2 lb).]
-------------	-----------	--

GENERAL DESCRIPTION

BRAKE

B: COMPONENT

1. 14 INCH TYPE



BR0112

- | | | |
|-----------------------|--------------------|--------------|
| (1) Caliper body | (9) Support | (17) Bushing |
| (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)

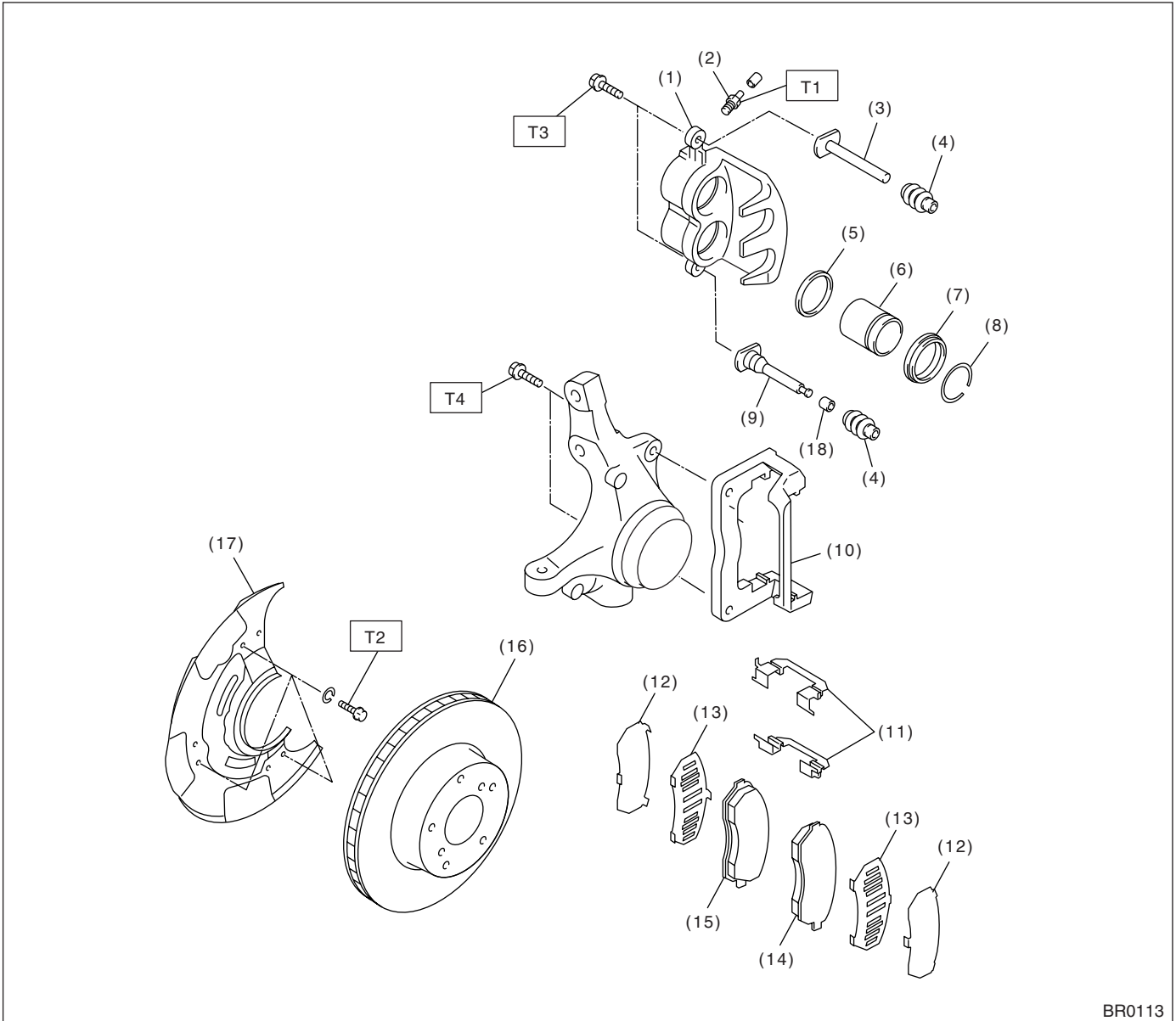
T1: 8 (0.8, 5.8)

T2: 18 (1.8, 13.0)

T3: 37 (3.8, 27.5)

T4: 80 (8.2, 59)

2. 15 INCH TYPE



BR0113

- | | | |
|--|-----------------------|-----------------|
| (1) Caliper body | (9) Lock pin (Yellow) | (17) Disc cover |
| (2) Air bleeder screw | (10) Support | (18) Bushing |
| (3) Guide pin (Green) | (11) Pad clip | |
| (4) Pin boot | (12) Outer shim | |
| (5) Piston seal | (13) Inner shim | |
| (6) Piston | (14) Pad (Outside) | |
| (7) Piston boot | (15) Pad (Inside) | |
| (8) Boot ring (Except Australia model) | (16) Disc rotor | |

Tightening torque: N·m (kgf·m, ft·lb)

T1: 8 (0.8, 5.8)

T2: 18 (1.8, 13.0)

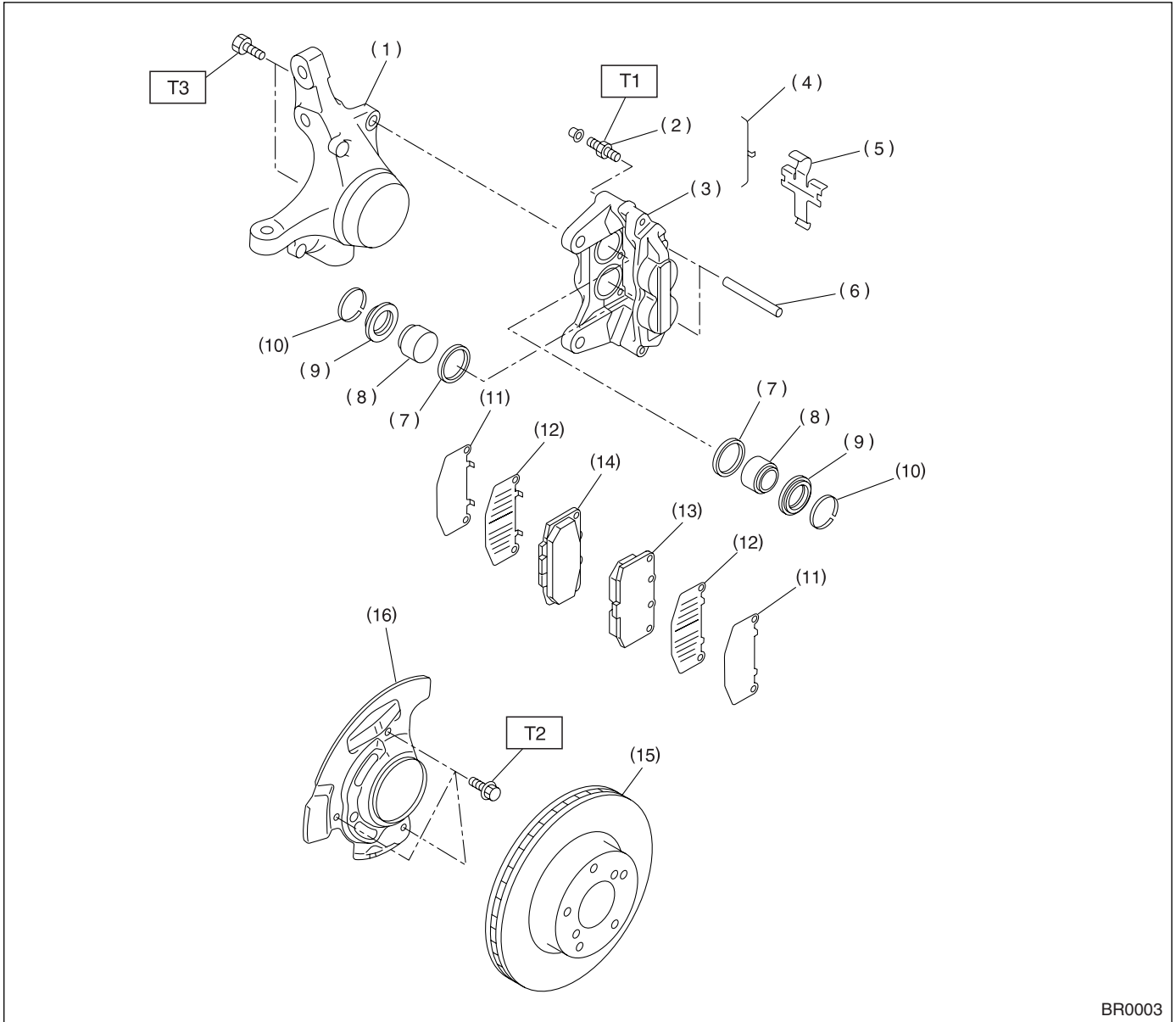
T3: 37 (3.8, 27.5)

T4: 80 (8.2, 59)

GENERAL DESCRIPTION

BRAKE

3. 16 INCH TYPE



BR0003

- | | |
|-----------------------|--------------------|
| (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 |

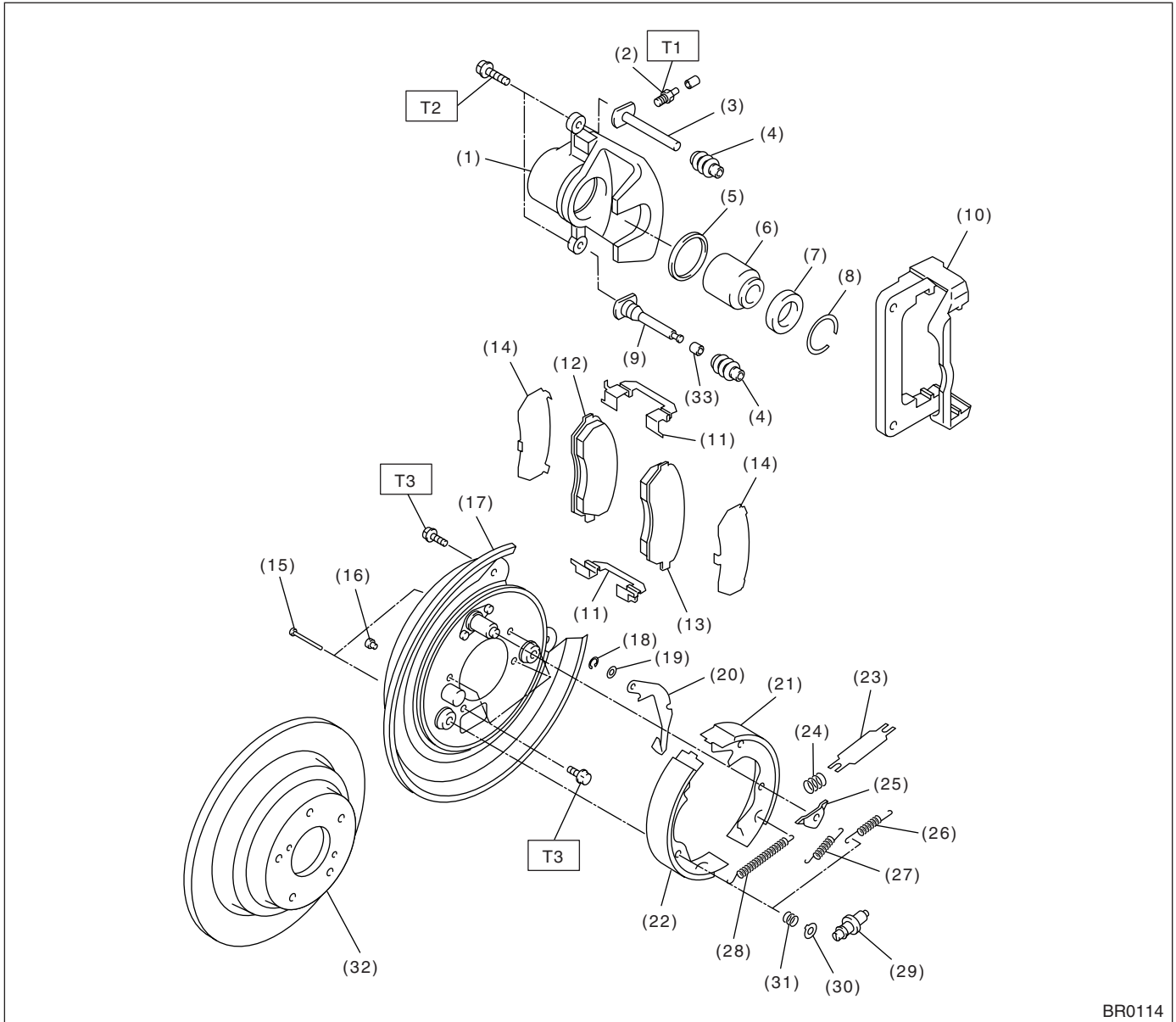
Tightening torque: N-m (kgf-m, ft-lb)

T1: 8 (0.8, 5.8)

T2: 18 (1.8, 13.0)

T3: 80 (8.2, 59)

4. REAR DISC BRAKE (14 INCH TYPE)



BR0114

- | | | |
|-----------------------|-------------------------------------|---------------------------------|
| (1) Caliper body | (14) Shim | (27) Primary shoe return spring |
| (2) Air bleeder screw | (15) Shoe hold-down pin | (28) Adjusting spring |
| (3) Guide pin (Green) | (16) Cover | (29) Adjuster |
| (4) Pin boot | (17) Back plate | (30) Shoe hold-down cup |
| (5) Piston seal | (18) Retainer | (31) Shoe hold-down spring |
| (6) Piston | (19) Spring washer | (32) Disc rotor |
| (7) Piston boot | (20) Parking brake lever | (33) Bushing |
| (8) Boot ring | (21) Parking brake shoe (Secondary) | |
| (9) Lock pin (Yellow) | (22) Parking brake shoe (Primary) | |
| (10) Support | (23) Strut | |
| (11) Pad clip | (24) Strut shoe spring | |
| (12) 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)

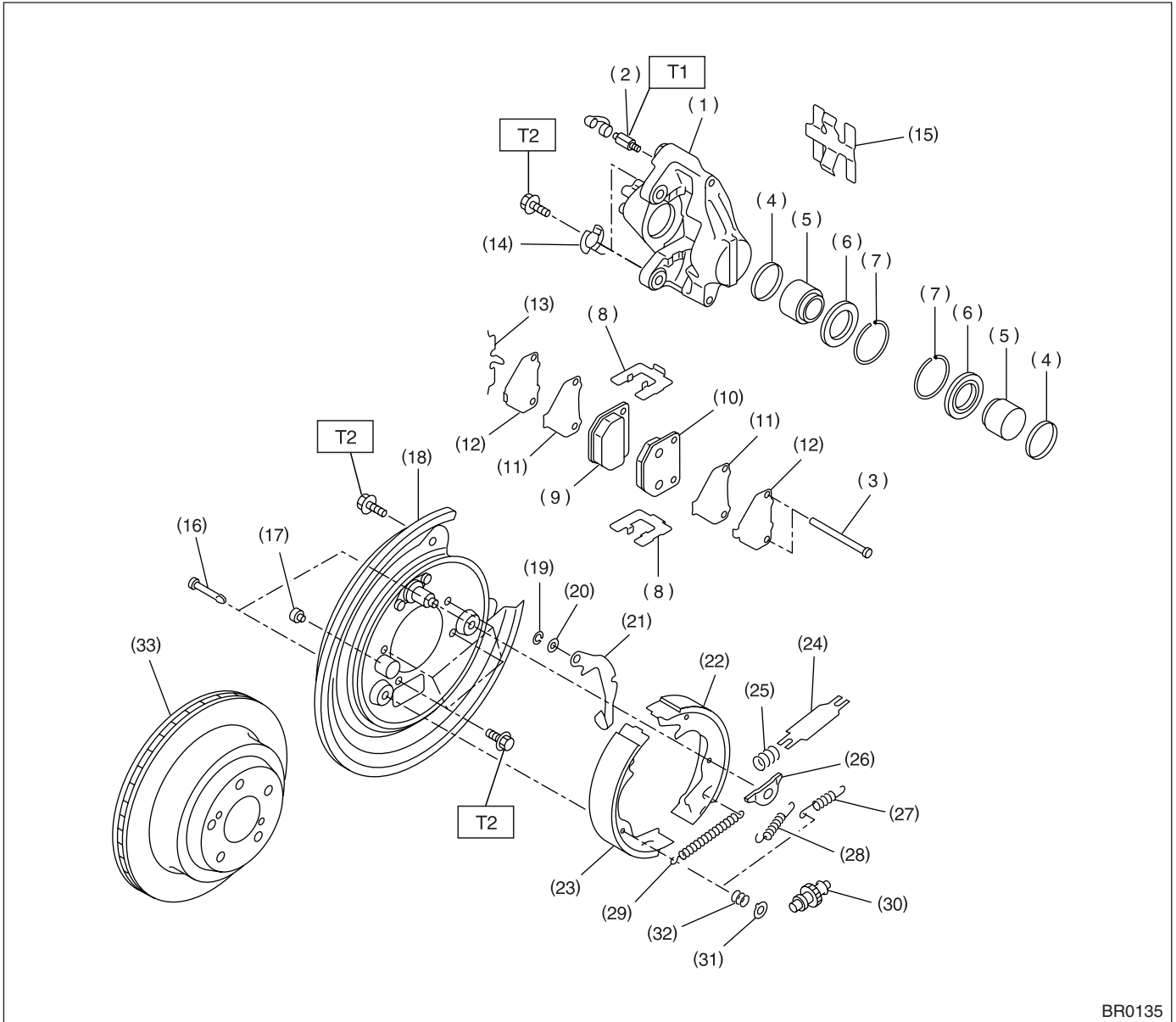
T2: 37 (3.8, 27.5)

T3: 52 (5.3, 38.3)

GENERAL DESCRIPTION

BRAKE

5. REAR DISC BRAKE (15 INCH TYPE)



BR0135

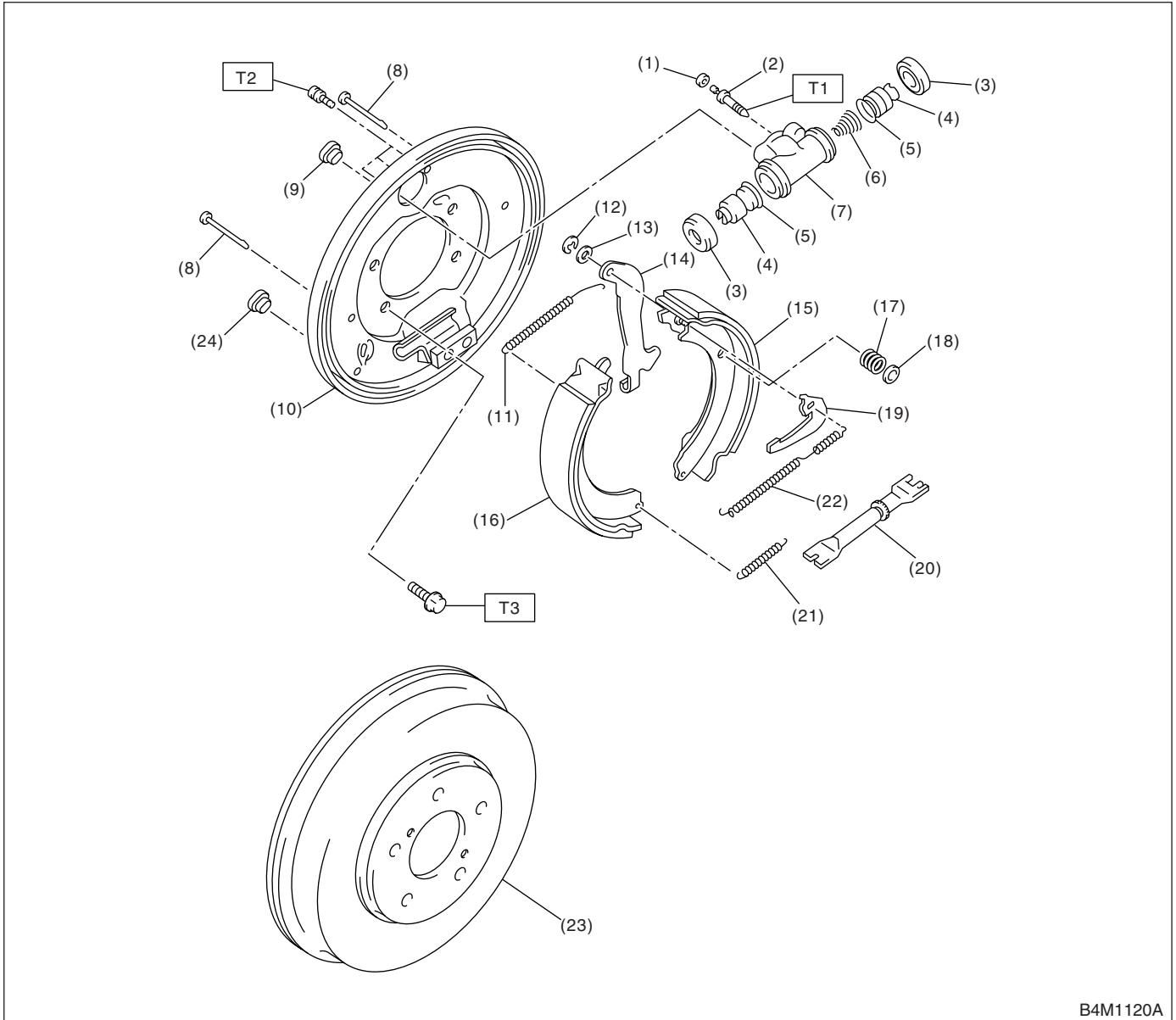
- | | | |
|-----------------------|-------------------------------------|-----------------------------------|
| (1) Caliper body | (14) Washer | (27) Secondary shoe return spring |
| (2) Air bleeder screw | (15) Cross spring | (28) Primary shoe return spring |
| (3) Pad pin | (16) Shoe hold-down pin | (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 | (24) Plug |
| (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)

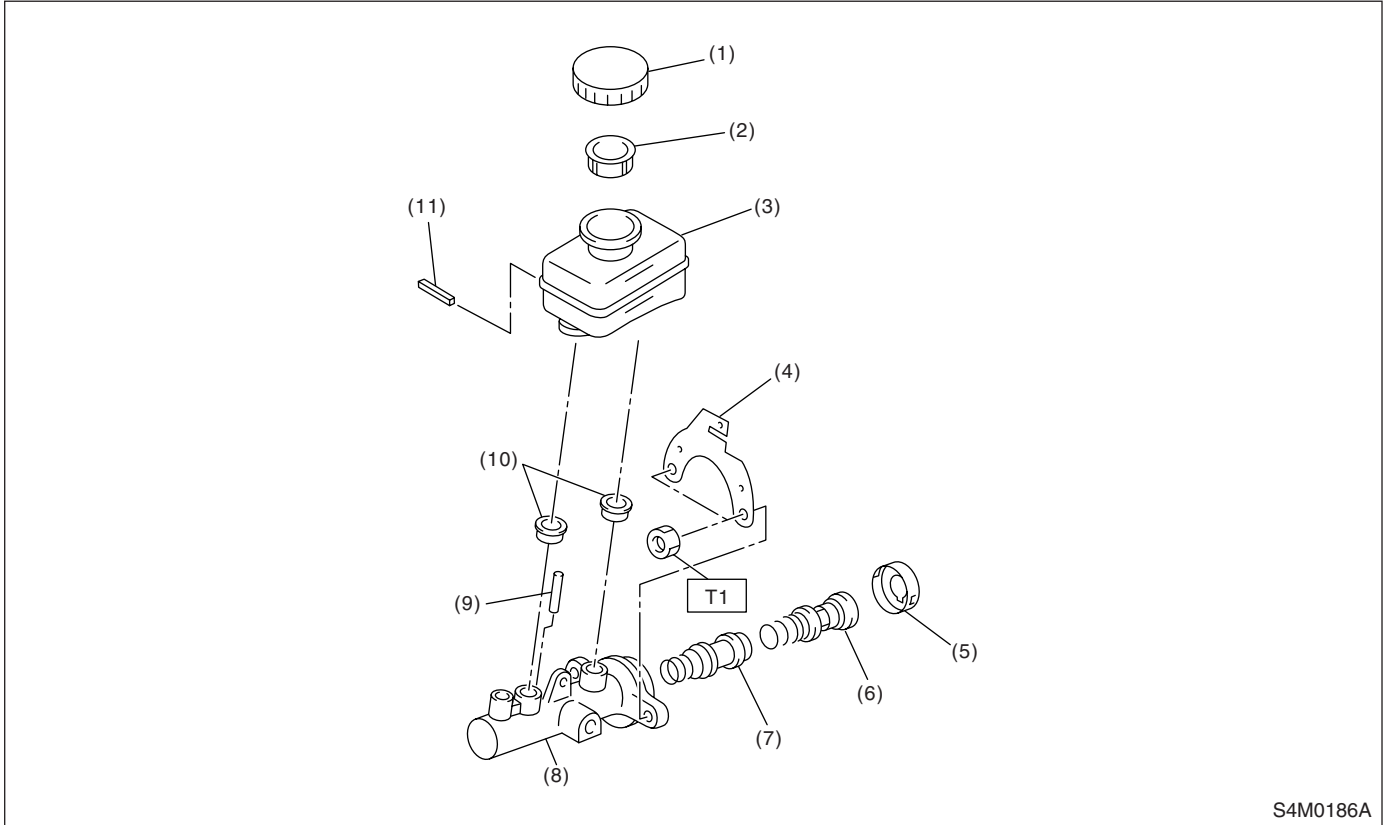
T3: 52 (5.3, 38.3)

GENERAL DESCRIPTION

BRAKE

7. MASTER CYLINDER

• LHD MODEL



S4M0186A

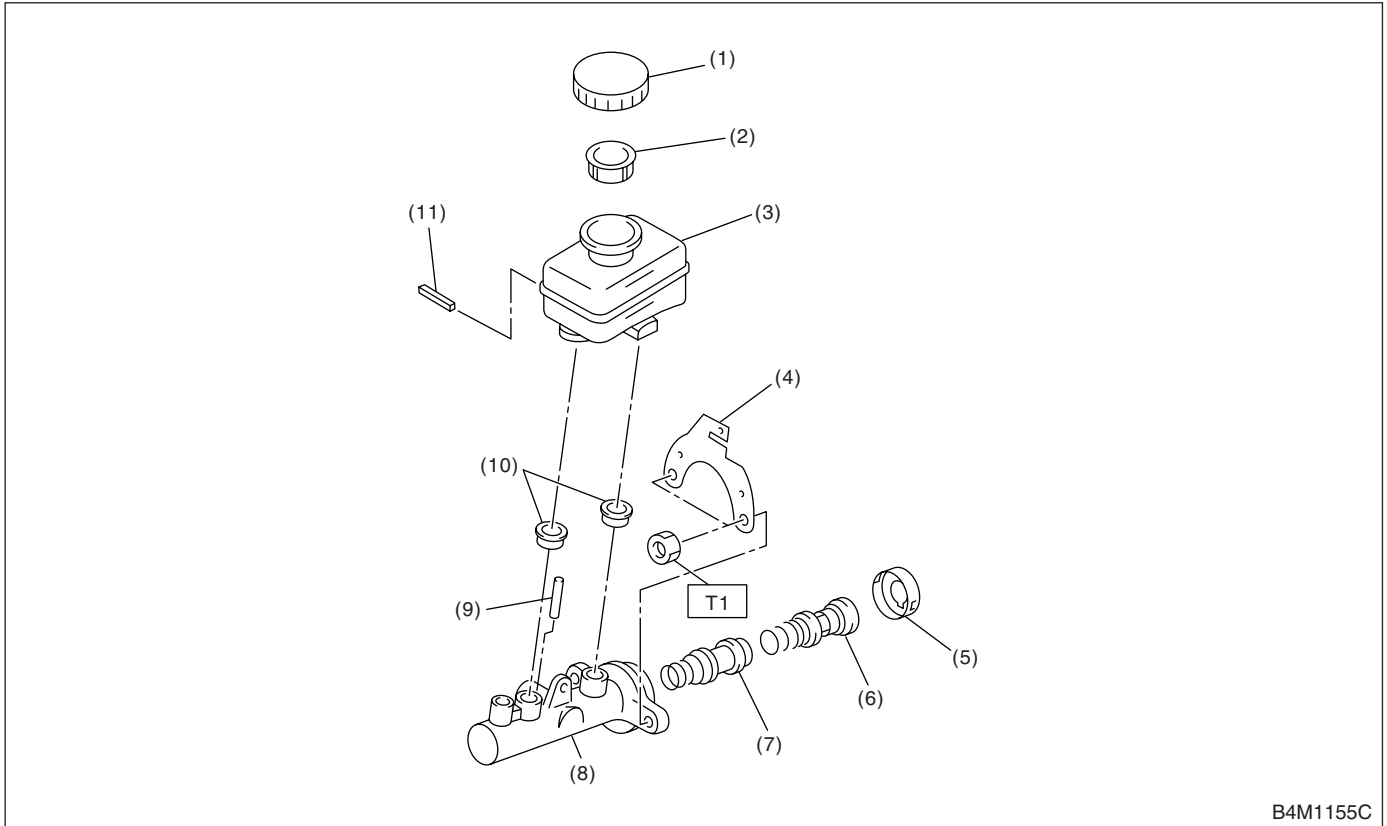
- | | |
|---------------------|-----------------------------|
| (1) Cap | (7) Secondary piston |
| (2) Filter | (8) Cylinder body |
| (3) Reservoir tank | (9) Cylinder pin (with ABS) |
| (4) Bracket | (10) Seal |
| (5) Piston retainer | (11) Pin |
| (6) Primary piston | |

Tightening torque: N·m (kgf·m, ft·lb)
T1: 14 (1.4, 10.1)

GENERAL DESCRIPTION

BRAKE

• RHD MODEL



- (1) Cap
- (2) Filter
- (3) Reservoir tank
- (4) Bracket
- (5) Piston retainer

- (6) Primary piston
- (7) Secondary piston
- (8) Cylinder body
- (9) Cylinder pin (with ABS)
- (10) Seal

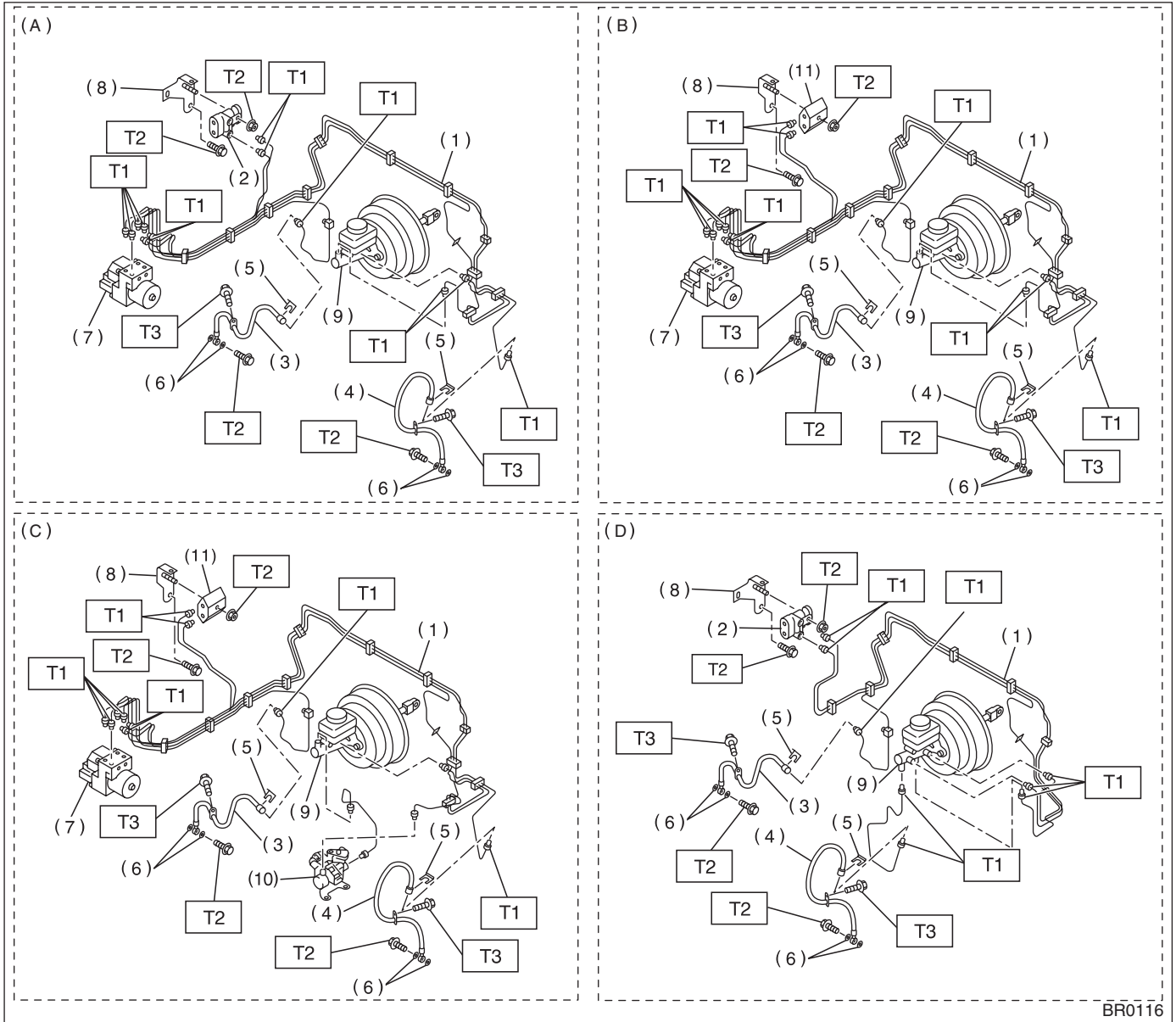
- (11) Pin

Tightening torque: N·m (kgf·m, ft·lb)
T1: 14 (1.4, 10.1)

GENERAL DESCRIPTION

BRAKE

8. FRONT BRAKE PIPES AND HOSE FOR LHD MODEL



(A) AT model
MT model without hill holder (1.6 L)

(C) MT model without hill holder

(B) AT model
MT model without hill holder (Except 1.6 L)

(D) Without ABS

- (1) Front brake pipe assembly
- (2) Proportioning valve
- (3) Front brake hose RH
- (4) Front brake hose LH
- (5) Clamp
- (6) Gasket

- (7) ABS control module and hydraulic control unit
- (8) Bracket
- (9) Master cylinder
- (10) Hill holder
- (11) Two-way connector

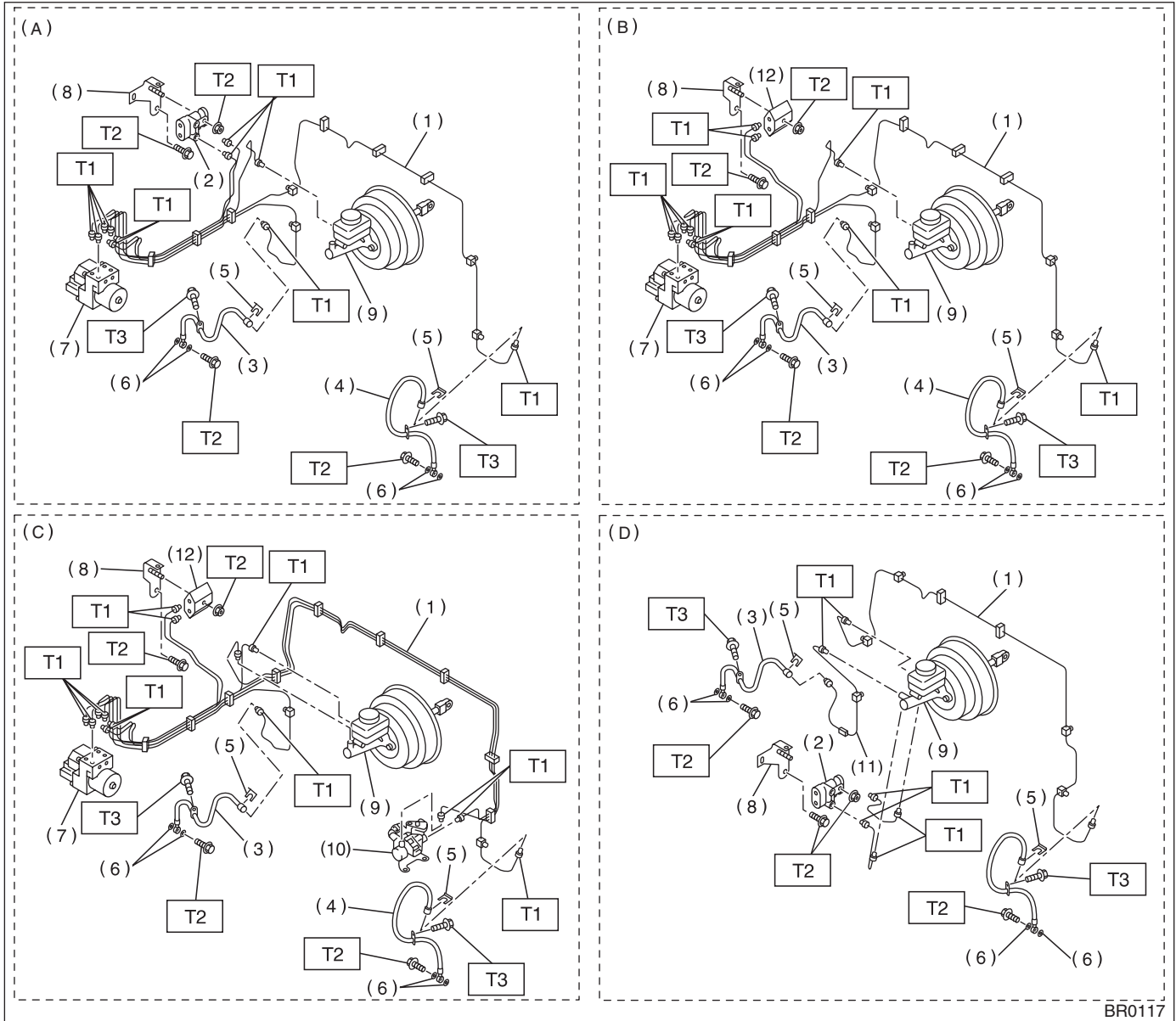
Tightening torque: N·m (kgf·m, ft·lb)

T1: 15 (1.5, 10.8)

T2: 18 (1.8, 13.0)

T3: 32 (3.3, 23.6)

9. FRONT BRAKE PIPES AND HOSE FOR RHD MODEL



BR0117

- | | |
|---|----------------------------------|
| (A) AT model
MT model without hill holder (1.6 L) | (C) MT model without hill holder |
| (B) AT model
MT model without hill holder (Except 1.6 L) | (D) Without ABS |

- | | | |
|-------------------------------|---|------------------------|
| (1) Front brake pipe assembly | (7) ABS control module and hydraulic control unit | (12) Two-way connector |
| (2) Proportioning valve | (8) Bracket | |
| (3) Front brake hose RH | (9) Master cylinder | |
| (4) Front brake hose LH | (10) Hill holder | |
| (5) Clamp | (11) Adapter pipe | |
| (6) Gasket | | |

Tightening torque: N·m (kgf·m, ft·lb)

T1: 15 (1.5, 10.8)

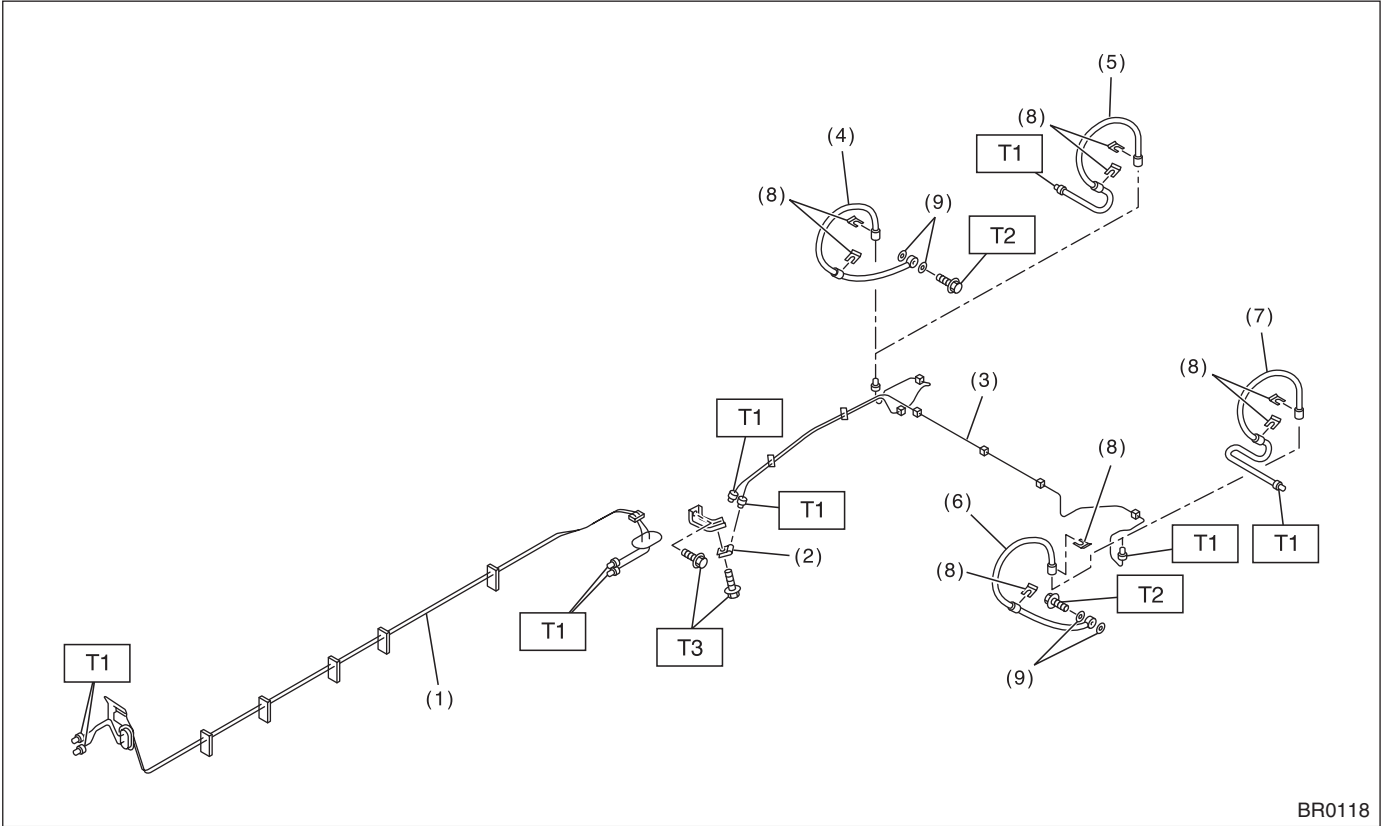
T2: 18 (1.8, 13.0)

T3: 32 (3.3, 23.6)

GENERAL DESCRIPTION

BRAKE

10.CENTER AND REAR BRAKE PIPES AND HOSE



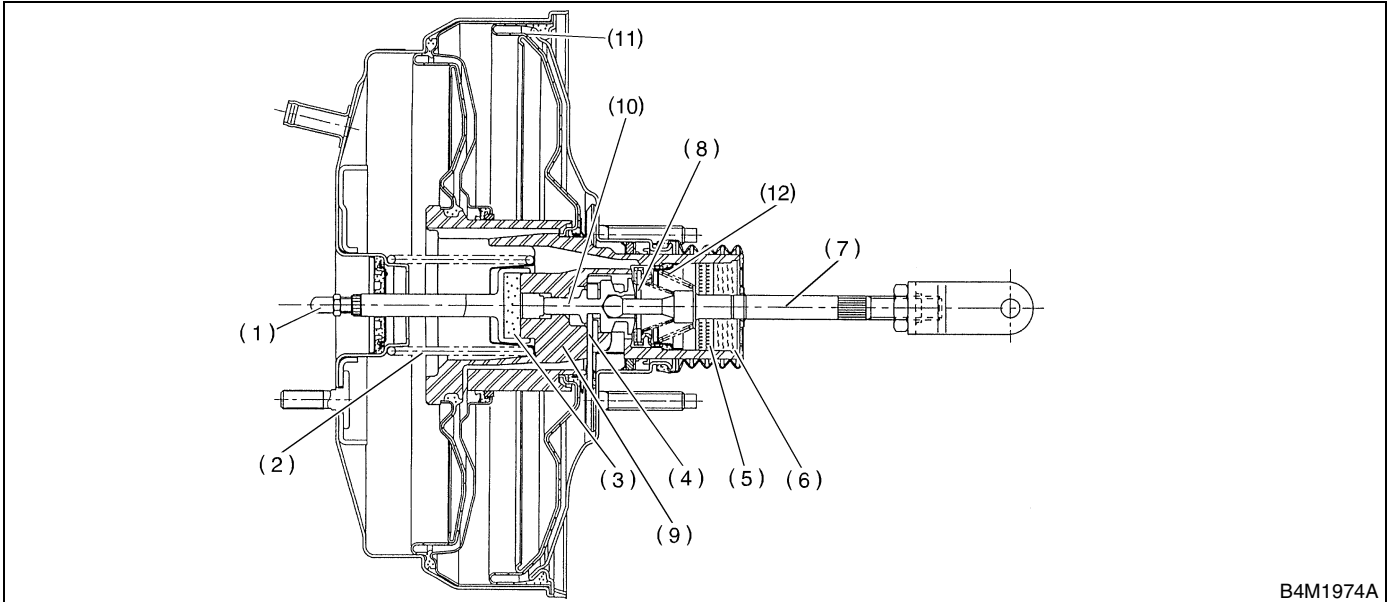
- | | |
|---|---|
| (1) Center brake pipe assembly | (6) Rear brake hose LH (Disc brake model) |
| (2) Two-way connector | (7) Rear brake hose LH (Drum brake model) |
| (3) Rear brake pipe assembly | (8) Clamp |
| (4) Rear brake hose RH (Disc brake model) | (9) Gasket |
| (5) Rear brake hose (Drum brake model) | |

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)

11. BRAKE BOOSTER

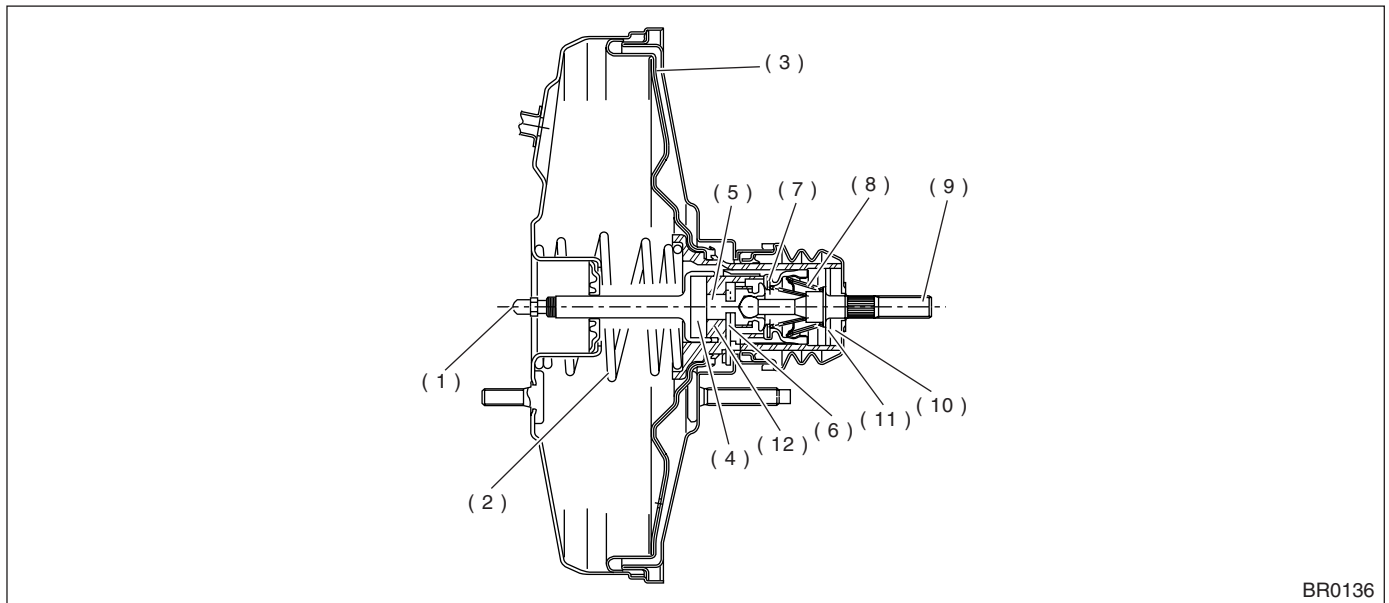
• MODEL with ABS



B4M1974A

- | | | |
|-------------------|-------------------|--------------------------|
| (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 |

• MODEL without ABS



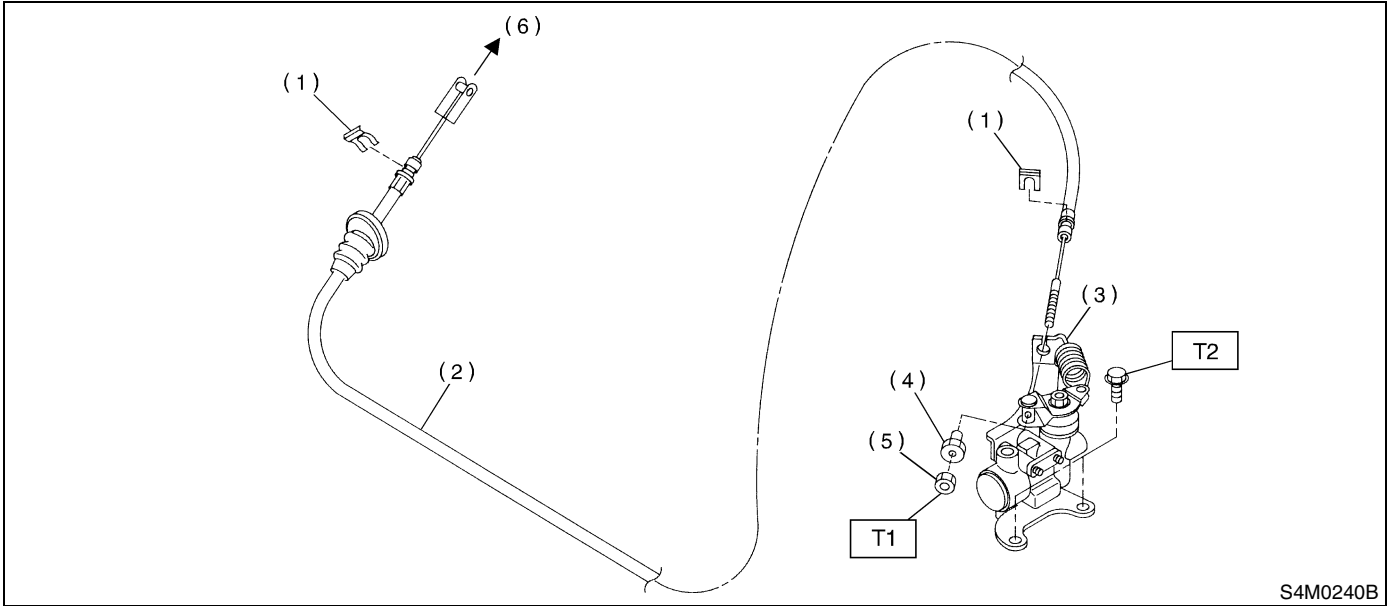
BR0136

- | | | |
|---------------------|-------------------------|-------------------|
| (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 |

GENERAL DESCRIPTION

BRAKE

12.HILL HOLDER

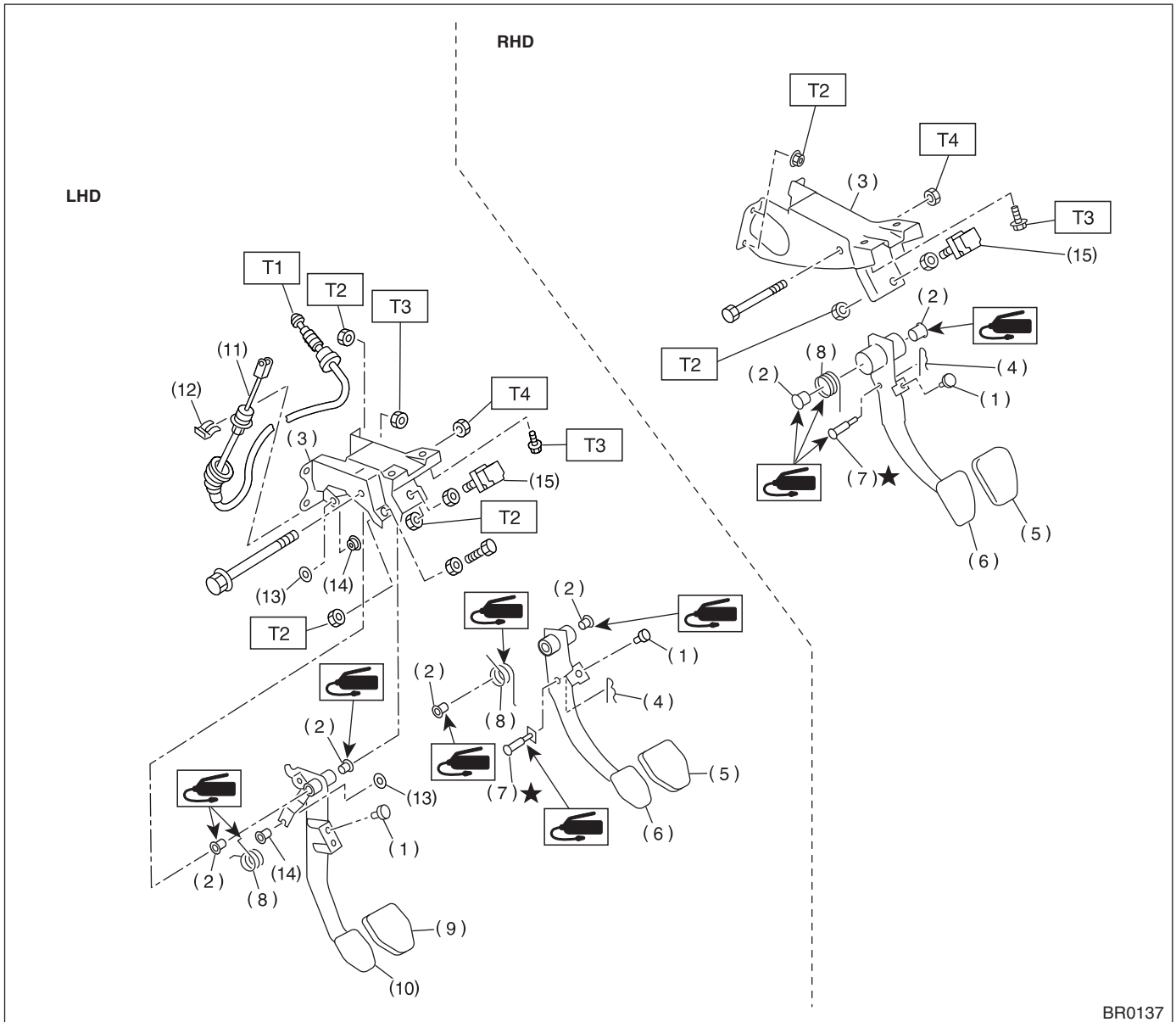


- (1) Clamp
- (2) PHV cable
- (3) PHV (Pressure hold valve)
- (4) Adjusting nut
- (5) Lock nut
- (6) To clutch pedal

Tightening torque: N·m (kgf·m, ft·lb)
T1: 3.5 (0.35, 2.5)
T2: 18 (1.8, 13.0)

13. BRAKE PEDAL

• 1.6 L MODEL



BR0137

- | | | |
|---------------------|-------------------------|------------------------|
| (1) Stopper | (8) Spring | (15) Stop light switch |
| (2) Bushing | (9) Clutch pedal pad | |
| (3) 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 | |

Tightening torque: N·m (kgf·m, ft·lb)

T1: 5.9 (0.6, 4.3)

T2: 8 (0.8, 5.8)

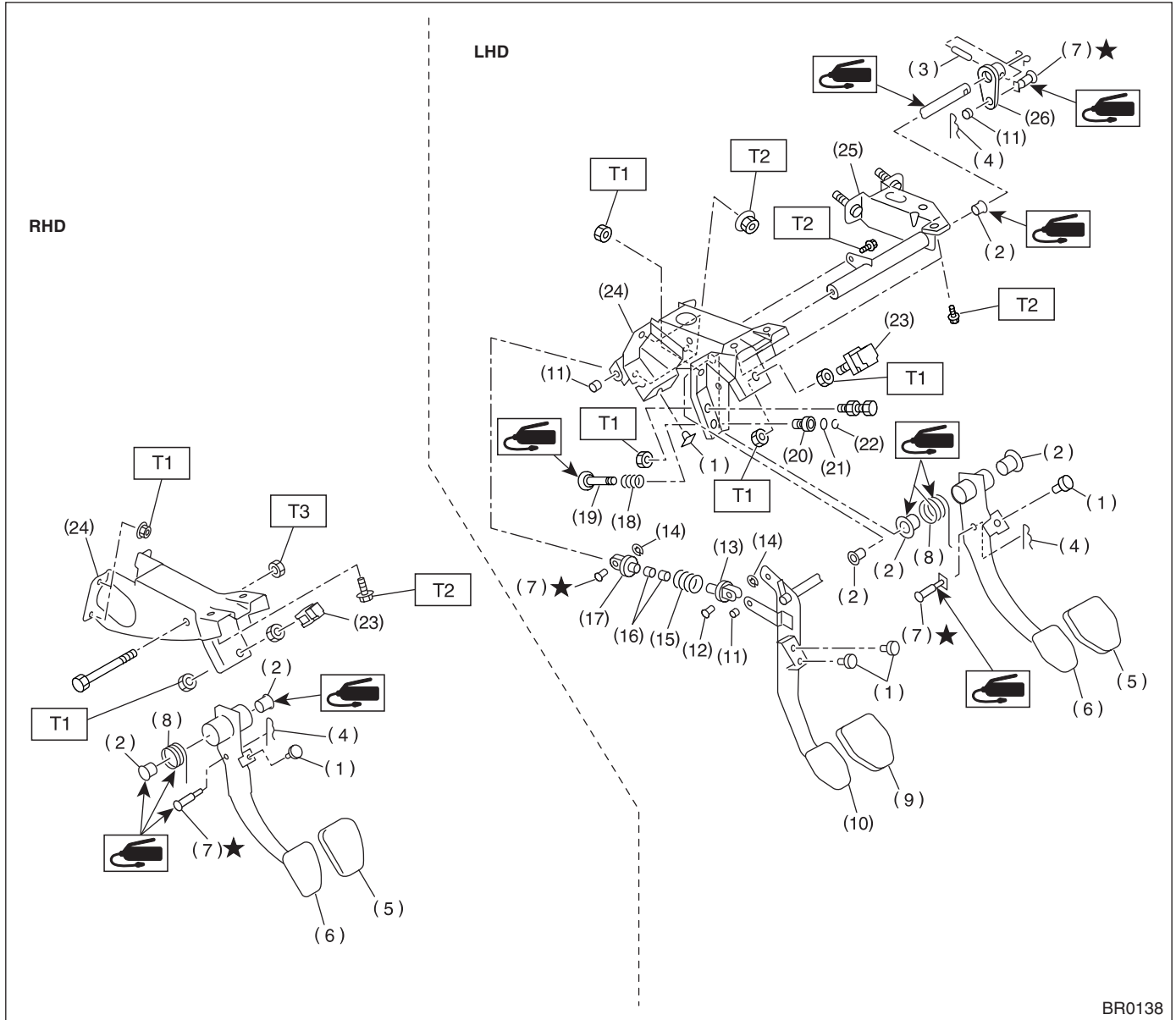
T3: 18 (1.8, 13.0)

T4: 30 (3.1, 22.4)

GENERAL DESCRIPTION

BRAKE

• 2.0 L MODEL



BR0138

- | | | |
|------------------------|------------------------|-------------------------------------|
| (1) Stopper | (12) Clutch clevis pin | (23) Stop light switch |
| (2) Bushing | (13) Assist rod A | (24) Pedal bracket |
| (3) Spring pin | (14) Clip | (25) Clutch master cylinder bracket |
| (4) Snap pin | (15) Assist spring | (26) Lever |
| (5) Brake pedal pad | (16) Assist bushing | |
| (6) Brake pedal | (17) Assist rod B | |
| (7) Clevis pin | (18) Spring S | |
| (8) Brake pedal spring | (19) Rod S | |
| (9) Clutch pedal pad | (20) Bushing S | |
| (10) Clutch pedal | (21) O-ring | |
| (11) Bushing C | (22) Clip | |

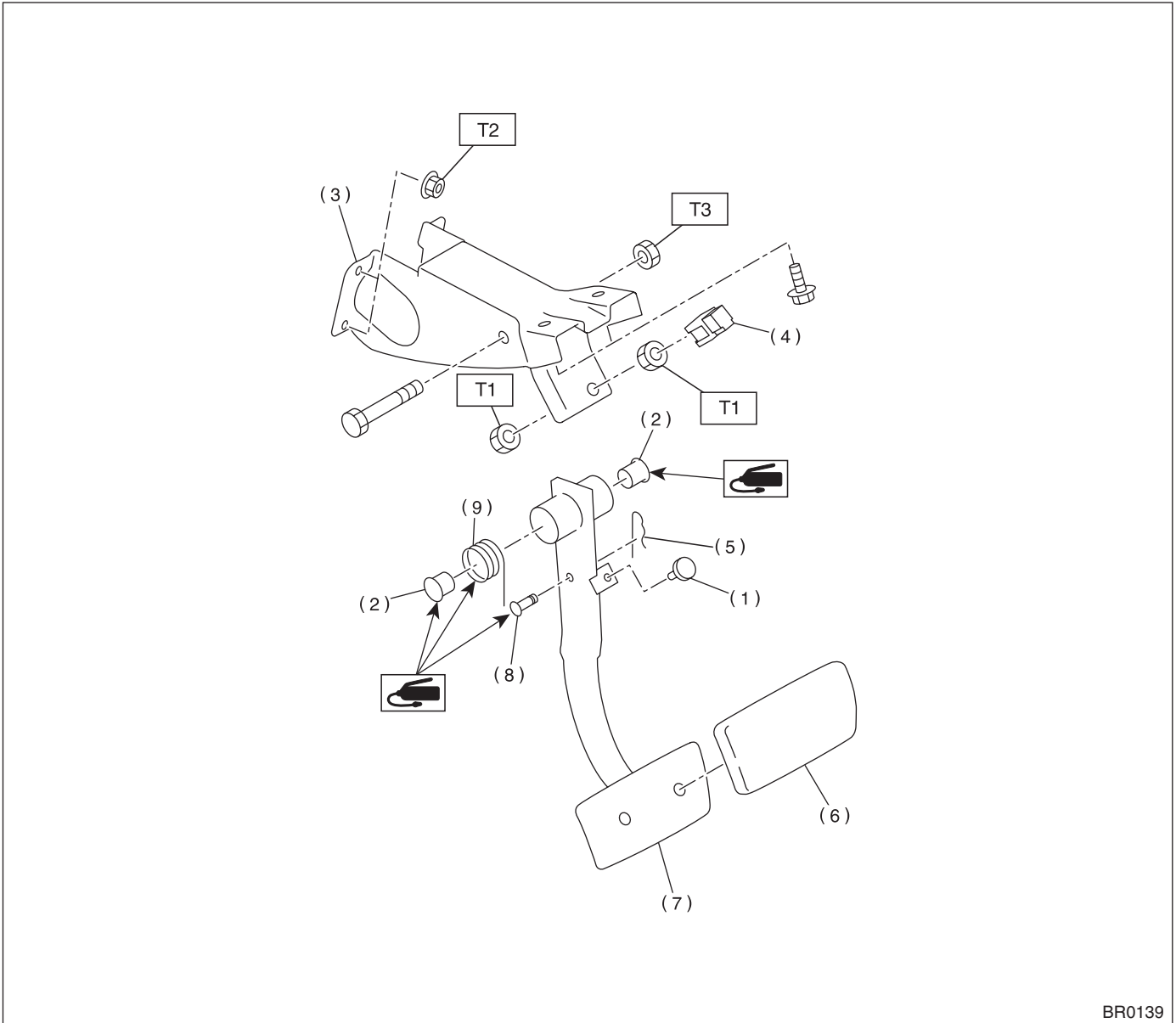
Tightening torque: N-m (kgf-m, ft-lb)

T1: 8 (0.8, 5.8)

T2: 18 (1.8, 13.0)

T3: 30 (3.1, 22.4)

14. 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

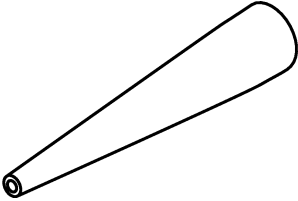
- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation 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 vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.
- Do not put fluid on body. If the body is tainted, wash away with water.

GENERAL DESCRIPTION

BRAKE

D: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p>B4M2406</p>	925460000	WHEEL CYLINDER 11/16" ADAPTER	Used for installing cup onto wheel cylinder piston (Size 11/16 in).

2. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
SNAP RING PLIERS	Used for removing and installing snap ring.

FRONT BRAKE PAD

BRAKE

2. Front Brake Pad

A: REMOVAL

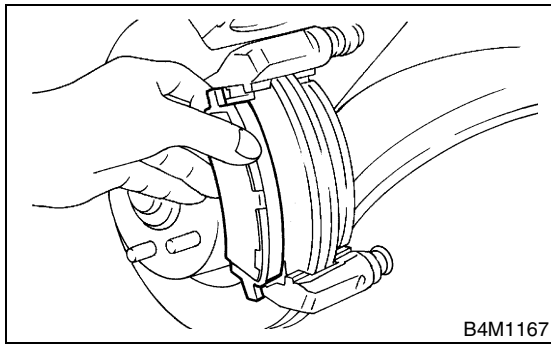
1. 14 INCH AND 15 INCH TYPE

- 1) Set the vehicle on a lift.
- 2) Loosen the wheel nuts.
- 3) Jack-up the vehicle, and then remove the front wheel.
- 4) Remove the lower caliper bolt.
- 5) Raise the caliper body upward and support it.

NOTE:

Do not disconnect the brake hose from caliper body.

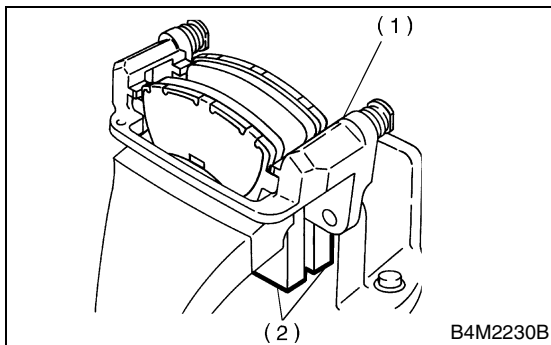
- 6) Remove the pad.



NOTE:

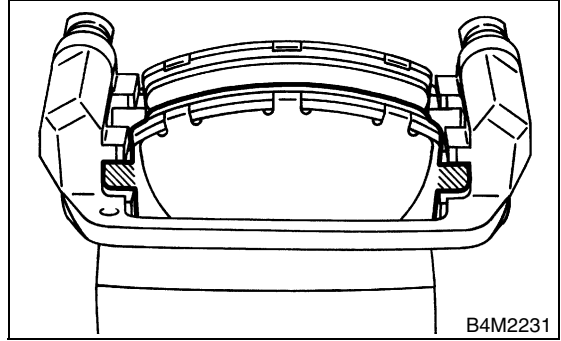
If the brake pad is difficult to remove, proceed as follows:

- (1) Remove the caliper body from support.
- (2) Remove the support.
- (3) Place a support in a vise between wooden blocks.



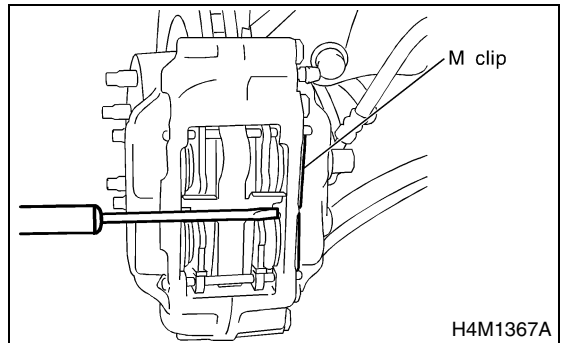
- (1) Support
- (2) Wooden blocks

- (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.

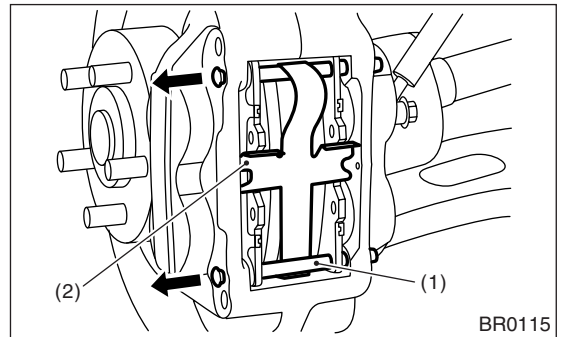


2. 16 INCH TYPE

- 1) Set the vehicle on a lift.
- 2) Loosen the wheel nuts.
- 3) Jack-up the vehicle, and then remove the front wheel.
- 4) Remove the M clip.

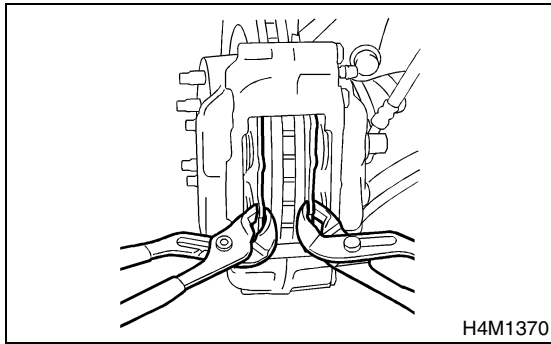


- 5) Remove the pad pins, then remove the cross spring.

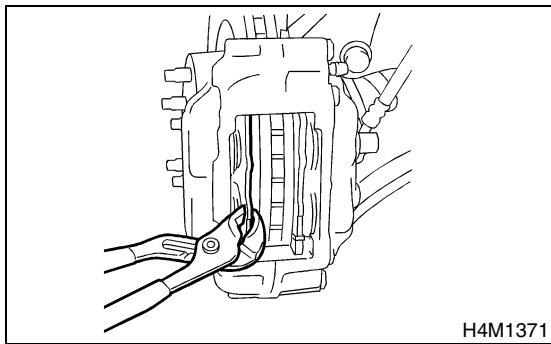


- (1) Pad pin
- (2) Cross spring

6) Use a wrench to expand the pads, then push the piston back.



7) Remove the pad.

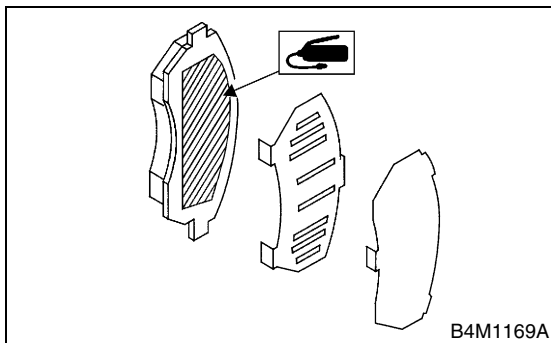


B: INSTALLATION

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 the pads on support.

4) Install the caliper body on support.

Tightening torque:

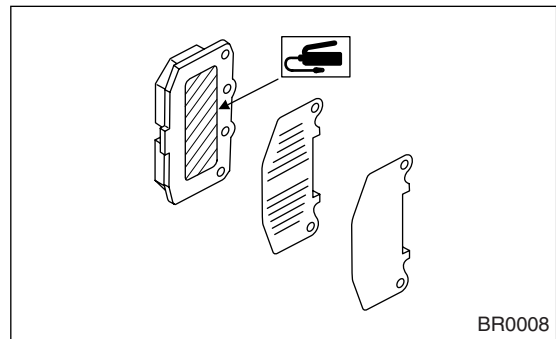
37 N·m (3.8 kgf·m, 27.5 ft·lb)

NOTE:

If it is difficult to push the piston during pad replacement, loosen the 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 the pads on caliper body.

3) Install the pad pins on caliper body.

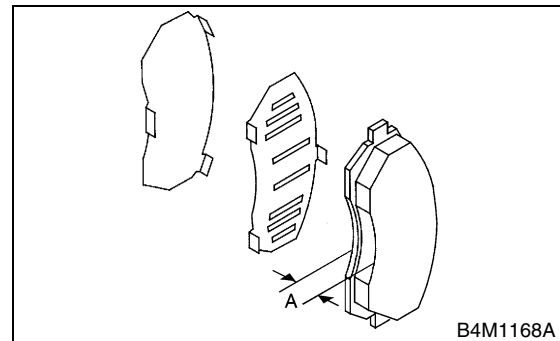
4) Install the M clip.

5) Install the cross spring.

C: INSPECTION

1. 14 INCH AND 15 INCH TYPE

Check the pad thickness A.



Pad thickness (including back metal)	Standard value	17 mm (0.67 in)
	Wear limit	7.5 mm (0.295 in)

CAUTION:

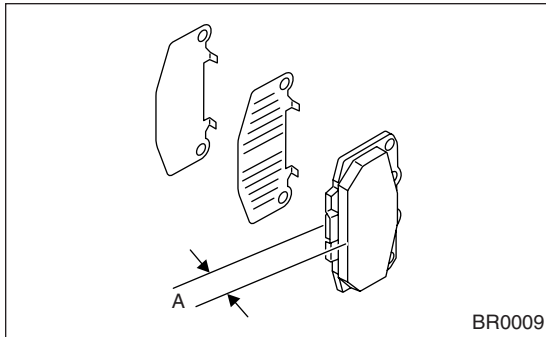
- Always replace the pads for both right and left wheels at the same time. Also replace the pad clips if they are twisted or worn.
- A wear indicator is provided on the inner disc brake pad. If the pad wears down to such an extent that the end of wear indicator contacts disc rotor, a squeaking sound is produced as the wheel rotates. If this sound is heard, replace the pad.
- Replace the pad if there is oil or grease on it.

FRONT BRAKE PAD

BRAKE

2. 16 INCH TYPE

Check the 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:

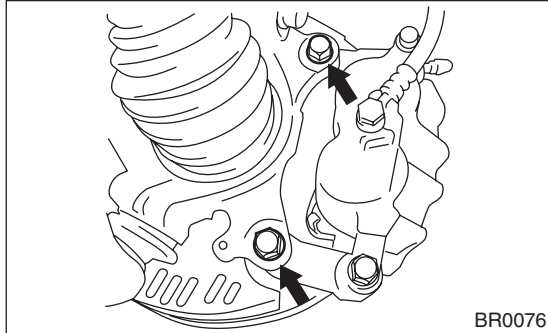
- Always replace the pads for both right and left wheels at the same time. Also replace the pad clips if they are twisted or worn.
- A wear indicator is provided on the inner disc brake pad. If the pad wears down to such an extent that the end of wear indicator contacts disc rotor, a squeaking sound is produced as the wheel rotates. If this sound is heard, replace the pad.
- Replace the pad if there is oil or grease on it.

3. Front Disc Rotor

A: REMOVAL

1. 14 INCH AND 15 INCH TYPE

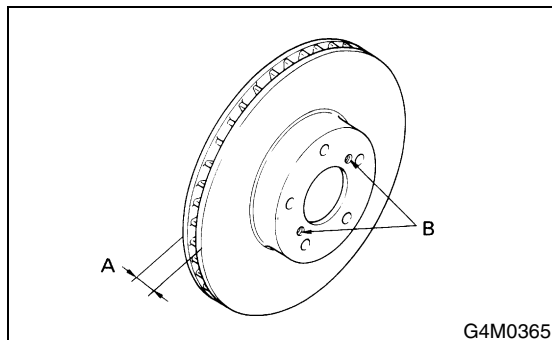
- 1) Set the vehicle on a lift.
- 2) Loosen the wheel nuts.
- 3) Jack-up the vehicle, and then remove the front wheel.
- 4) Remove the caliper body from housing, and suspend it from strut using a wire.



- 5) Remove the disc rotor.

NOTE:

If the disc rotor seizes up within the hub, drive the disc rotor out by installing an 8-mm bolt in holes B on rotor.

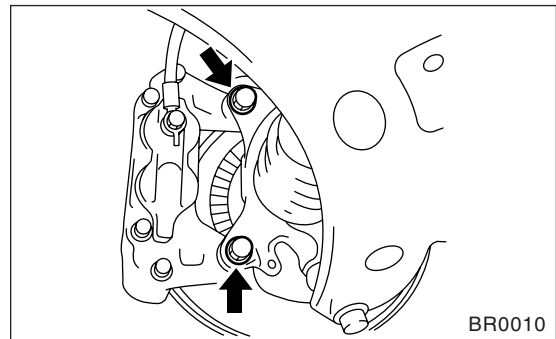


- 6) Clean mud and foreign particles from the caliper body assembly and support.

2. 16 INCH TYPE

- 1) Set the vehicle on a lift.
- 2) Loosen the wheel nut.
- 3) Jack-up the vehicle, and then remove the front wheel.

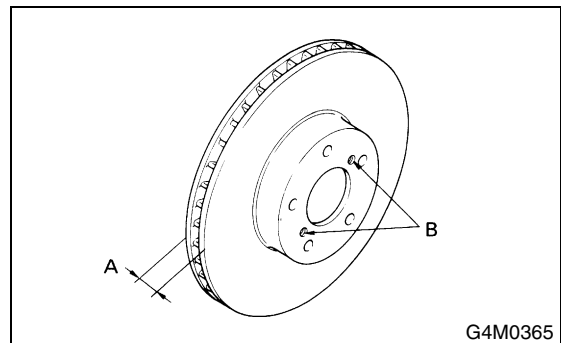
- 4) Remove the caliper body from housing and suspend from strut using a wire.



- 5) Remove the disc rotor from hub.

NOTE:

If the disc rotor seizes up within the hub, drive the disc rotor out by installing an 8-mm bolt in holes B on the rotor.



- 6) Clean mud and foreign particles from the caliper body assembly and support.

B: INSTALLATION

- 1) Install the disc rotor.
- 2) Install the caliper body on housing.

Tightening torque:

80 N·m (8.2 kgf·m, 59 ft·lb)

CAUTION:

- Always replace the pads for both right and left wheels at the same time. Also replace the 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 wear indicator contacts disc rotor, a squeaking sound is produced as the wheel rotates. If this sound is heard, replace the pad.

- 3) Install the wheel.

FRONT DISC ROTOR

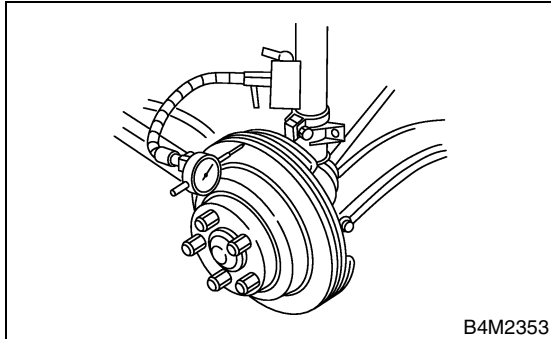
BRAKE

C: INSPECTION

- 1) Secure the disc rotor by tightening five wheel nuts.
- 2) Set a dial gauge on the disc rotor. Turn the disc rotor to check runout.

CAUTION:

Securely fix the disc rotor to hub.

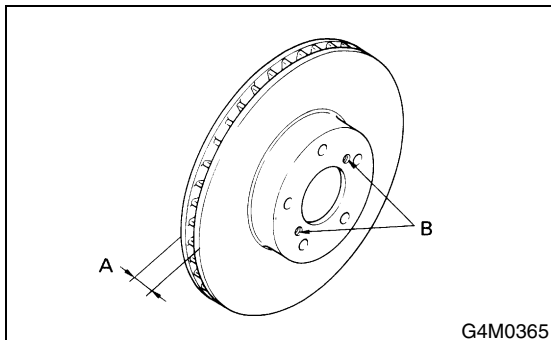


NOTE:

- Make sure that the dial gauge is set 5 mm (0.20 in) inward of rotor outer perimeter.
- If the disc rotor runout is above standard value, inspect the play of hub bearing axial direction and runout of axle hub. <Ref. to DS-23, INSPECTION, Front Axle.> If the bearing and hub are normal, replace the disc rotor.

Disc rotor runout limit: 0.075 mm (0.0030 in)

- 3) Measure the disc rotor thickness.
If the thickness of disc rotor is outside the standard value, replace the disc rotor.



NOTE:

Make sure that a micrometer is set 5 mm (0.20 in) inward of the rotor outer perimeter.

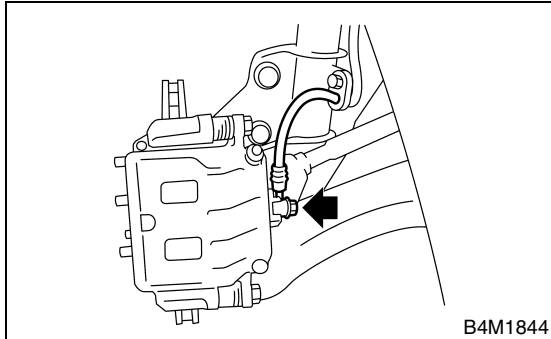
		Standard value	Service limit	Disc outer dia.
Disc rotor thickness A	14"	24 mm (0.94 in)	22 mm (0.87 in)	260 mm (10.24 in)
	15"	24 mm (0.94 in)	22 mm (0.87 in)	277 mm (10.91 in)
	16"	24 mm (0.94 in)	22 mm (0.87 in)	294 mm (11.57 in)

4. Front Disc Brake Assembly

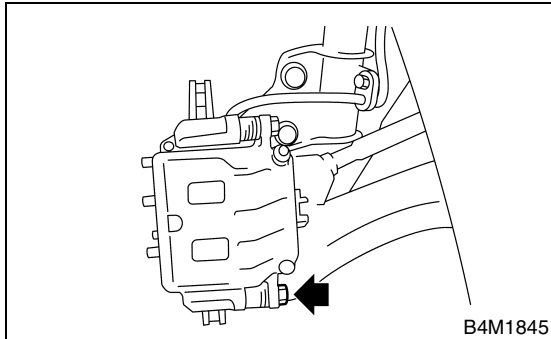
A: REMOVAL

1. 14 INCH AND 15 INCH TYPE

- 1) Set the vehicle on a lift.
- 2) Loosen the wheel nuts.
- 3) Jack-up the vehicle, and then remove the front wheel.
- 4) Remove the union bolt, and then disconnect the brake hose from caliper body assembly.



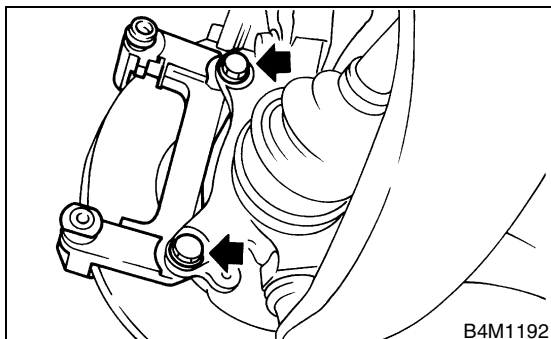
- 5) Remove the bolt securing lock pin to caliper body.



- 6) Raise the caliper body and move it toward vehicle center to separate it from support.
- 7) Remove the support from housing.

NOTE:

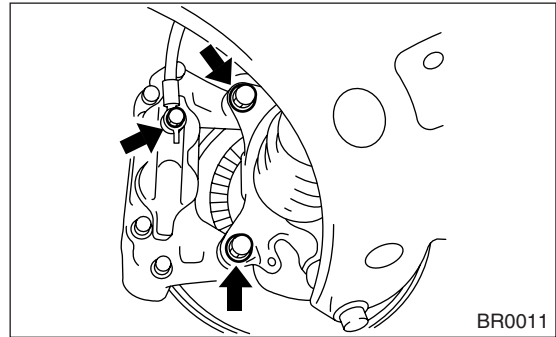
Remove the support only when replacing it or the rotor. It need not be removed when servicing the caliper body assembly.



- 8) Clean mud and foreign particles from the caliper body assembly and support.

2. 16 INCH TYPE

- 1) Set the vehicle on a lift.
- 2) Loosen the wheel nuts.
- 3) Jack-up the vehicle, and then remove the front wheel.
- 4) Remove the union bolt and, then disconnect the brake hose from caliper body assembly.
- 5) Remove the caliper body from housing.



- 6) Clean mud and foreign particles from the caliper body assembly and support.

FRONT DISC BRAKE ASSEMBLY

BRAKE

B: INSTALLATION

1. 14 INCH AND 15 INCH TYPE

1) Install the support on housing.

Tightening torque:

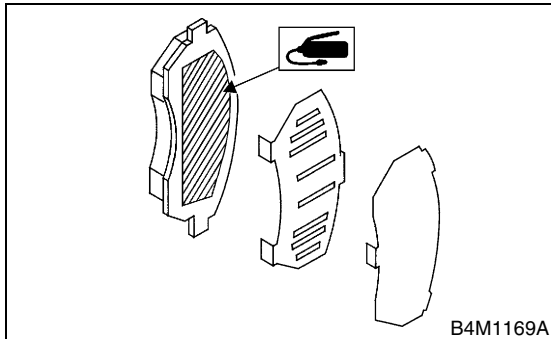
80 N·m (8.2 kgf·m, 59 ft-lb)

CAUTION:

- Always replace the pads for both right and left wheels at the same time. Also replace the 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 wear indicator contacts 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 the pads on support.

5) Install the caliper body on support.

Tightening torque:

37 N·m (3.8 kgf·m, 27.5 ft-lb)

6) Connect the brake hose.

Tightening torque:

18 N·m (1.8 kgf·m, 13.0 ft-lb)

CAUTION:

Replace the brake hose gaskets with new ones.

7) Bleed air from the brake system.

2. 16 INCH TYPE

1) Install the caliper body on housing.

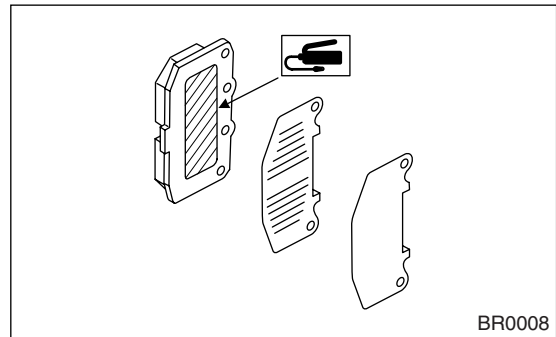
Tightening torque:

80 N·m (8.2 kgf·m, 59 ft-lb)

CAUTION:

- Always replace the pads for both right and left wheels at the same time. Also replace the 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 wear indicator contacts disc rotor, a squeaking sound is produced as the wheel rotates. If this sound is heard, replace the pad.

2) Apply thin coat of Molykote AS880N (Part No. 26298AC000) to the frictional portion between pad and pad inner shim.



3) Install the pads on caliper body.

4) Install the pad pins and cross spring on caliper body.

5) Install the M clip.

6) Connect the brake hose.

Tightening torque:

18 N·m (1.8 kgf·m, 13.0 ft-lb)

CAUTION:

Replace the brake hose gaskets with new ones.

7) Bleed air from the brake system.

C: DISASSEMBLY

1. 14 INCH TYPE

1) Clean mud and foreign particles from the caliper body assembly and support.

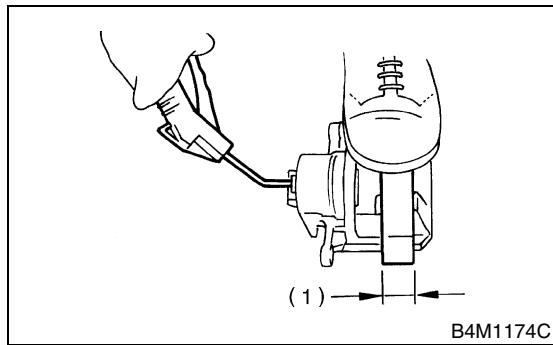
CAUTION:

Be careful not to allow foreign particles to enter inlet (at the brake hose connector).

2) Gradually supply compressed air via inlet of brake hose to force piston out.

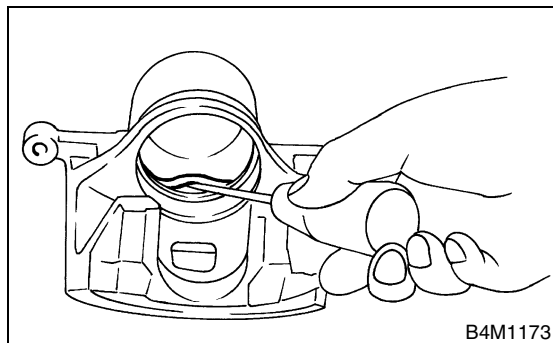
CAUTION:

- Place a wooden block as shown in the 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 the piston boot.
- 4) Remove the piston seal from caliper body cylinder.



5) Remove the guide pin and boot from caliper body.

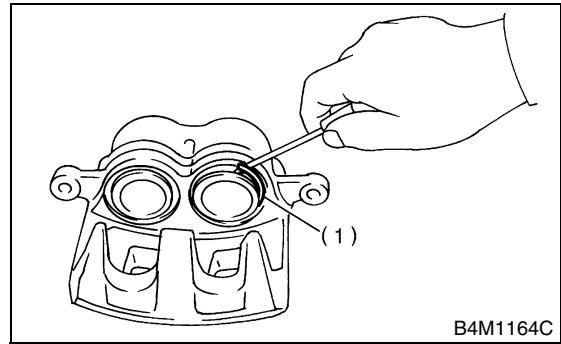
2. 15 INCH TYPE

1) Clean mud and foreign particles from the caliper body assembly and support.

CAUTION:

Be careful not to allow foreign particles to enter inlet (at brake hose connector).

2) Using a standard screwdriver, remove the boot ring from piston. (Except Australia model)

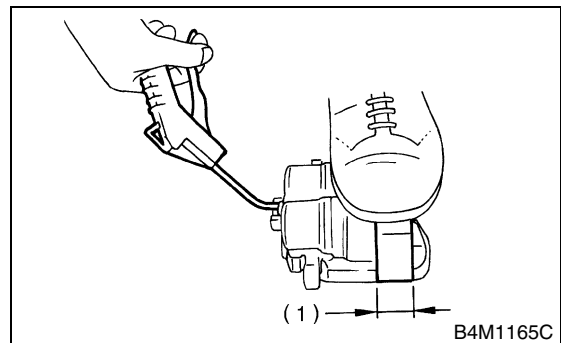


(1) Boot ring

- 3) Remove the boot from piston end.
- 4) Gradually supply compressed air via inlet of the brake hose to force piston out.

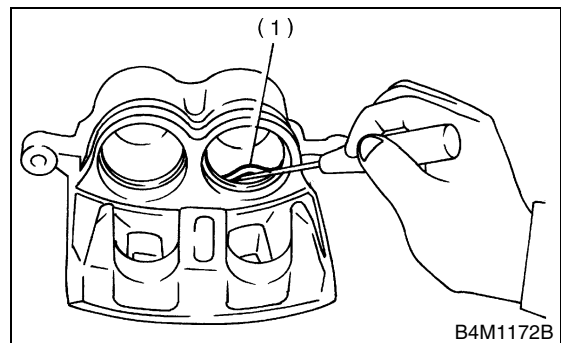
CAUTION:

Place a wooden block as shown in the figure to prevent damage to piston.



(1) Place a 30 mm (1.18 in) wide wooden block here.

5) Remove the piston seal from caliper body cylinder.



(1) Piston pin

6) Remove the lock pin boot and guide pin boot.

FRONT DISC BRAKE ASSEMBLY

BRAKE

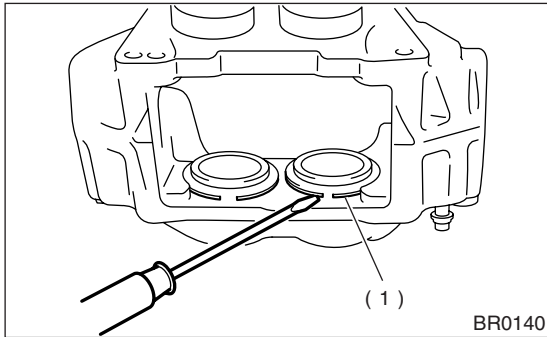
3. 16 INCH TYPE

1) Clean mud and foreign particles from the caliper body assembly.

CAUTION:

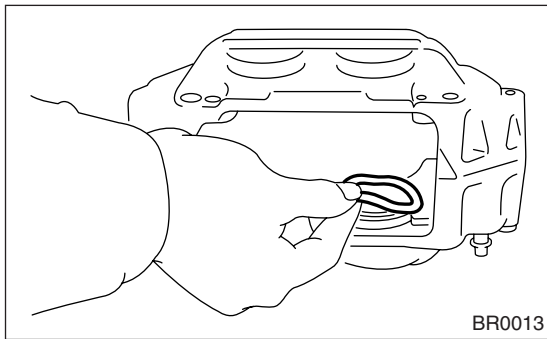
Be careful not to allow foreign particles to enter inlet (at brake hose connector).

2) Using a standard screwdriver, remove the boot ring from piston.



(1) Boot ring

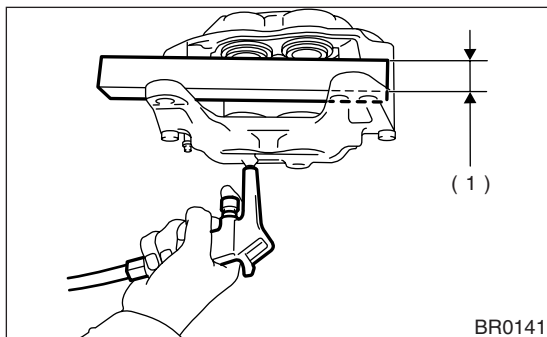
3) Remove the boot from piston end.



4) Gradually supply compressed air via inlet of the brake hose to force piston out.

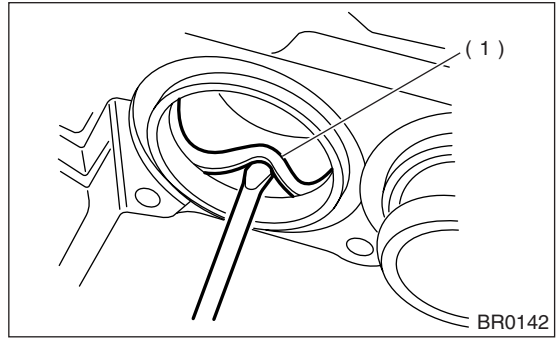
CAUTION:

Place a wooden block as shown in the figure to prevent damage to the piston.



(1) Place a 30 mm (1.18 in) wide wood block here.

5) Remove the piston seal from caliper body cylinder.



(1) Piston seal

D: ASSEMBLY

1. 14 INCH TYPE

- 1) Clean the caliper body interior using brake fluid.
- 2) Apply a coat of brake fluid to the piston seal and fit piston seal in groove on caliper body.
- 3) Apply a coat of brake fluid to the entire inner surface of cylinder and outer surface of piston.
- 4) Apply a coat of specified grease to the boot and fit in groove on ends of cylinder and install piston boot onto cylinder.

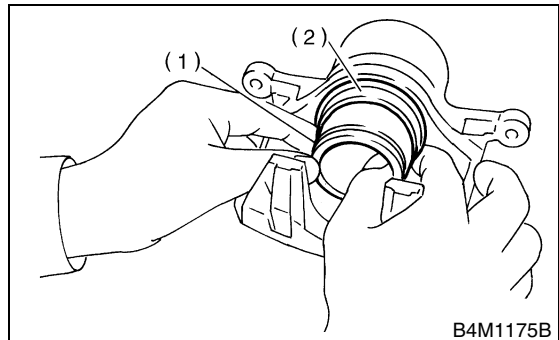
Grease:

NIGLUBE RX-2 (Part No. 003606000)

5) Insert the piston into cylinder.

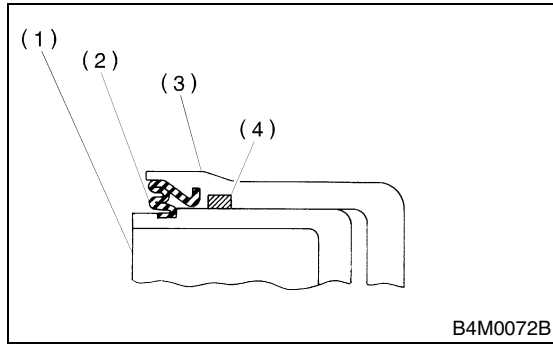
CAUTION:

Do not force the piston into cylinder.



(1) Piston
(2) Piston boot

6) Position the boot in grooves on cylinder and piston.



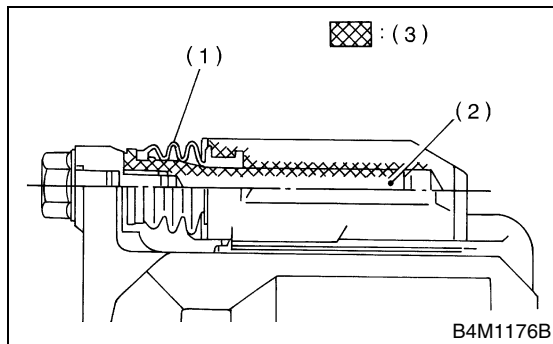
- (1) Piston
- (2) Piston boot
- (3) Caliper body
- (4) Piston seal

7) Apply a coat of specified grease to the lock pin and guide pin outer surface, cylinder inner surface, and boot grooves.

Grease:

NIGLUBE RX-2 (Part No. 003606000)

8) Install the lock and guide pin boot on support.



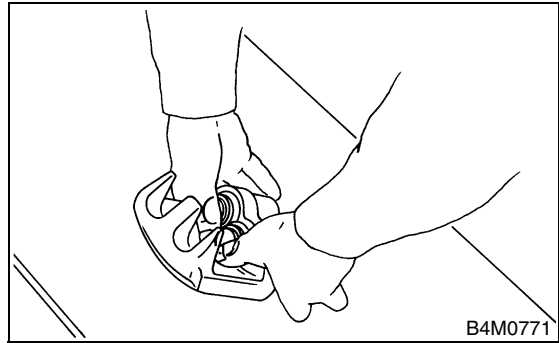
- (1) Pin boot
- (2) Lock pin or guide pin
- (3) Apply grease.

2. 15 INCH TYPE

- 1) Clean the caliper body interior using brake fluid.
- 2) Apply a coat of brake fluid to the piston seal and fit piston seal in groove on caliper body.
- 3) Apply a coat of brake fluid to the entire inner surface of cylinder and outer surface of piston.
- 4) Insert the piston into cylinder.

CAUTION:

Do not force the piston into cylinder.

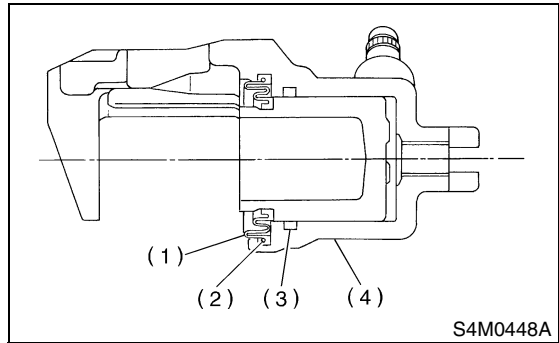


5) Apply a coat of specified grease to the boot and fit in groove on ends of cylinder and piston.

Grease:

NIGLUBE RX-2 (Part No. 003606000)

To facilitate installation, fit the boot starting with piston end.



- (1) Piston boot
- (2) Boot ring
- (3) Piston seal
- (4) Caliper body

6) Position the boot in grooves on cylinder and piston.

7) Install the boot ring. Be careful not scratch the boot.

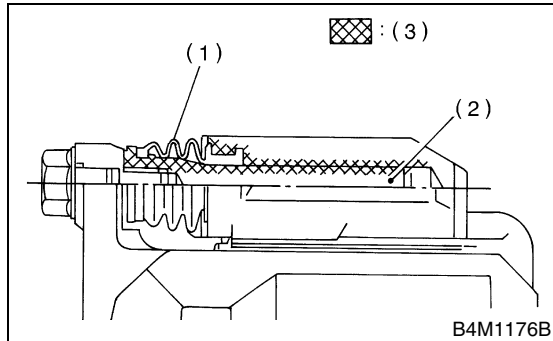
FRONT DISC BRAKE ASSEMBLY

BRAKE

8) Apply a coat of specified grease to the lock pin and guide pin, outer surface, cylinder inner surface, and boot grooves.

Grease:

NIGLUBE RX-2 (Part No. 003606000)



- (1) Pin boot
- (2) Lock pin or guide pin
- (3) Apply grease.

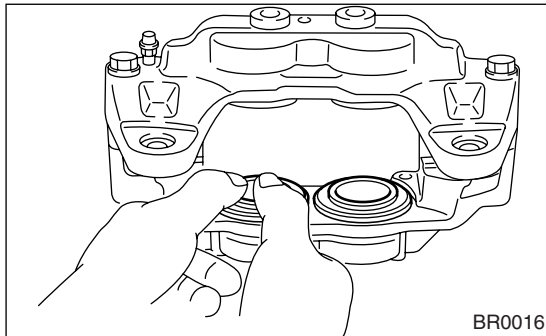
9) Install the lock pin boot and guide pin boot on support.

3. 16 INCH TYPE

- 1) Clean the caliper body interior using brake fluid.
- 2) Apply a coat of brake fluid to the piston seal and fit piston seal in groove on caliper body.
- 3) Apply a coat of brake fluid to the entire inner surface of cylinder and outer surface of piston.
- 4) Insert the piston into cylinder.

CAUTION:

Do not force the piston into cylinder.

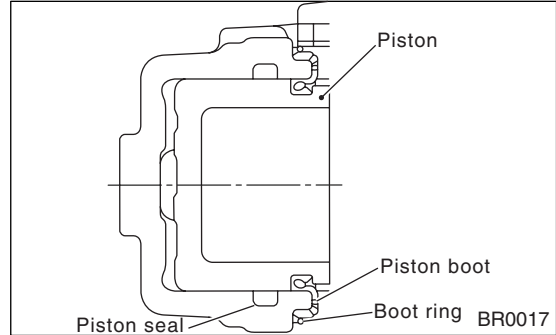


5) Apply a coat of specified grease to the boot and fit in groove on ends of cylinder and piston.

Grease:

NIGLUBE RX-2 (Part No. 003606000)

To facilitate installation, fit the boot starting with piston end.



6) Position the boot in grooves on cylinder and piston.

7) Install the boot ring. Be careful not scratch the boot.

E: INSPECTION

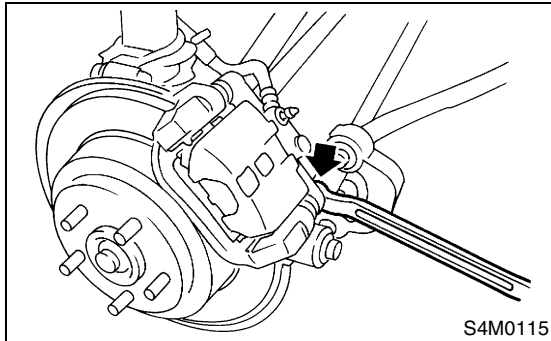
- 1) Repair or replace the faulty parts.
- 2) Check the caliper body and piston for uneven wear, damage or rust.
- 3) Check the rubber parts for damage or deterioration.

5. Rear Brake Pad

A: REMOVAL

1. 14 INCH TYPE

- 1) Set the vehicle on a lift.
- 2) Loosen the wheel nuts.
- 3) Jack-up the vehicle, and then remove the rear wheel.
- 4) Remove the lower caliper bolt.



- 5) Raise the caliper body upward and support it.

NOTE:

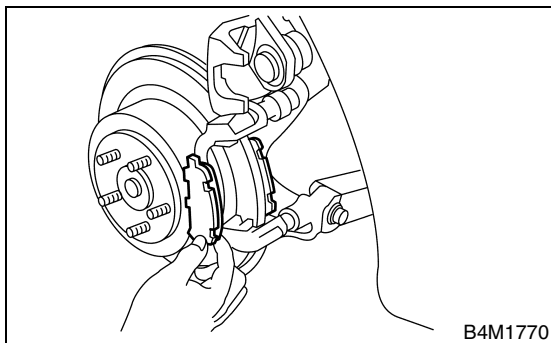
Do not disconnect the brake hose from caliper body.

- 6) Remove the pad.

NOTE:

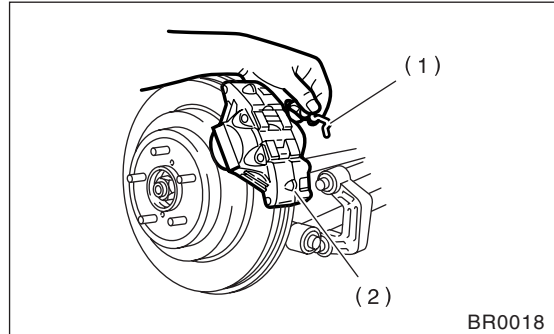
If the brake pad is difficult to remove, use the same procedure as for front disc brake pad.

<Ref. to BR-22, REMOVAL, Front Brake Pad.>



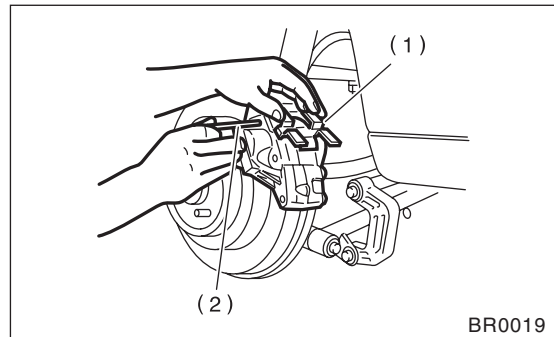
2. 15 INCH TYPE

- 1) Set the vehicle on a lift.
- 2) Loosen the wheel nuts.
- 3) Jack-up the vehicle, and then remove the front wheel.
- 4) Remove the M clip.



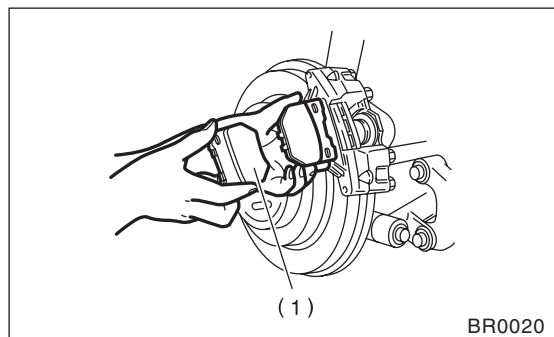
- (1) M clip
- (2) Caliper

- 5) Remove the two pad pins.
- 6) Remove the cross spring.



- (1) Cross spring
- (2) Pad pin

- 7) Expand the pads and push piston back.
- 8) Remove the pad and shim.



- (1) Brake pad

REAR BRAKE PAD

BRAKE

B: INSTALLATION

1. 14 INCH TYPE

- 1) Apply a thin coat of Molykote AS880N (Part No. 26298AC000) to the frictional portion between pad and pad clip.
- 2) Install the pad on support.
- 3) Install the caliper body on support.

Tightening torque:

39 N·m (4.0 kgf·m, 28.9 ft·lb)

NOTE:

If it is difficult to push the piston during pad replacement, loosen air bleeder to facilitate work.

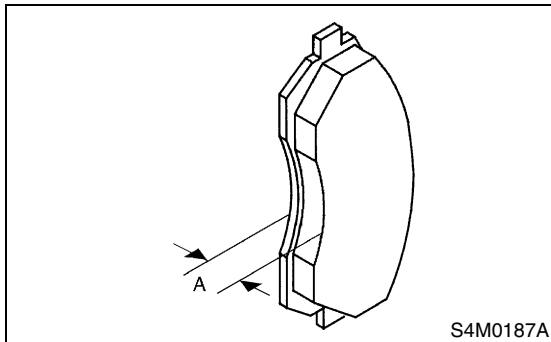
2. 15 INCH TYPE

- 1) Apply a thin coat of Molykote AS880N (Part No. 26298AC000) to frictional portion between pad and pad inner shim.
- 2) Install the pads on caliper body.
- 3) Install the cross spring.
- 4) Install the pad pins on caliper body.
- 5) Install the M clip.

C: INSPECTION

1. 14 INCH TYPE

Check pad thickness A.



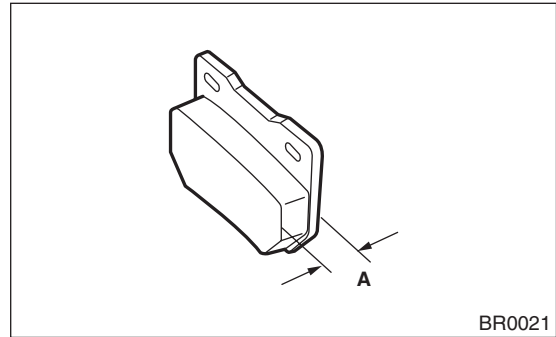
Pad thickness (including back metal)	Standard value	14.0 mm (0.551 in)
	Wear limit	6.5 mm (0.256 in)

CAUTION:

- Always replace the pads for both right and left wheels at the same time. Also replace the 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 wear indicator contacts disc rotor, a squeaking sound is produced as the wheel rotates. If this sound is heard, replace the pad.
- Replace the pad if there is oil or grease on it.

2. 15 INCH TYPE

Check the pad thickness A.



Pad thickness (including back metal)	Standard value	16.0 mm (0.63 in)
	Wear limit	6.0 mm (0.236 in)

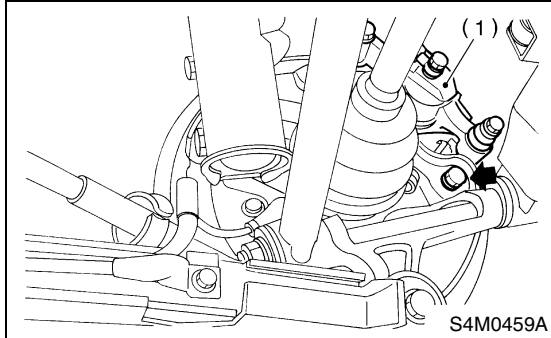
CAUTION:

- Always replace the pads for both right and left wheels at the same time. Also replace the 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 wear indicator contacts disc rotor, a squeaking sound is produced as the wheel rotates. If this sound is heard, replace the pad.
- Replace the pad if there is oil or grease on it.

6. Rear Disc Rotor

A: REMOVAL

- 1) Lift-up the vehicle, and then remove the wheels.
- 2) Remove the two mounting bolts, and then remove the disc brake assembly.



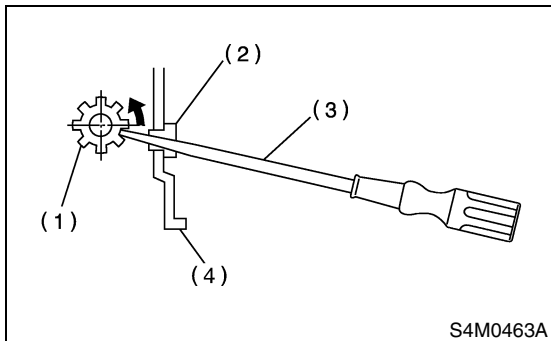
(1) Disk brake

- 3) Suspend the disc brake assembly so that hose is not stretched.
- 4) Pull down and release the parking brake.
- 5) Remove the disc rotor.

NOTE:

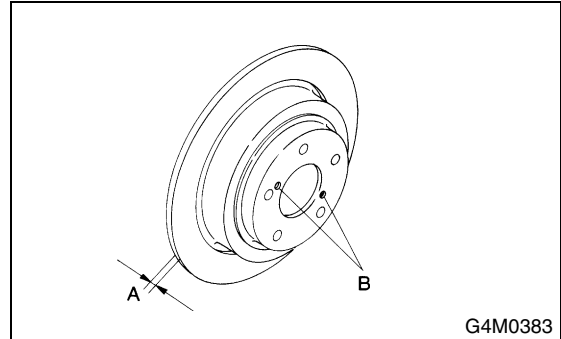
If the disc rotor is difficult to remove try following two methods in order.

- (1) Turn the 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 the disc rotor seizes up within hub, drive the disc rotor out by installing an 8-mm bolt in holes B on rotor.



B: INSTALLATION

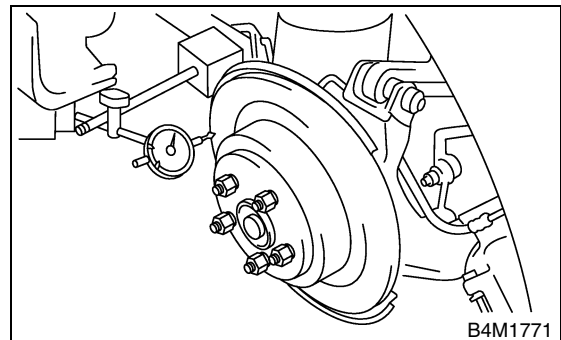
- 1) Install in the reverse order of removal.
- 2) Adjust the parking brake. <Ref. to PB-11, ADJUSTMENT, Parking Brake Assembly (Rear Disc Brake).>

C: INSPECTION

- 1) Secure the disc rotor by tightening five wheel nuts.
- 2) Set a dial gauge on the disc rotor. Turn the disc rotor to check runout.

CAUTION:

Securely fix the disc rotor to hub.



NOTE:

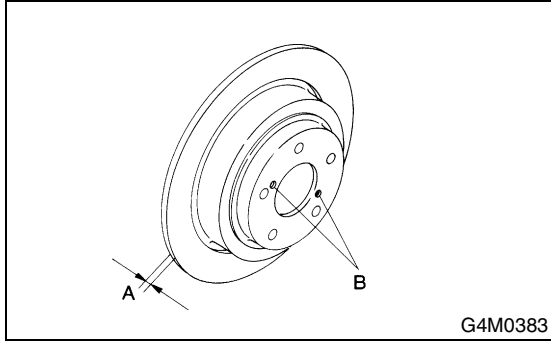
Make sure that a dial gauge is set 5 mm (0.20 in) inward of rotor outer perimeter.

Disc rotor runout limit:
0.070mm (0.0027 in)

REAR DISC ROTOR

BRAKE

3) Measure the disc rotor thickness.



NOTE:

Make sure that a micrometer is set 5 mm (0.20 in) inward of the rotor outer perimeter.

Disc rotor thickness: A (14 inch type)

Standard value

10 mm (0.39 in)

Service limit

8.5 mm (0.335 in)

Disc rotor thickness: A (15 inch type)

Standard value

18 mm (0.71 in)

Service limit

16 mm (0.63 in)

7. Rear Disc Brake Assembly

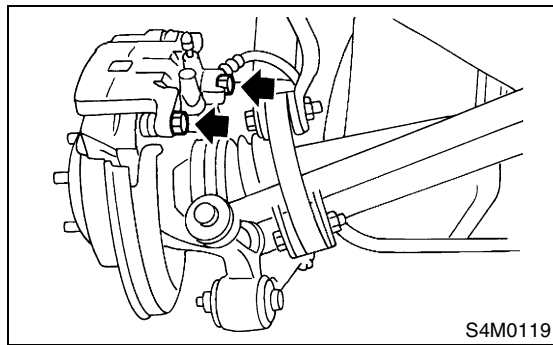
A: REMOVAL

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 a lift.
- 2) Loosen the wheel nuts.
- 3) Lift-up the vehicle, and then remove the wheels.
- 4) Disconnect the brake hose from caliper body assembly.
- 5) Remove the bolt securing lock pin to caliper body.



6) Raise the caliper body and move it toward vehicle center to separate it from support.

7) Remove the support from housing.

NOTE:

Remove the support only when replacing it or the rotor. It need not be removed when servicing the caliper body assembly.

8) Clean mud and foreign particles from the caliper body assembly and support.

CAUTION:

Be careful not to allow foreign particles to enter inlet (at brake hose connector).

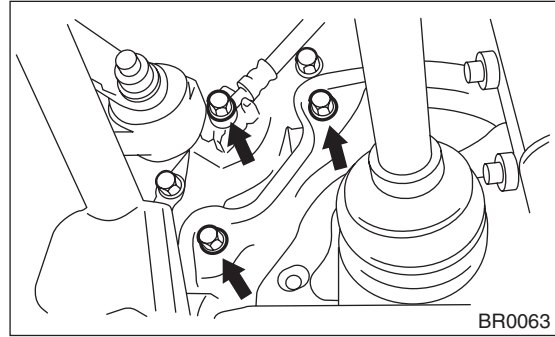
2. 15 INCH TYPE

CAUTION:

Do not allow brake fluid to come in contact with vehicle body; wipe off completely if spilled.

- 1) Set the vehicle on a lift.
- 2) Loosen the wheel nuts.
- 3) Lift-up the vehicle, and then remove the wheels.
- 4) Remove the pads from caliper body. <Ref. to BR-33, REMOVAL, Rear Brake Pad.>
- 5) Disconnect the brake hose from caliper body assembly.

6) Remove the caliper body from housing.



7) Clean mud and foreign particles from the caliper body assembly.

CAUTION:

Be careful not to allow foreign particles to enter inlet (at brake hose connector).

B: INSTALLATION

1. 14 INCH TYPE

- 1) Install the disc rotor on hub.
- 2) Install the support on housing.

Tightening torque:

52 N·m (5.3 kgf·m, 38.3 ft·lb)

CAUTION:

- Always replace the pads for both right and left wheels at the same time. Also replace the 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 wear indicator contacts disc rotor, a squeaking sound is produced as the wheel rotates. If this sound is heard, replace the pad.
- Replace the 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 the pads on support.

5) Install the caliper body on support.

Tightening torque:

37 N·m (3.8 kgf·m, 27.5 ft·lb)

6) Connect the 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 the brake hose gaskets with new ones.

7) Bleed air from the brake system.

REAR DISC BRAKE ASSEMBLY

BRAKE

2. 15 INCH TYPE

- 1) Install the disc rotor on hub.
- 2) Install the caliper body on housing.

Tightening torque:

52 N·m (5.3 kgf-m, 38.3 ft-lb)

CAUTION:

- Always replace the pads for both right and left wheels at the same time. Also replace the 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 wear indicator contacts disc rotor, a squeaking sound is produced as the wheel rotates. If this sound is heard, replace the pad.

- Replace the 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 the pads on caliper body.
- 5) Connect the brake hose.

Tightening torque:

18 N·m (1.8 kgf-m, 13.0 ft-lb)

CAUTION:

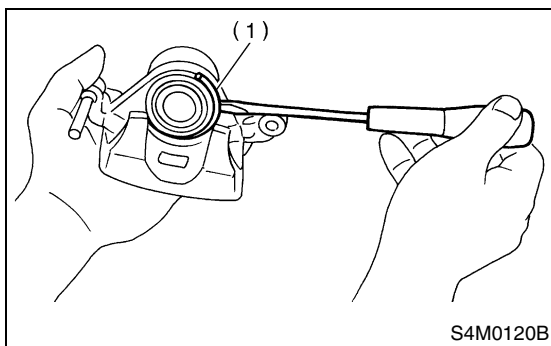
- The brake hose must be connected without any twist.
- Replace the brake hose gaskets with new ones.

6) Bleed air from the brake system.

C: DISASSEMBLY

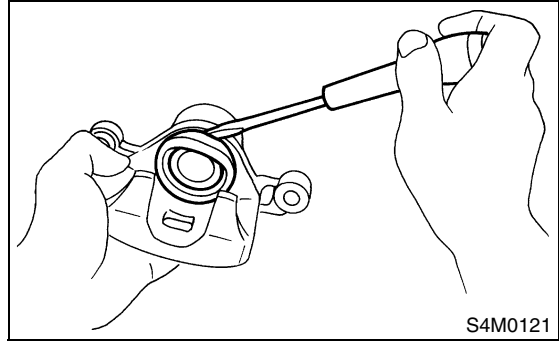
1. 14 INCH TYPE

- 1) Remove the boot ring.



(1) Boot ring

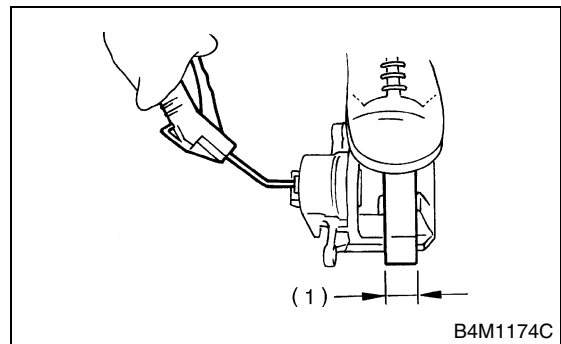
- 2) Remove the piston boot.



- 3) Gradually supply compressed air via inlet of the brake hose to force piston out.

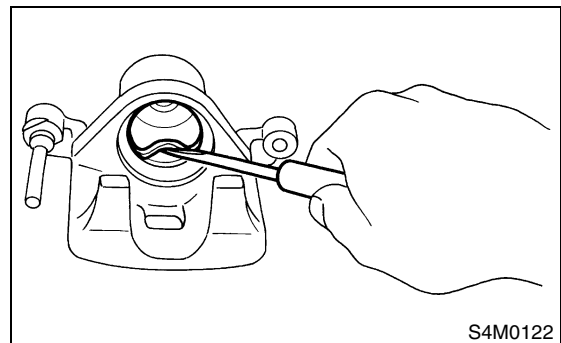
CAUTION:

- Place a wooden block as shown in the figure to prevent damage to piston.
- Do not apply excessively high-pressure.



(1) Place a 30 mm (1.18 in) wide wooden block here.

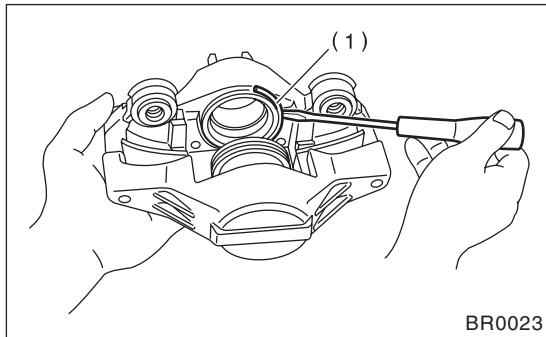
- 4) Remove the piston seal from caliper body cylinder.



- 5) Remove the lock pin sleeve and boot from caliper body.
- 6) Remove the guide pin boot.

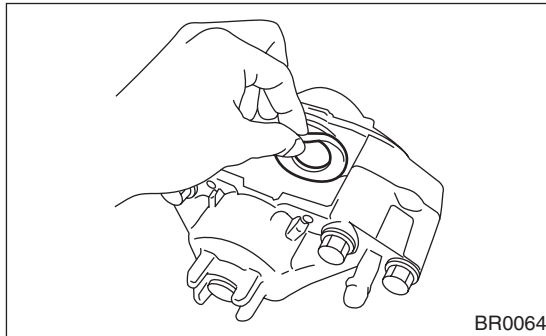
2. 15 INCH TYPE

1) Remove the boot ring.



(1) Boot ring

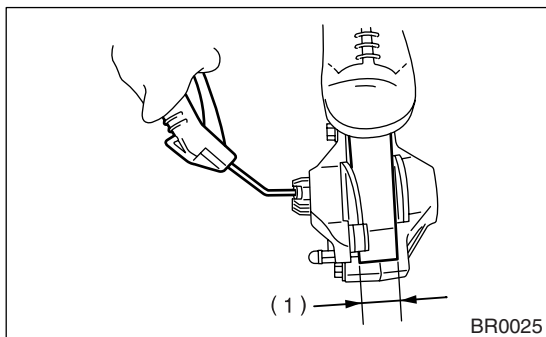
2) Remove the piston boot.



3) Gradually supply compressed air via inlet of the brake hose to force piston out.

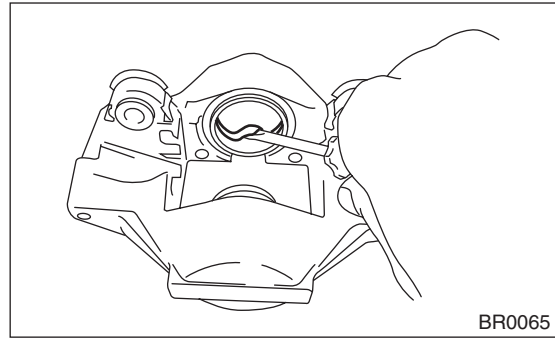
CAUTION:

- Place a wooden block as shown in the 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 the piston seal from caliper body cylinder.



D: ASSEMBLY

1. 14 INCH TYPE

- 1) Clean the caliper body interior using brake fluid.
- 2) Apply a coat of brake fluid to the piston seal and fit piston seal in groove on caliper body.
- 3) Apply a coat of brake fluid to the entire inner surface of cylinder and outer surface of piston.
- 4) Insert the piston into cylinder.

CAUTION:

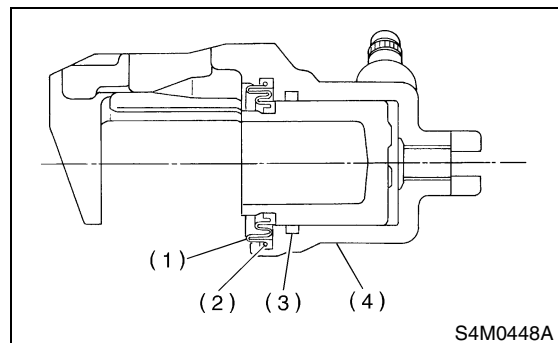
Do not force piston into cylinder.

- 5) Apply a coat of specified grease to the boot and fit in groove on ends of cylinder and piston.

Grease:

NIGLUBE RX-2 (Part No. 003606000)

- 6) Install the piston boot to caliper body, and attach boot ring.



- (1) Piston boot
- (2) Boot ring
- (3) Piston seal
- (4) Caliper body

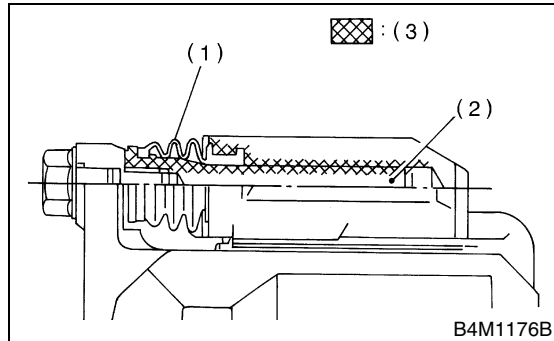
REAR DISC BRAKE ASSEMBLY

BRAKE

7) Apply a coat of specified grease to the 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 the guide pin boot on support.
9) Install the lock pin boot on support and insert lock pin sleeve into place.

2. 15 INCH TYPE

- 1) Clean the caliper body interior using brake fluid.
- 2) Apply a coat of brake fluid to the piston seal and fit piston seal in groove on caliper body.
- 3) Apply a coat of brake fluid to the entire inner surface of cylinder and outer surface of piston.
- 4) Insert the piston into cylinder.

CAUTION:

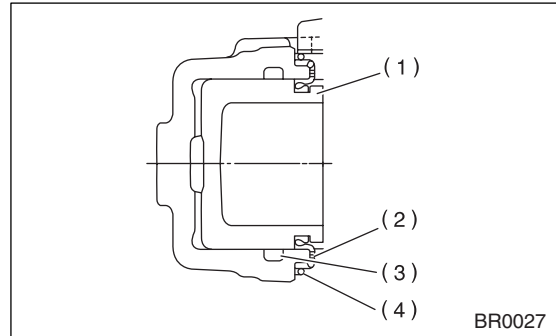
Do not force piston into cylinder.

5) Apply a coat of specified grease to the 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

E: INSPECTION

- 1) Repair or replace the faulty parts.
- 2) Check the caliper body and piston for uneven wear, damage or rust.
- 3) Check the rubber parts for damage or deterioration.

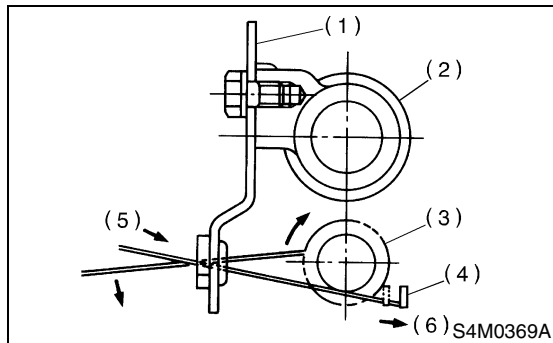
8. Rear Drum Brake Shoe

A: REMOVAL

- 1) Loosen the wheel nuts, jack-up the vehicle, support it with rigid racks, and remove the wheel.
- 2) Release the parking brake.
- 3) Remove the brake drum from brake assembly.

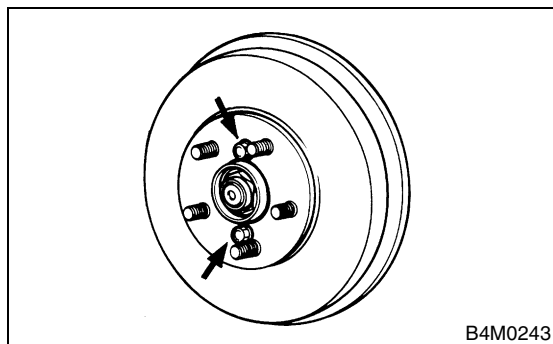
NOTE:

- If it is difficult to remove the brake drum, remove the adjusting hole cover from back plate, and then turn adjuster assembly pawls using a slot-type screwdriver until brake shoe separates from the drum.

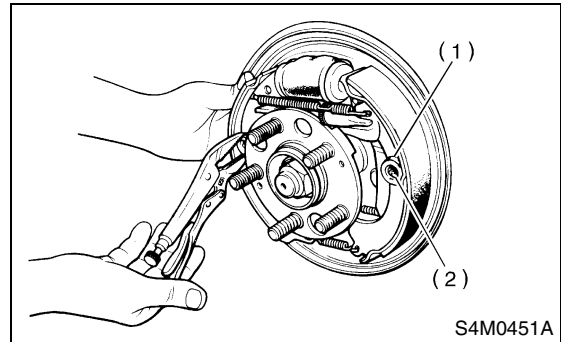


- (1) Back plate
- (2) Wheel cylinder
- (3) Adjuster ASSY pawls
- (4) Adjusting lever
- (5) Tightening direction
- (6) Push.

- If the brake drum is difficult to remove, drive it out by installing an 8-mm bolt into bolt hole in brake drum.

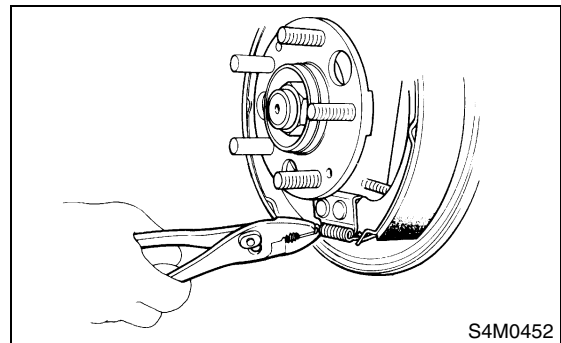


- 4) Hold the hold-down pin by securing rear of back plate with your hand.



- (1) Hold-down cup
- (2) Hold-down pin

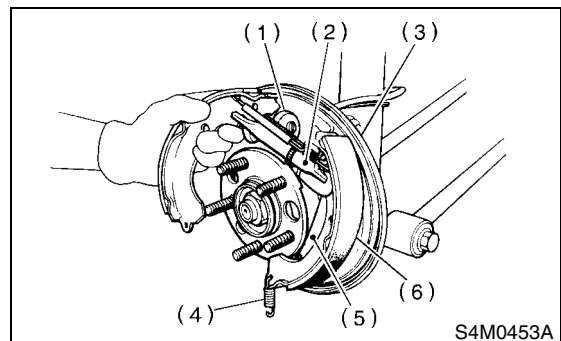
- 5) Disconnect the hold-down cup from hold-down pin by rotating hold-down cup.
- 6) Disconnect the lower shoe return spring from shoes.



- 7) Remove the shoes one by one from back plate with adjuster.

CAUTION:

Be careful not to bend the parking brake cable excessively when removing brake shoes.



- (1) Wheel cylinder
- (2) Adjuster
- (3) Back plate
- (4) Lower shoe return spring
- (5) Parking lever
- (6) Trailing shoe

REAR DRUM BRAKE SHOE

BRAKE

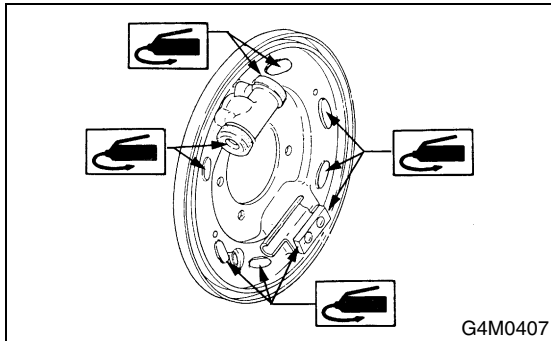
8) Disconnect the parking brake cable from parking lever.

B: INSTALLATION

- 1) Clean the back plate and wheel cylinder.
- 2) Apply grease to portions indicated by arrows in the figure.

Brake grease:

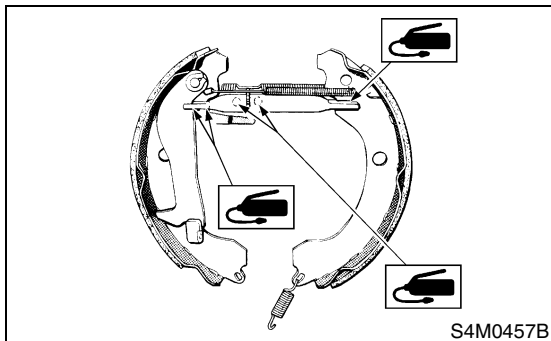
Dow Corning Molykote No. 7439 (Part No. 725191460)



3) Apply grease to the adjusting screw and both ends of adjuster.

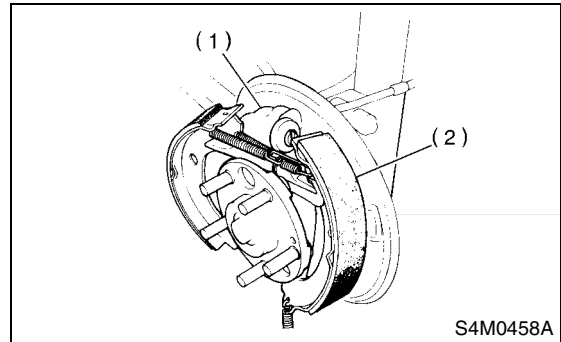
Brake grease:

Dow Corning Molykote No. 7439 (Part No. 725191460)



- 4) Connect the upper shoe return spring to shoes.
- 5) Connect the parking brake cable to parking lever.

6) While positioning the shoes (one at a time) in groove on wheel cylinder, secure the shoes.



- (1) Wheel cylinder
- (2) Shoe (Trailing)

- 7) Fix the shoes by connecting hold-down cup to hold-down pin.
- 8) Connect the 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 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 the upper and lower springs.

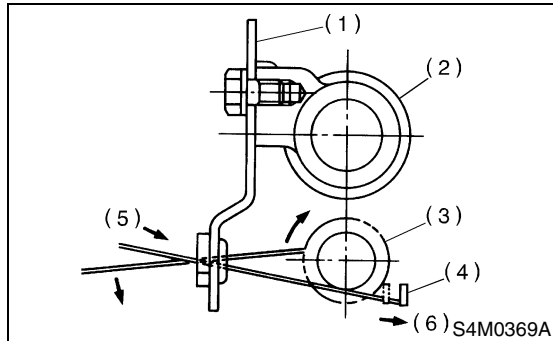
9. Rear Drum Brake Drum

A: REMOVAL

- 1) Loosen the wheel nuts, jack-up the vehicle, support it with rigid racks, and remove wheel.
- 2) Release the parking brake.
- 3) Remove the brake drum from brake assembly.

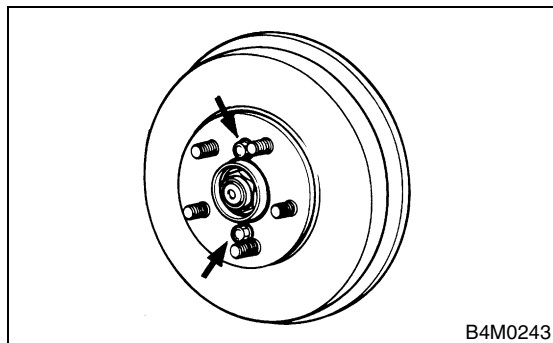
NOTE:

- If it is difficult to remove the brake drum, remove the adjusting hole cover from back plate, and then turn the adjuster assembly pawls using a slot-type screwdriver until brake shoe separates from drum.



- (1) Back plate
- (2) Wheel cylinder
- (3) Adjuster ASSY pawls
- (4) Adjusting lever
- (5) Tightening direction
- (6) Push.

- If the brake drum is difficult to remove, drive it out by installing an 8-mm bolt into bolt hole in the 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 inside diameter of brake drum.

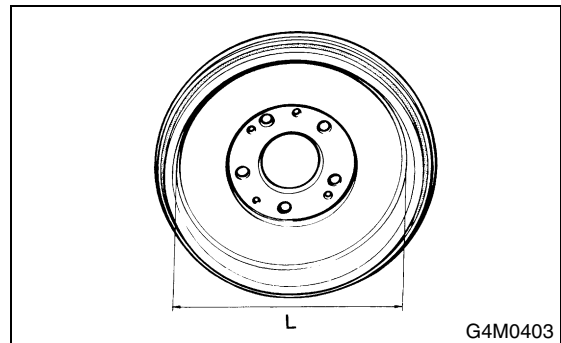
C: INSPECTION

- 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)



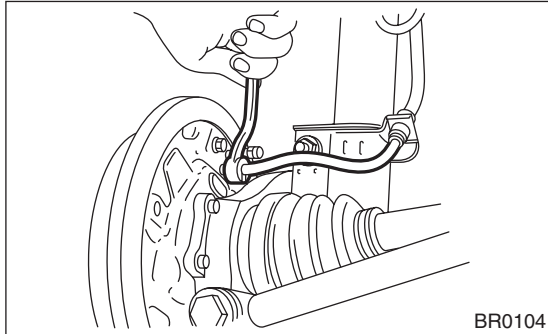
REAR DRUM BRAKE ASSEMBLY

BRAKE

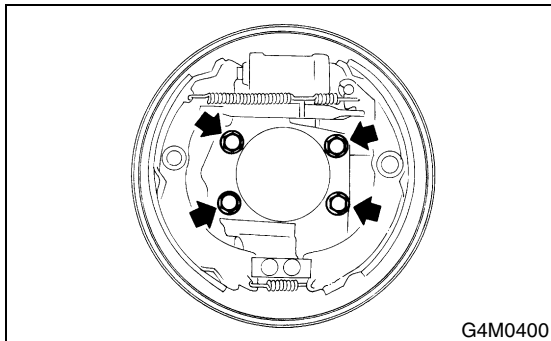
10. Rear Drum Brake Assembly

A: REMOVAL

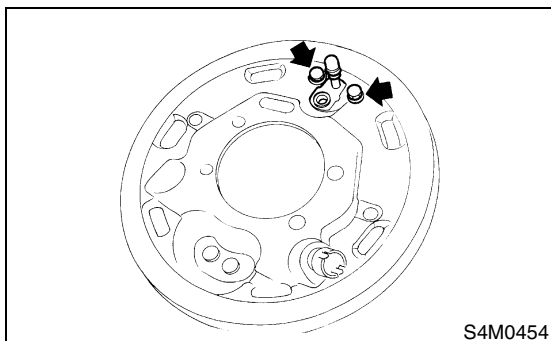
- 1) Loosen the wheel nuts, jack-up the vehicle, support it with rigid racks, and remove the wheel.
- 2) Release the parking brake.
- 3) Remove the brake drum from brake assembly. <Ref. to BR-43, REMOVAL, Rear Drum Brake Drum.>
- 4) Remove the brake shoe. <Ref. to BR-41, REMOVAL, Rear Drum Brake Shoe.>
- 5) Unscrew the brake hose flare nut and disconnect brake hose.



- 6) Remove the hub. <Ref. to DS-24, REMOVAL, Rear Axle.>
- 7) Disconnect the ABS sensor from back plate. (only vehicle equipped ABS)
- 8) Remove the brake assembly.



- 9) Remove the bolts installing wheel cylinder on back plate, and remove it.

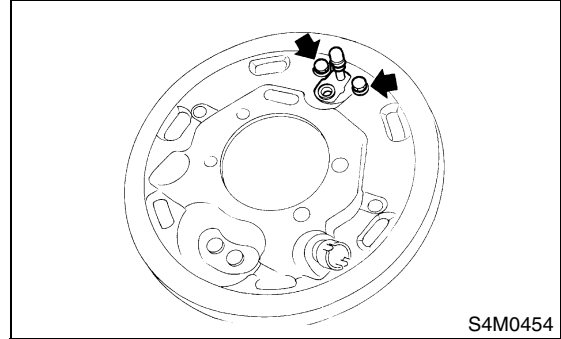


B: INSTALLATION

- 1) Clean the back plate and wheel cylinder.
- 2) Install the wheel cylinder on back plate, and tighten bolts.

Tightening torque:

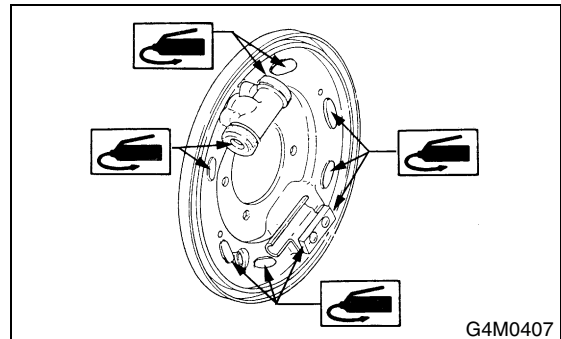
10 N·m (1.0 kgf-m, 7.2 ft-lb)



- 3) Apply grease to the portions indicated by arrows in the figure.

Brake grease:

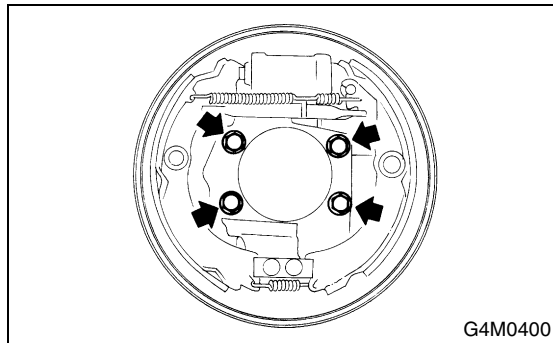
Dow Corning Molykote No. 7439 (Part No. 725191460)



4) Install the brake assembly on housing, and tighten the bolts to install back plate.

Tightening torque:

53 N-m (5.4 kgf-m, 39.1 ft-lb)



5) Install the hub. <Ref. to DS-27, INSTALLATION, Rear Axle.>

6) Connect the brake hose, and tighten the brake hose flange nut.

Tightening torque:

15 N-m (1.5 kgf-m, 10.8 ft-lb)

7) Connect the ABS sensor to back plate. (only vehicle equipped with ABS)

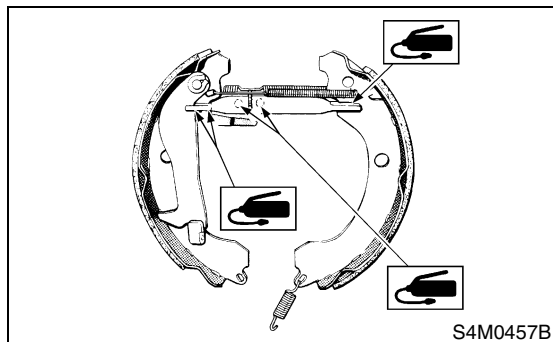
Tightening torque:

32 N-m (3.3 kgf-m, 24 ft-lb)

8) Apply grease to the adjusting screw and both ends of adjuster.

Brake grease:

Dow Corning Molykote No. 7439 (Part No. 725191460)



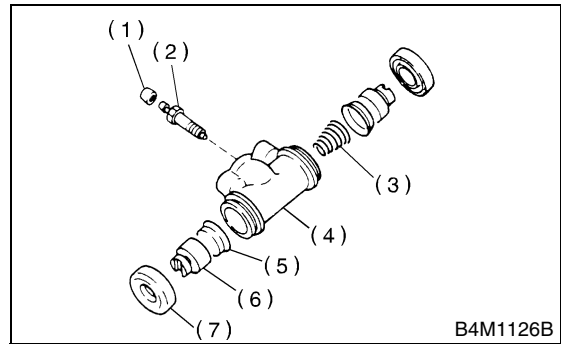
9) Install the brake shoe. <Ref. to BR-42, INSTALLATION, Rear Drum Brake Shoe.>

10) Install the brake drum. <Ref. to BR-43, INSTALLATION, Rear Drum Brake Drum.>

11) After installing the brake assembly, bleed air from the brake line. <Ref. to BR-57, Air Bleeding.>

C: DISASSEMBLY

1) Remove the 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 the piston, cup, spring and air bleeder screw and cap.

REAR DRUM BRAKE ASSEMBLY

BRAKE

D: ASSEMBLY

1) Clean all parts in brake fluid. Check and replace the faulty parts.

- Cup and boot for damage or fatigue
- Cylinder, piston and spring or damage or rust formation

2) Assemble in 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.

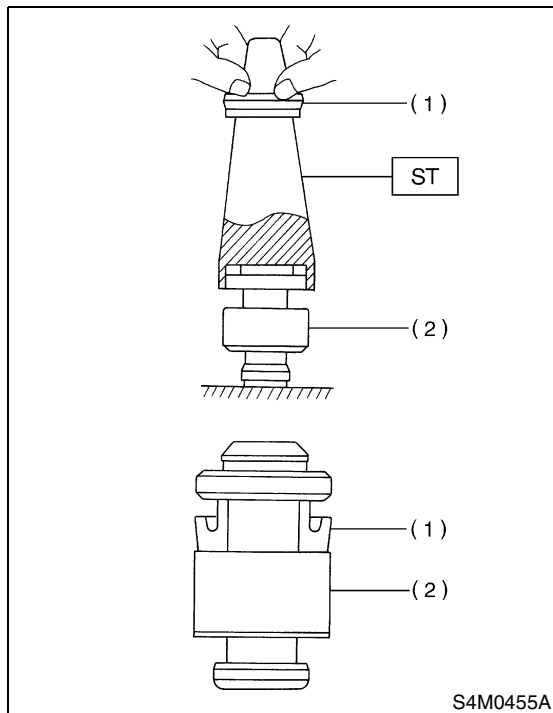
CAUTION:

- When replacing the repair kit, make sure that the sizes of cylinder and cup are same as those which were replaced.
- Use only the tool of 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

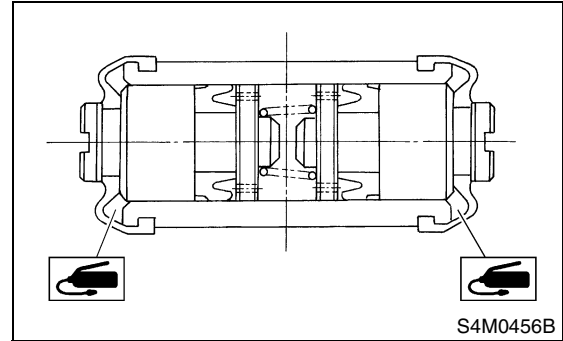
3) Apply rubber grease to the boot inside as shown in the figure.

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 the fluid level indicator harness connector.
- 3) Remove the brake pipes from master cylinder.
- 4) Remove the master cylinder mounting nuts, and take out master cylinder from brake booster.

CAUTION:

Be extremely careful not to spill the 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 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 the brake system. <Ref. to BR-57, PROCEDURE, Air Bleeding.>

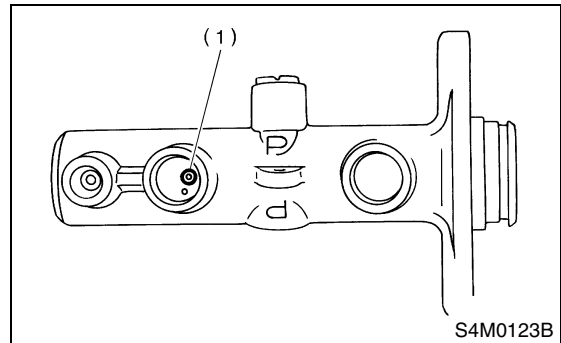
C: DISASSEMBLY

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 the work bench.
- 3) Clean the work bench.

2. DISASSEMBLING PROCEDURE

- 1) Remove the pin with drift pin which secures reserve tank to master cylinder.
- 2) Remove the cylinder pin with magnetic pick-up tool while pushing in primary piston. (with ABS)

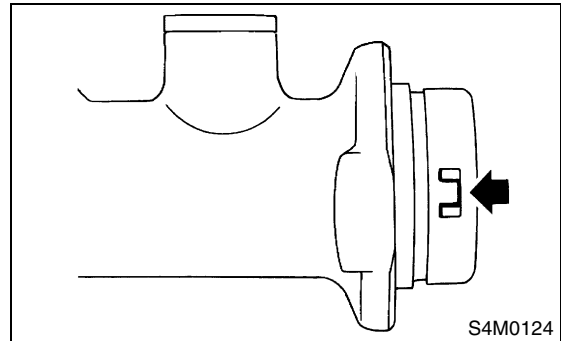


(1) Cylinder pin

- 3) Pry up the pawl and remove piston retainer.

NOTE:

The piston may jump out from master cylinder.



- 4) Extract the 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 the inside wall of cylinder, pistons and piston cups. Be careful not to damage the 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.

MASTER CYLINDER

BRAKE

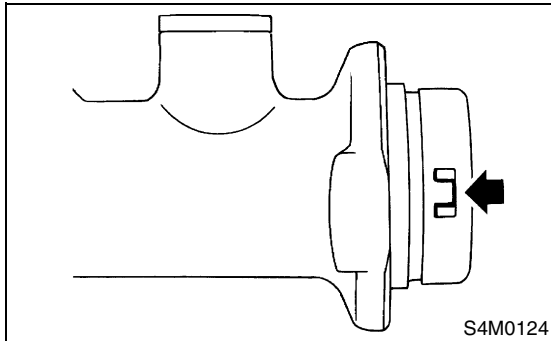
D: ASSEMBLY

1. PRECAUTIONS FOR ASSEMBLING

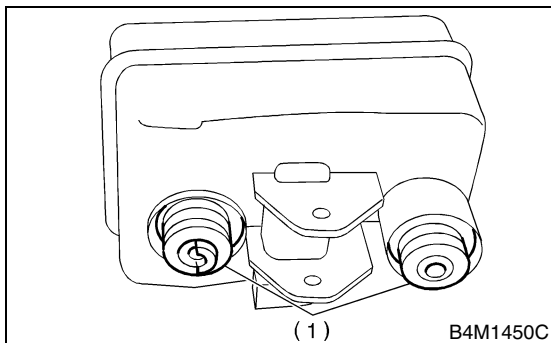
- 1) When assembling, be sure to use the recommended brake fluid.
- 2) Ensure that the inside wall of cylinder, pistons, and piston cups are free from dirt when assembling.
- 3) Be extremely careful not to damage, scratch, or dent the cylinder inside wall, pistons, and piston cups.
- 4) Do not drop the parts. Never attempt to use any part that has been dropped accidentally.

2. ASSEMBLING PROCEDURE

- 1) Assembling the piston assembly:
Apply recommended brake fluid to the inside wall of cylinder, and to outer surface of the piston assembly, and install the piston assemblies carefully into cylinder.
- 2) Assembling the cylinder pin:
Press the pawl and install the piston retainer into master cylinder.



- 3) Install the seal to reservoir tank.



(1) Seal

- 4) Install the pin with drift pins which secure 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 the valve stopper, or gasket, replace the faulty part.

CAUTION:

- The primary and secondary pistons must be replaced as complete assemblies.
- The service limit of 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 the connector for brake fluid level indicator.
- (2) Remove the brake pipes from master cylinder.
- (3) Remove the master cylinder installing nuts.
- (4) Disconnect the vacuum hose from brake booster.

2) Remove the following parts from pedal bracket.

- (1) Snap pin and clevis pin
- (2) Four brake booster installing nuts

3) Remove the brake booster while shunning brake pipes.

NOTE:

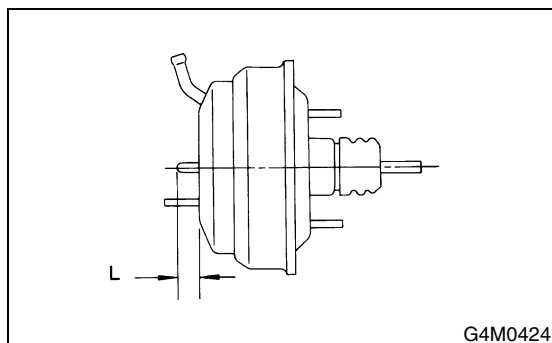
- Be careful not to drop the brake booster. The brake booster should be discarded if it has been dropped.
- Use special care when handling the operating rod.

If excessive force is applied to the 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 the brake booster on floor.
- Do not change the push rod length. If it has been changed, reset the projected length "L" to standard length.

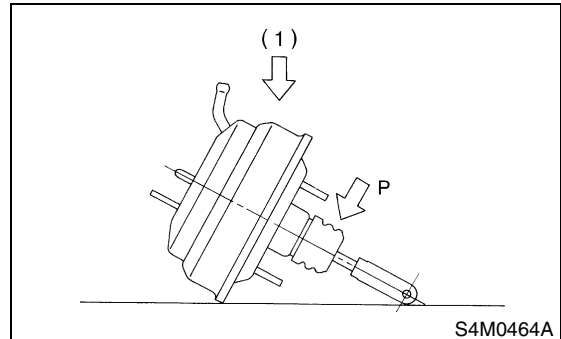
Standard:

L = 10.4 mm (0.41 in)



CAUTION:

If external force is applied from above when the brake booster is placed in this position, the resin portion as indicated by "P", may be damaged.



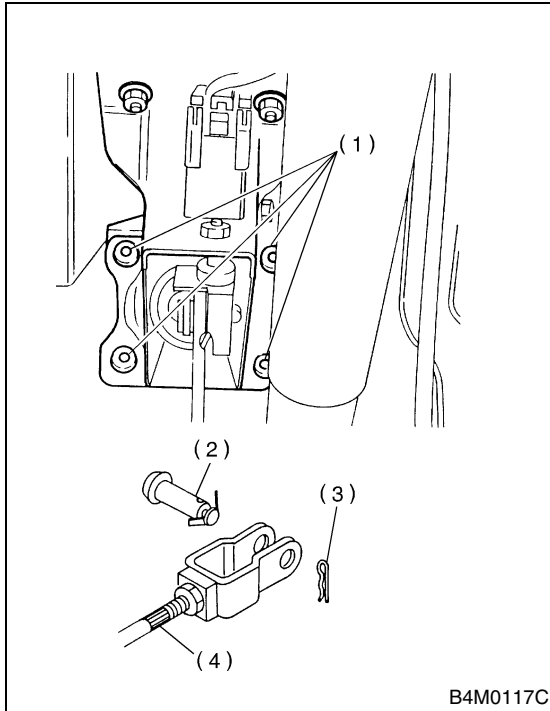
(1) Force

BRAKE BOOSTER

BRAKE

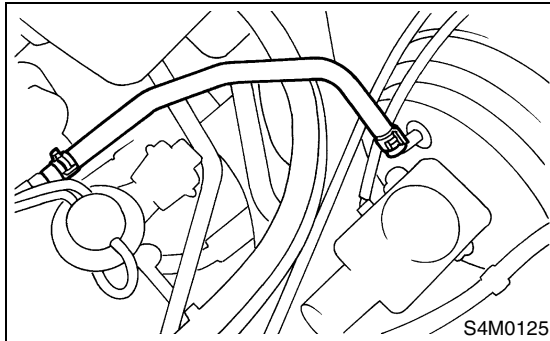
B: INSTALLATION

- 1) Mount the brake booster in position.
- 2) Connect the operating rod to brake pedal with clevis pin and snap pin.



- (1) Nuts
- (2) Clevis pin
- (3) Snap pin
- (4) Operating rod

- 3) Connect the vacuum hose to brake booster.



- 4) Mount the master cylinder onto brake booster.
- 5) Connect the brake pipes to master cylinder.
- 6) Connect the electric connector for brake fluid level indicator.

- 7) Adjust the operating rod of brake booster.

Standard: L

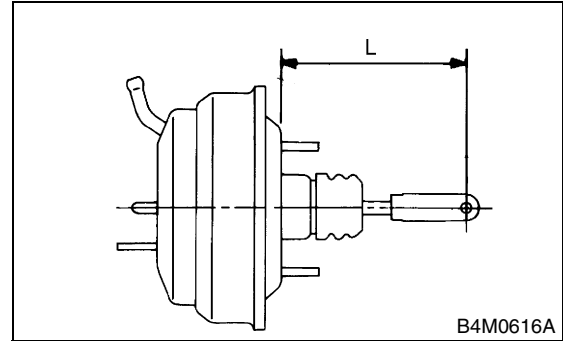
LHD model:

144.6 mm (5.69 in)

RHD model:

173.2 mm (6.82 in)

If it is not within specified value, adjust it by adjusting the brake booster operating rod.



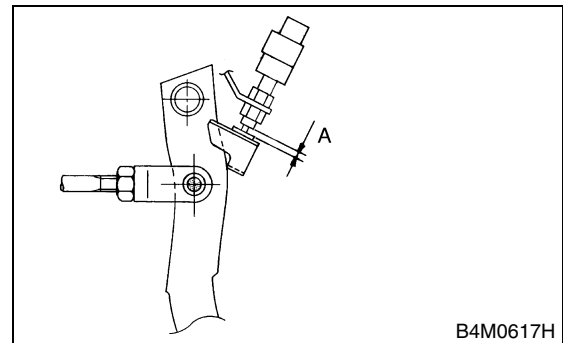
- 8) Measure the clearance between threaded end of stop light switch and stopper. If it is not within specified value, adjust it by adjusting the position of stop light switch.

CAUTION:

Be careful not to rotate the 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 the 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:

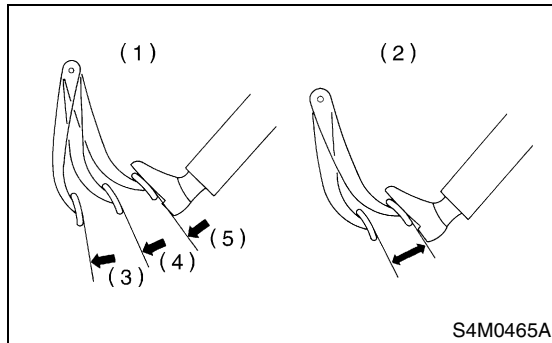
When checking operation, be sure to securely apply the hand brake.

• **Checking without gauges**

This method cannot determine the exact portion which has failed, but it can provide a rough understanding of the nature of failure if checking is conducted in accordance with the following procedures.

• **Air tightness check**

Start the engine, and run it for 1 to 2 minutes, then turn it off. Depress the brake pedal several times applying same pedal force as that used in ordinary braking operations. The pedal stroke should be greatest on 1st depression, and it should become smaller with each successive depression. If no change occurs in the pedal height while in a depressed state, the brake booster is faulty.



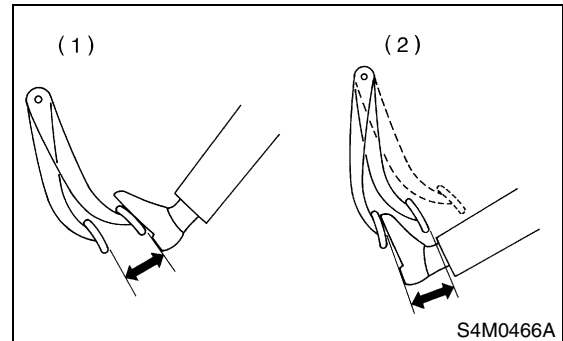
- (1) OK
- (2) NOT OK
- (3) 1st
- (4) 2nd
- (5) 3rd

NOTE:

- In the event of defective operation, inspect the condition of 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 the engine off, depress the brake pedal several times applying same pedal force and make sure that pedal height does not vary with each depression of pedal.



- (1) When engine is stopped
- (2) When engine is started

2) With the brake pedal depressed, start the engine.

3) As the engine starts, the brake pedal should move slightly toward the floor. If no change occurs in the pedal height, the brake booster is faulty.

NOTE:

If faulty, check precisely with gauges.

• **Loaded air tightness check**

Depress the brake pedal while engine is running, and turn off the engine while pedal is still depressed. Keep the pedal depressed for 30 seconds; if no change occurs in the pedal height, the brake booster is functioning normally; if the pedal height increases, it is faulty.

NOTE:

If faulty, check precisely with gauges.

BRAKE BOOSTER

BRAKE

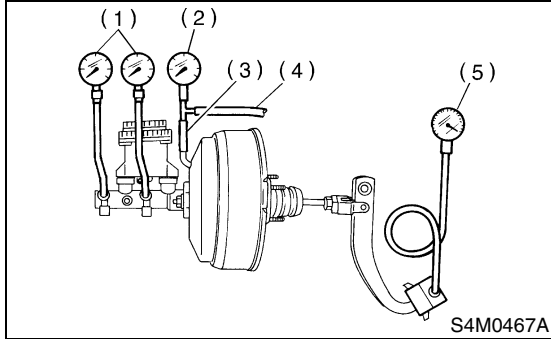
2. OPERATION CHECK (WITH GAUGES)

CAUTION:

When checking operation, be sure to securely apply the hand brake.

• Checking with gauges

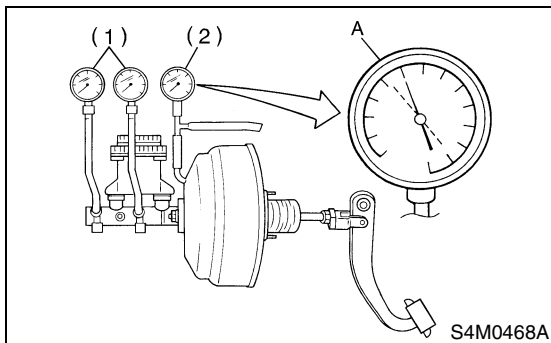
Connect gauges as shown in the figure. After bleeding air from pressure gauges, proceed to each check.



- (1) Pressure gauge
- (2) Vacuum gauge
- (3) Adapter hose
- (4) Vacuum hose
- (5) Pedal force gauge

• Air tightness check

1) Start the 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 the brake pedal.



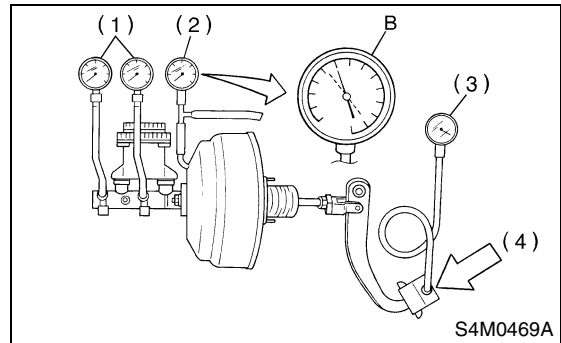
- (1) Pressure gauge
- (2) Vacuum gauge

2) Stop the 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, the 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 the engine and depress brake pedal with pedal force of 196 N (20 kgf, 44 lb). Keep the 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 the 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, the brake booster is functioning properly.
 If defective, refer to "AIR TIGHTNESS CHECK".
 <Ref. to BR-51, INSPECTION, Brake Booster.>

• **Lack of boosting action check**

Turn off the 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"	588 kPa	1,471 kPa
	16"	(6 kg/cm ² , 85 psi)	(15 kg/cm ² , 213 psi)

[]: ABS equipped vehicle.

• **Boosting action check**

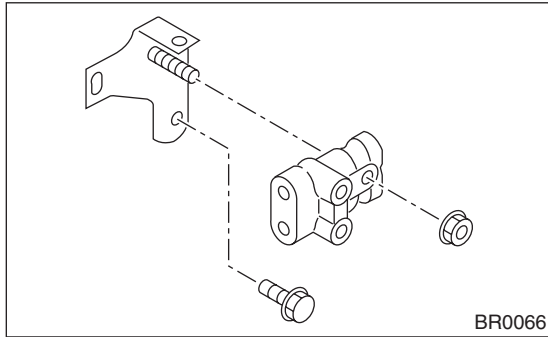
Set the vacuum gauge reading at 66.7 kPa (500 mmHg, 19.69 inHg) by running engine. Then, check the fluid pressure when brake pedal is depressed. The pressure must be greater than the standard value listed.

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)	7,649 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 the brake pipe from proportioning valve at four places.
- 2) Remove the 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 the proportioning valve to bracket.
- 2) Connect the brake pipes correctly to proportioning valve.
- 3) Bleed air, then check each joint of the 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)

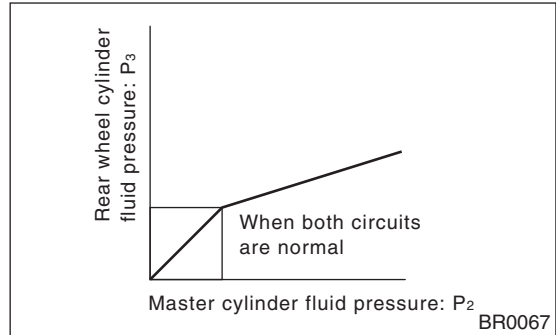
C: INSPECTION

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 the 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 the brake fluid level remains between “MIN” and “MAX”. If out of the specified range, refill or drain fluid. If the fluid level becomes close to “MIN”, refill the fluid.

2) Check the fluid for discoloration. If the 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 the 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 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.
- The brake pedal operating must be very slow.
- For convenience and safety, two people should do the work.
- The amount of brake fluid required is approx. 500 ml (16.9 US fl oz, 17.6 Imp fl oz) for total brake system.

1) Either jack-up the vehicle and place a safety stand under it, or left up vehicle.

2) Remove both front and rear wheels.

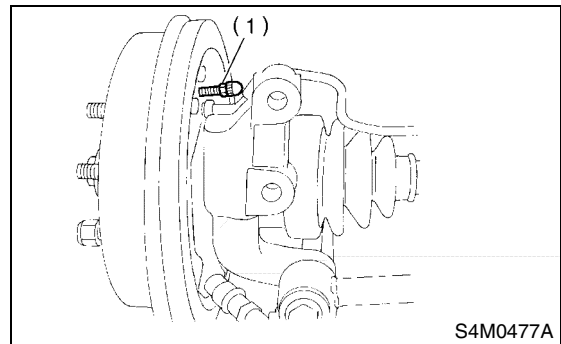
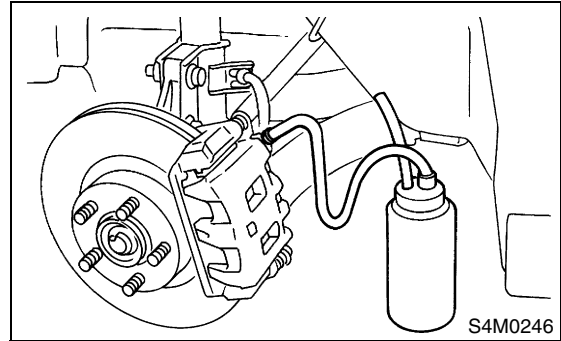
3) Draw out the brake fluid from master cylinder with syringe.

4) Refill the reservoir tank with recommended brake fluid.

Recommended brake fluid:

FMVSS No. 116, fresh DOT3 or 4 brake fluid

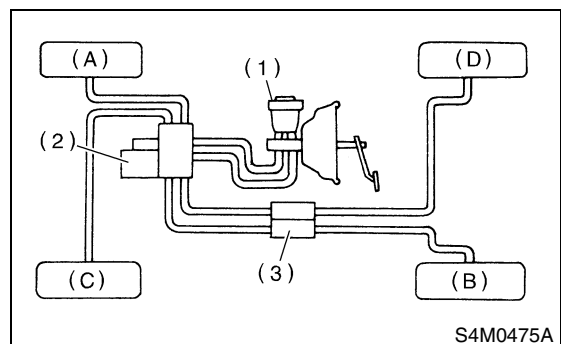
5) Install one end of a vinyl tube onto the air bleeder and insert the other end of the tube into a container to collect the brake fluid.



(1) Air bleeder screw

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 the bleeder screw approx. 1/4 turn until a small amount of brake fluid drains into container, and then quickly tighten the screw.

BRAKE FLUID

BRAKE

8) Repeat steps 6) and 7) until there are no air bubbles in the drained brake fluid and new fluid flows through vinyl tube.

NOTE:

Add brake fluid as necessary while performing 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 the brake pedal with a force of approx. 294 N (30 kgf, 66 lb) and hold it there for approx. 20 seconds. At this time check the pedal to see if it shows any unusual movement.

Visually inspect the bleeder screws and brake pipe joints to make sure that there is no fluid leakage.

12) Install the wheels, and drive the vehicle for a short distance between 2 to 3 km (1 to 2 miles) to make sure that brakes are operating properly.

15. Air Bleeding

A: PROCEDURE

CAUTION:

- The FMVSS No. 116, fresh DOT3 or 4 brake fluid must be used.
- Cover the 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.

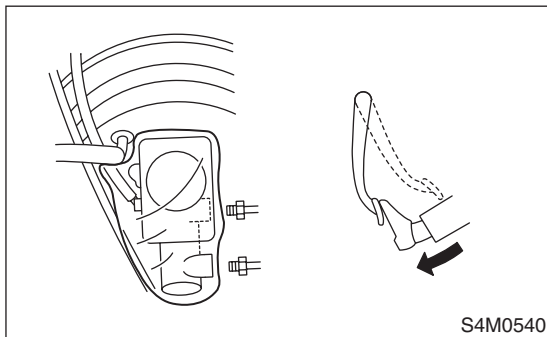
NOTE:

- Start with the brakes (wheels) connected to the secondary chamber of master cylinder.
- The time interval between two brake pedal operations (from the time when pedal is released to the time when it is depressed another time) shall be approx. 3 seconds.
- The air bleeder on each brake shall be released for 1 to 2 seconds.

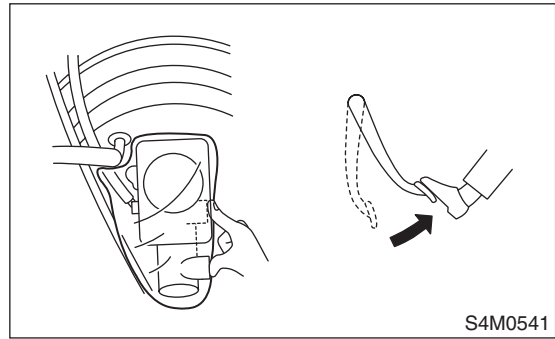
1. MASTER CYLINDER

NOTE:

- If the master cylinder is disassembled or reservoir tank is empty, bleed the master cylinder.
 - During the bleeding operation, keep the brake reservoir tank filled with brake fluid to eliminate entry of air.
 - The brake pedal operating must be very slow.
 - For convenience and safety, two people should do the work.
- 1) Loosen the wheel nuts, jack-up the vehicle, support it with safety stands, and remove the wheel.
 - 2) Disconnect the brake line at primary and secondary sides.
 - 3) Put a plastic bag cover on master cylinder.
 - 4) Carefully depress and hold the brake pedal.



- 5) Close the outlet plug with your finger, and release the brake pedal.



- 6) Repeat step 4) and 5) until the brake fluid is completely bled from outlet plug.
- 7) Remove the plastic bag.
- 8) Install the brake pipes to master cylinder.

Tightening torque:

15 N·m (1.5 kgf-m, 10.8 ft-lb)

- 9) Bleed air from the brake line. <Ref. to BR-57, BRAKE LINE, PROCEDURE, Air Bleeding.>

2. BRAKE LINE

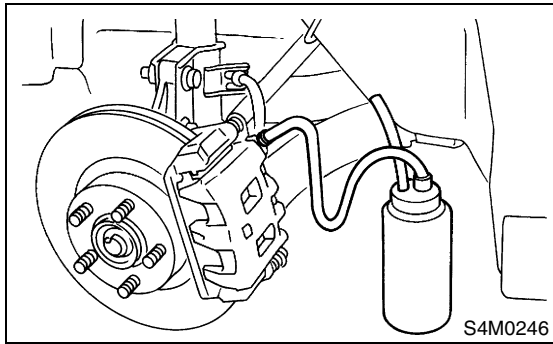
NOTE:

- During the bleeding operation, keep the brake reservoir tank filled with brake fluid to eliminate entry of air.
 - The 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 the joints and connections of brake system.

AIR BLEEDING

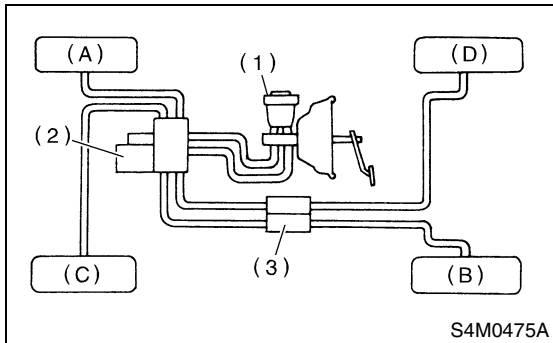
BRAKE

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 the 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 the bleeder with waste cloth, when loosening it, to prevent brake fluid from being splashed over surrounding parts.

NOTE:

The brake pedal operating must be very slow.

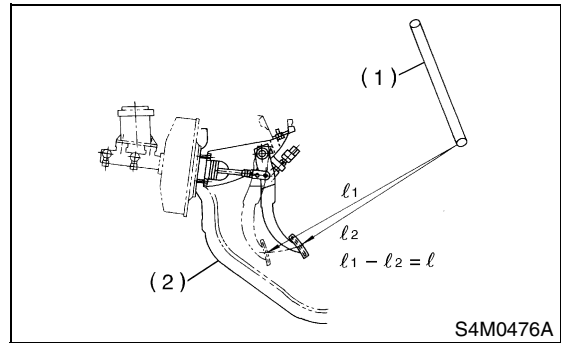
4) Tighten the air bleeder securely when no air bubbles are visible.

**Air bleeder tightening torque:
8 N·m (0.8 kgf·m, 5.8 ft·lb)**

5) Perform these steps for the brakes connecting to 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 approx. 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 brake pedal and steering wheel. With the brake pedal released, measure the distance between 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 the specifications, there is a possibility that air is in the brake line. Bleed the brake line until pedal stroke meets the specification.

8) Operate the 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 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.

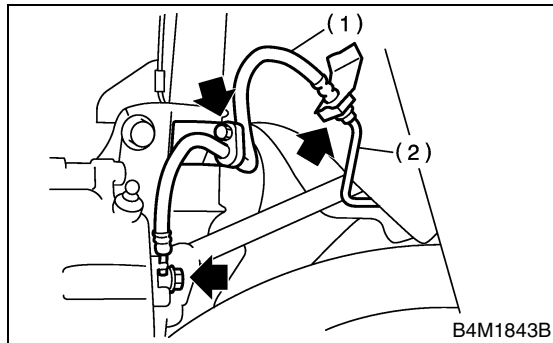
12) As a final step, test run the vehicle at low speed and apply brakes relatively hard 2 to 3 times to ensure that brakes provide normal braking action on all four wheels without dragging and uneven braking.

16. Brake Hose

A: REMOVAL

1. FRONT BRAKE HOSE

- 1) Separate the brake pipe from brake hose.
(Always use flare nut wrench and be careful not to deform the flare nut.)
- 2) Pull out the clamp to remove brake hose.
- 3) Remove the bolt at strut and union bolt.



- (1) Brake hose
- (2) Brake pipe

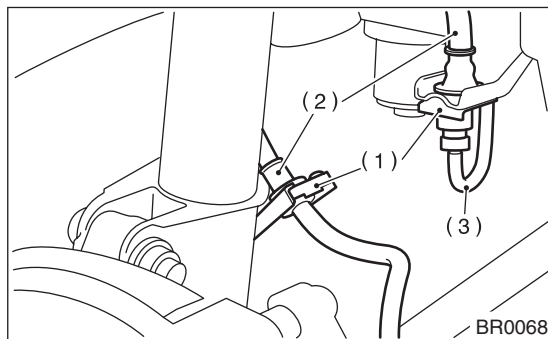
2. REAR BRAKE HOSE

- 1) Separate the brake pipe from brake hose.

NOTE:

Always use flare nut wrench and be careful not to deform the flare nut.

- 2) Pull out the clamp to remove brake hose.



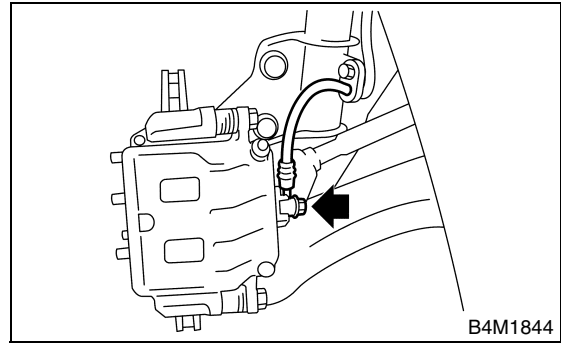
- (1) Brake hose clamp
- (2) Brake hose
- (3) Brake pipe

B: INSTALLATION

1. FRONT BRAKE HOSE

- 1) Route the end of brake hose (on caliper side) through hole in brake hose bracket at strut location.
- 2) Tighten the 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 the middle fitting of brake hose to bracket at strut location using a bolt.
- 4) Position the 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 the flare nut to connect brake pipe and hose.
- 6) Fix the brake hose with clamp at wheel apron bracket.
- 7) While holding the hexagonal part of brake hose fitting with a wrench, tighten the 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.

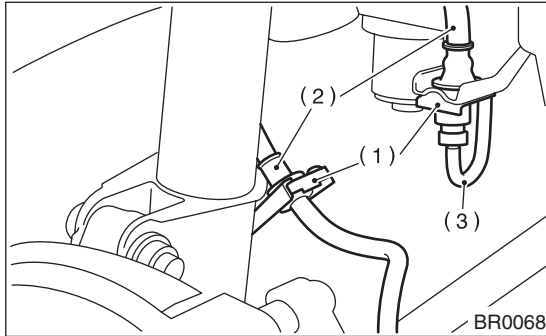
BRAKE HOSE

BRAKE

2. REAR BRAKE HOSE

- 1) Pass the brake hose through hole of bracket, and lightly tighten the flare nut to connect brake pipe.
- 2) Insert the clamp upward to fix brake hose.
- 3) While holding the hexagonal part of brake hose fitting with a wrench, tighten the 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 clamp
- (2) Brake hose
- (2) Brake pipe

- 4) Bleed air from the brake system.

C: INSPECTION

Ensure there are no cracks, breakage, or damage on the hoses. Check the joints for fluid leakage. If any cracks, breakage, damage or leakage is found, repair or replace the 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 the 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 the 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 the joints for fluid leakage. If any cracks, breakage, damage or leakage is found, repair or replace the pipe.

NOTE:

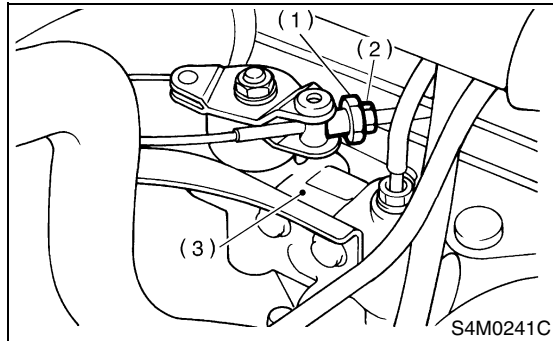
Use a mirror when inspecting low-visible part or back side.

18.Hill Holder

A: REMOVAL

1. PHV (PRESSURE HOLD VALVE)

- 1) Drain the brake fluid from reservoir of master cylinder.
- 2) Remove the adjusting nut and lock nut.

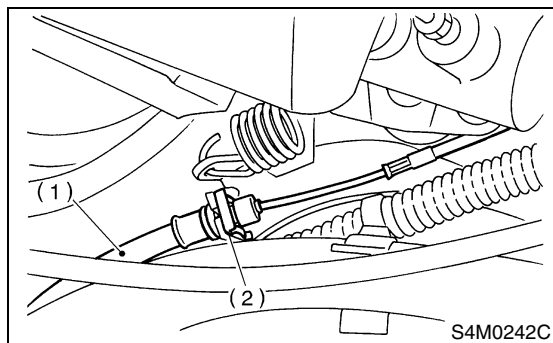


- (1) Adjusting nut
- (2) Lock nut
- (3) PHV

- 3) Remove the cable clamp, and disconnect the PHV cable from PHV.

CAUTION:

Carefully protect the boots and inner cable from damage when disconnecting PHV cable.



- (1) PHV cable
- (2) Clamp

- 4) Disconnect the brake pipes from PHV.

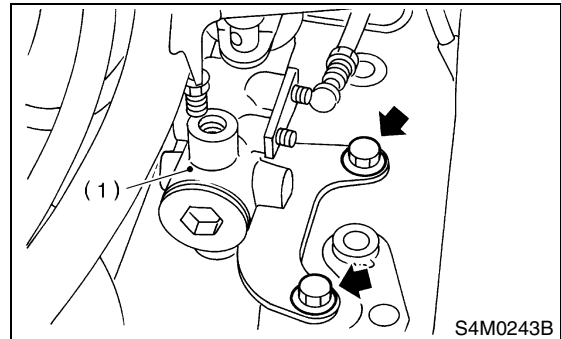
CAUTION:

- Pay attention not to drop the brake fluid onto body painting since it may dissolve paint.
- Pay attention not to damage hexagonal head of the flare nut by using pipe wrench without fail.

- 5) Detach the PHV along with support from side frame.

CAUTION:

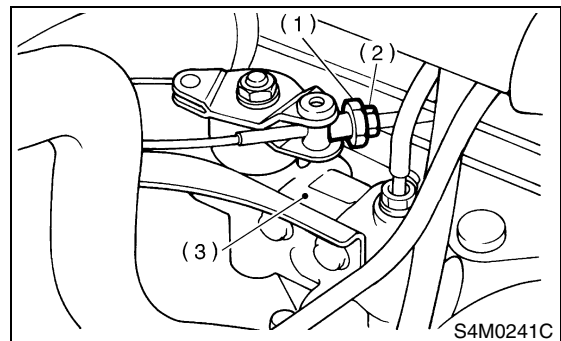
Exercise utmost care to prevent foreign matter from entering into the PHV when removing it.



- (1) PHV

2. PHV CABLE

- 1) Remove the adjusting nut and lock nut.

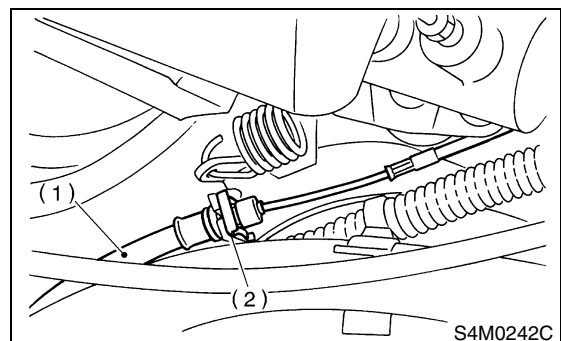


- (1) Adjusting nut
- (2) Lock nut
- (3) PHV

- 2) Remove the cable clamp, and disconnect PHV cable from PHV.

CAUTION:

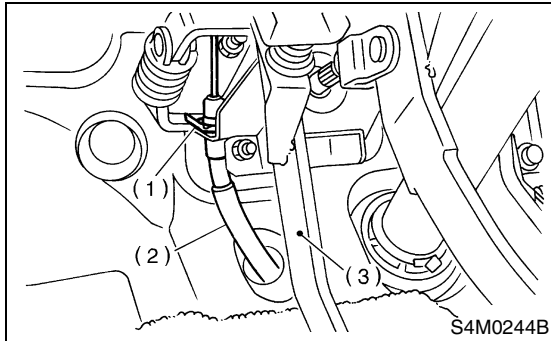
Carefully protect the boot and inner cable from damage when disconnecting PHV cable.



- (1) PHV cable
- (2) Clamp

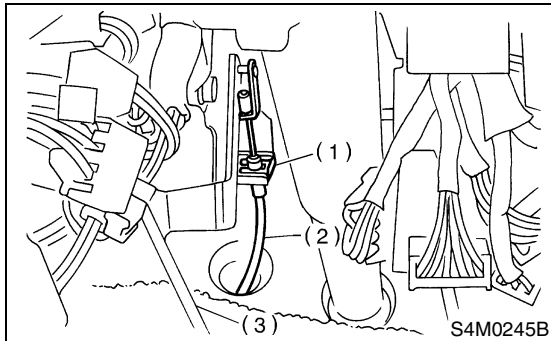
3) Remove the cable clamp from clutch pedal bracket.

• LHD MODEL



- (1) Clamp
- (2) PHV cable
- (3) Clutch pedal

• RHD MODEL



- (1) Clamp
- (2) PHV cable
- (3) Clutch pedal

4) Remove the PHV cable.

B: INSPECTION

Check up removed parts as follows, and replace defective ones.

- 1) Check if the boots of PHV cable are damaged or degraded, the inner cable is damaged or corroded.
- 2) Check if the return spring is worn out, damaged or corroded.
- 3) Confirm that rolling sound of the ball is heard with PHV inclined and lever rotates smoothly.

CAUTION:

Never disassemble the PHV. Replace entire PHV assembly if necessary.

C: INSTALLATION

1. PHV (PRESSURE HOLD VALVE)

1) Install the PHV onto side frame.

Tightening torque:

18 N·m (1.8 kgf-m, 13.0 ft-lb)

2) Connect the brake pipes to PHV.

Tightening torque:

15 N·m (1.5 kgf-m, 10.8 ft-lb)

CAUTION:

Confirm that the brake pipes are not deformed and/or damaged. Replace them with new ones if necessary.

3) Install the PHV cable to PHV.

CAUTION:

• **If the cable clamp (and clips) is damaged, replace it with a new one.**

• **Avoid sharp bending of PHV cable as it may cause breakage.**

4) Connect the PHV cable with clips.

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 the PHV cable. <Ref. to BR-63, PHV CABLE, INSTALLATION, Hill Holder.>

CAUTION:

After replacing the PHV cable with new one, operate the clutch pedal about 30 times as a running-in operation prior to adjustment.

2. PHV CABLE

1) Install the PHV cable in the reverse order of removal.

CAUTION:

• **If the 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)

HILL HOLDER

BRAKE

3) Adjust the PHV cable. <Ref. to BR-64, ADJUSTMENT, Hill Holder.>

CAUTION:

After replacing the PHV cable with new one, operate the clutch pedal about 30 times as a running-in operation prior to adjustment.

D: ADJUSTMENT

Confirm stopping and starting performances by activating the hill holder on an uphill road of 3° or higher inclination.

1) If the vehicle does not stop;

Tighten the adjusting nut of PHV cable.

2) If the vehicle does not start properly;

- Case A — When the hill holder is released later than engagement of clutch pedal (Engine tends to stall.):

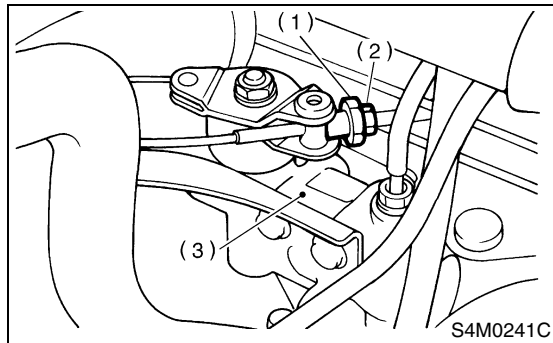
Loosen adjusting nut gradually until smooth starting is enabled.

- Case B — When the hill holder is released earlier than engagement of clutch pedal (Vehicle slips down slightly.):

Tighten the 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 the adjusting nut, prevent the PHV cable from revolving.



- (1) Adjusting nut
- (2) Lock nut
- (3) PHV

3) Tighten the lock nut.

Tightening torque:

3.4 N·m (0.35 kgf-m, 2.5 ft-lb)

19. Brake Pedal

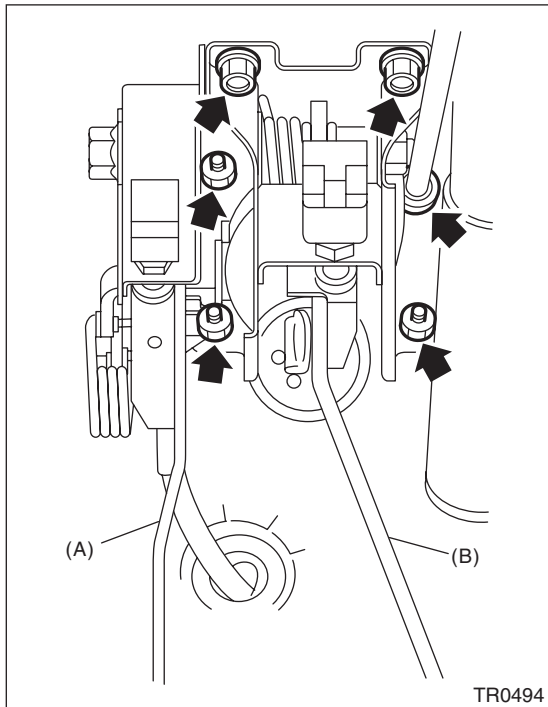
A: REMOVAL

1. LHD 1.6 L MT MODEL

- 1) Disconnect the ground cable from battery.
- 2) Disconnect the clutch cable from release lever.
- 3) Remove the 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 the clevis pin which secures pedal to push rod.
- 6) Remove the bolts and nuts which secure brake and clutch pedals, and remove the pedal bracket and clutch cable as a unit.

CAUTION:

Before removing the clutch cable from toe board, remove the grommet. Slowly remove the clutch cable, being careful not to scratch it.

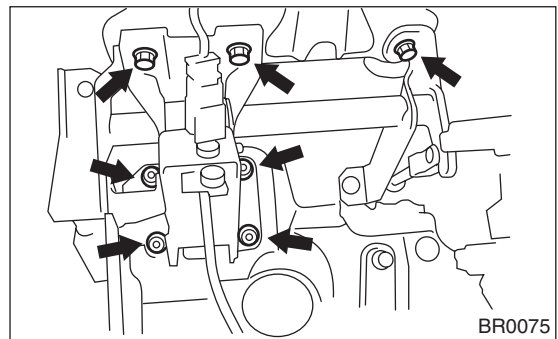


- (A) Clutch pedal
(B) Brake pedal

- 7) Depress the clutch pedal, disconnect the clutch cable from clutch pedal.

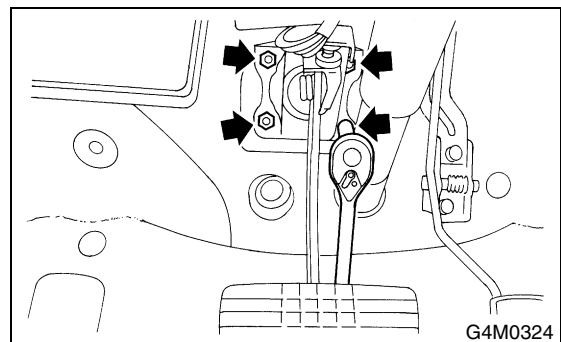
2. LHD 2.0 L MT MODEL

- 1) Remove the steering bolts.
- 2) Raise the vehicle on hoist and remove the two bolts which secure steering unit to underside of body.
- 3) Lower the vehicle to floor.
- 4) Remove the 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 the clevis pin which secures lever to push rod.
- 7) Remove the nut which secures clutch master cylinder.
- 8) Remove the steering assembly.
- 9) Remove the accelerator pedal.
- 10) Remove the bolts and nuts which secure pedal bracket.



3. AT MODEL AND RHD MT MODEL

- 1) Disconnect the ground cable from battery.
- 2) Remove the instrument panel lower cover from instrument panel.
- 3) Remove the clevis pin which secures brake pedal to brake booster operating rod. Also disconnect the stop light switch connector.
- 4) Remove the two bolts and four nuts which secure the brake pedal to pedal.



BRAKE PEDAL

BRAKE

B: INSTALLATION

1) Install in the reverse order of removal.

CAUTION:

- If the cable clamp is damaged, replace it with a new one.
- Never fail to cover the outer cable end with boot.
- Be careful not to kink the accelerator cable.
- Always use new clevis pins.

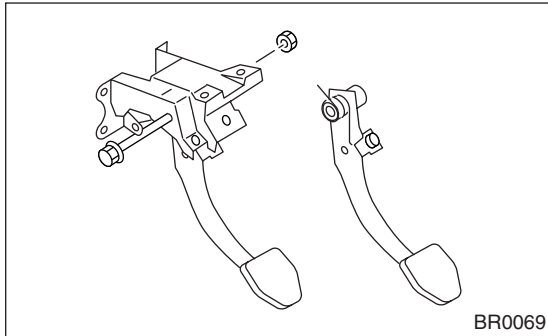
2) Adjust the clutch pedal <Ref. to CL-46, ADJUSTMENT, Clutch Pedal.>

3) Inspect the brake pedal after installation <Ref. to BR-68, INSPECTION, Brake Pedal.>

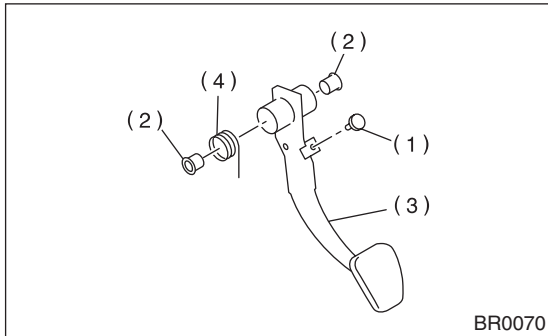
C: DISASSEMBLY

1. LHD 1.6 L MT MODEL

- 1) Remove the stop light switch.
<Ref. to BR-69, REMOVAL, Stop Light Switch.>
- 2) Remove the nut and pull out the bolt until brake pedal is able to remove, then remove brake pedal.



3) Remove the bushing, spring and stopper.

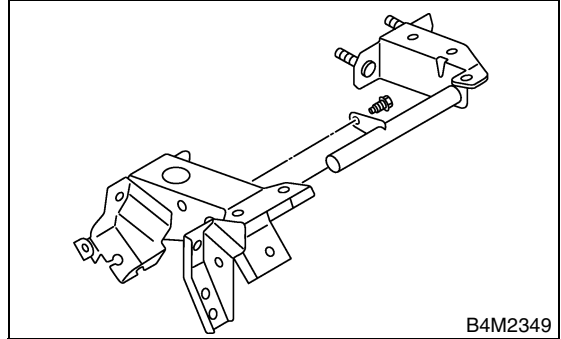


- (1) Stopper
- (2) Bushing
- (3) Brake pedal
- (4) Brake pedal spring

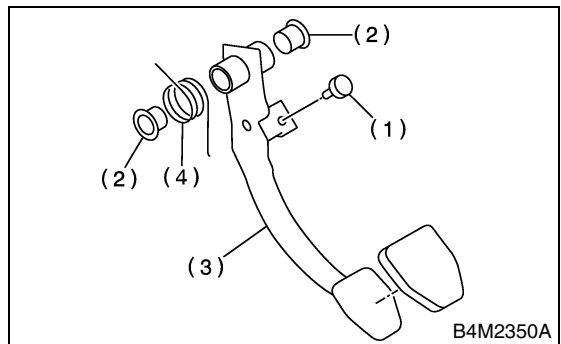
4) Remove the brake pad.

2. LHD 2.0 L MT MODEL

- 1) Remove the brake switch.
<Ref. to BR-69, REMOVAL, Stop Light Switch.>
- 2) Remove the clutch pedal.
<Ref. to CL-43, DISASSEMBLY, Clutch Pedal.>
- 3) Remove the clutch master cylinder bracket.



4) Remove the bushing, spring and stopper.

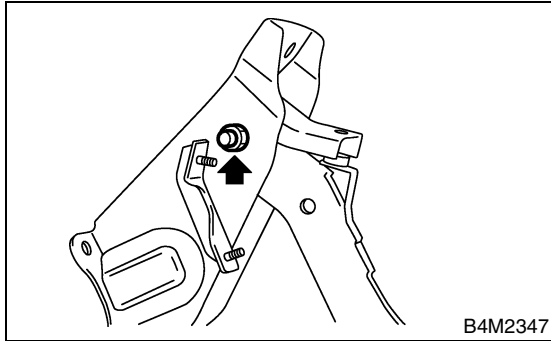


- (1) Stopper
- (2) Bushing
- (3) Brake pedal
- (4) Brake pedal spring

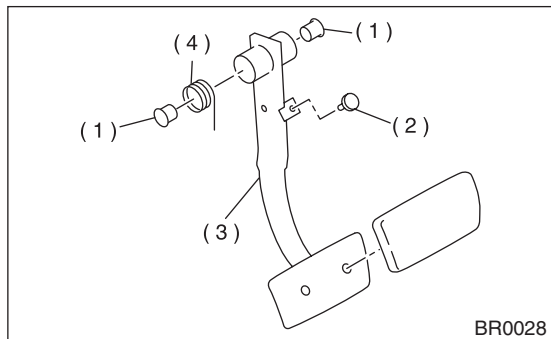
5) Remove the brake pedal pad.

3. AT MODEL AND RHD MT MODEL

- 1) Remove the brake switch.
- 2) Unbolt, and then remove the brake pedal.



- 3) Remove the bushing, spacer and spring.



- (1) Plug
- (2) Stopper
- (3) Brake pedal
- (4) Brake pedal spring

- 4) Remove the brake pedal pad.

D: ASSEMBLY

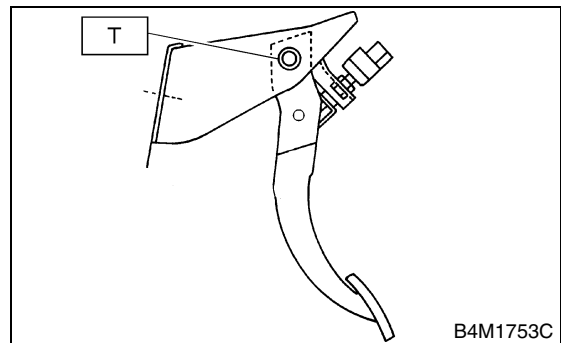
- 1) Attach the stop light switch, etc. to pedal bracket temporarily.
- 2) Clean the inside of bores of clutch pedal and brake pedal, apply grease, and set the bushings into bores.
- 3) Align bores of the pedal bracket, clutch pedal and brake pedal, attach the brake pedal return spring and clutch pedal effort reducing spring (vehicle with hill holder), and then install the pedal bolt.

NOTE:

Clean up the inside of bushings and apply grease before installing spacer.

Tightening torque:

T: 29 N·m (3.0 kgf-m, 21.7 ft-lb)



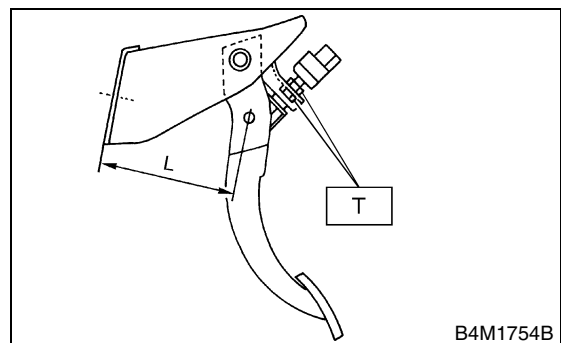
- 4) Set the brake pedal position by adjusting position of stop light switch.

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 the brake and clutch pedal pads in the lateral direction with a force of approx. 10 N (1 kgf, 2 lb) to ensure pedal deflection is in specified range.

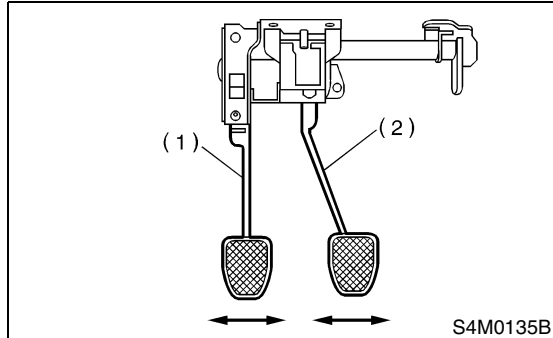
CAUTION:

If excessive deflection is noted, replace the bushings with new ones.

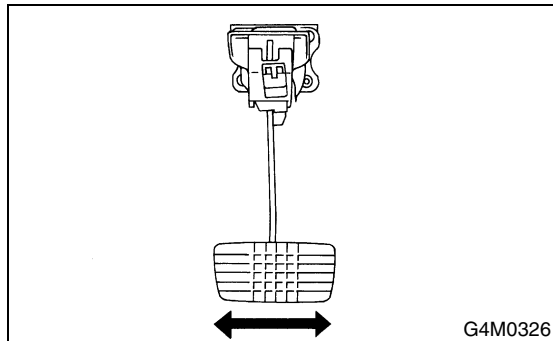
Deflection of brake and clutch pedal:

Service limit

5.0 mm (0.197 in) or less



- (1) Clutch pedal
- (2) Brake pedal



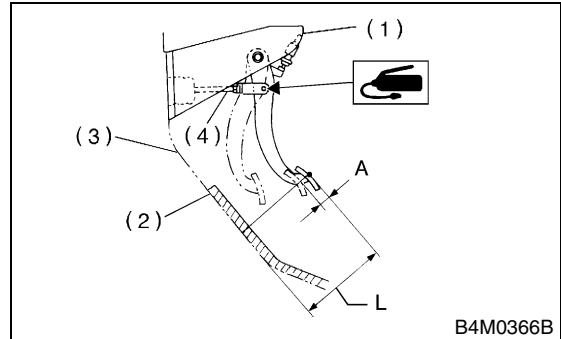
2) Check the position of pedal pad.

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).]



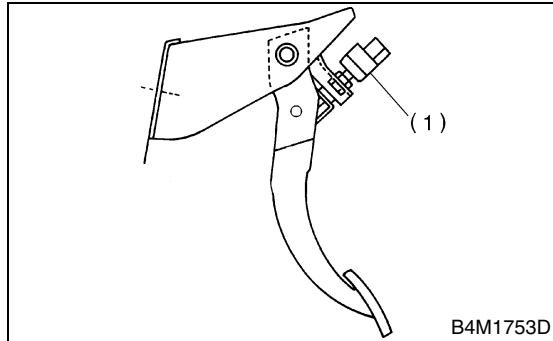
- (1) Stop light switch
- (2) Mat
- (3) Toe board
- (4) Brake booster operating rod

3) If it is not within specified value, adjust it by adjusting the brake booster operating rod length.

20. Stop Light Switch

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Disconnect the stop light switch connector.
- 3) Loosen nuts, and unscrew stop light switch to remove.



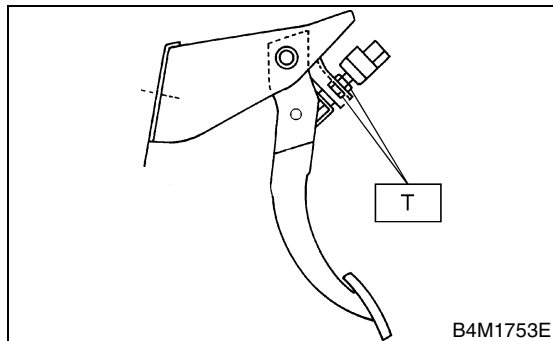
(1) Stop light switch

B: INSTALLATION

- 1) Screw the stop light switch onto a bracket and secure it temporarily with a nut.
 - 2) Adjust the stop light switch position, and then tighten the nut.
- <Ref. to BR-70, ADJUSTMENT, Stop Light Switch.>

Tightening torque:

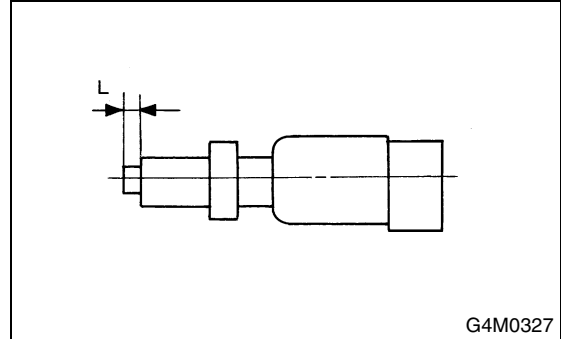
8 N·m (0.8 kgf·m, 5.8 ft·lb)



C: INSPECTION

- 1) If the 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)

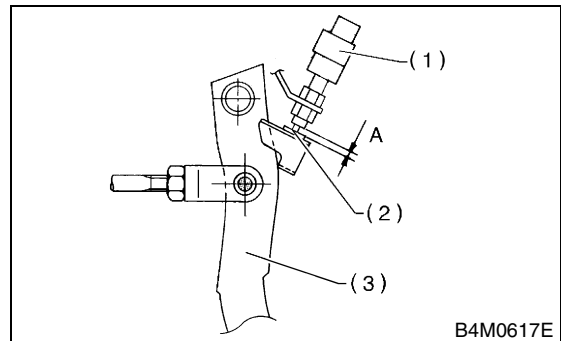


- 2) Measure the clearance between threaded end of stop light switch and stopper.

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 within specified value, adjust it by adjusting position of stop light switch.

CAUTION:

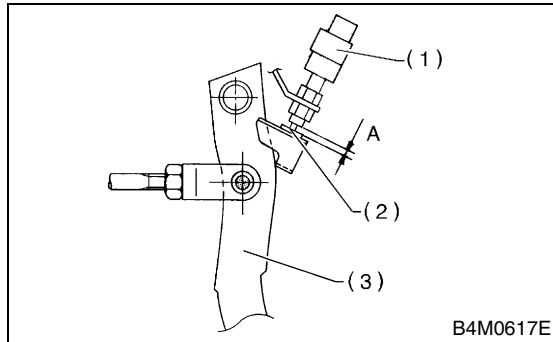
Be careful not to rotate the stop light switch.

STOP LIGHT SWITCH

BRAKE

D: ADJUSTMENT

Loosen the lock nut, and adjust the stop light switch position until the clearance between threaded end of stop light switch and 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) (creak sound)	(1) Hardened or deteriorated lining	Replace the shoe assembly or pad.
	(2) Worn lining	Replace the shoe assembly or pad.
	(3) Loosened back plate or the support installing bolts	Retighten.
	(4) Loose wheel bearing	Retighten to normal tightening torque.
	(5) Dirty 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.

PARKING BRAKE

PB

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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

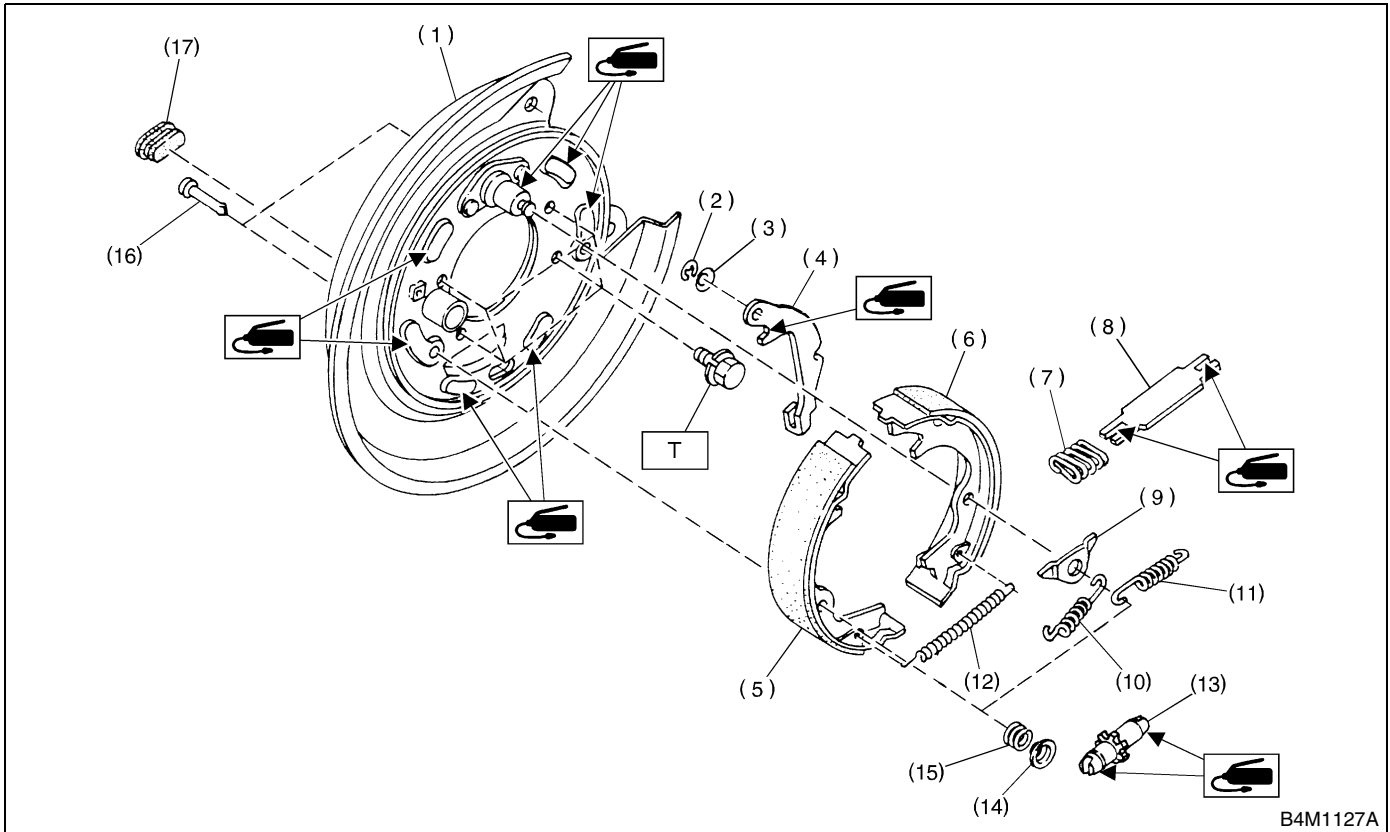
1. General Description

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)



- | | |
|------------------------------------|------------------------------|
| (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 | |

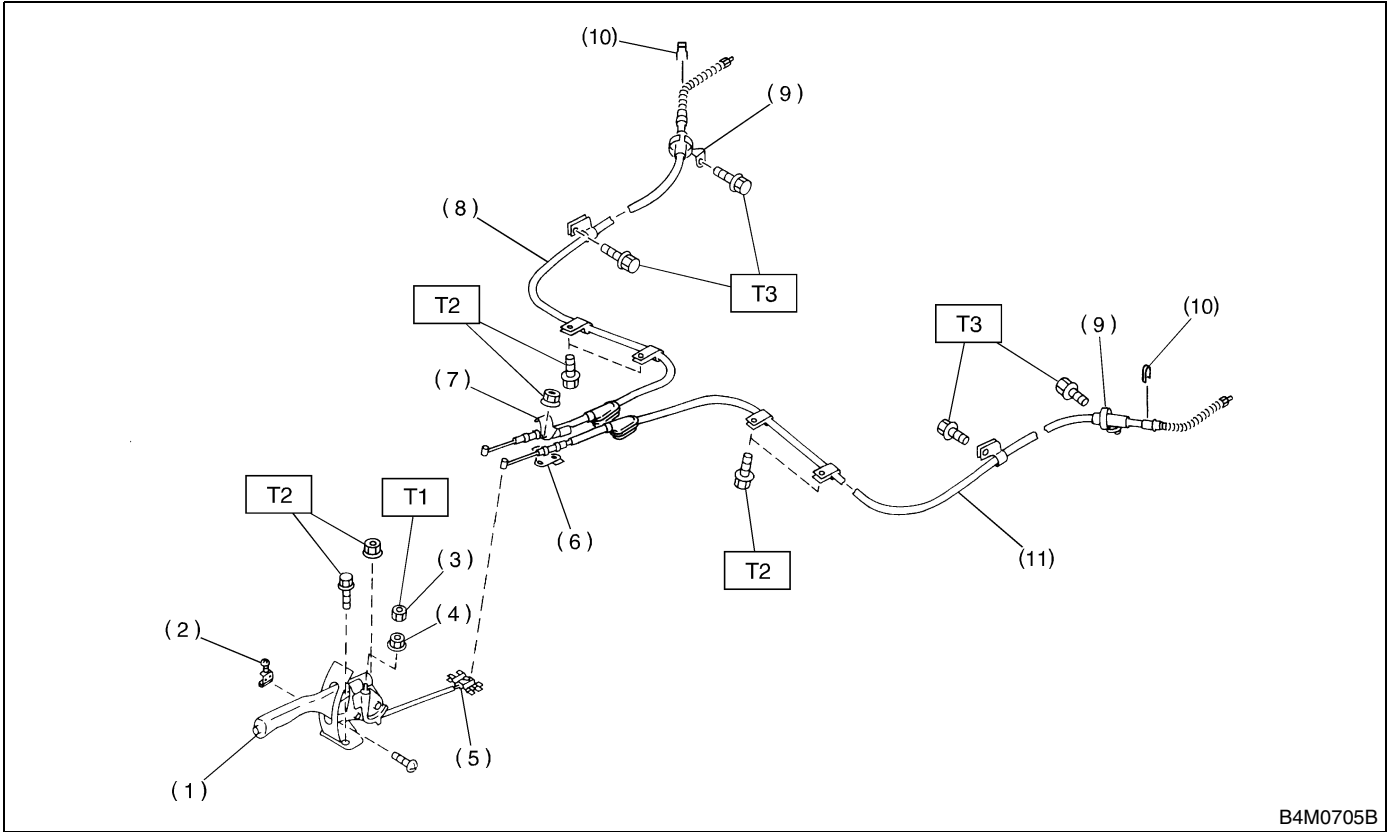
Tightening torque: N·m (kgf·m, ft·lb)

T: 53 (5.4, 39.1)

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 (0.6, 4.3)
T2:	18 (1.8, 13.0)
T3:	32 (3.3, 23.6)

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 on the vehicle is hot after running.
- Use SUBARU genuine grease etc. or the equivalent. Do not mix grease etc. with that of another grade or from other manufacturers.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Apply grease onto sliding or revolution surfaces before installation.
- Before installing O-rings or snap rings, apply sufficient amount of grease to avoid damage and deformation.
- Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.
- Keep grease etc. away from parking brake shoes.

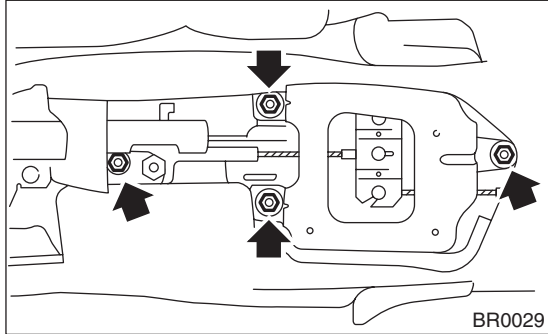
PARKING BRAKE LEVER

PARKING BRAKE

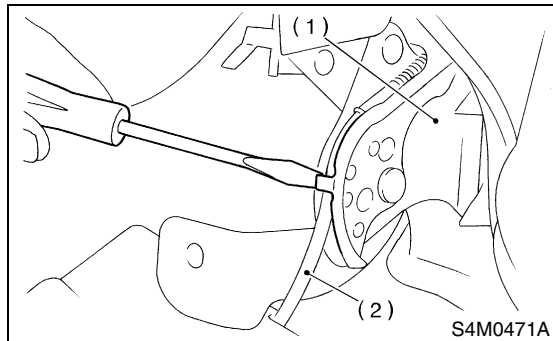
2. Parking Brake Lever

A: REMOVAL

- 1) Lift-up the vehicle.
- 2) Remove the rear tire and wheel.
- 3) Remove the rear cushion.
- 4) Remove the console box.
- 5) Loosen the parking cable adjusting nut and console bracket.
- 6) Disconnect the connector parking brake switch.
- 7) Remove the parking brake lever.



- 8) Unbend the 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 the 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 the 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)

If incorrect, adjust the parking brake. <Ref. to PB-11, ADJUSTMENT, Parking Brake Assembly (Rear Disc Brake).>

D: ADJUSTMENT

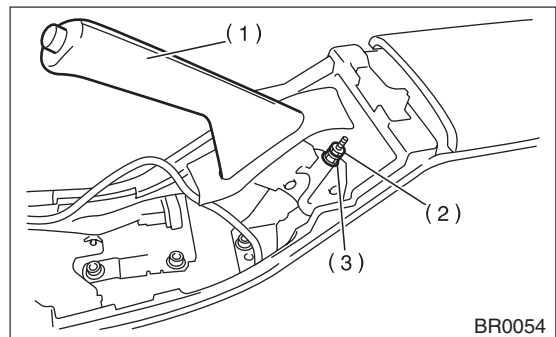
- 1) Remove the console cover.
- 2) Forcibly pull the parking brake lever 3 to 5 times.
- 3) Adjust the parking brake lever by turning adjuster until parking brake lever stroke is set at 7 to 8 notches with operating force of 196 N (20 kgf, 44 lb).
- 4) Tighten the lock nut.

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 (0.6 kgf·m, 4.3 ft·lb)



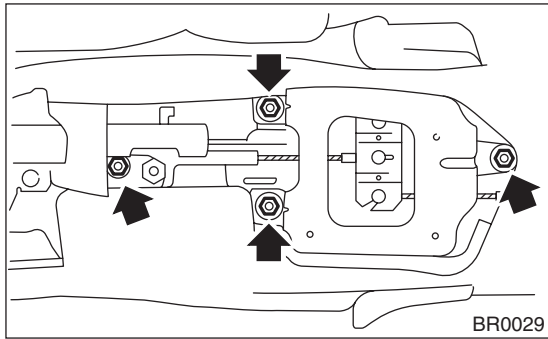
- (1) Parking brake lever
- (2) Lock nut
- (3) Adjusting nut

- 5) Install the console cover.

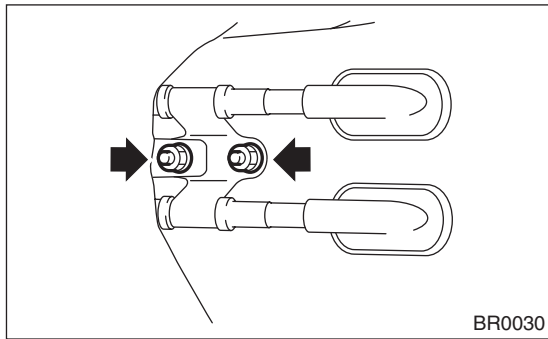
3. Parking Brake Cable

A: REMOVAL

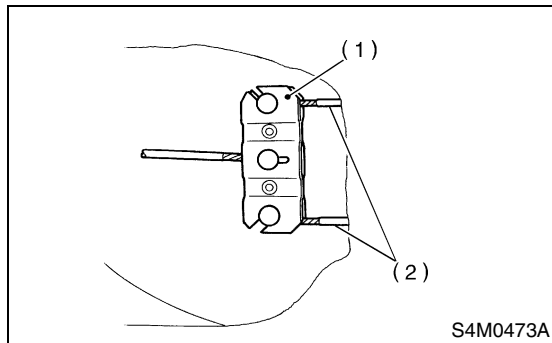
- 1) Lift-up the vehicle.
- 2) Remove the rear tires and wheels.
- 3) Remove the rear cushion.
- 4) Remove the console box from front floor.
- 5) Loosen the parking cable adjusting nut and console bracket.
- 6) Remove the parking brake lever.



- 7) Roll up the floor mat and remove clamps.



- 8) Remove the equalizer cover.
- 9) Remove the inner cable end from equalizer.



- (1) Equalizer
- (2) Inner cable end

- 10) Pull out the parking brake cable from rear brake.

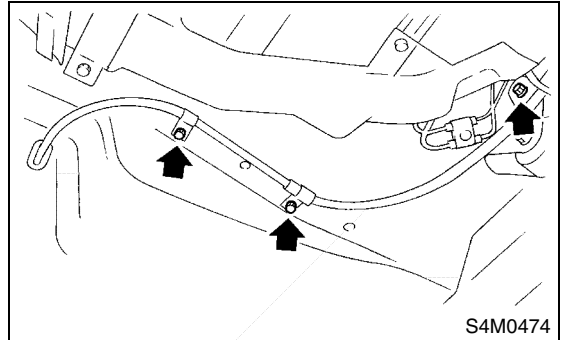
Disc brake

<Ref. to PB-9, REMOVAL, Parking Brake Assembly (Rear Disc Brake).>

Drum brake

<Ref. to BR-44, Rear Drum Brake Assembly.>

- 11) Pull out the clamp from rear brake.
- 12) Remove the bolt and bracket from trailing link bracket.
- 13) Remove the bolt and clamp from rear floor.



- 14) Detach the grommet from rear floor.
- 15) Remove the cable assembly from cabin by forcibly pulling it backward.
- 16) Detach the parking brake cable from cable guide at rear trailing link.

PARKING BRAKE CABLE

PARKING BRAKE

B: INSTALLATION

Install the (new) parking brake assembly in the reverse order of removal.

NOTE:

- Be sure to pass the cable through cable guide inside the tunnel.
- Be sure to adjust the lever stroke. <Ref. to PB-6, ADJUSTMENT, Parking Brake Lever.>

C: INSPECTION

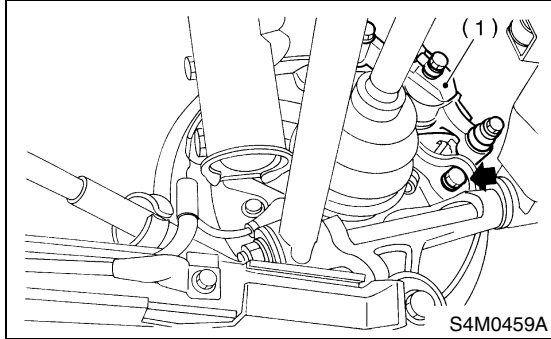
Check the removed cable and replace if damaged, rusty, or malfunctioning.

- 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.



(1) Disc brake assembly

2) Suspend the disc brake assembly so that the hose is not stretched.

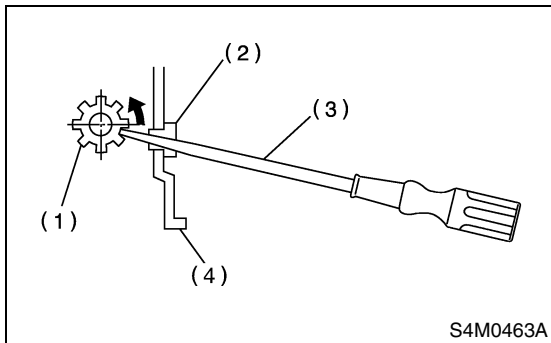
3) Pull down and release the parking brake.

4) Remove the disc rotor.

NOTE:

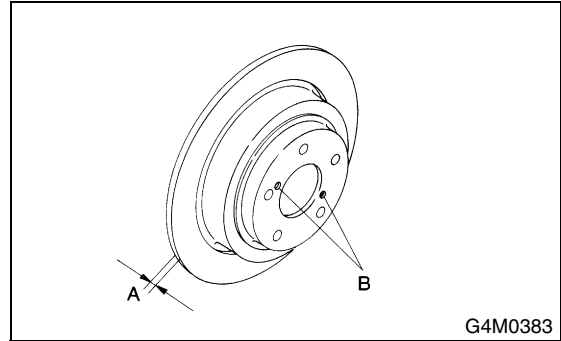
If the disc rotor is difficult to remove, try the following two methods in order.

(1) Turn the adjusting screw using a slot-type screwdriver until brake shoe gets away enough from the disc rotor.



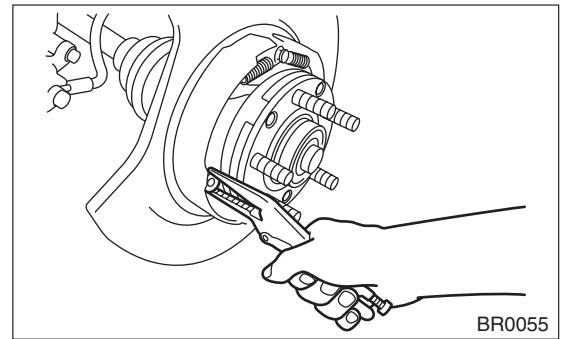
- (1) Adjusting screw
- (2) Cover (rubber)
- (3) Slot-type screwdriver
- (4) Back plate

(2) If the disc rotor seizes up within hub, drive the disc rotor out by installing an 8-mm bolt in holes B on rotor.



5) Remove the shoe return spring from parking brake assembly.

6) Remove the front shoe hold down spring and pin with pliers.



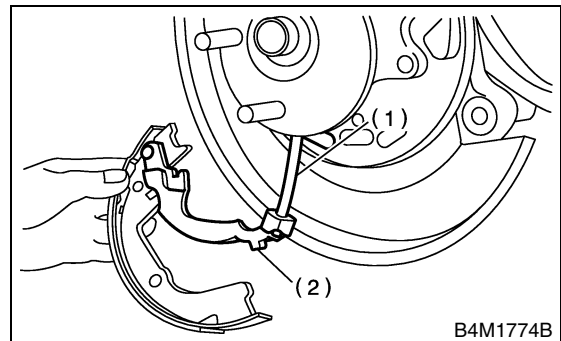
7) Remove the strut and strut spring.

8) Remove the adjuster assembly from parking brake assembly.

9) Remove the brake shoe.

10) Remove the rear shoe hold-down spring and pin with pliers.

11) Remove the parking cable from parking lever.



- (1) Parking brake cable
- (2) Parking brake lever

12) Using a standard screwdriver, raise the retainer. Remove the parking lever and washer from brake shoe.

PARKING BRAKE ASSEMBLY (REAR DISC BRAKE)

PARKING BRAKE

B: INSTALLATION

CAUTION:

Be sure the 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.

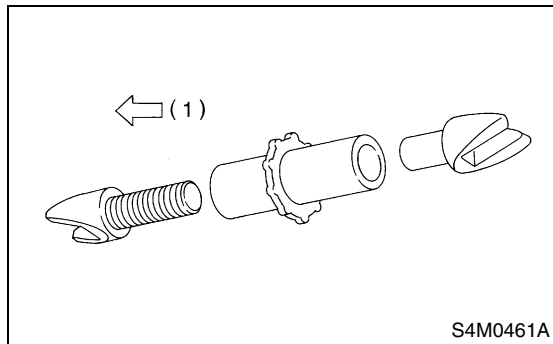
- Six contact surfaces of shoe rim and back plate packing
 - Contact surface of shoe wave and anchor pin
 - Contact surface of lever and strut
 - Contact surface of shoe wave and adjuster assembly
 - Contact surface of shoe wave and strut
 - Contact surface of lever and shoe wave
- 2) Install in reverse order of removal.

CAUTION:

- Use new retainers and clinch them when installing the brake shoes to levers.
- Ensure that the parking lever moves smoothly.
- Do not confuse the left parking lever with right one.
- Do not confuse the left strut with right one.

NOTE:

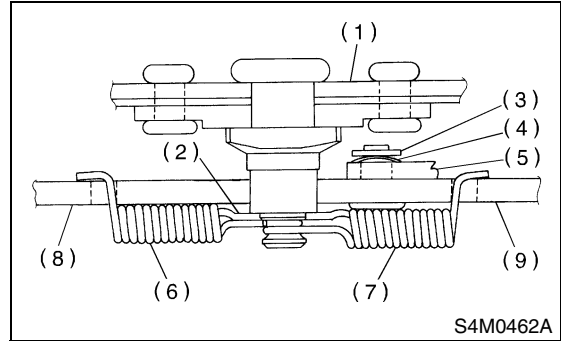
Ensure that the adjuster assembly is securely installed with screw in the left side, facing vehicle front.



(1) LEFT

NOTE:

Ensure that the shoe return spring is installed as shown in the 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 the parking brakes. <Ref. to PB-11, ADJUSTMENT, Parking Brake Assembly (Rear Disc Brake).>

CAUTION:

After replacing the parking brake lining, be sure to drive the vehicle for "break-in" purposes.

- (1) Drive the vehicle at 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 the parking brakes.

C: INSPECTION

1) Measure the 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 the shoe assembly.

Lining thickness:

Standard

3.2 mm (0.126 in)

Service limit

1.5 mm (0.059 in)

CAUTION:

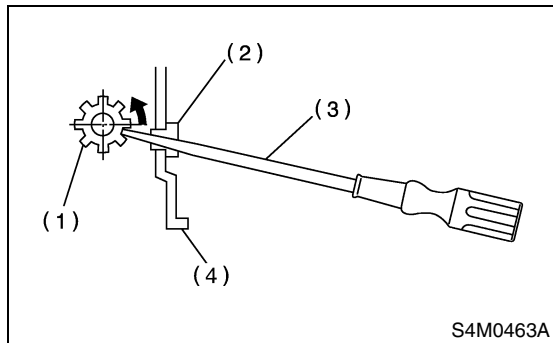
Replace the brake shoes on the right and left brake assembly at the same time.

D: ADJUSTMENT

1. SHOE CLEARANCE

1) Remove the adjusting hole cover from back plate.

2) Turn the 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) the adjusting screw 3 or 4 notches.

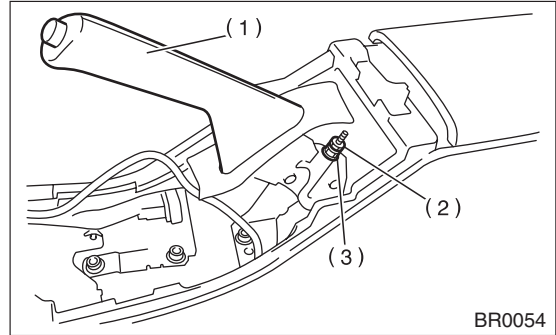
4) Install the adjusting hole cover to back plate.

2. LEVER STROKE

1) Remove the console box lid.

2) Forcibly pull the parking brake lever 3 to 5 times.

3) Adjust the 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).



- (1) Parking brake lever
- (2) Lock nut
- (3) Adjusting nut

4) Tighten the lock nut.

5) Install the console box lid.

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 (0.6 kgf·m, 4.3 ft·lb)

GENERAL DIAGNOSTIC TABLE

PARKING BRAKE

5. General Diagnostic Table

A: INSPECTION

Symptom	Possible cause	Remedy
Brake drag	• Parking brake lever is maladjusted.	• Adjustment.
	• Parking brake cable does not move.	• Repair or replace.
	• Parking brake shoe clearance is maladjusted.	• Adjustment.
	• Return spring is faulty.	• Replace.
Noise from brake	• Return spring is faulty.	• Replace.
	• Shoe hold down spring is faulty.	• Replace.

POWER ASSISTED SYSTEM (POWER STEERING)

PS

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GENERAL DESCRIPTION

POWER ASSISTED SYSTEM (POWER STEERING)

1. General Description

A: SPECIFICATIONS

Model		1.6 L	2.0 L				2.5 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	3.02
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 (0.476)			7.2 (0.439)		7.8 (0.476)
	Relief pressure kPa (kg/cm ² , psi)	6,174 — 6,860 (63 — 70, 896 — 994)	7,164 — 7,840 (73 — 80, 1,040 — 1,137)		7,350 — 8,036 (75 — 82, 1,067 — 1,165)		7,164 — 7,840 (73 — 80, 1,040 — 1,137)
	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}		1,000 rpm: 7 (7.4, 6.2) 3,000 rpm: 5 (5.3, 4.4)
	Range of revolution rpm	700 — 9,000					
	Revolving direction	Clockwise					
Working fluid (Power steering system)	Name		ATF DEXRON III or equivalent				
	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, RS	34°30'±1.5°
		Except TURBO, OUTBACK, RS	37°20'±1.5°
	Outer tire & wheel	TURBO, OUTBACK, RS	30°20'±1.5°
		Except TURBO, OUTBACK, RS	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
		Left-turn steering	mm (in) Horizontal movement: 0.15 (0.0059) or less Vertical movement: 0.3 (0.012) or less
	Input shaft play	In radial direction	mm (in) 0.18 (0.0071) or less
		In axial direction	mm (in) 0.5 (0.020) or less
	Turning resistance		N (kgf, lb) Maximum allowable value: Less than 9.33 N (0.95 kgf, 2.10 lb) Difference between right and left sliding resistance: Less than 20 %
Oil pump (Power steering system)	Pulley shaft	Radial play	mm (in) 0.4 (0.016) or less
		Axial play	Non-TURBO
	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	
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 III or equivalent	B.P.
	CALTEX
	CASTROL
	MOBIL
	SHELL
	TEXACO

GENERAL DESCRIPTION

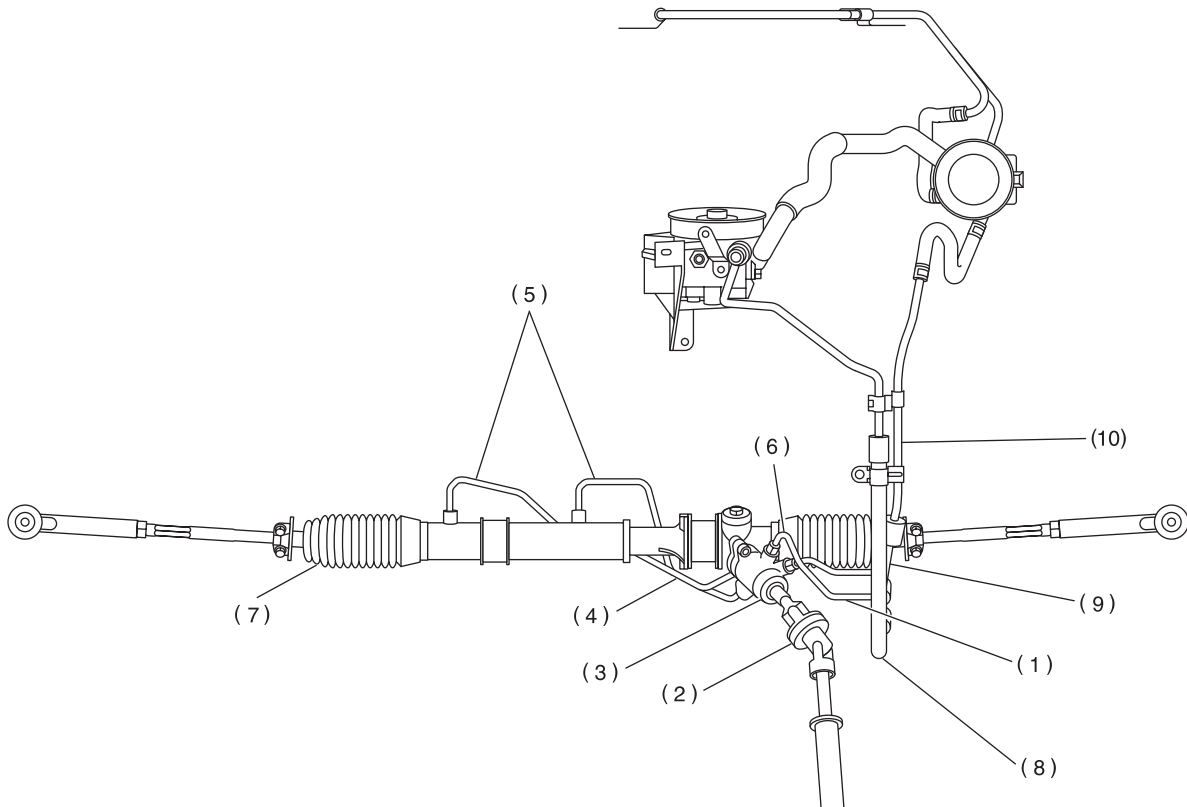
POWER ASSISTED SYSTEM (POWER STEERING)

CAUTION:

This table lists various clearances that must be correctly adjusted to ensure the 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

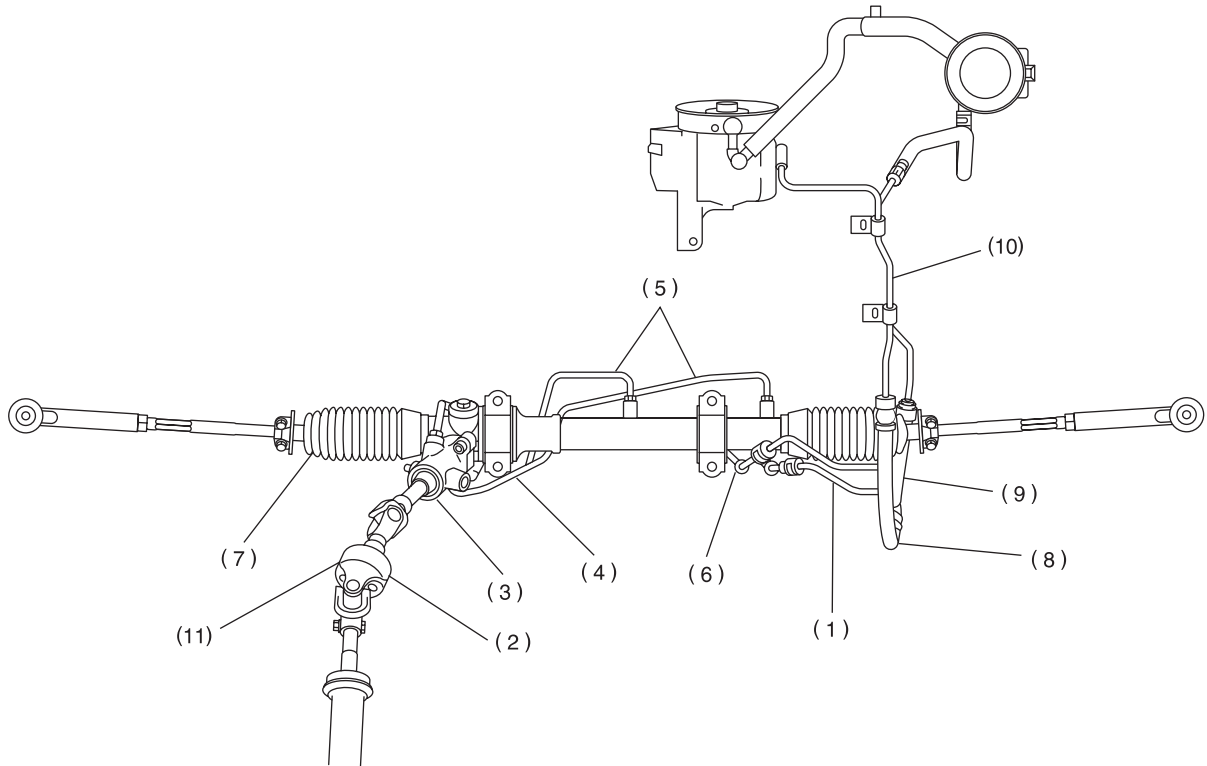


ST0001

GENERAL DESCRIPTION

POWER ASSISTED SYSTEM (POWER STEERING)

LHD MODEL



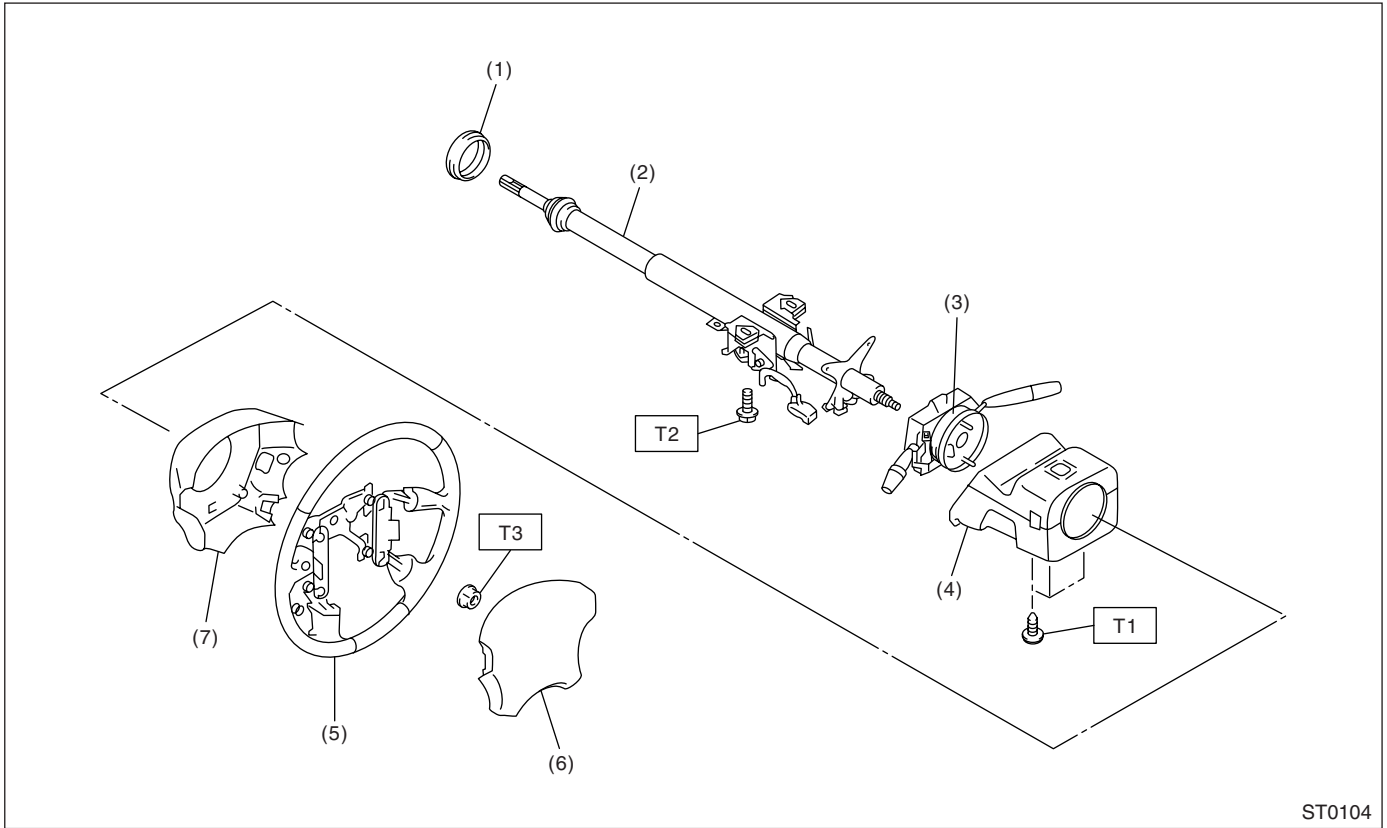
ST0002

GENERAL DESCRIPTION

POWER ASSISTED SYSTEM (POWER STEERING)

B: COMPONENT

1. STEERING WHEEL AND COLUMN



- | | |
|-----------------------------|--------------------------------|
| (1) Bushing | (6) Airbag module |
| (2) Steering shaft | (7) Lower steering wheel cover |
| (3) Steering roll connector | |
| (4) Column cover | |
| (5) Steering wheel | |

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

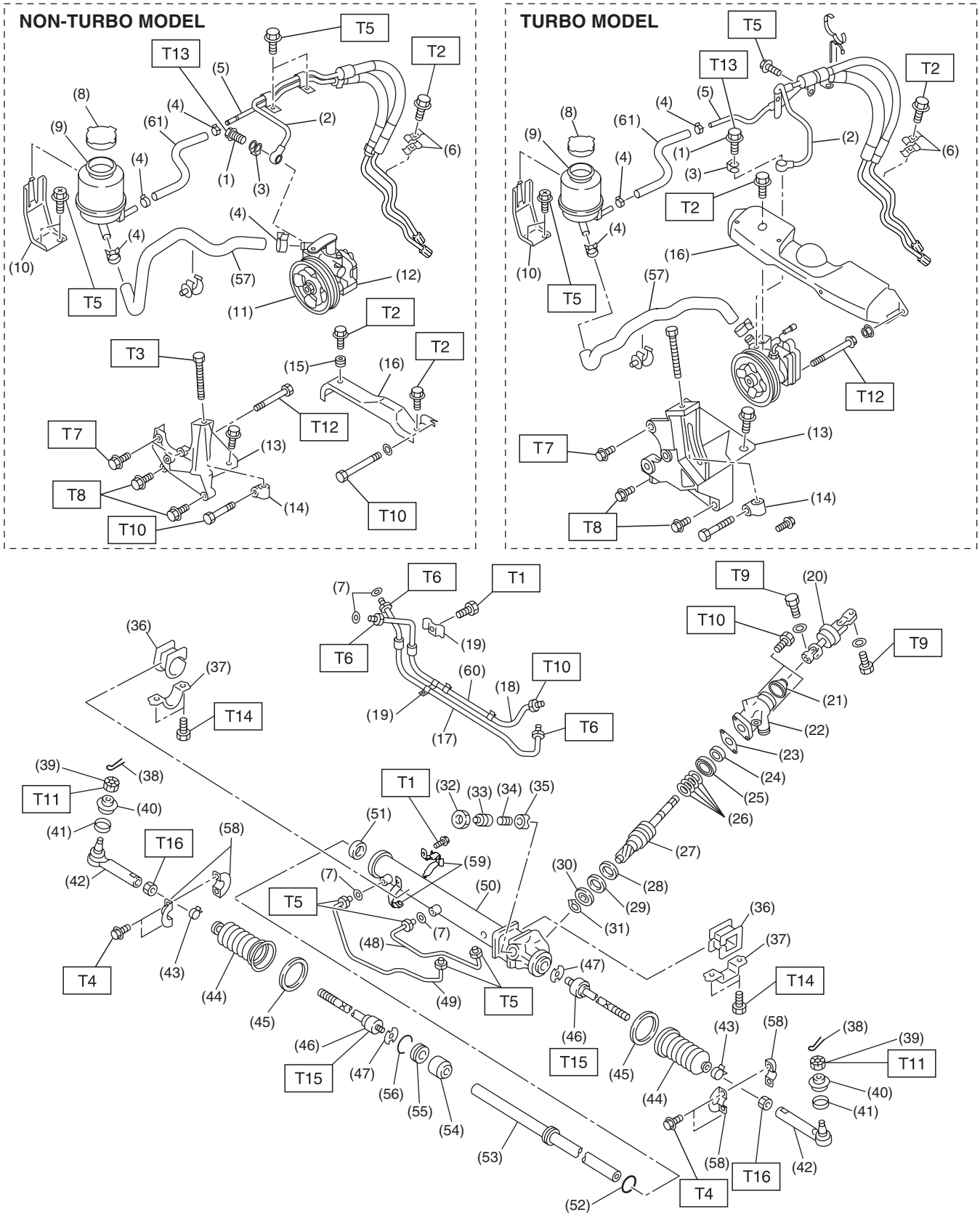
POWER ASSISTED SYSTEM (POWER STEERING)

GENERAL DESCRIPTION

POWER ASSISTED SYSTEM (POWER STEERING)

2. POWER ASSISTED SYSTEM

• LHD MODEL



ST0105

GENERAL DESCRIPTION

POWER ASSISTED SYSTEM (POWER STEERING)

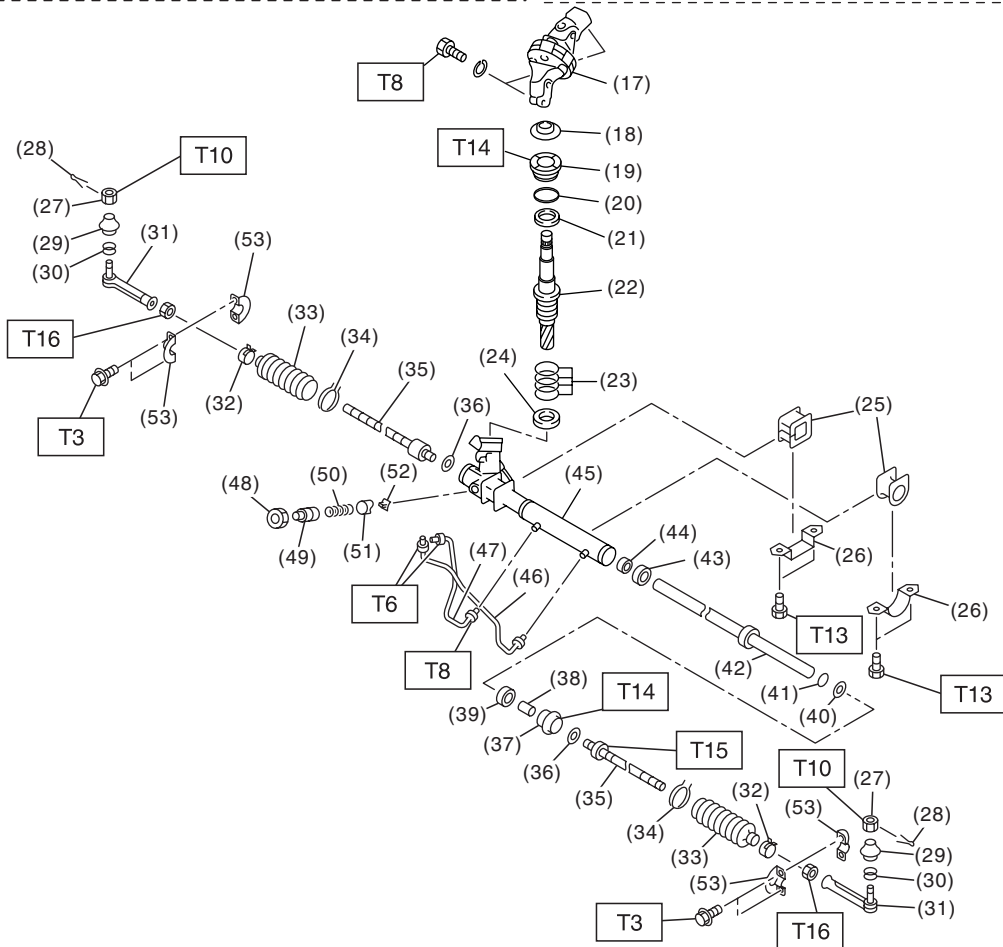
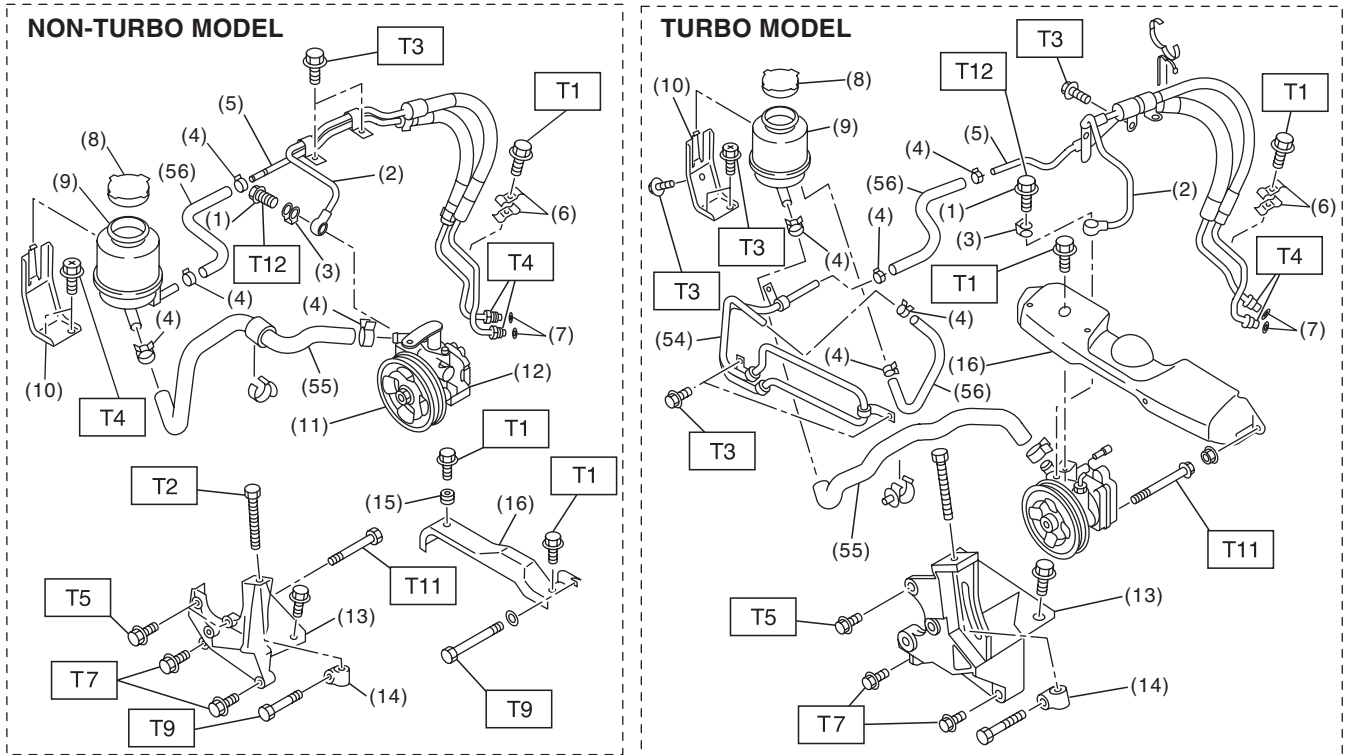
(1) Eye bolt	(28) Oil seal	(55) Rack stopper
(2) Pipe C	(29) Back-up washer	(56) Circlip
(3) Gasket	(30) Ball bearing	(57) Suction hose
(4) Clip	(31) Snap ring	(58) Tie-rod end plate
(5) Pipe D	(32) Lock nut	(59) Clamp plate
(6) Clamp E	(33) Adjusting screw	(60) Hose
(7) O-ring	(34) Spring	(61) Return hose
(8) Cap	(35) Sleeve	
(9) Reservoir tank	(36) Adapter	
(10) Reservoir tank bracket	(37) Clamp	
(11) Pulley	(38) Cotter pin	
(12) Oil pump	(39) Castle nut	
(13) Bracket	(40) Dust cover	
(14) Belt tension nut	(41) Clip	
(15) Bush	(42) Tie-rod end	
(16) Belt cover	(43) Clip	
(17) Pipe E	(44) Boot	
(18) Pipe F	(45) Band	
(19) Clamp plate	(46) Tie-rod	
(20) Universal joint	(47) Lock washer	
(21) Dust seal	(48) Pipe B	
(22) Valve housing	(49) Pipe A	
(23) Gasket	(50) Steering body	
(24) Oil seal	(51) Oil seal	
(25) Ball bearing	(52) Piston ring	
(26) Seal ring	(53) Rack	
(27) Pinion and valve ASSY	(54) Rack bushing	

Tightening torque: N-m (kgf-m, ft-lb)**T1: 6 (0.6, 4.3)****T2: 7.4 (0.75, 5.4)****T3: 8 (0.8, 5.8)****T4: 10 (1.0, 7.2)****T5: 13 (1.3, 9.4)****T6: 15 (1.5, 10.8)****T7: 15.7 (1.6, 11.6)****T8: 22 (2.2, 15.9)****T9: 24 (2.4, 17.4)****T10: 25 (2.5, 18.1)****T11: 27 (2.75, 19.9)****T12: 37.3 (3.8, 27.5)****T13: 39 (4.0, 28.9)****T14: 59 (6.0, 43.4)****T15: 78 (8.0, 57.9)****T16: 83 (8.5, 61.5)**

GENERAL DESCRIPTION

POWER ASSISTED SYSTEM (POWER STEERING)

• RHD MODEL



ST0106

GENERAL DESCRIPTION

POWER ASSISTED SYSTEM (POWER STEERING)

(1) Eye bolt	(26) Clamp	(51) Sleeve
(2) Pipe C	(27) Castle nut	(52) Seat pad
(3) Gasket	(28) Cotter pin	(53) Tie-rod end plate
(4) Clip	(29) Dust seal	(54) Oil cooler
(5) Pipe D	(30) Clip	(55) Suction hose
(6) Clamp E	(31) Tie-rod end	(56) Return hose
(7) O-ring	(32) Clip	
(8) Cap	(33) Boot	
(9) Reservoir tank	(34) Wire	
(10) Reservoir tank bracket	(35) Tie-rod	
(11) Pulley	(36) Lock washer	
(12) Oil pump	(37) Holder	
(13) Bracket	(38) Bush	
(14) Belt tension nut	(39) Oil seal	
(15) Bush	(40) Oil seal	
(16) Belt cover	(41) O-ring	
(17) Universal joint	(42) Rack	
(18) Dust cover	(43) Oil seal	
(19) Plug	(44) Back-up washer	
(20) O-ring	(45) Steering body	
(21) Oil seal	(46) Pipe A	
(22) Pinion	(47) Pipe B	
(23) Seal ring	(48) Lock nut	
(24) Oil seal	(49) Adjusting screw	
(25) Adapter	(50) Spring	

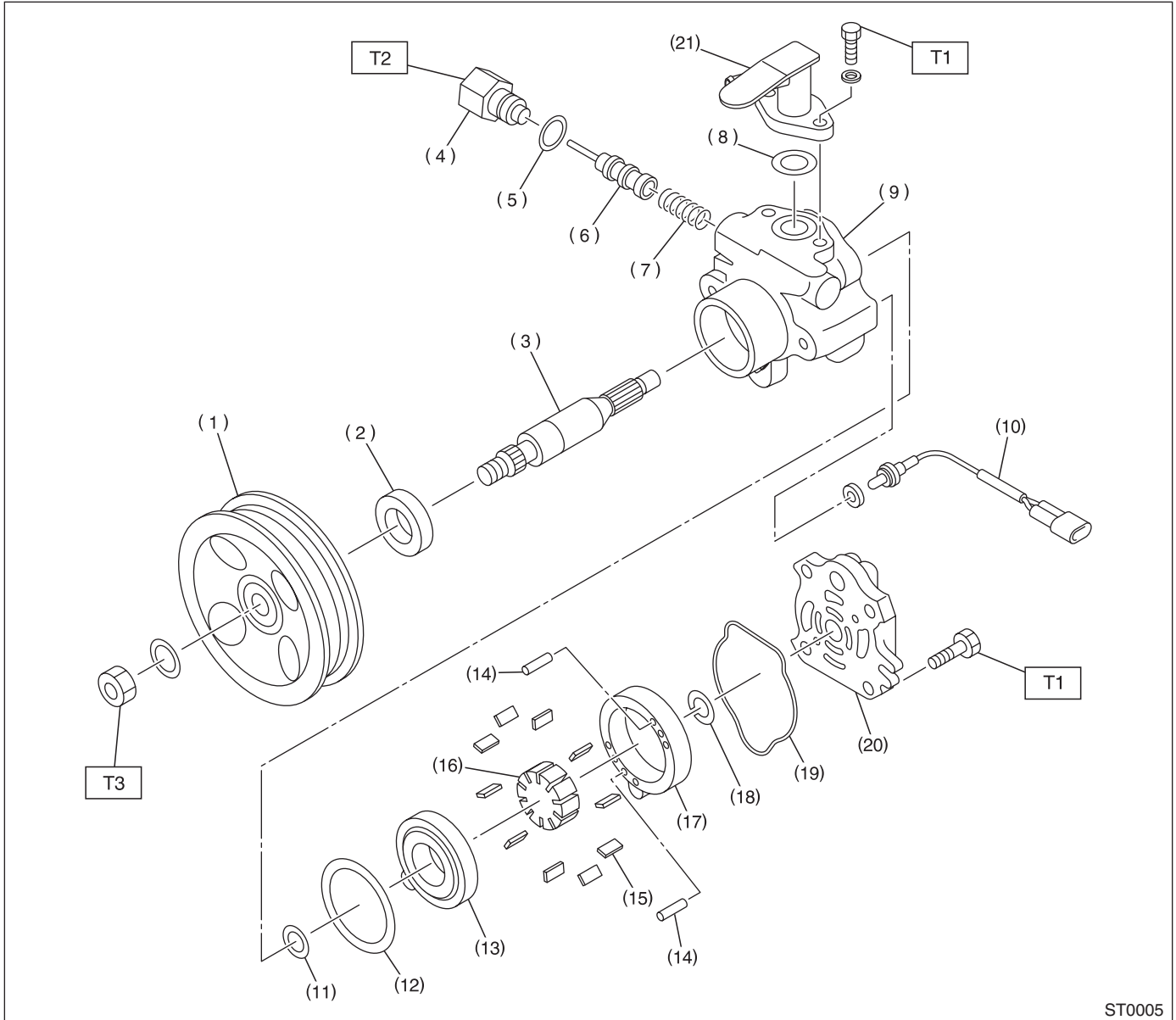
Tightening torque: N·m (kgf·m, ft·lb)**T1: 7.4 (0.75, 5.4)****T2: 8 (0.8, 5.8)****T3: 13 (1.3, 9.4)****T4: 15 (1.5, 10.8)****T5: 15.7 (1.6, 11.6)****T6: 20 (2.0, 14.5)****T7: 22 (2.2, 15.9)****T8: 24 (2.4, 17.4)****T9: 25 (2.5, 18.1)****T10: 27 (2.75, 19.9)****T11: 37.3 (3.8, 27.5)****T12: 39 (4.0, 28.9)****T13: 59 (6.0, 43.4)****T14: 64 (6.5, 47.0)****T15: 78 (8.0, 57.9)****T16: 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 (2.1, 15.2)

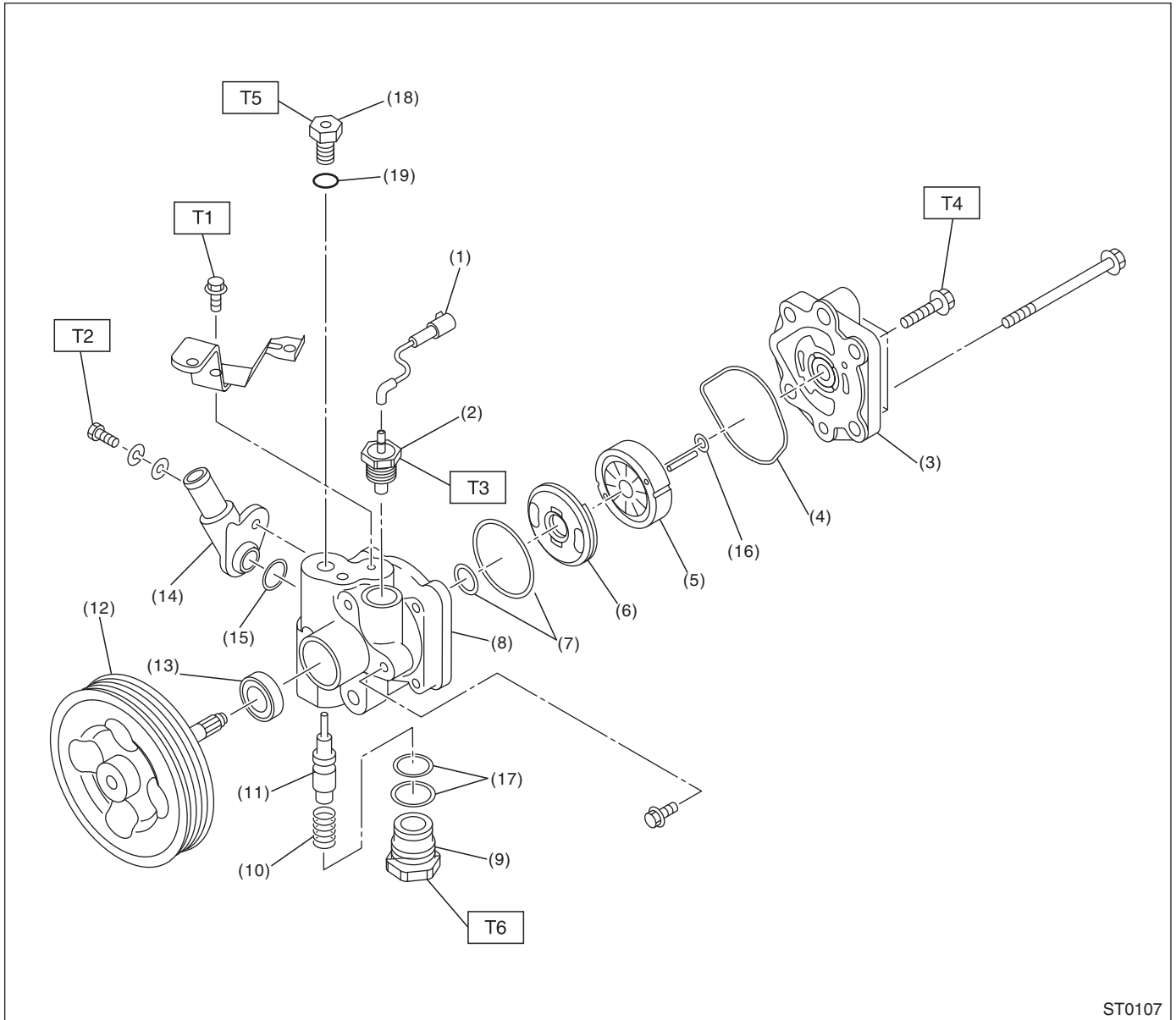
T2: 49 (5.0, 36.2)

T3: 52 (5.3, 38.3)

GENERAL DESCRIPTION

POWER ASSISTED SYSTEM (POWER STEERING)

• TURBO MODEL



ST0107

- | | |
|--------------------------|-------------------------|
| (1) Lead wire | (11) Flow control valve |
| (2) Pump switch | (12) Pulley |
| (3) Rear cover | (13) Oil seal |
| (4) O-ring | (14) Suction connector |
| (5) Cam | (15) O-ring |
| (6) Pressure plate | (16) Retaining ring |
| (7) O-ring | (17) O-ring |
| (8) Front casing | (18) Connector |
| (9) Energy saving valve | (19) O-ring |
| (10) Flow control spring | |

Tightening torque: N-m (kgf-m, ft-lb)

T1: 9.8 (1.0, 7.2)

T2: 11.8 (1.2, 8.7)

T3: 27 (2.75, 19.9)

T4: 27.4 (2.8, 20.3)

T5: 54 (5.5, 39.8)

T6: 59 (6.0, 43.4)

GENERAL DESCRIPTION

POWER ASSISTED SYSTEM (POWER STEERING)

C: CAUTION

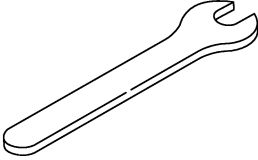
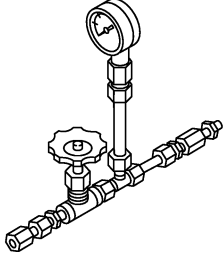
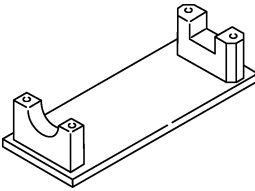
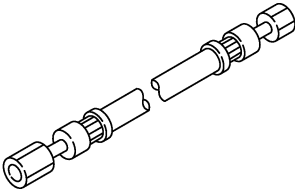
- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation 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 vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.

GENERAL DESCRIPTION

POWER ASSISTED SYSTEM (POWER STEERING)

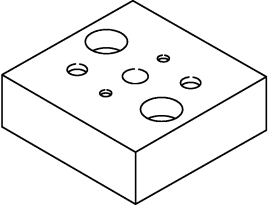
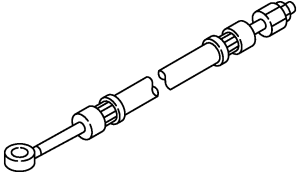
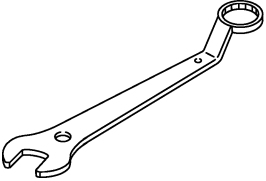
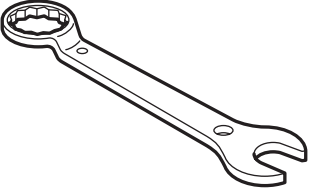
D: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p>B4M2411</p>	925700000	WRENCH	<ul style="list-style-type: none"> Used for removing and installing tie-rod. Apply this tool to rack.
 <p>B4M2412</p>	925711000	PRESSURE GAUGE	Used for measuring oil pump pressure.
 <p>B4M2413</p>	926200000	STAND	Used when inspecting characteristic of gearbox assembly and disassembling it.
 <p>B4M2414</p>	34099AC010	ADAPTER HOSE A	Used with PRESSURE GAUGE (925711000).

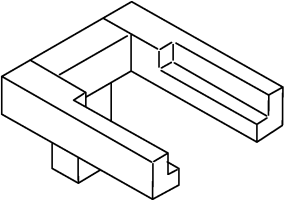
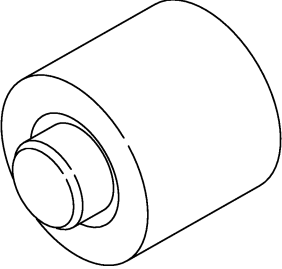
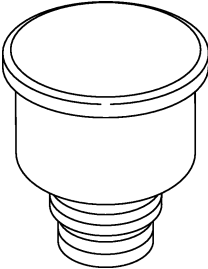
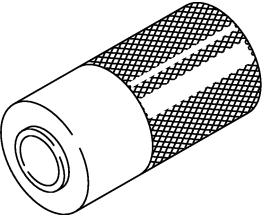
GENERAL DESCRIPTION

POWER ASSISTED SYSTEM (POWER STEERING)

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">G1H0273</p>	34099FA100	STAND BASE	<ul style="list-style-type: none"> • Used for assembling power steering gearbox. • For LHD model.
 <p style="text-align: center;">B4M2415</p>	34099AC020	ADAPTER HOSE B	Used with PRESSURE GAUGE (925711000).
 <p style="text-align: center;">B4M2416</p>	926230000	SPANNER	<ul style="list-style-type: none"> • For the lock nut when adjusting backlash of gearbox.
 <p style="text-align: center;">ST0047</p>	34099PA100	SPANNER	<ul style="list-style-type: none"> • Measurement of rotating resistance of gearbox assembly.

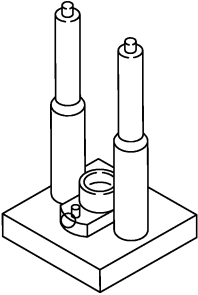
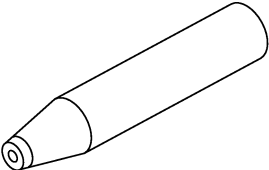
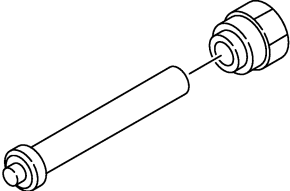
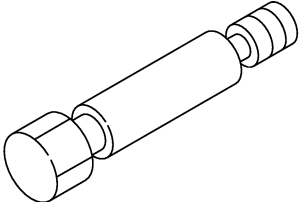
GENERAL DESCRIPTION

POWER ASSISTED SYSTEM (POWER STEERING)

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">B4M2417</p>	34199AE020	MOUNT	<ul style="list-style-type: none"> • Used for disassembling oil pump. • For Turbo model.
 <p style="text-align: center;">B4M2418</p>	34199AE030	INSTALLER	Used for installing oil seal into oil pump.
 <p style="text-align: center;">B4M2419</p>	34199AE040	OIL CHARGE GUIDE	Used for charging power steering oil.
 <p style="text-align: center;">B4M2420</p>	927640000	INSTALLER B	<ul style="list-style-type: none"> • Used for installing ball bearing into housing. • For LHD model.

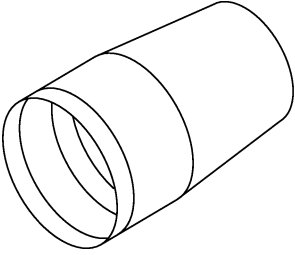
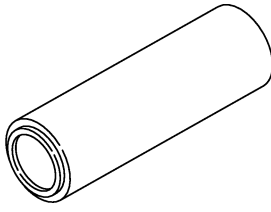
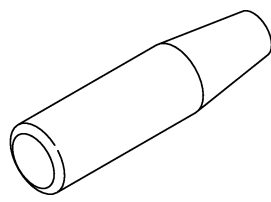
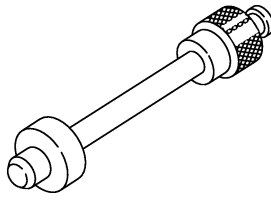
GENERAL DESCRIPTION

POWER ASSISTED SYSTEM (POWER STEERING)

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">B4M2421</p>	926370000	INSTALLER A	<ul style="list-style-type: none"> • Used for installing valve assembly into valve housing assembly. • Used with STAND BASE (927630000). • For LHD model.
 <p style="text-align: center;">B4M2422</p>	926390001	COVER & REMOVER ASSY	<ul style="list-style-type: none"> • Used for assembling rack assembly. • For LHD model.
 <p style="text-align: center;">B4M2423</p>	926420000	PLUG	<p>When oil leaks from pinion side of gearbox assembly, remove pipe B from valve housing, attach this tool and check oil leaking points.</p>
 <p style="text-align: center;">B4M2424</p>	926400000	GUIDE	<ul style="list-style-type: none"> • Right side of rack when installing rack bush. • Used with GUIDE (927660000). • For LHD model.

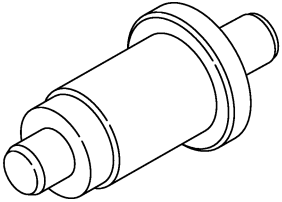
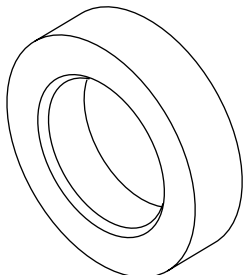
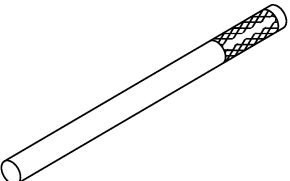
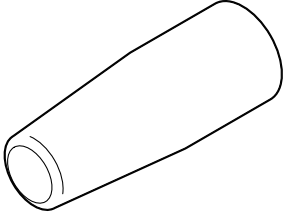
GENERAL DESCRIPTION

POWER ASSISTED SYSTEM (POWER STEERING)

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: right;">B4M2425</p>	927660000	GUIDE	<ul style="list-style-type: none"> • Right side of rack when installing rack bush. • Used with GUIDE (926400000). • For LHD model.
 <p style="text-align: right;">B4M2426</p>	927620000	INSTALLER B	<ul style="list-style-type: none"> • Used for installing oil seal of valve housing. • Used with INSTALLER A (926360000).
 <p style="text-align: right;">B4M2428</p>	926360000	INSTALLER A	<ul style="list-style-type: none"> • Used as a guide to install oil seal. • Used with INSTALLER B (927620000).
 <p style="text-align: right;">B4M2429</p>	34099FA110	INSTALLER	Used for installing oil seal.

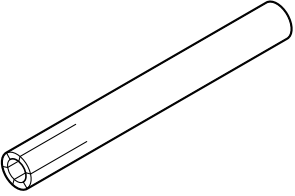
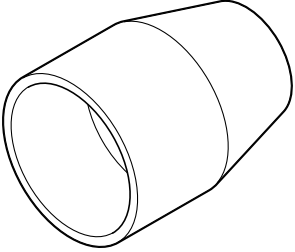
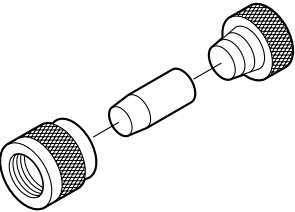
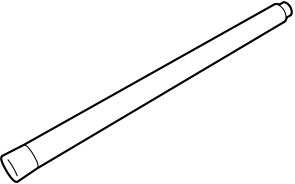
GENERAL DESCRIPTION

POWER ASSISTED SYSTEM (POWER STEERING)

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: right;">S1H0030</p>	34099FA120	INSTALLER AND REMOVER SEAL	<ul style="list-style-type: none"> • Used for installing valve housing oil seal. • Used with INSTALLER SEAL. (34099FA130) • Used for installing valve housing ball bearing. • Used for removing oil seal and ball bearing from valve housing.
 <p style="text-align: right;">ST0007</p>	34099FA130	INSTALLER SEAL	<ul style="list-style-type: none"> • Used for installing valve housing oil seal. • Used with INSTALLER AND REMOVER SEAL (34099FA120).
 <p style="text-align: right;">B4M2432</p>	34199AE050	REMOVER OIL SEAL	Used for removing back-up ring and oil seal.
 <p style="text-align: right;">H4M1408</p>	34099AC030	INSTALLER A	<ul style="list-style-type: none"> • Used for installing retaining ring. • Used with INSTALLER B (34099AC040). • For Non-turbo model.

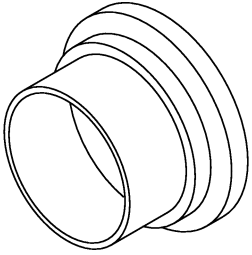
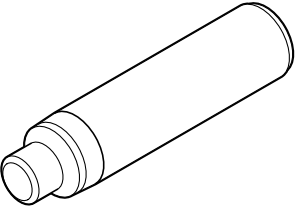
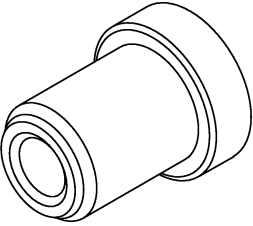
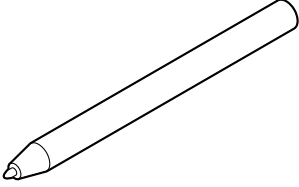
GENERAL DESCRIPTION

POWER ASSISTED SYSTEM (POWER STEERING)

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: right;">H4M1409</p>	34099AC040	INSTALLER B	<ul style="list-style-type: none"> • Used for installing retaining ring. • Used with INSTALLER A (34099AC030). • For Non-turbo model.
 <p style="text-align: right;">ST0059</p>	926250000	GUIDE	<ul style="list-style-type: none"> • Used for installing holder ASSY into rack housing. • For RHD model.
 <p style="text-align: right;">ST0063</p>	927490000	INSTALLER A, B, C	<ul style="list-style-type: none"> • Used for installing oil seal into rack assembly. • For RHD model.
 <p style="text-align: right;">ST0066</p>	927580000	REMOVER	<ul style="list-style-type: none"> • Used for removing back-up ring and oil seal. • For RHD model.

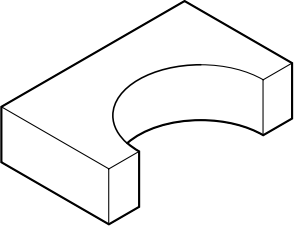
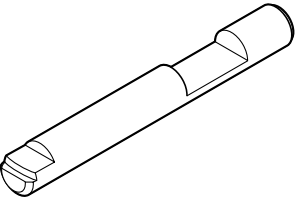
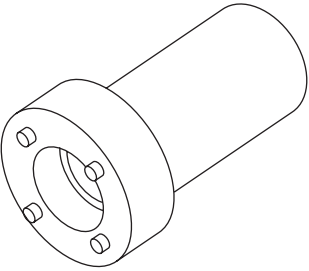
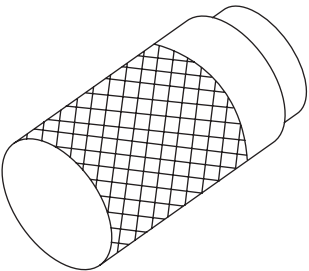
GENERAL DESCRIPTION

POWER ASSISTED SYSTEM (POWER STEERING)

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">B4M2500</p>	34099FA010	GUIDE	<ul style="list-style-type: none"> • Used for installing rack and seal into housing assembly. • For RHD model.
 <p style="text-align: center;">ST0072</p>	34099FA030	INSTALLER & REMOVER	<ul style="list-style-type: none"> • Used for removing and installing rack oil seal (outer & inner). • For RHD model.
 <p style="text-align: center;">B4M2503</p>	34099FA040	INSTALLER	<ul style="list-style-type: none"> • Used for installing rack oil seal (outer). • For RHD model.
 <p style="text-align: center;">ST0075</p>	34099FA060	PUNCH HOLDER	<ul style="list-style-type: none"> • Used for caulking. • For RHD model.

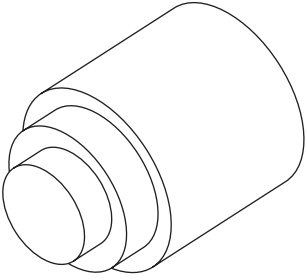
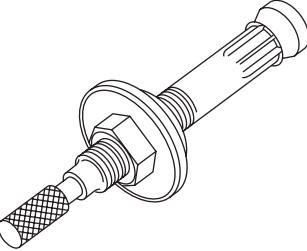
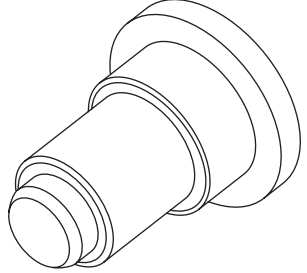
GENERAL DESCRIPTION

POWER ASSISTED SYSTEM (POWER STEERING)

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p>ST0076</p>	34099FA070	BASE	<ul style="list-style-type: none"> • Used for supporting housing assembly. • For RHD model.
 <p>ST0077</p>	34099FA080	PUNCH	<ul style="list-style-type: none"> • Used for removing caulking. • For RHD model.
 <p>B4M2615</p>	34199AE090	PLUG WRENCH	Used for removing plug.
 <p>B4M2616</p>	34199AE100	PLUG OIL SEAL REMOVER	Used for removing plug oil seal.

GENERAL DESCRIPTION

POWER ASSISTED SYSTEM (POWER STEERING)

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B4M2617	34199AE110	PLUG OIL SEAL INSTALLER	Used for installing plug oil seal.
 B4M2618	34199AE120	GEARBOX OIL SEAL REMOVER	Used for removing gearbox oil seal.
 B4M2619	34199AE130	GEARBOX OIL SEAL INSTALLER	Used for installing gearbox oil seal.

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 the ground cable from battery.
- 2) Set the tires to straight-ahead position.
- 3) Remove the airbag module. <Ref. to AB-12, REMOVAL, Driver's Airbag Module.>

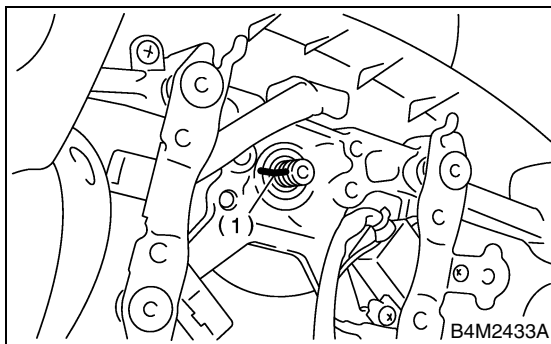
WARNING:

Always refer to “AirBag System” before performing airbag module service. <Ref. to AB-3, CAUTION, General Description.>

- 4) Remove the steering wheel nut, and then draw out the steering wheel from shaft using steering puller.

NOTE:

Make matching marks on the steering wheel and steering column in advance.



(1) Matching mark

B: INSTALLATION

- 1) Align the center of roll connector. <Ref. to AB-17, ADJUSTMENT, Roll Connector.>
- 2) Install in the reverse order of removal.

NOTE:

Align matching marks on the steering wheel and steering column.

Tightening torque:

44 N·m (4.5 kgf·m, 32.5 ft·lb)

Column cover-to-steering wheel clearance:

2 — 4 mm (0.08 — 0.16 in)

WARNING:

Always refer to “AirBag System” before performing airbag module service. <Ref. to AB-3, CAUTION, General Description.>

CAUTION:

Insert the roll connector guide pin into guide hole on lower end of surface of steering wheel to prevent damage. Draw out the airbag system connector, horn connector and cruise control connectors from guide hole of steering wheel lower end.

C: INSPECTION

- 1) Check the steering wheel for deformation. If the deformation is excessive, replace steering wheel.
- 2) Check the splines on steering wheel for damage. If the damage is excessive, replace steering wheel.

UNIVERSAL JOINT

POWER ASSISTED SYSTEM (POWER STEERING)

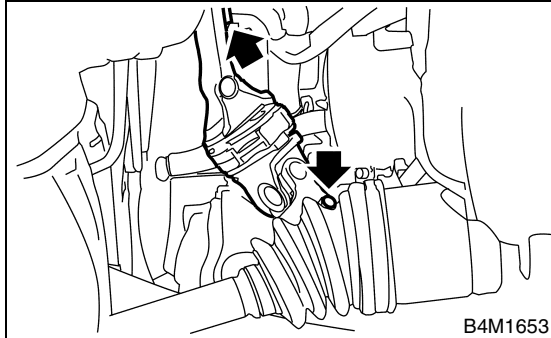
3. Universal Joint

A: REMOVAL

- 1) Remove the steering wheel. <Ref. to PS-26, REMOVAL, Steering Wheel.>
- 2) Remove the universal joint bolts, and then remove the universal joint.

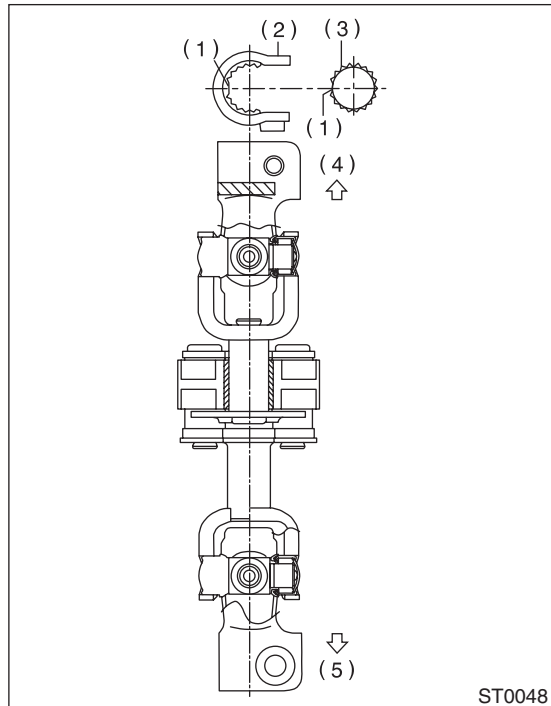
CAUTION:

Scribe alignment marks on the universal joint so that it can be reassembled at the original serration.



B: INSTALLATION

- 1) Install the universal joint.
 - (1) Align the cutout at serrated section of the column shaft and yoke, and then insert the universal joint into column shaft.



- (1) Cutout
- (2) Yoke
- (3) Column shaft
- (4) Column shaft side
- (5) Gearbox side

- (2) Align the bolt hole on gearbox side of universal joint with the cutout at serrated section of gearbox assembly. Lower the universal joint completely.

- (3) Temporarily tighten the bolt on gearbox side. Raise the universal joint to make sure the bolt is properly passing through the cutout at serrated section.

- (4) Tighten the bolt.

Tightening torque:

24 N·m (2.4 kgf-m, 17.4 ft-lb)

CAUTION:

- Make sure that the universal joint bolt is tightened through notch in shaft serration.
- Excessively large tightening torque of the universal joint bolts may lead to heavy steering wheel operation.

**Standard clearance between gearbox to DOJ:
Over 14 mm (0.55 in)**

- 2) Align the center of roll connector. <Ref. to AB-17, ADJUSTMENT, Roll Connector.>

CAUTION:

Ensure the front wheel are set straight forward direction.

- 3) Install the steering wheel and airbag module. <Ref. to PS-26, INSTALLATION, Steering Wheel.>

WARNING:

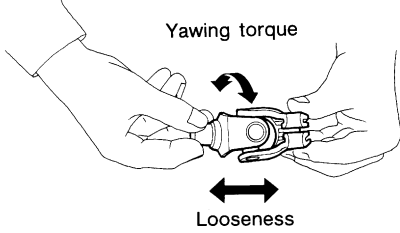
Always refer to "AirBag System" before performing airbag module service. <Ref. to AB-3, CAUTION, General Description.>

UNIVERSAL JOINT

POWER ASSISTED SYSTEM (POWER STEERING)

C: INSPECTION

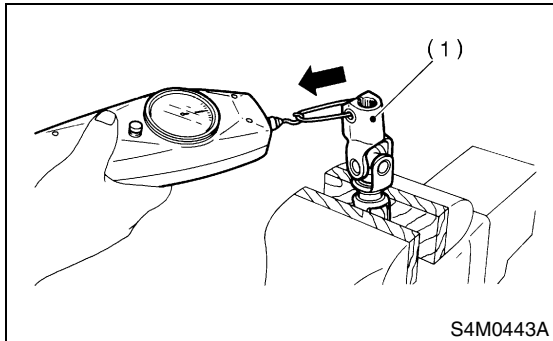
Clean the disassembled parts with a cloth, and check for wear, damage, or any other faults. If necessary, repair or replace faulty parts.

Inspection	Corrective action
<ul style="list-style-type: none"> • Free play • Swinging torque Yawing torque Looseness  <p style="text-align: center;">Yawing torque</p> <p style="text-align: center;">Looseness</p> <p style="text-align: right;">G4M0089</p> <p>Standard value of universal joint free play: 0 mm (0 in) Max. value of universal joint swinging torque: 0.3 N·m (0.03 kgf·m, 0.2 ft·lb)</p>	<p>Replace if faulty.</p>

Measurement of folding torque of universal joint is as shown in the figures.

Service limit:

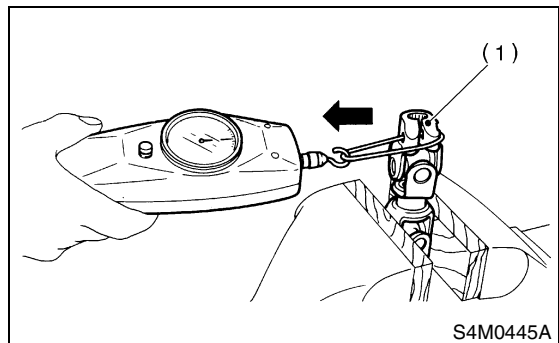
Maximum load; 7.3 N (0.74 kgf, 1.64 lb) or less



(1) Yoke (gearbox side)

Service limit:

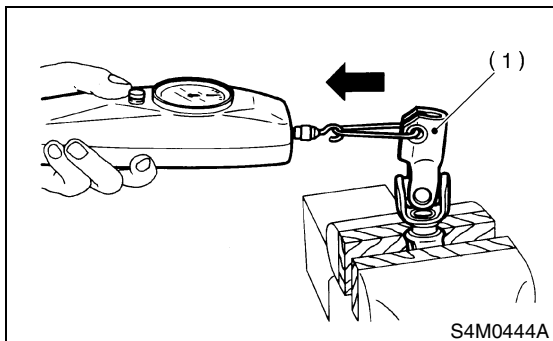
Maximum load; 7.3 N (0.74 kgf, 1.64 lb) or less



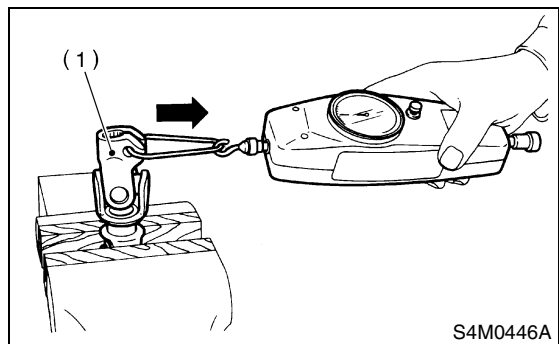
(1) Yoke (Steering column side)

Service limit:

Maximum load; 7.3 N (0.74 kgf, 1.64 lb) or less



(1) Yoke (gearbox side)



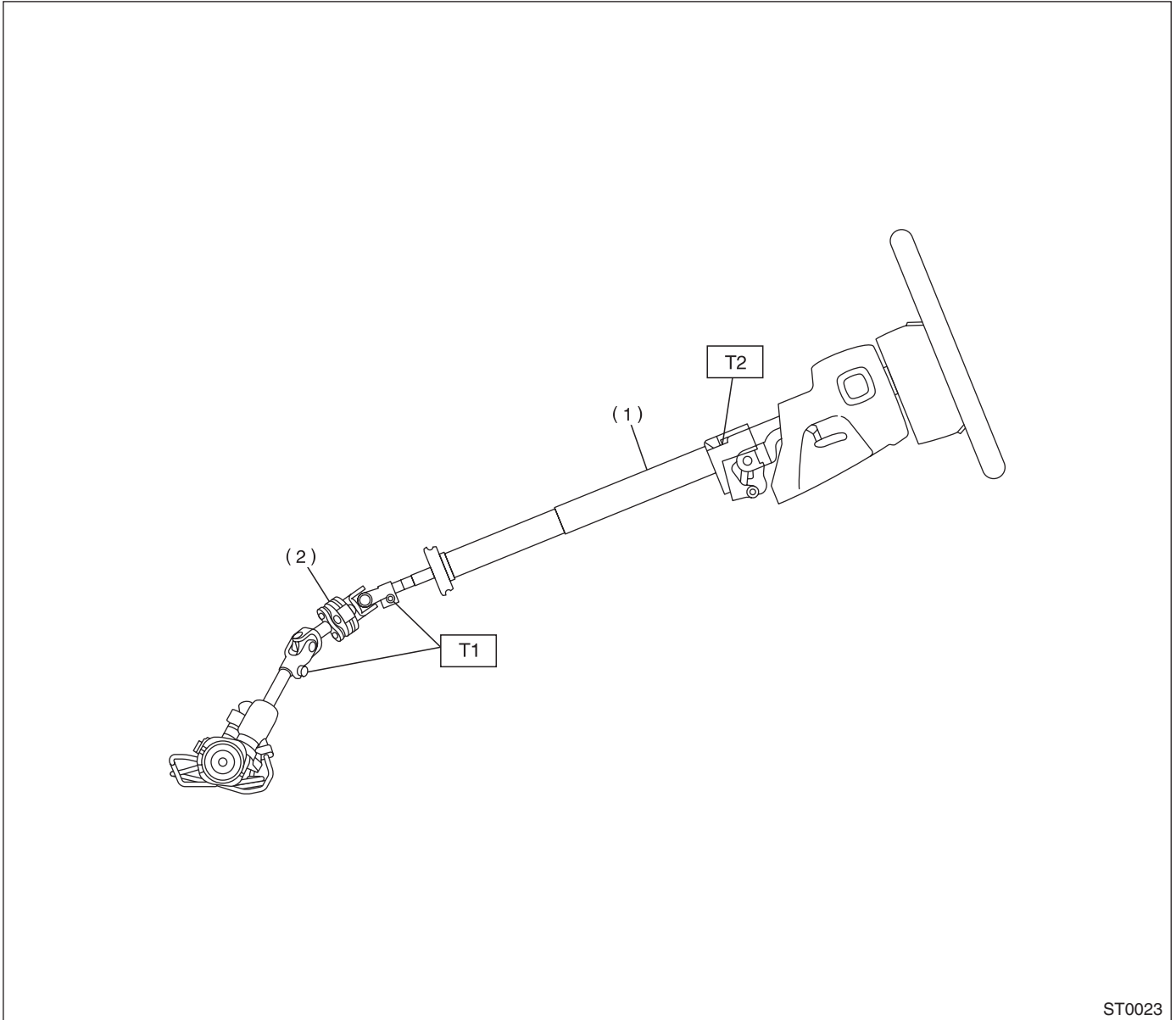
(1) Yoke (Steering column side)

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 a lift.
- 2) Disconnect the ground cable from battery.
- 3) Remove the airbag module. <Ref. to AB-12, REMOVAL, Driver's Airbag Module.>

WARNING:

Always refer to "AirBag System" before performing airbag module service. <Ref. to AB-3, CAUTION, General Description.>

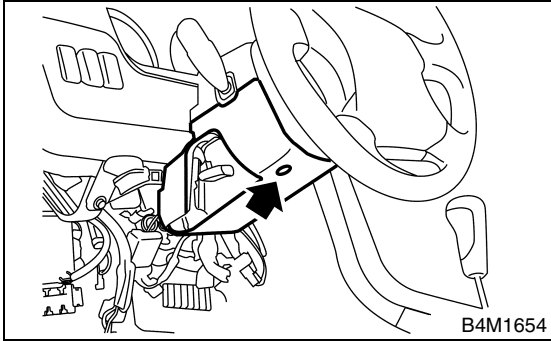
- 4) Remove the steering wheel. <Ref. to PS-26, REMOVAL, Steering Wheel.>

- 5) Remove the universal joint. <Ref. to PS-27, REMOVAL, Universal Joint.>
- 6) Remove the trim panel under instrument panel.

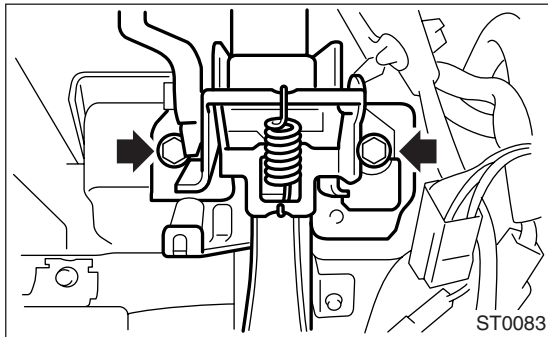
TILT STEERING COLUMN

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.



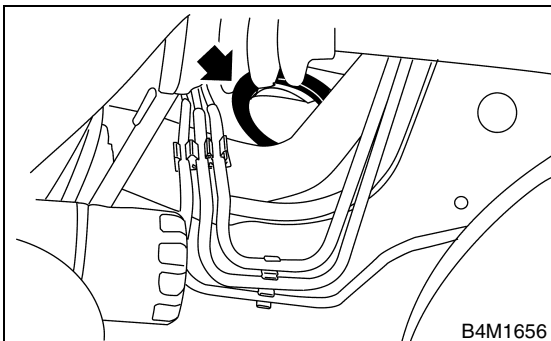
- 10) Pull out the steering shaft assembly from hole on toe board.

CAUTION:

Be sure to remove the 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 the grommet to toe board.



- 2) Insert the end of steering shaft into toe board grommet.
3) Tighten the 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 the airbag system connector at harness spool.

NOTE:

Make sure to apply double lock.

- 6) Install the lower column cover with tilt lever held in the lowered position.

- 7) Install the universal joint. <Ref. to PS-27, INSTALLATION, Universal Joint.>

- 8) Align center of roll connector. <Ref. to AB-17, ADJUSTMENT, Roll Connector.>

CAUTION:

Ensure the front wheels are set in straight forward direction.

- 9) Install the steering wheel. <Ref. to PS-26, INSTALLATION, Steering Wheel.>

Set the steering wheel to neutral and install it onto steering shaft.

CAUTION:

Insert the roll connector guide pin into guide hole on lower end of surface of steering wheel to prevent damage. Draw out the airbag system connector, horn connector and cruise control connectors from guide hole of steering wheel lower end.

- 10) Install the airbag module to steering wheel.

WARNING:

Always refer to "AirBag System" before performing the service operation. <Ref. to AB-3, CAUTION, General Description.>

C: DISASSEMBLY

Remove the two screws securing upper steering column covers, and two screws securing combination switch, and then remove the related parts.

D: ASSEMBLY

1) Insert the combination switch to upper column shaft, and then install the upper column cover. Then route the 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 the screw.

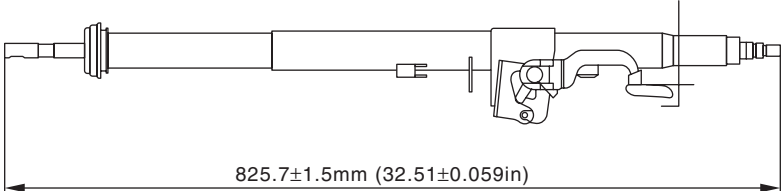
TILT STEERING COLUMN

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
<ul style="list-style-type: none">Overall length of steering column <p>Measure the overall length of steering column. Standard overall length of steering column:</p>  <p>825.7±1.5mm (32.51±0.059in)</p> <p>ST0024</p>	<p>Replace the steering column assembly.</p>

2. AIRBAG MODEL INSPECTION

WARNING:

For airbag model inspection procedures, refer to "AirBag System". <Ref. to AB-3, CAUTION, General Description.>

STEERING GEARBOX [LHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

5. Steering Gearbox [LHD MODEL]

A: REMOVAL

- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from battery.
- 3) Loosen the front wheel nuts.
- 4) Lift-up the vehicle, and then remove the front wheels.
- 5) Remove the under cover.
- 6) Remove the sub frame. <Ref. to FS-25, REMOVAL, Sub Frame.>
- 7) Remove the front exhaust pipe assembly. (Non-turbo model)

Non-turbo model without OBD

<Ref. to EX(w/oOBD)-9, REMOVAL, Front Exhaust Pipe.>

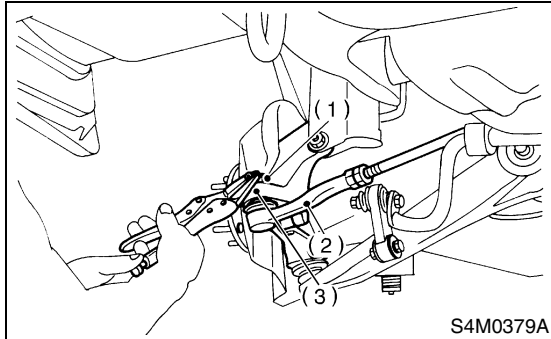
Non-turbo model with OBD

<Ref. to EX-7, REMOVAL, Front Exhaust Pipe.>

WARNING:

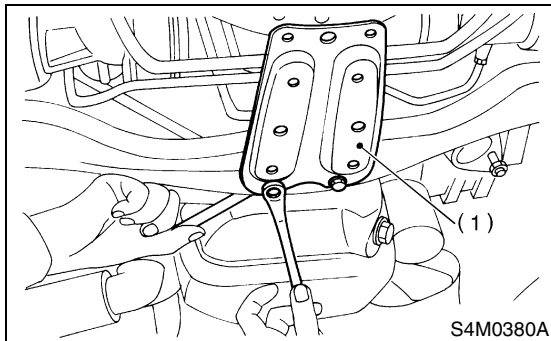
Be careful, the exhaust pipe is hot.

- 8) Using a puller, remove the tie-rod end from knuckle arm after pulling off the cotter pin and removing castle nut.



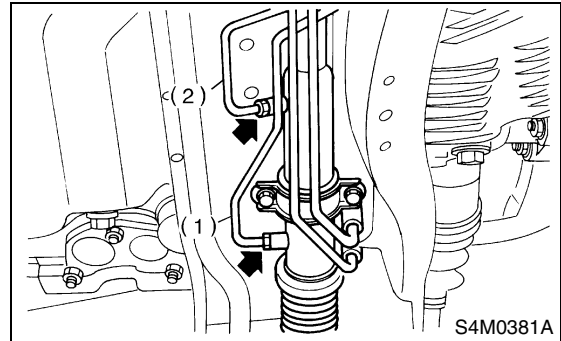
- (1) Castle nut
- (2) Tie-rod end
- (3) Knuckle arm

- 9) Remove the jack-up plate and front stabilizer.



- (1) Jack-up plate

- 10) Remove the one pipe joint at center of gearbox, and connect the vinyl hose to pipe and joint. Discharge the fluid by turning steering wheel fully clockwise and counterclockwise. Discharge the fluid similarly from other pipe.



- (1) Pipe A
- (2) Pipe B

- 11) Remove the universal joint. <Ref. to PS-27, REMOVAL, Universal Joint.>

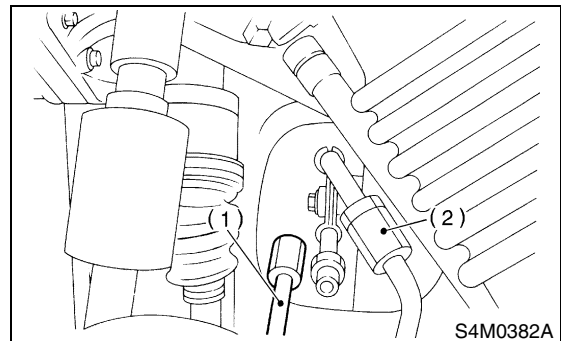
- 12) Disconnect the pipes C and D from pipe of gearbox.

CAUTION:

Be careful not to damage these pipes.

NOTE:

Disconnect the upper pipe D first, and lower pipe C second.

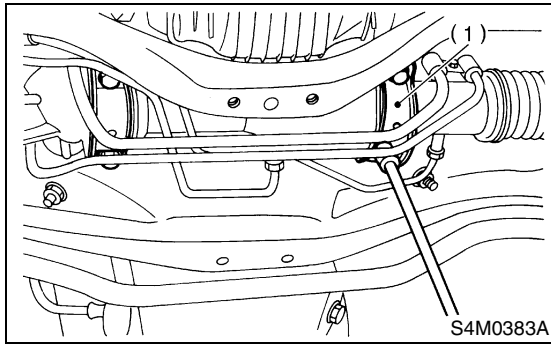


- (1) Pipe C
- (2) Pipe D

STEERING GEARBOX [LHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

- 13) Remove the clamp bolts securing gearbox to crossmember, and then remove the gearbox.



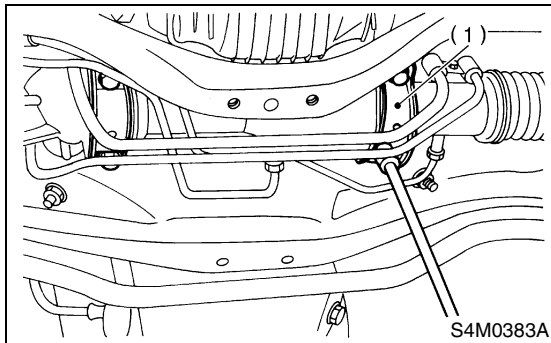
(1) Clamp

B: INSTALLATION

- 1) Insert the gearbox into crossmember, being careful not to damage the gearbox boot.
2) Tighten the gearbox to crossmember bracket via clamp with bolt to the specified torque.

Tightening torque:

59 N-m (6.0 kgf-m, 43.4 ft-lb)



(1) Clamp

- 3) Install the four pipes on gearbox.
(1) Connect the pipes A and B to four pipe joints of gearbox. Connect the upper pipe B first, and lower pipe A.

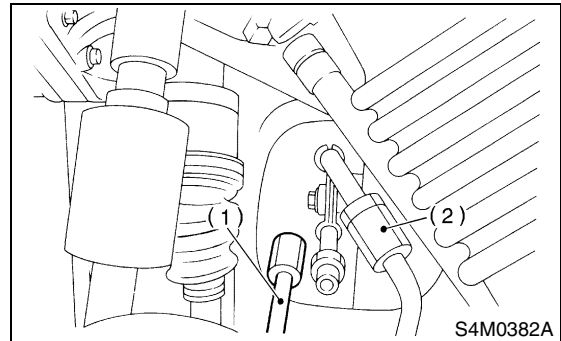
Tightening torque:

13 N-m (1.3 kgf-m, 9.4 ft-lb)

- (2) Connect the pipes C and D to gearbox. Connect the upper pipe D first, and lower pipe C second.

Tightening torque:

15 N-m (1.5 kgf-m, 10.8 ft-lb)



(1) Pipe C

(2) Pipe D

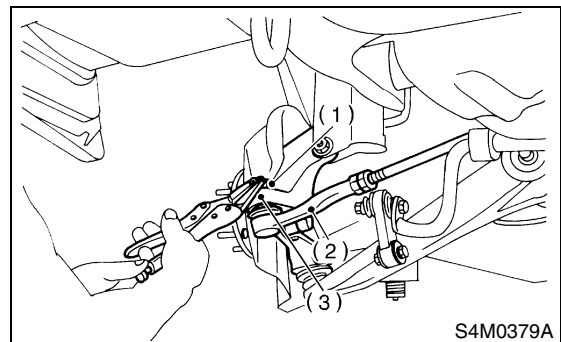
- 4) Install the universal joint. <Ref. to PS-27, INSTALLATION, Universal Joint.>
5) Connect the tie-rod end and knuckle arm, and tighten with castle nut. Fit the cotter pin into nut and bend the pin to lock.

Castle nut tightening torque:

Tighten to 27 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 the cap at bottom of tie-rod end with hammer.



(1) Castle nut

(2) Tie-rod end

(3) Knuckle arm

- 6) Install the front stabilizer to vehicle.
7) Install the front exhaust pipe assembly.
8) Install the sub frame. <Ref. to FS-25, REMOVAL, Sub Frame.>

STEERING GEARBOX [LHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

9) Align the center of roll connector. <Ref. to AB-17, ADJUSTMENT, Roll Connector.>

CAUTION:

Ensure the front wheels are set in straight forward direction.

10) Install the steering wheel. <Ref. to PS-26, INSTALLATION, Steering Wheel.>

11) Install the tires.

12) Tighten the wheel nuts to specified torque.

Tightening torque:

90 N·m (9.1 kgf·m, 65.8 ft·lb)

13) Connect the battery ground cable to battery.

14) Pour the fluid into the oil tank, and bleed air.

<Ref. to PS-107, Power Steering Fluid.>

15) Check for fluid leaks.

16) Install the jack-up plate.

17) Lower the vehicle.

18) Check the fluid level in oil tank.

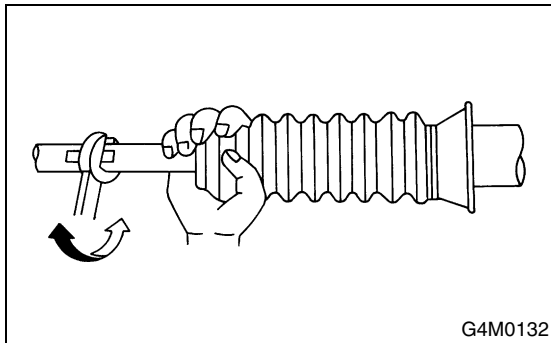
19) After adjusting the toe-in and steering angle, tighten the lock nut on tie-rod end.

Tightening torque:

83 N·m (8.5 kgf·m, 61.5 ft·lb)

CAUTION:

When adjusting the toe-in, hold the boot as shown to prevent it from being rotated or twisted. If twisted, straighten it.



C: DISASSEMBLY

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. RACK HOUSING ASSEMBLY

1) Disconnect the four pipes from gearbox.

NOTE:

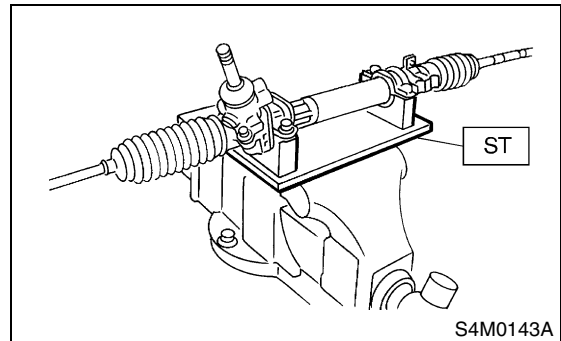
Remove the pipes E and F as a single unit being fixed at clamp plate.

2) Secure the gearbox removed from vehicle in vice using ST.

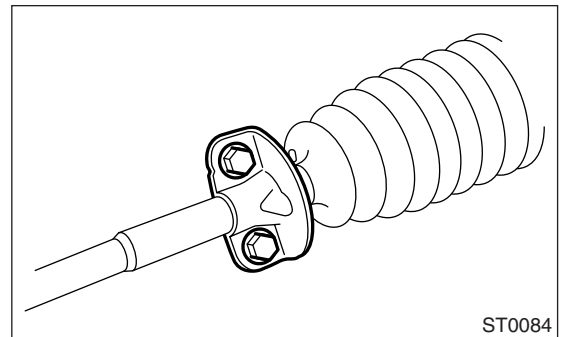
ST 926200000 STAND

CAUTION:

Secure the gearbox in a vise using ST as shown. Do not attempt to secure it without this ST.

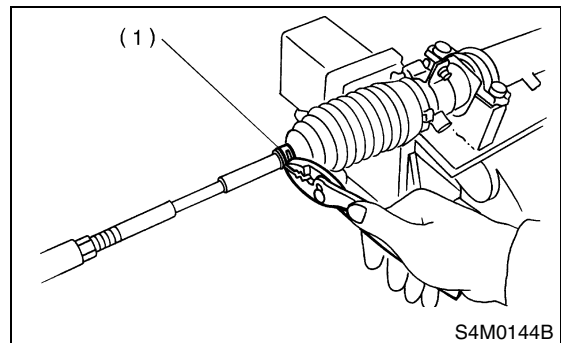


3) Remove the tie-rod end plate.



4) Remove the tie-rod end and lock nut from gearbox.

5) Remove the small clip from boot using pliers, and then move the boot to tie-rod end side.

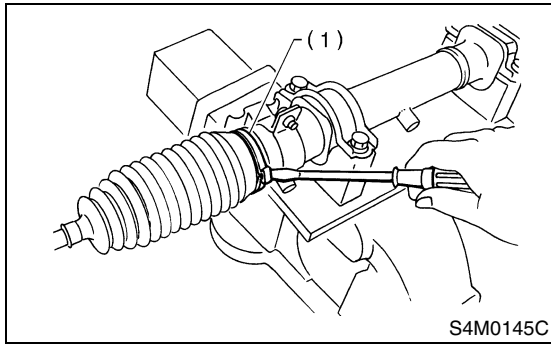


(1) Clip

STEERING GEARBOX [LHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

6) Using a standard screwdriver, remove the band from boot.

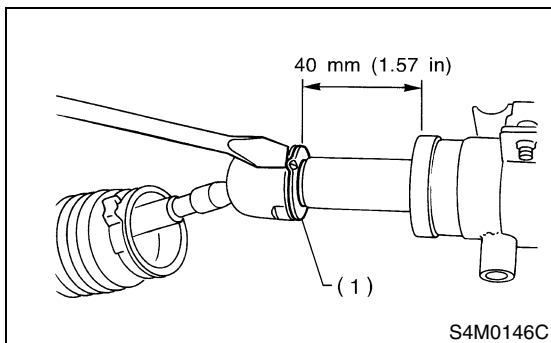


(1) Band

7) Extend the rack approx. 40 mm (1.57 in) out. Unlock the lock wire at lock washer on each side of tie-rod end using a standard screwdriver.

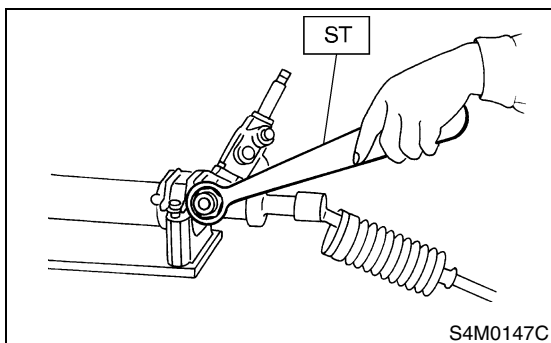
CAUTION:

Be careful not to scratch the rack surface as oil leaks may result.

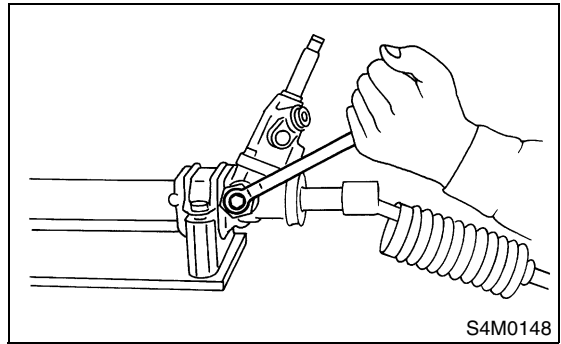


(1) Lock washer

8) Using the ST, loosen the lock nut.
ST 926230000 SPANNER



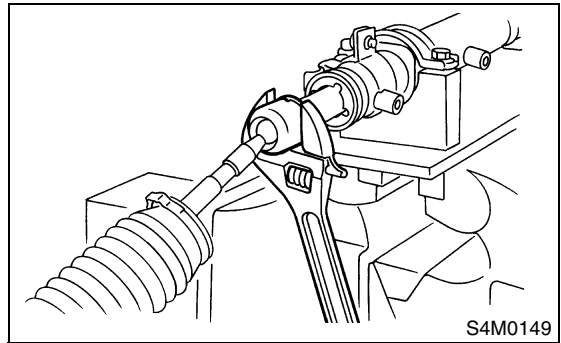
9) Tighten the adjusting screw until it no longer tightens.



10) Using a wrench [32 mm (1.26 in) width across flats] or adjustable wrench, remove the tie-rod.

CAUTION:

- Check the ball joint for free play, and tie-rod for bends. Replace if necessary.
- Check the dust seals used with tie-rod end ball joint for damage or deterioration. Replace if necessary.

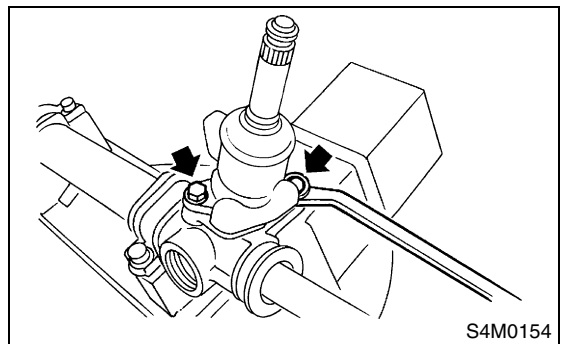


11) Loosen the adjusting screw, and then remove the spring and sleeve.

CAUTION:

Replace the spring and/or sleeve if damaged.

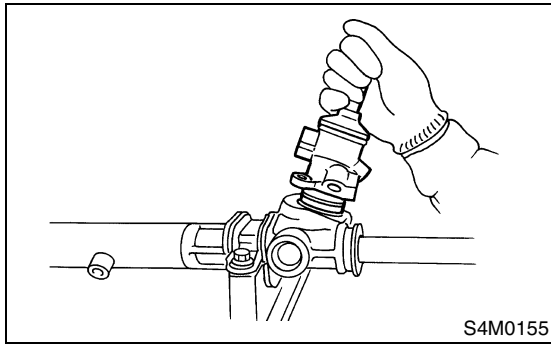
12) Remove the two bolts securing valve assembly.



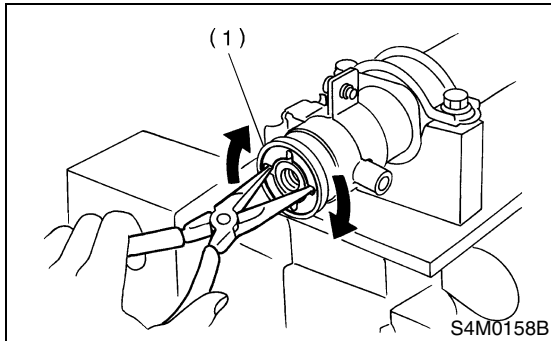
STEERING GEARBOX [LHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

13) Carefully draw out the input shaft, and then remove the valve assembly.



14) Using a sharp pointed pliers, rotate the rack stopper in direction of the arrow until end of the circlip comes out of stopper. Rotate the circlip in opposite direction and pull it out.

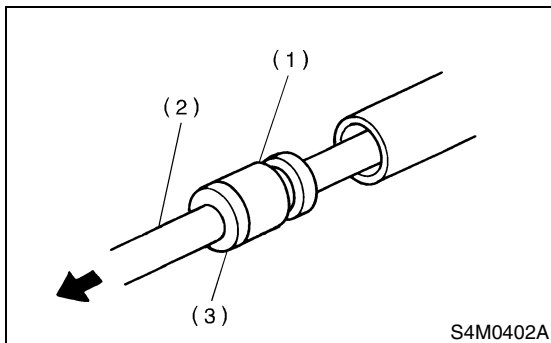


(1) Rack stopper

15) Pull the rack assembly from cylinder side, and draw out the rack bushing and rack stopper together with the rack assembly.

CAUTION:

Be careful not to contact the rack to inner wall of cylinder when drawing out. Any scratch on the cylinder inner wall will cause oil leakage.



- (1) Rack bushing
- (2) Rack assembly
- (3) Rack stopper

16) Remove the rack bushing and rack stopper from rack assembly.

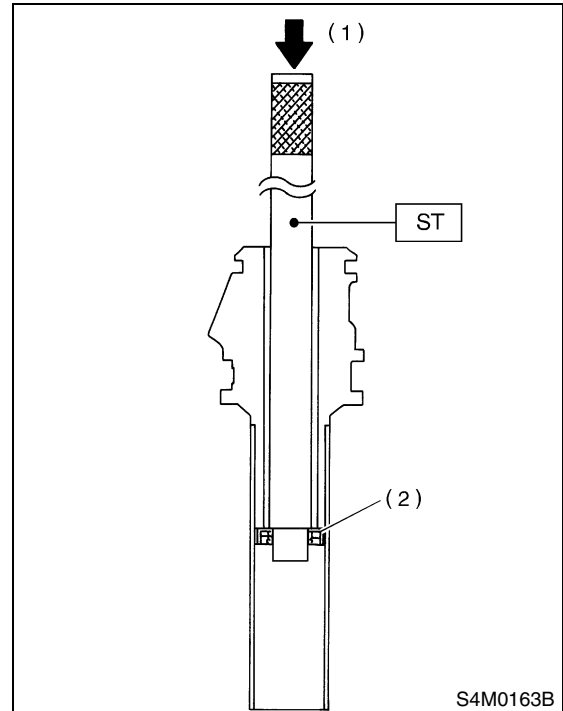
CAUTION:

Do not reuse the removed rack bushing and circlip.

17) Remove the oil seal from rack.

18) Insert the ST from pinion housing side, and then remove the oil seal using a press.

ST 34099FA110 INSTALLER



- (1) Press
- (2) Oil seal

NOTE:

Discard the removed the oil seal.

STEERING GEARBOX [LHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

2. CONTROL VALVE

1) Disconnect the four pipes from gearbox.

NOTE:

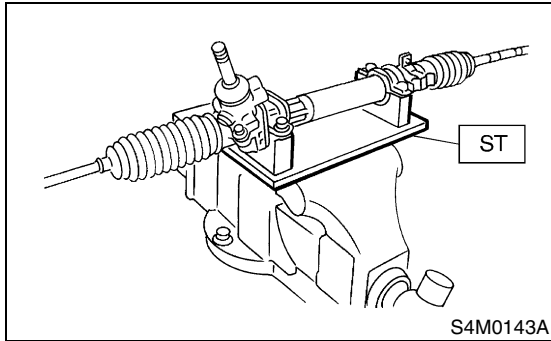
Remove the pipes E and F as a single unit being fixed at clamp plate.

2) Secure the gearbox removed from the vehicle in vise using ST.

ST 92620000 STAND

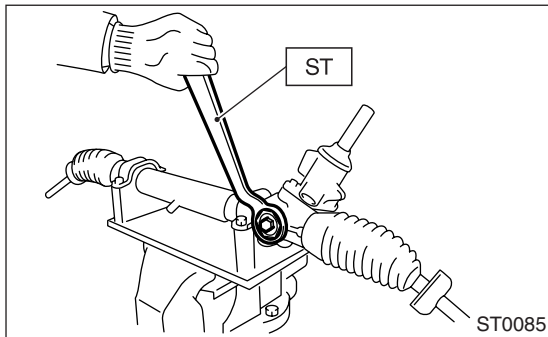
CAUTION:

Secure the gearbox in a vise using ST as shown. Do not attempt to secure it without this ST.

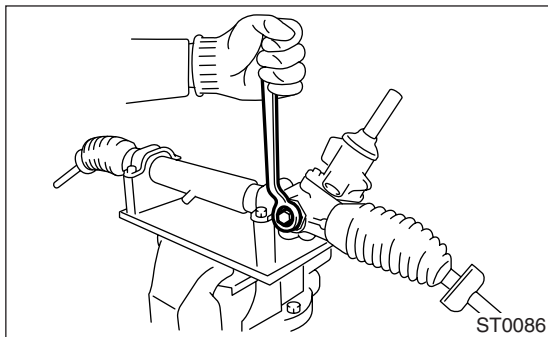


3) Using the ST, loosen the lock nut.

ST 926230000 SPANNER



4) Tighten the adjusting screw until it no longer tightens.

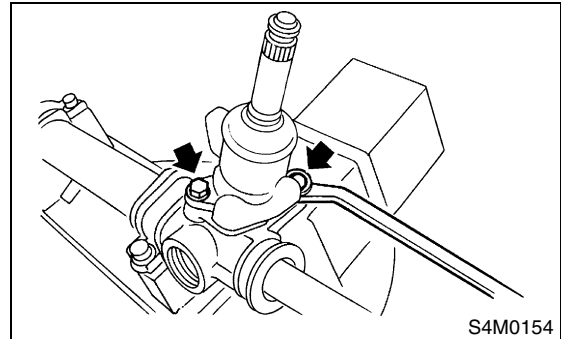


5) Loosen the adjusting screw, and then remove the spring and sleeve.

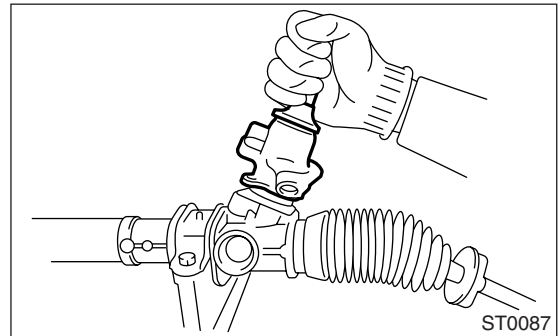
CAUTION:

Replace the spring and/or sleeve if damaged.

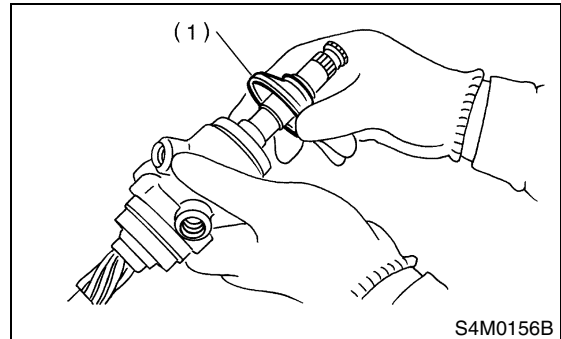
6) Remove the two bolts securing valve assembly.



7) Carefully draw out the input shaft, and then remove the valve assembly.



8) Slide the dust cover out.

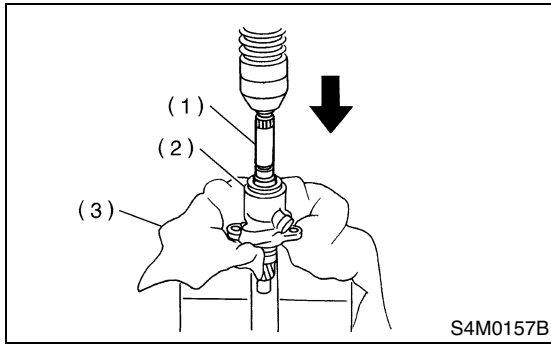


(1) Dust cover

STEERING GEARBOX [LHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

9) Using a press remove the pinion and valve assembly from valve housing.

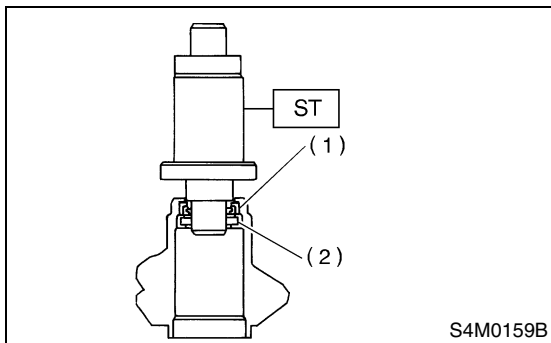


- (1) Valve assembly
- (2) Valve housing
- (3) Cloth

10) Using the ST and press, remove the dust seal, oil seal and special bearing from valve housing.
ST 34099FA120 INSTALLER & REMOVER SEAL

CAUTION:

- Do not apply force to the end surface of valve housing.
- Do not reuse the oil seal after removal.

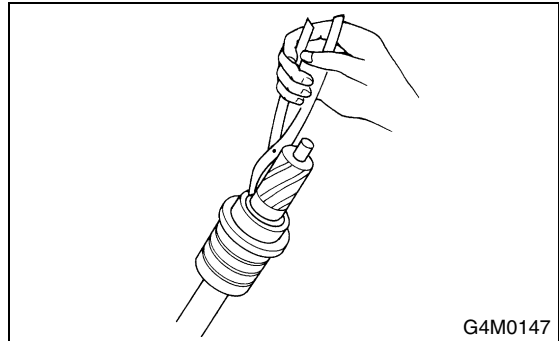


- (1) Oil seal
- (2) Special bearing

11) Remove the snap ring using snap ring pliers.

CAUTION:

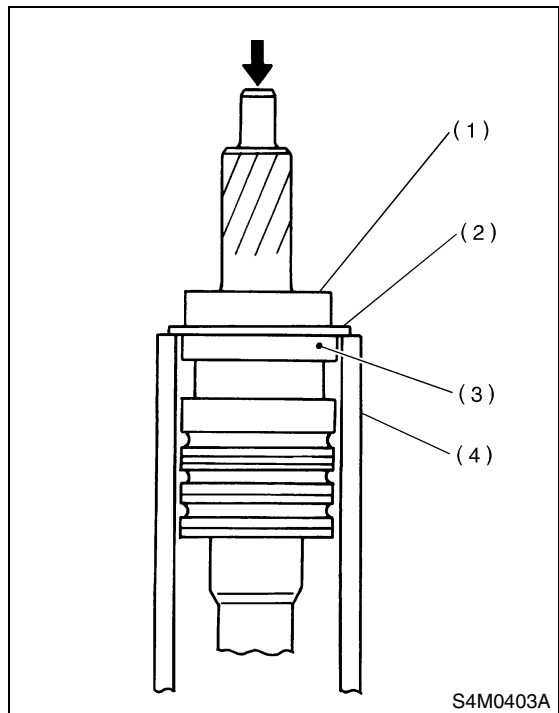
- Do not reuse the removed snap ring.
- Be careful not to scratch the pinion and valve assembly.



12) Press out the bearing together with the back up washer using pipe of I.D. 38.5 to 39.5 mm (1.516 to 1.555 in) and press.

CAUTION:

Do not reuse the removed bearing.



- (1) Bearing
- (2) Backing washer
- (3) Oil seal
- (4) Pipe

13) Remove the oil seal.

CAUTION:

Do not reuse the removed oil seal.

STEERING GEARBOX [LHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

D: ASSEMBLY

1. RACK HOUSING ASSEMBLY

CAUTION:

Use only SUBARU genuine grease for the gearbox.

Specified grease for gearbox:

VALIANT GREASE M2 (Part No. 003608001)

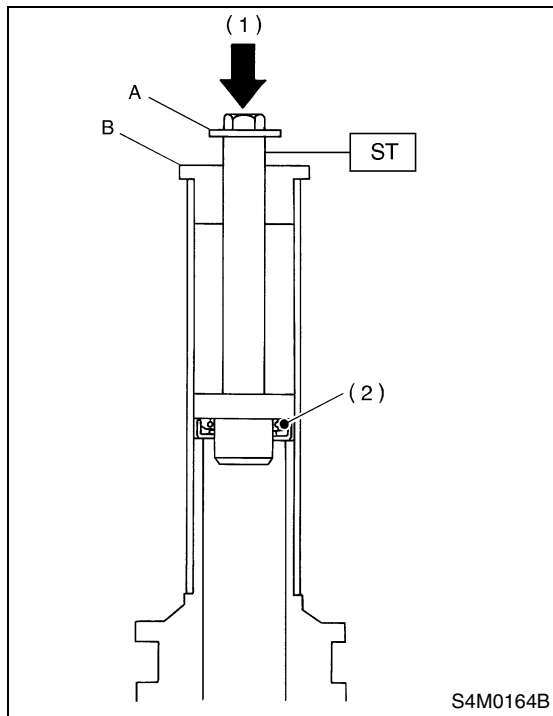
- 1) Clean all parts and tools before reassembling.
- 2) Force-fit the oil seal using the ST.
ST 34099FA110 INSTALLER

CAUTION:

Be careful not to damage or scratch the cylinder inner wall.

NOTE:

- Apply specified power steering fluid to oil seal.
- Pay special attention not to install oil seal in wrong direction.
- Push the oil seal until stepped portion of A contacts end face of B.



- (1) Press
- (2) Oil seal

3) Apply grease to the teeth of rack so that the grease applied is about as high as teeth, and also apply a thin film of grease to the sliding portion of rack shaft.

CAUTION:

- When moving the rack to stroke end without tie-rod attached, prevent shocks from being applied at the end.
- Do not apply grease to threaded portion at the end of rack shaft.
- Move the rack shaft to stroke end two or three times to squeeze grease which accumulates on both ends. Remove grease to prevent it from choking air passage hole.

4) Apply grease to the sleeve insertion hole.

5) Apply grease to the 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.

6) Fixing rack housing

Fix the rack housing in vise using ST.

ST 926200000 STAND

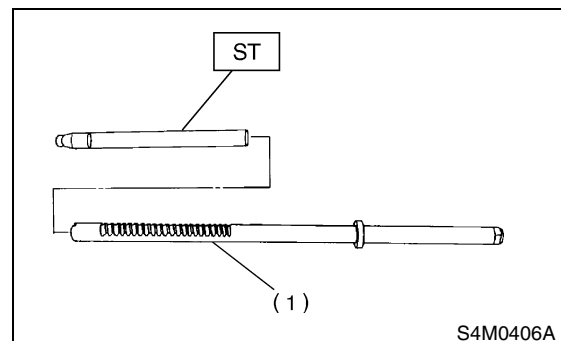
CAUTION:

- When fixing the rack housing in vise, be sure to use this special tool. Do not fix rack housing in vise using pad such as aluminum plates, etc.
- When using the old rack housing, be sure to clean and remove rust before assembling. Check pinion housing bushing carefully.

7) Install the oil seal to rack.

8) Fit the 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 assembly

STEERING GEARBOX [LHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

9) Apply genuine grease to the teeth of thoroughly washed rack assembly, and then fit the ST over the toothed portion.

CAUTION:

- Be careful not to block the air passage with grease. Remove excessive grease.
- After fitting cover, check the air passage hole for clogging. If clogged, open by removing grease from the hole.
- Check the rack shaft for damage.
- Apply specified power steering fluid to this ST and surface of the piston ring to prevent seal from being damaged.

10) Insert the rack assembly into rack housing from cylinder side, and then remove the ST after it has passed completely through oil seal.

NOTE:

Before inserting the rack assembly, apply a coat of specified power steering fluid to the surfaces of ST and rack piston.

ST 926390001 COVER & REMOVER

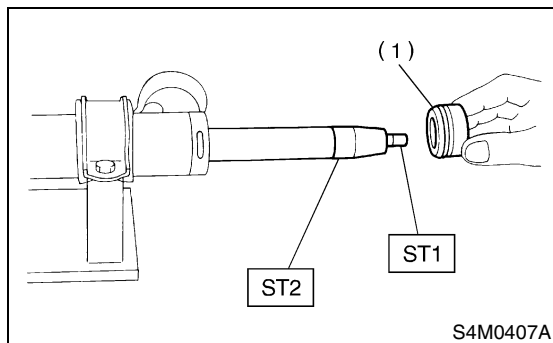
11) Fit the ST1 and ST2 over the end of rack, and then install the rack bushing.

ST1 926400000 GUIDE

ST2 927660000 GUIDE

CAUTION:

- If burrs, or nicks are found on this guide and rack shaft portion, remove by filing.
- Dip the rack bushing in specified power steering fluid before installing, and pay attention not to damage O-ring and oil seal.



(1) Rack bushing assembly

12) Insert the rack stopper into the cylinder tube until internal groove (on cylinder side) is aligned with external groove (on rack stopper). Turn the rack stopper with ST so that the rack stopper hole is seen through cylinder slits.

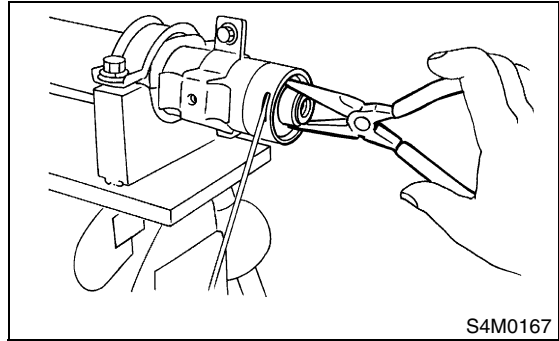
13) Insert the rack stopper into the rack housing, and then wrap the circlip using a sharp pointed pliers to secure the rack stopper in position.

CAUTION:

Be careful not to scratch the rack while winding circlip.

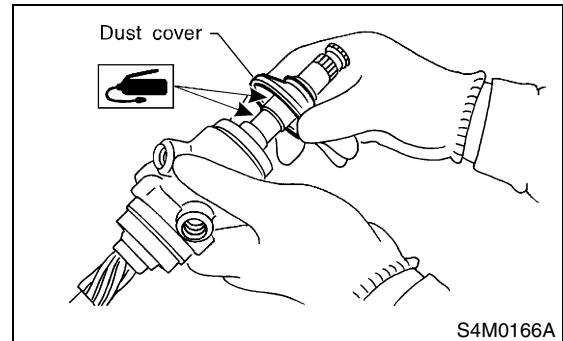
NOTE:

Rotate the wrench another 90 to 180° after end of circlip has been wrapped in.



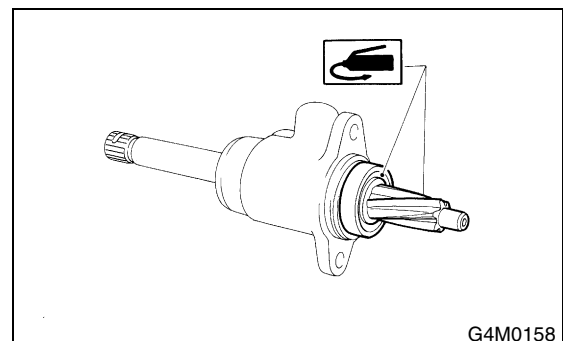
14) Fit the mounting rubber onto rack housing.

15) Apply the specified grease to dust cover.



16) Install the dust cover on valve assembly.

17) Apply genuine grease to the pinion gear and bearing of valve assembly.



STEERING GEARBOX [LHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

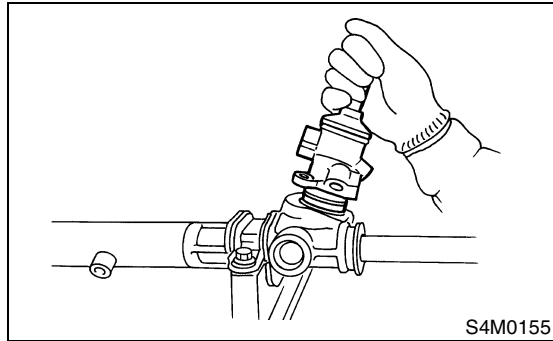
18) Install the gasket on valve assembly. Insert the valve assembly into place while facing rack teeth toward pinion.

CAUTION:

Be sure to use a new gasket.

NOTE:

Do not allow packing to be caught when installing valve assembly.



19) Tighten the bolts alternately to secure valve assembly.

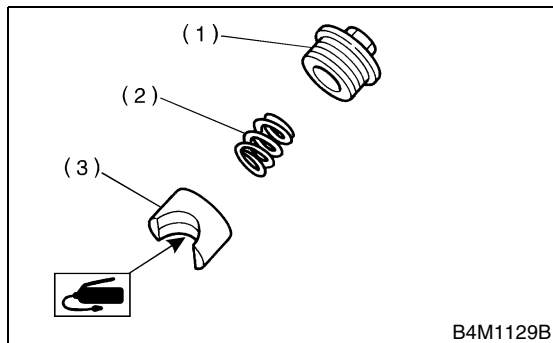
Tightening torque:

25 N-m (2.5 kgf-m, 18.1 ft-lb)

CAUTION:

Be sure to alternately tighten the bolts.

20) Apply grease to the sliding surface of sleeve and spring seat, then insert the sleeve into pinion housing. Fit the spring into sleeve screw, pack grease inside of screw, then install the screw.



- (1) Adjusting screw
- (2) Spring
- (3) Sleeve

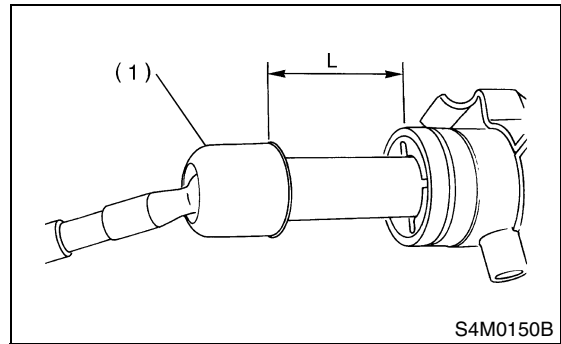
21) Install the lock washers, and then tighten the right and left tie-rods into the rack ends.

On condition

L: Approx. 40 mm (1.57 in)

Tightening torque:

78 N-m (8.0 kgf-m, 57.9 ft-lb)

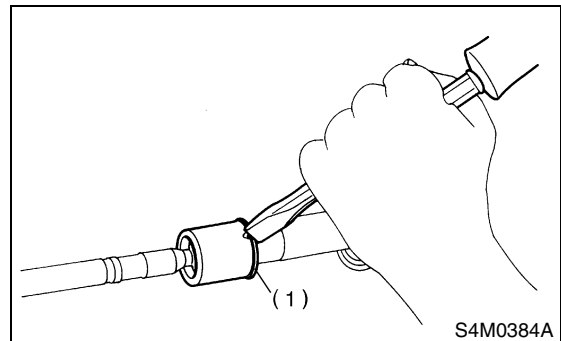


- (1) Tie-rod

22) Bend the lock washer using a chisel.

CAUTION:

Be careful not to scratch the rack when bending lock washer.



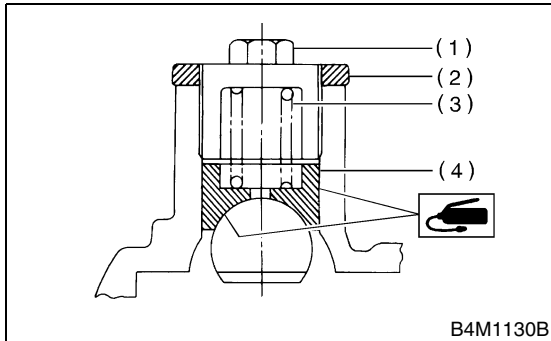
- (1) Lock washer

STEERING GEARBOX [LHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

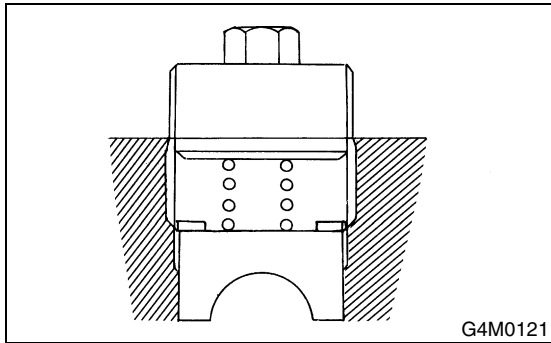
23) Rack and pinion backlash adjustment

- (1) Loosen the adjusting screw.
- (2) Rotate the input shaft so that the rack is in straight ahead direction.
- (3) Apply grease to the sleeve.



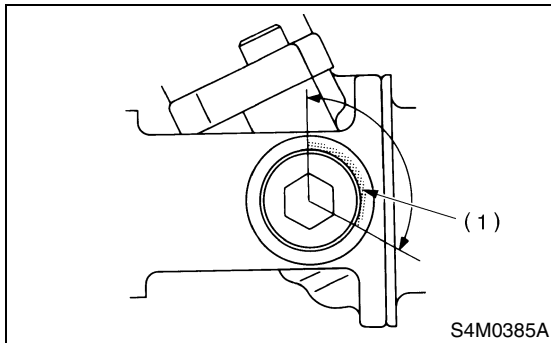
- (1) Adjusting screw
- (2) Lock nut
- (3) Spring
- (4) Sleeve

(4) Tighten the adjusting screw by two threads.



(5) Apply liquid packing to at least 1/3 of entire perimeter of the adjusting screw thread.

Liquid packing:
THREE BOND 1141



- (1) Apply liquid packing to at least 1/3 of entire perimeter.

(6) Tighten the adjusting screw.

Tightening torque:

First; 7.4 N·m (0.75 kgf-m, 5.4 ft-lb)

Second; Back off 25°

(7) Install the lock nut. While holding adjusting screw with a wrench, tighten the lock nut using ST.

ST 926230000 SPANNER

Tightening torque (Lock nut):

39 N·m (4.0 kgf-m, 28.9 ft-lb)

NOTE:

- Hold the adjusting screw with a wrench to prevent it from turning while tightening lock nut.
- Make adjustment so that the steering wheel can be rotated fully from lock to lock without binding.

24) Check for service limit as per article of "Service limit".<Ref. to PS-49, SERVICE LIMIT, INSPECTION, Steering Gearbox [LHD MODEL].> Make replacement and adjustment if necessary.

25) Install the boot to housing.

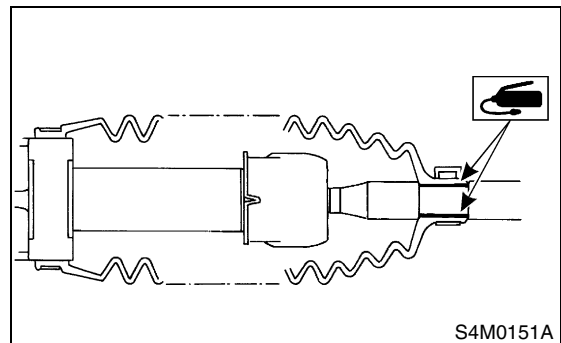
NOTE:

- Before installing the boot, be sure to apply grease to the groove of tie-rod.
- Install the 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 the boot is installed without unusual inflation or deflation.



STEERING GEARBOX [LHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

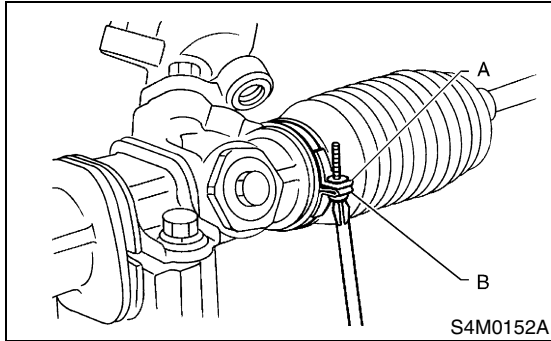
26) Using a screwdriver, tighten the screw until the ends "A" and "B" of the band come into contact with each other.

CAUTION:

Use a new band.

NOTE:

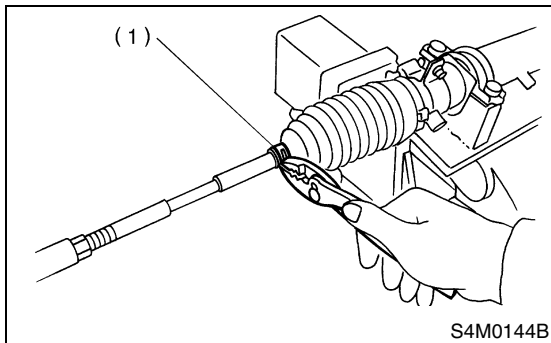
Always tighten the band from underside of gear box.



27) Fix the boot end with clip (small).

CAUTION:

After installing, check the boot end is positioned into groove on tie-rod.



(1) Clip

28) If the tie-rod end was removed, screw in the lock nut and tie-rod end to screwed portion of tie-rod, and tighten the lock nut temporarily in a position as shown in the figure.

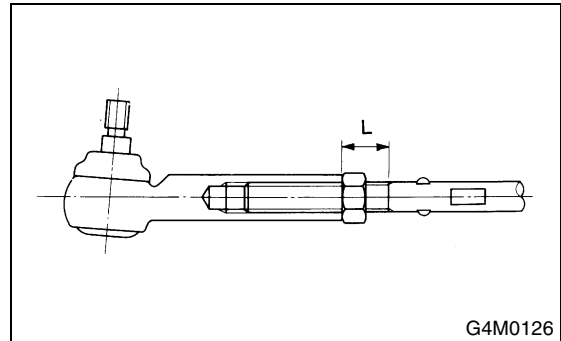
Installed tie-rod length: L

15 mm (0.59 in) (WAGON)

25 mm (0.98 in) (SEDAN)

NOTE:

Pay attention to the difference between right and left tie-rod ends.



29) Install the tie-rod end plate.

Tightening torque:

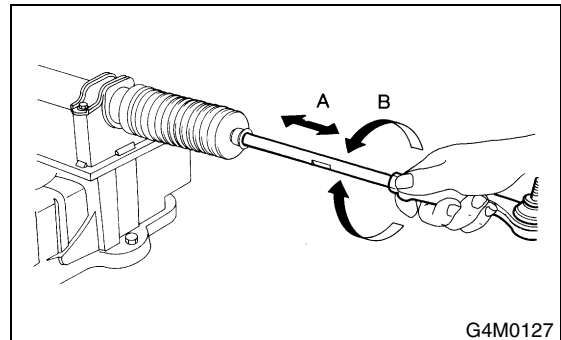
13 N·m (1.3 kgf-m, 9.4 ft-lb)

30) Inspect the 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 the boot is installed in the specified position without deflation.



31) Remove the gearbox from ST.

ST 926200000 STAND

32) Install the four pipes on gearbox.

(1) Connect the pipe A and B to four pipe joints of gearbox.

Tightening torque:

13 N·m (1.3 kgf-m, 9.4 ft-lb)

(2) Connect the pipe E and F to gearbox.

Tightening torque:

Pipe E: 15 N·m (1.5 kgf-m, 10.8 ft-lb)

Pipe F: 25 N·m (2.5 kgf-m, 18.1 ft-lb)

STEERING GEARBOX [LHD MODEL]

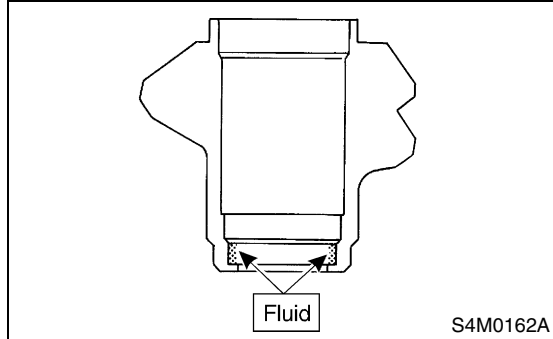
POWER ASSISTED SYSTEM (POWER STEERING)

2. CONTROL VALVE ASSEMBLY

Specified steering grease:

VALIANT GREASE M2 (Part No. 003608001)

- 1) Clean all parts and tools before reassembling.
- 2) Apply a coat of specified power steering fluid to the inner wall of valve housing.

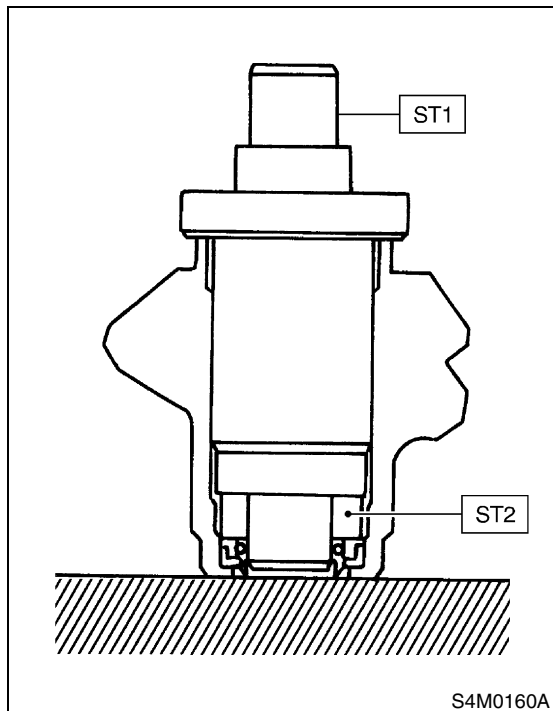


- 3) Attach the ST2 to ST1, and then press the oil seal into place using a press.

ST1 34099FA120 INSTALLER & REMOVER SEAL

ST2 34099FA130 INSTALLER SEAL

- (1) Face the oil seal in direction shown in the figure when installing.
- (2) To avoid scratching the oil seal, apply a coat of grease to the contact surface of installer and oil seal.
- (3) To facilitate installation, attach the oil seal to installer and position in valve housing before pressing into place.

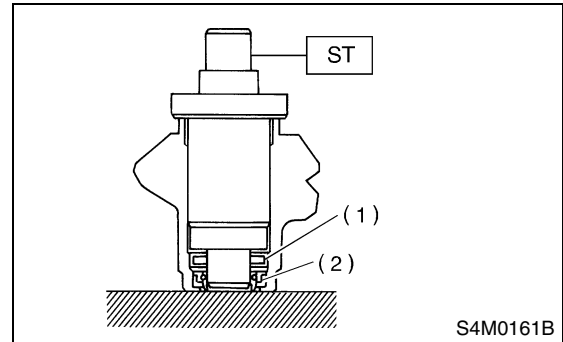


- 4) Using the ST and press, install the special bearing in valve housing.

ST 34099FA120 INSTALLER & REMOVER SEAL

NOTE:

To facilitate installation, attach the ball bearing to remover and position in valve housing before pressing it into place.



- (1) Special bearing
- (2) Oil seal

- 5) Put vinyl tape around the pinion shaft splines to protect oil seal from damage.

- 6) Fit the pinion and valve assembly into valve housing.

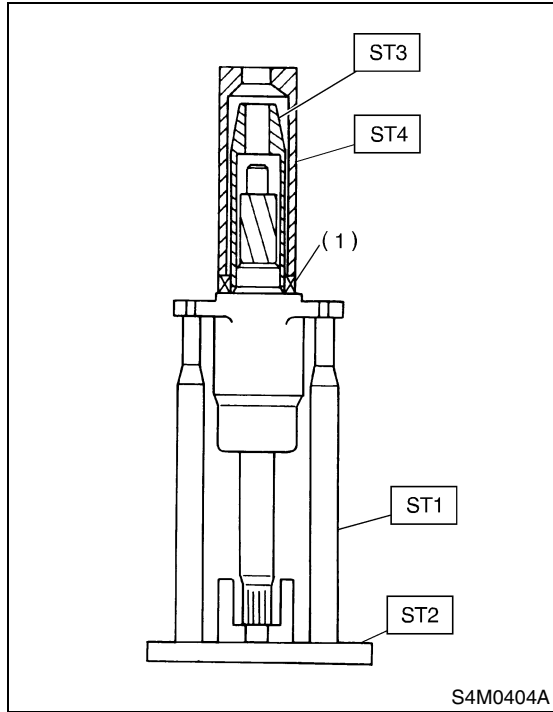
- 7) Secure the valve assembly to ST1 and ST2.

STEERING GEARBOX [LHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

8) Put the ST3 over pinion, and insert oil seal, then force-fit the 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

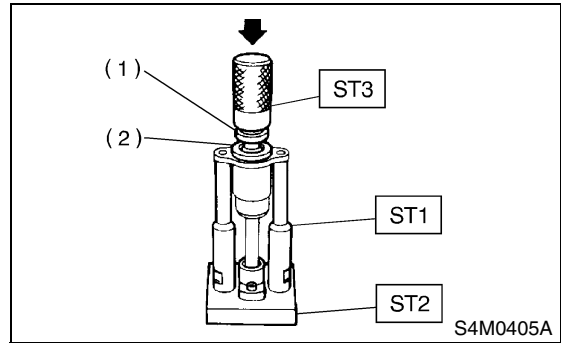
NOTE:

- Apply the specified power steering fluid to oil seal and ST3, being careful not to damage the oil seal lip.
- Push the oil seal until ST3 contacts housing end face.

9) Remove the ST3, and then fit the backing washer.

10) Force-fit the ball bearing using ST3.

ST1 926370000 INSTALLER A
ST2 34099FA100 STAND BASE
ST3 927640000 INSTALLER B



(1) Ball bearing
(2) Backing washer

NOTE:

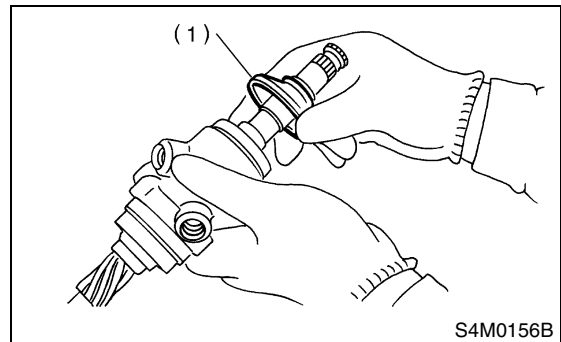
Be careful not to tilt the ball bearing during installation.

11) Install the snap ring using snap ring pliers.

NOTE:

Rotate the snap ring to check for proper installation.

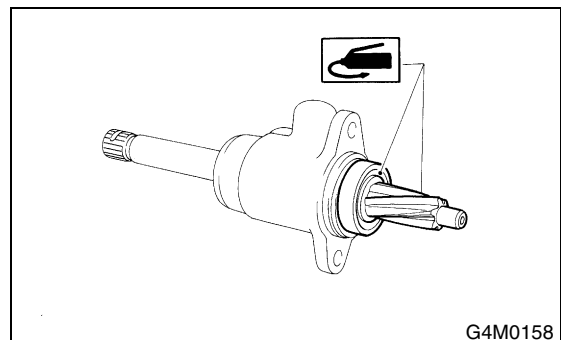
12) Apply the specified grease to dust cover.



(1) Dust cover

13) Install the dust cover on valve assembly.

14) Apply genuine grease to the pinion gear and bearing of valve assembly.



STEERING GEARBOX [LHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

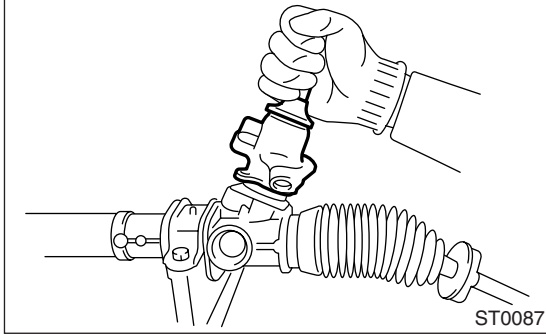
15) Install the gasket on valve assembly. Insert the valve assembly into place while facing rack teeth toward pinion.

CAUTION:

Be sure to use a new gasket.

NOTE:

Do not allow the packing to be caught when installing valve assembly.



16) Tighten the 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 the bolts.

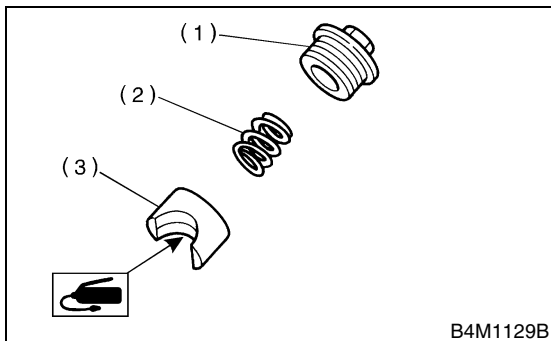
17) Apply grease to the sleeve insertion hole.

18) Apply grease to the 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.

19) Apply grease to the sliding surface of sleeve and spring seat, then insert the sleeve into pinion housing. Fit the spring into sleeve screw, pack grease inside of screw, then install the screw.



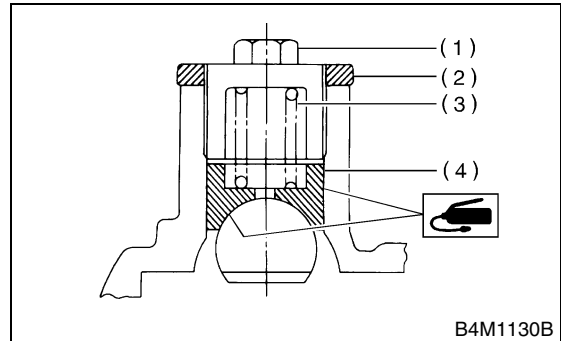
- (1) Adjusting screw
- (2) Spring
- (3) Sleeve

20) Rack and pinion backlash adjustment

(1) Loosen the adjusting screw.

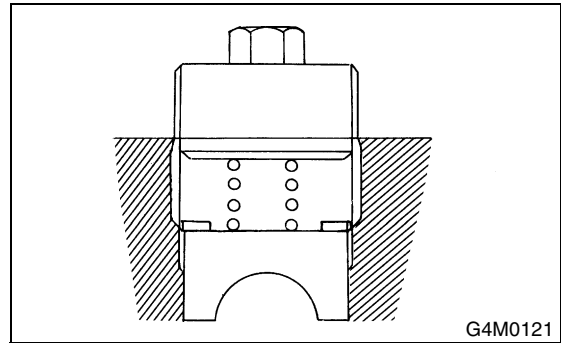
(2) Rotate the input shaft so that the rack is in straight ahead direction.

(3) Apply grease to the sleeve.



- (1) Adjusting screw
- (2) Lock nut
- (3) Spring
- (4) Sleeve

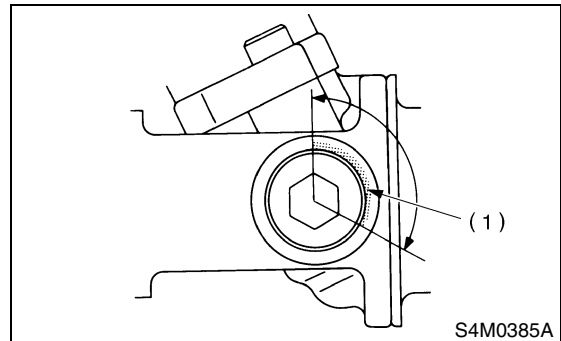
(4) Tighten the adjusting screw by two threads.



(5) Apply liquid packing to at least 1/3 of entire perimeter of the adjusting screw thread.

Liquid packing:

THREE BOND 1141



- (1) Apply liquid packing to at least 1/3 of entire perimeter.

STEERING GEARBOX [LHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

(6) Tighten the adjusting screw.

Tightening torque:

First; 7.4 N·m (0.75 kgf-m, 5.4 ft-lb)

Second; Back off 25°

(7) Install the lock nut. While holding adjusting screw with a wrench, tighten the lock nut using ST.

ST 926230000 SPANNER

Tightening torque (Lock nut):

39 N·m (4.0 kgf-m, 28.9 ft-lb)

NOTE:

- Hold the adjusting screw with a wrench to prevent it from turning while tightening lock nut.
- Make adjustment so that the steering wheel can be rotated fully from lock to lock without binding.

21) Check for service limit as per article of "Service limit".<Ref. to PS-49, SERVICE LIMIT, INSPECTION, Steering Gearbox [LHD MODEL].> Make replacement and adjustment if necessary.

22) Take off the gearbox from ST.

23) Install the four pipes on gearbox.

(1) Connect the pipe A and B to the gearbox.

Tightening torque:

13 N·m (1.3 kgf-m, 9.4 ft-lb)

(2) Connect the pipe E and F to gearbox.

Tightening torque:

Pipe E: 15 N·m (1.5 kgf-m, 10.8 ft-lb)

Pipe F: 25 N·m (2.5 kgf-m, 18.1 ft-lb)

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 the inside of gearbox for water. If any water is found, carefully check the 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 the bend or damage is excessive, replace the entire gearbox.
2	Dust seal	(1) Crack or damage (2) Wear	If the outer wall slips, the lip is worn out or damage is found, replace it with a new one.
3	Rack and pinion	Poor mating of rack with pinion	(1) Adjust the backlash properly. By measuring the 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 the 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 the entire gearbox.
4	Gearbox unit	(1) Bend of rack shaft (2) Bend of cylinder portion (3) Crack or damage on cast iron portion	Replace the gearbox with a new one.
		(4) Wear or damage on rack bush	If the free play of rack shaft in radial direction is out of the specified range, replace the gearbox with a new one. (Refer to "Service limit".)
		(5) Wear on input shaft bearing	If the free plays of input shaft in radial and axial directions are out of the specified ranges, replace the gearbox with a 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:

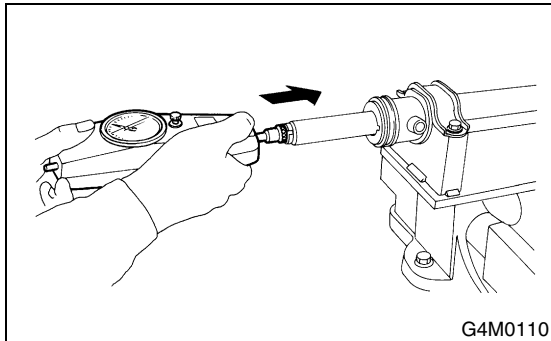
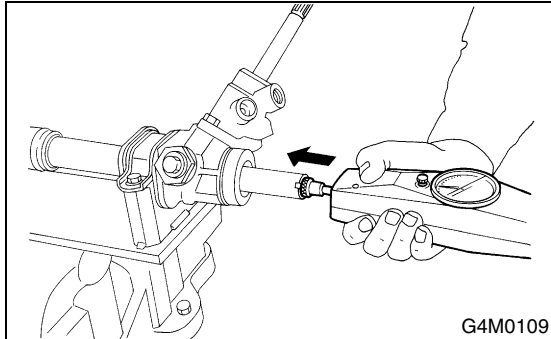
When making a measurement, vise the gearbox by using ST. Never vise the gearbox by inserting aluminum plates, etc. between vise and gearbox.

ST 926200000 STAND

Sliding resistance of rack shaft:

Service limit

304 N (31 kgf, 68 lb) or less



3. RACK SHAFT PLAY IN RADIAL DIRECTION

Right-turn steering:

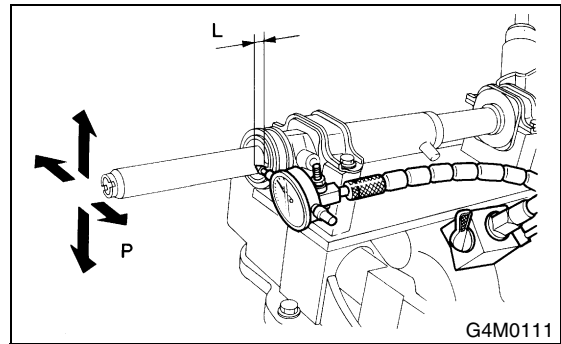
Service limit

0.19 mm (0.0075 in) or less

On condition

L: 5 mm (0.20 in)

P: 122.6 N (12.5 kgf, 27.6 lb)



Left-turn steering:

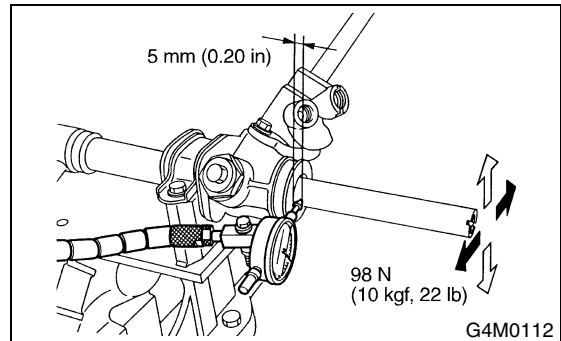
Service limit

Direction ⇄

0.3 mm (0.012 in) or less

Direction ⇄

0.15 mm (0.0059 in) or less



STEERING GEARBOX [LHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

4. INPUT SHAFT PLAY

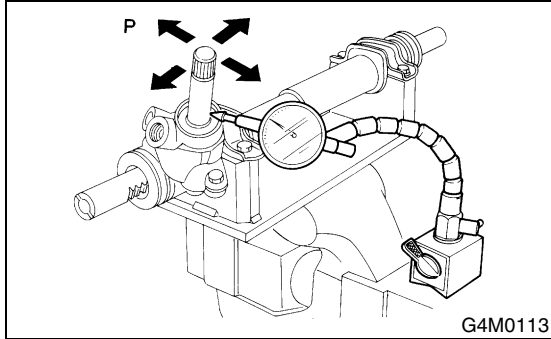
In radial direction:

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 the ST, measure the gearbox turning resistance.

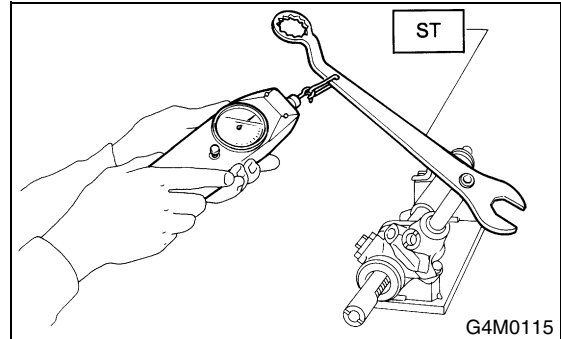
ST 34099PA100 SPANNER

Service limit

Maximum allowable resistance

Less than 9.33 N (0.95 kgf, 2.10 lb)

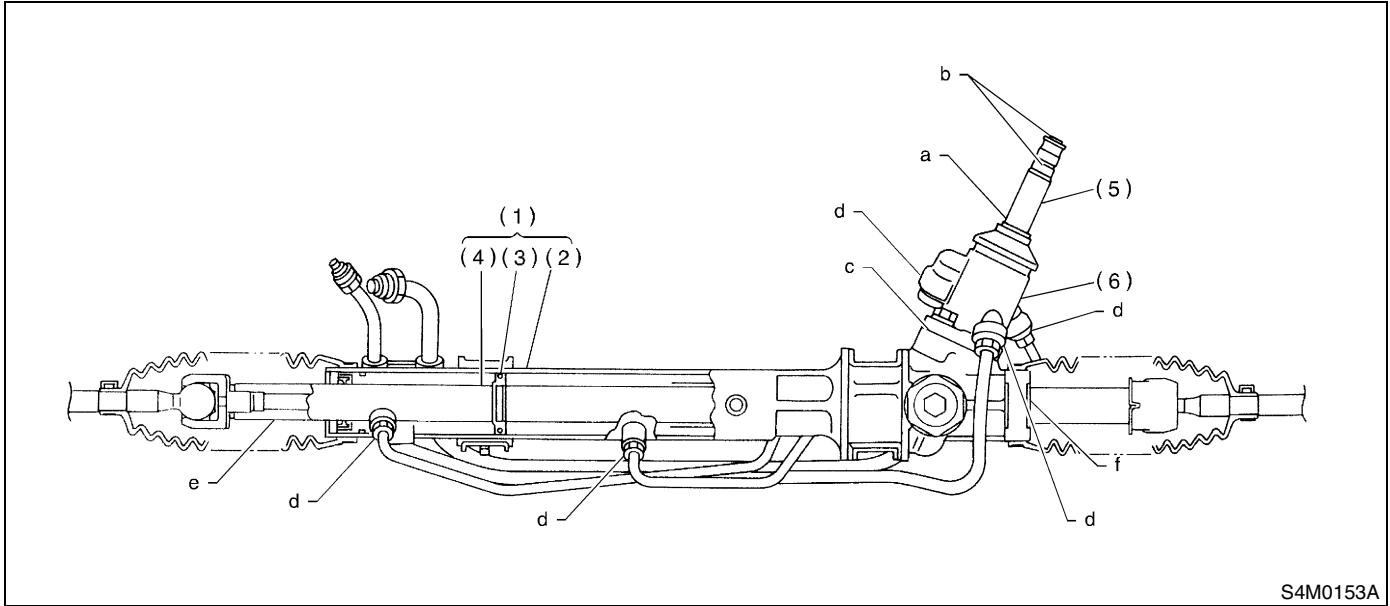
Difference between right and left sliding resistance: Less than 20 %



STEERING GEARBOX [LHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

6. OIL LEAKING



S4M0153A

- (1) Power cylinder
- (2) Cylinder

- (3) Rack piston
- (4) Rack axle

- (5) Input shaft
- (6) Valve housing

NOTE:

If the gearbox is dismantled without confirming where the leak is, it must be mounted again to locate the leak point.

1) 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 thirty to forty times with engine running, then make comparison of the suspected portion between immediately after and several hours after this operation.

2) Inspect leakage from "a"

The oil seal is damaged. Replace the valve assembly with a new one.

3) Inspect leakage from "b"

The torsion bar O-ring is damaged. Replace the valve assembly with a new one.

4) Inspect leakage from "c"

The oil seal is damaged. Replace the valve assembly or oil seal with a new one.

5) Inspect leakage from "d"

The pipe is damaged. Replace the faulty pipe or O-ring.

STEERING GEARBOX [LHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

6) 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 thirty to forty 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 the rack bush with a new one.

(2) Leakage from "f"

There are two possible causes. Take the 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 thirty to forty 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 the pinion and valve assembly with a new one. Or replace the oil seal and parts that are damaged during disassembly with new ones.

• If oil stops leaking from "f":

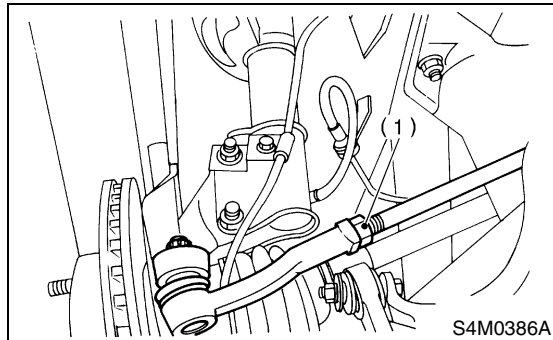
The oil seal of rack housing is damaged. Replace the oil seal and the parts that are damaged during disassembly with new ones.

F: ADJUSTMENT

1) Adjust the front toe.

Standard of front toe:

IN 3 — OUT 1 mm (IN 0.12 — OUT 0.039 in)



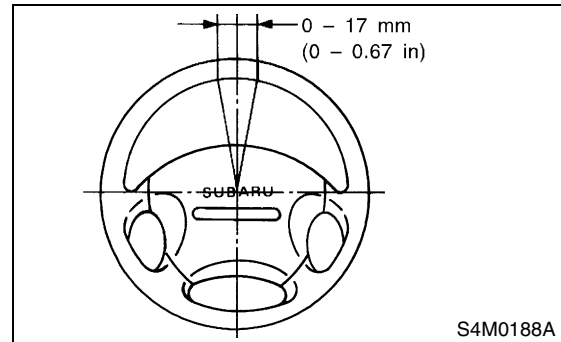
(1) Lock nut

2) Adjust the steering angle of wheels.

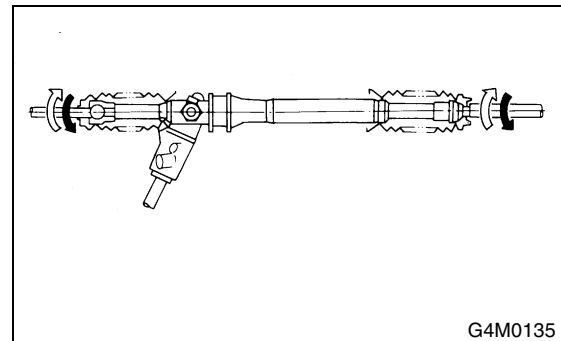
Standard of steering angle:

Model	TURBO, 2.5 L 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 the 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 the 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 same direction by same turns.



STEERING GEARBOX [RHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

6. Steering Gearbox [RHD MODEL]

A: REMOVAL

- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from battery.
- 3) Loosen the front wheel nut.
- 4) Lift-up the vehicle, and then remove the front wheels.
- 5) Remove the under cover.
- 6) Remove the sub frame.
- 7) Remove the front exhaust pipe assembly. (Non-turbo model)

Non-turbo model without OBD

<Ref. to EX(w/oOBD)-9, REMOVAL, Front Exhaust Pipe.>

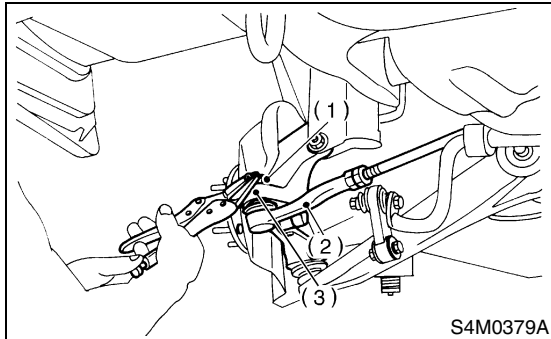
Non-turbo model with OBD

<Ref. to EX-7, REMOVAL, Front Exhaust Pipe.>

WARNING:

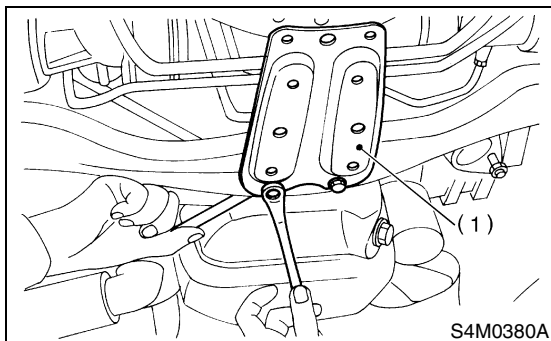
Be careful, the exhaust pipe is hot.

- 8) Using a puller, remove the tie-rod end from knuckle arm after pulling off cotter pin and removing castle nut.



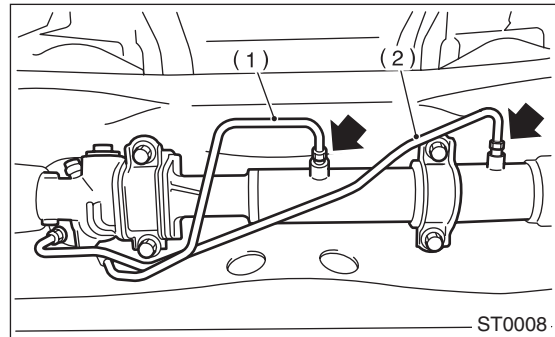
- (1) Castle nut
- (2) Tie-rod end
- (3) Knuckle arm

- 9) Remove the jack-up plate and front stabilizer.



- (1) Jack-up plate

- 10) Remove the one pipe joint at center of gearbox, and connect vinyl hose to pipe and joint. Discharge fluid by turning the steering wheel fully clockwise and counterclockwise. Discharge fluid similarly from the other pipe.



- (1) Pipe A
- (2) Pipe B

- 11) Remove the universal joint. <Ref. to PS-27, REMOVAL, Universal Joint.>

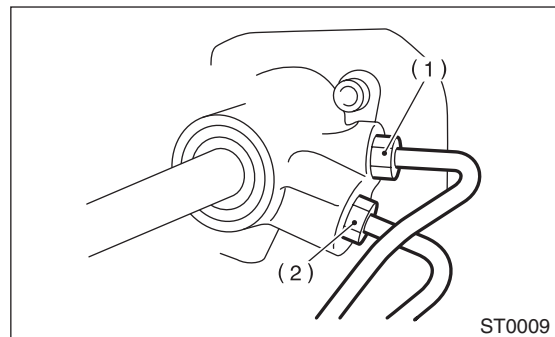
- 12) Disconnect the pipes C and D from pipe of gearbox.

CAUTION:

Be careful not to damage these pipes.

NOTE:

Disconnect the lower pipe C first, and upper pipe D second.

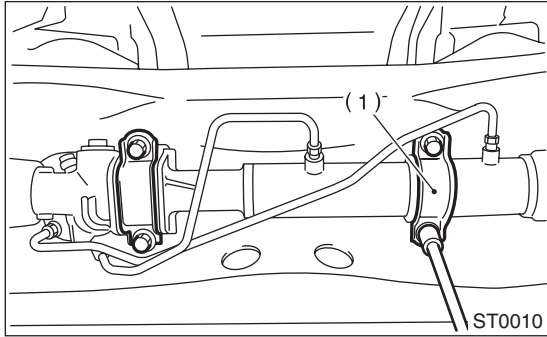


- (1) Pipe C
- (2) Pipe D

STEERING GEARBOX [RHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

- 13) Remove the clamp bolts securing gearbox to crossmember, and then remove the gearbox.



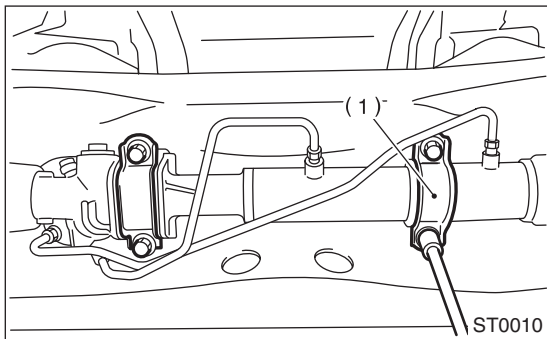
(1) Clamp

B: INSTALLATION

- 1) Insert the gearbox into crossmember, being careful not to damage the gearbox boot.
- 2) Tighten the gearbox to crossmember bracket via clamp with bolt to specified torque.

Tightening torque:

59 N·m (6.0 kgf·m, 43.4 ft·lb)

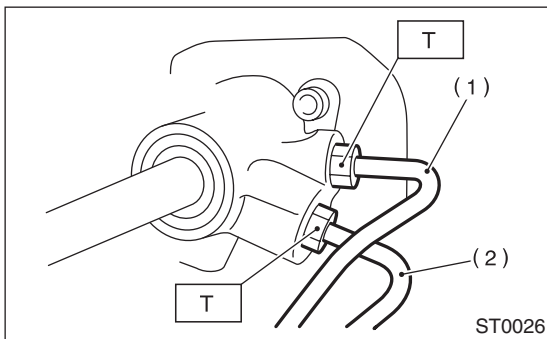


(1) Clamp

- 3) Connect the 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 the universal joint. <Ref. to PS-27, INSTALLATION, Universal Joint.>

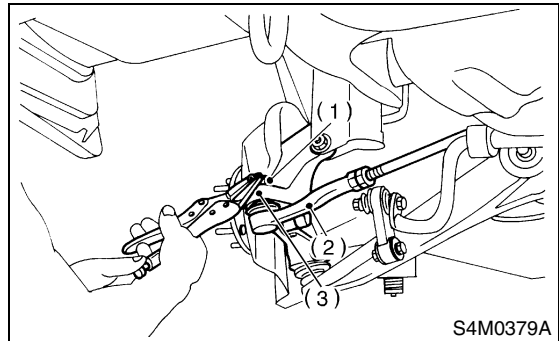
- 5) Connect the tie-rod end and knuckle arm, and tighten with castle nut. Fit the cotter pin into nut, and then bend the pin to lock.

Castle nut tightening torque:

Tighten to 27 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 the cap at bottom of tie-rod end with hammer.



(1) Castle nut
(2) Tie-rod end
(3) Knuckle arm

- 6) Install the front stabilizer to vehicle.
- 7) Install the front exhaust pipe assembly.
- 8) Install the sub frame.

Tightening torque:

45 N·m (4.6 kgf·m, 33.3 ft·lb)

- 9) Install the under cover.
- 10) Align the center of roll connector. <Ref. to AB-17, ADJUSTMENT, Roll Connector.>

CAUTION:

Ensure the front wheels are set in straight forward direction.

- 11) Install the steering wheel. <Ref. to PS-26, INSTALLATION, Steering Wheel.>
- 12) Install the tires.
- 13) Tighten the wheel nuts to specified torque.

Tightening torque:

90 N·m (9.1 kgf·m, 65.8 ft·lb)

- 14) Connect the battery ground cable to battery.
- 15) Pour fluid into the oil tank, and bleed air. <Ref. to PS-107, Power Steering Fluid.>
- 16) Check for fluid leaks.
- 17) Install the jack-up plate.
- 18) Lower the vehicle.
- 19) Check the fluid level in oil tank.

STEERING GEARBOX [RHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

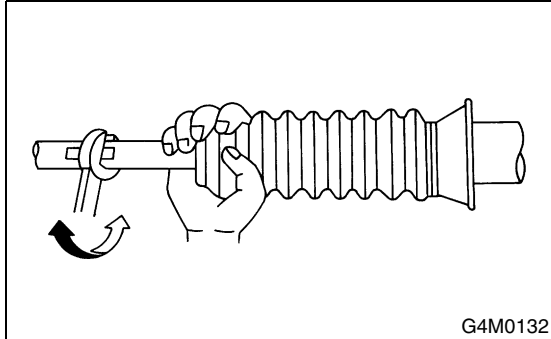
20) After adjusting the toe-in and steering angle, tighten the lock nut on tie-rod end.

Tightening torque:

83 N-m (8.5 kgf-m, 61.5 ft-lb)

CAUTION:

When adjusting the toe-in, hold boot as shown to prevent it from being rotated or twisted. If twisted, straighten it.



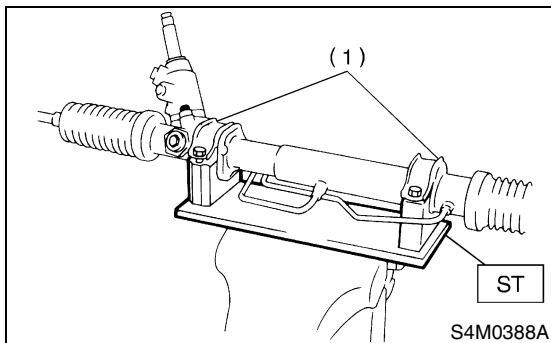
C: DISASSEMBLY

1) Secure the gearbox removed from vehicle in vise using the ST.

ST 926200000 STAND

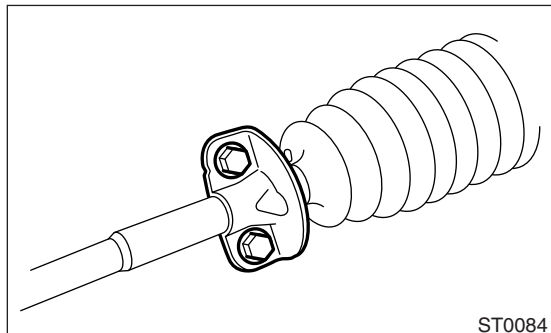
CAUTION:

Secure the gearbox assembly in a vise using the ST as shown. Do not attempt to secure it without this ST.



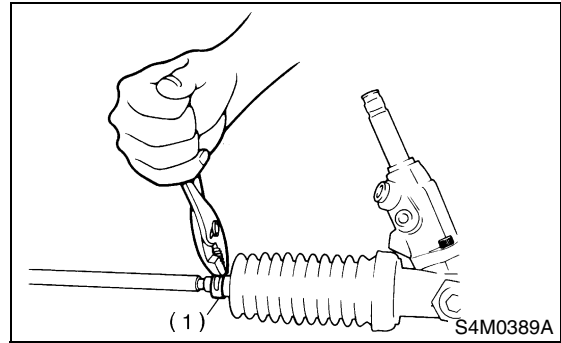
(1) Clamp

2) Remove the tie-rod end plate.



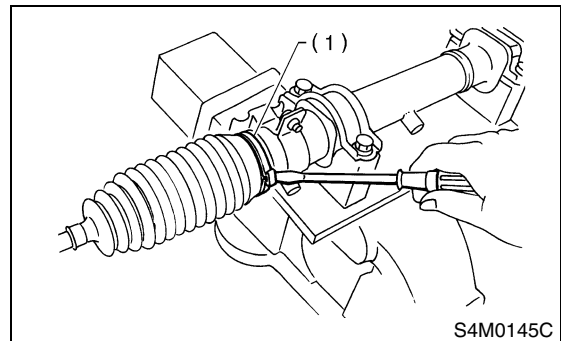
3) Remove the tie-rod end and lock nut from gearbox.

4) Pry off the clip from outer end of boot, and the slide the boot toward tie-rod end.



(1) Clip

5) Using standard screwdriver, remove the band from boot.

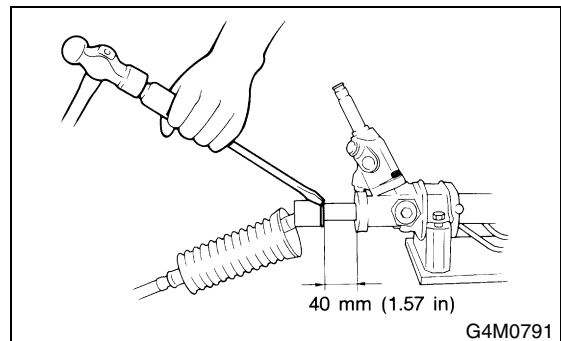


(1) Band

6) Extend the rack approx. 40 mm (1.57 in) out. Unlock the lock wire at lock washer on each side of tie-rod end using a standard screwdriver.

CAUTION:

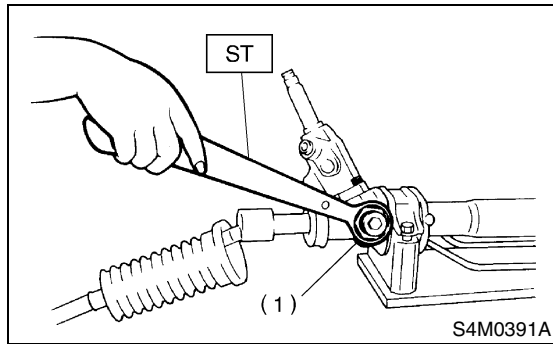
Be careful not to scratch the rack surface as oil leaks may result.



STEERING GEARBOX [RHD MODEL]

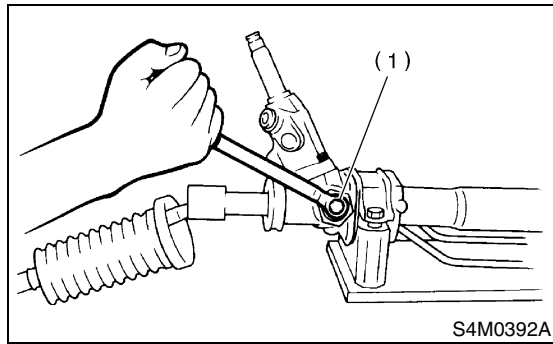
POWER ASSISTED SYSTEM (POWER STEERING)

7) Using the ST, loosen lock nut.
ST 926230000 SPANNER



(1) Lock nut

8) Tighten the adjusting screw until it no longer tightens.

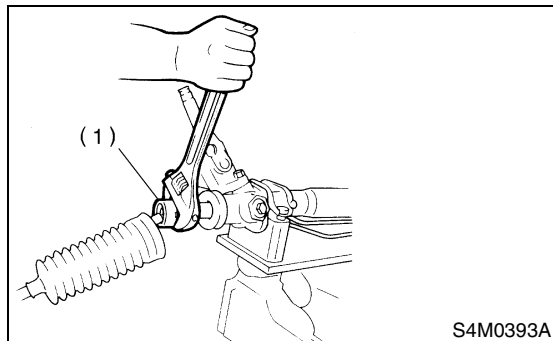


(1) Adjusting screw

9) Using a wrench (32 mm width across flats) or adjustable wrench, remove the tie-rod.

CAUTION:

- Check the ball joint for free play, and tie-rod for bends. Replace if necessary.
- Check the dust seals used with tie-rod end ball joint for damage or deterioration. Replace if necessary.



(1) Tie-rod

10) Loosen the adjusting screw, and then remove the spring and sleeve.

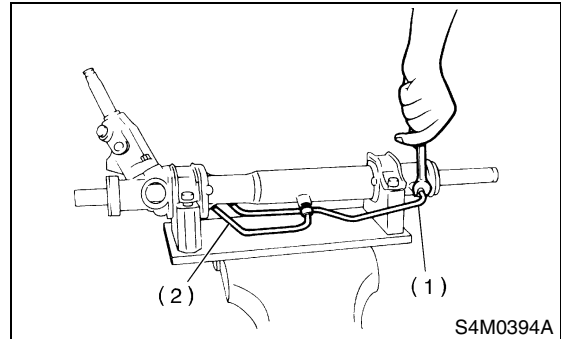
CAUTION:

Replace the spring and/or sleeve if damaged.

11) Disconnect the pipes A and B from steering body and control valve housing.

CAUTION:

Replace the pipes and/or flare nuts if damaged.



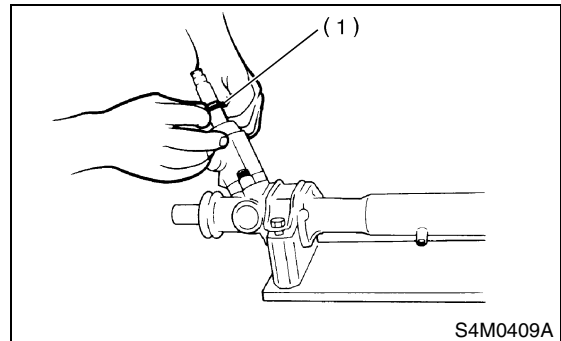
(1) Pipe A

(2) Pipe B

12) Slide the dust cover out.

CAUTION:

- Be careful not to scratch the housing or input shaft during dust cover removal. Also do not allow foreign matter to enter the housing interior.
- Replace the dust cover with a new one if its inside bore or lips are worn or damaged.



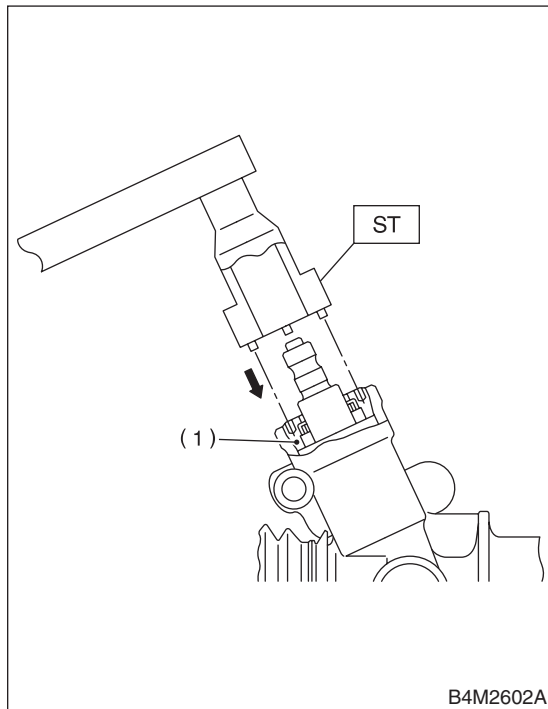
(1) Dust cover

STEERING GEARBOX [RHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

- 13) Using the ST, remove the plug.
ST 34199AE090 PLUG WRENCH

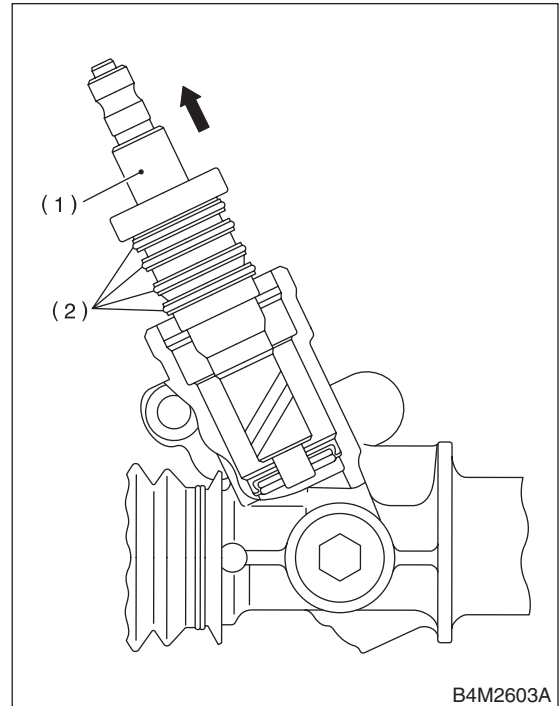
NOTE:
Make sure to align the ST pin to plug hole.



(1) Plug

- 14) Remove the valve assembly.

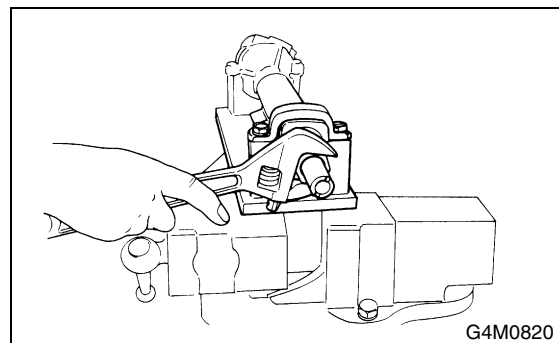
CAUTION:
Be careful not to scratch the seal ring.



(1) Valve assembly
(2) Seal ring

- 15) Remove the holder using a 32 mm wrench or adjustable wrench.

CAUTION:
Discard the old holder and replace with a new one.



STEERING GEARBOX [RHD MODEL]

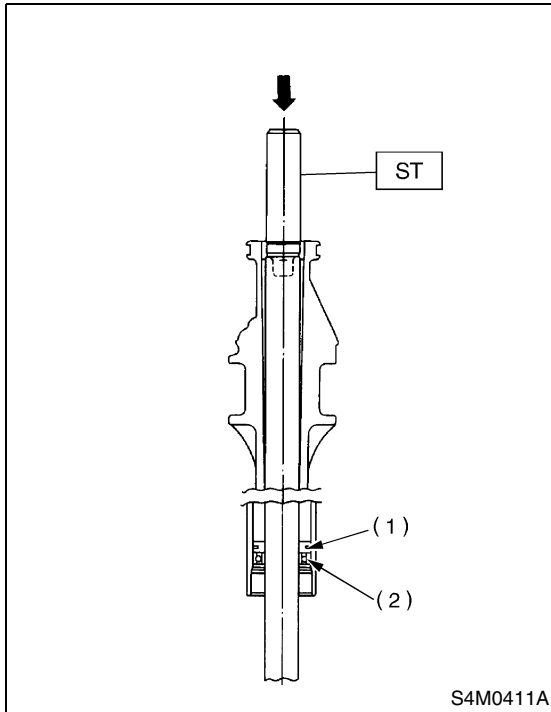
POWER ASSISTED SYSTEM (POWER STEERING)

16) Install ST the on valve side of rack and press outer side oil seal out.

ST 34099FA030 INSTALLER & REMOVER

CAUTION:

- Block the pipe connection of steering body to prevent fluid from flowing out.
- Do not allow the rack to come in contact with inner wall of cylinder. Otherwise, cylinder wall may be scratched, resulting in oil leaks.
- Remove the holder and rack as a unit.
- Check the rack and steering body for bends or cracks; replace as required.
- Discard the oil seal after removal and replace with new ones.



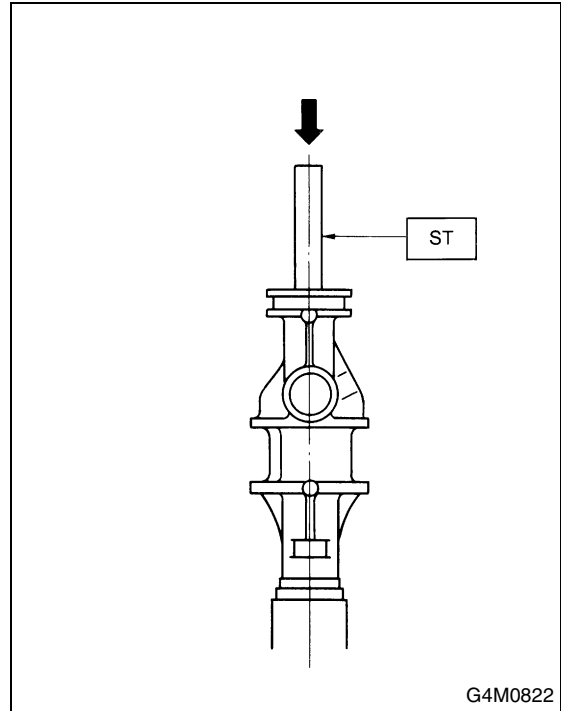
- (1) Rack piston
(2) Outer side oil seal

17) Insert the ST from valve side and press back-up ring and oil seal out.

CAUTION:

Discard the back-up ring and oil seal after removal and replace with new ones.

ST 927580000 REMOVER



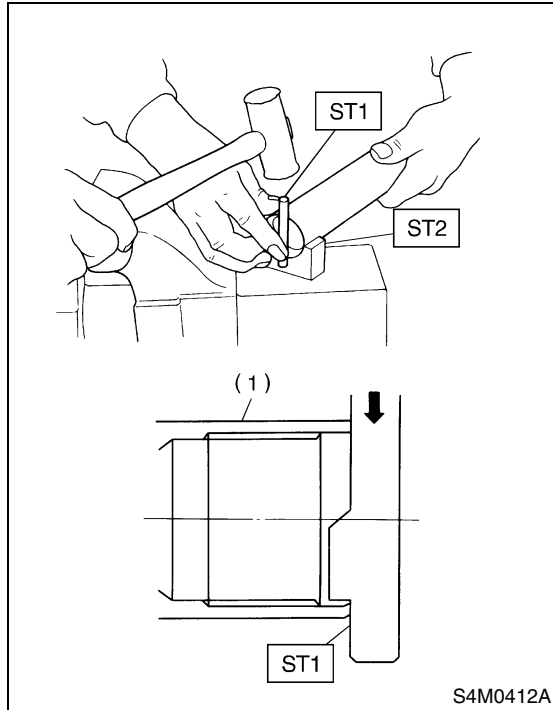
STEERING GEARBOX [RHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

18) Using the ST1 and ST2, repair the cylinder's clinched sections.

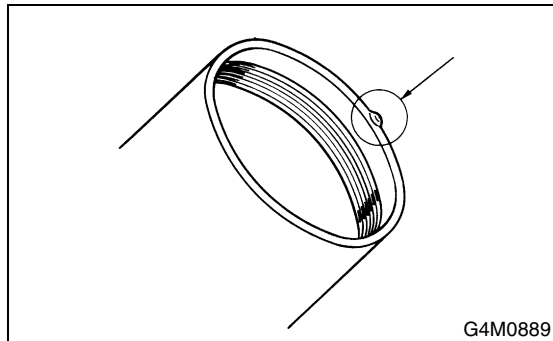
ST1 34099FA080 PUNCH

ST2 34099FA070 BASE



(1) Cylinder

19) If the cylinder edge is deformed in a convex shape, repair using an oil stone.

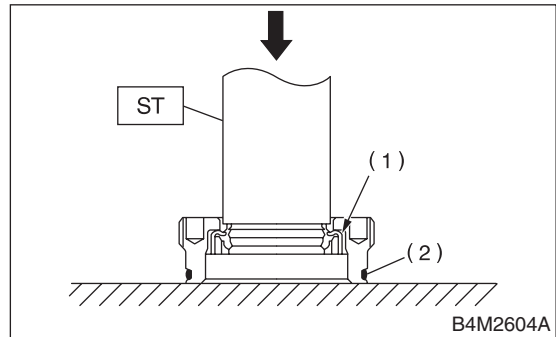


20) Remove the oil seal using ST and press from plug.

ST 34199AE100 PLUG OIL SEAL REMOVER

CAUTION:

Do not apply force on the plug edge surface. Replace the plug circumference O-rings with new ones.

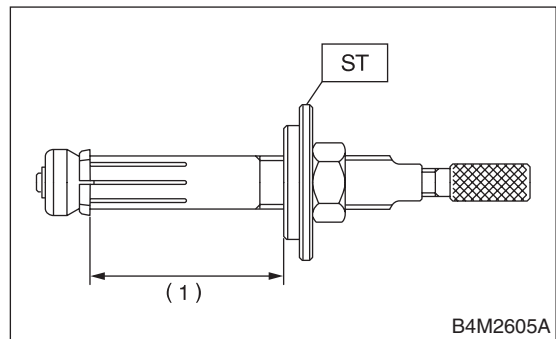


(1) Oil seal

(2) O-ring

21) Set the ST on drawing dimension.

ST 34199AE120 GEARBOX OIL SEAL REMOVER

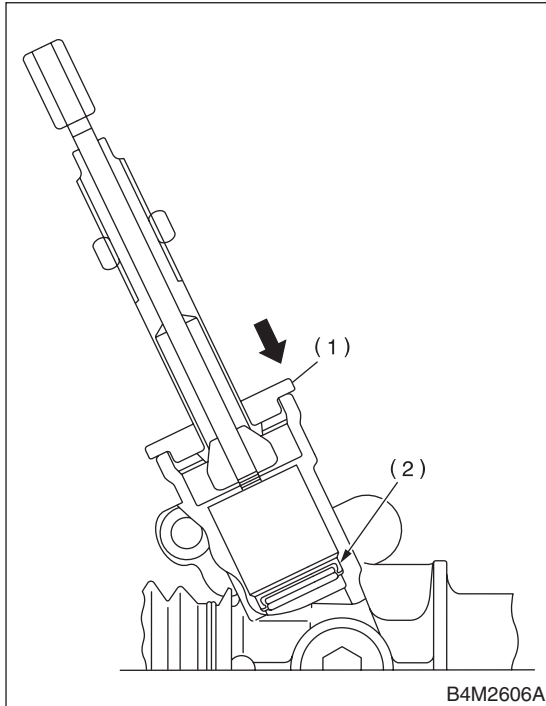


(1) 70 mm (2.76 in)

STEERING GEARBOX [RHD MODEL]

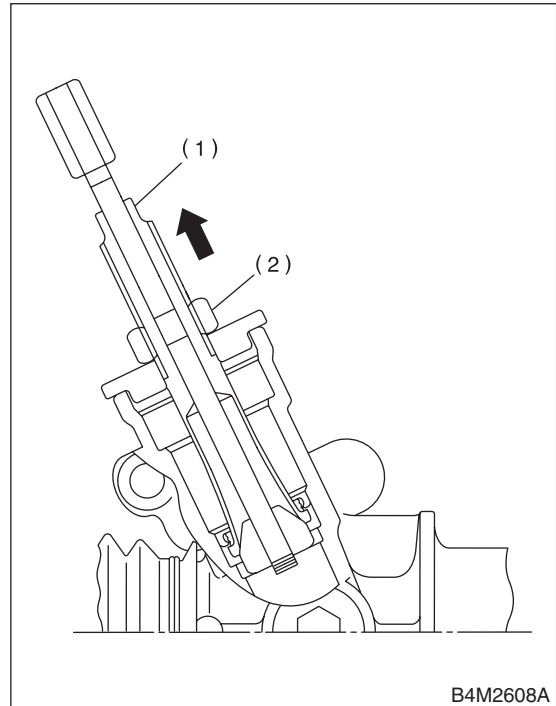
POWER ASSISTED SYSTEM (POWER STEERING)

22) Insert the ST into gearbox, while setting stopper in advance.



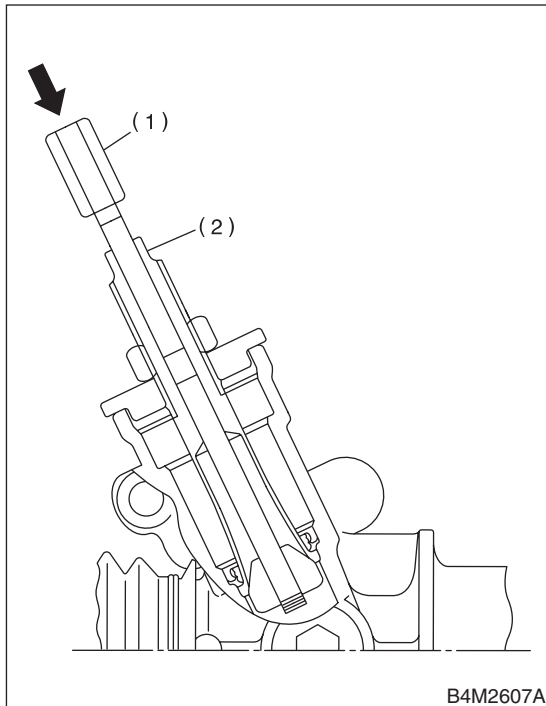
- (1) Stopper
- (2) Oil seal

24) While fixing the 2-surface width, pull out the oil seal by rotating nut.



- (1) 2-surface width
- (2) Nut

23) By fixing the 2-surface width, press in by rotating the rod and attach to oil seal.



- (1) Rod
- (2) 2-surface width

STEERING GEARBOX [RHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

D: ASSEMBLY

Specified steering grease:

VALIANT GREASE M2 (Part No. 003608001)

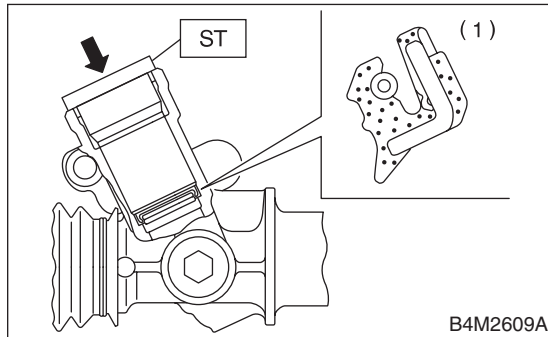
1) Apply grease inside and outside of the oil seal and press in using the ST and press.

ST 34199AE130 GEARBOX OIL SEAL INSTALLER

CAUTION:

Pay attention to the oil seal direction, and attaching position.

Be careful no to scratch the gearbox inside surface.



(1) Oil seal

2) Attach the steering body to ST as shown in the figure. Apply a coat of grease to needle bearing.

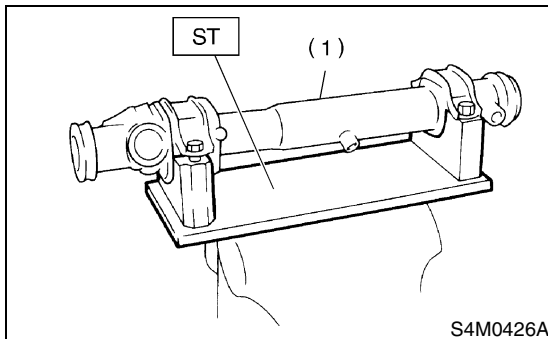
ST 926200000 STAND

CAUTION:

- Use the ST to support steering body.
- Ensure the needle bearing is free from defects. If it is faulty, replace the steering body with a new one.

NOTE:

If the steering body is removed from vehicle, be sure to remove rust and clean.



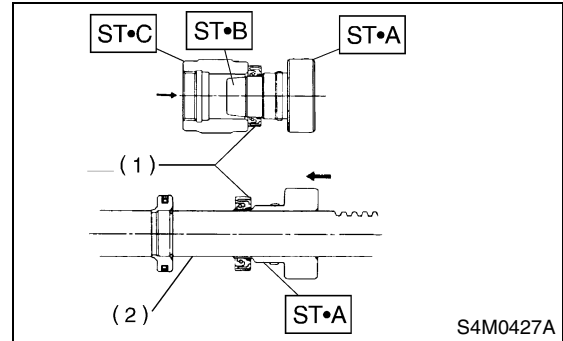
(1) Steering body

3) Using the ST-B and ST-C, attach the oil seal to ST-A. Insert the ST-A into rack from gear side. Remove the oil seal from ST-A when it approaches piston and remove STs from rack.

ST 927490000 INSTALLER; A-B-C

NOTE:

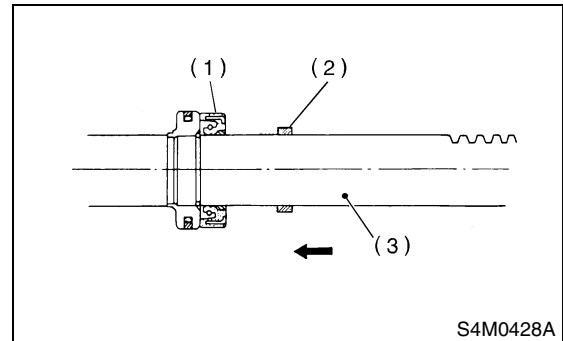
Face the oil seal in direction shown in the figure.



(1) Oil seal

(2) Rack

4) Install the back-up ring from gear side of rack.



(1) Oil seal

(2) Back-up ring

(3) Rack

STEERING GEARBOX [RHD MODEL]

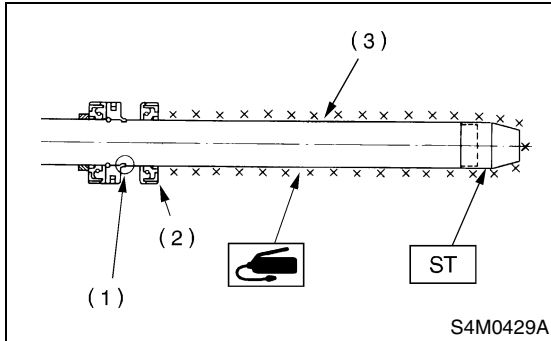
POWER ASSISTED SYSTEM (POWER STEERING)

5) Install the ST on rack and equally apply a thin coat of grease to the rack and ST, then install the oil seal.

ST 926250000 GUIDE

CAUTION:

Be careful not to scratch the oil seal lips with piston's knurl section.



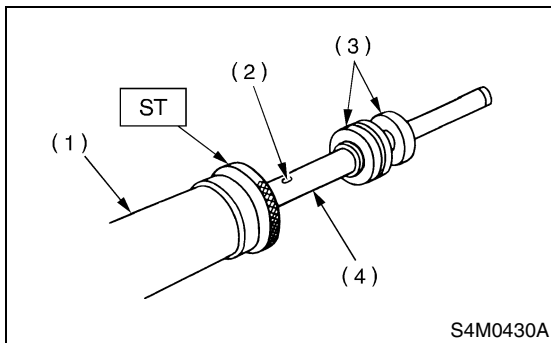
- (1) Rack piston inner ring
- (2) Outer side oil seal
- (3) Rack

6) Apply a coat of grease to the grooves in rack, sliding surface of sleeve and sealing surface of piston. Install the ST on end of steering body cylinder. Then insert the 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 the air vent hole on rack.



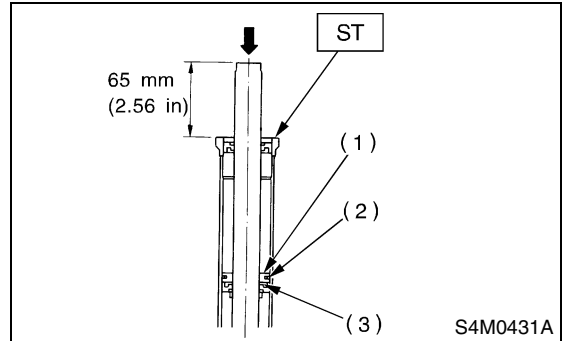
- (1) Cylinder side of steering body
- (2) Air vent hole
- (3) Oil seal
- (4) Rack

7) Slowly press the 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 the ST's inner wall is free of scratches. Otherwise, it may damage the oil seal during installation.

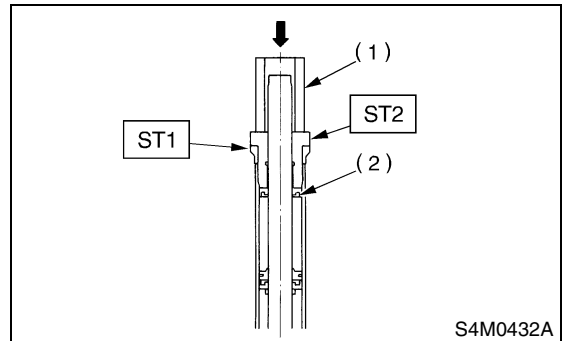


- (1) Rack piston
- (2) Inner side oil seal
- (3) Back-up ring

8) Pass the 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

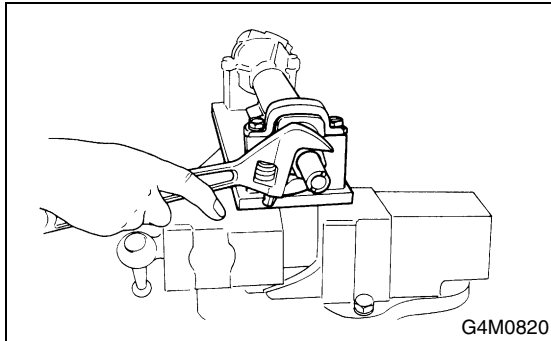
STEERING GEARBOX [RHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

9) Install the holder from cylinder side of steering body.

Tightening torque:

64 N·m (6.5 kgf·m, 47.0 ft·lb)

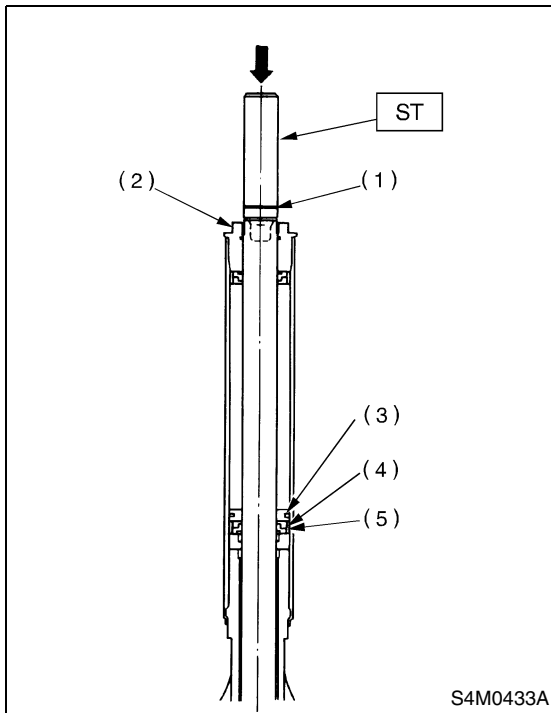


10) Attach the ST to rack cylinder. Using a press, install the back-up ring and oil seal.

NOTE:

Press the ST until its groove is aligned with end of holder.

ST 34099FA030 INSTALLER & REMOVER



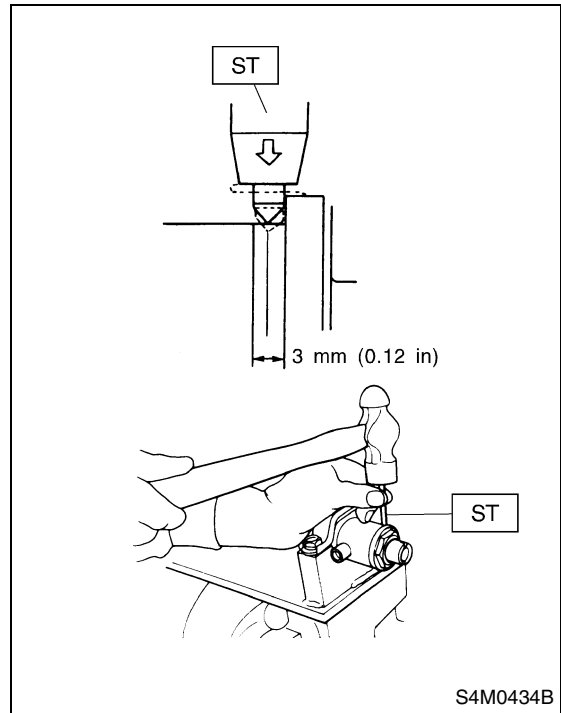
- (1) Installer guide
- (2) Holder
- (3) Rack piston
- (4) Oil seal
- (5) Back-up ring

11) Using the ST, clinch steering body cylinder at a point less than 3 mm (0.12 in) from holder.

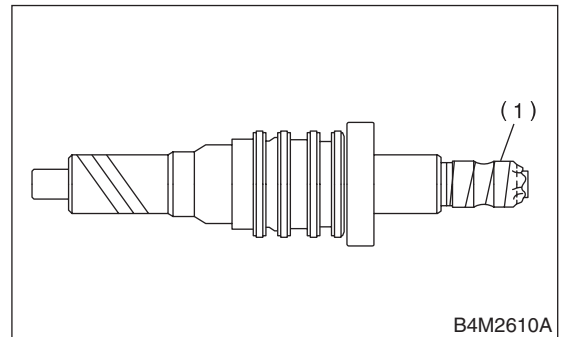
CAUTION:

Be careful not to deform the holder.

ST 34099FA060 PUNCH HOLDER



12) Roll the vinyl tape on serration part of valve assembly, and then apply grease on the tape surface.



- (1) Vinyl tape

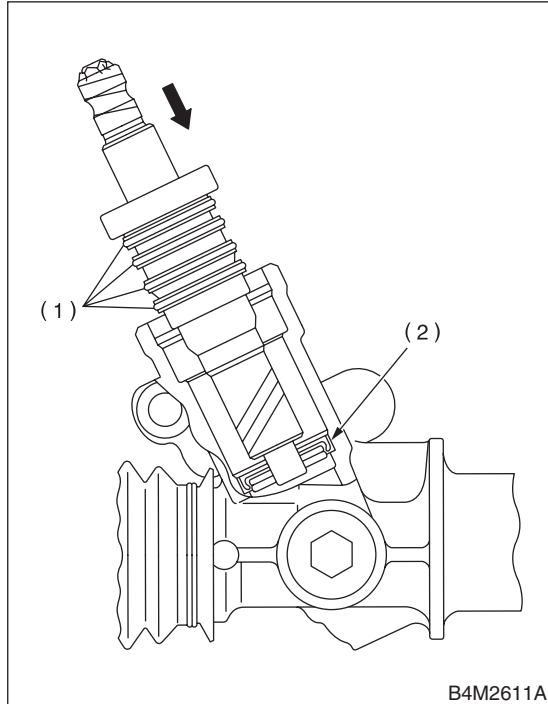
STEERING GEARBOX [RHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

13) Apply grease on the gear teeth of valve assembly and then attach the valve assembly.

CAUTION:

- Be careful not to scratch the oil seal on valve gear teeth.
- Be careful not to scratch the seal ring of valve circumference.



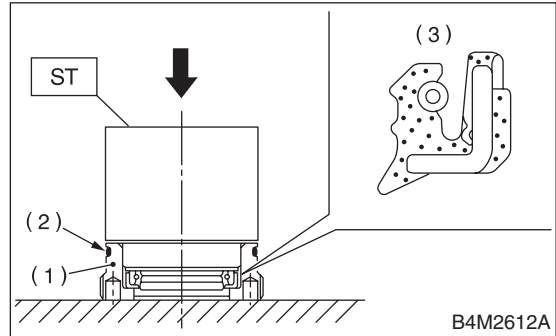
- (1) Seal ring
- (2) Oil seal

14) Apply grease on the oil seal circumference, and then press into the plug using ST and a press. Replace the plug circumference O-rings with new ones.

ST 34199AE110 PLUG OIL SEAL INSTALLER

CAUTION:

Pay attention to the oil seal direction, and attaching position.



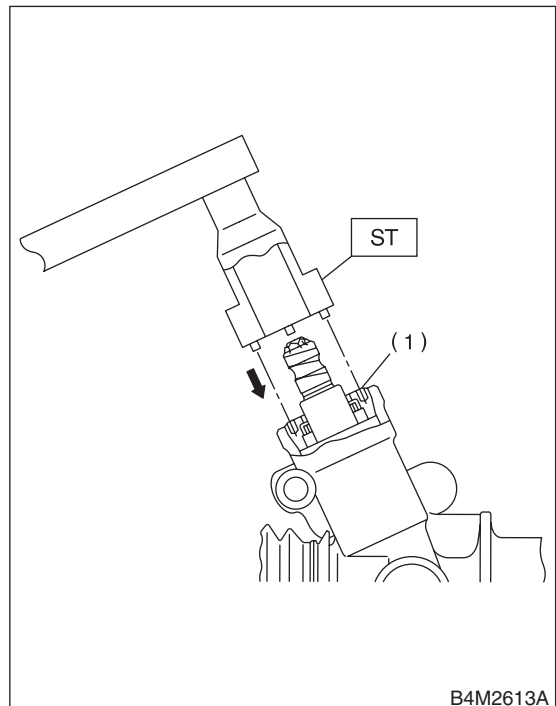
- (1) Plug
- (2) O-ring
- (3) Oil seal

15) Using the ST, install plug.

ST 34199AE090 PLUG WRENCH

Tightening torque:

64 N·m (6.5 kgf·m, 47.0 ft·lb)

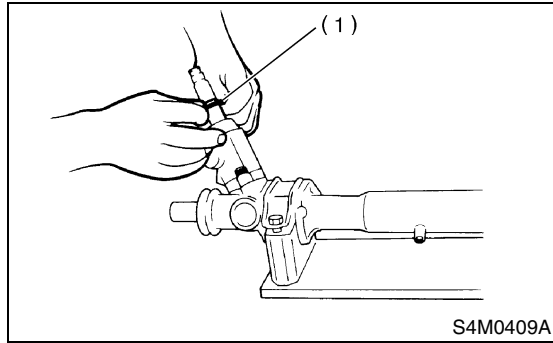


- (1) Plug

STEERING GEARBOX [RHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

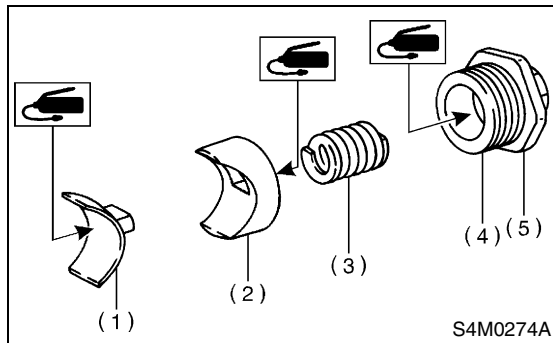
16) Install the dust cover.



(1) Dust cover

17) Apply a coat of grease to the sliding surface of seat pad, sleeve and seating surface of spring, and then insert sleeve into steering body.

Charge the adjusting screw with grease, and then insert the spring into adjusting screw and install on steering body.



- (1) Seat pad
- (2) Sleeve
- (3) Spring
- (4) Adjusting screw
- (5) Lock nut

18) Extend the rack L beyond pinion side of steering body.

On condition

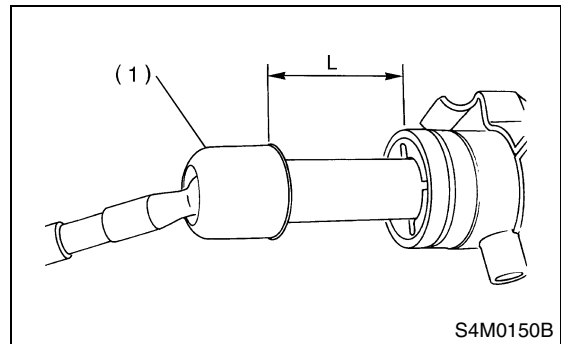
L: Approx. 40 mm (1.57 in)

19) Tighten the adjusting screw until it will no longer tighten.

20) Install the tie-rod and lock washer into rack end.

Tightening torque:

78 N·m (8.0 kgf·m, 57.9 ft·lb)

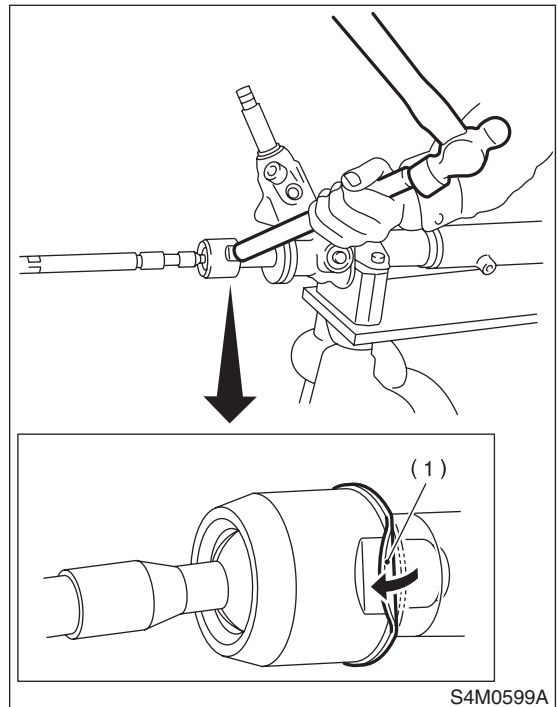


(1) Tie-rod

21) Bend the lock washer.

CAUTION:

Be careful not to scratch the rack when bending lock washer.



(1) Lock washer

22) Loosen the adjusting screw.

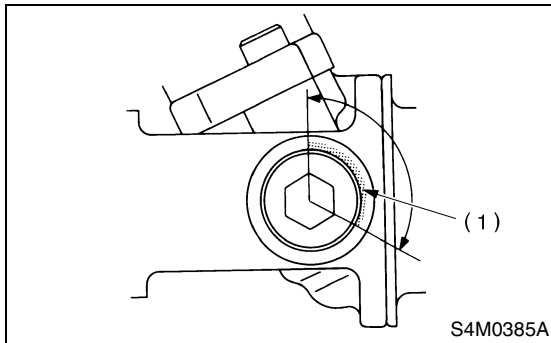
23) Move the rack shaft fully to right and left several times.

STEERING GEARBOX [RHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

24) Apply liquid packing to at least 1/3 of the entire perimeter of adjusting screw thread.

Liquid packing:
THREE BOND 1141



(1) Apply liquid packing to at least 1/3 of entire perimeter.

25) Tighten the adjusting screw.

Tightening torque:
First; 7.4 N·m (0.75 kgf-m, 5.4 ft-lb)
Second; Back off 25°

26) Install the lock nut. While holding the adjusting screw with a wrench, tighten lock nut using ST. ST 926230000 SPANNER

Tightening torque (Lock nut):
39 N·m (4.0 kgf-m, 28.9 ft-lb)

NOTE:

- Hold the adjusting screw with a wrench to prevent it from turning while tightening lock nut.
- Make adjustment so that the steering wheel can be rotated fully from lock to lock without binding.

27) Check for the service limit as per article of "Service limit". <Ref. to PS-68, INSPECTION, Steering Gearbox [RHD MODEL].> Make replacement and adjustment if necessary.

28) Install the boot to housing.

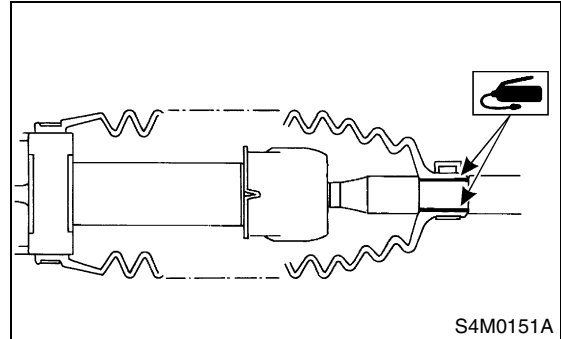
NOTE:

- Before installing the boot, be sure to apply grease to the groove of tie-rod.
- Install the fitting portions of boots to following portions in both sides of assembled steering gearbox.

The groove on gearbox

The groove on the rod

- Make sure that the boot is installed without unusual inflation or deflation.

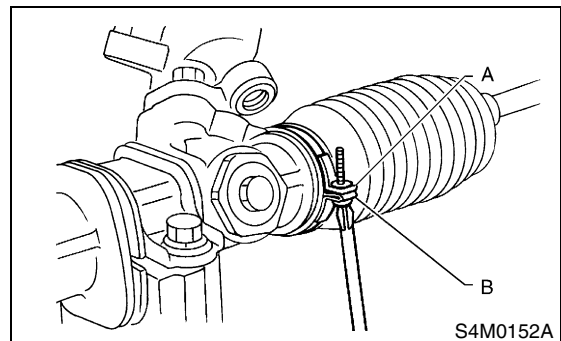


29) Using a screwdriver, tighten the screw until ends "A" and "B" of band come into contact with each other.

CAUTION:
Use a new band.

NOTE:

Always tighten the band from the underside of gear box.



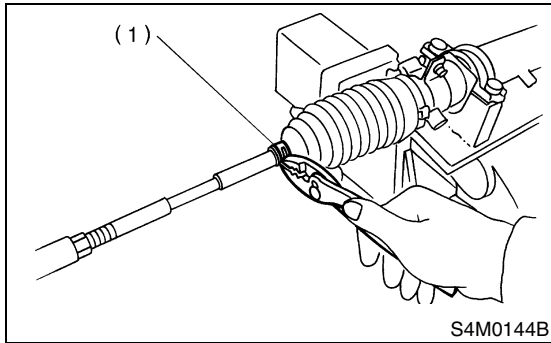
STEERING GEARBOX [RHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

30) Fix the boot end with clip (small).

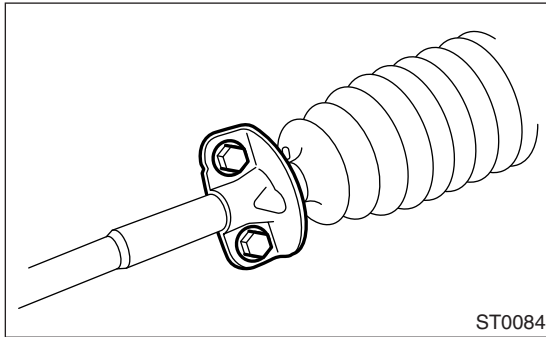
CAUTION:

After installing, check the boot end is positioned into groove on tie-rod.



(1) Clip

31) Install the tie-rod end plate.



Tightening torque:

13 N·m (1.3 kgf·m, 9.4 ft·lb)

32) If the tie-rod end was removed, screw in the lock nut and tie-rod end to screwed portion of tie-rod, and then tighten the lock nut temporarily in a position as shown in the figure.

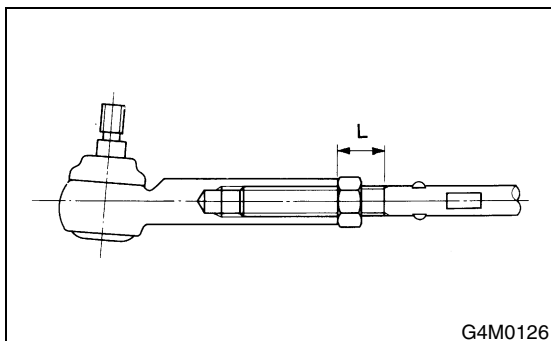
Installed tie-rod length: L

15 mm (0.59 in) (WAGON)

25 mm (0.98 in) (SEDAN)

NOTE:

Pay attention to the difference between right and left tie-rod ends.



33) Install the tie-rod end plate.

Tightening torque:

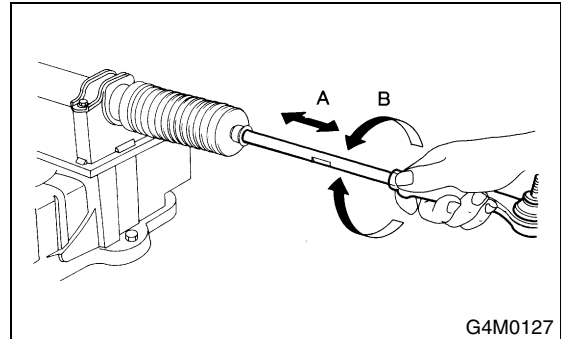
13 N·m (1.3 kgf·m, 9.4 ft·lb)

34) Inspect the gearbox as follows:

“A” Holding the tie-rod end, repeat lock to lock two or three times as quickly as possible.

“B” Holding the tie-rod end, turn it slowly at a radius one or two times as large as possible.

After all, make sure that the boot is installed in specified position without deflation.



35) Remove the gearbox from ST.

ST 92620000 STAND

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 the inside of gearbox for water. If any water is found, carefully check the 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 the bend or damage is excessive, replace the entire gearbox.
2	Dust seal	(1) Crack or damage (2) Wear	If the outer wall slips, lip is worn out or damage is found, replace it with a new one.
3	Rack and pinion	Poor mating of rack with pinion	(1) Adjust the backlash properly. By measuring the 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 the 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 the entire gearbox.
4	Gearbox unit	(1) Bend of rack shaft (2) Bend of cylinder portion (3) Crack or damage on cast iron portion	Replace the gearbox with a new one.
		(4) Wear or damage on rack bush	If the free play of rack shaft in radial direction is out of the specified range, replace the gearbox with a new one. (Refer to "Service limit".)
		(5) Wear on input shaft bearing	If the free plays of input shaft in radial and axial directions are out of the specified ranges, replace the gearbox with a 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:

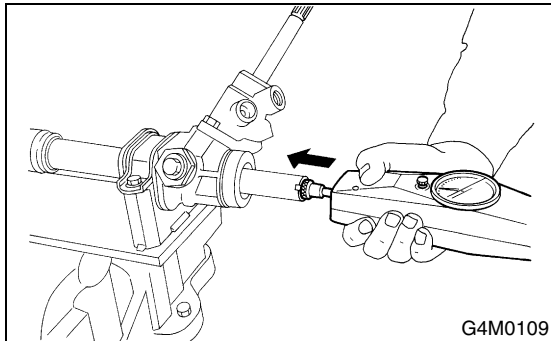
When making a measurement, vise gearbox by using ST. Never vise the gearbox by inserting aluminum plates, etc. between vise and gearbox.

ST 926200000 STAND

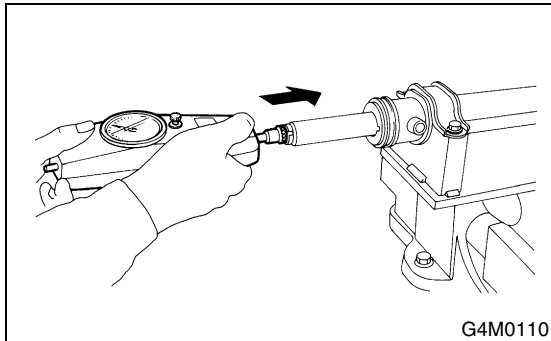
Sliding resistance of rack shaft:

Service limit

304 N (31 kgf, 68 lb) or less



G4M0109



G4M0110

3. RACK SHAFT PLAY IN RADIAL DIRECTION

Left-turn steering:

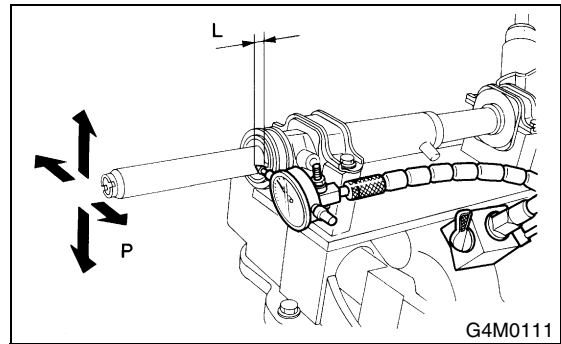
Service limit

0.19 mm (0.0075 in) or less

On condition

L: 5 mm (0.20 in)

P: 98 N (10 kgf, 22 lb)



G4M0111

Right-turn steering:

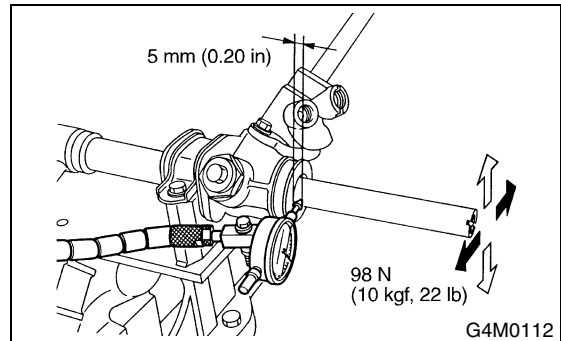
Service limit

Direction ⇐ ⇨

0.3 mm (0.012 in) or less

Direction ⇐ ⇨

0.19 mm (0.0075 in) or less



G4M0112

STEERING GEARBOX [RHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

4. INPUT SHAFT PLAY

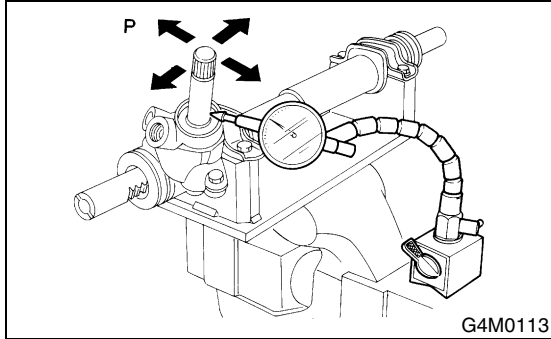
In radial direction:

Service limit

0.18 mm (0.0071 in) or less

On condition

P: 98 N (10 kgf, 22 lb)



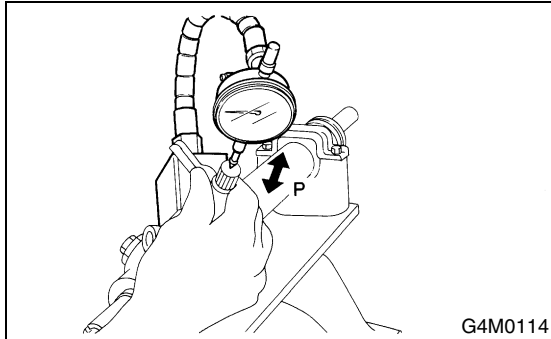
In axial direction:

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 the ST, measure gearbox turning resistance.
ST 34099PA100 SPANNER

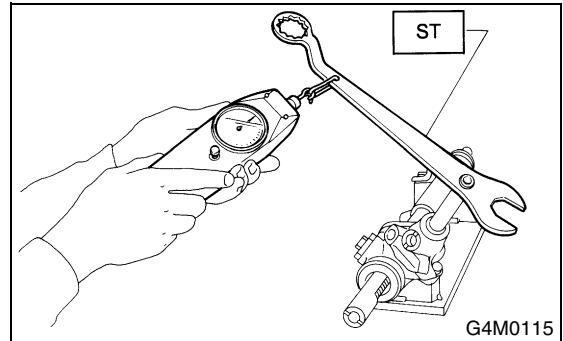
Service limit

Maximum allowable resistance

Less than 9.33 N (0.95 kgf, 2.10 lb)

Difference between right and left sliding resistance:

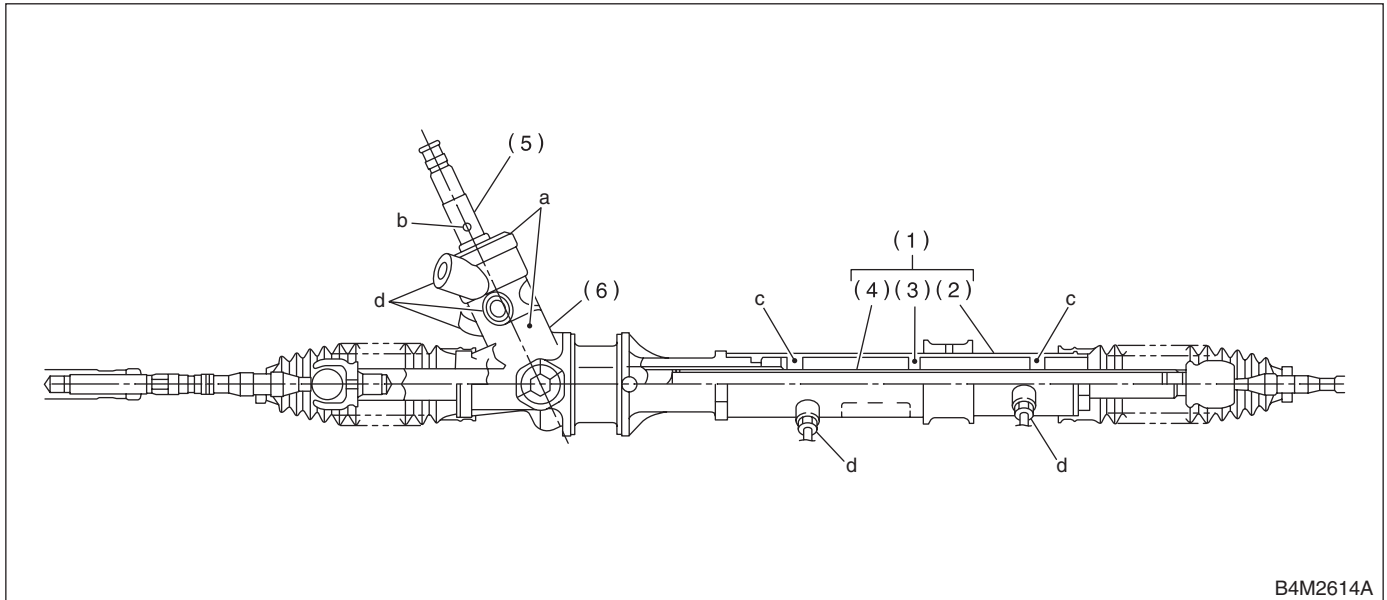
Less than 20%



STEERING GEARBOX [RHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

6. OIL LEAKING



B4M2614A

(1) Power cylinder
(2) Cylinder

(3) Rack piston
(4) Rack

(5) Input shaft
(6) Valve housing

NOTE:

If the gearbox is dismantled without confirming where the leak is, it must be mounted again to locate the leak point.

1) 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 thirty to forty times with engine running, then make comparison of the suspected portion between immediately after and several hours after this operation.

2) Inspect leakage from "a"

The oil seal is damaged. Replace the valve assembly with a new one.

3) Inspect leakage from "b"

The torsion bar O-ring is damaged. Replace the valve assembly with a new one.

4) Inspect leakage from "c"

The oil seal is damaged. Replace the oil seal with a new one.

5) Inspect leakage from "d"

The pipe is damaged. Replace the faulty pipe or O-ring.

STEERING GEARBOX [RHD MODEL]

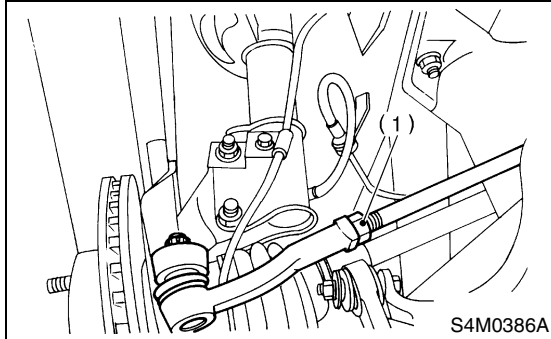
POWER ASSISTED SYSTEM (POWER STEERING)

F: ADJUSTMENT

1) Adjust the front toe.

Standard of front toe:

IN 3 — OUT 1 mm (IN 0.12 — OUT 0.039 in)



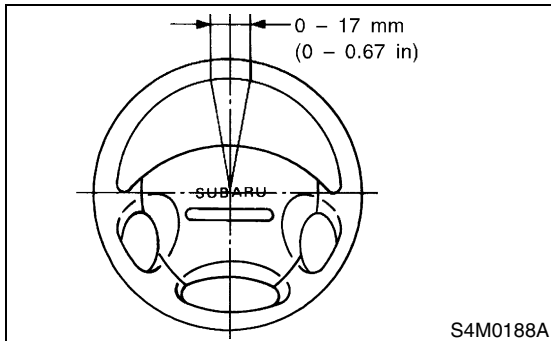
(1) Lock nut

2) Adjust the steering angle of wheels.

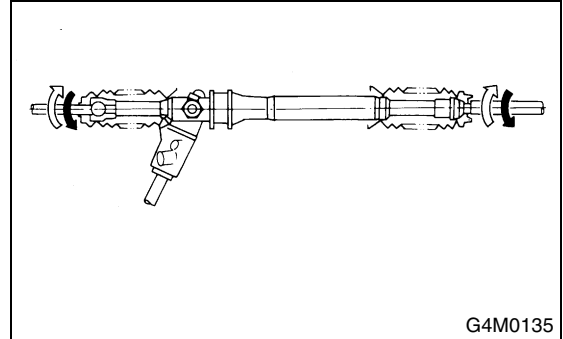
Standard of steering angle:

Model	TURBO, 2.5 L 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 the 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 the 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.



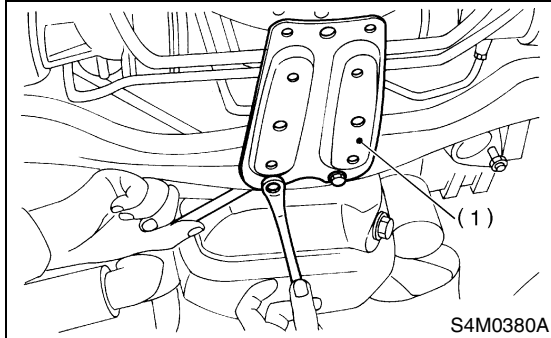
PIPE ASSEMBLY [LHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

7. Pipe Assembly [LHD MODEL]

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Lift-up the vehicle, and then remove the jack-up plate.

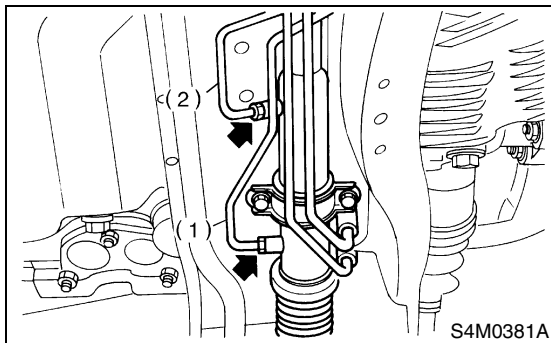


(1) Jack-up plate

- 3) Remove the one pipe joint at center of gearbox, and then connect the vinyl hose to pipe and joint. Discharge fluid by turning the steering wheel fully clockwise and counterclockwise. Discharge fluid similarly from the other pipe.

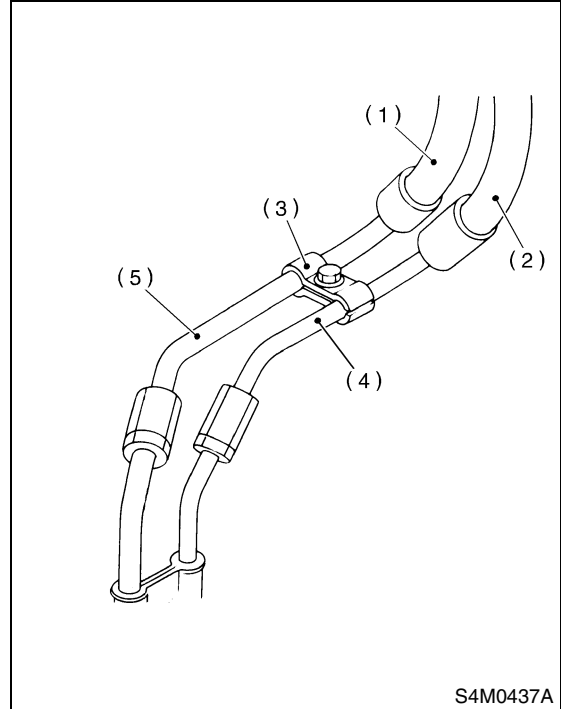
CAUTION:

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 the clamp E from pipes C and D.

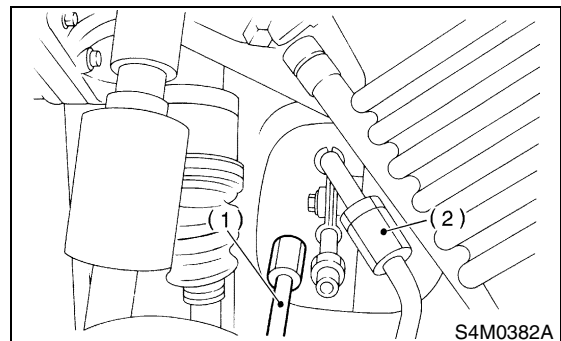


(1) Return hose
(2) Pressure hose
(3) Clamp E
(4) Pipe C
(5) Pipe D

- 5) Disconnect the pipes C and D from pipe (on the gearbox side).

CAUTION:

- When disconnecting the pipes C and D, use two wrenches to prevent deformities.
- Be careful to keep the pipe connections free from foreign matter.



(1) Pipe C
(2) Pipe D

PIPE ASSEMBLY [LHD MODEL]

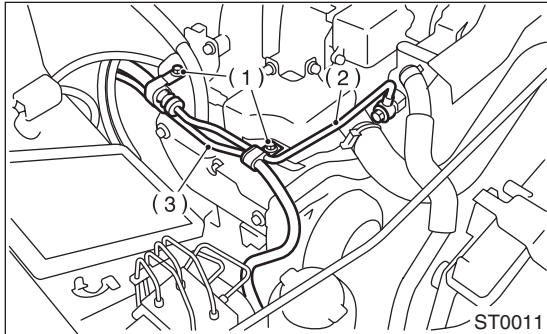
POWER ASSISTED SYSTEM (POWER STEERING)

6) Non-turbo MODEL:

- (1) Remove the air intake duct. <Ref. to IN-7, REMOVAL, Air Intake Duct.>
- (2) Remove the bolt A.
- (3) Disconnect the pipe C from oil pump. Disconnect the pipe D from return hose.

CAUTION:

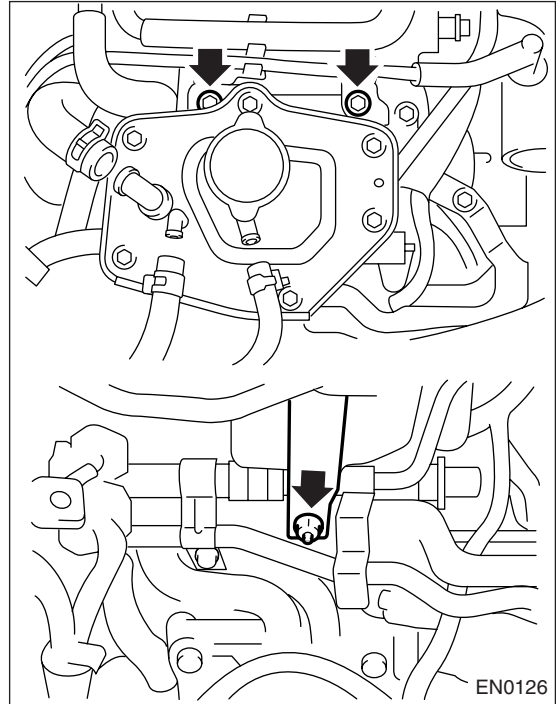
- Do not allow fluid from the hose end to come into contact with pulley belt.
- To prevent foreign matter from entering the hose and pipe, cover the open ends of them with a clean cloth.



- (1) Bolt A
- (2) Pipe C
- (3) Pipe D

7) Turbo MODEL:

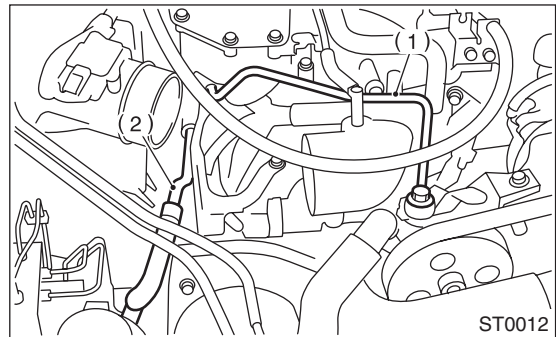
- (1) Remove the air intake duct, air cleaner upper cover and air intake boot. <Ref. to IN(TURBO)-8, REMOVAL, Air Intake Duct.> and <Ref. to IN(TURBO)-7, REMOVAL, Air Cleaner.>
- (2) Remove the two bolts fixing pipe C and D.
- (3) Remove the coolant filler tank.



- (4) Disconnect the pipe C from oil pump. Disconnect the pipe D from return hose.

CAUTION:

- Do not allow fluid from the hose end to come into contact with pulley belt.
- To prevent foreign matter from entering the hose and pipe, cover the open ends of them with a clean cloth.



- (1) Pipe C
- (2) Pipe D

PIPE ASSEMBLY [LHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

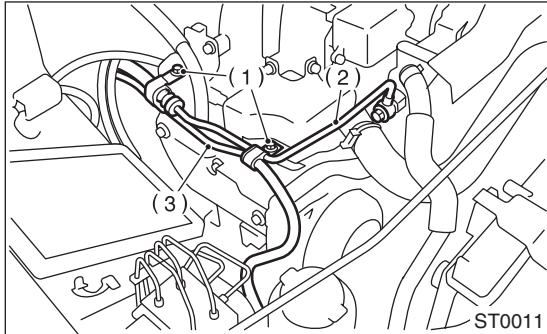
B: INSTALLATION

1) Temporarily tighten the two bolts fixing pipe C and D. (bolt A for Non-turbo model.)

CAUTION:

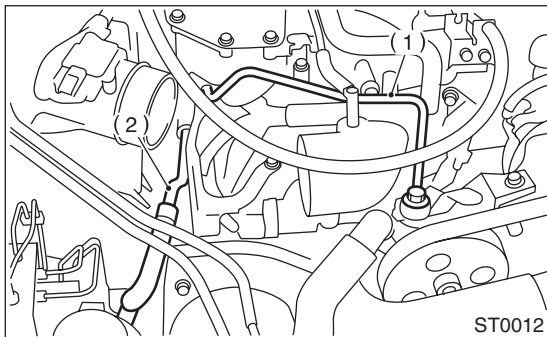
Visually check that the hose between tank and pipe D is free from bending or twisting.

- Non-turbo MODEL



- (1) Bolt A
- (2) Pipe C
- (3) Pipe D

- Turbo MODEL



- (1) Pipe C
- (2) Pipe D

- (1) Connect the pipe D to oil tank.
- (2) Install the 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 the two bolts fixing pipe C and D. (bolt A for Non-turbo model.)

Tightening torque:

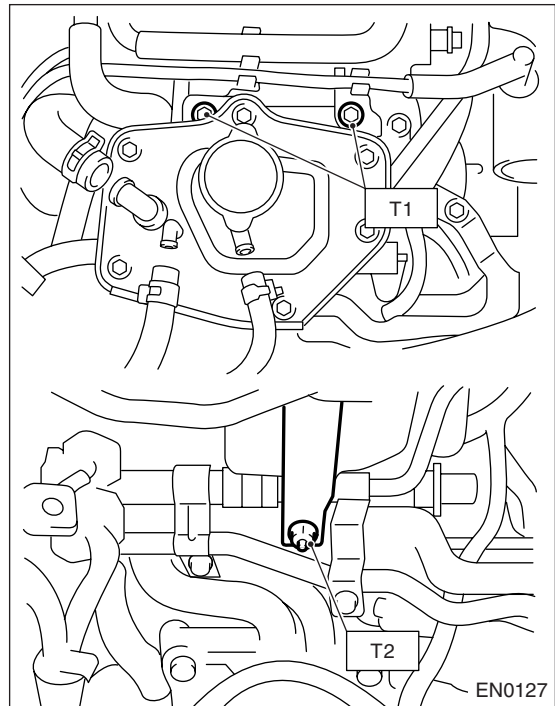
13 N·m (1.3 kgf·m, 9.4 ft·lb)

2) Install the coolant filler tank. (Turbo model)

Tightening torque:

T1: 19 N·m (1.9 kgf·m, 13.7 ft·lb)

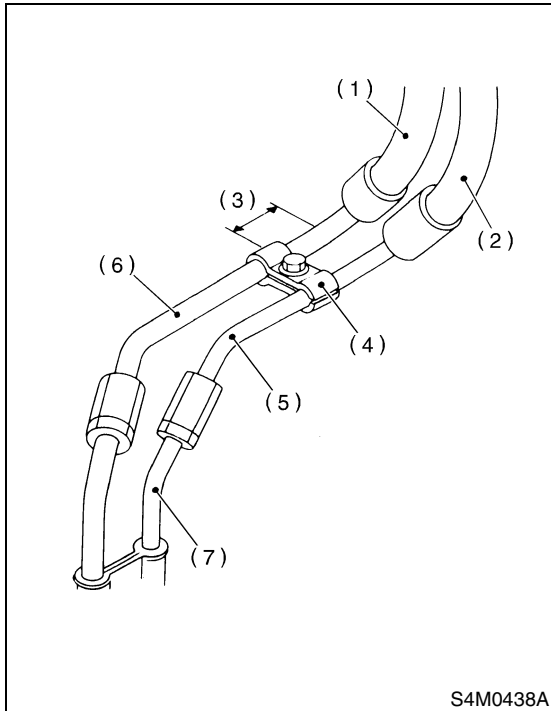
T2: 21 N·m (2.1 kgf·m, 15.2 ft·lb)



PIPE ASSEMBLY [LHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

3) Temporarily connect the pipes C and D to pipes (on the gearbox side).

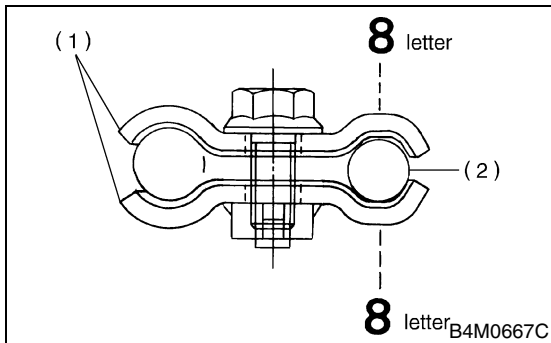


- (1) Return hose
- (2) Pressure hose
- (3) Approx. 30 mm (1.18 in)
- (4) Clamp E
- (5) Pipe C
- (6) Pipe D
- (7) Pipe (on gearbox side)

4) Temporarily install the clamp E on pipes C and D.

CAUTION:

Ensure the letter “8” on each clamp are diagonally opposite each other as shown in figure.



- (1) Clamp E
- (2) Pipe C

5) Tighten the clamp E firmly.

Tightening torque:

7.4 N·m (0.75 kgf-m, 5.4 ft-lb)

6) Tighten the joint nut.

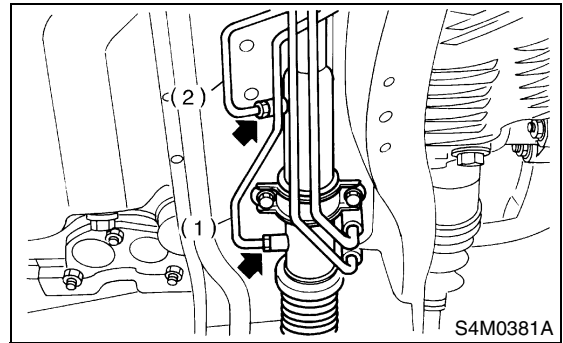
Tightening torque:

15 N·m (1.5 kgf-m, 10.8 ft-lb)

7) Connect the pipes A and B to four pipe joints of gearbox. Connect the 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 the jack-up plate.

9) Install the air intake duct. (Non-turbo model)
<Ref. to IN-7, INSTALLATION, Air Intake Duct.>

10) Install the air intake duct, air intake boot and air cleaner upper cover. (Turbo model)

<Ref. to IN(TURBO)-7, INSTALLATION, Air Cleaner.> and <Ref. to IN(TURBO)-8, INSTALLATION, Air Intake Duct.>

11) Connect the battery ground cable to battery.

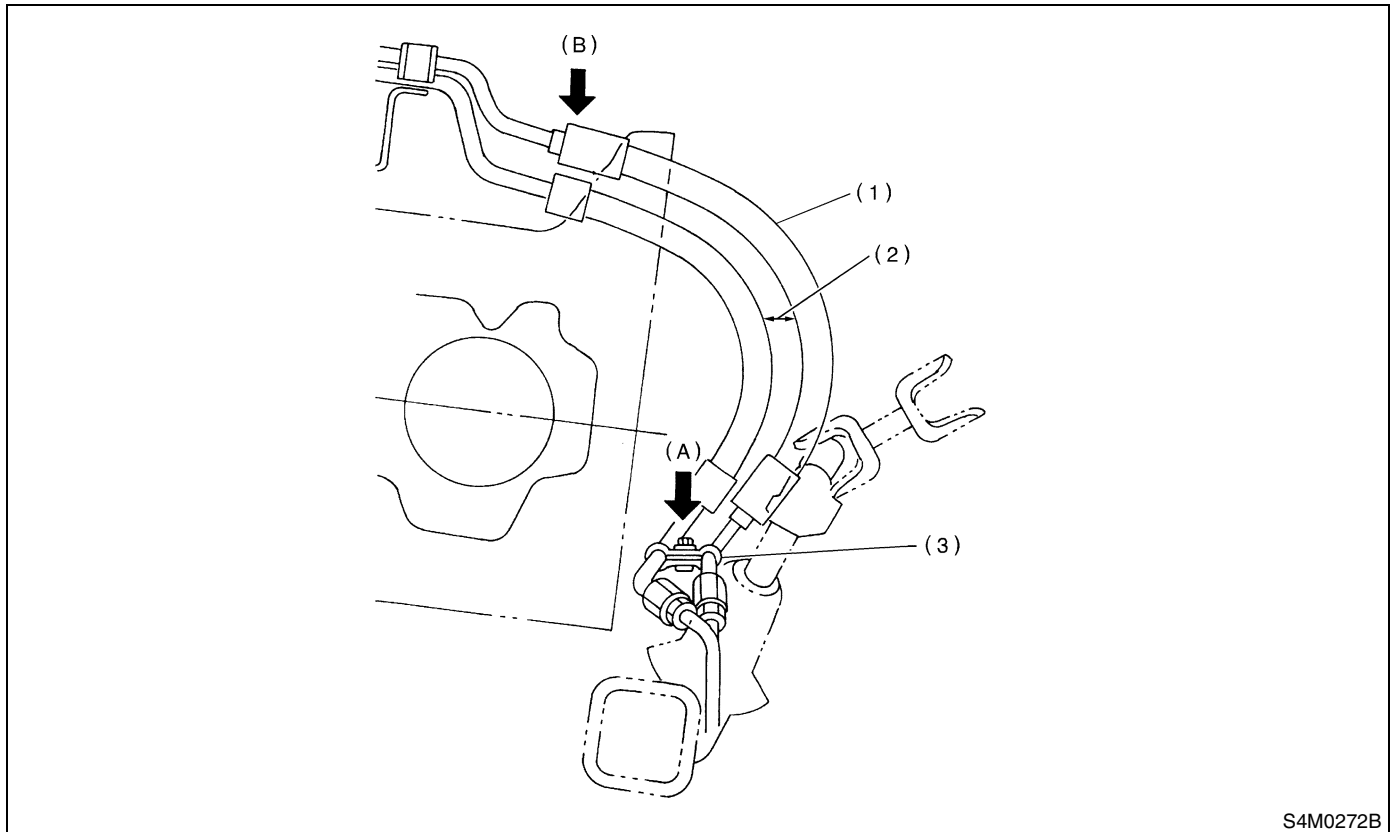
PIPE ASSEMBLY [LHD MODEL]

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.



S4M0272B

- | | |
|---|---|
| (1) High-pressure hose | (3) Clearance between crossmember and pipe: 3 — 8 mm (0.12 — 0.31 in) |
| (2) No interference is allowed between hoses. | |

13) Finally check the clearance between pipes and/or hoses, as shown above.

If the clearance between cruise control pump and power steering hose is less than 10 mm (0.39 in), proceed as follows:

- (1) Move the clamped section (A) (refer to the 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 the clearance between cruise control pump and power steering hose is at least 10 mm (0.39 in). If it is not, bend the 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	<ul style="list-style-type: none"> • O-ring fitting surface for damage • Nut for damage • Pipe for damage 	Replace with a new one.
Clamp	<ul style="list-style-type: none"> • Clamps for weak clamping force 	Replace with a new one.
Hose	<ul style="list-style-type: none"> • Flared surface for damage • Flare nut for damage • Outer surface for cracks • Outer surface for wear • Clip for damage • End coupling or adapter for degradation 	Replace with a new one.

CAUTION:

Although the 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 the 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 the 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.

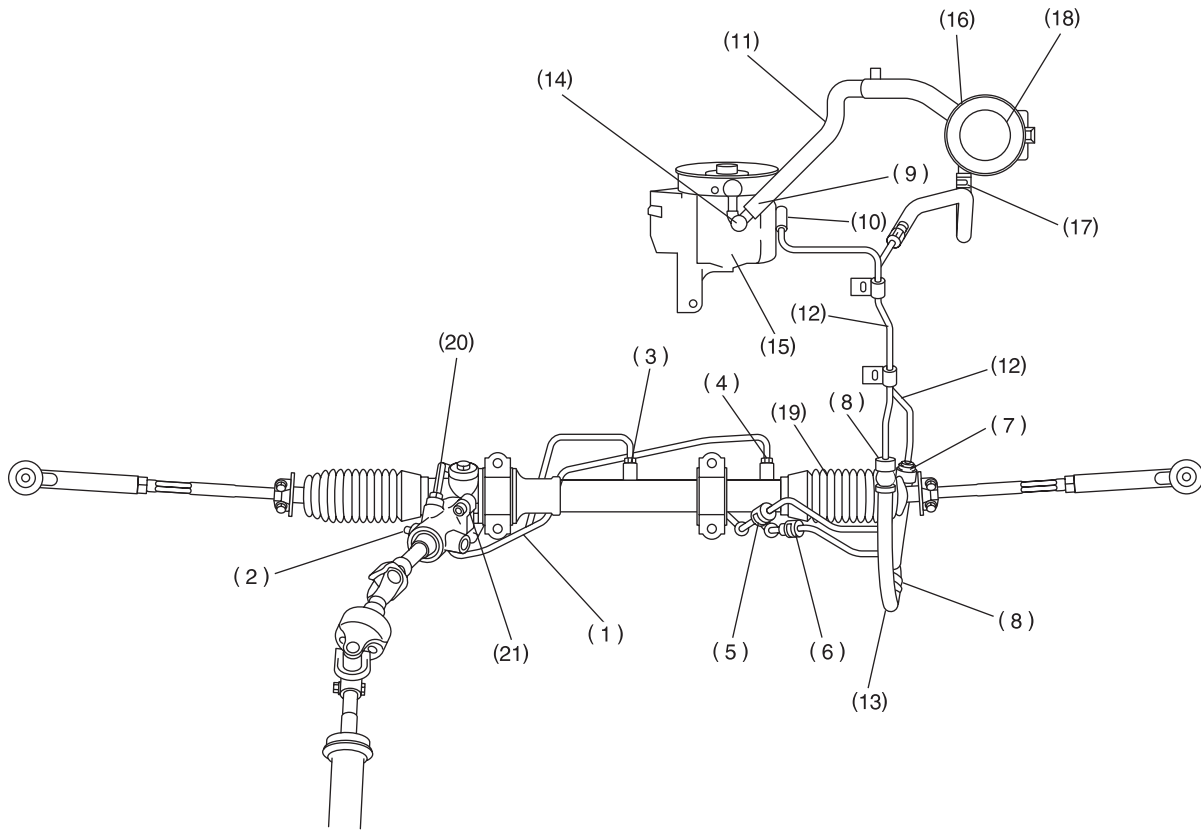
Trouble	Possible cause	Corrective action
Pressure hose burst	Excessive holding time of relief status	Instruct the customers.
	Malfunction of relief valve	Replace the oil pump.
	Poor cold characteristic of fluid	Replace the fluid.
Forced out return hose	Poor connection	Correct.
	Poor holding of clip	Retighten.
	Poor cold characteristic of fluid	Replace the fluid.
Fluid bleeding out of hose slightly	Wrong layout, tensioned	Replace the hose.
	Excessive play of engine due to deterioration of engine mounting rubber	Replace the defective parts.
	Improper stop position of pitching stopper	Replace the defective parts.
Crack on hose	Excessive holding time of relief status	Replace. Instruct the 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 the 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 the clamp.
	Damaged O-ring or gasket	Replace the O-ring or gasket pipe or hose with new one, if ineffective, replace the gearbox 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 the oil pump.
	Damaged gasket	Replace the oil pump.
Leakage from oil tank (16) and (17) in figure	Crack in oil tank	Replace the oil tank.
Leakage from filler neck (18)	Damaged cap packing	Replace the cap.
	Crack in root of filler neck	Replace the oil tank.
	High fluid level	Adjust the fluid level.
Leakage from surrounding of power cylinder of gearbox (19) in figure	Damaged oil seal	Replace the oil seal.
Leakage from control valve of gearbox (20) and (21) in figure	Damaged packing or oil seal	Replace the problem parts.
	Damage in control valve	Replace the 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.

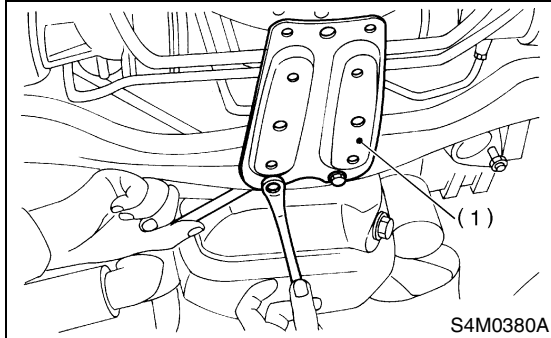
PIPE ASSEMBLY [RHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

8. Pipe Assembly [RHD MODEL]

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Lift-up the vehicle, and then remove the jack-up plate.

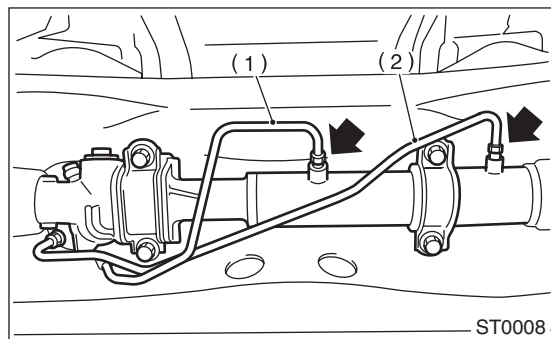


(1) Jack-up plate

- 3) Remove the one pipe joint at the center of gear-box, and then connect the vinyl hose to pipe and joint. Discharge fluid by turning steering wheel fully clockwise and counterclockwise. Discharge fluid similarly from the other pipe.

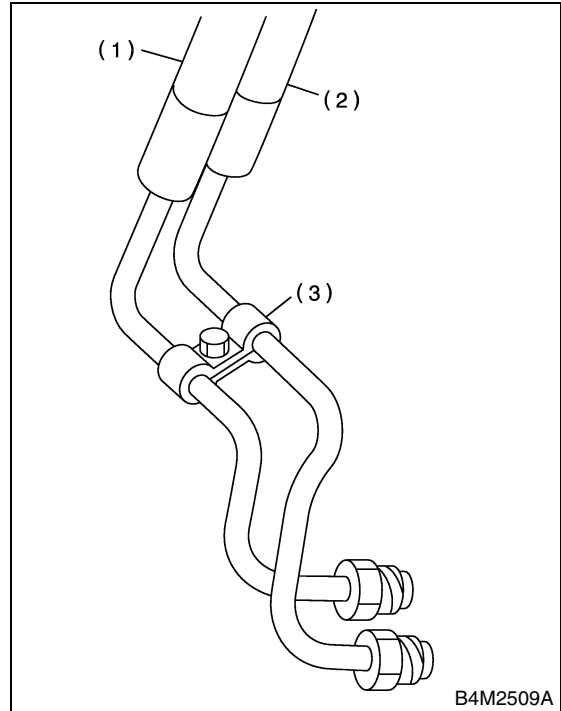
CAUTION:

Improper removal and installation of the 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 the clamp E from pipes C and D.

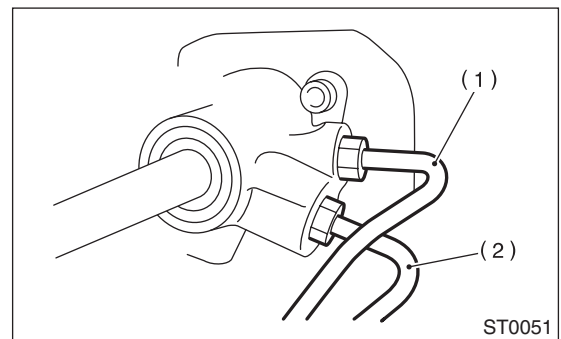


(1) Return hose
(2) Pressure hose
(3) Clamp E

- 5) Disconnect the pipes C and D from pipe (on the gearbox side).

CAUTION:

- When disconnecting the pipes C and D, use two wrenches to prevent deformities.
- Be careful to keep the pipe connections free from foreign matter.



(1) Pipe C
(2) Pipe D

PIPE ASSEMBLY [RHD MODEL]

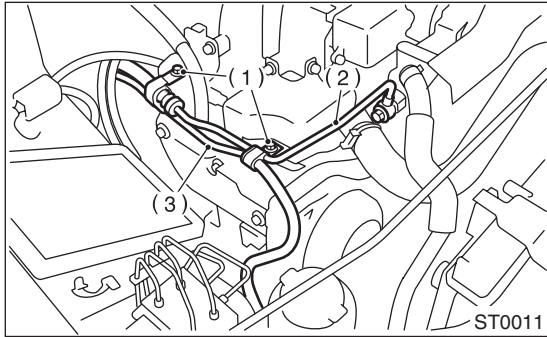
POWER ASSISTED SYSTEM (POWER STEERING)

6) Non-turbo MODEL:

- (1) Remove the air intake duct. <Ref. to IN-7, REMOVAL, Air Intake Duct.>
- (2) Remove the bolt A.
- (3) Disconnect the pipe C from oil pump. Disconnect the pipe D from return hose.

CAUTION:

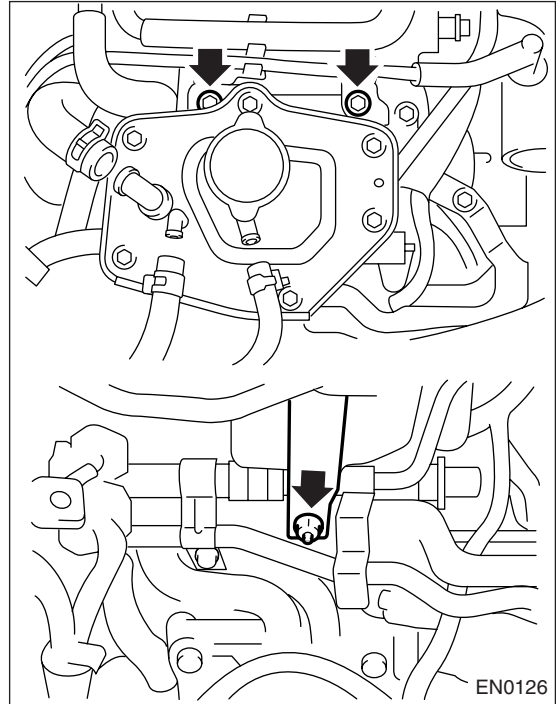
- Do not allow fluid from the hose end to come into contact with pulley belt.
- To prevent foreign matter from entering the hose and pipe, cover the open ends of them with a clean cloth.



- (1) Bolt A
- (2) Pipe C
- (3) Pipe D

7) Turbo MODEL:

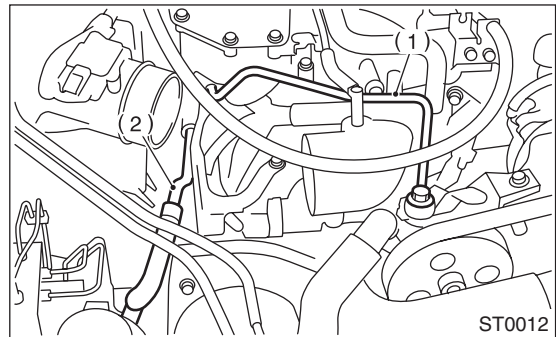
- (1) Remove the air intake duct, air cleaner upper cover and air intake boot. <Ref. to IN(TURBO)-8, REMOVAL, Air Intake Duct.> and <Ref. to IN(TURBO)-7, REMOVAL, Air Cleaner.>
- (2) Remove the two bolts fixing pipe C and D.
- (3) Remove the coolant filler tank.



- (4) Disconnect the pipe C from oil pump. Disconnect pipe D from return hose.

CAUTION:

- Do not allow fluid from the hose end to come into contact with pulley belt.
- To prevent foreign matter from entering the hose and pipe, cover the open ends of them with a clean cloth.



- (1) Pipe C
- (2) Pipe D

PIPE ASSEMBLY [RHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

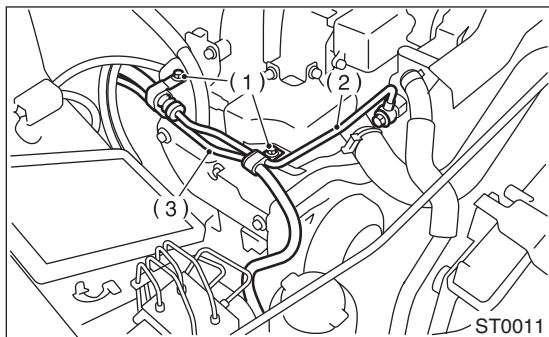
B: INSTALLATION

1) Temporarily tighten the two bolts fixing pipe C and D. (bolt A for Non-turbo model.)

CAUTION:

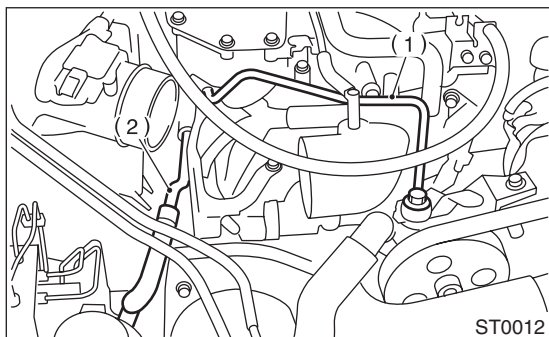
Visually check that the hose between tank and pipe D is free from bending or twisting.

- Non-turbo MODEL



- (1) Bolt A
- (2) Pipe C
- (3) Pipe D

- Turbo MODEL



- (1) Pipe C
- (2) Pipe D

- (1) Connect the pipe D to oil tank.
- (2) Install the 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 the two bolts fixing pipe C and D. (bolt A for Non-turbo model.)

Tightening torque:

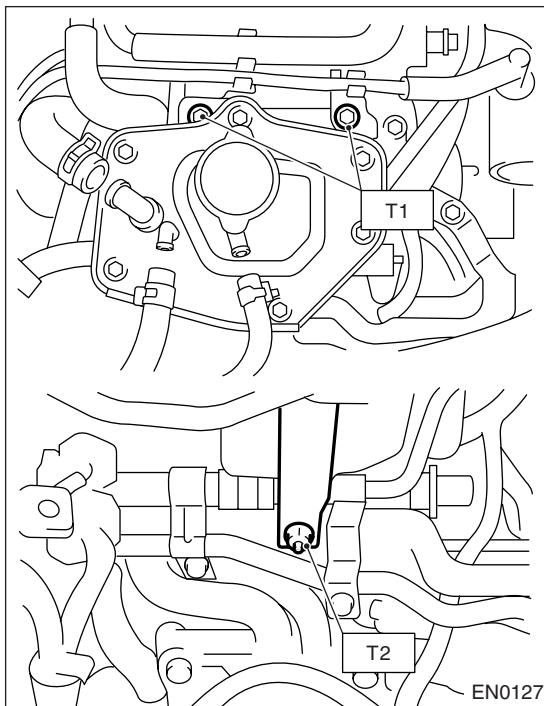
13 N·m (1.3 kgf·m, 9.4 ft·lb)

2) Install the coolant filler tank. (Turbo model)

Tightening torque:

T1: 19 N·m (1.9 kgf·m, 13.7 ft·lb)

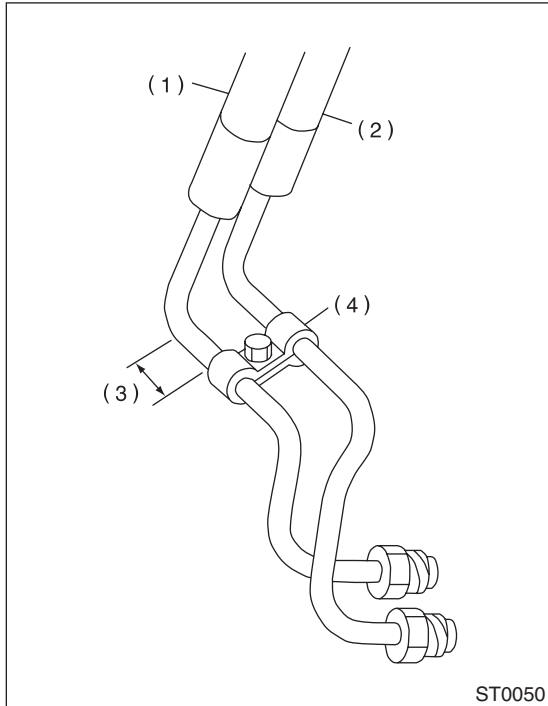
T2: 21 N·m (2.1 kgf·m, 15.2 ft·lb)



PIPE ASSEMBLY [RHD MODEL]

POWER ASSISTED SYSTEM (POWER STEERING)

3) Temporarily connect the pipes C and D to pipes (on the gearbox side).

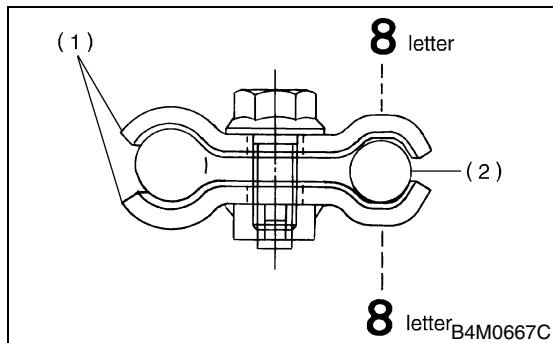


- (1) Return hose
- (2) Pressure hose
- (3) Approx. 30 mm (1.18 in)
- (4) Clamp E

4) Temporarily install the clamp E on pipes C and D.

CAUTION:

Ensure the letter "8" on each clamp are diagonally opposite each other as shown in the figure.



- (1) Clamp E
- (2) Pipe C

5) Tighten the clamp E firmly.

Tightening torque:

7.4 N·m (0.75 kgf·m, 5.4 ft·lb)

6) Tighten the joint nut.

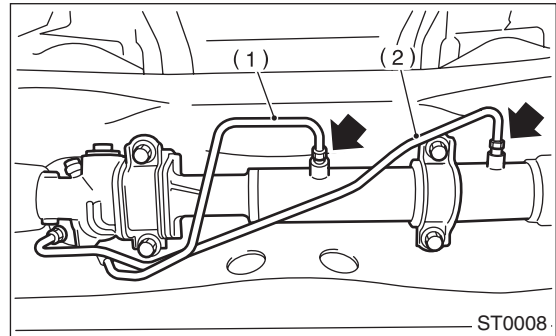
Tightening torque:

15 N·m (1.5 kgf·m, 10.8 ft·lb)

7) Connect the pipes A and B to four pipe joints of gearbox. Connect the 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 the jack-up plate.

9) Install the air intake duct. (Non-turbo model)
<Ref. to IN-7, INSTALLATION, Air Intake Duct.>

10) Install the air intake duct, air cleaner upper cover and air intake boot.

<Ref. to IN(TURBO)-7, INSTALLATION, Air Cleaner.> and <Ref. to IN(TURBO)-8, INSTALLATION, Air Intake Duct.>

11) Connect the battery ground cable to battery.

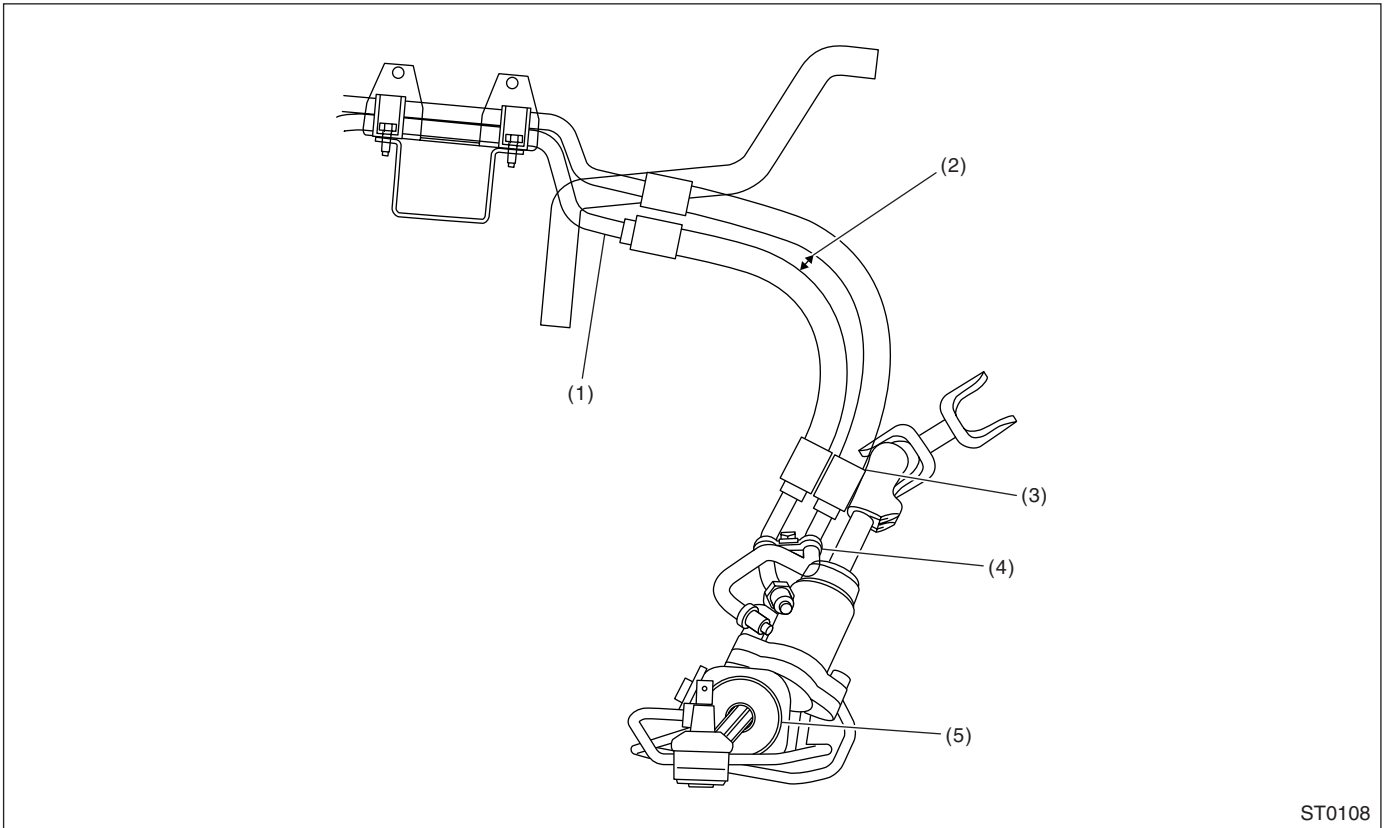
PIPE ASSEMBLY [RHD MODEL]

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.



ST0108

(1) Clearance between blow-by hose and pipe: 3 — 5 mm (0.12 — 0.20 in)

(2) No interference is allowed between hoses.

(3) Clearance between side frame and hose: 15 mm (0.59 in) or more

(4) Clearance between crossmember and pipe: 5 — 13 mm (0.20 — 0.51 in)

(5) Steering gearbox

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 the clearance between cruise control pump and power steering hose is at least 10 mm (0.39 in). If it is not, bend the 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	<ul style="list-style-type: none"> • O-ring fitting surface for damage • Nut for damage • Pipe for damage 	Replace with a new one.
Clamp	<ul style="list-style-type: none"> • Clamps for weak clamping force 	Replace with a new one.
Hose	<ul style="list-style-type: none"> • Flared surface for damage • Flare nut for damage • Outer surface for cracks • Outer surface for wear • Clip for damage • End coupling or adapter for degradation 	Replace with a new one.

CAUTION:

Although the 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 the 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 the 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.

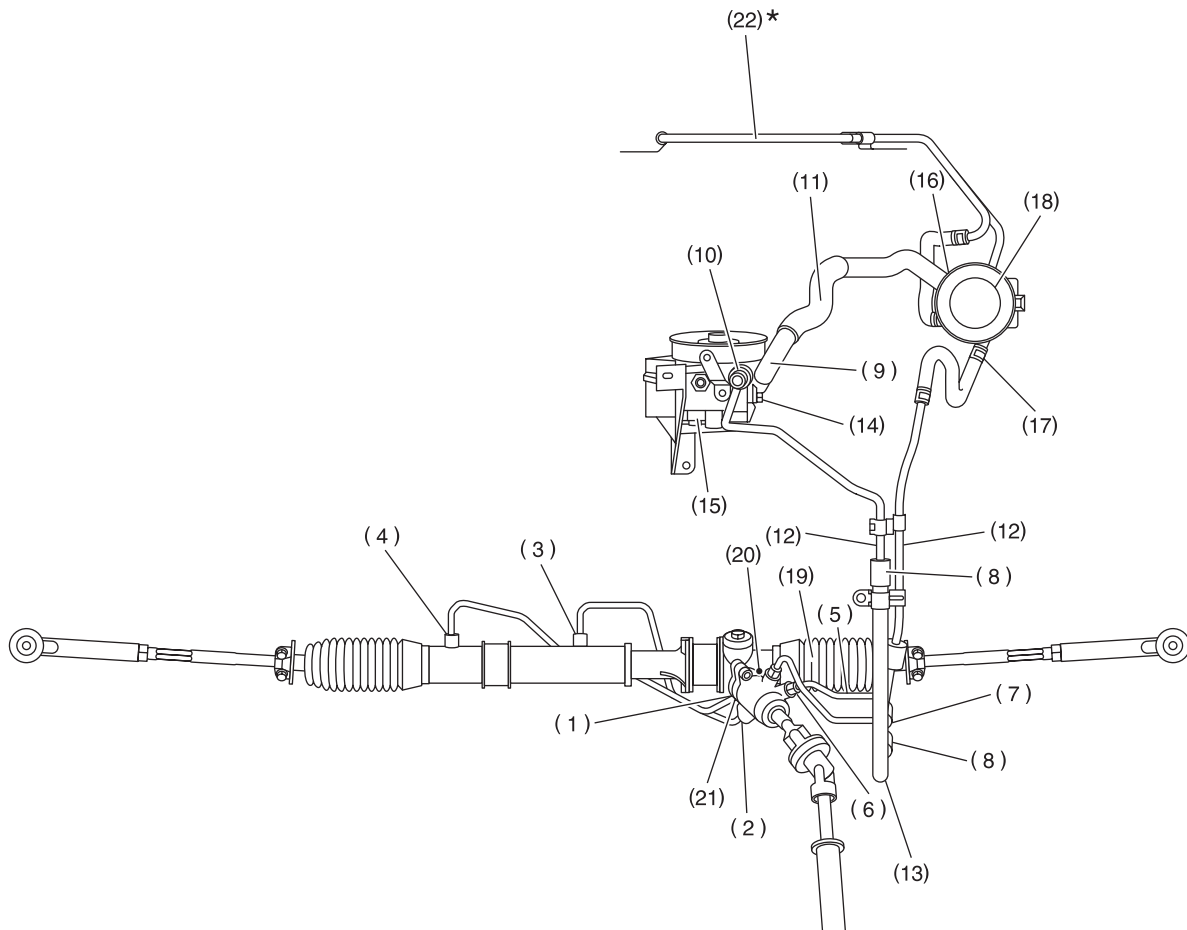
Trouble	Possible cause	Corrective action
Pressure hose burst	Excessive holding time of relief status	Instruct the customers.
	Malfunction of relief valve	Replace the oil pump.
	Poor cold characteristic of fluid	Replace the fluid.
Forced out return hose	Poor connection	Correct.
	Poor holding of clip	Retighten.
	Poor cold characteristic of fluid	Replace the fluid.
Fluid bleeding out of hose slightly	Wrong layout, tensioned	Replace the hose.
	Excessive play of engine due to deterioration of engine mounting rubber	Replace the defective parts.
	Improper stop position of pitching stopper	Replace the 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 the 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 the clamp.
	Damaged O-ring or gasket	Replace the O-ring or gasket pipe or hose with new one, if ineffective, replace gearbox 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 the oil pump.
	Damaged gasket	Replace the oil pump.
Leakage from oil tank (16) and (17) in figure	Crack in oil tank	Replace the oil tank.
Leakage from filler neck (18)	Damaged cap packing	Replace the cap.
	Crack in root of filler neck	Replace the oil tank.
	High fluid level	Adjust the fluid level.
Leakage from surrounding of power cylinder of gearbox (19) in figure	Damaged oil seal	Replace the oil seal.
Leakage from control valve of gearbox (20) and (21) in figure	Damaged packing or oil seal	Replace the problem parts.
	Damage in control valve	Replace the 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

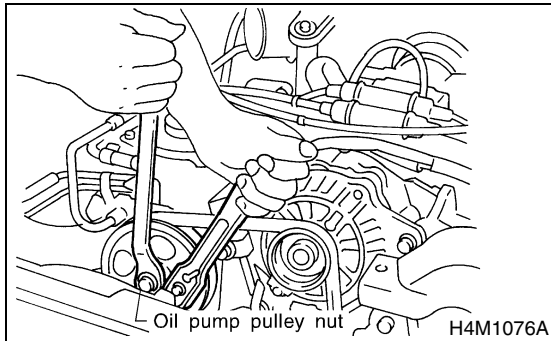
POWER ASSISTED SYSTEM (POWER STEERING)

9. Oil Pump

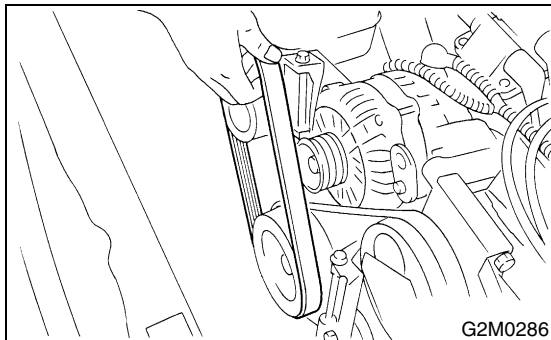
A: REMOVAL

1. NON-TURBO MODEL

- 1) Disconnect the ground cable from battery.
- 2) Remove the pulley belt cover.
- 3) Loosen oil pump pulley nut, then remove the bolts which secure alternator.



- 4) Loosen the lock bolt and slider bolt, and then remove the power steering pump drive V-belt.

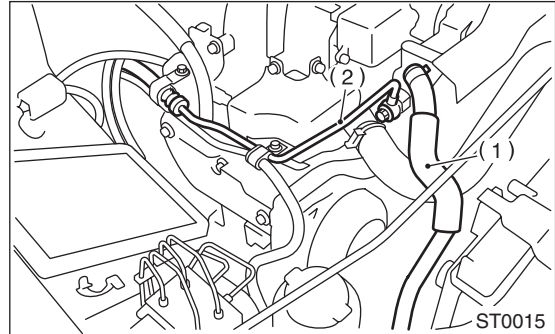


- 5) Disconnect the connector from power steering pump switch.

- 6) Disconnect the pipe C and suction hose from oil pump.

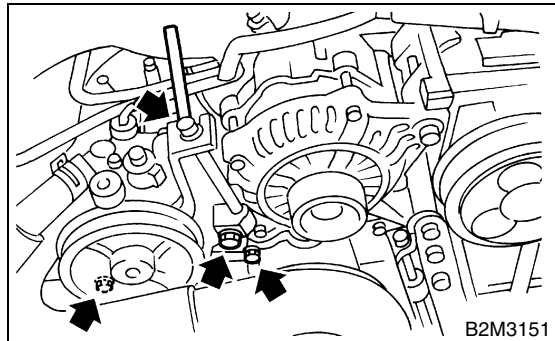
CAUTION:

- 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

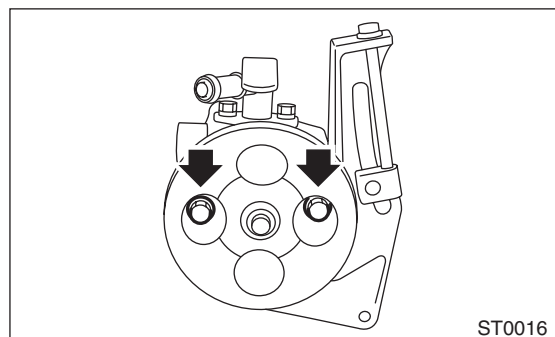
- 7) Remove the bolts which install power steering pump bracket.



- 8) Place the oil pump bracket in a vise, remove the two bolts from front side of oil pump.

CAUTION:

- Do not place the oil pump bracket directly in the vise; use soft pads and hold oil pump lightly to protect the pump.

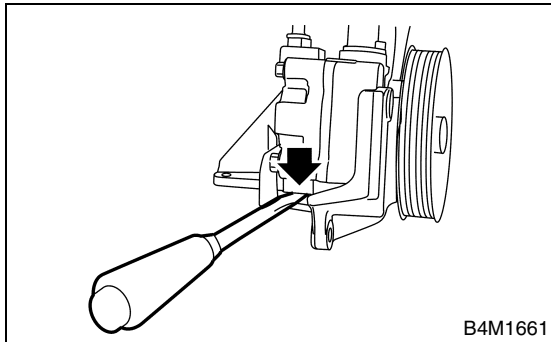


- 9) Remove the bolt from the rear side of oil pump.

OIL PUMP

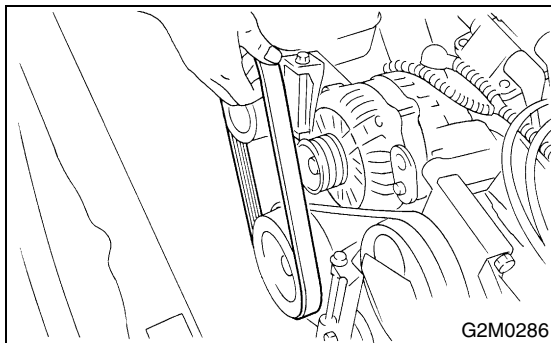
POWER ASSISTED SYSTEM (POWER STEERING)

10) Disassemble the oil pump and bracket by inserting a screwdriver as shown in the figure.



2. TURBO MODEL

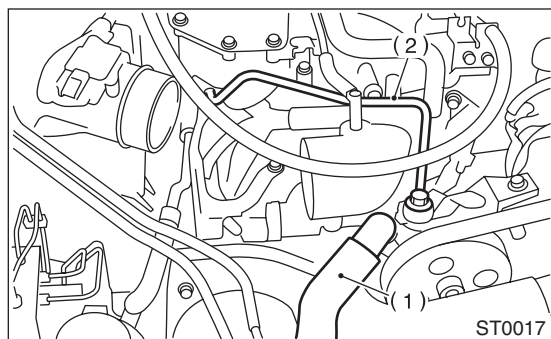
- 1) Disconnect the ground cable from battery.
- 2) Remove the pulley belt cover.
- 3) Loosen the lock bolt and slider bolt, and then remove the power steering pump drive V-belt.



- 4) Disconnect the connector from power steering pressure switch.
- 5) Disconnect the pipe C and suction hose from oil pump.

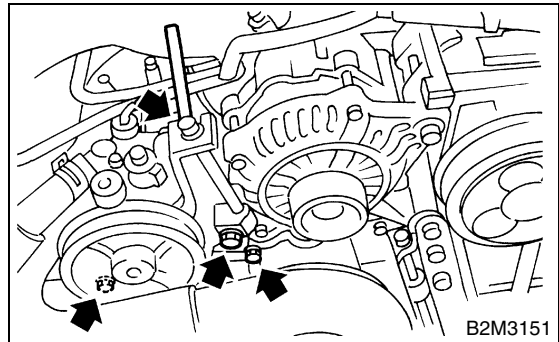
CAUTION:

- 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

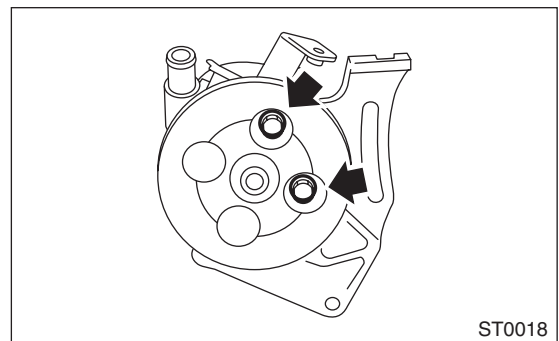
6) Remove the bolts which install power steering pump bracket.



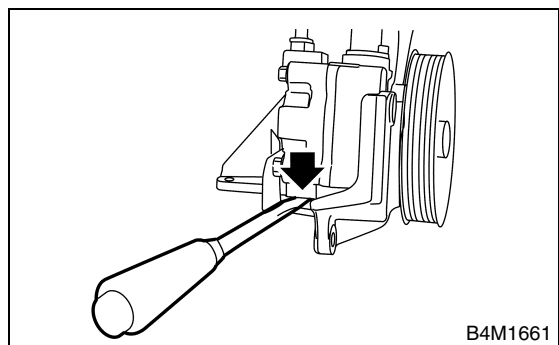
7) Place the oil pump bracket in a vise, remove the two bolts from front side of oil pump.

CAUTION:

Do not place the oil pump bracket directly in the vise; use soft pads and hold oil pump lightly to protect the pump.



- 8) Remove the bolt from the rear side of oil pump.
- 9) Disassemble the oil pump and bracket by inserting a screwdriver as shown in the figure.



OIL PUMP

POWER ASSISTED SYSTEM (POWER STEERING)

B: INSTALLATION

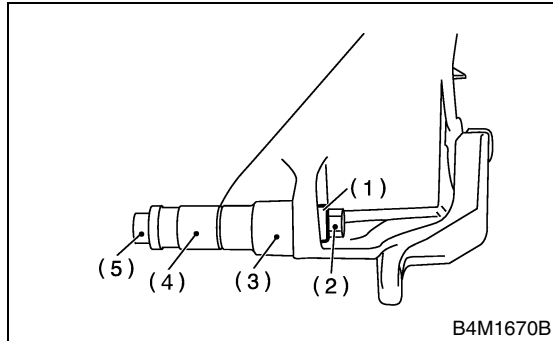
1. NON-TURBO MODEL

1) Install the oil pump to bracket.

(1) Place the oil pump bracket in a vise. Tighten the bushing using a 12.7 mm (1/2") type 14 and 21-mm box wrench until it is in contact with the oil pump mounting surface.

CAUTION:

Do not place the oil pump bracket directly in the vise; use soft pads and hold oil pump lightly to protect the pump.

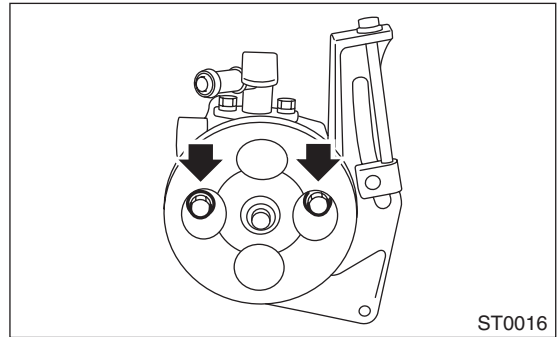


- (1) Bush
- (2) Nut
- (3) 21 mm
- (4) 14 mm
- (5) Bolt

(2) Tighten the bolt which installs oil pump to bracket.

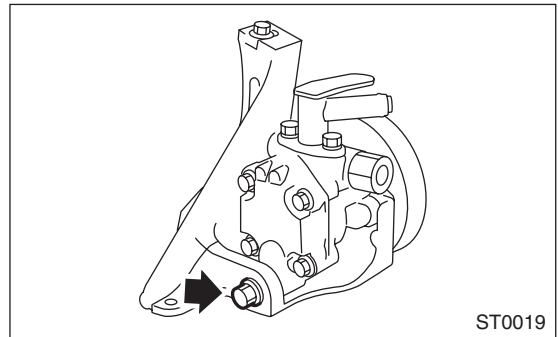
Tightening torque:

15.7 (1.6 kgf-m, 11.6 ft-lb)

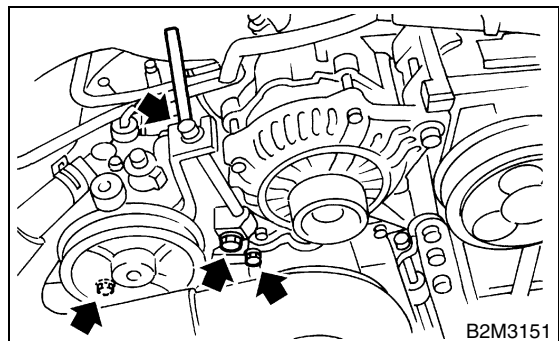


Tightening torque:

37.3 (3.8 kgf-m, 27.5 ft-lb)



2) Tighten the bolt which installs power steering pump bracket.



OIL PUMP

POWER ASSISTED SYSTEM (POWER STEERING)

3) Interconnect the pipe C and suction hose.

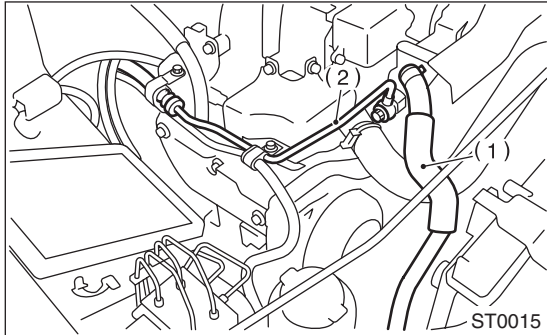
Tightening torque:

Joint nut

39 N·m (4.0 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 the connector to power steering pump switch.

5) Install the pulley belt to oil pump.

6) Tighten the oil pump pulley nut to the specified torque.

Tightening torque:

52 N·m (5.3 kgf·m, 38 ft-lb)

7) Check the pulley belt tension.

<Ref. to ME-45, INSPECTION, V-belt.>

8) Tighten the bolt belt tension.

Tightening torque:

8 (0.8 kgf·m, 5.8 ft-lb)

9) Install the pulley belt cover.

10) Connect the battery ground cable to battery.

11) Feed the specified power steering fluid. <Ref. to PS-107, Power Steering Fluid.>

CAUTION:

Never start the engine before feeding the fluid; otherwise vane pump might be seized up.

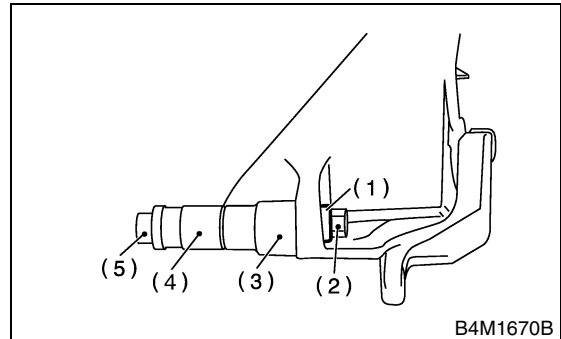
2. TURBO MODEL

1) Install the oil pump to bracket.

(1) Place the oil pump bracket in a vise. Tighten the bushing using a 12.7 mm (1/2") type 14- and 21-mm box wrench until it is in contact with the oil pump mounting surface.

CAUTION:

Do not place the 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

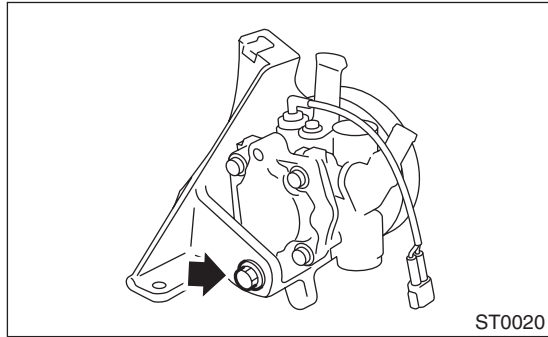
OIL PUMP

POWER ASSISTED SYSTEM (POWER STEERING)

(2) Tighten the bolts which install oil pump to bracket.

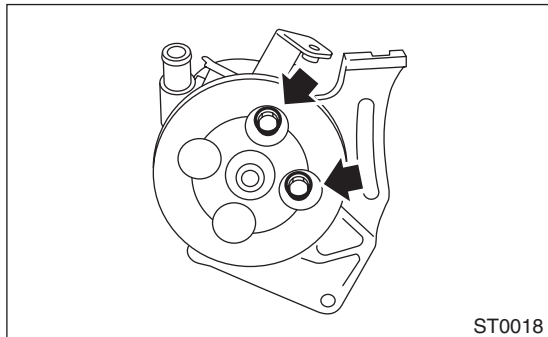
Tightening torque:

37.3 N·m (3.8 kgf-m, 27.5 ft-lb)



Tightening torque:

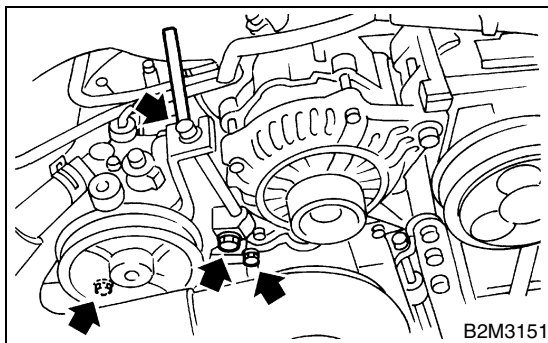
15.7 N·m (1.6 kgf-m, 11.6 ft-lb)



2) Tighten the bolts which install power steering pump bracket.

Tightening torque:

22 N·m (2.2 kgf-m, 15.9 ft-lb)



3) Interconnect the pipes C and suction hose.

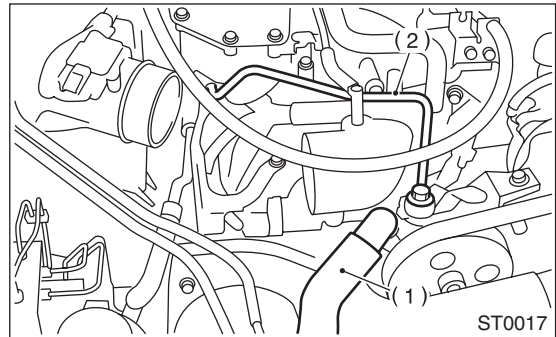
Tightening torque:

Joint nut

39 N·m (4.0 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 the connector to power steering oil pressure switch.

5) Install the pulley belt to oil pump.

6) Check the pulley belt tension. <Ref. to ME(TURBO)-45, INSPECTION, V-belt.>

7) Tighten bolt belt tension.

Tightening torque:

8 N·m (0.8 kgf-m, 5.8 ft-lb)

8) Install the pulley belt cover.

9) Connect the battery ground cable to battery.

10) Feed the specified power steering fluid <Ref. to PS-107, Power Steering Fluid.>

CAUTION:

Never start the engine before feeding the fluid; otherwise vane pump might be seized up.

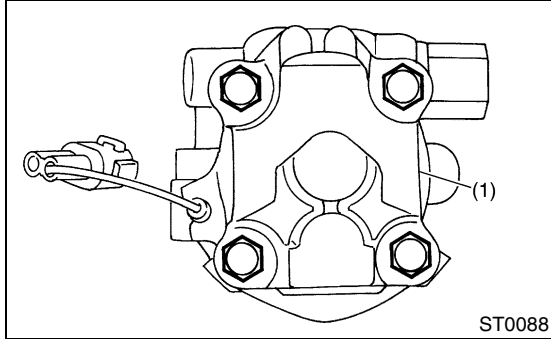
OIL PUMP

POWER ASSISTED SYSTEM (POWER STEERING)

C: DISASSEMBLY

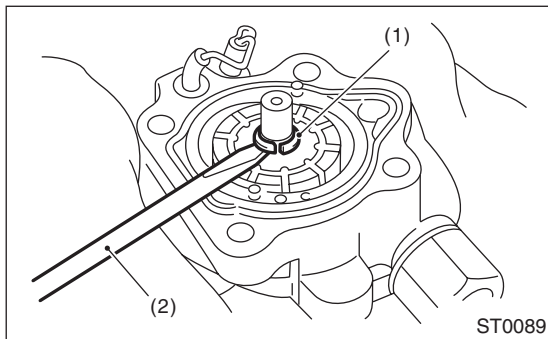
1. NON-TURBO MODEL

- 1) Remove the nut and detach oil pump pulley.
- 2) Remove the stay from oil pump.
- 3) Remove the four bolts which secure rear cover.



(1) Rear cover

- 4) Using a screwdriver, pry the retaining ring off.



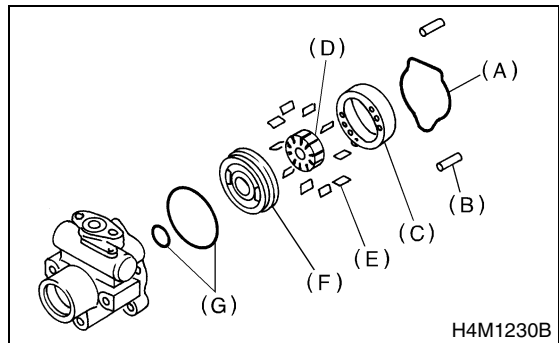
(1) Retaining ring
(2) Screwdriver

- 5) Extract the shaft from front casing.

- 6) Remove the following parts from front casing.

CAUTION:

Discard old seal washer; replace with a new one.

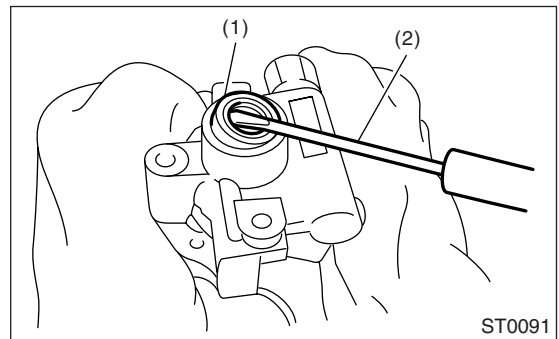


(A) O-ring
(B) Straight pin (2 ea.)
(C) Cam ring
(D) Rotor
(E) Vane (10 ea.)
(F) Pressure plate
(G) O-ring (2 ea.)

- 7) Pry off the oil seal using a screwdriver.

CAUTION:

Be careful not to scratch the inner surface of casing.



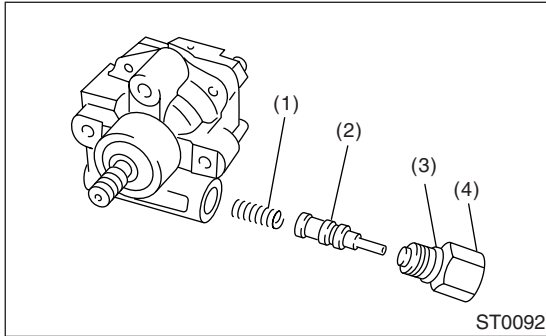
(1) Oil seal
(2) Screwdriver

- 8) Remove the pressure switch.

OIL PUMP

POWER ASSISTED SYSTEM (POWER STEERING)

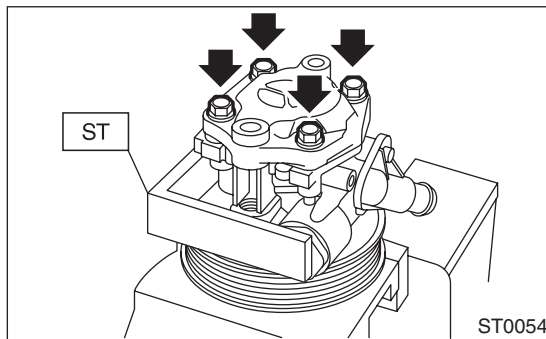
9) Slightly loosen the outlet connector, and the remove connector.



- (1) Flow control spring
- (2) Spool valve assembly
- (3) O-ring
- (4) Connector

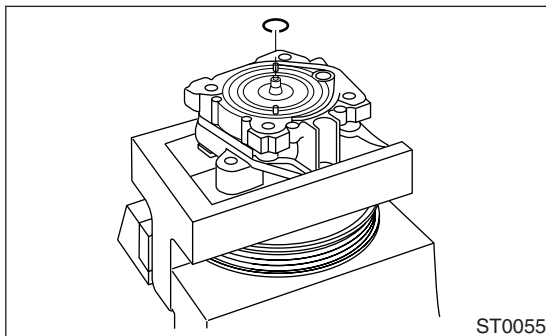
2. TURBO MODEL

1) Using the ST, place the oil pump in a vise and remove four bolts which secure rear cover.
ST 34199AE020 MOUNT



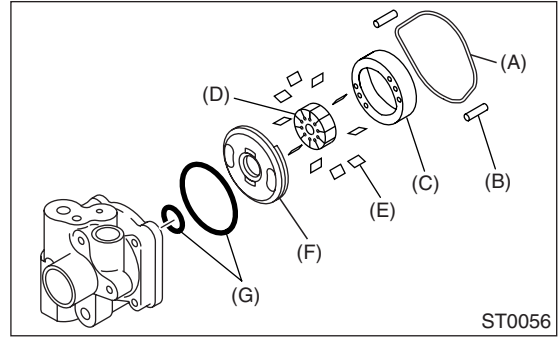
2) Using a screwdriver, pry the retaining ring off.

CAUTION:
Do not remove the cam ring, rotor, etc.



3) Extract the oil pump pulley from front casing.

4) Remove the following parts from front casing.



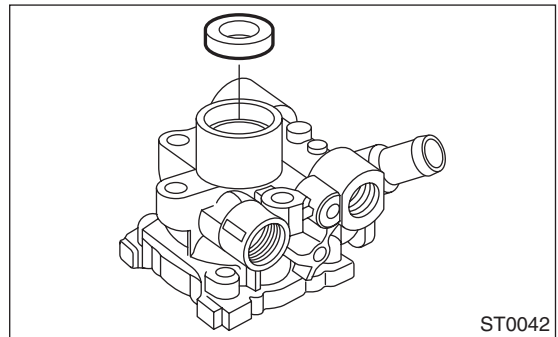
- (A) O-ring
- (B) Straight pin (2 ea.)
- (C) Cam ring
- (D) Rotor
- (E) Vane (10 ea.)
- (F) Pressure plate
- (G) O-ring (2 ea.)

5) Place the oil pump in a vise.

CAUTION:
Do not place the oil pump directly in the vise, use soft pads and hold oil pump lightly to protect the pump.

6) Pry off the oil seal using a screwdriver.

CAUTION:
Be careful not to scratch the inner surface of casing.



OIL PUMP

POWER ASSISTED SYSTEM (POWER STEERING)

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 the 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 the parts are free from rust. (Use specified hydraulic oil for rust prevention after cleaning and drying.)

(6) Reverse the sequence of disassembly procedures.

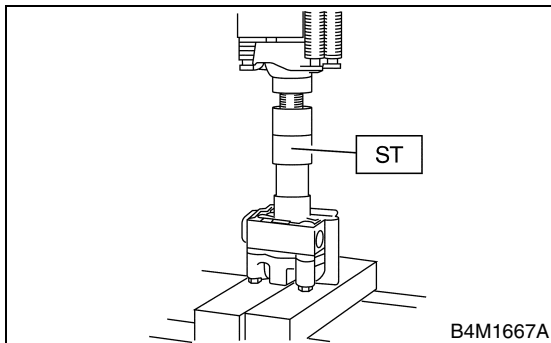
2) Apply grease to the oil seal and inner surface of front casing (at bearing location).

CAUTION:

Make sure that the front body internal surfaces are free from damage.

3) Attach the ST to front body. Using a press, install the oil seal.

ST 34199AE030 INSTALLER



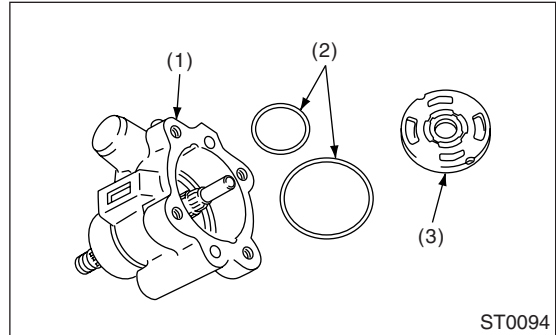
4) Press-fit the shaft assembly into front body.

5) Apply the specified hydraulic oil to O-rings and fit them into front casing.

6) Install the side plate to front casing.

CAUTION:

Use care not to let side plate gall.

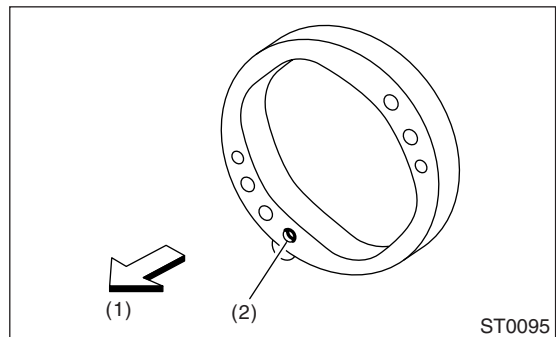


(1) Front casing

(2) O-ring

(3) Side plate

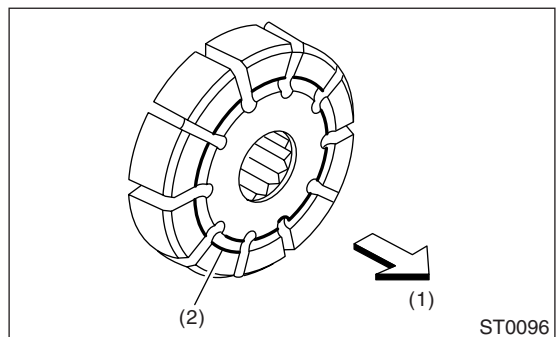
7) Install the cam ring to front casing with alignment mark facing forward.



(1) Front

(2) Alignment mark

8) Install the rotor to front casing with groove facing rearward.



(1) Rear

(2) Groove

9) Install the ten vanes into rotor with their nose radius facing toward cam ring.

OIL PUMP

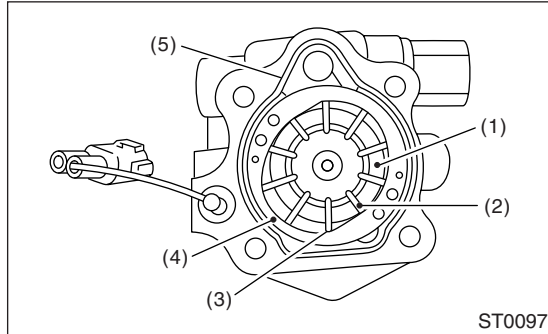
POWER ASSISTED SYSTEM (POWER STEERING)

10) Install the cam ring to front casing, securing with knock pins.

CAUTION:

Do not use a hammer to fit knock pins in position.

11) Mount the O-ring on front casing.



- (1) Rotor
- (2) Vane
- (3) Radius facing
- (4) Cam ring
- (5) O-ring

12) Using the ST, press the retaining ring into shaft groove.

CAUTION:

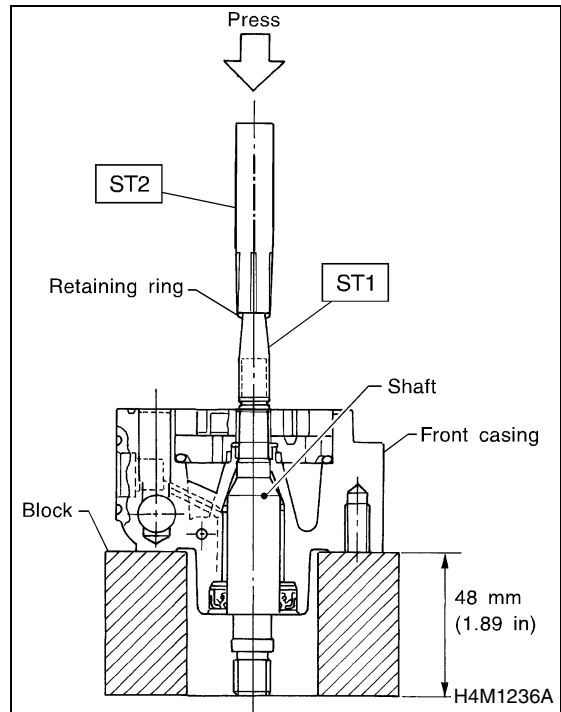
Discard the retaining ring and replace with a new one.

NOTE:

Use the ST2, bending its top edge slightly toward the inside.

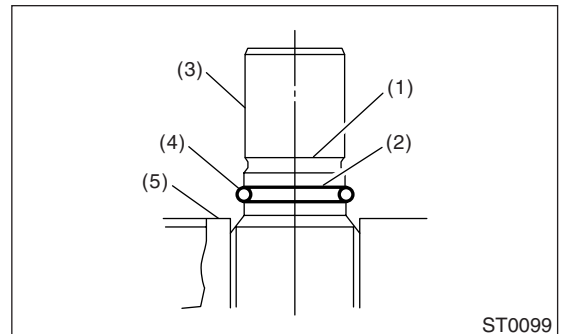
ST1 34099AC030 INSTALLER RETAINING RING CAP

ST2 34099AC040 INSTALLER RETAINING RING PIPE



CAUTION:

Make sure the retaining ring is fit in the second groove of the shaft.



- (1) First groove
- (2) Second groove
- (3) Shaft
- (4) Retaining ring
- (5) Rotor

OIL PUMP

POWER ASSISTED SYSTEM (POWER STEERING)

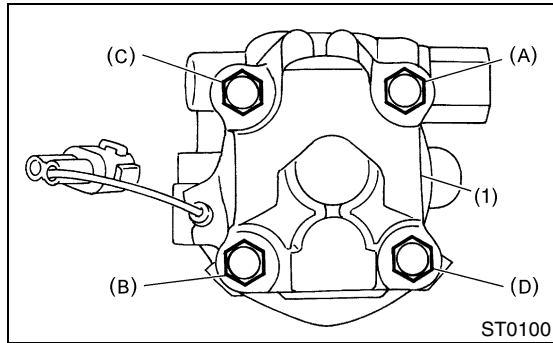
- 13) Mount on the pressure switch on front casing.
14) With the knock pin positions aligned, install the rear cover.

CAUTION:

Loosely tighten the bolts in the sequence (A), (B), (C), and (D) shown in figure. Then, tighten in the same sequence.

Tightening torque:

21 N-m (2.1 kgf-m, 15.2 ft-lb)



(1) Rear cover

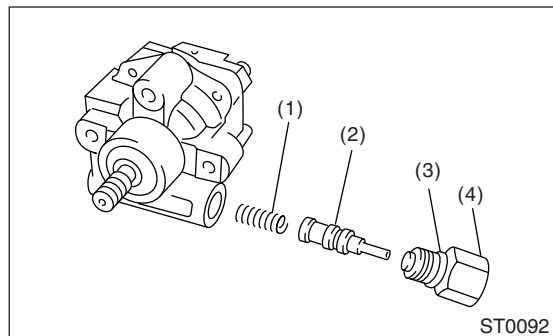
- 15) Install the spring into front casing. Then, with the spool valve dipped in specified hydraulic oil, install it into the front casing.
16) Using a 5-mm dia. round bar, ensure the valve moves smoothly.
17) Set the O-ring, with grease applied to it, onto connector and secure connector to front casing.

CAUTION:

- Use care to prevent damage to O-ring at installation.
- When tightening the connector, ensure the O-ring does not protrude or get caught.

Tightening torque:

49 N-m (5.0 kgf-m, 36.2 ft-lb)



- (1) Flow control spring
(2) Spool valve assembly
(3) O-ring
(4) Connector

- 18) Fix the oil pump pulley temporarily.

- 19) When reassembly procedures have been completed, turn the 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 the 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 the 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 the parts are free from rust. (Use specified hydraulic oil for rust prevention after cleaning and drying.)
- (6) Reverse the sequence of disassembly procedures.

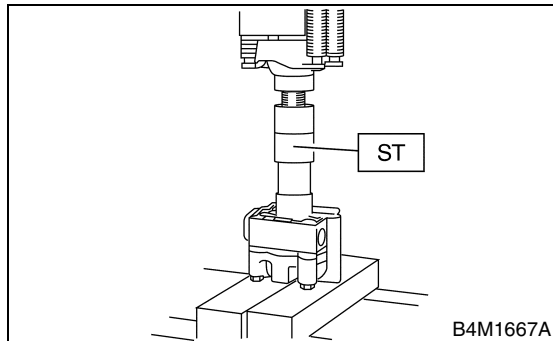
2) Apply grease to the oil seal and inner surface of front casing (at bearing location).

CAUTION:

Make sure that the front body internal surfaces are free from damage.

3) Attach the ST to front body. Using a press, install oil seal.

ST 34199AE030 INSTALLER



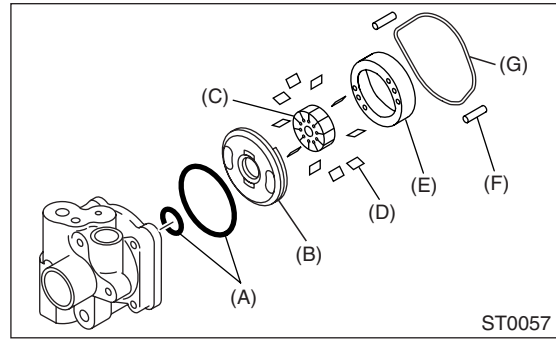
4) Install the pump pulley to front body.

5) Using the ST, place oil pump in a vise.

ST 34199AE020 MOUNT

6) Remove the rear cover.

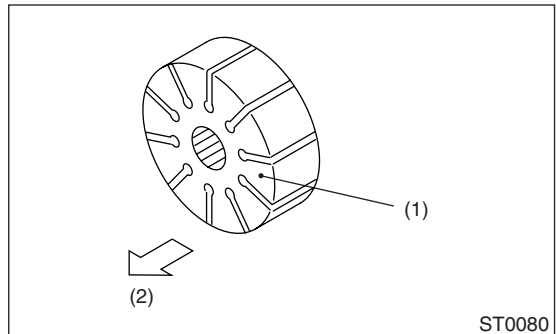
7) Install following parts to casing.



- (A) O-ring
- (B) Pressure plate
- (C) Rotor
- (D) Vane
- (E) Cam ring
- (F) Straight pin
- (G) O-ring

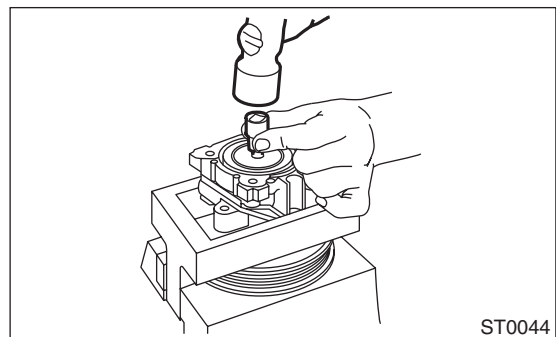
NOTE:

Install the rotor with the mark facing the rear case side.



- (1) Mark
- (2) Rear

8) Using the 8-mm box wrench, tap retaining ring into shaft groove.



9) Install the O-ring to rear cover.

OIL PUMP

POWER ASSISTED SYSTEM (POWER STEERING)

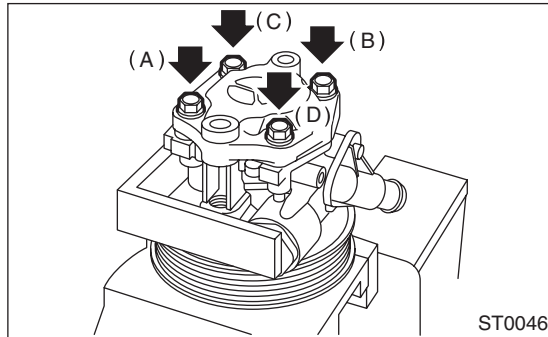
10) Install the rear cover.

Tightening torque:

27.4 N·m (2.8 kgf-m, 20.3 ft-lb)

CAUTION:

Loosely tighten the 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 the 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 the sliding surfaces and improper installation. Eliminate the cause of trouble.

12) Check the followings by referring to “CHECK” article.

- Excessive play in pulley shaft
- Ditch deflection of pulley
- Resistance to rotation of pulley
- Measurement of generated oil pressure

OIL PUMP

POWER ASSISTED SYSTEM (POWER STEERING)

E: INSPECTION

1. BASIC INSPECTION

Perform the following inspection procedures and repair or replace defective parts.

Part name	Description	Remedy
1. Front casing	1) Damage on body surfaces 2) Excessive wear on hole, into which spool valve is inserted. 3) Wear and damage on cartridge assembly mounting surface 4) Wear and damage on surfaces in contact with shaft and oil seal	Replace with a new one together with spool valve as selective fit is made.
2. Rear cover	1) Damage on body surfaces 2) Wear and damage on sliding surfaces	Replace with a new one.
3. Shaft	1) Shaft bend 2) Wear and damage on surfaces in contact with bushing and oil seal 3) Wear and damage on rotor mounting surfaces 4) Bearing damage	Replace with a new one.
4. Pressure plate	Wear and damage on sliding surfaces	Replace with a new one.
5. Cam ring	Ridge wear on sliding surfaces	If damage is serious, replace with a new cartridge assembly.
6. Vane	Excessive wear on nose radius and side surfaces	
7. Rotor	1) Wear and damage on sliding surfaces 2) Ridge wear on vane sliding grooves (If light leaks with vane in slit against light source) 3) Damage resulting from snap ring removal	
8. Connector	Damage on threads	Correct with oil stone. If damage is serious, replace with a new cartridge assembly.
9. Spring	Damage	Replace with a new one.
10. Bolts and nuts	Damage on threads	Replace with a new one.

• In accordance with the following table, check all removed parts for wear and damage, and make repair or replacement if necessary.

No.	Parts	Inspection	Corrective action
1	Oil pump (Exterior)	(1) Crack, damage or oil leakage	Replace the oil pump with a new one.
		(2) Play of pulley shaft	Measure the radial play and axial play. If any of these exceeds the service limit, replace the oil pump with a new one.
2	Pulley	(1) Damage	Replace it with a new one.
		(2) Bend	Measure the V ditch deflection. If it exceeds the service limit, replace the pulley with a new one.
3	Oil pump (Interior)	(1) Defect or burning of vane pump	Check the resistance to rotation of pulley. If it is past the service limit, replace the 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 the 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 the oil pump on a vise to make a measurement. At this time, hold the oil pump with 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.

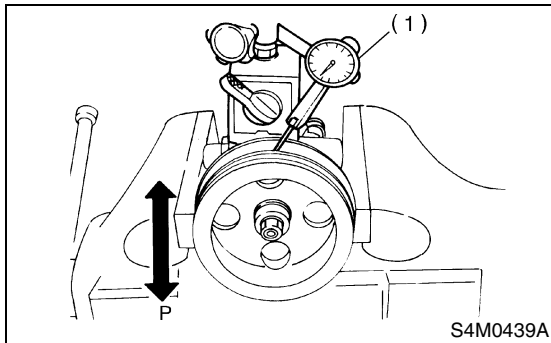
1) Play of the pulley shaft

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

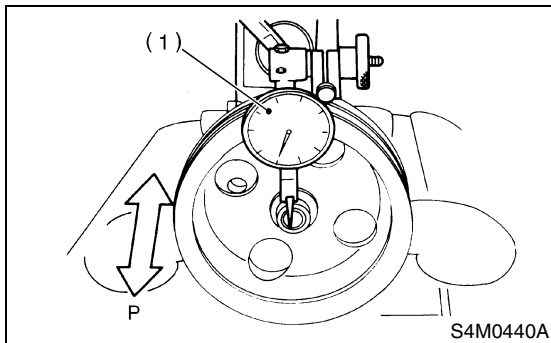
Axial play (Direction \longleftrightarrow)

Non-turbo model

0.4 mm (0.016 in) or less

Turbo model

0.8 mm (0.031 in) or less



(1) Dial indicator

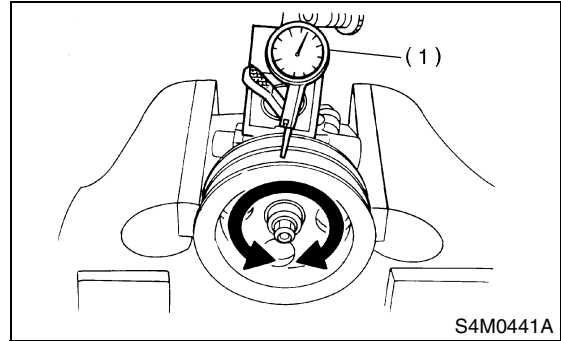
2) Ditch deflection of pulley

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

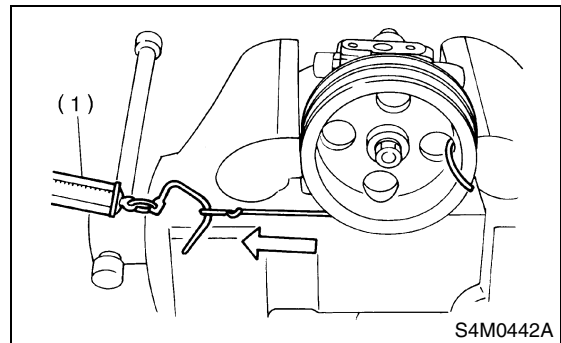
3) Resistance to rotation of pulley

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

OIL PUMP

POWER ASSISTED SYSTEM (POWER STEERING)

3. HYDRAULIC PRESSURE

CAUTION:

- Be sure to complete all items aforementioned in "INSPECTION", prior to measuring hydraulic pressure. Otherwise, pressure can not be measured correctly. <Ref. to PS-109, Inspection.>
- 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 a cotton cloth waste at a place where fluid drops before the pressure gauge is installed. Wipe off split fluid thoroughly after the measurement.

NOTE:

Keep the engine idling during measurement.

1) REGULAR PRESSURE MEASUREMENT

- (1) Connect the ST1, ST2 and ST3.

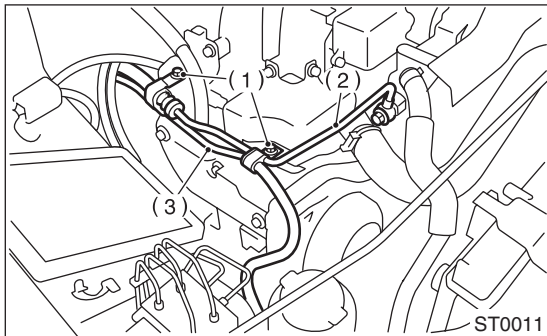
ST1 92511000 PRESSURE GAUGE

ST2 34099AC020 ADAPTER HOSE B

ST3 34099AC010 ADAPTER HOSE A

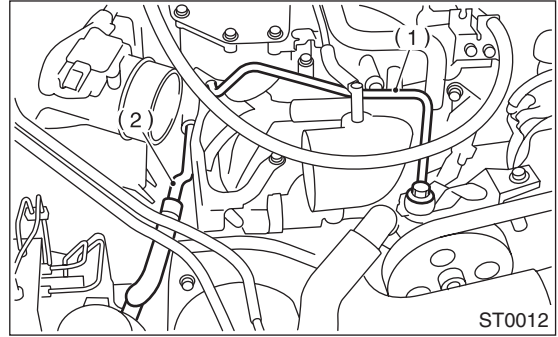
- (2) Remove the air intake duct.
- (3) Disconnect the pipe C from the pump.
- (4) Using the gasket (Part No. 34621AC021) and bolt (Part No. 34620AC010), install the ST2 to the pump instead of pipe C.

- Non-turbo MODEL



- (1) Bolt A
- (2) Pipe C
- (3) Pipe D

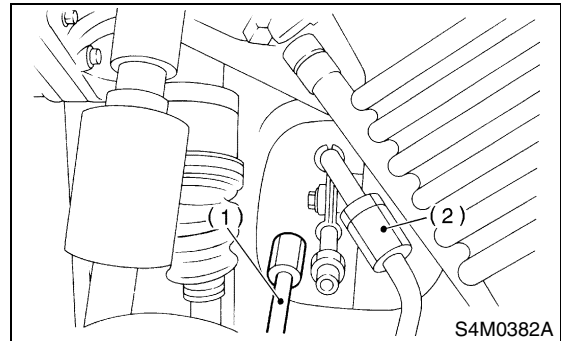
- Turbo MODEL



- (1) Pipe C
- (2) Pipe D

- (5) Disconnect the pipe C from pipe (on gear-box side).

- (6) Install the ST3 to pipe C.



- (1) Pipe C
- (2) Pipe D

- (7) Replenish power steering fluid up to the specified level.

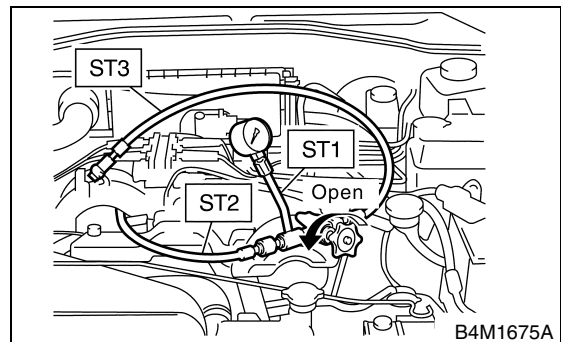
- (8) Open the valve, and start the engine.

- (9) Measure the regular pressure.

ST1 925711000 PRESSURE GAUGE

ST2 34099AC020 ADAPTER HOSE B

ST3 34099AC010 ADAPTER HOSE A



Service limit:

981 kPa (10 kg/cm², 142 psi) or less

OIL PUMP

POWER ASSISTED SYSTEM (POWER STEERING)

(10) 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 the relief pressure.

(1) Using the STs, measure the relief pressure.

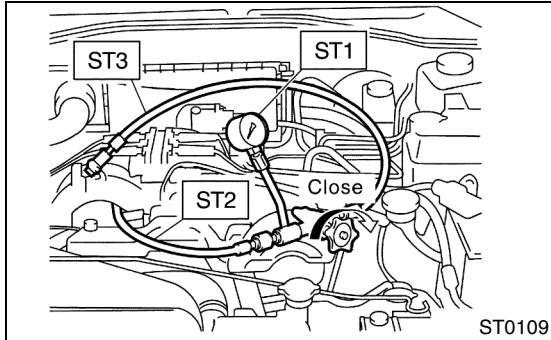
(2) Close the valve.

(3) Measure the 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)

2.5 L, 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 the working pressure.

(1) Using the STs, measure the working pressure.

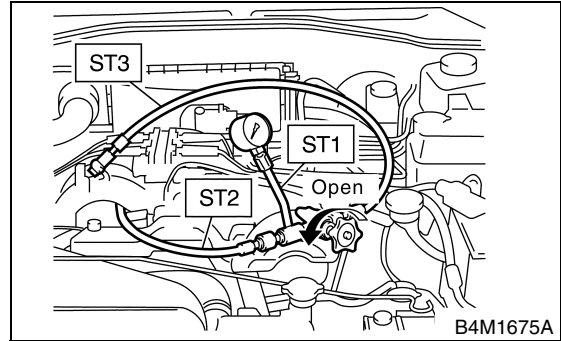
(2) Open the valve.

(3) Measure the 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)

2.5 L, 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 the steering effort. <Ref. to PS-113, Measurement of Steering Effort.> If it is not within specified value, replace the control valve itself or control valve and pinion as a single unit with new ones.

RESERVOIR TANK

POWER ASSISTED SYSTEM (POWER STEERING)

10. Reservoir Tank

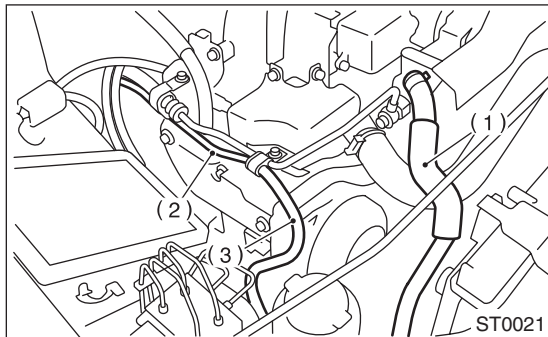
A: REMOVAL

1. NON-TURBO MODEL

- 1) Remove the air intake duct. <Ref. to IN-7, REMOVAL, Air Intake Duct.>
- 2) Drain fluid from the reservoir tank.
- 3) Disconnect the 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 the reservoir tank from bracket by pulling it upwards.

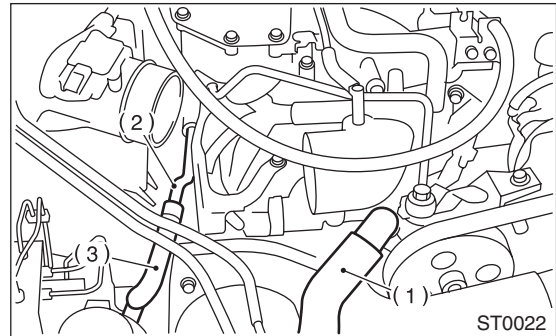
2. TURBO MODEL

- 1) Remove the air intake duct. <Ref. to IN(TURBO)-9, REMOVAL, Intake Duct.>
- 2) Drain fluid from the reservoir tank.

- 3) Disconnect the 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.



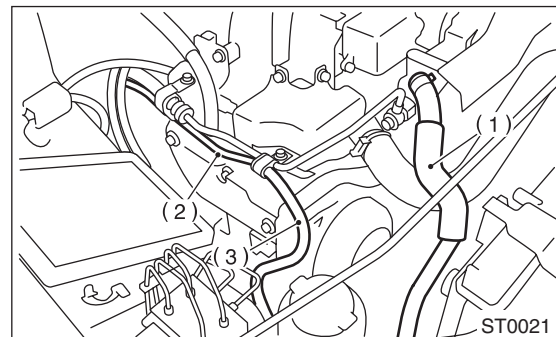
- (1) Suction hose
- (2) Pipe D
- (3) Return hose

- 4) Remove the reservoir tank from bracket by pulling it upwards.

B: INSTALLATION

1. NON-TURBO MODEL

- 1) Install the reservoir tank to bracket.
- 2) Connect the pipes D to return hose and suction hose to oil pump.



- (1) Suction hose
- (2) Pipe D
- (3) Return hose

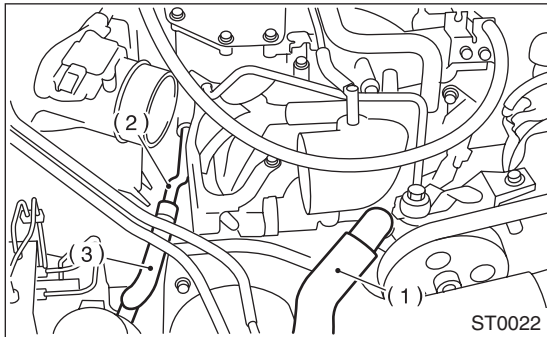
- 3) Feed the specified power steering fluid. <Ref. to PS-107, Power Steering Fluid.>

RESERVOIR TANK

POWER ASSISTED SYSTEM (POWER STEERING)

2. TURBO MODEL

- 1) Install the reservoir tank to bracket.
- 2) Connect the 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-107, Power Steering Fluid.>

C: INSPECTION

Check the reservoir tank for cracks, breakage, or damage. If any cracks, breakage, or damage is found, replace the reservoir tank.

POWER STEERING FLUID

POWER ASSISTED SYSTEM (POWER STEERING)

11. Power Steering Fluid

A: SPECIFICATION

Recommended power steering fluid	Manufacturer
DEXRON III or equivalent	B.P.
	CALTEX
	CASTROL
	MOBIL
	SHELL
	TEXACO

B: INSPECTION

1) Check the power steering fluid for deterioration or contamination. If the fluid is highly deteriorated or contaminated, drain it and refill with new fluid.

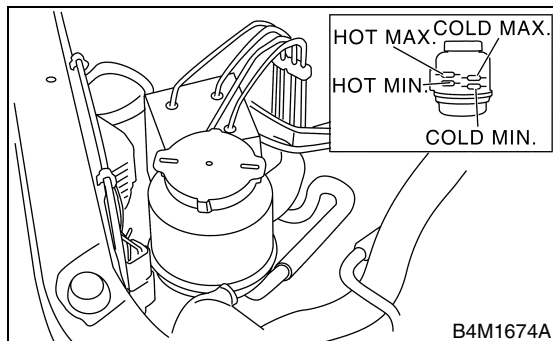
2) Check the joints and units for oil leakage. If any oil leaks are found, repair or replace the applicable part.

3) Inspect the 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 the reservoir surface of oil pump; read the fluid level on the "COLD" side.

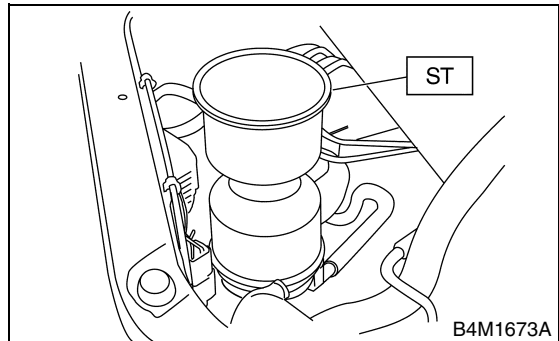
(2) Check at temperature 80°C (176°F) on the reservoir surface of oil pump; read the fluid level on the "HOT" side.



C: INSTALLATION

1) Set the ST on top of reservoir tank and fill it about half way with the specified fluid.

ST 34199AE040 OIL CHARGE



2) Continue to turn the steering wheel slowly from lock to lock until bubbles stop appearing in the tank while keeping the fluid at that level.

3) In case the 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 the engine and let it idle.

5) Continue to turn the 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 the 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 then take out the safety stands after jacking up vehicle again.

Then lower the vehicle, and then idle the engine.

8) Continue to turn the 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.

POWER STEERING FLUID

POWER ASSISTED SYSTEM (POWER STEERING)

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)

12. General Diagnostic Table

A: INSPECTION

Trouble	Possible cause	Corrective action
<ul style="list-style-type: none"> • Heavy steering effort in all ranges • Heavy steering effort at stand still • Steering wheel surges when turning. 	1. Pulley belt <ul style="list-style-type: none"> • Unequal length of pulley belts • Adhesion of oil and grease • Loose or damage of pulley belt • Poor uniformity of pulley belt cross section • Pulley belt touches to pulley bottom • Poor revolution of pulleys except oil pump pulley • Poor revolution of oil pump pulley 	Adjust or replace.
	2. Tire and rim <ul style="list-style-type: none"> • Improper tires out of specification • Improper rims out of specification • Tires not properly inflated*1 	Replace or reinflate.
	3. Fluid <ul style="list-style-type: none"> • Low fluid level • Aeration • Dust mix • Deterioration of fluid • Poor warming-up of fluid *2 	Refill, bleed air, replace or instruct the customer.
	4. Idling speed <ul style="list-style-type: none"> • Lower idling speed • Excessive drop of idling speed at start or at turning steering wheel *3 	Adjust or instruct the customer.
	5. Measure hydraulic pressure.<Ref. to PS-101, INSPECTION, Oil Pump.>	Replace the problem parts.
	6. Measure steering effort.<Ref. to PS-109, INSPECTION, General Diagnostic Table.>	Adjust or replace.
<ul style="list-style-type: none"> • Vehicle leads to one side or the other. • Poor return of steering wheel to center • Steering wheel surges when turning. 	1. Fluid line <ul style="list-style-type: none"> • Folded hose • Flattened pipe 	Reform or replace.
	2. Tire and rim <ul style="list-style-type: none"> • Flat tire • Mix use of different tires • Mix use of different rims • Abnormal wear of tire • Unbalance of remained grooves • Unbalance of tire pressure 	Fix or replace.
	3. Front alignment <ul style="list-style-type: none"> • Improper or unbalance caster • Improper or unbalance toe-in • Loose connection of suspension 	Adjust or retighten.
	4. Others <ul style="list-style-type: none"> • Damaged joint assembly • Unbalanced height • One-sided weight 	Replace, adjust or instruct the customer.
	5. Measure steering effort.<Ref. to PS-109, INSPECTION, General Diagnostic Table.>	Adjust or replace.

*1 If tires and/or rims are wider, the load to power steering system is the more. Accordingly, in a condition, for example before fluid warms-up, relief valve may work before maximum turning angle. In this case, steering effort may be heavy. When measured hydraulic pressure is normal, there is no abnormal thing.

*2 In cold weather, steering effort may be heavy due to increased flow resistance of cold fluid. After warming-up engine, turn steering wheel from stop to stop several times to warm-up fluid. Then if steering effort reduces normally, there is no abnormal thing.

*3 In cold weather or with insufficient warm-up of engine, steering effort may be heavy due to excessive drop of idling when turning steering wheel. In this case, it is recommended to start the vehicle with increasing engine speed than usual. Then if steering effort reduces normally, there is no abnormal thing.

GENERAL DIAGNOSTIC TABLE

POWER ASSISTED SYSTEM (POWER STEERING)

1. NOISE AND VIBRATION

CAUTION:

Don't keep the relief valve operated over 5 seconds at any time or inner parts of the oil pump may be damaged due to rapid increase of fluid temperature.

NOTE:

- Grinding noise may be heard immediately after the engine start in extremely cold condition. In this case, if the noise goes off during warm-up there is no abnormal function in the system. This is due to the fluid characteristic in extremely cold condition.
- Oil pump makes whine or growl noise slightly due to its mechanism. Even if the noise can be heard when steering wheel is turned at stand still there is no abnormal function in the system provided that the noise eliminates when the vehicle is running.
- When stopping with service brake and/or parking brake applied, power steering can be operated easily due to its light steering effort. If doing so, the disk rotates slightly and makes creaking noise. The noise is generated by creaking between the disk and pads. If the noise goes off when the brake is released, there is no abnormal function in the system.
- There may be a little vibration around the steering devices when turning steering wheel at standstill, even though the component parts are properly adjusted and have no defects.

Hydraulic systems are likely to generate this kind of vibration as well as working noise and fluid noise because of combined conditions, i.e., road surface and tire surface, engine speed and turning speed of steering wheel, fluid temperature and braking condition.

This phenomena does not indicate there is some abnormal function in the system.

The vibration can be known when steering wheel is turned repeatedly at various speeds from slow to rapid step by step with parking brake applied on concrete road and in "D" range for automatic transmission vehicle.

GENERAL DIAGNOSTIC TABLE

POWER ASSISTED SYSTEM (POWER STEERING)

Trouble	Possible cause	Corrective action
Hiss noise (continuous) While engine is running.	Relief valve emits operating sound when steering wheel is completely turned in either direction. (Don't keep this condition over 5 seconds.)	Normal
	Relief valve emits operating sound when steering wheel is not turned. This means that the relief valve is faulty.	Defective Replace the oil pump.
Rattling noise (intermittent) While engine is running.	Interference with adjacent parts	Check the clearance. Correct if necessary. <Ref. to PS-78, INSPECTION, Pipe Assembly [LHD MODEL].><Ref. to PS-86, 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 the faulty parts of 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 the fluid line connection. Refill fluid and vent air.
	Vane pump seizing	Replace the oil pump.
	Pulley bearing seizing of oil pump	Replace the 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 the wrong part causing aeration. Replace the fluid and vent air.
	Damaged pipe of gearbox	Replace the 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 the cap.
Whistle (continuous) While engine is running.	Abnormal pipe of gearbox or abnormal inside of hose	Replace the faulty 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 the oil pump, hose, if the noise can be heard when running as well as stand still.
	Torque converter growl, air conditioner compression growl	Remove the power steering pulley belt and confirm.
Creaking noise (intermittent) While engine is running with steering turned.	Abnormal inside of gearbox	Replace the faulty 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 the wrong part. Vent air.
	Damaged valve in oil pump, gearbox	Replace the oil pump, faulty 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 the spring scale on the steering wheel. 5) Pull the spring scale at an right angle to steering wheel, and measure both right and left steering wheel effort. NOTE: When turning the 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.	Adjust the backlash.
2 CHECK STEERING EFFORT. 1) Stop the engine. 2) Pull the spring scale at an right angle to the steering wheel, and measure both right and left steering wheel effort.	Is the steering effort 314 N (35 kgf, 77 lb) or less?	Go to step 3.	Perform adjustment.
3 CHECK STEERING WHEEL EFFORT. 1) Remove the universal joint. 2) Measure the 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 the 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 the folding torque of the joint (yoke of steering column side). <Ref. to PS-28, 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 the folding torque of the joint (yoke of gearbox side). <Ref. to PS-28, 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 the 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 the tie-rod ends of suspension for unsteady revolution or rattling?	Inspect and replace if necessary.	Go to step 9.
9 CHECK BALL JOINT.	Are the ball joints of suspension for unsteady revolution or rattling?	Inspect and replace if necessary.	Go to step 10.
10 CHECK GEARBOX. Measure the rotating of gearbox. LHD: <Ref. to PS-50, TURNING RESISTANCE OF GEARBOX, INSPECTION, Steering Gearbox [LHD MODEL].> RHD: <Ref. to PS-70, TURNING RESISTANCE OF GEARBOX, INSPECTION, Steering Gearbox [RHD MODEL].>	Is the 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 the backlash, and if ineffective, replace the faulty parts.

GENERAL DIAGNOSTIC TABLE

POWER ASSISTED SYSTEM (POWER STEERING)

	Step	Check	Yes	No
11	CHECK GEARBOX. Measure the sliding of gearbox. LHD: <Ref. to PS-49, SERVICE LIMIT, INSPECTION, Steering Gearbox [LHD MODEL].> RHD: <Ref. to PS-69, 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 the backlash, and if ineffective, replace the faulty parts.

BODY SECTION

This service manual has been prepared to provide SUBARU service personnel with the necessary information and data for the correct maintenance and repair of SUBARU vehicles.

This manual includes the procedures for maintenance, disassembling, reassembling, inspection and adjustment of components and diagnostics for guidance of experienced mechanics.

Please peruse and utilize this manual fully to ensure complete repair work for satisfying our customers by keeping their vehicle in optimum condition. When replacement of parts during repair work is needed, be sure to use SUBARU genuine parts.

All information, illustration and specifications contained in this manual are based on the latest product information available at the time of publication approval.

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)	AC
HVAC SYSTEM (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	<ul style="list-style-type: none"> • Mode selector switch: HEAT • Temperature control switch: FULL HOT • Temperature difference between hot water and inlet air: 65°C (149°F) • Hot water flow rate: 360 ℓ (95.1 US gal, 79.2 Imp gal)/h
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	<ul style="list-style-type: none"> • Temperature control switch: FULL COLD • Blower fan speed: 4th position • Mode selector lever: RECIRC
Heater core size (height × length × width)		LHD model	—
		RHD model	
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

• AUTO A/C 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)		<p style="text-align: center;">Diff. 2.5 ± 0.5°C (36.5 ± 0.9°F) ON OFF 1.5 ± 0.5°C (35 ± 0.9°F)</p>	

HV0045

GENERAL DESCRIPTION

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

• MANUAL A/C 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)		<p style="text-align: center;"> OFF ————— ON 3.0 ± 0.5°C (37 ± 0.9°F) Diff. 1.5 ± 0.5°C (35 ± 0.9°F) </p>	

G4M0938

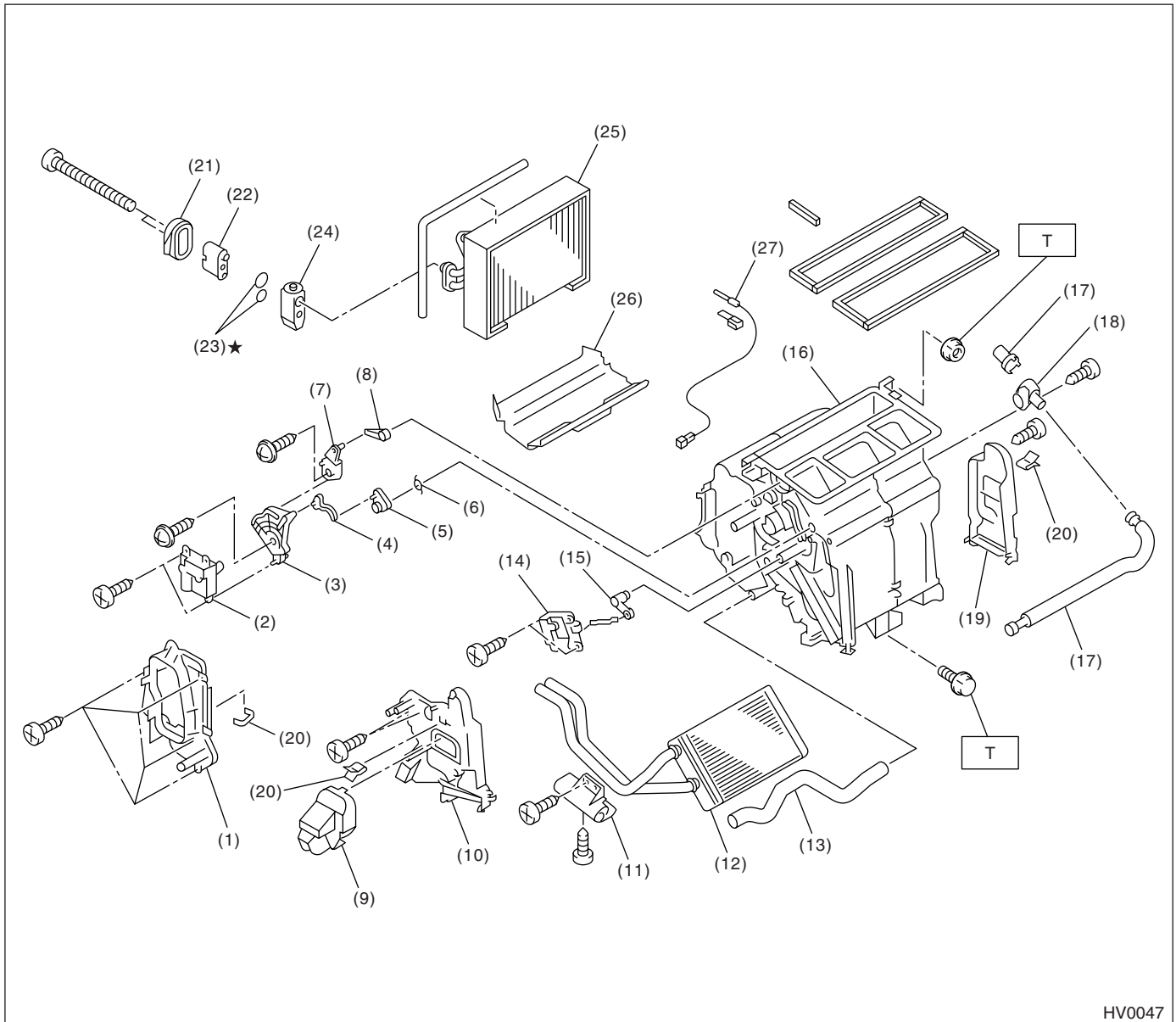
GENERAL DESCRIPTION

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

B: COMPONENT

1. HEATER COOLING UNIT

• AUTO A/C MODEL



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 | |

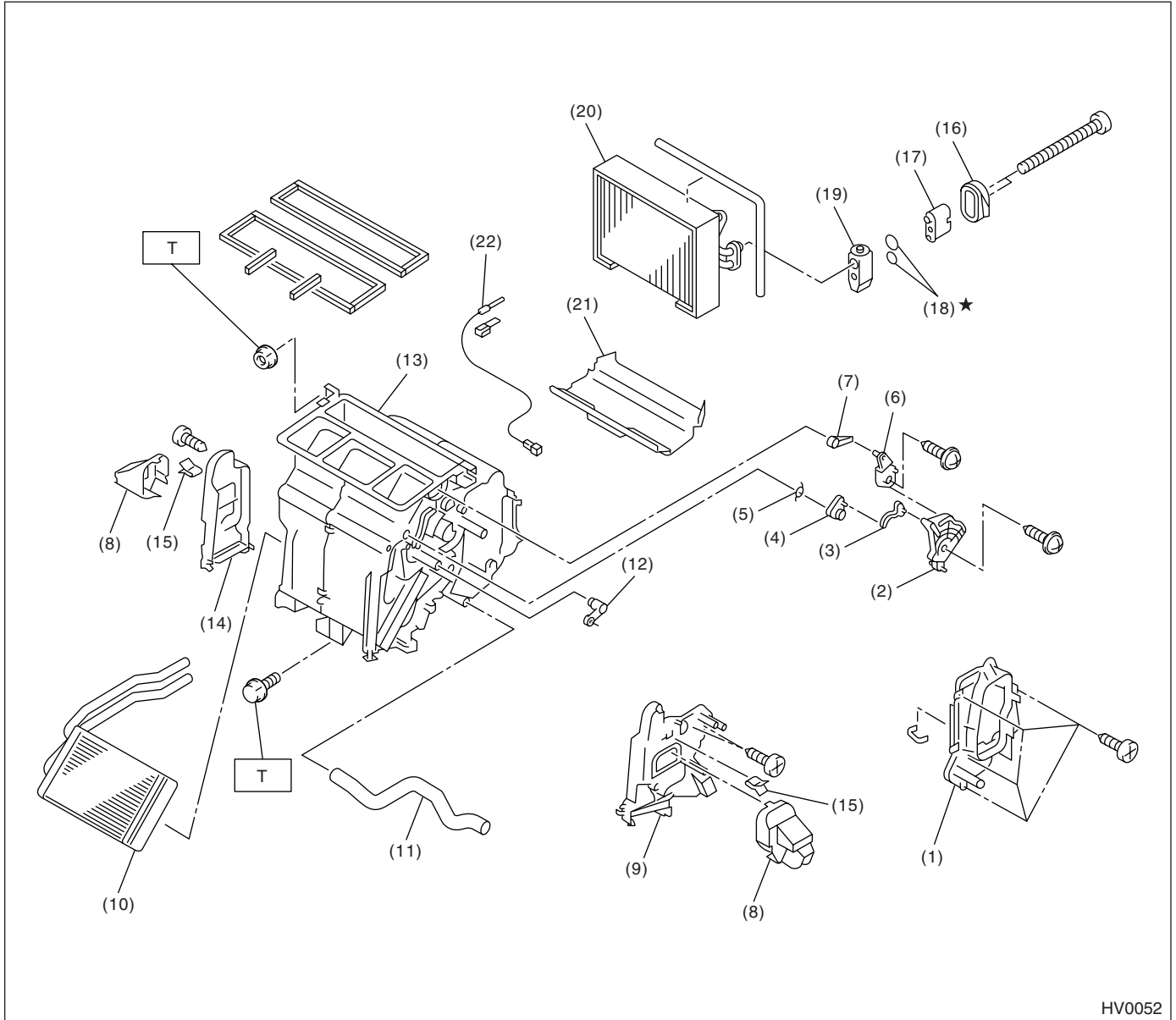
Tightening torque: N·m (kgf·m, ft·lb)

T: 7.35 (0.750, 5.421)

GENERAL DESCRIPTION

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

• MANUAL A/C MODEL



HV0052

- | | | |
|-------------------------|-------------------------|-----------------------|
| (1) Unit cover | (10) Heater core | (19) Expansion valve |
| (2) Side link | (11) Drain hose | (20) Evaporator |
| (3) Mode actuator lever | (12) Mix actuator lever | (21) Evaporator cover |
| (4) Foot lever | (13) Unit assembly | (22) Thermistor |
| (5) Spring | (14) Foot duct | |
| (6) Mode actuator link | (15) Clip | |
| (7) Defroster lever | (16) Packing | |
| (8) Foot nozzle | (17) Cooling unit block | |
| (9) Unit duct cover | (18) O-ring | |

Tightening torque: N·m (kgf·m, ft·lb)

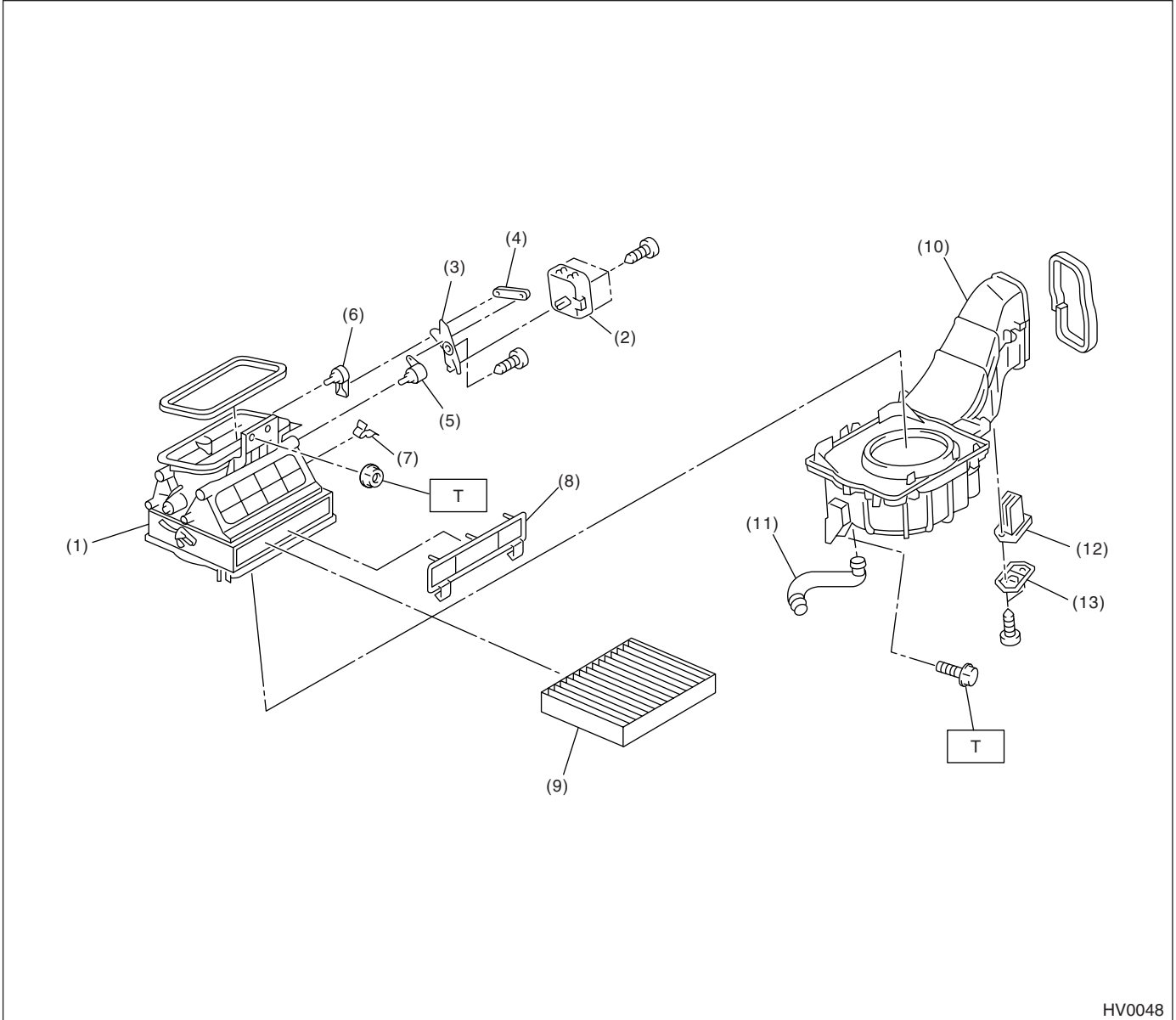
T: 7.35 (0.750, 5.421)

GENERAL DESCRIPTION

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

2. BLOWER MOTOR UNIT

• AUTO A/C MODEL



- (1) Upper case
- (2) Servo motor
- (3) Blower link
- (4) Blower link lever A
- (5) Blower link lever B
- (6) Blower link lever C

- (7) Clip
- (8) Filter cover
- (9) Filter
- (10) Blower motor assembly
- (11) Hose
- (12) Power transistor

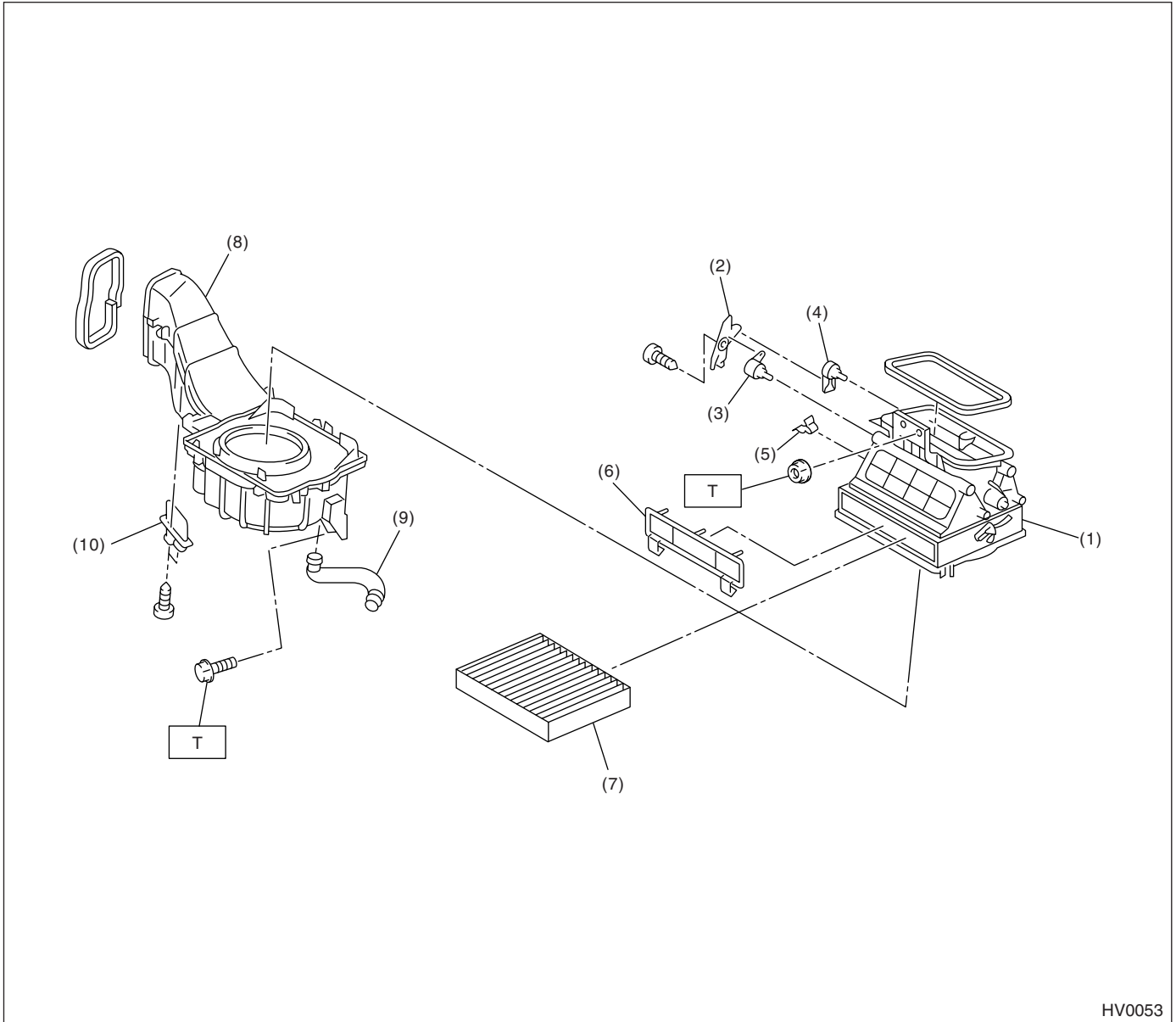
- (13) Power transistor cover

Tightening torque: N·m (kgf·m, ft·lb)
T: 7.35 (0.750, 5.421)

GENERAL DESCRIPTION

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

• MANUAL A/C MODEL



- | | |
|-------------------------|---------------------------|
| (1) Upper case | (6) Filter cover |
| (2) Blower link | (7) Filter |
| (3) Blower link lever A | (8) Blower motor assembly |
| (4) Blower link lever B | (9) Hose |
| (5) Clip | (10) Blower resistor |

Tightening torque: N·m (kgf·m, ft·lb)

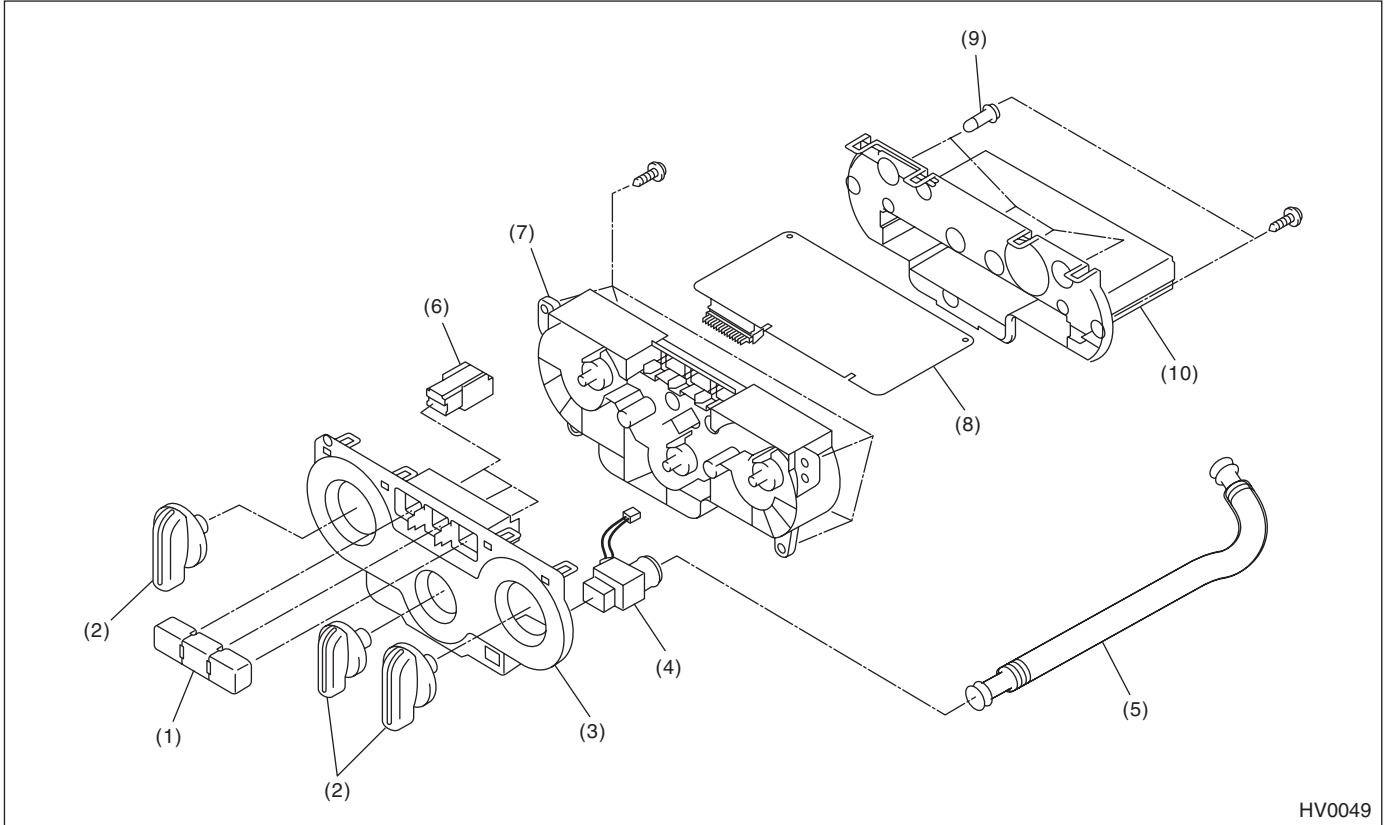
T: 7.35 (0.750, 5.421)

GENERAL DESCRIPTION

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

3. CONTROL UNIT

• AUTO A/C MODEL



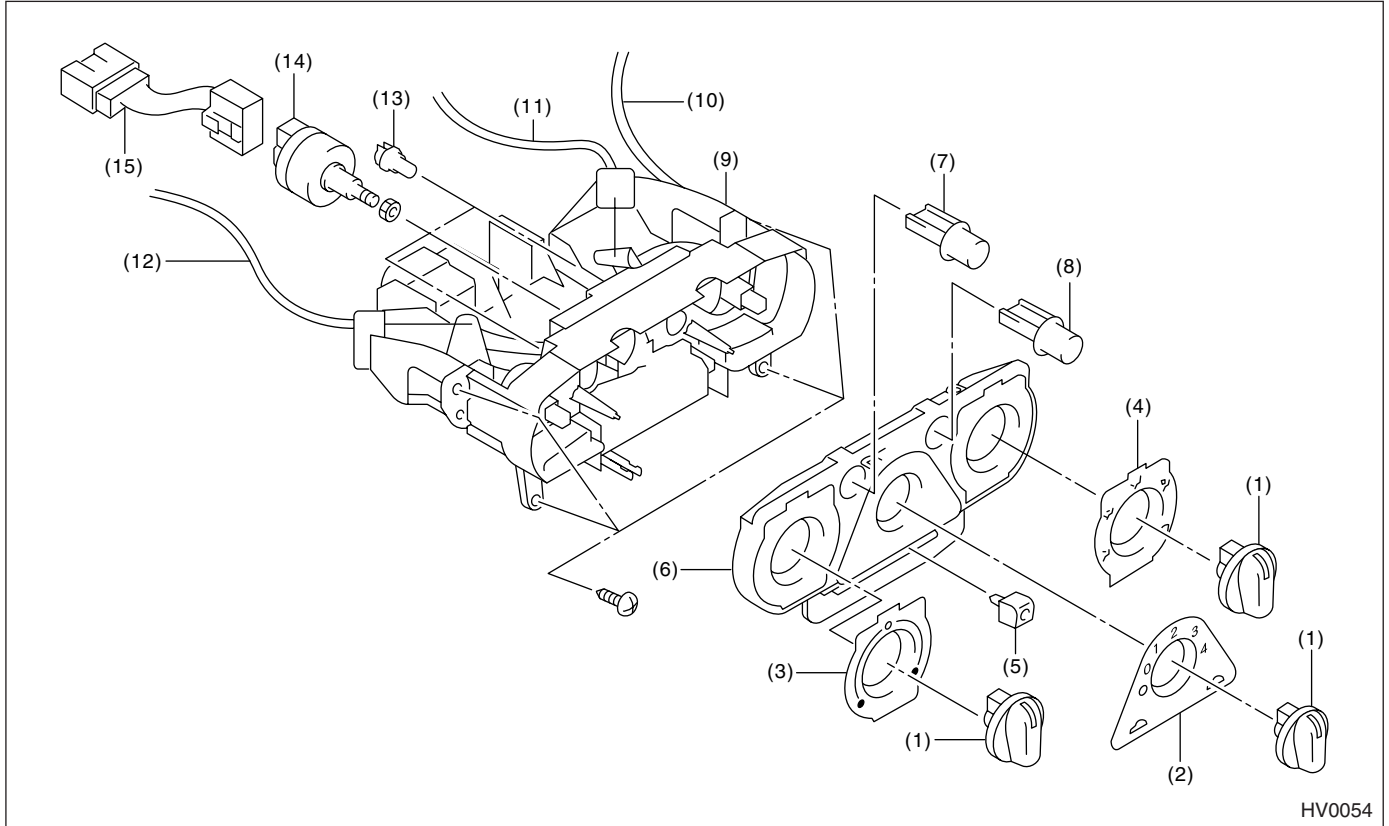
HV0049

- | | |
|-------------------|-----------------------------|
| (1) Switch | (6) Switch assembly |
| (2) Control lever | (7) Control base |
| (3) Control panel | (8) Electronic control unit |
| (4) Incar sensor | (9) Bulb |
| (5) Hose | (10) Control case |

GENERAL DESCRIPTION

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

• MANUAL A/C MODEL



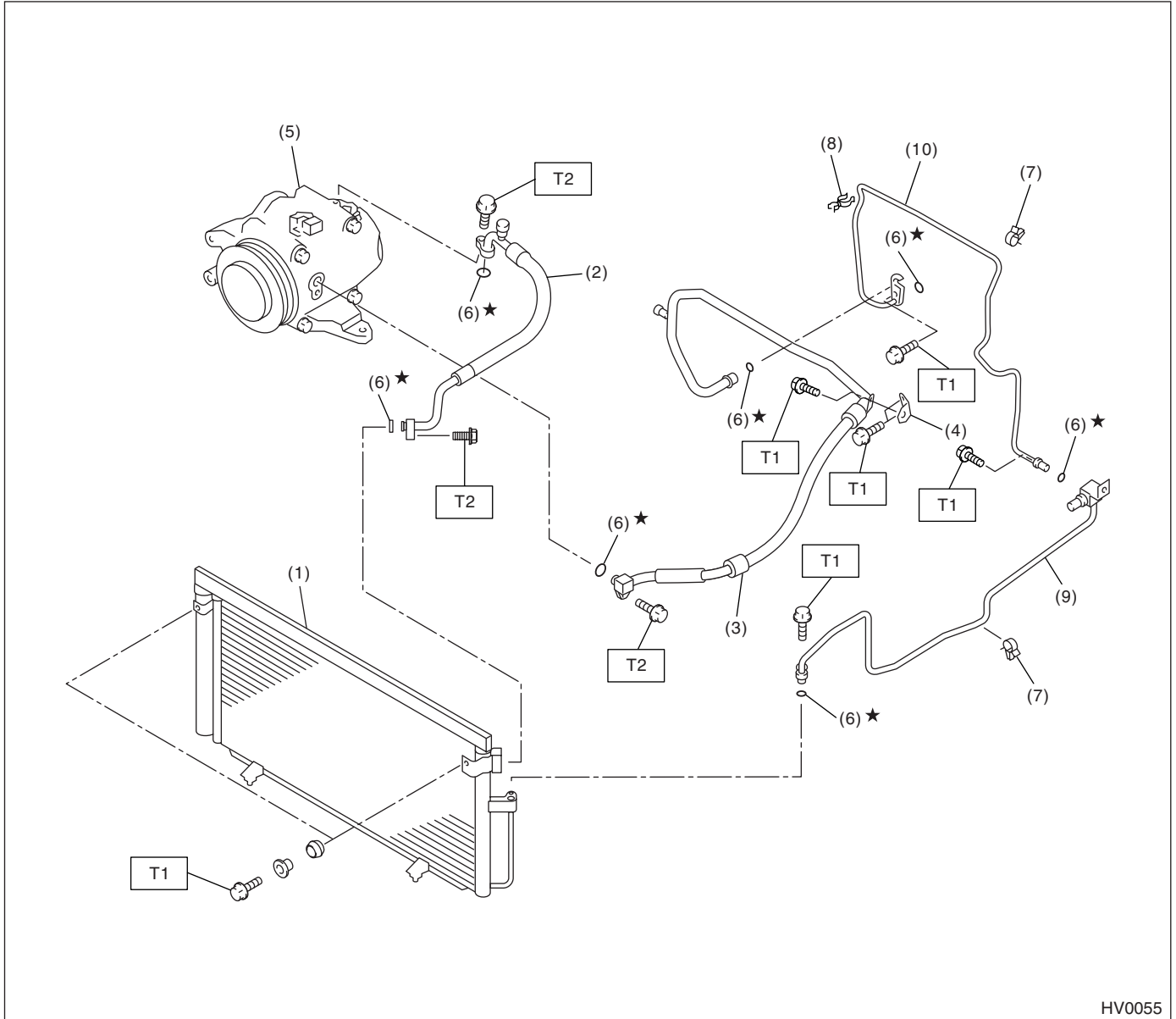
- | | | |
|-------------------------------|--------------------------|------------------------|
| (1) Dial | (6) Heater control panel | (11) Mode cable |
| (2) Fan control plate | (7) Air conditioner knob | (12) Temperature cable |
| (3) Temperature control plate | (8) Plug knob | (13) Bulb |
| (4) Mode control plate | (9) Heater control base | (14) Fan switch ASSY |
| (5) Heater control knob | (10) Intake cable | (15) Harness |

GENERAL DESCRIPTION

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

4. AIR CONDITIONING UNIT

• LHD MODEL



- | | |
|--------------------------|---------------------------|
| (1) Condenser | (6) O-ring |
| (2) Hose (High-pressure) | (7) Clamp A |
| (3) Hose (Low-pressure) | (8) Clamp B |
| (4) Bracket | (9) Tube (To condenser) |
| (5) Compressor | (10) Tube (To evaporator) |

Tightening torque: N-m (kgf-m, ft-lb)

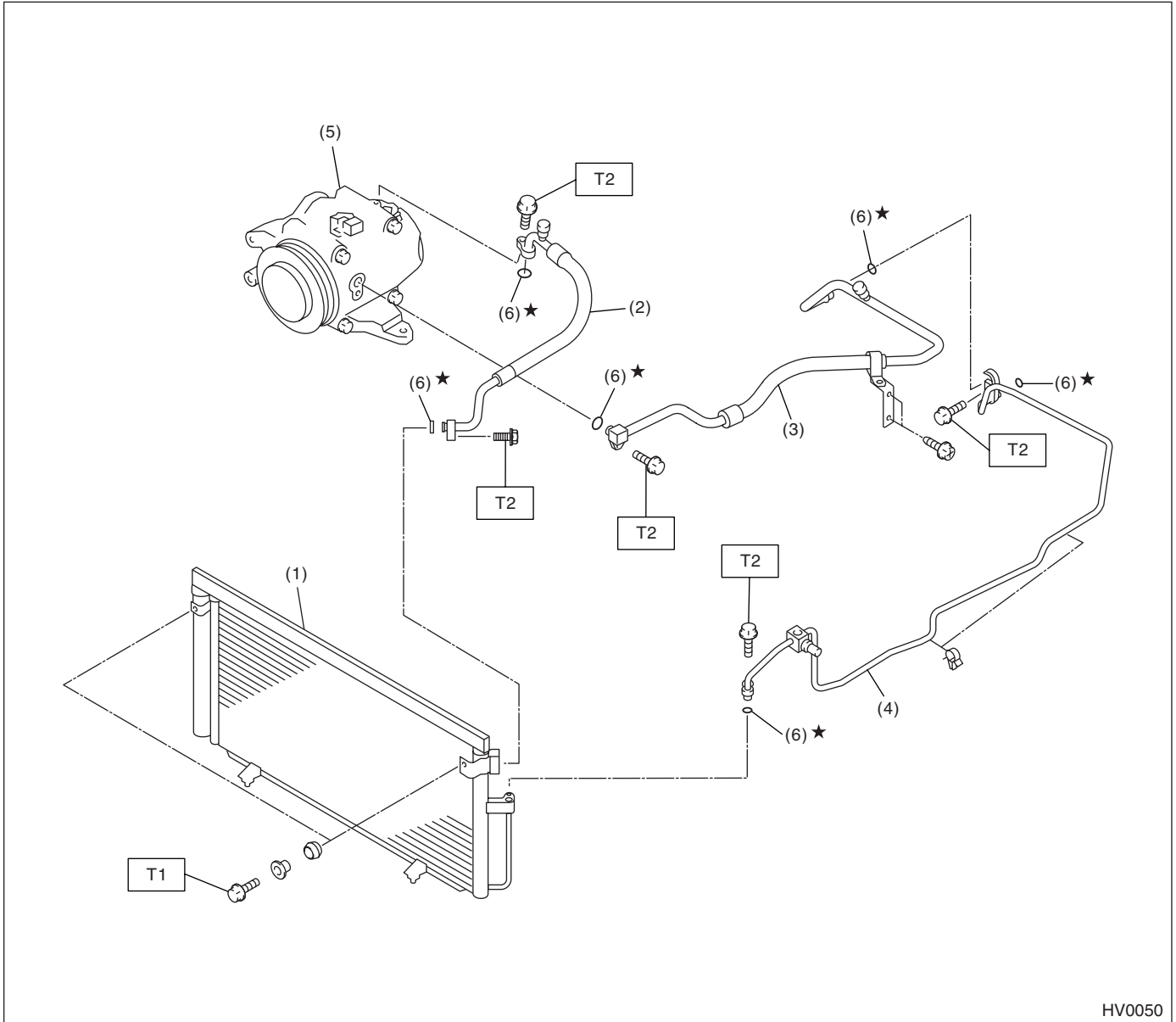
T1: 7.4 (0.75, 5.4)

T2: 15 (1.5, 10.8)

GENERAL DESCRIPTION

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

• RHD MODEL



HV0050

- | | |
|--------------------------|----------------|
| (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)

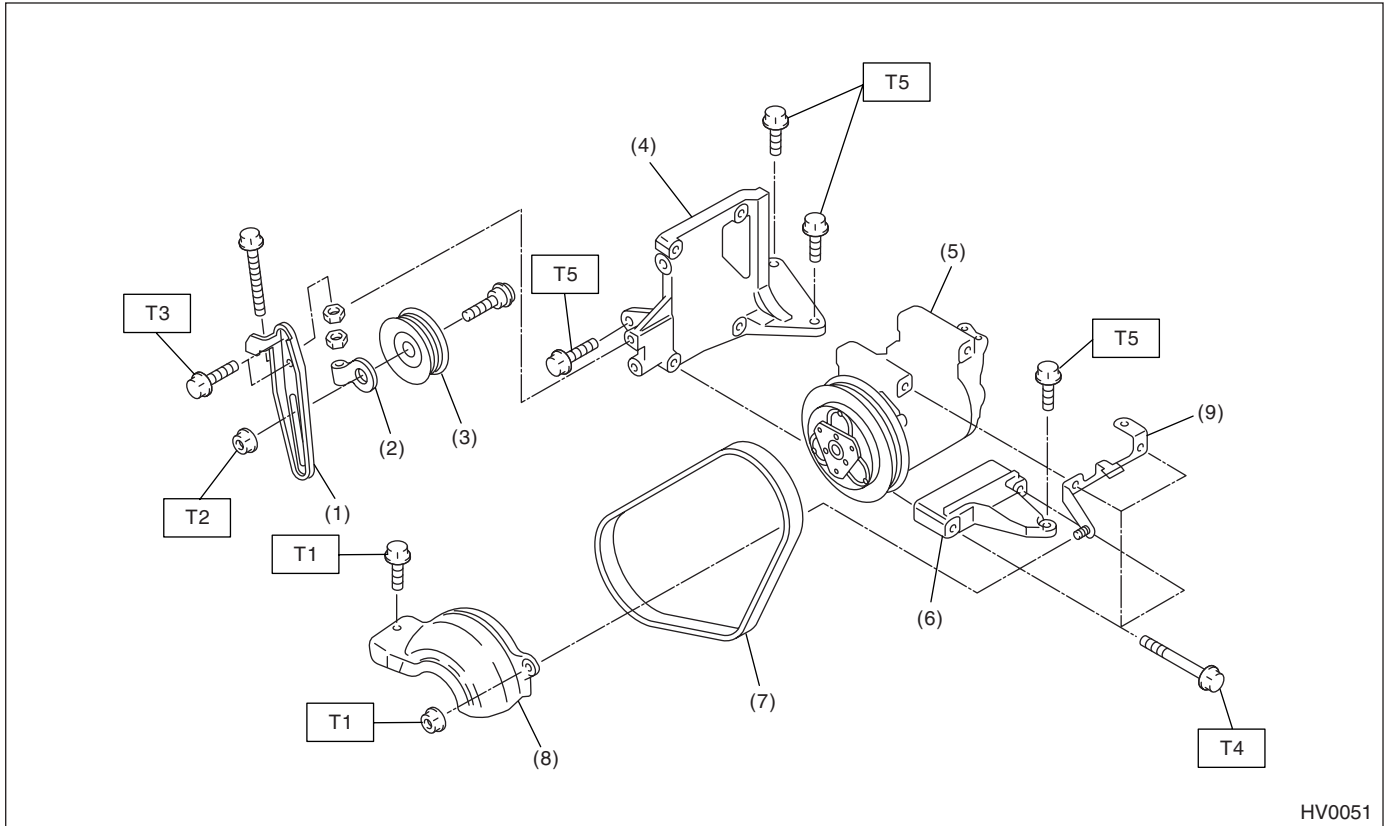
T1: 7.4 (0.75, 5.4)

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 | (9) Compressor belt cover bracket |
| (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)

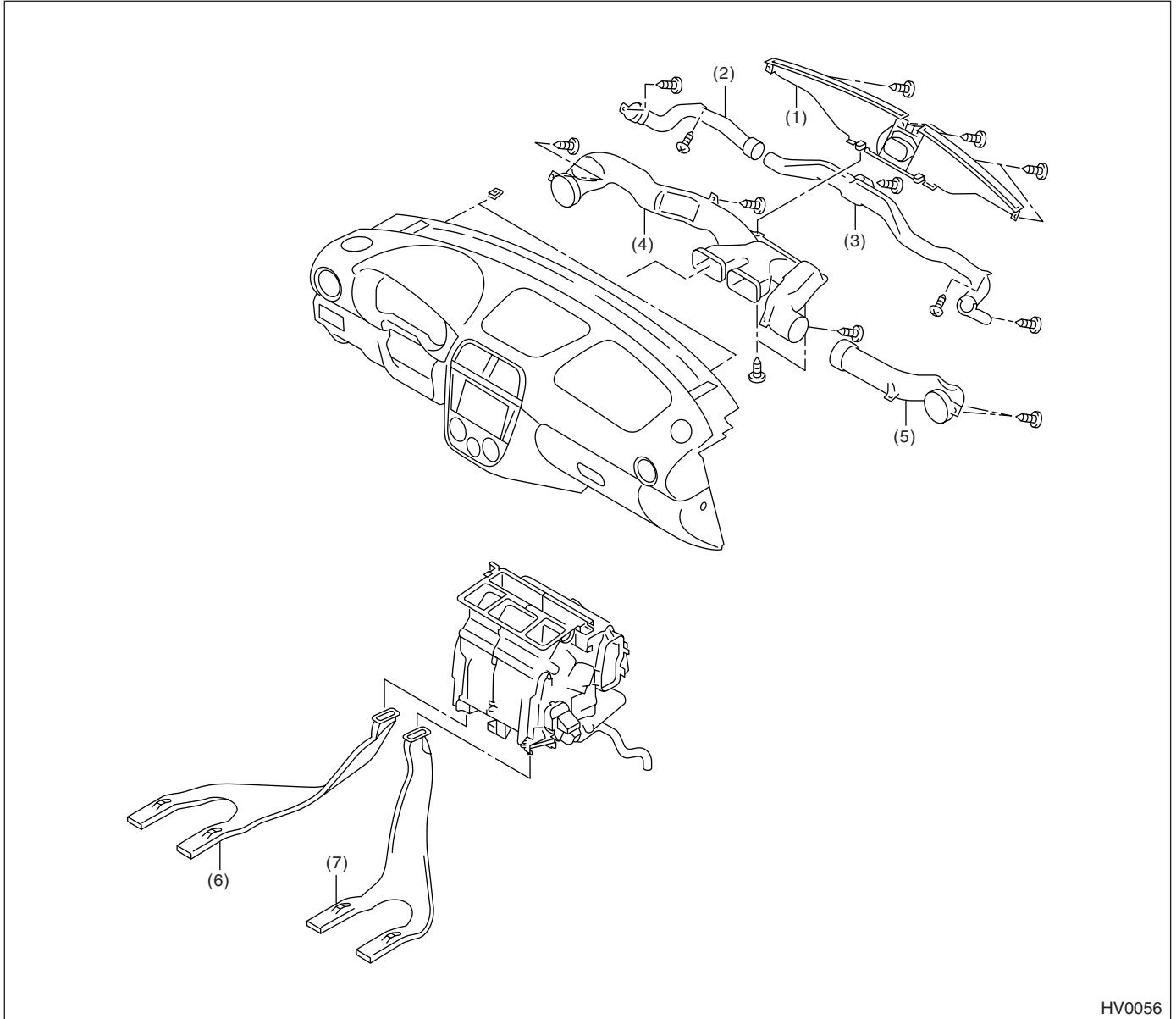
T4: 28.9 (2.95, 21.3)

T5: 35 (3.6, 26)

GENERAL DESCRIPTION

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

6. HEATER DUCT



HV0056

- | | | |
|------------------------------|--------------------------------|---------------------------|
| (1) Front defroster nozzle | (4) Side ventilation duct (LH) | (7) Rear heater duct (RH) |
| (2) Side defroster duct (LH) | (5) Side ventilation duct (RH) | |
| (3) Side defroster duct (RH) | (6) Rear heater duct (LH) | |

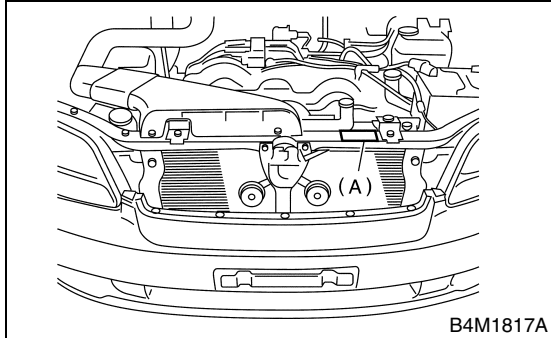
GENERAL DESCRIPTION

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

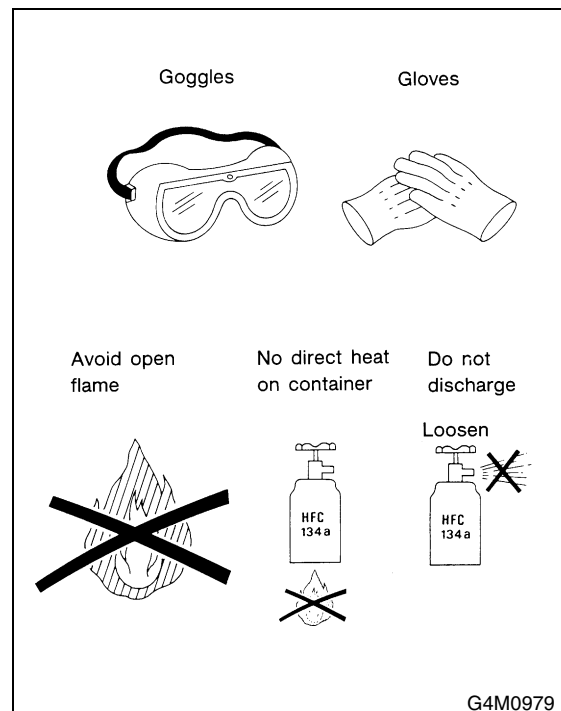
- HFC-134a compressor oil has no compatibility with that for R12 system.
 - Use only the manufacturer-authorized compressor oil for the HFC-134a system; only use DH-PR.
 - Do not mix multiple compressor oils.
- If HFC-12 compressor oil is used in a HFC-134a A/C system, the compressor may become stuck 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.

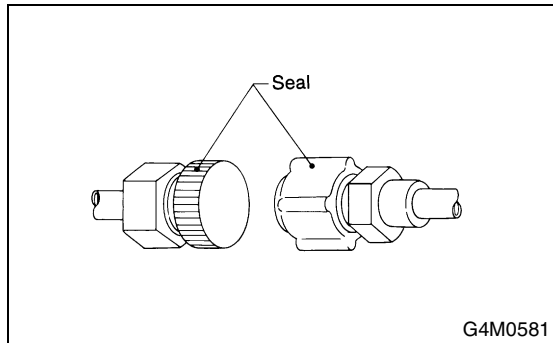


GENERAL DESCRIPTION

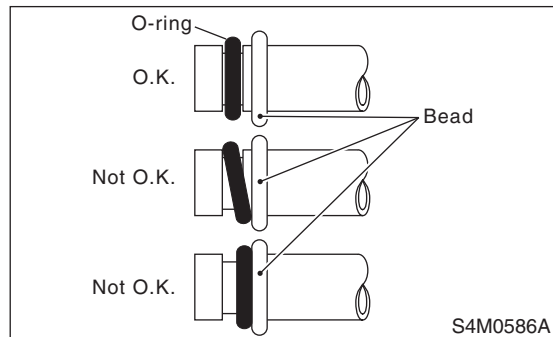
HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

5. O-RING CONNECTIONS

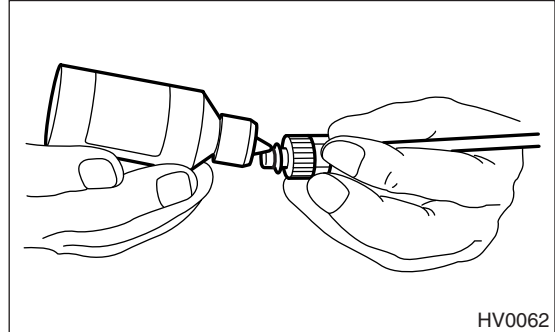
- Use new O-rings.
- In order to keep the O-rings free of lint which will cause a refrigerant gas leak, perform operations without gloves and shop towels.
- Apply the compressor oil to the O-rings to avoid sticking, then install them.
- Use a torque wrench to tighten the O-ring fittings: Over-tightening 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.



- After tightening, use 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)

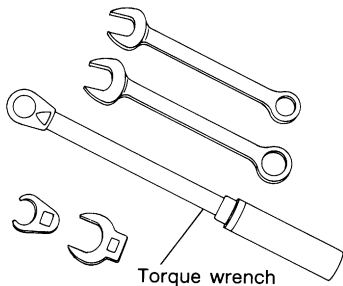
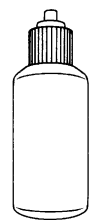
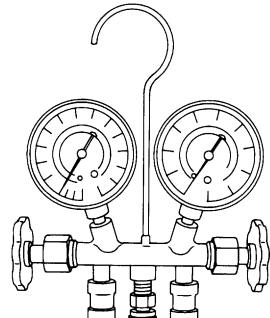
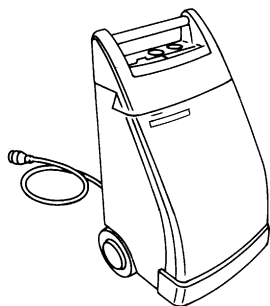
D: PREPARATION TOOL

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.

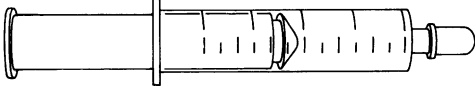
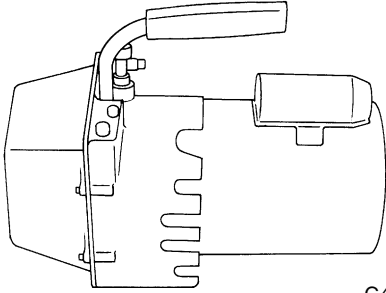
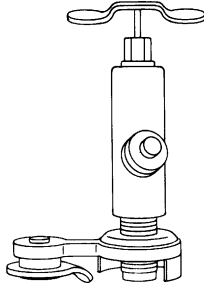
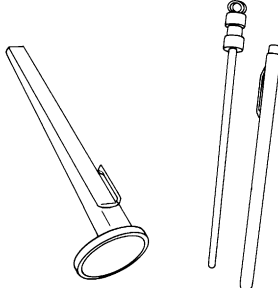
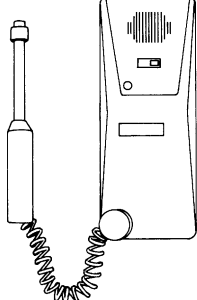
In order to help prevent mixing HFC-134a and CFC-12 parts and liquid, the tool and screw type and the type of service valves used are different. The gas leak detectors for the HFC-134a and CFC-12 systems must also not be interchanged.

	HFC-134a	CFC-12
Tool & screw type	Millimeter size	Inch size
Valve type	Quick joint type	Screw-in type

Tools and Equipment	Description
<p>Wrench</p> <p>Various WRENCHES will be required to service any A/C system. A 7 to 40 N·m (0.7 to 4.1 kgf-m, 5 to 30 ft-lb) torque wrench with various crowfoot wrenches will be needed. Open end or flare nut wrenches will be needed for back-up on the tube and hose fittings.</p>	 <p style="text-align: right;">G4M0571</p>
<p>Applicator bottle</p> <p>A small APPLICATOR BOTTLE is recommended to apply refrigerant oil to the various parts. They can be obtained at a hardware or drug store.</p>	 <p style="text-align: right;">G4M0572</p>
<p>Manifold gauge set</p> <p>A MANIFOLD GAUGE SET (with hoses) can be obtained from either a commercial refrigeration supply house or from an auto shop equipment supplier.</p>	 <p style="text-align: right;">G4M0573</p>
<p>Refrigerant recovery system</p> <p>A REFRIGERANT RECOVERY SYSTEM is used for the recovery and reuse of A/C system refrigerant after contaminants and moisture have been removed from the refrigerant.</p>	 <p style="text-align: right;">G4M0574</p>

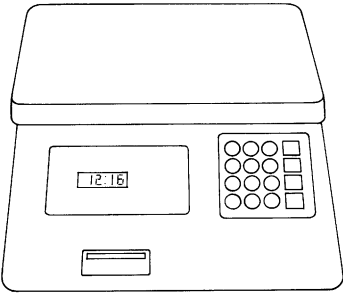
GENERAL DESCRIPTION

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

Tools and Equipment	Description
<p>Syringe</p> <p>A graduated plastic SYRINGE will be needed to add oil back into the system. The syringe can be found at a pharmacy or drug store.</p>	 <p style="text-align: right;">G4M0575</p>
<p>Vacuum pump</p> <p>A VACUUM PUMP (in good working condition) is necessary, and may be obtained from either a commercial refrigeration supply house or an automotive equipment supplier.</p>	 <p style="text-align: right;">G4M0576</p>
<p>Can tap</p> <p>A CAN TAP for the 397 g (14 oz) can is available from an auto supply store.</p>	 <p style="text-align: right;">G4M0577</p>
<p>Thermometer</p> <p>Pocket THERMOMETERS are available from either industrial hardware store or commercial refrigeration supply houses.</p>	 <p style="text-align: right;">G4M0578</p>
<p>Electronic leak detector</p> <p>An ELECTRONIC LEAK DETECTOR can be obtained from either a specialty tool supply or an A/C equipment supplier.</p>	 <p style="text-align: right;">G4M0579</p>

GENERAL DESCRIPTION

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

Tools and Equipment	Description
<p>Weight scale</p> <p>A WEIGHT SCALE such as an electronic charging scale or a bathroom scale with digital display will be needed if a 13.6 kg (30 lb) refrigerant container is used.</p>	 <p>G4M0580</p>

REFRIGERANT PRESSURE WITH MANIFOLD GAUGE SET

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

2. Refrigerant Pressure with Manifold Gauge Set

A: OPERATION

- 1) Place the vehicle in the shade and draftless condition.
- 2) Connect the manifold gauge set.
- 3) Open the front windows and close all doors.
- 4) Open the hood.
- 5) Increase the engine to 1,500 rpm.
- 6) Turn ON the A/C switch.
- 7) Turn the temperature control switch to MAX COOL.
- 8) Put in RECIRC position.
- 9) Turn the blower control switch to HI.
- 10) Read the gauge.

Standard:

Low pressure: 127 — 196 kPa (1.3 — 2.0 kg/cm², 18 — 28 psi)

High pressure: 1,471 — 1,667 kPa (15 — 17 kg/cm², 213 — 242 psi)

Ambient temperature: 30 — 35 °C (86 — 95 °F)

B: INSPECTION

Symptom	Probable cause	Repair order
High-pressure side is unusually high.	<ul style="list-style-type: none">• Defective condenser fan motor• Clogged condenser fan• Too much refrigerant• Air inside the system• Defective receiver dryer	<ul style="list-style-type: none">• Replace the fan motor.• Clean the condenser fin.• Discharge refrigerant.• Replace the receiver dryer.
High-pressure side is unusually low.	<ul style="list-style-type: none">• Defective compressor• Not enough refrigerant• Clogged expansion valve• Expansion valve frozen temporarily by moisture	<ul style="list-style-type: none">• Replace the compressor.• Check for leaks.• Replace the expansion valve.
Low-pressure side is unusually high.	<ul style="list-style-type: none">• Defective compressor• Defective expansion valve• Too much refrigerant	<ul style="list-style-type: none">• Replace the compressor.• Replace the expansion valve.• Discharge refrigerant.
Low-pressure side is unusually low.	<ul style="list-style-type: none">• Not enough refrigerant• Clogged expansion valve• Expansion valve frozen temporarily by moisture• Saturated receiver dryer	<ul style="list-style-type: none">• Check for leaks.• Replace the expansion valve• Replace the receiver dryer.

REFRIGERANT RECOVERY PROCEDURE

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

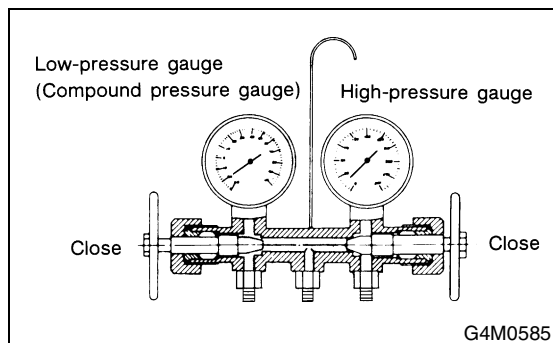
3. Refrigerant Recovery Procedure

A: OPERATION

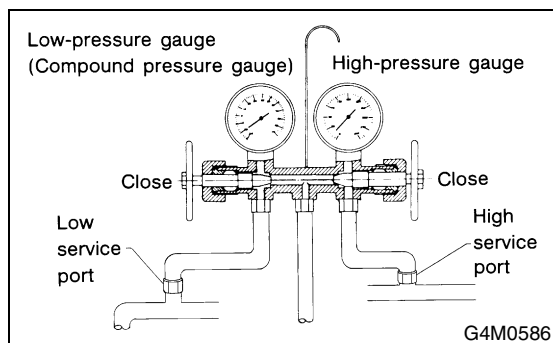
CAUTION:

- During operation, be sure to wear safety goggles and protective gloves.
- Connect the refrigerant recovery system with the manifold gauge set to discharge the refrigerant from the A/C system and reuse it.
- When reusing the discharged refrigerant, keep service cans on hand. Because the discharge rate with the recovery system is approx. 90%, service cans are necessary to charge the refrigerant.
- Follow the detailed operation procedure described in the operation manual attached to the refrigerant recovery system.

- 1) Perform the compressor oil return operation.
<Ref. to AC-26, OPERATION, Compressor Oil.>
- 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:

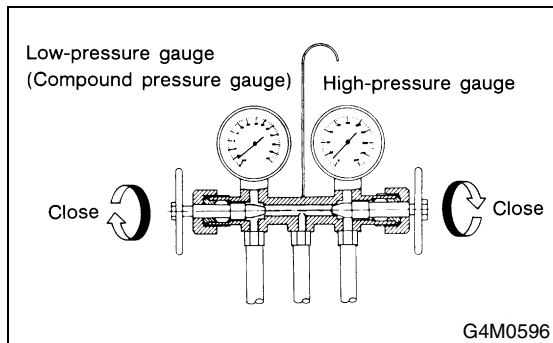
- During operation, be sure to wear safety goggles and protective gloves.
- Before charging the refrigerant, evacuate the system to remove small amounts of moisture remaining in the system.

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.

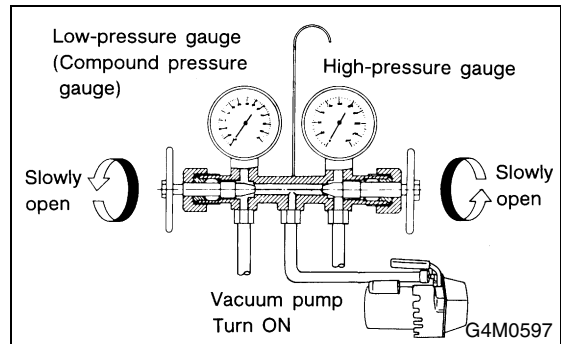
Vacuum level required to boil water (at sea level)	
Temperature	Vacuum
1.7°C (35°F)	100.9 kPa (757 mmHg, 29.8 inHg)
7.2°C (45°F)	100.5 kPa (754 mmHg, 29.7 inHg)
12.8°C (55°F)	99.8 kPa (749 mmHg, 29.5 inHg)
18.3°C (65°F)	99.2 kPa (744 mmHg, 29.3 inHg)
23.9°C (75°F)	98.5 kPa (739 mmHg, 29.1 inHg)
29.4°C (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.

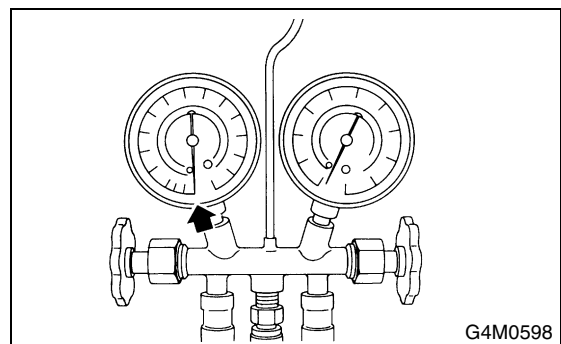


- 2) Install the low-/high-pressure hoses to the corresponding service ports on the vehicle respectively.
 3) Connect the center hose of the manifold gauge set with the vacuum pump.

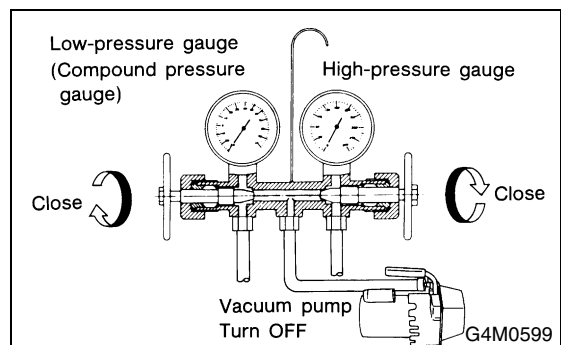
4) Carefully open the valves on the low-/high-pressure sides to activate the vacuum pump.



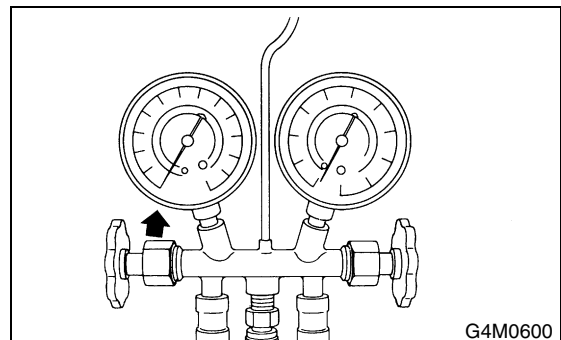
5) After the low-pressure gauge reaches 100.0 kPa (750 mmHg, 29.5 inHg) or higher, evacuate the system for approx. 15 minutes.



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.



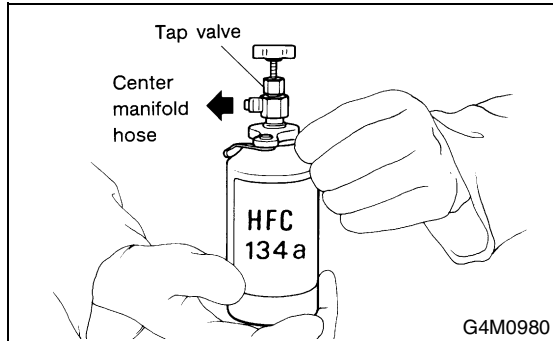
REFRIGERANT CHARGING PROCEDURE

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.

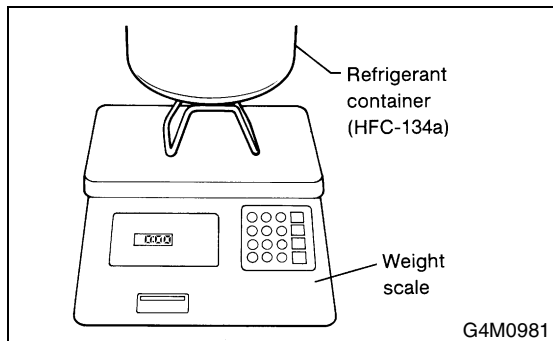
When a gauge indicator shows near to zero point, this is a sign of leakage. Check pipe connector points, repair them, make sure there is no leakage by air bleeding.

9) Following the can tap operation manual instructions, install it to the refrigerant can.

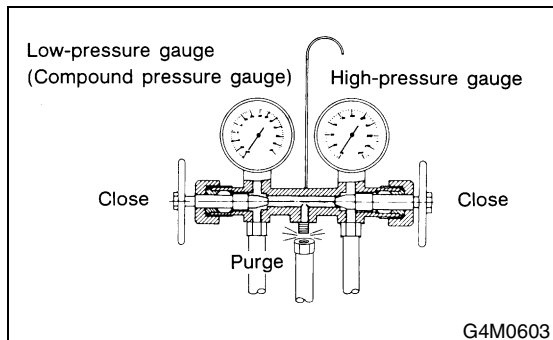


10) Disconnect the center manifold hose from the vacuum pump, and connect the hose to the tap valve.

11) When a 13.6 kg (30 lb) refrigerant container is used, measure the refrigerant amount in use using a weighting scale.



12) Confirm that all the 3 hoses are tightly connected to the manifold gauge set.



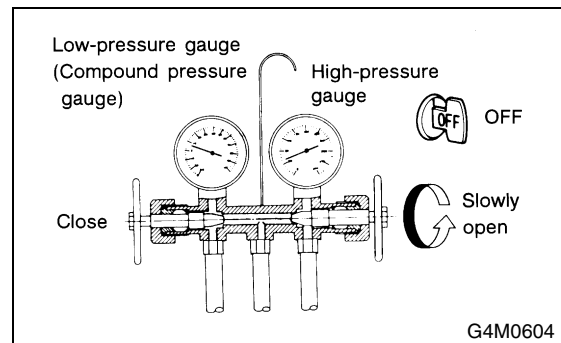
13) Open the valve on the HFC-134a source.

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.

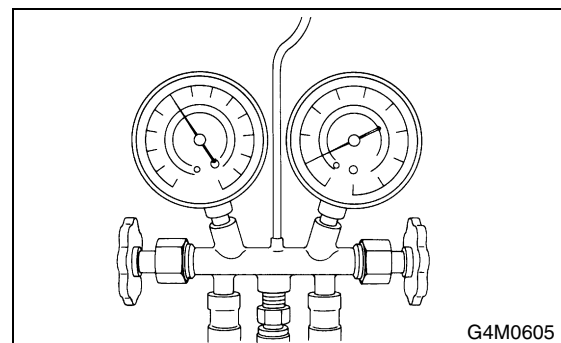
17) After confirming that there are no leaks with the leak test, charge the required amount of refrigerant.

CAUTION:

Never run the engine during charging from the high-pressure side.

18) Close the high-pressure valve when;

- the readings of low-/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.

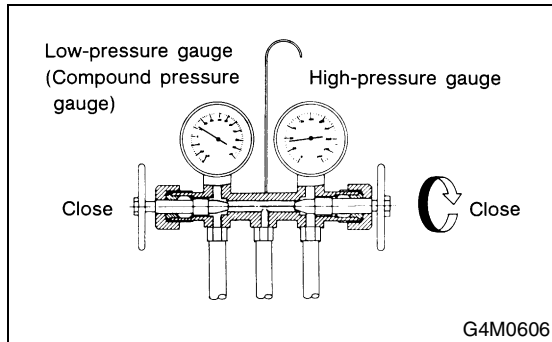


REFRIGERANT CHARGING PROCEDURE

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-/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.

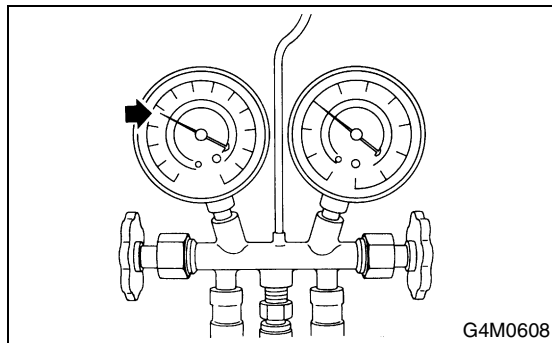
22) Set up the vehicle to the following status:

- 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 purged.

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-pressure side 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.

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.

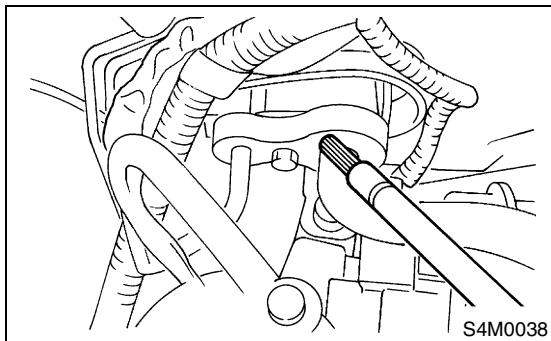
7) Check the thermal limiter (if equipped) on the compressor housing.

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 two parts
- Connection between the tube and nut

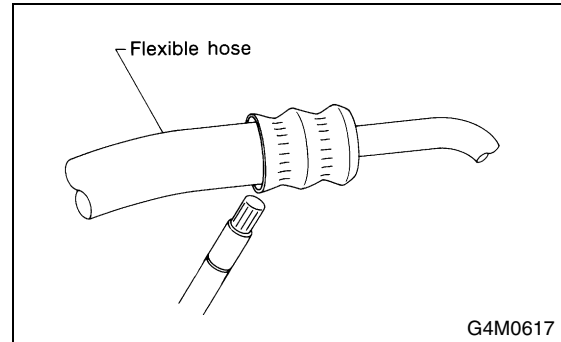


10) Visually check the rubber area of the flexible hose for cracks.

Check the entire length of the flexible hose, especially the connection with the metal hose end.

CAUTION:

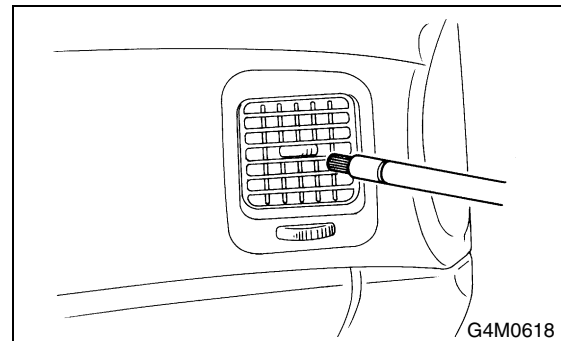
Carefully check the external surface of hoses and tubes at approx. 25 mm (0.98 in) per second.



11) Disconnect the drain hose from the evaporator case, and check the hose end for at least 10 seconds.

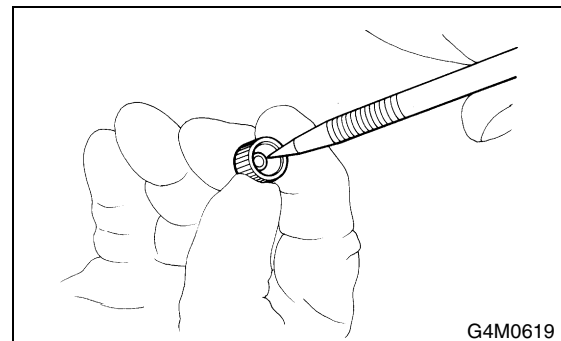
After the test is finished, reconnect the drain hose.

12) Turn the ignition key to ON position, and run the blower at high speed for 1 minute. Stop the blower to check the ventilation grille on the instrument panel. While moving the tester closer to the grille, run the blower for 1 or 2 seconds, then stop it. Check the grille at that point for at least 10 seconds.



13) Check the valve in the service port.

14) Visually check the rubber seal in the service port cap.



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 to 1,500 rpm.
- 2) Turn ON the A/C switch.
- 3) Turn the temperature control switch to MAX COOL.
- 4) Put in RECIRC position.
- 5) Turn the blower control switch to HI.
- 6) Leave in this condition for 10 minutes.

B: REPLACEMENT

NOTE:

- If a component is replaced, add an appropriate amount of compressor oil.
- When replacing the compressor, the new compressor will already have the specified amount of oil in it. Install the new compressor after removing the same amount of oil that is remaining in the compressor removed.

Replacement parts	Amount of oil replenishment
Evaporator	114 m ℓ (3.9 US fl oz, 4.0 Imp fl oz)
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)

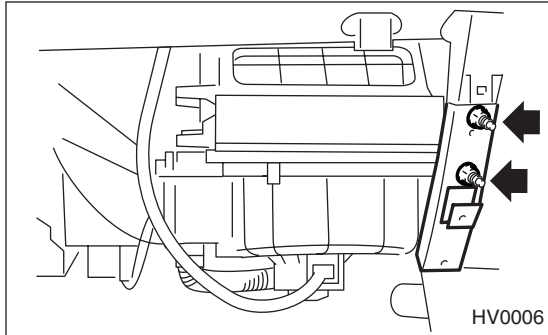
BLOWER MOTOR UNIT ASSEMBLY

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

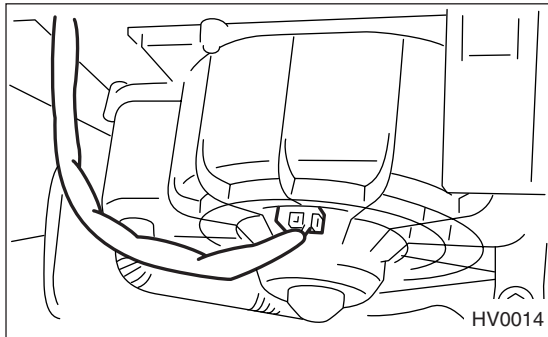
7. Blower Motor Unit Assembly

A: REMOVAL

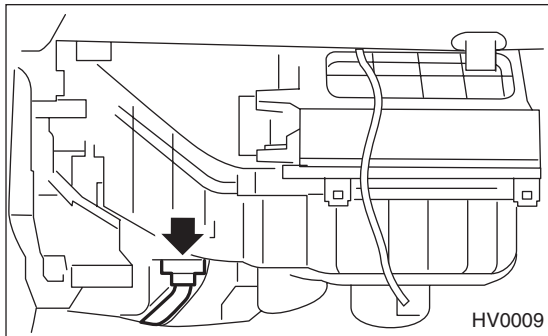
- 1) Disconnect the ground cable from battery.
- 2) Remove the glove box. <Ref. to EI-38, REMOVAL, Glove Box.>
- 3) Loosen the nut to remove the support beam stay.



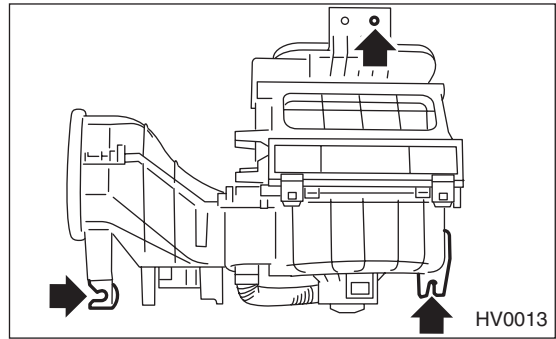
- 4) Disconnect the blower motor connector.



- 5) Disconnect the power transistor connector.



- 6) Loosen the bolt and nut to remove blower motor unit assembly.



B: INSTALLATION

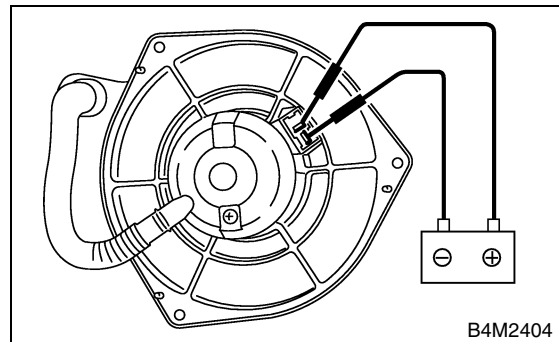
Install in the reverse order of removal.

Tightening torque:

Refer to **COMPONENT** in *General Description*. <Ref. to AC-5, HEATER COOLING UNIT, **COMPONENT**, *General Description*.> and <Ref. to AC-7, BLOWER MOTOR UNIT, **COMPONENT**, *General Description*.>

C: INSPECTION

Connect the motor connector terminal 1 from the battery to the positive (+) lead and terminal 2 to the negative (-) lead. Make sure the motor runs smoothly.



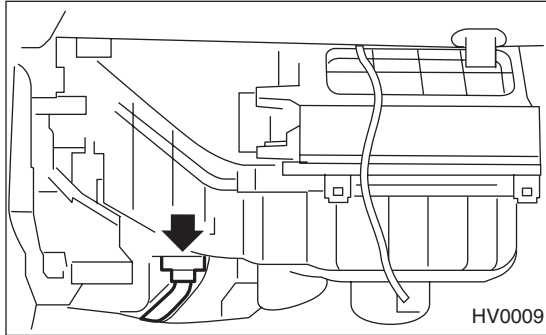
POWER TRANSISTOR (AUTO A/C MODEL)

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

8. Power Transistor (Auto A/C Model)

A: REMOVAL

- 1) Remove the glove box. <Ref. to EI-38, REMOVAL, Glove Box.>
- 2) Disconnect the power transistor connector.
- 3) Loosen the two screws to remove power transistor.



B: INSTALLATION

Install in the reverse order of removal.

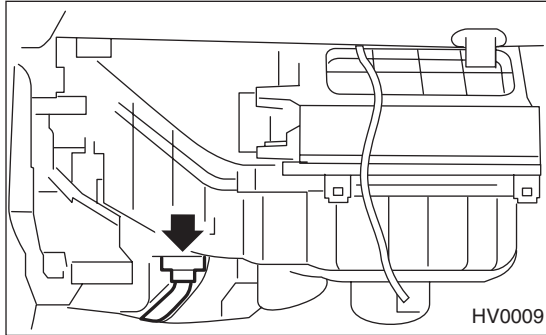
BLOWER RESISTOR (MANUAL A/C MODEL)

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

9. Blower Resistor (Manual A/C Model)

A: REMOVAL

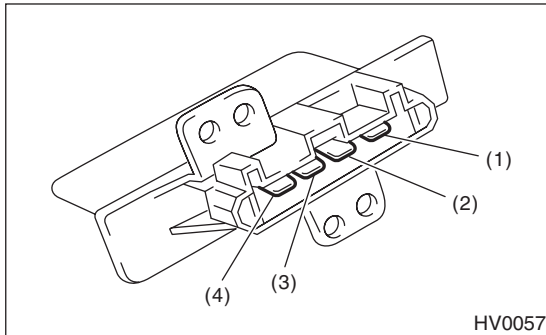
- 1) Remove the glove box. <Ref. to EI-38, REMOVAL, Glove Box.>
- 2) Disconnect the blower resistor connector.
- 3) Loosen the two screws to remove blower resistor.



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION



Measure the blower resistor resistance.

Terminal No.	Standard
3 and 1	Approx. 0.51 Ω
3 and 2	Approx. 2.70 Ω
3 and 4	Approx. 1.43 Ω

If NG, replace the blower resistor.

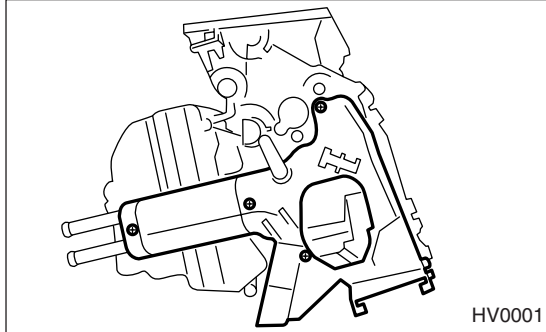
HEATER CORE

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

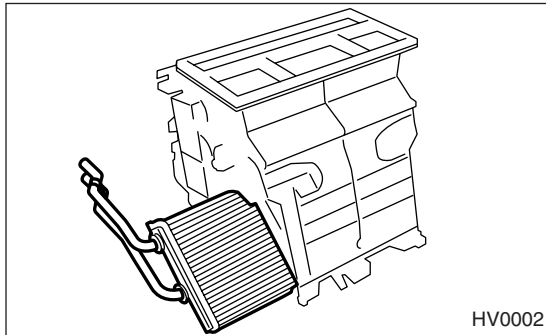
10.Heater Core

A: REMOVAL

- 1) Remove the heater and cooling unit. <Ref. to AC-35, REMOVAL, Heater and Cooling Unit.>
- 2) Loosen the screws to remove heater core cover.



- 3) Remove the heater core.



B: INSTALLATION

Install in the reverse order of removal.

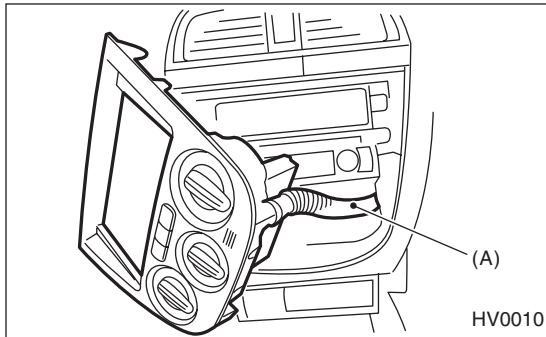
CONTROL UNIT

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

11. Control Unit

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the center console panel.
- 3) Disconnect the connector and aspirator hose (A).



B: INSTALLATION

Install in the reverse order of removal.

COMPRESSOR

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

12. Compressor

A: INSPECTION

1. MAGNETIC CLUTCH CLEARANCE

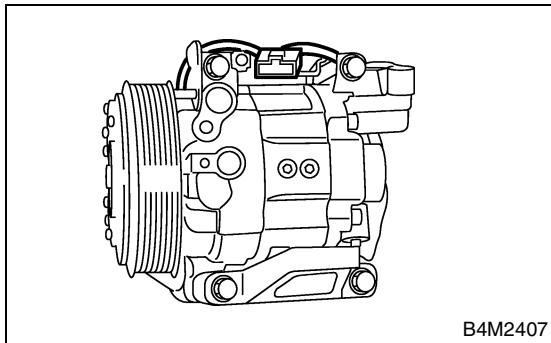
1) Check the clearance of the entire circumference around the drive plate and pulley.

Standard:

$0.45 \pm 0.15 \text{ mm}$ ($0.0177 \pm 0.0059 \text{ in}$)

2. MAGNETIC CLUTCH OPERATION

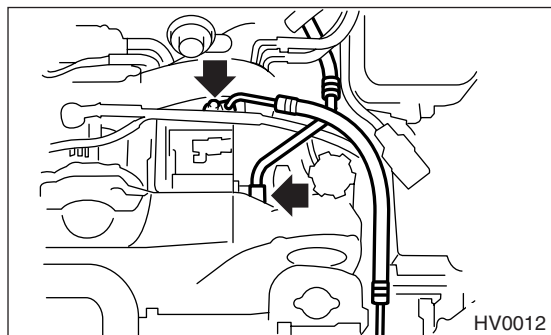
1) Disconnect the compressor connector.
2) Connect the battery positive (+) terminal to the No.3 terminal of the compressor connector.



3) Make sure the magnet clutch engages.
If NG, replace the compressor.

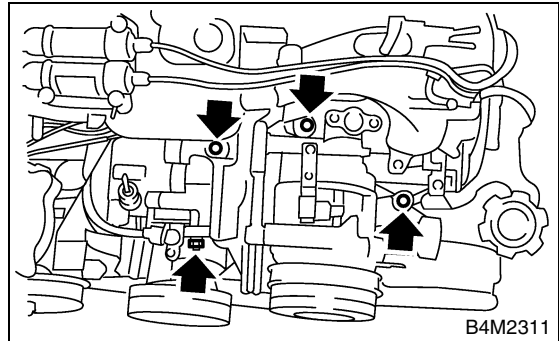
B: REMOVAL

1) Perform the compressor oil return operation.
<Ref. to AC-26, OPERATION, Compressor Oil.>
2) Turn the A/C switch OFF and stop the engine.
3) Using the refrigerant recovery system, discharge refrigerant. <Ref. to AC-21, OPERATION, Refrigerant Recovery Procedure.>
4) Disconnect the ground cable from battery.
5) Remove the V-belt. <Ref. to ME-44, REMOVAL, V-belt.> or <Ref. to ME(TURBO)-44, REMOVAL, V-belt.>
6) Remove the generator. <Ref. to SC-14, REMOVAL, Generator.>
7) Remove the low-pressure hose and high-pressure hose.

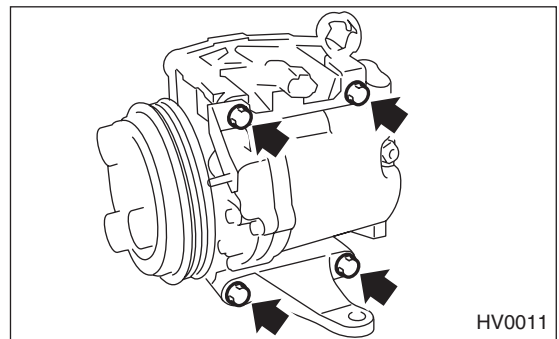


8) Disconnect the compressor harness from body harness.

9) Loosen the bolts to remove compressor bracket.



10) Remove the bolts and then separate compressor and bracket.



C: INSTALLATION

- 1) Install in the reverse order of removal.
- 2) Replace the 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-26, OPERATION, Compressor Oil.>
- 4) Charge refrigerant. <Ref. to AC-22, OPERATION, Refrigerant Charging Procedure.>

Tightening torque:

Refer to COMPONENT in General Description. <Ref. to AC-11, AIR CONDITIONING UNIT, COMPONENT, General Description.> and <Ref. to AC-13, COMPRESSOR, COMPONENT, General Description.>

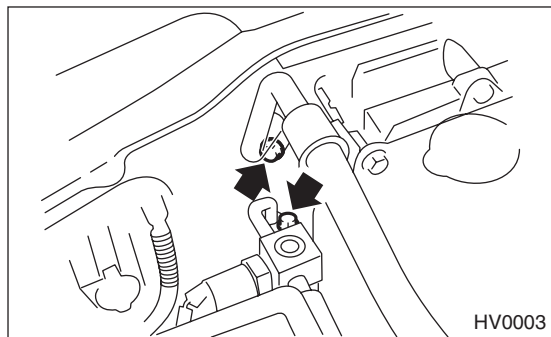
CONDENSER

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

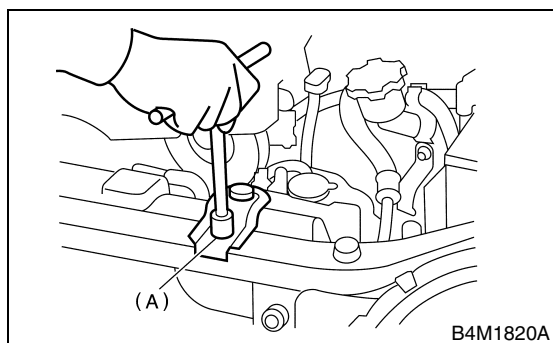
13. Condenser

A: REMOVAL

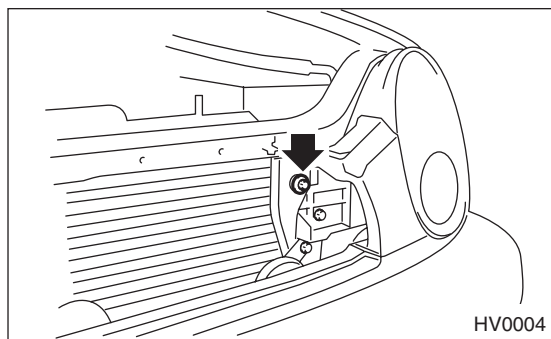
- 1) Using the refrigerant recovery system, discharge refrigerant. <Ref. to AC-21, OPERATION, Refrigerant Recovery Procedure.>
- 2) Disconnect the ground cable from battery.
- 3) Disconnect the pressure hose and pipe from condenser.



- 4) Remove the radiator bracket (A).



- 5) Remove the two bolts. While lifting the condenser, pull it out through the space between radiator and radiator panel.



CAUTION:

Be careful not to damage the condenser fins. If a damaged fin is found, repair it using a thin screwdriver.

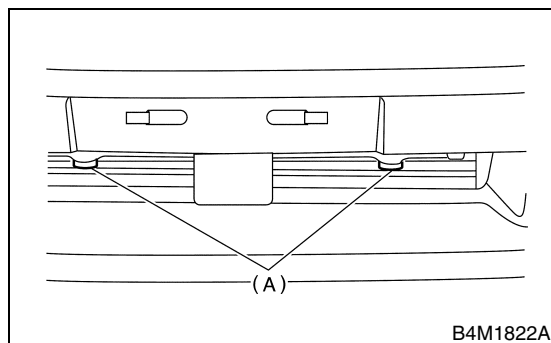
If the condenser is replaced, add appropriate amount of compressor oil to the compressor. <Ref. to AC-26, REPLACEMENT, Compressor Oil.>

B: INSTALLATION

- 1) Install in the reverse order of removal.

CAUTION:

Replace the O-rings on hoses or pipes with new ones, and then apply compressor oil. Confirm that lower guide of condenser (A) has been fitted into holes on radiator panel.



- 2) Charge refrigerant. <Ref. to AC-22, OPERATION, Refrigerant Charging Procedure.>

Tightening torque:

Refer to COMPONENT in General Description. <Ref. to AC-11, AIR CONDITIONING UNIT, COMPONENT, General Description.> and <Ref. to CO-5, RADIATOR AND RADIATOR FAN, COMPONENT, General Description.>

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 the condenser with a new one.

HEATER AND COOLING UNIT

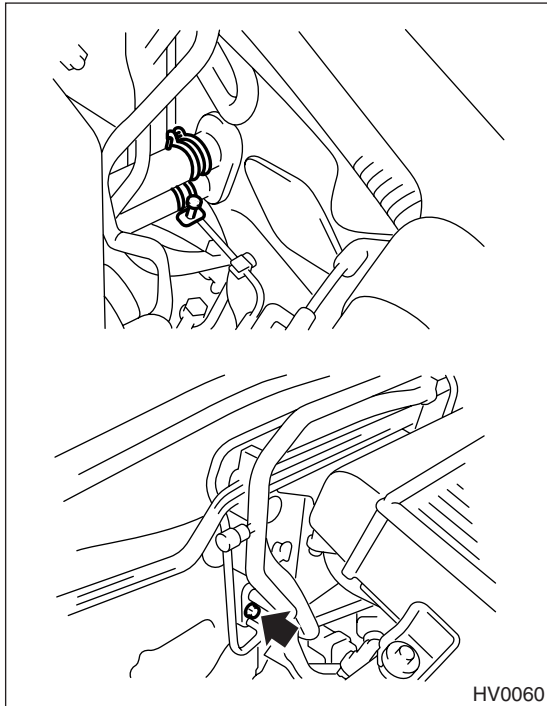
HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

14.Heater and Cooling Unit

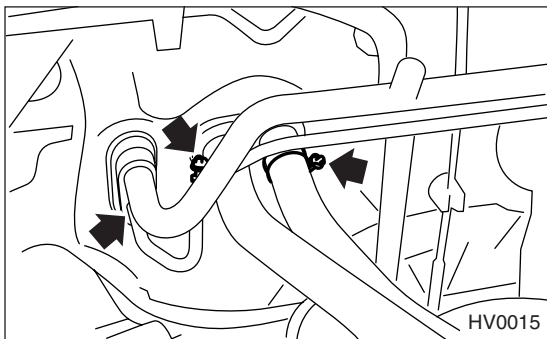
A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Using the refrigerant recovery system, discharge refrigerant. <Ref. to AC-21, OPERATION, Refrigerant Recovery Procedure.>
- 3) Drain LLC from the radiator.
- 4) Remove the bolt securing expansion valve and pipe in engine compartment. Release the heater hose clamps in engine compartment to remove the hoses.

• LHD MODEL

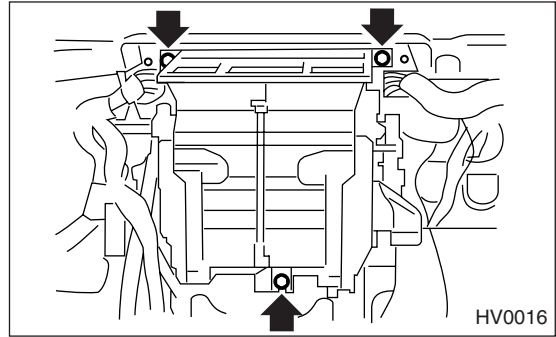


• RHD MODEL



- 5) Remove the instrument panel. <Ref. to EI-41, REMOVAL, Instrument Panel Assembly.>
- 6) Remove the support beam.
- 7) Remove the blower motor unit assembly. <Ref. to AC-27, REMOVAL, Blower Motor Unit Assembly.>
- 8) Disconnect the servo motor connectors.

- 9) Loosen the bolt and nuts to remove the heater and cooling unit.



B: INSTALLATION

- 1) Install in the reverse order of removal.
- 2) Charge refrigerant. <Ref. to AC-22, OPERATION, Refrigerant Charging Procedure.>

Tightening torque:

Refer to COMPONENT in General Description. <Ref. to AC-5, HEATER COOLING UNIT, COMPONENT, General Description.>

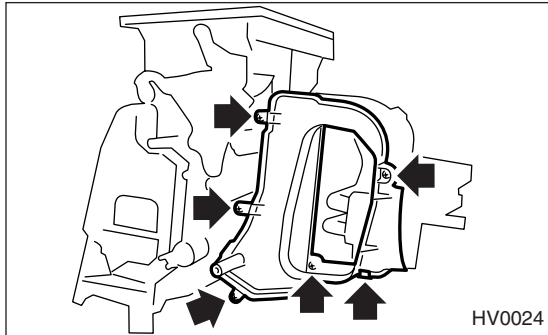
EVAPORATOR

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

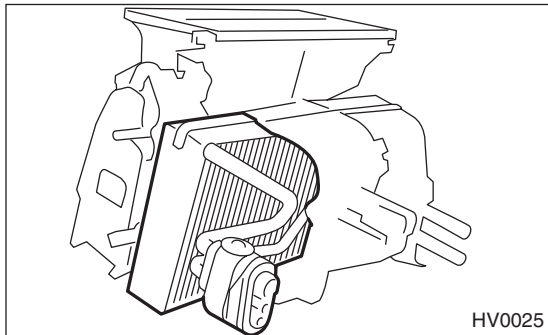
15. Evaporator

A: REMOVAL

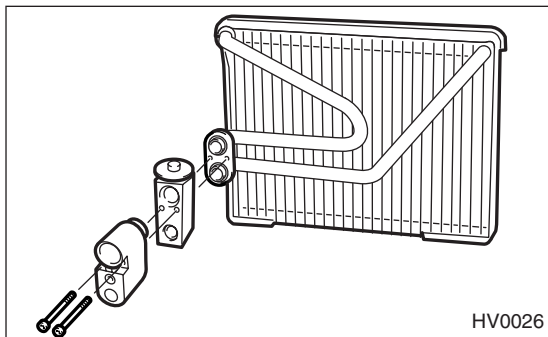
- 1) Remove the heater and cooling unit. <Ref. to AC-35, REMOVAL, Heater and Cooling Unit.>
- 2) Loosen the screws and clip to remove evaporator cover.



- 3) Remove the evaporator.



- 4) Loosen the two bolts to remove expansion valve.



CAUTION:

If the evaporator is replaced, add appropriate amount of compressor oil to evaporator. <Ref. to AC-26, REPLACEMENT, Compressor Oil.>

B: INSTALLATION

Install in the reverse order of removal.

HOSE AND TUBE

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

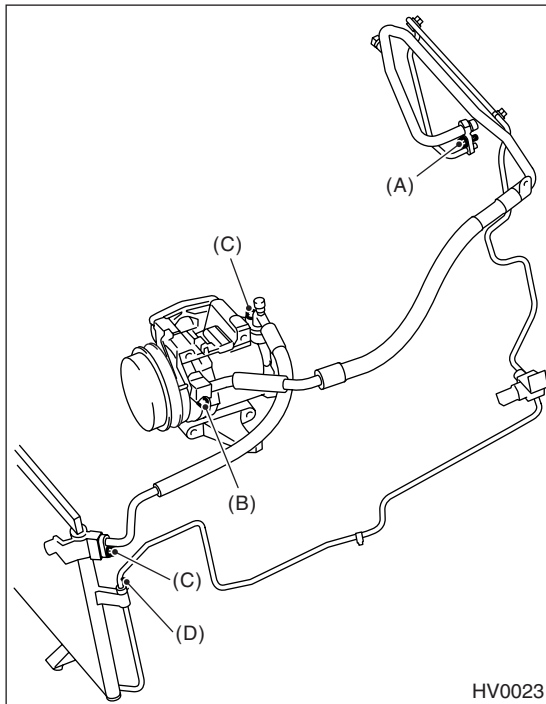
16.Hose and Tube

A: REMOVAL

CAUTION:

- When disconnecting/connecting hoses, do not apply excessive force to them. Confirm that no torsion and excessive tension exists after installing.
- Seal the disconnected hose with a plug or vinyl tape to prevent contamination from entering.

- 1) Disconnect the ground cable from battery.
- 2) Using the refrigerant recovery system, discharge refrigerant. <Ref. to AC-21, OPERATION, Refrigerant Recovery Procedure.>
- 3) Remove the evaporator unit mounting bolt (A).
- 4) Remove the low-pressure hose attaching bolts (B).
- 5) Disconnect the low-pressure hose from evaporator unit.
- 6) Disconnect the low-pressure hose from compressor.
- 7) Remove the low-pressure hose from vehicle.
- 8) Remove the high-pressure hose attaching bolts (C).
- 9) Disconnect the high-pressure hose from compressor.
- 10) Disconnect the high-pressure hose from condenser.
- 11) Remove the high-pressure hose from vehicle.
- 12) Remove the high-pressure tube attaching bolt (D).
- 13) Remove the high-pressure tube from vehicle.



B: INSTALLATION

CAUTION:

- When disconnecting/connecting hoses, do not apply an excessive force to them. Confirm that no torsion and excessive tension exists 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-22, OPERATION, Refrigerant Charging Procedure.>

Tightening torque:

Refer to COMPONENT in General Description. <Ref. to AC-11, AIR CONDITIONING UNIT, COMPONENT, General Description.>

C: INSPECTION

NOTE:

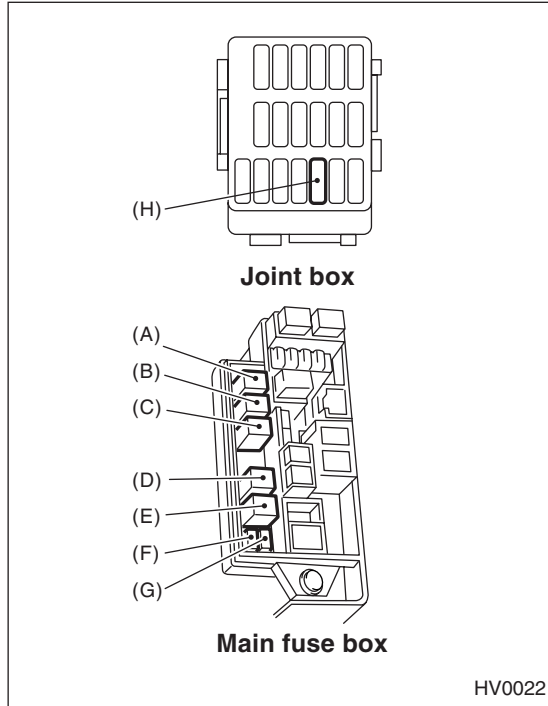
If cracking, damage, or swelling is found on a hose, replace it with a new one.

RELAY AND FUSE

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

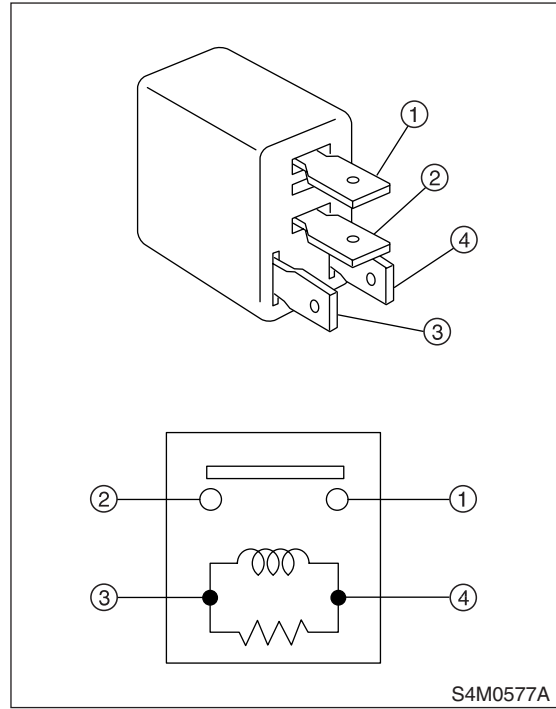
17. Relay and Fuse

A: LOCATION



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 terminal between (3) and (4), check continuity between (1) and (2).

If no continuity exists, replace the relay with a new one.

PRESSURE SWITCH (DUAL SWITCH)

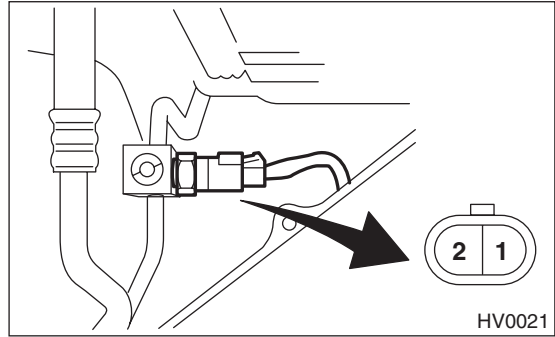
HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

18. Pressure Switch (Dual Switch)

A: INSPECTION

1) Connect the manifold gauge to the service valve on the high-pressure side.

2) Remove the pressure switch harness connector. Using a circuit tester, inspect the ON-OFF operation of the pressure switch.



	Terminal No.	Operation	Standard kPa (kg/cm ² , psi)
High and low pressure switch	1 and 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)

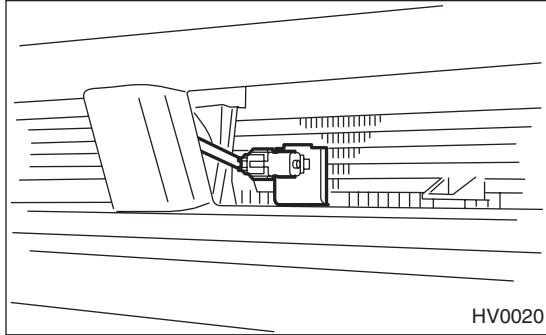
AMBIENT SENSOR (AUTO A/C MODEL)

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

19. Ambient Sensor (Auto A/C Model)

A: REMOVAL

- 1) Open the front hood.
- 2) Disconnect the ground cable from battery.
- 3) Disconnect the ambient sensor connector.
- 4) Remove the ambient sensor from radiator lower panel.



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

<Ref. to AC-38, AMBIENT SENSOR, Diagnostic Procedure for Sensors.>

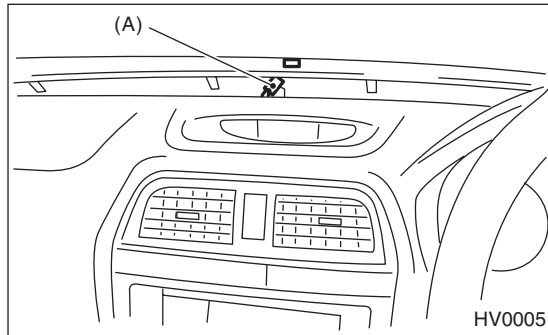
SUN-LOAD SENSOR (AUTO A/C MODEL)

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

20.Sun-load Sensor (Auto A/C Model)

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the front defroster grille.
- 3) Disconnect the sunload sensor connector (A).



CAUTION:

Be careful not to damage the sensors and interior trims when removing them.

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

<Ref. to AC-44, SUNLOAD SENSOR, Diagnostic Procedure for Sensors.>

AIR VENT GRILLE

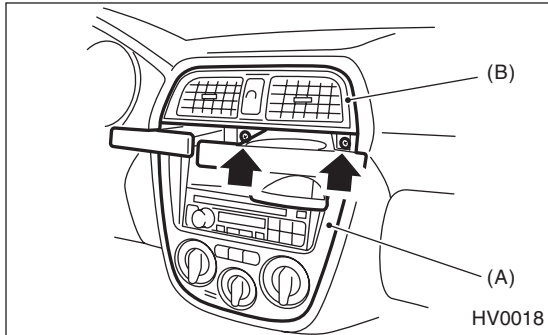
HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

21. Air Vent Grille

A: REMOVAL

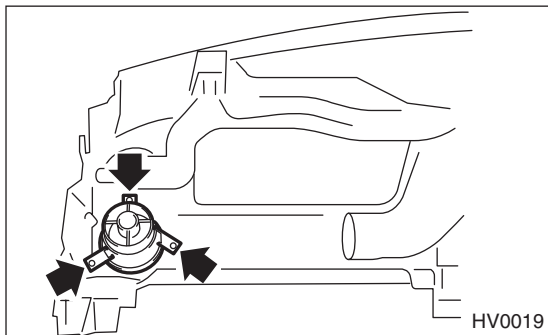
1. CENTER GRILLE

- 1) Disconnect the ground cable from battery.
- 2) Remove the center console panel (A).
- 3) Loosen the two screws to remove the center air vent grille (B).



2. SIDE GRILLE

- 1) Disconnect the ground cable from battery.
- 2) Remove the heater vent duct. <Ref. to AC-44, REMOVAL, Heater Vent Duct.>
- 3) Loosen the screws to remove the 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.

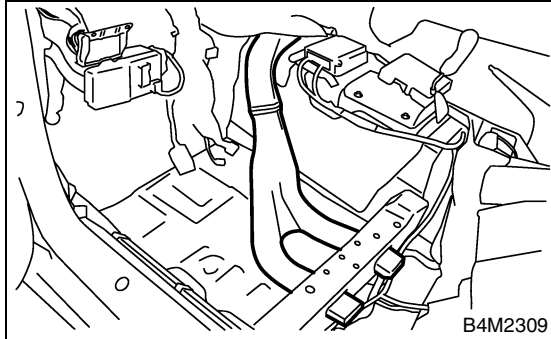
HEATER DUCT

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

22.Heater Duct

A: REMOVAL

- 1) Remove the heater unit. <Ref. to AC-35, Removal.>
- 2) Remove the front seat. <Ref. to SE-6, REMOVAL, Front Seat.>
- 3) Remove the front side sill cover.
- 4) Pull off the floor mat to remove heater duct.



B: INSTALLATION

Install in the reverse order of removal.

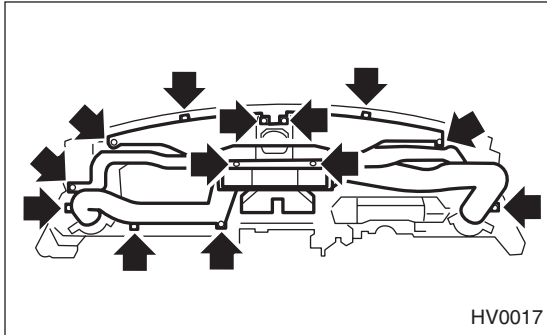
HEATER VENT DUCT

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

23.Heater Vent Duct

A: REMOVAL

- 1) Remove the instrument panel. <Ref. to EI-41, REMOVAL, Instrument Panel Assembly.>
- 2) Remove the screws.
- 3) Remove the heater vent duct.



B: INSTALLATION

Install in the reverse order of removal.

GENERAL DIAGNOSTICS

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

24. General Diagnostics

A: INSPECTION

Symptom		Repair order
Blower motor	Doesn't move.	Fuse
		Blower motor relay
		Blower motor
		Blower motor resistor
		Blower switch
		Wire harness
	Strange noise.	Blower motor
Compressor	Doesn't move.	Refrigerant
		Fuse
		Air conditioning relay
		Magnet clutch
		Compressor
		Pressure switch
		A/C switch
		Blower switch
		Wire harness
	Strange noise	V-Belt
		Magnet clutch
		Compressor
Cold air not emitted.	Refrigerant	
	V-Belt	
	Magnet clutch	
	Compressor	
	Pressure switch	
	A/C switch	
	Blower switch	
	Wire harness	
	Heater duct	
	Heater vent duct	
Warm air not emitted.	Engine coolant	
	Blower switch	
	Heater core	
Temperature of air from vents does not change.	Engine coolant	
	Mode actuator	
	Wire harness	
Unable to switch blow vents.	Mode actuator	
	Air flow switch	
	Wire harness	
Unable to switch suction vents.	Air inlet select switch	
	FRESH/RECIRC actuator	
	Wire harness	

GENERAL DIAGNOSTICS

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

AC

	Page
1. Basic Diagnostic Procedure	2
2. General Description	3
3. Electrical Components Location.....	6
4. A/C Control Module I/O Signal	8
5. Diagnostics Chart for Diagnosis System.....	18
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9. Symptom Related Diagnostic.....	46

BASIC DIAGNOSTIC PROCEDURE

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

1. Basic Diagnostic Procedure

A: PROCEDURE

Step	Check	Yes	No
1 START INSPECTIONS. 1) Perform the pre-inspection. 2) Perform the self-diagnosis. <Ref. to AC-18, SELF-DIAGNOSIS MODE, Diagnostics Chart for Diagnosis System.>	Does the 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 the 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 the A/C switch ON. 2) Set the temperature at maximum cold position. 3) Check the 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 the response of A/C system.	Does the 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 cables while the engine is running.
 - A large counter electromotive force will be generated in the alternator, and this voltage may damage electronic parts such as 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 the 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 the battery voltage and specific gravity of electrolyte.

Standard voltage: 12 V

Specific gravity: Above 1.260

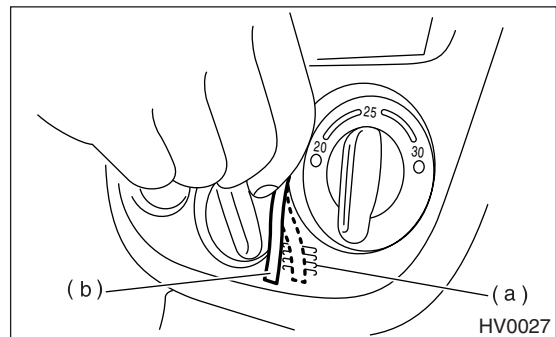
- 2) Check the condition of the fuses for A/C, heater and other fuses.
- 3) Check the condition of the harnesses and harness connectors connection.

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 the ignition switch to ON and push the "A/C" switch.
- 3) Turn the temperature control dial to maximum hot position.
- 4) Turn the air flow control dial to "DEF" position.
- 5) Turn the 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:

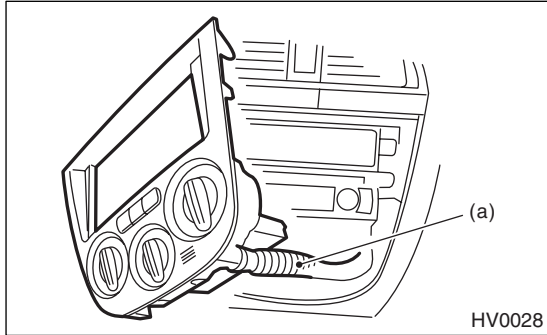
- Ensure the thread does not get sucked into the port.
- Hold the thread approx. 5 mm (0.02 in) away from port when the suction force is not very strong.



GENERAL DESCRIPTION

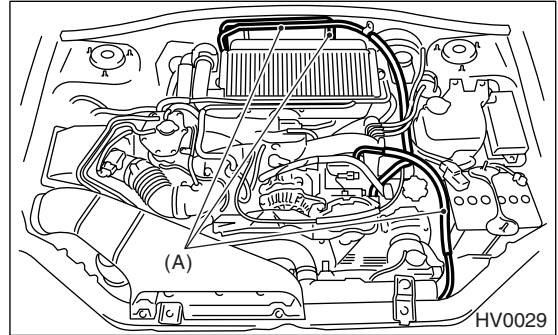
HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

7) If the thread does not move at all, remove the auto A/C control unit <Ref. to AC-31, 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 the state of mode door linkage.
- 2) Check the state of air mix door linkage.
- 3) Check the state of intake door linkage.

GENERAL DESCRIPTION

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

5. CONTROL SWITCHES

Start and warm up the 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 the 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.

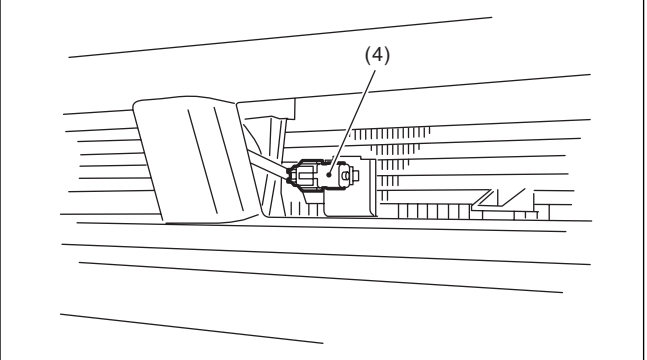
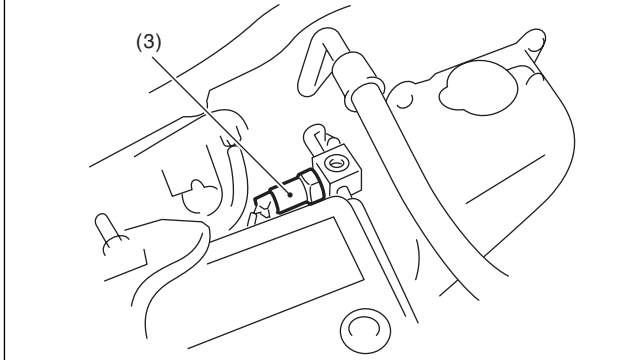
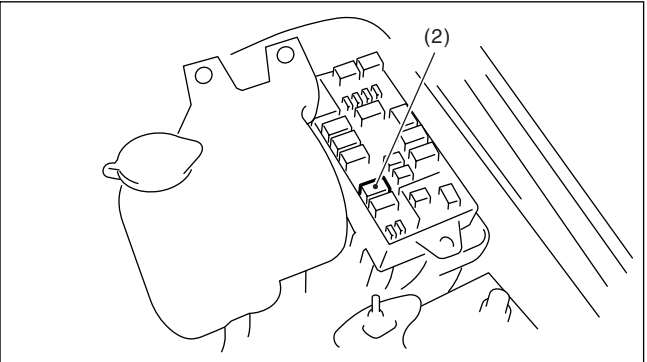
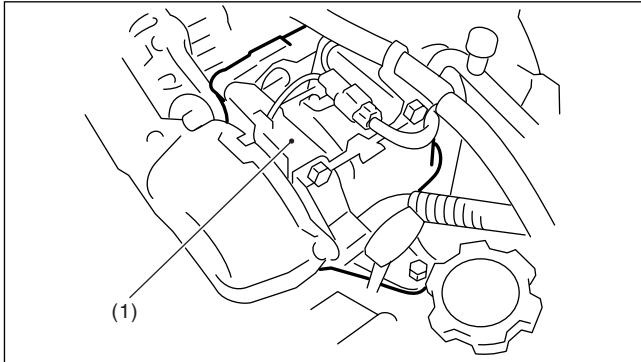
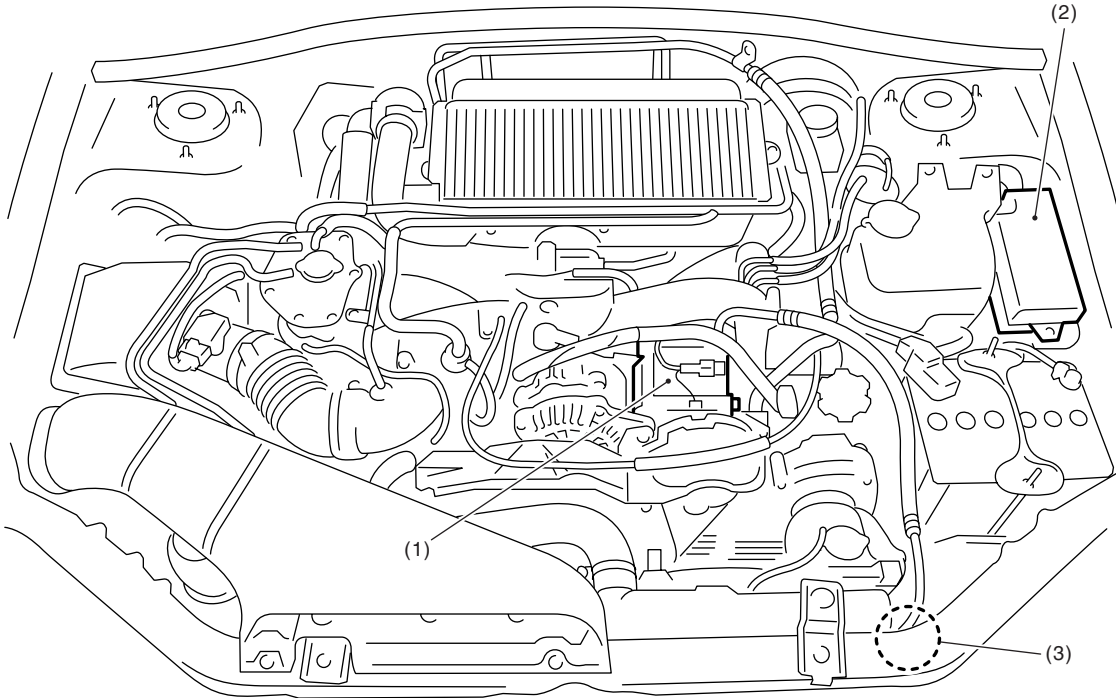
ELECTRICAL COMPONENTS LOCATION

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

3. Electrical Components Location

A: LOCATION

1. ENGINE COMPARTMENT



HV0030

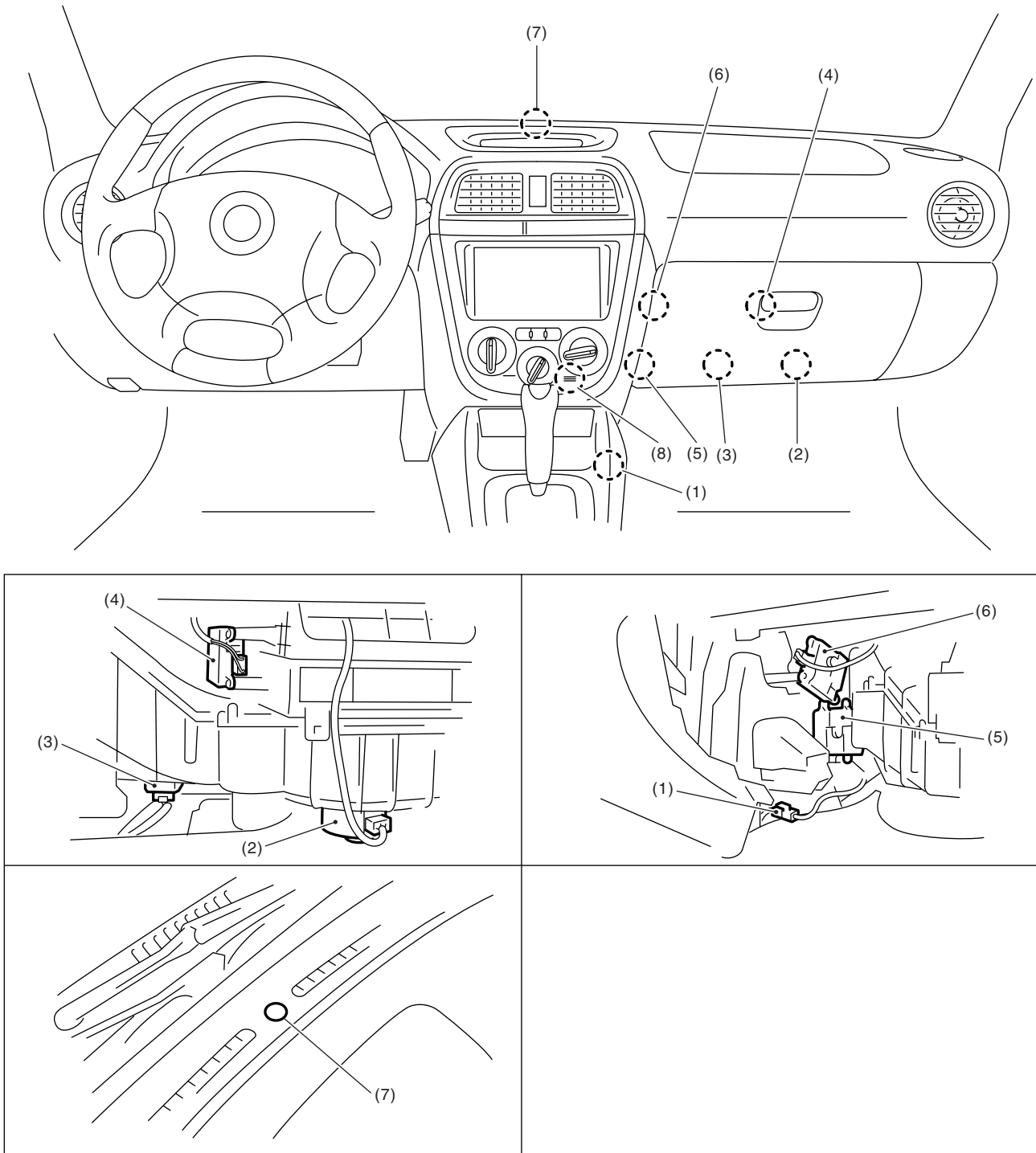
- (1) A/C compressor
- (2) A/C relay

- (3) Pressure switch
- (4) Ambient sensor

ELECTRICAL COMPONENTS LOCATION

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

2. PASSENGER COMPARTMENT



HV0031

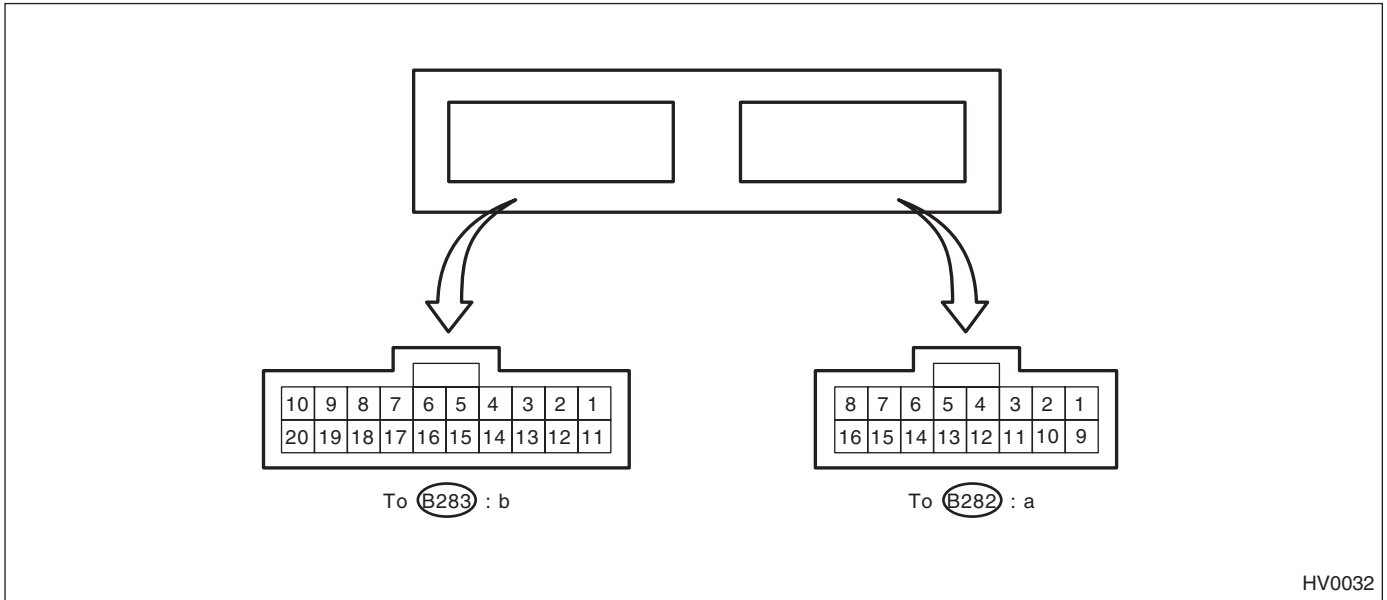
- | | | |
|---------------------------|---------------------------|---|
| (1) Evaporator sensor | (4) Intake door actuator | (7) Sunload sensor |
| (2) Blower motor | (5) Air mix door actuator | (8) In-vehicle sensor
(built-in Auto A/C control module) |
| (3) Blower motor resistor | (6) Mode door actuator | |

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

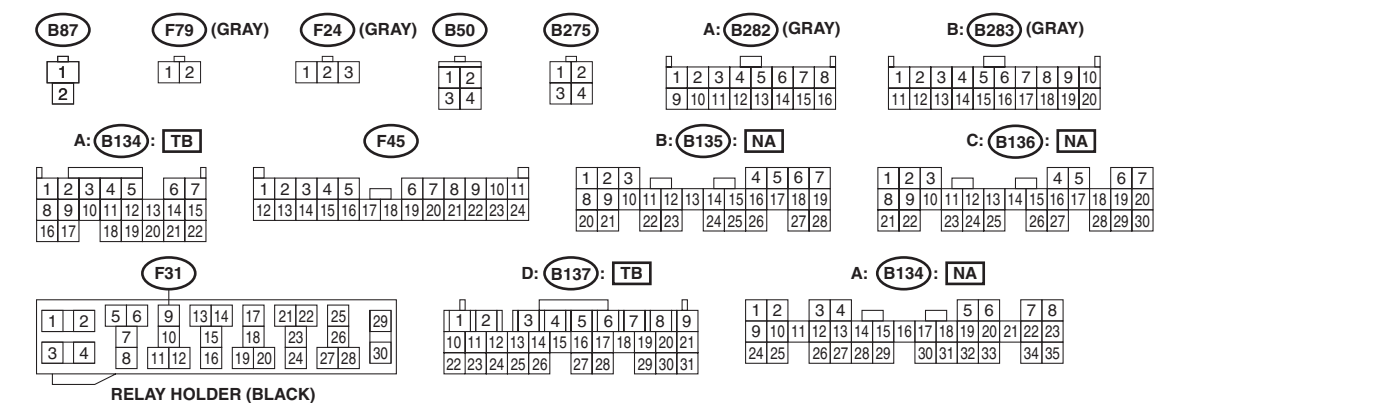
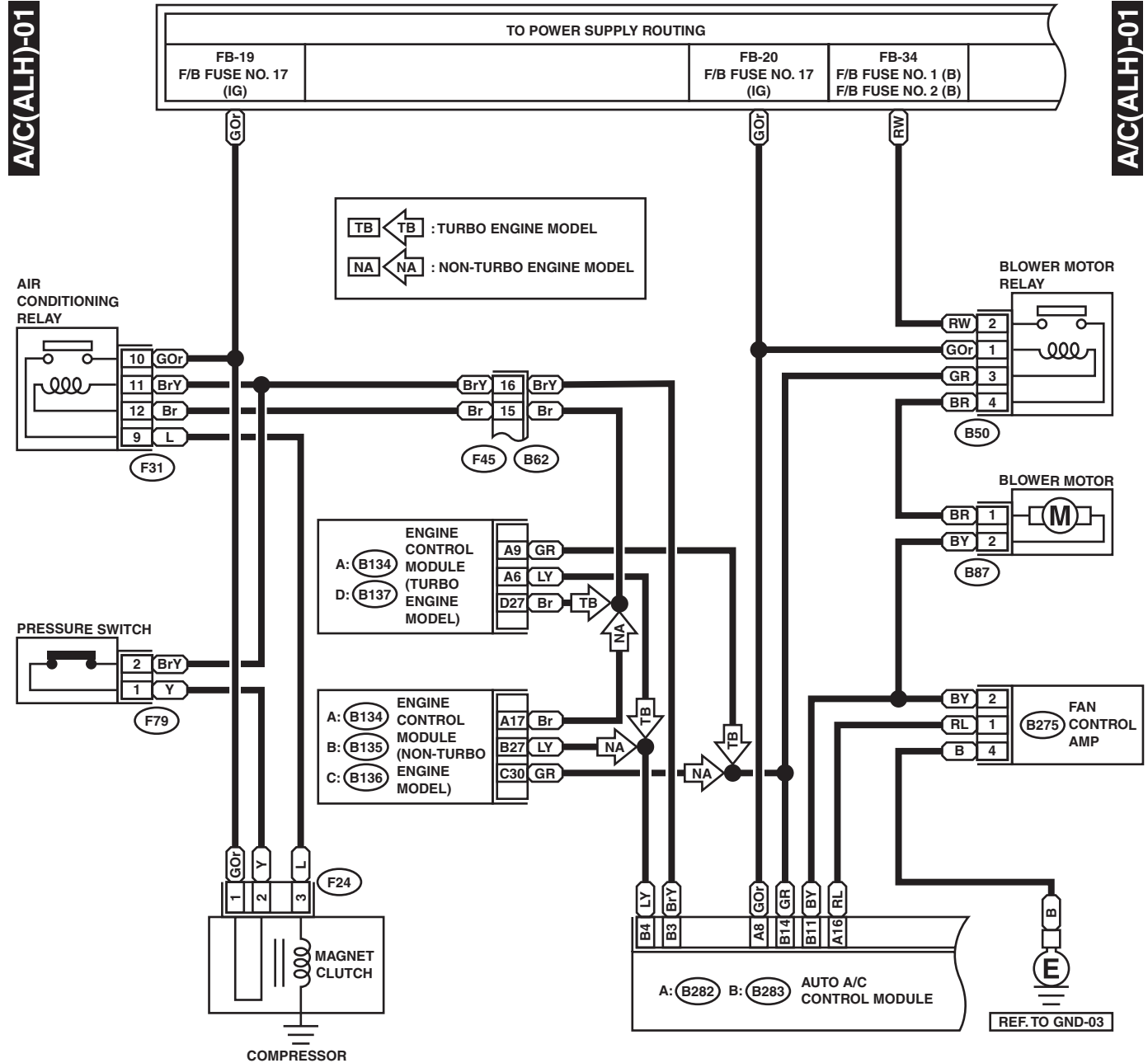
Content	Connector & Terminal No.	Signal (V)
Battery power supply (Memory back-up)	b1—b12	Battery voltage, 13 — 14 (engine running)
IGN power supply	a8—b12	Battery voltage (ignition switch ON), 13 — 14 (engine running)
ACC power supply (OFF: ignition in START or diagnosis system reset)	b2—b12	Battery 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

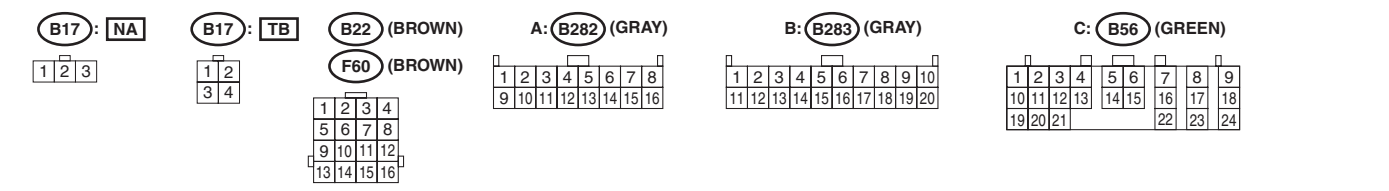
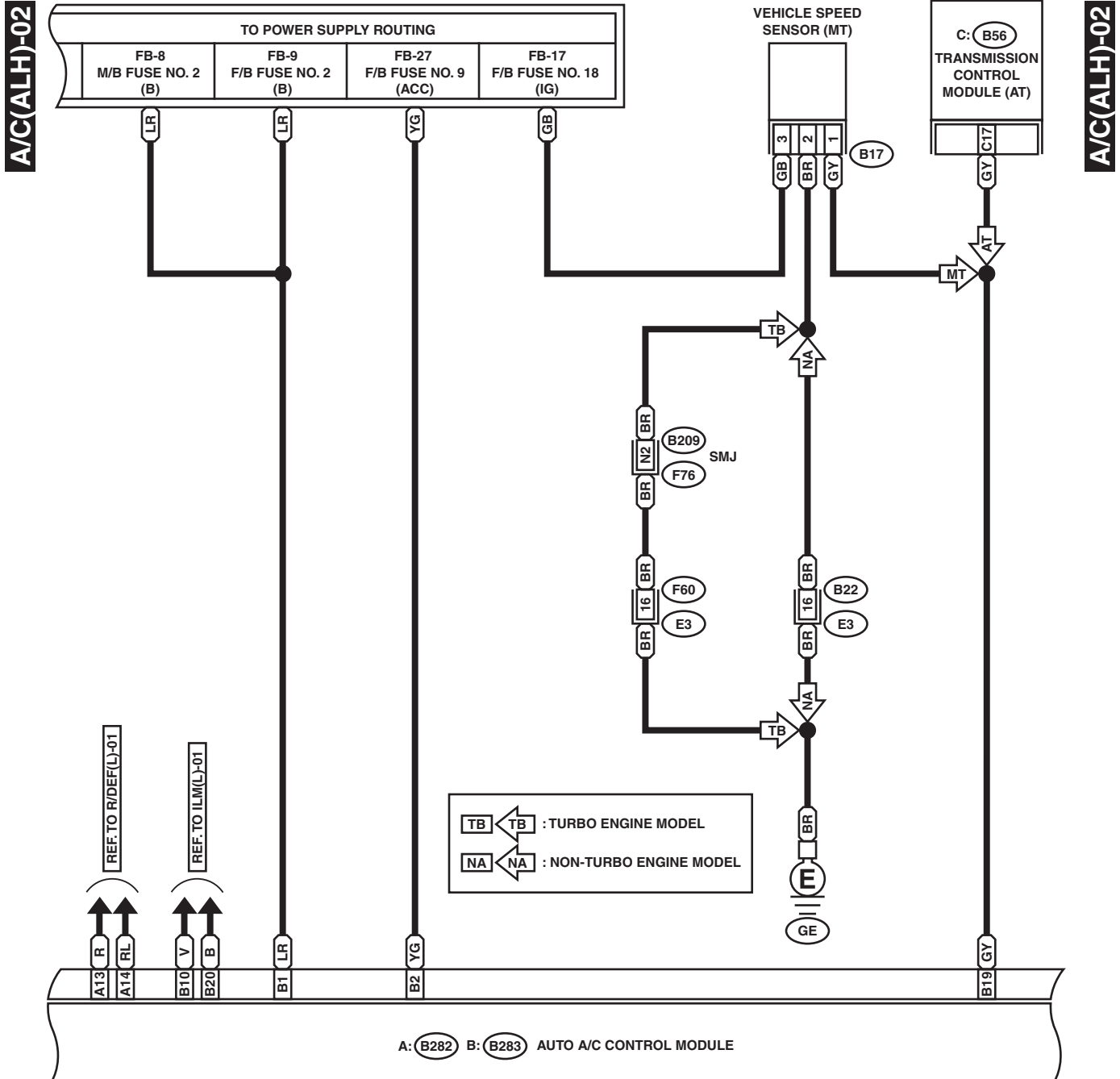
1. AIR CONDITIONER AUTO A/C LHD MODEL



GL46-21A

A/C CONTROL MODULE I/O SIGNAL

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

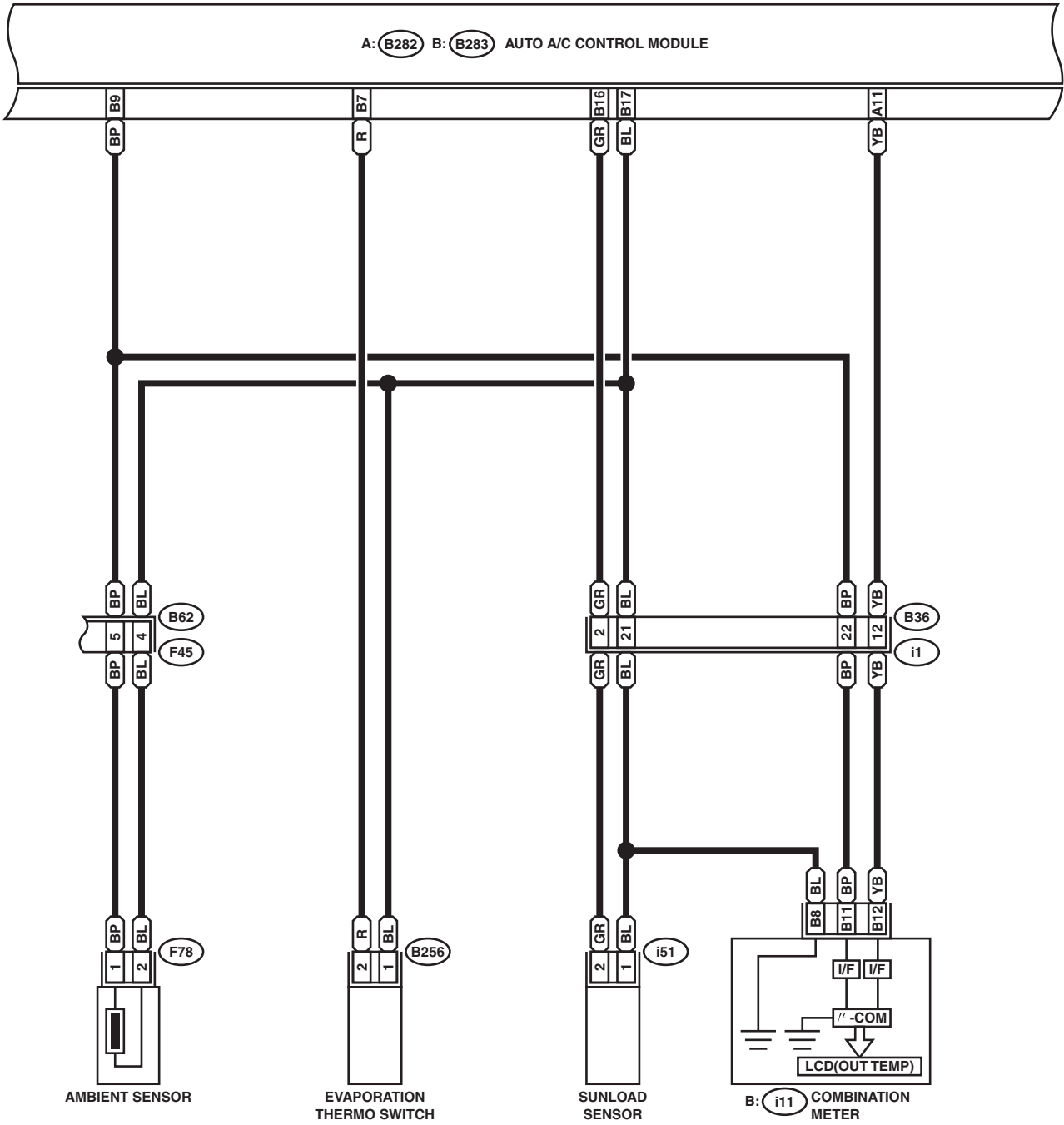


A/C CONTROL MODULE I/O SIGNAL

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

A/C(ALH)-03

A/C(ALH)-03



B256

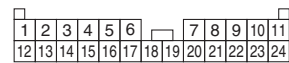
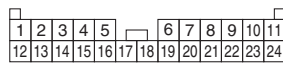
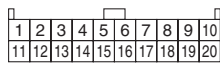
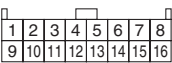
A: B282 (GRAY)

B: B283 (GRAY)

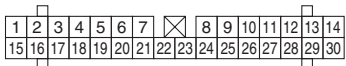
F45

B36 (BLACK)

F78 (BLACK)



B: i11 (GREEN)

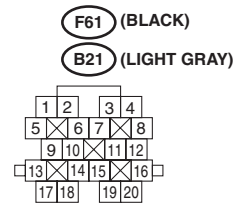
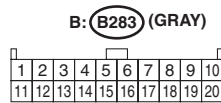
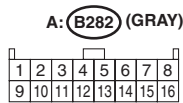
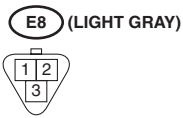
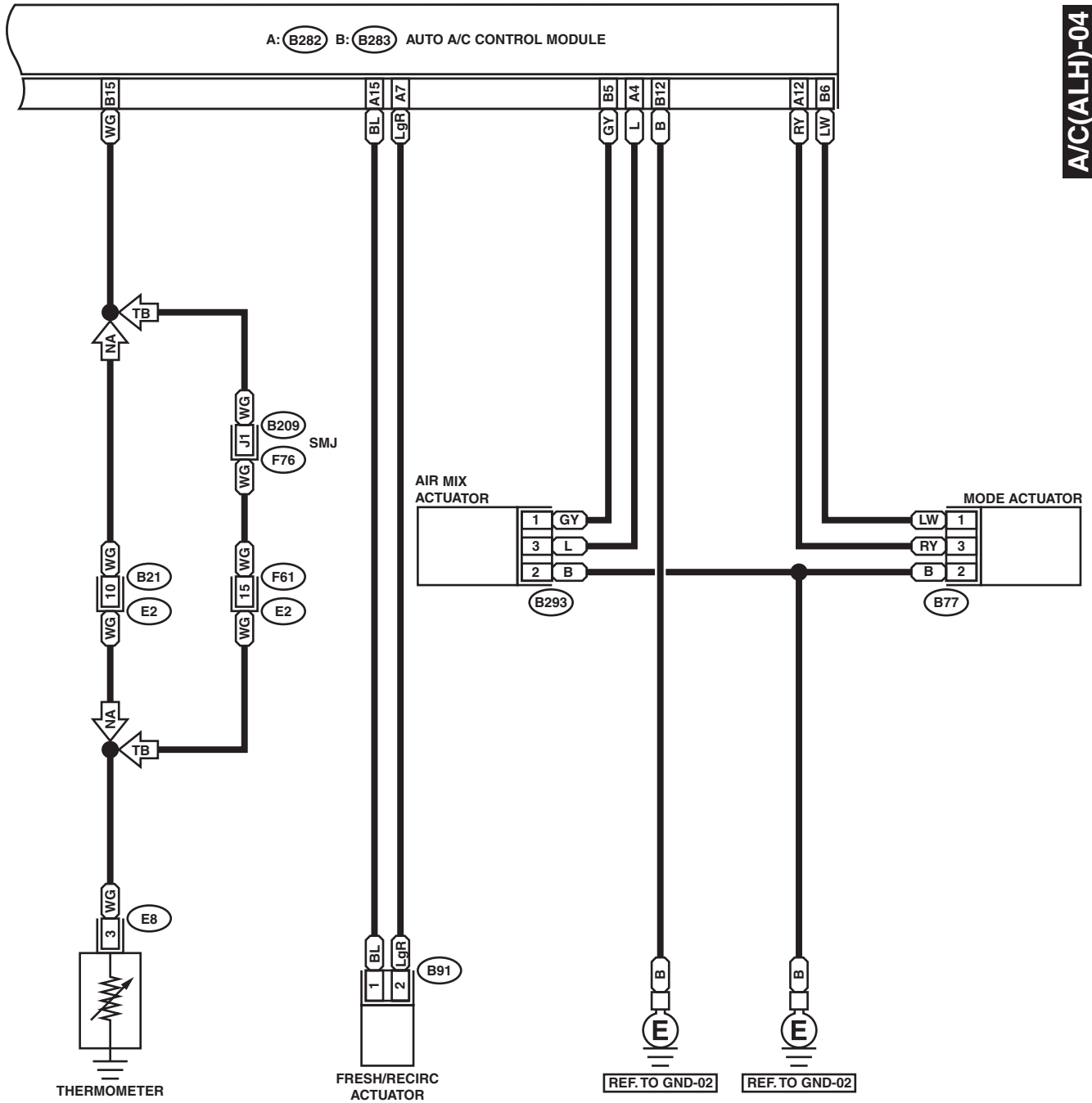


A/C CONTROL MODULE I/O SIGNAL

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

A/C(ALH)-04

A/C(ALH)-04

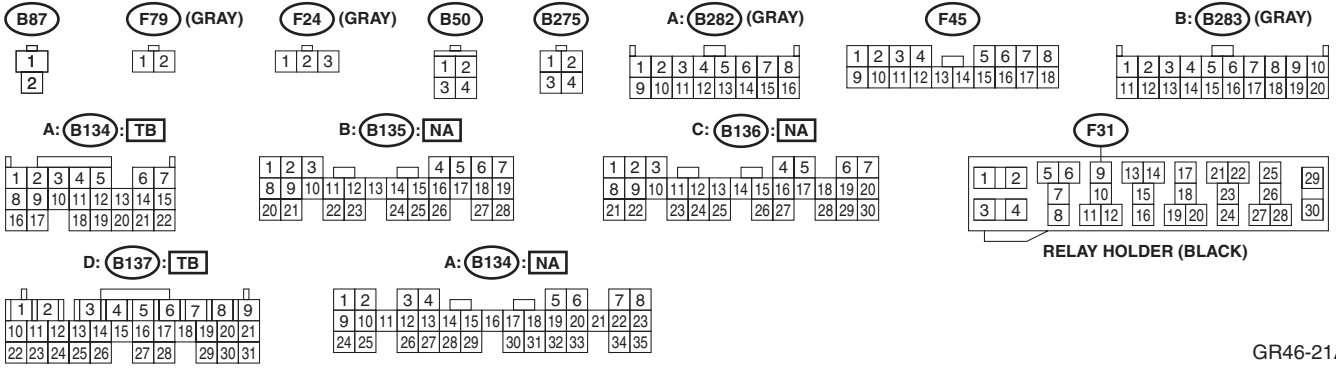
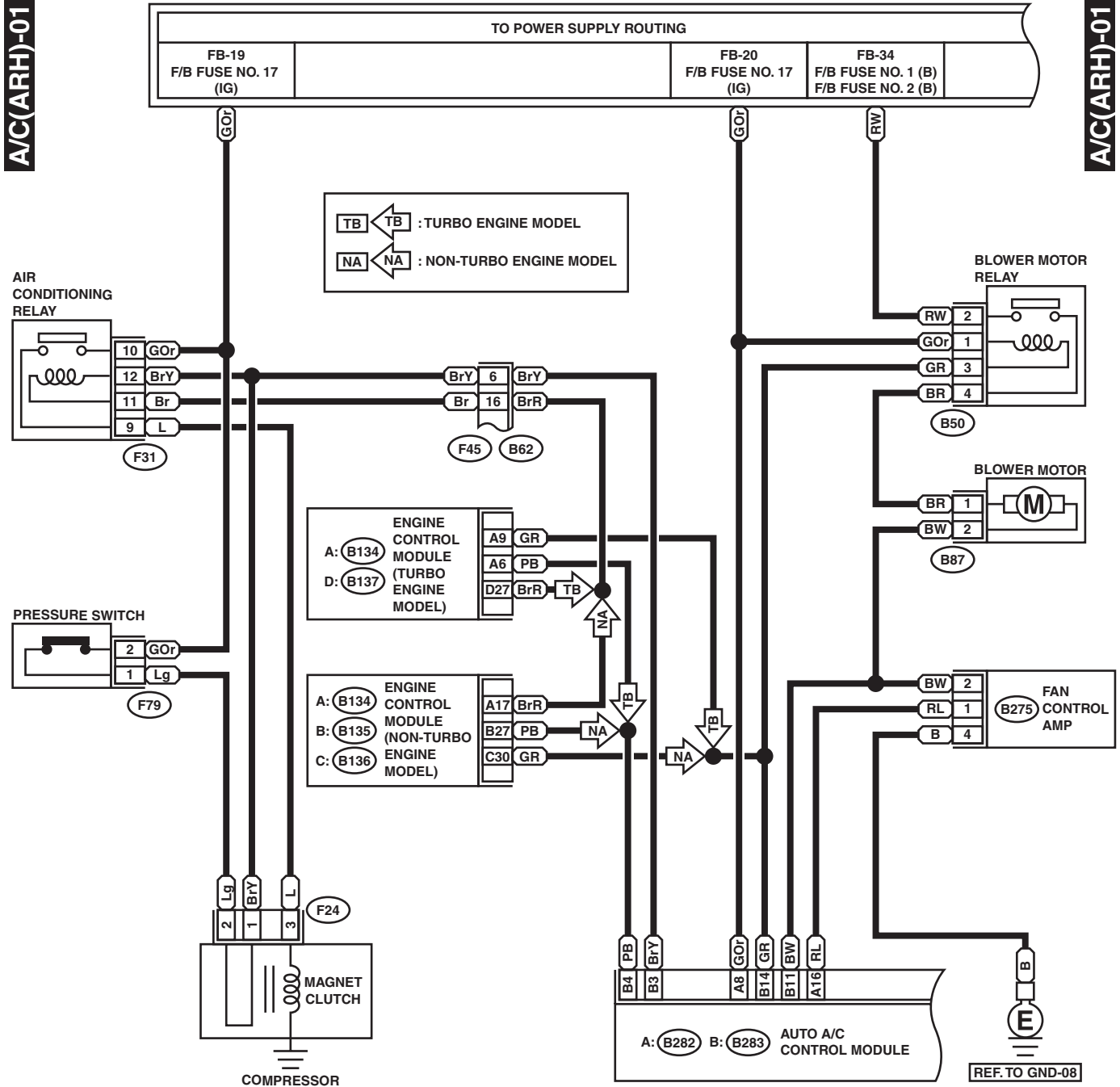


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A/C CONTROL MODULE I/O SIGNAL

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

2. AIR CONDITIONER AUTO A/C RHD MODEL



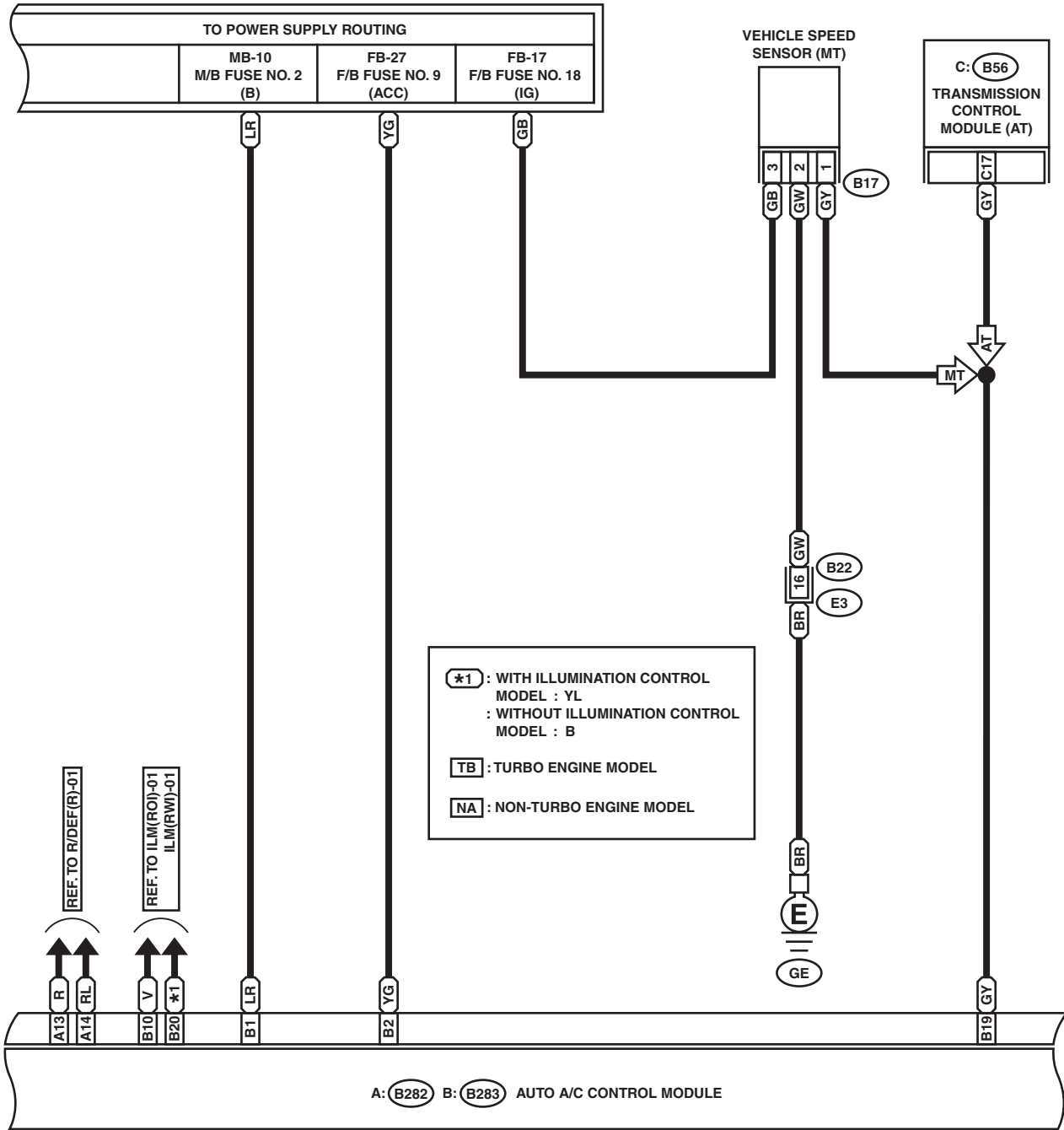
GR46-21A

A/C CONTROL MODULE I/O SIGNAL

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

A/C(ARH)-02

A/C(ARH)-02



B17 (BLACK): NA



B17 (BLACK): TB



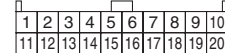
B22 (BROWN)



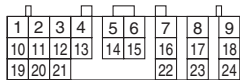
A: B282 (GRAY)



B: B283 (GRAY)



C: B56 (GREEN)



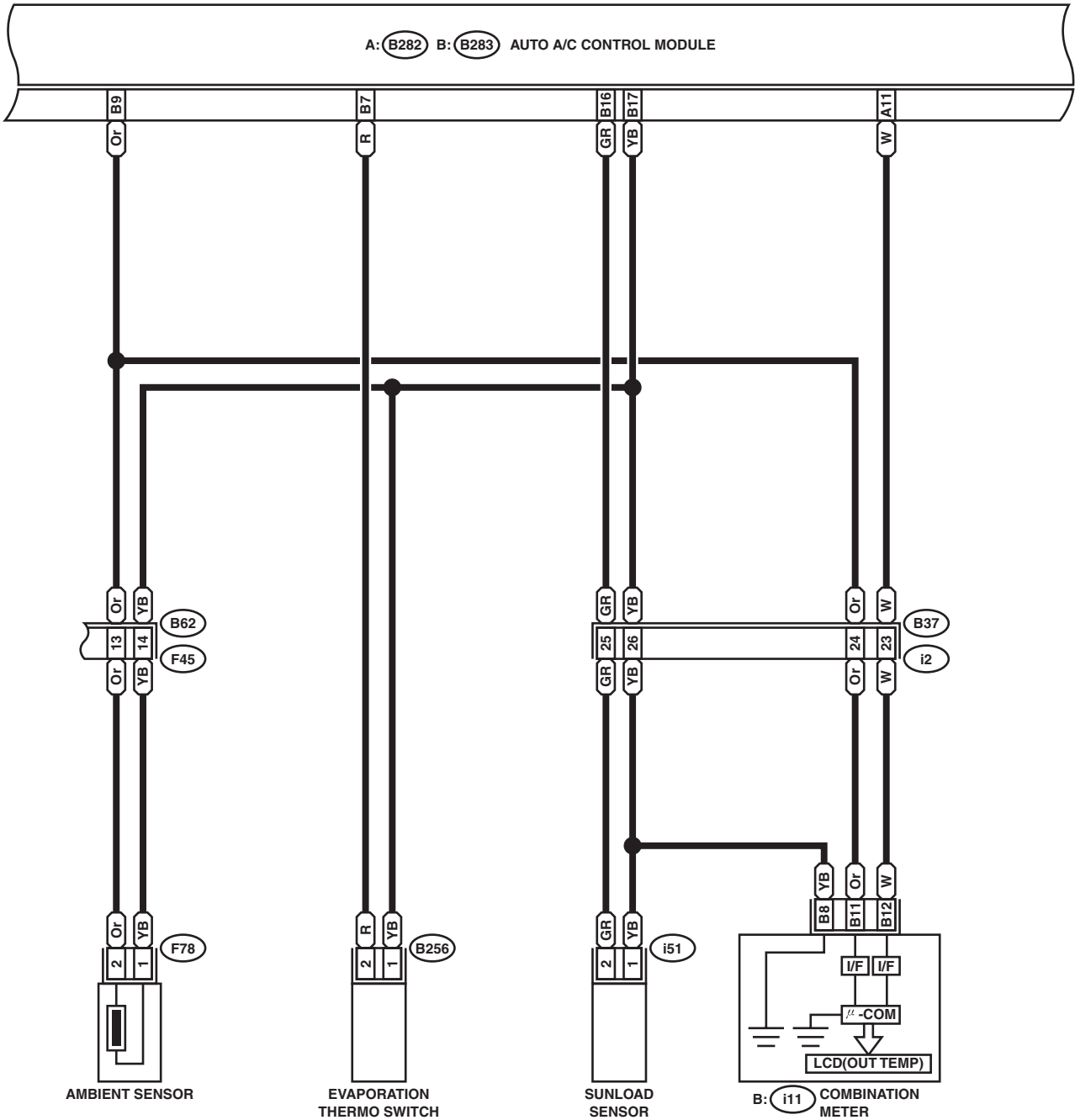
GR46-21B

A/C CONTROL MODULE I/O SIGNAL

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

A/C(ARH)-03

A/C(ARH)-03



F78 (BLACK)

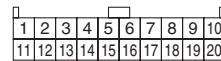
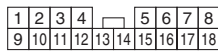
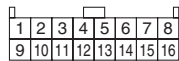
A: B282 (GRAY)

F45

B: B283 (GRAY)

B: i11 (GREEN)

B256



i1

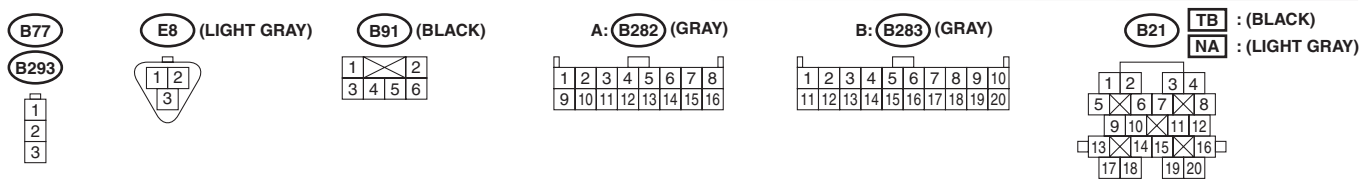
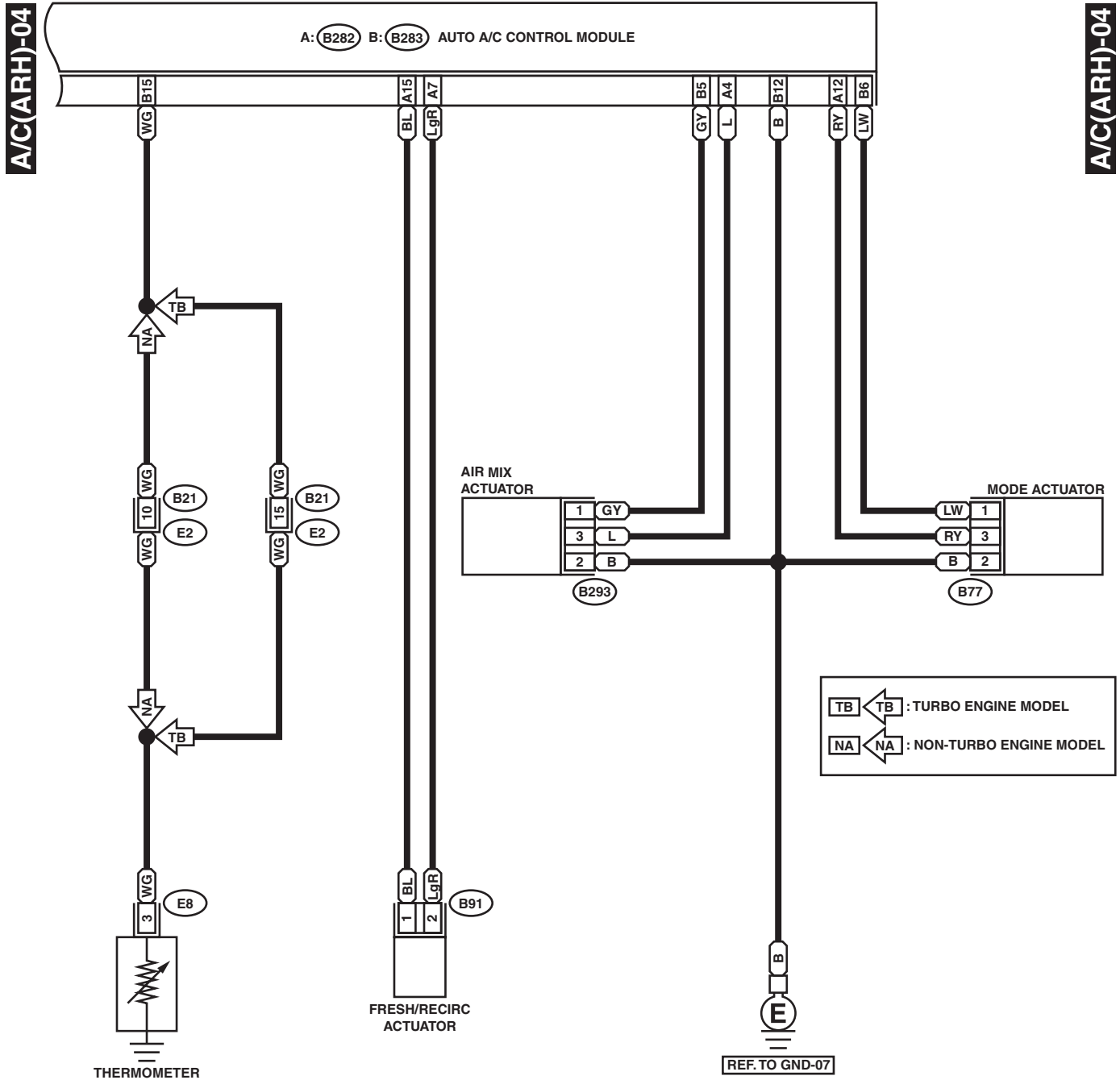
i2



GR46-21C

A/C CONTROL MODULE I/O SIGNAL

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)



A/C CONTROL MODULE I/O SIGNAL

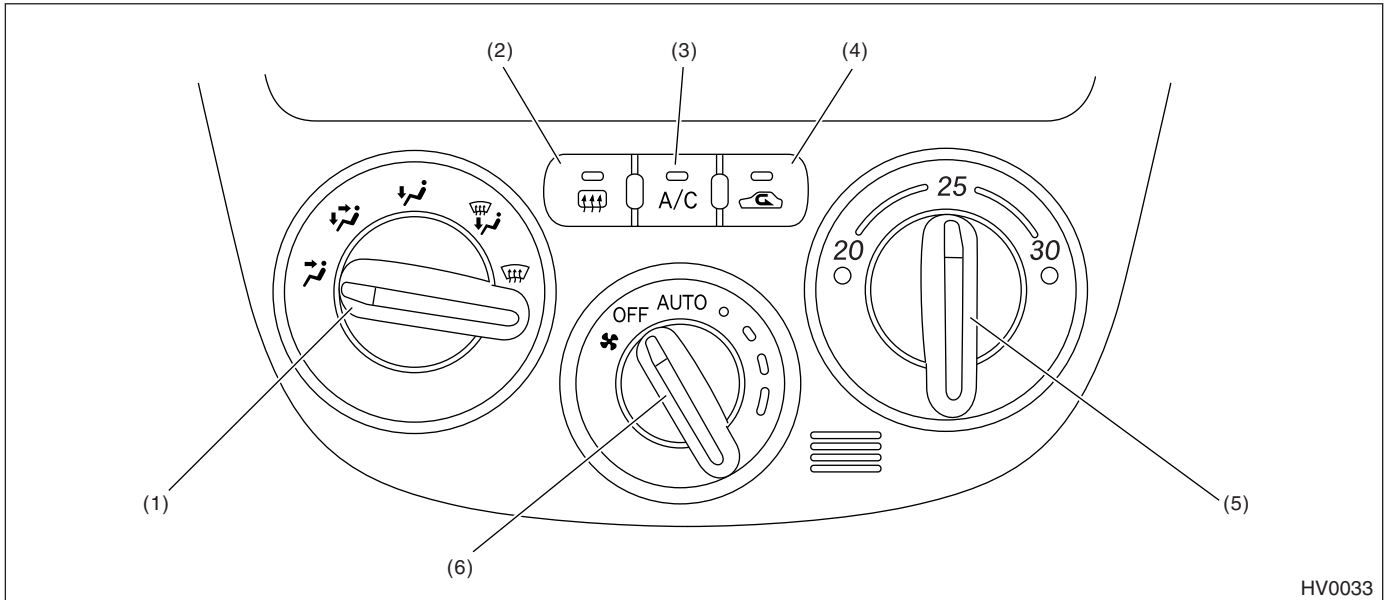
HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

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 the fan speed control dial to OFF position. 2) Start the 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 illuminates (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 the fan speed control dial to AUTO position. 2) If the system has trouble for each sensor, rear window defogger switch LED is turned off. 3) If the system has no trouble, rear window defogger switch LED is illuminated.	Does the rear window defogger switch LED illuminate?	Go to step 5.	Go to step 4.
4 CONFIRM MALFUNCTIONING SENSOR. 1) Turn the fan speed control dial to 1st position. 2) Turn the 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 the malfunctioning sensor. <Ref. to AC-38, 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 the fan speed control dial to 2nd position. 2) If the system has trouble for mode door position signal, rear window defogger switch LED is turned off. 3) If the system has no trouble, rear window defogger switch LED is illuminated.	Does the rear window defogger switch LED illuminate?	Go to step 6.	Check the mode door actuator circuit. <Ref. to AC-34, MODE DOOR ACTUATOR, Diagnostic Procedure for Actuators.>
6 CHECK BLOWER FAN OPERATION. 1) Turn the fan speed control dial to 3rd position. 2) Turn the temperature control dial, check that blower fan speed changes depending on set temperature.	Does the blower fan speed change?	Go to step 7.	Check the 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 the fan speed control dial to 4th position. 2) Select the 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 the 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 (Potential 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)

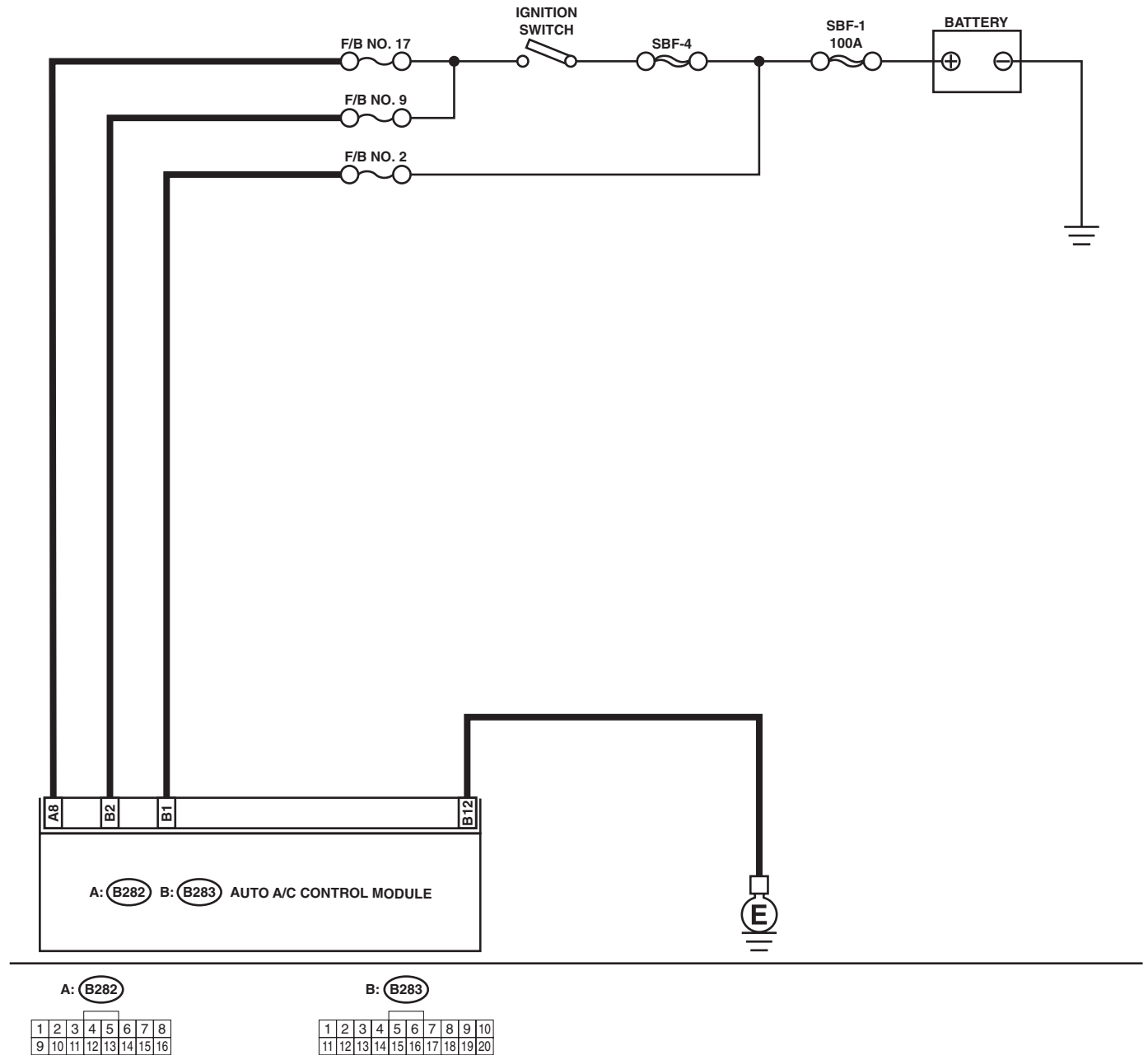
6. Diagnostics for A/C System Failure

A: A/C AND/OR SELF-DIAGNOSIS SYSTEMS DO NOT OPERATE

TROUBLE SYMPTOM:

- "Set" temperature is not indicated on the 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 the ignition switch to OFF. 2) Remove the fuse No. 2 from main fuse box. 3) Check the condition of fuse.	Is the fuse blown-out?	Replace the fuse.	Go to step 2.
2 CHECK FUSE. 1) Turn the ignition switch to OFF. 2) Remove the fuses No. 9 and No. 17 from fuse & relay box. 3) Check the condition of fuse.	Is the fuse blown-out?	Replace the fuse.	Go to step 3.
3 CHECK A/C CONTROL MODULE POWER CIRCUIT. 1) Pull out the A/C control module connector. 2) Measure the voltage between A/C control module connector terminal and chassis ground when turning ignition switch to OFF. <i>Connector & terminal</i> <i>(B283) No. 1 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Go to step 4.	Repair the short circuit in harness for power supply line.
4 CHECK A/C CONTROL MODULE POWER CIRCUIT. Measure the voltage between A/C control module connector terminal and chassis ground when turning ignition switch to ACC. <i>Connector & terminal</i> <i>(B283) No. 2 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Go to step 5.	Repair the short circuit in harness for power supply line.
5 CHECK A/C CONTROL MODULE POWER CIRCUIT. Measure the voltage between A/C control module connector terminal and chassis ground when turning ignition switch to ON. <i>Connector & terminal</i> <i>(B282) No. 8 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Go to step 6.	Repair the short circuit in harness for power supply line.
6 CHECK A/C CONTROL MODULE GROUND CIRCUIT. Measure the resistance of harness between A/C control module and chassis ground. <i>Connector & terminal</i> <i>(B283) No. 12 — Chassis ground:</i>	Is the resistance less than 5 Ω ?	Go to step 7.	Repair the 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 the poor contact in A/C control module.	Contact with your Subaru distributor service.

DIAGNOSTICS FOR A/C SYSTEM FAILURE

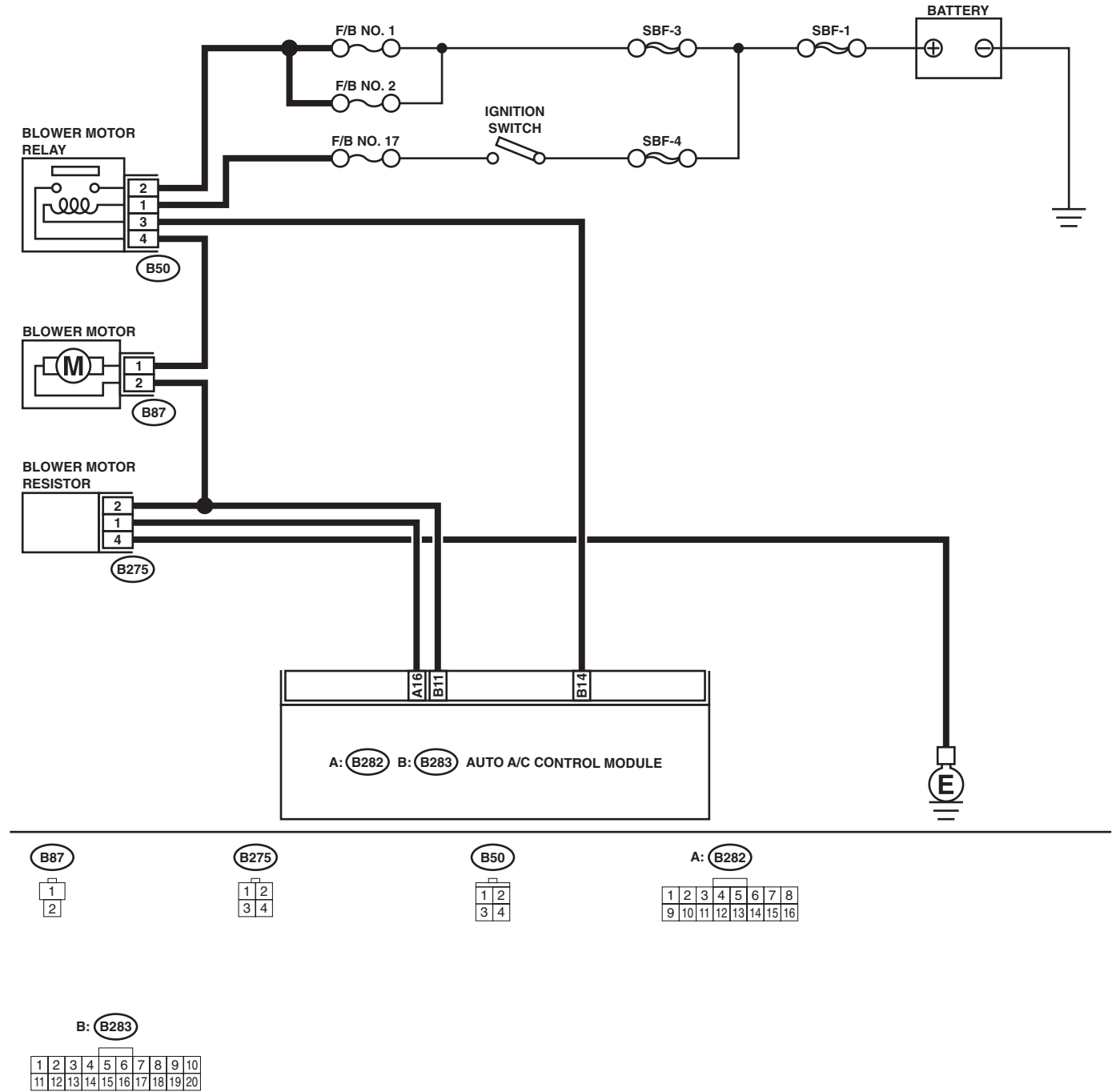
HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

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)

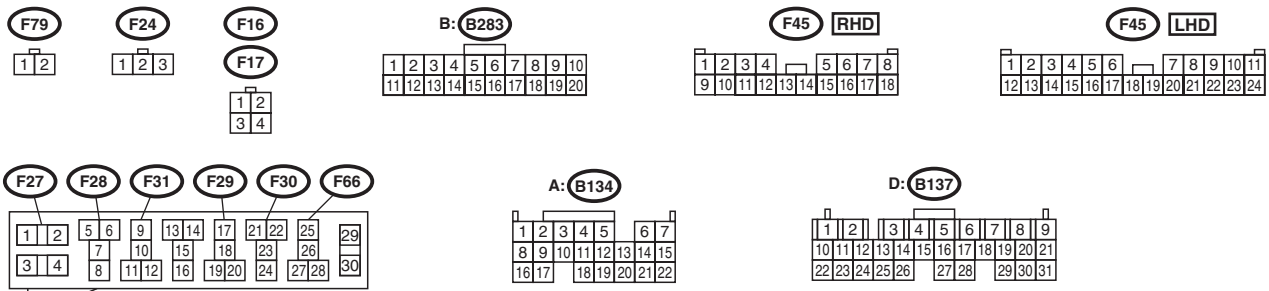
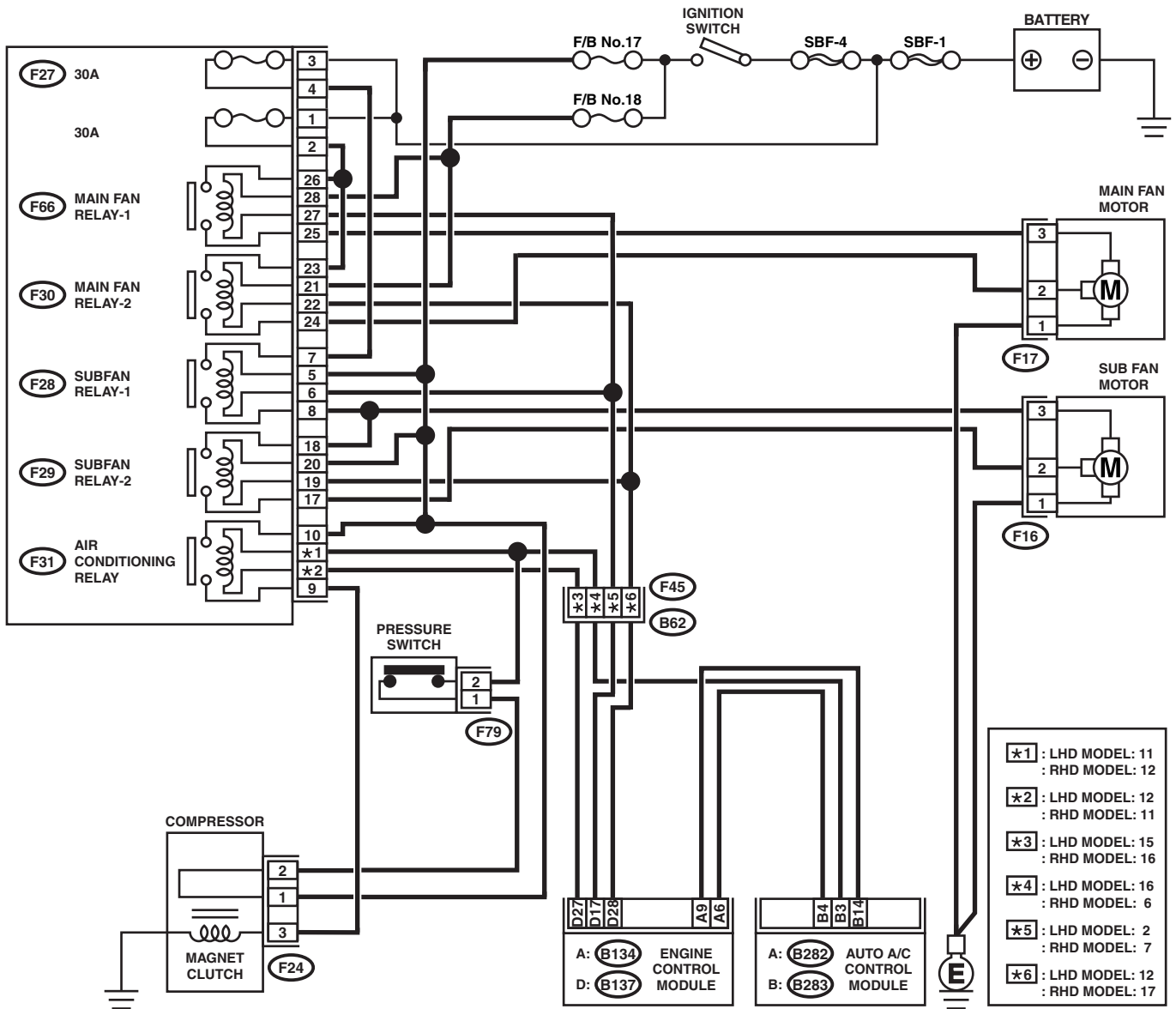
Step	Check	Yes	No
1 CHECK FUSE. 1)Remove the No.1, No. 2 and No. 17 fuses in fuse & relay box. 2)Check the condition of fuses.	Are any of the fuses blown-out?	Replace the fuse.	Go to step 2.
2 CHECK POWER SUPPLY TO BLOWER FAN MOTOR. 1)Turn the ignition switch to ON. 2)Turn the blower switch to ON. 3)Measure the 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 the open circuit in harness for blower fan motor power supply line.
3 CHECK BLOWER FAN MOTOR RELAY. 1)Turn the ignition switch to OFF. 2)Remove the blower fan motor relay. 3)Connect the battery to No. 1 and No. 3 terminals of blower fan motor connector. 4)Measure the 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 the blower fan motor relay.
4 CHECK BLOWER FAN MOTOR. 1)Disconnect the connector from blower fan motor. 2)Connect the battery to connector terminals of blower fan motor. 3)Make sure that the blower fan motor is operated.	Does the blower fan motor operate?	Go to step 5.	Replace the 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 service.

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

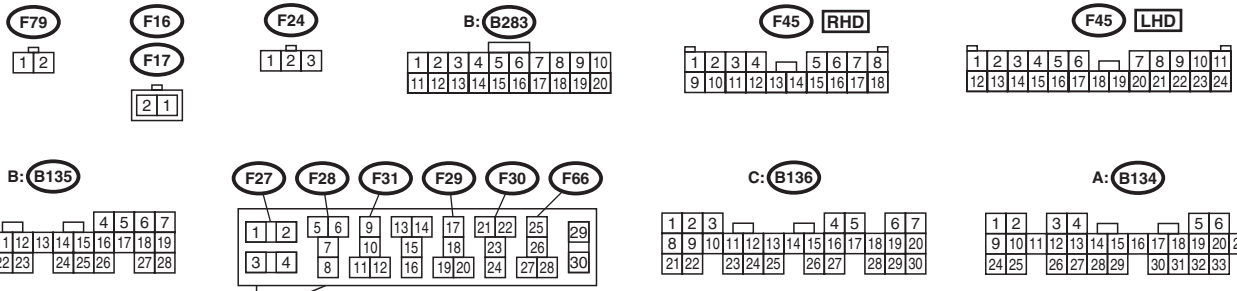
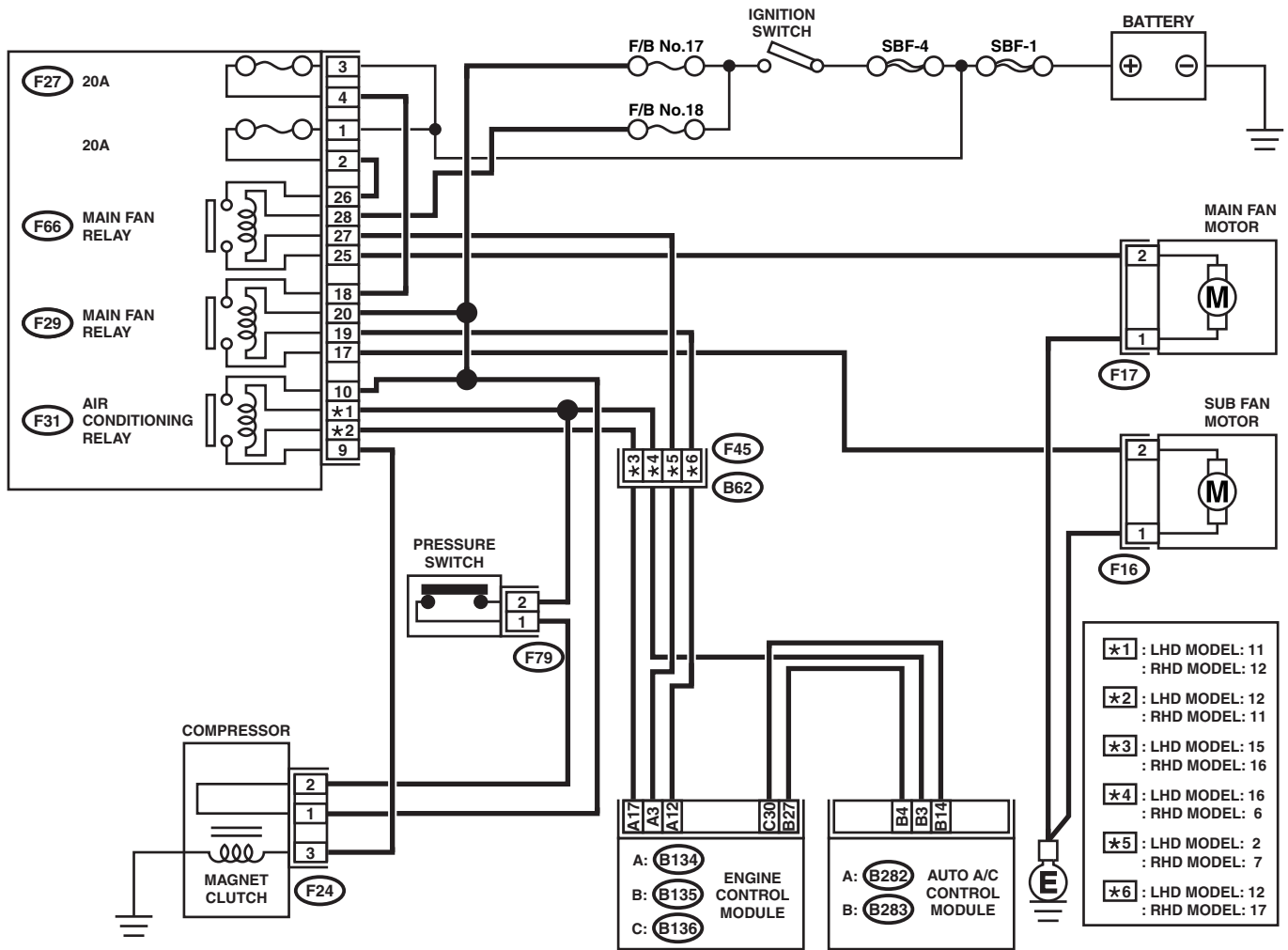
WIRING DIAGRAM FOR TURBO ENGINE MODEL:



DIAGNOSTICS FOR A/C SYSTEM FAILURE

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

WIRING DIAGRAM FOR NON-TURBO ENGINE MODEL:



HV0066

Step	Check	Yes	No
1	<p>CHECK FUSE.</p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Remove the No. 2 fuse in main fuse box.</p> <p>3) Check the condition of fuse.</p>	Is the fuse blown-out?	Replace the fuse. Go to step 2.

DIAGNOSTICS FOR A/C SYSTEM FAILURE

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

Step	Check	Yes	No
2 CHECK POWER SUPPLY TO MAGNET CLUTCH OF A/C COMPRESSOR. 1) Start the engine, and turn A/C switch to ON. 2) Set the temperature control dial to maximum cold position. 3) Measure the voltage between magnet clutch connector and chassis ground. <i>Connector & terminal</i> <i>(F24) No. 3 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Go to step 3.	Repair the open circuit in harness for power supply line of the A/C compressor.
3 CHECK SIGNAL VOLTAGE TO A/C RELAY. 1) Turn the ignition switch to ON. 2) Turn the A/C switch to ON. 3) Measure the signal voltage to A/C relay and chassis ground. <i>Connector & terminal</i> <i>(F31) No. 9 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Go to step 4.	Repair the open circuit in harness for power supply line.
4 CHECK A/C RELAY. 1) Remove the A/C relay in main fuse box. 2) Check the A/C relay. <Ref. to AC-38, INSPECTION, Relay and Fuse.>	Is the operation of the relay OK?	Go to step 5.	Replace the A/C relay.
5 CHECK OPERATION OF MAIN FAN MOTOR. 1) Start the engine. 2) Turn the A/C switch to ON. 3) Check the 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 the engine during repair. 1) Turn the ignition switch to OFF. 2) Disconnect the 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 the voltage between main fan motor connector and chassis ground. <i>Connector & terminal</i> <i>Turbo engine model:</i> <i>(F17) No. 2, 3 (+) — Chassis ground (-):</i> <i>Non-turbo engine model:</i> <i>(F17) No. 2 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Go to step 7.	Repair the open circuit in harness for power supply circuit.
7 CHECK GROUND CIRCUIT OF MAIN FAN MOTOR. 1) Turn the ignition switch to OFF. 2) Measure the resistance between main fan motor connector and chassis ground. <i>Connector & terminal</i> <i>(F17) No. 1 — Chassis ground:</i>	Is the resistance less than 1 Ω?	Go to step 8.	Repair the 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 the 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 the battery positive (+) terminal to terminal No. 2 and 3 (turbo engine model) or 2 (non-turbo engine model), and ground (-) terminal to terminal No. 1 of main fan motor connector.	Does the main fan rotate?	Repair the poor contact in main fan motor connector.	Replace the main fan motor with a new one.
10 CHECK OPERATION OF SUB FAN MOTOR. Check the 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 the engine during repair. 1) Turn the ignition switch to OFF. 2) Disconnect the 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 the 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 the open circuit in harness for power supply circuit.
12 CHECK GROUND CIRCUIT OF SUB FAN MOTOR. 1) Turn the ignition switch to OFF. 2) Measure the 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 the 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 the poor contact in sub fan motor connector.	Go to step 14.
14 CHECK SUB FAN MOTOR. Connect the battery positive (+) terminal to terminal No. 2 and 3 (turbo engine model) or 2 (non-turbo engine model), and ground (-) terminal to terminal No. 1 of sub fan motor connector.	Does the sub fan rotate?	Repair the poor contact in sub fan motor connector.	Replace the sub fan motor with a new one.
15 CHECK EACH SENSOR AND POTENTIOMETER. Check the sensors and potentiometer for proper operation using the self-diagnostic function. <Ref. to AC-18, Diagnostics Chart for Diagnosis System.>	Is the operation of each sensor and potentiometer normal?	Go to step 16.	Check the sensor and circuit. <Ref. to AC-38, 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 the 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-32, Diagnostic Procedure for Actuators.>

DIAGNOSTICS FOR A/C SYSTEM FAILURE

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

Step	Check	Yes	No
18 CHECK POOR CONTACT. Check poor contact in A/C control module.	Is there poor contact in A/C control module?	Repair the poor contact in A/C control module.	Contact with your Subaru distributor service.

DIAGNOSTICS FOR A/C SYSTEM FAILURE

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

DIAGNOSTIC PROCEDURE FOR ACTUATORS

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

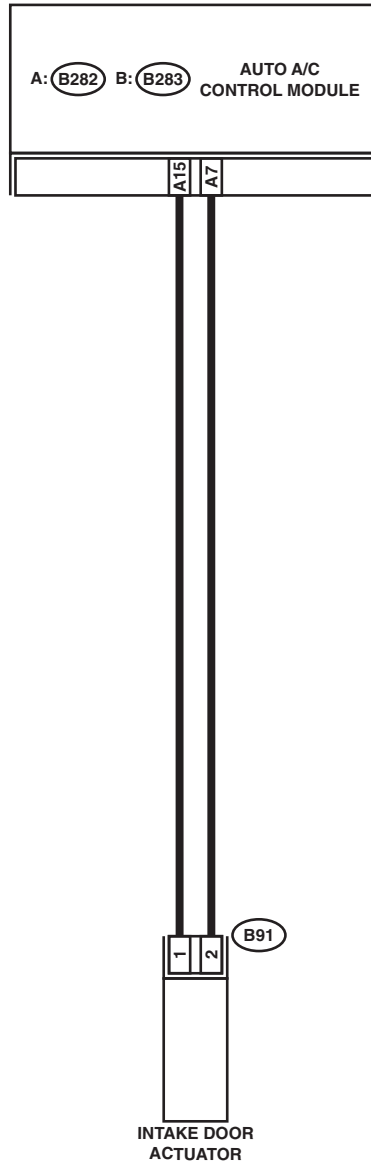
7. Diagnostic Procedure for Actuators

A: INTAKE DOOR ACTUATOR

TROUBLE SYMPTOM:

FRESH/RECIRC mode is not changed.

WIRING DIAGRAM:



B91

A: B282

1	2
3	4
5	6

1	2	3	4	5	6	7	8
9	10	11	12	13	14	15	16

HV0038

DIAGNOSTIC PROCEDURE FOR ACTUATORS

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK FUSE. 1)Remove the No. 17 fuse in fuse & relay box. 2)Check the condition of fuse.	Is the fuse blown-out?	Replace the fuse.	Go to step 2.
2 CHECK SIGNAL VOLTAGE. 1)Change the air intake to RECIRC by pushing FRESH/RECIRC switch. 2)Measure the voltage between A/C control module and chassis ground. <i>Connector & terminal</i> <i>(B282) No. 15 (+) — Chassis ground (-):</i>	Is the voltage less than 1 V?	Go to step 3.	Repair the short circuit in harness for power supply line.
3 CHECK SIGNAL VOLTAGE. 1)Change the air intake to FRESH with pushing FRESH/RECIRC switch. 2)Measure the voltage between A/C control module and chassis ground. <i>Connector & terminal</i> <i>(B282) No. 7 (+) — Chassis ground (-):</i>	Is the voltage less than 1 V?	Go to step 4.	Repair the short circuit in harness for power supply line.
4 CHECK HARNESS CONNECTOR BETWEEN A/C CONTROL MODULE AND FRESH/RECIRC ACTUATOR. 1)Turn the ignition switch to OFF. 2)Disconnect the connector from A/C control module and intake door actuator. 3)Measure the resistance of harness between A/C control module and intake door actuator. <i>Connector & terminal:</i> <i>(B282) No. 15 — (B91) No. 1</i>	Is the resistance less than 1 Ω ?	Go to step 5.	Repair the 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 the resistance of harness between A/C control module and intake door actuator. <i>Connector & terminal:</i> <i>(B282) No. 7 — (B91) No. 2</i>	Is the resistance less than 1 Ω ?	Go to step 6.	Repair the 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 the poor contact in A/C control module.	Contact with your Subaru distributor service.

DIAGNOSTIC PROCEDURE FOR ACTUATORS

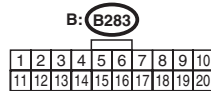
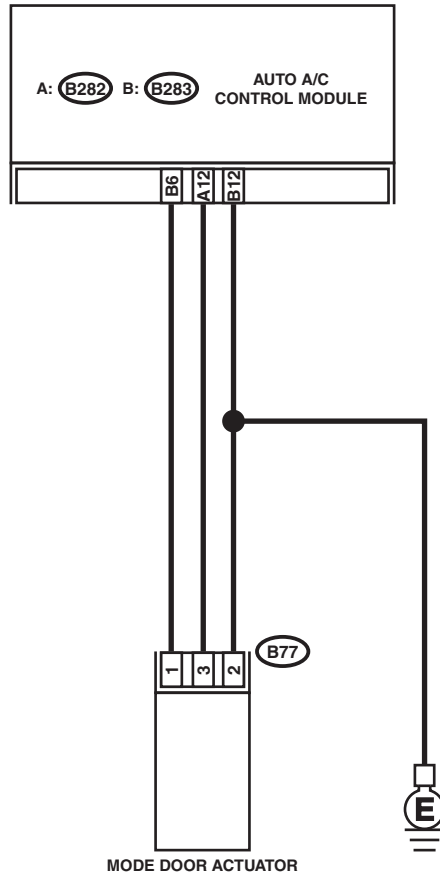
HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

B: MODE DOOR ACTUATOR

TROUBLE SYMPTOM:

Air flow outlet is not changed.

WIRING DIAGRAM:



HV0039

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 the ignition switch ON. 2) Turn the A/C switch ON. 3) Measure the voltage between auto A/C control module harness connector terminal and chassis ground. <i>Connector & terminal</i> <i>(B283) No. 6 (+) — Chassis ground (-):</i>	Is the voltage more than 10V?	Go to step 2.	Replace the auto A/C control module.
2 CHECK POWER SUPPLY FOR ACTUATOR SIDE. Measure the voltage between mode door actuator harness connector terminal and chassis ground. <i>Connector & terminal</i> <i>(B77) No. 1 (+) — Chassis ground (-):</i>	Is the voltage more than 10V?	Go to step 3.	Repair the 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 the voltage between auto A/C control module harness connector terminal and chassis ground with oscilloscope. <i>Connector & terminal</i> <i>(B282) No. 12 (+) — Chassis ground (-):</i>	Is the voltage approx. 5.5V?	Go to step 4.	Replace the auto A/C control module.
4 CHECK SIGNAL FOR ACTUATOR SIDE. Measure the voltage between mode door actuator harness connector terminal and chassis ground. <i>Connector & terminal</i> <i>(B77) No. 3 (+) — Chassis ground (-):</i>	Is the voltage approx. 5.5V?	Go to step 5.	Repair the open circuit in harness between auto A/C control module and mode door actuator.
5 CHECK GROUND CIRCUIT OF ACTUATOR. 1) Turn the ignition switch and A/C switch OFF. 2) Measure the resistance between mode door actuator harness connector terminal and chassis ground. <i>Connector & terminal</i> <i>(B77) No. 2 — Chassis ground:</i>	Is the resistance less than 1 Ω ?	Go to step 6.	Repair the 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 the poor contact.	Contact with your Subaru distributor service.

DIAGNOSTIC PROCEDURE FOR ACTUATORS

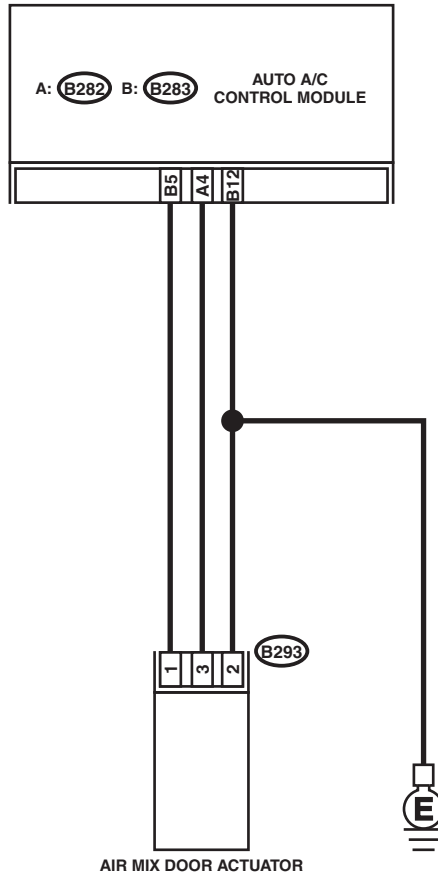
HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

C: AIR MIX DOOR ACTUATOR

TROUBLE SYMPTOM:

Outlet air temperature is not changed.

WIRING DIAGRAM:



HV0040

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 the ignition switch ON. 2) Turn the A/C switch ON. 3) Measure the voltage between auto A/C control module harness connector terminal and chassis ground. <i>Connector & terminal</i> <i>(B283) No. 5 (+) — Chassis ground (-):</i>	Is the voltage more than 10V?	Go to step 2.	Replace the auto A/C control module.
2 CHECK POWER SUPPLY FOR ACTUATOR SIDE. Measure the voltage between air mix door actuator harness connector terminal and chassis ground. <i>Connector & terminal</i> <i>(B293) No. 1 (+) — Chassis ground (-):</i>	Is the voltage more than 10V?	Go to step 3.	Repair the 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 the voltage between auto A/C control module harness connector terminal and chassis ground with oscilloscope. <i>Connector & terminal</i> <i>(B282) No. 4 (+) — Chassis ground (-):</i>	Is the voltage approx. 5.5V?	Go to step 4.	Replace the auto A/C control module.
4 CHECK SIGNAL FOR ACTUATOR SIDE. Measure the voltage between air mix door actuator harness connector terminal and chassis ground with oscilloscope. <i>Connector & terminal</i> <i>(B293) No. 3 (+) — Chassis ground (-):</i>	Is the voltage approx. 5.5V?	Go to step 5.	Repair the open circuit in harness between auto A/C control module and air mix door actuator.
5 CHECK GROUND CIRCUIT OF ACTUATOR. 1) Turn the ignition switch and A/C switch OFF. 2) Measure the resistance between air mix door actuator harness connector terminal and chassis ground. <i>Connector & terminal</i> <i>(B293) No. 2 — Chassis ground:</i>	Is the resistance less than 1 Ω ?	Go to step 6.	Repair the 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 the poor contact.	Contact with your Subaru distributor service.

DIAGNOSTIC PROCEDURE FOR SENSORS

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

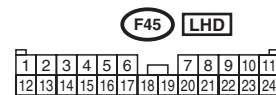
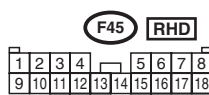
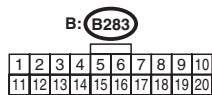
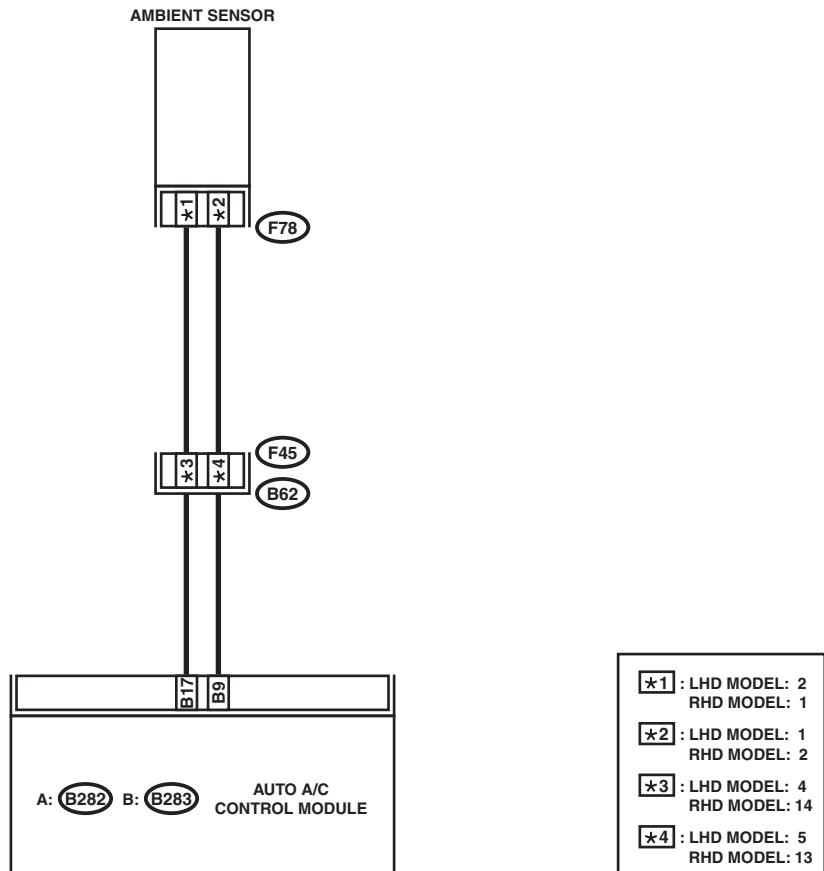
8. Diagnostic Procedure for Sensors

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 the ignition switch to OFF. 2) Disconnect the connector from ambient sensor. 3) Measure the resistance between connector terminals of ambient sensor. <i>Terminals:</i> <i>No. 1 — No. 2</i>	Is the resistance approx. 2.2 k Ω at 25°C (77°F)?	Go to step 2.	Replace the ambient sensor.
2 CHECK INPUT SIGNALS FOR AMBIENT SENSOR. 1) Turn the ignition ON. 2) Measure the voltage between (F78) connector terminals. <i>Connector & terminal:</i> <i>(F78) No. 1 — No. 2</i>	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 the ignition switch to OFF. 2) Pull out the A/C control panel. 3) Disconnect the connector from ambient sensor. 4) Turn the ignition switch to ON. 5) Measure the voltage between connector terminals of A/C control module. <i>Connector & terminal:</i> <i>(B283) No. 9 (+) — No. 17 (-)</i>	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 the ignition switch to OFF. 2) Disconnect the connectors from A/C control module. 3) Measure the resistance of harness between A/C control module and ambient sensor. <i>Connector & terminal</i> <i>LHD model:</i> <i>(F78) No. 1 — (B283) No. 9</i> <i>RHD model:</i> <i>(F78) No. 2 — (B283) No. 9</i>	Is the resistance less than 1 Ω ?	Go to step 5.	Repair the 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 the resistance of harness between A/C control module and ambient sensor. <i>Connector & terminal</i> <i>LHD model:</i> <i>(F78) No. 2 — (B283) No. 17</i> <i>RHD model:</i> <i>(F78) No. 1 — (B283) No. 17</i>	Is the resistance less than 1 Ω ?	Go to step 6.	Repair the 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 the poor contact in A/C control module.	Contact with your Subaru distributor service.

DIAGNOSTIC PROCEDURE FOR SENSORS

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

B: IN-VEHICLE SENSOR

TROUBLE SYMPTOM:

When turning the AUTO switch to ON, blower fan speed, outlet port and inlet port is not changed.

If the 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

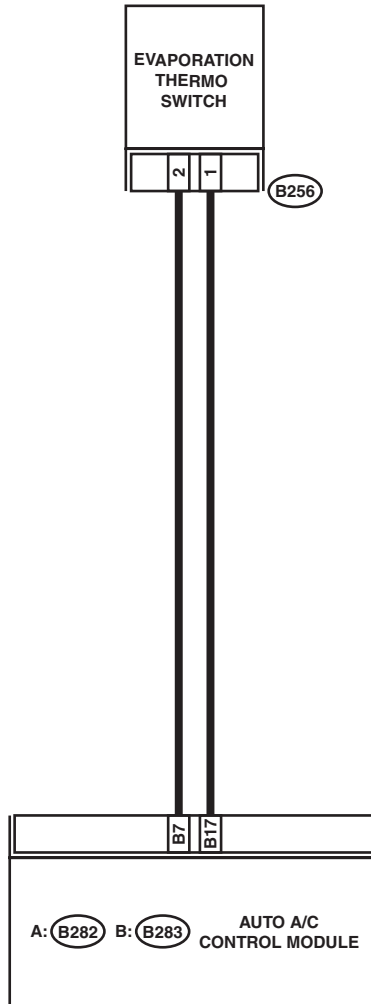
HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

DIAGNOSTIC PROCEDURE FOR SENSORS

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

C: EVAPORATOR SENSOR

WIRING DIAGRAM:



B256

B: B283

1 2

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20

HV0042

DIAGNOSTIC PROCEDURE FOR SENSORS

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK EVAPORATOR SENSOR. 1) Turn the ignition switch to OFF. 2) Remove the glove box. 3) Disconnect the connector from evaporator sensor. 4) Measure the resistance between connector terminals of evaporator sensor. <i>Terminals:</i> <i>No. 1 — No. 2</i>	Is the resistance approx. 3.3 k Ω at 20°C (68°F)?	Go to step 2.	Replace the evaporator sensor.
2 CHECK INPUT SIGNALS FOR EVAPORATOR SENSOR. 1) Turn the ignition switch to "ON". 2) Measure the voltage between (B88) connector terminal and chassis ground. <i>Connector & terminal</i> <i>(B256) No. 2 (+) — Chassis ground (-):</i>	Is the voltage approx. 4.5 V?	Go to step 3.	Replace the evaporator sensor.
3 CHECK OUTPUT SIGNALS FROM A/C CONTROL MODULE. 1) Turn the ignition switch to OFF. 2) Pull out the A/C control module. 3) Turn the ignition switch to "ON". 4) Measure the voltage between A/C control module connector terminals. <i>Connector & terminal:</i> <i>(B283) No. 7 (+) — No. 17 (-)</i>	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 the ignition switch to OFF. 2) Disconnect the connectors from A/C control module. 3) Measure the resistance of harness between A/C control module and evaporator sensor. <i>Connector & terminal:</i> <i>(B256) No. 2 — (B283) No. 7</i>	Is the resistance less than 1 Ω ?	Go to step 5.	Repair the 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 the resistance of harness between A/C control module and evaporator sensor. <i>Connector & terminal:</i> <i>(B256) No. 1 — (B283) No. 17</i>	Is the resistance less than 1 Ω ?	Go to step 6.	Repair the 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 the poor contact in A/C control module.	Contact with your Subaru distributor service.

DIAGNOSTIC PROCEDURE FOR SENSORS

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

D: SUNLOAD SENSOR

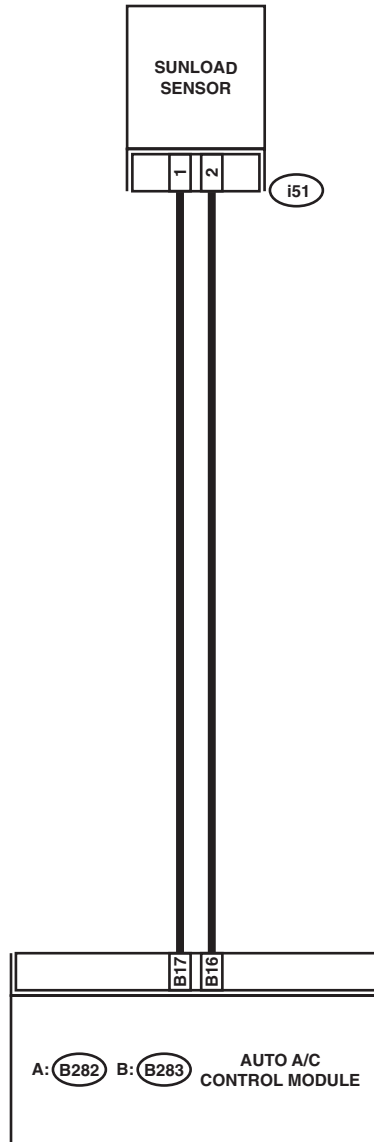
TROUBLE SYMPTOM:

- 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.

WIRING DIAGRAM:



i51

B: B283

1 2

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20

HV0043

DIAGNOSTIC PROCEDURE FOR SENSORS

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK SUNLOAD SENSOR. 1) Turn the ignition switch to OFF. 2) Remove the sunload sensor. <Ref. to AC-41, INSTALLATION, Sun-load Sensor (Auto A/C Model).> 3) Measure the resistance between sunload sensor terminals. <i>Terminals:</i> <i>No. 2 — No. 1</i>	Is the resistance less than 1 Ω ?	Go to step 2.	Replace the sunload sensor.
2 CHECK SUNLOAD SENSOR. Make sure that there is no resistance in the reverse side terminals. <i>Terminals:</i> <i>No. 1 — No. 2</i>	Is the resistance more than 1 M Ω ?	Go to step 3.	Replace the sunload sensor.
3 CHECK INPUT VOLTAGE TO SUNLOAD SENSOR. 1) Turn the ignition switch to ON. 2) Measure the input voltage to sunload sensor. <i>Connector & terminal:</i> <i>(i51) No. 2 (+) — No. 1 (-)</i>	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 the ignition switch to OFF. 2) Disconnect the connectors from A/C control module. 3) Measure the resistance of harness between A/C control module and sunload sensor. <i>Connector & terminal:</i> <i>(i51) No. 2 — (B283) No. 16</i>	Is the resistance less than 1 Ω ?	Go to step 5.	Repair the 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 the resistance of harness between A/C control module and sunload sensor. <i>Connector & terminal:</i> <i>(i51) No. 1 — (B283) No. 17</i>	Is the resistance less than 1 Ω ?	Go to step 6.	Repair the 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 the poor contact in A/C control module.	Contact with your Subaru distributor service.

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)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>							
Poor connector contacts	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>			
Ground	<input type="radio"/>			<input type="radio"/>							
A/C control module	<input type="radio"/>		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>		
Air mix door actuator and potentiometer (including links)							<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
Mode door actuator and potentiometer (including links)						<input type="radio"/>					
Intake door actuator and potentiometer (including links)					<input type="radio"/>						
Blower fan motor				<input type="radio"/>							
Blower fan relay				<input type="radio"/>							
A/C relay								<input type="radio"/>			
Magnet clutch								<input type="radio"/>			
Radiator fan motors (Main and sub)											<input type="radio"/>
Radiator fan relays (Main and sub)											<input type="radio"/>
Sensors (In-vehicle, ambient, water temperature, evaporator, sunload, etc.)							<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
In-vehicle sensor aspirator duct								<input type="radio"/>			

HV0044

AIRBAG SYSTEM

AB

	Page
1. General Description	2
2. Airbag Connector	8
3. Inspection Locations After a Collision	10
4. Driver's Airbag Module	12
5. Passenger's Airbag Module	13
6. Side Airbag Module	14
7. Airbag Control Module	15
8. Side Airbag Sensor	16
9. Roll Connector	17
10. Front Sub Sensor	18
11. Disposal of Airbag Module (Deploying While Installed in Vehicle)	19
12. Disposal of Airbag Module (Deploying After Removal from Vehicle)	23

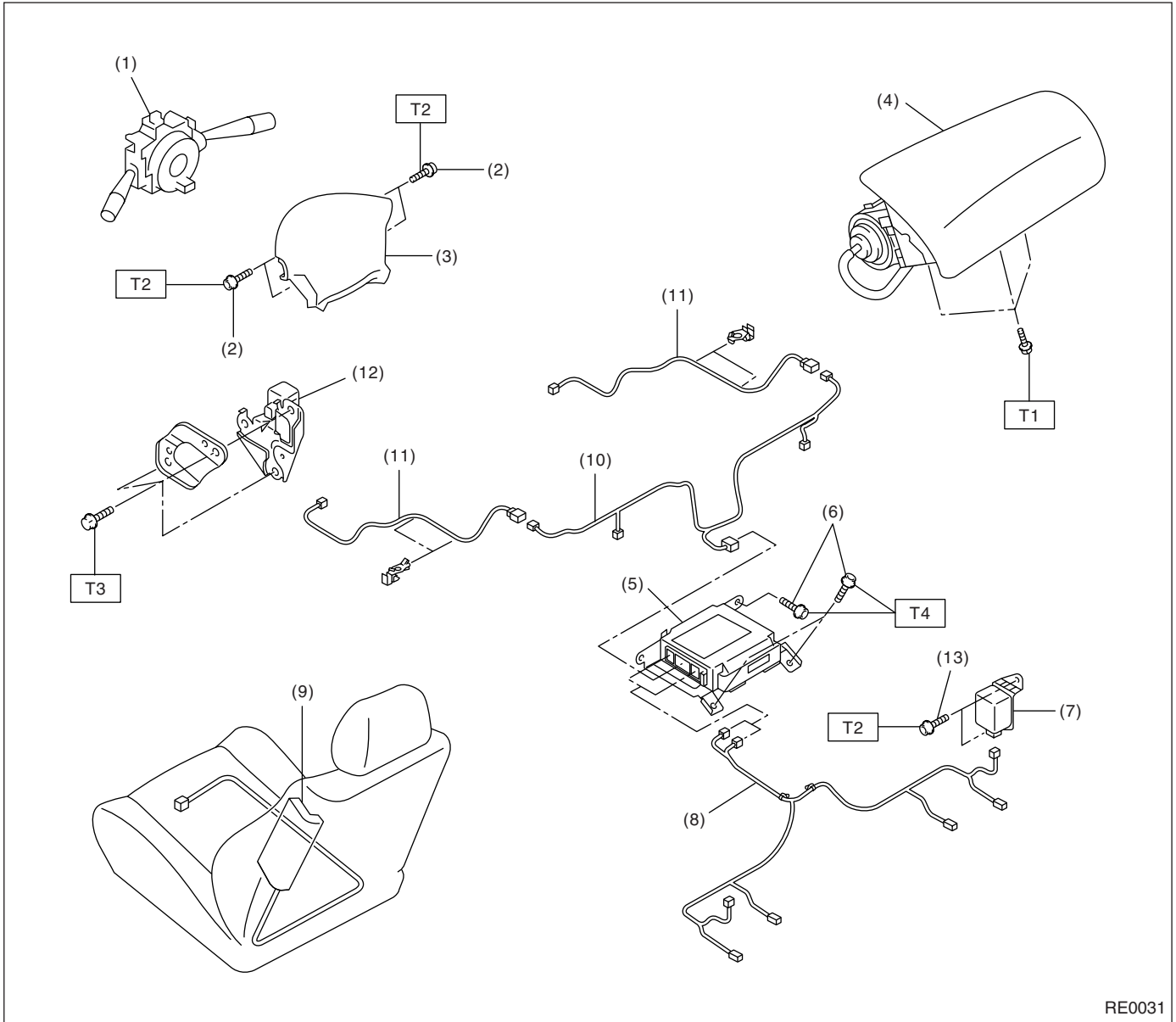
GENERAL DESCRIPTION

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 (kgf-m, ft-lb)

T1: 7.4 (0.75, 5.4)

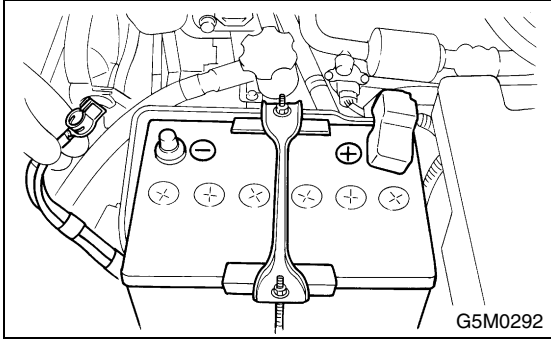
T2: 10 (1.0, 7.2)

T3: 20 (2.0, 14.5)

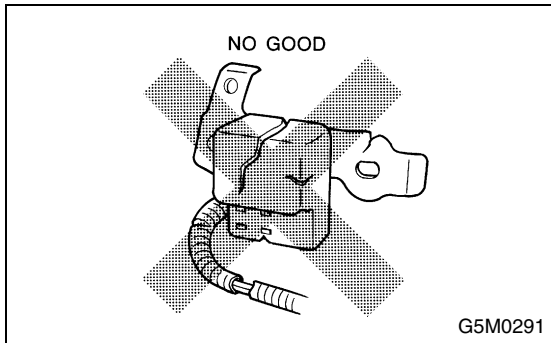
T4: 25 (2.5, 18.1)

B: CAUTION

- When servicing a vehicle, be sure to turn the ignition switch to OFF, disconnect the ground cable from 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.

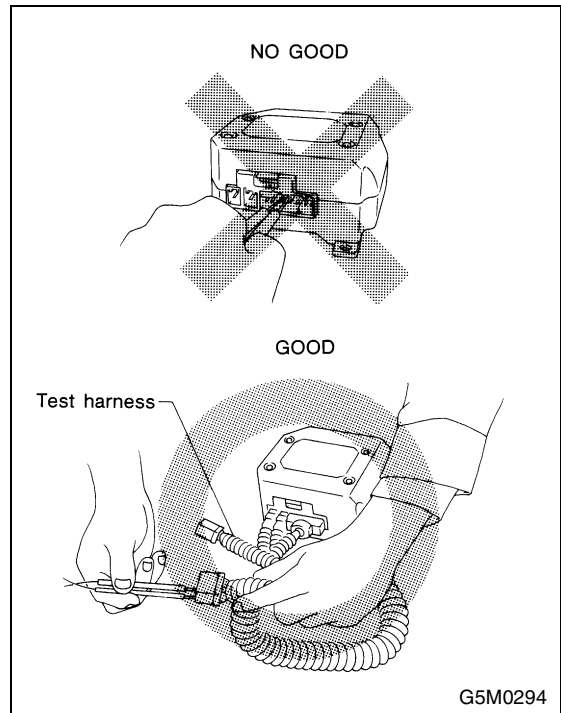
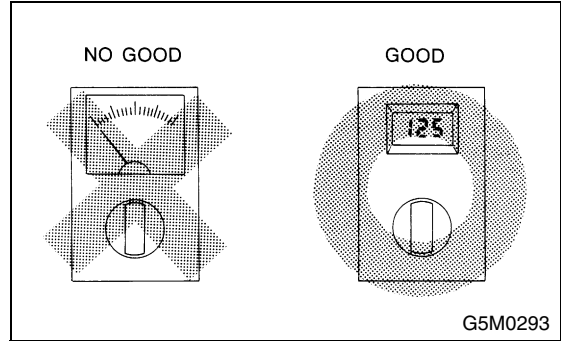


- If sensors, airbag module, airbag control module, pretensioner, and harness are deformed or damaged, replace them with new genuine parts.

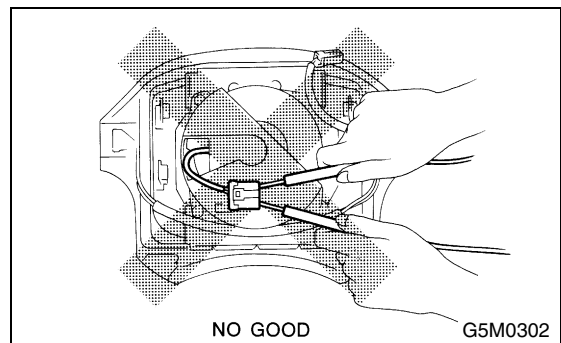


- When checking the system, be sure to use a digital circuit tester. Use of an analog circuit tester may cause the airbag to activate erroneously.

- When checking, use a test harness. Do not directly apply the tester probe to any connector terminal of the airbag.



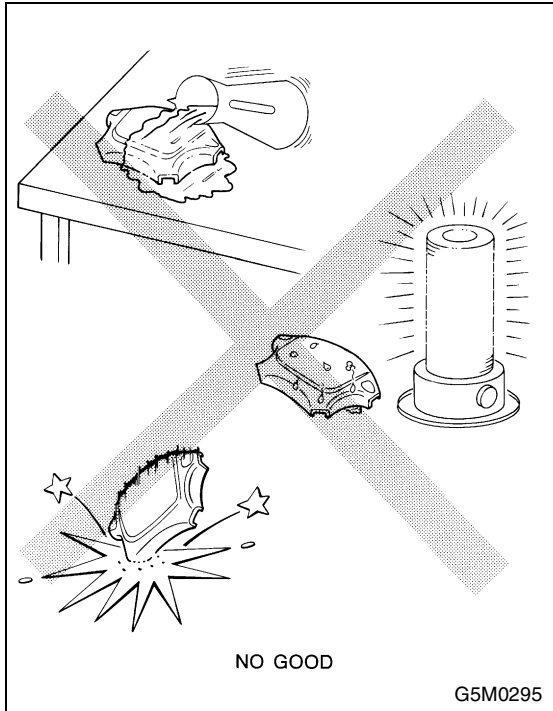
- Do not check continuity of either of the airbag modules for driver, passenger or side, or pretensioner.



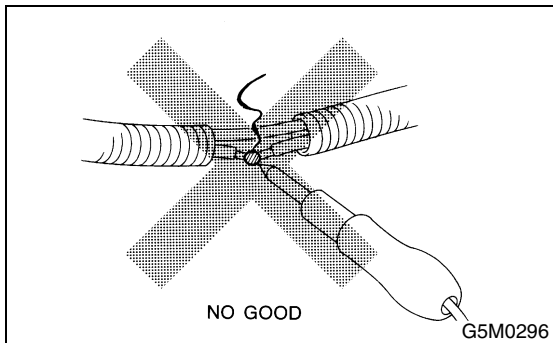
GENERAL DESCRIPTION

AIRBAG SYSTEM

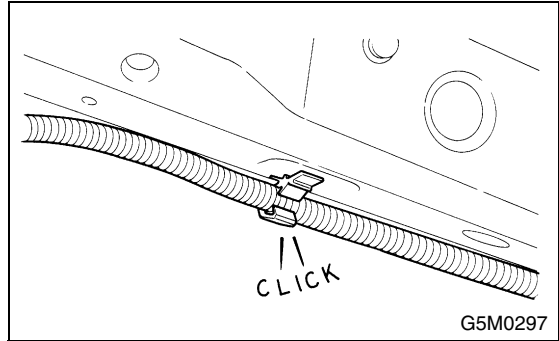
- Do not drop the airbag modulator parts, subject them to high temperature over 93°C (199°F), or let water, oil, or grease get on them; otherwise, the internal parts may be damaged and reliability greatly lowered.



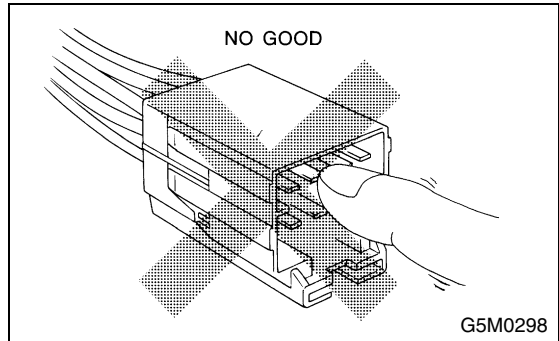
- If any damage, opening, or rust is found on the airbag system wire harness, do not attempt to repair using soldering equipment. Be sure to replace the faulty harness with a new genuine part.



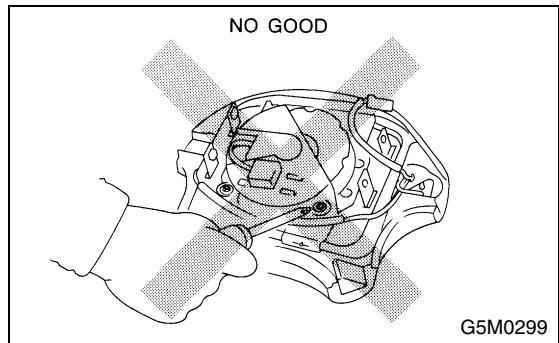
- Install the wire harness securely with the specified clips to avoid interference or tangled up with other parts.



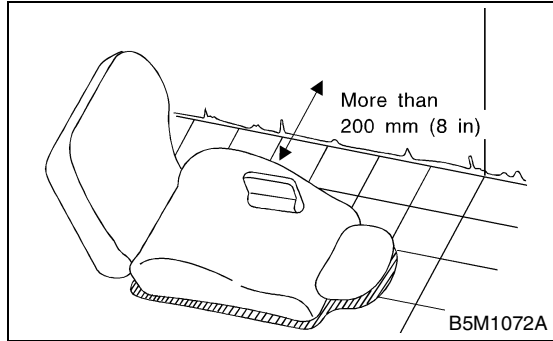
- Do not allow water or oil to come in contact with the connector terminals. Do not touch the connector terminals.



- Either of the airbag modules for driver, passenger or side, or pretensioner must not be disassembled.

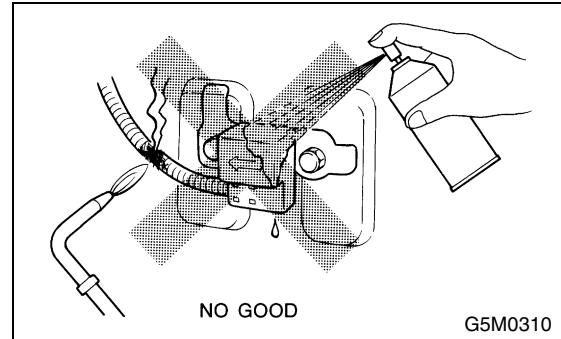


- The removed front seat with the airbag module must be kept at least 200 mm (8 in) away from walls and other objects.



- 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.



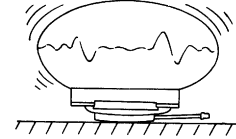
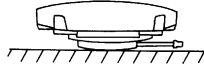
- When storing a removed airbag module, do not place any objects on it or pile airbag modules on top of each other. If the airbag inflates for some reason when it is placed with its pad side facing downward or under any object, a serious accident may result.

GENERAL DESCRIPTION

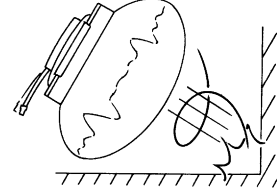
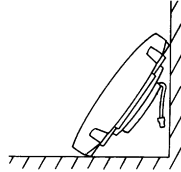
AIRBAG SYSTEM

Driver side

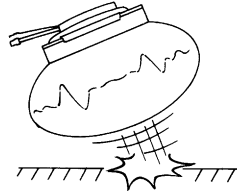
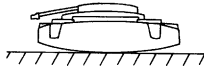
GOOD



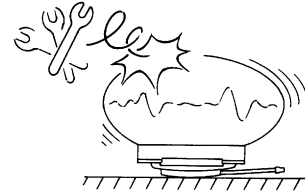
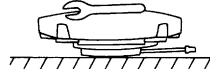
NO GOOD



NO GOOD

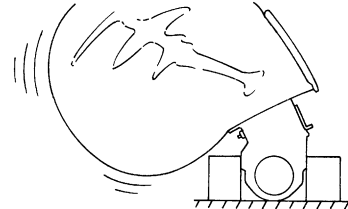
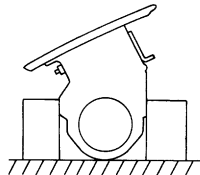


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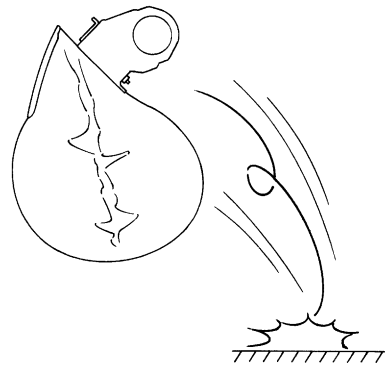
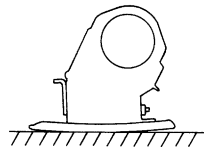


Passenger side

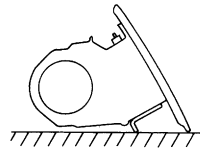
GOOD



NO GOOD



NO GOOD



G5M0604

C: PREPARATION TOOL

1. GENERAL TOOL

TOOL NAME	REMARKS
TORX® T30	Used for removal/installation of driver's airbag module.
TORX® T40 (Tamper resistant type)	Used for removal/installation of airbag control module.
TORX® T30 (Tamper resistant type)	Used for removal of side airbag sensor.

AIRBAG CONNECTOR

AIRBAG SYSTEM

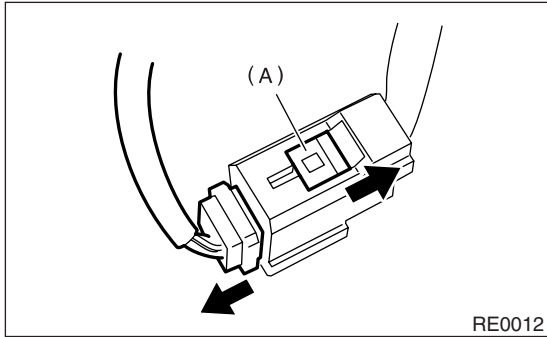
2. Airbag Connector

A: OPERATION

1. POWER SUPPLY

1) How to disconnect:

- (1) Move the slide lock (A) in the direction of the arrow.
- (2) Pull the female connector in the direction of the arrow with slide lock (A) moved.

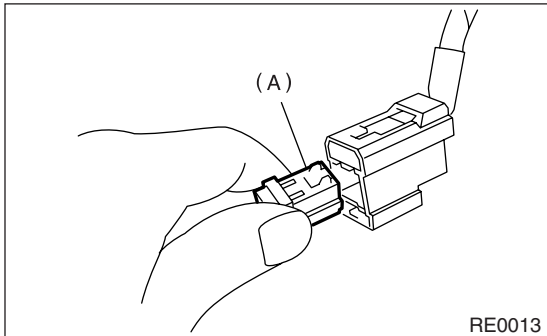


CAUTION:

When pulling, be sure to hold onto the connector and not the wire.

2) How to connect:

Holding the connector (A), and push it in carefully until a connecting sound is heard.



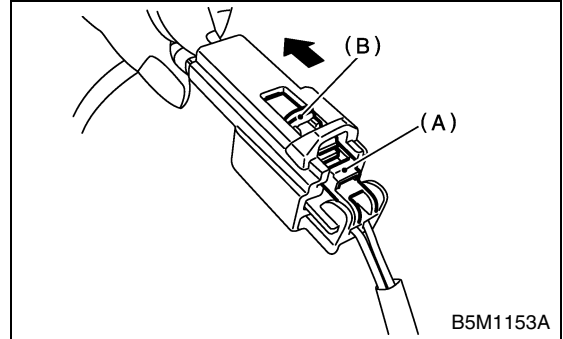
CAUTION:

Be sure to insert the connector in until it locks. Then pull on it gently to make sure that it is locked.

2. DRIVER'S AIRBAG, PASSENGER'S AIRBAG AND SIDE AIRBAG

1) How to disconnect:

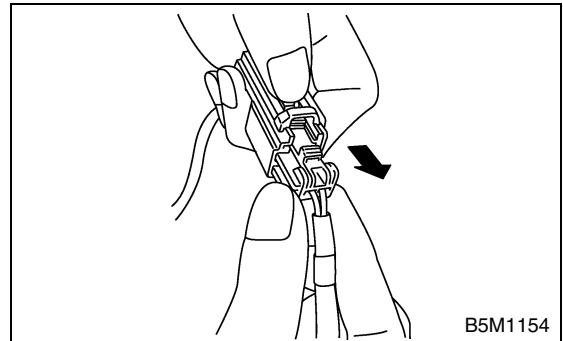
- (1) Push the lock arm (A).
- (2) With the lock arm (A) pushed in, move the slide lock (B) in the direction of the arrow.



- (3) With the slide lock (B) pulled, remove the lock arm (A) to its original position, and then pull in the direction of the arrow and separate the connector.

CAUTION:

When pulling, be sure to hold onto the connector and not the wire.

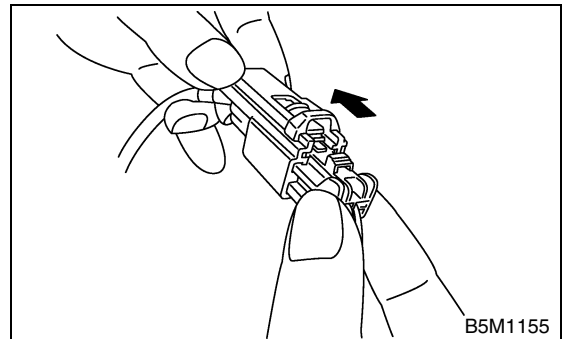


2) How to connect:

Holding the connector, and push it in carefully until a connecting sound is heard.

CAUTION:

Be sure to insert the connector in until it locks. Then pull on it gently to make sure that it is locked.



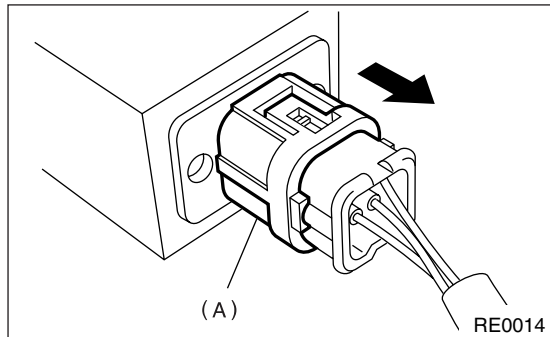
3. FRONT SUB-SENSOR AND SIDE AIR-BAG SENSOR

1) How to disconnect:

- (1) Holding outer part (A), pull it in the direction of the arrow.

CAUTION:

When pulling, be sure to hold onto the connector and not the wire.

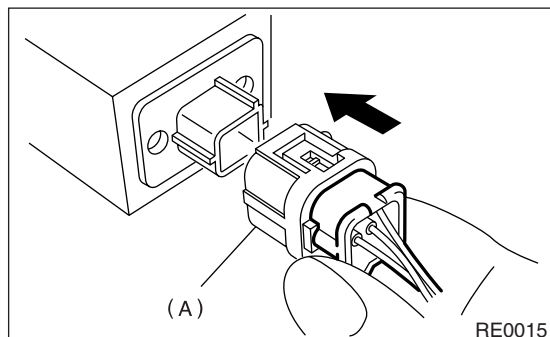


2) How to connect:

Holding the connector, and push it in carefully until a connecting sound is heard.

CAUTION:

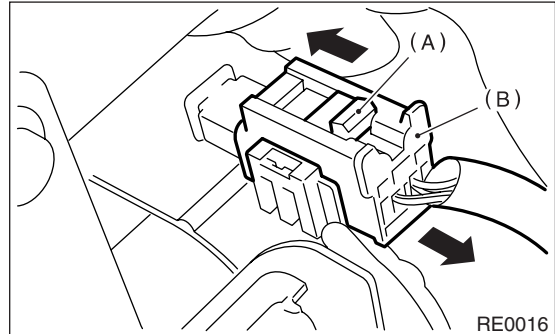
- Outer (A) moves back, and so do not put your hand on the outer part.
- Be sure to insert the connector in until it locks. Then pull on it gently to make sure that it is locked.



4. PRETENSIONER

1) How to disconnect:

- (1) Move the 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.

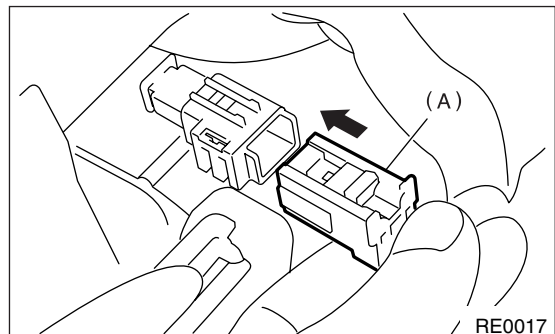


CAUTION:

When pulling, be sure to hold onto the connector and not the wire.

2) How to connect:

Holding the connector (A), and push it in carefully until a connecting sound is heard.



CAUTION:

- Be sure to insert the connector in until it locks.
- Then pull on it gently to make sure that it is locked.

INSPECTION LOCATIONS AFTER A COLLISION

AIRBAG SYSTEM

3. Inspection Locations After a Collision

A: INSPECTION

If the vehicle is involved in a collision on any side, even if it is a slight collision, be sure to check the following system parts.

1. AIRBAG MODULE (DRIVER)

1) Check for the following, and replace damaged parts with new parts.

- Airbag module is cracked or deformed.
- Harness and/or connector is cracked, deformed or open. Lead wire is exposed.
- The module surface is fouled with grease, oil, water or cleaning solvent.

2) When installing a new driver's airbag module, check the following. If necessary, install a new airbag module and steering wheel.

- The 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.
- The steering wheel deformation in axial and radial directions exceed limits.

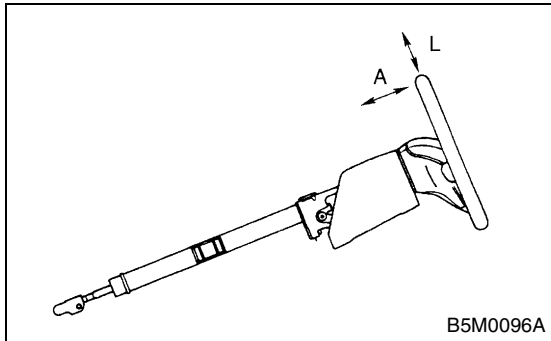
Specifications:

Height deflection *A*

Less than 6 mm (0.24 in)

O.D. deflection *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.

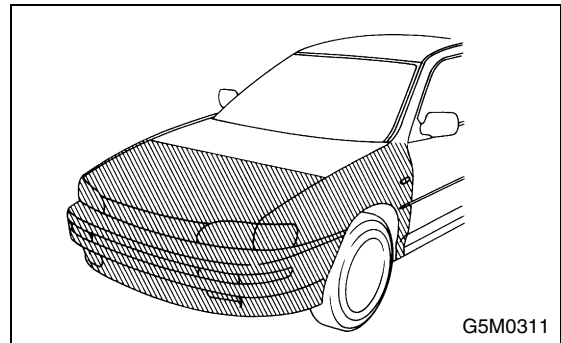
4. AIRBAG CONTROL MODULE

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.

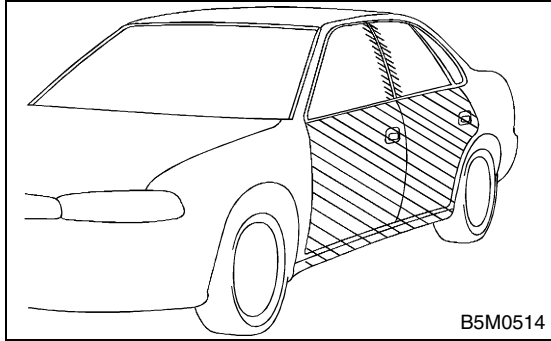
6. FRONT SUB SENSOR HARNESS

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)

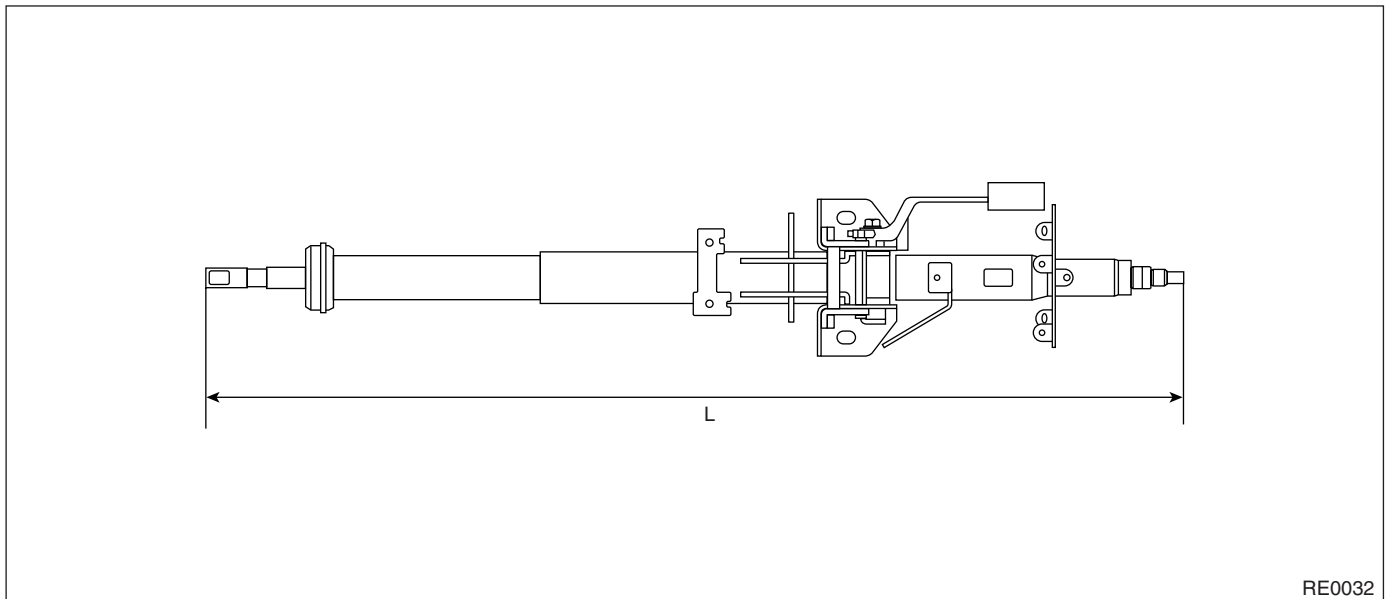
11. STEERING SHAFT

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)



If necessary, replace it with a 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.

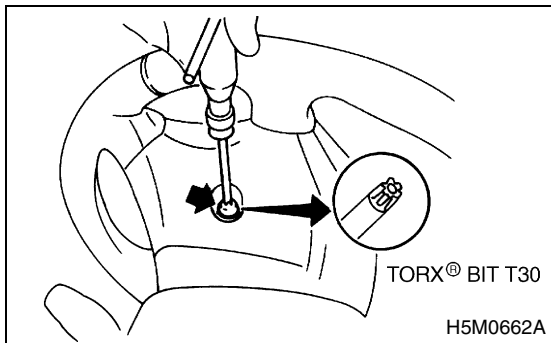
4. Driver's Airbag Module

A: REMOVAL

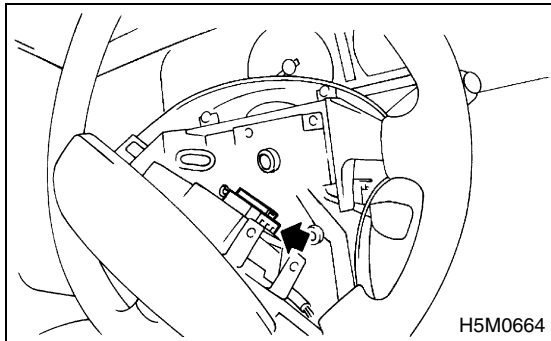
CAUTION:

Refer to “CAUTION” in General Description before handling the airbag module. <Ref. to AB-3, CAUTION, General Description.>

- 1) Position the front wheels straight ahead. (After moving the vehicle more than 5 m (16 ft) with front wheels positioned straight ahead, make sure that the vehicle moves straight ahead).
- 2) Turn the ignition switch to OFF.
- 3) Disconnect the ground cable from battery, and wait for at least 20 seconds before starting work.
- 4) Using the TORX® BIT T30, remove the two TORX® bolts on side of steering wheel.



- 5) Disconnect the airbag connector on the back of airbag module, and then remove the airbag module.



- 6) Refer to “CAUTION” for handling of a removed airbag module. <Ref. to AB-3, CAUTION, General Description.>

B: INSTALLATION

- 1) Install in the reverse order of removal.

CAUTION:

Do not allow harness and connectors to interfere or get tangled up with other parts.

C: INSPECTION

CAUTION:

Refer to “CAUTION” in General Description before handling the airbag module. <Ref. to AB-3, CAUTION, General Description.>

Check for the following, and replace damaged parts with new parts.

- Airbag module, harness, connector, and mounting bracket are damaged.

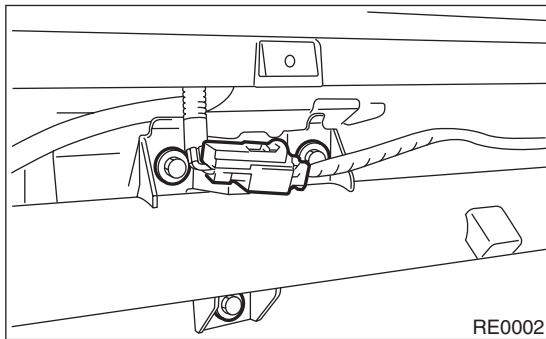
5. Passenger's Airbag Module

A: REMOVAL

CAUTION:

Refer to “CAUTION” in General Description before handling the airbag module. <Ref. to AB-3, CAUTION, General Description.>

- 1) Turn the ignition switch to OFF.
- 2) Disconnect the ground cable from battery, and wait for at least 20 seconds before starting work.
- 3) Remove the glove box. <Ref. to EI-38, REMOVAL, Glove Box.>
- 4) Detach the airbag connector from support beam bracket, and then disconnect the airbag connector.
- 5) Remove the three bolts, and then carefully remove the airbag module.



- 6) Refer to “CAUTION” for handling of a removed airbag module. <Ref. to AB-3, CAUTION, General Description.>

B: INSTALLATION

Install in the reverse order of removal.

CAUTION:

Do not allow harness and connectors to interfere or get tangled up with other parts.

C: INSPECTION

CAUTION:

Refer to “CAUTION” in General Description before handling the airbag module. <Ref. to AB-3, CAUTION, General Description.>

Check for the following, and replace damaged parts with new parts.

- Airbag module, harness, connector, and mounting bracket are damaged.

6. Side Airbag Module

A: REMOVAL

CAUTION:

- Refer to “CAUTION” in General Description before handling the airbag module. <Ref. to AB-3, CAUTION, General Description.>
- The side airbag module cannot be detached from the front seat assembly.
- When replacing the side airbag module, replace the front seat assembly.
<Ref. to SE-6, REMOVAL, Front Seat.>

B: INSTALLATION

<Ref. to SE-6, INSTALLATION, Front Seat.>

C: INSPECTION

CAUTION:

Refer to “CAUTION” in General Description before handling the airbag module. <Ref. to AB-3, CAUTION, General Description.>

Check for the following, and replace damaged parts with new parts.

- Front seat is deformed or damaged.
- Harness and/or connector is cracked, deformed or open.
- Lead wire is exposed.

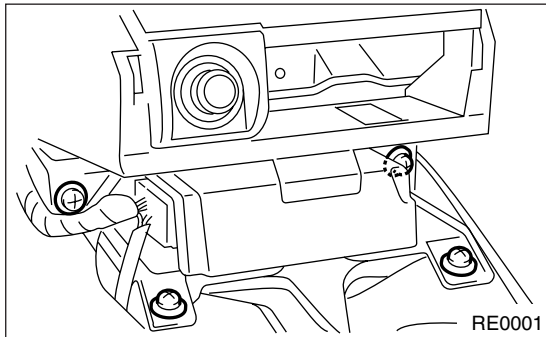
7. Airbag Control Module

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 the ignition switch to OFF.
- 2) Disconnect the ground cable from battery, and wait for at least 20 seconds before starting work.
- 3) Remove the console box. <Ref. to EI-40, REMOVAL, Console Box.>
- 4) Disconnect the connector from airbag control module.
- 5) Using the T40[®] TORX bit (Tamper resistant type), remove the 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

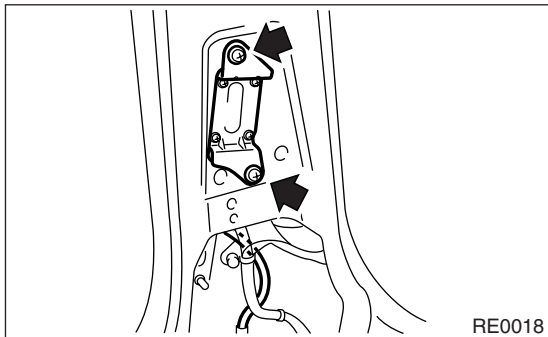
Check for the following, and replace damaged parts with new parts.

- Control module, connector, and mounting bracket are damaged.
- Airbag is deployed.
- Side airbag is deployed.

8. Side Airbag Sensor

A: REMOVAL

- 1) Turn the ignition switch to OFF.
- 2) Disconnect the ground cable from battery, and wait for at least 20 seconds before starting work.
- 3) Remove the outer belt (FRONT). <Ref. to SB-8, OUTER BELT (FRONT), REMOVAL, Front Seat Belt.>
- 4) Using the T30 TORX® bit (Tamper resistant type), remove the two TORX® bolts.
- 5) Detach the side airbag sensor, and then disconnect the airbag connector.



B: INSTALLATION

CAUTION:

Use new TORX® bolts during re-assembly.
Install in the reverse order of removal.

C: INSPECTION

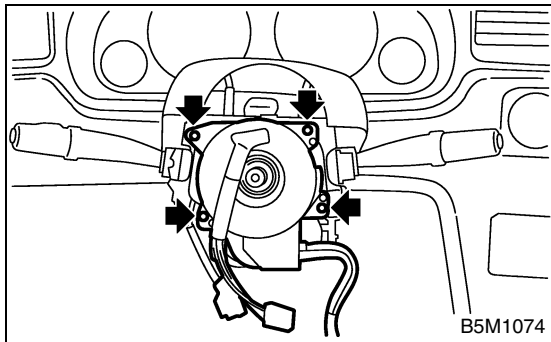
Check for the following, and replace damaged parts with new parts.

- Bracket connector for side airbag sensor is damaged.

9. Roll Connector

A: REMOVAL

- 1) Turn the ignition switch to OFF.
- 2) Disconnect the ground cable from battery, and wait for at least 20 seconds before starting work.
- 3) Remove the driver's airbag module. <Ref. to AB-12, Driver's Airbag Module.>
- 4) Remove the steering wheel. <Ref. to PS-26, REMOVAL, Steering Wheel.>
- 5) Remove the steering column cover.
- 6) Remove the screws, and then remove the roll connector.



B: INSTALLATION

- 1) Install in the reverse order of removal.
- 2) Before installing the steering wheel, be sure the direction of roll connector is adjusted with steering. <Ref. to AB-17, ADJUSTMENT, Roll Connector.>

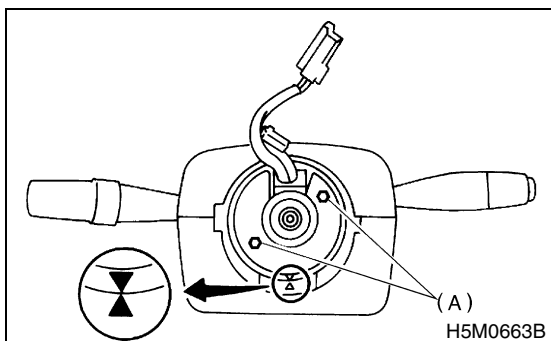
C: INSPECTION

Check for the following, and replace damaged parts with new parts.

- Combination switch and roll connector is cracked or deformed.

D: ADJUSTMENT

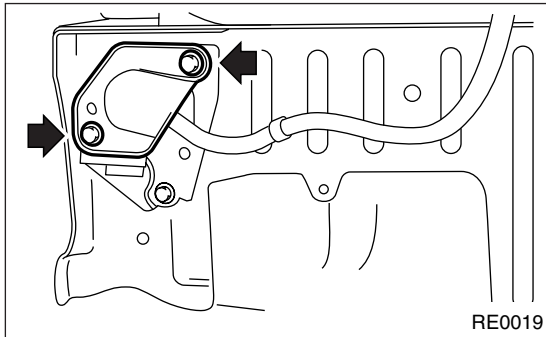
- 1) Check that the front wheels are positioned in straight ahead direction.
- 2) Turn the roll connector pin (A) clockwise until it stops.
- 3) Turn the roll connector pin (A) counterclockwise approx. 2.65 turns until "▲" marks are aligned.



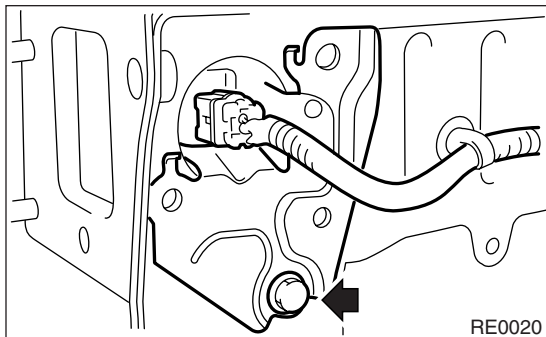
10. Front Sub Sensor

A: REMOVAL

- 1) Turn the ignition switch to OFF.
- 2) Disconnect the ground cable from battery, and wait for at least 20 seconds before starting work.
- 3) Remove the front bumper. <Ref. to EI-22, REMOVAL, Front Bumper.>
- 4) Loosen the two bolts to remove the sensor cover.



- 5) Remove the bolt, and then detach the front sub sensor.
- 6) Disconnect the 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.

11. Disposal of Airbag Module (Deploying While Installed in Vehicle)

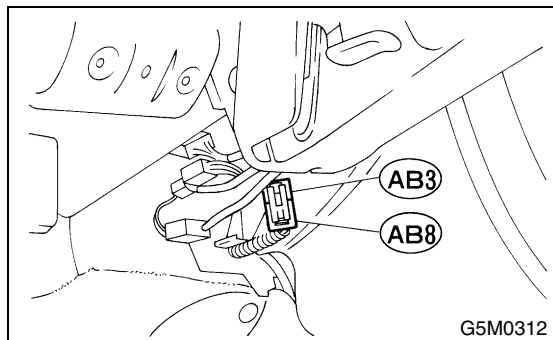
A: OPERATION

CAUTION:

- Do not discard an 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)

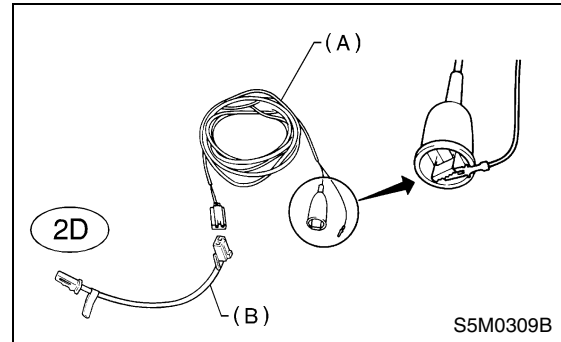
- 1) Turn the ignition switch to OFF.
- 2) Disconnect the ground cable from battery, and wait for at least 20 seconds before starting work.
- 3) Remove the lower cover.
- 4) Disconnect the airbag connector (AB3) and (AB8) below steering column.



- 5) Short the terminal to alligator clip furnished as deployment tool (A).
- 6) Connect the deployment tool and adapter A (deployment) (B).

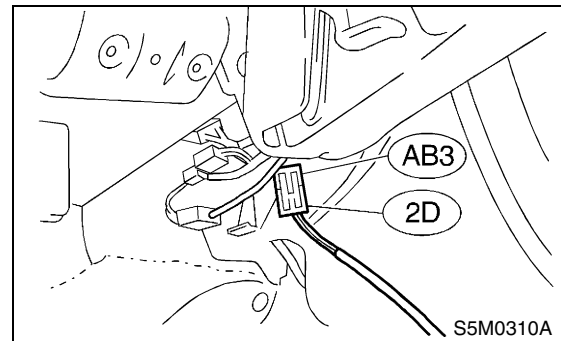
CAUTION:

The deployment tool should be kept shorted until just before deployment of the airbag module.

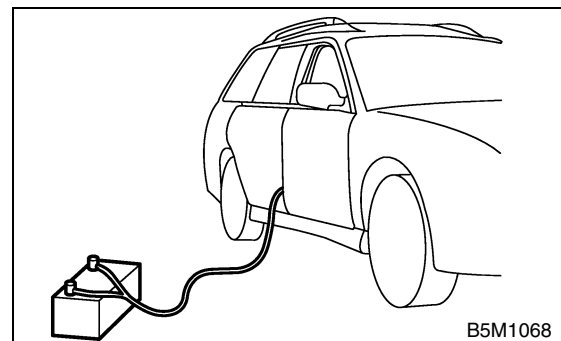


- (A) Deployment tool: (Part No. 98299PA030)
 (B) Adapter A (deployment): (Part No. 98299FC030)

- 7) Connect the 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.

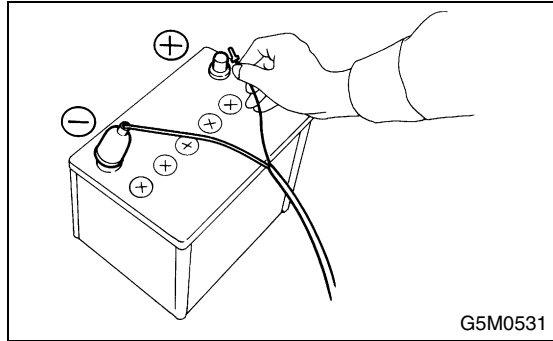


- 9) Move the battery at least 5 m (16 ft) from vehicle, and secure the nearby area. Connect the deployment tool alligator clip to the battery negative (-) terminal.

DISPOSAL OF AIRBAG MODULE (DEPLOYING WHILE INSTALLED IN VEHICLE)

AIRBAG SYSTEM

10) Connect the other cable of the deployment tool to the battery positive (+) terminal. Then, deploy the airbag module.

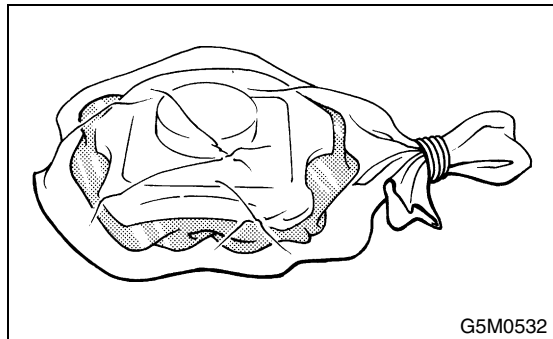


CAUTION:

- After deployment, the airbag module will be especially hot. Leave it unattended for 40 minutes, and then discard it.
- Do not let water get on the deployed airbag module.

11) Remove the airbag module. <Ref. to AB-12, Driver's Airbag Module.>

12) Wrap the deployed airbag module in an airtight vinyl bag, and discard it.



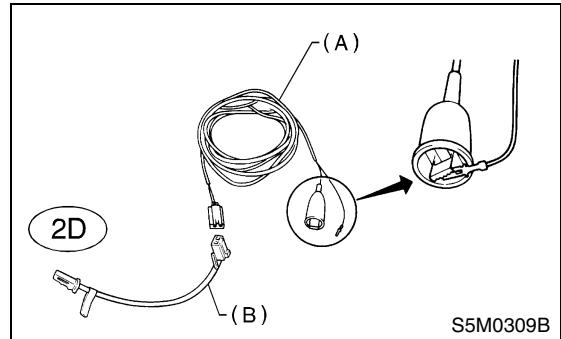
2. AIRBAG MODULE (PASSENGER)

- 1) Turn the ignition switch to OFF.
- 2) Disconnect the ground cable from battery, and wait for at least 20 seconds before starting work.
- 3) Remove the glove box.
- 4) Disconnect the airbag connectors (AB9) and (AB10).
- 5) Short the terminal to alligator clip furnished as deployment tool (A).

6) Connect the deployment tool and adapter A (deployment) (B).

CAUTION:

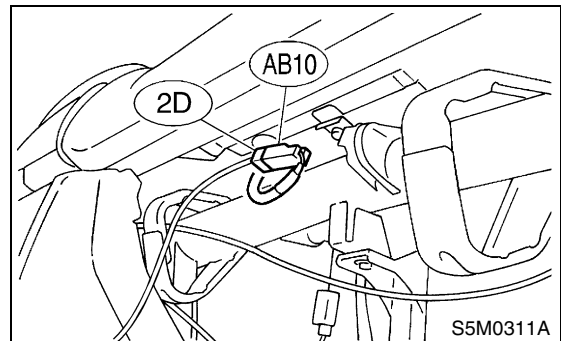
The deployment tool should be kept shorted until just before deployment of the airbag module.



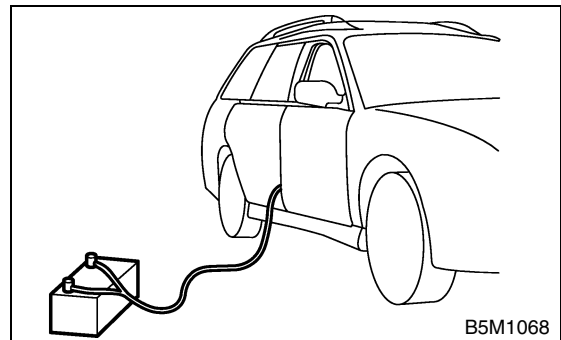
(A) Deployment tool: (Part No. 98299PA030)

(B) Adapter A (deployment): (Part No. 98299FC030)

7) Connect the 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.

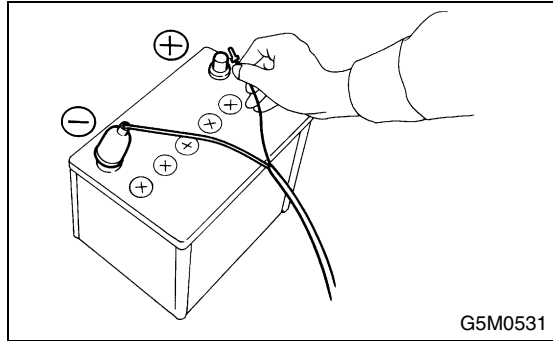


9) Move the battery at least 5 m (16 ft) from vehicle, and secure the nearby area. Connect the deployment tool alligator clip to the battery negative (-) terminal.

DISPOSAL OF AIRBAG MODULE (DEPLOYING WHILE INSTALLED IN VEHICLE)

AIRBAG SYSTEM

10) Connect the other cable of the deployment tool to the battery positive (+) terminal. Then, deploy the airbag module.

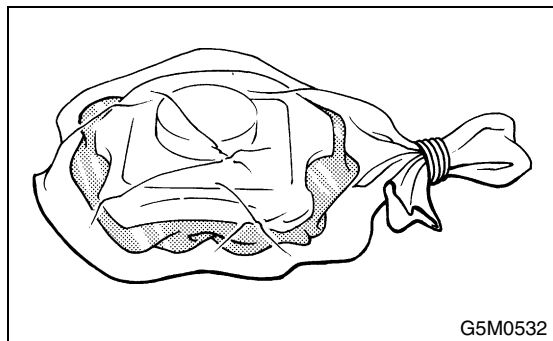


CAUTION:

- After deployment, the airbag module will be especially hot. Leave it unattended for 40 minutes, and then discard it.
- Do not let water get on the deployed airbag module.

11) Remove the airbag module. <Ref. to AB-13, Passenger's Airbag Module.>

12) Wrap the deployed airbag module in an airtight vinyl bag, and discard it.



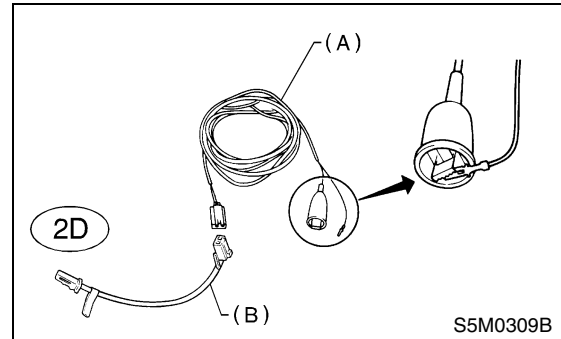
3. AIRBAG MODULE (SIDE)

- 1) Turn the ignition switch to OFF.
- 2) Disconnect the ground cable from 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 the terminal to alligator clip furnished as deployment tool (A).

6) Connect the deployment tool and adapter A (deployment) (B).

CAUTION:

The deployment tool should be kept shorted until just before deployment of the airbag module.



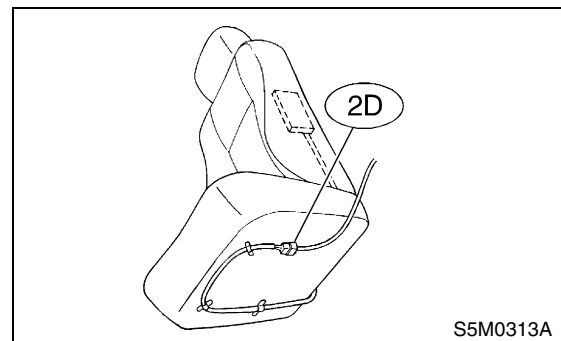
(A) Deployment tool: (Part No. 98299PA030)

(B) Adapter A (deployment): (Part No. 98299FC030)

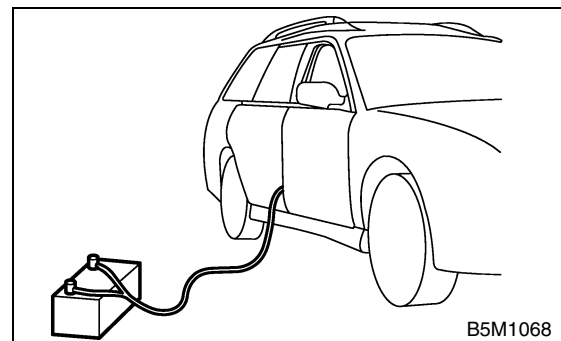
7) Connect the adapter A (deployment) connector (2D) to side airbag module connector (yellow).

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.

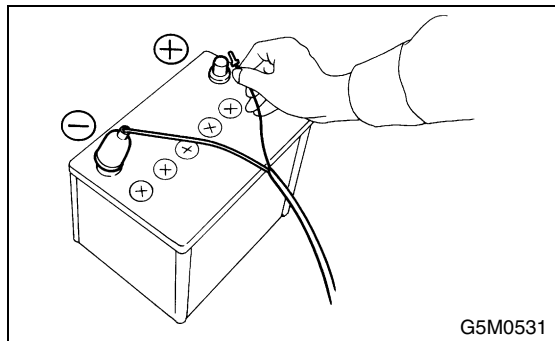


9) Move the battery at least 5 m (16 ft) from vehicle, and secure the nearby area. Connect the deployment tool alligator clip to the battery negative (-) terminal.

DISPOSAL OF AIRBAG MODULE (DEPLOYING WHILE INSTALLED IN VEHICLE)

AIRBAG SYSTEM

10) Connect the other cable of the deployment tool to the battery positive (+) terminal. Then, deploy the airbag module.

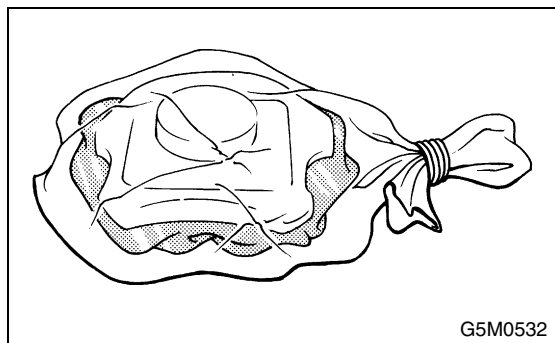


CAUTION:

- After deployment, the airbag module will be especially hot. Leave it unattended for 40 minutes, and then discard it.
- Do not let water get on the deployed airbag module.

11) Remove the side airbag module.

12) Wrap the deployed airbag module in an airtight vinyl bag, and discard it.



12. Disposal of Airbag Module (Deploying After Removal from Vehicle)

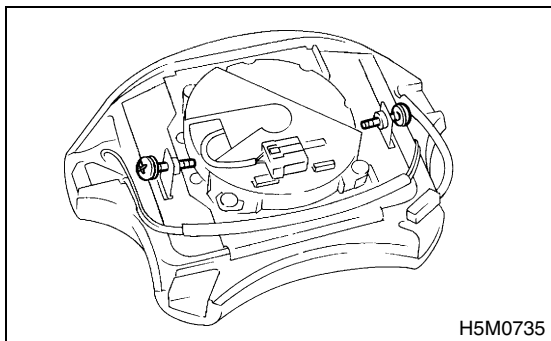
A: OPERATION

CAUTION:

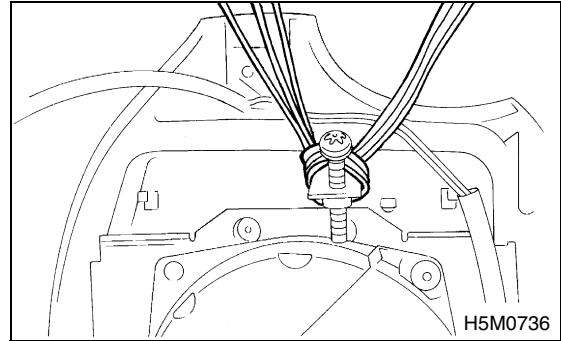
- Do not discard an undeployed airbag module because it may cause serious personal injury when accidentally deployed.
- As a rule, the airbag module should be deployed while still installed in the vehicle. Do not remove it unless necessary.
- Deployment of the airbag module should be done on a flat place 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 the ignition switch to OFF.
- 2) Disconnect the ground cable from battery, and wait for at least 20 seconds before starting work.
- 3) Remove the airbag module. <Ref. to AB-12, Driver's Airbag Module.>
- 4) Install the removed bolts to airbag module.



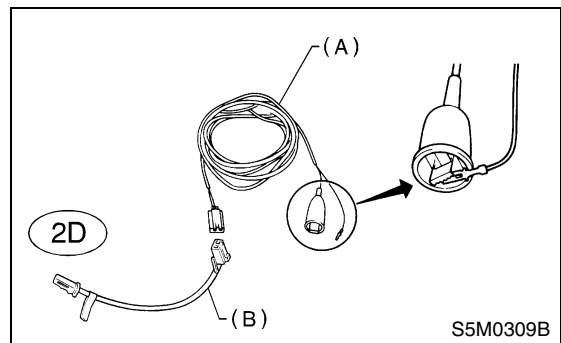
- 5) Bundle three wire automotive harnesses [each with a sectional area of 1.25 mm² (0.00194 sq in) or more], and bind them twofold around the airbag module stay.



- 6) Short the terminal to alligator clip furnished as deployment tool (A).
- 7) Connect the deployment tool and adapter A (deployment) (B).

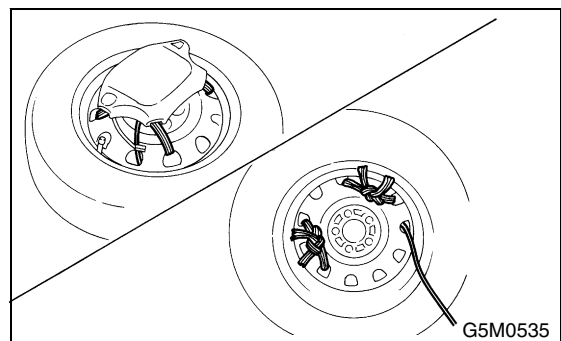
CAUTION:

The deployment tool should be kept shorted until just before deployment of the airbag module.



- (A) Deployment tool: (Part No. 98299PA030)
 (B) Adapter A (deployment): (Part No. 98299FC030)

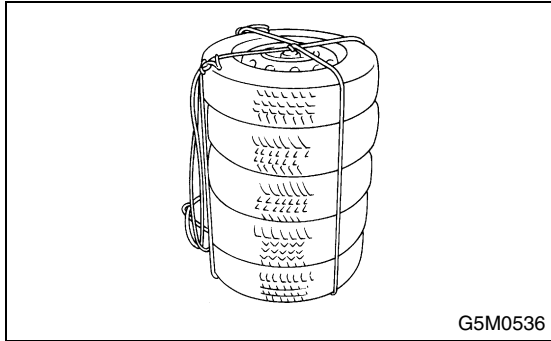
- 8) Connect the adapter A (deployment) connector (2D) to airbag module.
- 9) Install the airbag module with pad side facing upward on a wheel with tire.



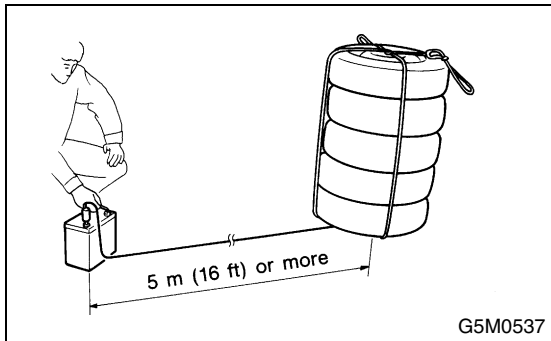
DISPOSAL OF AIRBAG MODULE (DEPLOYING AFTER REMOVAL FROM VEHICLE)

AIRBAG SYSTEM

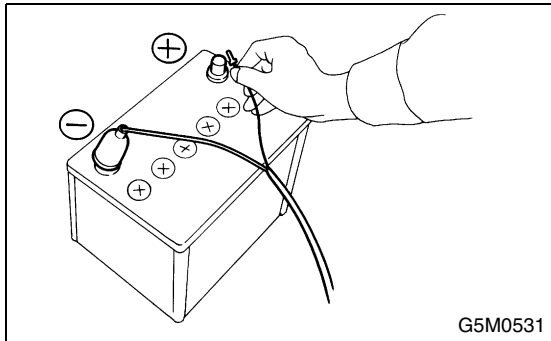
10) Put three tires without a wheel on the tire installed with the airbag module. Put on an additional tire with a wheel, and then fasten them tight with a rope.



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 negative (-) terminal.



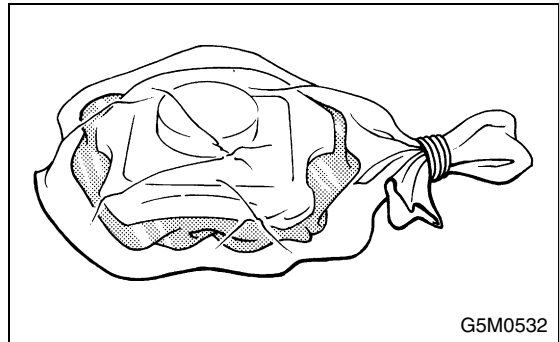
12) Connect the other cable of the deployment tool to the battery positive (+) terminal. Then, deploy the airbag module.



CAUTION:

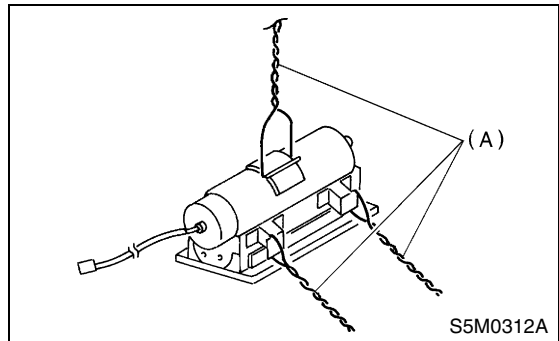
- After deployment, the airbag module will be especially hot. Leave it unattended for 40 minutes, and then discard it.
- Do not let water get on the deployed airbag module.

13) Wrap the deployed airbag module in an airtight vinyl bag, and discard it.



2. AIRBAG MODULE (PASSENGER)

- 1) Turn the ignition switch to OFF.
- 2) Disconnect the ground cable from battery, and wait for at least 20 seconds before starting work.
- 3) Remove the airbag module. <Ref. to AB-13, 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 the terminal to alligator clip furnished as deployment tool (A).

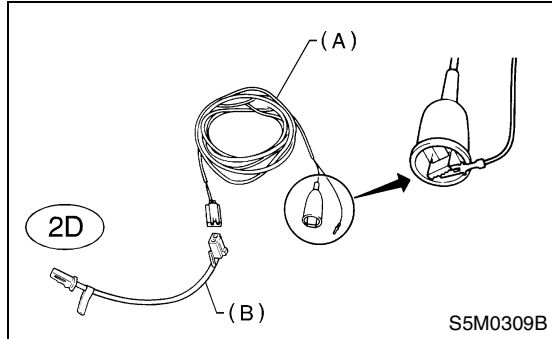
DISPOSAL OF AIRBAG MODULE (DEPLOYING AFTER REMOVAL FROM VEHICLE)

AIRBAG SYSTEM

6) Connect the deployment tool and adapter A (deployment) (B).

CAUTION:

The deployment tool should be kept shorted until just before deployment of the airbag module.

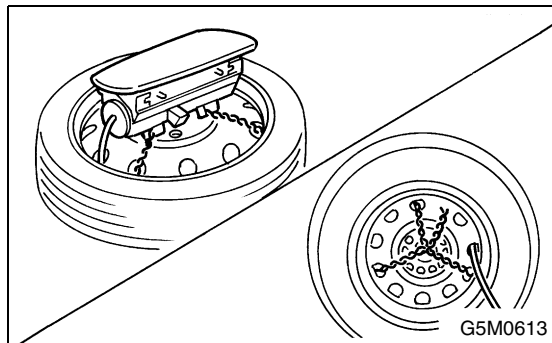


(A) Deployment tool: (Part No. 98299PA030)

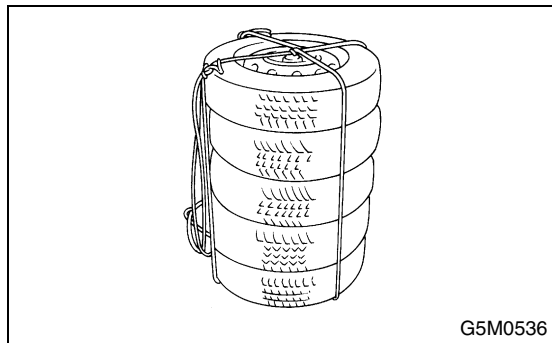
(B) Adapter A (deployment): (Part No. 98299FC030)

7) Connect the adapter A (deployment) connector (2D) to airbag module.

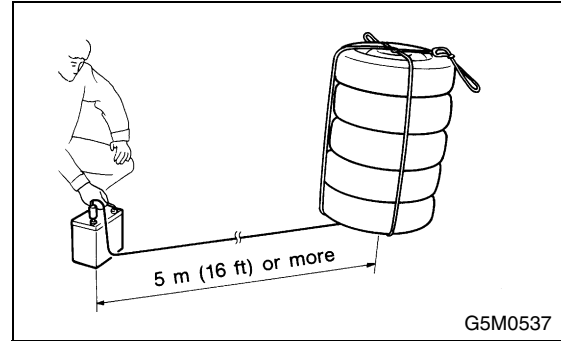
8) Install the airbag module with pad side facing upward on 14 inch or greater size wheel with tire.



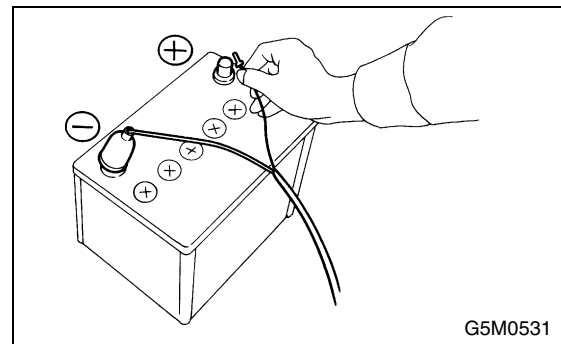
9) Put three tires without a wheel on the tire installed with the airbag module. Put on an additional tire with a wheel on top, and then fasten them tight with a rope.



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 negative (-) terminal.



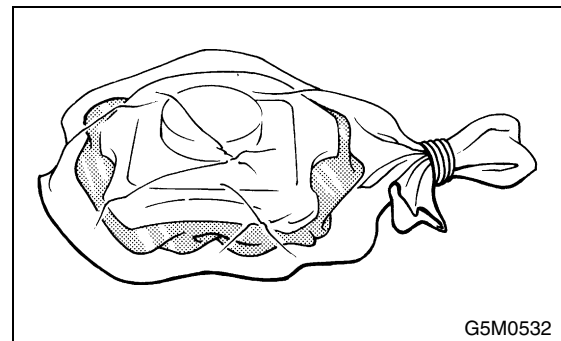
11) Connect the other cable of the deployment tool to the battery positive (+) terminal. Then, deploy the airbag module.



CAUTION:

- After deployment, the airbag module will be especially hot. Leave it unattended for 40 minutes, and then discard it.
- Do not let water get on the deployed airbag module.

12) Wrap the deployed airbag module in an airtight vinyl bag, and discard it.

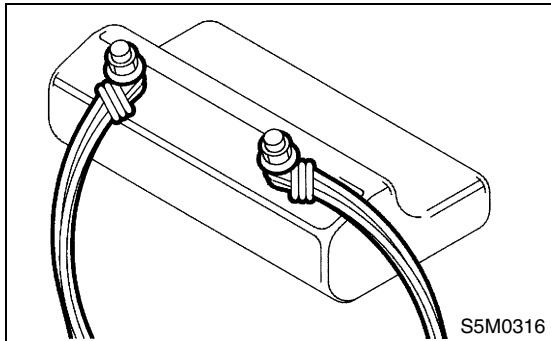


DISPOSAL OF AIRBAG MODULE (DEPLOYING AFTER REMOVAL FROM VEHICLE)

AIRBAG SYSTEM

3. AIRBAG MODULE (SIDE)

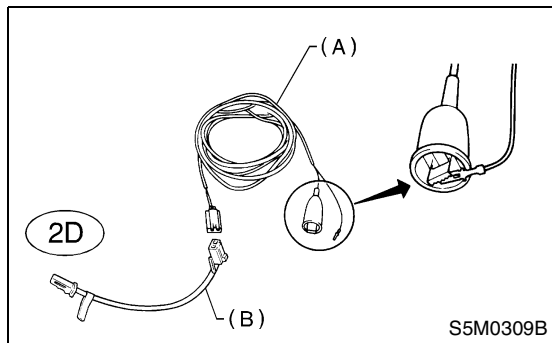
- 1) Turn the ignition switch to OFF.
- 2) Disconnect the ground cable from battery, and wait for at least 20 seconds before starting work.
- 3) Remove the front seat. <Ref. to SE-6, REMOVAL, Front Seat.>
- 4) Remove the side airbag module. <Ref. to SE-6, DISASSEMBLY, Front Seat.>
- 5) Install the nuts to side airbag module.
- 6) Bundle three wire automotive harnesses [each with a sectional area of 1.25 mm² (0.00194 sq in) or more], and bind them twofold around the airbag module stay.



- 7) Short the terminal to alligator clip furnished as deployment tool (A).
- 8) Connect the deployment tool and adapter A (deployment) (B).

CAUTION:

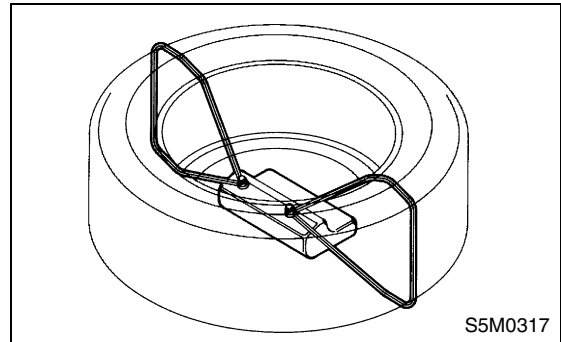
The deployment tool should be kept shorted until just before deployment of the airbag module.



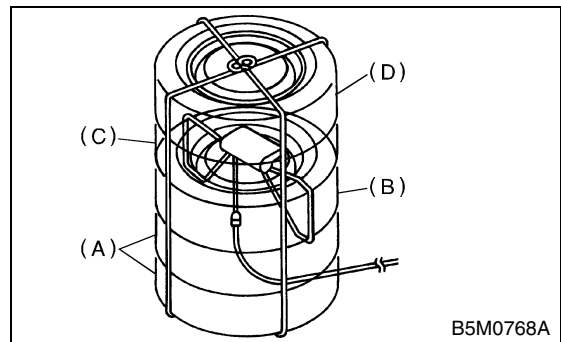
- (A) Deployment tool: (Part No. 98299PA030)
(B) Adapter A (deployment): (Part No. 98299FC030)

- 9) Connect the adapter A (deployment) connector (2D) to airbag module.

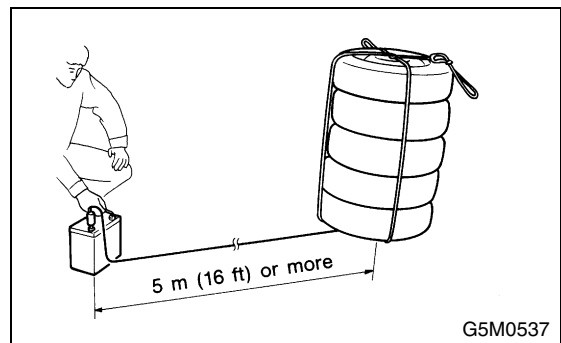
- 10) Install the side airbag module on 14 inch or greater size tire without disk wheel.



- 11) Put two tires without a 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 a wheel (D) on top. Fasten them tight with a rope.



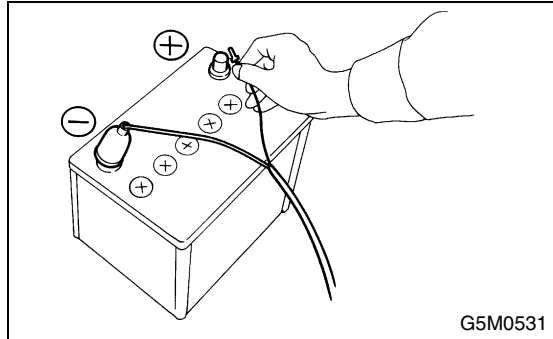
- 12) Move the battery at least 5 m (16 ft) from the vehicle, and secure the nearby area. Connect the deployment tool alligator clip to the battery negative (-) terminal.



DISPOSAL OF AIRBAG MODULE (DEPLOYING AFTER REMOVAL FROM VEHICLE)

AIRBAG SYSTEM

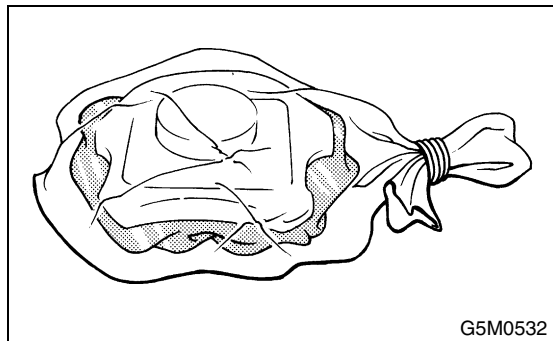
13) Connect the other cable of the deployment tool to the battery positive (+) terminal. Then, deploy the airbag module.



CAUTION:

- After deployment, the airbag module will be especially hot. Leave it unattended for 40 minutes, and then discard it.
- Do not let water get on the deployed airbag module.

14) Wrap the deployed airbag module in an airtight vinyl bag, and discard it.



DISPOSAL OF AIRBAG MODULE (DEPLOYING AFTER REMOVAL FROM VEHICLE)

AIRBAG SYSTEM

AIRBAG SYSTEM (DIAGNOSTICS)

AB

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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 (DTC). <Ref. to AB-29, Read Diagnostic Trouble Code (DTC).>	Is the normal code being detected?	Finish the diagnosis.	Go to step 2.
2	READ DIAGNOSTIC TROUBLE CODE (DTC). <Ref. to AB-29, Read Diagnostic Trouble Code (DTC).>	Is the DTC 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 (DTC).> . 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 any DTC again.	Is the DTC being detected?	Perform the procedure 1) to 5) in step 3.	Finish the diagnosis.

CHECK LIST FOR INTERVIEW

AIRBAG SYSTEM (DIAGNOSTICS)

2. Check List for Interview

A: CHECK

Customer's Name		Inspector's Name	
Date Vehicle Brought In	/ /	Registration No.	
Odometer Reading	Km Miles	Vin No.	
Date Problem Occurred	/ /	Registration Year	/ /
Weather	<input type="checkbox"/> Fine <input type="checkbox"/> Cloudy <input type="checkbox"/> Rainy <input type="checkbox"/> Snowy <input type="checkbox"/> Other:		
Temperature	°C (°F)		
Road Condition	<input type="checkbox"/> Level road <input type="checkbox"/> Uphill <input type="checkbox"/> Downhill <input type="checkbox"/> Rough road <input type="checkbox"/> Others:		
Vehicle Operation	<input type="checkbox"/> Driving (<input type="checkbox"/> Starting <input type="checkbox"/> Idling <input type="checkbox"/> Constant Speed <input type="checkbox"/> Acceleration <input type="checkbox"/> Deceleration <input type="checkbox"/> Steering wheel turn <input type="checkbox"/> Other:)		
Details of Problem			
Check Airbag Warning Light	<input type="checkbox"/> Remains ON <input type="checkbox"/> Remains OFF		
Check DTC	<input type="checkbox"/> Normal Code <input type="checkbox"/> Trouble Code: (Code:)		

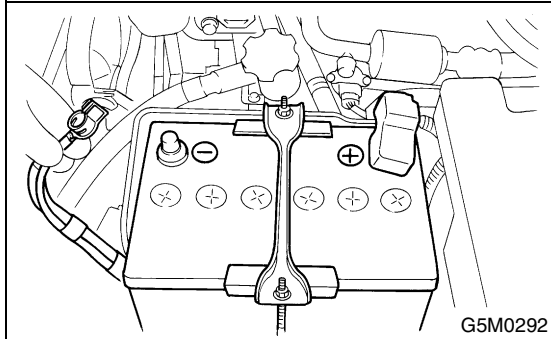
GENERAL DESCRIPTION

AIRBAG SYSTEM (DIAGNOSTICS)

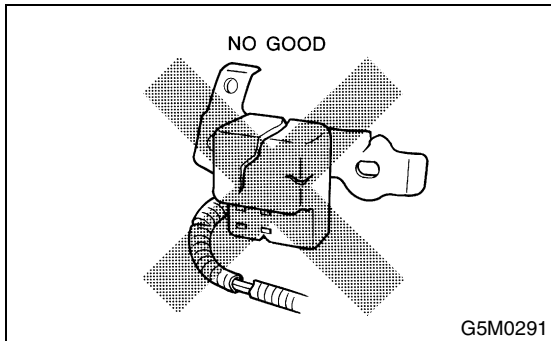
3. General Description

A: CAUTION

- When servicing a vehicle, be sure to turn the ignition switch to OFF, disconnect the ground cable from 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.

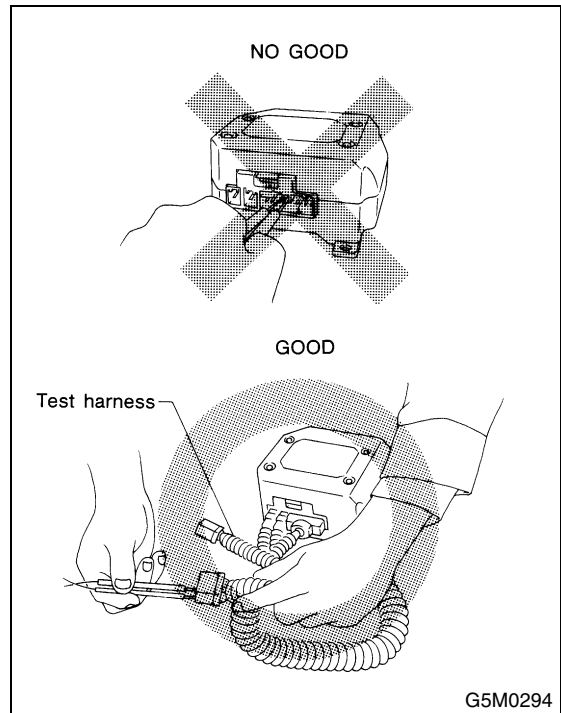
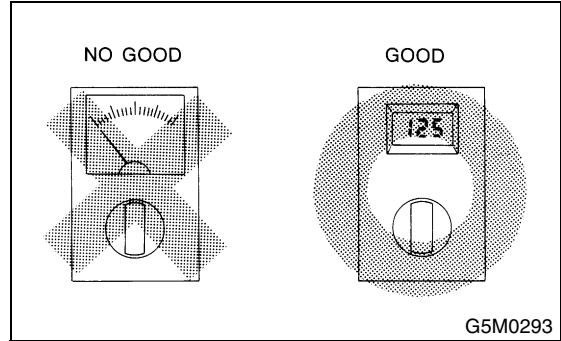


- If sensors, airbag module, airbag control module pretensioner, and harness are deformed or damaged, replace them with new genuine parts.
- Do not use the airbag system and pretensioners on other vehicles. When replacing parts, be sure to replace them with new parts.



- 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.

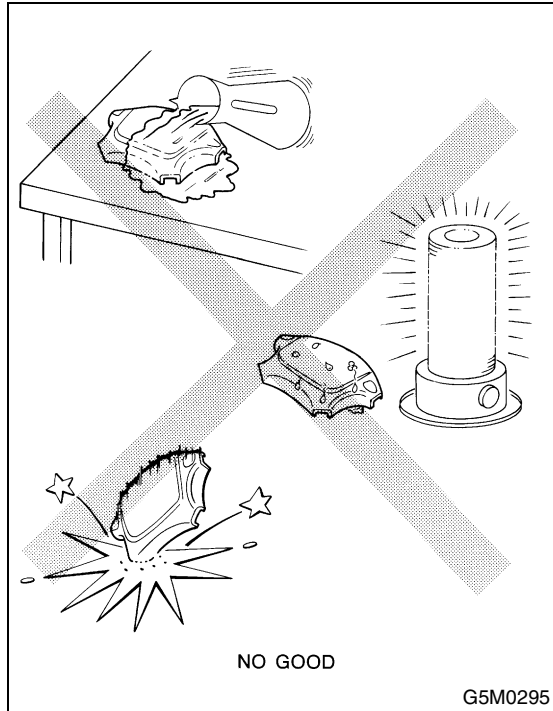
- When checking, use a test harness. Do not directly apply the tester probe to any connector terminal of the airbag.



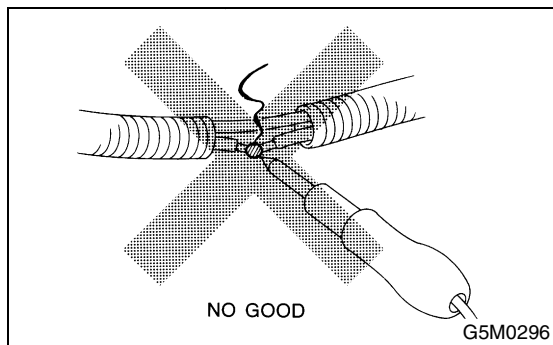
GENERAL DESCRIPTION

AIRBAG SYSTEM (DIAGNOSTICS)

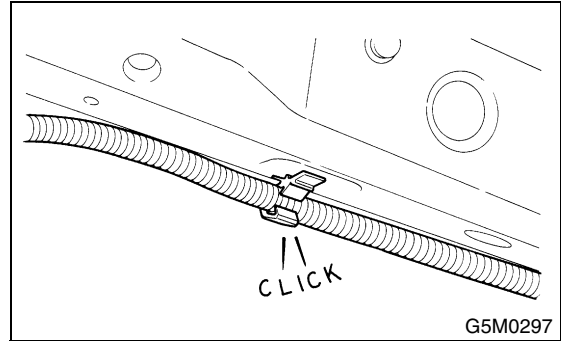
- Do not drop the airbag modulator parts, subject them to high temperature over 93°C (199°F), or let water, oil, or grease get on them; otherwise, the internal parts may be damaged and reliability greatly lowered.



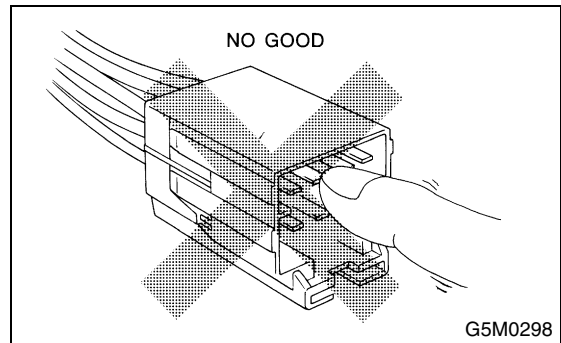
- If any damage, opening or rust is found on the airbag system wire harness, do not attempt to repair using soldering equipment. Be sure to replace the faulty harness with a new genuine part.



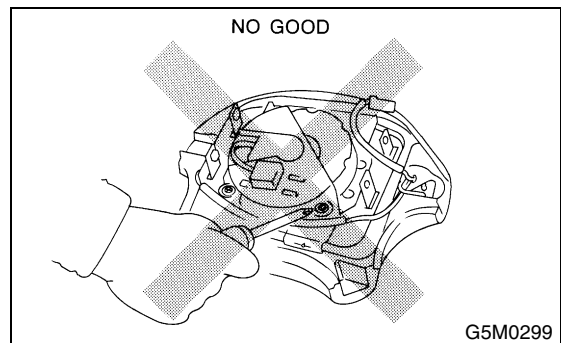
- Install the wire harness securely with the specified clips to avoid interference or tangled up with other parts.



- Do not allow water or oil to come in contact with the connector terminals. Do not touch the connector terminals.



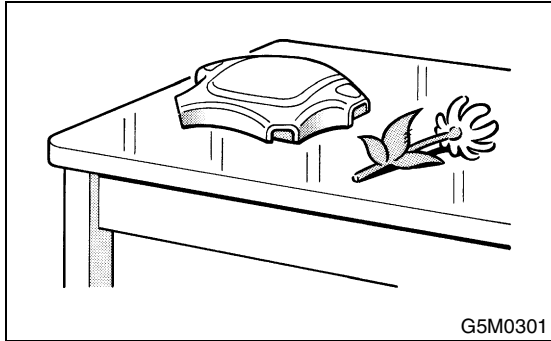
- The airbag module (driver, passenger, and side, pretensioner) must not be disassembled.
- The airbag module cannot be used again once inflated.



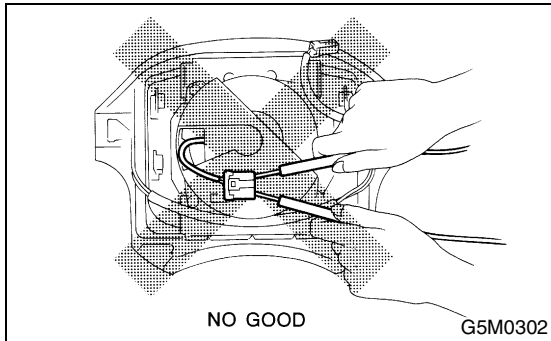
GENERAL DESCRIPTION

AIRBAG SYSTEM (DIAGNOSTICS)

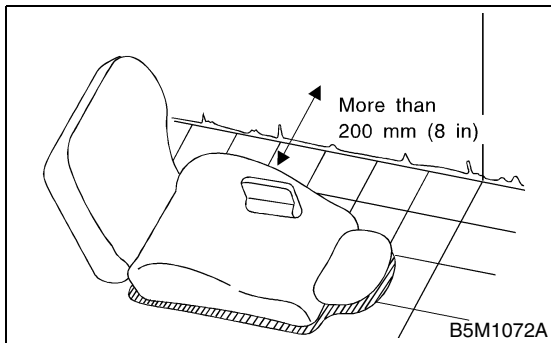
- After removal, keep the airbag module with the pad facing upward on a dry, clean, and flat surface away from heat and light sources, and moisture and dust.



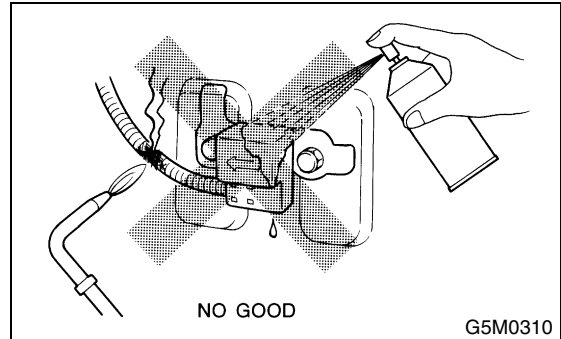
- Do not check continuity of the airbag module (driver, passenger, and side, pretensioner).



- The removed front seat with the airbag module must be kept at least 200 mm (8 in) away from walls and other objects.



- 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.

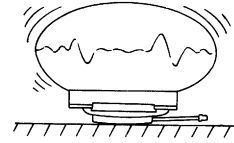
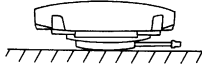
- When painting or performing sheet metal work on the front part of the vehicle, including the front wheel apron, front fender, and front side frame, remove the front sub sensors and wire harness of the airbag system.

GENERAL DESCRIPTION

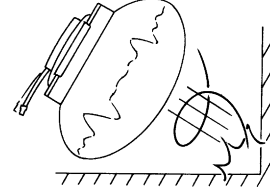
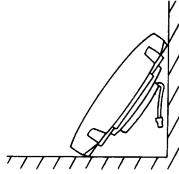
AIRBAG SYSTEM (DIAGNOSTICS)

Driver side

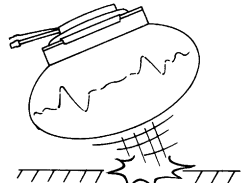
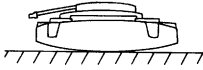
GOOD



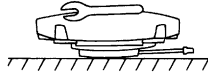
NO GOOD



NO GOOD

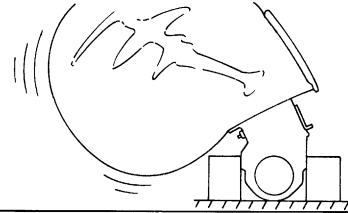
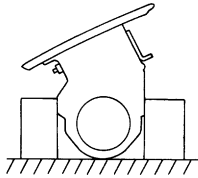


NO GOOD

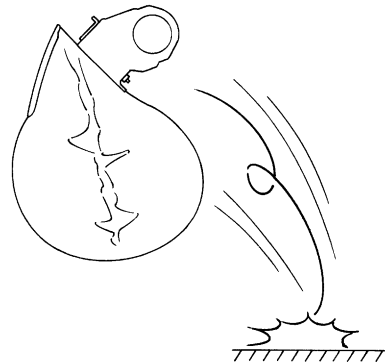
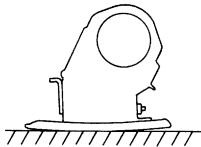


Passenger side

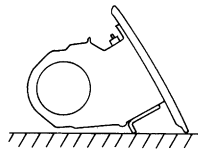
GOOD



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 the battery voltage and specific gravity of electrolyte.

Standard voltage: 12 V

Specific gravity: Above 1.260

GENERAL DESCRIPTION

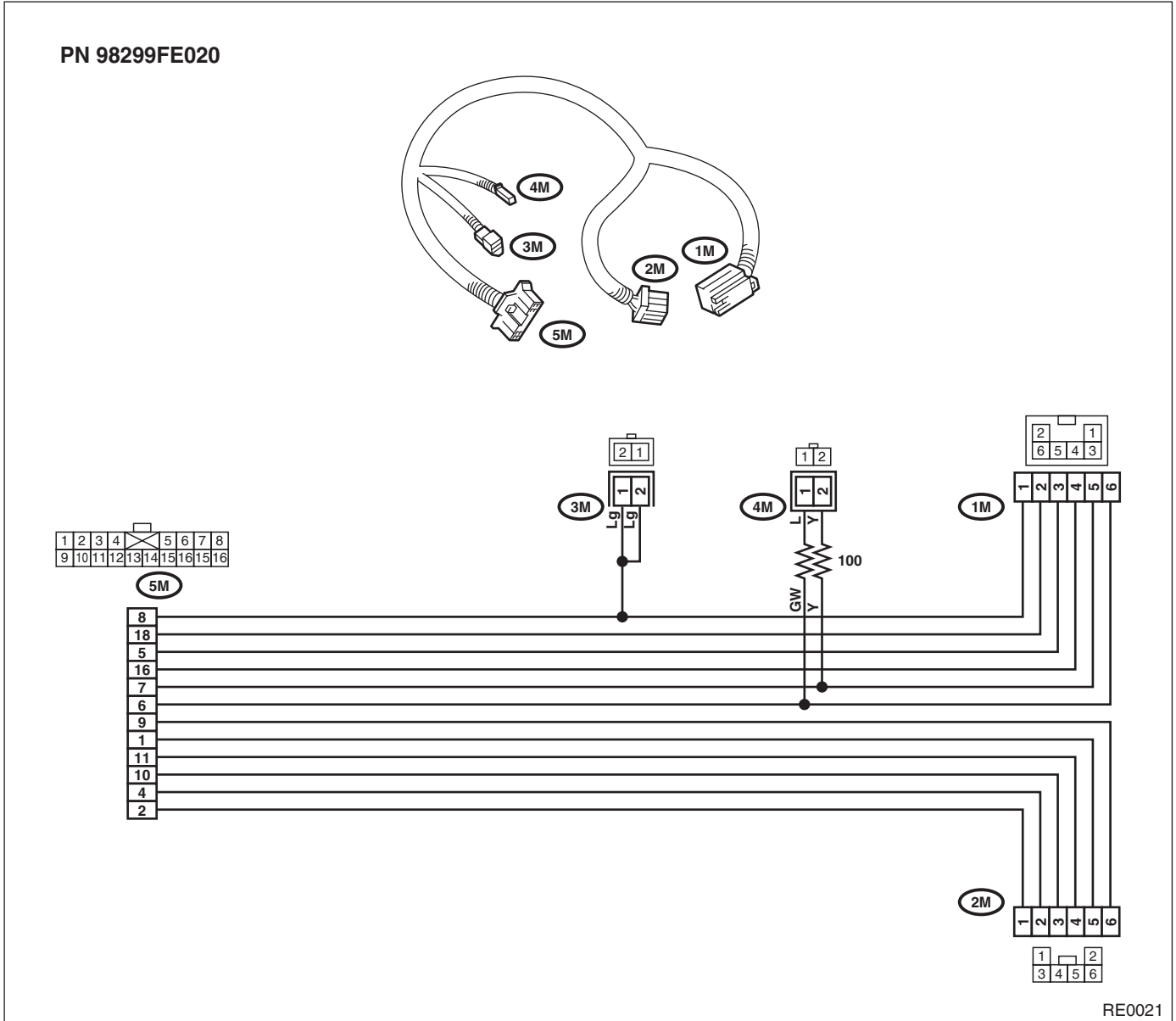
AIRBAG SYSTEM (DIAGNOSTICS)

C: PREPARATION TOOL

CAUTION:

Be sure to use specified test harness M, F, G, H, L and I or I2 when measuring the voltage, resistance, etc. of AIRBAG system component parts.

1. TEST HARNESS M

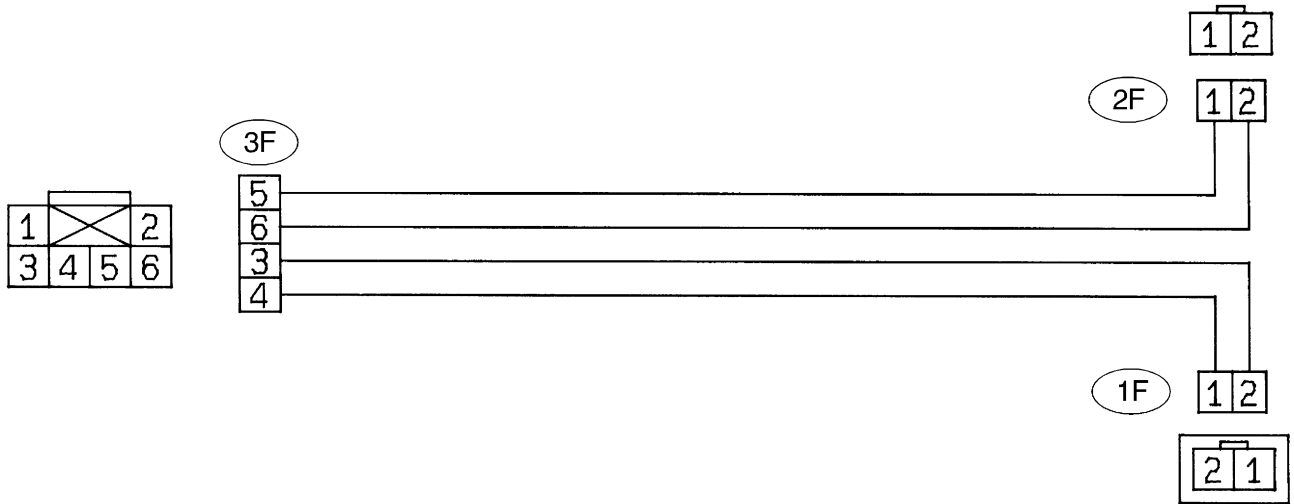
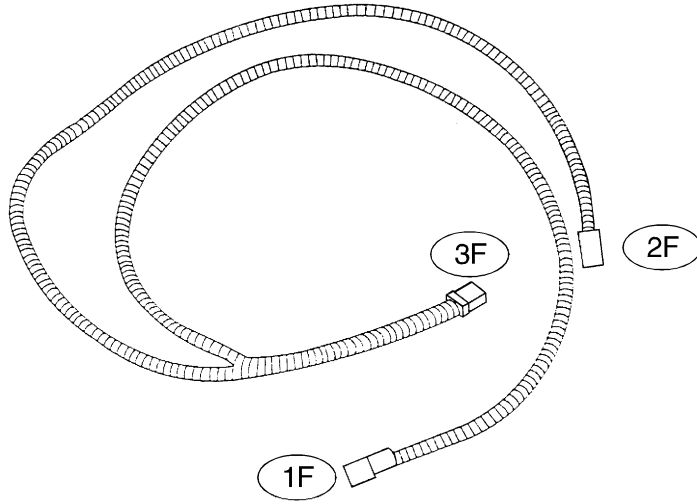


GENERAL DESCRIPTION

AIRBAG SYSTEM (DIAGNOSTICS)

2. TEST HARNESS F

PN 98299FC010

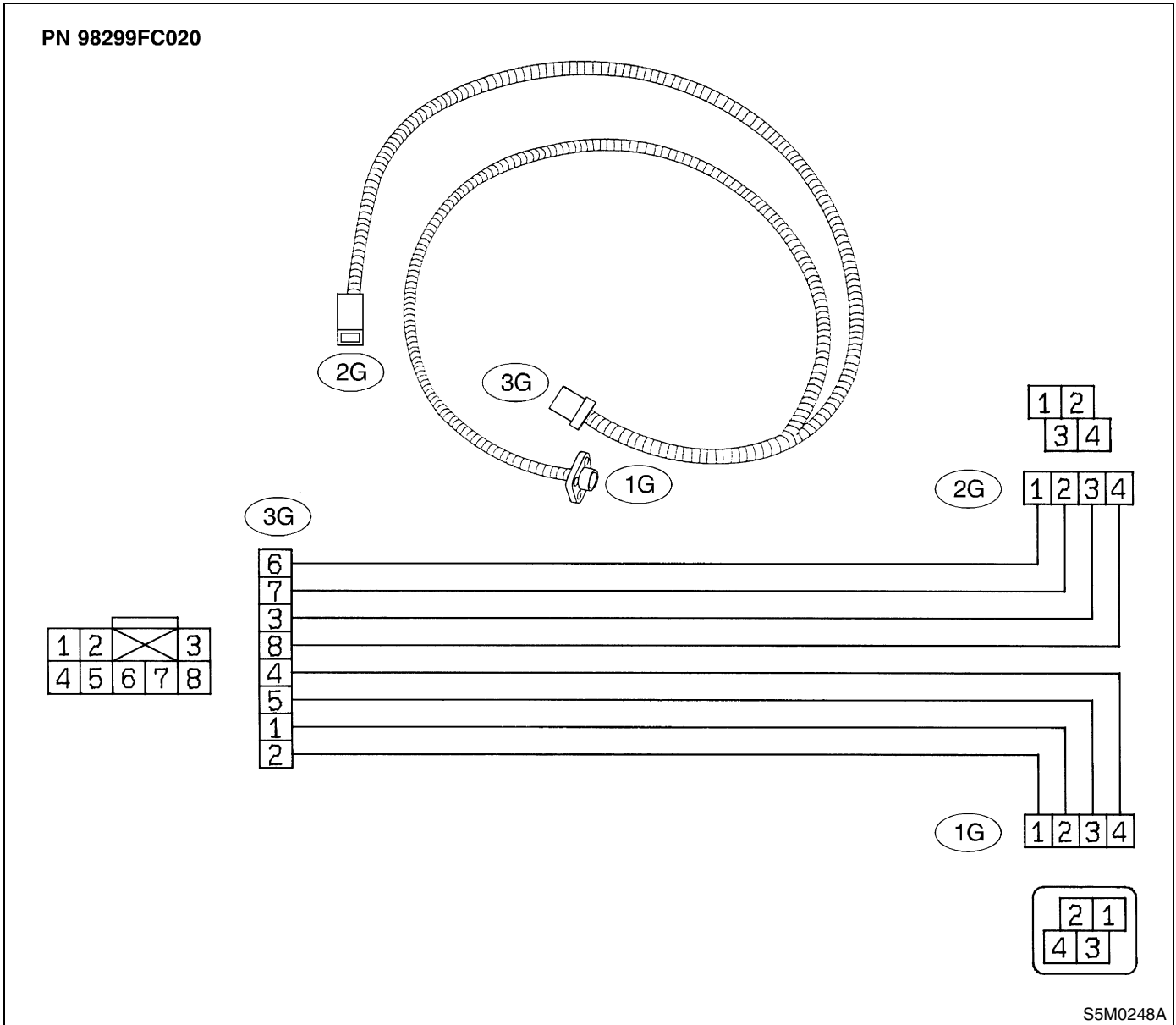


S5M0247A

GENERAL DESCRIPTION

AIRBAG SYSTEM (DIAGNOSTICS)

3. TEST HARNESS G

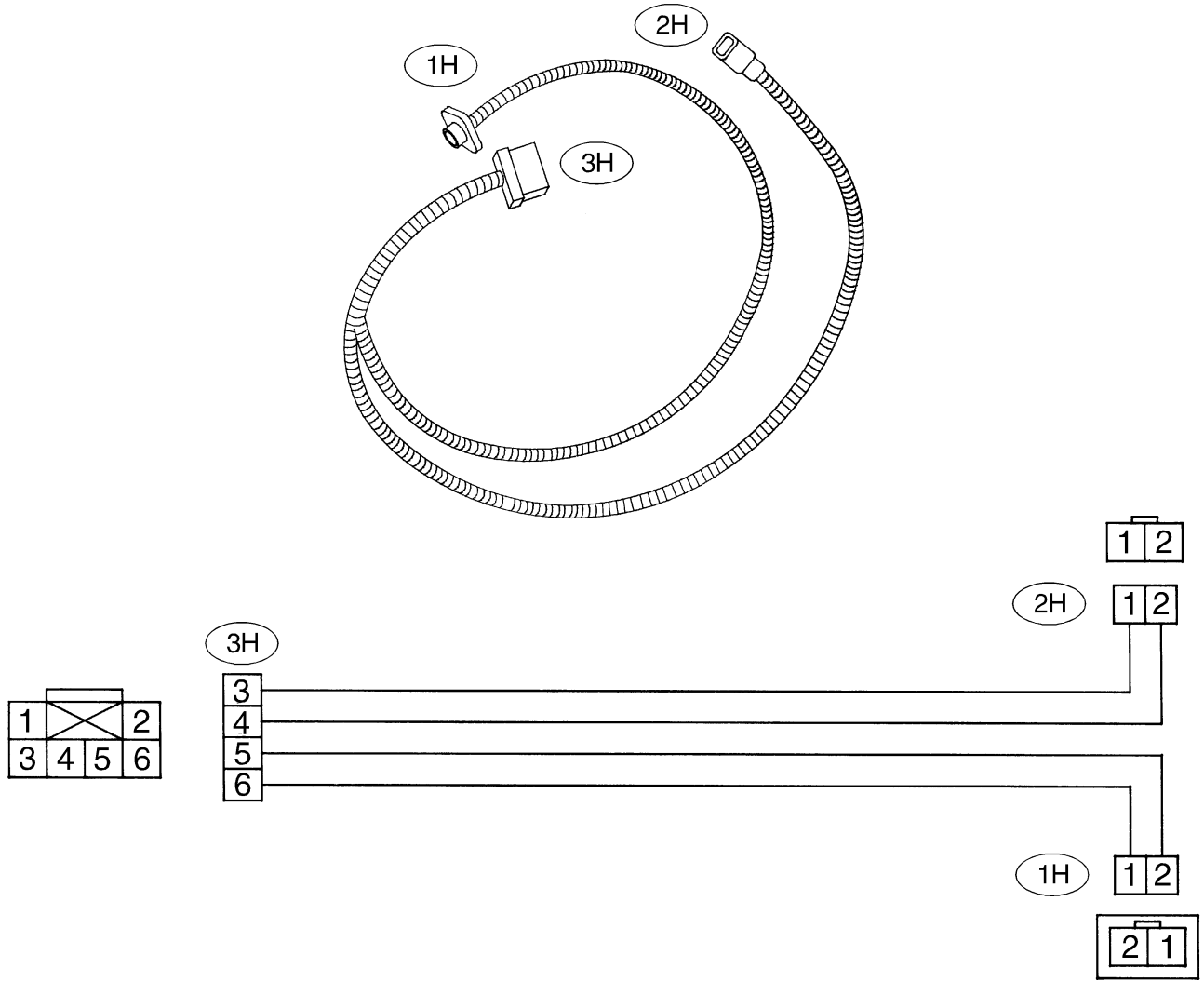


GENERAL DESCRIPTION

AIRBAG SYSTEM (DIAGNOSTICS)

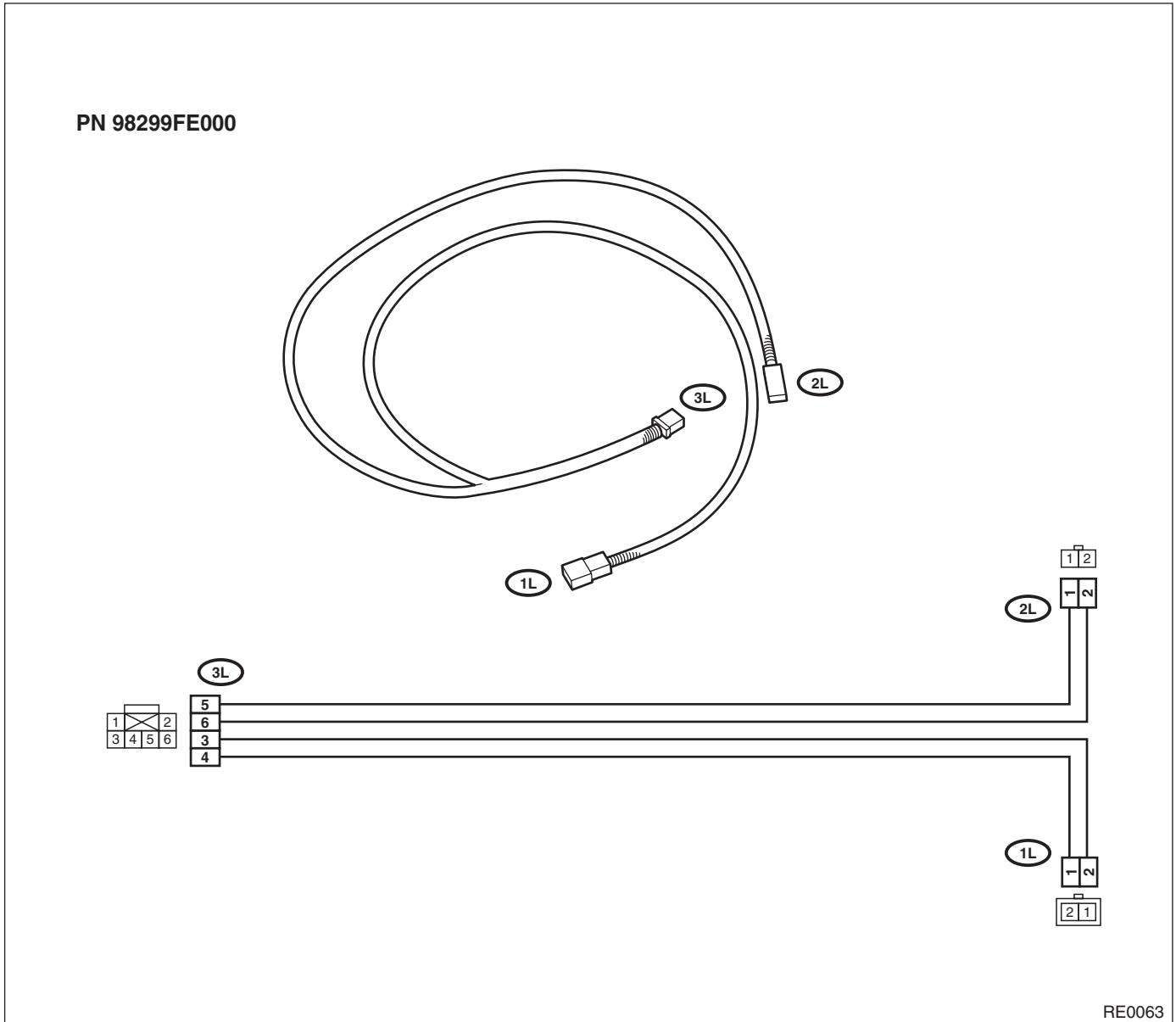
4. TEST HARNESS H

PN 98299FA030



B5M0553B

5. TEST HARNESS L

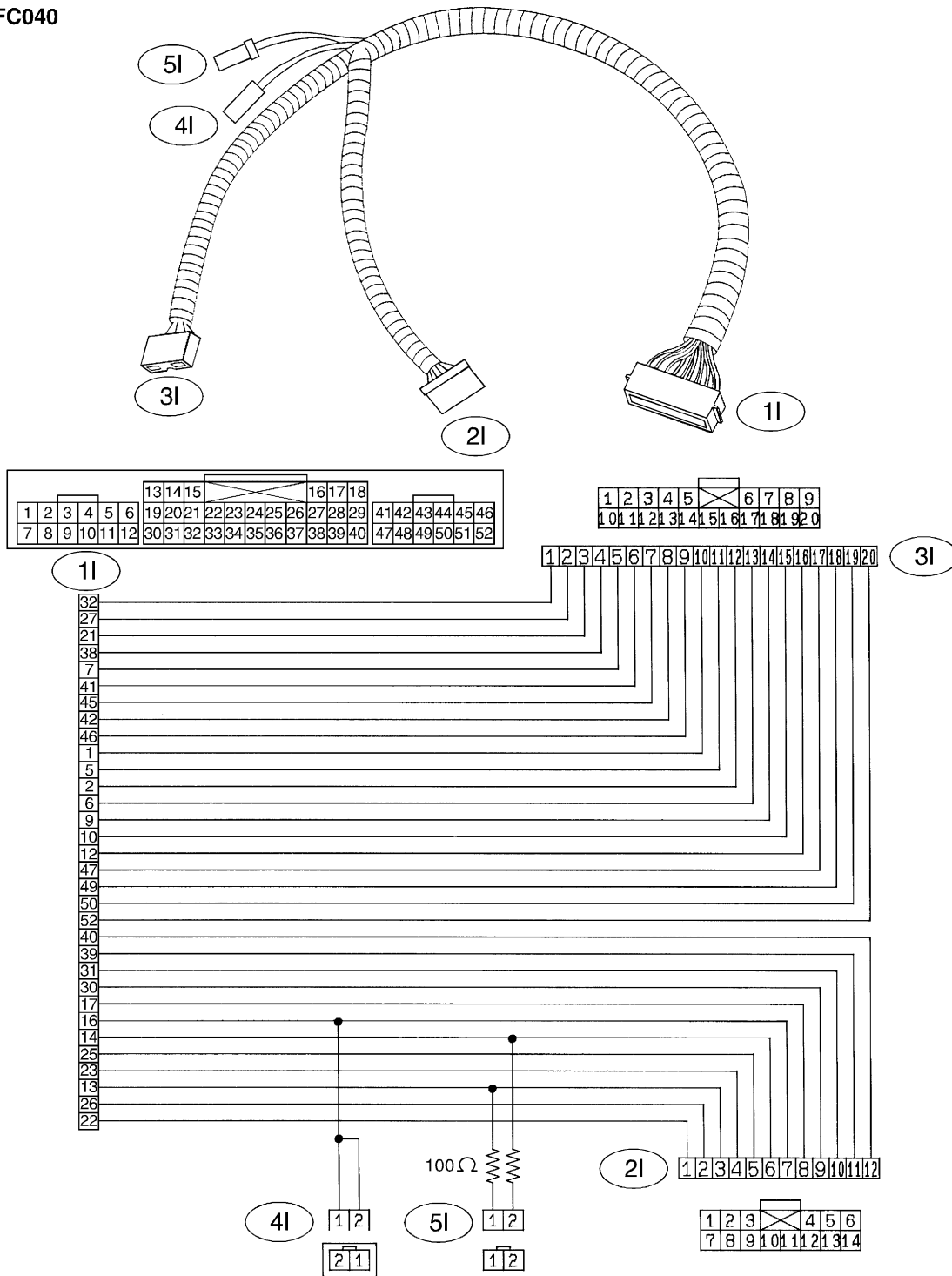


GENERAL DESCRIPTION

AIRBAG SYSTEM (DIAGNOSTICS)

6. TEST HARNESS I

PN 98299FC040



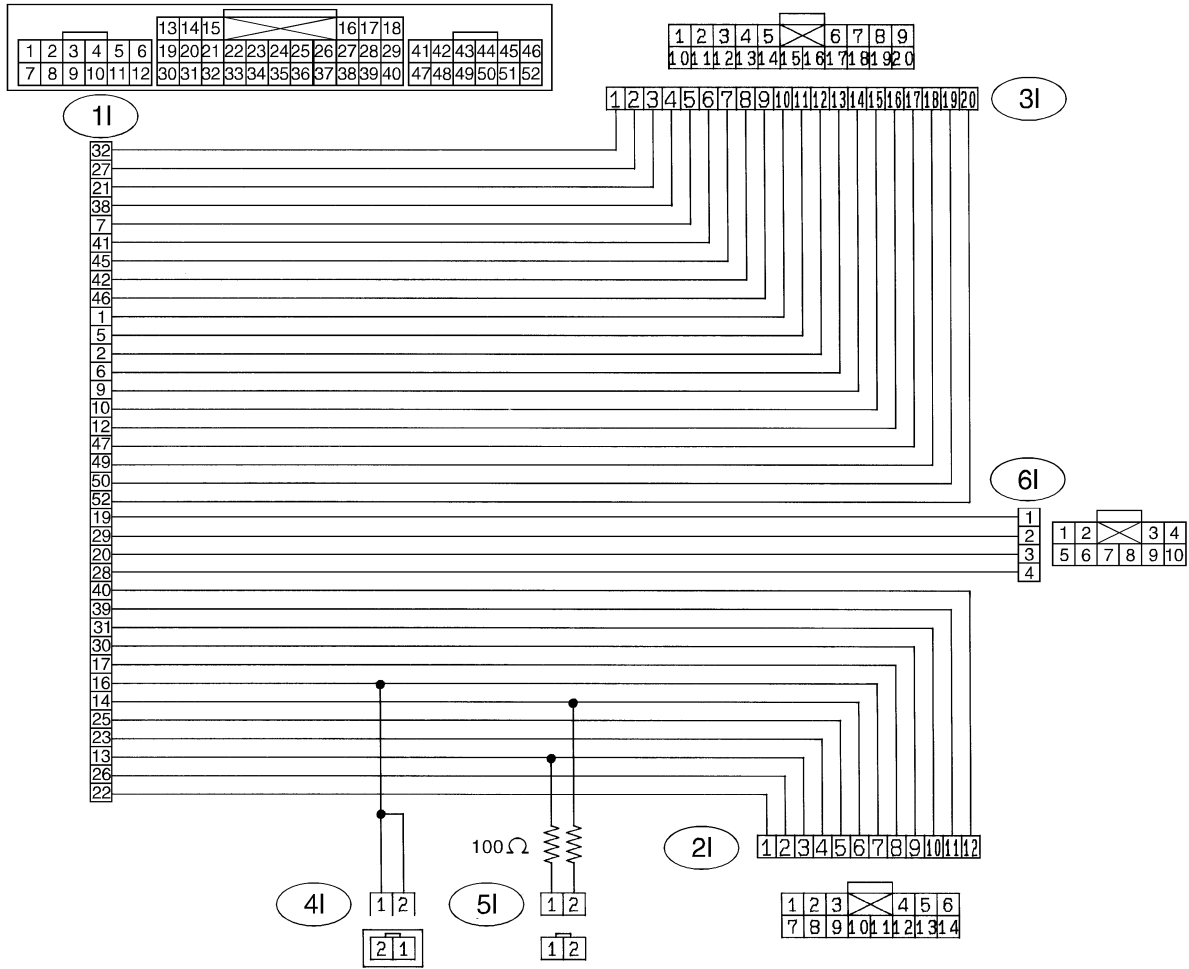
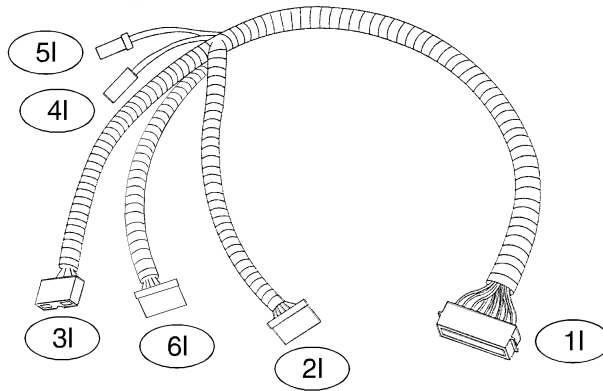
S5M0340A

GENERAL DESCRIPTION

AIRBAG SYSTEM (DIAGNOSTICS)

7. TEST HARNESS I2

PN 98299FC041



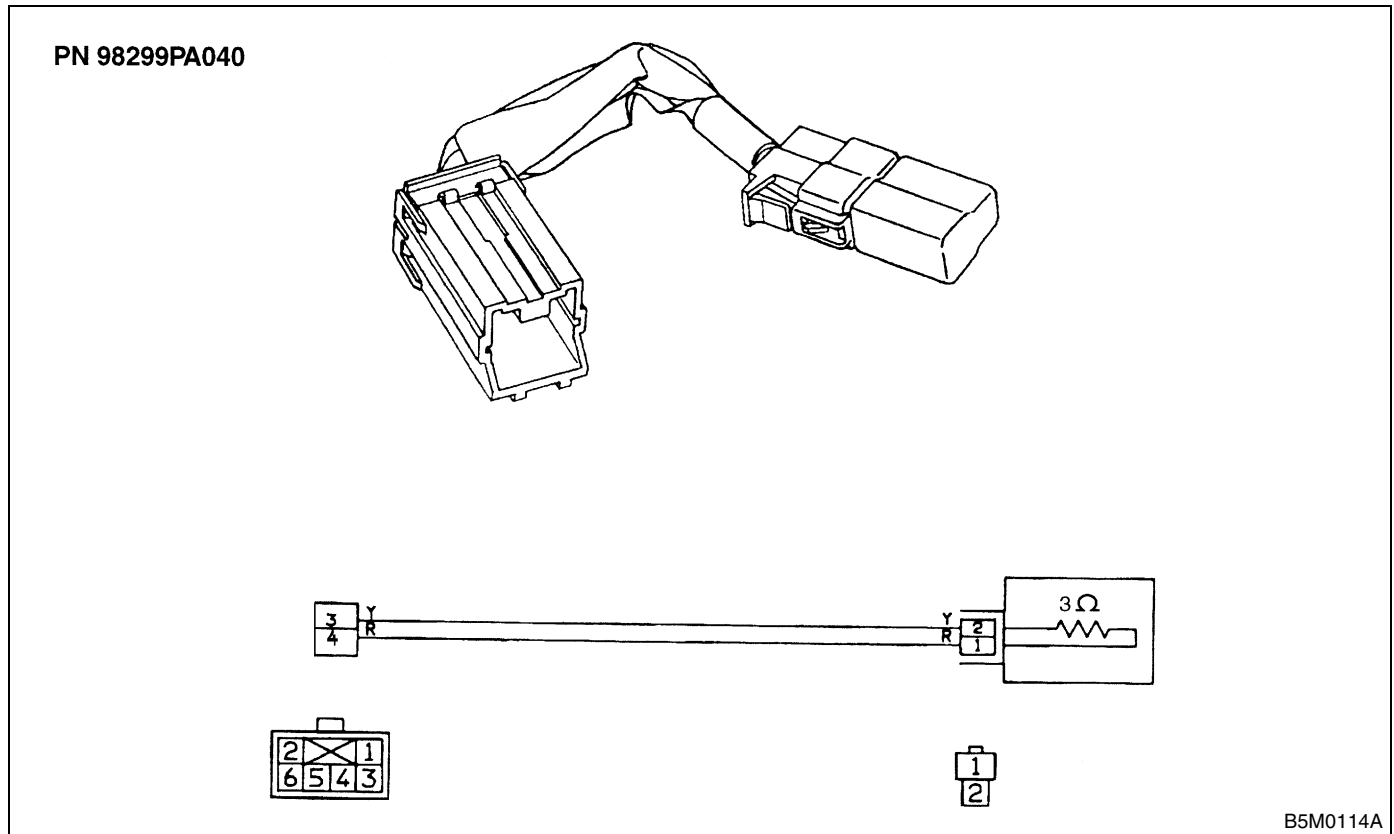
B5M0927A

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.



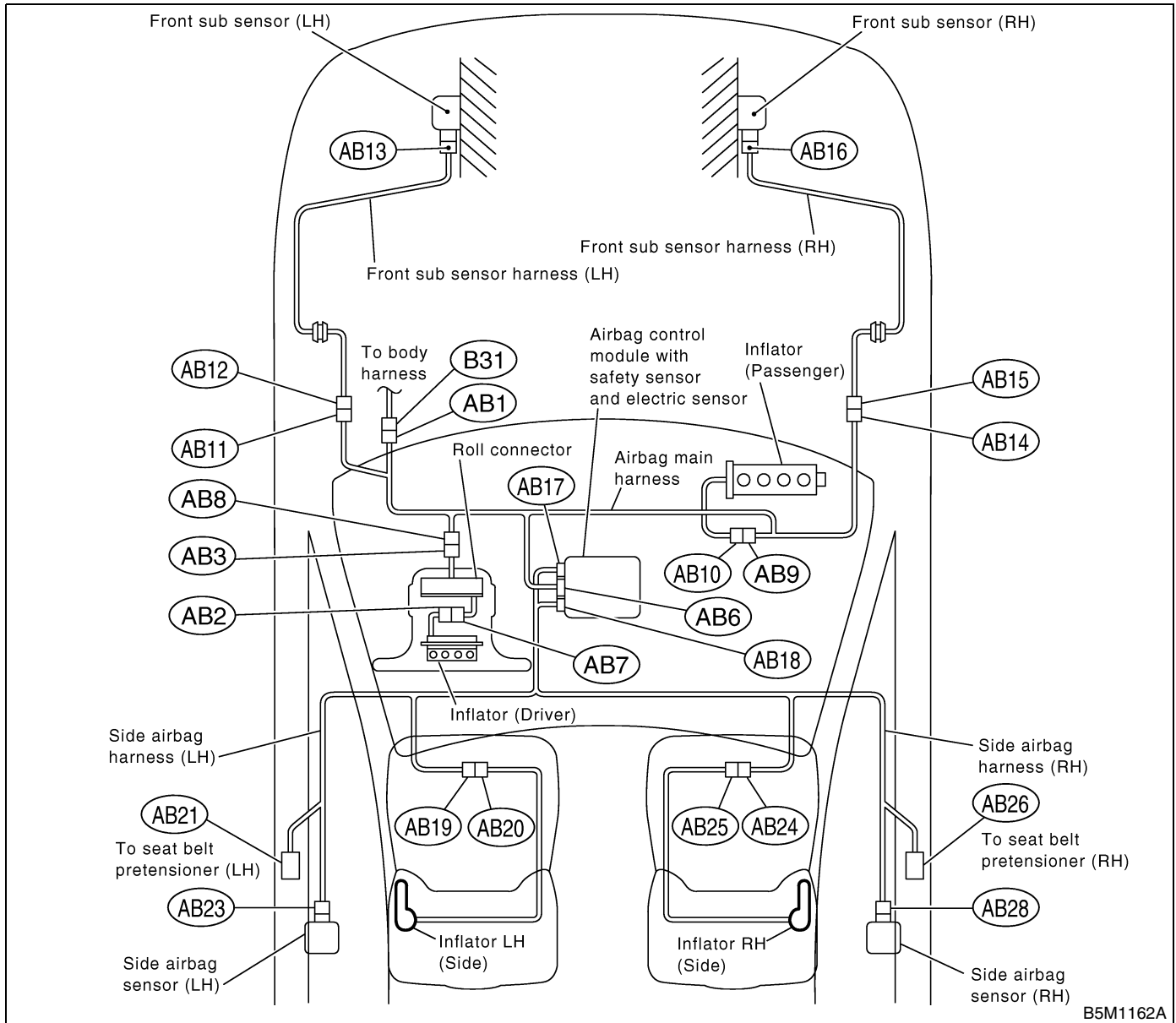
ELECTRICAL COMPONENTS LOCATION

AIRBAG SYSTEM (DIAGNOSTICS)

4. Electrical Components Location

A: LOCATION

1. LHD MODEL



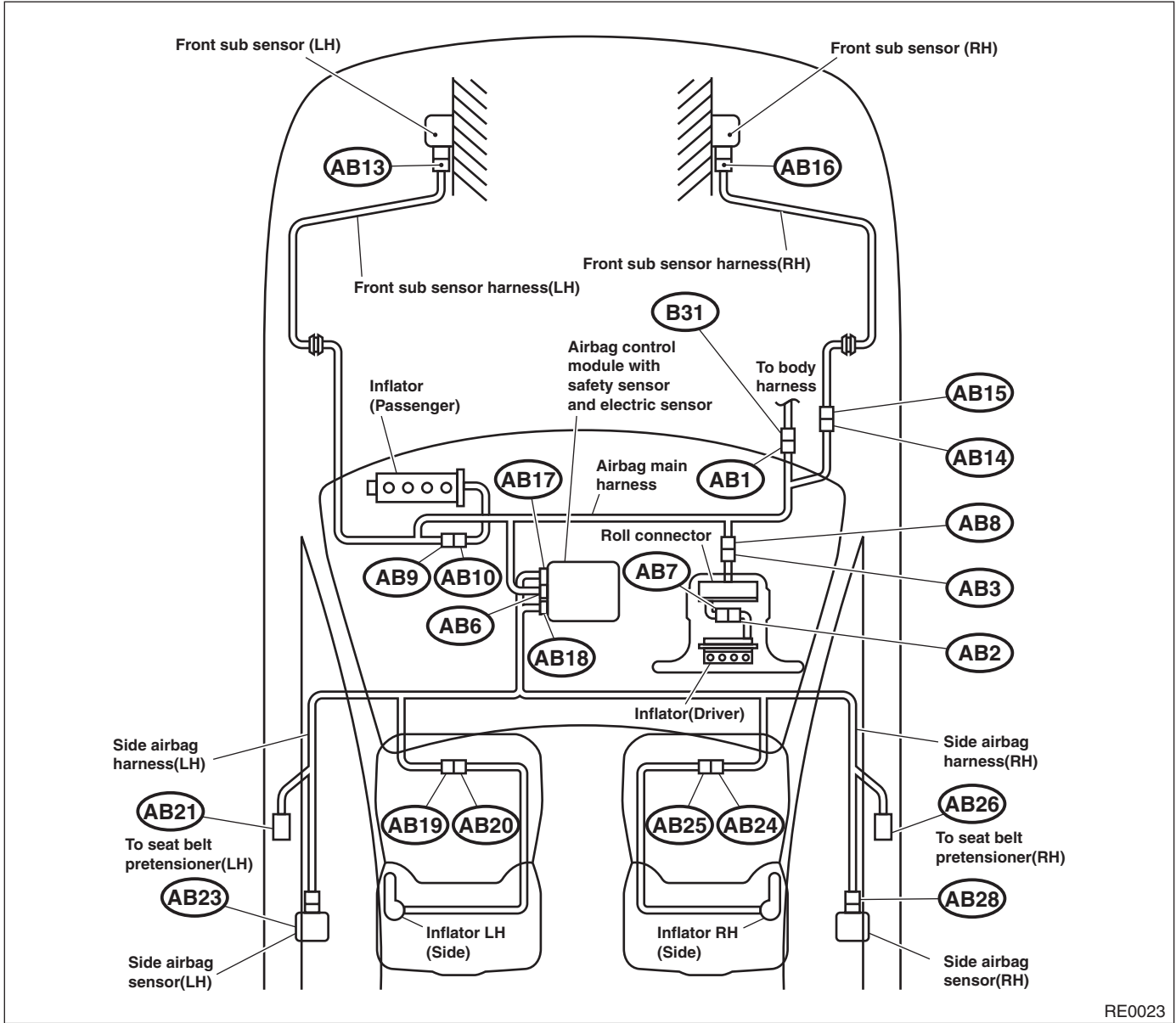
B5M1162A

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



RE0023

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

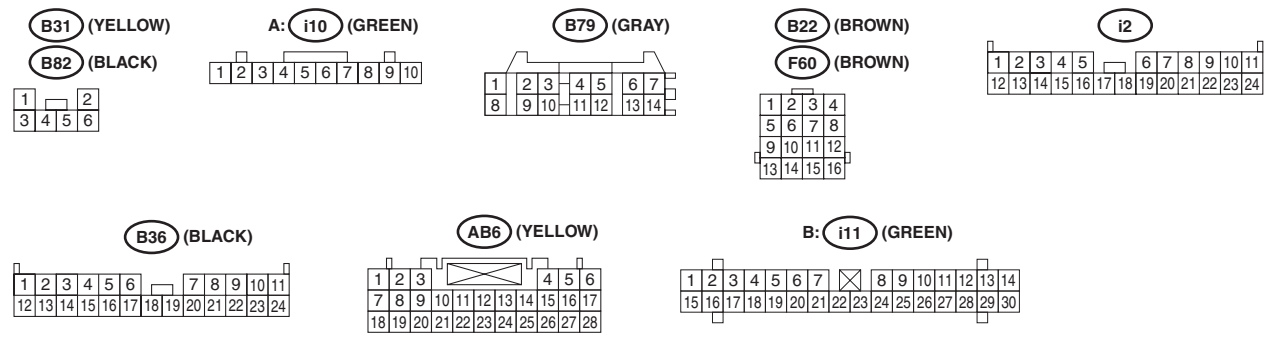
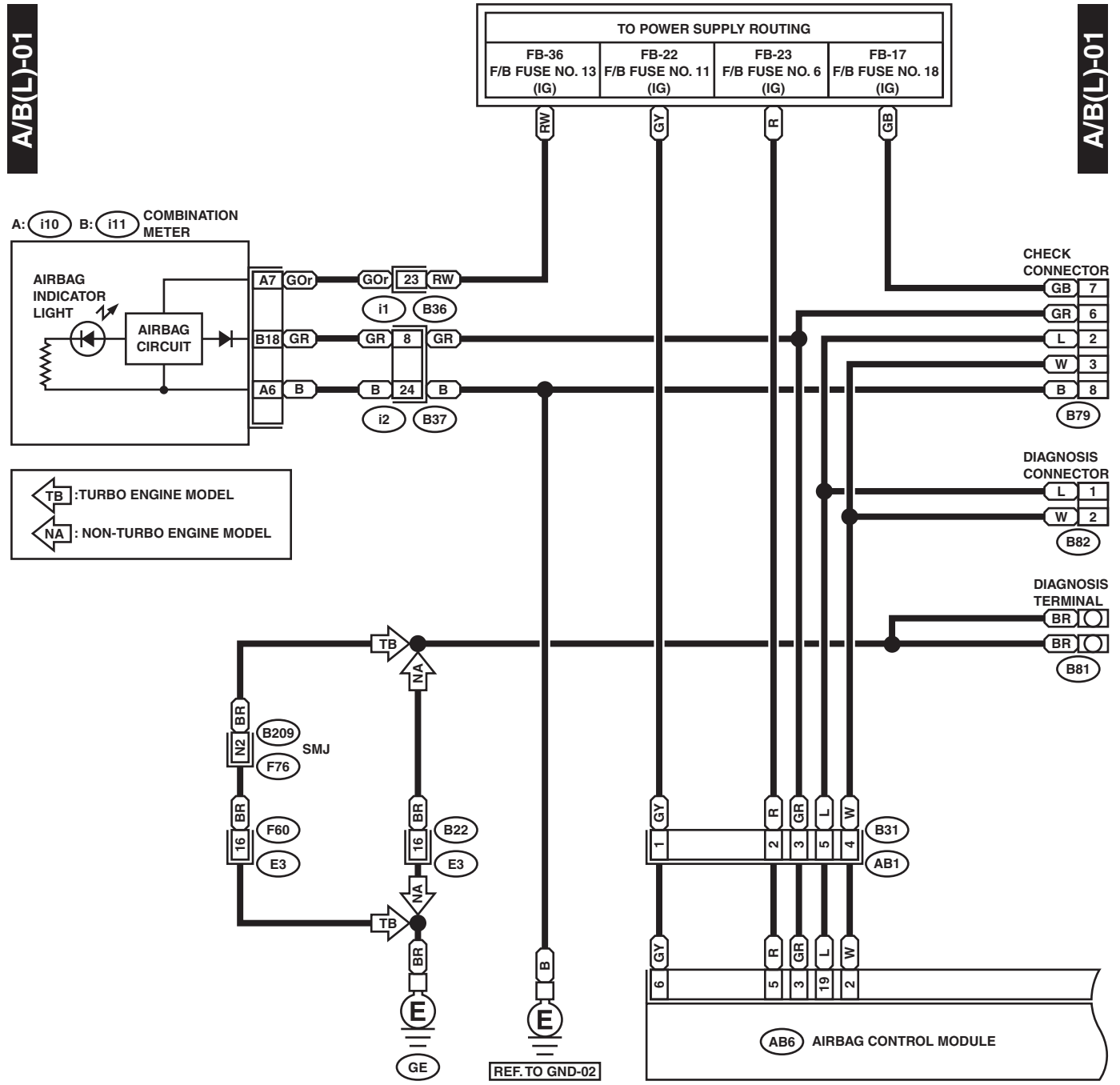
5. A/B Control Module I/O Signal

A: SCHEMATIC

A/B CONTROL MODULE I/O SIGNAL

AIRBAG SYSTEM (DIAGNOSTICS)

1. AIRBAG LHD MODEL



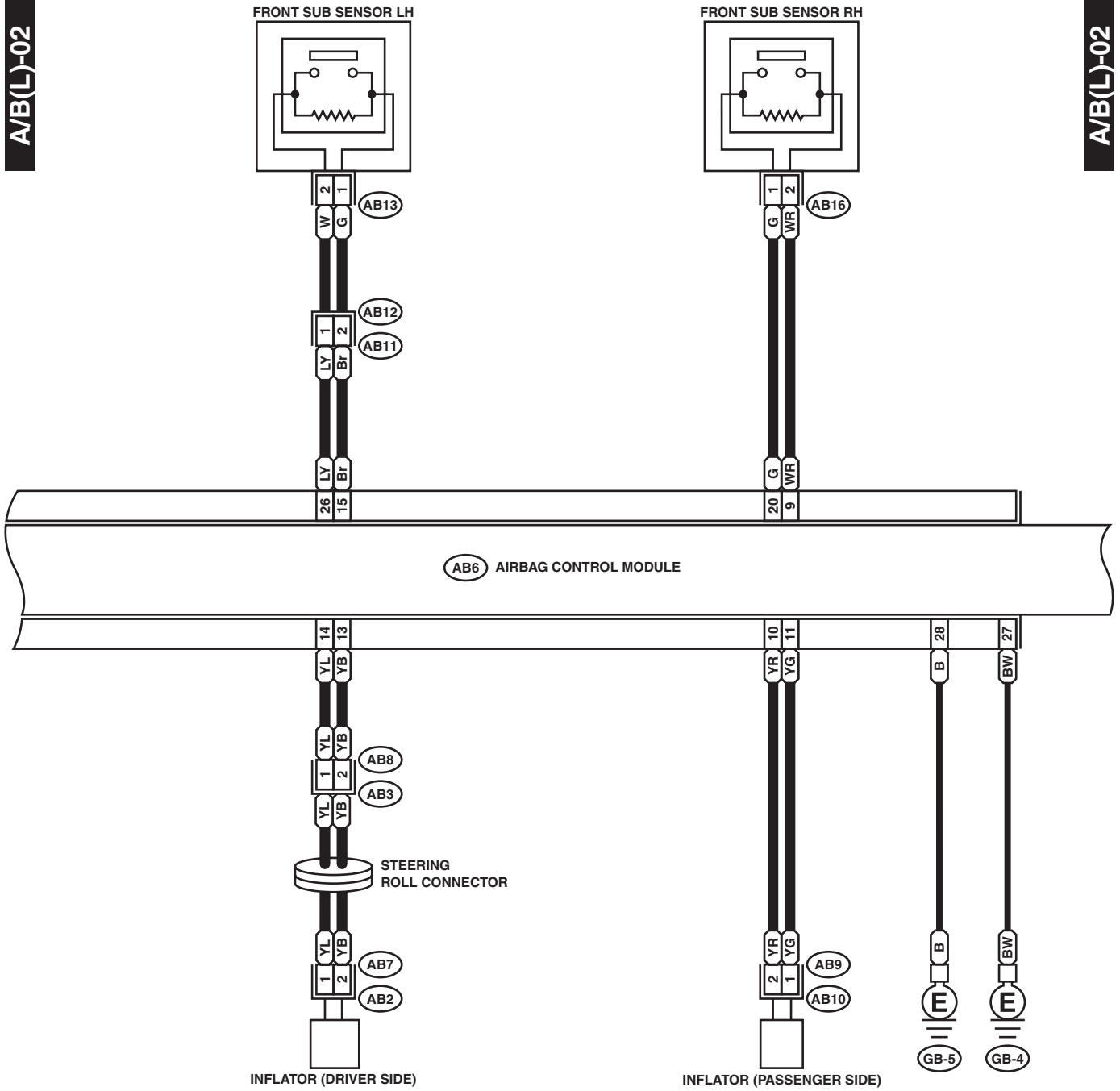
GL86-21A

A/B CONTROL MODULE I/O SIGNAL

AIRBAG SYSTEM (DIAGNOSTICS)

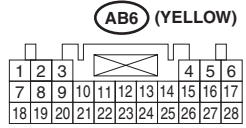
A/B(L)-02

A/B(L)-02



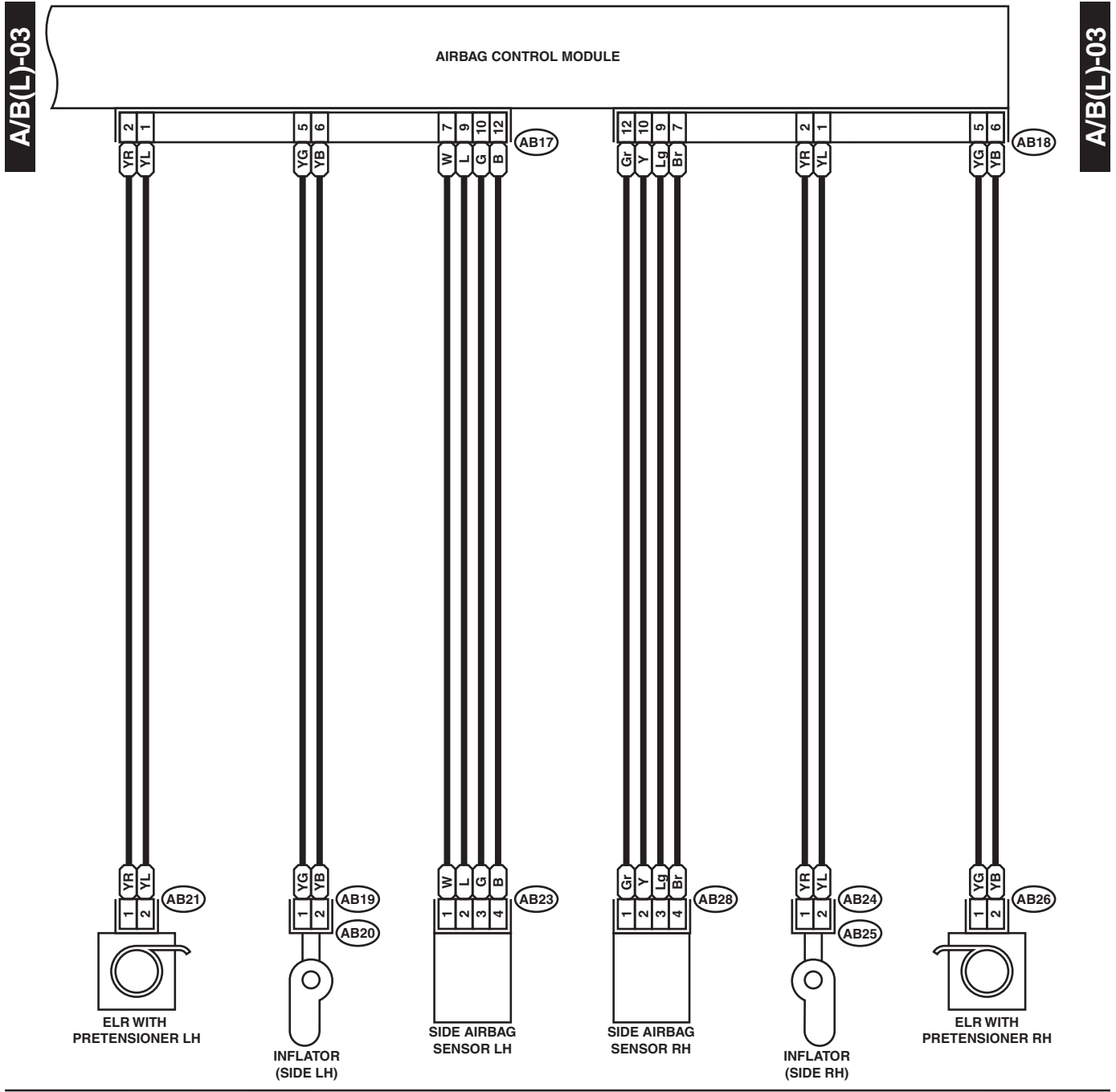
- AB7 (YELLOW)
- AB8 (YELLOW)
- AB9 (YELLOW)
- AB11 (YELLOW)

- AB13 (YELLOW)
- AB16 (YELLOW)

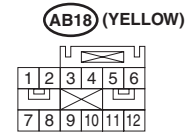
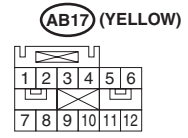
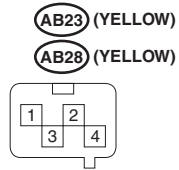


A/B CONTROL MODULE I/O SIGNAL

AIRBAG SYSTEM (DIAGNOSTICS)



- AB19 (YELLOW)
- AB21 (YELLOW)
- AB24 (YELLOW)
- AB26 (YELLOW)

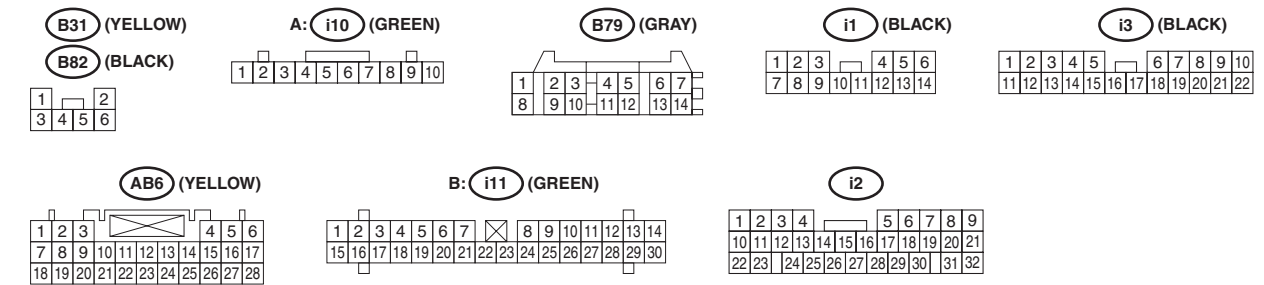
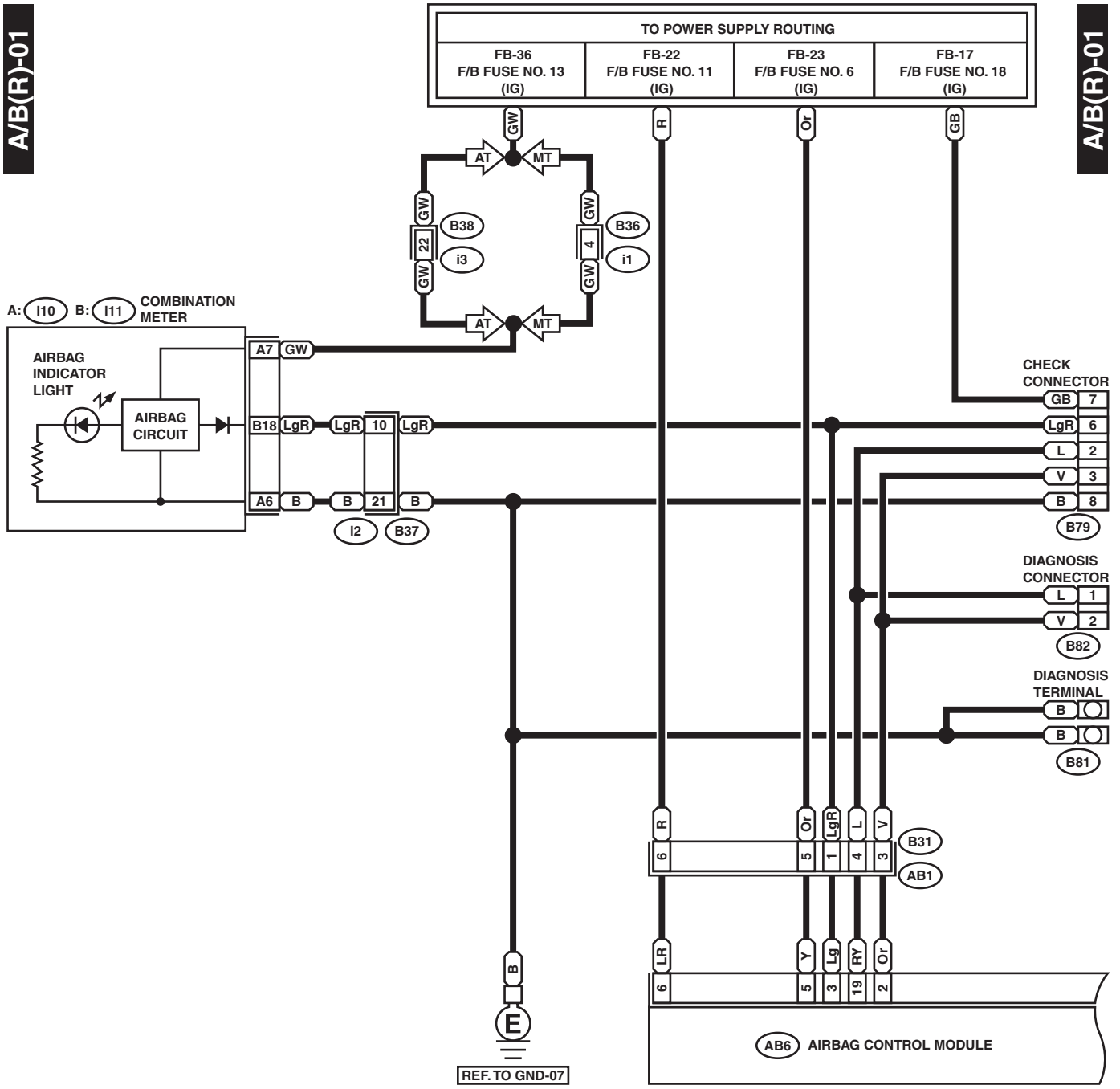


GL86-21C

A/B CONTROL MODULE I/O SIGNAL

AIRBAG SYSTEM (DIAGNOSTICS)

2. AIRBAG RHD MODEL



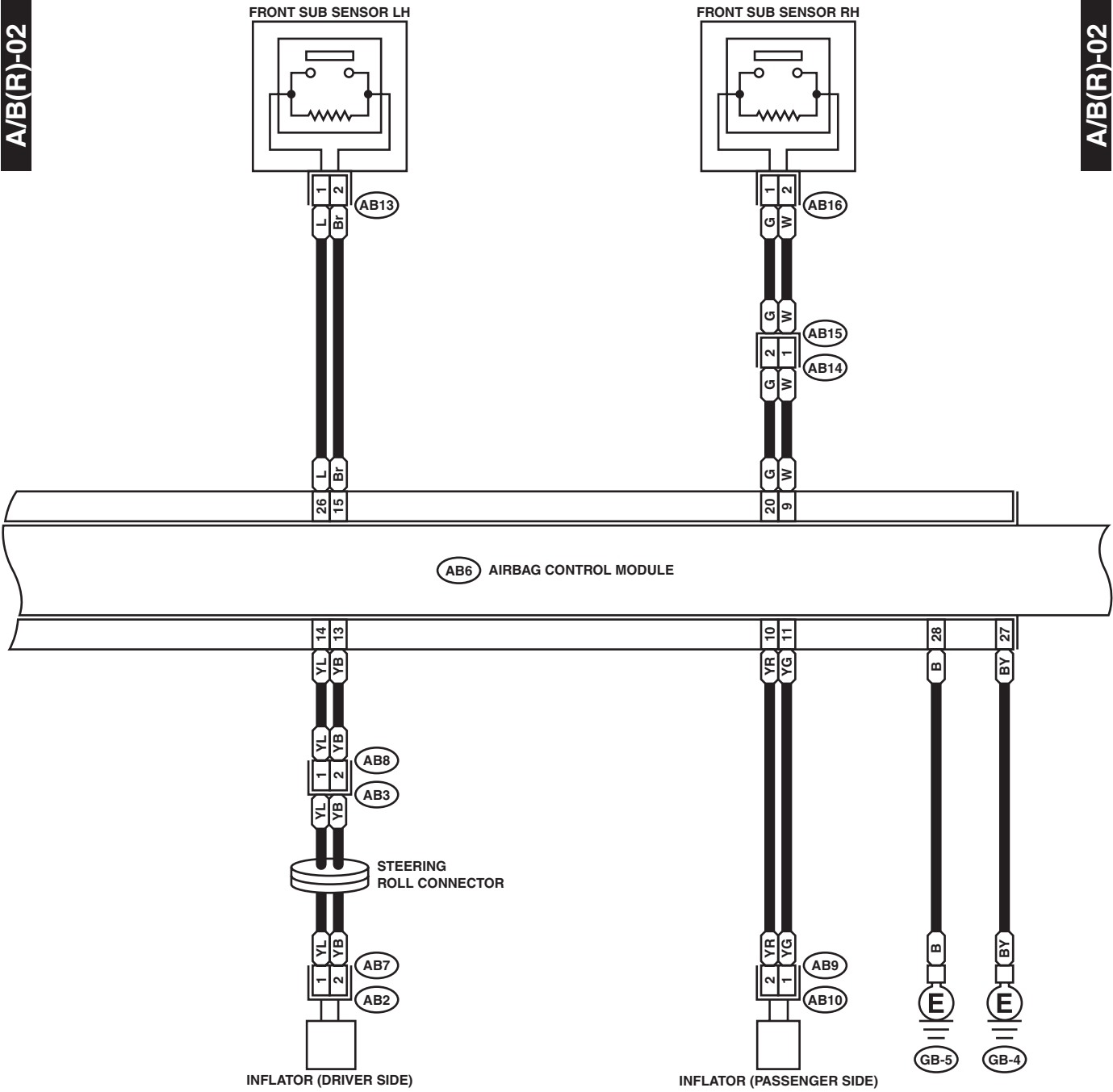
GR86-21A

A/B CONTROL MODULE I/O SIGNAL

AIRBAG SYSTEM (DIAGNOSTICS)

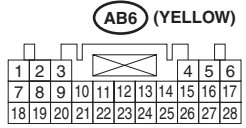
A/B(R)-02

A/B(R)-02



- AB7 (YELLOW)
 - AB8 (YELLOW)
 - AB9 (YELLOW)
 - AB14 (YELLOW)
-

- AB13 (YELLOW)
 - AB16 (YELLOW)
-

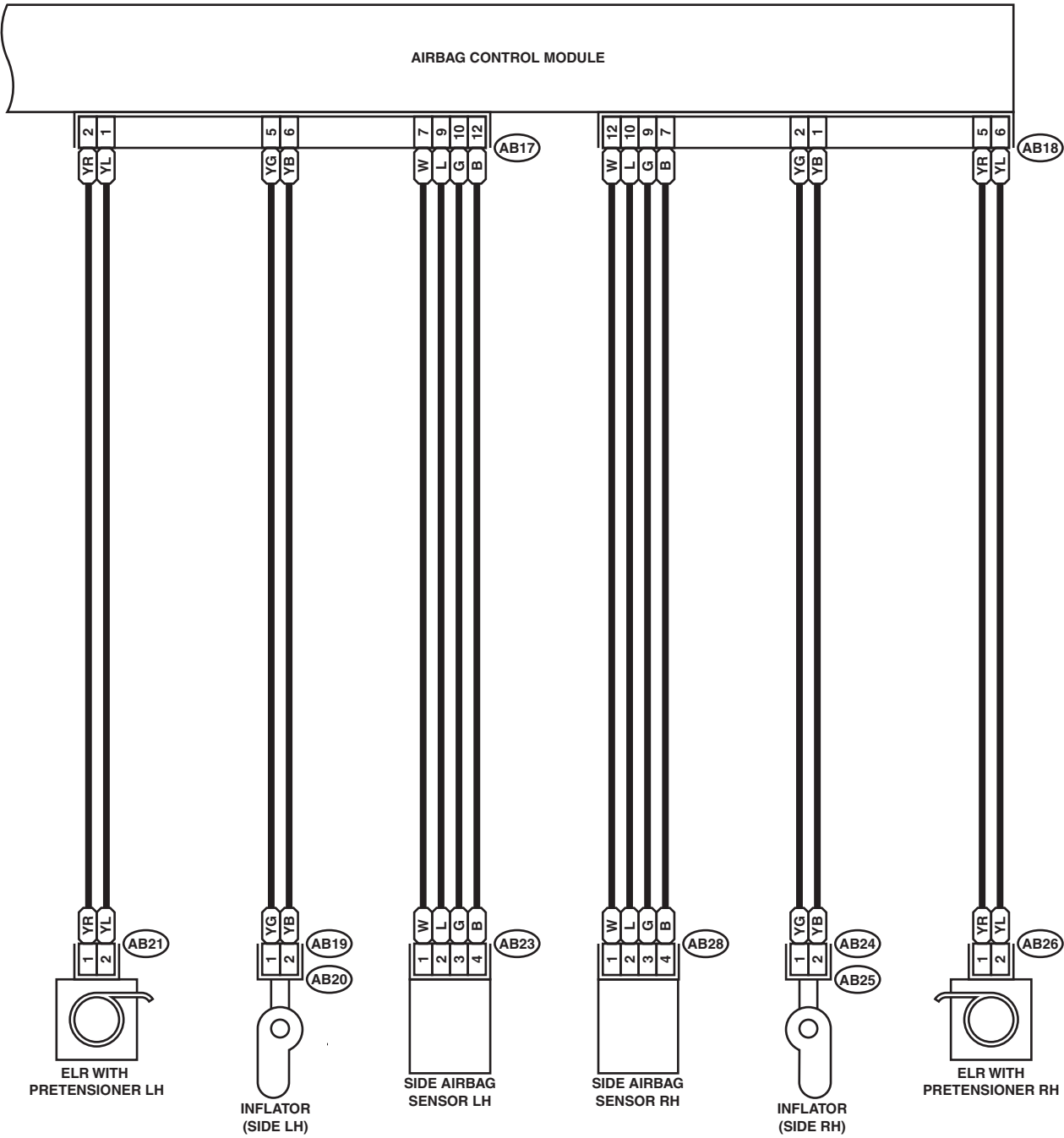


A/B CONTROL MODULE I/O SIGNAL

AIRBAG SYSTEM (DIAGNOSTICS)

A/B(R)-03

A/B(R)-03



AB19 (YELLOW)

AB21 (YELLOW)

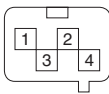
AB24 (YELLOW)

AB26 (YELLOW)

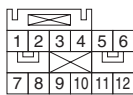


AB23 (YELLOW)

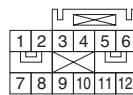
AB28 (YELLOW)



AB17 (YELLOW)



AB18 (YELLOW)



AIRBAG CONNECTOR

AIRBAG SYSTEM (DIAGNOSTICS)

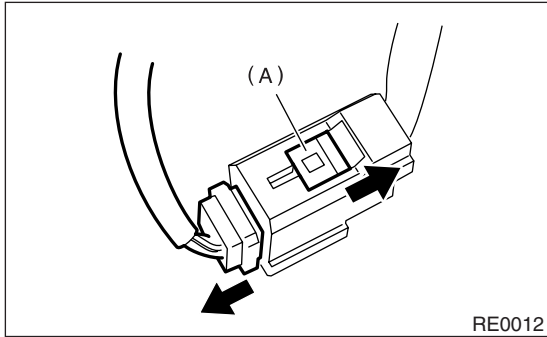
6. Airbag Connector

A: OPERATION

1. POWER SUPPLY

1) How to disconnect:

- (1) Move the slide lock (A) in the direction of the arrow.
- (2) Pull the female connector in the direction of the arrow with slide lock (A) moved.

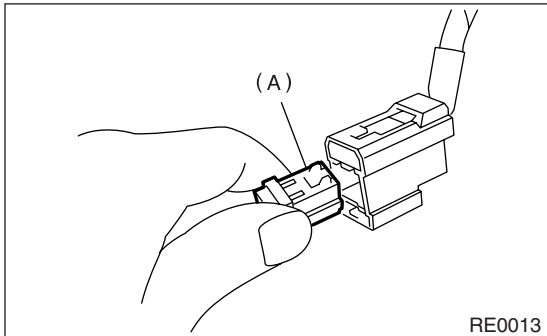


CAUTION:

When pulling, be sure to hold onto the connector and not the wire.

2) How to connect:

Holding the connector (A), and push it in carefully until a connecting sound is heard.



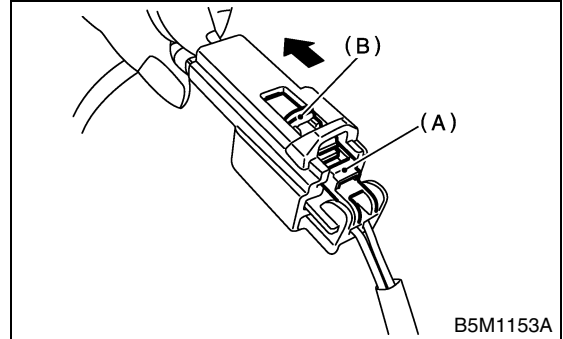
CAUTION:

Be sure to insert the connector in until it locks. Then pull on it gently to make sure that it is locked.

2. DRIVER'S AIRBAG, PASSENGER'S AIRBAG, AND SIDE AIRBAG

1) How to disconnect:

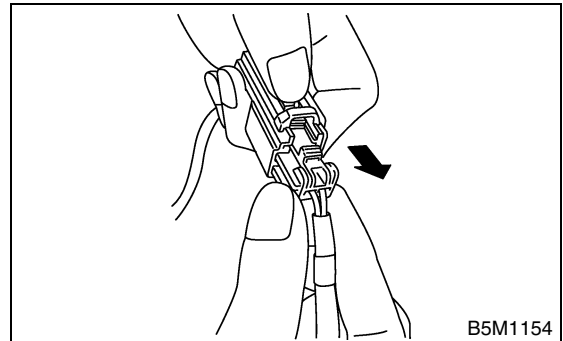
- (1) Push the lock arm (A).
- (2) With lock arm (A) pushed in, move the slide lock (B) in the direction of the arrow.



- (3) With slide lock (B) pulled, remove the lock arm (A) to its original position, and then pull in the direction of the arrow and separate the connector.

CAUTION:

When pulling, be sure to hold onto the connector and not the wire.

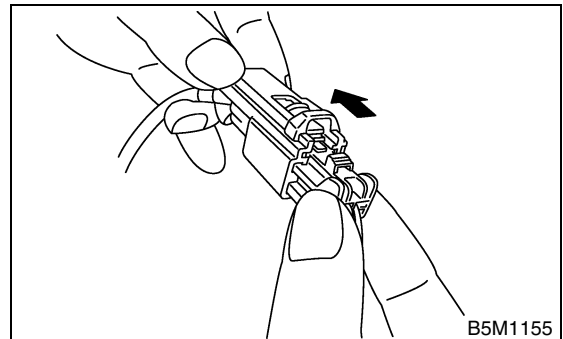


2) How to connect:

Holding the connector, and push it in carefully until a connecting sound is heard.

CAUTION:

Be sure to insert the connector in until it locks. Then pull on it gently to make sure that it is locked.



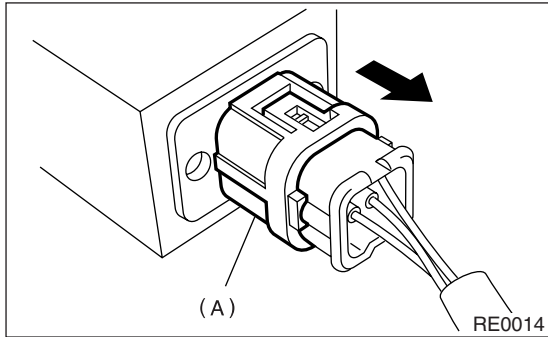
3. FRONT SUB-SENSOR, SIDE AIRBAG SENSOR

1) How to disconnect:

- (1) Holding the outer part (A), pull it in the direction of the arrow.

CAUTION:

When pulling, be sure to hold onto the connector and not the wire.

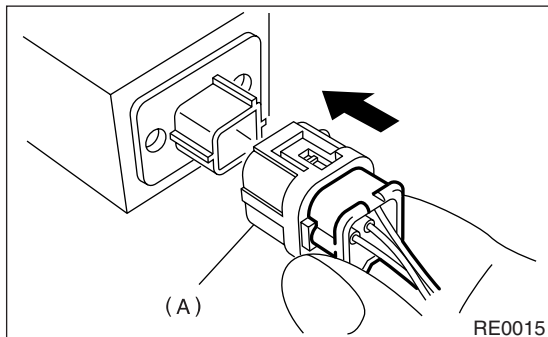


2) How to connect:

Holding the connector, and push it in carefully until a connecting sound is heard.

CAUTION:

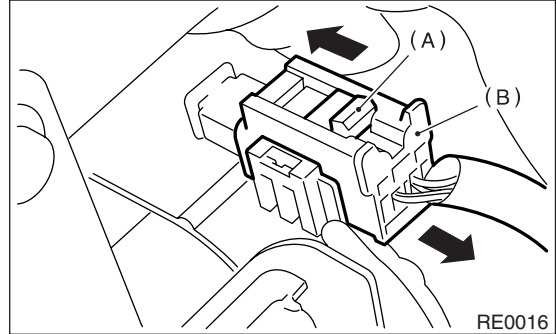
- Outer (A) moves back, and so do not put your hand on the outer part.
- Be sure to insert the connector in until it locks. Then pull on it gently to make sure that it is locked.



4. PRETENSIONER

1) How to disconnect:

- (1) Move the 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.

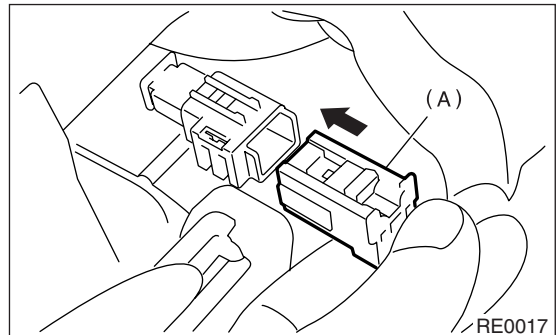


CAUTION:

When pulling, be sure to hold onto the connector and not the wire.

2) 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.

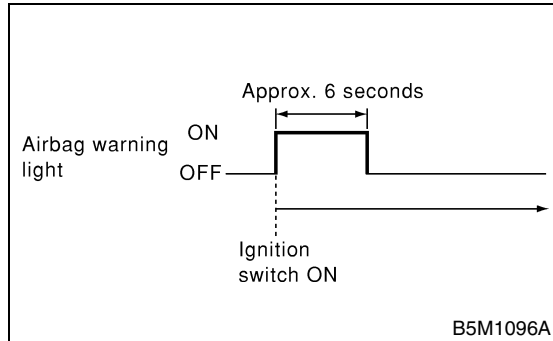
AIRBAG WARNING LIGHT ILLUMINATION PATTERN

AIRBAG SYSTEM (DIAGNOSTICS)

7. Airbag Warning Light Illumination Pattern

A: INSPECTION

Keep the ignition switch to ON, and confirm that the airbag warning light remains off approx. 6 seconds after being turned on.



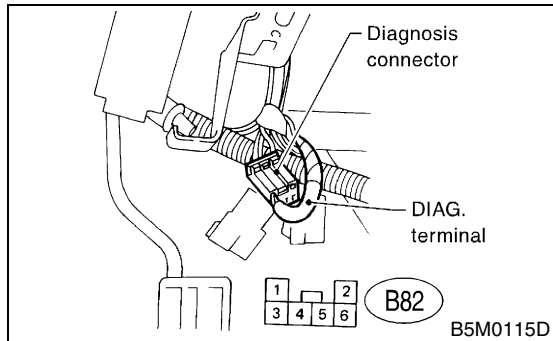
READ DIAGNOSTIC TROUBLE CODE (DTC)

AIRBAG SYSTEM (DIAGNOSTICS)

8. Read Diagnostic Trouble Code (DTC)

A: OPERATION

- 1) Turn the ignition switch to ON.
- 2) Connect the diagnosis terminal to diagnosis connector terminal No. 1 in the driver's seat lower cover area.



3) Read the DTC by identifying the way airbag warning light flashes.

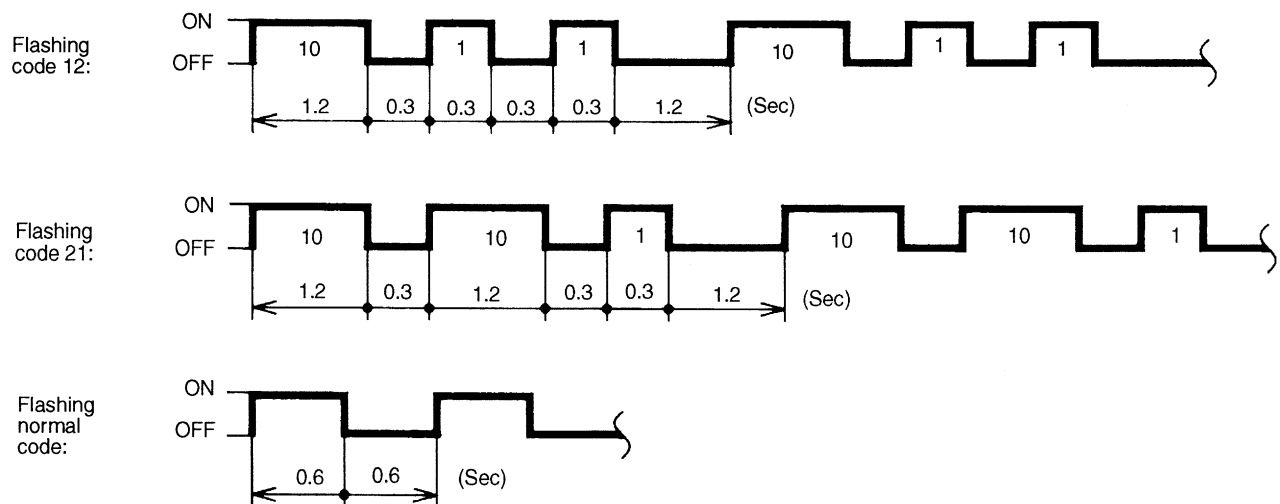
The airbag warning light flashes a code corresponding to the faulty parts.

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 (DTC).>
- "Airbag Warning Light Failure" <Ref. to AB-33, Airbag Warning Light Failure.>

Example:



B5M0117A

4) Turn the ignition switch to 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

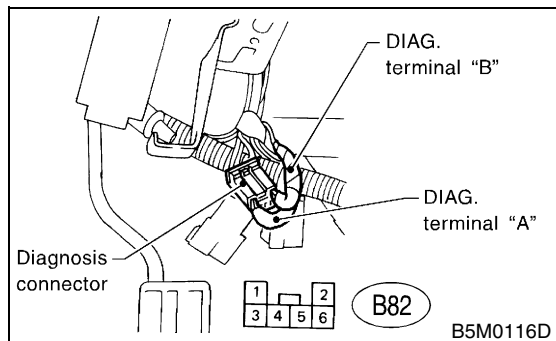
A: OPERATION

Recreate the circumstance by referring to the conditions described in the checklist.

10. Clear Memory Mode

A: OPERATION

- 1) Turn the ignition switch to 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 unit 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 the airbag control module.

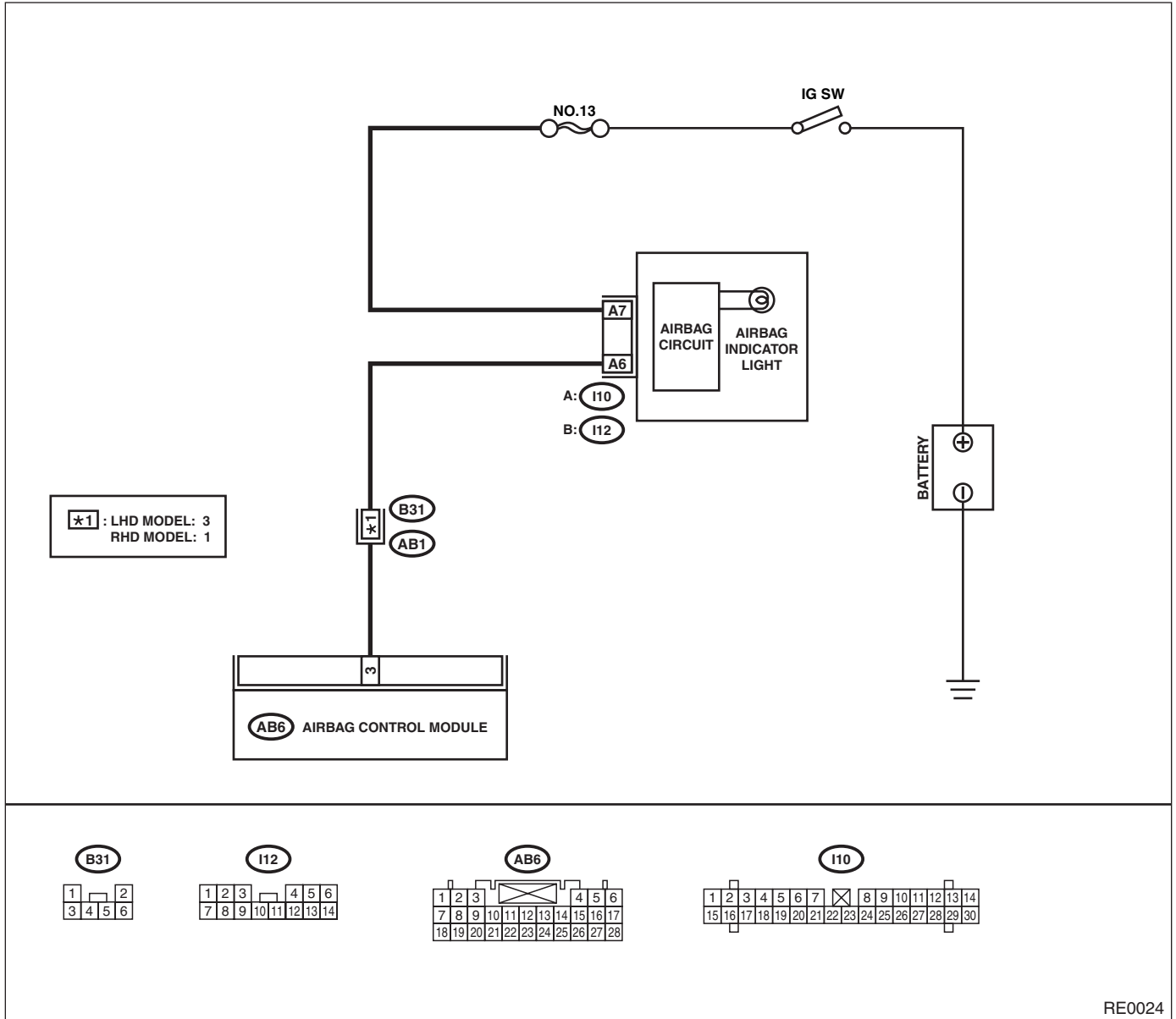
CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.
- Before replacing the airbag module, seat belt pretensioner 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:



	Step	Check	Yes	No
1	<p>CHECK POOR CONTACT IN CONNECTORS (AB1) AND (B31).</p> <p>1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds.</p> <p>2) Remove the side sill cover. (Driver's side)</p> <p>3) Confirm that firm contact is secured between connectors (AB1) and (B31).</p>	<p>Is the poor contact in connectors (AB1) and (B31)?</p>	<p>Repair the body harness or replace the body harness with airbag main harness.</p>	<p>Go to step 2.</p>

AIRBAG WARNING LIGHT FAILURE

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
2 CHECK AIRBAG WARNING LIGHT. 1) Turn the ignition switch to 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 to 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 the connectors (3M) and (4M).	Is there anything unusual to body harness?	Repair the body harness.	Replace the combination meter printed circuit. <Ref. to IDI-15, 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-15, Airbag Control Module.>	Is there poor contact in connector (AB6)?	Replace the body harness with airbag main harness or Replace the airbag control module. <Ref. to AB-15, Airbag Control Module.>	Go to step 5.
5 CHECK AIRBAG MAIN HARNESS. 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Connect the connector (AB1) to (B31). 3) Disconnect the connectors (AB3) and (AB8). 4) Remove the glove box and disconnect the 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-15, Airbag Control Module.> 6) Connect the battery ground cable and turn the ignition switch to ON. 7) Connect the connectors (4I) and (5I) in test harness I or I2. NOTE: After problem has been eliminated, disconnect the 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 to 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-15, Airbag Control Module.>	Repair the body-grounding circuit.

AIRBAG WARNING LIGHT FAILURE

AIRBAG SYSTEM (DIAGNOSTICS)

B: AIRBAG WARNING LIGHT REMAINS OFF.

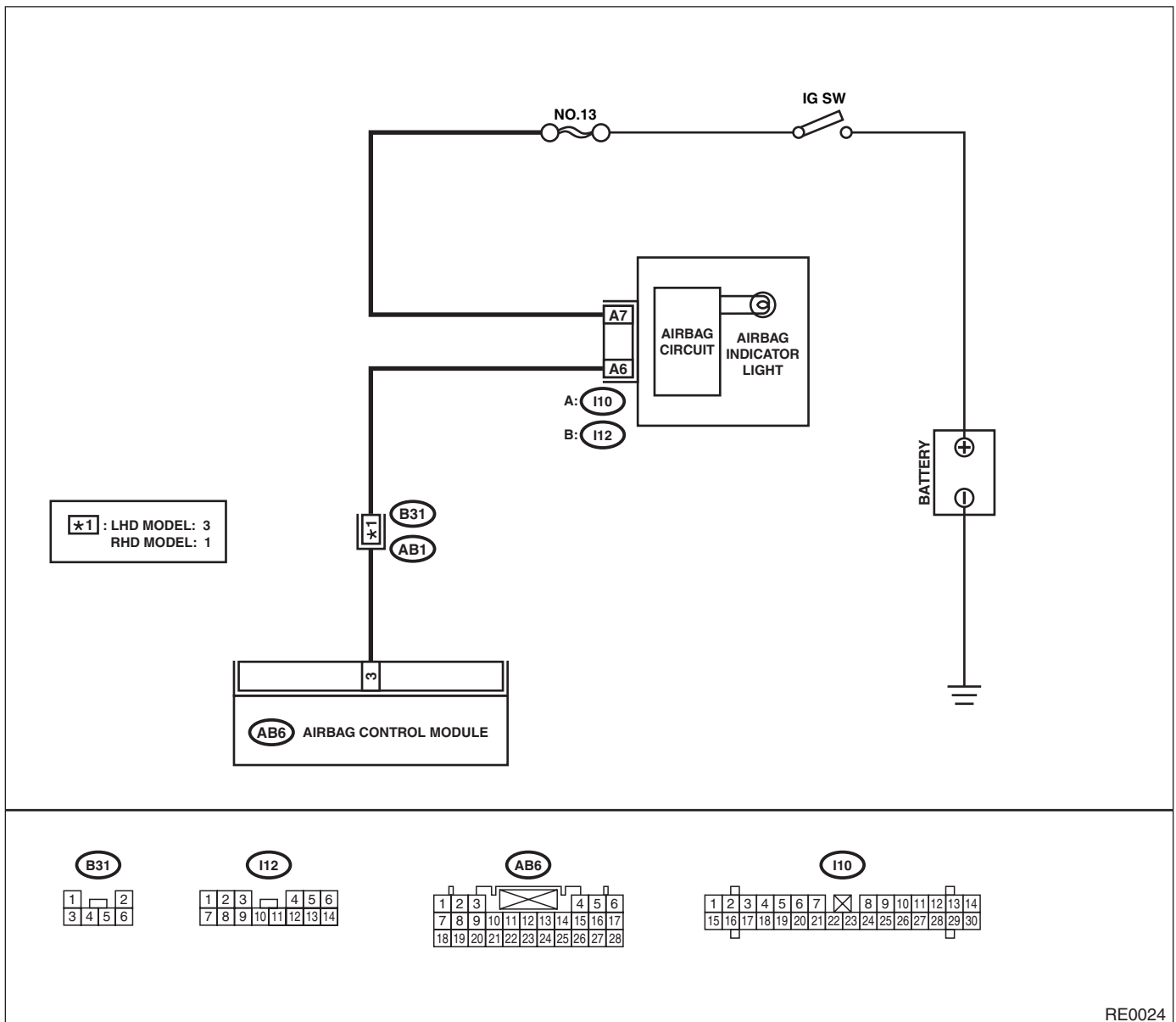
DIAGNOSIS:

- 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 to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.
- Before replacing the airbag module, seat belt pretensioner 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:



RE0024

AIRBAG WARNING LIGHT FAILURE

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK COMBINATION METER. Turn the ignition switch to ON, and confirm that warning lights equipped in the combination meter are turned on.	Do the warning lights not for airbag turn on?	Go to step 2.	Repair the combination meter power supply. <Ref. to IDI-4, Combination Meter System.>
2 CHECK FUSE NO. 13 (IN MAIN FUSE BOX). Remove the fuse No. 13 and perform visual inspection.	Is the fuse No. 13 (in main fuse box) blown?	Replace the 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 to 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 to ON.	Is the airbag warning light turned on?	Go to step 4.	Replace the airbag warning light bulb or combination meter printed circuit. <Ref. to IDI-15, Combination Meter Assembly.>
4 CHECK AIRBAG MAIN HARNESS. 1) Turn the ignition switch to 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-15, Airbag Control Module.> 4) Connect the battery ground cable and turn the ignition switch to ON.	Is the airbag warning light turned on?	Replace the airbag control module. <Ref. to AB-15, Airbag Control Module.>	Replace the body harness with airbag main harness.

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

AIRBAG SYSTEM (DIAGNOSTICS)

12. List of Diagnostic Trouble Code (DTC)

A: LIST

DTC	Memory function	Contents of diagnosis	Index No.
11	Provided.	<ul style="list-style-type: none"> • Airbag main harness circuit is open, shorted or shorted to ground. • Airbag module harness (driver) circuit is open, shorted or shorted to ground. • Roll connector circuit is open, shorted or shorted to ground. • Airbag control module is faulty. • Driver's airbag module is faulty. 	<Ref. to AB-40, DTC 11, Diagnostic Chart with Trouble Code.>
12	Provided.	<ul style="list-style-type: none"> • Airbag main harness circuit is open, shorted or shorted to ground. • Airbag module harness (passenger) circuit is open, shorted or shorted to ground. • Airbag control module is faulty. • Passenger's airbag module is faulty. 	<Ref. to AB-42, DTC 12, Diagnostic Chart with Trouble Code.>
15	Provided.	<ul style="list-style-type: none"> • Airbag main harness circuit (driver) is shorted to power supply. • Airbag module harness (driver) is shorted to power supply. • Roll connector is shorted to power supply. • Airbag control module is faulty. • Driver's airbag module is faulty. 	<Ref. to AB-44, DTC 15, Diagnostic Chart with Trouble Code.>
16	Provided.	<ul style="list-style-type: none"> • Airbag main harness circuit (passenger) is shorted to power supply. • Airbag module harness (passenger) is shorted to power supply. • Airbag control module is faulty. • Passenger's airbag module is faulty. 	<Ref. to AB-46, DTC 16, Diagnostic Chart with Trouble Code.>
21	Provided.	Airbag control module is faulty.	<Ref. to AB-47, DTC 21, Diagnostic Chart with Trouble Code.>
22	Provided.	Front airbag module and seat belt pretensioner (LH/RH) are inflated.	<Ref. to AB-48, DTC 22, Diagnostic Chart with Trouble Code.>
23	Not provided.	(AB6), (AB17) and (AB18) are not connected properly to airbag control module.	<Ref. to AB-49, DTC 23, Diagnostic Chart with Trouble Code.>
24	Not provided.	<ul style="list-style-type: none"> • Airbag control module is faulty. • Airbag main harness circuit is open. • Fuse No. 11 (in joint box) is blown. • Body harness circuit is open. 	<Ref. to AB-50, DTC 24, Diagnostic Chart with Trouble Code.>
25	Provided.	<ul style="list-style-type: none"> • Airbag control module is faulty. • Airbag main harness circuit is open. • Fuse No. 6 (in joint box) is blown. • Body harness circuit is open. 	<Ref. to AB-52, DTC 25, Diagnostic Chart with Trouble Code.>
31	Provided.	<ul style="list-style-type: none"> • Front sub-sensor harness (RH) circuit is shorted. • Front sub-sensor harness (RH) circuit is open. • Front sub-sensor (RH) is faulty. • Airbag control module is faulty. 	<Ref. to AB-54, DTC 31, Diagnostic Chart with Trouble Code.>
32	Provided.	<ul style="list-style-type: none"> • Front sub-sensor harness (LH) circuit is shorted. • Front sub-sensor harness (LH) circuit is open. • Front sub-sensor (LH) is faulty. • Airbag control module is faulty. 	<Ref. to AB-58, DTC 32, Diagnostic Chart with Trouble Code.>

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

AIRBAG SYSTEM (DIAGNOSTICS)

DTC	Memory function	Contents of diagnosis	Index No.
41	Provided.	<ul style="list-style-type: none"> • Side airbag harness (RH) is faulty. • Side airbag module (RH) is faulty. • Airbag control module is faulty. 	<Ref. to AB-62, DTC 41, Diagnostic Chart with Trouble Code.>
42	Provided.	<ul style="list-style-type: none"> • Side airbag harness (LH) is faulty. • Side airbag module (LH) is faulty. • Airbag control module is faulty. 	<Ref. to AB-64, DTC 42, Diagnostic Chart with Trouble Code.>
45	Provided.	<ul style="list-style-type: none"> • Side airbag harness (RH) is shorted to power supply. • Airbag control module is faulty. 	<Ref. to AB-66, DTC 45, Diagnostic Chart with Trouble Code.>
46	Provided.	<ul style="list-style-type: none"> • Side airbag harness (LH) is shorted to power supply. • Airbag control module is faulty. 	<Ref. to AB-68, DTC 46, Diagnostic Chart with Trouble Code.>
51	Provided.	<ul style="list-style-type: none"> • Side airbag sensor (RH) is faulty. • Side airbag harness (RH) is faulty. • Airbag control module is faulty. 	<Ref. to AB-70, DTC 51, Diagnostic Chart with Trouble Code.>
52	Provided.	<ul style="list-style-type: none"> • Side airbag sensor (LH) is faulty. • Side airbag harness (LH) is faulty. • Airbag control module is faulty. 	<Ref. to AB-72, DTC 52, Diagnostic Chart with Trouble Code.>
53	Provided.	Side airbag sensor (RH) is faulty.	<Ref. to AB-73, DTC 53, Diagnostic Chart with Trouble Code.>
54	Provided.	Side airbag sensor (LH) is faulty.	<Ref. to AB-73, DTC 54, Diagnostic Chart with Trouble Code.>
55	Provided.	Side airbag module is inflated.	<Ref. to AB-73, DTC 55, Diagnostic Chart with Trouble Code.>
61	Provided.	<ul style="list-style-type: none"> • Seat belt pretensioner (RH) circuit is open, shorted or shorted to ground. • Airbag control module is faulty. • Pretensioner is faulty. • Pretensioner harness is faulty. 	<Ref. to AB-74, DTC 61, Diagnostic Chart with Trouble Code.>
62	Provided.	<ul style="list-style-type: none"> • Seat belt pretensioner (LH) circuit is open, shorted or shorted to ground. • Airbag control module is faulty. • Pretensioner is faulty. • Pretensioner harness is faulty. 	<Ref. to AB-76, DTC 62, Diagnostic Chart with Trouble Code.>
65	Provided.	<ul style="list-style-type: none"> • Seat belt pretensioner (RH) circuit is shorted to power supply. • Pretensioner is faulty. • Pretensioner harness is faulty. • Airbag control module is faulty. 	<Ref. to AB-78, DTC 65, Diagnostic Chart with Trouble Code.>
66	Provided.	<ul style="list-style-type: none"> • Seat belt pretensioner (LH) circuit is shorted to power supply. • Pretensioner is faulty. • Pretensioner harness is faulty. • Airbag control module is faulty. 	<Ref. to AB-80, DTC 66, Diagnostic Chart with Trouble Code.>

DIAGNOSTIC CHART WITH TROUBLE CODE

AIRBAG SYSTEM (DIAGNOSTICS)

13. Diagnostic Chart with Trouble Code

A: DTC 11

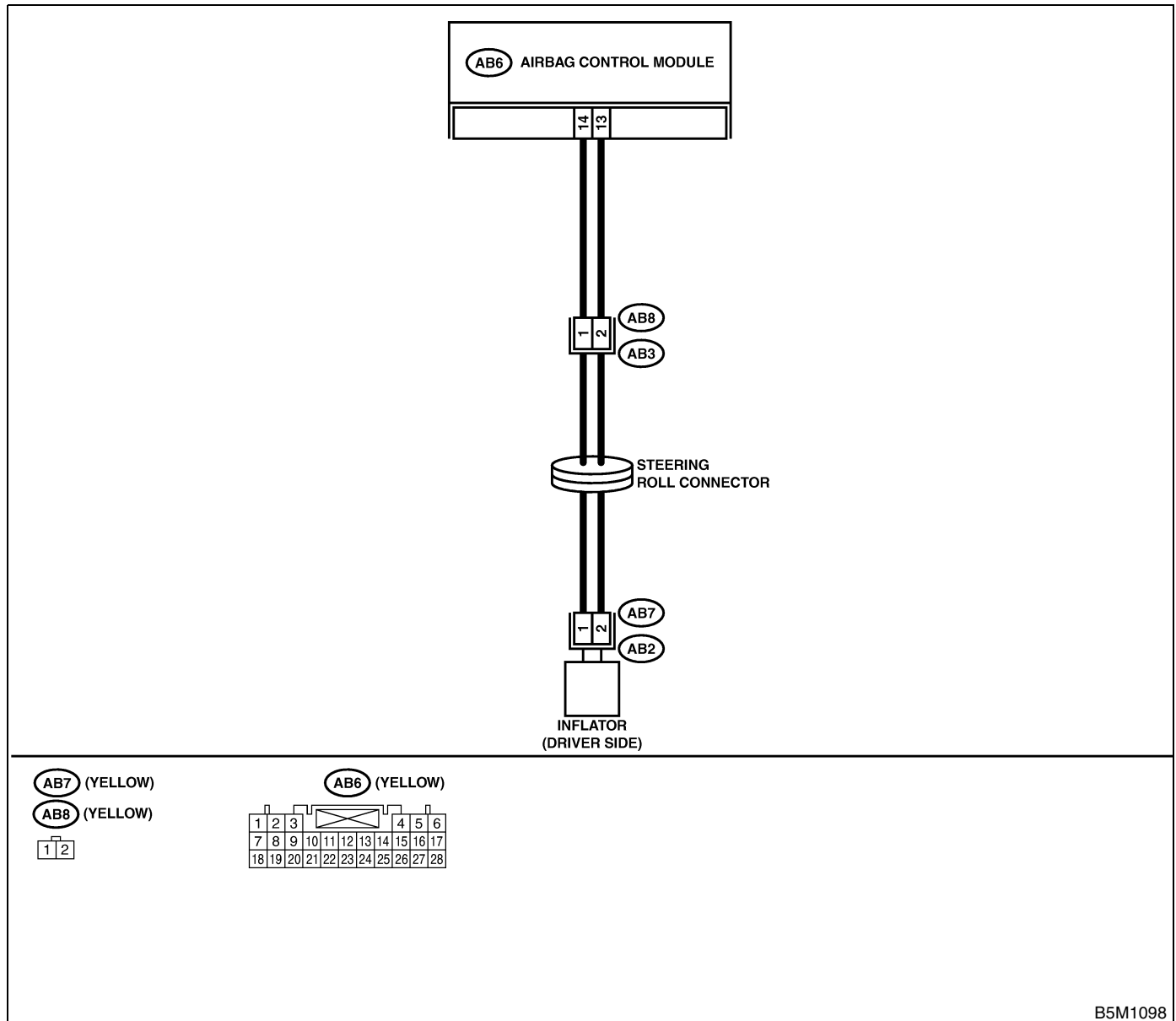
DIAGNOSIS:

- Airbag main harness circuit is open, shorted or shorted to ground.
- Airbag module harness (Driver) circuit is open, shorted or shorted to ground.
- Roll connector circuit is open, shorted or shorted to ground.
- Driver's airbag module is faulty.
- Airbag control module is faulty.

CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.
- Before replacing the airbag module, seat belt pretensioner 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:



B5M1098

DIAGNOSTIC CHART WITH TROUBLE CODE

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK DRIVER'S AIRBAG MODULE. 1) Turn the ignition switch to 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 (1F) in test harness F to connector (AB7). 4) Connect the airbag resistor to connector (3F) in test harness F. 5) Connect the battery ground cable and turn the ignition switch to 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 to 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 to ON.	Does the airbag warning light operate properly?	Replace the roll connector. <Ref. to AB-17, Roll Connector.>	Go to step 3.
3 CHECK AIRBAG MAIN HARNESS. 1) Turn the ignition switch to OFF, disconnect the ground cable, and wait more than 20 seconds. 2) Disconnect the airbag resistor from the connector (3F) in test harness F. 3) Remove the glove box, <Ref. to AB-13, Passenger's Airbag Module.> 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-15, 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 <i>(2I) No. 1 — (3F) No. 4:</i> <i>(2I) No. 4 — (3F) No. 3:</i>	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 <i>(2I) No. 1 — No. 4:</i> <i>(2I) No. 4 — Chassis ground:</i> <i>(2I) No. 1 — Chassis ground:</i>	Is the resistance more than 1 MΩ?	Replace the airbag control module. <Ref. to AB-15, Airbag Control Module.>	Replace the body harness with airbag main harness.

DIAGNOSTIC CHART WITH TROUBLE CODE

AIRBAG SYSTEM (DIAGNOSTICS)

B: DTC 12

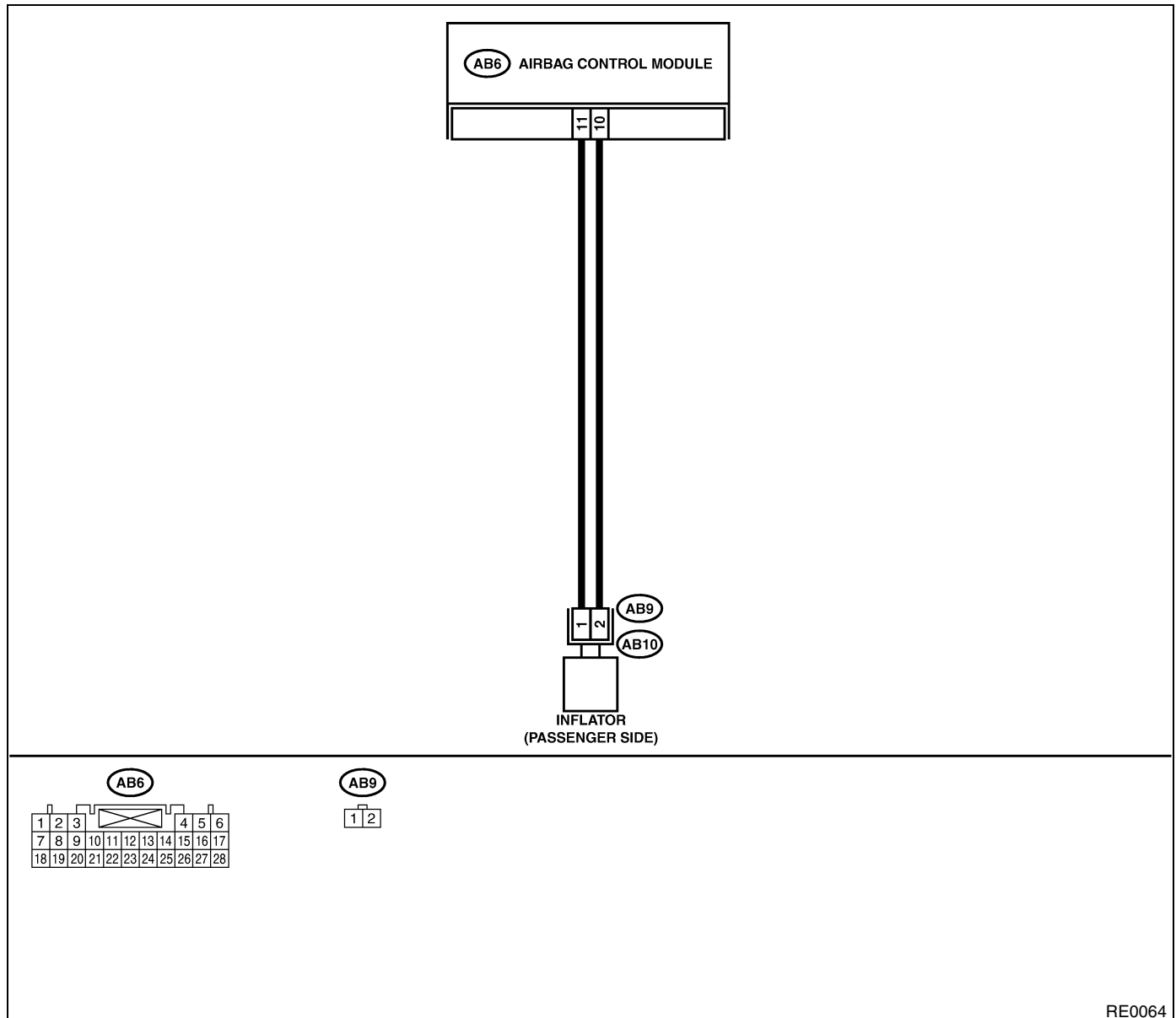
DIAGNOSIS:

- Airbag main harness circuit is open, shorted or shorted to ground.
- Airbag module harness (Passenger) circuit is open, shorted or shorted to ground.
- Passenger's airbag module is faulty.
- Airbag control module is faulty.

CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.
- Before replacing the airbag module, seat belt pretensioner 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:



RE0064

DIAGNOSTIC CHART WITH TROUBLE CODE

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK PASSENGER'S AIRBAG MODULE. 1) Turn the ignition switch to 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 to ON.	Does the airbag warning light operate properly?	Replace the passenger airbag module. <Ref. to AB-13, Passenger's Airbag Module.>	Go to step 2.
2 CHECK AIRBAG MAIN HARNESS. 1) Turn the ignition switch to 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-15, Airbag Control Module.> 5) Measure the resistance between connector (2I) in test harness I or I2 and the connector (3F) in test harness F. <i>Connector & terminal</i> <i>(2I) No. 2 — (3F) No. 3:</i> <i>(2I) No. 5 — (3F) No. 4:</i>	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. <i>Connector & terminal</i> <i>(2I) No. 2 — No. 5:</i> <i>(2I) No. 2 — Chassis ground:</i> <i>(2I) No. 5 — Chassis ground:</i>	Is the resistance more than 1 M Ω ?	Replace the airbag control module. <Ref. to AB-15, Airbag Control Module.>	Replace the body harness with airbag main harness.

DIAGNOSTIC CHART WITH TROUBLE CODE

AIRBAG SYSTEM (DIAGNOSTICS)

C: DTC 15

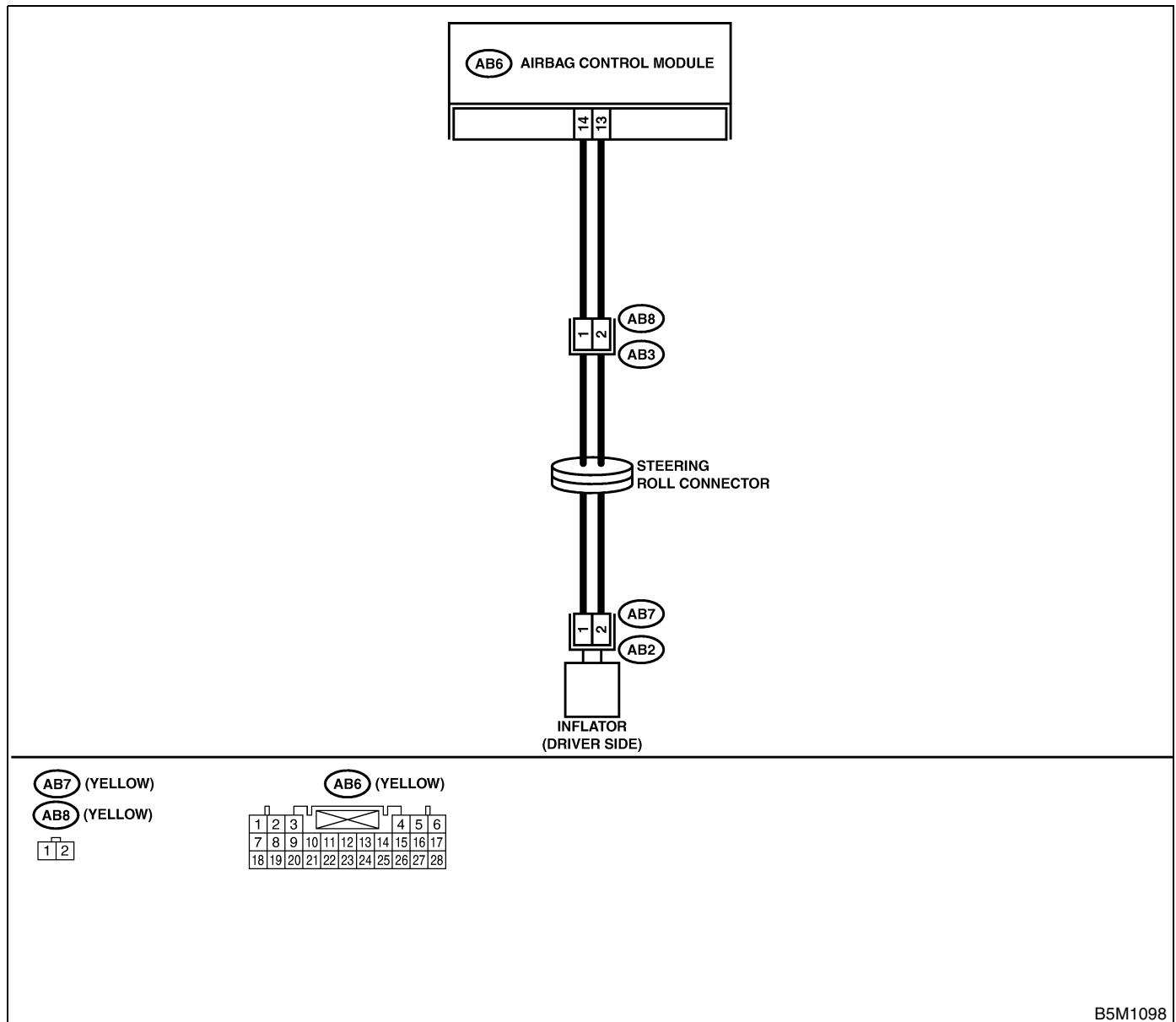
DIAGNOSIS:

- Airbag main harness circuit (Driver) is shorted to the power supply.
- Airbag module harness (Driver) is shorted to the power supply.
- Roll connector is shorted to the power supply.
- Driver's airbag module is faulty.
- Airbag control module is faulty.

CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.
- Before replacing the airbag module, seat belt pretensioner 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:



B5M1098

DIAGNOSTIC CHART WITH TROUBLE CODE

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK DRIVER'S AIRBAG MODULE. 1) Turn the ignition switch to 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 to 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 to 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 to ON.	Does the airbag warning light operate properly?	Replace the roll connector. <Ref. to AB-17, Roll Connector.>	Go to step 3.
3 CHECK AIRBAG MAIN HARNESS. 1) Turn the ignition switch to 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 glove box, and disconnect the 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-15, Airbag Control Module.> 5) Connect the battery ground cable and turn the ignition switch to 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-15, Airbag Control Module.>	Replace the body harness with airbag main harness.

DIAGNOSTIC CHART WITH TROUBLE CODE

AIRBAG SYSTEM (DIAGNOSTICS)

D: DTC 16

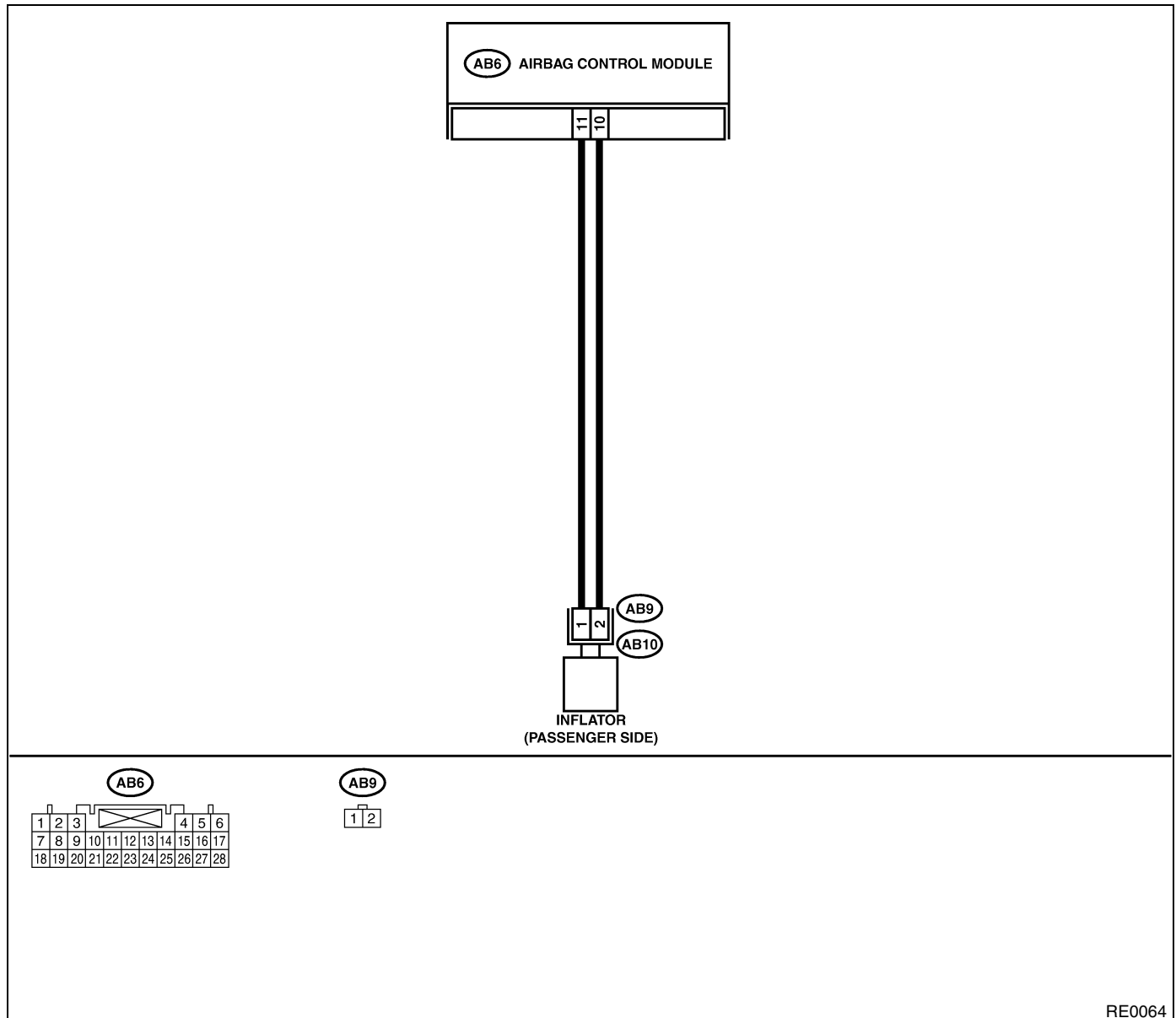
DIAGNOSIS:

- Airbag main harness circuit (Passenger) is shorted to the power supply.
- Airbag module harness (Passenger) is shorted to the power supply.
- Passenger's airbag module is faulty.
- Airbag control module is faulty.

CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.
- Before replacing the airbag module, seat belt pretensioner 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:



RE0064

DIAGNOSTIC CHART WITH TROUBLE CODE

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK PASSENGER'S AIRBAG MODULE. 1) Turn the ignition switch to 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 to ON.	Does the airbag warning light operate properly?	Replace the passenger airbag module. <Ref. to AB-13, Passenger's Airbag Module.>	Go to step 2.
2 CHECK AIRBAG MAIN HARNESS. 1) Turn the ignition switch to 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-15, 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-15, Airbag Control Module.>	Replace the body harness with airbag main harness.

E: DTC 21

DIAGNOSIS:

- Airbag control module is faulty.

CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.
- Before replacing the airbag module, seat belt pretensioner roll connector, control module, and sensor, reconnect each part and confirm that the warning light operates properly.

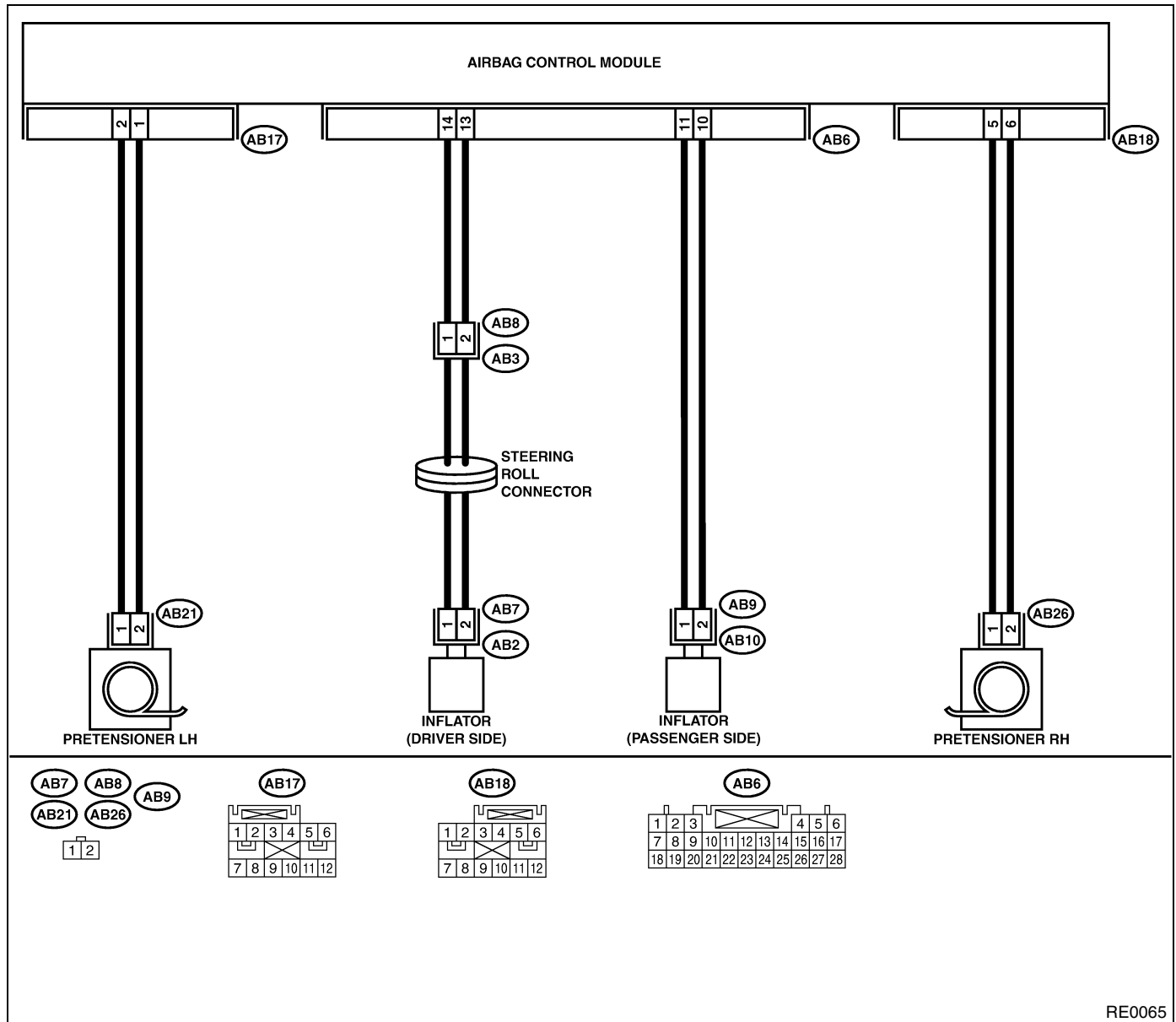
Step	Check	Yes	No
1 CHECK IF TROUBLE CODE 21 IS INDICATED. Read the DTC. <Ref. to AB-29, Read Diagnostic Trouble Code (DTC).>	Is the airbag warning light DTC 21 indicated?	Replace the airbag control module. <Ref. to AB-15, Airbag Control Module.>	Perform clear memory. <Ref. to AB-31, Clear Memory Mode.>

DIAGNOSTIC CHART WITH TROUBLE CODE

AIRBAG SYSTEM (DIAGNOSTICS)

F: DTC 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 replace the following parts.

- Airbag control module. <Ref. to AB-15, Airbag Control Module.>
- Driver's airbag module. <Ref. to AB-12, Driver's Airbag Module.>
- Passenger's airbag module. <Ref. to AB-13, Passenger's Airbag Module.>
- Front sub-sensor of both sides. <Ref. to AB-18, 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: DTC 23

DIAGNOSIS:

(AB6), (AB17) and (AB18) are not connected properly to airbag control module.

CAUTION:

Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from 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 to 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-15, 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-15, 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 to ON.	Does the airbag warning light operate properly?	Finish the diagnosis.	Replace the airbag control module. <Ref. to AB-15, Airbag Control Module.>

DIAGNOSTIC CHART WITH TROUBLE CODE

AIRBAG SYSTEM (DIAGNOSTICS)

H: DTC 24

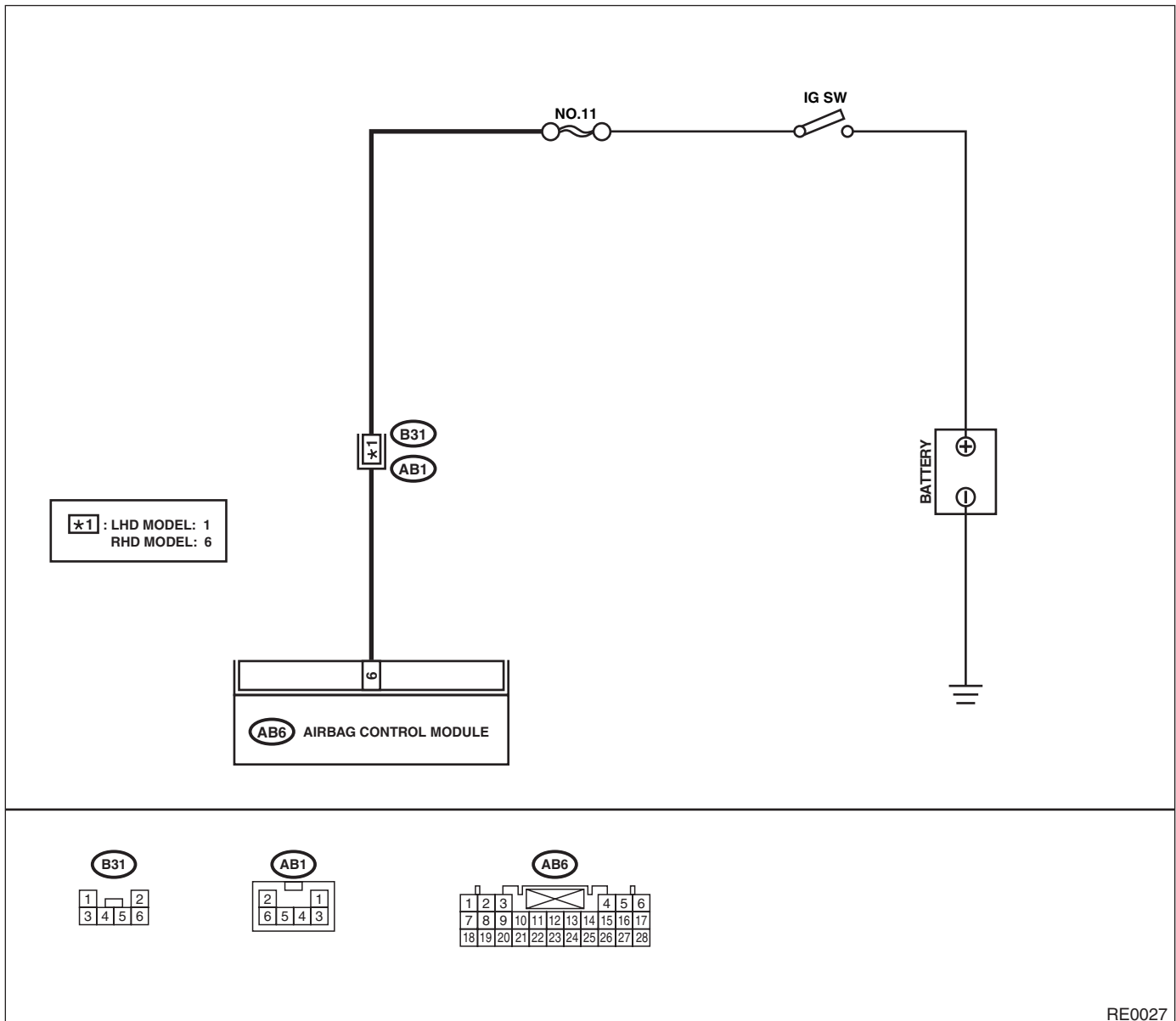
DIAGNOSIS:

- Airbag control module is faulty.
- Airbag main harness circuit is open.
- Fuse No, 11 (in joint box) is blown.
- Body harness circuit is open.

CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.
- Before replacing the airbag module, seat belt pretensioner 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:



RE0027

DIAGNOSTIC CHART WITH TROUBLE CODE

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
<p>1</p> <p>CHECK AIRBAG CONTROL MODULE. 1) Turn the ignition switch to 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-15, 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 to ON. 5) Measure the voltage between connector (2I) in test harness I or I2 and chassis ground.</p> <p>Connector & terminal (2I) No. 3 (+) — Chassis ground (-):</p>	<p>Is the voltage more than 10 V?</p>	<p>Replace the airbag control module. <Ref. to AB-15, Airbag Control Module.></p>	<p>Go to step 2.</p>
<p>2</p> <p>CHECK AIRBAG MAIN HARNESS. 1) While checking control module, turn the ignition switch to 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.</p> <p>Connector & terminal LHD MODEL: (5M) No. 2 — (2I) No. 3: RHD MODEL: (5M) No. 9 — (2I) No. 3:</p>	<p>Is the resistance less than 10 Ω?</p>	<p>Go to step 3.</p>	<p>Replace the body harness with airbag main harness.</p>
<p>3</p> <p>CHECK AIRBAG MAIN HARNESS. Measure the following resistance with the above-mentioned condition maintained.</p> <p>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:</p>	<p>Is the resistance more than 1 MΩ?</p>	<p>Go to step 4.</p>	<p>Replace the body harness with airbag main harness.</p>
<p>4</p> <p>CHECK FUSE No. 11 (IN JOINT BOX). 1) Confirm that the ignition switch is turned OFF. 2) Remove the fuse No. 11 (in joint box) and perform visual inspection.</p>	<p>Is the fuse No. 11 blown?</p>	<p>Replace the fuse No. 11. If fuse No. 11 blows again, repair the body harness.</p>	<p>Repair the body harness.</p>

DIAGNOSTIC CHART WITH TROUBLE CODE

AIRBAG SYSTEM (DIAGNOSTICS)

I: DTC 25

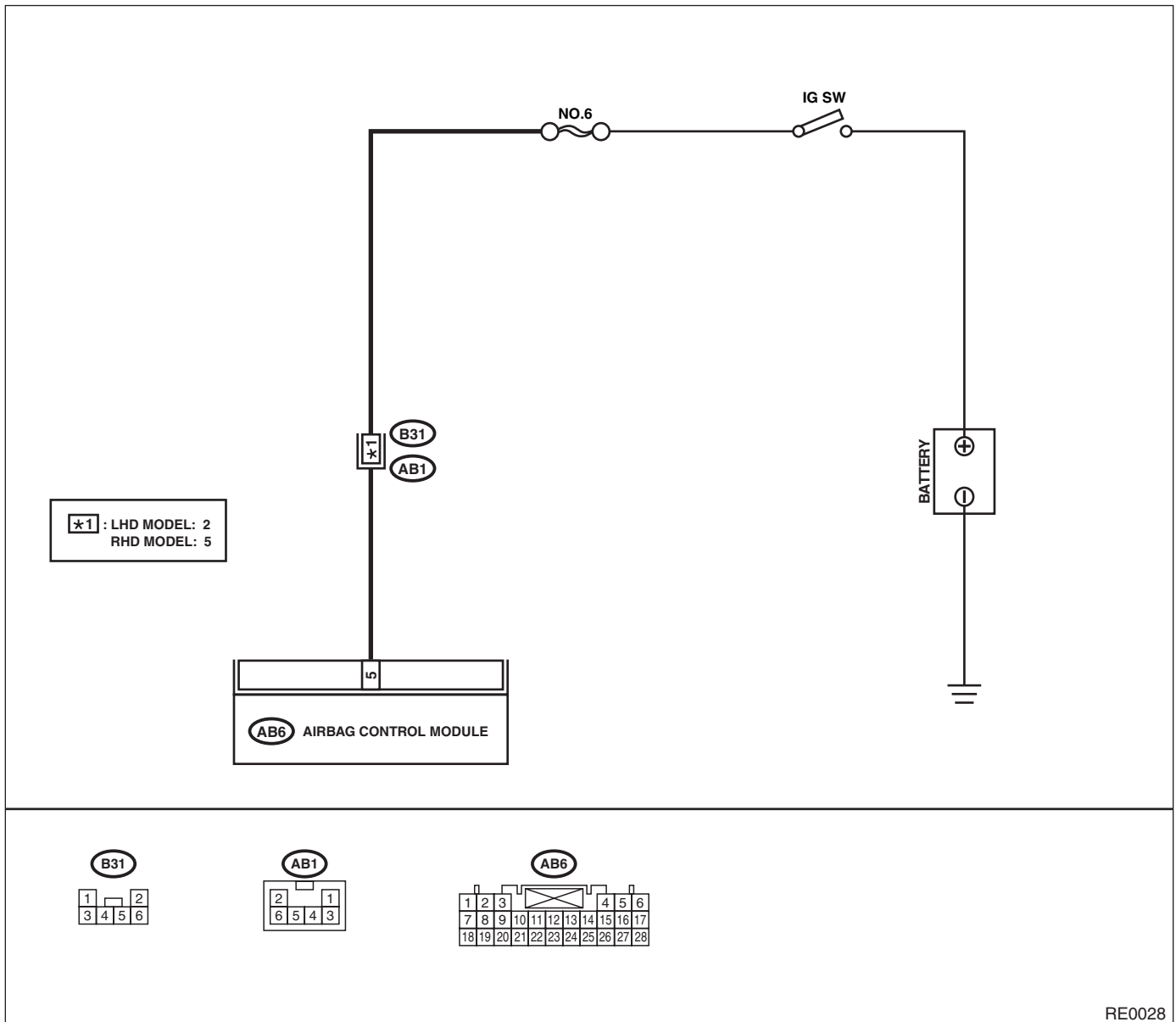
DIAGNOSIS:

- Airbag control module is faulty.
- Airbag main harness circuit is open.
- Fuse No. 6 (in joint box) is blown.
- Body harness circuit is open.

CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.
- Before replacing the airbag module, seat belt pretensioner 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:



RE0028

DIAGNOSTIC CHART WITH TROUBLE CODE

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
<p>1 CHECK AIRBAG CONTROL MODULE. 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB6) from airbag control module. <Ref. to AB-15, 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 to 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 (-):</p>	<p>Is the voltage more than 10 V?</p>	<p>Replace the airbag control module. <Ref. to AB-15, Airbag Control Module.></p>	<p>Go to step 2.</p>
<p>2 CHECK AIRBAG MAIN HARNESS. 1) While checking control module, turn the ignition switch to 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:</p>	<p>Is the resistance less than 10 Ω?</p>	<p>Go to step 3.</p>	<p>Replace the body harness with airbag main harness.</p>
<p>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:</p>	<p>Is the resistance more than 1 MΩ?</p>	<p>Go to step 4.</p>	<p>Replace the body harness with airbag main harness.</p>
<p>4 CHECK FUSE NO. 6 (IN JOINT BOX). 1) Confirm that the ignition switch is turned OFF. 2) Remove the No. 6 fuse (in joint box) and perform visual inspection.</p>	<p>Is the fuse No. 6 blown?</p>	<p>Replace the fuse No. 6. If fuse No. 6 is blown again, repair the body harness.</p>	<p>Repair the body harness.</p>

DIAGNOSTIC CHART WITH TROUBLE CODE

AIRBAG SYSTEM (DIAGNOSTICS)

J: DTC 31

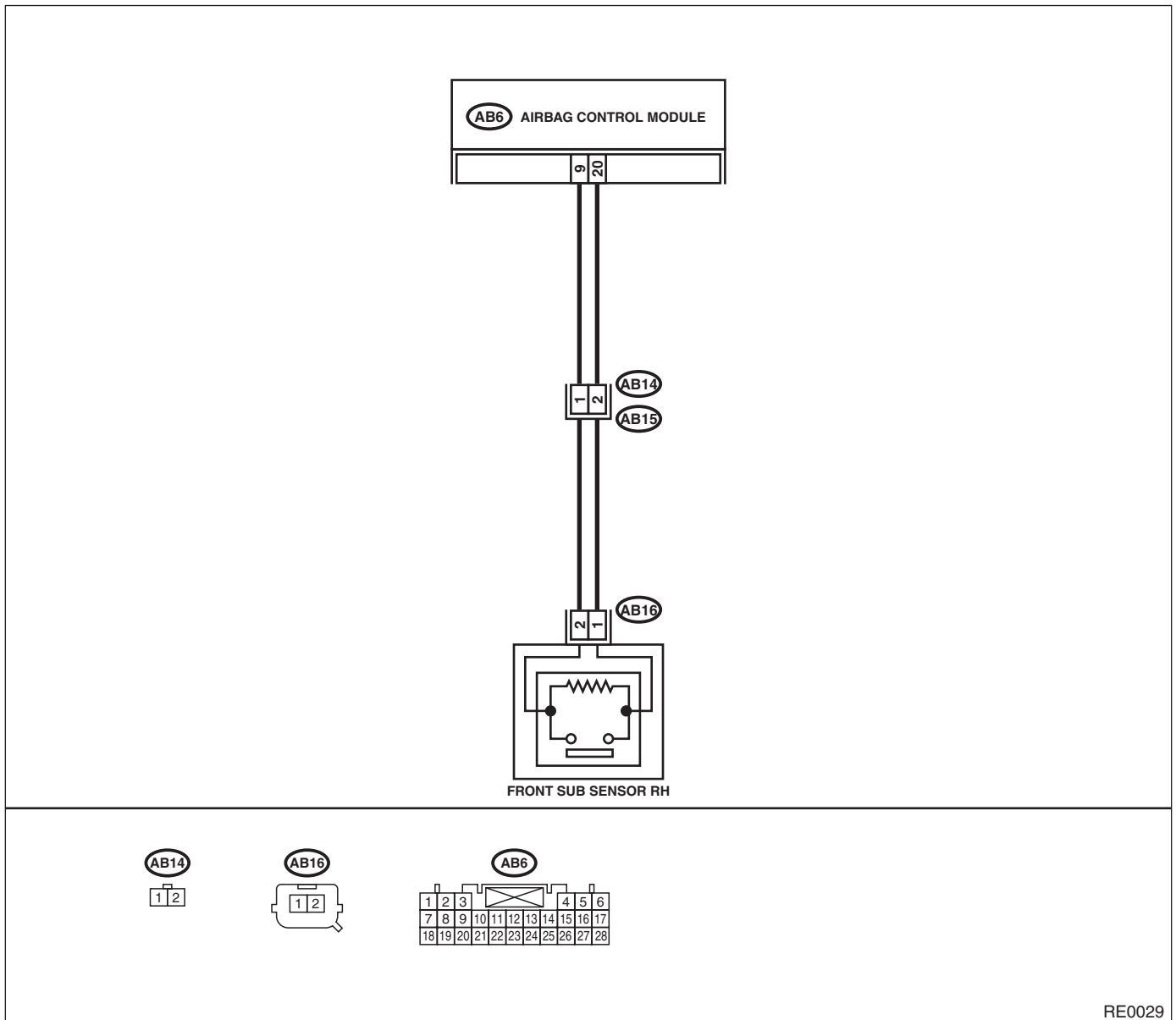
DIAGNOSIS:

- Front sub-sensor harness (RH) circuit is shorted.
- Front sub-sensor harness (RH) circuit is open.
- Front sub-sensor (RH) is faulty.
- Airbag control module is faulty.

CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.
- Before replacing the airbag module, seat belt pretensioner 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
<p>1 CHECK FRONT SUB-SENSOR (RH) AND FRONT SUB-SENSOR HARNESS (RH). 1) Turn the ignition switch to 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-15, Airbag Control Module.> 3) Measure the resistance of the connector (3I) in test harness I or I2. Connector & terminal (3I) No. 2 — No. 4:</p>	<p>Is the resistance between 750 Ω and 1 KΩ?</p>	<p>Replace the airbag control module. <Ref. to AB-15, Airbag Control Module.></p>	<p>Go to step 2.</p>
<p>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:</p>	<p>Is the resistance more than 1 MΩ?</p>	<p>Replace the airbag control module. <Ref. to AB-15, Airbag Control Module.></p>	<p>Go to step 3.</p>
<p>3 CHECK AIRBAG MAIN HARNESS AND FRONT SUB-SENSOR HARNESS (RH). 1) Disconnect the connector (AB16) from the front sub-sensor. <Ref. to AB-18, Front Sub Sensor.> 2) Connect the 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:</p>	<p>Is the resistance less than 10 Ω?</p>	<p>Go to step 4.</p>	<p>Go to step 5.</p>
<p>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:</p>	<p>Is the resistance more than 1 MΩ?</p>	<p>Go to step 9.</p>	<p>Go to step 5.</p>
<p>5 CHECK AIRBAG MAIN HARNESS 1) Disconnect the connector (AB15) from (AB14), and connect the 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:</p>	<p>Is the resistance less than 10 Ω?</p>	<p>Go to step 6.</p>	<p>Replace the body harness with airbag main harness.</p>
<p>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:</p>	<p>Is the resistance more than 1 MΩ?</p>	<p>Go to step 7.</p>	<p>Replace the body harness with airbag main harness.</p>

DIAGNOSTIC CHART WITH TROUBLE CODE

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
7 CHECK FRONT SUB-SENSOR HARNESS (RH). 1)Connect the 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 the 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-18, 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-18, Front Sub Sensor.>

DIAGNOSTIC CHART WITH TROUBLE CODE

AIRBAG SYSTEM (DIAGNOSTICS)

DIAGNOSTIC CHART WITH TROUBLE CODE

AIRBAG SYSTEM (DIAGNOSTICS)

K: DTC 32

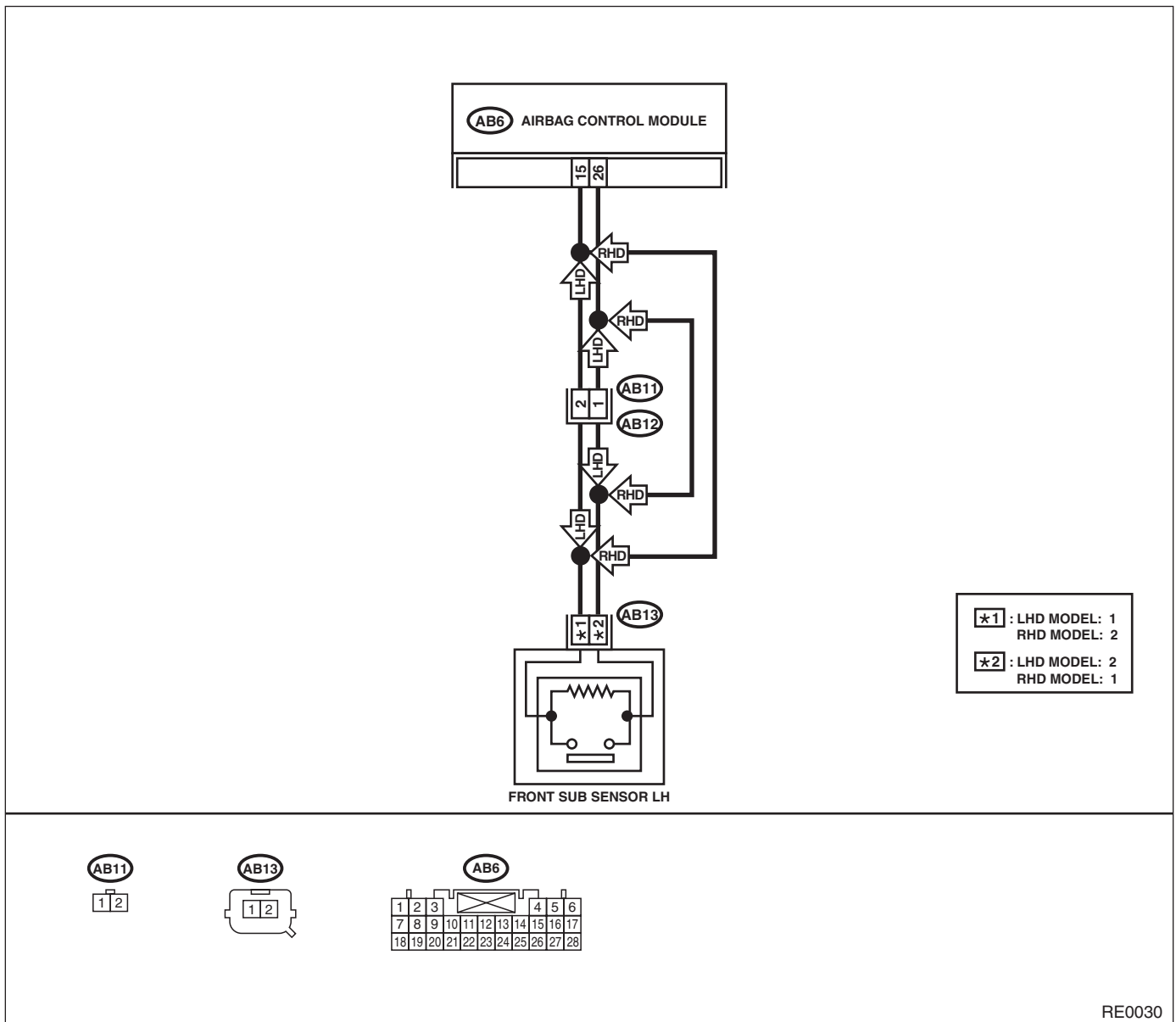
DIAGNOSIS:

- Front sub-sensor harness (LH) circuit is shorted.
- Front sub-sensor harness (LH) circuit is open.
- Front sub-sensor (LH) is faulty.
- Airbag control module is faulty.

CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.
- Before replacing the airbag module, seat belt pretensioner 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:



RE0030

DIAGNOSTIC CHART WITH TROUBLE CODE

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
<p>1 CHECK FRONT SUB-SENSOR (LH) AND FRONT SUB-SENSOR HARNESS (RH). 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB6) from the airbag control module, and connect connector (1I) in the test harness I or I2 to connector (AB6). <Ref. to AB-15, 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:</p>	<p>Is the resistance between 750 Ω and 1 KΩ?</p>	<p>Replace the airbag control module. <Ref. to AB-15, Airbag Control Module.></p>	<p>Go to step 2.</p>
<p>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:</p>	<p>Is the resistance more than 1 MΩ?</p>	<p>Replace the airbag control module. <Ref. to AB-15, Airbag Control Module.></p>	<p>Go to step 3.</p>
<p>3 CHECK AIRBAG MAIN HARNESS AND FRONT SUB-SENSOR HARNESS (LH). 1) Disconnect the connector (AB13) from the front sub-sensor. <Ref. to AB-18, Front Sub Sensor.> 2) Connect the 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:</p>	<p>Is the resistance less than 10 Ω?</p>	<p>Go to step 4.</p>	<p>Go to step 5.</p>
<p>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:</p>	<p>Is the resistance more than 1 MΩ?</p>	<p>LHD MODEL: Go to step 9. RHD MODEL: Finish the diagnosis.</p>	<p>LHD MODEL: Go to step 5. RHD MODEL: Replace the front sub-sensor (LH). <Ref. to AB-18, Front Sub Sensor.></p>
<p>5 CHECK AIRBAG MAIN HARNESS. 1) Disconnect the connector (AB11) from (AB12), and connect the 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:</p>	<p>Is the resistance less than 10 Ω?</p>	<p>Go to step 6.</p>	<p>Replace the body harness with airbag main harness.</p>

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. <i>Connector & terminal</i> <i>(3I) No. 3 — Chassis ground:</i> <i>(3I) No. 1 — Chassis ground:</i>	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 the 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. <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 (LH).
8 CHECK FRONT SUB-SENSOR HARNESS (LH). 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 MΩ?	Go to step 9.	Replace the body harness with front sub-sensor harness (LH).
9 CHECK FRONT SUB-SENSOR (LH). 1)Connect the connector (2H) in test harness H to front sub-sensor (LH). 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 KΩ?	Go to step 10.	Replace the front sub-sensor (LH). <Ref. to AB-18, Front Sub Sensor.>
10 CHECK FRONT SUB-SENSOR (LH). 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 MΩ?	Finish the diagnosis.	Replace the front sub-sensor (LH). <Ref. to AB-18, Front Sub Sensor.>

DIAGNOSTIC CHART WITH TROUBLE CODE

AIRBAG SYSTEM (DIAGNOSTICS)

DIAGNOSTIC CHART WITH TROUBLE CODE

AIRBAG SYSTEM (DIAGNOSTICS)

L: DTC 41

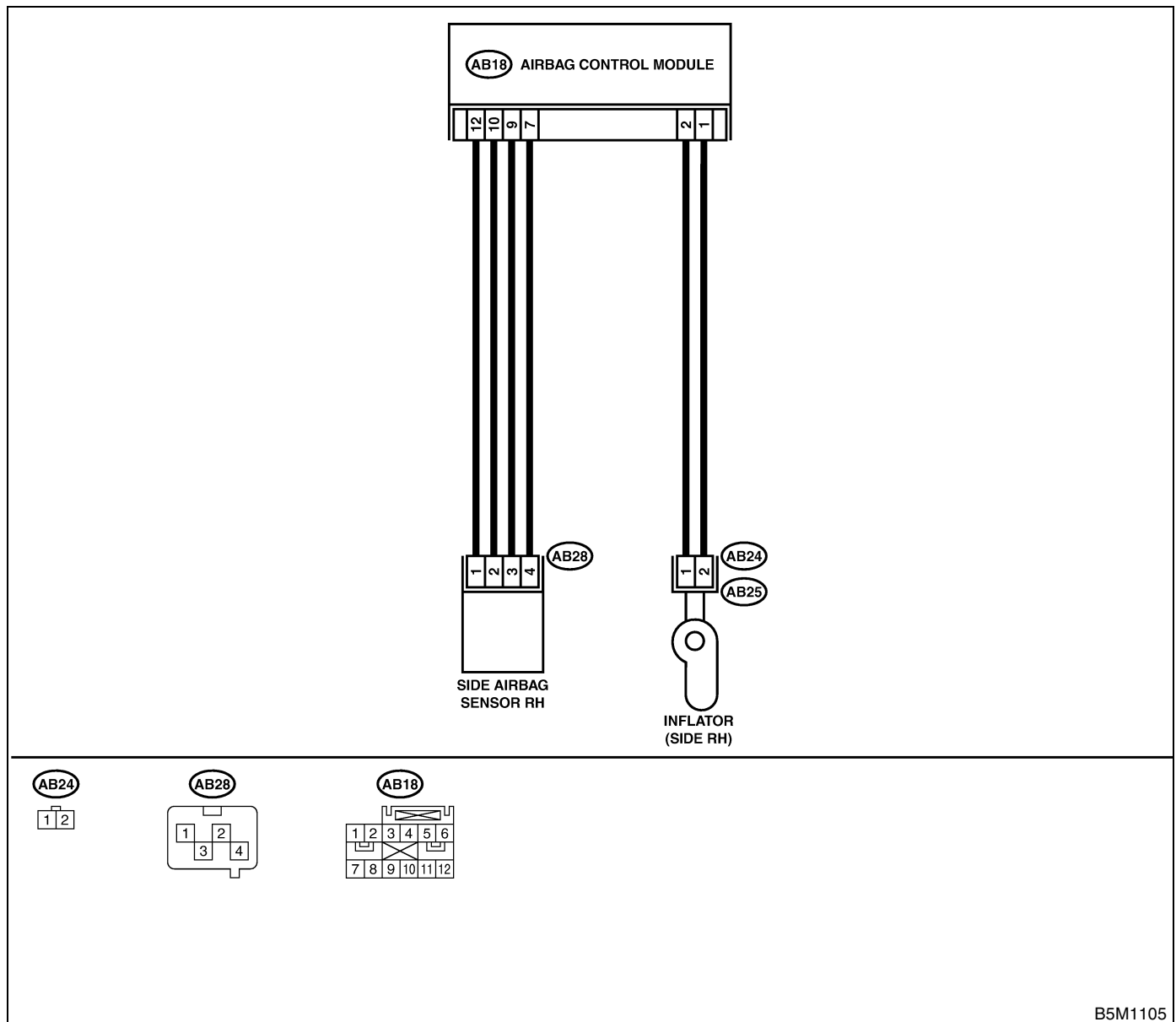
DIAGNOSIS:

- Side airbag harness (RH) is faulty.
- Side airbag module (RH) is faulty.
- Airbag control module is faulty.

CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.
- Before replacing the airbag module, seat belt pretensioner 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 to 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 the connector (1F) in test harness F to (AB24). 4) Connect the airbag resistor to connector (3F) in test harness F. 5) Connect the battery ground cable, and turn the ignition switch to ON.	Does the airbag warning light operate properly?	Replace the 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 to OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the airbag resistor from test harness F. 3) Disconnect the connector (AB18) from air bag control module. <Ref. to AB-15, Airbag Control Module.> 4) Connect the 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 1 MΩ?	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-15, Airbag Control Module.>	Replace the body harness with side airbag harness.

DIAGNOSTIC CHART WITH TROUBLE CODE

AIRBAG SYSTEM (DIAGNOSTICS)

M: DTC 42

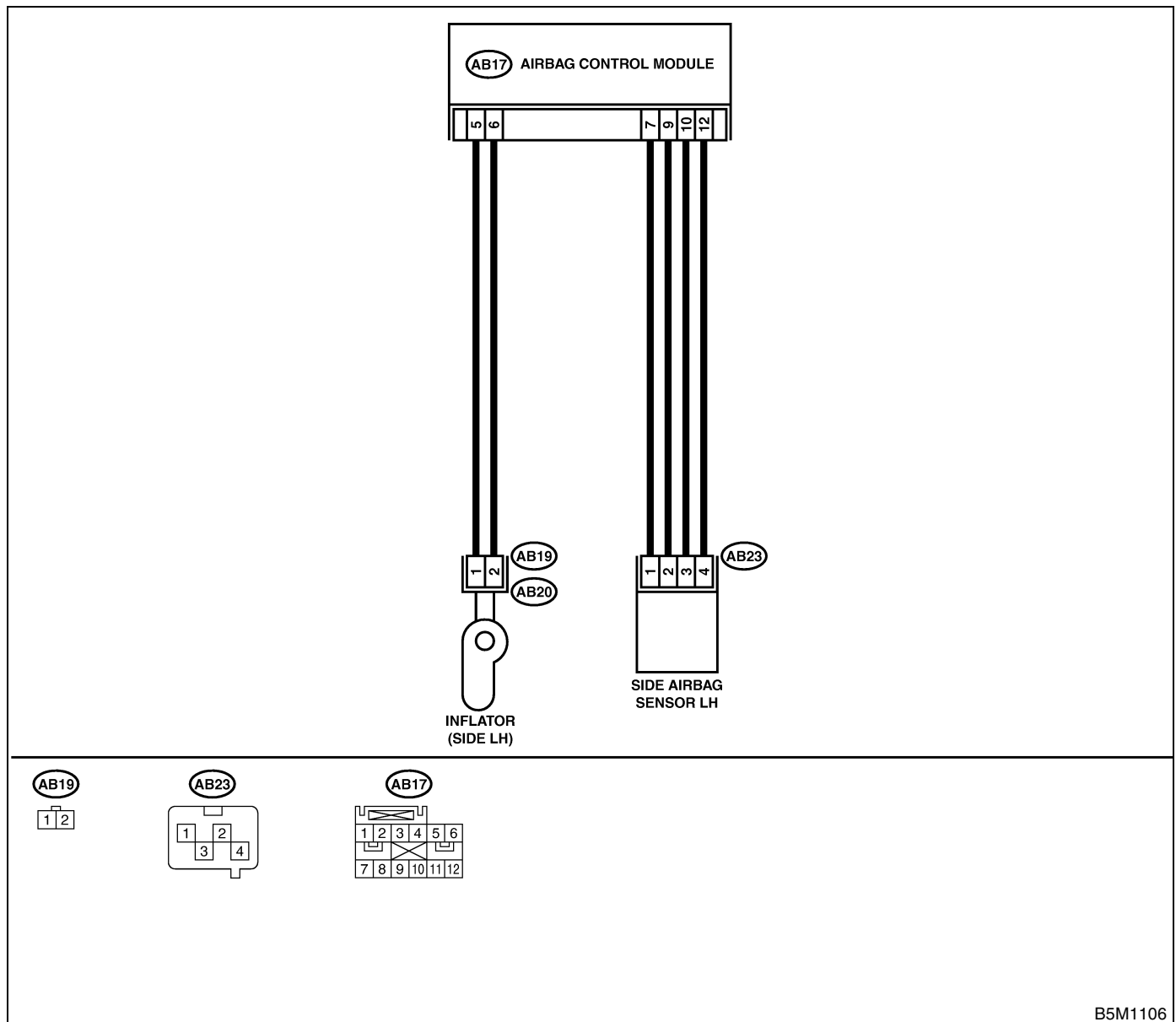
DIAGNOSIS:

- Side airbag harness (LH) is faulty.
- Side airbag module (LH) is faulty.
- Airbag control module is faulty.

CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.
- Before replacing the airbag module, seat belt pretensioner 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 to 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 the connector (AB20) from (AB19), and connect the connector (1F) in test harness F to (AB19). 4) Connect the airbag resistor to connector (3F) in test harness F. 5) Connect the battery ground cable, and turn the ignition switch to ON.	Does the airbag warning light operate properly?	Replace the 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 to 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 (AB17) from the airbag control module. <Ref. to AB-15, Airbag Control Module.> 4) Connect the 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. <i>Connector & terminal</i> <i>(3I) No. 10 — (3F) No. 3:</i> <i>(3I) No. 12 — (3F) No. 4:</i>	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. <i>Connector & terminal</i> <i>(3I) No. 10 — No. 12:</i>	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. <i>Connector & terminal</i> <i>(3F) No. 3 — No. 4:</i>	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. <i>Connector & terminal</i> <i>(3F) No. 3 — Chassis ground:</i> <i>(3F) No. 4 — Chassis ground:</i>	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. <i>Connector & terminal</i> <i>(3I) No. 10 — Chassis ground:</i> <i>(3I) No. 12 — Chassis ground:</i>	Is the resistance more than 1 M Ω ?	Replace the airbag control module. <Ref. to AB-15, Airbag Control Module.>	Replace the body harness with side airbag harness.

DIAGNOSTIC CHART WITH TROUBLE CODE

AIRBAG SYSTEM (DIAGNOSTICS)

N: DTC 45

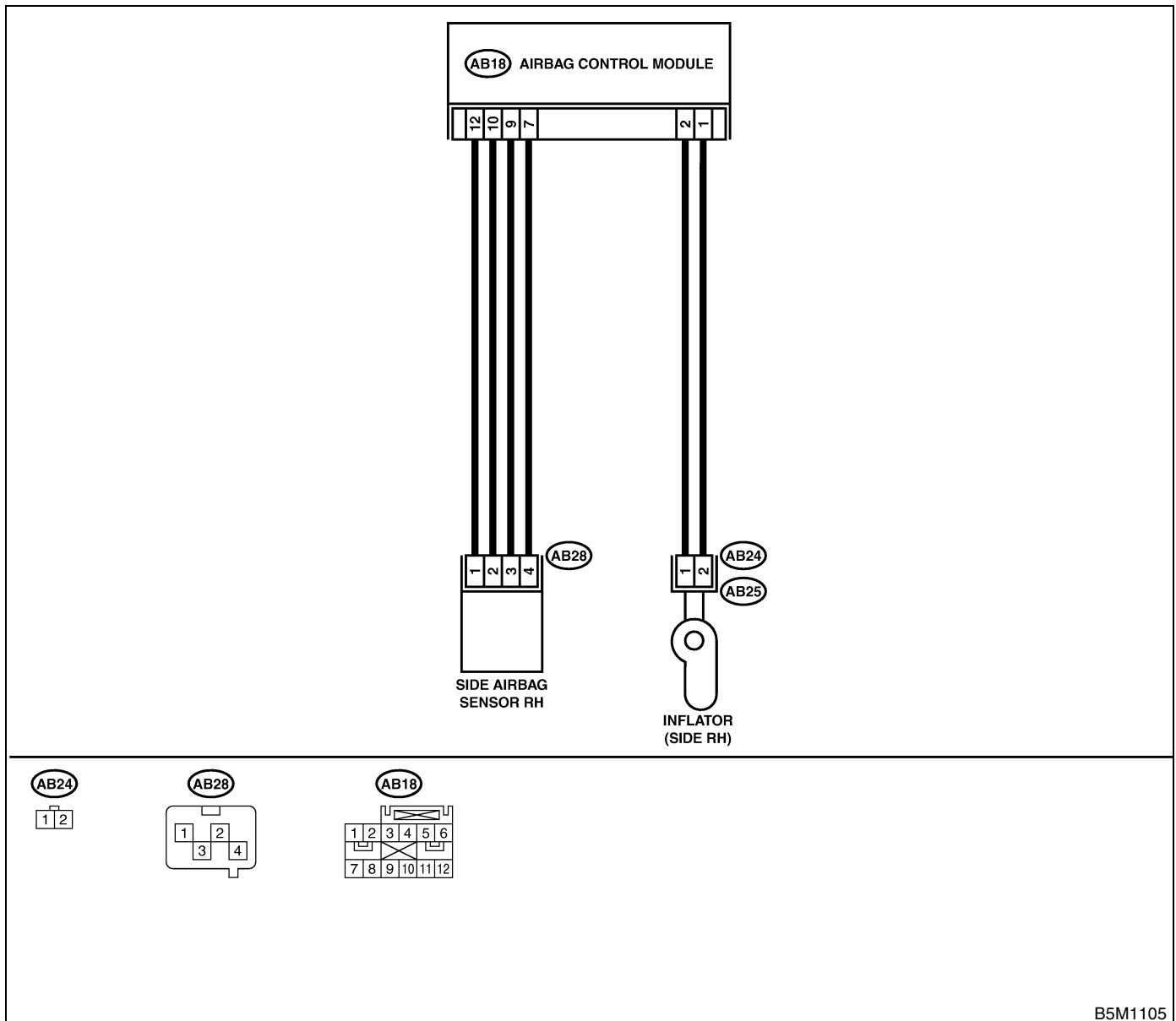
DIAGNOSIS:

- Side airbag harness (RH) is shorted to power supply.
- Airbag control module is faulty.

CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.
- Before replacing the airbag module, seat belt pretensioner 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
<p>1</p> <p>CHECK SIDE AIRBAG MODULE.</p> <p>1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds.</p> <p>2) Disconnect the connector (AB26) from the seat belt pretensioner (RH). <Ref. to SB-8, Front Seat Belt.></p> <p>3) Disconnect the connector (AB25) from (AB24), and connect the connector (1F) in test harness F to (AB24).</p> <p>4) Connect the airbag resistor to connector (3F) in test harness F.</p> <p>5) Connect the battery ground cable, and turn the ignition switch to ON.</p>	<p>Does the airbag warning light operate properly?</p>	<p>Replace the front seat with side airbag module (RH). <Ref. to SE-6, Front Seat.></p>	<p>Go to step 2.</p>
<p>2</p> <p>CHECK SIDE AIRBAG HARNESS (RH).</p> <p>1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds.</p> <p>2) Disconnect the airbag resistor from the test harness.</p> <p>3) Disconnect the connector (AB18) from the airbag control module. <Ref. to AB-15, Airbag Control Module.></p> <p>4) Connect the connector (1I) in test harness I or I2 to connector (AB18).</p> <p>5) Connect the battery ground cable, and turn the ignition switch to ON.</p> <p>6) Measure the voltage between connector (3I) in test harness I or I2 and the chassis ground.</p> <p>Connector & terminal</p> <p>(3I) No. 7 (+) — Chassis ground (-):</p> <p>(3I) No. 9 (+) — Chassis ground (-):</p>	<p>Is the voltage less than 1 V?</p>	<p>Replace the airbag control module. <Ref. to AB-15, Airbag Control Module.></p>	<p>Replace the body harness with side airbag harness.</p>

DIAGNOSTIC CHART WITH TROUBLE CODE

AIRBAG SYSTEM (DIAGNOSTICS)

O: DTC 46

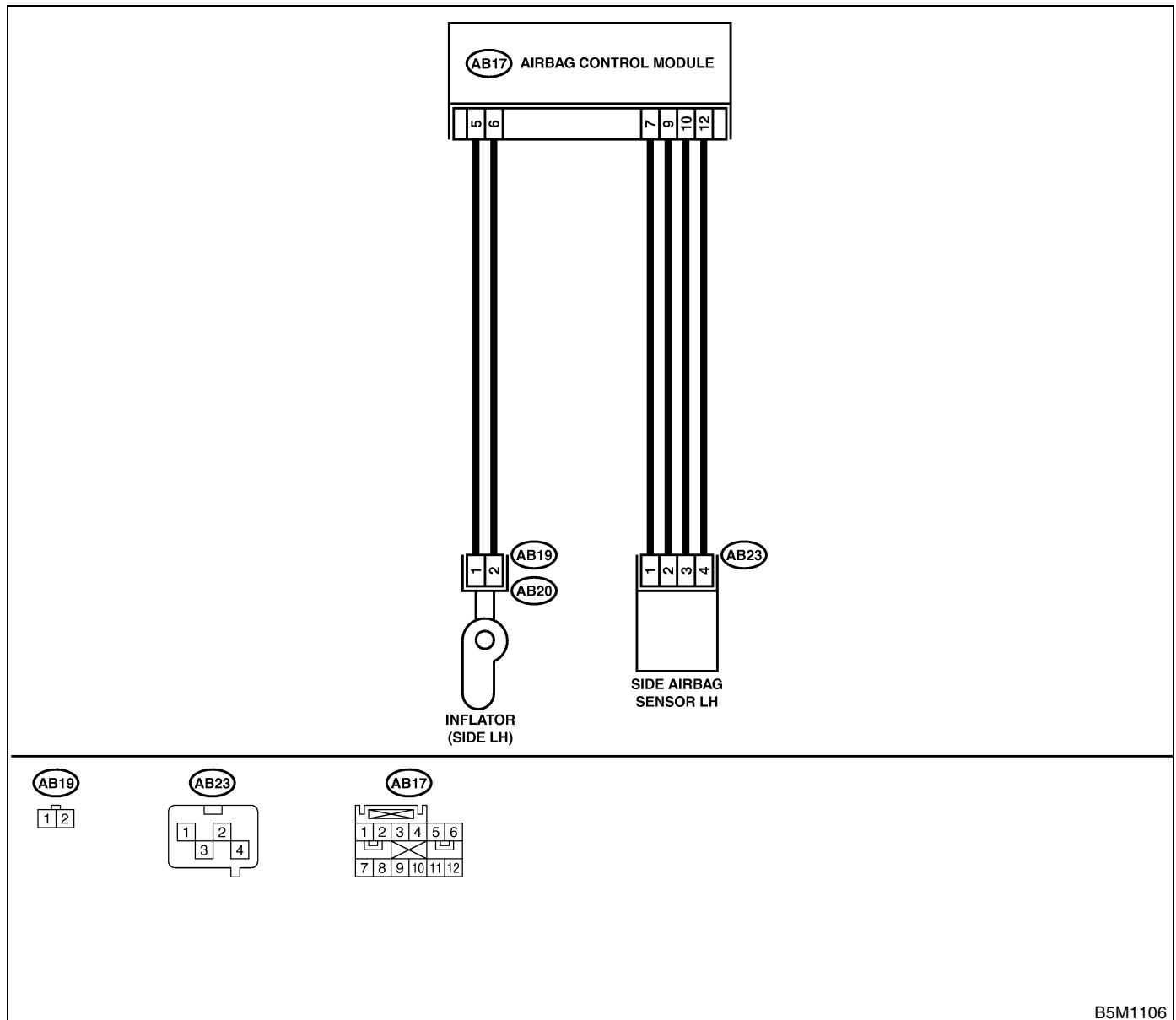
DIAGNOSIS:

- Side airbag harness (LH) is shorted to power supply.
- Airbag control module is faulty.

CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.
- Before replacing the airbag module, seat belt pretensioner 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 to 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 the connector (AB20) from (AB19), and connect the connector (1F) in test harness F to (AB19). 4) Connect the airbag resistor to connector (3F) in test harness F. 5) Connect the battery ground cable and turn the ignition switch to ON.	Does the airbag warning light operate properly?	Replace the 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 to 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 (AB17) from the airbag control module. <Ref. to AB-15, Airbag Control Module.> 4) Connect the connector (1I) in test harness I or I2 to connector (AB17). 5) Connect the battery ground cable, and turn the ignition switch to ON. 6) Measure the voltage between connector (3I) in test harness I or I2 and the chassis ground. Connector & terminal <i>(3I) No. 10 (+) — Chassis ground (-):</i> <i>(3I) No. 12 (+) — Chassis ground (-):</i>	Is the voltage less than 1 V?	Replace the airbag control module. <Ref. to AB-15, Airbag Control Module.>	Replace the body harness with side airbag harness.

DIAGNOSTIC CHART WITH TROUBLE CODE

AIRBAG SYSTEM (DIAGNOSTICS)

P: DTC 51

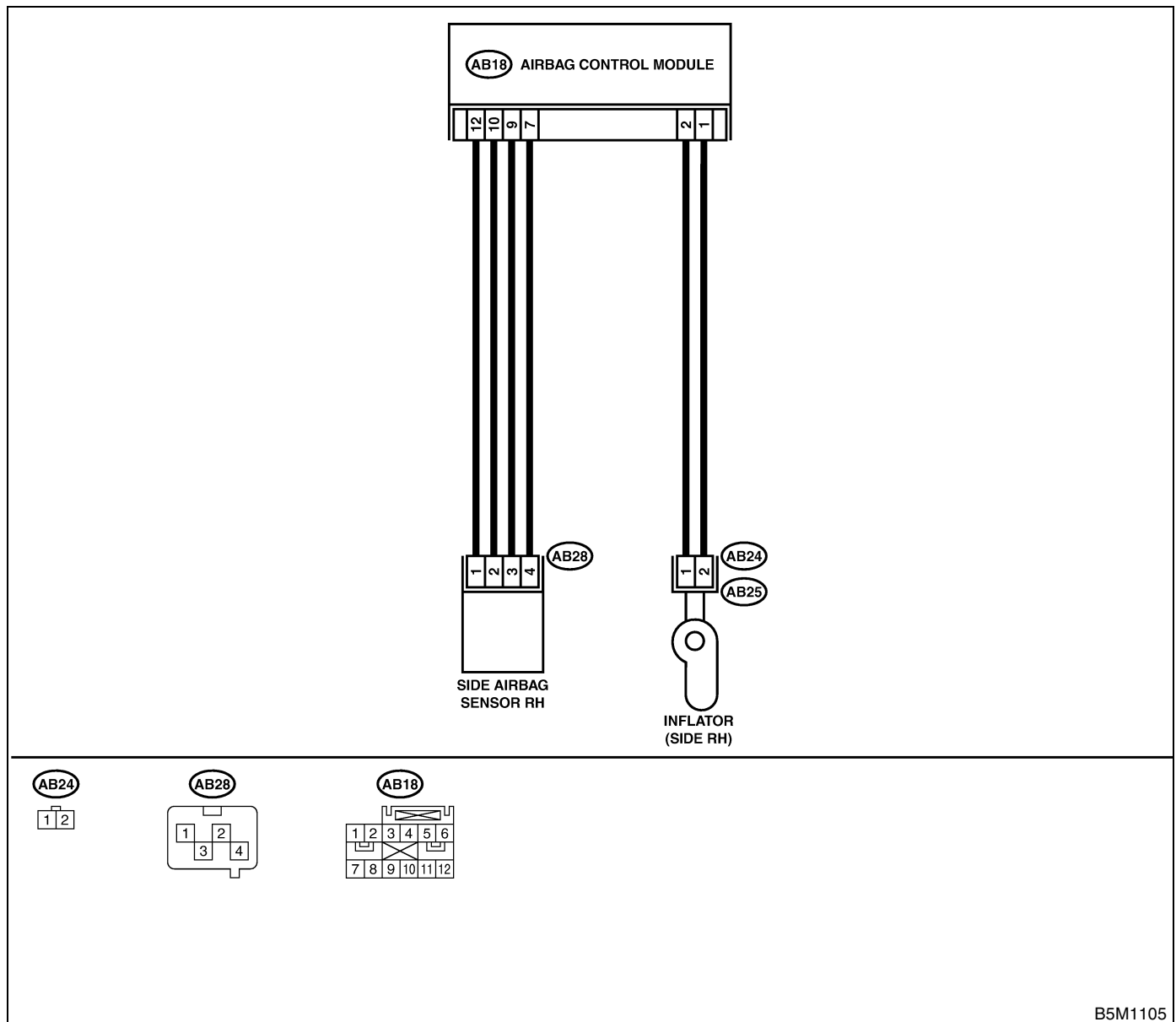
DIAGNOSIS:

- Side airbag sensor (RH) is faulty.
- Side airbag harness (RH) is faulty.
- Airbag control module is faulty.

CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.
- Before replacing the airbag module, seat belt pretensioner 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
<p>1</p> <p>CHECK SIDE AIRBAG HARNESS (RH). 1) Turn the ignition switch to 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). 4) Disconnect the connector (AB18) from the airbag control module. <Ref. to AB-15, Airbag Control Module.> 5) Connect the connector (1I) in test harness I or I2 to the connector (AB18). 6) Disconnect the connector (AB28) from the side airbag sensor (RH), and connect the 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.</p> <p>Connector & terminal <i>(3I) No. 17 — (3G) No. 2:</i> <i>(3I) No. 18 — (3G) No. 1:</i> <i>(3I) No. 19 — (3G) No. 5:</i> <i>(3I) No. 20 — (3G) No. 4:</i></p>	<p>Is the resistance less than 10 Ω?</p>	<p>Go to step 2.</p>	<p>Replace the body harness with side airbag harness.</p>
<p>2</p> <p>CHECK SIDE AIRBAG HARNESS (RH). Measure the resistance between connector (3I) in test harness I or I2 and the chassis ground.</p> <p>Connector & terminal <i>(3I) No. 17 — Chassis ground:</i> <i>(3I) No. 18 — Chassis ground:</i> <i>(3I) No. 19 — Chassis ground:</i> <i>(3I) No. 20 — Chassis ground:</i></p>	<p>Is the resistance more than 1 MΩ?</p>	<p>Replace the side airbag sensor (RH). <Ref. to AB-16, Side Airbag Sensor.> When sensor replacement is not OK, replace the airbag control module. <Ref. to AB-15, Airbag Control Module.></p>	<p>Replace the body harness with side airbag harness.</p>

DIAGNOSTIC CHART WITH TROUBLE CODE

AIRBAG SYSTEM (DIAGNOSTICS)

Q: DTC 52

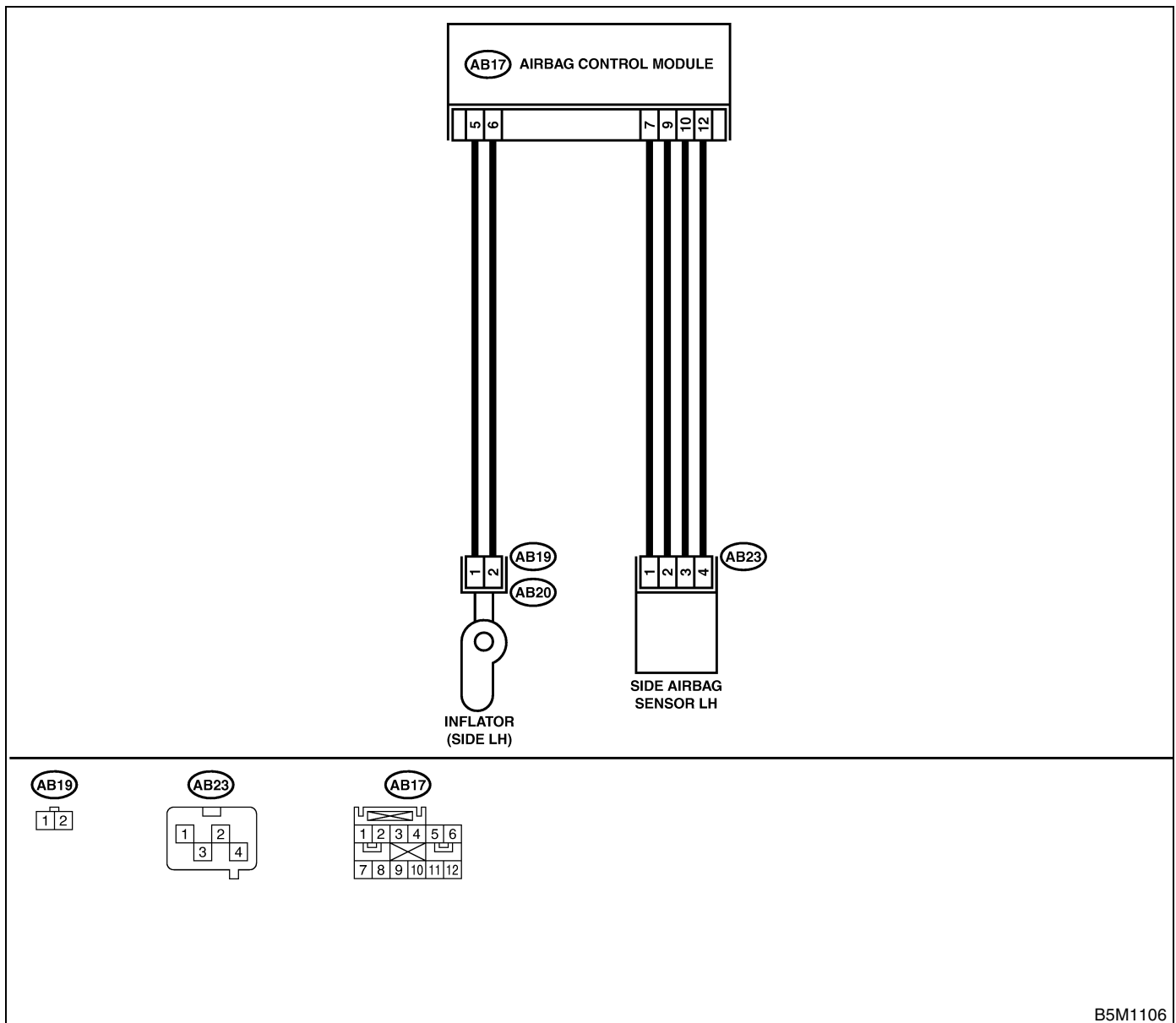
DIAGNOSIS:

- Side airbag sensor (LH) is faulty.
- Side airbag harness (LH) is faulty.
- Airbag control module is faulty.

CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.
- Before replacing the airbag module, seat belt pretensioner 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
<p>1 CHECK SIDE AIRBAG HARNESS (LH). 1) Turn the ignition switch to 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 the connector (AB20) from (AB19). 4) Disconnect the connector (AB17) from the airbag control module. <Ref. to AB-15, Airbag Control Module.> 5) Connect the connector (1I) in test harness I or I2 to connector (AB17). 6) Disconnect the connector (AB23) from the side airbag sensor (LH), and connect the 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.</p> <p>Connector & terminal <i>(3I) No. 5 — (3G) No. 4:</i> <i>(3I) No. 14 — (3G) No. 5:</i> <i>(3I) No. 15 — (3G) No. 1:</i> <i>(3I) No. 16 — (3G) No. 2:</i></p>	<p>Is the resistance less than 10 Ω?</p>	<p>Go to step 2.</p>	<p>Replace the body harness with side airbag harness.</p>
<p>2 CHECK SIDE AIRBAG HARNESS (RH). Measure the resistance between connector (3I) in test harness I or I2 and the chassis ground.</p> <p>Connector & terminal <i>(3I) No. 5 — Chassis ground:</i> <i>(3I) No. 14 — Chassis ground:</i> <i>(3I) No. 15 — Chassis ground:</i> <i>(3I) No. 16 — Chassis ground:</i></p>	<p>Is the resistance more than 1 MΩ?</p>	<p>Replace the side airbag sensor (LH). <Ref. to AB-16, Side Airbag Sensor.> When sensor replacement is not OK, replace the airbag control module. <Ref. to AB-15, Airbag Control Module.></p>	<p>Replace the body harness with side airbag harness.</p>

R: DTC 53

DIAGNOSIS:

- Side airbag sensor (RH) is faulty.

When Code 53 is displayed, the circuit within the side airbag sensor (RH) is faulty. Replace the side airbag sensor (RH).

<Ref. to AB-16, Side Airbag Sensor.>

S: DTC 54

DIAGNOSIS:

- Side airbag sensor (LH) is faulty.

When Code 53 is displayed, the circuit within the side airbag sensor (LH) is faulty. Replace the side airbag sensor (LH).

<Ref. to AB-16, Side Airbag Sensor.>

T: DTC 55

This code is displayed when the side airbag is deployed.

When this code is displayed, the memory cannot be erased. Replace the following parts.

- Airbag control module. <Ref. to AB-15, 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-16, Side Airbag Sensor.>

DIAGNOSTIC CHART WITH TROUBLE CODE

AIRBAG SYSTEM (DIAGNOSTICS)

U: DTC 61

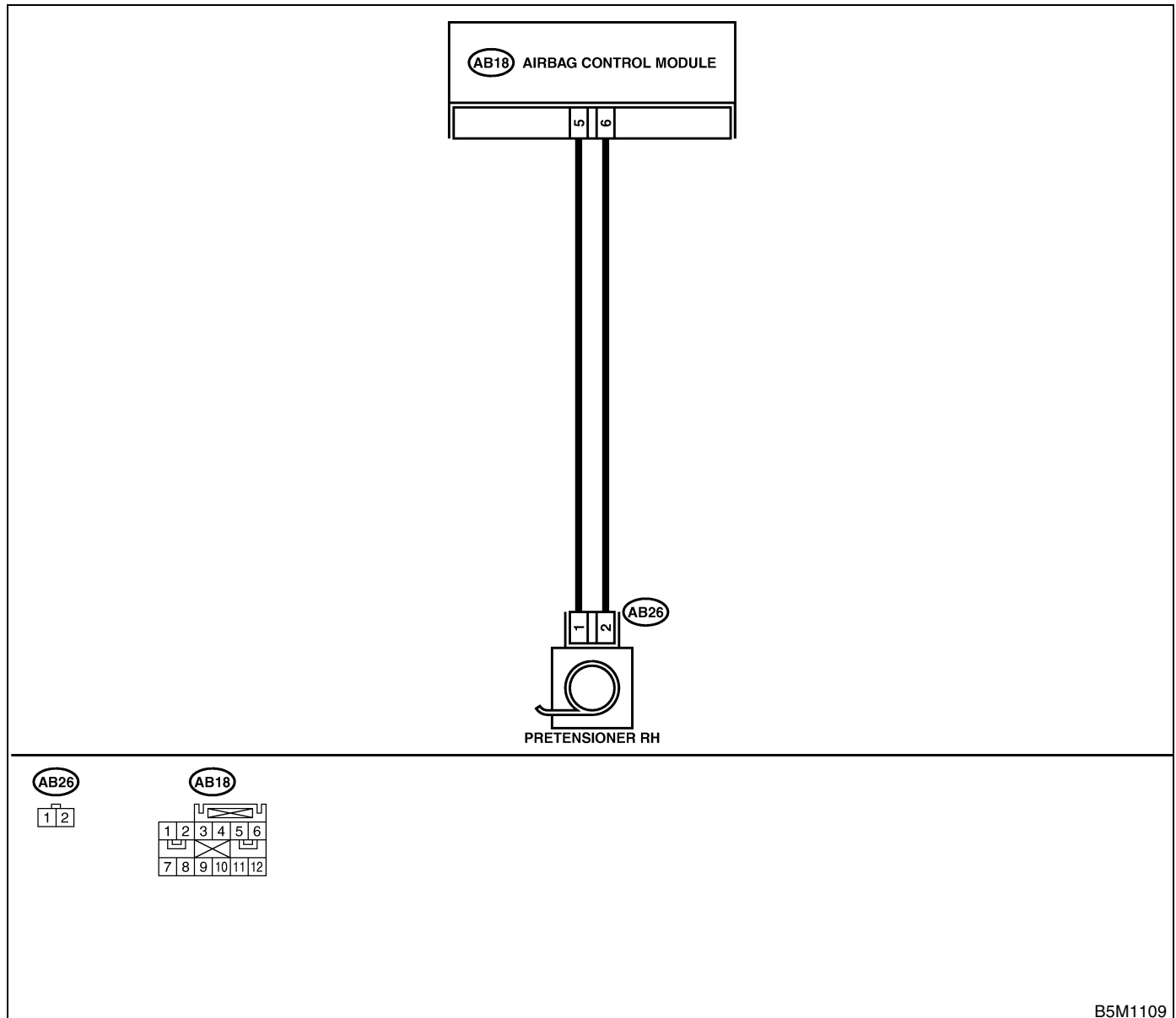
DIAGNOSIS:

- Seat belt pretensioner (RH) circuit is open, shorted or shorted to ground.
- Airbag control module is faulty.
- Pretensioner is faulty.
- Pretensioner harness is faulty.

CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.
- Before replacing the airbag module, seat belt pretensioner 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:



B5M1109

DIAGNOSTIC CHART WITH TROUBLE CODE

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK SEAT BELT PRETENSIONER. 1) Turn the ignition switch to 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 to ON.	Does the airbag warning light operate properly?	Replace the 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 to 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-15, 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. <i>Connector & terminal</i> <i>(3I) No. 8 — (3L) No. 6:</i> <i>(3I) No. 6 — (3L) No. 5:</i>	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. <i>Connector & terminal</i> <i>(3I) No. 6 — No. 8:</i>	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 (RH). Measure the resistance between connector (3I) in test harness I or I2 and the chassis ground. <i>Connector & terminal</i> <i>(3I) No. 6 — Chassis ground:</i> <i>(3I) No. 8 — Chassis ground:</i>	Is the resistance more than 1 M Ω ?	Replace the airbag control module. <Ref. to AB-15, Airbag Control Module.>	Replace the body harness with side airbag harness.

DIAGNOSTIC CHART WITH TROUBLE CODE

AIRBAG SYSTEM (DIAGNOSTICS)

V: DTC 62

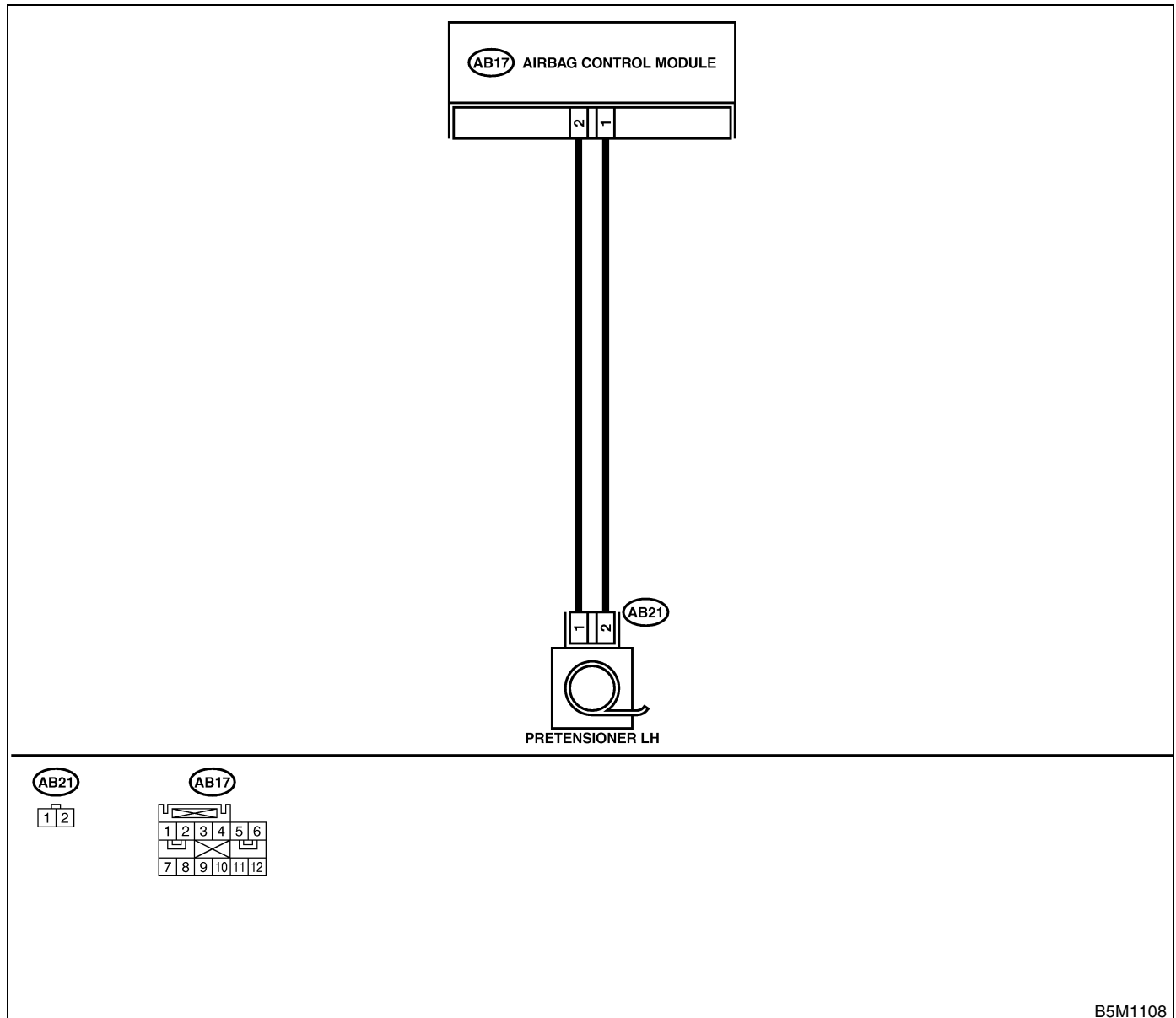
DIAGNOSIS:

- Seat belt pretensioner (LH) circuit is open, shorted or shorted to ground.
- Airbag control module is faulty.
- Pretensioner is faulty.
- Pretensioner harness is faulty.

CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.
- Before replacing the airbag module, seat belt pretensioner 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 to 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 to ON.	Does the airbag warning light operate properly?	Replace the 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 to 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-15, 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. <i>Connector & terminal</i> <i>(3I) No. 11 — (3L) No. 6:</i> <i>(3I) No. 13 — (3L) No. 5:</i>	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. <i>Connector & terminal</i> <i>(3I) No. 11 — No. 13:</i>	Is the resistance more than 1 MΩ?	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. <i>Connector & terminal</i> <i>(3I) No. 11 — Chassis ground:</i> <i>(3I) No. 13 — Chassis ground:</i>	Is the resistance more than 1 MΩ?	Replace the airbag control module. <Ref. to AB-15, Airbag Control Module.>	Replace the body harness with side airbag harness.

DIAGNOSTIC CHART WITH TROUBLE CODE

AIRBAG SYSTEM (DIAGNOSTICS)

W: DTC 65

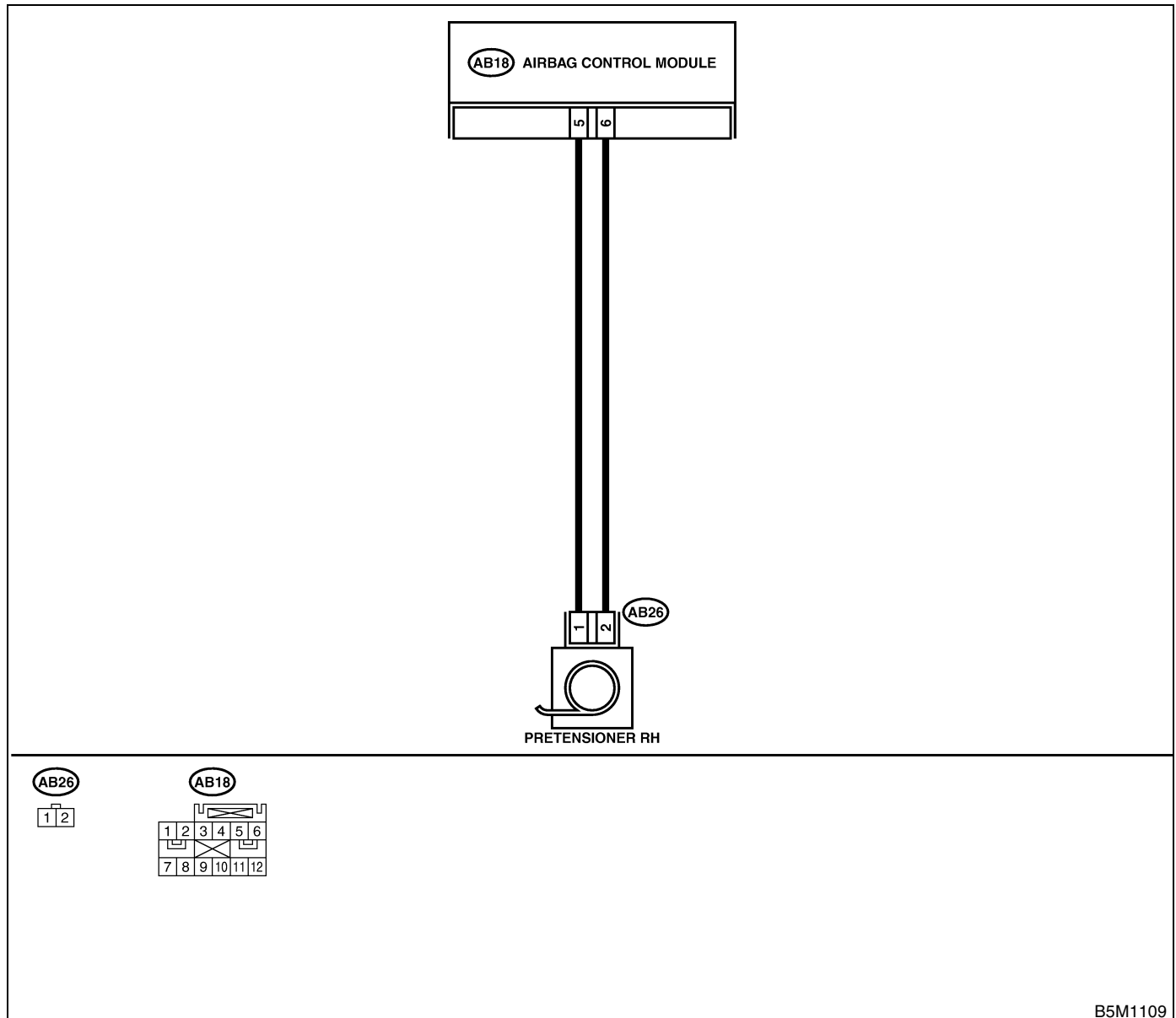
DIAGNOSIS:

- Seat belt pretensioner (RH) circuit is shorted to the power supply.
- Pretensioner is faulty.
- Pretensioner harness is faulty.
- Airbag control module is faulty.

CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.
- Before replacing the airbag module, seat belt pretensioner 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:



B5M1109

DIAGNOSTIC CHART WITH TROUBLE CODE

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK SEAT BELT PRETENSIONER. 1) Turn the ignition switch to 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 to ON.	Does the airbag warning light operate properly?	Replace the 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 to 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-15, 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 to 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-15, Airbag Control Module.>	Replace the body harness with side airbag harness.

DIAGNOSTIC CHART WITH TROUBLE CODE

AIRBAG SYSTEM (DIAGNOSTICS)

X: DTC 66

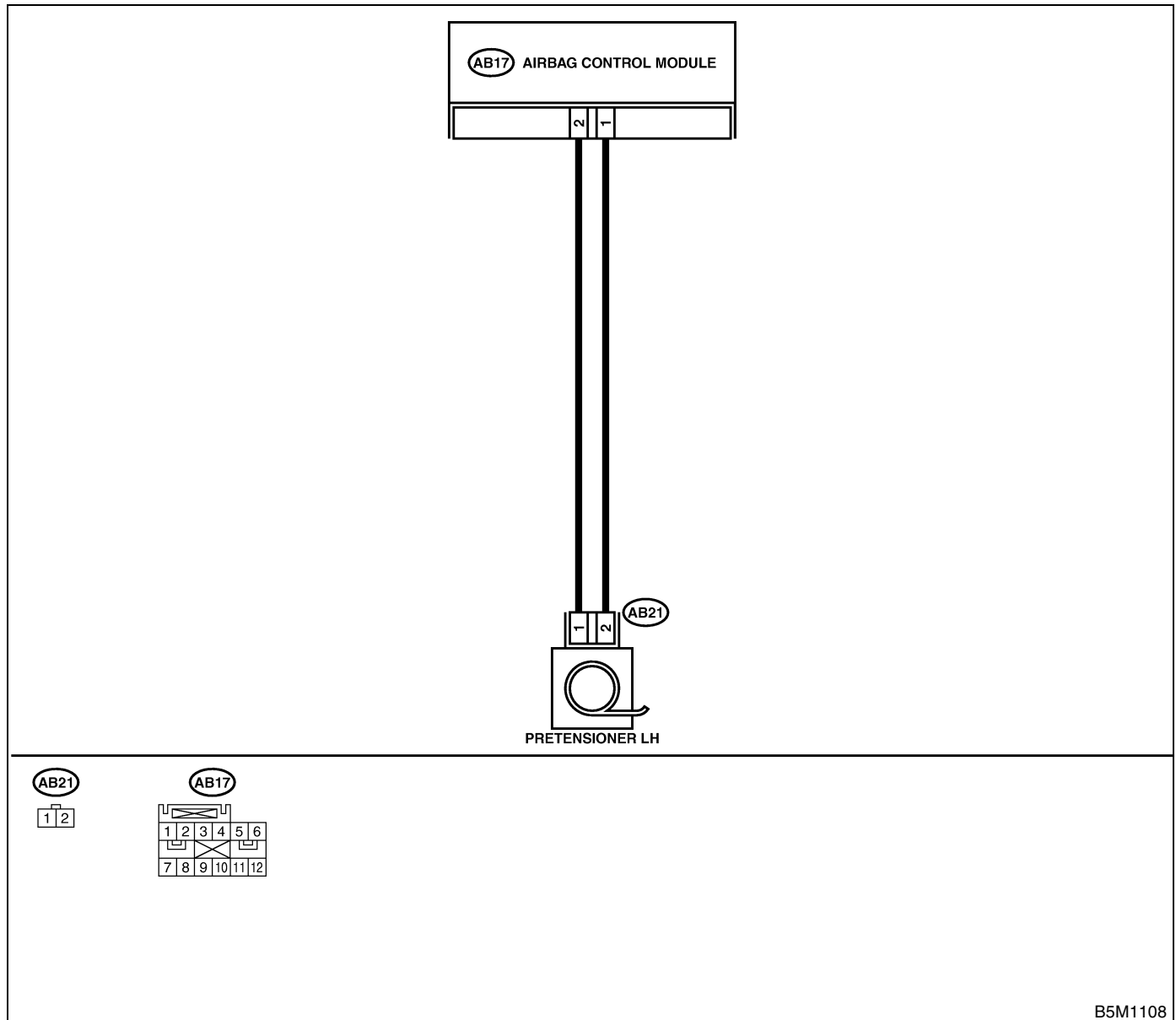
DIAGNOSIS:

- Seat belt pretensioner (LH) circuit is shorted to the power supply.
- Pretensioner is faulty.
- Pretensioner harness is faulty.
- Airbag control module is faulty.

CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait more than 20 seconds before starting to work.
- Before replacing the airbag module, seat belt pretensioner 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:



B5M1108

DIAGNOSTIC CHART WITH TROUBLE CODE

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK SEAT BELT PRETENSIONER. 1) Turn the ignition switch to 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 to ON.	Does the airbag warning light operate properly?	Replace the 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 to 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-15, 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 to 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-15, Airbag Control Module.>	Replace the body harness with side airbag harness.

DIAGNOSTIC CHART WITH TROUBLE CODE

AIRBAG SYSTEM (DIAGNOSTICS)

SEAT BELT SYSTEM

SB

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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

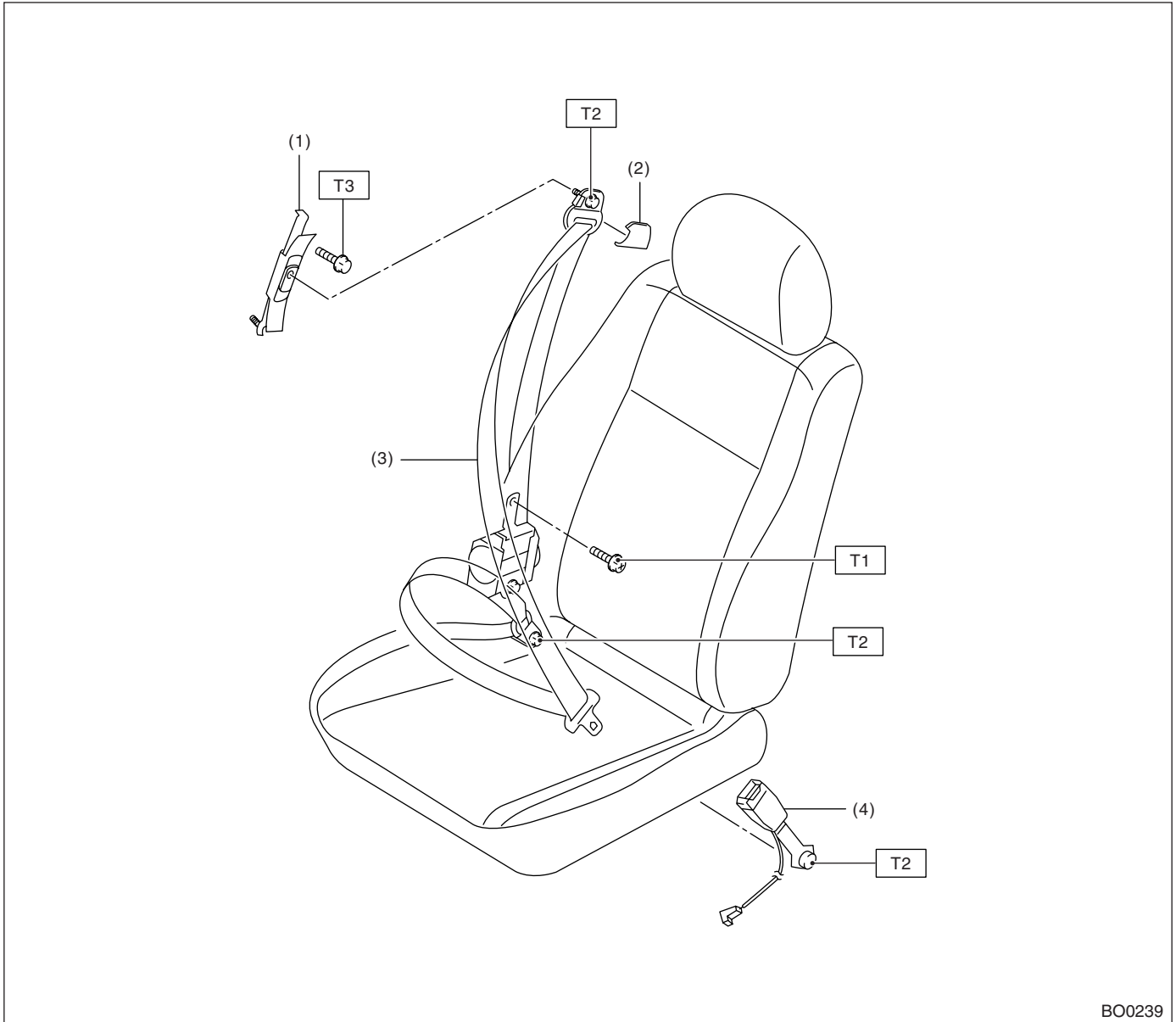
GENERAL DESCRIPTION

SEAT BELT SYSTEM

1. General Description

A: COMPONENT

1. FRONT SEAT BELT



BO0239

- (1) Adjuster anchor ASSY
- (2) Anchor cover
- (3) Outer belt ASSY
- (4) Inner belt ASSY

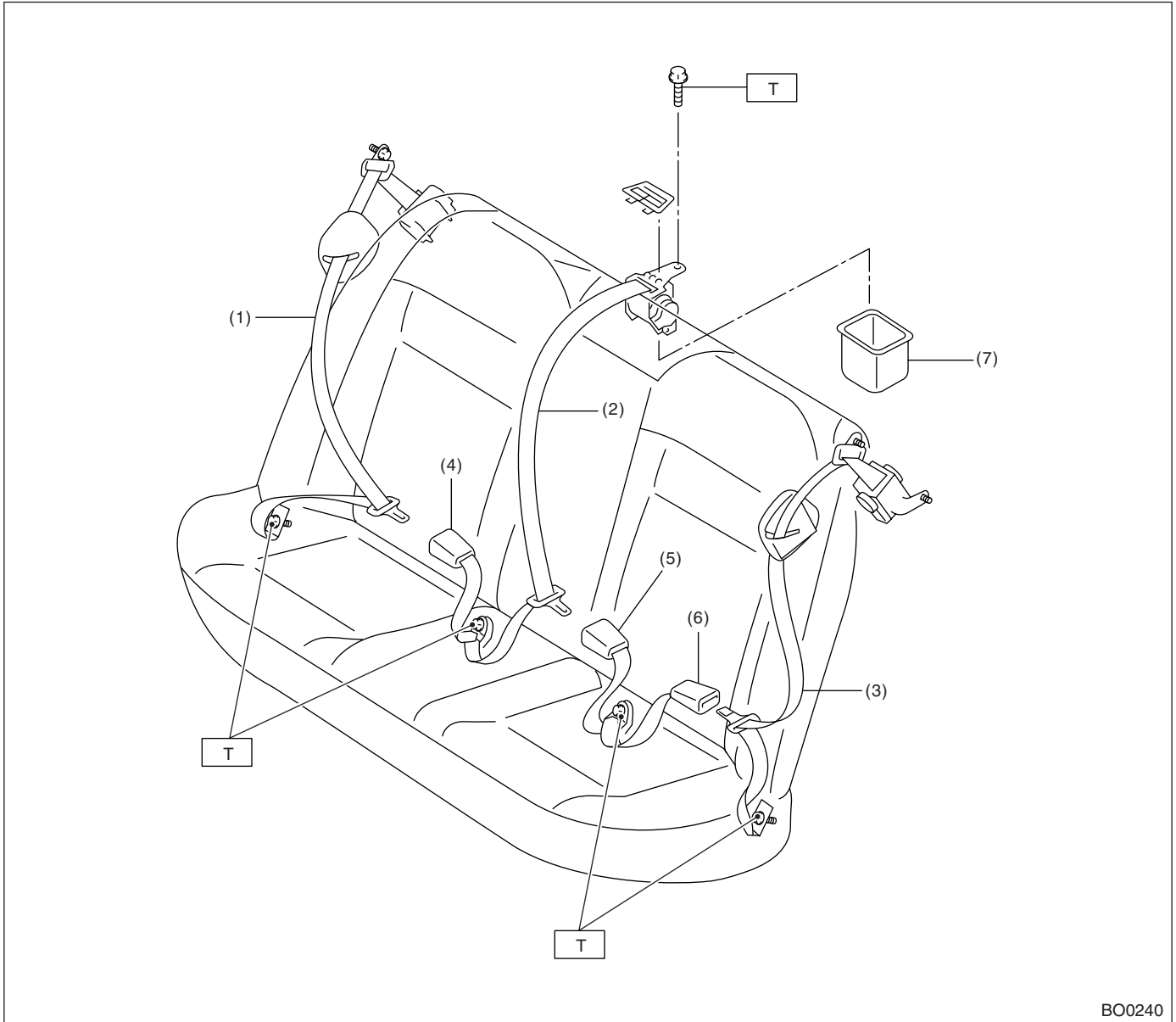
Tightening torque: N·m (kgf·m, ft·lb)

T1: 7.5 (0.76, 5.5)

T2: 30 (3.1, 22)

T3: 53 (5.4, 39)

2. REAR SEAT BELT (SEDAN)



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 | |

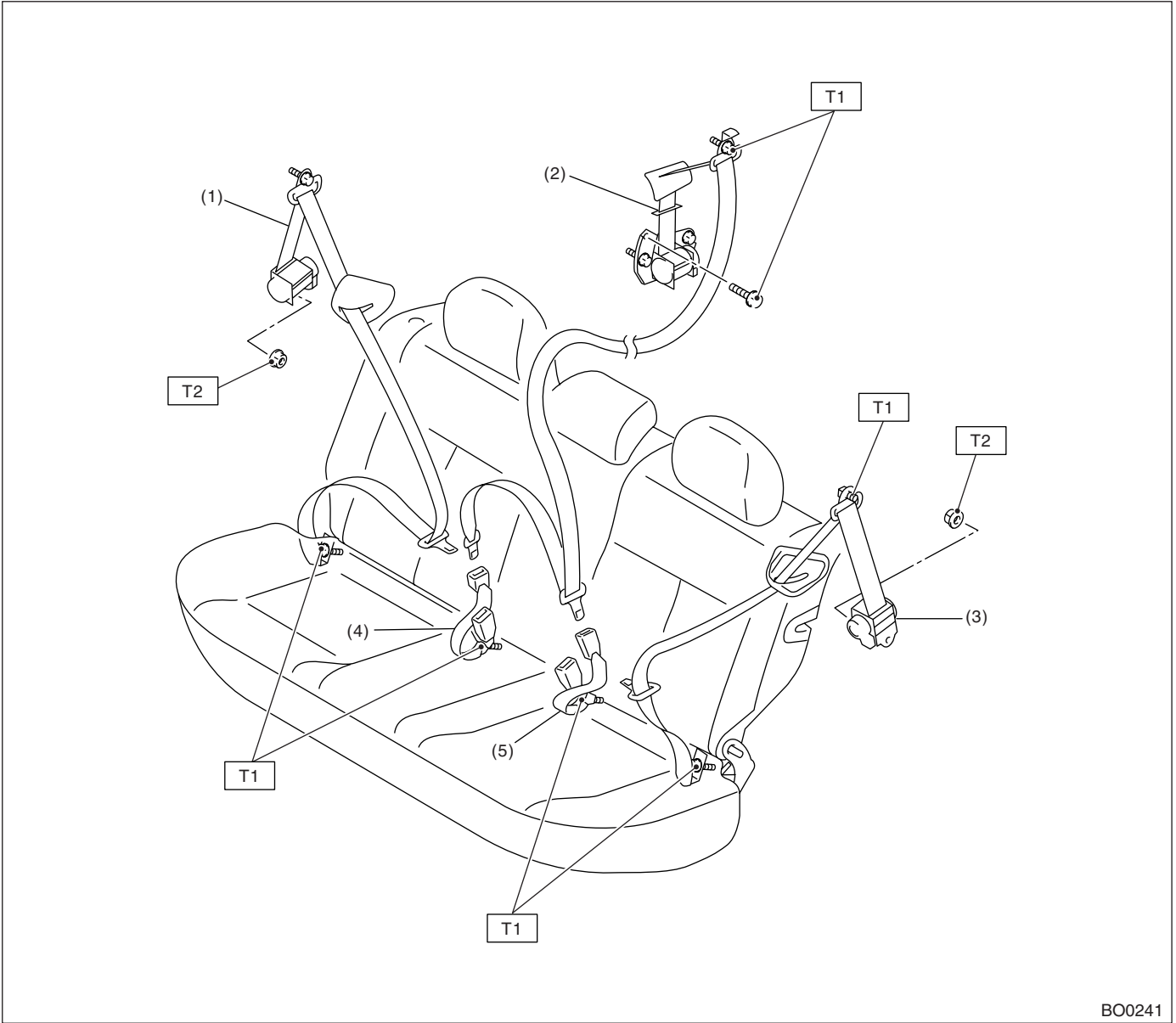
Tightening torque: N·m (kgf·m, ft·lb)

T: 30 (3.1, 22)

GENERAL DESCRIPTION

SEAT BELT SYSTEM

3. REAR SEAT BELT (WAGON)



- (1) Outer seat belt RH
- (2) Outer seat belt CENTER
- (3) Outer seat belt LH
- (4) Inner seat belt RH

- (5) Inner seat belt LH

Tightening torque: N-m (kgf-m, ft-lb)

T1: 30 (3.1, 22)

T2: 53 (5.4, 39)

B: CAUTION


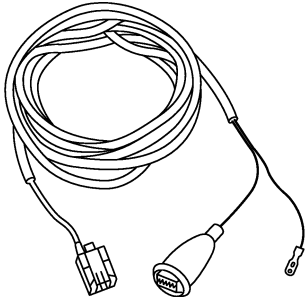
- Before starting, turn the ignition switch to OFF, disconnect the battery ground cable and wait for 20 seconds or more.
- The pretension system has a backup power source. The pretensioner might deploy if you do not wait for 20 seconds or more before starting work.
- Do not drop or apply any impact to 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 airbag or pretensioner parts from other vehicles. Always replace parts with new parts.
- When handling a seat belt with a deployed pretensioner, wear gloves and goggles. Wash your hands afterwards.
- Do not re-use a seat belt with a deployed pretensioner again.
- Be sure to deploy pretensioner before disposal. <Ref. to SB-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)	<ul style="list-style-type: none">• Used for deploying the pretensioner.• Used with DEPLOYMENT TOOL (98299PA030).
 B5M1115	98299PA030	DEPLOYMENT TOOL	<ul style="list-style-type: none">• Used for deploying the pretensioner.• Used with ADAPTER C (DEPLOYMENT) (98299FE010).

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

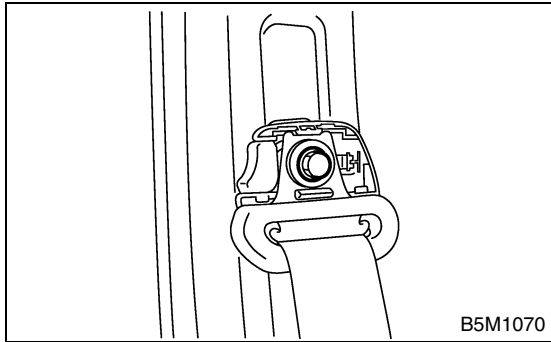
SEAT BELT SYSTEM

3. Front Seat Belt

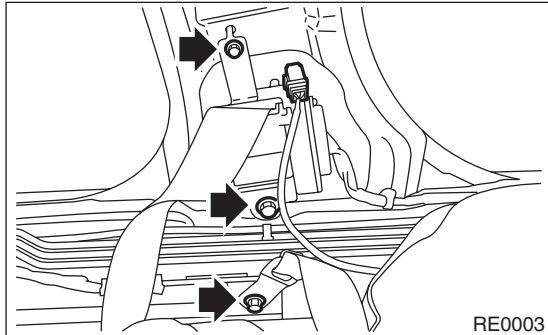
A: REMOVAL

1. OUTER BELT (FRONT)

- 1) Fold backrest all the way forward, and then move front seat all the way forward.
- 2) Turn the ignition switch to OFF, disconnect the ground cable from battery, and wait for more than 20 seconds before starting work.
- 3) Remove the center pillar lower trim. <Ref. to EI-45, REMOVAL, Lower Inner Trim.>
- 4) Remove the anchor cover. Loosen the shoulder anchor bolt, and then detach the shoulder anchor from center pillar.



- 5) Turn over the floor mat to remove the bolts.



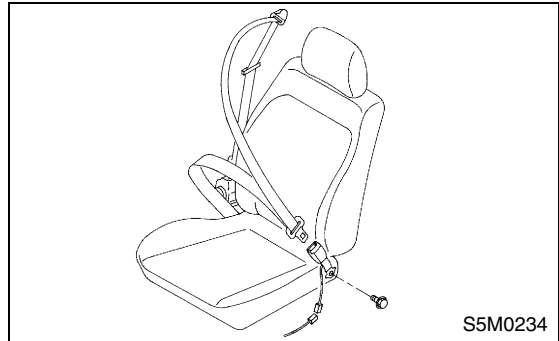
- 6) Disconnect the yellow connector of pretensioner harness, and remove the outer belt (front).

CAUTION:

- Do not drop or apply any impact to the pretensioner.
- Pretensioner and bracket should be treated as an assembly. Do not attempt to disassemble it.

2. INNER BELT (FRONT)

- 1) Disconnect the connector.
- 2) Remove the anchor bolt, and then detach the inner belt.



B: INSTALLATION

1. OUTER BELT (FRONT)

Install in the reverse order of removal.

CAUTION:

- **The parts on right and left are not identical. Before installation, make sure that the correct part is used.**
- **Be careful not to twist the 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

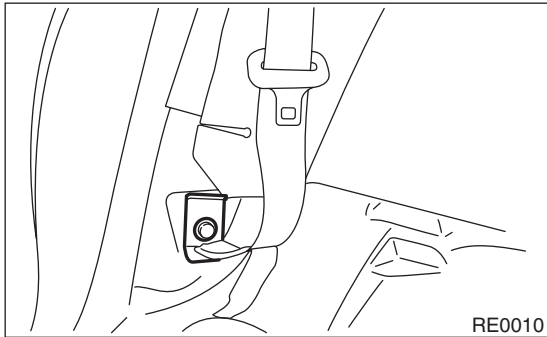
SEAT BELT SYSTEM

4. Rear Seat Belt

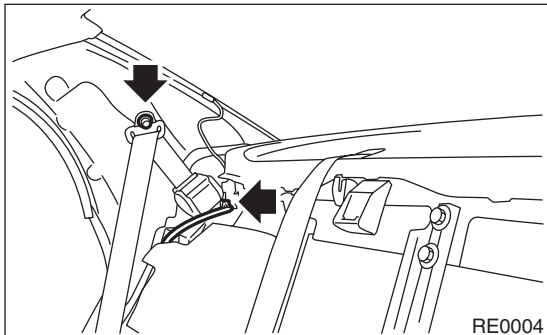
A: REMOVAL

1. OUTER BELT SIDE (SEDAN)

- 1) Remove the rear seat. <Ref. to SE-11, REMOVAL, Rear Seat.>
- 2) Remove the side sill rear lower cover. <Ref. to EI-45, REMOVAL, Lower Inner Trim.>
- 3) Remove the seat belt lower anchor bolt.

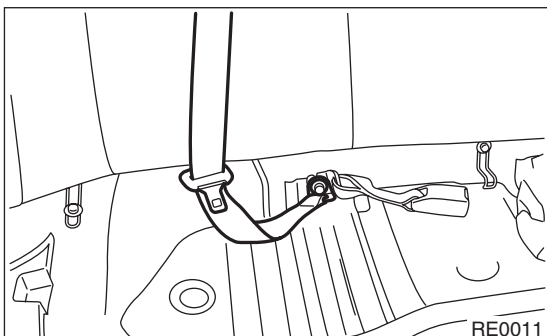


- 4) Remove the quarter pillar trim. <Ref. to EI-46, REMOVAL, Rear Quarter Trim.>
- 5) Remove the bolts, and then detach the seat belt.



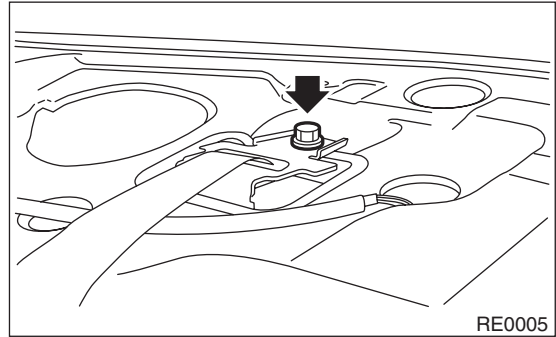
2. OUTER BELT CENTER (SEDAN)

- 1) Remove the rear seat. <Ref. to SE-11, REMOVAL, Rear Seat.>
- 2) Remove the seat belt lower anchor bolt.



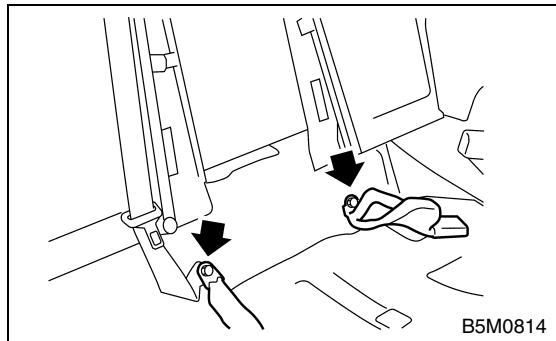
- 3) Remove the quarter pillar trim. <Ref. to EI-46, Removal, Rear Quarter Trim.>
- 4) Remove the rear shelf trim. <Ref. to EI-51, REMOVAL, Rear Shelf Trim.>

- 5) Remove the bolts, and then detach the seat belt.



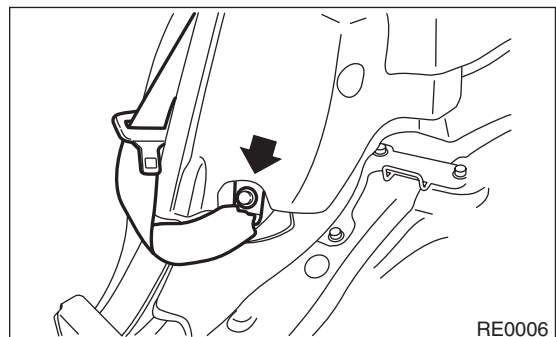
3. INNER BELT (SEDAN)

- 1) Remove the rear cushion. <Ref. to SE-11, REMOVAL, Rear Seat.>
- 2) Remove the bolts, and then detach the inner belt.



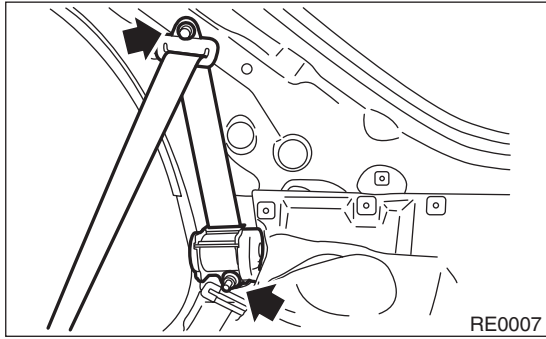
4. OUTER BELT SIDE (WAGON)

- 1) Remove the luggage floor mat. <Ref. to EI-54, REMOVAL, Luggage Floor Mat.>
- 2) Remove the rear seat. <Ref. to SE-11, REMOVAL, Rear Seat.>
- 3) Remove the side sill rear lower cover. <Ref. to EI-45, REMOVAL, Lower Inner Trim.>
- 4) Remove the seat belt lower anchor bolt.



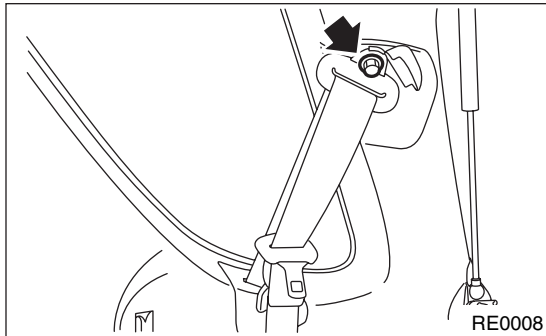
- 5) Remove the rear quarter trim. <Ref. to EI-46, REMOVAL, Rear Quarter Trim.>

6) Remove the bolts, and then detach the outer belt side.



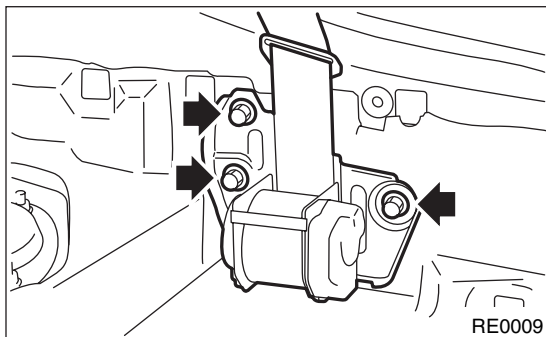
5. OUTER BELT CENTER (WAGON)

1) Remove the shoulder anchor bolt, and then detach the shoulder anchor from quarter pillar.



2) Remove the quarter trim. <Ref. to EI-46, REMOVAL, Rear Quarter Trim.>

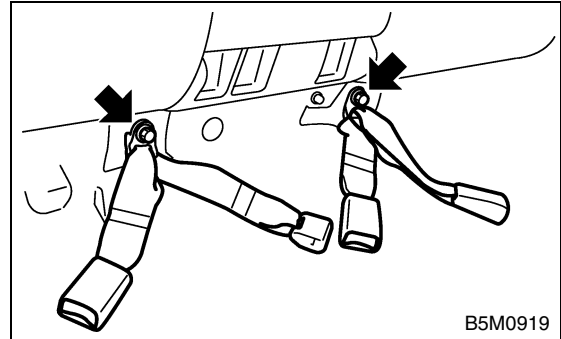
3) Remove the three bolts, and then detach the outer belt center.



6. INNER BELT (WAGON)

1) Remove the rear cushion.

2) Remove the bolt, and then detach the inner belt.



REAR SEAT BELT

SEAT BELT SYSTEM

B: INSTALLATION

1. OUTER BELT SIDE (SEDAN)

Install in the reverse order of removal.

CAUTION:

- During installation, make sure that the seat belts are not twisted.
- After installation, make sure that the seat belts can be smoothly extended and wound.

2. OUTER BELT CENTER (SEDAN)

Install in the reverse order of removal.

CAUTION:

- During installation, make sure that the seat belts are not twisted.
- After installation, make sure that the seat belts can be smoothly extended and wound.

3. INNER BELT (SEDAN)

Install in the reverse order of removal.

CAUTION:

During installation, make sure that the seat belts are not twisted.

4. OUTER BELT SIDE (WAGON)

Install in the reverse order of removal.

CAUTION:

- During installation, make sure that the seat belts are not twisted.
- After installation, make sure that the seat belts can be smoothly extended and wound.

5. OUTER BELT CENTER (WAGON)

Install in the reverse order of removal.

CAUTION:

- During installation, make sure that the seat belts are not twisted.
- After installation, make sure that the seat belts are smoothly extended and wound.

6. INNER BELT (WAGON)

Install in the reverse order of removal.

CAUTION:

During installation, make sure that the seat belts are not twisted.

C: INSPECTION

1. OUTER BELT SIDE (SEDAN)

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)

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)

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)

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)

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)

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

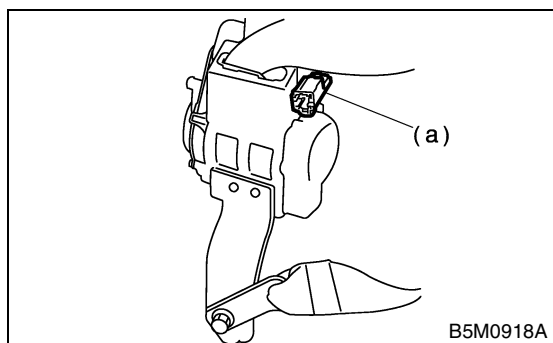
A: CAUTION

- 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 the 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 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 the ignition switch to OFF, disconnect the ground cable from battery, and wait for more than 20 seconds before starting work.
- 3) Remove the center pillar lower trim. <Ref. to EI-45, REMOVAL, Lower Inner Trim.>
- 4) Disconnect the yellow connector from pretensioner (a).

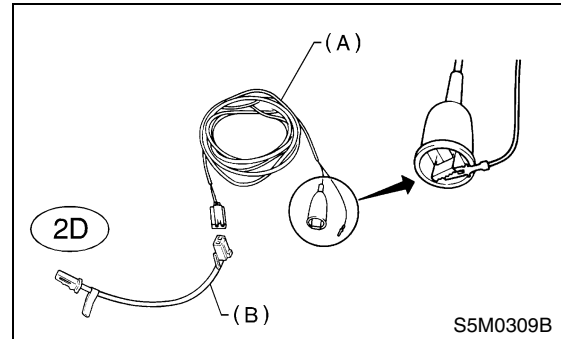


- 5) Short the terminal to alligator clip furnished as deployment tool (A).

- 6) Connect the deployment tool and adapter C (deployment) (B).

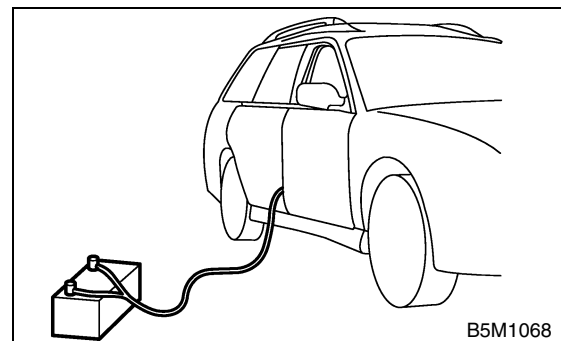
CAUTION:

The deployment tool should be kept shorted until just before deployment of the pretensioner.



- (A) Deployment tool: (Part No. 98299PA030)
 (B) Adapter C (deployment): (Part No. 98299FE010)

- 7) Connect the adapter A (deployment) connector and pretensioner yellow connector.
- 8) Extend the deployment tool to the limit, and make sure that the vehicle is empty. Close all windows, sunroof, and rear gate completely.

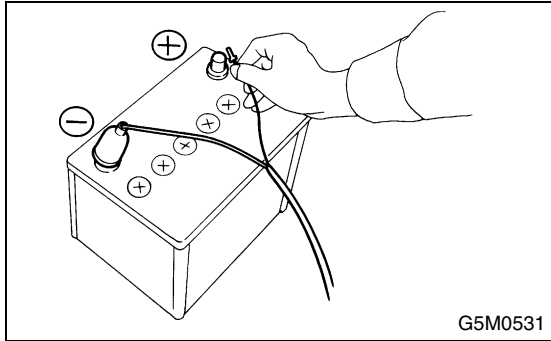


- 9) Move the battery at least 5 m (16 ft) from the vehicle, and secure the nearby area. Connect the deployment tool alligator clip to the battery negative (-) terminal.

DISPOSAL OF PRETENSIONER

SEAT BELT SYSTEM

10) Connect the other cable of deployment tool to the battery positive (+) terminal. Then deploy the pretensioner.

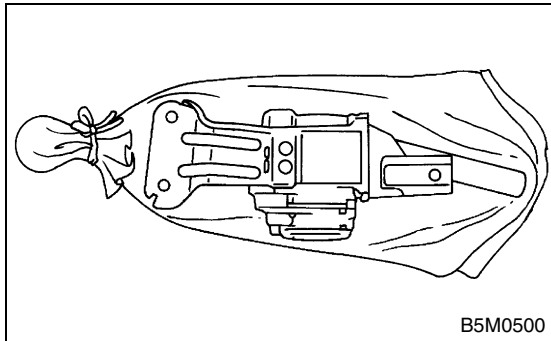


CAUTION:

- After deployment, pretensioner is especially hot. Leave it unattended for 40 minutes.
- Do not let water get on the deployed pretensioner.

11) Remove the outer belt (front). <Ref. to SB-8, Removal.>

12) Wrap the deployed pretensioner in an airtight vinyl bag, and then discard it.



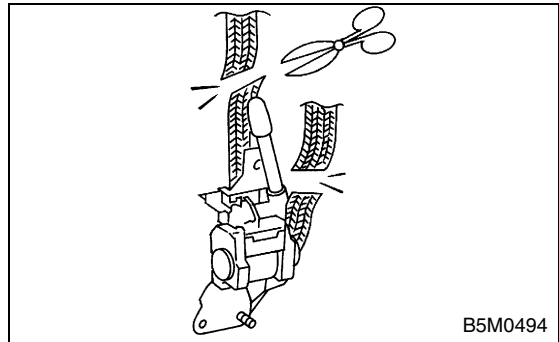
2. DEPLOYING AFTER REMOVAL FROM VEHICLE

1) Fold backrest all the way forward, then move front seat all the way forward.

2) Turn the ignition switch to OFF, disconnect the ground cable from battery, and wait for more than 20 seconds before starting work.

3) Remove the outer belt (front). <Ref. to SB-8, Removal.>

4) Cut off the seat belt as close to retractor as possible.

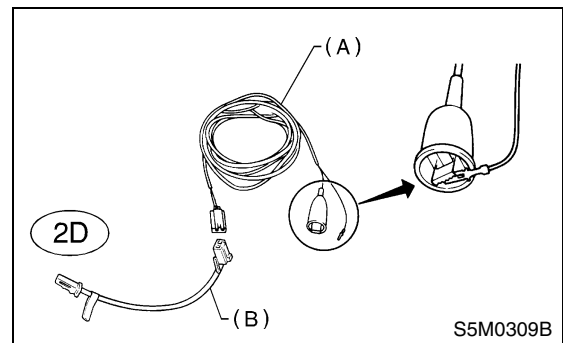


5) Short the terminal to alligator clip furnished as a deployment tool (A).

6) Connect the deployment tool and adapter C (deployment) (B).

CAUTION:

The deployment tool should be kept shorted until just before deployment of the pretensioner.

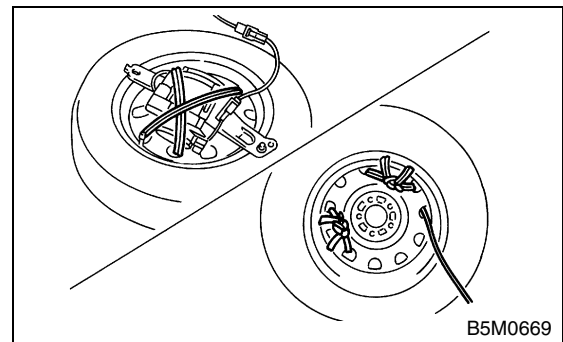


(A) Deployment tool: (Part No. 98299PA030)

(B) Adapter C (deployment): (Part No. 98299FE010)

7) Connect the adapter A (deployment) connector and pretensioner yellow connector.

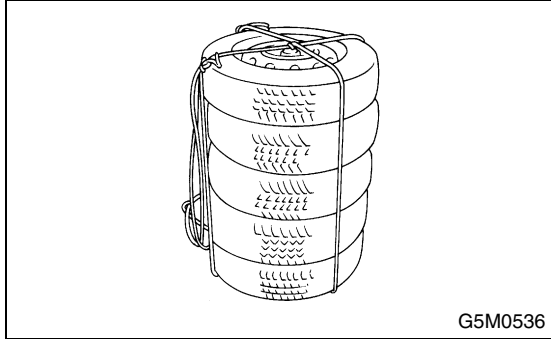
8) Install the pretensioner on a wheel with tire. Then, bundle three wire automotive harness [each with a sectional area of 1.25 mm² (0.00194 sq in) or more], and bind them twofold around the pretensioner bracket and wheel.



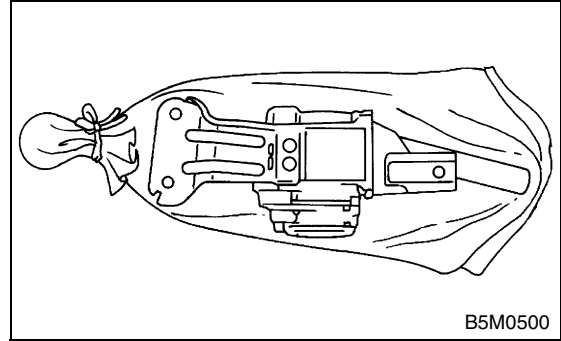
DISPOSAL OF PRETENSIONER

SEAT BELT SYSTEM

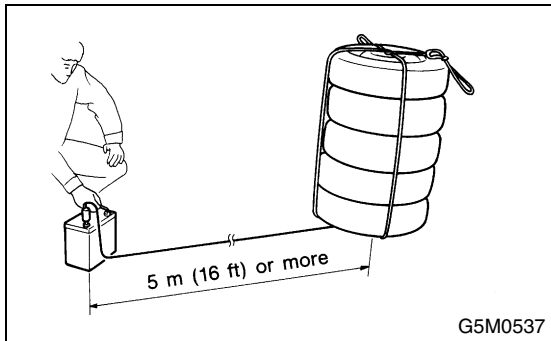
9) Put three tires without a wheel on the tire installed with pretensioner. Put on an additional tire with a wheel on top, and then fasten them tight with a rope.



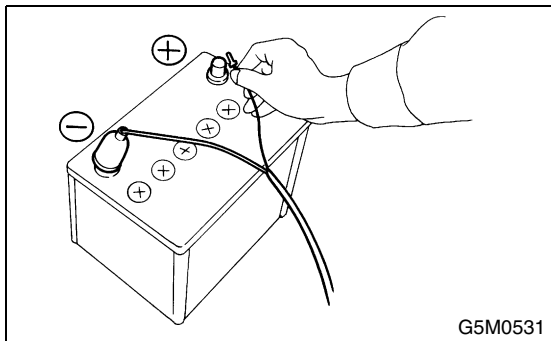
12) Wrap the deployed pretensioner in an airtight vinyl bag, and discard it.



10) Move the battery at least 5 m (16 ft) from the vehicle, and secure the nearby area. Connect the deployment tool alligator clip to the battery negative (-) terminal.



11) Connect the other cable of deployment tool to the battery positive (+) 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.

LIGHTING SYSTEM



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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	
Trunk room light		12 V — 5 W	
Glove box light		12 V — 1.4 W	

B: PRECAUTIONS

- Before disassembling or reassembling parts, always disconnect the 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 the connectors and hoses securely during reassembly.

- After reassembly, make sure functional parts operate smoothly.

WARNING:

- **Airbag system wiring harness is routed near electrical parts and switches. All airbag system wiring harnesses and connectors are yellow. Do not use electric test equipment on these circuits.**
- **Be careful not to damage the airbag system wiring harness when servicing electrical parts and switches.**

C: PREPARATION TOOL

1. GENERAL TOOLS

TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance and voltage.

2. Headlight and Tail Light System

A: SCHEMATIC

1. HEADLIGHT LHD MODEL

<Ref. to WI-209, LHD MODEL, SCHEMATIC, Headlight System.>

2. HEADLIGHT RHD MODEL

<Ref. to WI-210, RHD MODEL, SCHEMATIC, Headlight System.>

3. CLEARANCE LIGHT AND ILLUMINATION LIGHT LHD MODEL

<Ref. to WI-195, LHD MODEL, SCHEMATIC, Clearance Light and Illumination Light System.>

4. CLEARANCE LIGHT AND ILLUMINATION LIGHT RHD WITHOUT ILLUMINATION CONTROL MODEL

<Ref. to WI-198, RHD WITHOUT ILLUMINATION CONTROL MODEL, SCHEMATIC, Clearance Light and Illumination Light System.>

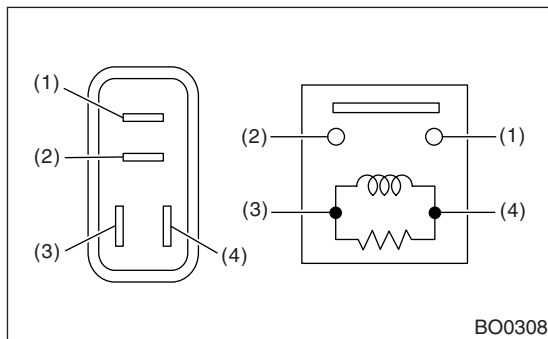
5. CLEARANCE LIGHT AND ILLUMINATION LIGHT RHD WITH ILLUMINATION CONTROL MODEL

<Ref. to WI-201, RHD WITH ILLUMINATION CONTROL MODEL, SCHEMATIC, Clearance Light and Illumination Light System.>

B: INSPECTION

1. HEADLIGHT RELAY

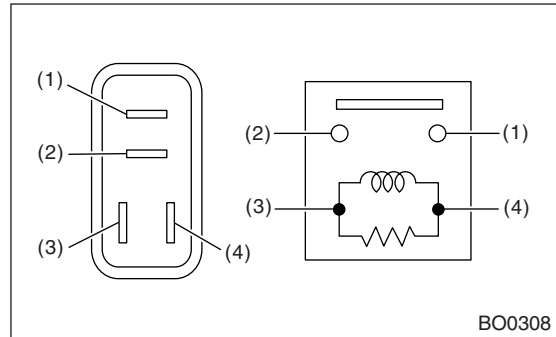
Measure the headlight relay resistance between terminals when connecting terminal No. 4 to battery positive terminal and terminal No. 3 to battery ground terminal.



Current	Terminal No.	Standard
Flow	1 and 2	Less than 1Ω
No flow		More than 1MΩ

2. TAIL AND ILLUMINATION RELAY

Measure the tail and illumination relay resistance between terminals when connecting terminal No. 4 to battery positive terminal and terminal No. 3 to battery ground terminal.



Current	Terminal No.	Standard
Flow	1 and 2	Less than 1Ω
No flow		More than 1MΩ

FRONT FOG LIGHT SYSTEM

LIGHTING SYSTEM

3. Front Fog Light System

A: SCHEMATIC

1. FRONT FOG LIGHT LHD MODEL

<Ref. to WI-205, LHD MODEL, SCHEMATIC, Front Fog Light System.>

2. FRONT FOG LIGHT RHD FOR EUROPE MODEL

<Ref. to WI-206, RHD FOR EUROPE MODEL, SCHEMATIC, Front Fog Light System.>

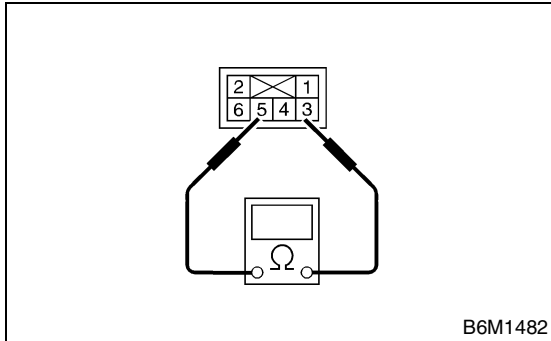
3. FRONT FOG LIGHT RHD EXCEPT FOR EUROPE MODEL

<Ref. to WI-207, RHD EXCEPT FOR EUROPE MODEL, SCHEMATIC, Front Fog Light System.>

B: INSPECTION

1. FRONT FOG LIGHT SWITCH

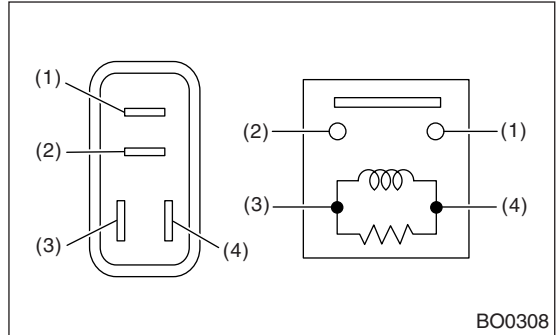
Measure the front fog light switch resistance.



Switch position	Terminal No.	Standard
OFF	3 and 5	More than 1MΩ
ON		Less than 1Ω

2. FRONT FOG LIGHT RELAY

Measure the front fog light relay resistance between terminals when connecting terminal No. 4 to battery positive terminal and terminal No. 3 to battery ground terminal.



Current Flow	Terminal No.	Standard
Flow	1 and 2	Less than 1Ω
No flow		More than 1MΩ

4. Rear Fog Light System

A: SCHEMATIC

1. REAR FOG LIGHT LHD MODEL

<Ref. to WI-244, LHD MODEL, SCHEMATIC, Rear Fog Light System.>

2. REAR FOG LIGHT RHD FOR EUROPE MODEL

<Ref. to WI-245, RHD FOR EUROPE MODEL, SCHEMATIC, Rear Fog Light System.>

3. REAR FOG LIGHT RHD EXCEPT FOR EUROPE MODEL

<Ref. to WI-246, RHD EXCEPT FOR EUROPE MODEL, SCHEMATIC, Rear Fog Light System.>

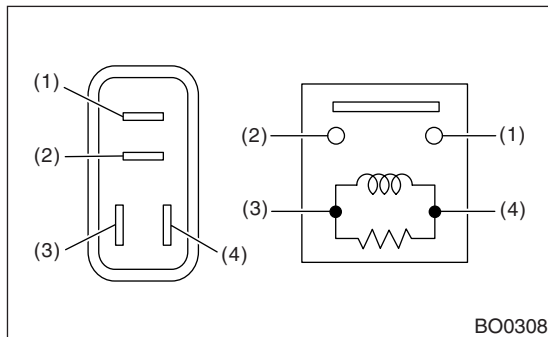
B: INSPECTION

1. REAR FOG LIGHT SWITCH

- 1) Turn the ignition switch to ON.
- 2) Turn on the headlight or front fog light.
- 3) Push the rear fog light switch and check if the rear fog light turns on.

2. REAR FOG LIGHT RELAY

Measure the rear fog light relay resistance between terminals when connecting terminal No. 4 to battery positive terminal and terminal No. 3 to battery ground terminal.



Current	Terminal No.	Standard
Flow	1 and 2	Less than 1Ω
No flow		More than 1MΩ

TURN SIGNAL AND HAZARD LIGHT SYSTEM

LIGHTING SYSTEM

5. Turn Signal and Hazard Light System

A: SCHEMATIC

1. TURN SIGNAL LIGHT AND HAZARD LIGHT LHD MODEL

<Ref. to WI-218, LHD MODEL, SCHEMATIC, Turn Signal Light and Hazard Light System.>

2. TURN SIGNAL LIGHT AND HAZARD LIGHT RHD MODEL

<Ref. to WI-220, RHD MODEL, SCHEMATIC, Turn Signal Light and Hazard Light System.>

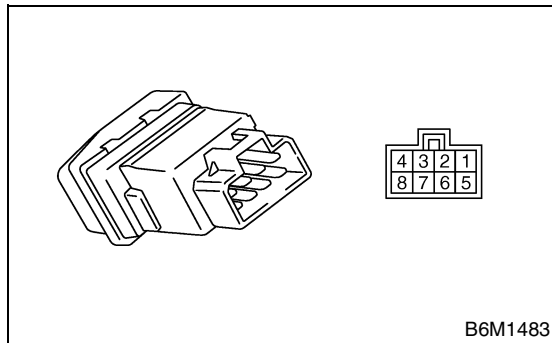
B: INSPECTION

1. TURN SIGNAL SWITCH

<Ref. to LI-11, INSPECTION, Combination Switch (Light).>

2. HAZARD SWITCH

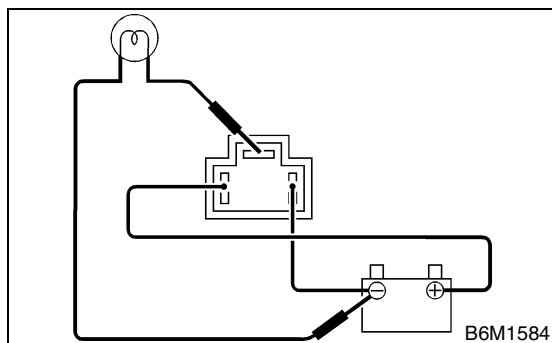
Measure the hazard switch resistance.



Switch position	Terminal No.	Standard
OFF	6 and 7	Less than 1Ω
ON	1, 3 and 4	Less than 1Ω
	7 and 8	Less than 1Ω

3. TURN SIGNAL & HAZARD MODULE

Connect the battery and turn signal light bulb to the module, as shown in the figure. The module is properly functioning if it blinks when power is supplied to the circuit.



6. Back-up Light System

A: SCHEMATIC

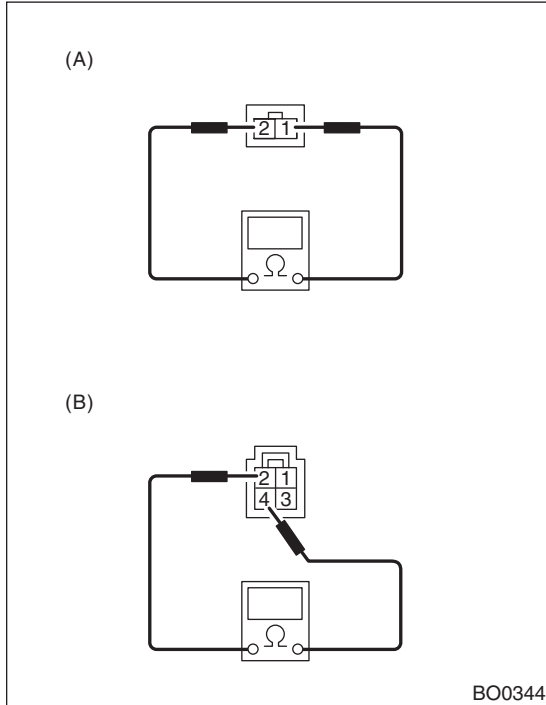
1. BACK-UP LIGHT

<Ref. to WI-193, SCHEMATIC, Back-up Light System.>

B: INSPECTION

1. BACK-UP LIGHT SWITCH (M/T)

Measure the back-up light switch resistance.



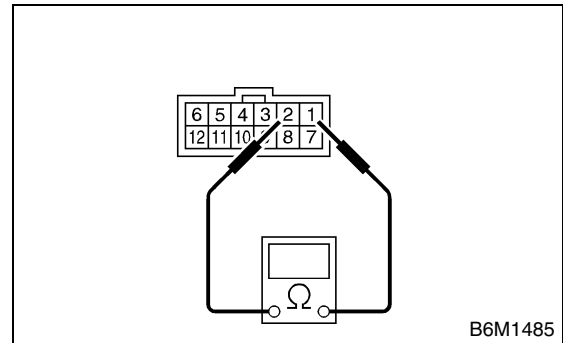
(A) Non-turbo model

(B) Turbo model

Switch position	Terminal No.	Standard
When shift lever is set in reverse position	Turbo model: 2 and 4 Non-turbo model: 1 and 2	Less than 1Ω
Other positions	1 and 2	More than 1MΩ

2. INHIBITOR SWITCH (A/T)

Measure the inhibitor switch resistance.



Switch position	Terminal No.	Standard
When select lever is set in "R" position	1 and 2	Less than 1Ω
Other positions		More than 1MΩ

STOP LIGHT SYSTEM

LIGHTING SYSTEM

7. Stop Light System

A: SCHEMATIC

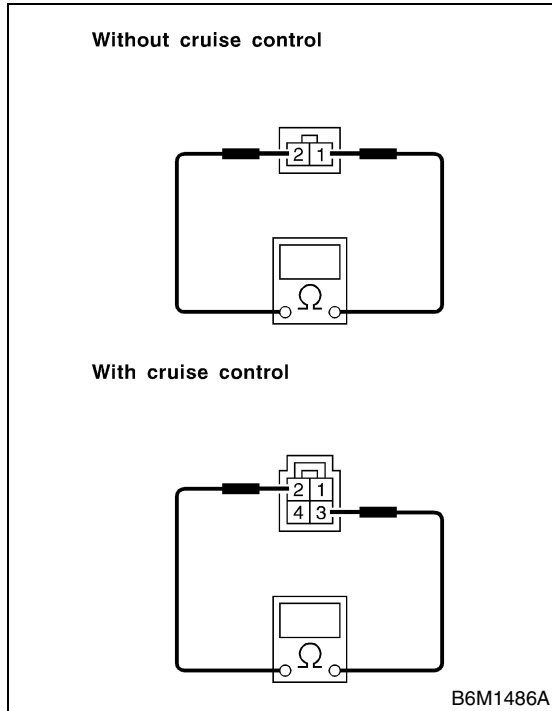
1. STOP LIGHT

<Ref. to WI-216, SCHEMATIC, Stop Light System.>

B: INSPECTION

1. STOP LIGHT SWITCH

Measure the stop light switch resistance.



Switch position	Terminal No.	Standard
When brake pedal is depressed	1 and 2: Without cruise control	Less than 1Ω
When brake pedal is released	2 and 3: With cruise control	More than $1M\Omega$

8. Interior Light System

A: SCHEMATIC

1. INTERIOR LIGHT LHD MODEL

<Ref. to WI-212, LHD MODEL, SCHEMATIC, In Compartment Light System.>

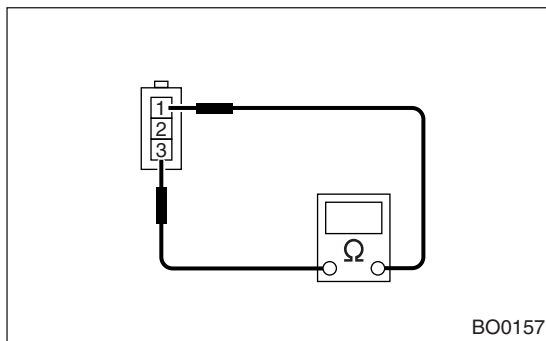
2. INTERIOR LIGHT RHD MODEL

<Ref. to WI-214, RHD MODEL, SCHEMATIC, In Compartment Light System.>

B: INSPECTION

1. DOOR SWITCH

Measure the door switch resistance.



Switch position	Terminal No.	Standard
When door is opened	1 and 3	Less than 1Ω
When door is closed		More than 1MΩ

2. REAR GATE LATCH SWITCH

Measure the rear gate latch switch resistance.

Switch position	Terminal No.	Standard
When rear gate is opened	1 and 2	Less than 1Ω
When rear gate is closed		More than 1MΩ

3. TRUNK ROOM LIGHT SWITCH

Measure the trunk room light switch resistance.

Switch position	Terminal No.	Standard
When trunk lid is opened	1 and 2	Less than 1Ω
When trunk lid is closed		More than 1MΩ

HEADLIGHT BEAM LEVELER SYSTEM

LIGHTING SYSTEM

9. Headlight Beam Leveler System

A: SCHEMATIC

1. HEADLIGHT BEAM LEVELER

<Ref. to WI-179, SCHEMATIC, Headlight Beam Leveler System.>

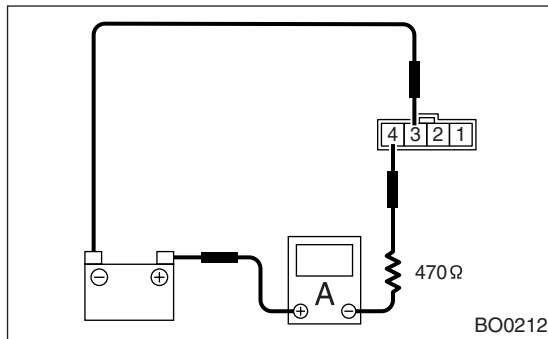
B: INSPECTION

1. HEADLIGHT BEAM LEVELER ACTUATOR

- 1) Turn on the headlights.
- 2) Confirm the headlight beam level is lowered by changing the switch position to 0 - 1 - 2 - 3.

2. HEADLIGHT BEAM LEVELER SWITCH

Connect the battery, headlight beam leveler switch connector, circuit tester and resistor (470 Ω) as shown in the figure. Measure the current at each switch position.

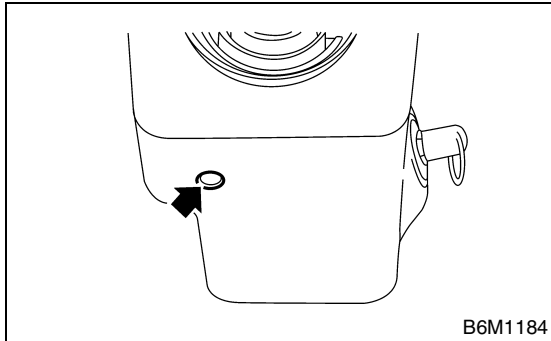


Switch position	Current (mA)
0	3.8
1	9.8
2	15
3	21

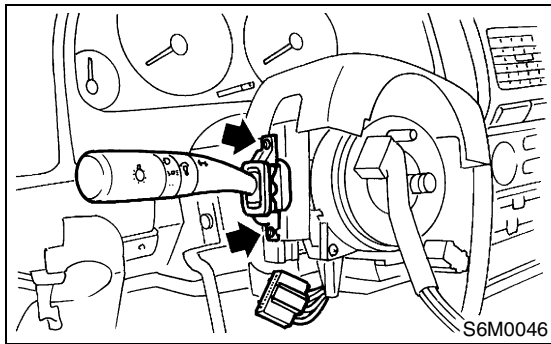
10. Combination Switch (Light)

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the instrument panel lower cover. <Ref. to EI-41, REMOVAL, Instrument Panel Assembly.>
- 3) Remove the screws which secure upper column cover to lower column cover.



- 4) Disconnect the connector from combination switch.
- 5) Remove the screws which secure switch, and then remove the switch.

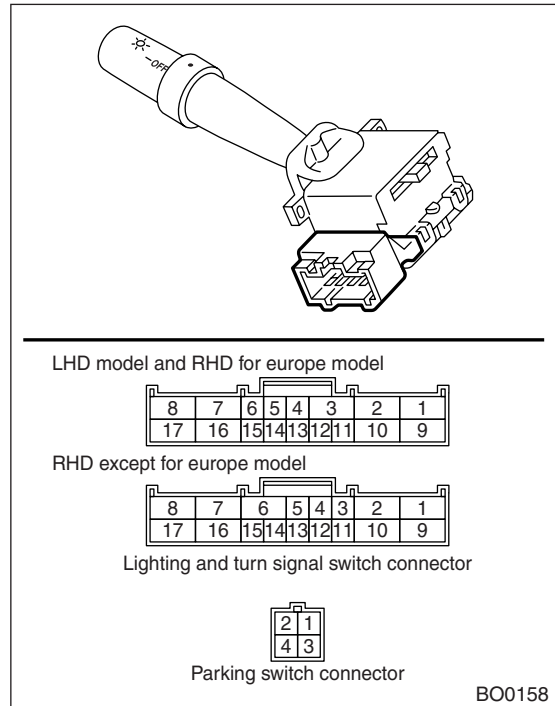


B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the combination switch resistance.



1. LIGHTING SWITCH

LHD model and RHD for europe model:

Switch position	Terminal No.	Standard
OFF	—	More than 1MΩ
Tail	14 and 16	Less than 1Ω
Head	13, 14 and 16	Less than 1Ω

RHD except for europe model:

Switch position	Terminal No.	Standard
OFF	—	More than 1MΩ
Tail	9 and 15	Less than 1Ω
Head	9, 14 and 15	Less than 1Ω

2. DIMMER AND PASSING SWITCH

LHD model and RHD for europe model:

Switch position	Terminal No.	Standard
Passing	7, 8 and 16	Less than 1Ω
Low beam	16 and 17	Less than 1Ω
High beam	7 and 16	Less than 1Ω

RHD except for europe model:

Switch position	Terminal No.	Standard
Passing	1, 2 and 9	Less than 1Ω
Low beam	9 and 10	Less than 1Ω
High beam	2 and 9	Less than 1Ω

COMBINATION SWITCH (LIGHT)

LIGHTING SYSTEM

3. TURN SIGNAL SWITCH

LHD model and RHD for europe model:

Switch position	Terminal No.	Standard
Left	1 and 2	Less than 1Ω
Neutral	—	More than 1MΩ
Right	2 and 3	Less than 1Ω

RHD except for europe model:

Switch position	Terminal No.	Standard
Left	6 and 7	Less than 1Ω
Neutral	—	More than 1MΩ
Right	7 and 8	Less than 1Ω

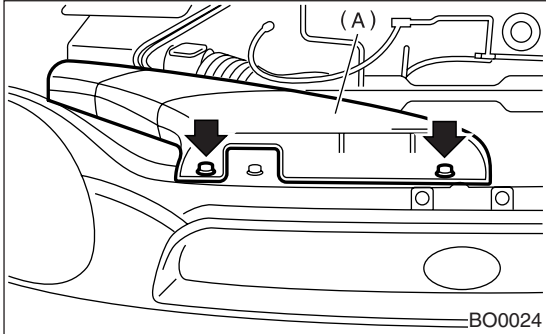
4. PARKING SWITCH

Switch position	Terminal No.	Standard
OFF	2 and 4	Less than 1Ω
ON	1 and 4	Less than 1Ω

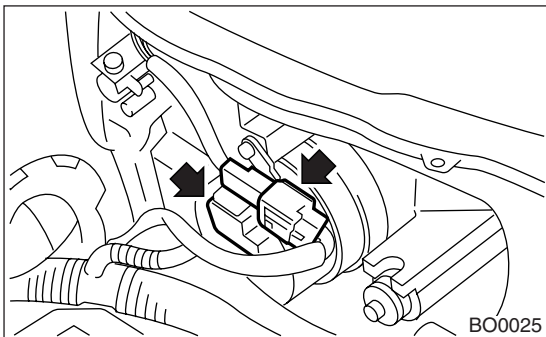
11. Headlight Assembly

A: REMOVAL

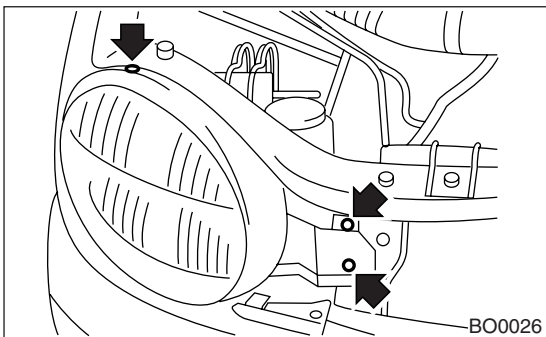
- 1) Disconnect the ground cable from battery.
- 2) Remove the duct (A) (when right side headlight is removed).



- 3) Remove the front grille and headlight side cover. <Ref. to EI-17, REMOVAL, Front Grille.> and <Ref. to EI-22, REMOVAL, Front Bumper.>
- 4) Disconnect the headlight bulb connector.



- 5) Remove the three bolts and disconnect connectors, and then detach the 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 2 minutes.

NOTE:

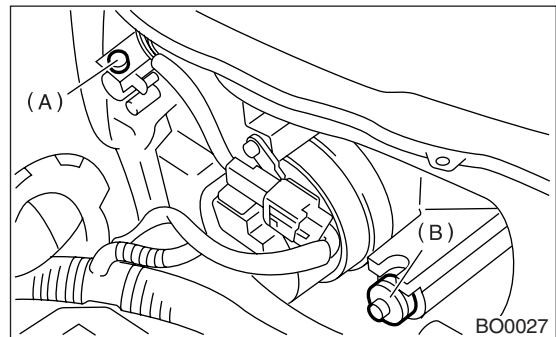
Before checking the headlight aiming, be sure of the following:

- 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.

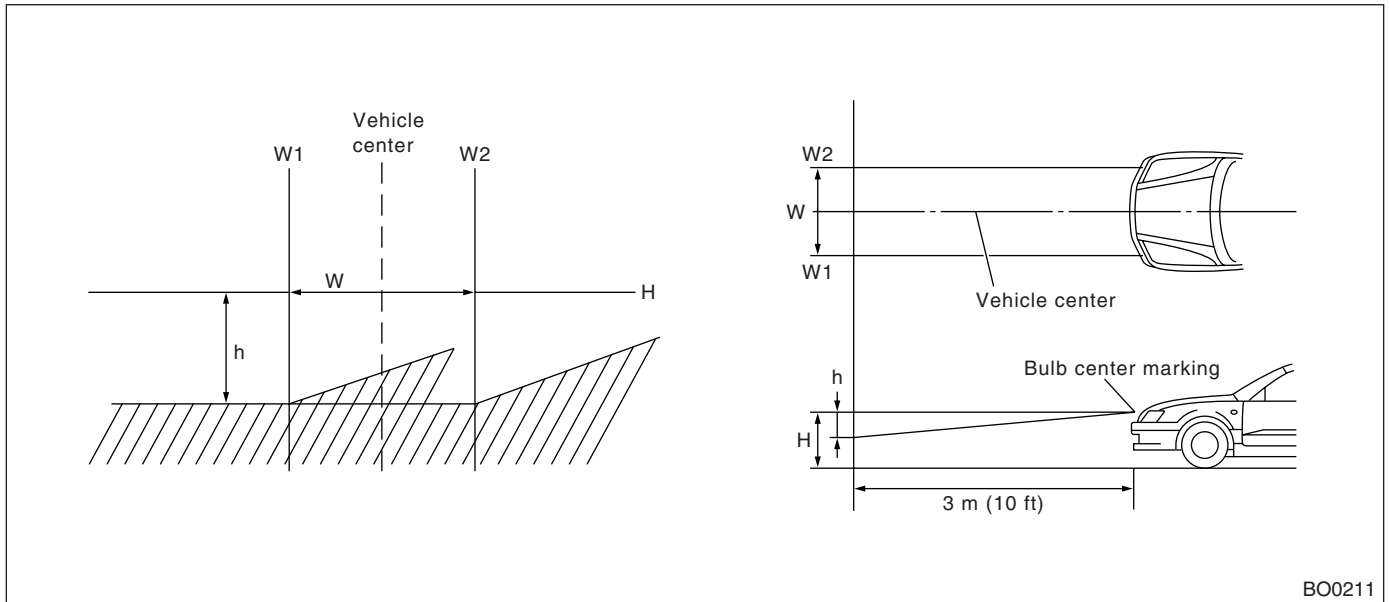
NOTE:

- Set the headlight leveler switch to "0" position.
- Adjust the 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			
	TS	GX, RS, WRX STi	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)

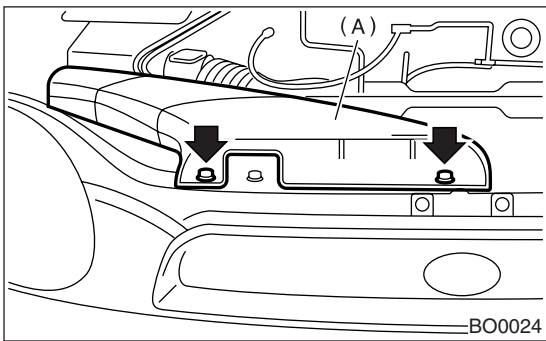
12.Headlight Bulb

A: REMOVAL

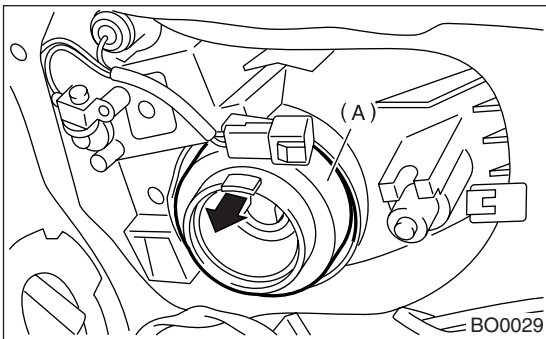
CAUTION:

- 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.

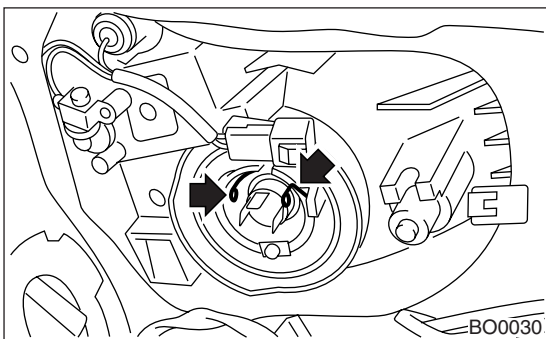
- 1) Disconnect the ground cable from battery.
- 2) Remove the duct (A) (when right side headlight is removed).



- 3) Disconnect the harness connector.
- 4) Remove the rubber cap (A).



- 5) 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.

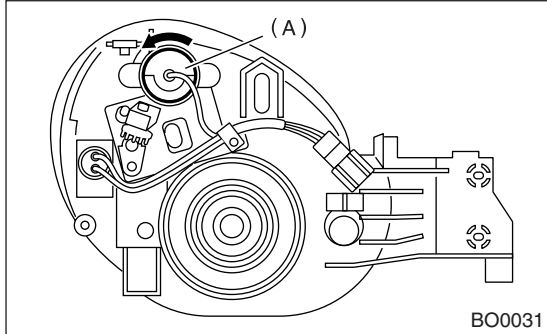
C: INSPECTION

- 1) Visually check the bulb for blow out.
- 2) Check the bulb specification. <Ref. to LI-2, SPECIFICATIONS, General Description.>
- 3) If NG, replace the bulb with a new one.

13. Front Turn Signal Light Bulb

A: REMOVAL

- 1) Remove the headlight assembly. <Ref. to LI-13, REMOVAL, Headlight Assembly.>
- 2) Turn the socket (A) and remove the bulb.



B: INSTALLATION

Install in the reverse order of removal.

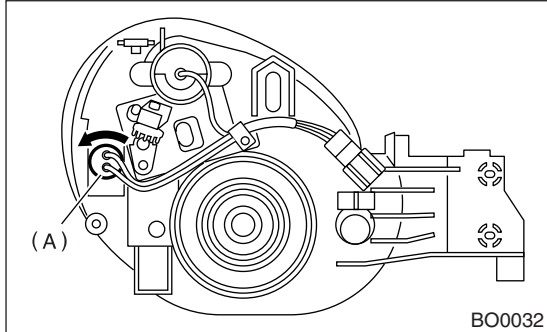
C: INSPECTION

- 1) Visually check the bulb for blow out.
- 2) Check the bulb specification. <Ref. to LI-2, SPECIFICATIONS, General Description.>
- 3) If NG, replace the bulb with a new one.

14. Clearance/Parking Light Bulb

A: REMOVAL

- 1) Remove the headlight assembly. <Ref. to LI-13, REMOVAL, Headlight Assembly.>
- 2) Turn the socket (A) and remove the bulb.



BO0032

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

- 1) Visually check the bulb for blow out.
- 2) Check the bulb specification. <Ref. to LI-2, SPECIFICATIONS, General Description.>
- 3) If NG, replace the bulb with a new one.

FRONT FOG LIGHT ASSEMBLY

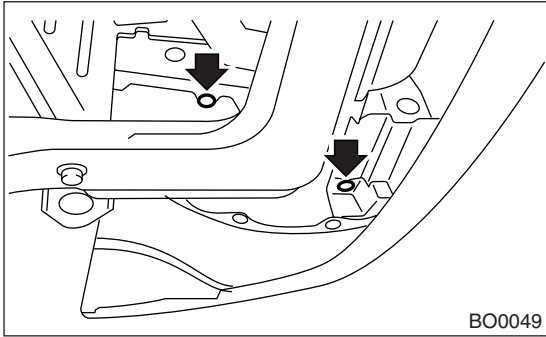
LIGHTING SYSTEM

15. Front Fog Light Assembly

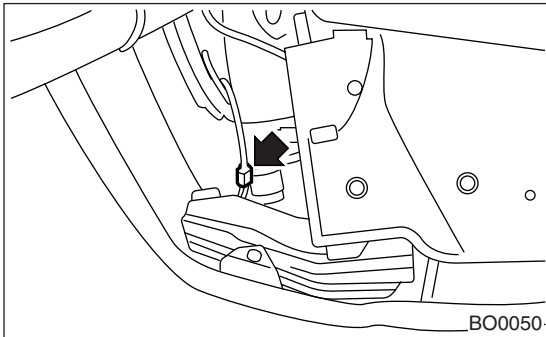
A: REMOVAL

1. TURBO ENGINE MODEL

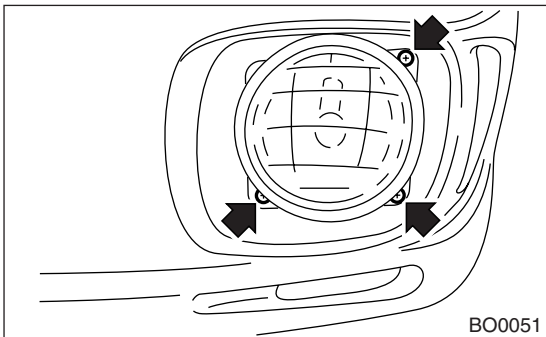
- 1) Disconnect the ground cable from battery.
- 2) Remove the two clips and lower mudguard.



- 3) Disconnect the harness connector.

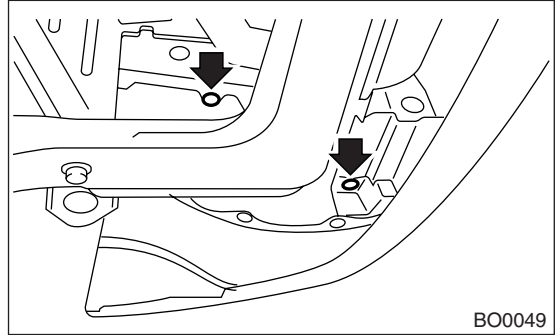


- 4) Remove the mounting bolts, and then detach the fog light assembly.

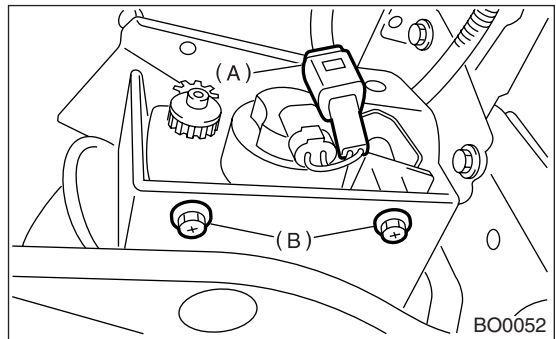


2. NON-TURBO ENGINE MODEL

- 1) Disconnect the ground cable from battery.
- 2) Remove the two clips and lower mudguard.



- 3) Disconnect the harness connector (A).
- 4) Remove the bolts (B), and then detach the fog light assembly.



B: INSTALLATION

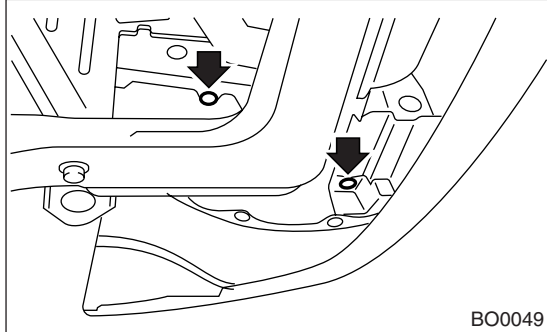
Install in the reverse order of removal.

16. Front Fog Light Bulb

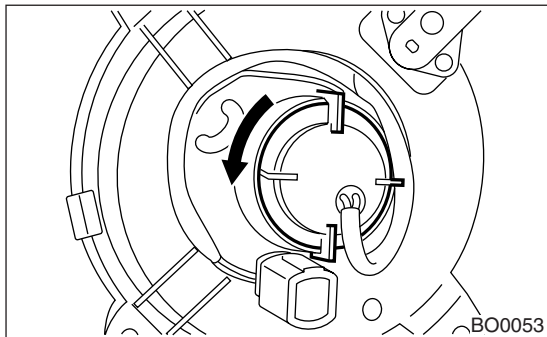
A: REMOVAL

1. TURBO ENGINE MODEL

1) Remove the two clips and lower mudguard.



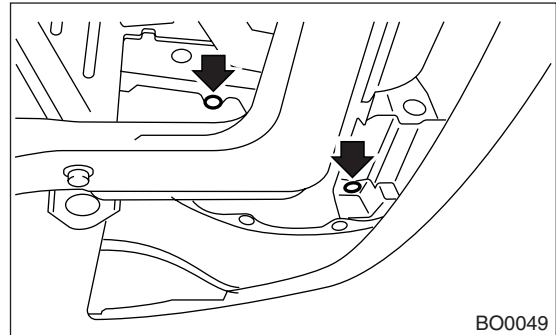
2) Remove the back cover.



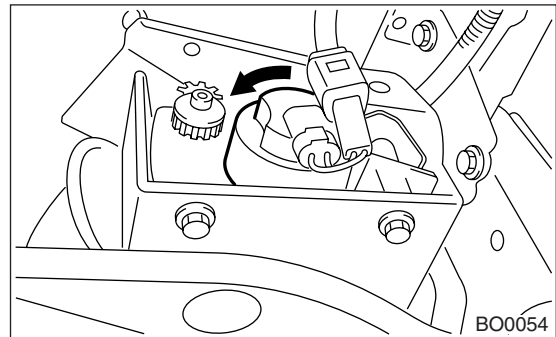
3) Remove the spring retainer, and then detach the fog light bulb.

2. NON-TURBO ENGINE MODEL

1) Remove the two clips and lower mudguard.



2) Remove the back cover.



3) Remove the spring retainer, and then detach the fog light bulb.

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

- 1) Visually check the bulb for blow out.
- 2) Check the bulb specification. <Ref. to LI-2, SPECIFICATIONS, General Description.>
- 3) If NG, replace the bulb with a new one.

REAR COMBINATION LIGHT ASSEMBLY

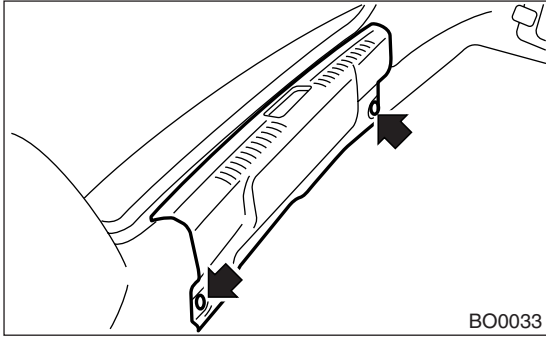
LIGHTING SYSTEM

17. Rear Combination Light Assembly

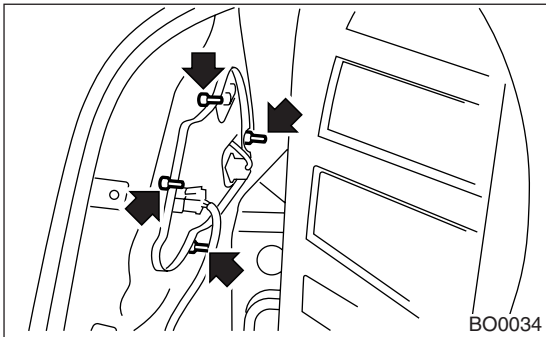
A: REMOVAL

1. SEDAN

- 1) Disconnect the ground cable from battery.
- 2) Remove the clips, and then detach the trunk rear trim.

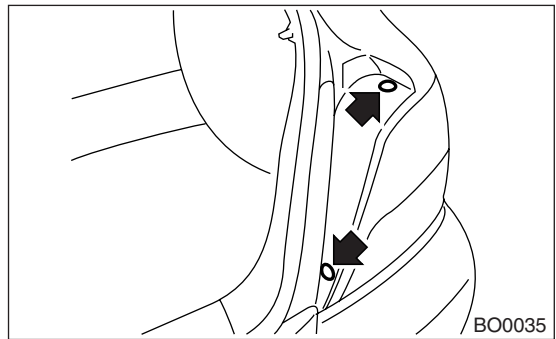


- 3) Remove the trunk side trim of rear portion.
- 4) Remove the four nuts, and then detach the rear combination light while disconnecting connector.

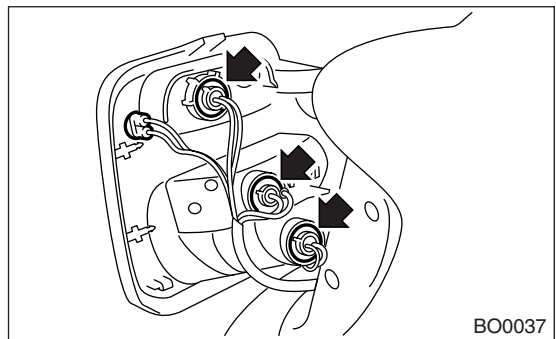
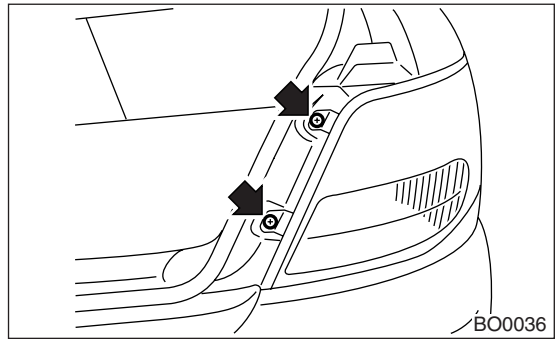


2. WAGON

- 1) Disconnect the ground cable from battery.
- 2) Remove the clips, and then detach the rear combination light covers.



- 3) Remove the two bolts, and then remove the rear combination light while disconnecting connector.



B: INSTALLATION

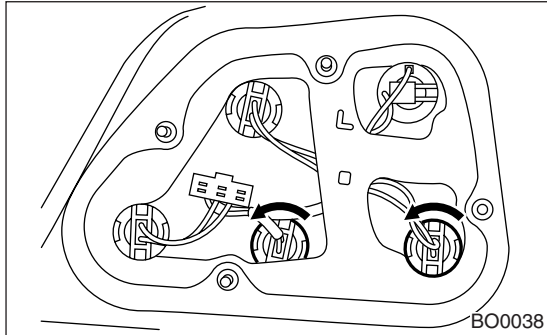
Install in the reverse order of removal.

18.Brake/Tail Light Bulb

A: REMOVAL

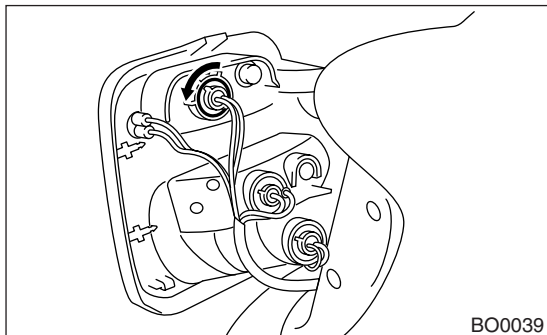
1. SEDAN

- 1) Remove the trunk side trim of rear portion.
- 2) Turn the socket and remove the bulb.



2. WAGON

- 1) Remove the rear combination light assembly.
<Ref. to LI-20, WAGON, REMOVAL, Rear Combination Light Assembly.>
- 2) Turn the socket and remove the bulb.



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

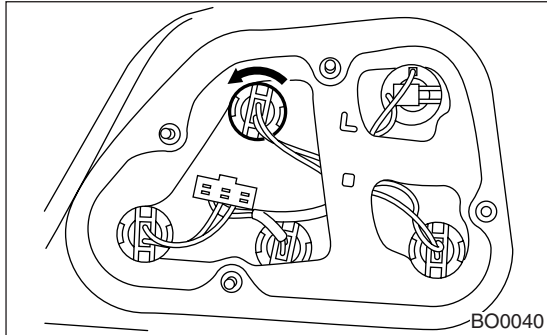
- 1) Visually check the bulb for blow out.
- 2) Check the bulb specification. <Ref. to LI-2, SPECIFICATIONS, General Description.>
- 3) If NG, replace the bulb with a new one.

19. Back-up Light Bulb

A: REMOVAL

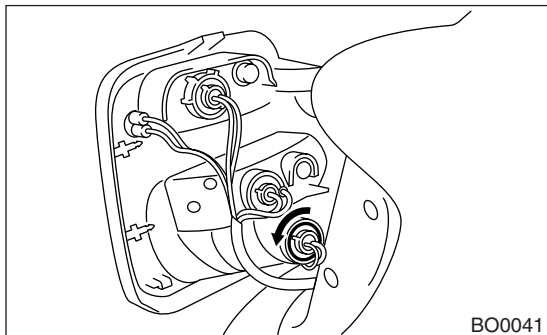
1. SEDAN

- 1) Remove the trunk side trim of rear portion.
- 2) Turn the socket and remove the bulb.



2. WAGON

- 1) Remove the rear combination light assembly.
<Ref. to LI-20, WAGON, REMOVAL, Rear Combination Light Assembly.>
- 2) Turn the socket and remove the bulb.



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

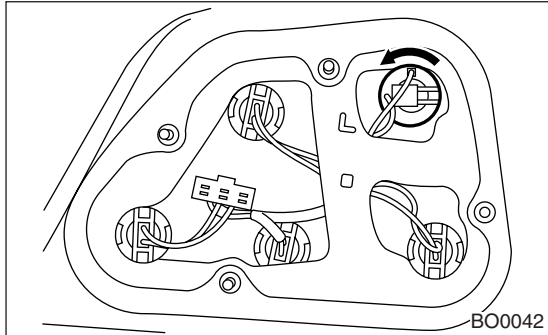
- 1) Visually check the bulb for blow out.
- 2) Check the bulb specification. <Ref. to LI-2, SPECIFICATIONS, General Description.>
- 3) If NG, replace the bulb with a new one.

20.Rear Turn Signal Light Bulb

A: REMOVAL

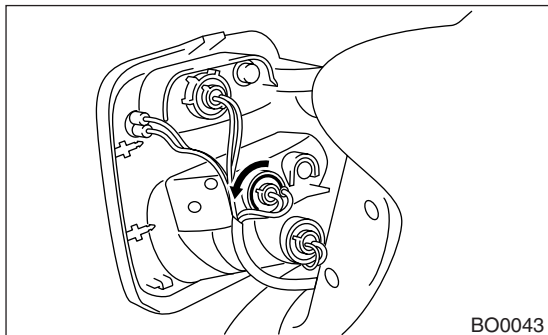
1. SEDAN

- 1) Remove the trunk side trim of rear portion.
- 2) Turn the socket and remove the bulb.



2. WAGON

- 1) Remove the rear combination light assembly.
<Ref. to LI-20, WAGON, REMOVAL, Rear Combination Light Assembly.>
- 2) Turn the socket and remove the bulb.



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

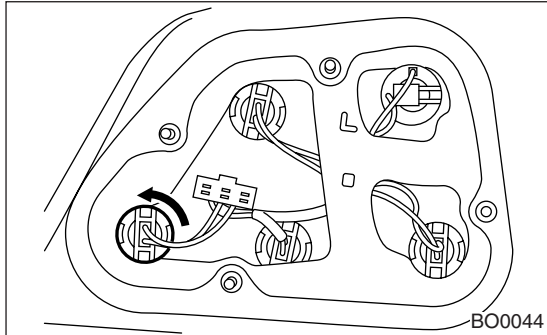
- 1) Visually check the bulb for blow out.
- 2) Check the bulb specification. <Ref. to LI-2, SPECIFICATIONS, General Description.>
- 3) If NG, replace the bulb with a new one.

21. Rear Fog Light Bulb

A: REMOVAL

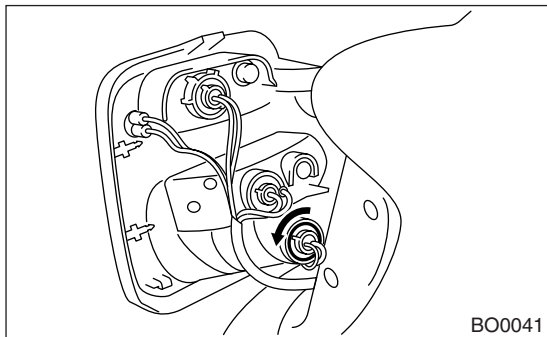
1. SEDAN

- 1) Remove the trunk side trim of rear portion.
- 2) Turn the socket and remove the bulb.



2. WAGON

- 1) Remove the rear combination light assembly.
<Ref. to LI-20, WAGON, REMOVAL, Rear Combination Light Assembly.>
- 2) Turn the socket and remove the bulb.



B: INSTALLATION

Install in the reverse order of removal.

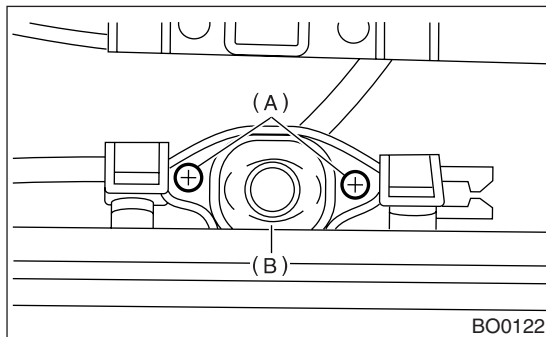
C: INSPECTION

- 1) Visually check the bulb for blow out.
- 2) Check the bulb specification. <Ref. to LI-2, SPECIFICATIONS, General Description.>
- 3) If NG, replace the bulb with a new one.

22. License Plate Light

A: REMOVAL

- 1) Remove the 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.

C: INSPECTION

- 1) Visually check the bulb for blow out.
- 2) Check the bulb specification. <Ref. to LI-2, SPECIFICATIONS, General Description.>
- 3) If NG, replace the bulb with a new one.

HIGH-MOUNTED STOP LIGHT

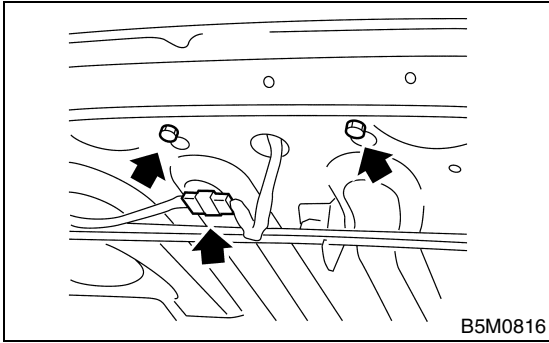
LIGHTING SYSTEM

23.High-mounted Stop Light

A: REMOVAL

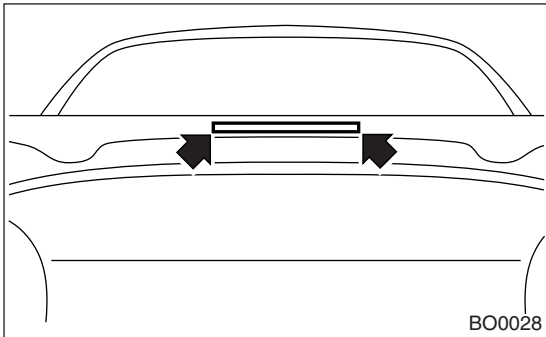
1. SEDAN (STANDARD TYPE)

- 1) Disconnect the ground cable from battery.
- 2) Disconnect the connector of high-mounted stop light from body harness.
- 3) Remove the bolts, then detach the high-mounted stop light assembly.



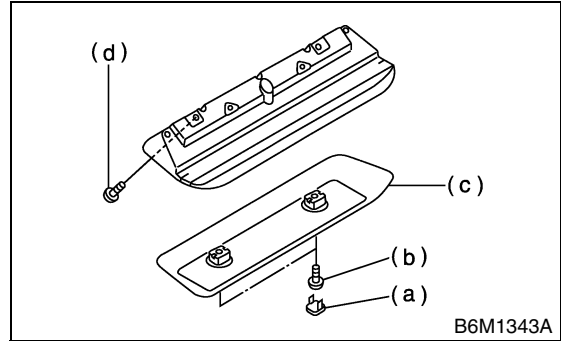
2. SEDAN (REAR SPOILER BUILT-IN TYPE)

- 1) Disconnect the ground cable from battery.
- 2) Remove the bolts, then detach the high-mounted stop light assembly.
- 3) Disconnect the connector of high-mounted stop light from body harness.



3. WAGON

- 1) Disconnect the ground cable from battery.
- 2) Remove the cap (a) by prying on the edge with screwdriver.
- 3) Remove the screws (b), and then the detach cover (c).
- 4) Remove screws (d), and then detach the high-mounted stop light while disconnecting connector.



B: INSTALLATION

Install in the reverse order of removal.

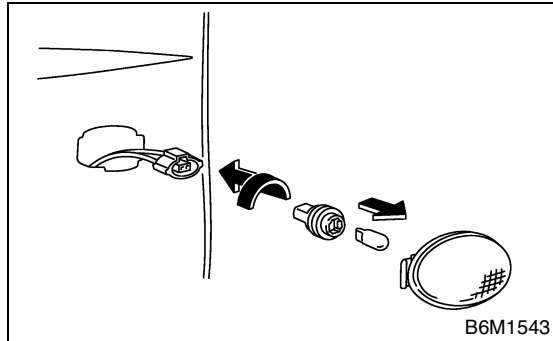
C: INSPECTION

- 1) Visually check the bulb for blow out.
- 2) Check the bulb specification. <Ref. to LI-2, SPECIFICATIONS, General Description.>
- 3) If NG, replace the bulb with a new one.

24.Side Turn Signal Light

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Pull out the light from body while pushing it in direction of vehicle front.
- 3) Disconnect the harness connector and remove the light.



B: INSTALLATION

Install in the reverse order of removal.

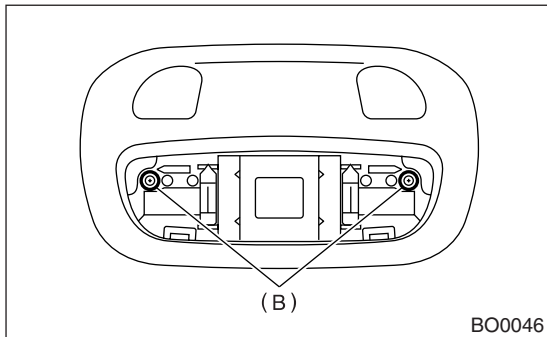
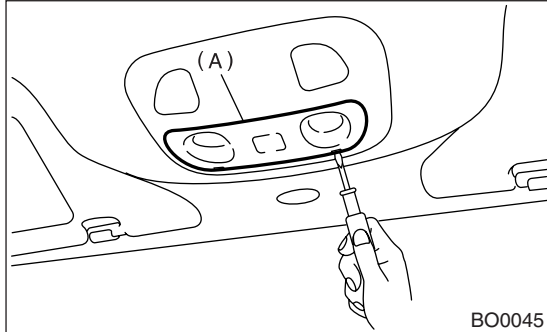
C: INSPECTION

- 1) Visually check the bulb for blow out.
- 2) Check the bulb specification. <Ref. to LI-2, SPECIFICATIONS, General Description.>
- 3) If NG, replace the bulb with a new one.

25. Spot Light

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the lens (A) and spot light mounting screw (B).



- 3) Disconnect the harness connectors and remove the spot light.

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

1. SPOT LIGHT BULB

- 1) Visually check the bulb for blow out.
- 2) Check the bulb specification. <Ref. to LI-2, SPECIFICATIONS, General Description.>
- 3) If NG, replace the bulb with a new one.

2. SPOT LIGHT SWITCH

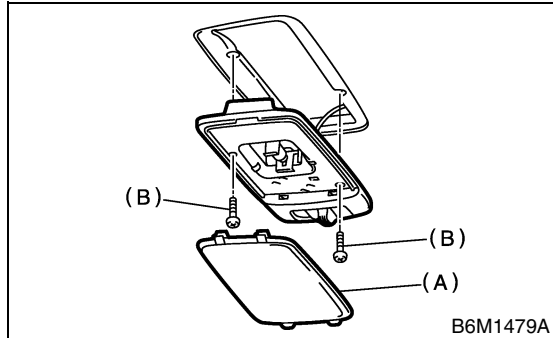
Measure the spot light resistance.

Switch position	Terminal No.	Standard
OFF	—	More than 1MΩ
ON	1 and 2	18 ± 5.4Ω

26.Room Light

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the lens (A) and room light mounting screws (B).



- 3) Disconnect the harness connectors and remove the light.

B: INSTALLATION

Install in the reverse order of removal.

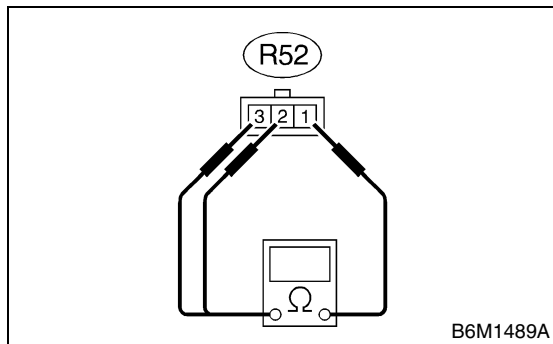
C: INSPECTION

1. ROOM LIGHT BULB

- 1) Visually check the bulb for blow out.
- 2) Check the bulb specification. <Ref. to LI-2, SPECIFICATIONS, General Description.>
- 3) If NG, replace the bulb with a new one.

2. ROOM LIGHT SWITCH

Measure the room light resistance.



Switch position	Terminal No.	Standard
OFF	—	More than 1MΩ
ON	1 and 3	1.5 ± 0.5Ω
DOOR	1 and 2	1.5 ± 0.5Ω

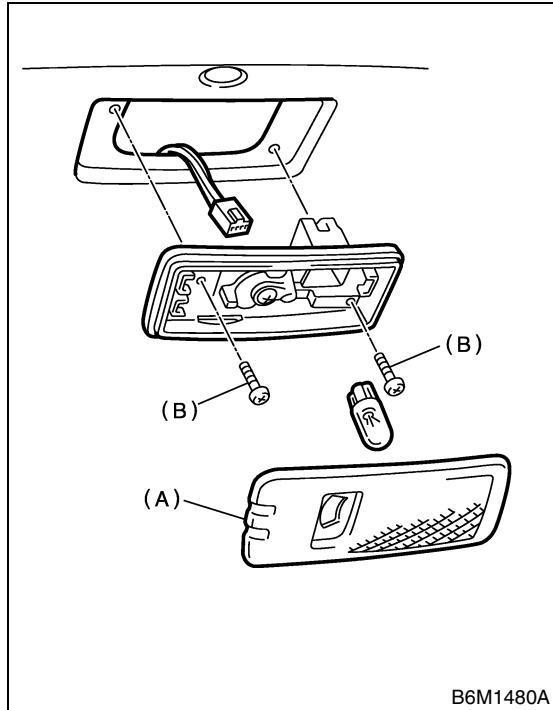
LUGGAGE ROOM LIGHT

LIGHTING SYSTEM

27.Luggage Room Light

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the lens (A) And luggage room light mounting screws (B).



- 3) Disconnect the harness connectors and remove the luggage room light.

B: INSTALLATION

Install in the reverse order of removal.

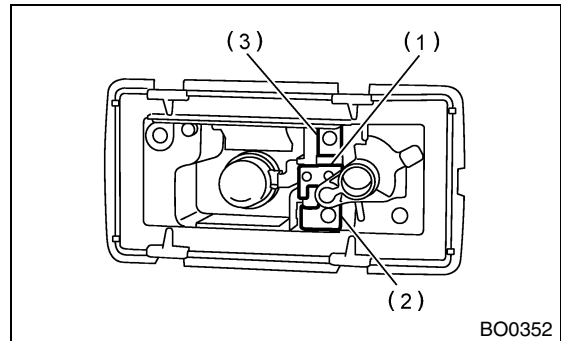
C: INSPECTION

1. LUGGAGE ROOM LIGHT BULB

- 1) Visually check the bulb for blow out.
- 2) Check the bulb specification. <Ref. to LI-2, SPECIFICATIONS, General Description.>
- 3) If NG, replace the bulb with a new one.

2. LUGGAGE ROOM LIGHT SWITCH

Measure the luggage room light resistance.

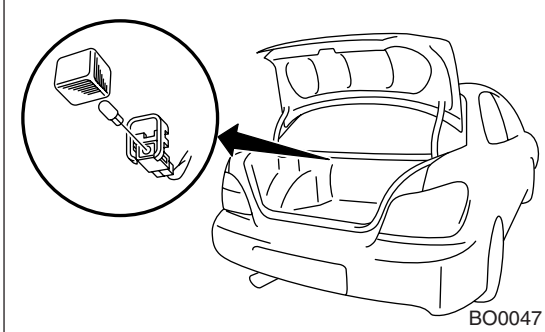


Switch position	Terminal No.	Standard
OFF	—	More than 1MΩ
ON	1 and 3	1.5 ± 0.5Ω
DOOR	1 and 2	1.5 ± 0.5Ω

28.Trunk Room Light

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Disconnect the harness connectors and remove the trunk room light.



B: INSTALLATION

Install in the reverse order of removal.

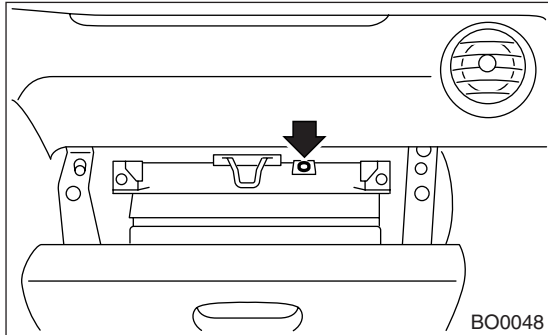
C: INSPECTION

- 1) Visually check the bulb for blow out.
- 2) Check the bulb specification. <Ref. to LI-2, SPECIFICATIONS, General Description.>
- 3) If NG, replace the bulb with a new one.

29. Glove Box Light

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the glove box. <Ref. to EI-38, REMOVAL, Glove Box.>
- 3) Disconnect the harness connector.
- 4) Remove the glove box light.



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

- 1) Visually check the bulb for blow out.
- 2) Check the bulb specification. <Ref. to LI-2, SPECIFICATIONS, General Description.>
- 3) If NG, replace the bulb with a new one.

WIPER AND WASHER SYSTEMS



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10. Rear Wiper Motor.....	18
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GENERAL DESCRIPTION

WIPER AND WASHER SYSTEMS

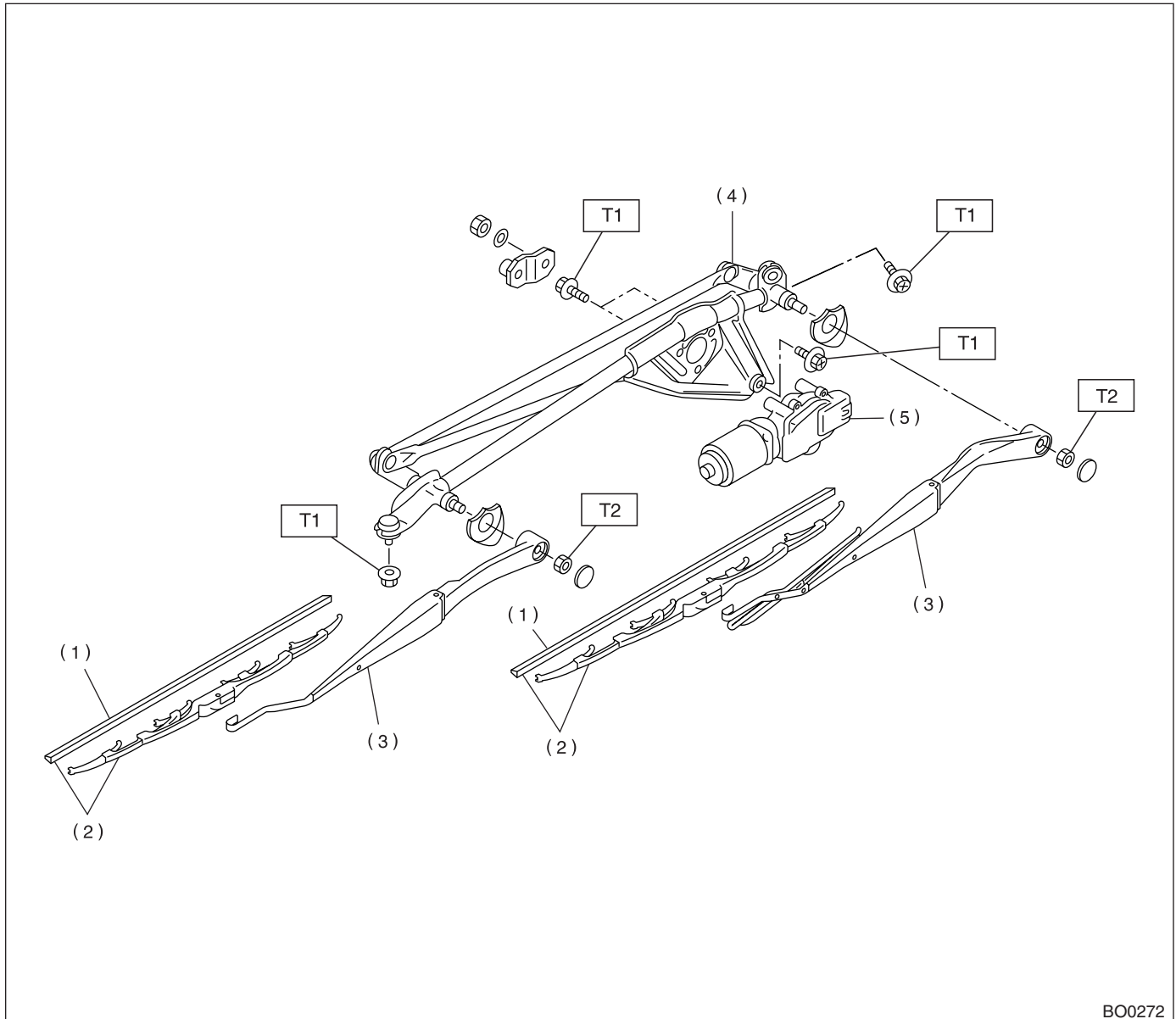
1. General Description

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



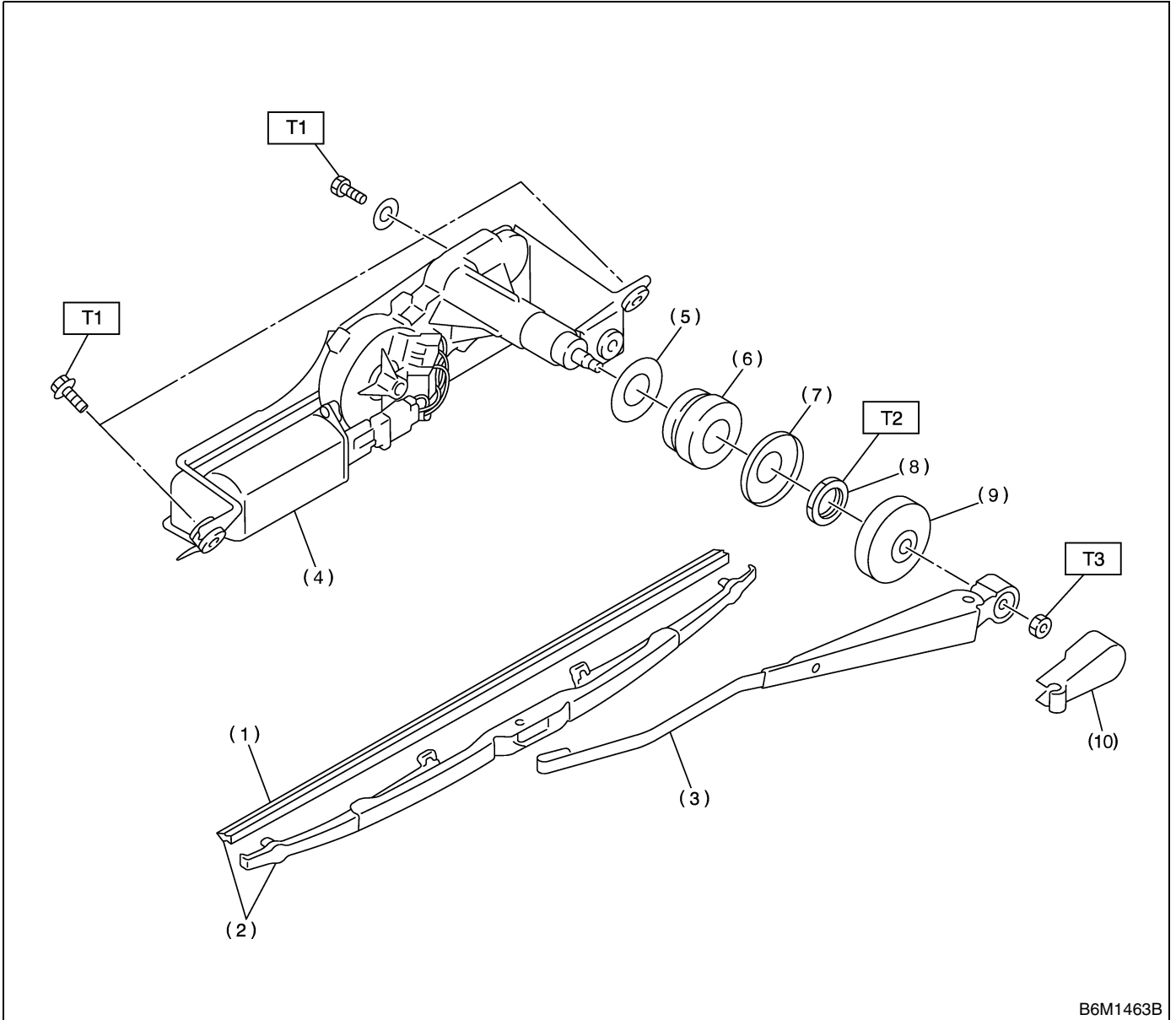
- (1) Wiper rubber
- (2) Wiper blade ASSY
- (3) Wiper arm

- (4) Wiper link
- (5) Wiper motor

Tightening torque: N·m (kgf·m, ft·lb)
T1: 6.0 (0.61, 4.4)
T2: 20 (2.0, 14.5)

GENERAL DESCRIPTION

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: 6.0 (0.61, 4.4)

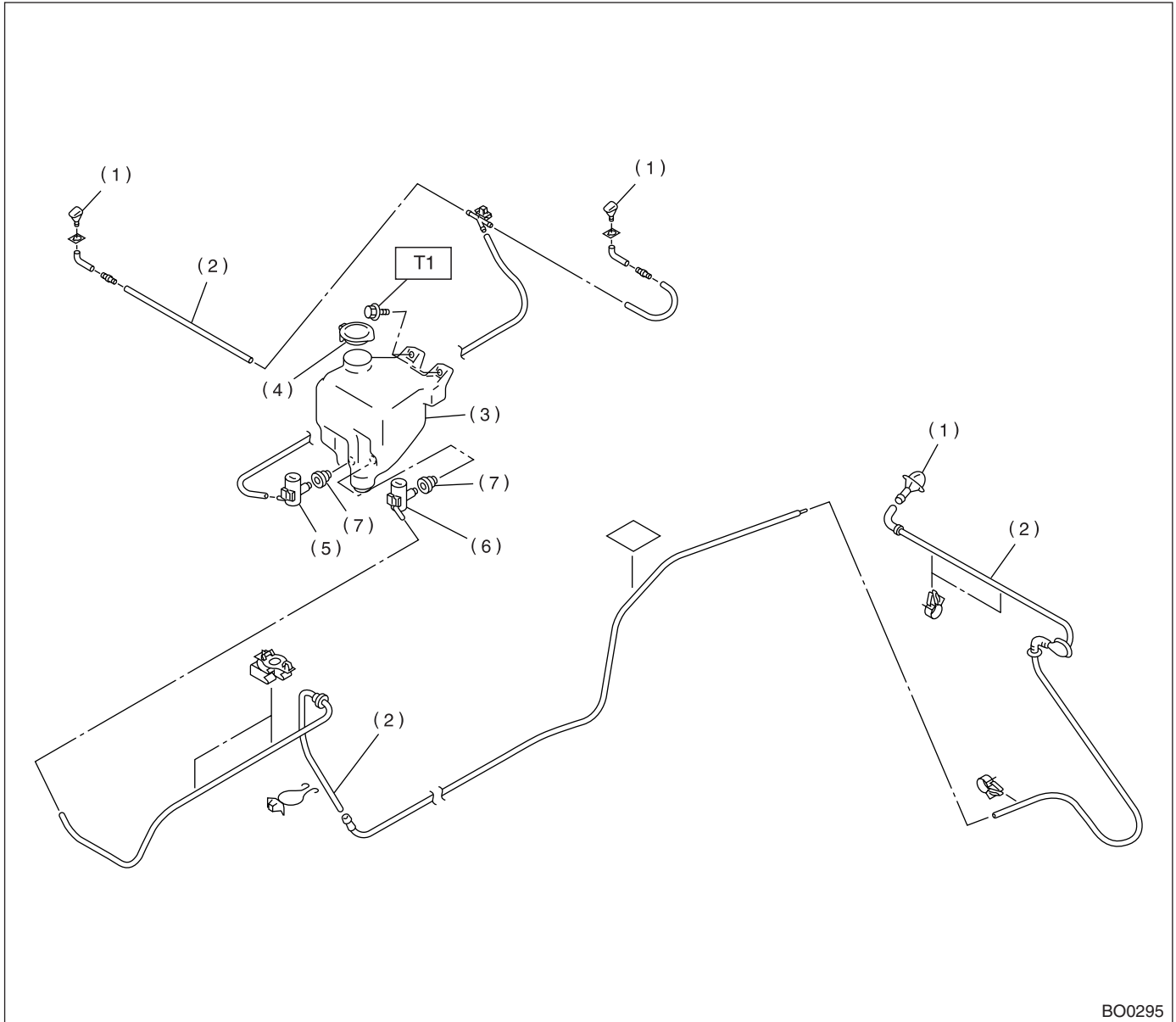
T2: 7.5 (0.76, 5.5)

T3: 8.0 (0.82, 5.9)

GENERAL DESCRIPTION

WIPER AND WASHER SYSTEMS

3. WASHER TANK



BO0295

- | | |
|---------------------|------------------------|
| (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 the connectors and hoses securely.
- After reconnecting, confirm that each function operates normally.
- Be careful that wire harnesses of airbag system pass near electrical parts and switches.
- Wire harnesses and connectors of all airbag system are yellow color. Do not use a tester on these circuits.
- Care must be taken when installing the piping hose so that no bending, jamming, etc. are caused.
- If even a little oil or grease such as silicon oil gets in the tank and washer passages, an oil film easily forms on the glass, causing the wiper to chatter and judder. Therefore, be careful not to let this happen.

2. Wiper and Washer System

A: SCHEMATIC

1. WIPER AND WASHER (FRONT) LHD MODEL

<Ref. to WI-261, LHD MODEL, SCHEMATIC, Wiper and Washer System (Front).>

2. WIPER AND WASHER (FRONT) RHD MODEL

<Ref. to WI-262, RHD MODEL, SCHEMATIC, Wiper and Washer System (Front).>

3. WIPER AND WASHER (REAR) LHD MODEL

<Ref. to WI-264, LHD MODEL, SCHEMATIC, Wiper and Washer System (Rear).>

4. WIPER AND WASHER (REAR) RHD MODEL

<Ref. to WI-265, RHD MODEL, SCHEMATIC, Wiper and Washer System (Rear).>

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

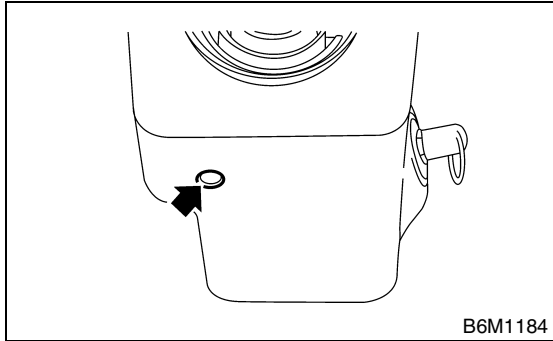
COMBINATION SWITCH (WIPER)

WIPER AND WASHER SYSTEMS

3. Combination Switch (Wiper)

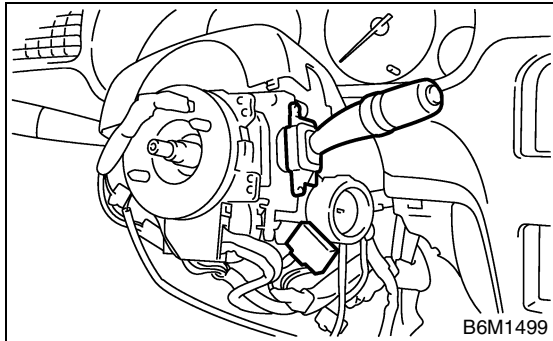
A: REMOVAL

1) Loosen the screw to remove the steering column cover.



2) Disconnect the connectors from combination switches.

3) Loosen the screw to remove combination switch.

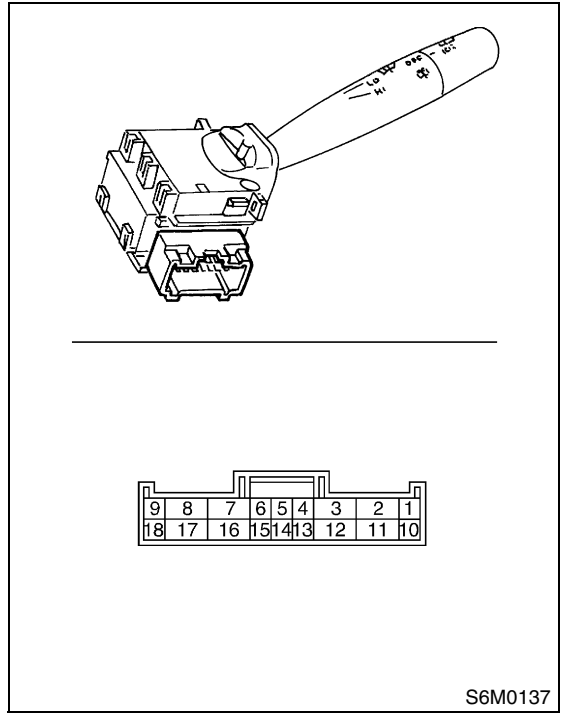


B: INSTALLATION

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	Terminal No.	Standard
FRONT	OFF	7 and 16	Less than 1Ω
	INT	7 and 16	Less than 1Ω
	LO	7 and 17	Less than 1Ω
	HI	8 and 17	Less than 1Ω
	Washer ON	2 and 11	Less than 1Ω
REAR	Washer ON	2 and 10 10 and 12 2 and 12	Less than 1Ω
	OFF	—	More than 1MΩ
	ON	2 and 10	Less than 1Ω
	Washer ON	2 and 10 10 and 12 2 and 12	Less than 1Ω

If continuity is not as specified, replace the switch.

COMBINATION SWITCH (WIPER)

WIPER AND WASHER SYSTEMS

RHD model (Except Europe model):

	Switch position	Terminal No.	Standard
FRONT	OFF	3 and 12	Less than 1Ω
	INT	3 and 12	Less than 1Ω
	LO	3 and 11	Less than 1Ω
	HI	2 and 11	Less than 1Ω
	Washer ON	8 and 17	Less than 1Ω
REAR	Washer ON	8 and 16 16 and 18 8 and 18	Less than 1Ω
	OFF	—	More than 1MΩ
	ON	8 and 18	Less than 1Ω
	Washer ON	8 and 16 16 and 18 8 and 18	Less than 1Ω

If continuity is not as specified, replace the switch.

COMBINATION SWITCH (WIPER)

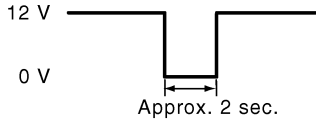
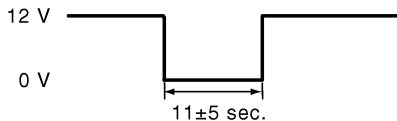
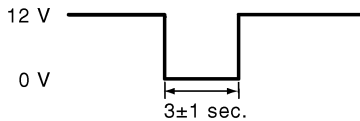
WIPER AND WASHER SYSTEMS

- 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.	 <p>12 V</p> <p>0 V</p> <p>Approx. 2 sec.</p>
MAX.	 <p>12 V</p> <p>0 V</p> <p>11±5 sec.</p>
Non variable type	 <p>12 V</p> <p>0 V</p> <p>3±1 sec.</p>

B6M1465A

If operation is not as specified, replace the switch.

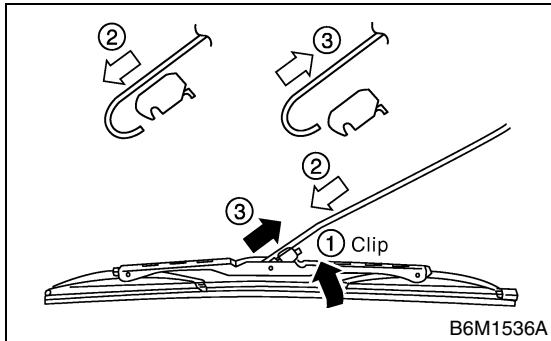
WIPER BLADE

WIPER AND WASHER SYSTEMS

4. Wiper Blade

A: REMOVAL

While pushing the locking clip (A) up, pull out the blade from arm to arrow direction.



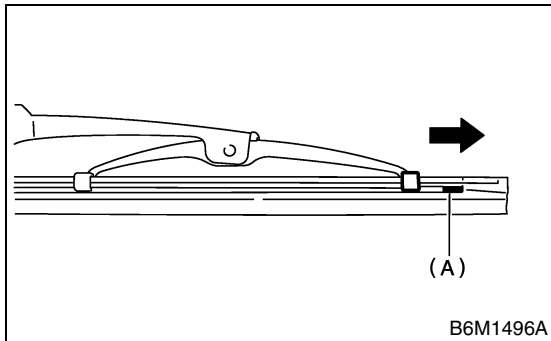
B: INSTALLATION

- 1) Install in the reverse order of removal.
- 2) Confirm that the clip is locked securely.

C: DISASSEMBLY

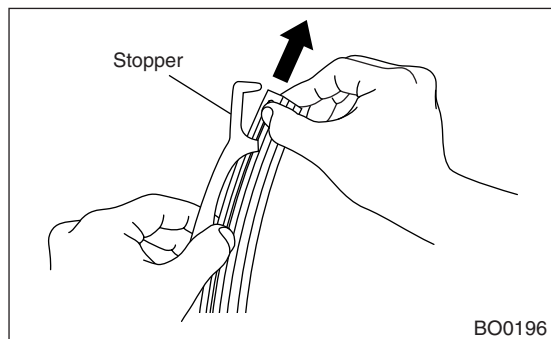
1. METAL TYPE

Pull on side (A) of the wiper rubber stopper and remove the rubber from the blade assembly.



2. RESIN TYPE

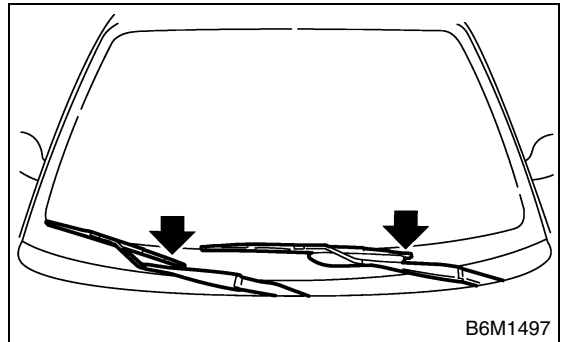
Pull the wiper rubber top slightly from the stopper and pull out fully.



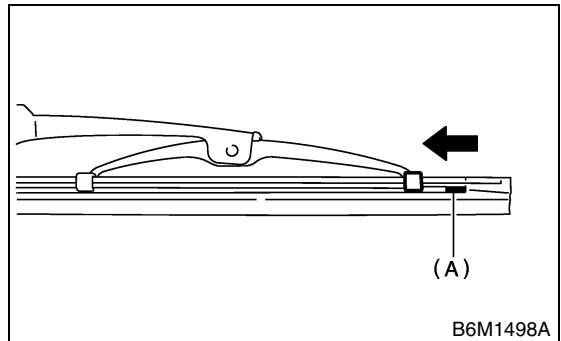
D: ASSEMBLY

1. METAL TYPE

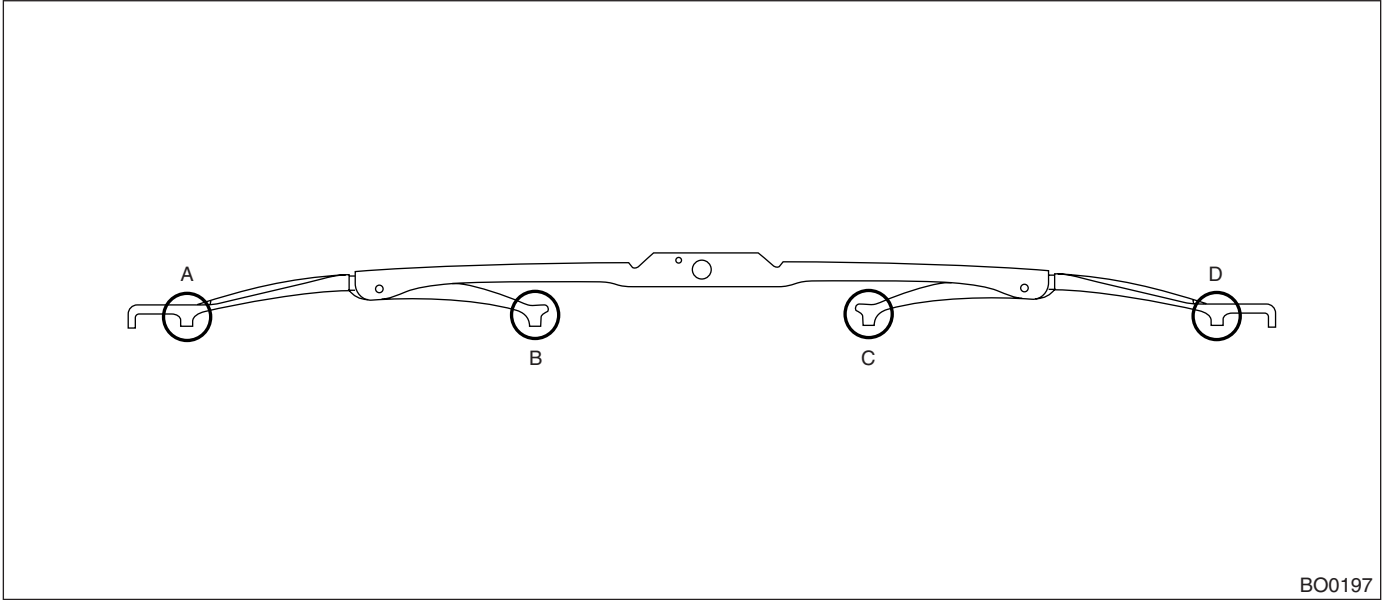
- 1) Insert the wiper rubber onto the blade so that the stopper is in the position shown.



- 2) Make sure the wiper rubber is securely fastened to the pull stopper (A).

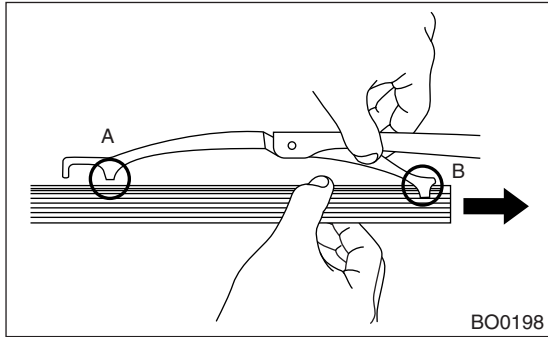


2. RESIN TYPE



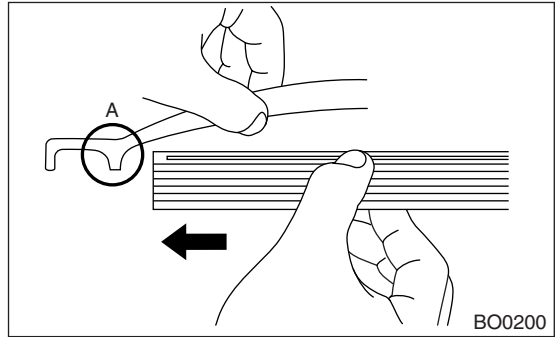
BO0197

1) Insert the wiper rubber through the claw (B).



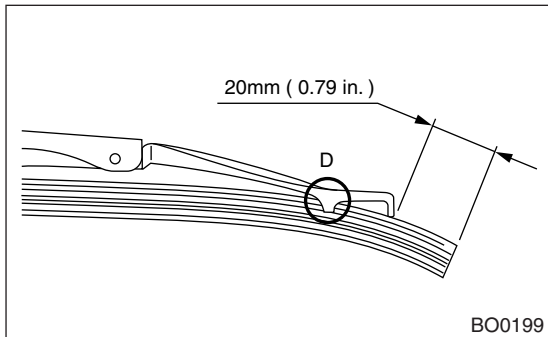
BO0198

3) Insert the wiper rubber into the claw (A).



BO0200

2) Insert the wiper rubber top until it protrudes about 20 mm (0.79 in) from the stopper (D).



BO0199

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.

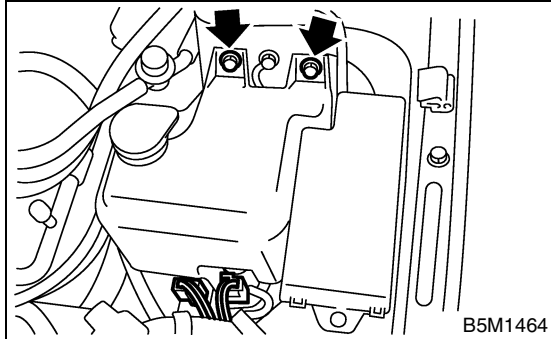
WASHER TANK AND MOTOR

WIPER AND WASHER SYSTEMS

5. Washer Tank and Motor

A: REMOVAL

- 1) Open the hood.
- 2) Disconnect the ground cable from battery.
- 3) Remove the two bolts, hose and connector, and then remove the tank.



B: INSTALLATION

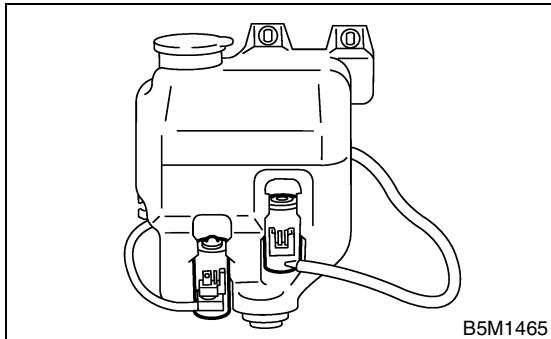
Install in the reverse order of removal.

Tightening torque:

6.0 N·m (0.61 kgf-m, 4.4 ft-lb)

C: DISASSEMBLY

Pull out the washer motor from tank.

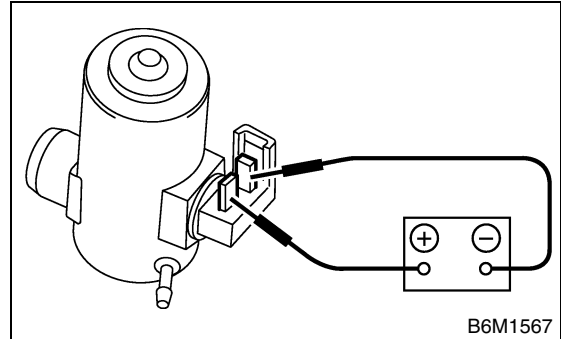


D: ASSEMBLY

- 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.



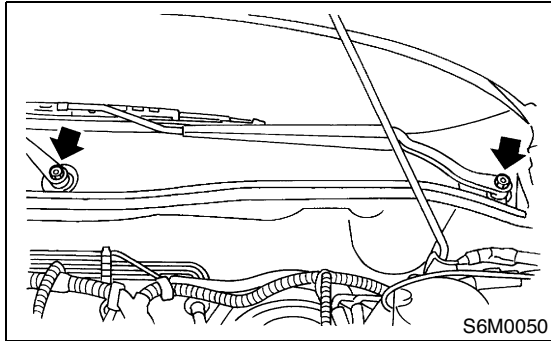
6. Front Wiper Arm

A: REMOVAL

NOTE:

The positions for RHD model are symmetrically opposite.

- 1) Open the hood.
- 2) Remove the cap.
- 3) Loosen the nut to remove arm.

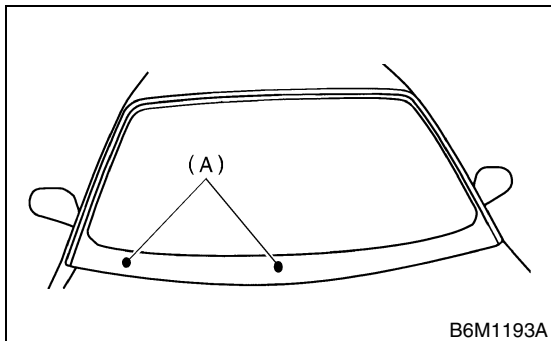


B: INSTALLATION

NOTE:

The positions for RHD model are symmetrically opposite.

- 1) Install in the reverse order of removal.
- 2) Operate the wiper once.
- 3) Align the wiper blade to ceramic print point mark (A) of front window pane.

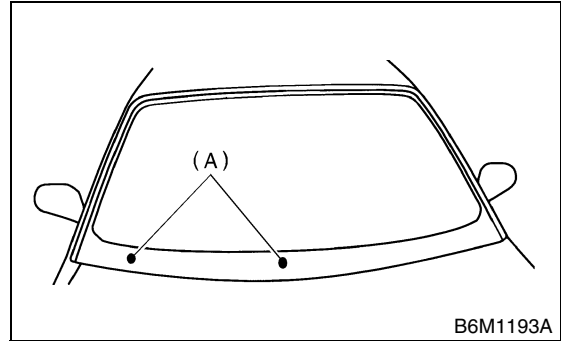


C: ADJUSTMENT

NOTE:

The positions for RHD model are symmetrically opposite.

Operate the wiper once. Align the wiper blade to ceramic print point mark (A) of front window pane.



Tightening torque:

Refer to COMPONENT in General Description.

<Ref. to WW-2, FRONT WIPER, COMPONENT, General Description.>

FRONT WIPER MOTOR AND LINK

WIPER AND WASHER SYSTEMS

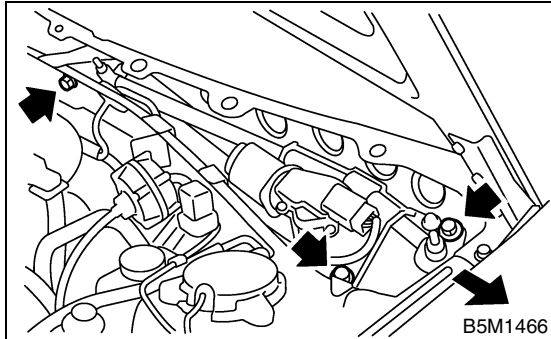
7. Front Wiper Motor and Link

A: REMOVAL

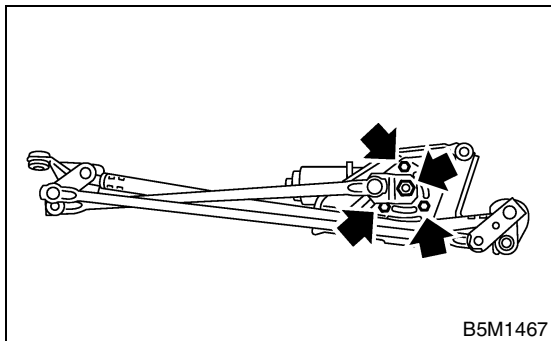
NOTE:

The positions for RHD model are symmetrically opposite.

- 1) Disconnect the ground cable from battery.
- 2) Remove the cowl panel. <Ref. to EI-32, REMOVAL, Cowl Panel.>
- 3) Disconnect the connector of motor.
- 4) Loosen the bolts and nuts to remove wiper link.

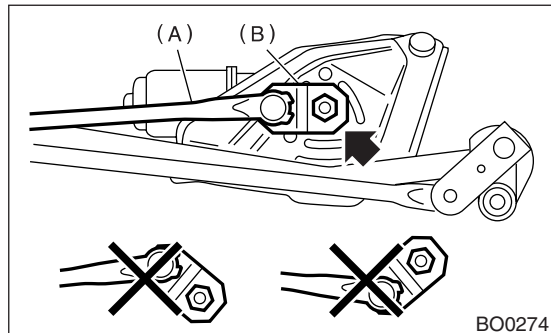


- 5) Loosen the bolts and nuts to remove motor.



B: INSTALLATION

- 1) Connect the battery ground cable to battery.
- 2) To confirm that the motor is at auto stop position, connect the harness to motor and turn the wiper switch ON/OFF once.
- 3) Disconnect the ground cable from battery.
- 4) Tighten the nut where rod (A) and link plate (B) is aligned in a straight line.



- 5) Install in the reverse order of removal.

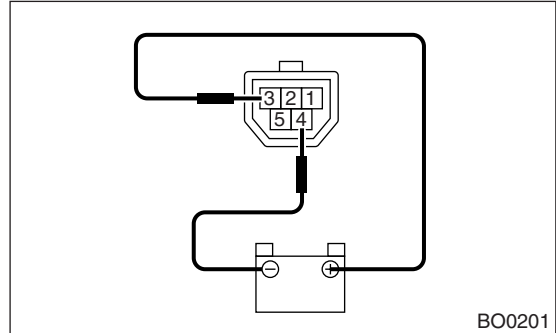
Tightening torque:

Refer to **COMPONENT** in *General Description*.

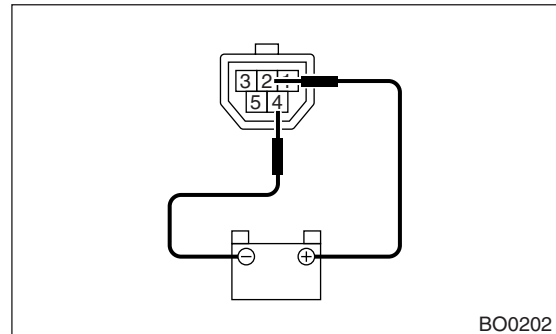
<Ref. to **WW-2, FRONT WIPER, COMPONENT, General Description.**>

C: INSPECTION

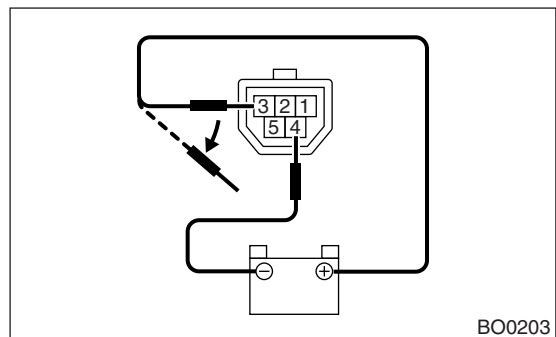
- 1) When the battery is connected to the terminal of connectors, confirm that motor operates at low speed.



- 2) When the battery is connected to the terminal of connectors, confirm that motor operates at high speed.

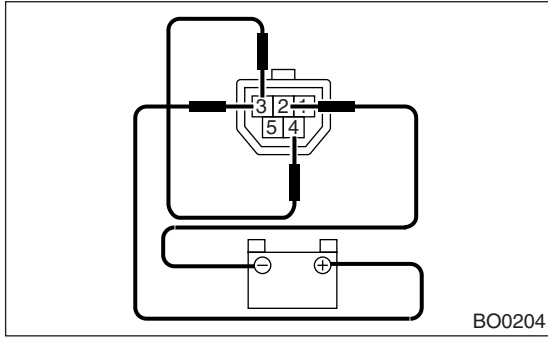


- 3) Connect the battery to terminals of connector, and remove the terminal connection with motor rotated at low speed, and stop the wiper motor through operation.



FRONT WIPER MOTOR AND LINK

4) Connect the battery and confirm that the motor stops at automatic stop position after the motor operates at low speed again.



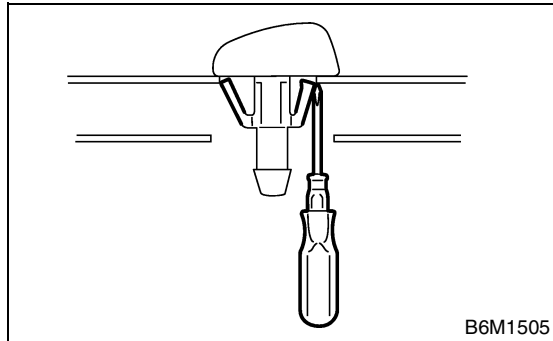
FRONT WASHER NOZZLE

WIPER AND WASHER SYSTEMS

8. Front Washer Nozzle

A: REMOVAL

- 1) Remove the washer hose from the washer nozzle.
- 2) Open the clips on the underside of the hood with a thin screwdriver or other tool, and remove the washer nozzle.



B: INSTALLATION

- 1) Install in the reverse order of removal.
- 2) Adjust the position of the washer liquid sprayer.
<Ref. to WW-16, ADJUSTMENT, Front Washer Nozzle.>

C: INSPECTION

- Make sure the nozzle and hose are not clogged.
- Make sure the hose is not bent.

D: ADJUSTMENT

NOTE:

This adjustment position is for left-handed vehicle. Carry out left-right symmetry for adjustment positions for right-handed vehicle.

- 1) Turn the wiper switch to OFF position.
- 2) When the vehicle stops, adjust the washer injection position as shown in the figure.

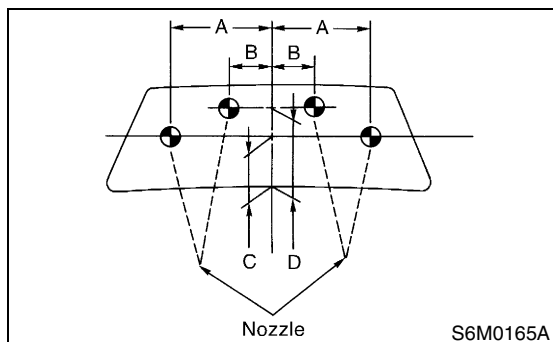
Injection position:

A: 350 mm (13.78 in)

B: 162 mm (6.38 in)

C: 300 mm (11.81 in)

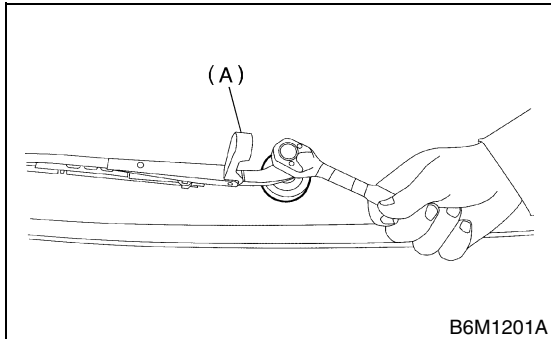
D: 500 mm (19.69 in)



9. Rear Wiper Arm

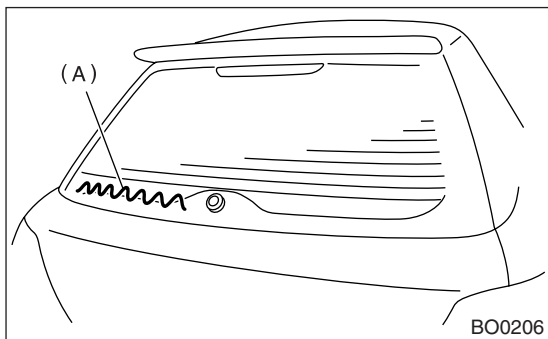
A: REMOVAL

- 1) Raise the wiper arm cover (A).
- 2) Loosen the nut to remove wiper arm.



B: INSTALLATION

- 1) Install in the reverse order of removal.
- 2) Operate the rear wiper once.
- 3) Align the blade to rear defogger heat wire (A).



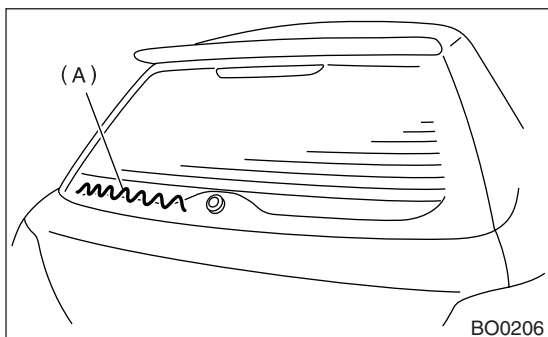
Tightening torque:

Refer to COMPONENT in General Description.

<Ref. to WW-3, REAR WIPER, COMPONENT, General Description.>

C: ADJUSTMENT

- 1) Operate the rear wiper once.
- 2) Align the blade to rear defogger heat wire (A).



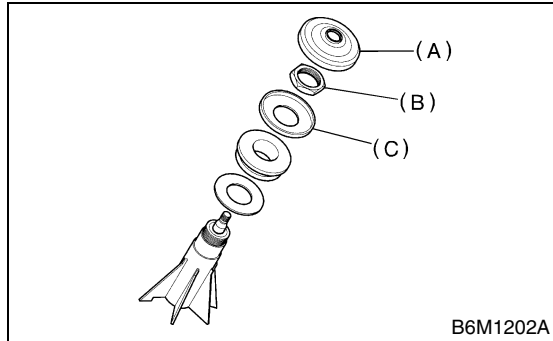
REAR WIPER MOTOR

WIPER AND WASHER SYSTEMS

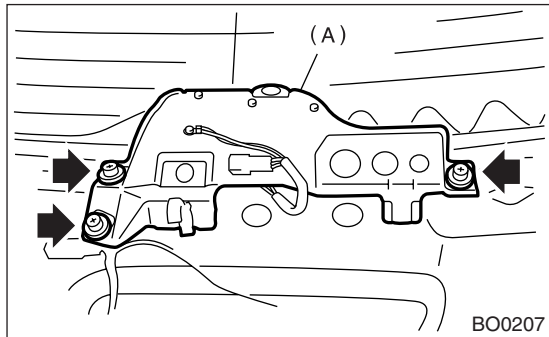
10.Rear Wiper Motor

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the rear wiper arm.
- 3) Remove the cap (A), nut (B), and spacer (C) from rear wiper shaft.

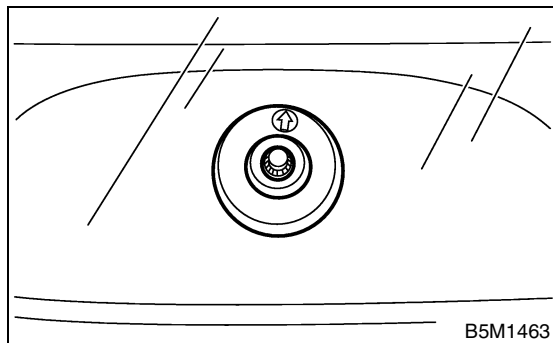


- 4) Remove the rear gate lower trim. <Ref. to EI-50, REMOVAL, Rear Gate Trim.>
- 5) Unclip the clip of harness and disconnect the connector of wiper motor.
- 6) Loosen the bolts to remove the wiper motor assembly (A).



B: INSTALLATION

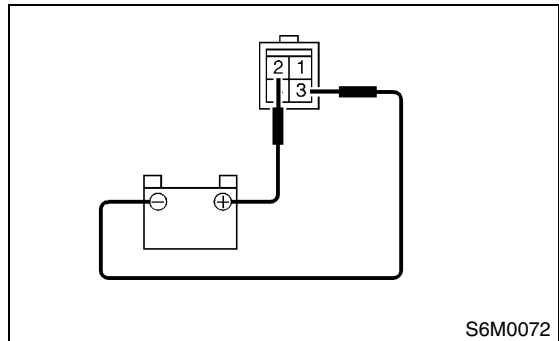
- 1) Install in the reverse order of removal.
- 2) Install the rear wiper cushion with the arrow mark facing up, as shown in the figure.



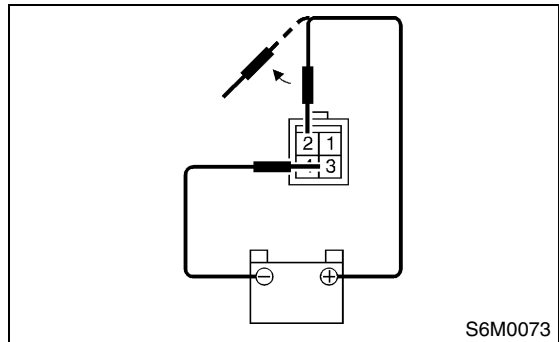
Tightening torque:
Refer to **COMPONENT** in **General Description**.
<Ref. to **WW-3, REAR WIPER, COMPONENT, General Description.**>

C: INSPECTION

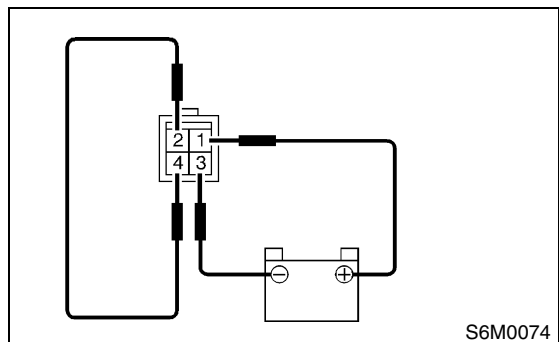
- 1) Connect the battery to wiper motor connector and confirm that the wiper motor operates.



- 2) Connect the battery to terminal of connector and remove the terminal connections with motor rotated, and stop the wiper motor through operation.



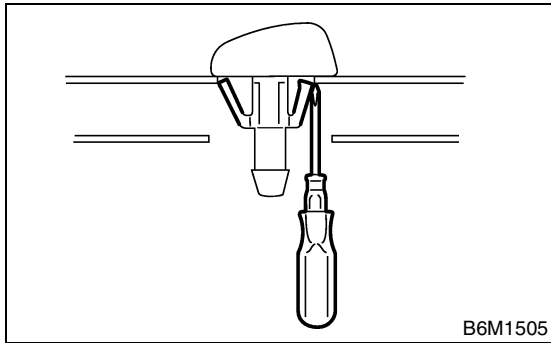
- 3) Connect the battery and confirm that the motor stops at automatic stop position after the motor operates at low speed again.



11.Rear Washer

A: REMOVAL

- 1) Remove the high-mount stop light. <Ref. to LI-26, 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.



B: INSTALLATION

- 1) Install in the reverse order of removal.
- 2) Adjust the position of the washer liquid sprayer. <Ref. to WW-19, ADJUSTMENT, Rear Washer.>

C: INSPECTION

- Make sure the nozzle and hose are not clogged.
- Make sure the hose is not bent.

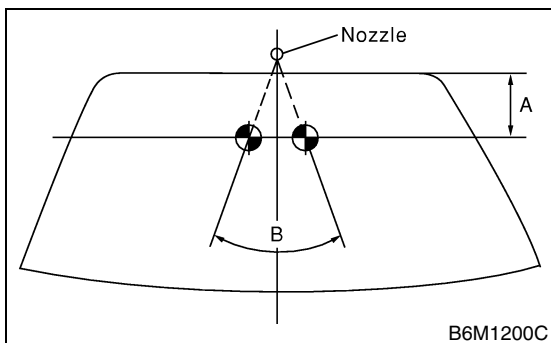
D: ADJUSTMENT

- 1) Turn the wiper switch to OFF position.
- 2) When the vehicle stops, adjust the washer injection position as shown in the figure.

Injection position:

A: 39 mm (1.54 in)

B: 72°



WIPER CONTROL RELAY

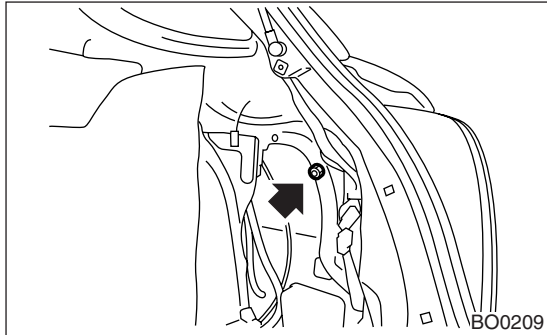
WIPER AND WASHER SYSTEMS

12. Wiper Control Relay

A: REMOVAL

1. WAGON

- 1) Disconnect the ground cable from battery.
- 2) Remove the right quarter lower trim. <Ref. to EI-46, REMOVAL, Rear Quarter Trim.>
- 3) Loosen the nut to remove control unit.



B: INSTALLATION

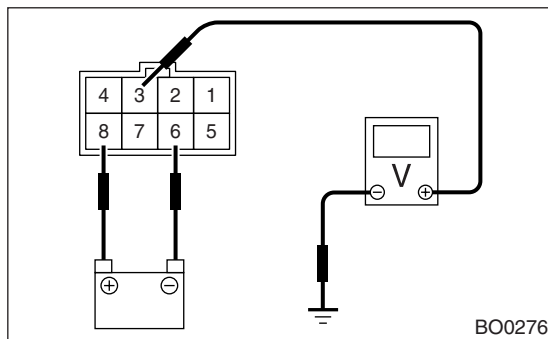
1. WAGON

Install in the reverse order of removal.

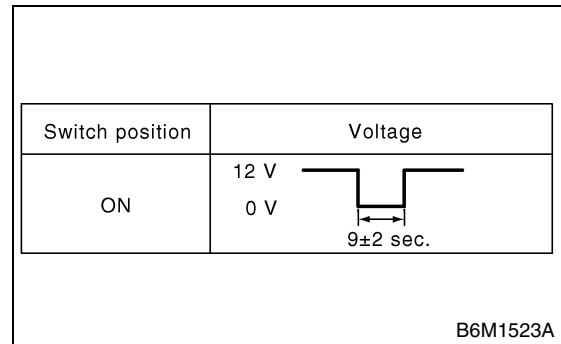
C: INSPECTION

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 the negative (-) lead to ground.



- 3) Measure the voltage when the wiper relay is operated.



If operation is not as specified, replace the switch.

ENTERTAINMENT

ET

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3. Cigarette Lighter System.....	4
4. Radio Body.....	5
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GENERAL DESCRIPTION

ENTERTAINMENT

1. General Description

A: CAUTION

- Before disassembling or reassembling parts, always disconnect the 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 the connectors and hoses securely during reassembly.
- After reassembly, make sure functional parts operate smoothly.

B: PREPARATION TOOL

1. GENERAL TOOLS

TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance and voltage.
Conductive Silver Composition (DUPONT NO. 4817 or equivalent)	Used for repairing antenna wire.

2. Radio System

A: SCHEMATIC

1. RADIO LHD MODEL

<Ref. to WI-91, LHD MODEL, SCHEMATIC, Audio System.>

2. RADIO RHD MODEL

<Ref. to WI-93, RHD MODEL, SCHEMATIC, Audio System.>

B: INSPECTION

Symptom	Repair order
No power coming in. (No display and no sound from speakers)	(1) Check the fuse and power supply for radio. (2) Check the radio ground. (3) Remove the radio for repair.
A specific speaker does not operate.	(1) Check the speaker. (2) Check the output circuit between radio and speaker.
Radio generates noise with engine running.	(1) Check the radio ground. (2) Check the generator. (3) Check the ignition coil. (4) Remove the radio for repair.
AM and FM modes are weak or noisy.	(1) Check the antenna. (2) Check the antenna amplifier. (3) Check the noise suppressor. (4) Check the radio ground. (5) Remove the radio for repair.

3. Cigarette Lighter System

A: SCHEMATIC

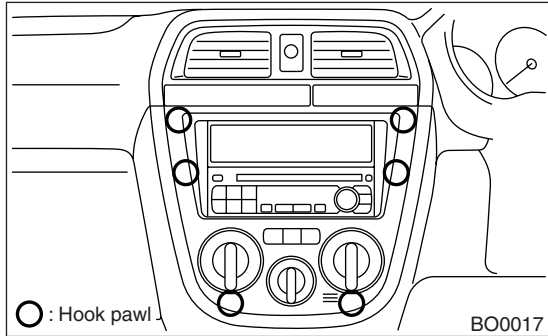
1. CIGARETTE LIGHTER

<Ref. to WI-178, SCHEMATIC, Front Accessory
Power Supply System.>

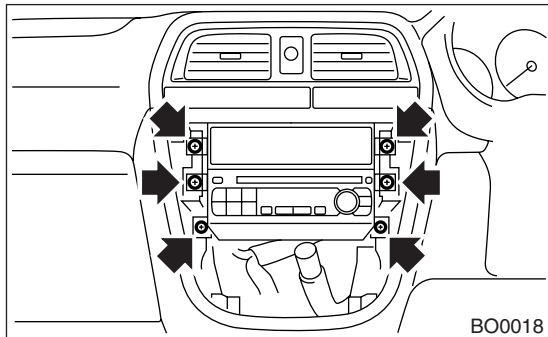
4. Radio Body

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the center panel while disconnecting connector.



- 3) Remove the fitting screws, and slightly pull out the radio from center console.



- 4) Disconnect the electric connectors and antenna feeder cord.

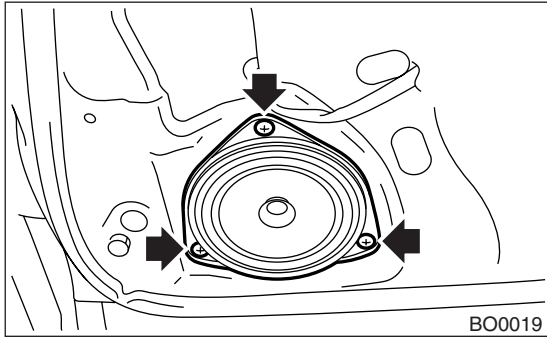
B: INSTALLATION

Install in the reverse order of removal.

5. Front Speaker

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the front door trim. <Ref. to EI-36, REMOVAL, Front Door Trim.>
- 3) Remove the front speaker mounting screws.



- 4) Disconnect the harness connector and remove front speaker.

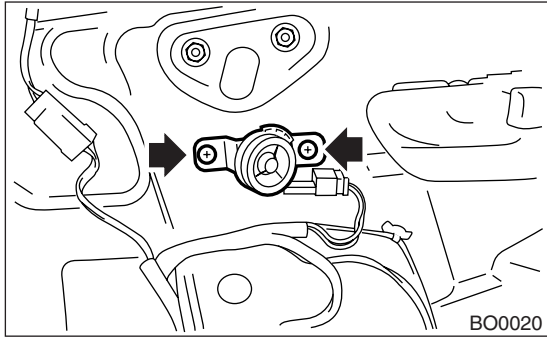
B: INSTALLATION

Install in the reverse order of removal.

6. Tweeter

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the front door trim. <Ref. to EI-36, REMOVAL, Front Door Trim.>
- 3) Remove the tweeter mounting screws.



- 4) Disconnect the harness connector and remove tweeter.

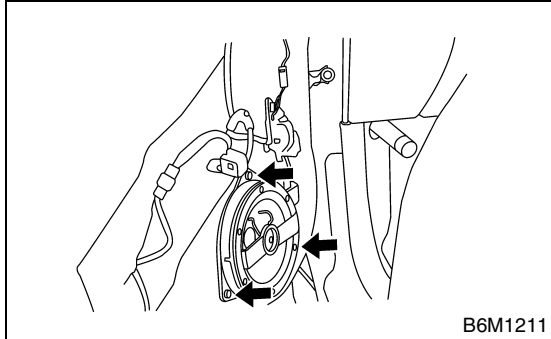
B: INSTALLATION

Install in the reverse order of removal.

7. Rear Speaker

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the rear door trim. <Ref. to EI-37, REMOVAL, Rear Door Trim.>
- 3) Remove the rear speaker mounting screws.



- 4) Disconnect the harness connector and remove rear speaker.

B: INSTALLATION

Install in the reverse order of removal.

8. Antenna

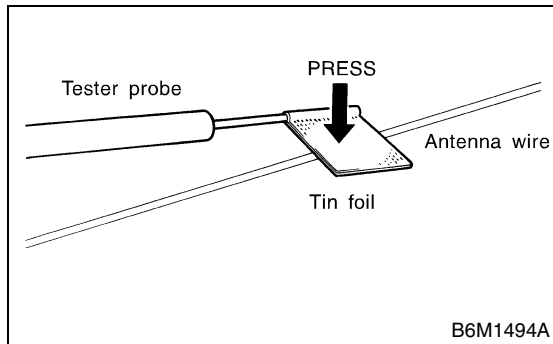
A: INSPECTION

Measure the resistance between antenna terminal and each antenna wire.

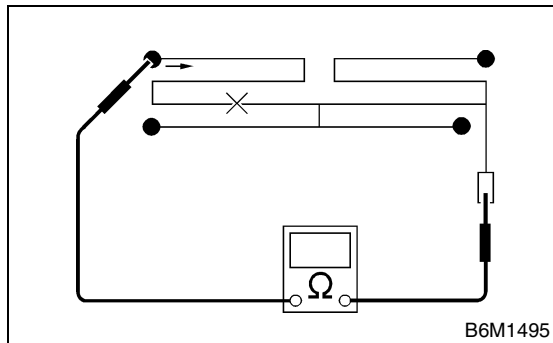
If an antenna wire is OK, resistance will be less than 1 W. If an antenna wire is broken, the resistance will be more than 1 MW.

NOTE:

When checking the continuity, wind a piece of tin foil around the tip of tester probe and press foil against wire with your finger.

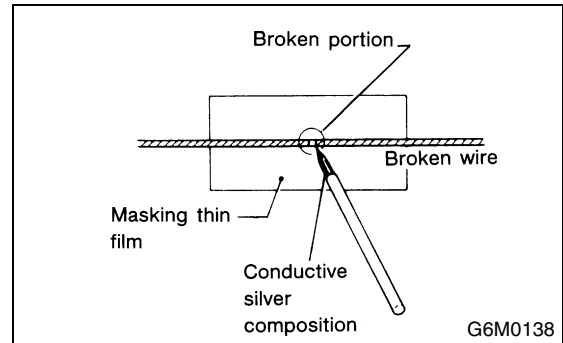


To locate the broken point, move the probe along antenna wire.



B: REPAIR

- 1) Clean the antenna wire and surrounding area with a cloth dampened by alcohol.
- 2) Paste a thin masking film on the glass along broken wire.
- 3) Deposit conductive silver composition (DU-PONT NO. 4817) on the broken portion with a drawing pen.



- 4) Dry out the deposited portion.
- 5) After repair has been completed, measure the resistance in repaired wire.

ANTENNA AMPLIFIER

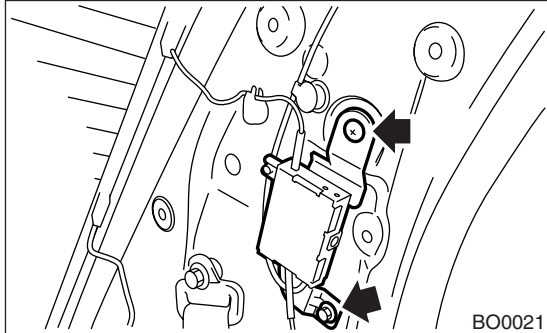
ENTERTAINMENT

9. Antenna Amplifier

A: REMOVAL

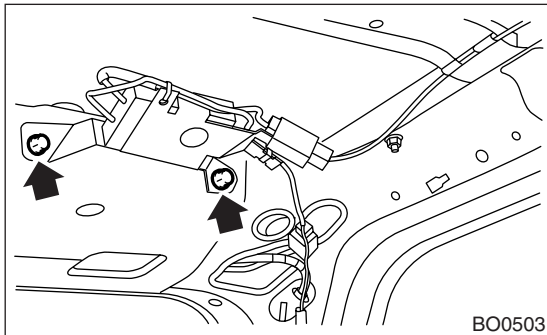
1. SEDAN

- 1) Disconnect the ground cable from battery.
- 2) Remove the rear pillar upper trim. <Ref. to EI-46, SEDAN, REMOVAL, Rear Quarter Trim.>
- 3) Disconnect the harness connector and terminal.
- 4) Remove the mounting screws and detach antenna amplifier.



2. WAGON

- 1) Disconnect the ground cable from battery.
- 2) Remove the rear quarter upper trim and roof trim. <Ref. to EI-48, WAGON, REMOVAL, Roof Trim.>
- 3) Disconnect the harness connector and terminal.
- 4) Remove the mounting screws and detach antenna amplifier.



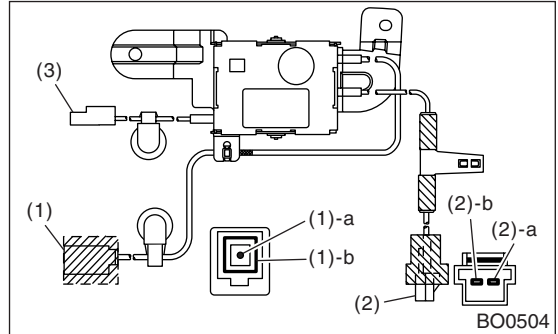
B: INSTALLATION

Install in the reverse order of removal.

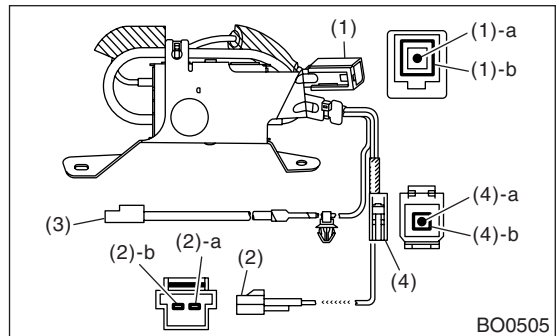
C: INSPECTION

Measure the antenna amplifier resistance.

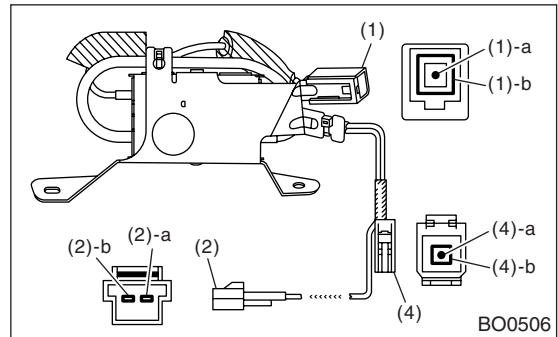
- SEDAN



- WAGON (Specification for Europe)



- WAGON (Specification except for Europe)



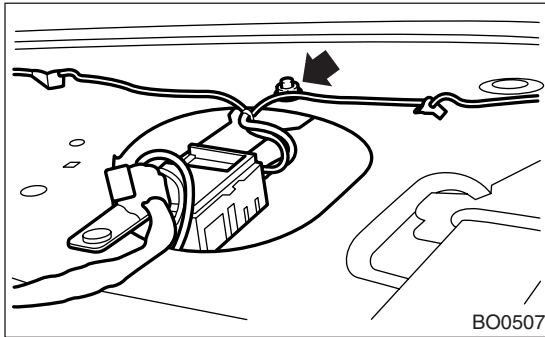
Terminal No.	Standard
1-a and Amplifier body	More than 100 kΩ
1-b and Amplifier body	Less than 1 Ω
2-a and Amplifier body	More than 100 kΩ
2-b and Amplifier body	More than 100 kΩ
3 and Amplifier body	More than 100 kΩ
4-a and Amplifier body	More than 100 kΩ
4-b and Amplifier body	Less than 1 Ω

10.Noise Suppressor

A: REMOVAL

1. SEDAN

- 1) Disconnect the ground cable from battery.
- 2) Remove the rear pillar upper trim. <Ref. to EI-46, SEDAN, REMOVAL, Rear Quarter Trim.>
- 3) Remove the rear shelf trim. <Ref. to EI-51, REMOVAL, Rear Shelf Trim.>
- 4) Disconnect the feeder cord connector from antenna amplifier.
- 5) Disconnect the harness connector of noise suppressor from terminal on glass antenna.
- 6) Remove the harness clip.
- 7) Remove the mounting nut and detach noise suppressor.



2. WAGON

- 1) Disconnect the ground cable from battery.
- 2) Remove the rear gate trim. <Ref. to EI-50, REMOVAL, Rear Gate Trim.>
- 3) Disconnect the connector from noise suppressor.
- 4) Remove the mounting nut and detach noise suppressor.

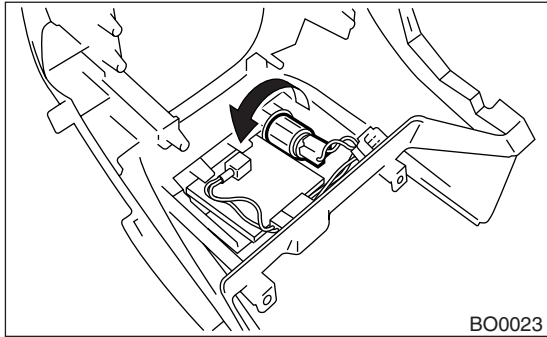
B: INSTALLATION

Install in the reverse order of removal.

11.Cigarette Lighter

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the center panel. <Ref. to ET-5, REMOVAL, Radio Body.>
- 3) Disconnect the harness connectors and remove cigarette lighter.



B: INSTALLATION

Install in the reverse order of removal.

COMMUNICATION SYSTEM

COM

	Page
1. General Description	2
2. Horn System	3
3. Horn	4
4. Horn Switch	5

GENERAL DESCRIPTION

COMMUNICATION SYSTEM

1. General Description

A: PREPARATION TOOL

1. GENERAL TOOLS

TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance and voltage.

2. Horn System

A: SCHEMATIC

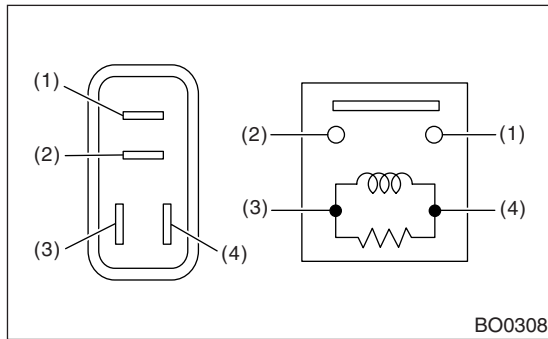
1. HORN

<Ref. to WI-180, SCHEMATIC, Horn System.>

B: INSPECTION

1. HORN RELAY

Measure the horn relay resistance between terminals (indicated in table below) when connecting terminal No. 4 to battery positive terminal and terminal No. 3 to battery ground cable.

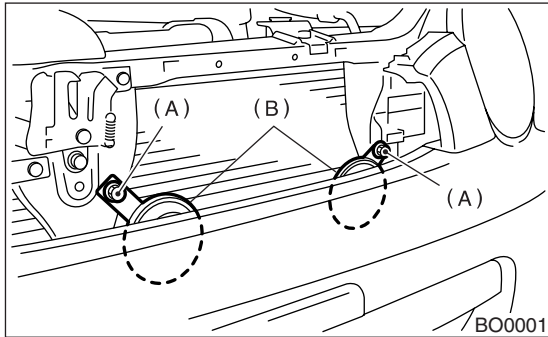


Current	Terminal No.	Standard
Flow	1 and 2	Less than 1Ω
No Flow		More than 1MΩ

3. Horn

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the horn bracket mounting bolt (A).
- 3) Disconnect the harness connector and remove the horn assembly (B).

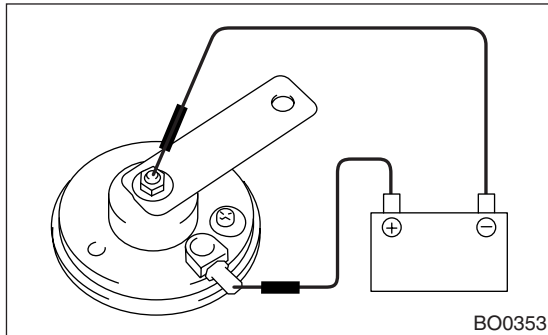


B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

With 12 V direct current supplied between horn terminal and case ground, check that the horn sounds properly.



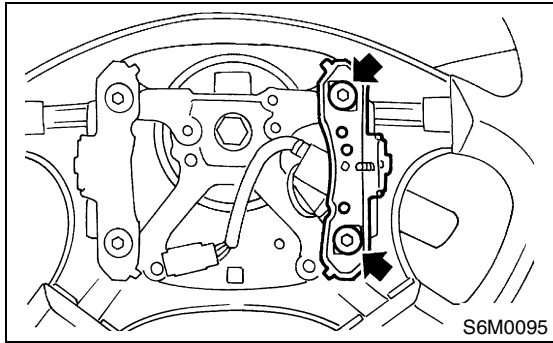
4. Horn Switch

A: REMOVAL

WARNING:

Before servicing, be sure to read the notes in the AB section for proper handling of the driver airbag module. <Ref. to AB-3, CAUTION, General Description.>

- 1) Disconnect the ground cable from battery.
- 2) Remove the driver's airbag module. <Ref. to AB-12, Driver's Airbag Module.>
- 3) Remove the horn switch from the steering wheel as shown.

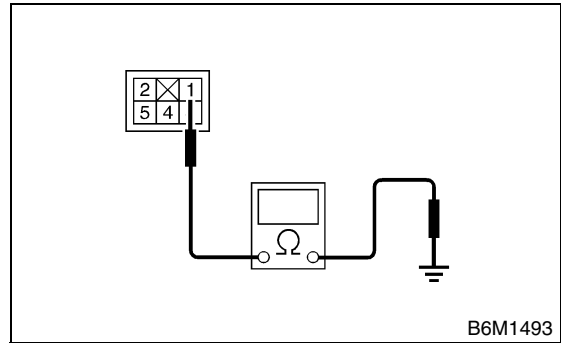


B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the horn switch resistance.



Switch position	Terminal No.	Resistance
When horn switch is pushed.	1 and Body ground	Less than 1Ω
When horn switch is not pushed.		More than 1MΩ

HORN SWITCH

COMMUNICATION SYSTEM

GLASS/WINDOWS/MIRRORS

GW

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3. Power Window Control Switch	9
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5. Front Regulator and Motor Assembly	16
6. Remote Control Mirror System	17
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8. Outer Mirror	20
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11. Rear Regulator and Motor Assembly	25
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17. Rear Quarter Glass	33
18. Roof Window Glass	34
19. Inner Rearview Mirror	35

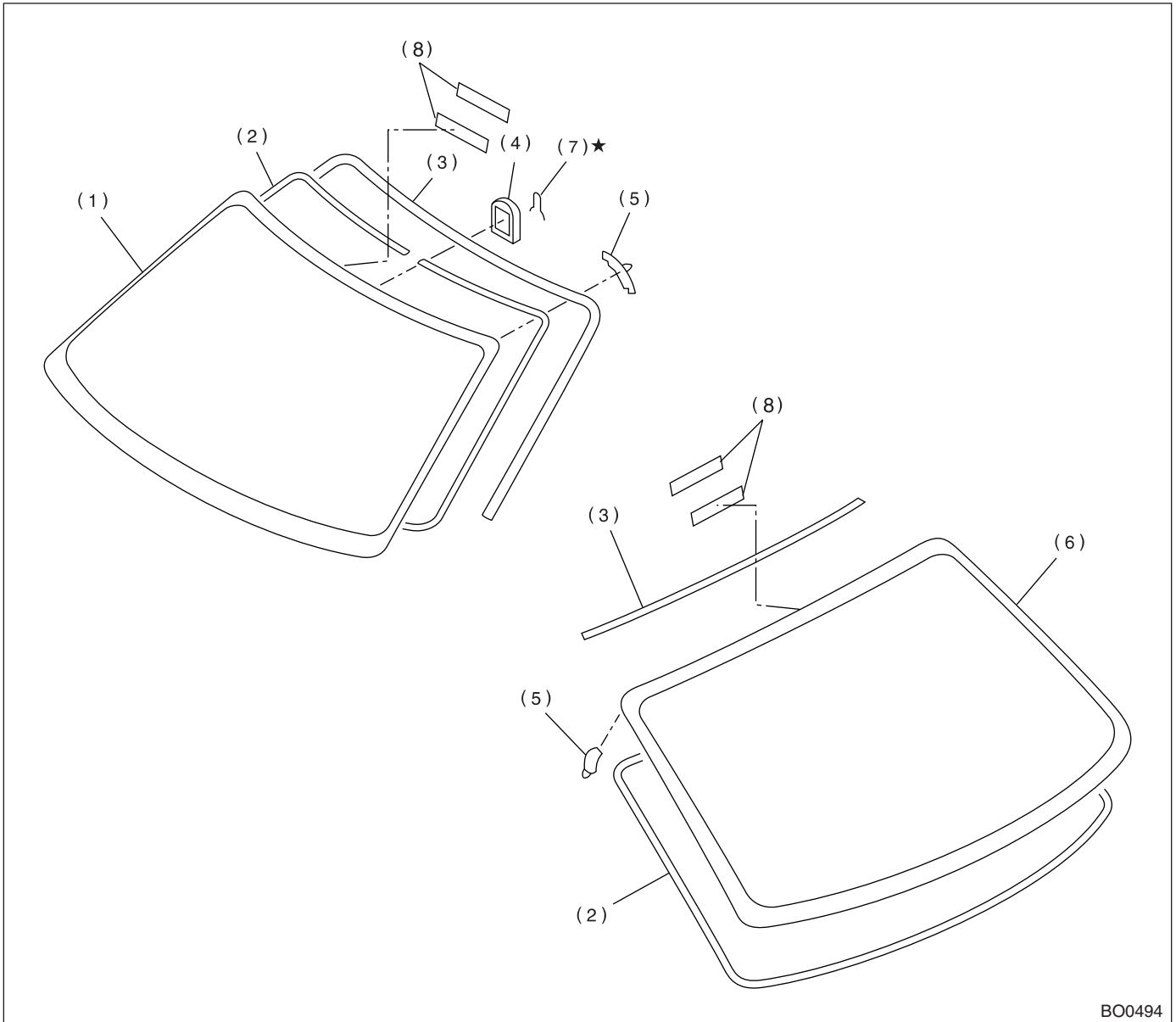
GENERAL DESCRIPTION

GLASS/WINDOWS/MIRRORS

1. General Description

A: COMPONENT

1. FIXED GLASS (SEDAN)



BO0494

- (1) Windshield glass
- (2) Dam rubber
- (3) Molding

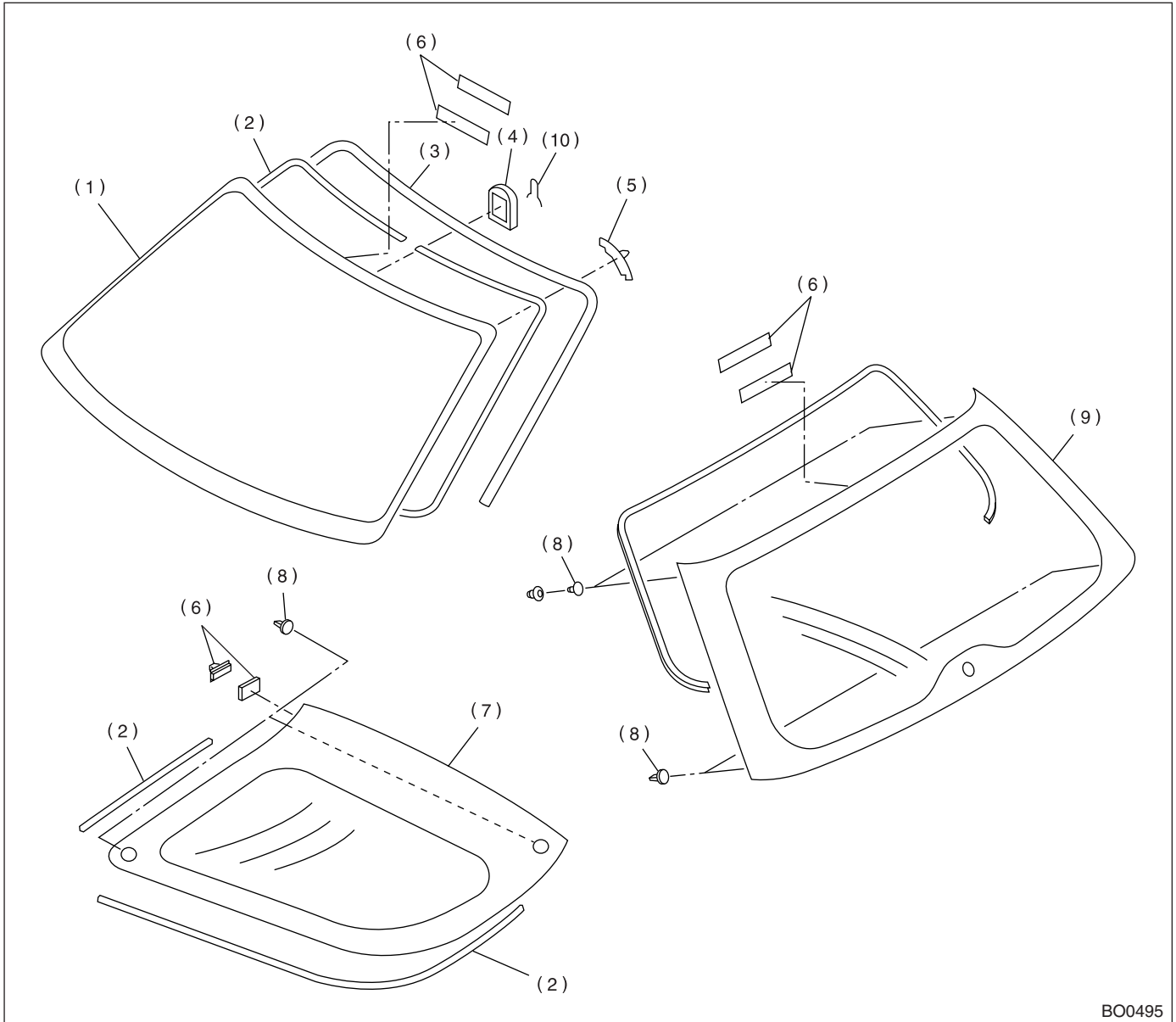
- (4) Rearview mirror mount
- (5) Locate pin
- (6) Rear window glass

- (7) Spring
- (8) Fastener

GENERAL DESCRIPTION

GLASS/WINDOWS/MIRRORS

2. FIXED GLASS (WAGON)



(1) Windshield glass

(2) Dam rubber

(3) Molding

(4) Rearview mirror mount

(5) Locate pin

(6) Fastener

(7) Rear quarter glass

(8) Locate pin

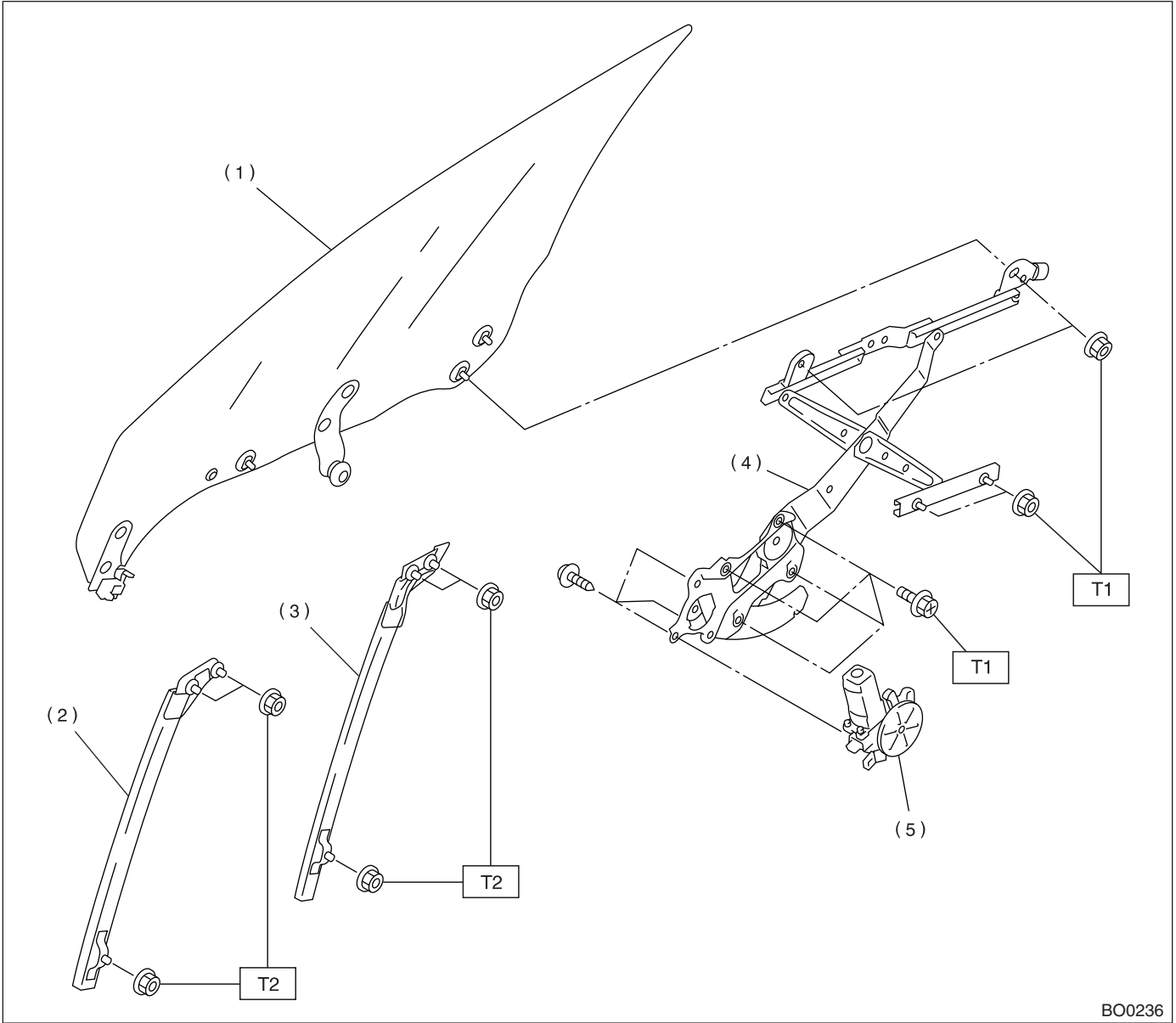
(9) Glass

(10) Spring

GENERAL DESCRIPTION

GLASS/WINDOWS/MIRRORS

3. FRONT DOOR GLASS



- (1) Glass
- (2) Door sash (Front)
- (3) Door sash (Rear)
- (4) Regulator ASSY

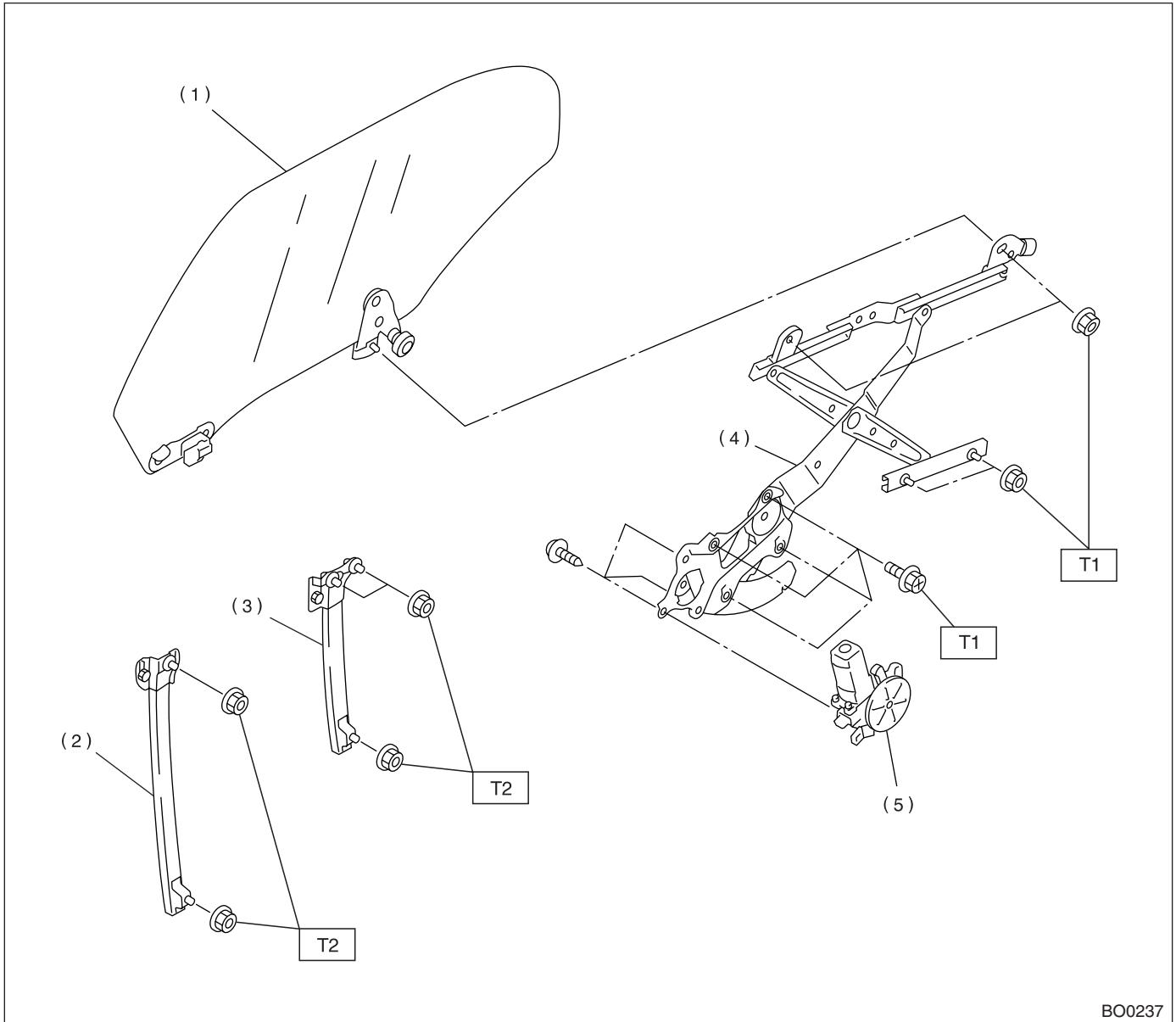
- (5) Motor ASSY

Tightening torque: N-m (kgf-m, ft-lb)

T1: 7.4 (0.75, 5.5)

T2: 13.7 (1.4, 10.1)

4. REAR 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)

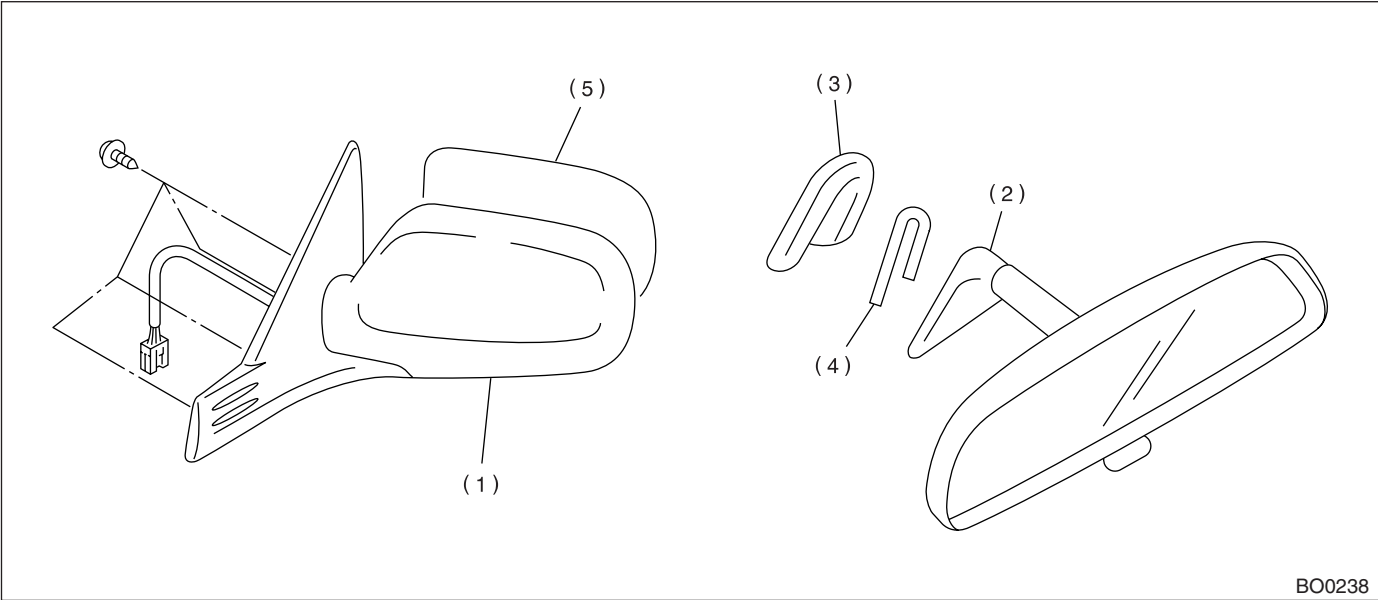
T1: 7.4 (0.75, 5.5)

T2: 13.7 (1.4, 10.1)

GENERAL DESCRIPTION

GLASS/WINDOWS/MIRRORS

5. MIRRORS



- (1) Outer mirror
- (2) Inner rearview mirror

- (3) Mount
- (4) Spring

- (5) Mirror

GENERAL DESCRIPTION

GLASS/WINDOWS/MIRRORS

B: CAUTION

- When the electrical connectors are disconnected, always conduct an operational check after connecting them again.
- Avoid impact and damage to the glass.

C: PREPARATION TOOL

TOOL NAME	REMARKS
Circuit Tester	Used for checking voltage and continuity.
Piano Wire	Used for window glass removal.
Windshield Knife	Used for window glass removal.

POWER WINDOW SYSTEM

GLASS/WINDOWS/MIRRORS

2. Power Window System

A: SCHEMATIC

1. POWER WINDOW LHD MODEL

<Ref. to WI-232, LHD MODEL, SCHEMATIC, Power Window System.>

2. POWER WINDOW RHD MODEL

<Ref. to WI-236, RHD MODEL, SCHEMATIC, Power Window System.>

B: INSPECTION

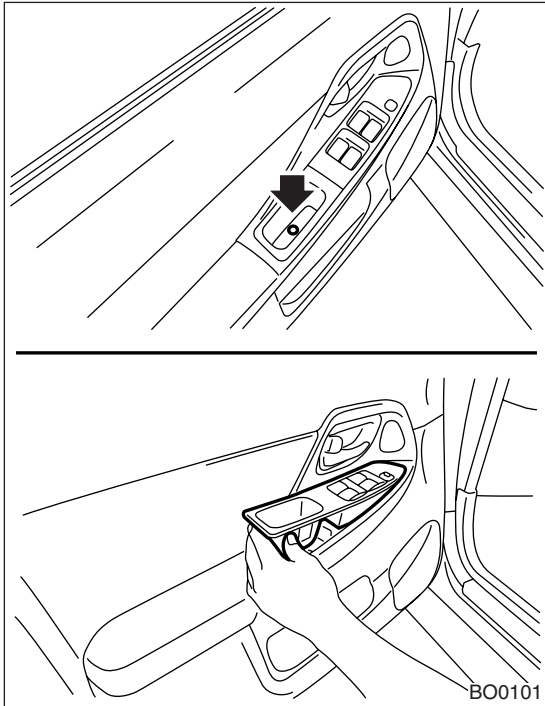
Symptom	Repair order
All power windows does not operate.	(1) Fuse (SBF-6) (F/B No. 18: RHD model) (2) Power window circuit breaker (3) Power window relay (4) Wire harness
One window does not operate.	(1) Power window main switch (2) Power window sub switch (3) Power window motor (4) Wire harness
"Window Lock" does not operate.	(1) Power window main switch

3. Power Window Control Switch

A: REMOVAL

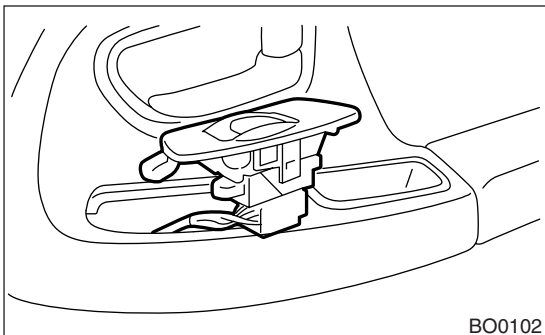
1. MAIN SWITCH

- 1) Disconnect the ground cable from battery.
- 2) Loosen the screw to remove the power window main switch.
- 3) Disconnect the connector.



2. SUB-SWITCH

- 1) Disconnect the ground cable from battery.
- 2) Remove the switch panel.
- 3) 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.

POWER WINDOW CONTROL SWITCH

GLASS/WINDOWS/MIRRORS

C: INSPECTION

1. MAIN SWITCH LHD MODEL

Measure the switch resistance.

Driver's switch:

Switch position	Terminal No.	Standard
AUTO UP	13 and 2, 1 and 5	Less than 1 Ω
UP	13 and 2, 1 and 5	Less than 1 Ω
OFF	1 and 2 1 and 5 2 and 5	Less than 1 Ω
DOWN	13 and 1, 2 and 5	Less than 1 Ω
AUTO DOWN	13 and 1, 2 and 5	Less than 1 Ω

Front passenger's switch:

Switch position	Terminal No.	Standard
UP	13 and 6, 7 and 5	Less than 1 Ω
OFF	5 and 6 5 and 7 6 and 7	Less than 1 Ω
DOWN	13 and 7, 6 and 5	Less than 1 Ω

Rear left switch:

Switch position	Terminal No.	Standard
UP	10 and 13, 9 and 5	Less than 1 Ω
OFF	5 and 9 5 and 10 9 and 10	Less than 1 Ω
DOWN	13 and 9, 10 and 5	Less than 1 Ω

Rear right switch:

Switch position	Terminal No.	Standard
UP	13 and 16, 15 and 5	Less than 1 Ω
OFF	5 and 15 5 and 16 15 and 16	Less than 1 Ω
DOWN	13 and 15, 16 and 5	Less than 1 Ω

If NG, replace the main switch.

POWER WINDOW CONTROL SWITCH

GLASS/WINDOWS/MIRRORS

2. MAIN SWITCH RHD MODEL

Measure the switch resistance.

Driver's switch:

Switch position	Terminal No.	Standard
AUTO UP	12 and 6, 7 and 1	Less than 1 Ω
UP	12 and 6, 7 and 1	Less than 1 Ω
OFF	1 and 6 1 and 7 6 and 7	Less than 1 Ω
DOWN	12 and 7, 6 and 1	Less than 1 Ω
AUTO DOWN	12 and 7, 6 and 1	Less than 1 Ω

Front passenger's switch:

Switch position	Terminal No.	Standard
UP	12 and 3, 2 and 1	Less than 1 Ω
OFF	1 and 2 1 and 3 2 and 3	Less than 1 Ω
DOWN	12 and 2, 3 and 1	Less than 1 Ω

Rear left switch:

Switch position	Terminal No.	Standard
UP	12 and 10, 9 and 1	Less than 1 Ω
OFF	1 and 9 1 and 10 9 and 10	Less than 1 Ω
DOWN	12 and 9, 10 and 1	Less than 1 Ω

Rear right switch:

Switch position	Terminal No.	Standard
UP	12 and 14, 1 and 13	Less than 1 Ω
OFF	1 and 13 1 and 14 13 and 14	Less than 1 Ω
DOWN	12 and 13, 14 and 1	Less than 1 Ω

If NG, replace the main switch.

3. SUB-SWITCH

Measure the switch resistance.

Front passenger's door switch and rear door switch:

Switch position	Terminal No.	Standard
UP	8 and 5, 6 and 7	Less than 1 Ω
OFF	4 and 5, 6 and 7	Less than 1 Ω
DOWN	8 and 7, 4 and 5	Less than 1 Ω

If NG, replace the sub-switch.

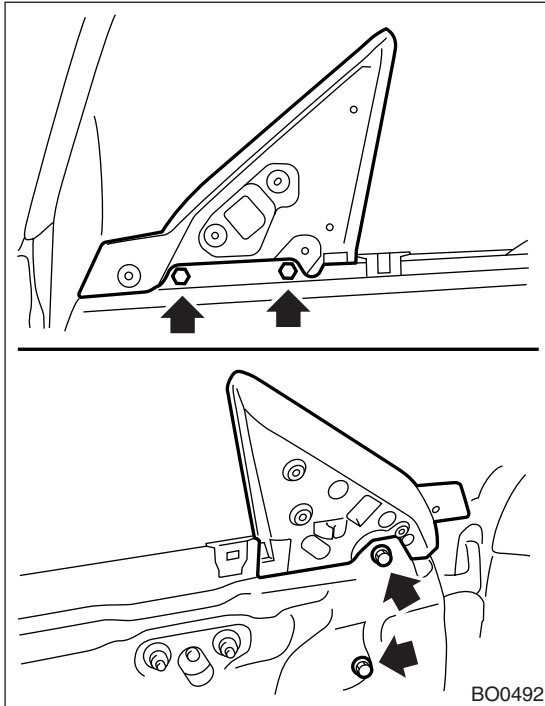
FRONT DOOR GLASS

GLASS/WINDOWS/MIRRORS

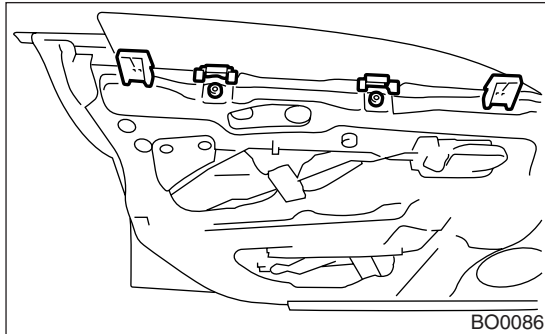
4. Front Door Glass

A: REMOVAL

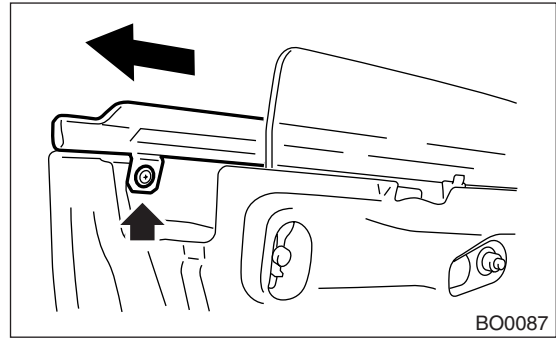
- 1) Remove the front door trim. <Ref. to EI-36, REMOVAL, Front Door Trim.>
- 2) Remove the sealing cover. <Ref. to EB-14, REMOVAL, Front Sealing Cover.>
- 3) Remove the outer mirror assembly. <Ref. to GW-18, REMOVAL, Outer Mirror Assembly.>
- 4) Remove the gusset.



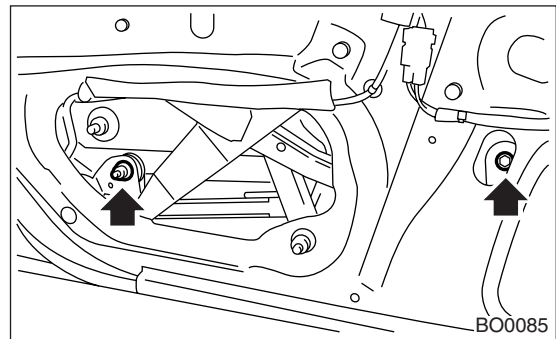
- 5) Remove the stabilizers and trim hooks.



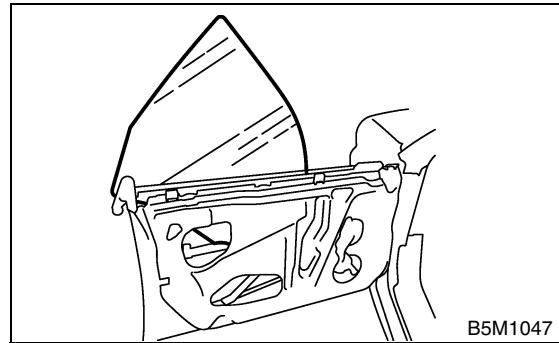
- 6) Remove the rear end of door weather strip and weather strip outer.



- 7) Operate the power window switch to move the glass to position shown in the figure, and then remove the two nuts from service holes.



- 8) Take out the door glass.



CAUTION:

- Do not turn the regulator in 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 the glass stay is placed securely in sash.

2) Adjust the front door glass. <Ref. to GW-13, ADJUSTMENT, Front Door Glass.>

Tightening torque:

Refer to COMPONENT in General Description. <Ref. to GW-4, FRONT DOOR GLASS, COMPONENT, General Description.> and <Ref. to GW-3, FIXED GLASS (WAGON), COMPONENT, General Description.>

C: ADJUSTMENT

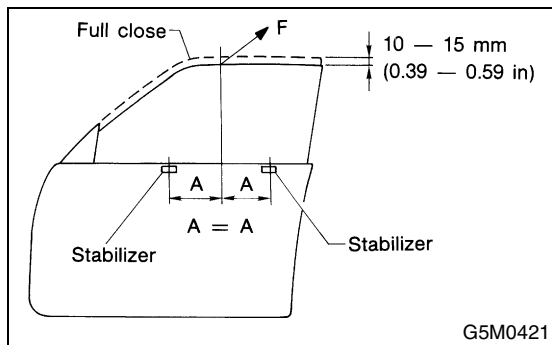
NOTE:

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.

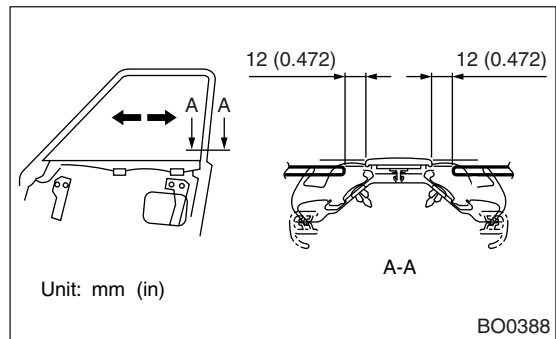
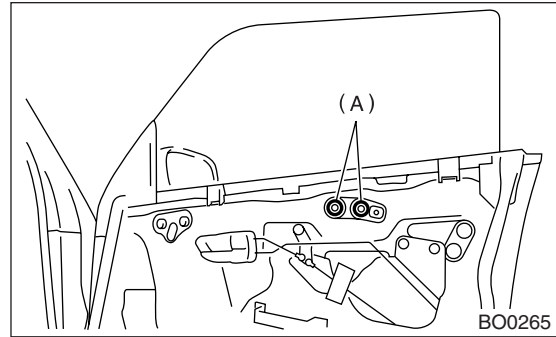
1) Temporarily tighten one adjusting bolt on one side of rear sash at the midpoint of slotted hole in the inner panel.

2) Temporarily tighten the regulator B-channel in a position at the top of slotted hole.

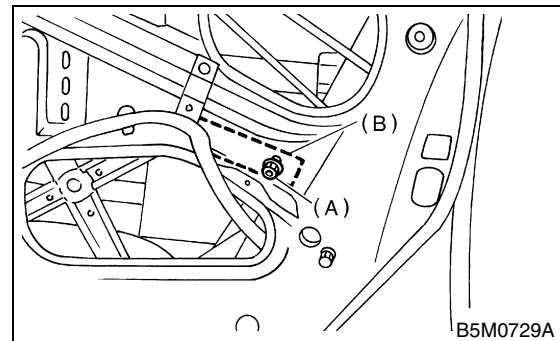
3) Lower the door glass 10 to 15 mm (0.39 to 0.59 in) from fully closed position. While applying outward pressure of 45.0 ± 4.9 N (4.6 ± 0.5 kg, 11.0 ± 1.1 lb) (F) to upper edge of glass above midpoint of two outer stabilizers, press the inner stabilizer at pressure of 10 ± 5 N (1.0 ± 0.5 kg, 0.2 ± 0.1 lb) to the glass, then secure it.



4) For adjustment of clearance between front glass and center pillar cover, loosen the nuts (A), and move the glass sash back and forward until clearance becomes the value shown.



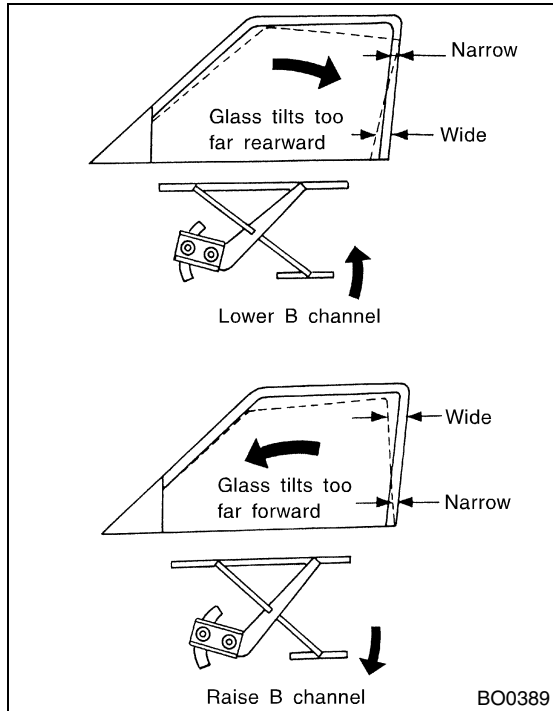
5) For adjustment of upper and lower ends of center pillar, loosen the adjusting nut (A) of B-channel (B).



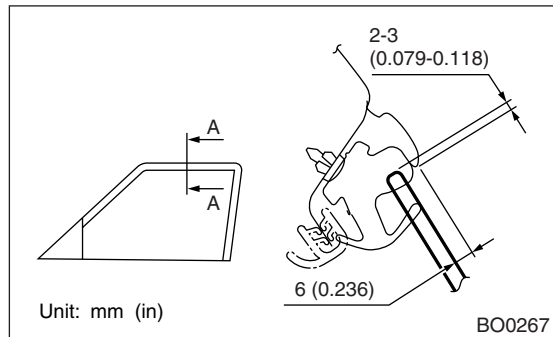
FRONT DOOR GLASS

GLASS/WINDOWS/MIRRORS

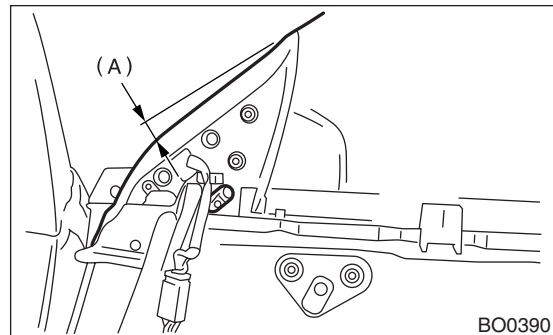
6) Adjust so that the upper and lower ends of center pillar are the same size.



7) For glass stroke adjustment, close the door, raise glass until positional relationship between glass and weatherstrip becomes as shown. And secure the glass so that the upper stopper lightly touches the glass holder.



For preventing wind noise, adjust the glass at the position where tip of gusset is raised up a little.



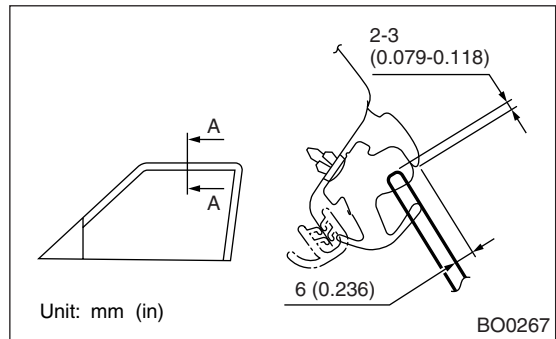
(A) 0-1.5 mm (0-0.059 in)

8) After stabilizer adjustment, carry out the 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:

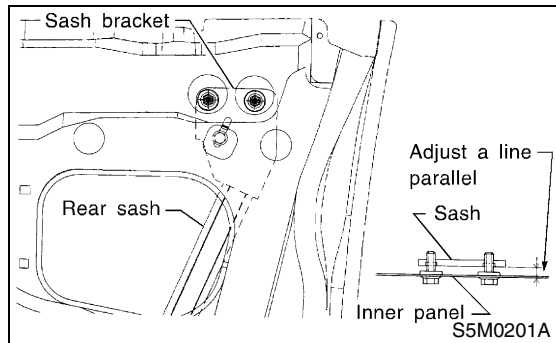
If two nuts are loosened at the same time, sash moves back and forth. Therefore, when one nut is adjusted, secure the other.

9) Make the same adjustment of two adjusting bolts of rear sash.



CAUTION:

Do not tilt the sash bracket to inner panel during adjustment. Otherwise smooth regulator operation cannot be achieved.

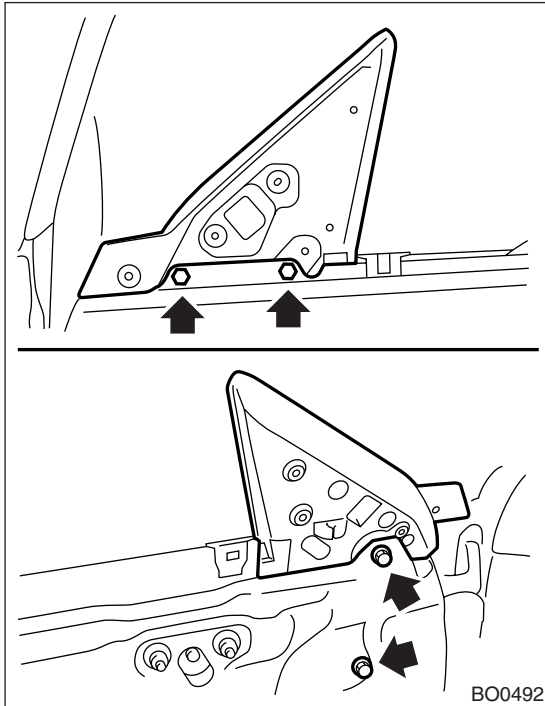


10) Make adjustment of front sash in the same manner as that of rear sash.

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 the nuts.
- 12) After adjustment to glass, close the door. 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 the gusset to prevent generation of wind noise.
- 13) During adjustments, loosen the other three clamping bolts.



- 14) After adjustment, tighten the bolts and nuts.

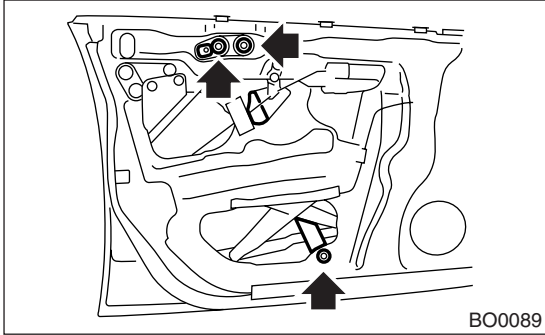
FRONT REGULATOR AND MOTOR ASSEMBLY

GLASS/WINDOWS/MIRRORS

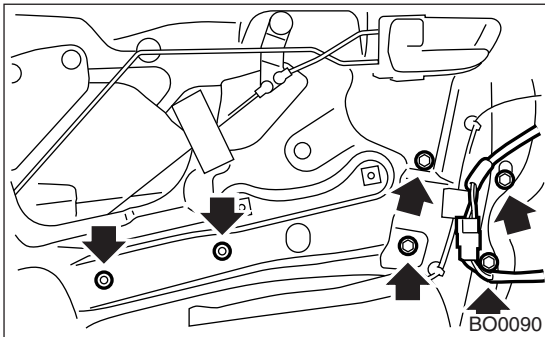
5. Front Regulator and Motor Assembly

A: REMOVAL

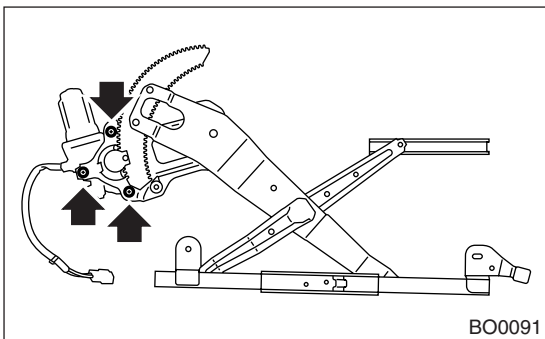
- 1) Remove the door glass. <Ref. to GW-12, REMOVAL, Front Door Glass.>
- 2) Loosen the nuts to remove rear sash.



- 3) Disconnect the motor connector.
- 4) Loosen the four bolts and two nuts to remove regulator assembly.



- 5) Loosen the screw to remove motor assembly.



B: INSTALLATION

- 1) Install in the reverse order of removal.
- 2) Adjust the front door glass. <Ref. to GW-13, ADJUSTMENT, Front Door Glass.>

Tightening torque:

Refer to COMPONENT in General Description. <Ref. to GW-4, FRONT DOOR GLASS, COMPONENT, General Description.>

C: INSPECTION

- 1) Make sure that the power window motor rotates properly when battery voltage is applied to the terminals of motor connector.
- 2) Change polarity of battery connections to terminals to ensure that the motor rotates in reverse direction.

REMOTE CONTROL MIRROR SYSTEM

GLASS/WINDOWS/MIRRORS

6. Remote Control Mirror System

A: SCHEMATIC

1. REMOTE CONTROL MIRROR LHD MODEL

<Ref. to WI-251, LHD MODEL, SCHEMATIC, Remote Controlled Rearview Mirror System.>

2. REMOTE CONTROL MIRROR RHD MODEL

<Ref. to WI-252, RHD MODEL, SCHEMATIC, Remote Controlled Rearview Mirror System.>

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

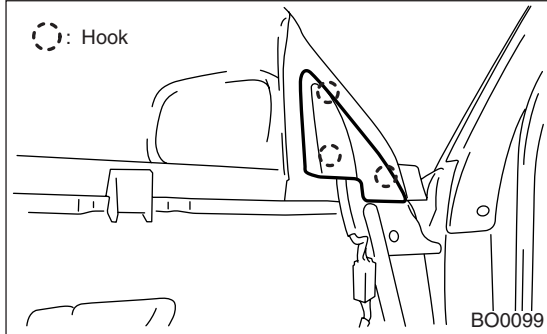
OUTER MIRROR ASSEMBLY

GLASS/WINDOWS/MIRRORS

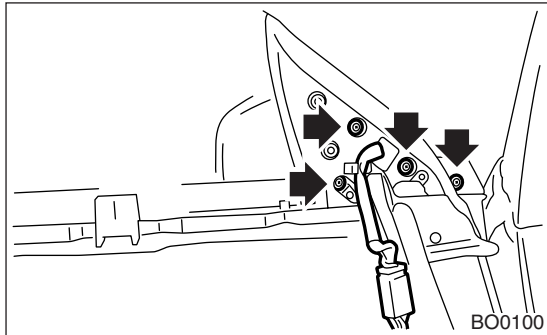
7. Outer Mirror Assembly

A: REMOVAL

- 1) Remove the door trim. <Ref. to EI-36, REMOVAL, Front Door Trim.>
- 2) Remove the mirror gusset cover.



- 3) Disconnect the mirror connector.
- 4) Loosen the screws to remove mirror assembly.



B: INSTALLATION

Install in the reverse order of removal.

OUTER MIRROR ASSEMBLY

GLASS/WINDOWS/MIRRORS

C: INSPECTION

Check to ensure that the rearview mirror moves properly when battery voltage is applied to terminals.

Mirror heater not-equipped model:

Switch position	Terminal No.
OFF	—
UP	4 (+) and 6 (-)
DOWN	6 (+) and 4 (-)
LEFT	5 (+) and 6 (-)
RIGHT	6 (+) and 5 (-)

If NG, replace the mirror.

Mirror heater equipped model:

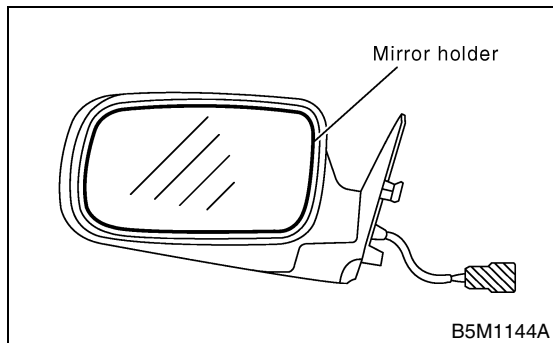
Switch position	Terminal No.
OFF	—
UP	6 (+) and 8 (-)
DOWN	8 (+) and 6 (-)
LEFT	7 (+) and 8 (-)
RIGHT	8 (+) and 7 (-)

If NG, replace the mirror.

8. Outer Mirror

A: REPLACEMENT

- 1) Remove the door mirror assembly. <Ref. to GW-18, 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 double-stick 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.

REMOTE CONTROL MIRROR SWITCH

GLASS/WINDOWS/MIRRORS

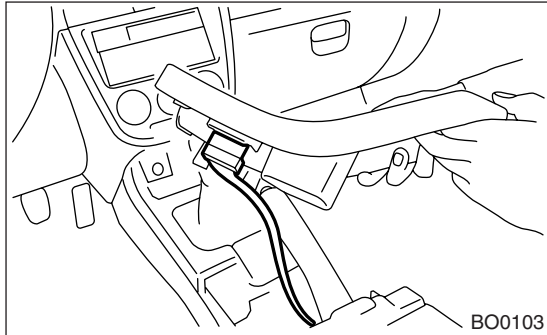
9. Remote Control Mirror Switch

B: INSTALLATION

Install in the reverse order of removal.

A: REMOVAL

- 1) Remove the console cover.
- 2) Disconnect the connector.

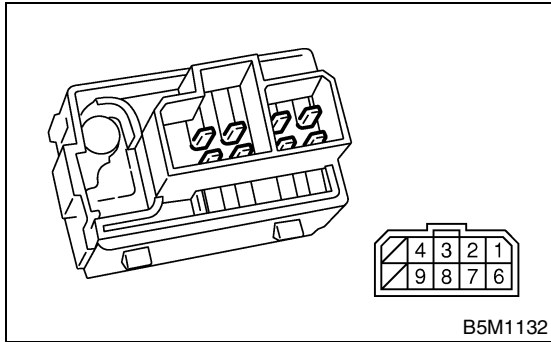


REMOTE CONTROL MIRROR SWITCH

GLASS/WINDOWS/MIRRORS

C: INSPECTION

Move the rearview mirror switch to each position and check continuity between terminals.



Change over switch right position:

Switch position	Terminal No.	Standard
OFF	—	More than 1M Ω
UP	4 and 6, 2 and 1	Less than 1 Ω
DOWN	6 and 2, 4 and 1	Less than 1 Ω
LEFT	4 and 8, 2 and 1	Less than 1 Ω
RIGHT	8 and 2, 4 and 1	Less than 1 Ω

Change over switch left position:

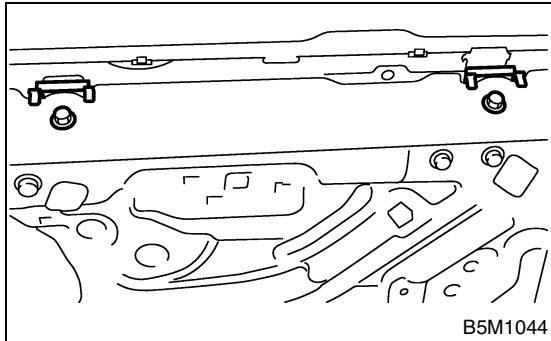
Switch position	Terminal No.	Standard
OFF	—	More than 1M Ω
UP	4 and 7, 2 and 1	Less than 1 Ω
DOWN	7 and 2, 4 and 1	Less than 1 Ω
LEFT	4 and 9, 2 and 1	Less than 1 Ω
RIGHT	9 and 2, 4 and 1	Less than 1 Ω

If NG, replace the switch.

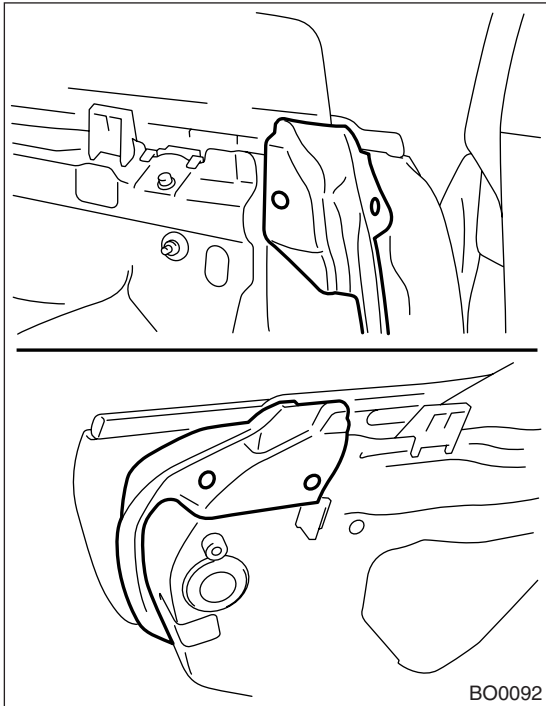
10. Rear Door Glass

A: REMOVAL

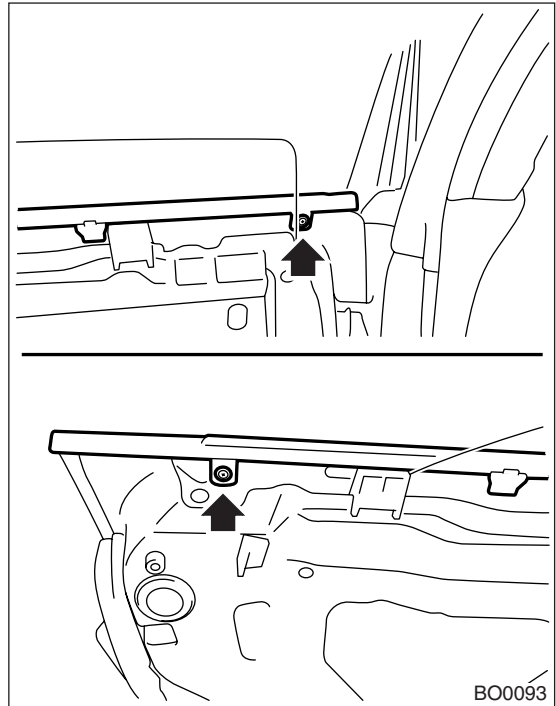
- 1) Remove the rear door trim. <Ref. to EI-37, REMOVAL, Rear Door Trim.>
- 2) Remove the sealing cover. <Ref. to EB-17, REMOVAL, Rear Sealing Cover.>
- 3) Remove the stabilizer.



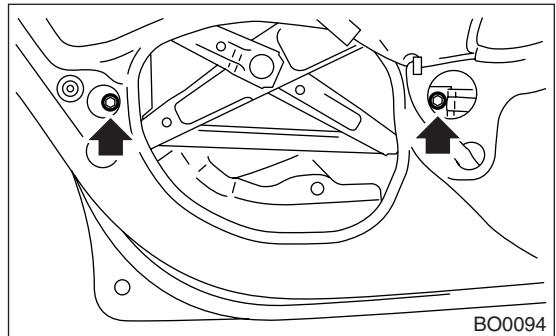
- 4) Remove the door weather strip.



- 5) Loosen the two screws to remove the weather strip outer.



- 6) Operate the power window switch to remove glass as shown in the figure, and then remove two nuts.



- 7) Loosen the two rear sash installation nuts, and then move the rear sash backward.
- 8) Remove the glass.

CAUTION:
Avoid impact and damage to the glass.

REAR DOOR GLASS

GLASS/WINDOWS/MIRRORS

B: INSTALLATION

1) Install in the reverse order of removal.

CAUTION:

Make sure that the glass stay is placed securely in sash.

2) Adjust the rear door glass. <Ref. to GW-24, ADJUSTMENT, Rear Door Glass.>

Tightening torque:

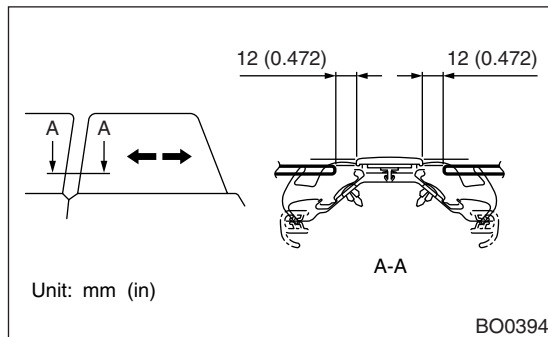
Refer to **COMPONENT in General Description**. <Ref. to GW-5, REAR DOOR GLASS, COMPONENT, General Description.> and <Ref. to GW-4, FRONT DOOR GLASS, COMPONENT, General Description.>

C: ADJUSTMENT

NOTE:

The 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 the rear glass are given below.

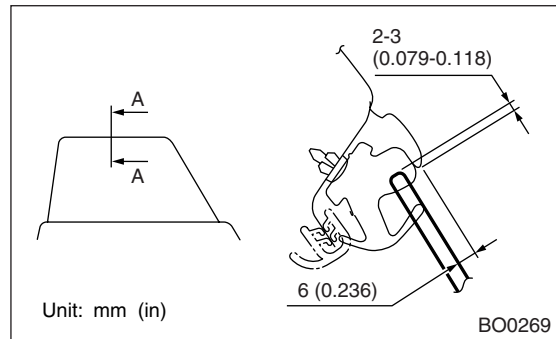
1) Adjust the glass position using the following dimensions as a guide line.



CAUTION:

- If the dimensions are smaller than the given dimensions, glass may get caught in weatherstrip during lifting/lowering operation. In the worst case, it may cause the glass not to be opened fully.
- After adjustment, move the glass up and down to check whether it is caught.

2) Adjust the crimp of glass using the following dimensions as a guide line.



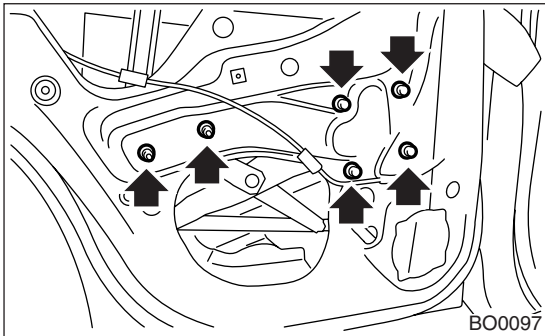
CAUTION:

- If the 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 the glass up and down to check whether it is caught.

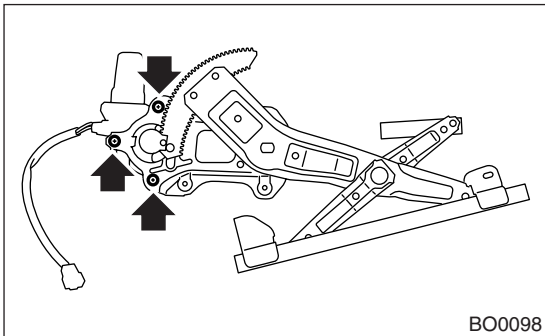
11. Rear Regulator and Motor Assembly

A: REMOVAL

- 1) Remove the door glass. <Ref. to GW-23, REMOVAL, Rear Door Glass.>
- 2) Remove the front sash.
- 3) Disconnect the motor connector.
- 4) Loosen the four bolts and two nuts to remove regulator assembly.



- 5) Loosen the screws to remove motor assembly.



B: INSTALLATION

- 1) Install in the reverse order of removal.
- 2) Adjust the rear door glass. <Ref. to GW-24, ADJUSTMENT, Rear Door Glass.>

Tightening torque:

Refer to COMPONENT in General Description. <Ref. to GW-5, REAR DOOR GLASS, COMPONENT, General Description.>

C: INSPECTION

- 1) Make sure that the power window motor rotates properly when battery voltage is applied to the terminals of motor connector.
- 2) Change polarity of battery connections to the terminals to ensure that the motor rotates in reverse direction.

WINDSHIELD GLASS

GLASS/WINDOWS/MIRRORS

12. Windshield Glass

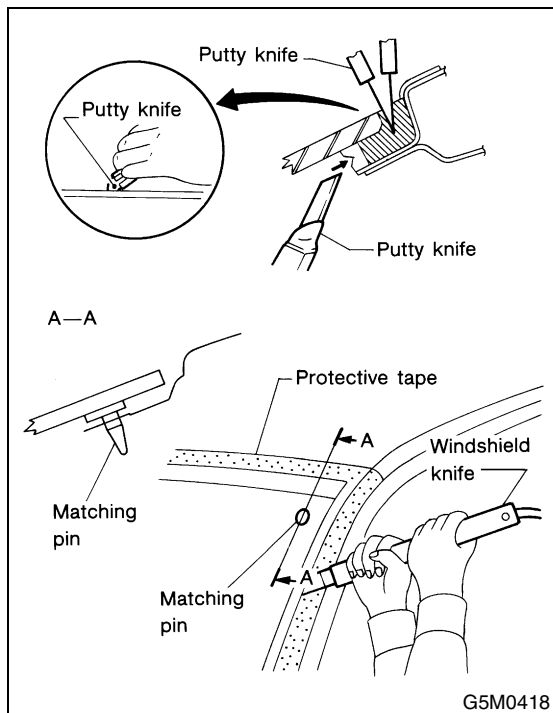
A: REMOVAL

1. USING WINDSHIELD KNIFE

- 1) Remove the cowl panel. <Ref. to EI-32, REMOVAL, Cowl Panel.>
- 2) Remove the glass molding.
- 3) Tape the body side of the circumference of windshield glass for protection.
- 4) Apply sufficient amount of soapy water to the adhesive layer.
- 5) Insert the windshield knife into the adhesive layer.
- 6) While holding the knife edge and windshield glass edge at a right angle, move the windshield knife in parallel to the windshield glass edge along face and edge of windshield glass to cut the adhesive layer.

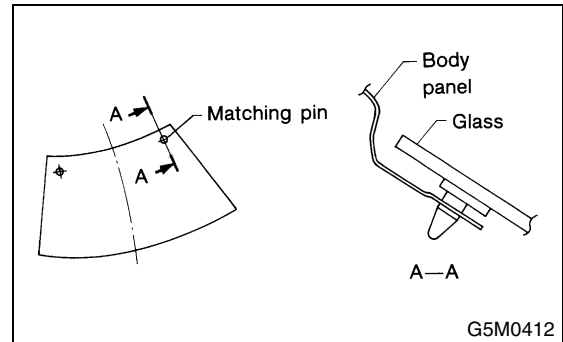
CAUTION:

- Do not twist the windshield knife.
- Cutting of adhesive layer shall be started with wider gap between windshield glass and body.



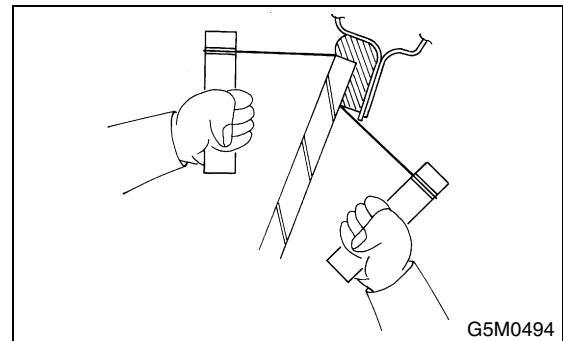
NOTE:

Because the matching pins are bonded to the corners of glass, use piano wire to cut the pin.



2. USING PIANO WIRE

- 1) Remove the cowl panel. <Ref. to EI-32, REMOVAL, Cowl Panel.>
- 2) Remove the roof molding and upper front molding.
- 3) Tape the body side of the circumference of windshield glass for protection.
- 4) Make a hole in the adhesive layer using a drill or knife.
- 5) Pass the 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:

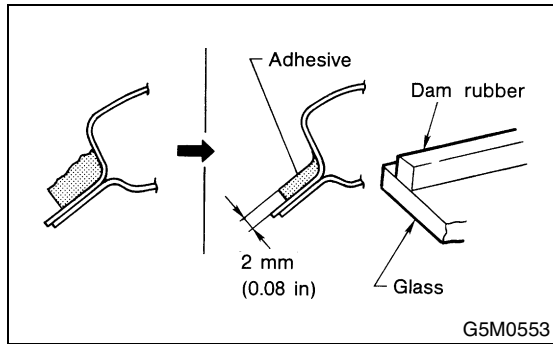
- Do not tightly pull the piano wire against the windshield glass edge.
- Be careful not to damage the interior and exterior parts.
- When removal is made with area close to instrument panel, place a protection plate over it. Pay particular attention to the removal.
- Do not cross piano wires. Otherwise they may be cut.

B: INSTALLATION

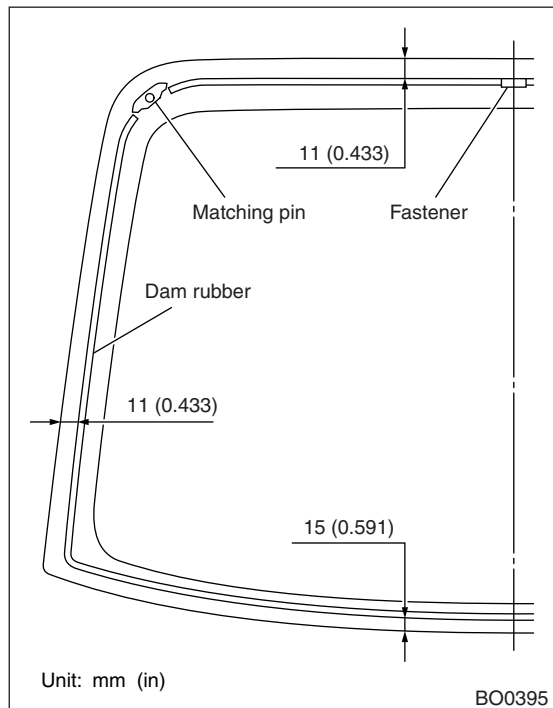
- 1) Clean the external circumference of windshield glass with alcohol or white gasoline.
- 2) Remove the adhesive layer on the body using cutter knife to obtain smooth face 2 mm (0.08 in) thick.

CAUTION:

Be careful not to damage the body and paint surface.

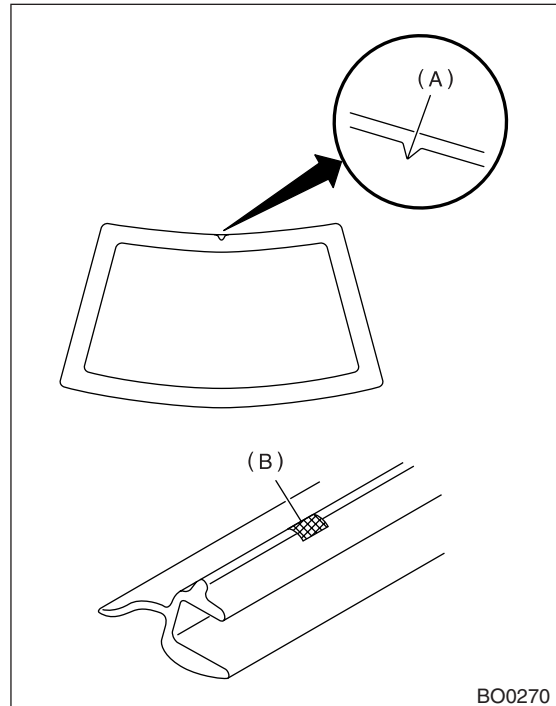


- 3) Clean the body with alcohol or white gasoline to remove thoroughly chips, dusts, and dirt from body face.
- 4) Place the glass on body.
- 5) Adjust the glass position to make uniform clearance between body and glass in four corners.
- 6) Place the matching pins and body on glass.



- 7) Remove the glass from body.

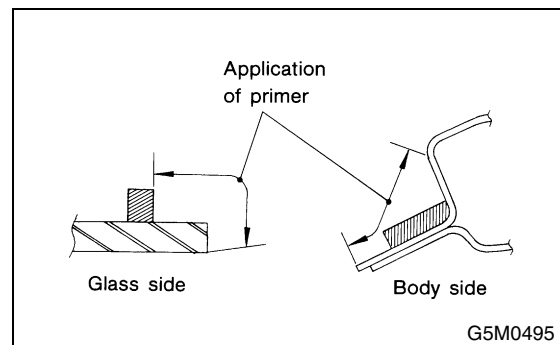
- 8) Fit the molding mark (B) to notch (A).



- 9) Apply primer to the adhesive layer of glass using sponge.
- 10) Apply primer to the adhesive layer of body.

CAUTION:

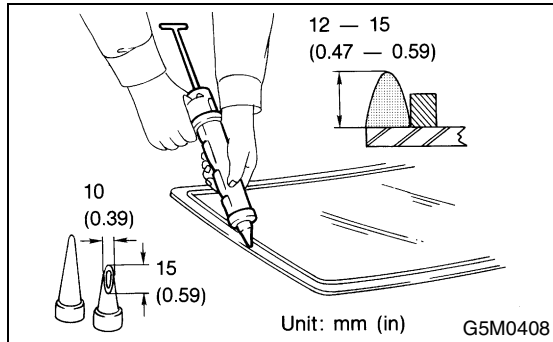
- Primer once attached to the painted surface of the body and internal trim is hard to wipe off. Mask the circumference of such areas.
- Let the primer dry for about ten minutes before installing the glass.
- Do not touch the surface coated with primer.



WINDSHIELD GLASS

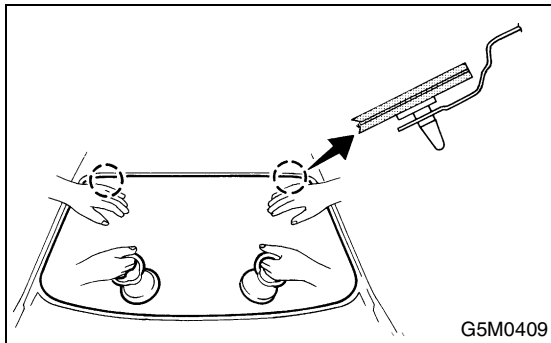
GLASS/WINDOWS/MIRRORS

11) Cut off the cartridge nozzle tip and set it in sealant gun as shown.



12) Apply adhesive to the glass end surface as shown.

13) Fit the matching pins using suction rubber cup to install the windshield glass.



14) Lightly press the windshield glass for tight fit.

15) Make the adhesive surface flush using spatula.

CAUTION:

- When the door is opened/closed after glass is bonded, always lower the door glass and then open/close it carefully.
- Move the vehicle slowly.

16) After completion of all work, allow the 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 the cowl panel. <Ref. to EI-32, INSTALLATION, Cowl Panel.>

13.Rear Gate Glass

A: REMOVAL

- 1) Remove the rear wiper motor. <Ref. to WW-18, REMOVAL, Rear Wiper Motor.>
- 2) Remove the electrical connector from rear defogger terminal.
- 3) Remove the glass in the same procedure as for windshield glass. <Ref. to GW-26, 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.

- 4) After completion of all work, allow the vehicle to stand for about 24 hours.

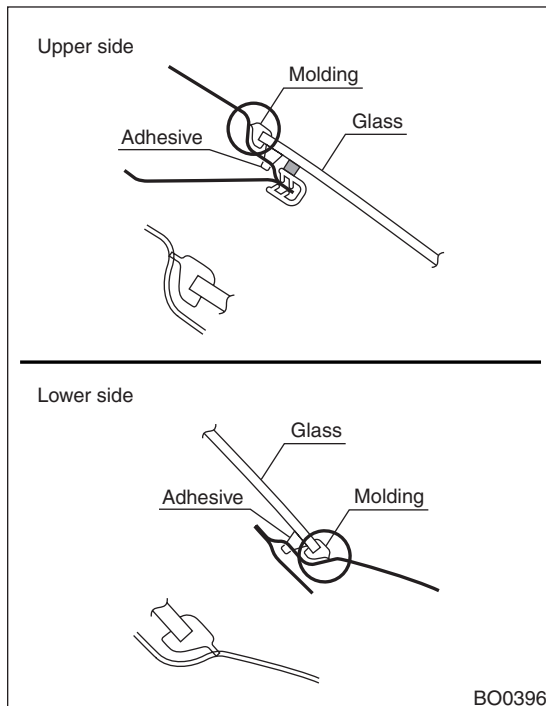
NOTE:

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.

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 the rear defogger terminals.
- 6) Install the rear wiper. <Ref. to WW-18, INSTALLATION, Rear Wiper Motor.>



CAUTION:

- When the door is opened/closed after glass is bonded, always lower the door glass and then open/close it carefully.
- Move the vehicle slowly.

REAR WINDOW GLASS

GLASS/WINDOWS/MIRRORS

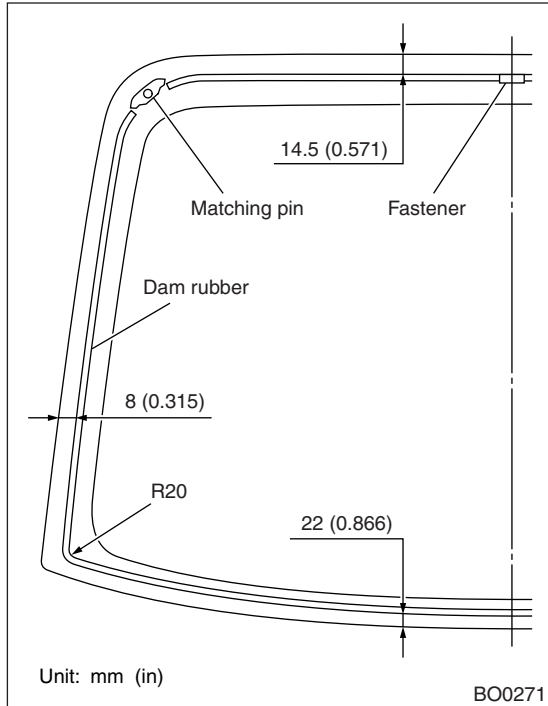
14. Rear Window Glass

A: REMOVAL

- 1) Disconnect the electrical connectors from rear defogger terminals.
- 2) Remove the glass in the same procedure as for windshield glass. <Ref. to GW-26, REMOVAL, Windshield Glass.>

B: INSTALLATION

- 1) Bond the dam rubber and matching pin.



- 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.

- 2) Install the glass in the same procedure as for windshield glass. <Ref. to GW-27, INSTALLATION, Windshield Glass.>
- 3) Connect the rear defogger terminals.

CAUTION:

- **When the door is opened/closed after glass is bonded, always lower the door glass and then open/close door carefully.**
- **Move the vehicle slowly.**

- 4) After completion of all work, allow the 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.

15.Rear Window Defogger System

A: SCHEMATIC

1. REAR WINDOW DEFOGGER LHD MODEL

<Ref. to WI-248, LHD MODEL, SCHEMATIC, Rear Window Defogger System.>

2. REAR WINDOW DEFOGGER RHD MODEL

<Ref. to WI-249, RHD MODEL, SCHEMATIC, Rear Window Defogger System.>

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) Defogger wire (7) Wire harness

REAR WINDOW DEFOGGER

GLASS/WINDOWS/MIRRORS

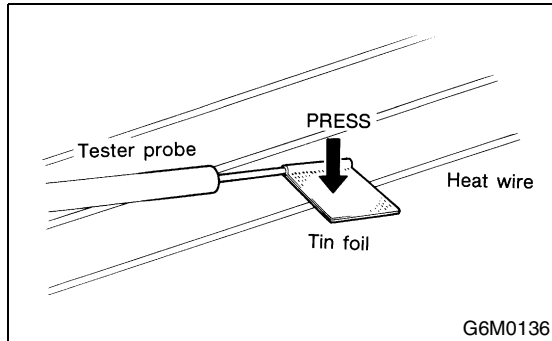
16. Rear Window Defogger

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.

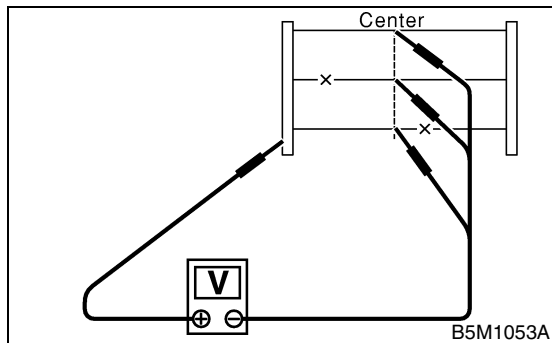
- 1) Turn the ignition switch to ON.
- 2) Turn the defogger switch to ON.
- 3) Wrap the tips of tester pins with aluminum foil to avoid damage to heat wire.



- 4) Measure the voltage at wire center with DC volt-meter.

Standard voltage:

Approx. 6 volts



Voltage	Criteria
Approx. 6 V	OK
Approx. 12 V or 0 V	Broken

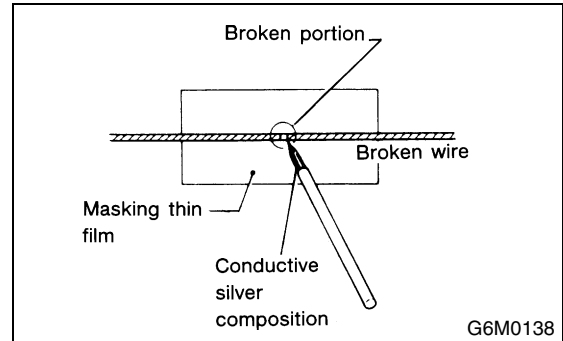
NOTE:

- 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 the negative lead along the wire up to 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 the 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.

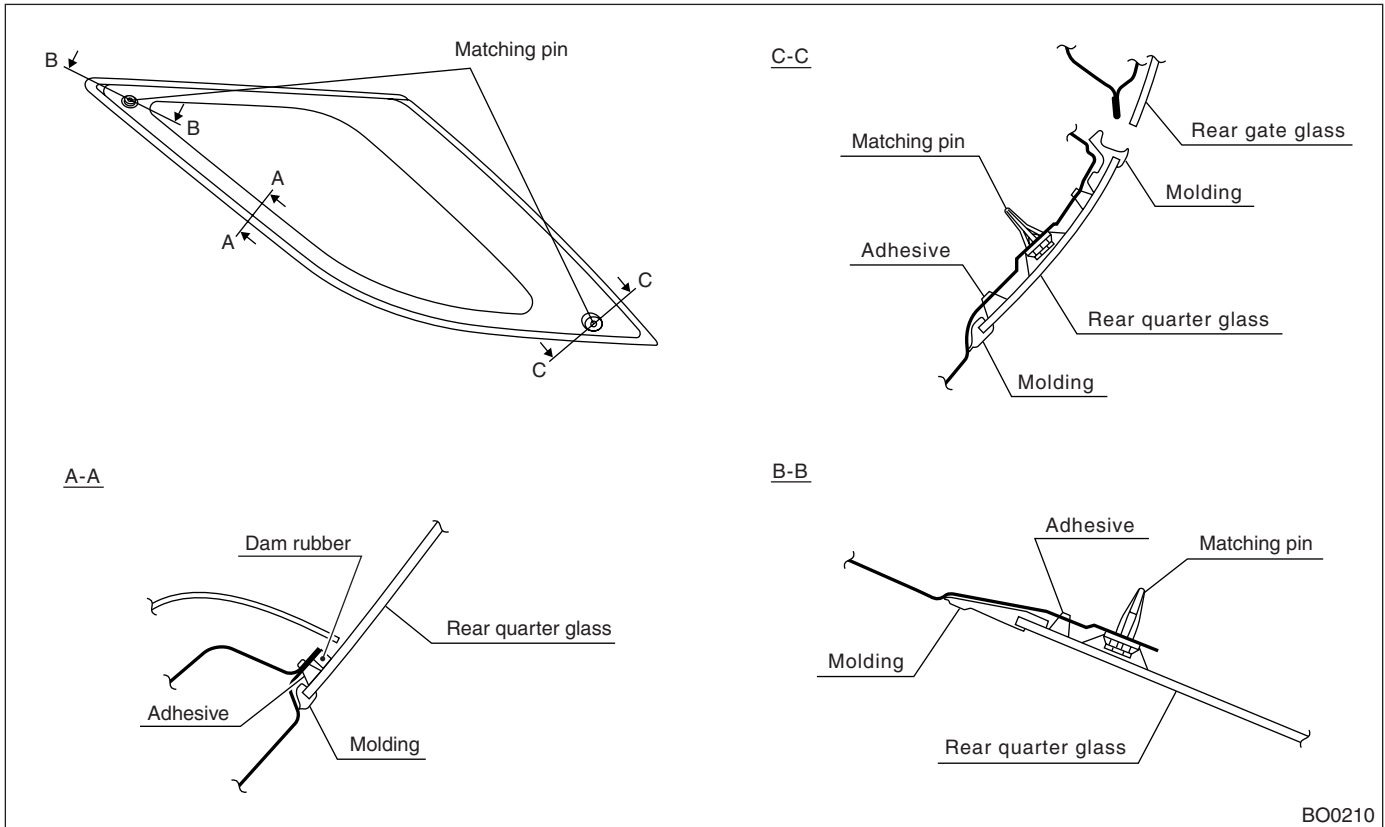


- 4) After repair, check the wire.

17.Rear Quarter Glass

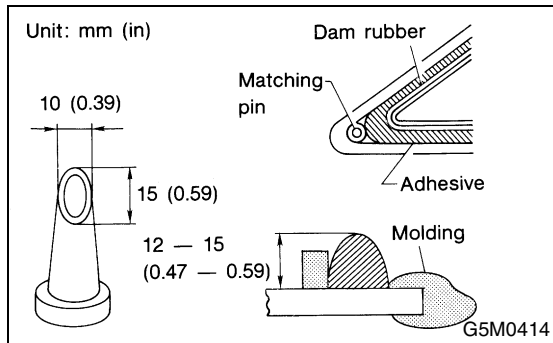
A: REMOVAL

Remove the glass in the same procedure as for windshield glass. <Ref. to GW-26, REMOVAL, Windshield Glass.>



B: INSTALLATION

1) Cut off the nozzle tip as shown in the figure.



2) Install the glass in the same procedure as for windshield glass. <Ref. to GW-27, INSTALLATION, Windshield Glass.>

CAUTION:

- When the door is opened/closed after glass is bonded, always lower the door glass and then open/close it carefully.
- Move the vehicle slowly.

3) After completion of all work, allow the 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.

18.Roof Window Glass

A: REMOVAL

<Ref. to SR-5, REMOVAL, Sunroof Lid.>

B: INSTALLATION

<Ref. to SR-5, INSTALLATION, Sunroof Lid.>

C: ADJUSTMENT

<Ref. to SR-5, ADJUSTMENT, Sunroof Lid.>

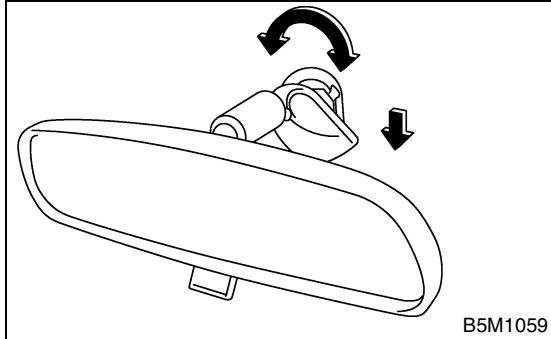
19.Inner Rearview Mirror

A: REMOVAL

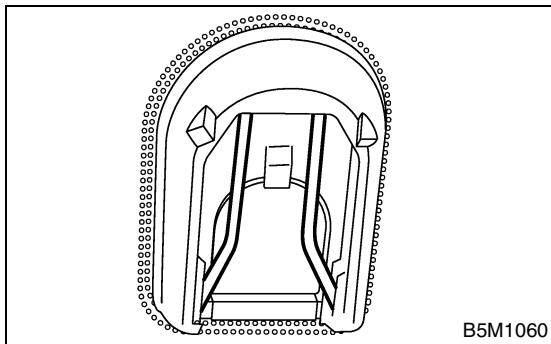
NOTE:

The spring cannot be reused. Prepare a new spring before removal.

1) Turn the mirror base 90 degrees clockwise or counterclockwise to remove it.



2) Remove the 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 the mirror be damaged.

Do not let the spring deteriorate.

INNER REARVIEW MIRROR

GLASS/WINDOWS/MIRRORS

BODY STRUCTURE

BS

	Page
1. General Description	2
2. Datum Points.....	3
3. Datum Dimensions.....	11



GENERAL DESCRIPTION

BODY STRUCTURE

1. General Description

A: PREPARATION TOOL

TOOL NAME	REMARKS
Tram tracking gauge	Used for measuring dimension.
Tape measure	Used for measuring dimension.

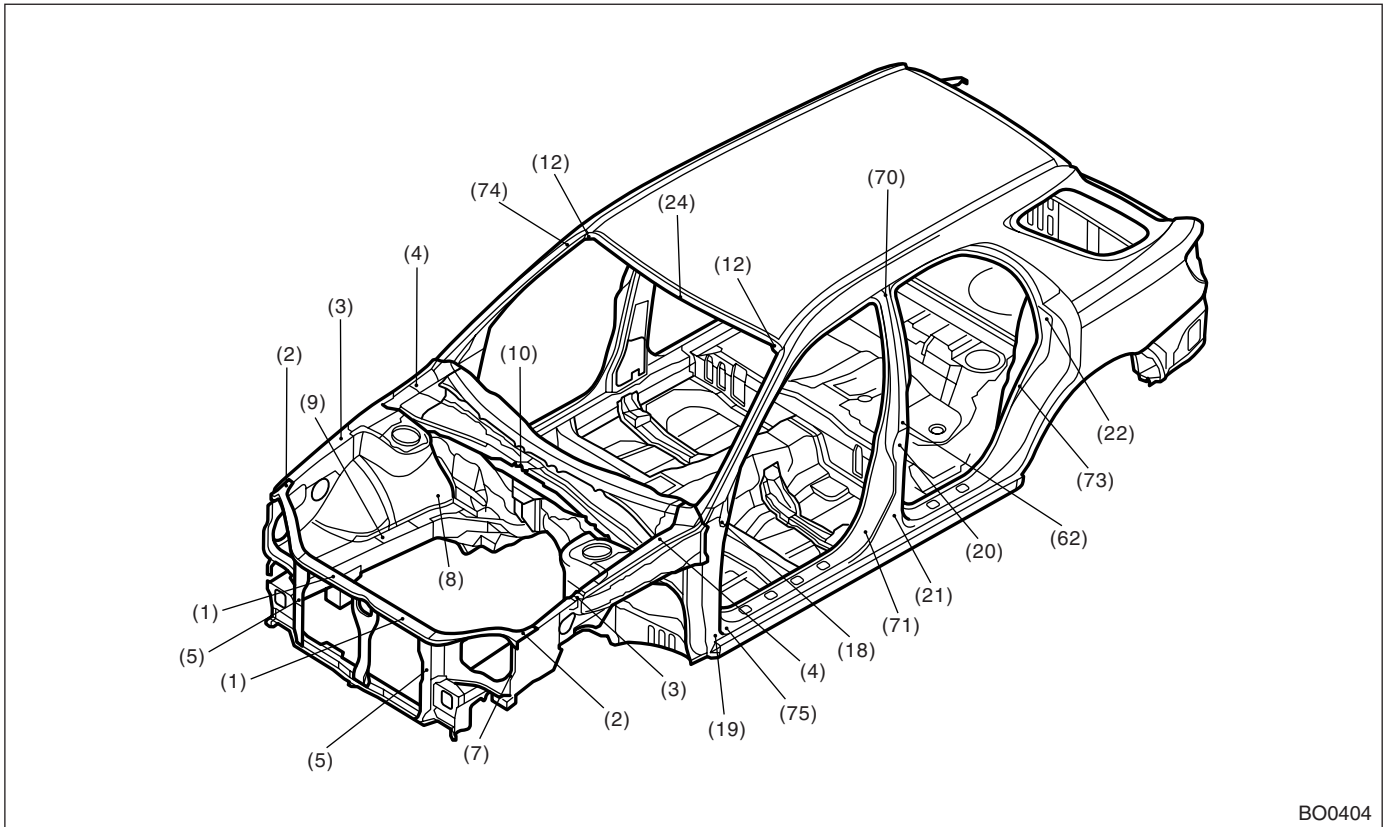
2. Datum Points

A: LOCATION

NOTE:

- Datum points are specified for body repair.
- Guide holes, locators, and indents are provided to facilitate panel replacement and to increase alignment accuracy.
- Both right and left reference points are symmetrical.

1. WAGON/SEDAN



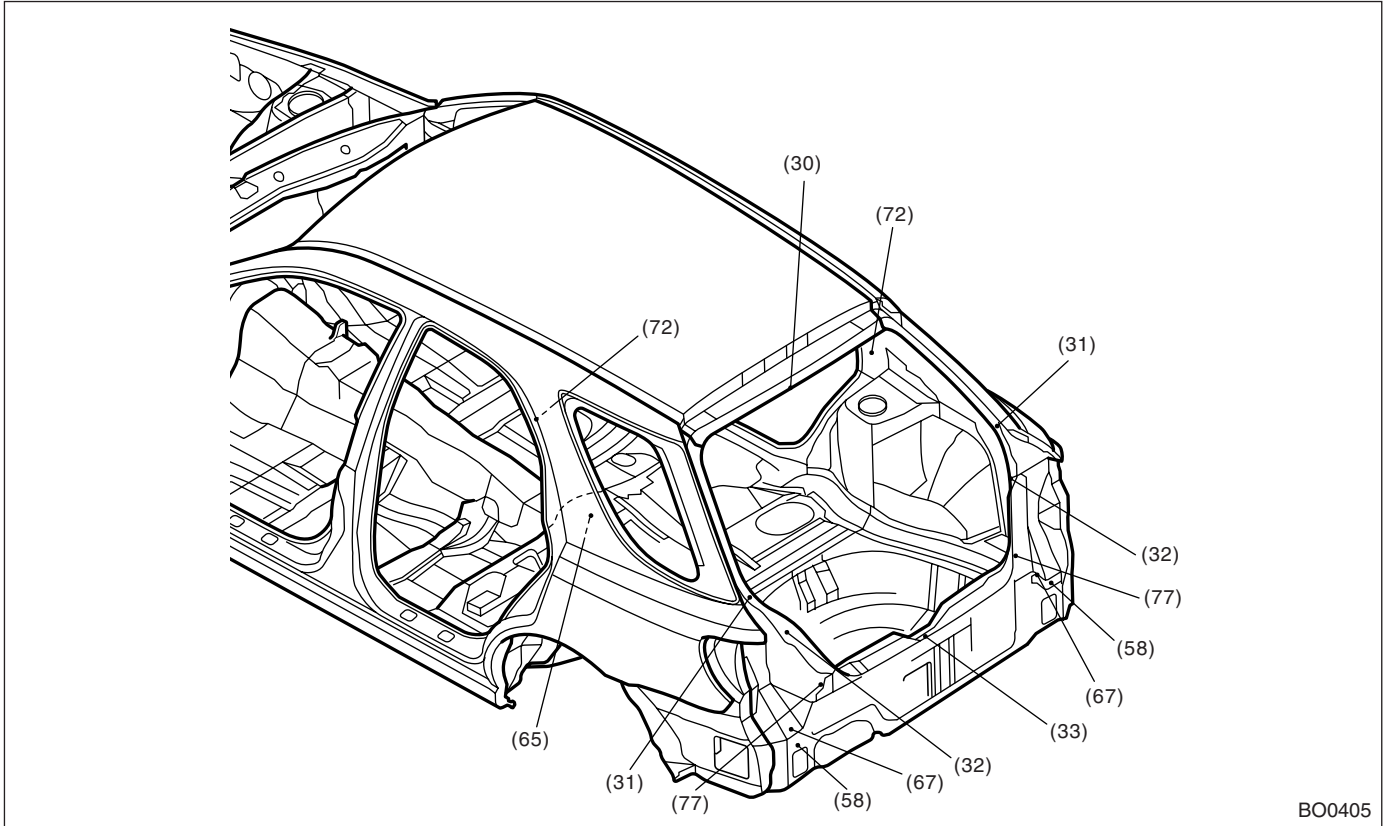
BO0404

- | | | |
|--|--|--|
| (1) Radiator attaching hole 12 mm (0.47 in) dia. (Symmetrical) | (10) Cowl panel attaching hole 6 mm (0.24 in) dia. (Vehicle center) | (24) Roof panel repair locator hollow |
| (2) Fender attaching hole 7 mm (0.28 in) dia. (Symmetrical) | (12) Front glass attaching hole Right 6.5 mm (0.256 in) dia. Left 6.5 × 10 mm (0.256 × 0.39 in) dia. | (62) Belt anchor attaching hole 11 mm (0.43 in) dia. (Symmetrical) |
| (3) Fender attaching hole 10 mm (0.39 in) dia. (Symmetrical) | (18) Fender attaching hole 12 mm (0.47 in) dia. (Symmetrical) | (70) Trim clip attaching hole 8.5 mm (0.335 in) dia. (Symmetrical) |
| (4) Hood hinge attaching hole 12 mm (0.47 in) dia. (Symmetrical) | (19) Fender attaching hole 12 mm (0.47 in) dia. (Symmetrical) | (71) Harness clip attaching hole 7 mm (0.28 in) dia. (Symmetrical) |
| (5) Radiator panel side gauge hole 20 mm (0.79 in) dia. (Symmetrical) | (20) Outer panel center pillar gauge hole 12 mm (0.47 in) dia. (Symmetrical) | (73) Harness clip attaching hole 7 mm (0.28 in) dia. (Symmetrical) |
| (7) Fender attaching hole 9 mm (0.35 in) dia. (Symmetrical) | (21) Outer panel center pillar gauge hole 12 mm (0.47 in) dia. (Symmetrical) | (74) Trim clip attaching hole 10 mm (0.39 in) dia. (Symmetrical) |
| (8) Gauge hole 12 mm (0.47 in) dia. (Symmetrical) | (22) Weather strip patch attaching hole 5.2 mm (0.205 in) dia. (Symmetrical) | (75) Insulator attaching hole 8 mm (0.31 in) dia. (Symmetrical) |
| (9) Front suspension cross member attaching hole 12.4 mm (0.488 in) dia. (Symmetrical) | | |

DATUM POINTS

BODY STRUCTURE

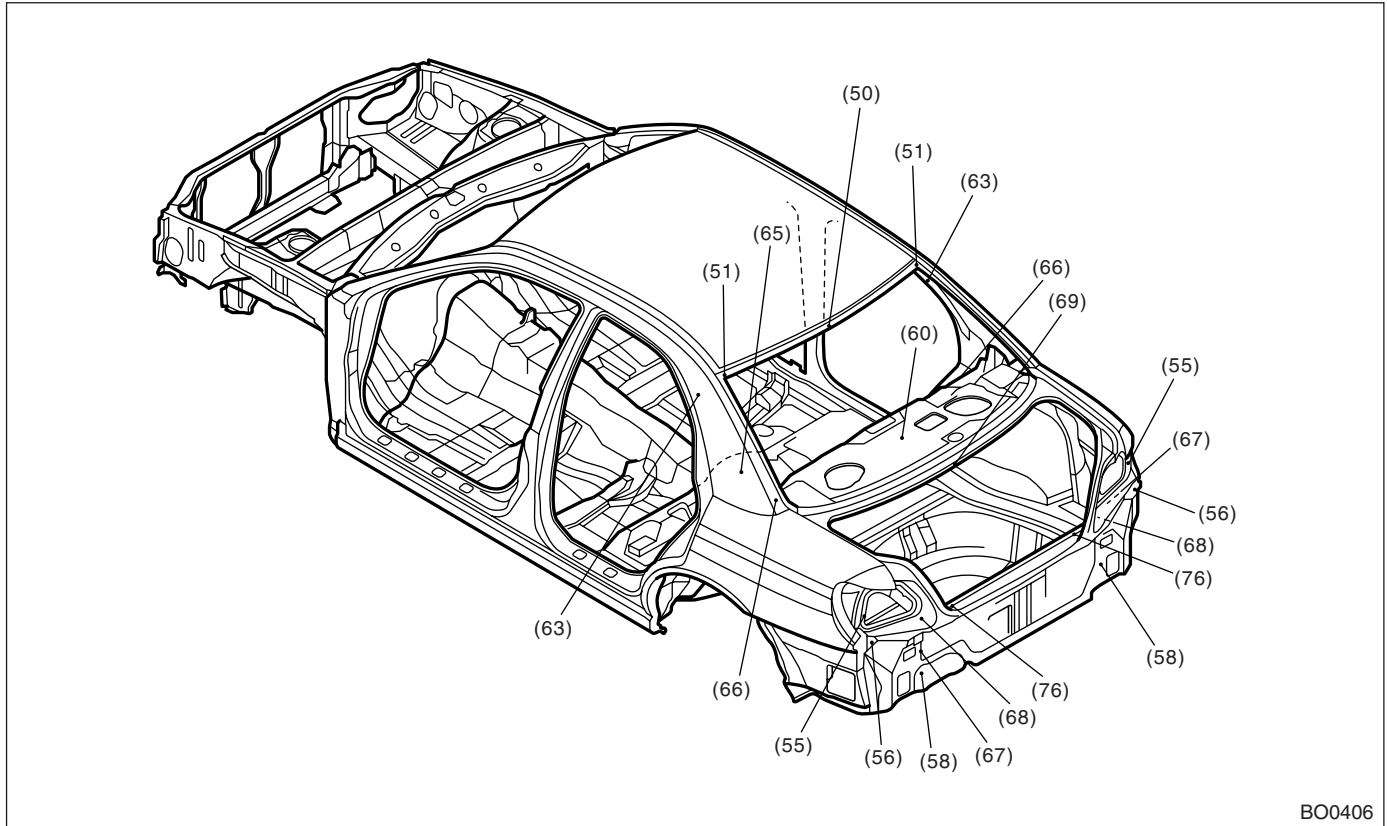
2. WAGON (REAR SECTION)



BO0405

- | | | |
|---|--|--|
| (30) Child anchor attaching hole 11 mm (0.43 in) dia. | (33) Two striker attaching hole 15 mm (0.59 in) dia. | (67) Gusset floor rear side gauge hole 11.5 mm (0.453 in) dia. (Symmetrical) |
| (31) Washer hose attaching hole Left 7 mm (0.28 in) dia. | (58) Rear bumper plate nut attaching hole 11 mm (0.43 in) dia. (Symmetrical) | (72) Trim upper clip attaching hole 8.5 mm (0.335 in) dia. (Symmetrical) |
| (32) Rear combination light mounting hole 7 mm (0.28 in) dia. (Symmetrical) | (65) Floor mat clip attaching hole 8 mm (0.31 in) dia. | (77) Harness clip attaching hole 7 mm (0.28 in) dia. (Symmetrical) |

3. SEDAN (REAR SECTION)



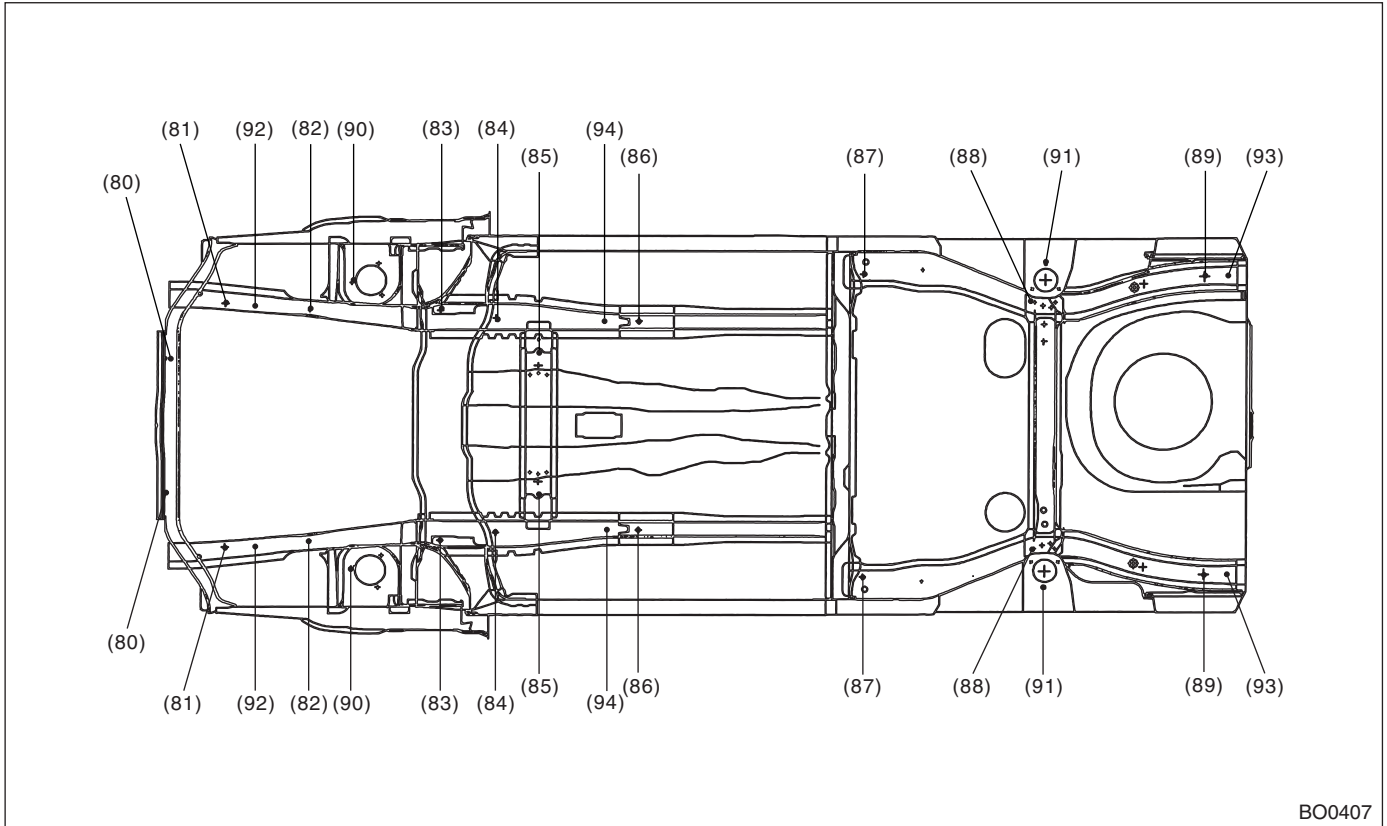
BO0406

- | | | |
|--|--|--|
| (50) Repair locator hollow (Vehicle center) | (58) Rear bumper attaching hole 11 mm (0.43 in) dia. (Symmetrical) | (67) Gusset floor rear side gauge hole 11.5 mm (0.453 in) dia. (Symmetrical) |
| (51) Glass attaching hole Right 6.5 mm (0.256 in) dia. Left 6.5 × 10 mm (0.256 × 0.39 in) dia. | (60) Choke coil harness attaching hole 5.4 mm (0.213 in) dia. | (68) Rear skirt inner side gauge hole 10 mm (0.39 in) dia. (Symmetrical) |
| (55) Rear combination light mounting hole 8 mm (0.31 in) dia. (Symmetrical) | (63) Feeder line fixing hole 7 mm (0.28 in). (Symmetrical) | (69) Rear panel (reinforcement) repair locator hollow (Vehicle center) |
| (56) Bumper attaching hole 7 mm (0.28 in) dia. (Symmetrical) | (65) Floor mat clip attaching hole 8 mm (0.31 in) dia. | (76) Press location hole 15 mm (0.59 in) dia. (Symmetrical) |
| | (66) Bulkhead rear gauge hole 10 mm (0.39 in) dia. (Symmetrical) | |

DATUM POINTS

BODY STRUCTURE

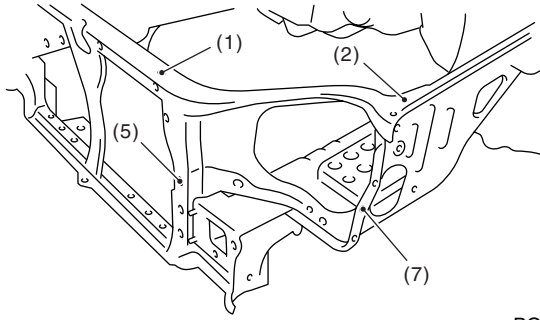
4. UNDERBODY SECTION



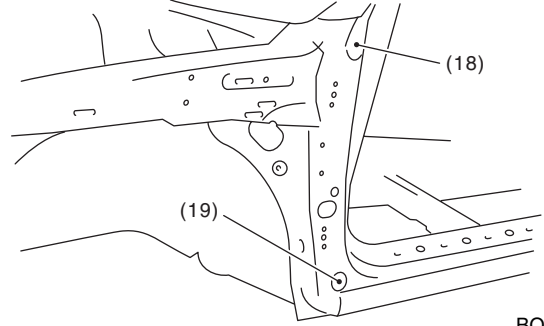
- | | | |
|--|--|--|
| (80) Radiator lower frame gauge hole 12 mm (0.47 in) dia. (Symmetrical) | (85) Transmission mount attaching hole 14 mm (0.55 in) dia. | (90) Strut mount attaching hole 9.5 mm (0.374 in) dia. (Symmetrical) |
| (81) Side frame gauge hole 20 mm (0.79 in) dia. (Symmetrical) | (86) Side frame gauge hole 18 mm (0.71 in) dia. (Symmetrical) | (91) Strut mount attaching hole 10 mm (0.39 in) dia. (Symmetrical) |
| (82) Front crossmember (Ft) attaching hole 12.4 mm (0.488 in) dia. (Symmetrical) | (87) Rear differential attaching hole 16 mm (0.63 in) dia. (Symmetrical) | (92) Sub frame attaching hole 16 mm (0.63 in) dia. (Symmetrical) |
| (83) Suspension attaching hole 17 mm (0.67 in) dia. (Symmetrical) | (88) Rear suspension attaching hole 16 mm (0.63 in) dia. (Symmetrical) | (93) Bumper beam attaching hole Right 15 mm (0.59 in) dia. Left 19 × 15 mm (0.75 × 0.59 in) dia. |
| (84) Side frame gauge hole 20 mm (0.79 in) dia. (Symmetrical) | (89) Rear side frame gauge hole 15 mm (0.59 in) dia. (Symmetrical) | (94) Side frame gauge hole 15 mm (0.59 in) dia. (Symmetrical) |

DATUM POINTS

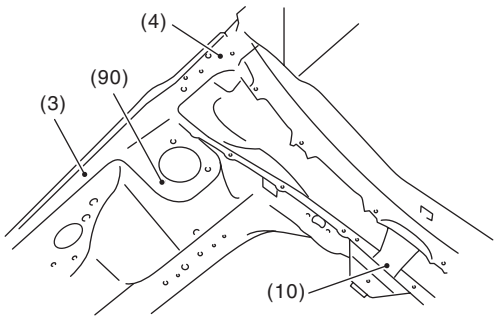
BODY STRUCTURE



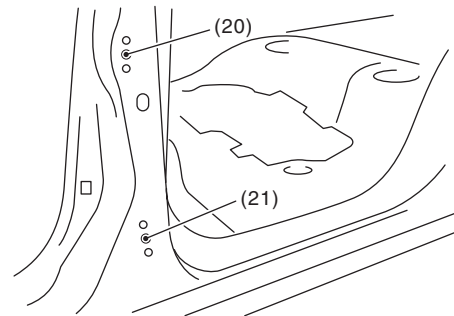
BO0408



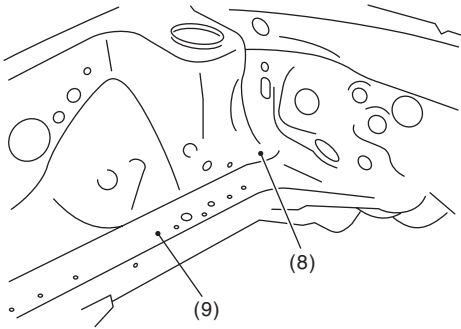
BO0413



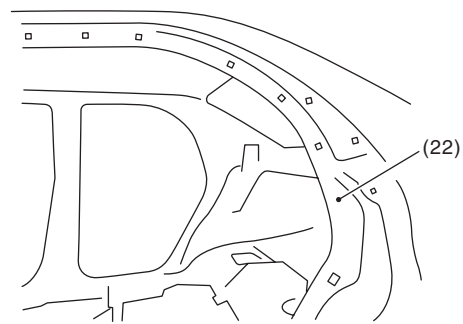
BO0409



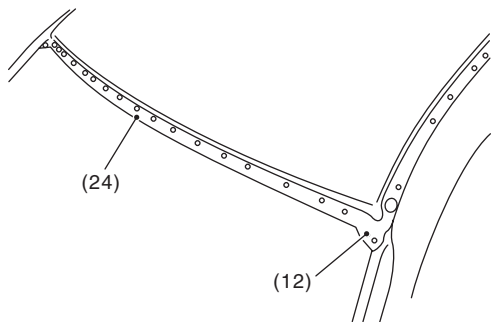
BO0414



BO0410

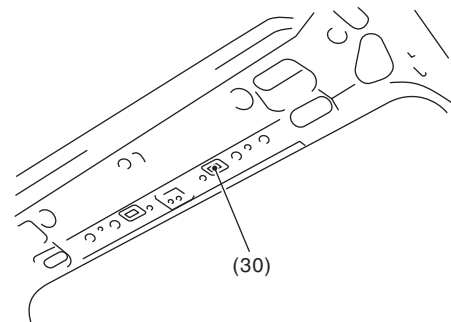


BO0415



BO0411


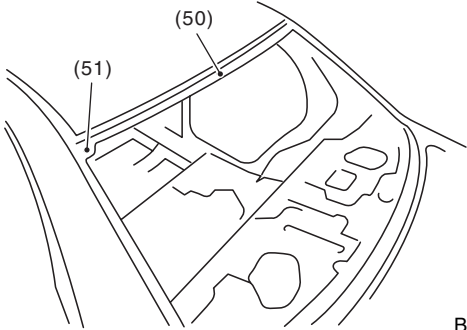
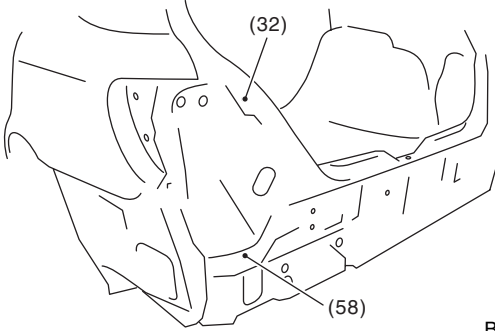
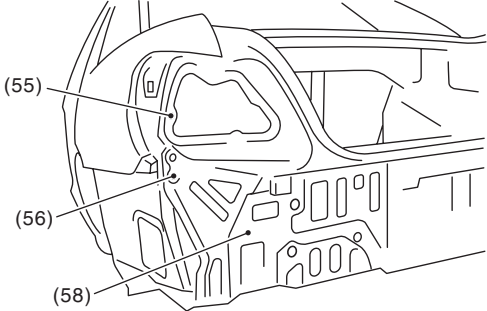
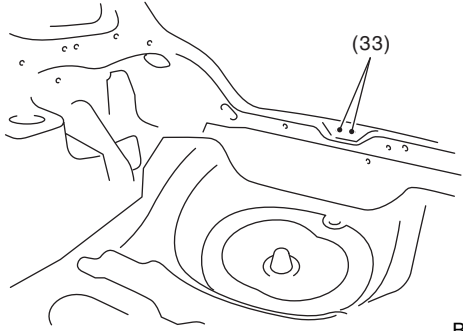
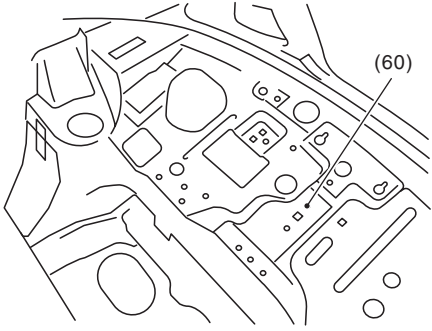
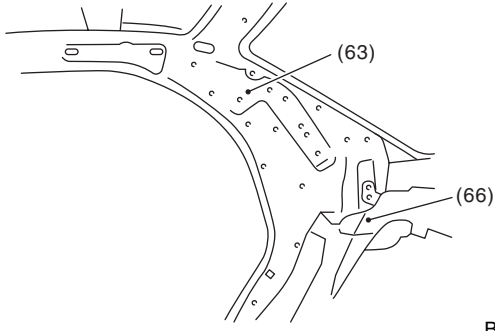
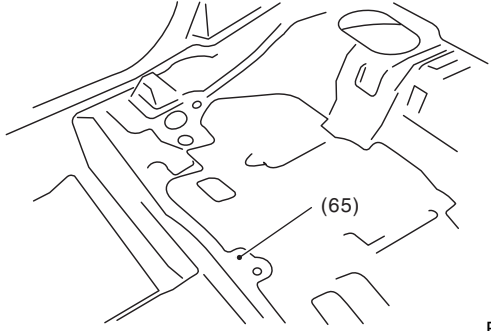
WAGON



BO0417

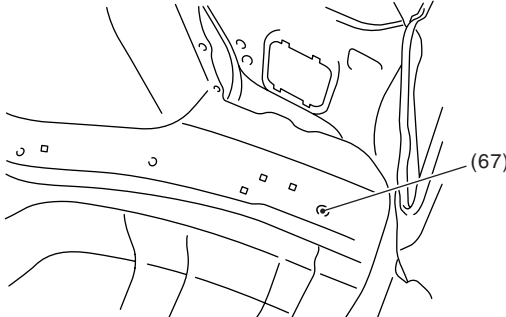
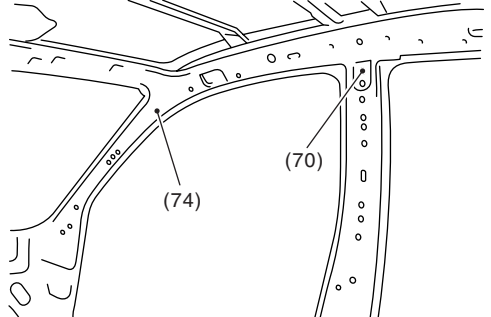
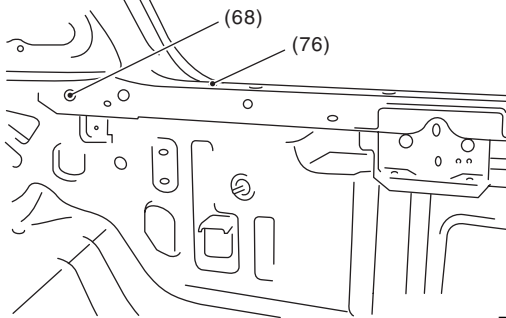
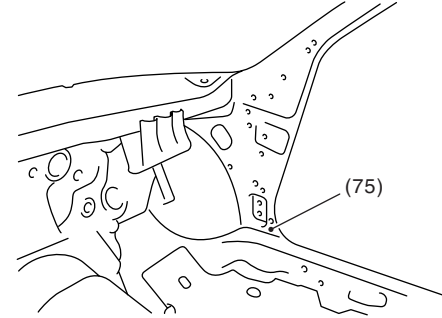
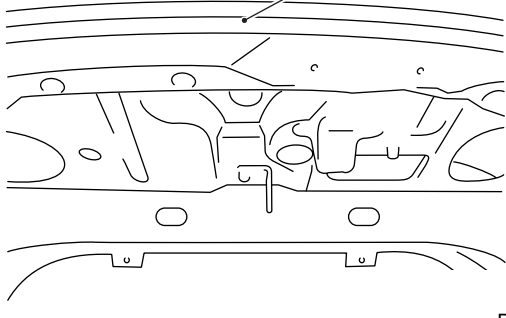
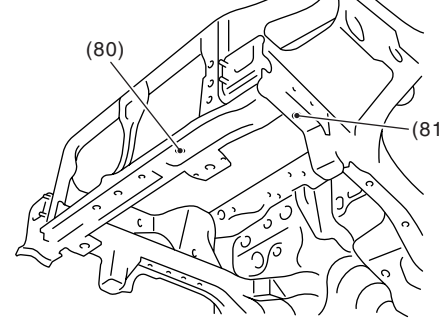
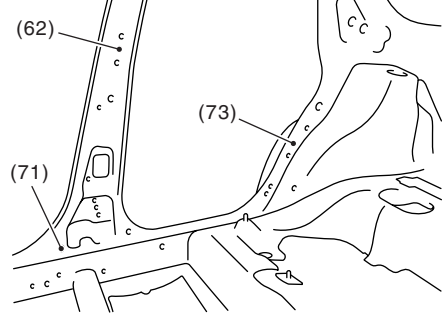
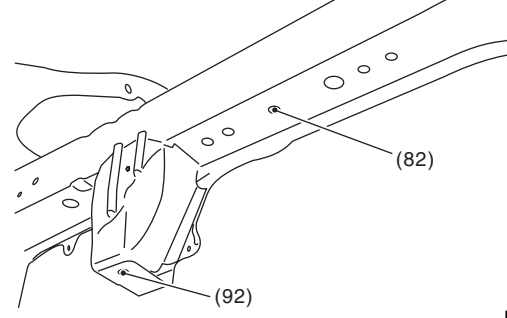
DATUM POINTS

BODY STRUCTURE

<p>WAGON</p>  <p>Diagram of a wagon body structure showing datum points (72), (31), (77), and (91).</p> <p>BO0418</p>	<p>SEDAN</p>  <p>Diagram of a sedan body structure showing datum points (50) and (51).</p> <p>BO0422</p>
<p>WAGON</p>  <p>Diagram of a wagon body structure showing datum points (32) and (58).</p> <p>BO0419</p>	<p>SEDAN</p>  <p>Diagram of a sedan body structure showing datum points (55), (56), and (58).</p> <p>BO0424</p>
<p>WAGON</p>  <p>Diagram of a wagon body structure showing datum point (33).</p> <p>BO0420</p>	<p>SEDAN</p>  <p>Diagram of a sedan body structure showing datum point (60).</p> <p>BO0425</p>
<p>SEDAN</p>  <p>Diagram of a sedan body structure showing datum points (63) and (66).</p> <p>BO0421</p>	 <p>Diagram of a sedan body structure showing datum point (65).</p> <p>BO0426</p>

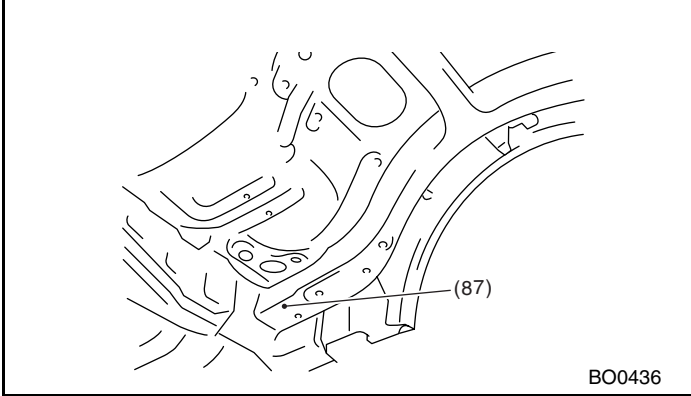
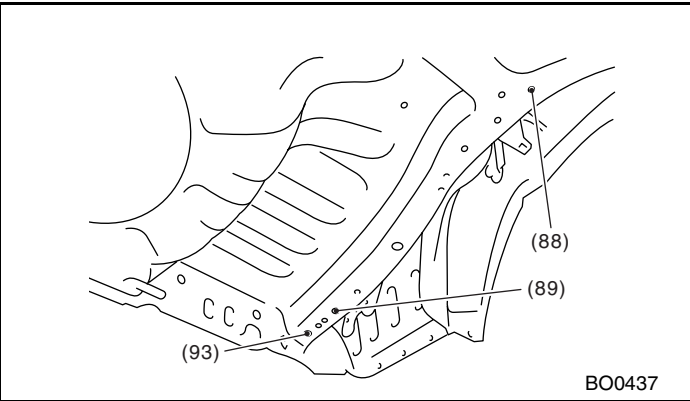
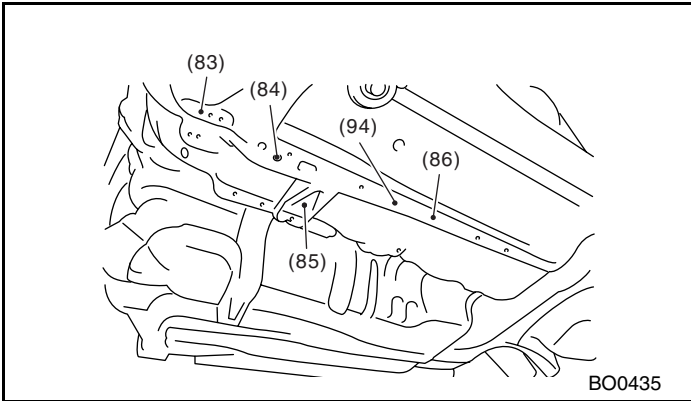
DATUM POINTS

BODY STRUCTURE

 <p>(67)</p> <p>BO0427</p>	 <p>(74)</p> <p>(70)</p> <p>BO0431</p>
<p>SEDAN</p>  <p>(68)</p> <p>(76)</p> <p>BO0428</p>	 <p>(75)</p> <p>BO0432</p>
<p>SEDAN</p>  <p>(69)</p> <p>BO0429</p>	 <p>(80)</p> <p>(81)</p> <p>BO0433</p>
 <p>(62)</p> <p>(71)</p> <p>(73)</p> <p>BO0430</p>	 <p>(82)</p> <p>(92)</p> <p>BO0434</p>

DATUM POINTS

BODY STRUCTURE



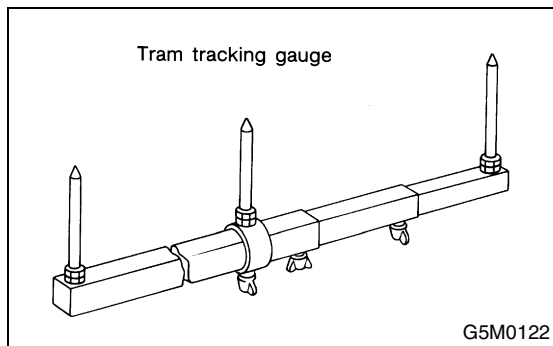
3. Datum Dimensions

A: MEASUREMENT

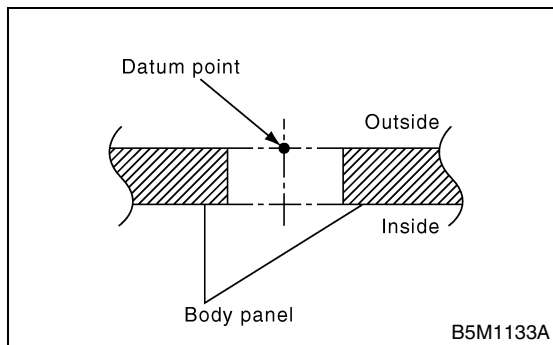
Refer to LOCATION for details on measurement points. <Ref. to BS-3, LOCATION, Datum Points.>

NOTE:

- Using a tram tracking gauge, measure all the dimensions.
- When using a tape measure, carefully measure dimensions without letting the tape measure sag or twist.
- Measure the linear dimensions between cores of holes.
- Suffixes “RH” and “LH” indicate right-hand and left-hand.



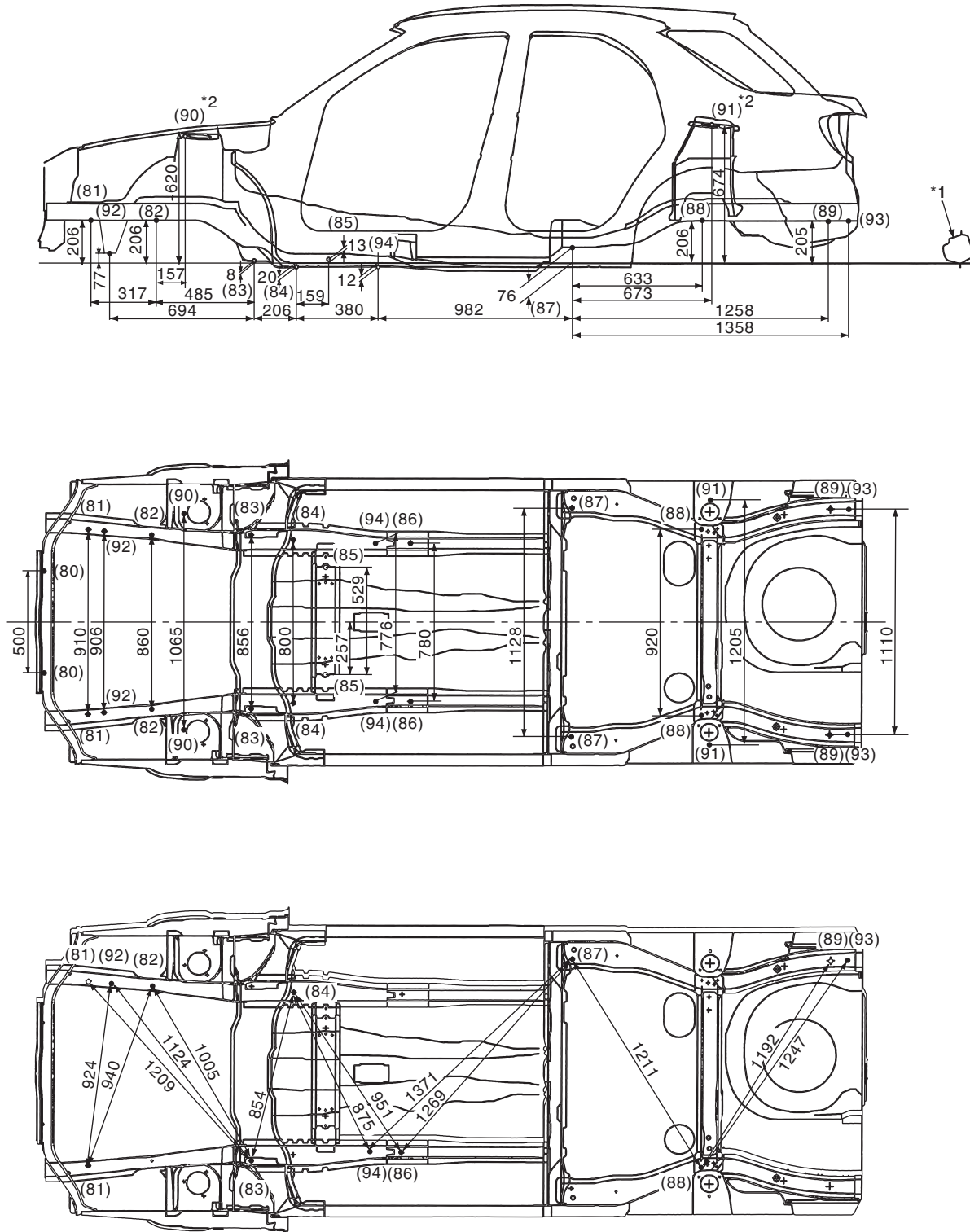
- Measure at the center of the circle around the outside of the body panel.



DATUM DIMENSIONS

BODY STRUCTURE

1. CENTER STRUCTURE



*1: Side sill

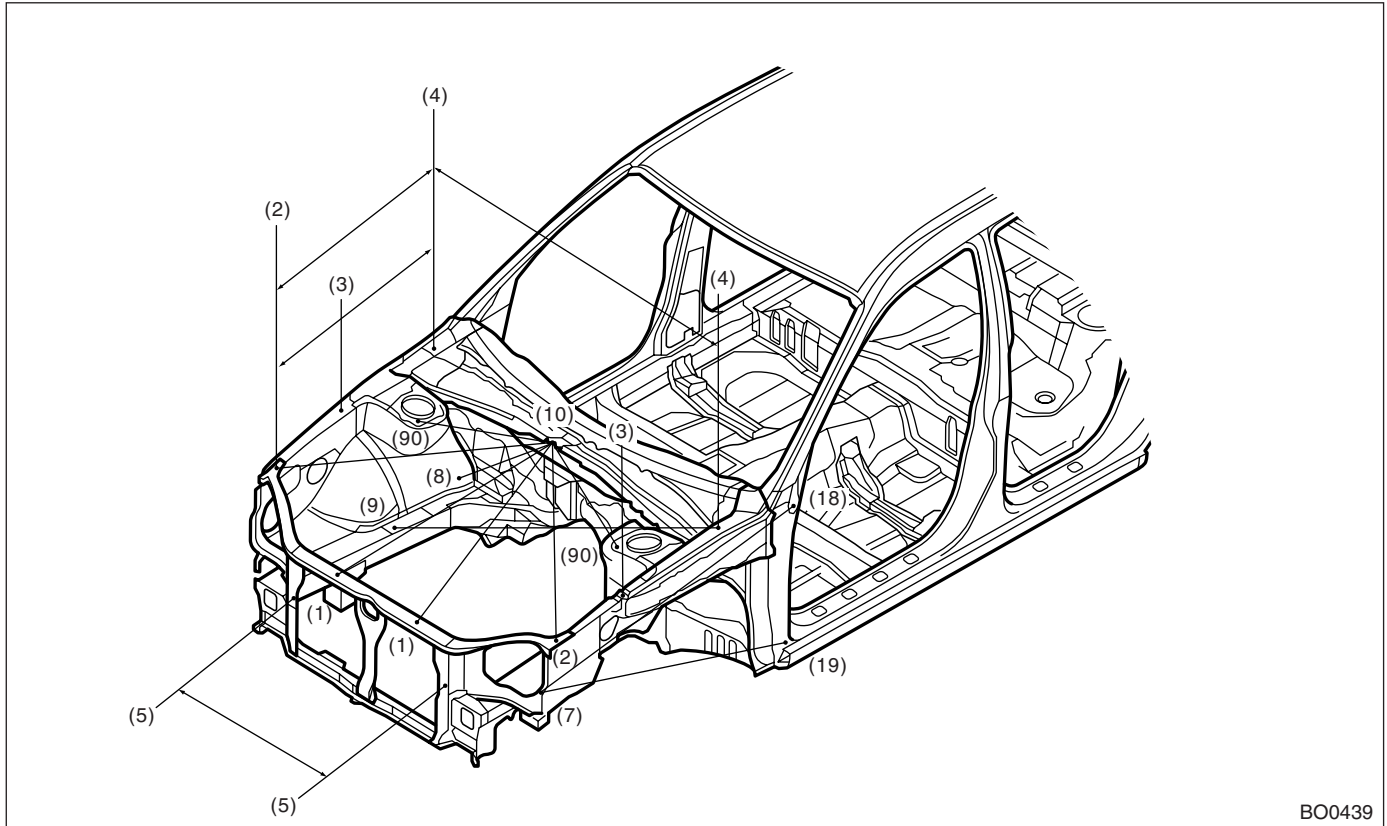
*2: Upper surface

BO0438

DATUM DIMENSIONS

BODY STRUCTURE

2. WAGON/SEDAN (FRONT STRUCTURE)



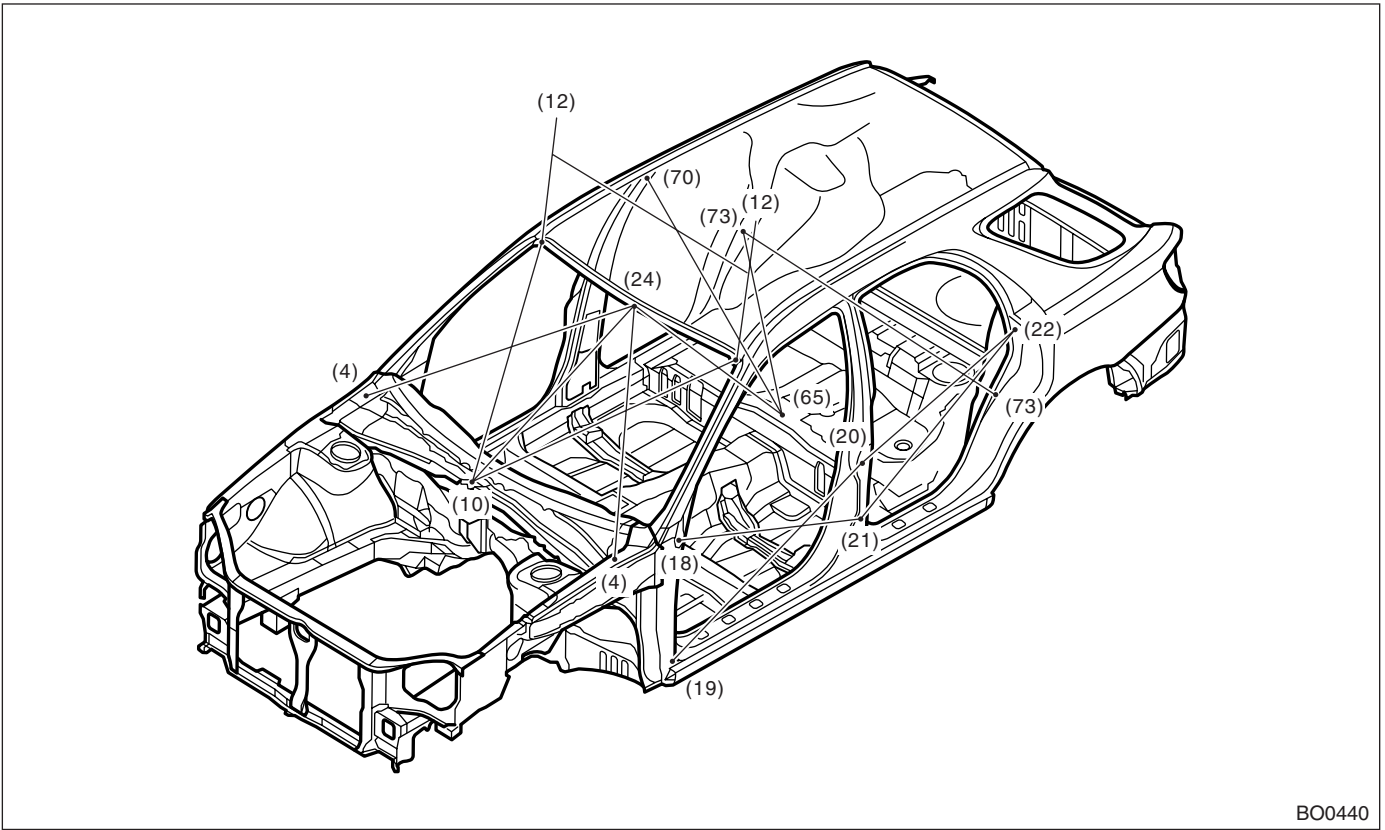
BO0439

Unit: mm (in)

Point to point	Dimension	Point to point	Dimension
(10) to (1) RH	912 (35.91)	(2) RH to (2) LH	1,341 (52.80)
(10) to (1) LH	912 (35.91)	(5) RH to (5) LH	720 (28.35)
(10) to (90) RH	566 (22.28)	(7) RH to (18) RH	1,138 (44.80)
(10) to (90) LH	566 (22.28)	(7) LH to (18) LH	1,138 (44.80)
(10) to (8) RH	581 (22.87)	(7) RH to (19) RH	1,116 (43.94)
(10) to (8) LH	581 (22.87)	(7) LH to (19) LH	1,116 (43.94)
(10) to (2) RH	947 (37.28)	(4) RH to (2) LH	1,583 (62.32)
(10) to (2) LH	947 (37.28)	(4) LH to (2) RH	1,583 (62.32)
(4) RH to (2) RH	778 (30.63)	(3) RH to (3) LH	1,396 (54.96)
(4) LH to (2) LH	778 (30.63)	(3) RH to (4) LH	1,470 (57.87)
(4) RH to (3) RH	430 (16.93)	(3) LH to (4) RH	1,470 (57.87)
(4) LH to (3) LH	430 (16.93)	(2) RH to (3) LH	1,412 (55.59)
(90) RH to (90) LH	1,065 (41.93)	(2) LH to (3) RH	1,412 (55.59)
(8) RH to (8) LH	894 (35.20)	(9) RH to (9) LH	860 (33.86)
(8) RH to (4) LH	1,210 (47.64)	(9) RH to (8) LH	931 (36.65)
(8) LH to (4) RH	1,210 (47.64)	(9) LH to (8) RH	931 (36.65)
(3) RH to (2) RH	349 (13.74)	(9) RH to (4) LH	1,280 (50.39)
(3) LH to (2) LH	349 (13.74)	(9) LH to (4) RH	1,280 (50.39)
(4) RH to (4) LH	1,417 (55.79)	—	—

DATUM DIMENSIONS

BODY STRUCTURE



BO0440

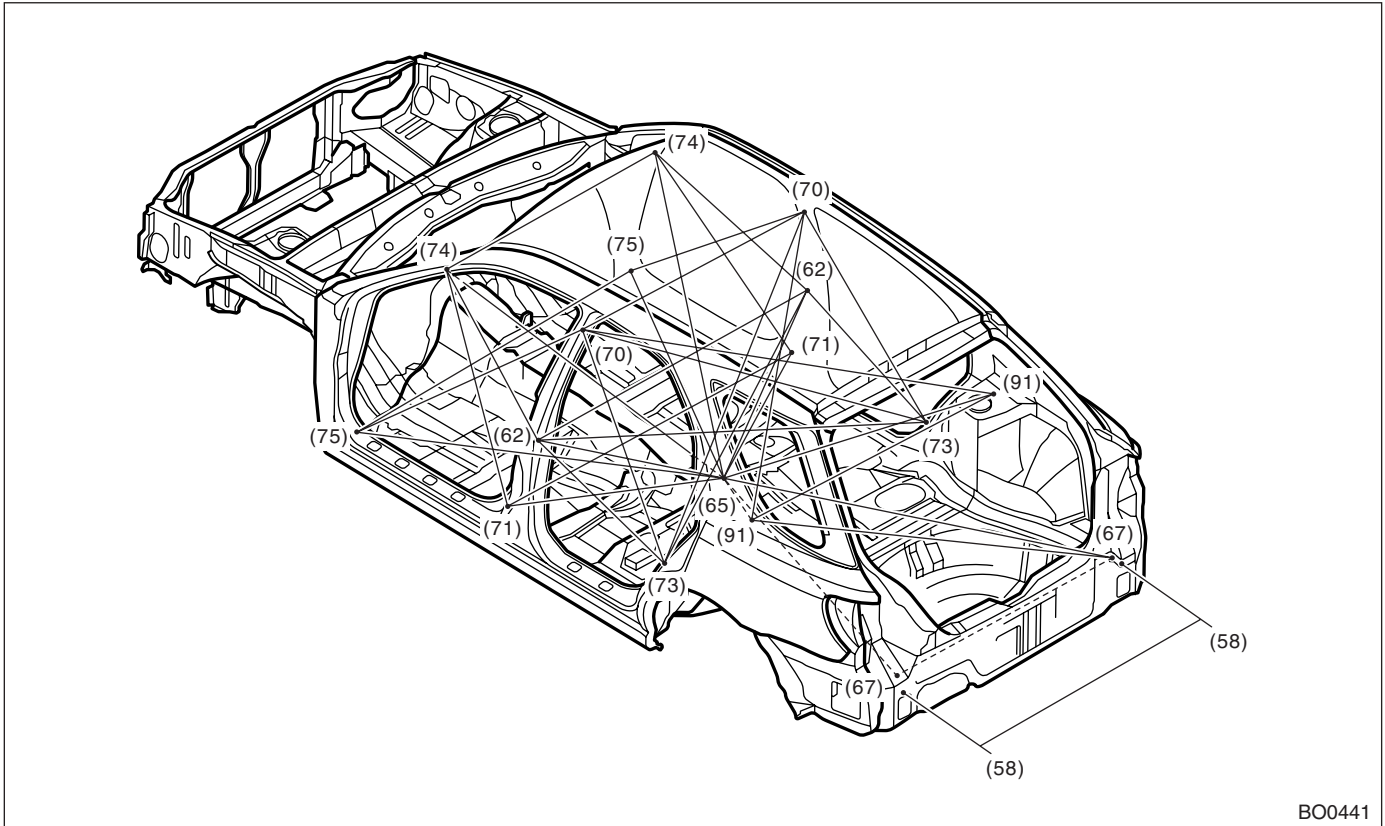
Unit: mm (in)

Point to point	Dimension	Point to point	Dimension
(4) RH to (24)	1,127 (44.37) Wagon	(19) LH to (20) LH	1,089 (42.87)
(4) LH to (24)	1,110 (43.70) Sedan	(20) RH to (22) RH	869 (34.21)
(10) to (24)	957 (37.68) Wagon	(20) LH to (22) LH	869 (34.21)
(10) to (24)	935 (36.81) Sedan	(21) RH to (22) RH	985 (38.78)
(10) to (12) RH	1,122 (44.17) Wagon	(21) LH to (22) LH	985 (38.78)
(10) to (12) RH	1,106 (43.54) Sedan	(24) to (65)	1,232 (48.50) Wagon
(10) to (12) LH	1,122 (44.17) Wagon	(24) to (65)	1,237 (48.70) Sedan
(10) to (12) LH	1,106 (43.17) Sedan	(65) to (70) RH	1,067 (42.01)
(12) RH to (12) LH	1,029 (40.51) Wagon	(65) to (70) LH	1,067 (42.01)
(12) RH to (12) LH	1,042 (41.02) Sedan	(65) to (73) RH	830 (32.68)
(18) RH to (21) RH	1,049 (41.30)	(65) to (73) LH	830 (32.68)
(18) LH to (21) LH	1,049 (41.30)	(73) RH to (73) LH	1,394 (54.88)
(19) RH to (20) RH	1,089 (42.87)	—	—

DATUM DIMENSIONS

BODY STRUCTURE

3. WAGON/SEDAN (REAR STRUCTURE)



BO0441

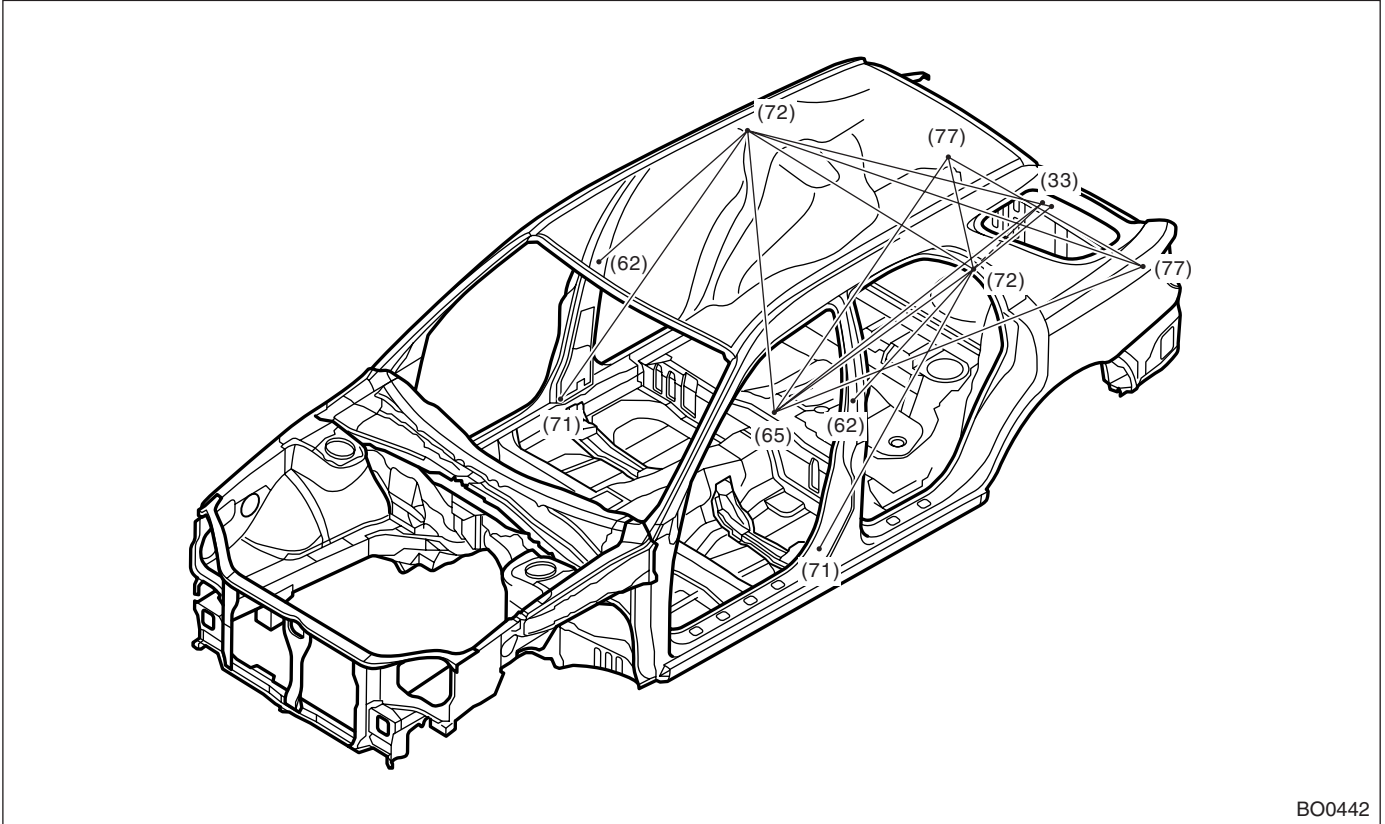
Unit: mm (in)

Point to point	Dimension	Point to point	Dimension
(58) RH to (58) LH	1,128 (44.41)	(67) RH to (67) LH	1,110 (43.70)
(62) RH to (62) LH	1,332 (52.44)	(67) RH to (91) LH	1,381 (54.37)
(62) RH to (65)	915 (36.02)	(67) LH to (91) RH	1,381 (54.37)
(62) LH to (65)	915 (36.02)	(70) RH to (70) LH	1,060 (41.73)
(62) RH to (73) RH	762 (30.00)	(70) RH to (73) RH	948 (37.32)
(62) LH to (73) LH	762 (30.00)	(70) LH to (73) LH	948 (37.32)
(62) RH to (73) LH	1,561 (61.46)	(70) RH to (73) LH	1,542 (60.71)
(62) LH to (73) RH	1,561 (61.46)	(70) LH to (73) RH	1,542 (60.71)
(62) RH to (74) RH	592 (23.31) Wagon	(70) RH to (75) RH	1,443 (56.81)
(62) LH to (74) LH	603 (23.74) Sedan	(70) LH to (75) LH	1,443 (56.81)
(65) to (67) RH	1,501 (59.09)	(70) RH to (91) LH	1,532 (60.32)
(65) to (67) LH	1,501 (59.09)	(70) LH to (91) RH	1,532 (60.32)
(65) to (71) RH	823 (32.40)	(71) RH to (71) LH	1,361 (53.58)
(65) to (71) LH	823 (32.40)	(71) RH to (74) RH	954 (37.56) Wagon
(65) to (74) RH	1,275 (50.20) Wagon	(71) LH to (74) LH	949 (37.36) Sedan
(65) to (74) LH	1,282 (50.47) Sedan	(74) RH to (74) LH	1,135 (44.69) Wagon
(65) to (75) RH	1,450 (57.09)	(74) RH to (74) LH	1,147 (45.16) Sedan
(65) to (75) LH	1,450 (57.09)	(75) RH to (75) LH	1,399 (55.08)
(65) to (91) RH	1,064 (41.89)	(91) RH to (91) LH	1,205 (47.44)
(65) to (91) LH	1,064 (41.89)	—	—

DATUM DIMENSIONS

BODY STRUCTURE

4. WAGON (FRONT STRUCTURE)



BO0442

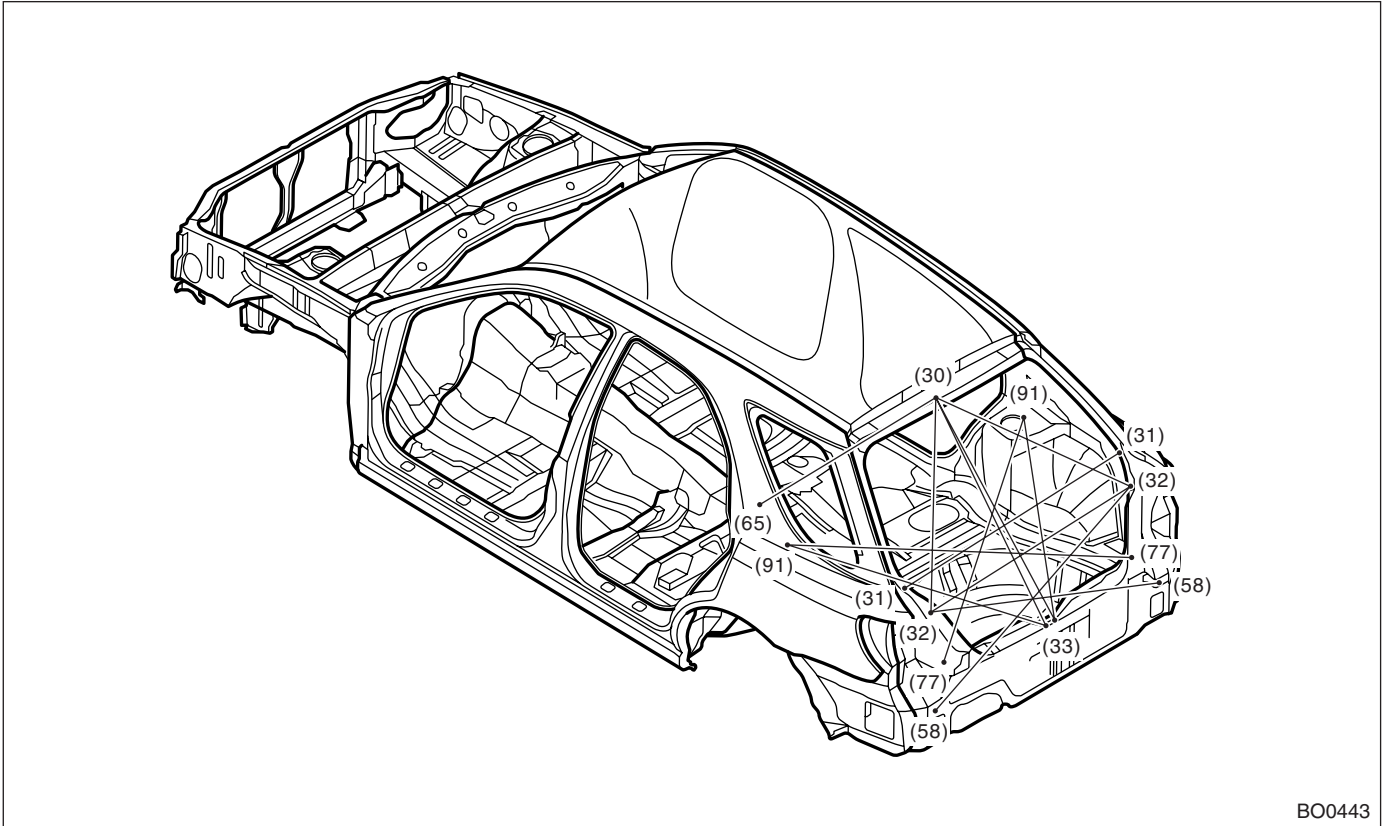
Unit: mm (in)

Point to point	Dimension	Point to point	Dimension
(33) RH to (65)	1,534 (60.39)	(65) to (77) RH	1,538 (60.55)
(33) LH to (65)	1,534 (60.39)	(65) to (77) LH	1,538 (60.55)
(33) RH to (72) LH	1,344 (52.91)	(71) RH to (72) RH	1,223 (48.15)
(33) LH to (72) RH	1,344 (52.91)	(71) LH to (72) LH	1,223 (48.15)
(62) RH to (72) RH	732 (28.82)	(72) RH to (72) LH	1,226 (48.27)
(62) LH to (72) LH	732 (28.82)	(72) RH to (77) LH	1,544 (60.79)
(65) to (72) RH	1,076 (42.36)	(72) LH to (77) RH	1,544 (60.79)
(65) to (72) LH	1,076 (42.36)	(77) RH to (77) LH	898 (35.35)

DATUM DIMENSIONS

BODY STRUCTURE

5. WAGON (REAR STRUCTURE)



BO0443

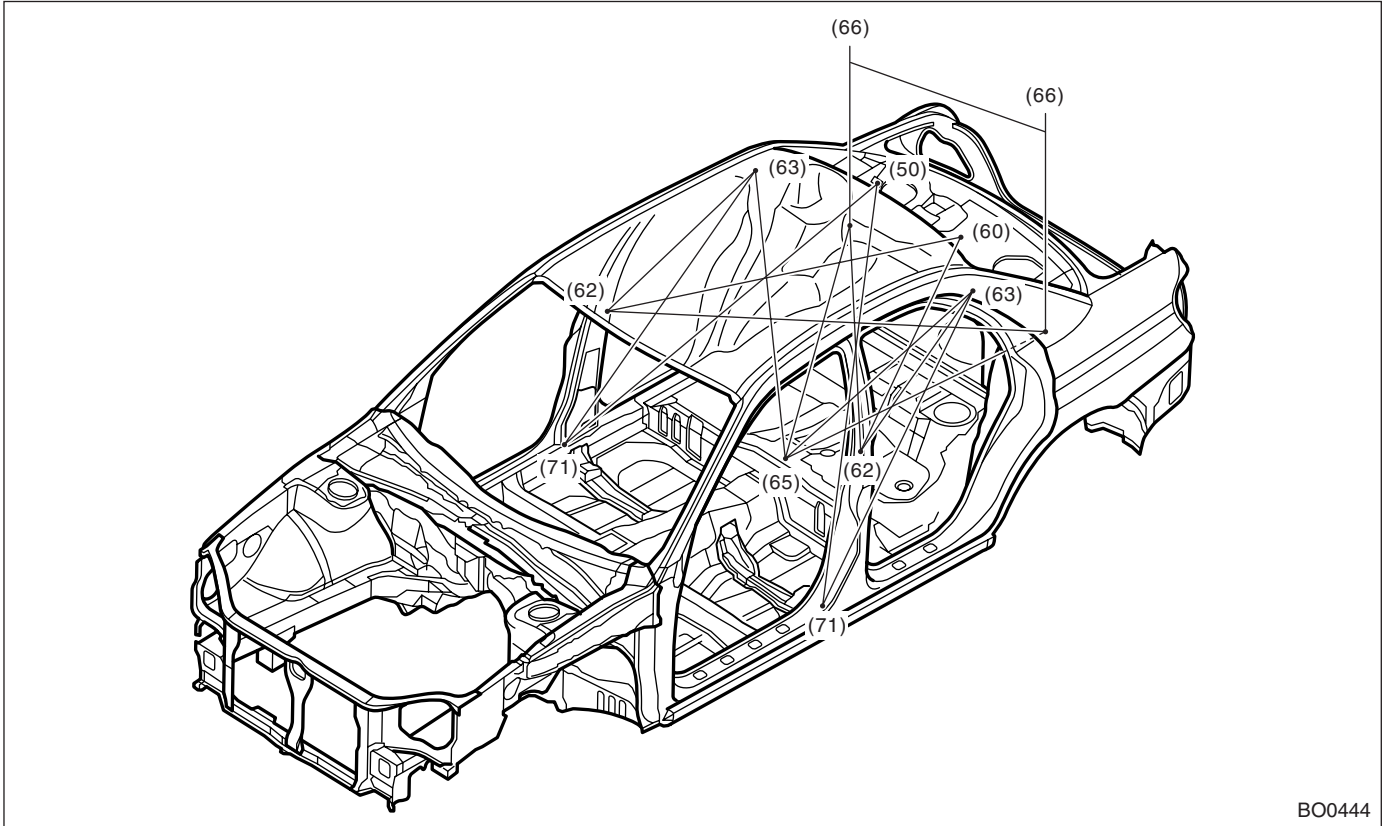
Unit: mm (in)

Point to point	Dimension	Point to point	Dimension
(30) to (32) RH	850 (33.46)	(32) RH to (58) LH	1,139 (44.84)
(30) to (32) LH	850 (33.46)	(32) LH to (58) RH	1,139 (44.84)
(30) to (33) RH	904 (35.59)	(33) RH to (91) LH	993 (39.09)
(30) to (33) LH	904 (35.59)	(33) LH to (91) LH	993 (39.09)
(30) to (65)	1,292 (50.87)	(77) RH to (91) LH	1,289 (50.75)
(31) RH to (31) LH	1,212 (47.72)	(77) LH to (91) RH	1,289 (50.75)
(32) RH to (32) LH	1,038 (40.87)	—	—

DATUM DIMENSIONS

BODY STRUCTURE

6. SEDAN (FRONT STRUCTURE)



BO0444

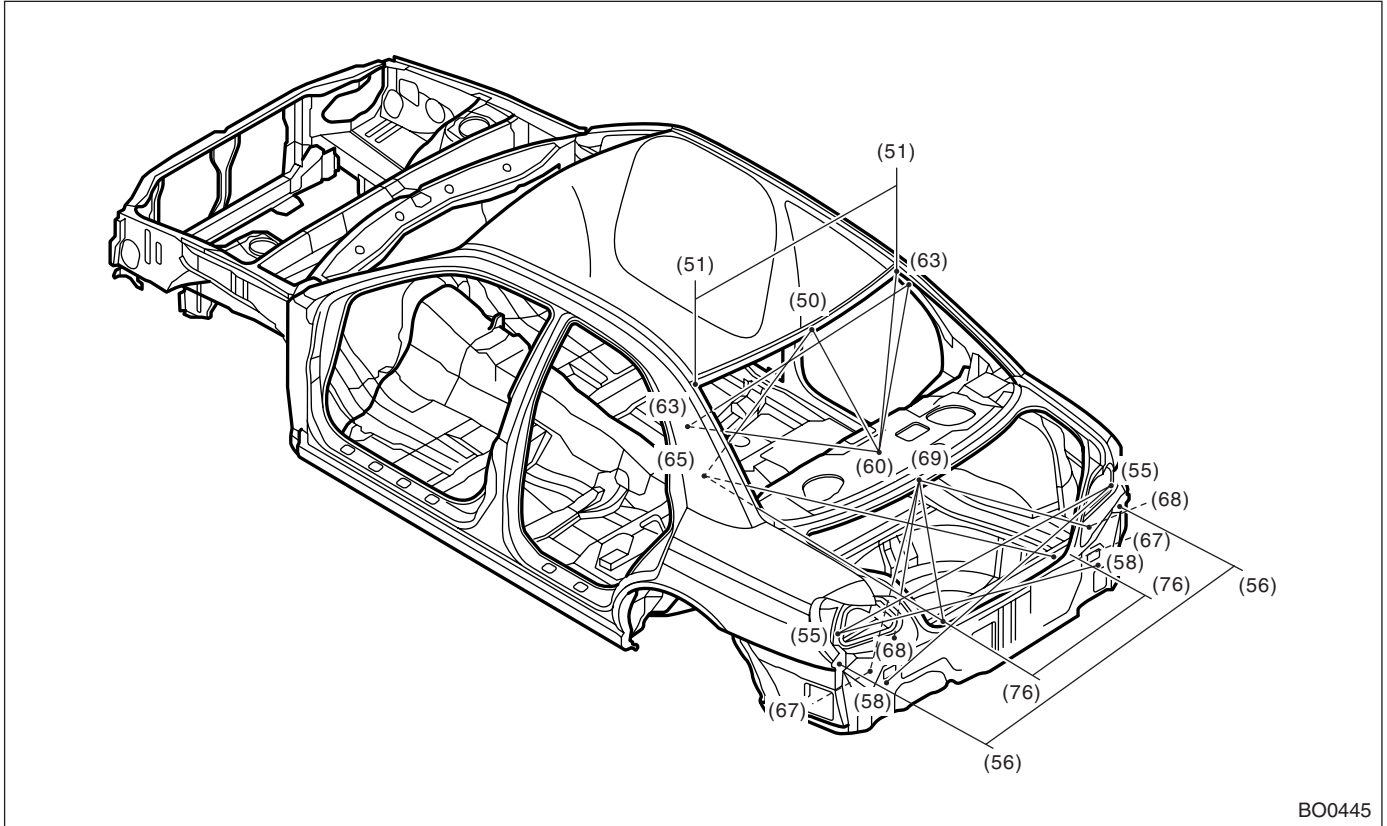
Unit: mm (in)

Point to point	Dimension	Point to point	Dimension
(50) to (71) RH	1,562 (61.50)	(63) RH to (65)	1,118 (44.02)
(50) to (71) LH	1,562 (61.50)	(63) LH to (65)	1,118 (44.02)
(60) to (62) RH	1,338 (52.68)	(63) RH to (71) RH	1,283 (50.51)
(60) to (62) LH	1,338 (52.68)	(63) LH to (71) LH	1,283 (50.51)
(62) RH to (63) RH	773 (30.43)	(65) to (66) RH	956 (37.64)
(62) LH to (63) LH	773 (30.43)	(65) to (66) LH	956 (37.64)
(62) RH to (66) LH	1,449 (57.05)	(66) RH to (66) LH	840 (33.07)
(62) LH to (66) RH	1,449 (57.05)	—	—

DATUM DIMENSIONS

BODY STRUCTURE

7. SEDAN (REAR STRUCTURE)



BO0445

Unit: mm (in)

Point to point	Dimension	Point to point	Dimension
(50) to (60)	501 (19.72)	(65) to (76) LH	1,544 (60.79)
(50) to (65)	1,082 (42.60)	(65) to (68) RH	1,581 (62.24)
(51) RH to (51) LH	1,025 (40.35)	(65) to (68) LH	1,581 (62.24)
(51) RH to (60)	734 (28.90)	(67) RH to (69)	784 (30.87)
(55) RH to (55) LH	1,406 (55.35)	(67) LH to (69)	784 (30.87)
(55) RH to (58) LH	1,297 (51.06)	(68) RH to (68) LH	1,020 (40.16)
(55) LH to (58) RH	1,297 (51.06)	(68) RH to (69)	681 (26.81)
(56) RH to (56) LH	1,426 (56.14)	(68) LH to (69)	681 (26.81)
(60) to (63) RH	764 (30.08)	(69) to (76) RH	537 (21.14)
(60) to (63) LH	764 (30.08)	(69) to (76) LH	537 (21.14)
(63) RH to (63) LH	1,183 (46.57)	(76) RH to (76) LH	600 (23.62)
(65) to (76) RH	1,544 (60.79)	—	—

DATUM DIMENSIONS

BODY STRUCTURE

INSTRUMENTATION/DRIVER INFO



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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	

GENERAL DESCRIPTION

INSTRUMENTATION/DRIVER INFO

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 the printed circuit.
- Do not drop or otherwise apply impact.

C: PREPARATION TOOL

1. GENERAL TOOLS

TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance and voltage.

COMBINATION METER SYSTEM

INSTRUMENTATION/DRIVER INFO

2. Combination Meter System

A: SCHEMATIC

1. COMBINATION METER

<Ref. to WI-98, SCHEMATIC, Combination Meter.>

2. OUTSIDE TEMPERATURE INDICATOR

<Ref. to WI-225, SCHEMATIC, Outside Temperature Display System.>

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-6, 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-7, CHECK VEHICLE SPEED SENSOR, INSPECTION, Combination Meter System.>
		AT: <Re. to IDI-<Ref. to IDI-8, CHECK TRANSMISSION CONTROL MODULE, INSPECTION, Combination Meter System.>
Tachometer does not operate.	(1) Engine control module (2) Harness (3) Tachometer	<Ref. to IDI-9, 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-10, 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-12, 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-13, 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. 1)Remove the combination meter. <Ref. to IDI-15, REMOVAL, Combination Meter Assembly.> 2)Disconnect the combination meter harness connector. 3)Turn the ignition switch to ON. 4)Measure the voltage between combination meter connector and chassis ground. Connector & terminal <i>(i10) No. 7 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Go to step 2.	Check the harness for open or short between ignition switch and combination meter.
2 CHECK POWER SUPPLY FOR COMBINATION METER. Measure the voltage between combination meter connector and chassis ground. Connector & terminal <i>(i10) No. 10 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Go to step 3.	Check the harness for open or short between fuse and combination meter.
3 CHECK GROUND CIRCUIT OF COMBINATION METER. 1)Turn the ignition switch to OFF. 2)Measure the resistance of harness between combination meter connector and chassis ground. Connector & terminal <i>(i10) No. 6 (+) — Chassis ground (-):</i>	Is the resistance less than 10 Ω ?	Replace the combination meter printed circuit.	Repair the wiring harness.

COMBINATION METER SYSTEM

INSTRUMENTATION/DRIVER INFO

3. CHECK VEHICLE SPEED SENSOR

Step	Check	Yes	No
<p>1 CHECK VEHICLE SPEED SENSOR. 1)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 the voltage between combination meter connector and chassis ground. Connector & terminal <i>(i10) No. 2 (+) — Chassis ground (-):</i></p>	<p>Is the voltage less than 1V ←→ more than 4 V?</p>	<p>Check the speedometer. <Ref. to IDI-17, REMOVAL, Speedometer.></p>	<p>Go to step 2.</p>
<p>2 CHECK VEHICLE SPEED SENSOR POWER SUPPLY. 1)Turn the ignition switch to OFF. 2)Disconnect the vehicle speed sensor harness connector. 3)Turn the ignition switch to ON. 4)Measure the voltage between vehicle speed sensor connector and engine ground. Connector & terminal <i>(B17) No. 3 (+) — Engine ground (-):</i></p>	<p>Is the voltage more than 10 V?</p>	<p>Go to step 3.</p>	<p>Check the harness for open or short between ignition switch and vehicle speed sensor.</p>
<p>3 CHECK HARNESS BETWEEN VEHICLE SPEED SENSOR AND ENGINE GROUND. 1)Turn the ignition switch to OFF. 2)Measure the resistance between vehicle speed sensor connector and engine ground. Connector & terminal <i>(B17) No. 2 (+) — Engine ground (-):</i></p>	<p>Is the resistance less than 10 Ω?</p>	<p>Go to step 4.</p>	<p>Repair the wiring harness.</p>
<p>4 CHECK HARNESS BETWEEN VEHICLE SPEED SENSOR AND COMBINATION METER. 1)Disconnect the connector from combination meter. 2)Measure the resistance between vehicle speed sensor harness connector and combination meter harness connector. Connector & terminal <i>(B17) No. 1 — (i10) No. 2:</i></p>	<p>Is the resistance less than 10 Ω?</p>	<p>Replace the vehicle speed sensor.</p>	<p>Repair the wiring harness.</p>

COMBINATION METER SYSTEM

INSTRUMENTATION/DRIVER INFO

4. CHECK TRANSMISSION CONTROL MODULE

Step	Check	Yes	No
<p>1</p> <p>CHECK TRANSMISSION CONTROL MODULE SIGNAL.</p> <p>1)Lift-up the vehicle and support it with safety stands.</p> <p>Warning: Be careful not to get caught in the running wheels.</p> <p>2)Drive the vehicle faster than 10 km/h (6 MPH).</p> <p>3)Measure the voltage between transmission control module connector and chassis ground.</p> <p>Connector & terminal (B56) No. 17 (+) — Chassis ground (-):</p>	<p>Is the voltage less than 1 V ←→ more than 4 V?</p>	<p>Go to step 2.</p>	<p>Check the transmission control module. <Ref. to AT-2, Basic Diagnostic Procedure.></p>
<p>2</p> <p>CHECK HARNESS BETWEEN TRANSMISSION CONTROL MODULE AND COMBINATION METER.</p> <p>1)Turn the ignition switch to OFF.</p> <p>2)Disconnect the connector from transmission control module and combination meter.</p> <p>3)Measure the resistance between transmission control module harness connector and combination meter harness connector.</p> <p>Connector & terminal (B56) No. 17 — (i10) No. 2:</p>	<p>Is the resistance less than 10 Ω?</p>	<p>Check the speed meter. <Ref. to IDI-17, REMOVAL, Speedometer.></p>	<p>Repair the wiring harness.</p>

COMBINATION METER SYSTEM

INSTRUMENTATION/DRIVER INFO

5. CHECK ENGINE CONTROL MODULE

Step	Check	Yes	No
<p>1</p> <p>CHECK ENGINE CONTROL MODULE SIGNAL.</p> <p>1) Start the engine.</p> <p>2) Measure the voltage between engine control module connector and engine ground.</p> <p>Connector & terminal</p> <p>Turbo engine model: (B136) No. 9 (+) — Engine ground (-):</p> <p>Non-turbo engine model: (B134) No. 30 (+) — Engine ground (-):</p>	<p>Is the voltage 0 ↔ 13 V or more?</p>	<p>Go to step 2.</p>	<p>Check the engine control module. <Ref. to EN-2, Basic Diagnostic Procedure.> or <Ref. to EN(w/oOBD)-2, Basic Diagnostic Procedure.> or <Ref. to EN(TURBO)-2, Basic Diagnostic Procedure.></p>
<p>2</p> <p>CHECK HARNESS BETWEEN COMBINATION METER AND ENGINE CONTROL MODULE.</p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Disconnect the connector from engine control module and combination meter.</p> <p>3) Measure the resistance between engine control module harness connector and combination meter harness connector.</p> <p>Connector & terminal</p> <p>Turbo engine model: (B136) No. 9 — (i10) No. 5:</p> <p>Non-turbo engine model: (B134) No. 30 — (i10) No. 5:</p>	<p>Is the resistance less than 10 Ω?</p>	<p>Check the tachometer. <Ref. to IDI-18, REMOVAL, Tachometer.></p>	<p>Repair the wiring harness.</p>

COMBINATION METER SYSTEM

INSTRUMENTATION/DRIVER INFO

6. CHECK FUEL LEVEL SENSOR

Step	Check	Yes	No
1	CHECK ENGINE TYPE.	Go to step 2 .	Go to step 7 .
2	CHECK FUEL LEVEL SENSOR. 1)Remove the fuel level sensor. <Ref. to FU(TURBO)-62, REMOVAL, Fuel Level Sensor.> 2)Measure the resistance between fuel level sensor terminals when setting the float to FULL and EMPTY position. Terminals No. 3 — No. 5:	Go to step 3 .	Replace the fuel level sensor.
3	CHECK FUEL SUB LEVEL SENSOR. 1)Remove the fuel sub level sensor. <Ref. to FU(TURBO)-63, REMOVAL, Fuel Sub Level Sensor.> 2)Measure the resistance between fuel sub level sensor terminals when setting the float to FULL and EMPTY position. Terminals No. 1 — No. 2:	Go to step 4 .	Replace the fuel sub level sensor.
4	CHECK HARNESS BETWEEN FUEL SUB LEVEL SENSOR AND COMBINATION METER. 1)Disconnect the connector from combination meter. 2)Measure the resistance between fuel sub level sensor harness connector terminal and combination meter harness connector terminal. Connector & terminal (R59) No. 1 — (i12) No. 2:	Go to step 5 .	Repair the wiring harness.
5	CHECK HARNESS BETWEEN FUEL LEVEL SENSOR AND FUEL SUB LEVEL SENSOR. Measure the resistance between fuel level sensor harness connector terminal and fuel sub level sensor harness connector terminal. Connector & terminal (R58) No. 3 — (R59) No.2:	Go to step 6 .	Repair the wiring harness.
6	CHECK FUEL LEVEL SENSOR GROUND CIRCUIT. Measure the resistance between fuel level sensor harness connector terminal and chassis ground. Connector & terminal (R58) No. 5 — Chassis ground:	Check the fuel gauge. <Ref. to IDI-19, REMOVAL, Fuel Gauge.>	Repair the wiring harness.
7	CHECK FUEL LEVEL SENSOR. 1)Remove the fuel level sensor. <Ref. to FU-65, REMOVAL, Fuel Level Sensor.> or <Ref. to FU(w/oOBD)-62, REMOVAL, Fuel Level Sensor.> 2)Measure the resistance between fuel level sensor terminals when setting the float to FULL and EMPTY position. Terminals No. 3 — No. 5:	Go to step 8 .	Replace the fuel level sensor.

COMBINATION METER SYSTEM

INSTRUMENTATION/DRIVER INFO

Step	Check	Yes	No
8 CHECK HARNESS BETWEEN FUEL LEVEL SENSOR AND COMBINATION METER. 1)Disconnect the connector from combination meter. 2)Measure the 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 9 .	Repair the wiring harness.
9 CHECK FUEL LEVEL SENSOR GROUND CIRCUIT. Measure the 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 ?	Check the fuel gauge. <Ref. to IDI-19, Removal.>	Repair the 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 the engine coolant temperature sensor. <Ref. to EN-2, Basic Diagnostic Procedure.> or <Ref. to EN(w/oOBD)-2, Basic Diagnostic Procedure.> or <Ref. to EN(TURBO)-2, Basic Diagnostic Procedure.>	Go to step 2.	Replace the engine coolant temperature sensor.
2	CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND COMBINATION METER. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from engine coolant temperature sensor and combination meter. 3) Measure the resistance between engine coolant temperature sensor harness connector and combination meter harness connector. Connector & terminal (E8) No. 3 — (I12) No. 9:	Is the resistance less than 10 Ω ? Check the water temperature gauge. <Ref. to IDI-20, REMOVAL, Water Temperature Gauge.>	Repair the 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 the ignition switch to OFF. 2) Disconnect the connector from combination meter. 3) Turn the ignition switch to ON. 4) Measure the voltage between combination meter terminal and chassis ground. Connector & terminal <i>(i11) No. 11 (+) — Chassis ground (-):</i>	Go to step 3.	Replace the combination meter printed circuit.
3	CHECK HARNESS BETWEEN AMBIENT SENSOR AND COMBINATION METER. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ambient sensor. 3) Measure the resistance between ambient sensor harness connector terminal and combination meter harness connector terminal. Connector & terminal LHD model: <i>(F78) No. 1 — (i11) No. 11:</i> <i>(F78) No. 2 — (i11) No. 8:</i> RHD model: <i>(F78) No. 2 — (i11) No. 11:</i> <i>(F78) No. 1 — (i11) No. 8:</i>	Go to step 4.	Repair the wiring harness.
4	CHECK AMBIENT SENSOR. 1) Remove the ambient sensor. 2) Check the ambient sensor. <Ref. to IDI-21, INSPECTION, Ambient Sensor.>	Go to step 5.	Replace the ambient sensor.
5	CHECK OUTSIDE TEMPERATURE INDICATOR. 1) Connect the combination meter harness connector. 2) Connect a resistor (2.2 kΩ) between terminals of ambient sensor harness connector. 3) Turn the ignition switch to ON and check the outside temperature indicator display.	Repair the poor contact of ambient sensor harness connector.	Replace the combination meter printed circuit.
6	CHECK POWER SUPPLY FOR COMBINATION METER. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from auto A/C control module. 3) Turn the ignition switch to ON. 4) Measure the voltage between auto A/C control module terminal and chassis ground. Connector & terminal <i>(B282) No. 11 (+) — chassis ground (-):</i>	Go to step 7.	Replace the auto A/C control module.

COMBINATION METER SYSTEM

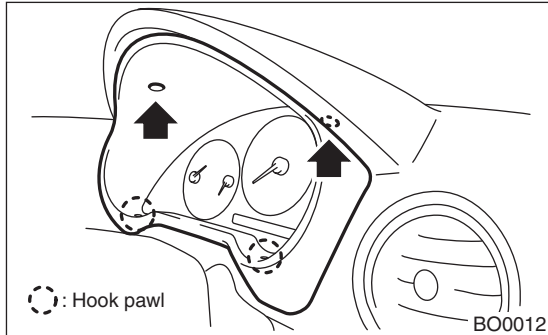
INSTRUMENTATION/DRIVER INFO

Step	Check	Yes	No
<p>7 CHECK HARNESS BETWEEN AUTO A/C CONTROL MODULE AND COMBINATION METER.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connector from combination meter. 3) Measure the resistance between auto A/C control module harness connector terminal and combination meter harness connector terminal.</p> <p>Connector & terminal (B282) No. 11 — (i11) No. 12:</p>	Is the resistance less than 10 Ω ?	Go to step 8.	Repair the wiring harness.
<p>8 CHECK POWER SUPPLY FOR AMBIENT SENSOR.</p> <p>1) Turn the ignition switch to ON. 2) Measure the voltage between auto A/C control module terminal and chassis ground.</p> <p>Connector & terminal (B283) No. 9 (+) — chassis ground (-):</p>	Is the voltage more than 4V?	Go to step 9.	Replace the auto A/C control module.
<p>9 CHECK HARNESS BETWEEN AMBIENT SENSOR AND COMBINATION METER.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connector from ambient sensor. 3) Measure the resistance between ambient sensor harness connector terminal, combination meter harness connector terminal and auto A/C control module harness connector terminal.</p> <p>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:</p>	Is the resistance less than 10 Ω ?	Go to step 10.	Repair the wiring harness.
<p>10 CHECK AMBIENT SENSOR.</p> <p>1) Remove the ambient sensor. 2) Check the ambient sensor. <Ref. to IDI-21, INSPECTION, Ambient Sensor.></p>	Is the ambient sensor OK?	Go to step 11.	Replace the ambient sensor.
<p>11 CHECK OUTSIDE TEMPERATURE INDICATOR.</p> <p>1) Connect the combination meter and auto A/C control module harness connector. 2) Connect a resistor (2.2 kΩ) between terminals of ambient sensor harness connector. 3) Turn the ignition switch to ON and check the outside temperature indicator display.</p>	Is the outside temperature indicator indicating 25°C (77°F)?	Repair the poor contact of ambient sensor harness connector.	Replace the combination meter printed circuit.

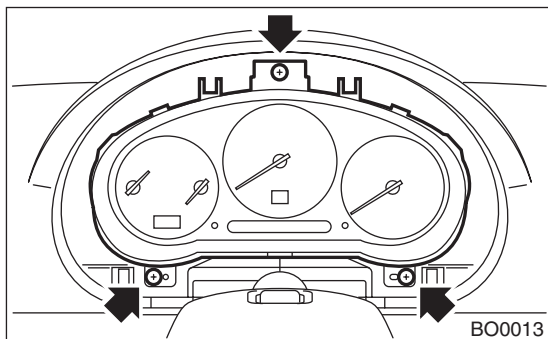
3. Combination Meter Assembly

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Set the tilt steering at lowest position.
- 3) Remove the screws and detach meter visor.



- 4) Remove the screws of combination meter and pull out the meter toward you.



- 5) Disconnect the connector in the upper area of combination meter to remove meter.

CAUTION:

- Be careful not to damage the 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

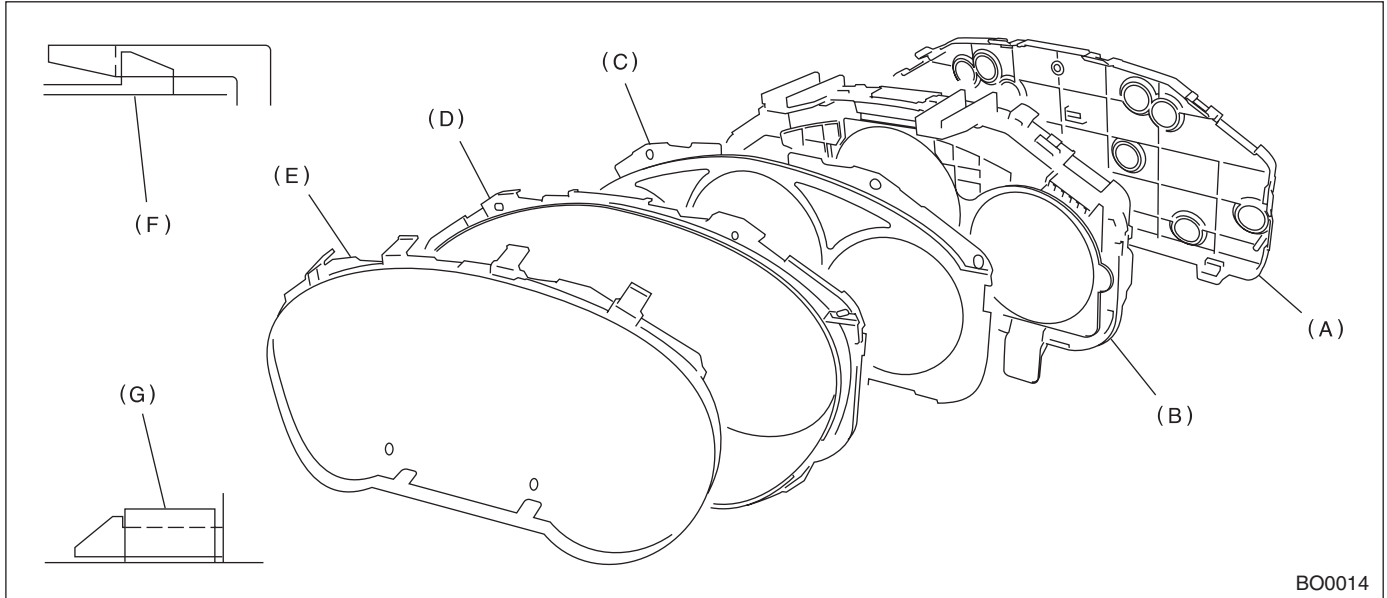
INSTRUMENTATION/DRIVER INFO

C: DISASSEMBLY

CAUTION:

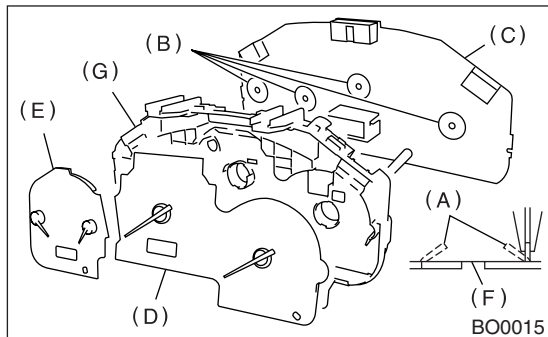
Use gloves to avoid damage and getting fingerprints on the glass surface and meter surfaces.

- 1) Disengage the claw (F) to remove case (B) from back cover (A).
- 2) Disengage the claw (G) to remove meter glass (E), reflector (D), and window plate (C) from inner case.

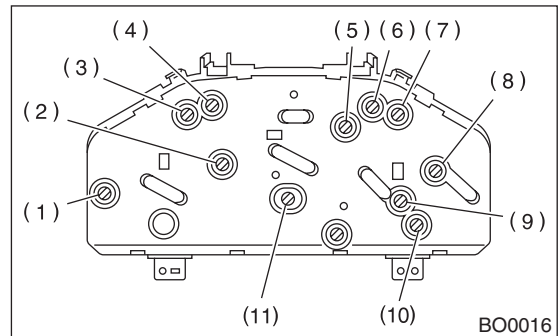


3) Pull up the claw (A) in portion (B) of combination meter printed circuit (C) with combination pliers. Push out the speedometer and tachometer assembly (D) and fuel gauge and water temperature gauge assembly (E) using hole (F).

4) Pull up the claw in center of combination meter printed circuit (C), and remove the printed circuit 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

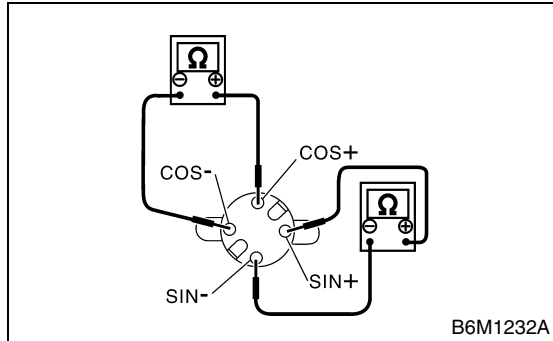
Disassemble the combination meter, and then remove the speedometer and tachometer assembly.
<Ref. to IDI-16, DISASSEMBLY, Combination Meter Assembly.>

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the speedometer resistance.



Terminal	Resistance
Terminals SIN+ and SIN-	200±8 Ω
Terminals COS+ and COS-	200±8 Ω

If NG, replace the speedometer and tachometer assembly.

If OK, replace the combination meter printed circuit.

5. Tachometer

A: REMOVAL

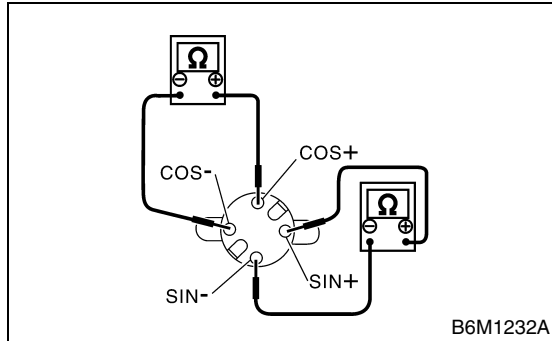
Disassemble the combination meter, and then remove the speedometer and tachometer assembly.
<Ref. to IDI-16, DISASSEMBLY, Combination Meter Assembly.>

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the tachometer resistance.



Terminal	Resistance
Terminals SIN+ and SIN-	200±8 Ω
Terminals COS+ and COS-	200±8 Ω

If NG, replace the speedometer and tachometer assembly.

If OK, replace the combination meter printed circuit.

6. Fuel Gauge

A: REMOVAL

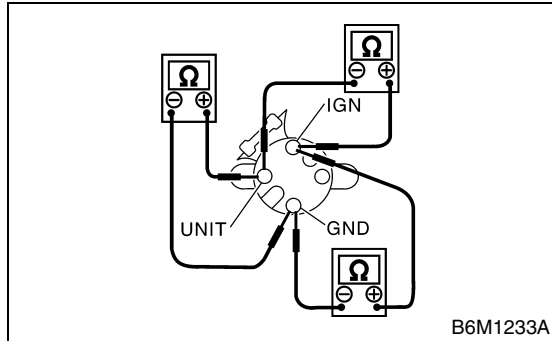
Disassemble the combination meter, and then remove the water temperature gauge and fuel gauge assembly. <Ref. to IDI-16, DISASSEMBLY, Combination Meter Assembly.>

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the fuel gauge resistance.



Terminal	Resistance
Terminals IGN and GND	170±10 Ω
Terminals IGN and UNIT	35±10 Ω
Terminals UNIT and GND	136±10 Ω

If NG, replace the water temperature gauge and fuel gauge assembly.

If OK, replace the combination meter printed circuit.

WATER TEMPERATURE GAUGE

INSTRUMENTATION/DRIVER INFO

7. Water Temperature Gauge

A: REMOVAL

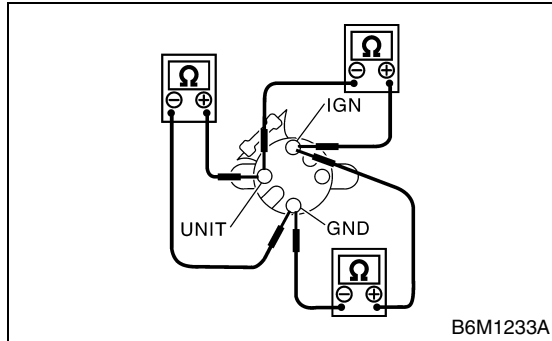
Disassemble the combination meter, and then remove the tachometer and water temperature gauge and fuel gauge assembly. <Ref. to IDI-16, DISASSEMBLY, Combination Meter Assembly.>

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the water temperature gauge resistance.



Terminal	Resistance
Terminals IGN and GND	$208 \pm 10 \Omega$
Terminals IGN and UNIT	$56 \pm 10 \Omega$
Terminals UNIT and GND	$264 \pm 10 \Omega$

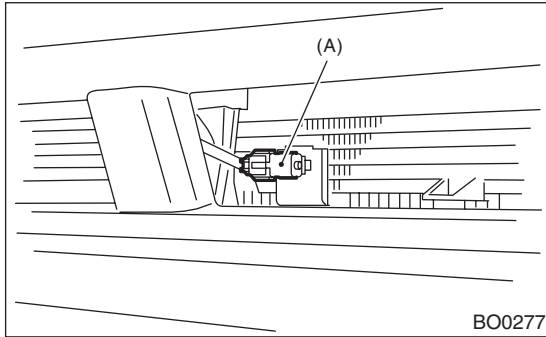
If NG, replace the water temperature gauge and fuel gauge assembly.

If OK, replace the combination meter printed circuit.

8. Ambient Sensor

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Disconnect the ambient sensor connector.
- 3) Remove the ambient sensor (A) from radiator lower panel.

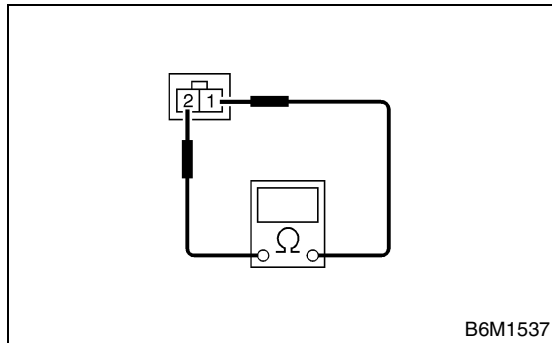


B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the ambient sensor resistance.



Terminal	Resistance
1 and 2	2.2 kΩ/25°C (77°F)

If NG, replace the ambient sensor.

AMBIENT SENSOR

INSTRUMENTATION/DRIVER INFO

SEATS

SE

	Page
1. General Description	2
2. Front Seat	6
3. Rear Seat	11

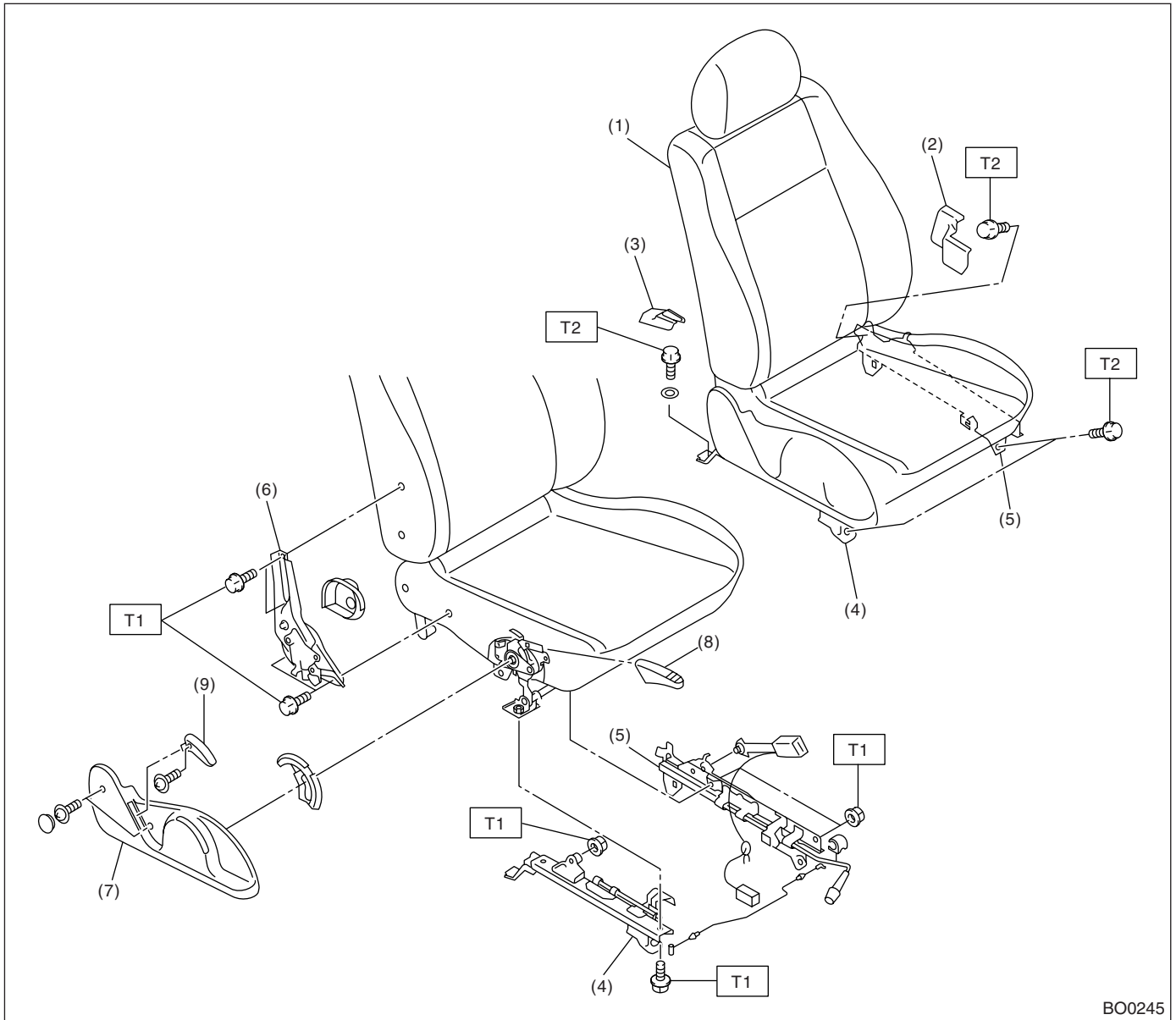
GENERAL DESCRIPTION

SEATS

1. General Description

A: COMPONENT

1. FRONT SEAT



BO0245

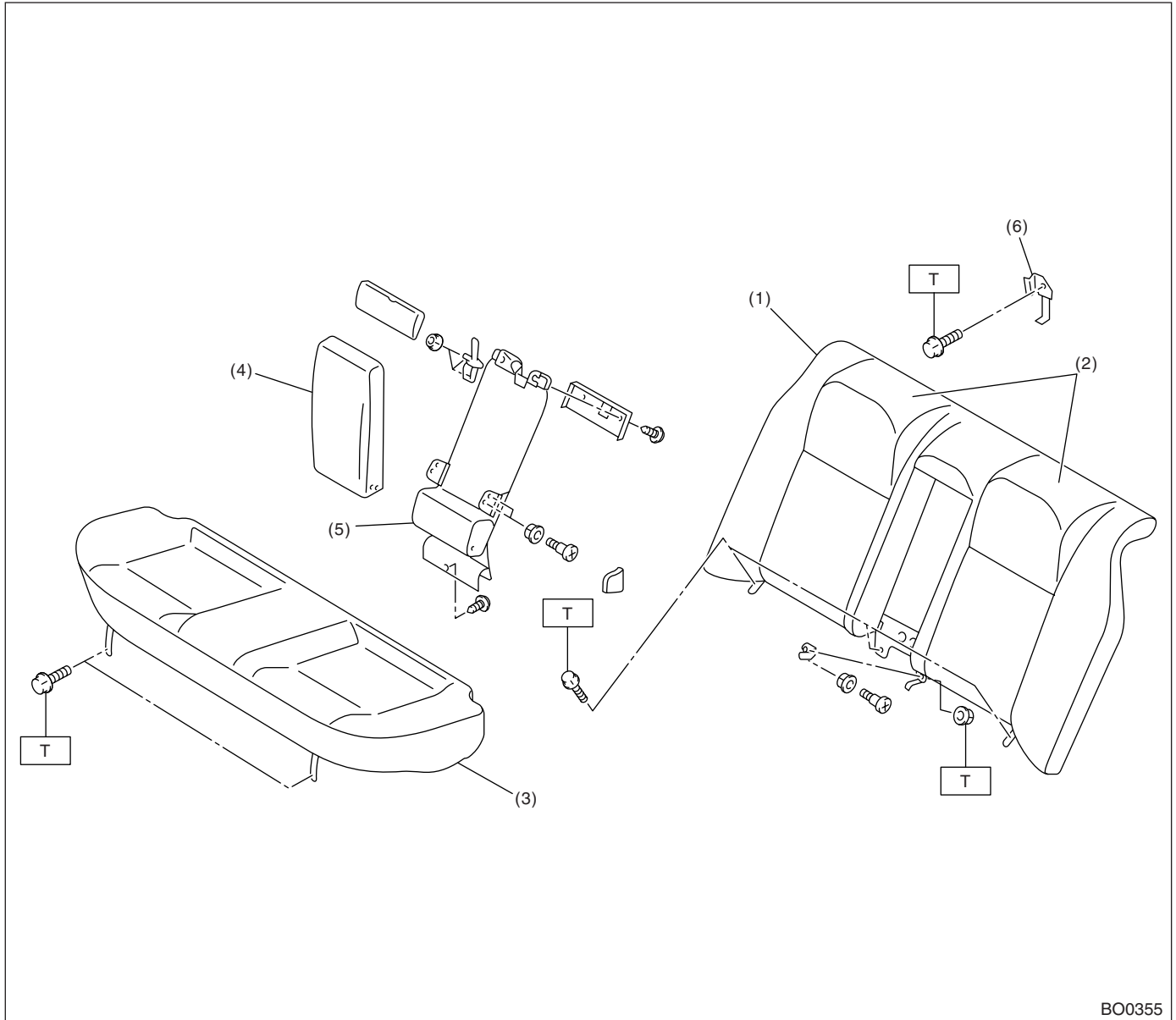
- | | |
|---------------------|-----------------------|
| (1) Front seat ASSY | (6) Seat hinge |
| (2) Rail cover IN | (7) Seat hinge cover |
| (3) Rail cover OUT | (8) Seat lifter lever |
| (4) Slide rail OUT | (9) Reclining lever |
| (5) Slide rail IN | |

Tightening torque: N-m (kgf-m, ft-lb)

T1: 30 (3.1, 22)

T2: 53 (5.4, 39)

2. REAR SEAT (SEDAN)



BO0355

- | | |
|--------------------|--------------------------|
| (1) Backrest | (4) Arm rest |
| (2) Head restraint | (5) Center through frame |
| (3) Cushion | (6) Hook |

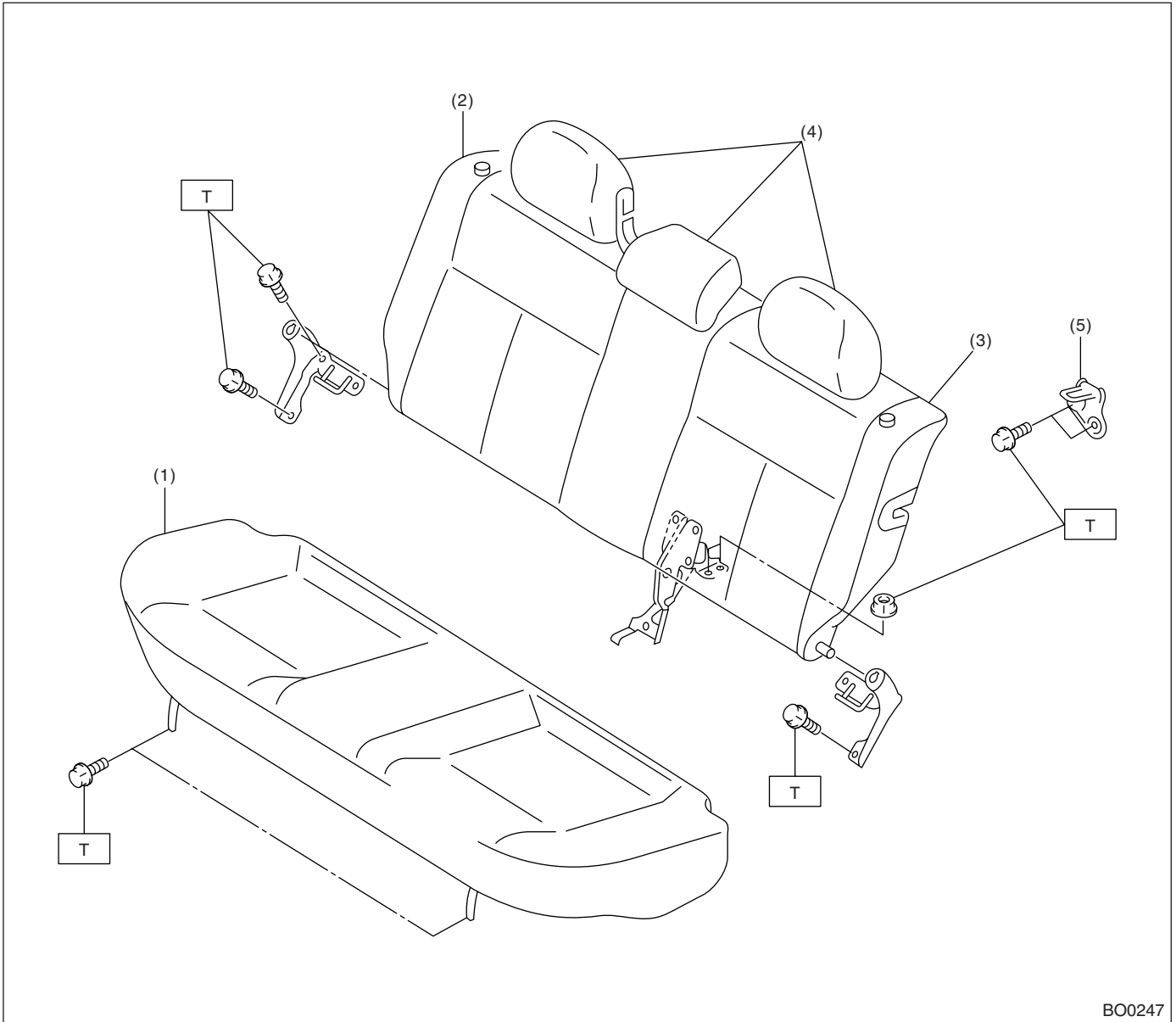
Tightening torque: N·m (kgf·m, ft·lb)

T: 24.5 (2.5, 18.1)

GENERAL DESCRIPTION

SEATS

3. REAR SEAT (WAGON)



- | | |
|-----------------|--------------------|
| (1) Cushion | (4) Head restraint |
| (2) Backrest RH | (5) Striker |
| (3) Backrest LH | |

Tightening torque: N·m (kgf·m, ft·lb)

T: 24.5 (2.5, 18.1)

GENERAL DESCRIPTION

SEATS

B: CAUTION

- Take care not to contaminate or damage the seat surface.
- While loading to or unloading to the vehicle, take care not to contact body.
- When removing the 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

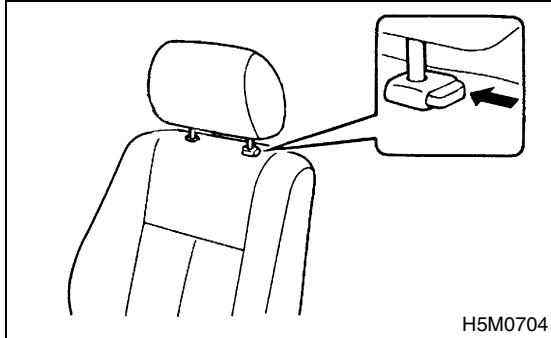
FRONT SEAT

SEATS

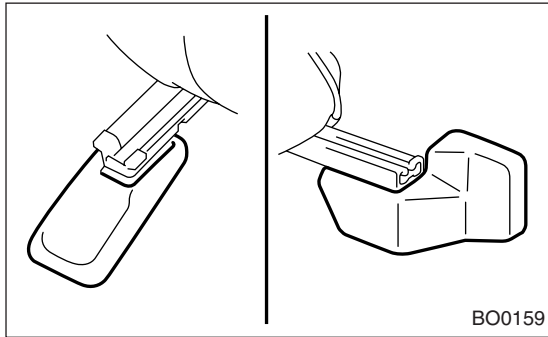
2. Front Seat

A: REMOVAL

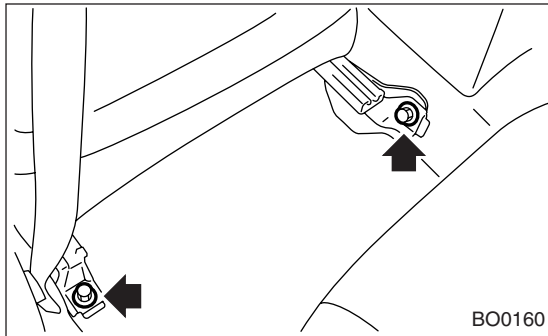
- 1) Disconnect the ground cable from battery.
- 2) While pressing the headrest lock button, remove the headrest.



- 3) Tilt forward the backrest.
- 4) Move the seat to full front end.
- 5) Remove the bolt cover at rear end of slide rail.

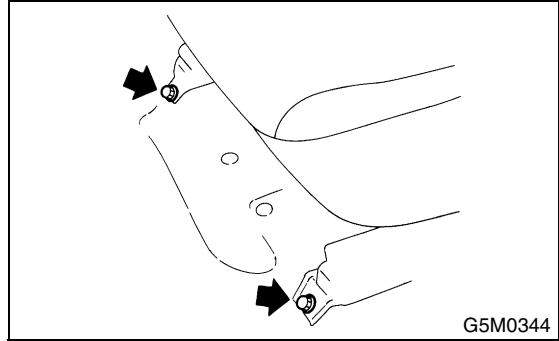


- 6) Remove the two bolts at rear side of seat rail.

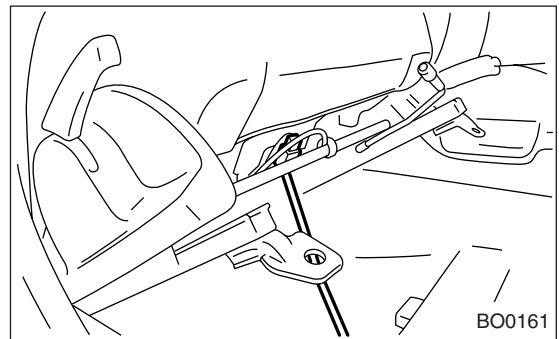


- 7) Move the seat to full rear end.

- 8) Remove the two bolts at front side of seat rail.



- 9) Disconnect the side airbag connector under the seat. (Side airbag equipped vehicle)
- 10) Disconnect the connector of seat belt warning.



- 11) Remove the front seat from vehicle.

CAUTION:

When removing the seat from vehicle, take care not to damage body, seat, or trim.

B: INSTALLATION

Install in the reverse order of removal.

CAUTION:

Confirm that the seat can move smoothly and be locked securely at any position.

Tightening torque:

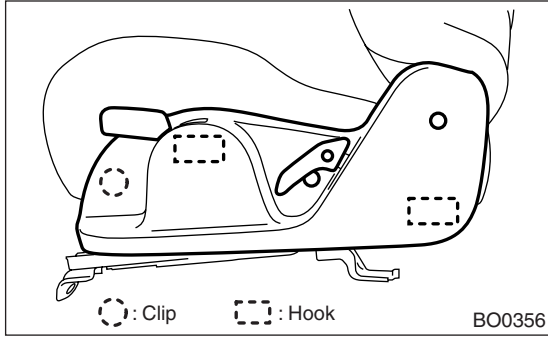
Refer to **COMPONENT** in *General Description*. <Ref. to **SE-2, FRONT SEAT, COMPONENT, General Description.**>

C: DISASSEMBLY

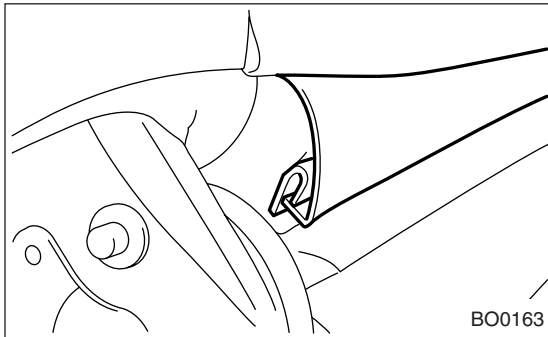
1. DRIVER'S SEAT

- 1) Remove the seat from vehicle. <Ref. to SE-6, REMOVAL, Front Seat.>

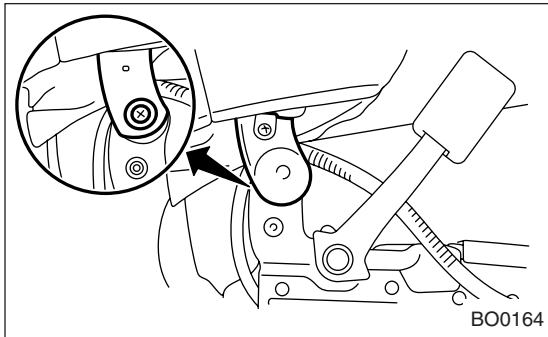
2) Remove the reclining hinge cover.



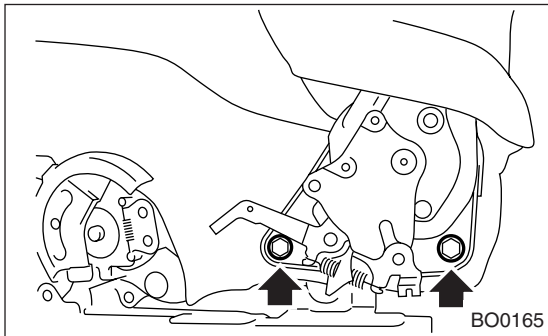
3) Remove the hook at bottom of seat backrest.



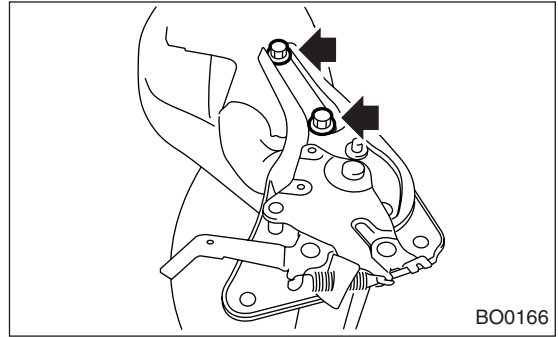
4) Remove the hinge cover and screw.



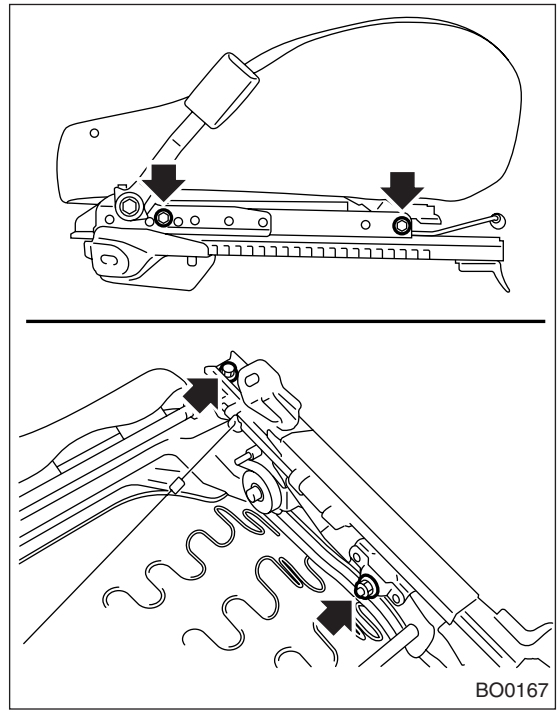
5) Remove the two bolts.



6) Turn the cover, and remove the two bolts from hinge.

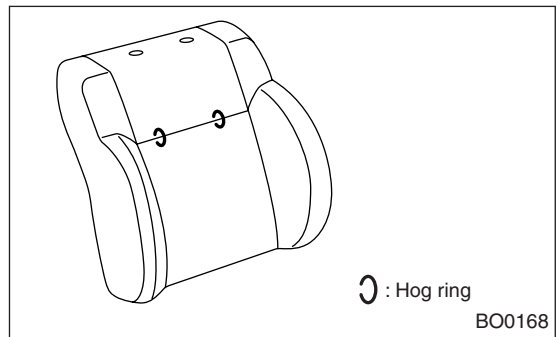


7) Loosen the bolt and nuts to remove slide rail.



8) Remove the hog rings, and then remove the seat back rest cover.

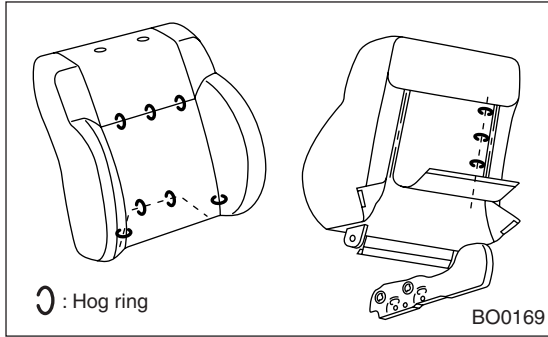
- Without side airbag MODEL



FRONT SEAT

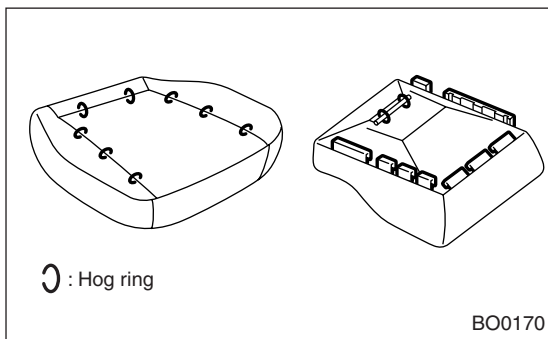
SEATS

- With side airbag MODEL

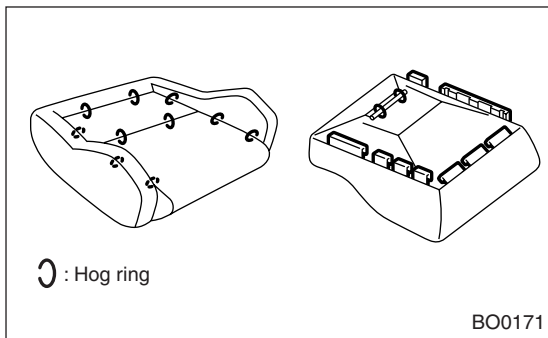


9) Remove the hog rings, and then remove the seat cushion cover.

- Standard type MODEL



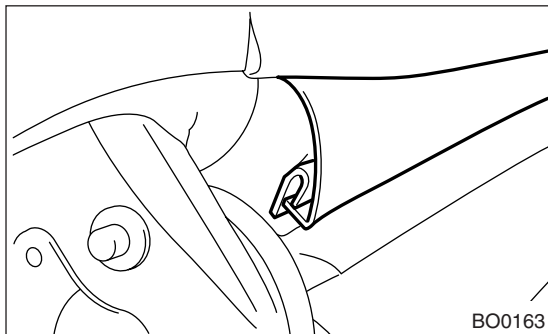
- Sporty type MODEL



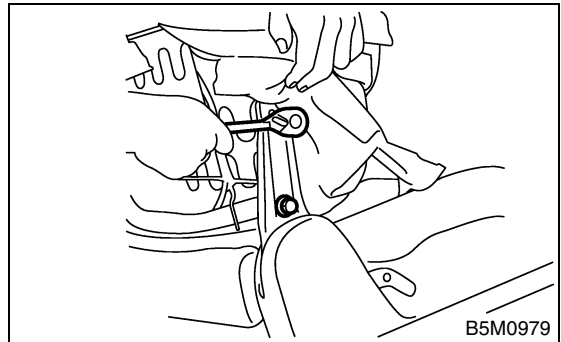
2. PASSENGER'S SEAT

1) Remove the seat from vehicle. <Ref. to SE-6, REMOVAL, Front Seat.>

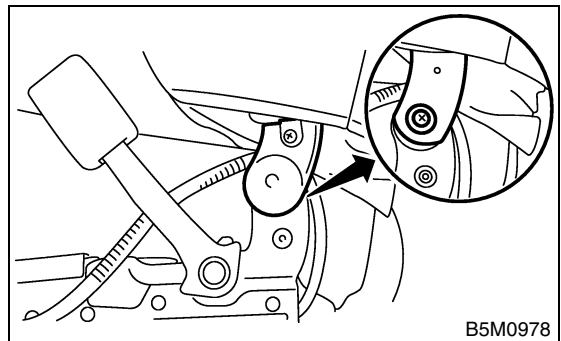
2) Remove the hook at bottom of seat back rest.



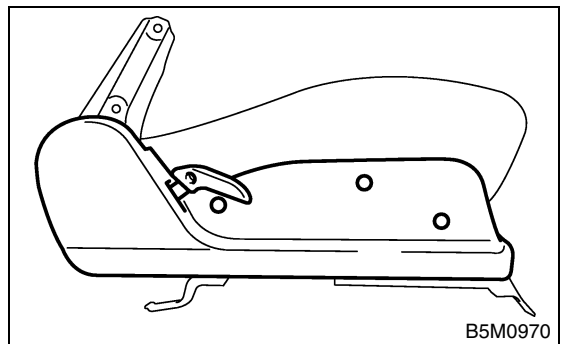
3) Turn the cover, and remove the two bolts from hinge.



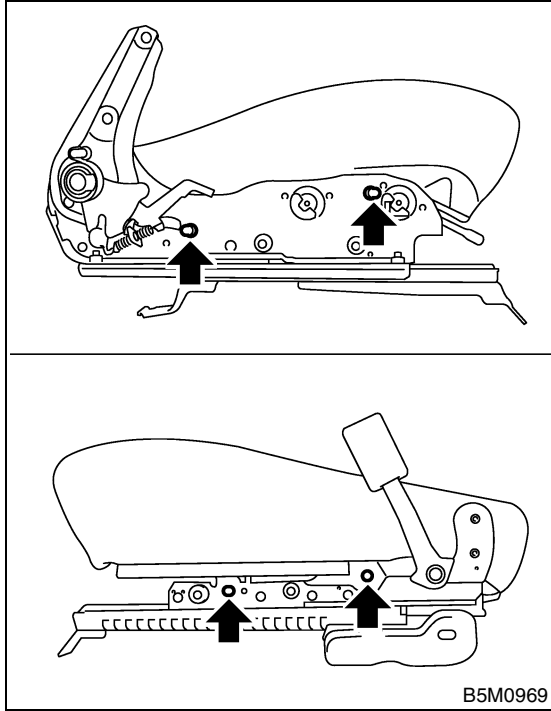
4) Remove the hinge screw cover and screw, and remove the seat back rest from hinge.



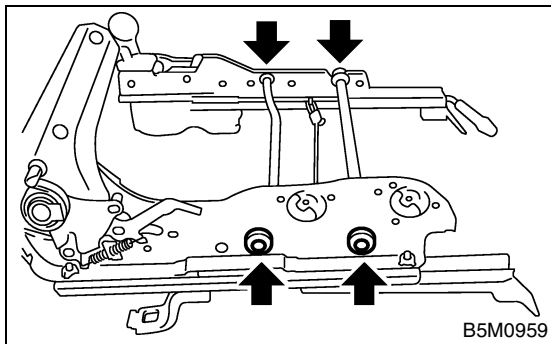
5) Remove the reclining lever cover and hinge cover.



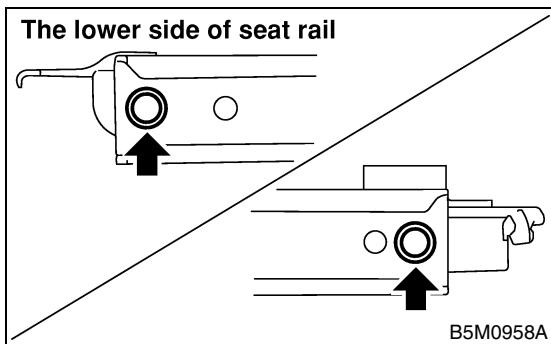
6) Loosen the four bolts to remove seat cushion.



7) Loosen the four screws to remove hinge.

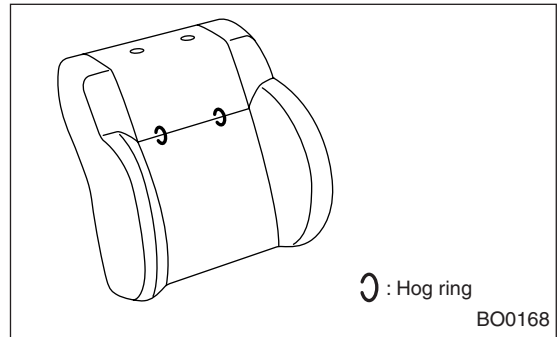


8) Loosen the two bolts to remove slide rail.

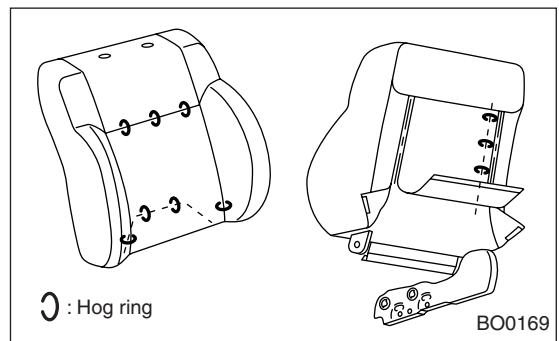


9) Remove the hog rings, and then remove the seat back rest cover.

- Without side airbag MODEL

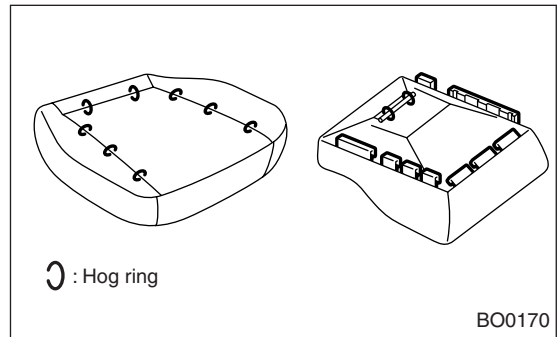


- With side airbag MODEL

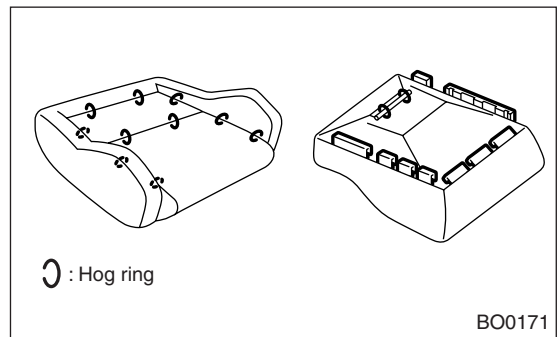


10) Remove the hog rings, and then remove the seat cushion cover.

- 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 the cover.
- While installing the hog rings, prevent the seat from getting wrinkled.

2. PASSENGER'S SEAT

Assemble in the reverse order of disassembly.

NOTE:

- Do not contaminate or damage the cover.
- While installing the hog rings, prevent the seat from getting wrinkled.

Tightening torque:

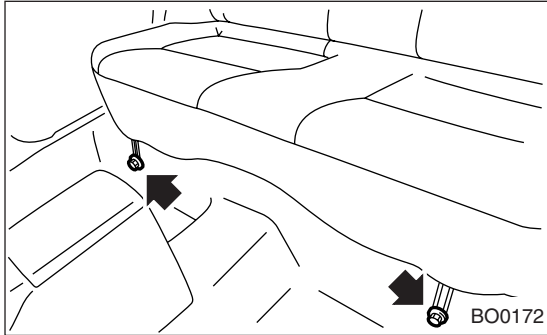
Refer to COMPONENT in General Description. <Ref. to SE-2, FRONT SEAT, COMPONENT, General Description.>

3. Rear Seat

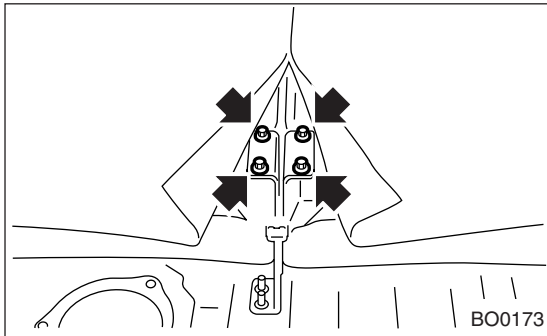
A: REMOVAL

1. WAGON

1) Remove the bolts, and then detach the rear seat cushion.



- 2) Remove the headrest.
- 3) Remove the luggage floor mat. <Ref. to EI-54, REMOVAL, Luggage Floor Mat.>
- 4) Turn over the mat to remove bolts.

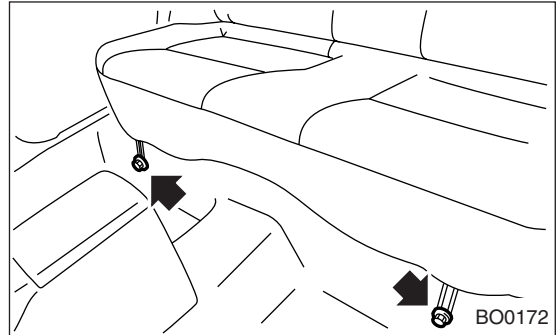


5) Remove the rear seat backrest.

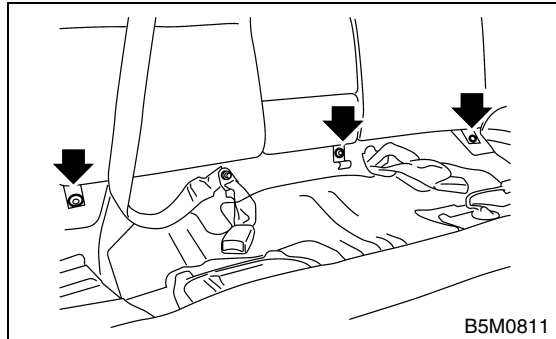


2. SEDAN

1) Remove the bolts, and then detach the rear seat cushion.



2) Remove the bolts securing lower portion of backrest and then open the center trunk through lid.



3) Lift the rear seat backrest and then remove it.

B: INSTALLATION

1. WAGON

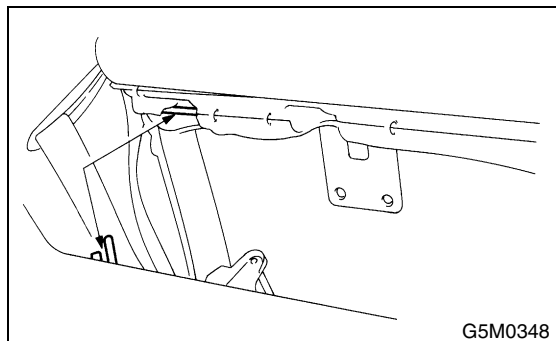
Install in the reverse order of removal.

Tightening torque:

Refer to COMPONENT in General Description. <Ref. to SE-4, REAR SEAT (WAGON), COMPONENT, General Description.>

2. SEDAN

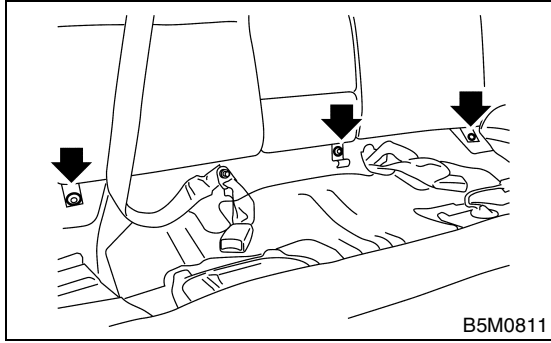
1) Hook and fasten the upper-back side of the rear seat backrest to the body hook.



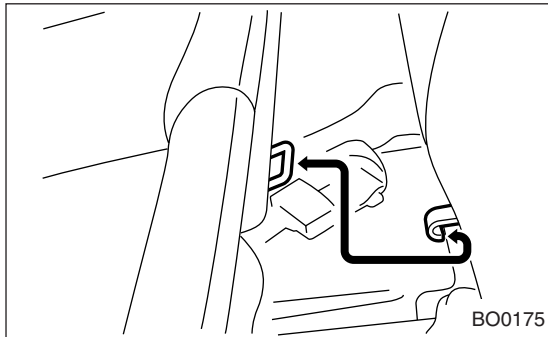
REAR SEAT

SEATS

2) Tighten the bolts.



3) Hook and fasten the seat cushion to the hook on the lower part of the rear seat backrest.



Tightening torque:

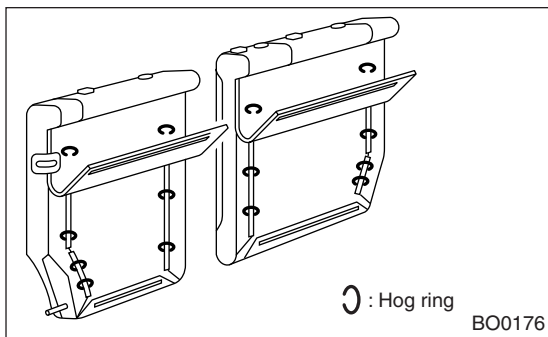
Refer to **COMPONENT** in *General Description*. <Ref. to **SE-4, REAR SEAT (WAGON), COMPONENT, General Description.**>

C: DISASSEMBLY

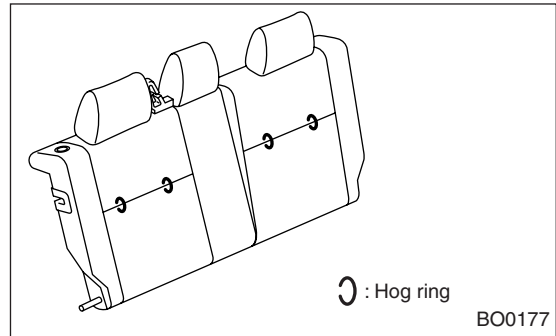
1. WAGON

1) Remove the rear seat. <Ref. to SE-11, WAGON, REMOVAL, Rear Seat.>

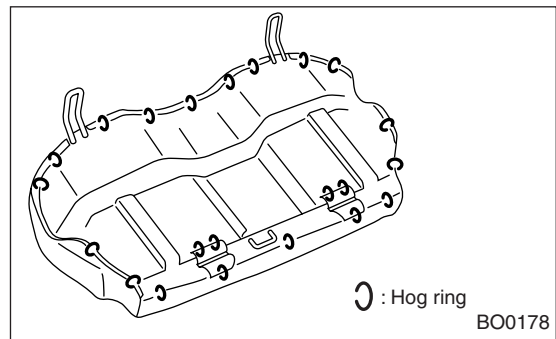
2) Remove the hog rings from around the seat backrest.



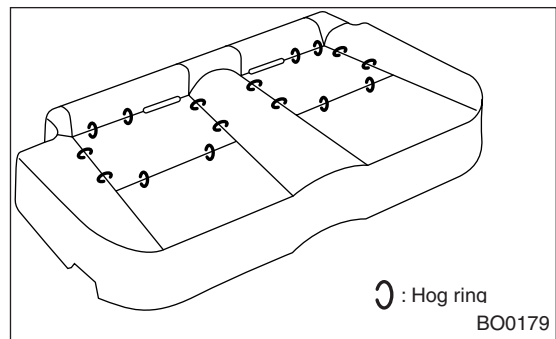
3) Remove the hog rings on front side of cushion pad, and remove the cover.



4) Remove the hog rings from around the seat cushion.



5) Remove the hog rings, and then remove the cover.

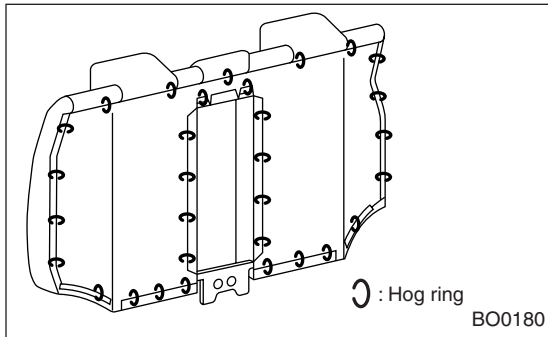


2. SEDAN

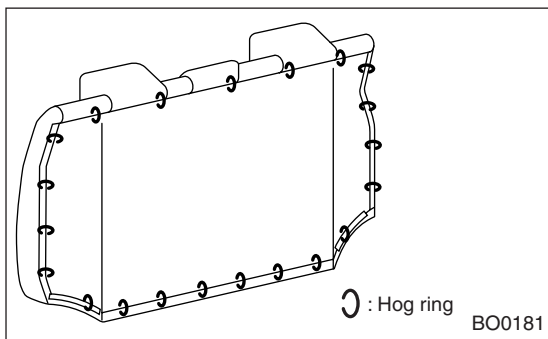
1) Remove the rear seat. <Ref. to SE-11, SEDAN, REMOVAL, Rear Seat.>

2) Remove the hog rings from around the seat backrest.

- Armrest through type MODEL

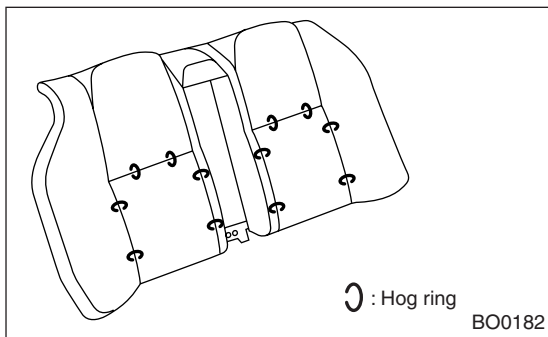


- Unified type MODEL

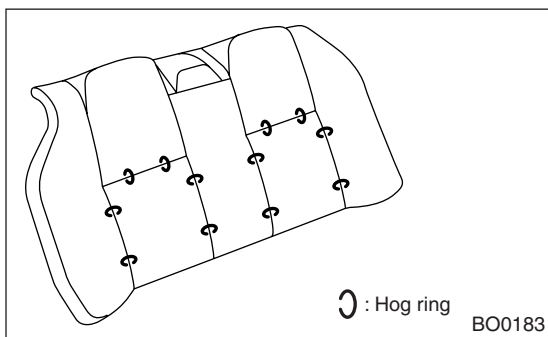


3) Remove the hog rings, and then remove the seat cover.

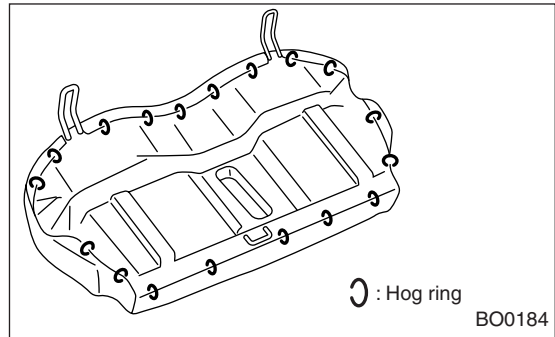
- Armrest through type MODEL



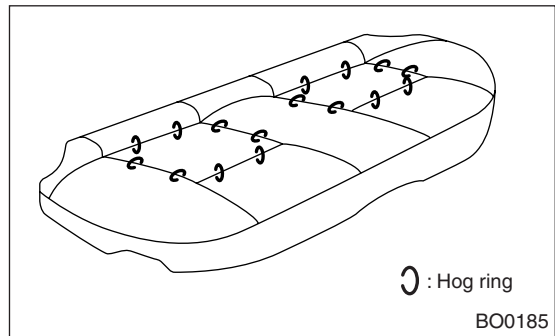
- Unified type MODEL



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 the cover.
- While installing the hog rings, prevent the seat from getting wrinkled.

2. SEDAN

Assemble in the reverse order of disassembly.

NOTE:

- Do not contaminate or damage the cover.
- While installing the hog rings, prevent the seat from getting wrinkled.

REAR SEAT

SEATS

SECURITY AND LOCKS

SL

	Page
1. General Description	2
2. Door Lock Control System	8
3. Keyless Entry System	12
4. Front Inner Remote	18
5. Front Outer Handle	19
6. Front Door Latch Assembly.....	20
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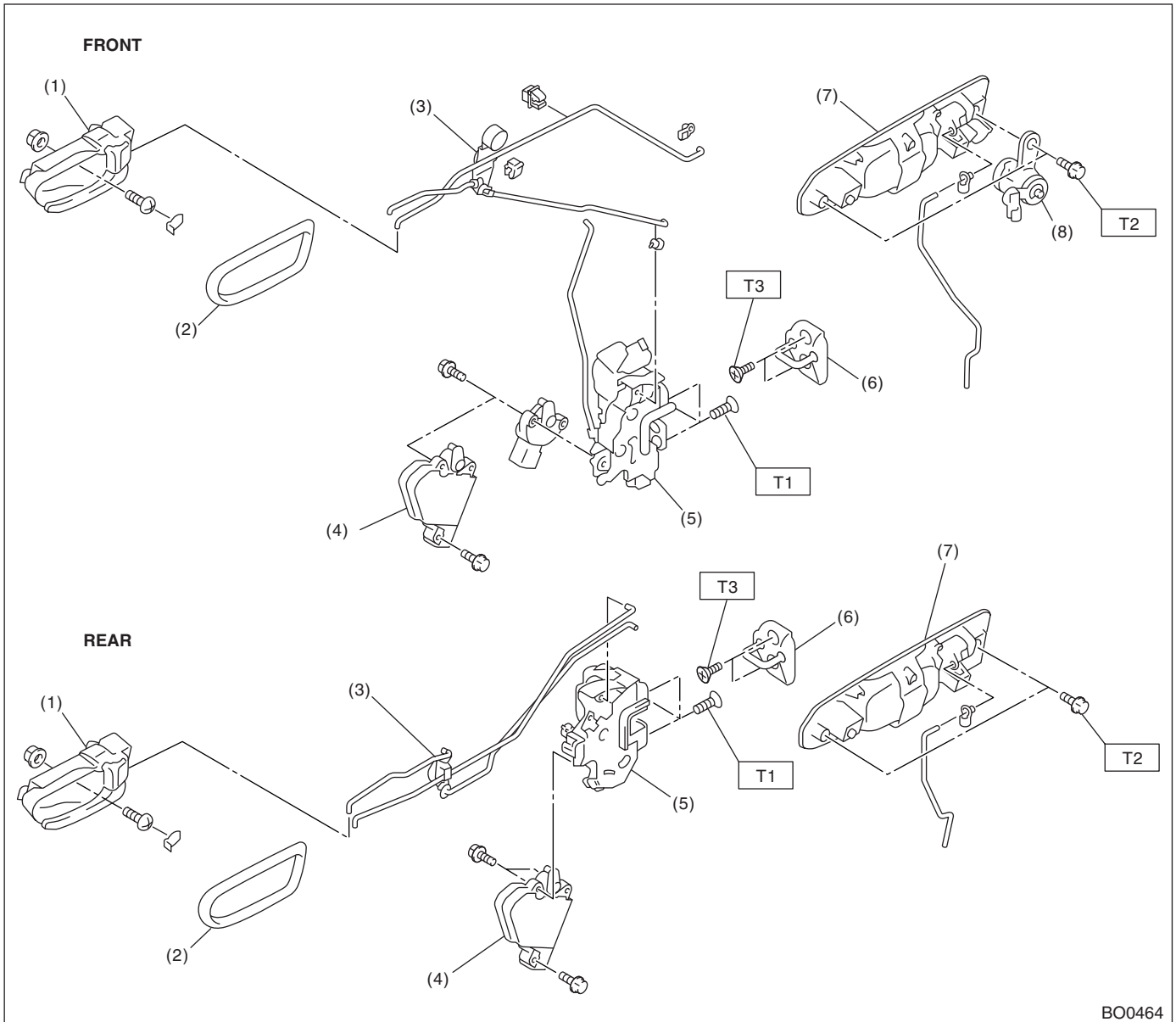
GENERAL DESCRIPTION

SECURITY AND LOCKS

1. General Description

A: COMPONENT

1. DOOR LOCK ASSEMBLY



- (1) Inner remote ASSY
- (2) Inner remote cover
- (3) Bell crank
- (4) Auto-door lock actuator
- (5) Door latch

- (6) Striker
- (7) Door outer handle
- (8) Key cylinder

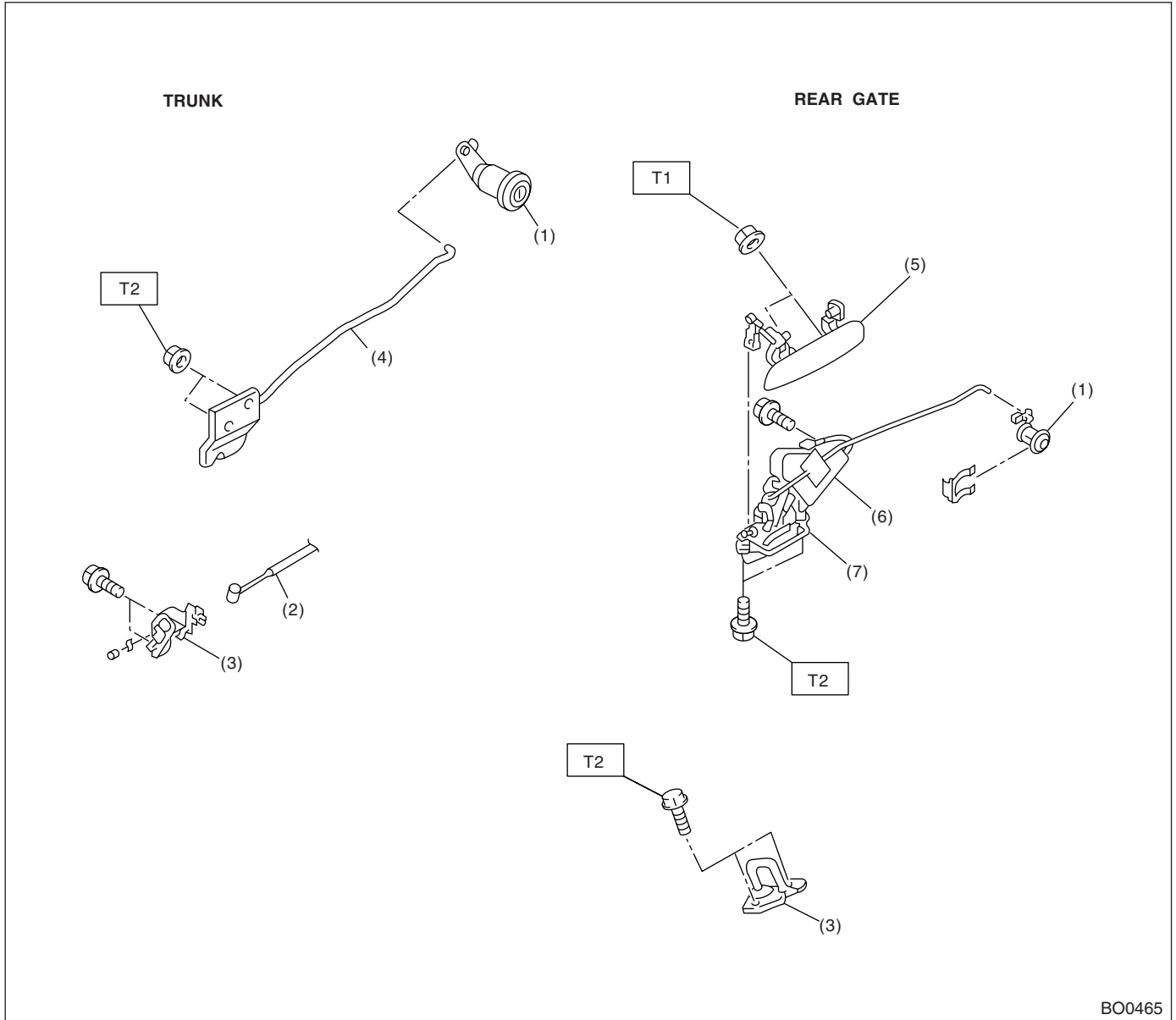
Tightening torque: N-m (kgf-m, ft-lb)

T1: 6.4 (0.65, 4.7)

T2: 7.4 (0.75, 5.5)

T3: 17.6 (1.8, 13.0)

2. TRUNK LID AND REAR GATE LOCK



BO0465

- | | |
|-------------------------|----------------------------|
| (1) Key cylinder | (5) Rear gate outer handle |
| (2) Cable | (6) Rear gate actuator |
| (3) Striker | (7) Rear gate latch |
| (4) Trunk lid lock ASSY | |

Tightening torque: N·m (kgf·m, ft·lb)

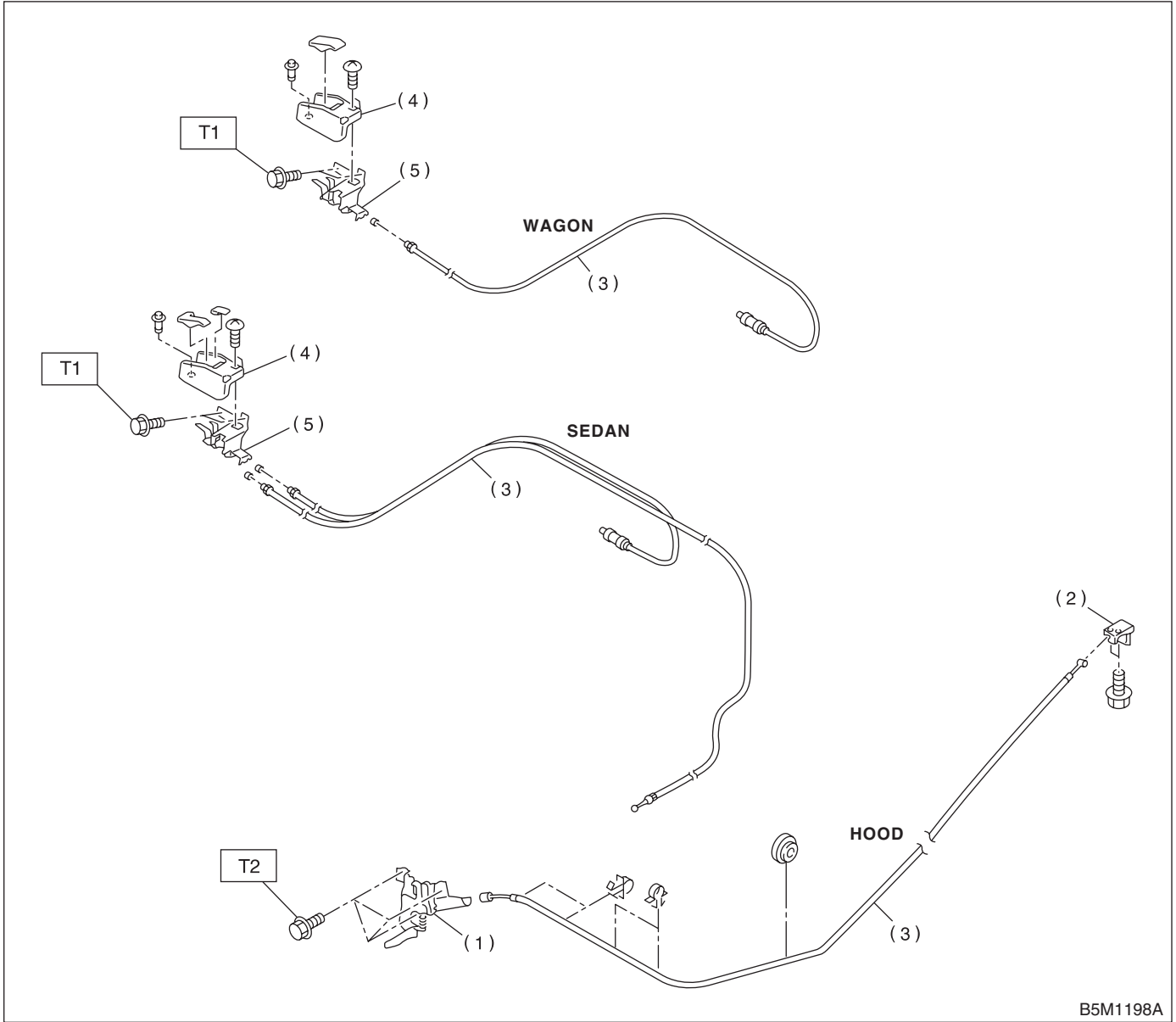
T1: 4.5 (0.45, 3.3)

T2: 25 (2.5, 18.4)

GENERAL DESCRIPTION

SECURITY AND LOCKS

3. HOOD LOCK AND REMOTE OPENERS



- (1) Hood lock ASSY
- (2) Lever ASSY
- (3) Cable
- (4) Cover

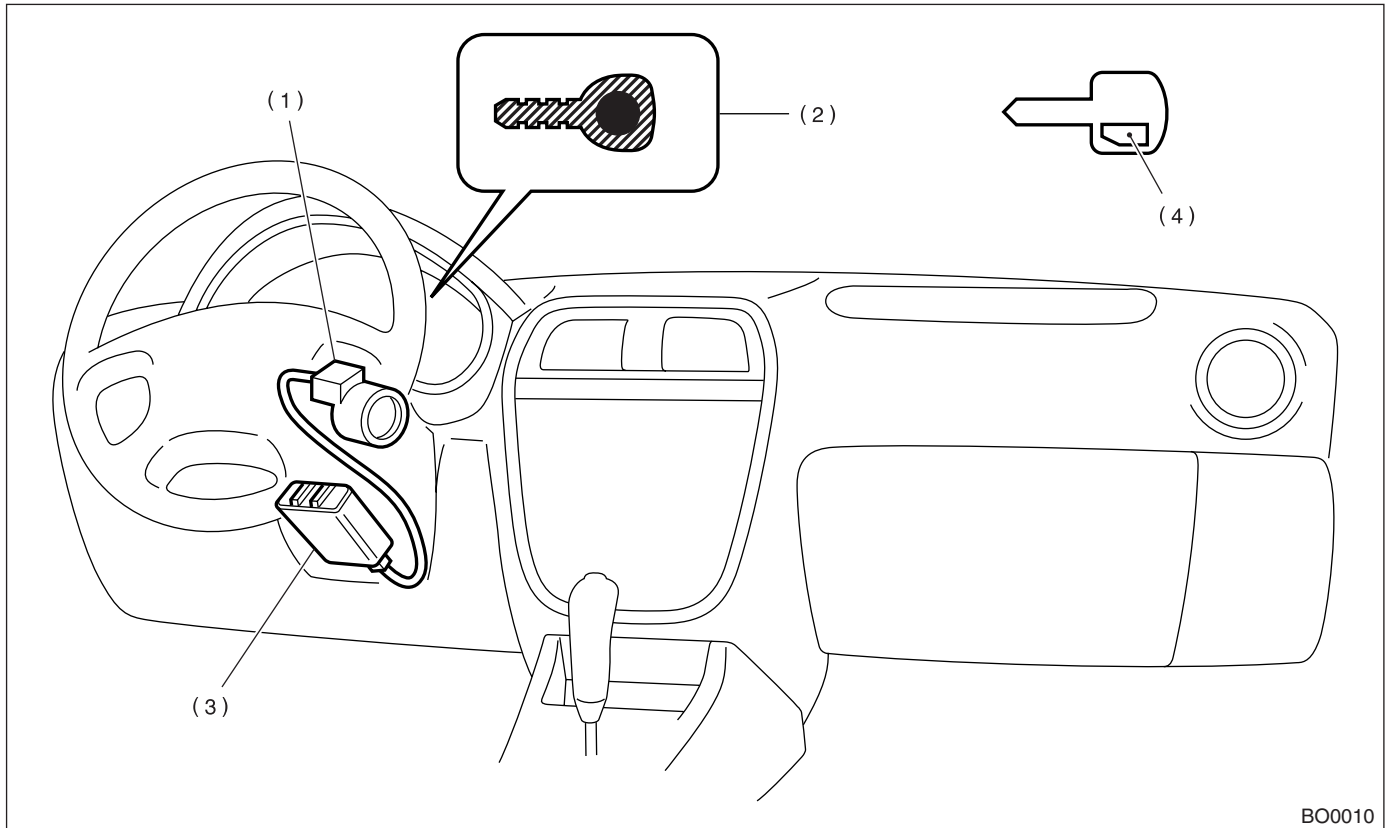
- (5) Pull handle ASSY

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

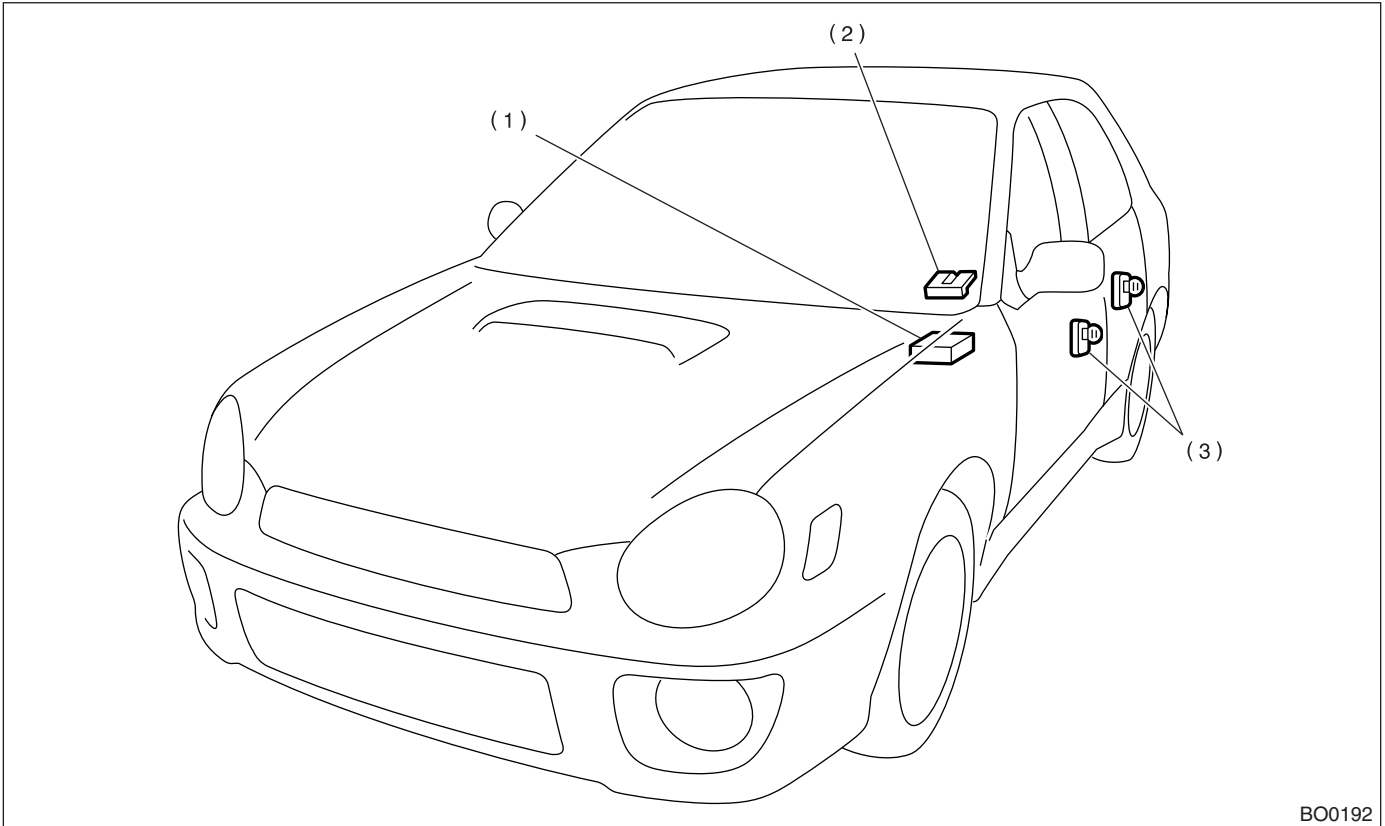
NOTE:

IMM ECM location for RHD model is symmetrically opposite.

GENERAL DESCRIPTION

SECURITY AND LOCKS

5. KEYLESS ENTRY SYSTEM



BO0192

- (1) Keyless entry control module (2) Rear gate latch switch (Wagon) (3) Door switch

B: CAUTION

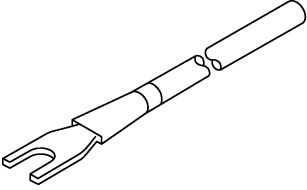
- Before disassembling or reassembling parts, always disconnect the ground cable from battery. When repairing radio, control module, etc. which are provided with memory functions, record the memory contents before disconnecting the ground cable from battery. Otherwise, these contents are cancelled upon disconnection.
- Reassemble parts in the reverse order of disassembly procedure unless otherwise indicated.
- Adjust parts to specifications contained in this manual if so designated.
- Connect the connectors and hoses securely during reassembly.
- After reassembly, ensure all functional parts operate smoothly.
- Airbag system wiring harness is routed near the electrical parts and switch.
- All airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuits.
- Be careful not to damage the airbag system wiring harness when servicing the ignition key cylinder.

GENERAL DESCRIPTION

SECURITY AND LOCKS

C: 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

<Ref. to WI-105, SCHEMATIC, Door Lock System.>

B: INSPECTION

1. SYMPTOM CHART

Symptom	Repair order	Reference
The door lock control system does not operate.	1. Check the fuse.	<Ref. to SL-8, CHECK FUSE, INSPECTION, Door Lock Control System.>
	2. Check the power supply and ground circuit for the door lock timer (without keyless entry) or keyless entry control module (with keyless entry).	<Ref. to SL-9, CHECK POWER SUPPLY AND GROUND CIRCUIT, INSPECTION, Door Lock Control System.>
	3. Check the door lock switch and circuit.	<Ref. to SL-9, CHECK DOOR LOCK SWITCH AND CIRCUIT, INSPECTION, Door Lock Control System.>
	4. Check the door lock actuator and circuit.	<Ref. to SL-10, 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 circuit.	<Ref. to SL-9, CHECK DOOR LOCK SWITCH AND CIRCUIT, INSPECTION, Door Lock Control System.>
A specific door lock actuator does not operate.	Check the door lock actuator and circuit.	<Ref. to SL-10, 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 the 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 the power supply and ground circuit. <Ref. to SL-9, CHECK POWER SUPPLY AND GROUND CIRCUIT, INSPECTION, Door Lock Control System.>

DOOR LOCK CONTROL SYSTEM

SECURITY AND LOCKS

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 harness connector terminal and chassis ground. <i>Connector & terminal</i> <i>Without keyless entry:</i> (B92) No. 2 (+) — Chassis ground (-): (B92) No. 6 (+) — Chassis ground (-): <i>With keyless entry:</i> (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 fuse.
2 CHECK GROUND CIRCUIT. Measure the resistance between harness connector terminal and chassis ground. <i>Connector & terminal</i> <i>Without keyless entry:</i> (B92) No. 4 — Chassis ground: <i>With keyless entry:</i> (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 the 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 harness connector terminal and chassis ground when moving the driver's door lock knob to UNLOCK. <i>Connector & terminal</i> (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 harness connector terminal and chassis ground when the driver's door lock knob is moved to LOCK. <i>Connector & terminal</i> (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) Measure the resistance between door lock switch terminals when moving the door lock knob to UNLOCK. <i>Terminal</i> No. 1 — No. 2:	Is the resistance less than 1 Ω ?	Go to step 5.	Replace the door lock switch.
5 CHECK DOOR LOCK SWITCH. Measure the resistance between door lock switch terminals when moving the door lock knob to LOCK. <i>Terminal</i> No. 1 — No. 2:	Is the resistance more than 1 M Ω ?	Check the harness for open circuits or shorts between door lock timer and door lock switch.	Replace the door lock switch.

DOOR LOCK CONTROL SYSTEM

SECURITY AND LOCKS

Step	Check	Yes	No
6 CHECK DOOR LOCK SWITCH CIRCUIT. 1)Disconnect the keyless entry control module harness connector. 2)Measure the resistance between harness connector terminal and chassis ground when moving the driver's door lock knob to UNLOCK. <i>Connector & terminal</i> <i>(B176) No. 7 — Chassis ground:</i>	Is the resistance less than 10 Ω ?	Go to step 7.	Go to step 8.
7 CHECK DOOR LOCK SWITCH CIRCUIT. Measure the resistance between harness connector terminal and chassis ground when the driver's door lock knob is moved to LOCK. <i>Connector & terminal</i> <i>(B176) No. 7 — Chassis ground:</i>	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)Measure the resistance between door lock switch terminals when moving the door lock knob to UNLOCK. <i>Terminal</i> <i>No. 2 — No. 4:</i>	Is the resistance less than 1 Ω ?	Go to step 9.	Replace the door lock switch (actuator).
9 CHECK DOOR LOCK SWITCH. Measure the resistance between door lock switch terminals when moving the door lock knob to LOCK. <i>Terminal</i> <i>No. 2 — No. 4:</i>	Is the resistance more than 1 M Ω ?	Check the harness for open circuits or shorts between keyless entry control module and door lock switch.	Replace the door lock switch (actuator).

5. CHECK DOOR LOCK ACTUATOR AND CIRCUIT

Step	Check	Yes	No
1 CHECK OUTPUT SIGNAL. Measure the voltage between harness connector terminal and chassis ground when moving the door lock knob to LOCK. <i>Connector & terminal</i> <i>Without keyless entry:</i> <i>(B92) No. 3 (+) — Chassis ground (-):</i> <i>With keyless entry:</i> <i>(B176) No. 18 (+) — Chassis ground (-):</i>	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 harness connector terminal and chassis ground when moving the door lock knob to UNLOCK. <i>Connector & terminal</i> <i>Without keyless entry:</i> <i>(B92) No. 1 (+) — Chassis ground (-):</i> <i>With keyless entry:</i> <i>(B176) No. 17 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Go to step 3.	Replace the door lock timer or keyless entry control module.

DOOR LOCK CONTROL SYSTEM

SECURITY AND LOCKS

Step	Check	Yes	No
3 CHECK DOOR LOCK ACTUATOR. Check the door lock actuator. Front door lock actuator: <Ref. to SL-21, Front Door Lock Actuator.> Rear door lock actuator: <Ref. to SL-25, Rear Door Lock Actuator.> Rear gate latch lock actuator: <Ref. to SL-28, 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 door lock actuator.	Replace the door lock actuator.

KEYLESS ENTRY SYSTEM

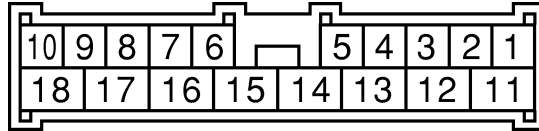
SECURITY AND LOCKS

3. Keyless Entry System

A: SCHEMATIC

<Ref. to WI-186, SCHEMATIC, Keyless Entry System.>

B: ELECTRICAL SPECIFICATION



B5M1141

Content	Terminal No.	Measuring condition
Key warning switch	1 (INPUT)	Battery voltage is present when inserting the key into 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/Ignition switch illumination	11 (OUTPUT)	<ul style="list-style-type: none"> 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.

C: INSPECTION

1. SYMPTOM CHART

Symptom	Repair order	Reference
None of the functions of keyless entry system operate.	1. Check the transmitter battery.	<Ref. to SL-14, CHECK TRANSMITTER BATTERY, INSPECTION, Keyless Entry System.>
	2. Check the fuse.	<Ref. to SL-14, CHECK FUSE, INSPECTION, Keyless Entry System.>
	3. Check the keyless entry control module power supply and ground circuit.	<Ref. to SL-14, CHECK POWER SUPPLY AND GROUND CIRCUIT, INSPECTION, Keyless Entry System.>
	4. Replace the keyless entry control module.	<Ref. to SL-36, Keyless Entry Control Module.>
The transmitter cannot be registered.	1. Check the transmitter battery.	<Ref. to SL-14, CHECK TRANSMITTER BATTERY, INSPECTION, Keyless Entry System.>
	2. Check the registration connector circuit.	<Ref. to SL-15, CHECK REGISTRATION CONNECTOR CIRCUIT, INSPECTION, Keyless Entry System.>
	3. Replace the keyless entry control module.	<Ref. to SL-36, 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-8, INSPECTION, INSPECTION, Door Lock Control System.>	1. Check the transmitter battery.	<Ref. to SL-14, CHECK TRANSMITTER BATTERY, INSPECTION, Keyless Entry System.>
	2. Check the key warning switch.	<Ref. to SL-16, CHECK KEY WARNING SWITCH, INSPECTION, Keyless Entry System.>
	3. Check the door switch.	<Ref. to SL-15, CHECK DOOR SWITCH, INSPECTION, Keyless Entry System.>
	4. Replace the keyless entry control module.	<Ref. to SL-36, Keyless Entry Control Module.>
The hazard light does not operate.	1. Check the transmitter battery	<Ref. to SL-14, CHECK TRANSMITTER BATTERY, INSPECTION, Keyless Entry System.>
	2. Check the key warning switch.	<Ref. to SL-16, CHECK KEY WARNING SWITCH, INSPECTION, Keyless Entry System.>
	3. Check the door switch.	<Ref. to SL-15, CHECK DOOR SWITCH, INSPECTION, Keyless Entry System.>
	4. Check the hazard light operation.	<Ref. to SL-17, CHECK HAZARD LIGHT OPERATION, INSPECTION, Keyless Entry System.>
	5. Replace the keyless entry control module.	<Ref. to SL-36, Keyless Entry Control Module.>

KEYLESS ENTRY SYSTEM

SECURITY AND LOCKS

Symptom	Repair order	Reference
The room light and ignition switch illumination operation does not activate.	1. Check the transmitter battery.	<Ref. to SL-14, CHECK TRANSMITTER BATTERY, INSPECTION, Keyless Entry System.>
	2. Check the room light operation.	<Ref. to SL-17, CHECK ROOM LIGHT OPERATION, INSPECTION, Keyless Entry System.>
	3. Check the ignition switch illumination circuit.	<Ref. to SL-17, CHECK IGNITION SWITCH ILLUMINATION CIRCUIT, INSPECTION, Keyless Entry System.>
	4. Check the key warning switch.	<Ref. to SL-16, CHECK KEY WARNING SWITCH, INSPECTION, Keyless Entry System.>
	5. Check the door switch.	<Ref. to SL-15, CHECK DOOR SWITCH, INSPECTION, Keyless Entry System.>
	6. Replace the keyless entry control module.	<Ref. to SL-36, Keyless Entry Control Module.>

2. CHECK TRANSMITTER BATTERY

Step	Check	Yes	No
1 CHECK TRANSMITTER BATTERY. 1)Remove the battery from transmitter. <Ref. to SL-37, REMOVAL, Keyless Transmitter.> 2)Check the battery voltage. <Ref. to SL-37, INSPECTION, Keyless Transmitter.>	Is the battery voltage OK?	Further inspection is necessary, refer to "SYMPTOM CHART". <Ref. to SL-13, SYMPTOM CHART, INSPECTION, Keyless Entry System.>	Replace the transmitter battery.

3. CHECK FUSE

Step	Check	Yes	No
1 CHECK FUSE. Remove and visually check the 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 the power supply and ground circuit. <Ref. to SL-14, CHECK POWER SUPPLY AND GROUND CIRCUIT, INSPECTION, Keyless Entry System.>

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 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 keyless entry control module and fuse.

KEYLESS ENTRY SYSTEM

SECURITY AND LOCKS

Step	Check	Yes	No
2 CHECK GROUND CIRCUIT. Measure the resistance between harness connector terminal and chassis ground. <i>Connector & terminal</i> <i>(B176) No. 6, No. 14 — Chassis ground:</i>	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 the registration connector. 2) Measure the voltage between keyless entry control module harness connector and chassis ground. <i>Connector & terminal</i> <i>(B176) No. 2 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Go to step 2.	Repair the harness, and (or) connector.
2 REGISTRATION CONNECTOR INPUT VOLTAGE INSPECTION 1) Connect the registration connector. 2) Measure the voltage between keyless entry control module harness connector and chassis ground. <i>Connector & terminal</i> <i>(B176) No. 2 (+) — Chassis ground (-):</i>	Is the voltage 0 V?	Registration connector circuit is OK.	Repair the harness, and (or) connector.

6. CHECK DOOR SWITCH

Step	Check	Yes	No
1 CHECK DOOR SWITCH CIRCUIT. Measure the voltage between keyless entry control module harness connector terminal and chassis ground. <i>Connector & terminal</i> <i>(B176) No. 3 (+) — Chassis ground (-):</i>	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 keyless entry control module harness connector terminal and chassis ground. <i>Connector & terminal</i> <i>(B176) No. 3 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V when each door and rear gate is closed?	The door switch is OK.	Go to step 3.
3 CHECK DOOR SWITCH. 1) Disconnect the door switch harness connector. 2) Measure the resistance between 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>	Is the resistance more than 1 M Ω when door switch is pushed?	Go to step 4.	Replace the door switch.

KEYLESS ENTRY SYSTEM

SECURITY AND LOCKS

Step	Check	Yes	No
4 CHECK DOOR SWITCH. Measure the resistance between 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>	Is the resistance less than 1 Ω when door switch is released?	Check the harness for open circuits or shorts between keyless entry control module and door switch.	Replace the door switch.

7. CHECK KEY WARNING SWITCH

Step	Check	Yes	No
1 CHECK FUSE. Remove and visually check the 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 ignition switch. (LOCK position) 3)Measure the voltage between harness connector terminal and chassis ground. <i>Connector & terminal</i> <i>(B176) No. 1 (+) — Chassis ground (-):</i>	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 ignition switch. 2)Measure the voltage between harness connector terminal and chassis ground. <i>Connector & terminal</i> <i>(B176) No. 1 (+) — Chassis ground (-):</i>	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 ignition switch. (LOCK position) 3)Measure the resistance between key warning switch terminals. <i>Terminal</i> <i>No. 1 — No. 2:</i>	Is the resistance less than 1 Ω ?	Go to step 5.	Replace the key warning switch.
5 CHECK KEY WARNING SWITCH. 1)Remove the key from ignition switch. 2)Measure the resistance between key warning switch terminals. <i>Terminal</i> <i>No. 1 — No. 2:</i>	Is the resistance more than 1 M Ω ?	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	Replace the 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 the hazard light blink?	Go to step 2.	Check the hazard light circuit.
2 CHECK OUTPUT SIGNAL. 1)Remove the key from ignition switch. 2)Close all doors and rear gate. 3)Measure the 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 the 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 keyless entry control module harness connector terminal and 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 keyless entry control module and room light.

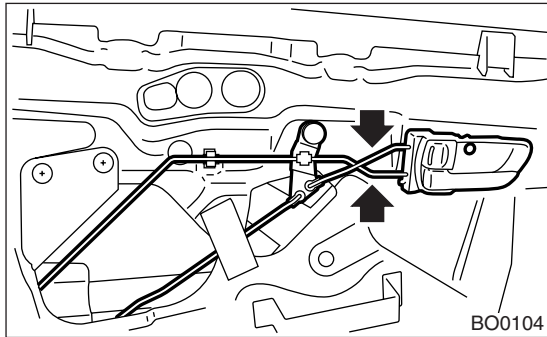
10. CHECK IGNITION SWITCH ILLUMINATION CIRCUIT

Step	Check	Yes	No
1 CHECK IGNITION SWITCH ILLUMINATION POWER SUPPLY. 1)Disconnect the ignition switch illumination harness connector. 2)Measure the voltage between ignition switch illumination harness connector terminal and chassis ground. Connector & terminal (B224) No. 1 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 2.	Check the harness for open circuit or shorts between ignition switch illumination and fuse.
2 CHECK HARNESS BETWEEN IGNITION SWITCH ILLUMINATION AND KEYLESS ENTRY CONTROL MODULE. 1)Disconnect the keyless entry control module harness connector. 2)Measure the resistance between keyless entry harness connector terminal and ignition switch illumination harness connector. Connector & terminal (B176) No. 11 — (B224) No. 2:	Is the resistance less than 10 Ω ?	Check the ignition switch illumination. If NG, replace the ignition switch illumination.	Repair the harness.

4. Front Inner Remote

A: REMOVAL

- 1) Remove the door trim. <Ref. to EI-36, REMOVAL, Front Door Trim.>
- 2) Remove the sealing cover. <Ref. to EB-14, REMOVAL, Front Sealing Cover.>
- 3) Remove the screw and two rod joints.
- 4) Remove the front inner remote.



B: INSTALLATION

Install in the reverse order of removal.

NOTE:

Make sure the inner remote works properly after installation.

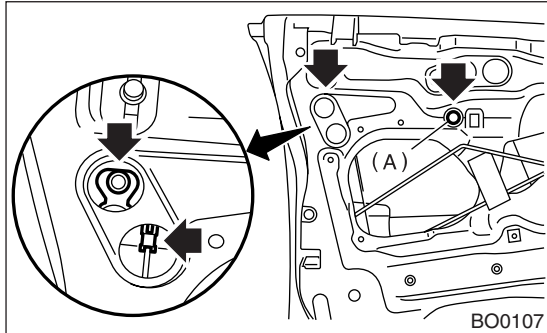
C: INSPECTION

- 1) Make sure the rod is not deformed.
- 2) Make sure the lever and rod work smoothly.

5. Front Outer Handle

A: REMOVAL

- 1) Remove the door trim. <Ref. to EI-36, REMOVAL, Front Door Trim.>
- 2) Remove the sealing cover. <Ref. to EB-14, REMOVAL, Front Sealing Cover.>
- 3) Remove the bolt (A).
- 4) Move the front door glass downward. Remove the 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.

NOTE:

Make sure the outer handle works properly after installation.

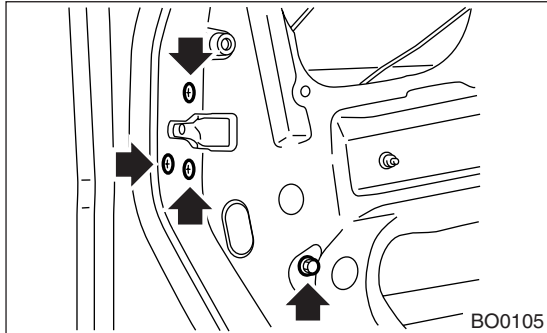
C: INSPECTION

- 1) Make sure the rod is not deformed.
- 2) Make sure the lever and rod work smoothly.

6. Front Door Latch Assembly

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the front door trim. <Ref. to EI-36, REMOVAL, Front Door Trim.>
- 3) Remove the sealing cover. <Ref. to EB-14, REMOVAL, Front Sealing Cover.>
- 4) Remove the front inner remote. <Ref. to SL-18, REMOVAL, Front Inner Remote.>
- 5) Remove the three screws and bolt.



- 6) Disconnect the connector. Remove the front door latch assembly.

B: INSTALLATION

Install in the reverse order of removal.

NOTE:

Make sure the lock works properly after installation.

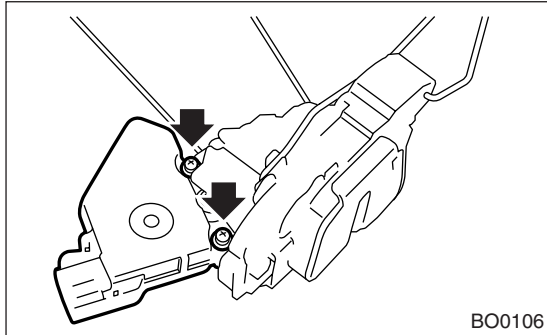
C: INSPECTION

- 1) Make sure the rod is not deformed.
- 2) Make sure the lever and rod work smoothly.

7. Front Door Lock Actuator

A: REMOVAL

- 1) Remove the front door latch assembly. <Ref. to SL-20, REMOVAL, Front Door Latch Assembly.>
- 2) Loosen the two screws to remove front door lock actuator.



B: INSTALLATION

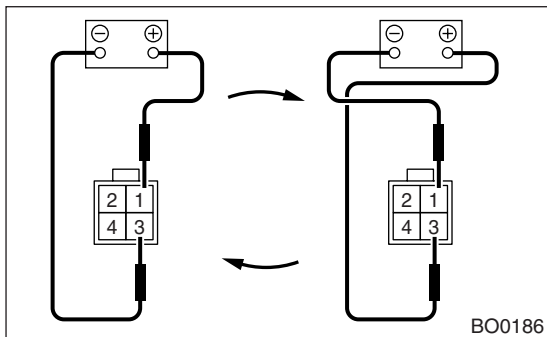
Install in the reverse order of removal.

NOTE:

Make sure the lock works properly after installation.

C: INSPECTION

- 1) Disconnect the door lock actuator harness connector.
- 2) Connect the battery to door lock actuator terminals.



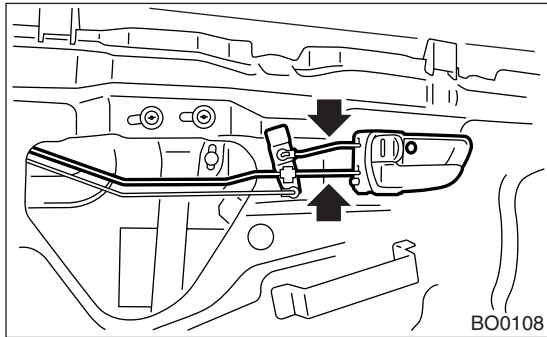
Terminal No.	Actuator operation
No. 3 (+) and No. 1 (-)	Unlocked → Locked
No. 1 (+) and No. 3 (-)	Locked → Unlocked

If NG, replace the door lock actuator.

8. Rear Inner Remote

A: REMOVAL

- 1) Remove the rear door trim. <Ref. to EI-37, REMOVAL, Rear Door Trim.>
- 2) Remove the sealing cover. <Ref. to EB-17, REMOVAL, Rear Sealing Cover.>
- 3) Remove the screw and two rod joints.
- 4) Remove the inner remote.



B: INSTALLATION

Install in the reverse order of removal.

NOTE:

Make sure the inner remote works properly after installation.

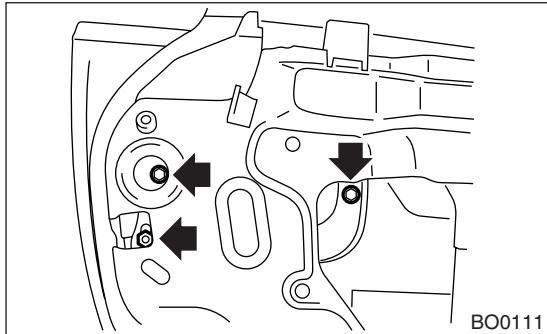
C: INSPECTION

- 1) Make sure the rod is not deformed.
- 2) Make sure the lever and rod work smoothly.
- 3) Make sure the child safety lock on rear doors work properly, when applicable.

9. Rear Outer Handle

A: REMOVAL

- 1) Remove the rear door trim. <Ref. to EI-37, REMOVAL, Rear Door Trim.>
- 2) Remove the sealing cover. <Ref. to EB-17, REMOVAL, Rear Sealing Cover.>
- 3) Remove the rear inner remote. <Ref. to SL-22, REMOVAL, Rear Inner Remote.>
- 4) Remove the rear door latch assembly. <Ref. to SL-24, REMOVAL, Rear Door Latch Assembly.>
- 5) Loosen the two 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.

NOTE:

Make sure the outer handle works properly after installation.

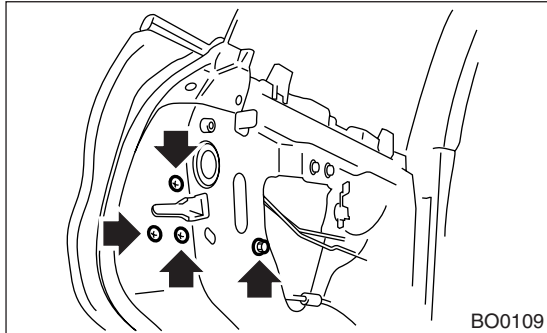
C: INSPECTION

- 1) Make sure the rod is not deformed.
- 2) Make sure the lever and rod work smoothly.

10.Rear Door Latch Assembly

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the rear door trim. <Ref. to EI-37, REMOVAL, Rear Door Trim.>
- 3) Remove the sealing cover. <Ref. to EB-17, REMOVAL, Rear Sealing Cover.>
- 4) Remove the rear inner remote. <Ref. to SL-22, REMOVAL, Rear Inner Remote.>
- 5) Remove the three screws and bolt.



- 6) Disconnect the connector, and then remove the rear door latch assembly.

B: INSTALLATION

Install in the reverse order of removal.

NOTE:

Make sure the lock works properly after installation.

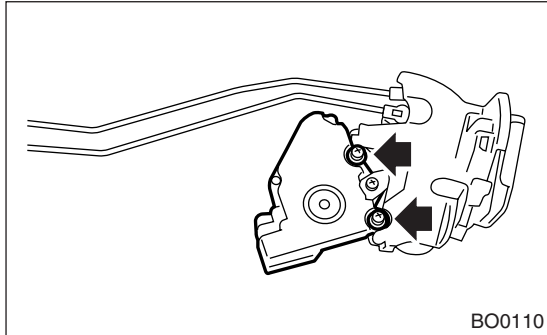
C: INSPECTION

- 1) Make sure the rod is not deformed.
- 2) Make sure the lever and rod work smoothly.

11. Rear Door Lock Actuator

A: REMOVAL

- 1) Remove the rear door latch assembly. <Ref. to SL-24, REMOVAL, Rear Door Latch Assembly.>
- 2) Loosen the two screws to remove rear door lock actuator.



B: INSTALLATION

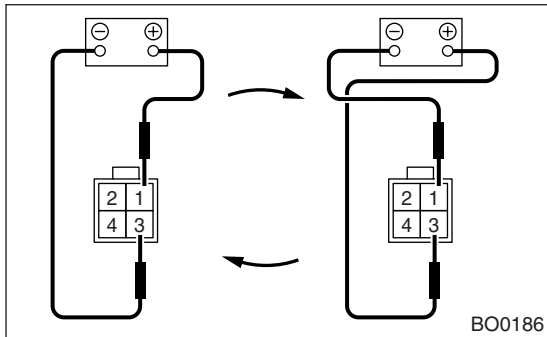
Install in the reverse order of removal.

NOTE:

Make sure the lock works properly after installation.

C: INSPECTION

- 1) Disconnect the door lock actuator harness connector.
- 2) Connect the battery to door lock actuator terminals.



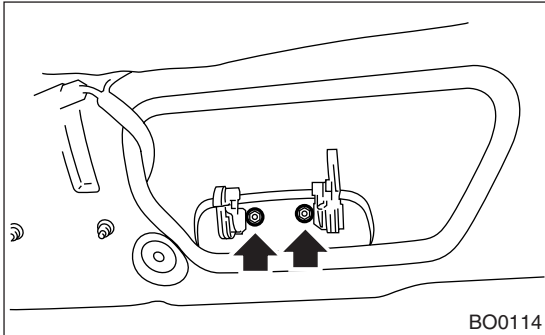
Terminal No.	Actuator operation
No. 3 (+) and No. 1 (-)	Unlocked → Locked
No. 1 (+) and No. 3 (-)	Locked → Unlocked

If NG, replace the door lock actuator.

12.Rear Gate Outer Handle

A: REMOVAL

- 1) Remove the rear gate trim. <Ref. to EI-50, REMOVAL, Rear Gate Trim.>
- 2) Remove the rear gate latch assembly. <Ref. to SL-27, REMOVAL, Rear Gate Latch Assembly.>
- 3) Loosen the two nuts to remove rear gate outer handle.



B: INSTALLATION

Install in the reverse order of removal.

NOTE:

Make sure the outer handle works properly after installation.

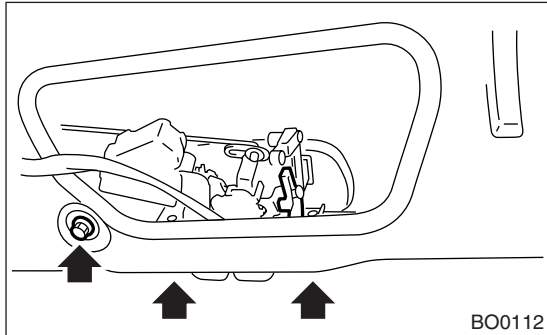
C: INSPECTION

- 1) Inspect the rod for deformation.
- 2) Make sure the lever and rod move smoothly.

13.Rear Gate Latch Assembly

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the rear gate trim. <Ref. to EI-50, REMOVAL, Rear Gate Trim.>
- 3) Remove the rear gate key cylinder rod clamp.
- 4) Remove the three bolts.



- 5) Disconnect the connectors, and then remove the rear gate latch assembly.

B: INSTALLATION

Install in the reverse order of removal.

NOTE:

Make sure the lock works properly after installation.

C: INSPECTION

- 1) Make sure the rod is not deformed.
- 2) Make sure the lever and rod work smoothly.

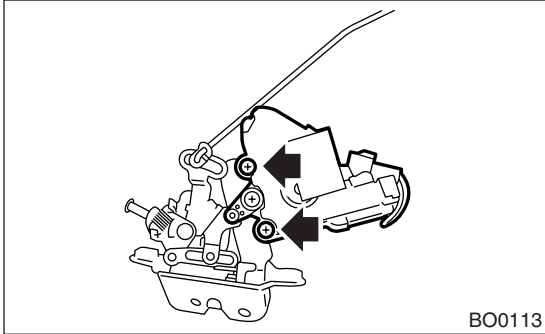
REAR GATE LATCH LOCK ACTUATOR

SECURITY AND LOCKS

14. Rear Gate Latch Lock Actuator

A: REMOVAL

- 1) Remove the rear gate latch assembly. <Ref. to SL-27, REMOVAL, Rear Gate Latch Assembly.>
- 2) Loosen the two screws to remove rear gate lock actuator.



B: INSTALLATION

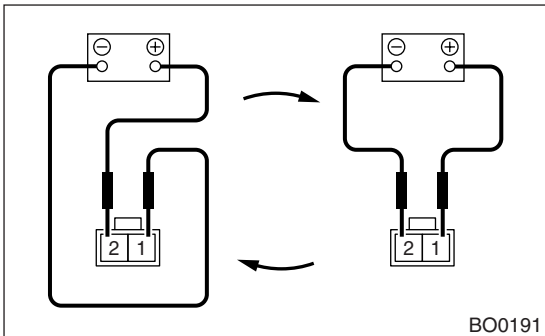
Install in the reverse order of removal.

NOTE:

Make sure the lock works properly after installation.

C: INSPECTION

- 1) Disconnect the door lock actuator harness connector.
- 2) Connect the battery to door lock actuator terminals.



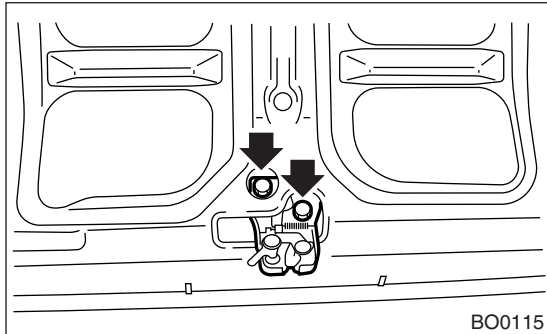
Terminal No.	Actuator operation
No. 1 (+) and No. 2 (-)	Unlocked → Locked
No. 2 (+) and No. 1 (-)	Locked → Unlocked

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 the two bolts to remove trunk lid lock assembly.



B: INSTALLATION

Install in the reverse order of removal.

NOTE:

- Apply grease to parts that rub.
- Make sure the lock works properly after installation.

C: INSPECTION

- 1) Check the striker for bending or abnormal wear.
- 2) Check the safety lever for improper movement.
- 3) Check other levers and the spring for rust formation and unsmooth movement.

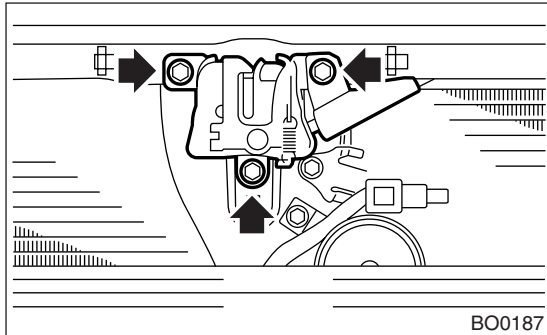
FRONT HOOD LOCK ASSEMBLY

SECURITY AND LOCKS

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 lock assembly.



B: INSTALLATION

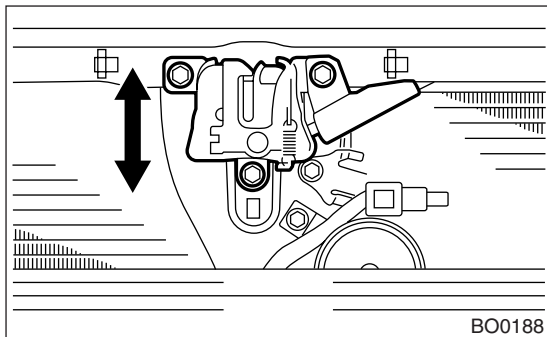
Install in the reverse order of removal.

NOTE:

- Apply grease to parts that rub.
- Make sure the release cable works properly after installation.

C: ADJUSTMENT

Loosen the bolt. Adjust the lock assembly while moving it up and down.



D: INSPECTION

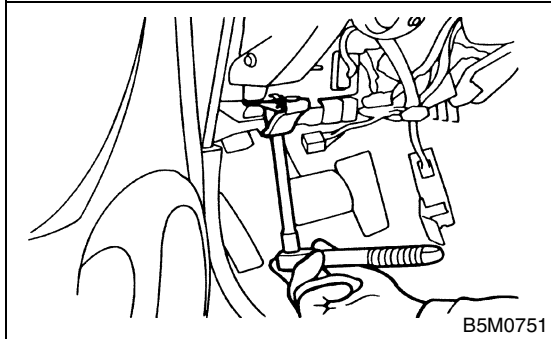
- 1) Check the striker for bending or abnormal wear.
- 2) Check the safety lever for improper movement.
- 3) Check other levers and the spring for rust formation and unsmooth movement.

17. Remote Openers

A: REMOVAL

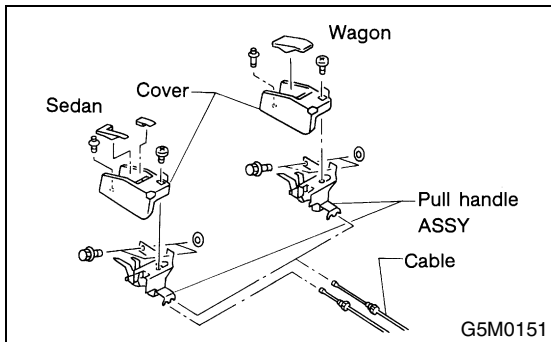
1. HOOD OPENER

- 1) Remove the release cable from hood lock.
- 2) Remove the bolt. Remove the opener lever.

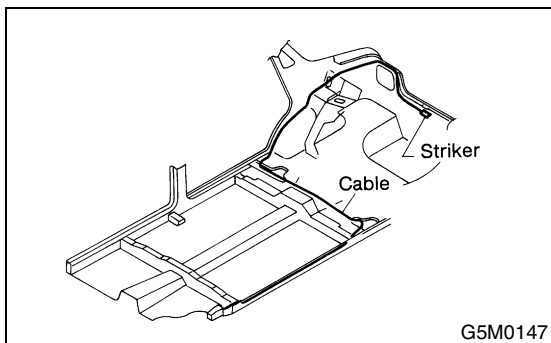


2. TRUNK LID OPENER

- 1) Remove the rear seat. <Ref. to SE-11, REMOVAL, Rear Seat.>
- 2) Remove the center pillar lower trim and side sill cover on 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.

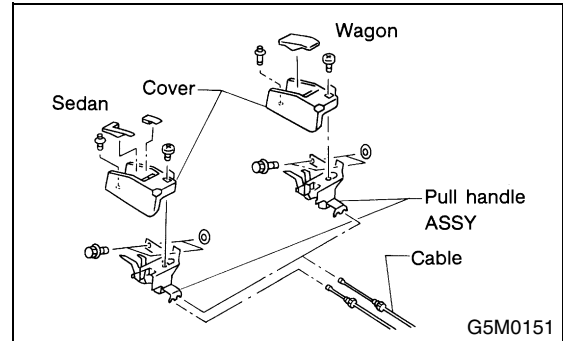


- 4) Remove the cable from opener pull handle.
- 5) Remove the striker from trunk lid.
- 6) Remove the cable from striker.

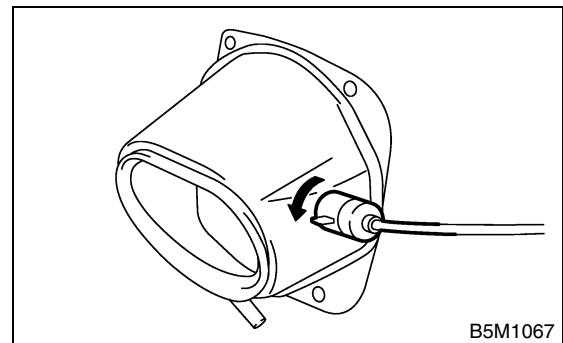


3. FUEL FLAP OPENER

- 1) Remove the rear seat. <Ref. to SE-11, REMOVAL, Rear Seat.>
- 2) Remove the center pillar lower trim and side sill cover on 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 opener pull handle.
- 5) Remove the right rear quarter trim. <Ref. to EI-46, 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.

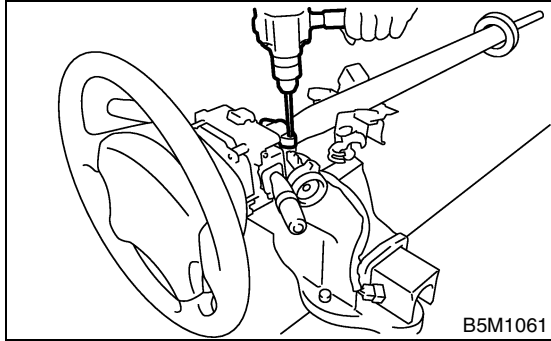
C: INSPECTION

Make sure the fuel flap opens and closes smoothly.

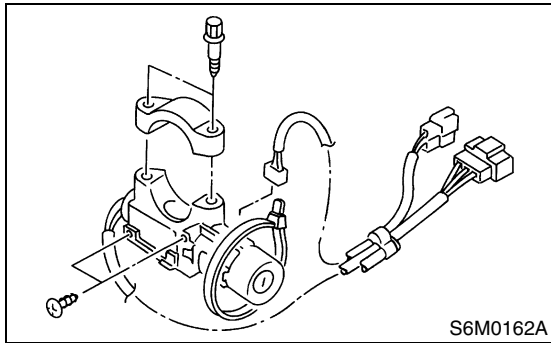
18. Ignition Key Lock

A: REPLACEMENT

- 1) Remove the ground cable from battery.
- 2) Remove the steering column. <Ref. to PS-29, 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 end of thread.



B: INSPECTION

- 1) Remove the instrument panel lower cover.
- 2) Remove the lower column cover.
- 3) Unfasten the holddown clip which secures harness and disconnect the connector of ignition switch from body harness.
- 4) Turn the ignition key plate to each position and check the continuity between terminals of ignition connector.

Switch position	Terminal No.	Standard
LOCK	—	—
ACC	No. 1 and No. 2	Less than 1 Ω
ON	No. 1 and No. 2 No. 1 and No. 4 No. 2 and No. 4	Less than 1 Ω
ST	No. 1 and No. 3 No. 1 and No. 4 No. 3 and No. 4	Less than 1 Ω

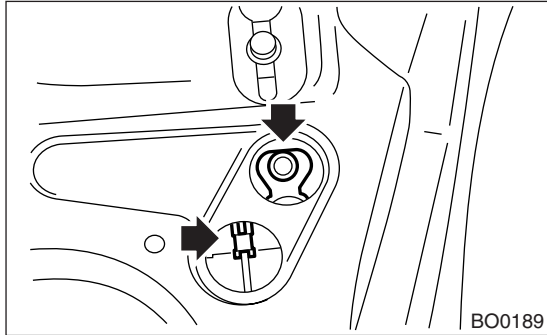
If NG, replace the ignition switch.

19. Key Lock Cylinders

A: REPLACEMENT

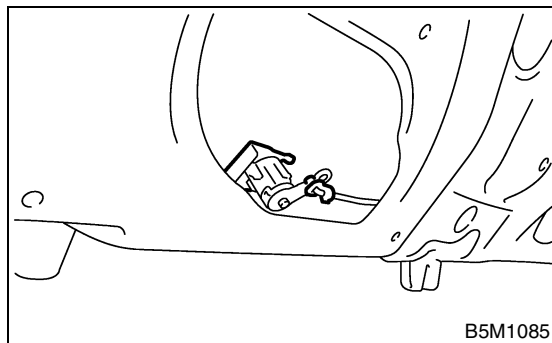
1. FRONT DOOR

- 1) Remove the door trim. <Ref. to EI-36, REMOVAL, Front Door Trim.>
- 2) Pull back the sealing cover. <Ref. to EB-14, REMOVAL, Front Sealing Cover.>
- 3) Move the front door glass downward.
- 4) Remove the rod clamp. Remove the bolt. Replace the key cylinder.



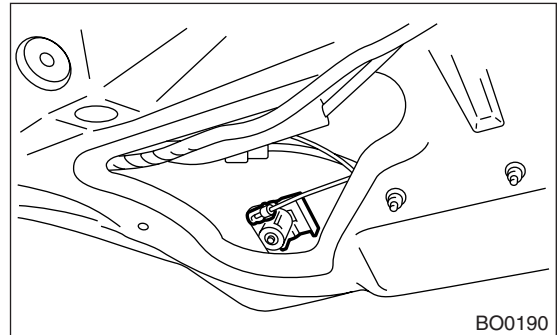
2. TRUNK LID

- 1) Remove the trunk trim. <Ref. to EI-52, 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-50, REMOVAL, Rear Gate Trim.>
- 2) Remove the rod clamp. Remove the lock plate. Replace the key cylinder.



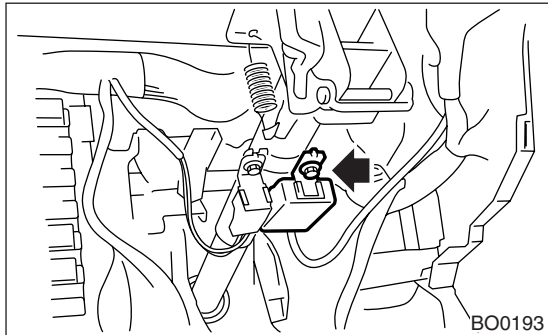
20. Immobilizer Control Module

A: REMOVAL

NOTE:

The following positions for removal and installation are for LHD models. The positions for RHD models are symmetrically opposite.

- 1) Disconnect the ground cable from battery.
- 2) Remove the instrument panel lower cover. <Ref. to EI-41, REMOVAL, Instrument Panel Assembly.>
- 3) Disconnect the connector from immobilizer control module.
- 4) Remove the immobilizer control module.



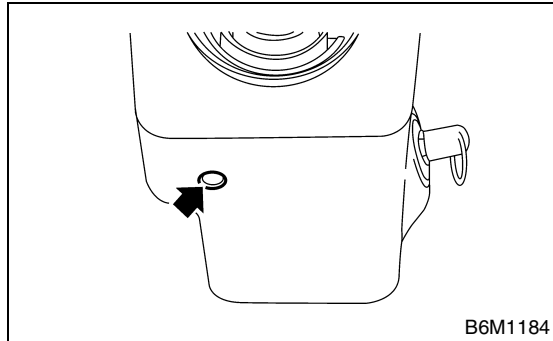
B: INSTALLATION

Install in the reverse order of removal.

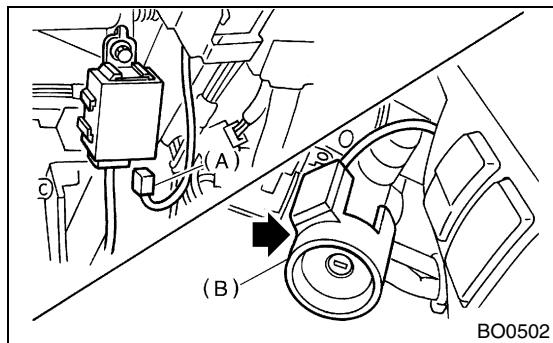
21. Immobilizer Antenna

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the instrument panel lower cover. <Ref. to EI-41, REMOVAL, Instrument Panel Assembly.>
- 3) Remove the screws, separate upper column cover and lower column cover.



- 4) Disconnect the immobilizer antenna connector (A) from immobilizer control module.
- 5) Remove the screw, and detach the immobilizer antenna (B).



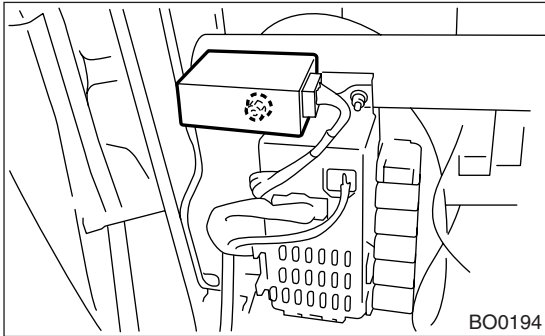
B: INSTALLATION

Install in the reverse order of removal.

22. Keyless Entry Control Module

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the instrument panel lower cover. <Ref. to EI-41, REMOVAL, Instrument Panel Assembly.>
- 3) Remove the nut, and then remove the keyless entry control module while disconnecting connector.



- 4) Disconnect the keyless entry control module and other electrical control module.

B: INSTALLATION

Install in the reverse order of removal.

23. Keyless Transmitter

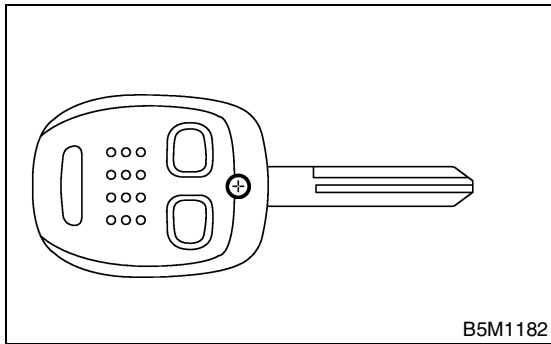
A: REMOVAL

1. TRANSMITTER BATTERY

Remove the battery from transmitter.

NOTE:

To prevent static electricity damage to transmitter printed circuit board, touch the steel area of building with hand to discharge the static electricity carried on body or clothes before disassembling transmitter.



B: INSTALLATION

1. TRANSMITTER BATTERY

Install in the reverse order of removal.

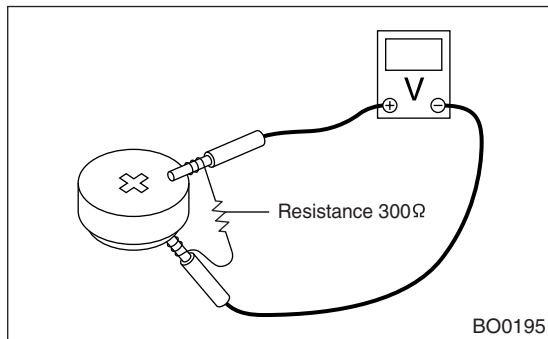
C: INSPECTION

1. TRANSMITTER BATTERY

Measure the voltage between battery (+) terminal and (-) terminal.

NOTE:

- Battery discharge occurs during measurement. Complete the measurement within 5 seconds.
- During battery voltage measurement, voltage falls more than 1.8 volts in 3 seconds period.



Tester connection		Standard
(+)	(-)	
Battery (+) terminal	Battery (-) terminal	2.5 — 3.0 V

If NG, replace the battery. (Use CR1620 or equivalent.)

D: REPLACEMENT

1. TRANSMITTER REGISTRATION

NOTE:

- A maximum of three transmitters can be registered for each individual vehicle.
- When replacing the transmitter (key), registration to immobilizer system is also necessary.
 - 1) Remove the side sill cover at driver's side, then connect the registration connectors at front pillar lower section.
 - 2) Unlock the door lock.
 - 3) Press any button of the transmitter twice to be registered.
 - 4) The door lock will automatically lock and unlock in sequence. This indicates the completion of transmitter registration for first transmitter.
 - 5) If the registration of a second transmitter is now to be carried out, press any button of that transmitter twice.
 - 6) The door lock will automatically lock and unlock in sequence. This indicates the completion of transmitter registration for second transmitter.
 - 7) If the registration of third transmitter is now to be carried out, repeat the procedure 5) and 6).
 - 8) Disconnect the registration connectors after the completion of all registration operations. After confirming the operation of door lock using newly registered transmitter(s), reinstall the side sill cover at driver's side.

KEYLESS TRANSMITTER

SECURITY AND LOCKS

IMMOBILIZER (DIAGNOSTICS)



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3. Electrical Components Location.....	5
4. Immobilizer Control Module I/O Signal.....	6
5. Subaru Select Monitor.....	7
6. Read Diagnostic Trouble Code (DTC)	9
7. Clear Memory Mode.....	10
8. Diagnostics Chart for Immobilizer Indicator Light.....	12
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10. Diagnostics Chart with Diagnostic Trouble Code (DTC)	17

BASIC DIAGNOSTIC PROCEDURE

IMMOBILIZER (DIAGNOSTICS)

1. Basic Diagnostic Procedure

A: PROCEDURE

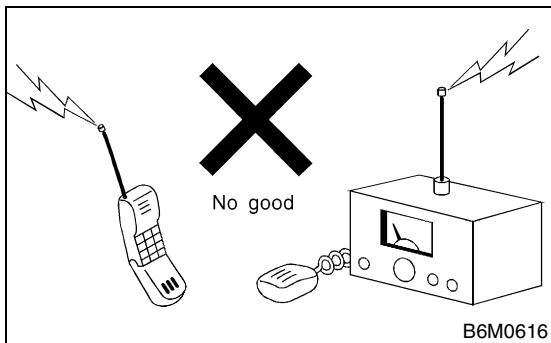
Step	Check	Yes	No
1 CHECK ILLUMINATION OF IMMOBILIZER INDICATOR LIGHT. Turn the ignition switch to ON.	Does the immobilizer indicator light illuminate?	Go to step 2.	Go to step 3.
2 CHECK ENGINE START. Turn the ignition switch to START position.	Is the engine hard to start?	Go to step 5.	Go to step 3.
3 CHECK ILLUMINATION OF IMMOBILIZER INDICATOR LIGHT. 1) Turn the ignition switch to OFF or ACC position. 2) Wait at least 60 seconds.	Does the immobilizer indicator light blink?	Go to step 4.	Check the immobilizer indicator light circuit. <Ref. to IM-12, CHECK IMMOBILIZER INDICATOR CIRCUIT, Diagnostics Chart for Immobilizer Indicator Light.>
4 CHECK ILLUMINATION OF IMMOBILIZER INDICATOR LIGHT. Remove the key from ignition switch.	Does the immobilizer indicator light begin to blink within 1 second after the key is removed?	The immobilizer system is OK.	Check the key switch circuit. <Ref. to IM-14, CHECK KEY SWITCH CIRCUIT, Diagnostics Chart for Immobilizer Indicator Light.>
5 CHECK INDICATION OF DTC ON DISPLAY. 1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor to data link connector. <Ref. to IM-7, Subaru Select Monitor.> 3) Turn the ignition switch and Subaru Select Monitor switch to ON. 4) Read any DTC on the display.	Are DTCs 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-17, Diagnostics Chart with Diagnostic Trouble Code (DTC).> 2) Repair the trouble cause. 3) Perform the clear memory mode. 4) Read any DTC again.	Are DTCs indicated on display?	Inspect using "Diagnostic Chart with Trouble Code". <Ref. to IM-17, Diagnostics Chart with Diagnostic Trouble Code (DTC).>	Finish the diagnostics.

2. General Description

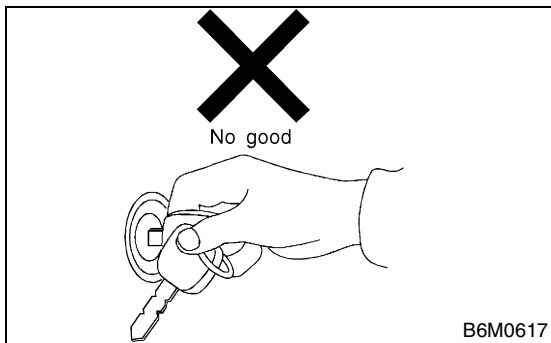
A: CAUTION

CAUTION:

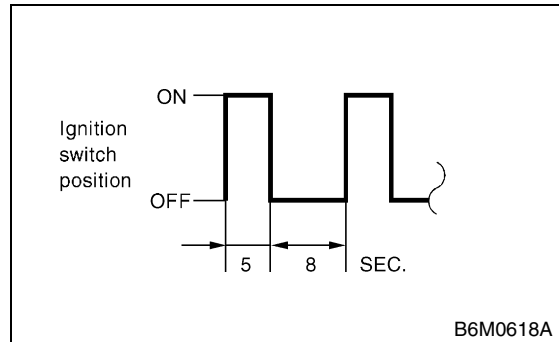
- The airbag system wiring harness is routed near the immobilizer control module. All airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuits.
- Be careful not to damage the airbag system wiring harness when servicing the immobilizer control module.
- While diagnostic items are being checked, do not operate radios, portable telephones, etc. which emit electromagnetic waves near or inside the vehicle.



- When the 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 the ignition key is in a key holder, remove it from the holder before carrying out diagnoses.



- When repeatedly turning the 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.



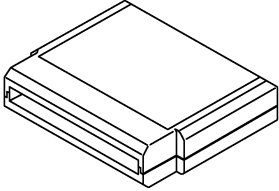

- If the engine fails to start with a registered ignition key, detach the ignition key from ignition switch and wait for approx. 1 second until immobilizer indicator light begins to flash. Start the engine again.
- Before checking the diagnostic items, obtain all keys for the vehicle to be checked possessed by owner.

GENERAL DESCRIPTION

IMMOBILIZER (DIAGNOSTICS)

B: PREPARATION TOOL

1. SPECIAL TOOLS

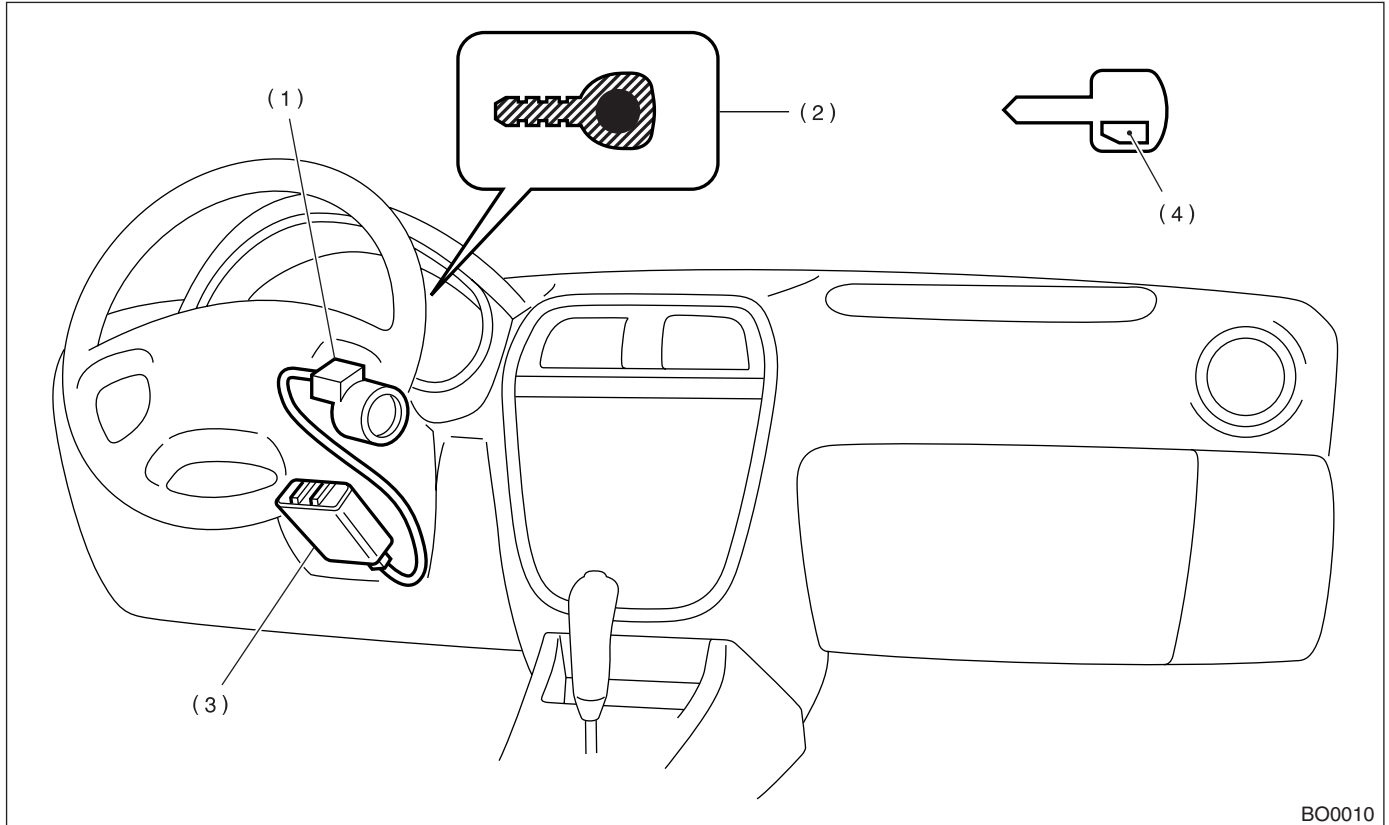
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B2M3876	24082AA190 (Newly adopted tool)	CARTRIDGE	Troubleshooting for electrical systems.
 B2M3877	22771AA030	SELECT MONITOR KIT	Troubleshooting for electrical systems. <ul style="list-style-type: none"> • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

2. GENERAL TOOLS

TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance, voltage and ampere.

3. Electrical Components Location

A: LOCATION



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 CONTROL MODULE I/O SIGNAL

IMMOBILIZER (DIAGNOSTICS)

4. Immobilizer Control Module I/O Signal

A: SCHEMATIC

1. IMMOBILIZER

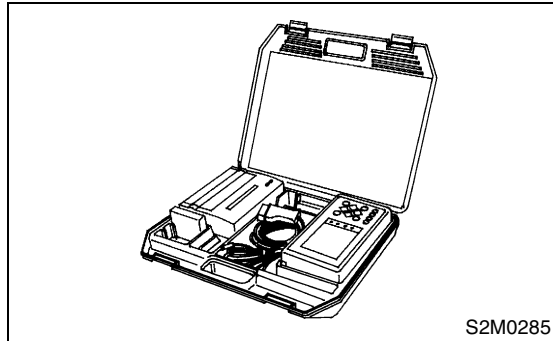
<Ref. to WI-181, SCHEMATIC, Immobilizer System.>

5. Subaru Select Monitor

A: OPERATION

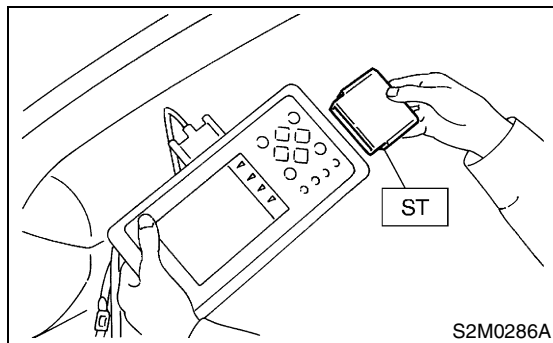
1. HOW TO USE SUBARU SELECT MONITOR

1) Prepare the Subaru Select Monitor kit.



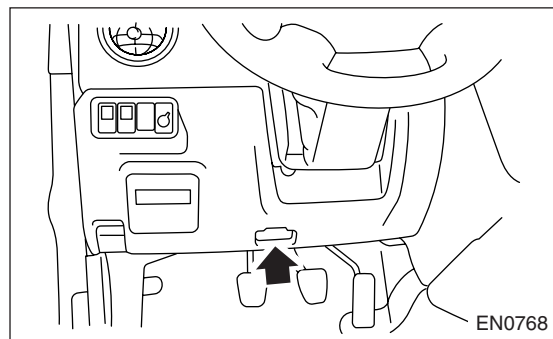
2) Connect the diagnosis cable to Subaru Select Monitor.

3) Insert the cartridge into Subaru Select Monitor.



4) Connect the Subaru Select Monitor to data link connector.

(1) Data link connector is located in the lower portion of the instrument panel (on driver's side).

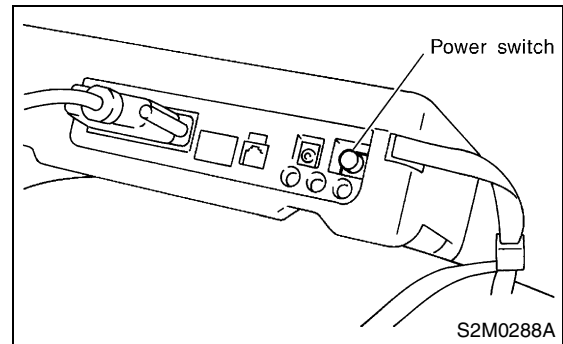


(2) Connect the diagnosis cable to data link connector.

CAUTION:

Do not connect the scan tools except for Subaru Select Monitor.

5) Turn the ignition switch to ON (engine OFF), and then Subaru Select Monitor switch to ON.



6) Using the Subaru Select Monitor, call up any DTCs and various data, and then record them.

2. READ DIAGNOSTIC TROUBLE CODE (DTC) FOR ENGINE.

Refer to Read Diagnostic Trouble Code for information about how to indicate DTC. <Ref. to IM-9, Read Diagnostic Trouble Code (DTC).>

3. INTERFACE CHECK

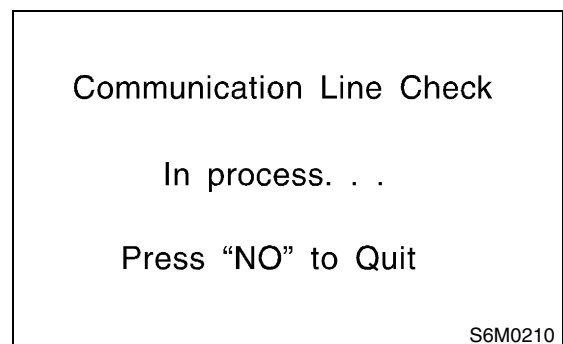
NOTE:

The communication line between ECM and IMM ECM can be checked in «System Operation Check Mode». This is referred to as «interface check».

1) Connect the select monitor.

2) Set the «System Operation Check Mode» menu display screen, and then select «Immobilizer System».

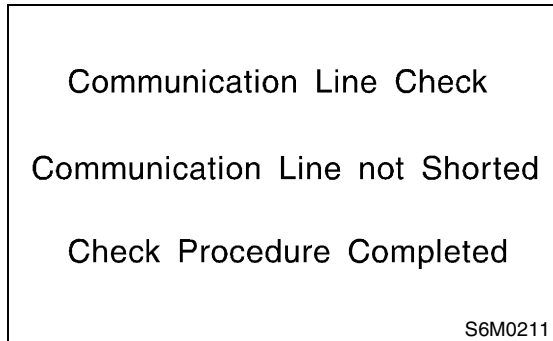
3) Screen indicates as shown.



SUBARU SELECT MONITOR

IMMOBILIZER (DIAGNOSTICS)

- 4) Start the 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 the short circuit is not a diagnostic item. This completes interface check.
7) If a problem is detected, repair. <Ref. to IM-18, DTC P1572 IMM CIRCUIT FAILURE (EXCEPT ANTENNA CIRCUIT), Diagnostics Chart with Diagnostic Trouble Code (DTC).>

6. Read Diagnostic Trouble Code (DTC)

A: OPERATION

- 1) On the «Main Menu» display screen, select the {Each System Check}, and then press the [YES] key.
- 2) On the «System Selection Menu» display screen, select the {Engine Control System}, and then press the [YES] key.
- 3) Press the [YES] key after displayed information of engine type.
- 4) On the «Engine Diagnosis» display screen, select the {Diagnostic Code(s) Display}, and then press the [YES] key.
- 5) On the «Diagnostic Code(s) Display» display screen, select the {Current Diagnostic Code(s)} or {History Diagnostic Code(s)}, and then press the [YES] key.

NOTE:

- For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
- For detailed concerning diagnostic trouble codes, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to IM-16, LIST, List of Diagnostic Trouble Code (DTC).>

CLEAR MEMORY MODE

IMMOBILIZER (DIAGNOSTICS)

7. Clear Memory Mode

A: OPERATION

- 1) On the «Main Menu» display screen, select the {2. Each System Check}, and then press the [YES] key.
- 2) On the «System Selection Menu» display screen, select the {Engine Control System}, and then press the [YES] key.
- 3) Press the [YES] key after displayed information of engine type.
- 4) On the «Engine Diagnosis» display screen, select the {Clear Memory}, and then press the [YES] key.
- 5) When the `Done' and `Turn Ignition Switch OFF' are shown on the display screen, turn the Subaru Select Monitor and ignition switch to OFF.

NOTE:

- After the memory has been cleared, the ISC must be initialized. To do this, turn the ignition switch to ON position. Wait 3 seconds before starting the engine.
- For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

DIAGNOSTICS CHART FOR IMMOBILIZER INDICATOR LIGHT

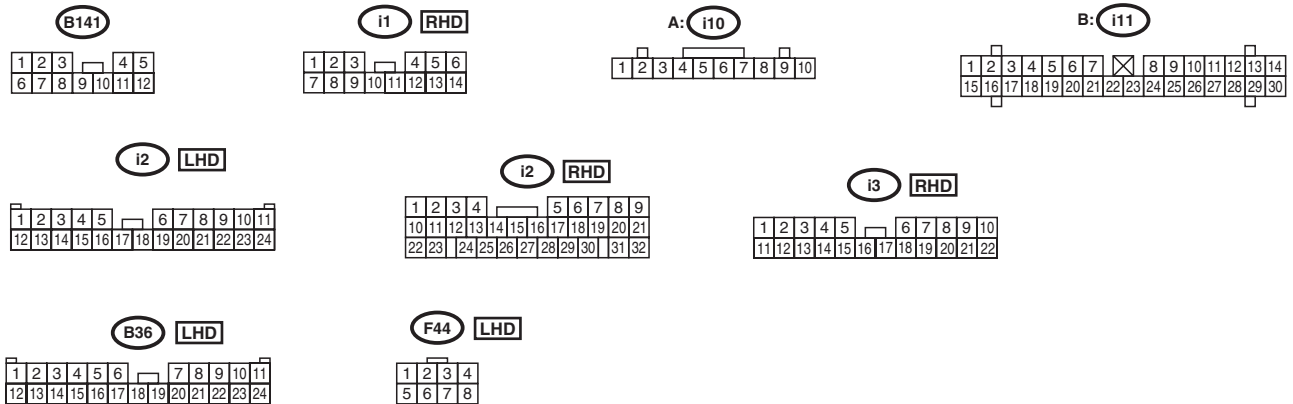
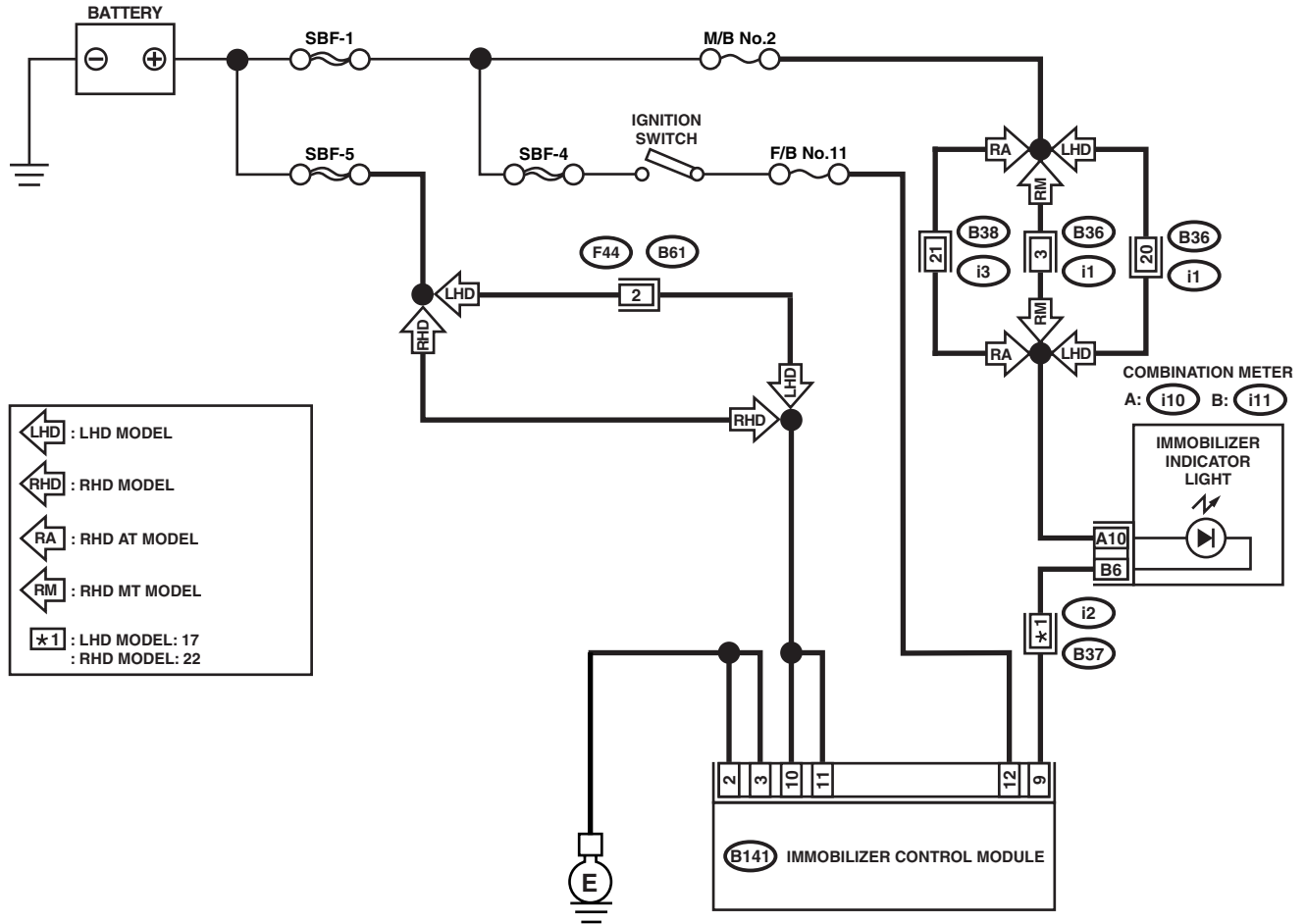
IMMOBILIZER (DIAGNOSTICS)

8. Diagnostics Chart for Immobilizer Indicator Light

A: INSPECTION

1. CHECK IMMOBILIZER INDICATOR CIRCUIT

WIRING DIAGRAM:



BO0459

DIAGNOSTICS CHART FOR IMMOBILIZER INDICATOR LIGHT

IMMOBILIZER (DIAGNOSTICS)

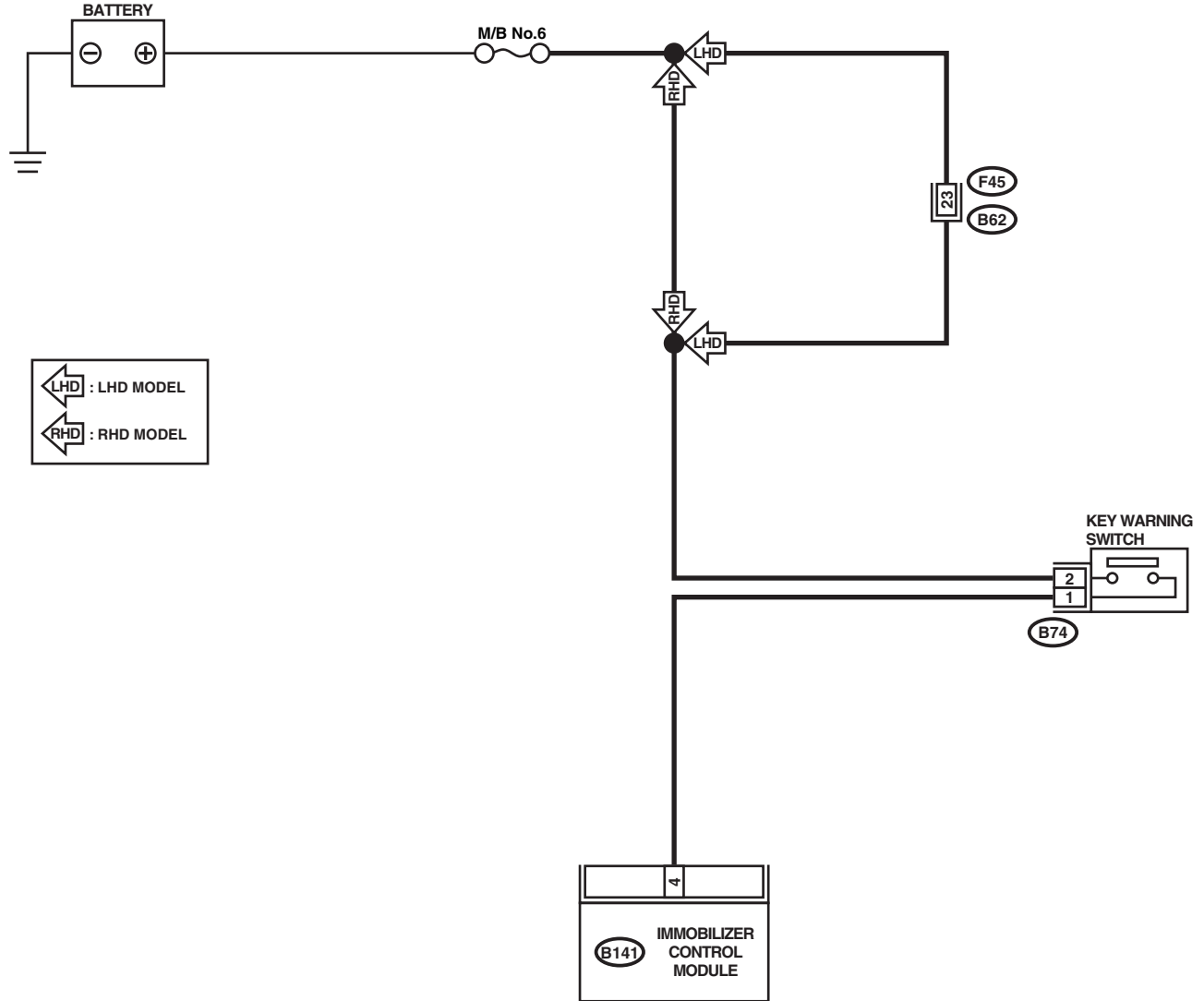
Step	Check	Yes	No
1 CHECK IMMOBILIZER INDICATOR LIGHT COMES ON. 1) Turn the ignition switch to OFF. 2) Disconnect the harness connector from IMM ECM. 3) Connect a resistor (750 Ω) between IMM ECM harness connector terminal No. 9 and chassis ground.	Does the indicator light come on?	Go to step 2.	Go to step 5.
2 CHECK IMM ECM GROUND CIRCUIT. Measure the resistance between IMM ECM harness connector terminal and chassis ground. <i>Connector & terminal</i> <i>(B141) No. 2, No. 3 — Chassis ground:</i>	Is the resistance less than 10 Ω?	Go to step 3.	Repair the open circuit of IMM ECM ground circuit.
3 CHECK IMM ECM IGNITION CIRCUIT. 1) Turn the ignition switch to ON. (engine OFF.) 2) Measure the voltage between IMM ECM harness connector terminal and chassis ground. <i>Connector & terminal</i> <i>(B141) No. 12 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Go to step 4.	Check the harness for open or short between IMM ECM and ignition switch.
4 CHECK IMM ECM POWER SUPPLY CIRCUIT. 1) Turn the ignition switch to OFF. 2) Measure the voltage between IMM ECM harness connector terminal and chassis ground. <i>Connector & terminal</i> <i>(B141) No. 10, No. 11 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Replace the IMM ECM <Ref. to SL-34, 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 the harness for open or short between IMM ECM and fuse.
5 CHECK COMBINATION METER CIRCUIT. 1) Remove the combination meter. <Ref. to IDI-15, Combination Meter Assembly.> 2) Measure the voltage between combination meter harness connector terminal and chassis ground. <i>Connector & terminal</i> <i>(i10) No. 10 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Go to step 6.	Check the harness for open or short between combination meter and fuse.
6 CHECK COMBINATION METER CIRCUIT. Measure the resistance between IMM ECM harness connector terminal and combination meter harness connector terminal. <i>Connector & terminal</i> <i>(B141) No. 9 — (i11) No. 6:</i>	Is the resistance less than 10 Ω?	Faulty LED bulb. Replace the combination meter printed circuit. <Ref. to IDI-16, DISASSEMBLY, Combination Meter Assembly.>	Repair the harness or connector.

DIAGNOSTICS CHART FOR IMMOBILIZER INDICATOR LIGHT

IMMOBILIZER (DIAGNOSTICS)

2. CHECK KEY SWITCH CIRCUIT

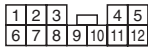
WIRING DIAGRAM:



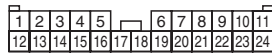
B74



B141



F45



BO0150

DIAGNOSTICS CHART FOR IMMOBILIZER INDICATOR LIGHT

IMMOBILIZER (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK POWER SUPPLY CIRCUIT. 1) Disconnect the harness connector from key warning switch. 2) Turn the ignition switch to ACC or LOCK position (The key inserted). 3) Measure the voltage between key warning switch harness connector terminal and chassis ground. <i>Connector & terminal</i> <i>(B74) No. 2 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Go to step 2.	Check the 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) Measure the resistance between key warning switch connector terminals. <i>Connector & terminal</i> <i>No. 1 — No. 2:</i>	Is the resistance less than 1 Ω ?	Go to step 3.	Replace the key warning switch.
3 CHECK KEY SWITCH. 1) Remove the ignition key from the ignition switch. 2) Measure the resistance between key warning switch connector terminals. <i>Connector & terminal</i> <i>No. 1 — No. 2:</i>	Is the resistance more than 1 M Ω ?	Go to step 4.	Replace the key warning switch.
4 CHECK HARNESS BETWEEN KEY SWITCH AND IMM ECM. 1) Disconnect the harness connector from key warning switch. 2) Disconnect the harness connector from IMM ECM. 3) Measure the resistance between key warning switch harness connector terminal and IMM ECM harness connector terminal. <i>Connector & terminal</i> <i>(B74) No. 1 — (B141) No. 4:</i>	Is the resistance less than 10 Ω ?	Replace the IMM ECM <Ref. to SL-34, 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 the 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-17, DTC P1571 REFERENCE CODE INCOMPATIBILITY, Diagnostics Chart with Diagnostic Trouble Code (DTC).>
	P1572	IMM Circuit Failure (Except Antenna Circuit)	Communication failure between IMM ECM and ECM	<Ref. to IM-18, DTC P1572 IMM CIRCUIT FAILURE (EXCEPT ANTENNA CIRCUIT), Diagnostics Chart with Diagnostic Trouble Code (DTC).>
	P1574	Key Communication Failure	Failure of IMM ECM to verify key (transponder) ID code	<Ref. to IM-21, DTC P1574 KEY COMMUNICATION FAILURE, Diagnostics Chart with Diagnostic Trouble Code (DTC).>
	P0153	Use of Unregistered Key	Incorrect immobilizer key (Use of unregistered key in IMM ECM)	<Ref. to IM-22, DTC P0153 INCORRECT IMMOBILIZER KEY (USE OF UNREGISTERED KEY), Diagnostics Chart with Diagnostic Trouble Code (DTC).>
	P1576	EGI Control Module EEPROM	ECM malfunctioning	<Ref. to IM-22, DTC P1576 EGI CONTROL MODULE EEPROM, Diagnostics Chart with Diagnostic Trouble Code (DTC).>
	P1577	IMM Control Module EEPROM	IMM ECM malfunctioning	<Ref. to IM-22, DTC P1577 IMM CONTROL MODULE EEPROM, Diagnostics Chart with Diagnostic Trouble Code (DTC).>
	P1570	ANTENNA	Faulty antenna	<Ref. to IM-24, DTC P1570 ANTENNA, Diagnostics Chart with Diagnostic Trouble Code (DTC).>

NOTE:

- If any DTC except for the above immobilizer trouble code has been output, carry out diagnosis for the engine trouble code. <Ref. to EN-83, List of Diagnostic Trouble Code (DTC).> or <Ref. to EN(w/oOBD)-63, List of Diagnostic Trouble Code (DTC).> or <Ref. to EN(TURBO)-75, List of Diagnostic Trouble Code (DTC).>

DIAGNOSTICS CHART WITH DIAGNOSTIC TROUBLE CODE (DTC)

IMMOBILIZER (DIAGNOSTICS)

10. Diagnostics Chart with Diagnostic Trouble Code (DTC)

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 the teaching operation manual.	Is teaching operation for all keys completed?	END	Replace the ECM <Ref. to FU-51, Engine Control Module.>, <Ref. to FU(w/oOBD)-48, Engine Control Module.> or <Ref. to FU(TURBO)-49, Engine Control Module.>, IMM ECM <Ref. to SL-34, Immobilizer Control Module.> and then replace all ignition keys (including the transponder). Then perform teaching operation. Refer to the teaching operation manual (Pub. No. S0820GZ).

DIAGNOSTICS CHART WITH DIAGNOSTIC TROUBLE CODE (DTC)

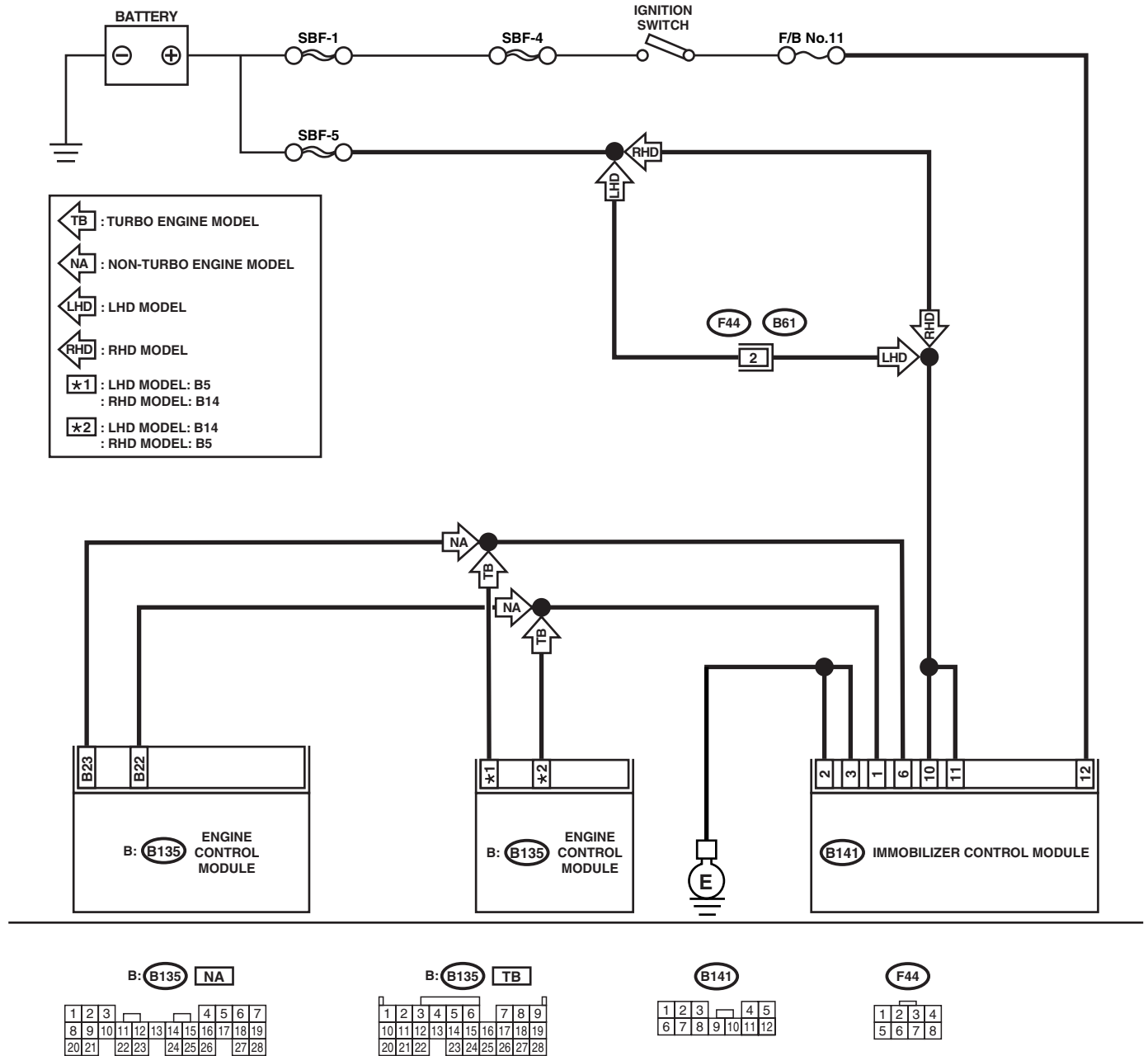
IMMOBILIZER (DIAGNOSTICS)

B: DTC P1572 IMM CIRCUIT FAILURE (EXCEPT ANTENNA CIRCUIT)

DIAGNOSIS:

- Communication failure between IMM ECM and ECM

WIRING DIAGRAM:



BO0460

DIAGNOSTICS CHART WITH DIAGNOSTIC TROUBLE CODE (DTC)

IMMOBILIZER (DIAGNOSTICS)

Step	Check	Yes	No
<p>1</p> <p>CHECK POWER SUPPLY CIRCUIT OF IMM ECM. 1) Turn the ignition switch to OFF. 2) Disconnect the harness connector from IMM ECM. 3) Measure the voltage between IMM ECM harness connector terminal and chassis ground. Connector & terminal (B141) No. 10, No.11 (+) — Chassis ground (-):</p>	Is the voltage more than 10 V?	Go to step 2.	Check the harness for open or short between IMM ECM and fuse.
<p>2</p> <p>CHECK POWER SUPPLY CIRCUIT OF IMM ECM. 1) Turn the ignition switch to ON. (engine OFF.) 2) Measure the voltage between IMM ECM harness connector terminal and chassis ground. Connector & terminal (B141) No. 12 (+) — Chassis ground (-):</p>	Is the voltage more than 10 V?	Go to step 3.	Check the harness for open or short between IMM ECM and ignition switch.
<p>3</p> <p>CHECK GROUND CIRCUIT OF IMM ECM. 1) Turn the ignition switch to OFF. 2) Measure the resistance between IMM ECM harness connector terminal and chassis ground. Connector & terminal (B141) No. 2, No.3 — Chassis ground:</p>	Is the resistance less than 10 Ω?	Go to step 4.	Repair the open circuit of IMM ECM ground circuit.
<p>4</p> <p>CHECK HARNESS BETWEEN IMM ECM AND ECM. 1) Disconnect the harness connector from ECM and IMM ECM. 2) Measure the resistance between IMM ECM harness connector terminal and ECM harness connector terminal. Connector & terminal Non-turbo engine model (B141) No. 1 — (B135) No. 22: LHD turbo engine model (B141) No. 1 — (B135) No. 14: RHD turbo engine model (B141) No. 1 — (B135) No. 5:</p>	Is the resistance less than 10 Ω?	Go to step 5.	Repair the open circuit of harness between IMM ECM and ECM.
<p>5</p> <p>CHECK HARNESS BETWEEN IMM ECM AND ECM. Measure the resistance between IMM ECM harness connector terminal and ECM harness connector terminal. Connector & terminal Non-turbo engine model (B141) No. 6 — (B135) No. 23: LHD turbo engine model (B141) No. 6 — (B135) No. 5: RHD turbo engine model (B141) No. 6 — (B135) No. 14:</p>	Is the resistance less than 10 Ω?	Go to step 6.	Repair the open circuit of harness between IMM ECM and ECM.
<p>6</p> <p>CHECK HARNESS OF COMMUNICATION LINE. 1) Turn the ignition switch to ON. (Engine OFF.) 2) Measure the voltage between IMM ECM harness connector terminal and chassis ground. Connector & terminal (B141) No. 1, No.6 (+) — Chassis ground (-):</p>	Is the voltage 0 V?	Go to step 7.	Repair the harness between IMM ECM and ECM, because there is short circuit with battery voltage line or ignition switch "ON" line.

DIAGNOSTICS CHART WITH DIAGNOSTIC TROUBLE CODE (DTC)

IMMOBILIZER (DIAGNOSTICS)

Step	Check	Yes	No
7 CHECK HARNESS OF COMMUNICATION LINE. Measure the voltage between ECM harness connector terminal and engine ground. Connector & terminal Non-turbo engine model <i>(B135) No. 22, No.23 (+) — Engine ground (-):</i> Turbo engine model <i>(B135) No. 5, No.14 (+) — Engine ground (-):</i>	Is the voltage 0 V?	Go to step 8 .	Repair the harness between IMM ECM and ECM, because there is short circuit with battery voltage line or ignition switch "ON" line.
8 CHECK ECM BY INTERFACE CHECK. 1)Connect the harness connector to ECM. 2)Disconnect the harness connector from IMM ECM. 3)Perform interface check. <Ref. to IM-7, INTERFACE CHECK, Subaru Select Monitor.>	Does "Commun. Line Shorted to Ground" appear on the screen?	Replace the ECM. <Ref. to FU-51, Engine Control Module.>, <Ref. to FU(w/oOBD)-48, Engine Control Module.> or <Ref. to FU(TURBO)-49, Engine Control Module.> Then perform teaching operation. Refer to the 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 the screen?	Replace the ECM. <Ref. to FU-51, Engine Control Module.>, <Ref. to FU(w/oOBD)-48, Engine Control Module.> or <Ref. to FU(TURBO)-49, Engine Control Module.> Then perform teaching operation. Refer to the teaching operation manual (Pub. No. S0820GZ).	Go to step 10 .
10 CHECK ECM BY INTERFACE CHECK. Perform interface check.	Does "Communication Line not Shorted" appear on the screen?	Replace the IMM ECM <Ref. to SL-34, Immobilizer Control Module.> and then replace all ignition keys (including the transponder). Then perform teaching operation. Refer to the teaching operation manual (Pub. No. S0820GZ).	When " Check (Time Out) " appears on the screen, perform interface check again.

DIAGNOSTICS CHART WITH DIAGNOSTIC TROUBLE CODE (DTC)

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? (Approx. 0.1 second after inserting the key) Is the voltage 0 V? (Approx. 1 second after inserting the key)	Go to step 2.	Replace the IMM ECM <Ref. to SL-34, Immobilizer Control Module.> and then replace all ignition keys (including the transponder). Then perform teaching operation. Refer to the teaching operation manual (Pub. No. S0820GZ).
2	CHECK IGNITION KEY (TRANSPONDER). 1)Remove the key from ignition switch. 2)Start the engine using other keys that have undergone the teaching operation, furnished with vehicle.	Does the engine start?	Replace the ignition key (including the transponder). Then perform teaching operation. Refer to the teaching operation manual (Pub. No. S0820GZ).	Replace the IMM ECM <<Ref. to SL-34, Immobilizer Control Module.> and then replace all ignition keys (including the transponder). Then perform teaching operation. Refer to the teaching operation manual (Pub. No. S0820GZ).

DIAGNOSTICS CHART WITH DIAGNOSTIC TROUBLE CODE (DTC)

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 the 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 the teaching operation manual (Pub. No. S0820GZ).	Is teaching operation for all keys completed?	END	Replace the IMM ECM <Ref. to SL-34, Immobilizer Control Module.> and then replace all ignition keys (including the transponder). Then perform teaching operation. Refer to the teaching operation manual (Pub. No. S0820GZ).

E: DTC P1576 EGI CONTROL MODULE EEPROM

DIAGNOSIS:

- ECM malfunctioning

1. REPLACE ECM.

Replace the ECM.

<Ref. to FU-51, Engine Control Module.>, <Ref. to FU(w/oOBD)-48, Engine Control Module.> or <Ref. to FU(TURBO)-49, Engine Control Module.>

Then perform teaching operation. Refer to the teaching operation manual (Pub. No. S0820GZ).

F: DTC P1577 IMM CONTROL MODULE EEPROM

DIAGNOSIS:

- IMM ECM malfunctioning

1. REPLACE IMM ECM.

Replace the IMM ECM <Ref. to SL-34, Immobilizer Control Module.>, and then replace all ignition keys (including the transponder). Then perform teaching operation. Refer to the teaching operation manual (Pub. No. S0820GZ).

DIAGNOSTICS CHART WITH DIAGNOSTIC TROUBLE CODE (DTC)

IMMOBILIZER (DIAGNOSTICS)

DIAGNOSTICS CHART WITH DIAGNOSTIC TROUBLE CODE (DTC)

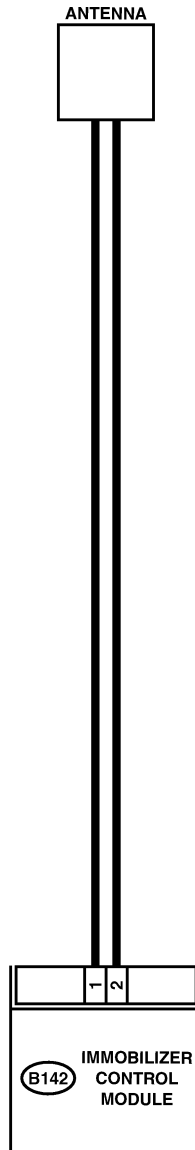
IMMOBILIZER (DIAGNOSTICS)

G: DTC P1570 ANTENNA

DIAGNOSIS:

- Faulty antenna

WIRING DIAGRAM:



(B142)

1 2

B6M1534

DIAGNOSTICS CHART WITH DIAGNOSTIC TROUBLE CODE (DTC)

IMMOBILIZER (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANTENNA CIRCUIT. 1) Turn the ignition switch to OFF. 2) Disconnect the harness antenna connector from IMM ECM. <Ref. to SL-35, Immobilizer Antenna.> 3) Measure the resistance of antenna circuit. Connector & terminal (B142) No. 1 — No. 2:	Is the resistance less than 10 Ω ?	Go to step 2.	Replace the antenna. <Ref. to SL-35, Immobilizer Antenna.>
2 CHECK ANTENNA CIRCUIT. Measure the resistance between antenna harness connector and chassis ground. Connector & terminal (B142) No. 1 — Chassis ground:	Is the resistance less than 10 Ω ?	Replace the antenna. <Ref. to SL-35, Immobilizer Antenna.>	Go to step 3.
3 CHECK ANTENNA CIRCUIT. Measure the resistance between antenna harness connector and chassis ground. Connector & terminal (B142) No. 2 — Chassis ground:	Is the resistance less than 10 Ω ?	Replace the antenna. <Ref. to SL-35, Immobilizer Antenna.>	Go to step 4.
4 CHECK ANTENNA CIRCUIT. 1) Turn the ignition switch to ON. (engine OFF.) 2) Measure the 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 the antenna. <Ref. to SL-35, Immobilizer Antenna.>
5 CHECK ANTENNA CIRCUIT. Measure the 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 the harness between IMM ECM and antenna, because there is short circuit with battery voltage line or ignition switch "ON" line.
6 CHECK IMM ECM FUNCTION. 1) Turn the ignition switch to OFF. 2) Connect the 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? (Approx. 0.1 second after inserting the key) Is the voltage 0 V? (Approx. 1 second after inserting the key)	Go to step 7.	Replace the IMM ECM <Ref. to SL-34, Immobilizer Control Module.> and then replace all ignition keys (including the transponder). Then perform teaching operation. Refer to the teaching operation manual (Pub. No. S0820GZ).
7 CHECK IGNITION KEY (TRANSPONDER). 1) Remove the key from ignition switch. 2) Start the engine using other keys that have undergone the teaching operation, furnished with vehicle.	Does the engine start?	Replace the ignition key (including the transponder). Then perform teaching operation. Refer to the teaching operation manual (Pub. No. S0820GZ).	Replace the IMM ECM <Ref. to SL-34, Immobilizer Control Module.> and then replace all ignition keys (including the transponder). Then perform teaching operation. Refer to the teaching operation manual (Pub. No. S0820GZ).

DIAGNOSTICS CHART WITH DIAGNOSTIC TROUBLE CODE (DTC)

IMMOBILIZER (DIAGNOSTICS)

SUNROOF/T-TOP/CONVERTIBLE TOP (SUNROOF)

SR

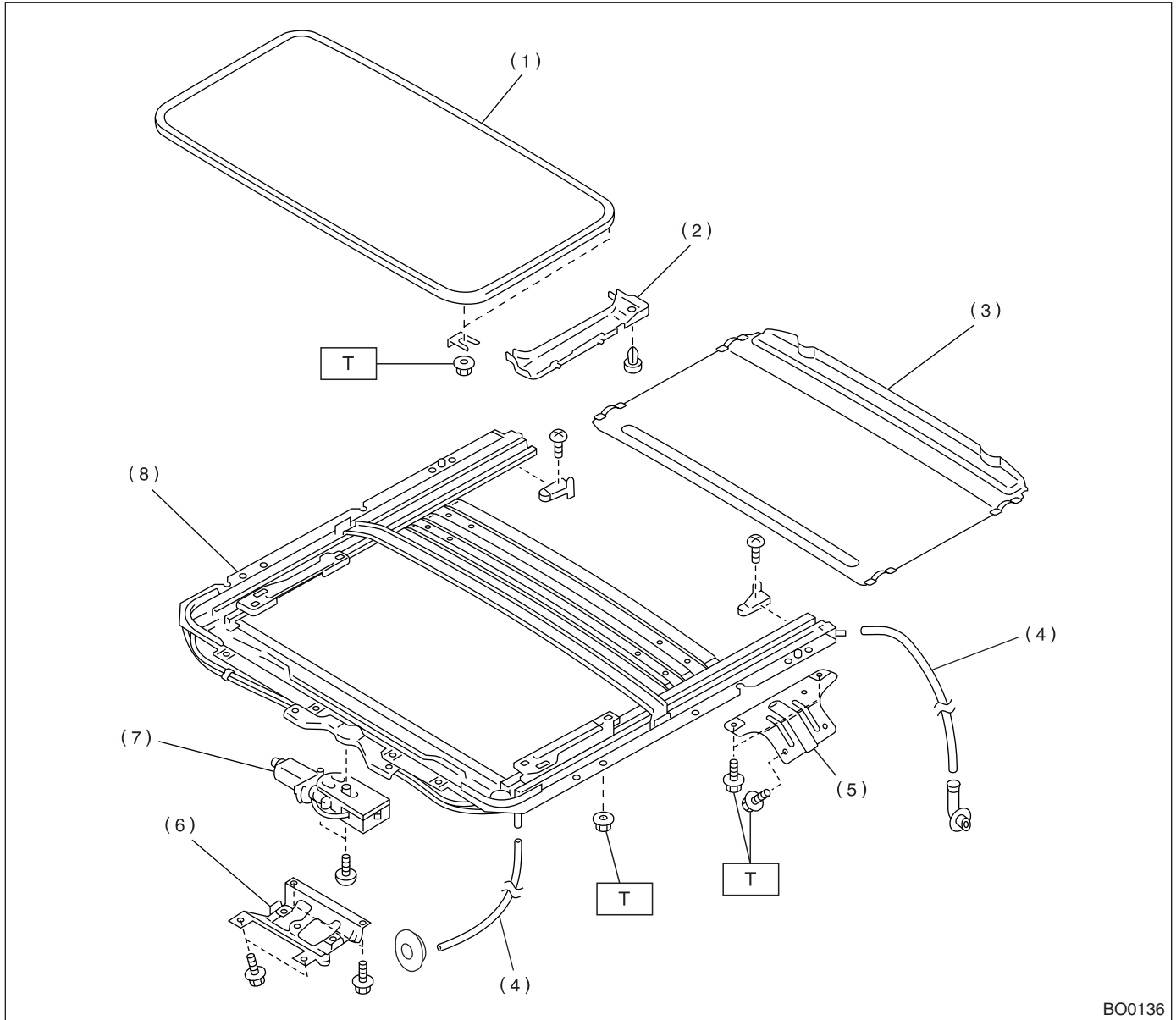
	Page
1. General Description	2
2. Sunroof Control System	4
3. Sunroof Lid.....	5
4. Sunroof Assembly	6
5. Sunroof Motor	8
6. Sunroof Switch	9

GENERAL DESCRIPTION

SUNROOF/T-TOP/CONVERTIBLE TOP (SUNROOF)

1. General Description

A: COMPONENT



BO0136

- | | |
|----------------------|-----------------|
| (1) Glass lid | (6) Motor cover |
| (2) Guide rail cover | (7) Motor ASSY |
| (3) Sunshade | (8) Frame ASSY |
| (4) Drain tube | |
| (5) Sunroof bracket | |

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 the 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

<Ref. to WI-259, SCHEMATIC, Sunroof System.>

B: INSPECTION

Symptom	Checking order
Water leaks.	(1) Check roof panel and sunroof lid for improper or poor sealing. (2) Check drain tube for clogging. (3) Check sunroof frame seal and body for improper fit.
Booming noise	(1) Check sunroof lid and roof panel for improper clearance. (2) Check sunshade and roof trim for improper clearance.
Abnormal motor noise	(1) Check motor for looseness. (2) Check gears and bearings for wear. (3) Check cables for wear. (4) Check cable pipe for deformities.
Failure of sunroof (Motor operates properly.)	(1) Check guide rail for foreign particles. (2) Check guide rail for improper installation. (3) Check parts for mutual interference. (4) Check cable slider for improper clinching. (5) Check cable for improper installation. (6) Check clutch adjustment nut for improper tightness.
Motor does not rotate or rotates improperly.	(1) Check fuse for blow-out. (2) Check switch for improper function. (3) Check motor for incorrect terminal voltage. (4) Check relay for improper operation. (5) Check poor grounding system. (6) Check harness for open or short and terminals for poor connections. (7) Check limit switch for improper operation.

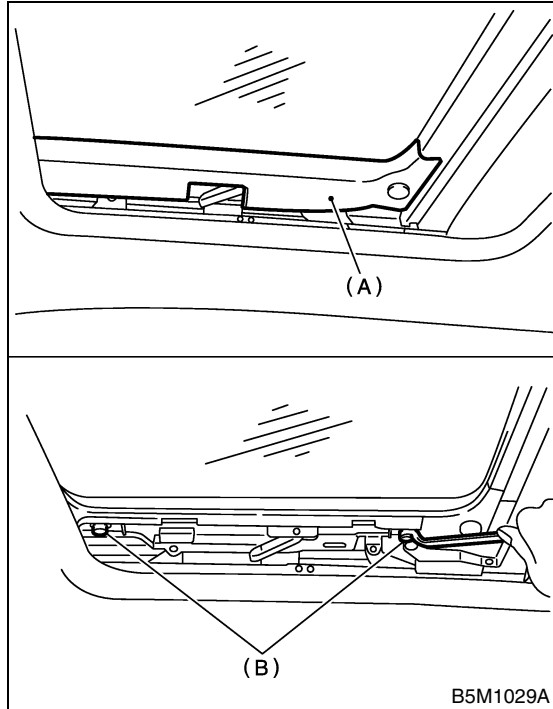
SUNROOF LID

SUNROOF/T-TOP/CONVERTIBLE TOP (SUNROOF)

3. Sunroof Lid

A: REMOVAL

- 1) Completely close the rear sunroof lid and open the sunshade.
- 2) Remove the covers (A) then remove the nuts (B).



- 3) Remove the sunroof lid carefully.

B: INSTALLATION

Install in the reverse order of removal.

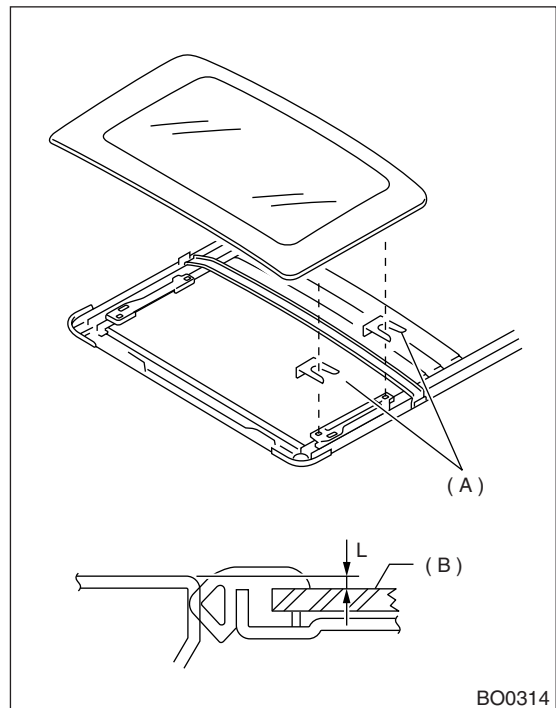
C: ADJUSTMENT

1. ALIGNMENT OF HEIGHT BETWEEN SUNROOF LID AND ROOF PANEL

Loosen the sunroof lid installation nuts and then adjust height by adding (max: two pieces) or extracting (max: one piece) shims (A) (standard: one piece) between sunroof lid (B) and body.

Difference in height between sunroof lid and roof panel: L

L: 2.0 ± 0.5 mm (0.079 ± 0.020 in)



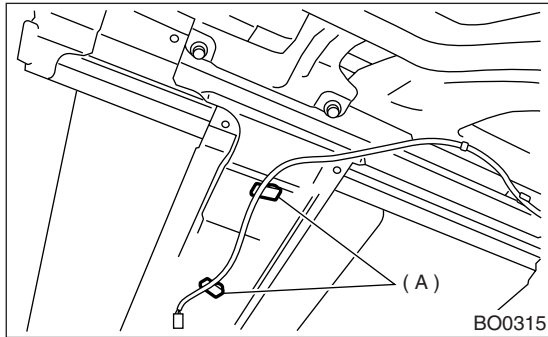
SUNROOF ASSEMBLY

SUNROOF/T-TOP/CONVERTIBLE TOP (SUNROOF)

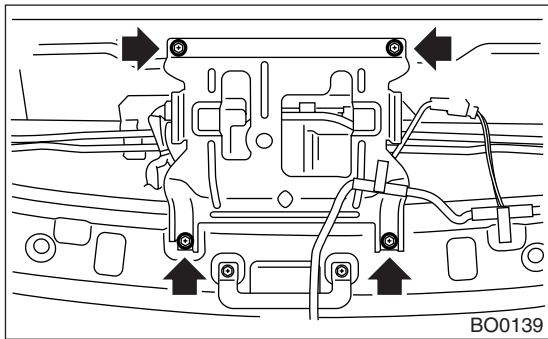
4. Sunroof Assembly

A: REMOVAL

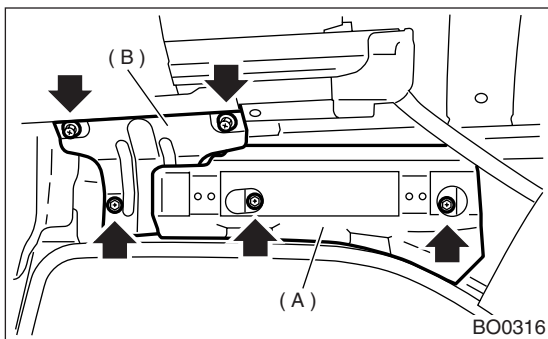
- 1) Disconnect the ground cable from battery.
- 2) Remove the roof trim. <Ref. to EI-48, REMOVAL, Roof Trim.>
- 3) Remove the sunroof lid. <Ref. to SR-5, REMOVAL, Sunroof Lid.>
- 4) Disconnect the drain tubes from sunroof frame.
- 5) Remove the room lamp harness clip (A).



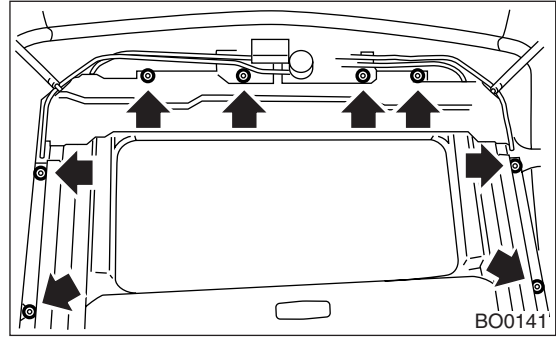
- 6) Disconnect the sunroof harness connector.
- 7) Remove the motor cover.



- 8) Remove the assist grip bracket (A) and sunroof bracket (B).



- 9) Remove the nuts then detach the sunroof frame.



SUNROOF ASSEMBLY

SUNROOF/T-TOP/CONVERTIBLE TOP (SUNROOF)

B: INSTALLATION

Install in the reverse order of removal.

CAUTION:

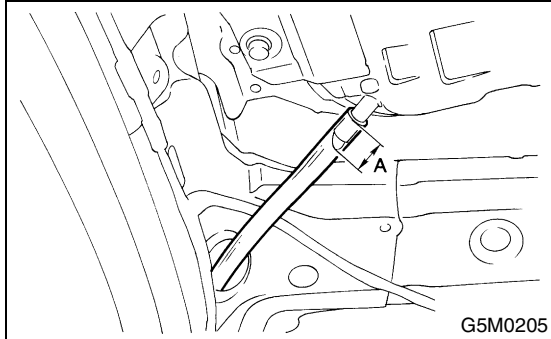
Be careful not to snag the harness.

NOTE:

- Make sure to connect the harness connector.
- When installing the drain tube, insert it securely onto drain pipe.

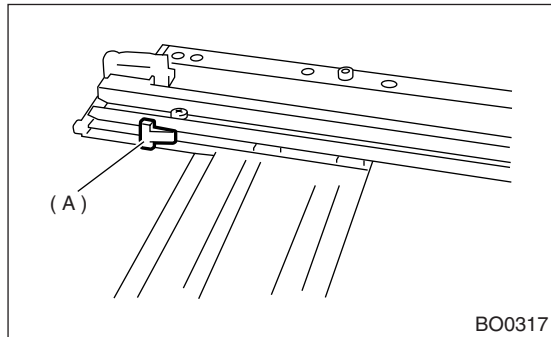
Length A:

15 mm (0.59 in) or more

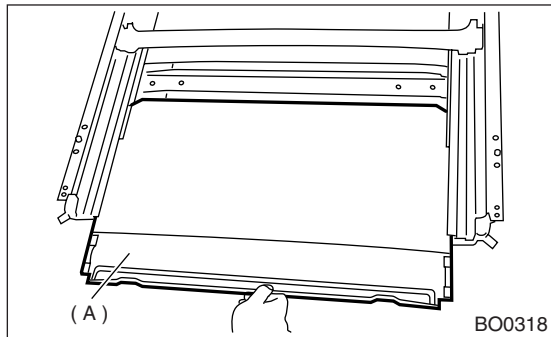


C: DISASSEMBLY

- 1) Remove the sunroof frame.
- 2) Remove the rail stoppers (A).



- 3) Pull out the sunshade (A) from sunroof frame.



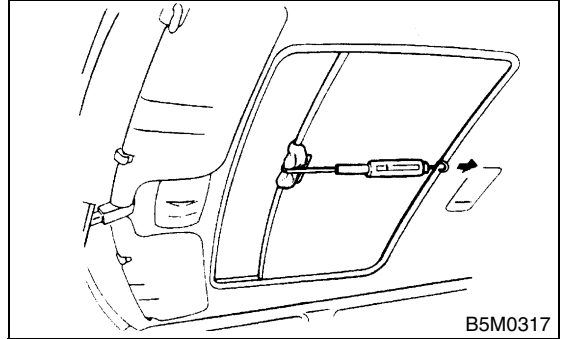
D: ASSEMBLY

Assemble in the reverse order of disassembly.

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 the 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.

SUNROOF MOTOR

SUNROOF/T-TOP/CONVERTIBLE TOP (SUNROOF)

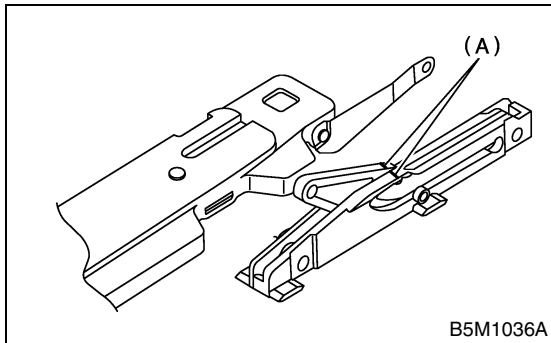
5. Sunroof Motor

A: REMOVAL

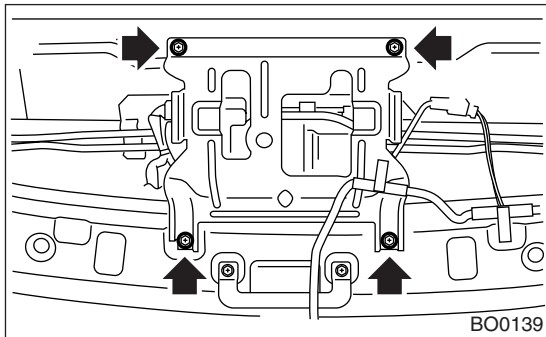
CAUTION:

When removing the clip, use great care to not damage the roof trim.

- 1) Disconnect the ground cable from battery.
- 2) Completely close the sunroof.
- 3) Remove the sunroof lid. <Ref. to SR-5, REMOVAL, Sunroof Lid.>
- 4) Confirm the matching mark (A) of sunroof bracket link and the guide from sunroof opening. (If the mark does not match, adjust to match the mark.)



- 5) Remove the roof trim. <Ref. to EI-48, REMOVAL, Roof Trim.>
- 6) Remove the motor cover.



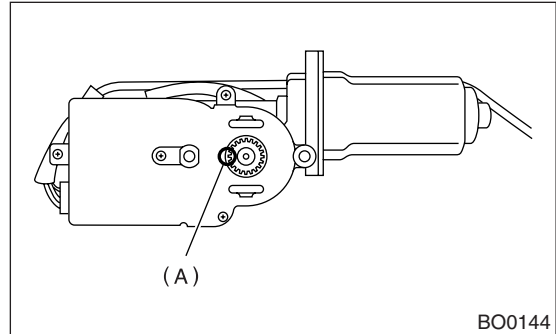
- 7) Disconnect the harness connector and remove the sunroof motor mounting screw.

B: INSTALLATION

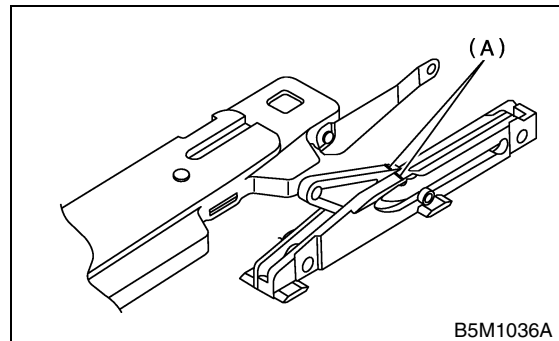
CAUTION:

- 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 the sunroof motor.
- 4) After installing the motor, reconfirm the matching marks of motor side and sunroof bracket link side.
- 5) Connect the sunroof motor harness connector and then connect the battery ground cable.
- 6) Check the sunroof operation with the procedure as shown in the table.

Operation	Switch position
(1) Completely close sunroof.	Closed
(2) Tilt-up sunroof to most upper position.	Tilt-up
(3) Lower sunroof completely.	Tilt-down
(4) Open sunroof to near the completely open position.	Open
(5) Completely open sunroof.	Open
(6) Close sunroof 150 mm (5.91 in) away from completely closed position.	Closed
(7) Completely close sunroof.	Closed

- 7) Install the sunroof lid and trims in the reverse order of removal.

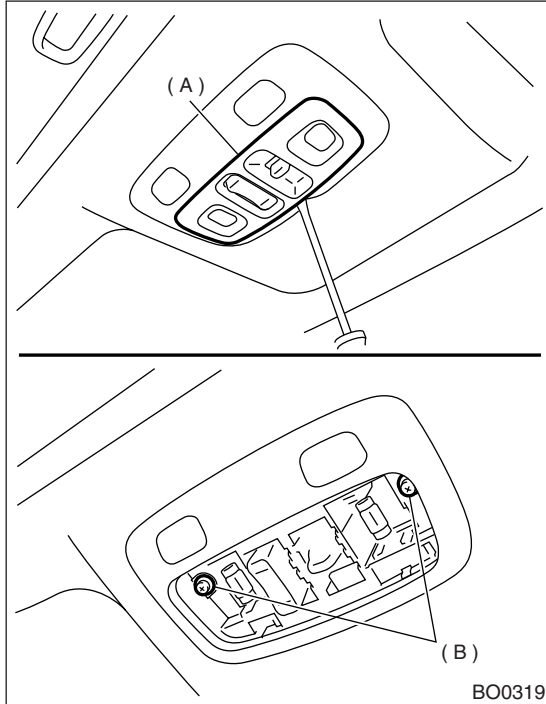
SUNROOF SWITCH

SUNROOF/T-TOP/CONVERTIBLE TOP (SUNROOF)

6. Sunroof Switch

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the spot light lens (A) and sunroof switch mounting screw (B).



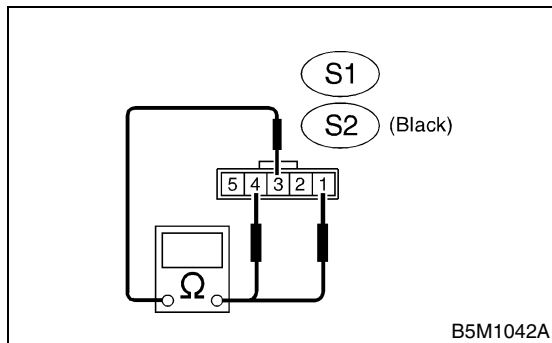
- 3) Disconnect the harness connectors and remove the sunroof switch.

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the sunroof switch resistance.



Switch position	Terminal No.	Standard
Open	S1: 3 and 4	Less than 1 Ω
Close	S1: 1 and 3	Less than 1 Ω
Tilt-up	S2: 3 and 4	Less than 1 Ω
Tilt-down	S2: 1 and 3	Less than 1 Ω

SUNROOF SWITCH

SUNROOF/T-TOP/CONVERTIBLE TOP (SUNROOF)

EXTERIOR/INTERIOR TRIM



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7. Mud Guard	31
8. Cowl Panel	32
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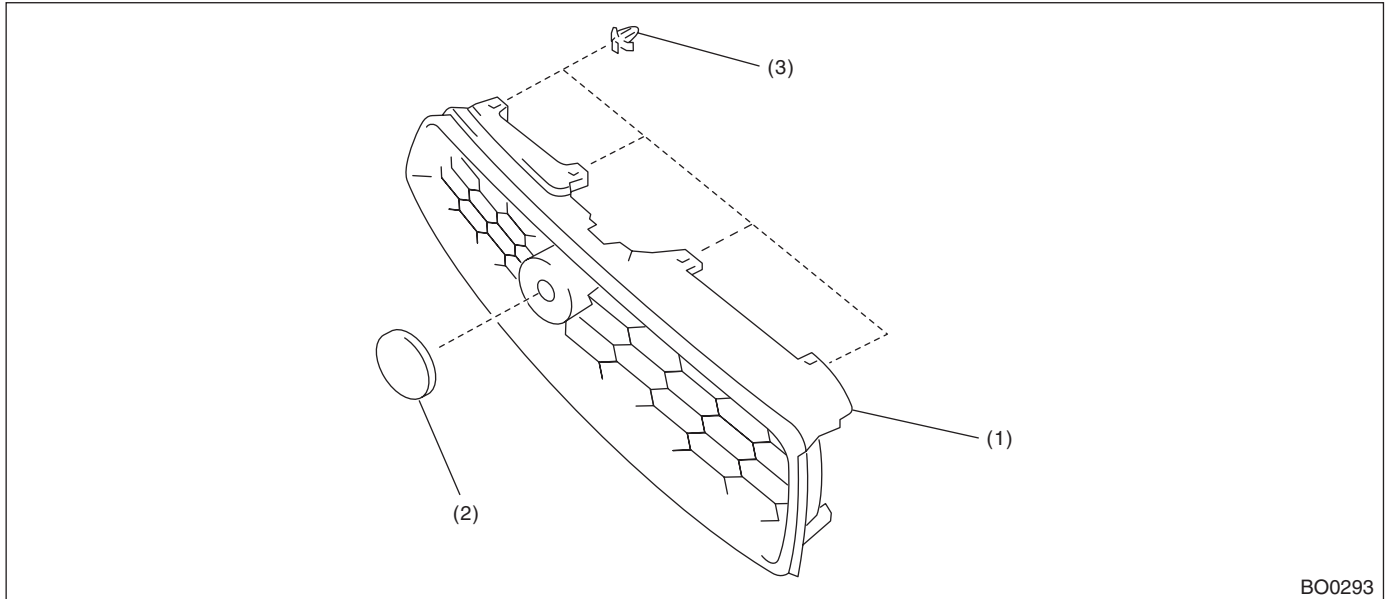
GENERAL DESCRIPTION

EXTERIOR/INTERIOR TRIM

1. General Description

A: COMPONENT

1. FRONT GRILLE



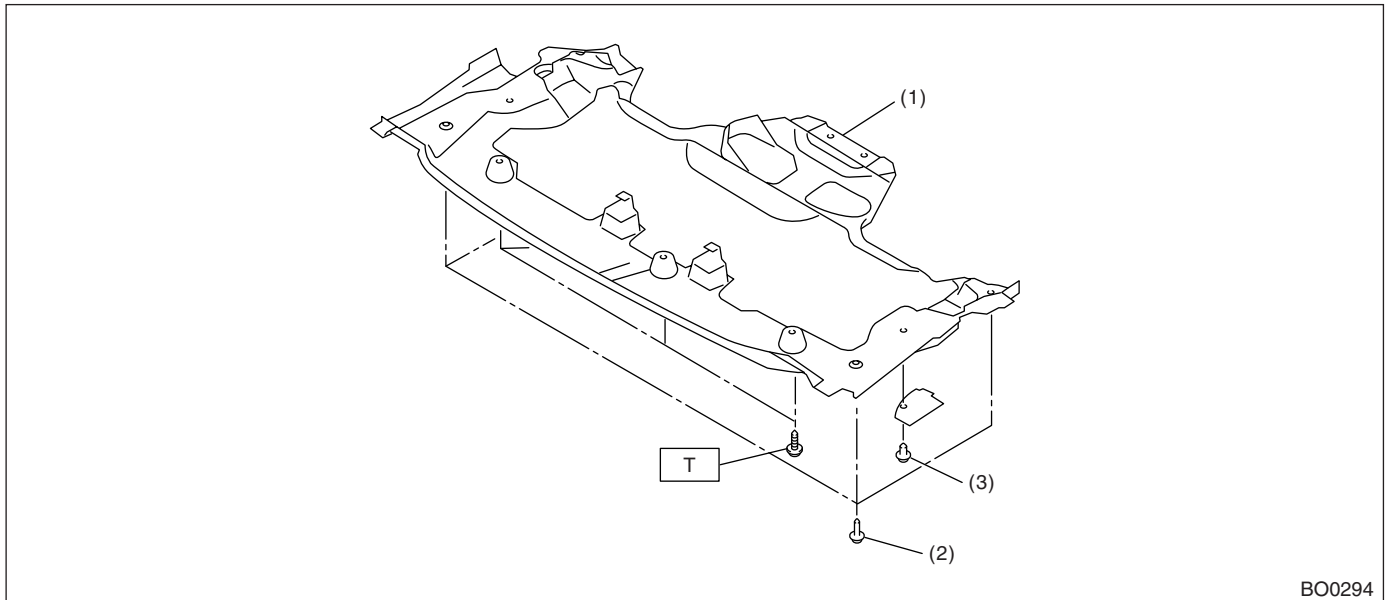
BO0293

(1) Front grille

(2) Front grille emblem

(3) Clip

2. UNDER COVER



BO0294

(1) Under cover

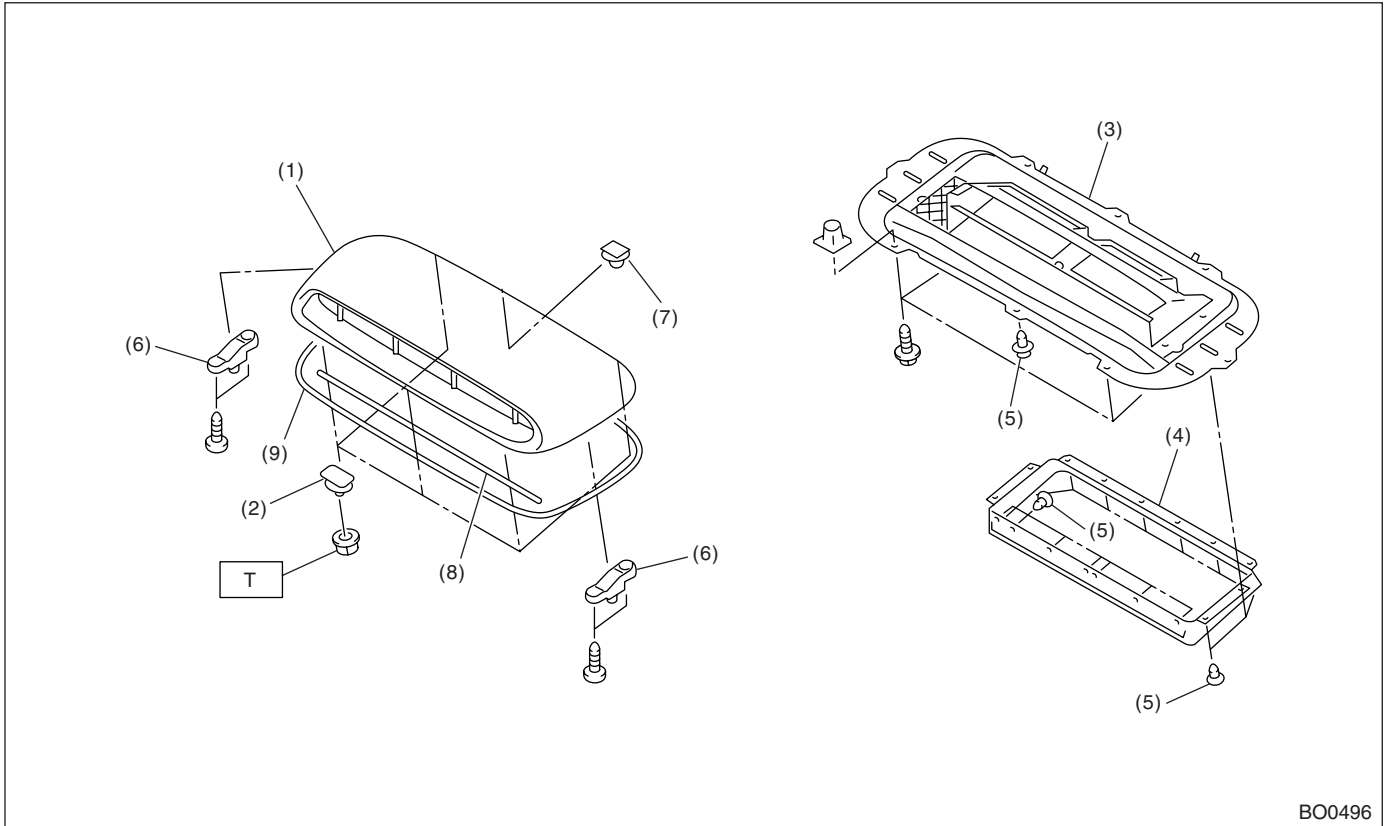
(3) Clip

(2) Clip (side)

Tightening torque: N·m (kgf·m, ft·lb)

T: 14 (1.42, 10.3)

3. HOOD GRILLE



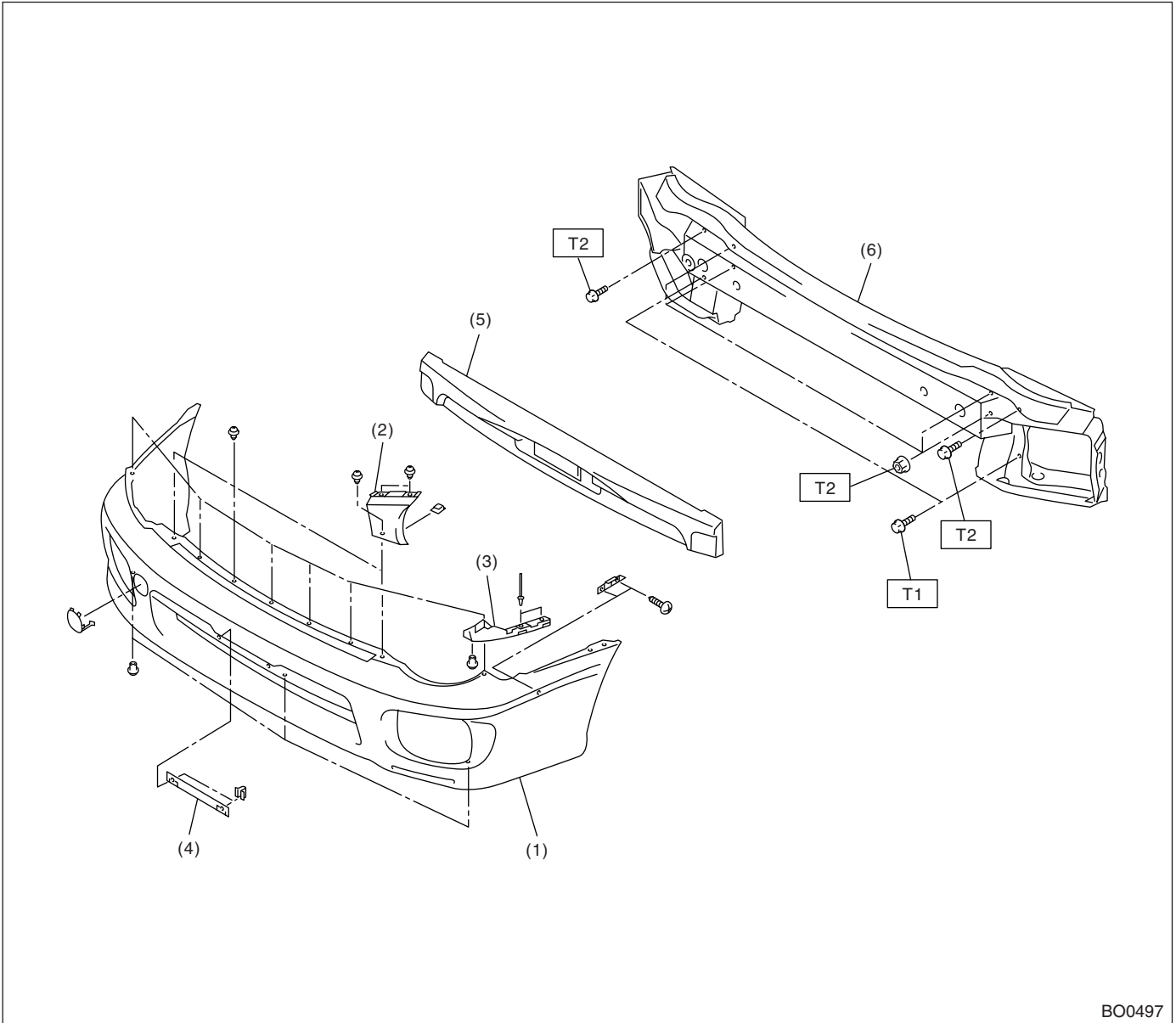
- | | |
|-----------------------|----------------|
| (1) Hood grille | (6) Black clip |
| (2) Bolt | (7) White clip |
| (3) Grille duct | (8) Packing |
| (4) Grille lower duct | (9) Packing |
| (5) Clip | |

Tightening torque: N·m (kgf·m, ft·lb)
T: 4.4 (0.45, 3.25)

GENERAL DESCRIPTION

EXTERIOR/INTERIOR TRIM

4. FRONT BUMPER



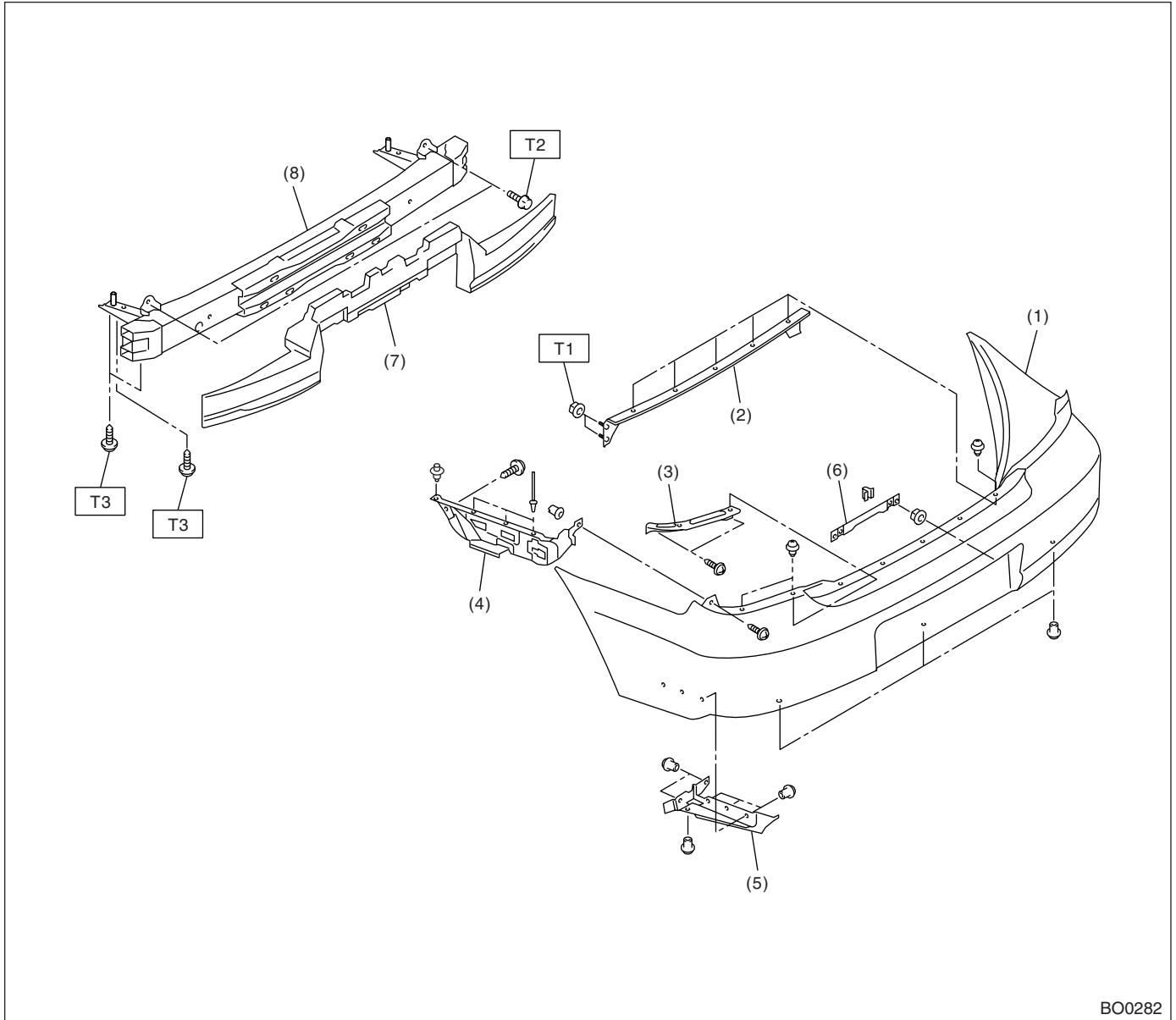
- | | |
|---------------------------|----------------------------|
| (1) Bumper face | (4) License plate bracket |
| (2) Head light side cover | (5) Bumper energy absorber |
| (3) Bumper corner bracket | (6) Bumper back beam |

Tightening torque: N-m (kgf-m, ft-lb)

T1: 32 (3.3, 24)

T2: 69 (7.0, 51)

5. REAR BUMPER



BO0282

- | | |
|---------------------------|----------------------------|
| (1) Bumper face | (5) Bumper side cover |
| (2) Bumper upper beam | (6) License plate base |
| (3) Bumper corner bracket | (7) Bumper energy absorber |
| (4) Bumper side bracket | (8) Bumper back beam |

Tightening torque: N-m (kgf-m, ft-lb)

T1: 33 (3.4, 24)

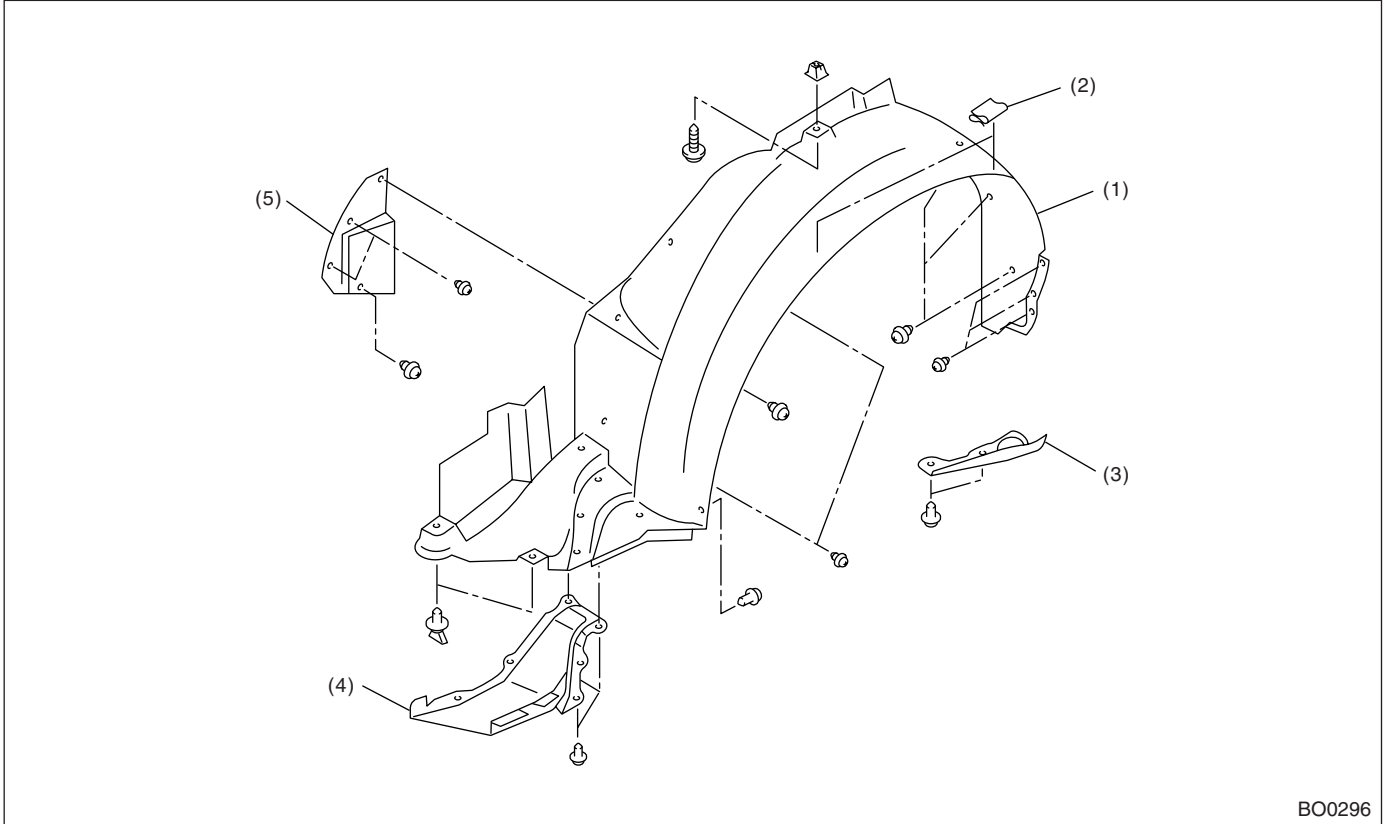
T2: 34 (3.5, 25)

T3: 95 (9.7, 70)

GENERAL DESCRIPTION

EXTERIOR/INTERIOR TRIM

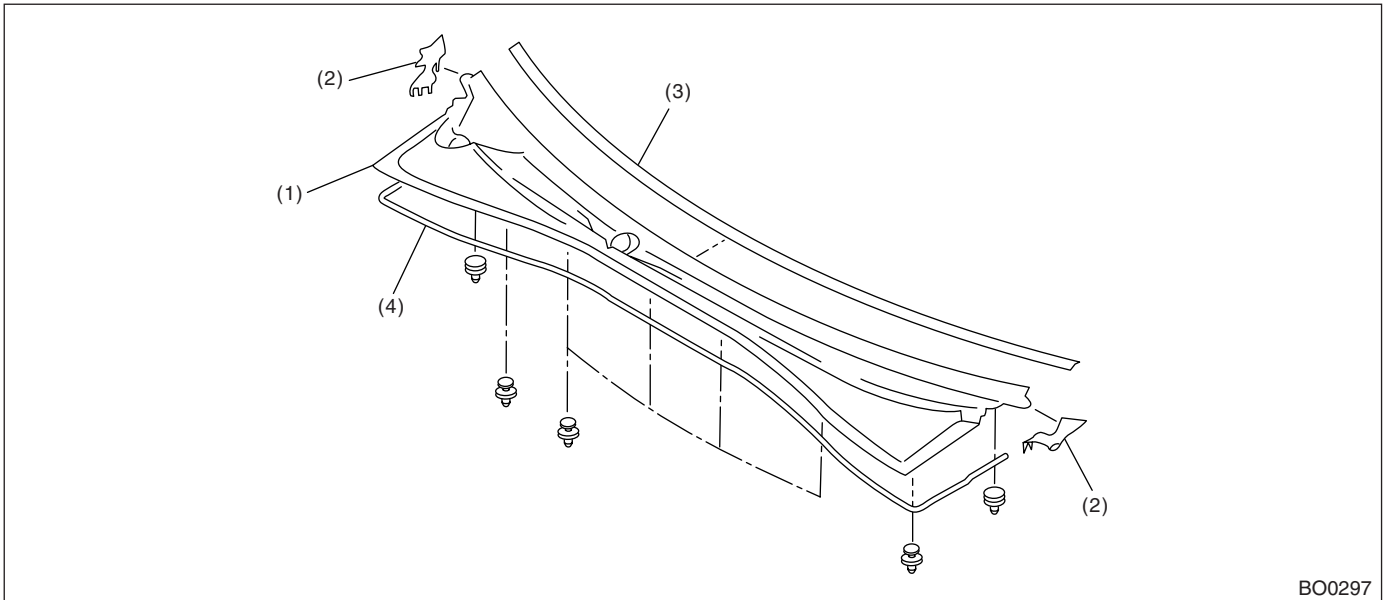
6. MUD GUARD



BO0296

- (1) Mud guard
- (2) Clip
- (3) Sub frame cover
- (4) Brake duct plate
- (5) Mud guard plate

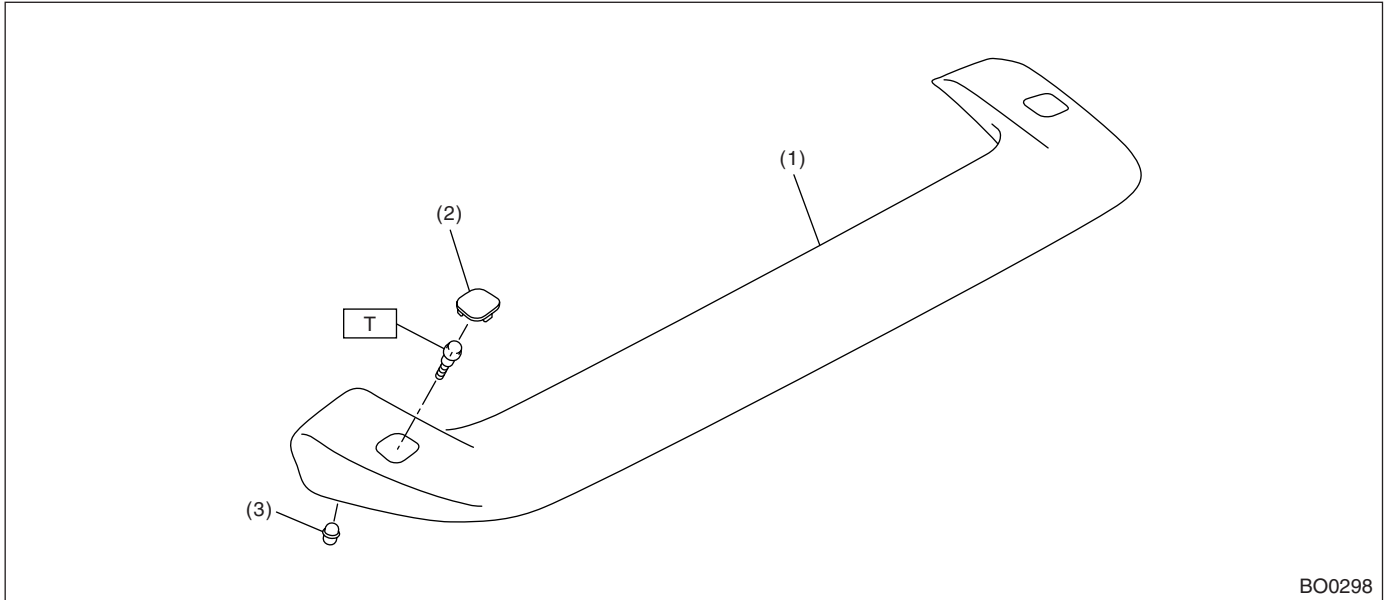
7. COWL PANEL



BO0297

- (1) Cowl panel
- (2) Cowl side panel
- (3) Protector
- (4) Seal

8. ROOF SPOILER



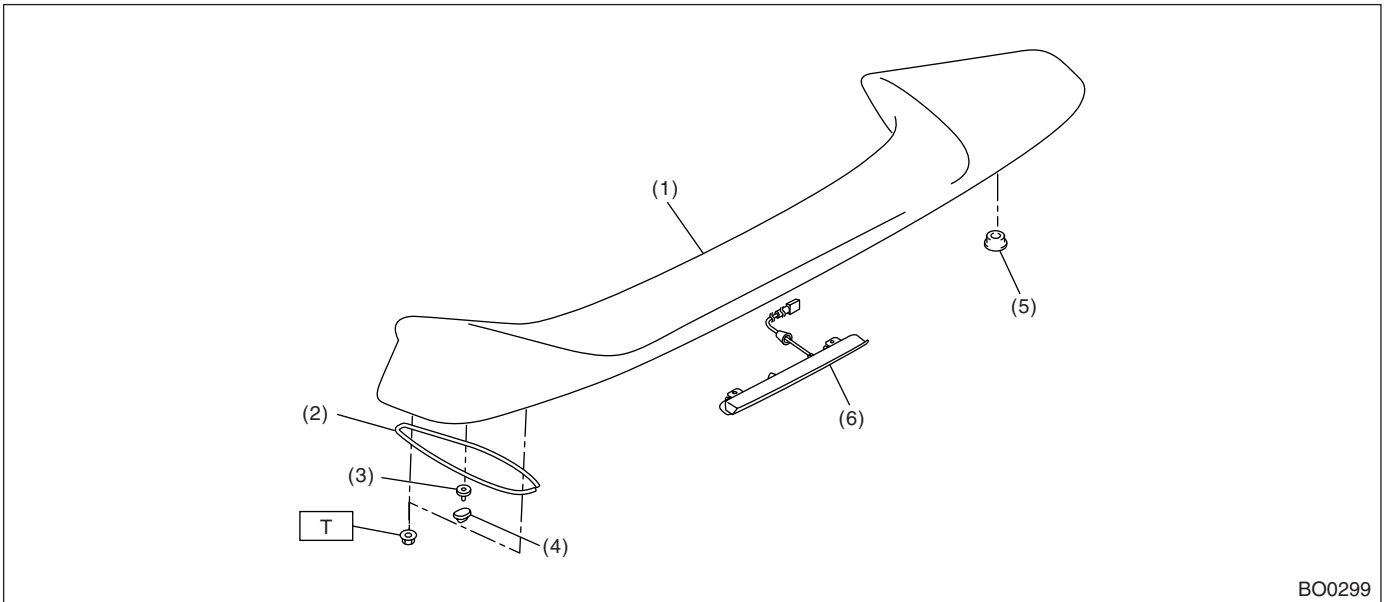
BO0298

- (1) Roof spoiler
- (2) Cap

- (3) Clip

Tightening torque: N·m (kgf·m, ft·lb)
T: 7.35 (0.749, 5.42)

9. REAR SPOILER



BO0299

- (1) Rear spoiler
- (2) Protector
- (3) Clip

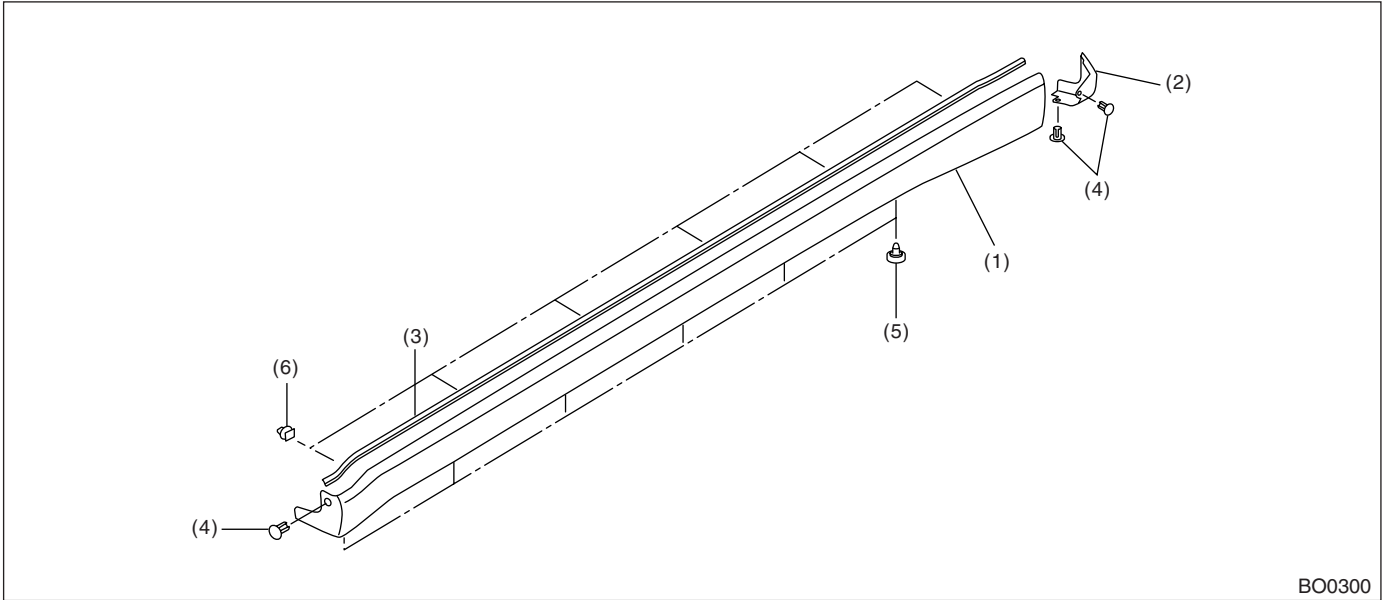
- (4) Grommet
- (5) Seal (only RH side)
- (6) High mount stop lamp

Tightening torque: N·m (kgf·m, ft·lb)
T: 7.4 (0.75, 5.46)

GENERAL DESCRIPTION

EXTERIOR/INTERIOR TRIM

10.SIDE SILL SPOILER



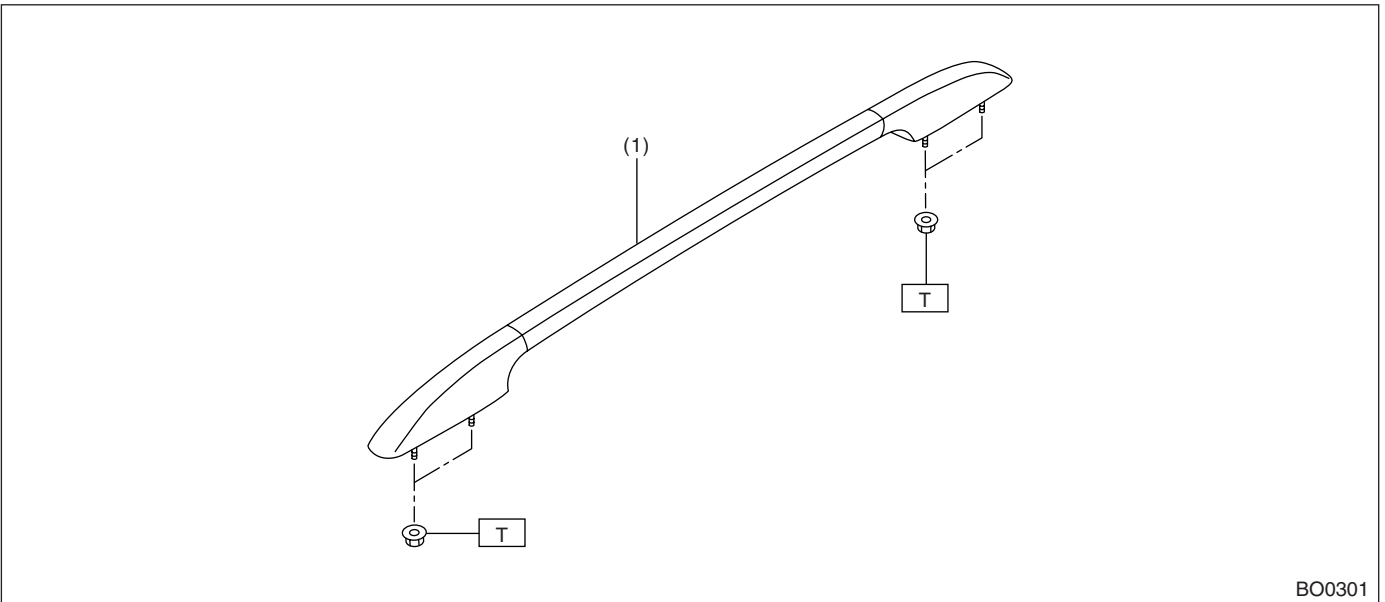
BO0300

- (1) Side sill spoiler
- (2) End cover

- (3) Protector
- (4) Rivet clip

- (5) Clip (Side sill spoiler)
- (6) Clip

11.ROOF RAIL

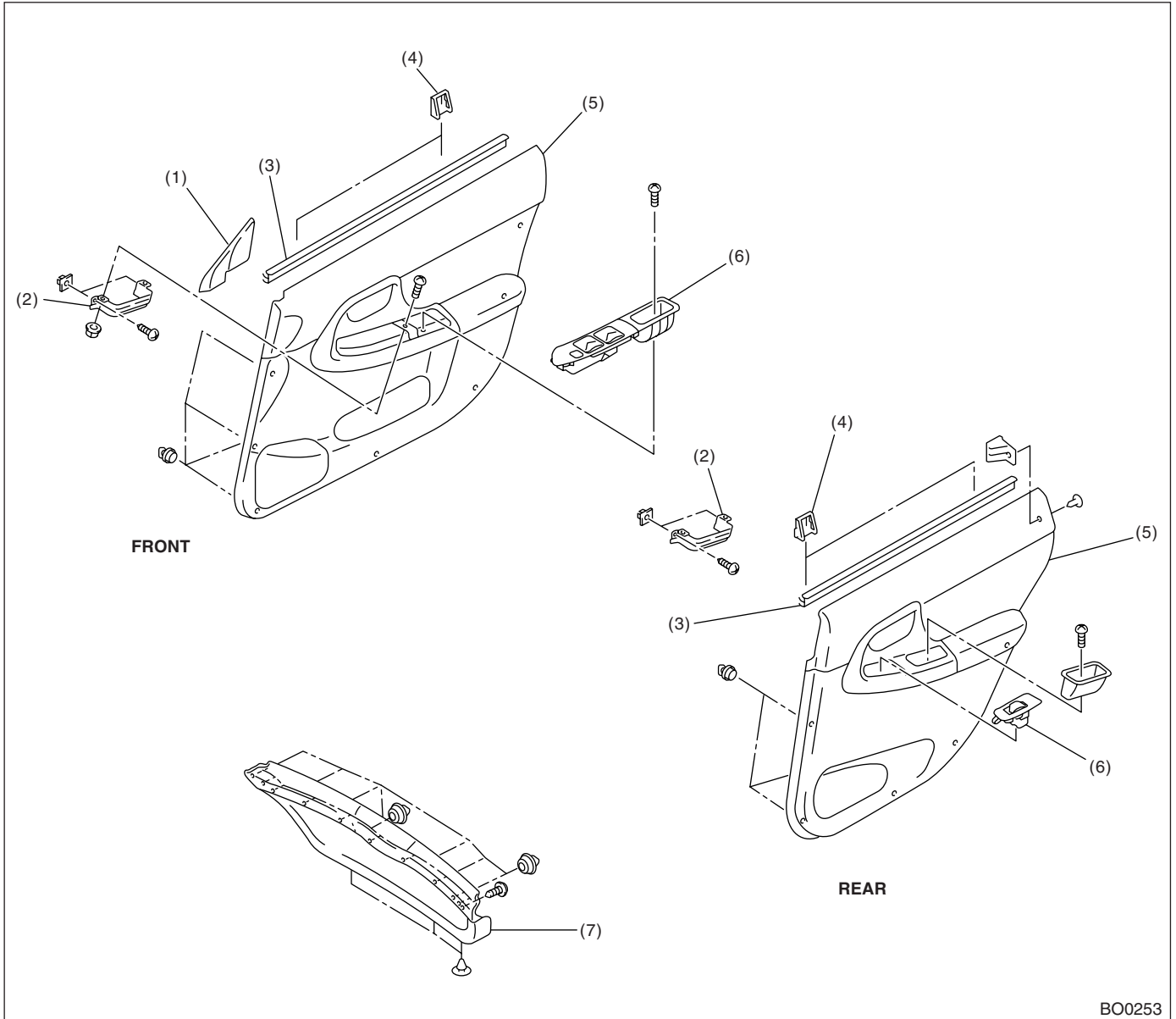


BO0301

- (1) Roof rail

Tightening torque: N·m (kgf·m, ft·lb)
T: 7.4 (0.75, 5.46)

12.DOOR TRIM



BO0253

- (1) Gusset cover
- (2) Bracket
- (3) Weatherstrip upper

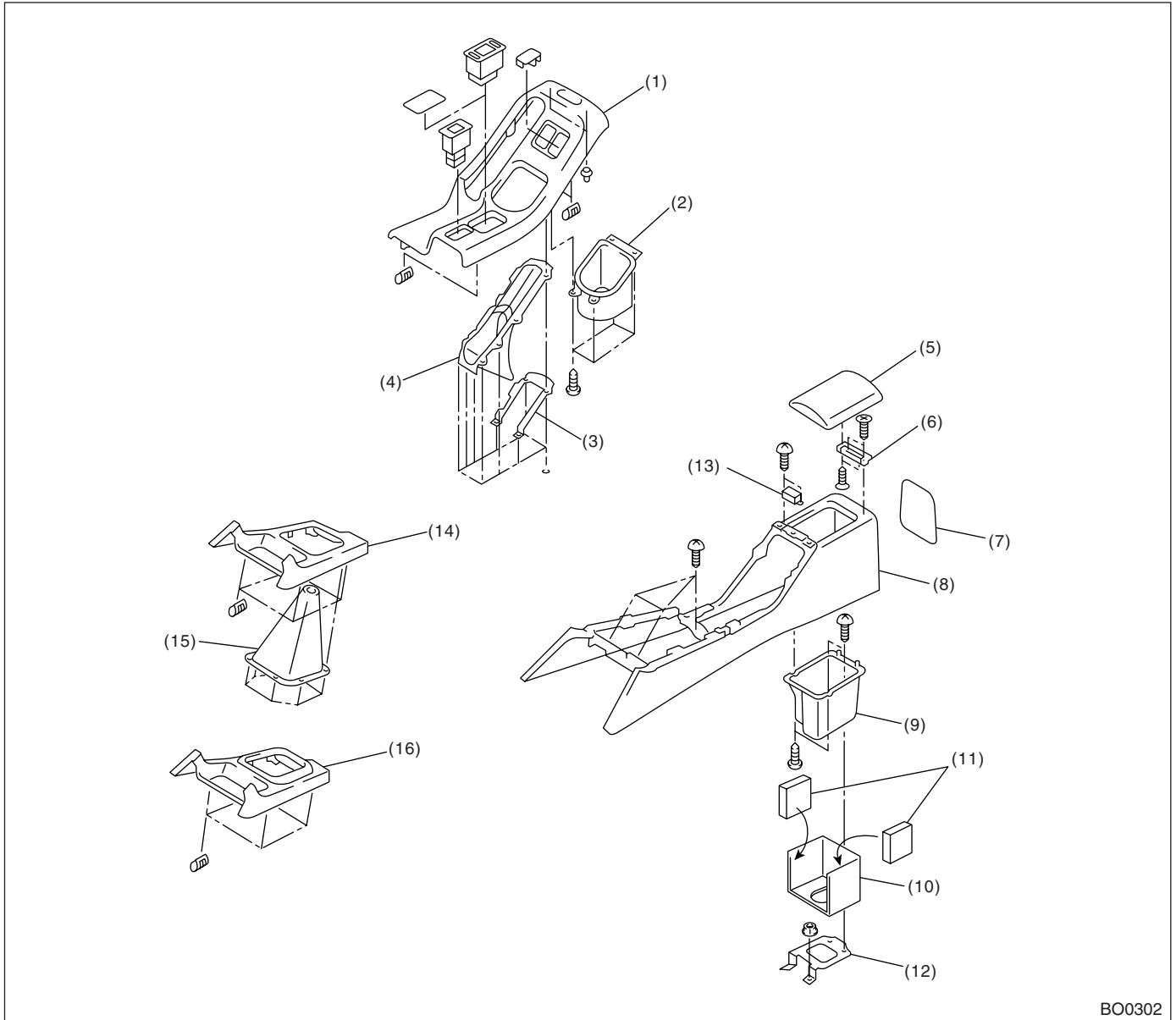
- (4) Clip
- (5) Trim panel
- (6) Power window switch cover

- (7) Lower trim

GENERAL DESCRIPTION

EXTERIOR/INTERIOR TRIM

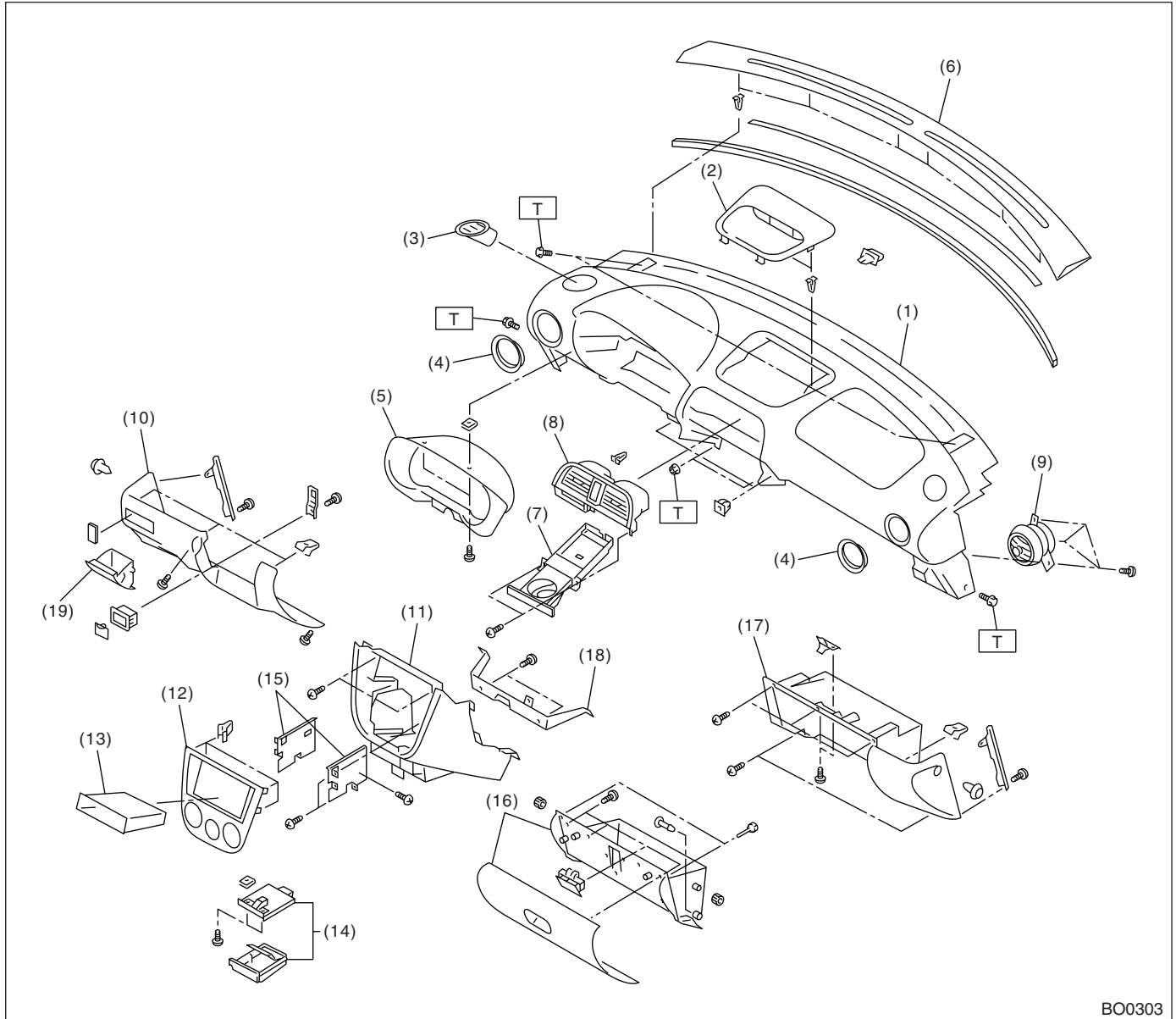
13. CONSOLE BOX



BO0302

- | | | |
|-------------------|--------------------|-----------------------|
| (1) Console cover | (7) Rear lid | (13) Lock |
| (2) Cup holder | (8) Console box | (14) Front cover (MT) |
| (3) Bracket | (9) Console pocket | (15) Boot |
| (4) Strip | (10) Upper bracket | (16) Front cover (AT) |
| (5) Upper lid | (11) Pad | |
| (6) Lid hinge | (12) Lower bracket | |

14. INSTRUMENT PANEL



BO0303

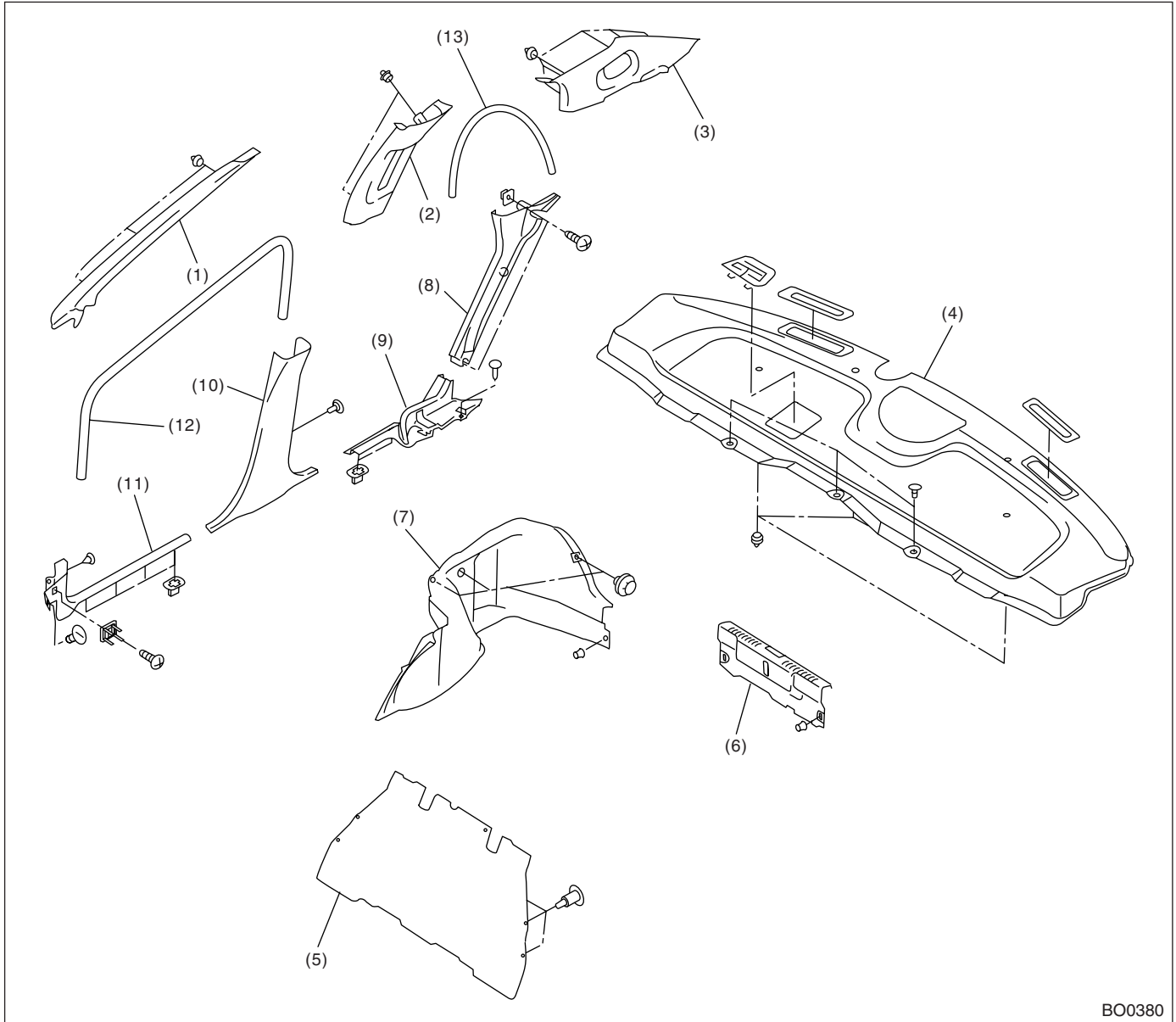
- | | | |
|---------------------------------|----------------------------|-----------------------------|
| (1) Pad & frame | (9) Air vent grille (Side) | (17) Glove box panel |
| (2) Center upper panel | (10) Lower cover | (18) Console rein forcement |
| (3) Air vent grille (Defroster) | (11) Console cover | (19) Coin box |
| (4) Grille cover | (12) Center panel | |
| (5) Meter visor | (13) Center pocket | |
| (6) Defroster grille | (14) Ash tray | |
| (7) Cup holder | (15) Audio bracket | |
| (8) Air vent grille (Center) | (16) Glove box lid | |

Tightening torque: N·m (kgf·m, ft·lb)
T: 7 (0.71, 5.2)

GENERAL DESCRIPTION

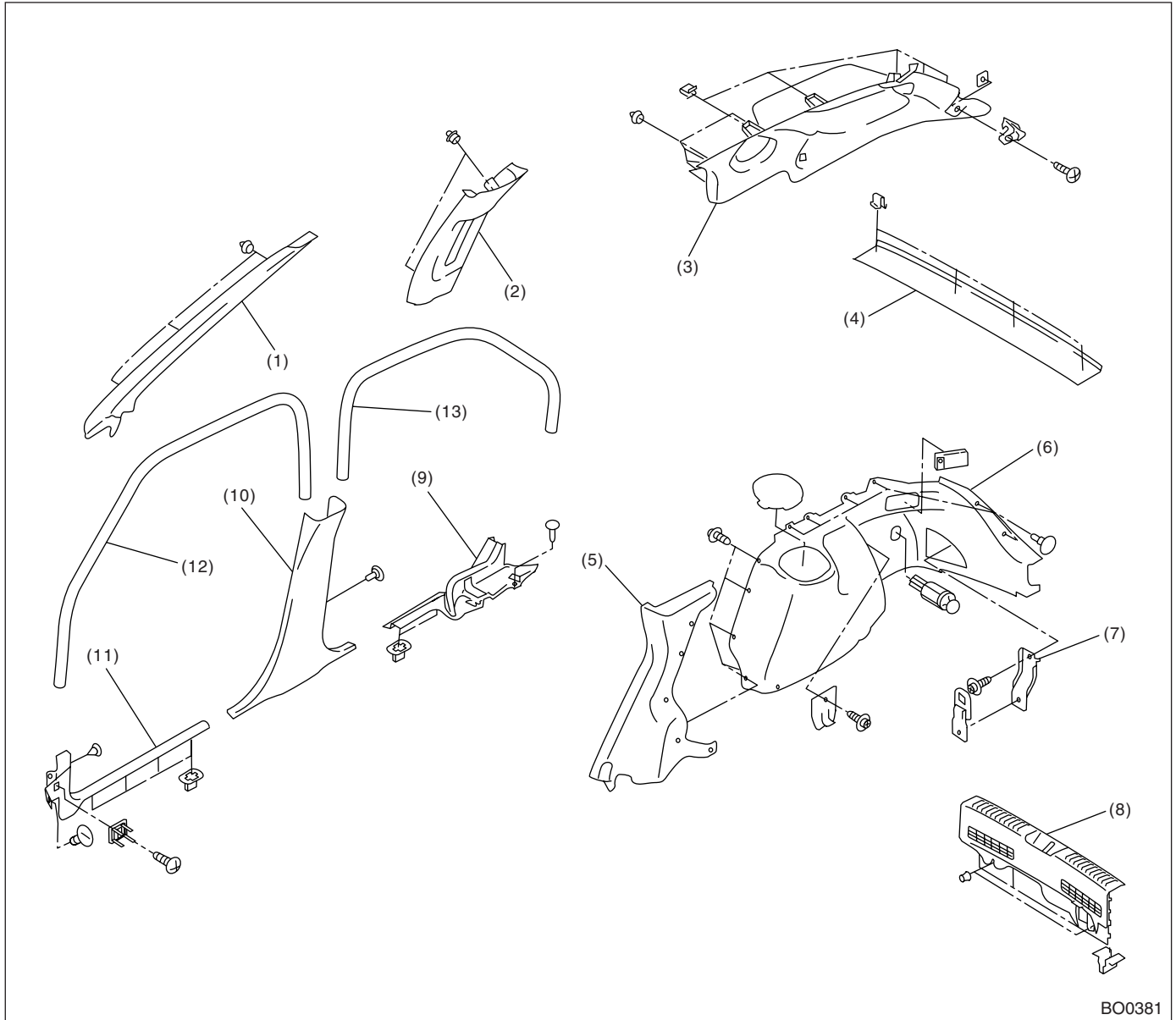
EXTERIOR/INTERIOR TRIM

15.INNER TRIM (SEDAN)



- | | | |
|------------------------------|-------------------------------|----------------------------|
| (1) Front pillar upper trim | (6) Trunk rear trim | (11) Side sill front cover |
| (2) Center pillar upper trim | (7) Trunk side trim | (12) Front garnish |
| (3) Rear pillar upper trim | (8) Rear pillar lower trim | (13) Rear garnish |
| (4) Rear shelf trim | (9) Side sill rear cover | |
| (5) Rear bulk trim | (10) Center pillar lower trim | |

16.INNER TRIM (WAGON)



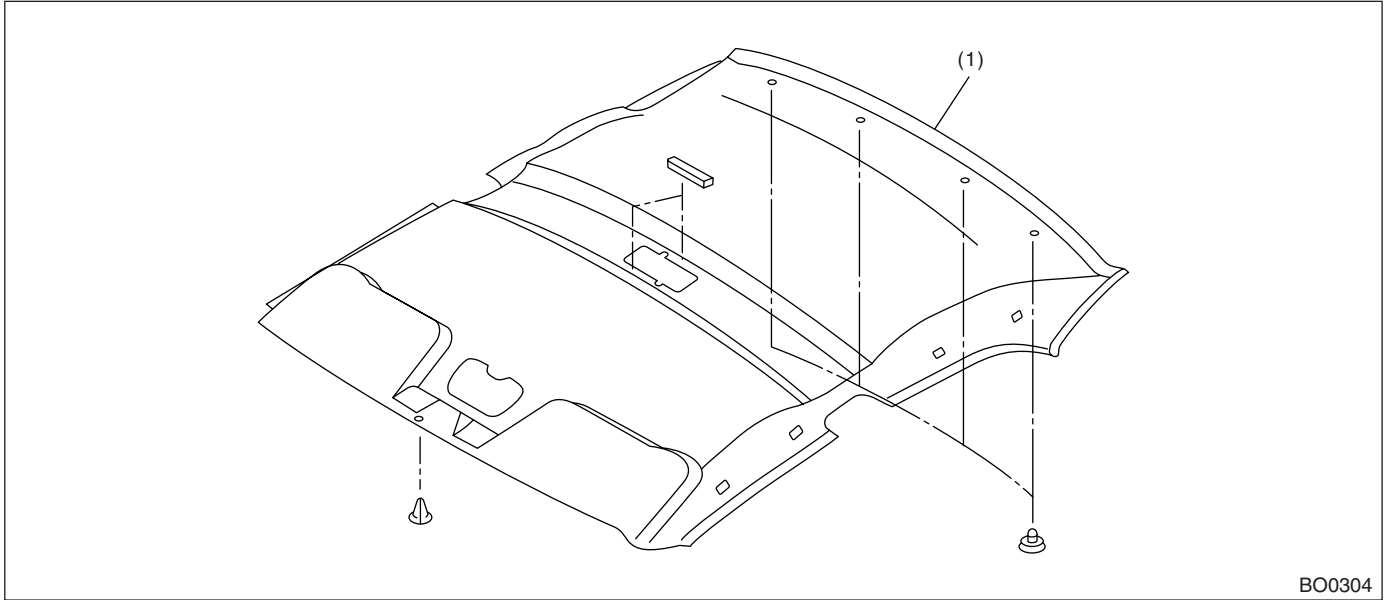
BO0381

- | | | |
|------------------------------|-------------------------------|----------------------------|
| (1) Front pillar upper trim | (6) Rear quarter lower trim | (11) Side sill front cover |
| (2) Center pillar upper trim | (7) Hook | (10) Front garnish |
| (3) Rear pillar upper trim | (8) Rear skirt trim | (11) Rear garnish |
| (4) Rear rail trim | (9) Side sill rear cover | (12) Front garnish |
| (5) Rear pillar lower trim | (10) Center pillar lower trim | (13) Rear garnish |

GENERAL DESCRIPTION

EXTERIOR/INTERIOR TRIM

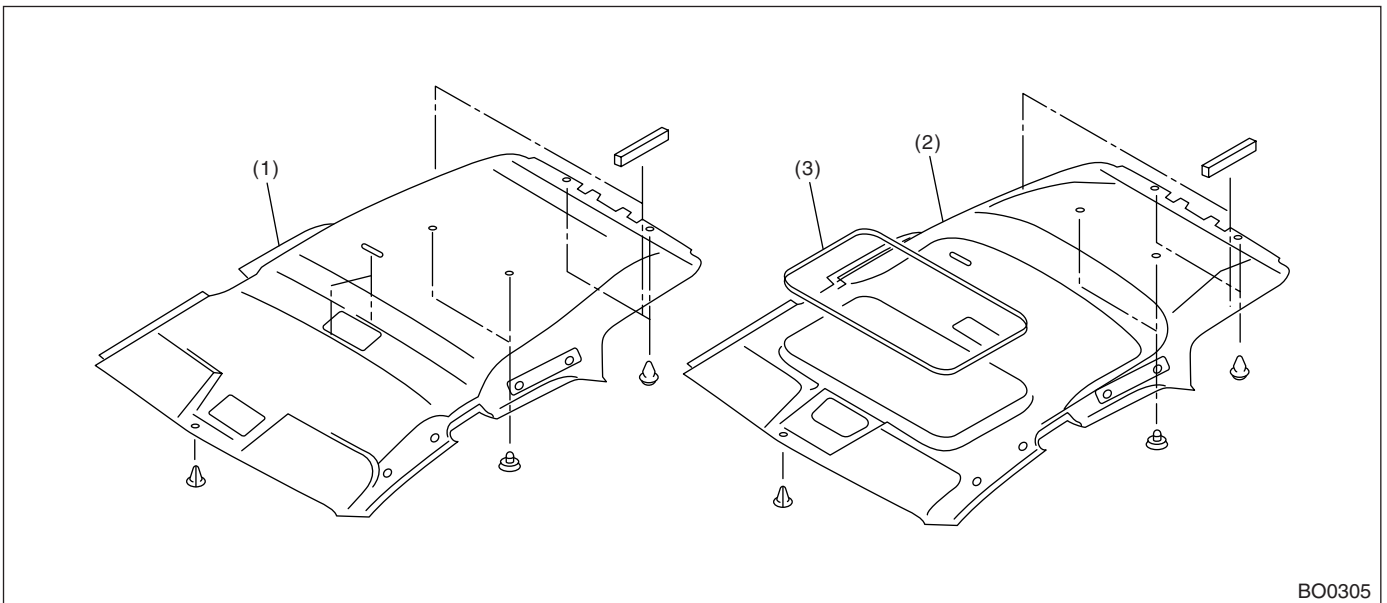
17. ROOF TRIM (SEDAN)



BO0304

(1) Roof trim

18. ROOF TRIM (WAGON)



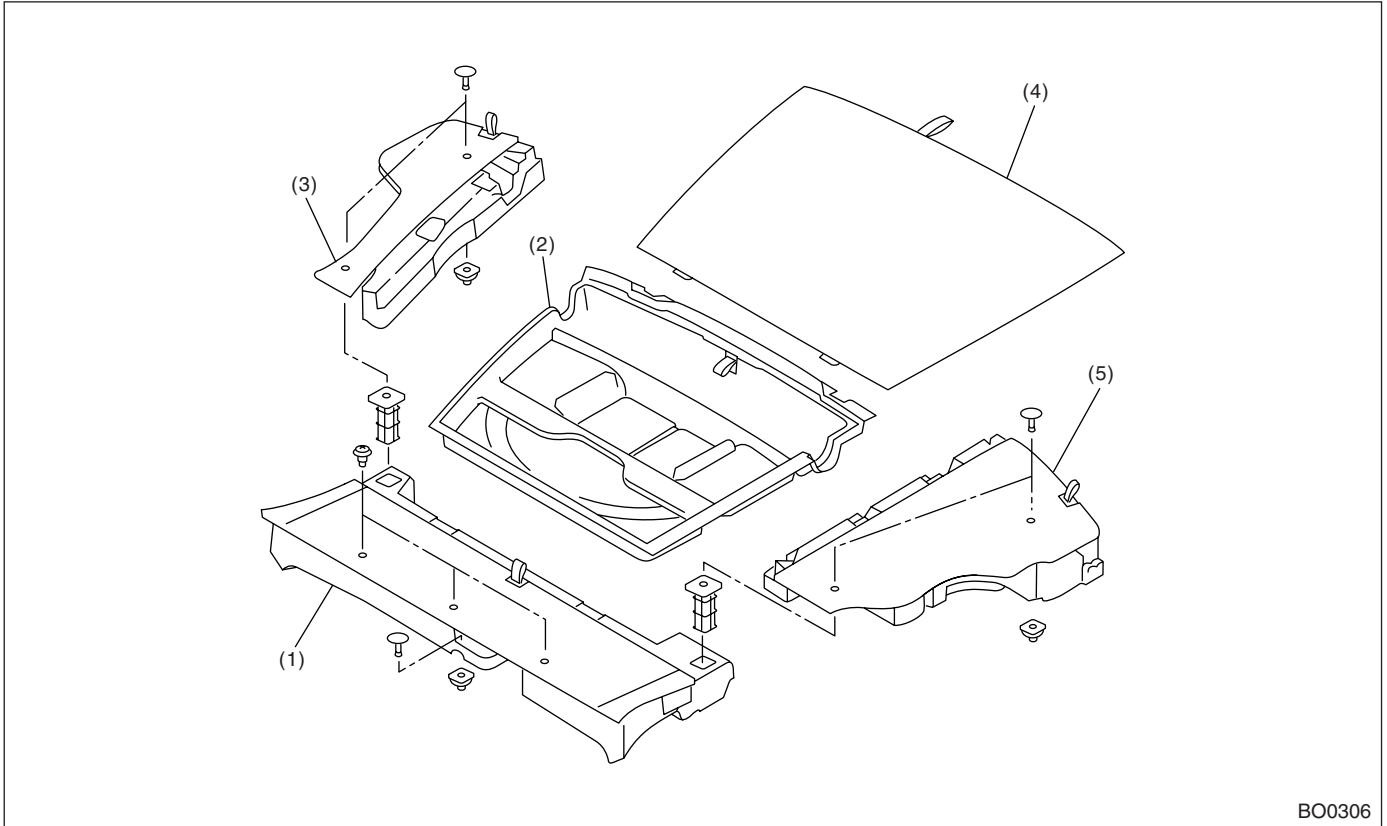
BO0305

(1) Roof trim

(2) Roof trim (sun roof model)

(3) Sun roof garnish

19.LUGGAGE FLOOR MAT



BO0306

- (1) Front floor mat
- (2) Floor box

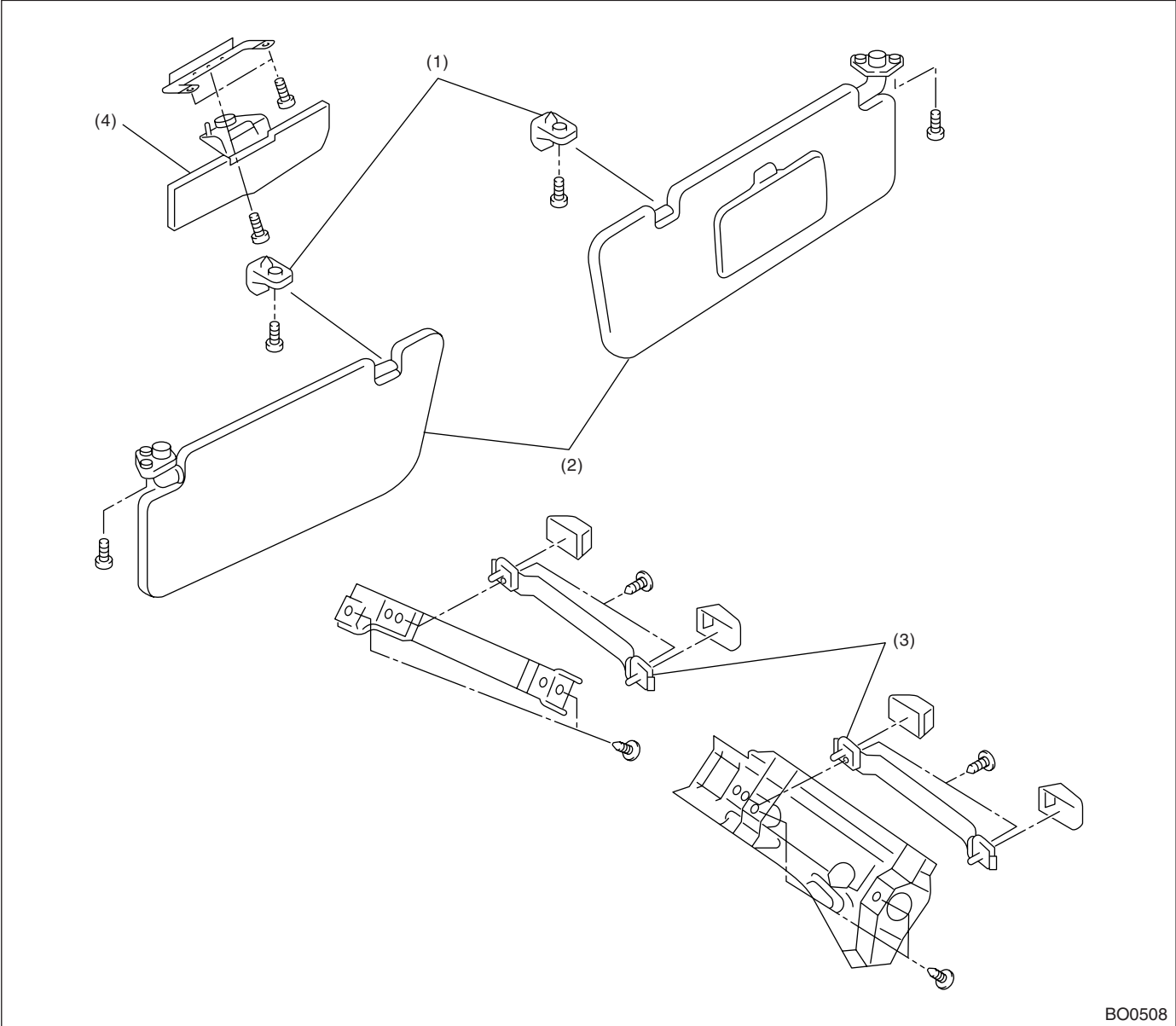
- (3) Side floor mat (RH)
- (4) Center floor mat

- (5) Side floor mat (LH)

GENERAL DESCRIPTION

EXTERIOR/INTERIOR TRIM

20.INNER ACCESSORIES



BO0508

- (1) Hook
- (2) Sun visor
- (3) Assist grip
- (4) Center visor

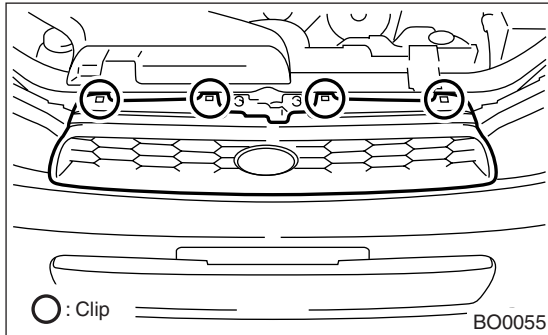
B: PREPARATION TOOL

TOOL NAME	REMARKS
Clip remover	Used for removal of trim.

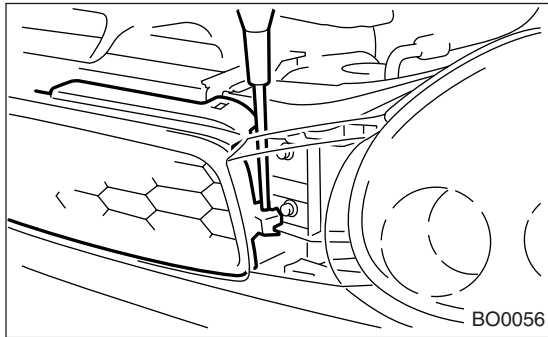
2. Front Grille

A: REMOVAL

- 1) Open the hood.
- 2) Remove the four clips.



- 3) Remove the two hooks.



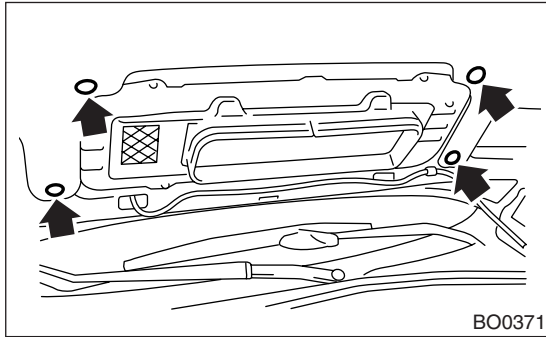
B: INSTALLATION

Install in the reverse order of removal.

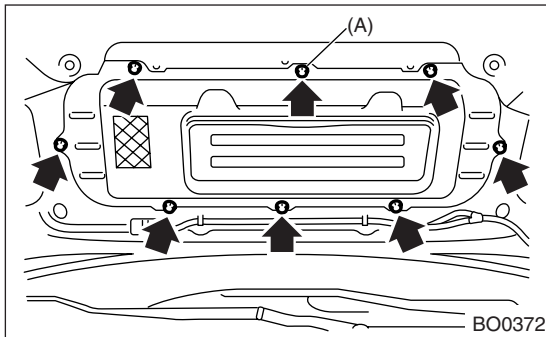
3. Hood Grille

A: REMOVAL

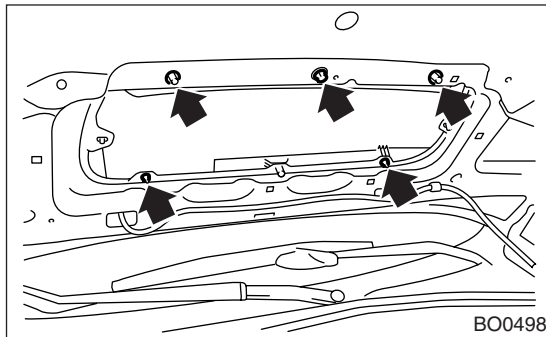
1) Remove the four clips of hood insulator.



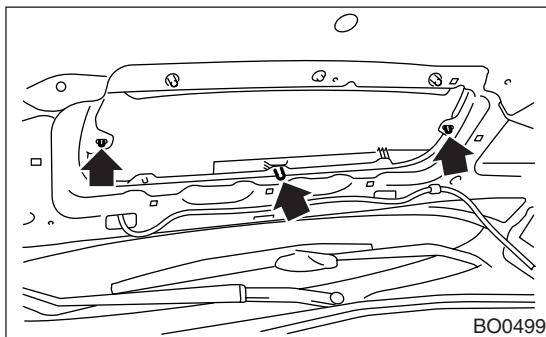
2) Remove the seven bolts and clip (A) to remove hood duct.



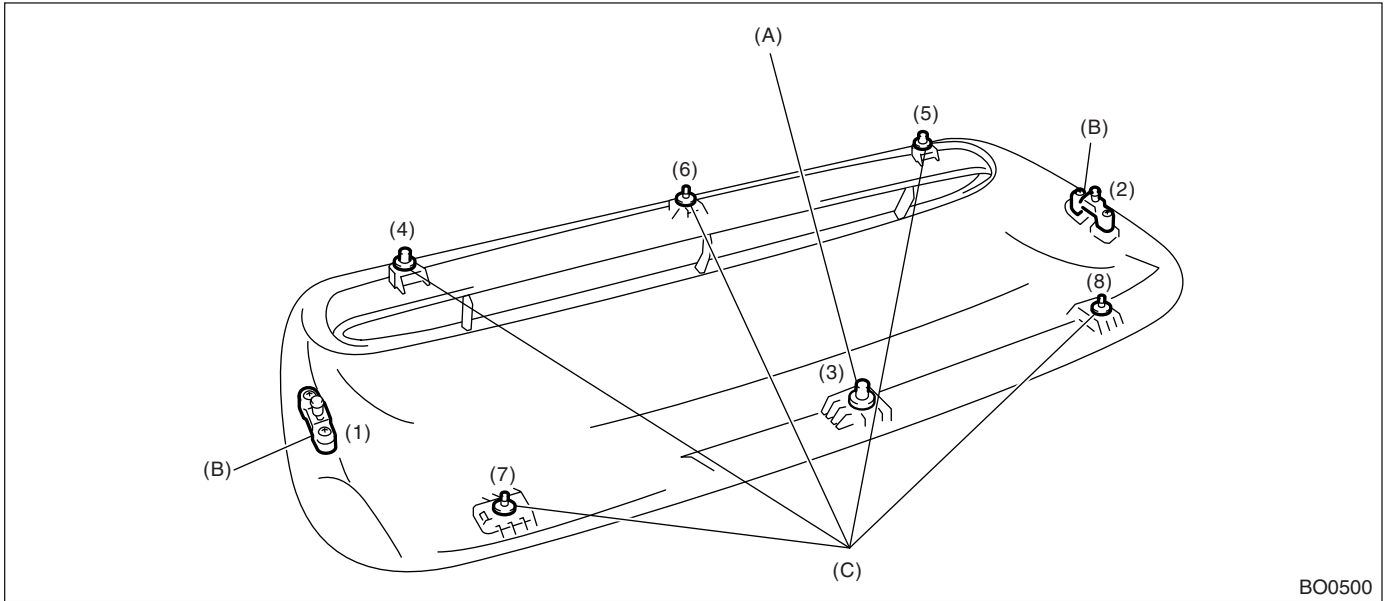
3) Remove the five nuts.



4) Remove the white clip and two black clips to remove hood grille.



B: INSTALLATION



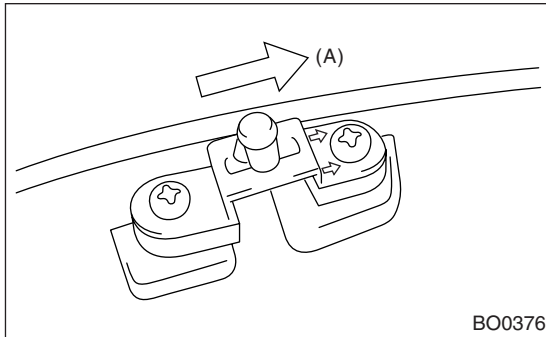
BO0500

(A) White clip

(B) Black clip

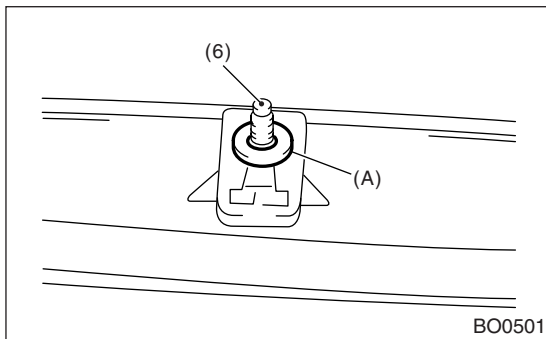
(C) Bolt

1) Replace the black clip (1), (2) with a new one. Install the clip with arrow mark facing the front side of grille (A).



BO0376

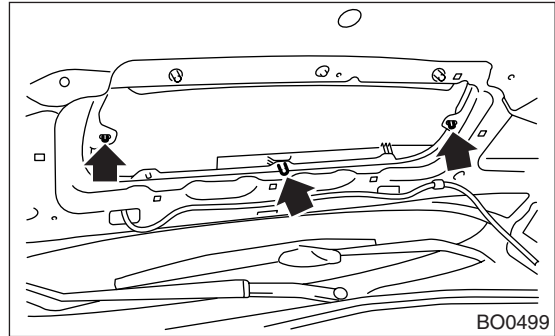
2) Replace the white clip (3) with a new one.
3) Attach the metal washer (A) only to bolt (4), (5), (6), (7), (8).



BO0501

4) Insert the hood grille clip and engage the three clips.

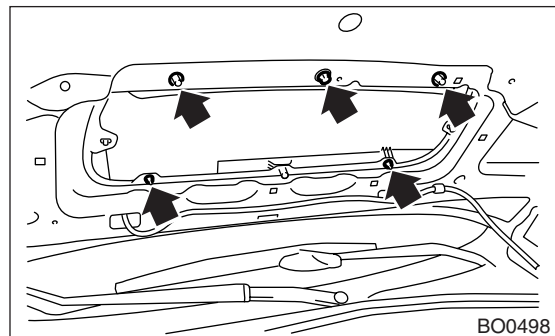
CAUTION:
Make sure that the anchor portion of each clip is firmly engaged.



BO0499

5) Install the five nuts.

Tightening torque:
4.4 N·m (0.45 kgf·m, 3.25 ft·lb)

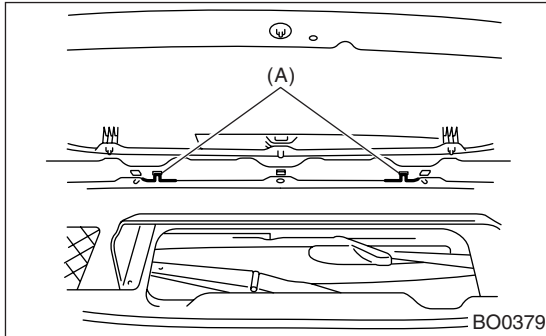


BO0498

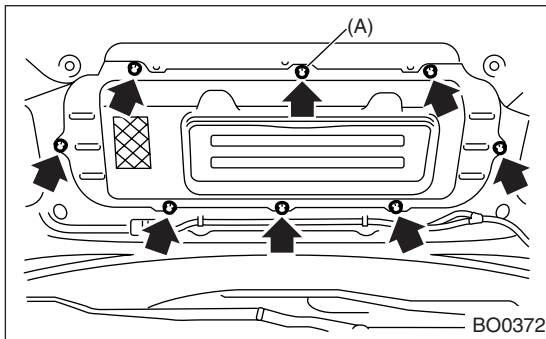
HOOD GRILLE

EXTERIOR/INTERIOR TRIM

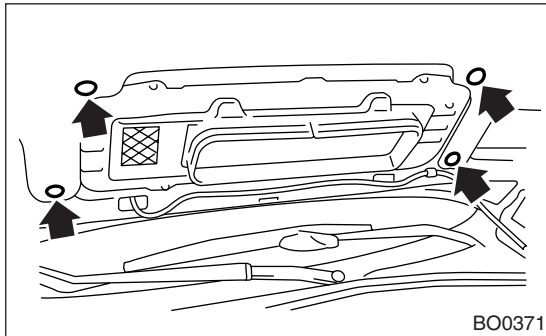
6) Catch the two hooks of hood duct to the hood holes.



7) Install the hood duct with clip (A) and seven bolts.



8) Install the hood insulator with four new clips.



C: INSPECTION

Make sure that the clip is firmly engaged.

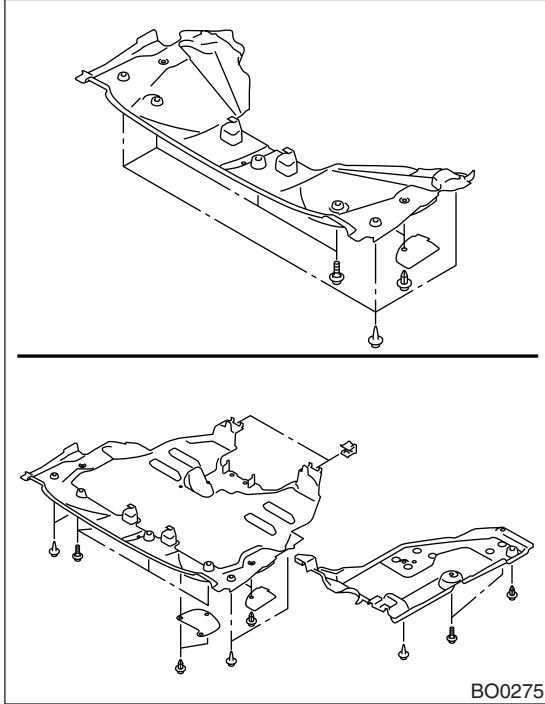
Make sure that there is no abnormal gap at whole periphery of hood grille.

Make sure that there is no damage on hood grille.

4. Front Under Cover

A: REMOVAL

- 1) Lift-up the vehicle.
- 2) Loosen the bolts and clips to remove under cover.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

14 N·m (1.42 kgf·m, 10.3 ft·lb)

FRONT BUMPER

EXTERIOR/INTERIOR TRIM

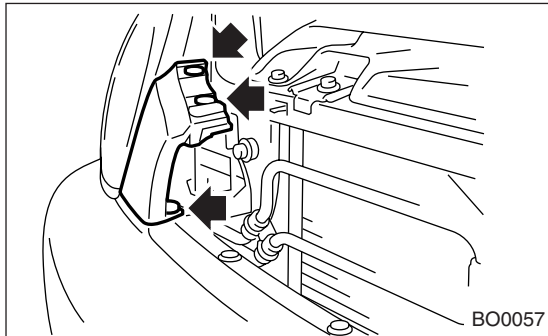
5. Front Bumper

A: REMOVAL

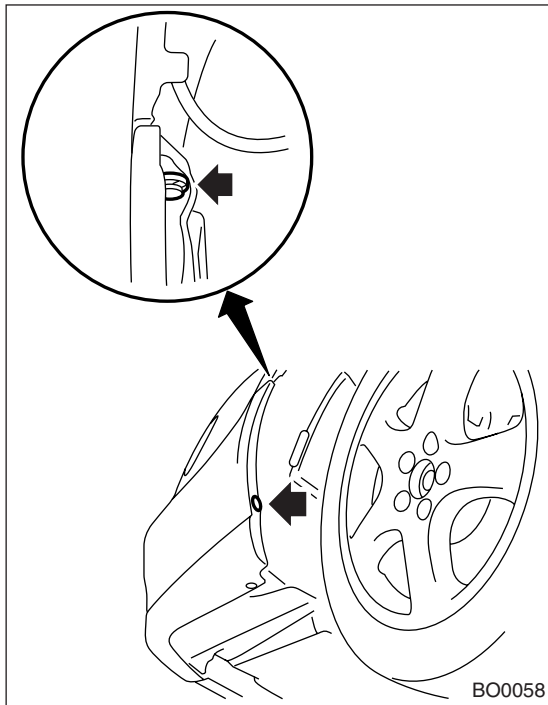
CAUTION:

- Handle the bumper carefully to avoid damage to bumper face.
- Do not damage the body during removal or installation of bumper.
- To avoid damage to bumper, lay the removed bumper on sheet spread on the floor. Do not lay it directly on the floor.

- 1) Disconnect the ground cable from battery.
- 2) Remove the front grille. <Ref. to EI-17, REMOVAL, Front Grille.>
- 3) Loosen the three clips to remove the front grille side.

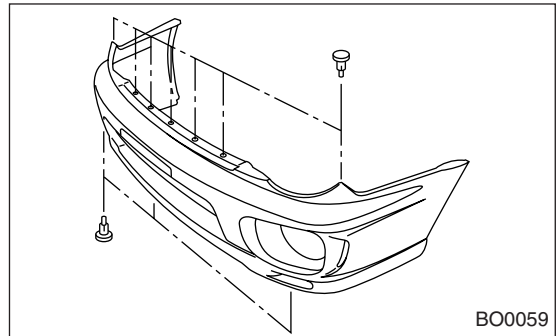


- 4) Pull off the front side of front mud guard to remove clip.



- 5) Remove the clips, and pull out the bumper slightly.

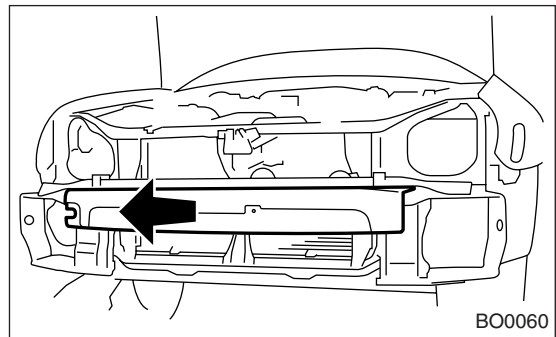
- 6) Disconnect the fog light connector to remove bumper.



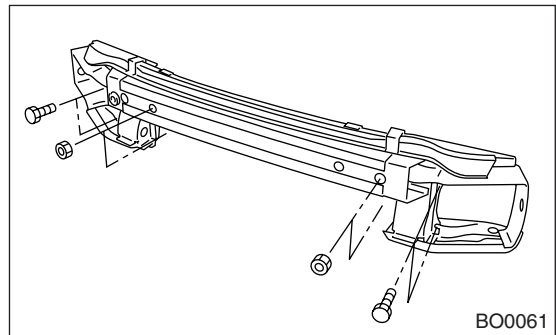
- 7) Remove the E/A FORM from bumper beam.

CAUTION:

- E/A FORM may easily break. Do not apply excessive force to it during removal.



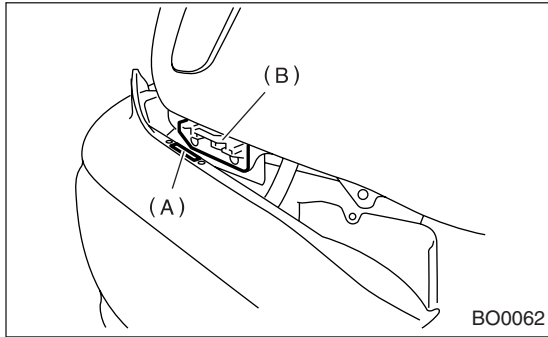
- 8) Remove the bumper beam.



B: INSTALLATION**CAUTION:**

- Handle the bumper carefully to avoid damage to bumper face.
- Do not damage the body during removal or installation of bumper.

- 1) Install in the reverse order of removal.
- 2) Fit the slider (A) to guide plate (B) securely.

**Tightening torque:**

Refer to COMPONENT in General Description.

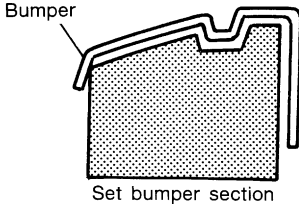
<Ref. to EI-3, HOOD GRILLE, COMPONENT, General Description.>14 N·m (1.42 kgf·m, 10.3 ft·lb)

FRONT BUMPER

EXTERIOR/INTERIOR TRIM

C: REPAIR

1. COATING METHOD FOR PP BUMPER

Process No.	Process name	Job contents	
1	Bumper mounting	Set the bumper on paint worktable if required. Use paint worktable conforming to inner shape of bumper when possible.	 <p style="text-align: center;">Bumper Set bumper section</p> <p style="text-align: right;">G5M0164</p>
2	Masking	Mask specified part (black base) with masking tape. Use masking tape for PP (example, Nichiban No. 533, etc.).	
3	Degreasing, cleaning	Clean all parts to be painted with white gasoline, normal alcohol, etc. to remove dirt, oil, fat, etc.	
4	Primer paint	Apply primer one to all parts to be painted, using air gun. Use primer (clear).	
5	Drying	Dry at normal temperature [10 to 15 min. at 20°C (68°F)]. In half-dried condition, PP primer paint is dissolved by solvent, e.g. thinner, etc. Therefore, if dust or dirt must be removed, use ordinary alcohol, etc.	
6	Top coat paint (I)	Solid color	Metallic color
		Use section (block) paint for top coat. <ul style="list-style-type: none"> • 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/cm², 36 — 50 psi) 	Use section (block) paint for top coat. <ul style="list-style-type: none"> • 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/cm², 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. <ul style="list-style-type: none"> • 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/cm², 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 the masking in process No. 2.	

FRONT BUMPER

EXTERIOR/INTERIOR TRIM

2. REPAIR INSTRUCTIONS FOR COLORED PP BUMPER

NOTE:

All PP bumpers are provided with a grained surface, and if the surface is damaged, it cannot normally be restored to its former condition. Damage limited to shallow scratches that cause only a change in the lustre of the base material or coating, can be almost fully restored. Before repairing a damaged area, explain this point to the customer and get an understanding about the matter. Repair methods are outlined below, based on a classification of the extent of damage.

• **Minor damage causing only a change in the lustre of the bumper due to a light touch**

Almost restorable.

Process No.	Process name	Job contents	
1	Cleaning	Clean the area to be repaired using water.	
2	Sanding	Grind the repairing area with #500 sand paper in a "feathering" motion.	
3	Finish	Resin section	Coated section
		Repeatedly apply wax to the affected area using a soft cloth (such as flannel). Recommended wax: NITTO KASEI Soft 99 TIRE WAX BLACK, or equivalent.	
		Polish the waxed area with a clean cloth after 5 to 10 minutes.	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.

• **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 the 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.

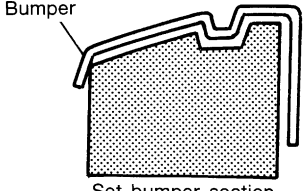
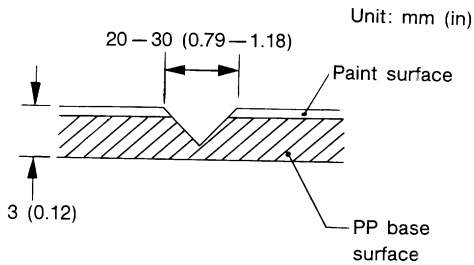
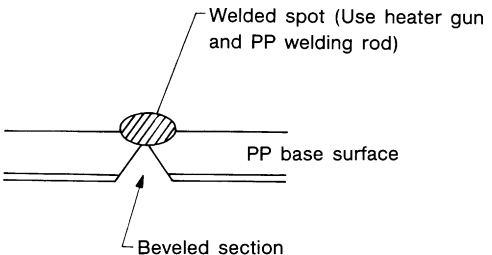
FRONT BUMPER

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 the bumper as required.	
2	Part removal	Remove the parts built into bumper as required.	
3	Bumper placement	Place the bumper on a paint worktable as required. It is recommended that contour of worktable accommodate internal shape of bumper.	 <p style="text-align: right;">G5M0164</p>
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.	 <p style="text-align: right;">G5M0165</p>
6	Sanding (I)	Grind beveled surface with sand paper (#40 to #60) to smooth finish.	
7	Cleaning	Clean the sanded surface with the same solvent as used in Process No. 4.	
8	Temporary welding	Grind the side just opposite the beveled area with sand paper (#40 to #60) and clean using a solvent. Temporarily spot-weld the side, using a PP welding rod and heater gun.	 <p style="text-align: right;">G5M0166</p>
		<p>NOTE:</p> <ul style="list-style-type: none"> • Do not melt the 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	<p>Using a heater gun and PP welding rod, weld the beveled spot while melting the rod and damaged area.</p> <div style="text-align: center;"> </div> <p style="text-align: right;">G5M0167</p> <p>NOTE:</p> <ul style="list-style-type: none"> • Melt the sections indicated by hatched area. • Do not melt the 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)	<p>Remove excess part of weld with a putty knife. If a drill or disc wheel is used instead of the knife, operate it at a rate lower than 1,500 rpm and grind the excess part little by little. A higher rpm will cause the PP substrate to melt from the heat.</p> <div style="text-align: center;"> </div> <p style="text-align: right;">G5M0168</p> <p>Sand the welded spot smooth with #240 sand paper.</p>
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	<p>Apply a coat of primer to the repaired surface and its surrounding areas. Mask these areas, if necessary.</p> <p>Recommended primer: Mp/ 364 PP Primer</p> <p>NOTE: Be sure to apply one coat of primer at a spraying pressure of 245 to 343 kPa (2.5 to 3.5 kg/cm², 36 to 50 psi) with a spray gun.</p>
14	Leave unattended.	<p>Leave the repaired area unattended at 20°C (68°F) for 10 to 15 minutes until primer is half-dry.</p> <p>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.)</p>
15	Primer surfacer coating	<p>Apply a coat of primer surfacer to the repaired area two or three times at an interval of 3 to 5 minutes.</p> <p>Recommended surfacer:</p> <ul style="list-style-type: none"> • UPS 300 Flex Primer • No. 303 UPS 300 Exclusive hardener • NPS 725 Exclusive Reducer (thinner) • Mixing ratio: 2 : 1 (UPS 300: No. 303) • Viscosity: 12 — 14 sec/20°C (68°F) • Coated film thickness: 40 — 50μ
16	Drying	Allow the coated surface to dry for 60 minutes at 20°C (68°F) [or 30 minutes at 60°C (140°F)].
17	Sanding (III)	Sand the coated surface and its surrounding areas using #400 sand paper and water.
18	Cleaning/ degreasing	Same as Process No. 12.

FRONT BUMPER

EXTERIOR/INTERIOR TRIM

Process No.	Process name	Job contents	
		Solid color	Metallic color
19	Top coat (I)	Use a "block" coating method. <ul style="list-style-type: none"> • Recommended paint: Suncryl (SC) No. 307 Flex Hardener SC Reducer (thinner) • Mixing ratio: 3 : 1 Suncryl (SC) vs. No. 307 Flex Hardener • Viscosity: 11 — 13 sec/20°C (68°F) • Coated film thickness: 40 — 50μ • Spraying thickness: 245 — 343 kPa (2.5 — 3.5 kg/cm², 36 — 50 psi) 	Use a "block" coating method. <ul style="list-style-type: none"> • Recommended paint: Suncryl (SC) No. 307 Flex Hardener SC Reducer (thinner) • Mixing ratio: 3 : 1 Suncryl (SC) vs. No. 307 Flex Hardener • Viscosity: 11 — 13 sec/20°C (68°F) • Coated film thickness: 20 — 30μ • Spraying thickness: 245 — 343 kPa (2.5 — 3.5 kg/cm², 36 — 50 psi)
20	Leave unattended.	Not required.	Leave unattended at 20°C (68°F) for at least 10 minutes until the topcoated area is half-dry. NOTE: Be careful to keep dust or dirt from coming in contact with the affected area.
21	Top coat (II)	Not required.	Apply a clear coat three times at an interval of 3 to 5 minutes. <ul style="list-style-type: none"> • Recommended paint: SC710 Overlay Clear No. 307 Flex Hardener SC Reducer (thinner) • Mixing ratio: 3 : 1 Suncryl (SC) vs. No. 307 Flex Hardener • Viscosity: 10 — 13 sec/20°C (68°F) • Coated film thickness: 20 — 30μ • Spraying pressure: 245 — 343 kPa (2.5 — 3.5 kg/cm², 36 — 50 psi)
22	Drying	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 the masking tape applied in Process No. 11 and 13.	
25	Parts installation	Install the parts on bumper in reverse order of removal.	
26	Bumper installation	Install the bumper.	

6. Rear Bumper

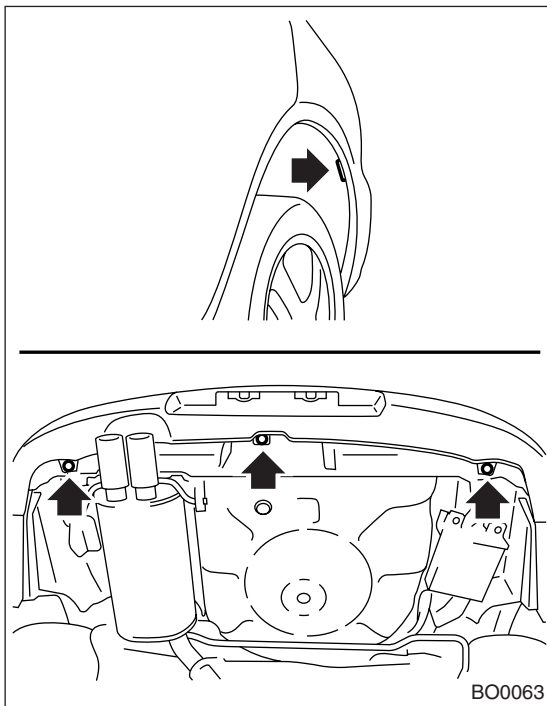
A: REMOVAL

1. WAGON

CAUTION:

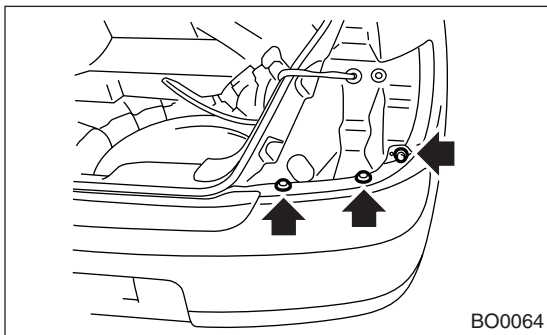
- Handle the bumper carefully to avoid damage to bumper face.
- Do not damage the body during removal or installation of bumper.
- To avoid damage to bumper, lay the removed bumper on sheet spread on the floor. Do not lay it directly on the floor.

- 1) Disconnect the ground cable from battery.
- 2) Remove the bolts and clips.



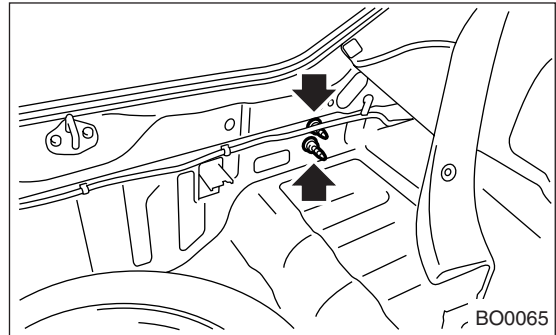
- 3) Remove the rear combination light assembly. <Ref. to LI-20, REMOVAL, Rear Combination Light Assembly.>

- 4) Remove the screw and two clips from each side.

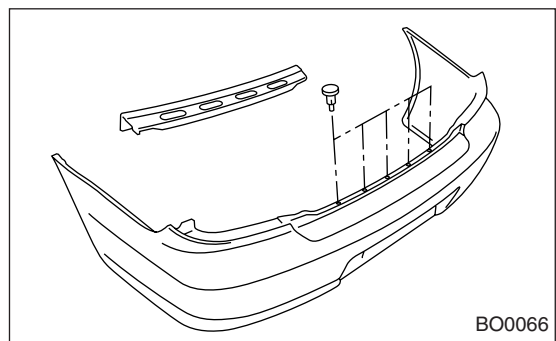


- 5) Remove the floor box.
- 6) Remove the rear skirt trim.

- 7) Pull off the rear end of rear quarter lower trim, and then loosen the two nuts from each side to remove rear bumper.



- 8) Loosen the clips to remove bumper beam.



2. SEDAN

Refer to rear bumper removal WAGON. <Ref. to EI-29, WAGON, REMOVAL, Rear Bumper.>

B: INSTALLATION

1. WAGON

CAUTION:

- Handle the bumper carefully to avoid damage to bumper face.
- Do not damage the body during removal or installation of bumper.

- 1) Install in the reverse order of removal.

Tightening torque:

Refer to COMPONENT in General Description.

<Ref. to EI-5, Rear Bumper.>

REAR BUMPER

EXTERIOR/INTERIOR TRIM

2. SEDAN

CAUTION:

- Handle the bumper carefully to avoid damage to bumper face.
- Do not damage the body during removal or installation of bumper.

1) Install in the reverse order of removal.

Tightening torque:

Refer to COMPONENT in General Description.

<Ref. to EI-5, Rear Bumper.>

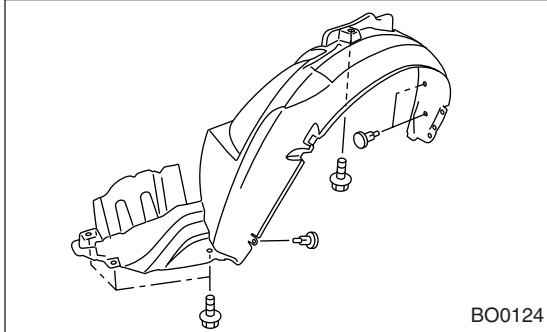
C: REPAIR

Refer to front bumper repair. <Ref. to EI-22, REMOVAL, Front Bumper.>

7. Mud Guard

A: REMOVAL

- 1) Jack-up the vehicle.
- 2) Remove the screws and clips to remove mud guard.



B: INSTALLATION

Insert the hook into body, and tighten it with screw and clip.

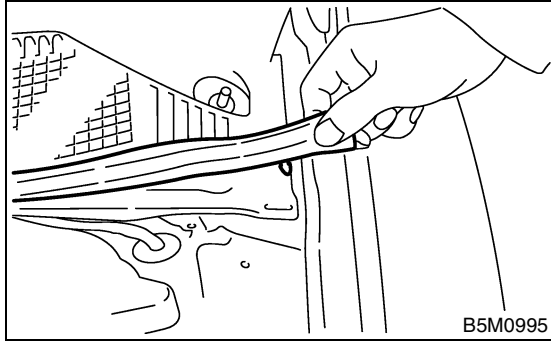
Tightening torque:

14 N·m (1.42 kgf-m, 10.3 ft-lb)

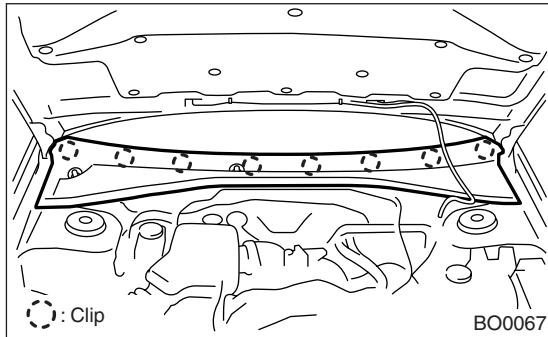
8. Cowl Panel

A: REMOVAL

- 1) Open the hood.
- 2) Remove the wiper arm. <Ref. to WW-13, REMOVAL, Front Wiper Arm.>
- 3) Remove the front panel seal.



- 4) Loosen the clips to remove cowl panel.



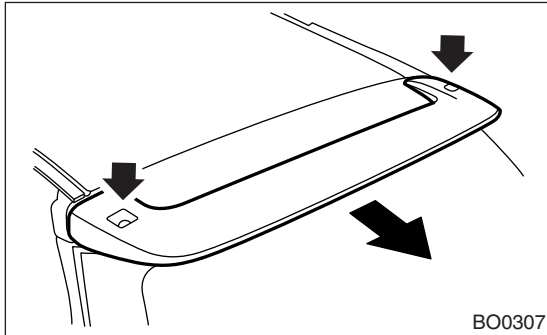
B: INSTALLATION

Install in the reverse order of removal.

9. Roof Spoiler

A: REMOVAL

- 1) Remove the bolt cap, then remove the two bolts.
- 2) Detach the roof spoiler.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

7.35 N·m (0.749 kgf-m, 5.42 ft-lb)

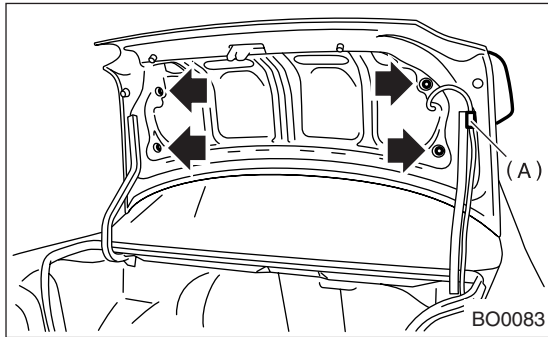
10.Rear Spoiler

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Open the trunk lid.
- 3) Remove the electrical connector (A) of high-mounted stop light.
- 4) Loosen the mounting nut of rear spoiler to remove rear spoiler.

CAUTION:

- When removing the 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 the mounting surfaces of trunk lid and spoiler before installation.

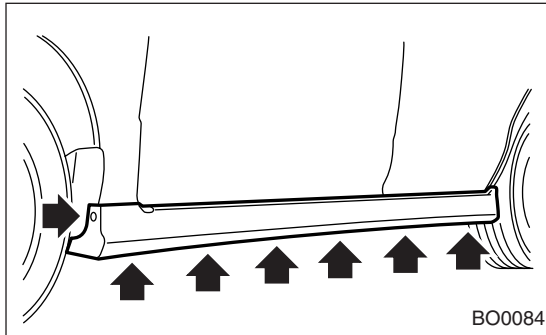
Tightening torque:

7.4 N·m (0.75 kgf-m, 5.46 ft-lb)

11.Side Sill Spoiler

A: REMOVAL

Remove the clips (1 on front, 6 on lower), then remove the side spoiler.



B: INSTALLATION

Install in the reverse order of removal.

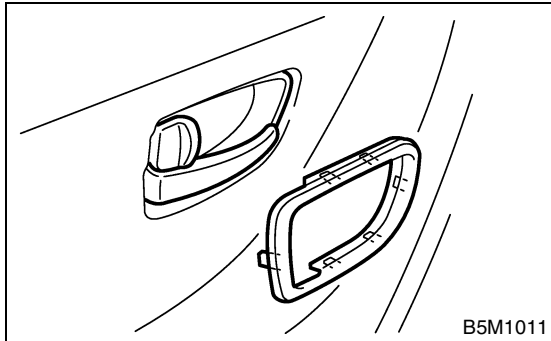
12. Front Door Trim

A: REMOVAL

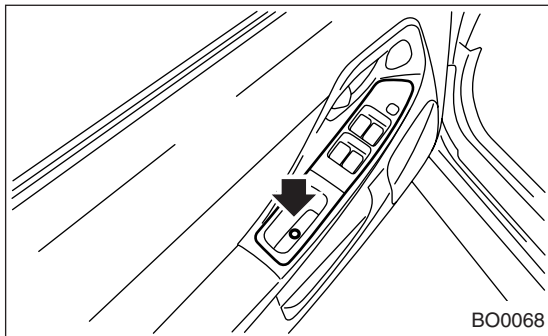
CAUTION:

Do not apply excessive force to the clip. Otherwise the clip may be broken.

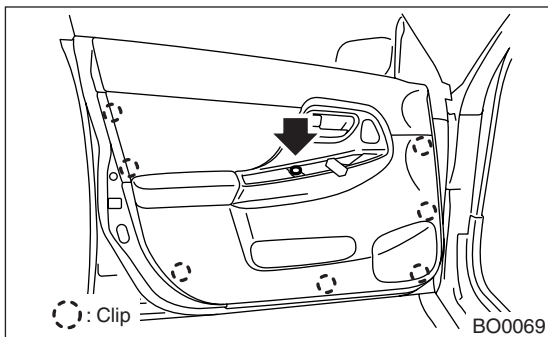
- 1) Disconnect the ground cable from battery.
- 2) Pull up the inner remote cover toward you to remove upper hook. Pull down it to remove the lower hook. Remove the inner remote cover.



- 3) Remove the screw.
 - 4) Remove the power window switch assembly and disconnect the harness connector. (for models with power window)
- Remove the pull handle and panel. (for models without power window)



- 5) Remove the screw.
- 6) Remove the clips of trim panel using clip remover to remove trim panel.



B: INSTALLATION

Install in the reverse order of removal.

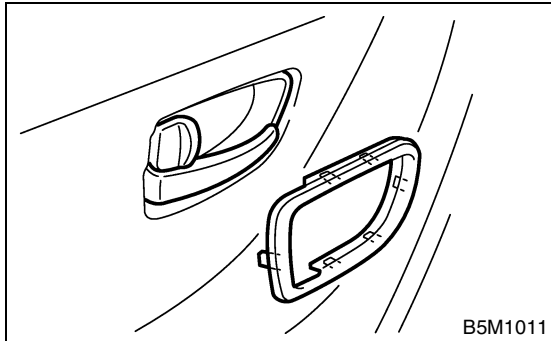
13. Rear Door Trim

A: REMOVAL

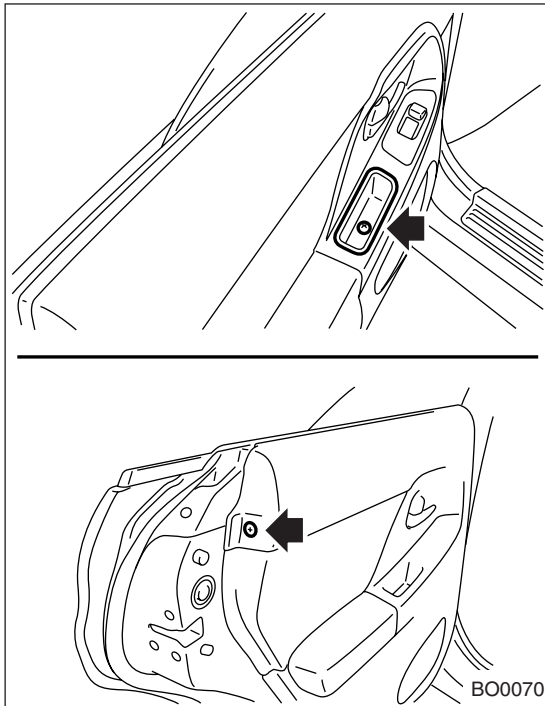
CAUTION:

Do not apply excessive force to the clip. Otherwise the clip may be broken.

- 1) Disconnect the ground cable from battery.
- 2) Pull up the inner remote cover toward you to remove upper hook. Pull down it to remove the lower hook. Remove the inner remote cover.

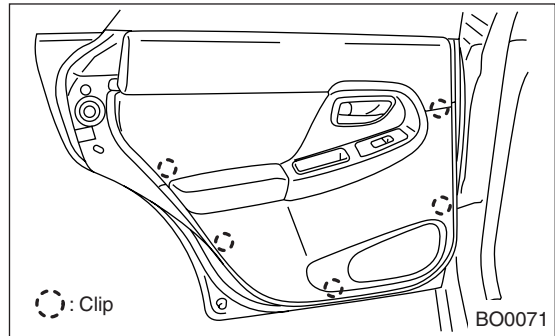


- 3) Remove the screw and clip.



- 4) Remove the clips of trim panel using clip remover to remove trim panel.

- 5) Disconnect the power window harness connector. (for models with power window)



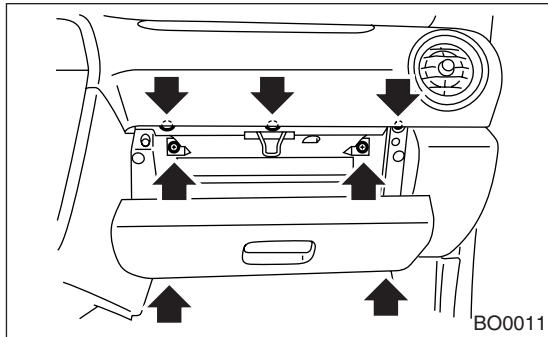
B: INSTALLATION

Install in the reverse order of removal.

14. Glove Box

A: REMOVAL

- 1) Open the glove box.
- 2) Loosen the screws to remove glove box.



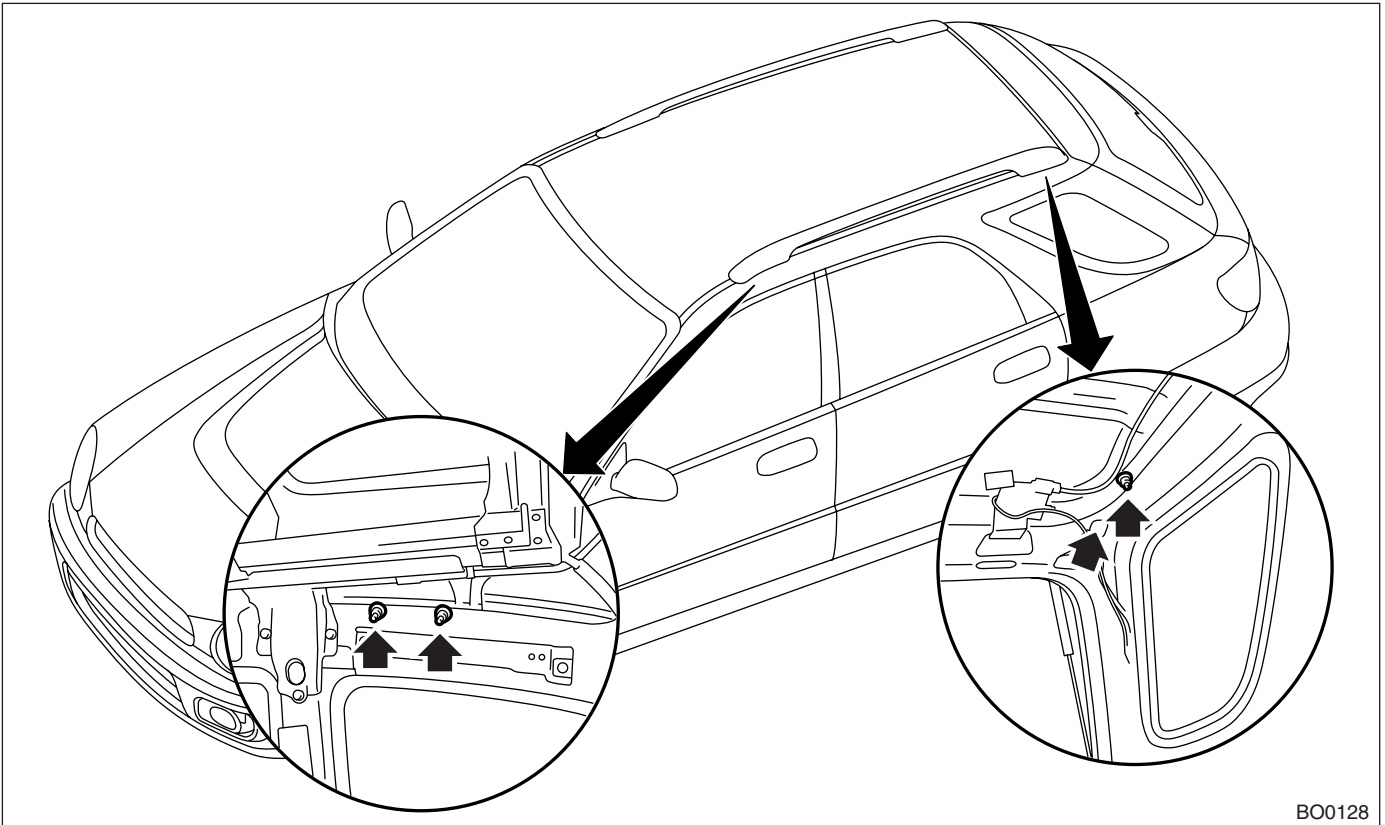
B: INSTALLATION

Install in the reverse order of removal.

15. Roof Rail

A: REMOVAL

- 1) Remove the roof trim. <Ref. to EI-48, REMOVAL, Roof Trim.>
- 2) Remove the four mounting nuts and then detach the roof rail carefully.



BO0128

B: INSTALLATION

Install in the reverse order of removal.

CAUTION:

Be careful not to scratch the body panels with roof rail stud bolts when removing and installing them.

Tightening torque:

7.4 N·m (0.75 kgf-m, 5.46 ft-lb)

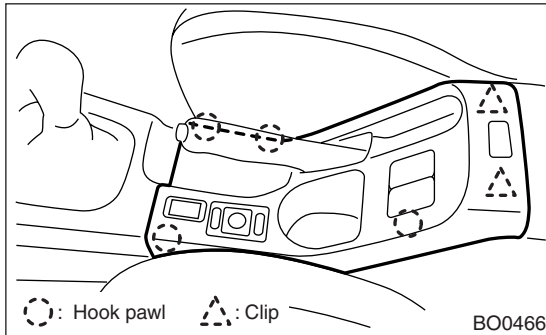
CONSOLE BOX

EXTERIOR/INTERIOR TRIM

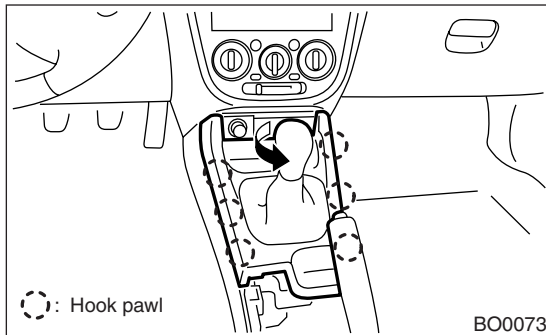
16. Console Box

A: REMOVAL

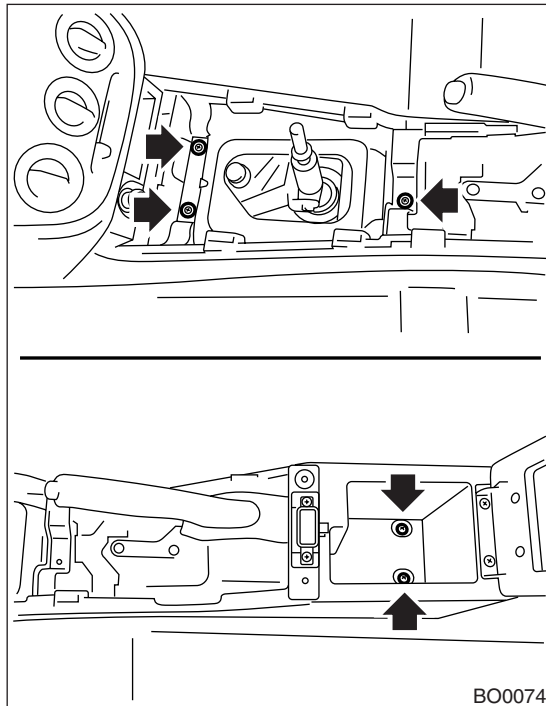
- 1) Disconnect the ground cable from battery.
- 2) Remove the console cover.



- 3) Remove the shift knob (MT model) and front cover.



- 4) Loosen the screws to remove console box.



B: INSTALLATION

Install in the reverse order of removal.

17. Instrument Panel Assembly

A: REMOVAL

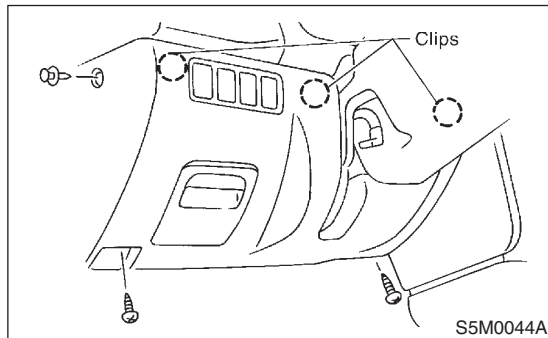
WARNING:

- All airbag system wiring harness and connectors are colored yellow. Do not use electrical test equipment on these circuits.
- Be careful not to damage the airbag system harness when servicing the instrument panel.

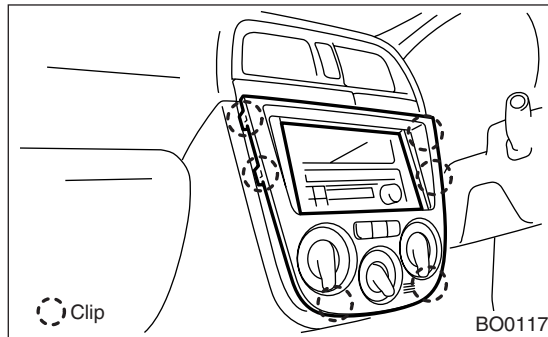
NOTE:

The following location are for LHD model.
The locations for RHD model are symmetrically opposite.

- 1) Disconnect the ground cable from battery.
- 2) Loosen the screws and clips to remove lower cover.

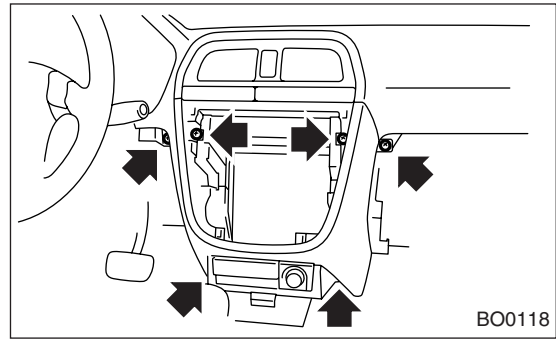


- 3) Loosen the clips to remove center console panel.

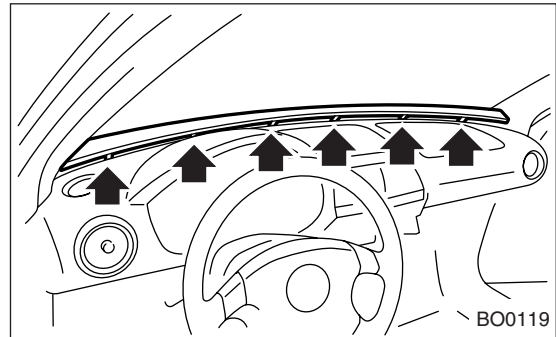


- 4) Remove the glove box. <Ref. to EI-38, REMOVAL, Glove Box.>
- 5) Remove the passenger airbag module. <Ref. to AB-13, Passenger's Airbag Module.>

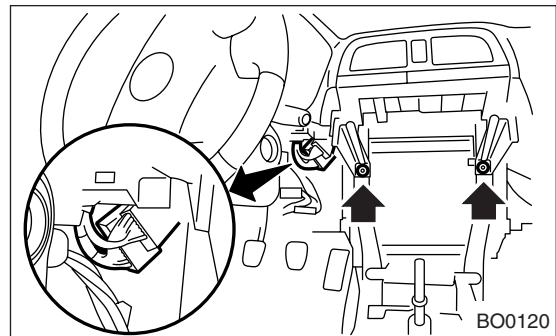
- 6) Loosen the four screws and two nuts to remove lower console panel.



- 7) Loosen the hooks to remove defroster panel.



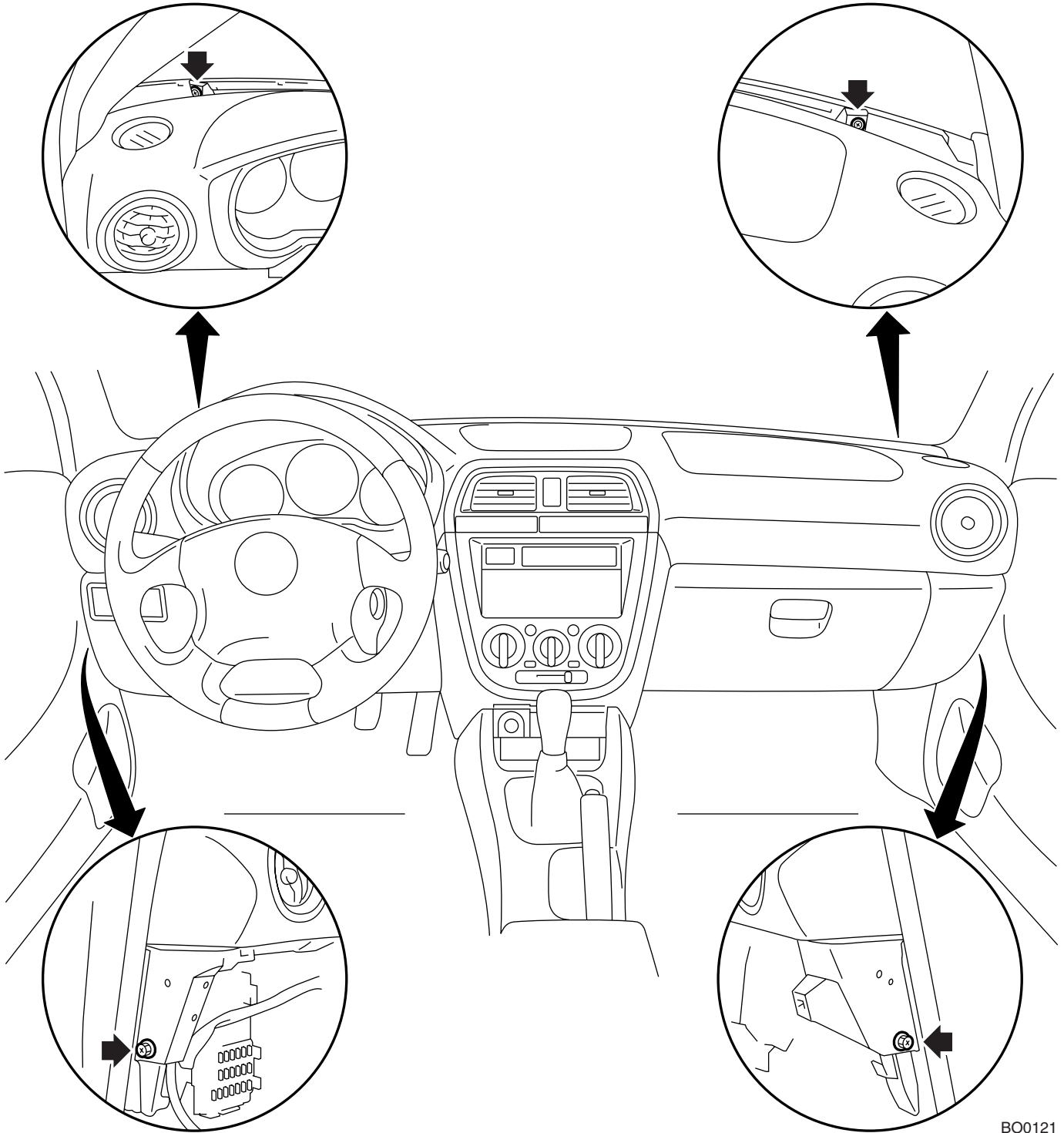
- 8) Remove the two nuts and disconnect the two connectors.



INSTRUMENT PANEL ASSEMBLY

EXTERIOR/INTERIOR TRIM

9) Remove the instrument panel mounting bolts.



BO0121

10) Remove the instrument panel.

CAUTION:

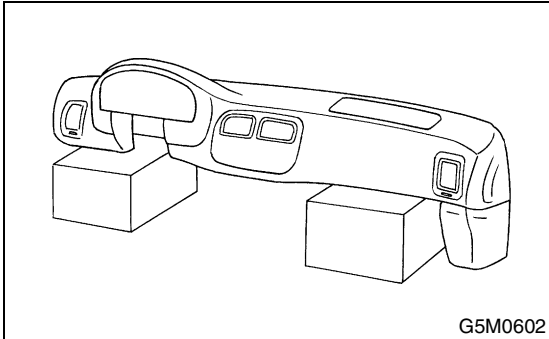
Do not pull the harness when disconnecting the connector.

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

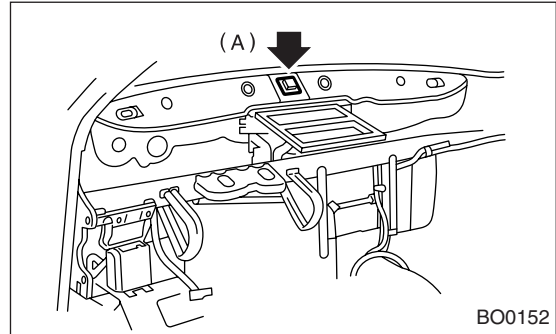
Install in the reverse order of removal.

CAUTION:

- **Be careful not to snag the harness.**
- **Make sure to connect the harness connector.**
- **Take care not to scratch the instrument panel and related parts.**

NOTE:

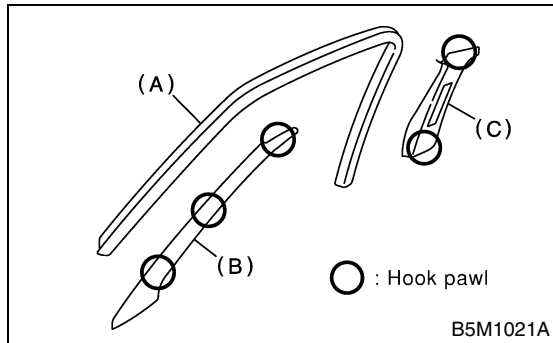
When setting the instrument panel into position, push the hook into grommet (A) on the body panel.



18.Upper Inner Trim

A: REMOVAL

- 1) Remove the lower inner trim. <Ref. to EI-45, REMOVAL, Lower Inner Trim.>
- 2) Remove the front mole (A).
- 3) Remove the front pillar upper trim (B).
- 4) Detach the front seat belt shoulder anchor, then remove the center pillar upper trim (C).



B: INSTALLATION

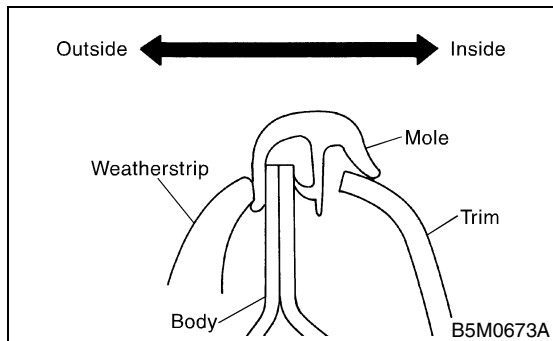
Install in the reverse order of removal.

CAUTION:

Be sure to securely hook pawls of inner trim panel to body flange.

NOTE:

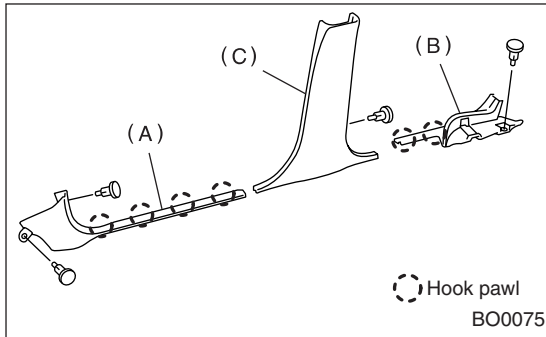
When installing the center pillar upper trim and front pillar upper trim, be sure to set the front mole as shown in the figure.



19.Lower Inner Trim

A: REMOVAL

- 1) Remove the side sill front cover (A).
- 2) Remove the rear seat cushion <Ref. to SE-11, REMOVAL, Rear Seat.>, then remove side sill rear cover (B).
- 3) Remove the 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.

REAR QUARTER TRIM

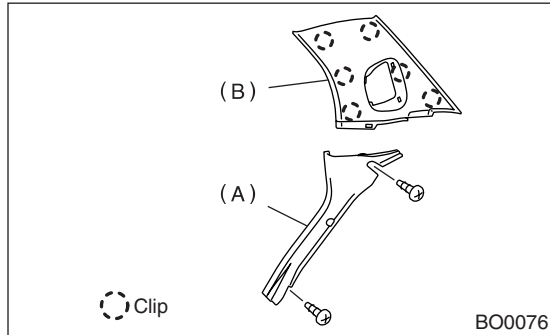
EXTERIOR/INTERIOR TRIM

20. Rear Quarter Trim

A: REMOVAL

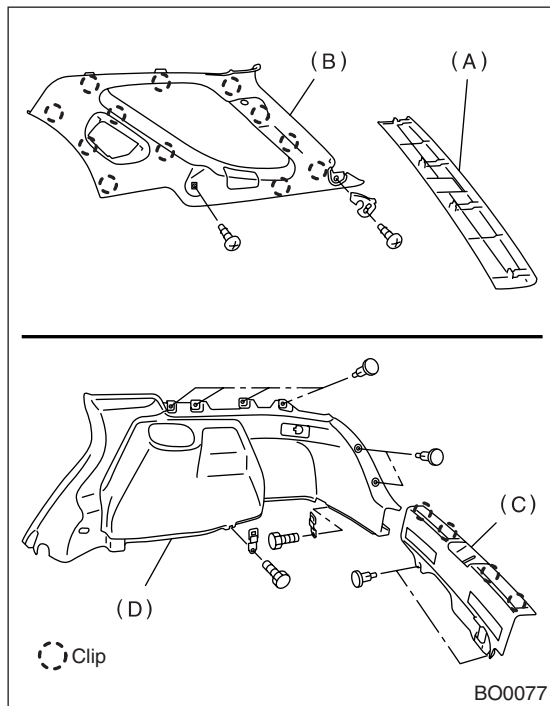
1. SEDAN

- 1) Remove the rear seat. <Ref. to SE-11, REMOVAL, Rear Seat.>
- 2) Remove the side sill rear cover. <Ref. to EI-45, REMOVAL, Lower Inner Trim.>
- 3) Remove the rear pillar lower cover (A).
- 4) Remove the seatbelt lower anchor bolt, and then remove the rear pillar upper trim (B).



2. WAGON

- 1) Remove the rear seat. <Ref. to SE-11, REMOVAL, Rear Seat.>
- 2) Remove the side sill rear cover.
- 3) Remove the rear rail trim (A).
- 4) Loosen the screws and clips to remove rear quarter upper trim (B).
- 5) Remove the rear skirt trim (C).
- 6) Loosen the bolts and clips to remove rear quarter lower trim (D).



B: INSTALLATION

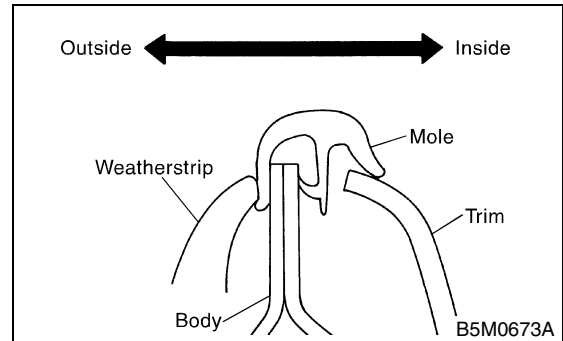
Install in the reverse order of removal.

CAUTION:

Be sure to securely hook pawls of inner trim panel to body flange.

NOTE:

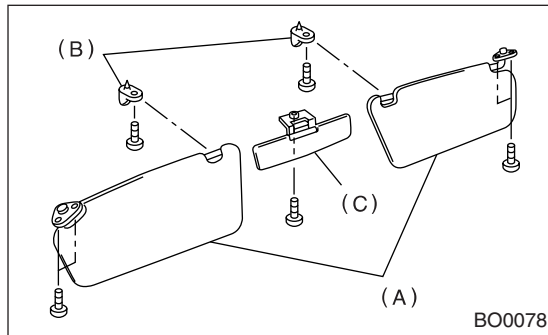
When installing the rear quarter upper trim, be sure to set the rear mole as shown in the figure.



21.Sun Visor

A: REMOVAL

Remove the mounting screws then detach the sun visor (A), hook (B) and center visor (C).



B: INSTALLATION

Install in the reverse order of removal.

ROOF TRIM

EXTERIOR/INTERIOR TRIM

22. Roof Trim

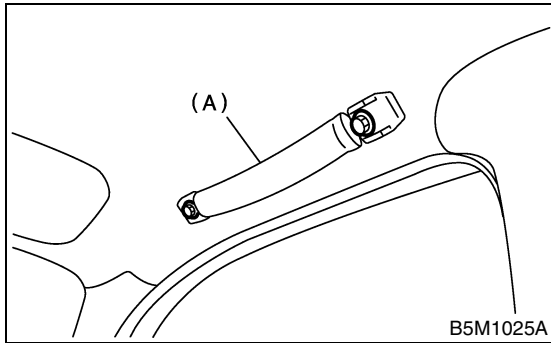
A: REMOVAL

CAUTION:

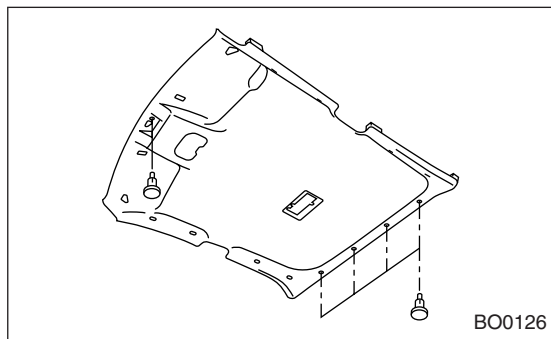
When removing the clip, use great care not to damage the roof trim.

1. SEDAN

- 1) Disconnect the ground cable from battery.
- 2) Remove the sunroof switch. (Sunroof equipped model) <Ref. to SR-9, REMOVAL, Sunroof Switch.>
- 3) Remove the spot light. <Ref. to LI-28, REMOVAL, Spot Light.>
- 4) Remove the room light. <Ref. to LI-29, REMOVAL, Room Light.>
- 5) Remove the sun visor and hook or both sides. <Ref. to EI-47, REMOVAL, Sun Visor.>
- 6) Remove the assist-grips (A).

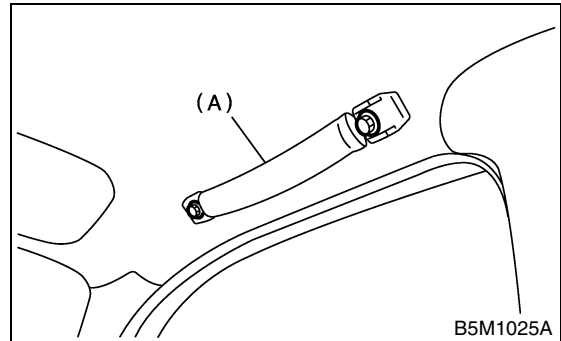


- 7) Remove the upper inner trim. <Ref. to EI-44, REMOVAL, Upper Inner Trim.>
- 8) Remove the quarter upper trim. <Ref. to EI-46, SEDAN, REMOVAL, Rear Quarter Trim.>
- 9) Remove the clips, and then remove the roof trim.

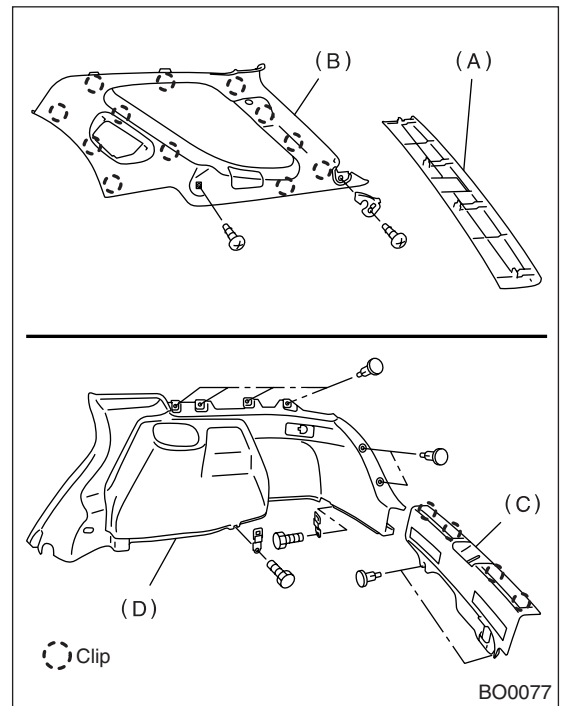


2. WAGON

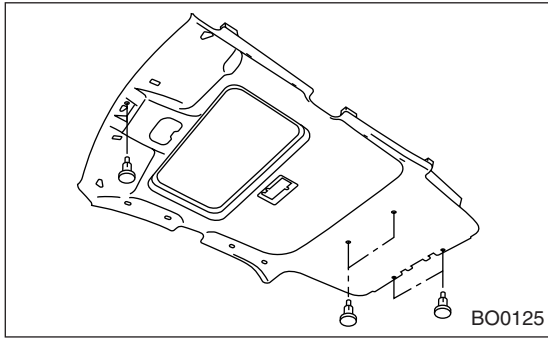
- 1) Disconnect the ground cable from battery.
- 2) Remove the sunroof switch. (Sunroof equipped model) <Ref. to SR-9, REMOVAL, Sunroof Switch.>
- 3) Remove the room light. <Ref. to LI-29, REMOVAL, Room Light.>
- 4) Remove the sun visor and hook or both sides. <Ref. to EI-47, REMOVAL, Sun Visor.>
- 5) Remove the assist-grips (A).



- 6) Remove the upper inner trim. <Ref. to EI-44, REMOVAL, Upper Inner Trim.>
- 7) Remove the rear quarter upper trim shown in the figure.
- 8) Remove the rear rail trim (A).
- 9) Remove the rear quarter upper trim (B) of both sides.



10) Remove the clips, and then remove the roof trim.



B: INSTALLATION

Install in the reverse order of removal.

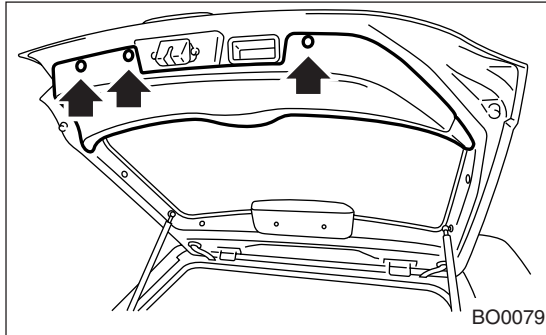
23.Rear Gate Trim

A: REMOVAL

CAUTION:

Be careful not to damage the clips or their holes.

- 1) Remove the clips and detach the rear gate trim.



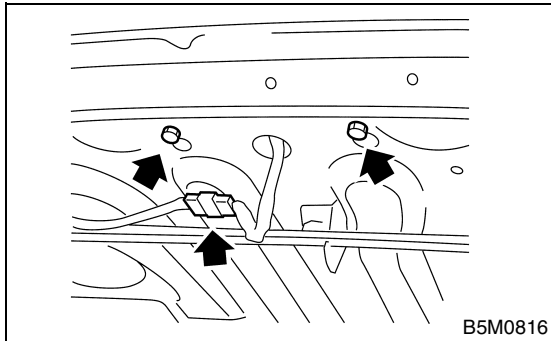
B: INSTALLATION

Install in the reverse order of removal.

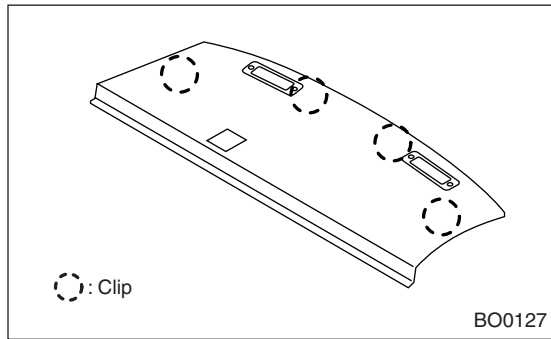
24.Rear Shelf Trim

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the high-mounted stop light.



- 3) Remove the rear quarter upper trim. <Ref. to EI-46, REMOVAL, Rear Quarter Trim.>
- 4) Remove the seat belt center lower anchor bolt.
- 5) Remove the rear shelf trim.



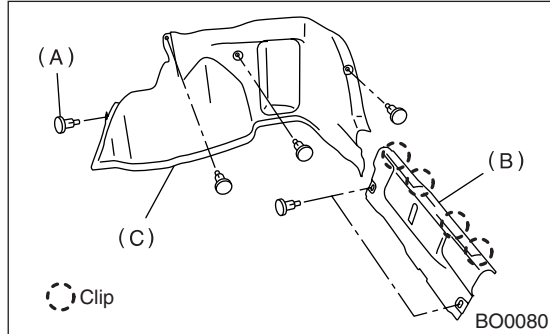
B: INSTALLATION

Install in the reverse order of removal.

25. Trunk Trim

A: REMOVAL

- 1) Remove the rear seat backrest. <Ref. to SE-11, SEDAN, REMOVAL, Rear Seat.>
- 2) Remove the clip (A).
- 3) Loosen the clips, and then detach the trunk rear trim (B).
- 4) Loosen the clips to remove trunk side trim (C).



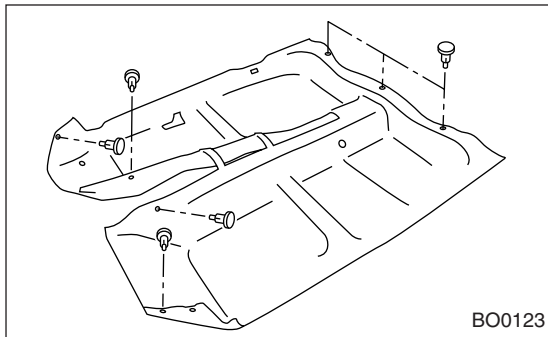
B: INSTALLATION

Install in the reverse order of removal.

26.Floor Mat

A: REMOVAL

- 1) Remove the front seats. <Ref. to SE-6, REMOVAL, Front Seat.>
- 2) Remove the rear seat cushion. <Ref. to SE-11, REMOVAL, Rear Seat.>
- 3) Remove the console box. <Ref. to EI-40, Console Box.>
- 4) Remove the side sill front cover, side sill rear cover and center pillar lower trim. <Ref. to EI-45, REMOVAL, Lower Inner Trim.>
- 5) Remove the clips from floor mat.
- 6) Remove the mat hook.
- 7) Remove the mat from toe board area.
- 8) Remove the mat from rear heater duct.
- 9) Roll the mat, and then take it out of opened rear door.



B: INSTALLATION

Install in the reverse order of removal.

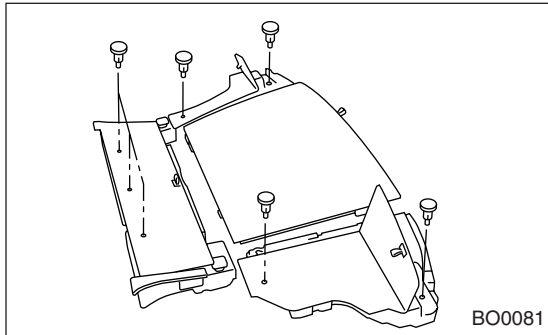
NOTE:

- Secure the mat firmly with hook and Velcro tape.
- Insert the mat edge firmly into the groove of side sill cover.

27.Luggage Floor Mat

A: REMOVAL

Remove the clips, then detach the rear floor mats and boxes.



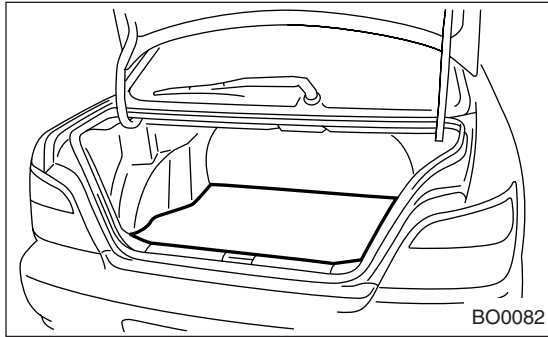
B: INSTALLATION

Install in the reverse order of removal.

28.Trunk Room Mat

A: REMOVAL

Draw out the trunk room mat.



BO0082

B: INSTALLATION

Install in the reverse order of removal.

TRUNK ROOM MAT

EXTERIOR/INTERIOR TRIM

EXTERIOR BODY PANELS



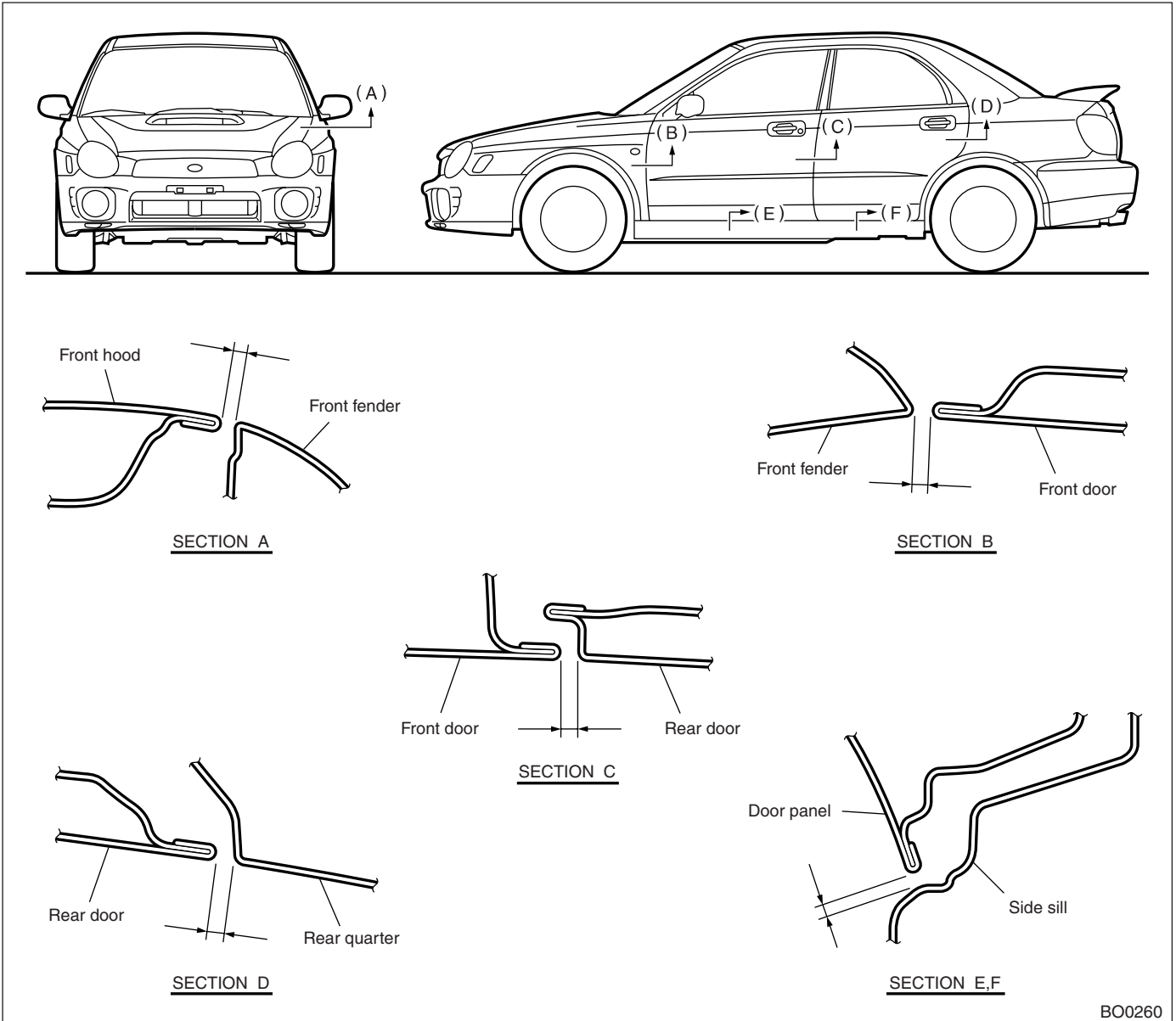
	Page
1. General Description	2
2. Front Hood	10
3. Fender Panel.....	11
4. Front Door Panel.....	12
5. Front Sealing Cover	14
6. Rear Door Panel	15
7. Rear Sealing Cover.....	17
8. Trunk Lid Panel	18
9. Rear Gate Panel	19

GENERAL DESCRIPTION

EXTERIOR BODY PANELS

1. General Description

A: SPECIFICATIONS

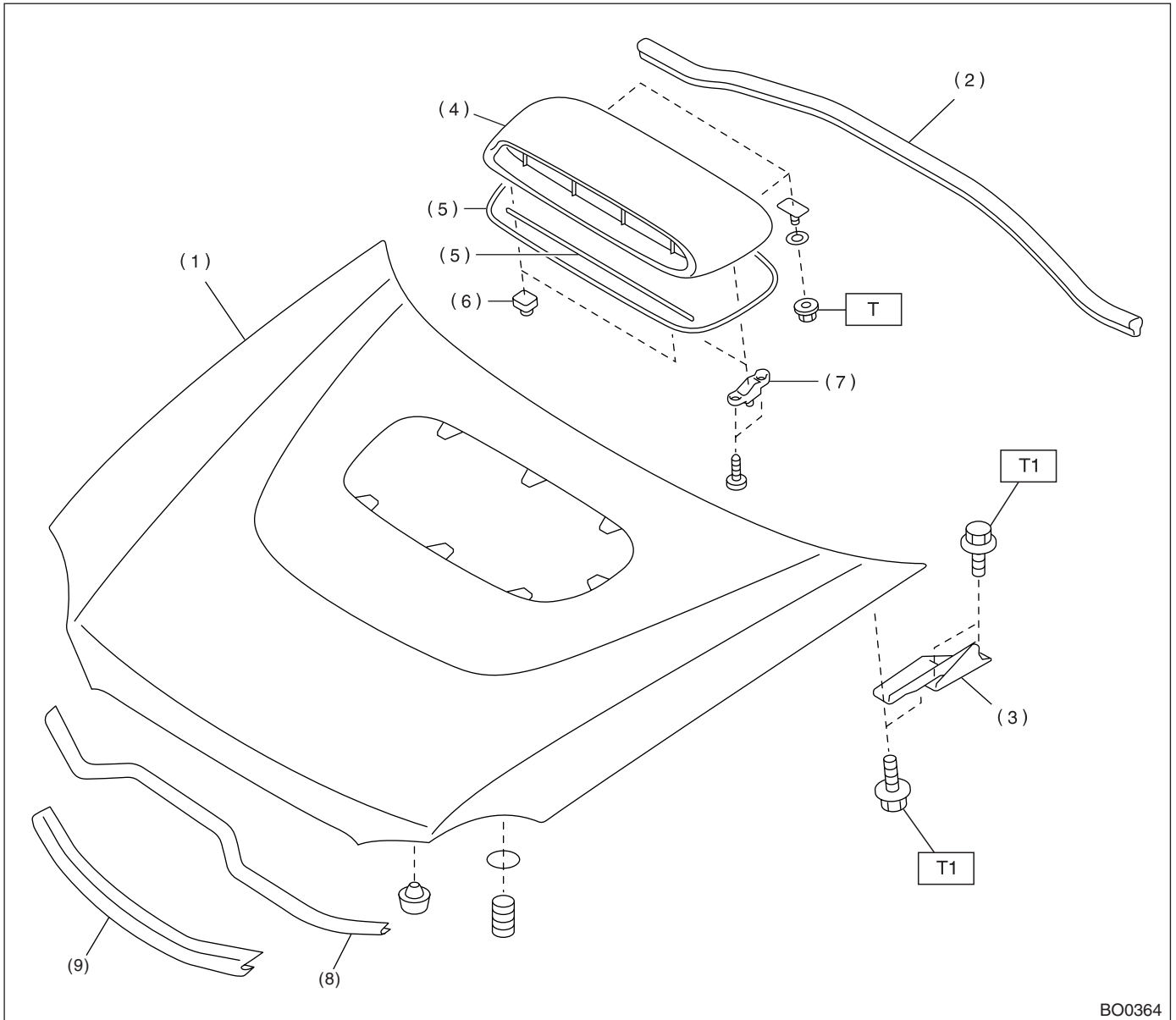


BO0260

Section	Part	Specification
A	Front hood to Front fender	NA: 4.0 ± 1.0 mm (0.16 \pm 0.04 in) TURBO: 3.7 ± 1.0 mm (0.15 \pm 0.04 in)
B	Front fender to Front door	4.6 ± 1.0 mm (0.18 \pm 0.04 in)
C	Front door to Rear door	5.0 mm (0.20 in)
D	Rear door to Rear quarter	4.6 mm (0.18 in)
E, F	Door panel to Side sill	5.9 mm (0.23 in)

B: COMPONENT

1. FRONT HOOD



BO0364

- | | |
|------------------------|--|
| (1) Front hood | (6) Clip |
| (2) Seal (Front panel) | (7) Locking piece |
| (3) Hinge | (8) Seal (Intake duct)
(Only Turbo model) |
| (4) Hood grille | (9) Seal (Hood) |
| (5) Packing | |

Tightening torque: N·m (kgf·m, ft·lb)

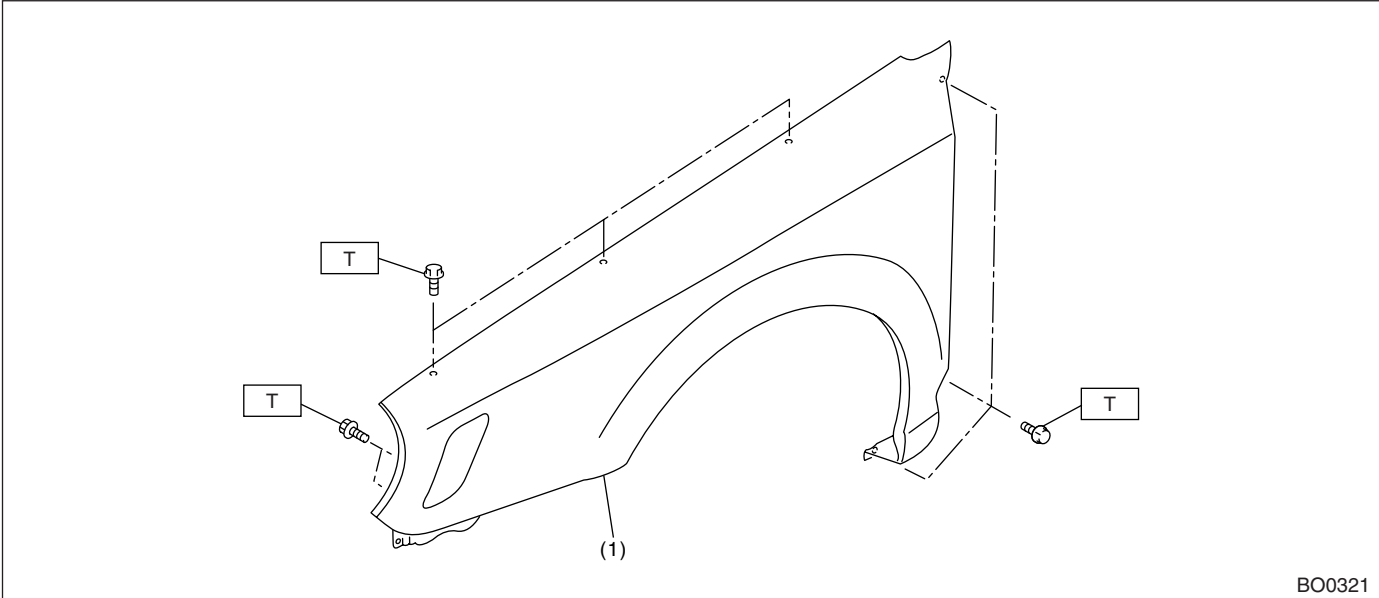
T: 7.4 (0.75, 5.5)

T1: 24.5 (2.5, 18.1)

GENERAL DESCRIPTION

EXTERIOR BODY PANELS

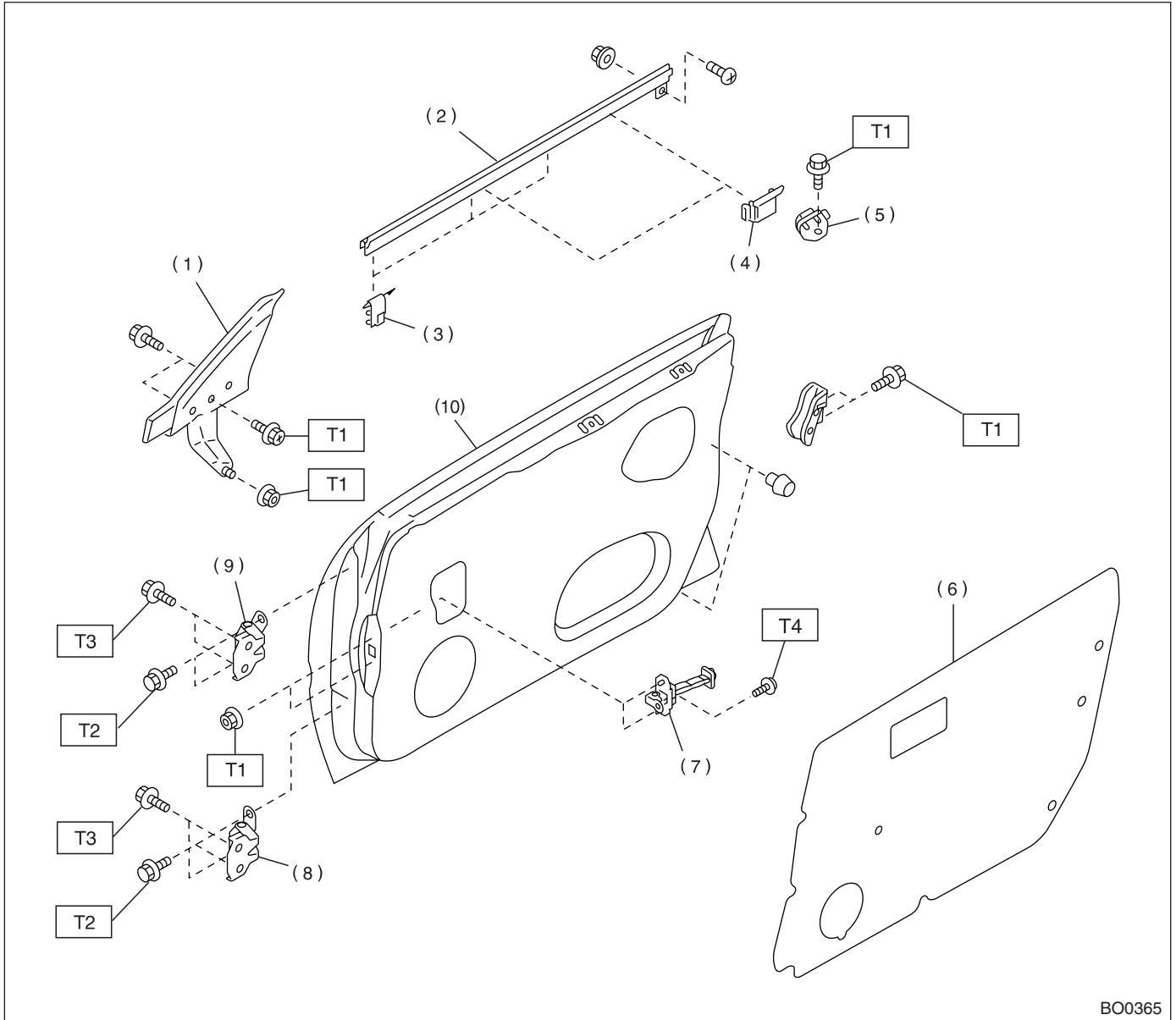
2. FRONT FENDER PANEL



(1) Front fender panel

Tightening torque: N·m (kgf·m, ft·lb)
T: 7.4 (0.75, 5.5)

3. FRONT DOOR PANEL



- | | |
|--------------------------------|-------------------|
| (1) Gusset | (6) Sealing cover |
| (2) Weatherstrip (Outer) | (7) Checker |
| (3) Clip (Weatherstrip, outer) | (8) Lower hinge |
| (4) Stabilizer (Outer) | (9) Upper hinge |
| (5) Stabilizer (Inner) | (10) Door panel |

Tightening torque: N·m (kgf·m, ft·lb)

T1: 7.4 (0.75, 5.5)

T2: 24.5 (2.5, 18.1)

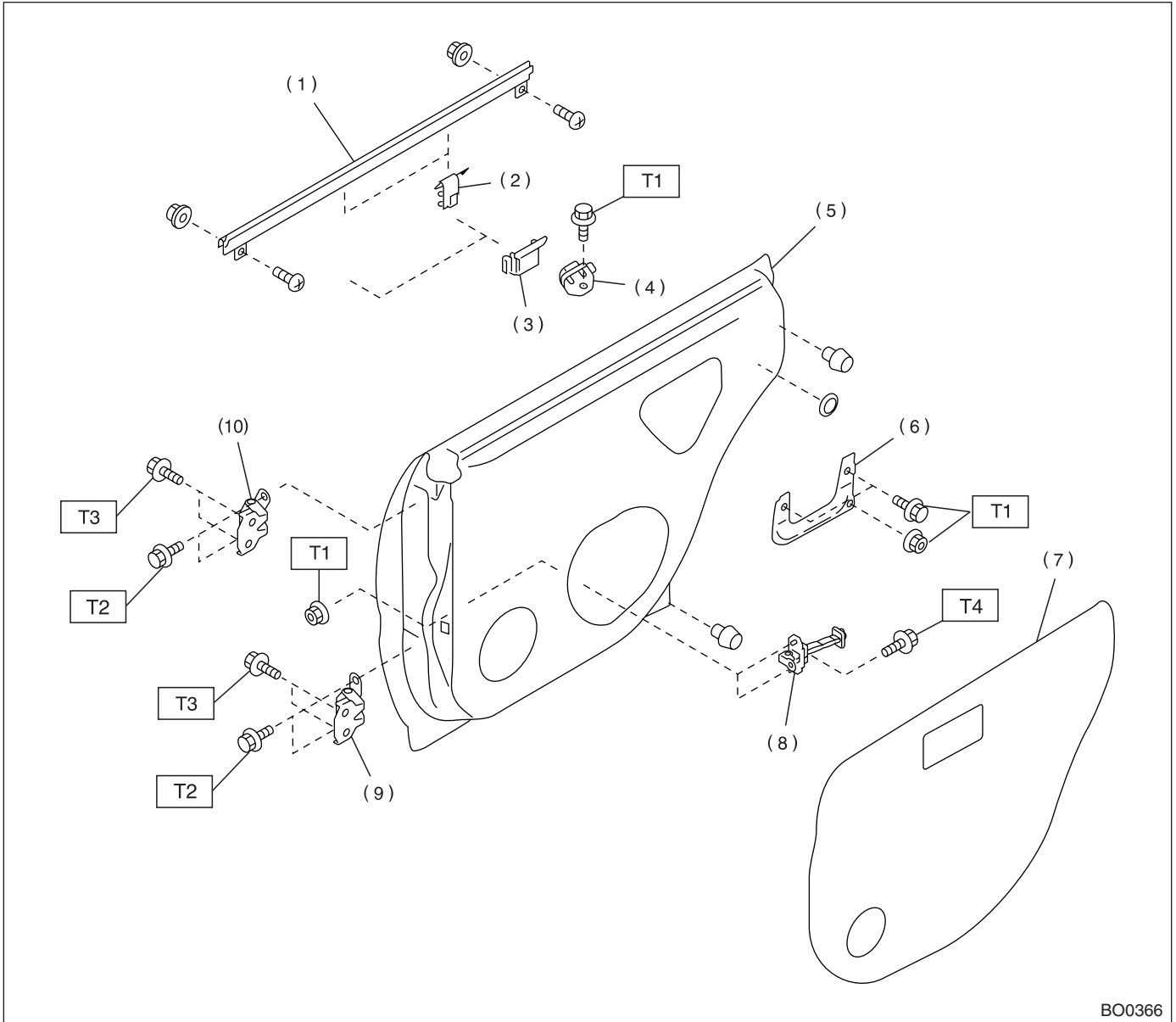
T3: 29.4 (3.0, 21.7)

T4: 32.3 (3.3, 23.8)

GENERAL DESCRIPTION

EXTERIOR BODY PANELS

4. REAR DOOR PANEL



BO0366

- | | |
|--------------------------------|-------------------|
| (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 (kgf·m, ft·lb)

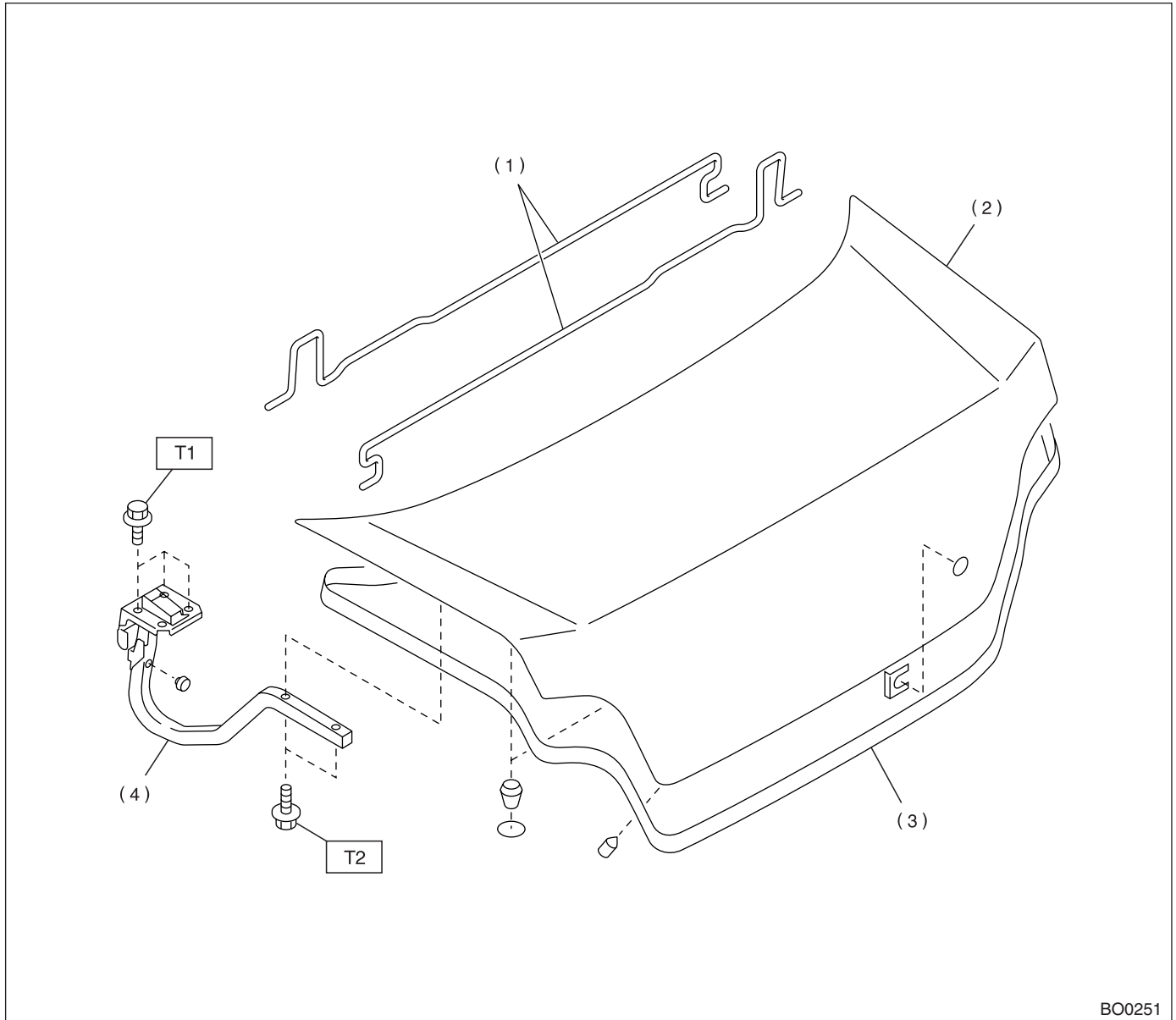
T1: 7.4 (0.75, 5.5)

T2: 24.5 (2.5, 18.1)

T3: 29.4 (3.0, 21.7)

T4: 32.3 (3.3, 23.8)

5. TRUNK LID PANEL



BO0251

- (1) Torsion bar
- (2) Trunk lid
- (3) Weatherstrip

- (4) Hinge ASSY

Tightening torque: N-m (kgf-m, ft-lb)

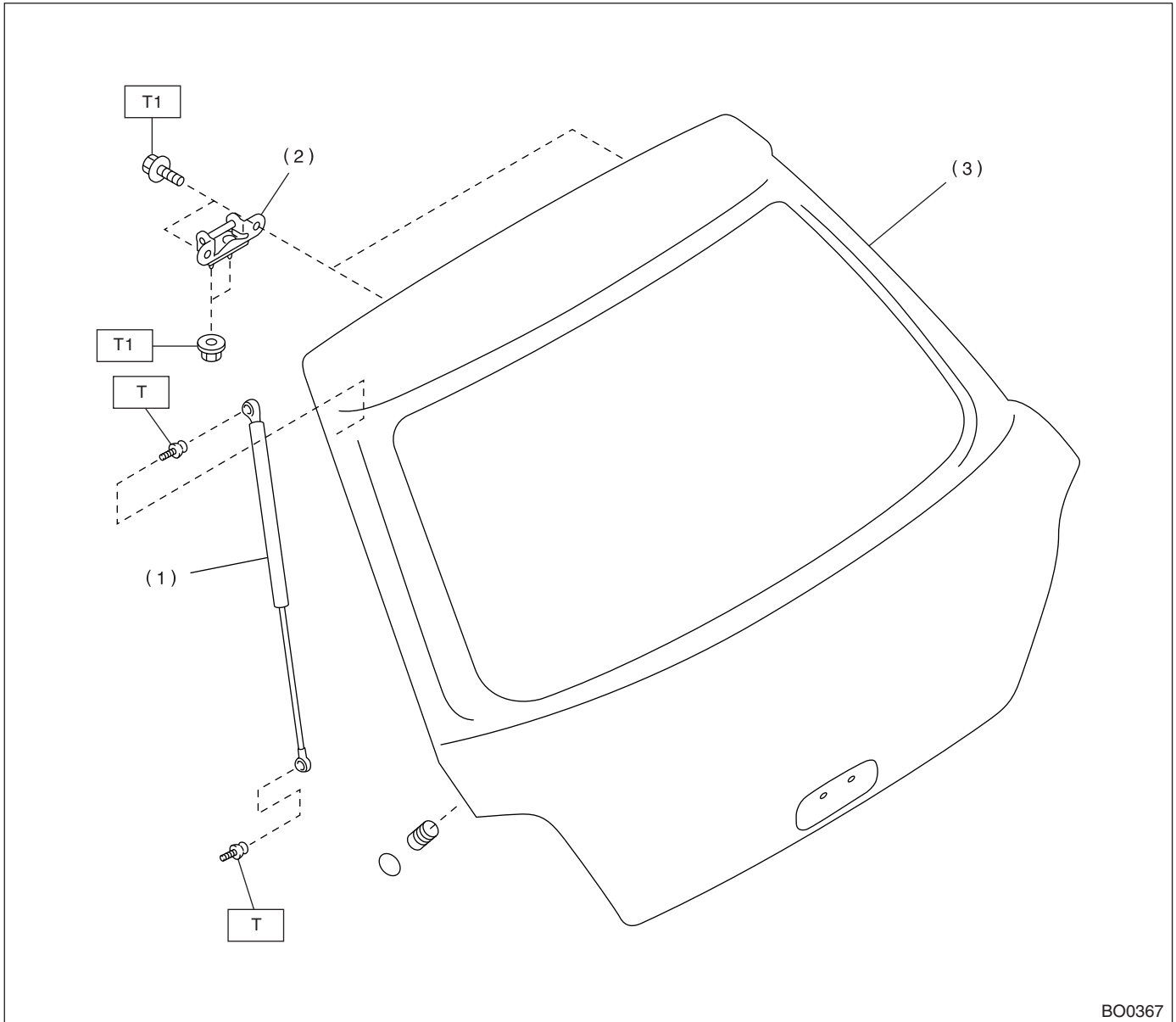
T1: 7.5 (0.76, 5.5)

T2: 14 (1.43, 10.3)

GENERAL DESCRIPTION

EXTERIOR BODY PANELS

6. REAR GATE PANEL



- (1) Gas stay
- (2) Hinge
- (3) Rear gate

Tightening torque: N-m (kgf-m, ft-lb)

T: 14 (1.43, 10.3)

T1: 25 (2.5, 18.1)

C: CAUTION

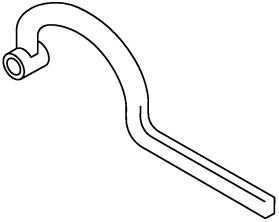
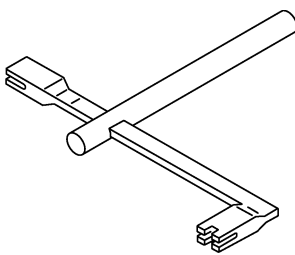
- Exterior body panels are heavy. Do not drop and damage the panels. During removal and installation, do not damage the panel painting surface.
- While removing the mounting bolts, using assistance devices such as a support jack will help support the panel.
- Be careful not to lose small parts.

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 hinge.
 B5M1118	927780000	REMOVER	Used for removing and installing trunk torsion bar.

2. GENERAL TOOL

TOOL NAME	REMARKS
Support Jack	Used for supporting door panel.

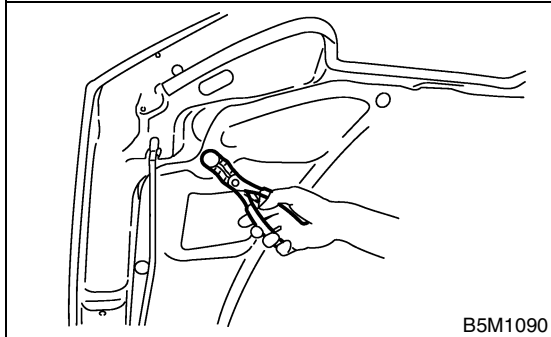
FRONT HOOD

EXTERIOR BODY PANELS

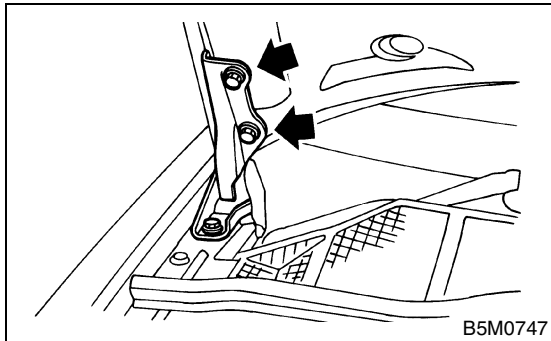
2. Front Hood

A: REMOVAL

- 1) Open the front hood to remove washer nozzles.
- 2) Release the clips to remove hood insulator.



- 3) Remove the bolts to disconnect hood from hinges.



B: INSTALLATION

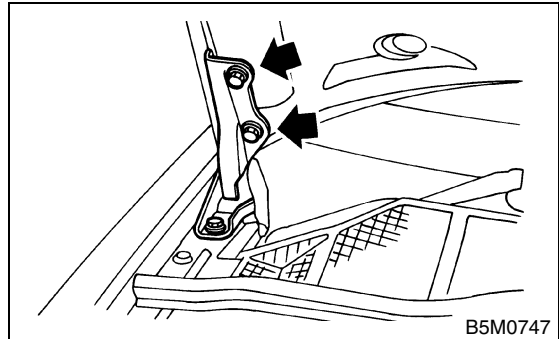
- 1) Install in the reverse order of removal.
- 2) Adjust the clearance between hood and fender. Clearance must be equal at both sides.

Tightening torque:

24.5 N-m (2.5 kgf-m, 18.1 ft-lb)

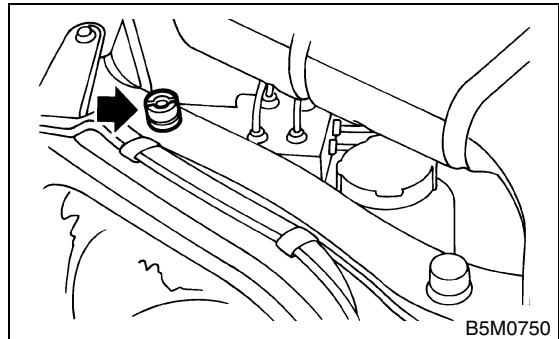
C: ADJUSTMENT

- 1) Use the hinge mounting holes to align the front hood longitudinally and laterally.



- 2) Adjust the height at front end of hood. <Ref. to SL-30, ADJUSTMENT, Front Hood Lock Assembly.>

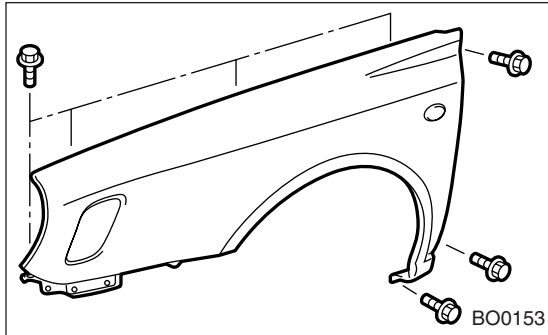
- 3) Rotate the hood buffer to adjust lateral height.



3. Fender Panel

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the side sill spoilers. <Ref. to EI-35, Side Sill Spoiler.> (If fitted)
- 3) Remove the front bumper face. <Ref. to EI-22, REMOVAL, Front Bumper.>
- 4) Remove the mud guard. <Ref. to EI-31, REMOVAL, Mud Guard.>
- 5) Loosen the bolts to remove front fender.



B: INSTALLATION

- 1) Install in the reverse order of removal.
- 2) When the fender panel is installed, clearance between fender panel and hood or front fender must be equal.

Tightening torque:

7.4 N·m (0.75 kgf·m, 5.5 ft·lb)

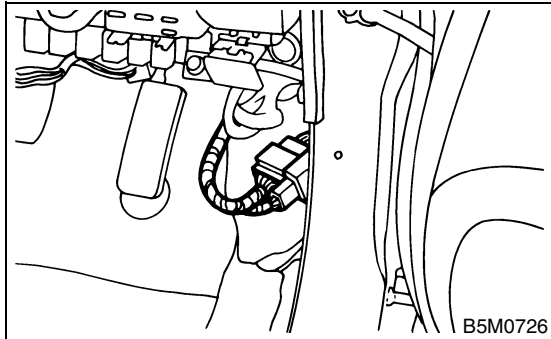
FRONT DOOR PANEL

EXTERIOR BODY PANELS

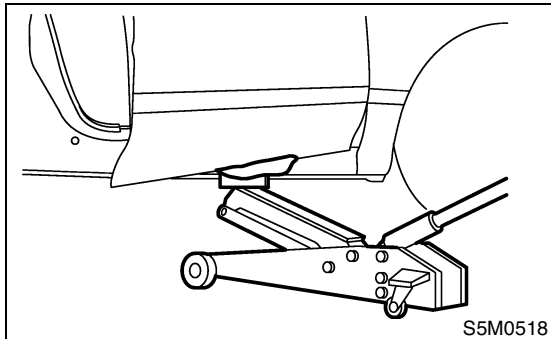
4. Front Door Panel

A: REMOVAL

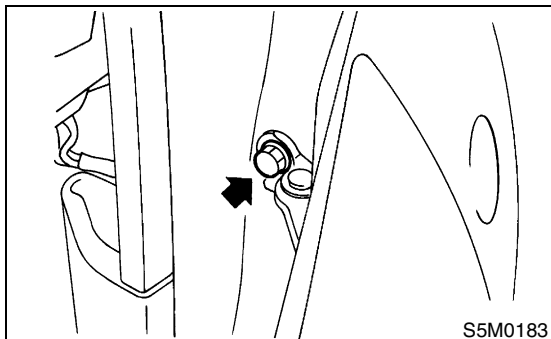
- 1) Disconnect the ground cable from battery.
- 2) Remove the front door trim. <Ref. to EI-36, REMOVAL, Front Door Trim.>
- 3) Remove the outer mirror assembly. <Ref. to GW-18, REMOVAL, Outer Mirror Assembly.>
- 4) Remove the front door glass. <Ref. to GW-12, REMOVAL, Front Door Glass.>
- 5) Remove the front door regulator and motor. <Ref. to GW-16, REMOVAL, Front Regulator and Motor Assembly.>
- 6) Remove the front door latch assembly. <Ref. to SL-20, REMOVAL, Front Door Latch Assembly.>
- 7) Remove the front outer handle. <Ref. to SL-19, REMOVAL, Front Outer Handle.>
- 8) Remove the front pillar lower trim to disconnect the connector from body harness.



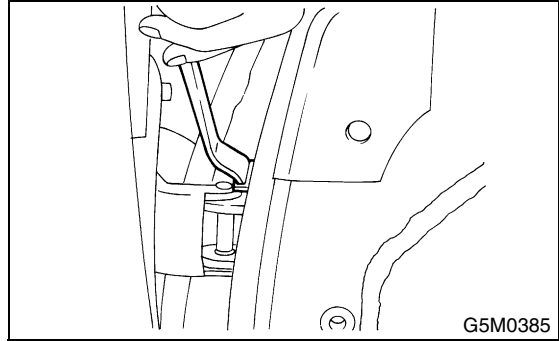
- 9) Put a wooden block on jack and place jack under door. Support the door with a support jack to protect it from damage.



- 10) Remove the checker bolts.



- 11) Remove the door-side bolts for upper and lower hinges to remove the door.



CAUTION:

- During removal and installation of doors, do not damage the 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 the sliding area of door hinges.

Tightening torque:

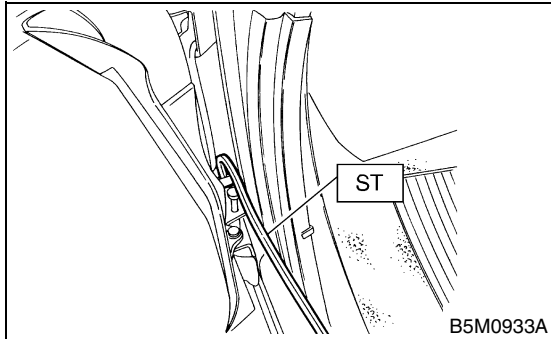
Refer to **COMPONENT** in *General Description*.

<Ref. to **EB-5, FRONT DOOR PANEL, COMPONENT, General Description.**>

C: ADJUSTMENT

1) Using the ST, loosen the body-side bolts of upper and lower hinges to align the position of front door panel longitudinally and vertically.

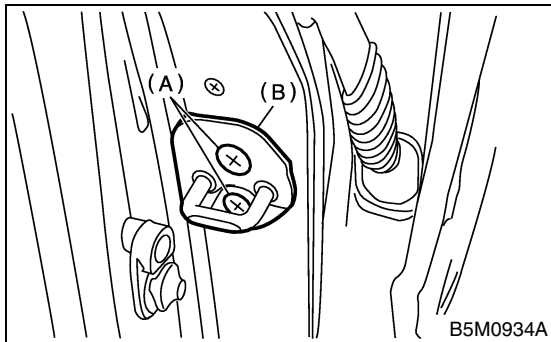
ST 925610000 DOOR HINGE WRENCH



2) Loosen the screw (A) and tap striker (B) using a plastic hammer to adjust striker to align the position of front door panel vertically and laterally at the front end.

CAUTION:

Do not use an impact wrench. Welding area on the striker nut plate is easily broken.



FRONT SEALING COVER

EXTERIOR BODY PANELS

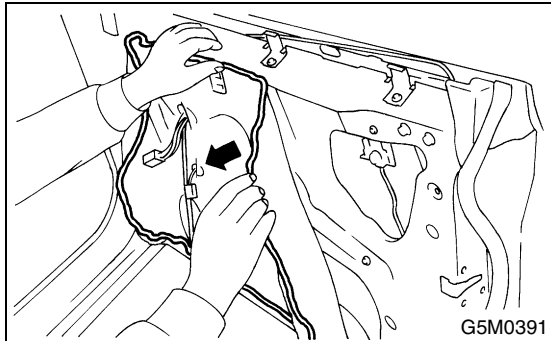
5. Front Sealing Cover

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the front door trim. <Ref. to EI-36, REMOVAL, Front Door Trim.>
- 3) Remove the front speaker. <Ref. to ET-6, REMOVAL, Front Speaker.>

CAUTION:

- Carefully remove the butyl tape. Excessive force will easily break the cover.
- If the cover gets broken, replace it with a new one.



B: INSTALLATION

- 1) Install in the reverse order of removal.
- 2) When replacing the sealing cover, use butyl tape sealer.
- 3) Press the sealer-applied area firmly to prevent any floating on surface.

Butyl tape:

3M8626 or equivalent

CAUTION:

- Apply a uniform bead of butyl tape.
- Attach the sealing cover, keeping it from becoming wrinkled.
- Breaks in the bead will allow water leakage and contamination.

C: INSPECTION

If the sealing cover is damaged, replace it with a new one.

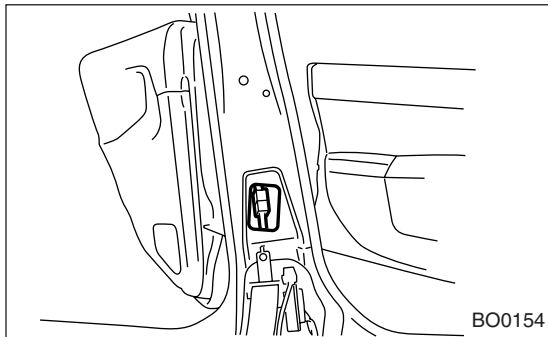
6. Rear Door Panel

A: REMOVAL

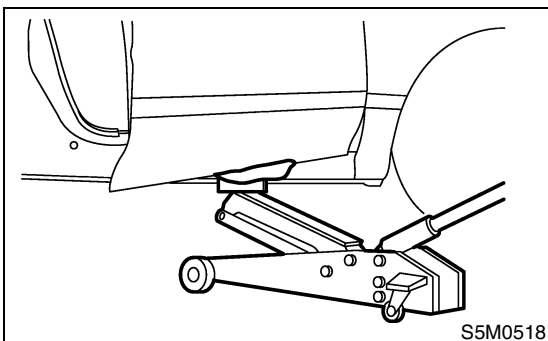
CAUTION:

- During removal and installation of doors, do not damage the body.
- Doors are heavy. Be careful not to drop and damage them.

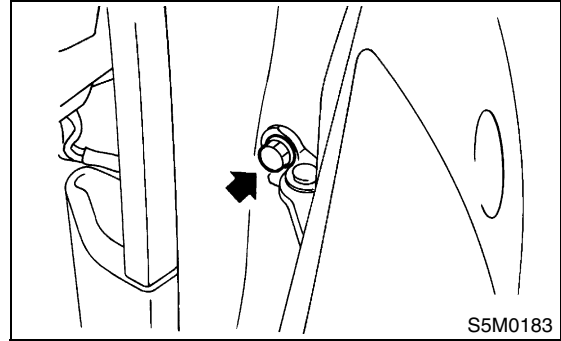
- 1) Disconnect the ground cable from battery.
- 2) Remove the rear door trim. <Ref. to EI-37, REMOVAL, Rear Door Trim.>
- 3) Remove the rear door glass. <Ref. to GW-23, REMOVAL, Rear Door Glass.>
- 4) Remove the rear door regulator and motor assembly. <Ref. to GW-25, REMOVAL, Rear Regulator and Motor Assembly.>
- 5) Remove the rear door latch. <Ref. to SL-24, REMOVAL, Rear Door Latch Assembly.>
- 6) Remove the rear outer handle. <Ref. to SL-23, REMOVAL, Rear Outer Handle.>
- 7) Remove the center pillar lower trim. <Ref. to EI-45, REMOVAL, Lower Inner Trim.>
- 8) Disconnect the connector of door harness.



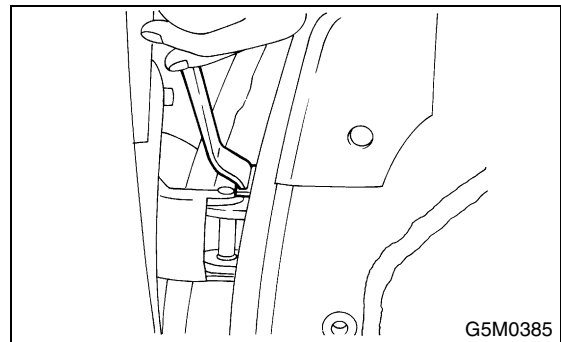
- 9) Put a wooden block on the jack and place the jack under the door. Support the door with the jack to protect it.



- 10) Remove the checker bolts.



- 11) Remove the door-side bolts for upper and lower hinges to remove the door.



B: INSTALLATION

- 1) Install in the reverse order of removal.
- 2) Apply grease to the sliding area of door hinges.

Tightening torque:

Refer to COMPONENT in General Description.

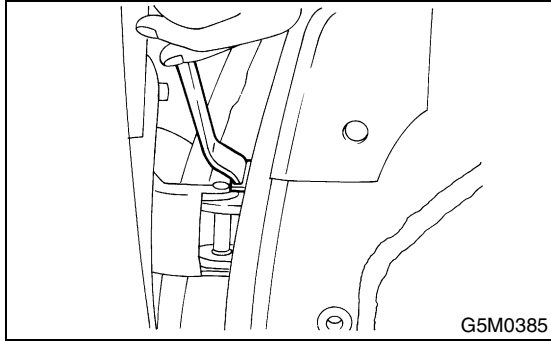
<Ref. to EB-6, REAR DOOR PANEL, COMPONENT, General Description.>

REAR DOOR PANEL

EXTERIOR BODY PANELS

C: ADJUSTMENT

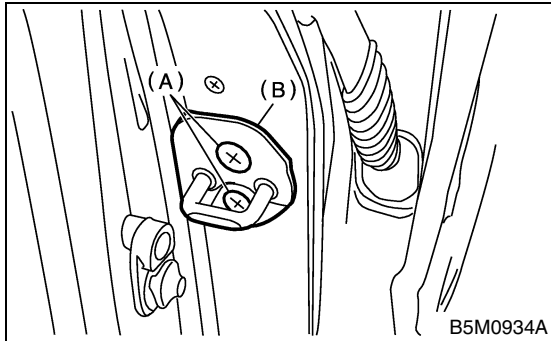
1) Open the front door, loosen the door-side bolts of upper and lower hinges to align the position of rear door panel longitudinally and vertically.



2) Loosen the screw (A) and tap striker (B) using plastic hammer to adjust striker to align the position of front door panel vertically and laterally at the rear end.

CAUTION:

Do not use an impact wrench. The welding area on the striker nut plate is easily broken.



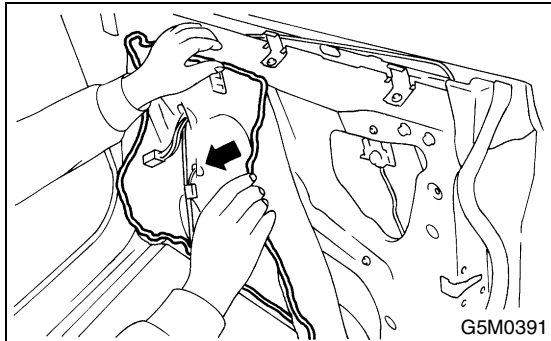
7. Rear Sealing Cover

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the rear door trim. <Ref. to EI-37, REMOVAL, Rear Door Trim.>
- 3) Remove the rear speaker. <Ref. to ET-8, REMOVAL, Rear Speaker.>

CAUTION:

- Carefully remove the butyl tape. Excessive force will easily break the cover.
- If the cover gets broken, replace it with a new one.



B: INSTALLATION

- 1) Install in the reverse order of removal.
- 2) When replacing the sealing cover, use butyl tape.
- 3) Press the sealer-applied area firmly to prevent any floating on surface.

Butyl tape:

3M8626 or equivalent

CAUTION:

- Apply an uniform bead of butyl tape.
- Attach the sealing cover, keeping it from becoming wrinkled.
- Breaks in the bead will allow water leakage and contamination.

C: INSPECTION

If the sealing cover is damaged, replace it with a new one.

TRUNK LID PANEL

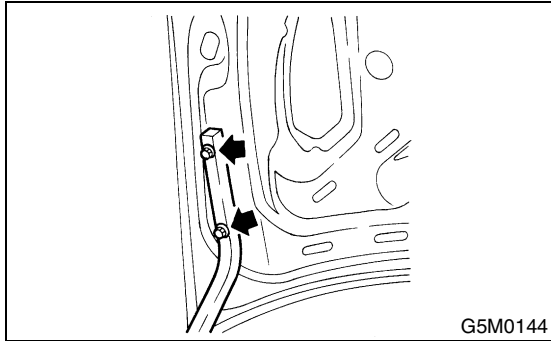
EXTERIOR BODY PANELS

8. Trunk Lid Panel

A: REMOVAL

1. TRUNK LID

- 1) Open the trunk lid.
- 2) Disconnect the trunk lid connector.
- 3) Loosen the trunk lid mounting bolts to remove the trunk lid from hinges.



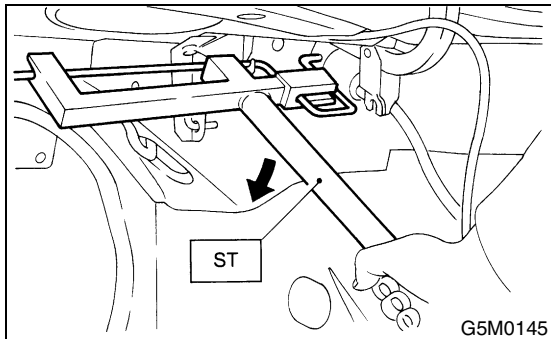
2. TORSION BAR

- 1) Open the trunk lid.
- 2) Using the ST, remove the torsion bar from hinge link.

ST 927780000 REMOVER

CAUTION:

During removal and installation, carefully handle the torsion bar. It will generate reactive force.



- 3) Remove the 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 the trunk lid with uniform clearance.

Tightening torque:

14 N·m (1.43 kgf-m, 10.3 ft-lb)

2. TORSION BAR

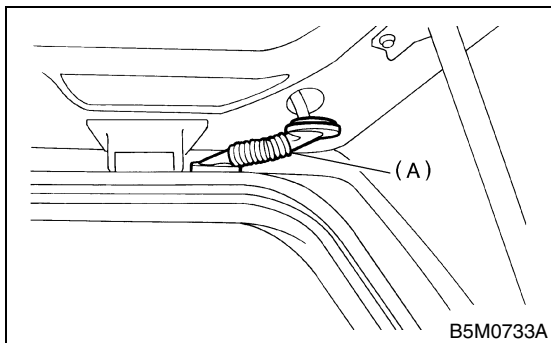
- 1) Install in the reverse order of removal.
- 2) Apply grease to the rotating area of hinges and mating surface of torsion bar.

9. Rear Gate Panel

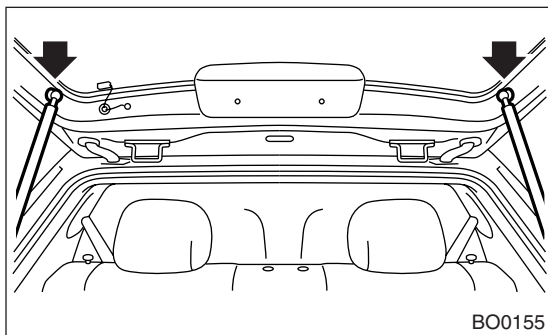
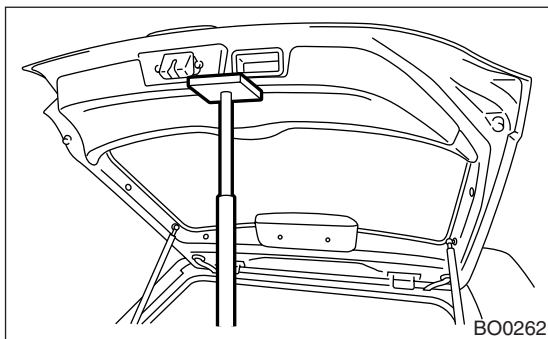
A: REMOVAL

1. REAR GATE PANEL

- 1) Disconnect the ground cable from battery.
- 2) Open the rear gate.
- 3) Remove the rear gate outer handle. <Ref. to SL-26, REMOVAL, Rear Gate Outer Handle.>
- 4) Remove the rear gate latch assembly. <Ref. to SL-27, REMOVAL, Rear Gate Latch Assembly.>
- 5) Remove the rear gate key lock cylinders. <Ref. to SL-33, REAR GATE, REPLACEMENT, Key Lock Cylinders.>
- 6) Remove the rear wiper. <Ref. to WW-18, REMOVAL, Rear Wiper Motor.>
- 7) Disconnect the connectors of rear wiper, rear defogger, and other lighting devices.
- 8) Disconnect the washer hose.
- 9) Remove the rubber duct (A) connection, and pull out the harness and washer hose from rear gate.



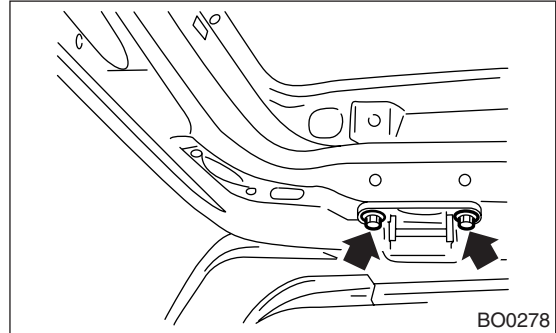
- 10) Using a support, support the rear gate while removing gas stay mounting bolts.



CAUTION:

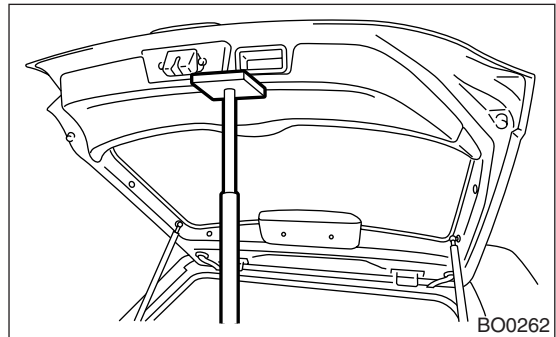
When the rear gate is released, it may hit and damage the body. To prevent this, place a shop cloth between the body and gate.

- 11) Loosen the rear gate bolts to remove rear gate.



2. GAS STAY

- 1) Open the rear gate. Use a support jack to support the rear gate.



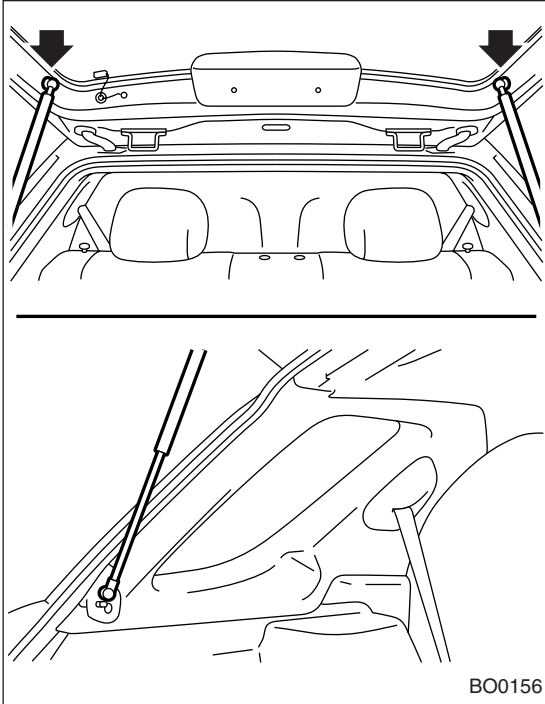
CAUTION:

- After the gas stay is removed, the rear gate cannot stay open. Supporting the rear gate with a jack, remove the bolts.
- Do not damage the piston rods and oil seals.
- Never disassemble the cylinders: They contain gas.

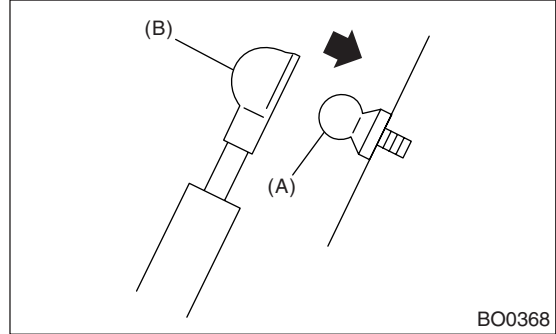
REAR GATE PANEL

EXTERIOR BODY PANELS

2) Loosen the bolts to remove the gas stay from rear gate.



2) Firmly install the gas stay (B) to mounting bolt (A).



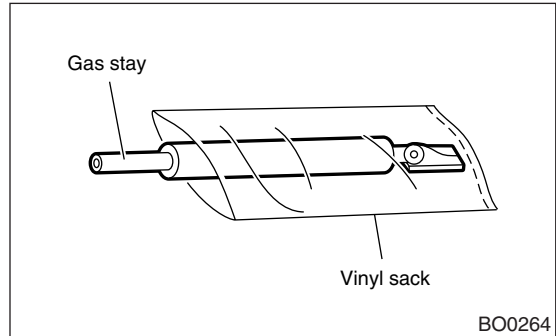
CAUTION:
After supporting the rear gate with a jack, start operation.

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.

1) Cover with a vinyl case as shown in the figure.



B: INSTALLATION

1. REAR GATE PANEL

1) Install in the reverse order of removal.
2) Install the rear gate panel with uniform clearance to the body.
Refer to COMPONENT of General Description for tightening torque. <Ref. to EB-8, REAR GATE PANEL, General Description.>

CAUTION:
Do not damage the painted surfaces of body and rear gate.

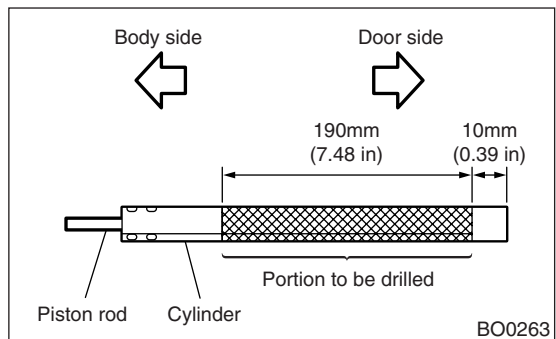
2. GAS STAY

1) Install the mounting bolt (A) to the rear gate panel and body.

Tightening torque:
14 N·m (1.43 kgf·m, 10.3 ft·lb)

CAUTION:
Prevent the vinyl case from being caught by drill cutting edge

2) Lift the body side slightly with piston rods fully extended, and secure the 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 the door side, and bleed the gas stay completely.



CRUISE CONTROL SYSTEM

CC

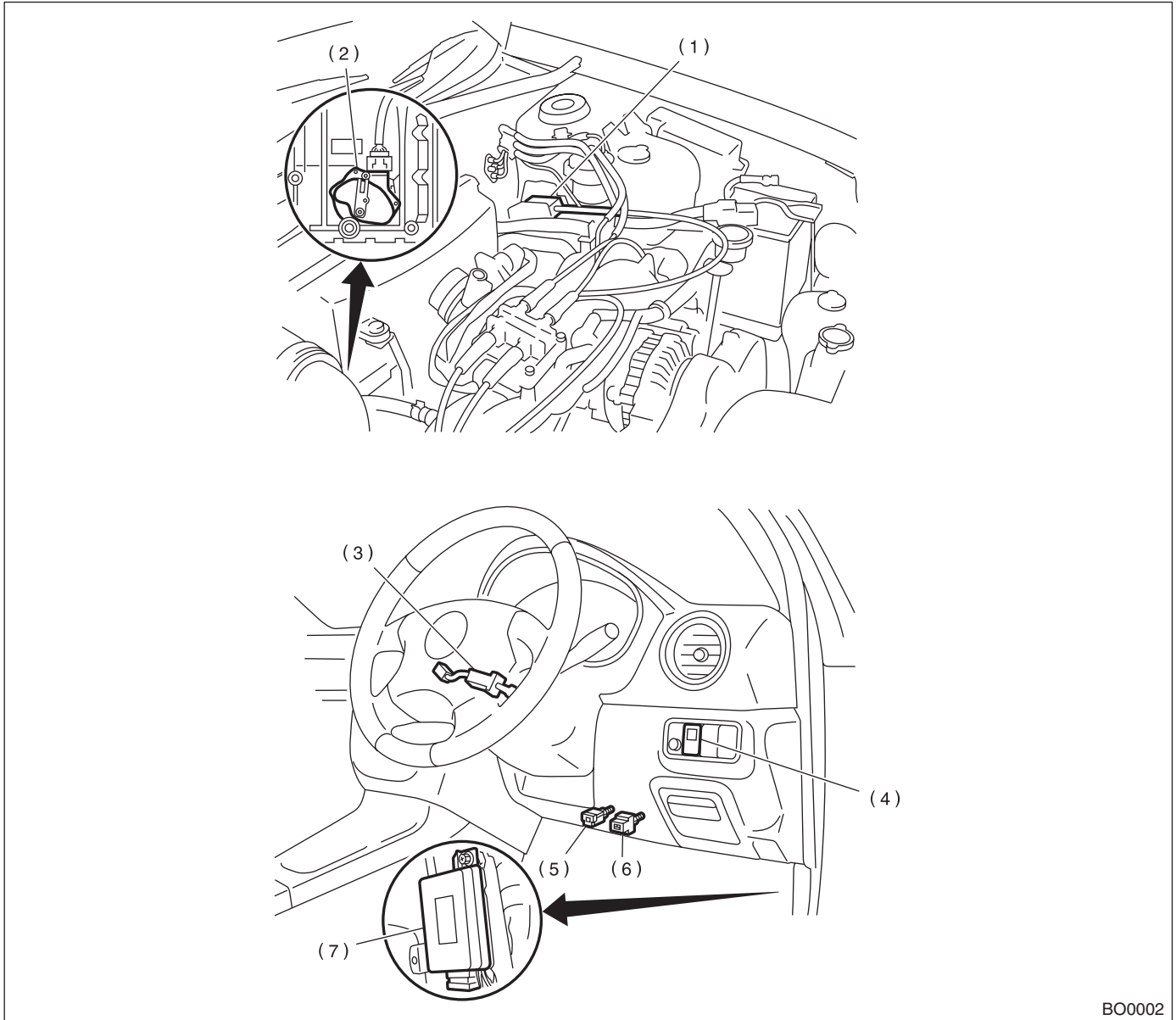
	Page
1. General Description	2
2. Actuator.....	3
3. Cruise Control Module	4
4. Cruise Control Main Switch.....	5
5. Cruise Control Command Switch	6
6. Stop and Brake Switch.....	7
7. Clutch Switch	8
8. Inhibitor Switch.....	9

GENERAL DESCRIPTION

CRUISE CONTROL SYSTEM

1. General Description

A: COMPONENT



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 | |

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 the 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.

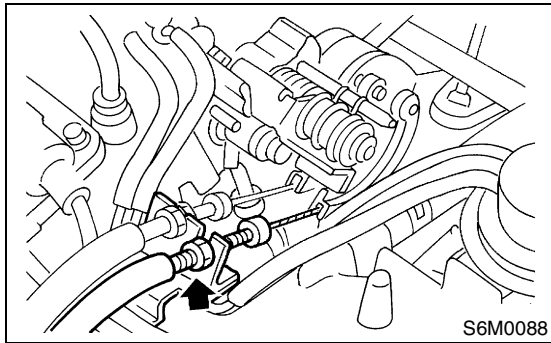
2. Actuator

A: REMOVAL

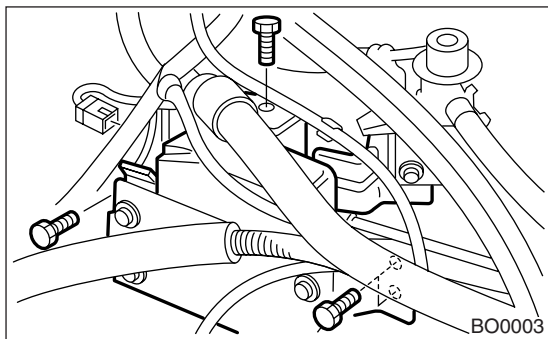
CAUTION:

- 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 the cable sharply with a radius less than 100 mm (3.94 in); otherwise, cable may bend permanently, resulting in poor performance.
- When installing the cable, be careful not to sharply bend or pinch the inner cable; otherwise, the cable may break.

- 1) Disconnect the ground cable from battery.
- 2) Remove the clip bands from cruise control cable.
- 3) Loosen the nut which secures cruise control cable end to throttle cam, and then remove the cable from throttle cam.



- 4) Remove the actuator attaching bolts.
- 5) Remove the actuator while disconnecting the connector.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

7.4 N·m (0.75 kgf·m, 5.4 ft·lb)

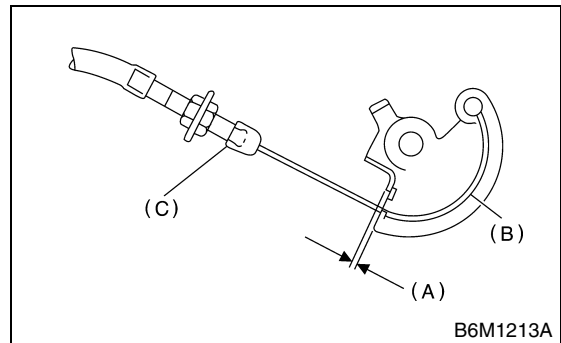
NOTE:

(A): Must be adjusted when the 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 the throttle cam is being pulled by wire cable.)

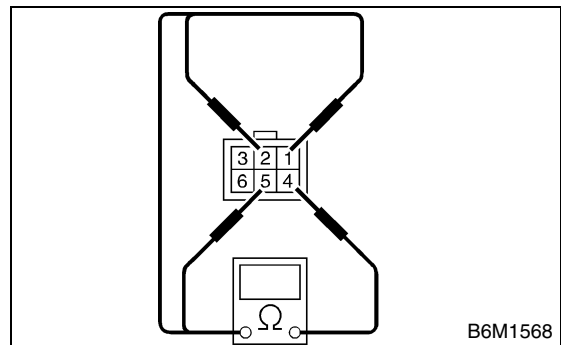
(B): Must be coated evenly on the cam end inner connection.

(C): Cover must be inserted securely, until tip of cable touches cover stopper.



C: INSPECTION

Measure the cruise control actuator resistance.



Terminal No.	Standard
4 and 1	Approx. 5 Ω
4 and 2	Approx. 5 Ω
4 and 5	Approx. 5 Ω
3 and 6	Approx. 39 Ω

If NG, replace the cruise control actuator.

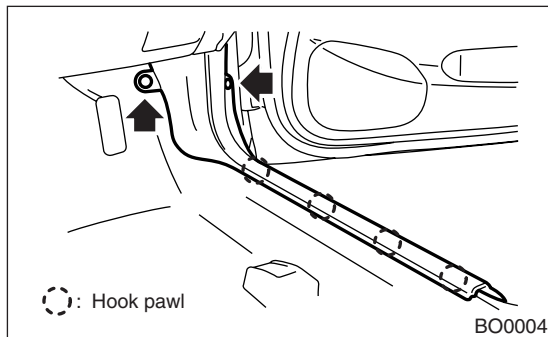
CRUISE CONTROL MODULE

CRUISE CONTROL SYSTEM

3. Cruise Control Module

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the side sill front cover.



- 3) Disconnect the connector from cruise control module.
- 4) Remove the bolt, then detach the cruise control module (A).



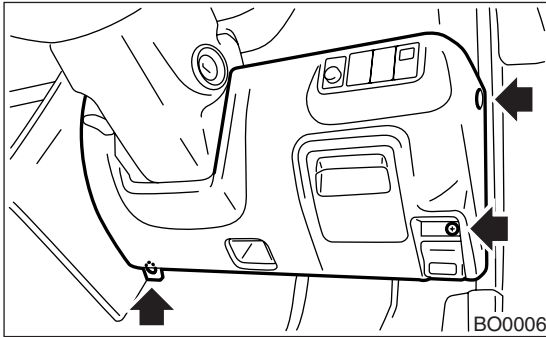
B: INSTALLATION

Install in the reverse order of removal.

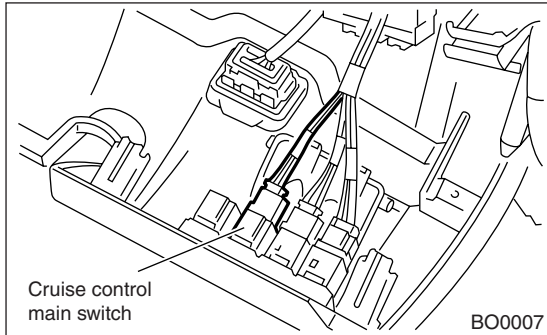
4. Cruise Control Main Switch

A: REMOVAL

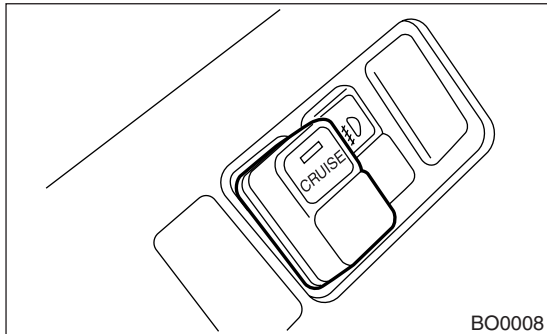
- 1) Disconnect the ground cable from battery.
- 2) Remove the screws and clip from instrument panel lower cover.
- 3) Remove the instrument panel lower cover.



- 4) Disconnect the connector from cruise control main switch.



- 5) Remove the main switch by pushing it outward.

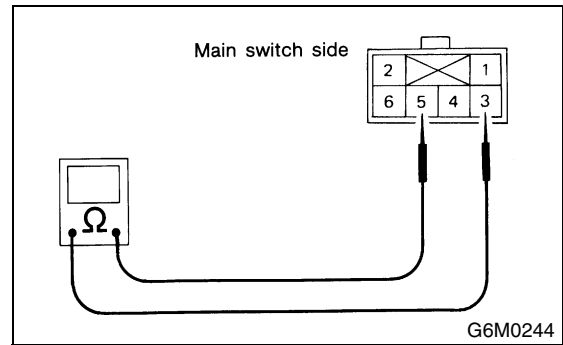


B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the cruise control main switch resistance.



Switch position	Terminal No.	Standard
OFF	3 and 5	More than 1 M Ω
ON	3 and 5	Less than 1 Ω

If NG, replace the cruise control main switch.

CRUISE CONTROL COMMAND SWITCH

CRUISE CONTROL SYSTEM

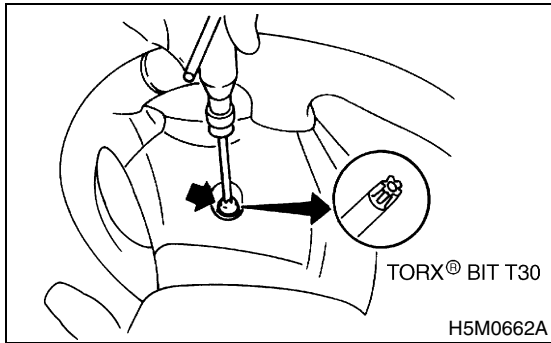
5. Cruise Control Command Switch

A: REMOVAL

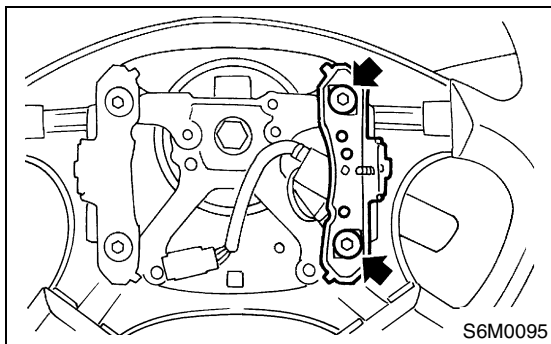
WARNING:

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.>

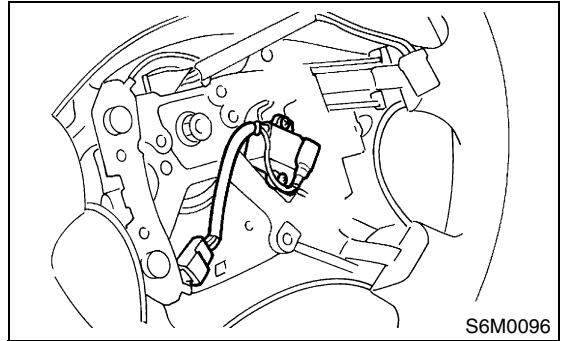
- 1) Set the front wheels in straight ahead position.
- 2) Turn the ignition switch to OFF.
- 3) Disconnect the ground cable from battery and wait for at least 20 seconds before starting work.
- 4) Using the TORX® BIT T30 (Tamper resistant type), loosen the two TORX® bolts which secure driver's airbag module.



- 5) Disconnect the airbag module connector on back of airbag module.
- 6) Remove the horn switch from steering wheel as shown.



- 7) Disconnect the horn and cruise control command switch connector, then remove the cruise control command switch.

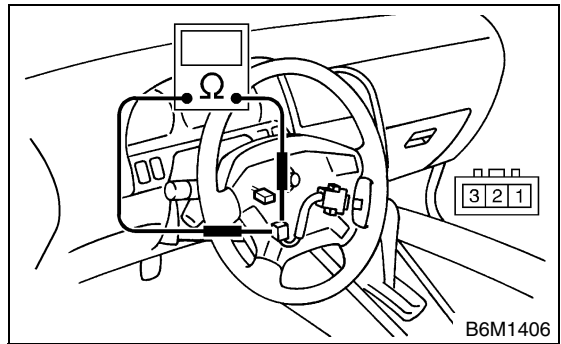


B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the cruise control command switch resistance.



Switch	Position	Terminal No.	Standard
CANCEL	ON	1 (+) and 2 (-)	Less than 1 Ω
	ON	1 (+) and 3 (-)	Less than 1 Ω
SET/COAST	OFF	1 and 2	More than 1 M Ω
	ON	1 and 2	Less than 1 Ω
RESUME/ ACCEL	OFF	1 and 3	More than 1 M Ω
	ON	1 and 3	Less than 1 Ω

If NG, replace the cruise control command switch.

6. Stop and Brake Switch

A: REMOVAL

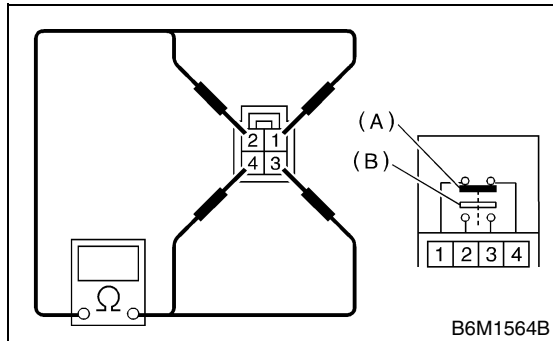
- 1) Disconnect the ground cable from battery.
- 2) Disconnect the connector from stop and brake switch, and then remove the switch. <Ref. to BR-69, REMOVAL, Stop Light Switch.>

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the brake switch (A) and stop light switch (B) resistance.



Switch	Pedal	Terminal No.	Standard
Brake	Released	1 and 4	Less than 1 Ω
	Depressed	1 and 4	More than 1 M Ω
Stop light	Released	2 and 3	More than 1 M Ω
	Depressed	2 and 3	Less than 1 Ω

If NG, replace the stop and brake switch.

7. Clutch Switch

A: REMOVAL

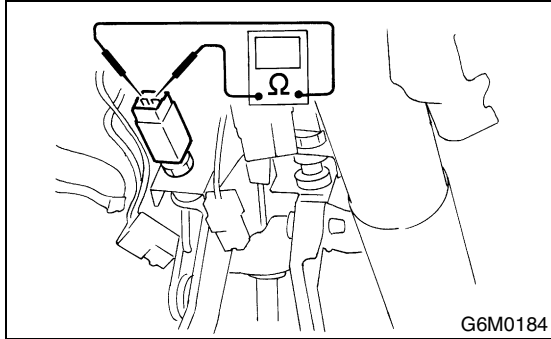
- 1) Disconnect the ground cable from battery.
- 2) Disconnect the connector from clutch switch, and then remove the switch. <Ref. to CL-43, DIS-ASSEMBLY, Clutch Pedal.>

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the clutch switch resistance.



Switch	Pedal	Terminal No.	Standard
Clutch	Released	1 and 2	Less than 1 Ω
	Depressed	1 and 2	More than 1 M Ω

If NG, replace the clutch switch.

8. Inhibitor Switch

A: REMOVAL

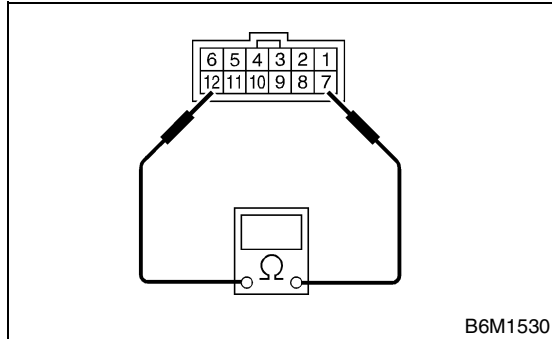
- 1) Disconnect the ground cable from battery.
- 2) Disconnect the connector from inhibitor switch, and then remove the switch. <Ref. to AT-29, REMOVAL, Inhibitor Switch.>

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the inhibitor switch resistance.



Selector lever position	Terminal No.	Standard
P	7 and 12	Less than 1 Ω
N		Less than 1 Ω
Except P and N		More than 1 M Ω

If NG, replace the inhibitor switch.

INHIBITOR SWITCH

CRUISE CONTROL SYSTEM

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

CC

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6. Diagnostics Chart with Symptom	13
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BASIC DIAGNOSTIC PROCEDURE

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

1. Basic Diagnostic Procedure

A: PROCEDURE

Step	Check	Yes	No
1 START DIAGNOSIS. 1) Perform the pre-inspection. <Ref. to CC-5, INSPECTION, General Description.> 2) Check the cruise control main switch operation.	Is the 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 the cruise cancel conditions diagnosis. <Ref. to CC-11, Subaru Select Monitor.>	Are any trouble codes indicated?	Go to "List of Diagnostic Trouble Code (DTC)". <Ref. to CC-28, List of Diagnostic Trouble Code (DTC).>	Go to step 4.
4 CHECK CRUISE CONTROL SET OPERATION. Check the cruise control set operation.	Can the 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 the vehicle speed is held within set speed.	Is the 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 the RESUME/ACCEL operation.	Does the 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 the SET/COAST operation.	Does the 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 the CANCEL operation.	Is the 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 the cruise control release operation.	Is the 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.>

BASIC DIAGNOSTIC PROCEDURE

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
10 CHECK CRUISE CONTROL RELEASE OPERATION. Check the cruise control release operation.	Is the 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”

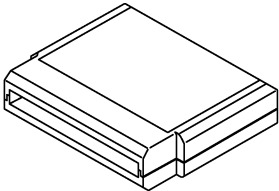

Airbag system wiring harness is routed near the cruise control module and cruise control command switch.

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 the 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
 B2M3876	24082AA190 (Newly adopted tool)	CARTRIDGE	Troubleshooting for electrical systems.
 B2M3877	22771AA030	SELECT MONITOR KIT	Troubleshooting for electrical systems. <ul style="list-style-type: none"> • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

2. GENERAL TOOLS

TOOL NAME	REMARKS
Circuit Tester	Used for measuring resistance, voltage and ampere.

GENERAL DESCRIPTION

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

C: INSPECTION

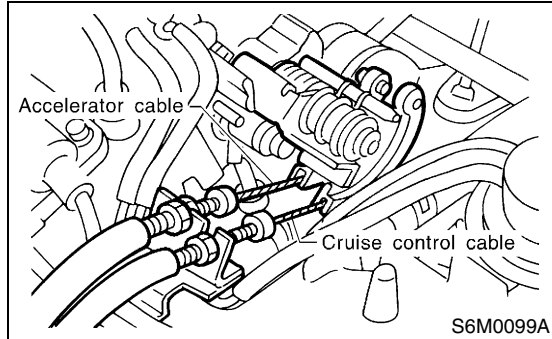
1. BATTERY

Measure the battery voltage and specific gravity of electrolyte.

Standard voltage:
12 V, or more

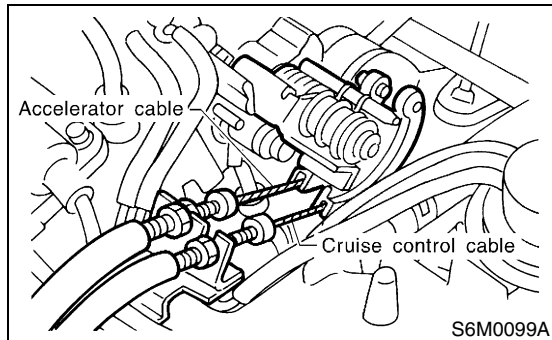
Specific gravity:
Above 1.260

2. CRUISE CONTROL CABLE



Check the cruise control cable installation.
If NG, install the cable securely.

3. ACCELERATOR CABLE

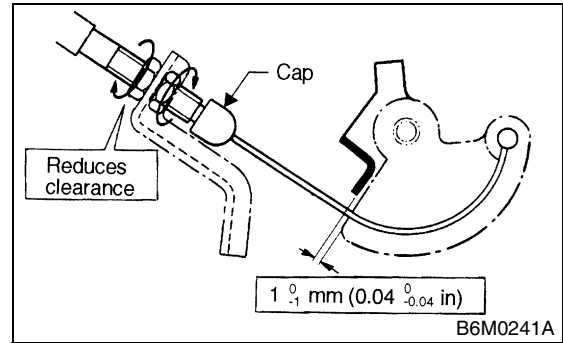


Check the movement of accelerator cable when the cruise control throttle is moved by hand.
If NG, check the throttle cam.

4. THROTTLE CAM

Check that the throttle cam moves smoothly.
If NG, repair the 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:

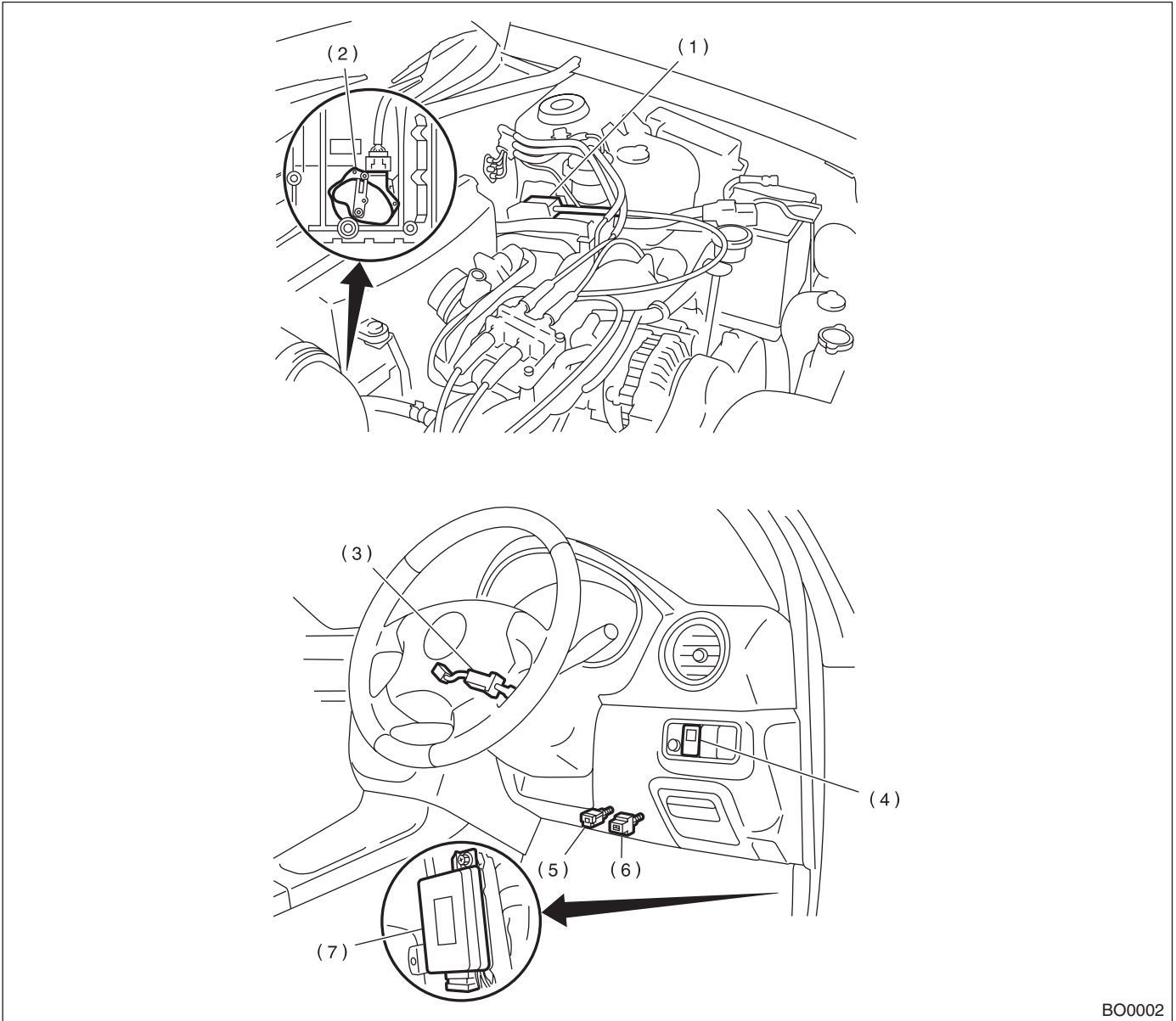
Check that the cap is positioned in the groove.

ELECTRICAL COMPONENTS LOCATION

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

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 | |

ELECTRICAL COMPONENTS LOCATION

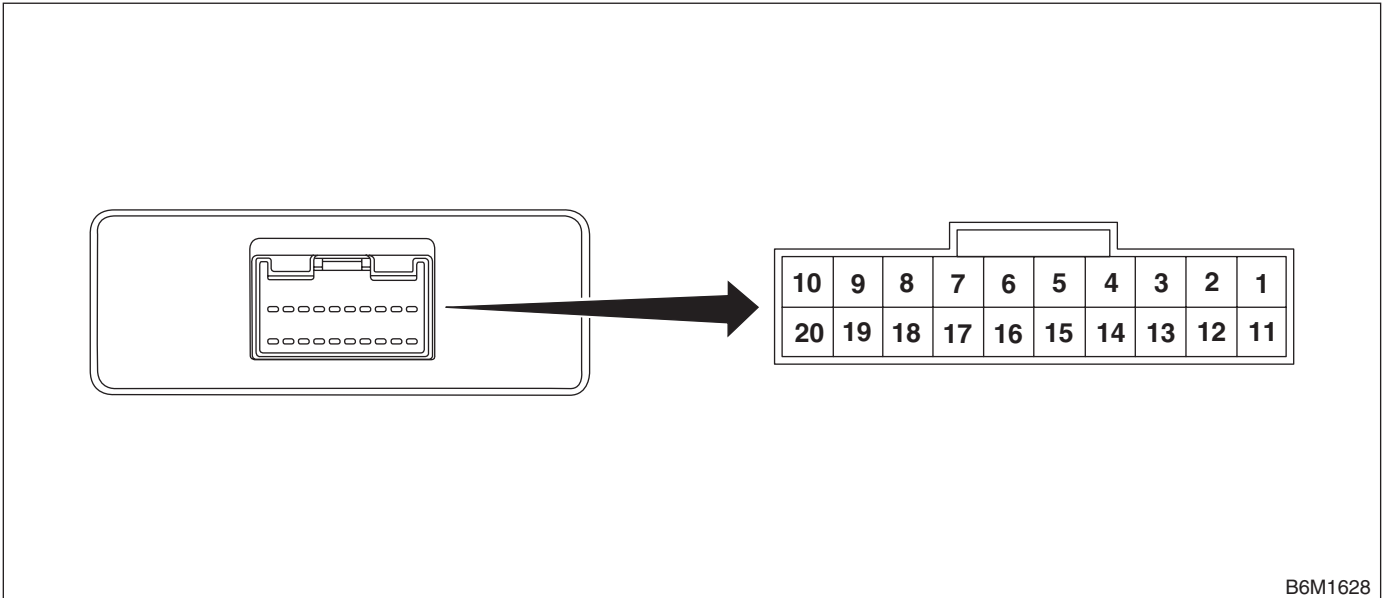
CRUISE CONTROL SYSTEM (DIAGNOSTICS)

CRUISE CONTROL MODULE I/O SIGNAL

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

4. Cruise Control Module I/O Signal

A: ELECTRICAL SPECIFICATION



B6M1628

Content	Terminal No.	Measuring conditions and I/O signals (ignition switch ON and engine idling)
Main light	1	<ul style="list-style-type: none"> Battery voltage is present when main switch is turned OFF. "0" volt is present when main switch is turned ON.
Inhibitor switch (AT)	4	<ul style="list-style-type: none"> Battery voltage is present when selector lever is other than "P" or "N" position. "0" volt is present when selector lever is set to "P" or "N" position.
Motor B	5	<ul style="list-style-type: none"> ON-and-OFF ("0"-and-battery voltage) operation is alternately repeated while cruise control is operating. "0" volt is present when main switch is turned OFF.
Ground	6	—
Motor A	7	<ul style="list-style-type: none"> ON-and-OFF ("0"-and-battery voltage) operation is alternately repeated while cruise control is operating. "0" volt is present when main switch is turned OFF.
RESUME/ACCEL switch	9	<ul style="list-style-type: none"> Battery voltage is present when command switch is turned to RESUME/ACCEL position. "0" volt is present when command switch is released.
SET/COAST switch	10	<ul style="list-style-type: none"> Battery voltage is present when command switch is turned to SET/COAST position. "0" volt is present when command switch is released.
Main power supply	11	<ul style="list-style-type: none"> Battery voltage is present when main power is turned ON. "0" volt is present when main power is turned OFF.
Ignition switch	12	<ul style="list-style-type: none"> Battery voltage is present when ignition switch is turned ON. "0" volt is present when ignition switch is turned OFF.
Motor C	13	<ul style="list-style-type: none"> ON-and-OFF ("0"-and-battery voltage) operation is alternately repeated while cruise control is operating. "0" volt is present when main switch is turned OFF.
Motor clutch	14	<ul style="list-style-type: none"> ON-and-OFF ("0"-and-battery voltage) operation is alternately repeated while cruise control is operating. "0" volt is present when vehicle is stopped.
Cruise control main switch	15	<ul style="list-style-type: none"> Battery voltage is present during pressing the cruise control main switch. "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; <ul style="list-style-type: none">• 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; <ul style="list-style-type: none">• Battery voltage is present when clutch pedal is released.• "0" volt is present when clutch pedal is depressed.
Data link connector	17	—
Data link connector	18	—
Vehicle speed sensor (MT) TCM (AT)	19	Lift-up the vehicle until all four wheels are raised off ground, and then rotate any wheel manually. Approx. "5" and "0" volt pulse signals are alternately input to cruise control module.
Stop light switch	20	Turn ignition switch to OFF. Then check that; <ul style="list-style-type: none">• Battery voltage is present when brake pedal is depressed.• "0" volt is present when brake pedal is released.
NOTE: Voltage at terminals 5, 7, 13 and 14 cannot be checked unless vehicle is driving by cruise control operation.		

CRUISE CONTROL MODULE I/O SIGNAL

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

B: SCHEMATIC

<Ref. to WI-102, SCHEMATIC, Cruise Control System.>

SUBARU SELECT MONITOR

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

5. Subaru Select Monitor

A: OPERATION

1. GENERAL

The on-board diagnosis function of the cruise control system uses an external Subaru Select Monitor.

The on-board diagnosis function operates in two categories, which are used depending on the type of problems;

1) Cruise cancel conditions diagnosis:

(1) This category of diagnosis requires actual vehicle driving in order to determine the cause, (as when cruise speed is cancelled during driving although cruise cancel condition is not entered).

(2) Cruise control module memory stores the cancel condition (Code No.) which occurred during driving. When there are plural cancel conditions (Code No.), they are shown on the Subaru Select Monitor.

CAUTION:

- The cruise control memory stores not only the cruise “cancel” which occurred (although “cancel” operation is not entered by the driver), but also the “cancel” condition input by the driver.
- The content of memory is cleared when ignition switch or cruise main switch is turned OFF.

2) Real-time diagnosis:

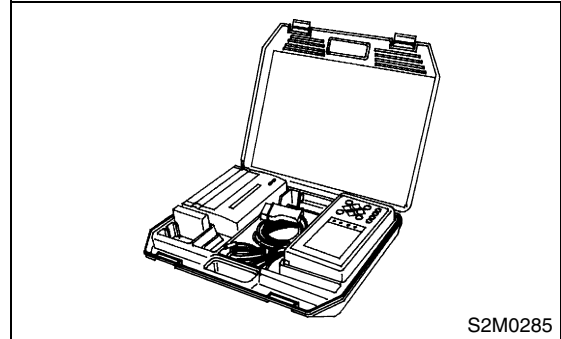
The real-time diagnosis function is used to determine whether or not the input signal system is in good order, according to signal emitted from switches, sensors, etc.

(1) Vehicle cannot be driven at cruise speed because problem occurs in the cruise control system or its associated circuits.

(2) Monitor the signal conditions from switches and sensors.

2. CRUISE CANCEL CONDITIONS DIAGNOSIS

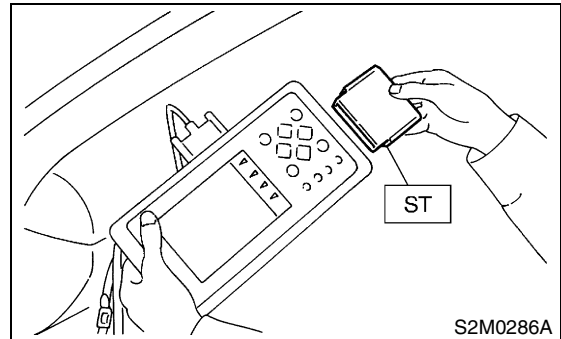
1) Prepare the Subaru Select Monitor kit.



S2M0285

2) Connect the diagnosis cable to Subaru Select Monitor.

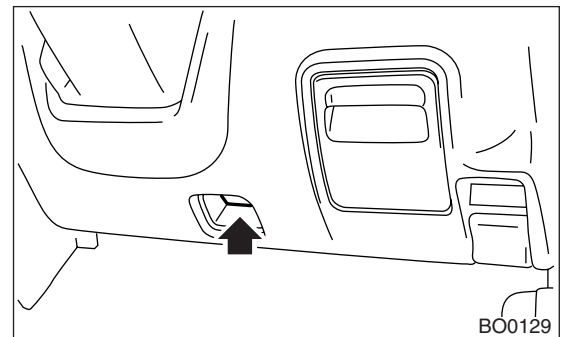
3) Insert the cartridge into Subaru Select Monitor. <Ref. to CC-4, SPECIAL TOOLS, PREPARATION TOOL, General Description.>



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4) Connect the Subaru Select Monitor to data link connector.

(1) Data link connector is located in the lower portion of the instrument panel (on the driver's side).



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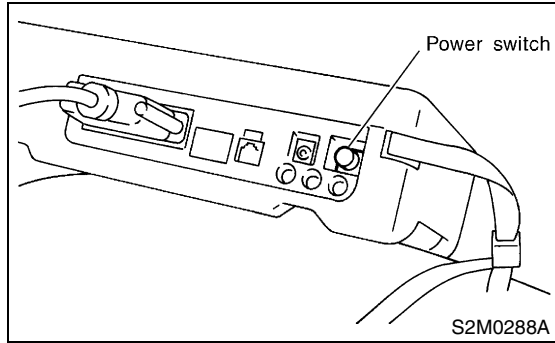
(2) Connect the diagnosis cable to data link connector.

5) Start the engine and turn the cruise control main switch to ON.

SUBARU SELECT MONITOR

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

6) Turn the Subaru Select Monitor switch to ON.



7) On the Main Menu display screen, select the {All System Diagnosis} and press [YES] key.

NOTE:

The diagnostic trouble code (DTC) is also shown in the {Each System Check} mode. This mode is called up on the Cruise Control Diagnosis screen by selecting the item {Cancel Code(s) Display}.

8) Drive the vehicle at least 30 km/h (19 MPH) with cruise speed set.

9) If the cruise speed is canceled itself (without doing any cancel operations), a diagnostic trouble code (DTC) will appear on select monitor display.

CAUTION:

- A diagnostic trouble code (DTC) will also appear when cruise cancel is effected by driver. Do not confuse.
- Have a co-worker ride in the vehicle to assist in diagnosis during driving.

NOTE:

Diagnostic trouble code (DTC) will be cleared by turning the ignition switch or cruise control main switch to OFF.

3. REAL-TIME DIAGNOSIS

- 1) Connect the select monitor.
- 2) Turn the ignition switch and cruise control main switch to ON.
- 3) Turn the Subaru Select Monitor switch to ON.
- 4) On the Main Menu display screen, select the {Each System Check} and press [YES] key.
- 5) On the System Selection Menu display screen, select the {Cruise Control} and press [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 [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 (DTCs), refer to the List of Diagnostic Trouble Code (DTC).
<Ref. to CC-28, List of Diagnostic Trouble Code (DTC).>

DIAGNOSTICS CHART WITH SYMPTOM

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

6. Diagnostics Chart with Symptom

A: SYMPTOM CHART

Symptom		Repair area	Reference
1	Cruise control main switch is not turned ON.	(1) Check the power supply.	<Ref. to CC-16, CHECK POWER SUPPLY, Diagnostics Chart with Symptom.>
		(2) Check the 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 the SET/COAST switch.	<Ref. to CC-20, CHECK CRUISE CONTROL COMMAND SWITCH, Diagnostics Chart with Symptom.>
		(2) Check the stop light switch and brake switch.	<Ref. to CC-22, CHECK STOP LIGHT SWITCH AND BRAKE SWITCH, Diagnostics Chart with Symptom.>
		(3) Check the clutch switch (MT).	<Ref. to CC-24, CHECK CLUTCH SWITCH (MT), Diagnostics Chart with Symptom.>
		(4) Check the inhibitor switch (AT).	<Ref. to CC-26, CHECK INHIBITOR SWITCH (AT), Diagnostics Chart with Symptom.>
		(5) Check the vehicle speed sensor.	<Ref. to CC-30, DTC 22 VEHICLE SPEED SENSOR, Diagnostics Chart with Trouble Code.>
		(6) Check the motor drive system.	<Ref. to CC-34, DTC 35 AND 36 ACTUATOR MOTOR, Diagnostics Chart with Trouble Code.>
		(7) Check the motor clutch drive system.	<Ref. to CC-36, DTC 37 ACTUATOR MOTOR CLUTCH, Diagnostics Chart with Trouble Code.>
3	Vehicle speed is not held within set speed ± 3 km/h (± 2 MPH).	(1) Check the vehicle speed sensor.	<Ref. to CC-30, DTC 22 VEHICLE SPEED SENSOR, Diagnostics Chart with Trouble Code.>
		(2) Check the motor drive system.	<Ref. to CC-34, DTC 35 AND 36 ACTUATOR MOTOR, Diagnostics Chart with Trouble Code.>
		(3) Check the motor clutch drive system.	<Ref. to CC-36, DTC 37 ACTUATOR MOTOR CLUTCH, Diagnostics Chart with Trouble Code.>
4	Vehicle speed does not increase or does not return to set speed after RESUME/ACCEL switch has been pressed.	(1) Check the RESUME/ACCEL switch.	<Ref. to CC-20, CHECK CRUISE CONTROL COMMAND SWITCH, Diagnostics Chart with Symptom.>
		(2) Check the motor drive system.	<Ref. to CC-34, DTC 35 AND 36 ACTUATOR MOTOR, Diagnostics Chart with Trouble Code.>
		(3) Check the motor clutch drive system.	<Ref. to CC-36, DTC 37 ACTUATOR MOTOR CLUTCH, Diagnostics Chart with Trouble Code.>
5	Vehicle speed does not decrease after SET/COAST switch has been pressed.	(1) Check the SET/COAST switch.	<Ref. to CC-20, CHECK CRUISE CONTROL COMMAND SWITCH, Diagnostics Chart with Symptom.>
		(2) Check the motor drive system.	<Ref. to CC-34, DTC 35 AND 36 ACTUATOR MOTOR, Diagnostics Chart with Trouble Code.>
		(3) Check the motor clutch drive system.	<Ref. to CC-36, DTC 37 ACTUATOR MOTOR CLUTCH, Diagnostics Chart with Trouble Code.>
6	Cruise control is not released after CANCEL switch has been pressed.	(1) Check the CANCEL switch.	<Ref. to CC-20, CHECK CRUISE CONTROL COMMAND SWITCH, Diagnostics Chart with Symptom.>
		(2) Check the motor drive system.	<Ref. to CC-34, DTC 35 AND 36 ACTUATOR MOTOR, Diagnostics Chart with Trouble Code.>
		(3) Check the motor clutch drive system.	<Ref. to CC-36, DTC 37 ACTUATOR MOTOR CLUTCH, Diagnostics Chart with Trouble Code.>
7	Cruise control is not released after brake pedal has been depressed.	(1) Check the stop light switch and brake switch.	<Ref. to CC-22, CHECK STOP LIGHT SWITCH AND BRAKE SWITCH, Diagnostics Chart with Symptom.>
		(2) Check the motor drive system.	<Ref. to CC-34, DTC 35 AND 36 ACTUATOR MOTOR, Diagnostics Chart with Trouble Code.>
		(3) Check the motor clutch drive system.	<Ref. to CC-36, DTC 37 ACTUATOR MOTOR CLUTCH, Diagnostics Chart with Trouble Code.>

DIAGNOSTICS CHART WITH SYMPTOM

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

Symptom		Repair area	Reference
8	Cruise control is not released after clutch pedal has been depressed (MT).	(1) Check the clutch switch.	<Ref. to CC-24, CHECK CLUTCH SWITCH (MT), Diagnostics Chart with Symptom.>
		(2) Check the motor drive system.	<Ref. to CC-34, DTC 35 AND 36 ACTUATOR MOTOR, Diagnostics Chart with Trouble Code.>
		(3) Check the motor clutch drive system.	<Ref. to CC-36, DTC 37 ACTUATOR MOTOR CLUTCH, Diagnostics Chart with Trouble Code.>

DIAGNOSTICS CHART WITH SYMPTOM

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

DIAGNOSTICS CHART WITH SYMPTOM

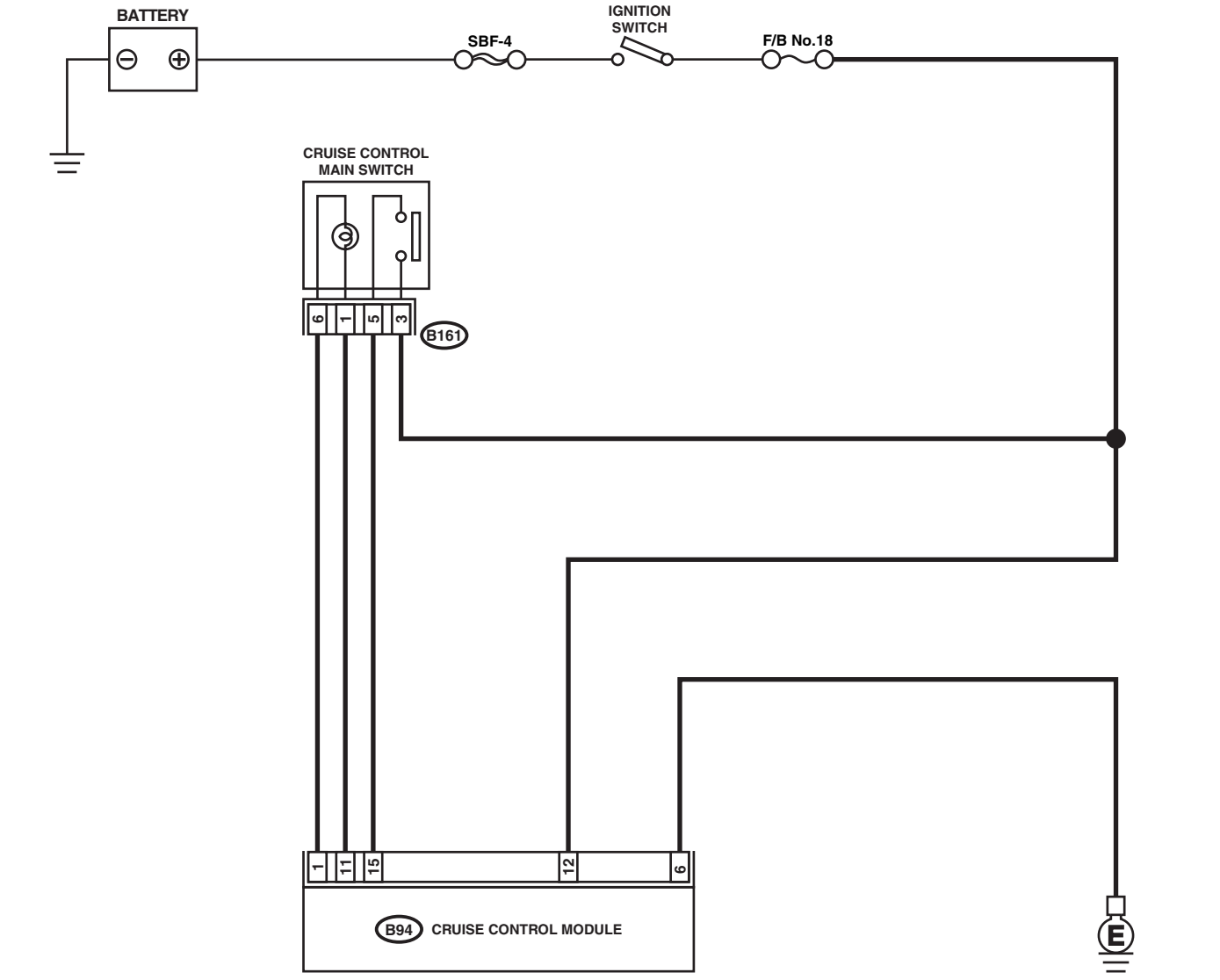
CRUISE CONTROL SYSTEM (DIAGNOSTICS)

B: CHECK POWER SUPPLY

TROUBLE SYMPTOM:

Cruise control can be set normally, but indicator does not come on. (When main switch is pressed.)

WIRING DIAGRAM:



(B161)

1	X	2
3	4	6

(B94)

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20

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DIAGNOSTICS CHART WITH SYMPTOM

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK POWER SUPPLY. 1) Turn the ignition switch to OFF. 2) Disconnect the cruise control module harness connector. 3) Turn the ignition switch to ON. 4) Measure the 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.	<ul style="list-style-type: none">• Check the fuse No. 18 (in fuse & relay box).• Check the harness for open or short between cruise control module and fuse & relay box.
2 CHECK GROUND CIRCUIT. 1) Turn the ignition switch OFF. 2) Measure the 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 the harness.

DIAGNOSTICS CHART WITH SYMPTOM

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

C: CHECK CRUISE CONTROL MAIN SWITCH

TROUBLE SYMPTOM:

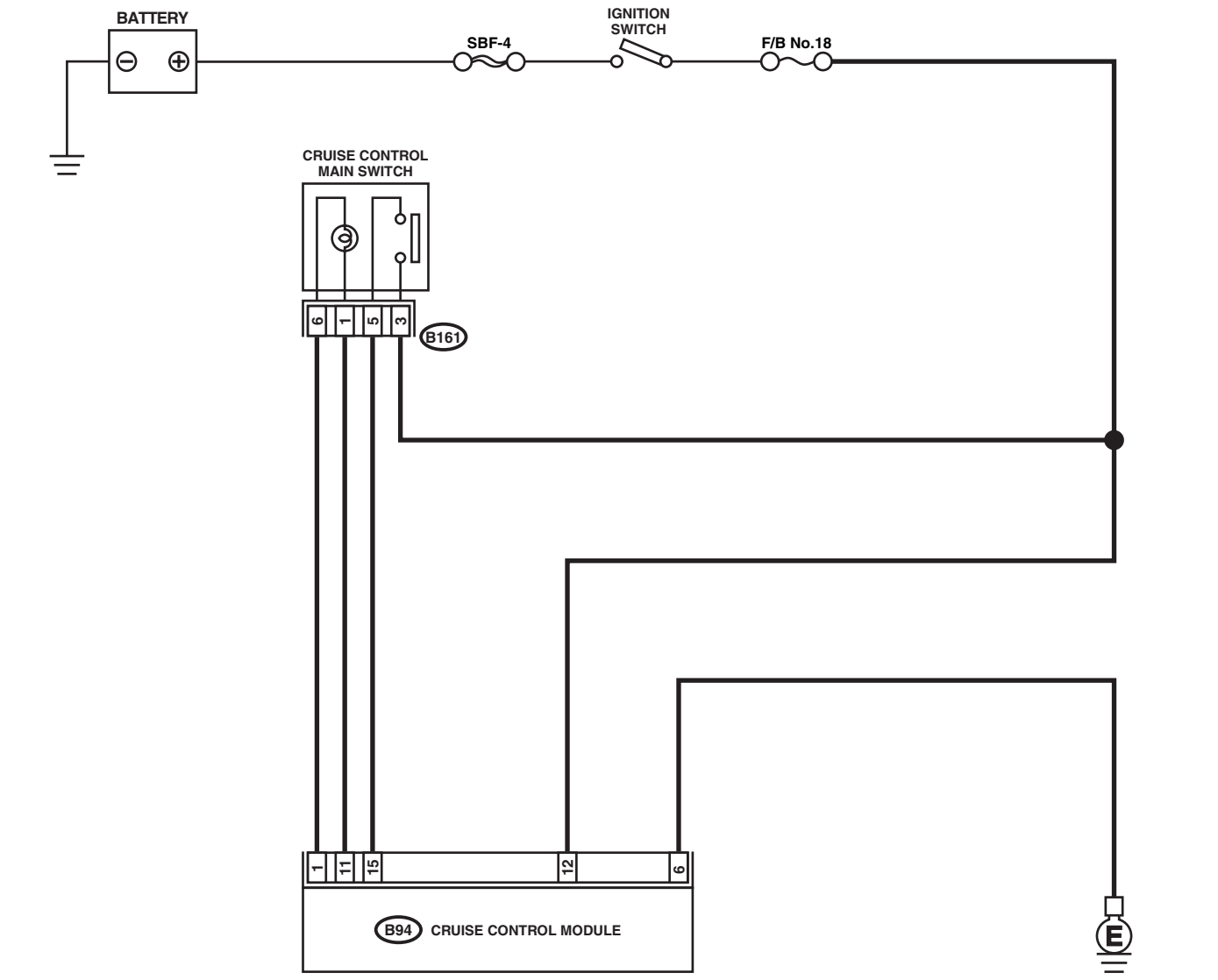
Cruise control main switch is not turned ON and cruise control cannot be set.

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 sound.

This operation sound will be heard when the ignition switch and cruise control main switch is turned to ON.

WIRING DIAGRAM:



B161

1	2
3	4
5	6

B94

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20

DIAGNOSTICS CHART WITH SYMPTOM

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK CRUISE CONTROL MAIN SWITCH CIRCUIT. 1) Turn the ignition switch to OFF. 2) Disconnect the cruise control main switch harness connector. 3) Turn the ignition switch to ON. 4) Measure the voltage between harness connector terminal and chassis ground. <i>Connector & terminal</i> <i>(B161) No. 3 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Go to step 2.	<ul style="list-style-type: none"> • Check the fuse No. 18 (in fuse & relay box). • Check the harness for open or short between cruise control main switch and fuse & relay box.
2 CHECK CRUISE CONTROL MAIN SWITCH CIRCUIT. 1) Turn the ignition switch OFF. 2) Disconnect the cruise control module harness connector. 3) Measure the resistance between cruise control module harness connector terminal and cruise control main switch harness connector terminal. <i>Connector & terminal</i> <i>(B94) No. 15 — (B161) No. 5:</i> <i>(B94) No. 1 — (B161) No. 6:</i> <i>(B94) No. 11 — (B161) No. 1:</i>	Is the resistance less than 10 Ω ?	Go to step 3.	Repair the harness.
3 CHECK CRUISE CONTROL MAIN SWITCH. Remove and check the cruise control main switch. <Ref. to CC-5, Cruise Control Main Switch.>	Is the cruise control main switch OK?	Replace the cruise control module.	Replace the cruise control main switch.

DIAGNOSTICS CHART WITH SYMPTOM

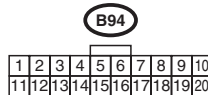
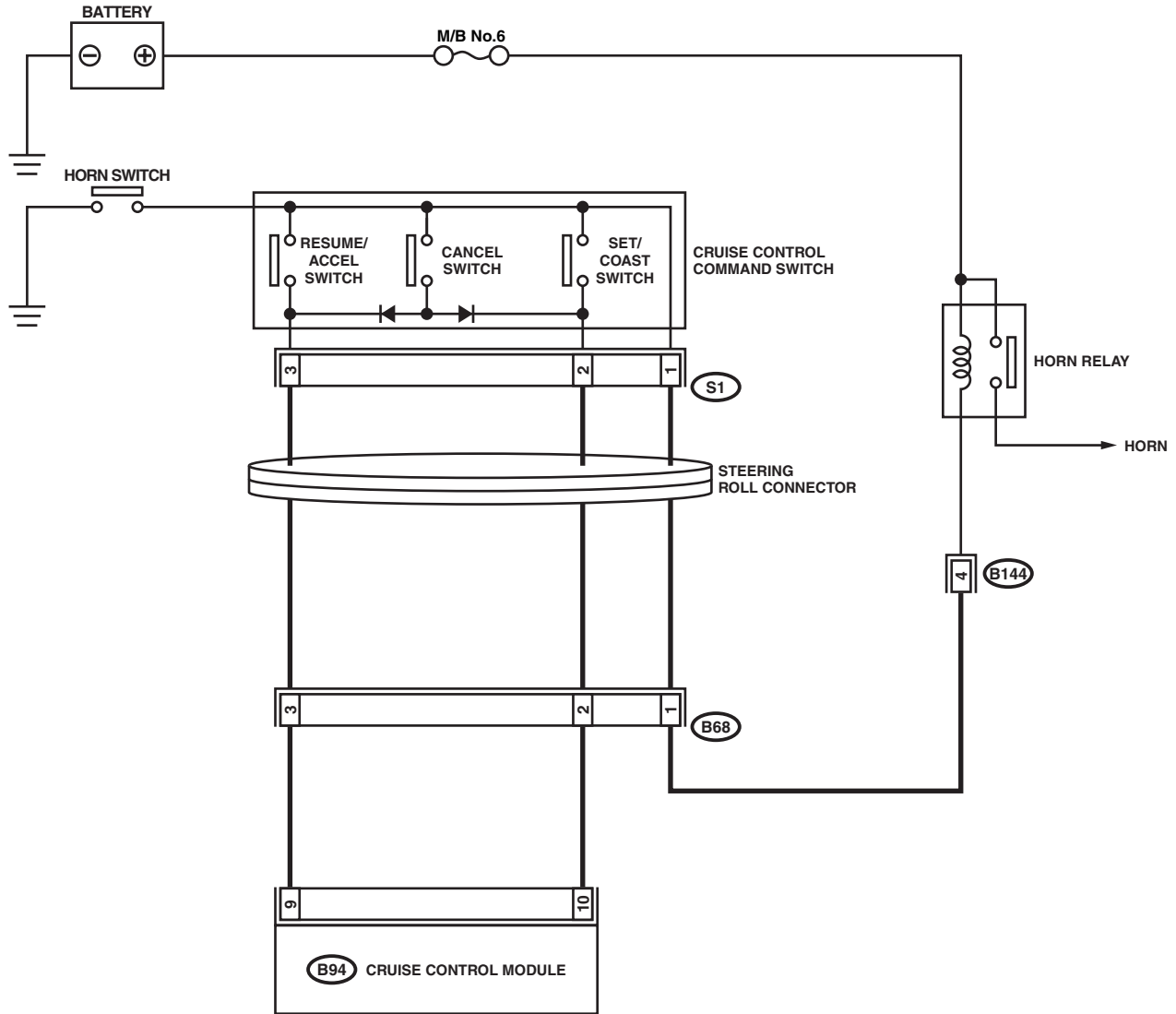
CRUISE CONTROL SYSTEM (DIAGNOSTICS)

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) Turn the ignition switch to OFF. 2) Disconnect the cruise control module harness connector. 3) Measure the 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 the 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 the 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 the horn operation.	Does the horn sound?	Go to step 5.	<ul style="list-style-type: none"> • Check the fuse No. 6 (in main fuse box). • Check the horn relay. <Ref. to COM-3, HORN RELAY, INSPECTION, Horn System.> • Check the harness for open or short between cruise control command switch and fuse & relay box.
5 CHECK CRUISE CONTROL COMMAND SWITCH. Remove and check the cruise control command switch. <Ref. to CC-6, Cruise Control Command Switch.>	Is the cruise control command switch OK?	Check the harness between cruise control command switch and cruise control module.	Replace the cruise control command switch.

DIAGNOSTICS CHART WITH SYMPTOM

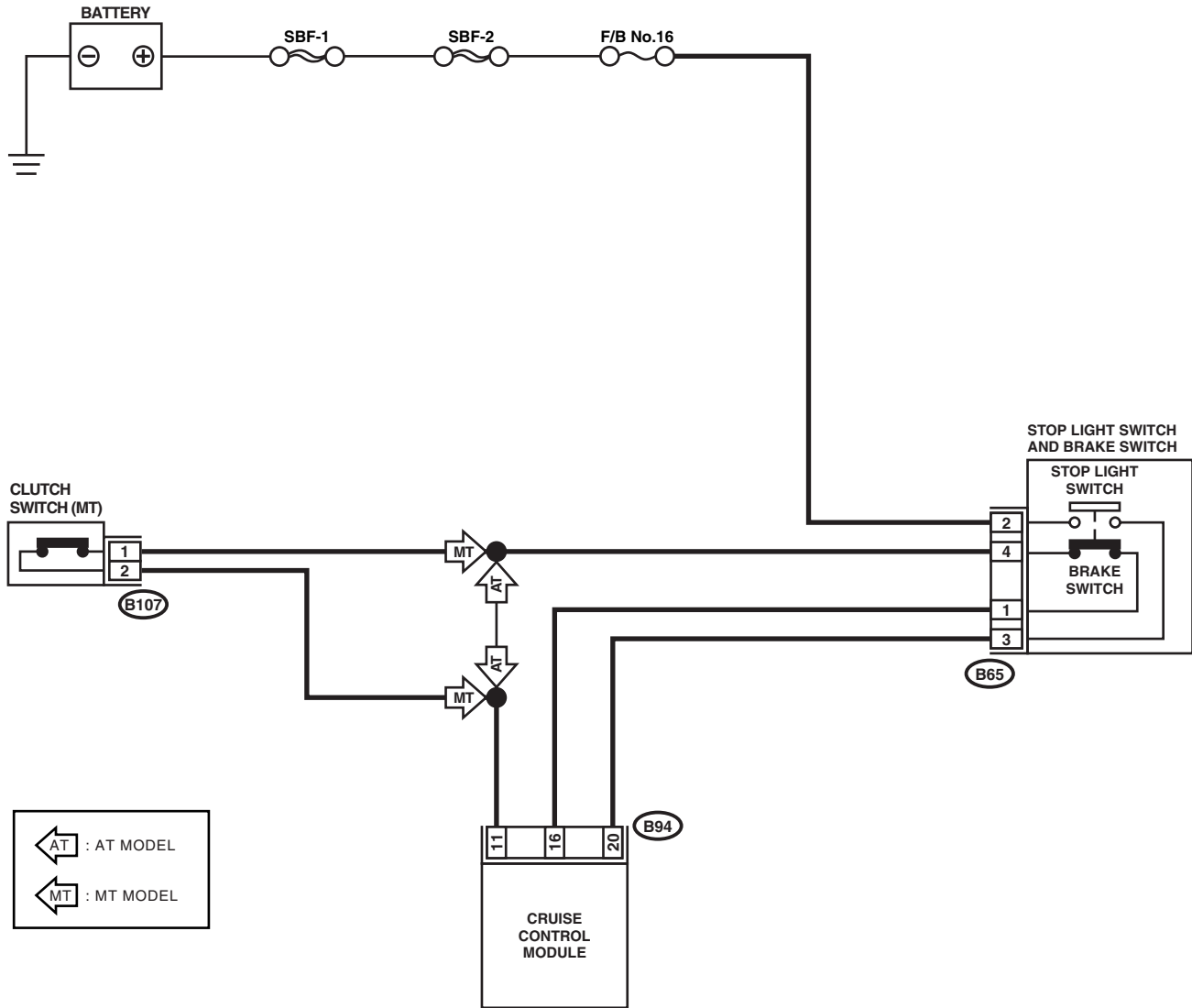
CRUISE CONTROL SYSTEM (DIAGNOSTICS)

E: CHECK STOP LIGHT SWITCH AND BRAKE SWITCH

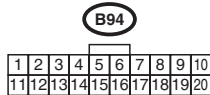
TROUBLE SYMPTOM:

Cruise control cannot be set.

WIRING DIAGRAM:



← AT : AT MODEL
 ← MT : MT MODEL



DIAGNOSTICS CHART WITH SYMPTOM

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK STOP LIGHT SWITCH AND BRAKE SWITCH CIRCUIT. 1) Turn the ignition switch to OFF. 2) Disconnect the stop light switch and brake switch harness connector. 3) Turn the ignition switch to ON. 4) Turn the cruise control main switch to ON. 5) Measure the voltage between harness connector terminal and chassis ground. <i>Connector & terminal</i> <i>(B65) No. 2 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Go to step 2.	<ul style="list-style-type: none"> • Check the fuse No. 16 (in fuse & relay box). • Check the harness for open or short between stop light/brake switch and fuse & relay box.
2 CHECK STOP LIGHT SWITCH AND BRAKE SWITCH CIRCUIT. Measure the voltage between harness connector terminal and chassis ground. <i>Connector & terminal</i> <i>(B65) No. 4 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Go to step 3.	<ul style="list-style-type: none"> • Check the harness for open or short between stop light/brake switch and cruise control module (AT). • Check the clutch switch and circuit (MT).
3 CHECK STOP LIGHT SWITCH AND BRAKE SWITCH CIRCUIT. 1) Turn the cruise control main switch and ignition switch to OFF. 2) Disconnect the cruise control module harness connector. 3) Measure the resistance between cruise control module harness connector terminal and stop light switch and brake switch harness connector terminal. <i>Connector & terminal</i> <i>(B94) No. 20 — (B65) No. 3:</i> <i>(B94) No. 16 — (B65) No. 1:</i>	Is the resistance less than 10 Ω ?	Go to step 4.	Repair the harness.
4 CHECK STOP LIGHT SWITCH AND BRAKE SWITCH. Remove and check the stop light switch and brake switch. <Ref. to CC-7, Stop and Brake Switch.>	Are the stop light switch and brake switch OK?	Stop light switch and brake switch circuit are OK.	Replace the stop light switch and brake switch.

DIAGNOSTICS CHART WITH SYMPTOM

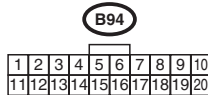
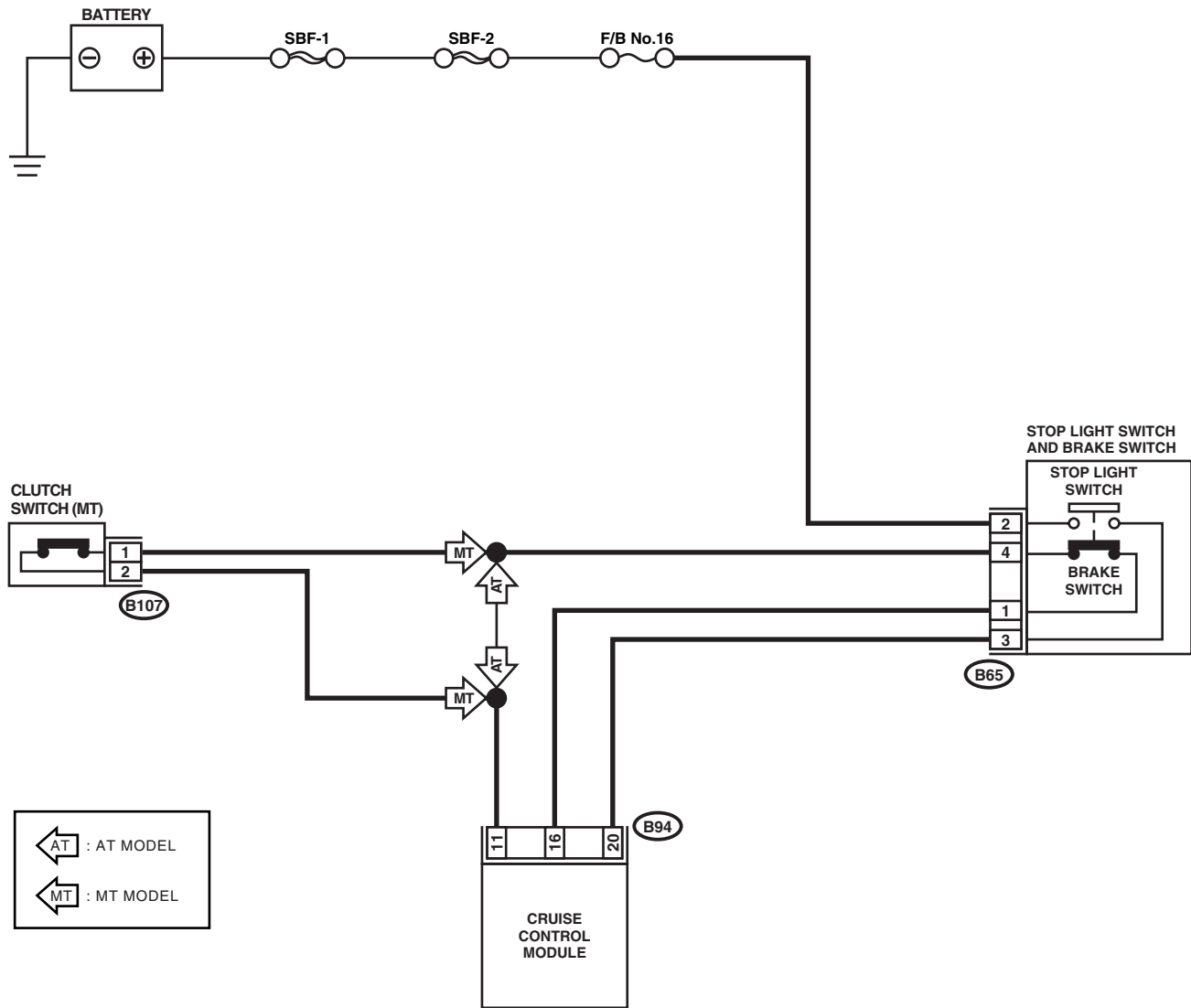
CRUISE CONTROL SYSTEM (DIAGNOSTICS)

F: CHECK CLUTCH SWITCH (MT)

TROUBLE SYMPTOM:

Cruise control cannot be set.

WIRING DIAGRAM:



DIAGNOSTICS CHART WITH SYMPTOM

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK CLUTCH SWITCH CIRCUIT. 1) Turn the ignition switch to OFF. 2) Disconnect the clutch switch harness connector. 3) Turn the ignition switch to ON. 4) Turn the cruise control main switch to ON. 5) Measure the 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 the harness for open or short between clutch switch and cruise control module.
2 CHECK CLUTCH SWITCH CIRCUIT. 1) Turn the cruise control main switch and ignition switch OFF. 2) Disconnect the stop light switch and brake switch harness connector. 3) Measure the 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 the harness.
3 CHECK CLUTCH SWITCH. Remove and check the clutch switch. <Ref. to CC-8, Clutch Switch.>	Is the clutch switch OK?	Clutch switch circuit is OK.	Replace the clutch switch.

DIAGNOSTICS CHART WITH SYMPTOM

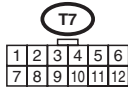
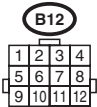
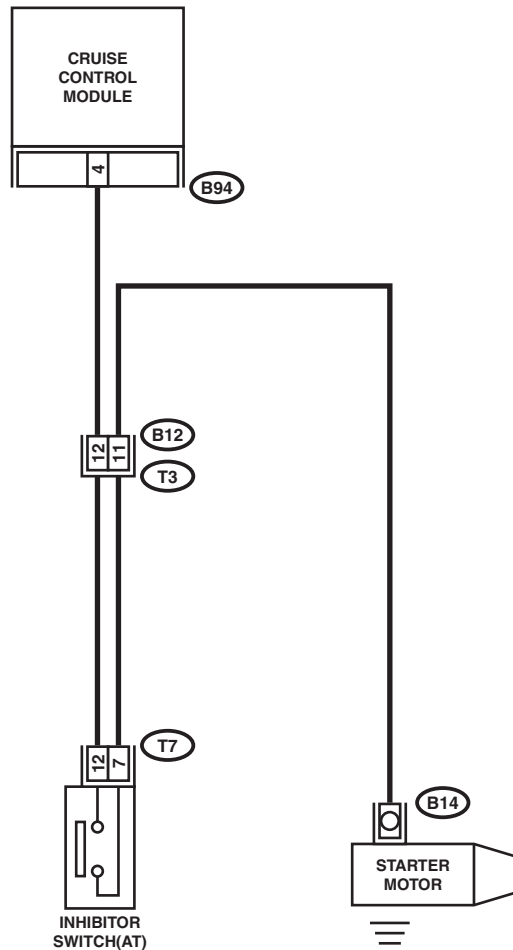
CRUISE CONTROL SYSTEM (DIAGNOSTICS)

G: CHECK INHIBITOR SWITCH (AT)

TROUBLE SYMPTOM:

Cruise control cannot be set.

WIRING DIAGRAM:



BO0133

DIAGNOSTICS CHART WITH SYMPTOM

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK INHIBITOR SWITCH CIRCUIT. 1) Turn the ignition switch to OFF. 2) Disconnect the inhibitor switch harness connector. 3) Turn the ignition switch to ON. 4) Turn the cruise control main switch to ON. 5) Measure the voltage between harness connector terminal and chassis ground. <i>Connector & terminal</i> <i>(T7) No. 12 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Go to step 2.	Check the harness for open or short between inhibitor switch and cruise control module.
2 CHECK INHIBITOR SWITCH CIRCUIT. 1) Turn the cruise control main switch and ignition switch to OFF. 2) Disconnect the starter motor harness connector. 3) Measure the resistance between inhibitor switch harness connector terminal and chassis ground. <i>Connector & terminal</i> <i>(T7) No. 7 — (B14) No. 1:</i>	Is the resistance less than 10 Ω ?	Go to step 3.	Repair the harness.
3 CHECK INHIBITOR SWITCH. Remove and check the inhibitor switch. <Ref. to CC-9, Inhibitor Switch.>	Is the inhibitor switch OK?	Inhibitor switch circuit is OK.	Replace the inhibitor switch.

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

7. List of Diagnostic Trouble Code (DTC)

A: LIST

DTC	Item	Contents of diagnosis	Reference
21	Inner relay is seized.	Cruise control module inner relay is seized when main switch is OFF.	<Ref. to CC-29, DTC 21, 24, 25 AND 2A CRUISE CONTROL MODULE BUILT-IN RELAY, CPU RAM, Diagnostics Chart with Trouble Code.>
22	Vehicle speed sensor	Vehicle speed signal changes more than 10 km/h (6 MPH) within 350 ms.	<Ref. to CC-30, DTC 22 VEHICLE SPEED SENSOR, Diagnostics Chart with Trouble Code.>
24	Cruise control module is abnormal.	Two vehicle speed values stored in cruise control module memory are not the same.	<Ref. to CC-29, DTC 21, 24, 25 AND 2A CRUISE CONTROL MODULE BUILT-IN RELAY, CPU RAM, Diagnostics Chart with Trouble Code.>
25	Cruise control module is abnormal.	Two output values stored in cruise control module memory are not the same.	<Ref. to CC-29, DTC 21, 24, 25 AND 2A CRUISE CONTROL MODULE BUILT-IN RELAY, CPU RAM, Diagnostics Chart with Trouble Code.>
28	Wiring harness opened.	Open wiring harness circuit is detected via control module relay when main switch is ON.	<Ref. to CC-33, DTC 28 WIRING HARNESS OPENED., Diagnostics Chart with Trouble Code.>
35	Motor drive system is abnormal.	<ul style="list-style-type: none"> • Motor output circuit is open or shorted. • Motor drive circuit is open or shorted. 	<Ref. to CC-34, DTC 35 AND 36 ACTUATOR MOTOR, Diagnostics Chart with Trouble Code.>
36	Trouble of motor turning speed	Motor turning speed is low.	<Ref. to CC-34, DTC 35 AND 36 ACTUATOR MOTOR, Diagnostics Chart with Trouble Code.>
37	Motor clutch drive system is abnormal.	<ul style="list-style-type: none"> • Motor clutch output circuit is open or shorted. • Motor clutch drive circuit is open or shorted. 	<Ref. to CC-36, DTC 37 ACTUATOR MOTOR CLUTCH, Diagnostics Chart with Trouble Code.>
38	Motor drive shaft does not engage properly.	Motor drive gear engagement is not properly adjusted.	<Ref. to CC-38, DTC 38 MOTOR DRIVE SHAFT DOES NOT ENGAGE PROPERLY., Diagnostics Chart with Trouble Code.>
39	Motor is overloaded.	Current flows through motor more frequently than under normal conditions.	<Ref. to CC-38, DTC 39 MOTOR IS OVERLOADED., Diagnostics Chart with Trouble Code.>
2A	Cruise control module is abnormal.	Cruise control module self-diagnosis function senses abnormality.	<Ref. to CC-29, DTC 21, 24, 25 AND 2A CRUISE CONTROL MODULE BUILT-IN RELAY, CPU RAM, Diagnostics Chart with Trouble Code.>

8. Diagnostics Chart with Trouble Code

A: DTC 21, 24, 25 AND 2A CRUISE CONTROL MODULE BUILT-IN RELAY, CPU RAM

DIAGNOSIS:

- Poor welding of built-in relay of cruise control module.
- Failure of built-in CPU RAM of cruise control module.

TROUBLE SYMPTOM:

- Cruise control is canceled and memorized cruise speed is also canceled.
- Once cruise control is canceled, cruise control cannot be set until the ignition switch and cruise control main switch turns OFF, and then turns ON again.

NOTE:

Check input/output signal and vehicle speed signal with select monitor. When signals are in good condition, failure is in cruise control module. (Check the power supply and ground conditions of cruise control module.)

DIAGNOSTICS CHART WITH TROUBLE CODE

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

B: DTC 22 VEHICLE SPEED SENSOR

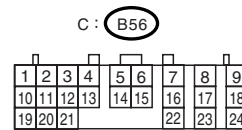
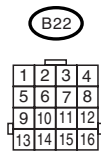
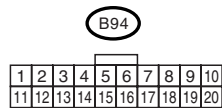
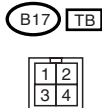
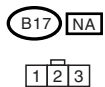
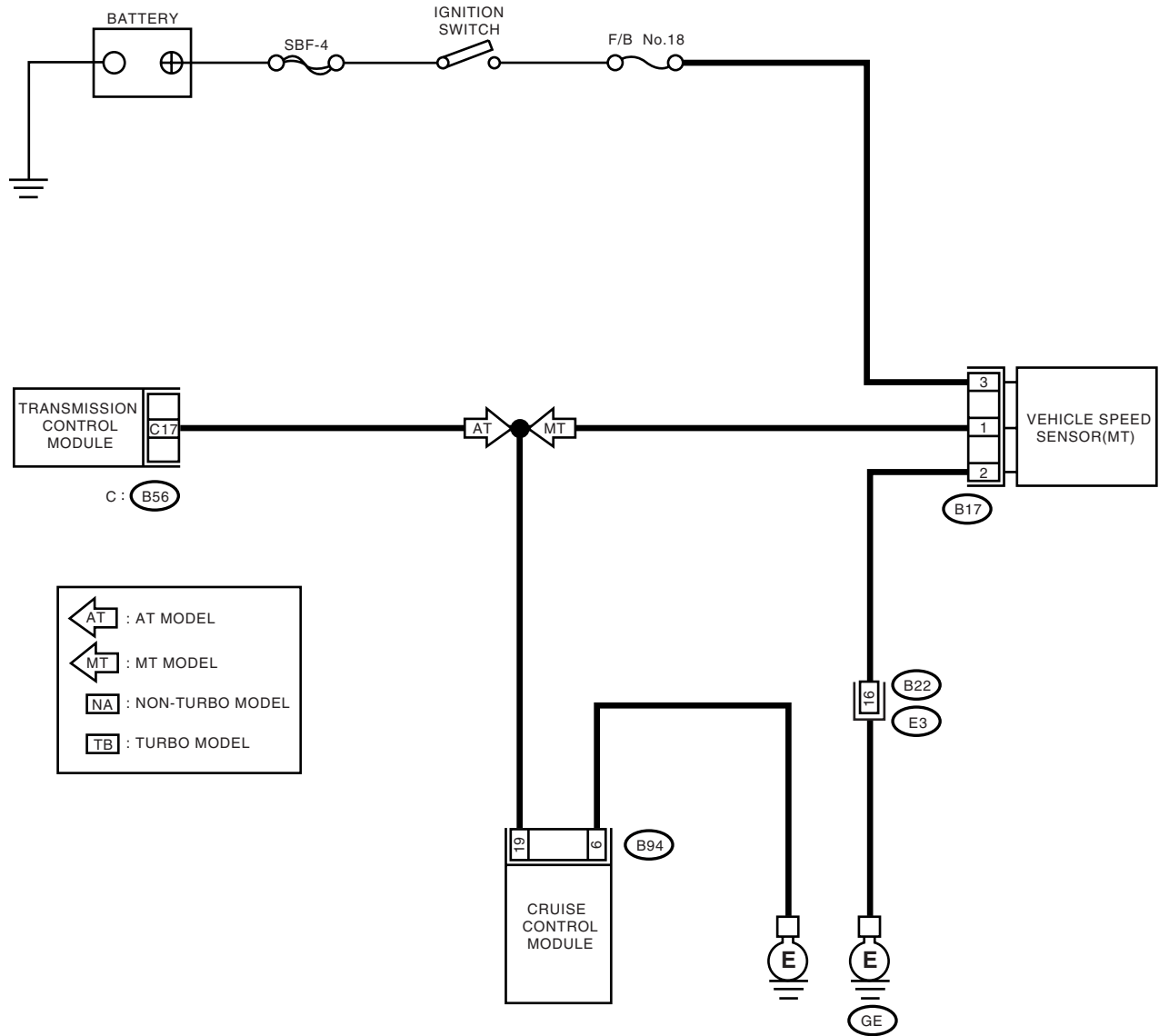
DIAGNOSIS:

Disconnection or short circuit of vehicle speed sensor system.

TROUBLE SYMPTOM:

Cruise control cannot be set. (Cancelled immediately.)

WIRING DIAGRAM:



DIAGNOSTICS CHART WITH TROUBLE CODE

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

Step	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) Turn the ignition switch to OFF. 2) Disconnect the harness connector from vehicle speed sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between vehicle speed sensor harness connector terminal and chassis ground. Connector & terminal (B17) No. 3 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 3.	Check the harness for open or short between fuse and vehicle speed sensor.
3	CHECK HARNESS BETWEEN CRUISE CONTROL MODULE AND VEHICLE SPEED SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the harness connector from cruise control module. 3) Measure the resistance between vehicle speed sensor harness connector terminal and cruise control module harness connector terminal. Connector & terminal (B17) No. 1 — (B94) No. 19:	Is the resistance less than 10 Ω ?	Go to step 4.	Repair the harness.
4	CHECK HARNESS BETWEEN VEHICLE SPEED SENSOR AND ENGINE GROUND. 1) Turn the ignition switch to OFF. 2) Measure the resistance between vehicle speed sensor harness connector terminal and engine ground. Connector & terminal (B17) No. 2 — Engine ground:	Is the resistance less than 10 Ω ?	Go to step 5.	Repair the harness.
5	CHECK VEHICLE SPEED SENSOR. 1) Connect the harness connector to vehicle speed sensor. 2) 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 the 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 the cruise control module. <Ref. to CC-4, Cruise Control Module.>	Replace the vehicle speed sensor.

DIAGNOSTICS CHART WITH TROUBLE CODE

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
<p>6</p> <p>CHECK HARNESS BETWEEN CRUISE CONTROL MODULE AND TRANSMISSION CONTROL MODULE.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the harness connector from transmission control module and cruise control module. 3) Measure the resistance between cruise control module harness connector terminal and transmission control module harness connector terminal.</p> <p>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 2 mm (0.08 in).</p> <p><i>Connector & terminal (B94) No. 19 — (B56) No. 17:</i></p>	<p>Is the resistance less than 10 Ω?</p>	<p>Go to step 7.</p>	<p>Repair the harness.</p>
<p>7</p> <p>CHECK TRANSMISSION CONTROL MODULE.</p> <p>1) Connect the harness connector to transmission control module. 2) Lift-up the vehicle and support with safety stands.</p> <p>Warning: Be careful not to be caught by the running wheels.</p> <p>3) Drive the vehicle faster than 10 km/h (6 MPH). 4) Measure the voltage between transmission control module harness connector terminal and chassis ground.</p> <p>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 2 mm (0.08 in).</p> <p><i>Connector & terminal (B56) No. 17 (+) — Chassis ground (-):</i></p>	<p>Is the voltage less than 1 V \leftrightarrow more than 4 V?</p>	<p>Replace the cruise control module. <Ref. to CC-4, Cruise Control Module.></p>	<p>Replace the transmission control module. <Ref. to AT-46, Transmission Control Module (TCM).></p>

DIAGNOSTICS CHART WITH TROUBLE CODE

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

C: DTC 28 WIRING HARNESS OPENED.

	Step	Check	Yes	No
1	CHECK BATTERY. Measure the battery specific gravity of electrolyte.	Is the battery specific gravity more than 1.250?	Go to step 2.	Charge or replace the battery. Go to step 2.
2	CHECK FUSES, CONNECTORS AND HARNESES. 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 the faulty parts.	End of inspection.

DIAGNOSTICS CHART WITH TROUBLE CODE

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

D: DTC 35 AND 36 ACTUATOR MOTOR

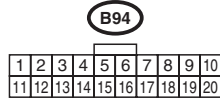
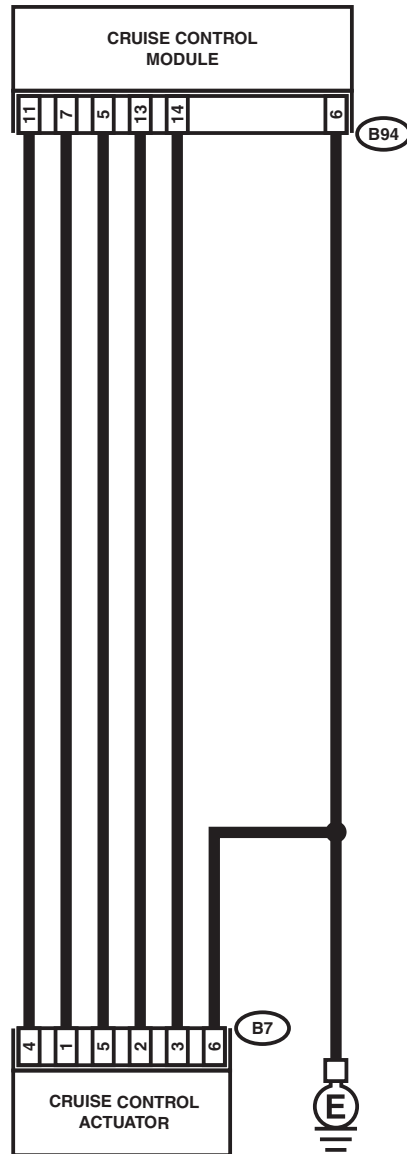
DIAGNOSIS:

Open or poor contact of cruise control actuator motor.

TROUBLE SYMPTOM:

Cruise control cannot be set. (Cancelled immediately.)

WIRING DIAGRAM:



B6M1616

DIAGNOSTICS CHART WITH TROUBLE CODE

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK POWER SUPPLY. 1) Turn the ignition switch to OFF. 2) Disconnect the harness connector from cruise control actuator. 3) Turn the ignition switch to ON. 4) Turn the cruise control main switch to ON. 5) Measure the voltage between cruise control actuator harness connector terminal and chassis ground. <i>Terminals</i> <i>(B7) No. 4 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Go to step 2.	Check the harness for open or short between cruise control module and cruise control actuator.
2 CHECK GROUND CIRCUIT OF ACTUATOR. 1) Turn the ignition switch and cruise control main switch to OFF. 2) Measure the resistance between cruise control actuator harness connector terminal and chassis ground. <i>Terminals</i> <i>(B7) No. 6 — Chassis ground:</i>	Is the resistance less than 10 Ω ?	Go to step 3.	Repair the harness.
3 MEASURE RESISTANCE OF ACTUATOR. Measure the resistance of cruise control actuator motor. <i>Terminals</i> <i>No. 4 — No. 1:</i> <i>No. 4 — No. 2:</i> <i>No. 4 — No. 5:</i>	Is the resistance approximately 5 Ω ?	Go to step 4.	Replace the cruise control actuator. <Ref. to CC-3, Actuator.>
4 CHECK HARNESS BETWEEN ACTUATOR AND CRUISE CONTROL MODULE. 1) Disconnect the harness connector from cruise control module. 2) Measure the resistance between cruise control module harness connector terminal and cruise control actuator harness connector terminal. <i>Connector & terminal</i> <i>(B7) No. 1 — (B94) No. 7:</i>	Is the resistance less than 10 Ω ?	Go to step 5.	Repair the harness.
5 CHECK HARNESS BETWEEN ACTUATOR AND CRUISE CONTROL MODULE. Measure the resistance between cruise control module harness connector terminal and cruise control actuator harness connector terminal. <i>Connector & terminal</i> <i>(B7) No. 5 — (B94) No. 5:</i>	Is the resistance less than 10 Ω ?	Replace the cruise control module. <Ref. to CC-4, Cruise Control Module.>	Repair the harness.

DIAGNOSTICS CHART WITH TROUBLE CODE

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

E: DTC 37 ACTUATOR MOTOR CLUTCH

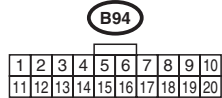
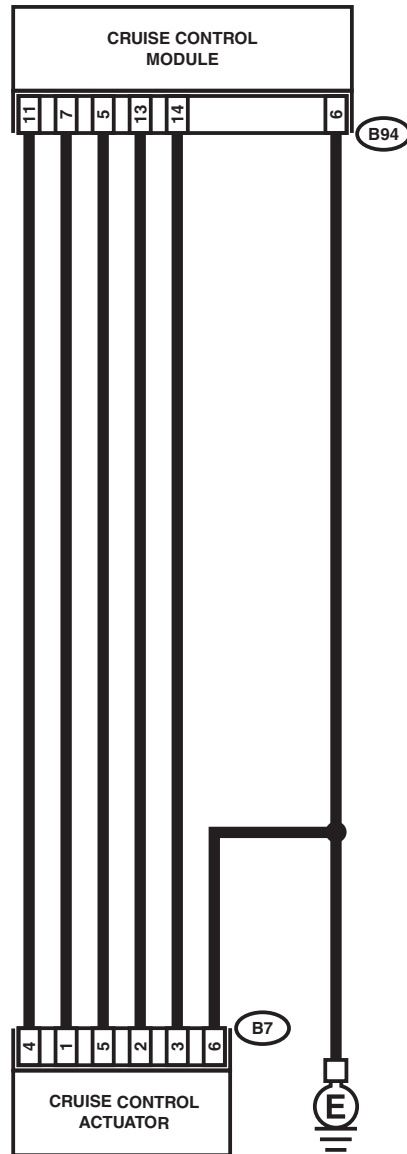
DIAGNOSIS:

Open or poor contact of cruise control actuator motor clutch.

TROUBLE SYMPTOM:

Cruise control cannot be set. (Cancelled immediately.)

WIRING DIAGRAM:



DIAGNOSTICS CHART WITH TROUBLE CODE

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK POWER SUPPLY. 1) Turn the ignition switch to OFF. 2) Disconnect the harness connector from cruise control actuator. 3) Turn the ignition switch to ON. 4) Turn the cruise control main switch to ON. 5) Measure the voltage between cruise control actuator harness connector terminal and chassis ground. <i>Terminals</i> <i>(B7) No. 4 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Go to step 2.	Check the harness for open or short between cruise control module and cruise control actuator.
2 CHECK GROUND CIRCUIT OF ACTUATOR. 1) Turn the ignition switch and cruise control main switch to OFF. 2) Measure the resistance between cruise control actuator harness connector terminal and chassis ground. <i>Terminals</i> <i>(B7) No. 6 — Chassis ground:</i>	Is the resistance less than 10 Ω ?	Go to step 3.	Repair the harness.
3 MEASURE RESISTANCE OF ACTUATOR CLUTCH. Measure the resistance of cruise control actuator clutch. <i>Terminals</i> <i>No. 3 — No. 6:</i>	Is the resistance approx. 39 Ω ?	Go to step 4.	Replace the cruise control actuator. <Ref. to CC-3, Actuator.>
4 CHECK HARNESS BETWEEN ACTUATOR AND CRUISE CONTROL MODULE. 1) Disconnect the harness connector from cruise control module. 2) Measure the resistance between cruise control module harness connector terminal and cruise control actuator harness connector terminal. <i>Connector & terminal</i> <i>(B7) No. 2 — (B94) No. 13:</i>	Is the resistance less than 10 Ω ?	Go to step 5.	Repair the harness.
5 CHECK HARNESS BETWEEN ACTUATOR AND CRUISE CONTROL MODULE. Measure the resistance between cruise control module harness connector terminal and cruise control actuator harness connector terminal. <i>Connector & terminal</i> <i>(B7) No. 3 — (B94) No. 14:</i>	Is the resistance less than 10 Ω ?	Replace the cruise control module. <Ref. to CC-4, Cruise Control Module.>	Repair the harness.

DIAGNOSTICS CHART WITH TROUBLE CODE

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

F: DTC 38 MOTOR DRIVE SHAFT DOES NOT ENGAGE PROPERLY.

	Step	Check	Yes	No
1	CHECK ACTUATOR MOTOR. 1)Turn the ignition switch to OFF. 2)Disconnect the harness connector from cruise control actuator. 3)Remove the cruise control actuator from mounting bracket. 4)Pull the cable by hand to check for looseness or status of inner gear engagement.	Are foreign particles caught in the inner gear or does inner gear engage and disengage improperly?	Replace the cruise control actuator. <Ref. to CC-3, Actuator.>	Check the cruise control cable adjustment.<Ref. to CC-5, CABLE FREE PLAY, General Description.>

G: DTC 39 MOTOR IS OVERLOADED.

	Step	Check	Yes	No
1	CHECK THE OPERATING CURRENT TO ACTUATOR MOTOR. 1)Connect the 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 the current more than 10A?	Replace the 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

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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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 symptom.

3. PROBABLE CAUSE OF TROUBLE

Look at the wiring diagram and check 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

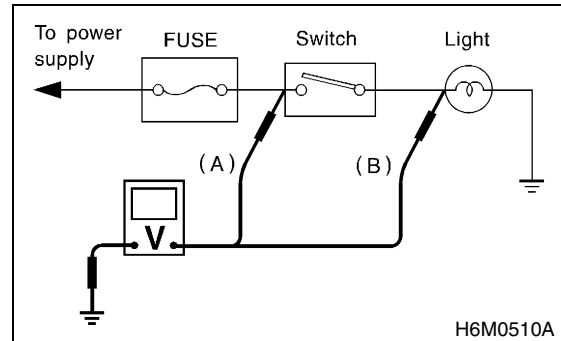
1. VOLTAGE MEASUREMENT

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 the 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 malfunction.

BASIC DIAGNOSTICS PROCEDURE

WIRING SYSTEM

2. CIRCUIT CONTINUITY CHECKS

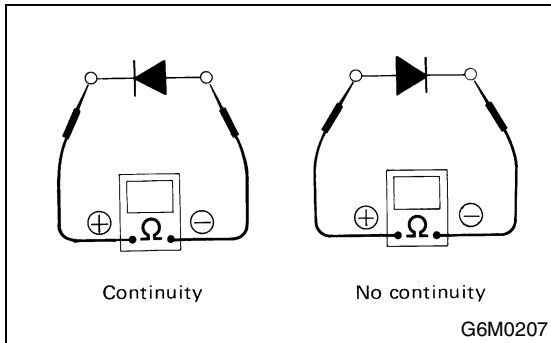
1) Disconnect the battery cable or connector so there is no voltage between check points.

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 the diode continuity. When contacting the negative lead to diode positive side and positive lead to negative side, there should be continuity.

When contacting the two leads in reverse, there should be no continuity.



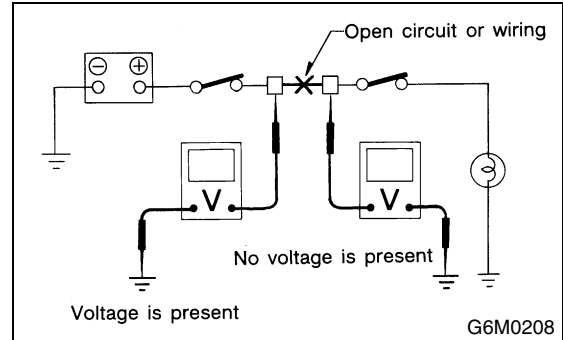
3) Symbol “○—○” indicates that continuity exists between two points or terminals. For example, when a switch position is “3”, continuity exists among terminals 1, 3 and 6, as shown in table below.

Terminal	1	2	3	4	5	6
Switch Position						
OFF						
1	○—○				○—○	
2	○—○			○—○		○—○
3	○—○		○—○			○—○
4	○—○	○—○				○—○

3. HOW TO DETERMINE AN OPEN CIRCUIT

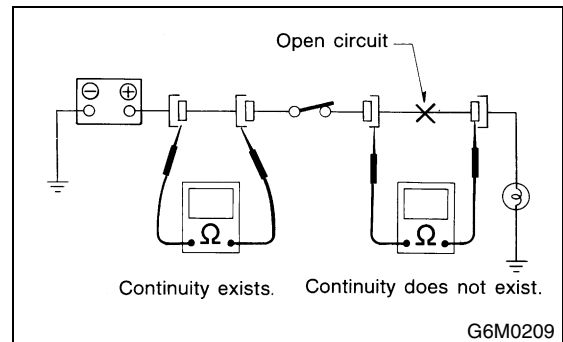
1) Voltmeter Method:

An open circuit is determined by measuring the voltage between respective connectors and ground using a voltmeter, starting with the connector closest to 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 previous connector is open.



2) Ohmmeter method:

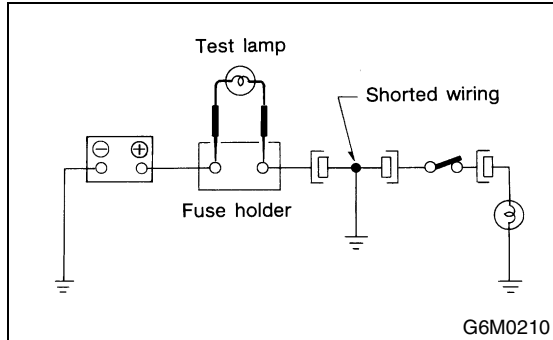
Disconnect all connectors affected, and check the continuity in wiring between adjacent connectors. When the ohmmeter indicates “infinite”, the wiring is open.



4. HOW TO DETERMINE A SHORT CIRCUIT

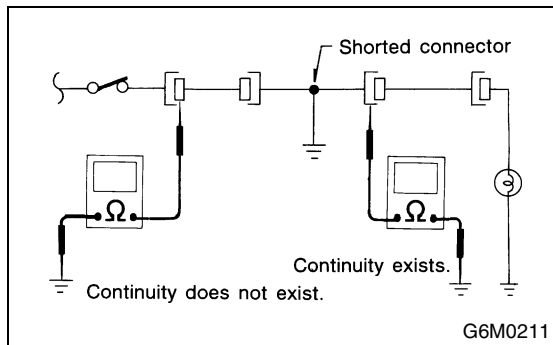
1) Test lamp method:

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 power supply. If the test lamp goes out when a connector is disconnected, the wiring between that connection and next connector (farther from the power supply) is shorted.



2) Ohmmeter method:

Disconnect all affected connectors, and check the continuity between each connector and ground. When the ohmmeter indicates continuity between a particular connector and ground, that the connector is shorted.



BASIC DIAGNOSTICS PROCEDURE

WIRING SYSTEM

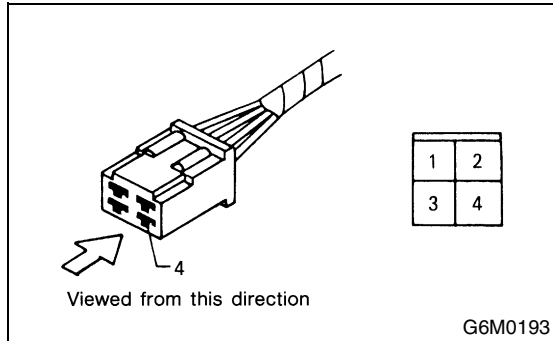
C: HOW TO READ WIRING DIAGRAMS

1. WIRING DIAGRAM

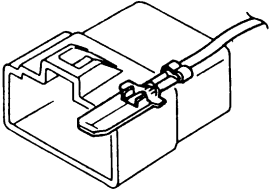
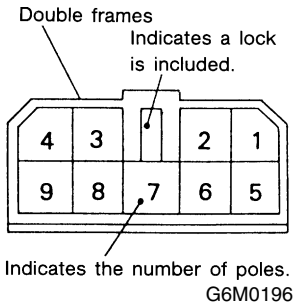
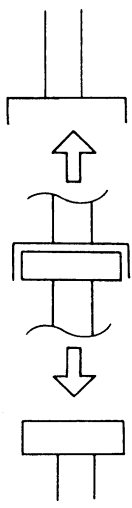
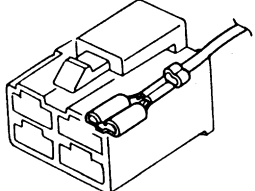
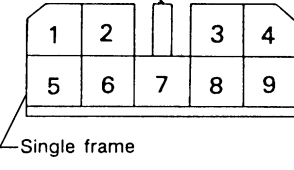
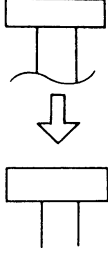
The wiring diagram of each system is illustrated so that you can understand the path through which electric current flows from battery.

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 front.

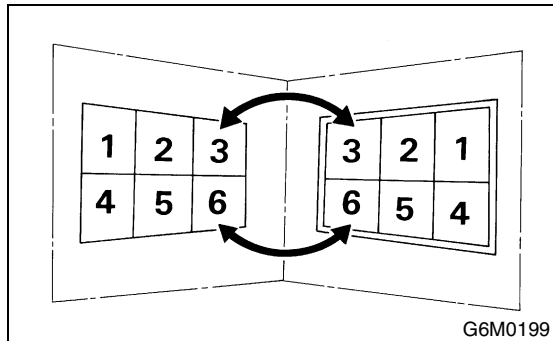


- The number of poles or pins, presence of a lock, and pin number of each terminal are indicated in the sketch of each connector. In the sketch, the highest pole number refers to the number of poles which connector has. For example, the sketch of connector shown in the figure indicates the connector has 9 poles.

Connector used in vehicle	Connector shown in wiring diagram		
	Sketch	Symbol	Number of poles
 G6M0194	 G6M0196		Numbered in order from upper right to lower left.
 G6M0195	 G6M0197		Numbered in order from upper left to lower right.

BASIC DIAGNOSTICS PROCEDURE

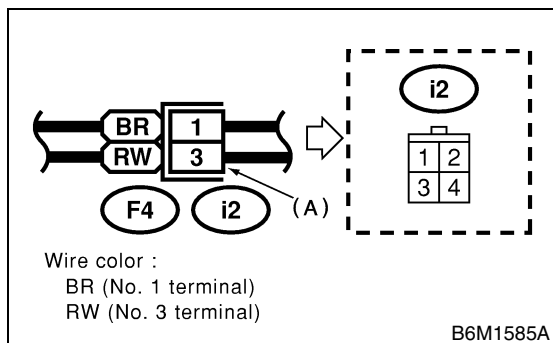
- When one set of connectors is viewed from the front side, the pole numbers of one connector are symmetrical to those of other. When these two connectors are connected as a unit, the poles which have the same number are joined.



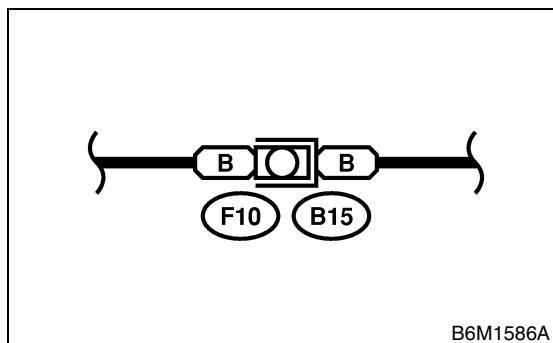
- Electrical wiring harness:**
The connectors are numbered along with the number of poles, external colors, and mating connections in accompanying list.
- The sketch of each connector in the wiring diagram usually shows (A) side of the connector. The relationship between wire color, terminal number and 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.

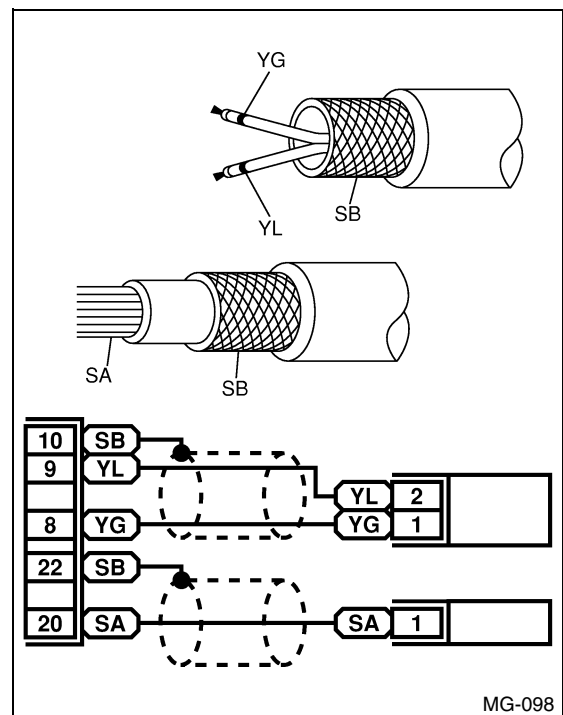


- In wiring diagram, connectors which have no terminal number refer to one-pole types. Sketches of these connectors are omitted intentionally.



- The following color codes are used to indicate the colors of the wires used.

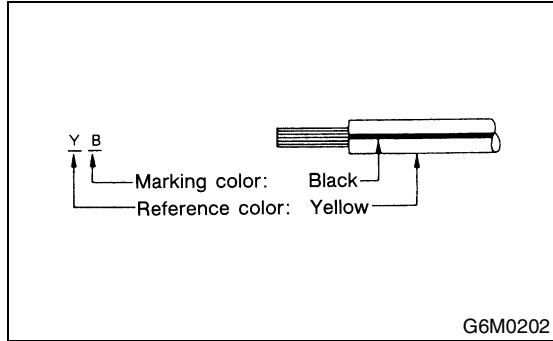
Color code	Color
L	Blue
B	Black
Y	Yellow
G	Green
R	Red
W	White
Br	Brown
Lg	Light green
Gr	Gray
P	Pink
Or	Orange
Lb	Light Blue
V	Violet
SA	Sealed (Inner)
SB	Sealed (Outer)



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 stripe marking by its second letter.



- The table lists the nominal sectional areas and allowable currents of wires.

CAUTION:

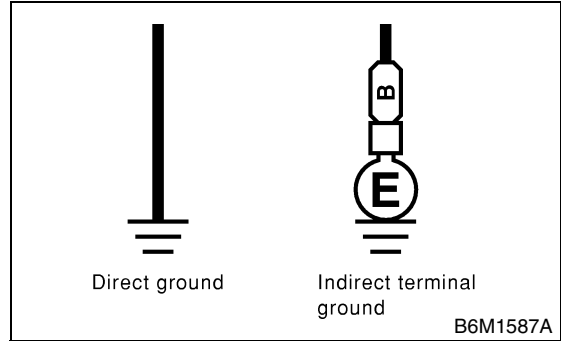
When replacing or repairing a wire, be sure to use the same size and type of wire which was originally used.

NOTE:

- The allowable current in the table indicates tolerable amperage of each wire at an ambient temperature of 40°C (104°F).
- The allowable current changes with ambient temperature. Also, it changes if a bundle of more than two wires is used.

Nominal sectional area mm ²	No. of strands/ strand diameter	Outside diameter of finished wiring mm	Allowable current Amps/ 40°C (104°F)
0.3	7/0.26	1.8	7
0.5	7/0.32	2.2 (or 2.0)	12
0.75	30/0.18	2.6 (or 2.4)	16
0.85	11/0.32	2.4 (or 2.2)	16
1.25	16/0.32	2.7 (or 2.5)	21
2	26/0.32	3.1 (or 2.9)	28
3	41/0.32	3.8 (or 3.6)	38
5	65/0.32	4.6 (or 4.4)	51
8	50/0.45	5.5	67

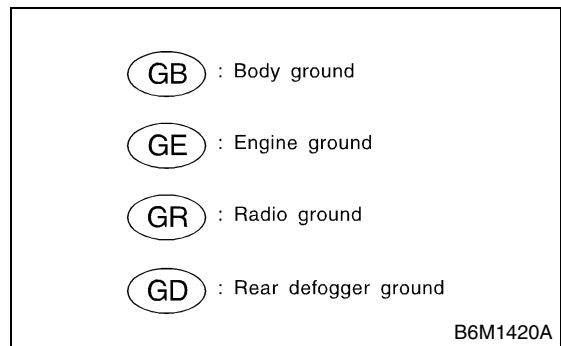
- Each unit is directly grounded to the body or indirectly grounds through a harness ground terminal. Different symbols are used in the wiring diagram to identify the two grounding systems.



- The ground points shown in the wiring diagram refer to the following:

NOTE:

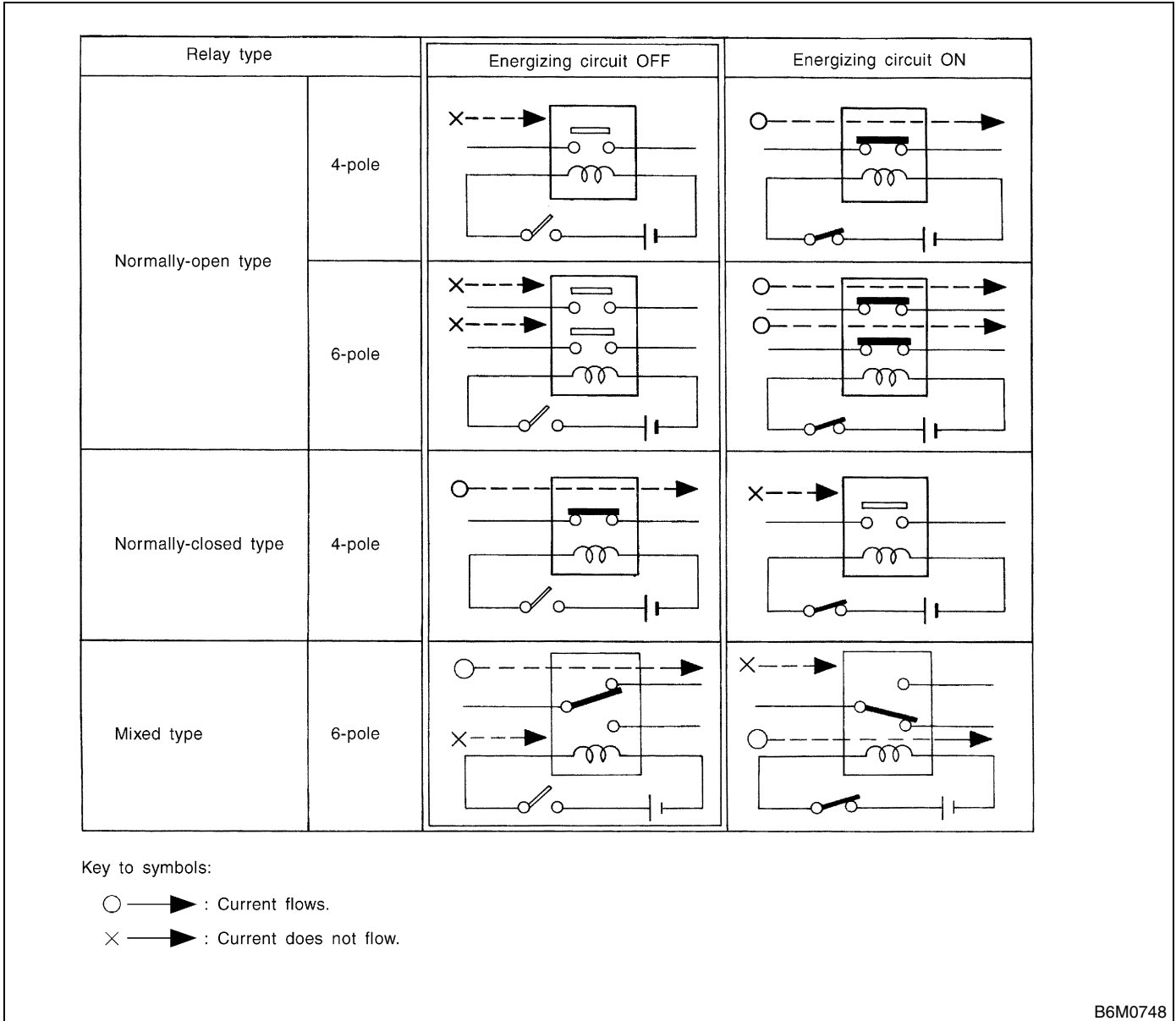
All wiring harnesses are provided with a ground point which should be securely connected.



BASIC DIAGNOSTICS PROCEDURE

- 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 energizing circuit is OFF.



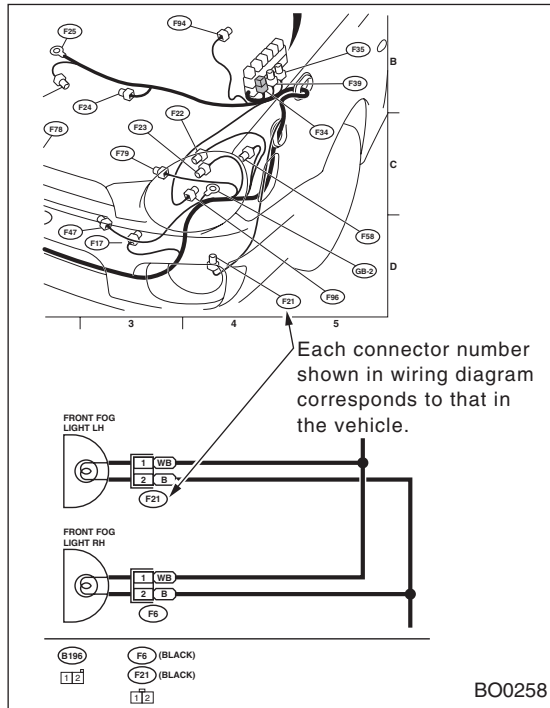
BASIC DIAGNOSTICS PROCEDURE

WIRING SYSTEM

- Each connector number shown in the wiring diagram corresponds to that in wiring harness. The location of each connector in actual vehicle is determined by reading the first character of the connector (for example, a "F" for F8, "I" for I16, etc.) and type of wiring harness.

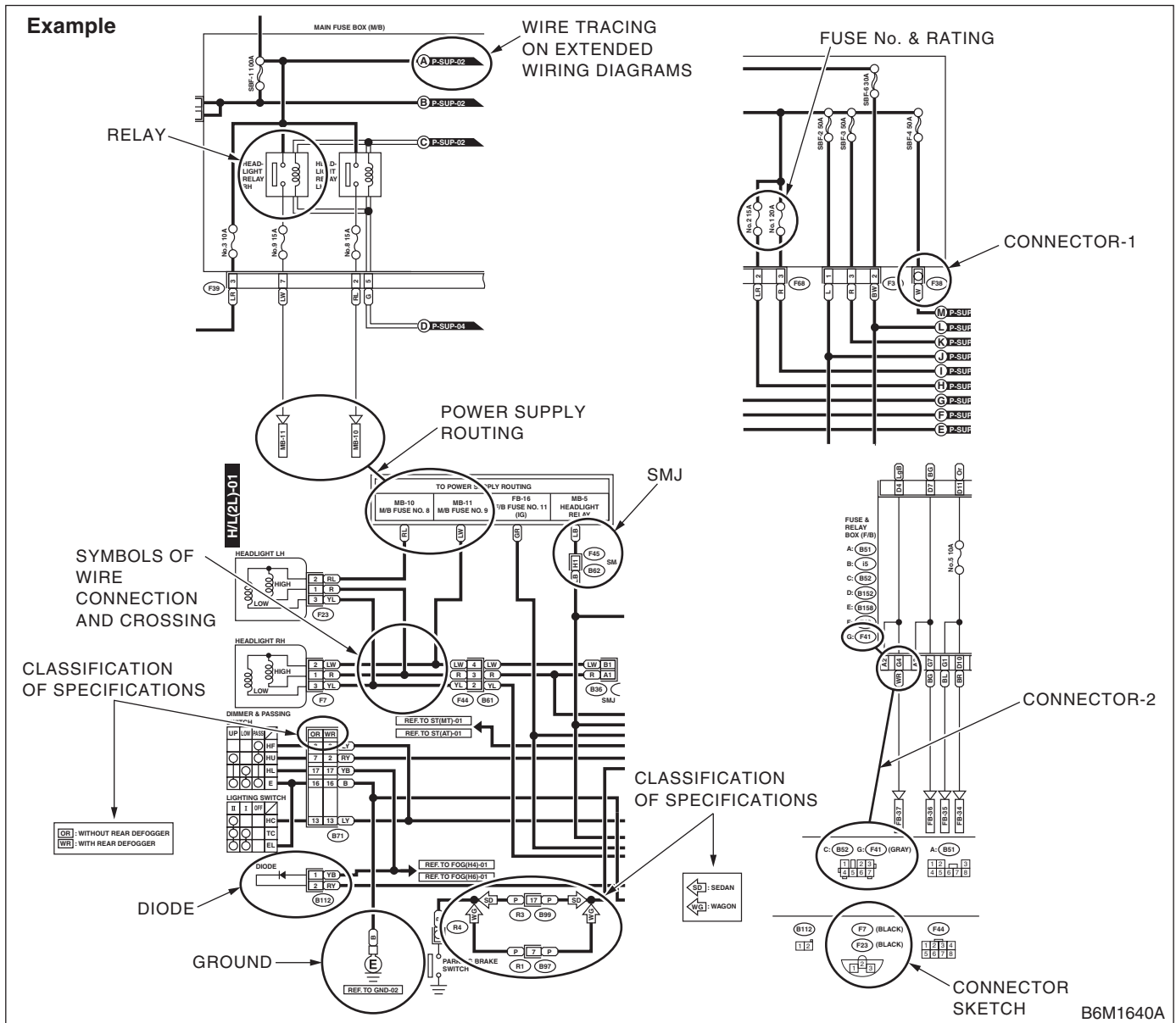
The first character of each connector number refers to the area or system of the vehicle.

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.



1. RELAY

A symbol used to indicate a relay.

2. CONNECTOR-1

The sketch of the connector indicates 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 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.

BASIC DIAGNOSTICS PROCEDURE

WIRING SYSTEM

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

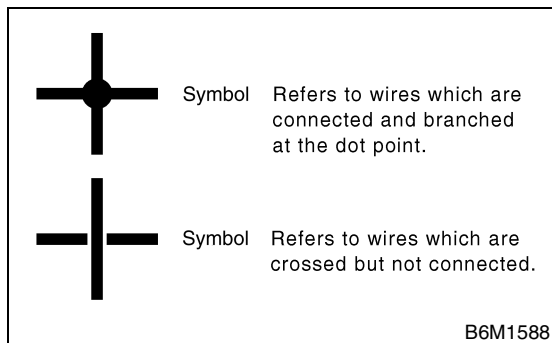
A symbol is used to indicate a diode.

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 ↔ A, B ↔ 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 POWER SUPPLY ROUTING in the wiring diagram.


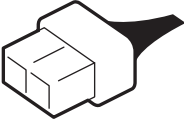
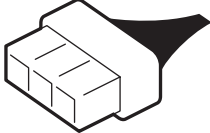


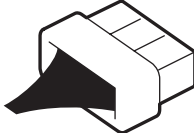
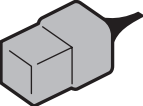
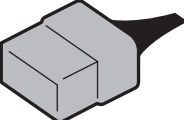
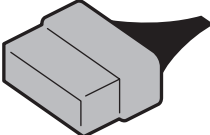
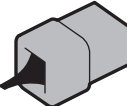


Accordingly, using the POWER SUPPLY ROUTING and wiring diagrams permits service personnel to understand the entire electrical arrangement of a system.

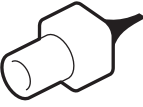




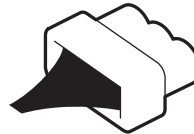

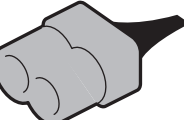
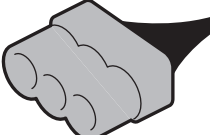
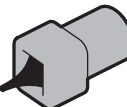

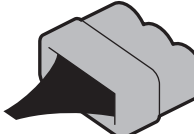
12. CLASSIFICATION BY SPECIFICATION

When the wiring diagrams differ according to vehicle specifications, the specification difference is described by using abbreviations.

E: CONNECTOR SYMBOL IN WIRING HARNESS

Main symbols of connector (in wiring harness) are indicated in below.

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		
		
		

BASIC DIAGNOSTICS PROCEDURE

WIRING SYSTEM

F: ABBREVIATION IN WIRING DIAGRAMS

Abbreviation	Full name
ABS	Antilock Brake System
ACC	Accessory
A/C	Air Conditioning
AD	Auto Down
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

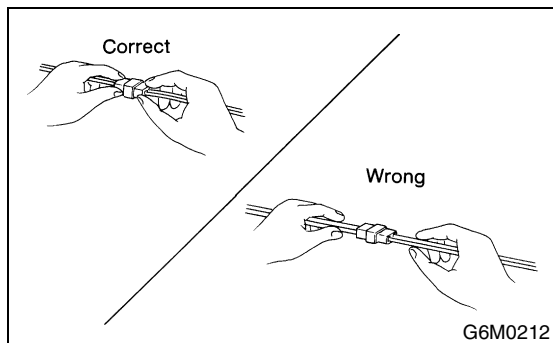
2. Working Precautions

A: PRECAUTIONS WHEN WORKING WITH THE PARTS MOUNTED ON THE VEHICLE

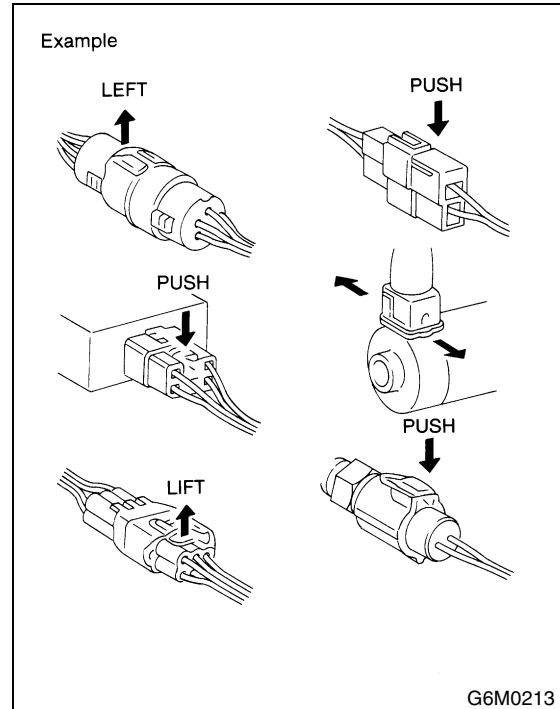
- 1) When working under a vehicle which is jacked-up, always be sure to use safety stands.
- 2) The parking brake must always be applied during working. Also, in automatic transmission vehicles, keep the select lever set to P (Parking) range.
- 3) Be sure the workshop is properly ventilated when running 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 battery's (-) terminal, and the ignition switch must be set to 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 body end parts or edges and bolts or screws.
- 3) When installing the 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.

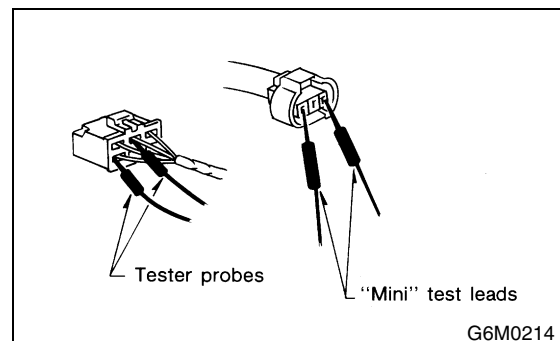


- 5) Some connectors are provided with a lock. One type of such a connector is disconnected by pushing the lock, and the other, by moving the lock up. In either type the lock shape must be identified before attempting to disconnect the connector. To connect, insert the connector until it snaps and confirm that it is tightly connected.



- 6) When checking continuity between connector terminals, or measuring the 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 terminals.



- 7) Sensors, relays, electrical unit, etc., are sensitive to strong impacts. Handle them with care so that they are not dropped or mishandled.

SUPER MULTIPLE JUNCTION (SMJ)

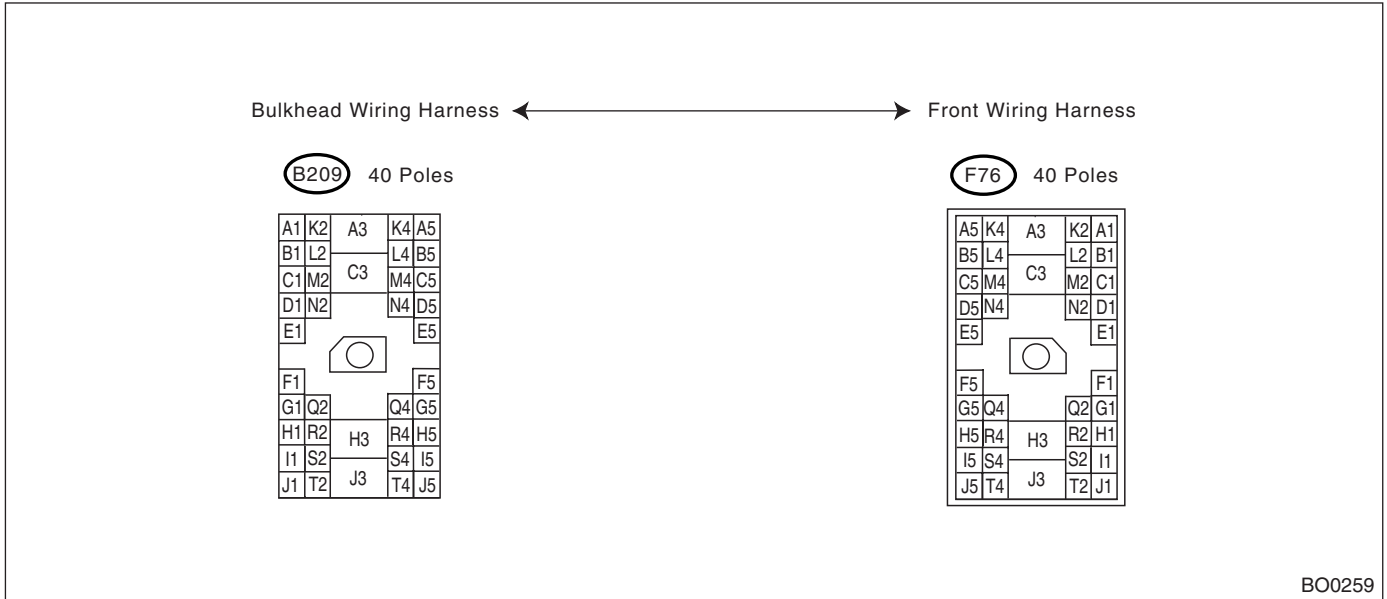
WIRING SYSTEM

3. Super Multiple Junction (SMJ)

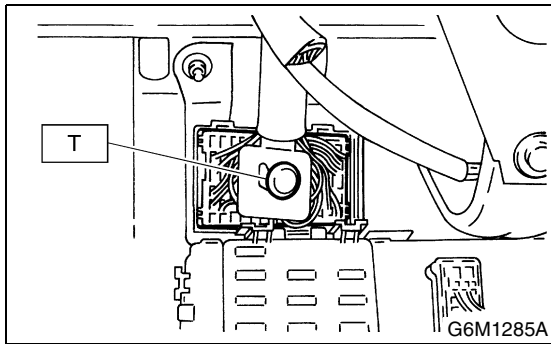
A: HOW TO USE SUPER MULTIPLE JUNCTION (SMJ)

The "SMJ" indicated in wiring diagrams is shown in a simplified form.

B: TERMINAL ARRANGEMENT



C: INSTALLATION



Tightening torque:

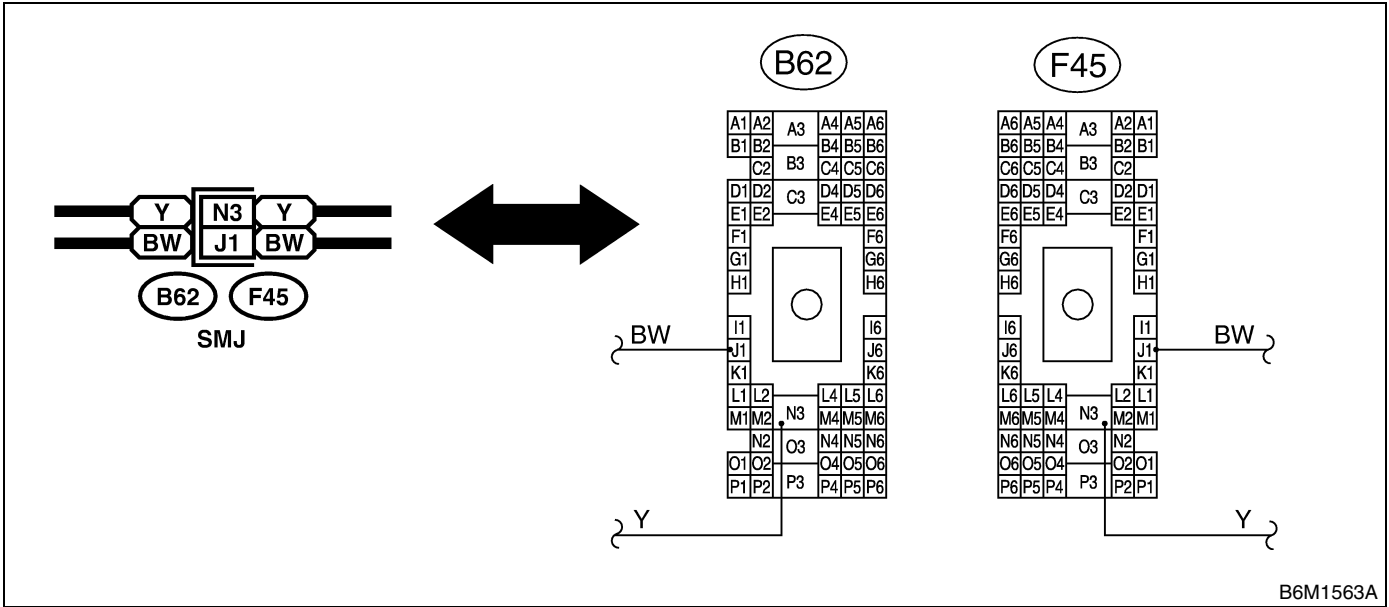
T: 4.4 N·m (0.45 kgf·m, 3.3 ft·lb)

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)

D: EXPLANATION OF SMJ SHOWN IN THE WIRING DIAGRAM



4. Power Supply Routing

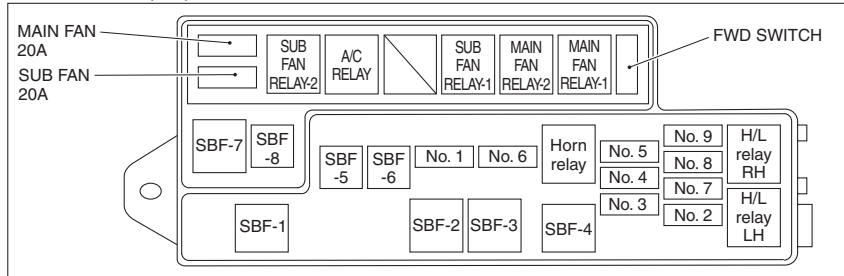
A: SCHEMATIC

1. LHD MODEL

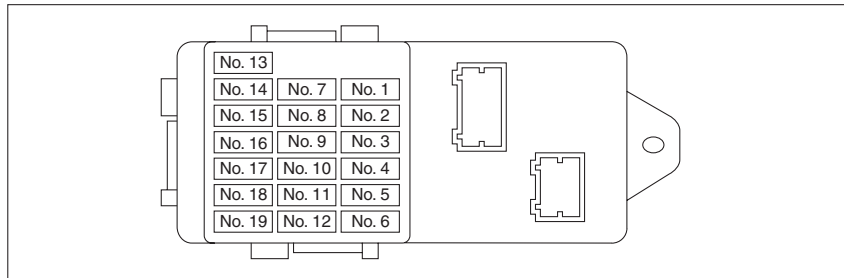
P-SUP(L)-01

P-SUP(L)-01

MAIN FUSE BOX (M/B)



FUSE & RELAY BOX (F/B)

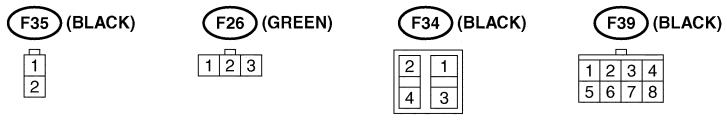
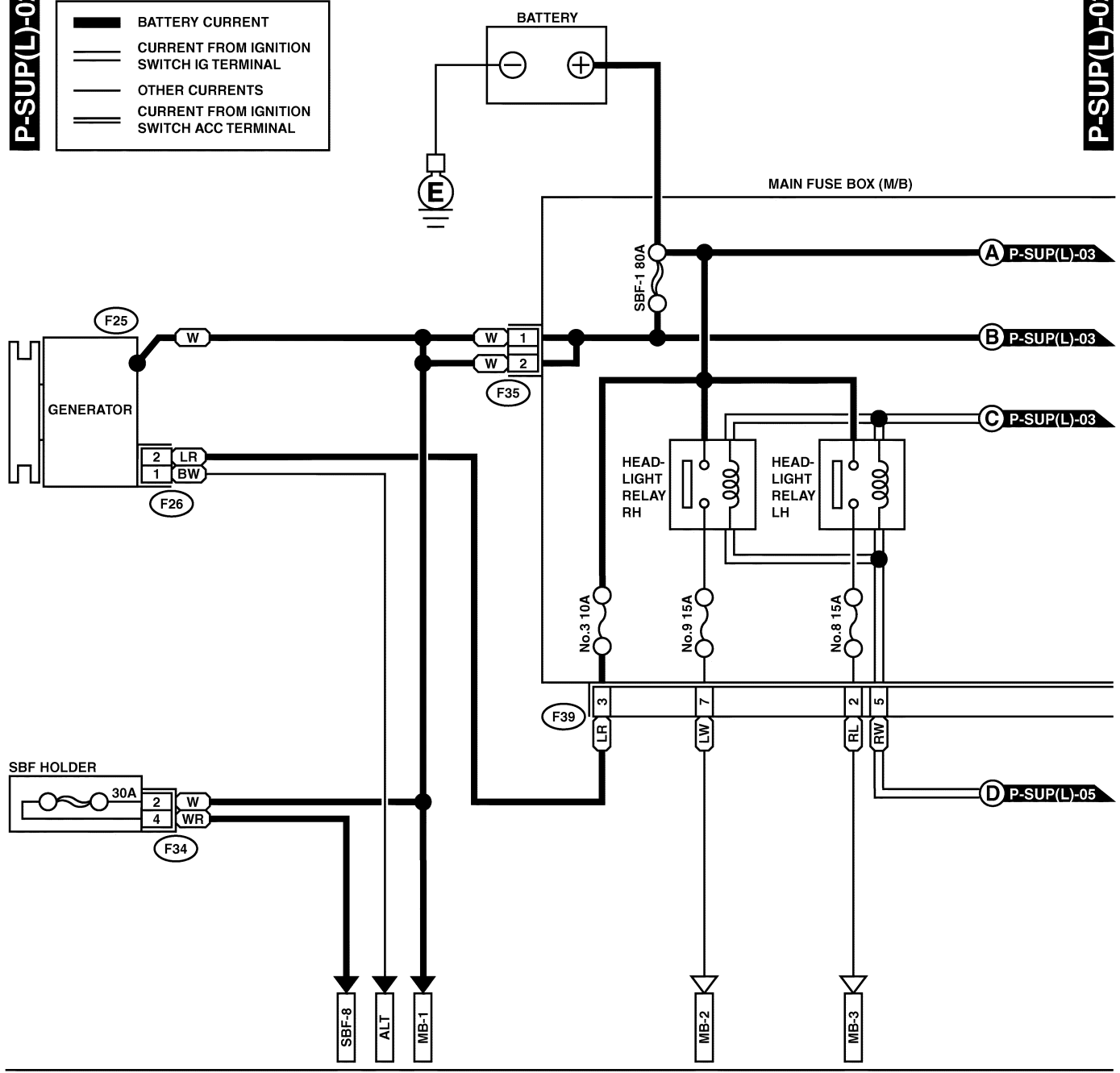
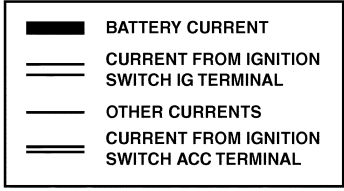


POWER SUPPLY ROUTING

WIRING SYSTEM

P-SUP(L)-02

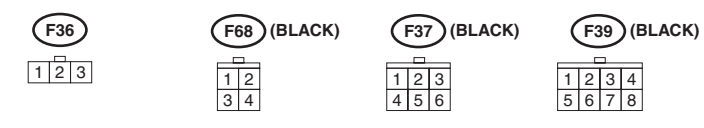
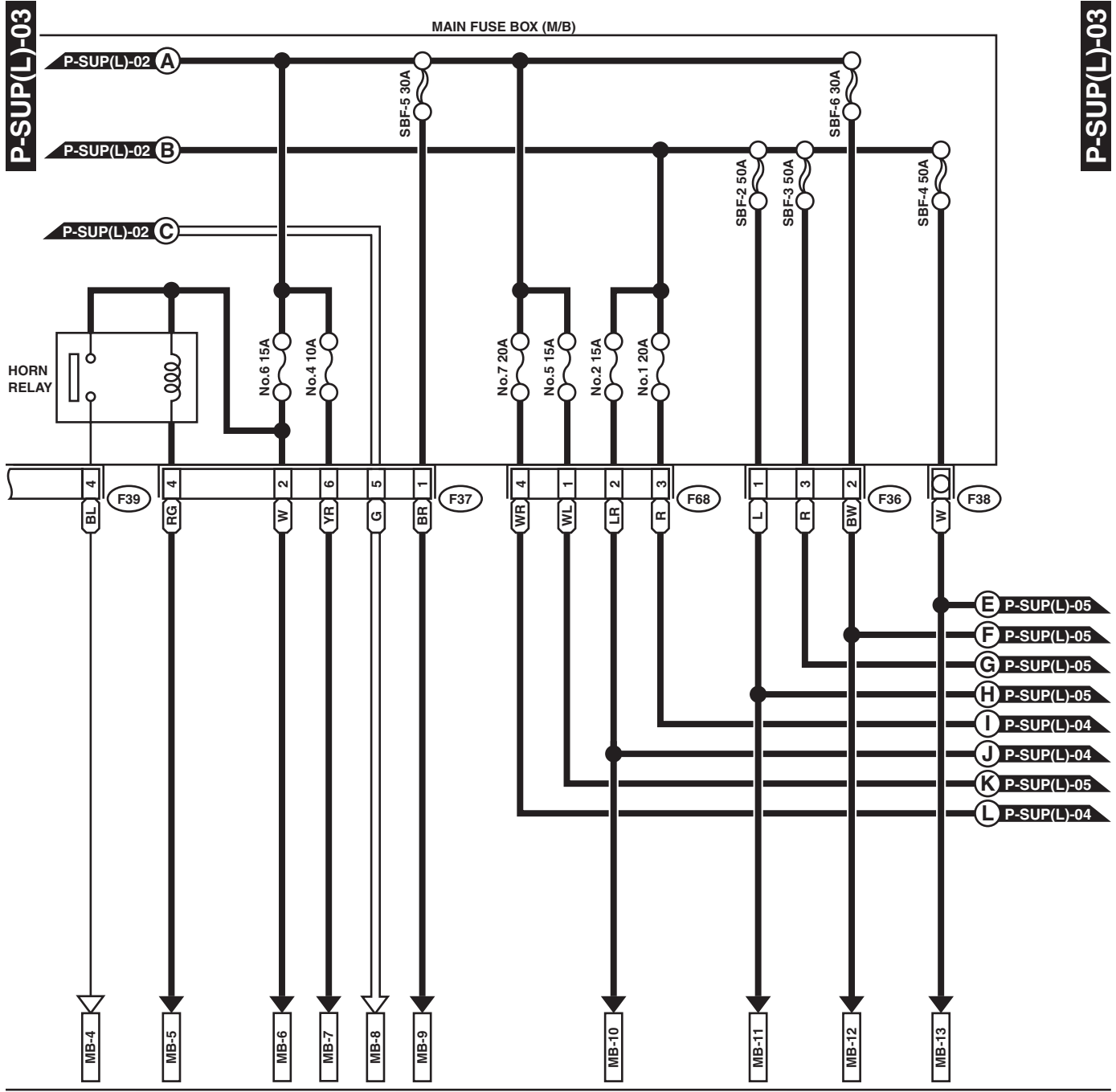
P-SUP(L)-02



GL01-21B

POWER SUPPLY ROUTING

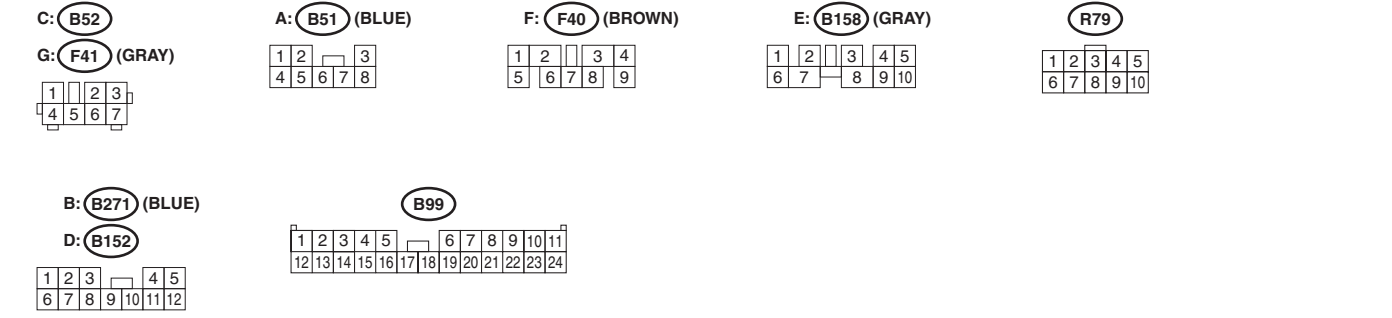
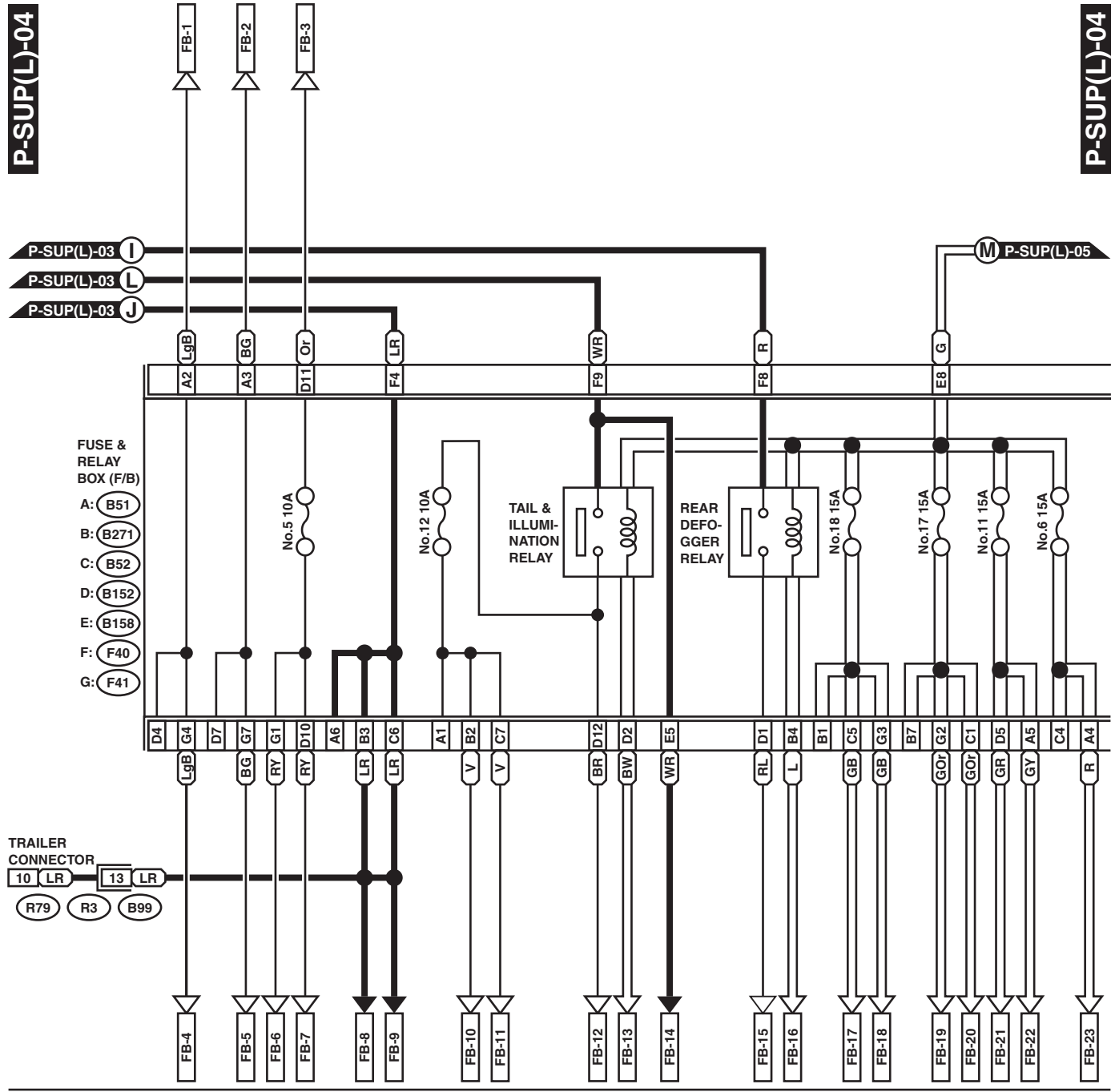
WIRING SYSTEM



GL01-21C

POWER SUPPLY ROUTING

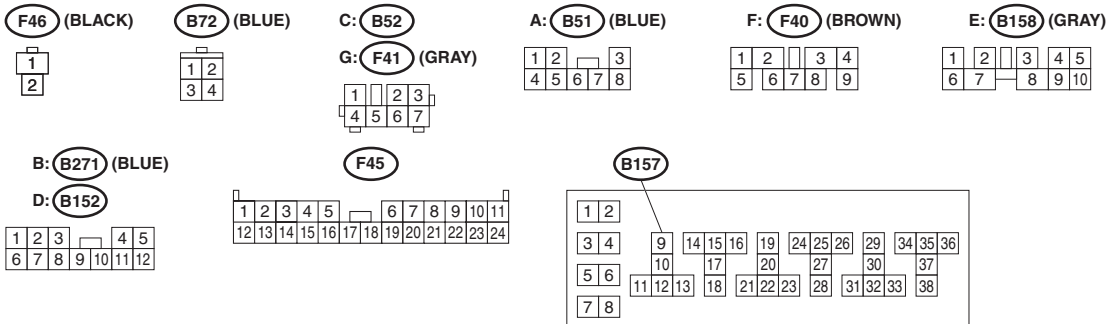
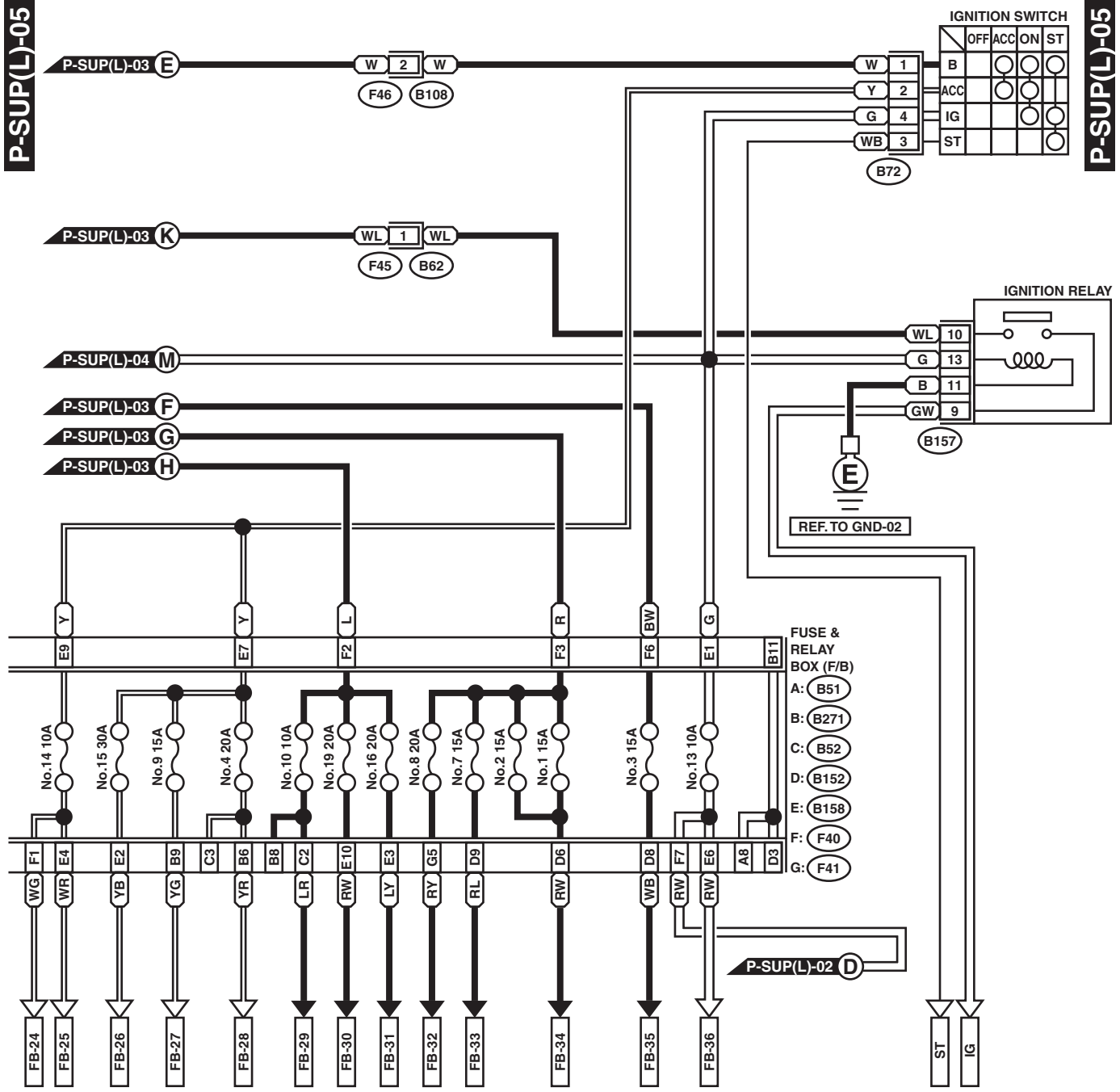
WIRING SYSTEM



GL01-21D

POWER SUPPLY ROUTING

WIRING SYSTEM



RELAY HOLDER (BLACK)

GL01-21E

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 Manual A/C switch
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

POWER SUPPLY ROUTING

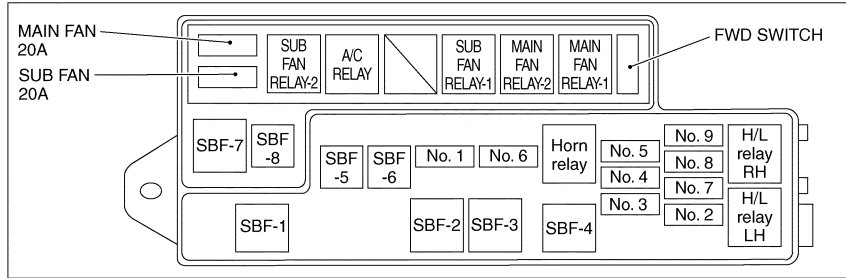
WIRING SYSTEM

2. RHD MODEL

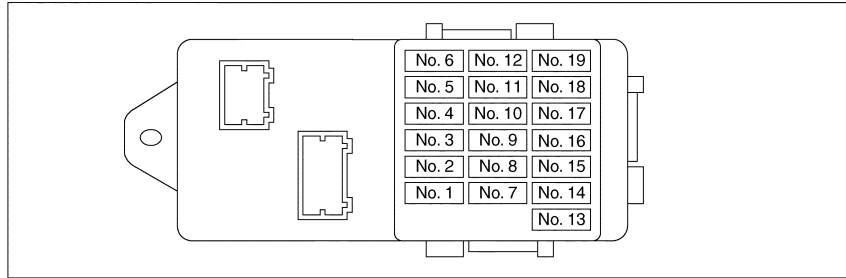
P-SUP(R)-01

P-SUP(R)-01

MAIN FUSE BOX (M/B)



FUSE & RELAY BOX (F/B)

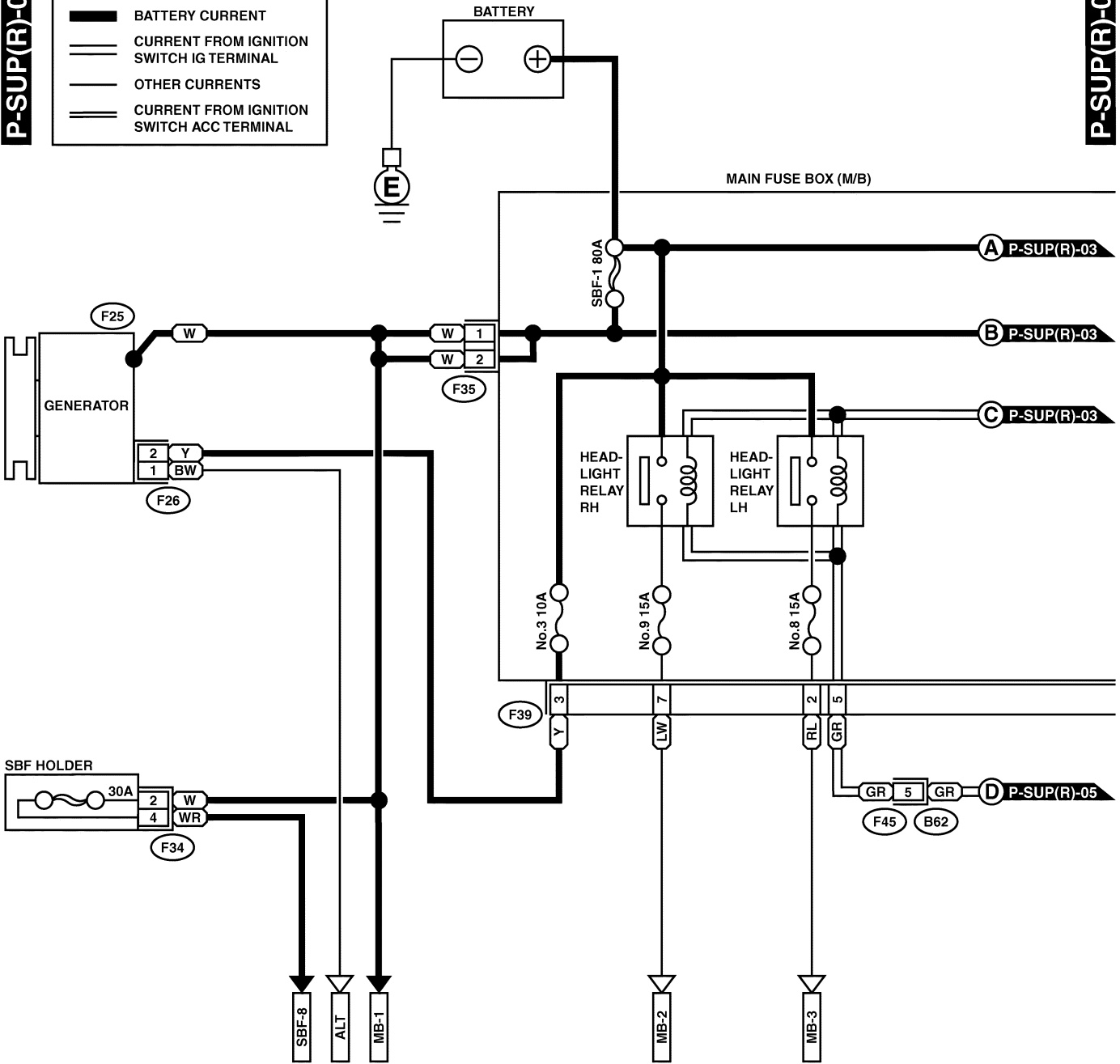
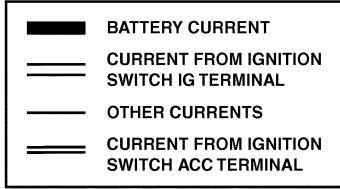


POWER SUPPLY ROUTING

WIRING SYSTEM

P-SUP(R)-02

P-SUP(R)-02



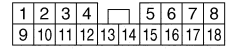
F35 (BLACK)

F26 (GREEN)

F34 (BLACK)

F39 (BLACK)

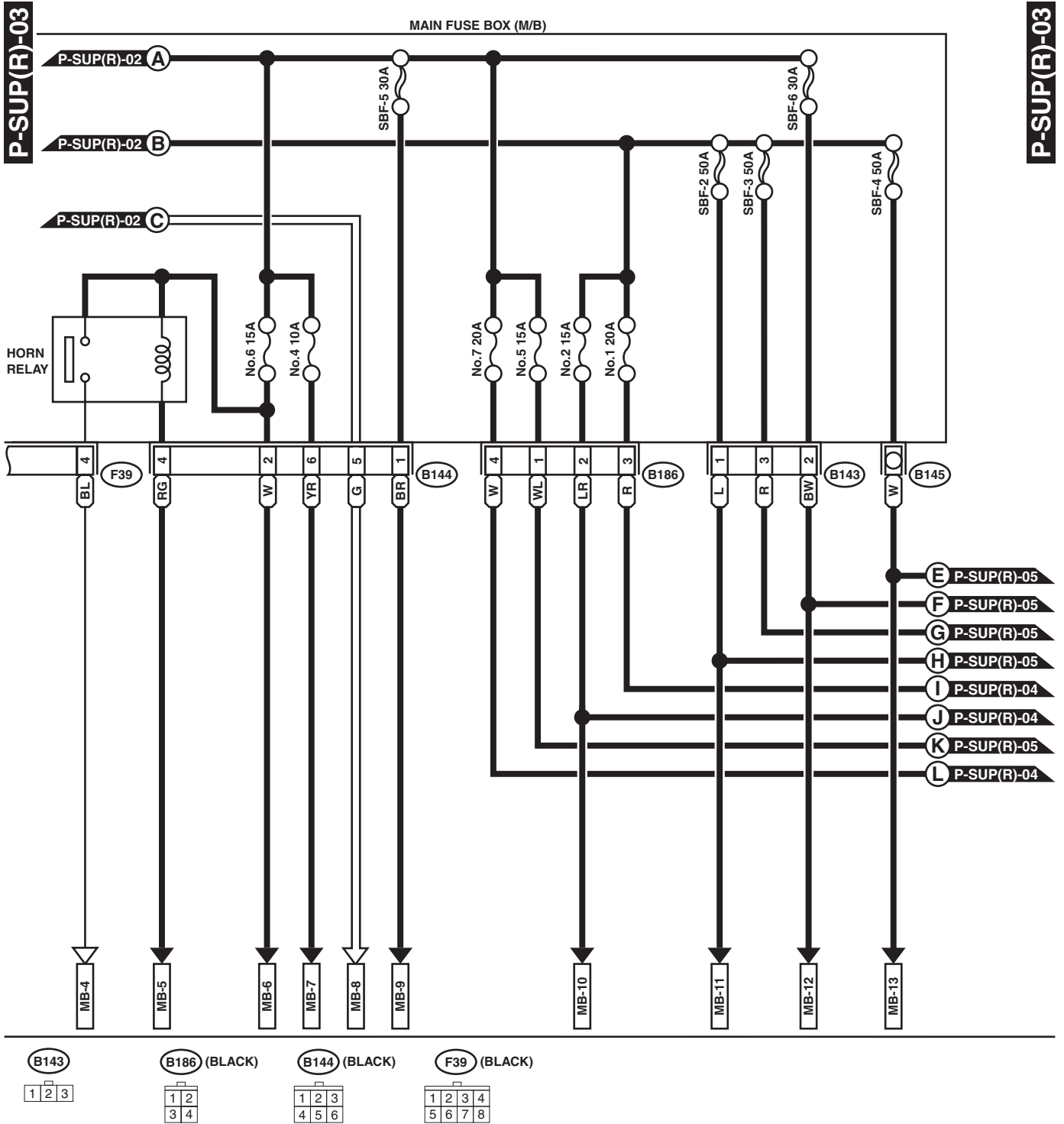
F45



GR01-21B

POWER SUPPLY ROUTING

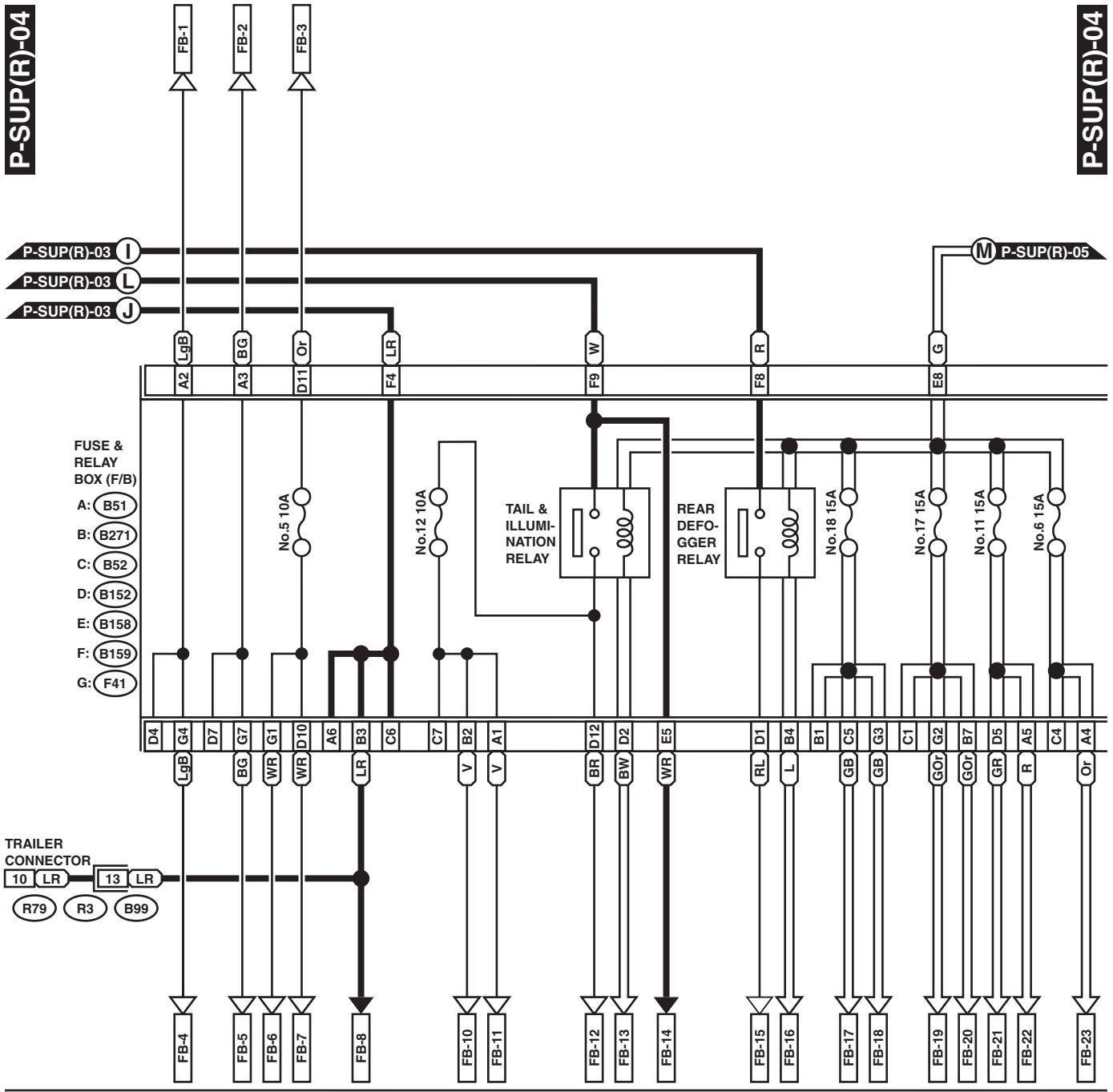
WIRING SYSTEM



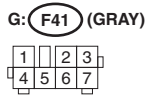
GR01-21C

POWER SUPPLY ROUTING

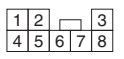
WIRING SYSTEM



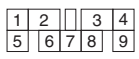
C: B52



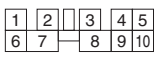
A: B51 (BLUE)



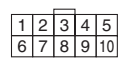
F: B159 (BROWN)



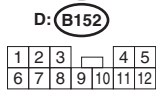
E: B158 (GRAY)



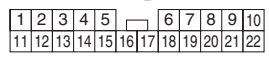
R79



B: B271 (BLUE)



B99



GR01-21D

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	Bright switch
FB-11	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 Manual A/C switch
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

POWER SUPPLY ROUTING

WIRING SYSTEM

No.	Load
FB-34	Blower motor relay
FB-35	Door lock timer Keyless entry control module
FB-36	Combination meter

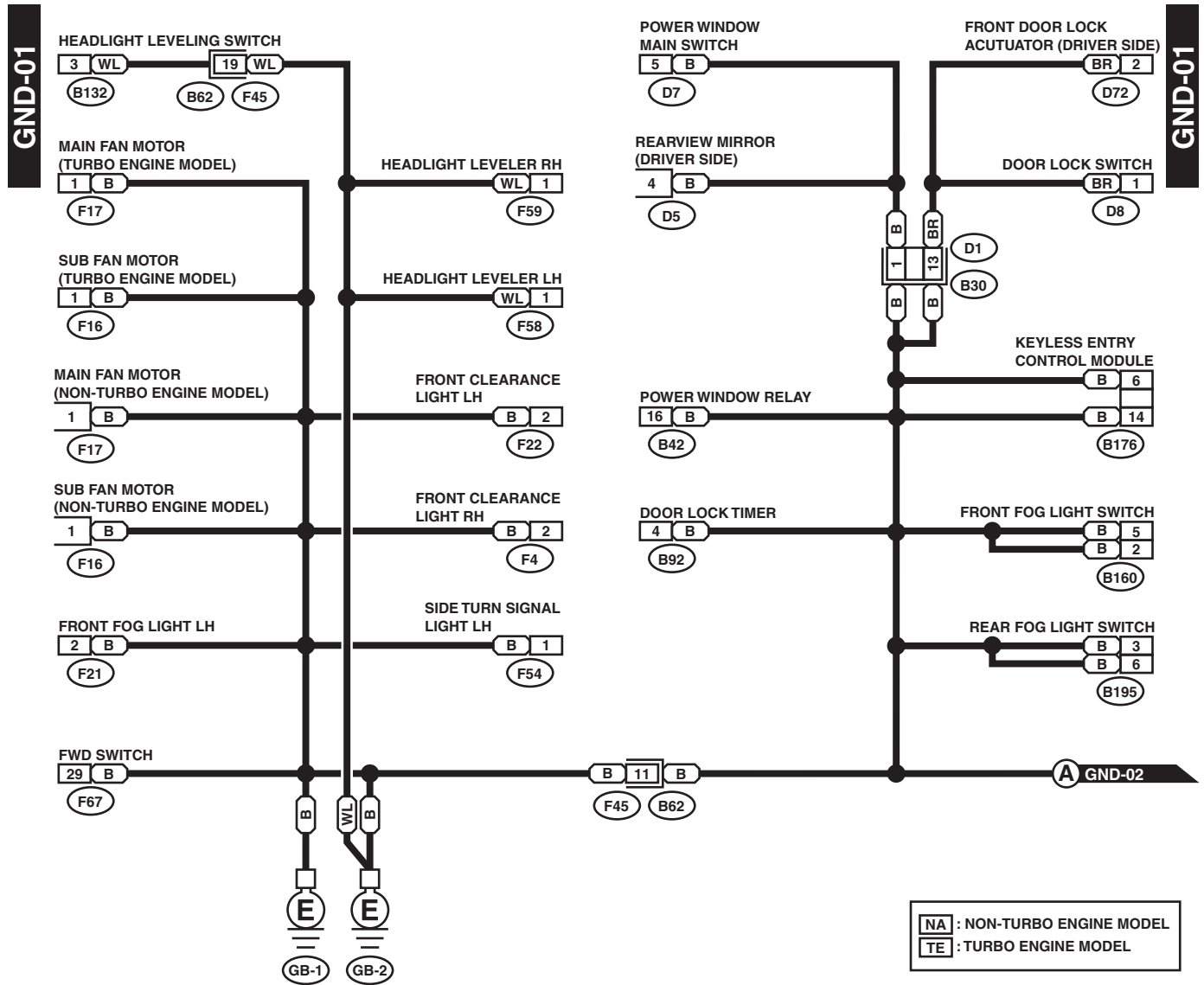
5. Ground Distribution

A: SCHEMATIC

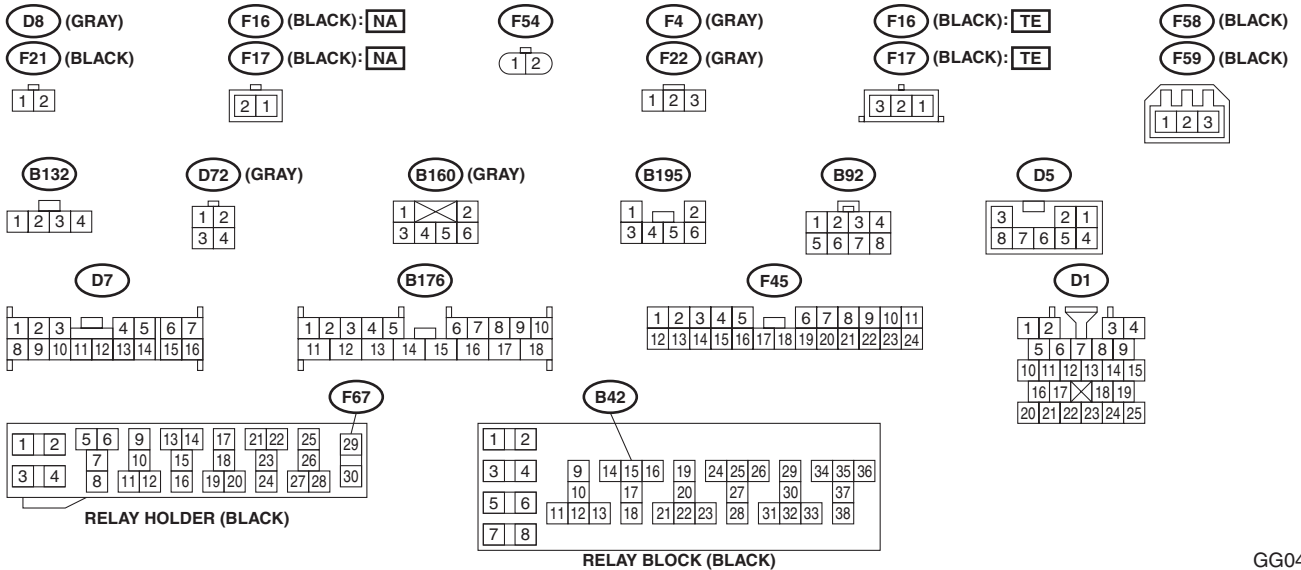
GROUND DISTRIBUTION

WIRING SYSTEM

1. LHD MODEL (GENERAL)



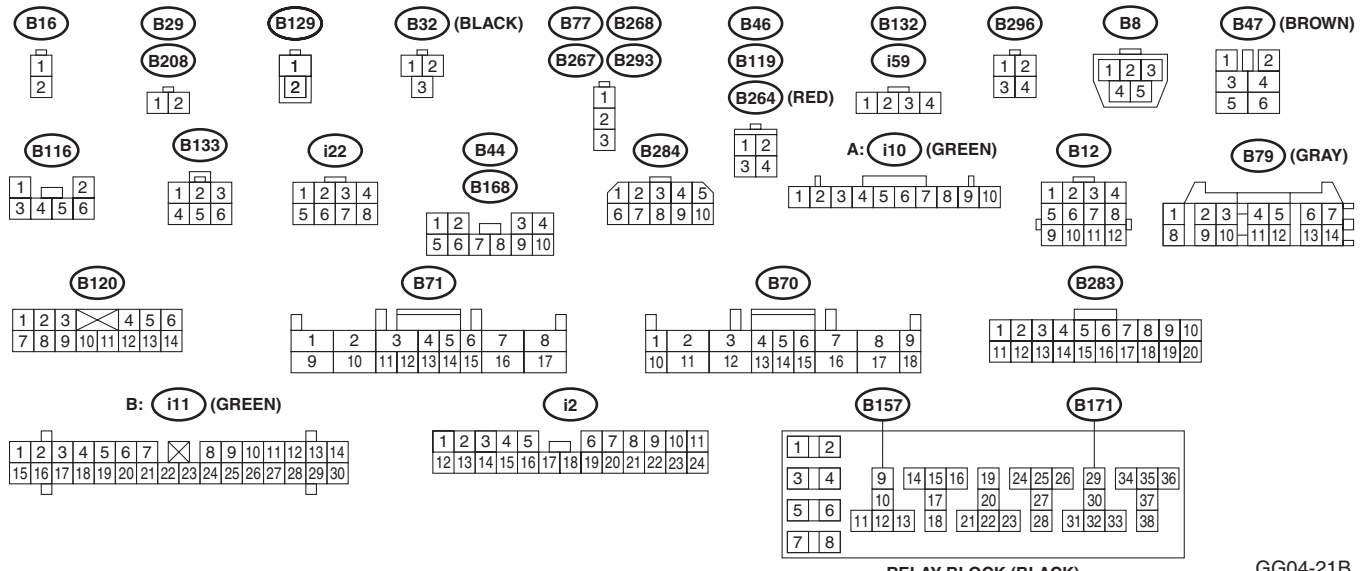
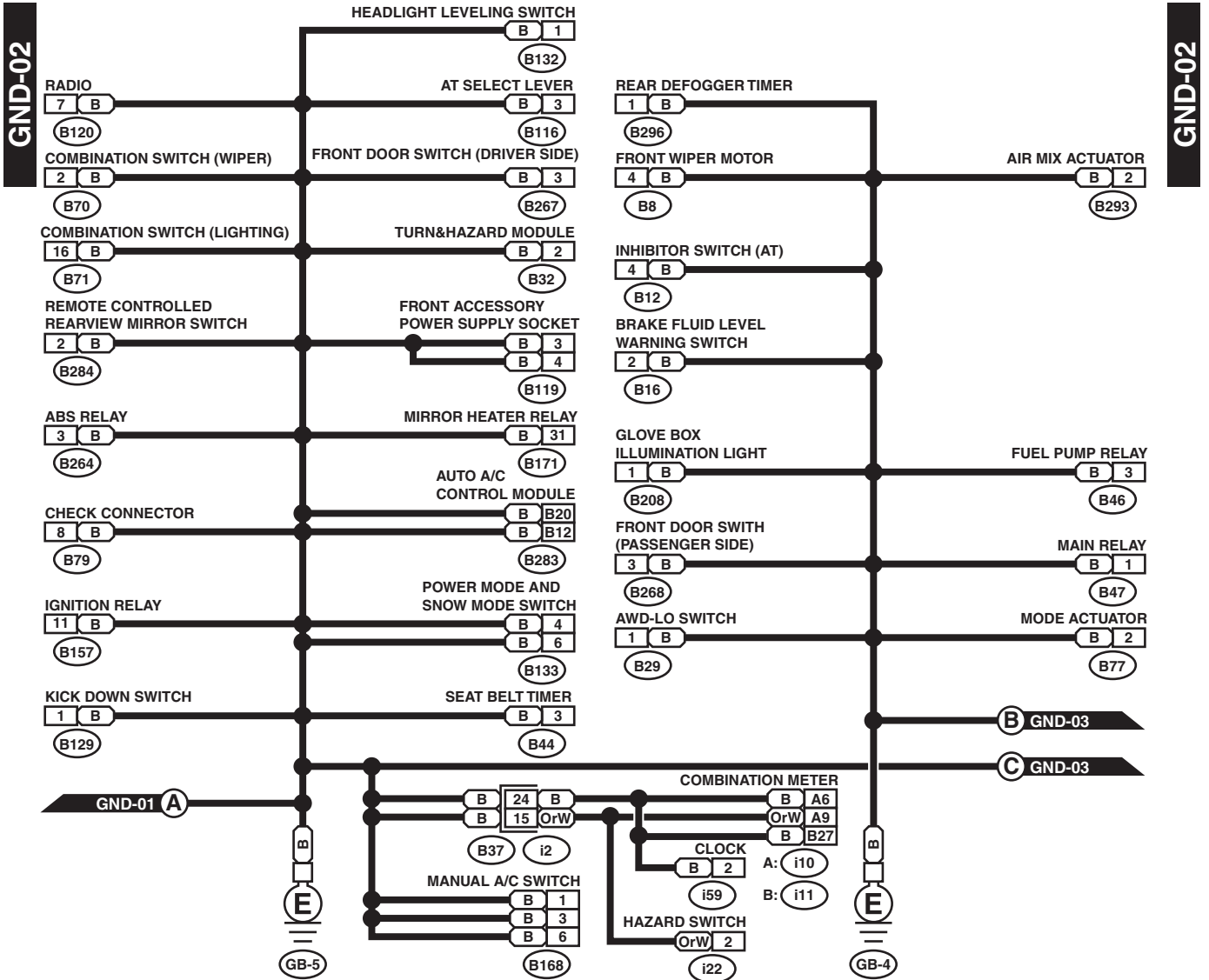
NA : NON-TURBO ENGINE MODEL
TE : TURBO ENGINE MODEL



GG04-21A

GROUND DISTRIBUTION

WIRING SYSTEM



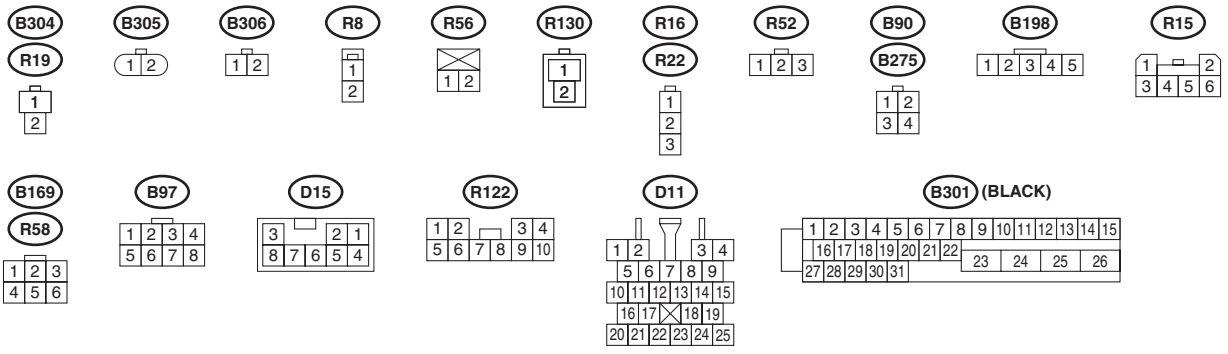
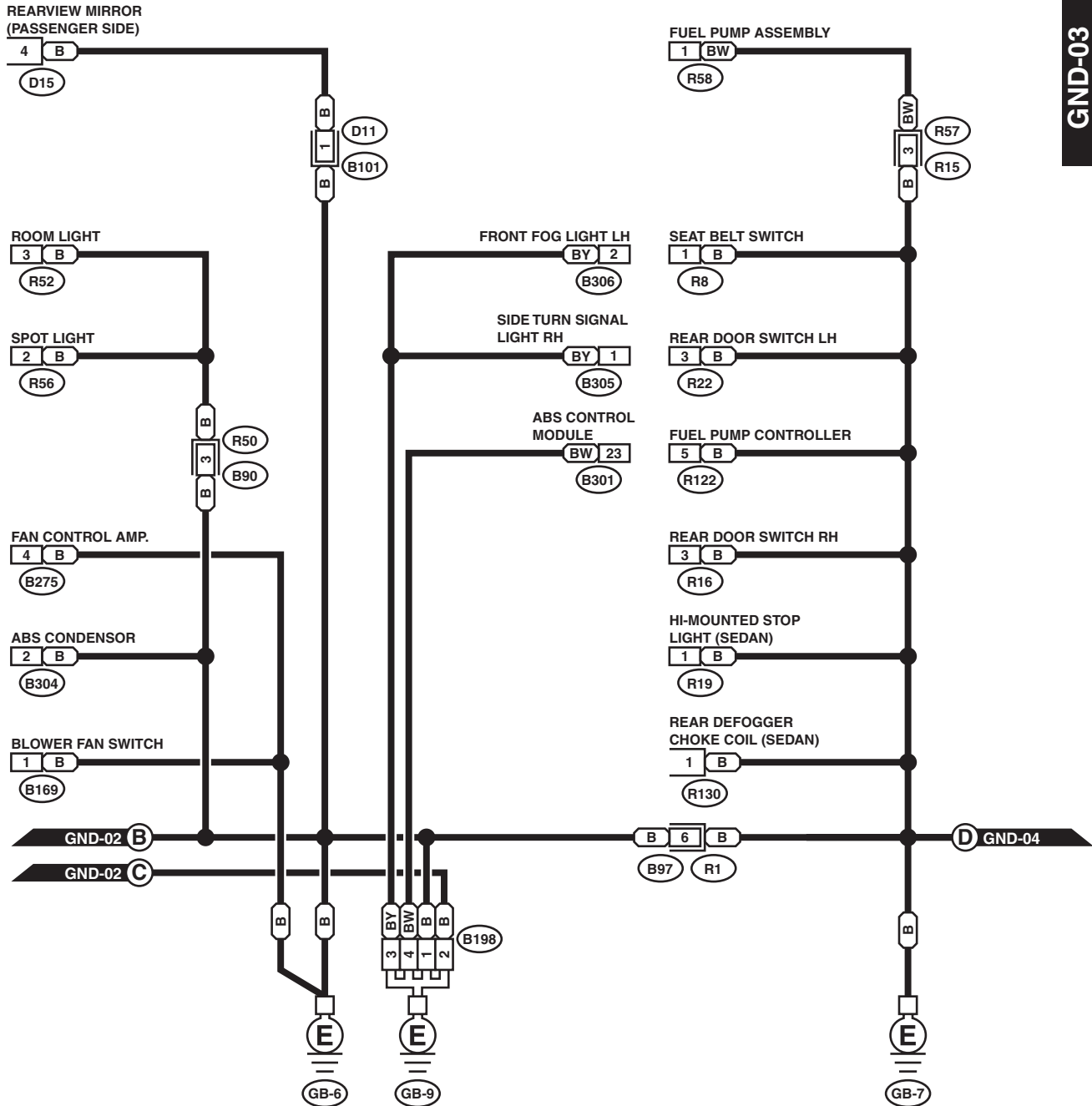
GG04-21B

GROUND DISTRIBUTION

WIRING SYSTEM

GND-03

GND-03



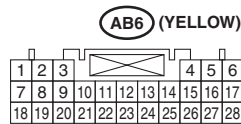
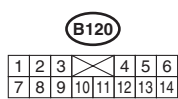
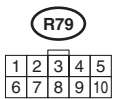
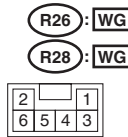
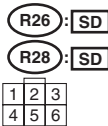
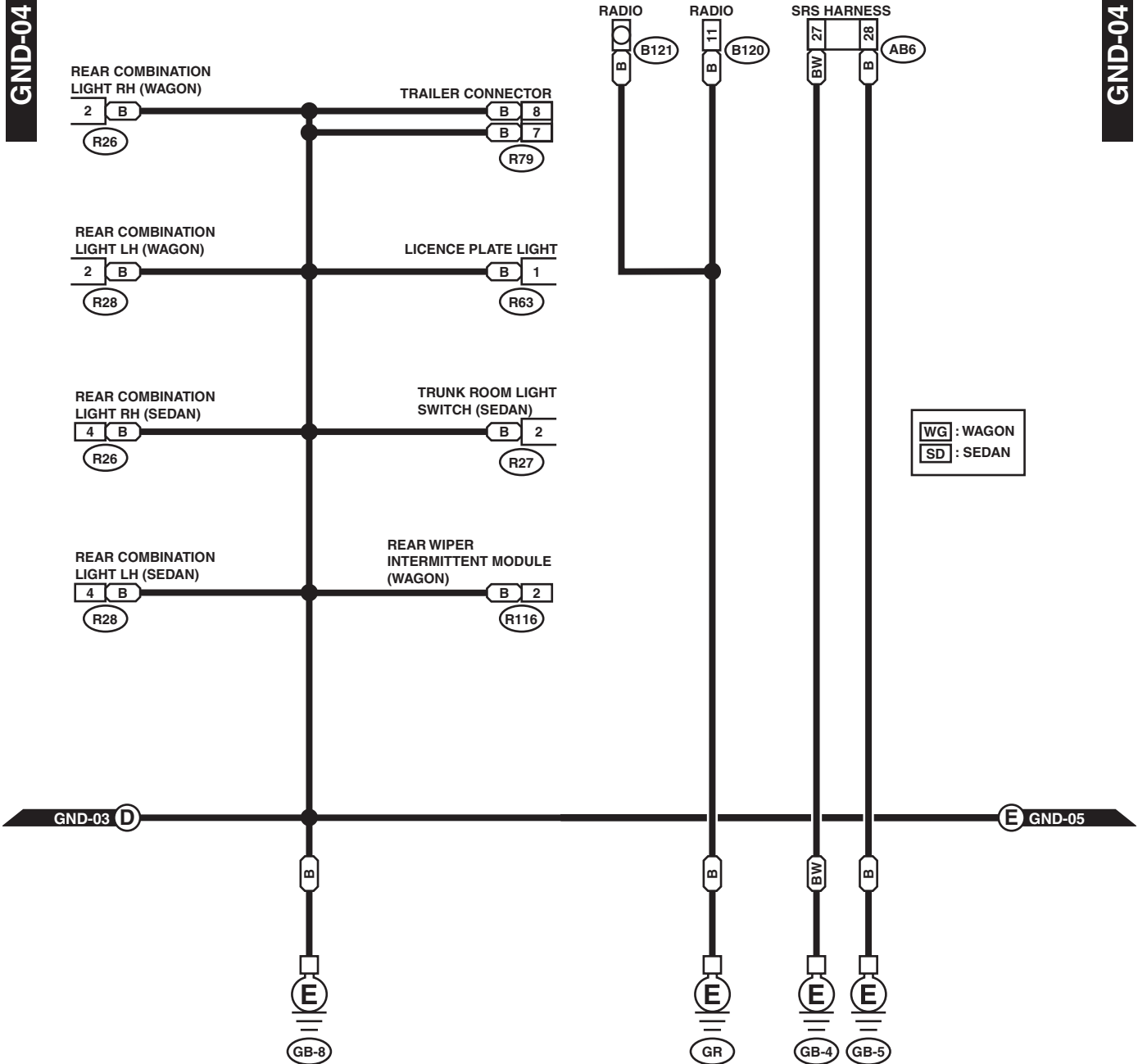
GG04-21C

GROUND DISTRIBUTION

WIRING SYSTEM

GND-04

GND-04



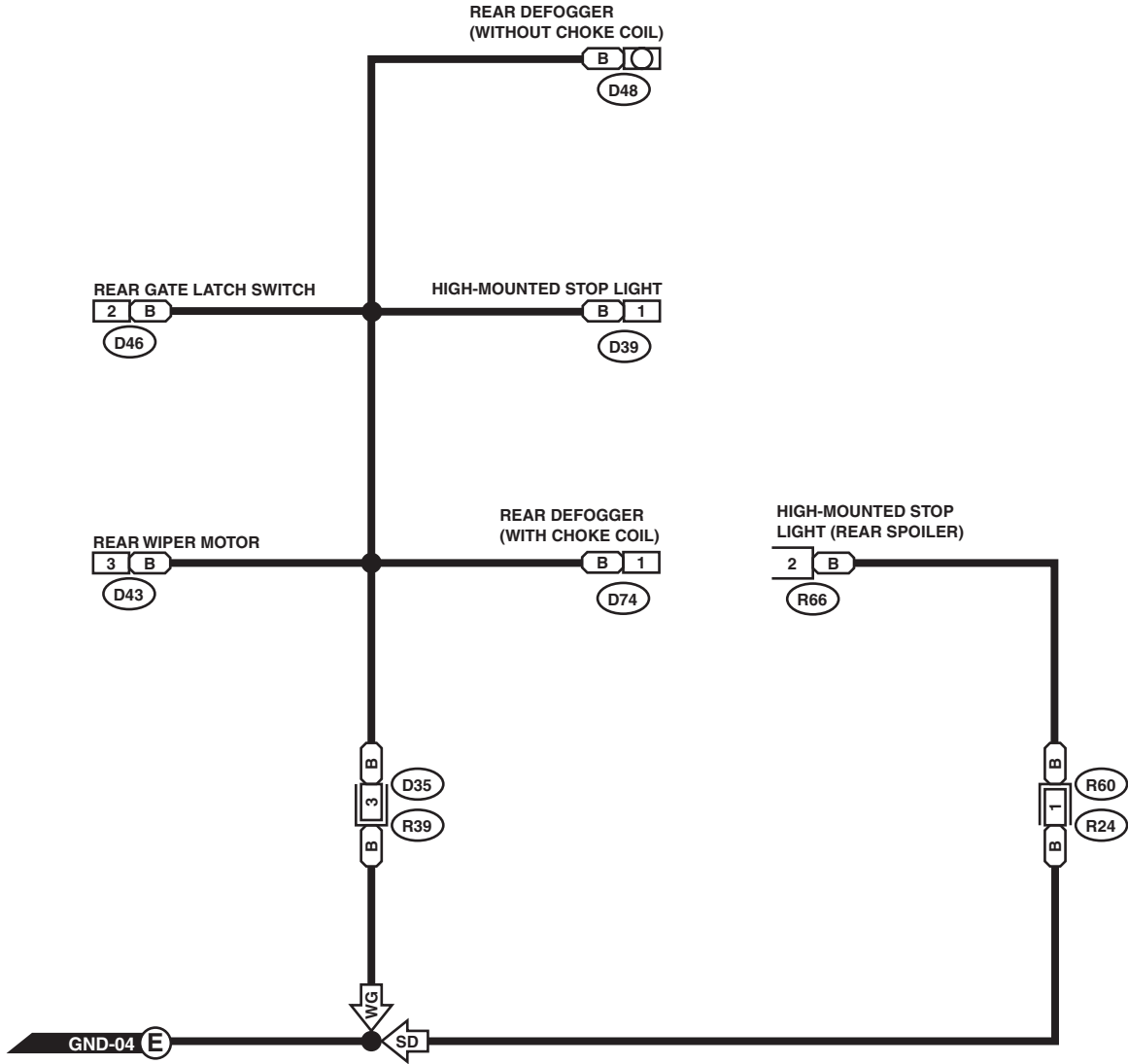
GG04-21D

GROUND DISTRIBUTION

WIRING SYSTEM

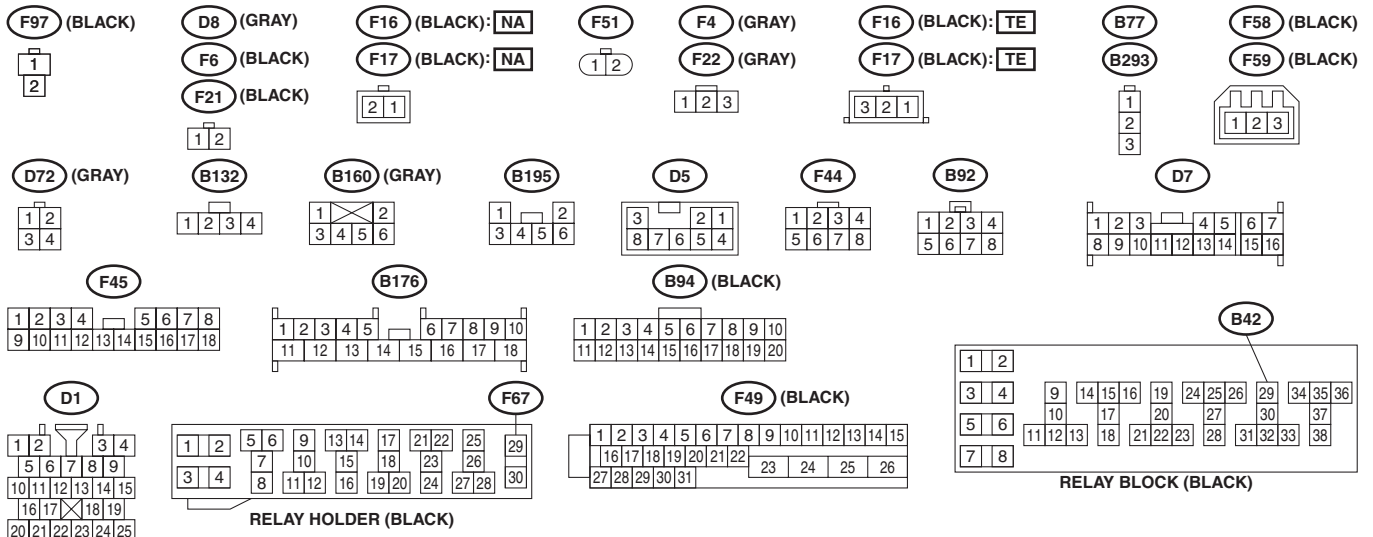
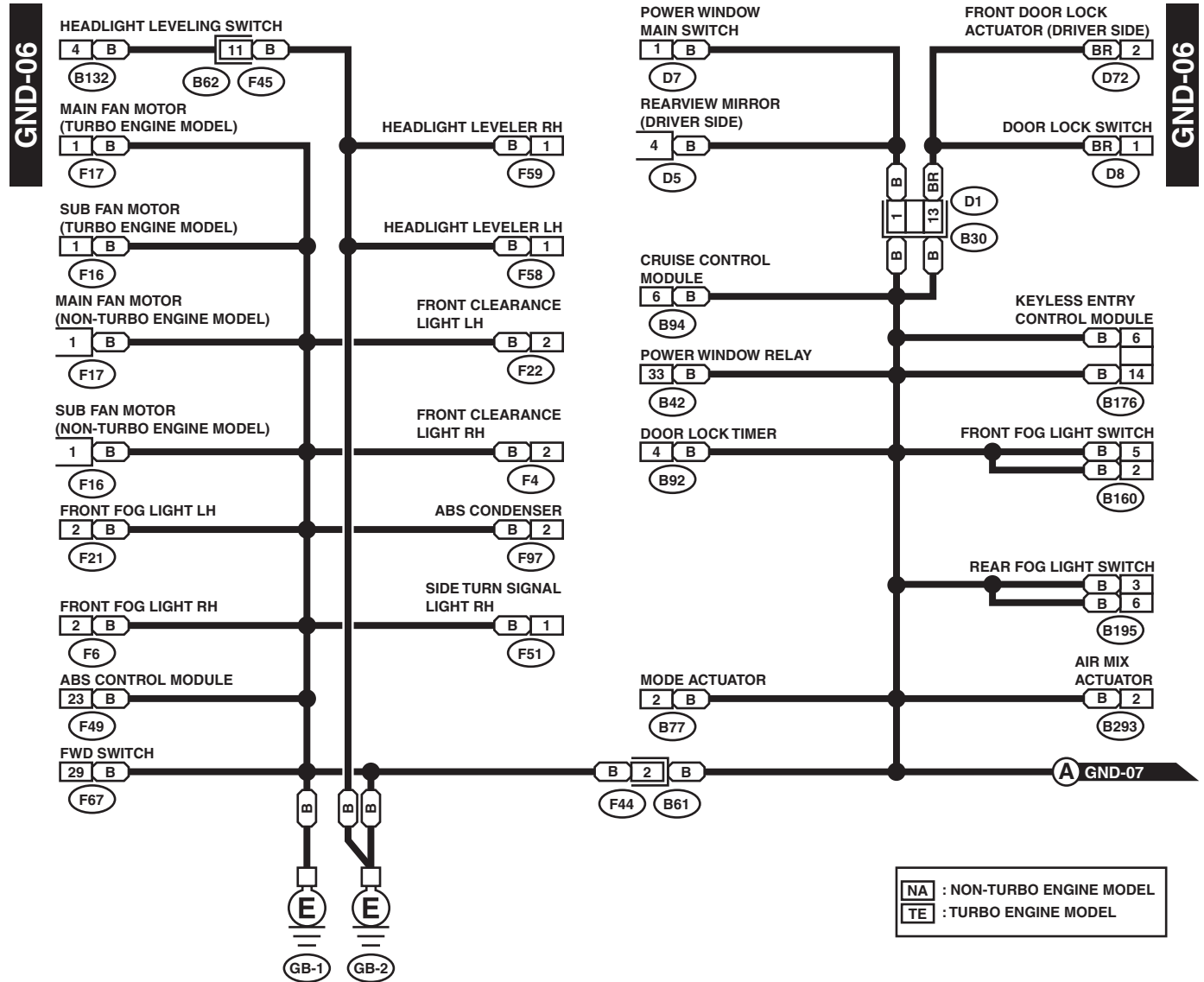
GND-05

GND-05



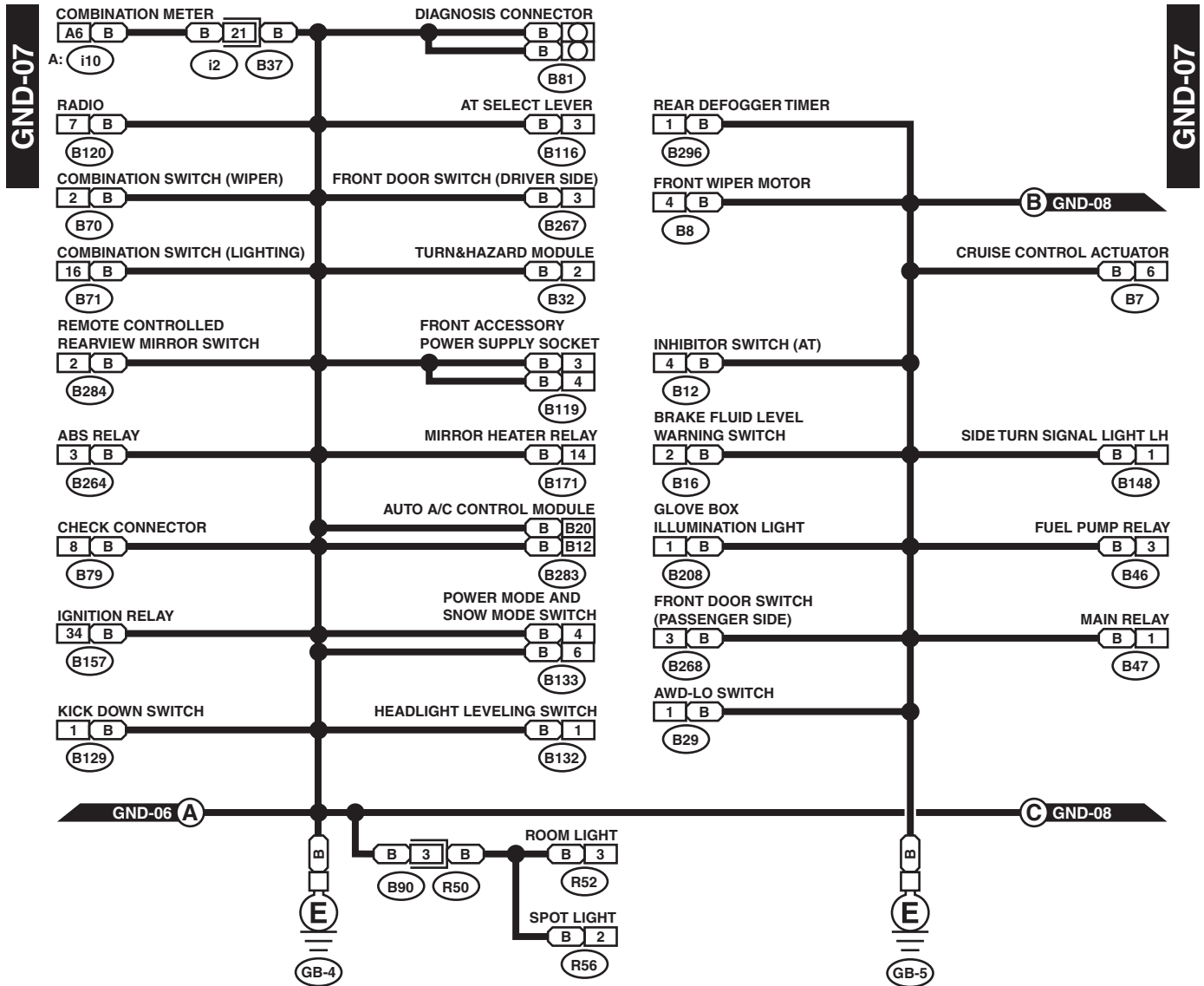
GG04-21E

2. RHD MODEL (GENERAL)



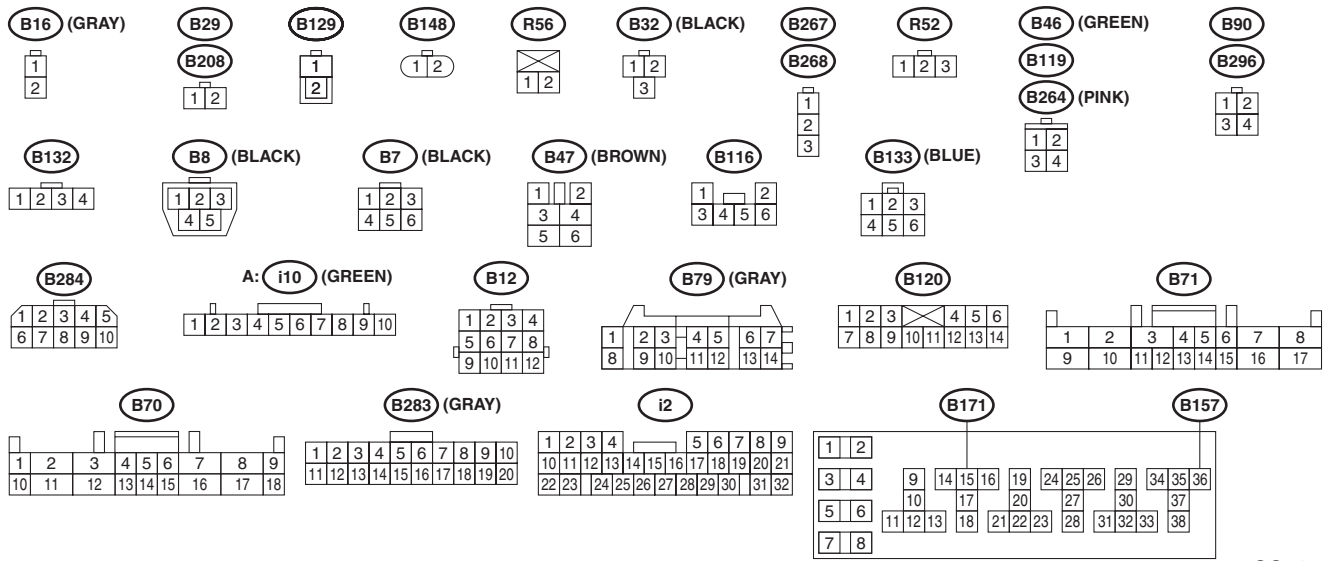
GROUND DISTRIBUTION

WIRING SYSTEM



GND-07

GND-07



RELAY BLOCK (BLACK)

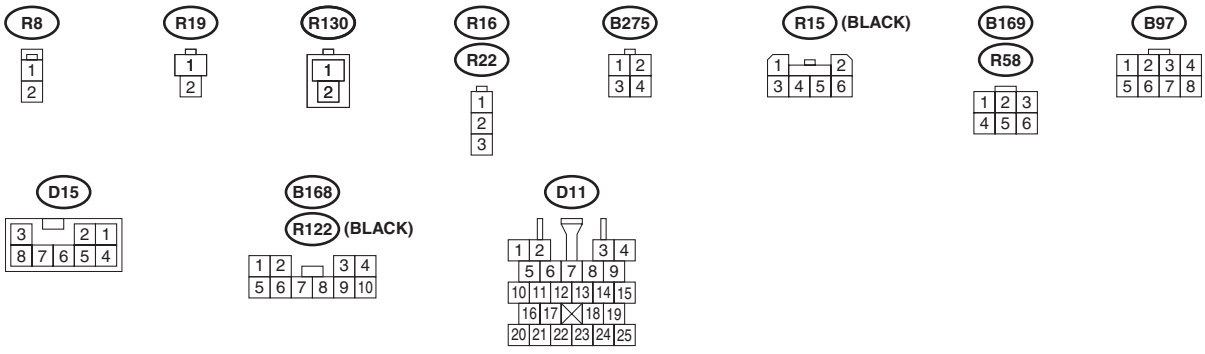
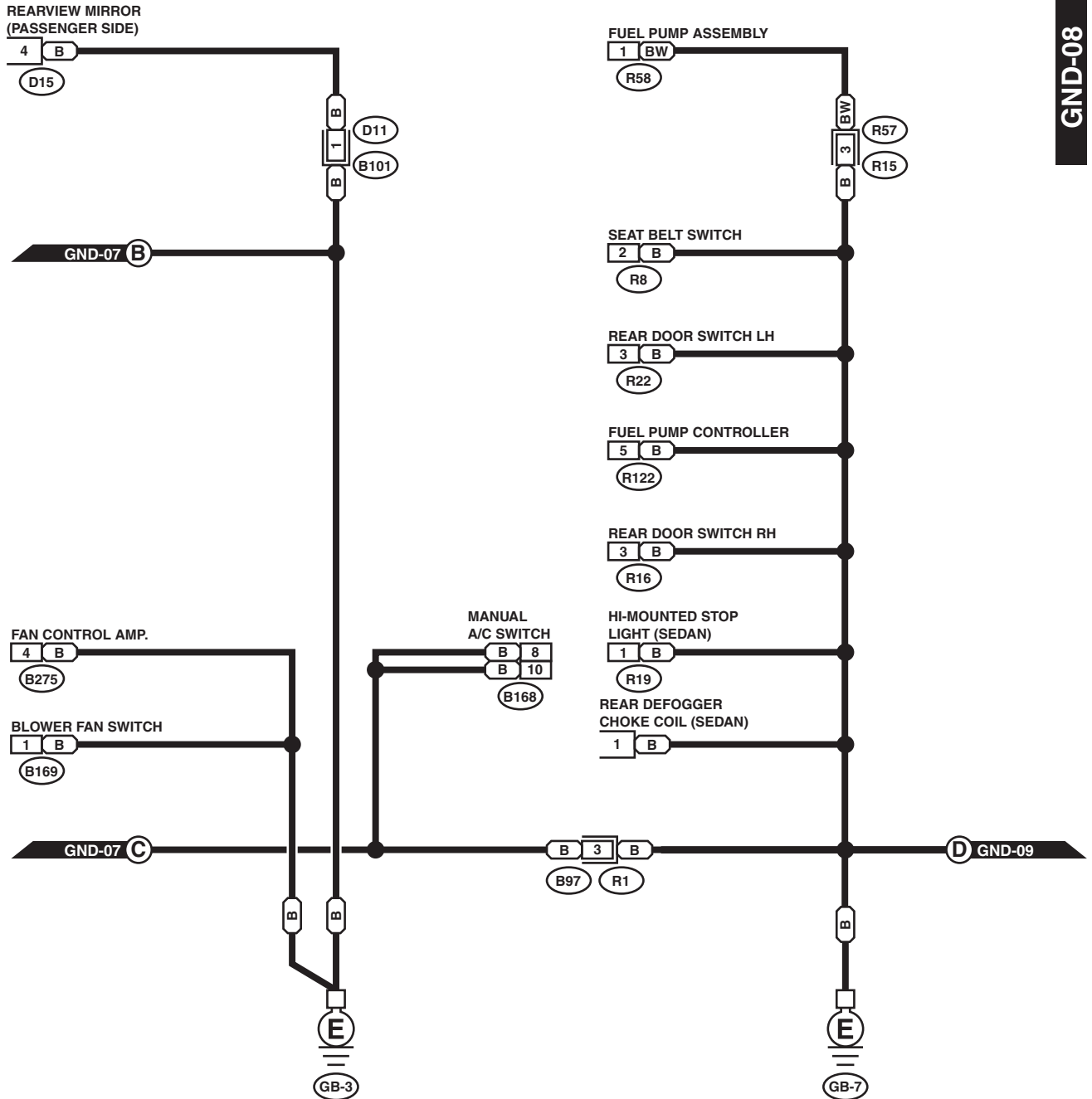
GG04-21G

GROUND DISTRIBUTION

WIRING SYSTEM

GND-08

GND-08



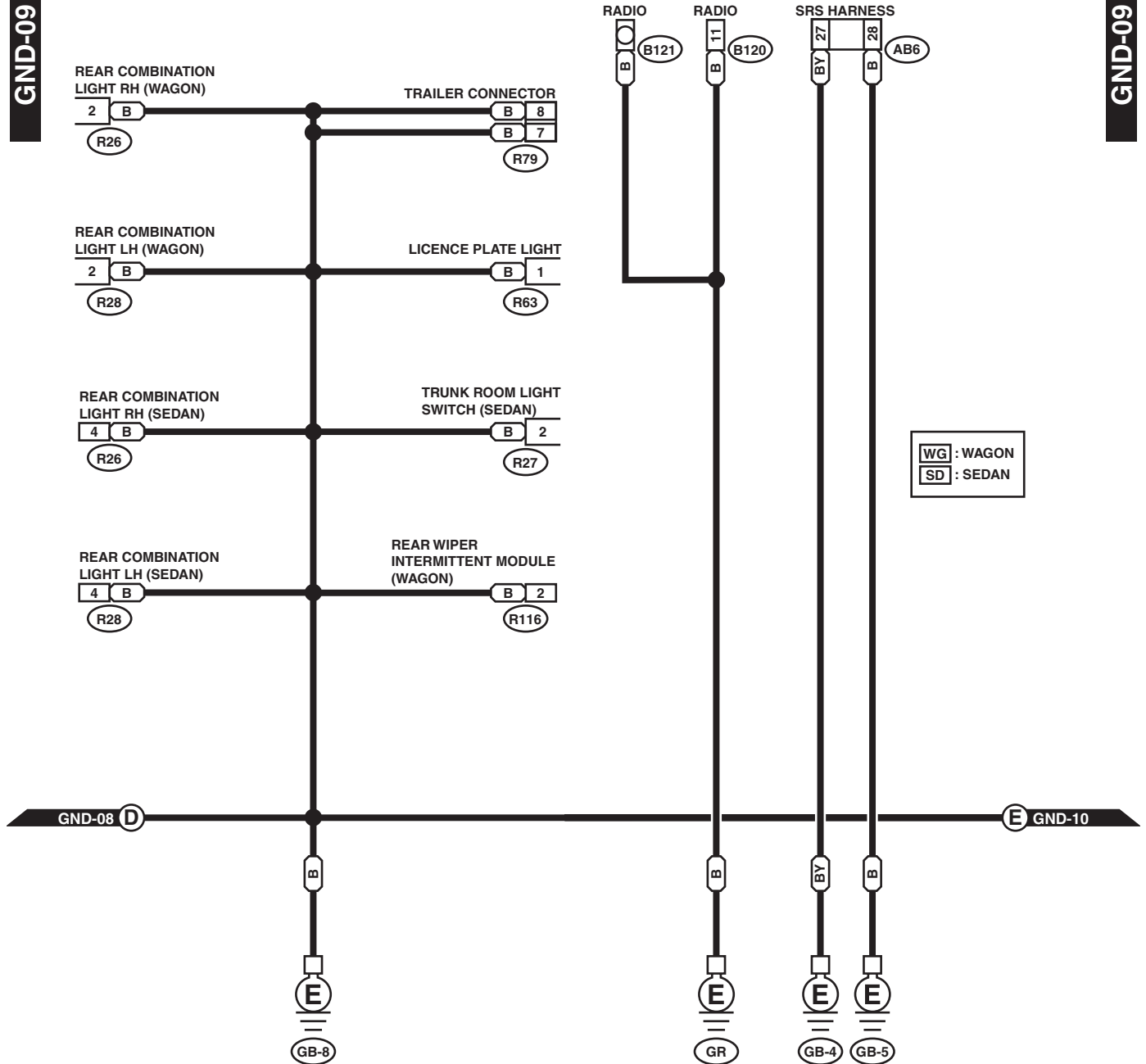
GG04-21H

GROUND DISTRIBUTION

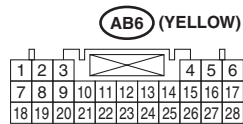
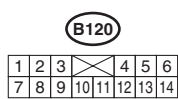
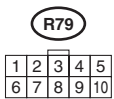
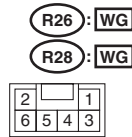
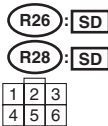
WIRING SYSTEM

GND-09

GND-09



WG : WAGON
SD : SEDAN



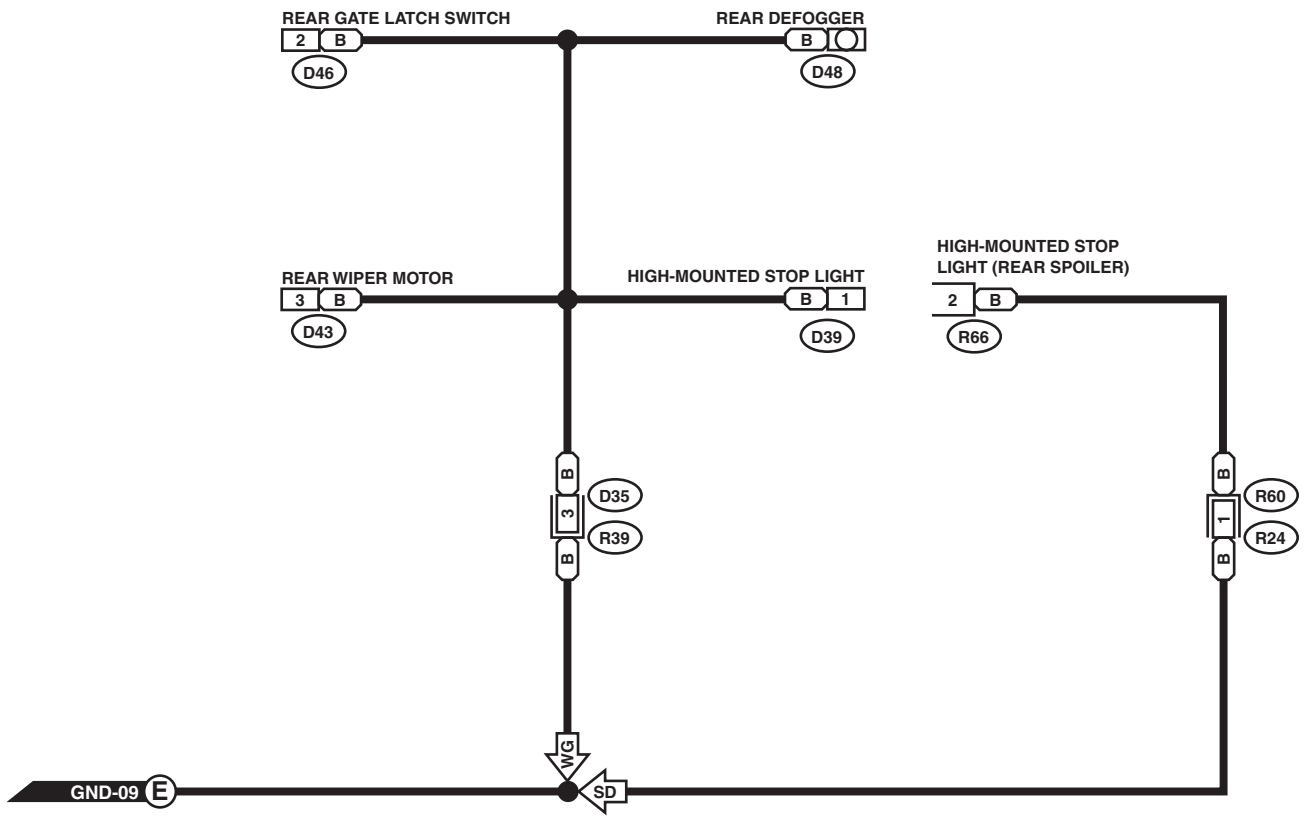
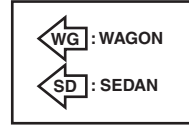
GG04-211

GROUND DISTRIBUTION

WIRING SYSTEM

GND-10

GND-10

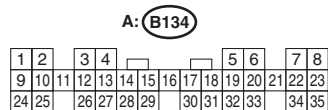
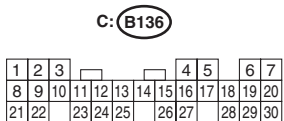
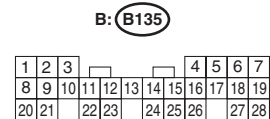
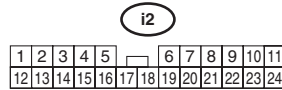
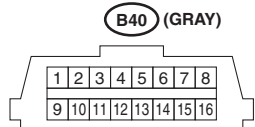
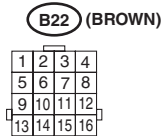
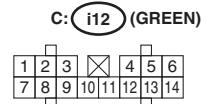
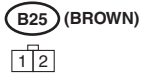
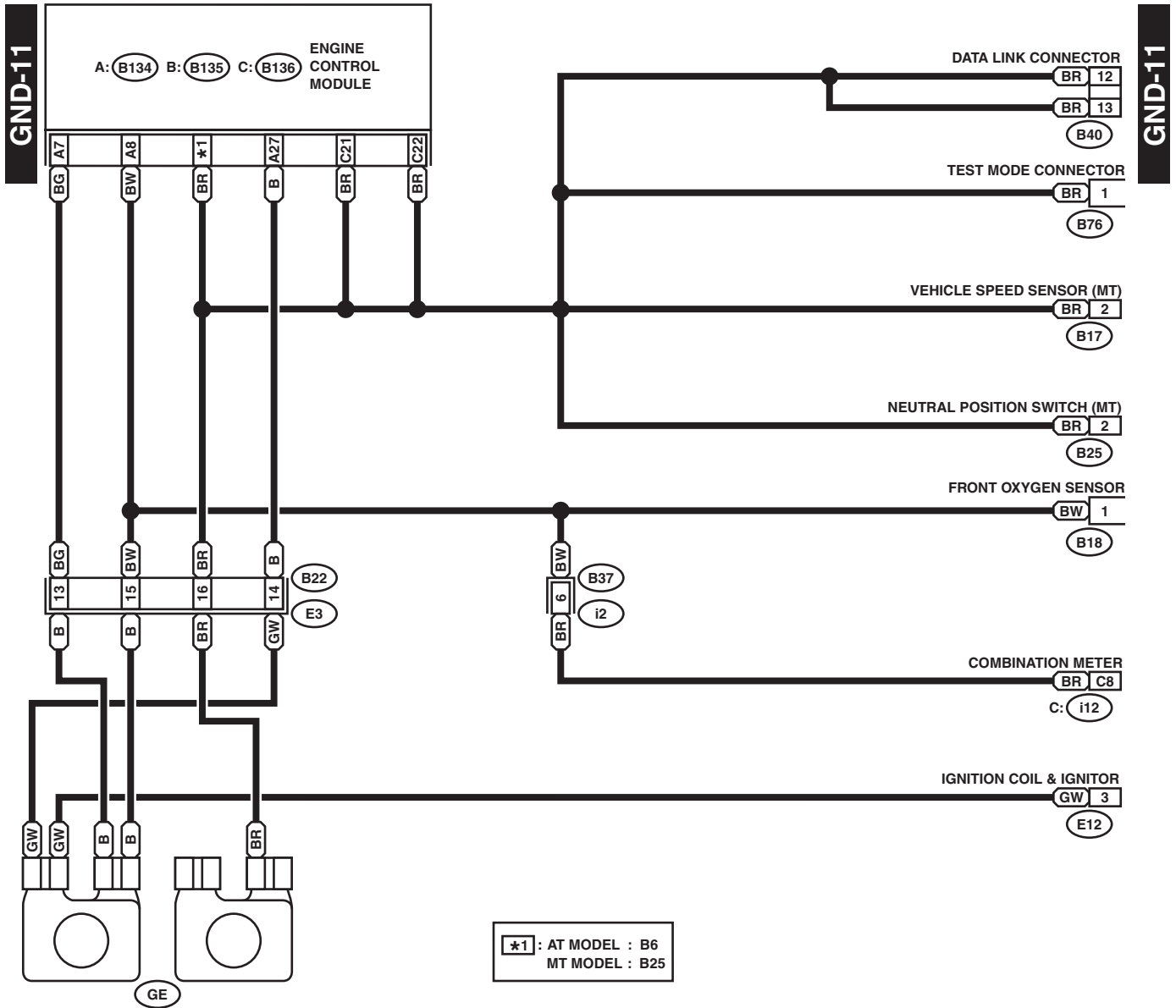


GG04-21J

GROUND DISTRIBUTION

WIRING SYSTEM

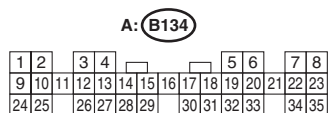
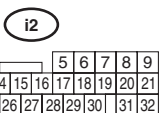
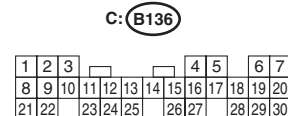
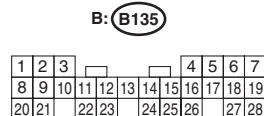
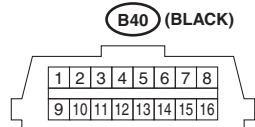
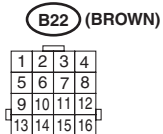
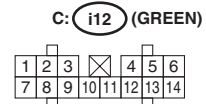
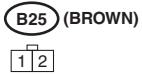
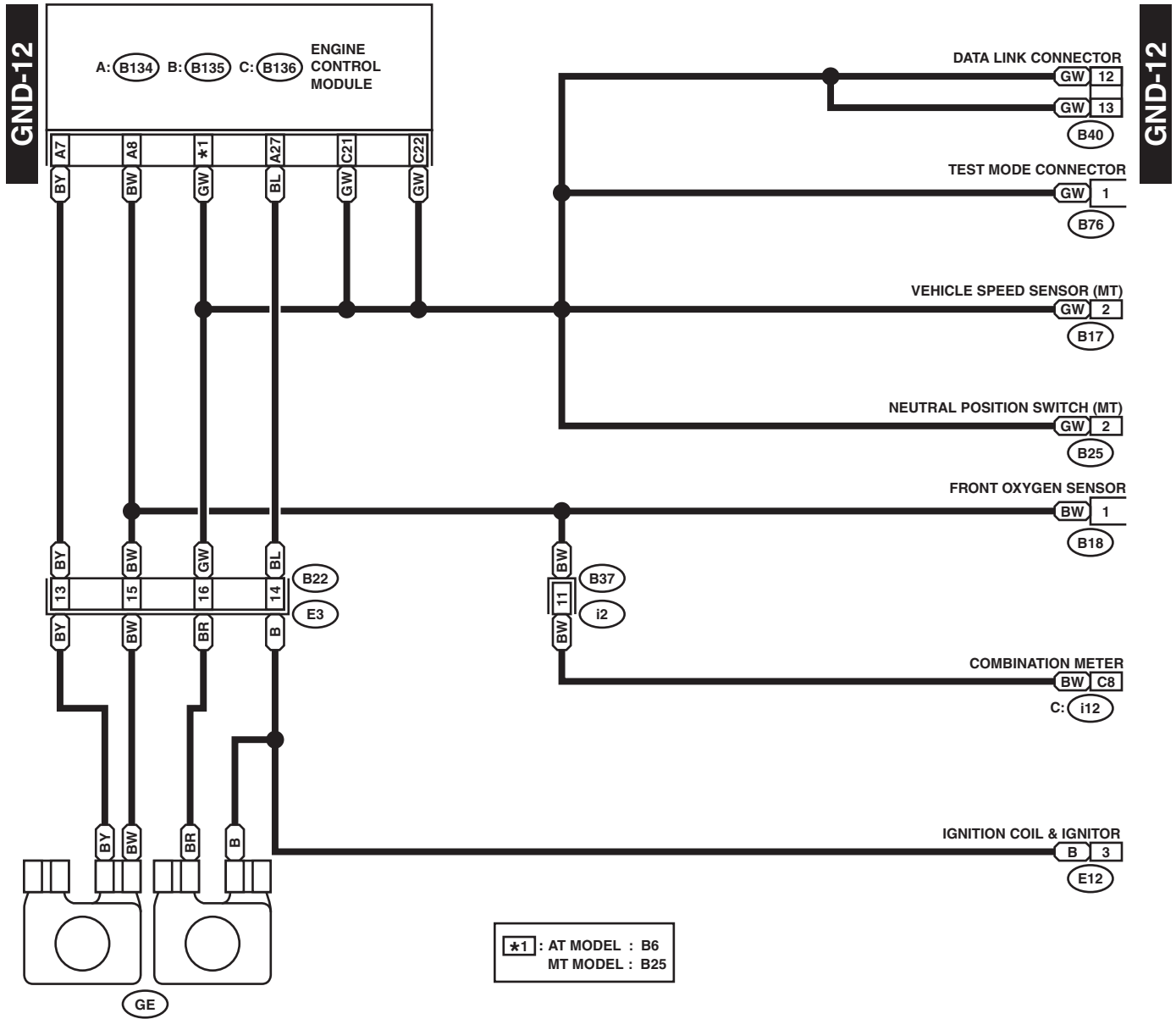
3. LHD SOHC W/O OBD ENGINE MODEL



GROUND DISTRIBUTION

WIRING SYSTEM

4. RHD SOHC W/O OBD ENGINE MODEL

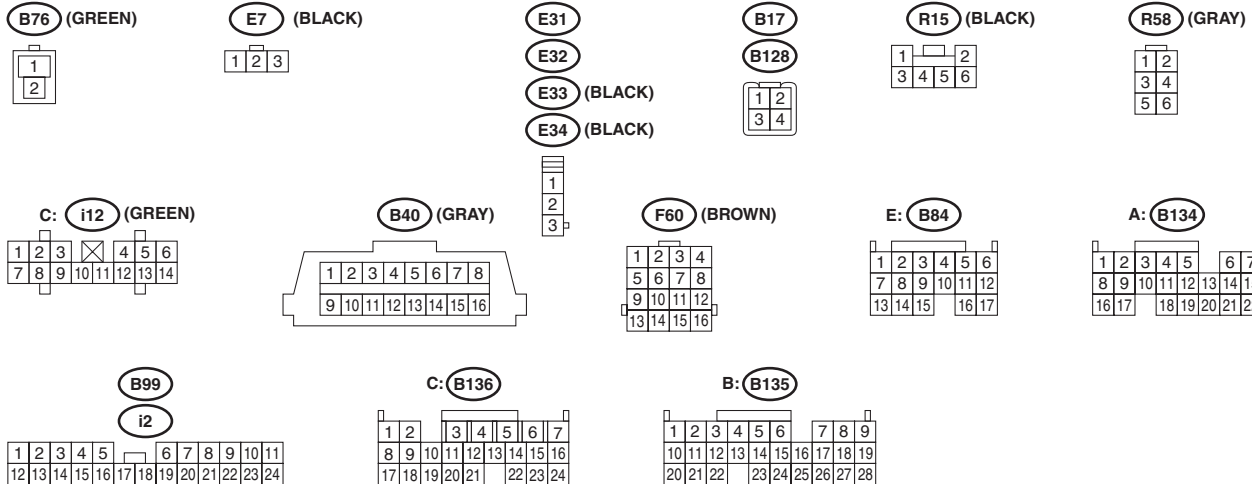
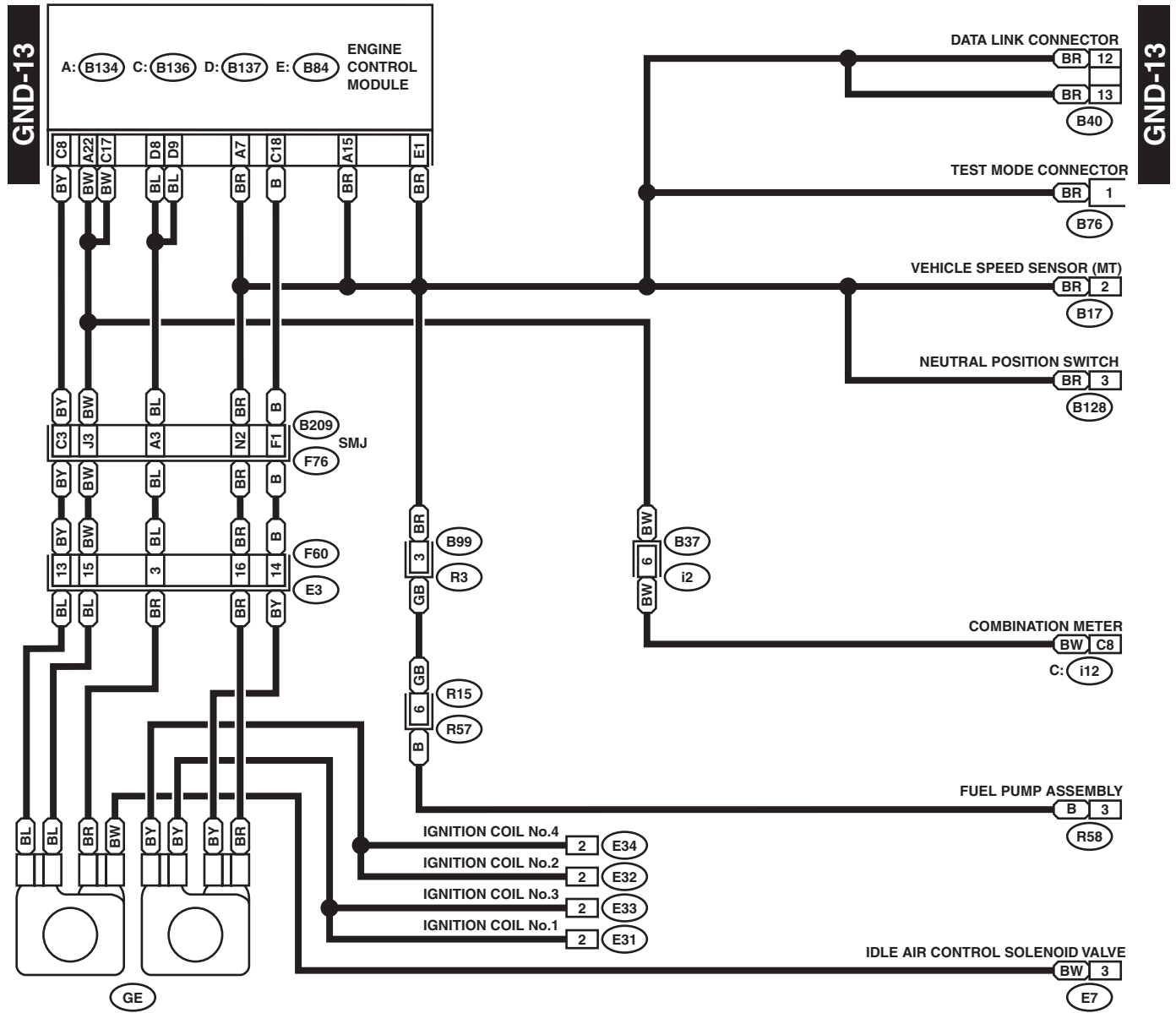


GG04-21L

GROUND DISTRIBUTION

WIRING SYSTEM

5. LHD TURBO ENGINE MODEL

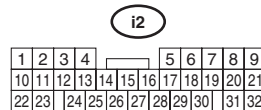
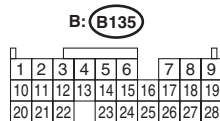
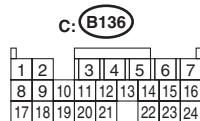
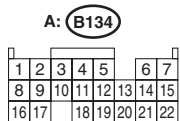
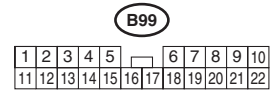
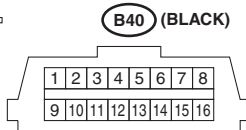
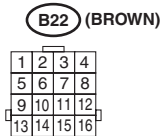
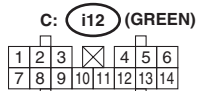
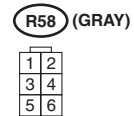
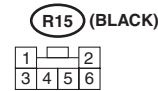
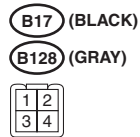
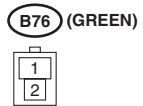
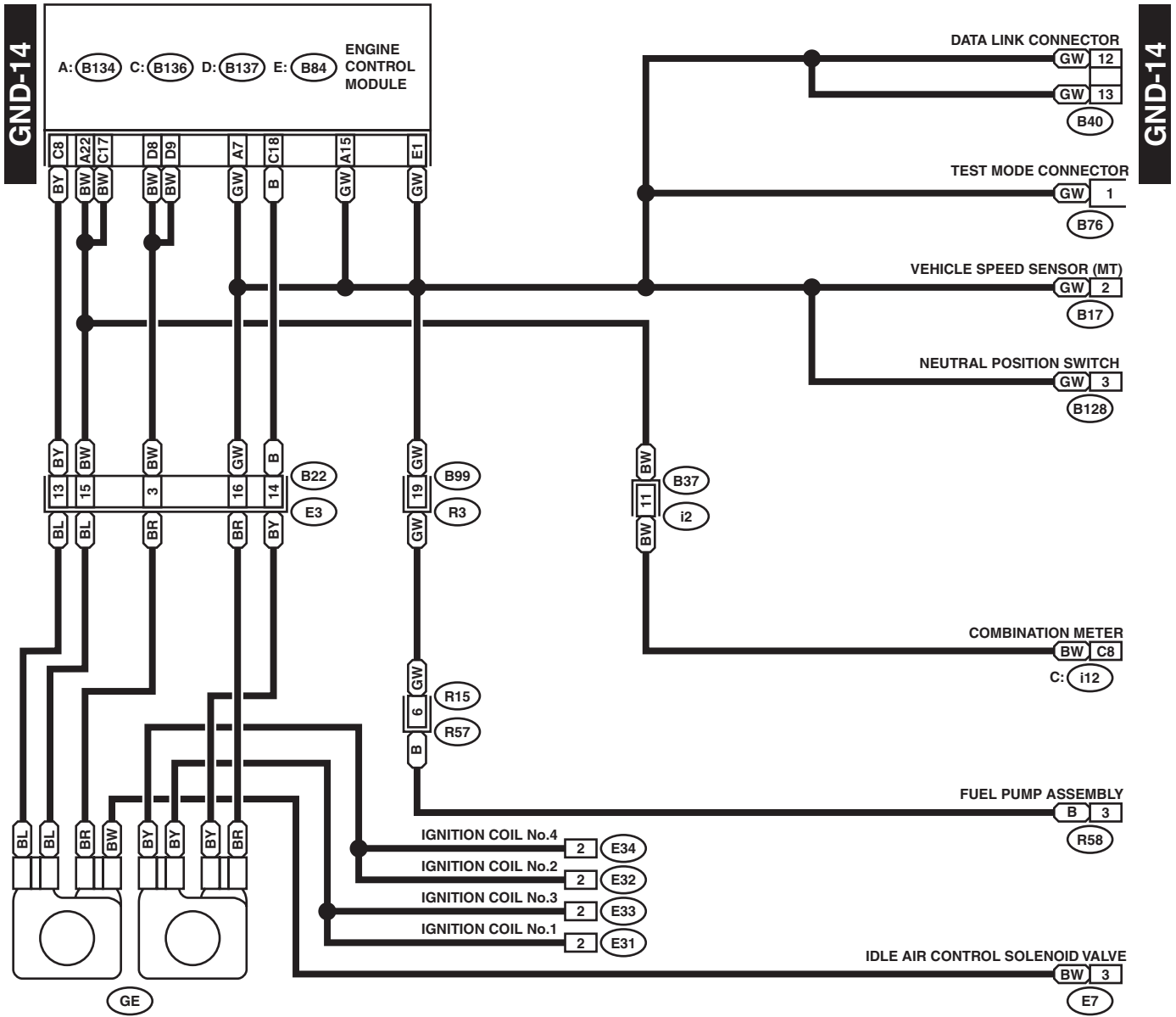


GG04-21M

GROUND DISTRIBUTION

WIRING SYSTEM

6. RHD TURBO ENGINE MODEL

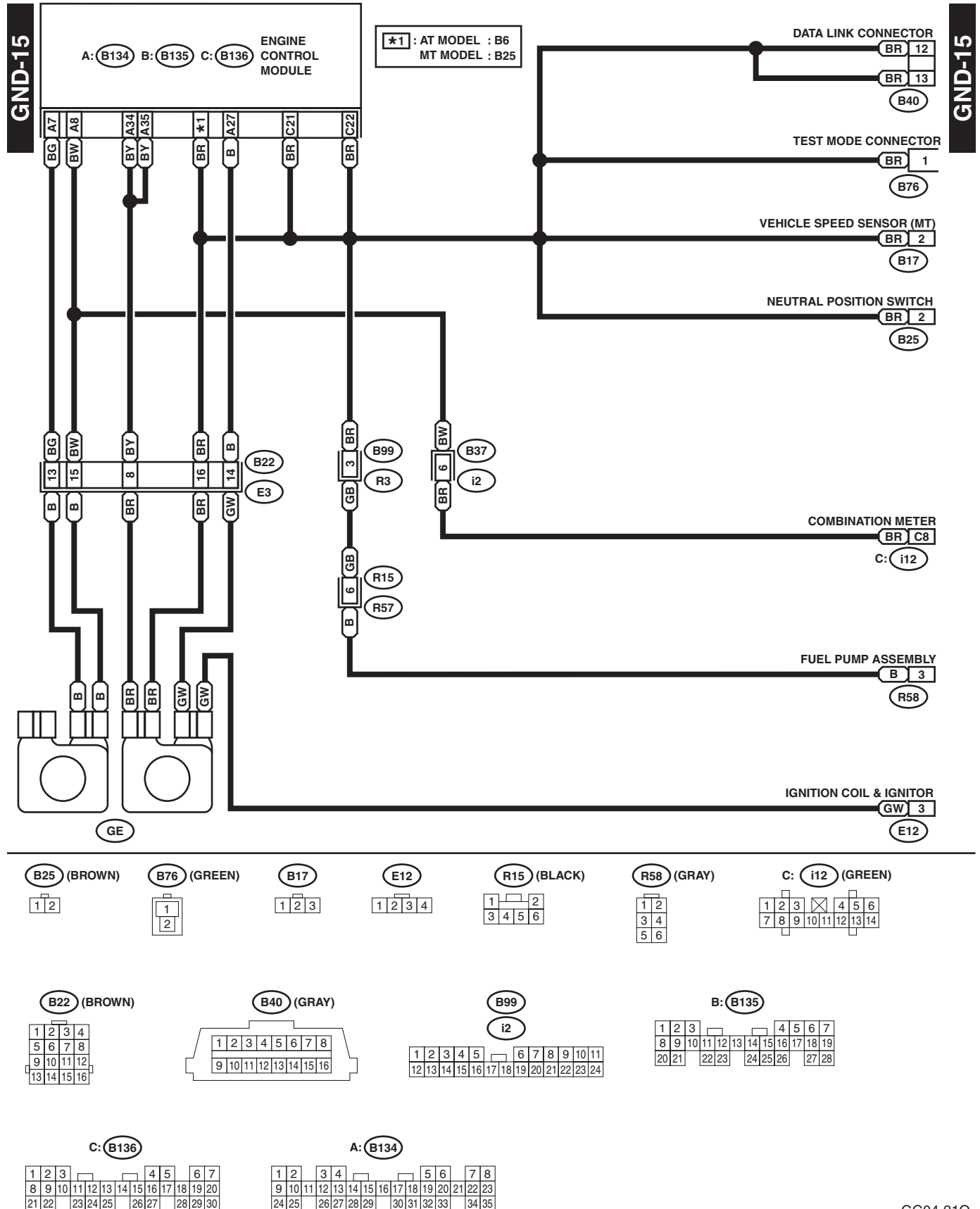


GG04-21N

GROUND DISTRIBUTION

WIRING SYSTEM

7. LHD SOHC MODEL

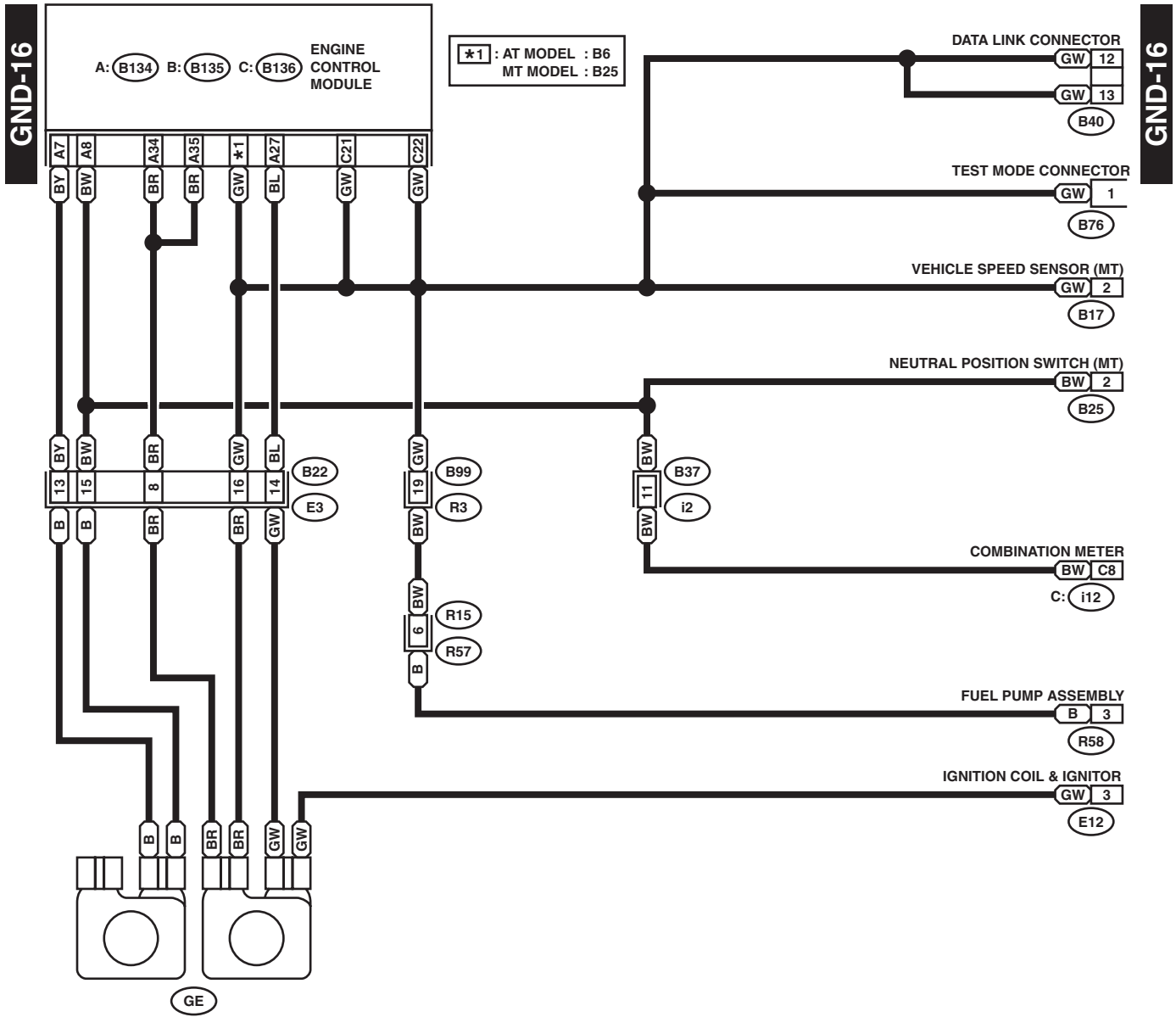


GG04-210

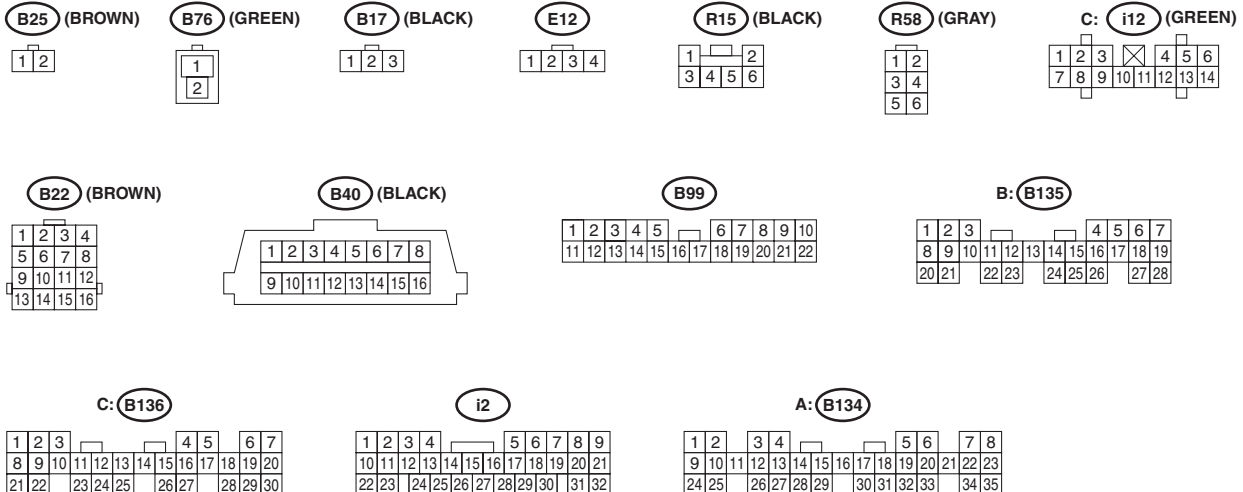
GROUND DISTRIBUTION

WIRING SYSTEM

8. RHD SOHC MODEL



GND-16



GG04-21P

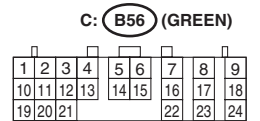
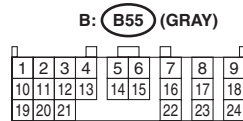
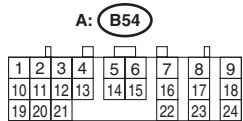
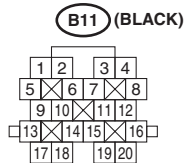
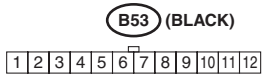
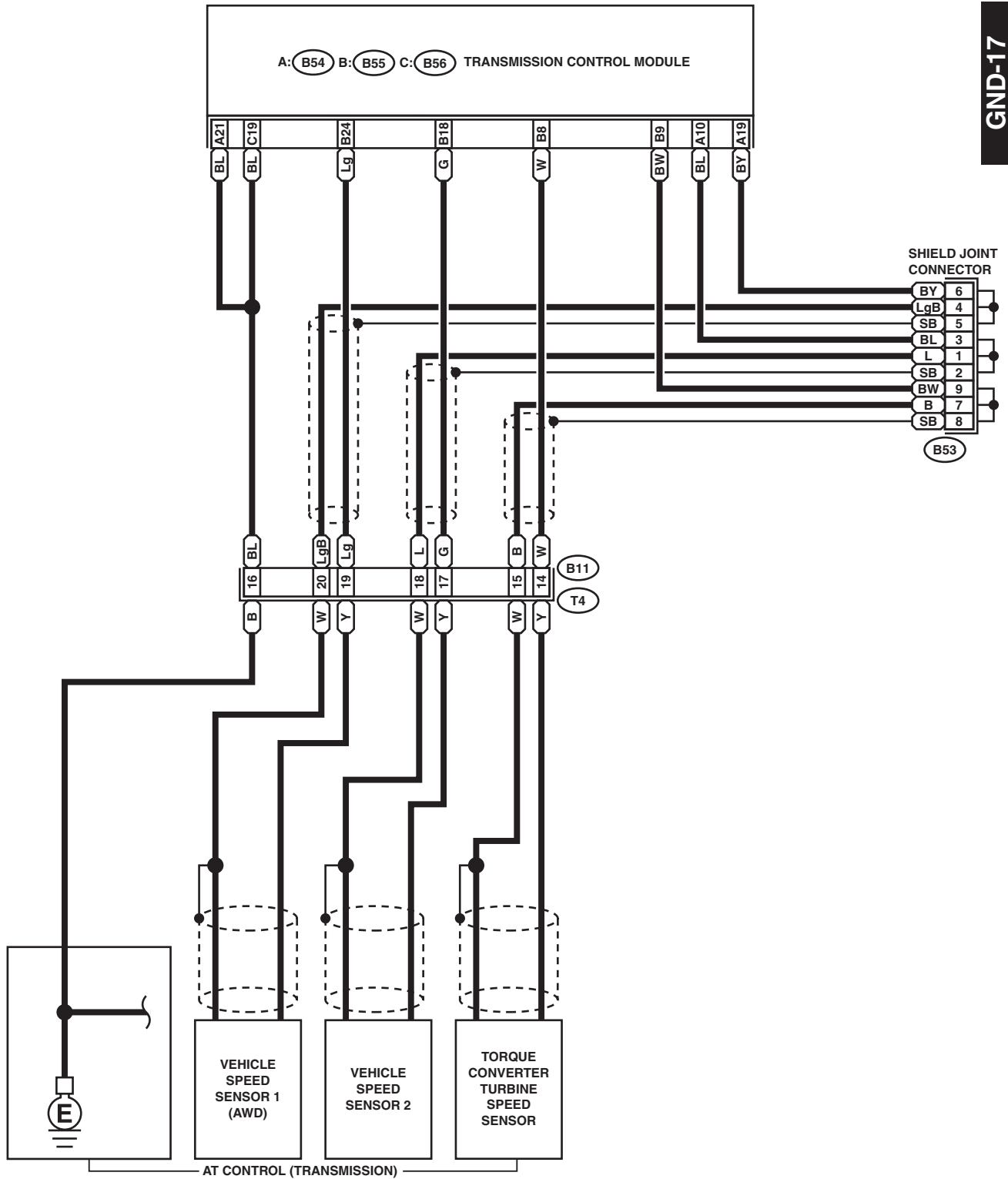
GROUND DISTRIBUTION

WIRING SYSTEM

9. LHD MODEL (TRANSMISSION)

GND-17

GND-17



GG04-21Q

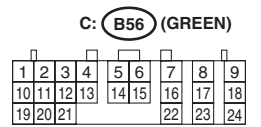
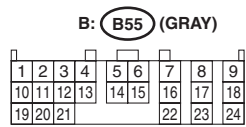
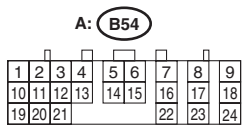
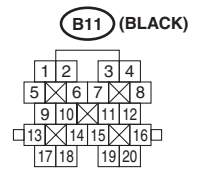
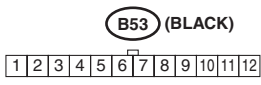
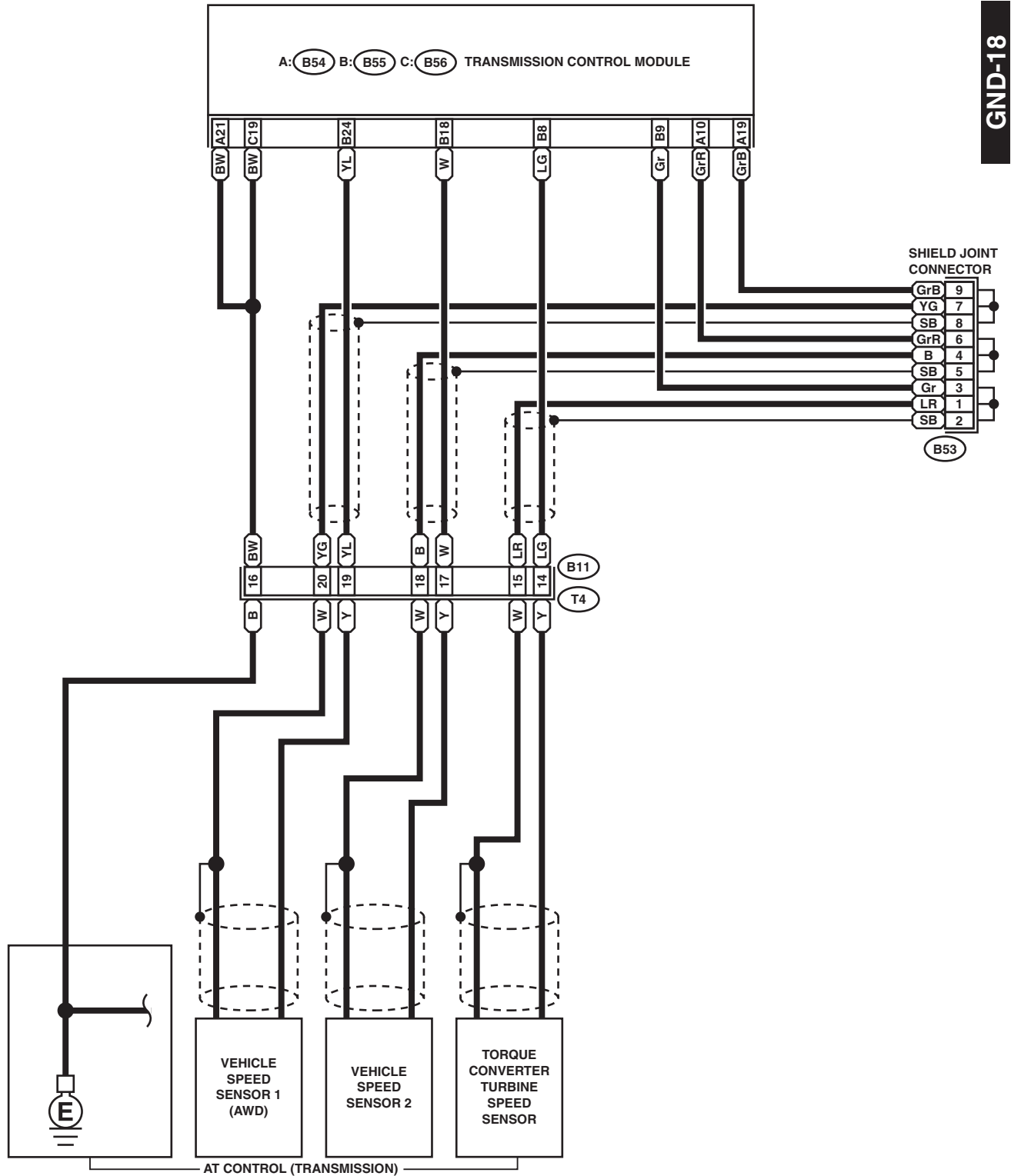
GROUND DISTRIBUTION

WIRING SYSTEM

10.RHD MODEL (TRANSMISSION)

GND-18

GND-18



GG04-21R

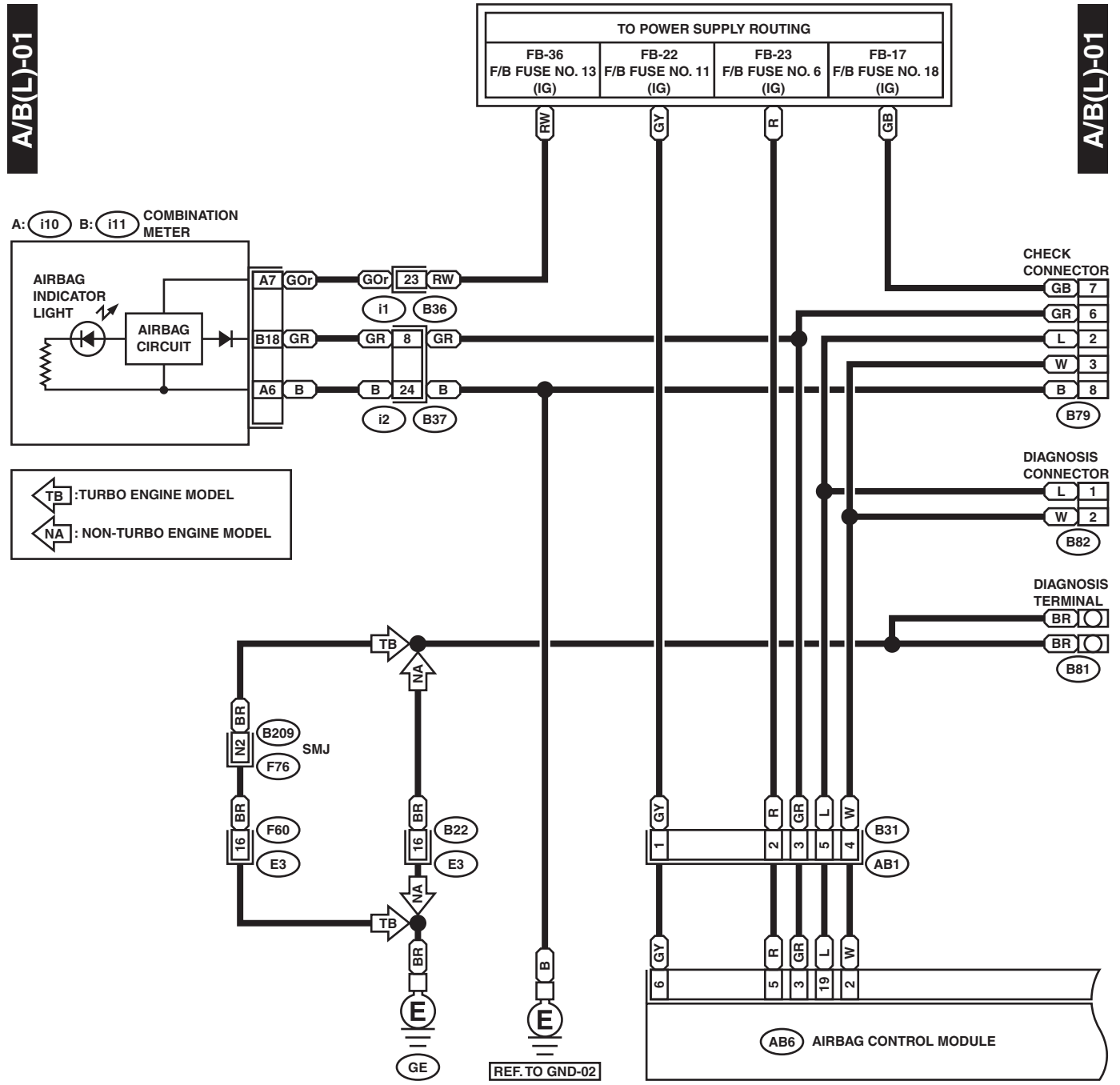
6. Airbag System

A: SCHEMATIC

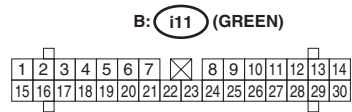
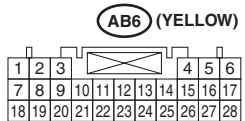
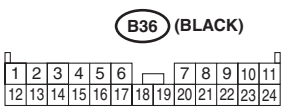
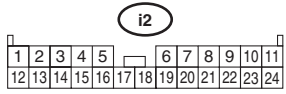
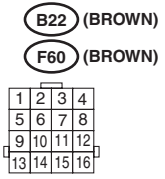
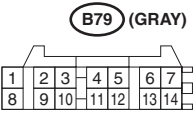
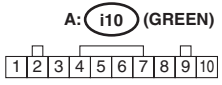
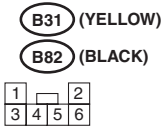
AIRBAG SYSTEM

WIRING SYSTEM

1. LHD MODEL



A/B(L)-01



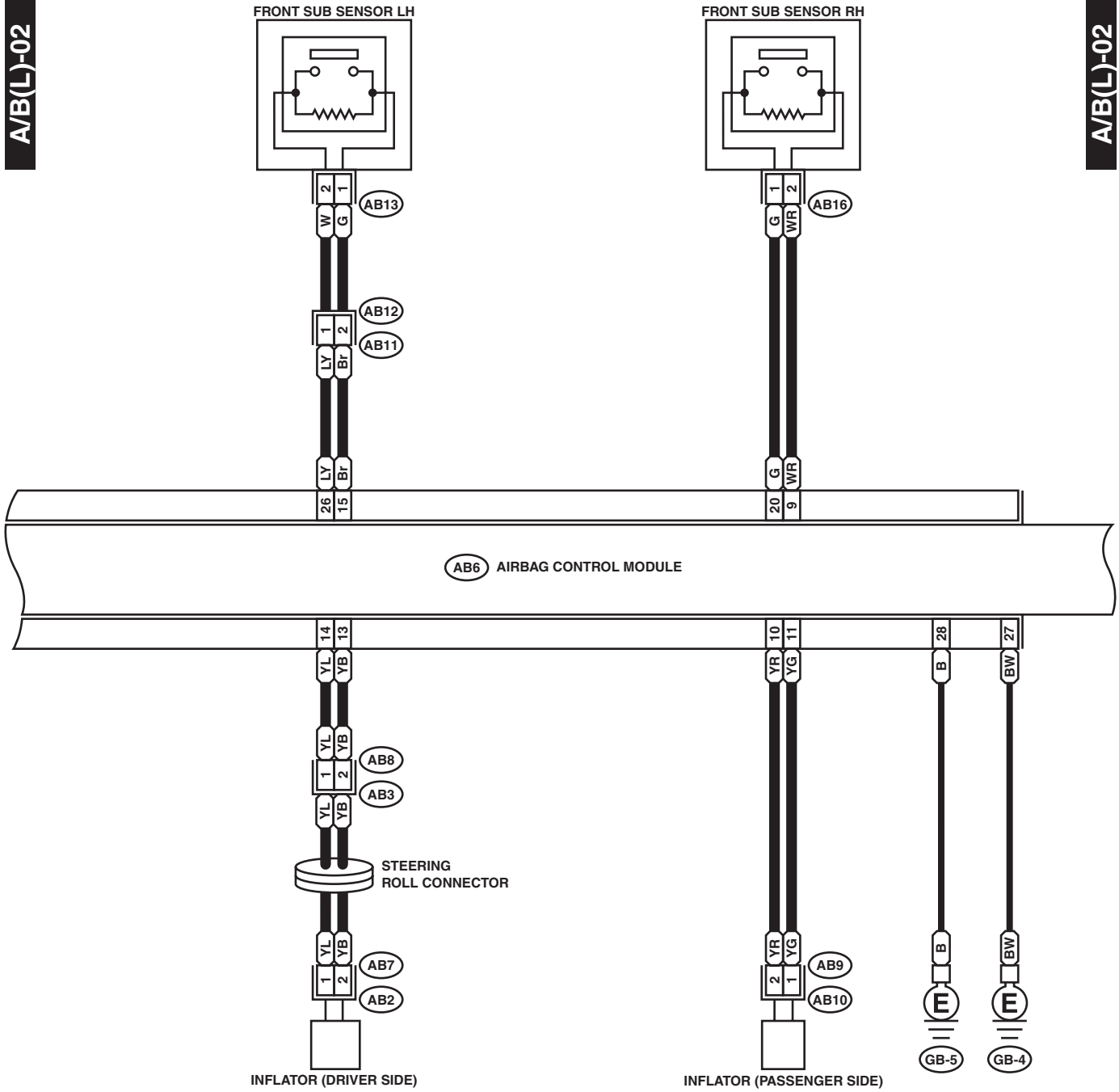
GL86-21A

AIRBAG SYSTEM

WIRING SYSTEM

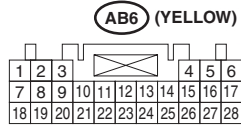
A/B(L)-02

A/B(L)-02



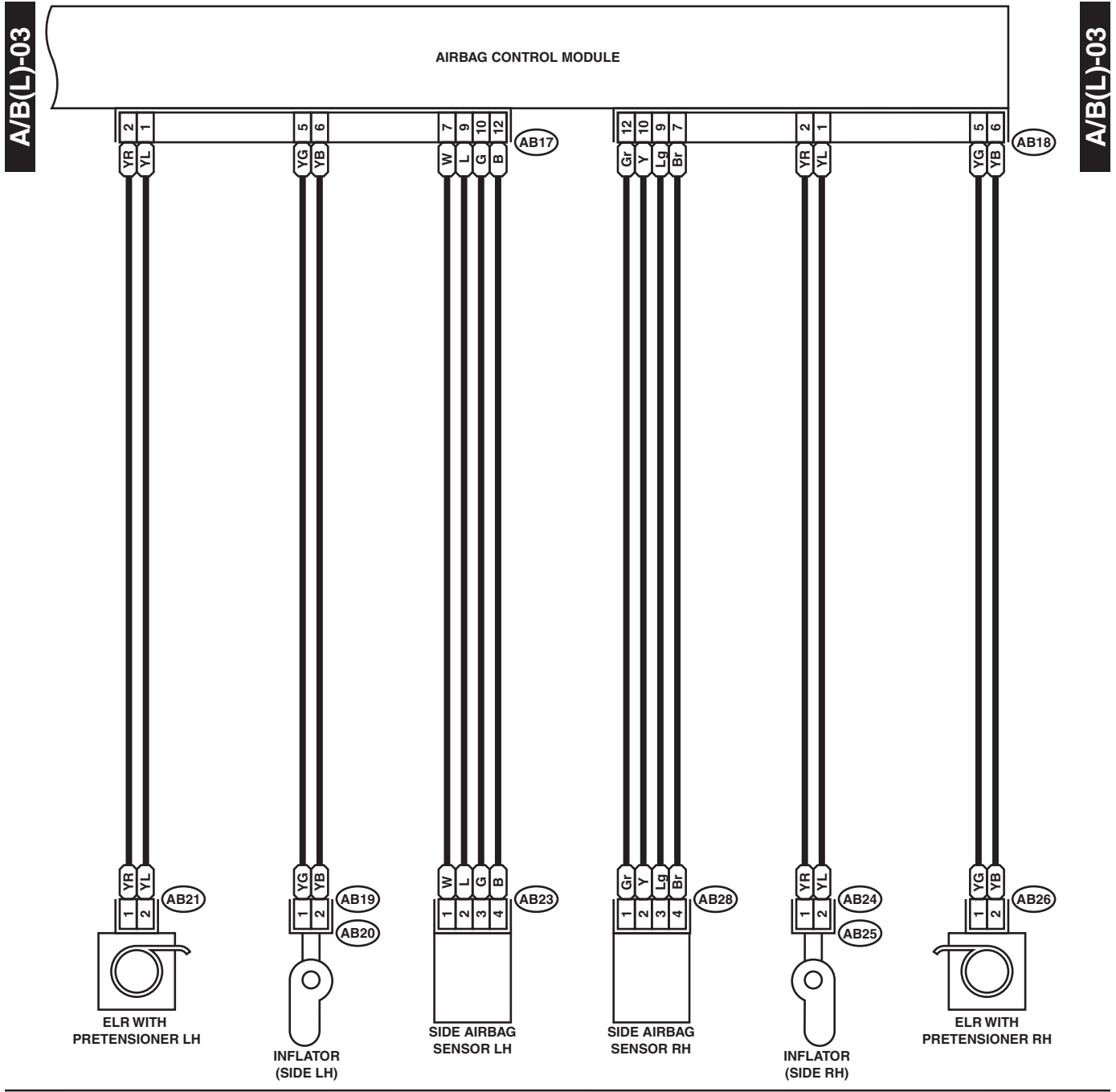
- AB7 (YELLOW)
- AB8 (YELLOW)
- AB9 (YELLOW)
- AB11 (YELLOW)

- AB13 (YELLOW)
- AB16 (YELLOW)

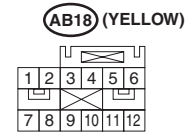
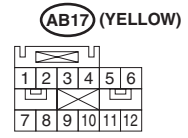
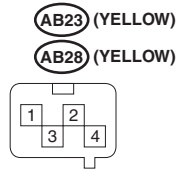


AIRBAG SYSTEM

WIRING SYSTEM



- AB19 (YELLOW)
- AB21 (YELLOW)
- AB24 (YELLOW)
- AB26 (YELLOW)

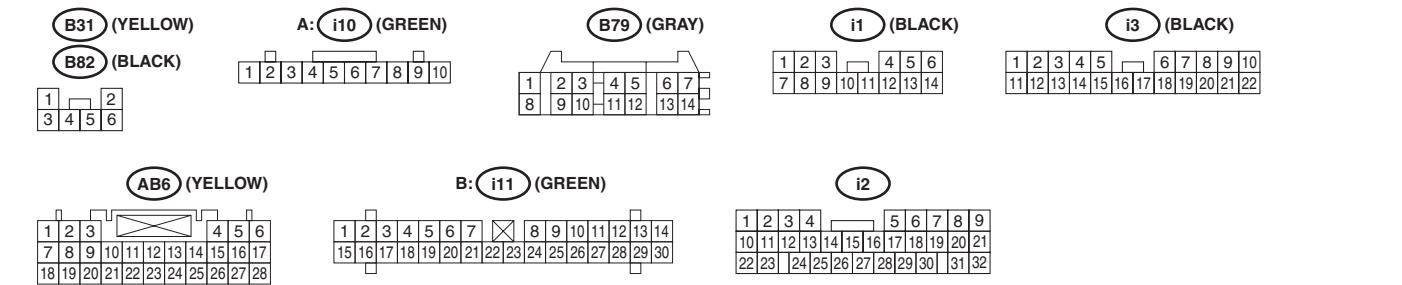
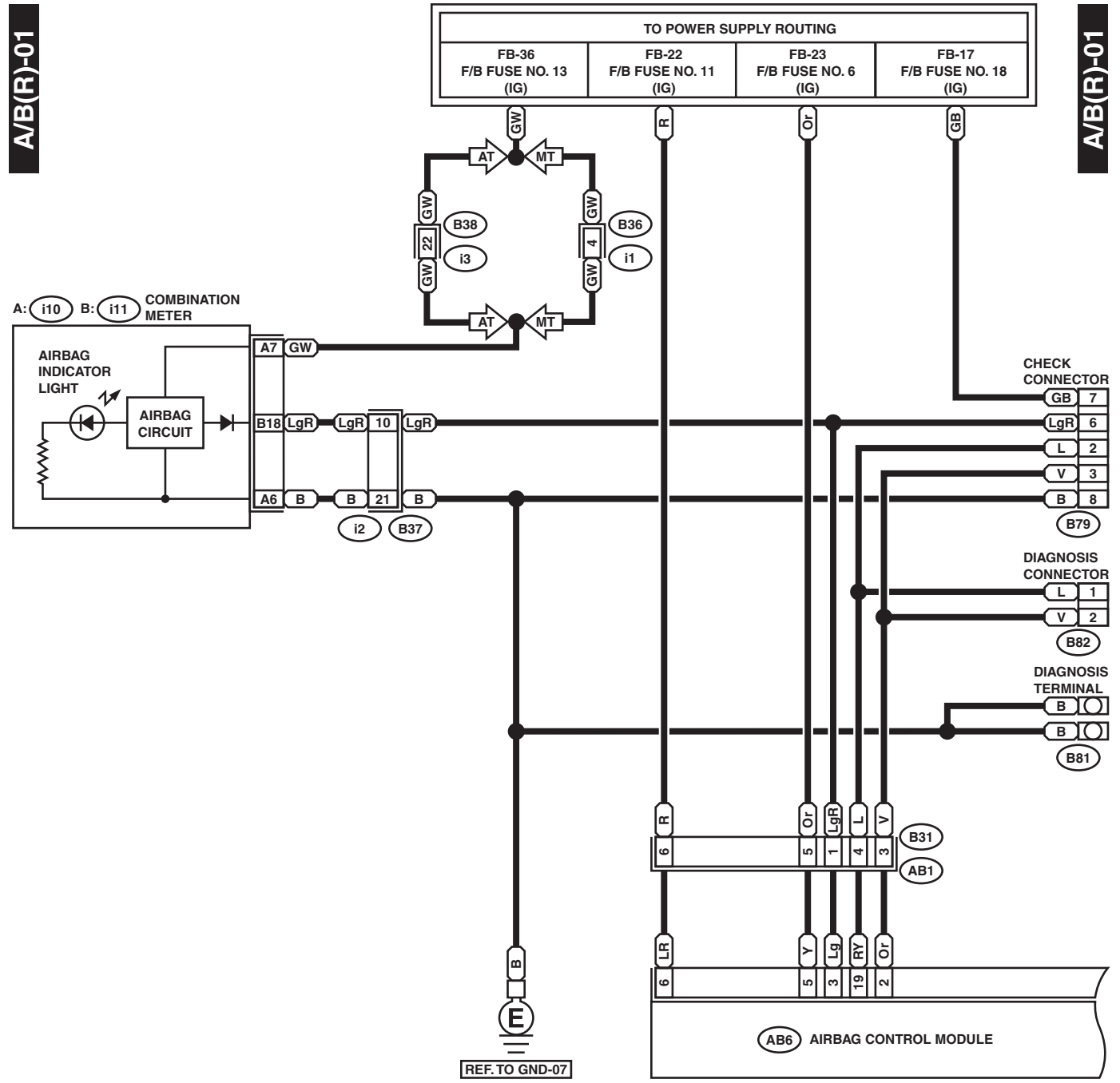


GL86-21C

AIRBAG SYSTEM

WIRING SYSTEM

2. RHD MODEL

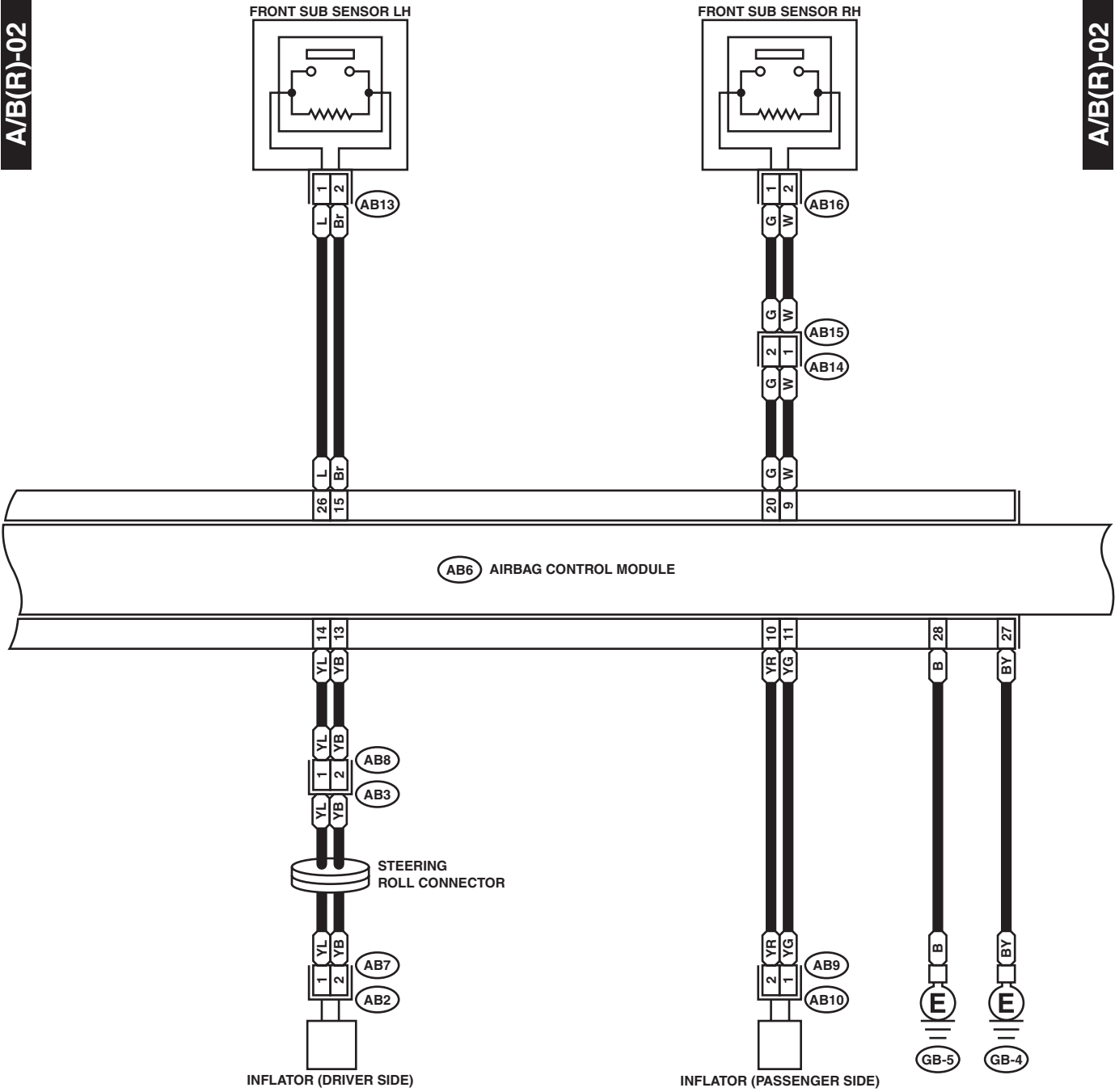


AIRBAG SYSTEM

WIRING SYSTEM

A/B(R)-02

A/B(R)-02



AB7 (YELLOW)

AB8 (YELLOW)

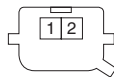
AB9 (YELLOW)

AB14 (YELLOW)

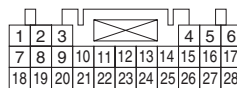


AB13 (YELLOW)

AB16 (YELLOW)



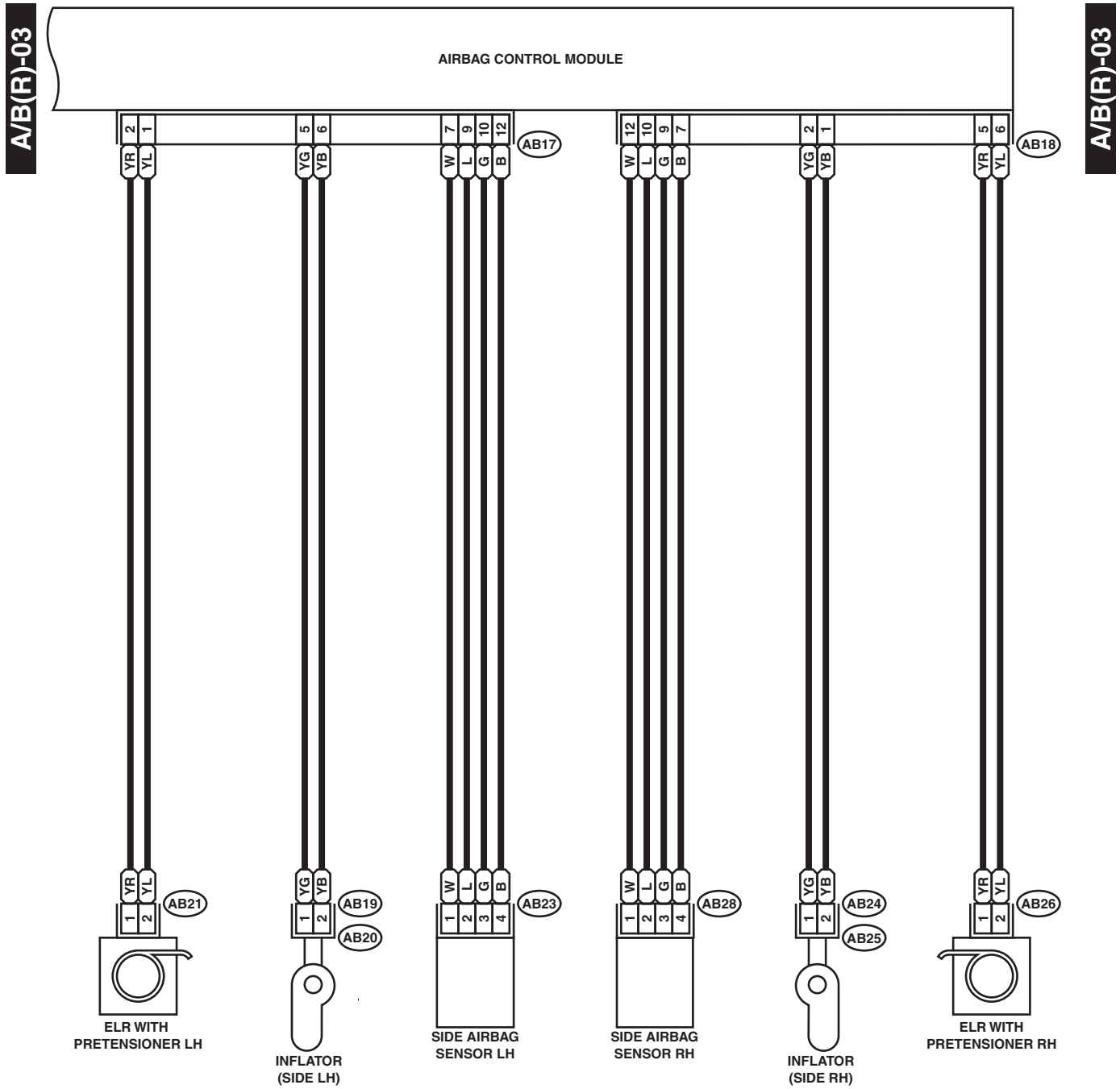
AB6 (YELLOW)



GR86-21B

AIRBAG SYSTEM

WIRING SYSTEM



AB19 (YELLOW)

AB21 (YELLOW)

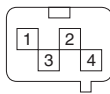
AB24 (YELLOW)

AB26 (YELLOW)

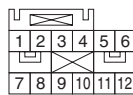


AB23 (YELLOW)

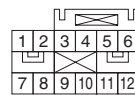
AB28 (YELLOW)



AB17 (YELLOW)



AB18 (YELLOW)



GR86-21C

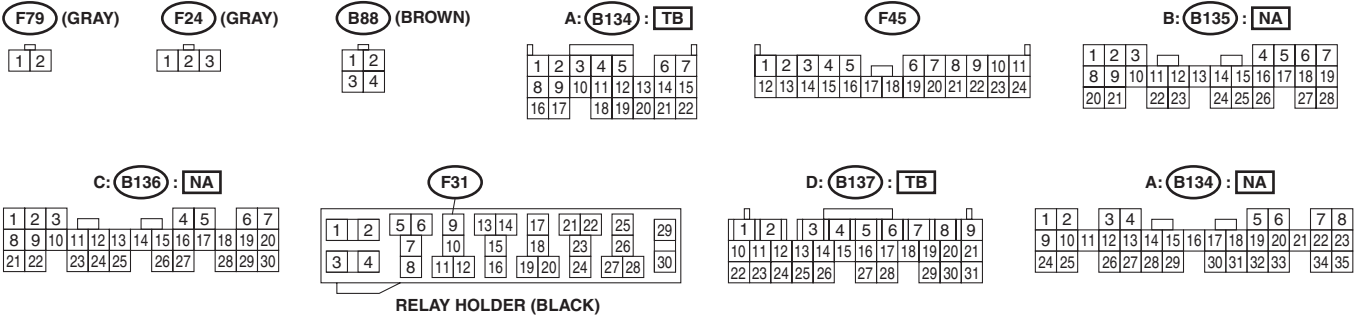
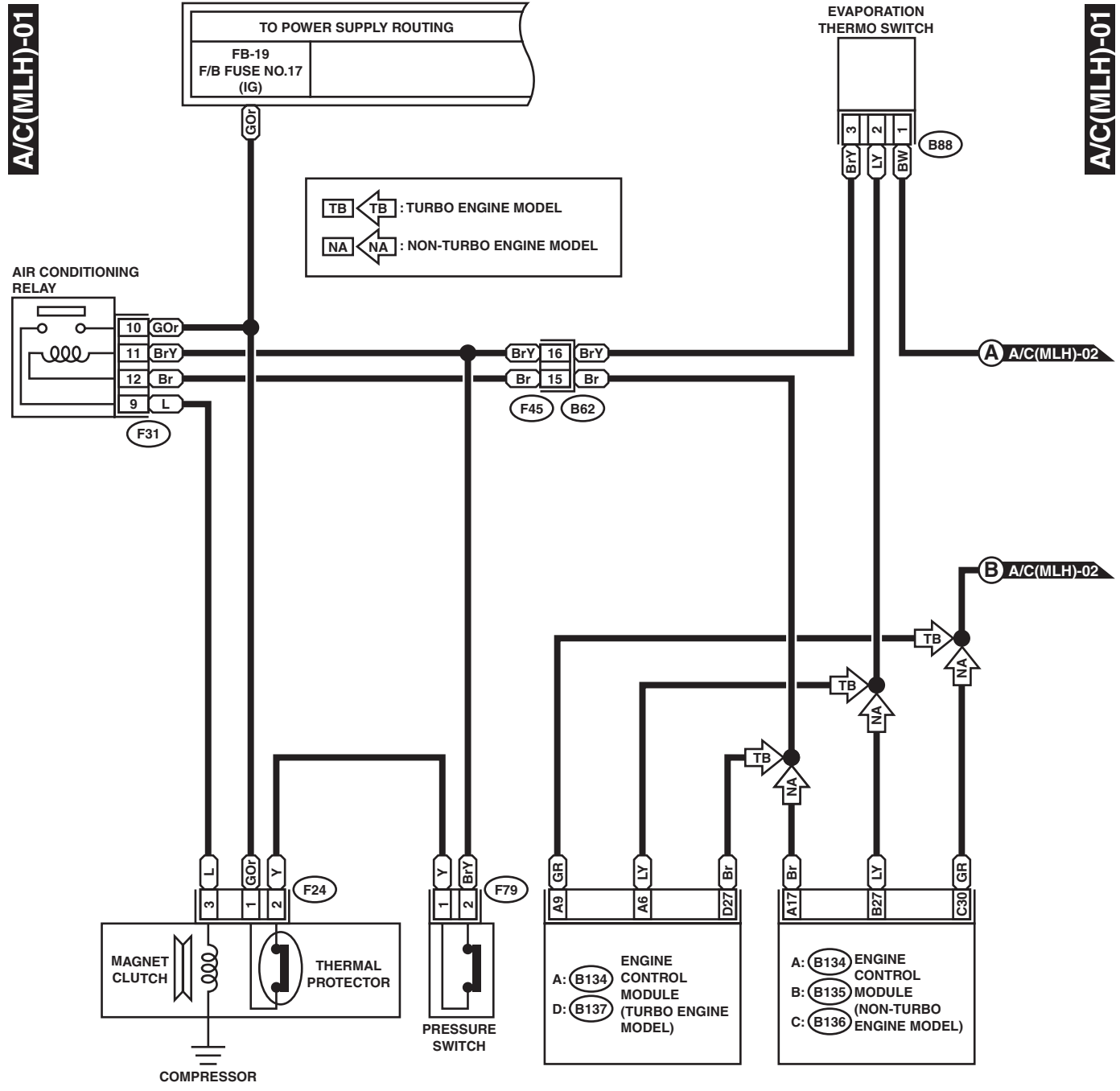
7. Air Conditioning System

A: SCHEMATIC

AIR CONDITIONING SYSTEM

WIRING SYSTEM

1. MANUAL A/C LHD MODEL

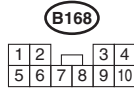
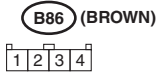
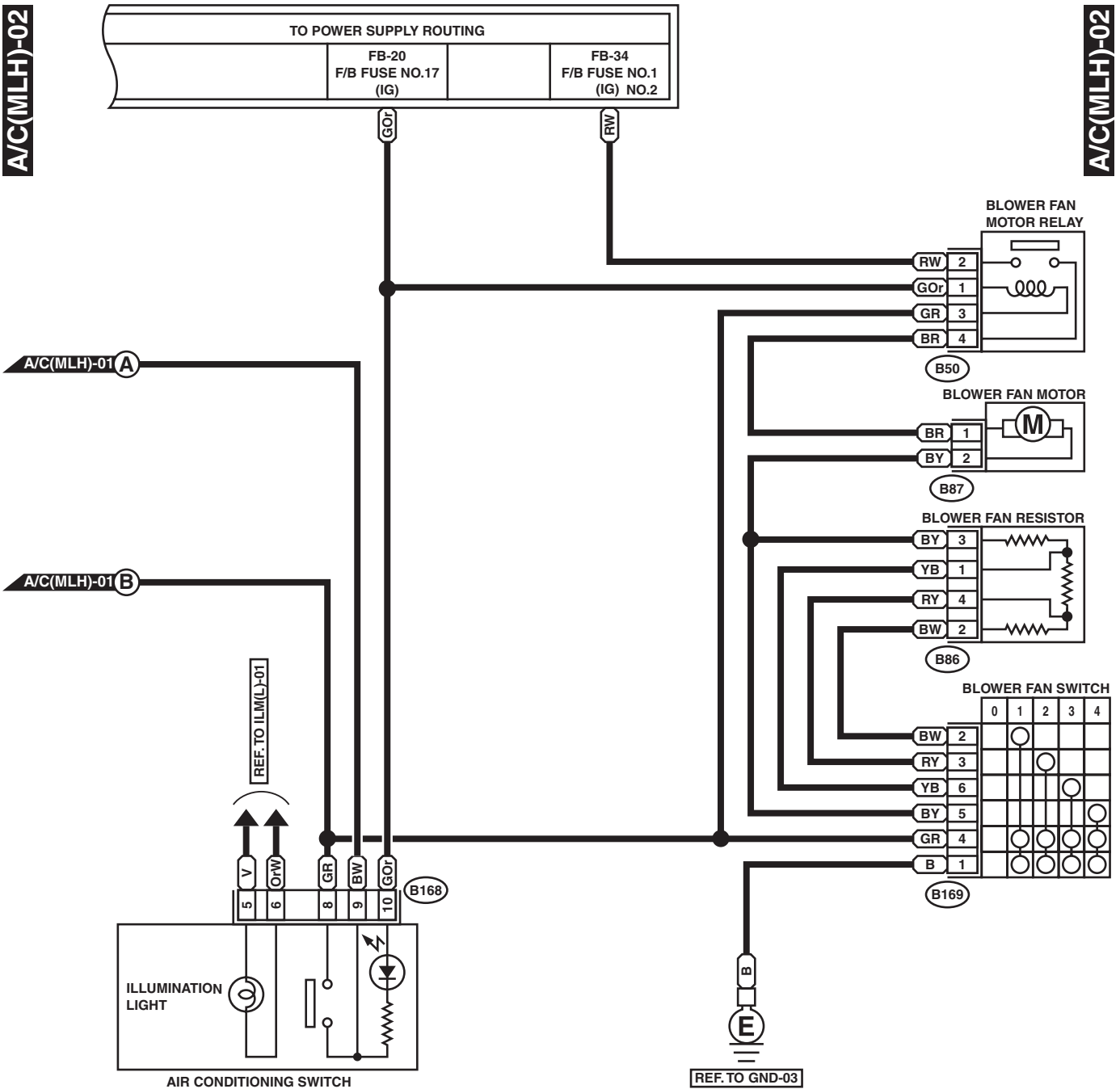


AIR CONDITIONING SYSTEM

WIRING SYSTEM

A/C(MLH)-02

A/C(MLH)-02

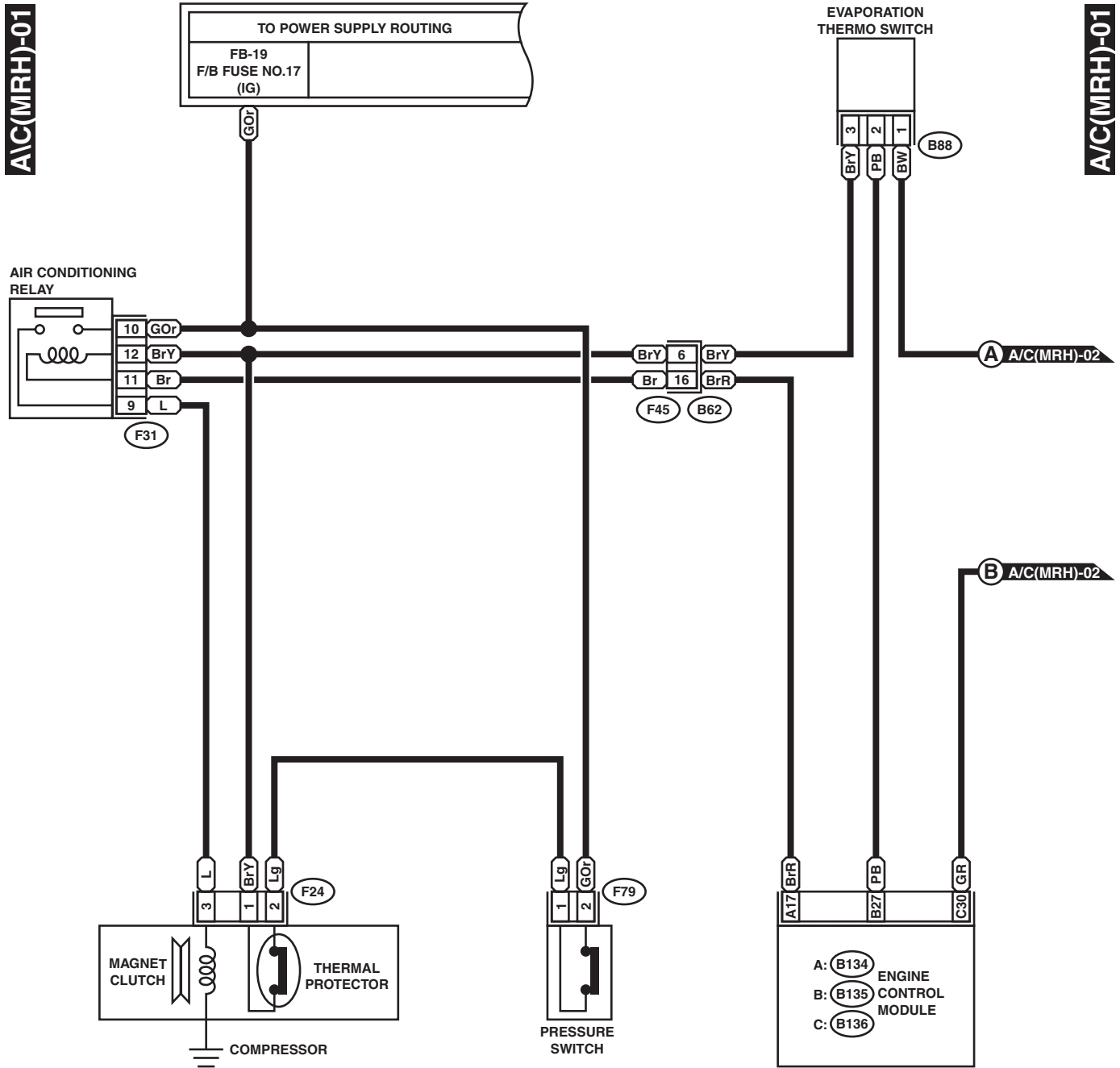


GL45-20B

AIR CONDITIONING SYSTEM

WIRING SYSTEM

2. MANUAL A/C RHD MODEL



F79 (GRAY)



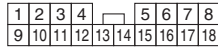
F24 (GRAY)



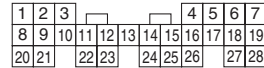
B88 (BROWN)



F45



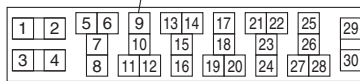
B: B135



C: B136



F31



RELAY HOLDER (BLACK)

A: B134

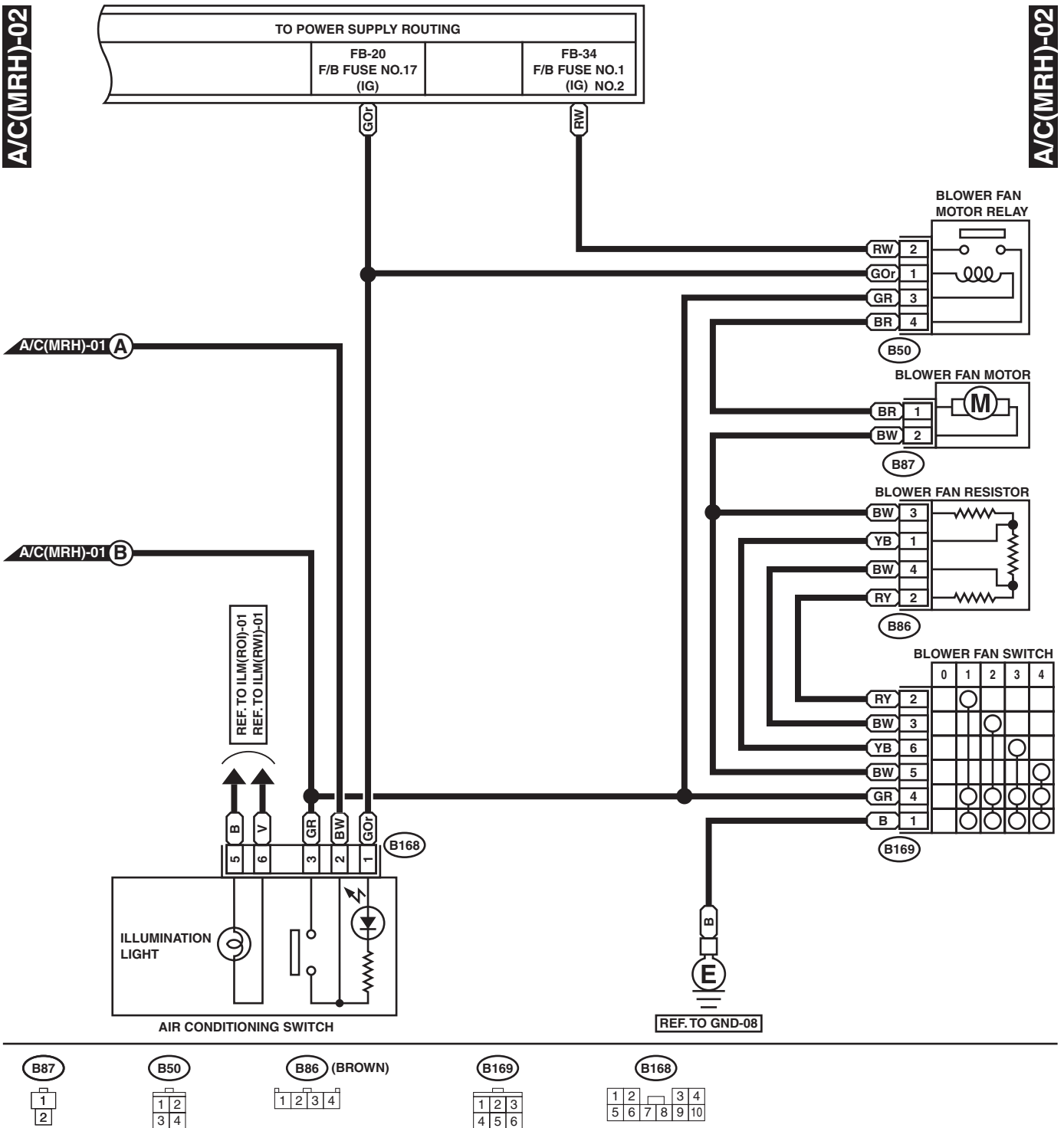


AIR CONDITIONING SYSTEM

WIRING SYSTEM

A/C(MRH)-02

A/C(MRH)-02

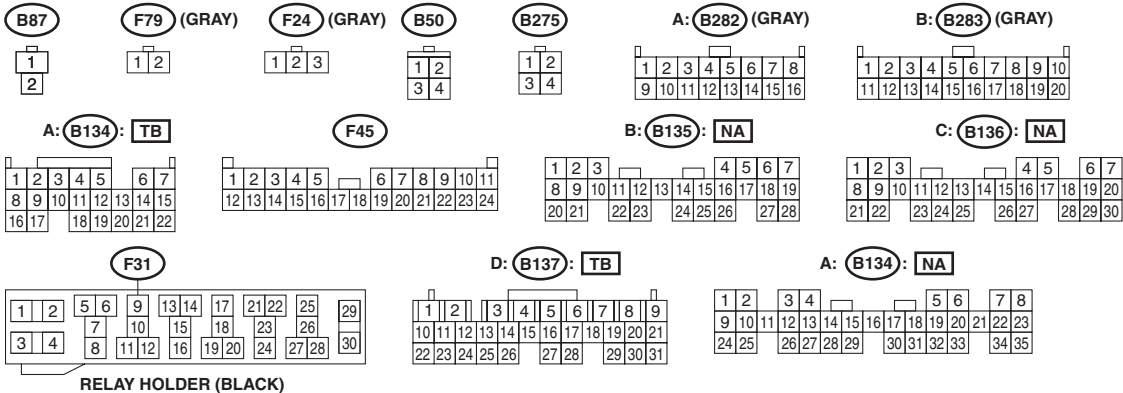
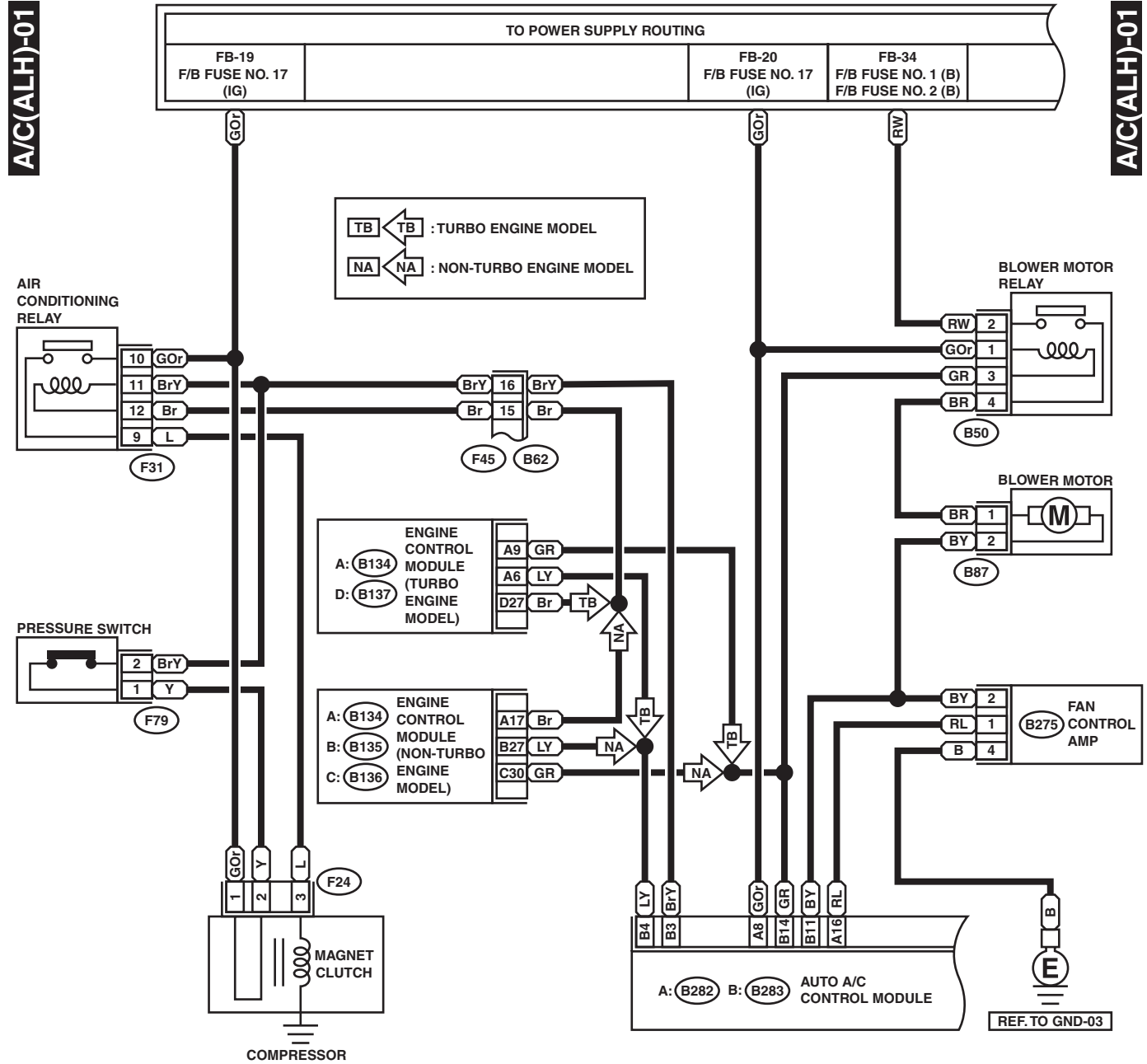


GR45-20B

AIR CONDITIONING SYSTEM

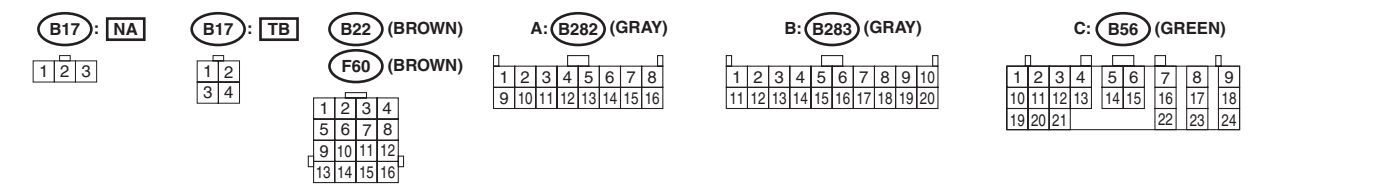
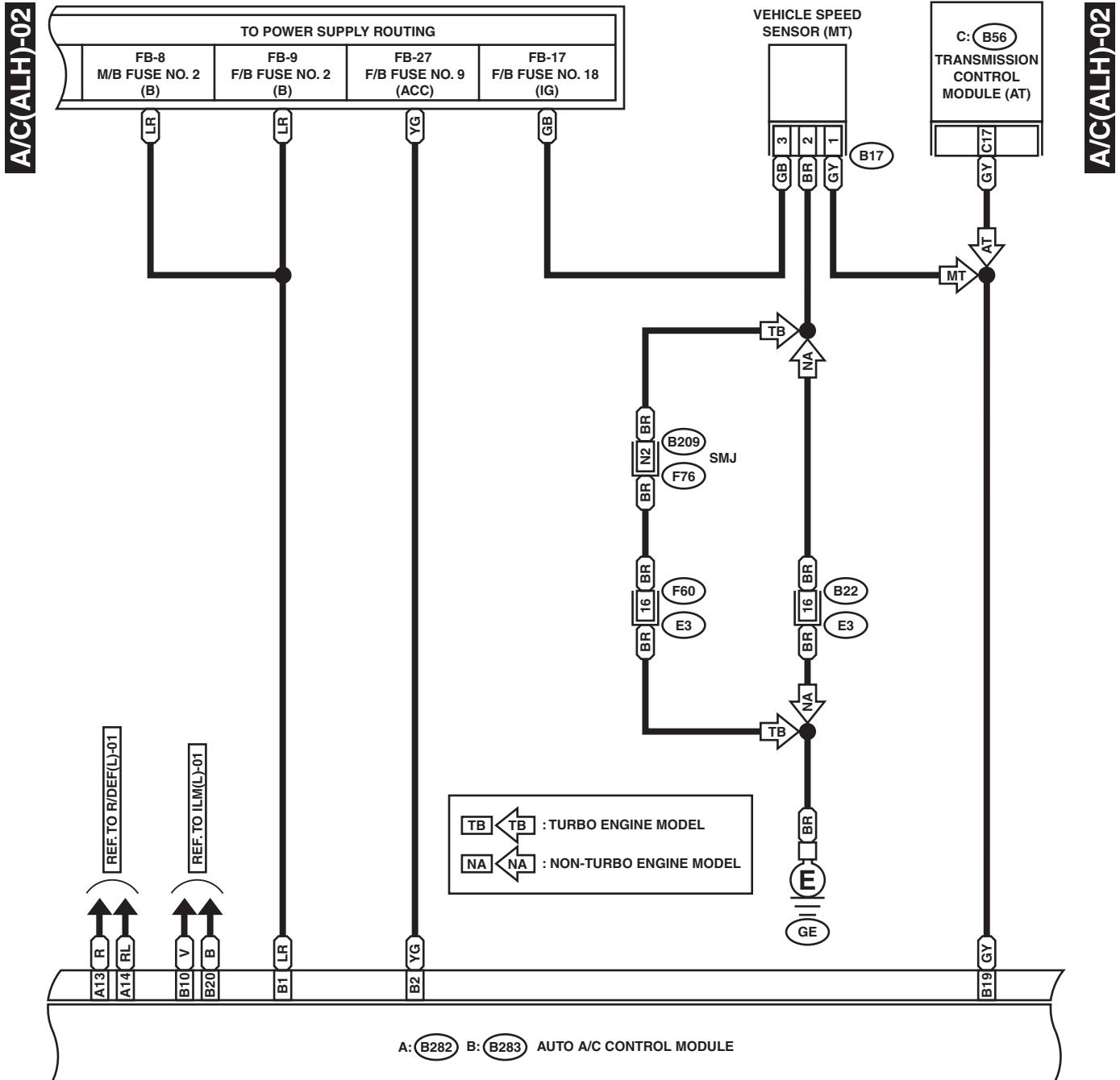
WIRING SYSTEM

3. AUTO A/C LHD MODEL



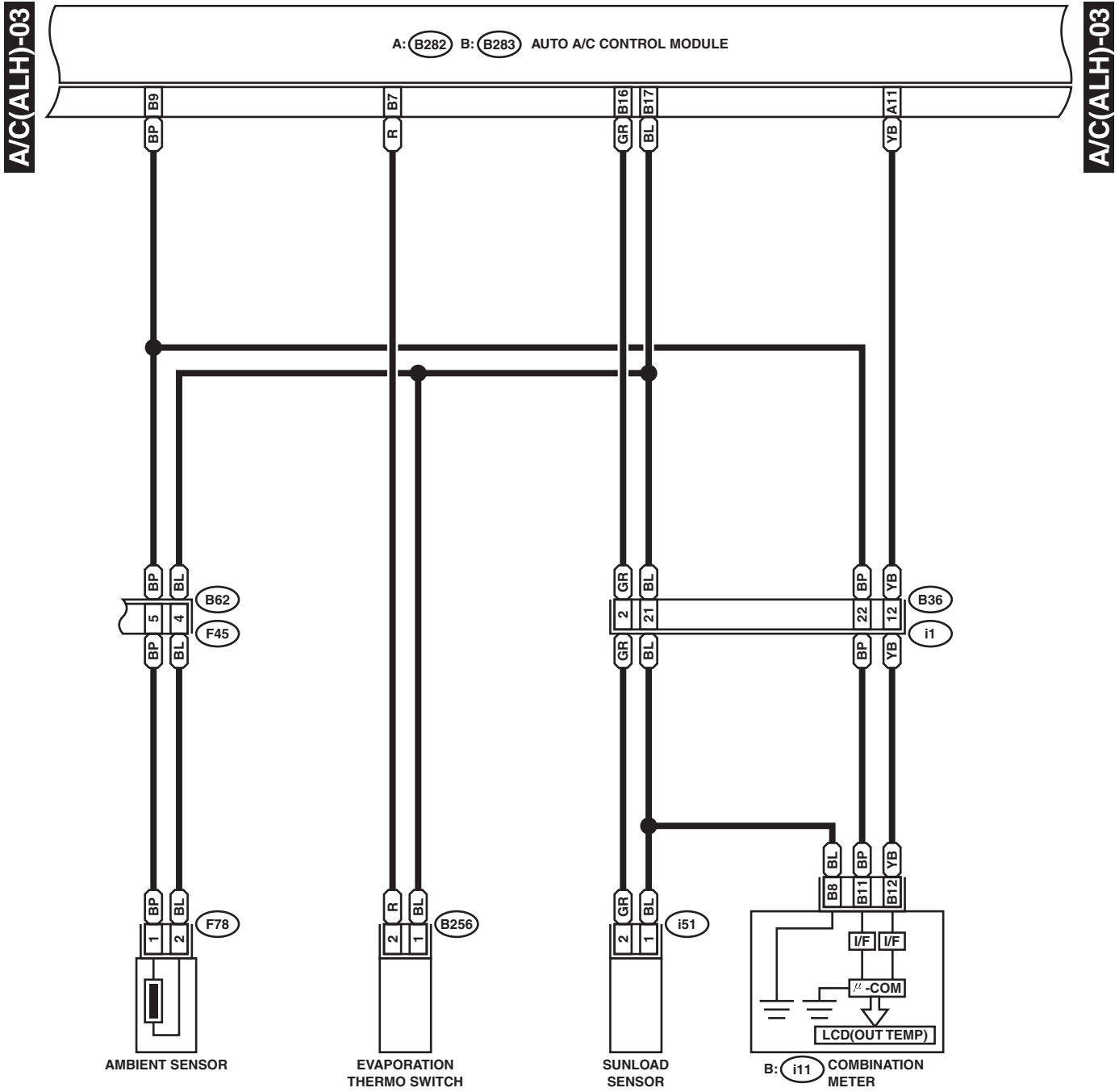
AIR CONDITIONING SYSTEM

WIRING SYSTEM



AIR CONDITIONING SYSTEM

WIRING SYSTEM



B256

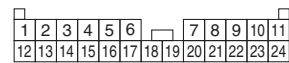
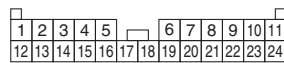
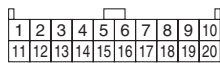
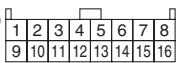
A: B282 (GRAY)

B: B283 (GRAY)

F45

B36 (BLACK)

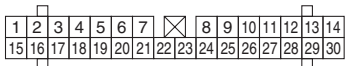
F78 (BLACK)



i51

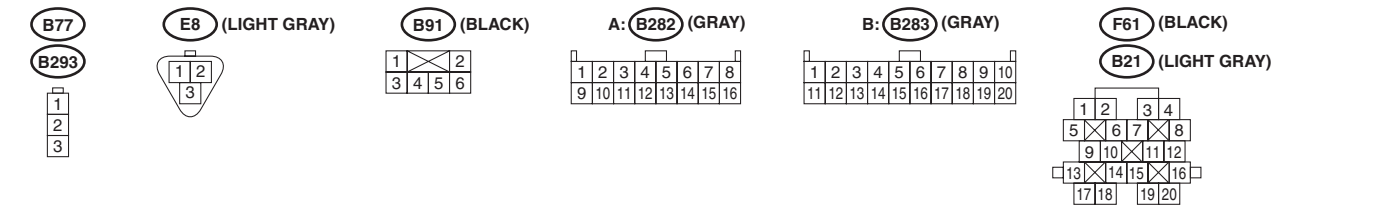
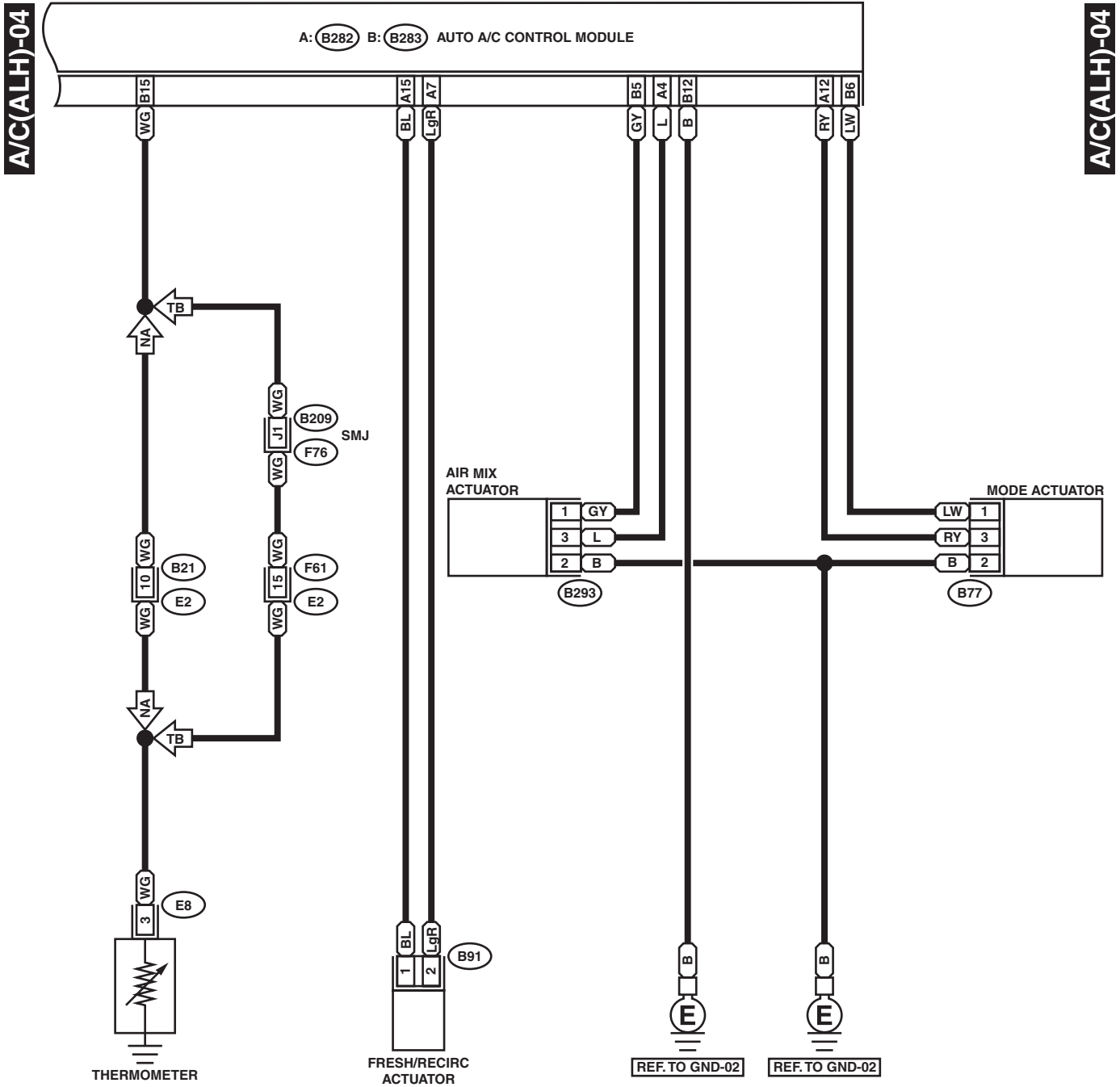


B: i11 (GREEN)



AIR CONDITIONING SYSTEM

WIRING SYSTEM

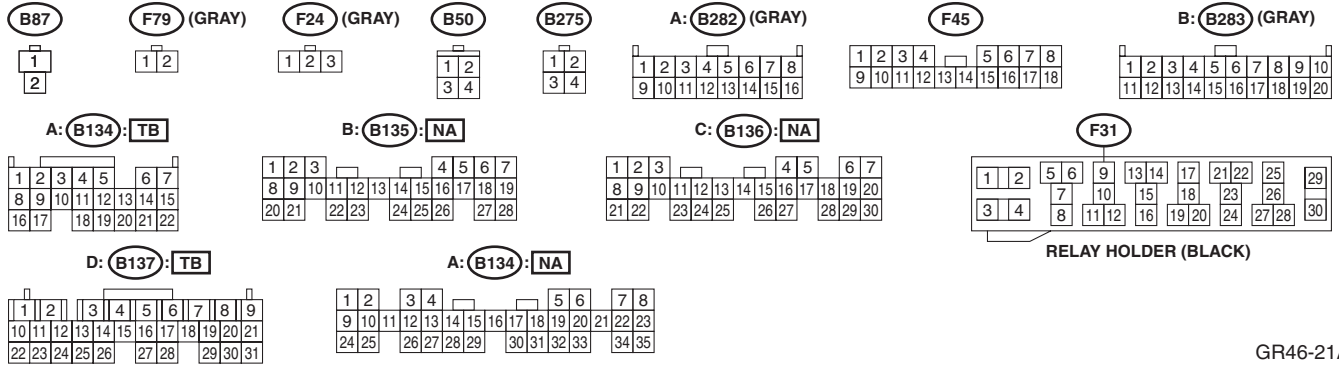
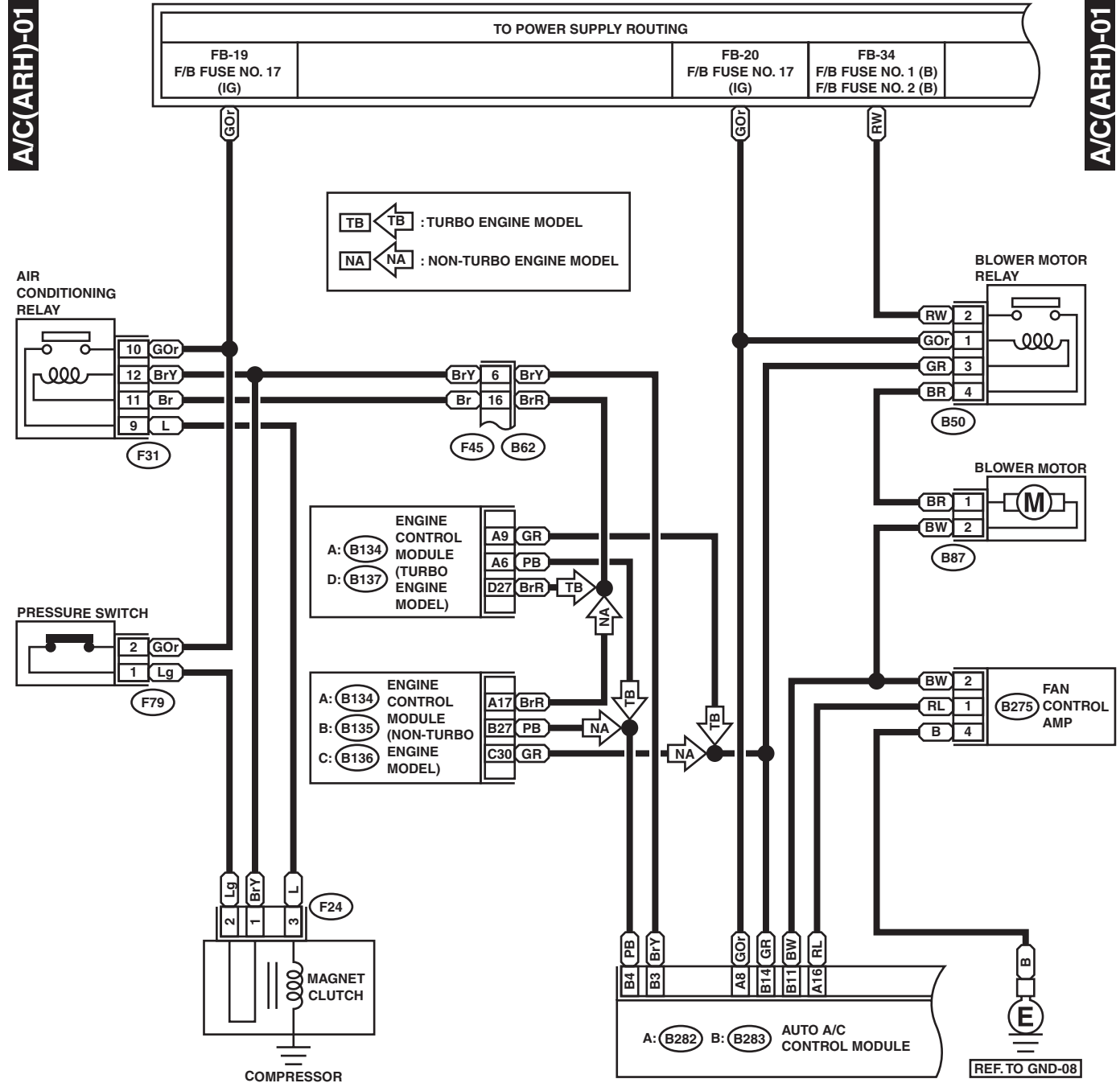


GL46-21D

AIR CONDITIONING SYSTEM

WIRING SYSTEM

4. AUTO A/C RHD MODEL



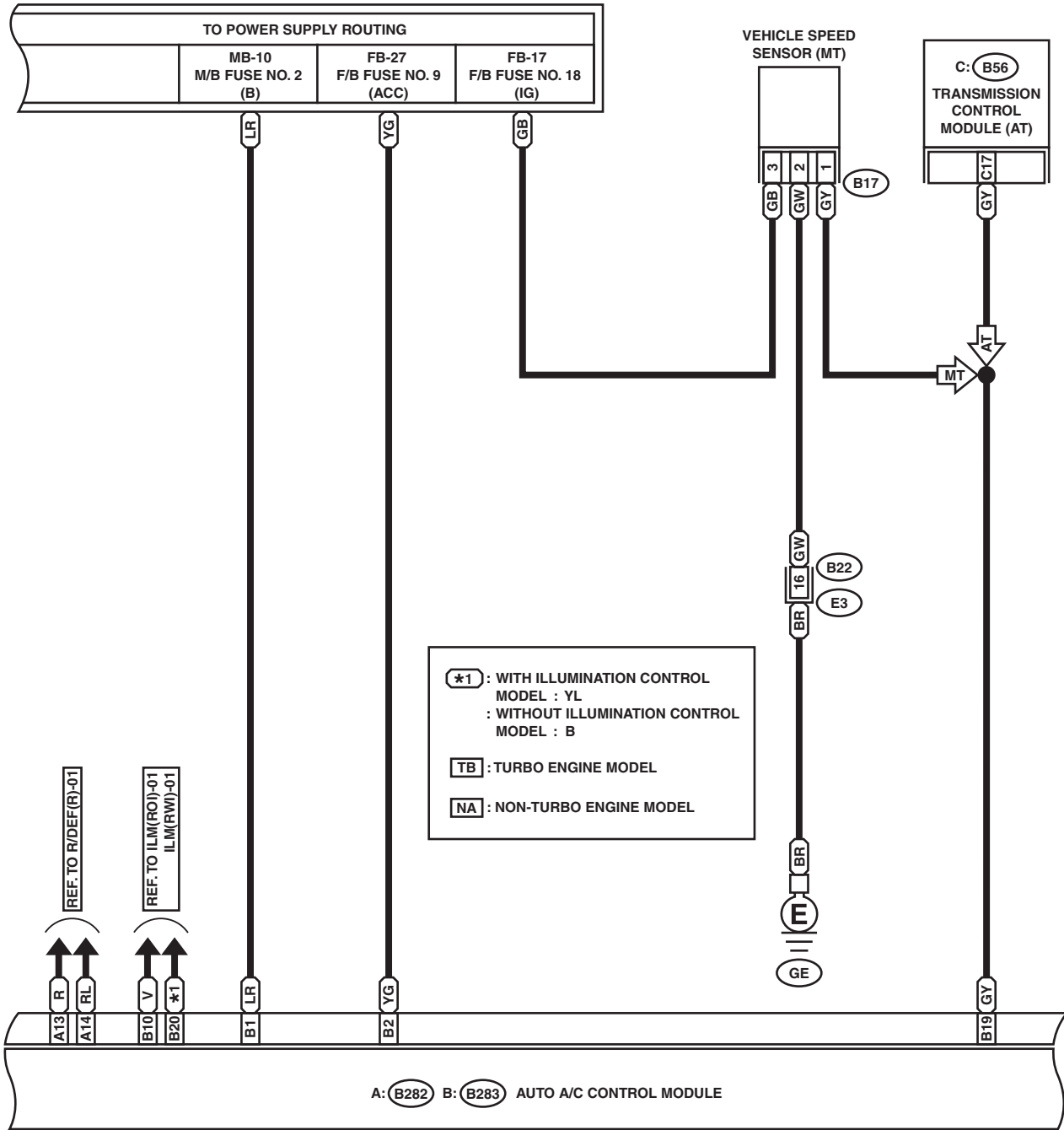
GR46-21A

AIR CONDITIONING SYSTEM

WIRING SYSTEM

A/C(ARH)-02

A/C(ARH)-02



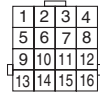
(B17) (BLACK): NA



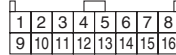
(B17) (BLACK): TB



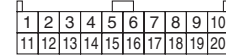
(B22) (BROWN)



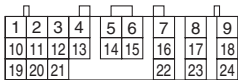
A: (B282) (GRAY)



B: (B283) (GRAY)

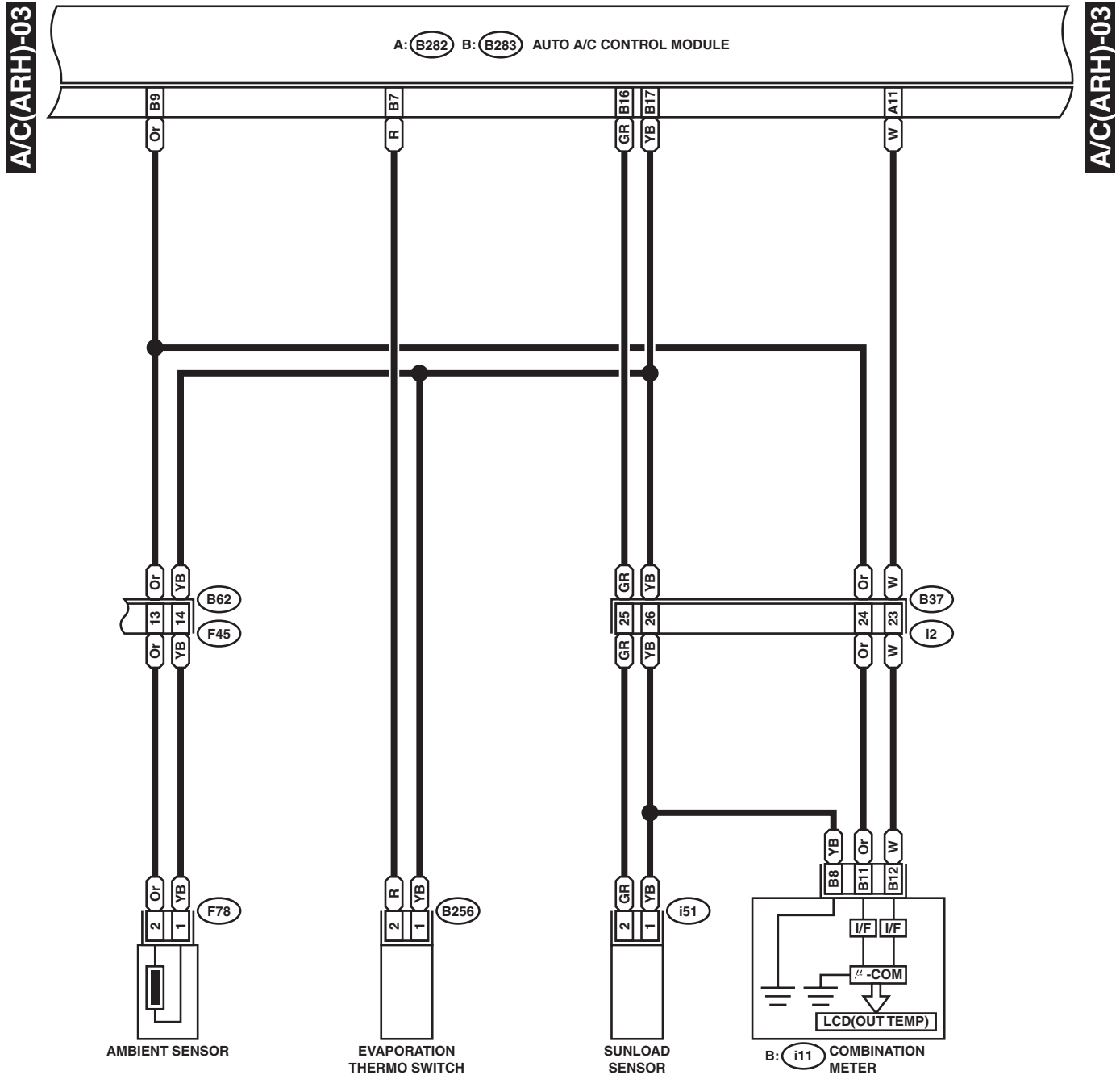


C: (B56) (GREEN)



AIR CONDITIONING SYSTEM

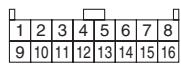
WIRING SYSTEM



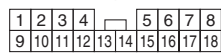
F78 (BLACK)



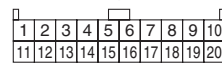
A: B282 (GRAY)



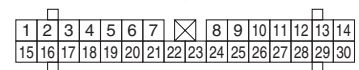
F45



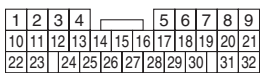
B: B283 (GRAY)



B: i11 (GREEN)



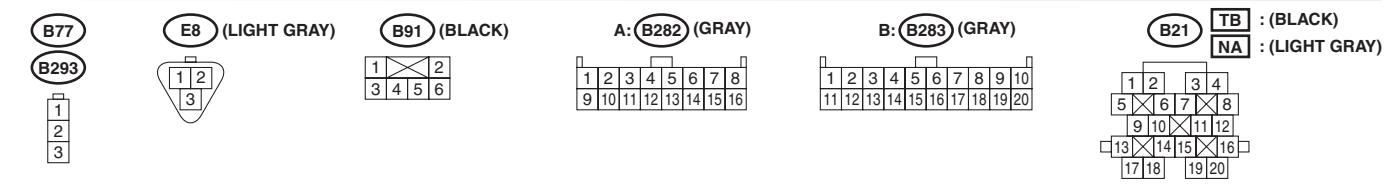
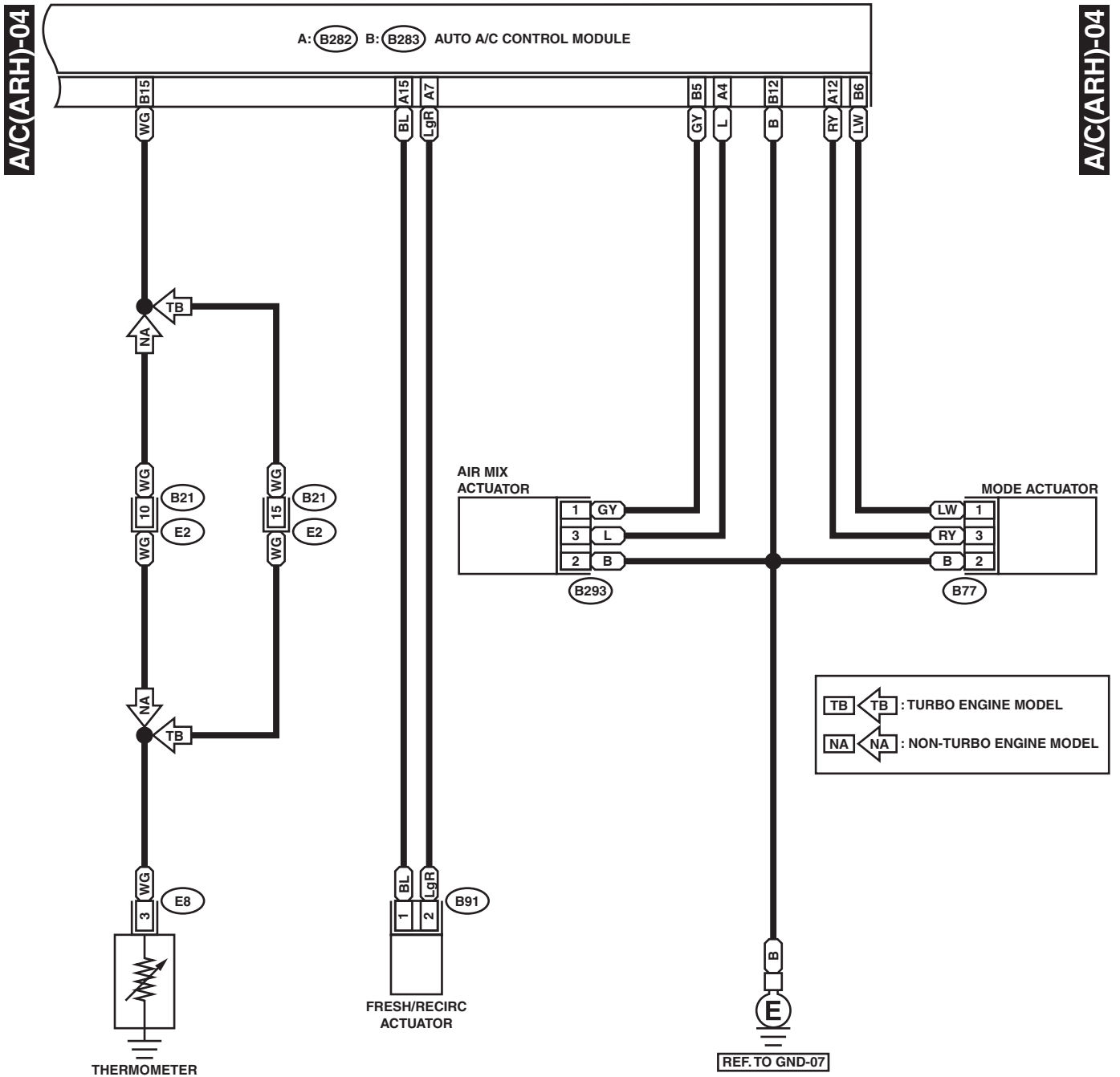
i2



GR46-21C

AIR CONDITIONING SYSTEM

WIRING SYSTEM



GR46-21D

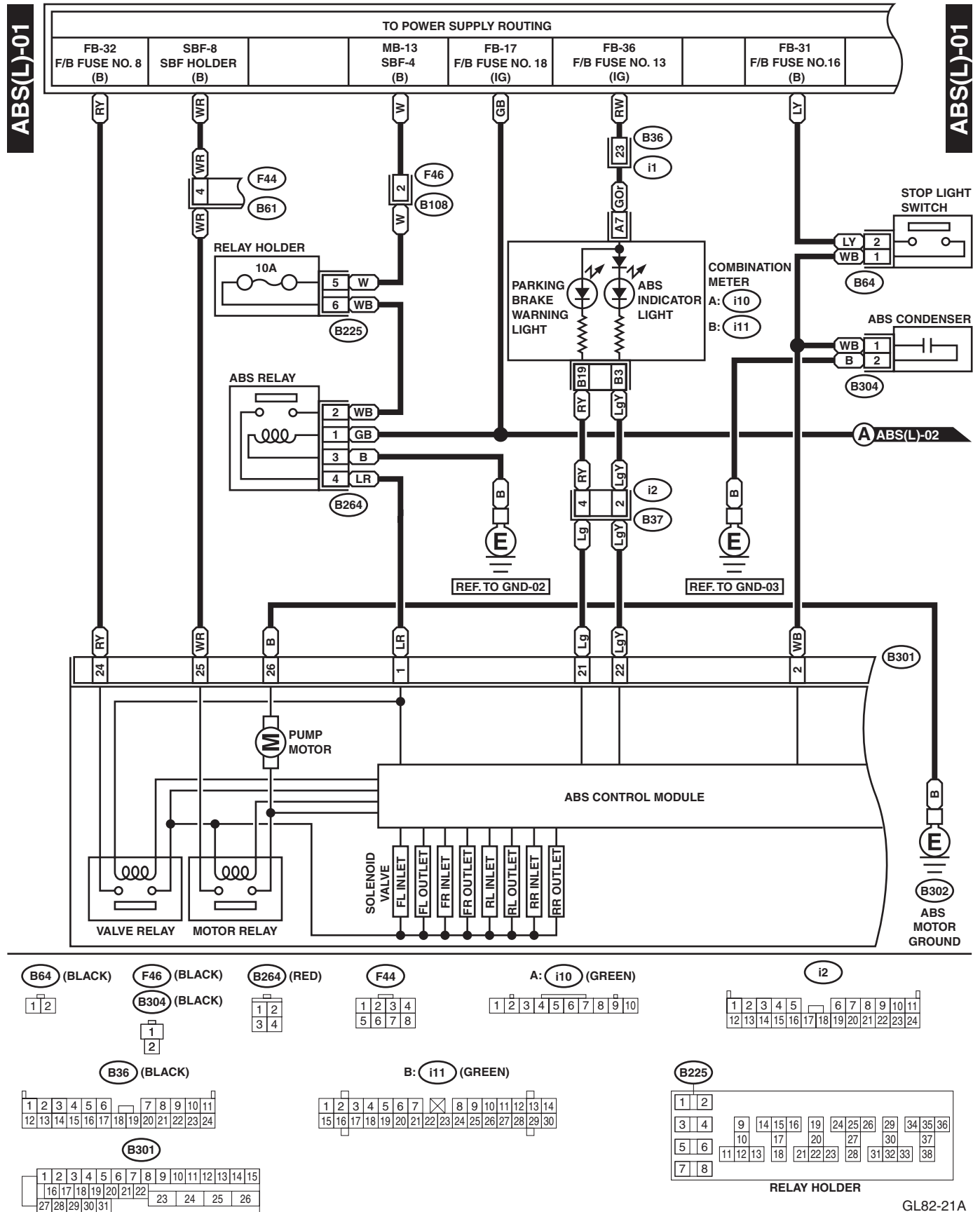
8. Anti-lock Brake System

A: SCHEMATIC

ANTI-LOCK BRAKE SYSTEM

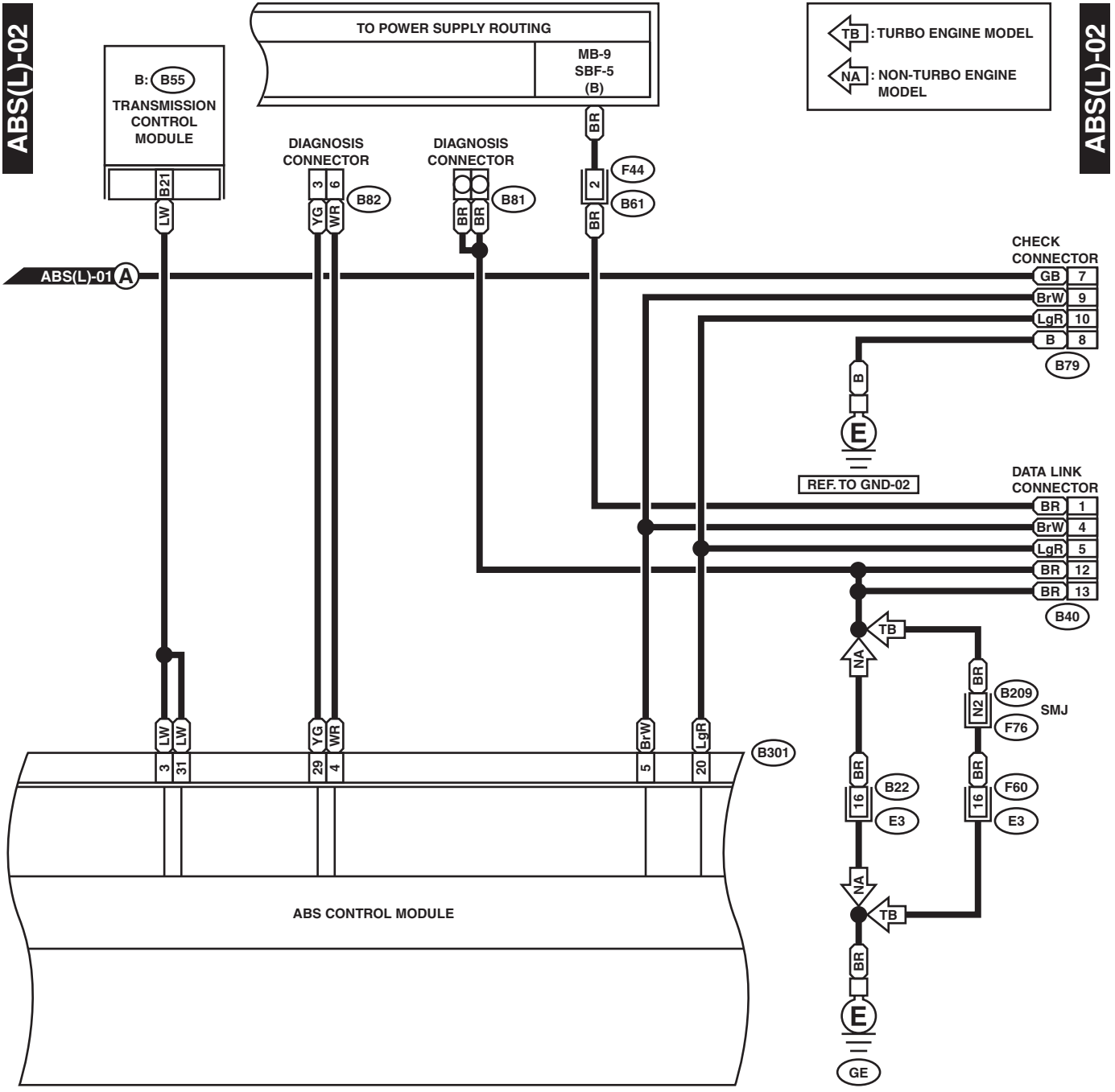
WIRING SYSTEM

1. LHD MODEL



ANTI-LOCK BRAKE SYSTEM

WIRING SYSTEM

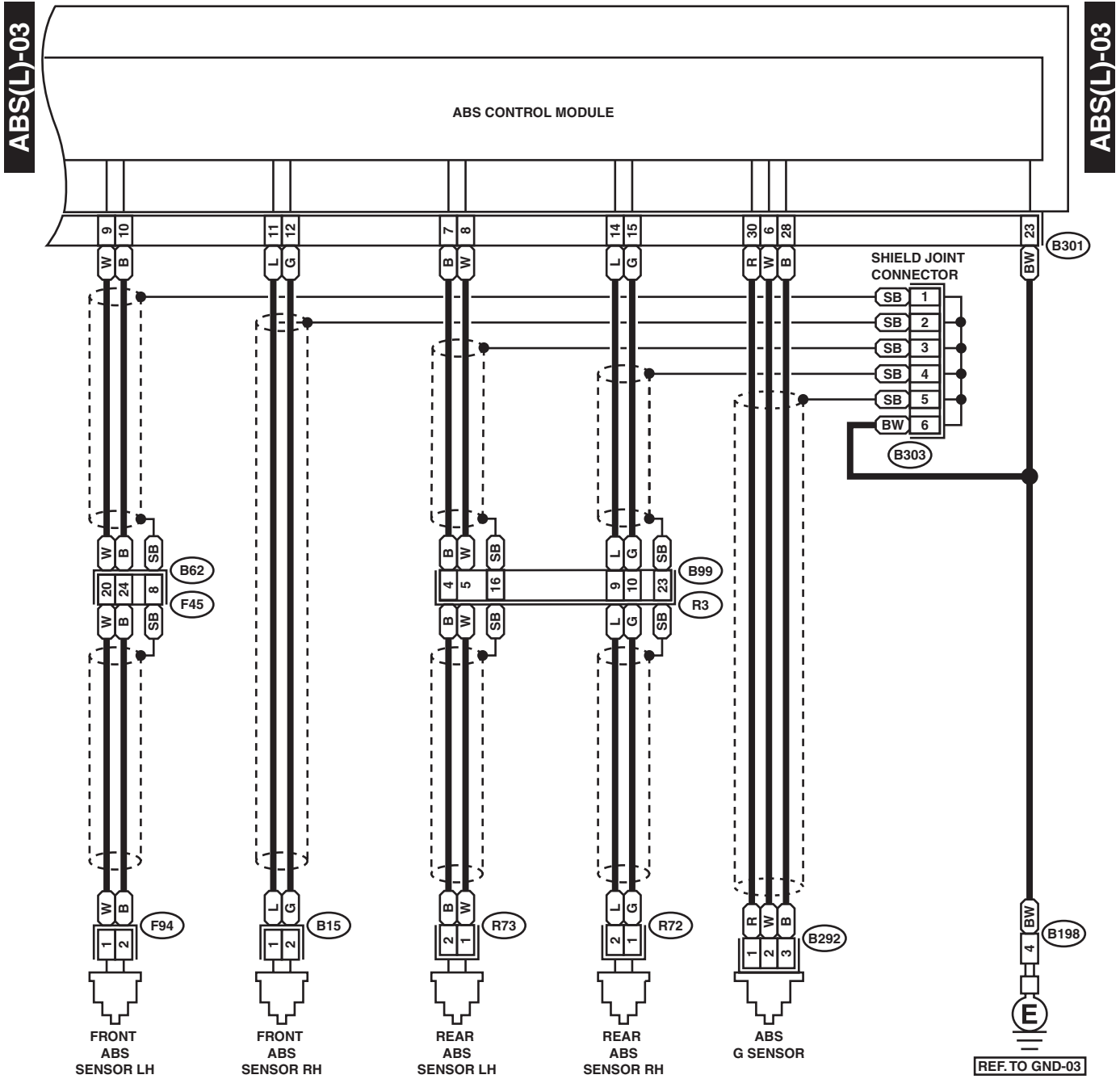


ABS(L)-02

GL82-21B

ANTI-LOCK BRAKE SYSTEM

WIRING SYSTEM



B15 (GRAY)

R72

B292

B198

B303 (GRAY)

F94 (GRAY)

R73

1	2	3
---	---	---

1	2	3	4	5
---	---	---	---	---

1	2	3	4
5	6	7	8

2	1
---	---

1	2
---	---

B99

F45

B301

1	2	3	4	5	6	7	8	9	10	11		
12	13	14	15	16	17	18	19	20	21	22	23	24

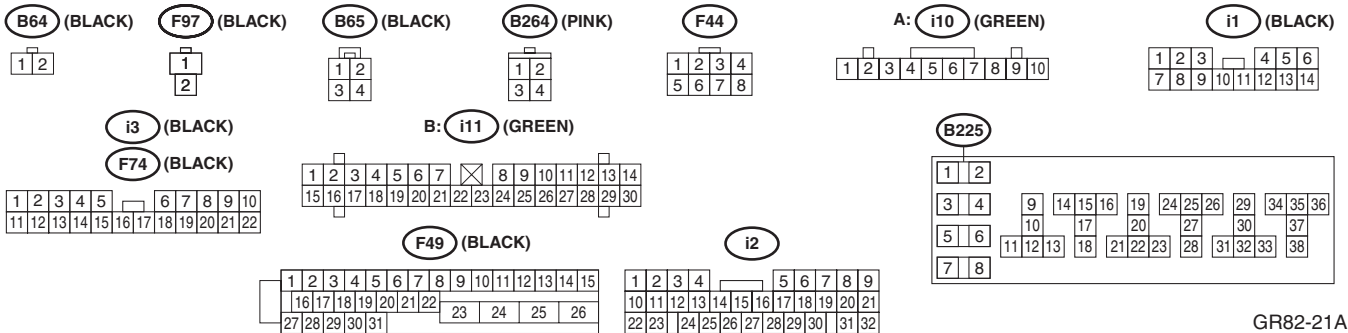
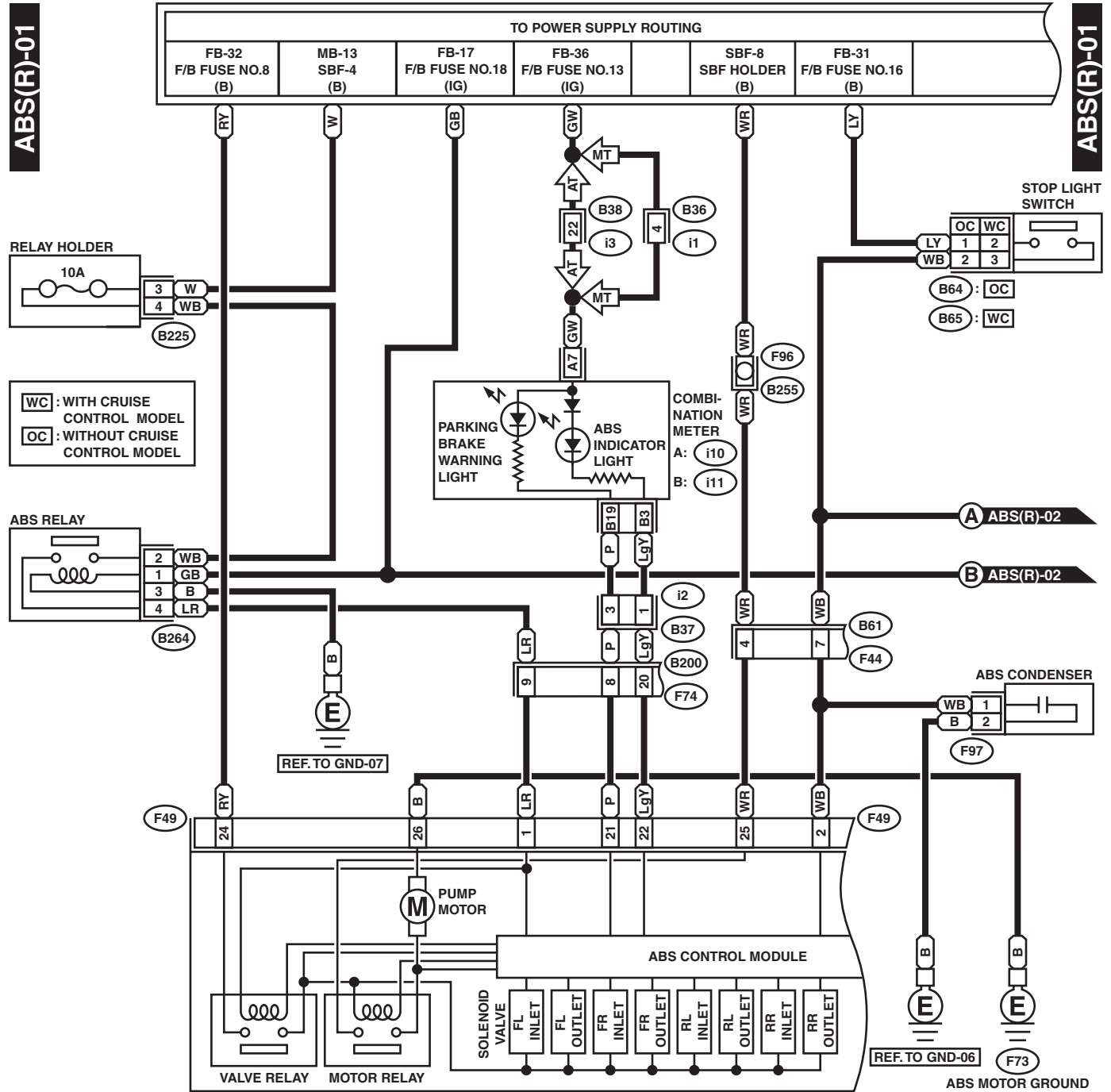
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
16	17	18	19	20	21	22	23	24	25	26				
27	28	29	30	31										

GL82-21C

ANTI-LOCK BRAKE SYSTEM

WIRING SYSTEM

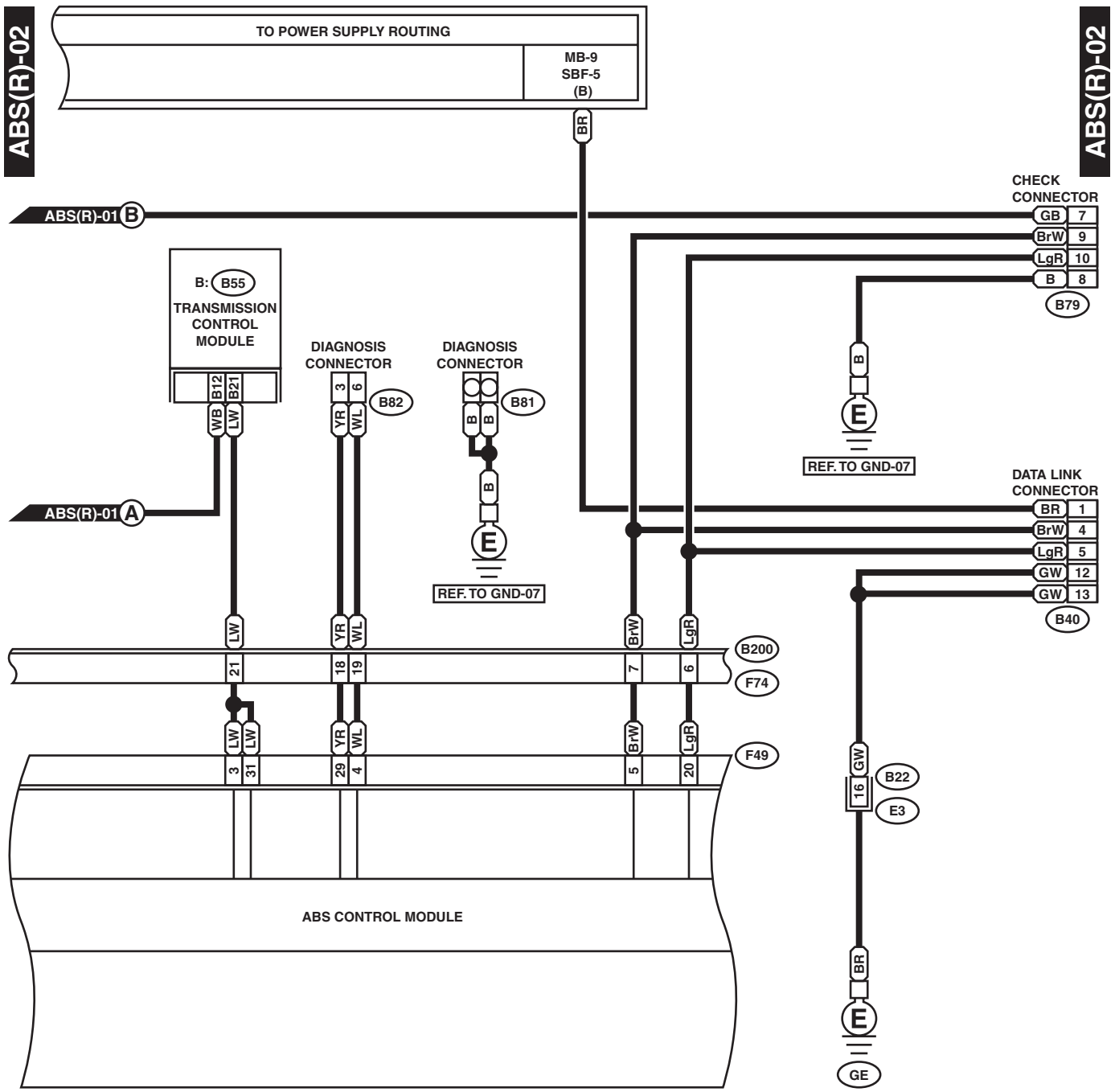
2. RHD MODEL



GR82-21A

ANTI-LOCK BRAKE SYSTEM

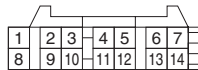
WIRING SYSTEM



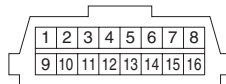
B82 (BLACK)



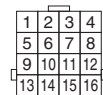
B79 (GRAY)



B40 (BLACK)



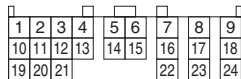
B22 (BROWN)



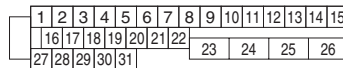
F74 (BLACK)



B: B55 (GRAY)



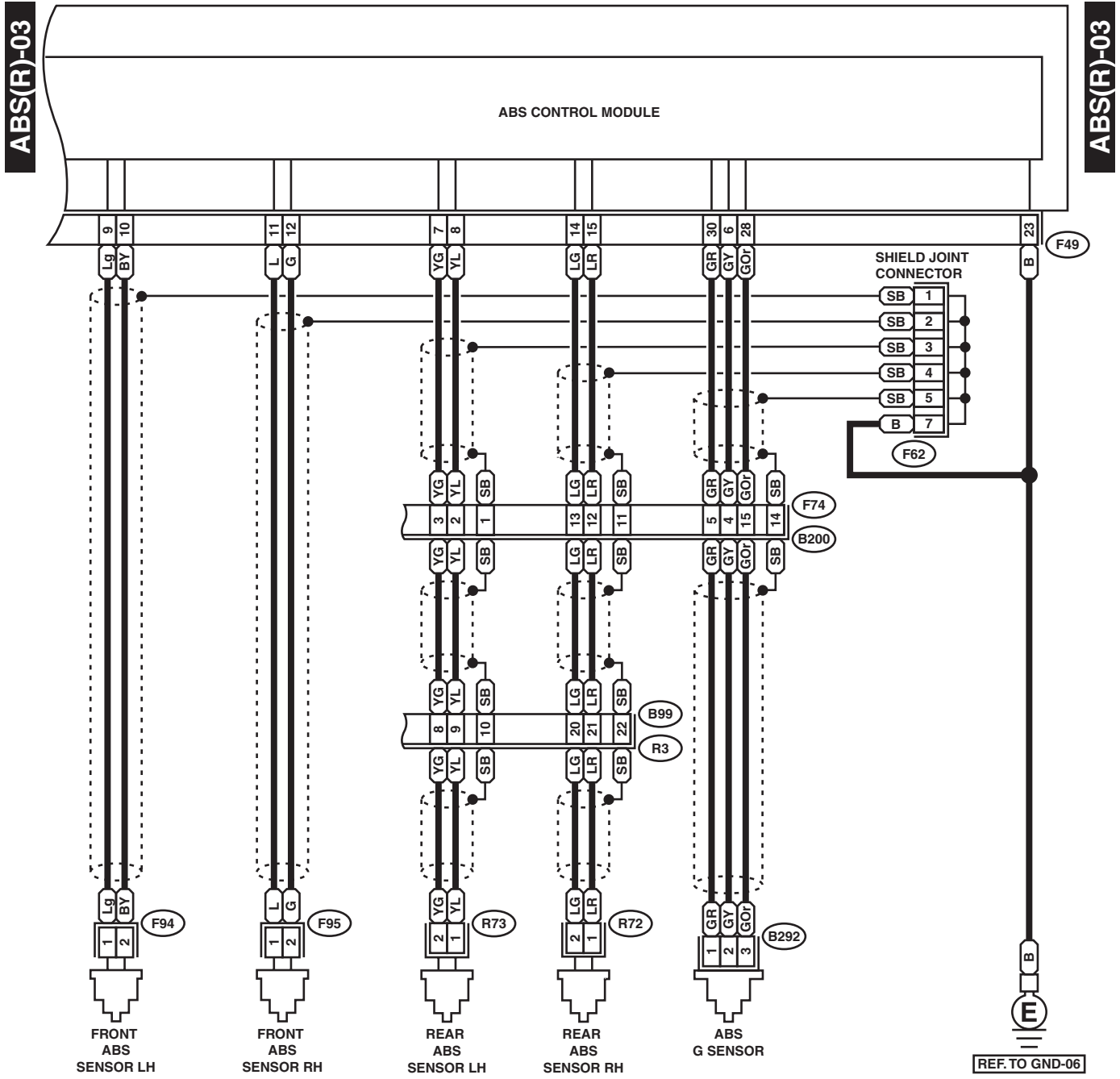
F49 (BLACK)



GR82-21B

ANTI-LOCK BRAKE SYSTEM

WIRING SYSTEM



F94 (GRAY)

F95 (GRAY)



R72

R73



B292

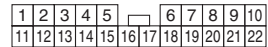


F62 (GRAY)

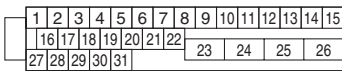


F74 (BLACK)

B99



F49 (BLACK)



REF. TO GND-06

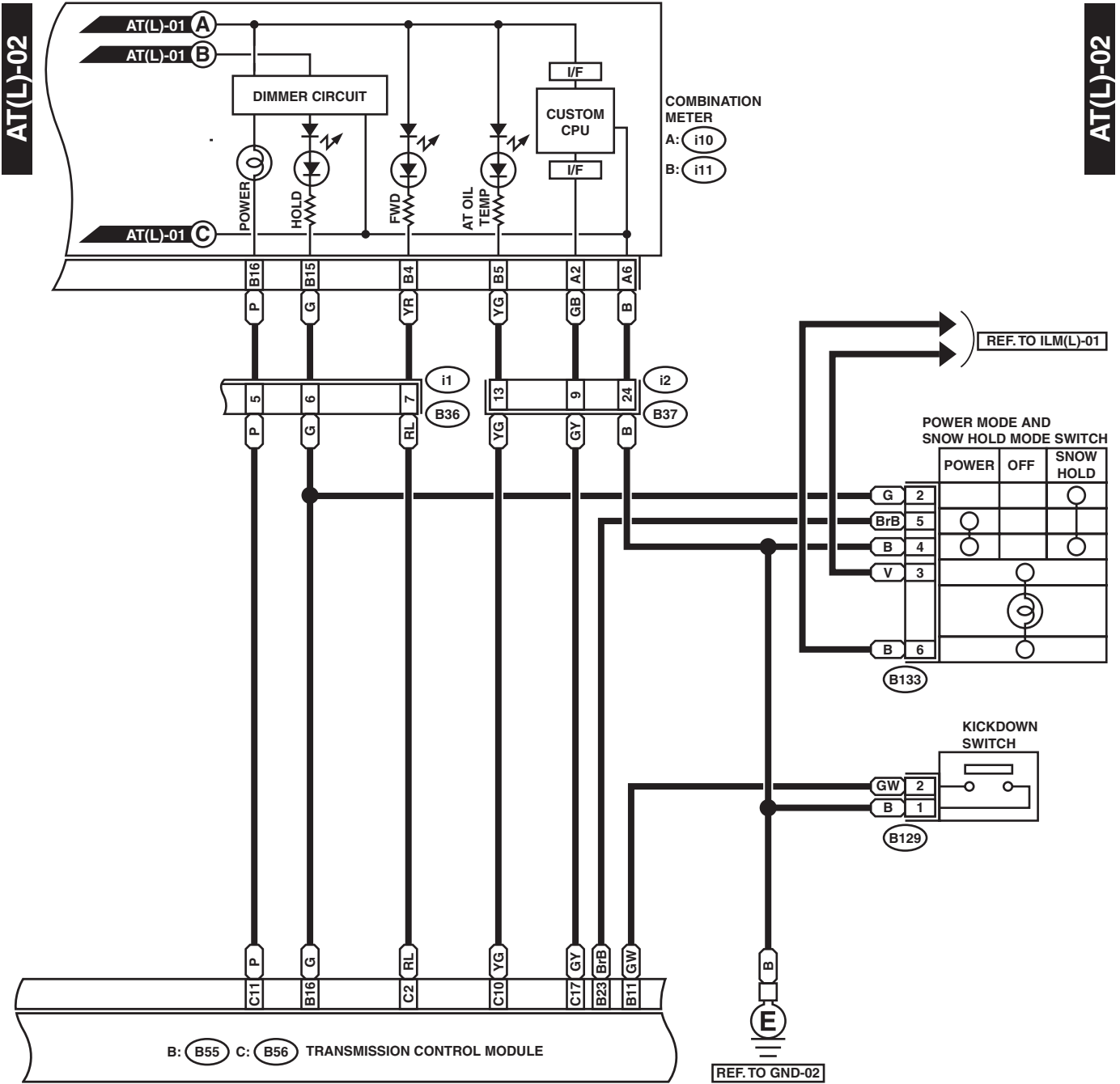
GR82-21C

9. A/T Control System

A: SCHEMATIC

A/T CONTROL SYSTEM

WIRING SYSTEM



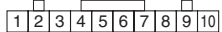
B129 (BLACK)



B133 (BLUE)



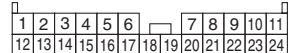
A: i10 (GREEN)



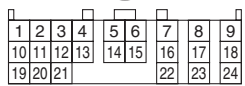
i2



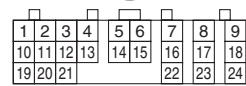
B36 (BLACK)



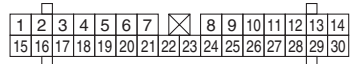
B: B55 (GRAY)



C: B56 (GREEN)



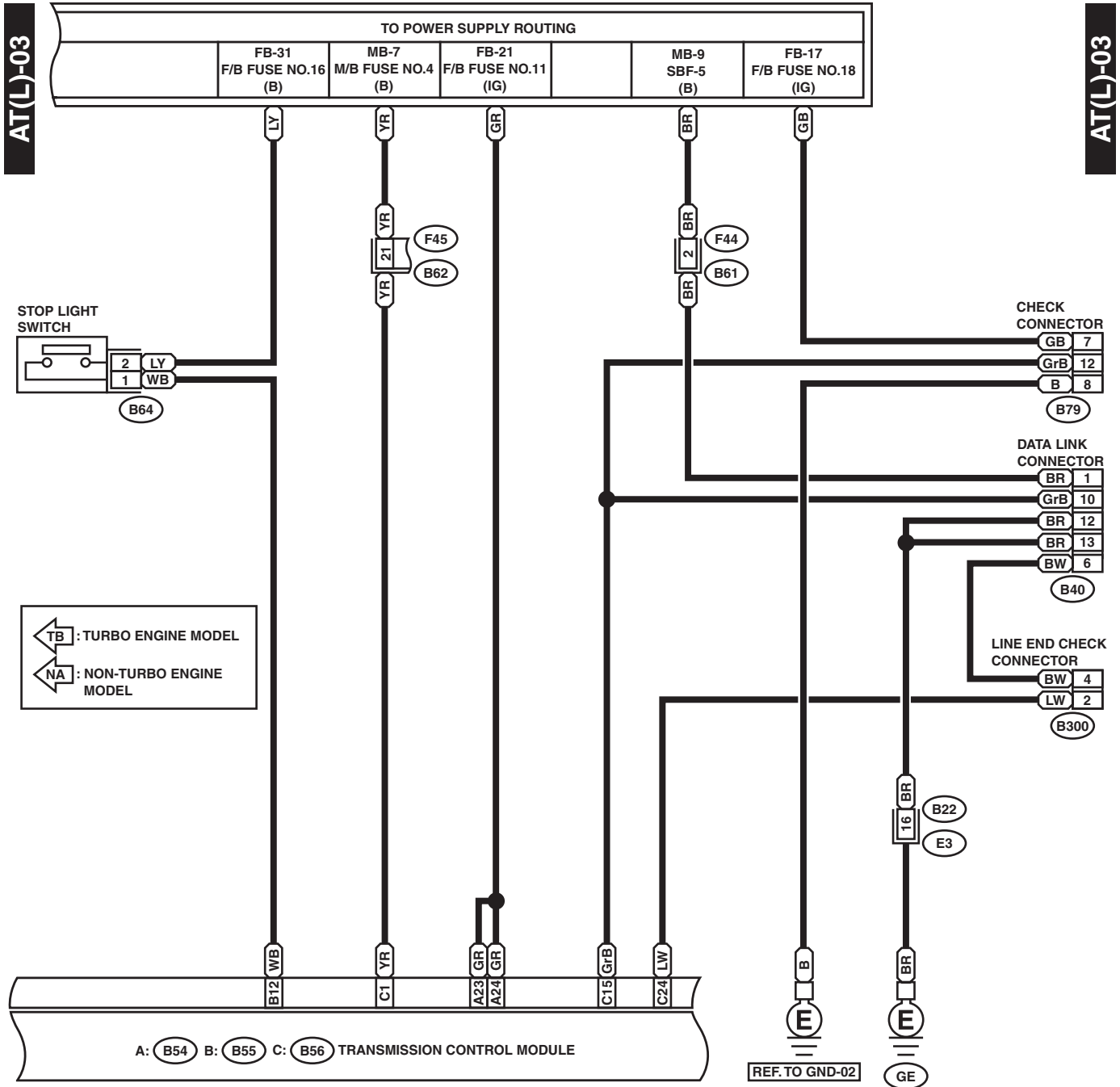
B: i11 (GREEN)



GL41-21B

A/T CONTROL SYSTEM

WIRING SYSTEM



B64 (BLACK)



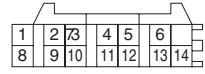
B300



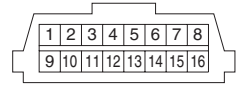
F44



B79 (GRAY)

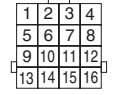


B40

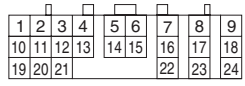


B22 (BROWN)

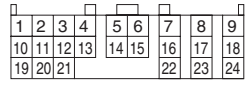
F60 (BROWN)



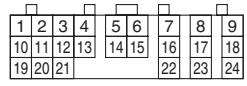
A: B54



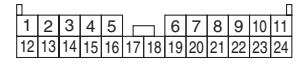
B: B55 (GRAY)



C: B56 (GREEN)

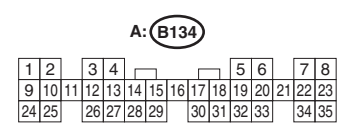
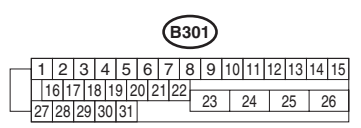
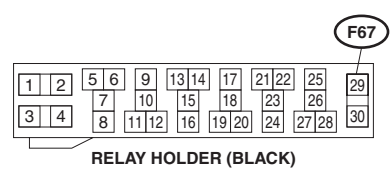
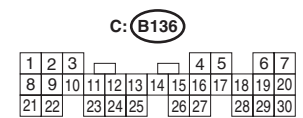
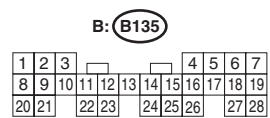
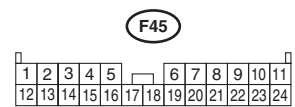
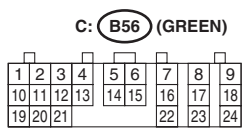
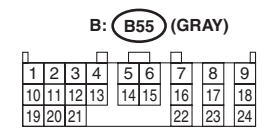
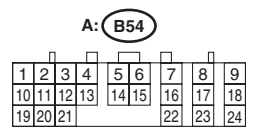
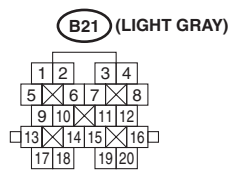
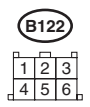
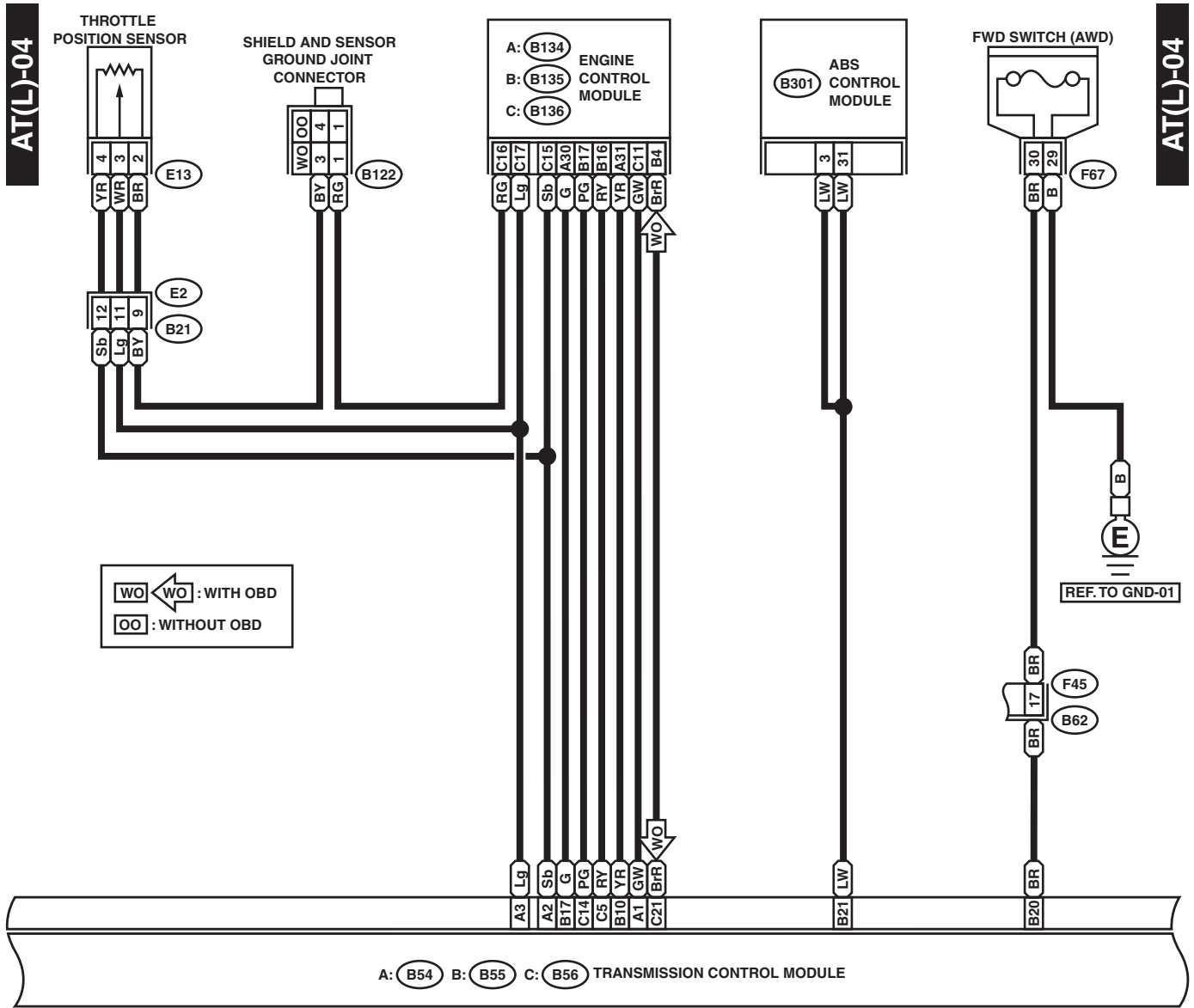


F45



A/T CONTROL SYSTEM

WIRING SYSTEM



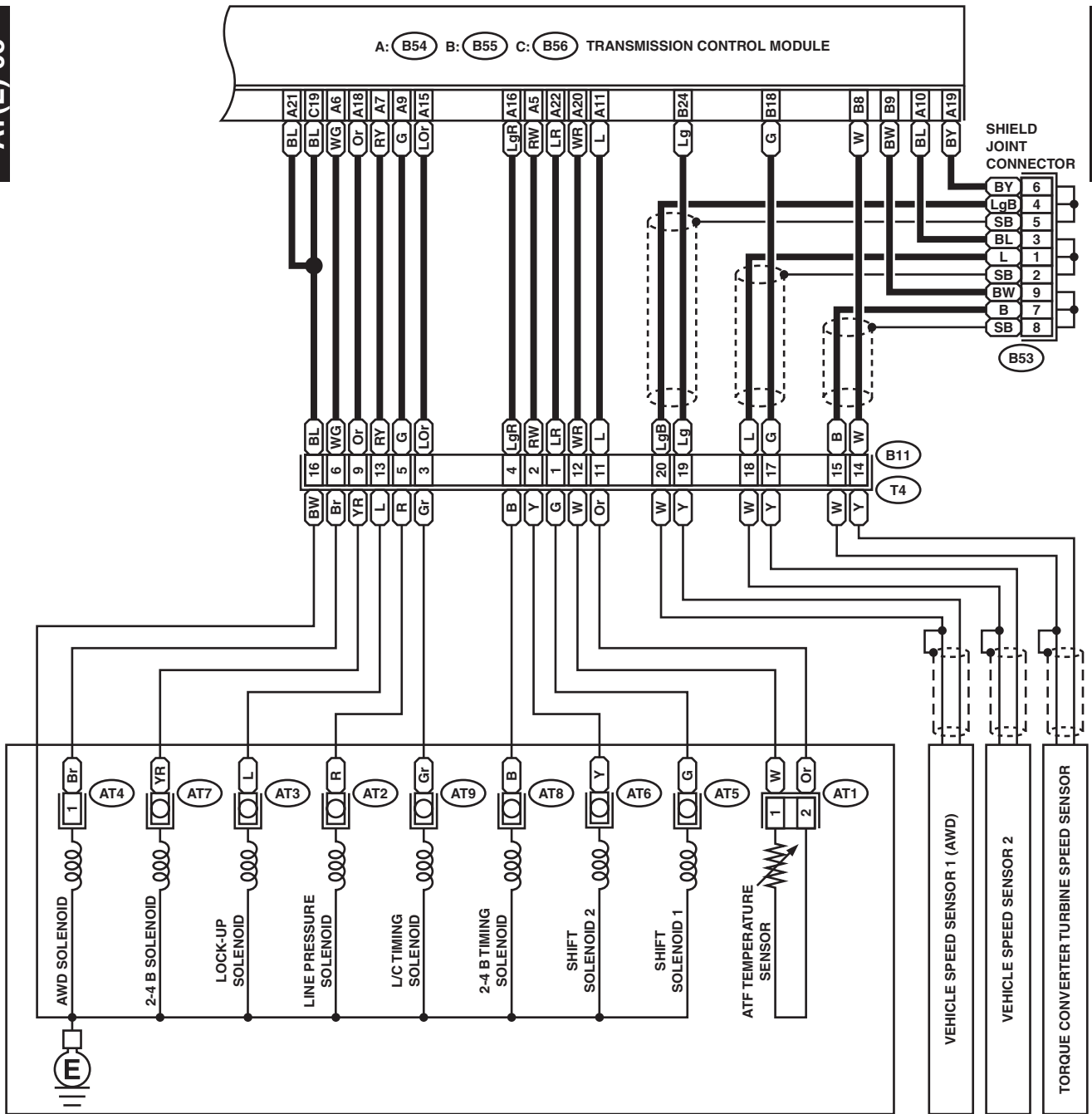
GL41-21D

A/T CONTROL SYSTEM

WIRING SYSTEM

AT(L)-05

AT(L)-05



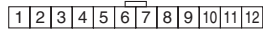
AT1 (GRAY)



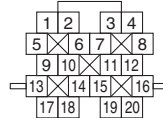
AT4 (BROWN)



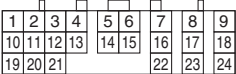
B53 (BLACK)



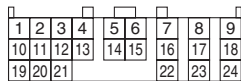
B11 (BLACK)



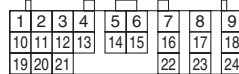
A: B54



B: B55 (GRAY)



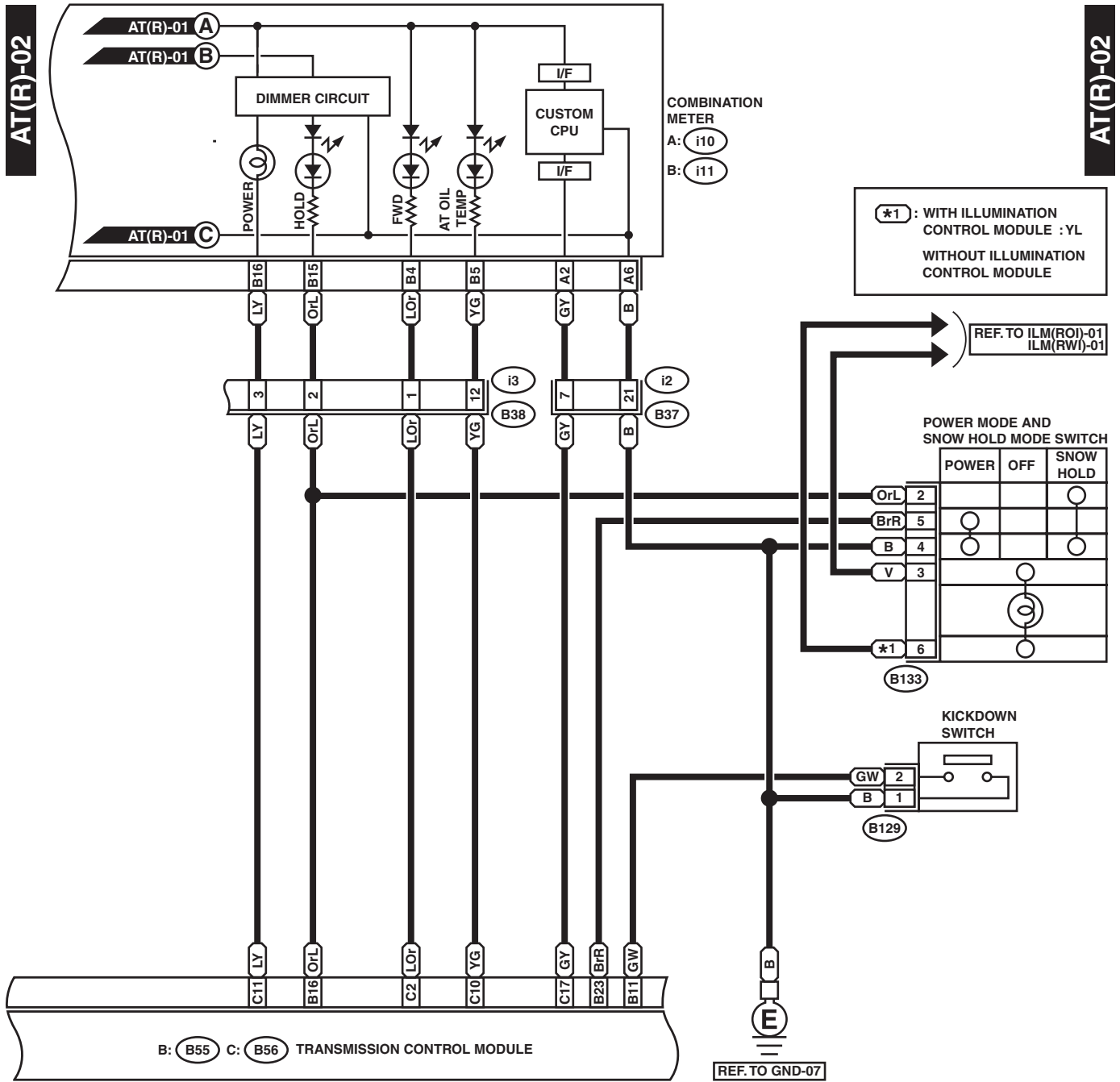
C: B56 (GREEN)



GL41-21E

A/T CONTROL SYSTEM

WIRING SYSTEM



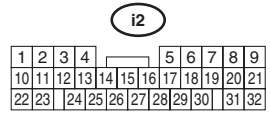
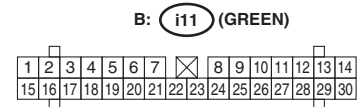
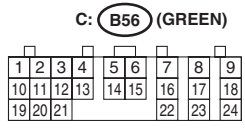
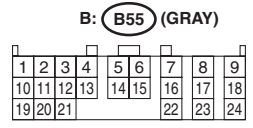
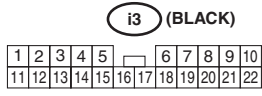
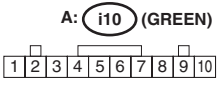
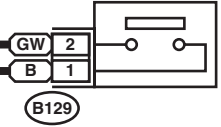
*1 : WITH ILLUMINATION CONTROL MODULE : YL
WITHOUT ILLUMINATION CONTROL MODULE

REF. TO ILM(ROI)-01
ILM(RW)-01

POWER MODE AND SNOW HOLD MODE SWITCH

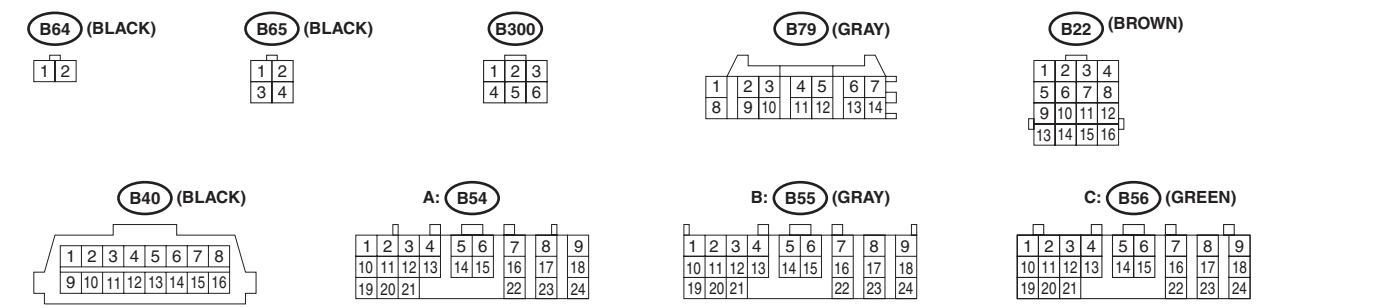
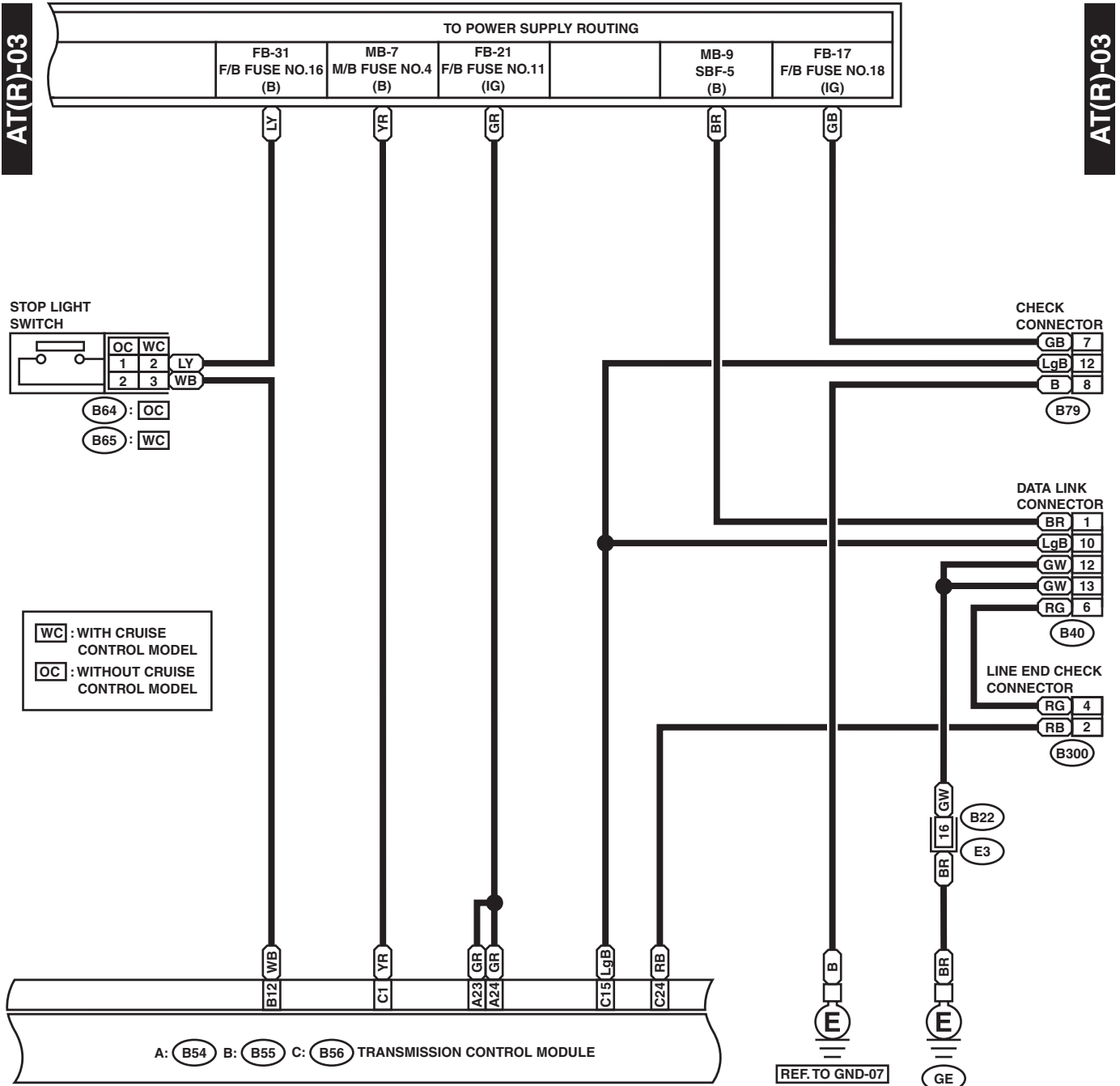
	POWER	OFF	SNOW HOLD
OrL 2			○
BrR 5	○		
B 4	○		○
V 3			○
*1 6			○

KICKDOWN SWITCH



A/T CONTROL SYSTEM

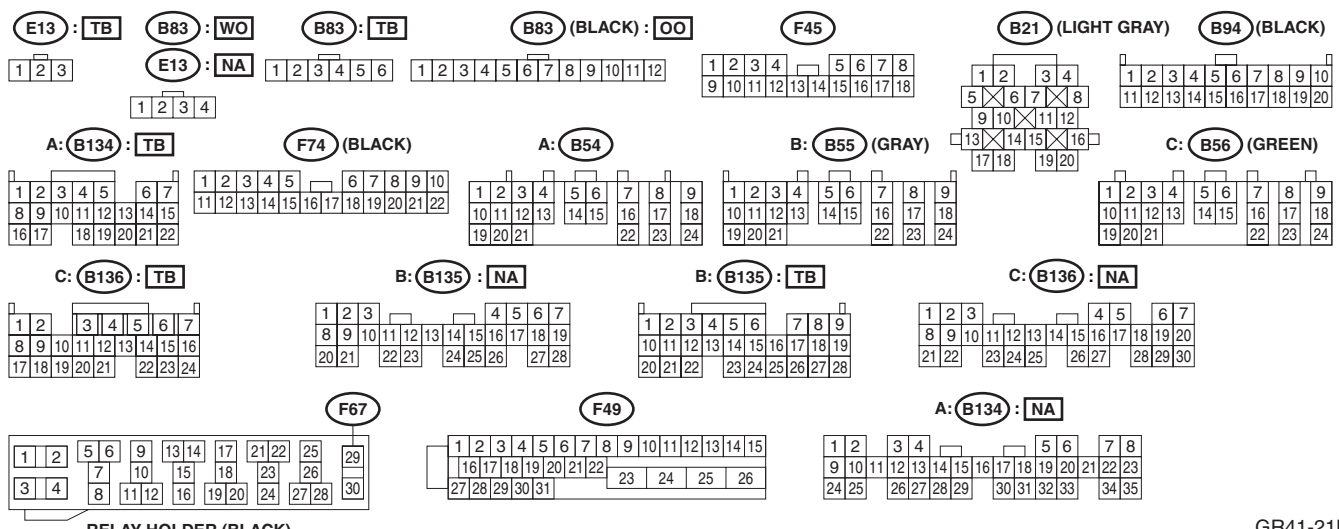
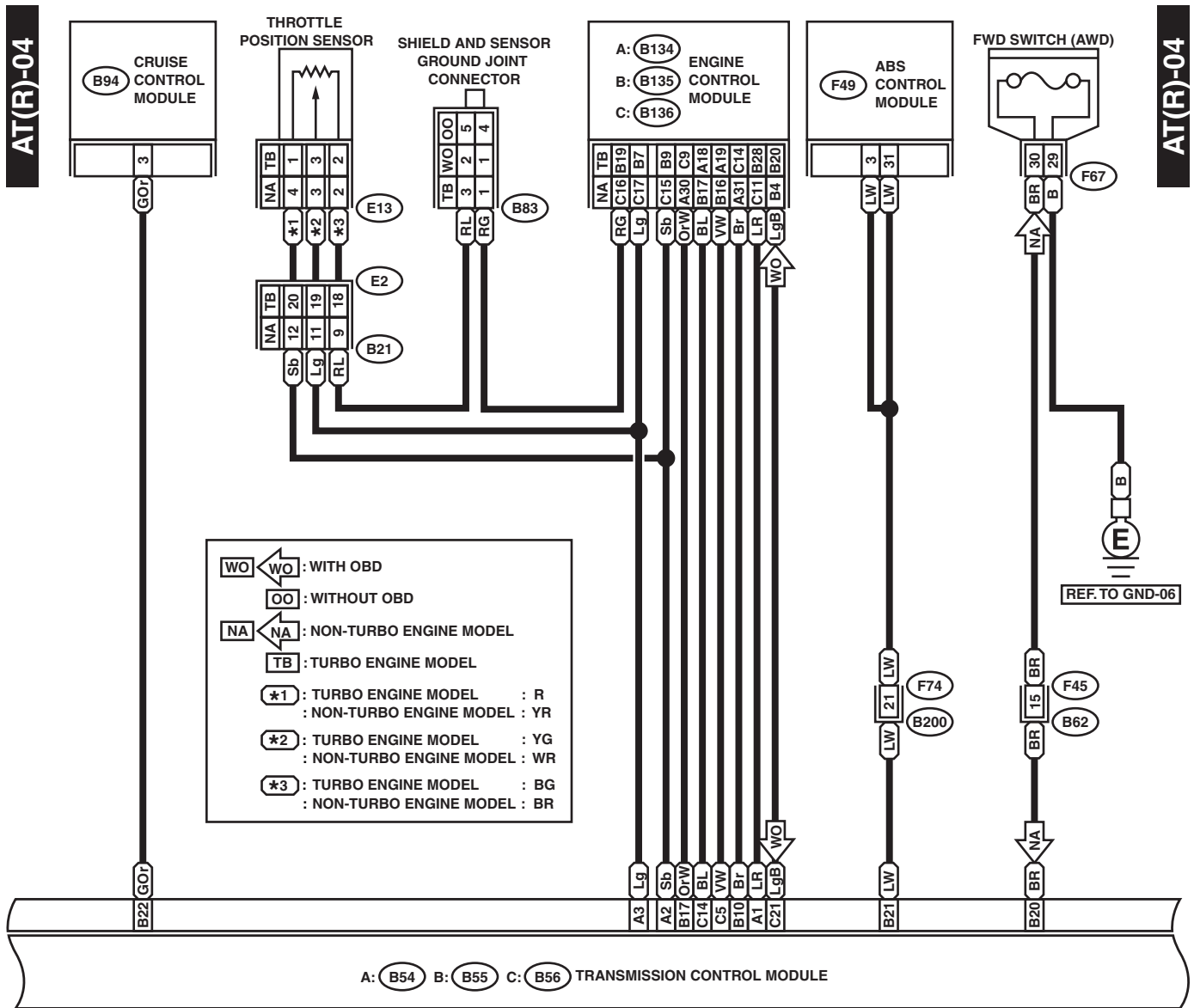
WIRING SYSTEM



GR41-21C

A/T CONTROL SYSTEM

WIRING SYSTEM



RELAY HOLDER (BLACK)

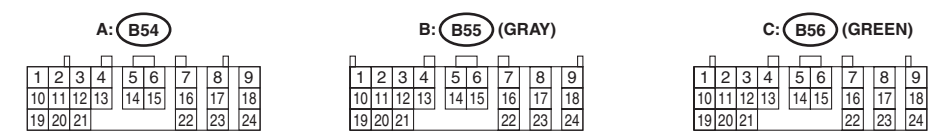
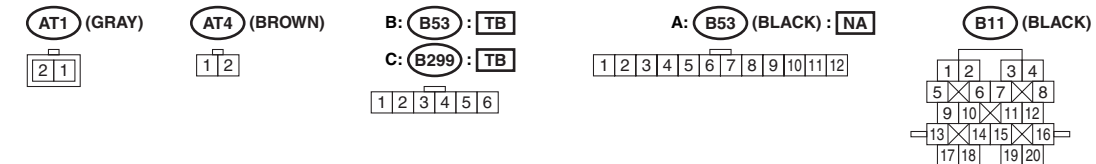
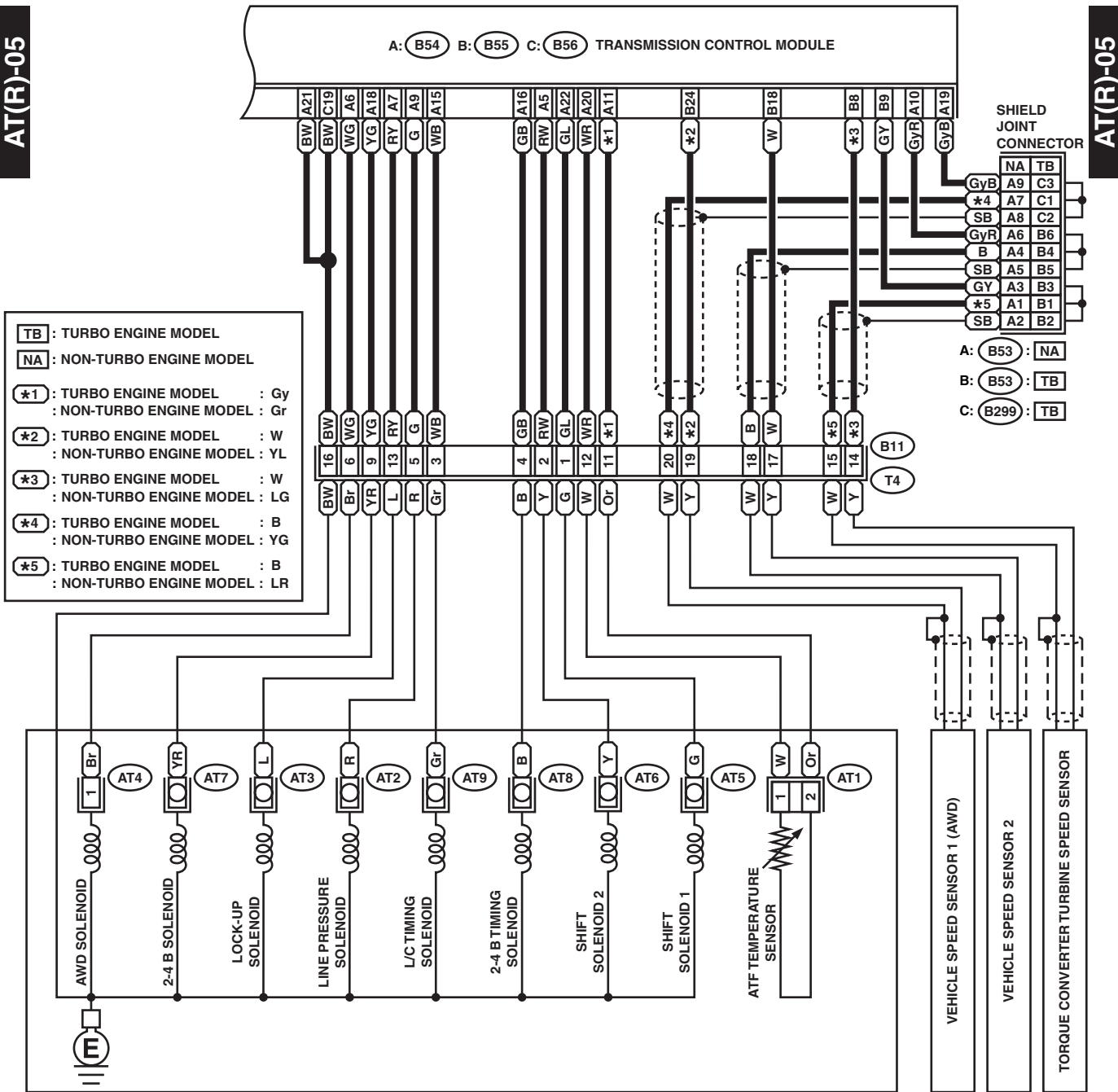
GR41-21D

A/T CONTROL SYSTEM

WIRING SYSTEM

AT(R)-05

AT(R)-05



GR41-21E

10.Audio System

A: SCHEMATIC

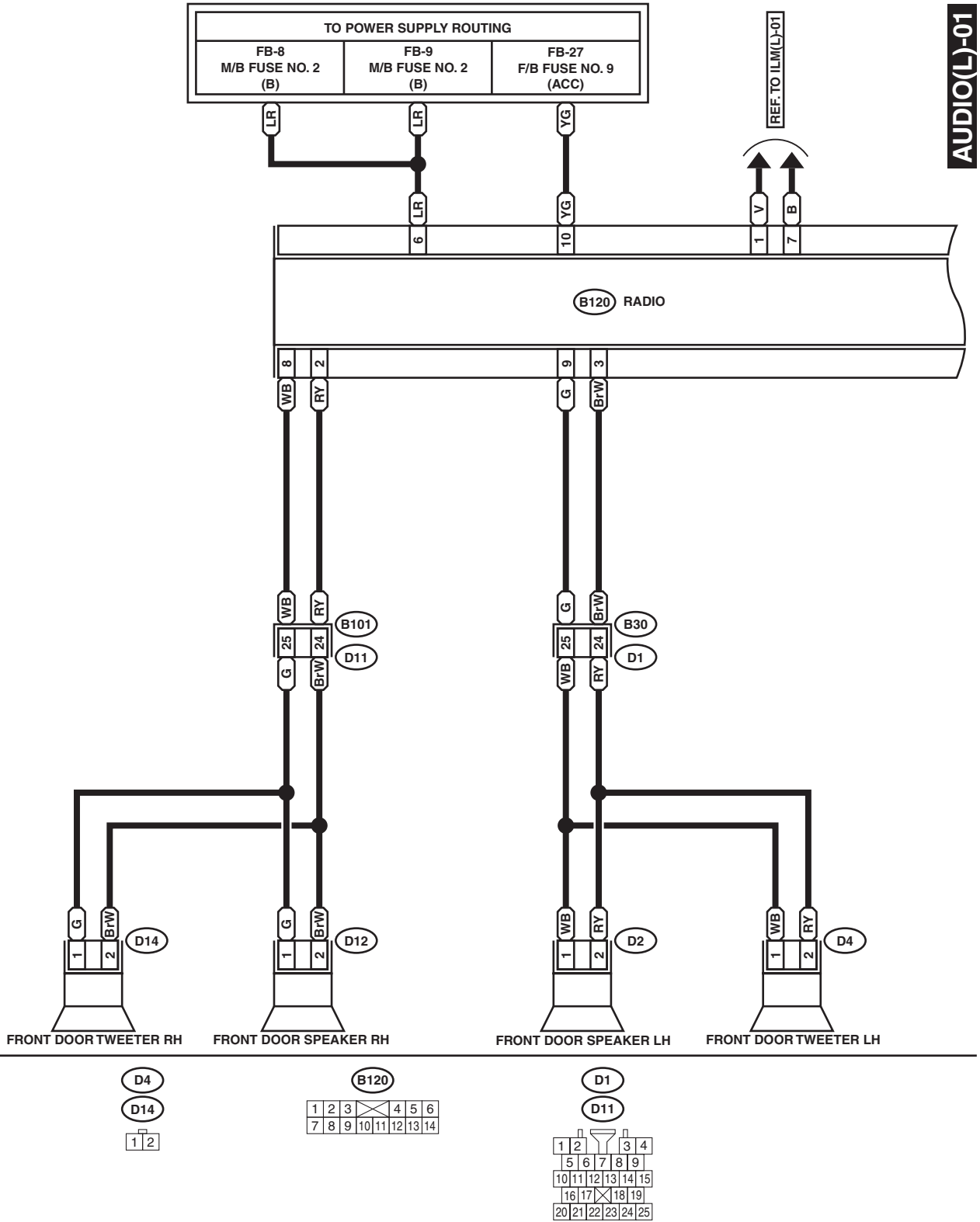
AUDIO SYSTEM

WIRING SYSTEM

1. LHD MODEL

AUDIO(L)-01

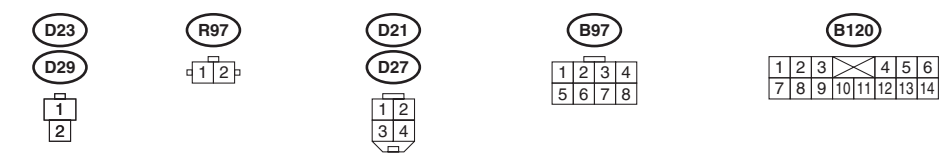
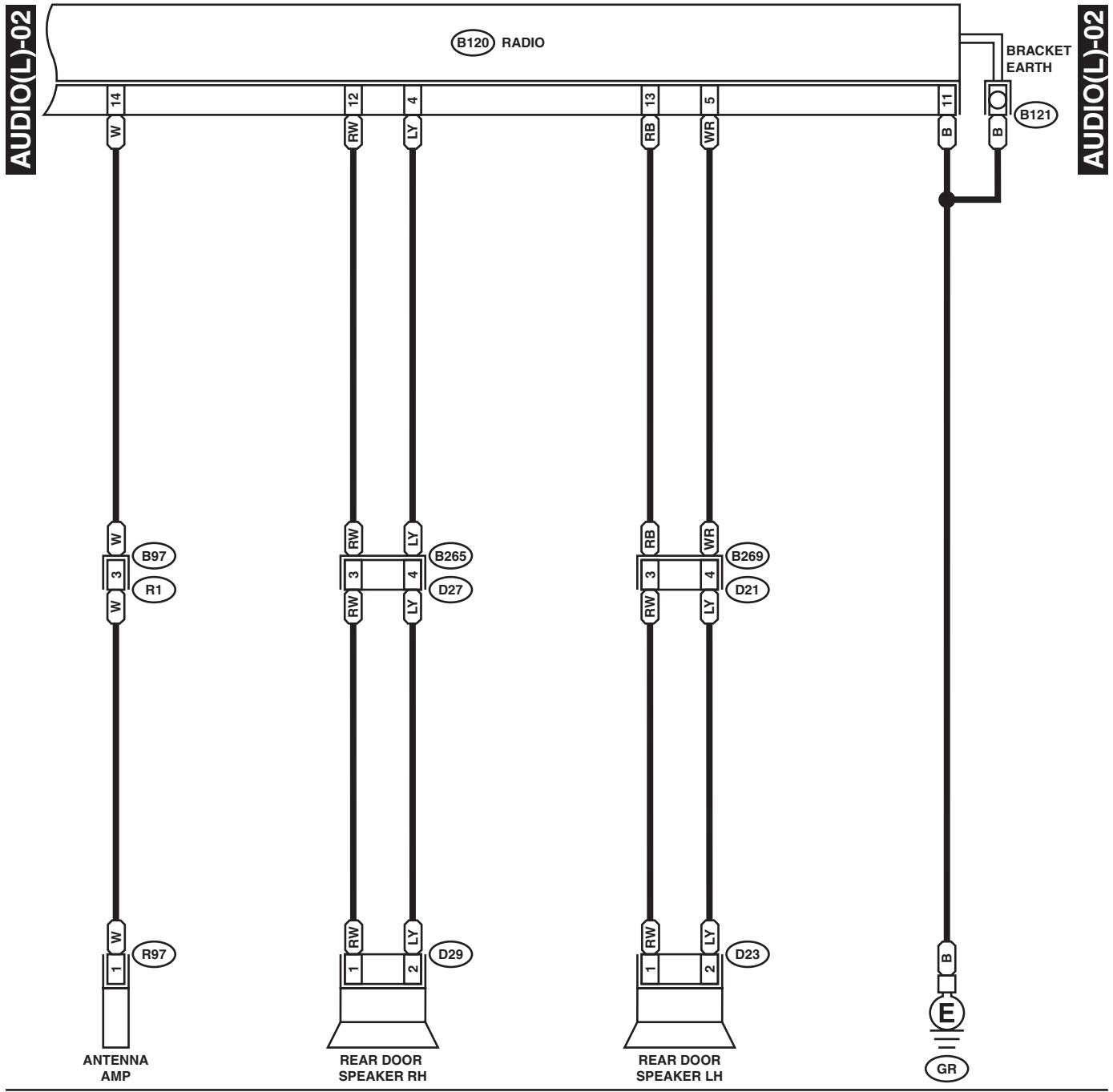
AUDIO(L)-01



GL76-21A

AUDIO SYSTEM

WIRING SYSTEM



GL76-21B

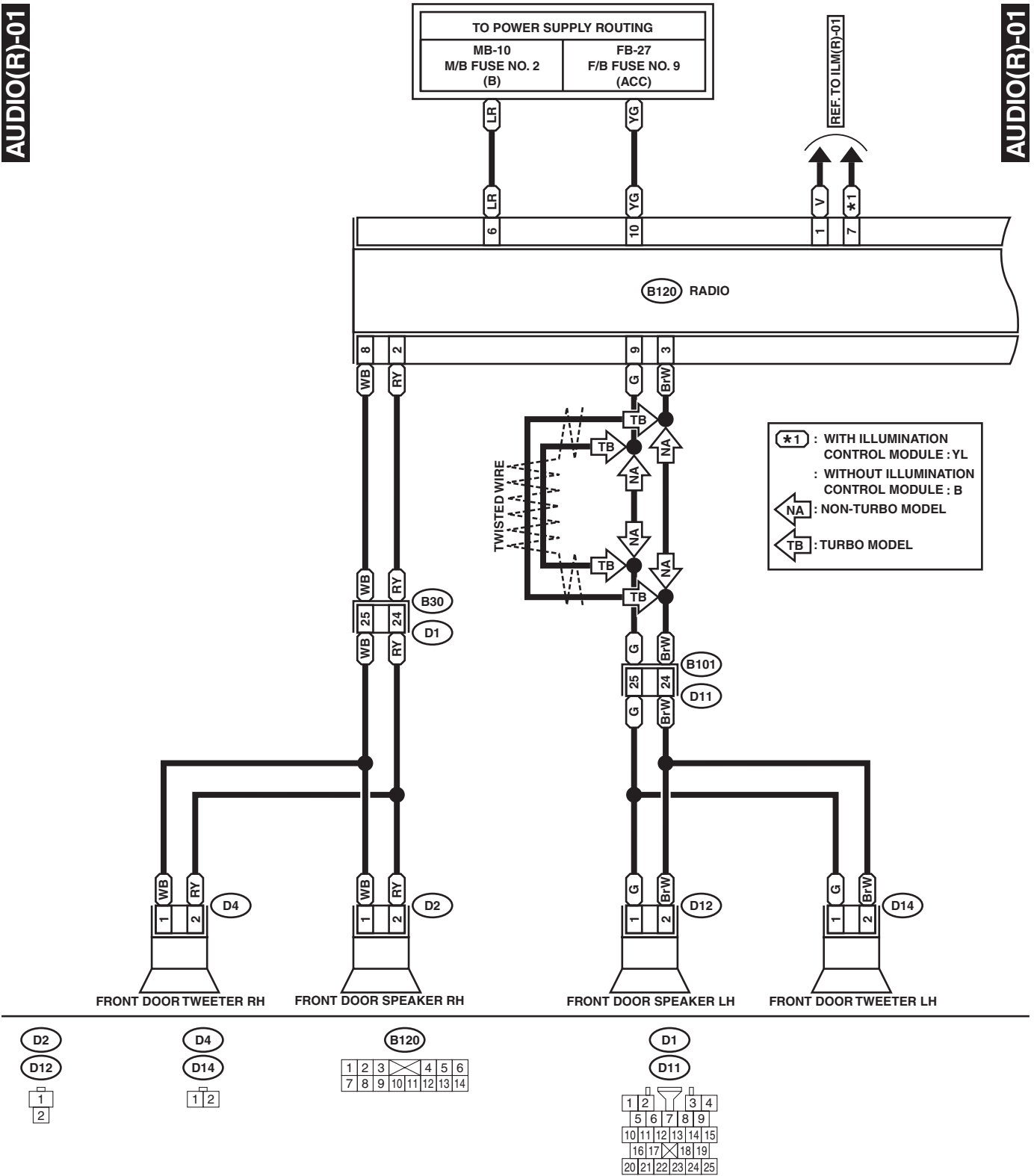
AUDIO SYSTEM

WIRING SYSTEM

2. RHD MODEL

AUDIO(R)-01

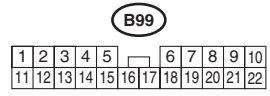
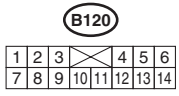
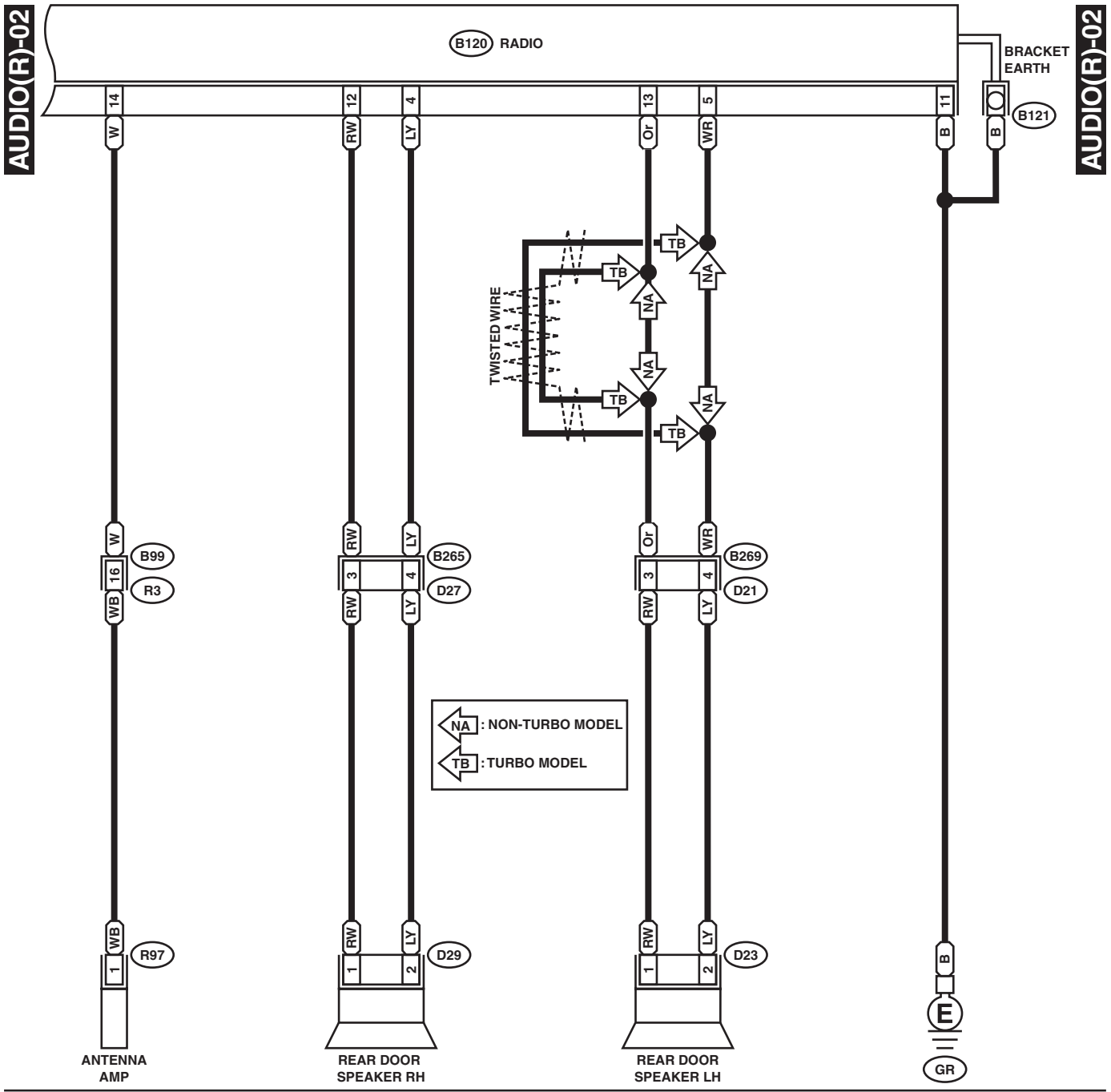
AUDIO(R)-01



GR76-21A

AUDIO SYSTEM

WIRING SYSTEM



GR76-21B

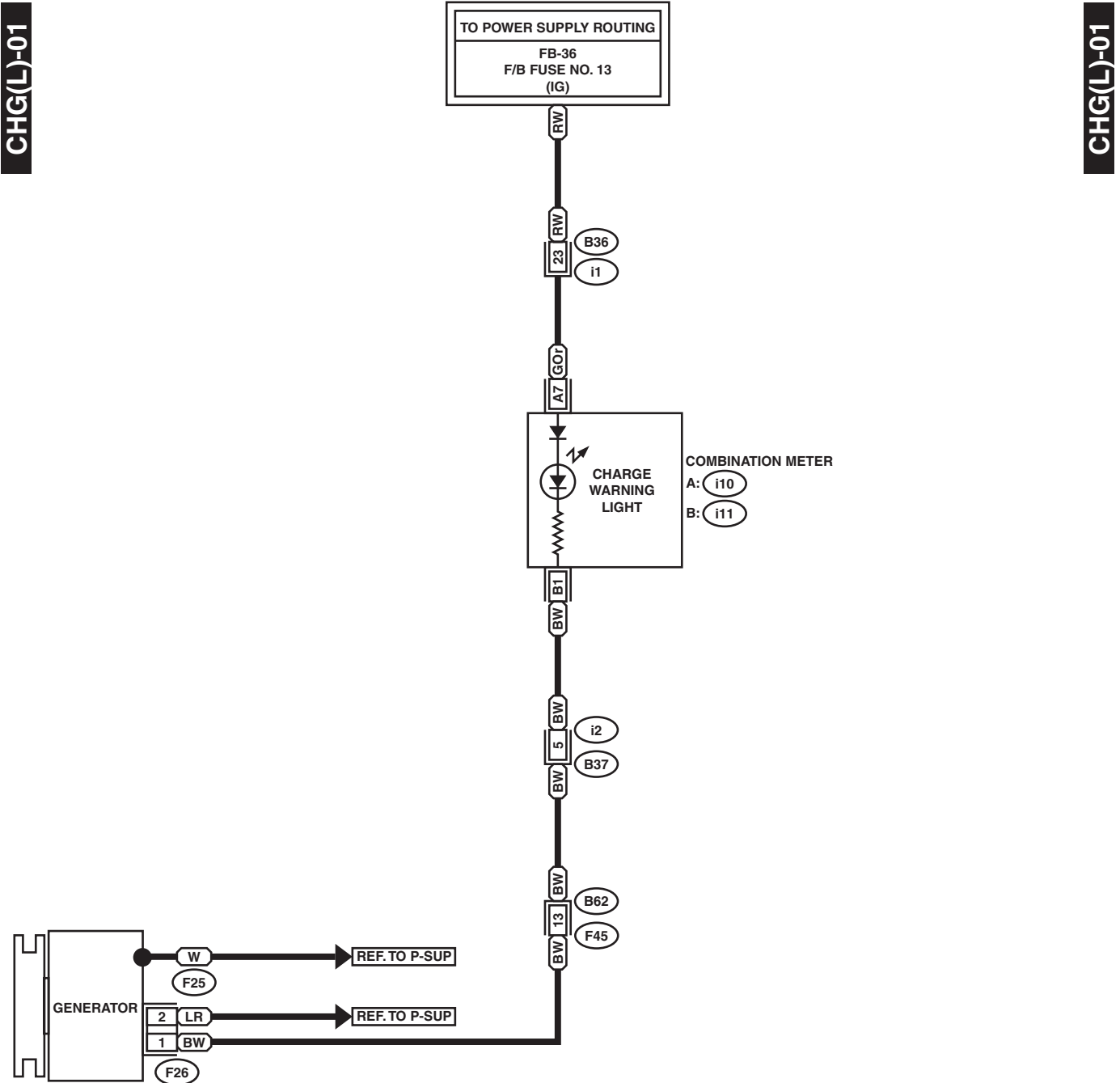
11.Charging System

A: SCHEMATIC

CHARGING SYSTEM

WIRING SYSTEM

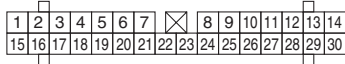
1. LHD MODEL



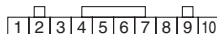
F26 (GREEN)



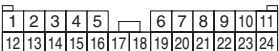
B: i11 (GREEN)



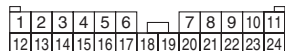
A: i10 (GREEN)



i2
F45



B36 (BLACK)



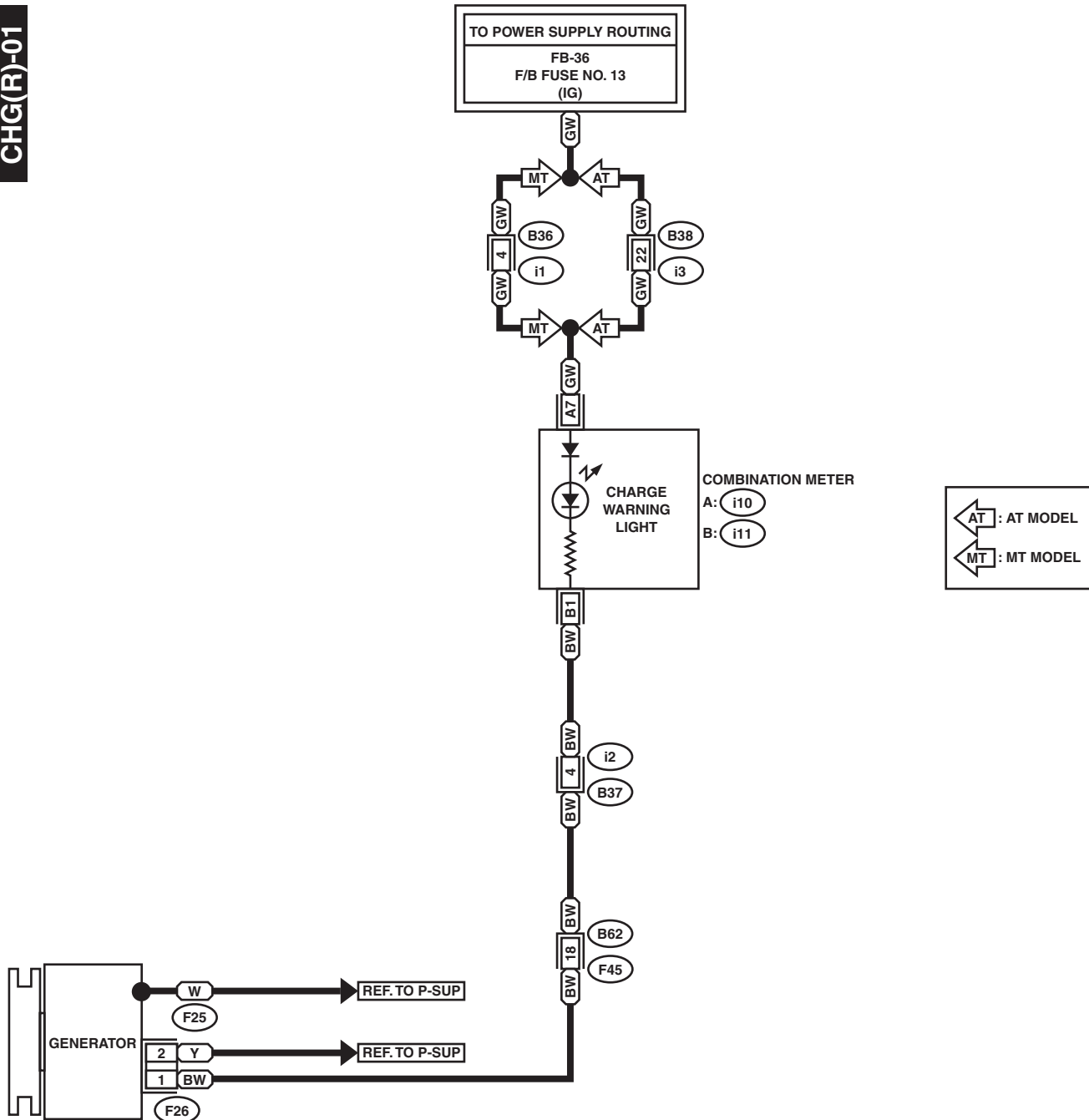
CHARGING SYSTEM

WIRING SYSTEM

2. RHD MODEL

CHG(R)-01

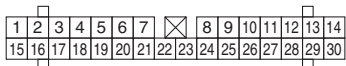
CHG(R)-01



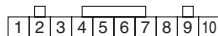
F26 (GREEN)



B: i11 (GREEN)



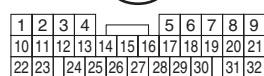
A: i10 (GREEN)



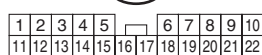
i1 (BLACK)



i2



i3 (BLACK)



F45



GR02-21

COMBINATION METER

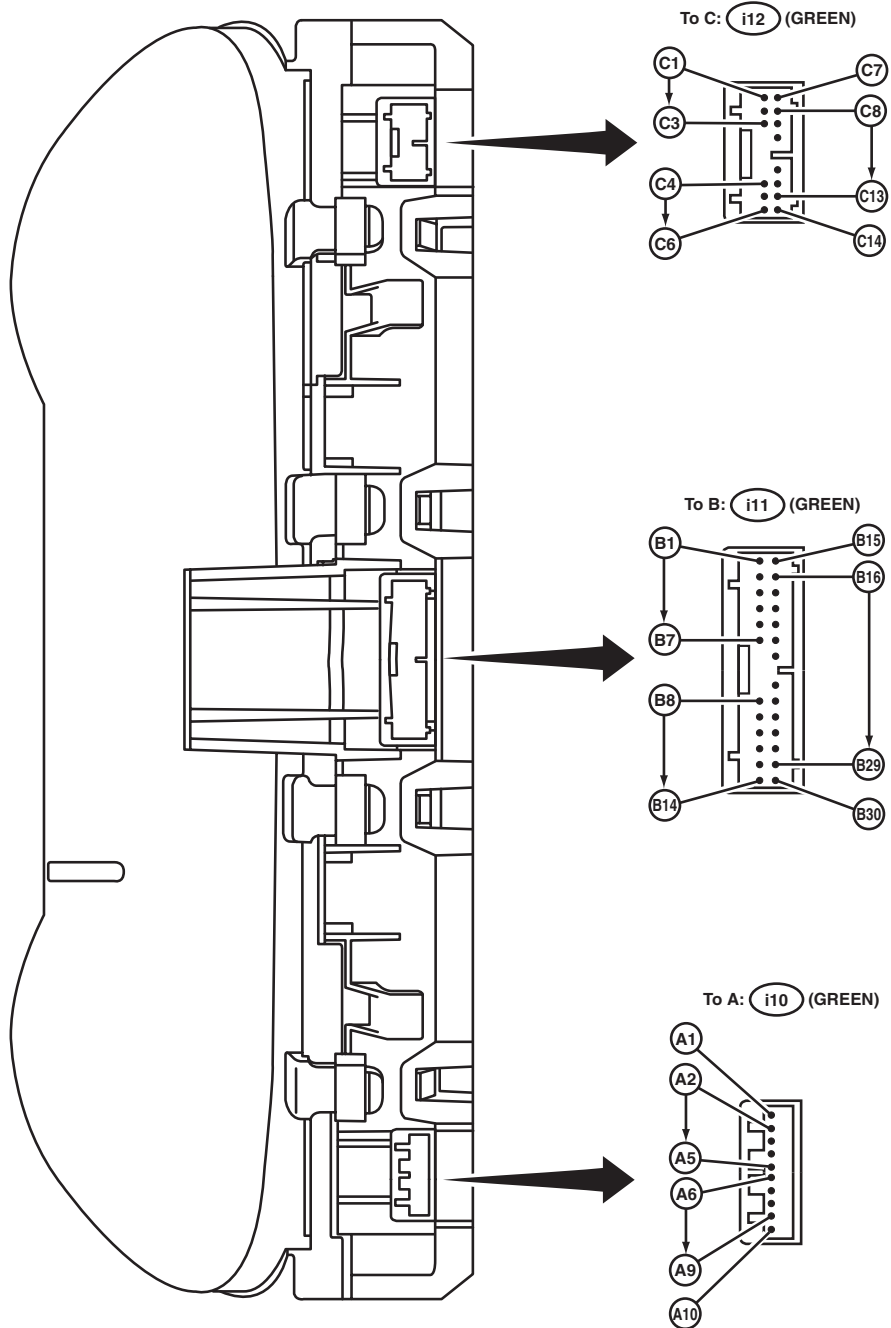
WIRING SYSTEM

12. Combination Meter

A: SCHEMATIC

METER-01

METER-01

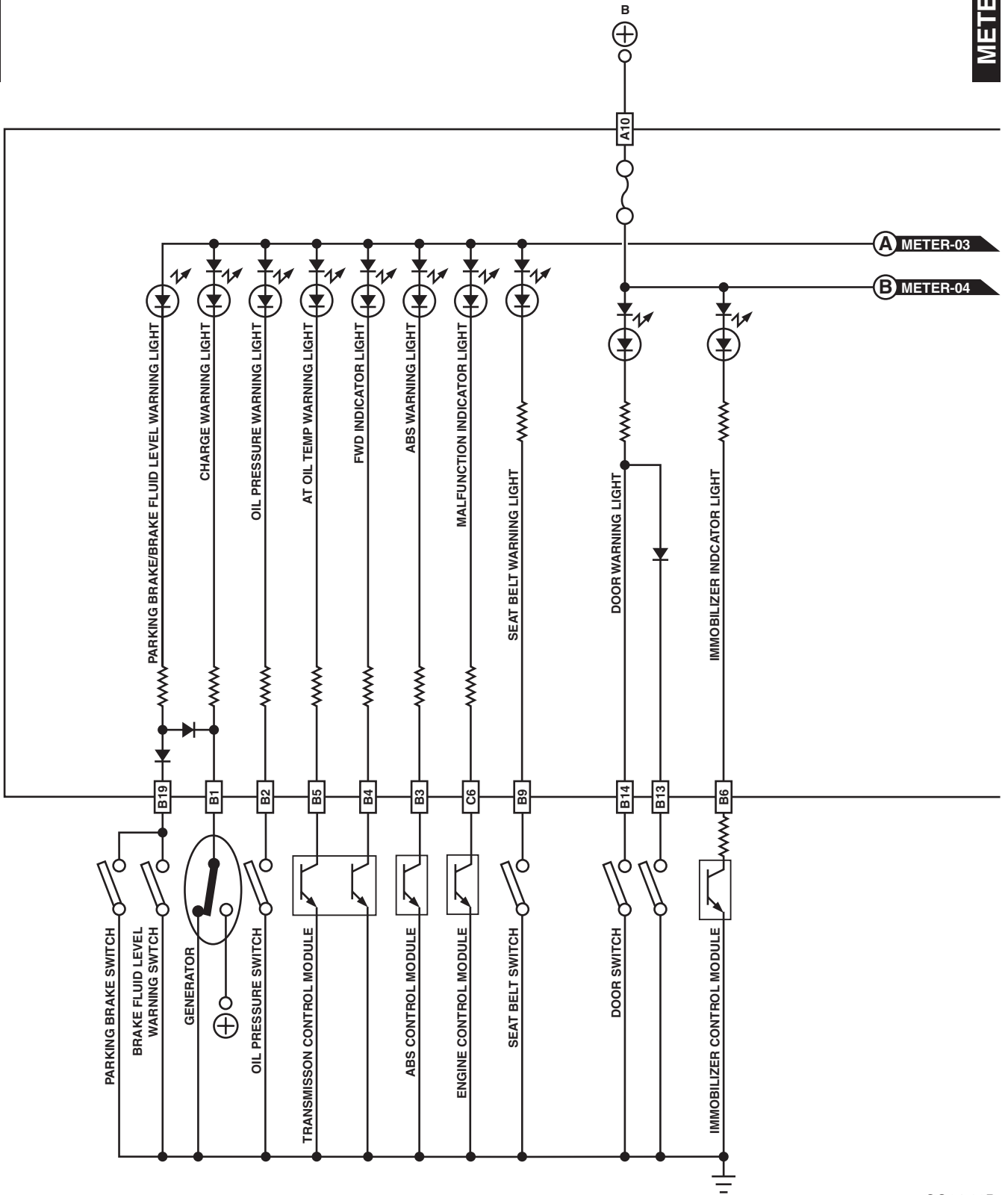


COMBINATION METER

WIRING SYSTEM

METER-02

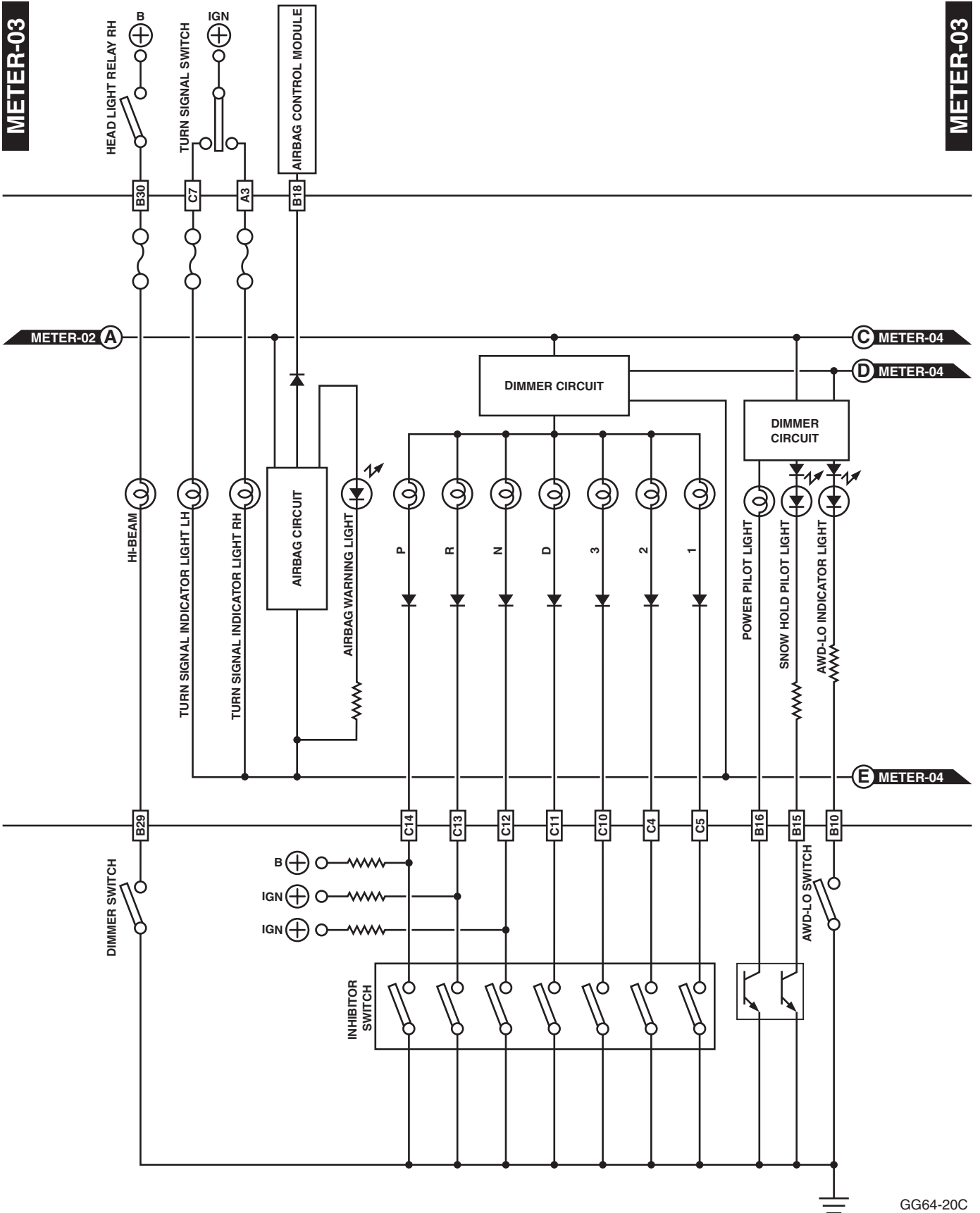
METER-02



GG64-20B

COMBINATION METER

WIRING SYSTEM



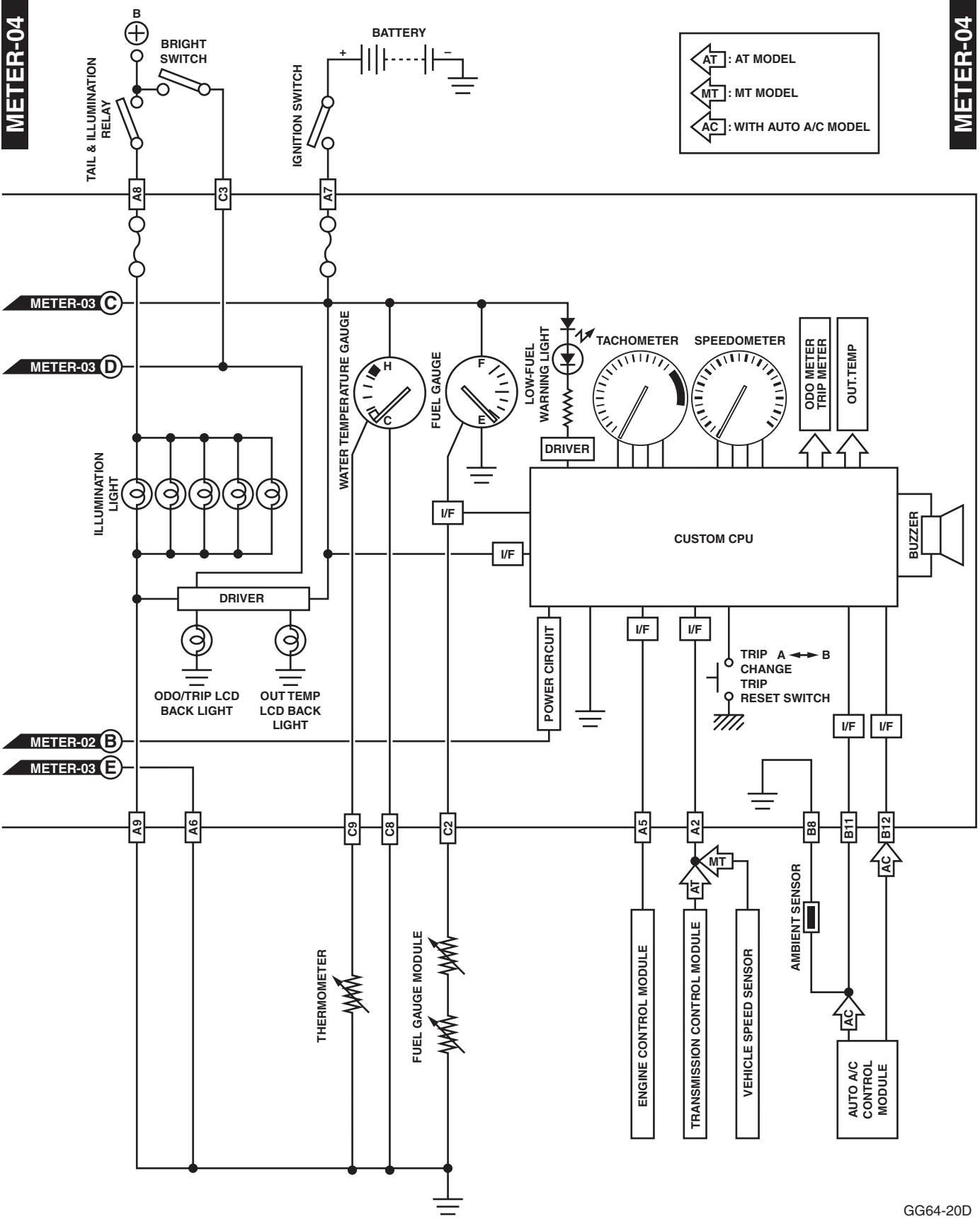
GG64-20C

COMBINATION METER

WIRING SYSTEM

METER-04

METER-04



AT : AT MODEL
 MT : MT MODEL
 AC : WITH AUTO A/C MODEL

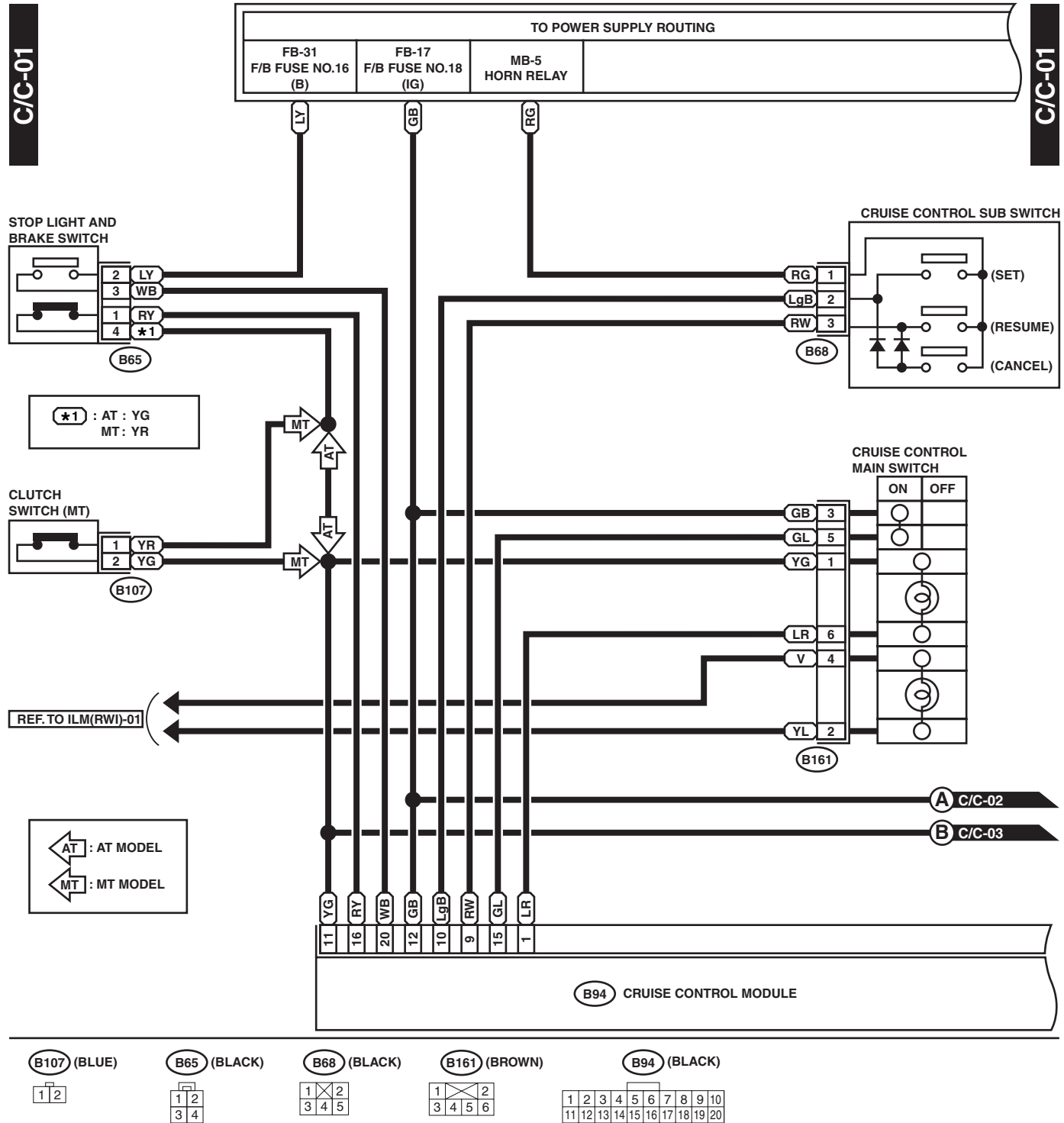
GG64-20D

CRUISE CONTROL SYSTEM

WIRING SYSTEM

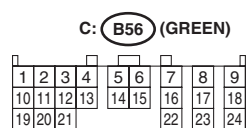
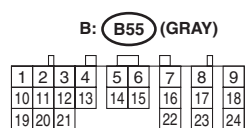
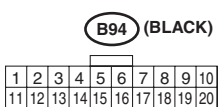
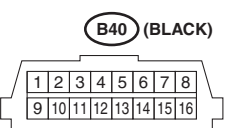
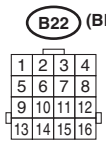
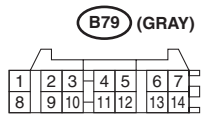
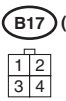
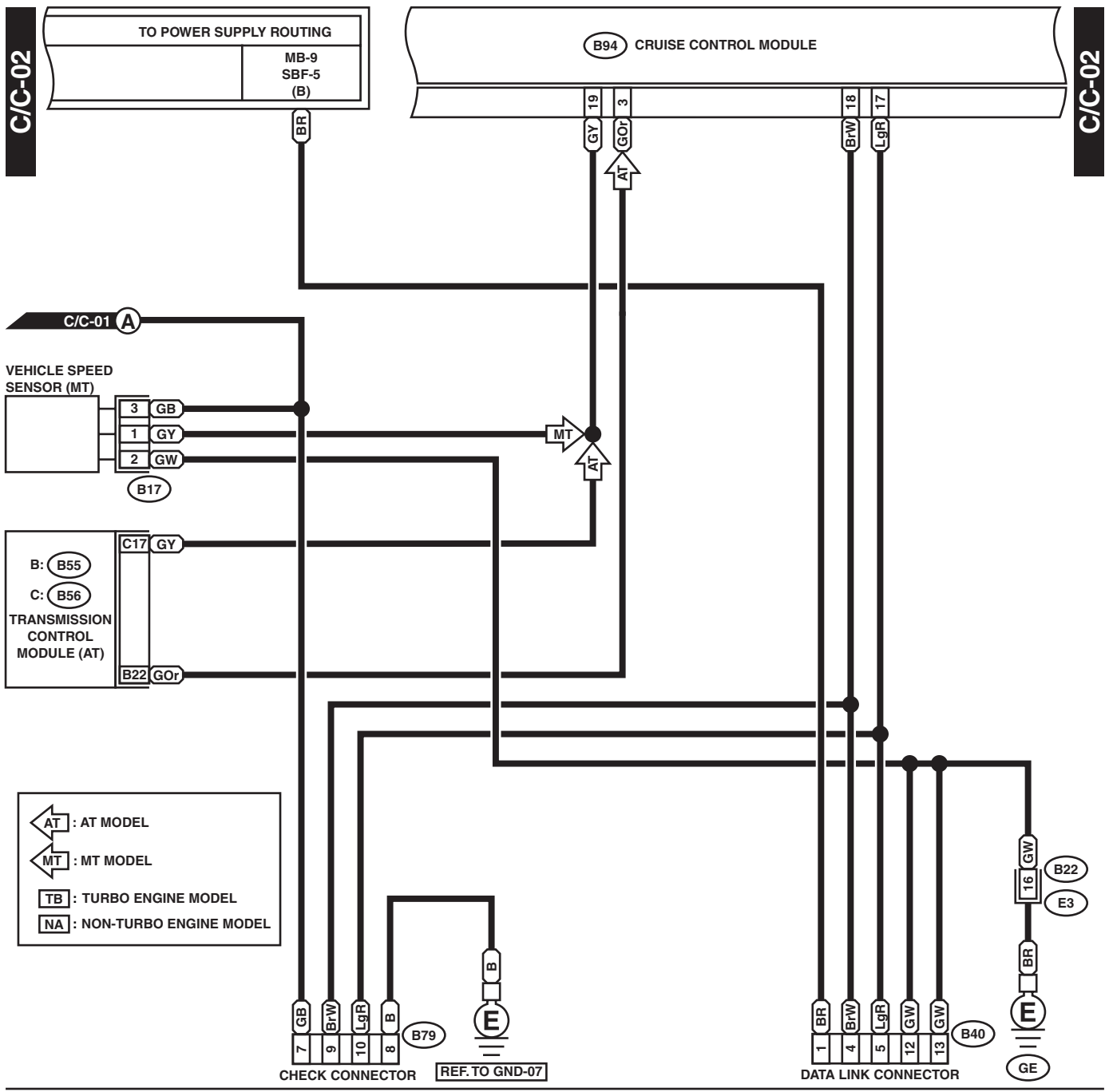
13. Cruise Control System

A: SCHEMATIC



CRUISE CONTROL SYSTEM

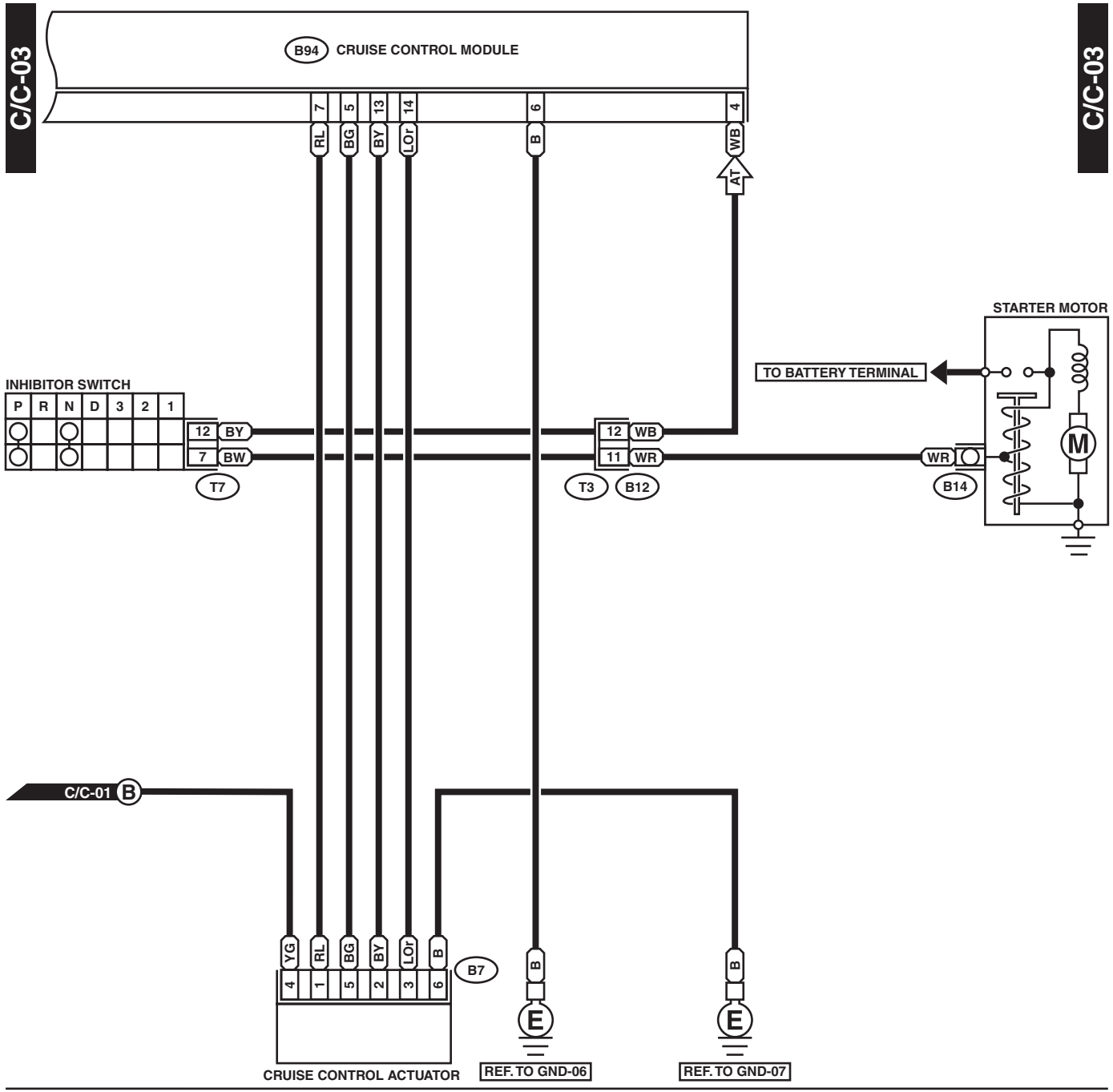
WIRING SYSTEM



GG71-21B

CRUISE CONTROL SYSTEM

WIRING SYSTEM



B7 (BLACK)

1	2	3
4	5	6

B12

1	2	3	4
5	6	7	8
9	10	11	12

T7

1	2	3	4	5	6
7	8	9	10	11	12

B94 (BLACK)

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20

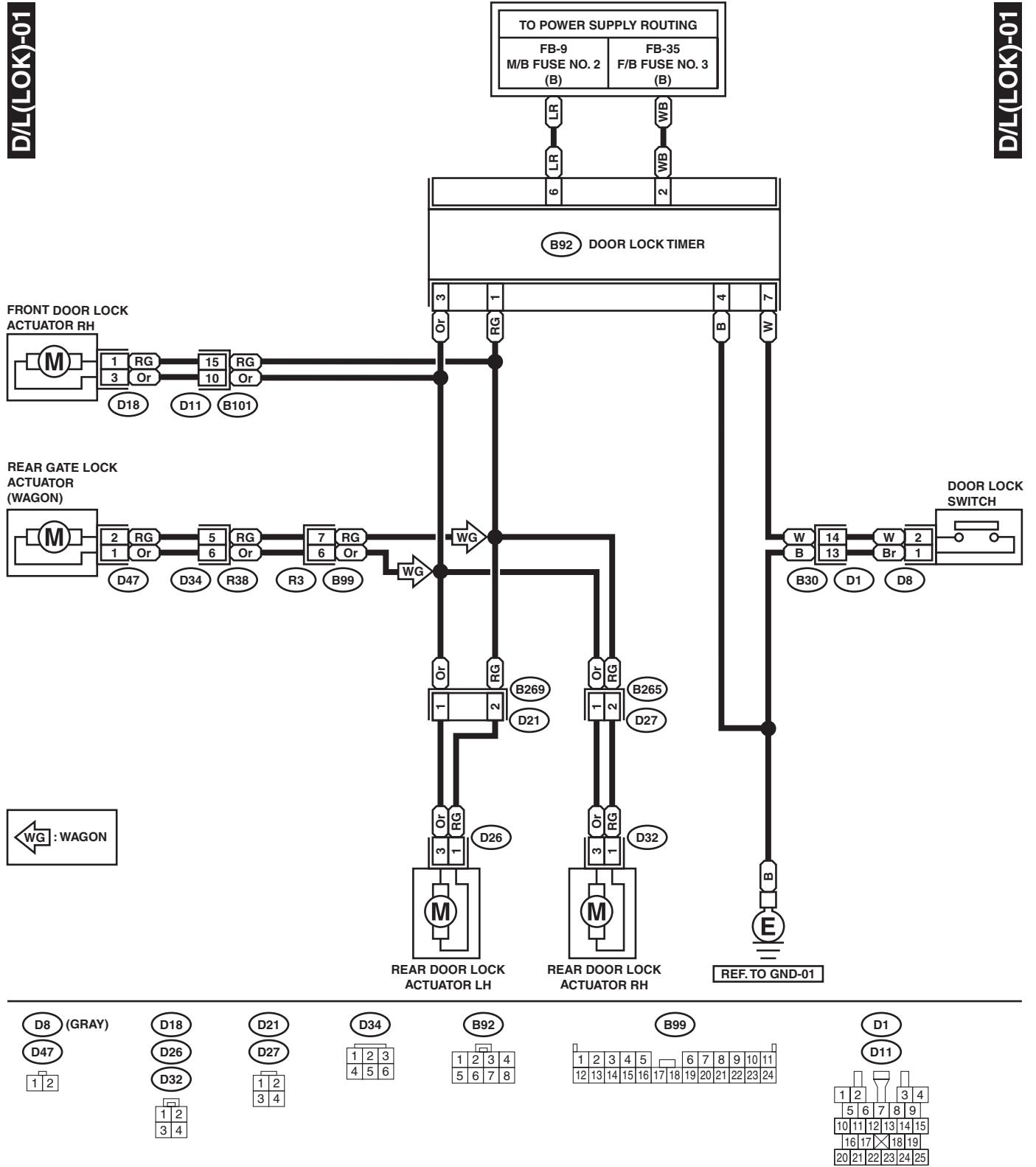
14.Door Lock System

A: SCHEMATIC

DOOR LOCK SYSTEM

WIRING SYSTEM

1. LHD WITHOUT KEYLESS ENTRY MODEL



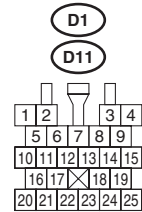
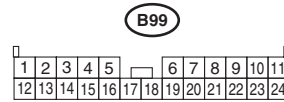
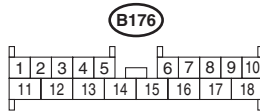
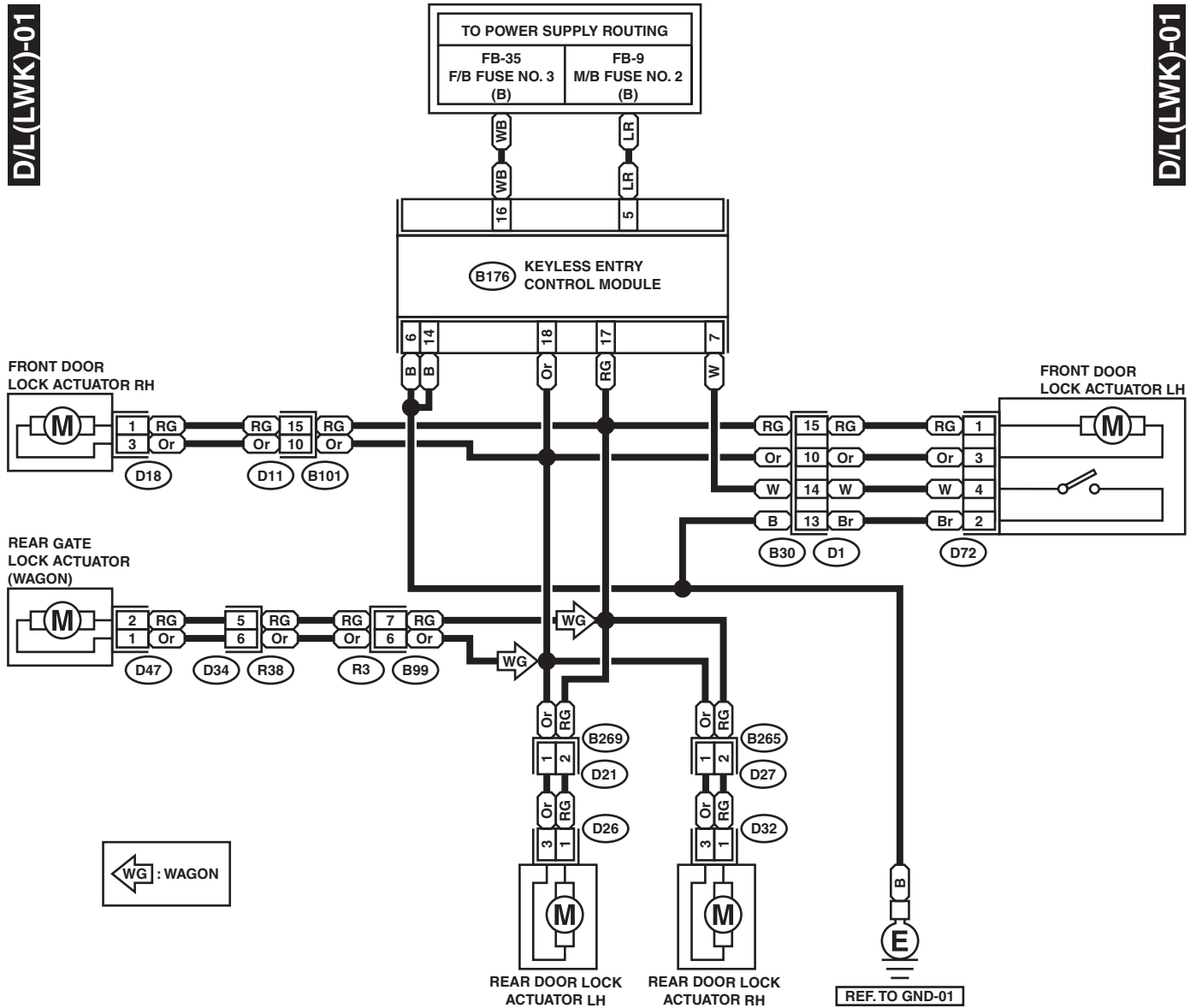
DOOR LOCK SYSTEM

WIRING SYSTEM

2. LHD WITH KEYLESS ENTRY MODEL

D/L(LWK)-01

D/L(LWK)-01



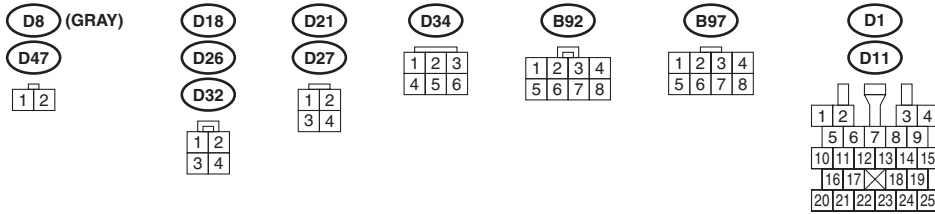
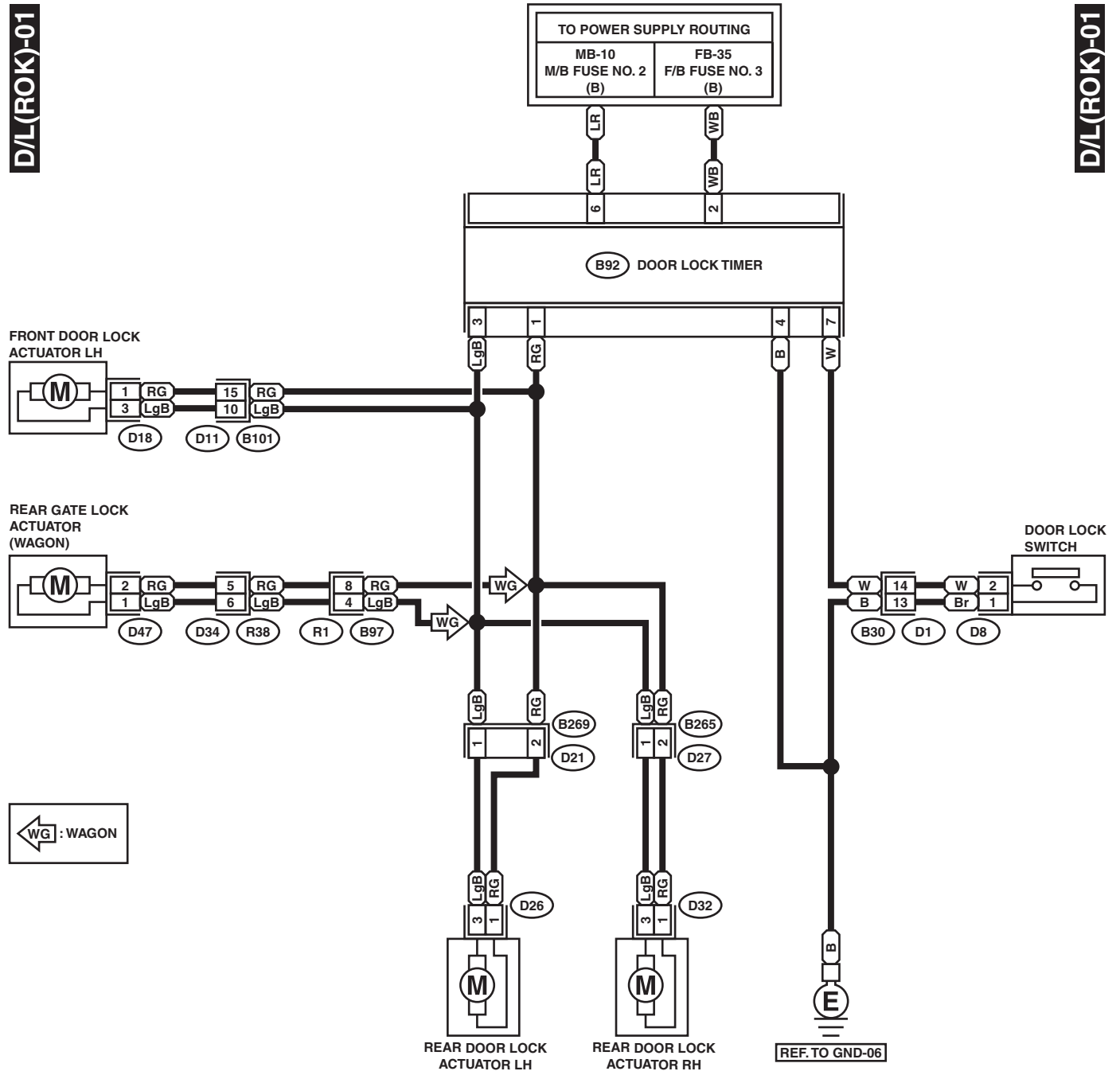
DOOR LOCK SYSTEM

WIRING SYSTEM

3. RHD WITHOUT KEYLESS ENTRY MODEL

D/L(ROK)-01

D/L(ROK)-01



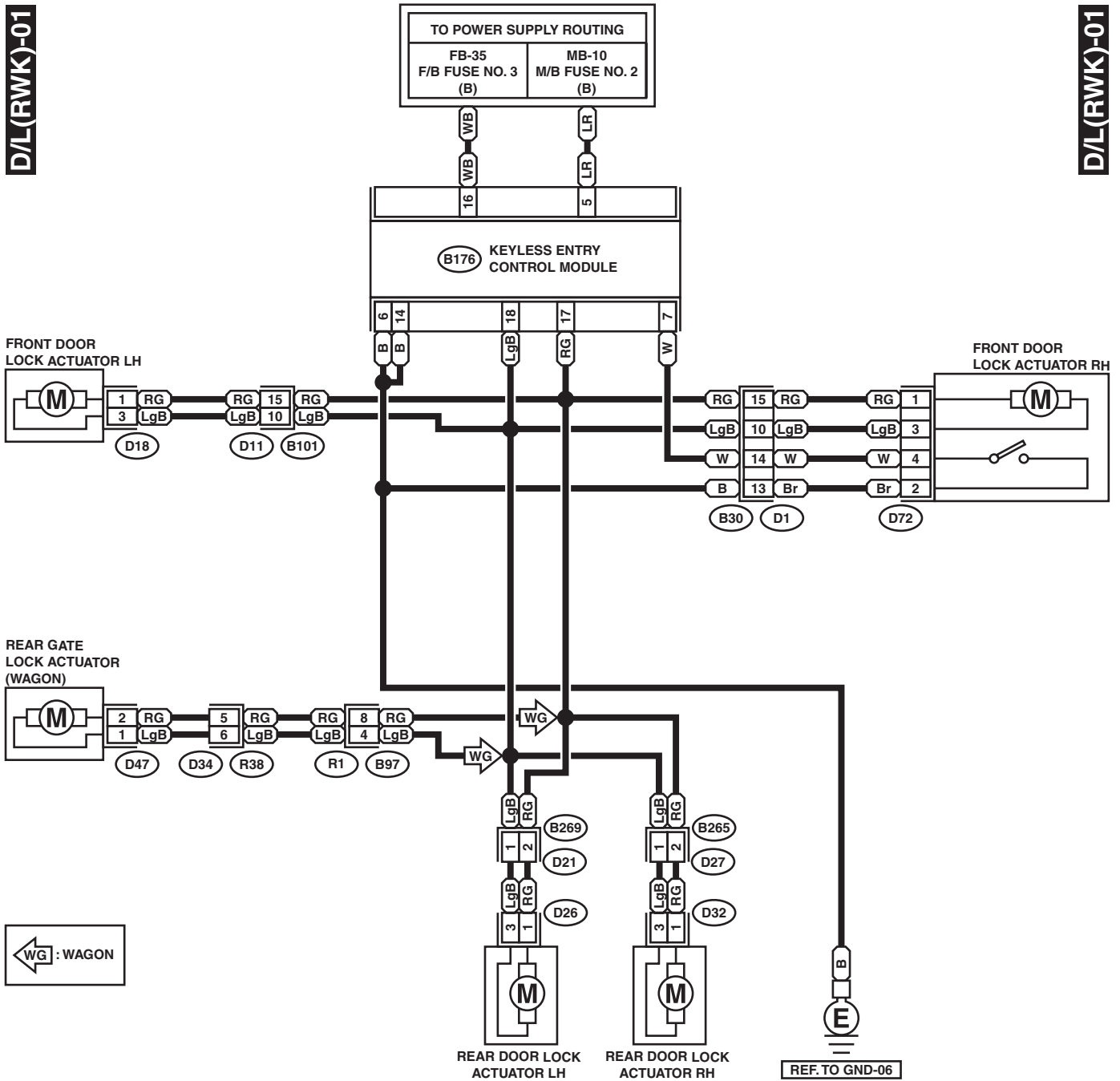
DOOR LOCK SYSTEM

WIRING SYSTEM

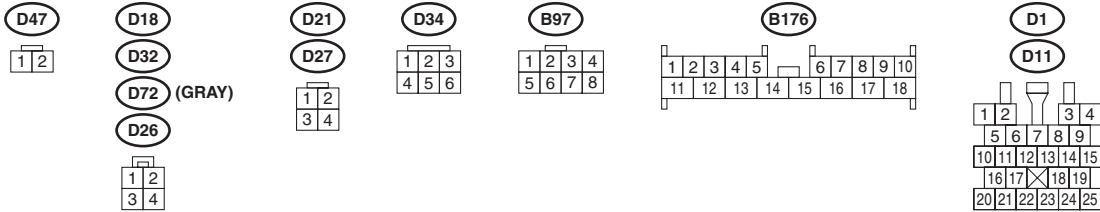
4. RHD WITH KEYLESS ENTRY MODEL

D/L(RWK)-01

D/L(RWK)-01



WG : WAGON



ENGINE COOLANT TEMPERATURE GAUGE SYSTEM

WIRING SYSTEM

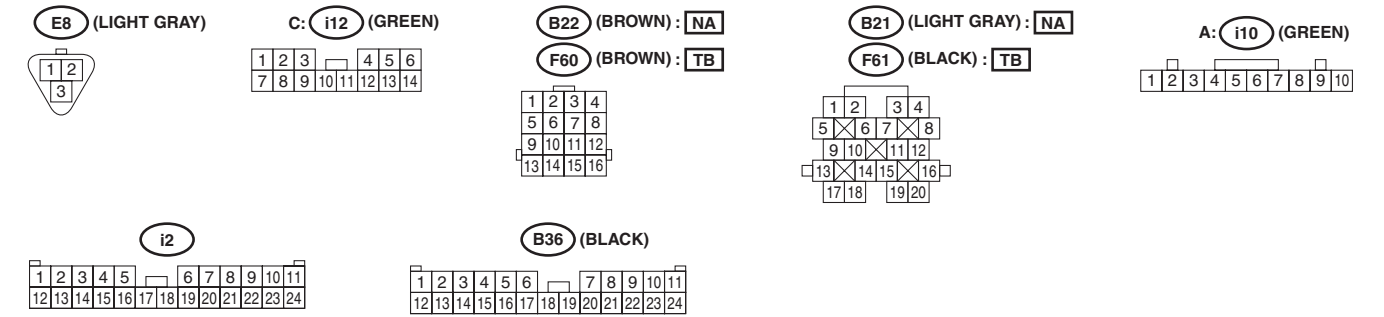
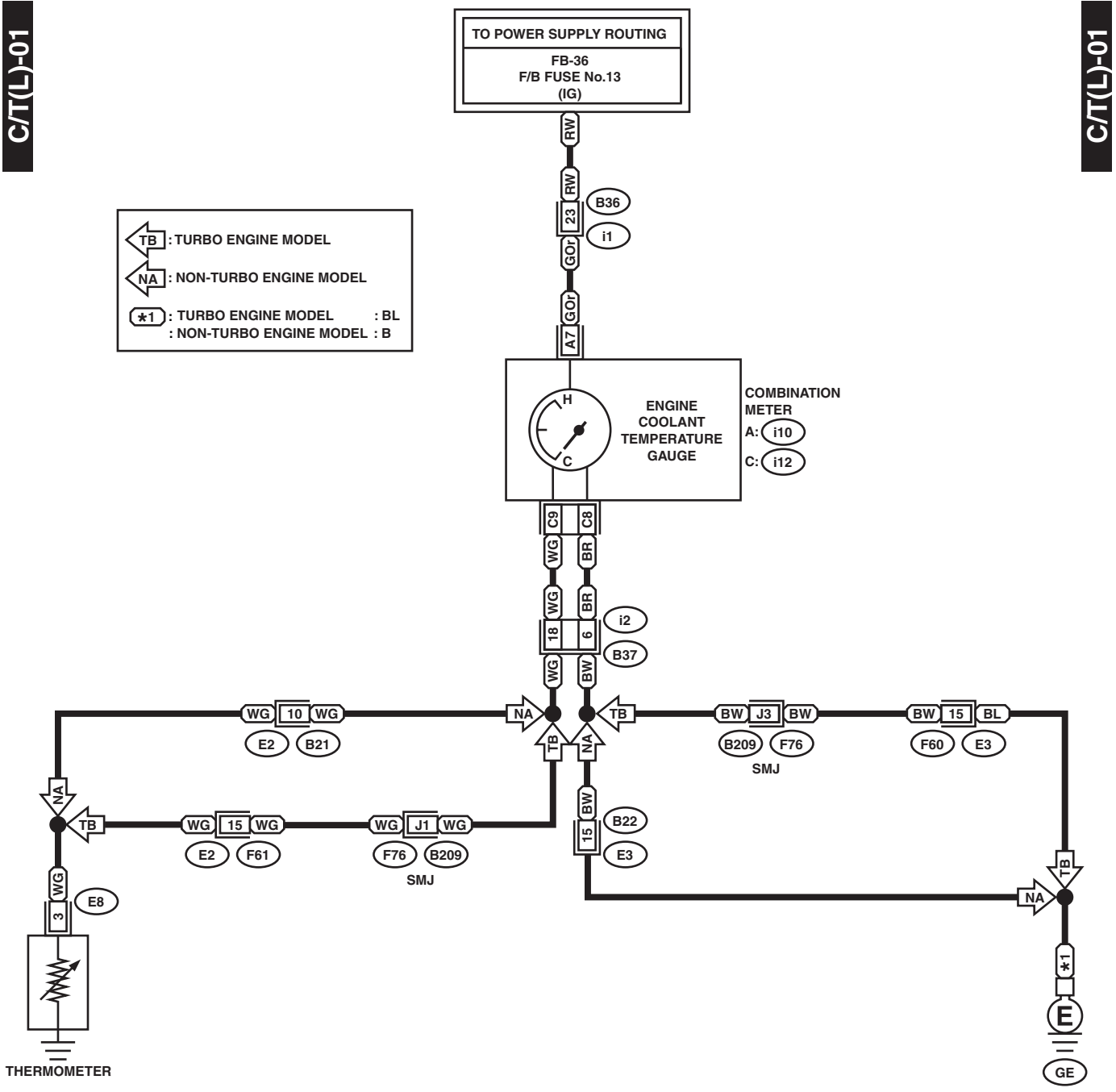
15.Engine Coolant Temperature Gauge System

A: SCHEMATIC

ENGINE COOLANT TEMPERATURE GAUGE SYSTEM

WIRING SYSTEM

1. LHD MODEL



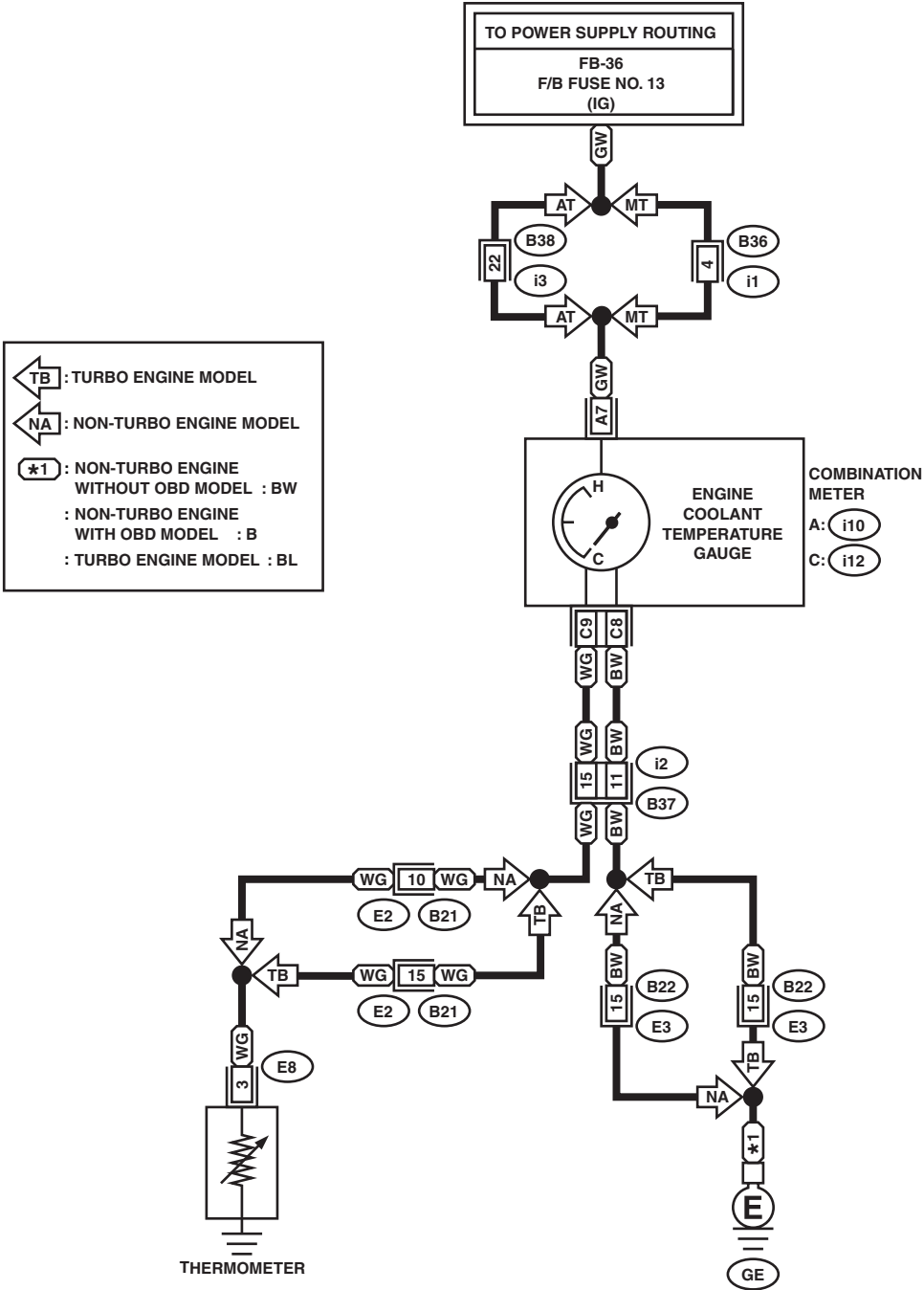
ENGINE COOLANT TEMPERATURE GAUGE SYSTEM

WIRING SYSTEM

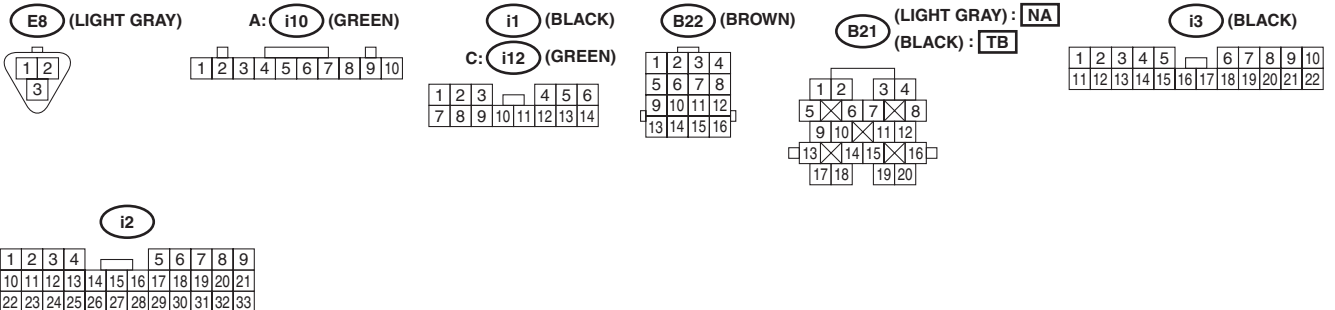
2. RHD MODEL

C/T(R)-01

C/T(R)-01



TB : TURBO ENGINE MODEL
 NA : NON-TURBO ENGINE MODEL
 *1 : NON-TURBO ENGINE WITHOUT OBD MODEL : BW
 : NON-TURBO ENGINE WITH OBD MODEL : B
 : TURBO ENGINE MODEL : BL



GR68-21

16.Engine Electrical System

A: SCHEMATIC

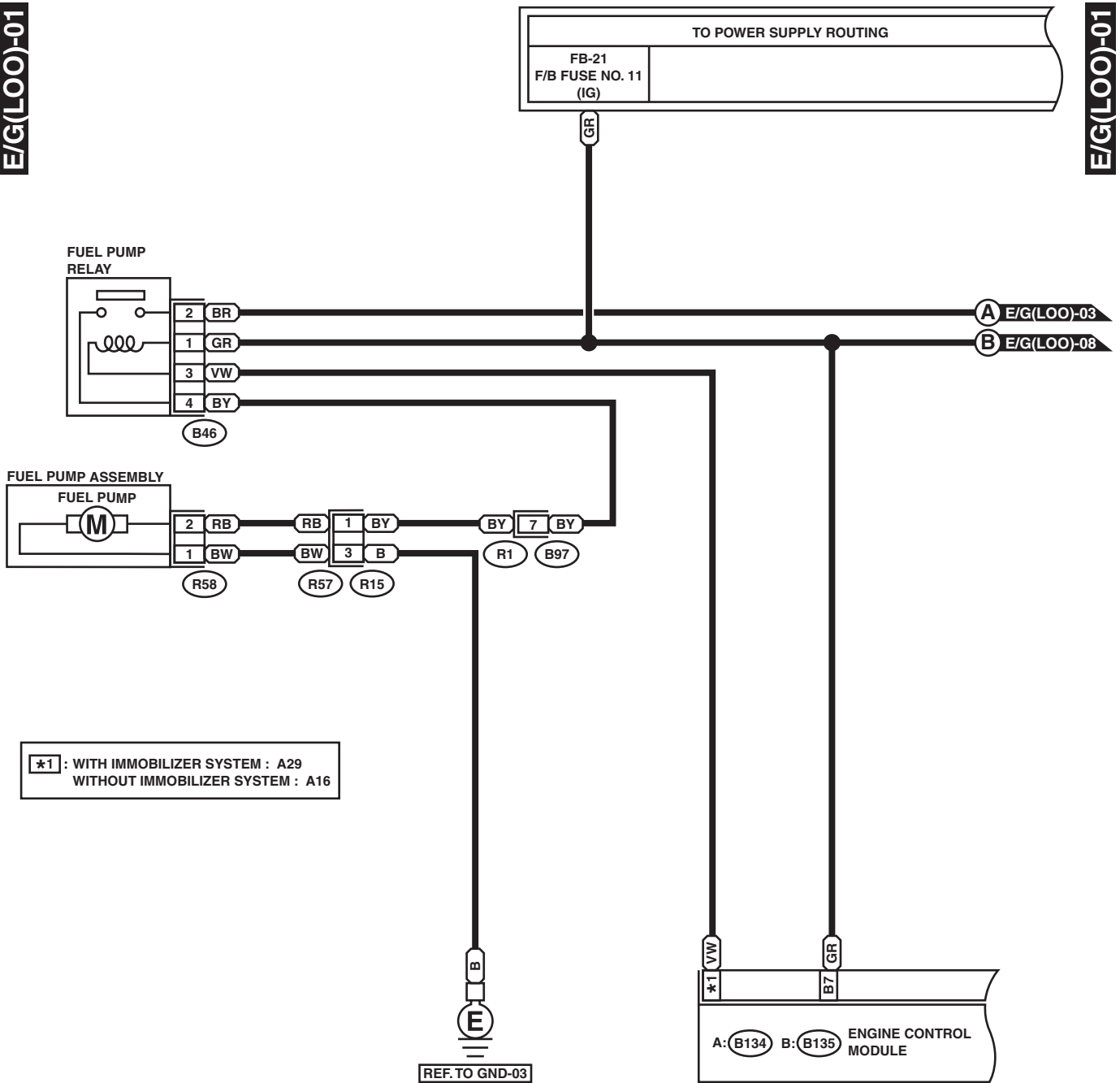
ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM

1. LHD SOHC W/O OBD MODEL

E/G(LOO)-01

E/G(LOO)-01



B46 (GREEN)

1	2
3	4

R15 (BLACK)

1	2
3	4
5	6

R58

1	2	3
4	5	6

B97

1	2	3	4
5	6	7	8

B: B135

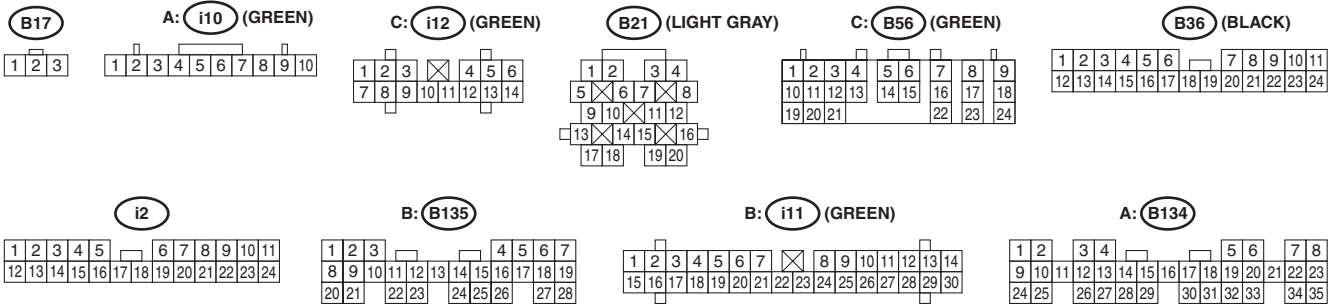
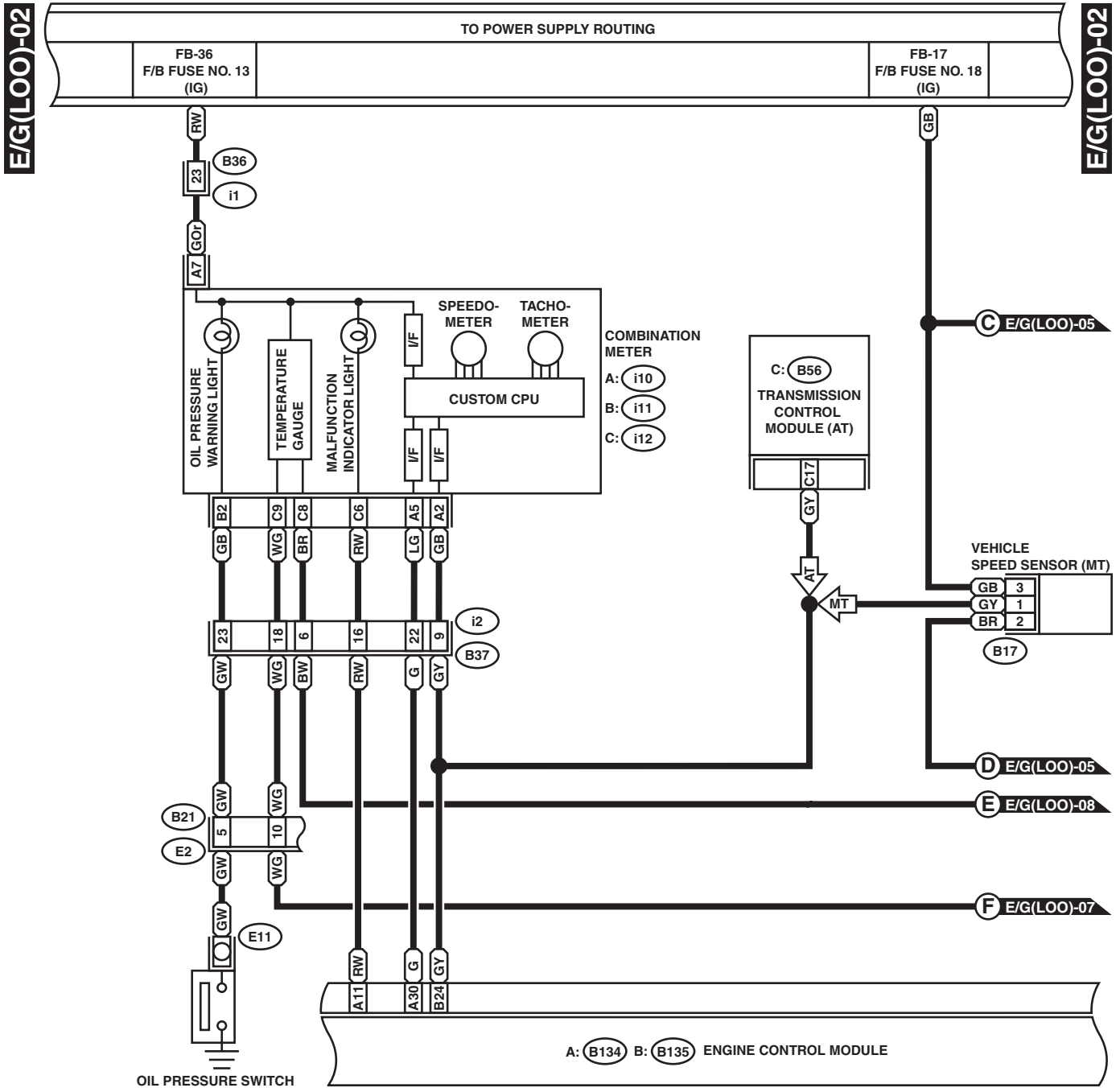
1	2	3			4	5	6	7			
8	9	10	11	12	13	14	15	16	17	18	19
20	21	22	23	24	25	26	27	28			

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

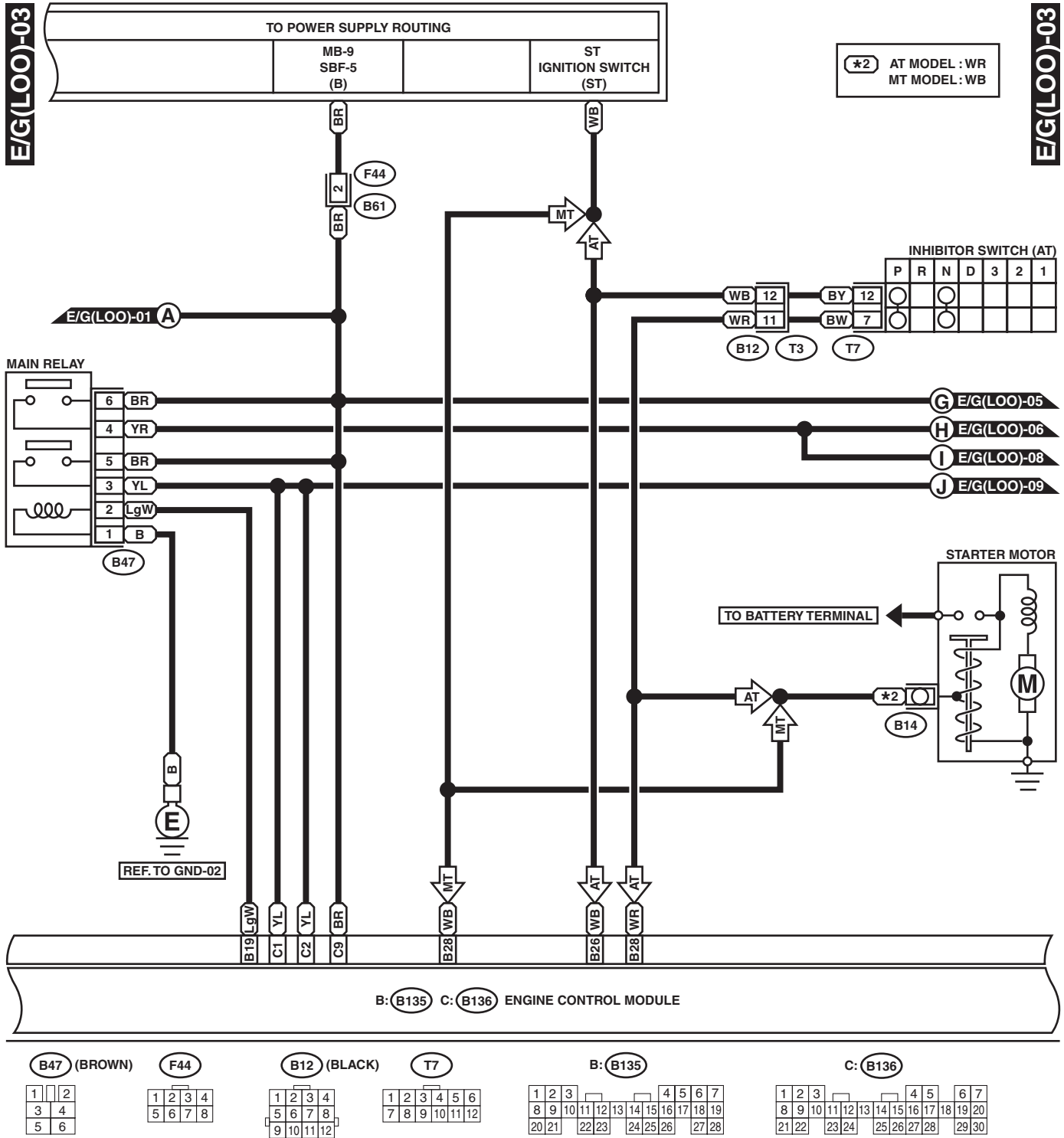
WIRING SYSTEM



GL10-23B

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM



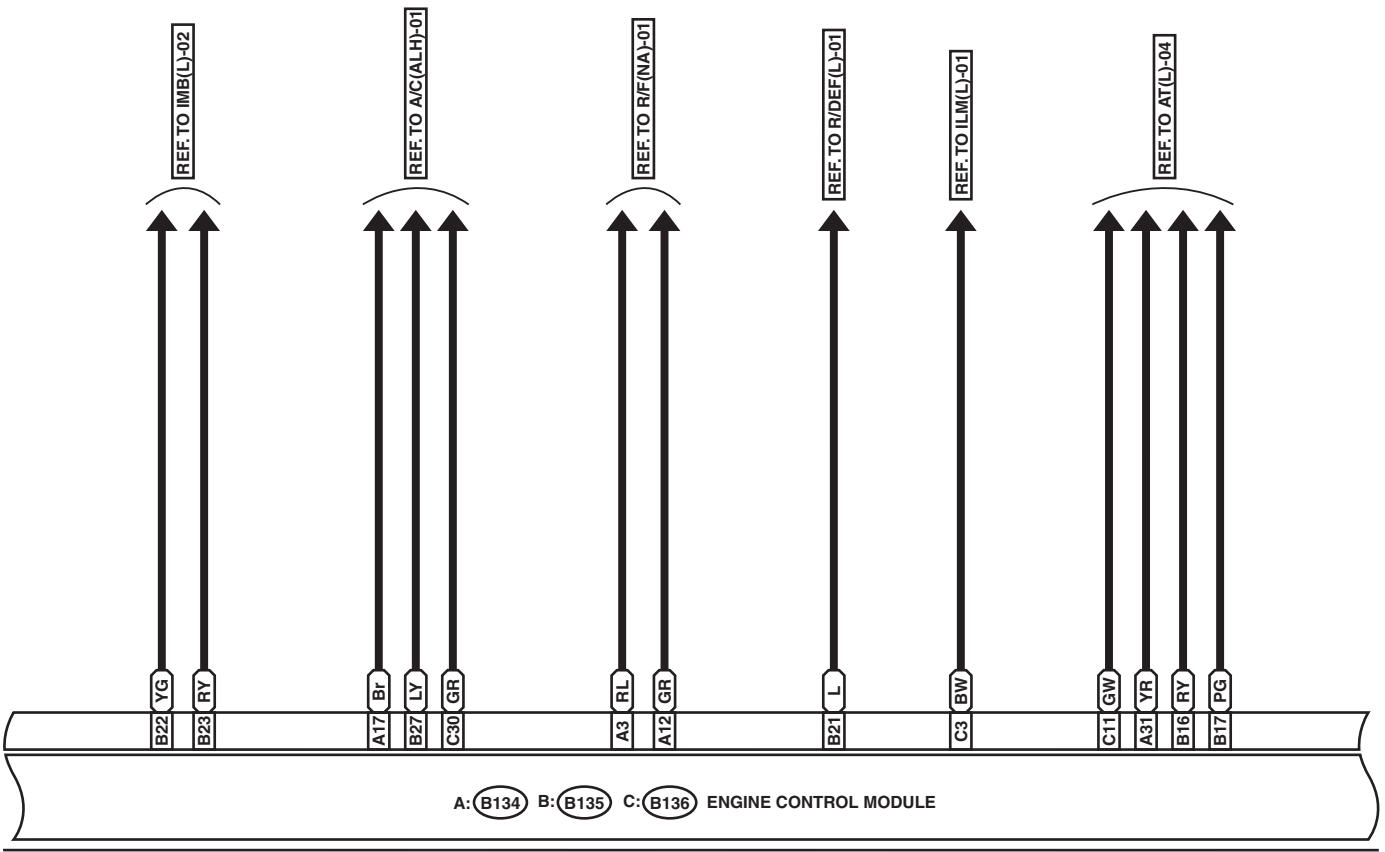
GL10-23C

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM

E/G(LOO)-04

E/G(LOO)-04



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			

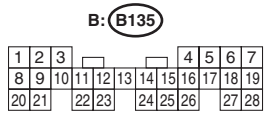
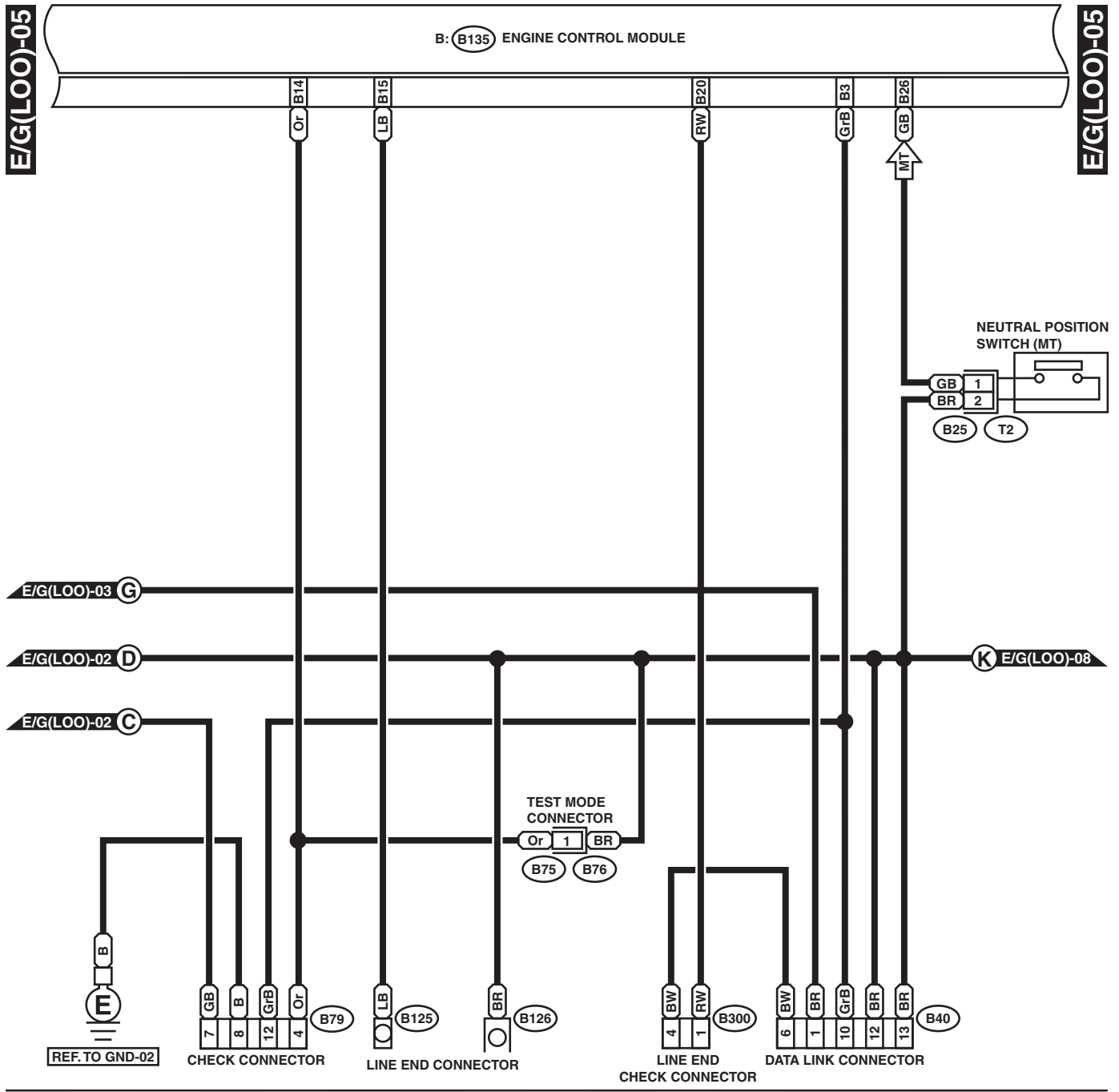
A: (B134)

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			

GL10-23D

ENGINE ELECTRICAL SYSTEM

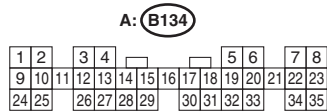
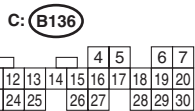
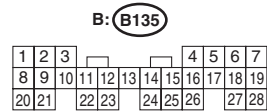
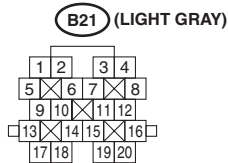
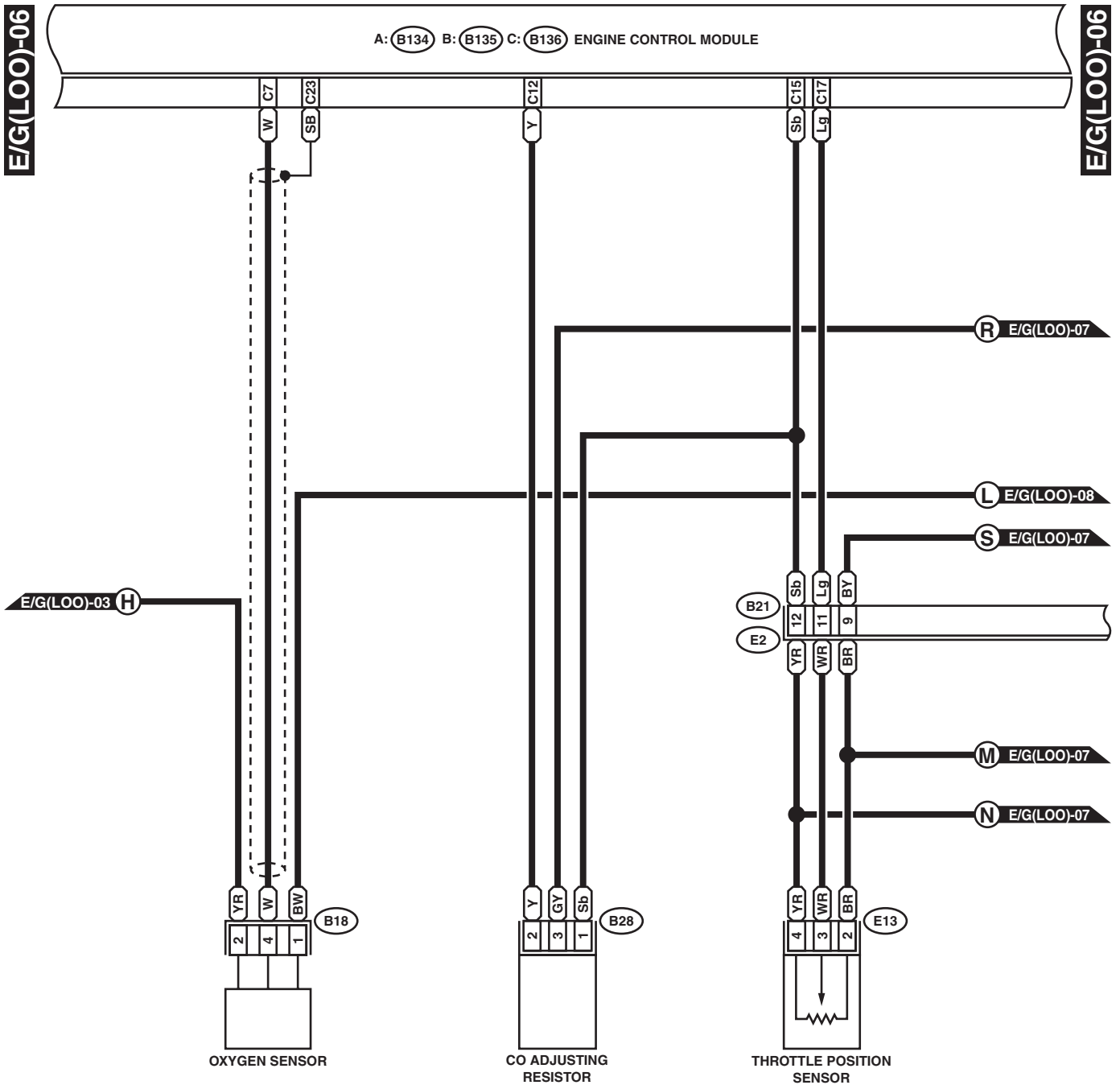
WIRING SYSTEM



GL10-23E

ENGINE ELECTRICAL SYSTEM

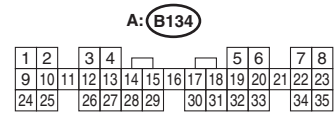
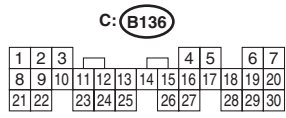
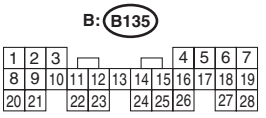
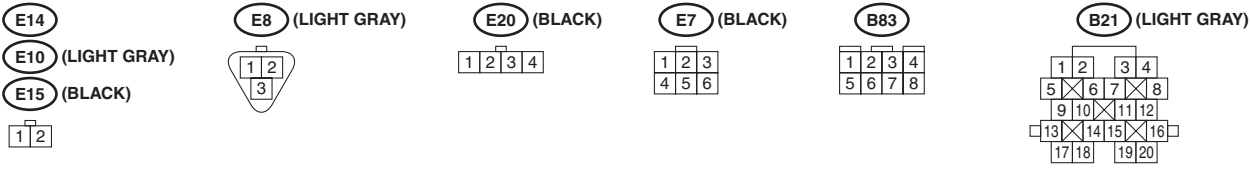
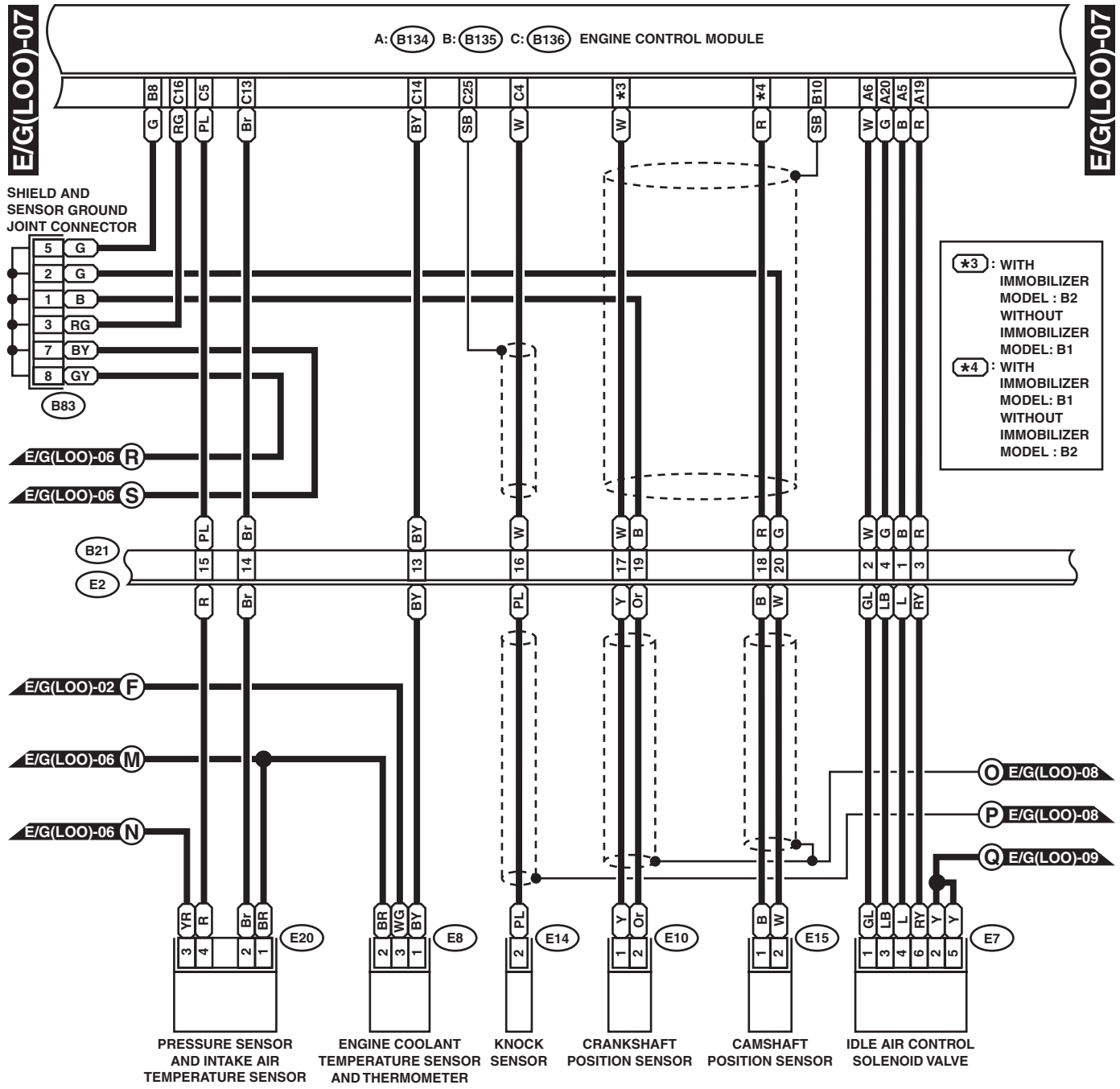
WIRING SYSTEM



GL10-23F

ENGINE ELECTRICAL SYSTEM

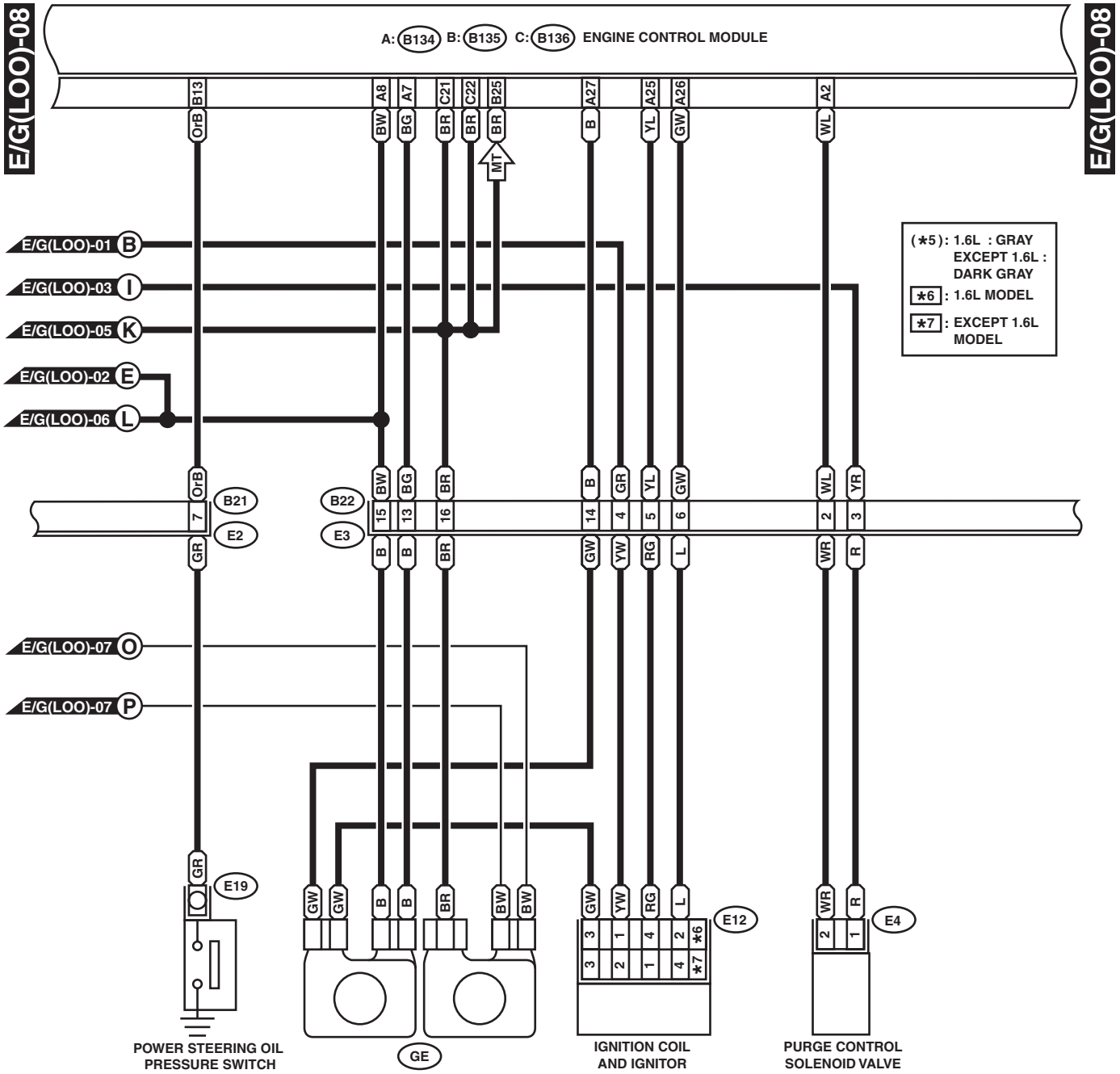
WIRING SYSTEM



GL10-23G

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM



E4 (BLUE)



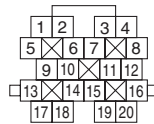
E12 (*5)



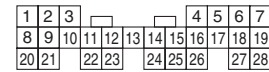
B22 (BROWN)



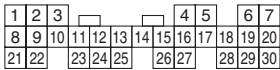
B21 (LIGHT GRAY)



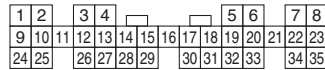
B: B135



C: B136



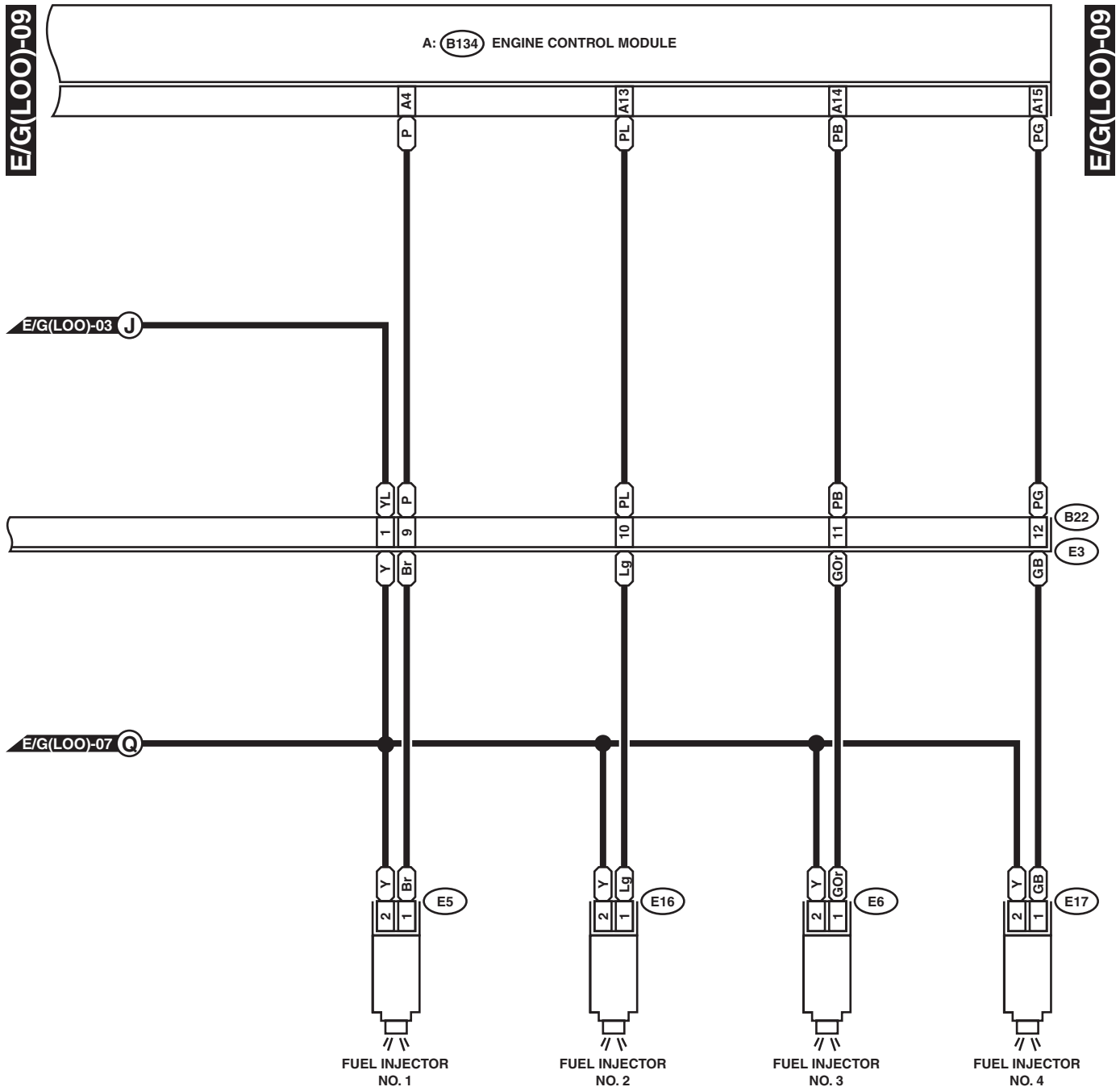
A: B134



GL10-23H

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM



(E5) (LIGHT GRAY)

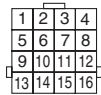
(E6) (LIGHT GRAY)

(E16) (LIGHT GRAY)

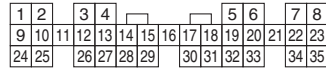
(E17) (LIGHT GRAY)



(B22) (BROWN)



A: (B134)

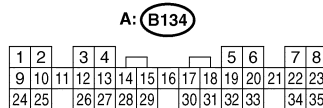
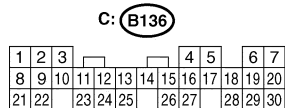
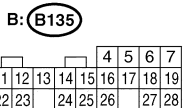
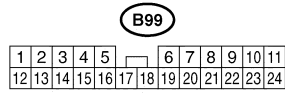
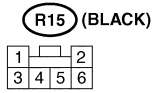
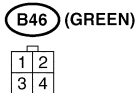
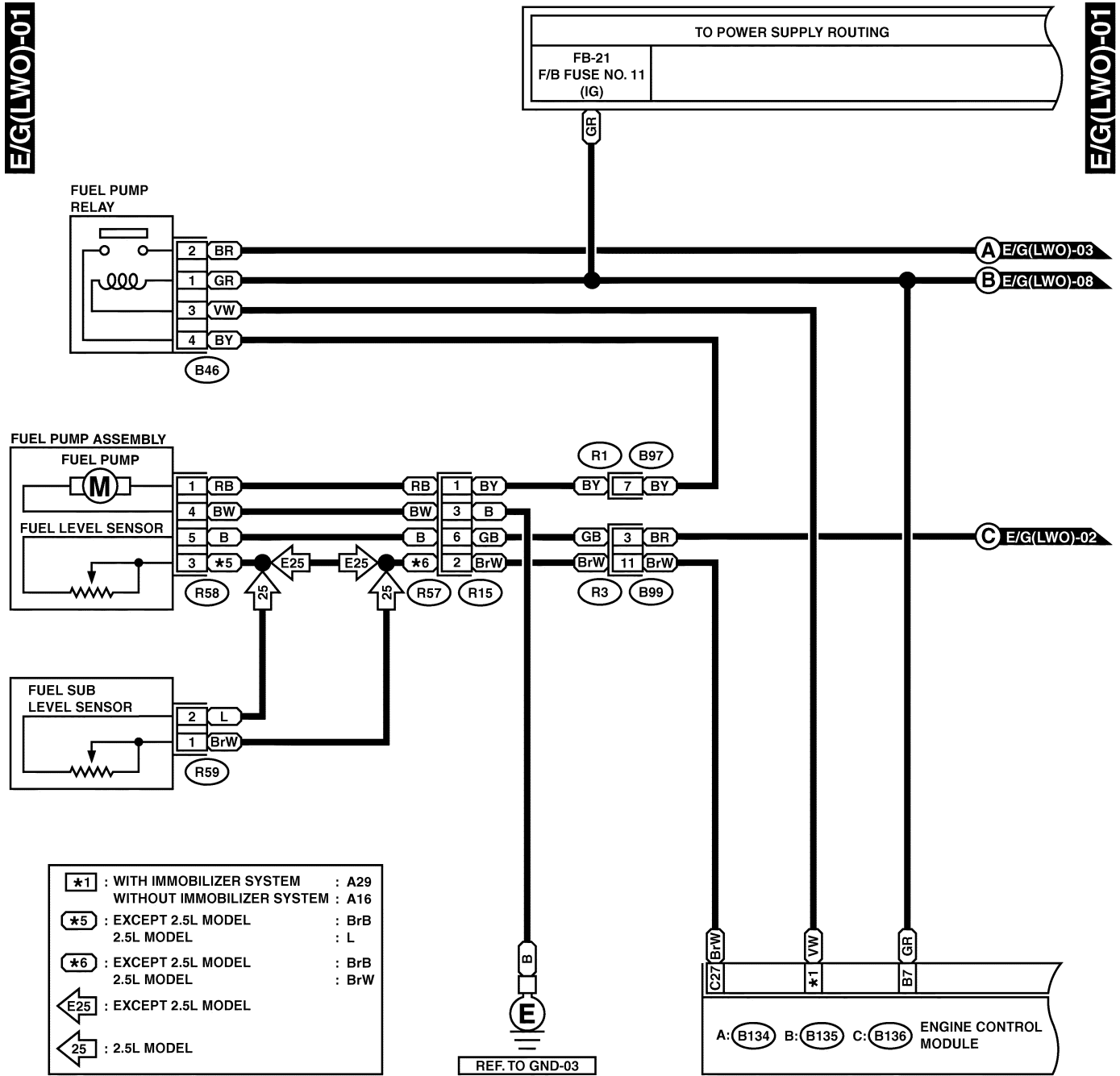


GL10-23I

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM

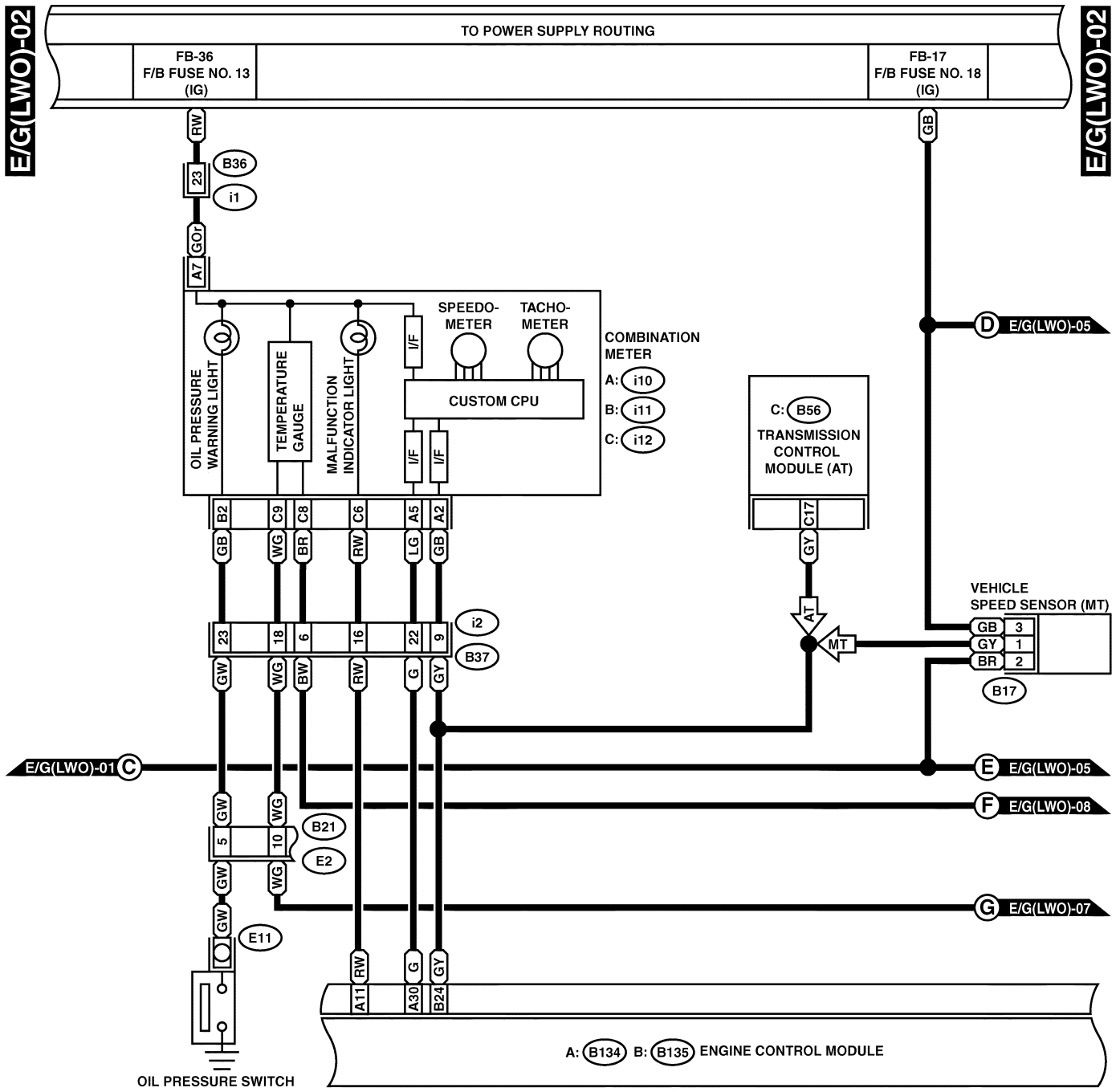
2. LHD SOHC MODEL



GL10-25A

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM



B17

1	2	3
---	---	---

A: i10 (GREEN)

1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	----

C: i12 (GREEN)

1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16		

B21 (LIGHT GRAY)

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16
17	18	19	20

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

B36 (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

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

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												

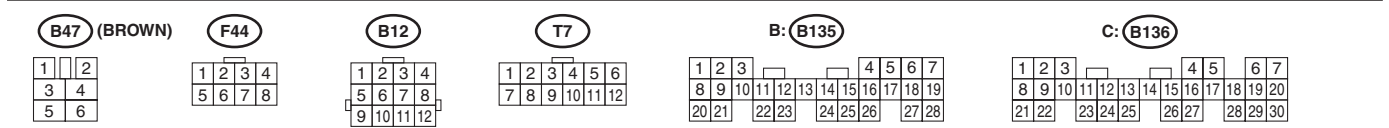
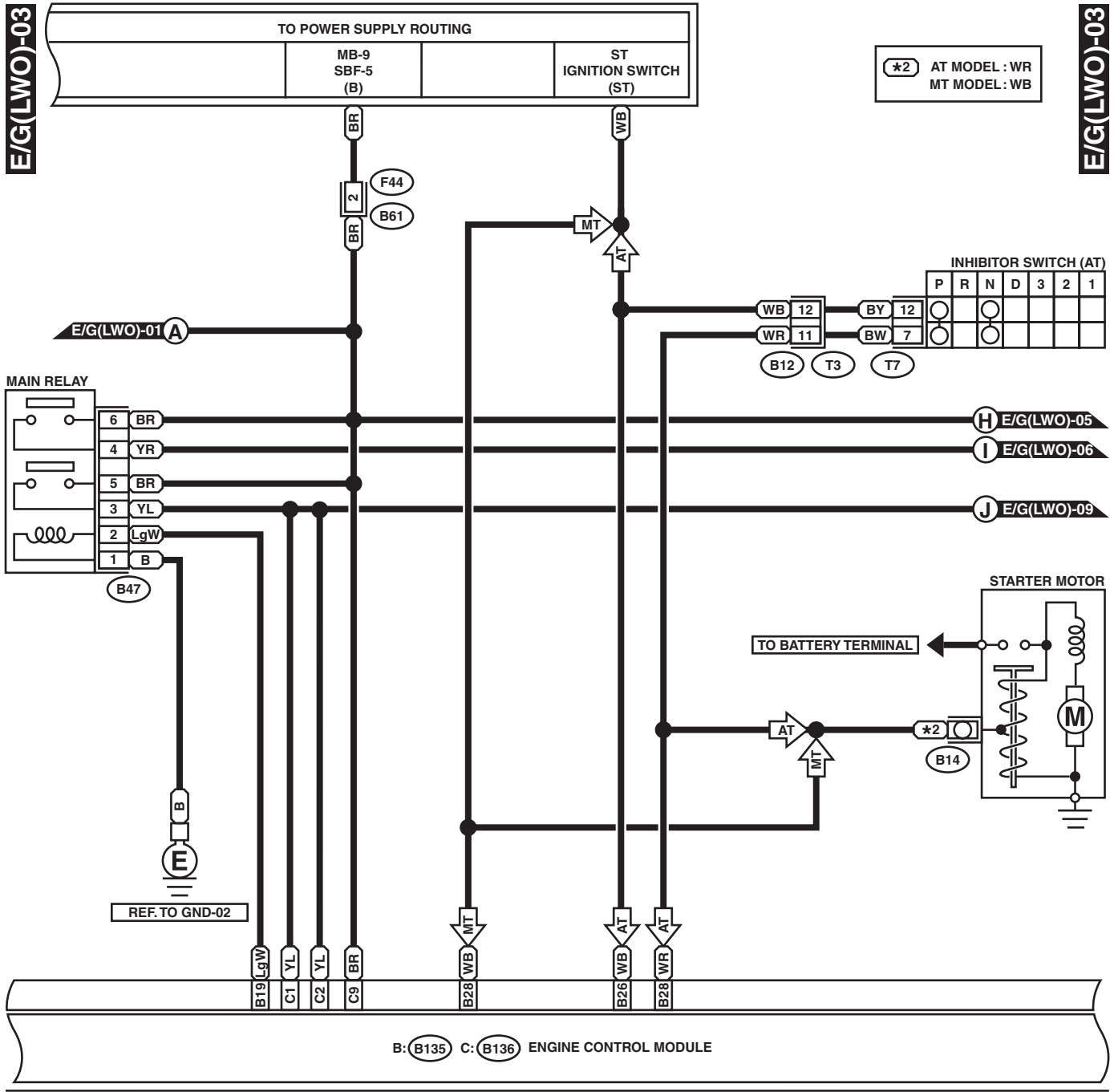
A: B134

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					

GL10-25B

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM



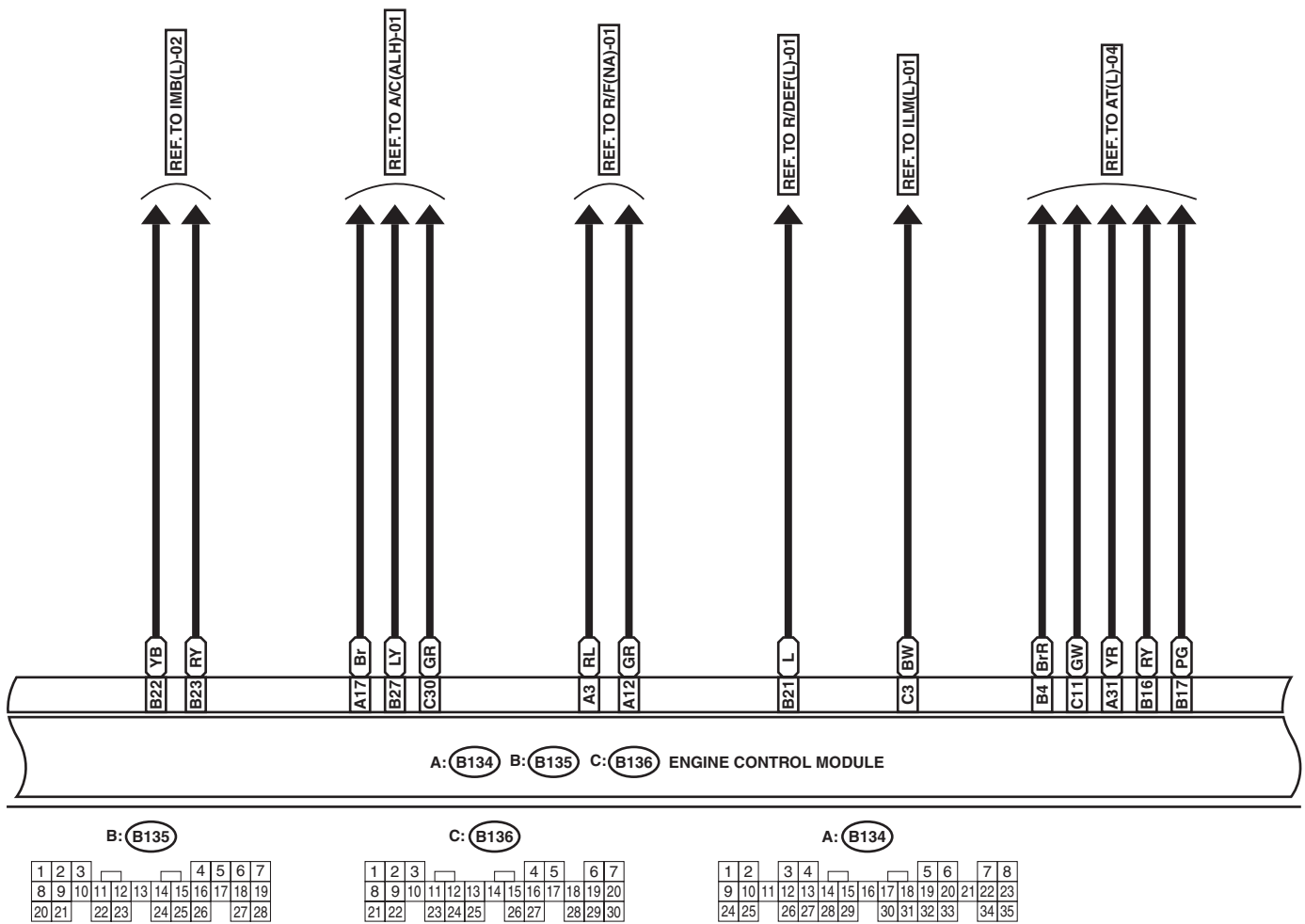
GL10-25C

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM

E/G(LWO)-04

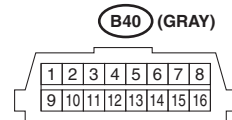
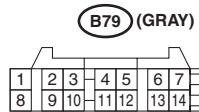
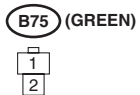
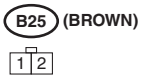
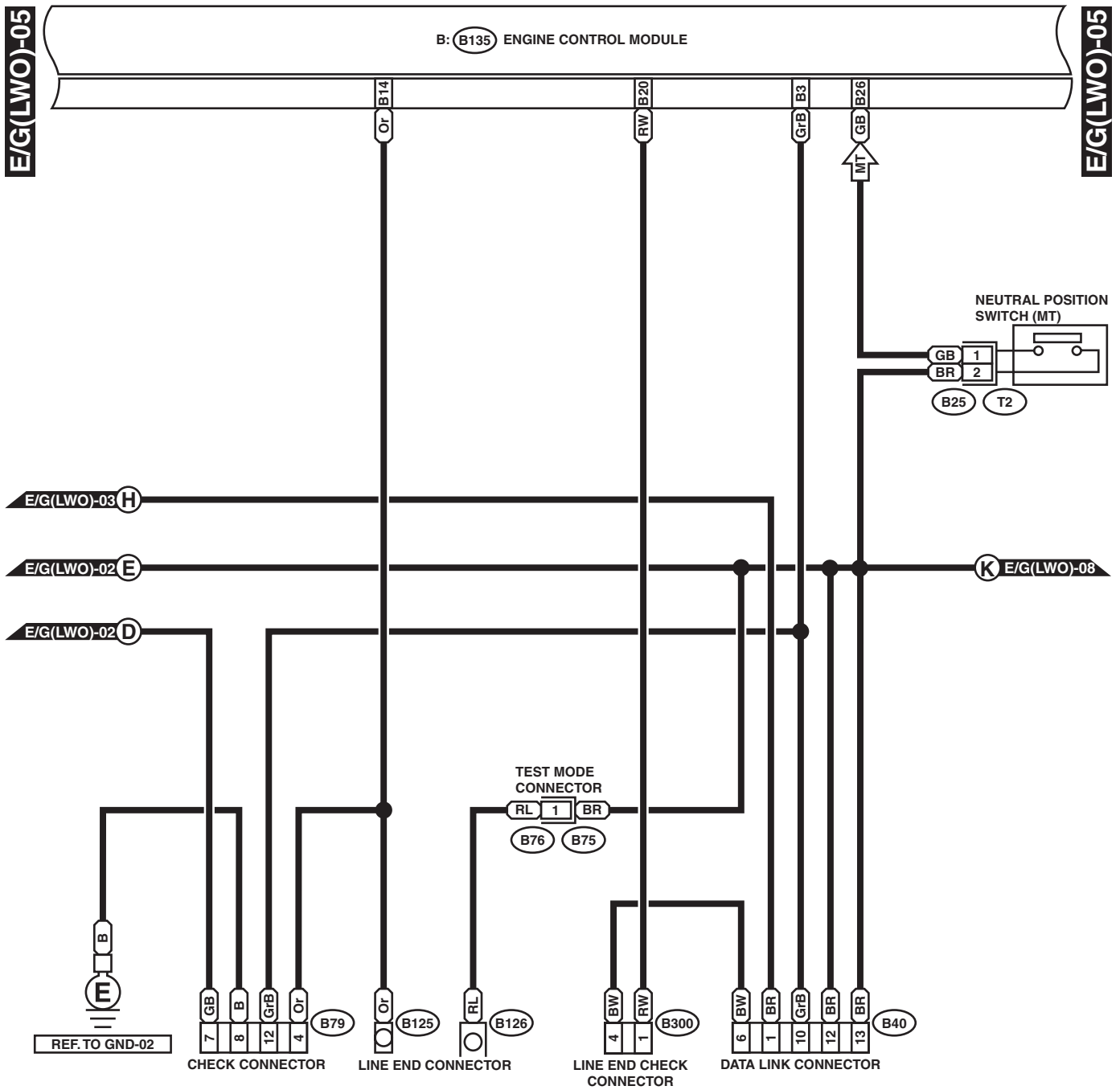
E/G(LWO)-04



GL10-25D

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM



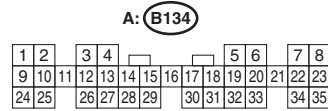
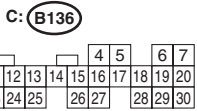
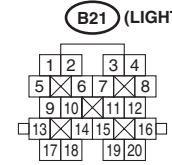
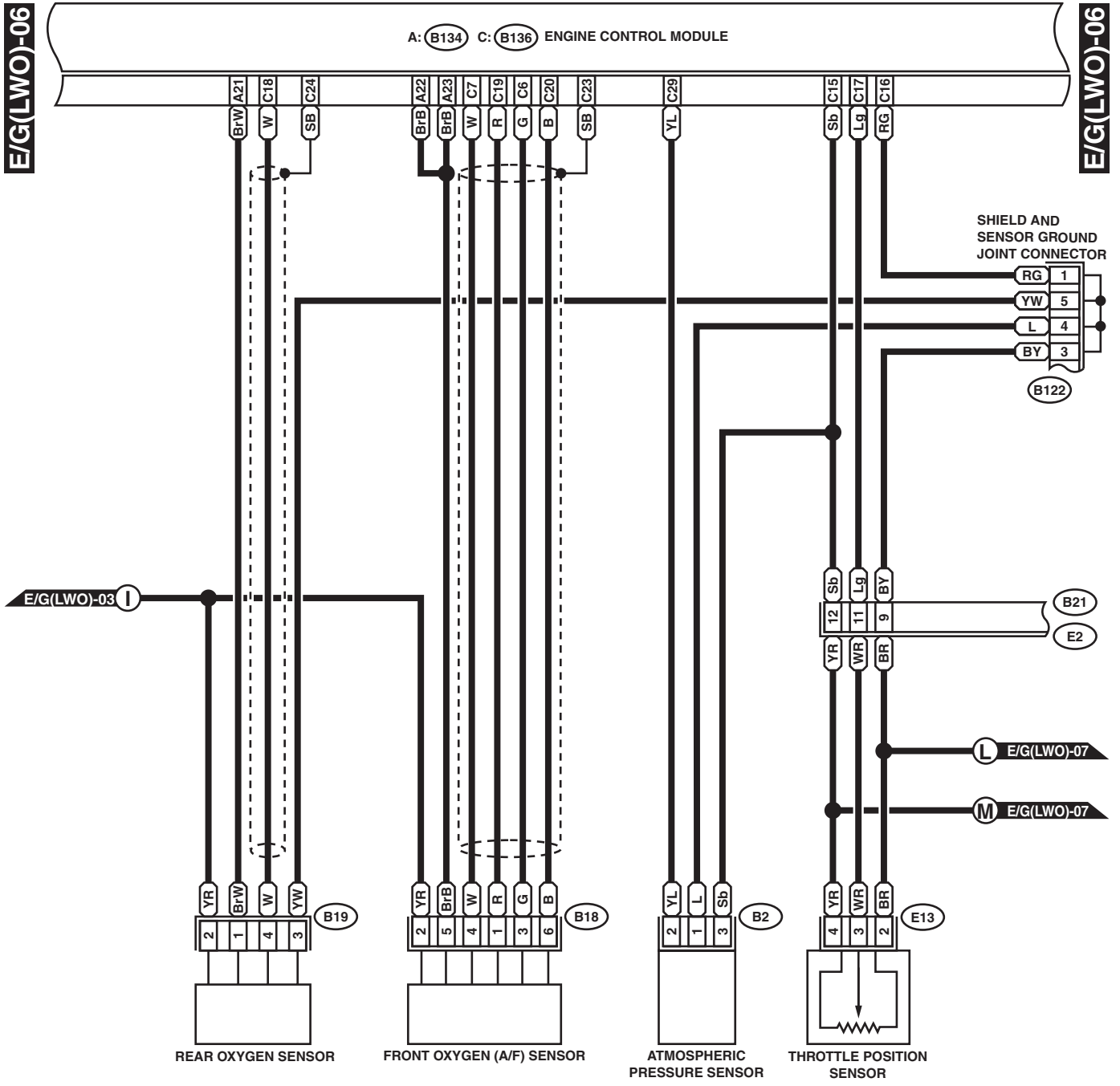
B: (B135)



GL10-25E

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM



GL10-25F

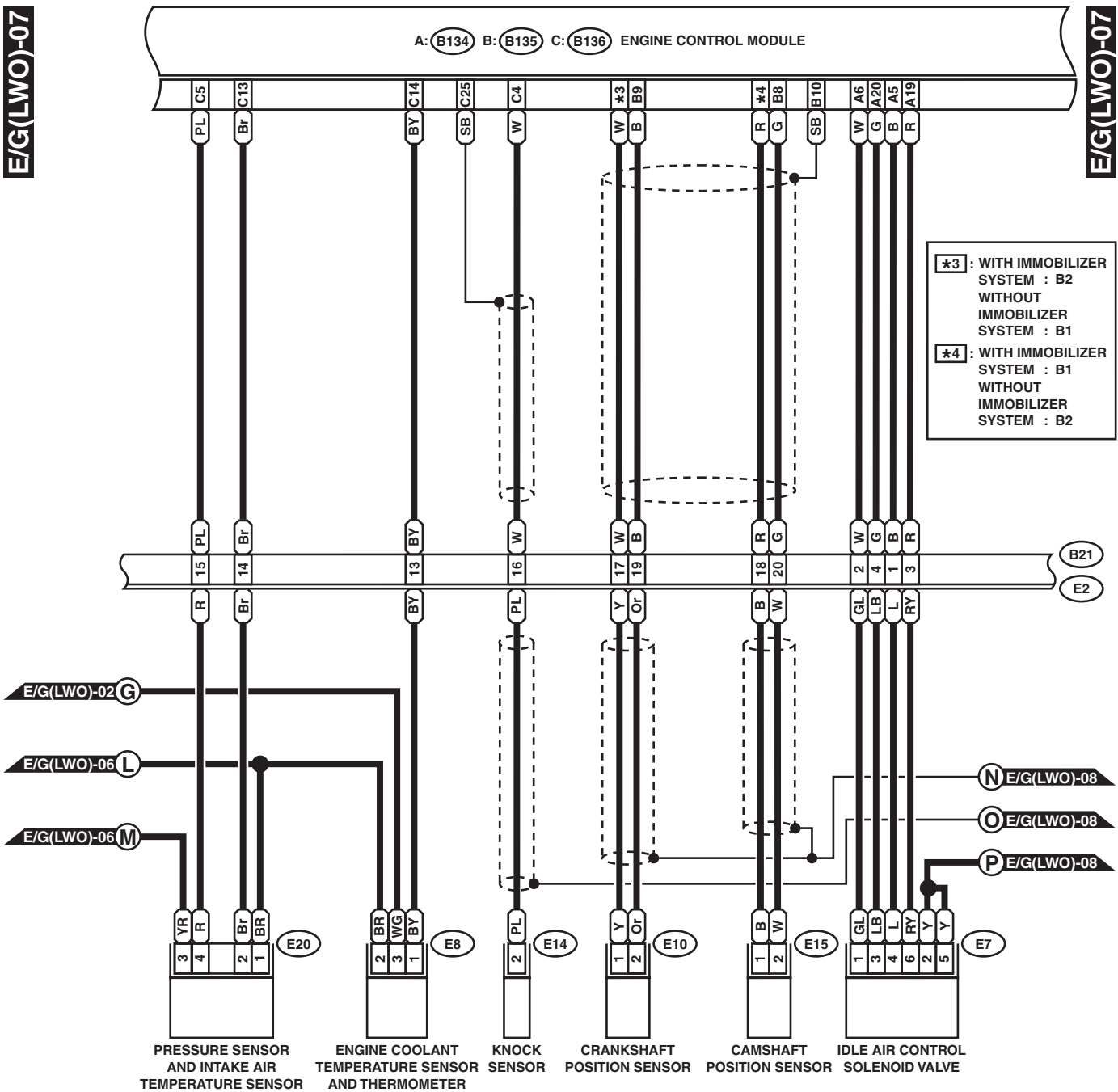
ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM

E/G(LWO)-07

E/G(LWO)-07

A: (B134) B: (B135) C: (B136) ENGINE CONTROL MODULE



(E10) (LIGHT GRAY)

(E8) (LIGHT GRAY)

(E20) (BLACK)

(E7) (BLACK)

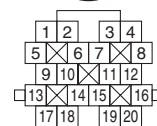
(B21) (LIGHT GRAY)

(E14)



1 2 3 4

1 2 3
4 5 6



(E15) (BLACK)

1 2

B: (B135)

C: (B136)

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					

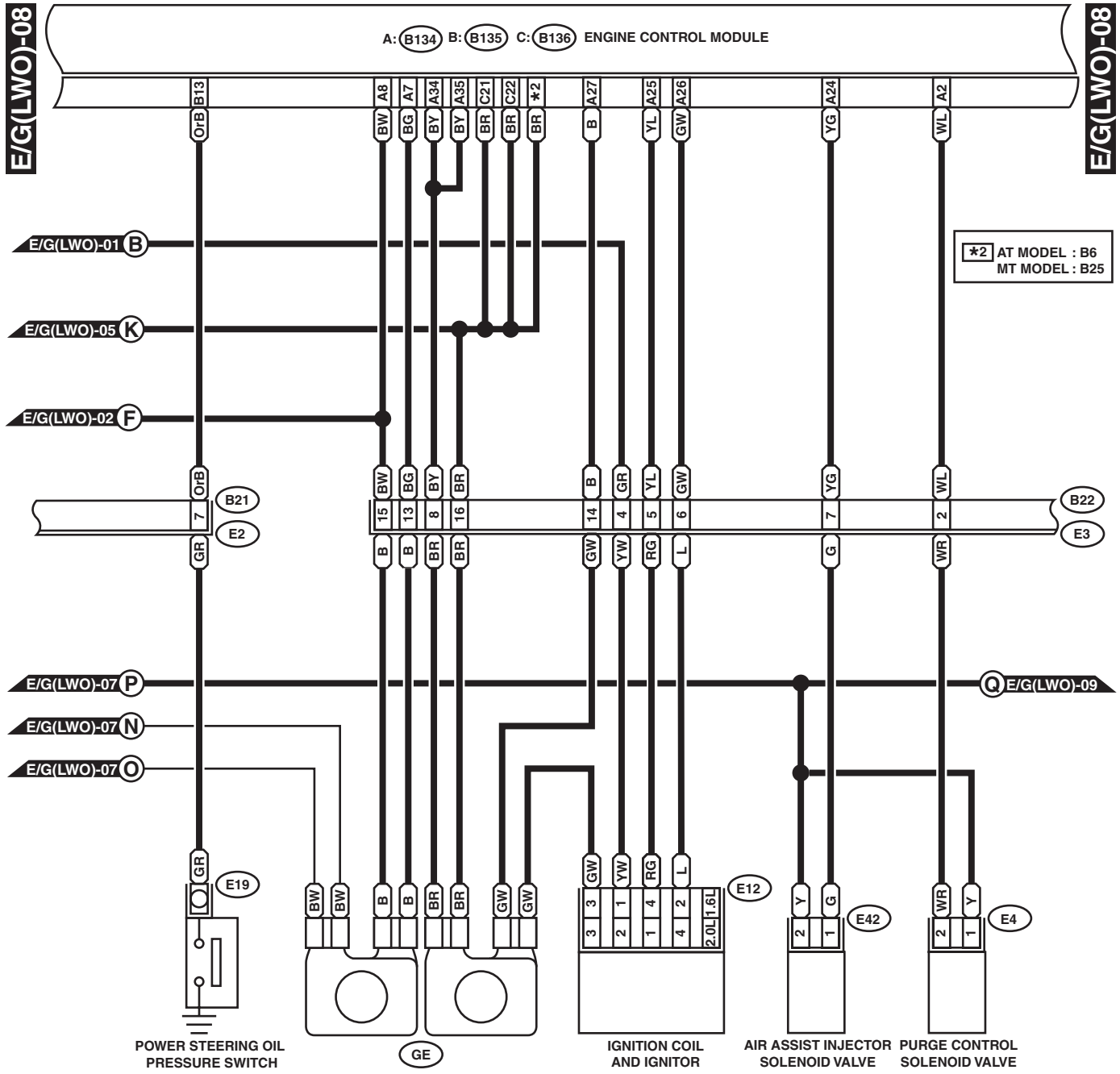
1	2	3		4	5	6	7
8	9	10	11	12	13	14	15
16	17	18	19	20			
21	22	23	24	25	26	27	28
29	30						

1	2	3	4		5	6	7	8
9	10	11	12	13	14	15	16	17
18	19	20	21	22	23			
24	25	26	27	28	29	30	31	32
33	34	35						

GL10-25G

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM



E4 (BLACK)

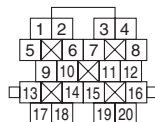
E12 : (*3)

B22 (BROWN)

B21 (LIGHT GRAY)

B : B135

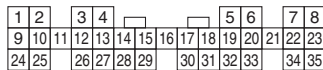
E42 (PURPLE)



C : B136



A : B134

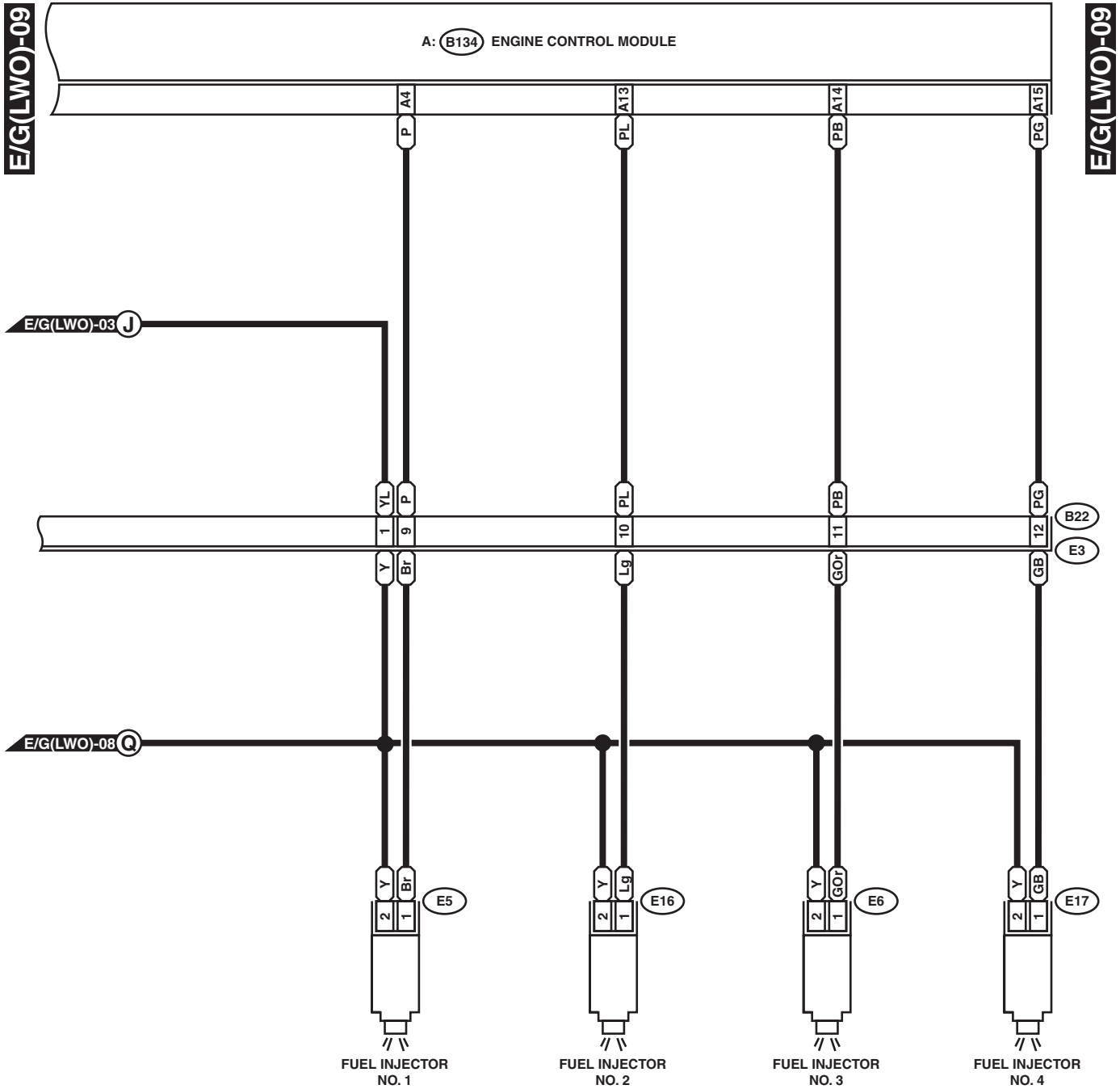


(*3) 1.6L: (GRAY)
2.0L: (DARK GRAY)

GL10-25H

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM



E5 (LIGHT GRAY)

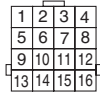
E6 (LIGHT GRAY)

E16 (LIGHT GRAY)

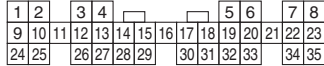
E17 (LIGHT GRAY)



B22 (BROWN)



A: B134

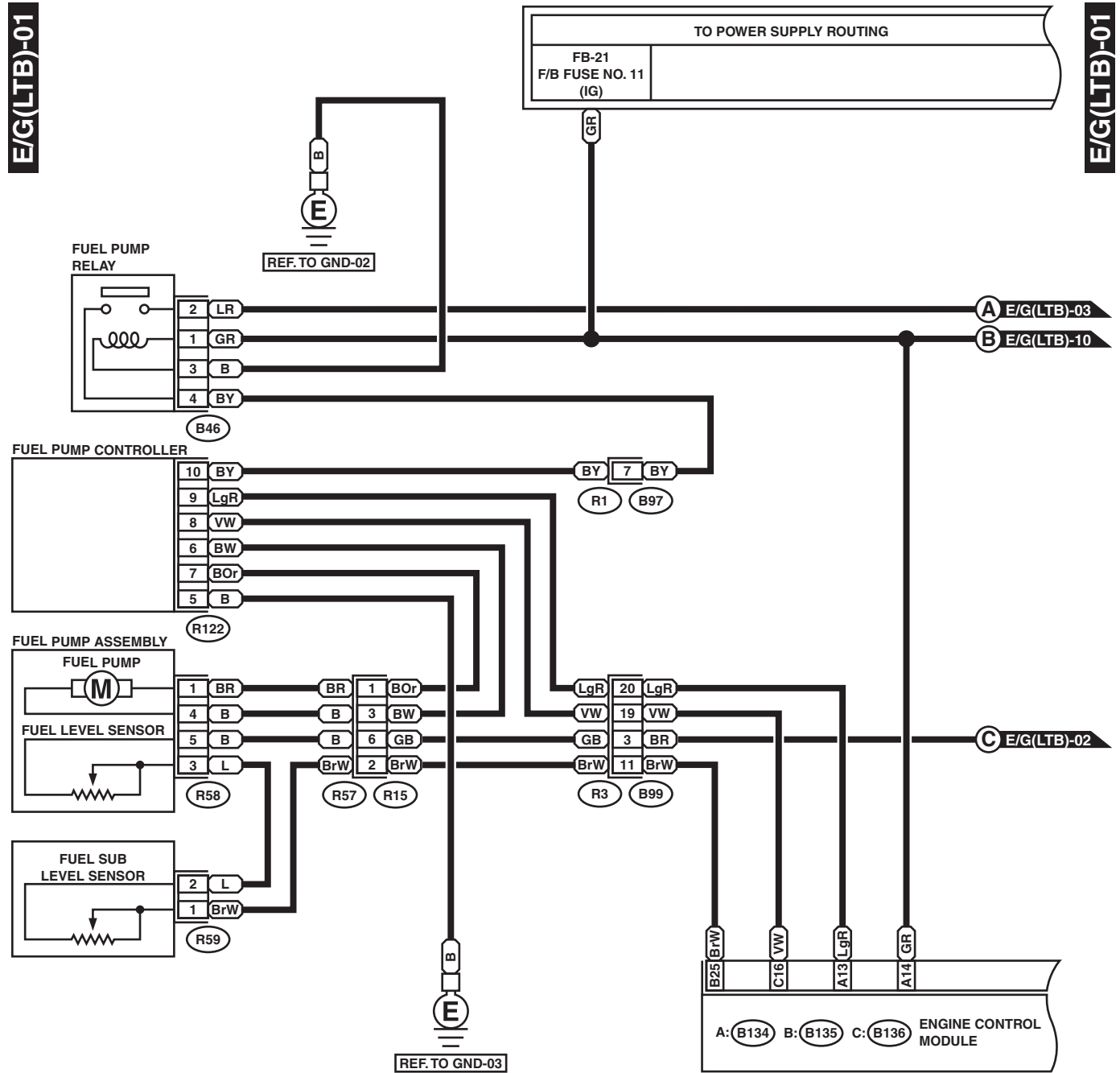


GL10-251

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM

3. LHD DOHC TURBO MODEL



(R59)



(B46) (GREEN)



(R15) (BLACK)



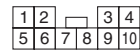
(R58)



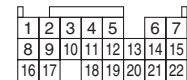
(B97)



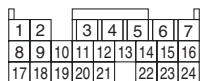
(R122)



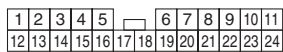
A: (B134)



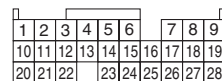
C: (B136)



(B99)



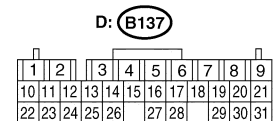
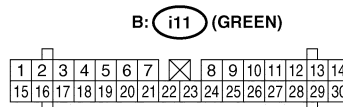
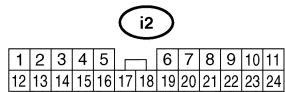
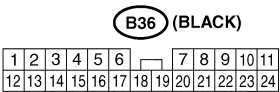
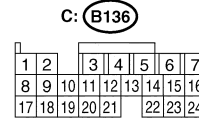
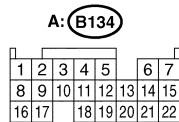
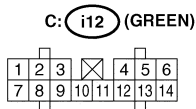
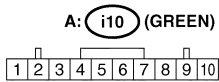
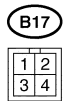
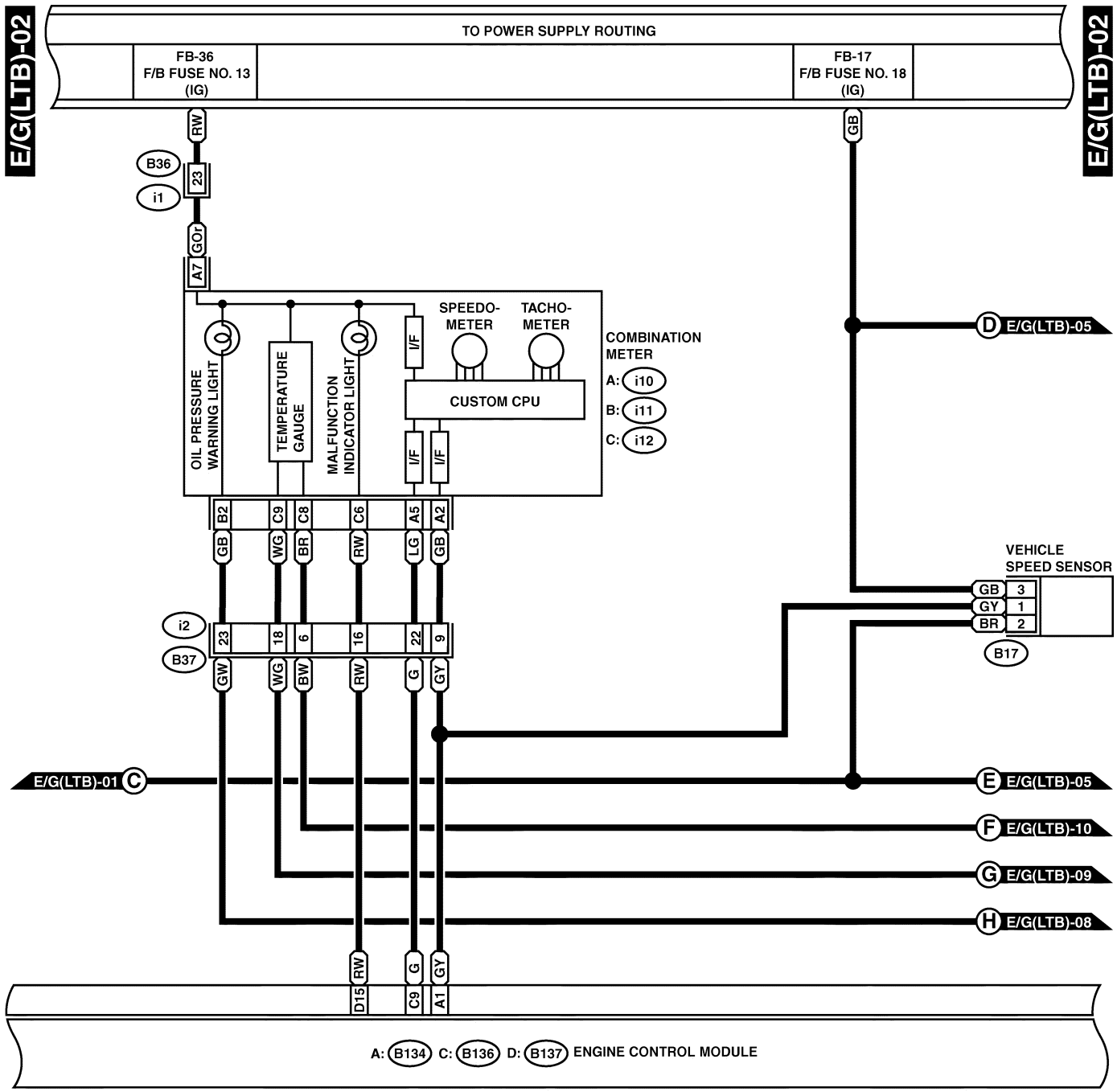
B: (B135)



GL10-24A

ENGINE ELECTRICAL SYSTEM

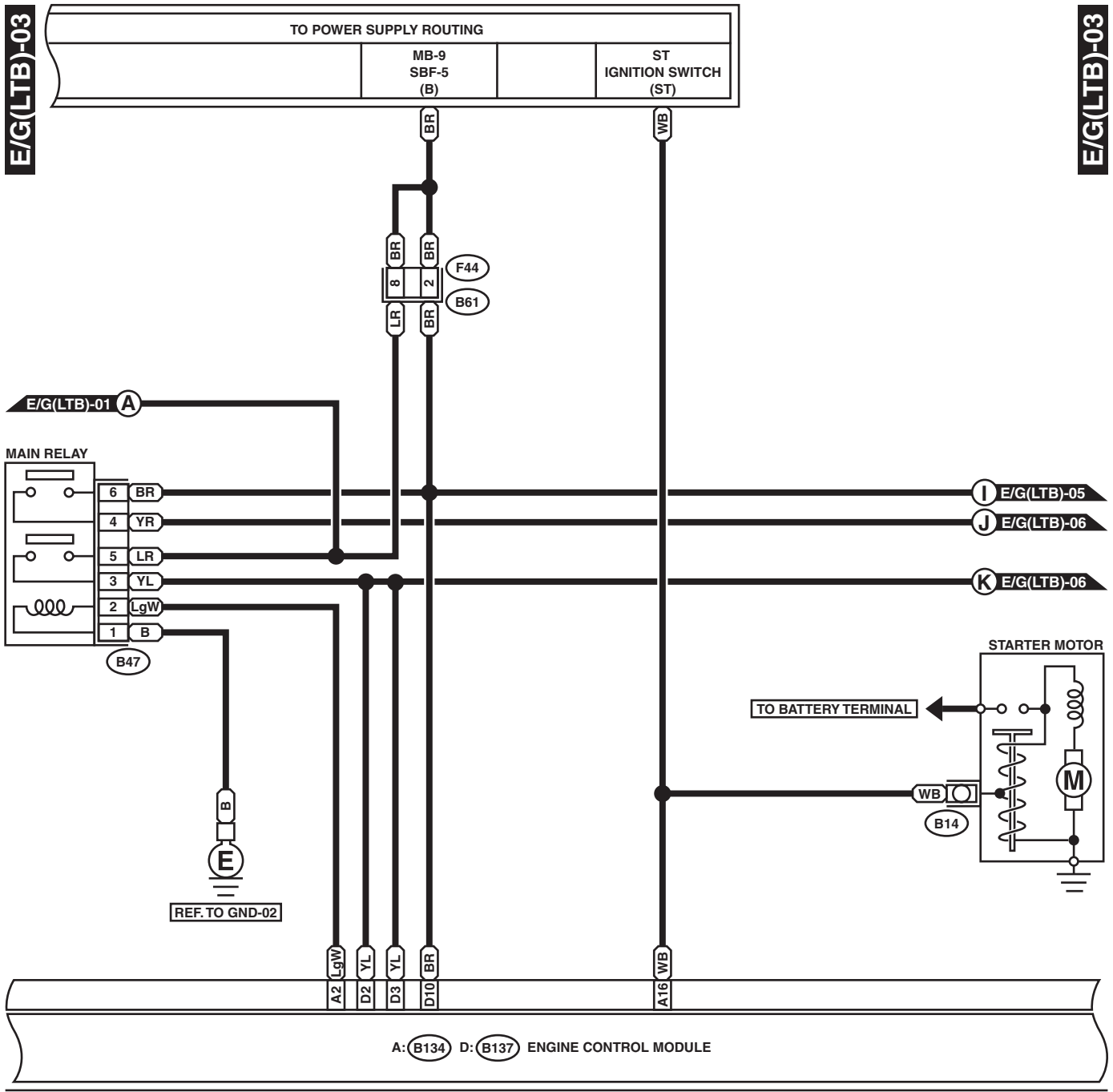
WIRING SYSTEM



GL10-24B

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM



B47 (BROWN)

1	2
3	4
5	6

F44

1	2	3	4
5	6	7	8

A: B134

1	2	3	4	5	6	7	
8	9	10	11	12	13	14	15
16	17	18	19	20	21	22	

D: B137

1	2	3	4	5	6	7	8	9			
10	11	12	13	14	15	16	17	18	19	20	21
22	23	24	25	26	27	28	29	30	31		

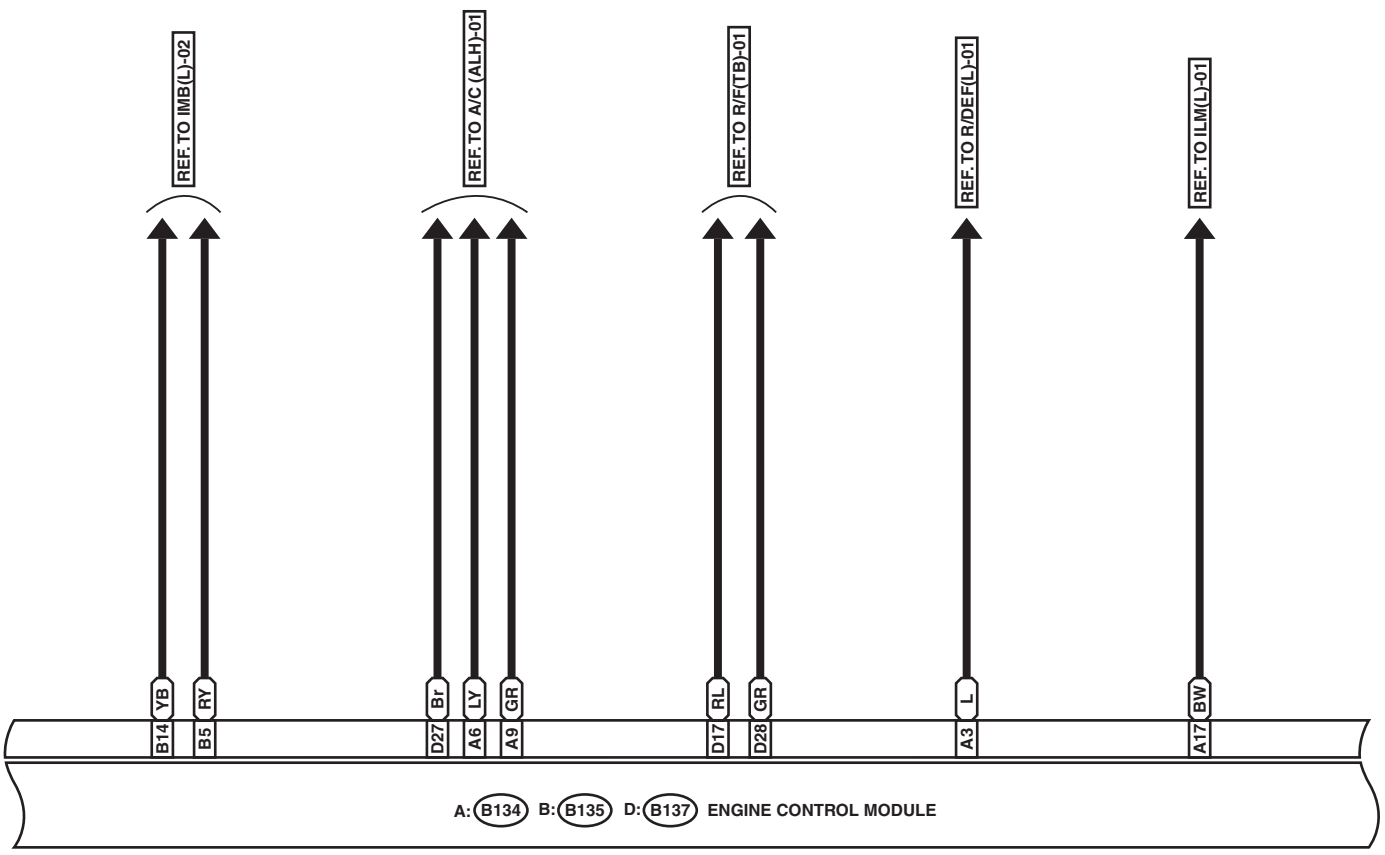
GL10-24C

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM

E/G(LTB)-04

E/G(LTB)-04



A: (B134)

1	2	3	4	5	6	7	
8	9	10	11	12	13	14	15
16	17	18	19	20	21	22	

B: (B135)

1	2	3	4	5	6	7	8	9	
10	11	12	13	14	15	16	17	18	19
20	21	22	23	24	25	26	27	28	

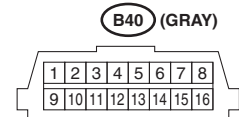
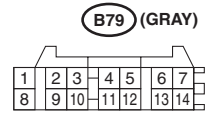
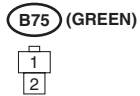
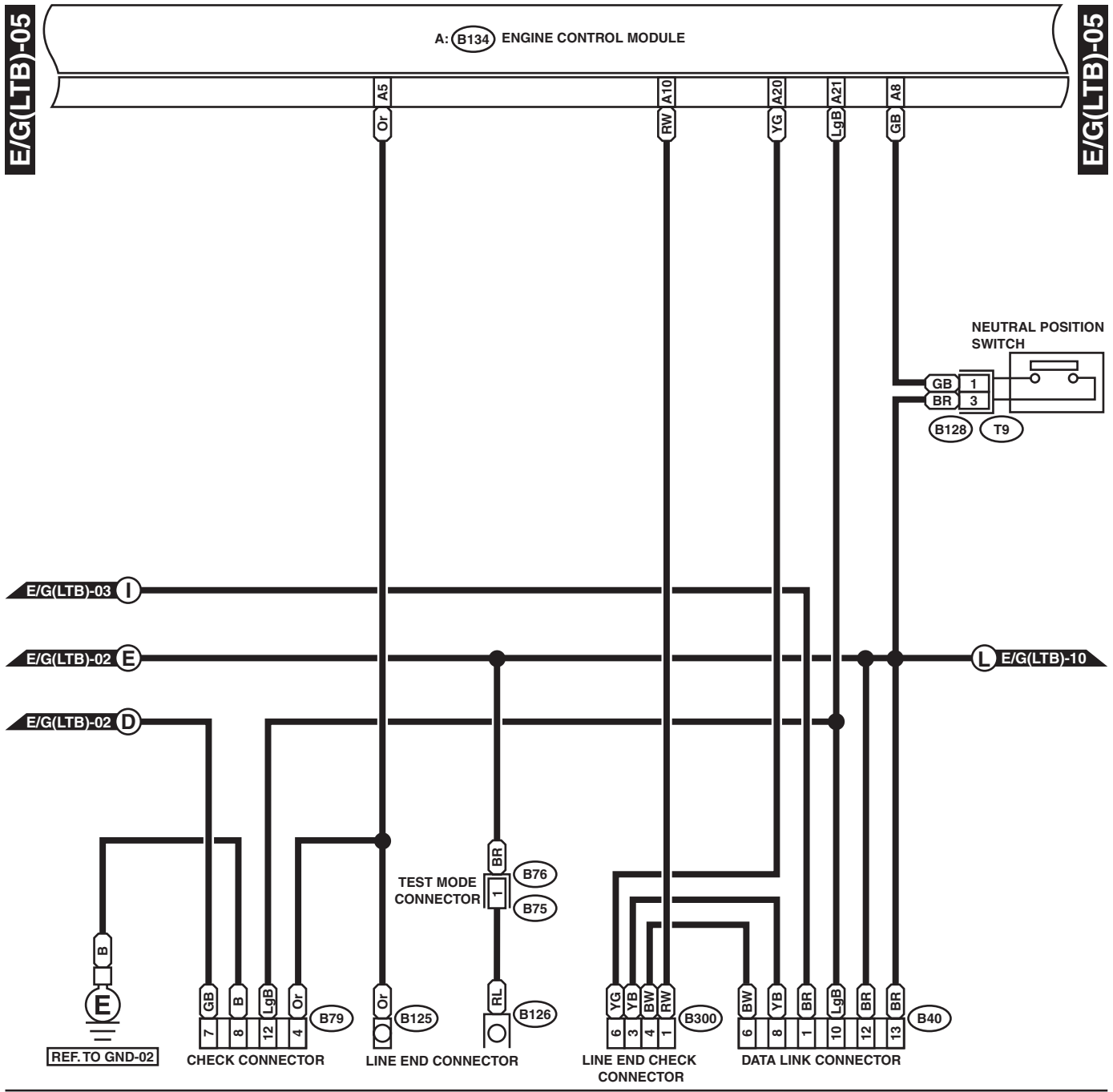
D: (B137)

1	2	3	4	5	6	7	8	9			
10	11	12	13	14	15	16	17	18	19	20	21
22	23	24	25	26	27	28	29	30	31		

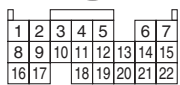
GL10-24D

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM



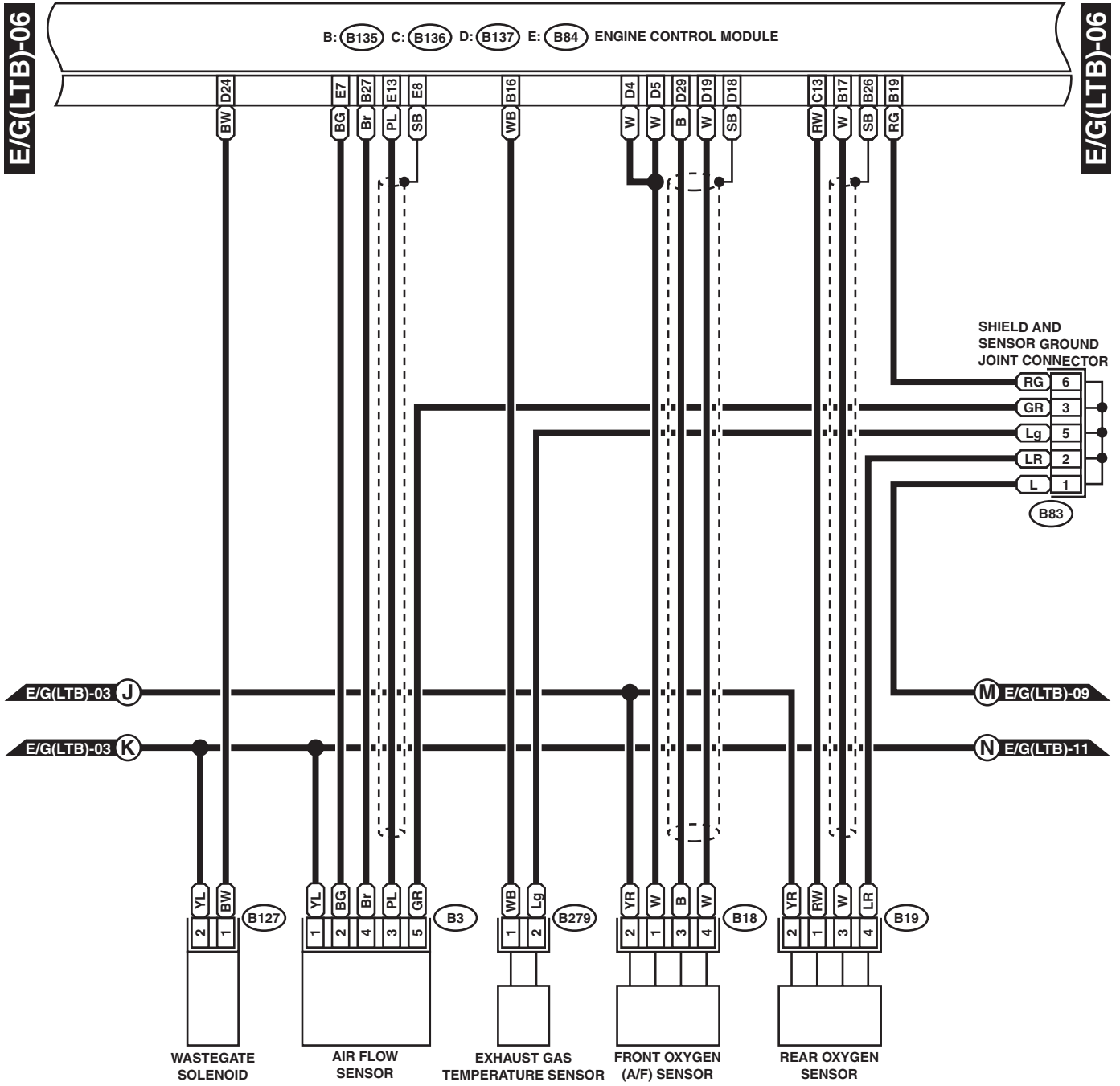
A: (B134)



GL10-24E

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM



B127 (BLUE)



B279



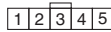
B18



B19



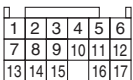
B3



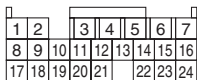
B83



E: B84



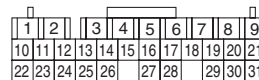
C: B136



B: B135



D: B137



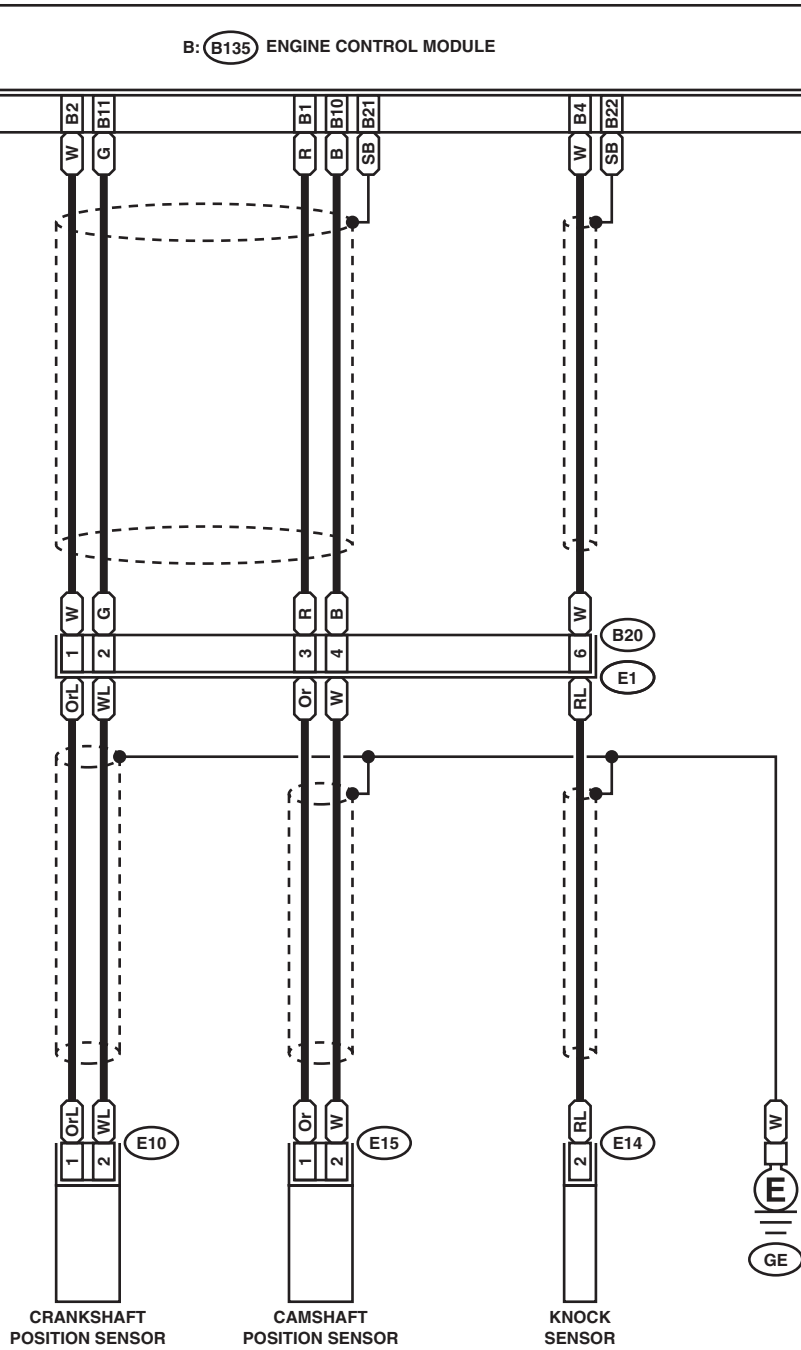
GL10-24F

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM

E/G(LTB)-07

E/G(LTB)-07



E10 (LIGHT GRAY)

B20 (LIGHT GRAY)

B: B135

E14 (GRAY)

1	2	3	4
5	6	7	
8	9	10	

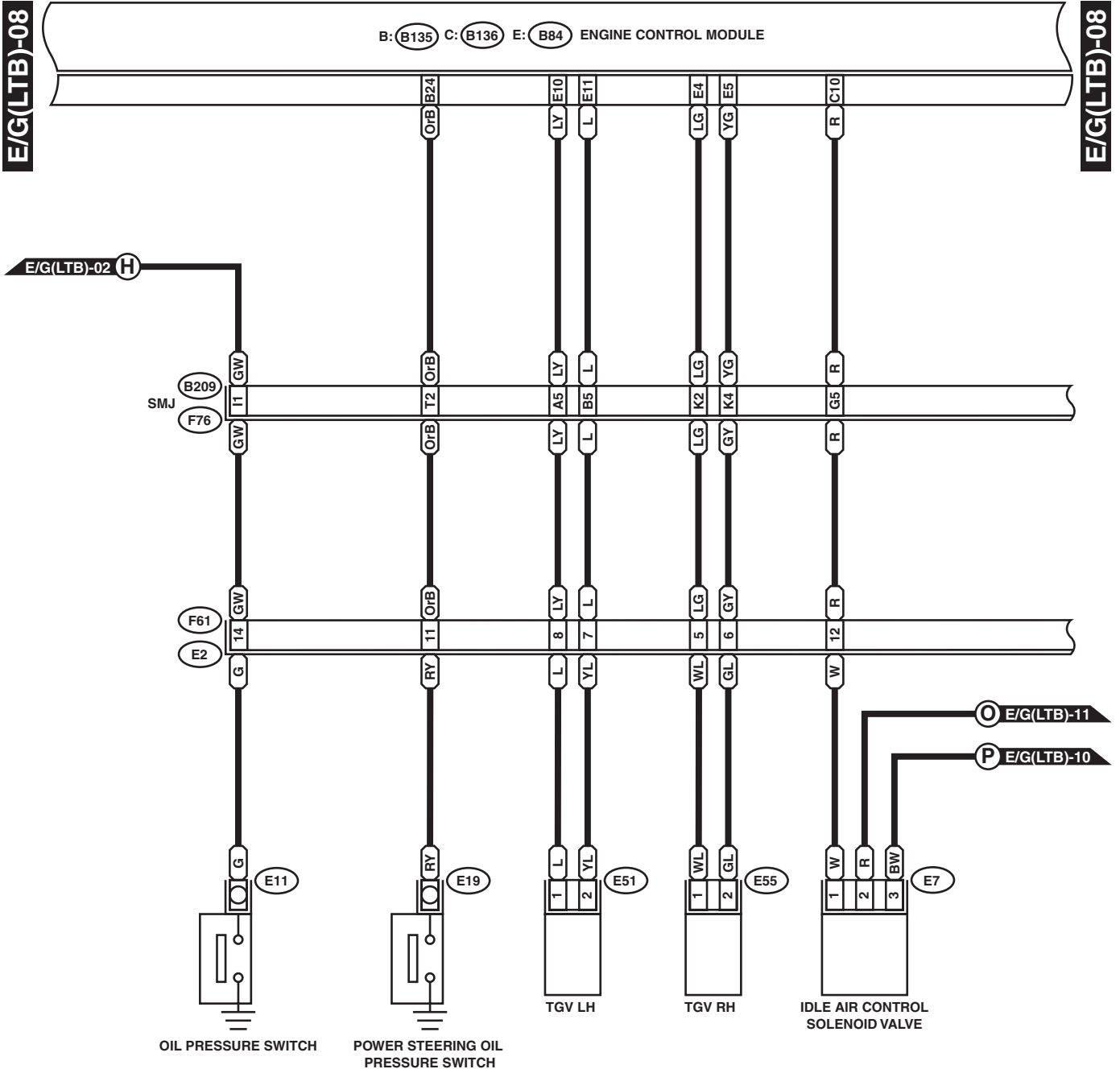
1	2	3	4	5	6	7	8	9	
10	11	12	13	14	15	16	17	18	19
20	21	22	23	24	25	26	27	28	

1	2
---	---

GL10-24G

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM



E51 (BLACK)

E7 (BLACK)

E: B84

F61 (BLACK)

C: B136

B: B135

E55 (BLACK)

1 2 3

1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16
17	18	19	20

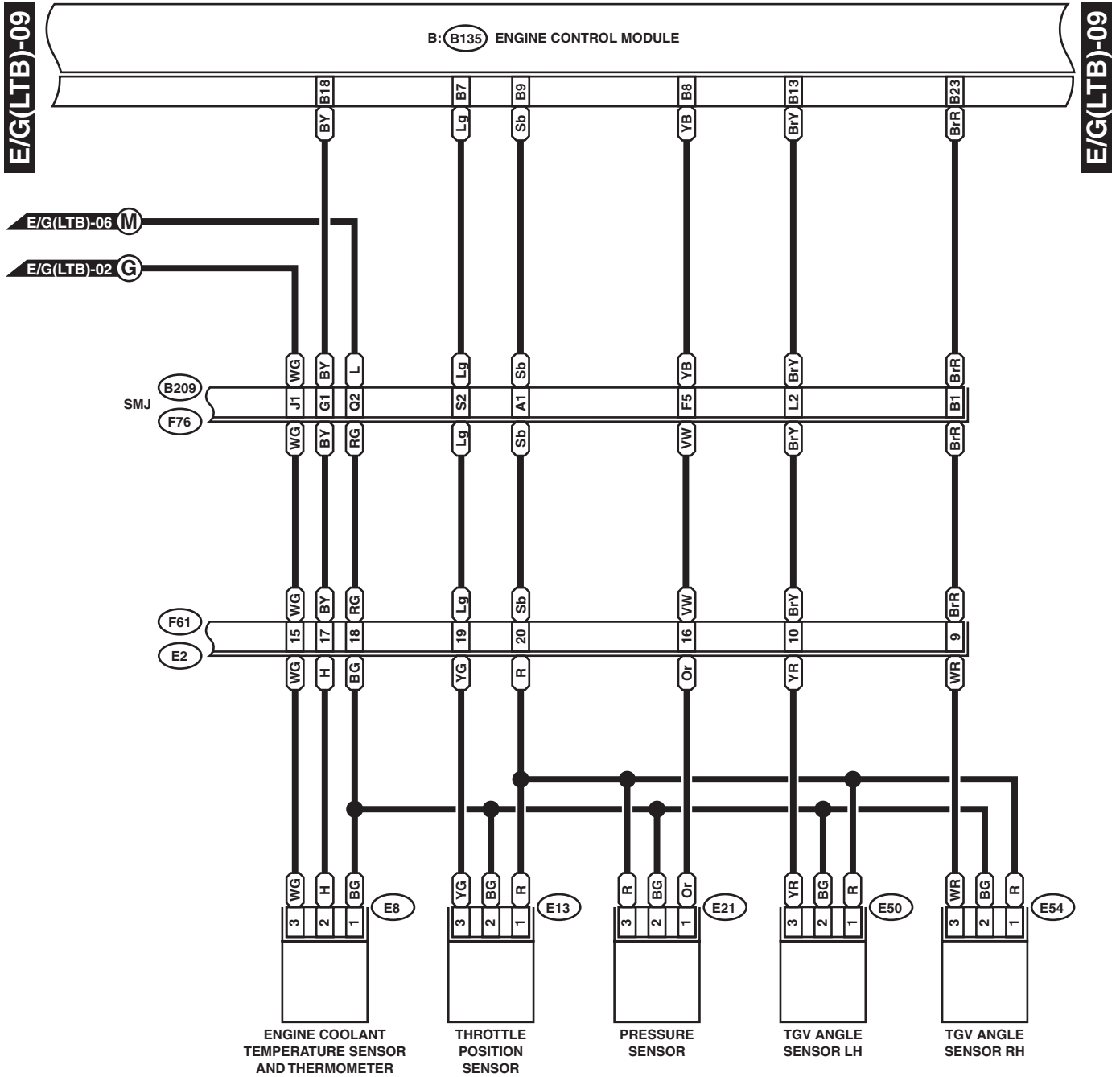
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24				

1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18
19	20	21	22	23	24	25	26	27
28								

GL10-24H

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM



E8 (LIGHT GRAY)



E13 (BLACK)

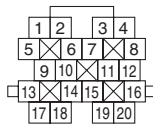
E21 (BLACK)

E50 (BLACK)

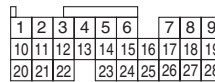
E54 (BLACK)



F61 (BLACK)



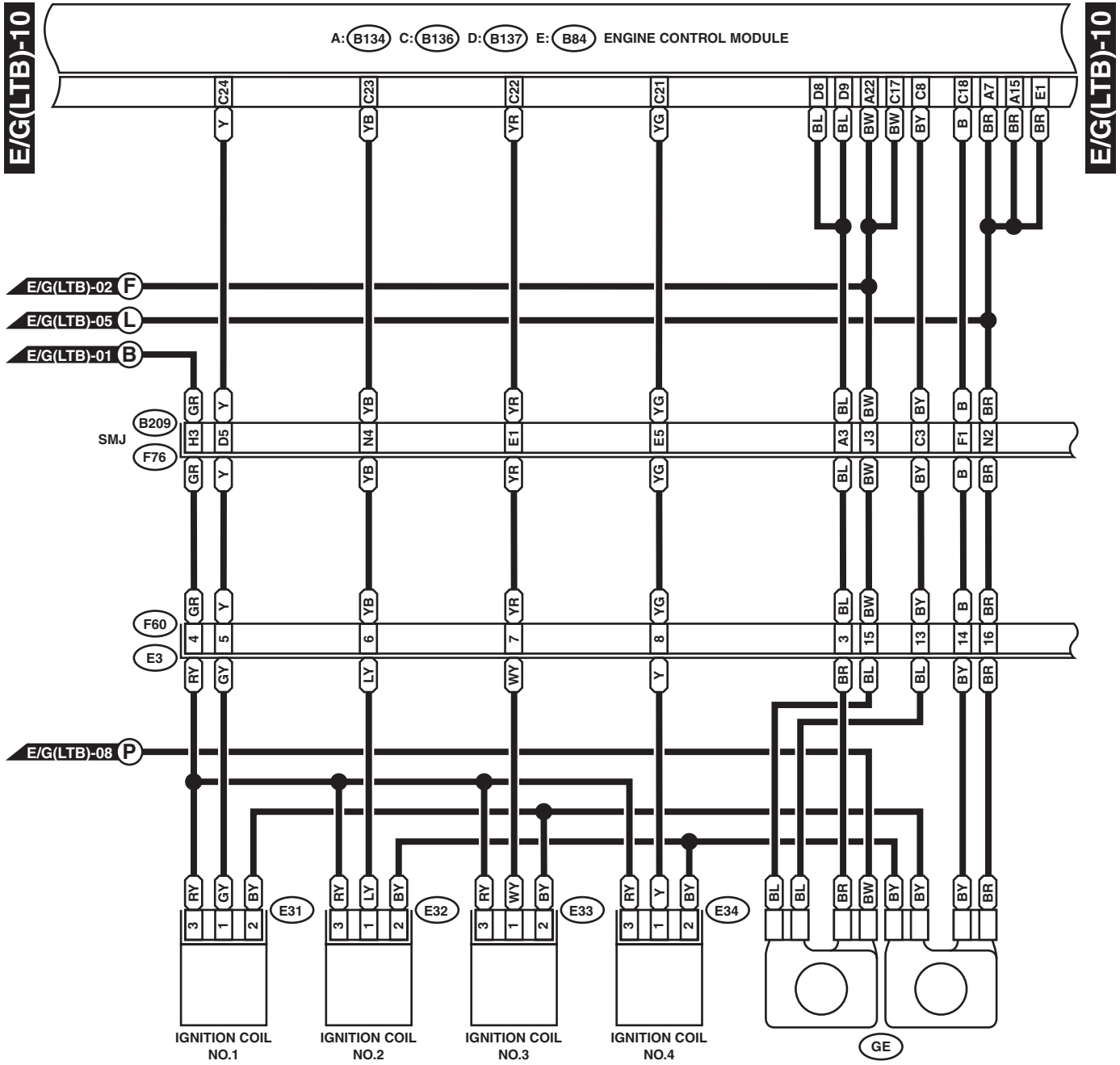
B: B135



GL10-24I

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

E: B84

1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	

A: B134

1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24				

C: B136

1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24				

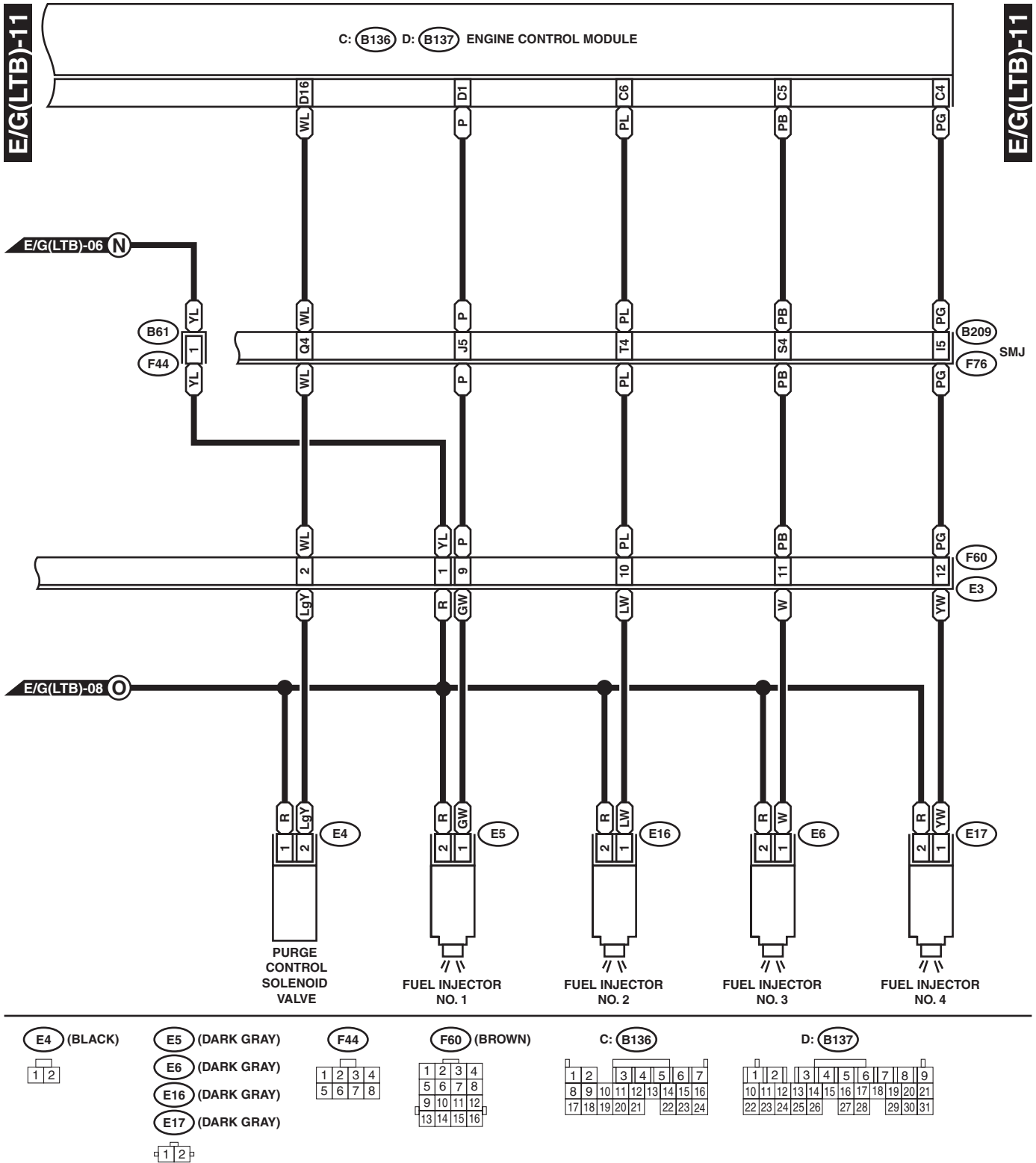
D: B137

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					

GL10-24J

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM



GL10-24K

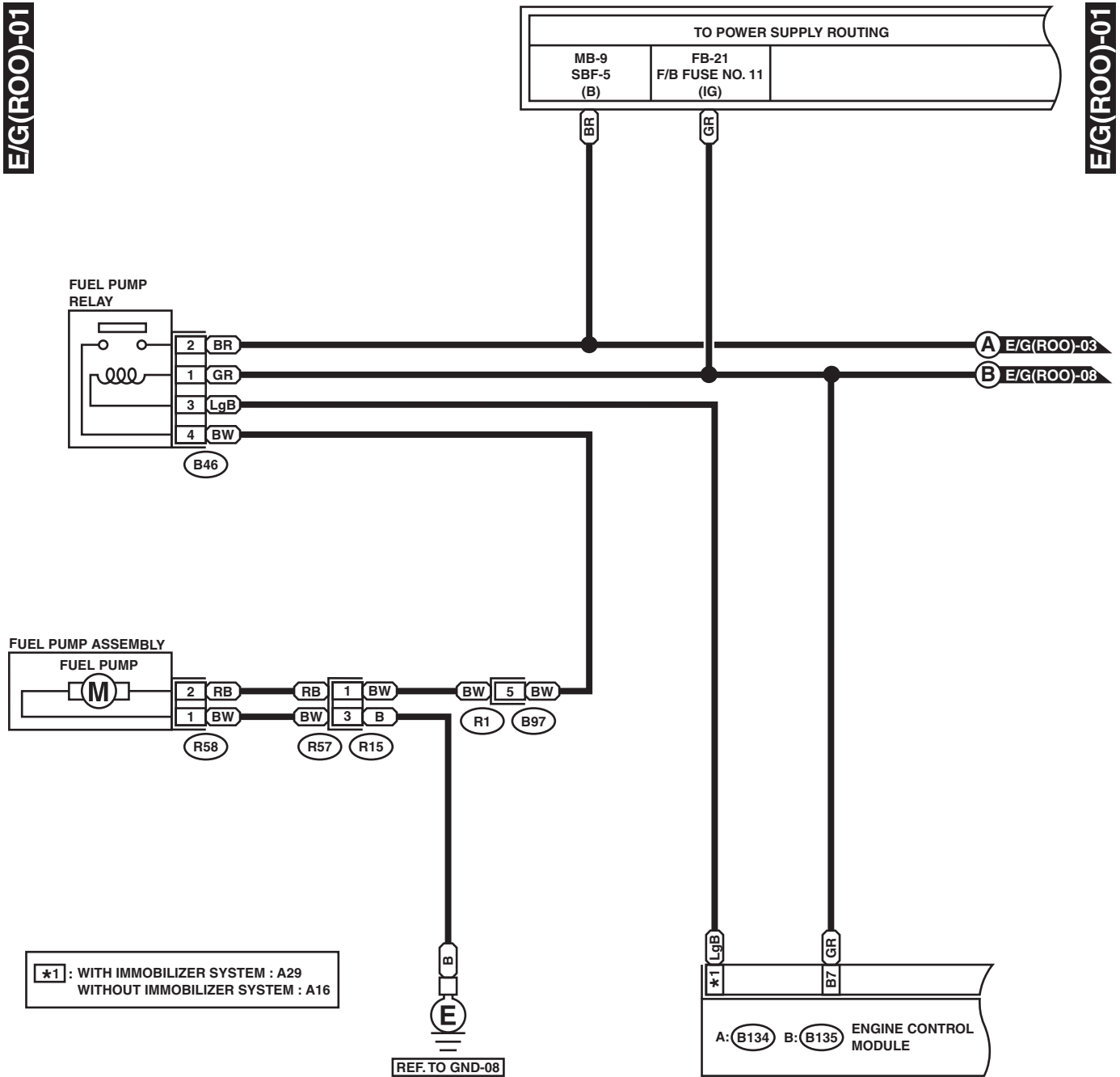
ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM

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

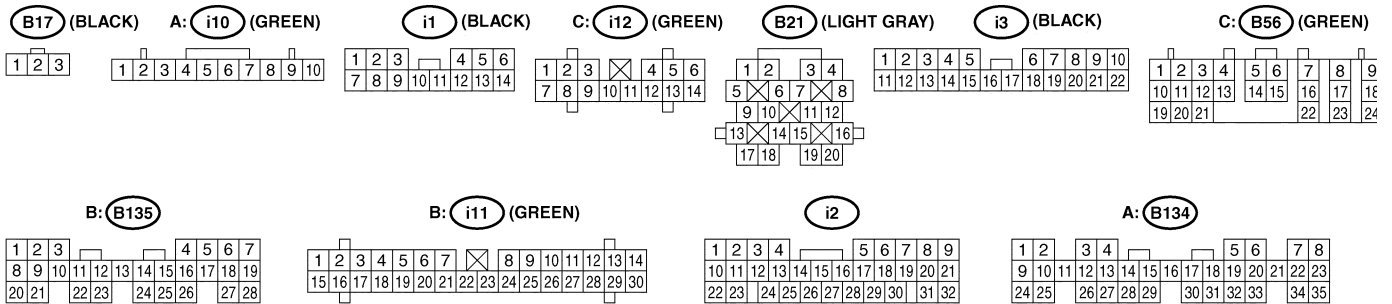
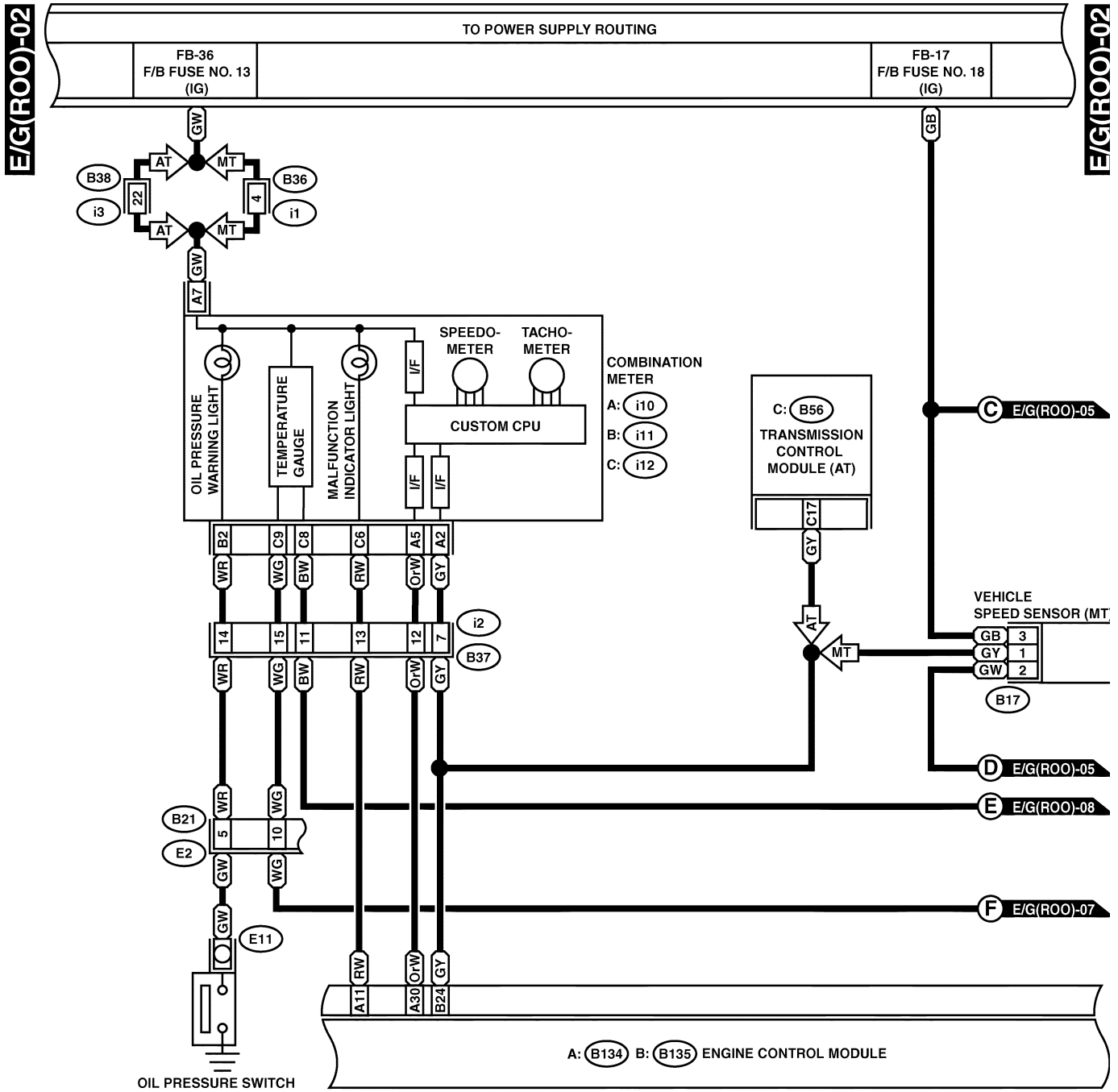
A: (B134)

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					

GR10-23A

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM



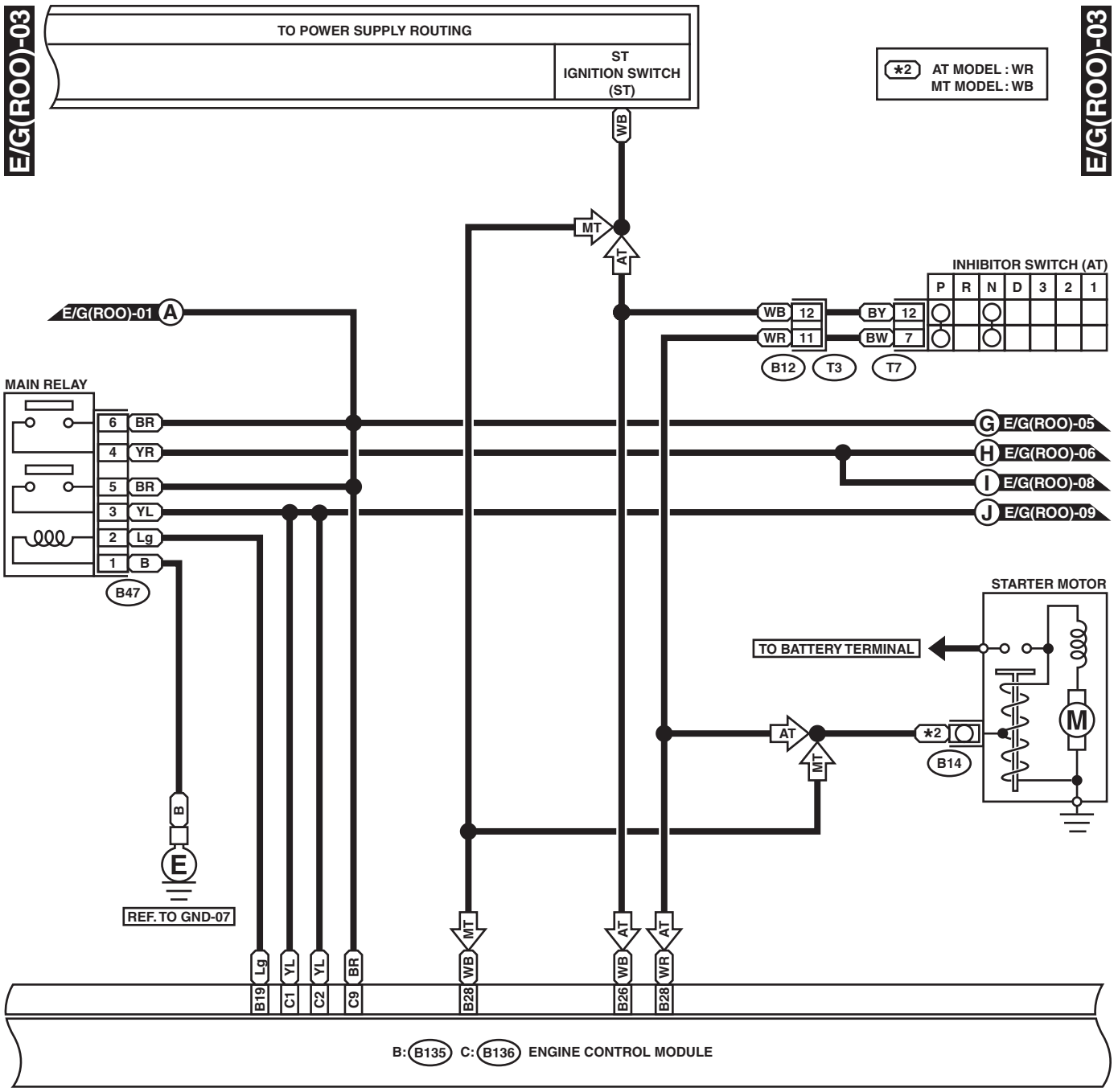
GR10-23B

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM

E/G(ROO)-03

E/G(ROO)-03



B47 (BROWN)

B12

T7

B: B135

C: B136

1	2
3	4
5	6

1	2	3	4
5	6	7	8
9	10	11	12

1	2	3	4	5	6
7	8	9	10	11	12

1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28

1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30					

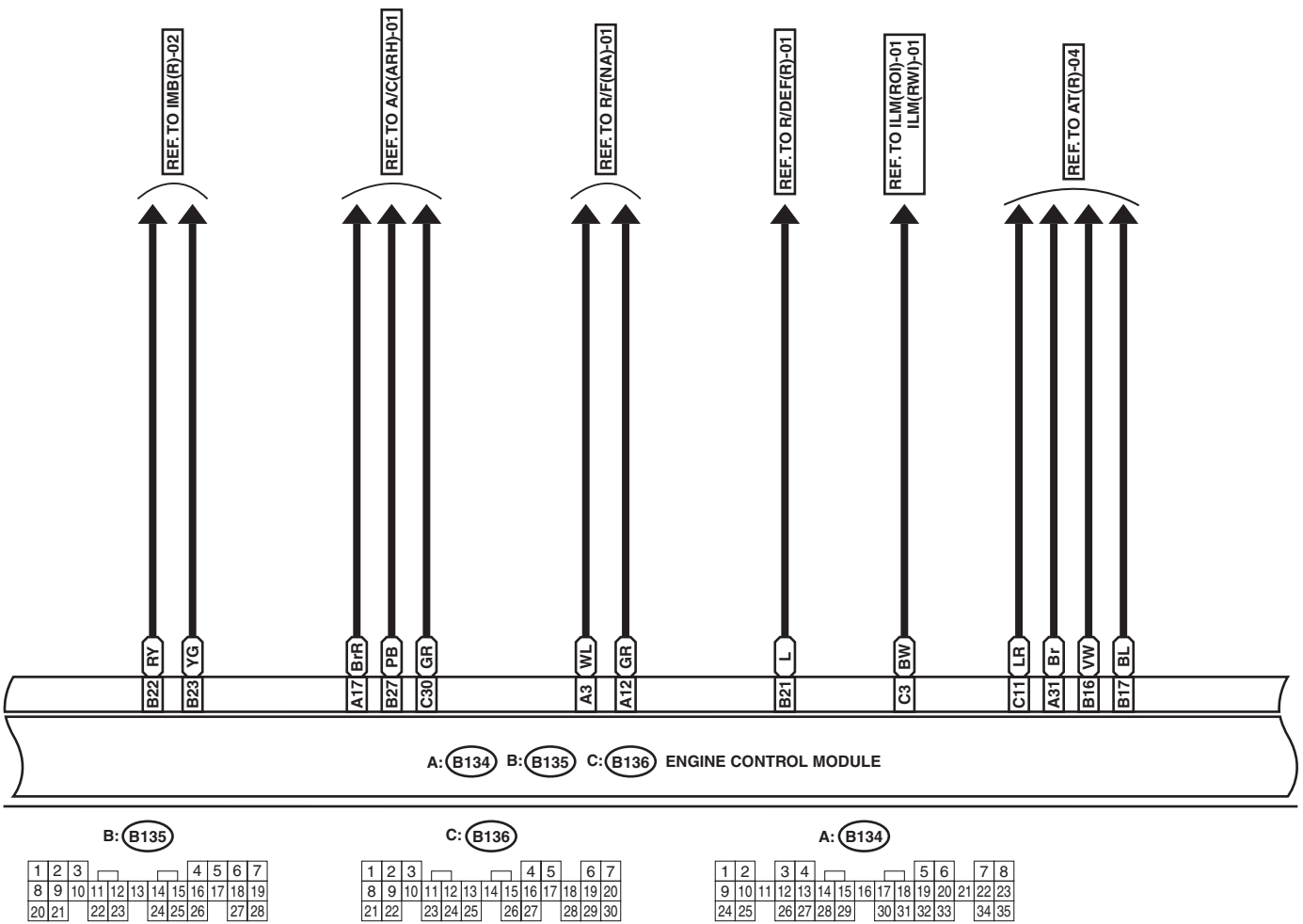
GR10-23C

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM

E/G(ROO)-04

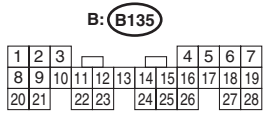
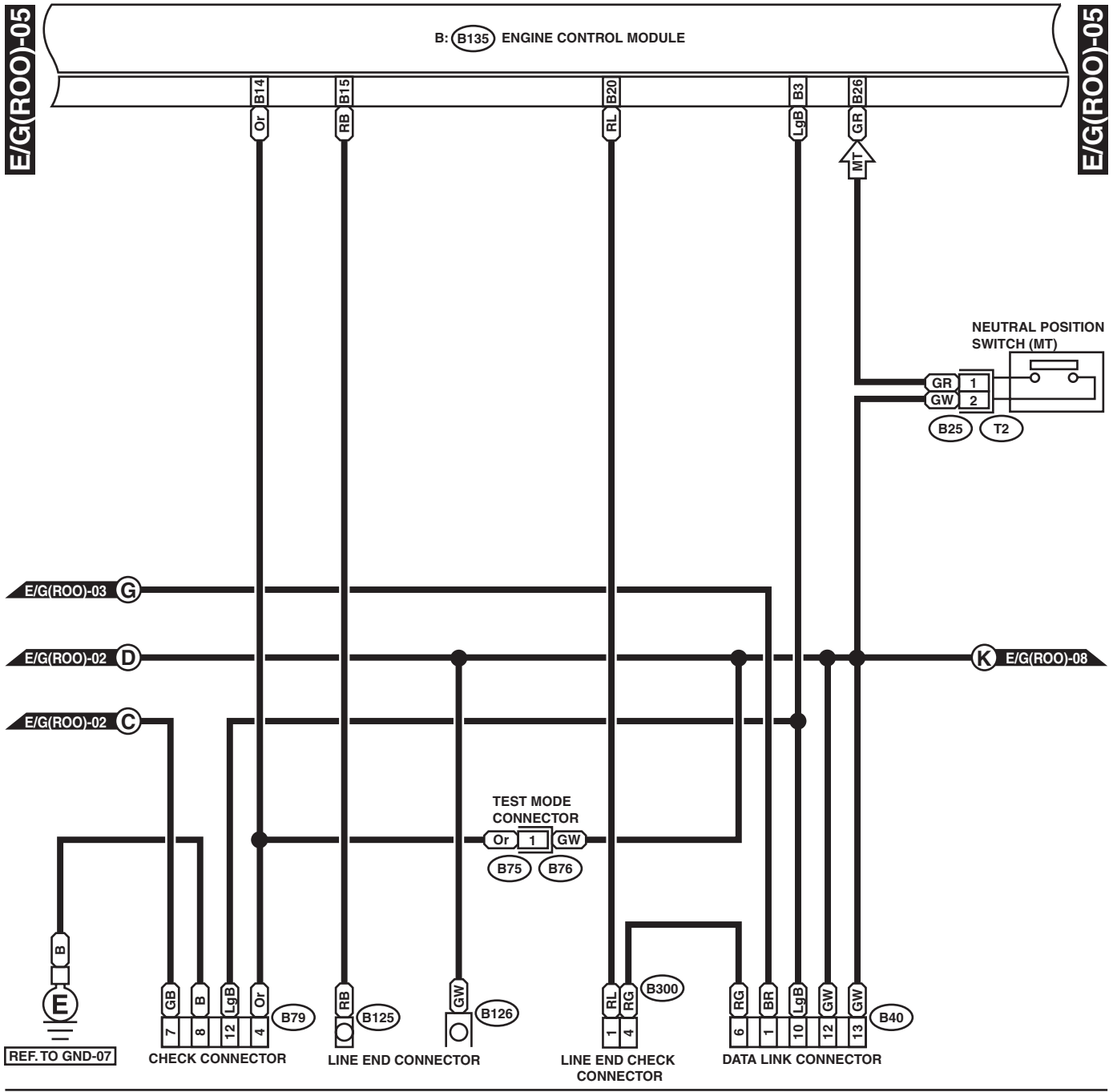
E/G(ROO)-04



GR10-23D

ENGINE ELECTRICAL SYSTEM

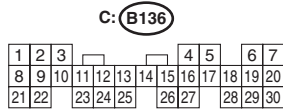
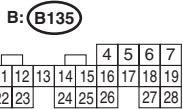
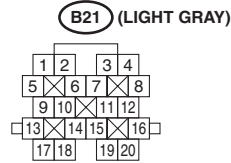
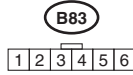
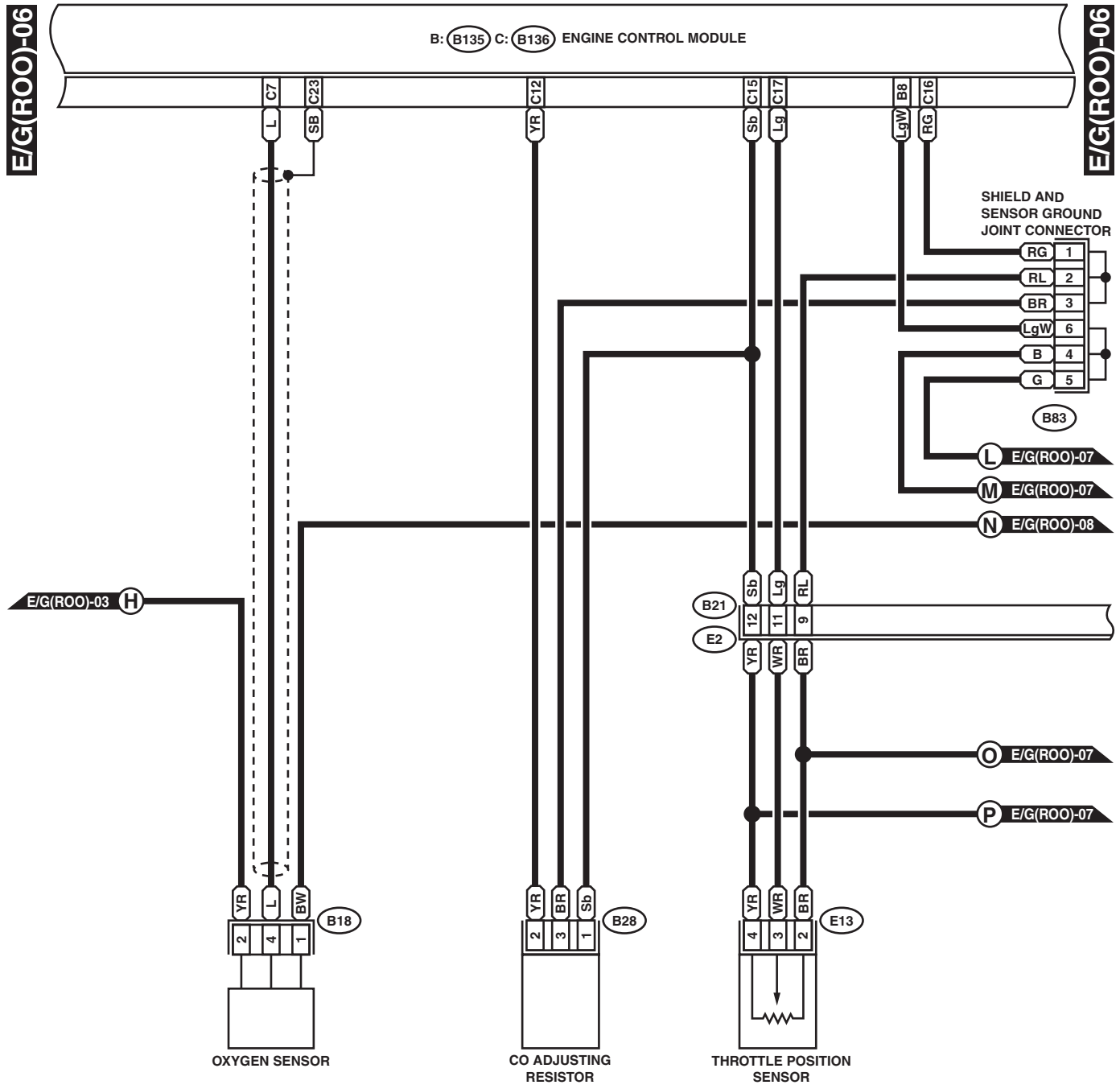
WIRING SYSTEM



GR10-23E

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM



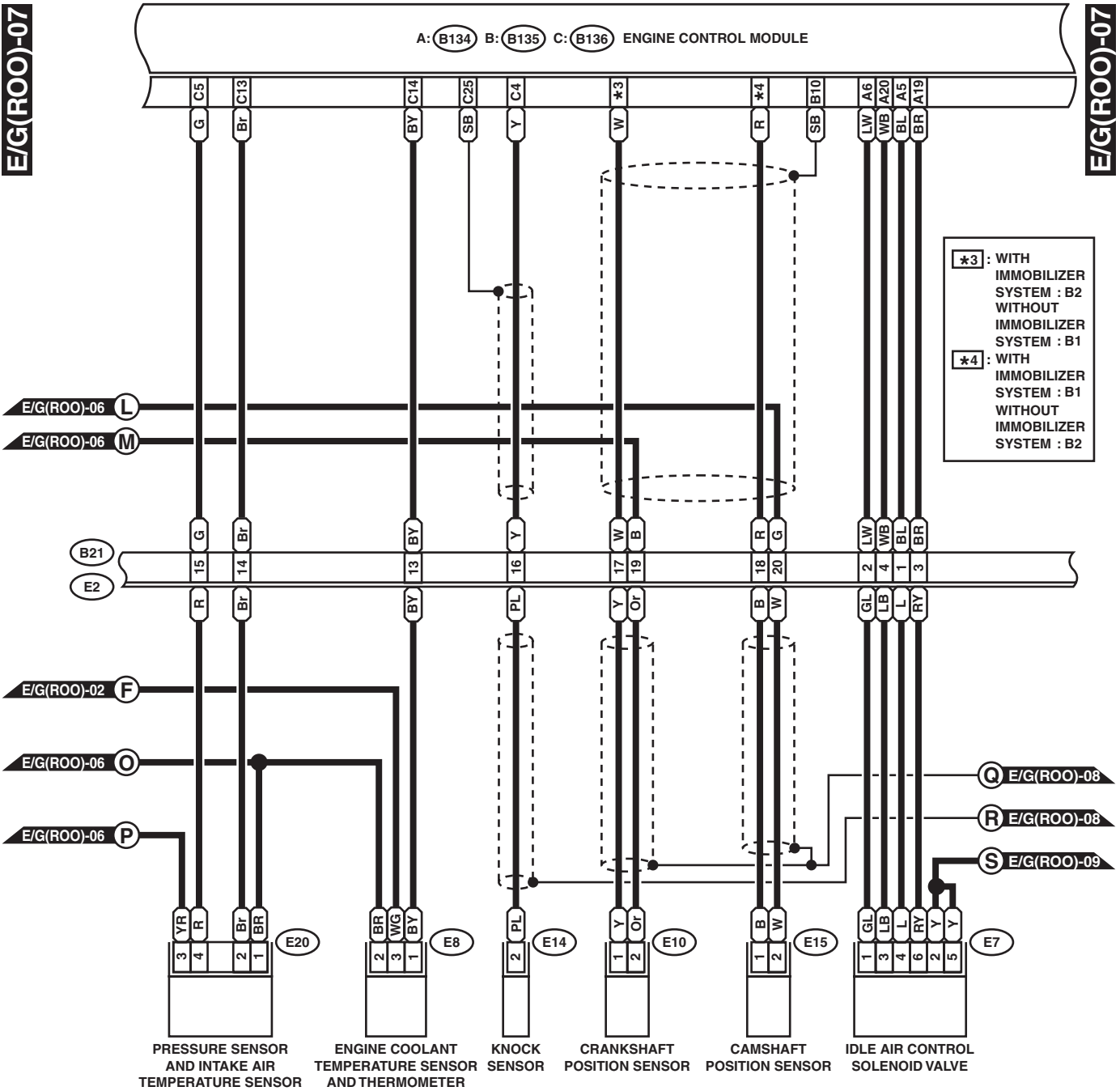
GR10-23F

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM

E/G(R00)-07

E/G(R00)-07



***3** : WITH IMMOBILIZER SYSTEM : B2
WITHOUT IMMOBILIZER SYSTEM : B1

***4** : WITH IMMOBILIZER SYSTEM : B1
WITHOUT IMMOBILIZER SYSTEM : B2

E14

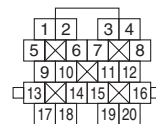
E8 (LIGHT GRAY)

E20 (BLACK)

E7 (BLACK)

B21 (LIGHT GRAY)

E10 (LIGHT GRAY)



E15 (BLACK)



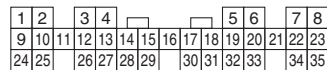
B: (B135)



C: (B136)



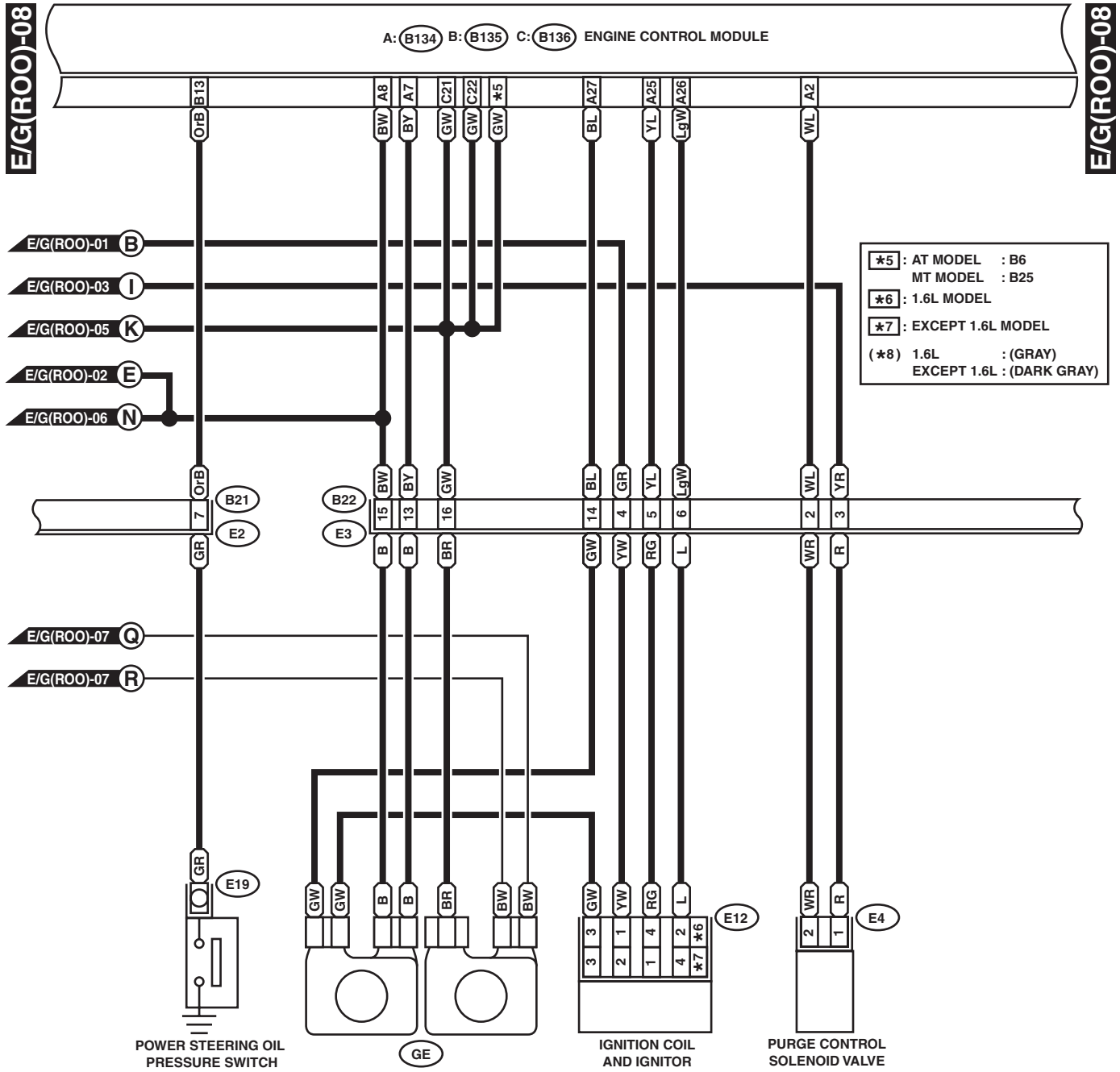
A: (B134)



GR10-23G

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM



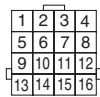
E4 (BLUE)



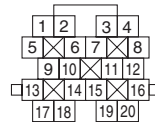
E12 (*8)



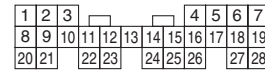
B22 (BROWN)



B21 (LIGHT GRAY)



B: B135



C: B136



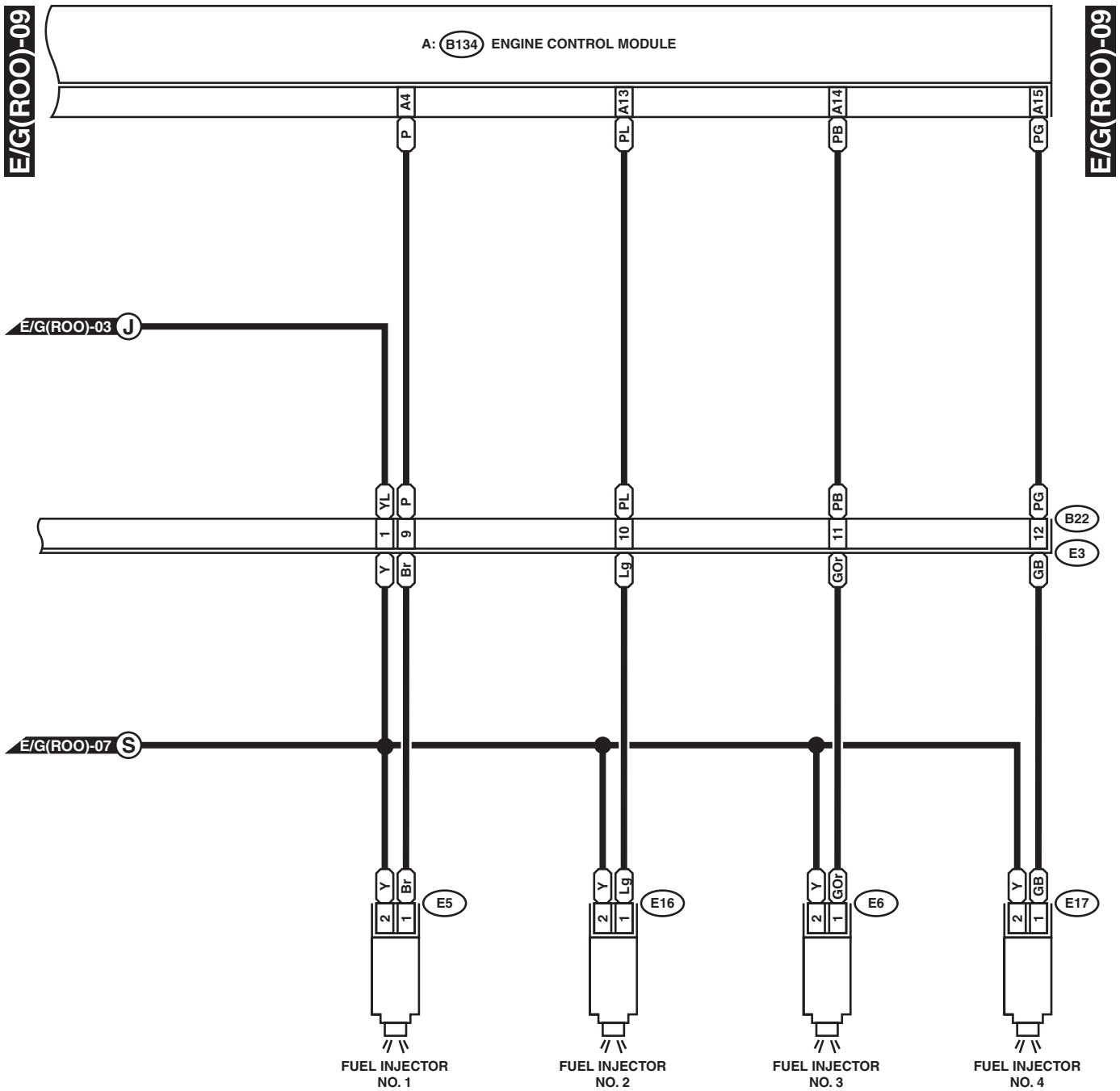
A: B134



GR10-23H

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM



E5 (LIGHT GRAY)

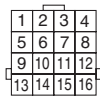
E6 (LIGHT GRAY)

E16 (LIGHT GRAY)

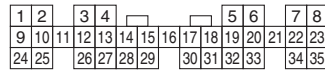
E17 (LIGHT GRAY)



B22 (BROWN)



A: (B134)



GR10-231

ENGINE ELECTRICAL SYSTEM

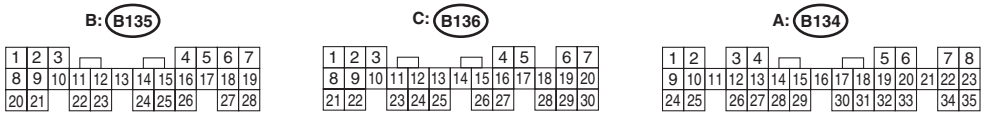
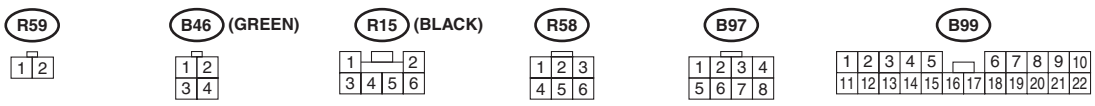
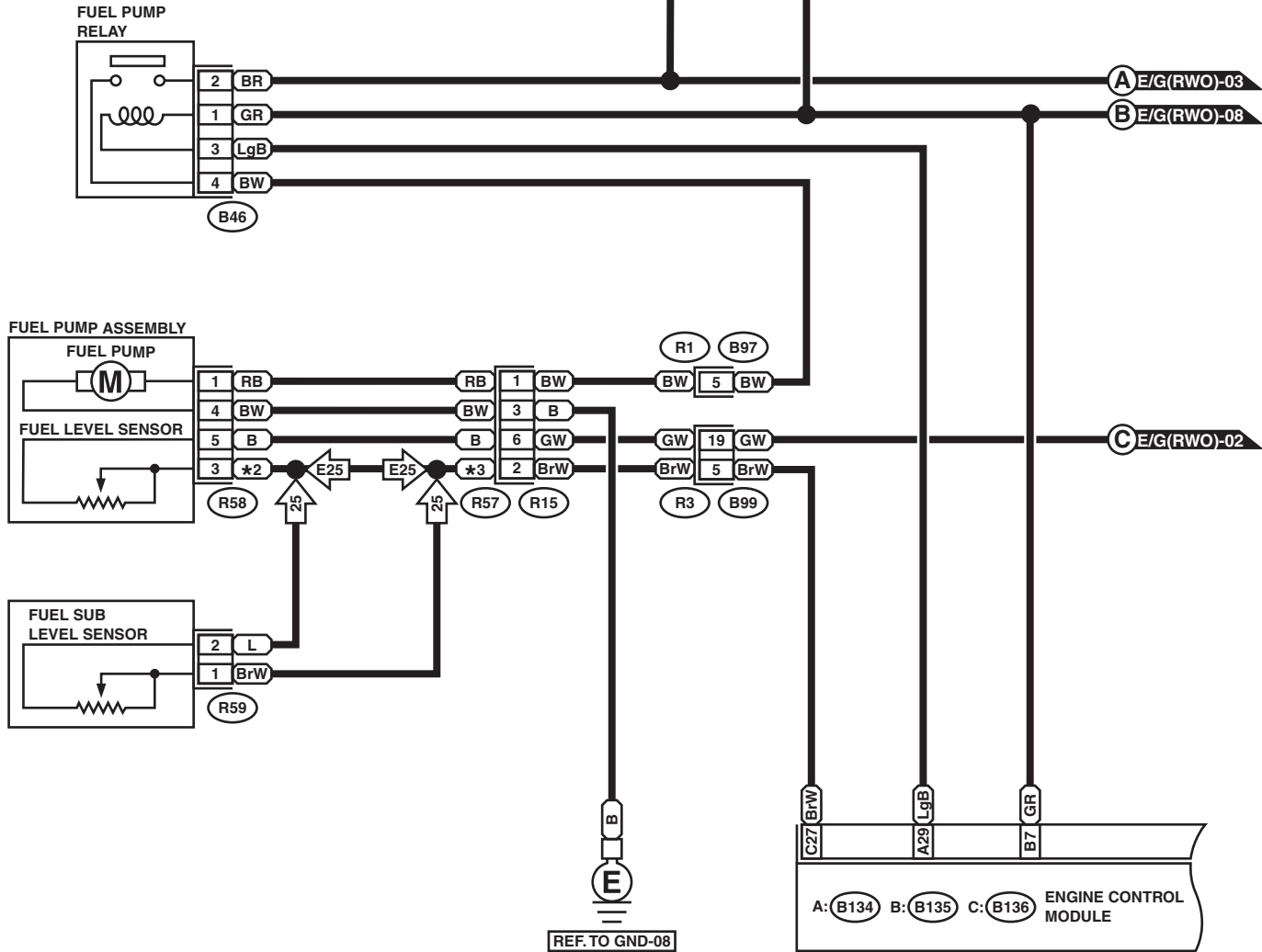
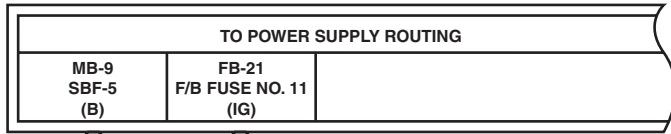
WIRING SYSTEM

5. RHD SOHC MODEL

E/G(RWO)-01

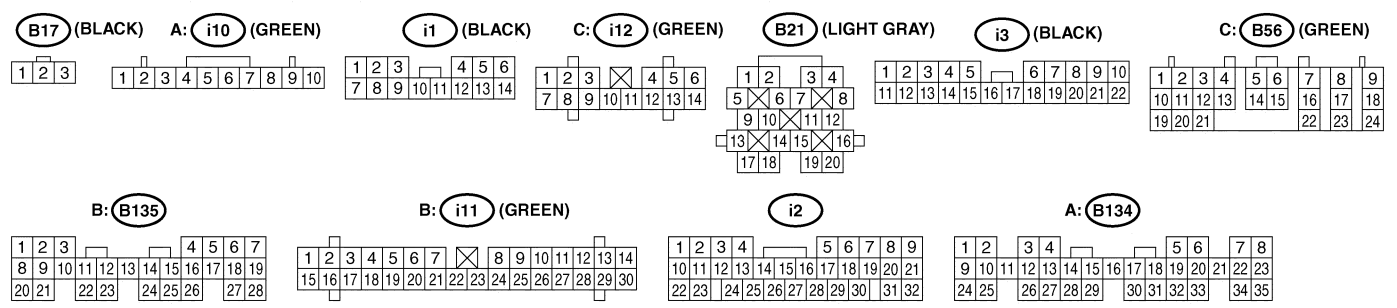
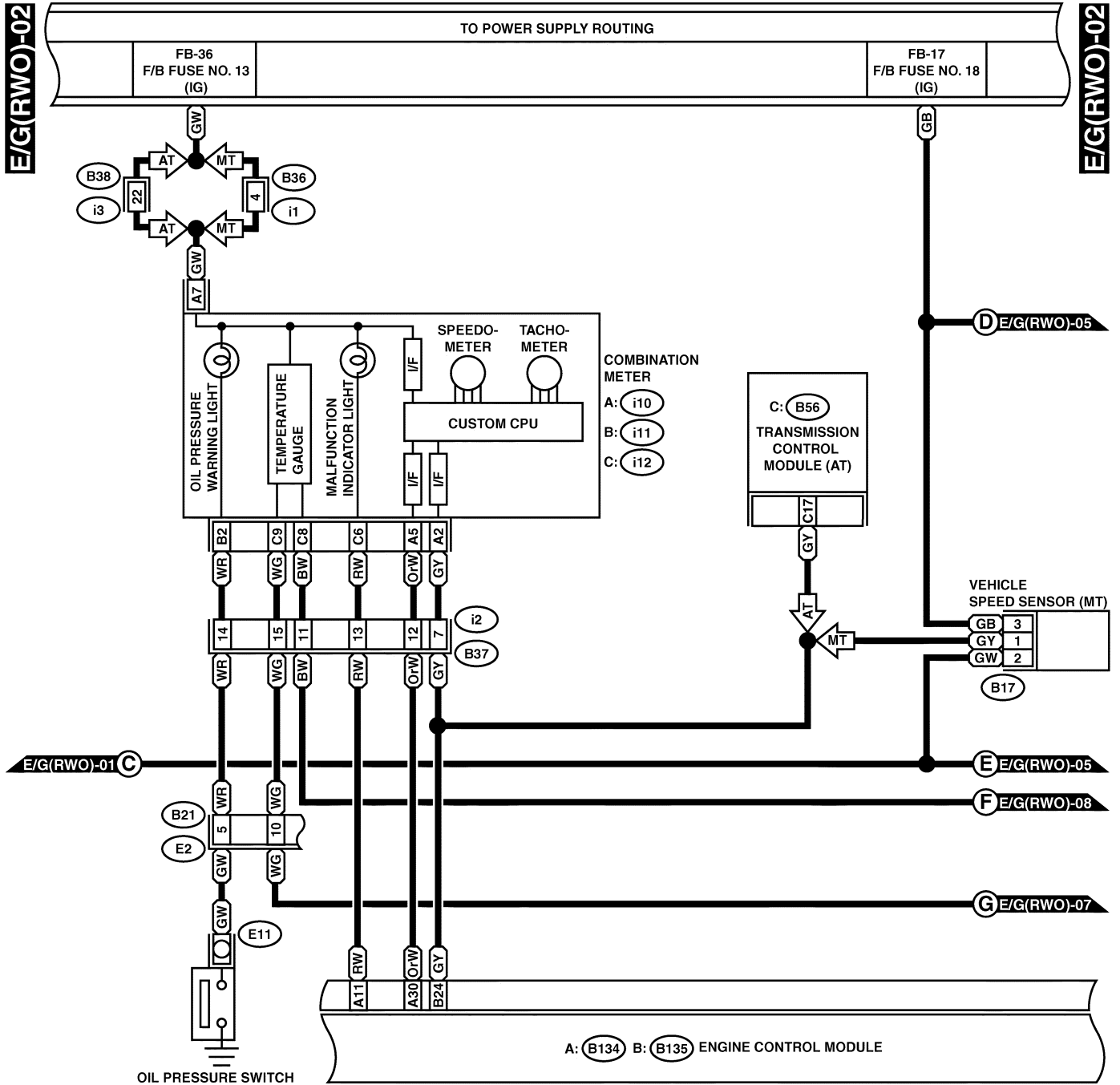
E/G(RWO)-01

*2 : EXCEPT 2.5L MODEL : BrB
2.5L MODEL : L
*3 : EXCEPT 2.5L MODEL : BrB
2.5L MODEL : BrW
←E25 : EXCEPT 2.5L MODEL
←25 : 2.5L MODEL



ENGINE ELECTRICAL SYSTEM

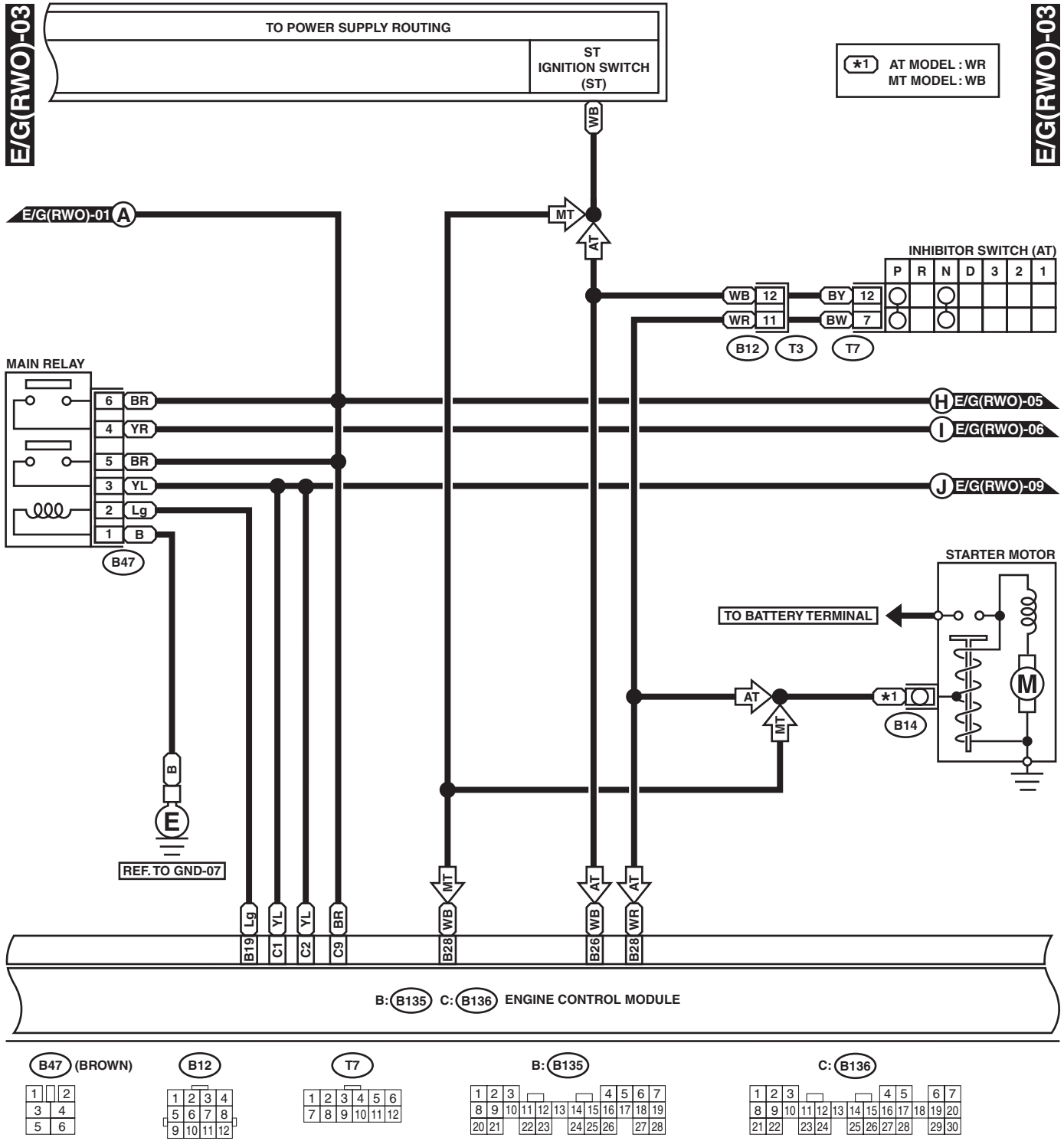
WIRING SYSTEM



GR10-25B

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM



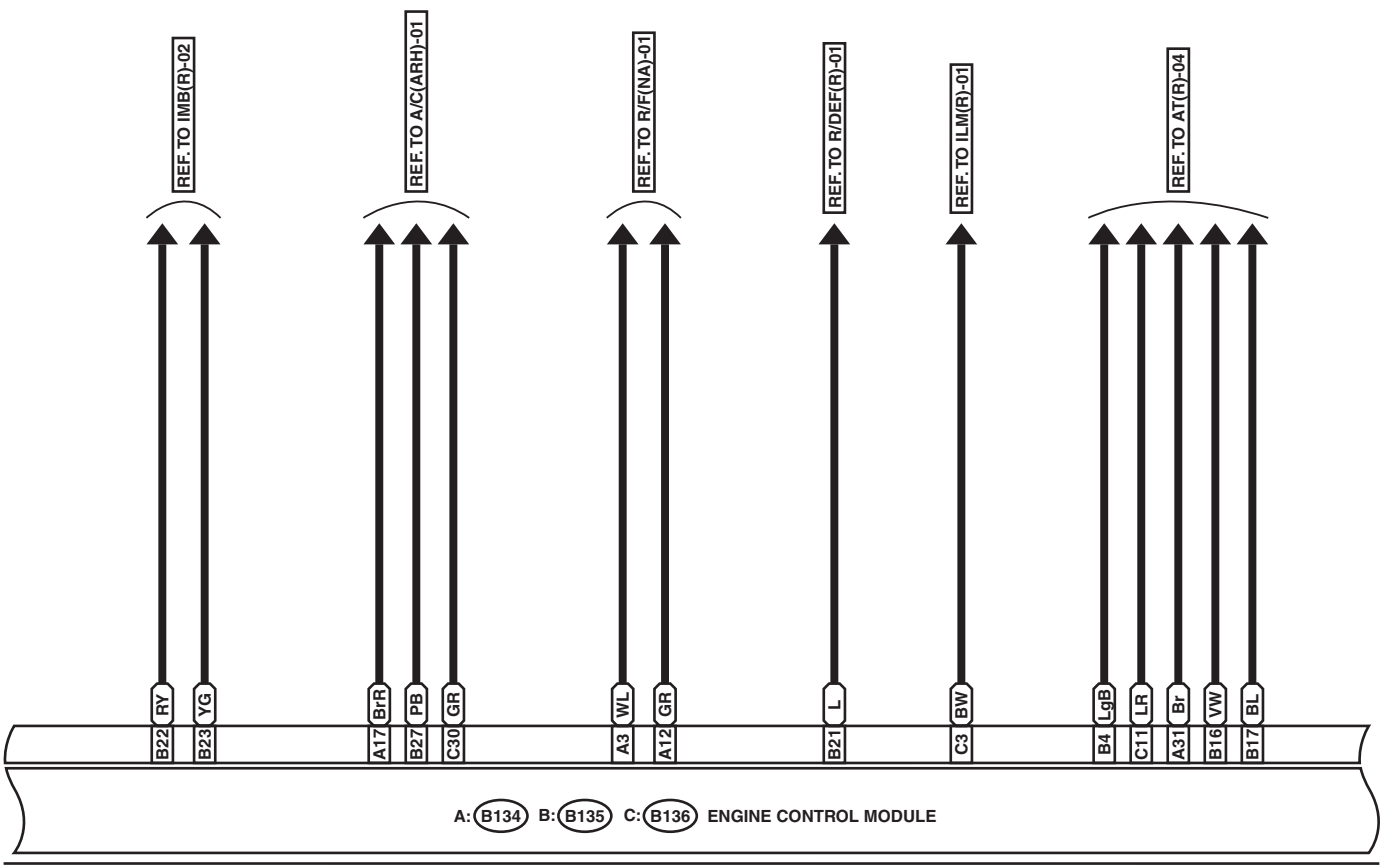
GR10-25C

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM

E/G(RWO)-04

E/G(RWO)-04



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			

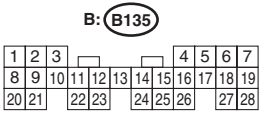
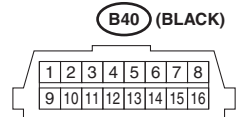
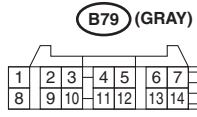
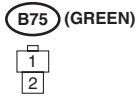
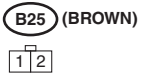
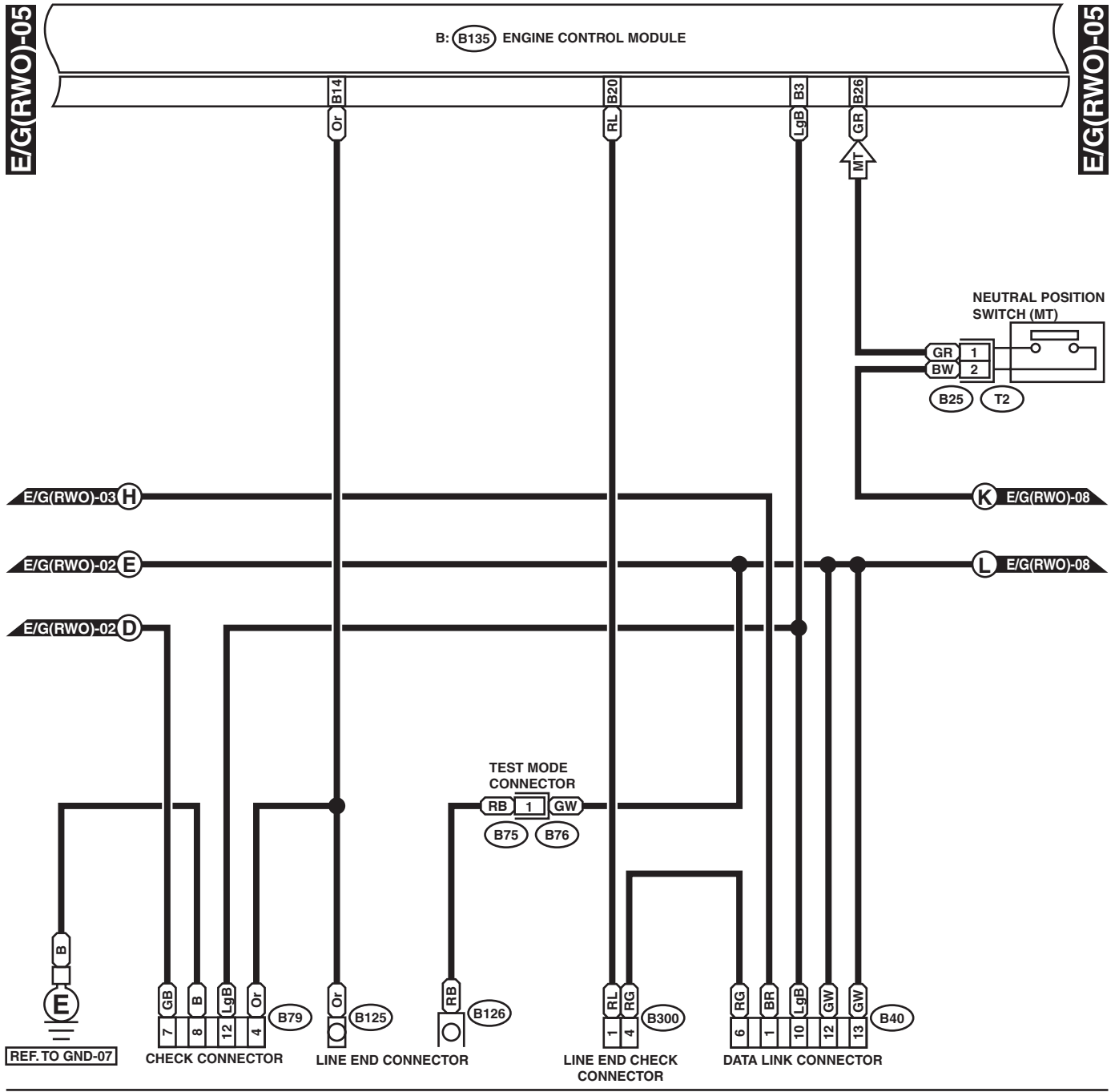
A: (B134)

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			

GR10-25D

ENGINE ELECTRICAL SYSTEM

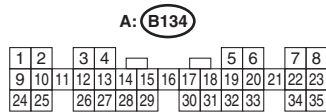
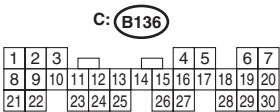
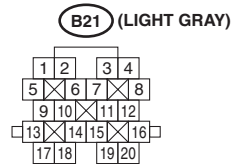
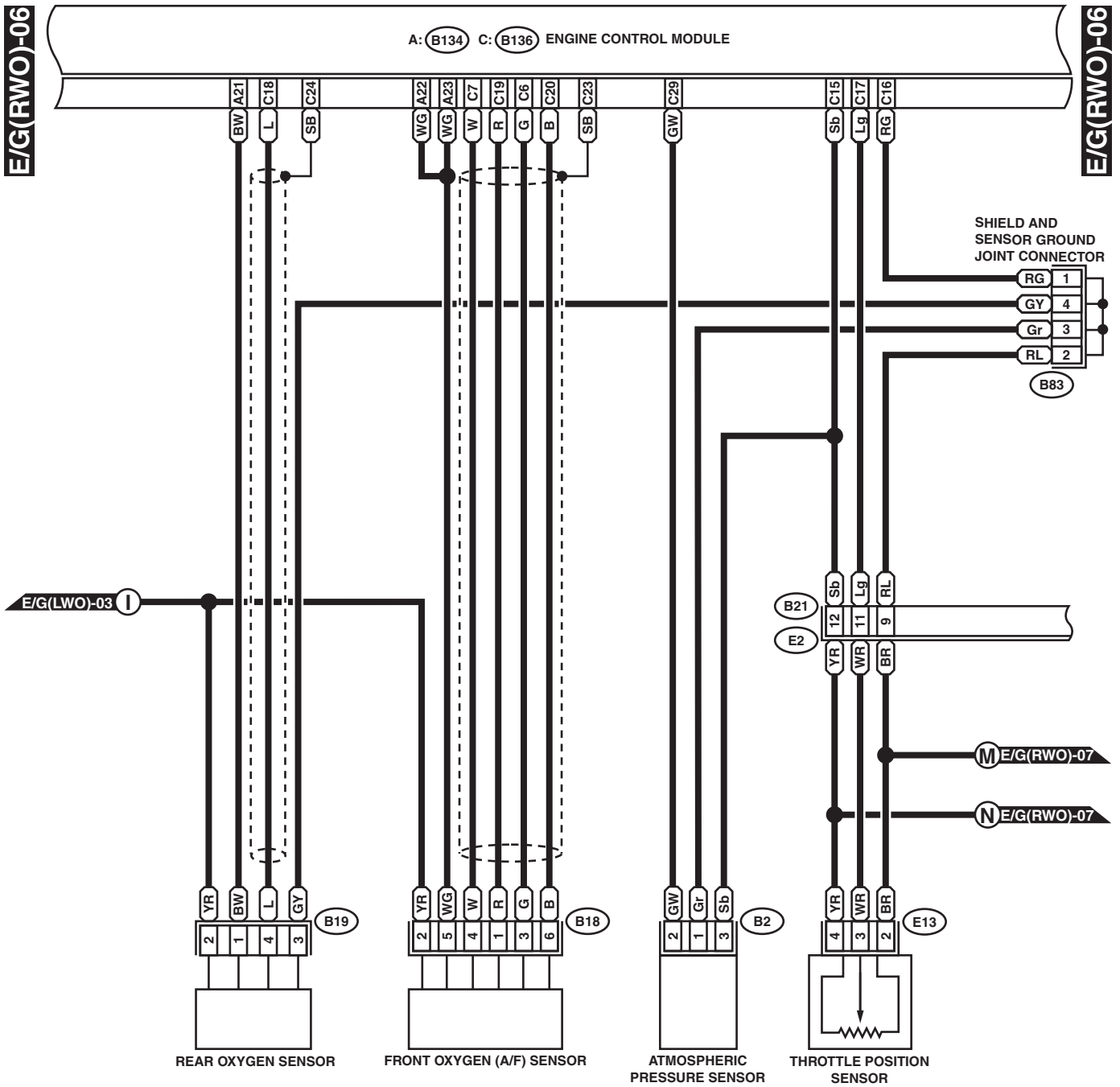
WIRING SYSTEM



GR10-25E

ENGINE ELECTRICAL SYSTEM

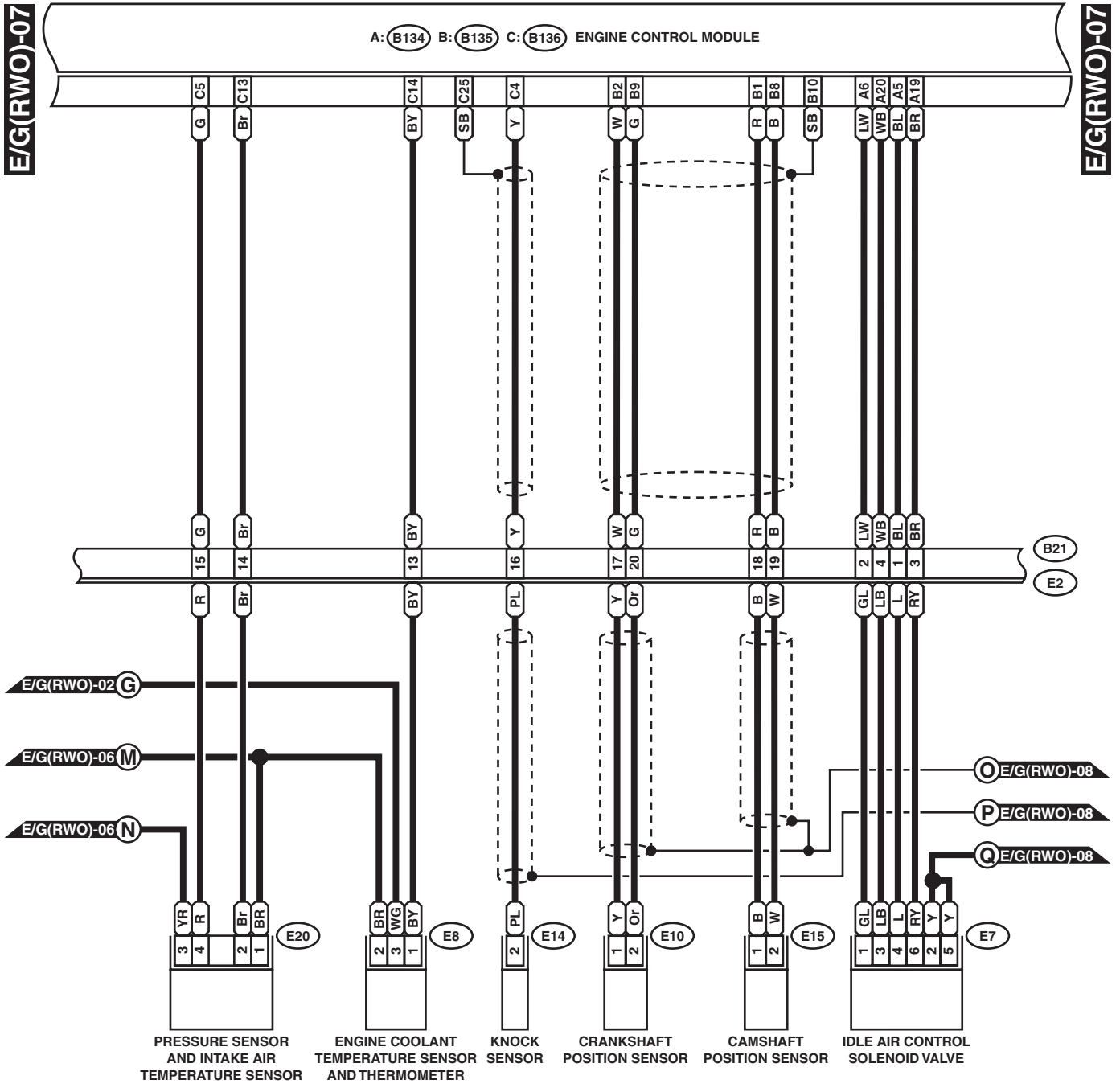
WIRING SYSTEM



GR10-25F

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM



E10 (LIGHT GRAY)



E8 (LIGHT GRAY)



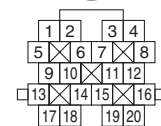
E20 (BLACK)



E7 (BLACK)



B21 (LIGHT GRAY)



B: B135



C: B136



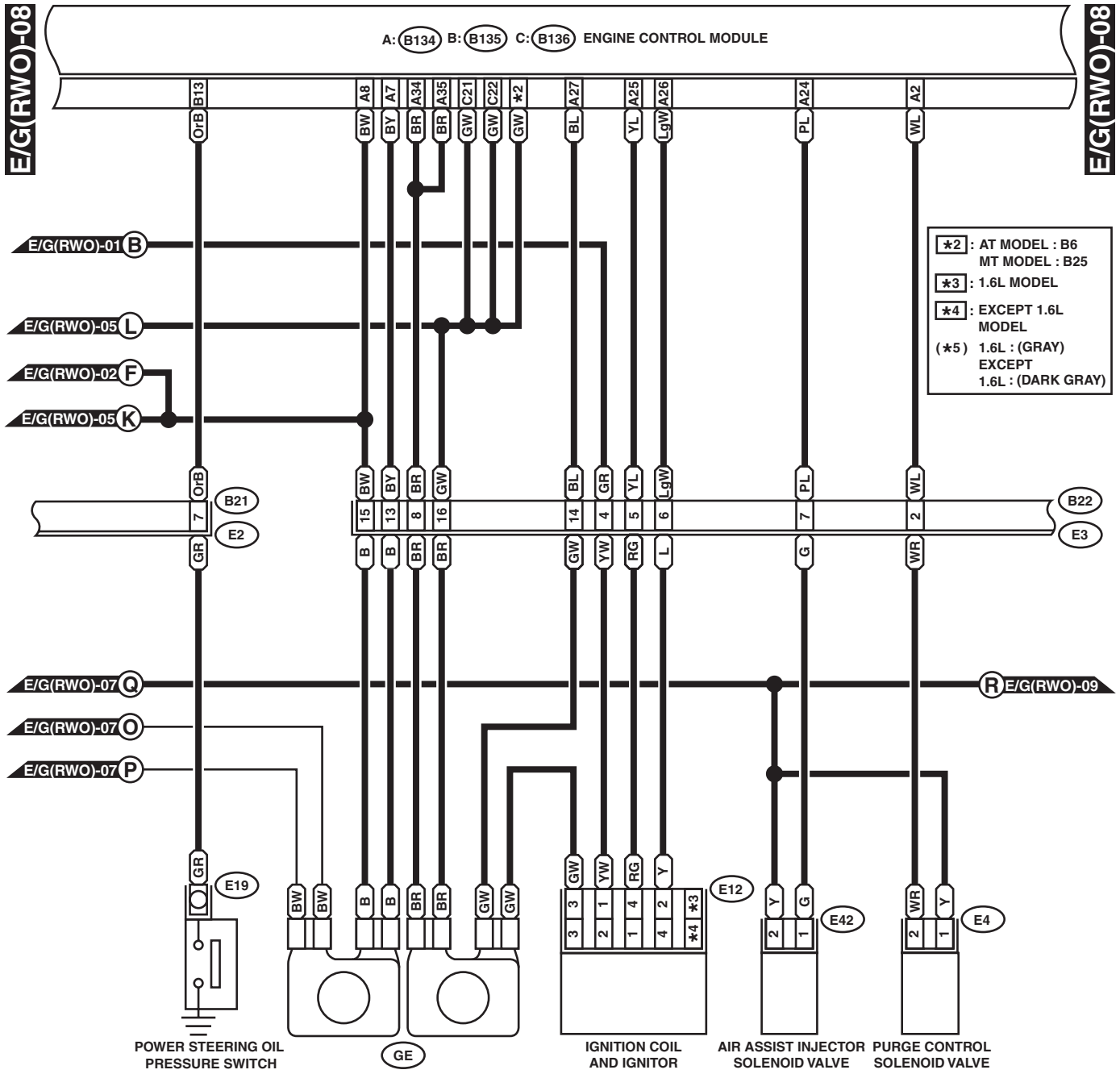
A: B134



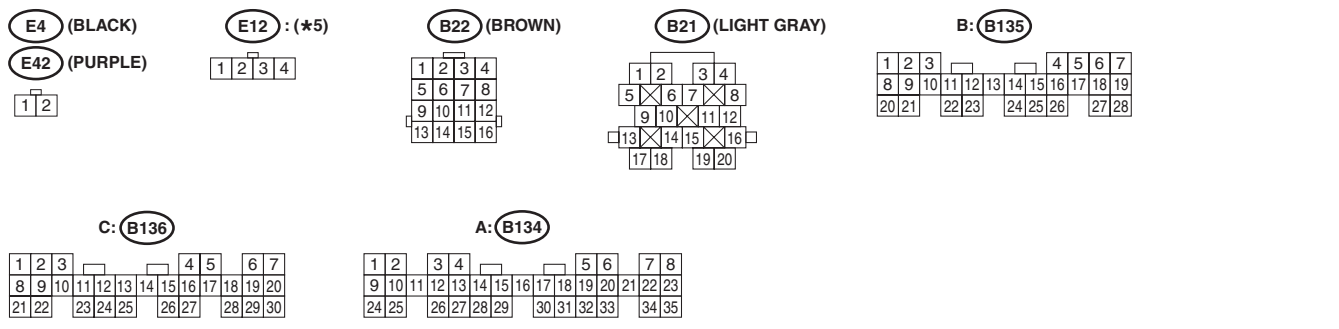
GR10-25G

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM



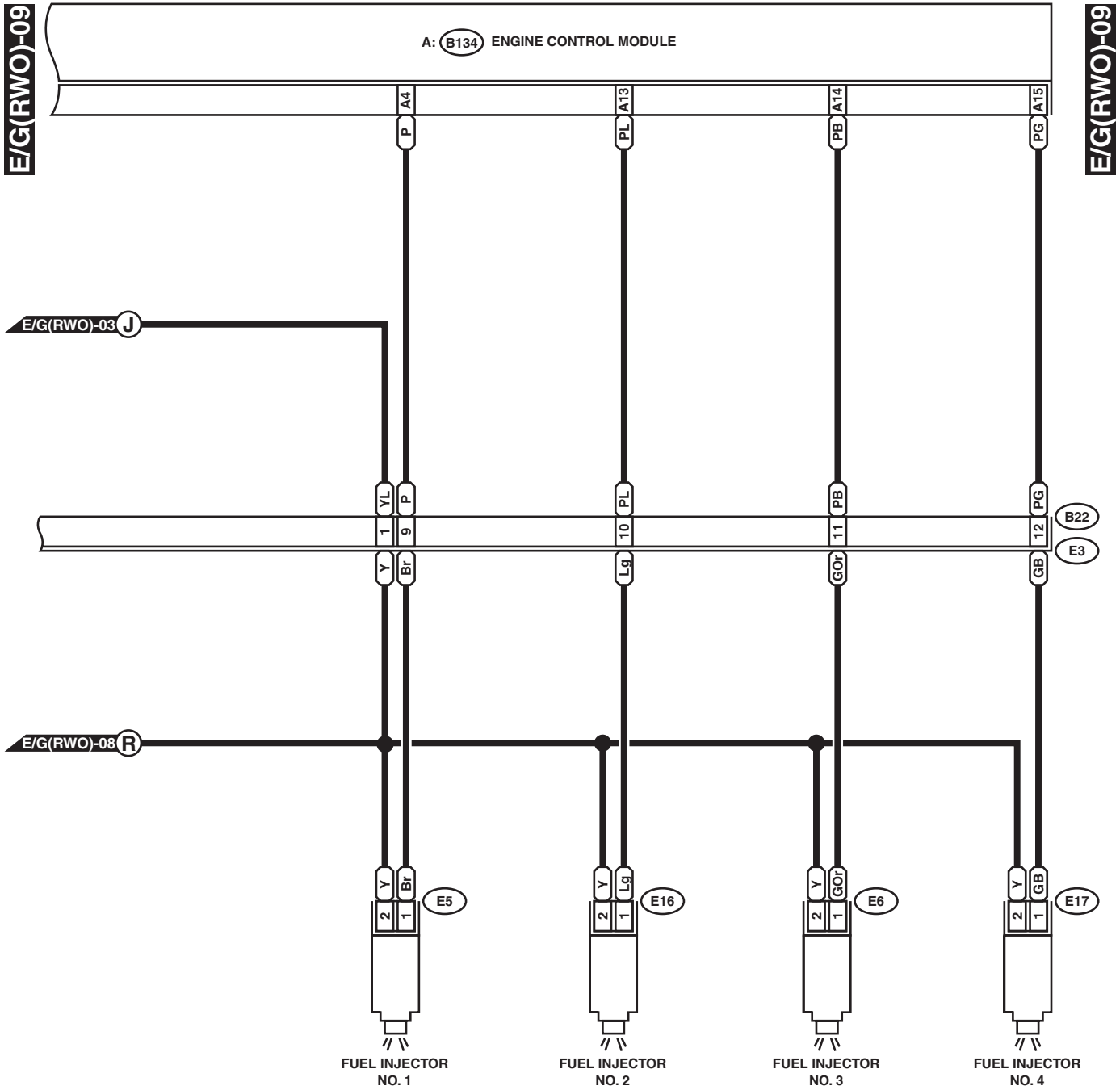
- *2 : AT MODEL : B6
MT MODEL : B25
- *3 : 1.6L MODEL
- *4 : EXCEPT 1.6L MODEL
- (*5) 1.6L : (GRAY)
EXCEPT
1.6L : (DARK GRAY)



GR10-25H

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM



E5 (LIGHT GRAY)

E6 (LIGHT GRAY)

E16 (LIGHT GRAY)

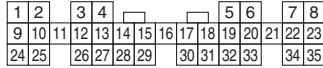
E17 (LIGHT GRAY)



B22 (BROWN)



A: B134

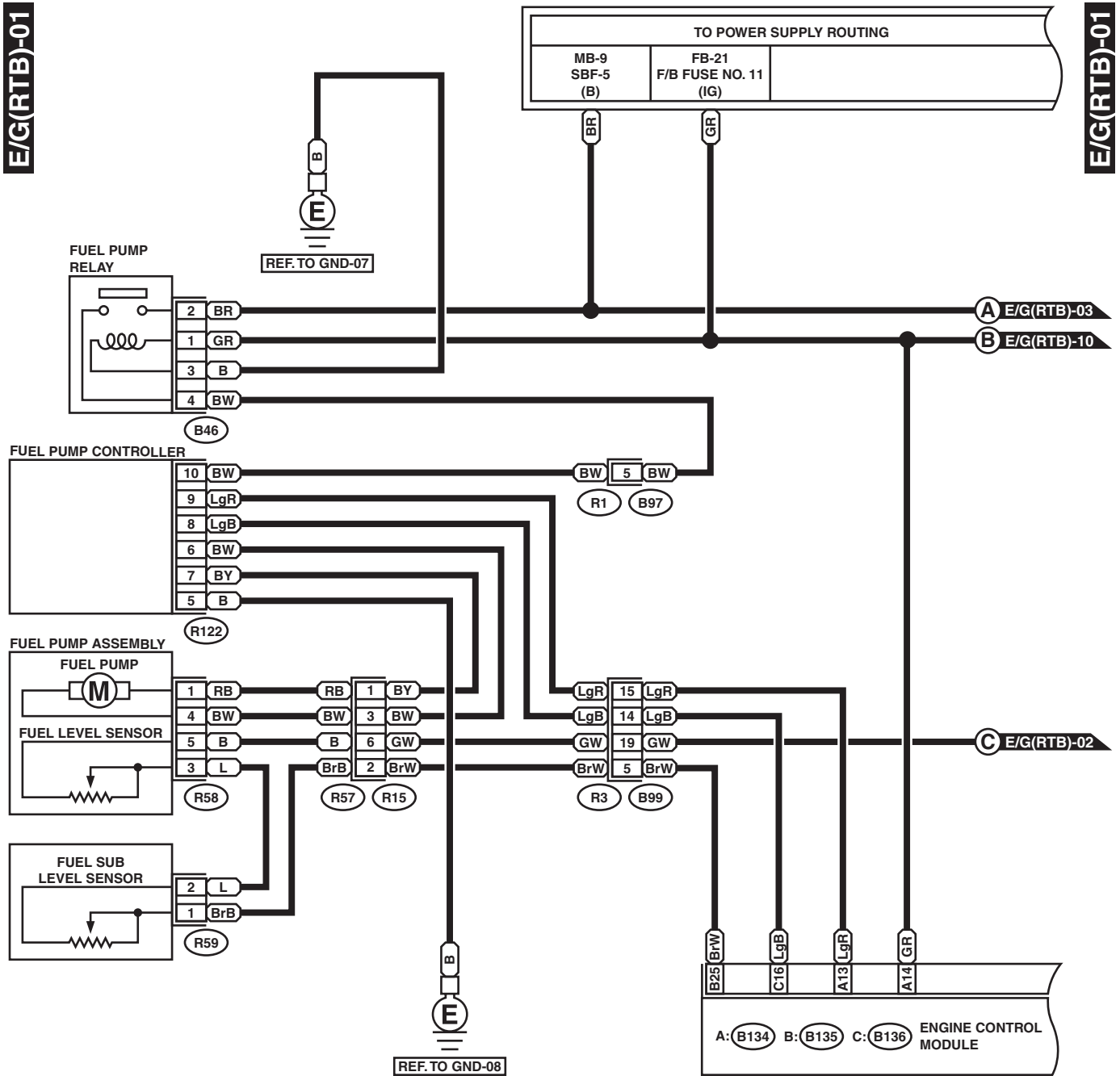


GR10-25I

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM

6. RHD DOHC TURBO MODEL



R59



B46 (GREEN)



R15 (BLACK)



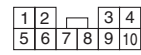
R58



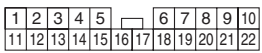
B97



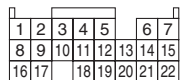
R122



B99



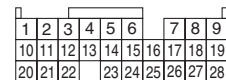
A: B134



C: B136



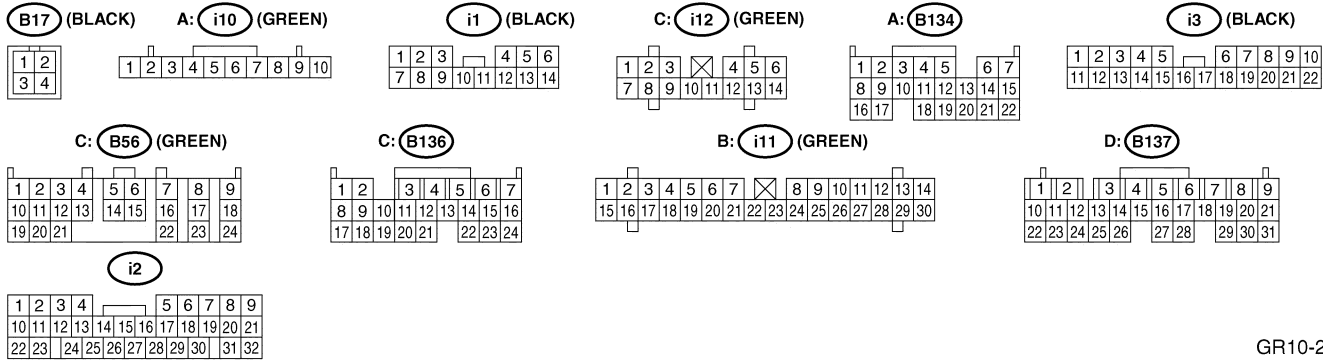
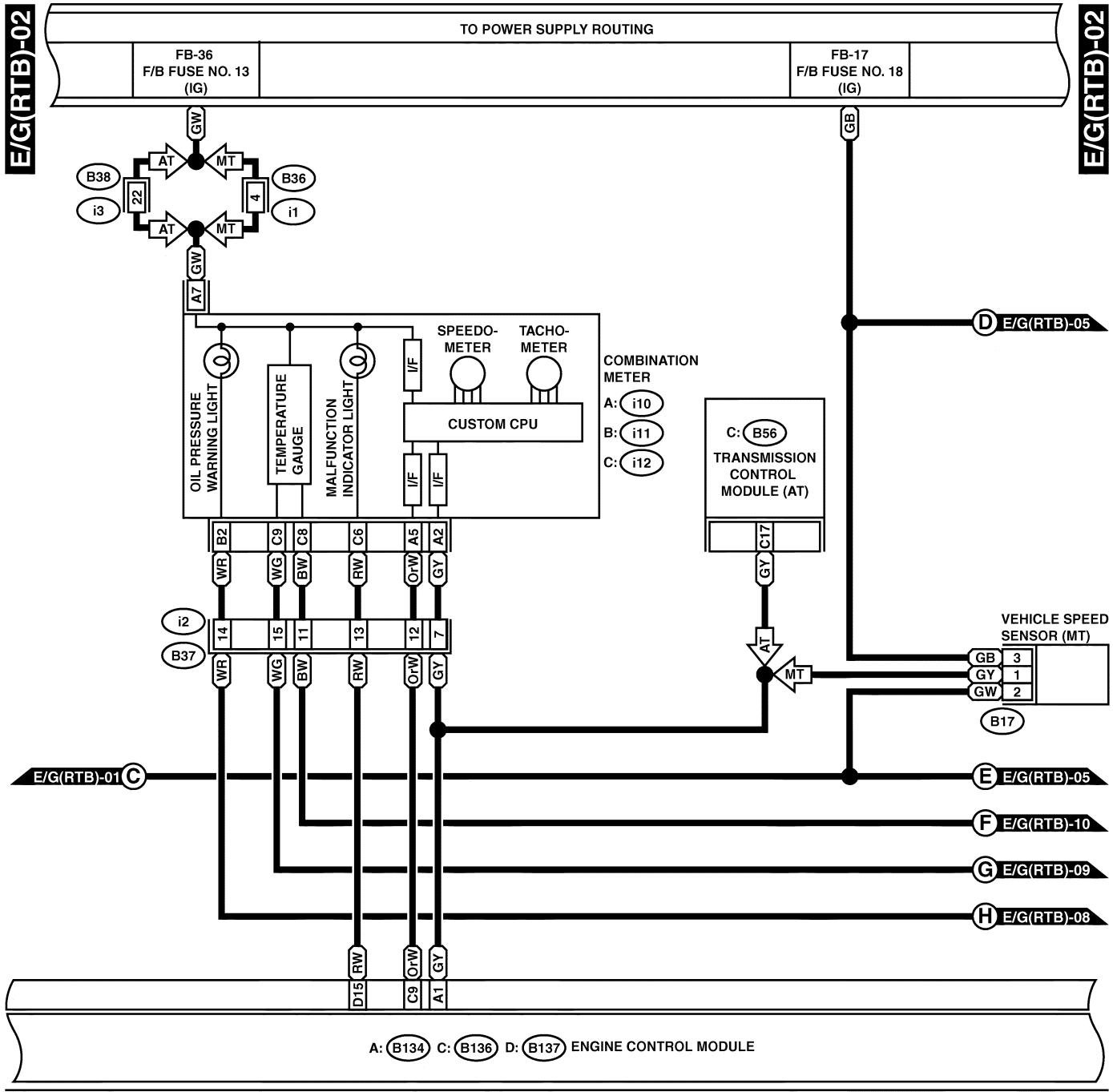
B: B135



GR10-24A

ENGINE ELECTRICAL SYSTEM

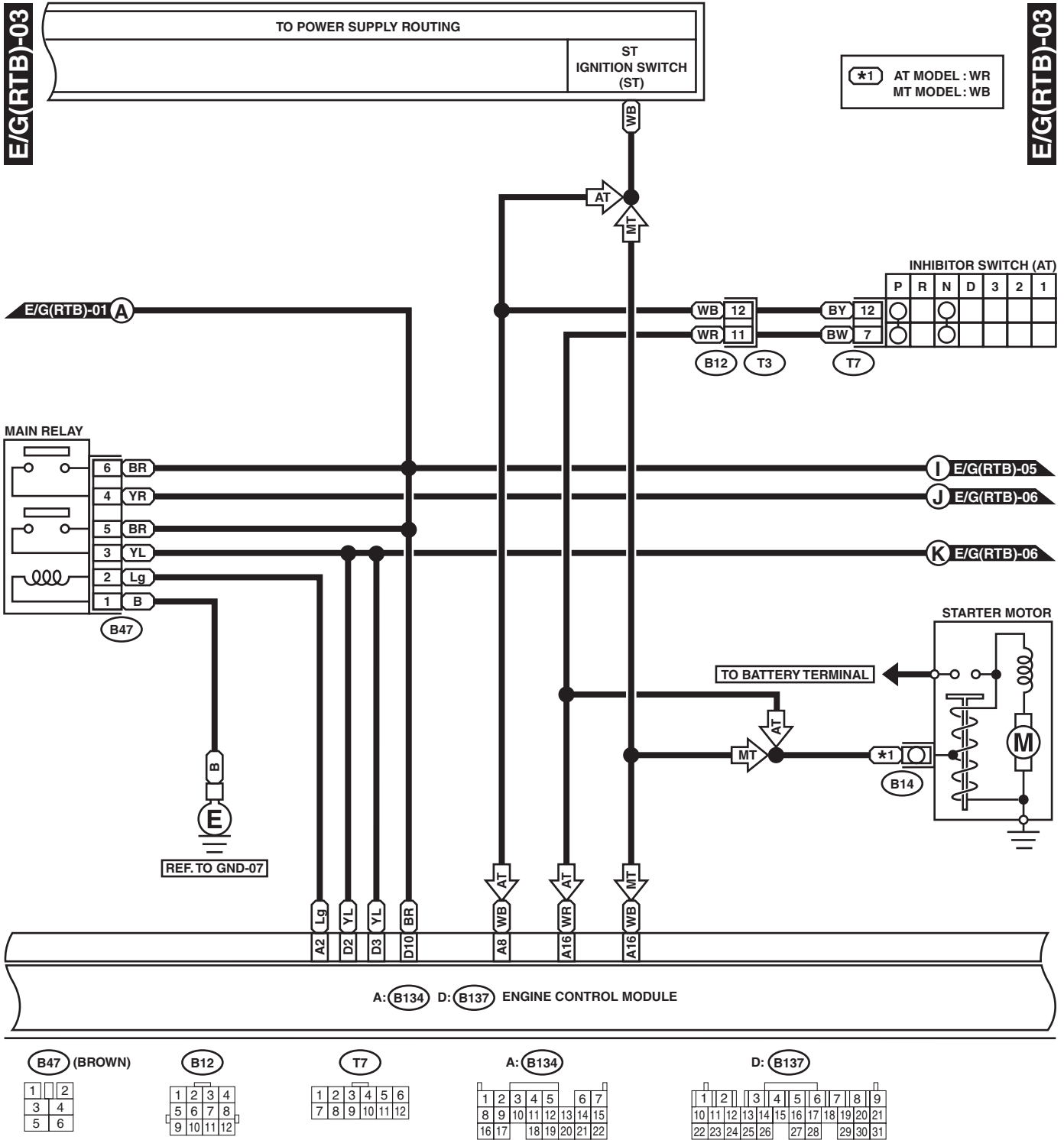
WIRING SYSTEM



GR10-24B

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM



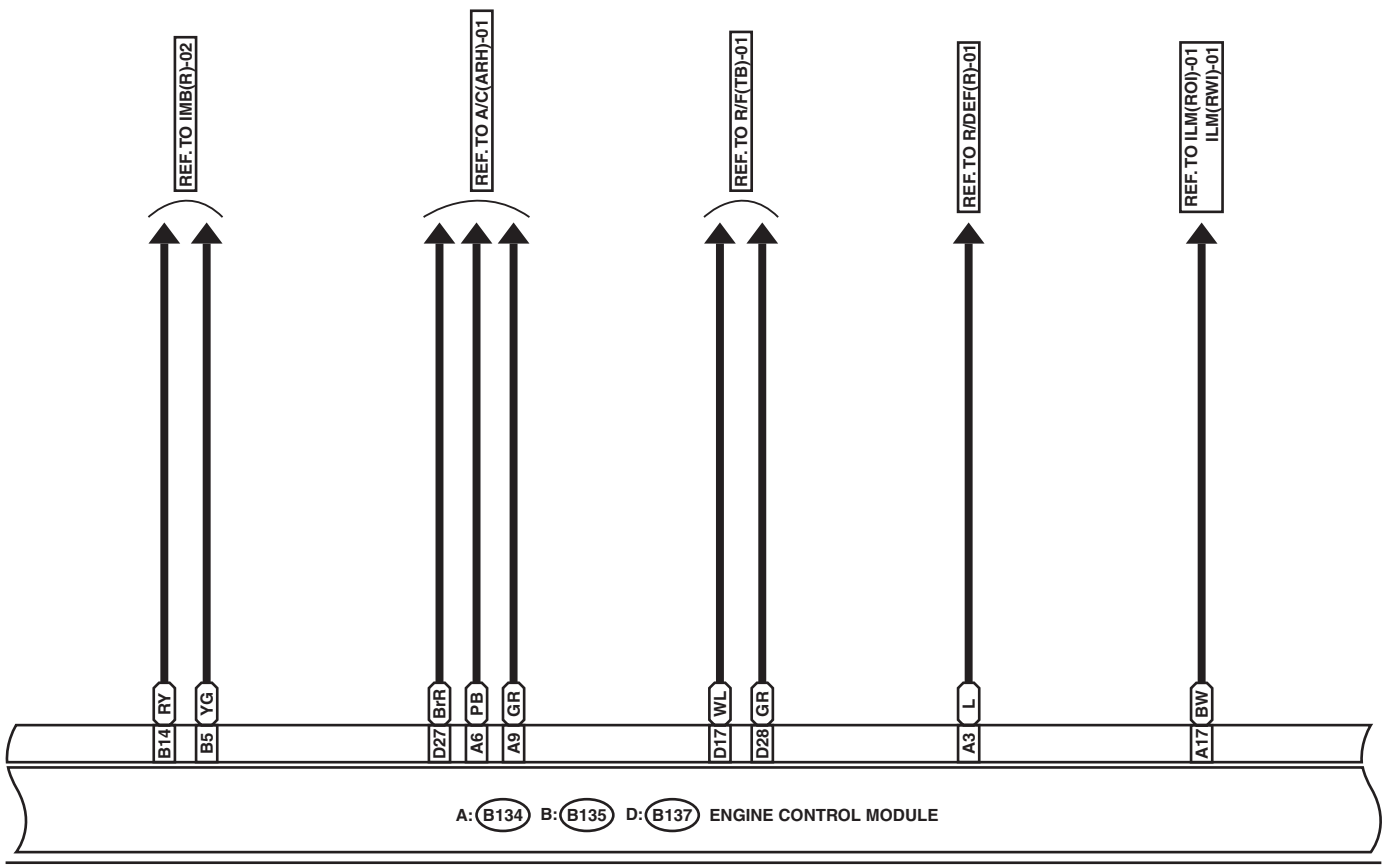
GR10-24C

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM

E/G(RTB)-04

E/G(RTB)-04



A: (B134)

1	2	3	4	5	6	7	
8	9	10	11	12	13	14	15
16	17	18	19	20	21	22	

B: (B135)

1	2	3	4	5	6	7	8	9	
10	11	12	13	14	15	16	17	18	19
20	21	22	23	24	25	26	27	28	

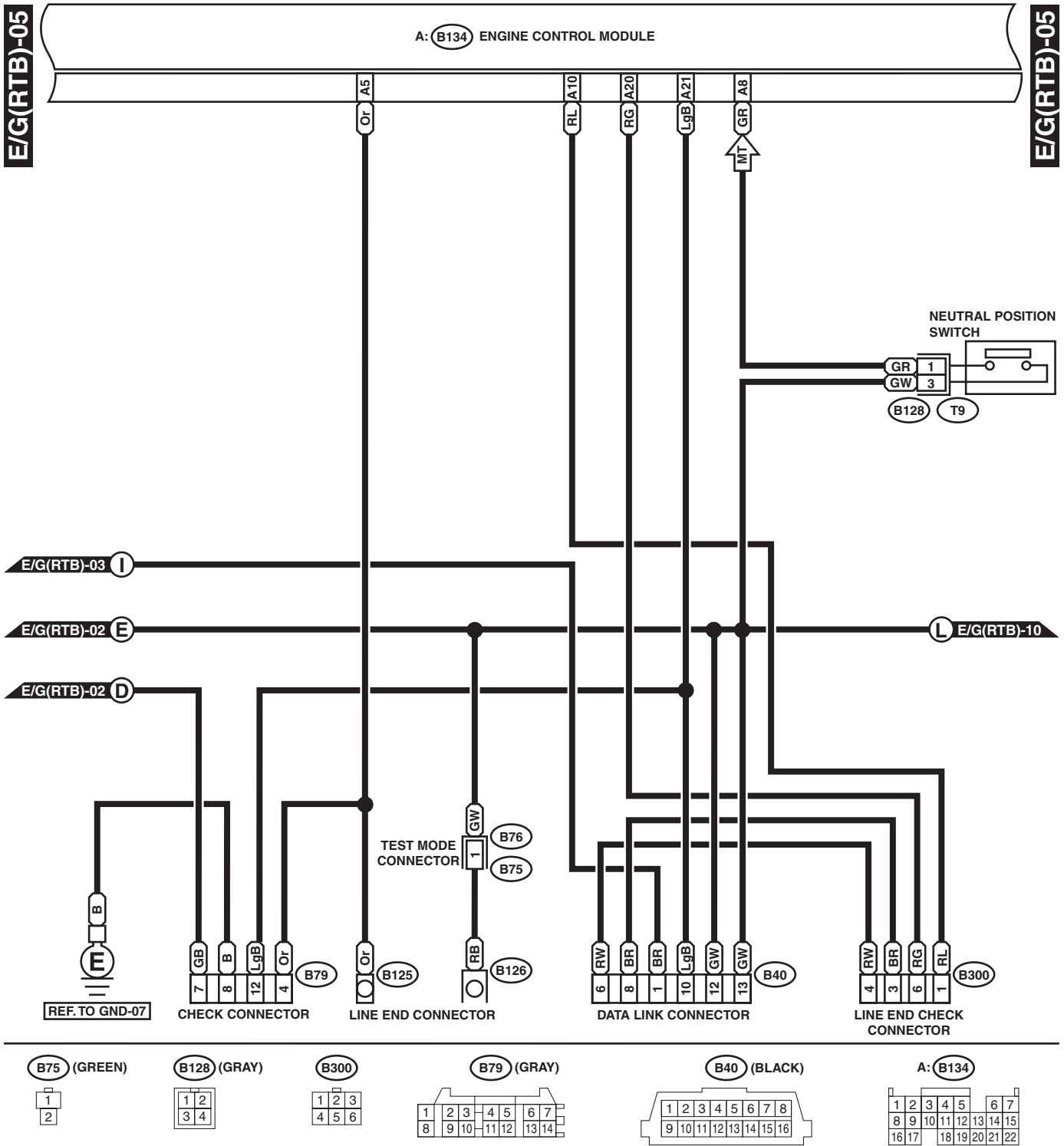
D: (B137)

1	2	3	4	5	6	7	8	9			
10	11	12	13	14	15	16	17	18	19	20	21
22	23	24	25	26	27	28	29	30	31		

GR10-24D

ENGINE ELECTRICAL SYSTEM

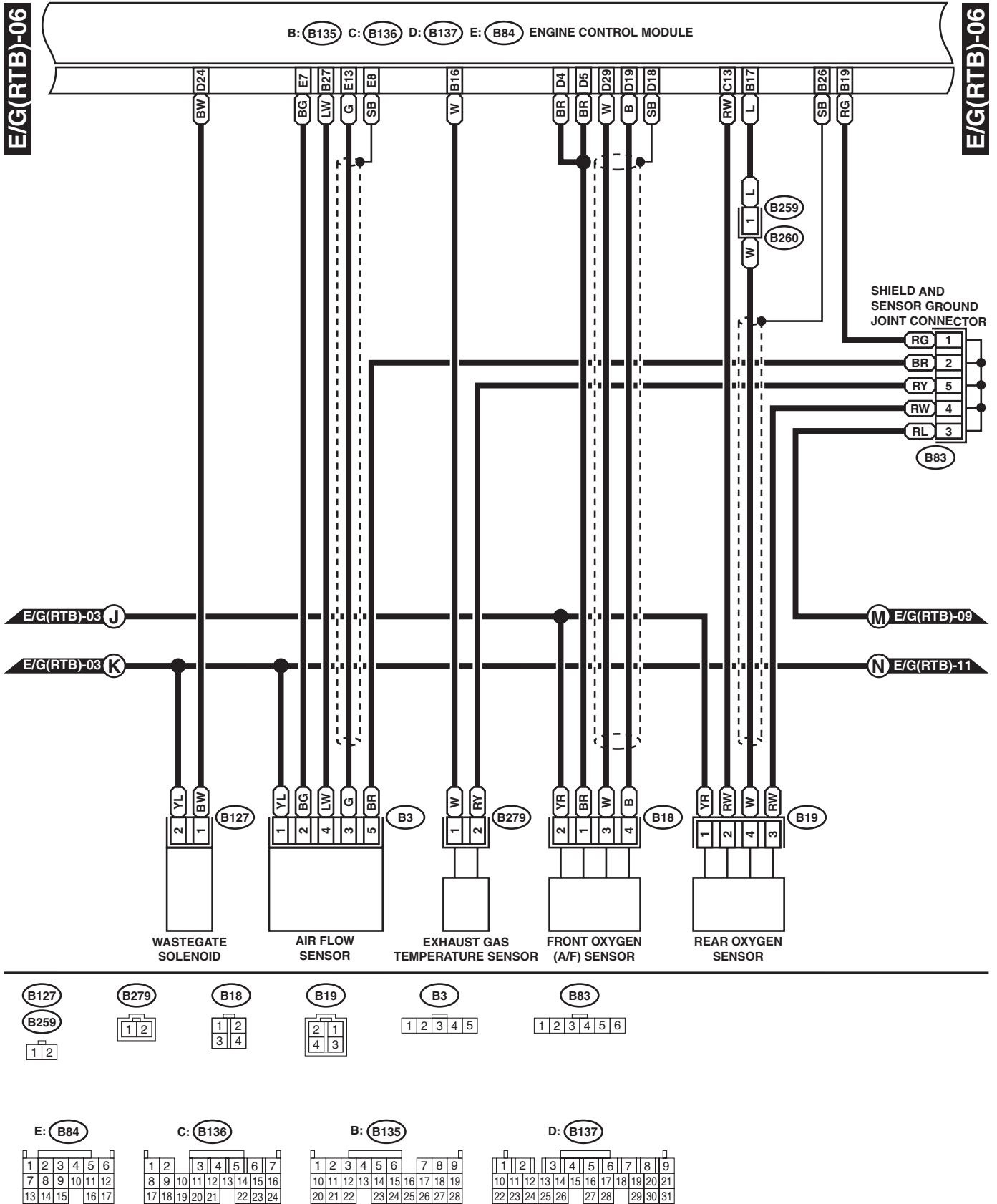
WIRING SYSTEM



GR10-24E

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM



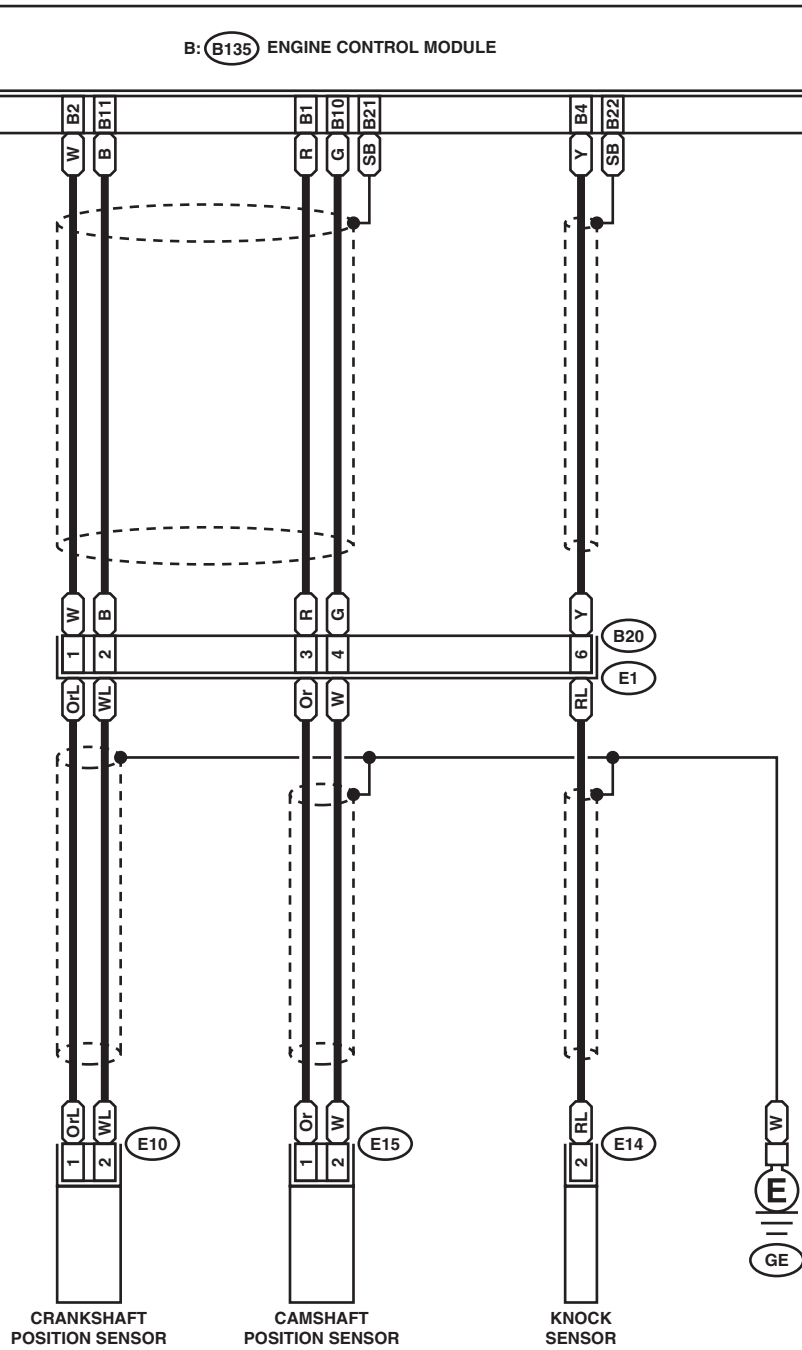
GR10-24F

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM

E/G(RTB)-07

E/G(RTB)-07



(E10) (LIGHT GRAY)

(B20) (LIGHT GRAY)

B: (B135)

(E14) (GRAY)

(E15) (LIGHT GRAY)

1 2

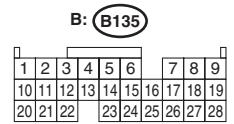
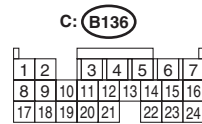
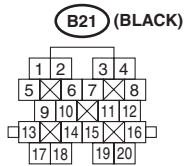
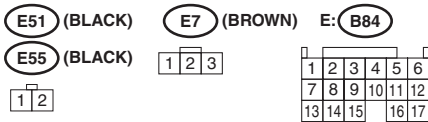
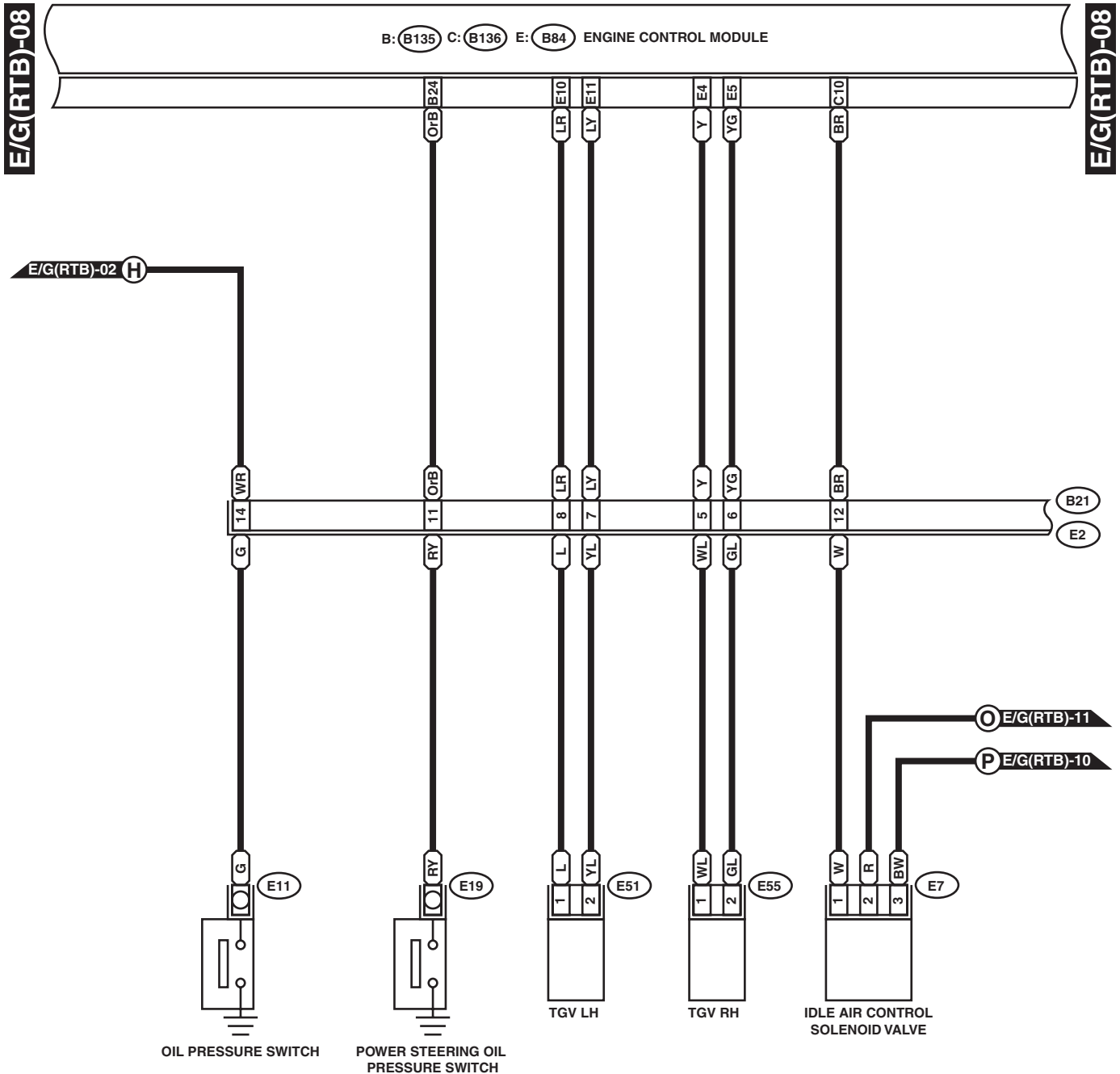
1	2	3	4
5	6	7	
8	9	10	

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	

GR10-24G

ENGINE ELECTRICAL SYSTEM

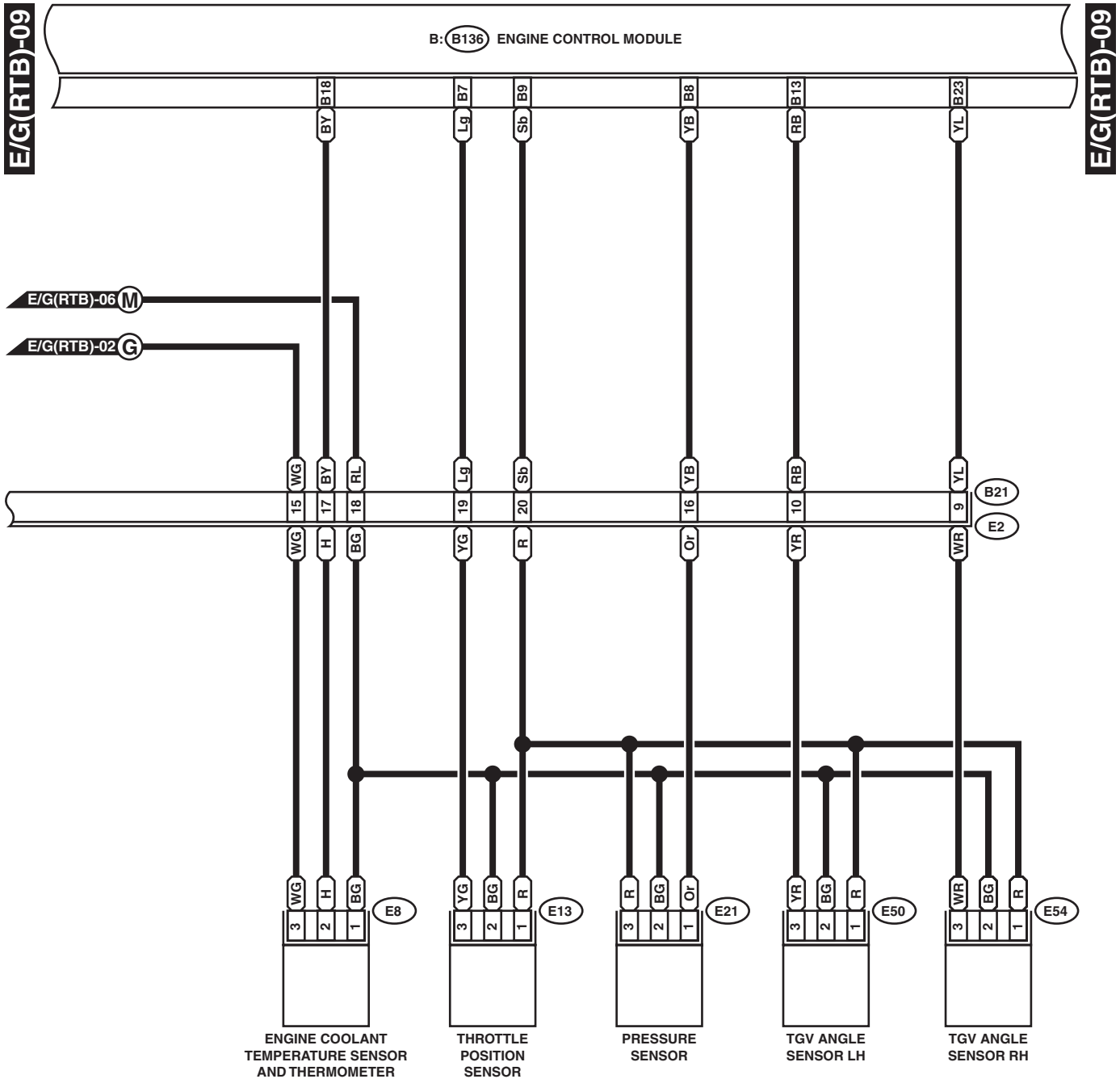
WIRING SYSTEM



GR10-24H

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM



E8 (LIGHT GRAY)



E13 (BLACK)

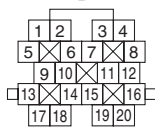
E21 (BLACK)

E50 (BLACK)

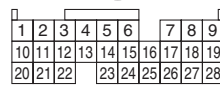
E54 (BLACK)



B21 (BLACK)



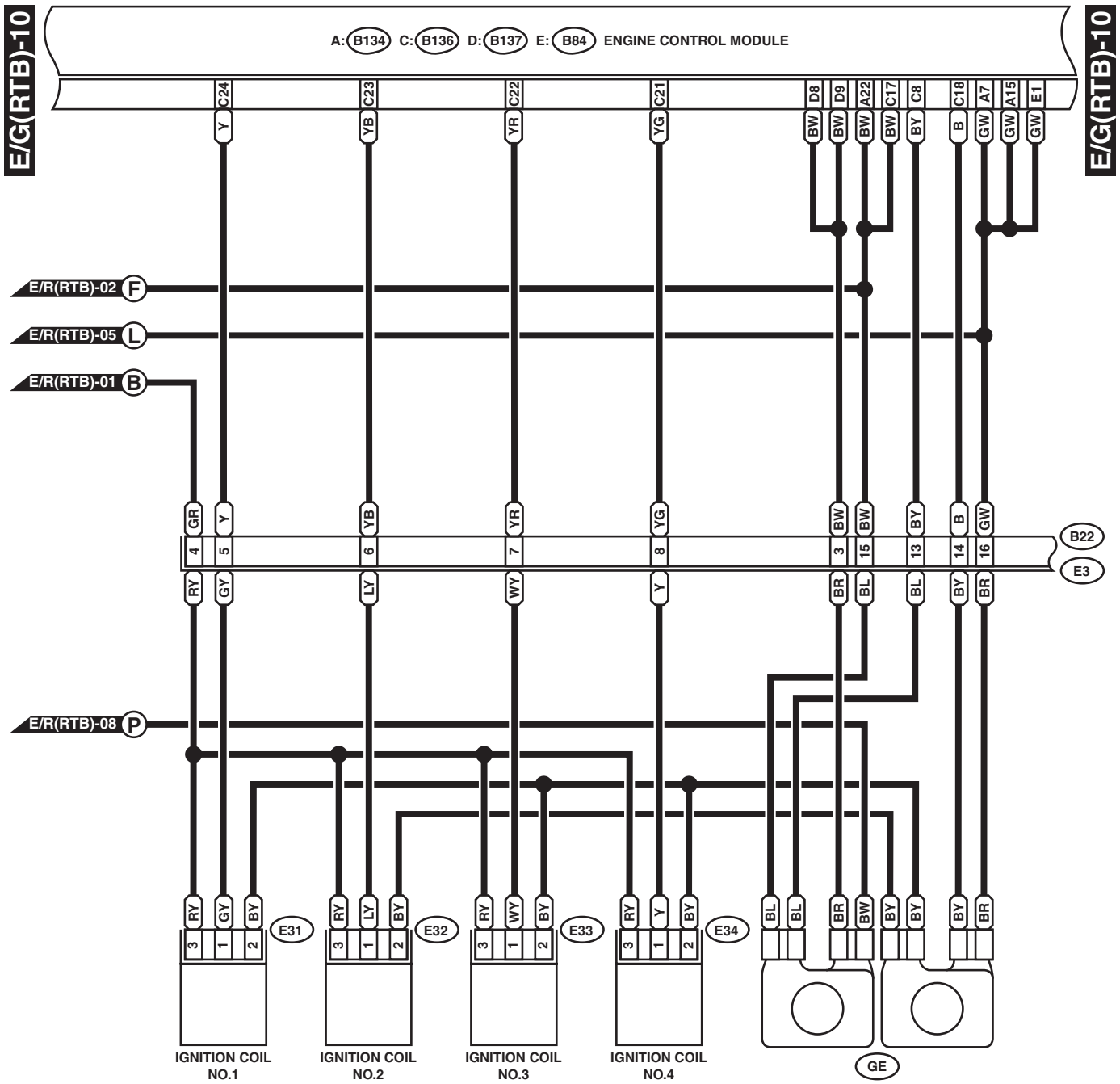
B: B135



GR10-24I

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM



E31

E32

E33 (BLACK)

E34 (BLACK)

1
2
3

B22 (BROWN)

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16

E: B84

1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	

A: B134

1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24				

C: B136

1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24				

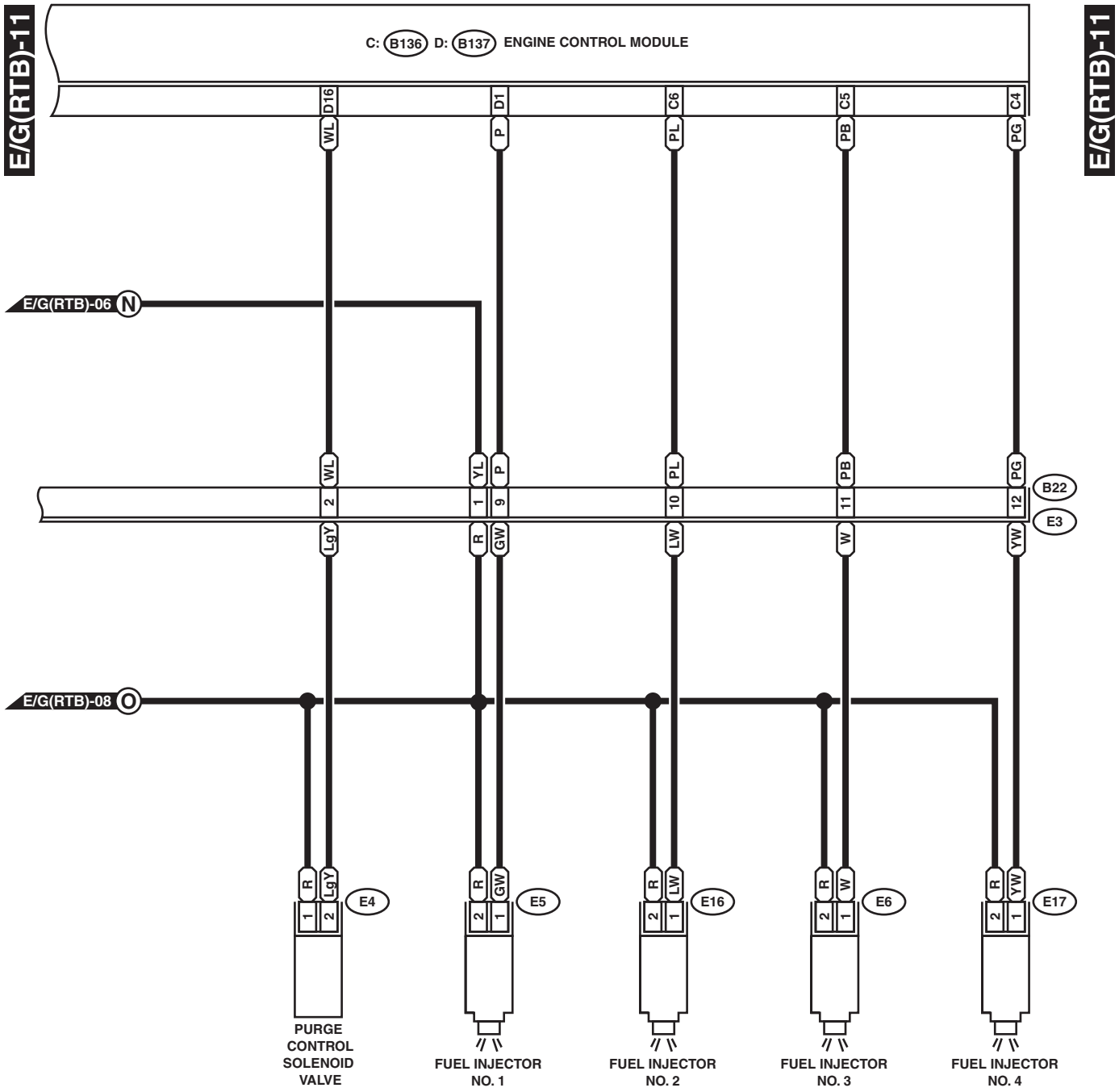
D: B137

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					

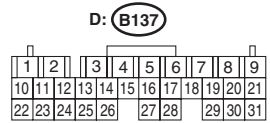
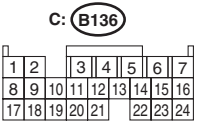
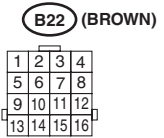
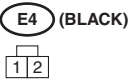
GR10-24J

ENGINE ELECTRICAL SYSTEM

WIRING SYSTEM



- E5 (DARK GRAY)
- E6 (DARK GRAY)
- E16 (DARK GRAY)
- E17 (DARK GRAY)



GR10-24K

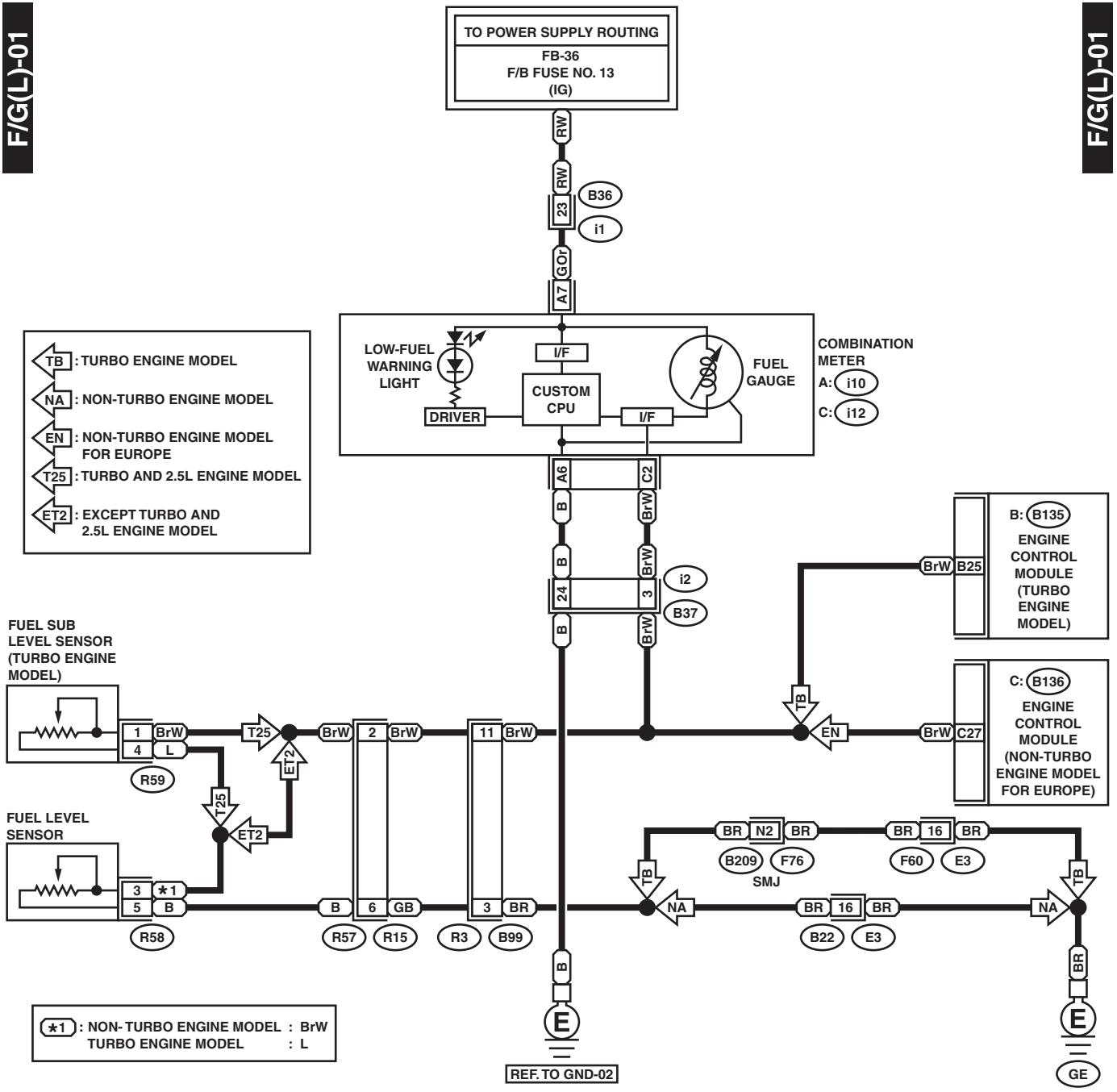
17.Fuel Gauge System

A: SCHEMATIC

FUEL GAUGE SYSTEM

WIRING SYSTEM

1. LHD MODEL



R59



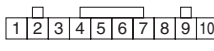
R15 (BLACK)



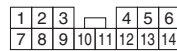
R58



A: i10 (GREEN)



C: i12 (GREEN)

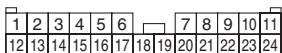


B22 (BROWN)

F60 (BROWN)

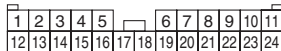


B36 (BLACK)

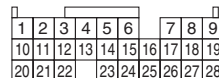


B99

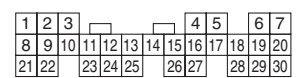
i2



B: B135



C: B136



GL61-21

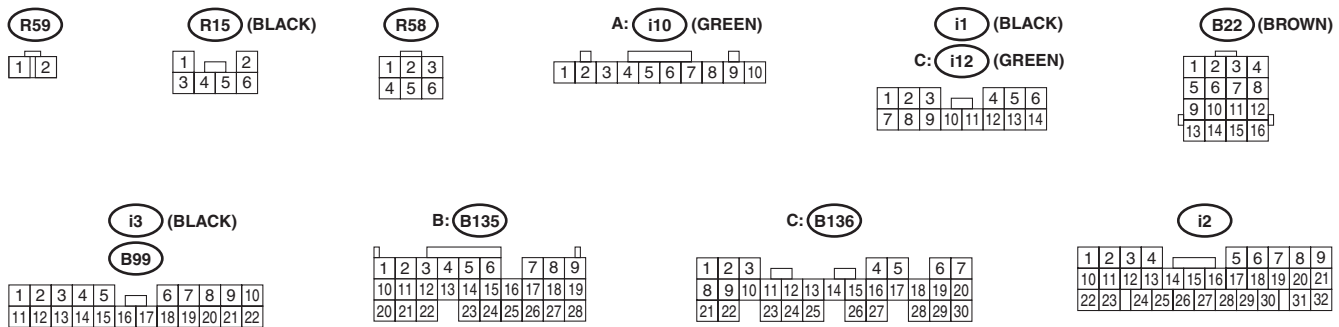
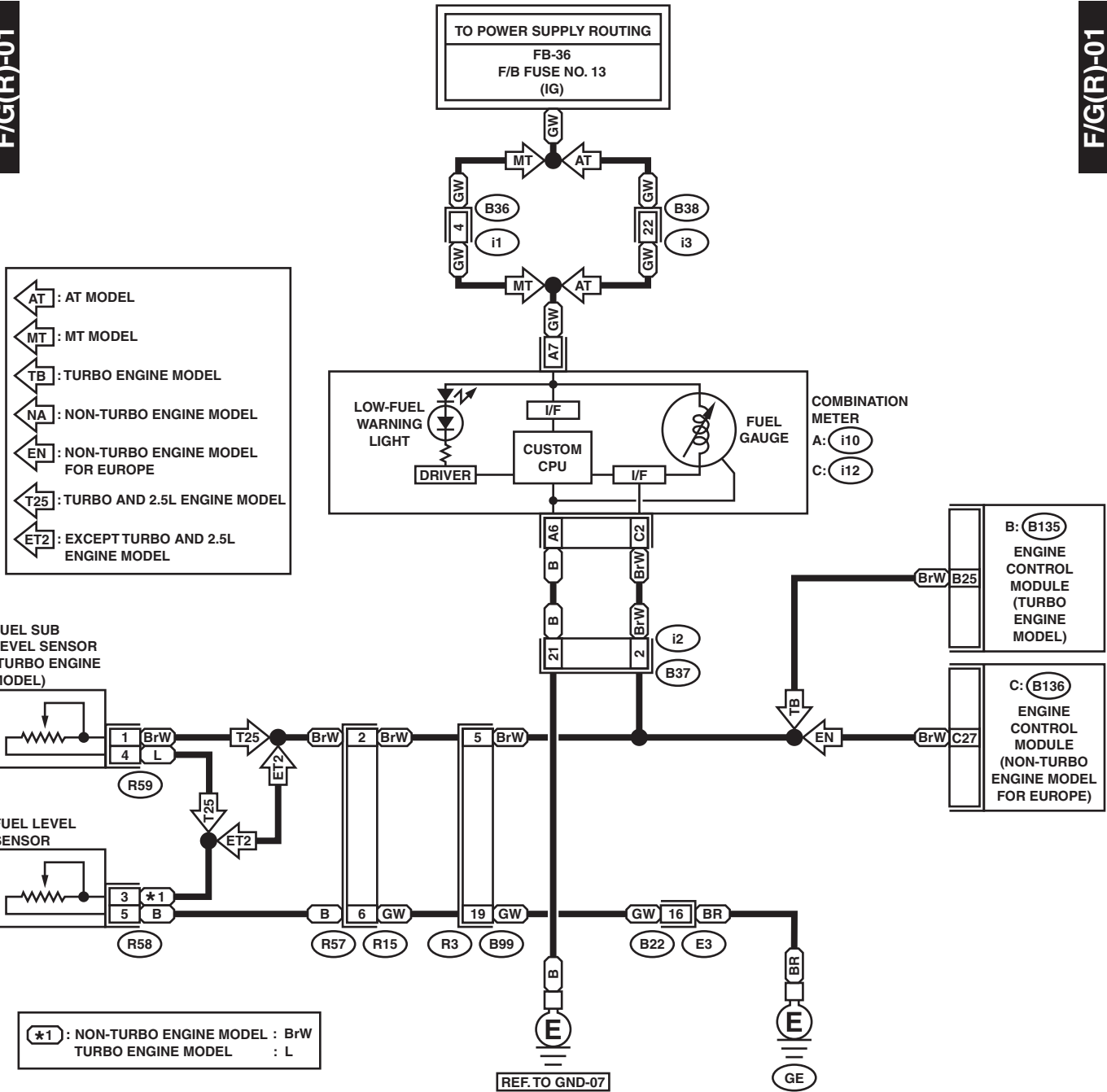
FUEL GAUGE SYSTEM

WIRING SYSTEM

2. RHD MODEL

F/G(R)-01

F/G(R)-01



GR61-21

18.Full-Time Dual-Range System

A: SCHEMATIC

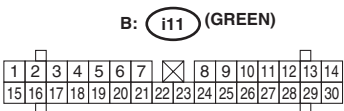
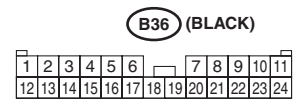
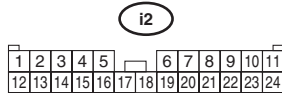
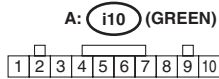
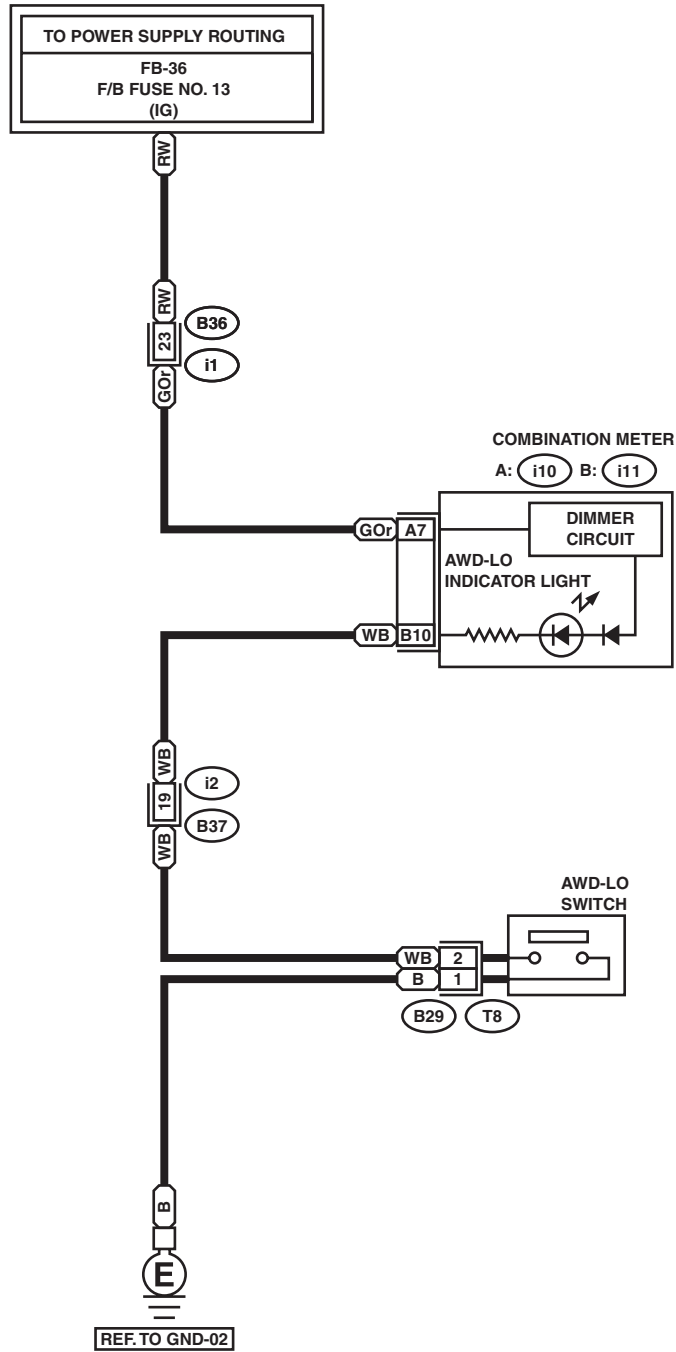
FULL-TIME DUAL-RANGE SYSTEM

WIRING SYSTEM

1. LHD MODEL

D/R(L)-01

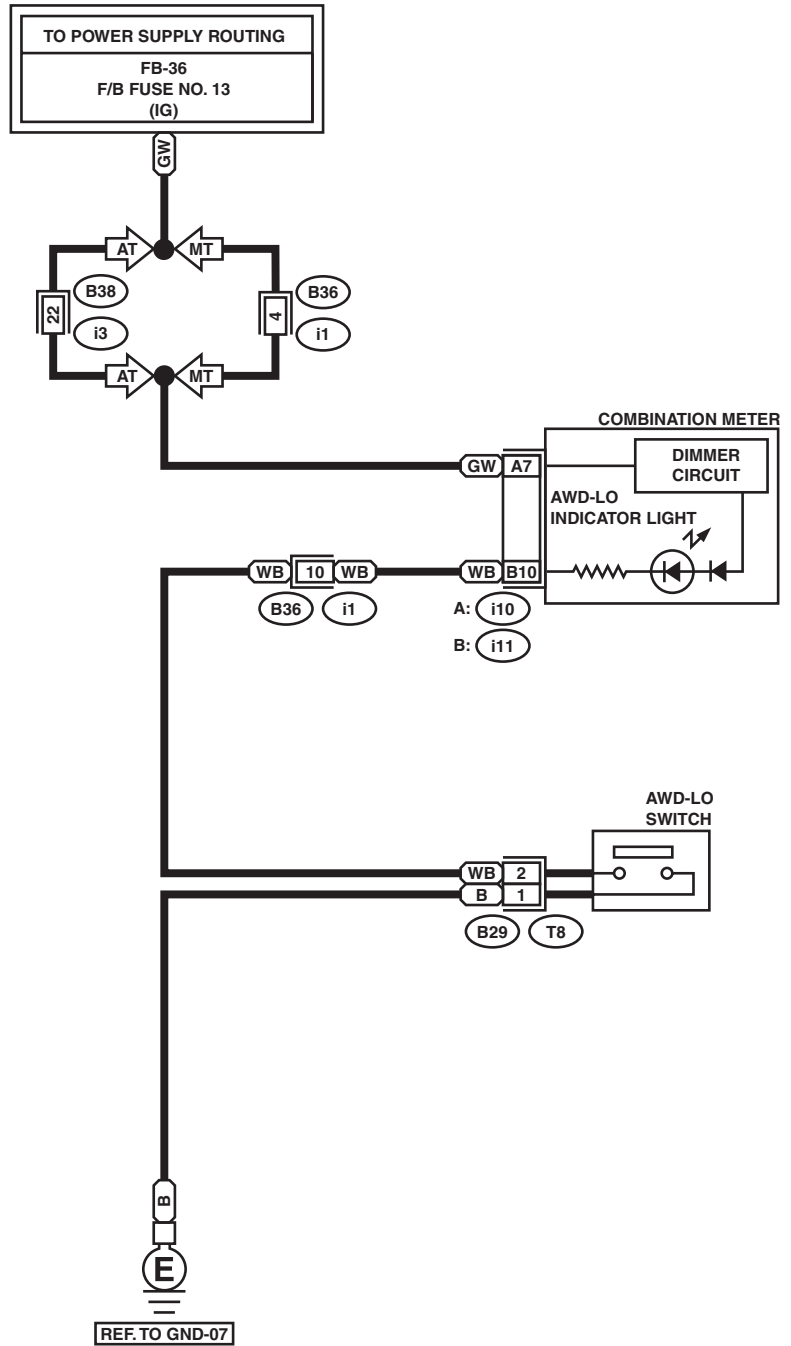
D/R(L)-01



2. RHD MODEL

D/R(R)-01

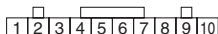
D/R(R)-01



B29



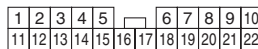
A: i10 (GREEN)



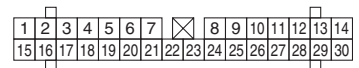
i1 (BLACK)



i3 (BLACK)



B: i11 (GREEN)



FRONT ACCESSORY POWER SUPPLY SYSTEM

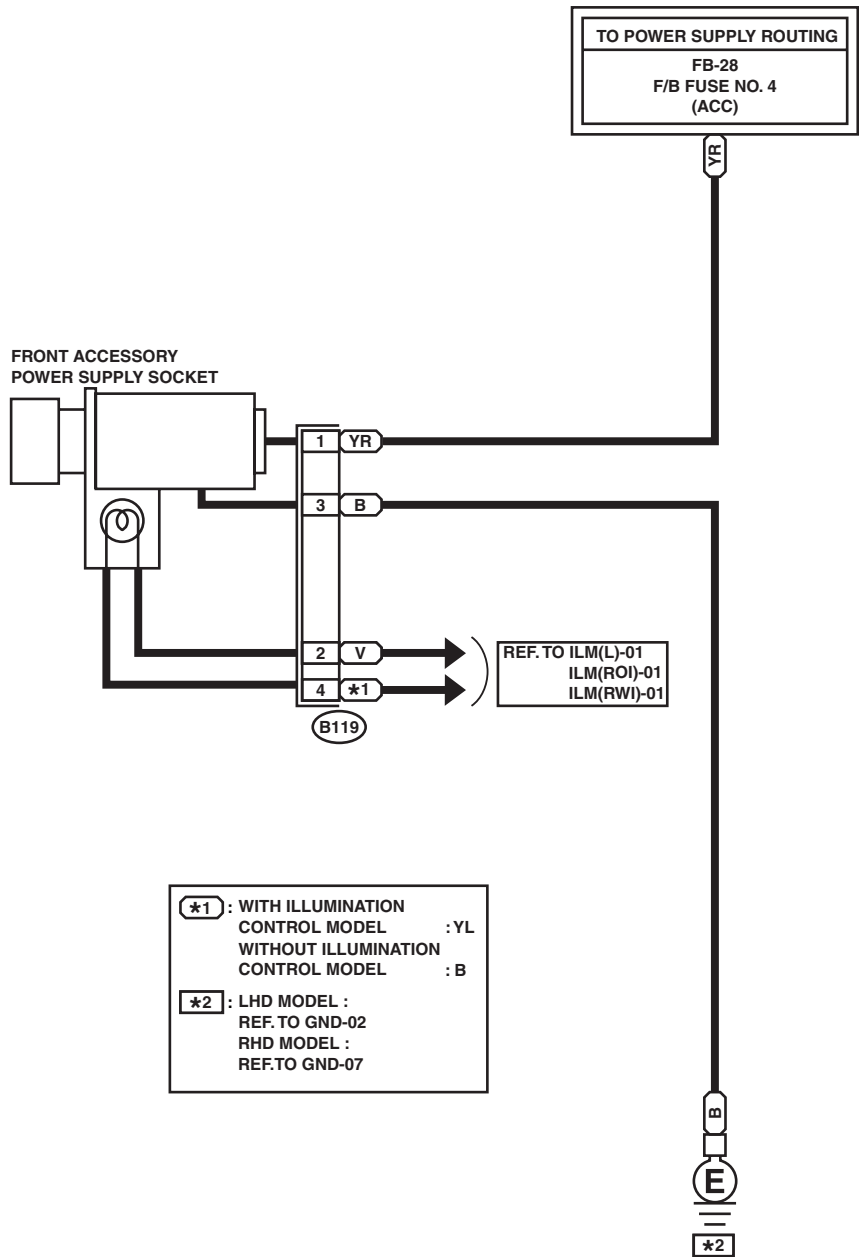
WIRING SYSTEM

19. Front Accessory Power Supply System

A: SCHEMATIC

FAPS-01

FAPS-01

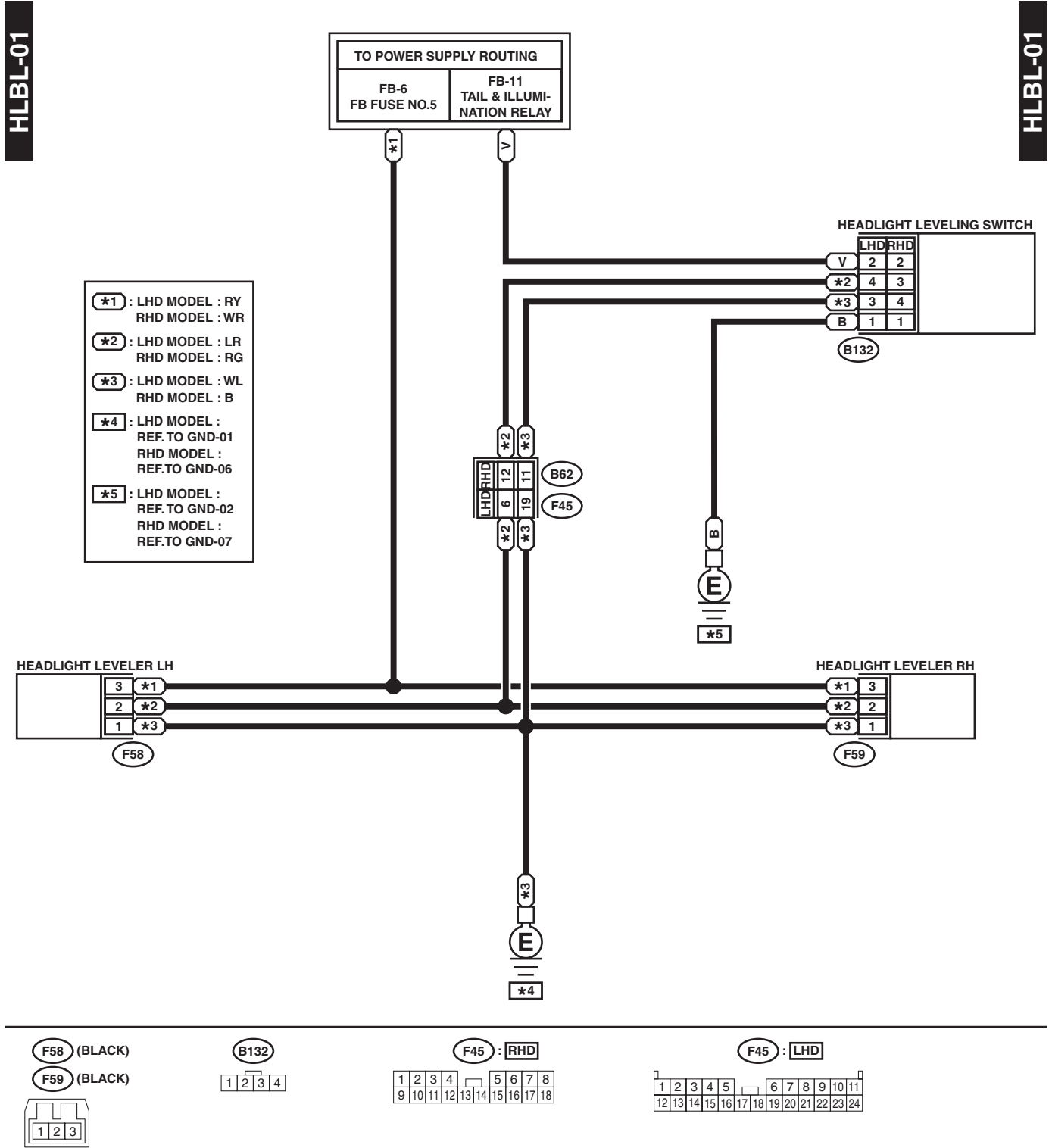


B119



20.Headlight Beam Leveler System

A: SCHEMATIC



HORN SYSTEM

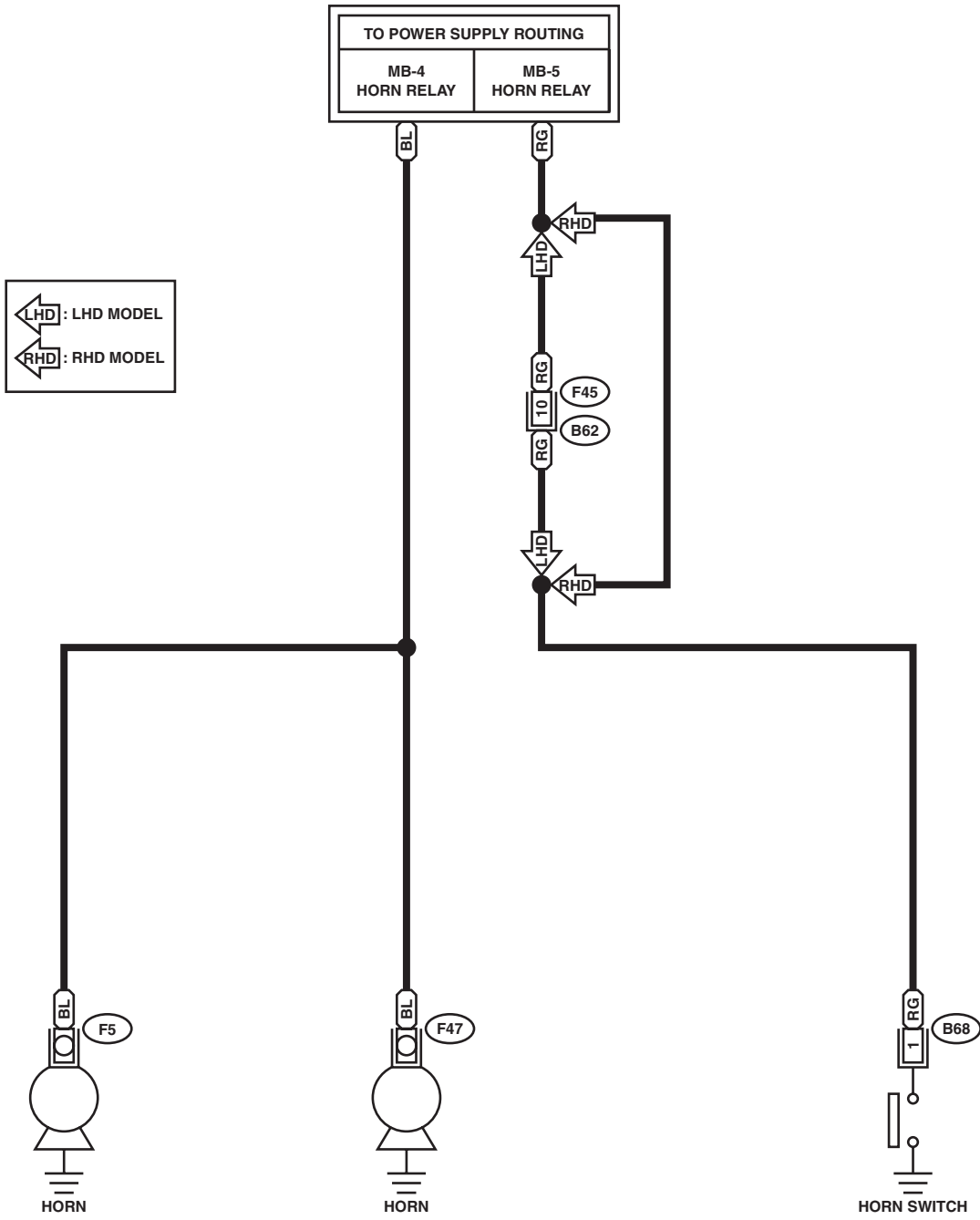
WIRING SYSTEM

21.Horn System

A: SCHEMATIC

HORN-01

HORN-01



(B68) (BLACK)

(F45)

1	2
3	4

1	2	3	4	5	6	7	8	9	10	11		
12	13	14	15	16	17	18	19	20	21	22	23	24

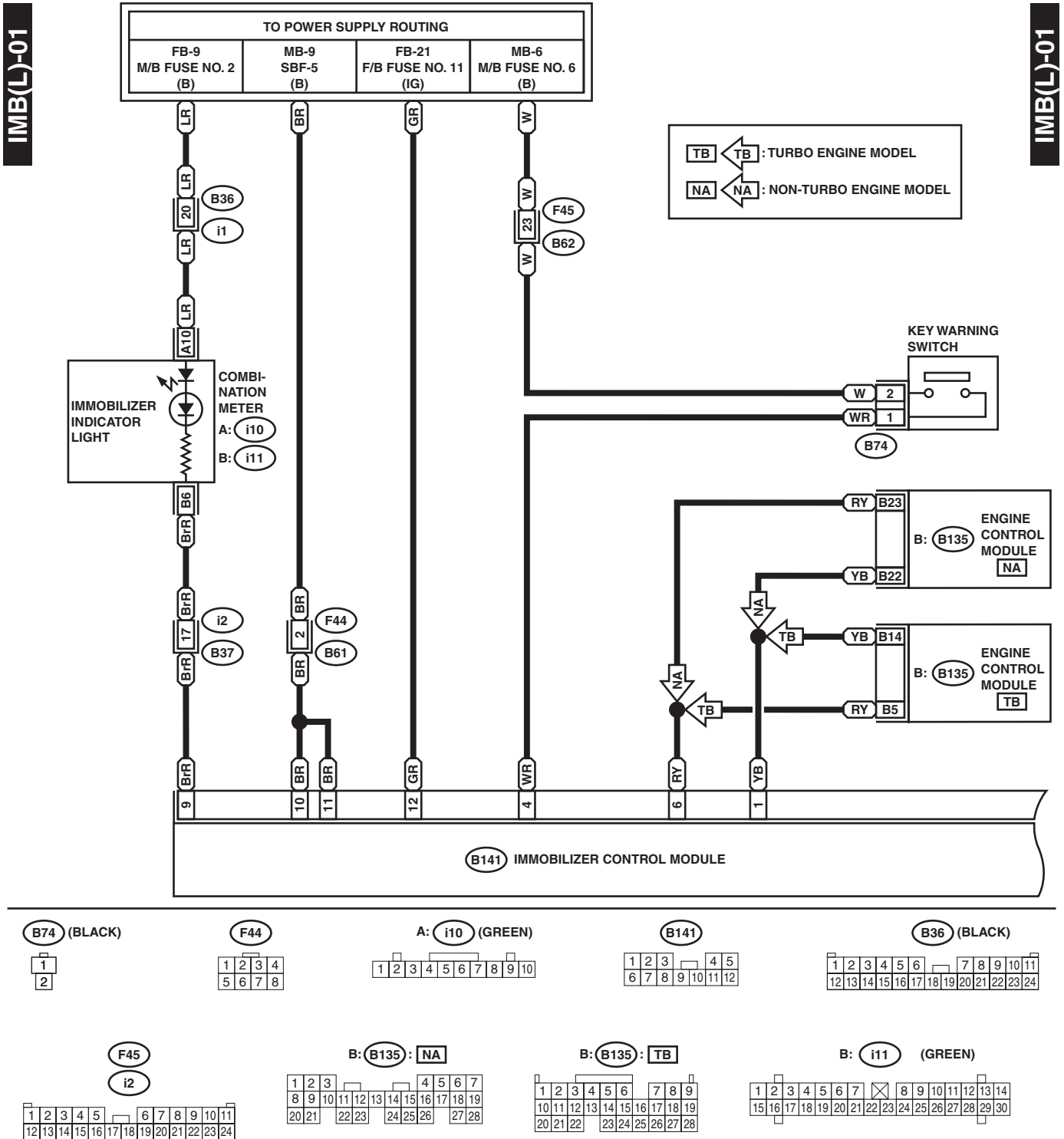
22. Immobilizer System

A: SCHEMATIC

IMMOBILIZER SYSTEM

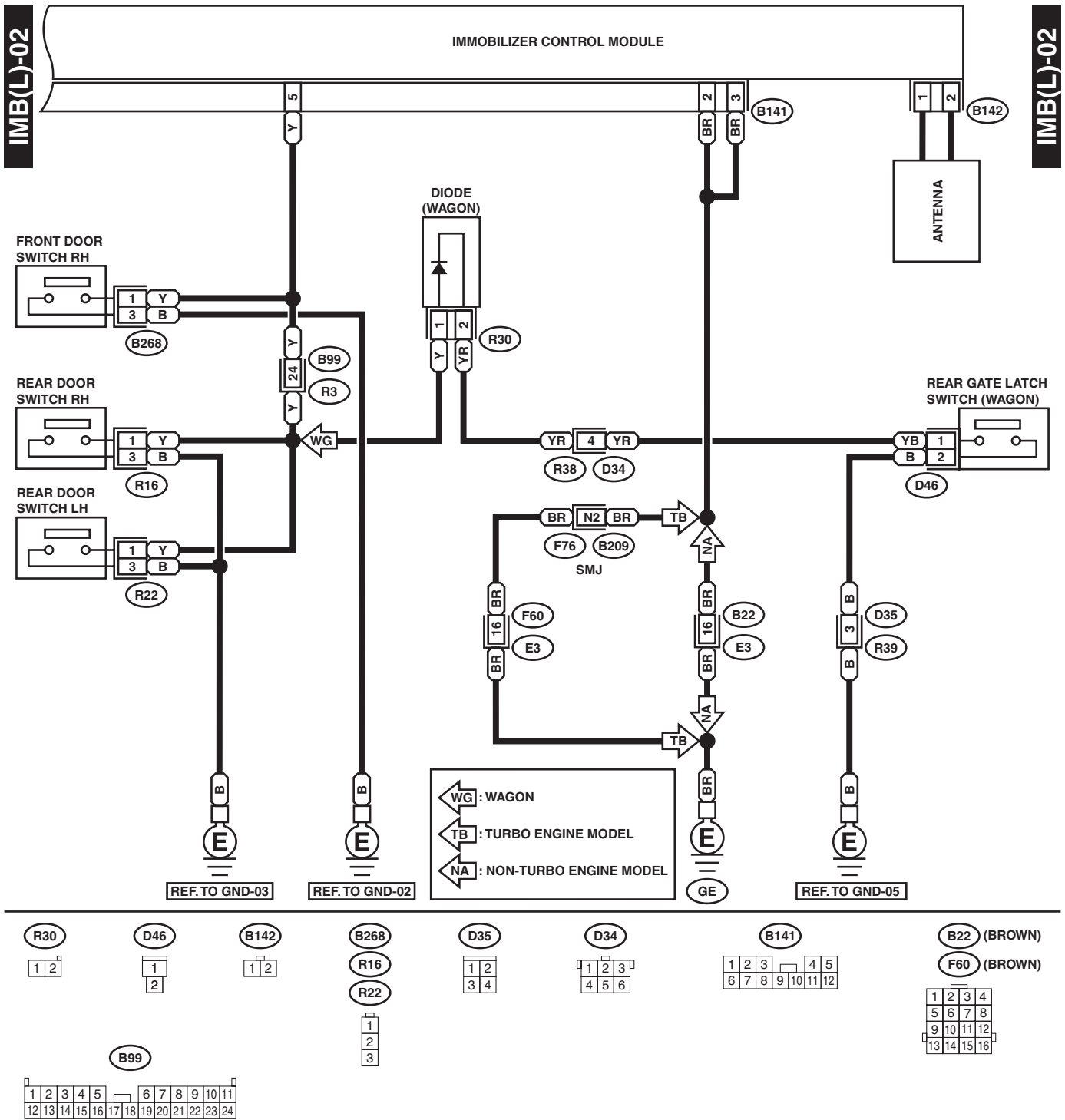
WIRING SYSTEM

1. LHD MODEL



IMMOBILIZER SYSTEM

WIRING SYSTEM



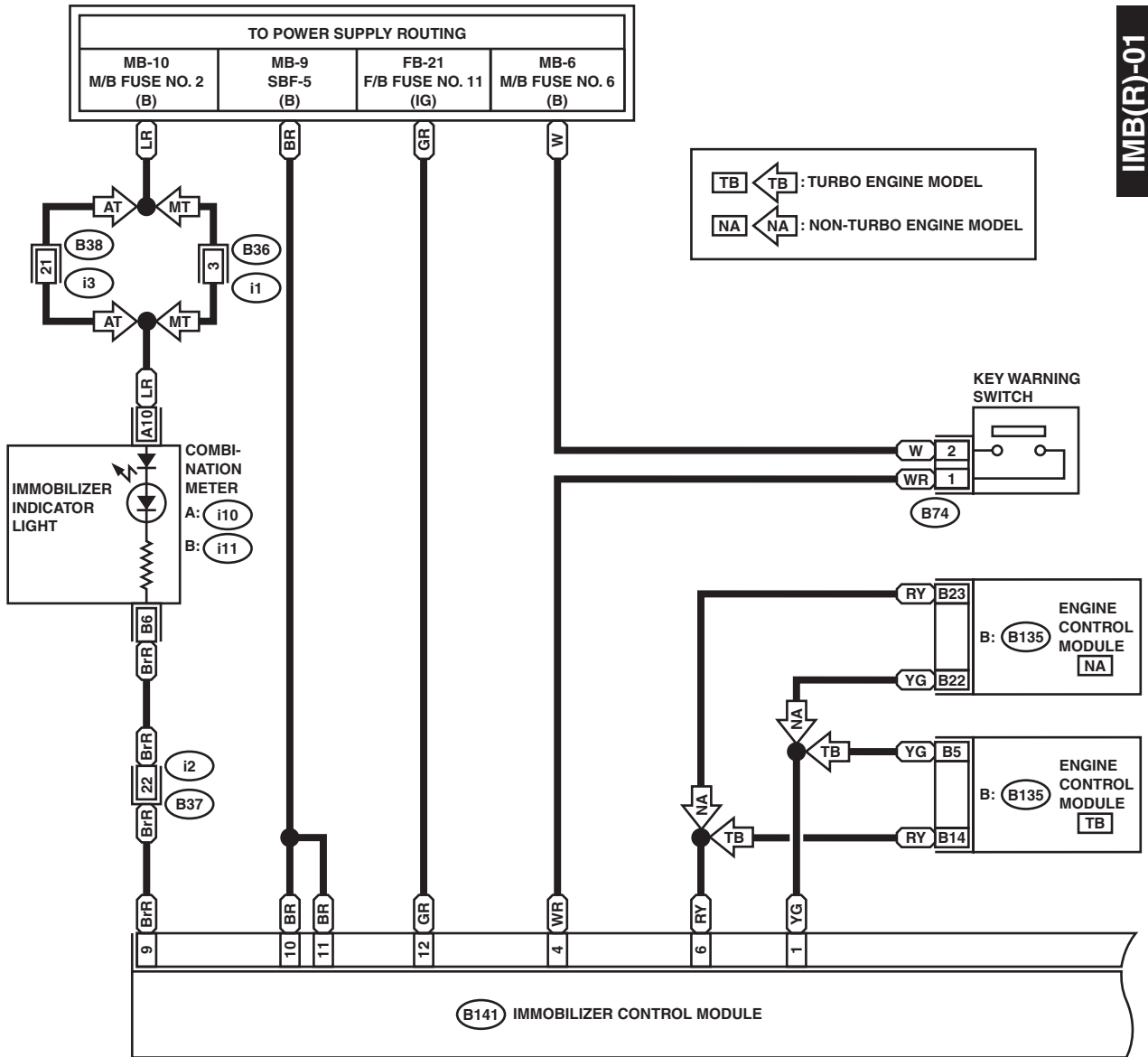
IMMOBILIZER SYSTEM

WIRING SYSTEM

2. RHD MODEL

IMB(R)-01

IMB(R)-01



B74 (BLACK)

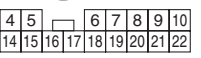
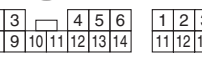
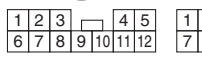
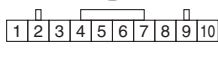
A: i10 (GREEN)

B141

i1 (BLACK)

i3 (BLACK)

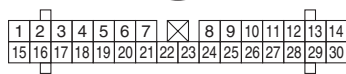
B: B135: NA



B: B135: TB

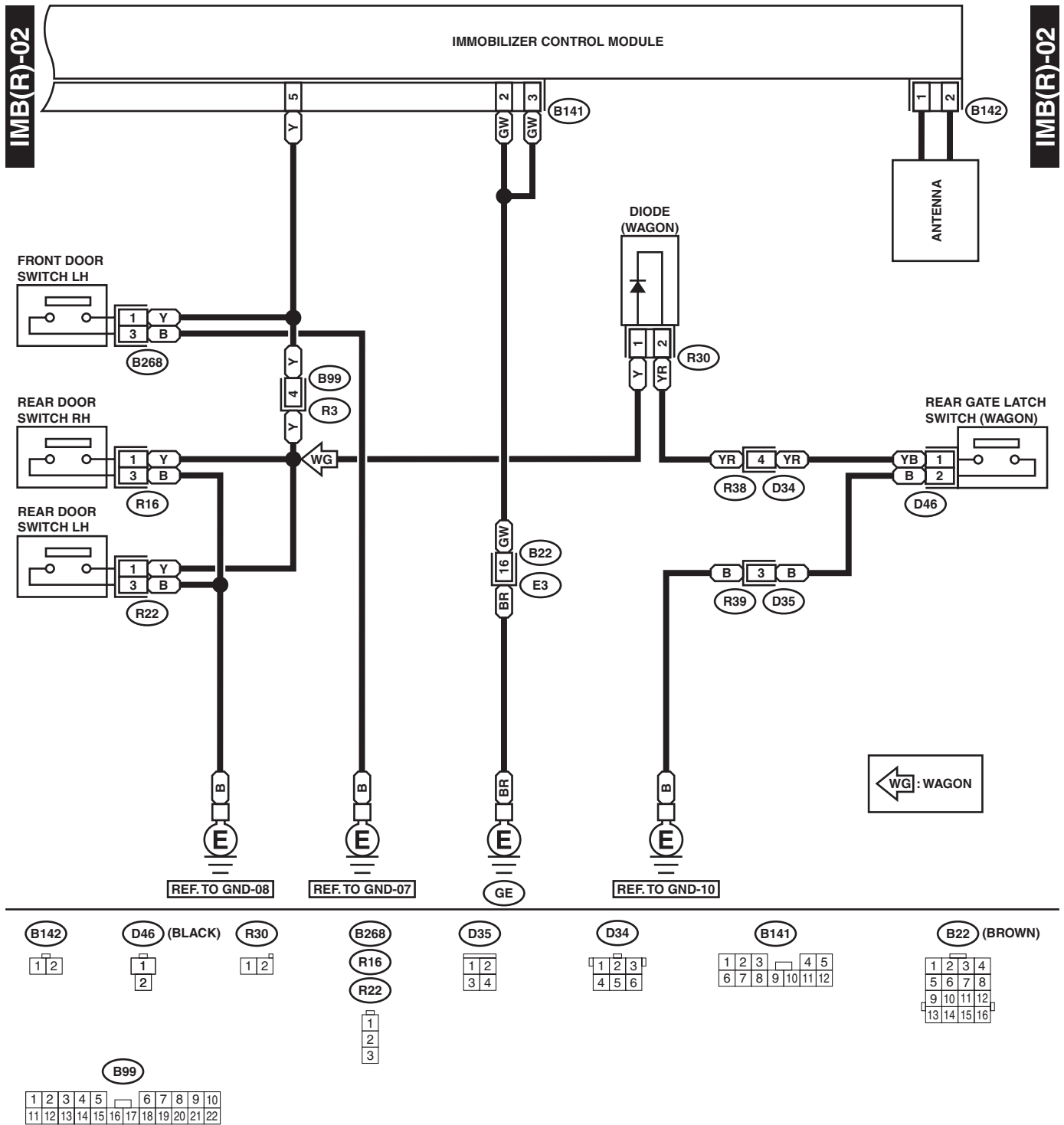
B: i11 (GREEN)

i2



IMMOBILIZER SYSTEM

WIRING SYSTEM



GR91-21B

23.Keyless Entry System

A: SCHEMATIC

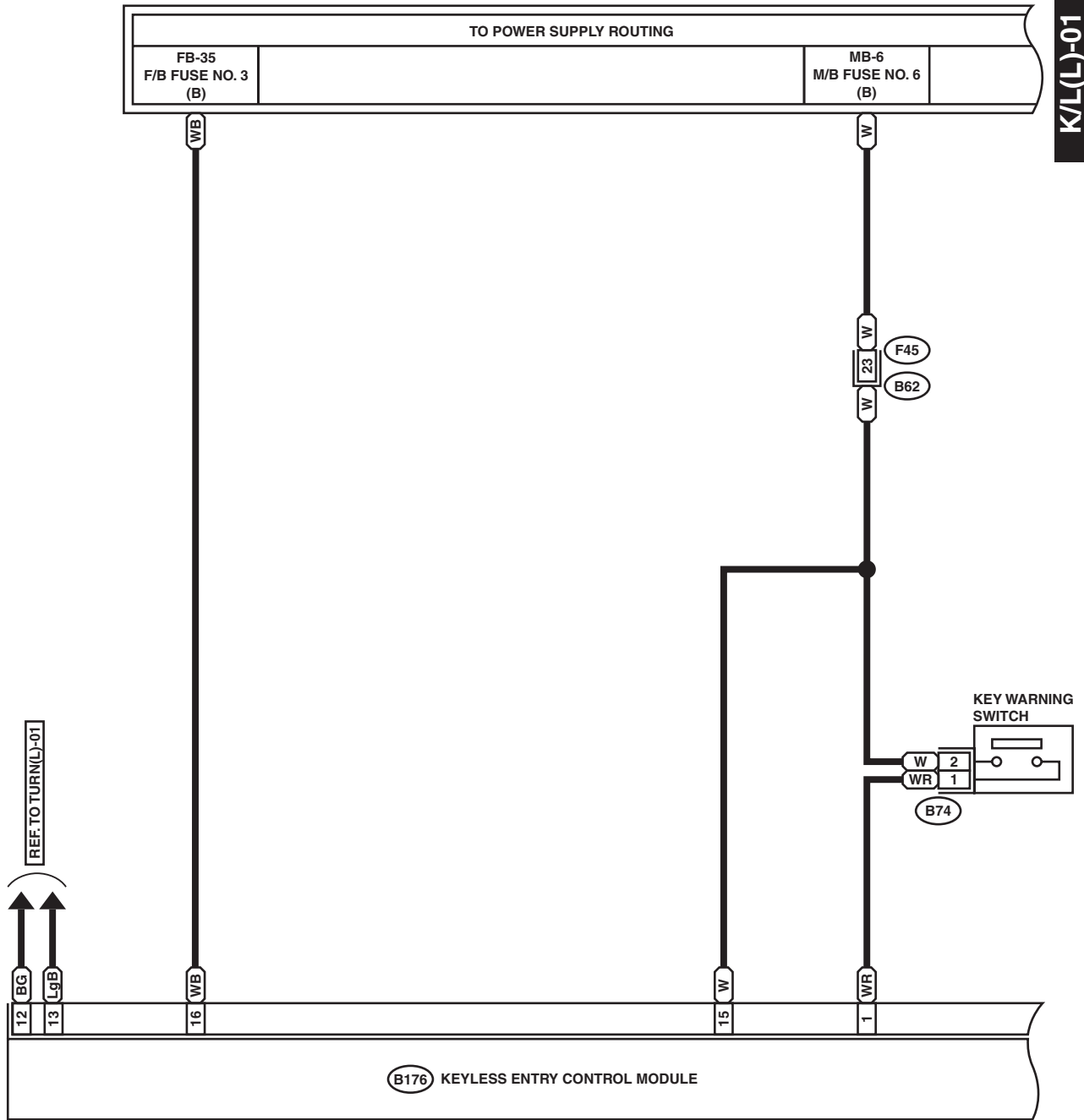
KEYLESS ENTRY SYSTEM

WIRING SYSTEM

1. LHD MODEL

K/L(L)-01

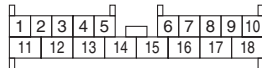
K/L(L)-01



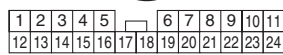
B74 (BLACK)



B176



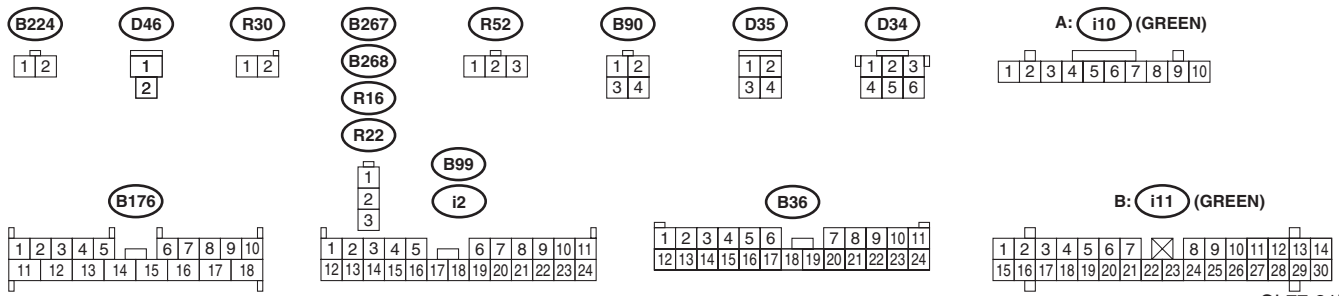
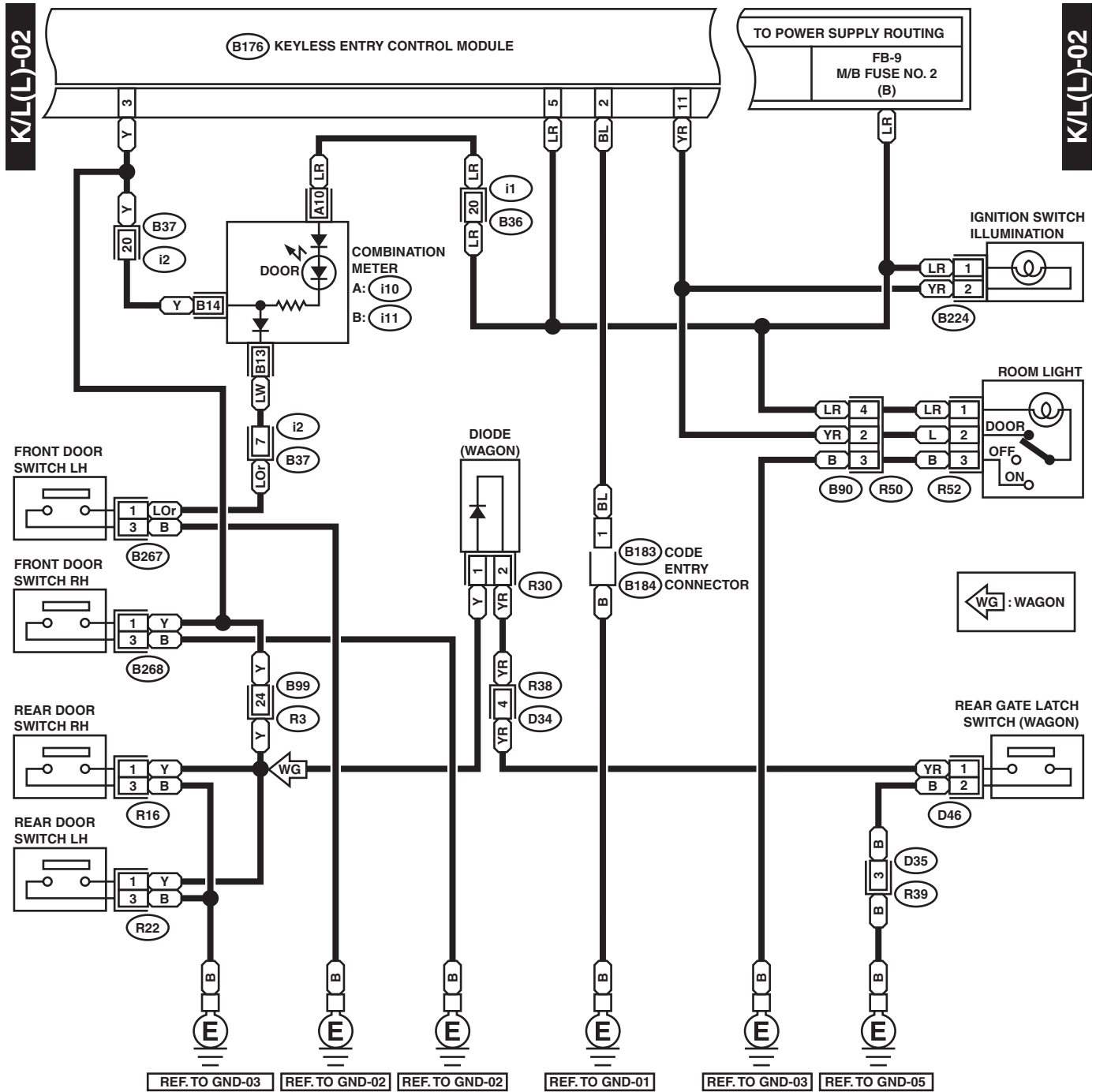
F45



GL77-21A

KEYLESS ENTRY SYSTEM

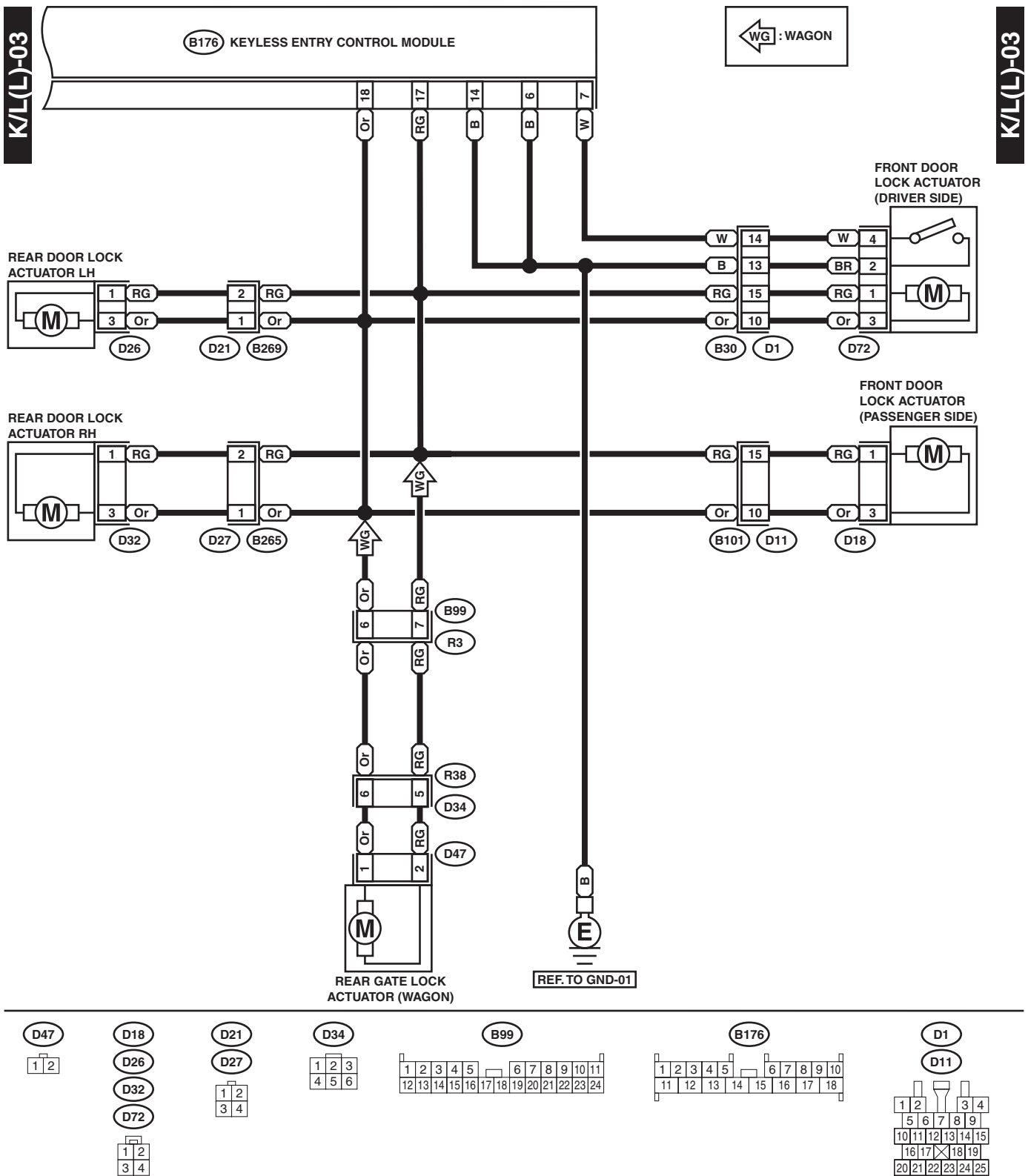
WIRING SYSTEM



GL77-21B

KEYLESS ENTRY SYSTEM

WIRING SYSTEM

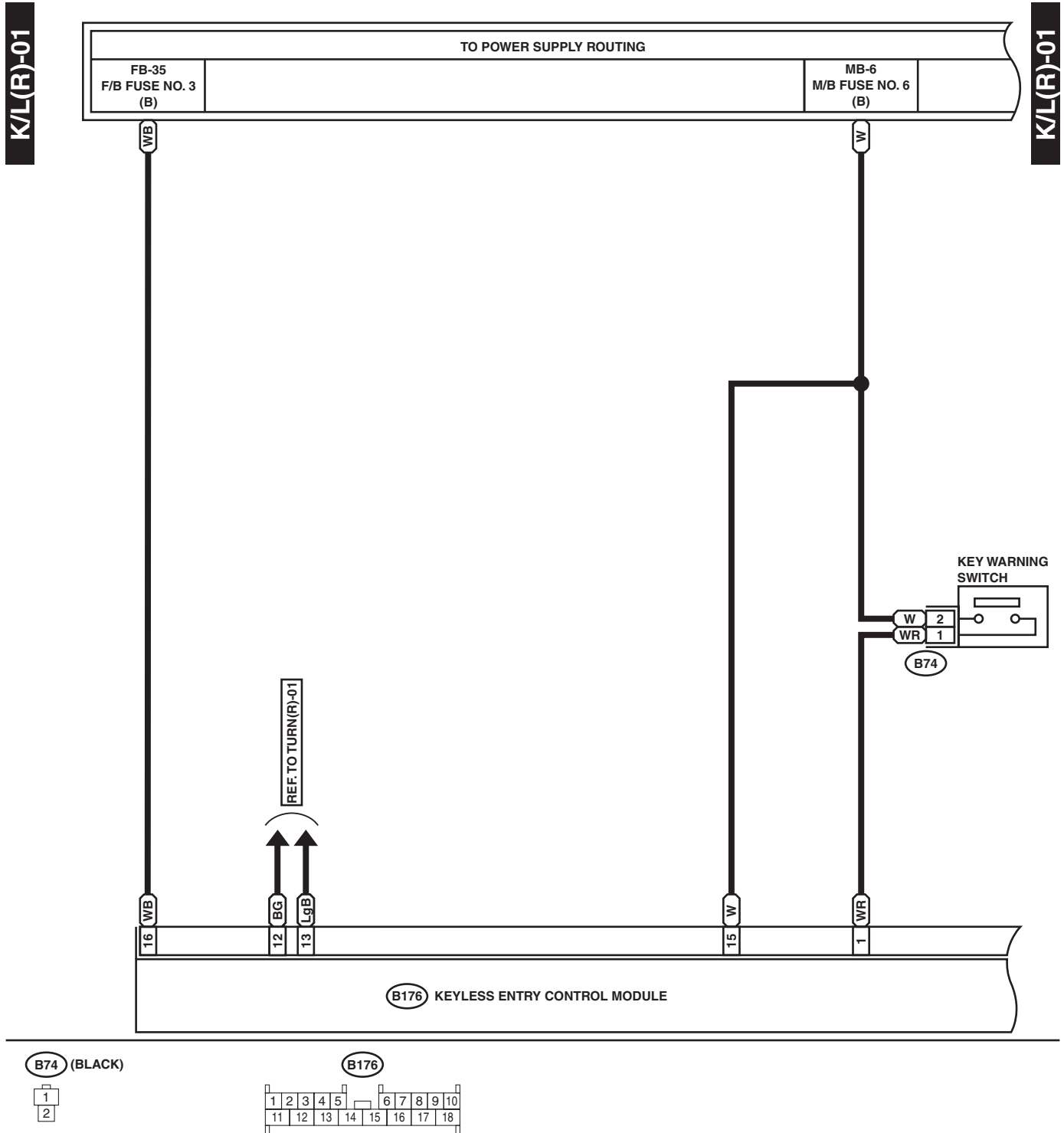


GL77-21C

KEYLESS ENTRY SYSTEM

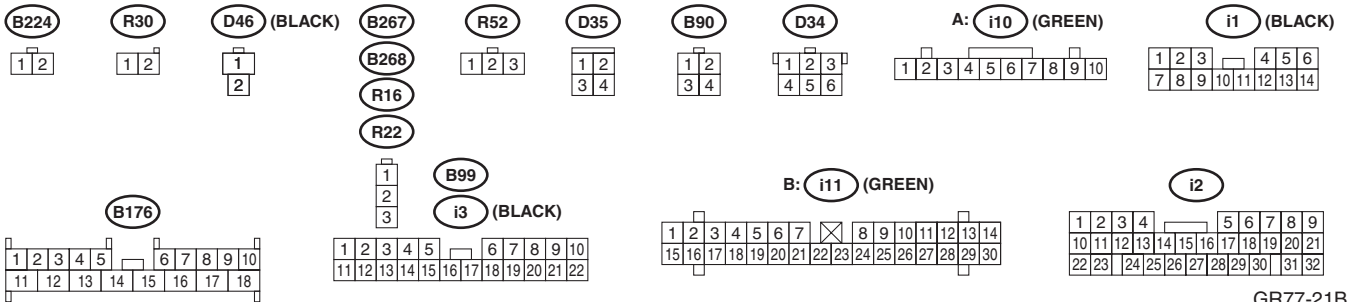
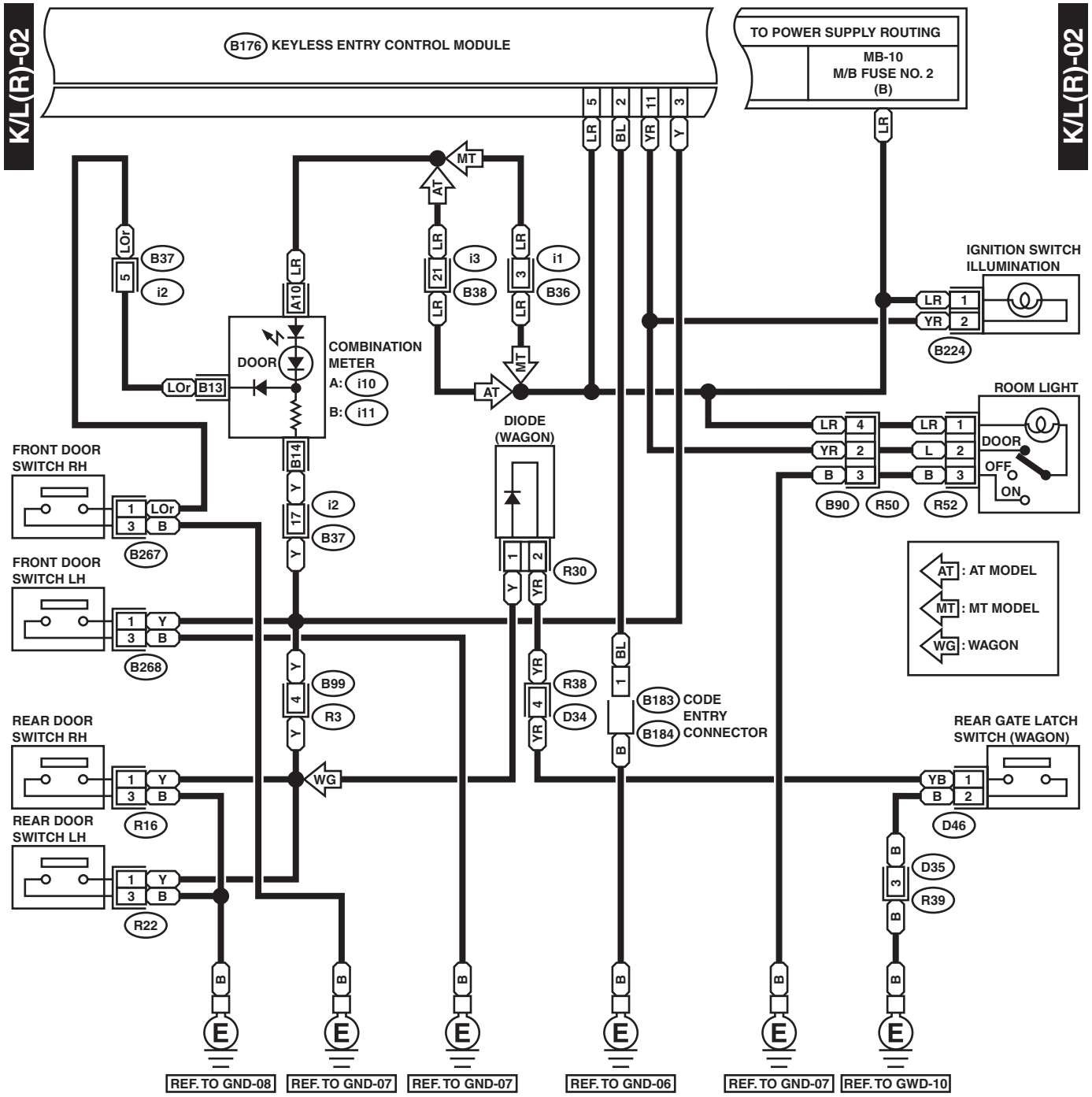
WIRING SYSTEM

2. RHD MODEL



KEYLESS ENTRY SYSTEM

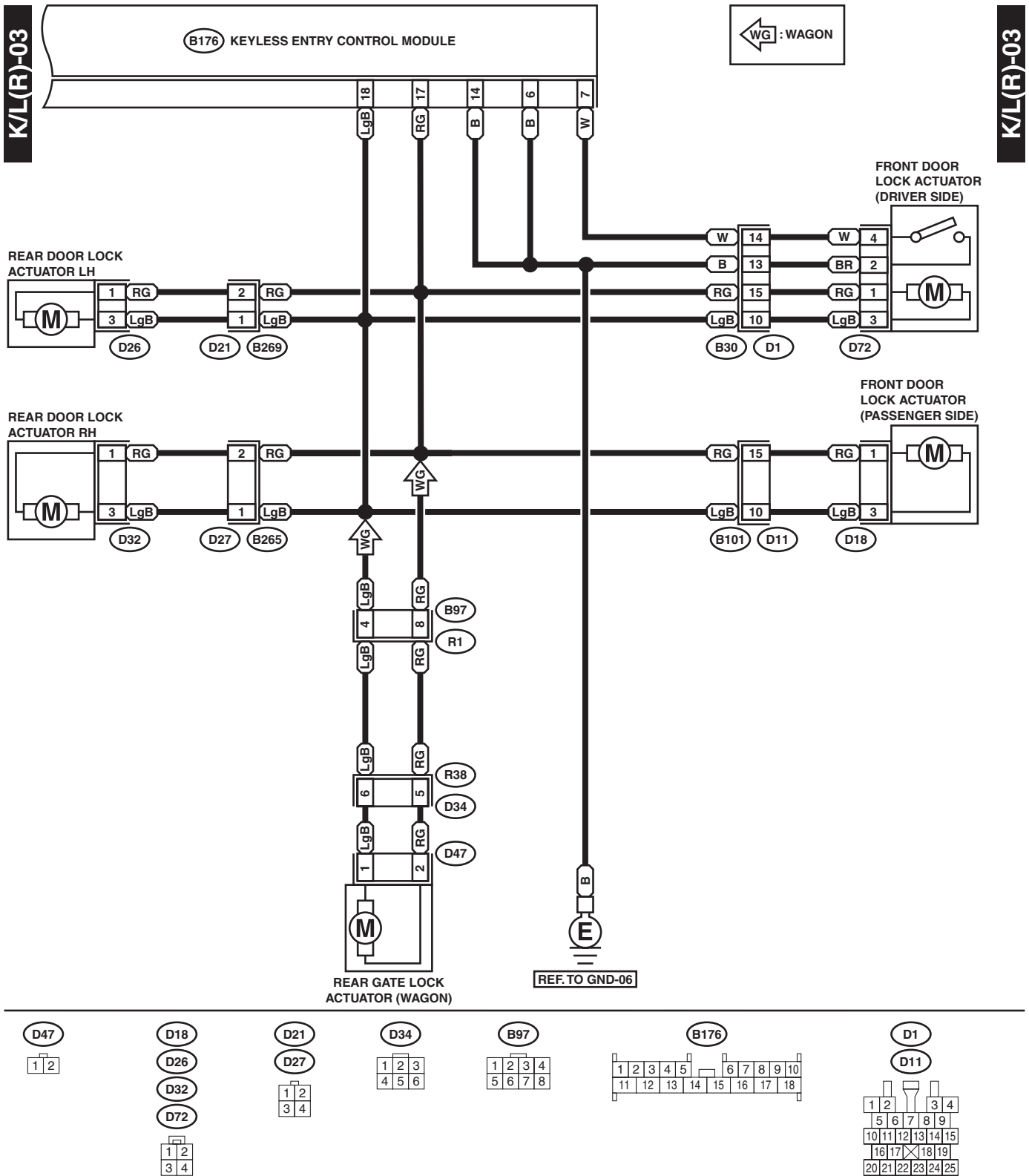
WIRING SYSTEM



GR77-21B

KEYLESS ENTRY SYSTEM

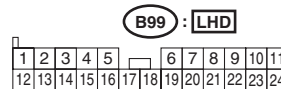
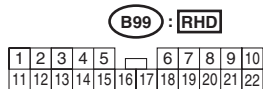
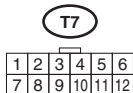
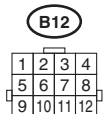
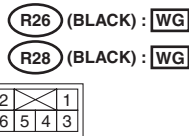
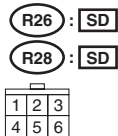
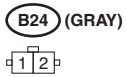
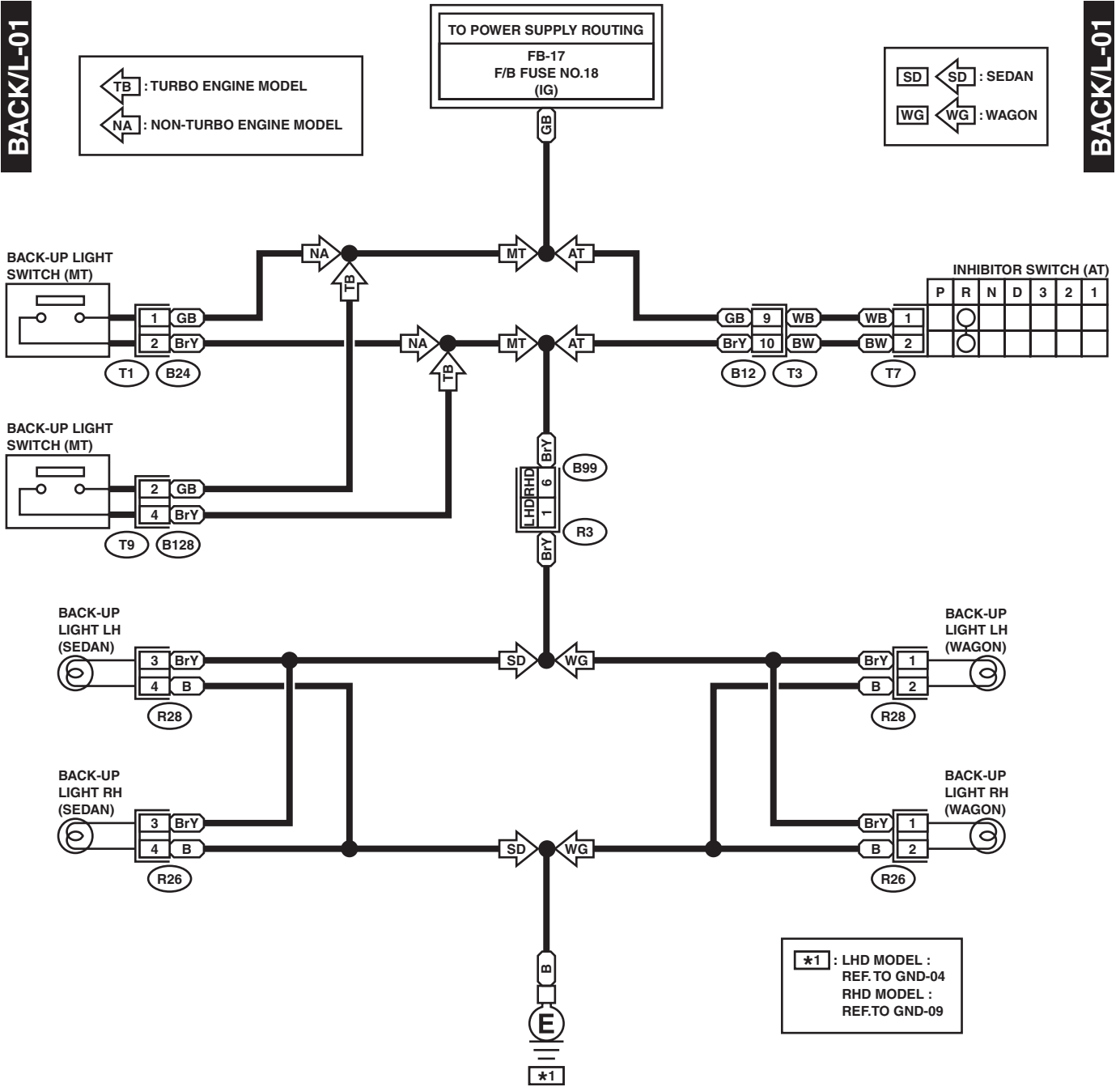
WIRING SYSTEM



GR77-21C

24.Back-up Light System

A: SCHEMATIC



CLEARANCE LIGHT AND ILLUMINATION LIGHT SYSTEM

WIRING SYSTEM

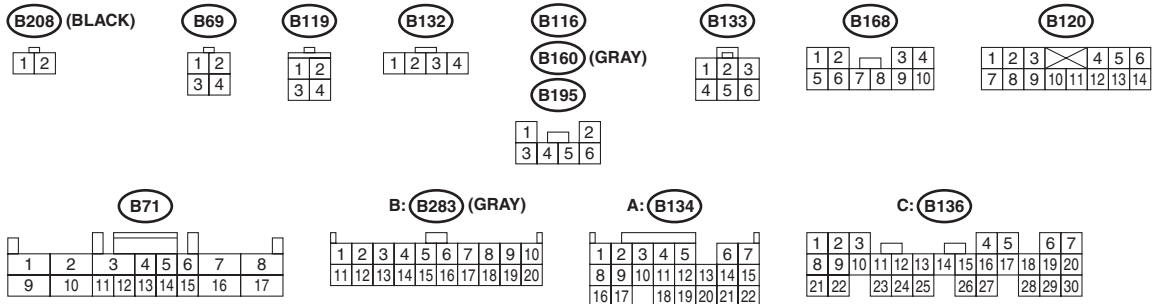
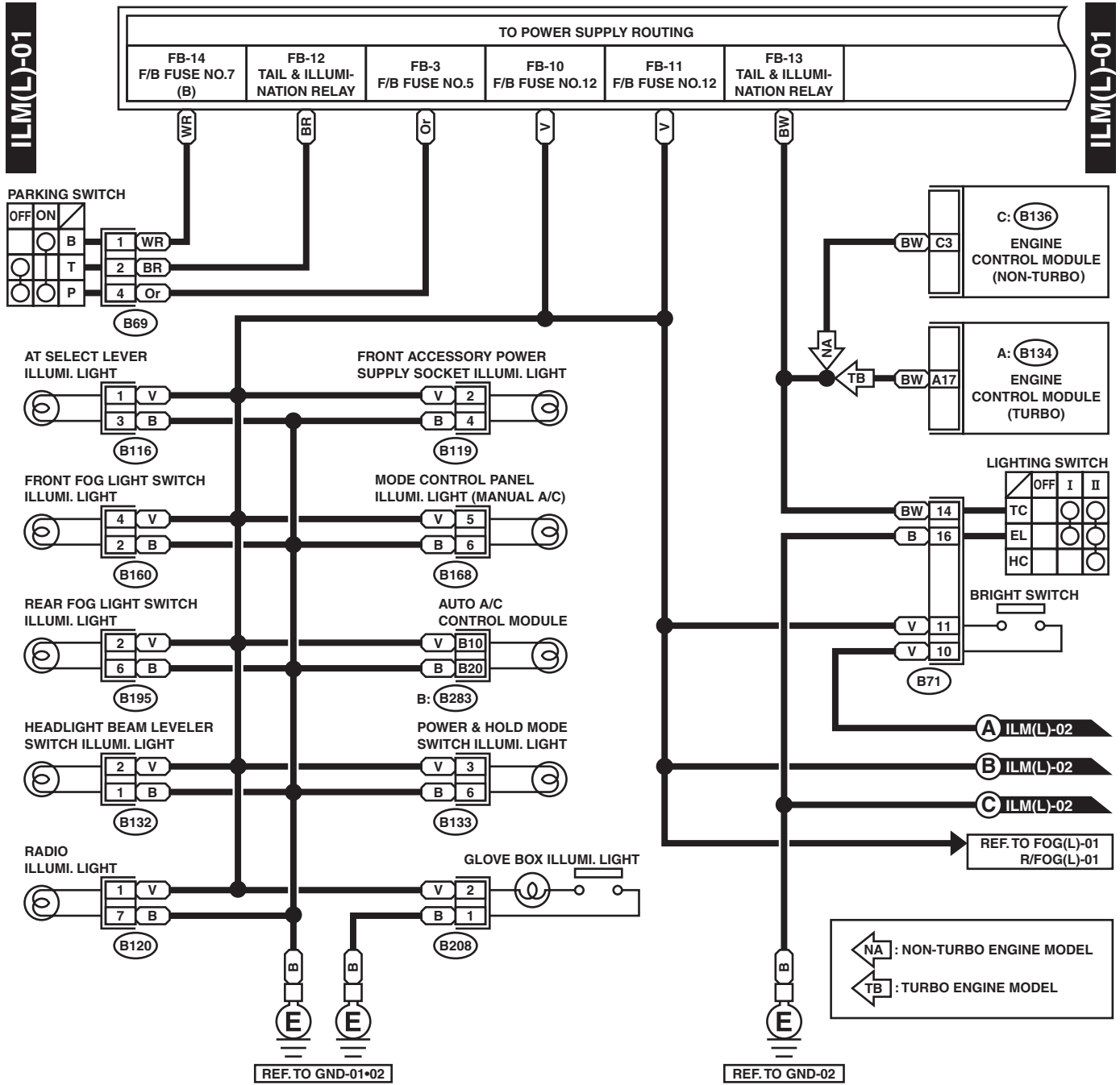
25. Clearance Light and Illumination Light System

A: SCHEMATIC

CLEARANCE LIGHT AND ILLUMINATION LIGHT SYSTEM

WIRING SYSTEM

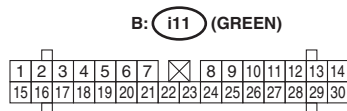
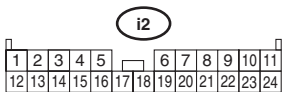
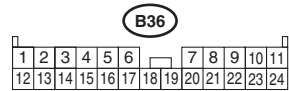
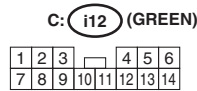
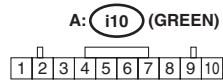
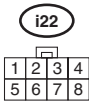
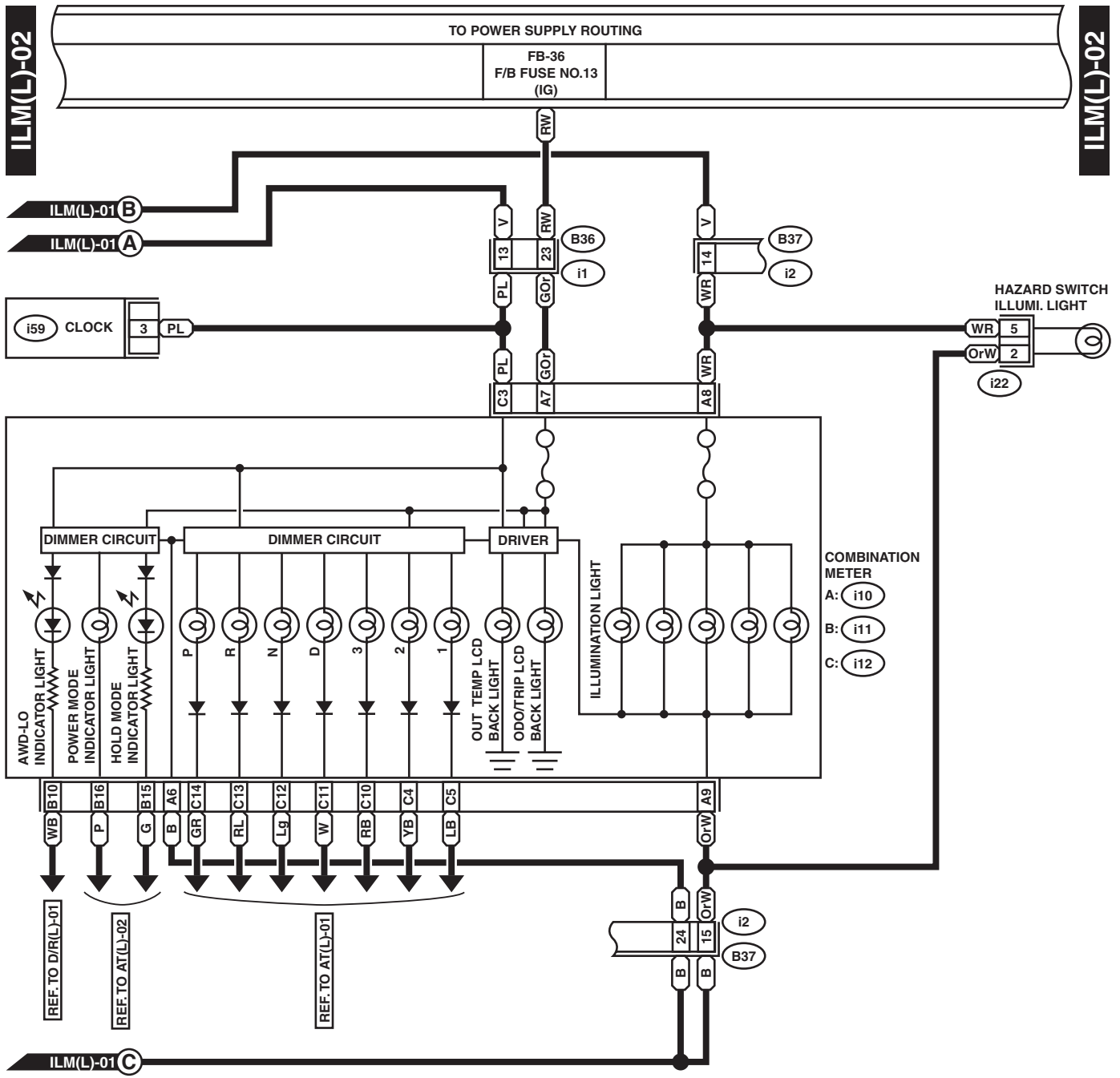
1. LHD MODEL



GL21-22A

CLEARANCE LIGHT AND ILLUMINATION LIGHT SYSTEM

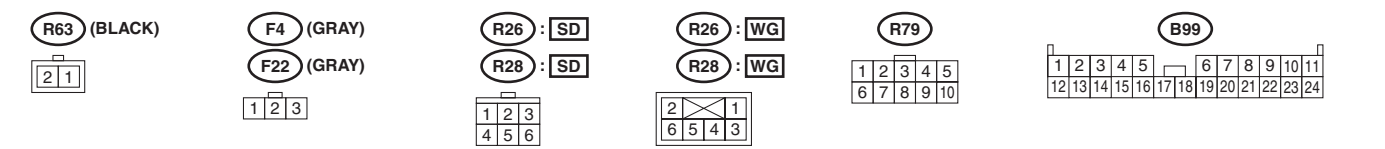
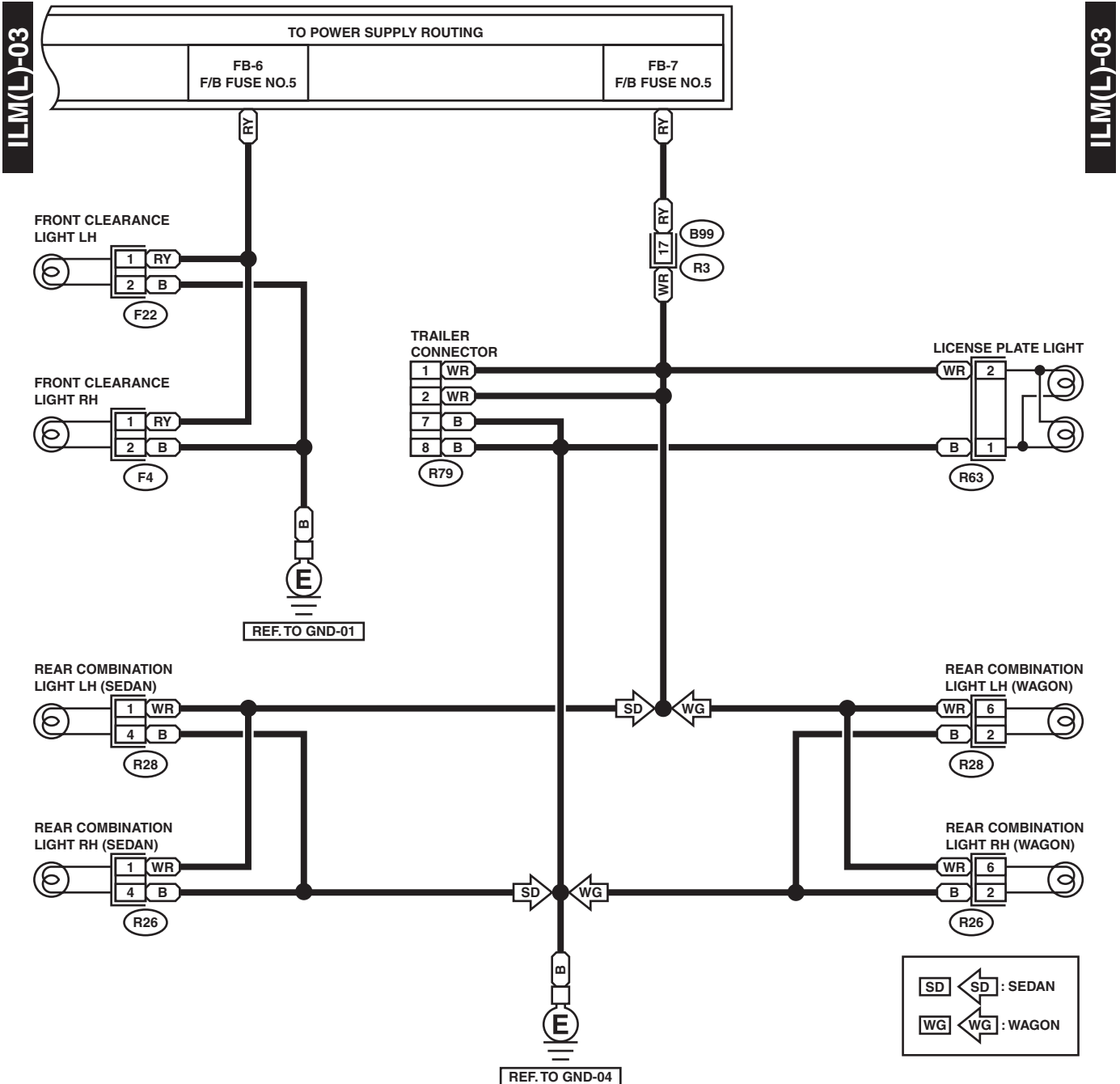
WIRING SYSTEM



GL21-22B

CLEARANCE LIGHT AND ILLUMINATION LIGHT SYSTEM

WIRING SYSTEM

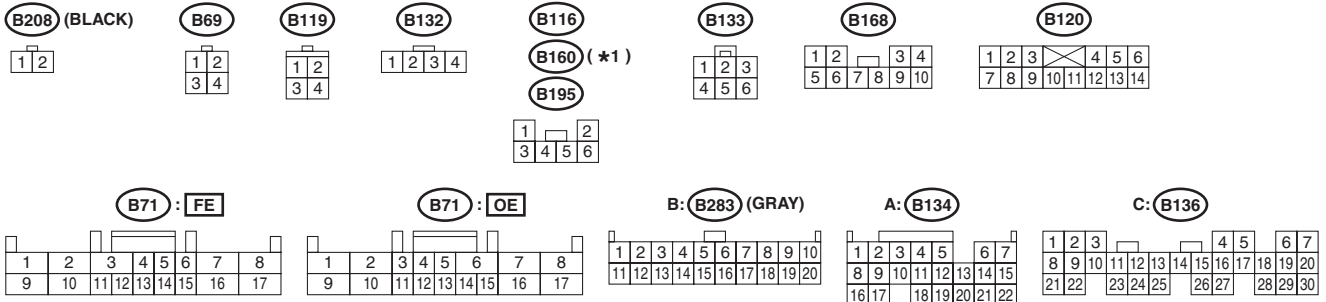
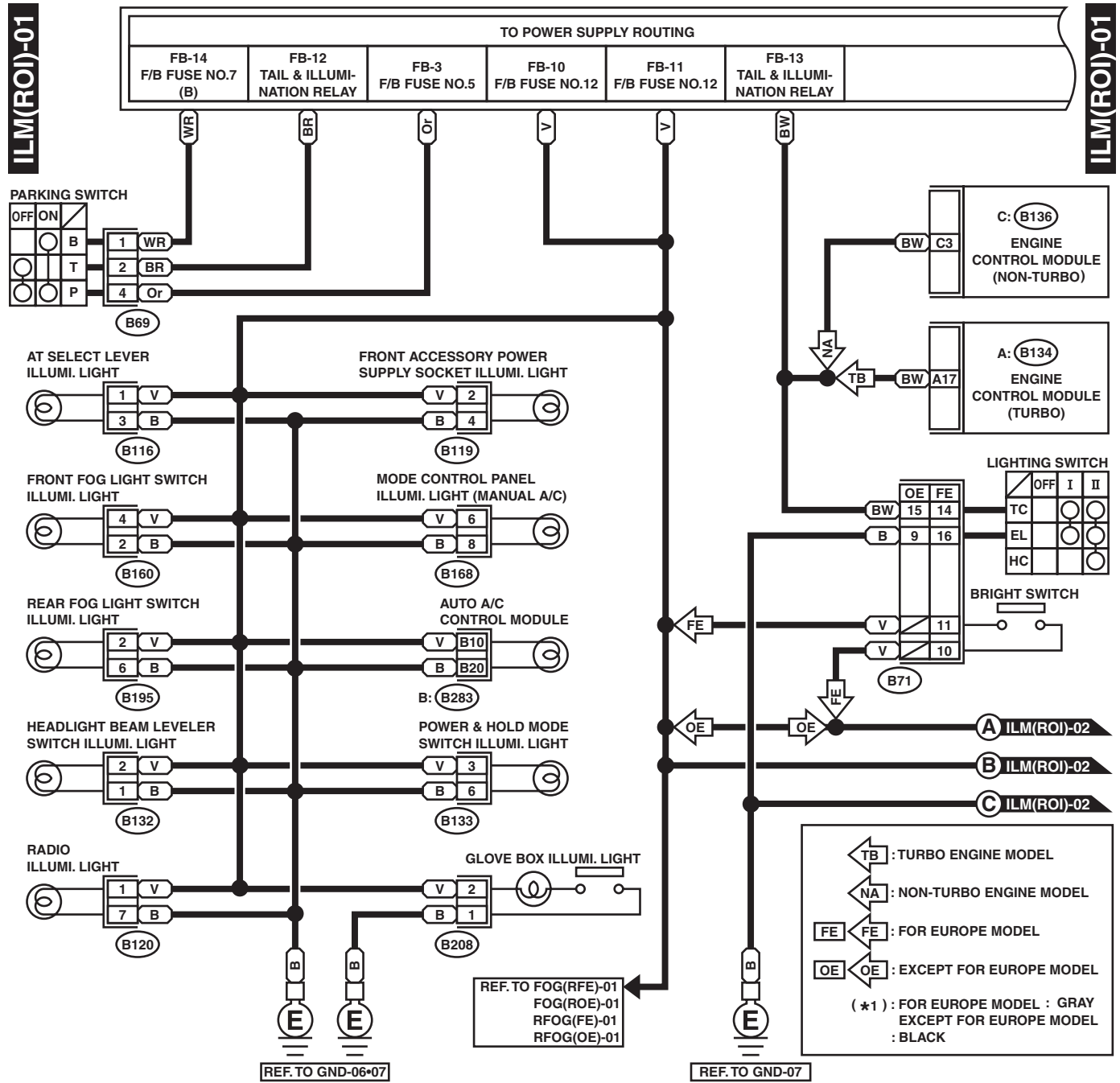


GL21-22C

CLEARANCE LIGHT AND ILLUMINATION LIGHT SYSTEM

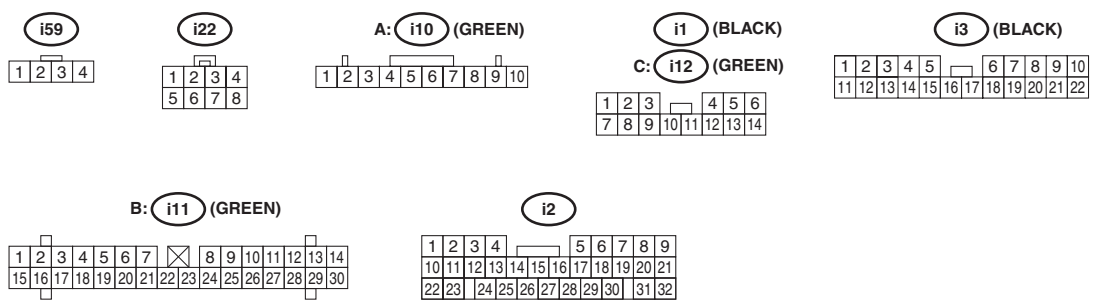
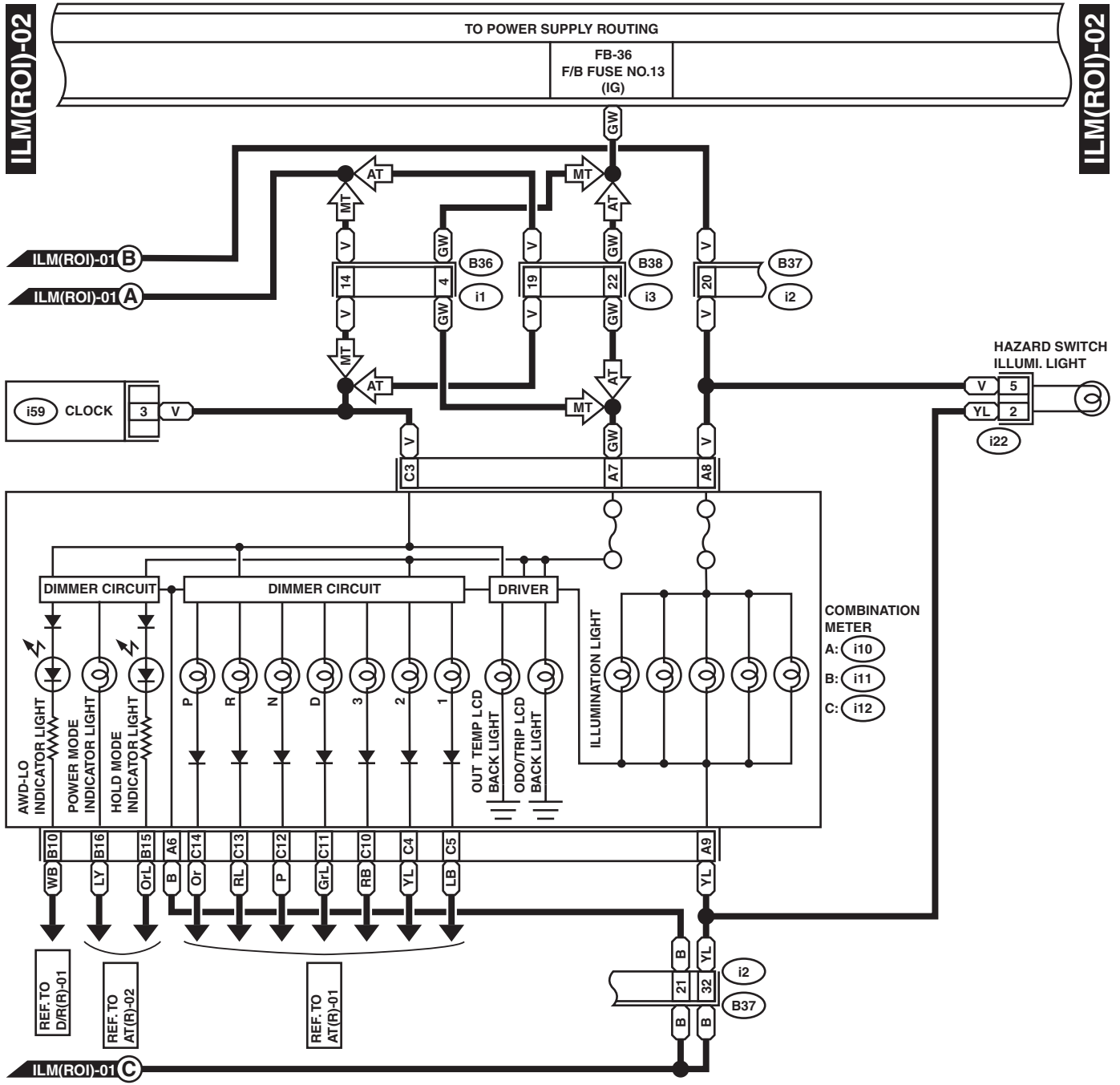
WIRING SYSTEM

2. RHD WITHOUT ILLUMINATION CONTROL MODEL



CLEARANCE LIGHT AND ILLUMINATION LIGHT SYSTEM

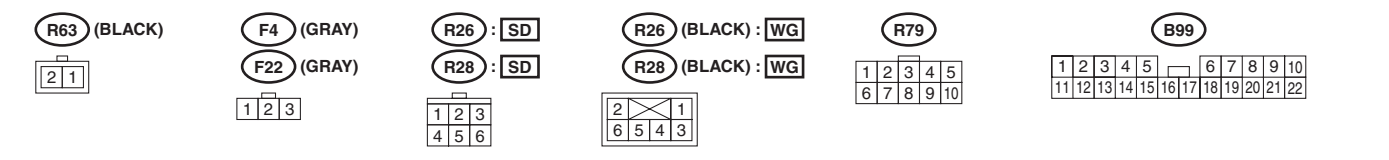
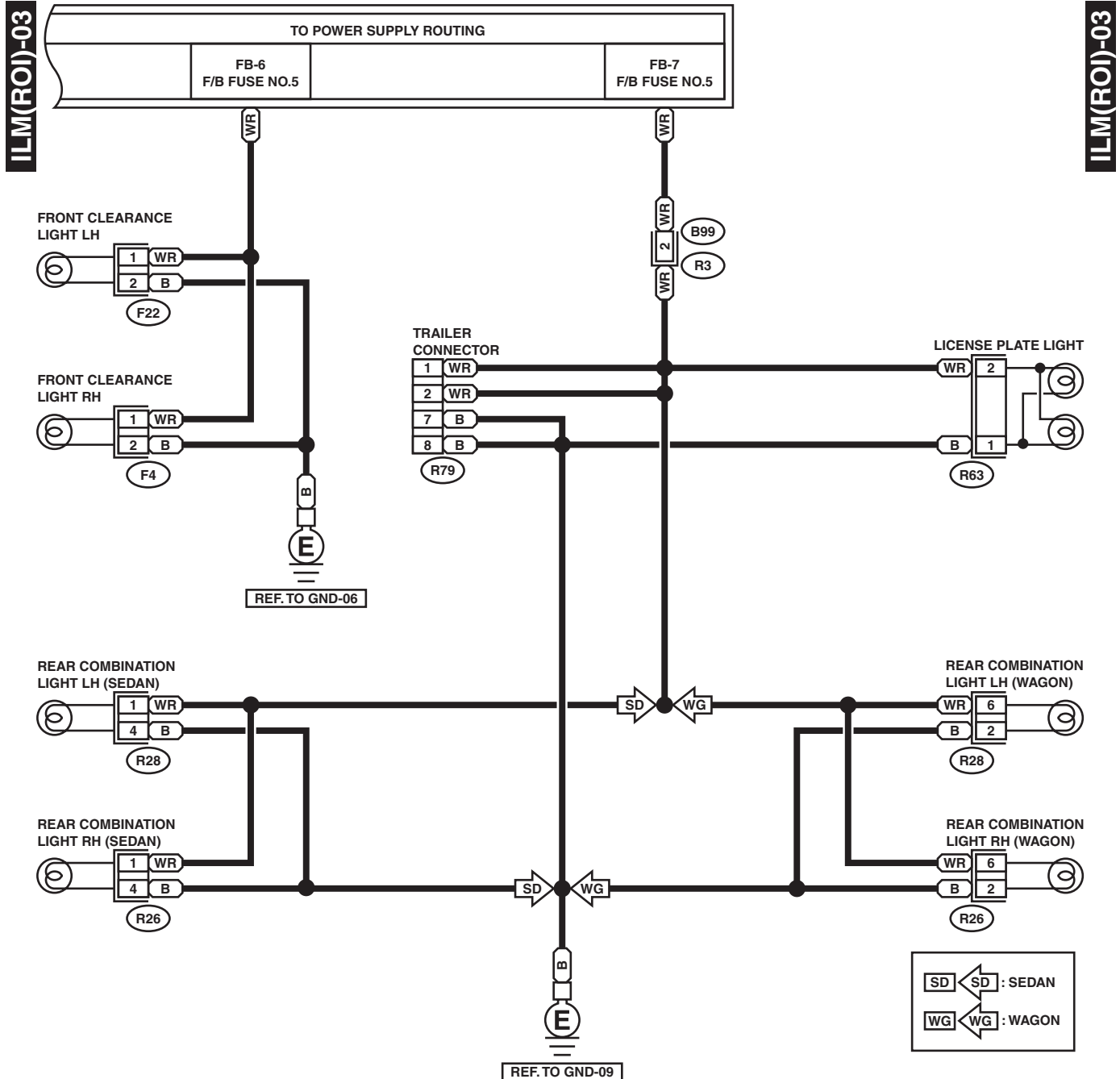
WIRING SYSTEM



GR21-23B

CLEARANCE LIGHT AND ILLUMINATION LIGHT SYSTEM

WIRING SYSTEM

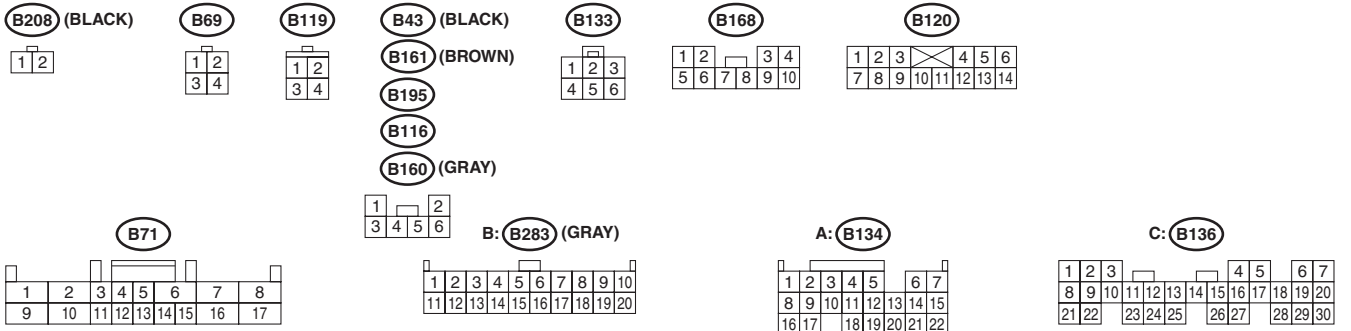
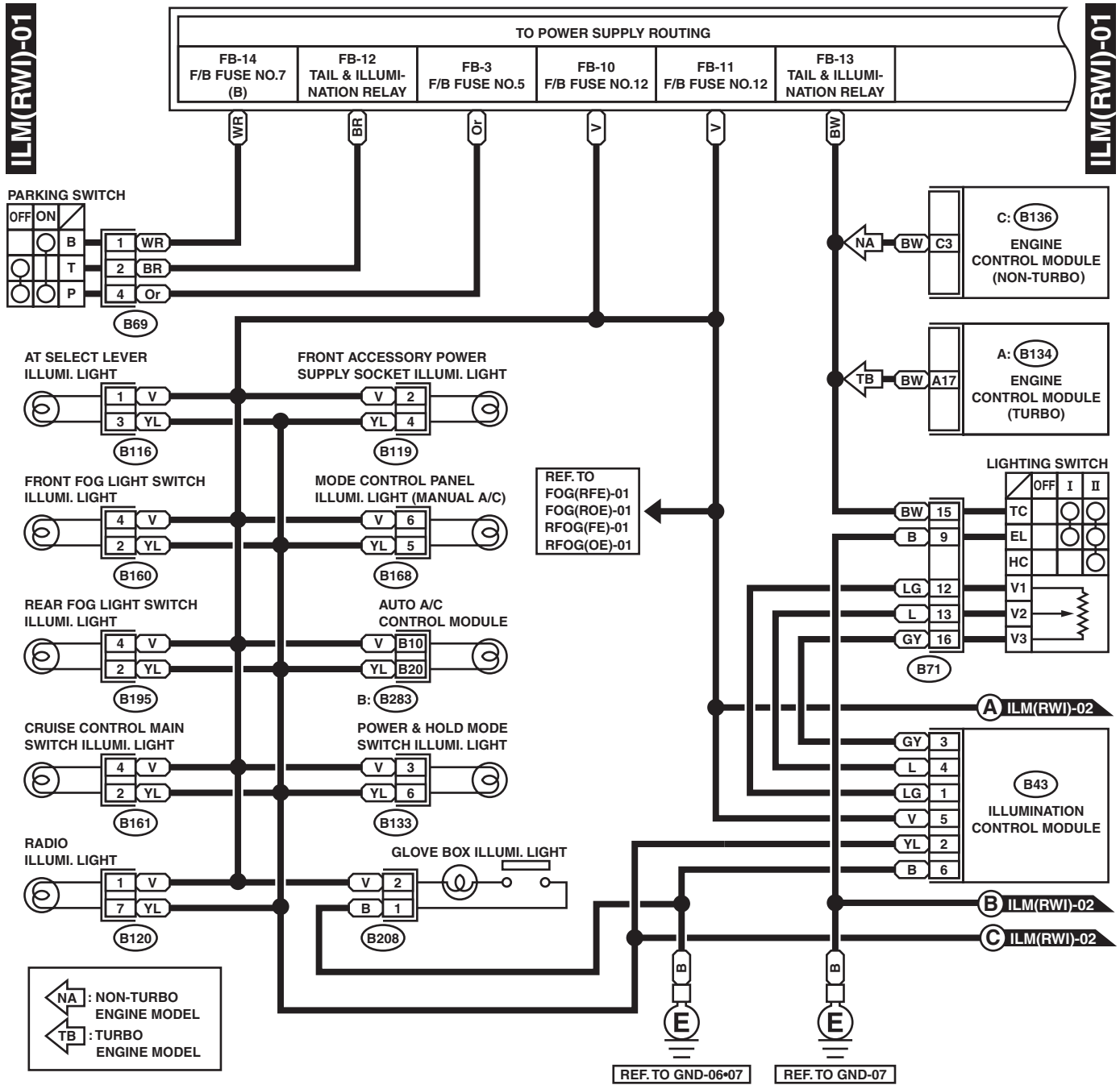


GR21-23C

CLEARANCE LIGHT AND ILLUMINATION LIGHT SYSTEM

WIRING SYSTEM

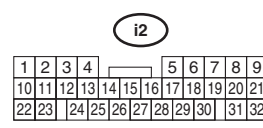
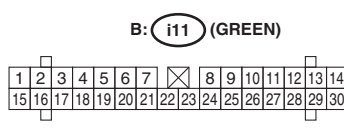
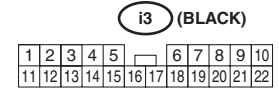
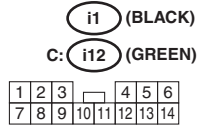
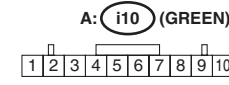
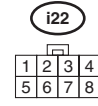
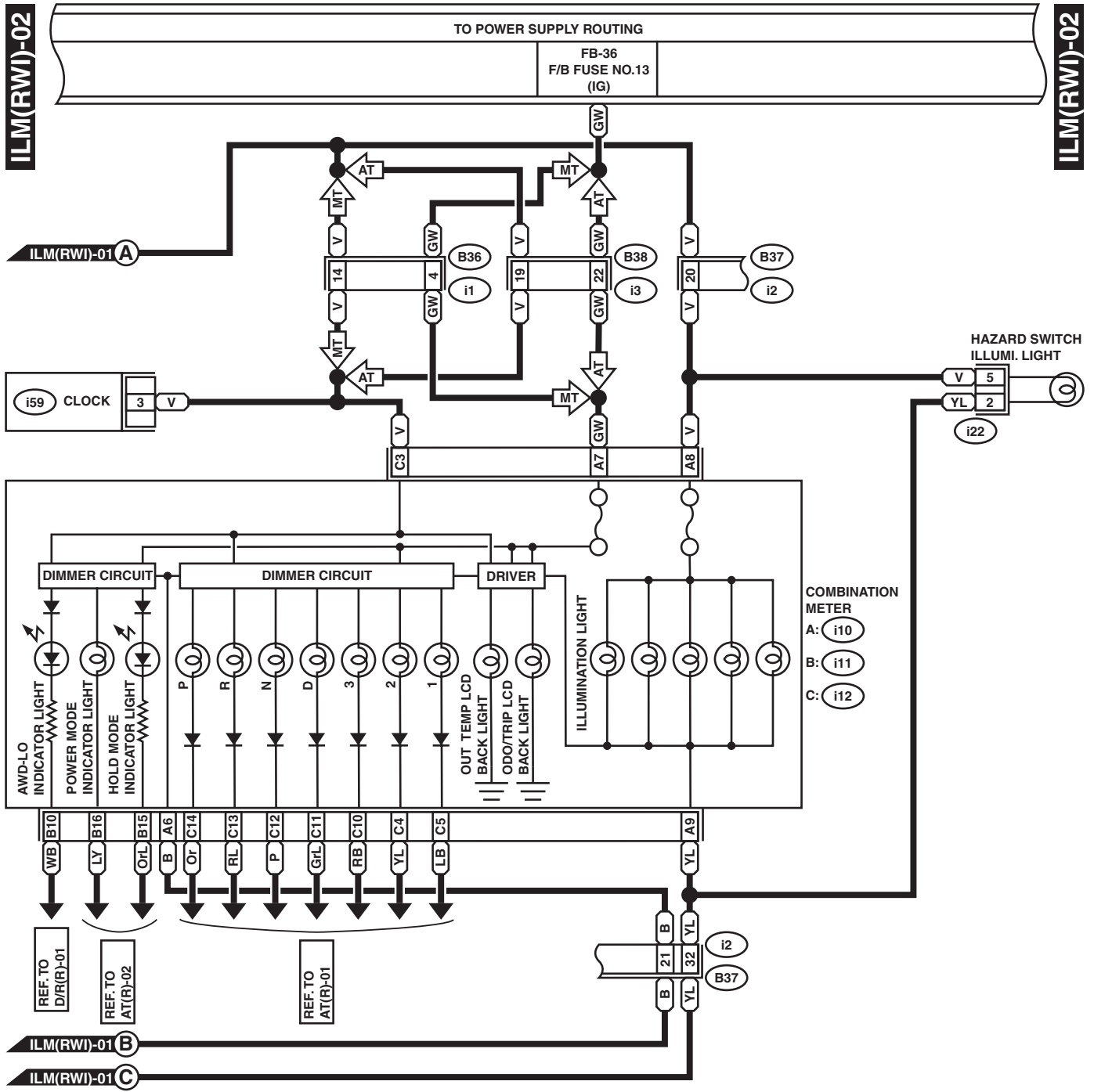
3. RHD WITH ILLUMINATION CONTROL MODEL



GR21-24A

CLEARANCE LIGHT AND ILLUMINATION LIGHT SYSTEM

WIRING SYSTEM



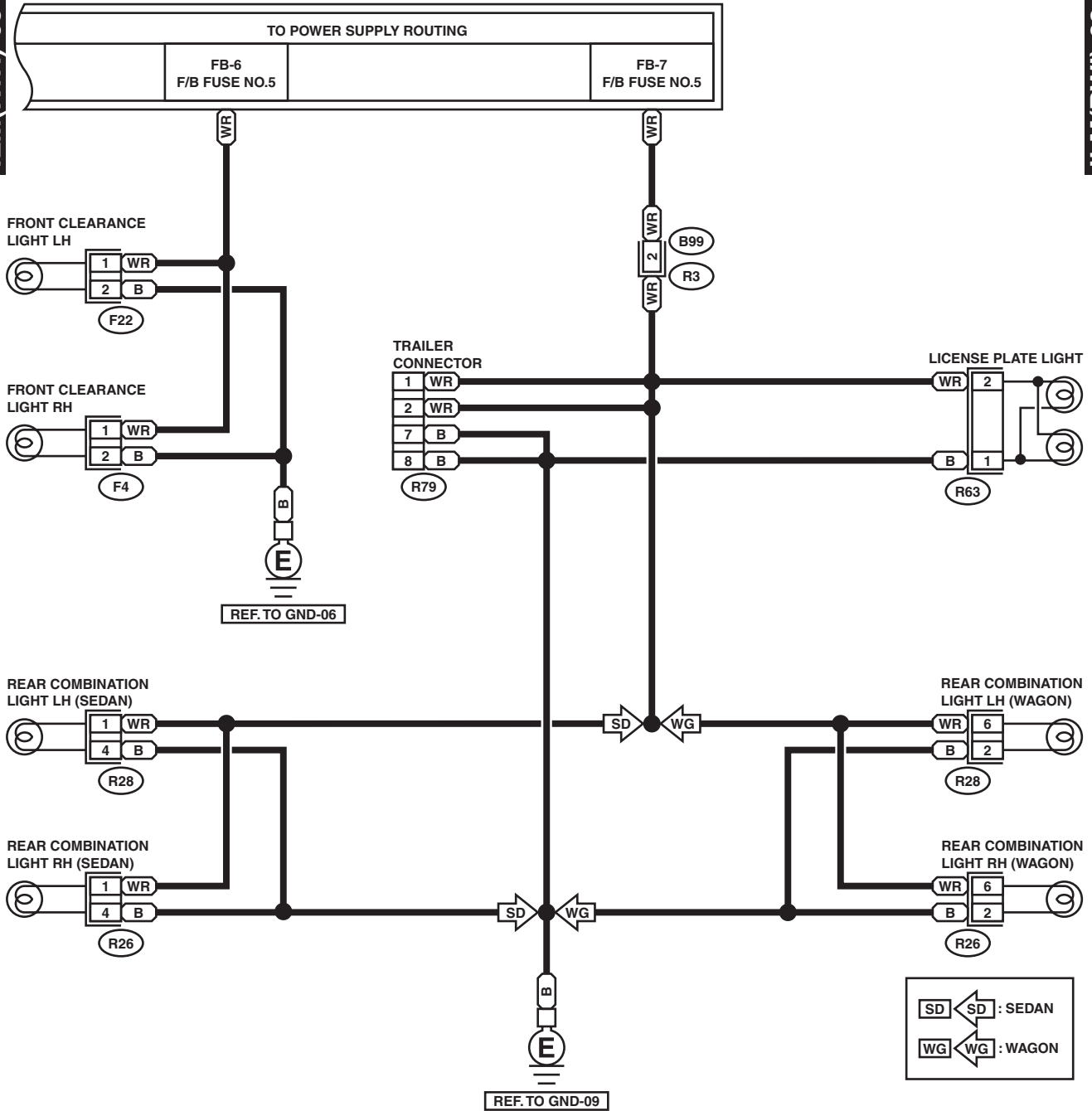
GR21-24B

CLEARANCE LIGHT AND ILLUMINATION LIGHT SYSTEM

WIRING SYSTEM

ILM(RWI)-03

ILM(RWI)-03



R63 (BLACK)



F4 (GRAY)

F22 (GRAY)



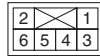
R26 : SD

R28 : SD



R26 (BLACK) : WG

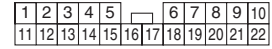
R28 (BLACK) : WG



R79



B99



GR21-24C

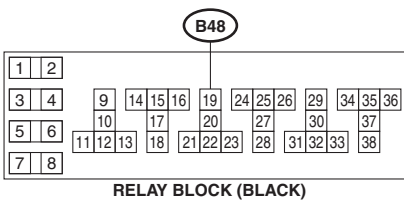
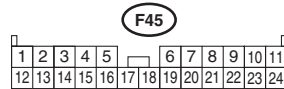
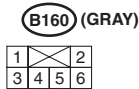
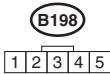
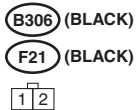
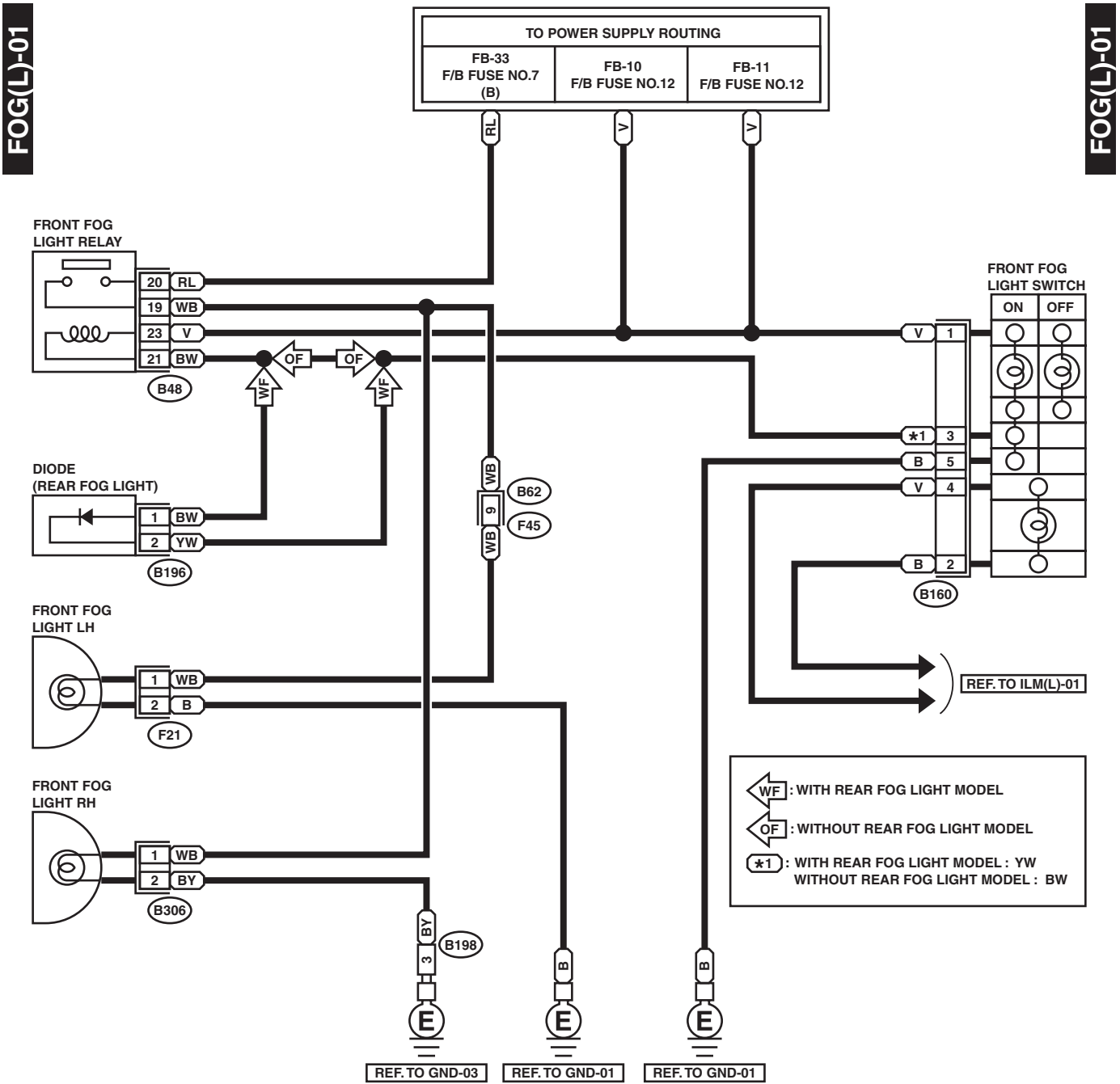
26.Front Fog Light System

A: SCHEMATIC

FRONT FOG LIGHT SYSTEM

WIRING SYSTEM

1. LHD MODEL



GL22-21

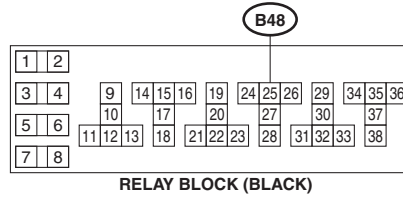
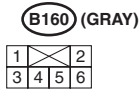
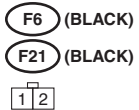
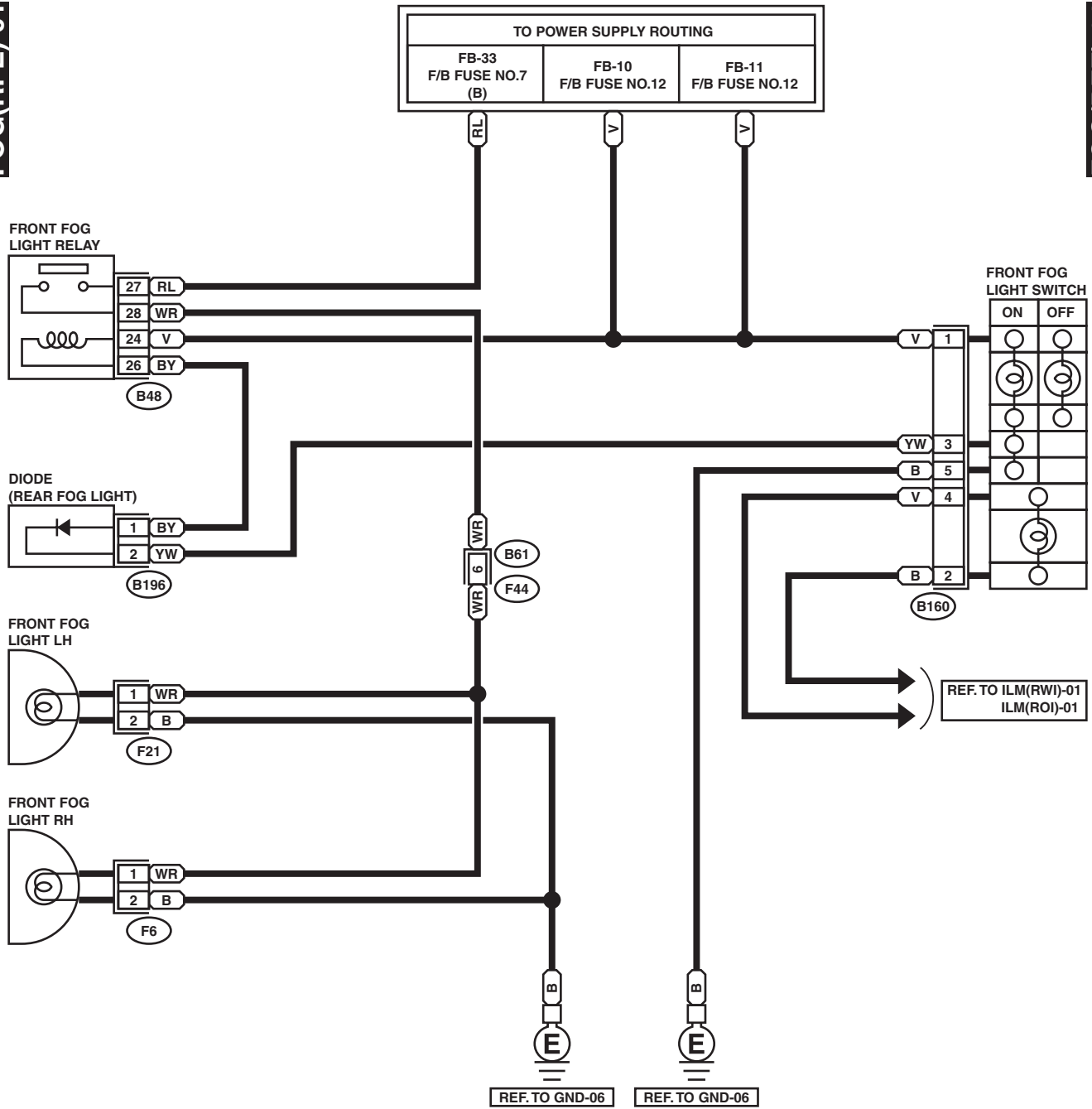
FRONT FOG LIGHT SYSTEM

WIRING SYSTEM

2. RHD FOR EUROPE MODEL

FOG(RFE)-01

FOG(RFE)-01



GR22-22

27.Headlight System

A: SCHEMATIC

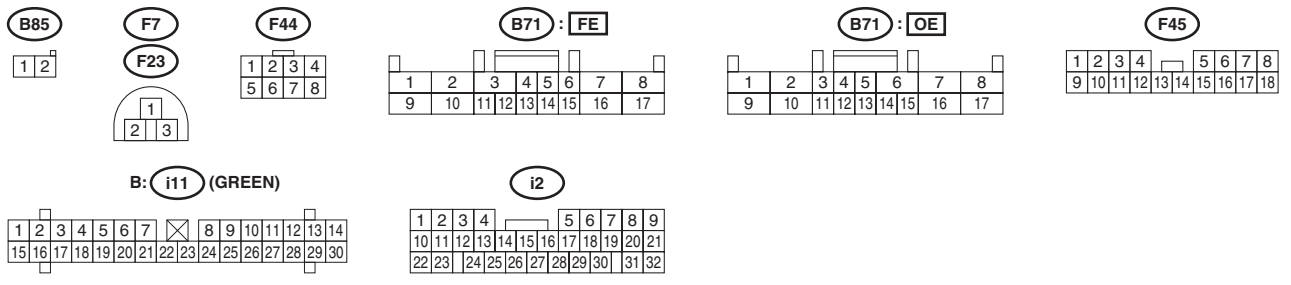
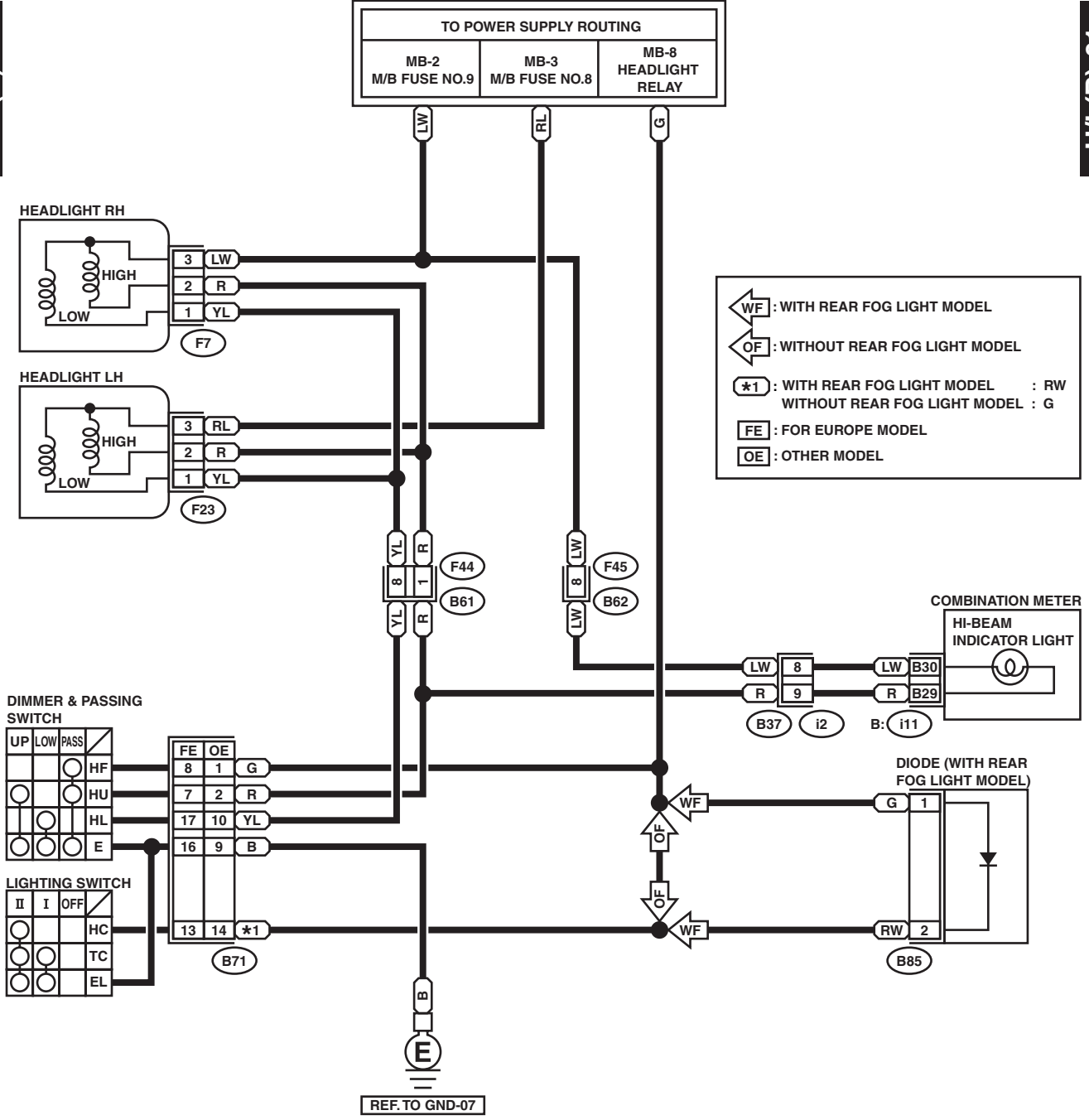
HEADLIGHT SYSTEM

WIRING SYSTEM

2. RHD MODEL

H/L(R)-01

H/L(R)-01



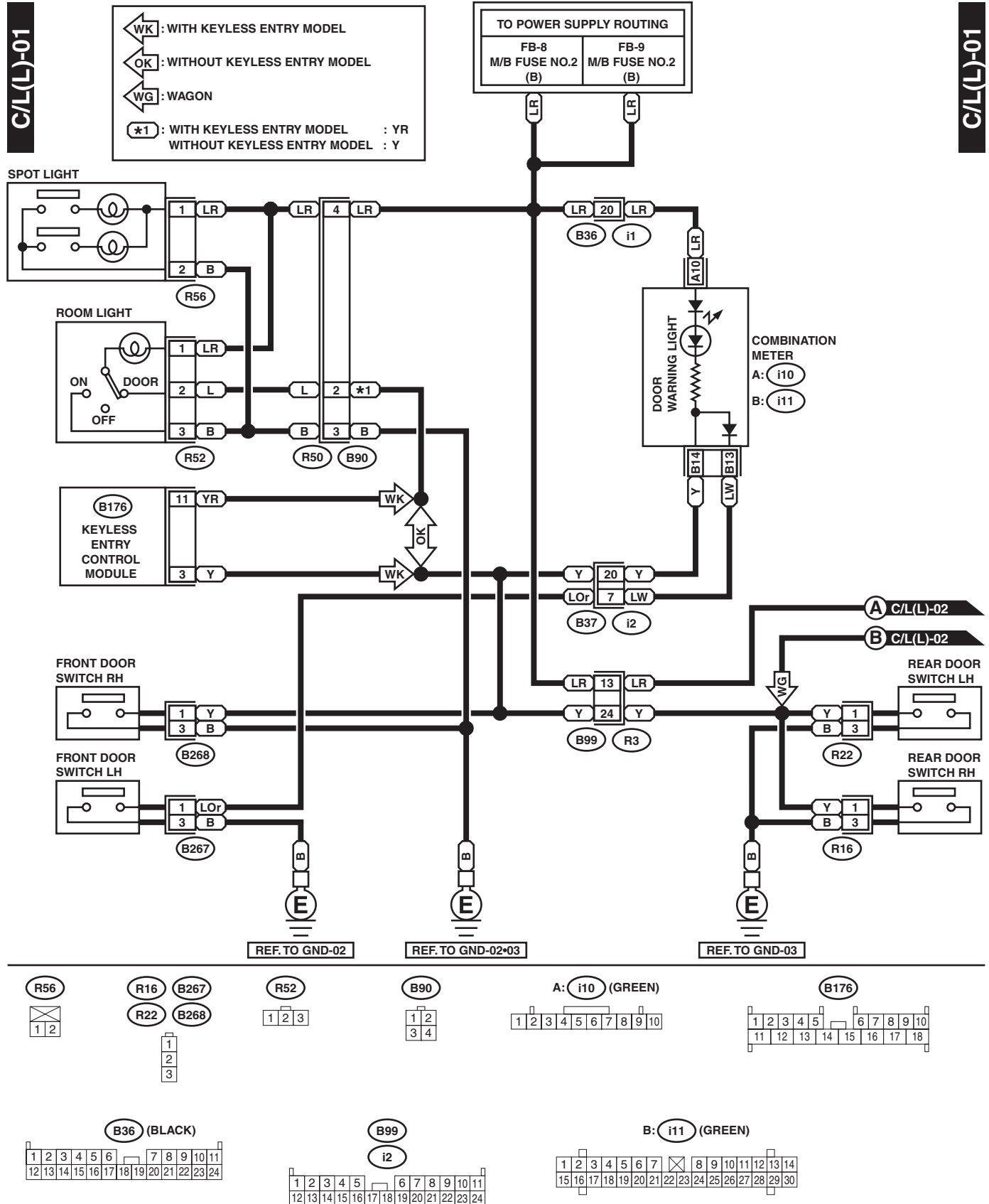
28.In Compartment Light System

A: SCHEMATIC

IN COMPARTMENT LIGHT SYSTEM

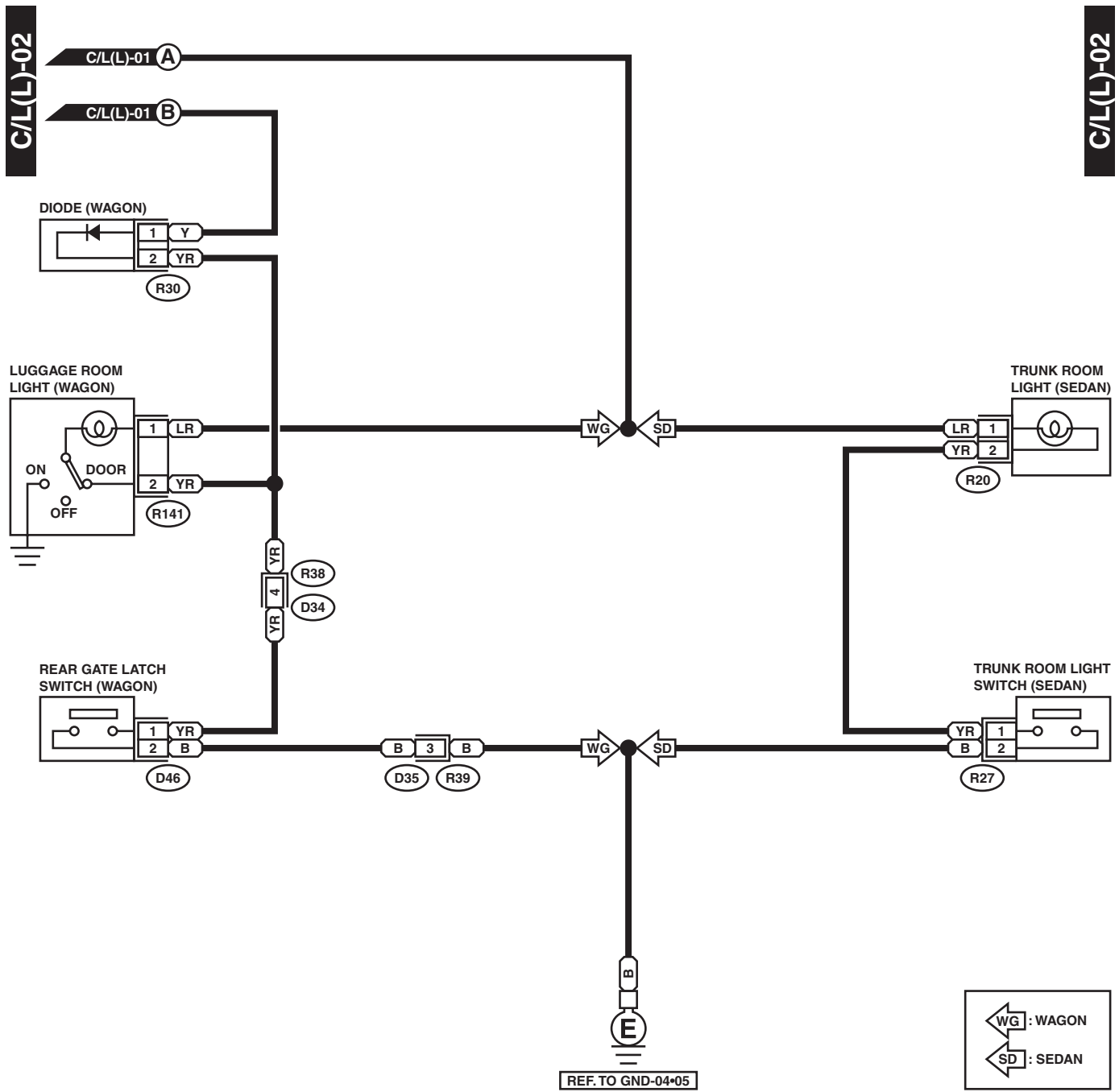
WIRING SYSTEM

1. LHD MODEL



IN COMPARTMENT LIGHT SYSTEM

WIRING SYSTEM



D46 (BLACK)



R20 (BLACK)

R141 (BLACK)



R27



R30



D35



D34

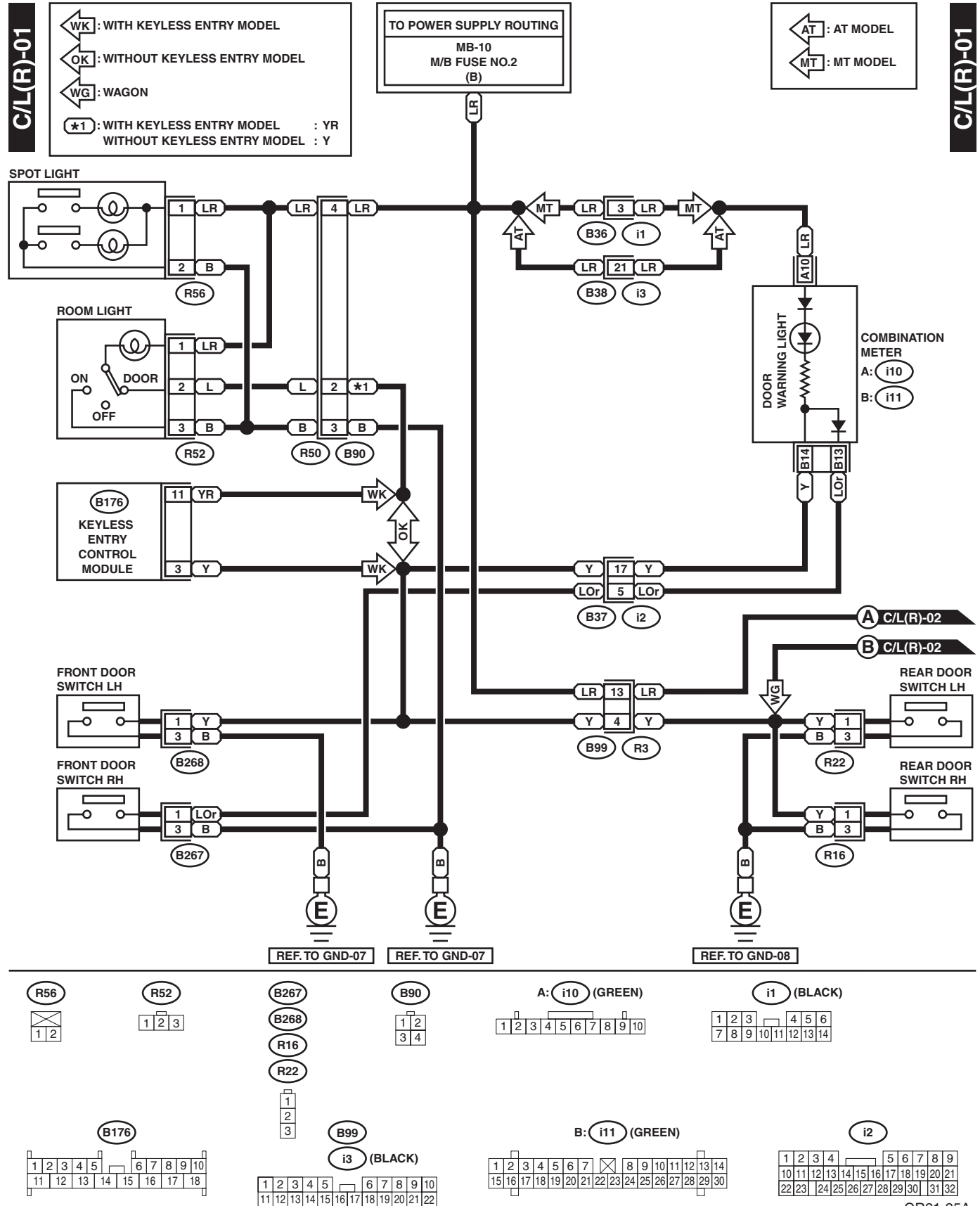


GL21-23B

IN COMPARTMENT LIGHT SYSTEM

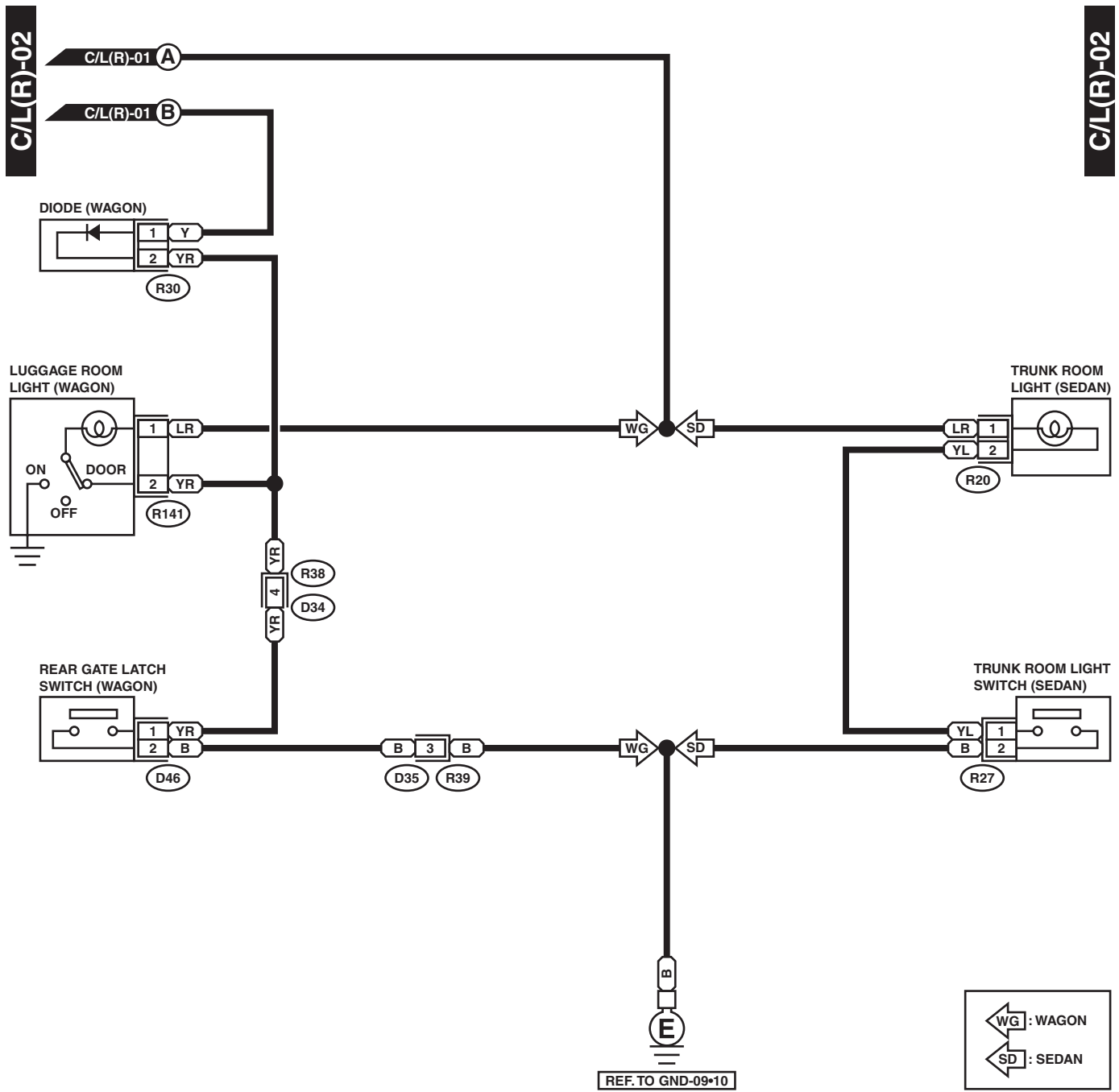
WIRING SYSTEM

2. RHD MODEL



IN COMPARTMENT LIGHT SYSTEM

WIRING SYSTEM



D46 (BLACK)



R20 (BLACK)



R27



R30



D35



D34



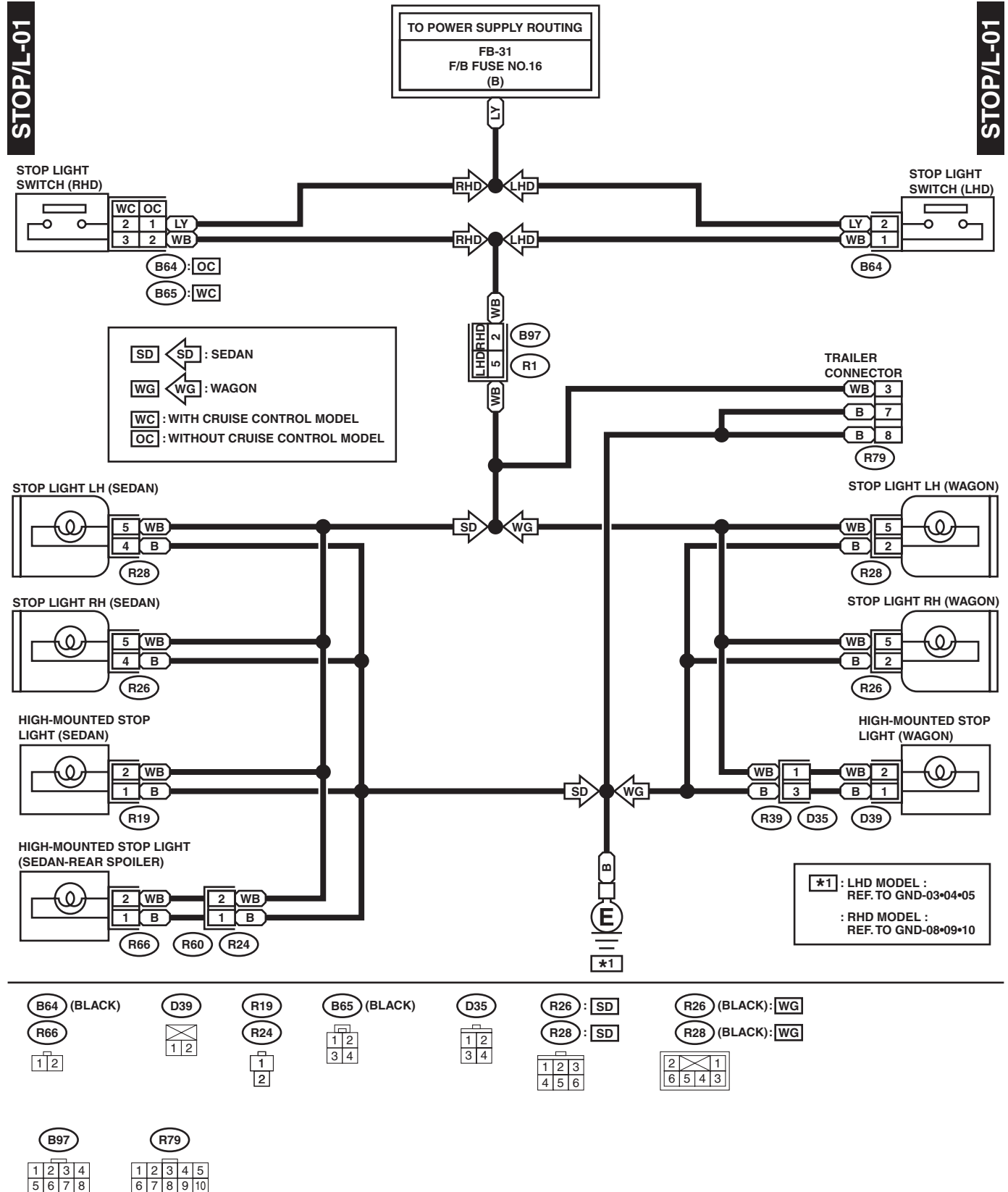
GR21-25B

STOP LIGHT SYSTEM

WIRING SYSTEM

29. Stop Light System

A: SCHEMATIC



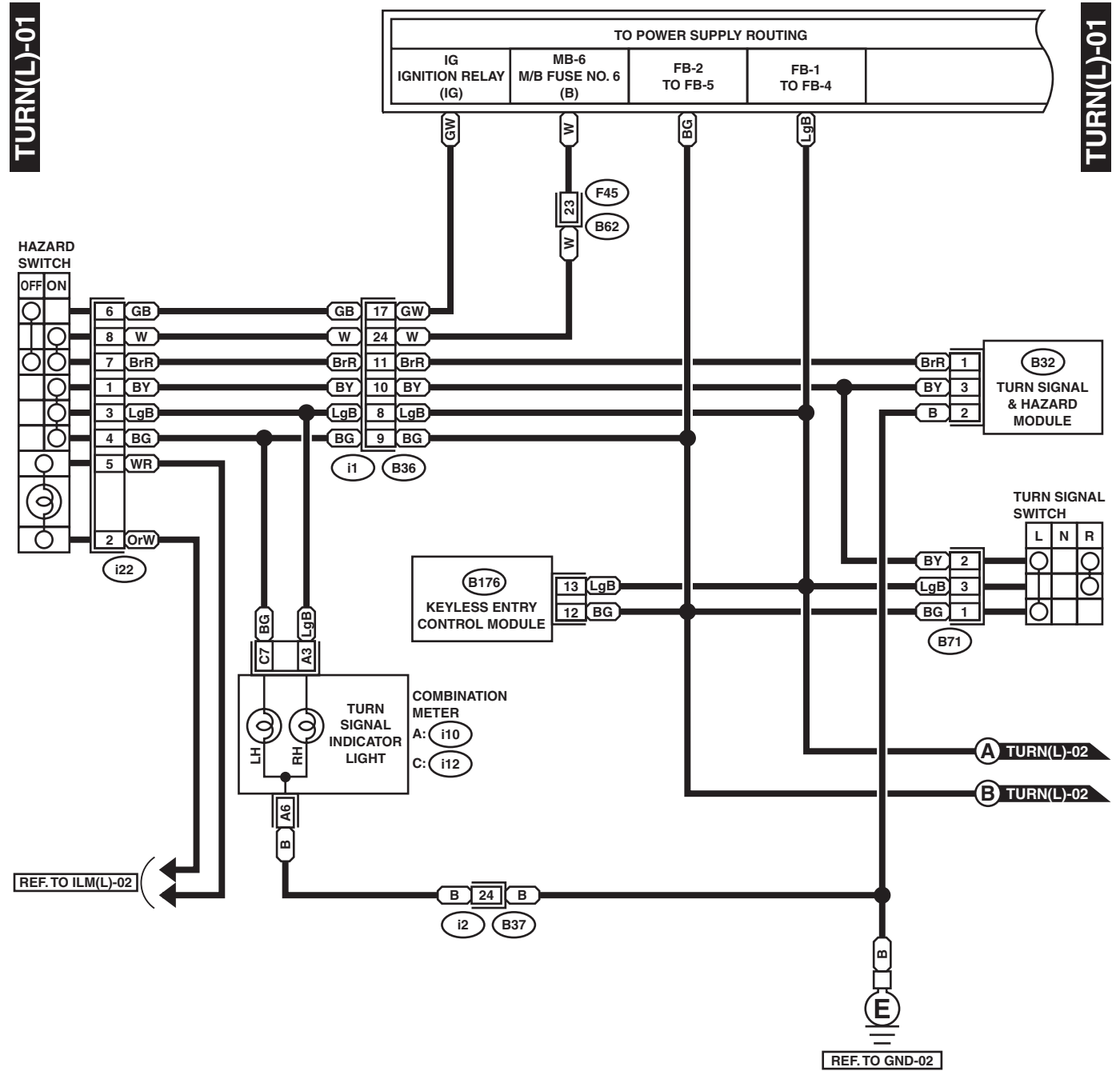
30. Turn Signal Light and Hazard Light System

A: SCHEMATIC

TURN SIGNAL LIGHT AND HAZARD LIGHT SYSTEM

WIRING SYSTEM

1. LHD MODEL



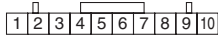
B32 (BLACK)



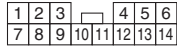
i22



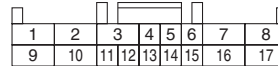
A: i10 (GREEN)



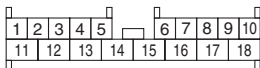
C: i12 (GREEN)



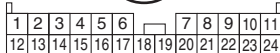
B71



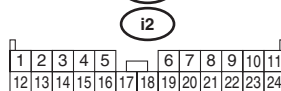
B176



B36 (BLACK)



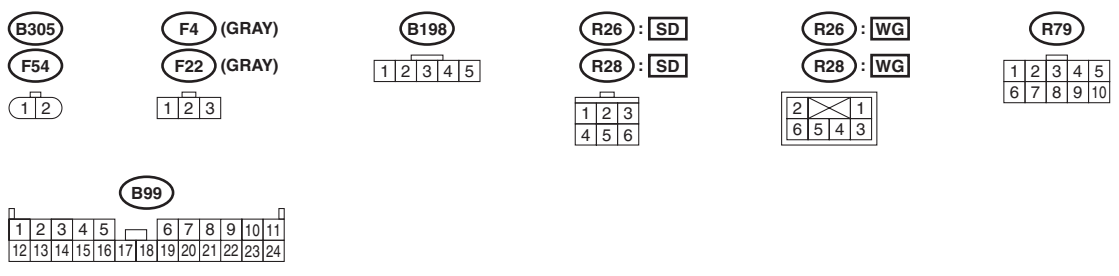
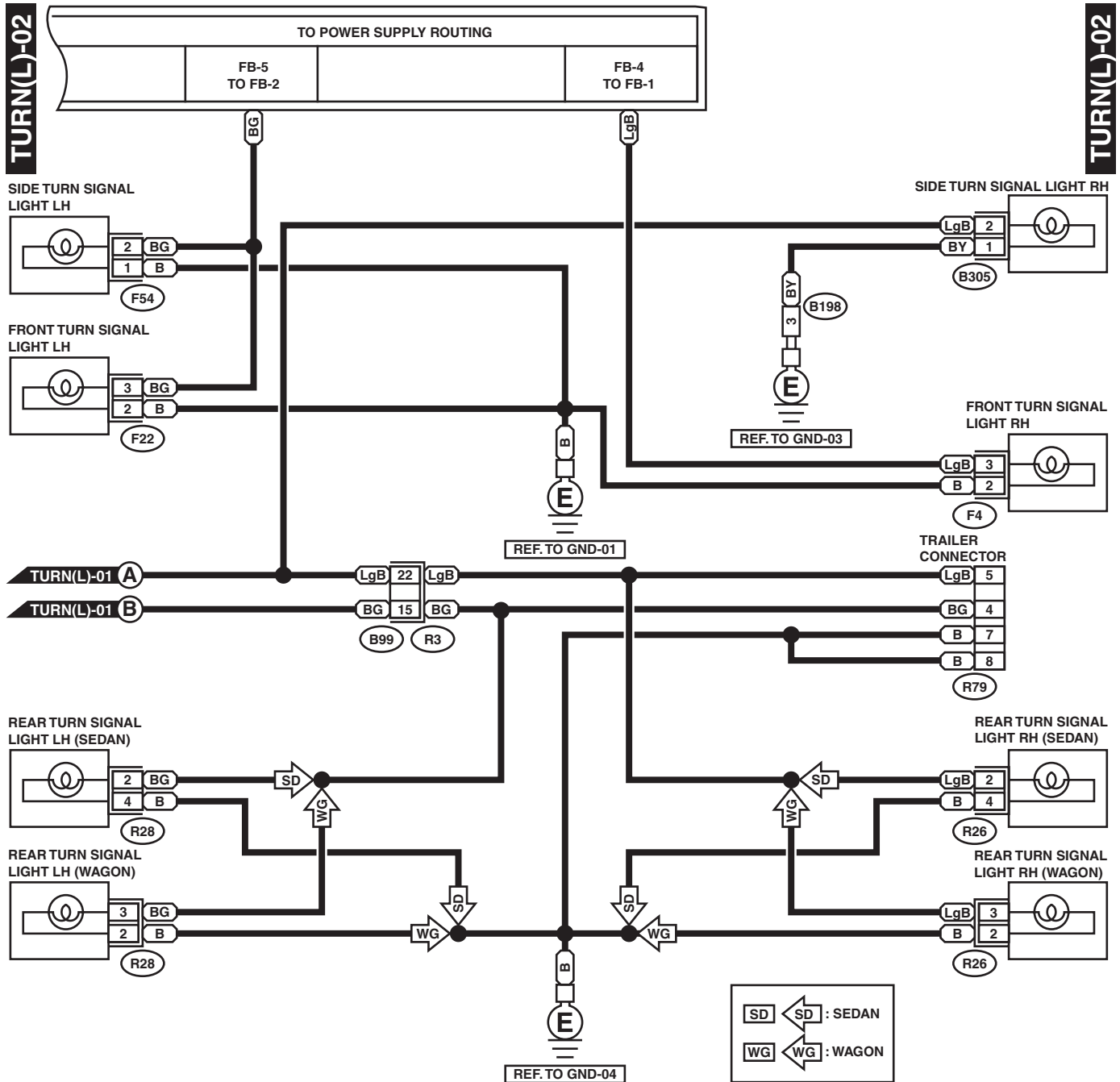
F45



i2

TURN SIGNAL LIGHT AND HAZARD LIGHT SYSTEM

WIRING SYSTEM

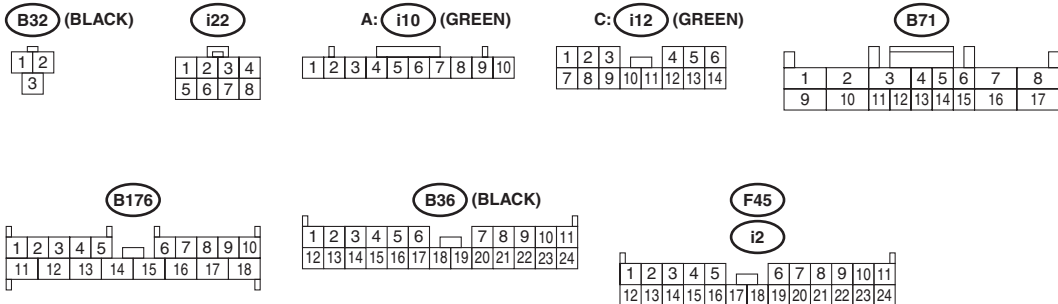
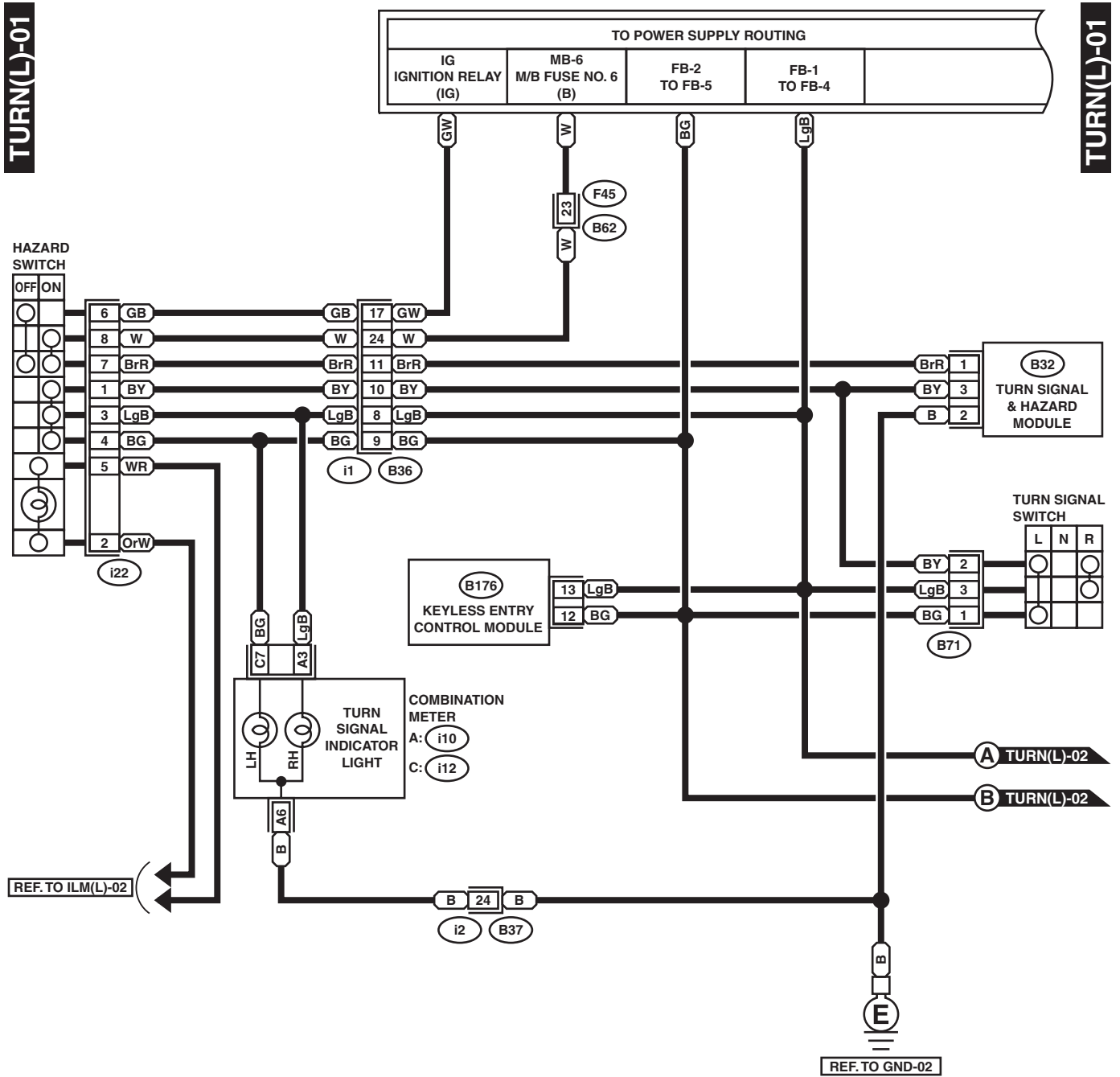


GL26-21B

TURN SIGNAL LIGHT AND HAZARD LIGHT SYSTEM

WIRING SYSTEM

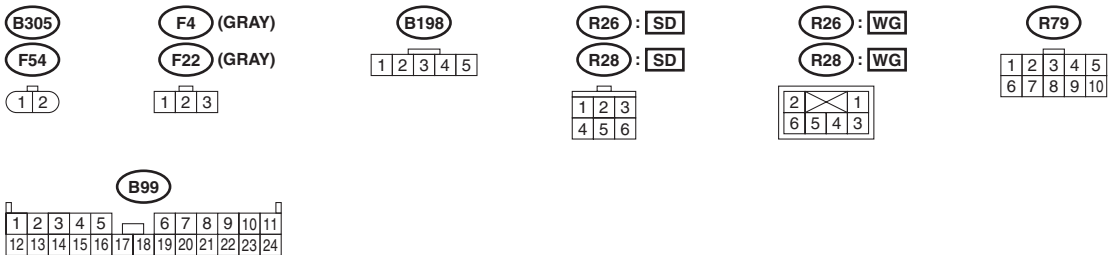
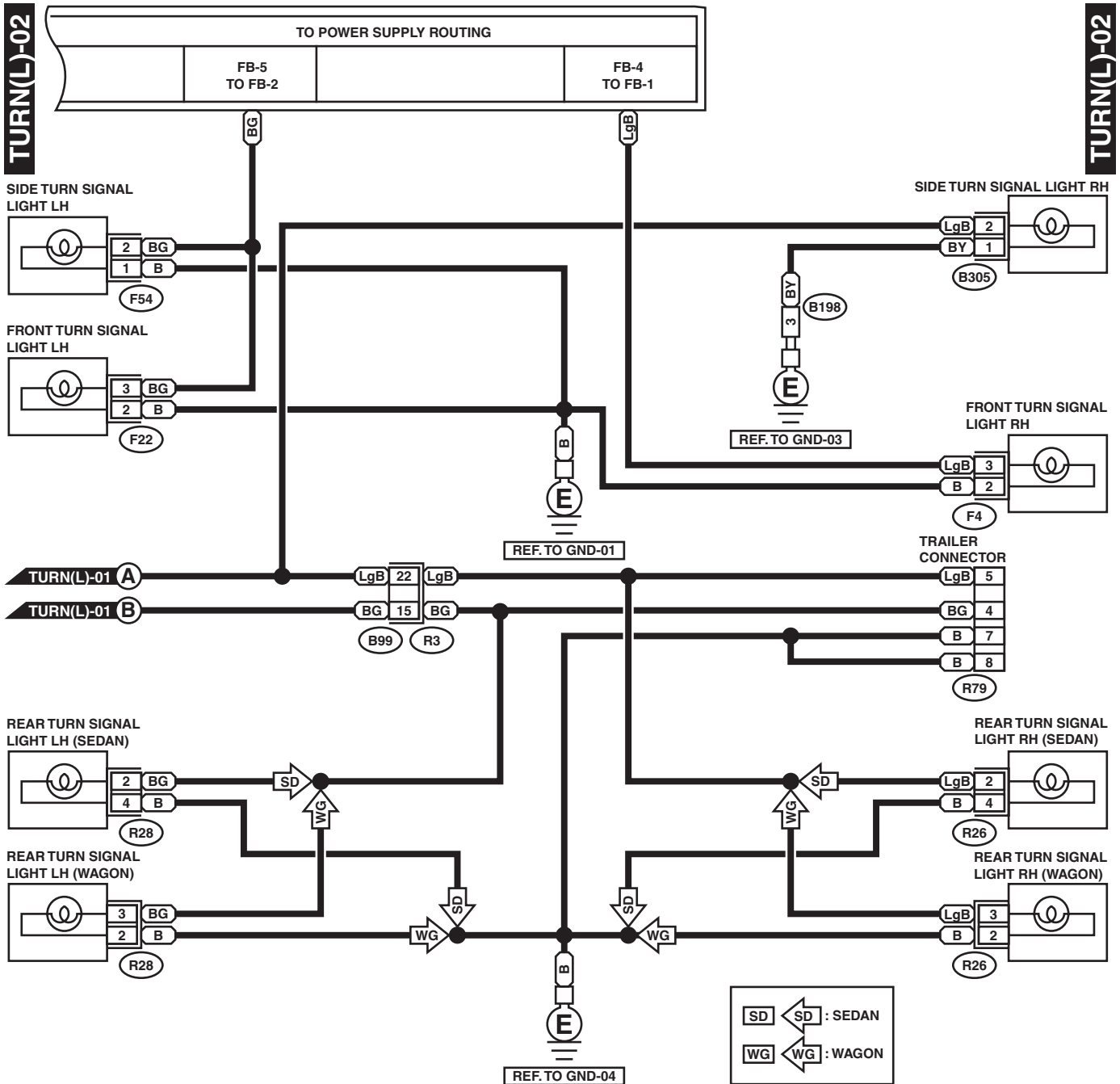
2. RHD MODEL



GR26-21A

TURN SIGNAL LIGHT AND HAZARD LIGHT SYSTEM

WIRING SYSTEM



GR26-21B

OIL PRESSURE WARNING LIGHT SYSTEM

WIRING SYSTEM

31.Oil Pressure Warning Light System

A: SCHEMATIC

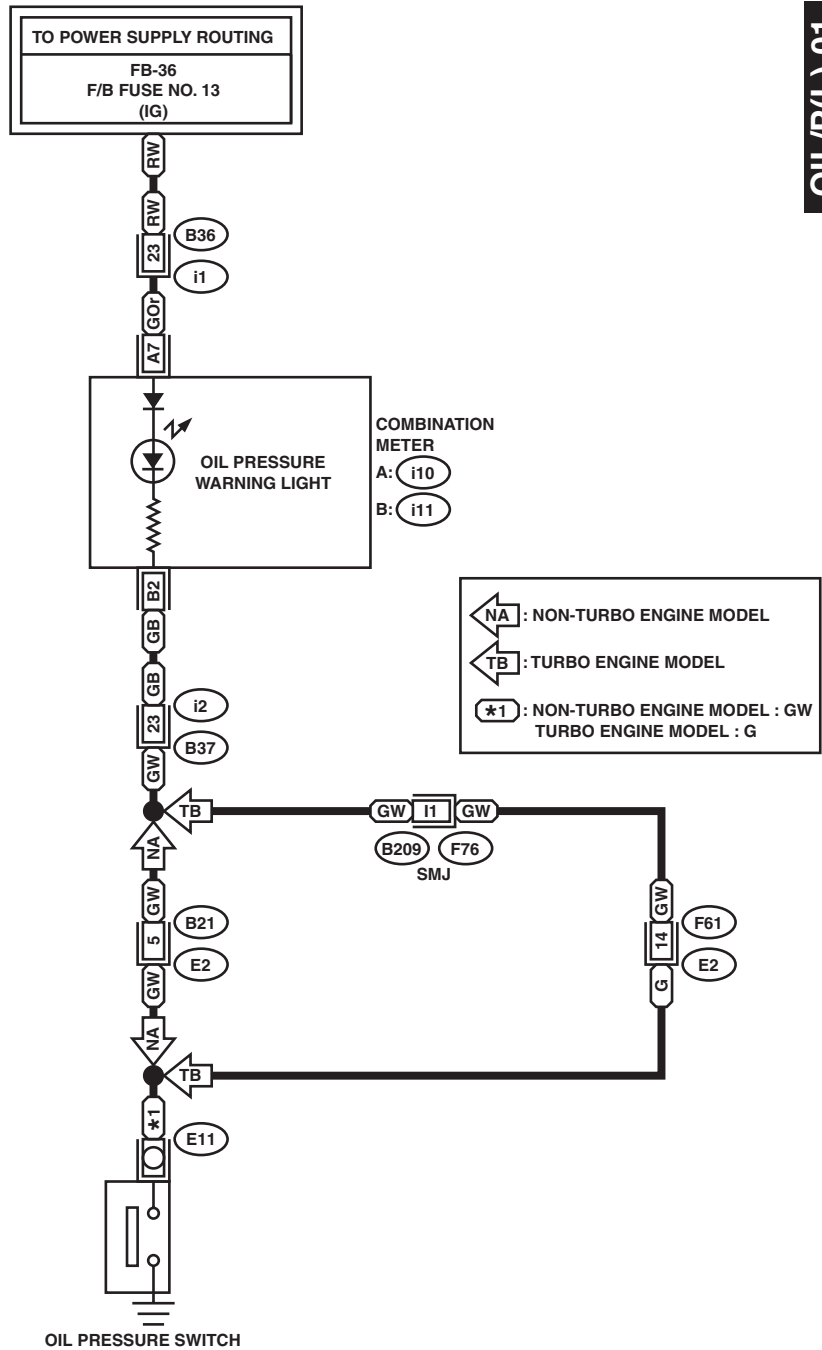
OIL PRESSURE WARNING LIGHT SYSTEM

WIRING SYSTEM

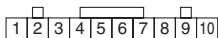
1. LHD MODEL

OIL/P(L)-01

OIL/P(L)-01

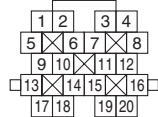


A: i10 (GREEN)

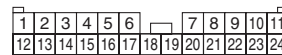


B21 (LIGHT GRAY)

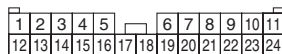
F61 (BLACK)



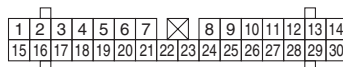
B36 (BLACK)



i2



B: i11 (GREEN)



GL66-21

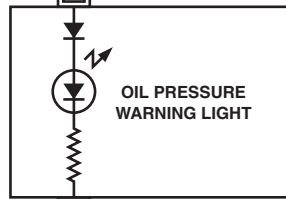
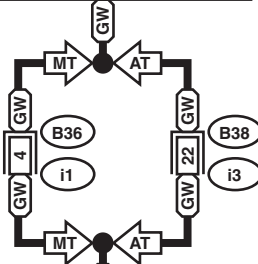
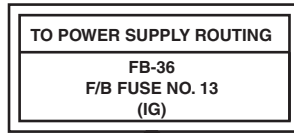
OIL PRESSURE WARNING LIGHT SYSTEM

WIRING SYSTEM

2. RHD MODEL

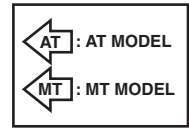
OIL/P(R)-01

OIL/P(R)-01

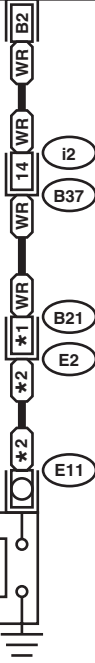


COMBINATION METER

- A: i10
- B: i11

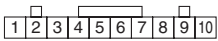


- *1 : NON-TURBO ENGINE MODEL : 5
TURBO ENGINE MODEL : 14
- *2 : NON-TURBO ENGINE MODEL : G
TURBO ENGINE MODEL : G



OIL PRESSURE SWITCH

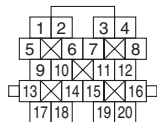
A: i10 (GREEN)



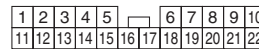
i1 (BLACK)



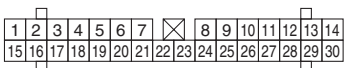
B21 (LIGHT GRAY)



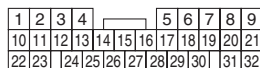
i3 (BLACK)



B: i11 (GREEN)



i2



GR66-21

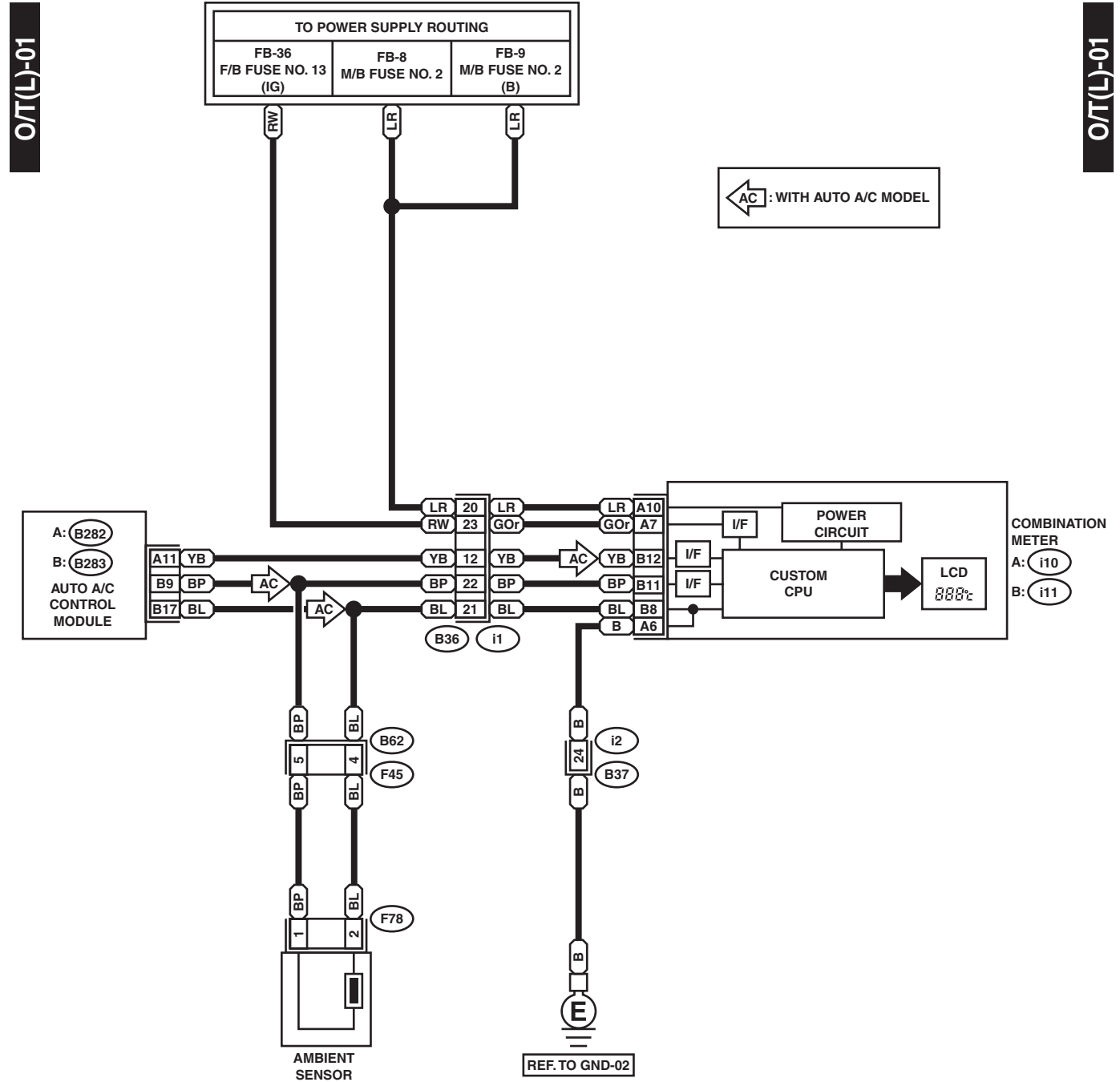
32. Outside Temperature Display System

A: SCHEMATIC

OUTSIDE TEMPERATURE DISPLAY SYSTEM

WIRING SYSTEM

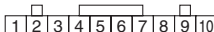
1. LHD MODEL



F78 (BLACK)



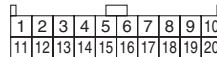
A: i10 (GREEN)



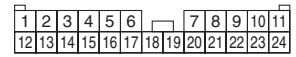
A: B282 (GRAY)



B: B283 (GRAY)



B36 (BLACK)

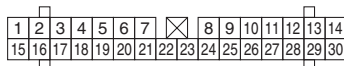


i2

F45



B: i11 (GREEN)



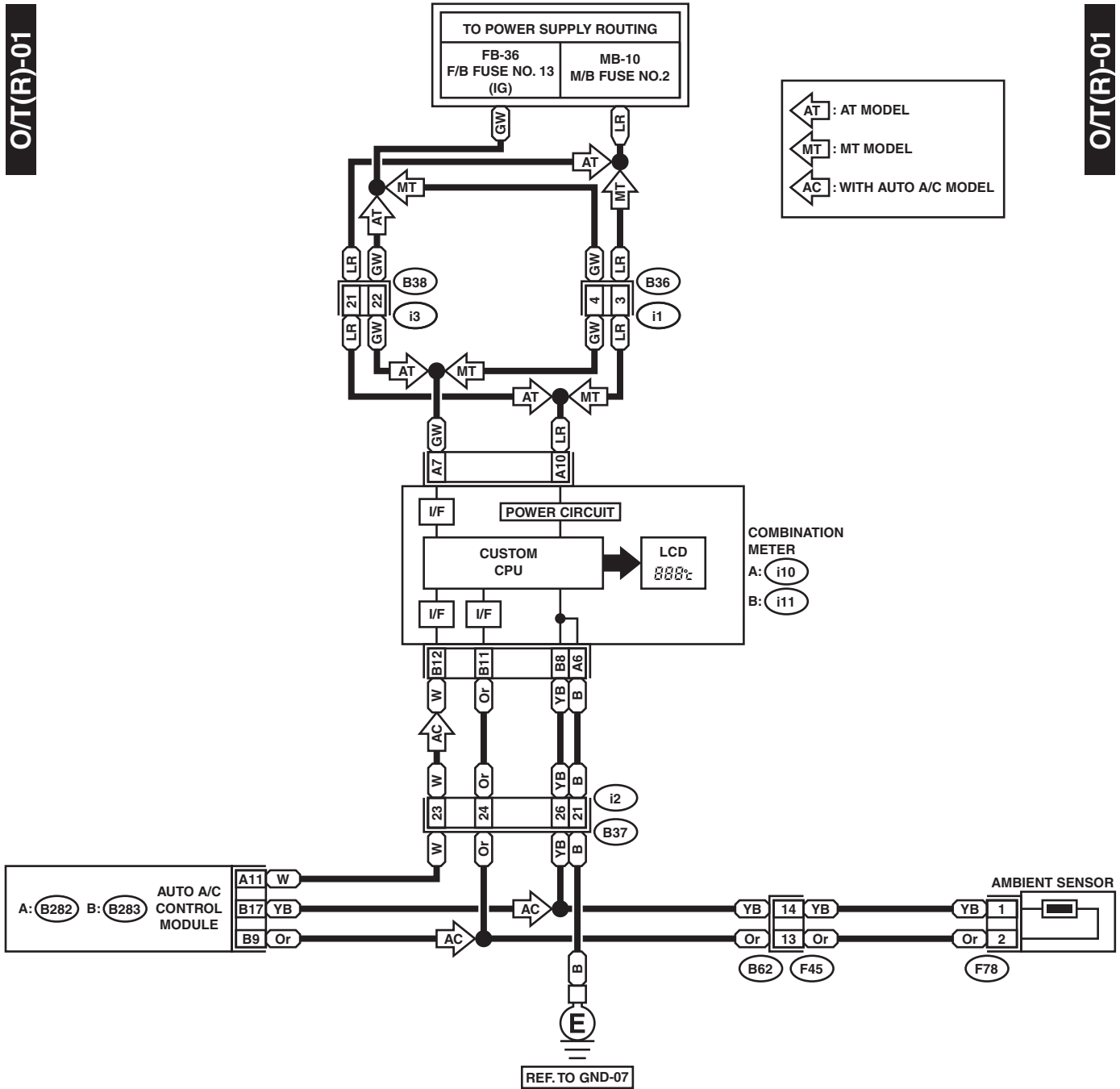
OUTSIDE TEMPERATURE DISPLAY SYSTEM

WIRING SYSTEM

2. RHD MODEL

O/T(R)-01

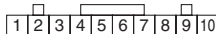
O/T(R)-01



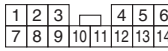
F78 (BLACK)



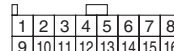
A: i10 (GREEN)



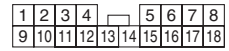
i1 (BLACK)



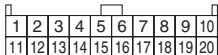
A: B282 (GRAY)



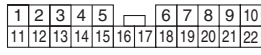
F45



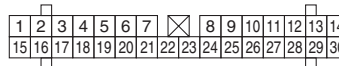
B: B283 (GRAY)



i3 (BLACK)



B: i11 (GREEN)



i2



PARKING BRAKE AND BRAKE FLUID LEVEL WARNING SYSTEM

WIRING SYSTEM

33.Parking Brake and Brake Fluid Level Warning System

A: SCHEMATIC

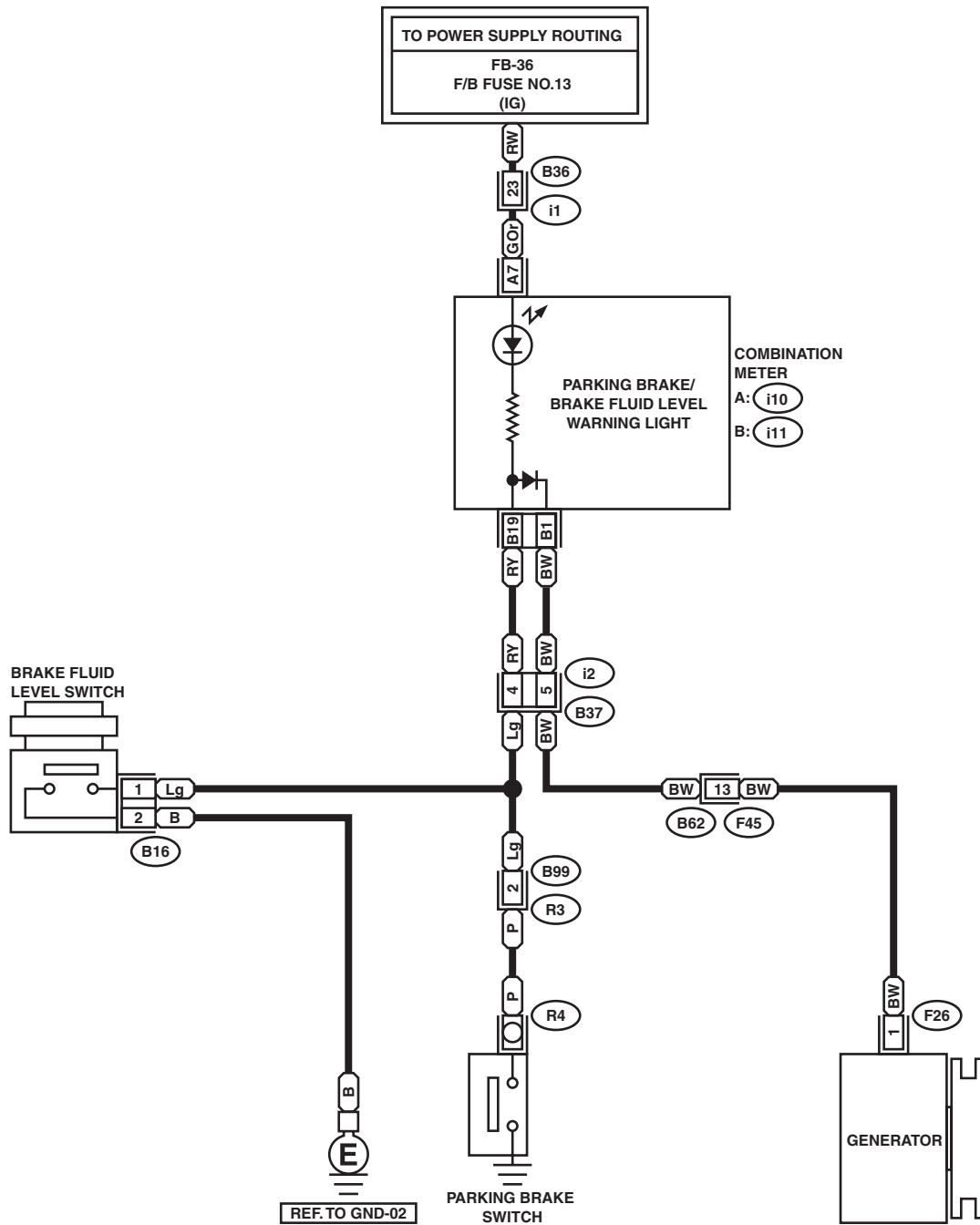
PARKING BRAKE AND BRAKE FLUID LEVEL WARNING SYSTEM

WIRING SYSTEM

1. LHD MODEL

BR/W(L)-01

BR/W(L)-01



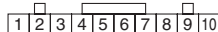
B16 (GRAY)



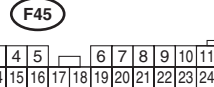
F26 (GREEN)



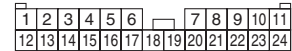
A: i10 (GREEN)



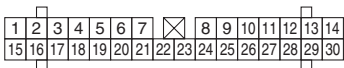
i2 B99



B36 (BLACK)



B: i11 (GREEN)



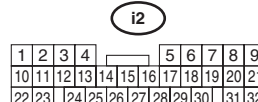
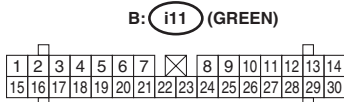
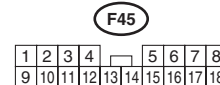
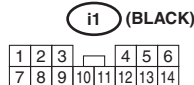
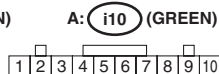
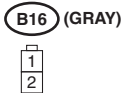
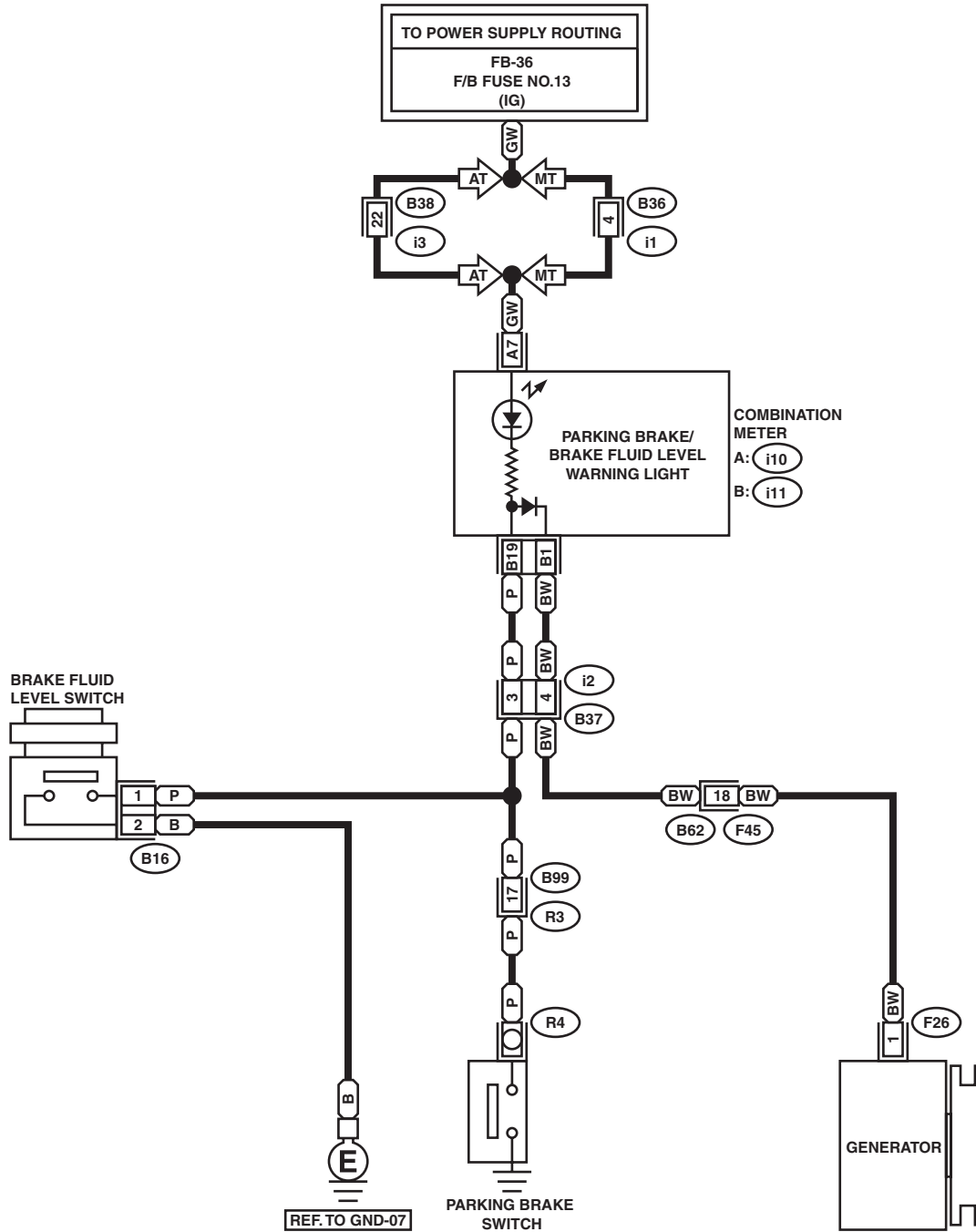
PARKING BRAKE AND BRAKE FLUID LEVEL WARNING SYSTEM

WIRING SYSTEM

2. RHD MODEL

BR/W(R)-01

BR/W(R)-01



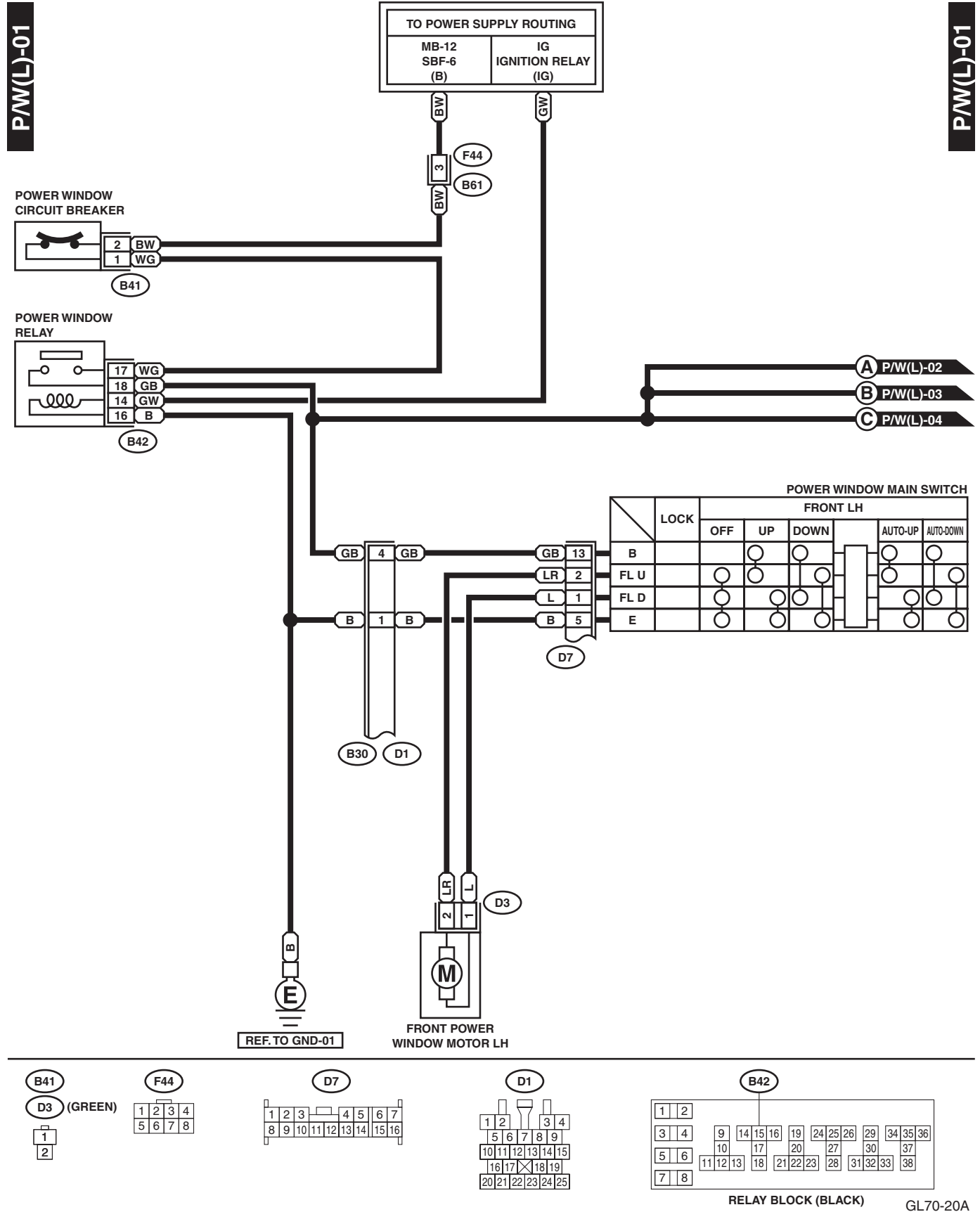
34. Power Window System

A: SCHEMATIC

POWER WINDOW SYSTEM

WIRING SYSTEM

1. LHD MODEL

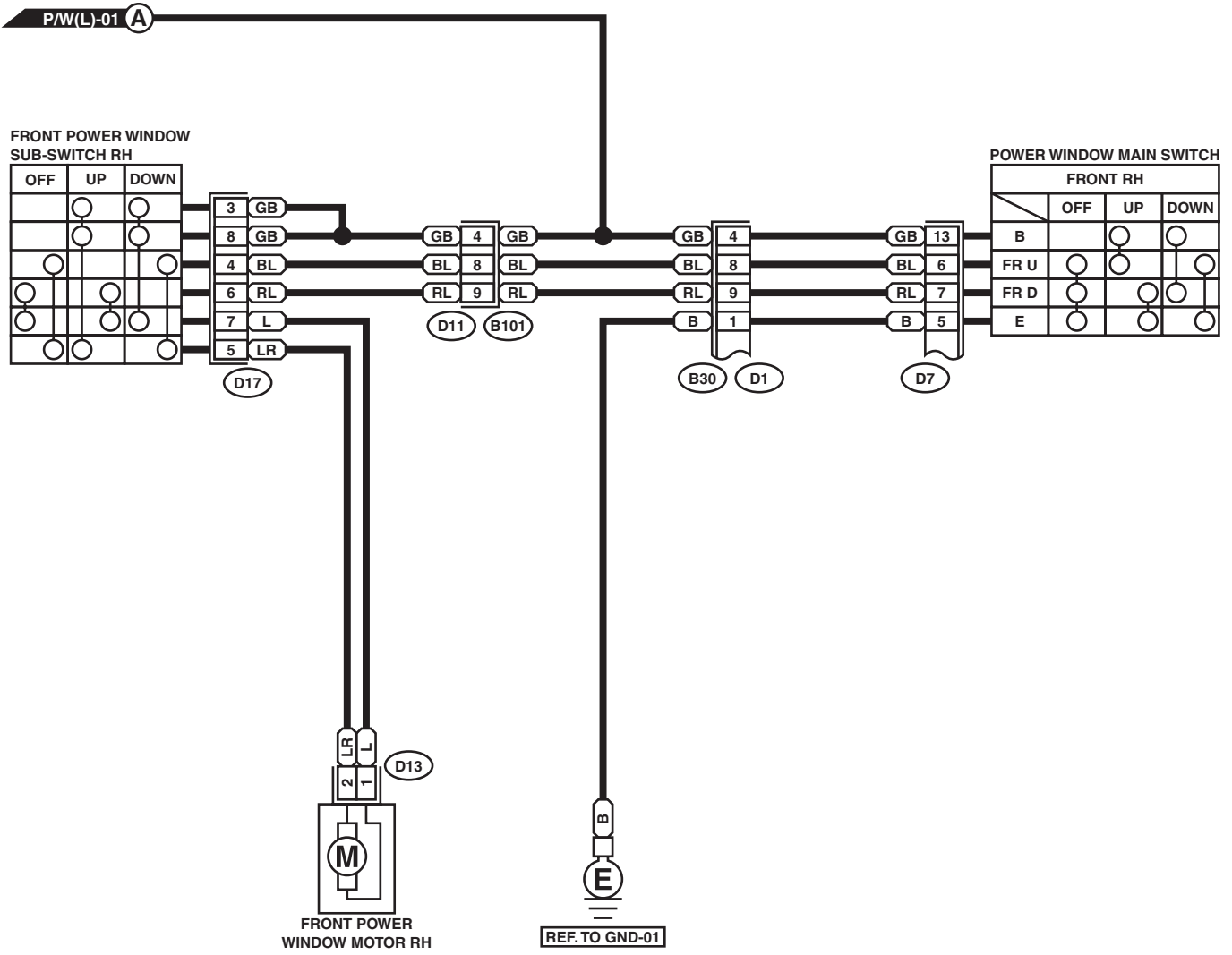


POWER WINDOW SYSTEM

WIRING SYSTEM

P/W(L)-02

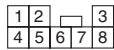
P/W(L)-02



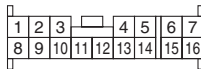
D13 (GREEN)



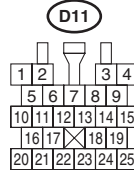
D17



D7



D1



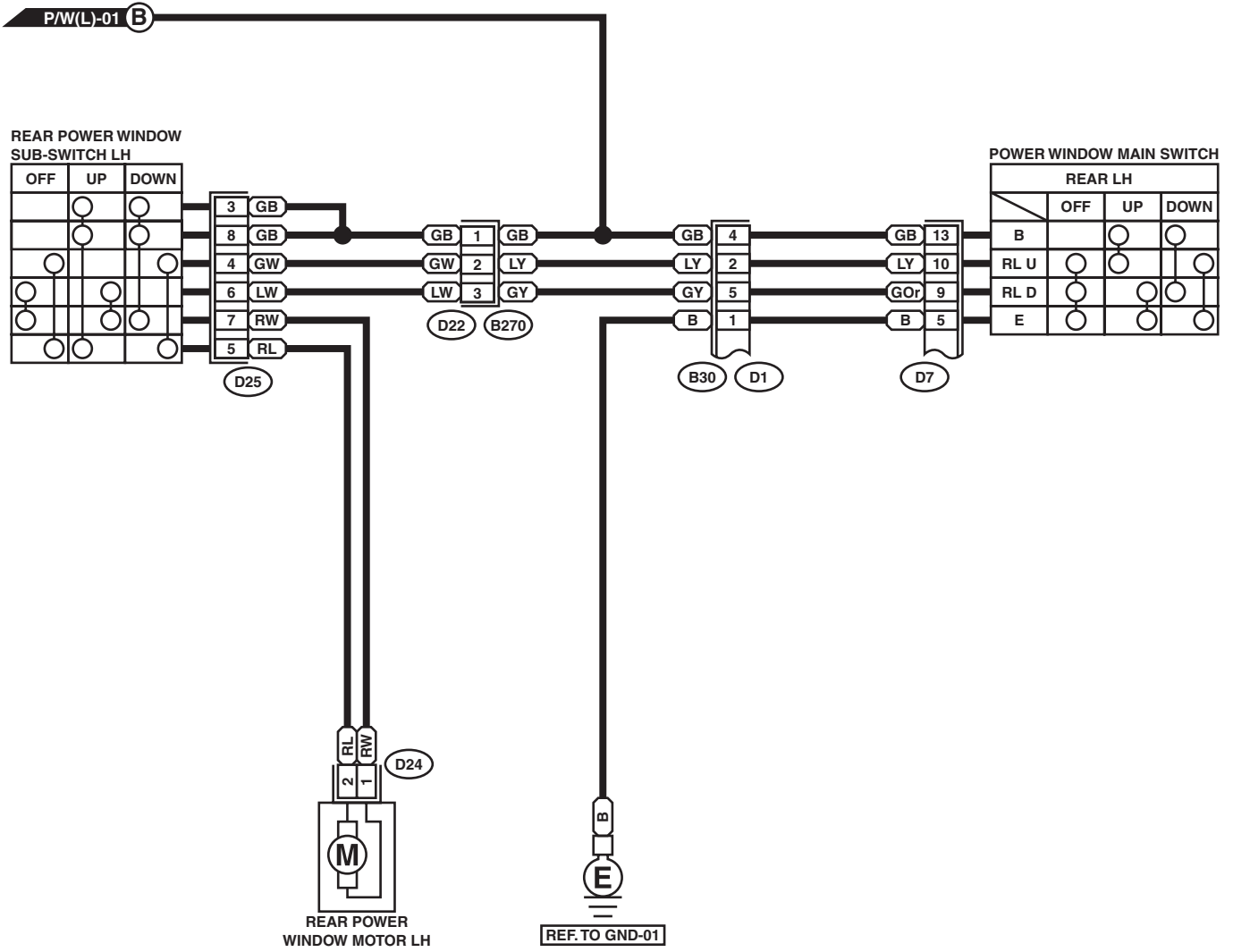
GL70-20B

POWER WINDOW SYSTEM

WIRING SYSTEM

P/W(L)-03

P/W(L)-03



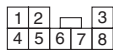
D24 (GREEN)



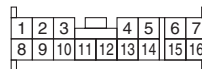
D22



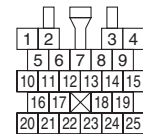
D25



D7



D1



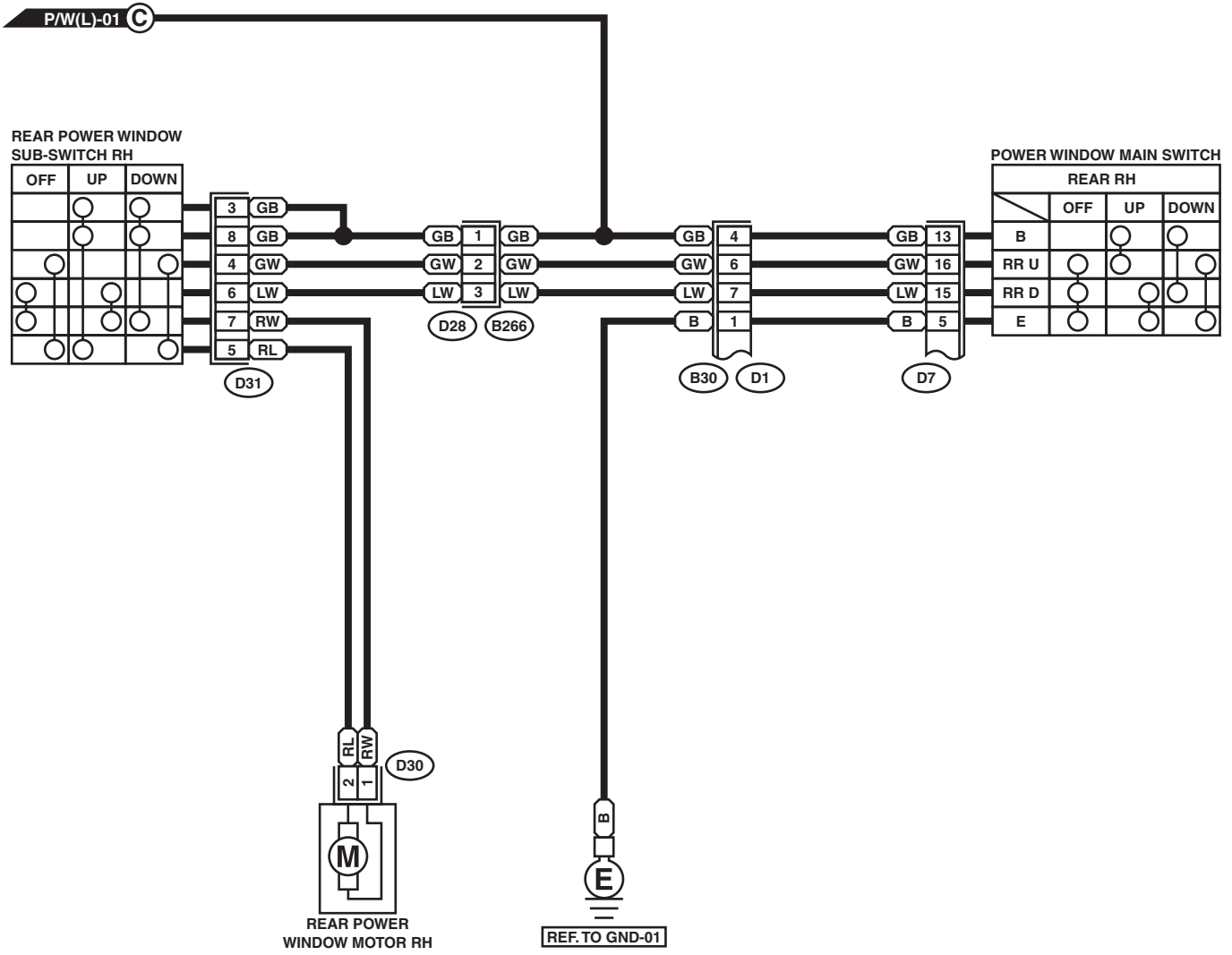
GL70-20C

POWER WINDOW SYSTEM

WIRING SYSTEM

P/W(L)-04

P/W(L)-04



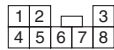
D30 (GREEN)



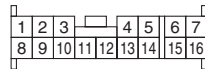
D28



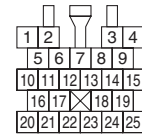
D31



D7



D1



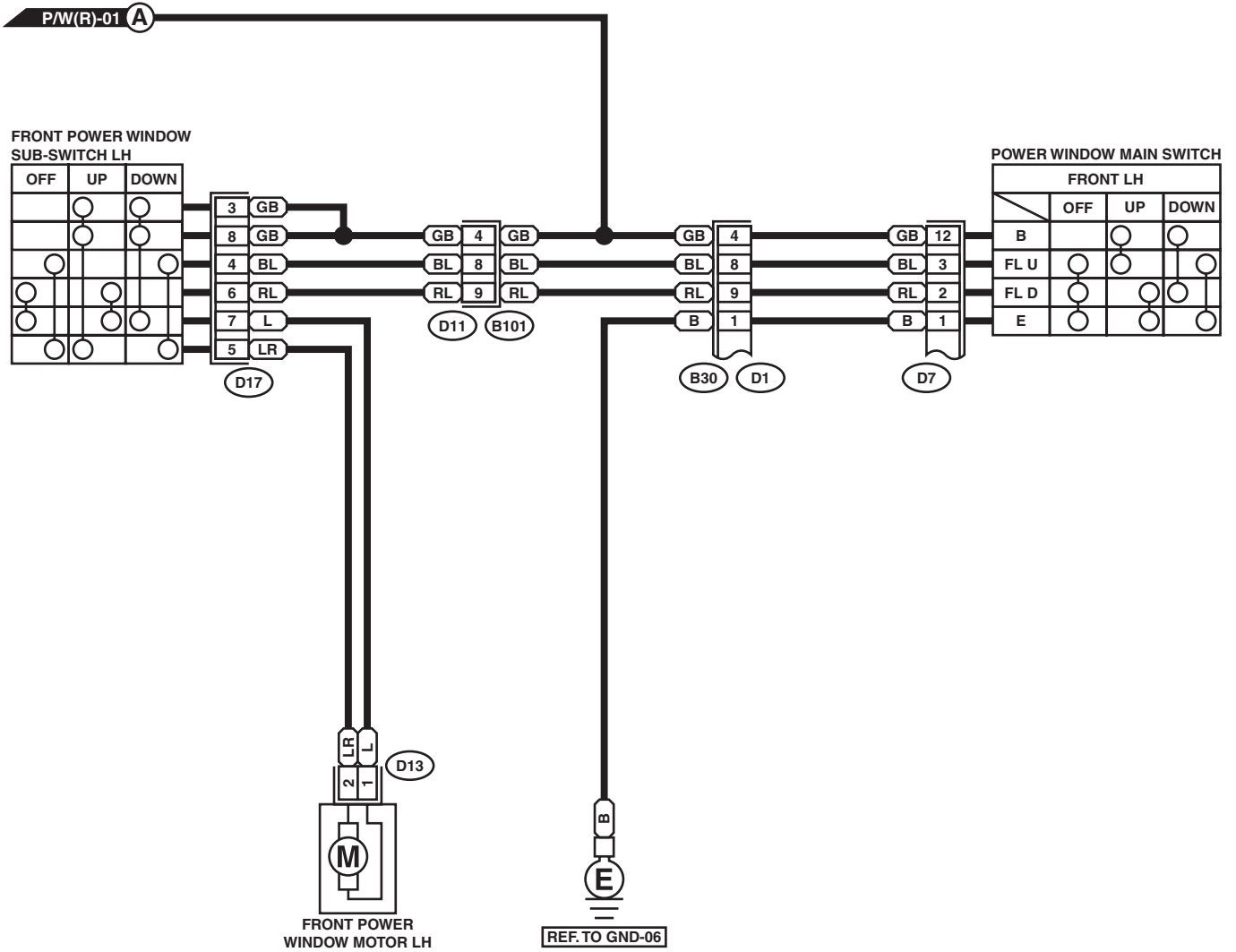
GL70-20D

POWER WINDOW SYSTEM

WIRING SYSTEM

P/W(R)-02

P/W(R)-02



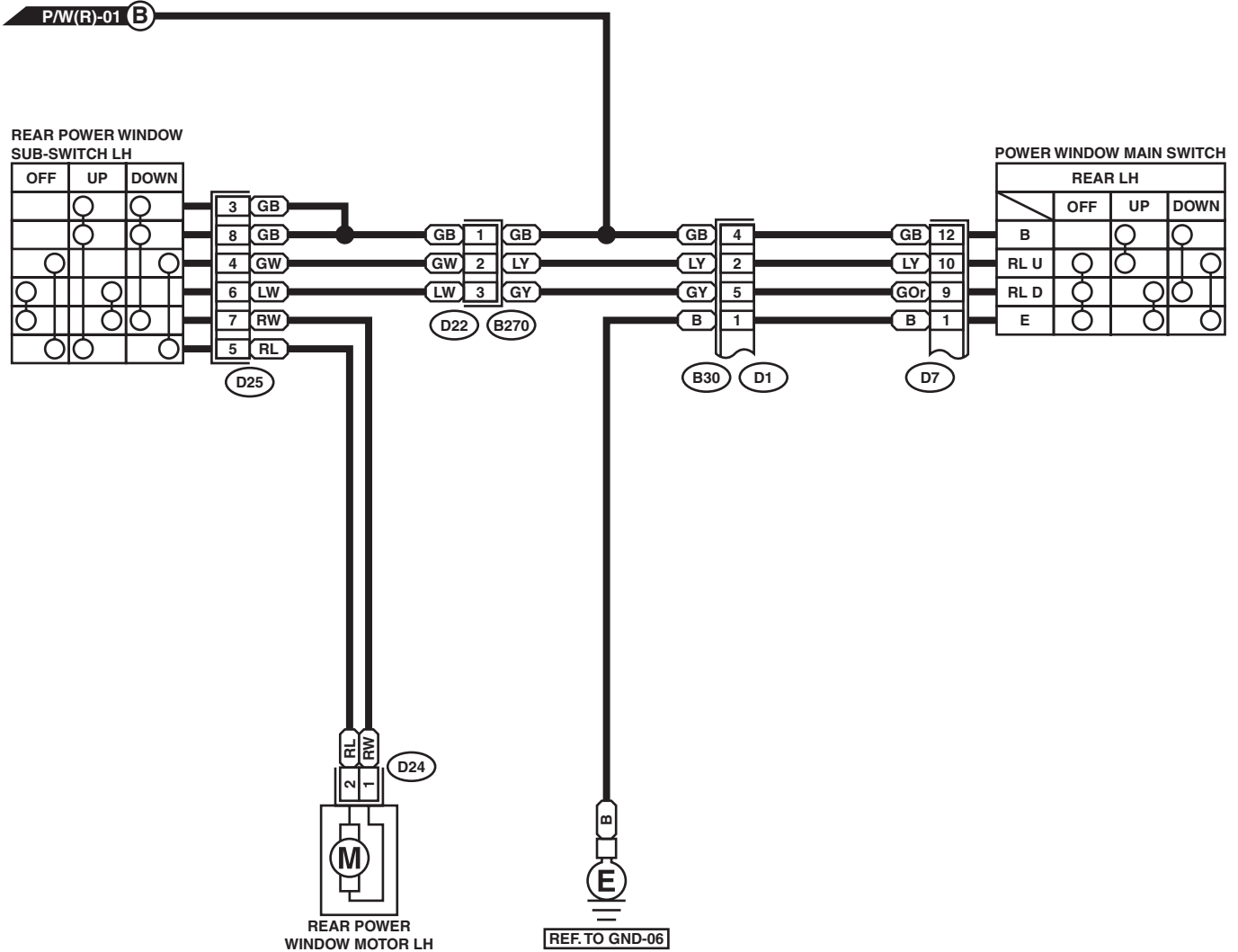
GR70-21B

POWER WINDOW SYSTEM

WIRING SYSTEM

P/W(R)-03

P/W(R)-03



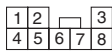
D24 (GREEN)



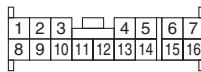
D22



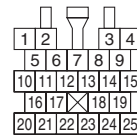
D25



D7



D1



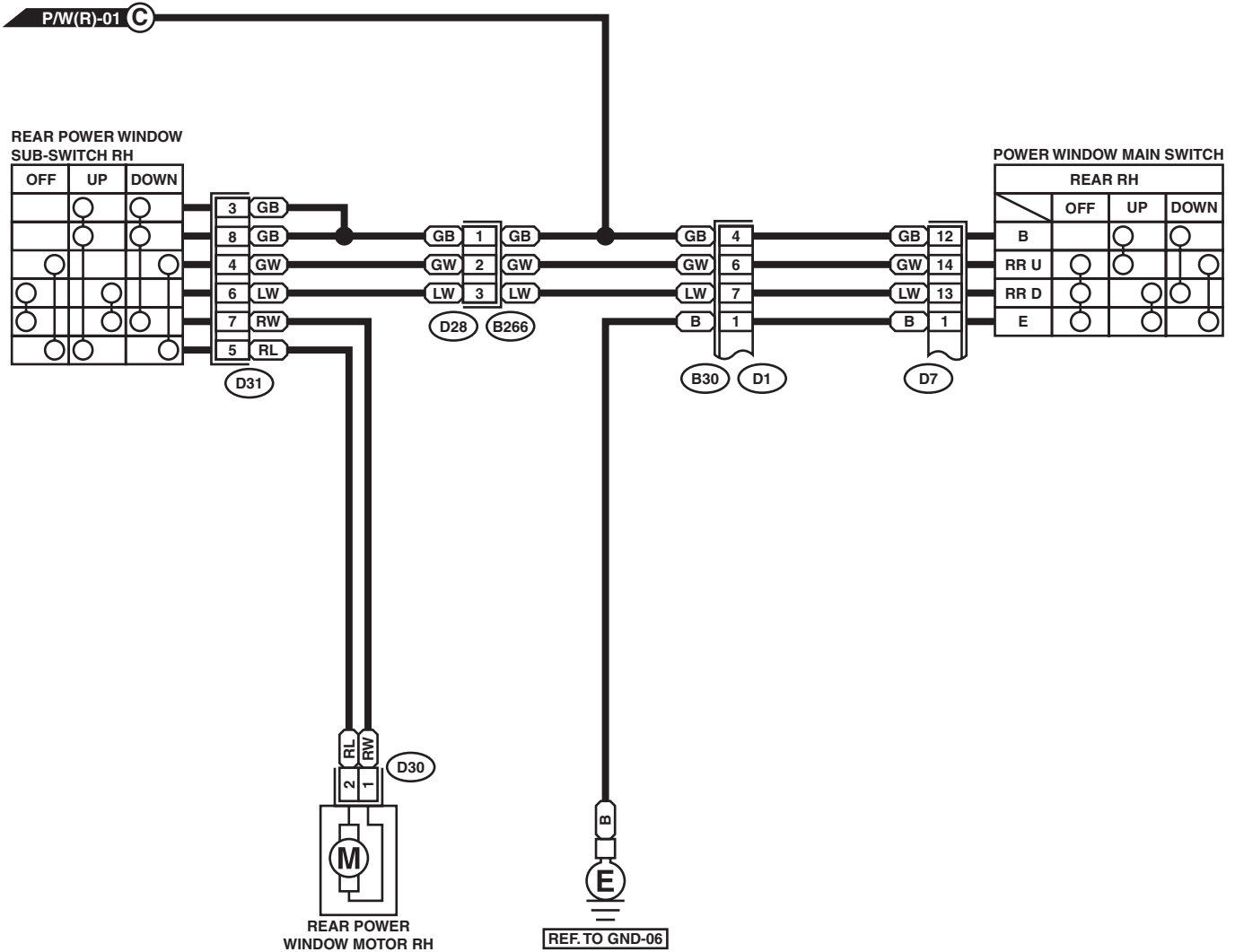
GR70-21C

POWER WINDOW SYSTEM

WIRING SYSTEM

P/W(R)-04

P/W(R)-04



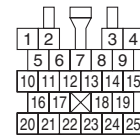
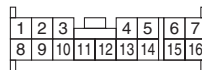
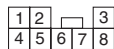
D30 (GREEN)

D28

D31

D7

D1



GR70-21D

35.Radiator Fan System

A: SCHEMATIC

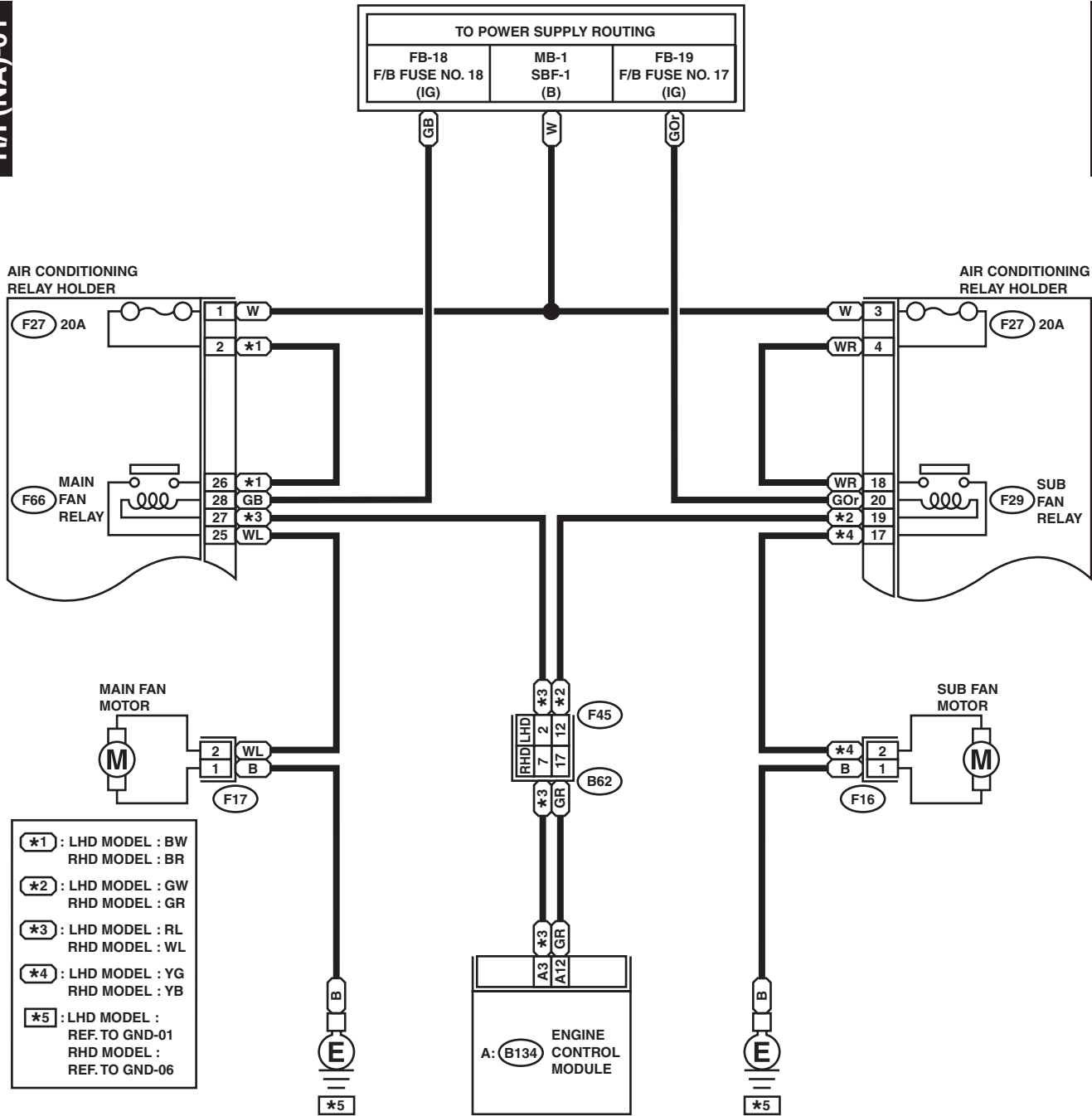
RADIATOR FAN SYSTEM

WIRING SYSTEM

1. NON-TURBO ENGINE MODEL

R/F(NA)-01

R/F(NA)-01



F16 (BLACK)

F45 : RHD

F45 : LHD

F27

F29

F66

F17 (BLACK)

1	2	3	4	5	6	7	8		
9	10	11	12	13	14	15	16	17	18

1	2	3	4	5	6	7	8	9	10	11		
12	13	14	15	16	17	18	19	20	21	22	23	24

1	2	5	6	9	13	14	17	21	22	25	29
3	4	7	10	15	18	23	26	27	28	30	
8	11	12	16	19	20	24	27	28	30		

RELAY HOLDER (BLACK)

A: B134

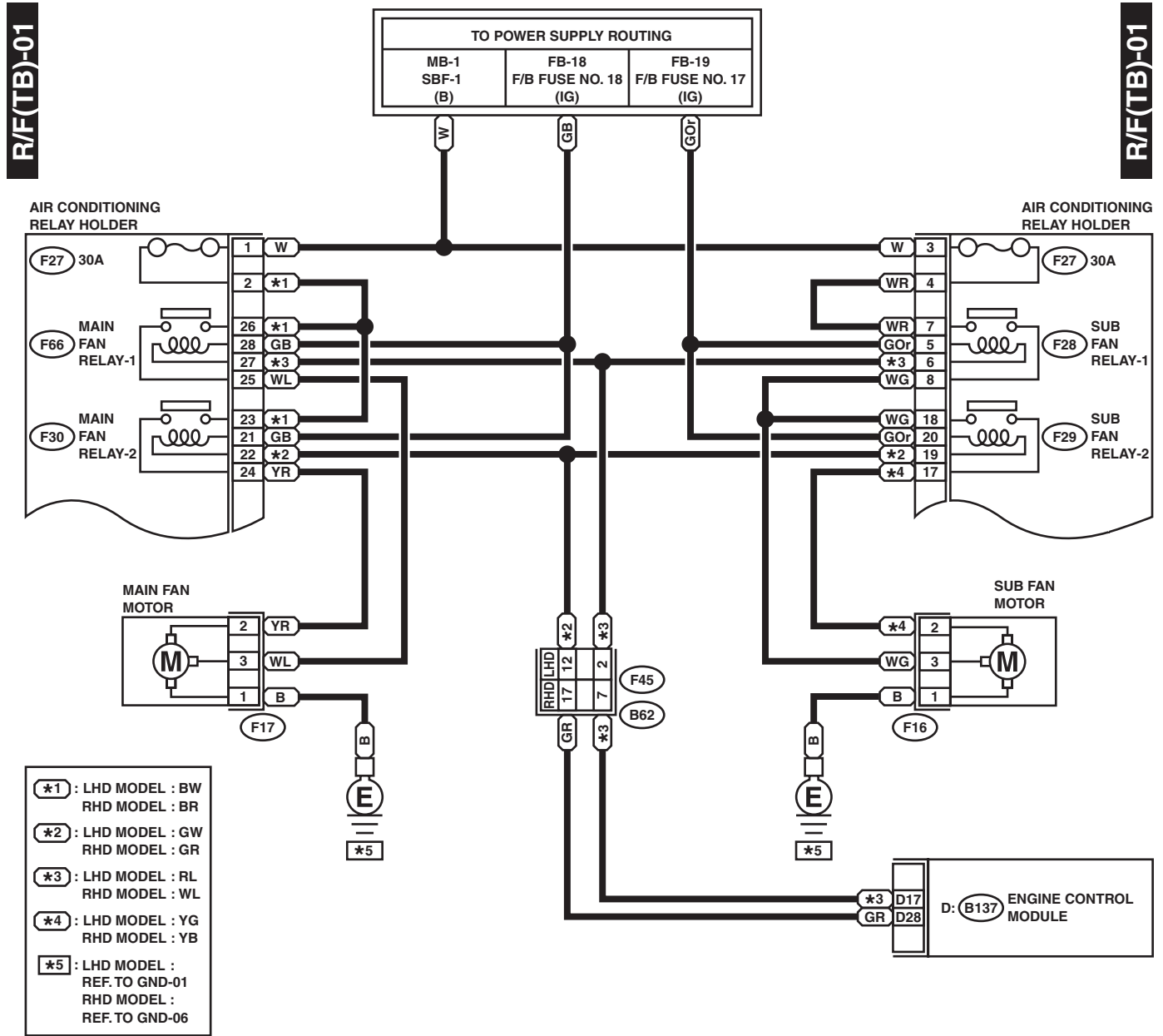
1	2	3	4	5	6	7	8							
9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
24	25	26	27	28	29	30	31	32	33	34	35			

GG14-23

RADIATOR FAN SYSTEM

WIRING SYSTEM

2. TURBO ENGINE MODEL



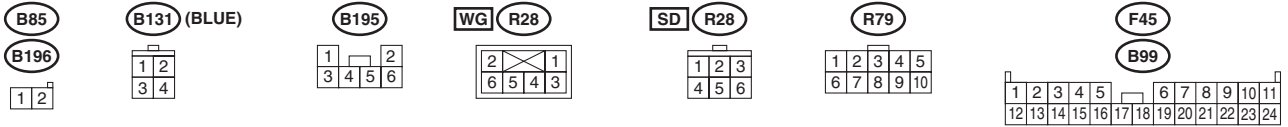
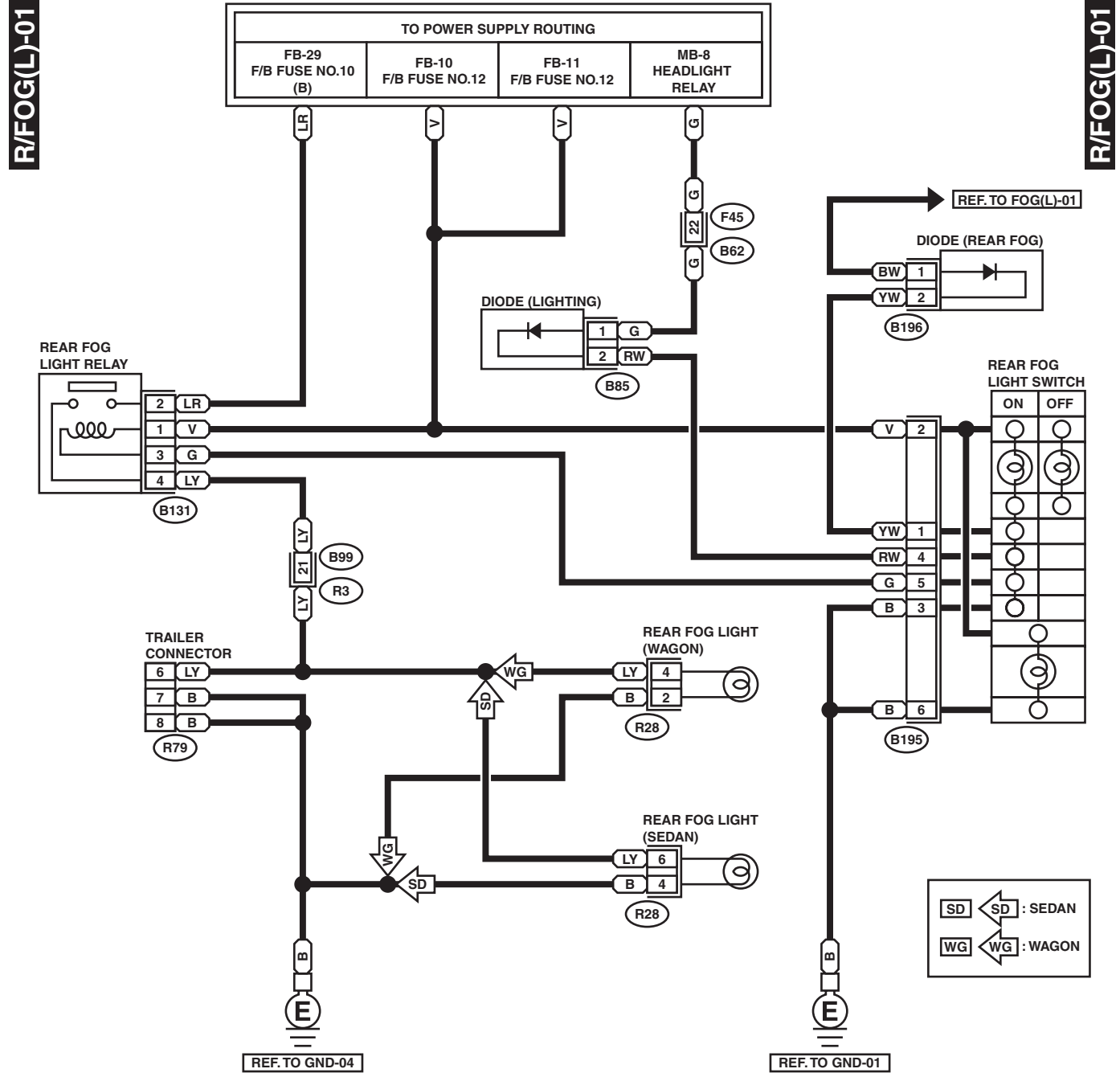
36.Rear Fog Light System

A: SCHEMATIC

REAR FOG LIGHT SYSTEM

WIRING SYSTEM

1. LHD MODEL



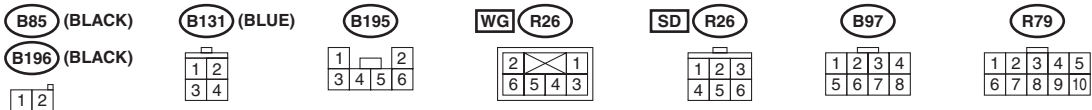
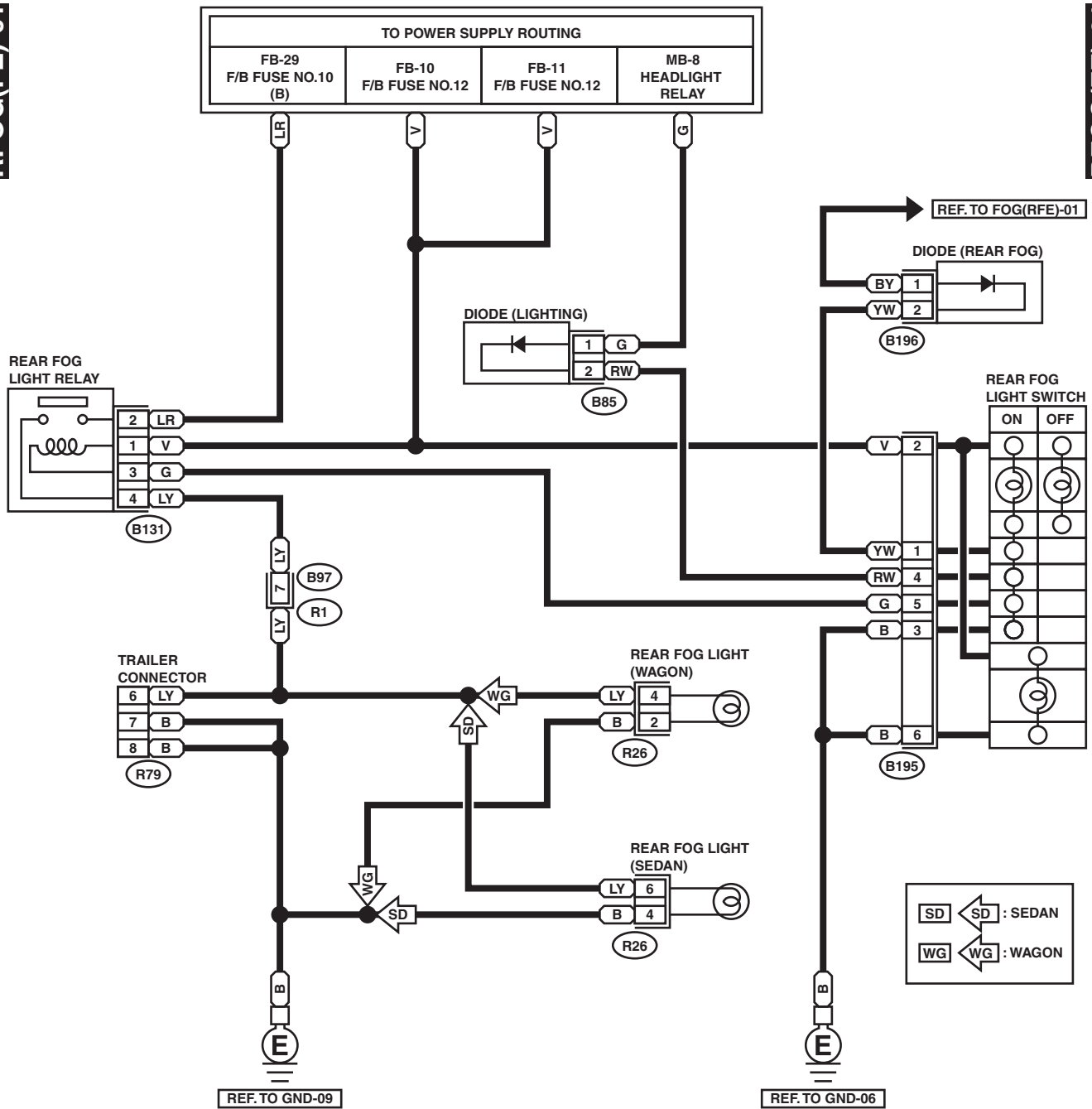
REAR FOG LIGHT SYSTEM

WIRING SYSTEM

2. RHD FOR EUROPE MODEL

RFOG(FE)-01

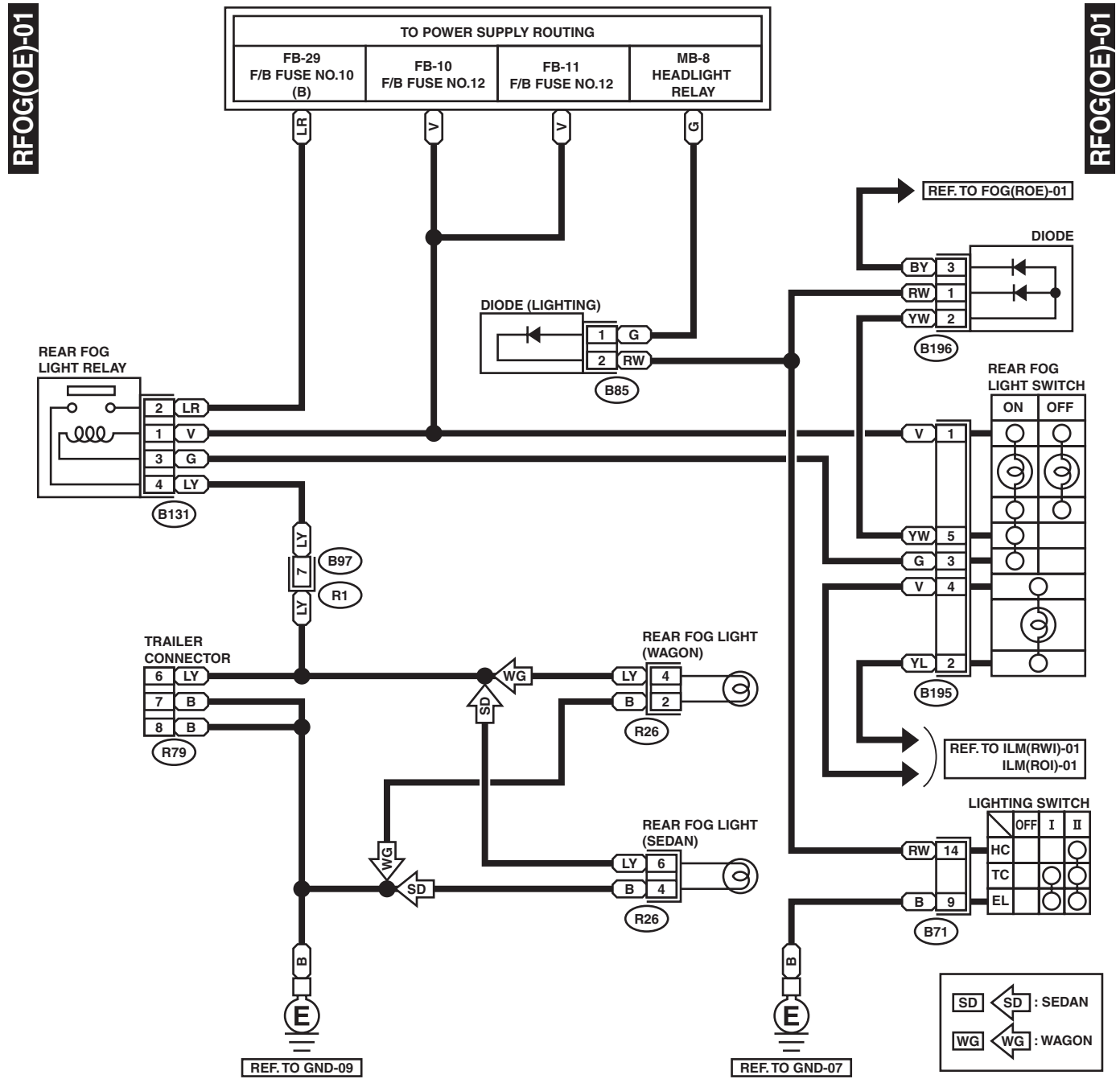
RFOG(FE)-01



REAR FOG LIGHT SYSTEM

WIRING SYSTEM

3. RHD EXCEPT FOR EUROPE MODEL



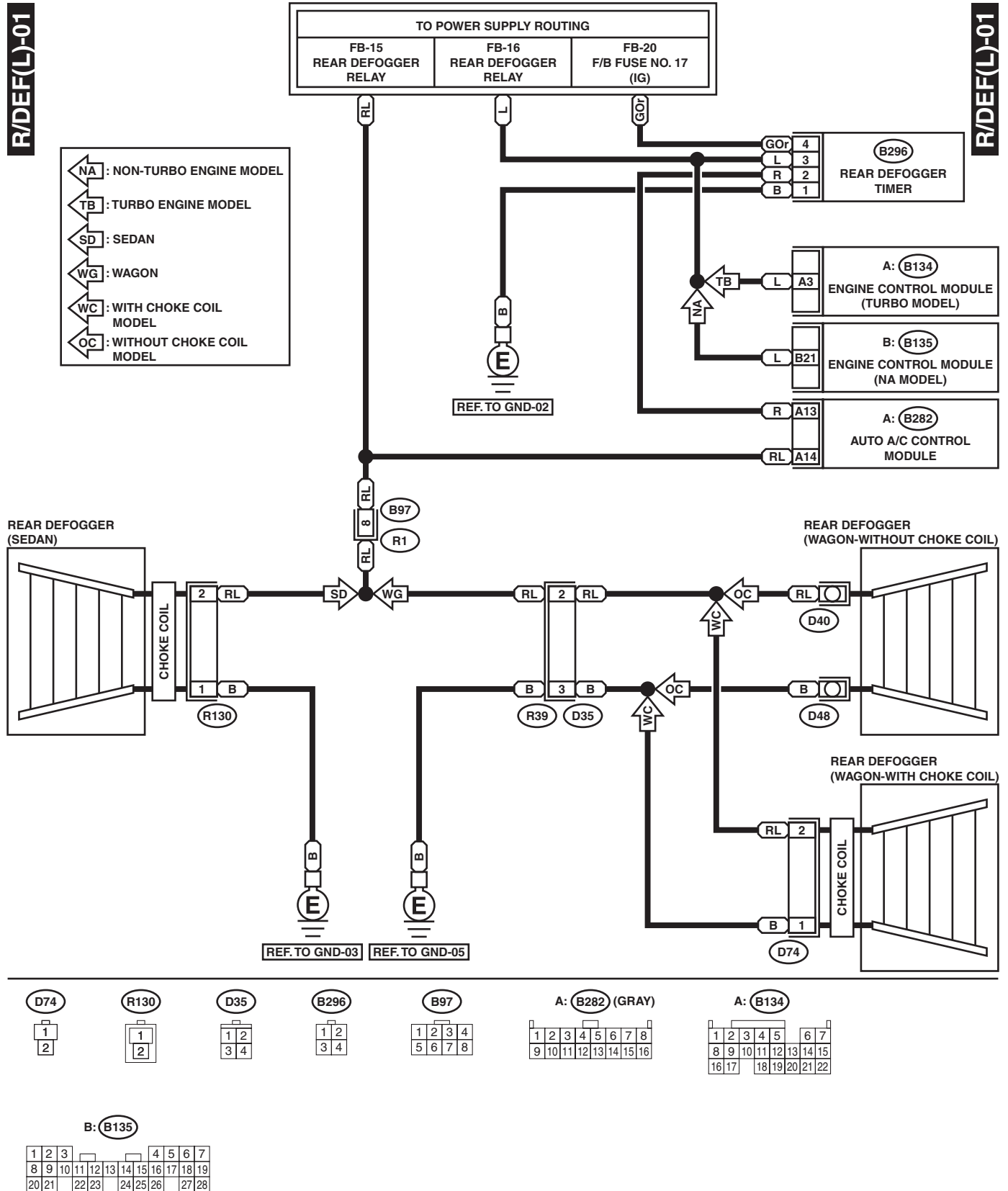
37.Rear Window Defogger System

A: SCHEMATIC

REAR WINDOW DEFOGGER SYSTEM

WIRING SYSTEM

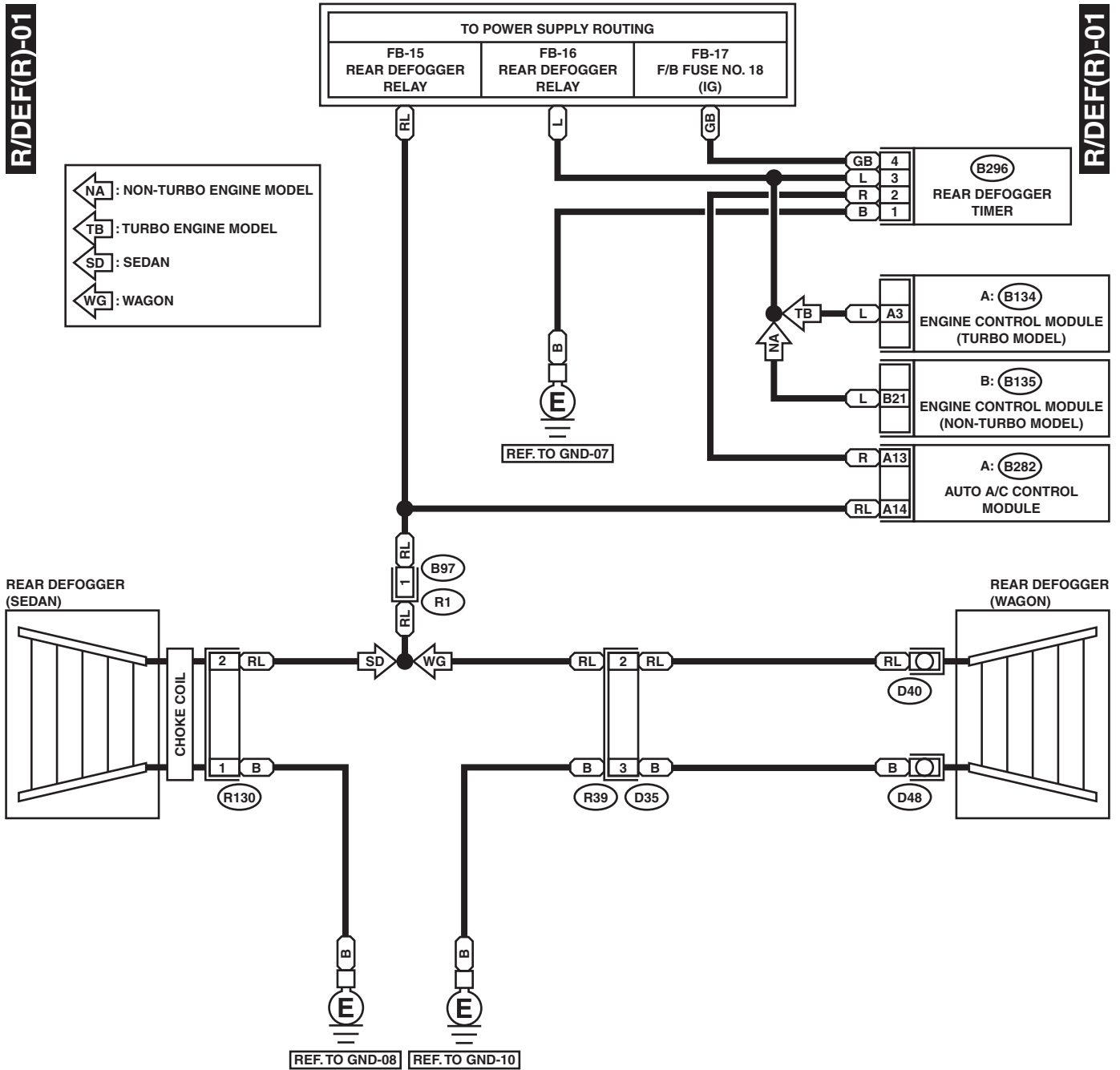
1. LHD MODEL



REAR WINDOW DEFOGGER SYSTEM

WIRING SYSTEM

2. RHD MODEL



R130



D35



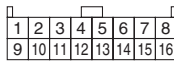
B296



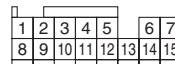
B97



A: (B282) (GRAY)



A: (B134)



B: (B135)



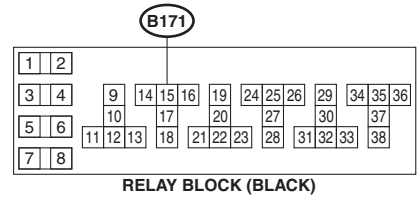
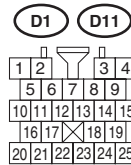
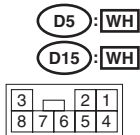
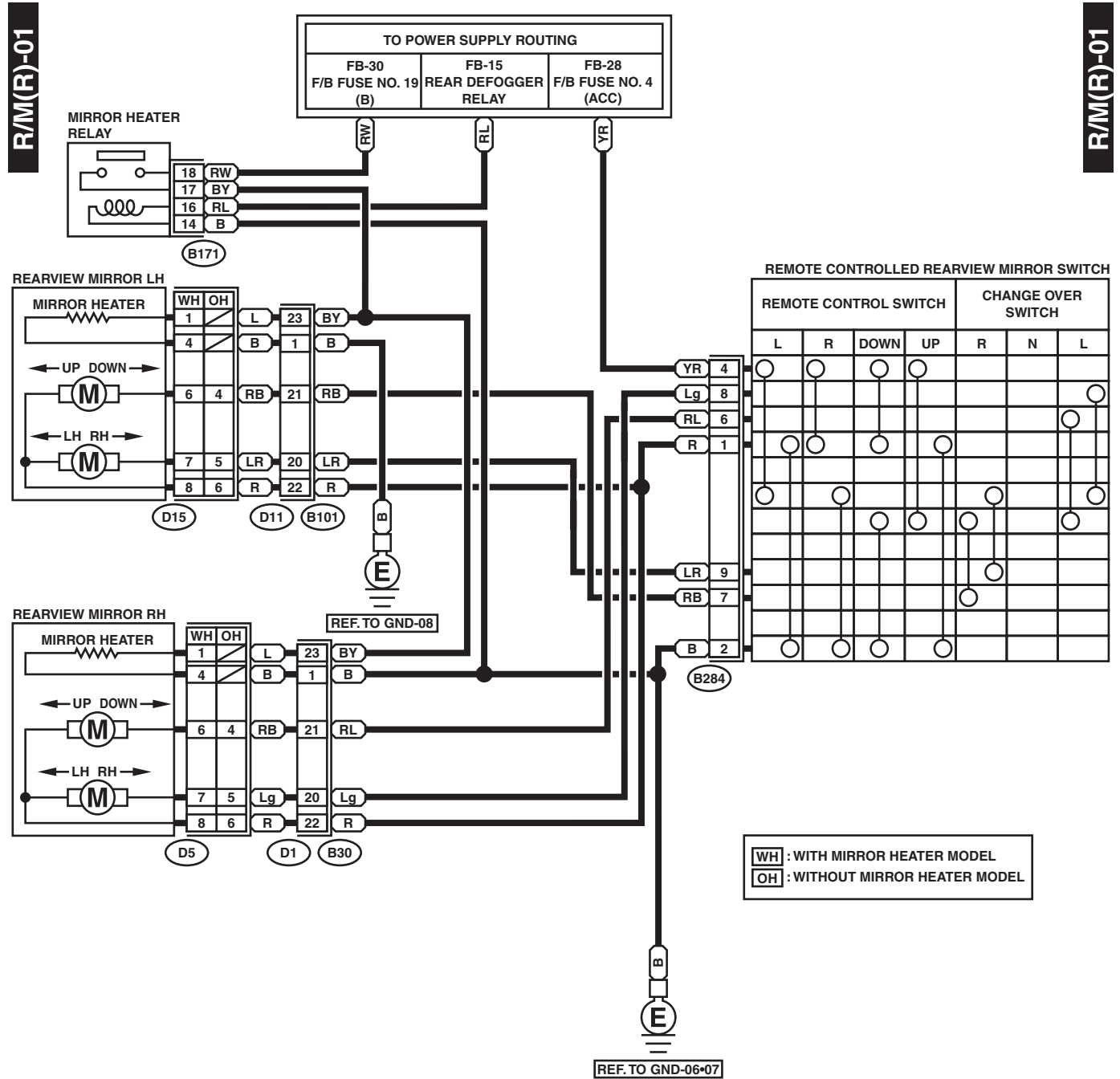
38.Remote Controlled Rearview Mirror System

A: SCHEMATIC

REMOTE CONTROLLED REARVIEW MIRROR SYSTEM

WIRING SYSTEM

2. RHD MODEL



39.Seat Belt Warning System

A: SCHEMATIC

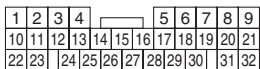
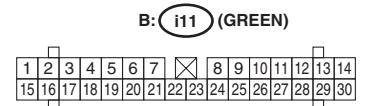
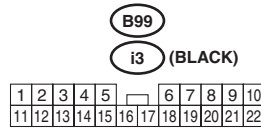
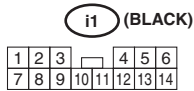
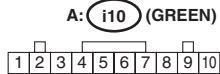
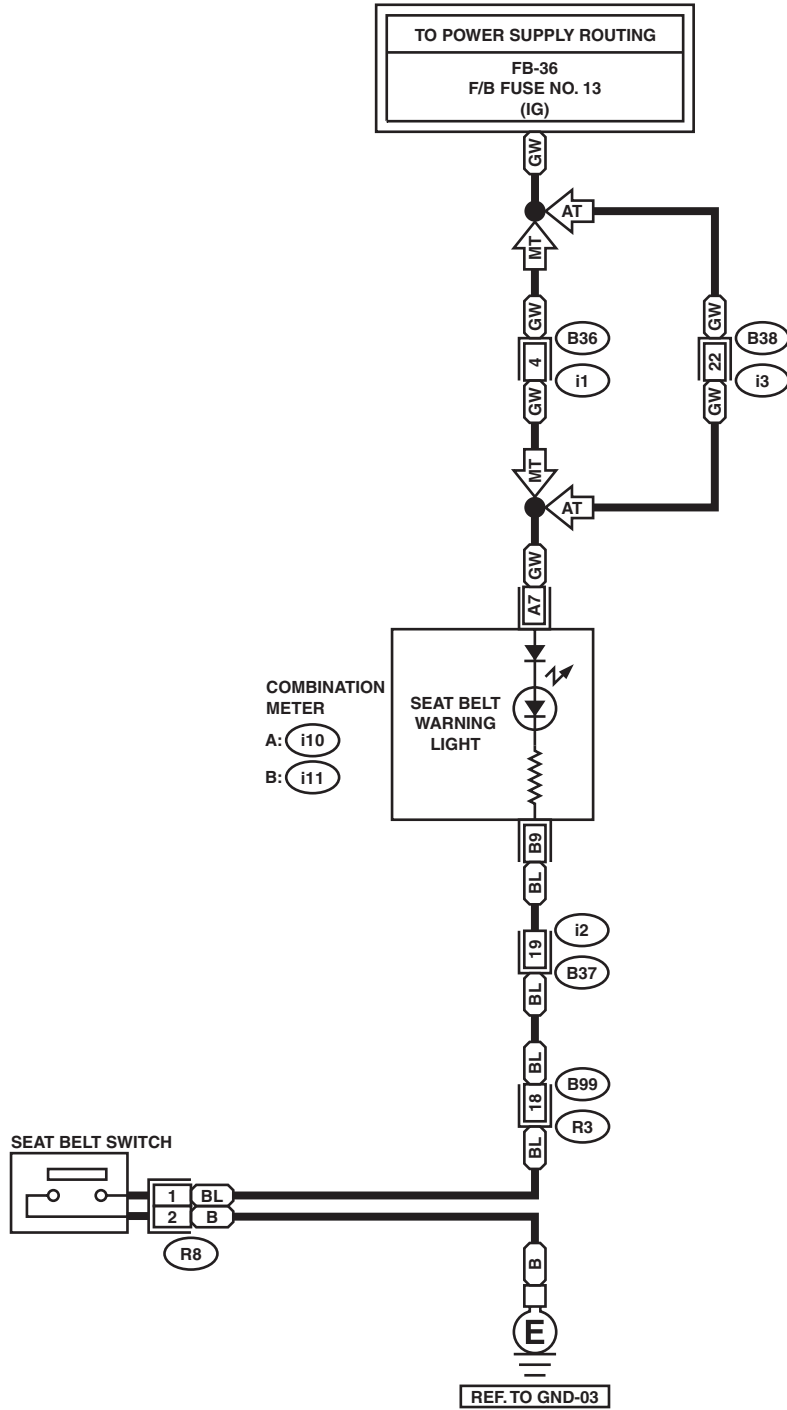
SEAT BELT WARNING SYSTEM

WIRING SYSTEM

1. WITHOUT SEAT BELT TIMER MODEL

S/BELT-01

S/BELT-01



GG87-21

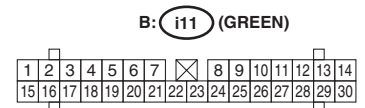
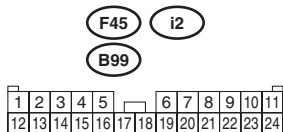
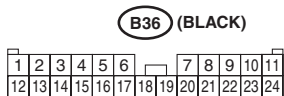
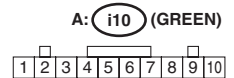
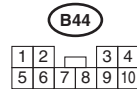
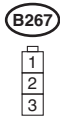
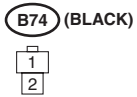
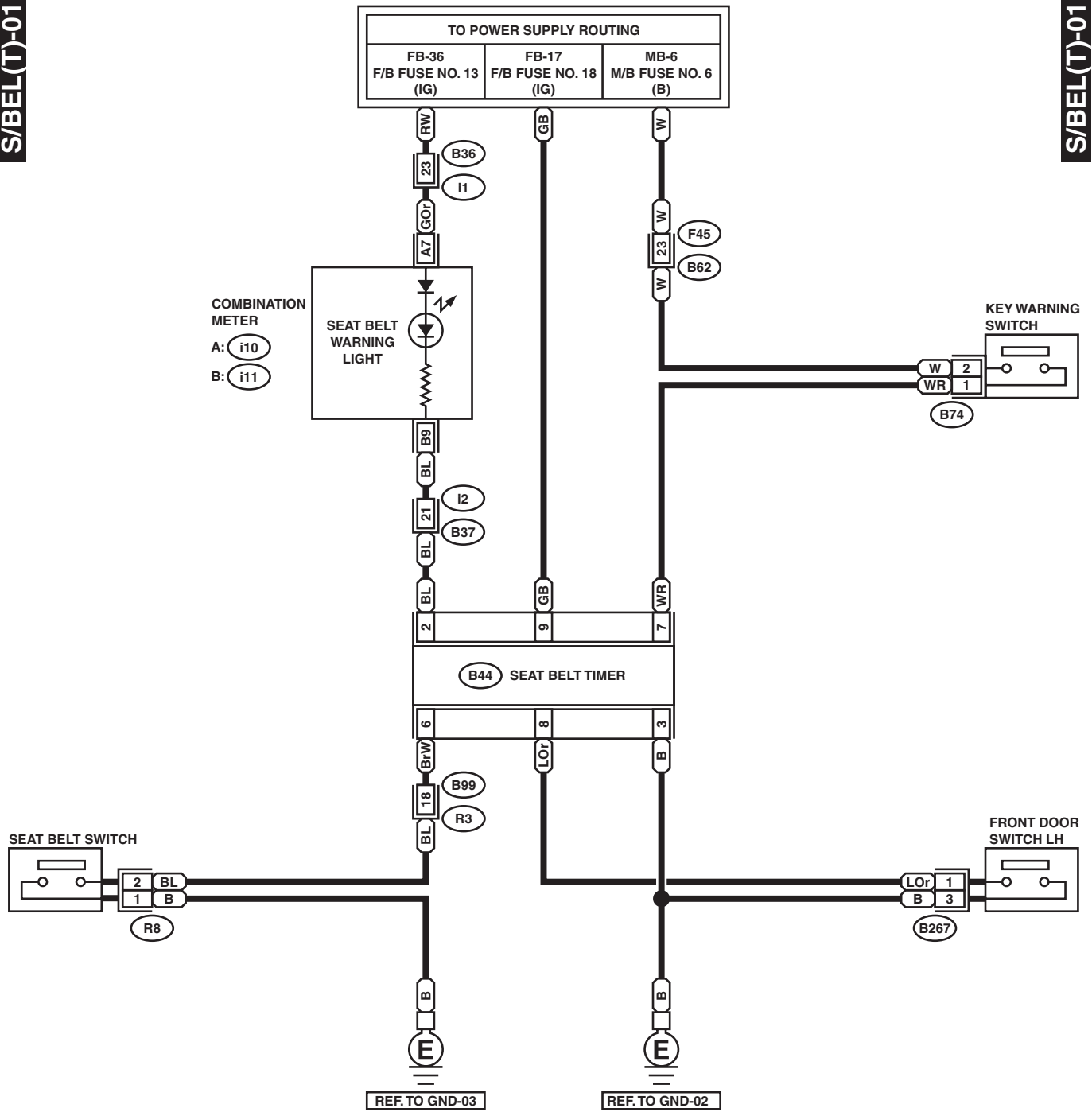
SEAT BELT WARNING SYSTEM

WIRING SYSTEM

2. WITH SEAT BELT TIMER MODEL

S/BEL(T)-01

S/BEL(T)-01



GL87-21

40.Starter System

A: SCHEMATIC

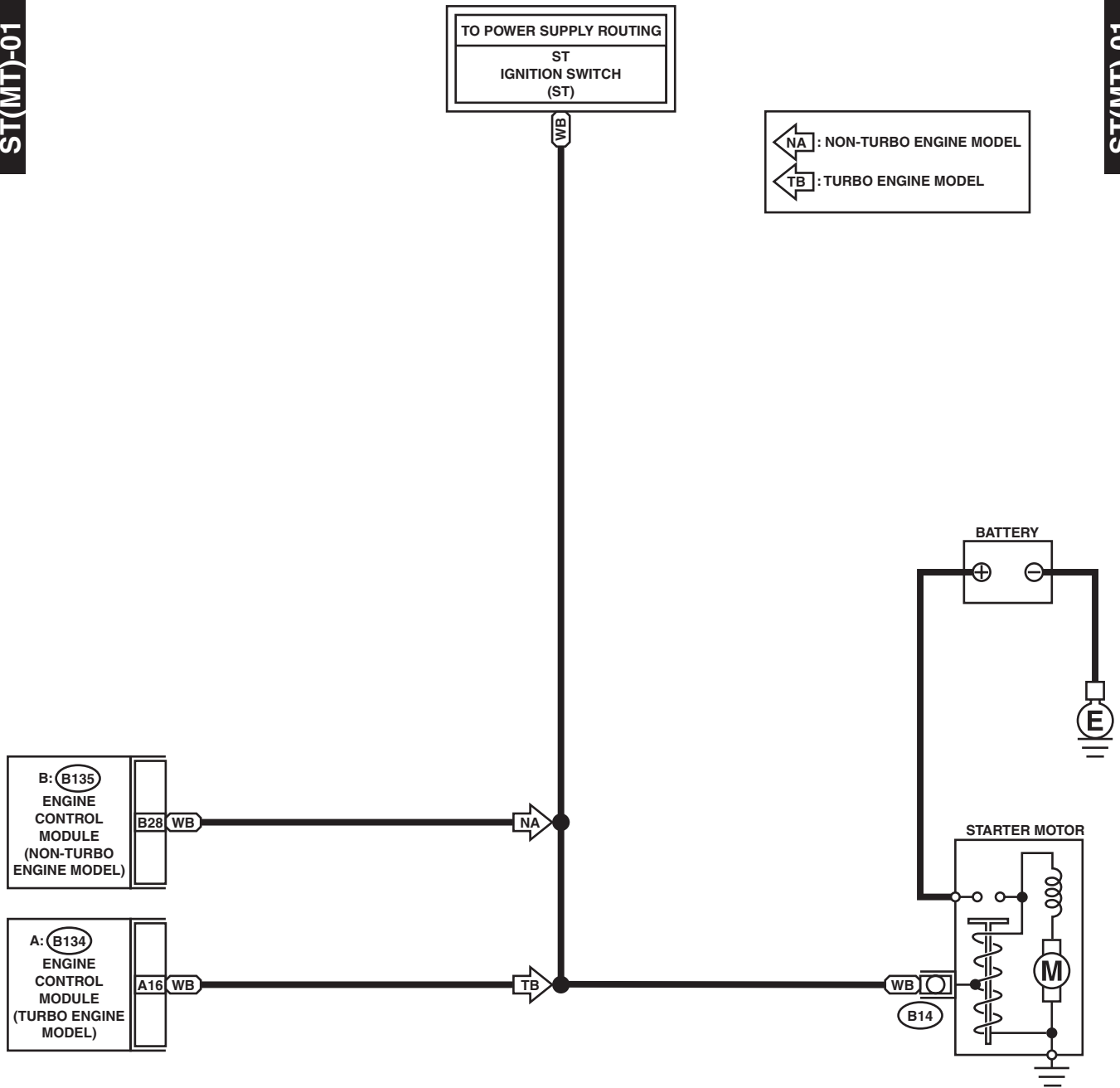
STARTER SYSTEM

WIRING SYSTEM

1. MT MODEL

ST(MT)-01

ST(MT)-01



A: (B134)

1	2	3	4	5	6	7	
8	9	10	11	12	13	14	15
16	17	18	19	20	21	22	

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			

GG03-20

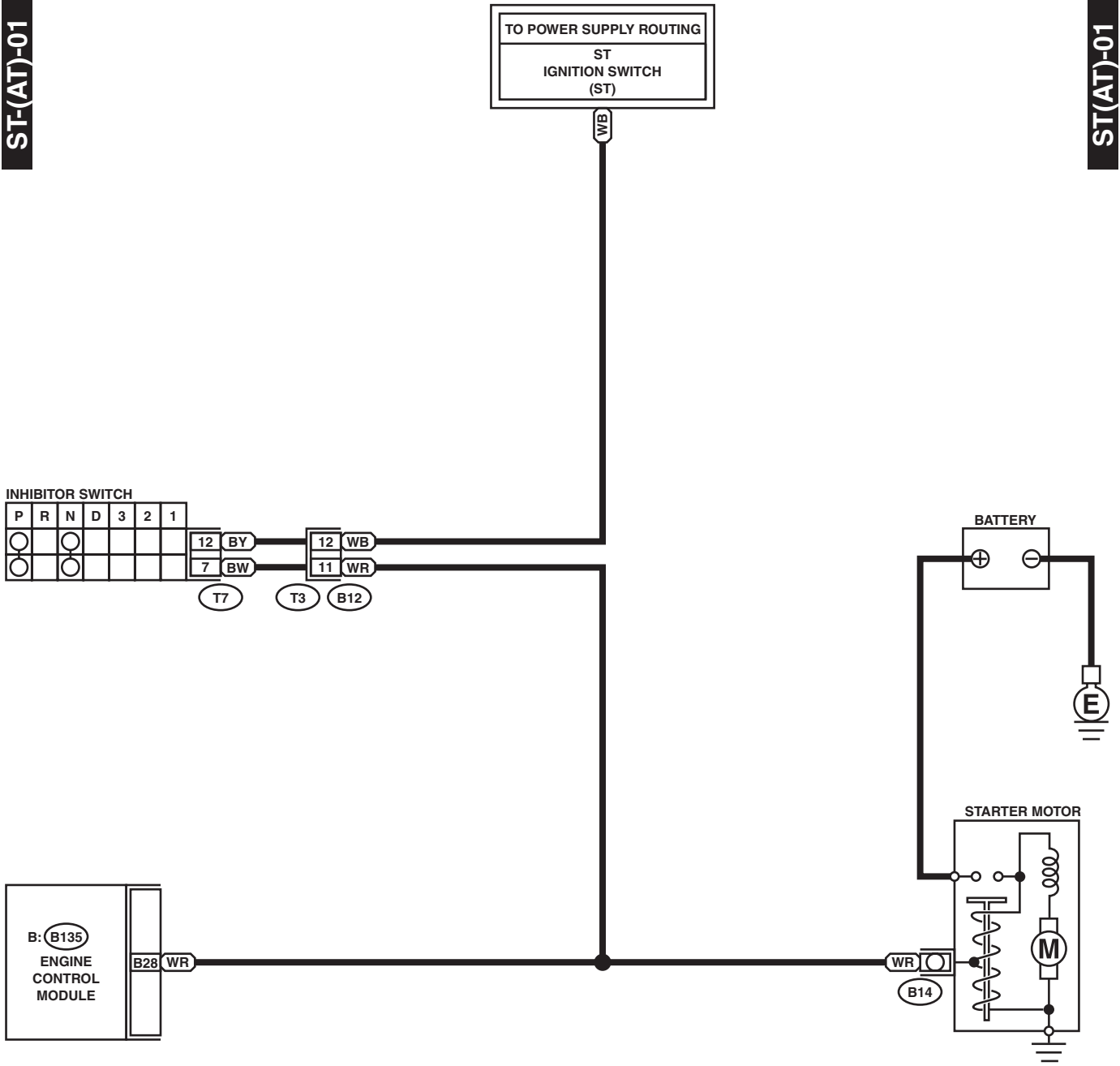
STARTER SYSTEM

WIRING SYSTEM

2. AT MODEL

ST(AT)-01

ST(AT)-01



(T7)

(B12)

B: (B135)

1	2	3	4	5	6
7	8	9	10	11	12

1	2	3	4
5	6	7	8
9	10	11	12

1	2	3			4	5	6	7
8	9	10	11	12	13	14	15	16
17	18	19	20	21	22	23	24	25
26	27	28						

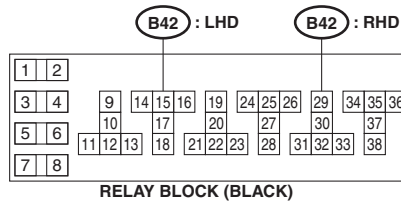
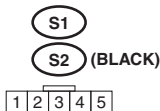
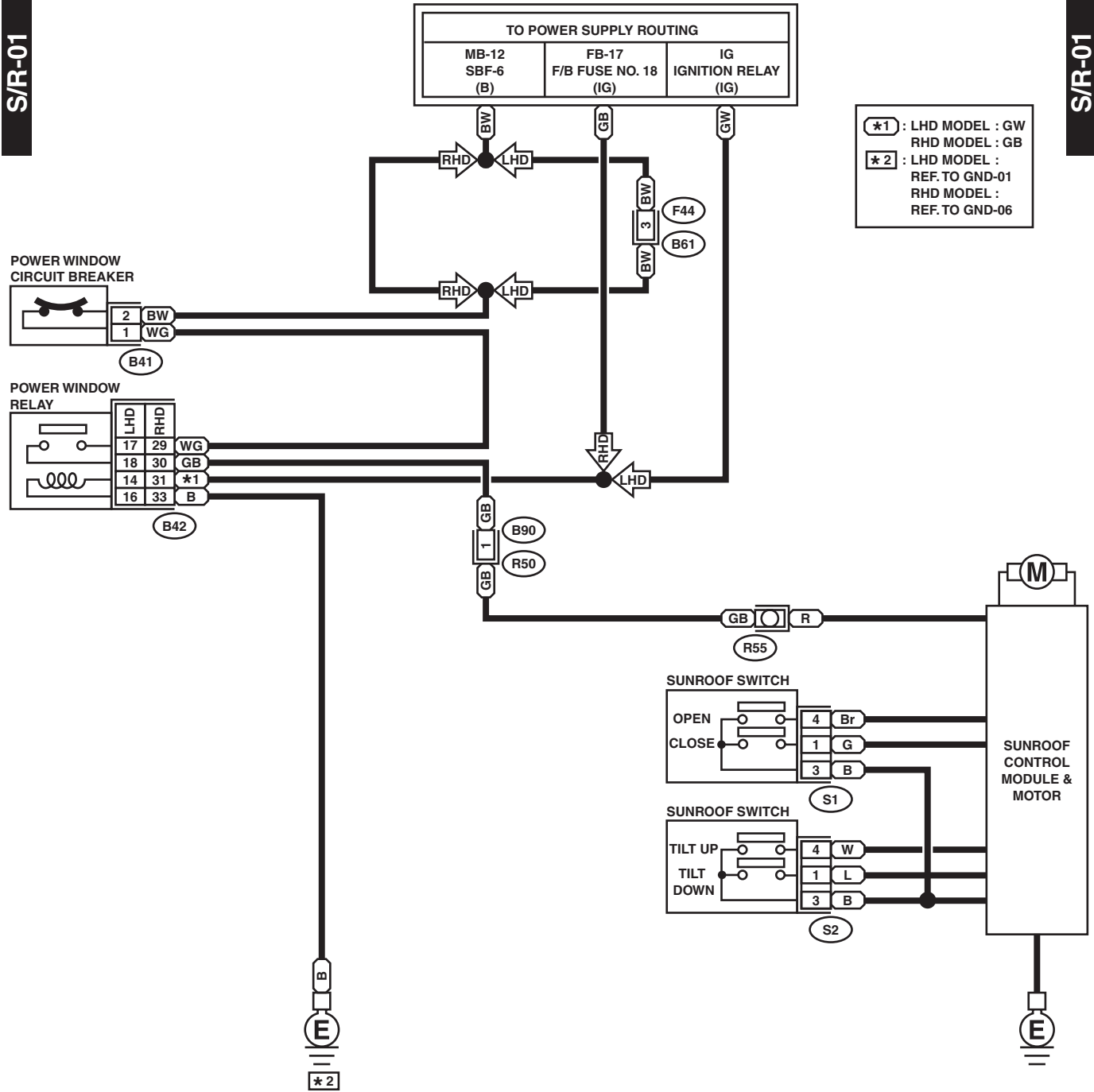
GG03-21

41.Sunroof System

A: SCHEMATIC

S/R-01

S/R-01



WIPER AND WASHER SYSTEM (FRONT)

WIRING SYSTEM

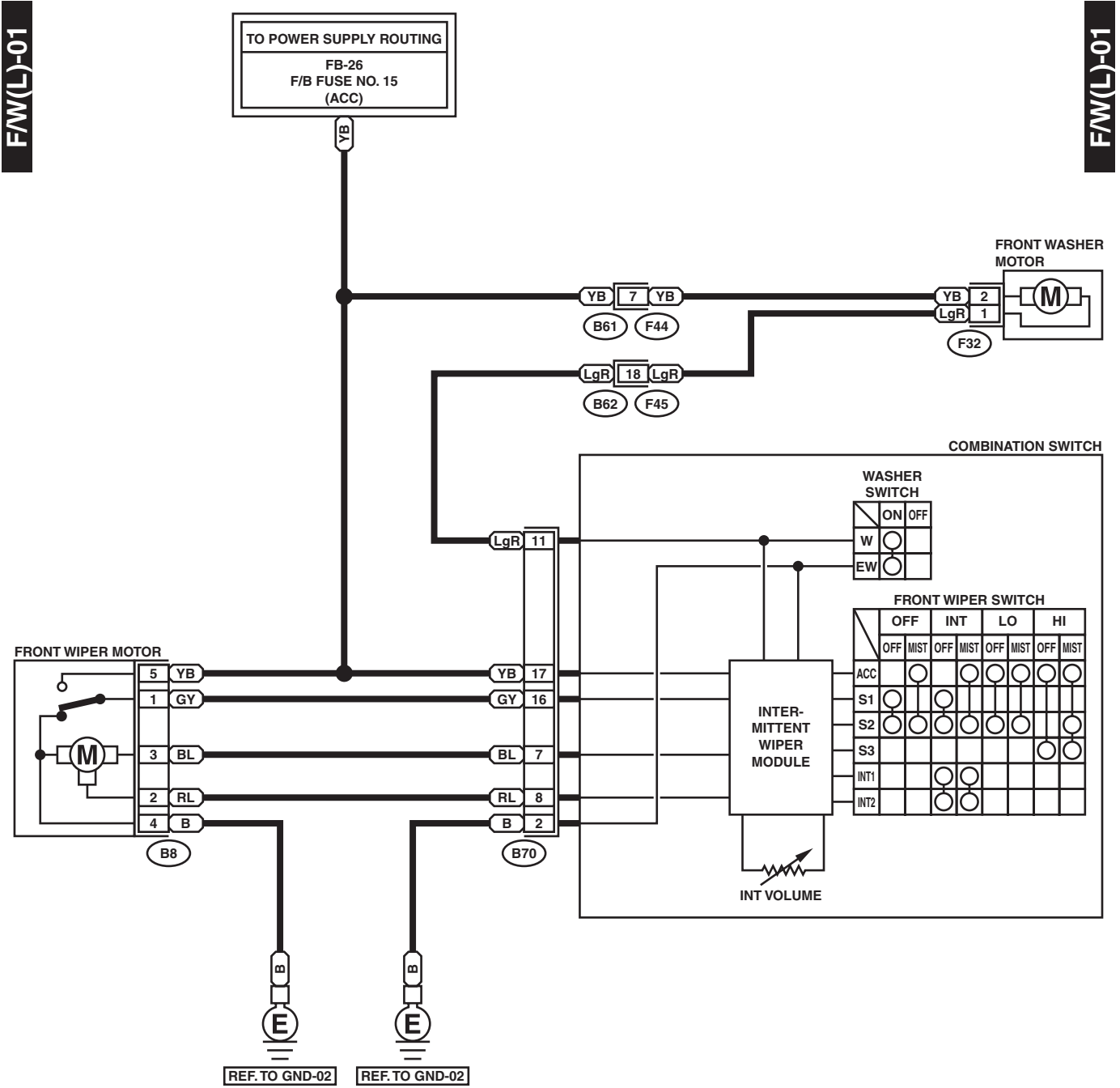
42. Wiper and Washer System (Front)

A: SCHEMATIC

WIPER AND WASHER SYSTEM (FRONT)

WIRING SYSTEM

1. LHD MODEL



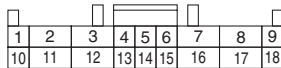
F32 (GREEN)



B8



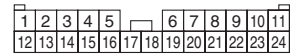
B70



F44



F45



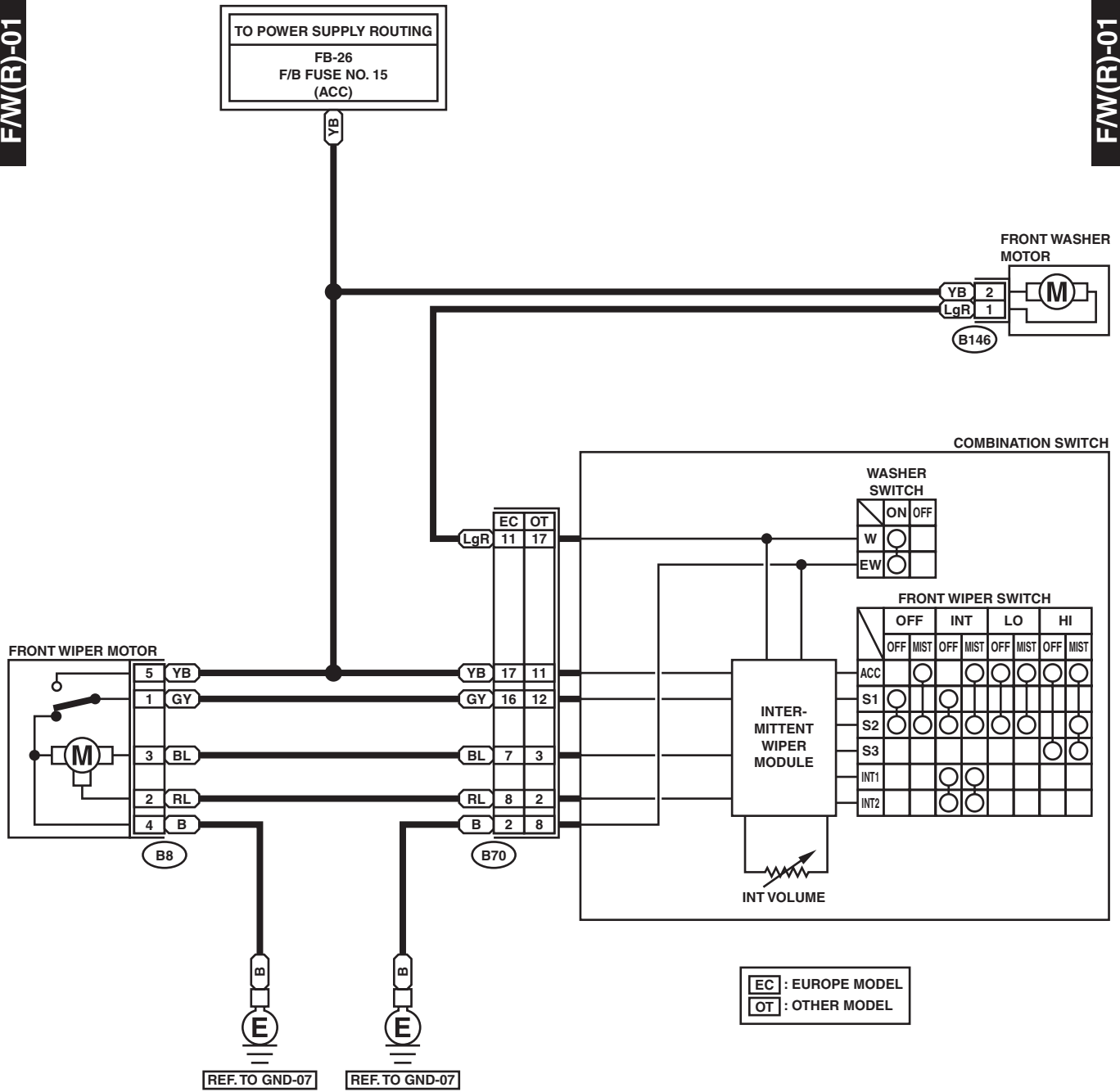
WIPER AND WASHER SYSTEM (FRONT)

WIRING SYSTEM

2. RHD MODEL

FW(R)-01

FW(R)-01



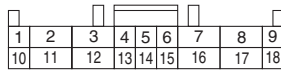
B146 (GREEN)



B8



B70



43. Wiper and Washer System (Rear)

A: SCHEMATIC

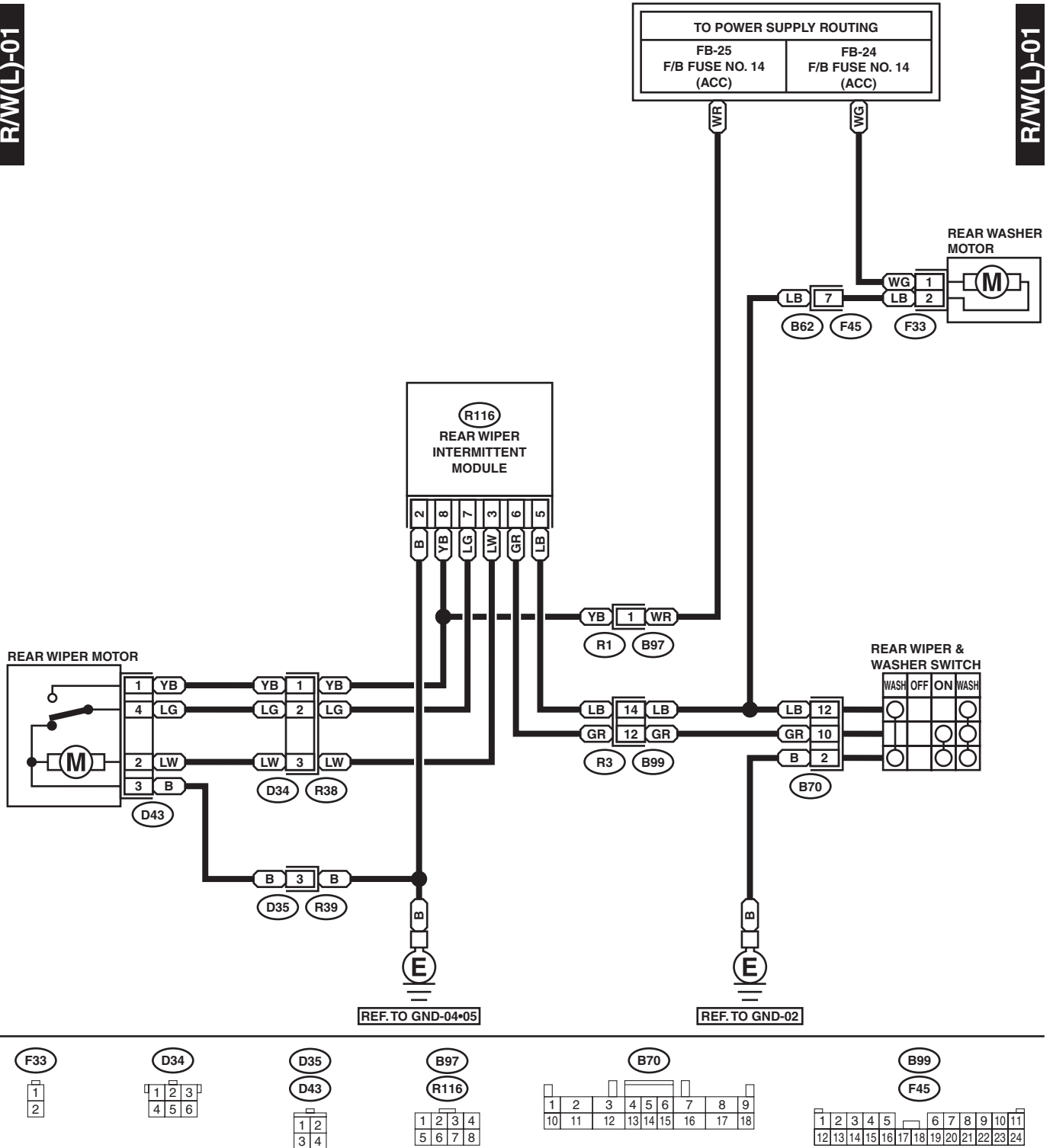
WIPER AND WASHER SYSTEM (REAR)

WIRING SYSTEM

1. LHD MODEL

R/W(L)-01

R/W(L)-01



GL51-21

WIPER AND WASHER SYSTEM (REAR)

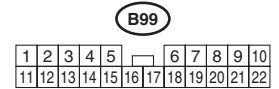
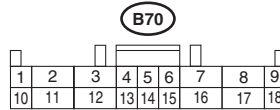
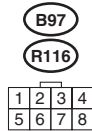
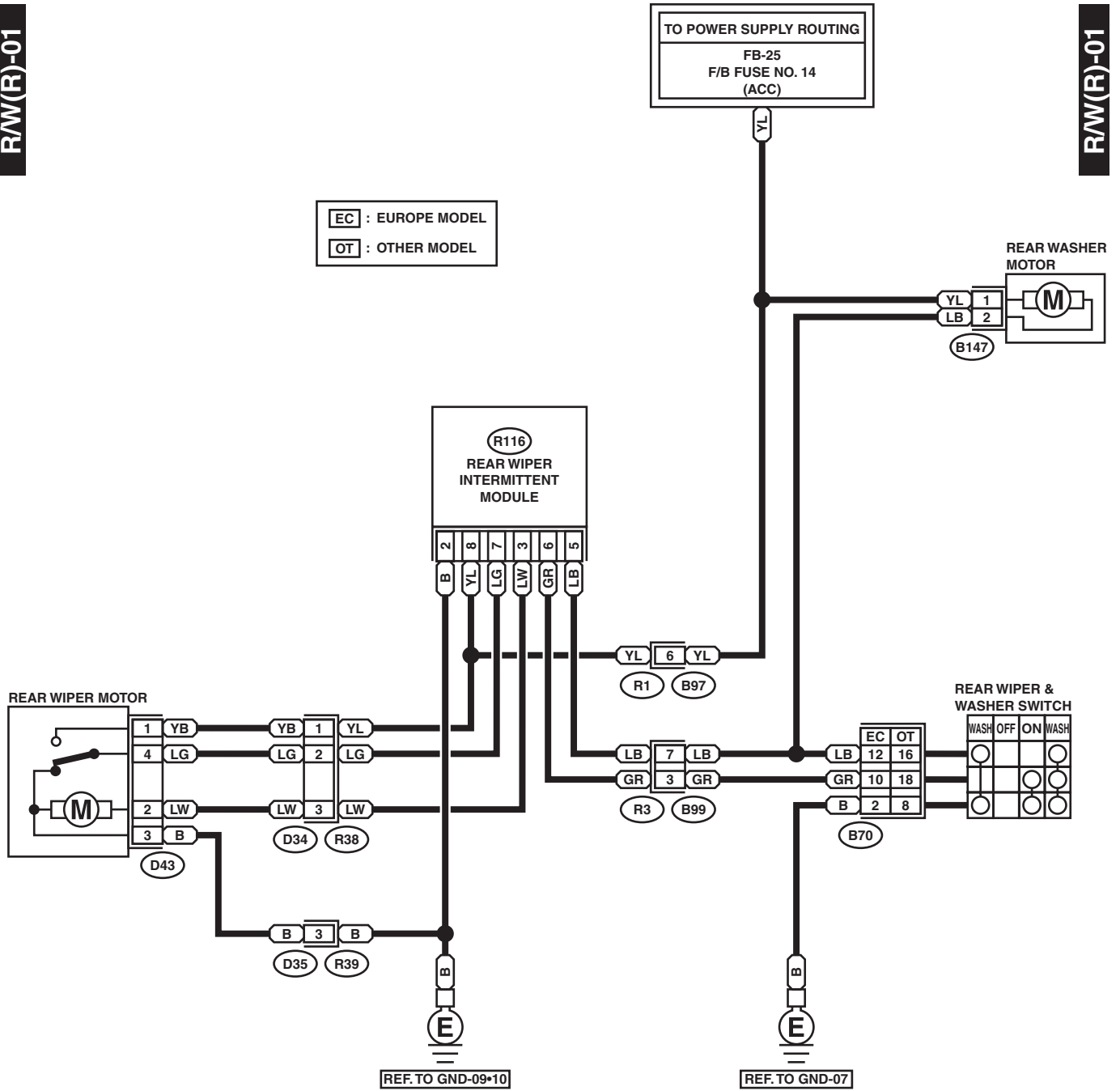
WIRING SYSTEM

2. RHD MODEL

R/W(R)-01

R/W(R)-01

EC : EUROPE MODEL
OT : OTHER MODEL



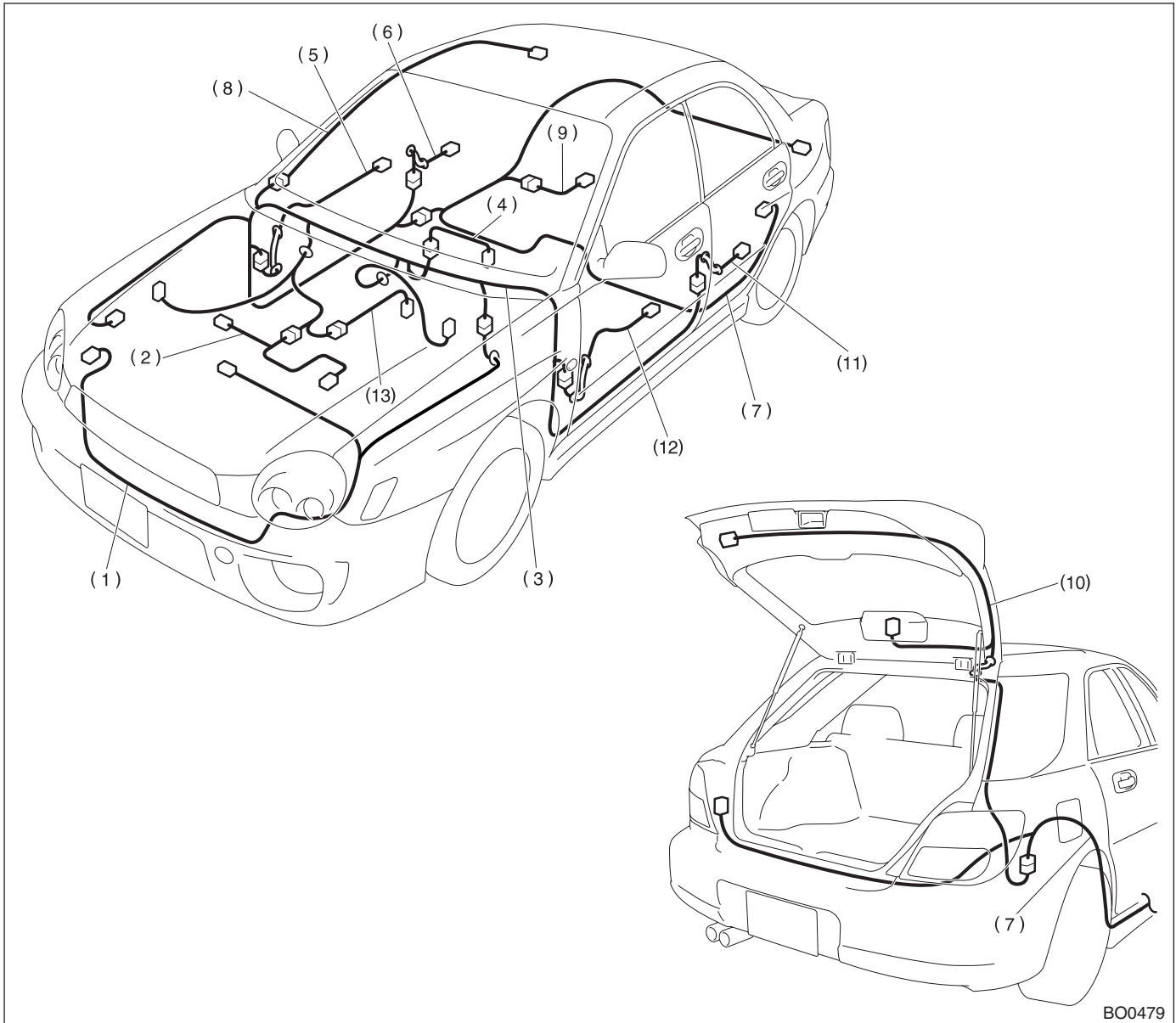
OVERALL SYSTEMS

WIRING SYSTEM

44. Overall Systems

A: LOCATION

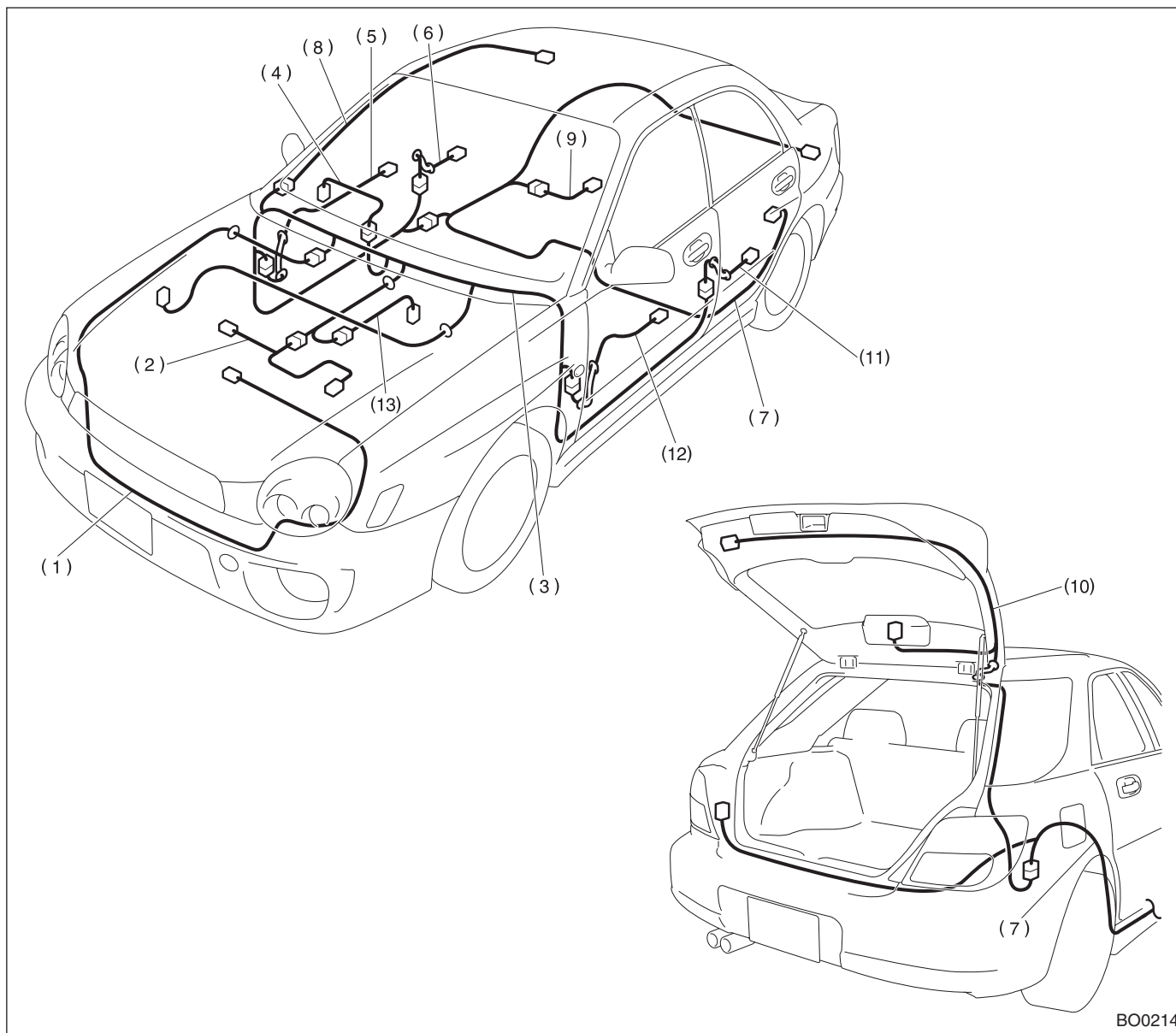
1. LHD MODEL



BO0479

- | | | |
|-------------------------------------|-------------------------|-------------------------|
| (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) Rear gate cord | |

2. RHD MODEL



- | | | |
|-------------------------------------|-------------------------|-------------------------|
| (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) Rear gate cord | |

FRONT WIRING HARNESS

WIRING SYSTEM

45. Front Wiring Harness

A: LOCATION

1. LHD MODEL

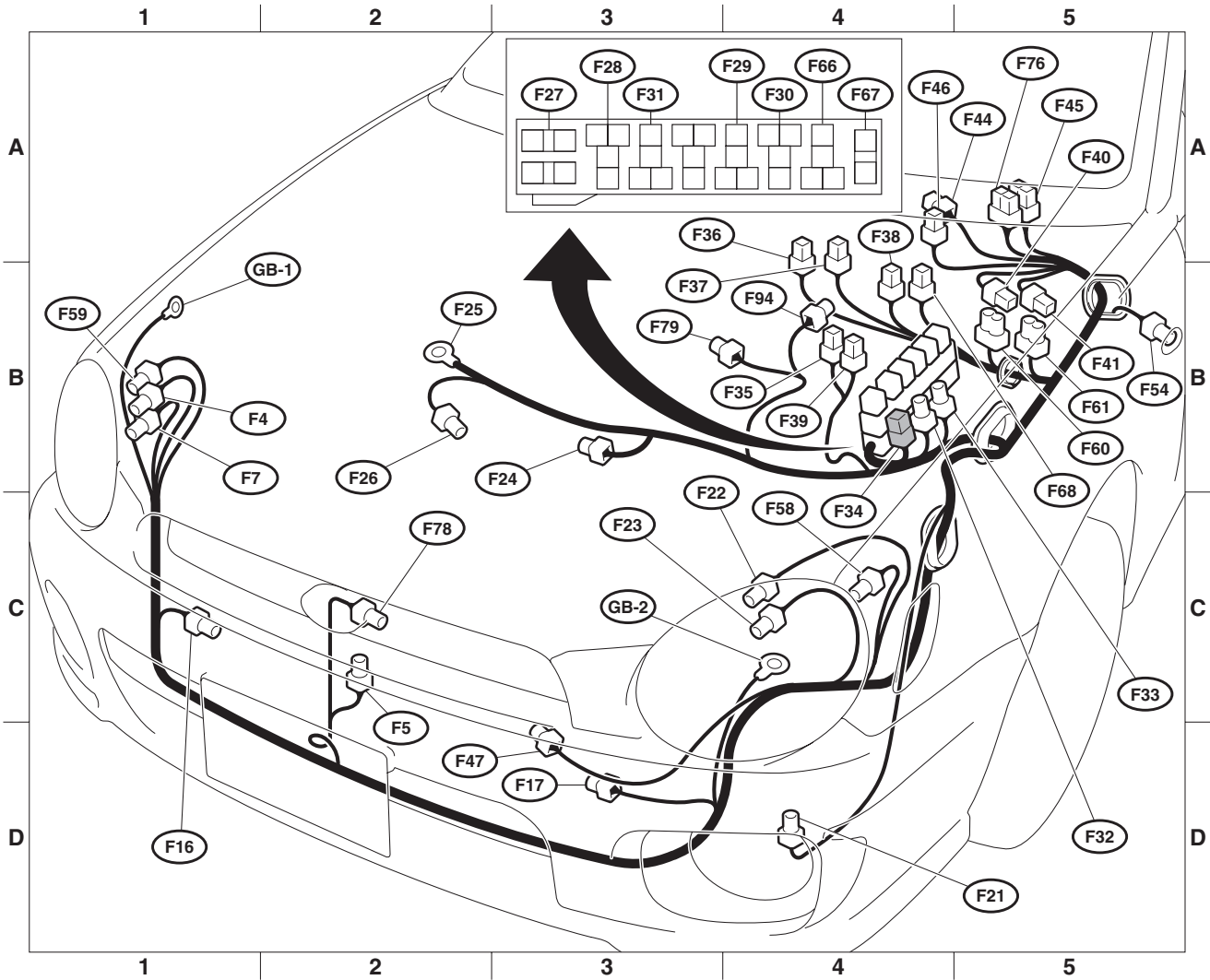
Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
F4	3	Gray	B-1		Front clearance light RH and front turn signal light RH
F5	1	Black	C-2		Horn
F7	3	★	B-1		Headlight RH
F16	2	Black	D-1		Sub fan motor (Non-turbo model)
	3	Black	D-1		Sub fan motor (Turbo model)
F17	2	Black	C-2		Radiator main fan motor (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		F/B
F40	9	Brown	B-3		
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
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)
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)
F68	4	Black	B-3		M/B
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

FRONT WIRING HARNESS

WIRING SYSTEM

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
F94	2	Gray	A-3		ABS front sensor LH

★: Non-colored



BO0467

FRONT WIRING HARNESS

WIRING SYSTEM

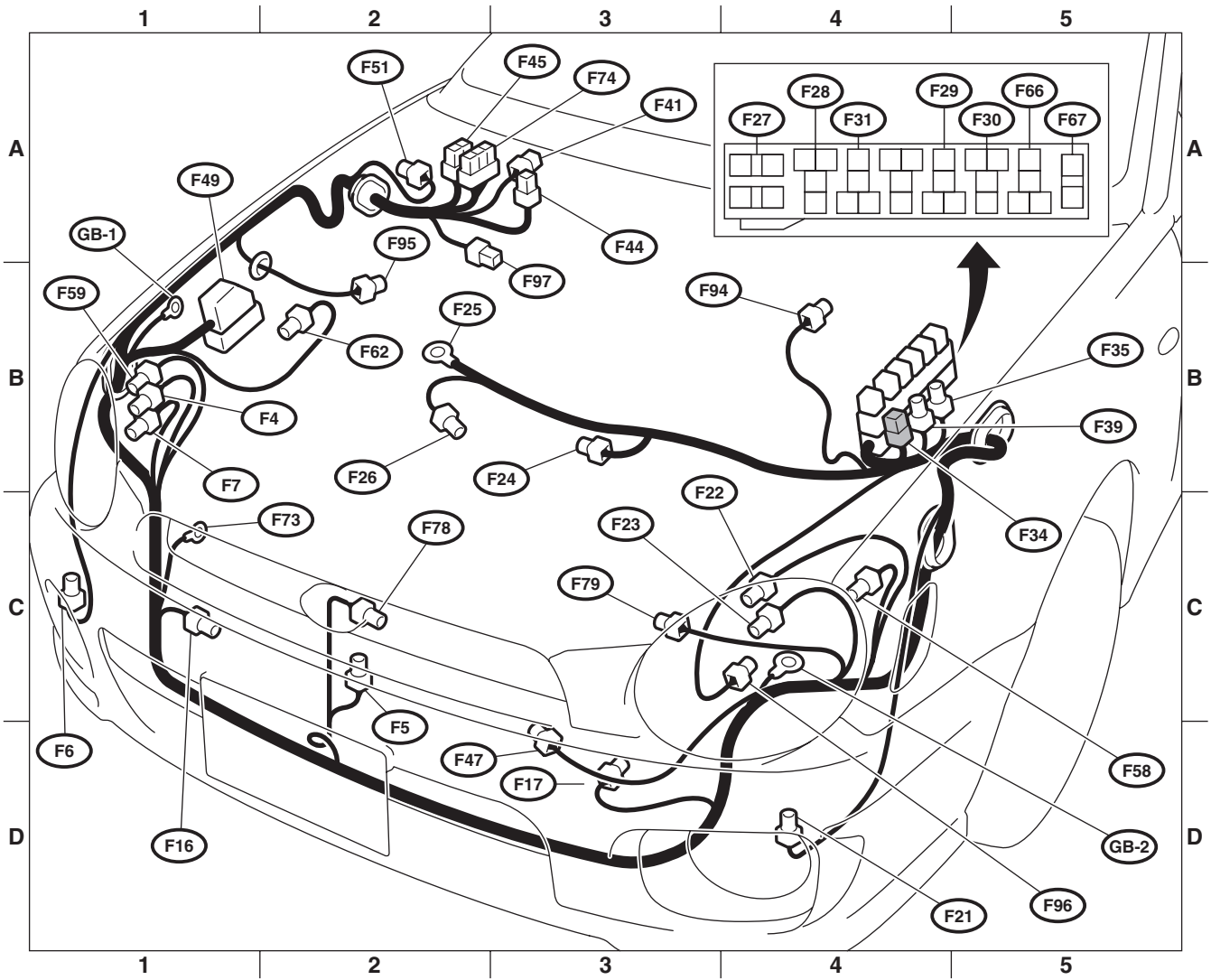
2. RHD MODEL

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		
F39	8	Black	B-4		M/B
F41	7	Gray	A-3		F/B
F44	8	★	A-3	B61	Bulkhead wiring harness
F45	18	★	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	Gray	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	Black	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
F97	2	Black	A-2		ABS condenser

★: Non-colored

FRONT WIRING HARNESS

WIRING SYSTEM



BO0468

BULKHEAD WIRING HARNESS (IN ENGINE ROOM)

WIRING SYSTEM

46. Bulkhead Wiring Harness (In Engine Room)

A: LOCATION

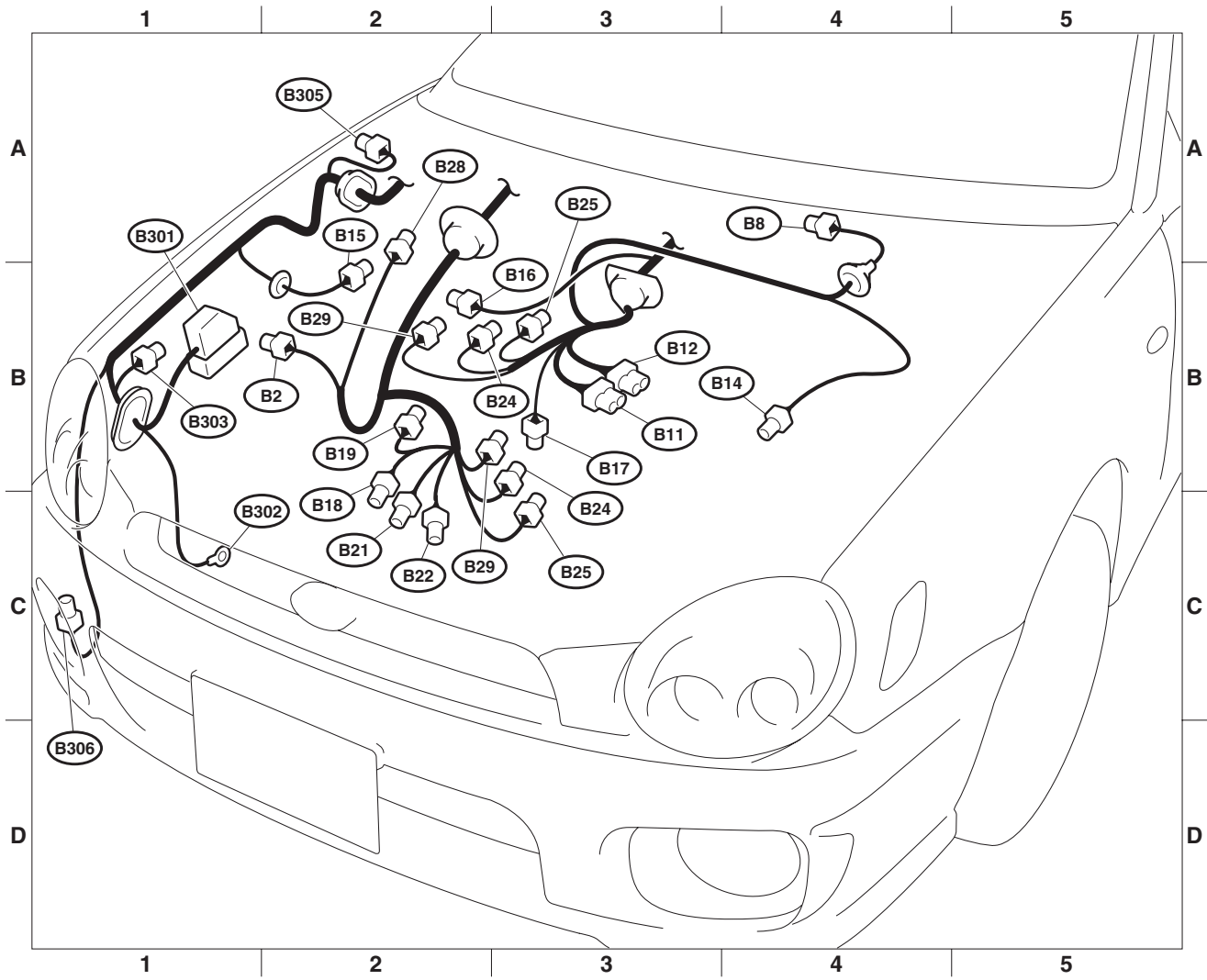
1. LHD NON-TURBO ENGINE MODEL

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
B2	3	★	B-1		Atmospheric pressure sensor
B8	5	Gray	A-4		Front wiper motor
B11	20	Black	B-3	T4	Transmission (AT)
B12	12	★	B-3	T3	
B14	1	★	B-4		Starter (Magnet)
B15	2	Gray	B-2		ABS front sensor RH
B16	2	Gray	B-2		Brake fluid level switch
B17	3	★	B-3		Vehicle speed sensor (MT)
B18	4	★	C-2		Oxygen sensor (Catalytic converter equipped vehicle without OBD)
	6	★	C-2		Front oxygen (A/F) sensor (With OBD)
B19	4	★	B-2		Rear oxygen sensor (With OBD)
B21	20	Light gray	C-2	E2	Engine wiring harness
B22	16	Brown	C-2	E3	
B24	2	Gray	B-2	T1	Back-up light switch (MT)
B25	2	Brown	C-3	T2	Neutral position switch (MT)
B28	3	★	A-2		CO resistor
B29	2	★	B-2	T8	Lo (AWD) indicator light switch (MT)
B301	31	Black	B-1		ABS control module
B302	1	★	C-1		ABS motor ground
B303	8	Gray	B-2		Shield joint connector (ABS)
B305	2	★	A-2		Side turn signal light RH
B306	2	Black	C-1		Front fog light RH

★: Non-colored

BULKHEAD WIRING HARNESS (IN ENGINE ROOM)

WIRING SYSTEM



BO0469

BULKHEAD WIRING HARNESS (IN ENGINE ROOM)

WIRING SYSTEM

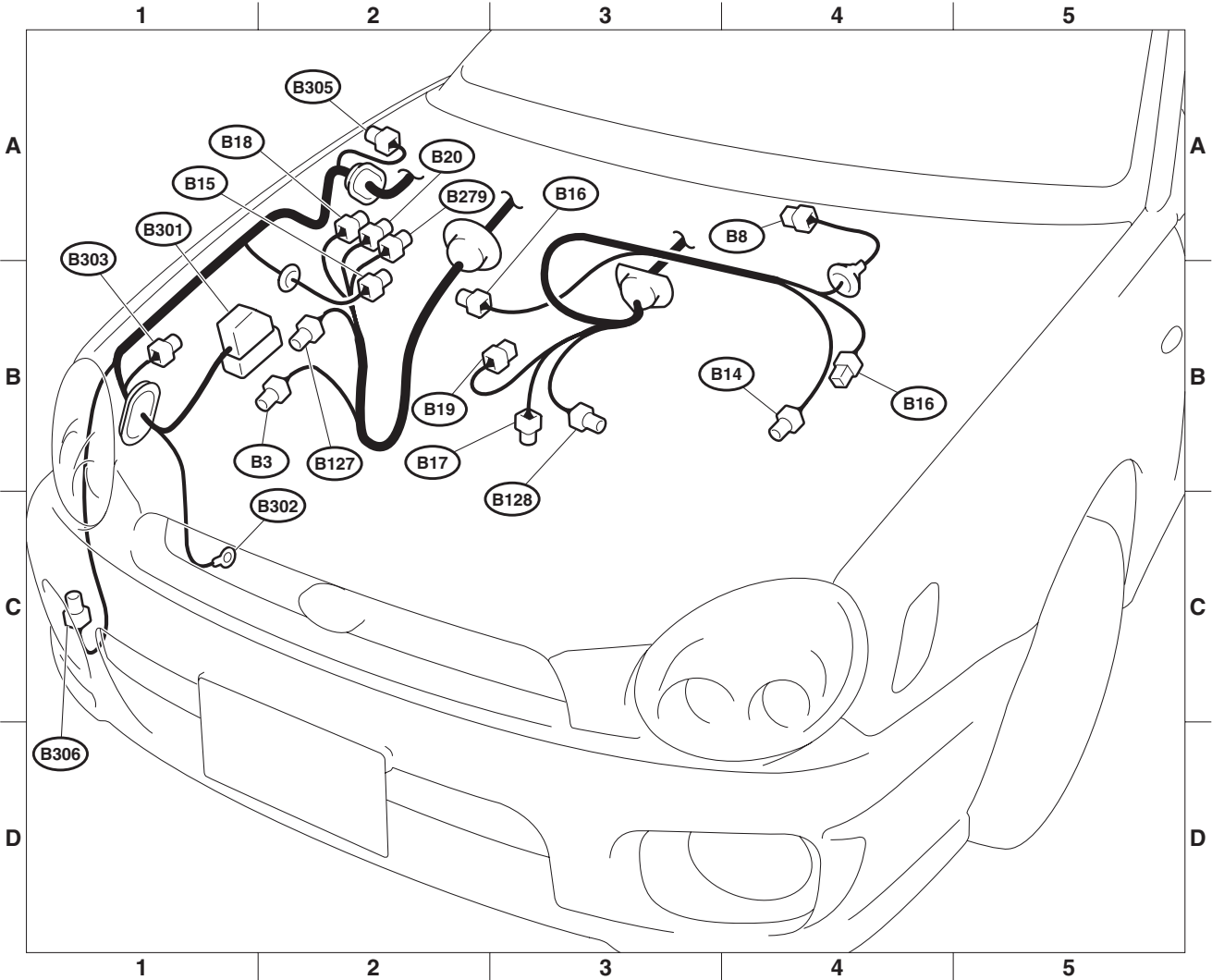
2. LHD TURBO ENGINE MODEL

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
B3	5	Gray	B-1		Mass air flow sensor
B8	5	★	A-4		Front wiper motor
B14	1	★	B-4		Starter (Magnet)
B15	2	Gray	B-2		ABS front sensor RH
B16	2	Gray	B-4		Brake fluid level switch
B17	4	★	B-3		Vehicle speed sensor (MT)
B18	4	★	A-2		Front oxygen (A/F) sensor
B19	4	★	A-2		Rear oxygen sensor
B20	10	★	A-2	E1	Engine wiring harness
B127	2	Blue	B-2		Wastegate control solenoid valve
B128	4	★	B-3	T9	Transmission (MT)
B279	2	★	A-2		Exhaust temperature sensor
B301	31	Black	B-1		ABS control module
B302	1	★	C-1		ABS motor ground
B303	8	Gray	B-1		Shield joint connector (ABS)
B305	2	★	A-2		Side turn signal light RH
B306	2	Black	C-1		Front fog light RH

★: Non-colored

BULKHEAD WIRING HARNESS (IN ENGINE ROOM)

WIRING SYSTEM



BO0470

BULKHEAD WIRING HARNESS (IN ENGINE ROOM)

WIRING SYSTEM

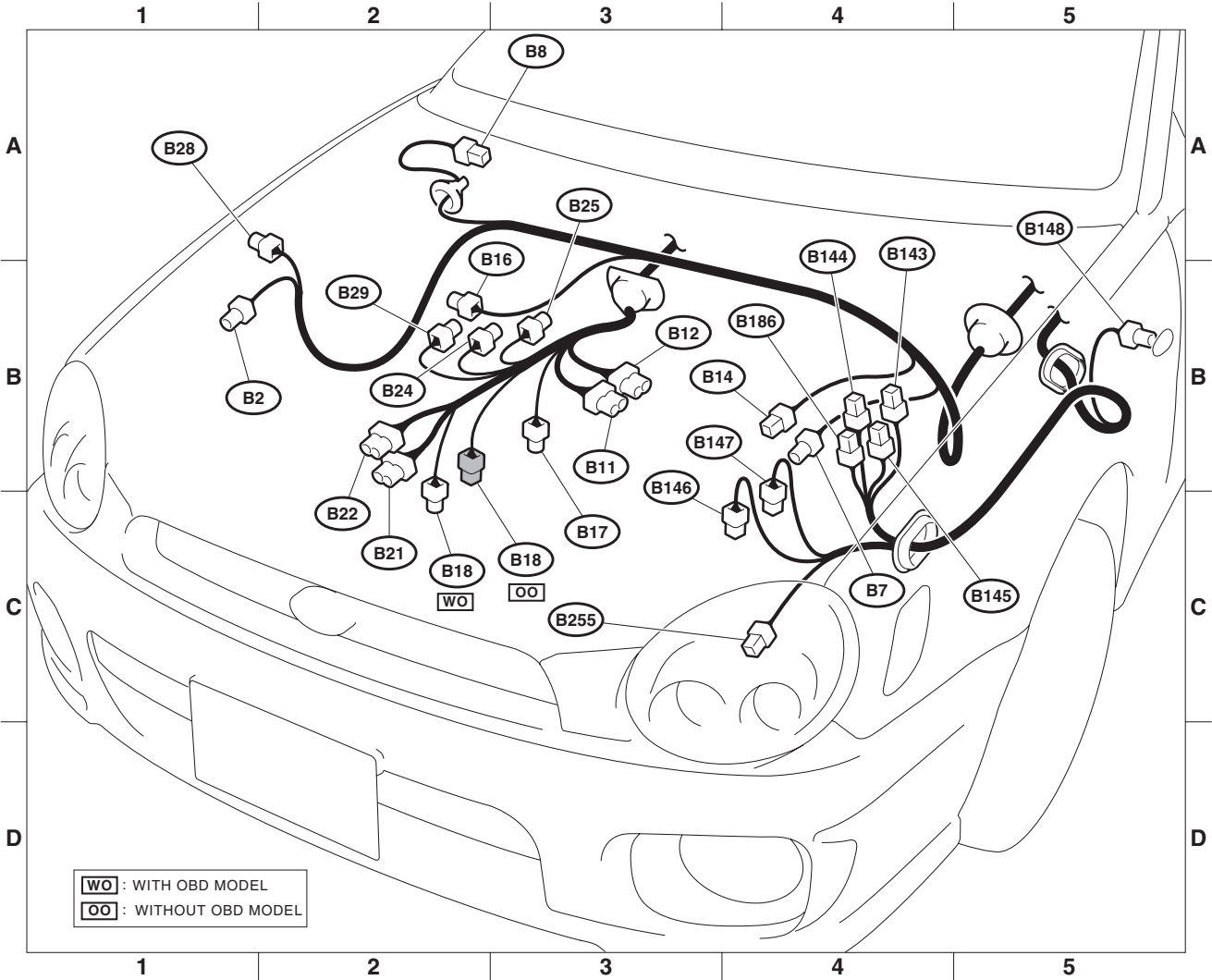
3. RHD NON-TURBO ENGINE MODEL

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	Black	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	Black	C-2		Vehicle speed sensor (MT)
B18	4	★	B-2		Oxygen sensor (Catalytic converter equipped vehicle without OBD)
	6	★	C-2		Front oxygen (A/F) sensor (With OBD)
B21	20	Light gray	C-2	E2	Engine wiring harness
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



BO0471

BULKHEAD WIRING HARNESS (IN ENGINE ROOM)

WIRING SYSTEM

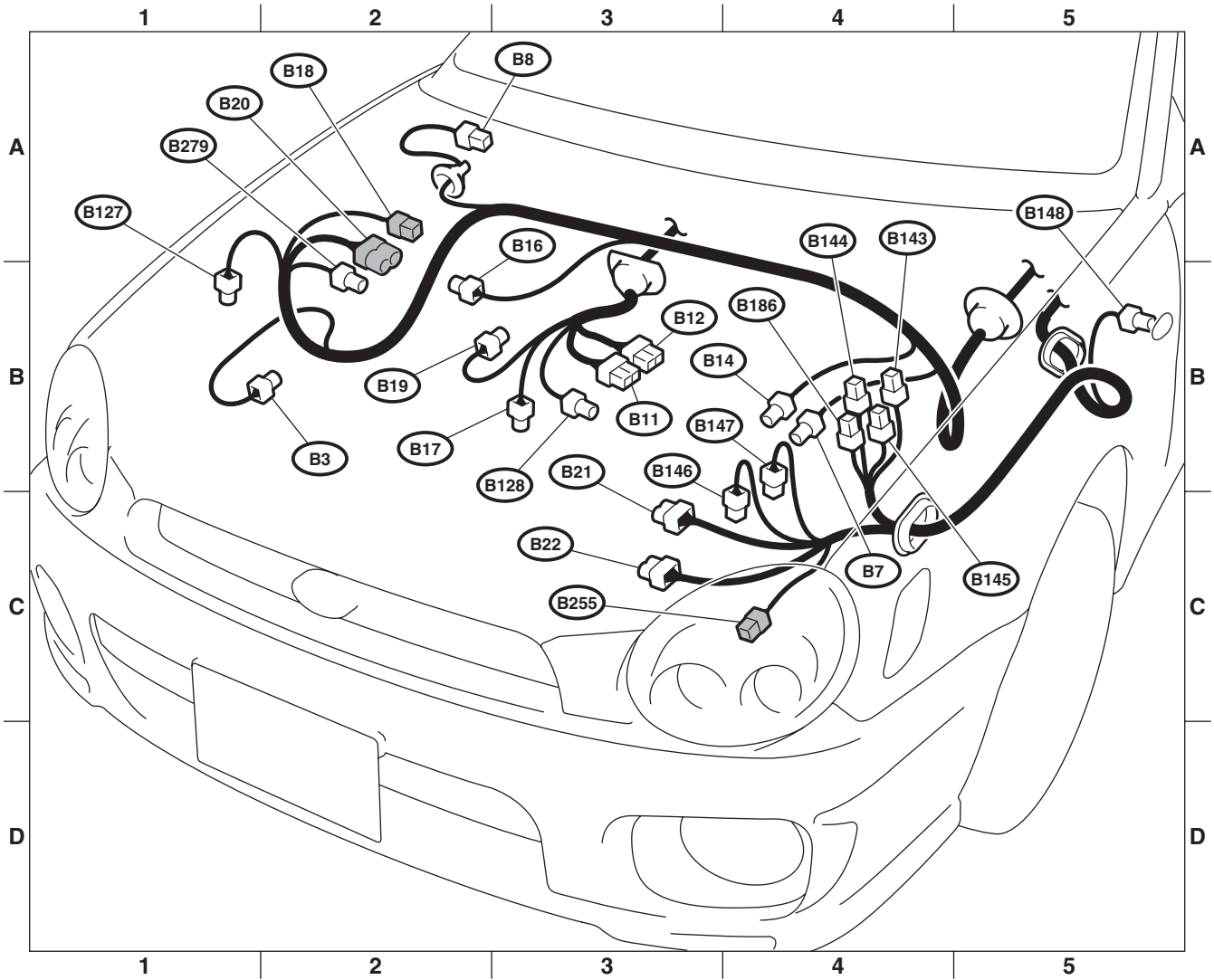
4. RHD TURBO ENGINE MODEL

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
B11	20	Black	B-3	T4	Transmission (AT)
B12	12	White	B-3	T3	
B14	1	★	B-3		Starter (Magnet)
B16	2	Gray	B-2		Brake fluid level switch
B17	4	Black	B-2		Vehicle speed sensor
B18	4	★	A-1		Front oxygen (A/F) sensor
B19	4	★	B-2		Oxygen sensor
B20	10	★	A-1	E1	Engine wiring harness
B21	20	Black	B-2	E2	Engine wiring harness
B22	16	Brown	C-2	E3	
B127	2	★	A-1		Wastegate control solenoid valve
B128	4	Gray	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



BO0478

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 fan 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		Test mode connector
B76	2	Green	C-2		
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)

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
B84	17	★	B-3		Engine control module
B85	2	★	A-2		Diode (Rear fog light)
B86	4	Brown	B-3		Blower fan resistor
B87	2	★	B-4		Blower fan motor
B88	4	Brown	B-3		Evaporator thermostat
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		Read memory connector
B126	1	Black	C-2		
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		Air conditioning switch (Manual A/C)
B169	6	★	C-3		Blower fan switch (Manual A/C)
B171	5	★	C-1		Mirror heated relay
B176	18	★	C-4		Keyless entry control module
B183	1	★	D-1		Joint connector (Keyless entry)
B184	1	★	D-1		
B195	6	★	C-1		Rear fog light switch

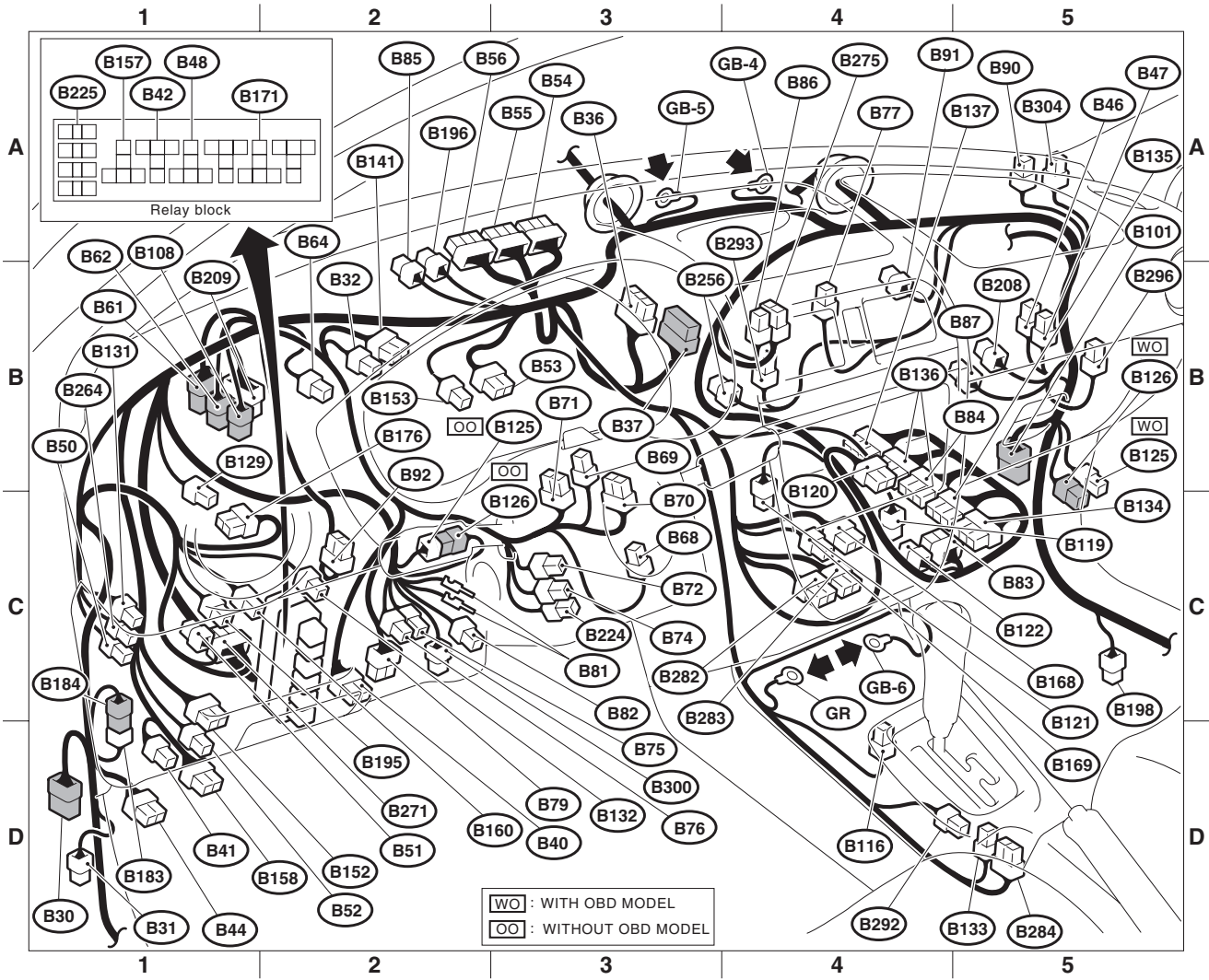
BULKHEAD WIRING HARNESS (IN COMPARTMENT)

WIRING SYSTEM

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
B196	3	★	B-4		Diode (Rear fog light)
B198	5	★	C-5	GB-9	Ground joint connector
B208	2	★	A-4		Glove box light
B209	40	★	B-1	F76	Front wiring harness (SMJ)
B224	2	★	C-3		Ignition switch illumination
B225	8	★	C-1		Fuse (Relay box)
B256	2	★	B-3		Evaporator sensor
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
B300	6	★	C-2		Line end check connector
B304	2	Black	A-5		ABS condenser
★: Non-colored					

BULKHEAD WIRING HARNESS (IN COMPARTMENT)

WIRING SYSTEM



BO0472

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	Black	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 fan motor relay
B51	8	Blue	C-4		F/B
B52	7	★	C-4		
B53	6	★	B-3		Shield joint connector (AT) (Turbo model)
	12	Black	B-3		Shield joint connector (AT) (Non-turbo model)
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	★	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		Test mode connector
B76	2	Green	C-3		
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

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
B83	4	★	C-2		Shield&sensor ground joint connector (E/G) (Non-turbo with OBD model)
	6	★	C-2		Shield & sensor ground joint connector (E/G) (Turbo model)
	12	Black	C-2		Shield & sensor ground joint connector (E/G) (Non-turbo without OBD model)
B85	2	Black	B-3		Diode (Rear fog light)
B86	4	Brown	B-4		Blower fan resistor
B87	2	★	B-1		Blower fan motor
B88	4	Brown	B-3		Evaporator thermostat
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		Read memory connector
B126	1	Black	C-3		
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	Blue	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	Gray	C-4		Front fog light switch
B161	6	Brown	C-4		Cruise control sub switch

BULKHEAD WIRING HARNESS (IN COMPARTMENT)

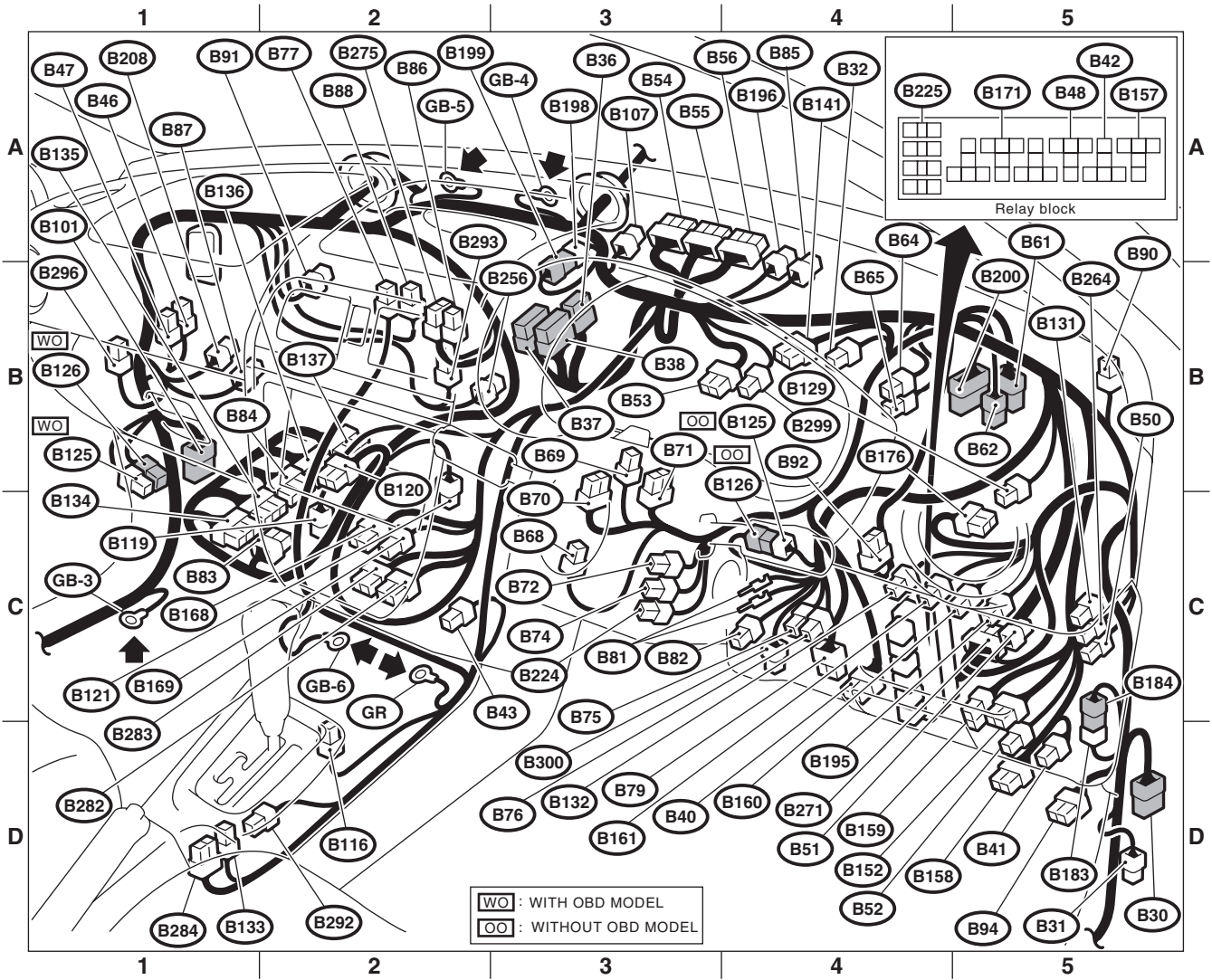
WIRING SYSTEM

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
B168	10	★	C-2		Air conditioning switch (Manual A/C)
B169	6	★	C-2		Blower fan switch (Manual A/C)
B171	5	★	C-3		Mirror heated relay
B176	18	★	C-4		Keyless entry control module
B183	1	★	D-4		Joint connector (Keyless entry)
B184	1	★	C-4		
B195	6	★	C-4		Rear fog light switch
B196	3	Black	B-3		Diode (Rear fog light)
B198	1	★	B-2	B199	Joint connection (Ground)
B199	1	★	B-2	B198	
B200	22	Black	B-4	F74	Front wiring harness
B208	2	★	B-1		Glove box light
B224	2	★	C-3		Ignition switch illumination
B225	8	Black	C-3		Fuse (Relay box)
B256	2	★	B-2		Evaporator sensor
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
B299	6	★	B-3		Shield joint connector (AT) (Turbo model)
B300	6	★	C-4		Line end check connector

★: Non-colored

BULKHEAD WIRING HARNESS (IN COMPARTMENT)

WIRING SYSTEM



BO0473

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	A-3	B21	Bulkhead wiring harness
E3	16	Brown	A-3	B22	Bulkhead wiring harness
E4	2	Blue	A-2		Purge control solenoid valve
E5	2	Light gray	B-1		Fuel injector No.1
E6	2	Light gray	A-2		Fuel injector No.3
E7	6	Black	B-1		Idle air control solenoid valve
E8	3	Light gray	B-2		Engine coolant temperature sensor and thermometer
E10	2	Light gray	B-2		Crankshaft position sensor
E11	1	★	B-2		Oil pressure switch
E12	4	Gray	B-2		Ignition coil and ignitor (1.6L model)
		Dark gray	B-2		Ignition coil and ignitor (Except 1.6L model)
E13	4	Dark brown	B-2		Throttle position sensor
E14	2	★	B-3		Knock sensor
E15	2	Black	C-3		Camshaft position sensor
E16	2	Light gray	C-3		Fuel injector No.2
E17	2	Light gray	B-3		Fuel injector No.4
E19	1	★	B-1		Power steering oil pressure switch
E20	4	Black	A-2		Pressure sensor and intake air temperature sensor

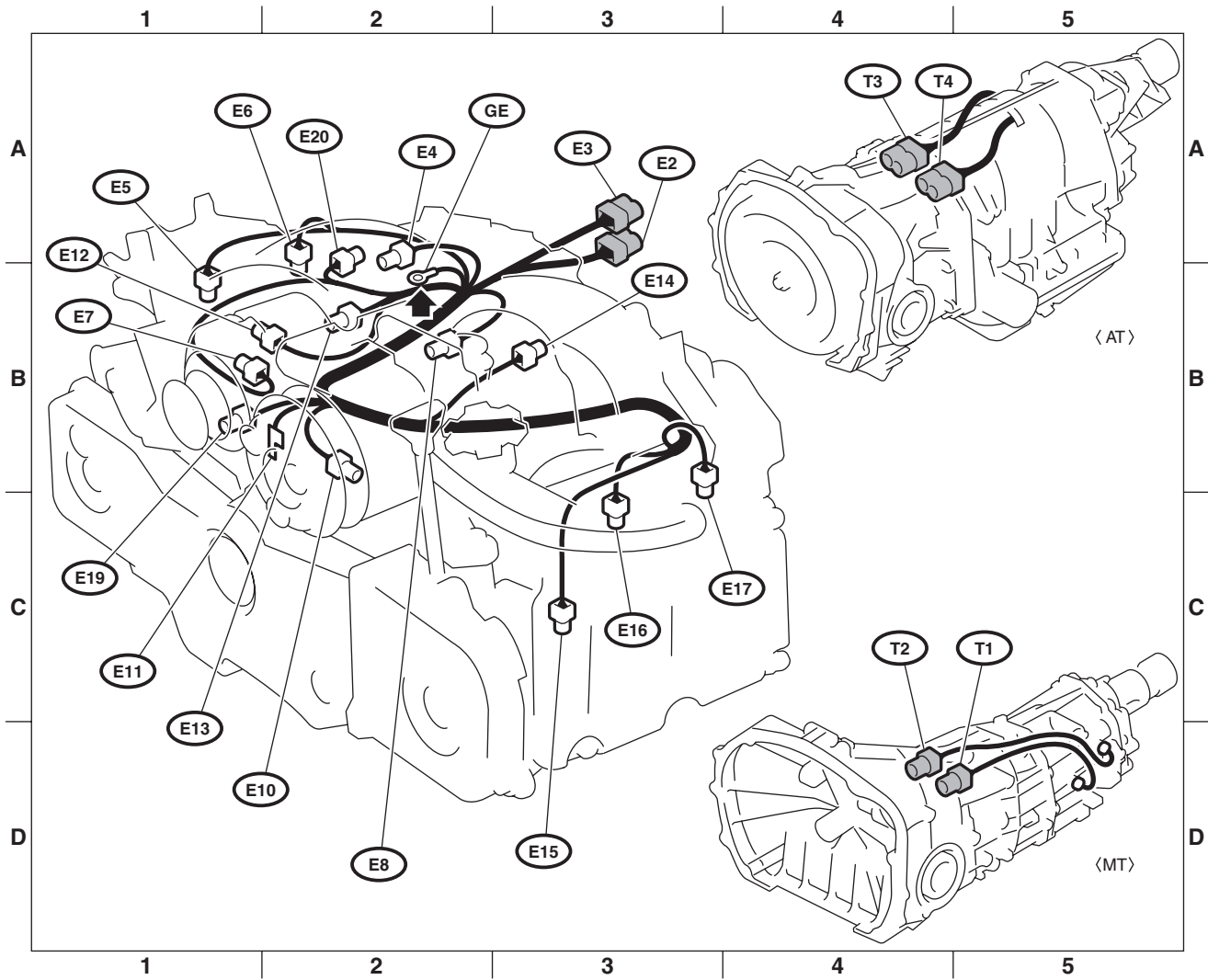
★: Non-colored

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
T1	2	Gray	D-4	B24	Bulkhead wiring harness
T2	2	Brown	D-4	B25	Bulkhead wiring harness
T3	12	★	A-4	B12	Bulkhead wiring harness
T4	20	Black	A-4	B11	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	A-3	B21	Bulkhead wiring harness
E3	16	Brown	A-3	B22	Bulkhead wiring harness
E4	2	Blue	A-2		Purge control solenoid valve
E5	2	Light gray	B-1		Fuel injector No.1
E6	2	Light gray	B-2		Fuel injector No.3
E7	6	Black	B-1		Idle air control solenoid valve
E8	3	Light gray	B-2		Engine coolant temperature sensor and thermometer
E10	2	Light gray	B-2		Crankshaft position sensor
E11	1	★	B-2		Oil pressure switch
E12	4	Gray	B-2		Ignition coil and ignitor (1.6L model)
		Dark gray	B-2		Ignition coil and ignitor (Except 1.6L model)
E13	4	Dark brown	B-2		Throttle position sensor
E14	2	★	B-3		Knock sensor
E15	2	Black	C-3		Camshaft position sensor
E16	2	Light gray	C-3		Fuel injector No.2
E17	2	Light gray	B-3		Fuel injector No.4
E19	1	★	B-1		Power steering oil pressure switch
E20	4	Black	B-2		Pressure sensor and intake air temperature sensor
E42	2	Purple	B-2		Air assist injector solenoid valve

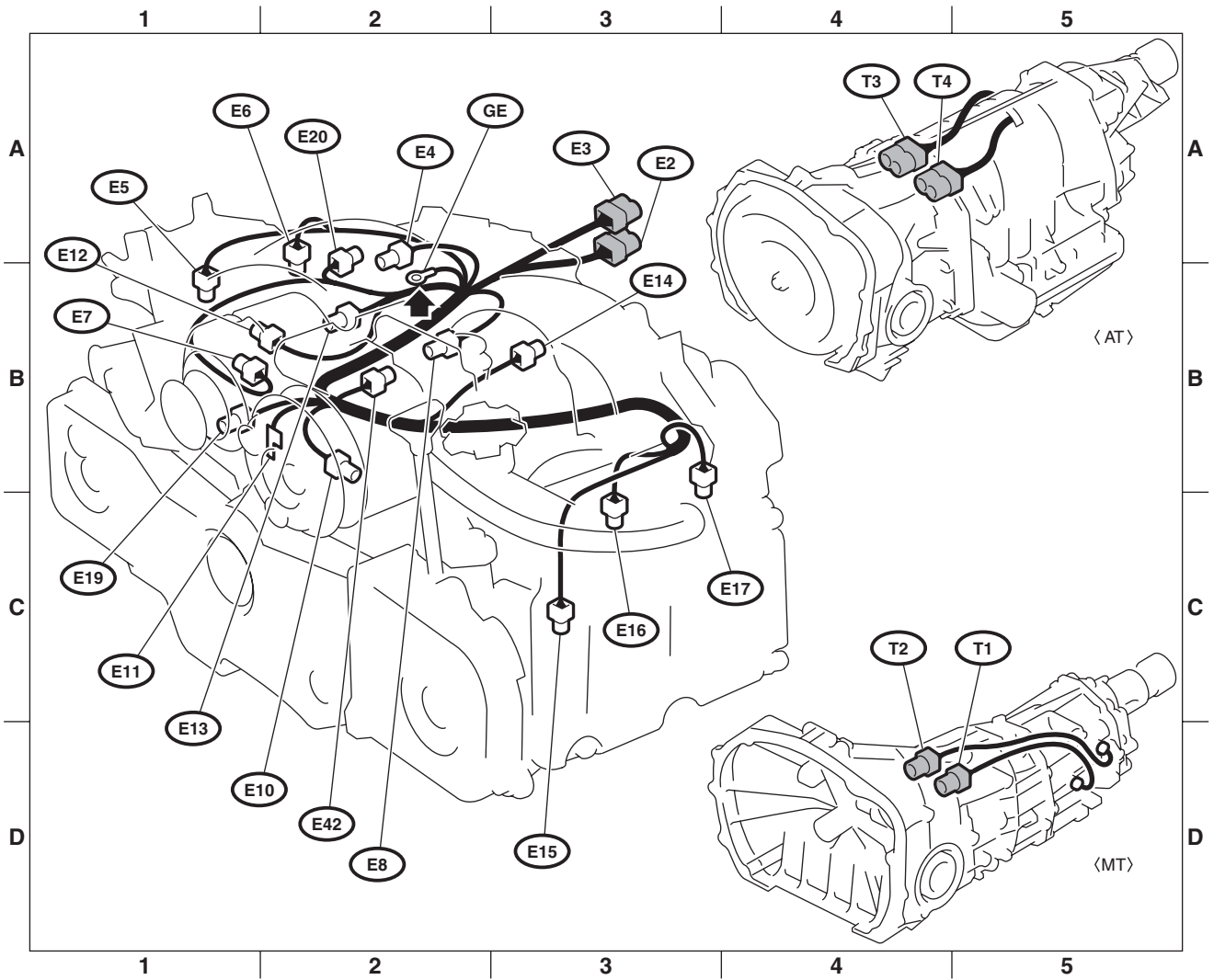
★: Non-colored

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
T1	2	Gray	D-4	B24	Bulkhead wiring harness
T2	2	Brown	D-4	B25	Bulkhead wiring harness
T3	12	★	A-4	B12	Bulkhead wiring harness
T4	20	Black	A-4	B11	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	A-1	B20	Bulkhead wiring harness
E2	20	Black	C-3	F61	Front wiring harness (LHD model)
				B21	Bulkhead wiring harness (RHD model)
E3	16	Brown	C-3	F60	Front wiring harness (LHD model)
				B22	Bulkhead wiring harness (RHD model)
E4	2	Black	B-2		Purge control solenoid valve
E5	2	Dark gray	B-1		Fuel injector No.1
E6	2	Dark gray	B-2		Fuel injector No.3
E7	3	Black	B-2		Idle air control solenoid valve
E8	3	Light gray	B-2		Engine coolant temperature sensor and thermometer
E10	2	Light gray	B-1		Crankshaft position sensor
E11	1	★	B-2		Oil pressure switch
E13	3	Black	B-2		Throttle position sensor
E14	2	Gray	B-3		Knock sensor
E15	2	Light gray	C-3		Camshaft position sensor
E16	2	Dark gray	C-3		Fuel injector No.2
E17	2	Dark gray	C-3		Fuel injector No.4
E19	1	★	B-2		Power steering oil pressure switch
E21	3	Black	B-2		Pressure sensor
E31	3	★	B-1		Ignition coil No.1
E32	3	★	C-3		Ignition coil No.2
E33	3	Black	B-2		Ignition coil No.3
E34	3	Black	C-3		Ignition coil No.4
E50	3	Black	B-2		TGV angle sensor LH
E51	2	Black	B-3		TGV LH
E54	3	Black	B-2		TGV angle sensor RH
E55	2	Black	B-1		TGV RH

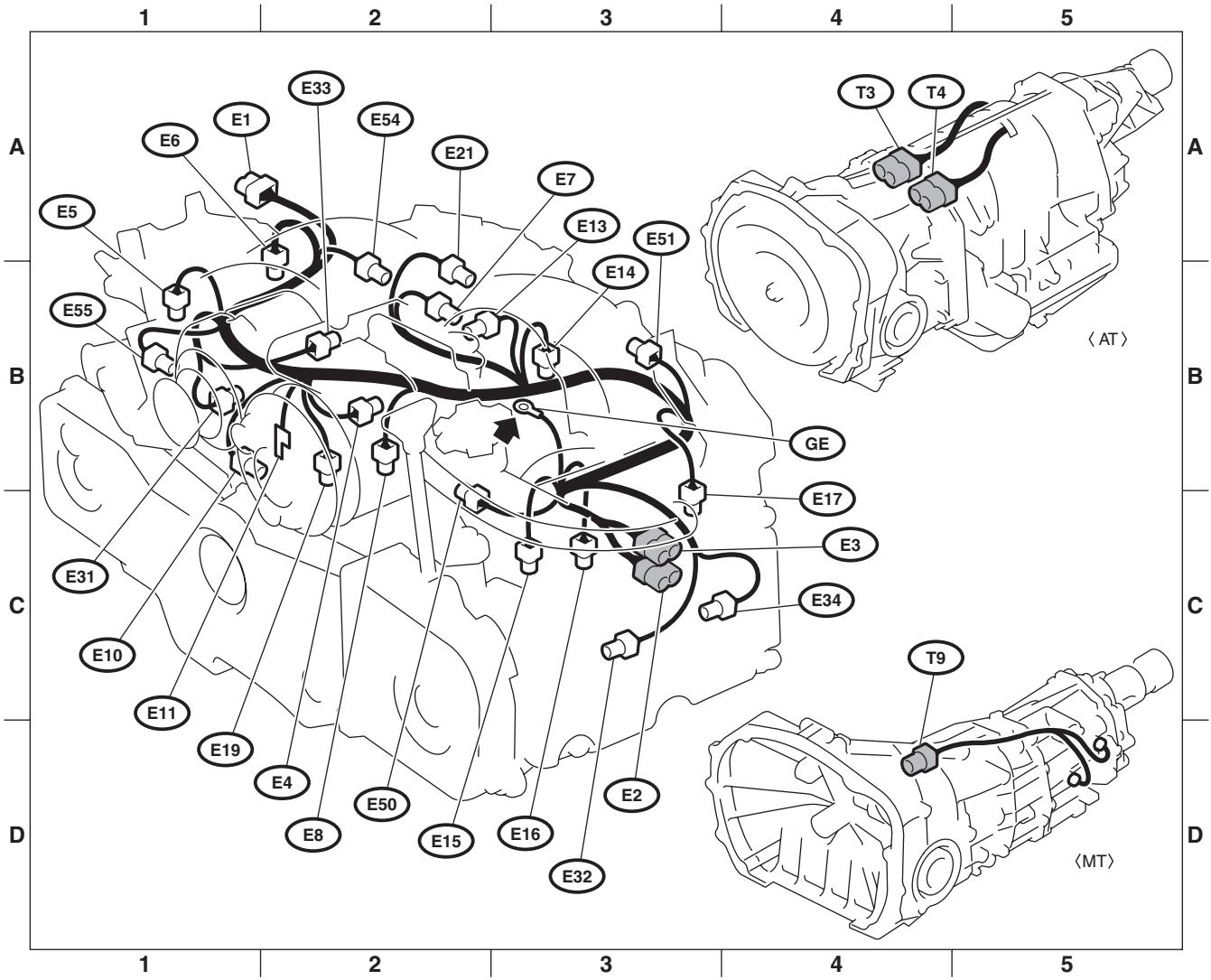
★: Non-colored

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
T3	12	★	A-4	B12	Bulkhead wiring harness (RHD model)
T4	20	Black	A-4	B11	Bulkhead wiring harness (RHD model)
T9	4	★	D-4	B128	Bulkhead wiring harness

★: Non-colored

ENGINE WIRING HARNESS AND TRANSMISSION CORD

WIRING SYSTEM



BO0474

INSTRUMENT PANEL WIRING HARNESS

WIRING SYSTEM

49. Instrument Panel Wiring Harness

A: LOCATION

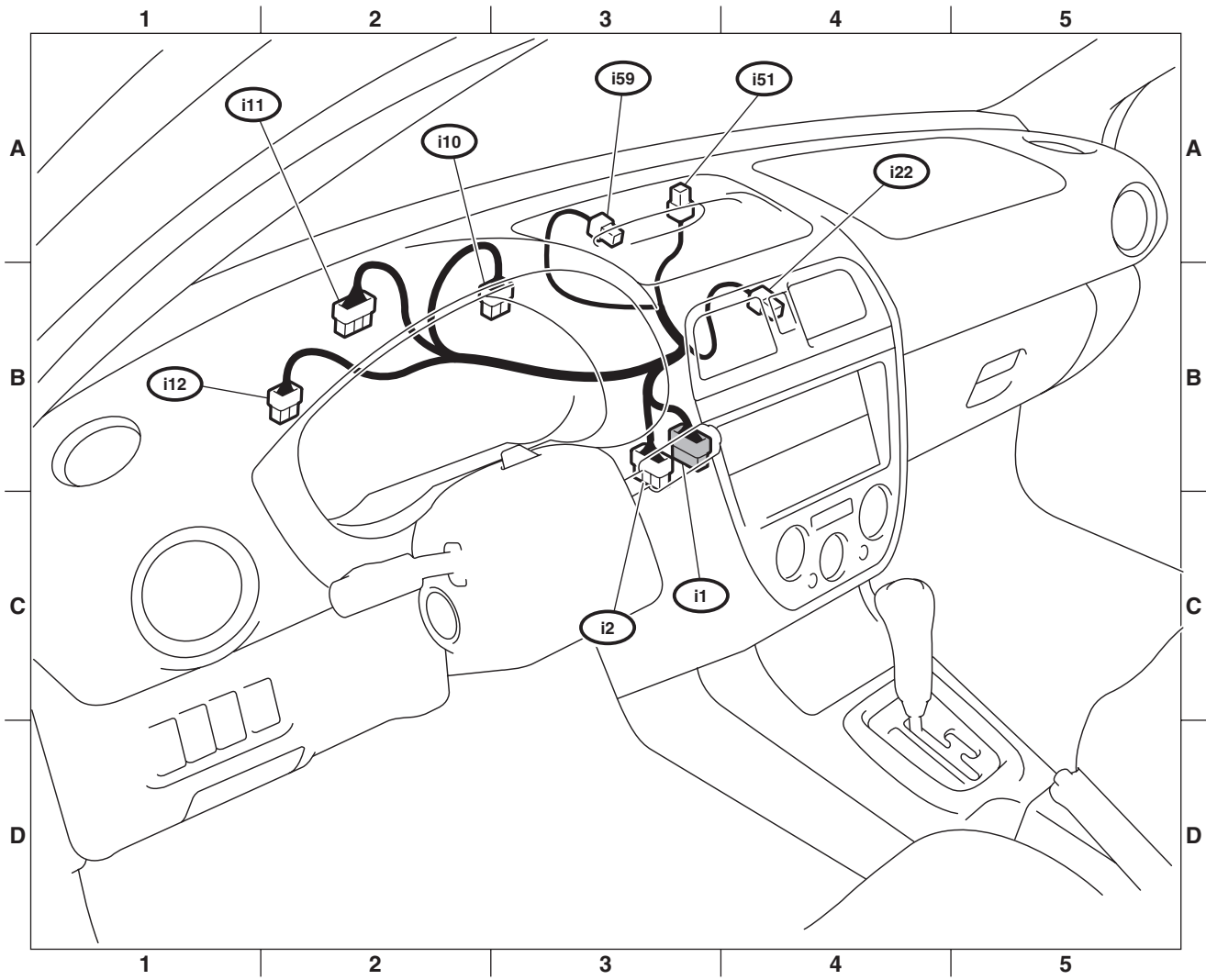
1. LHD MODEL

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
i1	24	Black	B-3	B36	Bulkhead wiring harness
i2	24	★	B-3	B37	
i10	10	Green	B-3		Combination meter
i11	30	Green	B-2		
i12	14	Green	B-2		
i22	8	★	B-4		Hazard switch
i51	2	★	A-3		Sunload sensor
i59	4	★	A-3		Clock

★: Non-colored

INSTRUMENT PANEL WIRING HARNESS

WIRING SYSTEM



BO0226

INSTRUMENT PANEL WIRING HARNESS

WIRING SYSTEM

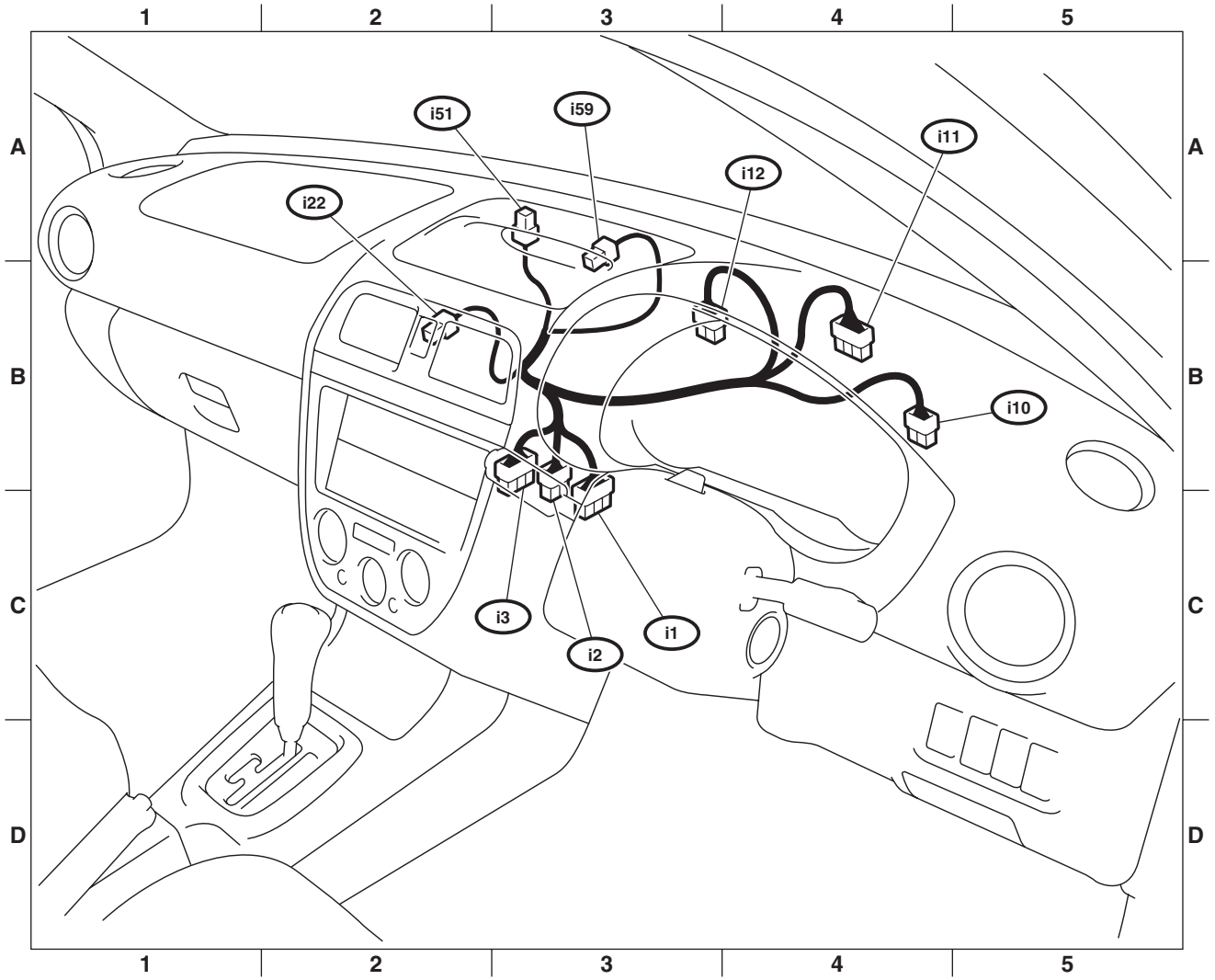
2. RHD MODEL

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
i1	14	Black	C-3	B36	Bulkhead wiring harness
i2	32	★	B-3	B37	
i3	22	Black	B-3	B38	
i10	10	Green	B-4		Combination meter
i11	30	Green	B-4		
i12	14	Green	B-3		
i22	8	★	B-2		Hazard switch
i51	2	★	A-3		Sunload sensor
i59	4	★	A-3		Clock

★: Non-colored

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	★	B-2	B97	Bulkhead wiring harness
R3	24	★	B-2	B99	Bulkhead wiring harness
R4	1	★	B-3		Parking brake switch
R8	2	★	C-4		Seat belt switch
R15	6	Black	B-3	R57	Fuel tank cord
R22	3	★	B-5		Rear door switch LH
R72	2	★	A-3		Rear ABS sensor RH
R73	2	★	B-5		Rear ABS sensor LH
R97	2	★	B-5		Antenna amp. (Sedan model)

★: Non-colored

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
B97	8	★	B-2	R1	Rear wiring harness
B99	24	★	B-2	R3	Rear wiring harness
B265	4	★	A-2	D27	Rear door cord RH
B266	3	★	A-2	D28	Rear door cord RH
B267	3	★	C-4		Front door switch LH
B268	3	★	A-2		Front door switch RH
B269	4	★	B-5	D21	Rear door cord LH
B270	3	★	B-4	D22	Rear door cord LH

★: Non-colored

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
R50	4	★	B-1	B90	Bulkhead wiring harness
R52	3	★	A-3		Room light
R55	1	Gray	A-2		Sunroof
R56	2	★	A-3		Spot light

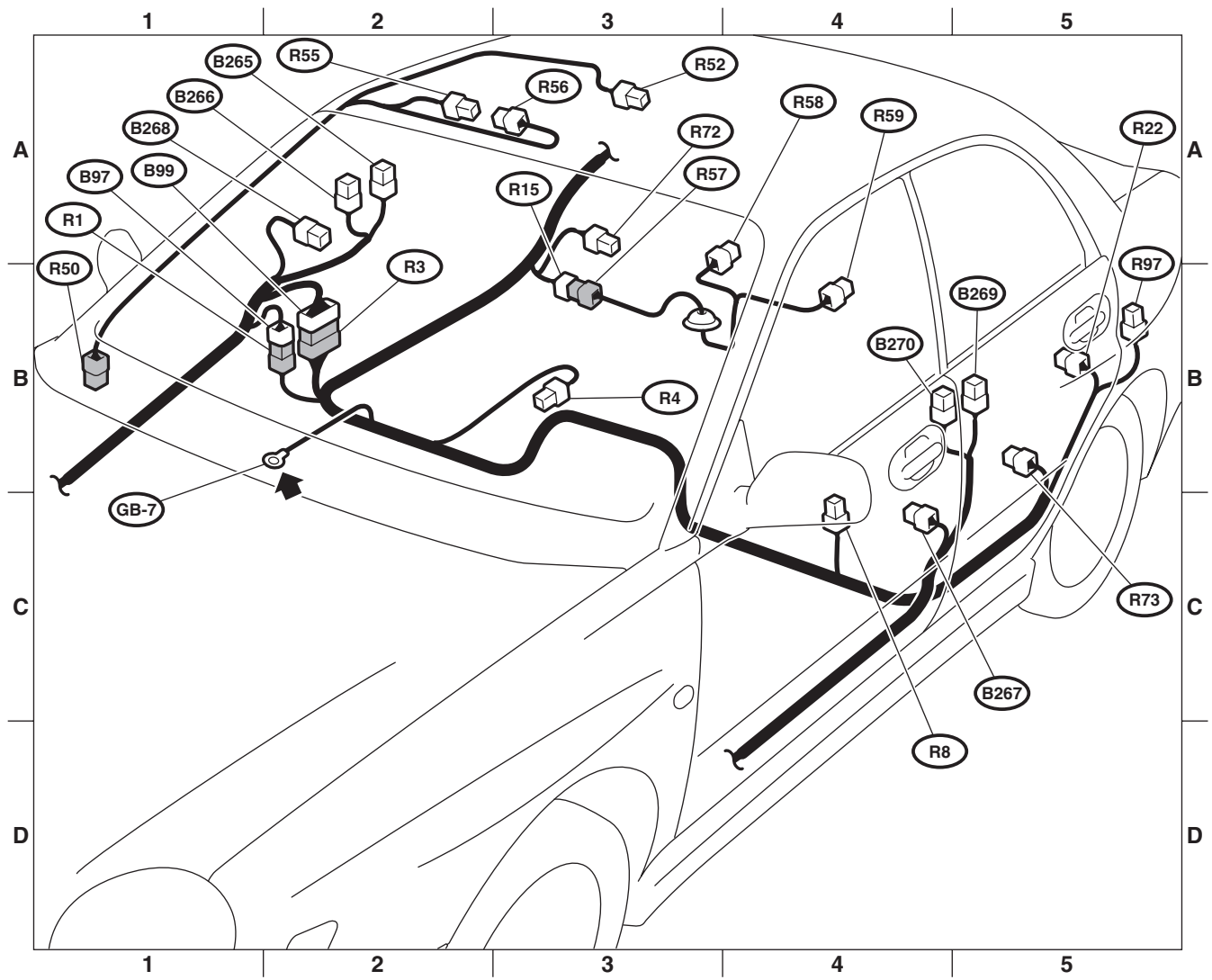
★: Non-colored

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
R57	6	Black	B-3	R15	Rear wiring harness
R58	6	★	B-3		Fuel pump assembly
R59	2	★	B-4		Fuel sub level sensor

★: Non-colored

REAR WIRING HARNESS, BULKHEAD WIRING HARNESS, ROOF CORD AND FUEL TANK CORD

WIRING SYSTEM



BO0475

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	★	B-2	B97	Bulkhead wiring harness
R3	22	★	B-2	B99	Bulkhead wiring harness
R4	1	★	B-3		Parking brake switch
R8	2	★	B-2		Seat belt switch
R15	6	Black	B-3	R57	Fuel tank cord
R22	3	★	B-5		Rear door switch LH
R72	2	★	B-3		Rear ABS sensor RH
R73	2	★	B-5		Rear ABS sensor LH
R97	2	★	B-5		Antenna amp. (Sedan model)

★: Non-colored

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
B97	8	★	B-2	R1	Rear wiring harness
B99	22	★	B-2	R3	Rear wiring harness
B265	4	★	A-2	D27	Rear door cord RH
B266	3	★	A-2	D28	Rear door cord RH
B267	3	★	A-2		Front door switch RH
B268	3	★	C-4		Front door switch LH
B269	4	★	B-5	D21	Rear door cord LH
B270	3	★	B-4	D22	Rear door cord LH

★: Non-colored

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
R50	4	★	B-1	B90	Bulkhead wiring harness
R52	3	★	A-3		Room light
R55	1	Gray	A-2		Sunroof
R56	2	★	A-3		Spot light

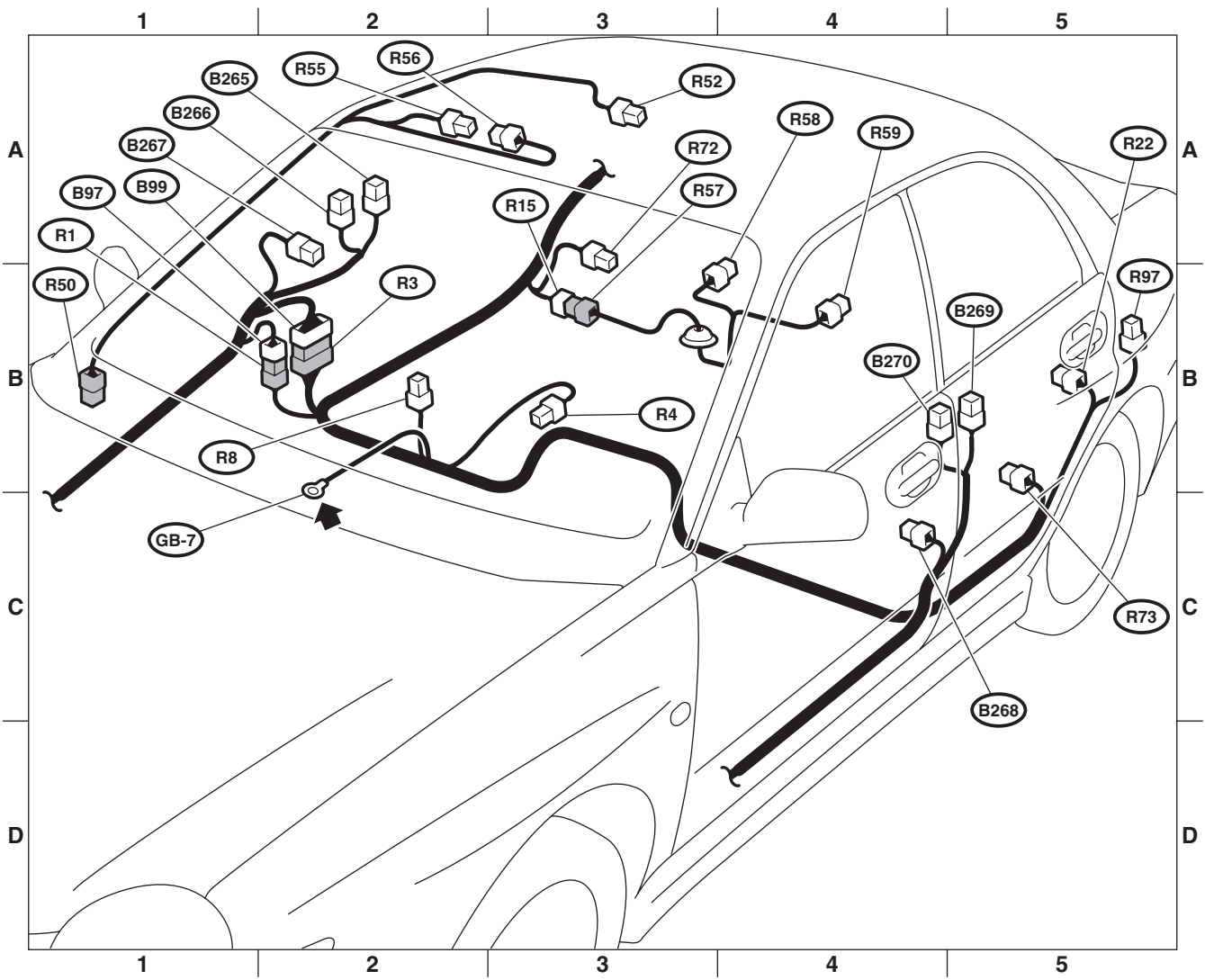
★: Non-colored

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
R57	6	Black	B-3	R15	Rear wiring harness
R58	6	★	B-3		Fuel pump assembly
R59	2	★	B-4		Fuel sub level sensor

★: Non-colored

REAR WIRING HARNESS, BULKHEAD WIRING HARNESS, ROOF CORD AND FUEL TANK CORD

WIRING SYSTEM



BO0476

DOOR CORD

WIRING SYSTEM

51. Door Cord

A: LOCATION

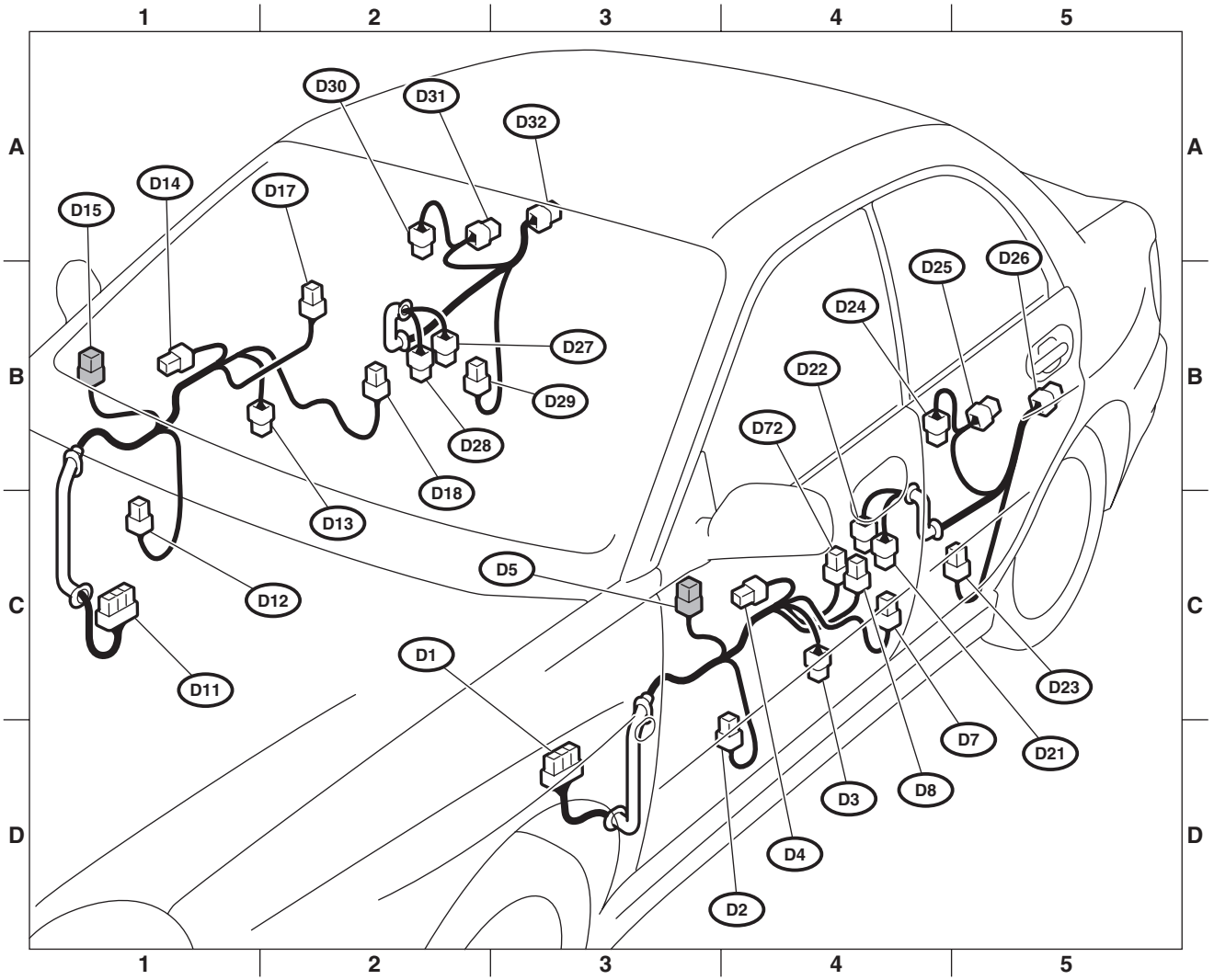
1. LHD MODEL

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	C-3		Remote control rearview mirror (Driver side)
D7	16	★	C-4		Power window main switch
D8	2	Gray	C-4		Front door lock actuator LH (Without keyless entry)
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	B-1		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	4	★	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	★	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	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
D72	4	★	C-3		Front door lock actuator LH (With keyless entry)

★: Non-colored

DOOR CORD

WIRING SYSTEM



BO0230

DOOR CORD

WIRING SYSTEM

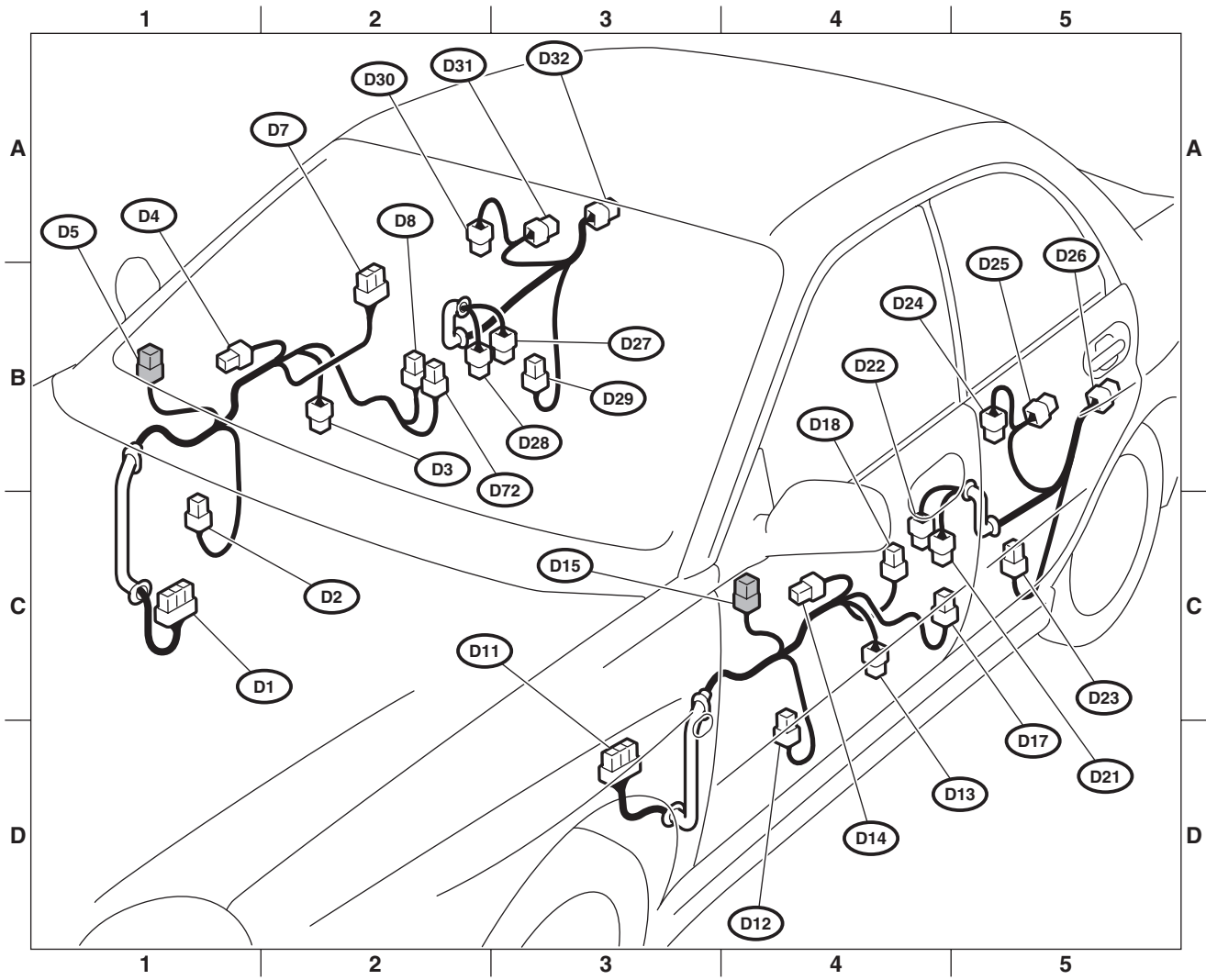
2. RHD MODEL

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 (Without keyless entry)
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
D72	4	★	B-2		Front door lock actuator RH (With keyless entry)

★: Non-colored

DOOR CORD

WIRING SYSTEM



BO0231

REAR WIRING HARNESS AND TRUNK LID CORD

WIRING SYSTEM

52.Rear Wiring Harness and Trunk Lid Cord

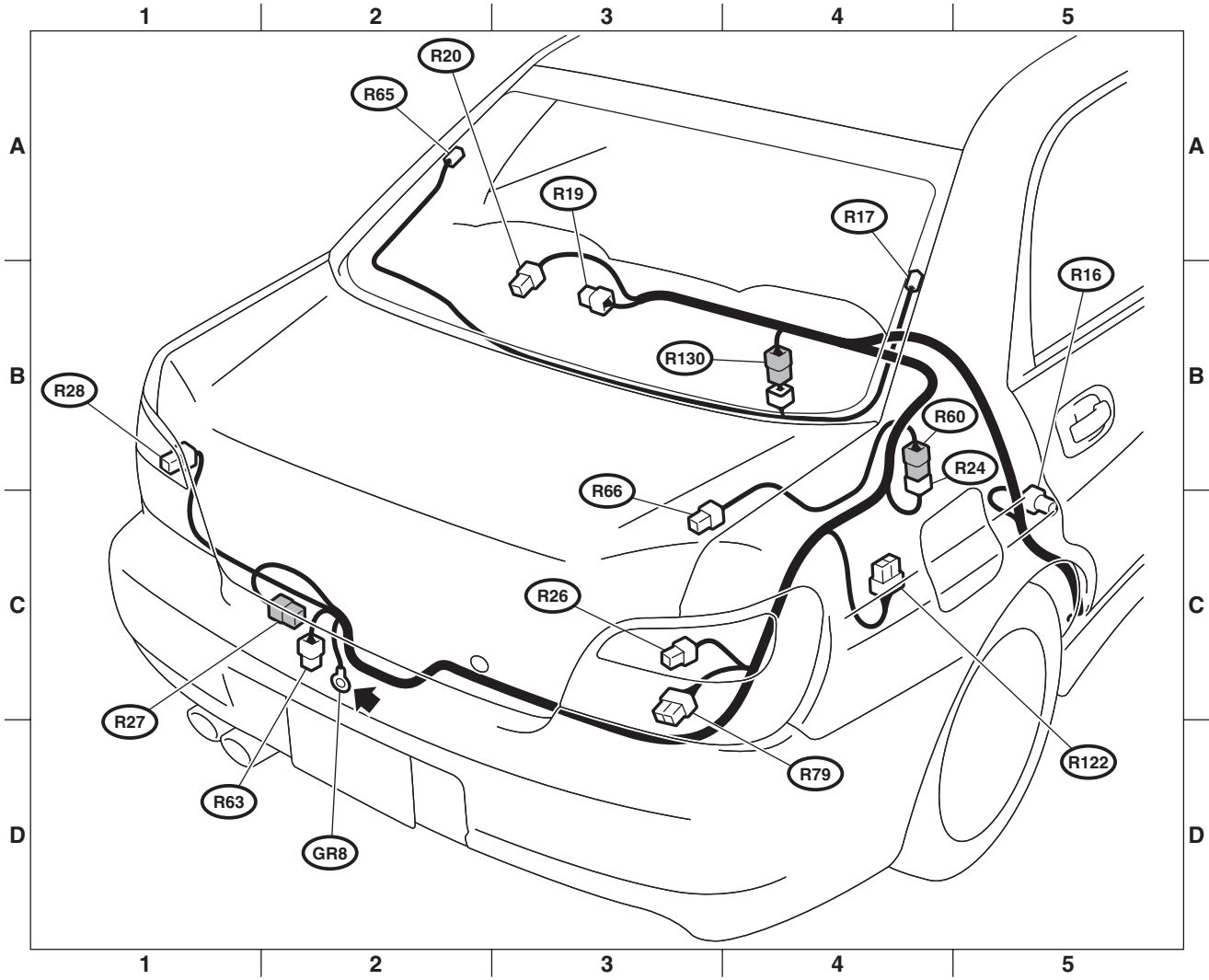
A: LOCATION

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
R16	3	★	C-3		Rear door switch RH
R17	1	Black	B-4		Rear defogger
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
R66	2	★	C-3		High-mounted stop light (Rear spoiler)
R79	10	★	C-3		Trailer connector
R122	10	Black	C-4		Fuel pump control (Turbo Model)
R130	2	★	B-3		Rear defogger choke coil

★: Non-colored

REAR WIRING HARNESS AND TRUNK LID CORD

WIRING SYSTEM



BO0486

REAR WIRING HARNESS AND REAR GATE CORD

WIRING SYSTEM

53.Rear Wiring Harness and Rear Gate Cord

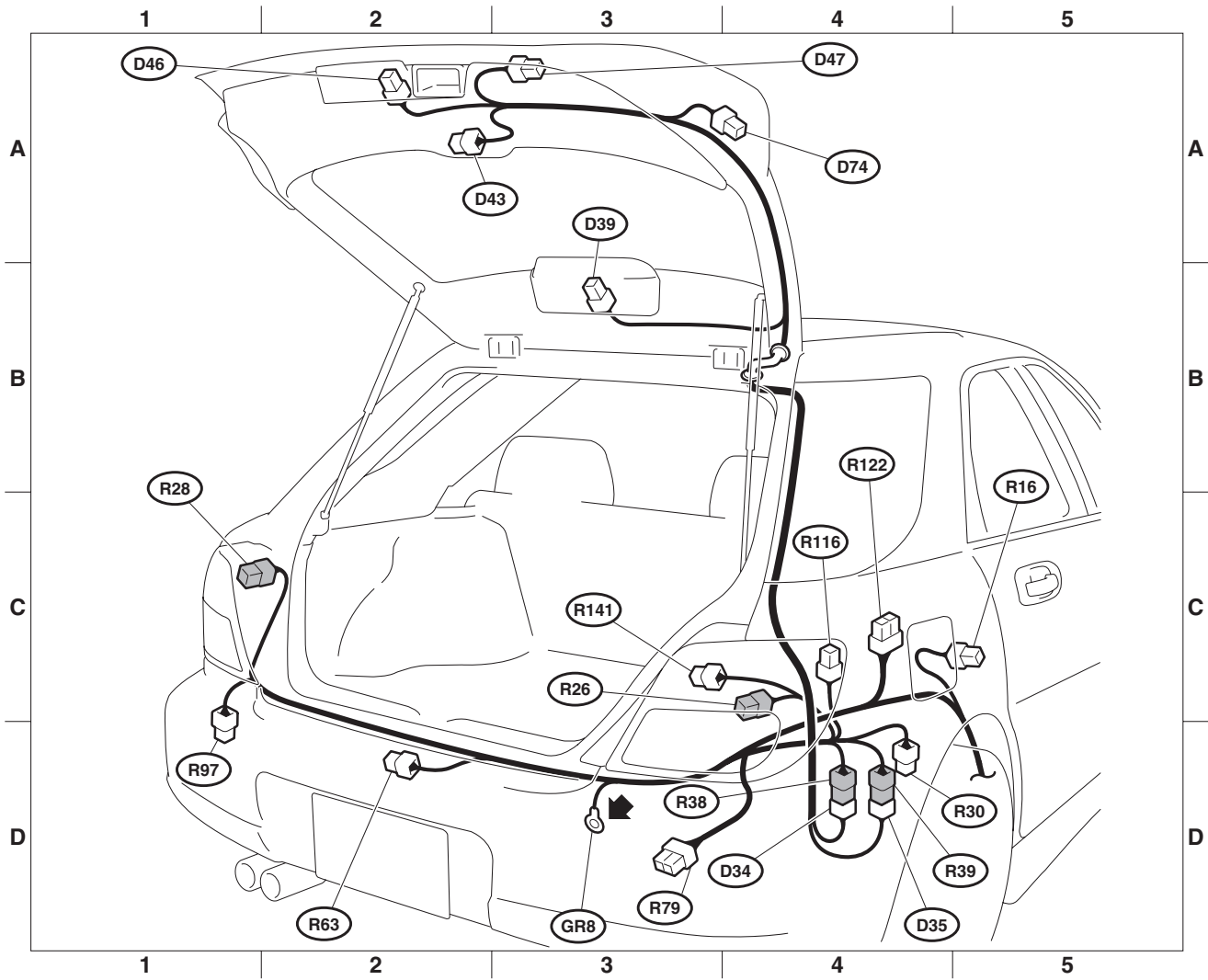
A: LOCATION

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	6	★	C-3	D34	Rear gate cord
R39	4	Black	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	Black	C-4		Fuel pump control (Turbo Model)
R141	2	★	C-3		Luggage room light
★: Non-colored					

Connector				Connecting to	
No.	Pole	Color	Area	No.	Name
D34	6	★	C-3	R38	Rear wiring harness
D35	4	Black	D-4	R39	
D39	2	★	B-3		High-mounted stop light
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
D74	2	★	A-3		Rear defogger choke coil
★: Non-colored					

REAR WIRING HARNESS AND REAR GATE CORD

WIRING SYSTEM



BO0477

REAR WIRING HARNESS AND REAR GATE CORD

WIRING SYSTEM
