

COOLING

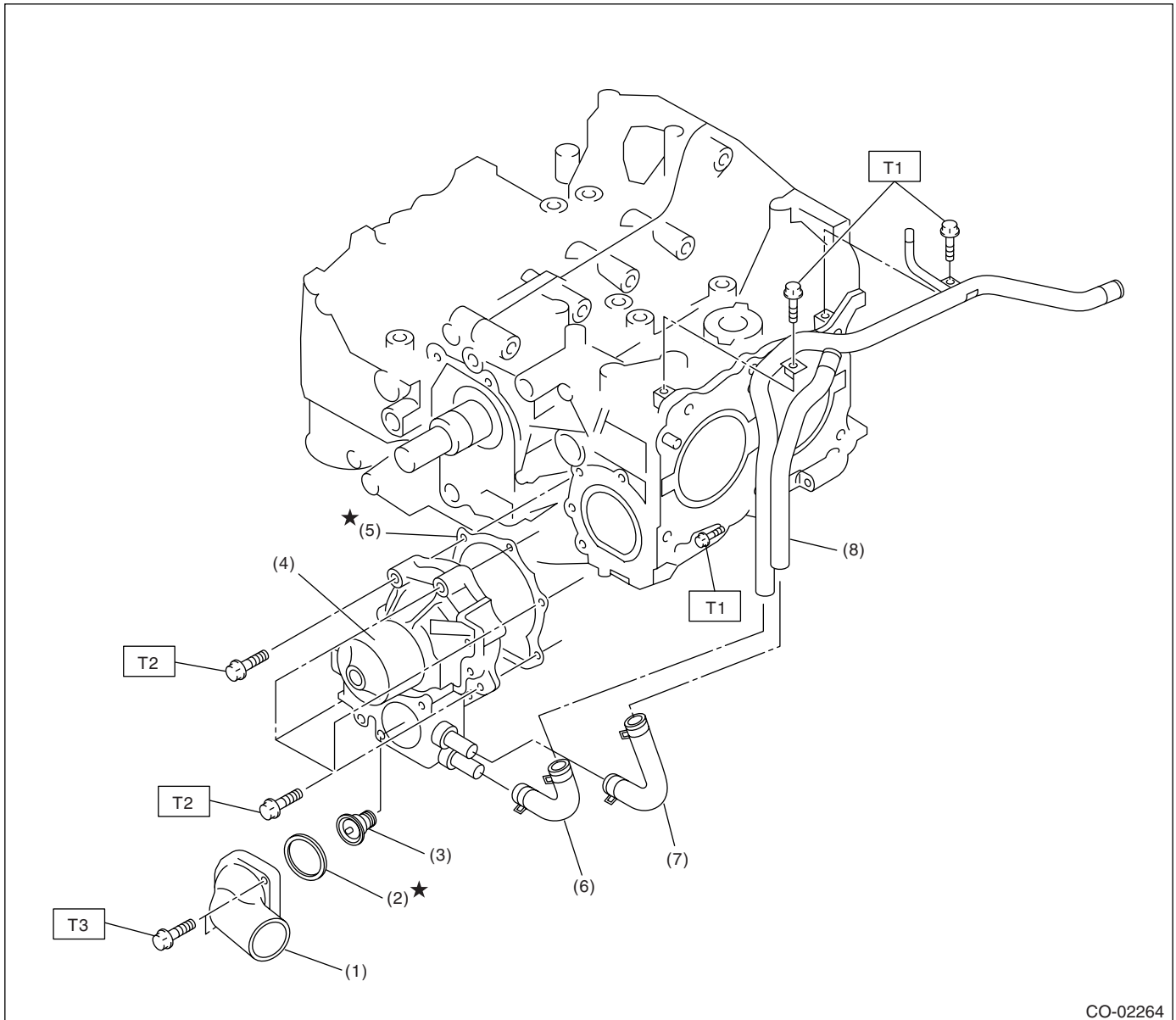
General Description

COOLING

1. General Description

A: SPECIFICATION

Model			DOHC TURBO
Cooling system			Electric fan + Forced engine coolant circulation system
Total engine coolant capacity		ℓ (US qt, Imp qt)	AT: Approx. 7.6 (8.0, 6.7) MT: Approx. 7.7 (8.1, 6.8)
Water pump	Type		Centrifugal impeller type
	Discharge performance I	Discharge	20 ℓ (5.3 US gal, 4.4 Imp gal)/min.
		Pump speed — Discharge pressure	760 rpm — 2.9 kPa (0.3 mAq)
		Engine coolant temperature	80°C (176°F)
	Discharge performance II	Discharge	100 ℓ (26.4 US gal, 22.0 Imp gal)/min.
		Pump speed — Discharge pressure	3,000 rpm — 49.0 kPa (5.0 mAq)
		Engine coolant temperature	80°C (176°F)
	Discharge performance III	Discharge	200 ℓ (52.8 US gal, 44.0 Imp gal)/min.
		Pump speed — Discharge pressure	6,000 rpm — 225.4 kPa (23.0 mAq)
		Engine coolant temperature	80°C (176°F)
	Impeller diameter		76 mm (2.99 in)
	Number of impeller vanes		8
	Pump pulley diameter		60 mm (2.36 in)
Thermostat	Clearance between impeller and case	Standard	0.5 — 1.5 mm (0.020 — 0.059 in)
	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/91°C (196°F)
Radiator fan	Motor	Main fan	120 W
		Sub fan	120 W
	Fan diameter/Blade		320 mm (12.60 in) × 5 (main fan) 320 mm (12.60 in) × 7 (sub fan)
Radiator	Type		Down flow
	Core dimensions	Width × Height × Thickness	691.5 × 340 × 27 mm (27.22 × 13.39 × 1.06 in)
	Pressure range in which cap valve is open	Coolant filler tank side	Above: 108±15 kPa (1.1±0.15 kgf/cm ² , 16±2 psi) Below: -1.0 to -4.9 kPa (-0.01 to -0.05 kgf/cm ² , -0.1 to -0.7 psi)
		Radiator side	Above only: 137±14.7 kPa (1.40±0.15 kgf/cm ² , 20±2.1 psi)
	Fins		Corrugated fin type
Reservoir tank	Capacity		0.5 ℓ (0.5 US qt, 0.4 Imp qt)

B: COMPONENT**1. WATER PUMP**

CO-02264

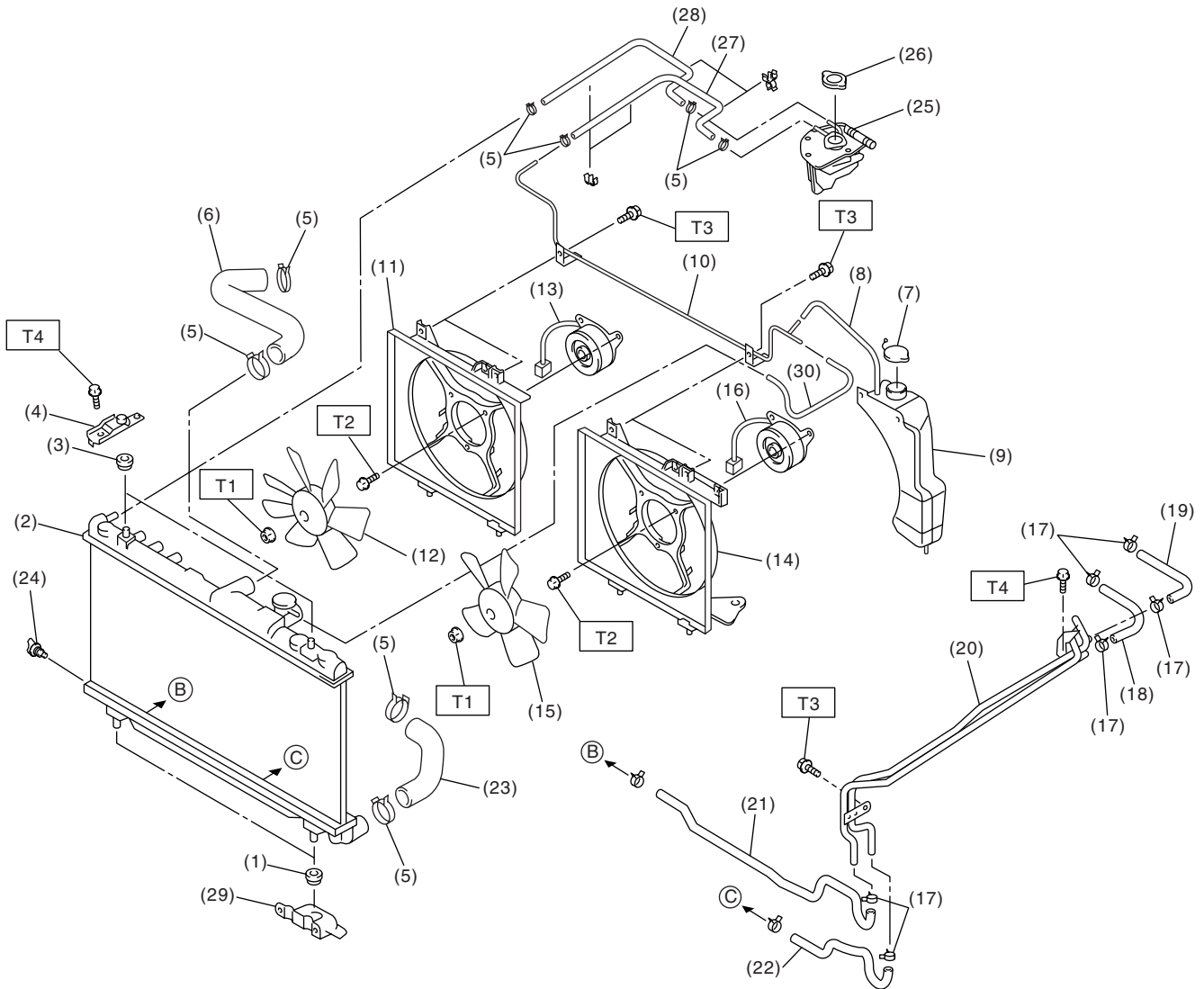
(1) Thermostat cover	(5) Gasket
(2) Gasket	(6) Heater by-pass hose
(3) Thermostat	(7) Coolant filler tank by-pass hose
(4) Water pump ASSY	(8) Water by-pass pipe

Tightening torque: N·m (kgf-m, ft-lb)**T1: 6.4 (0.65, 4.7)****T2: First 12 (1.2, 8.7)****Second 12 (1.2, 8.7)****T3: 12 (1.2, 8.7)**

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2. RADIATOR AND RADIATOR FAN



CO-02245

(1) Radiator lower cushion	(14) Radiator main fan shroud	(26) Radiator cap (engine coolant filler tank cap)
(2) Radiator	(15) Radiator main fan	(27) Engine overflow hose
(3) Radiator upper cushion	(16) Radiator main fan motor	(28) Engine air breather hose
(4) Radiator upper bracket	(17) ATF hose clamp (AT model)	(29) Radiator lower bracket
(5) Clamp	(18) ATF inlet hose A (AT model)	(30) Overflow hose B
(6) Radiator inlet hose	(19) ATF outlet hose A (AT model)	
(7) Engine coolant reservoir tank cap	(20) ATF pipe (AT model)	
(8) Overflow hose A	(21) ATF inlet hose B (AT model)	
(9) Engine coolant reservoir tank	(22) ATF outlet hose B (AT model)	
(10) Overflow pipe	(23) Radiator outlet hose	
(11) Radiator sub fan shroud	(24) Radiator drain plug	
(12) Radiator sub fan	(25) Engine coolant filler tank	
(13) Radiator sub fan motor		

Tightening torque: N·m (kgf-m, ft-lb)

T1: 3.4 (0.35, 2.5)

T2: 4.4 (0.45, 3.3)

T3: 7.5 (0.76, 5.5)

T4: 18 (1.8, 13.0)

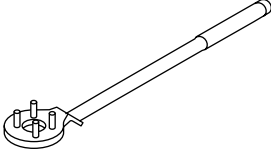
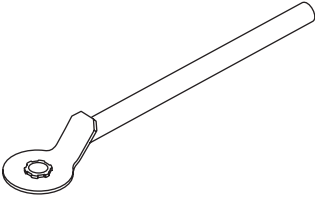
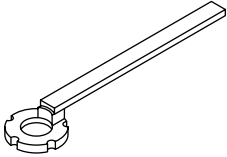
C: CAUTION

- 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 yourself, 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 rigid racks at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.

General Description

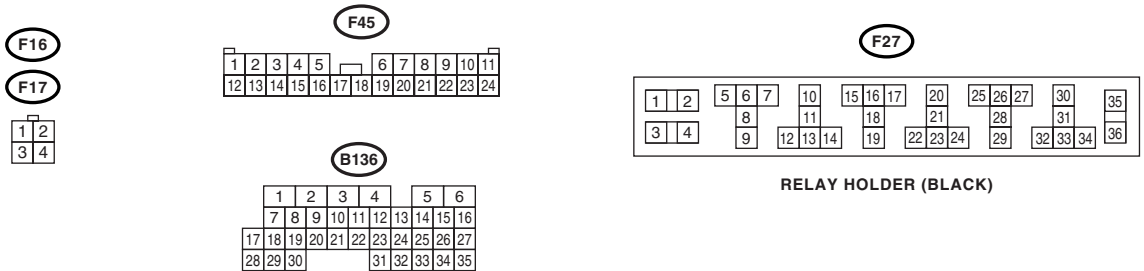
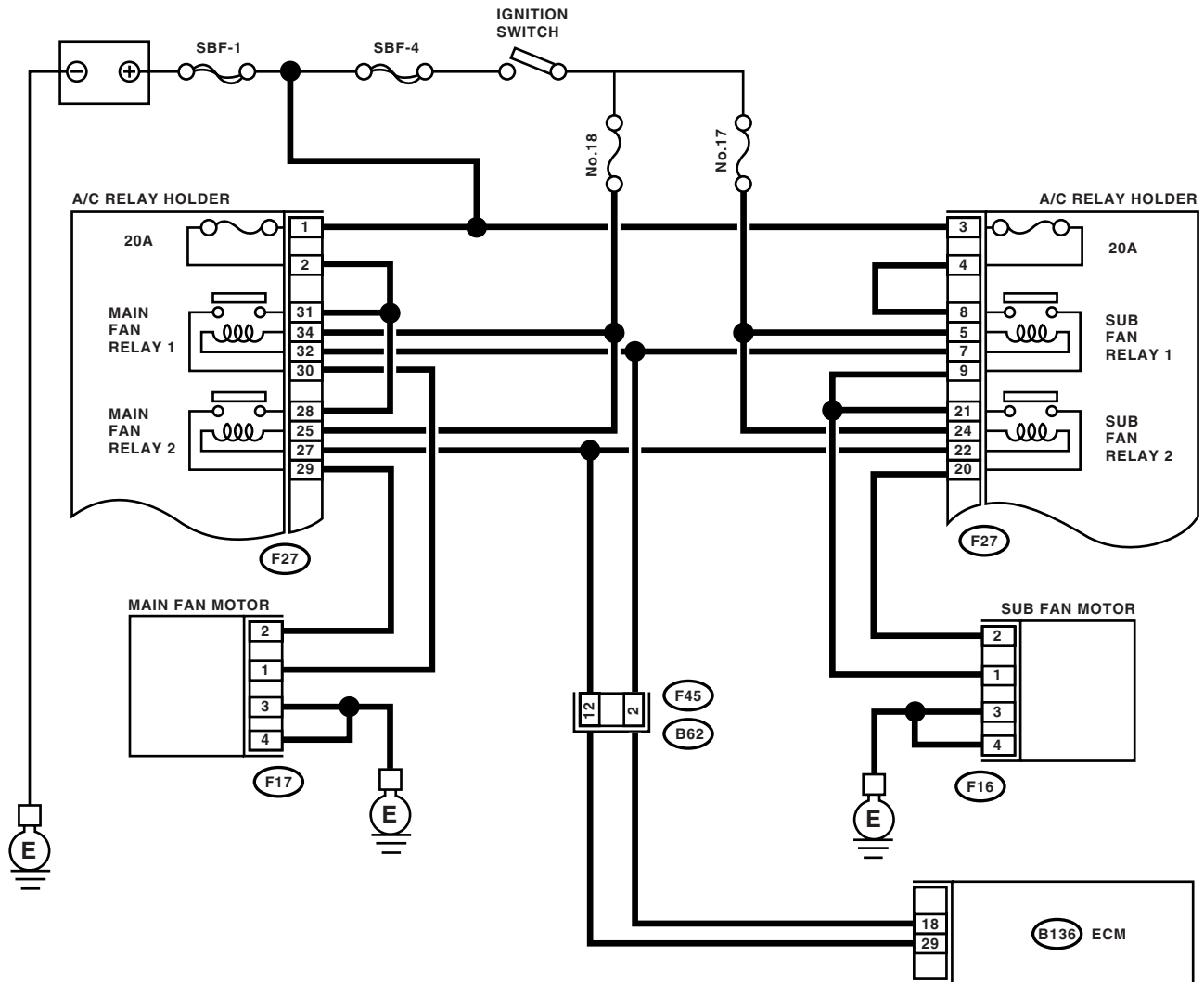
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D: PREPARATION TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499977100	499977100	CRANK PULLEY WRENCH	Used for stopping crank pulley when loosening and tightening crank pulley bolts.
 ST-499977500	499977500	CAM SPROCKET WRENCH	Used for removing and installing intake cam sprocket.
 ST-499207400	499207400	CAM SPROCKET WRENCH	Used for removing and installing exhaust cam sprocket.

2. Radiator Main Fan System

A: WIRING DIAGRAM



CO-02237

Radiator Main Fan System

COOLING

B: INSPECTION

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. Turn the A/C switch to 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. 1 (+) — 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. 3 — Chassis ground: (F17) No. 4 — 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. 1, and ground (-) terminal to terminal No. 3 or No. 4 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

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Step	Check	Yes	No
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 (F27) No. 31 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 8.	Go to step 9.
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 (F27) No. 34 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 12.	Go to step 11.
9 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 10.
10 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. Connector & terminal (F27) No. 1 (+) — Chassis ground (-):	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.
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.	Is the fuse blown out?	Replace the fuse.	Repair the open circuit in harness between main fan relay and ignition switch.
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. Terminals No. 30 — No. 31:	Is the resistance more than 1 MΩ?	Go to step 13.	Replace the main fan relay.
13 CHECK MAIN FAN RELAY. 1) Connect the battery to terminals No. 34 and No. 32 of main fan relay1. 2) Measure the resistance of main fan relay1. Terminals No. 30 — No. 31:	Is the resistance less than 1 Ω?	Go to step 14.	Replace the main fan relay.
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. 1 — (F27) No. 30:	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.

Radiator Main Fan System

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Step	Check	Yes	No
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 (F27) No. 32 — (B136) No. 18:	Is the resistance less than 1 Ω ?	Go to step 16.	Repair the open circuit in harness between main fan relay and ECM.
16 CHECK POOR CONTACT. Check poor contact in connector between main fan and ECM.	Is there poor contact in connector between main fan motor and ECM?	Repair the poor contact connector.	Record the DTC. Repair the trouble cause. <Ref. to EN(H4DOTC)(diag)-39, Read Diagnostic Trouble Code (DTC).>
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. 3 or No. 4 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 (F27) No. 28 (+) — 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 (F27) No. 25 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 25.	Go to step 24.

Radiator Main Fan System

COOLING

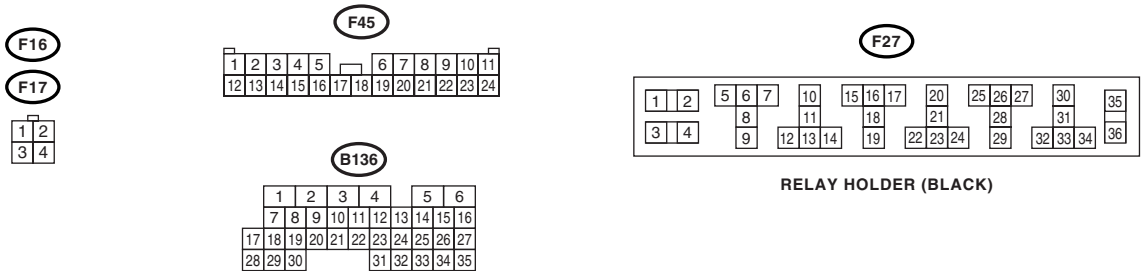
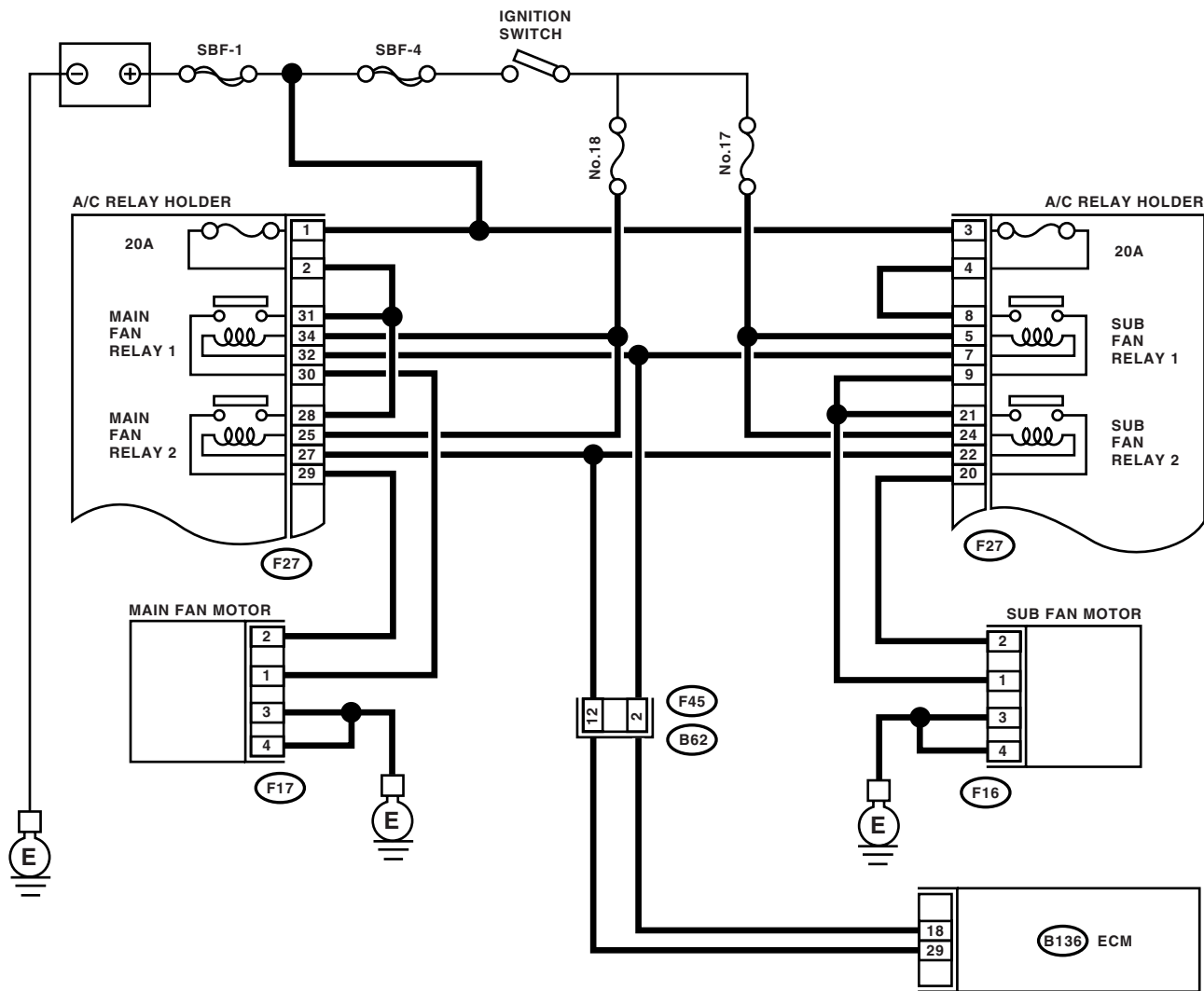
Step	Check	Yes	No
22 CHECK 20 A FUSE. 1) Remove the 20 A fuse from A/C relay holder. 2) Check the condition of fuse.	Is the fuse blown out?	Replace the fuse.	Go to step 23.
23 CHECK POWER SUPPLY TO A/C RELAY HOLDER 20 A FUSE TERMINAL. Measure the voltage of harness between A/C relay holder 20 A fuse terminal and chassis ground. Connector & terminal (F27) No. 1 (+) — Chassis ground (-):	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.
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.
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. Terminals No. 28 — No. 29:	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. 25 and No. 27 of main fan relay. 2) Measure the resistance of main fan relay. Terminals No. 28 — No. 29:	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. Connector & terminal (F17) No. 2 — (F27) No. 29:	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. Connector & terminal (F27) No. 27 — (B136) No. 29:	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.	Record the DTC. Repair the trouble cause. <Ref. to EN(H4DOTC)(diag)-39, Read Diagnostic Trouble Code (DTC).>

Radiator Sub Fan System

COOLING

3. Radiator Sub Fan System

A: WIRING DIAGRAM



CO-02237

B: INSPECTION

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. Turn the A/C switch to ON at condition of step 1.	Does the radiator sub fan rotate faster when A/C compressor is operated?	Radiator sub 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. 1 (+) — 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. 3 — Chassis ground: (F16) No. 4 — 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 SUB FAN MOTOR. Connect the battery positive (+) terminal to terminal No. 1, and ground (–) terminal to terminal No. 3 or No. 4 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.

Radiator Sub Fan System

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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. Connector & terminal (F27) No. 8 (+) — Chassis ground (-):	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. Connector & terminal (F27) No. 5 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 12.	Go to step 11.
9 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 10.
10 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. Connector & terminal (F27) No. 3 (+) — Chassis ground (-):	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 sub fuse box connector and 20 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 sub fan relay1. 3) Measure the resistance of sub fan relay1. Terminals No. 8 — No. 9:	Is the resistance more than 1 MΩ?	Go to step 13.	Replace the sub fan relay.
13 CHECK SUB FAN RELAY. 1) Connect the battery to terminals No. 5 and No. 7 of sub fan relay1. 2) Measure the resistance of sub fan relay. Terminals No. 8 — No. 9:	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. Connector & terminal (F16) No. 1 — (F27) No. 9:	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.

Radiator Sub Fan System

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Step	Check	Yes	No
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. Connector & terminal (F27) No. 7 — (B136) No. 18:	Is the resistance less than 1 Ω ?	Go to step 16.	Repair the open circuit in harness between sub fan relay and ECM.
16 CHECK POOR CONTACT. Check poor contact in connector between sub fan and ECM.	Is there poor contact in connector between sub fan motor and ECM?	Repair the poor contact connector.	Record the DTC. Repair the trouble cause. <Ref. to EN(H4DOTC)(diag)-39, Read Diagnostic Trouble Code (DTC).>
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. 3 or No. 4 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.
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 (F27) No. 21 (+) — 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 (F27) No. 24 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 25.	Go to step 24.

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Step	Check	Yes	No
22 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 23.
23 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. Connector & terminal (F27) No. 3 (+) — Chassis ground (-):	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 sub fuse box connector and 20 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.
25 CHECK SUB FAN RELAY. 1) Turn the ignition switch to OFF. 2) Remove the sub fan relay2. 3) Measure the resistance of sub fan relay2. Terminals No. 20 — No. 21:	Is the resistance more than 1 MΩ?	Go to step 26.	Replace the sub fan relay.
26 CHECK SUB FAN RELAY. 1) Connect the battery to terminals No. 22 and No. 24 of sub fan relay2. 2) Measure the resistance of sub fan relay2. Terminals No. 20 — No. 21:	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 relay2 terminal. Connector & terminal (F16) No. 2 — (F27) No. 20:	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. Connector & terminal (F27) No. 22 — (B136) No. 29:	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.	Record the DTC. Repair the trouble cause. <Ref. to EN(H4DOTC)(diag)-39, Read Diagnostic Trouble Code (DTC).>

4. Engine Coolant

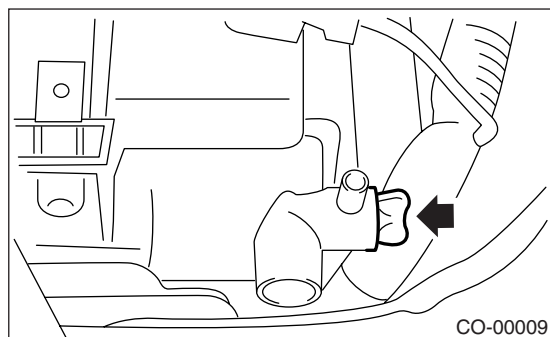
A: REPLACEMENT

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 coolant filler tank cap so that engine coolant will drain faster.
- If engine coolant adheres to the exhaust pipe, wipe it off completely.



- 4) Install the drain cock.

2. FILLING OF ENGINE COOLANT

- 1) Pour cooling system conditioner through the filter neck.

Cooling system protective agent:

COOLING SYSTEM CONDITIONER (Part No. SOA635071)

- 2) Fill engine coolant into the coolant filler tank up to filler neck position.

Coolant capacity (fill up to "FULL" level):

AT model

Approx. 7.6 ℓ (8.0 US qt, 6.7 Imp qt)

MT model

Approx. 7.7 ℓ (8.1 US qt, 6.8 Imp qt)

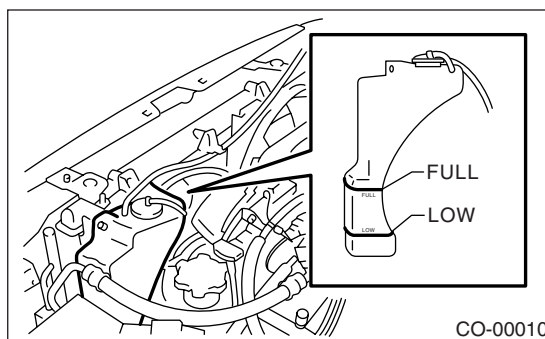
CAUTION:

Do not mix up the coolant filler tank side cap with radiator side cap.

NOTE:

- Do not remove the radiator side cap when filling engine coolant.
- 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.

- 3) Fill engine coolant into the reservoir tank up to "FULL" level.



- 4) Close the coolant filler tank cap, start the engine and race 5 to 6 times at less than 3,000 rpm, then stop the engine. (Complete this operation within 40 seconds.)
- 5) Wait for one minute after the engine stops, open the coolant filler tank cap. If the engine coolant level drops, add engine coolant to the filler neck position of radiator.
- 6) Perform the procedures 4) and 5) again.
- 7) Attach the coolant filler tank cap and reservoir tank cap properly.
- 8) Start the engine and operate the heater at maximum hot position and the blower speed setting to "LO".
- 9) Run the engine at 2,000 rpm or less until radiator fan starts and stops.

NOTE:

- Be careful with the engine coolant temperature gauge to prevent overheating.
 - If the radiator hose becomes to harden by the pressure of engine coolant, air bleeding operation seems to be almost completed.
- 10) Stop the engine and wait until engine coolant temperature lowers to 30°C (86°F) or less.
 - 11) Open the coolant filler tank cap. If the engine coolant level drops, add engine coolant into the coolant filler tank up to the filler neck position and the reservoir tank to "FULL" level.
 - 12) Attach the coolant filler tank cap and reservoir tank cap properly.
 - 13) Operate the heater at maximum hot position and the blower speed setting to "LO" and start the engine. Race at less than 3,000 rpm. If the flowing sound is heard from heater core, repeat the procedures from step 9).
 - 14) Install the collector cover.

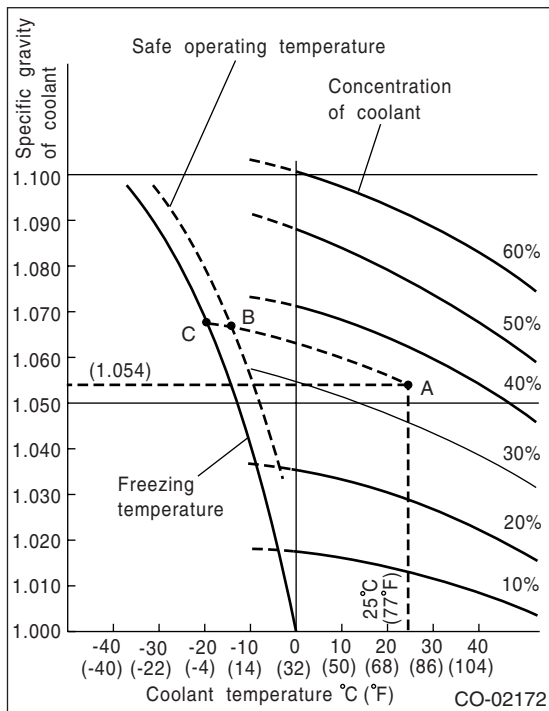
B: INSPECTION

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 and 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

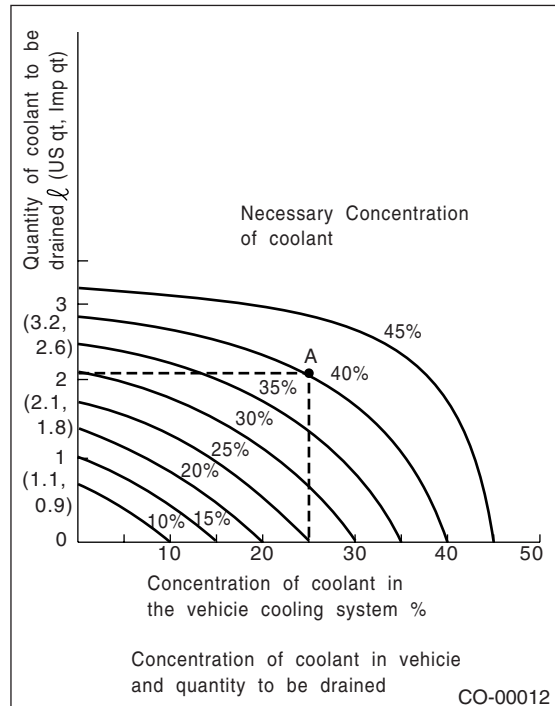
To adjust the concentration of the coolant according to temperature, find the proper fluid concentration in the above diagram and replace the necessary amount of coolant with an undiluted solution of SUBARU genuine coolant (concentration 50%).

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.

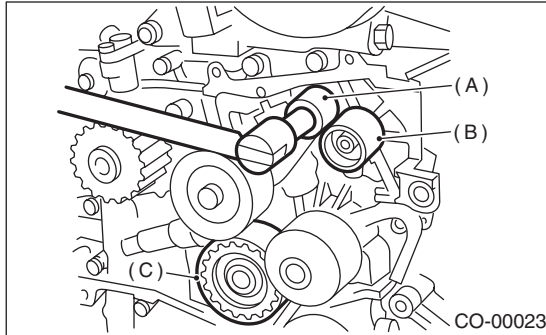
If a coolant concentration of 50% is needed, drain all the coolant and refill with the undiluted solution only.



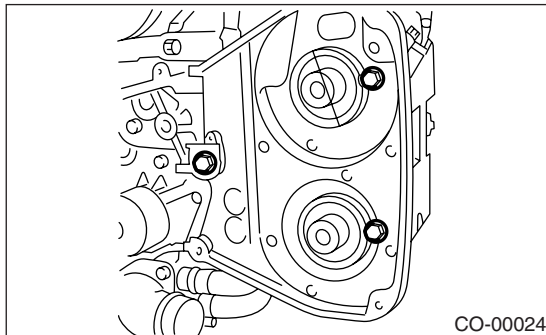
5. Water Pump

A: REMOVAL

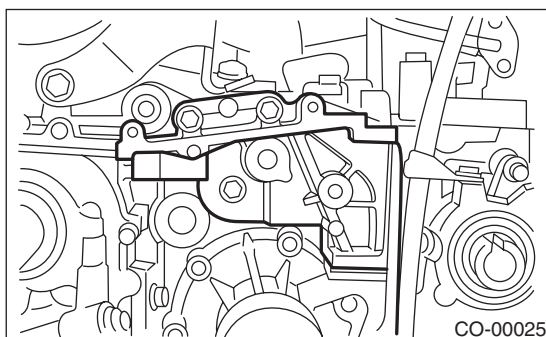
- 1) Remove the radiator. <Ref. to CO(H4DOTC)-23, REMOVAL, Radiator.>
- 2) Remove the V-belts. <Ref. to ME(H4DOTC)-41, REMOVAL, V-belt.>
- 3) Remove the timing belt. <Ref. to ME(H4DOTC)-45, REMOVAL, Timing Belt.>
- 4) Remove the automatic belt tension adjuster (A).
- 5) Remove the belt idler (B).
- 6) Remove the belt idler No. 2 (C).



- 7) Remove the camshaft position sensor. <Ref. to FU(H4DOTC)-29, REMOVAL, Camshaft Position Sensor.>
- 8) Remove the cam sprockets (LH) by using ST. <Ref. to ME(H4DOTC)-53, REMOVAL, Cam Sprocket.>
- 9) Remove the belt cover No. 2 (LH).

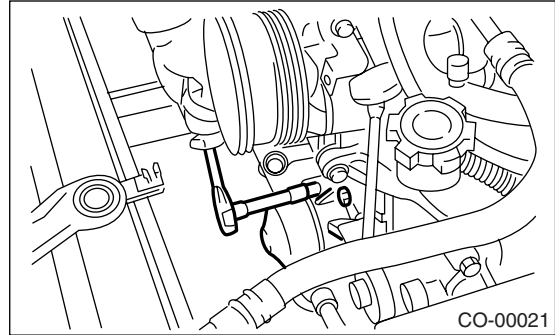


- 10) Remove the tensioner bracket.



- 11) Disconnect the hose from water pump.

- 12) Remove the water pump.



B: INSTALLATION

- 1) Install the water pump onto cylinder block (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.

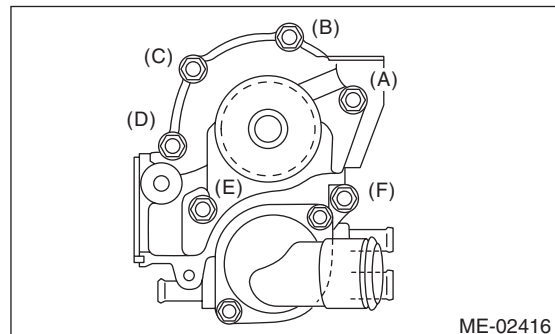
Tightening torque:

First:

12 N·m (1.2 kgf-m, 8.7 ft-lb)

Second:

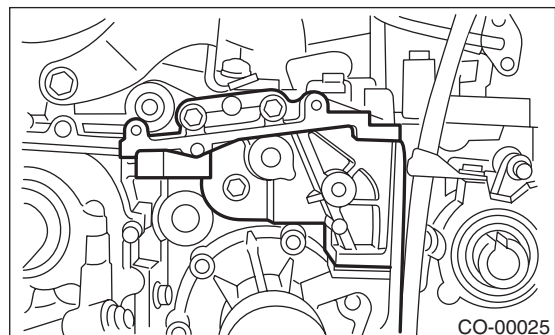
12 N·m (1.2 kgf-m, 8.7 ft-lb)



- 2) Connect the hose to water pump.
- 3) Install the tensioner bracket.

Tightening torque:

24.5 N·m (2.5 kgf-m, 18.1 ft-lb)



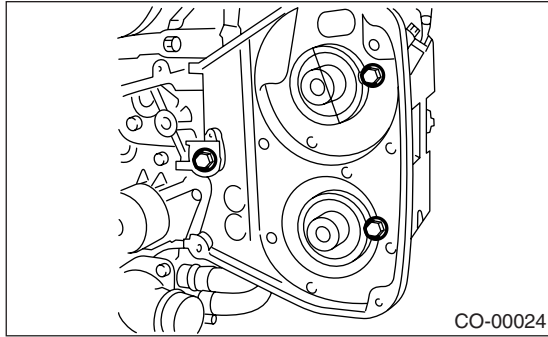
Water Pump

COOLING

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

Tightening torque:

5 N·m (0.5 kgf-m, 3.6 ft-lb)



5) Install the cam sprockets (LH) by using ST. <Ref. to ME(H4DOTC)-53, INSTALLATION, Cam Sprocket.>

6) Install the camshaft position sensor. <Ref. to FU(H4DOTC)-29, INSTALLATION, Camshaft Position Sensor.>

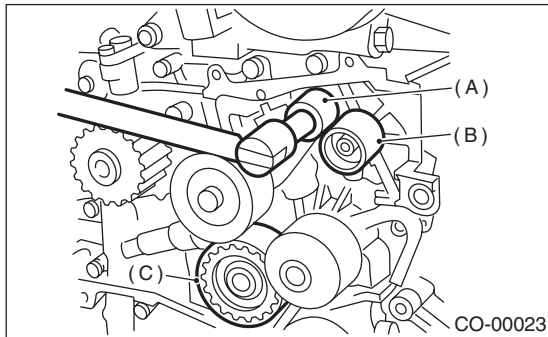
7) Install the belt idler No. 2 (C).

8) Install the belt idler (B).

9) Install the automatic belt tension adjuster (A) which has tension rod held by pin. <Ref. to ME(H4DOTC)-46, AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER, INSTALLATION, Timing Belt.>

Tightening torque:

39 N·m (4.0 kgf-m, 28.9 ft-lb)



10) Install the timing belt. <Ref. to ME(H4DOTC)-47, TIMING BELT, INSTALLATION, Timing Belt.>

11) Install the V-belts. <Ref. to ME(H4DOTC)-41, INSTALLATION, V-belt.>

12) Install the radiator. <Ref. to CO(H4DOTC)-24, INSTALLATION, Radiator.>

C: INSPECTION

1) Check the water pump bearing for smooth rotation.

2) Check the water pump pulley for abnormalities.

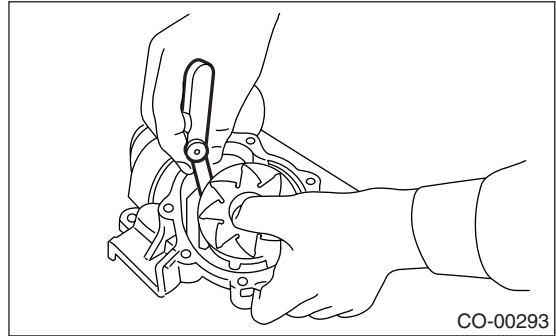
3) Make sure the impeller is not deformed or damaged.

4) Check the clearance between impeller and pump case.

Clearance between impeller and pump case:

Standard

0.5 — 1.5 mm (0.020 — 0.059 in)

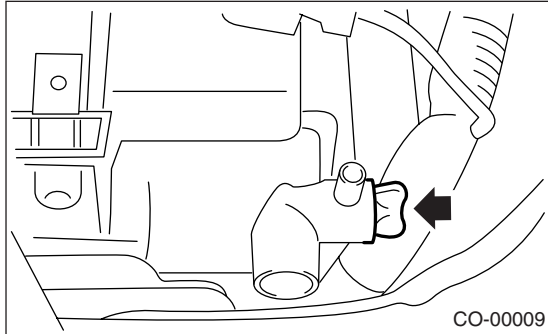


5) After water pump installation, check the pulley shaft for engine coolant leaks. If leaks are noted, replace the water pump assembly.

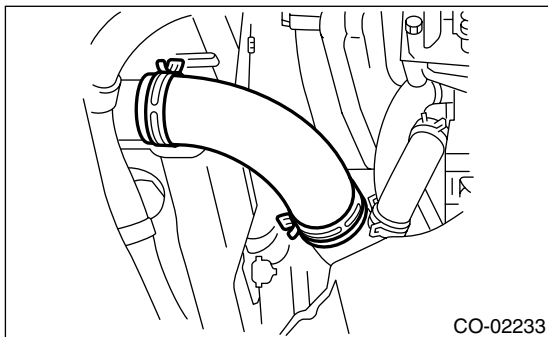
6. Thermostat

A: REMOVAL

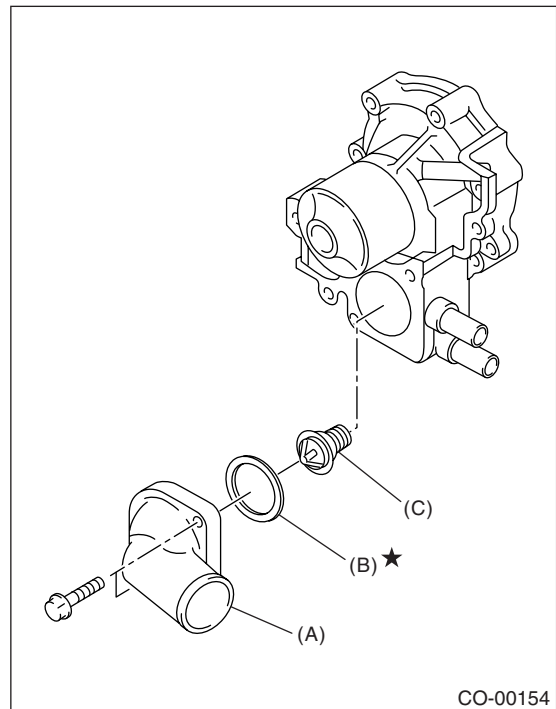
- 1) Set the vehicle on a lift.
- 2) Lift-up the vehicle.
- 3) Remove the under cover.
- 4) Drain the engine coolant completely. <Ref. to CO(H4DOTC)-17, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>



- 5) Disconnect the radiator outlet hose.



- 6) Remove the thermostat cover, and then remove the gasket and thermostat.



- (A) Thermostat cover
- (B) Gasket
- (C) Thermostat

B: INSTALLATION

- 1) Install the gasket to thermostat, and install the thermostat and gasket to water pump as a unit.

NOTE:

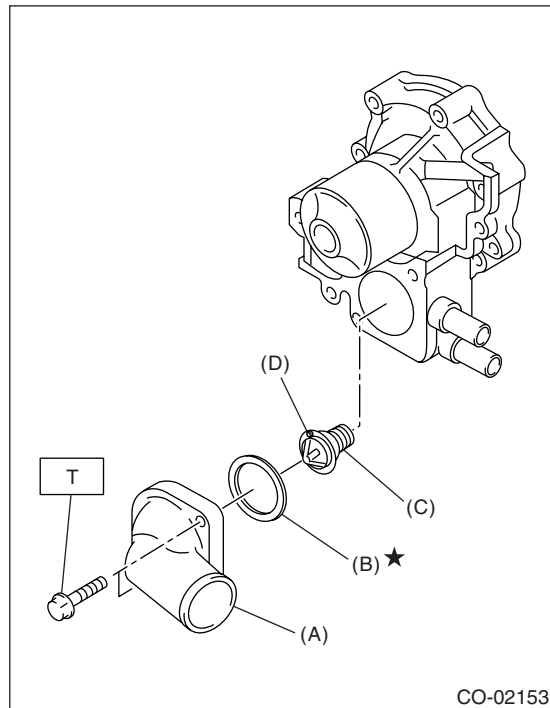
- When reinstalling the thermostat, use a new gasket.
- The thermostat must be installed with the jiggle pin (D) facing upward.

Thermostat

COOLING

Tightening torque:

12 N·m (1.2 kgf-m, 8.7 ft-lb)



- (A) Thermostat cover
- (B) Gasket
- (C) Thermostat
- (D) Jiggle pin

Starts to open:

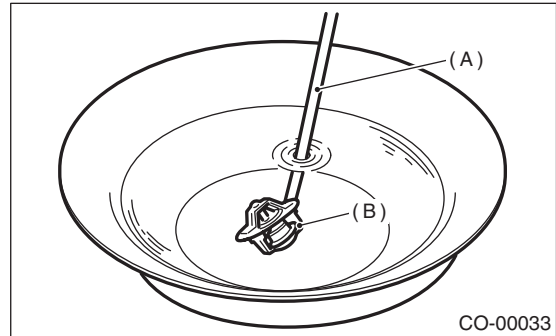
76 — 80°C (169 — 176°F)

Fully opens:

91°C (196°F)

Valve lift:

9.0 mm (0.35 in) or more



- (A) Thermometer
- (B) Thermostat

2) Fill engine coolant. <Ref. to CO(H4DOTC)-17, 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 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.

NOTE:

- Leave the thermostat in a boiled water for more than five minutes before measuring the valve lift.
- Hold the thermostat with a wire or the like to avoid contacting with the bottom of container.

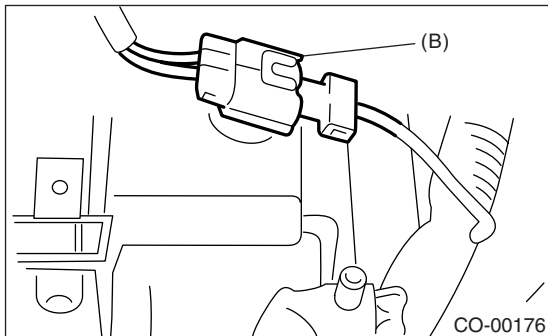
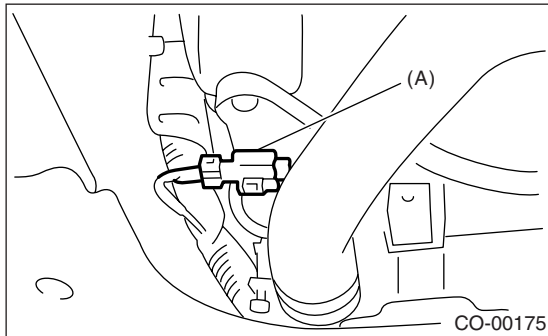
7. Radiator

A: REMOVAL

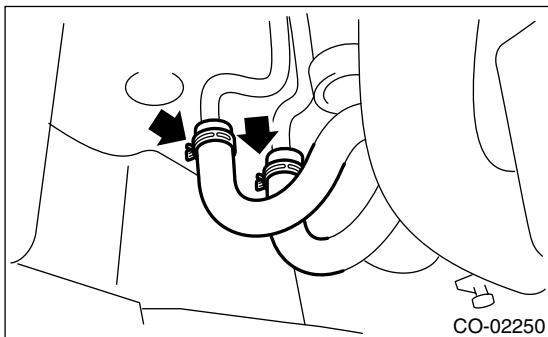
WARNING:

The radiator is pressurized. Wait until the engine cools down before working on the radiator.

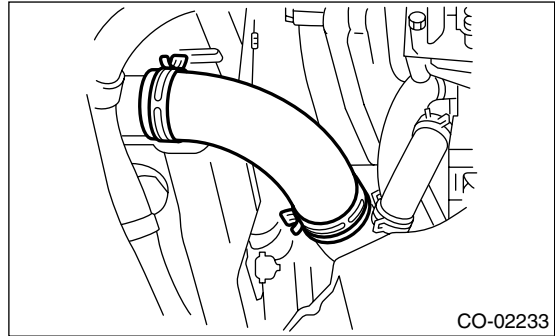
- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from battery.
- 3) Lift-up the vehicle.
- 4) Remove the under cover.
- 5) Drain the engine coolant completely. <Ref. to CO(H4DOTC)-17, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
- 6) Disconnect the connectors of radiator main fan motor (A) and sub fan motor (B).



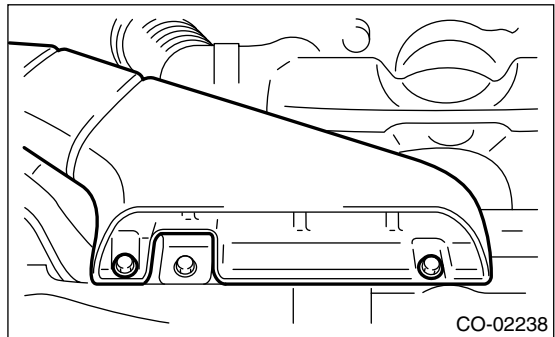
- 7) Disconnect the ATF cooler hose from ATF pipe. (AT model) Plug the openings in the hose and radiator with caps in order to prevent ATF from leaking.



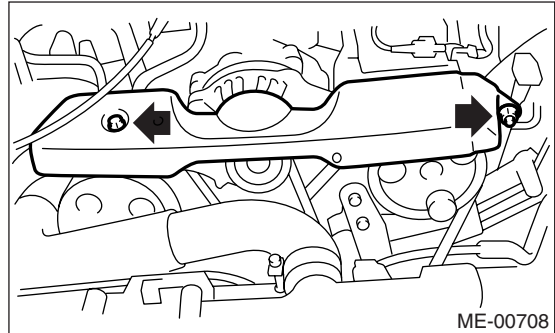
- 8) Disconnect the radiator outlet hose from thermostat cover.



- 9) Lower the vehicle.
- 10) Remove the air intake duct.



- 11) Remove the V-belt covers.

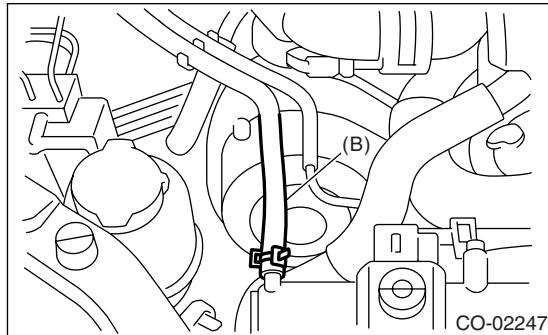
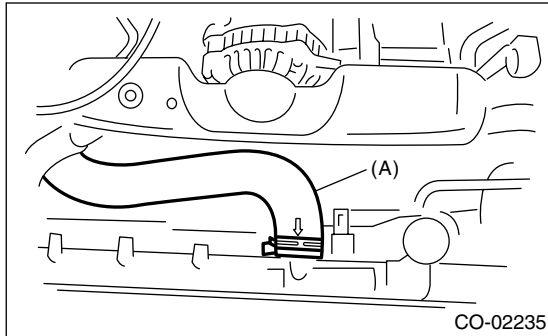


- 12) Disconnect the overflow hose.
- 13) Remove the reservoir tank. <Ref. to CO(H4DOTC)-32, REMOVAL, Reservoir Tank.>

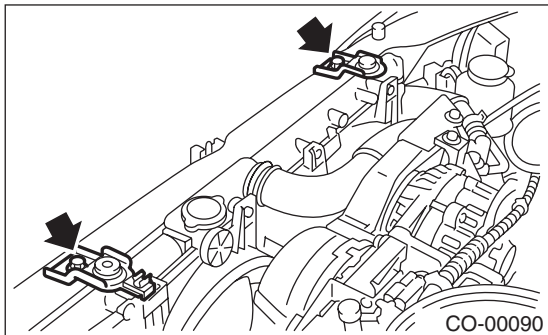
Radiator

COOLING

- 14) Disconnect the radiator inlet hose (A) and water tank hose (B) from radiator.



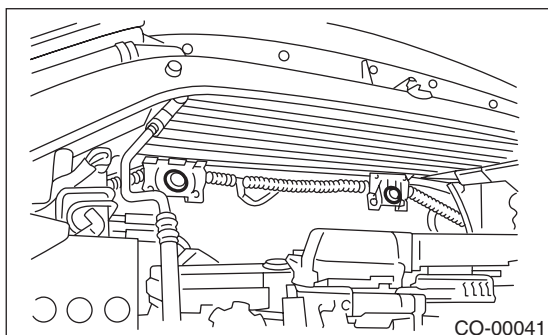
- 15) Remove the radiator upper brackets.



- 16) While lifting the radiator up, slide it to the left.
17) Lift-up the radiator, and then remove it from vehicle.

B: INSTALLATION

- 1) Attach the radiator mounting cushions to the holes on vehicle.



- 2) Install the radiator to vehicle.

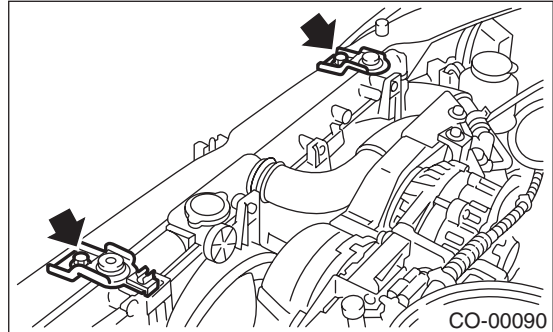
NOTE:

Fit the pins on lower side of radiator into the cushions on body side.

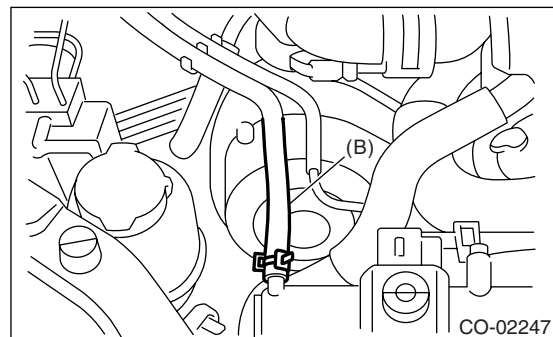
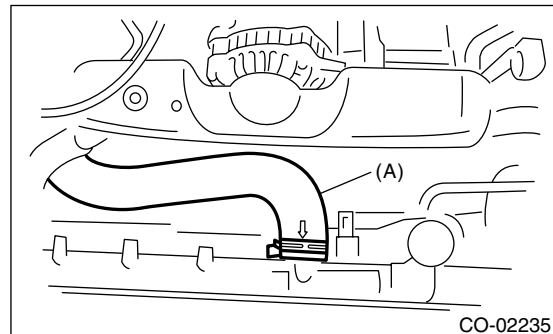
- 3) Install the radiator brackets, and then tighten the bolts.

Tightening torque:

18 N·m (1.8 kgf-m, 13.0 ft-lb)



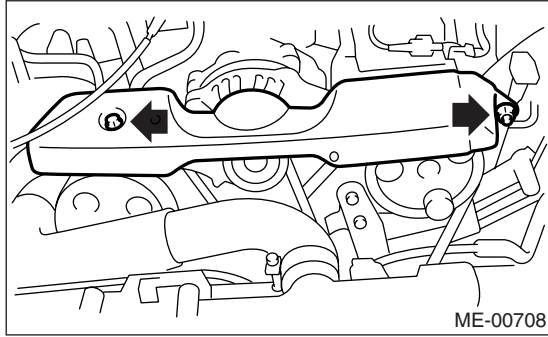
- 4) Connect the radiator inlet hose (A) and water tank hose (B).



- 5) Install the reservoir tank. <Ref. to CO(H4DOTC)-32, INSTALLATION, Reservoir Tank.>

- 6) Connect the overflow hose.

7) Install the V-belt cover.

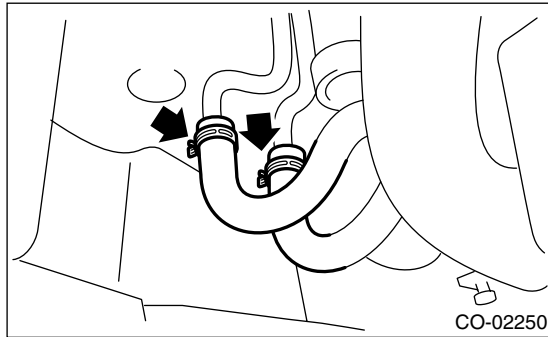


8) Install the air intake duct.

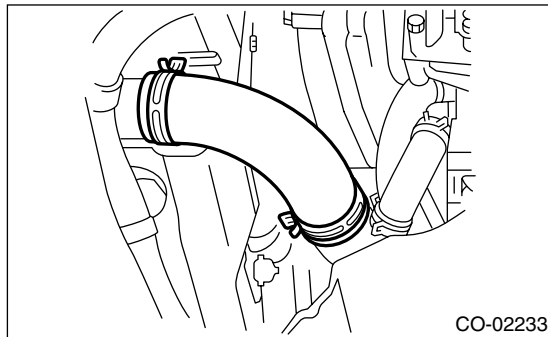
<Ref. to IN(H4DOTC)-9, INSTALLATION, Air Intake Duct.>

9) Lift-up the vehicle.

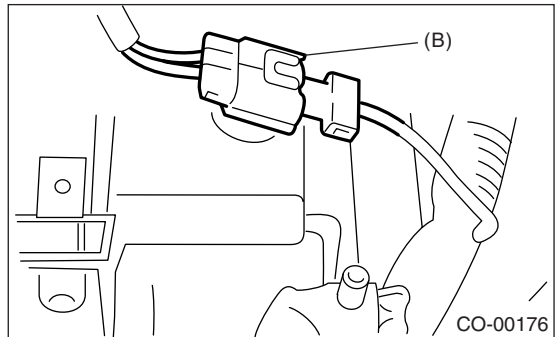
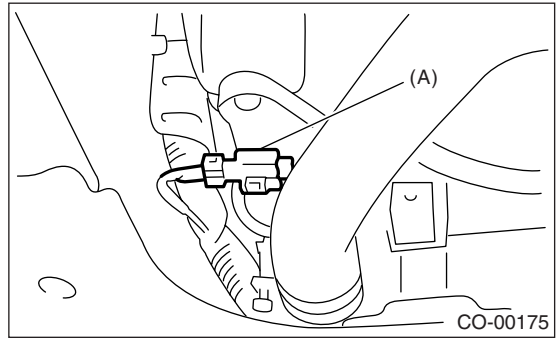
10) Connect the ATF cooler hoses. (AT model).



11) Connect the radiator outlet hose.



12) Connect the connectors to radiator main fan motor (A) and sub fan motor (B).



13) Install the under cover.

14) Lower the vehicle.

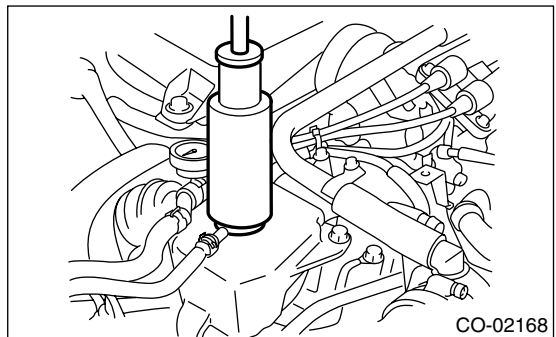
15) Connect the battery ground cable to battery.

16) Fill engine coolant. <Ref. to CO(H4DOTC)-17, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

17) Check the ATF level. <Ref. to 4AT-30, INSPECTION, Automatic Transmission Fluid.>

C: INSPECTION

1) Remove the coolant filler tank cap, top off coolant filler tank, and then attach the tester to coolant filler tank in place of cap.



2) Apply a pressure of 122 kPa (1.2 kgf/cm², 18 psi) to the coolant filler tank to check if:

- (1) Engine coolant leaks at/around radiator.
- (2) Engine coolant leaks at/around hoses or connections.

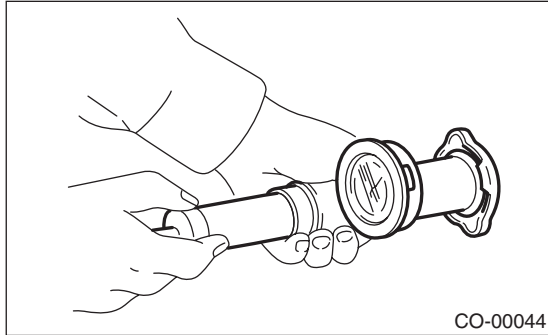
CAUTION:

- Inspection must be carried out at the side of coolant filler tank, not at the side of radiator.
- Engine should be turned off.
- Wipe engine coolant from check points in advance.
- If engine coolant adheres to the exhaust pipe, wipe it off completely.
- Be careful to prevent engine coolant from spurting out when removing the tester.
- Be careful also not to deform the filler neck of coolant filler tank 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.

Coolant filler tank side

Standard pressure:

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

Service limit pressure:

83 kPa (0.85 kgf/cm², 12 psi)

Radiator side

Standard pressure:

122 — 152 kPa (1.24 — 1.55 kgf/cm², 18 — 22 psi)

Service limit pressure:

112 kPa (1.14 kgf/cm², 16 psi)

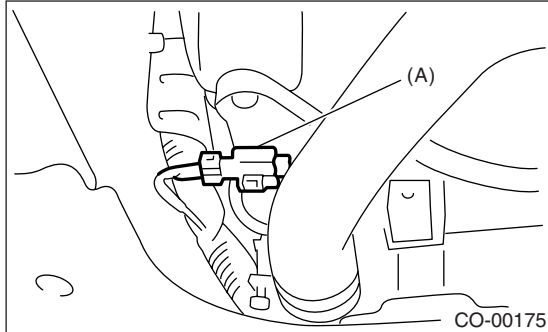
CAUTION:

- Be sure to remove foreign matter and rust from the cap in advance. Otherwise, results of pressure test will be incorrect.
- Do not mix up the coolant filler tank side cap with radiator side cap.

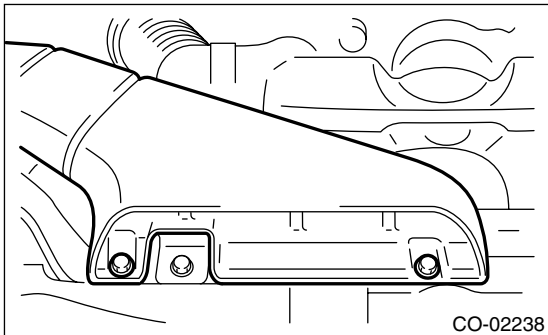
9. Radiator Main Fan and Fan Motor

A: REMOVAL

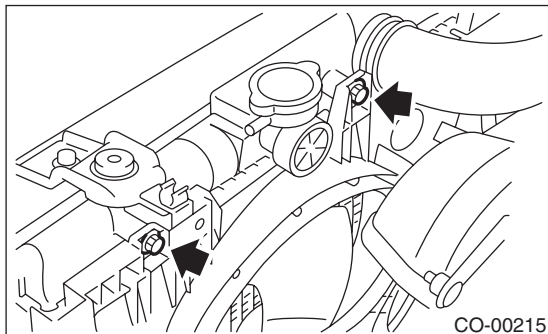
- 1) Disconnect the ground cable from battery.
- 2) Lift-up the vehicle.
- 3) Remove the under cover.
- 4) Disconnect the connector of main fan motor (A).



- 5) Lower the vehicle.
- 6) Remove the air intake duct.



- 7) Disconnect the overflow hose.
- 8) Remove the overflow pipe.
- 9) Remove the reservoir tank. <Ref. to CO(H4DOTC)-32, REMOVAL, Reservoir Tank.>
- 10) Remove the radiator main fan motor assembly.



B: INSTALLATION

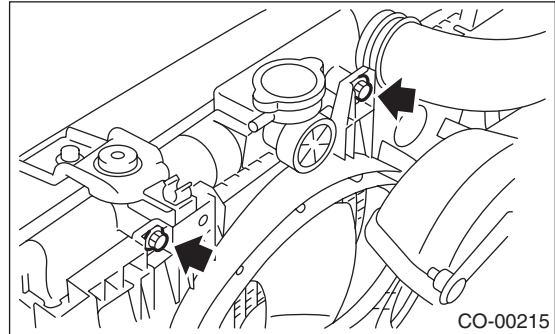
Install in the reverse order of removal.

NOTE:

When the main fan motor assembly cannot be installed as is, loosen the sub fan motor assembly securing bolts to install it.

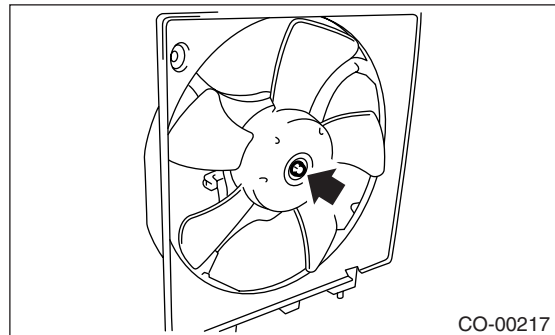
Tightening torque:

4.9 N·m (0.50 kgf-m, 3.6 ft-lb)

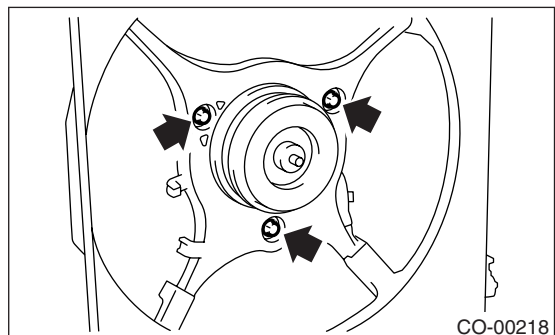


C: DISASSEMBLY

- 1) Remove the nut which holds the fan onto fan motor and shroud assembly.



- 2) Remove the bolts which install the fan motor onto shroud.

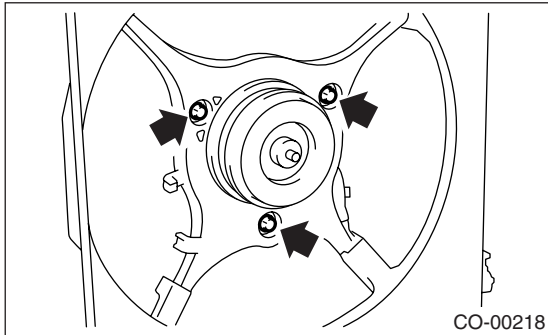


D: ASSEMBLY

Assemble in the reverse order of disassembly.

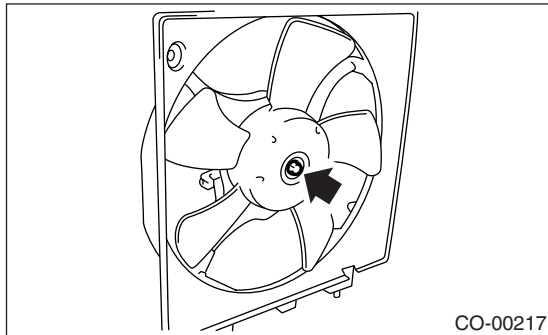
Tightening torque:

4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



Tightening torque:

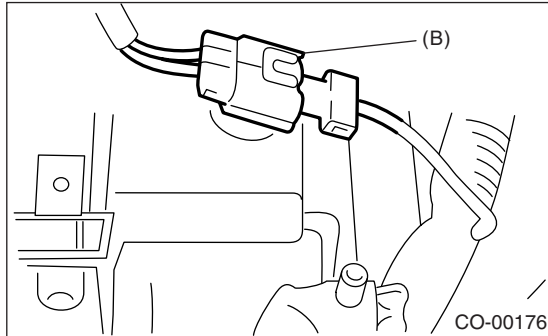
3.4 N·m (0.35 kgf-m, 2.5 ft-lb)



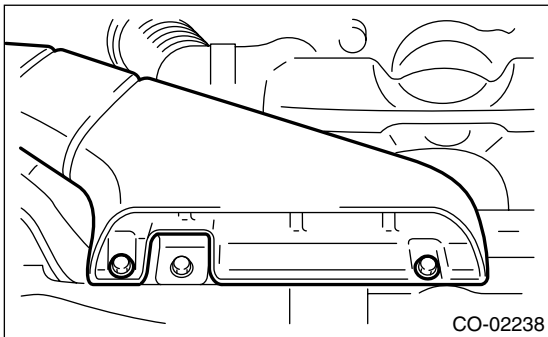
10. Radiator Sub Fan and Fan Motor

A: REMOVAL

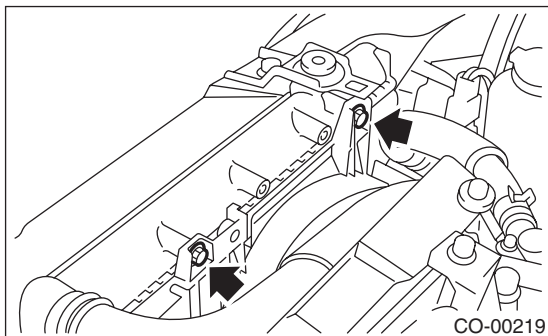
- 1) Disconnect the ground cable from battery.
- 2) Lift-up the vehicle.
- 3) Remove the under cover.
- 4) Disconnect the connector of sub fan motor (B).



- 5) Lower the vehicle.
- 6) Remove the air intake duct.



- 7) Remove the bolts which hold the sub fan shroud to radiator.
- 8) Remove the overflow pipe.
- 9) Remove the radiator sub fan shroud through the under side of vehicle.

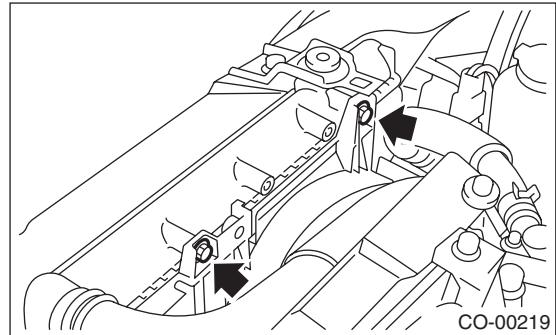


B: INSTALLATION

Install in the reverse order of removal.

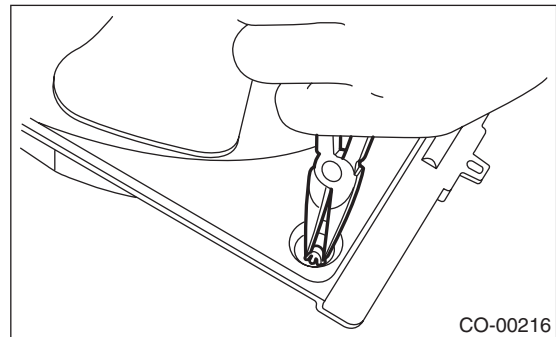
Tightening torque:

4.9 N·m (0.50 kgf-m, 3.6 ft-lb)

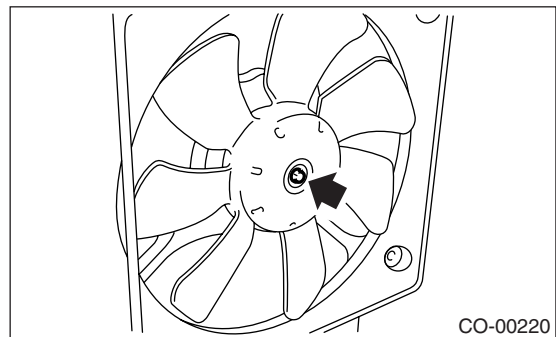


C: DISASSEMBLY

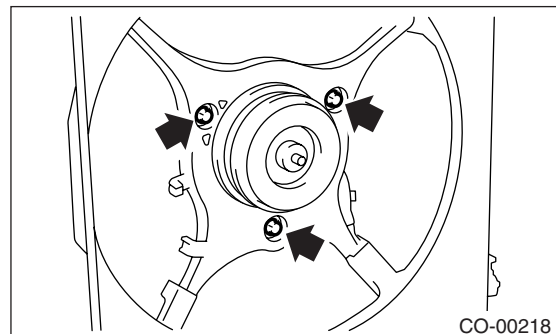
- 1) Remove the clip which holds the motor harness onto shroud.



- 2) Remove the nut which holds the fan onto fan motor and shroud assembly.



- 3) Remove the bolts which install the fan motor onto shroud.

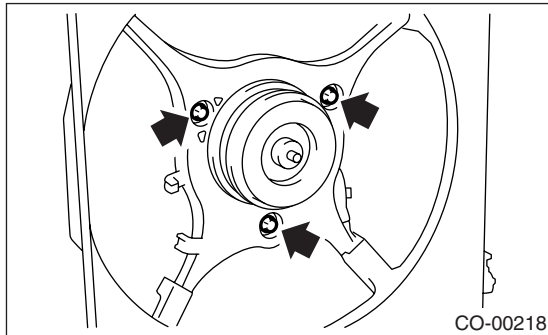


D: ASSEMBLY

Assemble in the reverse order of disassembly.

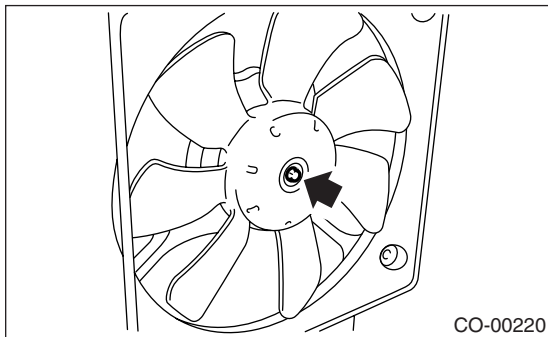
Tightening torque:

4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



Tightening torque:

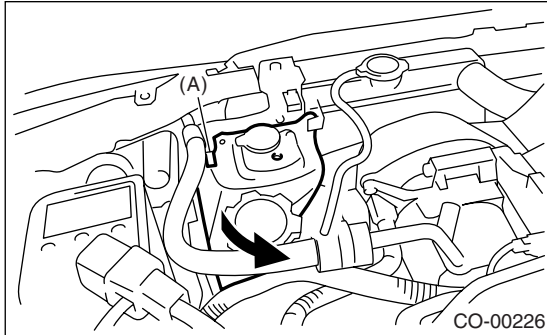
3.4 N·m (0.35 kgf-m, 2.5 ft-lb)



11. Reservoir Tank

A: REMOVAL

- 1) Disconnect the overflow hose from the radiator filler neck position.
- 2) Pull out the reservoir tank to the direction of arrow while pushing the pawl (A).



B: INSTALLATION

Install in the reverse order of removal.

NOTE:

Refer to COMPONENT for tightening torque. <Ref. to CO(H4DOTC)-3, COMPONENT, General Description.>

C: INSPECTION

Make sure the engine coolant level is between "FULL" and "LOW".

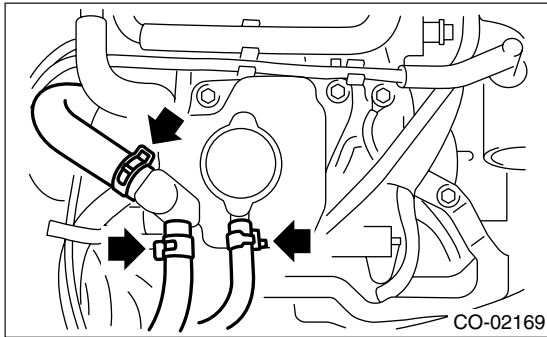
12.Coolant Filler Tank

A: REMOVAL

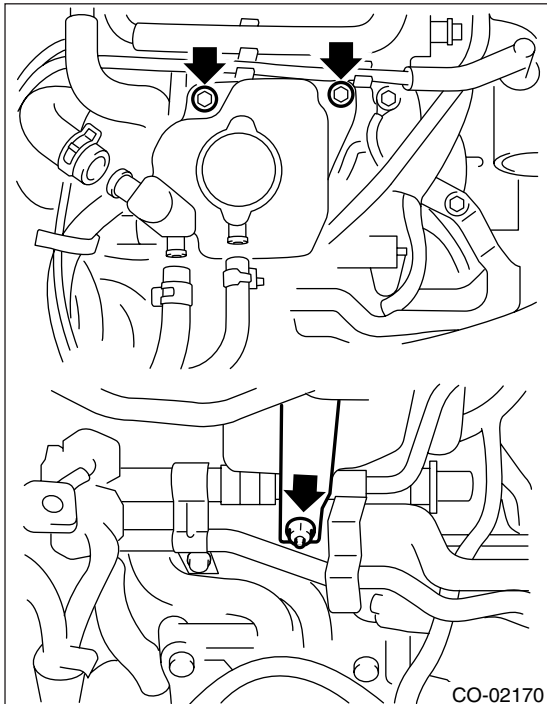
WARNING:

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(H4DOTC)-17, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
- 2) Remove the air cleaner upper cover and air intake boot. <Ref. to IN(H4DOTC)-8, REMOVAL, Air Cleaner Case.>
- 3) Remove the air cleaner element.
- 4) Disconnect the engine coolant hoses from coolant filler tank.



- 5) Remove the bolts and nut which install the coolant filler tank.
- 6) Disconnect the engine coolant hose which connects the under side of coolant filler tank.
- 7) Remove the coolant filler tank.



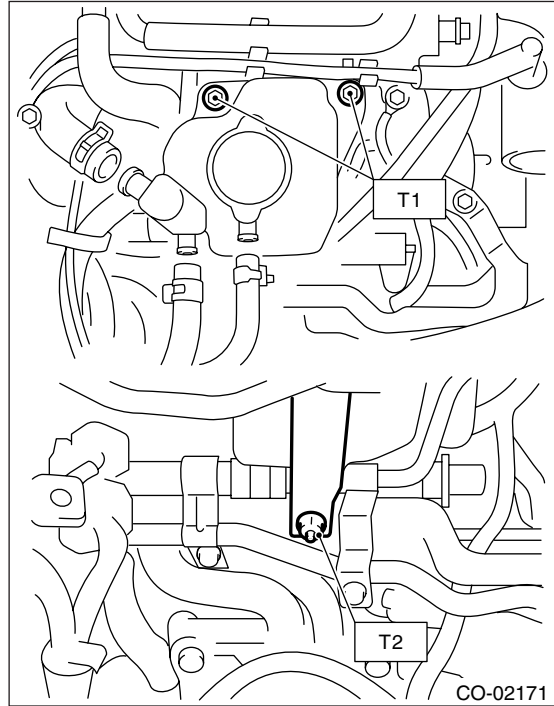
B: INSTALLATION

- 1) Install in the reverse order of removal.

Tightening torque:

T1: 16 N·m (1.6 kgf-m, 11.8 ft-lb)

T2: 13 N·m (1.3 kgf-m, 9.6 ft-lb)



- 2) Fill engine coolant. <Ref. to CO(H4DOTC)-17, 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 timing 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(H4DOTC)(diag)-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(H4DOTC)(diag)-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. Malfunction of radiator fan	Inspect the radiator fan relay, engine coolant temperature sensor or radiator motor and replace them.
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 cylinder block	Repair or replace.
	f. Damaged or cracked thermostat case	Repair or replace.
	g. Leakage from radiator	Repair or replace.
Noise	a. Defective timing 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.

EMISSION CONTROL
(AUX. EMISSION CONTROL DEVICES)

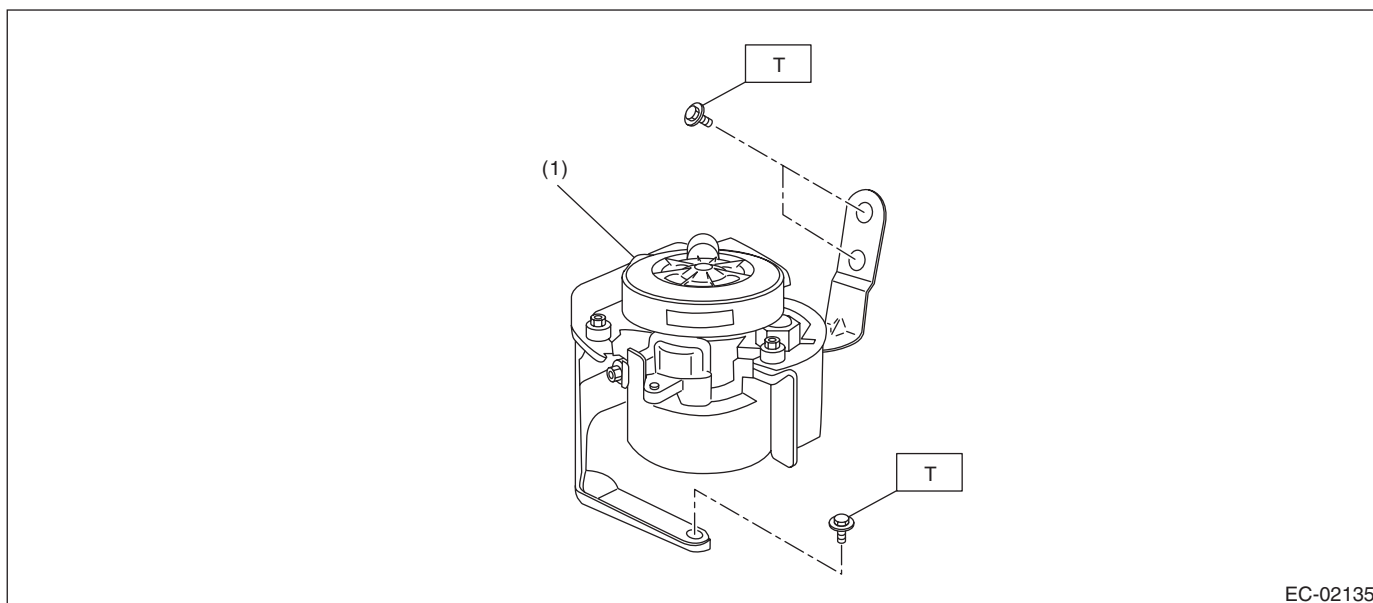
General Description

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

1. General Description

A: COMPONENT

1. SECONDARY AIR PUMP



EC-02135

(1) Secondary air pump

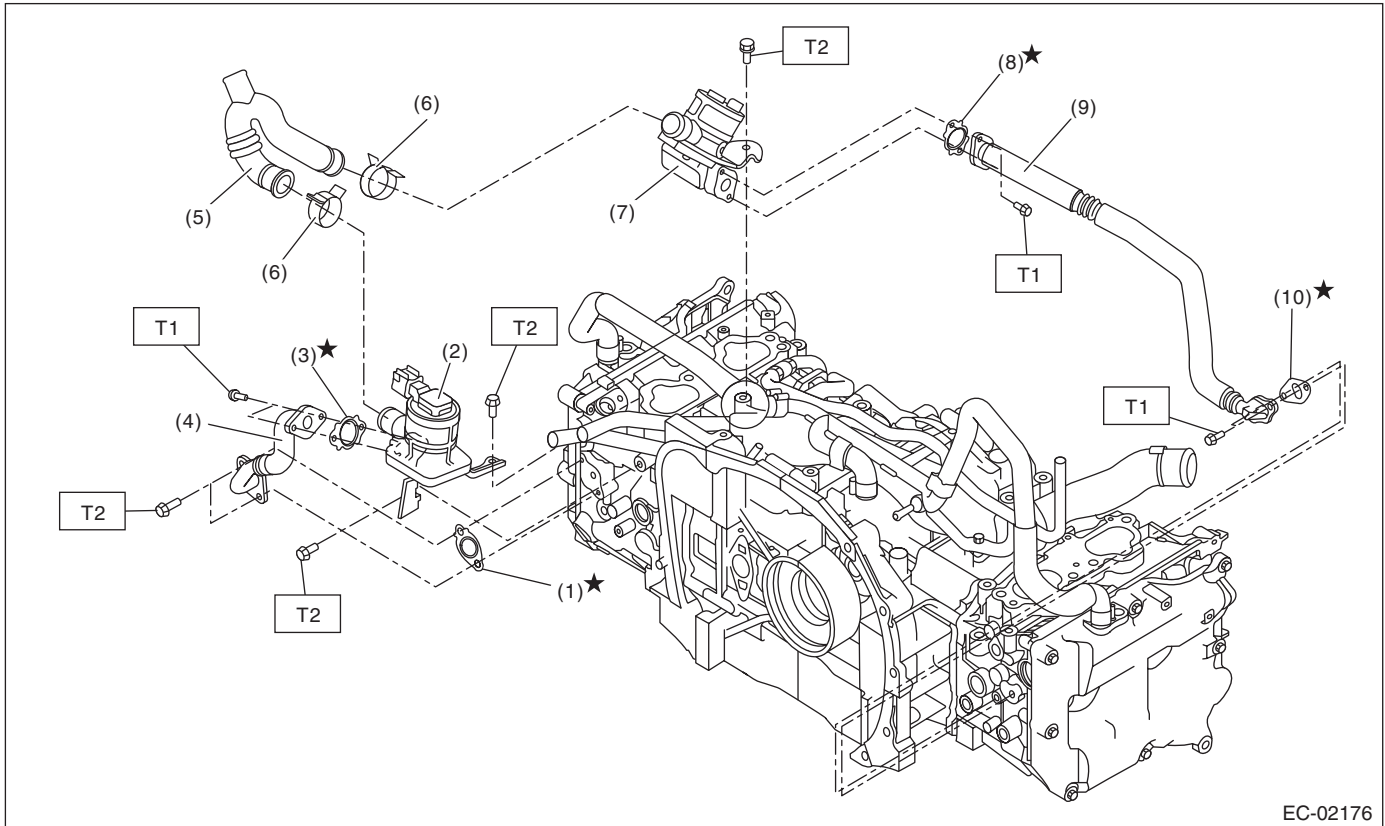
Tightening torque: N·m (kgf-m, ft-lb)

T: 5 (0.5, 3.7)

General Description

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

2. SECONDARY AIR COMBI VALVE



(1) Gasket	(6) Clamp
(2) Secondary air combi valve LH	(7) Secondary air combi valve RH
(3) Gasket	(8) Gasket
(4) Pipe LH	(9) Pipe RH
(5) Air duct	(10) Gasket

Tightening torque: N·m (kgf-m, ft-lb)

T1: 9 (0.9, 6.6)

T2: 19 (1.9, 13.7)

B: CAUTION

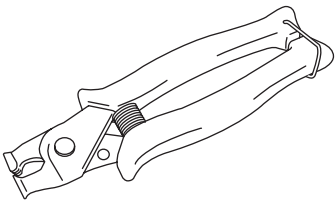
- Wear work clothing, including a cap, protective goggles and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn yourself, 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 rigid racks at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.

General Description

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

C: PREPARATION TOOL

1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18353AA000	18353AA000	CLAMP PLIERS	• Used for removing and installing PCV hose. • This tool is a general tool that is made by CAILLAU in France. (Code: 54.0.000.205) Tool number is fixed as special tool in order to obtain it as easily as SUBARU genuine parts.

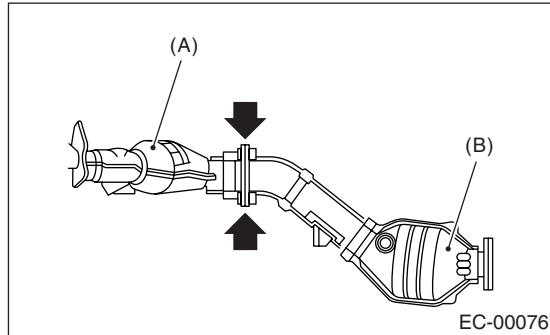
Front Catalytic Converter

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

2. Front Catalytic Converter

A: REMOVAL

- 1) Remove the center exhaust pipe.
<Ref. to EX(H4DOTC)-10, 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.

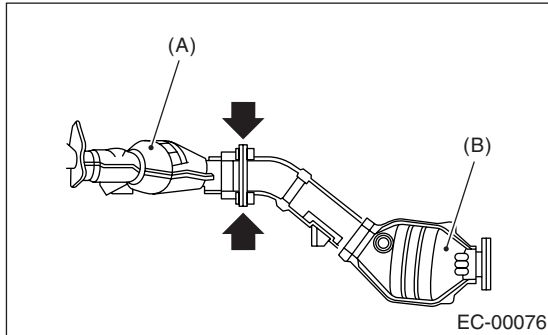
Rear Catalytic Converter

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

3. Rear Catalytic Converter

A: REMOVAL

- 1) Remove the center exhaust pipe.
<Ref. to EX(H4DOTC)-10, 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.

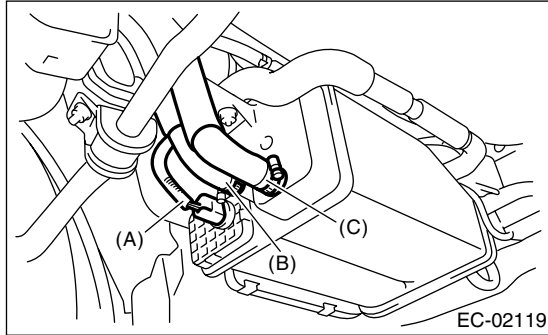
Canister

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

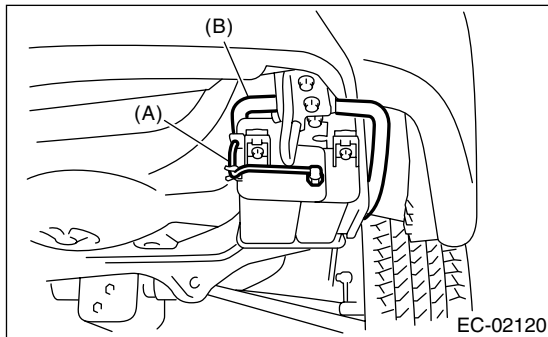
4. Canister

A: REMOVAL

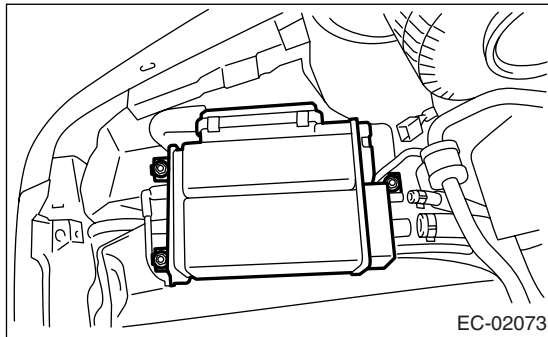
- 1) Disconnect the ground cable from battery.
- 2) Lift up the vehicle.
- 3) Disconnect connector (A) from drain valve.
- 4) Disconnect evaporation hoses (B) and (C) from canister.



- 5) Disconnect quick connector (A) from canister.
- 6) Disconnect drain hoses (B) from canister.



- 7) Remove the canister from vehicle.



B: INSTALLATION

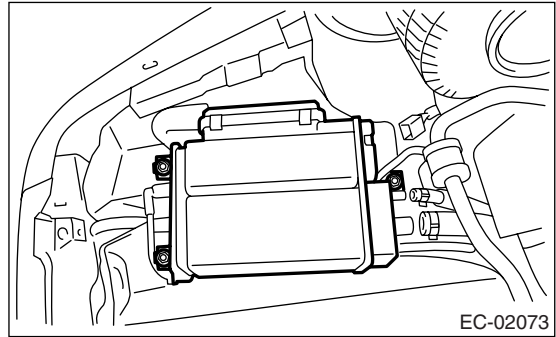
Install in the reverse order of removal.

NOTE:

Replace the retainer of quick connector with new one.

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.

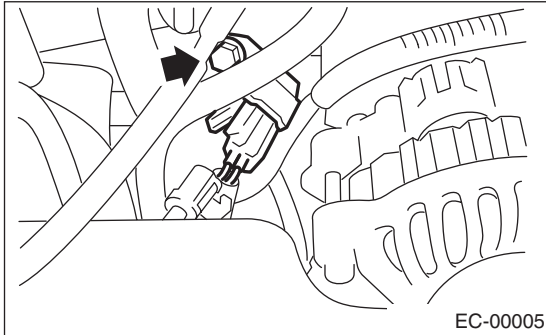
Purge Control Solenoid Valve

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

5. Purge Control Solenoid Valve

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Disconnect the connector and hoses from purge control solenoid valve.
- 3) Remove the bolt which installs the purge control solenoid valve onto intake manifold.

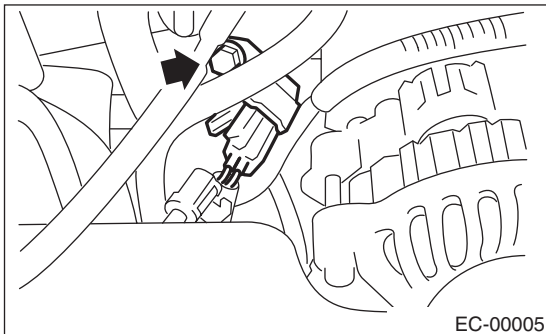


B: INSTALLATION

Install in the reverse order of removal.

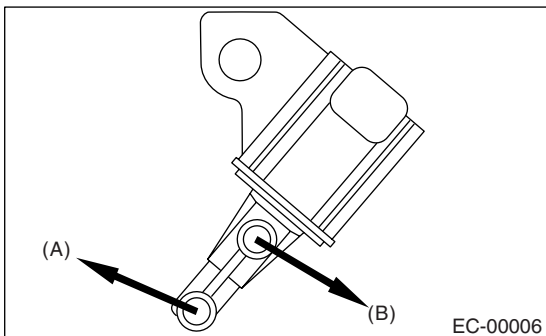
Tightening torque:

16 N·m (1.6 kgf-m, 11.6 ft-lb)



NOTE:

Connect the evaporation hoses as shown in the figure.



(A) To purge valve

(B) To intake manifold

C: INSPECTION

Make sure the hoses are not cracked or loose.

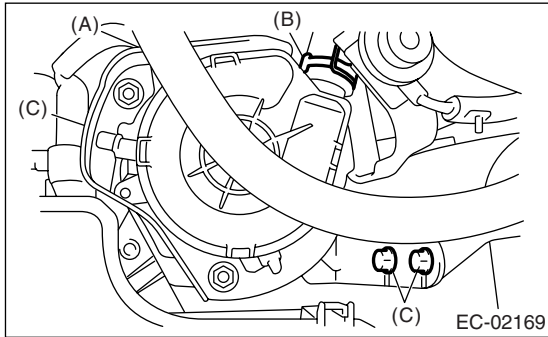
Secondary Air Pump

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

6. Secondary Air Pump

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Disconnect the connector (A) from secondary air pump.
- 3) Disconnect the hose (B) from secondary air pump.
- 4) Remove the bolt (C) which secures the secondary air pump to the vehicle.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

5 N·m (0.5 kgf-m, 3.7 ft-lb)

C: INSPECTION

Make sure the hoses are not cracked or loose.

Secondary Air Combi Valve

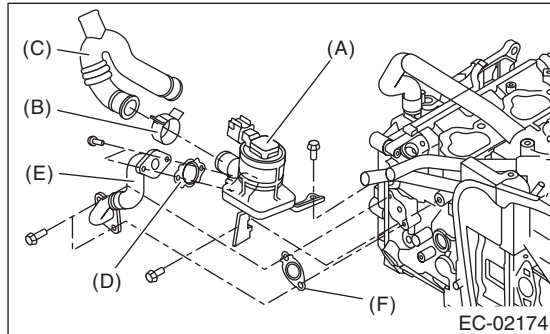
EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

7. Secondary Air Combi Valve

A: REMOVAL

1. SECONDARY AIR COMBI VALVE LH

- 1) Disconnect the ground cable from battery.
- 2) Remove the intercooler. <Ref. to IN(H4DOTC)-11, REMOVAL, Intercooler.>
- 3) Disconnect the connector from secondary air combi valve LH.
- 4) Disconnect the air duct.
- 5) Disconnect the pipe LH.
- 6) Remove the secondary air combi valve LH.

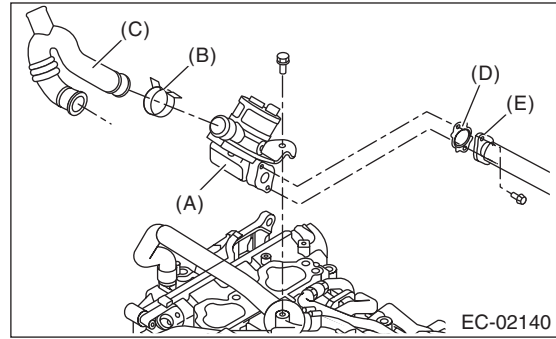


- (A) Secondary air combi valve LH
- (B) Clamp
- (C) Air duct
- (D) Gasket
- (E) Pipe LH
- (F) Gasket

2. SECONDARY AIR COMBI VALVE RH

- 1) Disconnect the ground cable from battery.
- 2) Remove the intercooler. <Ref. to IN(H4DOTC)-11, REMOVAL, Intercooler.>
- 3) Remove the secondary air combi valve LH. <Ref. to EC(H4DOTC)-10, SECONDARY AIR COMBI VALVE LH, REMOVAL, Secondary Air Combi Valve.>
- 4) Remove the intake manifold. <Ref. to FU(H4DOTC)-14, REMOVAL, Intake Manifold.>
- 5) Disconnect the connector from secondary air combi valve RH.
- 6) Disconnect the pipe RH.

- 7) Remove the secondary air combi valve RH.



- (A) Secondary air combi valve RH
- (B) Clamp
- (C) Air duct
- (D) Gasket
- (E) Pipe RH

B: INSTALLATION

1. SECONDARY AIR COMBI VALVE LH

Install in the reverse order of removal.

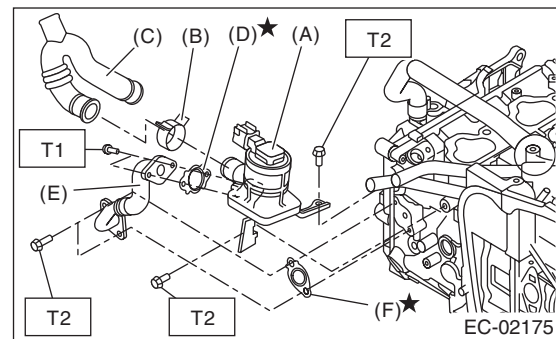
NOTE:

Use a new gasket.

Tightening torque:

T1: 9 N·m (0.9 kgf-m, 6.6 ft-lb)

T2: 19 N·m (1.9 kgf-m, 13.7 ft-lb)



- (A) Secondary air combi valve LH
- (B) Clamp
- (C) Air duct
- (D) Gasket
- (E) Pipe LH
- (F) Gasket

Secondary Air Combi Valve

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

2. SECONDARY AIR COMBI VALVE RH

Install in the reverse order of removal.

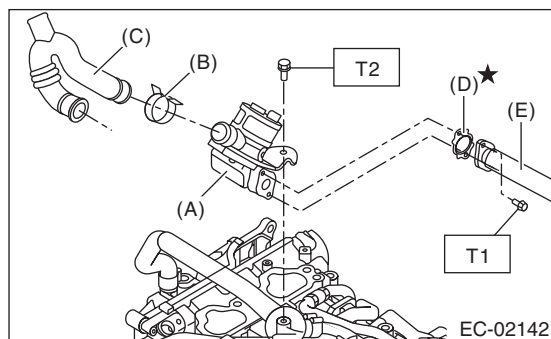
NOTE:

Use a new gasket.

Tightening torque:

T1: 9 N·m (0.9 kgf-m, 6.6 ft-lb)

T2: 19 N·m (1.9 kgf-m, 13.7 ft-lb)



- (A) Secondary air combi valve RH
- (B) Clamp
- (C) Air duct
- (D) Gasket
- (E) Pipe RH

C: INSPECTION

Make sure the hoses are not cracked or loose.

8. Fuel Level Sensor

A: REMOVAL

For removal procedure, refer to FU(H4DOTC) section. <Ref. to FU(H4DOTC)-60, REMOVAL, Fuel Level Sensor.>

B: INSTALLATION

For installation procedure, refer to FU(H4DOTC) section. <Ref. to FU(H4DOTC)-60, INSTALLATION, Fuel Level Sensor.>

9. Fuel Temperature Sensor

A: REMOVAL

Fuel temperature sensor and fuel level sensor are integrated into one unit; therefore, the removal procedure is the same as that for fuel level sensor.
<Ref. to FU(H4DOTC)-60, REMOVAL, Fuel Level Sensor.>

B: INSTALLATION

Fuel temperature sensor and fuel level sensor are integrated into one unit; therefore, the installation procedure is the same as that for fuel level sensor.
<Ref. to FU(H4DOTC)-60, INSTALLATION, Fuel Level Sensor.>

10. Fuel Sub Level Sensor

A: REMOVAL

For removal procedure, refer to FU(H4DOTC) section. <Ref. to FU(H4DOTC)-61, REMOVAL, Fuel Sub Level Sensor.>

B: INSTALLATION

For installation procedure, refer to FU(H4DOTC) section. <Ref. to FU(H4DOTC)-61, INSTALLATION, Fuel Sub Level Sensor.>

Fuel Tank Pressure Sensor

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

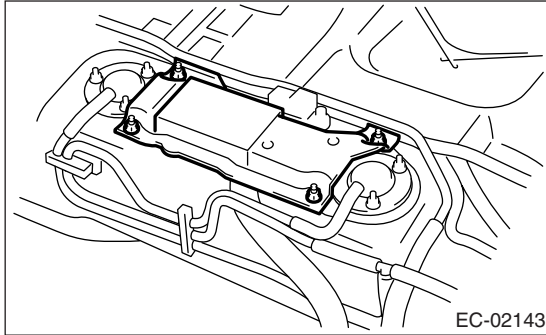
11. Fuel Tank Pressure Sensor

A: REMOVAL

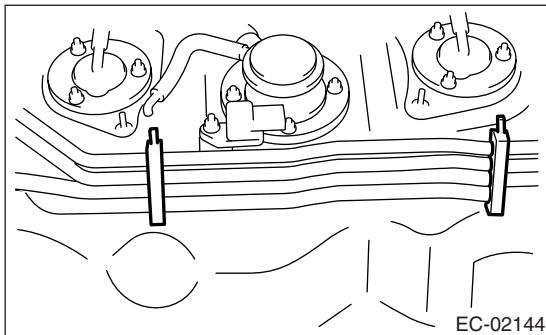
WARNING:

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

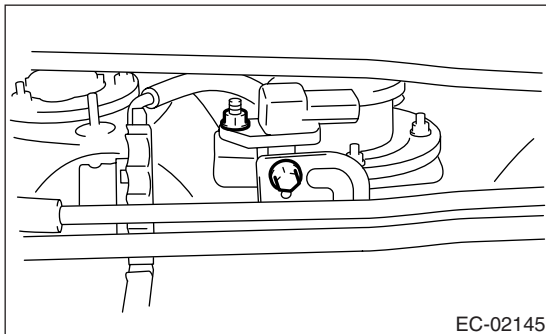
- 1) Remove the fuel tank. <Ref. to FU(H4DOTC)-51, REMOVAL, Fuel Tank.>
- 2) Remove the protector cover.



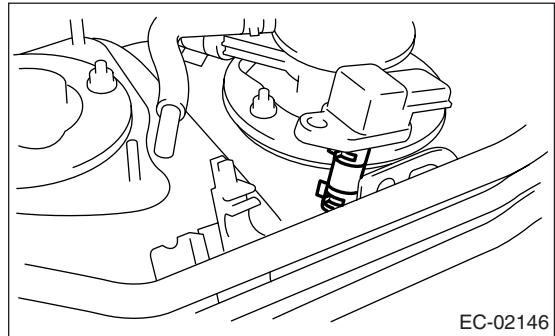
- 3) Disconnect the connector from fuel tank pressure sensor.
- 4) Release the clips which hold fuel pipes onto fuel tank.



- 5) Remove the bolt and nut which hold the fuel tank pressure sensor onto the bracket.



- 6) Disconnect the pressure hose from fuel tank pressure sensor.

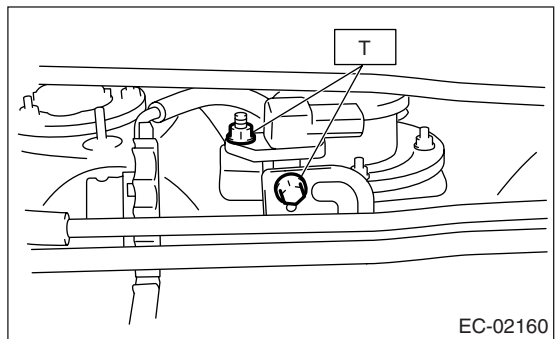


B: INSTALLATION

Install in the reverse order of removal.

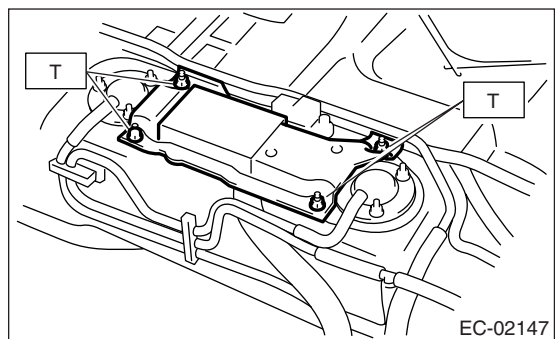
Tightening torque:

7.4 N·m (0.75 kgf-m, 5.4 ft-lb)



Tightening torque:

T: 4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



C: INSPECTION

Make sure the hoses are not cracked or loose.

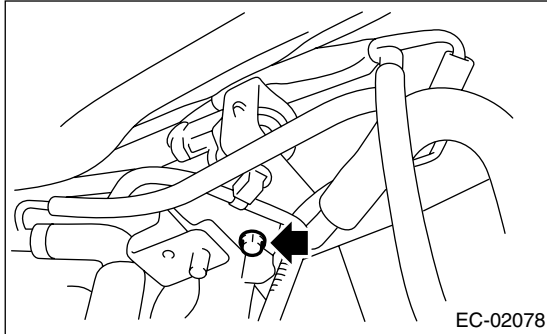
Pressure Control Solenoid Valve

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

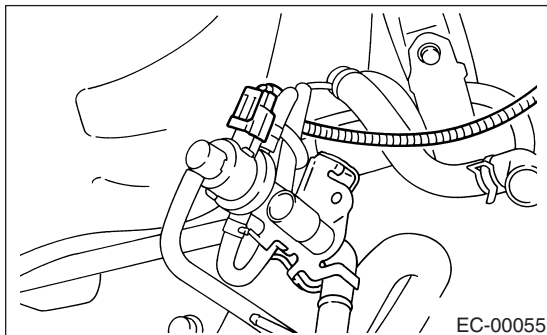
12. Pressure Control Solenoid Valve

A: REMOVAL

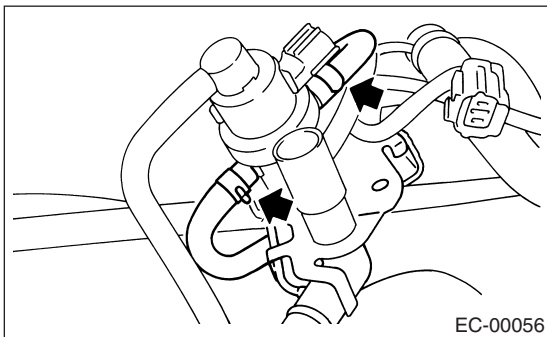
- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from battery.
- 3) Lift up the vehicle.
- 4) Remove the canister. <Ref. to EC(H4DOTC)-7, REMOVAL, Canister.>
- 5) Remove the bolt which installs the pressure control solenoid valve holding bracket on body.



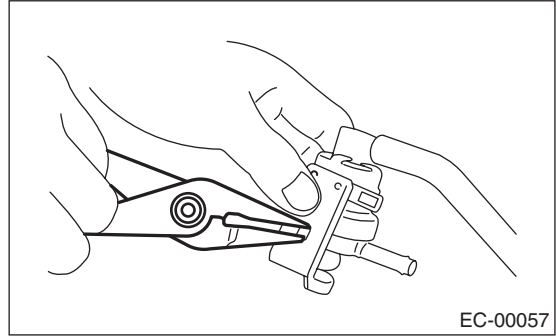
- 6) Remove the pressure control solenoid valve with bracket.
- 7) Disconnect the connector from pressure control solenoid valve.



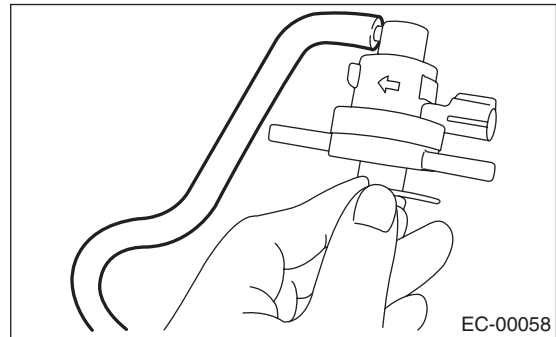
- 8) Disconnect the two evaporation hoses from pressure control solenoid valve.



- 9) Remove the pressure control solenoid valve from bracket.



- 10) Disconnect the pressure control valve hose from pressure control solenoid valve.

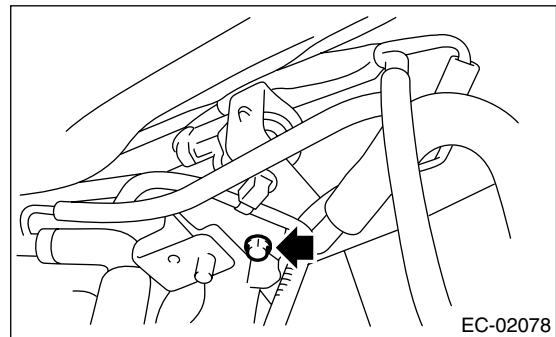


B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

25 N·m (2.6 kgf-m, 18.8 ft-lb)



C: INSPECTION

Make sure the hoses are not cracked or loose.

13.Drain Filter

A: SPECIFICATION

Drain filter is built in the canister, and it is a part which cannot be disassembled.

Vent Valve

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

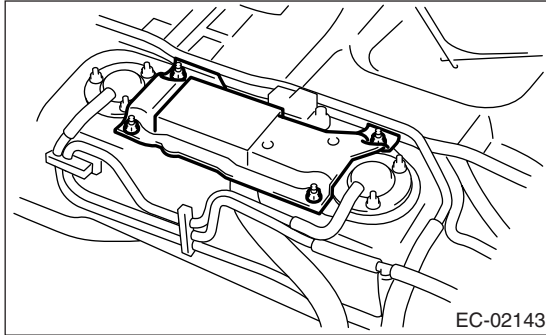
14. Vent Valve

A: REMOVAL

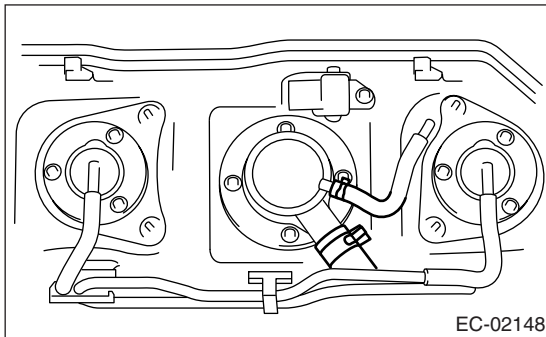
WARNING:

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

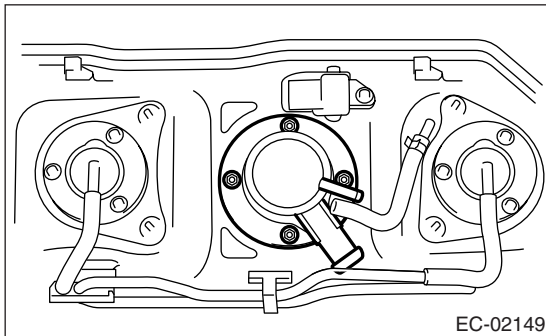
- 1) Remove the fuel tank. <Ref. to FU(H4DOTC)-51, REMOVAL, Fuel Tank.>
- 2) Remove the protector cover.



- 3) Remove the clips, and disconnect the hoses from vent valve.



- 4) Remove the nuts and then remove the vent valve.



B: INSTALLATION

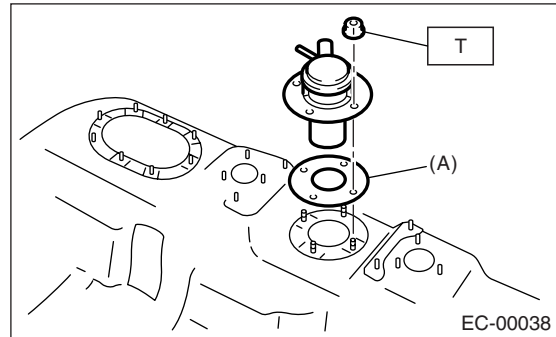
Install in the reverse order of removal.

NOTE:

Replace the gasket with a new one.

Tightening torque:

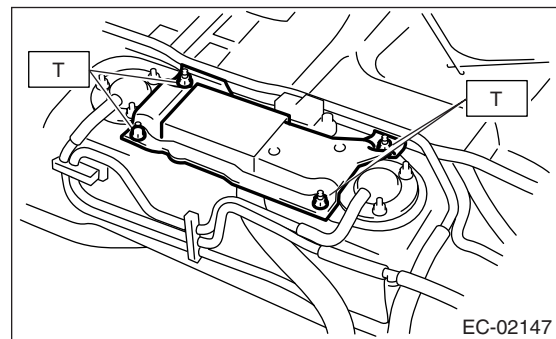
T: 4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



(A) Gasket

Tightening torque:

T: 4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



C: INSPECTION

Make sure the hoses are not cracked or loose.

15. Shut Valve

A: REMOVAL

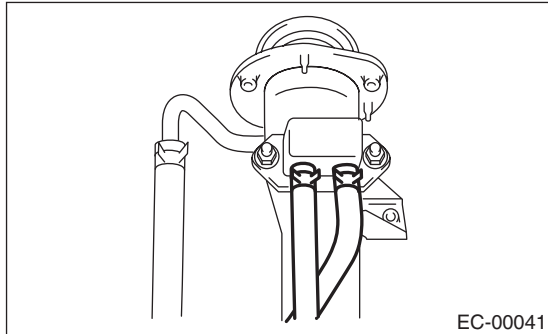
WARNING:

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

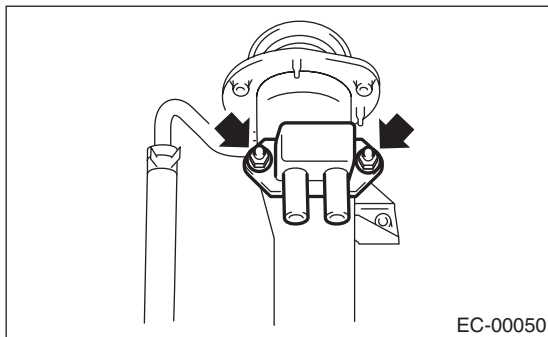
1) Remove the fuel filler pipe.

<Ref. to FU(H4DOTC)-54, REMOVAL, Fuel Filler Pipe.>

2) Disconnect the evaporation hoses from shut valve.



3) Remove the shut valve from fuel filler pipe.

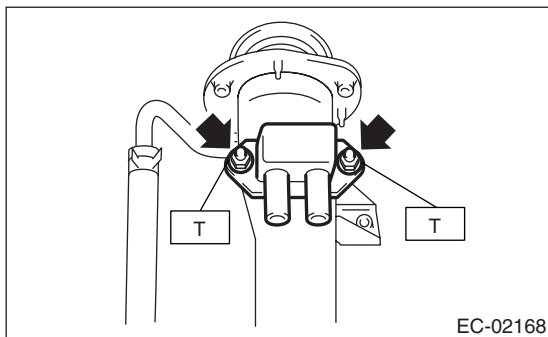


B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

4.5 N·m (0.46 kgf-m, 3.3 ft-lb)



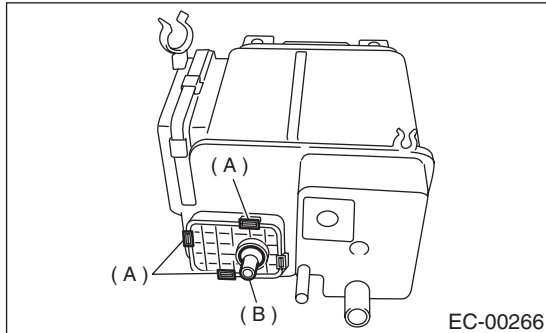
C: INSPECTION

Make sure the hoses are not cracked or loose.

16.Drain Valve

A: REMOVAL

- 1) Set the vehicle on the lift.
- 2) Disconnect the ground cable from battery.
- 3) Lift up the vehicle.
- 4) Remove the canister. <Ref. to EC(H4DOTC)-7, REMOVAL, Canister.>
- 5) Remove clip (A), and then remove drain valve (B) from canister.
- 6) Remove the filter from drain valve (B).



B: INSTALLATION

Install in the reverse order of removal.

CAUTION:

- Assemble the drain valve filter without any clearance.
- Make sure the packing in the groove before assembling drain valve to canister.
- Replace the clip with a new one.

C: INSPECTION

- 1) Make sure that all hoses are installed securely.
- 2) Make sure that hoses are not cracked or loose.

17.PCV Hose Assembly

A: REMOVAL

CAUTION:

Removal is not allowed except for the damage of PCV hose, diagnosis connector and PCV valve.

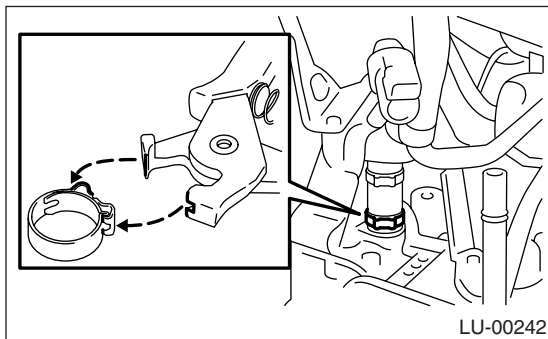
1) Remove the intake manifold.

<Ref. to FU(H4DOTC)-14, REMOVAL, Intake Manifold.>

2) Clip the protrusion of clamp after aligning the concave portion of ST with protrusion of clamp, and then unlock the lock.

3) Remove the PCV hose assembly.

ST 18353AA000 CLAMP PLIERS



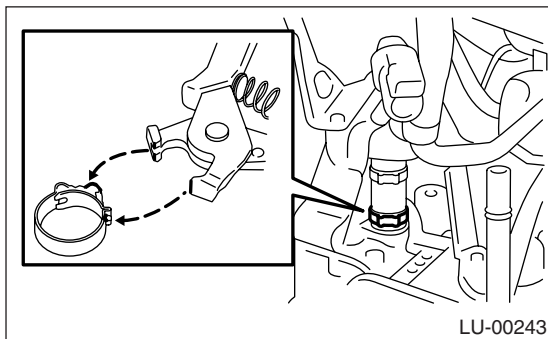
B: INSTALLATION

NOTE:

Replace the clamp with a new one.

1) Install the PCV hose assembly, and then lock the clamp with protrusion of clamp clipped by pliers.

ST 18353AA000 CLAMP PLIERS



2) Install the intake manifold.

<Ref. to FU(H4DOTC)-17, INSTALLATION, Intake Manifold.>

PCV Hose Assembly

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

ENGINE (DIAGNOSTICS)

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(H4DOTC)(diag)-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(H4DOTC)(diag)-62, Diagnostics for Engine Starting Failure.>
2 CHECK ILLUMINATION OF MALFUNCTION INDICATOR LIGHT.	Does the malfunction indicator light illuminate?	Go to step 3.	Inspection using "General Diagnostics Table". <Ref. to EN(H4DOTC)(diag)-394, General Diagnostic Table.>
3 CHECK INDICATION OF DTC ON DISPLAY. 1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor or general scan tool to data link connector. 3) Turn the ignition switch to ON and the Subaru Select Monitor or general scan tool power switch to ON. 4) Read the DTC on Subaru Select Monitor or general scan tool.	Does the Subaru Select Monitor or general scan tool indicate DTC?	Record the DTC code. Repair the trouble cause. <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).> Go to step 4.	Repair the related parts. NOTE: If a DTC is not shown on display although malfunction indicator light illuminates, perform diagnostics of malfunction indicator light circuit or combination meter. <Ref. to EN(H4DOTC)(diag)-53, Malfunction Indicator Light.>
4 PERFORM THE DIAGNOSIS. 1) Perform the clear memory mode. <Ref. to EN(H4DOTC)(diag)-50, Clear Memory Mode.> 2) Perform the inspection mode. <Ref. to EN(H4DOTC)(diag)-40, Inspection Mode.>	Does the Subaru Select Monitor or general scan tool indicate DTC?	Inspect using "Diagnostics Procedure with Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-82, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Complete the diagnosis.

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			miles
Weather	☐ Fine ☐ Cloudy ☐ Rainy ☐ Snowy ☐ Various/Others:		
Outdoor temperature	°C (°F)		
	☐ Hot ☐ Warm ☐ Cool ☐ Cold		
Place	☐ Highway ☐ Suburbs ☐ Inner city ☐ Uphill ☐ Downhill ☐ Rough road ☐ Others:		
Engine temperature	☐ Cold ☐ Warming-up ☐ After warming-up ☐ Any temperature ☐ Others:		
Engine speed	rpm		
Vehicle speed	MPH		
Driving conditions	☐ Not affected ☐ At starting ☐ While idling ☐ At racing ☐ While accelerating ☐ While cruising ☐ While decelerating ☐ While turning (RH/LH)		
Headlight	☐ ON / ☐ OFF	Rear defogger	☐ ON / ☐ OFF
Blower	☐ ON / ☐ OFF	Radio	☐ ON / ☐ OFF
A/C compressor	☐ ON / ☐ OFF	CD/Cassette	☐ ON / ☐ OFF
Cooling fan	☐ ON / ☐ OFF	Car phone	☐ ON / ☐ OFF
Front wiper	☐ ON / ☐ OFF	CB	☐ ON / ☐ OFF
Rear wiper	☐ ON / ☐ OFF		

Check List for Interview

ENGINE (DIAGNOSTICS)

2. CHECK LIST No. 2

Check the following items about the vehicle's state when malfunction indicator light turns on.

NOTE:

Use copies of this page for interviewing customers.

a) Other warning lights or indicators turn on. ☐ Yes / ☐ No
☐ Low fuel warning light ☐ Charge indicator light ☐ AT diagnostics indicator light ☐ ABS warning light ☐ Engine oil pressure warning light
b) Fuel level
• Lack of gasoline: ☐ Yes / ☐ No • Indicator position of fuel gauge: • Experienced running out of fuel: ☐ Yes / ☐ No
c) Intentional connecting or disconnecting of harness connectors or spark plug cords: ☐ Yes / ☐ No
• What:
d) Intentional connecting or disconnecting of hoses: ☐ Yes / ☐ No
• What:
e) Installing of parts other than genuine parts: ☐ Yes / ☐ No
• What: • Where:
f) Occurrence of noise: ☐ Yes / ☐ No
• From where: • What kind:
g) Occurrence of smell: ☐ Yes / ☐ No
• From where: • What kind:
h) Intrusion of water into engine compartment or passenger compartment: ☐ Yes / ☐ No
i) Troubles occurred
☐ Engine does not start. ☐ Engine stalls during idling. ☐ Engine stalls while driving. ☐ Engine speed decreases. ☐ Engine speed does not decrease. ☐ Rough idling ☐ Poor acceleration ☐ Back fire ☐ After fire ☐ No shift ☐ Excessive shift shock

3. General Description

A: CAUTION

1) Airbag system wiring harness is routed near the ECM, main relay and fuel pump relay.

CAUTION:

- Airbag system connectors are colored yellow. Do not use the electrical test equipment on these circuit.
- Be careful not to damage the airbag system wiring harness when servicing the ECM, 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.

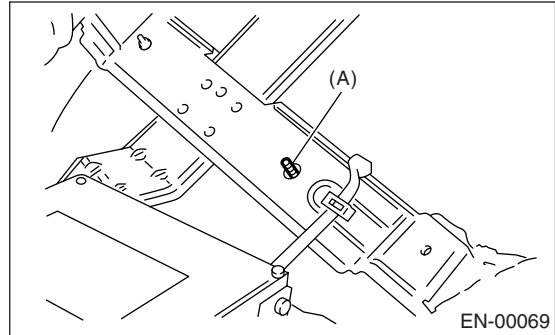
Otherwise, the ECM may be damaged.

CAUTION:

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

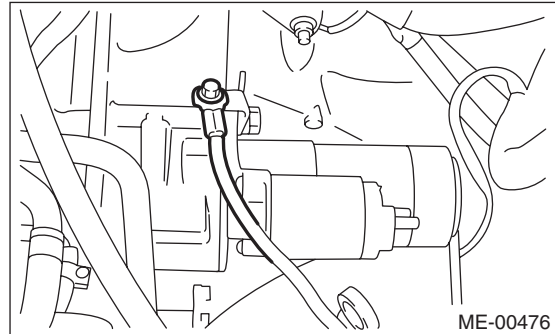
7) The connectors to each sensor in the engine compartment and the harness connectors on the engine side and body side are all designed to be waterproof. However, it is still necessary to take care not to allow water to get into the connectors when washing the vehicle, or when servicing the vehicle on 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) Every MFI-related part is a precision part. Do not drop them.

11) Observe the following cautions when installing a radio in MFI equipped models.

CAUTION:

- The antenna must be kept as far apart as possible from the control unit.

(The ECM is located under the steering column, inside of the instrument panel lower trim panel.)

- The antenna feeder must be placed as far as possible from ECM and MFI harness.

- Carefully adjust the antenna for correct matching.

- When mounting a large power type radio, pay special attention to the three items above mentioned.

- Incorrect installation of the radio may affect the operation of ECM.

12) Before disconnecting the fuel hose, disconnect the fuel pump connector and crank the engine for more than 5 seconds to release pressure in the fuel system. If the engine starts during this operation, run it until it stops.

General Description

ENGINE (DIAGNOSTICS)

13) On model with ABS, 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 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.

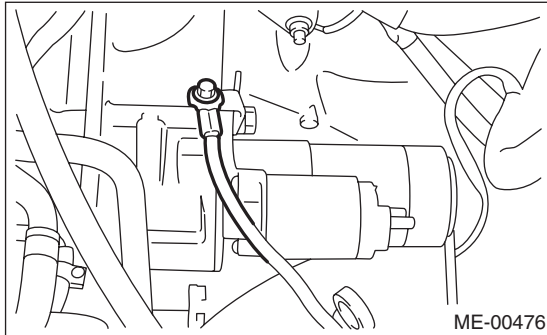
Standard voltage: 12 V

Specific gravity: Above 1.260

2) Check the condition of 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 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. Malfunction indicator light 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 OBD-II Regulations. 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, malfunction indicator light illuminates. At the same time of the malfunction indicator light illumi-

nation or blinking, a 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, malfunction indicator light is turned off, but DTC remains at on-board computer.
- When troubleshooting the vehicle which complies with OBD-II Regulations, connect the Subaru Select Monitor or 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.

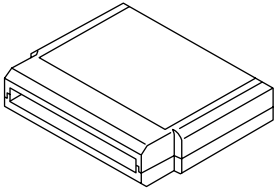
With this system fuel, which is pressurized at a constant pressure, is injected into the intake air passage of the cylinder head. The injection quantity of fuel is controlled by an intermittent injection system where the electro-magnetic injection valve (fuel injector) opens only for a short period of 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
 ST18482AA010	18482AA010 (Newly adopted tool)	CARTRIDGE	Troubleshooting for electrical systems.
 ST22771AA030	22771AA030	SUBARU SELECT MONITOR KIT	Troubleshooting for electrical systems.

Electrical Component Location

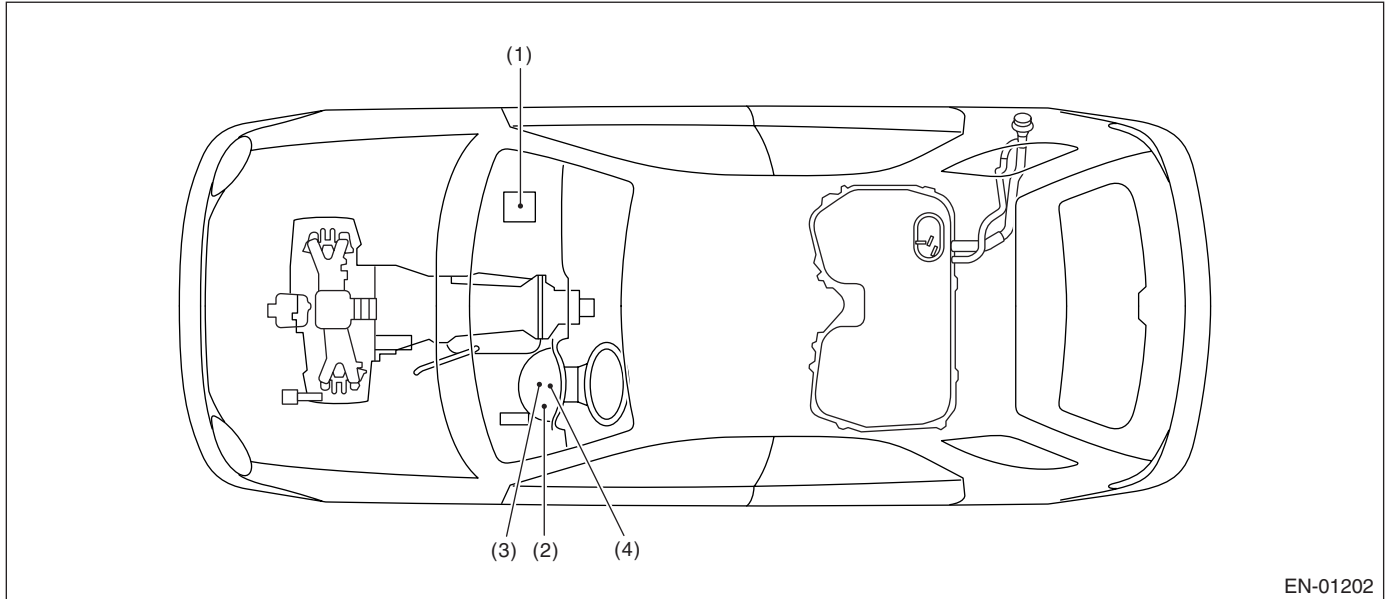
ENGINE (DIAGNOSTICS)

4. Electrical Component Location

A: LOCATION

1. ENGINE

• Module



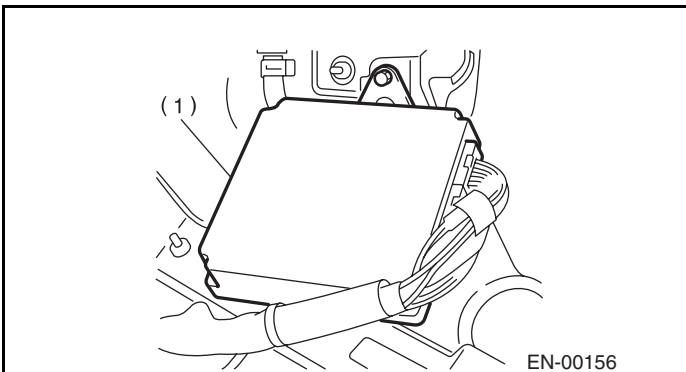
EN-01202

(1) Engine control module (ECM)

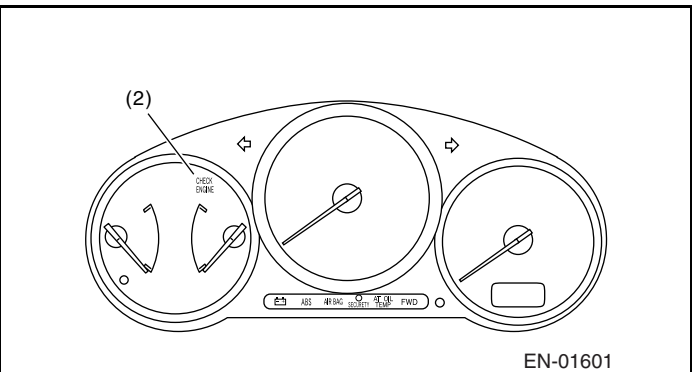
(3) Data link connector

(4) Test mode connector

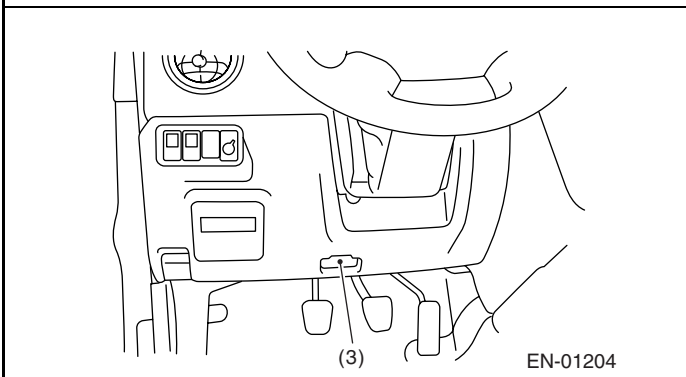
(2) Malfunction indicator light



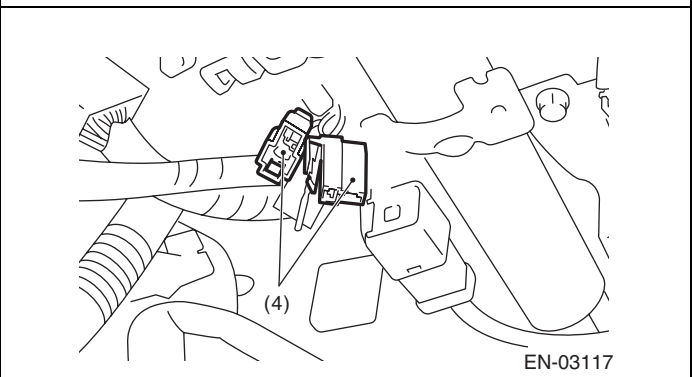
EN-00156



EN-01601

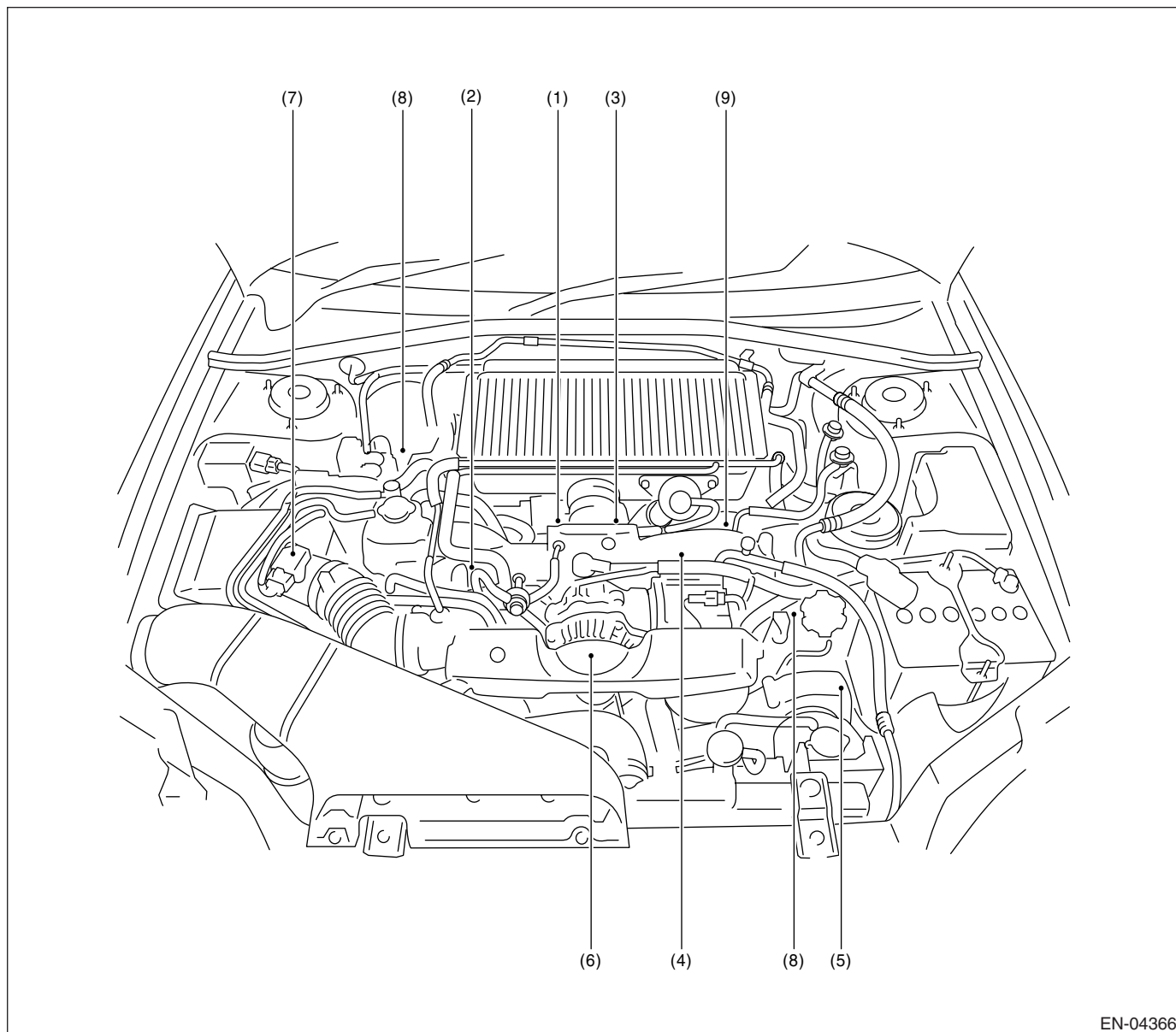


EN-01204



EN-03117

• Sensor

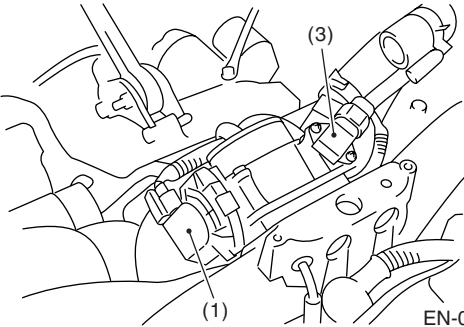
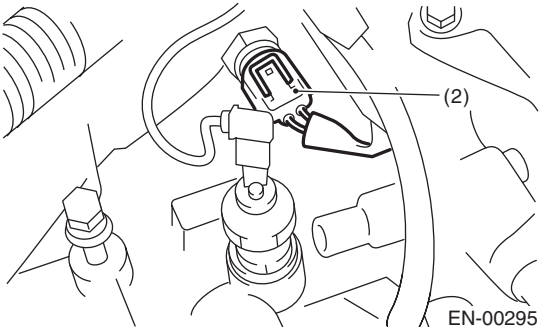
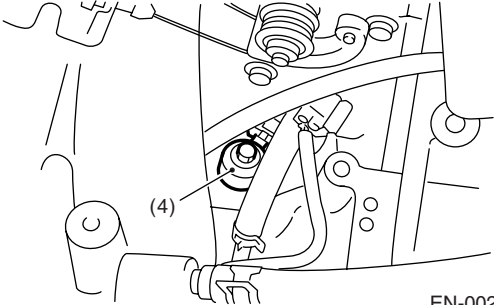
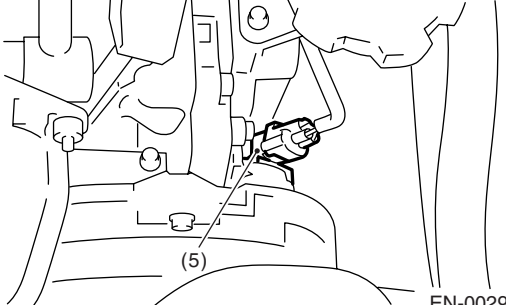
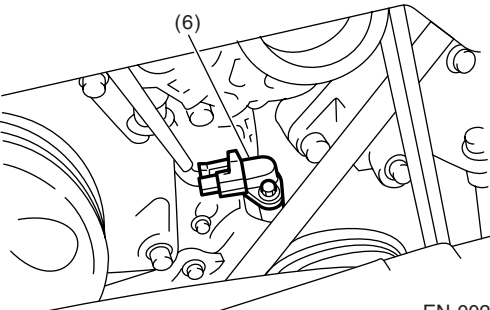
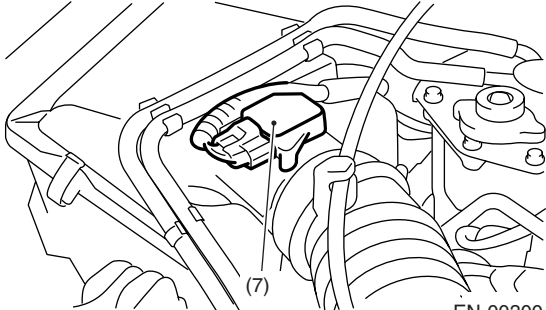
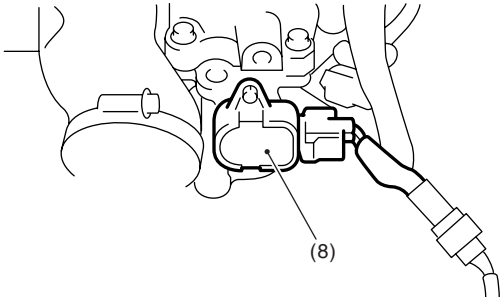
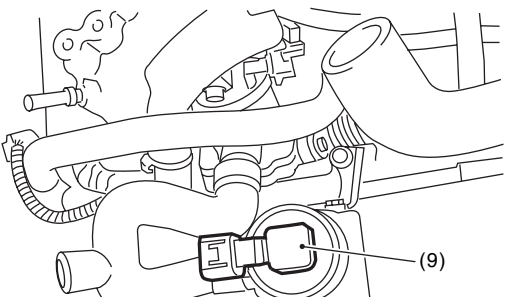


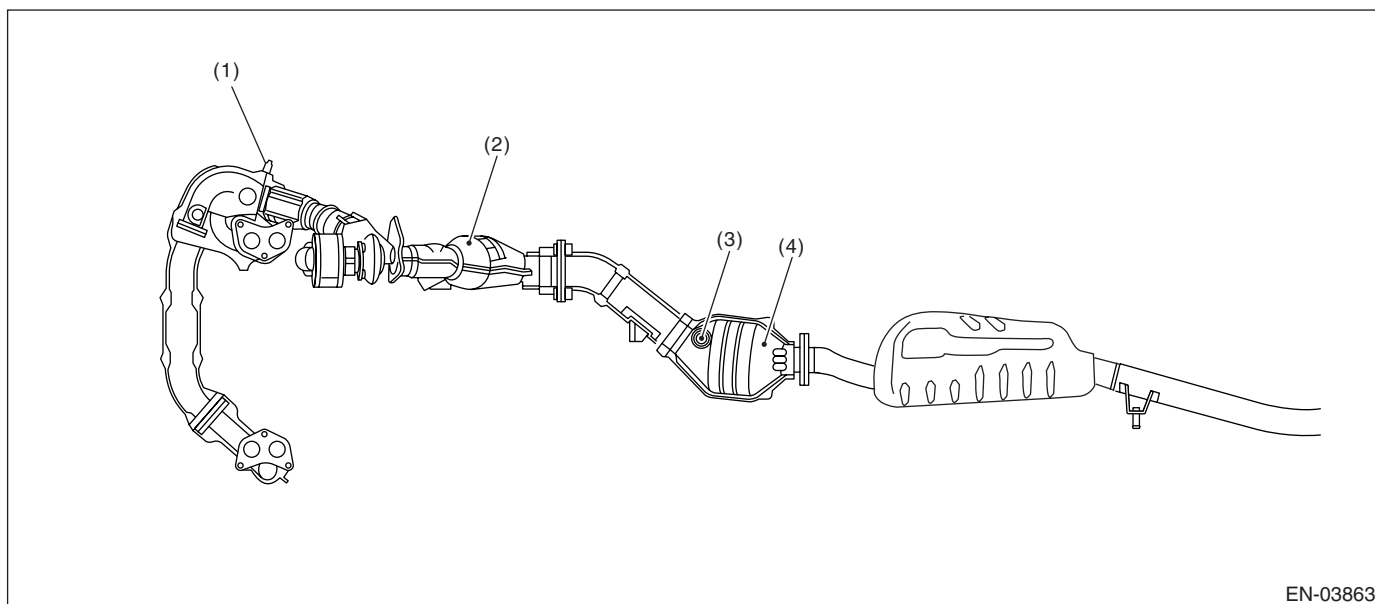
EN-04366

(1) Electronic throttle control	(5) Camshaft position sensor	(8) Tumble generator valve position sensor
(2) Engine coolant temperature sensor	(6) Crankshaft position sensor	(9) Secondary air pressure sensor
(3) Manifold absolute pressure sensor	(7) Mass air flow and intake air temperature sensor	
(4) Knock sensor		

Electrical Component Location

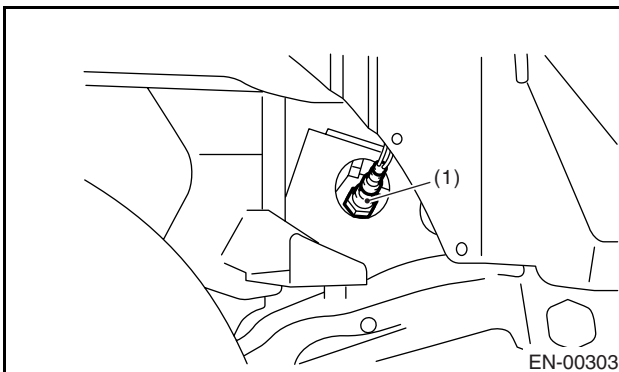
ENGINE (DIAGNOSTICS)

 EN-02009	 EN-00295
 EN-00297	 EN-00298
 EN-00299	 EN-00300
 EN-00301	 EN-03855

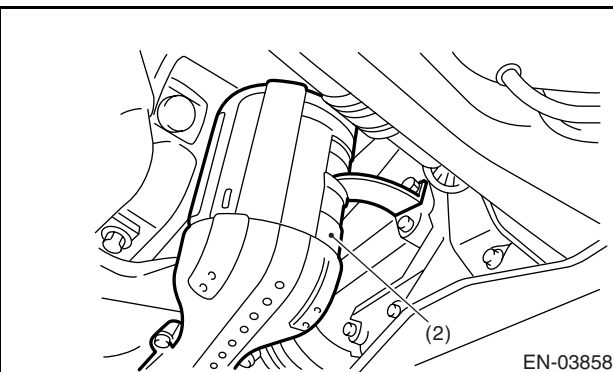


EN-03863

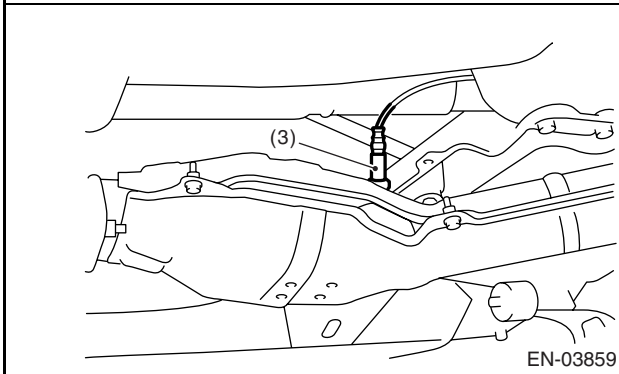
(1) Front oxygen (A/F) sensor	(3) Rear oxygen sensor
(2) Front catalytic converter	(4) Rear catalytic converter



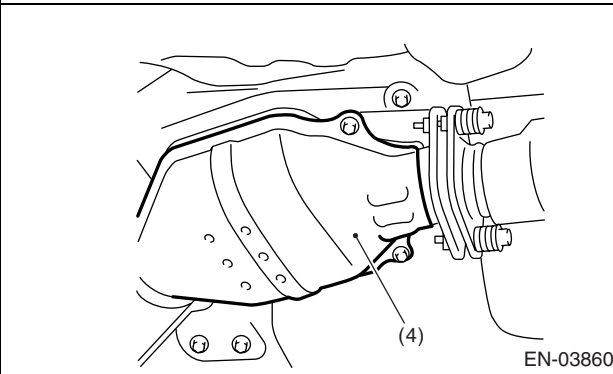
EN-00303



EN-03858



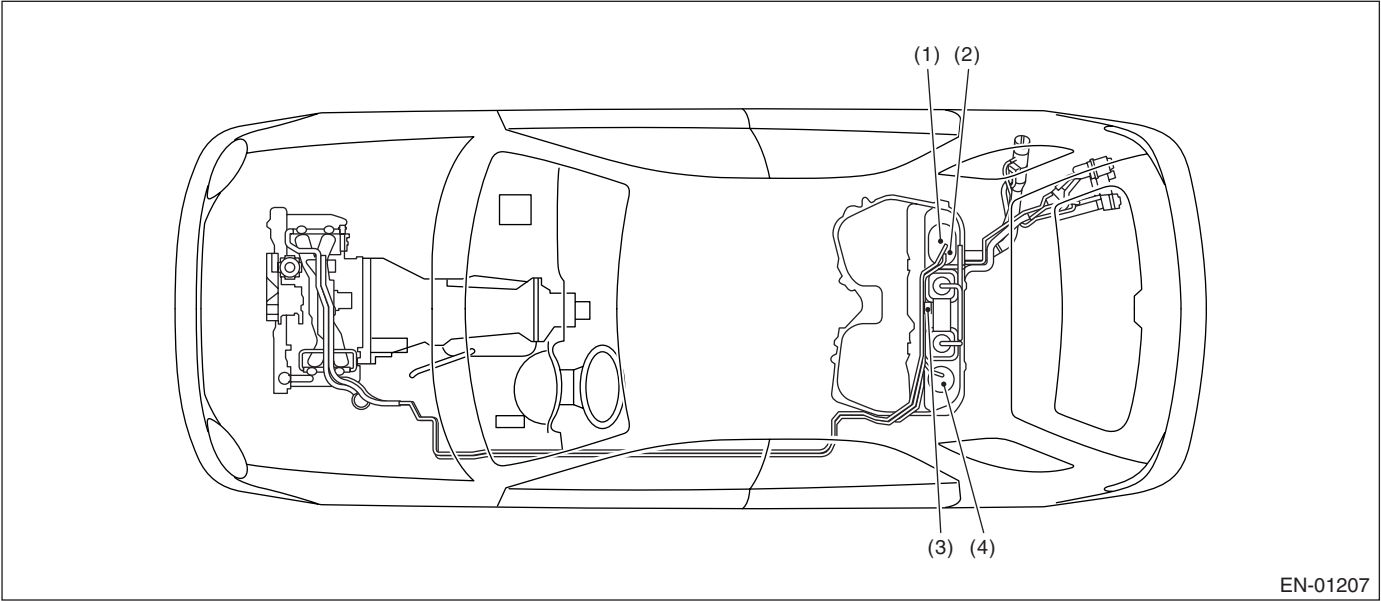
EN-03859



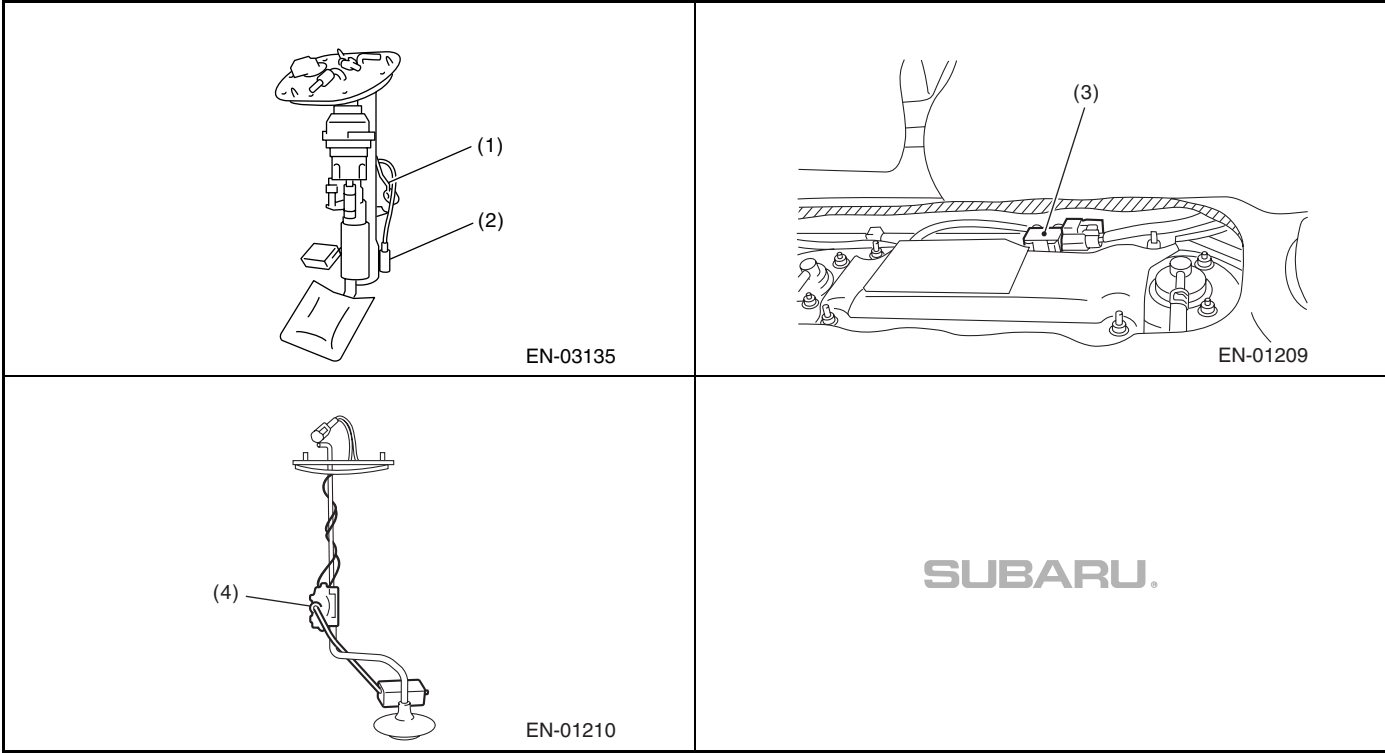
EN-03860

Electrical Component Location

ENGINE (DIAGNOSTICS)



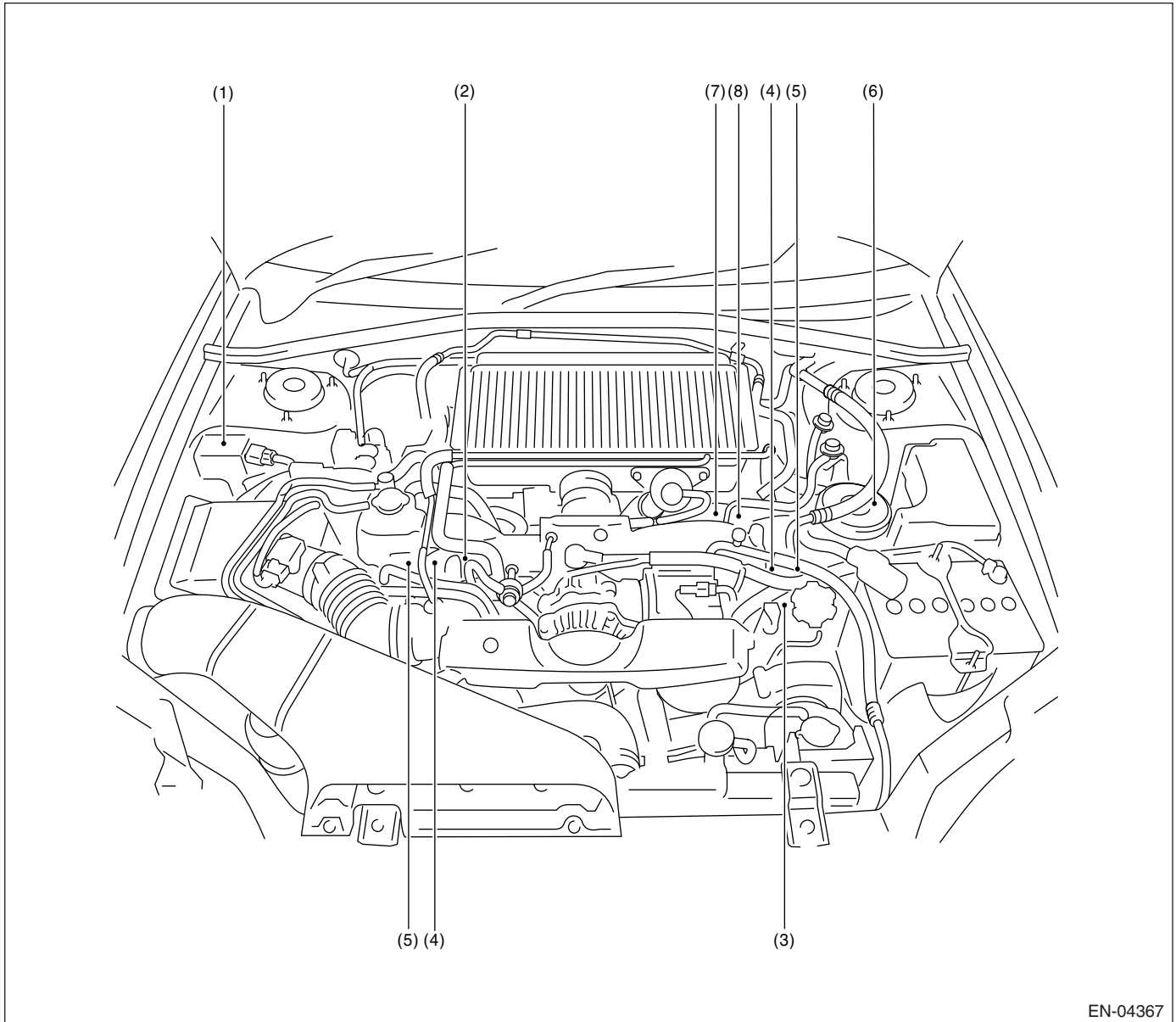
- (1) Fuel level sensor (3) Fuel tank pressure sensor (4) Fuel sub level sensor
(2) Fuel temperature sensor



Electrical Component Location

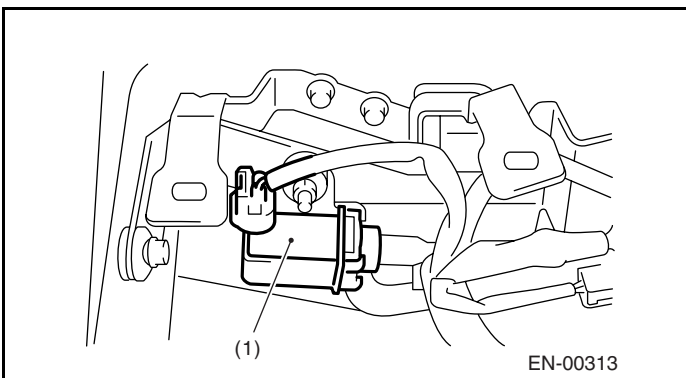
ENGINE (DIAGNOSTICS)

• Solenoid Valve, Actuator, Emission Control System Parts and Ignition System Parts

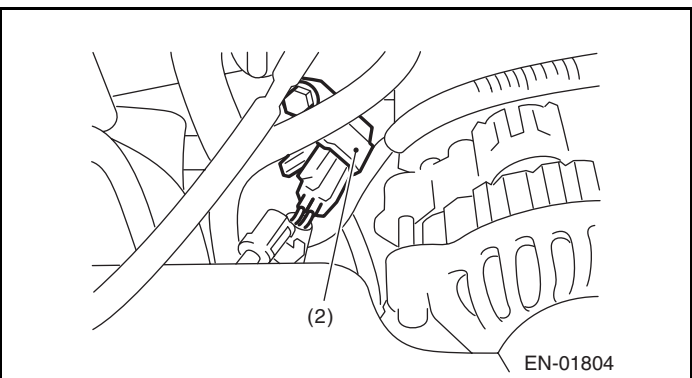


EN-04367

(1) Wastegate control solenoid valve	(4) Tumble generator valve actuator	(7) Secondary air combi valve (RH)
(2) Purge control solenoid valve	(5) Oil flow control solenoid valve	(8) Secondary air combi valve (LH)
(3) Ignition coil and ignitor ASSY	(6) Secondary air pump	



EN-00313

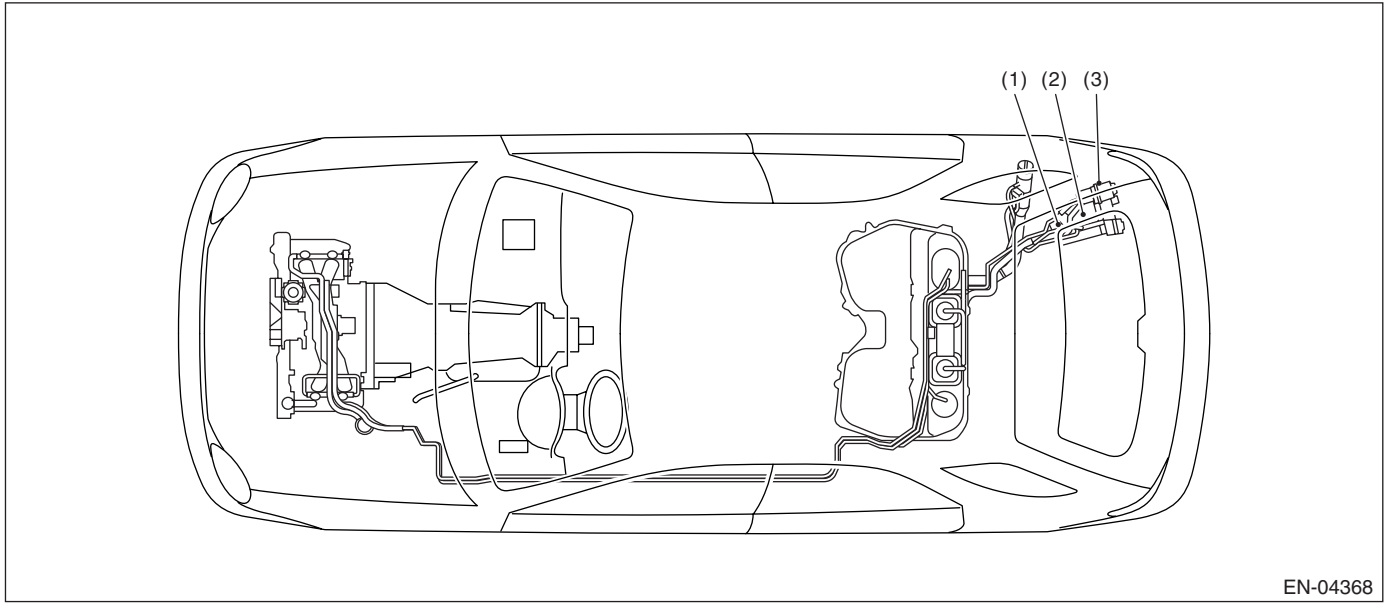


EN-01804

Electrical Component Location

ENGINE (DIAGNOSTICS)

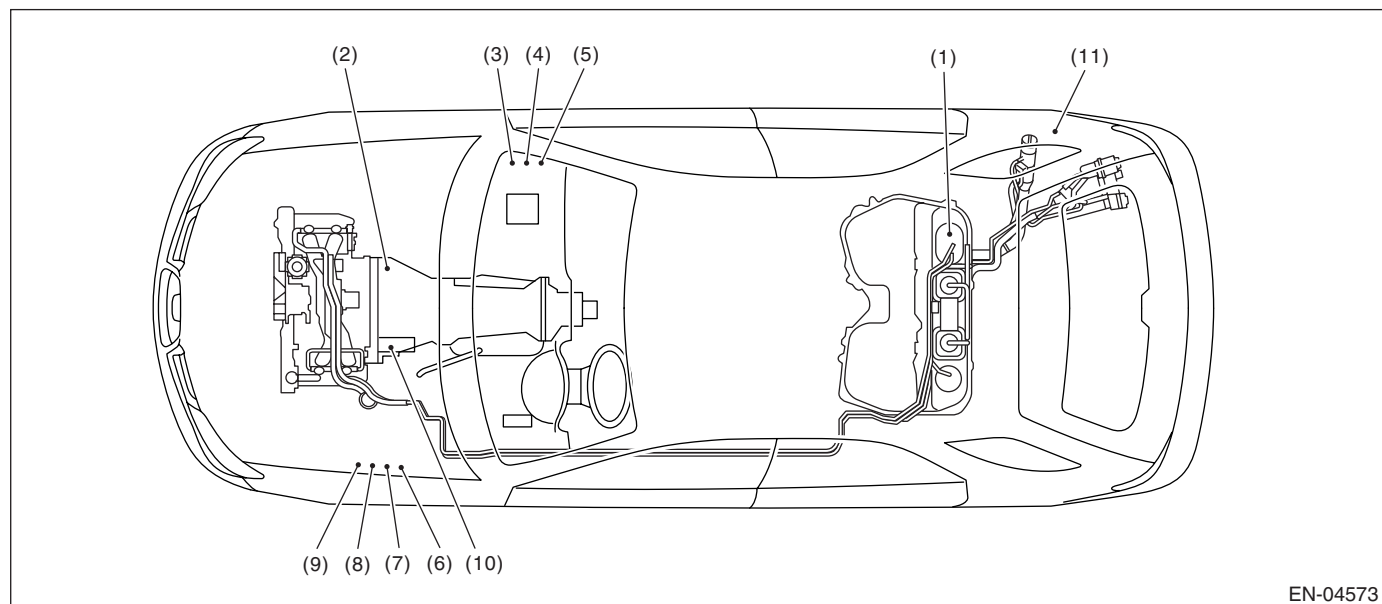
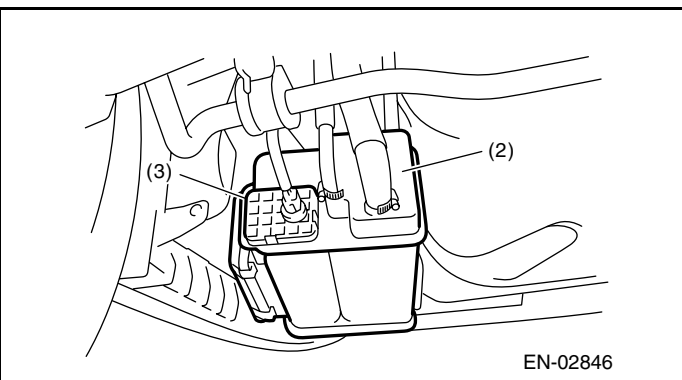
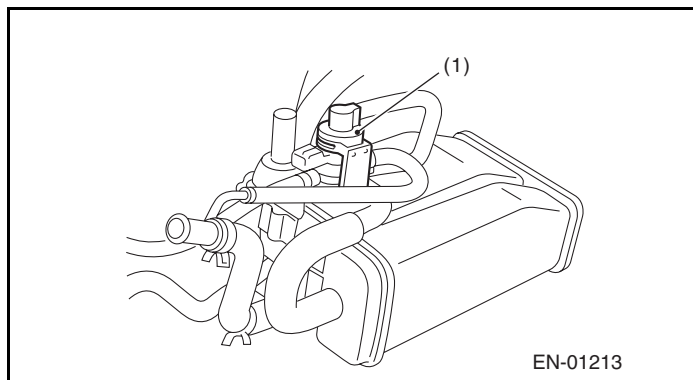
(3) EN-01805	(4) EN-01806
(5) EN-02011	(6) EN-04572
(7) (8) EN-03857	SUBARU.



- (1) Pressure control solenoid valve (2) Canister (3) Drain valve

Electrical Component Location

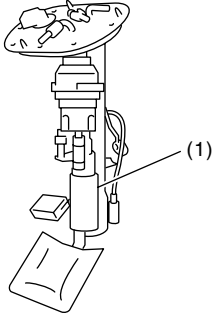
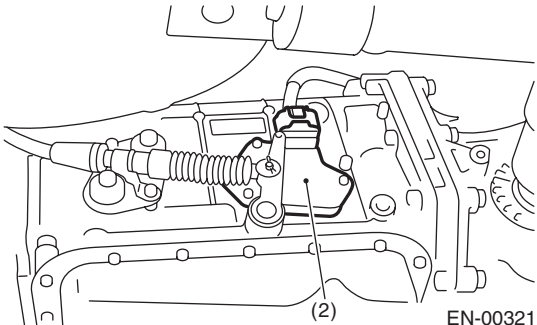
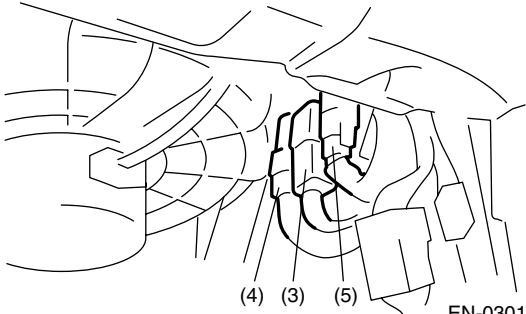
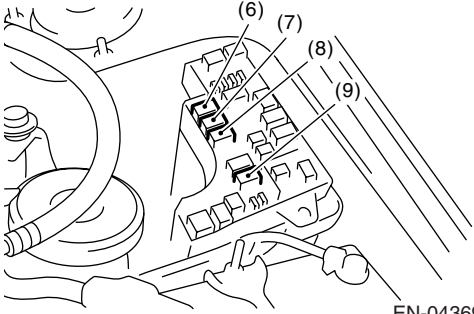
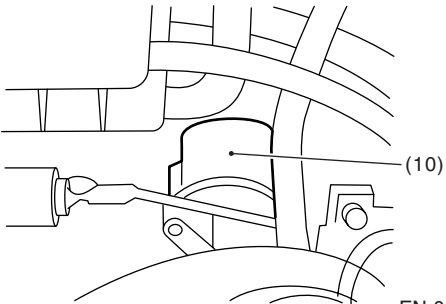
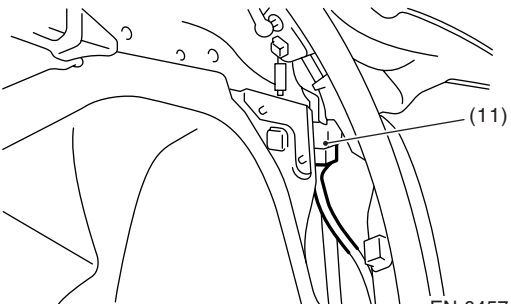
ENGINE (DIAGNOSTICS)



(1) Fuel pump	(5) Electronic throttle control relay	(9) Radiator sub fan relay 2
(2) Inhibitor switch	(6) Radiator main fan relay 1	(10) Starter
(3) Main relay	(7) Radiator main fan relay 2	(11) Fuel pump control unit
(4) Fuel pump relay	(8) Radiator sub fan relay 1	

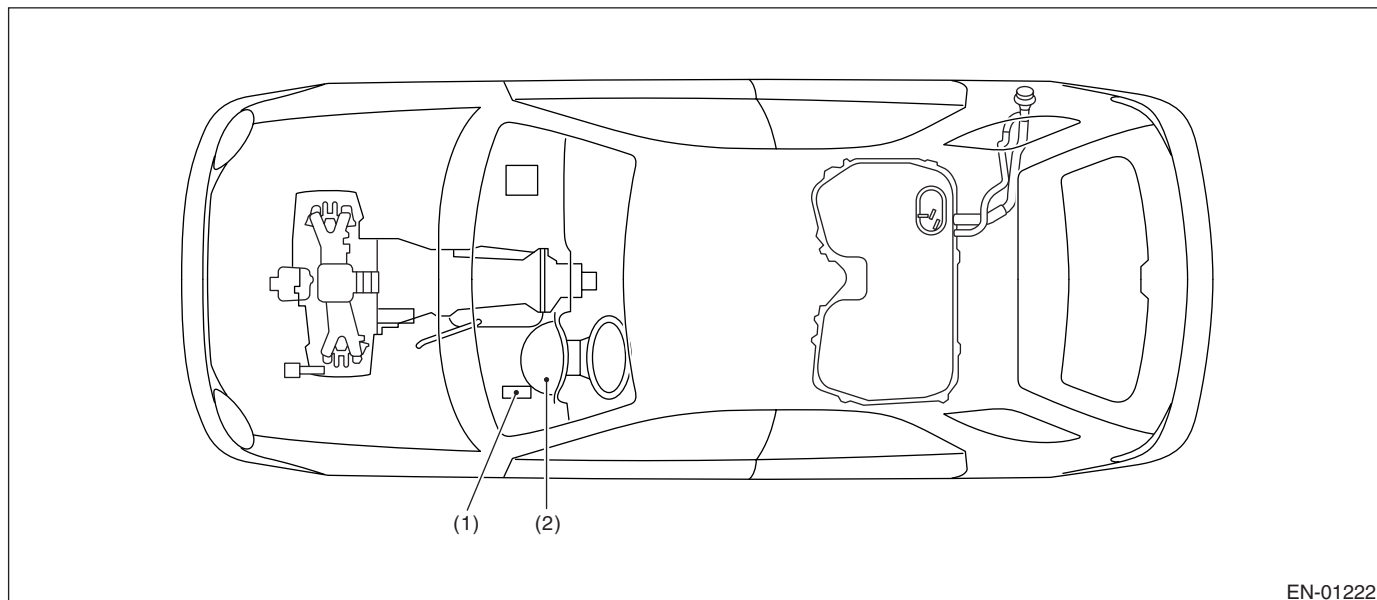
Electrical Component Location

ENGINE (DIAGNOSTICS)

 EN-03136	 EN-00321
 EN-03017	 EN-04369
 EN-01328	 EN-04574

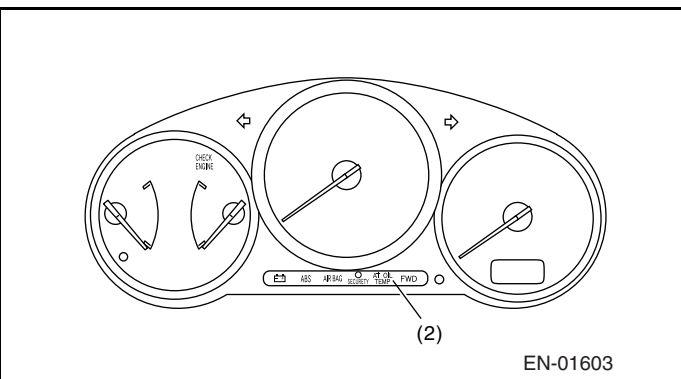
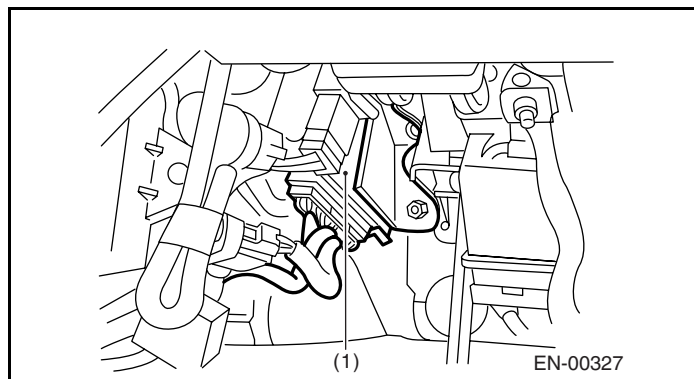
2. TRANSMISSION

• Module



(1) Transmission control module (TCM) (AT model)

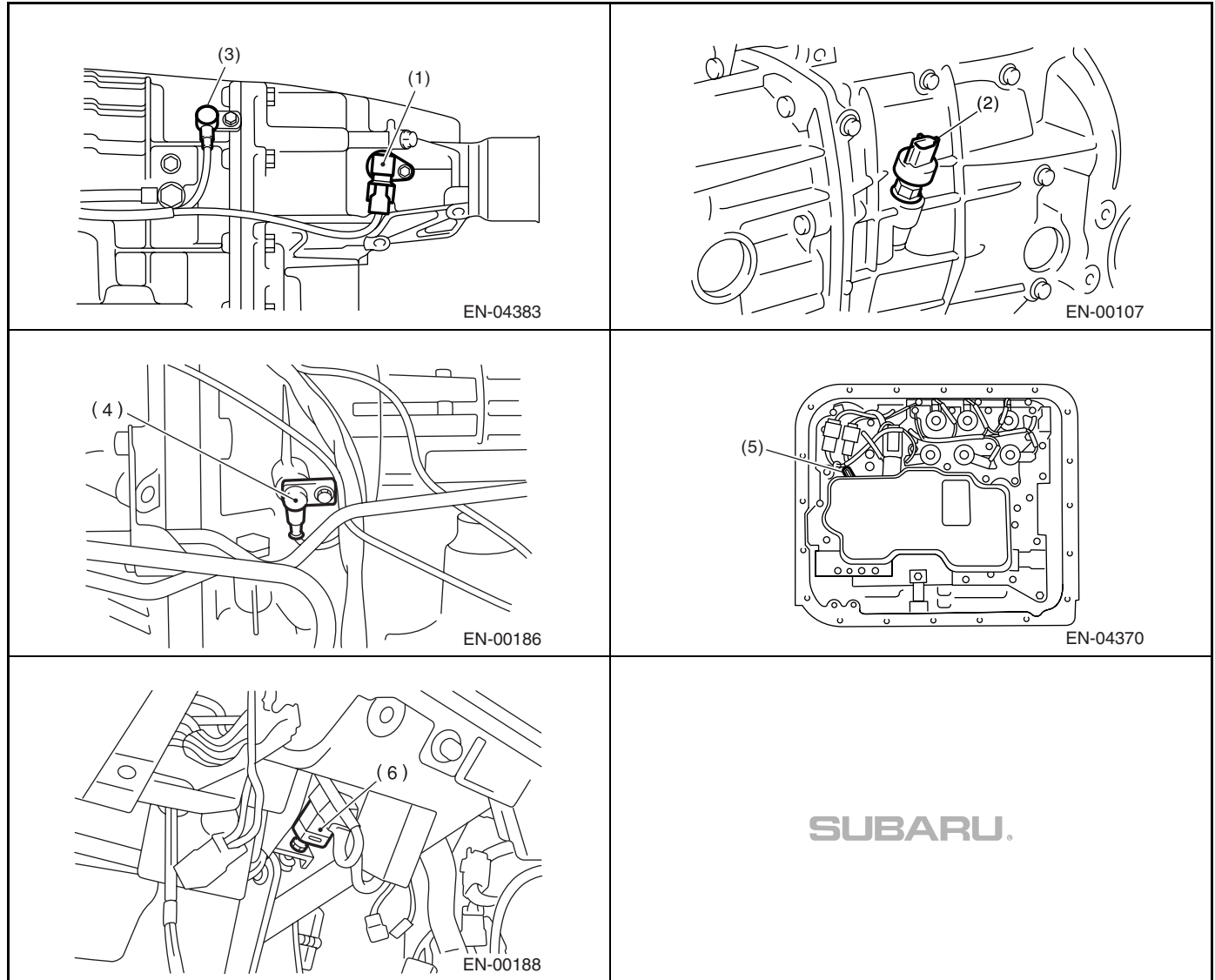
(2) AT diagnostic indicator light (AT model)



Electrical Component Location

ENGINE (DIAGNOSTICS)

• Sensor



(1) Rear vehicle speed sensor (AT model)

(2) Front vehicle speed sensor (MT model)

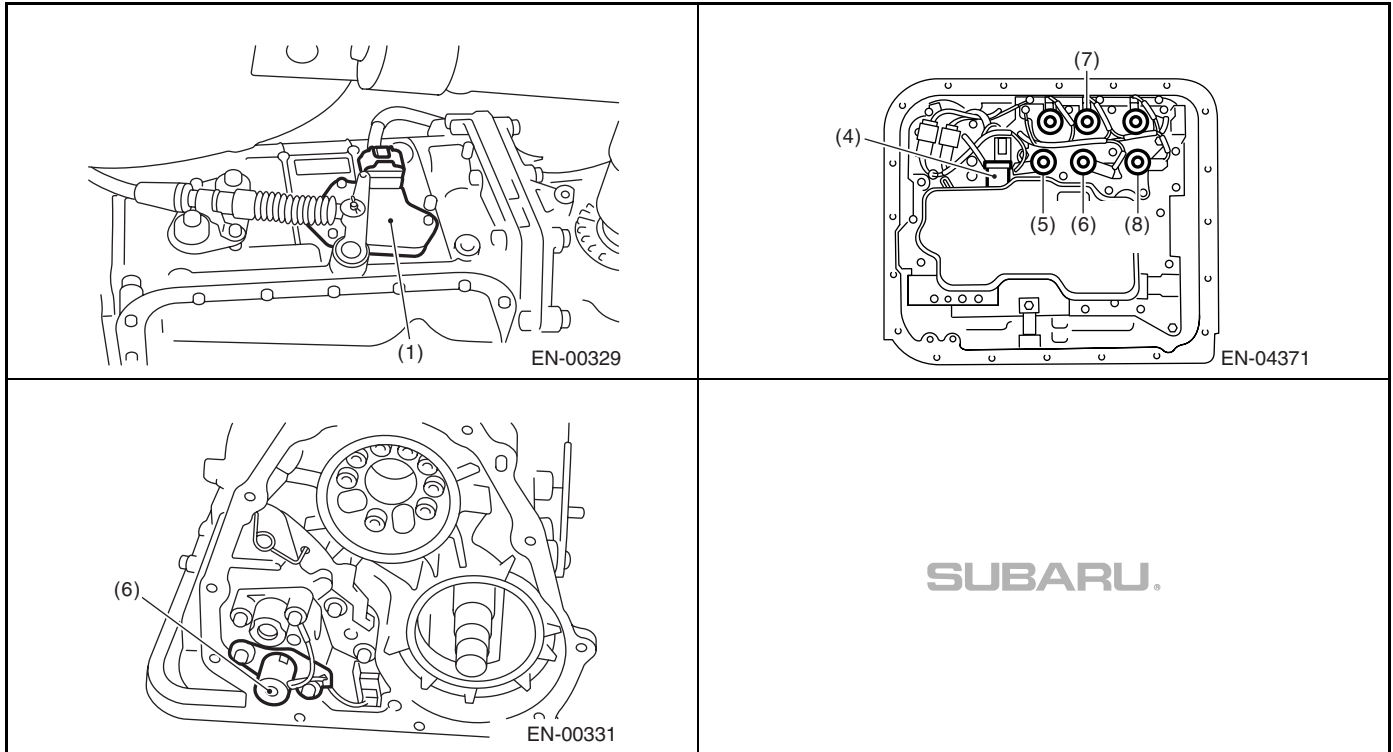
(3) Front vehicle speed sensor (AT model)

(4) Torque converter turbine speed sensor (AT model)

(5) ATF temperature sensor (AT model)

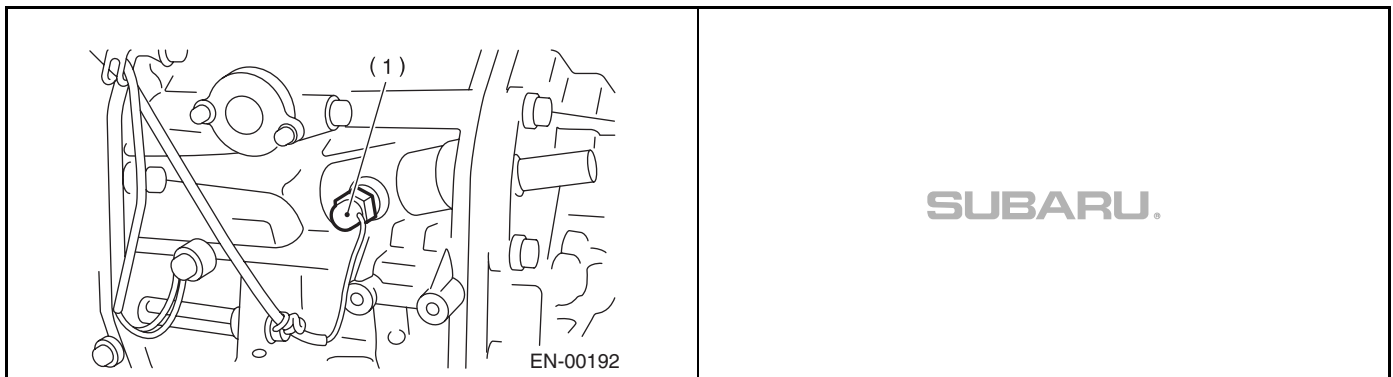
(6) Brake light switch

• Solenoid Valve and Switch (AT model)



(1) Inhibitor switch	(4) Line pressure linear solenoid	(7) 2-4 brake duty solenoid
(2) Shift solenoid valve 1	(5) Lock-up duty solenoid	(8) Low clutch timing solenoid valve
(3) Shift solenoid valve 2	(6) Transfer duty solenoid	

• Solenoid Valve and Switch (MT model)



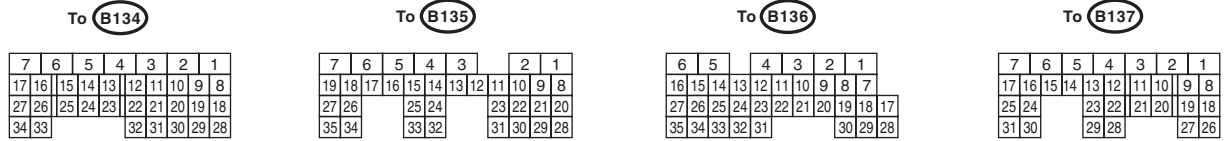
- (1) Neutral position switch

Engine Control Module (ECM) I/O Signal

ENGINE (DIAGNOSTICS)

5. Engine Control Module (ECM) I/O Signal

A: ELECTRICAL SPECIFICATION



EN-01812

Content		Con- nector No.	Termi- nal No.	Signal (V)		Note
				Ignition SW ON (Engine OFF)	Engine ON (Idling)	
Crank- shaft posi- tion sensor	Signal (+)	B134	13	0	-7 — +7	Sensor output waveform
	Signal (-)	B134	14	0	0	—
	Shield	B134	24	0	0	—
Rear oxy- gen sen- sor	Signal	B135	4	0	0 — 0.9	—
	Shield	B135	1	0	0	—
	GND (sen- sor)	B135	30	0	0	—
Front oxy- gen (A/F) sensor heater	Signal 1	B136	3	0 — 1.0	—	Sensor output waveform
	Signal 2	B136	2	0 — 1.0	—	Sensor output waveform
Rear oxygen sensor heater signal		B136	4	0 — 1.0	—	Sensor output waveform
Engine coolant tempera- ture sen- sor	Signal	B134	34	1.0 — 1.4	1.0 — 1.4	After warm-up the engine.
	GND (sen- sor)	B134	29	0	0	After warm-up the engine.
Vehicle speed signal		B136	13	0 or 5	0 or 5	“5” and “0” are repeatedly dis- played when vehicle is driven.
Mass air flow sen- sor	Signal	B135	26	—	0.3 — 4.5	—
	Shield	B135	35	0	0	—
	GND	B135	34	0	0	—
Intake air temperature sensor signal		B135	18	0.3 — 4.6	0.3 — 4.6	—
Tumble generator valve posi- tion sensor RH	Signal	B134	26	Fully closed: 3.8 — 4.9 Fully opened: 0.2 — 0.9		—
	Power supply	B134	19	5	5	—
	GND (sen- sor)	B134	29	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)	
Tumble generator valve position sensor LH	Signal	B134	16	Fully closed: 3.8 — 4.9 Fully opened: 0.2 — 0.9		—
	Power supply	B134	19	5	5	—
	GND (sen- sor)	B134	29	0	0	—
Tumble generator valve RH (open)		B137	22	0 or 10 — 13	0 or 12 — 14	Sensor output waveform
Tumble generator valve RH (close)		B137	23	0 or 10 — 13	0 or 12 — 14	Sensor output waveform
Tumble generator valve LH (open)		B137	12	0 or 10 — 13	0 or 12 — 14	Sensor output waveform
Tumble generator valve LH (close)		B137	13	0 or 10 — 13	0 or 12 — 14	Sensor output waveform
Wastegate control sole- noid valve		B137	27	0 or 10 — 13	0 or 12 — 14	Sensor output waveform
Starter switch		B136	32	0	0	Cranking: 8 — 14
A/C switch		B136	24	ON: 10 — 13 OFF: 0	ON: 12 — 14 OFF: 0	—
Ignition switch		B135	19	10 — 13	12 — 14	—
Neutral position switch		B136	31	ON: 10 — 13 OFF: 0	ON: 12 — 14 OFF: 0	—
Test mode connector		B135	27	10 — 13	12 — 14	When connected: 0
Knock sensor	Signal	B134	15	2.8	2.8	—
	Shield	B134	25	0	0	—
Back-up power supply		B135	5	10 — 13	12 — 14	Ignition switch “OFF”: 10 — 13
Control unit power sup- ply		B134	7	10 — 13	12 — 14	—
		B135	2	10 — 13	12 — 14	—
Sensor power supply		B134	19	5	5	—
Ignition control	#1	B137	18	0	12 — 14	Waveform
	#2	B137	19	0	12 — 14	Waveform
	#3	B137	20	0	12 — 14	Waveform
	#4	B137	21	0	12 — 14	Waveform
Fuel injec- tor	#1	B137	8	10 — 13	1 — 14	Waveform
	#2	B137	9	10 — 13	1 — 14	Waveform
	#3	B137	10	10 — 13	1 — 14	Waveform
	#4	B137	11	10 — 13	1 — 14	Waveform
Fuel pump control unit	Signal 1	B136	12	0 or 5	0 or 5	—
	Signal 2	B135	33	10 — 13	12 — 14	—
A/C relay control		B136	9	ON: 0.5 or less OFF: 10 — 13	ON: 0.5 or less OFF: 12 — 14	—
Radiator fan relay 1 control		B136	18	ON: 0.5 or less OFF: 10 — 13	ON: 0.5 or less OFF: 12 — 14	—
Radiator fan relay 2 control		B136	29	ON: 0.5 or less OFF: 10 — 13	ON: 0.5 or less OFF: 12 — 14	Model with A/C only
Malfunction indicator light		B136	11	—	—	Light “ON”: 1 or less Light “OFF”: 10 — 14
Engine speed output		B136	22	—	0 — 13, or more	Waveform
Purge control solenoid valve		B137	29	ON: 1 or less OFF: 10 — 13	ON: 1 or less OFF: 12 — 14	Sensor output 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)	
Manifold absolute pressure sensor	Signal	B134	6	1.7 — 2.4	1.1 — 1.6	—
	Power supply	B134	19	5	5	
	GND (sen- sor)	B134	29	0	0	
Fuel tank pressure sensor	Signal	B135	32	2.3 — 2.7	2.3 — 2.7	The valve operates when fuel filler cap is removed and rein- stalled.
	Power supply	B135	22	5	5	
	GND (sen- sor)	B135	30	0	0	
Pressure control sole- noid valve		B136	28	ON: 1 or less OFF: 10 — 13	ON: 1 or less OFF: 12 — 14	—
Drain valve		B136	17	ON: 1 or less OFF: 10 — 13	ON: 1 or less OFF: 12 — 14	—
Fuel level sensor		B135	10	0.12 — 4.75	0.12 — 4.75	—
Fuel temperature sen- sor signal		B135	17	2.5 — 3.8	2.5 — 3.8	Ambient temperature: 25°C (77°F)
Blow-by leak diagnosis signal		B134	30	0	0	When disconnection (malfunc- tion) = 5
Small light switch		B135	15	ON: 0 OFF: 10 — 13	ON: 0 OFF: 12 — 14	—
Blower fan switch		B135	16	ON: 0 OFF: 10 — 13	ON: 0 OFF: 12 — 14	—
Rear defogger switch		B135	14	ON: 0 OFF: 10 — 13	ON: 0 OFF: 12 — 14	—
Power steering oil pres- sure switch		B134	33	10 — 13	ON: 0 OFF: 12 — 14	—
Front oxygen (A/F) sen- sor signal (+)		B135	9	2.8 — 3.2	2.8 — 3.2	—
Front oxygen (A/F) sen- sor signal (–)		B135	8	2.4 — 2.7	2.4 — 2.7	—
Front oxygen (A/F) sen- sor shield		B135	1	0	0	—
SSM/GST communica- tion line		B136	16	1 ↔ 4	1 ↔ 4	—
Ground (engine 4)		B137	1	0	0	—
Ground	Ignition 1	B137	26	0	0	—
	Ignition 2	B137	6			
Ground (engine 3)		B137	2	0	0	—
Ground (engine 5)		B137	3	0	0	—
Ground (body)		B136	6	0	0	—
Ground (engine 1)		B134	5	0	0	—
Ground (engine 2)		B137	7	0	0	—
Camshaft position sen- sor (LH)		B134	21	0 — 0.9	ON: 0 OFF: 4.7 — 5.3	Sensor output waveform
Camshaft position sen- sor (RH)		B134	11	0 — 0.9	ON: 0 OFF: 4.7 — 5.3	Sensor output waveform

Engine Control Module (ECM) I/O Signal

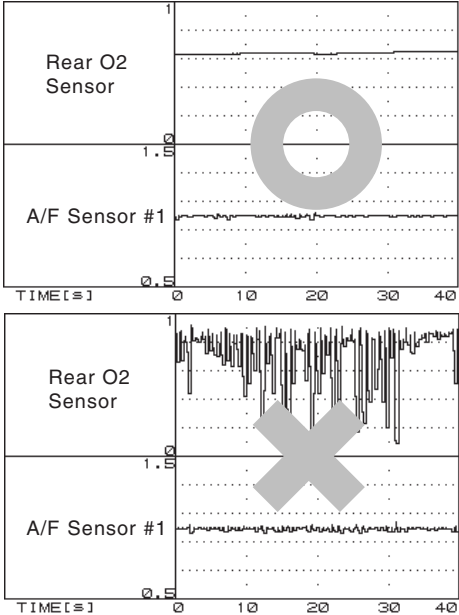
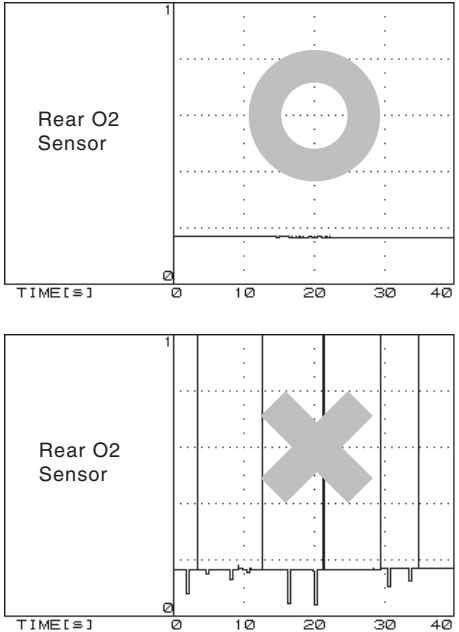
ENGINE (DIAGNOSTICS)

Content		Con- nector No.	Termi- nal No.	Signal (V)		Note
				Ignition SW ON (Engine OFF)	Engine ON (Idling)	
Electronic throttle control	Main	B134	18	0.64 — 0.72 Fully opened: 3.96	0.64 — 0.72 (After warm-up)	Fully closed: 0.6 Fully opened: 3.96
	Sub	B134	28	1.51 — 1.58 Fully opened: 4.17	1.51 — 1.58 (After warm-up)	Fully closed: 1.48 Fully opened: 4.17
	Power supply	B134	19	5	5	—
	GND (sen- sor)	B134	29	0	0	—
Electronic throttle con- trol motor (+)		B137	5	Duty waveform	Duty waveform	Driving frequency: 500 Hz
Electronic throttle con- trol motor (–)		B137	4	Duty waveform	Duty waveform	Driving frequency: 500 Hz
Electronic throttle con- trol motor power supply		B136	1	10 — 13	12 — 14	—
Electronic throttle con- trol motor relay		B136	21	ON: 0 OFF: 10 — 13	ON: 0 OFF: 12 — 14	When ignition switch is ON: ON
Oil flow control solenoid (LH)	Signal (+)	B137	15	ON: 10 — 13 OFF: 0	ON: 12 — 14 OFF: 0	—
	Signal (–)	B137	14	0	0	—
Oil flow control solenoid (RH)	Signal (+)	B137	17	ON: 10 — 13 OFF: 0	ON: 12 — 14 OFF: 0	—
	Signal (–)	B137	16	0	0	—
Accelerator pedal position sensor	Main cen- sor signal	B135	23	Fully closed: 1 Fully opened: 3.5	Fully closed: 1 Fully opened: 3.5	—
	Main power supply	B135	21	5	5	—
	GND (main sen- sor)	B135	29	0	0	—
	Sub cen- sor signal	B135	31	Fully closed: 1 Fully opened: 3.5	Fully closed: 1 Fully opened: 3.5	—
	Sub power supply	B135	22	5	5	—
	GND (sub sensor)	B135	30	0	0	—
Main light		B135	6	ON: 0 OFF: 10 — 13	ON: 0 OFF: 12 — 14	—
Cruise control set light		B135	3	ON: 0 OFF: 10 — 13	ON: 0 OFF: 12 — 14	—
Clutch switch		B136	25	When clutch pedal is depressed: 0 When clutch pedal is released: 10 — 13	When clutch pedal is depressed: 0 When clutch pedal is released: 12 — 14	—
SET/COAST switch		B135	24	ON: 10 — 13 OFF: 0	ON: 12 — 14 OFF: 0	—
Brake switch 1		B135	20	When brake pedal is depressed: 0 When brake pedal is released: 10 — 13	When brake pedal is depressed: 0 When brake pedal is released: 12 — 14	—

Engine Control Module (ECM) I/O Signal

ENGINE (DIAGNOSTICS)

Content		Con- nector No.	Termi- nal No.	Signal (V)		Note
				Ignition SW ON (Engine OFF)	Engine ON (Idling)	
Brake switch 2		B135	28	When brake pedal is depressed: 10 — 13 When brake pedal is released: 0	When brake pedal is depressed: 12 — 14 When brake pedal is released: 0	—
Main switch		B135	12	ON: 10 — 13 OFF: 0	ON: 12 — 14 OFF: 0	—
CAN com- munication	Signal (+)	B136	27	Pulse signal		—
	Signal (–)	B136	35	Pulse signal		—
Second- ary air pipe pres- sure sen- sor	Signal	B134	27	1.7 — 2.4	1.1 — 1.6	—
	Power supply	B134	19	5	5	—
	GND (sen- sor)	B134	29	0	0	—
Secondary air combi valve relay 1		B136	30	ON: 0 OFF: 10 — 13	ON: 0 OFF: 12 — 14	—
Secondary air combi valve relay 2		B136	19	ON: 0 OFF: 10 — 13	ON: 0 OFF: 12 — 14	—
Secondary air pump relay		B136	8	ON: 0 OFF: 10 — 13	ON: 0 OFF: 12 — 14	—

Input/Output	Measuring condition	Waveform
1. Rear oxygen sensor	5 minutes after driving at a constant speed of 80 — 113 km/h (50 — 70 MPH)	 EN-04680
2. Rear oxygen sensor	While idling (Oxygen sensor in active status)	 EN-04681

6. Engine Condition Data

A: ELECTRICAL SPECIFICATION

Content	Specified data
Engine load	17.6 — 35.64 (%): Idling
	13.2 — 26.73 (%): 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.

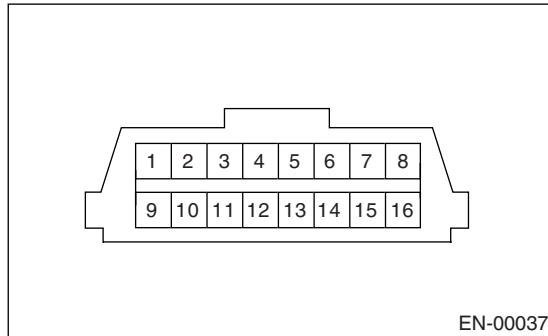
7. Data Link Connector

A: NOTE

This connector is used both for the general scan tools and Subaru Select Monitor.

CAUTION:

Do not connect any scan tools other than the general scan tools and Subaru Select Monitor, because the circuit for Subaru Select Monitor may be damaged.



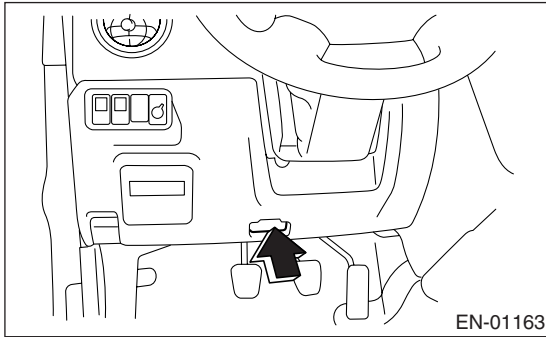
Terminal No.	Contents	Terminal No.	Contents
1	Power supply	9	Blank
2	Blank	10	Subaru Select Monitor/general scan tool signal
3	Blank	11	Blank
4	Blank	12	Ground
5	Blank	13	Ground
6	Blank	14	Blank
7	Blank	15	Blank
8	Blank	16	Blank

8. General Scan Tool

A: OPERATION

1. HOW TO USE GENERAL SCAN TOOL

- 1) Prepare a general scan tool required by SAE J1978.
- 2) Open the cover and connect the general scan tool to data link connector located in the lower portion of instrument panel (on the driver's side).



- 3) Using the general scan tool, call up DTC and freeze frame data.

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 DTC and malfunction indicator light status and diagnosis support information	—
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 mass air flow sensor	g/sec
11	Throttle valve absolute opening angle	%
12	Secondary air control condition	—
13	Check whether oxygen sensor is installed	—
15	Oxygen sensor output voltage and short term fuel trim associated with oxygen sensor	V and %
1C	Supporting OBD system	—
24	A/F value and A/F sensor output voltage	— and V
34	A/F value and A/F sensor current	— and mA

NOTE:

Refer to general scan tool manufacturer's instruction manual to access generic OBD-II PIDs (MODE \$01).

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 DTC
- (4) MODE \$04: Clear/Reset emission-related diagnostic information
- (5) MODE \$06: Request on-board monitoring test results for non-continuously monitored systems
- (6) MODE \$07: Request on-board monitoring test results for continuously monitored systems
- (7) MODE \$09: Request vehicle information

Read out the data according to repair procedures. (For detailed operation procedures, refer to the General Scan Tool Operation Manual.)

NOTE:

For details concerning DTC, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H4DOTC)(diag)-74, 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	DTC 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
0E	Ignition timing advance	°
0F	Intake air temperature	°C
10	Air flow rate from mass air flow sensor	g/sec
11	Throttle valve opening angle	%
15	Oxygen sensor output voltage and short term fuel trim associated with oxygen sensor	V and %
1C	Supporting OBD system	—

NOTE:

Refer to general scan tool manufacturer's instruction manual to access freeze frame data (MODE \$02).

4. MODE \$03 (EMISSION-RELATED POWERTRAIN DIAGNOSTIC TROUBLE CODE (DTC))

Refer to Read Diagnostic Trouble Code (DTC) for information about data denoting emission-related powertrain DTC. <Ref. to EN(H4DOTC)(diag)-39, 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 general scan tool manufacturer's instruction manual to clear or reset emission-related diagnostic information (MODE \$04).

General Scan Tool

ENGINE (DIAGNOSTICS)

6. MODE \$06

Refer to test value of troubleshooting and data of test limit on support data bit sequence table. List of support data is shown in the following table.

TID	CID	Test value & Test limit
\$41	\$81	Rear O ₂ sensor circuit (Bank 1 Sensor 2)
	\$02	Rear O ₂ sensor circuit (Bank 1 Sensor 2)
\$81	\$01	Catalyst system efficiency
\$83	\$01	Evaporative emission control system (0.04 inch leak)
	\$02	Evaporative emission control system (0.04 inch leak)
	\$03	Evaporative emission control system (0.04 inch leak)
	\$04	Evaporative emission control system (0.04 inch leak)
	\$05	Evaporative emission control system (0.02 inch leak)
	\$86	Evaporative emission control system (0.02 inch leak)
\$84	\$01	Front oxygen (A/F) sensor circuit slow response (Bank 1 Sensor 1)
\$85	\$01	Rear O ₂ sensor circuit slow response (Bank 1 Sensor 2) Rich → Lean
	\$02	Rear O ₂ sensor circuit slow response (Bank 1 Sensor 2) Lean → Rich
\$89	\$81	Secondary air system
	\$82	
	\$83	
	\$04	
	\$05	

7. MODE \$07

Refer to data of DTC (pending code) for troubleshooting result about emission in first time.

8. MODE \$09

Refer to data of vehicle specification (VIN, calibration ID, etc.).

9. Subaru Select Monitor

A: OPERATION

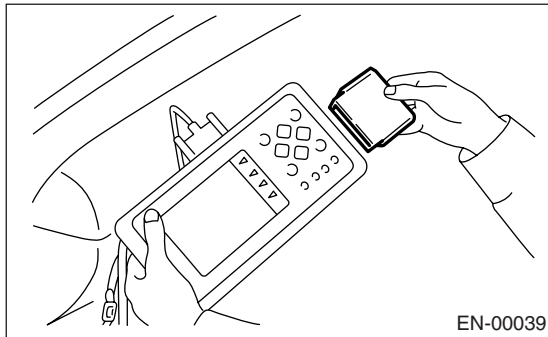
1. HOW TO USE SUBARU SELECT MONITOR

1) Prepare the Subaru Select Monitor kit. <Ref. to EN(H4DOTC)(diag)-7, PREPARATION TOOL, General Description.>



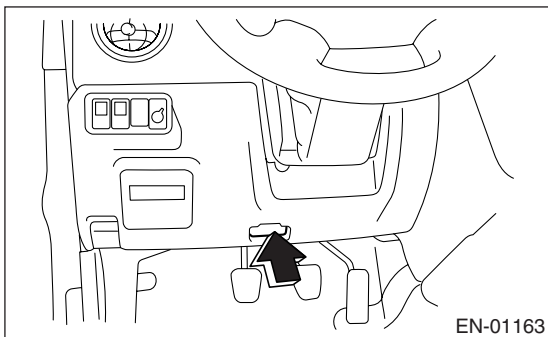
2) Connect the diagnosis cable to Subaru Select Monitor.

3) Insert the cartridge into Subaru Select Monitor. <Ref. to EN(H4DOTC)(diag)-7, PREPARATION TOOL, General Description.>



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

(1) Data link connector is located in the lower portion of instrument panel (on the driver's side).

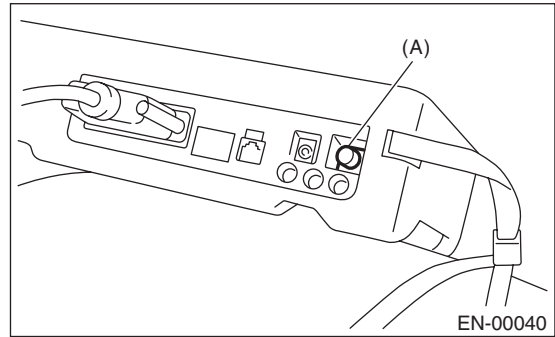


(2) Connect the diagnosis cable to data link connector.

CAUTION:

Do not connect the scan tools except for Subaru Select Monitor and general scan tool.

5) Turn the ignition switch to ON (engine OFF) and Subaru Select Monitor power switch to ON.



(A) Power switch

6) Using the Subaru Select Monitor, call up the DTC and various data, and then record them.

2. READ DIAGNOSTIC TROUBLE CODE (DTC) FOR ENGINE. (NORMAL MODE)

Refer to Read Diagnostic Trouble Code (DTC) for information about how to indicate DTC. <Ref. to EN(H4DOTC)(diag)-39, Read Diagnostic Trouble Code (DTC).>

3. READ DIAGNOSTIC TROUBLE CODE (DTC) FOR ENGINE. (OBD MODE)

Refer to Read Diagnostic Trouble Code (DTC) for information about how to indicate DTC. <Ref. to EN(H4DOTC)(diag)-39, Read Diagnostic Trouble Code (DTC).>

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 the [YES] key.
 - 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
 - 3) Press the [YES] key after the information of engine type is displayed.
 - 4) On the «Engine Diagnosis» display screen, select the {Current Data Display & Save} and press the [YES] key.
 - 5) On the «Data Display Menu» display screen, select the {Data Display} and press the [YES] key.
 - 6) Using the scroll key, move the display screen up or down until desired data is shown.
- A list of the support data is shown in the following table.

Remarks	Display	Unit of measure	Note (at idling)
Engine load	Engine Load	%	21.0%
Engine coolant temperature signal	Coolant Temp.	°C or °F	80 — 100°C or 176 — 212°F
A/F correction 1	A/F Correction #1	%	-10 — +10%
A/F learning 1	A/F Learning #1	%	-15 — +15%
Intake manifold absolute pressure	Mani. Absolute Pressure	mmHg, kPa, inHg or psig	220 — 275 mmHg, 29.5 — 37 kPa, 8.7 — 10 inHg or 4.2 — 5.3 psig
Engine speed signal	Engine Speed	rpm	700 rpm (Agree with the tachometer indication)
Vehicle speed signal	Vehicle Speed	km/h or MPH	0 km/h or 0 MPH (at parking)
Ignition timing signal	Ignition Timing	deg	+17.0 deg
Intake air temperature signal	Intake Air Temp.	°C or °F	20 — 50°C or 68 — 122°F
Amount of intake air	Mass Air Flow	g/s or lb/m	3.6 g/s or 0.48 lb/m
Throttle opening angle signal	Throttle Opening Angle	%	3.0 — 3.2%
Rear oxygen sensor voltage	Rear O2 Sensor	V	0 — 1.0 V
Battery voltage	Battery Voltage	V	12 — 15 V
Mass air flow voltage	Air Flow Sensor Voltage	V	1.0 — 1.7 V
Injection 1 pulse width	Fuel Injection #1 Pulse	ms	1.2 — 2.2 ms
Knock sensor correction	Knocking Correction	deg	0.0 deg
Atmospheric pressure signal	Atmosphere Pressure	mmHg, kPa, inHg or psig	(Atmosphere pressure)
Intake manifold relative pressure	Mani. Relative Pressure	mmHg, kPa, inHg or psig	(Mani. Absolute Pressure — Atmosphere pressure)
Fuel tank pressure signal	Fuel Tank Pressure	mmHg, kPa, inHg or psig	+8.8 mmHg, +1.2 kPa, +0.4 inHg or +0.2 psig
Acceleration opening angle signal	Accel. Opening Angle	%	0.0%
Fuel temperature signal	Fuel Temp	°C or °F	+21°C or +70°F
Fuel level signal	Fuel Level	V	0 — 5 V
Primary supercharged pressure control signal	Primary Control	%	0.0%
Purge control solenoid duty ratio	CPC Valve Duty Ratio	%	0 — 25%
Tumble generator valve RH opening angle signal	TGV Position Sensor R	V	0.44 V
Tumble generator valve LH opening angle signal	TGV Position Sensor L	V	0.48 V
Fuel pump duty ratio	Fuel Pump Duty	%	33%
AVCS advance angle amount RH	VVT Adv. Ang. Amount R	deg	0 deg
AVCS advance angle amount LH	VVT Adv. Ang. Amount L	deg	0 deg
Oil flow control solenoid valve duty RH	OSV Duty R	%	9.4%
Oil flow control solenoid valve duty LH	OSV Duty L	%	9.4%
Oil flow control solenoid valve current RH	OSV Current R	mA	40 — 100 mA
Oil flow control solenoid valve current LH	OSV Current L	mA	40 — 100 mA

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ENGINE (DIAGNOSTICS)

Remarks	Display	Unit of measure	Note (at idling)
A/F sensor current value 1	A/F Sensor #1 Current	mA	-20 — 20 mA
A/F sensor resistance value 1	A/F Sensor #1 Resistance	Ω	27 — 35 Ω
A/F sensor output lambda 1	A/F Sensor #1	—	1.00
A/F correction 3	A/F Correction #3	%	0.00%
A/F learning 3	A/F Learning #3	%	0.00%
Throttle motor duty	Throttle Motor Duty	%	-10%
Throttle power supply voltage	Throttle Motor Voltage	V	12 — 15 V
Sub throttle sensor voltage	Sub-throttle Sensor	V	1.52 V
Main throttle sensor voltage	Main-throttle Sensor	V	0.66 V
Sub acceleration sensor voltage	Sub-accelerator Sensor	V	0.68 V
Main acceleration sensor voltage	Main-accelerator Sensor	V	0.66 V
Secondary air pipe pressure signal	Sec. Air Piping Pressure	mmHg, kPa, inHg or psig	765 mmHg, 102 kPa, 30.1 inHg or 14.8 psig
Secondary air flow signal	Sec. Air Flow	g/s or lb/m	0.00 g/s or 0.00 lb/m
Memory vehicle speed	Memorized Cruise Speed	km/h or MPH	0 km/h or 0 MPH
Estimated cumulative driving distance	Odd Meter	km	—
#1 cylinder roughness monitor	Roughness Monitor #1	—	0
#2 cylinder roughness monitor	Roughness Monitor #2	—	0
#3 cylinder roughness monitor	Roughness Monitor #3	—	0
#4 cylinder roughness monitor	Roughness Monitor #4	—	0
AT/MT identification terminal	AT Vehicle ID Signal	—	ON/OFF
Test mode terminal	Test Mode Signal	—	OFF
Neutral position switch signal	Neutral Position Switch	—	ON
Soft idle switch signal	Idle Switch Signal	—	ON
Ignition switch signal	Ignition Switch	—	ON
Power steering switch input signal	P/S Switch	—	OFF (At OFF)
Air conditioning switch signal	A/C Switch	—	OFF (At OFF)
Starter switch signal	Starter Switch	—	OFF
Rear O ₂ monitor	Rear O2 Rich Signal	—	ON/OFF
Knocking signal	Knocking Signal	—	OFF
Crankshaft position sensor signal	Crankshaft Position Sig.	—	OFF
Camshaft position sensor signal	Camshaft Position Sig.	—	OFF
Rear defogger switch signal	Rear Defogger SW	—	OFF (At OFF)
Blower fan switch signal	Blower Fan SW	—	OFF (At OFF)
Light switch signal	Light Switch	—	OFF (At OFF)
Air conditioner compressor relay output signal	A/C Compressor Signal	—	OFF (At OFF)
Radiator fan relay 1 signal	Radiator Fan Relay #1	—	OFF (At OFF)
Radiator fan relay 2 signal	Radiator Fan Relay #2	—	OFF (At OFF)
PCV hose ASSY diagnosis signal	Blow-by Leak Connector	—	ON
Pressure control solenoid valve signal	PCV Solenoid	—	OFF output (At OFF)
Tumble generator valve output signal	TGV Output	—	OFF
Tumble generator valve drive signal	TGV Drive	—	Open
Drain valve signal	Vent Control Solenoid	—	OFF output (At OFF)
AT coordinate retard angle demand signal	Retard Signal from AT	—	OFF
AT coordinate fuel cut demand signal	Fuel Cut Signal from AT	—	OFF
AT coordinate permission demand	Torque Permission Signal	—	ON
Electronic throttle control motor relay signal	ETC Motor Relay	—	ON
Clutch switch signal	Clutch Switch	—	OFF (At OFF)

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ENGINE (DIAGNOSTICS)

Remarks	Display	Unit of measure	Note (at idling)
Stop light switch signal	Stop Light Switch	—	OFF (At OFF)
SET/COAST switch signal	SET/COAST Switch	—	OFF (At OFF)
RES/ACC switch signal	RESUME/ACCEL Switch	—	OFF (At OFF)
Brake switch signal	Brake Switch	—	OFF (At OFF)
Main switch signal	Main Switch	—	OFF (At OFF)
Secondary air combi valve relay 2 signal	Sec. Air Combi V Relay 2	—	OFF (At OFF)
Secondary air pump relay signal	Sec. Air Pump Relay	—	OFF (At OFF)
Secondary air combi valve relay 1 signal	Sec. Air Combi V Relay 1	—	OFF (At OFF)

NOTE:

For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

5. READ CURRENT DATA FOR ENGINE. (OBD MODE)

- 1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
 - 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
 - 3) Press the [YES] key after the information of engine type is displayed.
 - 4) On the «Engine Diagnosis» display screen, select the {OBD System} and press the [YES] key.
 - 5) On the «OBD Menu» display screen, select the {Current Data Display & Save} and press the [YES] key.
 - 6) On the «Data Display Menu» display screen, select the {Data Display} and press the [YES] key.
 - 7) Using the scroll key, move the display screen up or down until desired data is shown.
- A list of the support data is shown in the following table.

Contents	Display	Unit of measure	Note (at idling)
Number of DTC	Number of DTC	—	—
Malfunction indicator light 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	—	Complete or incomplete
Test of secondary air system	Secondary air system	—	Complete or incomplete
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	O ₂ 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	—	Close normal
Engine load data	Calculated load value	%	21.0%
Engine coolant temperature signal	Coolant Temp.	°C	+91°C or 196°F
Short term fuel trim by front oxygen (A/F) sensor	Short term fuel trim B1	%	+0.8%
Long term fuel trim by front oxygen (A/F) sensor	Long term fuel trim B1	%	+3.9%
Intake manifold absolute pressure signal	Mani. Absolute Pressure	mmHg, kPa, inHg or psig	233 mmHg or 31 kPa or 9.2 inHg or 4.5 psi
Engine speed signal	Engine Speed	rpm	700 rpm
Vehicle speed signal	Vehicle Speed	km/h or MPH	0 km/h or 0 MPH
Ignition timing advance for #1 cylinder	Ignition timing adv. #1	°	+16.5°
Intake air temperature signal	Intake Air Temp.	°C or °F	54°C or 129°F
Intake air amount	Mass Air Flow	g/s or lb/m	2.8 g/s or 0.37 lb/m
Throttle position signal	Throttle Opening Angle	%	13%
Secondary air system	Sec. air system	—	Stop
Oxygen sensor #12	Oxygen Sensor #12	V	0.1 — 0.7 V
Air fuel ratio correction by rear oxygen sensor	Short term fuel trim #12	%	+0.0%
On-board diagnostic system	OBD System	—	CARB-OBD2
Oxygen sensor #11	Oxygen Sensor #11	—	Support
Rear oxygen sensor output signal	Oxygen Sensor #12	—	Support
A/F lambda signal	A/F sensor #11	—	1.001
A/F sensor output signal	A/F sensor #11	V	2.805 V
A/F lambda signal #11	A/F sensor #11	—	0.999
A/F sensor current #11	A/F sensor #11	mA	0.02 mA

NOTE:

For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

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ENGINE (DIAGNOSTICS)

6. READ FREEZE FRAME DATA FOR ENGINE. (OBD MODE)

- 1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
 - 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
 - 3) Press the [YES] key after the information of engine type has been displayed.
 - 4) On the «Engine Diagnosis» display screen, select the {OBD System} and press the [YES] key.
 - 5) On the «OBD Menu» display screen, select the {Freeze Frame Data} and press the [YES] key.
- A list of support data is shown in the following table.

Contents	Display	Unit of measure	Note (at idling)
DTC for freeze frame data	Freeze frame data	—	DTC
Air fuel ratio control system for bank 1	Fuel system for Bank1	—	CLOSE normal or OPEN initial
Oxygen sensor output voltage	Oxygen Sensor #12	V	—
Air fuel ratio correction by rear oxygen sensor	Short term fuel trim #12	%	—
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, kPa, inHg or psig	—
Engine speed signal	Engine Speed	rpm	—
Vehicle speed signal	Vehicle Speed	km/h or MPH	—
Ignition timing signal	Ignition Timing	°	—
Intake air temperature signal	Intake Air Temp	°C or °F	—
Intake air volume	Mass Air Flow	g/s	—
Throttle position signal	Throttle Opening Angle	%	—
Secondary air system	Sec. Air system	—	—
Oxygen sensor #11	Oxygen sensor #11	—	Support
Oxygen sensor #12	Oxygen sensor #12	—	Support

NOTE:

For detailed operation procedure, refer to SUBARU SELECT MONITOR OPERATION MANUAL.

7. LED OPERATION MODE FOR ENGINE

- 1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
 - 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
 - 3) Press the [YES] key after the information of engine type is displayed.
 - 4) On the «Engine Diagnosis» display screen, select the {Current Data Display & Save} and press the [YES] key.
 - 5) On the «Data Display Menu» display screen, select the {Data & LED Display} and press the [YES] key.
 - 6) Using the scroll key, move the display screen up or down until the desired data is shown.
- A list of the support data is shown in the following table.

Remarks	Display	Message	LED "ON" requirements
AT/MT identification signal	AT Vehicle ID Signal	ON or OFF	Illuminate (AT model)
Test mode signal	Test Mode Signal	ON or OFF	D check
Neutral position switch signal	Neutral Position Switch	ON or OFF	When neutral position signal is entered.
Idle switch signal	Idle Switch Signal	ON or OFF	When idle switch signal is entered.
Ignition switch signal	Ignition Switch	ON or OFF	When ignition switch is turned to ON.
Power steering switch signal	P/S Switch	ON or OFF	When power steering switch is entered.
Air conditioning switch signal	A/C Switch	ON or OFF	When air conditioning switch is input.
Starter switch signal	Starter Switch	ON or OFF	When starter switch is input.
Rear oxygen sensor rich signal	Rear O2 Rich Signal	Lean or Rich	When rear oxygen sensor mixture ratio is rich.
Knocking signal	Knocking Signal	Provided or None	When knocking signal is input.
Crankshaft position sensor signal	Crankshaft Position Signal	Provided or None	When crankshaft position sensor signal is input.
Camshaft position sensor signal	Camshaft Position Signal	Provided or None	When camshaft position sensor signal is input.
Rear defogger switch signal	Rear Defogger Switch	ON or OFF	When rear defogger switch is turned to ON.
Blower fan switch signal	Blower Fan Switch	ON or OFF	When blower fan switch is turned to ON.
Small light switch signal	Light Switch	ON or OFF	When small light switch is turned to ON.
Air conditioning relay signal	A/C Compressor Signal	ON or OFF	When air conditioning relay is in function.
Radiator fan relay 1 signal	Radiator Fan Relay #1	ON or OFF	When radiator fan relay 1 is in function.
Radiator fan relay 2 signal	Radiator Fan Relay #2	ON or OFF	When radiator fan relay 2 is in function.
PCV hose assembly diagnosis signal	Blow-by leak Connector	Connect or Unconnect	When PCV hose assembly is connected.
Pressure control solenoid valve signal	PCV Solenoid	ON or OFF	When pressure control solenoid valve is ON.
Tumble generator valve signal	TGV Output	Provided or None	When tumble generator valve signal is input.
Tumble generator valve drive signal	TGV Drive	Open or Close	When tumble generator valve is open.
Drain valve signal	Vent Control Solenoid	ON or OFF	When drain valve is ON.
AT retard angle demand signal	Retard Signal	Provided or None	When AT retard angle demand signal is input.
AT fuel cut signal	Fuel Cut	Provided or None	When AT fuel cut signal is input.
AT coordinate permission signal	Torque Control Permission	Provided or None	When AT coordinate permission signal is input.
Electronic throttle control motor relay signal	ETC Motor Relay	ON or OFF	When electronic throttle control motor relay is in function.
Clutch switch signal	Clutch Switch	ON or OFF	When clutch switch is turned to ON.
Stop light switch signal	Stop Light Switch	ON or OFF	When stop switch is turned to ON.

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Remarks	Display	Message	LED "ON" requirements
SET/COAST switch signal	SET/COAST Switch	ON or OFF	When SET/COAST switch is turned to ON.
RES/ACC switch signal	RESUME/ACCEL Switch	ON or OFF	When RES/ACC switch is turned to ON.
Brake switch signal	Brake Switch	ON or OFF	When brake switch is turned to ON.
Main switch signal	Main Switch	ON or OFF	When main switch is turned to ON.
Secondary air combi valve 2 signal	Combi valve 2	ON or OFF	Secondary air combi valve 2 is ON.
Secondary air pump relay signal	Air pump relay	ON or OFF	Secondary air pump relay functions.
Secondary air combi valve 1 signal	Combi valve 1	ON or OFF	Secondary air combi valve 1 is ON.

NOTE:

For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

8. VIN REGISTRATION

- 1) On «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
- 2) On «System Selection Menu» display screen, select the {Engine} and press the [YES] key.
- 3) Press the [YES] key after the information of engine type is displayed.
- 4) On «Engine Diagnosis» display screen, select the {VIN Registration}, and then press the [YES] key.
- 5) Perform the procedure shown on the display.

NOTE:

For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

10. 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 the [YES] key.
- 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
- 3) Press the [YES] key after the information of engine type is displayed.
- 4) On the «Engine Diagnosis» display screen, select the {DTC Display} and press the [YES] key.
- 5) On the «DTC Display» display screen, select the {Current DTC} or {History DTC} and press the [YES] key.

NOTE:

- For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
- For detailed concerning DTC, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).>

2. SUBARU SELECT MONITOR (OBD MODE)

- 1) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
- 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
- 3) Press the [YES] key after the information of engine type is displayed.
- 4) On the «Engine Diagnosis» display screen, select the {OBD System} and press the [YES] key.
- 5) On the «OBD Menu» display screen, select the {DTC Display} and press the [YES] key.
- 6) Make sure that a DTC is shown on the display screen.

NOTE:

- For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
- For detailed concerning DTC, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).>

3. GENERAL SCAN TOOL

Refers to data denoting emission-related powertrain DTC.

For details concerning DTC, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).>

NOTE:

Refer to general scan tool manufacturer's instruction manual to access emission-related powertrain DTC (MODE \$03).

11. Inspection Mode

A: PROCEDURE

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(H4DOTC)(diag)-46, Drive Cycle.>

DTC	Item	Condition
P0011	Intake Camshaft Position - Timing Over-advanced or System Performance (Bank 1)	—
P0016	Crankshaft Position - Camshaft Position Correlation (Bank 1)	—
P0018	Crankshaft Position - Camshaft Position Correlation (Bank 2)	—
P0021	Intake Camshaft Position - Timing Over-advanced or System Performance (Bank 2)	—
P0031	HO2S Heater Control Circuit Low (Bank 1 Sensor 1)	—
P0032	HO2S Heater Control Circuit High (Bank 1 Sensor 1)	—
P0037	HO2S Heater Control Circuit Low (Bank 1 Sensor 2)	—
P0038	HO2S Heater Control Circuit High (Bank 1 Sensor 2)	—
P0102	Mass or Volume Air Flow Circuit Low Input	—
P0103	Mass or Volume Air Flow Circuit High Input	—
P0107	Manifold Absolute Pressure/Barometric Pressure Circuit Low Input	—
P0108	Manifold Absolute Pressure/Barometric Pressure Circuit High Input	—
P0112	Intake Air Temperature Circuit Low Input	—
P0113	Intake Air Temperature Circuit High Input	—
P0117	Engine Coolant Temperature Circuit Low Input	—
P0118	Engine Coolant Temperature Circuit High Input	—
P0122	Throttle/Pedal Position Sensor/Switch "A" Circuit Low Input	—
P0123	Throttle/Pedal Position Sensor/Switch "A" Circuit High Input	—
P0131	O ₂ Sensor Circuit Low Voltage (Bank 1 Sensor 1)	—
P0132	O ₂ Sensor Circuit High Voltage (Bank 1 Sensor 1)	—
P0137	O ₂ Sensor Circuit Low Voltage (Bank 1 Sensor 2)	—
P0138	O ₂ Sensor Circuit High Voltage (Bank 1 Sensor 2)	—
P0140	O ₂ Sensor Circuit No Activity Detected (Bank 1 Sensor 2)	—
P0182	Fuel Temperature Sensor "A" Circuit Low Input	—
P0183	Fuel Temperature Sensor "A" Circuit High Input	—
P0222	Throttle/Pedal Position Sensor/Switch "B" Circuit Low	—
P0223	Throttle/Pedal Position Sensor/Switch "B" Circuit High	—
P0230	Fuel Pump Primary Circuit	—
P0245	Turbo/Super Charger Wastegate Solenoid "A" Low	—
P0327	Knock Sensor 1 Circuit Low Input (Bank 1 or Single Sensor)	—
P0328	Knock Sensor 1 Circuit High Input (Bank 1 or Single Sensor)	—
P0335	Crankshaft Position Sensor "A" Circuit	—
P0336	Crankshaft Position Sensor "A" Circuit Range/Performance	—
P0340	Camshaft Position Sensor "A" Circuit (Bank 1 or Single Sensor)	—
P0345	Camshaft Position Sensor "A" Circuit (Bank 2)	—
P0413	Secondary Air Injection System Switching Valve "A" Circuit Open	—
P0416	Secondary Air Injection System Switching Valve "B" Circuit Open	—
P0418	Secondary Air Injection System Control "A" Circuit Open	—
P0447	Evaporative Emission Control System Vent Control Circuit Open	—
P0448	Evaporative Emission Control System Vent Control Circuit Shorted	—
P0452	Evaporative Emission Control System Pressure Sensor Low Input	—
P0453	Evaporative Emission Control System Pressure Sensor High Input	—

Inspection Mode

ENGINE (DIAGNOSTICS)

DTC	Item	Condition
P0458	Evaporative Emission Control System Purge Control Valve Circuit Low	—
P0462	Fuel Level Sensor Circuit Low Input	—
P0463	Fuel Level Sensor Circuit High Input	—
P0502	Vehicle Speed Sensor Circuit Low Input	—
P0503	Vehicle Speed Sensor Intermittent/Erratic/High	—
P0512	Starter Request Circuit	—
P0513	Incorrect Immobilizer Key	—
P0519	Idle Control System Malfunction (Fail-Safe)	—
P0600	Serial Communication Link	—
P0604	Internal Control Module Random Access Memory (RAM) Error	—
P0605	Internal Control Module Read Only Memory (ROM) Error	—
P0607	Control Module Performance	—
P0638	Throttle Actuator Control Range/Performance (Bank 1)	—
P0691	Cooling Fan 1 Control Circuit Low	—
P0700	Transmission Control System (MIL Request)	—
P0851	Neutral Switch Input Circuit Low	—
P0852	Neutral Switch Input Circuit High	—
P1152	O ₂ Sensor Circuit Range/Performance (Low) (Bank 1 Sensor 1)	—
P1153	O ₂ Sensor Circuit Range/Performance (High) (Bank 1 Sensor 1)	—
P1160	Return Spring Failure	—
P1400	Fuel Tank Pressure Control Solenoid Valve Circuit Low	—
P1410	Secondary Air Injection System Switching Valve Stuck Open	—
P1420	Fuel Tank Pressure Control Sol. Valve Circuit High	—
P1491	Positive Crankcase Ventilation (Blow-by) Function Problem	—
P1518	Starter Switch Circuit Low Input	—
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	—
P2006	Intake Manifold Runner Control Stuck Closed (Bank 1)	—
P2007	Intake Manifold Runner Control Stuck Closed (Bank 2)	—
P2008	Intake Manifold Runner Control Circuit / Open (Bank 1)	—
P2009	Intake Manifold Runner Control Circuit Low (Bank 1)	—
P2011	Intake Manifold Runner Control Circuit / Open (Bank 2)	—
P2012	Intake Manifold Runner Control Circuit Low (Bank 2)	—
P2016	Intake Manifold Runner Position Sensor / Switch Circuit Low (Bank 1)	—
P2017	Intake Manifold Runner Position Sensor / Switch Circuit High (Bank 1)	—
P2021	Intake Manifold Runner Position Sensor / Switch Circuit Low (Bank 2)	—
P2022	Intake Manifold Runner Position Sensor / Switch Circuit High (Bank 2)	—
P2088	OCV Solenoid Valve Signal A Circuit Open (Bank 1)	—
P2089	OCV Solenoid Valve Signal A Circuit Short (Bank 1)	—
P2092	OCV Solenoid Valve Signal A Circuit Open (Bank 2)	—
P2093	Intake Camshaft Position Actuator Control Circuit High (Bank 2)	—
P2101	Throttle Actuator Control Motor Circuit Range/Performance	—

Inspection Mode

ENGINE (DIAGNOSTICS)

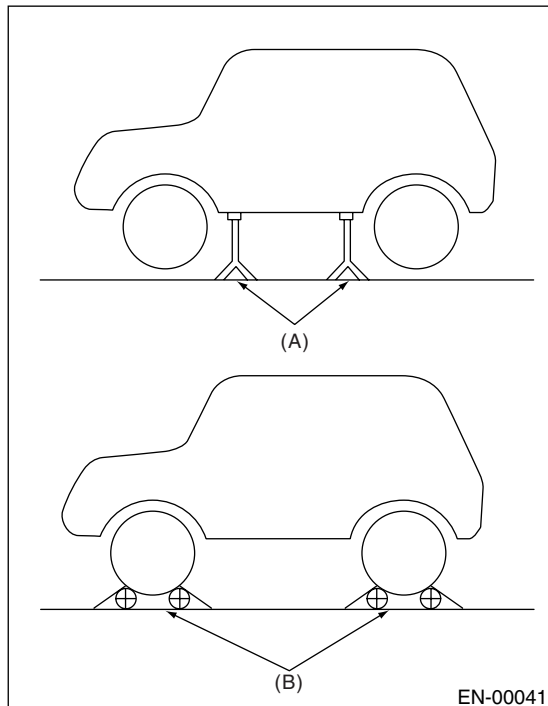
DTC	Item	Condition
P2102	Throttle Actuator Control Motor Circuit Low	—
P2109	Throttle/Pedal Position Sensor “A” Minimum Stop Performance	—
P2122	Throttle/Pedal Position Sensor/Switch “D” Circuit Low Input	—
P2123	Throttle/Pedal Position Sensor/Switch “D” Circuit High Input	—
P2127	Throttle/Pedal Position Sensor/Switch “E” Circuit Low Input	—
P2128	Throttle/Pedal Position Sensor/Switch “E” Circuit High Input	—
P2135	Throttle/Pedal Position Sensor/Switch “A” / “B” Voltage Correlation	—
P2138	Throttle/Pedal Position Sensor/Switch “D” / “E” Voltage Correlation	—
P2227	Barometric Pressure Circuit Range/Performance	—
P2228	Barometric Pressure Circuit Low	—
P2229	Barometric Pressure Circuit High	—
P2431	Secondary Air Injection System Air Flow /Pressure Sensor Circuit Range/Performance	—
P2432	Secondary Air Injection System Air Flow /Pressure Sensor Circuit Low	—
P2433	Secondary Air Injection System Air Flow /Pressure Sensor Circuit High	—
P2444	Secondary Air Injection System Pump Stuck On	—

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 rigid racks or drive the vehicle onto free rollers.

WARNING:

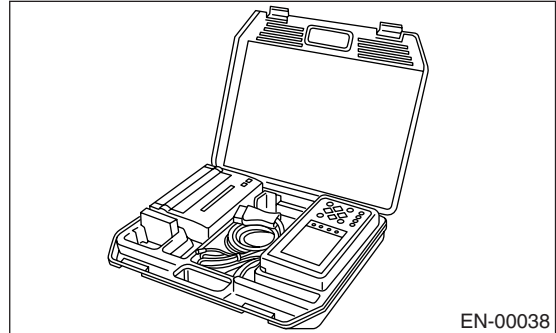
- Before raising the vehicle, ensure the parking brake is applied.
- Do not use a pantograph jack in place of a rigid rack.
- Secure a rope or wire to the front and rear towing or tie-down hooks to prevent the lateral runout of front wheels.
- Do not abruptly depress/release the clutch pedal or accelerator 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 rigid racks 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.



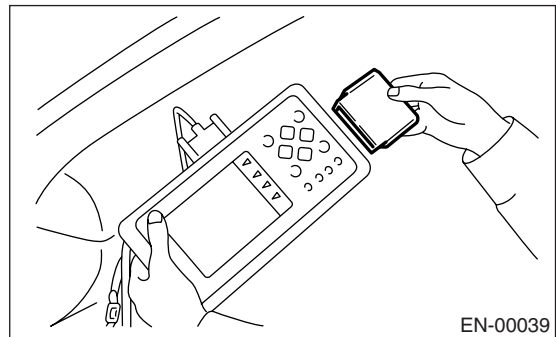
- (A) Rigid rack
(B) Free rollers

2. SUBARU SELECT MONITOR

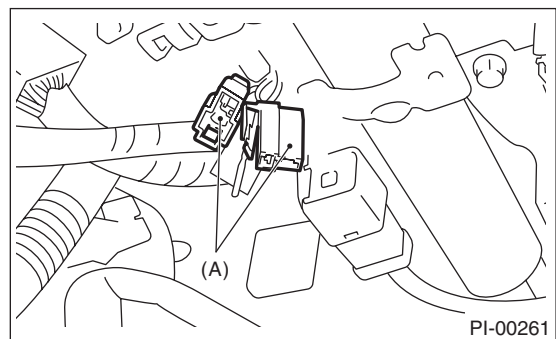
- 1) Warm up the engine.
- 2) Prepare the Subaru Select Monitor kit. <Ref. to EN(H4DOTC)(diag)-7, PREPARATION TOOL, General Description.>



- 3) Connect the diagnosis cable to Subaru Select Monitor.
- 4) Insert the cartridge into Subaru Select Monitor. <Ref. to EN(H4DOTC)(diag)-7, PREPARATION TOOL, General Description.>



- 5) Connect the test mode connector (A) at the lower portion of instrument panel (on the driver's side).

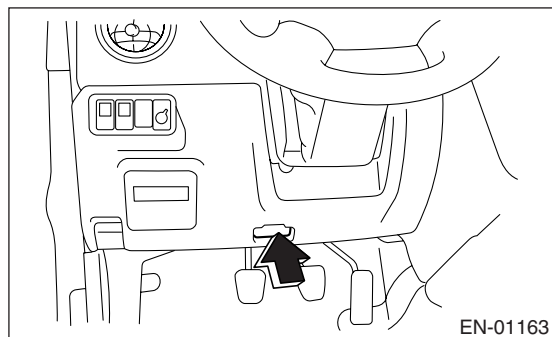


- (A) Test mode connector

Inspection Mode

ENGINE (DIAGNOSTICS)

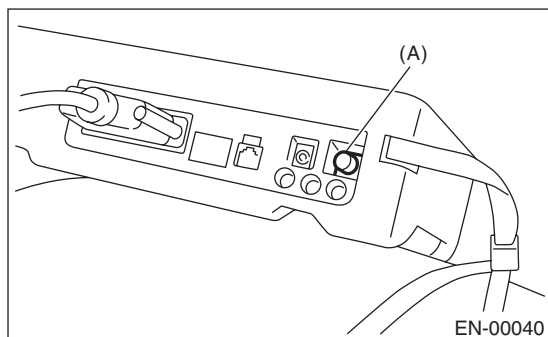
6) Connect the Subaru Select Monitor to data link connector located in the lower portion of the instrument panel (on the driver's side).



CAUTION:

Do not connect the scan tools except for Subaru Select Monitor and general scan tool.

7) Turn the ignition switch to ON (engine OFF) and Subaru Select Monitor power switch to ON.



(A) Power switch

8) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.

9) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.

10) Press the [YES] key after the information of engine type is displayed.

11) On the «Engine Diagnosis» display screen, select the {Dealer Check Mode Procedure} and press the [YES] key.

12) When the "Perform Inspection (Dealer Check Mode?)" is shown on the display screen, press the [YES] key.

13) Perform subsequent procedures as instructed on the display screen.

- If trouble still remains in the memory, the corresponding DTC appears on the display screen.

NOTE:

- For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

- For detailed concerning the DTC, refer to the List of Diagnostic Trouble Code (DTC).

<Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).>

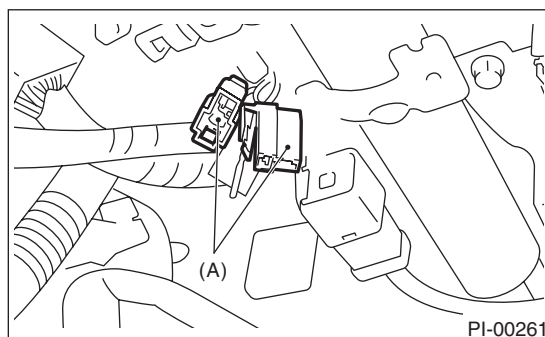
- Release the parking brake.

- 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. GENERAL SCAN TOOL

1) Warm up the engine.

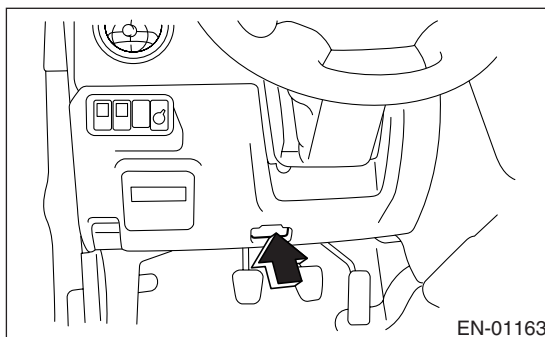
2) Connect the test mode connector (A) at the lower side of instrument panel (on the driver's side).



3) Connect the 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 general scan tool.



4) Start the engine.

NOTE:

- Ensure the select lever is placed in "P" range before starting. (AT model)

- Depress the clutch pedal when starting engine. (MT model)

5) Using the select lever or shift lever, turn the "P" position switch and "N" position switch to ON.

6) Depress the brake pedal to turn brake switch ON. (AT model)

7) Keep the engine speed in 2,500 — 3,000 rpm range for 40 seconds.

8) Place the select lever or shift lever in “D” range (AT model) or “1st” gear (MT model) and drive the vehicle at 5 to 10 km/h (3 to 6 MPH).

NOTE:

- On AWD model, 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.

9) Using the general scan tool, check for DTC and record the result(s).

NOTE:

- For detailed operation procedures, refer to the General Scan Tool Instruction Manual.
- For detailed concerning DTC, refer to the List of Diagnostic Trouble Code (DTC).

<Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).>

12. Drive Cycle

A: PROCEDURE

There are seven drive patterns of drive cycles A — G for the trouble diagnosis. Performing the specified drive pattern allows to diagnose malfunctioning items listed below. After the malfunctioning items listed below are repaired, always check if they correctly resume their functions by performing 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 12 V or more.
- 2) Disconnect the test mode connector.

NOTE:

- Except for the engine coolant 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. DRIVE CYCLE A (AFTER RUNNING 20 MINUTES AT 80 KM/H (50 MPH), IDLE ENGINE FOR 1 MINUTE.)

DTC	Item	Condition
*P0125	Insufficient Coolant Temperature for Closed Loop Fuel Control	Engine coolant temperature is less than 20°C (68°F) at engine start.
*P0128	Coolant Thermostat	Engine coolant temperature is less than 55°C (131°F) at engine start.
*P0133	O ₂ Sensor Circuit Slow Response (Bank 1 Sensor 1)	—
*P0171	System Too Lean (Bank 1)	Diagnosis completes in drive cycle B or C as well.
*P0172	System Too Rich (Bank 1)	Diagnosis completes in drive cycle B or C as well.
P0301	Cylinder 1 Misfire Detected	Diagnosis completes in drive cycle B or C as well.
P0302	Cylinder 2 Misfire Detected	Diagnosis completes in drive cycle B or C as well.
P0303	Cylinder 3 Misfire Detected	Diagnosis completes in drive cycle B or C as well.
P0304	Cylinder 4 Misfire Detected	Diagnosis completes in drive cycle B or C as well.
*P0420	Catalyst System Efficiency Below Threshold (Bank 1)	—
*P0442	Evaporative Emission Control System Leak Detected (small leak)	Engine coolant temperature is less than 25°C (77°F) at engine start.
*P0451	Evaporative Emission Control System Pressure Sensor Range/Performance	—
*P0456	Evaporative Emission Control System Leak Detected (very small leak)	Engine coolant temperature is less than 25°C (77°F) at engine start.
*P0457	Evaporative Emission Control System Leak Detected (fuel cap loose/off)	Engine coolant temperature is less than 25°C (77°F) at engine start.
*P0459	Evaporative Emission Control System Purge Control Valve Circuit High	—
*P0692	Cooling Fan 1 Control Circuit High	—
P1443	Vent Control Solenoid Valve Function Problem	—
*P2096	Post Catalyst Fuel Trim System Too Lean Bank 1	Diagnosis completes in drive cycle B or C as well.
*P2097	Post Catalyst Fuel Trim System Too Rich Bank 1	Diagnosis completes in drive cycle B or C as well.
P2103	Throttle Actuator Control Motor Circuit High	Diagnosis completes in drive cycle B or C as well.

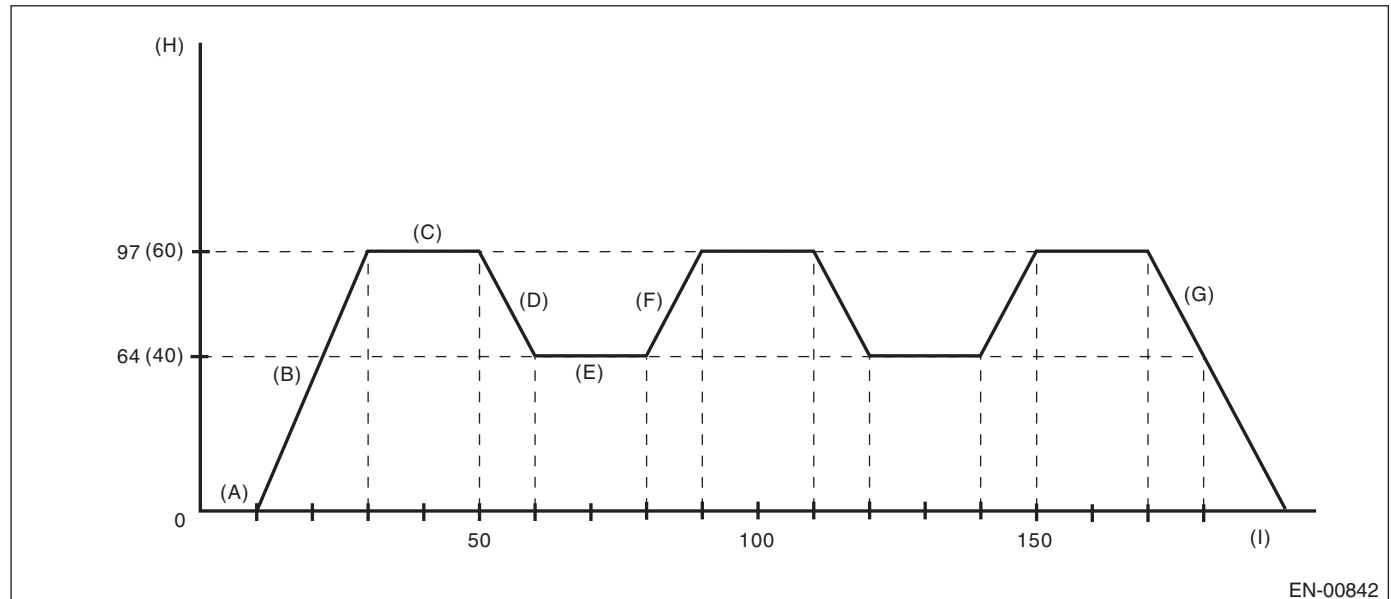
3. DRIVE CYCLE B (IDLE FOR 10 MINUTES)

NOTE:

Before the diagnosis, drive the vehicle at 10 km/h (6 MPH) or more.

DTC	Item	Condition
*P0126	Insufficient Engine Coolant Temperature for Stable Operation	—
*P0171	System too Lean (Bank 1)	Diagnosis completes in drive cycle A or C as well.
*P0172	System too Rich (Bank 1)	Diagnosis completes in drive cycle A or C as well.
P0301	Cylinder 1 Misfire Detected	Diagnosis completes in drive cycle A or C as well.
P0302	Cylinder 2 Misfire Detected	Diagnosis completes in drive cycle A or C as well.
P0303	Cylinder 3 Misfire Detected	Diagnosis completes in drive cycle A or C as well.
P0304	Cylinder 4 Misfire Detected	Diagnosis completes in drive cycle A or C as well.
*P0464	Fuel Level Sensor Circuit Intermittent	—
*P0483	Cooling Fan Rationality Check	—
*P0506	Idle Control System RPM Lower Than Expected	—
*P0507	Idle Control System RPM Higher Than Expected	—
*P2096	Post Catalyst Fuel Trim System Too Lean Bank 1	Diagnosis completes in drive cycle A or C as well.
*P2097	Post Catalyst Fuel Trim System Too Rich Bank 1	Diagnosis completes in drive cycle A or C as well.
P2103	Throttle Actuator Control Motor Circuit High	Diagnosis completes in drive cycle A or C as well.

4. DRIVE CYCLE C (DRIVE ACCORDING TO THE FOLLOWING DRIVE PATTERN)



(A) Idle engine for 10 seconds or more.	(D) Decelerate with fully closed throttle to 64 km/h (40 MPH).	(G) 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 20 seconds.	(H) Vehicle speed km/h (MPH)
(C) Drive vehicle at 97 km/h (60 MPH) for 20 seconds.	(F) Accelerate to 97 km/h (60 MPH) within 10 seconds.	(I) Seconds

Drive Cycle

ENGINE (DIAGNOSTICS)

DTC	Item	Condition
*P0030	HO2S Heater Control Circuit (Bank 1 Sensor 1)	—
P0068	Manifold Absolute Pressure/Barometric Pressure Circuit Range/Performance	—
*P0101	Mass or Volume Air Flow Circuit Range/Performance	—
P0134	O ₂ Sensor Circuit No Activity Detected (Bank 1 Sensor 1)	—
*P0139	O ₂ Sensor Circuit Slow Response (Bank 1 Sensor 2)	—
*P0171	System too Lean (Bank 1)	Diagnosis completes in drive cycle A or B as well.
*P0172	System too Rich (Bank 1)	Diagnosis completes in drive cycle A or B as well.
*P0244	Turbo/Supercharger Wastegate Solenoid "A" Range/Performance	—
P0246	Turbo/Supercharger Wastegate Solenoid "A" High	—
*P0301	Cylinder 1 Misfire Detected	Diagnosis completes in drive cycle A or B as well.
*P0302	Cylinder 2 Misfire Detected	Diagnosis completes in drive cycle A or B as well.
*P0303	Cylinder 3 Misfire Detected	Diagnosis completes in drive cycle A or B as well.
*P0304	Cylinder 4 Misfire Detected	Diagnosis completes in drive cycle A or B as well.
P2004	Intake Manifold Runner Control Stuck Open (Bank 1)	—
P2005	Intake Manifold Runner Control Stuck Open (Bank 2)	—
*P2096	Post Catalyst Fuel Trim System Too Lean Bank 1	Diagnosis completes in drive cycle A or B as well.
*P2097	Post Catalyst Fuel Trim System Too Rich Bank 1	Diagnosis completes in drive cycle A or B as well.
P2103	Throttle Actuator Control Motor Circuit High	Diagnosis completes in drive cycle A or B as well.

5. DRIVE CYCLE D

• DRIFT DIAGNOSIS

- 1) Make sure that the engine coolant temperature at engine starting is less than 30°C (86°F).
- 2) Make sure that fuel of more than 10 ℓ (2.6 US gal, 2.2 Imp gal) remains and the battery voltage is more than 10.9 V.
- 3) Make sure that the engine coolant temperature rises for more than 10°C (18°F) from the level of engine starting and is also more than 75°C (167°F).
- 4) Idle the engine for more than 120 seconds in the condition of step 3.

• STUCK DIAGNOSIS

- 1) Make sure that the battery voltage is more than 10.9 V.
- 2) Perform the clear memory mode. <Ref. to EN(H4DOTC)(diag)-50, Clear Memory Mode.>
- 3) Drive the vehicle for the distance equal to fuel of 50 ℓ (13.2 US gal, 11 Imp gal).

NOTE:

- It is possible to drive intermittently.
- Do not disconnect the terminal of battery during diagnosis. (If disconnecting the terminal of battery, the data will be cleared.)

DTC	Item	Condition
P0181	Fuel Temperature Sensor "A" Circuit Range/Performance	—

6. DRIVE CYCLE E

- 1) Make sure that the battery voltage is more than 10.9 V.
- 2) Perform the clear memory mode. <Ref. to EN(H4DOTC)(diag)-50, Clear Memory Mode.>
- 3) Drive the vehicle for the distance equal to fuel of 30 ℓ (7.9 US gal, 6.6 Imp gal).

NOTE:

- It is possible to drive intermittently.
- Do not disconnect the terminal of battery during diagnosis. (If disconnecting the terminal of battery, the data will be cleared.)

DTC	Item	Condition
P0461	Fuel Level Sensor Circuit Range/Performance	—

7. DRIVE CYCLE F

- 1) Make sure that the engine coolant temperature at engine starting is less than 30°C (86°F).
- 2) Warm-up the engine until the engine coolant temperature is more than 95°C (203°F) from engine starting.
- 3) Idle the engine for more than 10 minutes in the condition of step 2).

NOTE:

Do not disconnect the terminal of battery during diagnosis. (If disconnecting the terminal of battery, the data will be cleared.)

DTC	Item	Condition
P0111	Intake Air Temperature Circuit Range/Performance	—

8. DRIVE CYCLE G

- 1) Disconnect the ground cable from battery. Wait for 10 seconds and then reconnect it.
- 2) Start the engine and idle it until engine coolant temperature becomes 80°C (176°F).
- 3) Turn the engine OFF, and wait until coolant temperature goes down to 40°C (104°F).

NOTE:

Do not let the engine coolant temperature go down below 5°C (41°F).

- 4) Repeat the steps 2) and 3) again.

NOTE:

Do not let the engine coolant temperature go down below than 5°C (41°F).

- 5) Start and idle the engine.

DTC	Item	Condition
*P0410	Secondary Air Injection System	—
*P0411	Secondary Air Injection System Incorrect Flow Detected	—
P0414	Secondary Air Injection System Switching Valve "A" Circuit Shorted	—
P0417	Secondary Air Injection System Switching Valve "B" Circuit Shorted	—
P1418	Secondary Air Injection System Control "A" Circuit Shorted	—
*P2440	Secondary Air Injection System Switching Valve Stuck Open (Bank 1)	—
*P2441	Secondary Air Injection System Switching Valve Stuck Closed (Bank 1)	—
*P2442	Secondary Air Injection System Switching Valve Stuck Open (Bank 2)	—
*P2443	Secondary Air Injection System Switching Valve Stuck Closed (Bank 2)	—

13. Clear Memory Mode

A: OPERATION

1. SUBARU SELECT MONITOR (NORMAL MODE)

- 1) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
- 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
- 3) Press the [YES] key after the information of engine type is displayed.
- 4) On the «Engine Diagnosis» display screen, select the {Clear Memory} and press the [YES] key.
- 5) When the 'Done' and 'Turn Ignition Switch OFF' are shown on the display screen, turn the ignition switch to OFF, and then turn the Subaru Select Monitor power switch to OFF.

NOTE:

For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

2. SUBARU SELECT MONITOR (OBD MODE)

- 1) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
- 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
- 3) Press the [YES] key after the information of engine type is displayed.
- 4) On the «Engine Diagnosis» display screen, select the {OBD System} and press the [YES] key.
- 5) On the «OBD Menu» display screen, select the {4. Diagnosis Code(s) Cleared} and press the [YES] key.
- 6) When the 'Clear Diagnostic Code?' is shown on the display screen, press the [YES] key.
- 7) Turn the ignition switch to OFF, and then turn the Subaru Select Monitor power switch to OFF.

NOTE:

For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

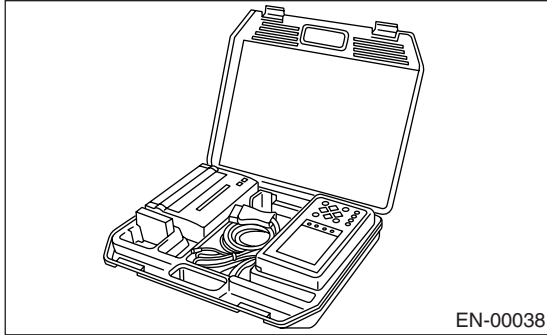
3. GENERAL SCAN TOOL

For clear memory procedures using the general scan tool, refer to the General Scan Tool Instruction Manual.

14. Compulsory Valve Operation Check Mode

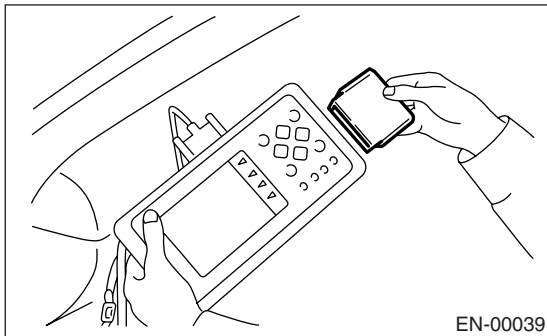
A: OPERATION

1) Prepare the Subaru Select Monitor kit. <Ref. to EN(H4DOTC)(diag)-7, PREPARATION TOOL, General Description.>

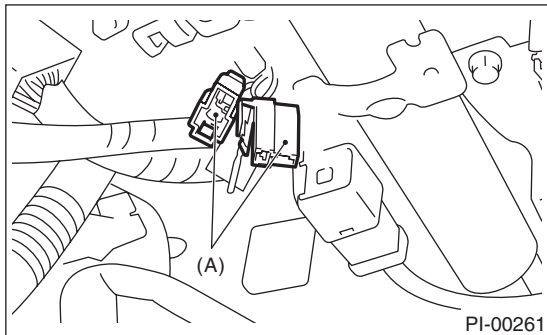


2) Connect the diagnosis cable to Subaru Select Monitor.

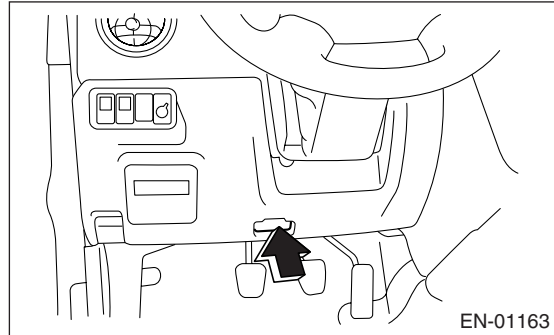
3) Insert the cartridge into Subaru Select Monitor. <Ref. to EN(H4DOTC)(diag)-7, PREPARATION TOOL, General Description.>



4) Connect the test mode connector (A) at the lower portion of instrument panel (on the driver's side).



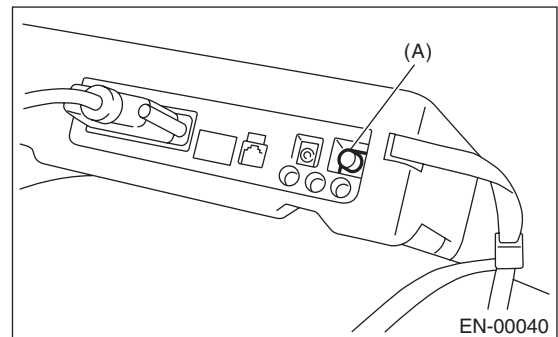
5) Connect the Subaru Select Monitor to data link connector located in the lower portion of instrument panel (on the driver's side).



CAUTION:

Do not connect scan tools except for the Subaru Select Monitor and general scan tool.

6) Turn the ignition switch to ON (engine OFF) and Subaru Select Monitor power switch to ON.



(A) Power switch

7) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.

8) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.

9) Press the [YES] key after the information of engine type is displayed.

10) On the «Engine Diagnosis» display screen, select the {System Operation Check Mode} and press the [YES] key.

11) On the «System Operation Check Mode» display screen, select the {Actuator ON/OFF Operation} and press the [YES] key.

12) Select the desired compulsory actuator on the «Actuator ON/OFF Operation» display screen and press the [YES] key.

13) Pressing the [NO] key completes the compulsory operation check mode. The display will then return to the «Actuator ON/OFF Operation» screen.

- A list of support data is shown in the following table.

Compulsory Valve Operation Check Mode

ENGINE (DIAGNOSTICS)

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 pressure control solenoid valve operation check	PCV Solenoid Valve
Compulsory drain valve operation check	Vent. Solenoid Valve
Compulsory turbocharger waste-gate solenoid operation check	Turbocharger Waste-gate Solenoid
Compulsory secondary air combi valve 1 operation check	Secondary Air Combi Valve 1
Compulsory secondary air combi valve 2 operation check	Secondary Air Combi Valve 2
Compulsory air pump relay operation check	Secondary Air Pump Relay

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
FICD Solenoid
Pressure Switching Sol. 1
Pressure Switching Sol. 2
AAI Solenoid Valve
Tank Sensor Cntl Valve
Emission-bypass valve permission flag

- For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

15. Malfunction Indicator Light

A: PROCEDURE

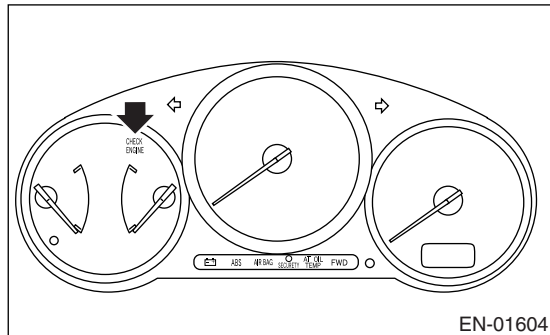
1. Activation of check malfunction indicator light. <Ref. to EN(H4DOTC)(diag)-53, ACTIVATION OF MALFUNCTION INDICATOR LIGHT, Malfunction Indicator Light.>
↓
2. Check that the malfunction indicator light does not come on. <Ref. to EN(H4DOTC)(diag)-55, MALFUNCTION INDICATOR LIGHT DOES NOT COME ON, Malfunction Indicator Light.>
↓
3. Check that the malfunction indicator light does not go off. <Ref. to EN(H4DOTC)(diag)-57, MALFUNCTION INDICATOR LIGHT DOES NOT GO OFF., Malfunction Indicator Light.>
↓
4. Check that the malfunction indicator light does not blink at a cycle of 3 Hz. <Ref. to EN(H4DOTC)(diag)-58, MALFUNCTION INDICATOR LIGHT DOES NOT BLINK AT A CYCLE OF 3 HZ., Malfunction Indicator Light.>
↓
5. Check that the malfunction indicator light remains blinking at a cycle of 3 Hz. <Ref. to EN(H4DOTC)(diag)-60, MALFUNCTION INDICATOR LIGHT REMAINS BLINKING AT A CYCLE OF 3 HZ., Malfunction Indicator Light.>

B: ACTIVATION OF MALFUNCTION INDICATOR LIGHT

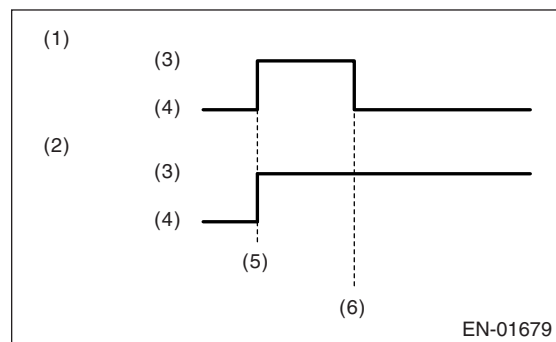
1) When the ignition switch is turned to ON (engine off), the malfunction indicator light in the combination meter illuminates.

NOTE:

If the malfunction indicator light does not illuminate, perform diagnostics of the malfunction indicator light circuit or the combination meter circuit. <Ref. to EN(H4DOTC)(diag)-55, MALFUNCTION INDICATOR LIGHT DOES NOT COME ON, Malfunction Indicator Light.>



2) After starting the engine, the malfunction indicator light goes out. If it does not, either the engine or the emission control system is malfunctioning.

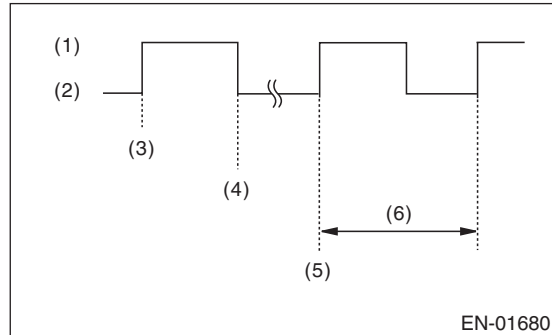


- (1) No trouble
- (2) Trouble occurs
- (3) ON
- (4) OFF
- (5) Ignition switch ON
- (6) Engine start

Malfunction Indicator Light

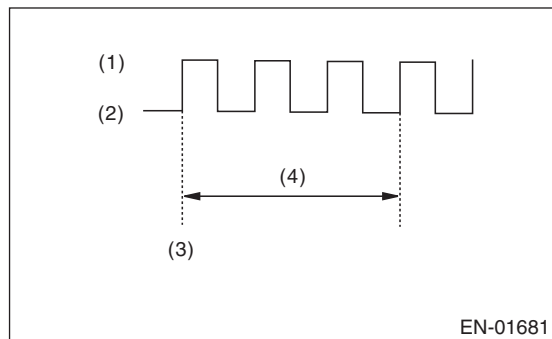
ENGINE (DIAGNOSTICS)

3) If the diagnosis system senses a misfire which could damage the catalyzer, the malfunction indicator light will blink at a cycle of 1 Hz.



- (1) ON
- (2) OFF
- (3) Ignition switch ON
- (4) Engine start
- (5) Misfire start
- (6) 1 second

4) When the ignition switch is turned to ON (engine off) or to START with the test mode connector connected, the malfunction indicator light blinks at a cycle of 3 Hz.



- (1) ON
- (2) OFF
- (3) Ignition switch ON
- (4) 1 second

C: MALFUNCTION INDICATOR LIGHT DOES NOT COME ON

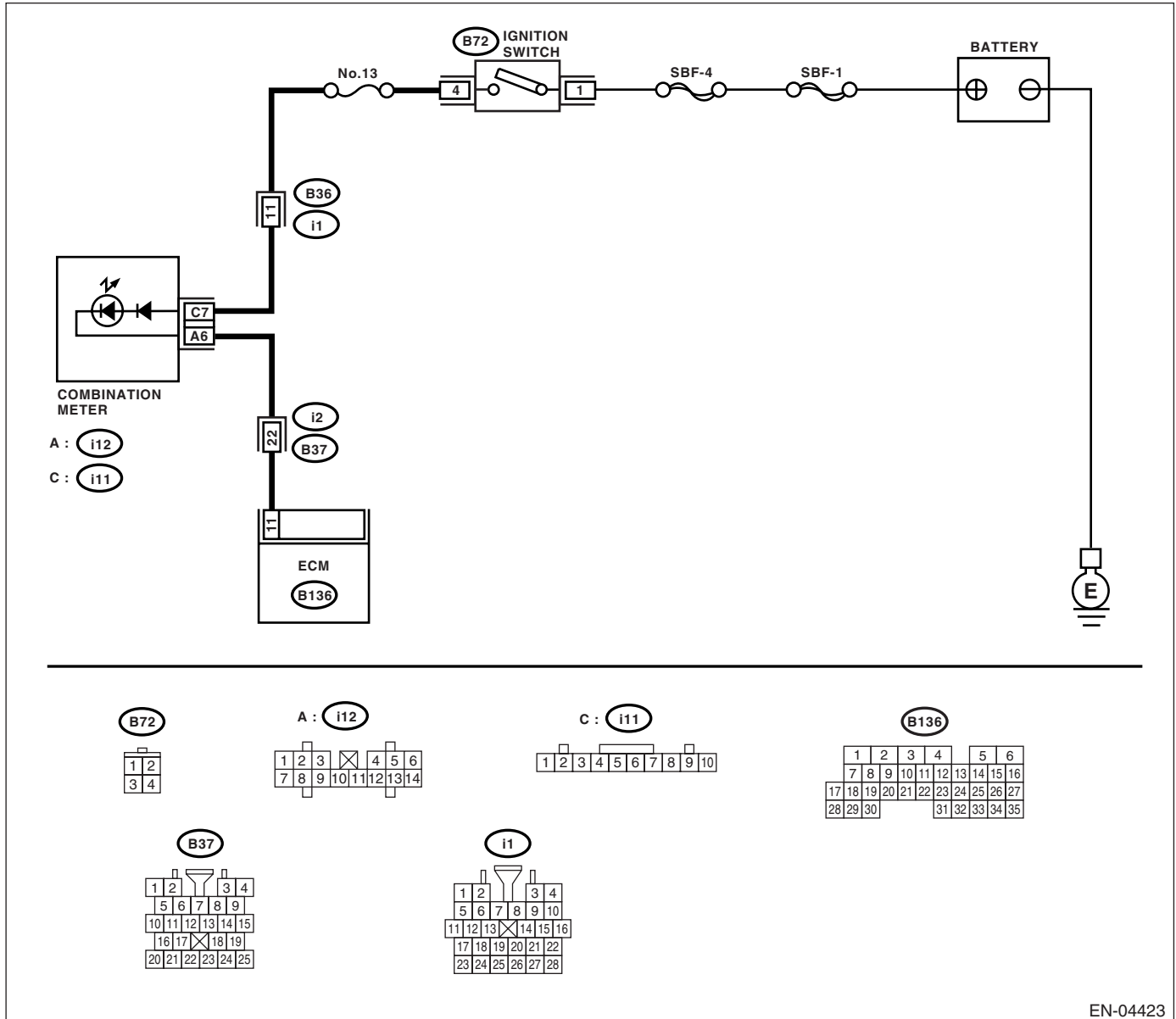
DIAGNOSIS:

The malfunction indicator light circuit is shorted.

TROUBLE SYMPTOM:

When the ignition switch is turned to ON (engine OFF), malfunction indicator light does not come on.

WIRING DIAGRAM:



EN-04423

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 (B136) No. 11 (+) — Chassis ground (-):	Go to step 4.	Go to step 2.
2	CHECK POOR CONTACT. Does the malfunction indicator light come on when shaking or pulling ECM connector and harness?	Repair the poor contact in ECM connector.	Go to step 3.

Malfunction Indicator Light

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
3 CHECK ECM CONNECTOR.	Is the ECM connector correctly connected?	Replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (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-10, Combination Meter.> 3) Disconnect the connector from ECM and combination meter. 4) Measure the resistance of harness between ECM and combination meter connector. Connector & terminal (B136) 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: • 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 (i11) No. 7 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Replace the combination meter circuit board. <Ref. to IDI-10, Combination Meter.>	Check the following and repair if necessary. NOTE: • Blown out fuse (No. 13) • Open or short circuit in harness between fuse (No. 13) and battery terminal • Poor contact in ignition switch connector

D: MALFUNCTION INDICATOR LIGHT DOES NOT GO OFF.

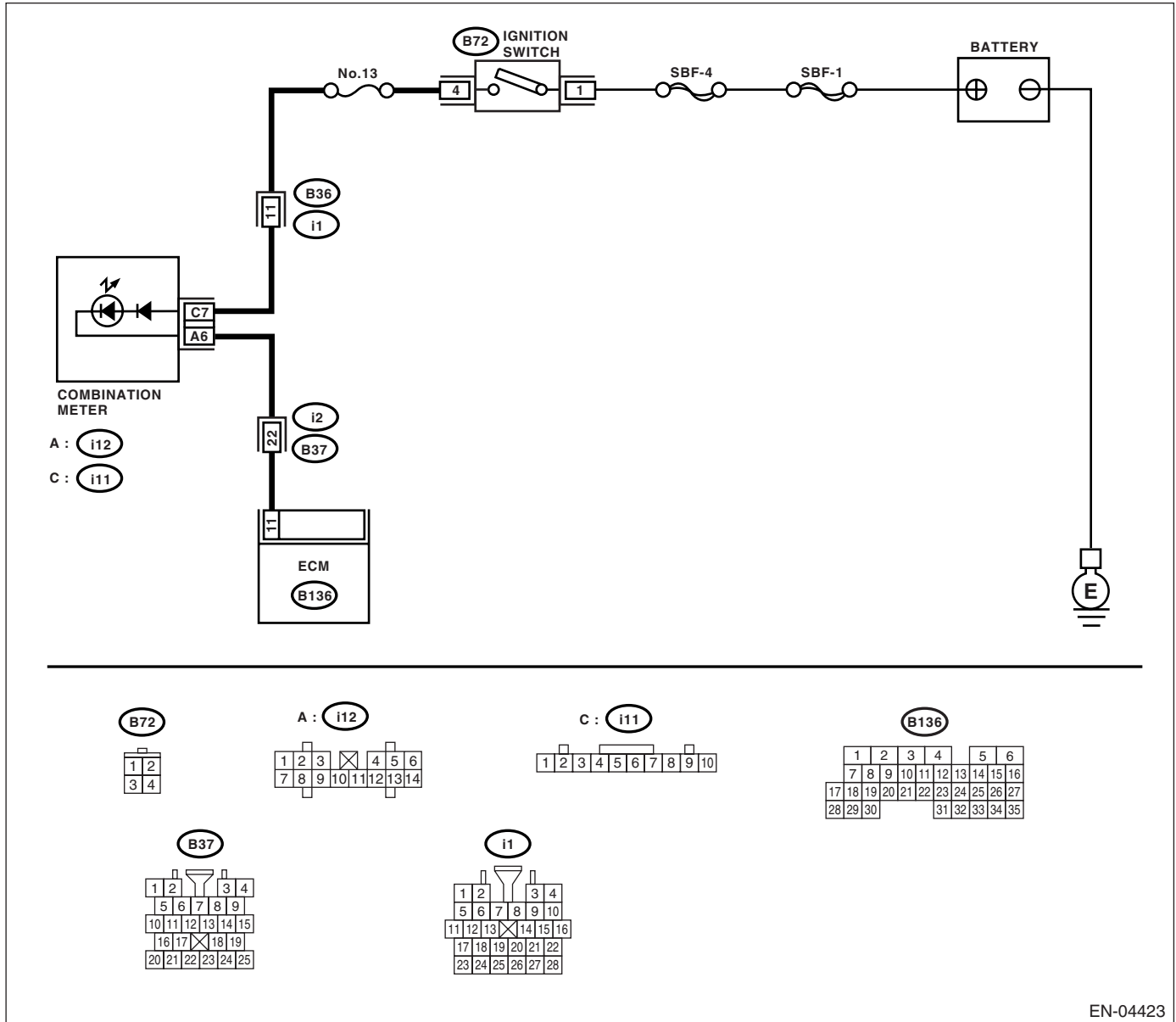
DIAGNOSIS:

The malfunction indicator light circuit is shorted.

TROUBLE SYMPTOM:

Although malfunction indicator light comes on when engine runs, but DTC is not shown on Subaru Select Monitor or general scan tool display.

WIRING DIAGRAM:



EN-04423

Step	Check	Yes	No
1	CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR. - Turn the ignition switch to OFF. - Disconnect the connector from ECM. - Turn the ignition switch to ON.	Does the malfunction indicator light come on? Repair the short circuit in harness between combination meter and ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>

Malfunction Indicator Light

ENGINE (DIAGNOSTICS)

E: MALFUNCTION INDICATOR LIGHT DOES NOT BLINK AT A CYCLE OF 3 Hz.

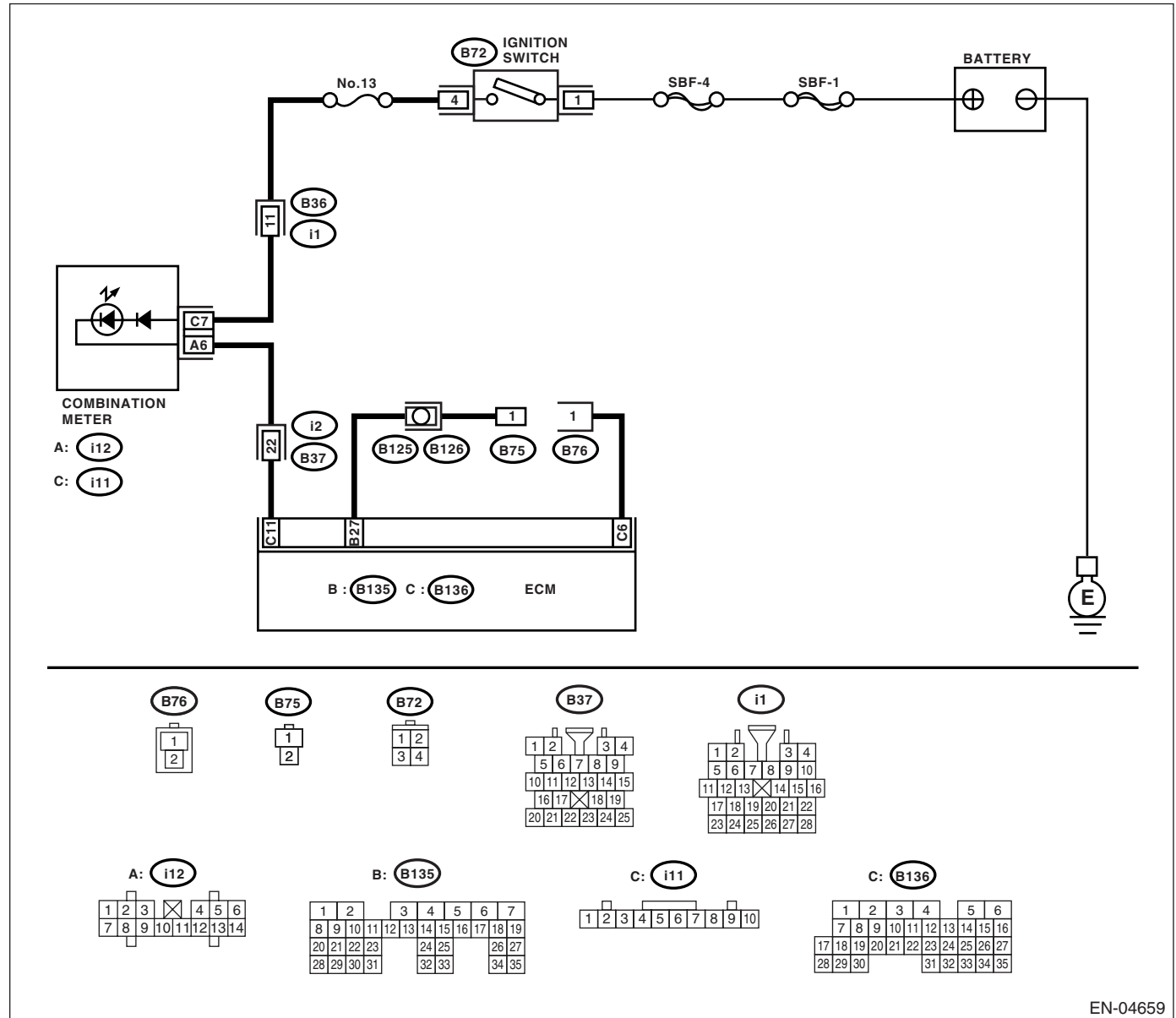
DIAGNOSIS:

- The malfunction indicator light circuit is open or shorted.
- Test mode connector circuit is open.

TROUBLE SYMPTOM:

During inspection mode, malfunction indicator light does not blink at a cycle of 3 Hz.

WIRING DIAGRAM:



EN-04659

Malfunction Indicator Light

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK STATUS OF MALFUNCTION INDICATOR LIGHT. 1) Turn the ignition switch to OFF. 2) Disconnect the test mode connector. 3) Turn the ignition switch to ON. (engine OFF)	Does the malfunction indicator light come on?	Go to step 2.	Repair the malfunction indicator light circuit. <Ref. to EN(H4DOTC)(diag)-55, MALFUNCTION INDICATOR LIGHT DOES NOT COME ON, Malfunction Indicator Light.>
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 malfunction indicator light 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 ECM. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between test mode connector and ECM. <i>Connector & terminal (B76) No. 1 — (B136) No. 6:</i>	Is the resistance less than 1 Ω ?	Go to step 4.	Repair the open circuit in harness between test mode connector and ECM.
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. Measure the resistance of harness between ECM and test mode connector. <i>Connector & terminal (B135) No. 27 — (B75) No. 1:</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(H4DOTC)-45, Engine Control Module (ECM).>

Malfunction Indicator Light

ENGINE (DIAGNOSTICS)

F: MALFUNCTION INDICATOR LIGHT REMAINS BLINKING AT A CYCLE OF 3 Hz.

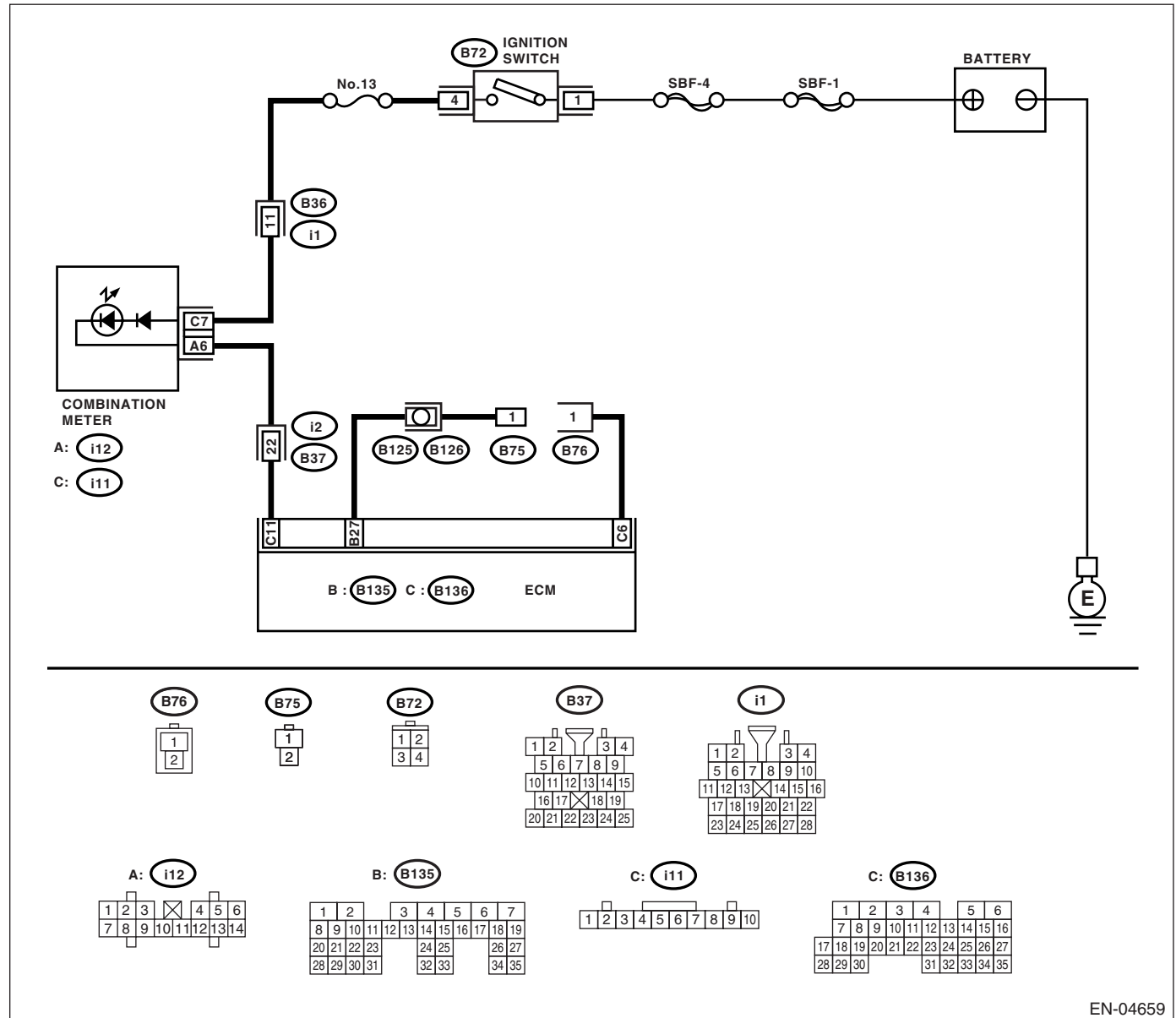
DIAGNOSIS:

Test mode connector circuit is shorted.

TROUBLE SYMPTOM:

Malfunction indicator light blinks at a cycle of 3 Hz when ignition switch is turned to ON.

WIRING DIAGRAM:



EN-04659

Step	Check	Yes	No
1 CHECK TEST MODE CONNECTOR. 1) Disconnect the test mode connector. 2) Turn the ignition switch to ON.	Does the malfunction indicator light blink?	Go to step 2.	System is in good order. NOTE: Malfunction indicator light blinks at a cycle of 3 Hz when test mode connector is connected.

Malfunction Indicator Light

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
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. 27 — 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(H4DOTC)-45, Engine Control Module (ECM).>

Diagnostics for Engine Starting Failure

ENGINE (DIAGNOSTICS)

16.Diagnostics for Engine Starting Failure

A: PROCEDURE

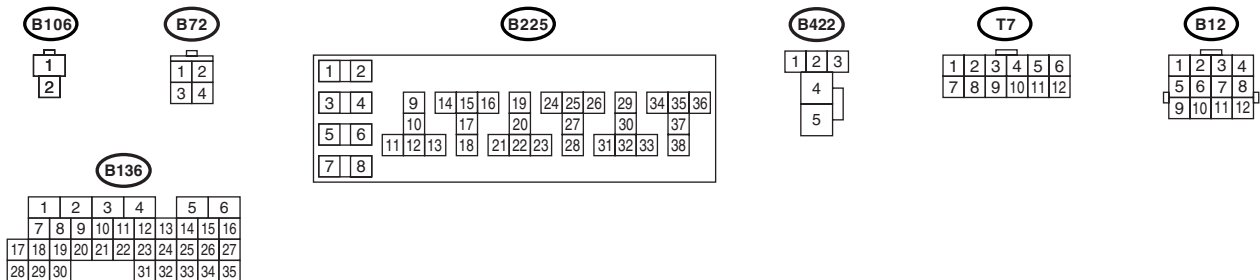
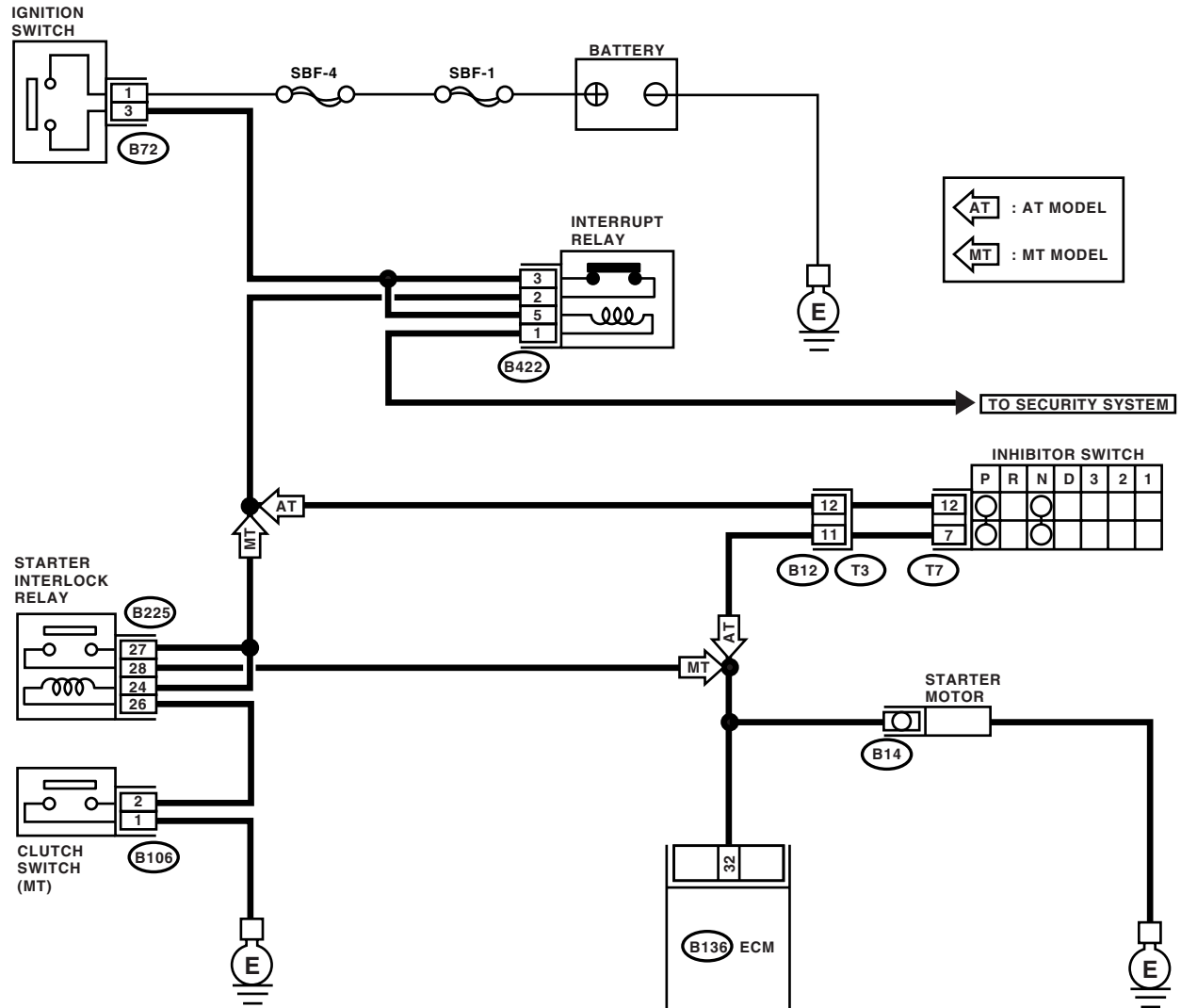
1. Check the fuel level.
↓
2. Inspection of starter motor circuit. <Ref. to EN(H4DOTC)(diag)-63, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
3. Inspection of ECM power supply and ground line. <Ref. to EN(H4DOTC)(diag)-66, CHECK POWER SUPPLY AND GROUND LINE OF ENGINE CONTROL MODULE (ECM), Diagnostics for Engine Starting Failure.>
↓
4. Inspection of ignition control system. <Ref. to EN(H4DOTC)(diag)-68, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>
↓
5. Inspection of fuel pump circuit. <Ref. to EN(H4DOTC)(diag)-71, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
6. Inspection of fuel injector circuit. <Ref. to EN(H4DOTC)(diag)-72, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

B: STARTER MOTOR CIRCUIT

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Diagnostics for Engine Starting Failure

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK BATTERY. Check the battery voltage.	Is the voltage more than 12 V?	Go to step 2.	Charge or replace the battery.
2 CHECK OPERATION OF STARTER MOTOR.	Does the starter motor operate?	Go to step 3.	Go to step 4.
3 CHECK DTC.	Is the DTC displayed? <Ref. to EN(H4DOTC)(diag)-39, OPERATION, Read Diagnostic Trouble Code (DTC).>	Using the List of Diagnostic Trouble Code (DTC), check the appropriate DTC. <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).>	Repair the poor contact in ECM connector.
4 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 model, move the select lever to "P" or "N" range. • On MT model, depress the clutch pedal.	Is the voltage more than 10 V?	Check the starter motor. <Ref. to SC(H4SO)-8, Starter.>	Go to step 5.
5 CHECK HARNESS BETWEEN BATTERY AND IGNITION SWITCH CONNECTOR. 1) Disconnect the connector from ignition switch. 2) Measure the power supply voltage between ignition switch connector and chassis ground. Connector & terminal (B72) No. 1 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 6.	Check the following, repair if necessary. • Blown out fuse • Open circuit in harness between ignition switch and battery
6 CHECK IGNITION SWITCH. 1) Disconnect the connector from ignition switch. 2) Measure the resistance between ignition switch terminals while turning ignition switch to START. Terminals No. 1 — No. 3:	Is the resistance less than 5 Ω ?	Go to step 7.	Replace the ignition switch.
7 CHECK TRANSMISSION TYPE.	Is the transmission AT?	Go to step 8.	Go to step 10.
8 CHECK INPUT VOLTAGE OF INHIBITOR SWITCH. 1) Turn ignition switch to OFF. 2) Disconnect the connector from inhibitor switch. 3) Connect the connector to ignition switch. 4) Measure the input voltage between inhibitor switch connector terminal and engine ground while turning ignition switch to START. Connector & terminal (B12) No. 12 (+) — Engine ground (-):	Is the voltage more than 10 V?	Go to step 9.	Repair open or short circuit to ground in harness between inhibitor switch and ignition switch. NOTE: Check security system. <Ref. to SL-21, Security System.>

Diagnostics for Engine Starting Failure

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
9 CHECK INHIBITOR SWITCH. 1) Move the selector lever to "P" or "N" range. 2) Measure the resistance between inhibitor switch terminals. Connector & terminal (T3) No. 11 — No. 12:	Is the resistance less than 1 Ω ?	Repair open or short circuit to ground in harness between inhibitor switch and starter motor.	Replace the inhibitor switch. <Ref. to 4AT-48, Inhibitor Switch.>
10 CHECK INPUT VOLTAGE OF STARTER INTERLOCK RELAY. 1) Turn ignition switch to OFF. 2) Disconnect the connector from starter interlock relay. 3) Connect the connector to ignition switch. 4) Measure the input voltage between starter interlock relay connector and chassis ground while turning ignition switch to START. Connector & terminal (B225) No. 27 (+) — Chassis ground (-): (B225) No. 24 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 11.	Repair open or short circuit to ground in harness between starter interlock relay and ignition switch. NOTE: Check security system. <Ref. to SL-21, Security System.>
11 CHECK STARTER INTERLOCK RELAY. 1) Connect the battery to starter interlock relay terminals No. 26 and No. 24. 2) Measure the resistance between starter interlock relay terminals. Terminals No. 27 — No. 28:	Is the resistance less than 1 Ω ?	Go to step 12.	Replace the starter interlock relay.
12 CHECK GROUND CIRCUIT OF CLUTCH SWITCH. 1) Disconnect the connector from clutch switch. 2) Measure the resistance between clutch switch connector and chassis ground. Connector & terminal (B106) No. 1 — Chassis ground:	Is the resistance less than 5 Ω ?	Go to step 13.	Repair open circuit of ground cable.
13 CHECK CLUTCH SWITCH. Measure the resistance between clutch switch terminals while depressing the clutch pedal. Terminals No. 1 — No. 2:	Is the resistance less than 1 Ω ?	Go to step 14.	Replace the clutch switch. <Ref. to CL-36, Clutch Switch.>
14 CHECK CLUTCH SWITCH CIRCUIT. 1) Connect the connector to clutch switch. 2) Measure the resistance between starter interlock relay connector and chassis ground while depressing the clutch pedal. Connector & terminal (B225) No. 26 — Chassis ground:	Is the resistance less than 1 Ω ?	Repair short circuit to ground in harness between starter interlock relay and starter motor.	Repair open circuit in harness between starter interlock relay and clutch switch.

Diagnostics for Engine Starting Failure

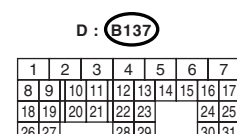
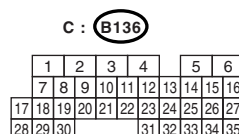
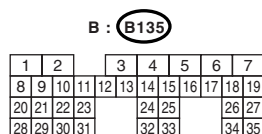
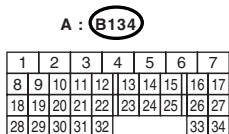
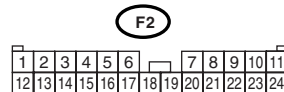
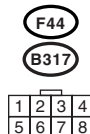
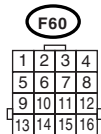
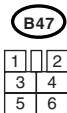
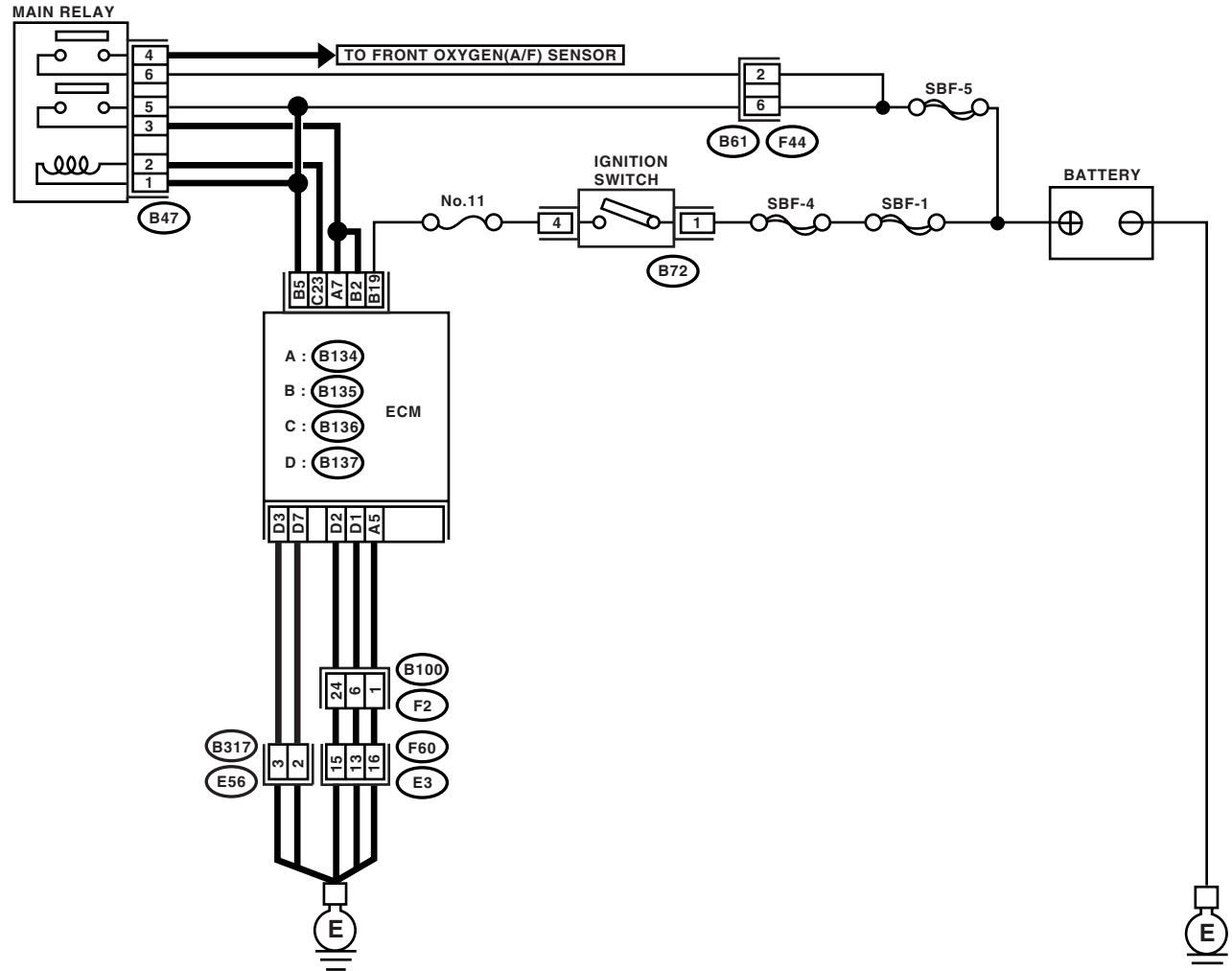
ENGINE (DIAGNOSTICS)

C: CHECK POWER SUPPLY AND GROUND LINE OF ENGINE CONTROL MODULE (ECM)

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04702

Diagnostics for Engine Starting Failure

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK MAIN RELAY. 1) Turn the ignition switch to OFF. 2) Remove the main relay. 3) Using a lead wire, connect the positive terminal of battery to main relay terminal No. 1, and ground terminal of battery to terminal 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.
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 (B134) No. 5 — Chassis ground: (B137) No. 1 — Chassis ground: (B137) No. 2 — Chassis ground: (B137) No. 3 — Chassis ground: (B137) No. 7 — Chassis 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 INPUT VOLTAGE OF ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 5 (+) — Chassis ground (-): (B135) No. 19 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 4.	Repair the open or ground short circuit of power supply circuit.
4 CHECK INPUT VOLTAGE OF MAIN RELAY. Measure the voltage between main relay connector and chassis ground. Connector & terminal (B47) No. 1 (+) — Chassis ground (-): (B47) No. 5 (+) — Chassis ground (-): (B47) No. 6 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 5.	Repair the open or ground short circuit in harness of power supply circuit.
5 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 (B134) No. 7 (+) — Chassis ground (-): (B135) No. 2 (+) — Chassis ground (-): (B136) No. 23 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Check the ignition control system. <Ref. to EN(H4DOTC)(diag)-68, 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

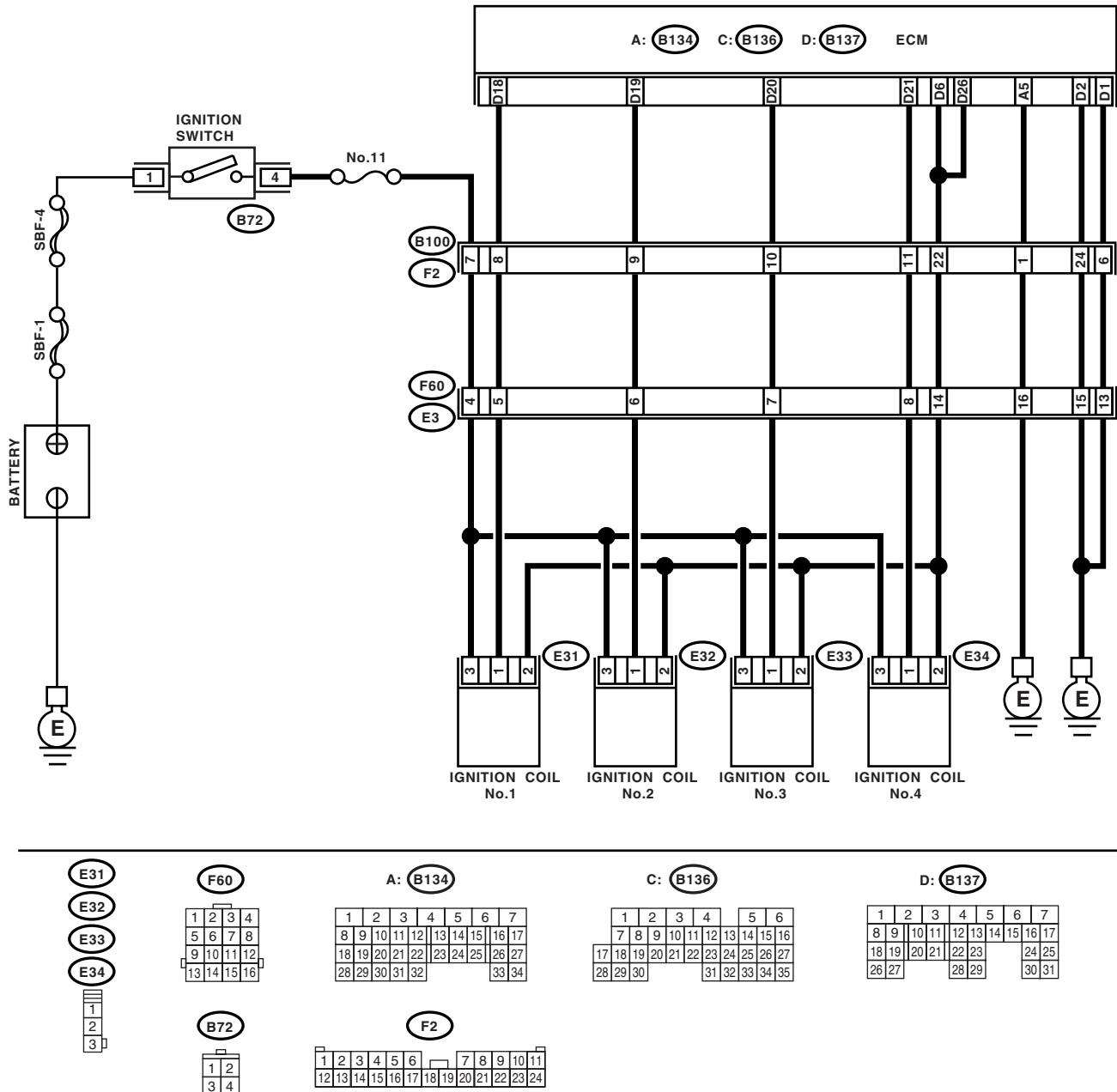
ENGINE (DIAGNOSTICS)

D: IGNITION CONTROL SYSTEM

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04703

Diagnostics for Engine Starting Failure

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK SPARK PLUG CONDITION. 1) Remove the spark plug. <Ref. to IG(H4DOTC)-4, INSTALLATION, Spark Plug.> 2) Check the spark plug condition. <Ref. to IG(H4DOTC)-5, 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 and ignitor assembly. 2) Release the fuel pressure. <Ref. to FU(H4DOTC)-50, RELEASING OF FUEL PRESSURE, PROCEDURE, 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(H4DOTC)(diag)-71, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>	Go to step 3.
3 CHECK POWER SUPPLY CIRCUIT FOR IGNITION COIL AND IGNITOR ASSEMBLY. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ignition coil and ignitor assembly. 3) Turn the ignition switch to ON. 4) Measure the power supply voltage between ignition coil and ignitor assembly connector and engine ground. Connector & terminal (E31) No. 3 (+) — Engine ground (-): (E32) No. 3 (+) — Engine ground (-): (E33) No. 3 (+) — Engine ground (-): (E34) No. 3 (+) — Engine ground (-):	Is the voltage more than 10 V?	Go to step 4.	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ignition coil and ignitor assembly, and ignition switch connector • Poor contact in coupling connectors
4 CHECK HARNESS OF IGNITION COIL AND IGNITOR ASSEMBLY GROUND CIRCUIT. 1) Turn the ignition switch to OFF. 2) Measure the resistance between ignition coil and ignitor assembly connector and engine ground. Connector & terminal (E31) No. 2 — Engine ground: (E32) No. 2 — Engine ground: (E33) No. 2 — Engine ground: (E34) No. 2 — Engine ground:	Is the resistance 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 ignition coil and ignitor assembly connector and engine grounding terminal
5 CHECK HARNESS BETWEEN ECM AND IGNITION COIL AND IGNITOR ASSEMBLY CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from ignition coil and ignitor assembly. 4) Measure the resistance of harness between ECM and ignition coil and ignitor assembly connector. Connector & terminal (B137) No. 18 — (E31) No. 1: (B137) No. 19 — (E32) No. 1: (B137) No. 20 — (E33) No. 1: (B137) No. 21 — (E34) No. 1:	Is the resistance less than 1 Ω ?	Go to step 6.	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and ignition coil and ignitor assembly connector • Poor contact in coupling connector

Diagnostics for Engine Starting Failure

ENGINE (DIAGNOSTICS)

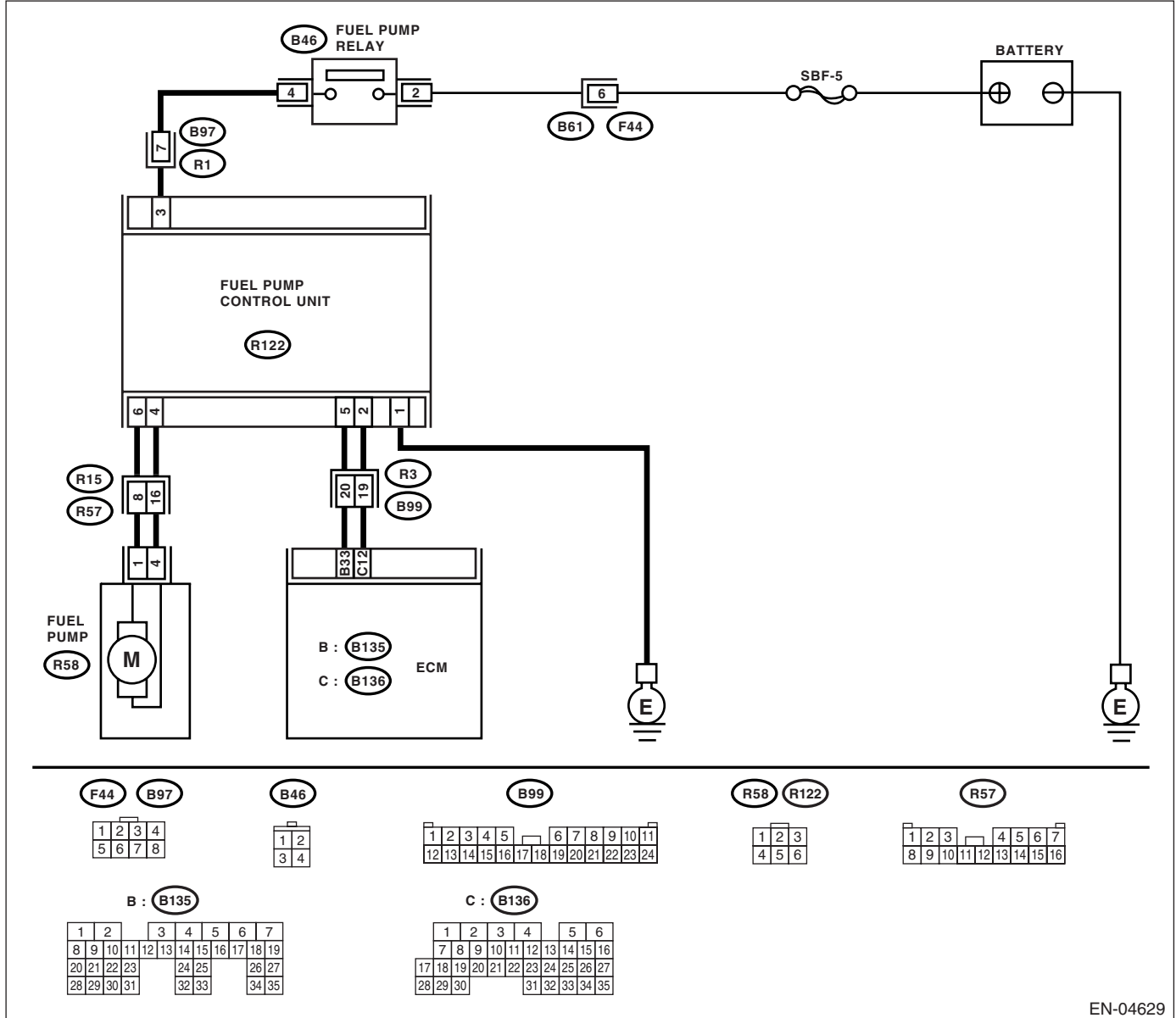
Step	Check	Yes	No
6 CHECK HARNESS BETWEEN ECM AND IGNITION COIL AND IGNITOR ASSEMBLY CONNECTOR. Measure the resistance of harness between ECM and engine ground. <i>Connector & terminal:</i> <i>(B137) No. 18 — Engine ground:</i> <i>(B137) No. 19 — Engine ground:</i> <i>(B137) No. 20 — Engine ground:</i> <i>(B137) No. 21 — Engine ground:</i>	Is the resistance more than 1 MΩ?	Go to step 7.	Repair the ground short circuit in harness between ECM and ignition coil and ignitor assembly connector.
7 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 ignition coil and ignitor assembly.

E: FUEL PUMP CIRCUIT

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04629

Step	Check	Yes	No
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 check can be executed using the Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-51, Compulsory Valve Operation Check Mode.>	Does the fuel pump produce "operating" sound?	Check the fuel injector circuit. <Ref. to EN(H4DOTC)(diag)-72, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>	Display the DTC. <Ref. to EN(H4DOTC)(diag)-39, OPERATION, Read Diagnostic Trouble Code (DTC).>

Diagnostics for Engine Starting Failure

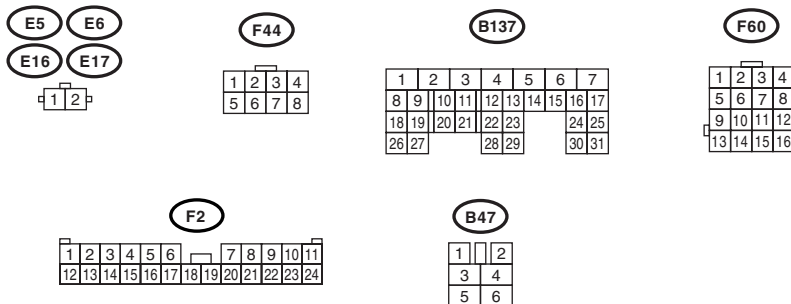
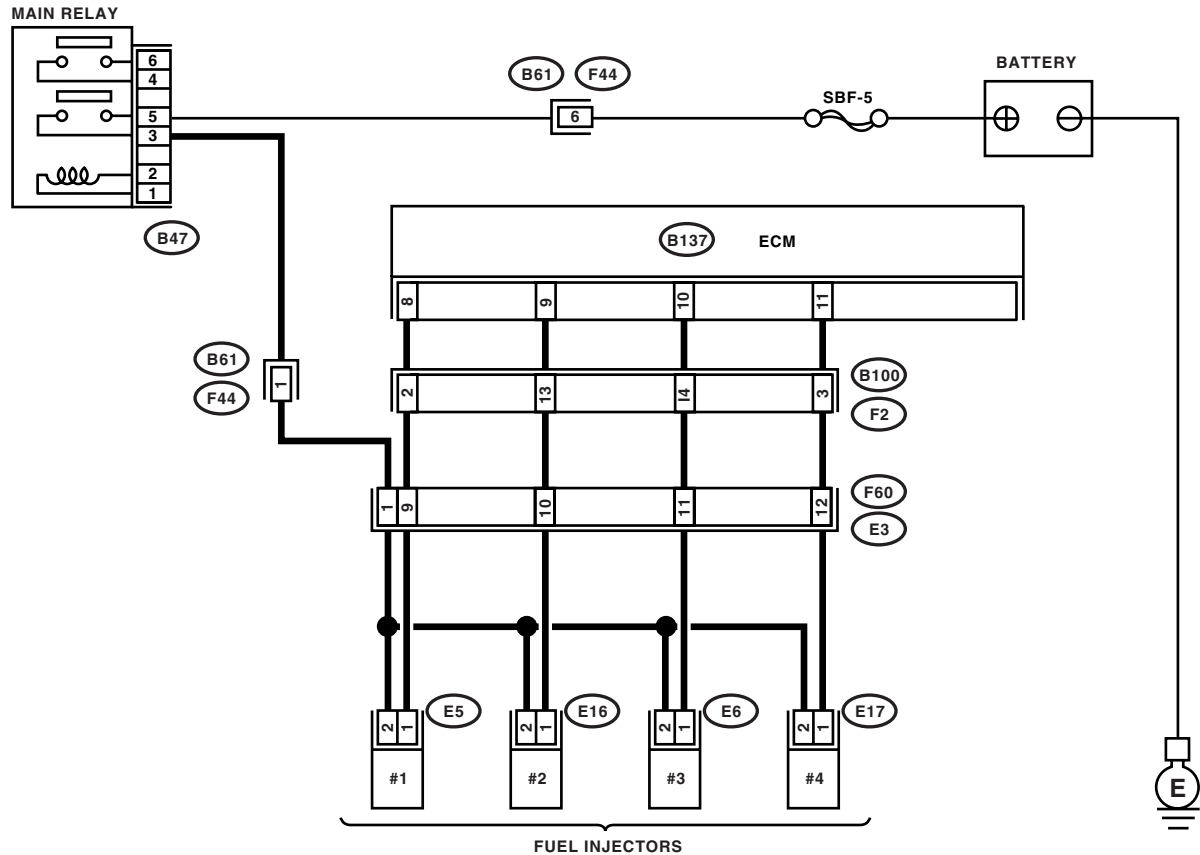
ENGINE (DIAGNOSTICS)

F: FUEL INJECTOR CIRCUIT

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04209

Diagnostics for Engine Starting Failure

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OPERATION OF EACH FUEL INJECTOR. While cranking the engine, check that each fuel injector emits "operating" sound. Use a sound scope or attach a screwdriver to injector for this check.	Does the fuel injector emit "operating" sound?	Check the fuel pressure. <Ref. to ME(H4DOTC)-28, INSPECTION, Fuel Pressure.>	Go to step 2.
2 CHECK POWER SUPPLY TO EACH FUEL INJECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel injector. 3) Turn the ignition switch to ON. 4) Measure the power supply voltage between the fuel injector terminal and engine ground. Connector & terminal <i>#1 (E5) No. 2 (+) — Engine ground (-):</i> <i>#2 (E16) No. 2 (+) — Engine ground (-):</i> <i>#3 (E6) No. 2 (+) — Engine ground (-):</i> <i>#4 (E17) 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: • Open circuit in harness between main relay and fuel injector connector • Poor contact in main relay connector • Poor contact in coupling connector • Poor contact in fuel injector connector
3 CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR. 1) Disconnect the connector from ECM. 2) Measure the resistance of harness between ECM and fuel injector connector. Connector & terminal <i>(B137) No. 8 — (E5) No. 1:</i> <i>(B137) No. 9 — (E16) No. 1:</i> <i>(B137) No. 10 — (E6) No. 1:</i> <i>(B137) No. 11 — (E17) 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: • Open circuit in harness between ECM and fuel injector connector • Poor contact in coupling connector
4 CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR. Measure the resistance of harness between ECM and fuel injector connector. Connector & terminal <i>(B137) No. 8 — Chassis ground:</i> <i>(B137) No. 9 — Chassis ground:</i> <i>(B137) No. 10 — Chassis ground:</i> <i>(B137) No. 11 — 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 5.
5 CHECK EACH FUEL INJECTOR. 1) Turn the ignition switch to OFF. 2) Measure the resistance between each fuel injector terminals. Terminals <i>No. 1 — No. 2:</i>	Is the resistance 5 — 20 Ω ?	Go to step 6.	Replace the faulty fuel injector.
6 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(H4DOTC)(diag)-394, INSPECTION, General Diagnostic Table.>

List of Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

17. List of Diagnostic Trouble Code (DTC)

A: LIST

DTC	Item	Index
P0011	Intake Camshaft Position - Timing Over-advanced or System Performance (Bank 1)	<Ref. to EN(H4DOTC)(diag)-82, DTC P0011 INTAKE CAMSHAFT POSITION-TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0016	Crankshaft Position - Camshaft Position Correlation (Bank 1)	<Ref. to EN(H4DOTC)(diag)-83, DTC P0016 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0018	Crankshaft Position - Camshaft Position Correlation (Bank 2)	<Ref. to EN(H4DOTC)(diag)-84, DTC P0018 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0021	Intake Camshaft Position - Timing Over-advanced or System Performance (Bank 2)	<Ref. to EN(H4DOTC)(diag)-85, DTC P0021 INTAKE CAMSHAFT POSITION-TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0030	HO2S Heater Control Circuit (Bank 1 Sensor 1)	<Ref. to EN(H4DOTC)(diag)-86, DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0031	HO2S Heater Control Circuit Low (Bank 1 Sensor 1)	<Ref. to EN(H4DOTC)(diag)-88, DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0032	HO2S Heater Control Circuit High (Bank 1 Sensor 1)	<Ref. to EN(H4DOTC)(diag)-91, DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0037	HO2S Heater Control Circuit Low (Bank 1 Sensor 2)	<Ref. to EN(H4DOTC)(diag)-93, DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0038	HO2S Heater Control Circuit High (Bank 1 Sensor 2)	<Ref. to EN(H4DOTC)(diag)-96, DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0068	Manifold Absolute Pressure/Barometric Pressure Circuit Range/Performance	<Ref. to EN(H4DOTC)(diag)-98, DTC P0068 MANIFOLD PRESSURE SENSOR RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0101	Mass or Volume Air Flow Circuit Range/Performance	<Ref. to EN(H4DOTC)(diag)-100, DTC P0101 MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0102	Mass or Volume Air Flow Circuit Low Input	<Ref. to EN(H4DOTC)(diag)-102, DTC P0102 MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0103	Mass or Volume Air Flow Circuit High Input	<Ref. to EN(H4DOTC)(diag)-105, DTC P0103 MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0107	Manifold Absolute Pressure/Barometric Pressure Circuit Low Input	<Ref. to EN(H4DOTC)(diag)-107, DTC P0107 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0108	Manifold Absolute Pressure/Barometric Pressure Circuit High Input	<Ref. to EN(H4DOTC)(diag)-109, DTC P0108 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0111	Intake Air Temperature Circuit Range/Performance	<Ref. to EN(H4DOTC)(diag)-111, DTC P0111 INTAKE AIR TEMPERATURE CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0112	Intake Air Temperature Circuit Low Input	<Ref. to EN(H4DOTC)(diag)-113, DTC P0112 INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0113	Intake Air Temperature Circuit High Input	<Ref. to EN(H4DOTC)(diag)-115, DTC P0113 INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

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P0117	Engine Coolant Temperature Circuit Low Input	<Ref. to EN(H4DOTC)(diag)-118, DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0118	Engine Coolant Temperature Circuit High Input	<Ref. to EN(H4DOTC)(diag)-120, DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0122	Throttle/Pedal Position Sensor/Switch "A" Circuit Low Input	<Ref. to EN(H4DOTC)(diag)-123, DTC P0122 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0123	Throttle/Pedal Position Sensor/Switch "A" Circuit High Input	<Ref. to EN(H4DOTC)(diag)-126, DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0125	Insufficient Coolant Temperature for Closed Loop Fuel Control	<Ref. to EN(H4DOTC)(diag)-129, DTC P0125 INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0126	Insufficient Coolant Temperature for Stable Operation	<Ref. to EN(H4DOTC)(diag)-131, DTC P0126 INSUFFICIENT COOLANT TEMPERATURE FOR STABLE OPERATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0128	Coolant Thermostat (Coolant Temperature Below Thermostat Regulating Temperature)	<Ref. to EN(H4DOTC)(diag)-133, DTC P0128 COOLANT THERMOSTAT (COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0131	O ₂ Sensor Circuit Low Voltage (Bank 1 Sensor 1)	<Ref. to EN(H4DOTC)(diag)-134, DTC P0131 O ₂ SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0132	O ₂ Sensor Circuit High Voltage (Bank 1 Sensor 1)	<Ref. to EN(H4DOTC)(diag)-136, DTC P0132 O ₂ SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0133	O ₂ Sensor Circuit Slow Response (Bank 1 Sensor 1)	<Ref. to EN(H4DOTC)(diag)-138, DTC P0133 O ₂ SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0134	O ₂ Sensor Circuit No Activity Detected (Bank 1 Sensor 1)	<Ref. to EN(H4DOTC)(diag)-140, DTC P0134 O ₂ SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0137	O ₂ Sensor Circuit Low Voltage (Bank 1 Sensor 2)	<Ref. to EN(H4DOTC)(diag)-142, DTC P0137 O ₂ SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0138	O ₂ Sensor Circuit High Voltage (Bank 1 Sensor 2)	<Ref. to EN(H4DOTC)(diag)-145, DTC P0138 O ₂ SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0139	O ₂ Sensor Circuit Slow Response (Bank 1 Sensor 2)	<Ref. to EN(H4DOTC)(diag)-148, DTC P0139 O ₂ SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0140	O ₂ Sensor Circuit No Activity Detected (Bank 1 Sensor 2)	<Ref. to EN(H4DOTC)(diag)-150, DTC P0140 O ₂ SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0171	System Too Lean (Bank 1)	<Ref. to EN(H4DOTC)(diag)-152, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0172	System Too Rich (Bank 1)	<Ref. to EN(H4DOTC)(diag)-153, DTC P0172 SYSTEM TOO RICH (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0181	Fuel Temperature Sensor "A" Circuit Range/Performance	<Ref. to EN(H4DOTC)(diag)-155, DTC P0181 FUEL TEMPERATURE SENSOR "A" CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0182	Fuel Temperature Sensor "A" Circuit Low Input	<Ref. to EN(H4DOTC)(diag)-157, DTC P0182 FUEL TEMPERATURE SENSOR "A" CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

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P0183	Fuel Temperature Sensor "A" Circuit High Input	<Ref. to EN(H4DOTC)(diag)-159, DTC P0183 FUEL TEMPERATURE SENSOR "A" CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0222	Throttle/Pedal Position Sensor/Switch "B" Circuit Low	<Ref. to EN(H4DOTC)(diag)-162, DTC P0222 THROTTLE/PEDAL POSITION SENSOR/SWITCH "B" CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0223	Throttle/Pedal Position Sensor/Switch "B" Circuit High	<Ref. to EN(H4DOTC)(diag)-165, DTC P0223 THROTTLE/PEDAL POSITION SENSOR/SWITCH "B" CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0230	Fuel Pump Primary Circuit	<Ref. to EN(H4DOTC)(diag)-169, DTC P0230 FUEL PUMP PRIMARY CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0244	Turbo/Super Charger Wastegate Solenoid "A" Range/Performance	<Ref. to EN(H4DOTC)(diag)-172, DTC P0244 TURBO/SUPER CHARGER WASTEGATE SOLENOID "A" RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0245	Turbo/Super Charger Wastegate Solenoid "A" Low	<Ref. to EN(H4DOTC)(diag)-174, DTC P0245 TURBO/SUPER CHARGER WASTEGATE SOLENOID "A" LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0246	Turbo/Super Charger Wastegate Solenoid "A" High	<Ref. to EN(H4DOTC)(diag)-176, DTC P0246 TURBO/SUPER CHARGER WASTEGATE SOLENOID "A" HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0301	Cylinder 1 Misfire Detected	<Ref. to EN(H4DOTC)(diag)-178, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0302	Cylinder 2 Misfire Detected	<Ref. to EN(H4DOTC)(diag)-178, DTC P0302 CYLINDER 2 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0303	Cylinder 3 Misfire Detected	<Ref. to EN(H4DOTC)(diag)-178, DTC P0303 CYLINDER 3 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0304	Cylinder 4 Misfire Detected	<Ref. to EN(H4DOTC)(diag)-178, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0327	Knock Sensor 1 Circuit Low Input (Bank 1 or Single Sensor)	<Ref. to EN(H4DOTC)(diag)-183, DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0328	Knock Sensor 1 Circuit High Input (Bank 1 or Single Sensor)	<Ref. to EN(H4DOTC)(diag)-185, DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0335	Crankshaft Position Sensor "A" Circuit	<Ref. to EN(H4DOTC)(diag)-187, DTC P0335 CRANKSHAFT POSITION SENSOR "A" CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0336	Crankshaft Position Sensor "A" Circuit Range/Performance	<Ref. to EN(H4DOTC)(diag)-189, DTC P0336 CRANKSHAFT POSITION SENSOR "A" CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0340	Camshaft Position Sensor "A" Circuit (Bank 1 or Single Sensor)	<Ref. to EN(H4DOTC)(diag)-191, DTC P0340 CAMSHAFT POSITION SENSOR "A" CIRCUIT (BANK 1 OR SINGLE SENSOR), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0345	Camshaft Position Sensor "A" Circuit (Bank 2)	<Ref. to EN(H4DOTC)(diag)-193, DTC P0345 CAMSHAFT POSITION SENSOR "A" CIRCUIT (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0410	Secondary Air Injection System	<Ref. to EN(H4DOTC)(diag)-195, DTC P0410 SECONDARY AIR INJECTION SYSTEM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0411	Secondary Air Injection System Incorrect Flow Detected	<Ref. to EN(H4DOTC)(diag)-198, DTC P0411 SECONDARY AIR INJECTION SYSTEM INCORRECT FLOW DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0413	Secondary Air Injection System Switching Valve "A" Circuit Open	<Ref. to EN(H4DOTC)(diag)-200, DTC P0413 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE "A" CIRCUIT OPEN, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0414	Secondary Air Injection System Switching Valve "A" Circuit Shorted	<Ref. to EN(H4DOTC)(diag)-202, DTC P0414 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE "A" CIRCUIT SHORTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

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P0416	Secondary Air Injection System Switching Valve "B" Circuit Open	<Ref. to EN(H4DOTC)(diag)-204, DTC P0416 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE "B" CIRCUIT OPEN, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0417	Secondary Air Injection System Switching Valve "B" Circuit Shorted	<Ref. to EN(H4DOTC)(diag)-206, DTC P0417 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE "B" CIRCUIT SHORTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0418	Secondary Air Injection System Control "A" Circuit Open	<Ref. to EN(H4DOTC)(diag)-208, DTC P0418 SECONDARY AIR INJECTION SYSTEM CONTROL "A" CIRCUIT OPEN, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0420	Catalyst System Efficiency Below Threshold (Bank 1)	<Ref. to EN(H4DOTC)(diag)-211, DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0442	Evaporative Emission Control System Leak Detected (small leak)	<Ref. to EN(H4DOTC)(diag)-214, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0447	Evaporative Emission Control System Vent Control Circuit Open	<Ref. to EN(H4DOTC)(diag)-218, DTC P0447 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0448	Evaporative Emission Control System Vent Control Circuit Shorted	<Ref. to EN(H4DOTC)(diag)-221, DTC P0448 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0451	Evaporative Emission Control System Pressure Sensor Range/Performance	<Ref. to EN(H4DOTC)(diag)-222, DTC P0451 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0452	Evaporative Emission Control System Pressure Sensor Low Input	<Ref. to EN(H4DOTC)(diag)-225, DTC P0452 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0453	Evaporative Emission Control System Pressure Sensor High Input	<Ref. to EN(H4DOTC)(diag)-228, DTC P0453 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0456	Evaporative Emission Control System Leak Detected (very small leak)	<Ref. to EN(H4DOTC)(diag)-231, DTC P0456 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0457	Evaporative Emission Control System Leak Detected (fuel cap loose/off)	<Ref. to EN(H4DOTC)(diag)-234, DTC P0457 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0458	Evaporative Emission Control System Purge Control Valve Circuit Low	<Ref. to EN(H4DOTC)(diag)-238, DTC P0458 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0459	Evaporative Emission Control System Purge Control Valve Circuit High	<Ref. to EN(H4DOTC)(diag)-240, DTC P0459 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0461	Fuel Level Sensor Circuit Range/Performance	<Ref. to EN(H4DOTC)(diag)-241, DTC P0461 FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0462	Fuel Level Sensor Circuit Low Input	<Ref. to EN(H4DOTC)(diag)-243, 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(H4DOTC)(diag)-247, DTC P0463 FUEL LEVEL SENSOR CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0464	Fuel Level Sensor Circuit Intermittent	<Ref. to EN(H4DOTC)(diag)-250, DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0483	Cooling Fan Rationality Check	<Ref. to EN(H4DOTC)(diag)-252, DTC P0483 COOLING FAN RATIONALITY CHECK, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

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P0502	Vehicle Speed Sensor Circuit Low Input	<Ref. to EN(H4DOTC)(diag)-255, DTC P0502 VEHICLE SPEED SENSOR CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0503	Vehicle Speed Sensor Intermittent/Erratic/High	<Ref. to EN(H4DOTC)(diag)-257, DTC P0503 VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0506	Idle Control System RPM Lower Than Expected	<Ref. to EN(H4DOTC)(diag)-258, 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(H4DOTC)(diag)-260, DTC P0507 IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0512	Starter Request Circuit	<Ref. to EN(H4DOTC)(diag)-262, DTC P0512 STARTER REQUEST CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0513	Incorrect Immobilizer Key	<Ref. to EN(H4DOTC)(diag)-264, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0519	Idle Control System Malfunction (Fail-Safe)	<Ref. to EN(H4DOTC)(diag)-264, DTC P0519 IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0600	Serial Communication Link	<Ref. to EN(H4DOTC)(diag)-267, DTC P0600 SERIAL COMMUNICATION LINK, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0604	Internal Control Module Random Access Memory (RAM) Error	<Ref. to EN(H4DOTC)(diag)-268, DTC P0604 INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0605	Internal Control Module Read Only Memory (ROM) Error	<Ref. to EN(H4DOTC)(diag)-270, DTC P0605 INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0607	Control Module Performance	<Ref. to EN(H4DOTC)(diag)-271, DTC P0607 CONTROL MODULE PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0638	Throttle Actuator Control Range/Performance (Bank 1)	<Ref. to EN(H4DOTC)(diag)-272, DTC P0638 THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0691	Cooling Fan 1 Control Circuit Low	<Ref. to EN(H4DOTC)(diag)-272, DTC P0691 COOLING FAN 1 CONTROL CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0692	Cooling Fan 1 Control Circuit High	<Ref. to EN(H4DOTC)(diag)-274, DTC P0692 COOLING FAN 1 CONTROL CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0700	Transmission Control System (MIL Request)	<Ref. to EN(H4DOTC)(diag)-276, DTC P0700 TRANSMISSION CONTROL SYSTEM (MIL REQUEST), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0851	Neutral Switch Input Circuit Low	<Ref. to EN(H4DOTC)(diag)-277, DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW (AT MODEL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).> or <Ref. to EN(H4DOTC)(diag)-279, DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW (MT MODEL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0852	Neutral Switch Input Circuit High	<Ref. to EN(H4DOTC)(diag)-282, DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (AT MODEL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).> or <Ref. to EN(H4DOTC)(diag)-285, DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (MT MODEL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1152	O ₂ Sensor Circuit Range/Performance (Low) (Bank 1 Sensor 1)	<Ref. to EN(H4DOTC)(diag)-287, DTC P1152 O ₂ SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1153	O ₂ Sensor Circuit Range/Performance (High) (Bank 1 Sensor 1)	<Ref. to EN(H4DOTC)(diag)-289, DTC P1153 O ₂ SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

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P1160	Return Spring Failure	<Ref. to EN(H4DOTC)(diag)-291, DTC P1160 RETURN SPRING FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1400	Fuel Tank Pressure Control Solenoid Valve Circuit Low	<Ref. to EN(H4DOTC)(diag)-291, DTC P1400 FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1410	Secondary Air Injection System Switching Valve Stuck Open	<Ref. to EN(H4DOTC)(diag)-293, DTC P1410 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1418	Secondary Air Injection System Control "A" Circuit Shorted	<Ref. to EN(H4DOTC)(diag)-295, DTC P1418 SECONDARY AIR INJECTION SYSTEM CONTROL "A" CIRCUIT SHORTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1420	Fuel Tank Pressure Control Sol. Valve Circuit High	<Ref. to EN(H4DOTC)(diag)-298, DTC P1420 FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1443	Vent Control Solenoid Valve Function Problem	<Ref. to EN(H4DOTC)(diag)-300, DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1491	Positive Crankcase Ventilation (Blow-by) Function Problem	<Ref. to EN(H4DOTC)(diag)-302, DTC P1491 POSITIVE CRANKCASE VENTILATION (BLOW-BY) FUNCTION PROBLEM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1518	Starter Switch Circuit Low Input	<Ref. to EN(H4DOTC)(diag)-303, DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1560	Back-Up Voltage Circuit Malfunction	<Ref. to EN(H4DOTC)(diag)-305, DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1570	Antenna	<Ref. to EN(H4DOTC)(diag)-308, DTC P1570 ANTENNA, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1571	Reference Code Incompatibility	<Ref. to EN(H4DOTC)(diag)-308, DTC P1571 REFERENCE CODE INCOMPATIBILITY, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1572	IMM Circuit Failure (Except Antenna Circuit)	<Ref. to EN(H4DOTC)(diag)-308, DTC P1572 IMM CIRCUIT FAILURE (EXCEPT ANTENNA CIRCUIT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1574	Key Communication Failure	<Ref. to EN(H4DOTC)(diag)-308, DTC P1574 KEY COMMUNICATION FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1576	EGI Control Module EEPROM	<Ref. to EN(H4DOTC)(diag)-308, DTC P1576 EGI CONTROL MODULE EEPROM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1577	IMM Control Module EEPROM	<Ref. to EN(H4DOTC)(diag)-308, DTC P1577 IMM CONTROL MODULE EEPROM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2004	Intake Manifold Runner Control Stuck Open (Bank 1)	<Ref. to EN(H4DOTC)(diag)-309, DTC P2004 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2005	Intake Manifold Runner Control Stuck Open (Bank 2)	<Ref. to EN(H4DOTC)(diag)-310, DTC P2005 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2006	Intake Manifold Runner Control Stuck Closed (Bank 1)	<Ref. to EN(H4DOTC)(diag)-311, DTC P2006 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2007	Intake Manifold Runner Control Stuck Closed (Bank 2)	<Ref. to EN(H4DOTC)(diag)-312, DTC P2007 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2008	Intake Manifold Runner Control Circuit / Open (Bank 1)	<Ref. to EN(H4DOTC)(diag)-313, DTC P2008 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2009	Intake Manifold Runner Control Circuit Low (Bank 1)	<Ref. to EN(H4DOTC)(diag)-315, DTC P2009 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

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P2011	Intake Manifold Runner Control Circuit / Open (Bank 2)	<Ref. to EN(H4DOTC)(diag)-317, DTC P2011 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2012	Intake Manifold Runner Control Circuit Low (Bank 2)	<Ref. to EN(H4DOTC)(diag)-319, DTC P2012 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2016	Intake Manifold Runner Position Sensor / Switch Circuit Low (Bank 1)	<Ref. to EN(H4DOTC)(diag)-321, DTC P2016 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT LOW (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2017	Intake Manifold Runner Position Sensor / Switch Circuit High (Bank 1)	<Ref. to EN(H4DOTC)(diag)-324, DTC P2017 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT HIGH (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2021	Intake Manifold Runner Position Sensor / Switch Circuit Low (Bank 2)	<Ref. to EN(H4DOTC)(diag)-326, DTC P2021 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT LOW (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2022	Intake Manifold Runner Position Sensor / Switch Circuit High (Bank 2)	<Ref. to EN(H4DOTC)(diag)-329, DTC P2022 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT HIGH (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2088	OCV Solenoid Valve Signal A Circuit Open (Bank 1)	<Ref. to EN(H4DOTC)(diag)-331, DTC P2088 OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2089	OCV Solenoid Valve Signal A Circuit Short (Bank 1)	<Ref. to EN(H4DOTC)(diag)-333, DTC P2089 OCV SOLENOID VALVE SIGNAL A CIRCUIT SHORT (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2092	OCV Solenoid Valve Signal A Circuit Open (Bank 2)	<Ref. to EN(H4DOTC)(diag)-335, DTC P2092 OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2093	Intake Camshaft Position Actuator Control Circuit High (Bank 2)	<Ref. to EN(H4DOTC)(diag)-337, DTC P2093 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2096	Post Catalyst Fuel Trim System Too Lean Bank 1	<Ref. to EN(H4DOTC)(diag)-339, DTC P2096 POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2097	Post Catalyst Fuel Trim System Too Rich Bank 1	<Ref. to EN(H4DOTC)(diag)-345, DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2101	Throttle Actuator Control Motor Circuit Range/Performance	<Ref. to EN(H4DOTC)(diag)-350, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2102	Throttle Actuator Control Motor Circuit Low	<Ref. to EN(H4DOTC)(diag)-356, DTC P2102 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2103	Throttle Actuator Control Motor Circuit High	<Ref. to EN(H4DOTC)(diag)-359, DTC P2103 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2109	Throttle/Pedal Position Sensor "A" Minimum Stop Performance	<Ref. to EN(H4DOTC)(diag)-361, DTC P2109 THROTTLE/PEDAL POSITION SENSOR "A" MINIMUM STOP PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2122	Throttle/Pedal Position Sensor/ Switch "D" Circuit Low Input	<Ref. to EN(H4DOTC)(diag)-362, DTC P2122 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2123	Throttle/Pedal Position Sensor/ Switch "D" Circuit High Input	<Ref. to EN(H4DOTC)(diag)-364, DTC P2123 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2127	Throttle/Pedal Position Sensor/ Switch "E" Circuit Low Input	<Ref. to EN(H4DOTC)(diag)-366, DTC P2127 THROTTLE/PEDAL POSITION SENSOR/SWITCH "E" CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

List of Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

DTC	Item	Index
P2128	Throttle/Pedal Position Sensor/Switch "E" Circuit High Input	<Ref. to EN(H4DOTC)(diag)-368, DTC P2128 THROTTLE/PEDAL POSITION SENSOR/SWITCH "E" CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2135	Throttle/Pedal Position Sensor/Switch "A"/"B" Voltage Correlation	<Ref. to EN(H4DOTC)(diag)-370, DTC P2135 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A"/"B" VOLTAGE CORRELATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2138	Throttle/Pedal Position Sensor/Switch "D"/"E" Voltage Correlation	<Ref. to EN(H4DOTC)(diag)-375, DTC P2138 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D"/"E" VOLTAGE CORRELATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2227	Barometric Pressure Circuit Range/performance	<Ref. to EN(H4DOTC)(diag)-378, DTC P2227 BAROMETRIC PRESSURE CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2228	Barometric Pressure Circuit Low Input	<Ref. to EN(H4DOTC)(diag)-378, DTC P2228 BAROMETRIC PRESSURE CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2229	Barometric Pressure Circuit High Input	<Ref. to EN(H4DOTC)(diag)-379, DTC P2229 BAROMETRIC PRESSURE CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2431	Secondary Air Injection System Air Flow/Pressure Sensor Circuit Range/Performance	<Ref. to EN(H4DOTC)(diag)-379, DTC P2431 SECONDARY AIR INJECTION SYSTEM AIR FLOW / PRESSURE SENSOR CIRCUIT RANGE / PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2432	Secondary Air Injection System Air Flow/Pressure Sensor Circuit Low	<Ref. to EN(H4DOTC)(diag)-381, DTC P2432 SECONDARY AIR INJECTION SYSTEM AIR FLOW / PRESSURE SENSOR CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2433	Secondary Air Injection System Air Flow/Pressure Sensor Circuit High	<Ref. to EN(H4DOTC)(diag)-383, DTC P2433 SECONDARY AIR INJECTION SYSTEM AIR FLOW / PRESSURE SENSOR CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2440	Secondary Air Injection System Switching Valve Stuck Open (Bank 1)	<Ref. to EN(H4DOTC)(diag)-385, DTC P2440 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2441	Secondary Air Injection System Switching Valve Stuck Closed (Bank 1)	<Ref. to EN(H4DOTC)(diag)-388, DTC P2441 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK CLOSED (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2442	Secondary Air Injection System Switching Valve Stuck Open (Bank 2)	<Ref. to EN(H4DOTC)(diag)-388, DTC P2442 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2443	Secondary Air Injection System Switching Valve Stuck Closed (Bank 2)	<Ref. to EN(H4DOTC)(diag)-391, DTC P2443 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK CLOSED (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2444	Secondary Air Injection System Pump Stuck On	<Ref. to EN(H4DOTC)(diag)-391, DTC P2444 SECONDARY AIR INJECTION SYSTEM PUMP STUCK ON, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

18. Diagnostic Procedure with Diagnostic Trouble Code (DTC)

A: DTC P0011 INTAKE CAMSHAFT POSITION-TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-10, DTC P0011 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Engine stalls.
- Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK CURRENT DATA. 1) Start the engine and let it idle. 2) Inspect the AVCS advance timing and oil flow control solenoid valve duty output using Subaru Select Monitor or 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(H4DOTC)(diag)-31, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the AVCS advance timing more than approx. 0°C and the oil flow control solenoid valve duty output more than approx. 10%?	Inspect the following items and repair or replace if necessary. • Oil pipe (clog) • Oil flow control solenoid valve (clog or contamination in oil passage, settling at spring, stuck at valve) • Intake camshaft (sludge, damage at camshaft) • Timing belt (timing mark aligning)	A temporary malfunction. Conduct the following to clean the oil passage. Replace the engine oil and idle the engine for 5 minutes, then replace the oil filter and engine oil.

B: DTC P0016 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK 1)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-12, DTC P0016 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Engine stalls.
- Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

Step	Check	Yes	No
1 CHECK FOR ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK CURRENT DATA. 1) Start the engine and let it idle. 2) Inspect the AVCS timing advance and oil flow control solenoid valve duty output using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the General Scan Tool Instruction Manual.	Is the AVCS timing advance more than approx. 0 degree? Also, is the oil flow control solenoid valve duty output more than approx. 10%?	Inspect the following items and repair or replace if necessary. • Oil pipe (clog) • Oil flow control solenoid valve (clog or contamination in oil passage, setting of spring, stuck at valve) • Intake camshaft (sludge, damage at camshaft) • Timing belt (timing mark aligning)	A temporary malfunction. Conduct the following to clean the oil passage. Replace the engine oil and idle the engine for 5 minutes, then replace the oil filter and engine oil.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

C: DTC P0018 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK 2)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-12, DTC P0018 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Engine stalls.
- Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

Step	Check	Yes	No
1 CHECK FOR ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK CURRENT DATA. 1) Start the engine and let it idle. 2) Inspect the AVCS timing advance and oil flow control solenoid valve duty output using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the General Scan Tool Instruction Manual.	Is the AVCS timing advance more than approx. 0 degree? Also, is the oil flow control solenoid valve duty output more than approx. 10%?	Inspect the following items and repair or replace if necessary. • Oil pipe (clog) • Oil flow control solenoid valve (clog or contamination in oil passage, setting of spring, stuck at valve) • Intake camshaft (sludge, damage at camshaft) • Timing belt (timing mark aligning)	A temporary malfunction. Conduct the following to clean the oil passage. Replace the engine oil and idle the engine for 5 minutes, then replace the oil filter and engine oil.

D: DTC P0021 INTAKE CAMSHAFT POSITION-TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 2)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-12, DTC P0021 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Engine stalls.
- Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK CURRENT DATA. 1) Start the engine and let it idle. 2) Inspect the AVCS advance timing and oil flow control solenoid valve duty output using Subaru Select Monitor or 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(H4DOTC)(diag)-31, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the AVCS advance timing more than approx. 0°C and the oil flow control solenoid valve duty output more than approx. 10%?	Inspect the following items and repair or replace if necessary. • Oil pipe (clog) • Oil flow control solenoid valve (clog or contamination in oil passage, settling at spring, stuck at valve) • Intake camshaft (sludge, damage at camshaft) • Timing belt (timing mark aligning)	A temporary malfunction. Conduct the following to clean the oil passage. Replace the engine oil and idle the engine for 5 minutes, then replace the oil filter and engine oil.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

E: DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1)

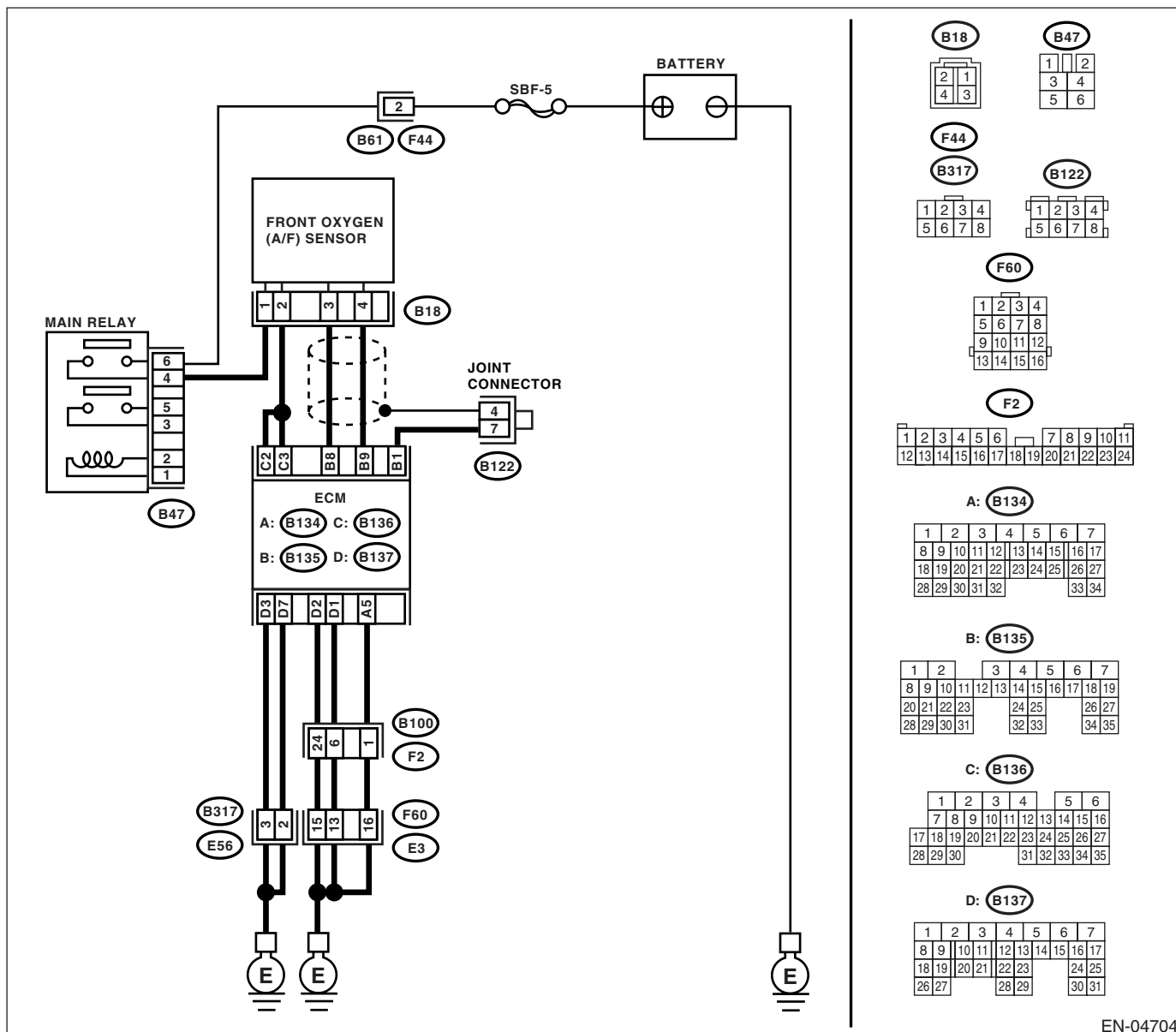
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-13, DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04704

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. Connector & terminal (B136) No. 3 — (B18) No. 2: (B136) No. 2 — (B18) No. 2:	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. Connector & terminal (B135) No. 8 — (B18) No. 3: (B135) No. 9 — (B18) No. 4:	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. Connector & terminal (B47) No. 4 — (B18) No. 1:	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. Terminals No. 2 — No. 1:	Is the resistance less than 5 Ω ?	Go to step 5.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-41, 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(H4DOTC)-41, Front Oxygen (A/F) Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

F: DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1)

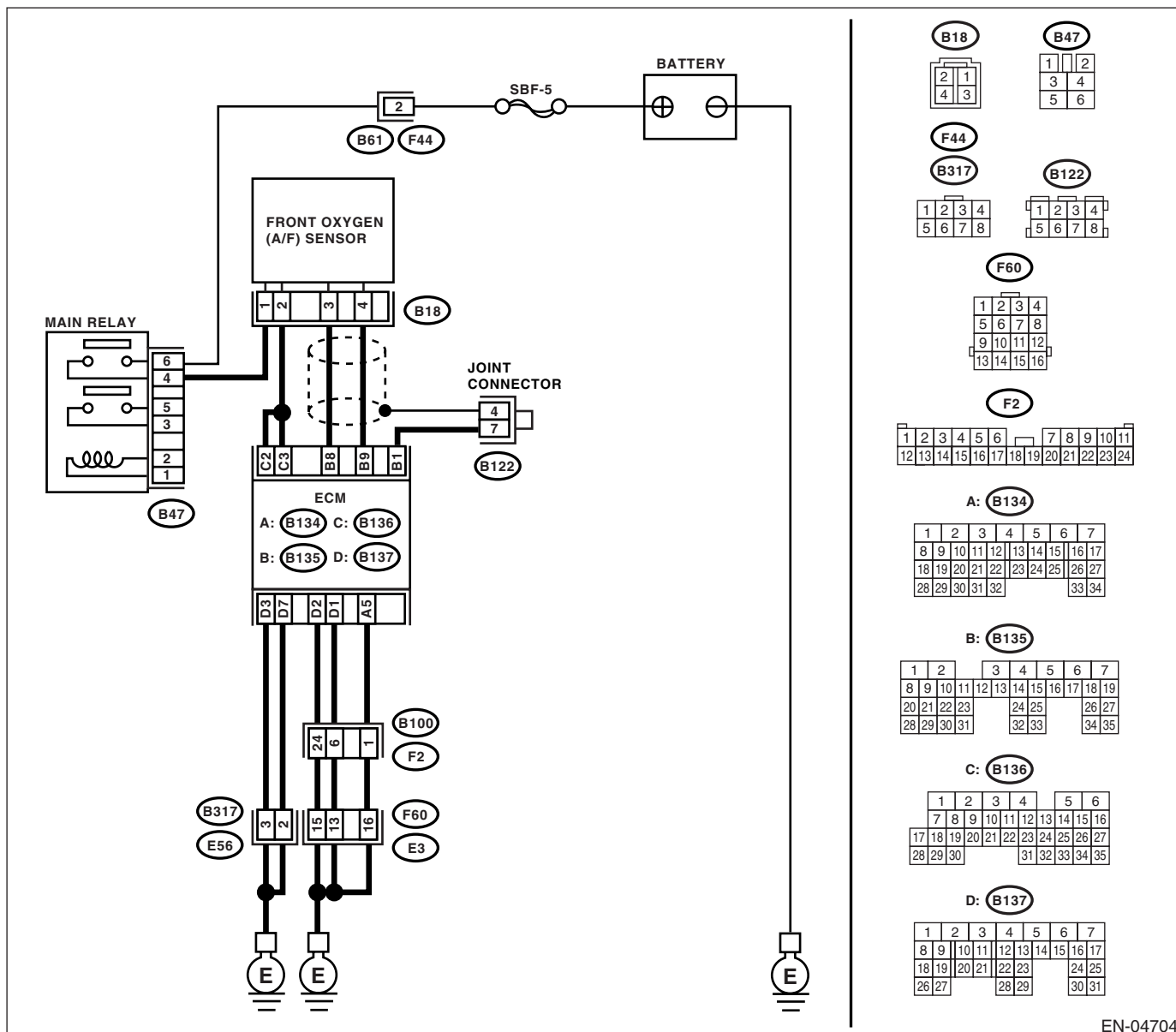
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-15, DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04704

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK POWER SUPPLY TO FRONT OXY-GEN (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. 1 (+) — Engine ground (-):	Is the voltage more than 10 V?	Go to step 2.	Repair the power supply line. NOTE: In this case, repair the following: • Open circuit in harness between main relay and front oxygen (A/F) sensor connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in main relay connector
2 CHECK GROUND CIRCUIT OF ECM. Measure the resistance of harness between ECM connector and chassis ground. Connector & terminal (B134) No. 5 — Chassis ground: (B137) No. 1 — Chassis ground: (B137) No. 2 — Chassis ground: (B137) No. 7 — Chassis ground: (B137) No. 3 — Chassis ground:	Is the resistance less than 5 Ω?	Go to step 3.	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and engine ground cable • Poor contact in ECM connector • Poor contact in coupling connector
3 CHECK CURRENT DATA. 1) Start the engine. 2) Read the data of front oxygen (A/F) sensor heater current using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the current more than 0.2 A?	Repair the poor contact in connector. NOTE: In this case, repair the following: • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector	Go to step 4.
4 CHECK OUTPUT SIGNAL FROM ECM. 1) Start and idle the engine. 2) Measure the voltage between ECM connector and chassis ground. Connector & terminal (B136) No. 2 (+) — Chassis ground (-): (B136) No. 3 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Go to step 6.	Go to step 5.
5 CHECK OUTPUT SIGNAL FROM ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B136) No. 2 (+) — Chassis ground (-): (B136) No. 3 (+) — Chassis ground (-):	Shake the ECM harness and connector, while monitoring value of voltage meter. Does the voltage change?	Repair the poor contact in ECM connector.	Go to step 6.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
6 CHECK FRONT OXYGEN (A/F) SENSOR. 1) Turn the ignition switch to OFF. 2) Measure the resistance between front oxygen (A/F) sensor connector terminals. Terminals No. 2 — No. 1:	Is the resistance less than 10 Ω ?	Repair the harness and connector. NOTE: In this case, repair the following: • Open or ground short circuit in harness between front oxygen (A/F) sensor and ECM connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-41, Front Oxygen (A/F) Sensor.>

G: DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1)

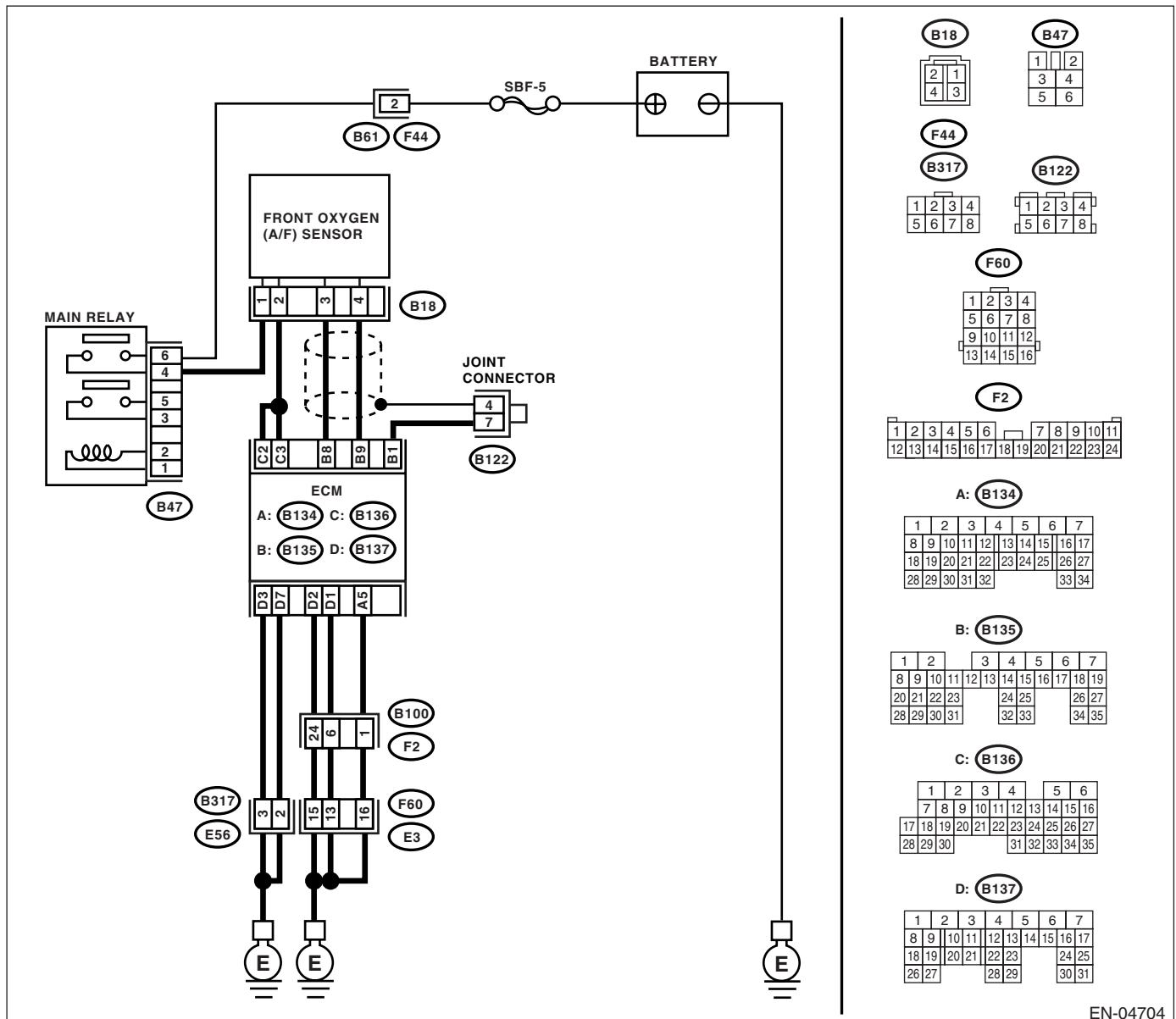
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-17, DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04704

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 connector and chassis ground. Connector & terminal (B136) No. 2 (+) — Chassis ground (-): (B136) No. 3 (+) — Chassis ground (-):	Is the voltage more than 8 V?	Go to step 3.	Go to step 2.
2 CHECK FRONT OXYGEN (A/F) SENSOR HEATER CURRENT. 1) Turn 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 general scan tool. NOTE: - Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> - General scan tool For detailed operation procedure, refer to the General Scan Tool Instruction Manual.	Is the current more than 2.3 A?	Replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>	Finish the diagnosis.
3 CHECK OUTPUT SIGNAL FROM ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B136) No. 2 (+) — Chassis ground (-): (B136) No. 3 (+) — Chassis ground (-):	Shake the ECM harness and connector, while monitoring value of voltage meter. Does the voltage change?	Repair the battery short circuit in harness between ECM and front oxygen (A/F) sensor connector.	Finish the diagnosis.

H: DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2)

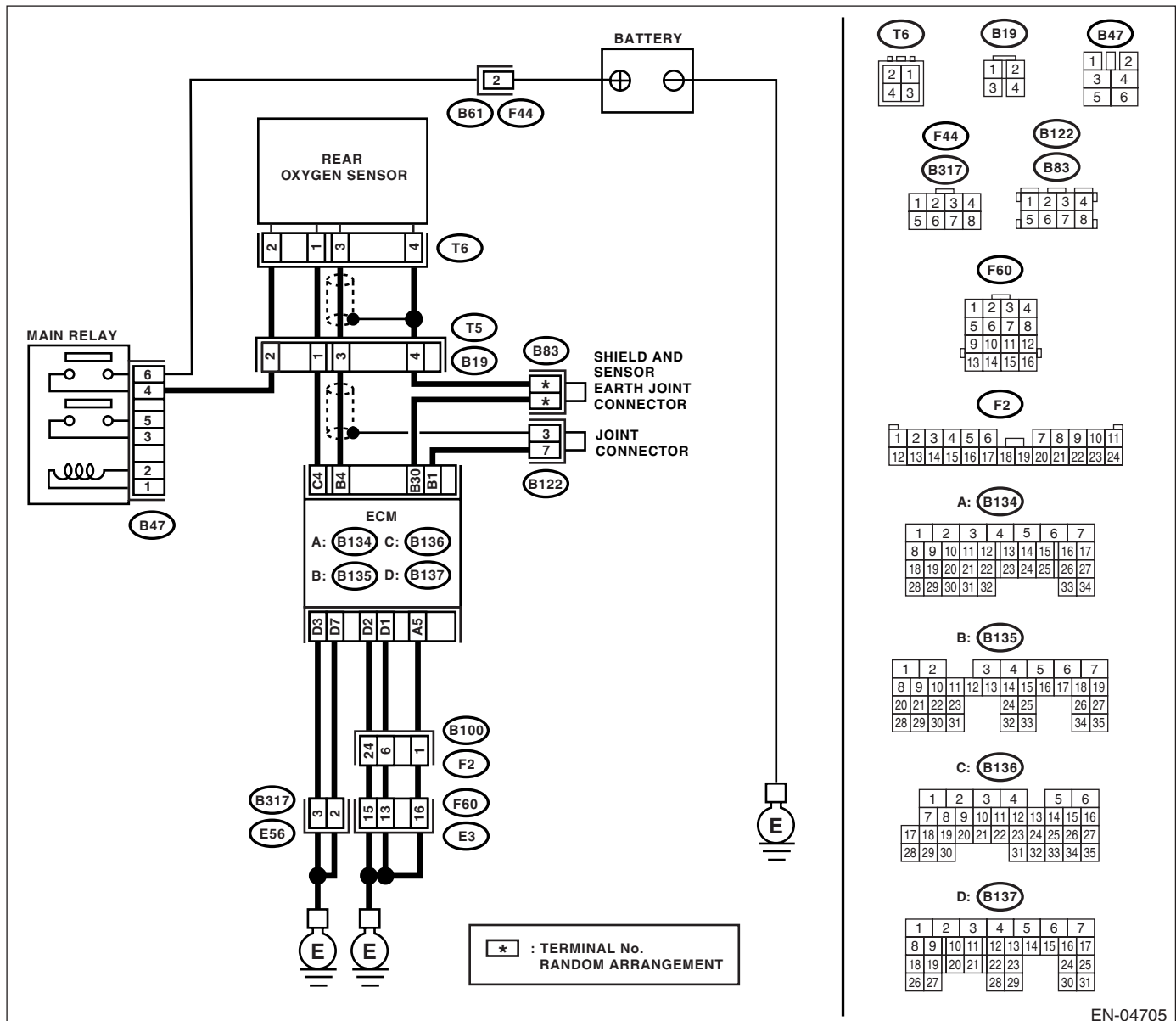
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-19, DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04705

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK GROUND CIRCUIT OF ECM. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM connector and chassis ground. Connector & terminal (B134) No. 5 — Chassis ground: (B137) No. 1 — Chassis ground: (B137) No. 2 — Chassis ground: (B137) No. 7 — Chassis ground: (B137) No. 3 — Chassis ground:	Is the resistance less than 5 Ω ?	Go to step 2.	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and engine ground cable • Poor contact in ECM connector • Poor contact in coupling connector
2 CHECK CURRENT DATA. 1) Start the engine. 2) Read the data of rear oxygen sensor heater current using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the current more than 0.2 A?	Repair the connector. NOTE: In this case, repair the following: • Poor contact in rear oxygen sensor connector • Poor contact in rear oxygen sensor connecting harness connector • Poor contact in ECM connector	Go to step 3.
3 CHECK OUTPUT SIGNAL FROM ECM. 1) Start and idle the engine. 2) Measure the voltage between ECM connector and chassis ground. Connector & terminal (B136) No. 4 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Go to step 6.	Go to step 4.
4 CHECK OUTPUT SIGNAL FROM ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B136) No. 4 (+) — Chassis ground (-):	Shake the ECM harness and connector, while monitoring value of voltage meter. Does the voltage change?	Repair the poor contact in ECM connector.	Go to step 5.
5 CHECK OUTPUT SIGNAL FROM ECM. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from rear oxygen sensor. 3) Measure the voltage between ECM connector and chassis ground. Connector & terminal (B136) No. 4 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>	Repair the battery short circuit in harness between ECM and rear oxygen sensor connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
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. Connector & terminal (T6) No. 2 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 7.	Repair the power supply line. NOTE: In this case, repair the following: • Open circuit in harness between main relay and rear oxygen sensor connector • Poor contact in rear oxygen sensor connector • Poor contact in coupling connector
7 CHECK REAR OXYGEN SENSOR. 1) Turn 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: • Open circuit in harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor connector • Poor contact in ECM connector • Poor contact in coupling connector	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-43, Rear Oxygen Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

I: DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2)

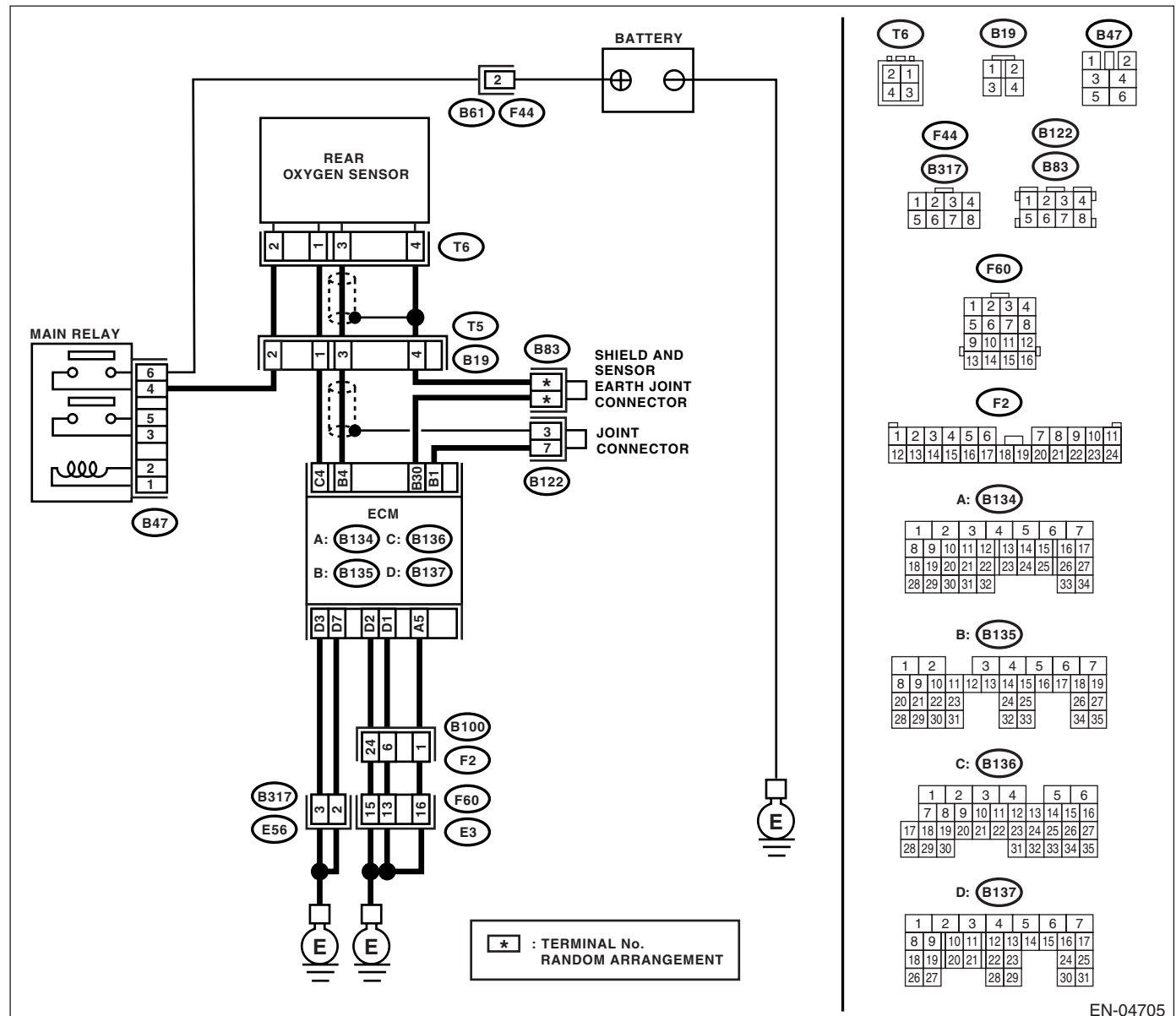
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-21, DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04705

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 OFF. 2) Measure the voltage between ECM connector and chassis ground. Connector & terminal (B136) No. 4 (+) — Chassis ground (-):	Is the voltage more than 8 V?	Go to step 2.	Go to step 3.
2 CHECK CURRENT DATA. 1) Repair the battery short circuit in harness between ECM and rear oxygen sensor connector. 2) Turn the ignition switch to ON. 3) Read the data of rear oxygen sensor heater current using Subaru Select Monitor or the general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the General Scan Tool Instruction Manual.	Is the current more than 7 A?	Replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>	Finish the diagnosis.
3 CHECK POOR CONTACT. Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Finish the diagnosis.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

J: DTC P0068 MANIFOLD PRESSURE SENSOR RANGE/PERFORMANCE

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-23, DTC P0068 MANIFOLD PRESSURE SENSOR RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

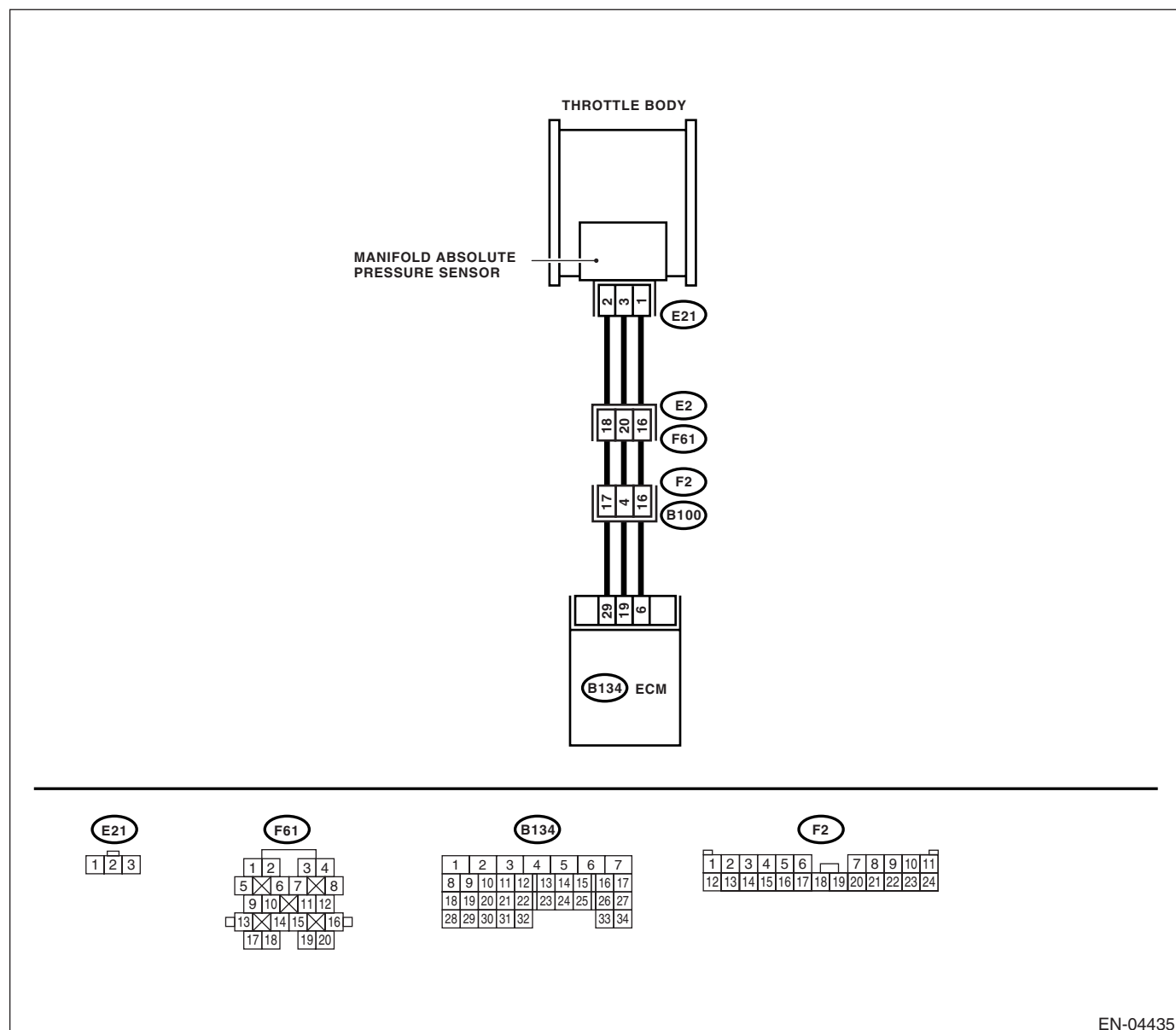
TROUBLE SYMPTOM:

Failure of engine to start

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04435

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(H4DOTC)(diag)-31, 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(H4DOTC)(diag)-370, DTC P2135 THROTTLE/ PEDAL POSITION SENSOR/ SWITCH "A"/"B" VOLTAGE CORRELATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
2 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC. "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).>	Go to step 3.
3 CHECK CONDITION OF MANIFOLD ABSOLUTE PRESSURE SENSOR.	Is the manifold absolute pressure sensor installation bolt tightened securely?	Go to step 4.	Tighten the manifold absolute pressure sensor installation bolt securely.
4 CHECK CONDITION OF THROTTLE BODY.	Is the throttle body installation bolt tightened securely?	Replace the manifold absolute pressure sensor. <Ref. to FU(H4DOTC)-32, Manifold Absolute Pressure Sensor.>	Tighten the throttle body installation bolt securely.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

K: DTC P0101 MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-25, DTC P0101 MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

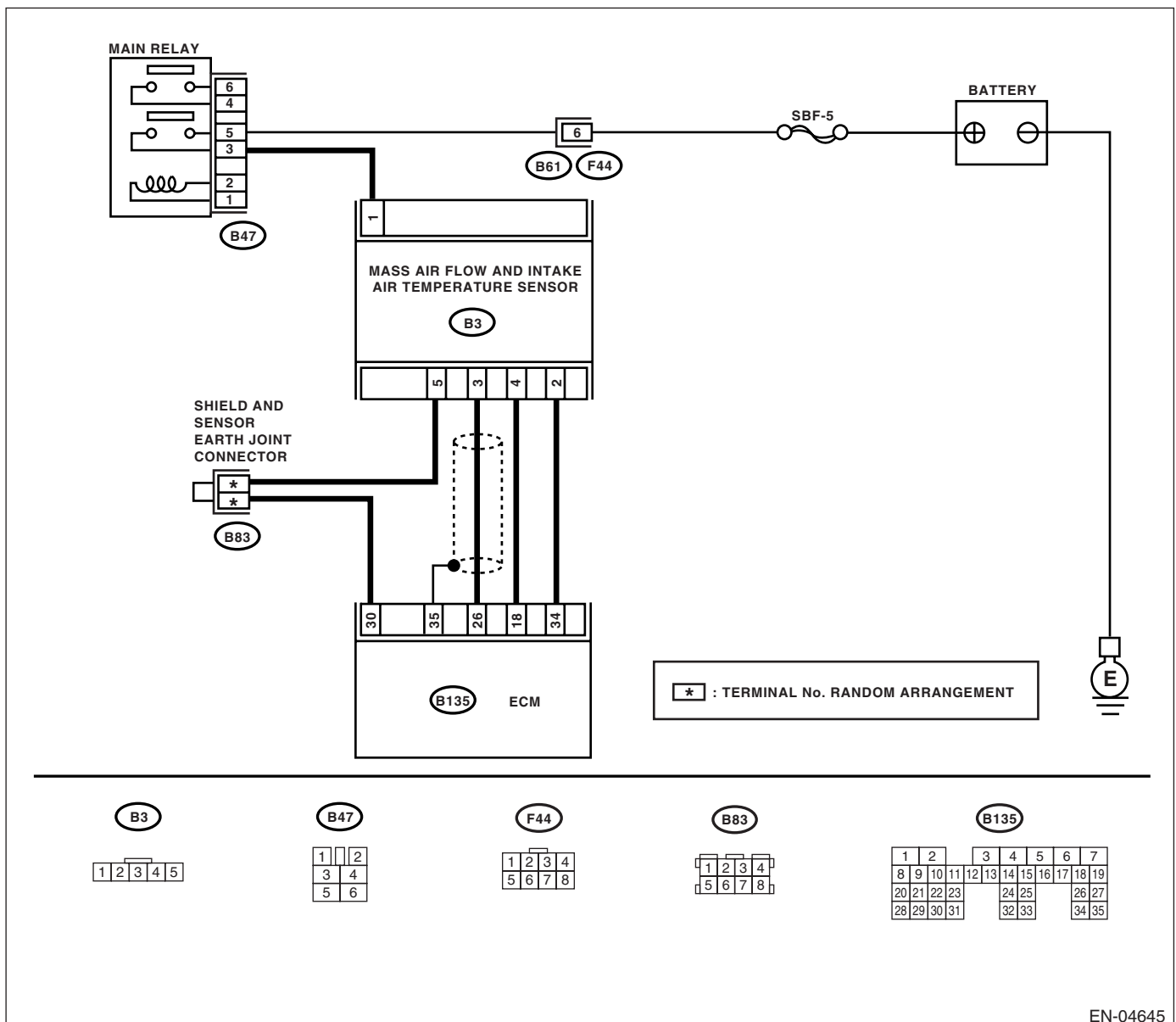
TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04645

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-74, 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(H4DOTC)-31, Mass Air Flow and Intake Air Temperature Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

L: DTC P0102 MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-28, DTC P0102 MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

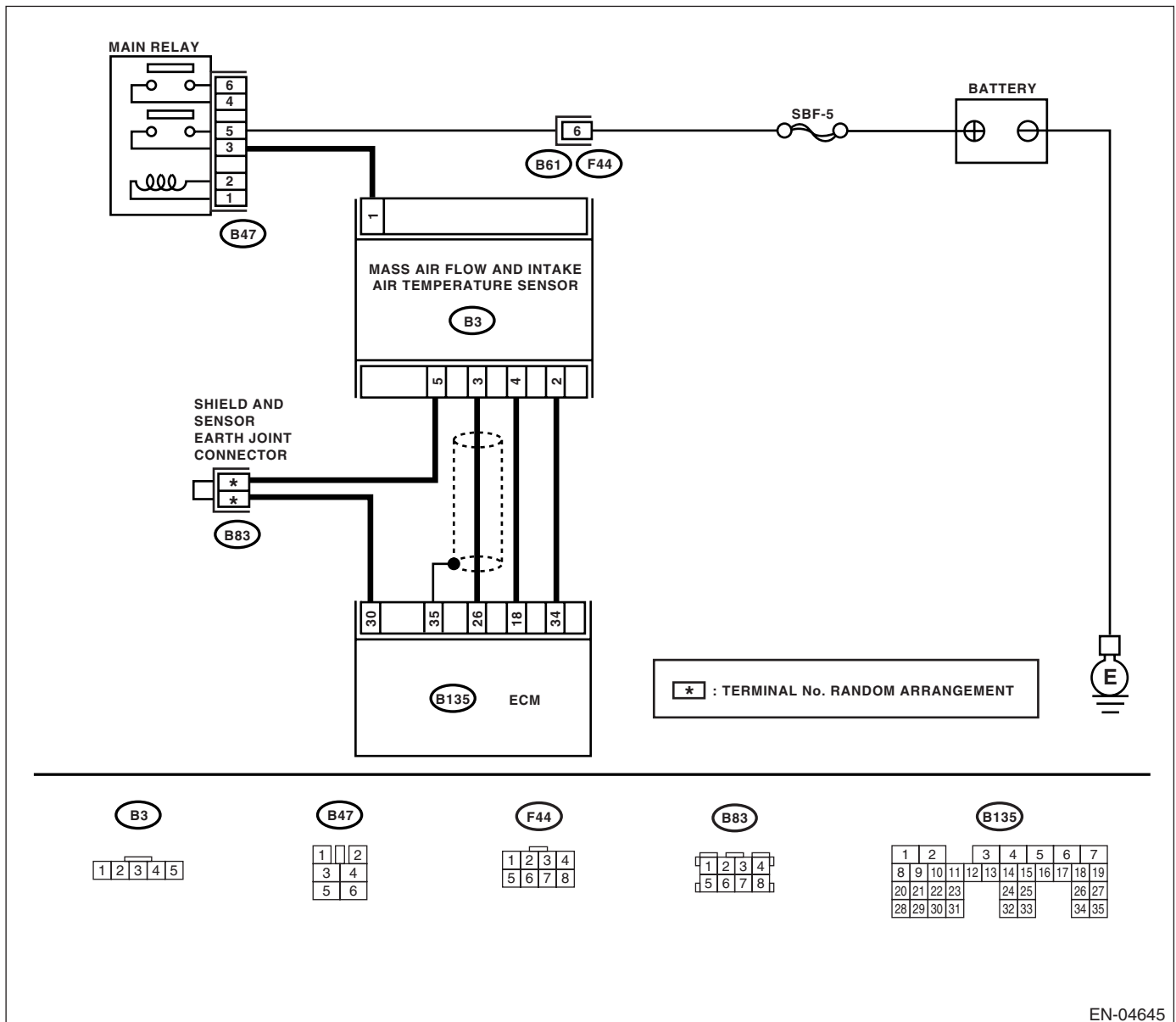
TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04645

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CONNECT SUBARU SELECT MONITOR OR THE GENERAL SCAN TOOL, AND READ DATA. 1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor or general scan tool to data link connector. 3) Turn the ignition switch to ON and Subaru Select Monitor or the general scan tool power switch to ON. 4) Start the engine. 5) Read the mass air flow sensor voltage using Subaru Select Monitor or general scan tool. NOTE: - Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> - General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the voltage 0.2 — 4.7 V?	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector or harness may be the cause. Repair the harness or connector in the mass air flow sensor. NOTE: In this case, repair the following: - Open or ground short circuit in harness between mass air flow sensor and ECM connector - Poor contact in mass air flow sensor or ECM connector	Go to step 2.
2 CHECK INPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground while engine is idling. Connector & terminal (B135) No. 26 (+) — Chassis ground (-):	Is the voltage less than 0.2 V?	Go to step 4.	Go to step 3.
3 CHECK INPUT SIGNAL FOR ECM (USING SUBARU SELECT MONITOR). Measure the voltage between ECM connector and chassis ground while engine is idling.	Shake the ECM harness and connector, while monitoring value of Subaru Select Monitor. Does the voltage change?	Repair the poor contact in ECM connector.	Contact your SOA Service Center since deterioration of some parts may be the cause.
4 CHECK POWER SUPPLY TO MASS AIR FLOW SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from mass air flow sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between mass air flow sensor connector and chassis ground. Connector & terminal (B3) No. 1 (+) — Chassis ground (-):	Is the voltage more than 5 V?	Go to step 5.	Repair the open circuit between mass air flow sensor and main relay.
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 (B135) No. 18 — (B3) No. 4: (B135) No. 26 — (B3) No. 3: (B135) No. 34 — (B3) No. 2: (B135) No. 30 — (B3) No. 5:	Is the resistance less than 1 Ω ?	Go to step 6.	Repair the open circuit between ECM and mass air flow sensor connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
6 CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW SENSOR CONNECTOR Measure the resistance of harness between ECM and chassis ground. <i>Connector & terminal</i> <i>(B135) No. 18 — Chassis ground:</i> <i>(B135) No. 26 — Chassis ground:</i> <i>(B135) No. 34 — Chassis ground:</i> <i>(B135) No. 30 — Chassis ground:</i>	Is the resistance more than 1 MΩ?	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(H4DOTC)-31, Mass Air Flow and Intake Air Temperature Sensor.>

M: DTC P0103 MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-30, DTC P0103 MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

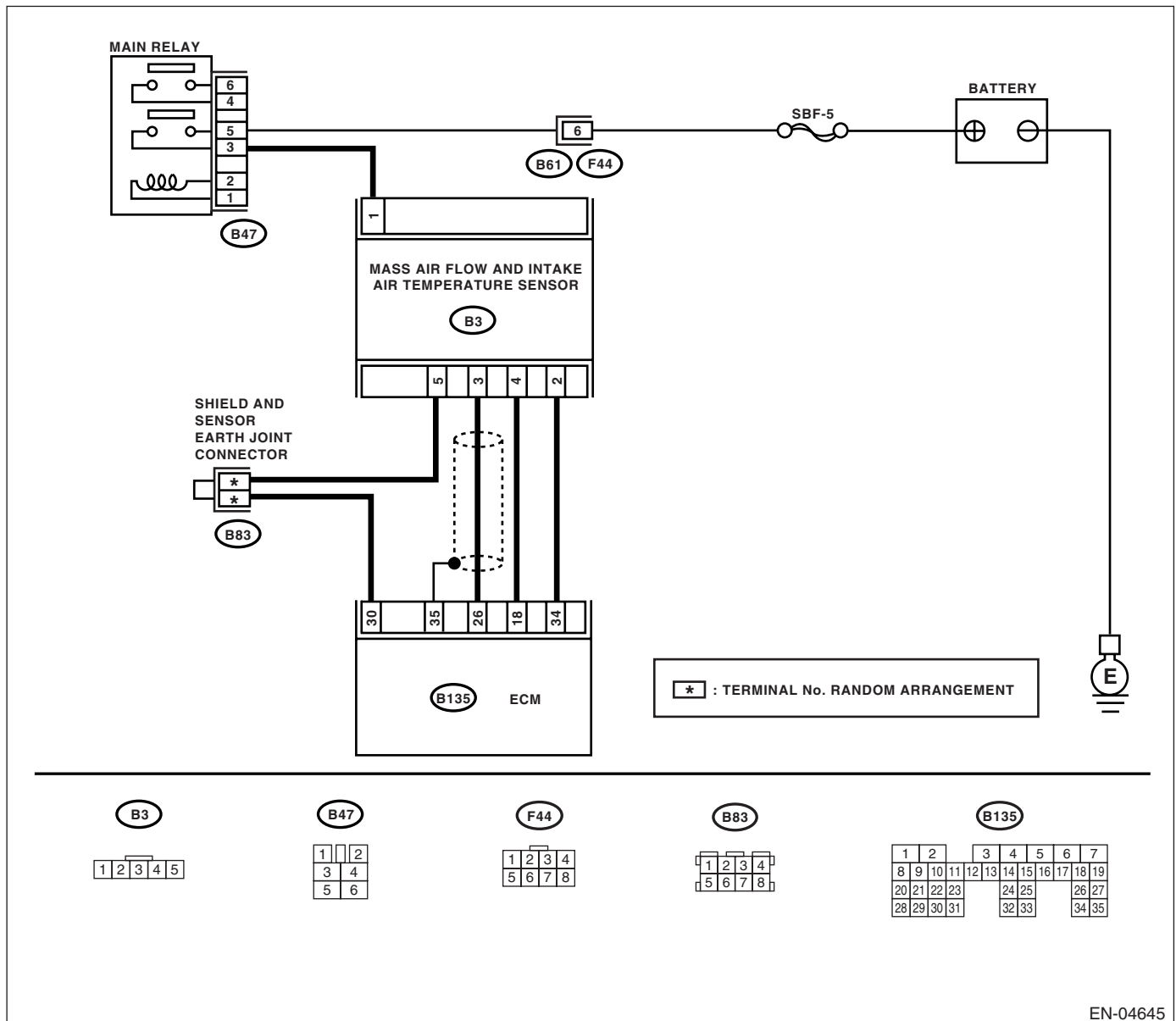
TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04645

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CONNECT SUBARU SELECT MONITOR OR THE GENERAL SCAN TOOL, AND READ DATA. 1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor or general scan tool to data link connector. 3) Turn the ignition switch to ON and Subaru Select Monitor or general scan tool power switch to ON. 4) Start the engine. 5) Read the mass air flow sensor voltage using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the voltage 0.2 — 4.7 V?	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time.	Go to step 2.
2 CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW SENSOR CONNECTOR. 1) Turn 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 and intake air temperature sensor connector and chassis ground. Connector & terminal (B3) No. 3 (+) — Chassis ground (-):	Is the voltage more than 5 V?	Repair the battery short of harness between mass air flow and intake air temperature sensor connector and ECM connector.	Go to step 3.
3 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 between ECM connector and mass air flow and intake air temperature sensor connector. Connector & terminal (B3) No. 2 — (B135) No. 34:	Is the resistance less than 1 Ω ?	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-31, Mass Air Flow and Intake Air Temperature Sensor.>	Repair the open harness between mass air flow and intake air temperature sensor connector and ECM connector.

N: DTC P0107 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT

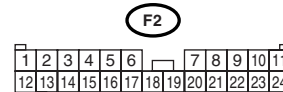
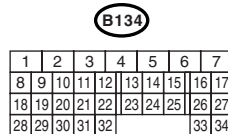
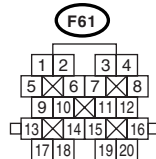
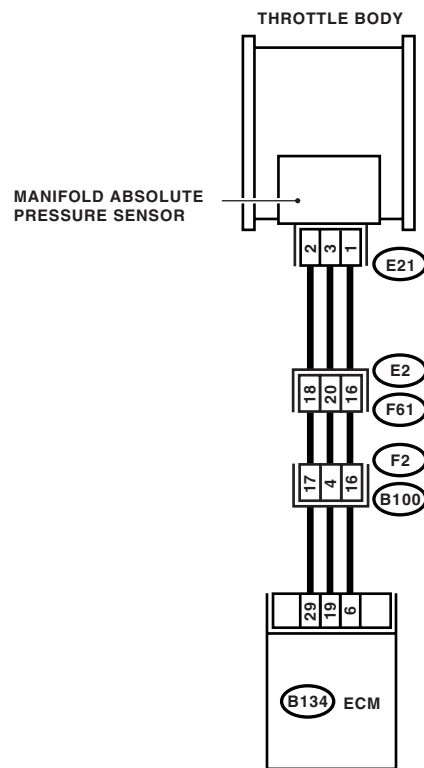
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-32, DTC P0107 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04435

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK INPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B134) No. 19 (+) — Chassis ground (-):	Is the voltage more than 4.5 V?	Go to step 3.	Go to step 2.
2 CHECK INPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B134) No. 19 (+) — Chassis ground (-):	Shake the ECM harness and connector, while monitoring value of voltage meter. Does the voltage change?	Repair the poor contact in ECM connector.	Contact your SOA Service Center since deterioration of some parts may be the cause.
3 CHECK INPUT SIGNAL FOR ECM. Measure the voltage between ECM and chassis ground. Connector & terminal (B134) No. 6 (+) — Chassis ground (-):	Is the voltage less than 0.7 V?	Go to step 4.	Contact your SOA Service Center since deterioration of some parts may be the cause.
4 CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from manifold absolute pressure sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between manifold absolute pressure sensor connector and engine ground. Connector & terminal (E21) No. 3 (+) — Engine ground (-):	Is the voltage more than 4.5 V?	Go to step 5.	Repair the open circuit in harness between ECM and manifold absolute pressure sensor connector.
5 CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE 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 manifold absolute pressure sensor connector. Connector & terminal (B134) No. 29 — (E21) No. 2:	Is the resistance less than 1 Ω ?	Go to step 6.	Repair the open circuit in harness between ECM and manifold absolute pressure sensor connector.
6 CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR. Measure the resistance of harness between manifold absolute pressure sensor connector and engine ground. Connector & terminal (E21) No. 1 — Engine ground:	Is the resistance more than 1 M Ω ?	Go to step 7.	Repair the ground short circuit in harness between ECM and manifold absolute pressure sensor connector.
7 CHECK POOR CONTACT. Check poor contact in manifold absolute pressure sensor connector.	Is there poor contact in manifold absolute pressure sensor connector?	Repair the poor contact in manifold absolute pressure sensor connector.	Replace the manifold absolute pressure sensor. <Ref. to FU(H4DOTC)-32, Manifold Absolute Pressure Sensor.>

O: DTC P0108 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT

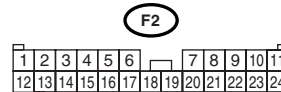
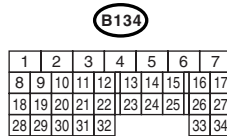
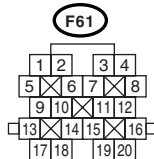
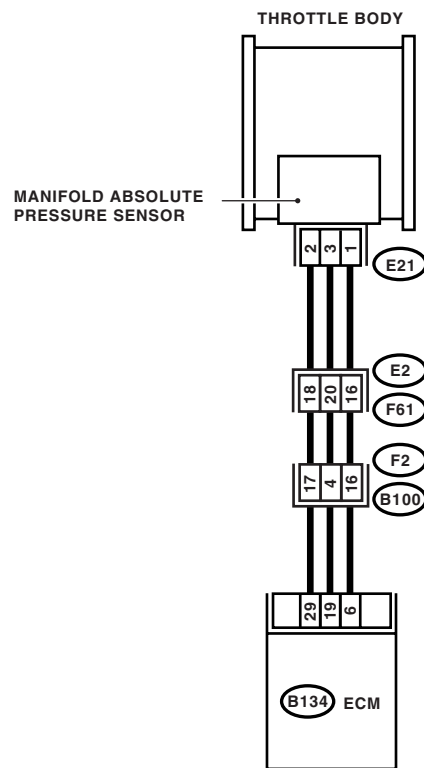
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-34, DTC P0108 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04435

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK INPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B134) No. 19 (+) — Chassis ground (-):	Is the voltage more than 4.5 V?	Go to step 3.	Go to step 2.
2 CHECK INPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B134) No. 19 (+) — Chassis ground (-):	Shake the ECM harness and connector, while monitoring value of voltage meter. Does the voltage change?	Repair the poor contact in ECM connector.	Contact your SOA Service Center since deterioration of some parts may be the cause.
3 CHECK INPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B134) No. 6 (+) — Chassis ground (-):	Is the voltage more than 4.5 V?	Go to step 4.	Contact your SOA Service Center since deterioration of some parts may be the cause.
4 CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from manifold absolute pressure sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between manifold absolute pressure sensor connector and engine ground. Connector & terminal (E21) No. 3 (+) — Engine ground (-):	Is the voltage more than 4.5 V?	Go to step 5.	Repair the open circuit in harness between ECM and manifold absolute pressure sensor connector.
5 CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE 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 manifold absolute pressure sensor connector. Connector & terminal (B134) No. 6 — (E21) No. 1:	Is the resistance less than 1 Ω ?	Go to step 6.	Repair the open circuit in harness between ECM and manifold absolute pressure sensor connector.
6 CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR. Measure the resistance of harness between ECM and manifold absolute pressure sensor connector. Connector & terminal (B134) No. 29 — (E21) No. 2:	Is the resistance less than 1 Ω ?	Go to step 7.	Repair the open circuit in harness between ECM and manifold absolute pressure sensor connector.
7 CHECK POOR CONTACT. Check poor contact in manifold absolute pressure sensor connector.	Is there poor contact in manifold absolute pressure sensor connector?	Repair the poor contact in manifold absolute pressure sensor connector.	Replace the manifold absolute pressure sensor. <Ref. to FU(H4DOTC)-32, Manifold Absolute Pressure Sensor.>

P: DTC P0111 INTAKE AIR TEMPERATURE CIRCUIT RANGE/PERFORMANCE

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-36, DTC P0111 INTAKE AIR TEMPERATURE CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

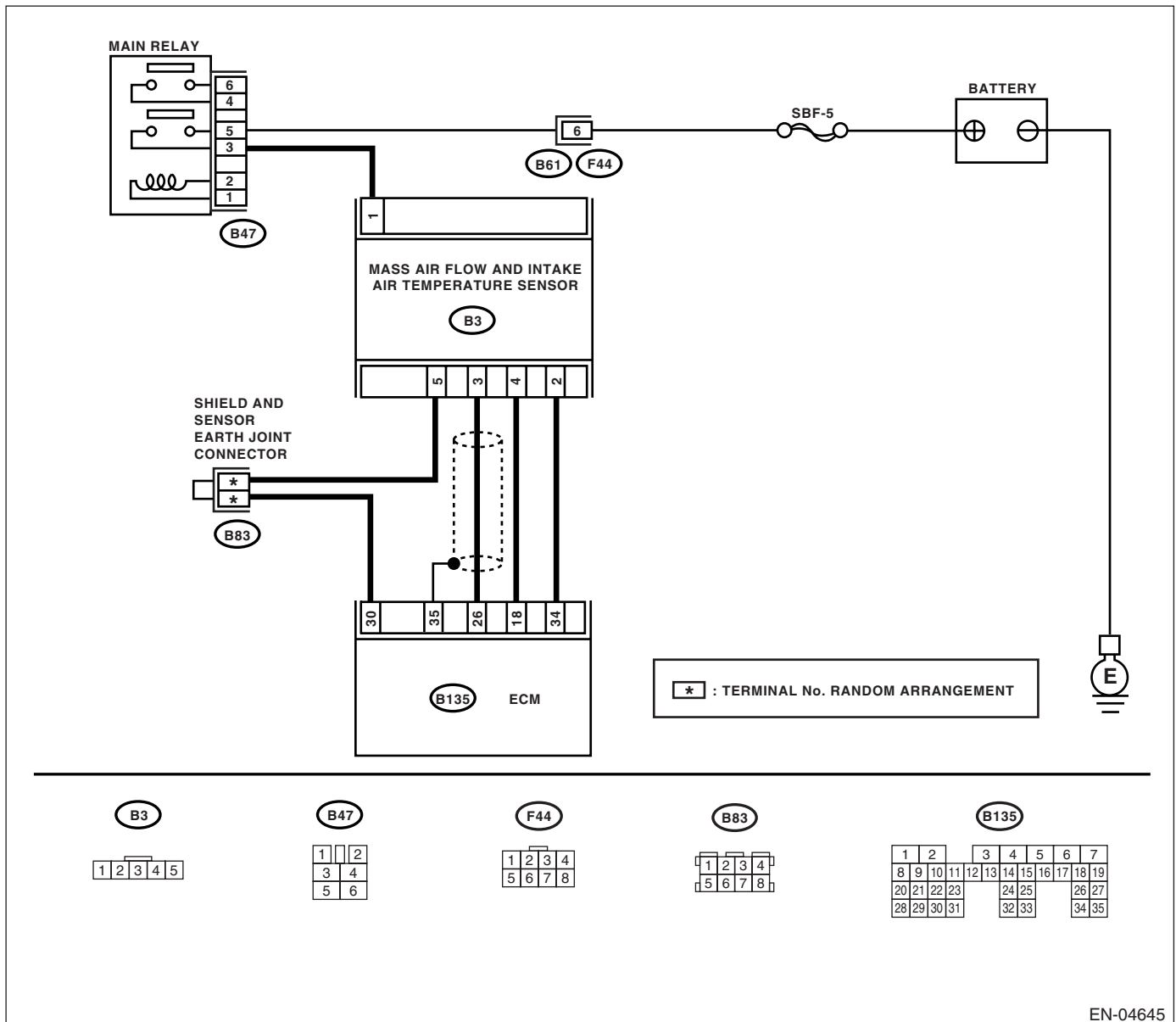
TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04645

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-74, 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 general scan tool. NOTE: - Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> - General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the engine coolant temperature 75 — 95°C (167 — 203°F)?	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-31, Mass Air Flow and Intake Air Temperature Sensor.>	Inspect the DTC P0125 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).>

Q: DTC P0112 INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-38, DTC P0112 INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

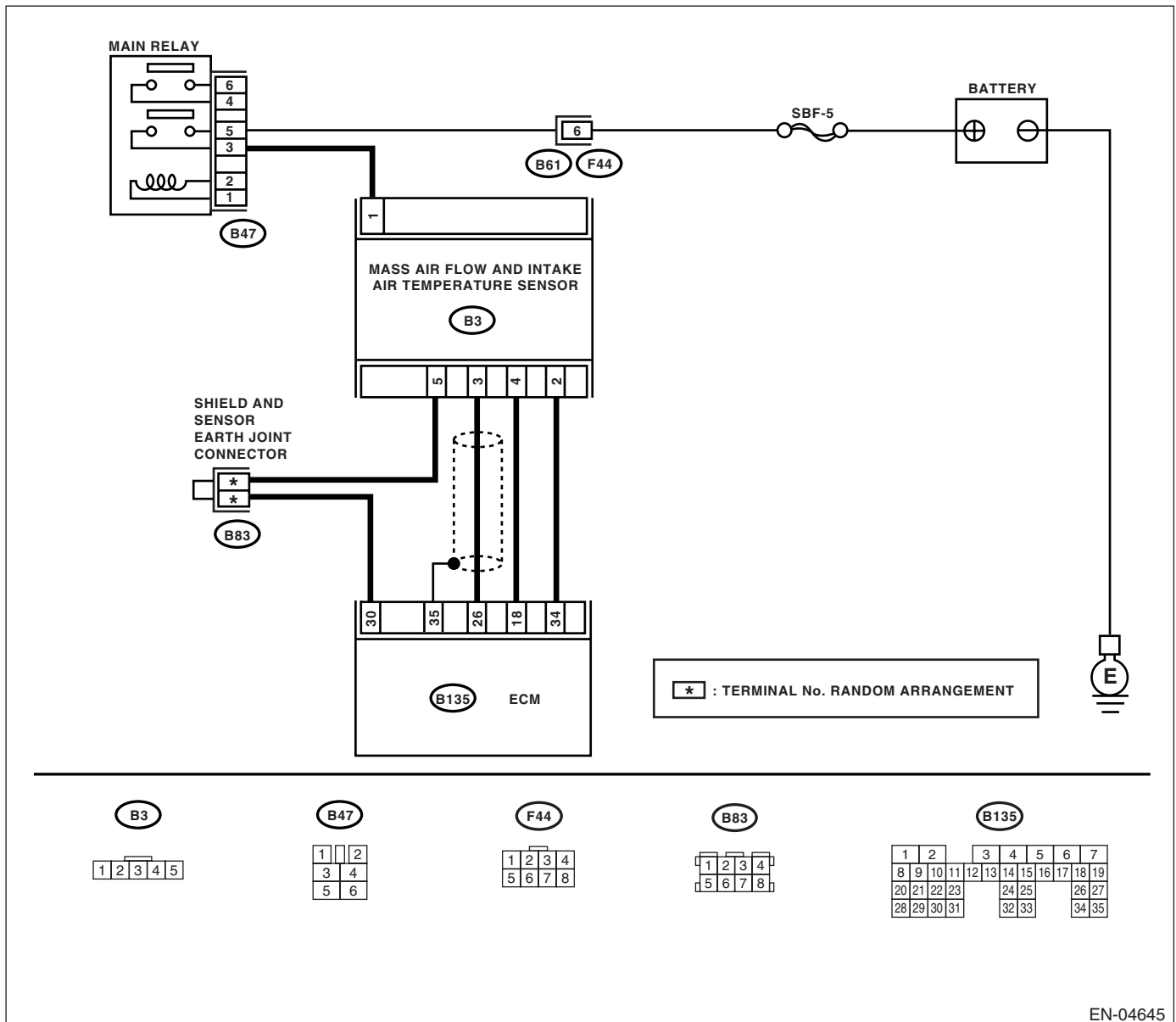
TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04645

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 air temperature sensor signal using Subaru Select Monitor or the general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the General Scan Tool Instruction Manual.	Is the temperature more than 55°C (131°F)?	Go to step 2.	Repair the poor contact. NOTE: In this case, repair the following: • Poor contact mass air flow and intake air temperature sensor • Poor contact in ECM • Poor contact in joint connector
2 CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR. 1) Turn 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 general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the General Scan Tool Instruction Manual.	Is the temperature less than – 36°C (–33°F)?	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-31, Mass Air Flow and Intake Air Temperature Sensor.>	Repair the ground short circuit in harness between mass air flow and intake air temperature sensor and ECM connector.

R: DTC P0113 INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-40, DTC P0113 INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

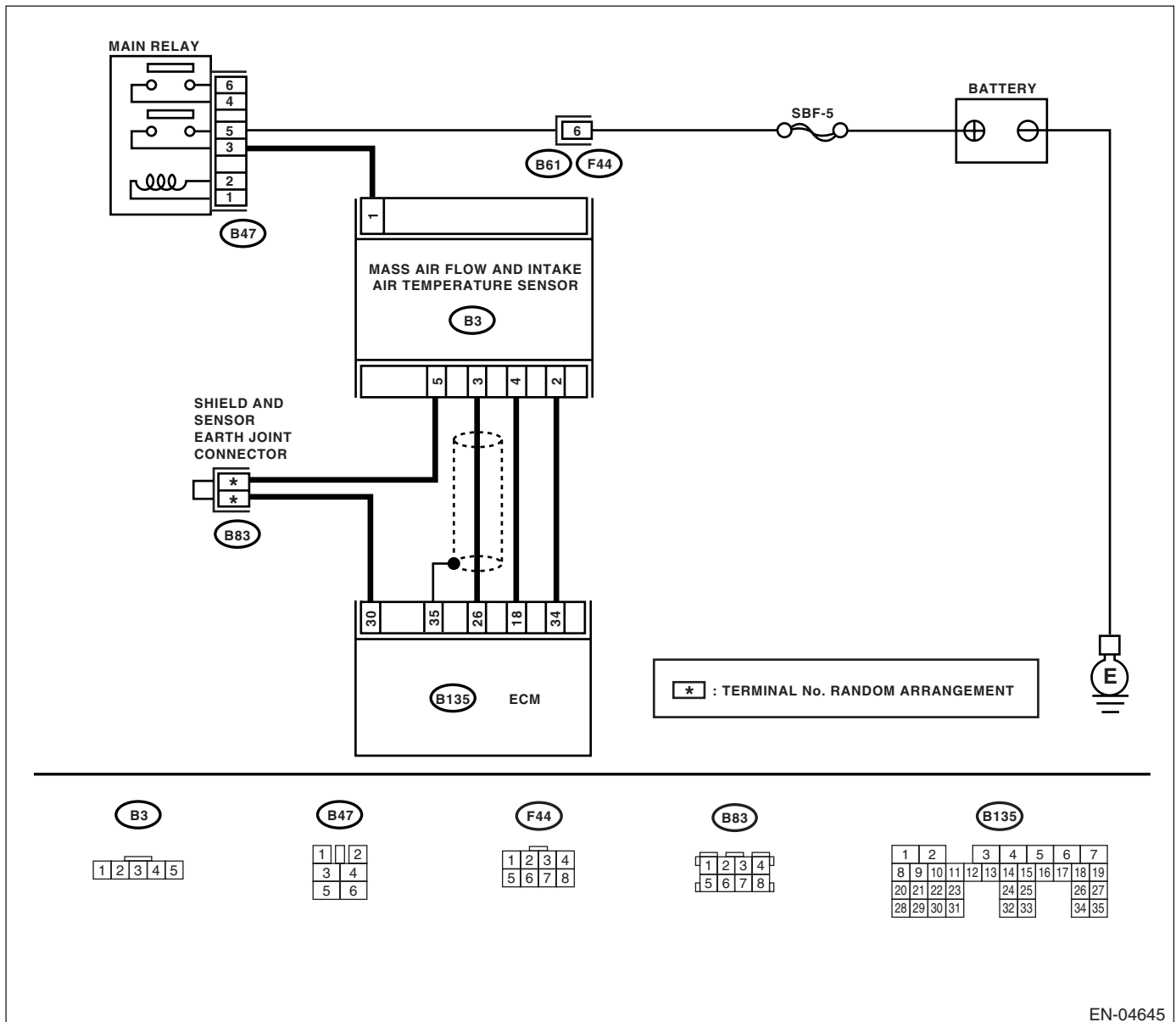
TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04645

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 air temperature sensor signal using Subaru Select Monitor or the general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the General Scan Tool Instruction Manual.	Is the temperature less than – 36°C (–33°F)?	Go to step 2.	Repair the poor contact. NOTE: In this case, repair the following: • Poor contact in mass air flow and intake air temperature sensor • Poor contact in ECM • Poor contact in joint connector
2 CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR. 1) Turn 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. Connector & terminal (B3) No. 4 (+) — Engine ground (–):	Is the voltage more than 10 V?	Repair the battery short circuit in harness between mass air flow and intake air temperature sensor and ECM connector.	Go to step 3.
3 CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE 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. Connector & terminal (B3) No. 4 (+) — Engine ground (–):	Is the voltage more than 10 V?	Repair the battery short circuit in harness between mass air flow and intake air temperature sensor and ECM connector.	Go to step 4.
4 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 manifold absolute pressure sensor connector and engine ground. Connector & terminal (B3) No. 4 (+) — Engine ground (–):	Is the voltage more than 4 V?	Go to step 5.	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between mass air flow and intake air temperature sensor and ECM connector • Poor contact in mass air flow and intake air temperature sensor • Poor contact in ECM • Poor contact in joint connector

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
5 CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between mass air flow and intake air temperature sensor and engine ground. Connector & terminal (B3) No. 5 — Engine ground:	Is the resistance less than 5 Ω ?	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-31, Mass Air Flow and Intake Air Temperature Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between mass air flow and intake air temperature sensor and ECM connector • Poor contact in mass air flow and intake air temperature sensor • Poor contact in ECM • Poor contact in joint connector

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

S: DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-42, DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

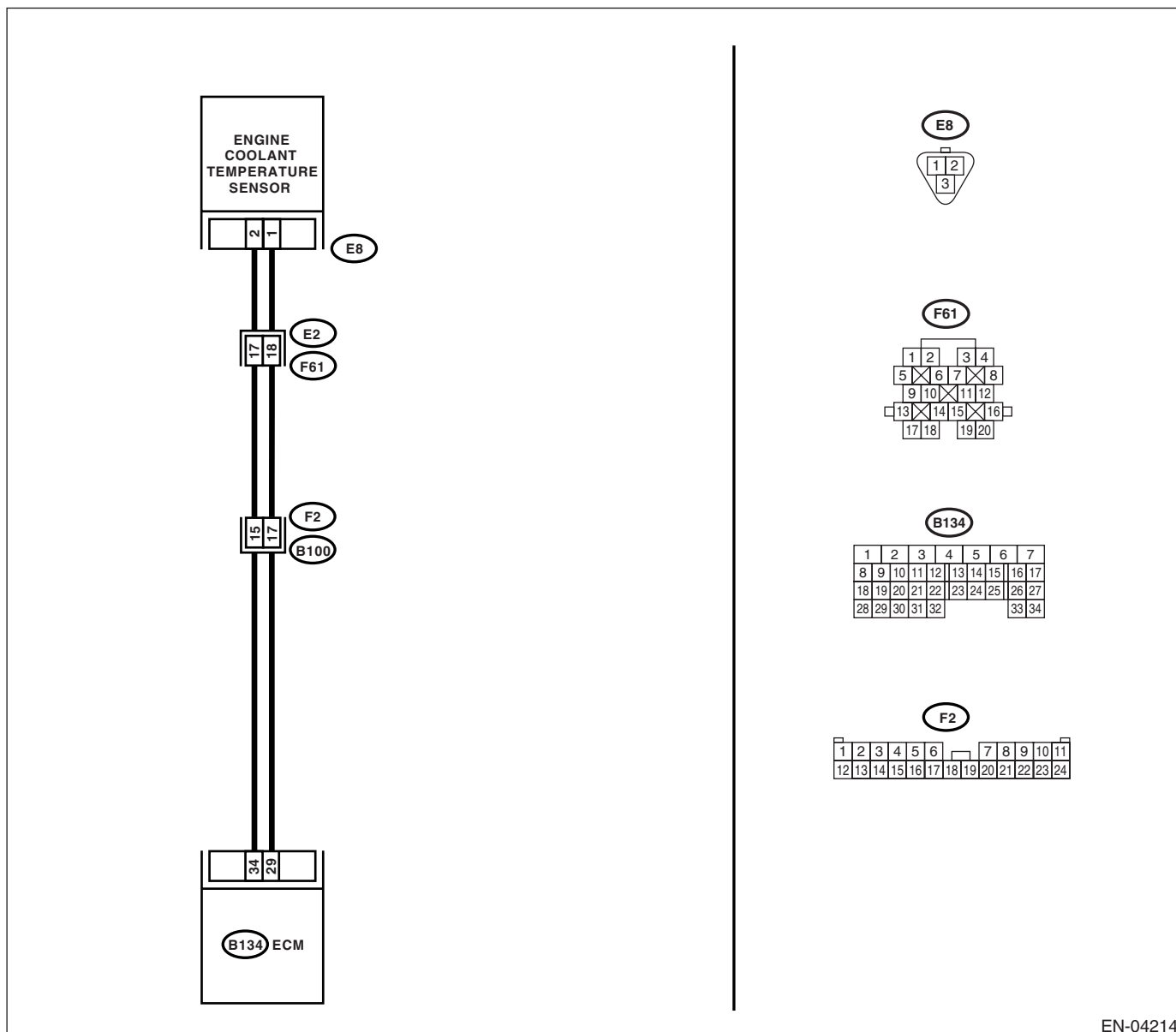
TROUBLE SYMPTOM:

- Hard to start
- Erroneous idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04214

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 engine coolant temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: - Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> - General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the temperature more than 120°C (248°F)?	Go to step 2.	Repair the poor contact. NOTE: In this case, repair the following: - Poor contact in engine coolant temperature sensor - Poor contact in ECM - Poor contact in coupling connector - Poor contact in joint connector
2 CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR. 1) Turn 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 general scan tool. NOTE: - Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> - General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the temperature less than – 40°C (–40°F)?	Replace the engine coolant temperature sensor. <Ref. to FU(H4DOTC)-27, Engine Coolant Temperature Sensor.>	Repair the ground short circuit in harness between engine coolant temperature sensor and ECM connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

T: DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-44, DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

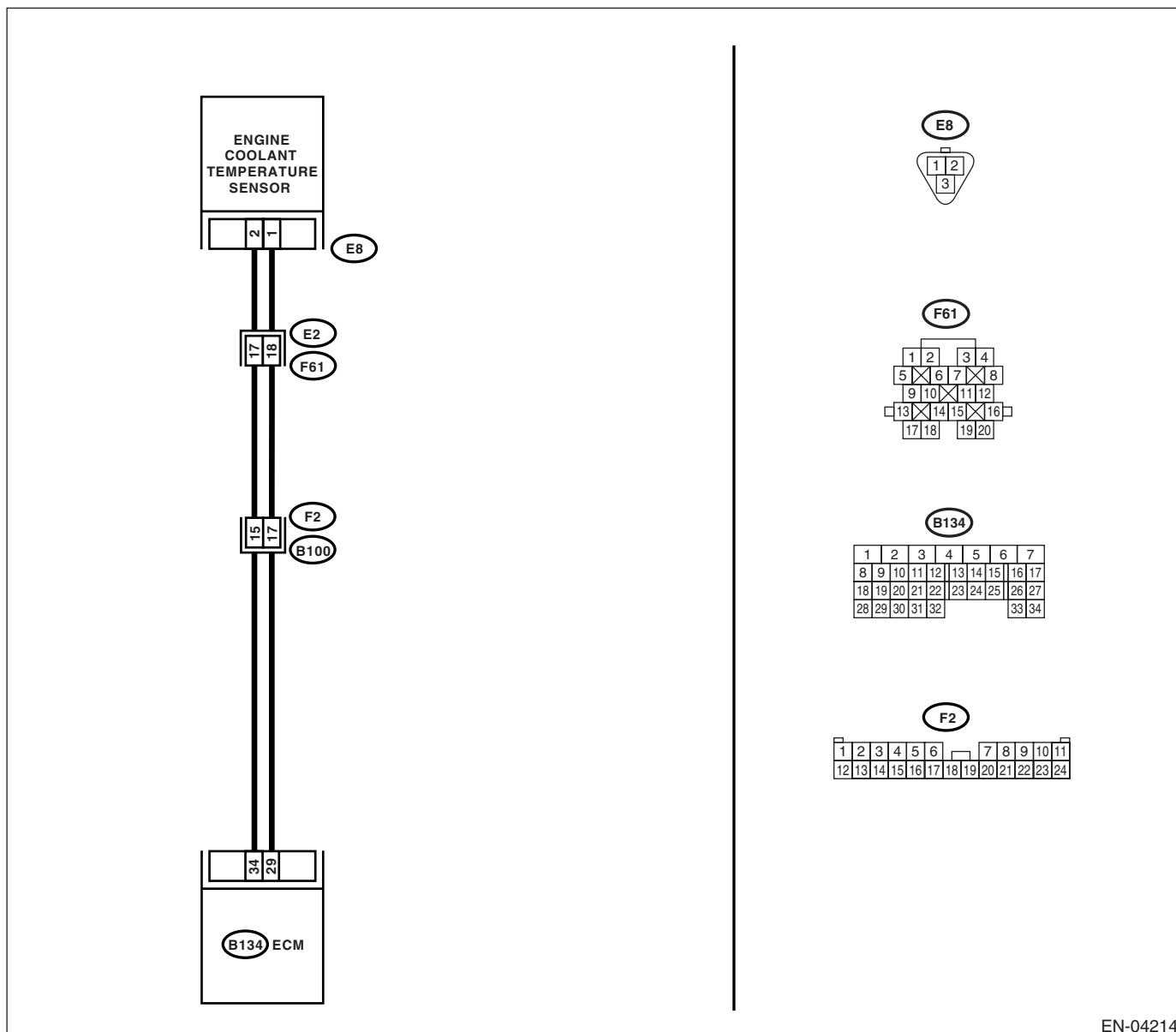
TROUBLE SYMPTOM:

- Hard to start
- Erroneous idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04214

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 engine coolant temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: - Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> - General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the temperature less than – 40°C (–40°F)?	Go to step 2.	Repair the poor contact. NOTE: In this case, repair the following: - Poor contact in engine coolant temperature sensor - Poor contact in ECM - Poor contact in coupling connector - Poor contact in joint connector
2 CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR. 1) Turn 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. Connector & terminal (E8) No. 2 (+) — Engine ground (–):	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.
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. Connector & terminal (E8) No. 2 (+) — Engine ground (–):	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 4.
4 CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR. Measure the voltage between engine coolant temperature sensor connector and engine ground. Connector & terminal (E8) No. 2 (+) — Engine ground (–):	Is the voltage more than 4 V?	Go to step 5.	Repair the harness and connector. NOTE: In this case, repair the following: - Open circuit in harness between ECM and engine coolant temperature sensor connector - Poor contact in engine coolant temperature sensor connector - Poor contact in ECM connector - Poor contact in coupling connector - Poor contact in joint connector

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
5 CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between engine coolant temperature sensor connector and engine ground. Connector & terminal (E8) No. 1 — Engine ground:	Is the resistance less than 5 Ω ?	Replace the engine coolant temperature sensor. <Ref. to FU(H4DOTC)-27, Engine Coolant Temperature Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and engine coolant temperature sensor connector • Poor contact in engine coolant temperature sensor connector • Poor contact in ECM connector • Poor contact in coupling connector • Poor contact in joint connector

**U: DTC P0122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT
LOW INPUT**

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-46, DTC P0122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

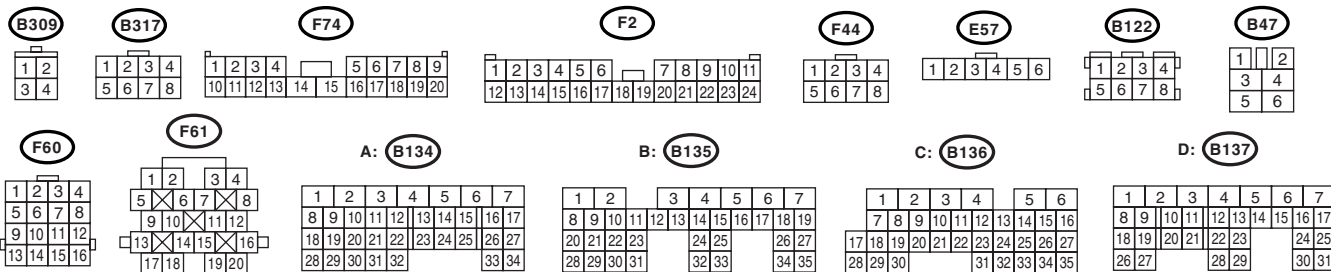
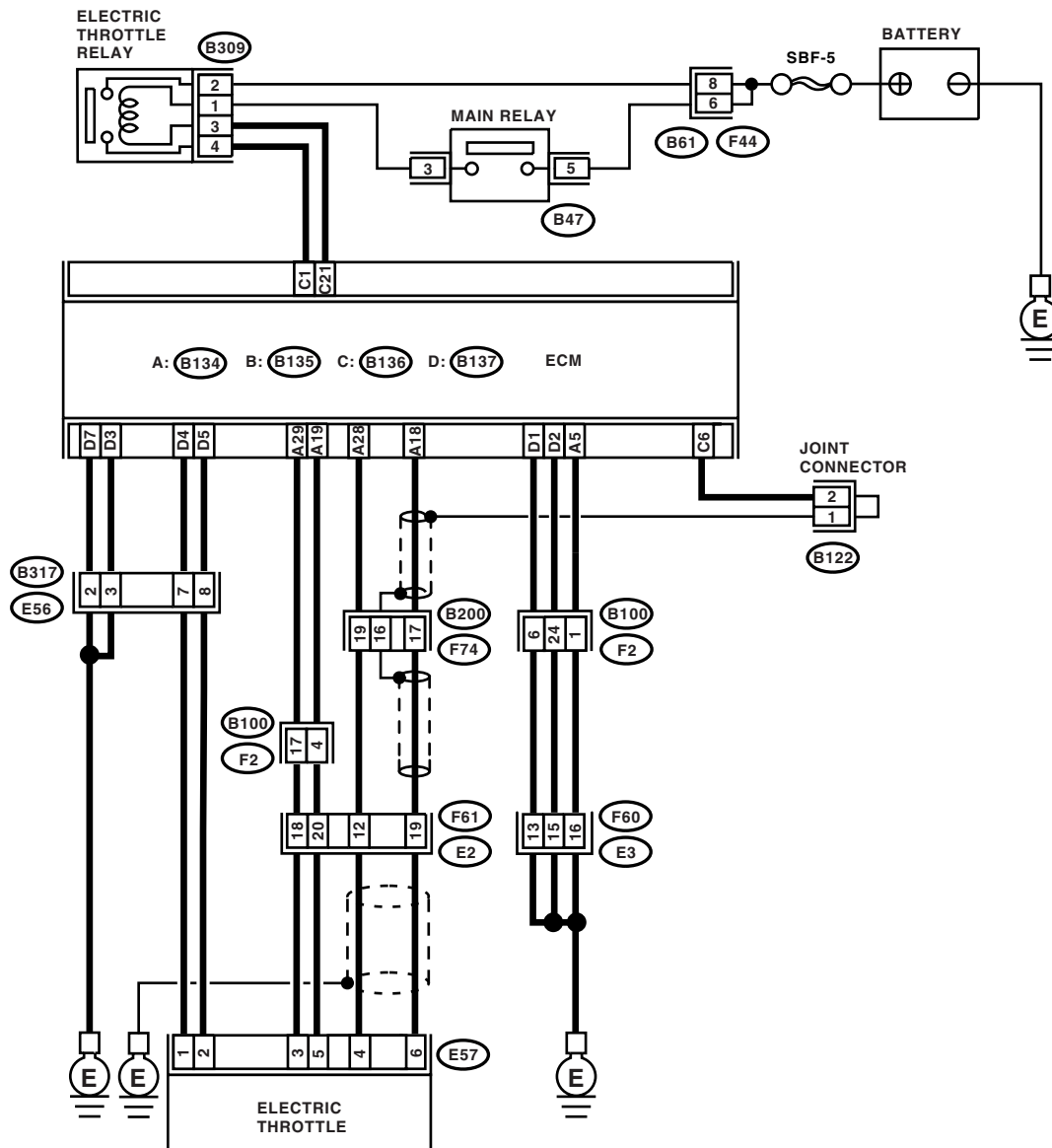
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-04706

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK SENSOR OUTPUT. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector and terminal. Connector & terminal (B134) No. 28 (+) — (B134) No. 29 (-): 3) Shake the ECM harness and connector, engine harness connectors, electronic throttle control connector harness while monitoring value of voltage meter.	Is the voltage more than 0.4 V?	Go to step 2.	Go to step 3.
2 CHECK POOR CONTACT. Check the poor contact in connector between ECM and electronic throttle control.	Is there poor contact in connector between ECM and electronic throttle control?	Repair the poor contact.	Temporary poor contact occurred, but it is normal at present.
3 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connectors from the electronic throttle control control. 4) Measure the resistance between ECM connector and electronic throttle control connector. Connector & terminal (B134) No. 19 — (E57) No. 5:	Is the resistance less than 1 Ω ?	Go to step 4.	Repair the open circuit of harness connector.
4 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. Measure the resistance between ECM connector and chassis ground. Connector & terminal (B134) No. 18 — Chassis ground: (B134) No. 19 — Chassis ground:	Is the resistance more than 1 M Ω ?	Go to step 5.	Repair the chassis short circuit of harness.
5 CHECK POWER SUPPLY OF ELECTRONIC THROTTLE CONTROL. 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control connector and engine ground. Connector & terminal (E57) No. 5 (+) — Engine ground (-): 4) Shake the ECM harness and connector, engine harness connectors, while monitoring value of voltage meter.	Is the voltage 4.5 — 5.5 V?	Go to step 6.	Repair the poor contact in ECM connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>
6 CHECK SHORT CIRCUIT INSIDE THE ECM. 1) Turn the ignition switch to OFF. 2) Measure the resistance between electronic throttle control control connector and engine ground. Connector & terminal (E57) No. 6 — Engine ground:	Is the resistance more than 10 Ω ?	Repair the poor contact of electronic throttle control connector. If problem persists, replace the electronic throttle control. <Ref. to FU(H4DOTC)-13, Throttle Body.>	Repair the poor contact in ECM connector. Replace the ECM if defective. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

V: DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT HIGH INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-47, DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

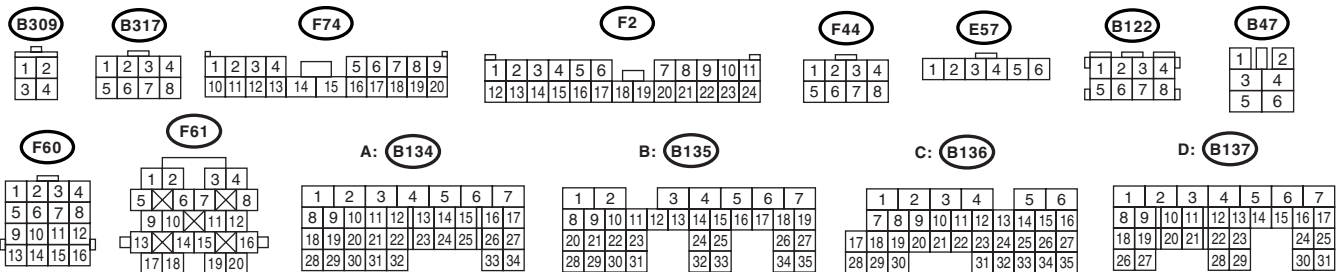
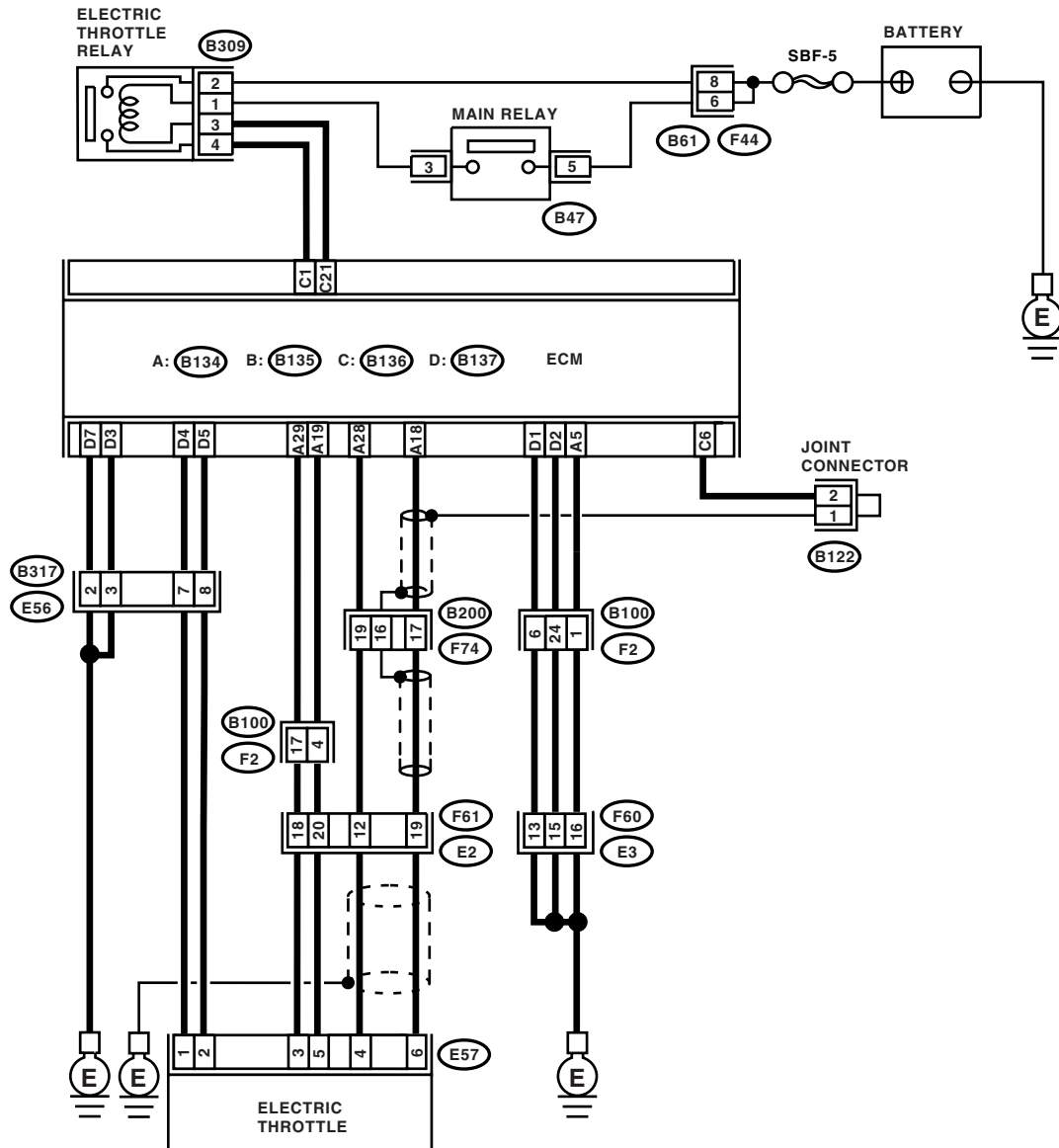
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-04706

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK SENSOR OUTPUT. 1) Turn the ignition switch to ON. 2) Read the data of main throttle sensor signal using Subaru Select Monitor. 3) Shake the ECM harness and connector, engine harness connectors, electronic throttle control connector harness while monitoring value of voltage meter.	Is the voltage less than 4.63 V?	Go to step 2.	Go to step 3.
2 CHECK POOR CONTACT. Check the poor contact in connector between ECM and electronic throttle control.	Is there poor contact in connector between ECM and electronic throttle control?	Repair the poor contact.	Temporary poor contact occurred, but it is normal at present.
3 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connectors from the electronic throttle control control. 4) Measure the resistance between ECM connector and electronic throttle control connector. Connector & terminal (B134) No. 18 — (E57) No. 6: (B134) No. 29 — (E57) No. 3:	Is the resistance less than 1 Ω ?	Go to step 4.	Repair the open circuit of harness connector.
4 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Connect the ECM connector. 2) Measure the resistance between electronic throttle control connector and engine ground. Connector & terminal (E57) No. 3 — Engine ground:	Is the resistance less than 5 Ω ?	Go to step 5.	Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>
5 CHECK SENSOR OUTPUT POWER SUPPLY. Measure the voltage between electronic throttle control connector and engine ground. Connector & terminal (E57) No. 6 (+) — Engine ground (-):	Is the voltage more than 10 V?	Replace the electronic throttle control. <Ref. to FU(H4DOTC)-13, Throttle Body.>	Repair battery short circuit in harness between ECM connector and electronic throttle control connector.

W: DTC P0125 INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL**DTC DETECTING CONDITION:**

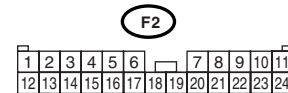
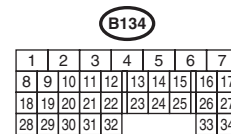
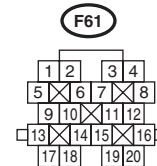
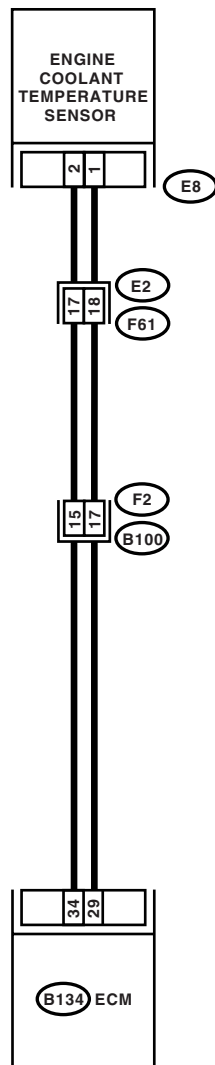
- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-49, DTC P0125 INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

Engine will not return to idling.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0125.	Go to step 2.
2 CHECK ENGINE COOLING SYSTEM. NOTE: Check the following items. • Thermostat open stuck • Coolant level • Coolant freeze • Tire diameter	Is there a fault in engine cooling system?	Replace the thermostat. <Ref. to CO(H4DOTC)-21, Thermostat.>	Replace the engine coolant temperature sensor. <Ref. to FU(H4DOTC)-27, Engine Coolant Temperature Sensor.>

X: DTC P0126 INSUFFICIENT COOLANT TEMPERATURE FOR STABLE OPERATION**DTC DETECTING CONDITION:**

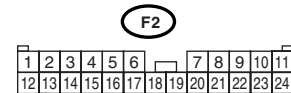
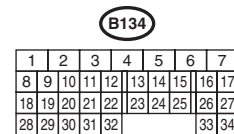
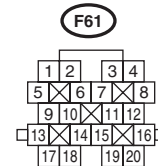
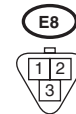
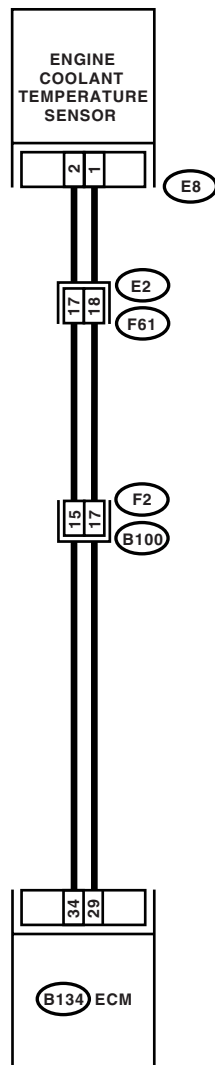
- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-51, DTC P0126 INSUFFICIENT COOLANT TEMPERATURE FOR STABLE OPERATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

Engine would not return to idling.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:

EN-04214

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK ENGINE COOLANT TEMPERATURE SENSOR. Measure the resistance between engine coolant temperature sensor terminals when engine coolant is cold and after warmed-up. Terminals No. 1 — No. 2:	Is the resistance of engine coolant temperature sensor different between when engine coolant is cold and after warmed-up?	Contact your SOA Service Center since deterioration of some parts may be the cause. NOTE: Deterioration of some parts may be the cause.	Replace the engine coolant temperature sensor. <Ref. to FU(H4DOTC)-27, Engine Coolant Temperature Sensor.>

Y: DTC P0128 COOLANT THERMOSTAT (COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE)**DTC DETECTING CONDITION:**

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-53, DTC P0128 COOLANT THERMOSTAT (COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

Thermostat remains open.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

Step	Check	Yes	No
1 CHECK VEHICLE CONDITION.	Was the vehicle driven or idled with the engine partially submerged under water?	In this case, it is not necessary to inspect DTC P0128.	Go to step 2.
2 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Codes (DTC)". <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).>	Go to step 3.
3 CHECK ENGINE COOLANT.	Are coolant level and mixture ratio of cooling water to anti-freeze solution correct?	Go to step 4.	Replace the engine coolant. <Ref. to CO(H4DOTC)-17, REPLACEMENT, Engine Coolant.>
4 CHECK RADIATOR FAN. 1) Start the engine. 2) Check radiator fan operation.	Does the radiator fan continuously rotate for more than 3 minutes during idling?	Repair radiator fan circuit. <Ref. to CO(H4DOTC)-28, Radiator Main Fan and Fan Motor.> and <Ref. to CO(H4DOTC)-30, Radiator Sub Fan and Fan Motor.>.	Replace the thermostat. <Ref. to CO(H4DOTC)-21, Thermostat.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Z: DTC P0131 O₂ SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1)

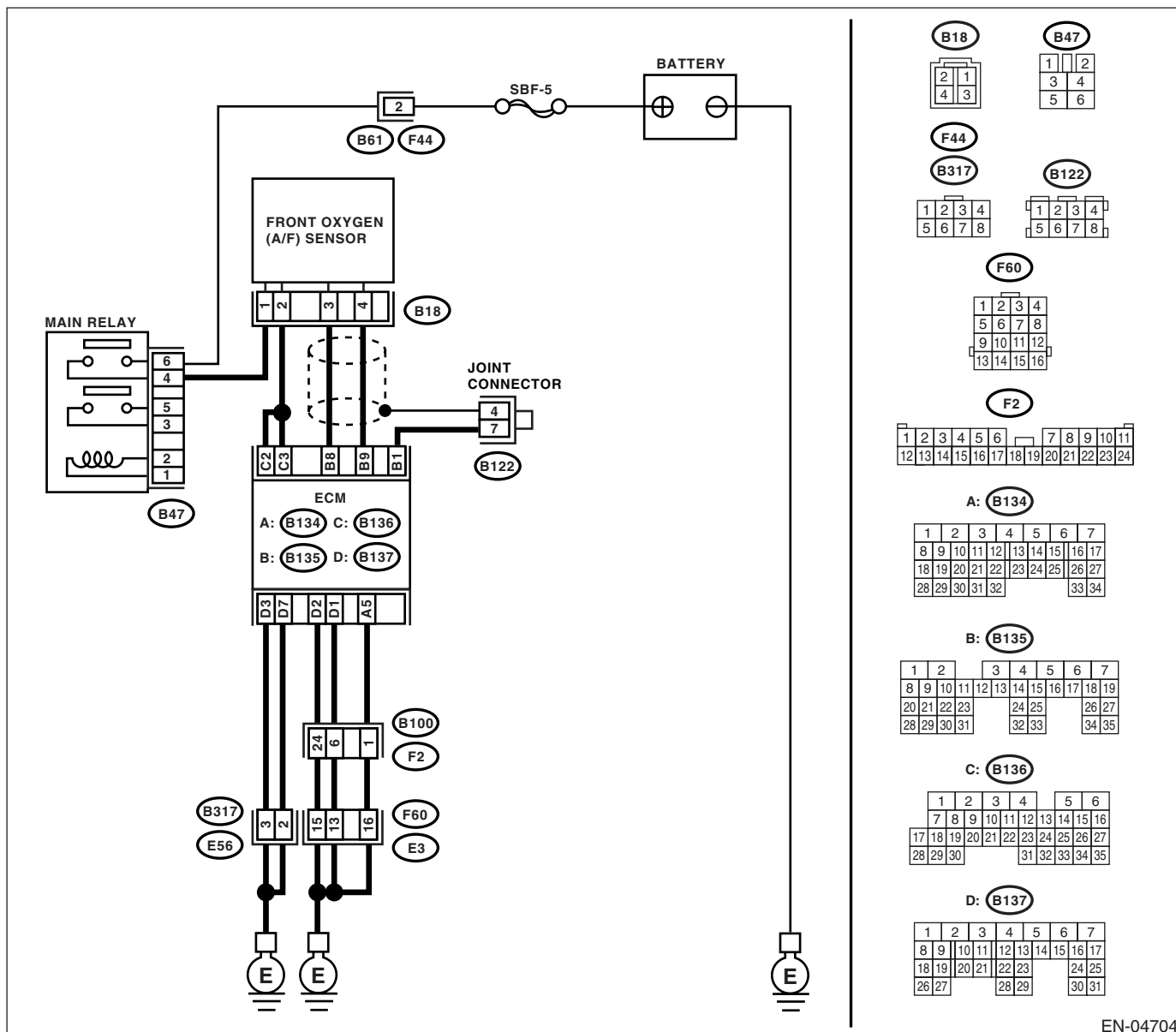
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-55, DTC P0131 O₂ SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04704

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.	Is there water in connector?	Remove infiltrating water completely.	Go to step 2.
2 CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR. 1) Disconnect the connector from ECM and front oxygen (A/F) sensor connector. 2) Turn the ignition switch to OFF. 3) Measure the resistance of harness between ECM connector and chassis ground. Connector & terminal (B135) No. 8 — Chassis ground: (B135) No. 9 — Chassis ground:	Is the resistance more than 1 MΩ?	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-41, Front Oxygen (A/F) Sensor.>	Repair the ground short circuit of harness between ECM and front oxygen (A/F) sensor connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

AA:DTC P0132 O₂ SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1)

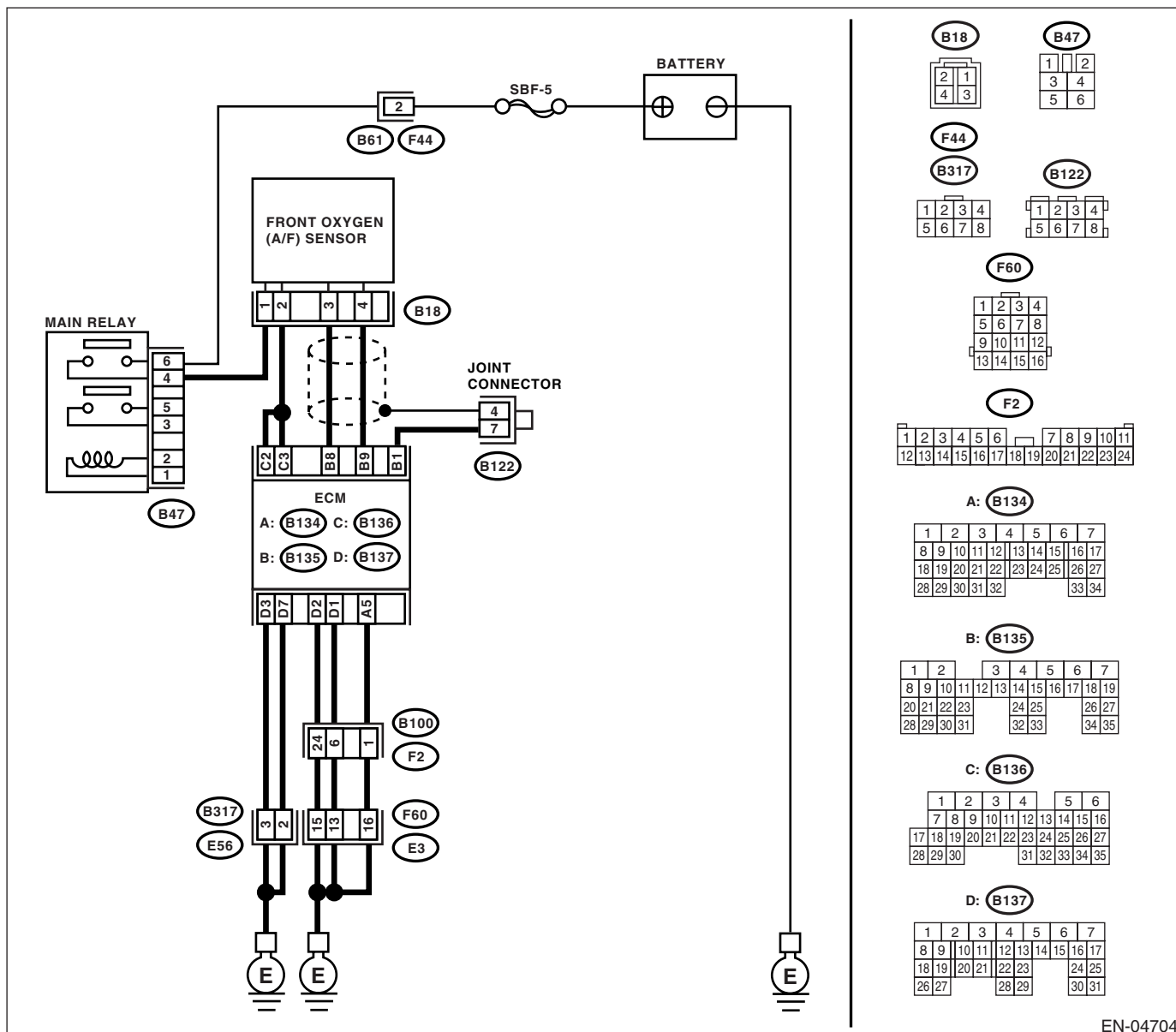
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-57, DTC P0132 O₂ SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, perform Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04704

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.	Is there water in connector?	Remove infiltrating water completely.	Go to step 2.
2 CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR. 1) Disconnect the connector from front oxygen (A/F) sensor. 2) Turn the ignition switch to ON. 3) Measure the voltage of harness between ECM connector and chassis ground. Connector & terminal (B135) No. 8 (+) — Chassis ground (-): (B135) No. 9 (+) — Chassis ground (-):	Is the voltage more than 8 V?	Repair the battery short circuit of harness between ECM and front oxygen (A/F) sensor connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-41, Front Oxygen (A/F) Sensor.>

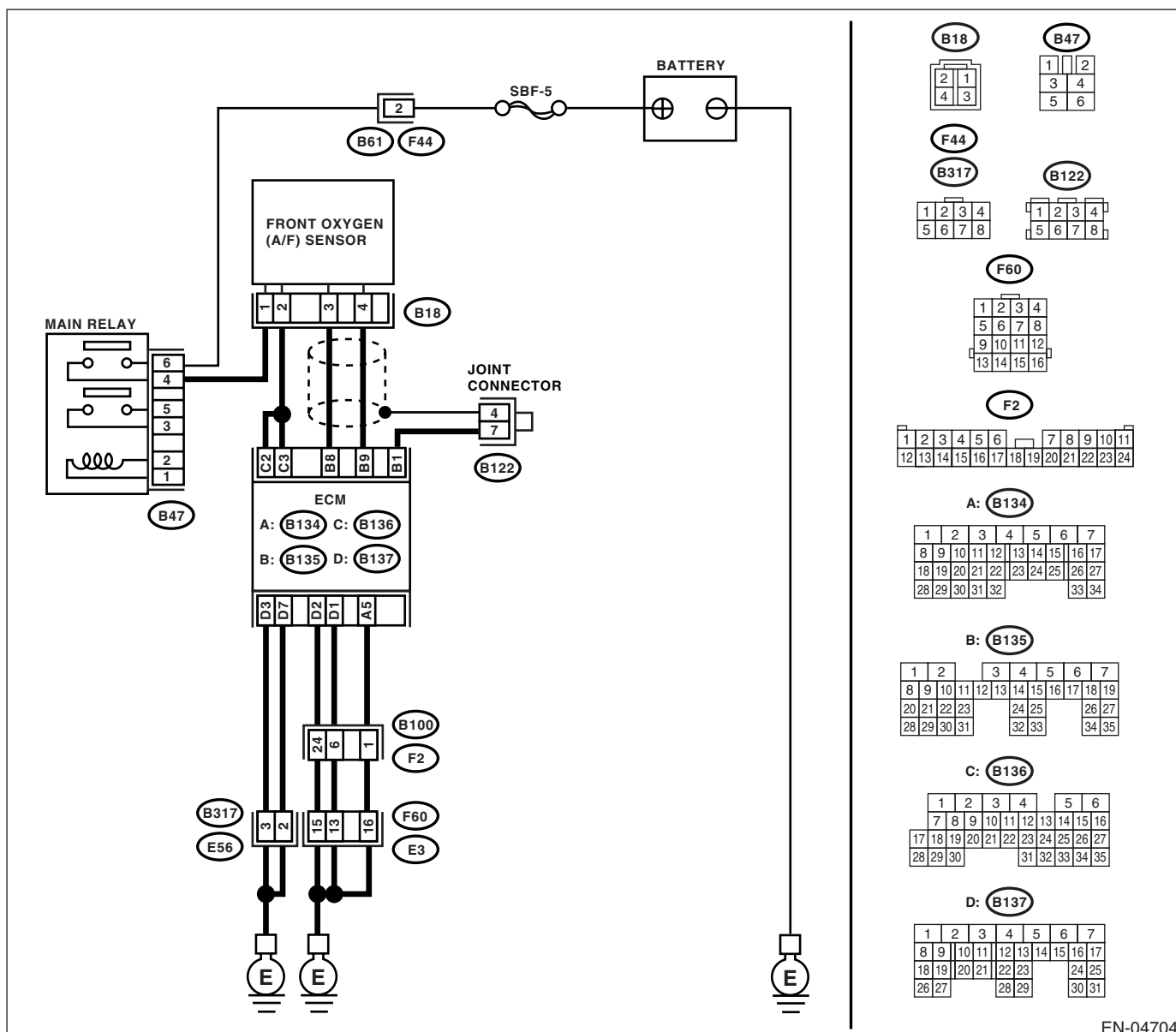
ENGINE (DIAGNOSTICS)

DTC DETECTING CONDITION:

- CAUTION:**

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0133.	Go to step 2.
2 CHECK EXHAUST SYSTEM. NOTE: Check the following items. • Loose installation of front portion of exhaust pipe onto cylinder heads • Loose connection between front exhaust pipe and front catalytic converter • Damage of exhaust pipe resulting in a hole	Is there a fault in exhaust system?	Repair the exhaust system.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-41, Front Oxygen (A/F) Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

AC:DTC P0134 O₂ SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1)

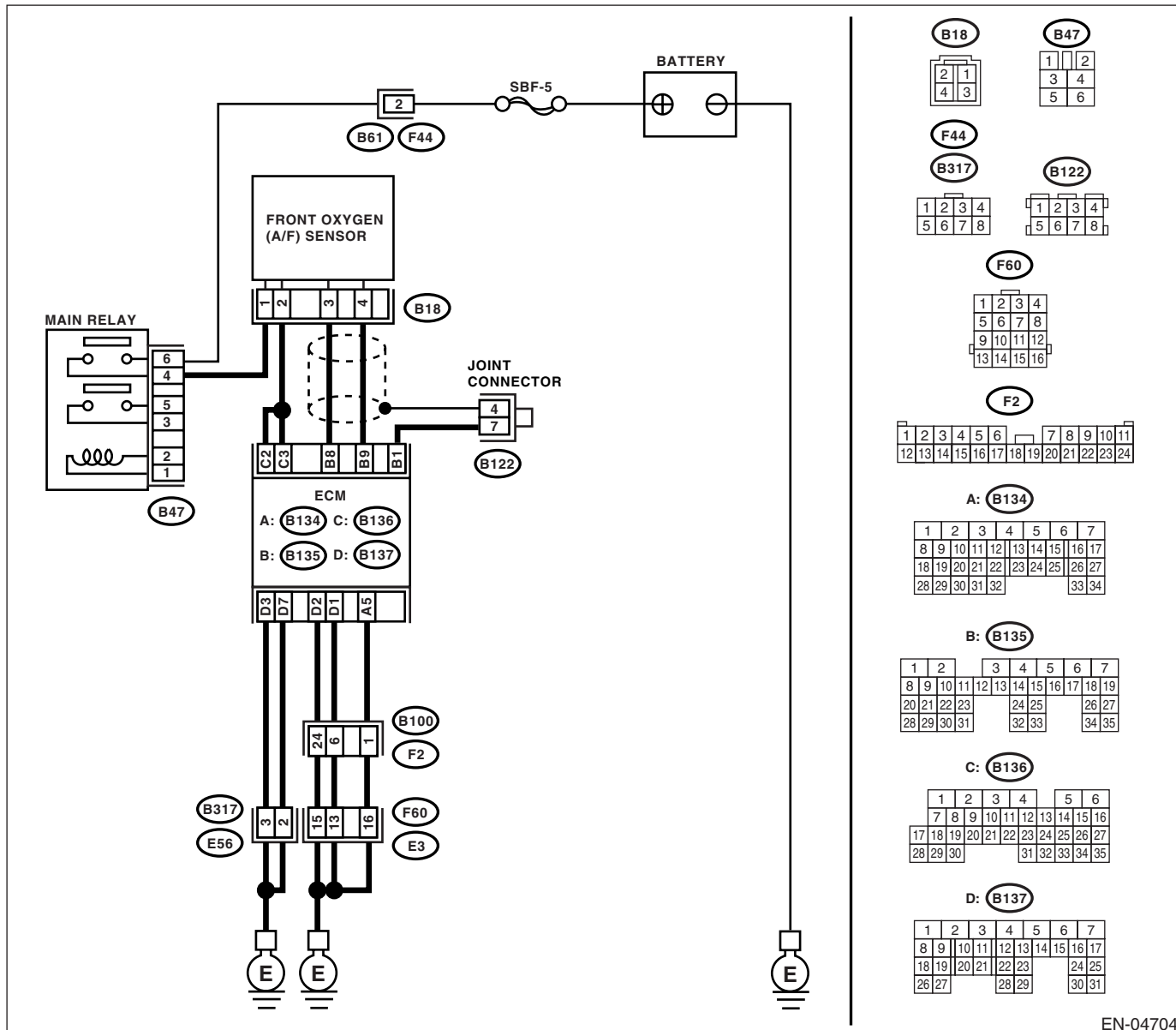
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-61, DTC P0134 O₂ SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04704

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 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. Connector & terminal (B135) No. 8 — (B18) No. 3: (B135) No. 9 — (B18) No. 4:	Is the resistance less than 1 Ω ?	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-41, Front Oxygen (A/F) Sensor.>	Repair the open circuit in harness between ECM and front oxygen (A/F) sensor.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

AD:DTC P0137 O₂ SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2)

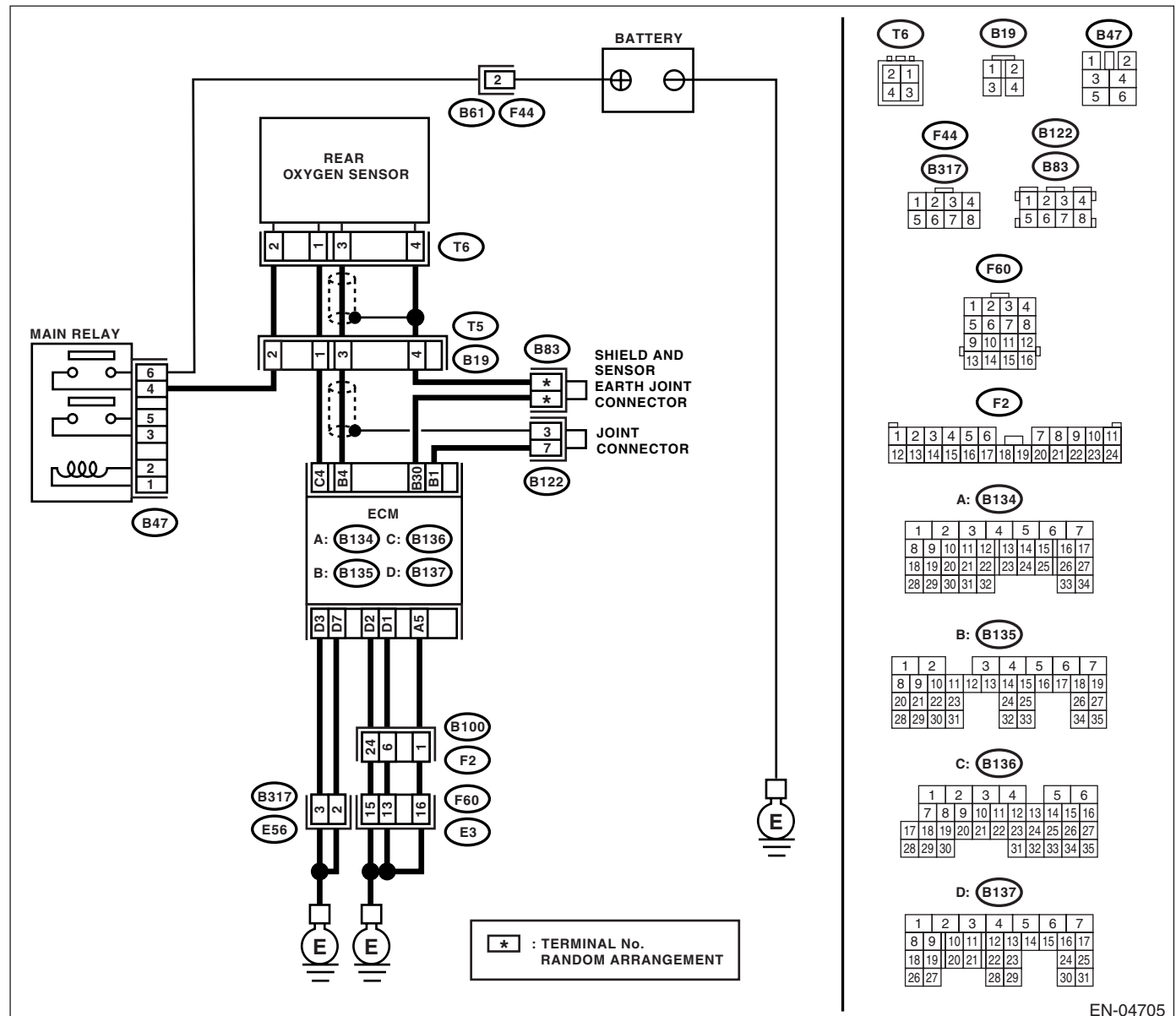
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-62, DTC P0137 O₂ SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04705

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Using the List of Diagnostic Trouble Code (DTC), check the appropriate DTC. <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0137.	Go to step 2.
2 CHECK REAR OXYGEN SENSOR DATA. 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and keep the engine speed at 3,000 rpm. (2 minutes at the longest) 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • For MT model, depress the clutch pedal. • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the voltage more than 490 mV?	Go to step 6.	Go to step 3.
3 CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.	Is there water in connector?	Remove infiltrating water completely.	Go to step 4.
4 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. 4 — (T6) No. 3: (B135) No. 30 — (T6) 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 5.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
5 CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from rear oxygen sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between rear oxygen sensor harness connector and engine ground or chassis ground. Connector & terminal (T6) No. 3 (+) — Chassis ground (-):	Is the voltage 0.2 — 0.5 V?	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-43, 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
6 CHECK EXHAUST SYSTEM. Check the exhaust system parts. NOTE: Check the following items. • Looseness and incomplete installation of exhaust system parts • 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(H4DOTC)-43, Rear Oxygen Sensor.>

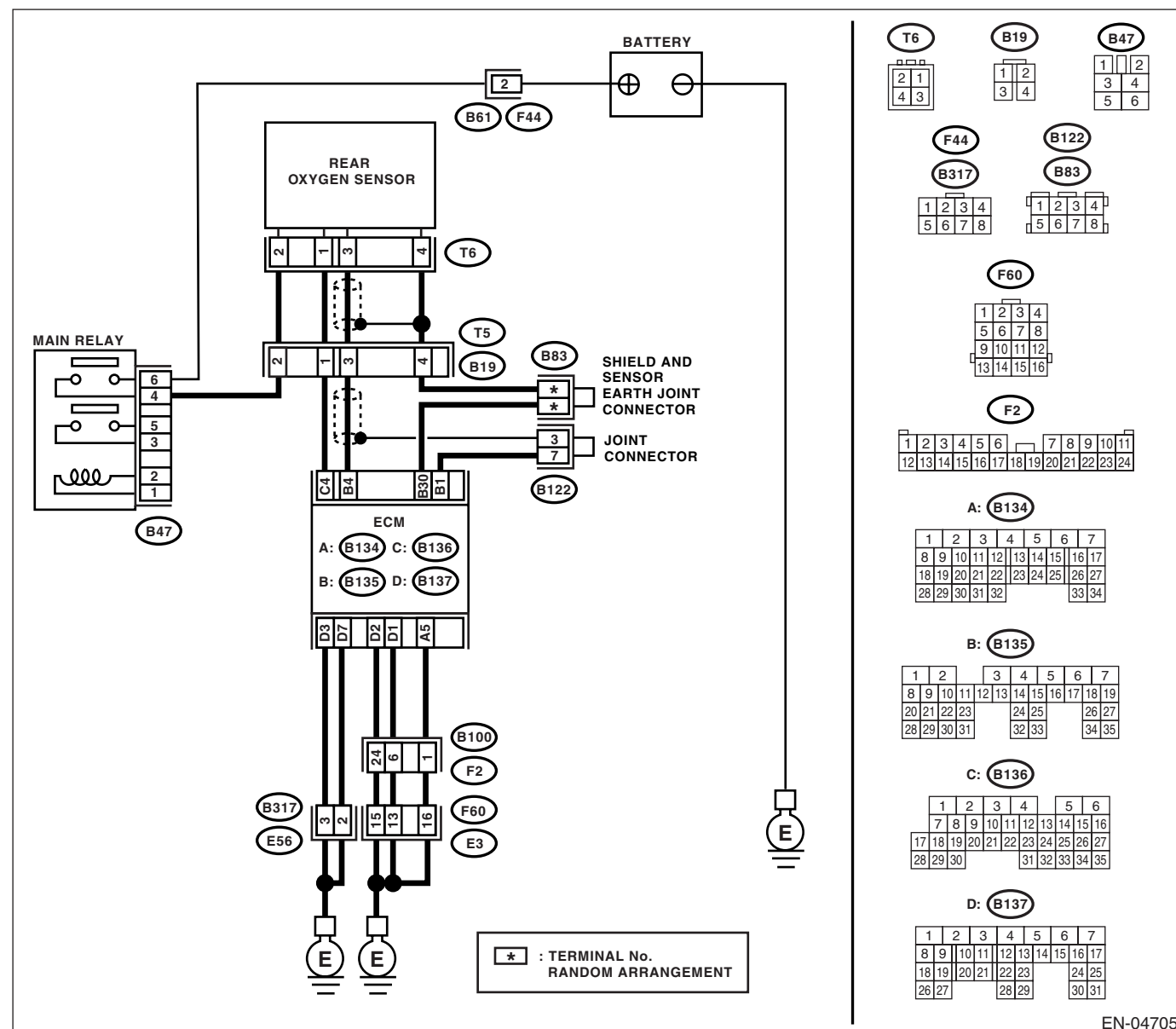
ENGINE (DIAGNOSTICS)

DTC DETECTING CONDITION:

- CAUTION:**

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Using the List of Diagnostic Trouble Code (DTC), check the appropriate DTC. <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0138.	Go to step 2.
2 CHECK REAR OXYGEN SENSOR DATA. 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and quickly lower the engine speed from 3,000 rpm. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • For MT model, depress the clutch pedal. • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the voltage less than 250 mV?	Go to step 6.	Go to step 3.
3 CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.	Is there water in connector?	Remove infiltrating water completely.	Go to step 4.
4 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. 4 — (T6) No. 3: (B135) No. 30 — (T6) 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 5.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
5 CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from rear oxygen sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between rear oxygen sensor harness connector and engine ground or chassis ground. Connector & terminal (T6) No. 3 (+) — Chassis ground (-):	Is the voltage 0.2 — 0.5 V?	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-43, 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
6 CHECK EXHAUST SYSTEM. Check the exhaust system parts. NOTE: Check the following items. • Looseness and incomplete installation of exhaust system parts • 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(H4DOTC)-43, Rear Oxygen Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

AF:DTC P0139 O₂ SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2)

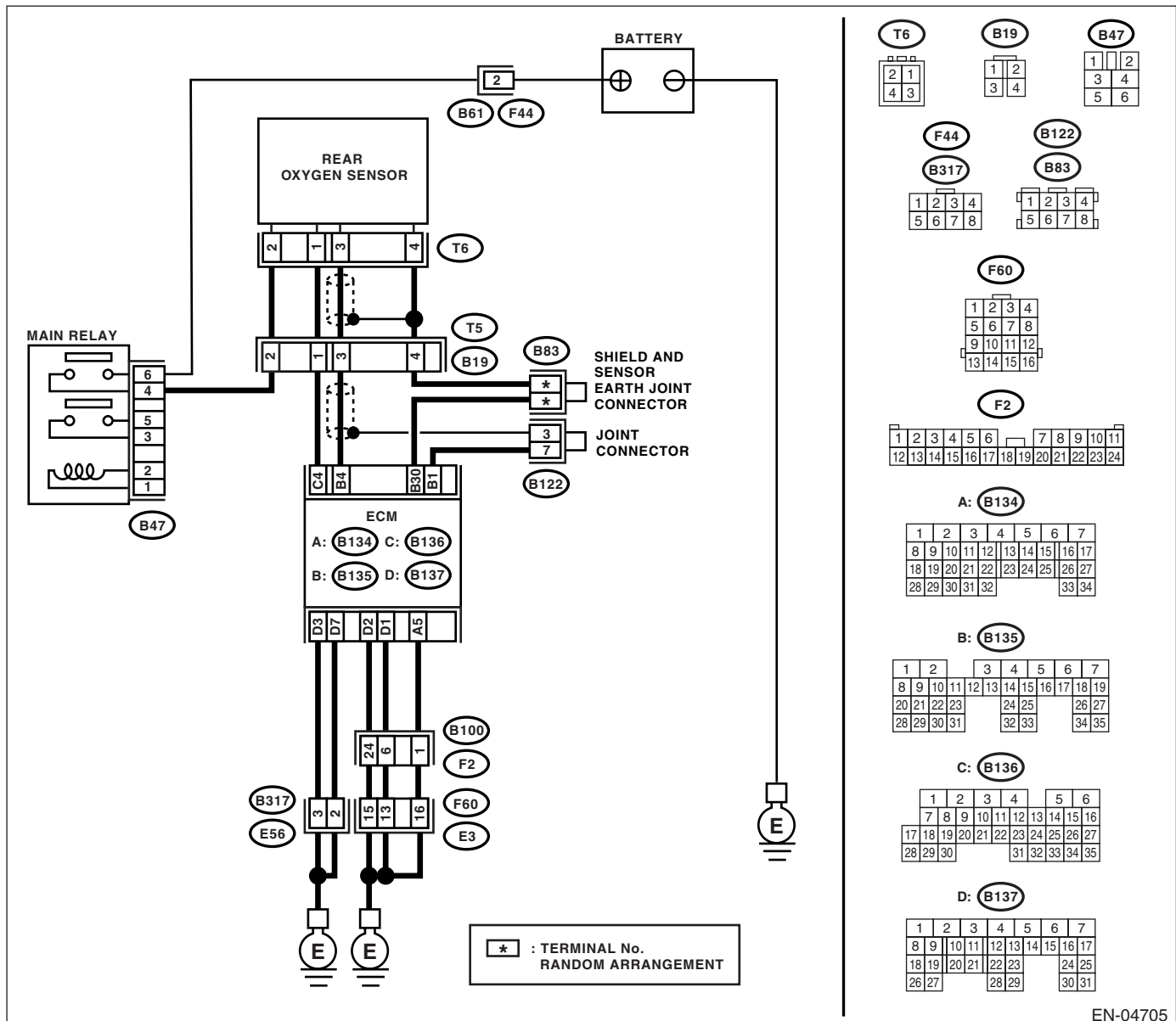
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-65, DTC P0139 O₂ SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04705

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0139.	Go to step 2.
2 CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and rear oxygen sensor. 3) Measure the resistance of harness between ECM and rear oxygen sensor. Connector & terminal (T6) No. 3 — (B135) No. 4:	Is the resistance less than 1 Ω ?	Go to step 3.	Repair open circuit in harness between rear oxygen sensor and ECM.
3 CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR. Measure the resistance between ECM connector and chassis ground. Connector & terminal (T6) No. 3 — Chassis ground:	Is the resistance more than 1 M Ω ?	Go to step 4.	Repair ground short circuit in harness between rear oxygen sensor and ECM.
4 CHECK REAR OXYGEN SENSOR. Measure the resistance between rear oxygen sensor terminals. Terminals No. 3 — No. 4:	Is the resistance less than 1 Ω ?	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-43, Rear Oxygen Sensor.>	Temporary poor contact occurs. Check poor contact in connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

AG:DTC P0140 O₂ SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 2)

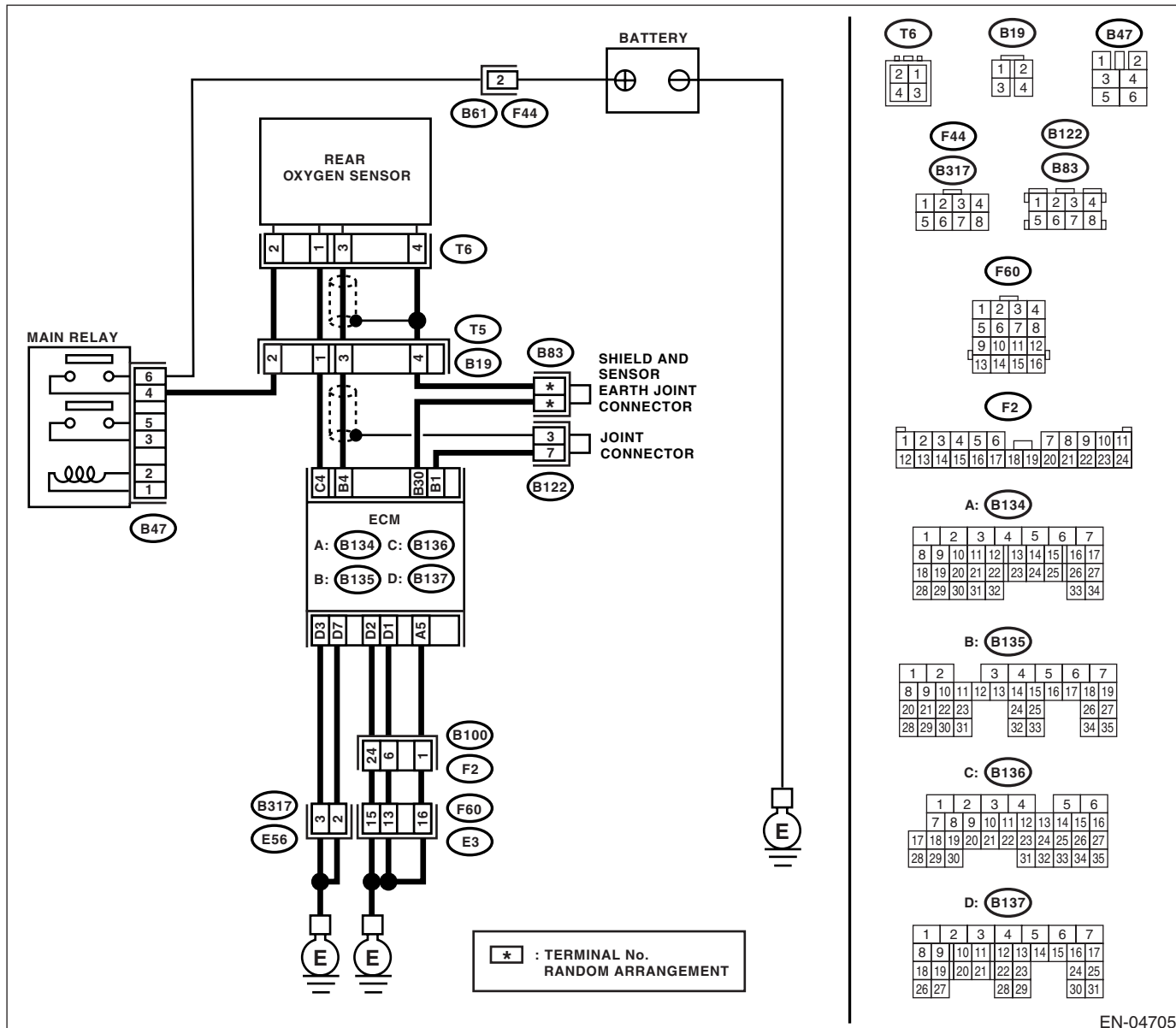
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-71, DTC P0140 O₂ SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04705

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK FOR ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Using the List of "Diagnostic Trouble Code (DTC)", check the appropriate DTC. <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0140.	Go to step 2.
2 CHECK REAR OXYGEN SENSOR DATA. 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and keep the engine speed at 3,000 rpm. (2 minutes at the longest) 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • For MT model, depress the clutch pedal. • Subaru Select Monitor For detailed operation procedures, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the General Scan Tool Instruction Manual.	Is the voltage more than 490 mV?	Go to step 7.	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 immediately decrease the engine speed from 3,000 rpm. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • For MT model, depress the clutch pedal. • Subaru Select Monitor For detailed operation procedures, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the General Scan Tool Instruction Manual.	Is the voltage less than 250 mV?	Go to step 7.	Go to step 4.
4 CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.	Is there water in connector?	Remove infiltrating water completely.	Go to step 5.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
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. 4 — (T6) No. 3: (B135) No. 30 — (T6) 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 the rear oxygen sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between rear oxygen sensor harness connector and chassis ground. Connector & terminal (T6) No. 3 (+) — Chassis ground (-):	Is the voltage 0.2 — 0.5 V?	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-43, Rear Oxygen Sensor.>	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor connector • Poor contact in ECM connector
7 CHECK EXHAUST SYSTEM. Check the exhaust system parts. NOTE: Check the following items: • Looseness and incomplete installation of exhaust system parts • Damage (crack, hole etc.) of parts • Looseness and incomplete installation of parts between front oxygen (A/F) sensor and rear oxygen sensor	Is there any fault in exhaust system?	Repair or replace faulty parts.	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-43, Rear Oxygen Sensor.>

AH:DTC P0171 SYSTEM TOO LEAN (BANK 1)

NOTE:

For the diagnostic procedure, refer to DTC P0172. <Ref. to EN(H4DOTC)(diag)-153, DTC P0172 SYSTEM TOO RICH (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AI: DTC P0172 SYSTEM TOO RICH (BANK 1)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-74, DTC P0172 SYSTEM TOO RICH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, 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. Measure the fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold. <Ref. to ME(H4DOTC)-28, INSPECTION, Fuel Pressure.> 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 measured value 284 — 314 kPa (2.9 — 3.2 kgf/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
4 CHECK FUEL PRESSURE. After connecting the pressure regulator vacuum hose, measure fuel pressure. <Ref. to ME(H4DOTC)-28, INSPECTION, Fuel Pressure.> 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. • If out of specification as measured at this step, check or replace the pressure regulator and pressure regulator vacuum hose.	Is the measured value 230 — 260 kPa (2.35 — 2.65 kgf/cm ² , 33 — 38 psi)?	Go to step 5.	Repair the following items. Fuel pressure too high: • Faulty pressure regulator • Clogged fuel return line or bent hose Fuel pressure too low: • Faulty pressure regulator • Improper fuel pump discharge • Clogged fuel supply line

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

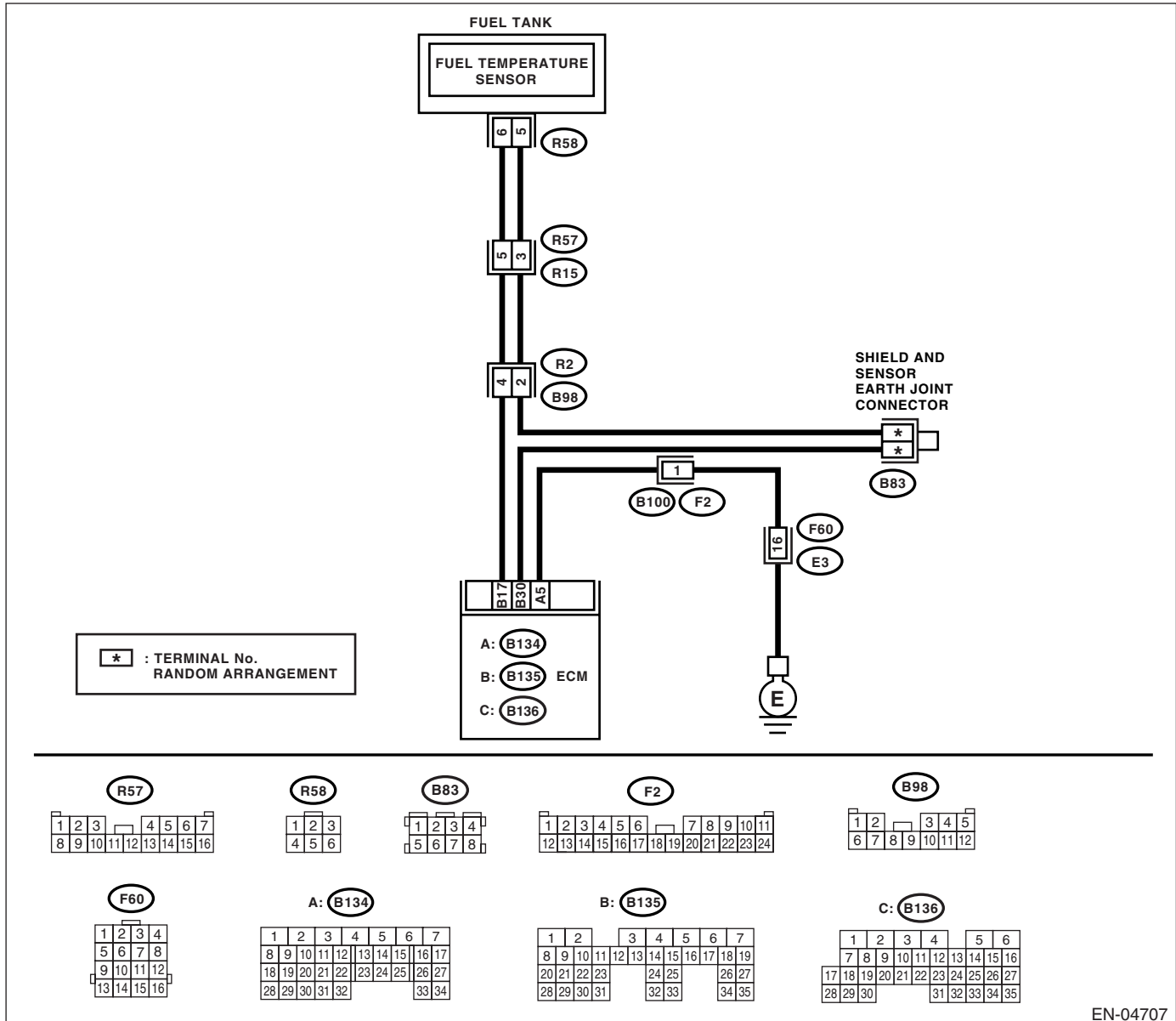
Step	Check	Yes	No
5 CHECK ENGINE COOLANT TEMPERATURE SENSOR. 1) Start the engine and warm-up completely. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the temperature more than 60°C (140°F)?	Go to step 6.	Replace the engine coolant temperature sensor. <Ref. to FU(H4DOTC)-27, Engine Coolant Temperature Sensor.>
6 CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE. 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 mass air flow and intake air temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the General Scan Tool Instruction Manual.	Is the measured value 2.7 — 4.7 g/s (0.36 — 0.62 lb/m)?	Go to step 7.	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-31, Mass Air Flow and Intake Air Temperature Sensor.>
7 CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR. 1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F). 2) Place the shift lever in neutral position. 3) Turn the A/C switch to OFF. 4) Turn all accessory switches to OFF. 5) Open the front hood. 6) Measure the ambient temperature. 7) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the General Scan Tool Instruction Manual.	Subtract ambient temperature from intake air temperature. Is the obtained value -10 — 50°C (-18 — 90°F)?	Replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>	Check the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-31, Mass Air Flow and Intake Air Temperature Sensor.>

AJ:DTC P0181 FUEL TEMPERATURE SENSOR “A” CIRCUIT RANGE/PERFORMANCE**DTC DETECTING CONDITION:**

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-77, DTC P0181 FUEL TEMPERATURE SENSOR “A” CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:

EN-04707

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Codes (DTC)". <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0181.	Replace the fuel temperature sensor. <Ref. to EC(H4DOTC)-13, Fuel Temperature Sensor.>

AK:DTC P0182 FUEL TEMPERATURE SENSOR “A” CIRCUIT LOW INPUT

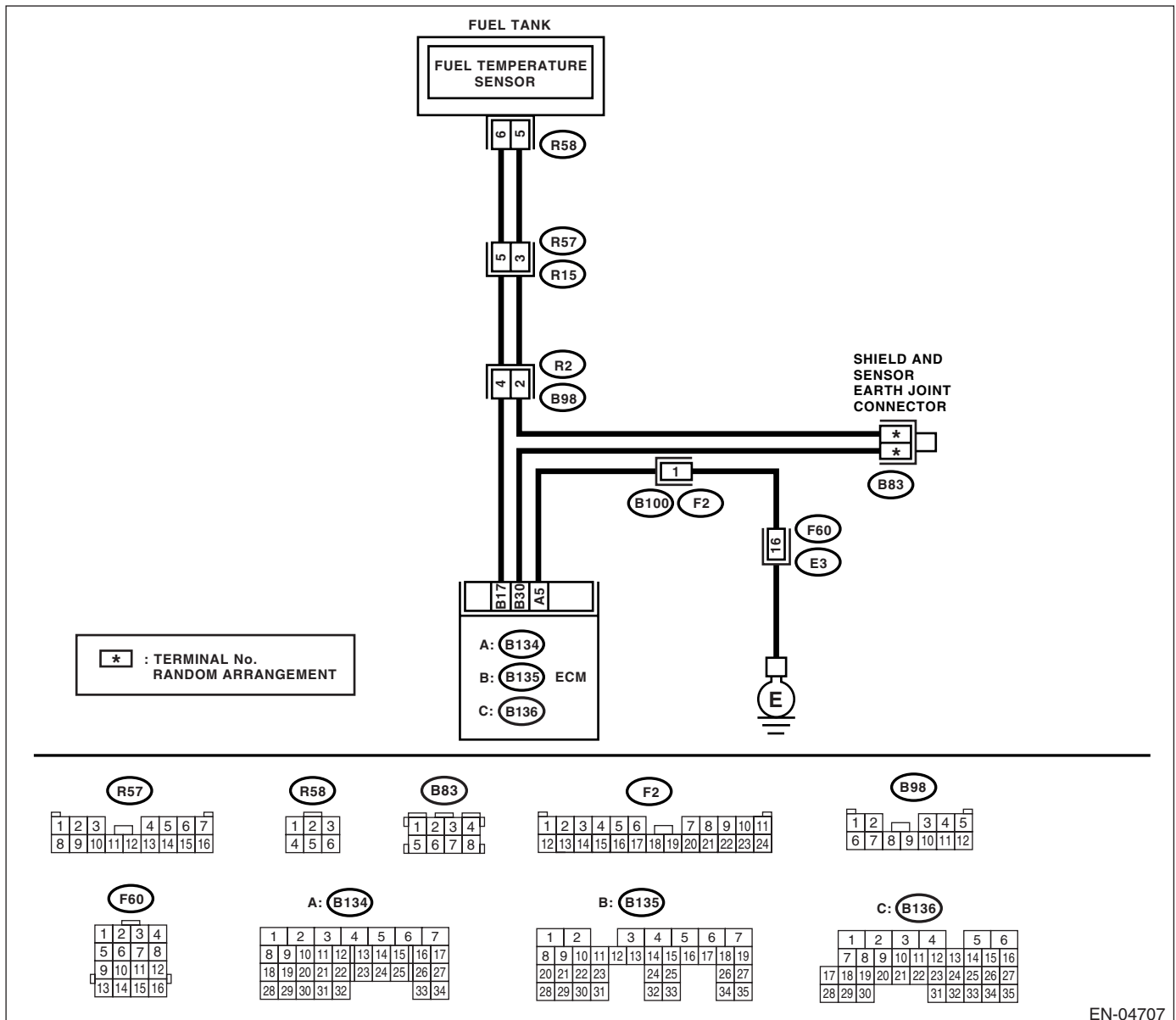
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-80, DTC P0182 FUEL TEMPERATURE SENSOR “A” CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04707

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 fuel temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: - Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> - General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the temperature more than 150°C (302°F)?	Go to step 2.	The malfunction indicator light may light up, however, the circuit is returned to the normal status at the moment.
2 CHECK CURRENT DATA. 1) Turn ignition switch to OFF. 2) Remove the access hole lid. 3) Disconnect the connector from fuel pump. 4) Turn ignition switch to ON. 5) Read the data of fuel temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: - Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> - General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the temperature less than -40°C (-40°F)?	Replace the fuel temperature sensor. <Ref. to EC(H4DOTC)-13, Fuel Temperature Sensor.>	Repair short circuit to ground in harness between fuel pump and ECM connector.

AL:DTC P0183 FUEL TEMPERATURE SENSOR "A" CIRCUIT HIGH INPUT

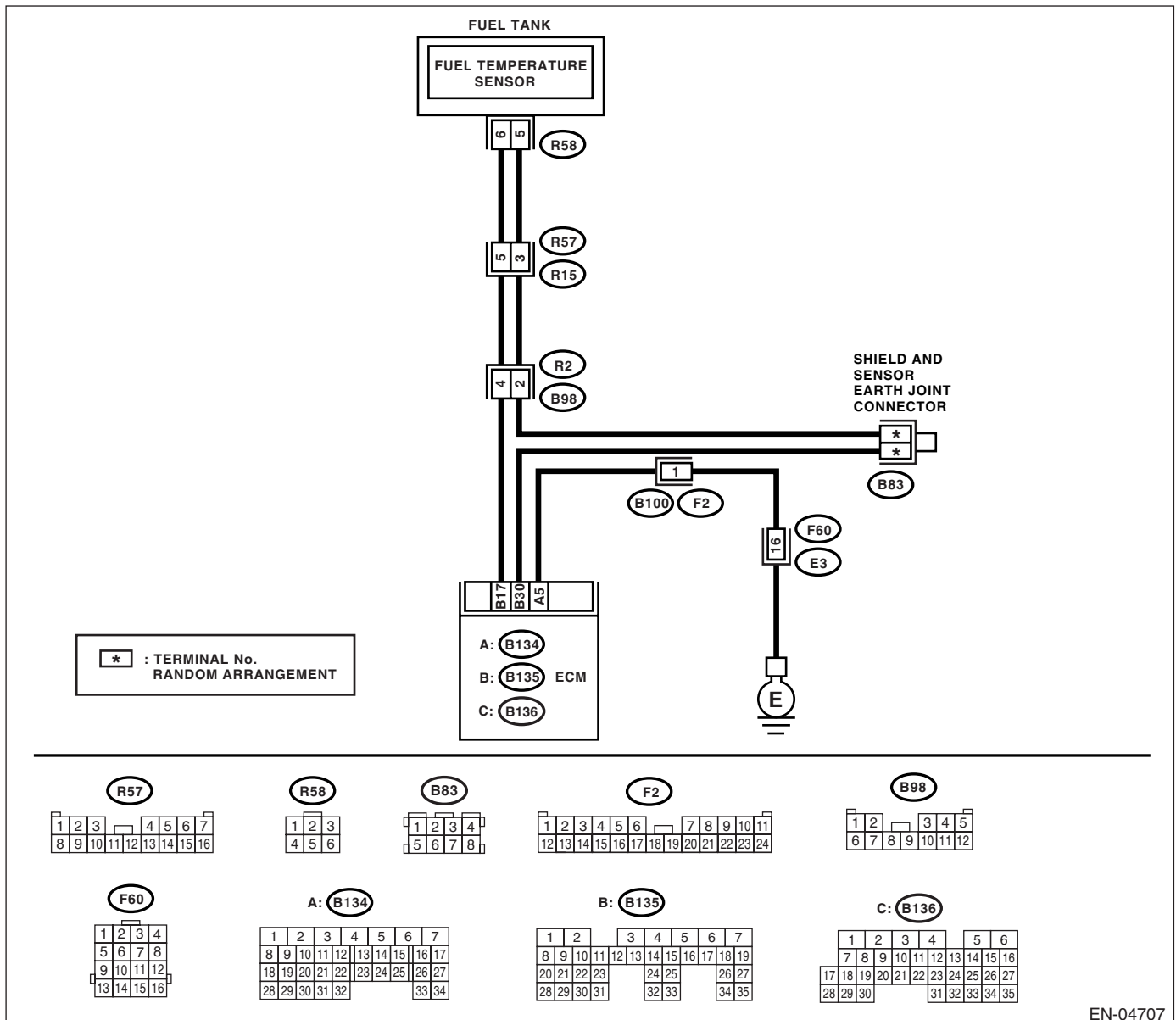
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-82, DTC P0183 FUEL TEMPERATURE SENSOR "A" CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04707

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 fuel temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: - Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> - General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the temperature less than – 40°C (–40°F)?	Go to step 2.	Repair poor contact. NOTE: In this case, repair the following: - Poor contact in fuel pump connector - Poor contact in ECM connector - Poor contact in coupling connector - Poor contact in joint connector
2 CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR. 1) Turn ignition switch to OFF. 2) Remove the access hole lid. 3) Disconnect the connector from fuel pump. 4) Measure the voltage between fuel pump connector and chassis ground. Connector & terminal (R58) No. 6 (+) — Chassis ground (–):	Is the voltage more than 10 V?	Repair short circuit to battery in harness between ECM and fuel pump connector.	Go to step 3.
3 CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR. 1) Turn ignition switch to ON. 2) Measure the voltage between fuel pump connector and chassis ground. Connector & terminal (R58) No. 6 (+) — Chassis ground (–):	Is the voltage more than 10 V?	Repair short circuit to battery in harness between ECM and fuel pump connector.	Go to step 4.
4 CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR. Measure the voltage between fuel pump connector and chassis ground. Connector & terminal (R58) No. 6 (+) — Chassis ground (–):	Is the voltage more than 4 V?	Go to step 5.	Repair harness and connector. NOTE: In this case, repair the following: - Open circuit in harness between ECM and fuel pump connector - Poor contact in fuel pump connector - Poor contact in ECM connector - Poor contact in coupling connector

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
5 CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR. 1) Turn ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between fuel pump connector and ECM. Connector & terminal (R58) No. 5 — (B135) No. 30:	Is the resistance less than 1 Ω ?	Replace the fuel temperature sensor. <Ref. to EC(H4DOTC)-13, Fuel Temperature Sensor.>	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and fuel pump connector • Poor contact in fuel pump 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)

AM:DTC P0222 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT LOW

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-84, DTC P0222 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance
- Engine stalls.

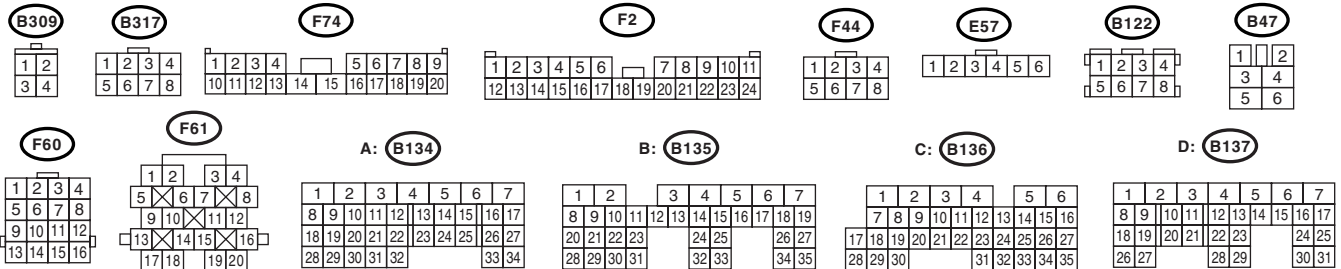
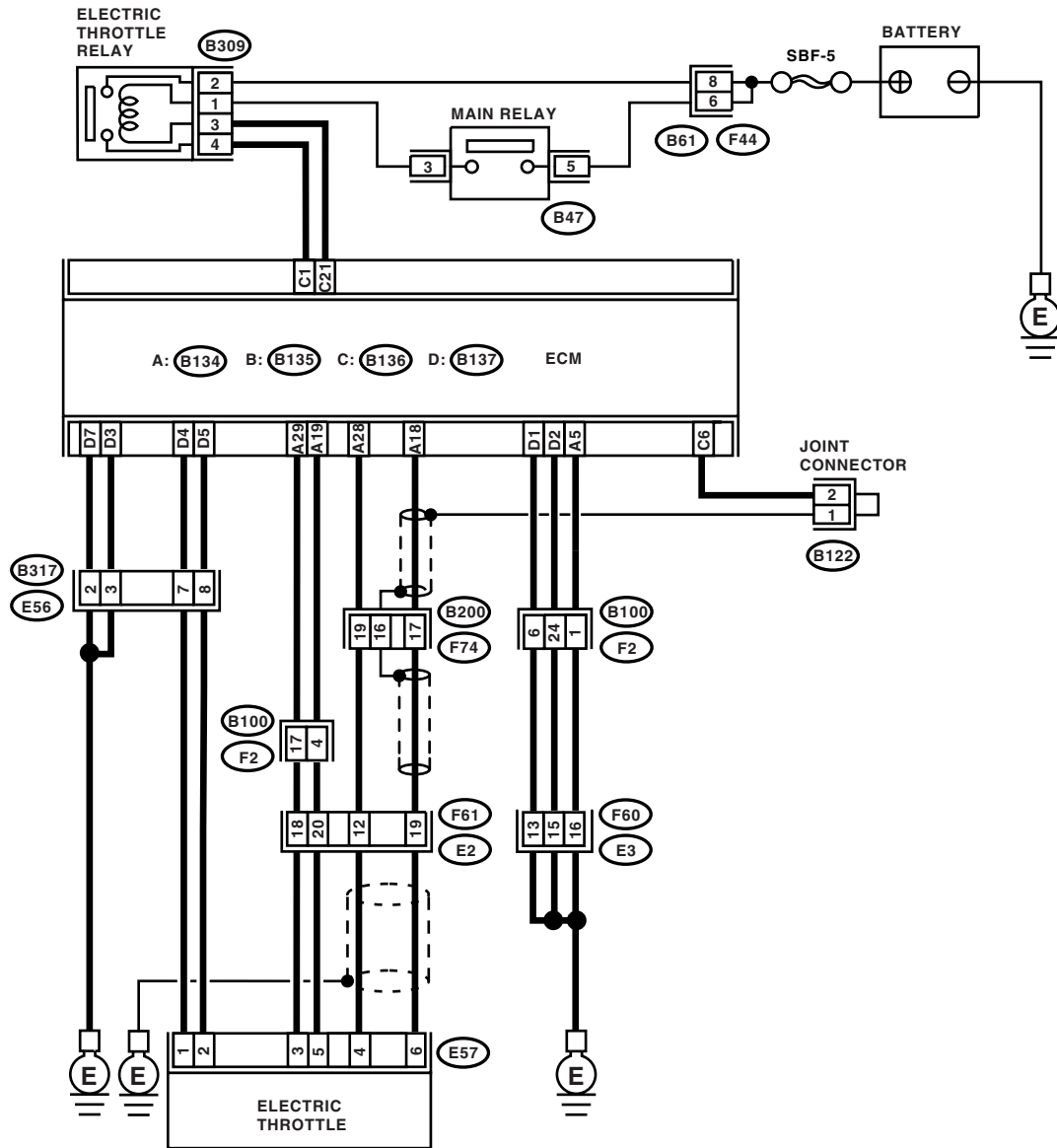
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-04706

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OUTPUT VOLTAGE OF SENSOR. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector terminals. Connector & terminal (B134) No. 28 (+) — (B134) No. 29 (-): 3) Shake the ECM harness and connector, engine harness connectors (E84, E22), electronic throttle control connector harness while monitoring value of voltage meter.	Is the voltage more than 0.8 V?	Go to step 2.	Go to step 3.
2 CHECK POOR CONTACT IN CONNECTORS. Check poor contact in the connectors between the ECM and electronic throttle control.	Is there poor contact in the connectors between ECM and electronic throttle control?	Repair the poor contact in connectors.	Connector has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause.
3 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from electronic throttle control. 4) Measure the resistance between the ECM connector and electronic throttle control connector. Connector & terminal (B134) No. 19 — (E57) No. 5:	Is the resistance less than 1 Ω ?	Go to step 4.	Repair the open circuit of harness connector.
4 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. Check the resistance between the ECM connector and chassis ground. Connector & terminal (B134) No. 19 — Chassis ground: (B134) No. 28 — Chassis ground:	Is the resistance more than 1 M Ω ?	Go to step 5.	Repair the ground short of harness.
5 CHECK POWER SUPPLY TO SENSOR. 1) Connect the ECM connectors. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control connector and engine ground. Connector & terminal (E57) No. 5 (+) — Engine ground (-): 4) Shake the ECM harness and connector, engine harness connectors, while monitoring value of voltage meter.	Is the voltage 4.5 — 5.5 V?	Go to step 6.	Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>
6 CHECK SHORT OF ECM. 1) Turn the ignition switch to OFF. 2) Measure the resistance between electronic throttle control connector and engine ground. Connector & terminal (E57) No. 4 — Engine ground:	Is the resistance more than 10 Ω ?	Repair the poor contact in electronic throttle control connector. If problem persists, replace the electronic throttle control.	Repair the poor contact in ECM connectors. If problem persists, replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>

AN:DTC P0223 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT HIGH

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-85, DTC P0223 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance
- Engine stalls.

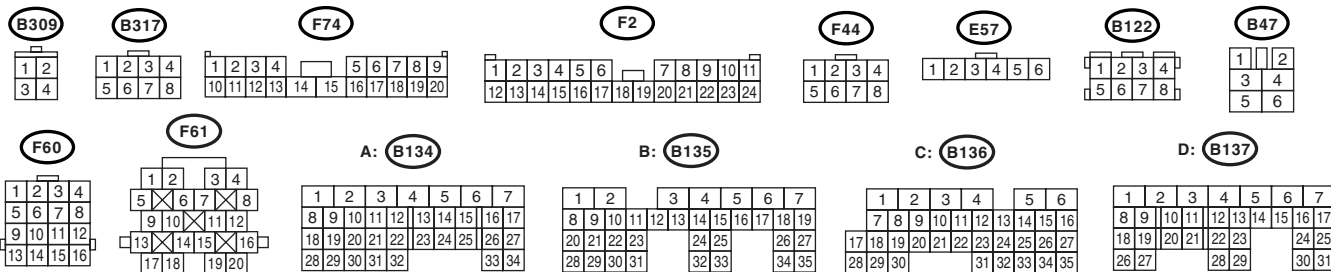
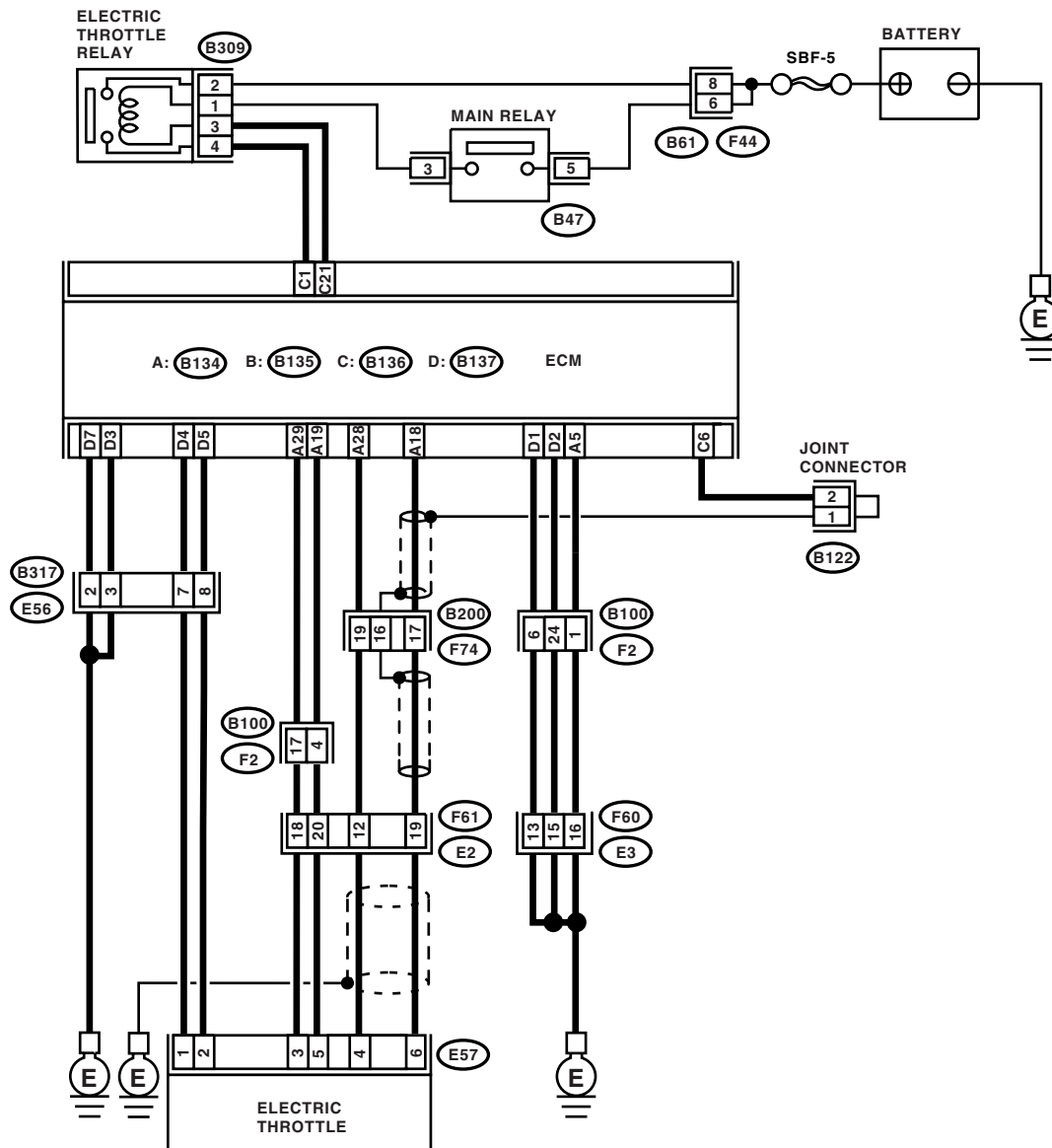
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-04706

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OUTPUT VOLTAGE OF SENSOR. 1) Turn the ignition switch to ON. 2) Read the data of sub throttle sensor signals, using the Subaru Select Monitor. 3) Shake the ECM harness and connector, engine harness connectors, electronic throttle control connector harness while monitoring value of voltage meter.	Is the voltage less than 4.73 V?	Go to step 2.	Go to step 3.
2 CHECK POOR CONTACT IN CONNECTORS. Check poor contact in connectors between ECM and electronic throttle control.	Is there poor contact in the connectors between ECM and electronic throttle control?	Repair the poor contact in connectors.	Connector has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause.
3 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Disconnect the connectors from electronic throttle control. 4) Measure the resistance between ECM connector and electronic throttle control connector. Connector & terminal (B134) No. 28 — (E57) No. 4: (B134) No. 29 — (E57) No. 3:	Is the resistance less than 1 Ω ?	Go to step 4.	Repair the open circuit of harness connector.
4 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Connect the ECM connector. 2) Measure the resistance between the electronic throttle control connector and engine ground. Connector & terminal (E57) No. 3 — Engine ground:	Is the resistance less than 5 Ω ?	Go to step 5.	Repair the poor contact in ECM connector. If the problem persists, replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>
5 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control connector and engine ground. Connector & terminal (E57) No. 5 (+) — Engine ground (-): 4) Shake the ECM harness and connector, engine harness connectors, while monitoring value of voltage meter.	Is the voltage more than 10 V?	Go to step 6.	Repair the battery short of harness between ECM connector and electronic throttle control connector.
6 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Measure the voltage between the electronic throttle control connector and engine ground. Connector & terminal (E57) No. 4 (+) — Engine ground (-): 2) Shake the ECM harness and connector, engine harness connectors, while monitoring value of voltage meter.	Is the voltage less than 10 V?	Go to step 7.	Repair the short of harness between ECM connector and electronic throttle control connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
7 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the voltage between connectors. Connector & terminal (B134) No. 28 — (B134) No. 19:	Is the resistance more than 1 M Ω ?	Repair the poor contact in electronic throttle control connector. If problem persists, replace the electronic throttle control.	Short circuit of sensor power supply may be the cause.

AO:DTC P0230 FUEL PUMP PRIMARY CIRCUIT

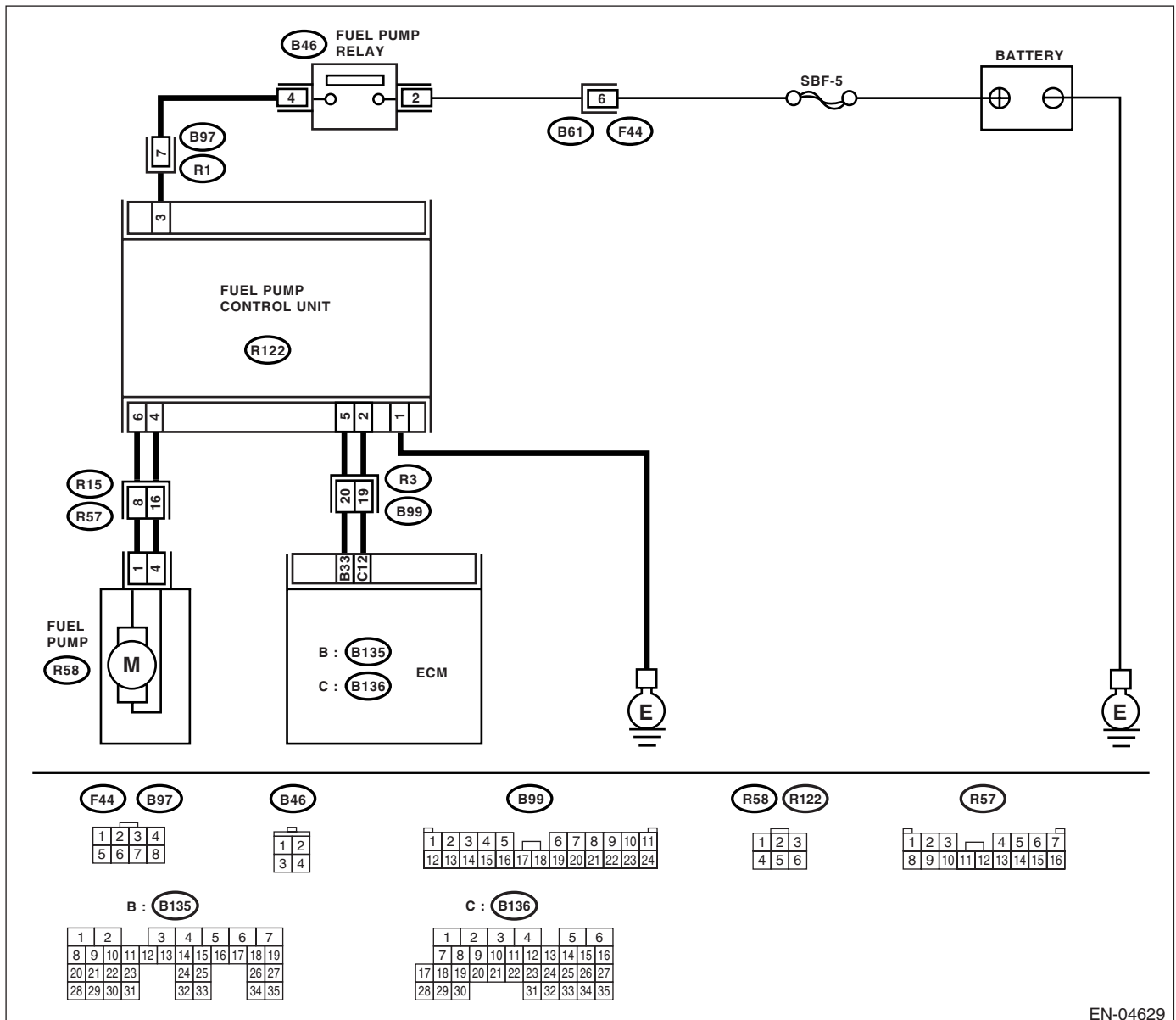
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-87, DTC P0230 FUEL PUMP PRIMARY CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04629

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK POWER SUPPLY CIRCUIT TO FUEL PUMP CONTROL UNIT. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel pump control unit. 3) Turn the ignition switch to ON. 4) Measure the voltage between fuel pump control unit and chassis ground. Connector & terminal (R122) No. 3 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 2.	Repair the power supply circuit. NOTE: In this case repair the following: • Open or ground short circuit in harness between fuel pump relay and fuel pump control unit • Poor contact in fuel pump control unit connector • Poor contact in fuel pump relay connector
2 CHECK GROUND CIRCUIT OF FUEL PUMP CONTROL UNIT. 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between fuel pump control unit and chassis ground. Connector & terminal (R122) No. 1 — Chassis ground:	Is the resistance less than 5 Ω ?	Go to step 3.	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit between fuel pump control unit and chassis ground • Poor contact in fuel pump control unit connector
3 CHECK HARNESS BETWEEN FUEL PUMP CONTROL UNIT AND FUEL PUMP CONNECTOR. 1) Disconnect the connector from fuel pump. 2) Measure the resistance of harness between fuel pump control unit and fuel pump connector. Connector & terminal (R122) No. 4 — (R58) No. 4: (R122) No. 6 — (R58) No. 1:	Is the resistance less than 1 Ω ?	Go to step 4.	Repair the open circuit between fuel pump control unit and fuel pump.
4 CHECK HARNESS BETWEEN FUEL PUMP CONTROL UNIT AND FUEL PUMP CONNECTOR. Measure the resistance of harness between fuel pump control unit and chassis ground. Connector & terminal (R122) No. 4 — Chassis ground: (R122) No. 6 — Chassis ground:	Is the resistance more than 1 M Ω ?	Go to step 5.	Repair the ground short circuit between fuel pump control unit and fuel pump.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
5 CHECK HARNESS BETWEEN FUEL PUMP CONTROL UNIT 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 control unit and ECM connector. Connector & terminal (R122) No. 5 — (B135) No. 33: (R122) No. 2 — (B136) No. 12:	Is the resistance less than 1 Ω ?	Go to step 6.	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit between fuel pump control unit and ECM • Poor contact in fuel pump control unit and ECM connector
6 CHECK HARNESS BETWEEN FUEL PUMP CONTROL UNIT AND ECM CONNECTOR. Measure the resistance of harness between fuel pump control unit and chassis ground. Connector & terminal (R122) No. 5 — Chassis ground: (R122) No. 2 — Chassis ground:	Is the resistance more than 1 M Ω ?	Go to step 7.	Repair the ground short circuit between fuel pump control unit and ECM.
7 CHECK POOR CONTACT. Check poor contact in ECM and fuel pump control unit connector.	Is there poor contact in ECM and fuel pump control unit connector?	Repair the poor contact in ECM and fuel pump control unit.	Go to step 8.
8 CHECK EXPERIENCE OF RUNNING OUT OF FUEL.	Has the vehicle run out of fuel before?	Finish the diagnosis. NOTE: DTC may be recorded due to the idle running of fuel pump when running out of fuel.	Replace the fuel pump control unit. <Ref. to FU(H4DOTC)-49, Fuel Pump Control Unit.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

AP:DTC P0244 TURBO/SUPER CHARGER WASTEGATE SOLENOID "A" RANGE/PERFORMANCE

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-89, DTC P0244 TURBO/SUPER CHARGER WASTEGATE SOLENOID "A" RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

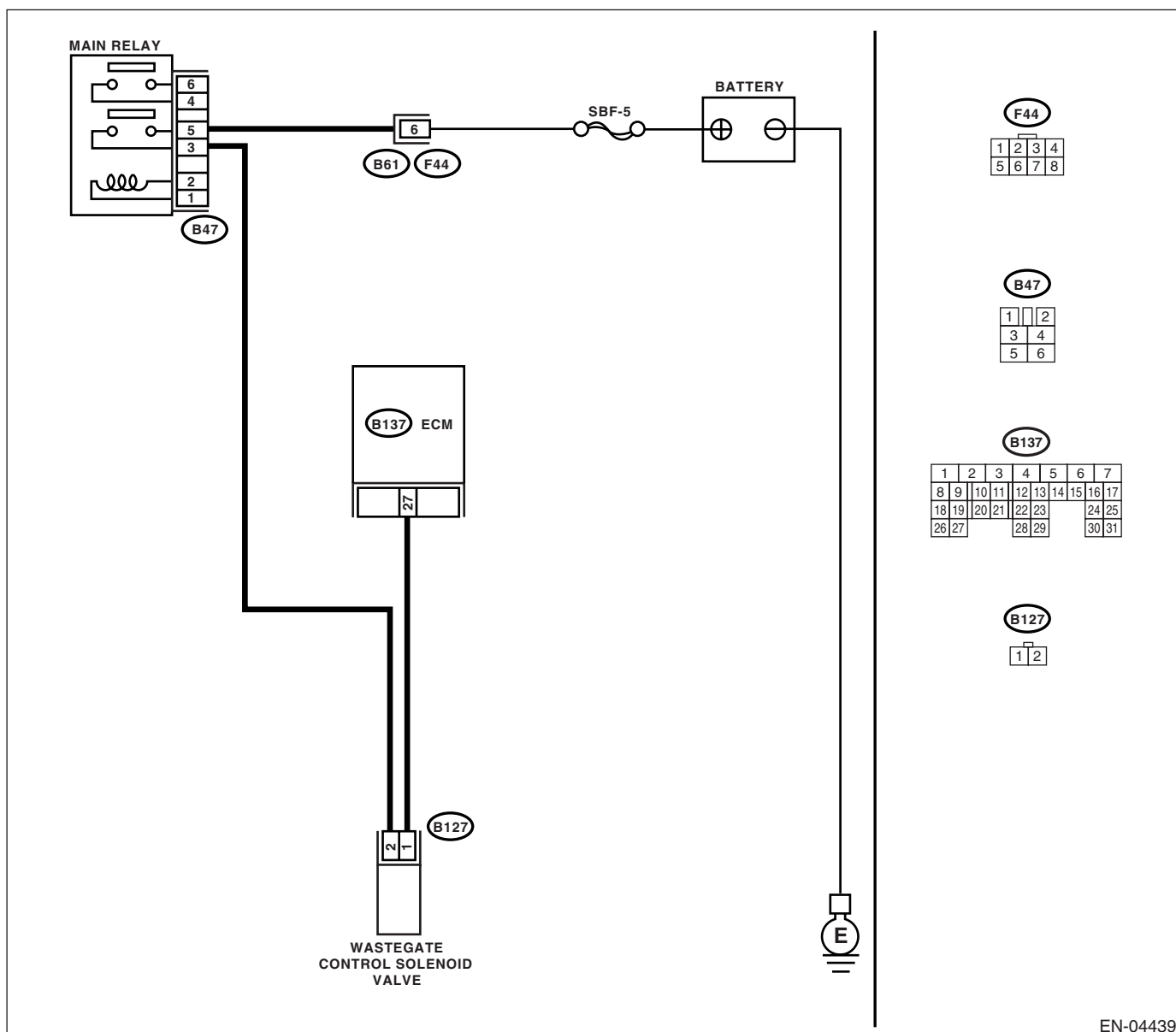
TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-74, 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(H4DOTC)-40, Wastegate Control Solenoid Valve.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

AQ:DTC P0245 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” LOW DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-91, DTC P0245 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

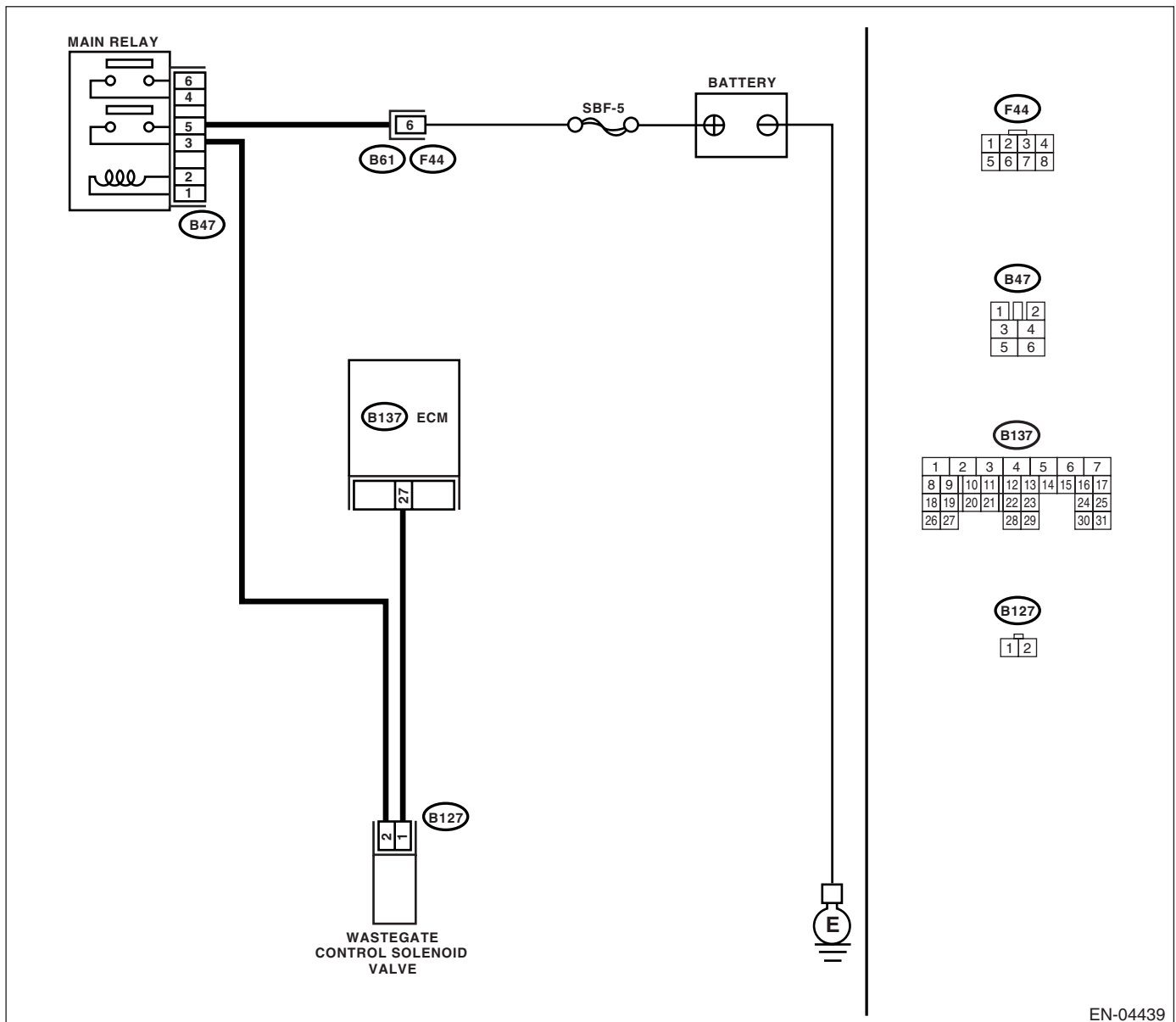
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04439

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. Connector & terminal (B137) No. 27 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time.	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. Connector & terminal (B127) No. 1 — Engine ground:	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. Connector & terminal (B137) No. 27 — (B127) No. 1:	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: • Open circuit in harness between ECM and wastegate control solenoid valve connector
4 CHECK WASTEGATE CONTROL SOLENOID VALVE. 1) Remove the wastegate control solenoid valve. 2) Measure the resistance between wastegate control solenoid valve terminals. Terminals No. 1 — No. 2:	Is the resistance 30 — 34 Ω ?	Go to step 5.	Replace the wastegate control solenoid valve. <Ref. to FU(H4DOTC)-40, 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. Connector & terminal (B127) No. 2 (+) — Engine ground (-):	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.
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 your SOA Service Center since deterioration of some parts may be the cause.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

AR:DTC P0246 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” HIGH DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-93, DTC P0246 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

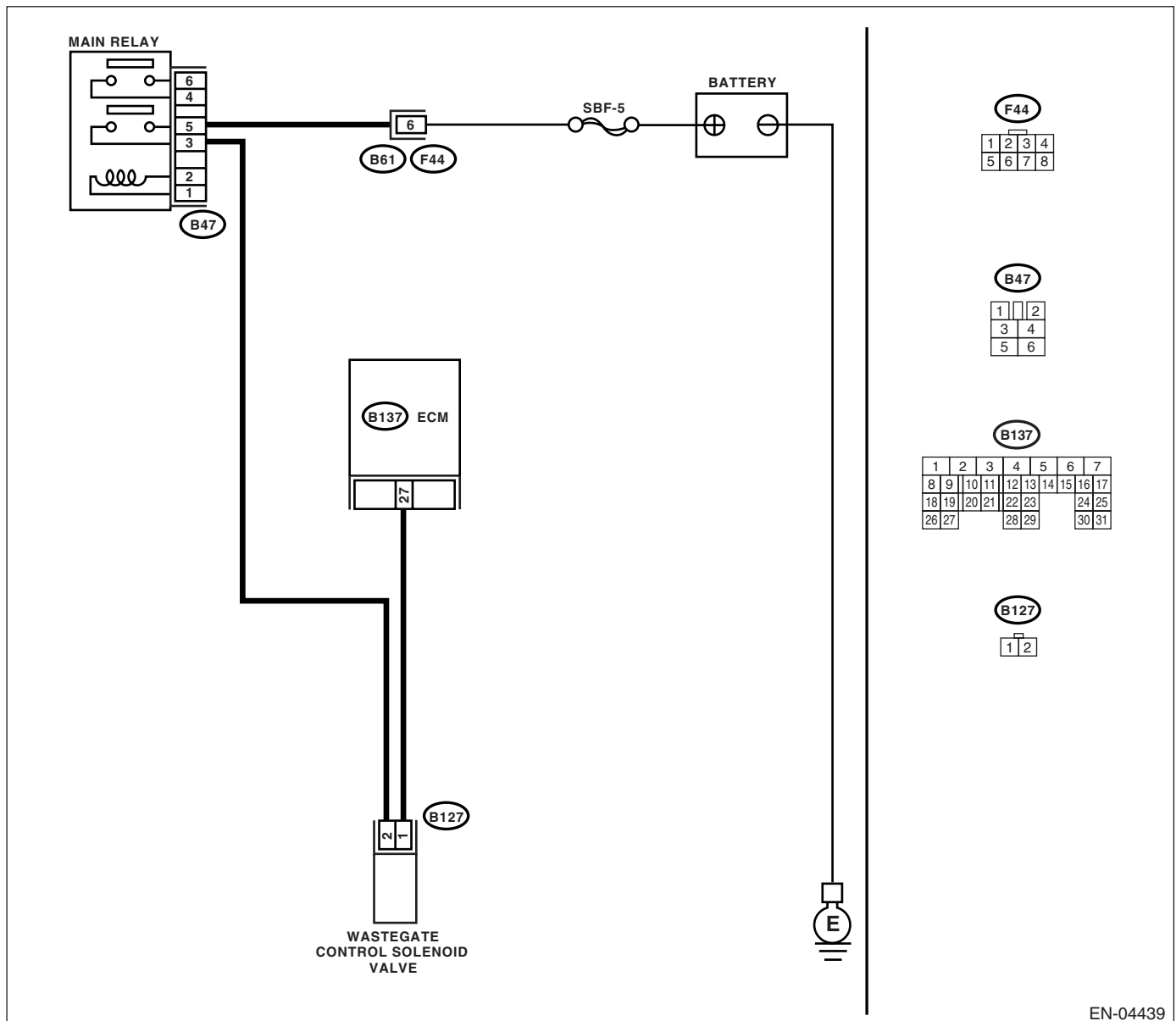
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04439

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. Connector & terminal (B137) No. 27 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 3.	Go to step 2.
2 CHECK POOR CONTACT. Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>
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. 27 (+) — 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(H4DOTC)-45, Engine Control Module (ECM).>	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(H4DOTC)-40, Wastegate Control Solenoid Valve.> and ECM <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>	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(H4DOTC)-45, Engine Control Module (ECM).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

AS:DTC P0301 CYLINDER 1 MISFIRE DETECTED

NOTE:

For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(H4DOTC)(diag)-178, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AT:DTC P0302 CYLINDER 2 MISFIRE DETECTED

NOTE:

For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(H4DOTC)(diag)-178, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AU:DTC P0303 CYLINDER 3 MISFIRE DETECTED

NOTE:

For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(H4DOTC)(diag)-178, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AV: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.)
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-100, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Engine stalls.
- Erroneous idling
- Rough driving

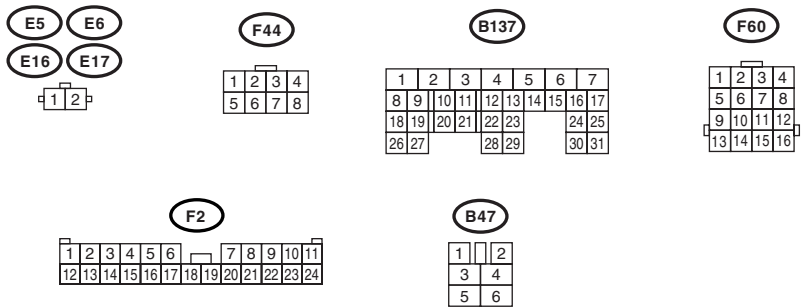
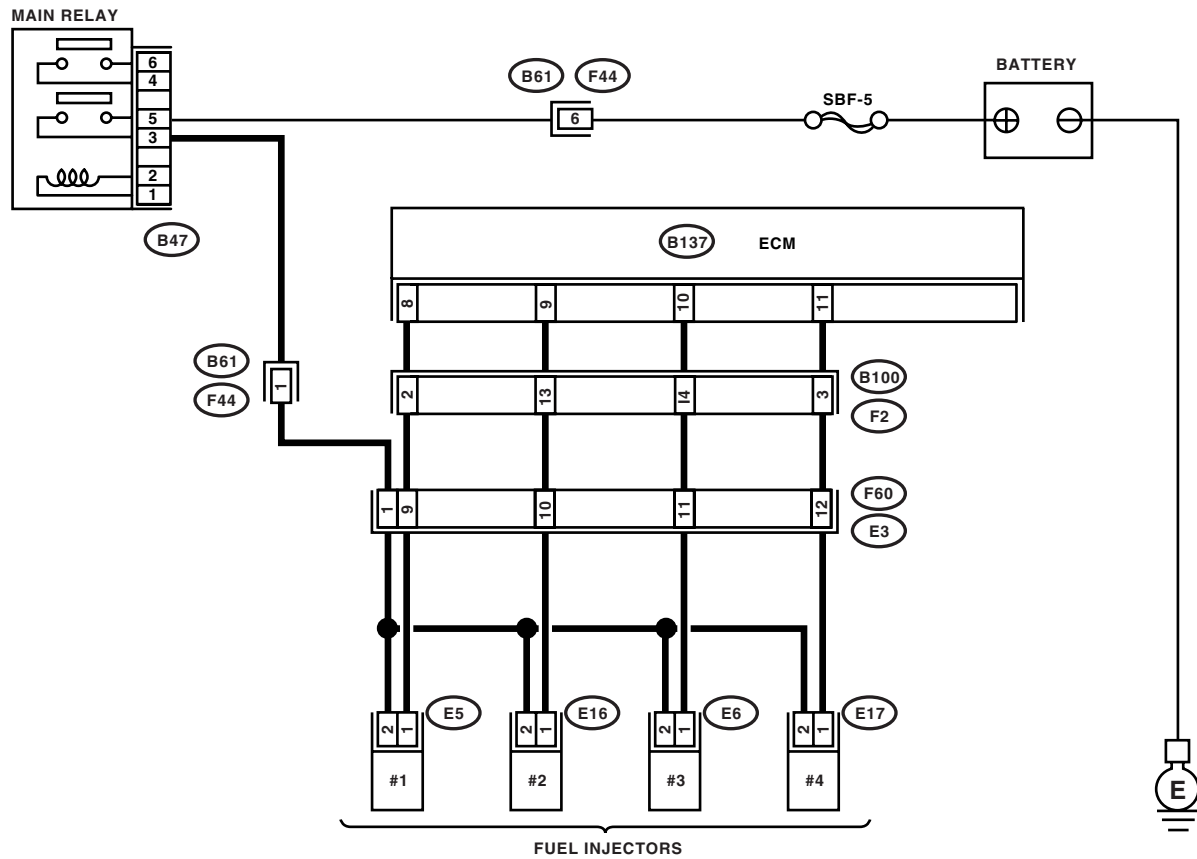
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-04209

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 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. Connector & terminal #1 (B137) No. 8 (+) — Chassis ground (-): #2 (B137) No. 9 (+) — Chassis ground (-): #3 (B137) No. 10 (+) — Chassis ground (-): #4 (B137) No. 11 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 7.	Go to step 3.
3 CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR. 1) Turn 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 fuel injector connector and engine ground on faulty cylinders. Connector & terminal #1 (E5) No. 1 — Engine ground: #2 (E16) No. 1 — Engine ground: #3 (E6) No. 1 — Engine ground: #4 (E17) No. 1 — Engine ground:	Is the resistance more than 1 MΩ?	Go to step 4.	Repair the ground short circuit in harness between fuel injector connector and ECM connector.
4 CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR. Measure the resistance of harness connector between ECM connector and fuel injector connector on faulty cylinders. Connector & terminal #1 (B137) No. 8 — (E5) No. 1: #2 (B137) No. 9 — (E16) No. 1: #3 (B137) No. 10 — (E6) No. 1: #4 (B137) No. 11 — (E17) No. 1:	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 connector and fuel injector connector • Poor contact in coupling connector
5 CHECK FUEL INJECTOR. Measure the resistance between fuel injector terminals on faulty cylinder. Terminals No. 1 — No. 2:	Is the resistance 5 — 20 Ω?	Go to step 6.	Replace the faulty fuel injector. <Ref. to FU(H4DOTC)-33, Fuel Injector.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
6 CHECK POWER SUPPLY LINE. 1) Turn the ignition switch to ON. 2) Measure the voltage between fuel injector connector and engine ground on faulty cylinders. Connector & terminal #1 (E5) No. 2 (+) — Engine ground (-): #2 (E16) No. 2 (+) — Engine ground (-): #3 (E6) No. 2 (+) — Engine ground (-): #4 (E17) No. 2 (+) — Engine ground (-):	Is the voltage more than 10 V?	Repair 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
7 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. Connector & terminal #1 (B137) No. 8 (+) — Chassis ground (-): #2 (B137) No. 9 (+) — Chassis ground (-): #3 (B137) No. 10 (+) — Chassis ground (-): #4 (B137) No. 11 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Repair the battery short circuit in harness between ECM and fuel injector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>	Go to step 8.
8 CHECK FUEL INJECTOR. 1) Turn the ignition switch to OFF. 2) Measure the resistance between fuel injector terminals on faulty cylinder. Terminals No. 1 — No. 2:	Is the resistance less than 1 Ω ?	Replace the faulty fuel injector <Ref. to FU(H4DOTC)-33, Fuel Injector.> and ECM <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>	Go to step 9.
9 CHECK INSTALLATION OF CAMSHAFT POSITION SENSOR/CRANKSHAFT POSITION SENSOR.	Is the camshaft position sensor or crankshaft position sensor loosely installed?	Tighten the camshaft position sensor or crankshaft position sensor.	Go to step 10.
10 CHECK CRANK SPROCKET. Remove the timing belt cover.	Is the crank sprocket rusted or does it have broken teeth?	Replace the crank sprocket. <Ref. to ME(H4DOTC)-54, Crank Sprocket.>	Go to step 11.
11 CHECK INSTALLATION CONDITION OF TIMING BELT. Turn the crankshaft, and align alignment mark on crank sprocket with alignment mark on cylinder block.	Is the timing belt dislocated from its proper position?	Repair the installation condition of timing belt. <Ref. to ME(H4DOTC)-45, Timing Belt.>	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 MALFUNCTION INDICATOR LIGHT. 1) Clear the memory using Subaru Select Monitor. <Ref. to EN(H4DOTC)(diag)-50, Clear Memory Mode.> 2) Start the engine, and drive the vehicle more than 10 minutes.	Is the malfunction indicator light 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.	Repair the poor contact. NOTE: In this case, repair the following: • 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: • 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 CYLINDER.	Is there a fault in that cylinder?	Repair or replace the faulty parts. NOTE: Check the following items. • Spark plug • Fuel injector • Compression pressure	Go to DTC P0171 and P0172. <Ref. to EN(H4DOTC)(diag)-152, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AW:DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR)**DTC DETECTING CONDITION:**

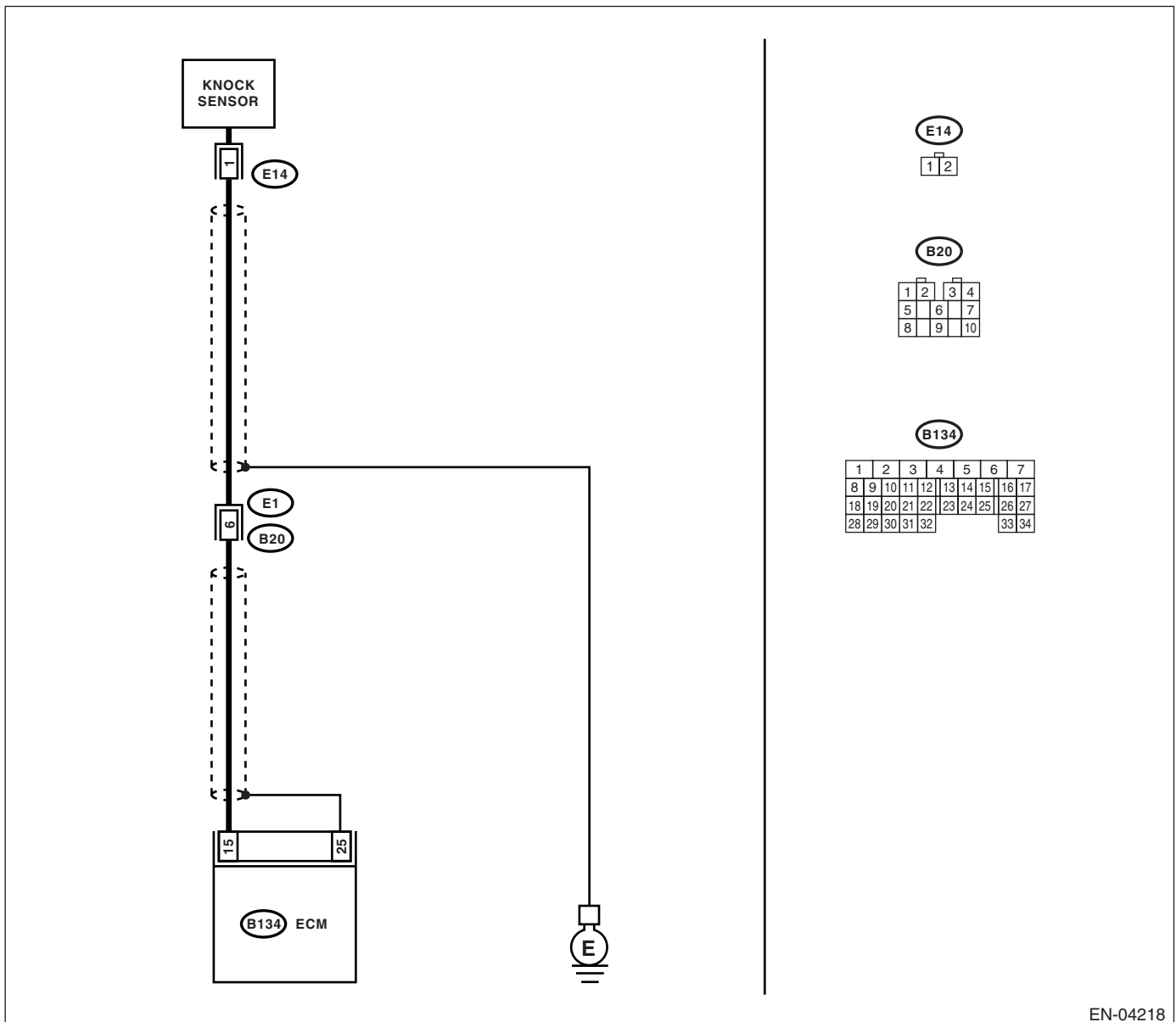
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-101, DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Poor driving performance
- Knocking occurs.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:

EN-04218

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS BETWEEN KNOCK SENSOR AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between ECM harness connector and chassis ground. Connector & terminal (B134) No. 15 — Chassis ground:	Is the resistance more than 700 k Ω ?	Go to step 2.	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between knock sensor and ECM connector • Poor contact in knock sensor connector • Poor contact in coupling connector
2 CHECK KNOCK SENSOR. 1) Disconnect the connector from knock sensor. 2) Measure the resistance between knock sensor connector terminal and engine ground. Terminals No. 1 — Engine ground:	Is the resistance more than 700 k Ω ?	Go to step 3.	Repair the harness and connector. NOTE: In this case, repair the following: • Poor contact in knock sensor connector • Poor contact in coupling connector
3 CHECK CONDITION OF KNOCK SENSOR INSTALLATION.	Is the knock sensor installation bolt tightened securely?	Replace the knock sensor. <Ref. to FU(H4DOTC)-30, Knock Sensor.>	Tighten the knock sensor installation bolt securely.

AX:DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR)**DTC DETECTING CONDITION:**

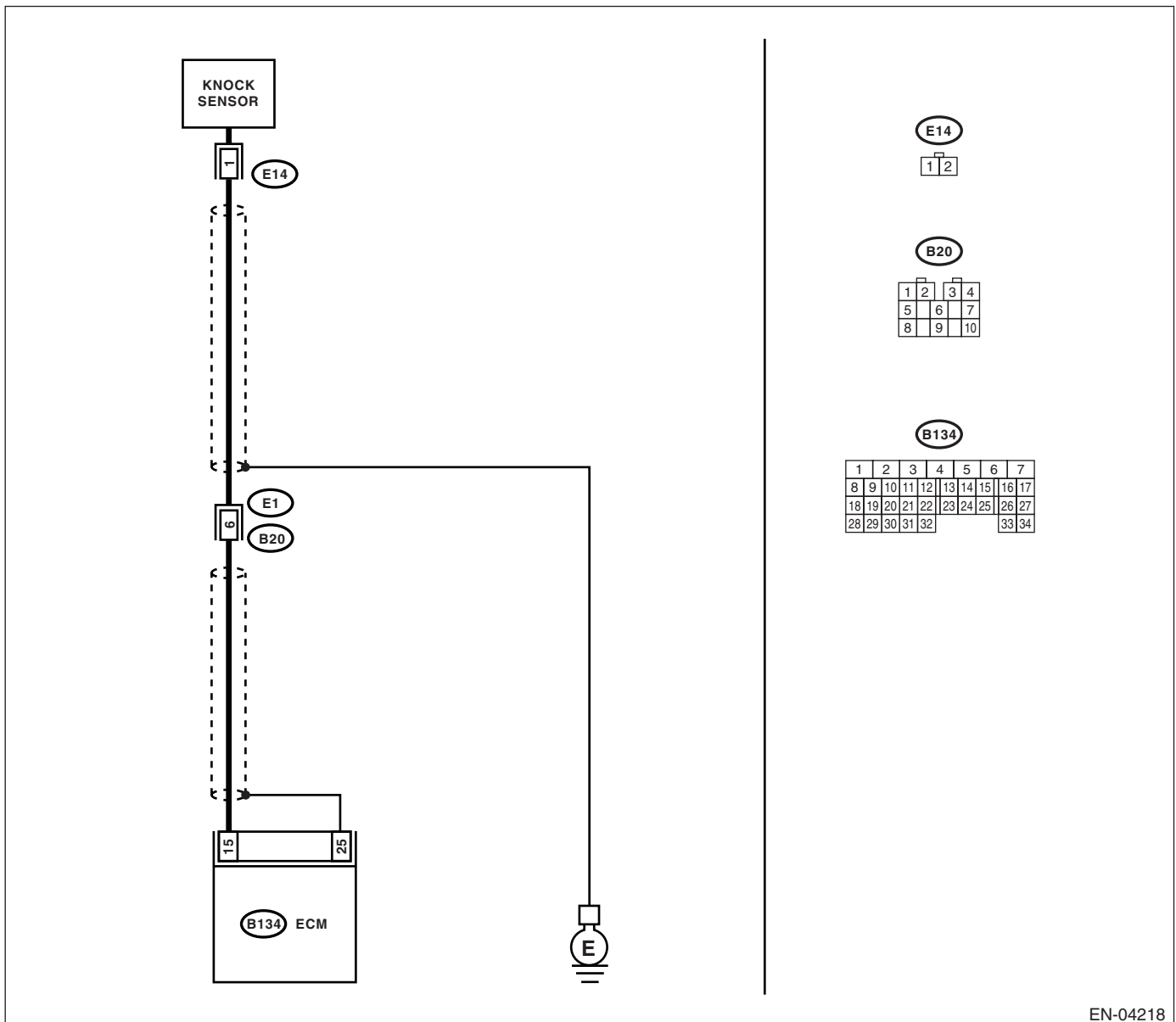
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-103, DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Poor driving performance
- Knocking occurs.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:

EN-04218

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS BETWEEN KNOCK SENSOR AND ECM CONNECTOR. Measure the resistance of harness between ECM connector and chassis ground. Connector & terminal (B134) No. 15 — Chassis ground:	Is the resistance less than 400 k Ω ?	Go to step 2.	Go to step 3.
2 CHECK KNOCK SENSOR. 1) Disconnect the connector from knock sensor. 2) Measure the resistance between knock sensor connector terminal and engine ground. Terminals No. 1 — Engine ground:	Is the resistance less than 400 k Ω ?	Replace the knock sensor. <Ref. to FU(H4DOTC)-30, Knock Sensor.>	Repair the ground short circuit in harness between knock sensor connector and ECM connector. NOTE: The harness between both connectors is shielded. Repair the short circuit of harness together with shield.
3 CHECK INPUT SIGNAL FOR ECM. 1) Connect the connectors to ECM and knock sensor. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM and chassis ground. Connector & terminal (B134) No. 15 (+) — Chassis ground (-):	Is the voltage more than 2 V?	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. (However, the possibility of poor contact still remains.) NOTE: In this case, repair the following: • Poor contact in knock sensor connector • Poor contact in ECM connector • Poor contact in coupling connector	Repair the poor contact in ECM connector.

AY:DTC P0335 CRANKSHAFT POSITION SENSOR "A" CIRCUIT**DTC DETECTING CONDITION:**

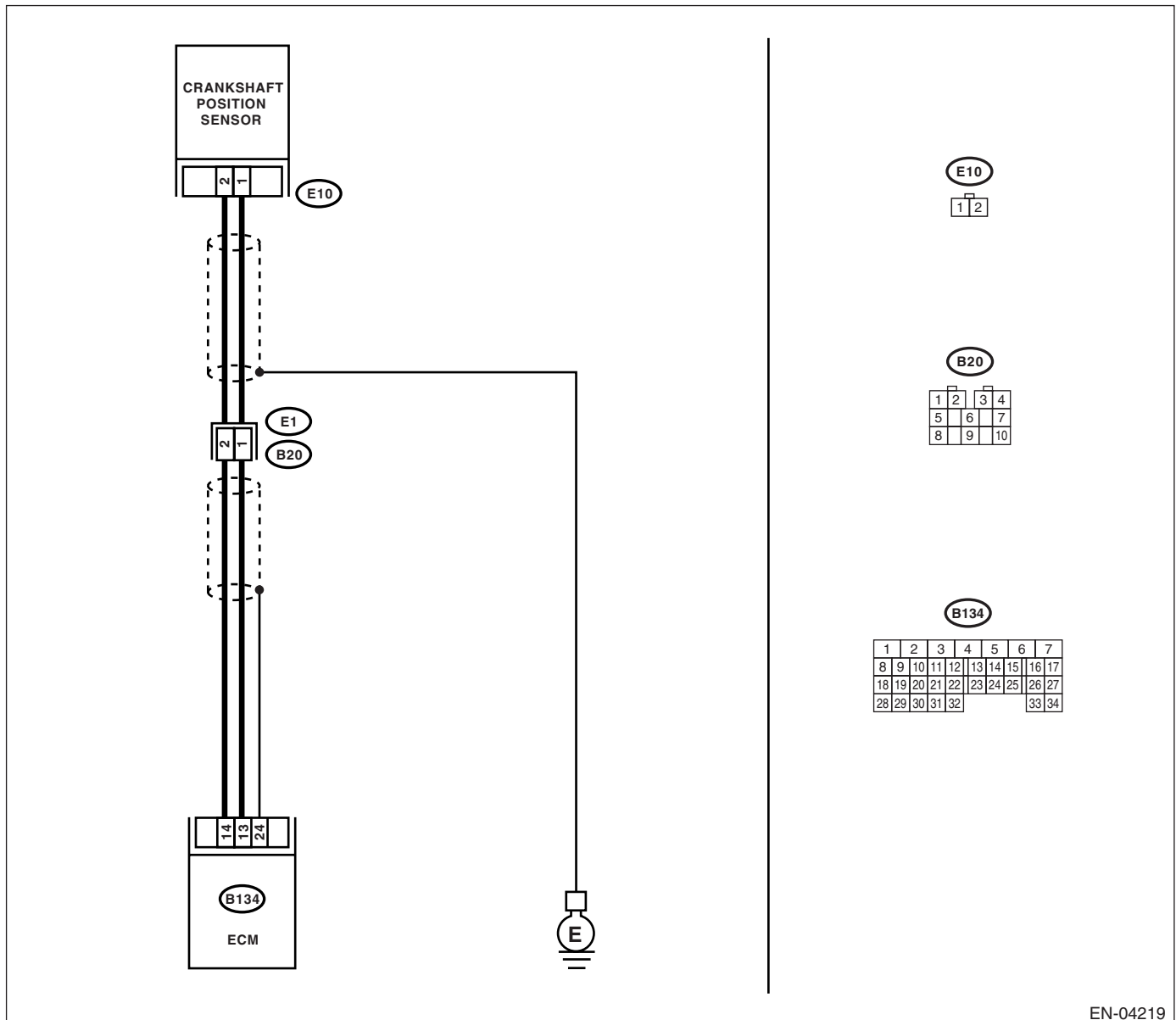
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-105, DTC P0335 CRANKSHAFT POSITION SENSOR "A" CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:

EN-04219

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR. 1) Turn 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. Connector & terminal (E10) 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 crankshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector	Go to step 2.
2 CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR. Measure the resistance of harness between crankshaft position sensor connector and engine ground. Connector & terminal (E10) No. 1 — Engine ground:	Is the resistance more than 1 MΩ?	Go to step 3.	Repair the ground short circuit in harness between crankshaft position sensor and ECM connector. NOTE: The harness between both connectors are shielded. Repair ground short circuit in harness together with shield.
3 CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR. Measure the resistance of harness between crankshaft position sensor connector and engine ground. Connector & terminal (E10) No. 2 — Engine ground:	Is the resistance less than 5 Ω?	Go to step 4.	Repair 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 ECM connector • Poor contact in coupling connector
4 CHECK CONDITION OF CRANKSHAFT POSITION SENSOR.	Is the crankshaft position sensor installation bolt tightened securely?	Go to step 5.	Tighten the crankshaft position sensor installation bolt securely.
5 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:	Is the resistance 1 — 4 kΩ?	Repair the poor contact in crankshaft position sensor connector.	Replace the crankshaft position sensor. <Ref. to FU(H4DOTC)-28, Crankshaft Position Sensor.>

AZ:DTC P0336 CRANKSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE**DTC DETECTING CONDITION:**

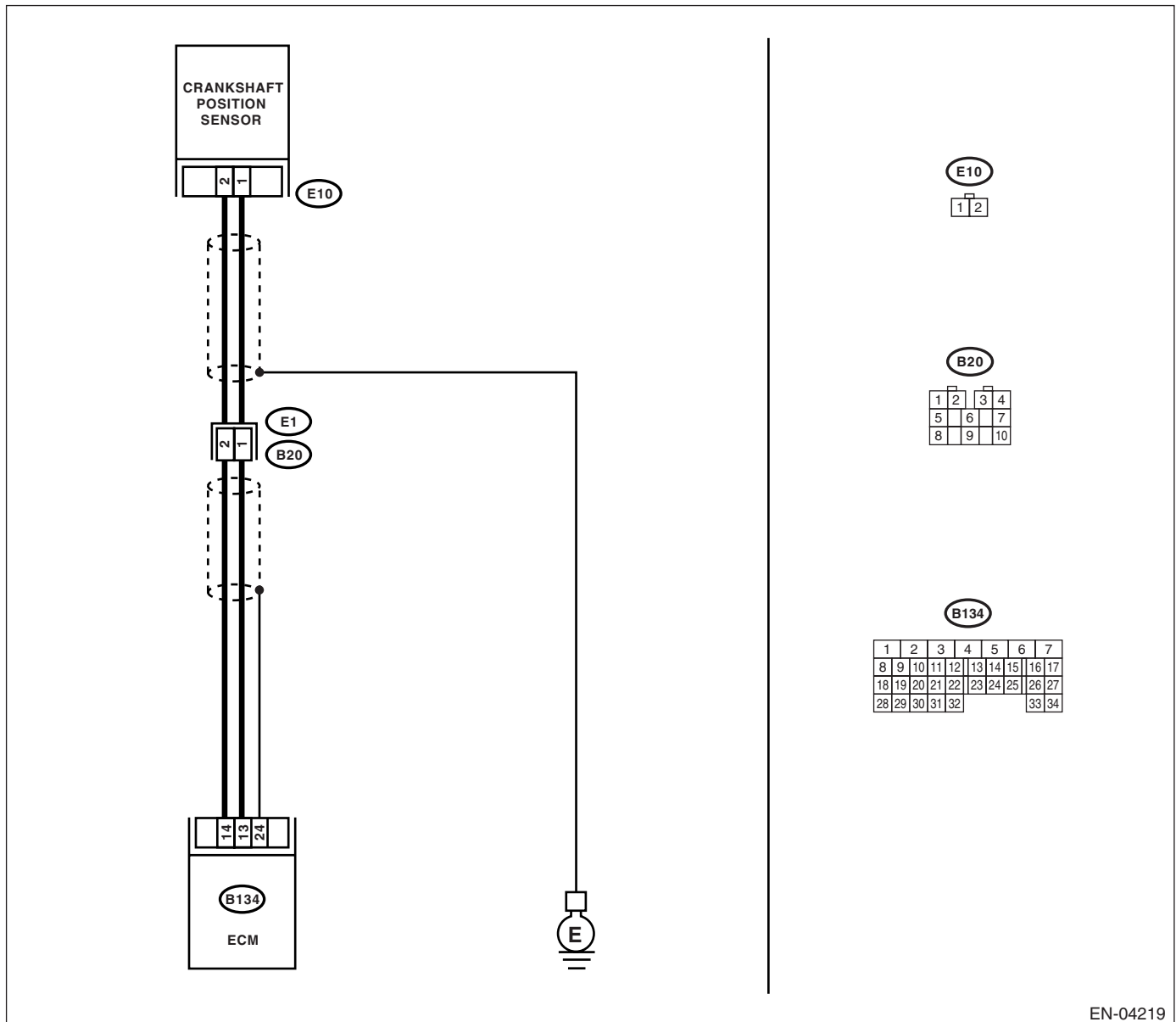
- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-107, DTC P0336 CRANKSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:

EN-04219

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-74, 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 CRANK SPROCKET. Remove the front belt cover.	Are the crank sprocket teeth cracked or damaged?	Replace the crank sprocket. <Ref. to FU(H4DOTC)-28, Crankshaft Position Sensor.>	Go to step 4.
4 CHECK INSTALLATION CONDITION OF TIMING BELT. Turn the crankshaft, and align alignment mark on crank sprocket with alignment mark on cylinder block.	Is the timing belt dislocated from its proper position?	Repair the installation condition of timing belt. <Ref. to ME(H4DOTC)-45, Timing Belt.>	Replace the crankshaft position sensor. <Ref. to FU(H4DOTC)-28, Crankshaft Position Sensor.>

BA:DTC P0340 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR)**DTC DETECTING CONDITION:**

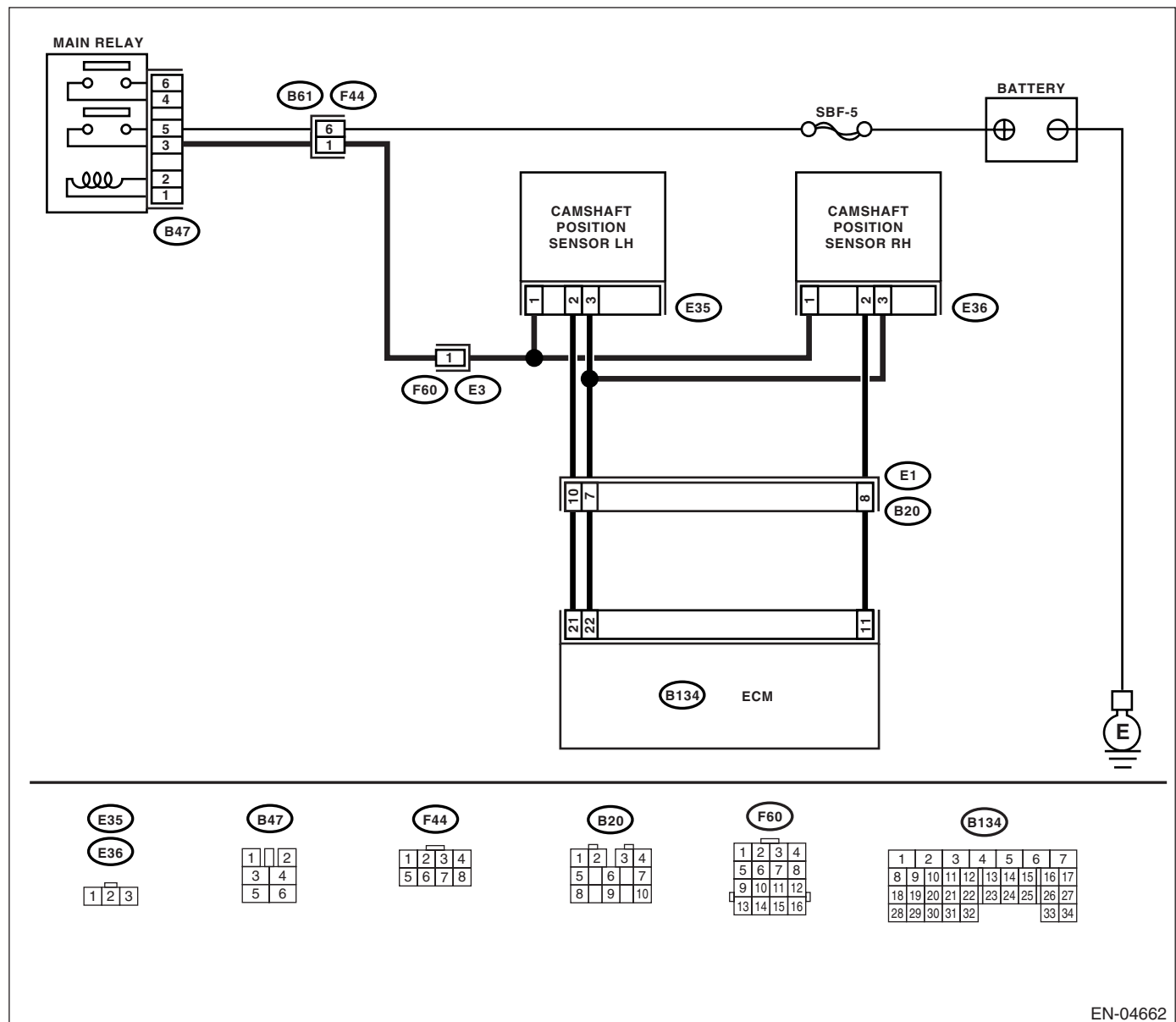
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-109, DTC P0340 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:

EN-04662

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK POWER SUPPLY OF CAMSHAFT POSITION SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the from camshaft position sensor. 3) Measure the voltage between camshaft position sensor and engine ground. Connector & terminal (E36) No. 1 (+) — Engine ground (-):	Is the voltage more than 10 V?	Repair the battery short circuit between main relay connector and camshaft position sensor connector.	Go to step 2.
2 CHECK POWER SUPPLY OF CAMSHAFT POSITION SENSOR. 1) Turn the ignition switch to ON. 2) Measure the voltage between camshaft position sensor and engine ground. Connector & terminal (E36) No. 1 (+) — Engine ground (-):	Is the voltage more than 10 V?	Go to step 3.	Repair the open or ground short circuit between main relay connector and camshaft position sensor connector.
3 CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between camshaft position sensor and ECM. Connector & terminal (E36) No. 2 — (B134) No. 11: (E36) No. 3 — (B134) No. 22:	Is the resistance less than 1 Ω ?	Go to step 4.	Repair the open circuit between camshaft position sensor and ECM.
4 CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM. Measure the resistance between camshaft position sensor and engine ground. Connector & terminal (E36) No. 2 — Engine ground: (E36) No. 3 — Engine ground:	Is the resistance more than 1 M Ω ?	Go to step 5.	Repair the ground short circuit between camshaft position sensor and ECM.
5 CHECK CONDITION OF CAMSHAFT POSITION SENSOR.	Is the camshaft position sensor installation bolt tightened securely?	Go to step 6.	Tighten the camshaft position sensor installation bolt securely.
6 CHECK CAMSHAFT POSITION SENSOR. Check waveform of camshaft position sensor. <Ref. to EN(H4DOTC)(diag)-20, Engine Control Module (ECM) I/O Signal.>	Is there any abnormality in waveform?	Replace the camshaft position sensor. <Ref. to FU(H4DOTC)-29, Camshaft Position Sensor.>	Go to step 7.
7 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(H4DOTC)-45, Engine Control Module (ECM).>

BB:DTC P0345 CAMSHAFT POSITION SENSOR "A" CIRCUIT (BANK 2)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-110, DTC P0345 CAMSHAFT POSITION SENSOR "A" CIRCUIT (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

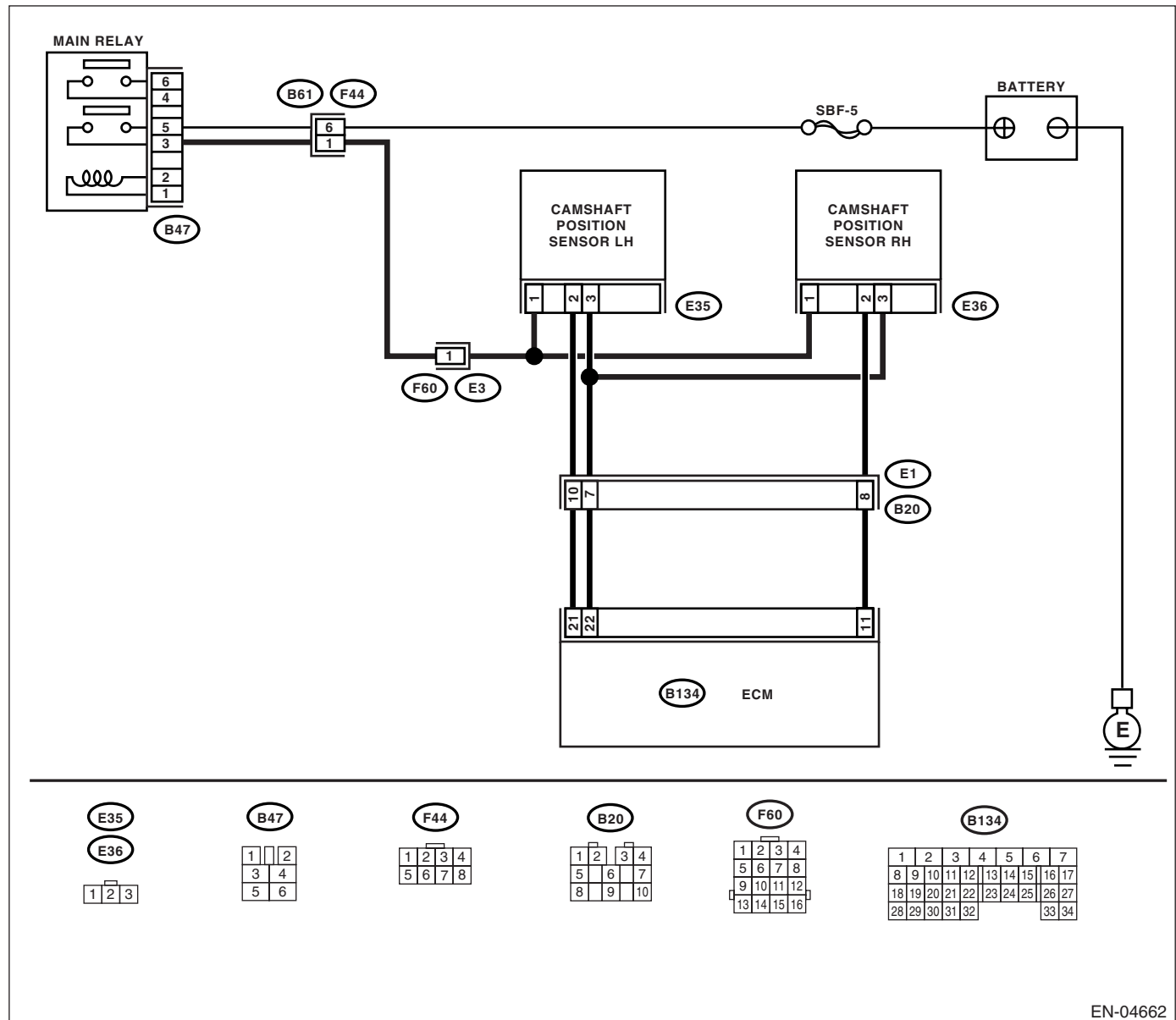
TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04662

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK POWER SUPPLY TO CAMSHAFT POSITION SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from camshaft position sensor. 3) Measure the voltage between camshaft position sensor and engine ground. Connector & terminal (E35) No. 1 (+) — Engine ground (-):	Is the voltage more than 10 V?	Repair the battery short circuit between main relay connector and camshaft position sensor connector.	Go to step 2.
2 CHECK POWER SUPPLY TO CAMSHAFT POSITION SENSOR. 1) Turn the ignition switch to ON. 2) Measure the voltage between camshaft position sensor and engine ground. Connector & terminal (E35) No. 1 (+) — Engine ground (-):	Is the voltage more than 10 V?	Go to step 3.	Repair the open or ground short circuit between main relay connector and camshaft position sensor connector.
3 CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between camshaft position sensor and ECM. Connector & terminal (E35) No. 2 — (B134) No. 21: (E35) No. 3 — (B134) No. 22:	Is the resistance less than 1 Ω ?	Go to step 4.	Repair the open circuit between camshaft position sensor and ECM.
4 CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM. Measure the resistance between camshaft position sensor and engine ground. Connector & terminal (E35) No. 2 — Engine ground: (E35) No. 3 — Engine ground:	Is the resistance more than 1 M Ω ?	Go to step 5.	Repair the ground short circuit between camshaft position sensor and ECM.
5 CHECK CONDITION OF CAMSHAFT POSITION SENSOR.	Is the camshaft position sensor installation bolt tightened securely?	Go to step 6.	Tighten the camshaft position sensor installation bolt securely.
6 CHECK CAMSHAFT POSITION SENSOR. Check the camshaft position sensor wave form. <Ref. to EN(H4DOTC)(diag)-20, Engine Control Module (ECM) I/O Signal.>	Is any abnormality found in waveform?	Replace the camshaft position sensor. <Ref. to FU(H4DOTC)-29, Camshaft Position Sensor.>	Go to step 7.
7 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(H4DOTC)-45, Engine Control Module (ECM).>

BC:DTC P0410 SECONDARY AIR INJECTION SYSTEM

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-111, DTC P0410 SECONDARY AIR INJECTION SYSTEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>

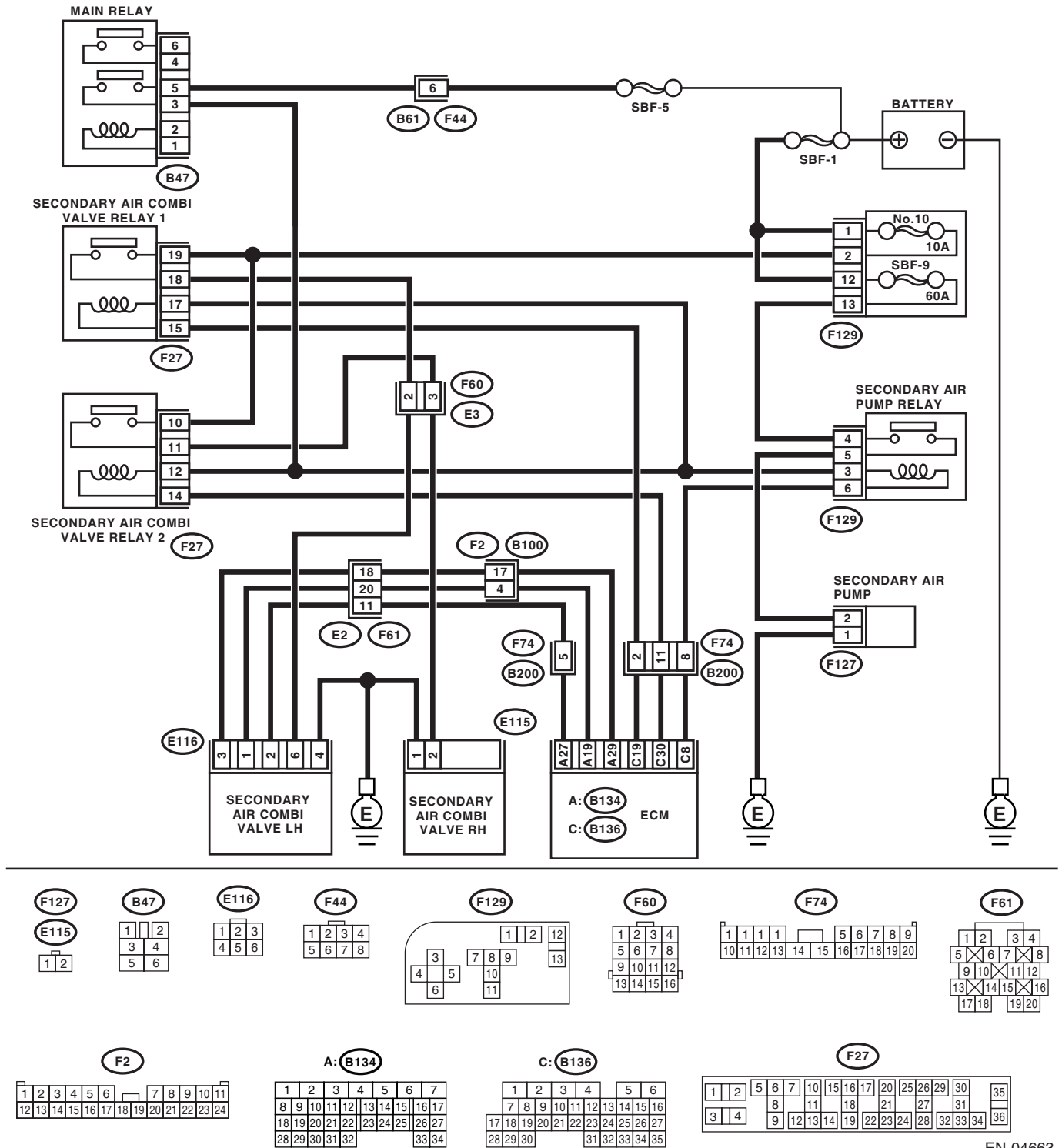
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-04663

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK SECONDARY AIR PUMP OPERATION. 1) Connect the test mode connector. 2) Turn the ignition switch to ON. 3) Perform the operational check of secondary air pump using the Subaru Select Monitor. NOTE: Subaru Select Monitor For detailed operation procedures, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-51, Compulsory Valve Operation Check Mode.>	Does the secondary air pump operate?	Go to step 2.	Go to step 3.
2 CHECK DUCT BETWEEN SECONDARY AIR PUMP AND COMBI VALVE. Check the duct between secondary air pump and combi valve.	Is the duct damaged or disconnected?	Replace or connect the duct.	A temporary poor contact occurs. Check poor contact in connector.
3 CHECK POWER SUPPLY TO SECONDARY AIR PUMP. Measure the voltage between secondary air pump and chassis ground at the condition of Step 1. Connector & terminal (F127) No. 2 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Replace the secondary air pump.	Go to step 4.
4 CHECK HARNESS BETWEEN SECONDARY AIR PUMP RELAY AND SECONDARY AIR PUMP CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from secondary air pump relay and secondary air pump. 3) Measure the resistance of harness between secondary air pump relay and secondary air pump connector terminal. Connector & terminal (F129) No. 5 — (F127) No. 2:	Is the resistance less than 1 Ω ?	Go to step 5.	Measure the resistance of harness between secondary air pump relay and secondary air pump connector terminal.
5 CHECK SECONDARY AIR PUMP RELAY. 1) Turn the ignition switch to OFF. 2) Remove the secondary air pump relay from relay box. 3) Connect the battery to terminals No. 3 and No. 6 of secondary air pump relay. 4) Measure the resistance between secondary air pump relay terminals. Terminals No. 4 — No. 5:	Is the resistance less than 1 Ω ?	Go to step 6.	Replace the secondary air pump relay.
6 CHECK POWER SUPPLY OF SECONDARY AIR PUMP RELAY. 1) Turn the ignition switch to ON. 2) Measure the voltage between secondary air pump relay connector and chassis ground. Connector & terminal (F129) No. 3 (+) — Chassis ground (-): (F129) No. 4 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 7.	Repair the open power supply circuit or ground short.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
7 CHECK HARNESS BETWEEN ECM AND SECONDARY AIR PUMP RELAY CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector of ECM. 3) Measure the resistance of harness between ECM and secondary air pump relay connector terminal. <i>Connector & terminal</i> <i>(B136) No. 8 — (F129) No. 6:</i>	Is the resistance less than 1 Ω ?	Replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>	Repair the open circuit in harness between ECM and secondary air pump relay connector terminal.

BD:DTC P0411 SECONDARY AIR INJECTION SYSTEM INCORRECT FLOW DETECTED

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-115, DTC P0411 SECONDARY AIR INJECTION SYSTEM INCORRECT FLOW DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

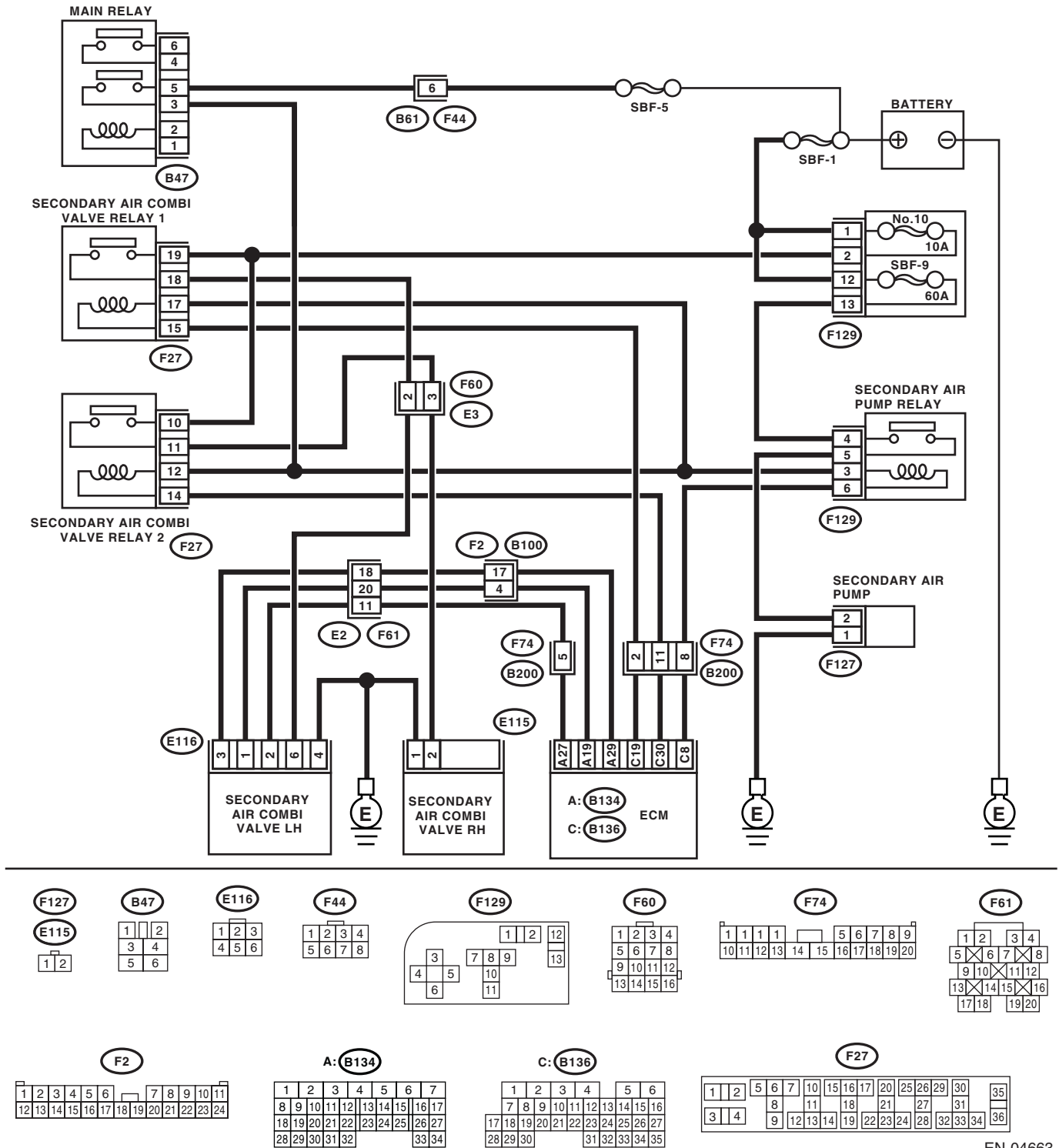
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-04663

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1	CHECK SECONDARY AIR COMBI VALVE. Check the pipe between secondary air combi valve and cylinder head.	Is the pipe damaged or disconnected?	Replace the pipe between secondary air combi valve and cylinder head.
2	CHECK SECONDARY AIR COMBI VALVE. Race at 2,000 rpm and check for sound of exhaust leakage.	Is there the sound of exhaust leakage?	Replace the pipe between secondary air combi valve and cylinder head.
			Go to step 2.
			Contact your SOA Service Center since deterioration of some parts may be the cause. NOTE: Deterioration of some parts may be the cause.

BE:DTC P0413 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “A” CIRCUIT OPEN

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-116, DTC P0413 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “A” CIRCUIT OPEN, Diagnostic Trouble Code (DTC) Detecting Criteria.>

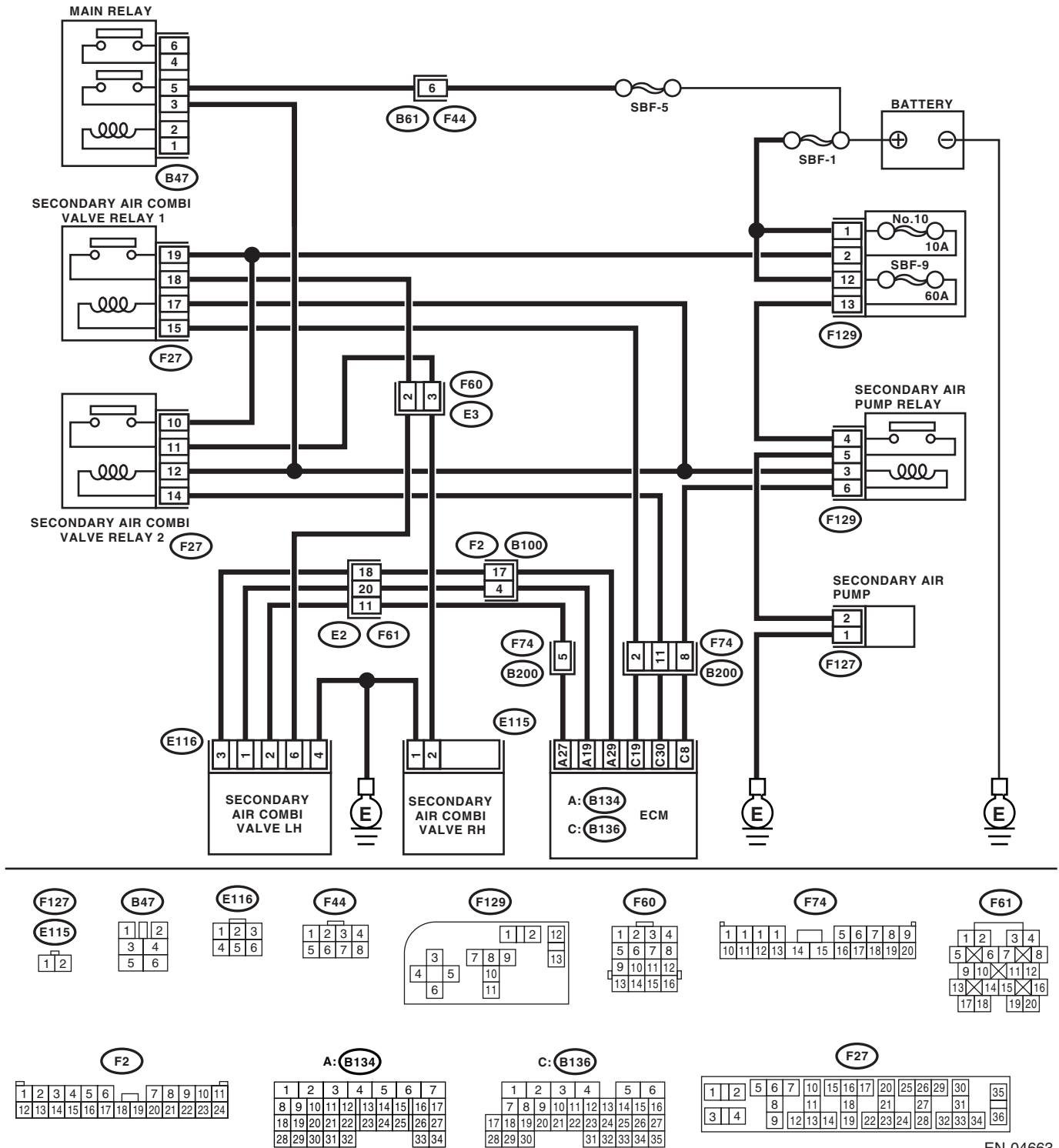
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-04663

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBI VALVE RELAY 1. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and secondary air combi valve relay 1. 3) Measure the resistance of harness between ECM and secondary air combi valve relay 1 terminal. <i>Connector & terminal</i> <i>(B136) No. 30 — (F27) No. 14:</i>	Is the resistance less than 1 Ω ?	Go to step 2.	Repair the open circuit in harness between ECM and secondary air combi valve relay 1 terminal.
2 CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBI VALVE RELAY 1. Measure the resistance of harness between ECM and chassis ground. <i>Connector & terminal</i> <i>(B136) No. 30 — Chassis ground:</i>	Is the resistance more than 1 M Ω ?	A temporary poor contact occurs. Check poor contact in connector.	Repair the ground short circuit in harness between ECM and secondary air combi valve relay 1 terminal.

BF:DTC P0414 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “A” CIRCUIT SHORTED

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-117, DTC P0414 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “A” CIRCUIT SHORTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBI VALVE RELAY 1. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and secondary air combi valve relay 1. 3) Measure the resistance of harness between ECM and secondary air combi valve relay 1 terminal. <i>Connector & terminal</i> <i>(B136) No. 30 — (F27) No. 14:</i>	Is the resistance less than 1 Ω ?	Go to step 2.	Repair the open circuit in harness between ECM and secondary air combi valve relay 1 terminal.
2 CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBI VALVE RELAY 1. Measure the voltage between ECM and chassis ground. <i>Connector & terminal</i> <i>(B136) No. 30 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Repair the battery short circuit in harness between ECM and secondary air combi valve relay 1 terminal.	A temporary poor contact occurs. Check poor contact in connector.

BG:DTC P0416 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “B” CIRCUIT OPEN

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-118, DTC P0416 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “B” CIRCUIT OPEN, Diagnostic Trouble Code (DTC) Detecting Criteria.>

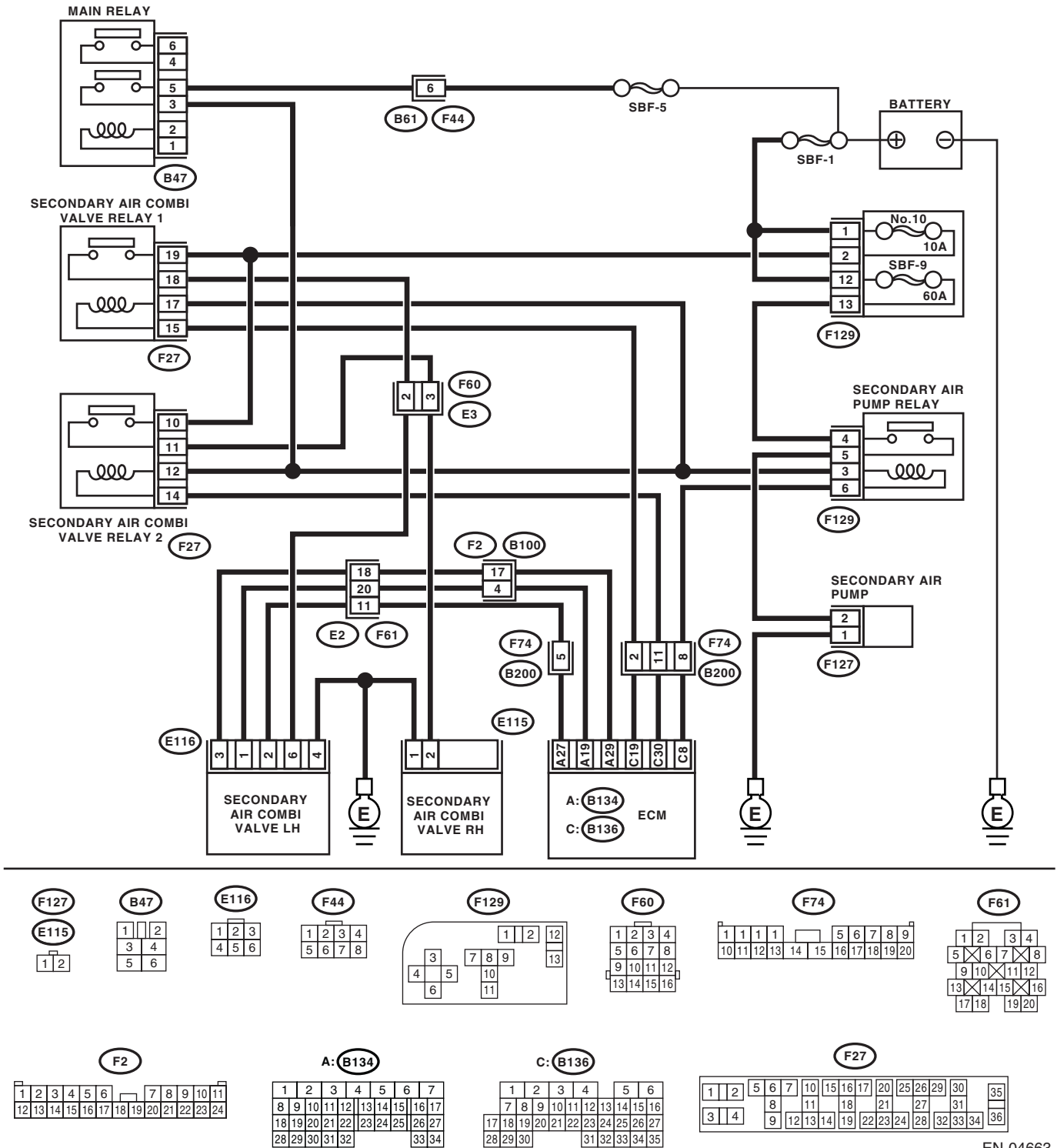
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-04663

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBI VALVE RELAY 2. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and secondary air combi valve relay 2. 3) Measure the resistance of harness between ECM and secondary air combi valve relay 2 terminal. <i>Connector & terminal</i> <i>(B136) No. 19 — (F27) No. 15:</i>	Is the resistance less than 1 Ω ?	Go to step 2.	Repair the open circuit in harness between ECM and secondary air combi valve relay 2 terminal.
2 CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBI VALVE RELAY 2. Measure the resistance of harness between ECM and chassis ground. <i>Connector & terminal</i> <i>(B136) No. 19 — Chassis ground:</i>	Is the resistance more than 1 M Ω ?	A temporary poor contact occurs. Check poor contact in connector.	Repair the ground short circuit in harness between ECM and secondary air combi valve relay 2 terminal.

BH:DTC P0417 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “B” CIRCUIT SHORTED

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-118, DTC P0417 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “B” CIRCUIT SHORTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

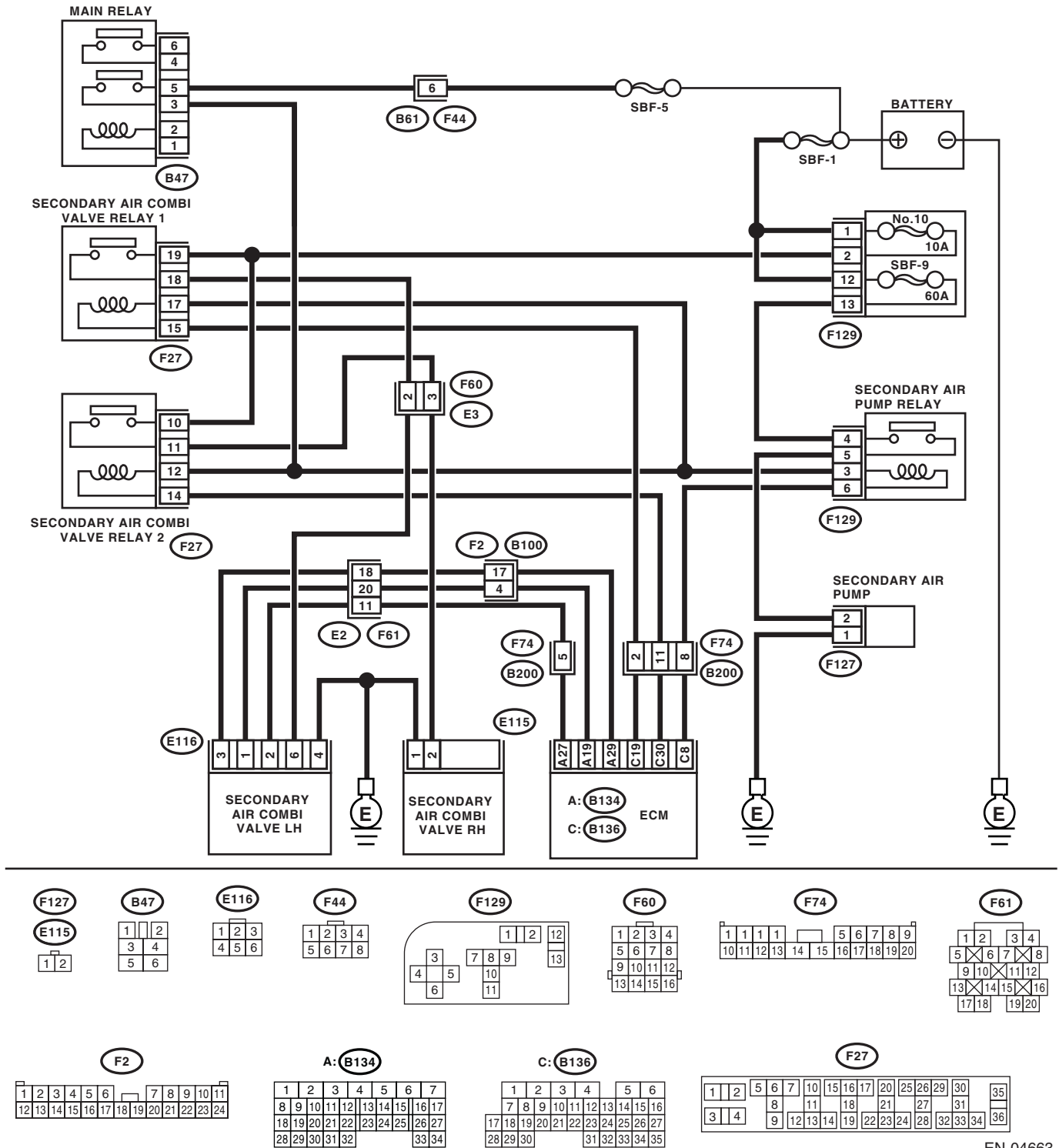
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-04663

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBI VALVE RELAY 2. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and secondary air combi valve relay 2. 3) Measure the resistance of harness between ECM and secondary air combi valve relay 2 terminal. <i>Connector & terminal</i> <i>(B136) No. 19 — (F27) No. 15:</i>	Is the resistance less than 1 Ω ?	Go to step 2.	Repair the open circuit in harness between ECM and secondary air combi valve relay 2 terminal.
2 CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBI VALVE RELAY 2. Measure the voltage between ECM and chassis ground. <i>Connector & terminal</i> <i>(B136) No. 19 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Repair the battery short circuit in harness between ECM and secondary air combi valve relay 2 terminal.	A temporary poor contact occurs. Check poor contact in connector.

BI: DTC P0418 SECONDARY AIR INJECTION SYSTEM CONTROL “A” CIRCUIT OPEN

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-119, DTC P0418 SECONDARY AIR INJECTION SYSTEM CONTROL “A” CIRCUIT OPEN, Diagnostic Trouble Code (DTC) Detecting Criteria.>

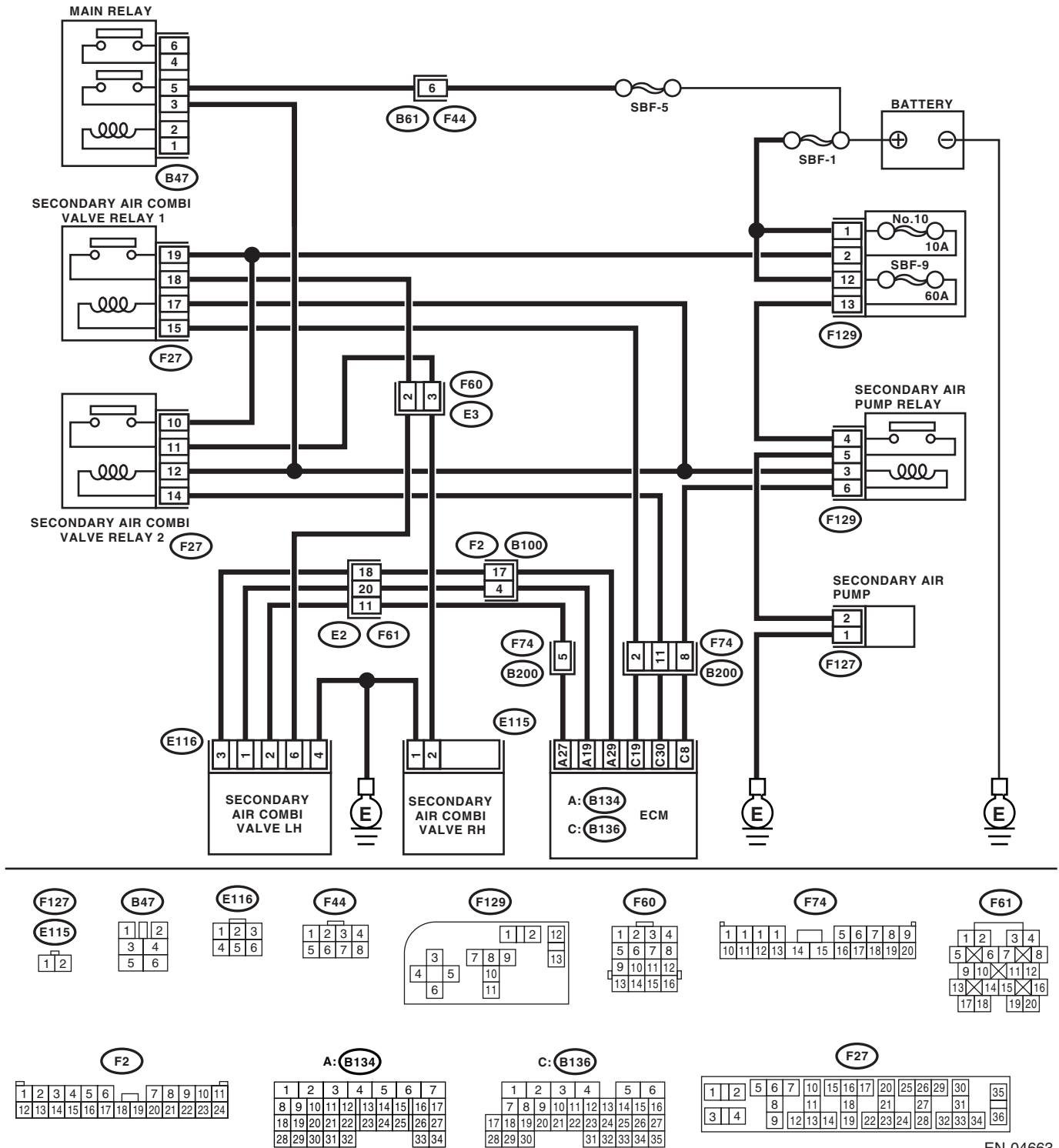
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-04663

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS BETWEEN ECM AND SECONDARY AIR PUMP RELAY. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and secondary air pump relay. 3) Measure the resistance of harness between ECM and secondary air pump relay terminal. <i>Connector & terminal (B136) No. 8 — (F129) No. 6:</i>	Is the resistance less than 1 Ω ?	Go to step 2.	Repair the open circuit in harness between ECM and secondary air pump relay terminal.
2 CHECK HARNESS BETWEEN ECM AND SECONDARY AIR PUMP RELAY. Measure the resistance of harness between ECM and chassis ground. <i>Connector & terminal (B136) No. 8 — Chassis ground:</i>	Is the resistance more than 1 M Ω ?	A temporary poor contact occurs. Check poor contact in connector.	Repair the ground short circuit in harness between ECM and secondary air pump relay terminal.

BJ:DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1)**DTC DETECTING CONDITION:**

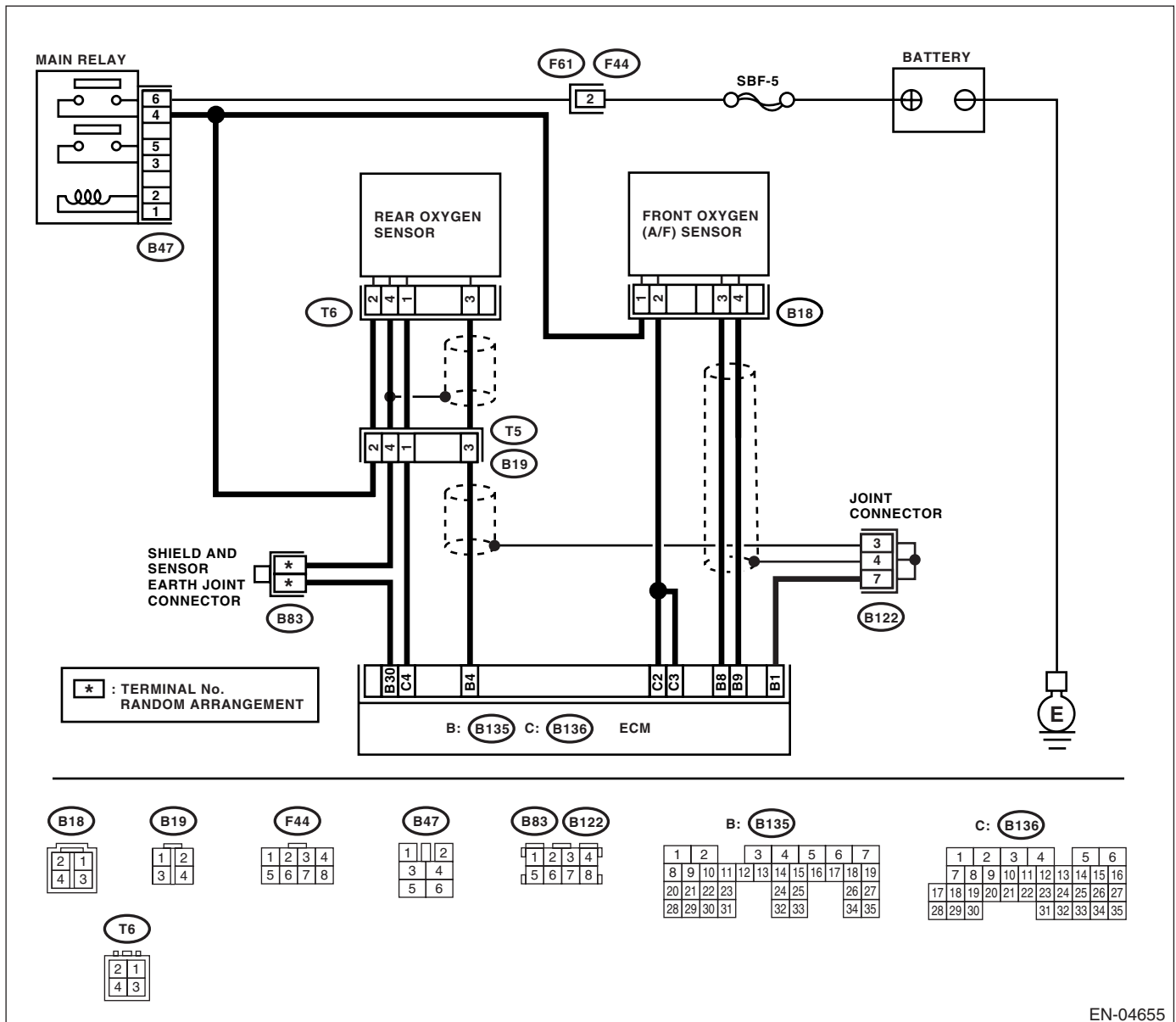
- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-120, DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

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(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:

EN-04655

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-74, 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 - Looseness and incomplete installation of front oxygen (A/F) sensor and rear oxygen sensor	Is there a fault in exhaust system?	Repair or replace the exhaust system. <Ref. to EX(H4DOTC)-2, General Description.>	Go to step 3.
3 CHECK WAVEFORM ON SUBARU SELECT MONITOR. (DURING DRIVING) 1) Drive at a constant speed of 80 — 113 km/h (50 — 70 MPH). 2) After leaving it in the condition of Step 1) for 5 minutes, read the waveform data using Subaru Select Monitor while driving. <Ref. to EN(H4DOTC)(diag)-20, ELECTRICAL SPECIFICATION, Engine Control Module (ECM) I/O Signal.>	Is normal waveform displayed?	Contact your SOA Service Center since deterioration of some parts may be the cause.	Go to step 4.
4 CHECK WAVEFORM ON SUBARU SELECT MONITOR. (DURING IDLING) 1) Run the vehicle at idle. 2) In the condition of Step 1), read the waveform data using Subaru Select Monitor. <Ref. to EN(H4DOTC)(diag)-20, ELECTRICAL SPECIFICATION, Engine Control Module (ECM) I/O Signal.>	Is normal waveform displayed?	Go to step 10.	Go to step 5.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
5 CHECK VOLTAGE OF REAR OXYGEN SENSOR. 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and keep the engine speed at 3,000 rpm. (2 minutes at the longest) 2) Read the rear oxygen sensor voltage using Subaru Select Monitor. NOTE: - For MT model, depress the clutch pedal. - Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.>	Is the voltage more than 490 mV?	Go to step 9.	Go to step 6.
6 CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.	Is there water in connector?	Remove infiltrating water completely.	Go to step 7.
7 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. 4 — (T6) No. 3: (B135) No. 30 — (T6) 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 8.
8 CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR. 1) Turn the ignition switch to ON. 2) Measure the voltage between rear oxygen sensor connector and chassis ground. Connector & terminal (T6) No. 3 (+) — Chassis ground (-):	Is the voltage 0.2 — 0.5 V?	Go to step 11.	Repair the harness and connector. NOTE: Repair the following items. - Open circuit in harness between rear oxygen sensor and ECM connector - Poor contact of rear oxygen sensor and ECM connector - Poor contact in ECM connector

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
9 CHECK VOLTAGE OF REAR OXYGEN SENSOR. 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and immediately decrease the engine speed from 3,000 rpm. 2) Read the rear oxygen sensor voltage using Subaru Select Monitor. NOTE: • For MT model, depress the clutch pedal. • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.>	Is the voltage less than 250 mV?	Contact your SOA Service Center since deterioration of some parts may be the cause.	Go to step 6.
10 CHECK CATALYTIC CONVERTER.	Is the catalytic converter damaged?	Replace the catalytic converter. <Ref. to EC(H4DOTC)-5, Front Catalytic Converter.>	Contact your SOA Service Center since deterioration of some parts may be the cause.
11 CHECK REAR OXYGEN SENSOR SHIELD. 1) Turn the ignition switch to OFF. 2) Bare the sensor shield of body side harness of rear oxygen sensor connector. 3) Measure the resistance between sensor shield and chassis ground.	Is the resistance less than 1 Ω?	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-43, Rear Oxygen Sensor.>	Repair the open circuit in rear oxygen sensor harness.

BK:DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-123, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Fuel odor
- There is a hole of more than 1.0 mm (0.04 in) dia. in evaporation system or fuel tank.

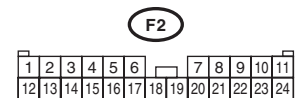
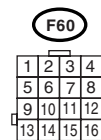
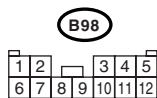
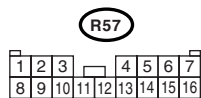
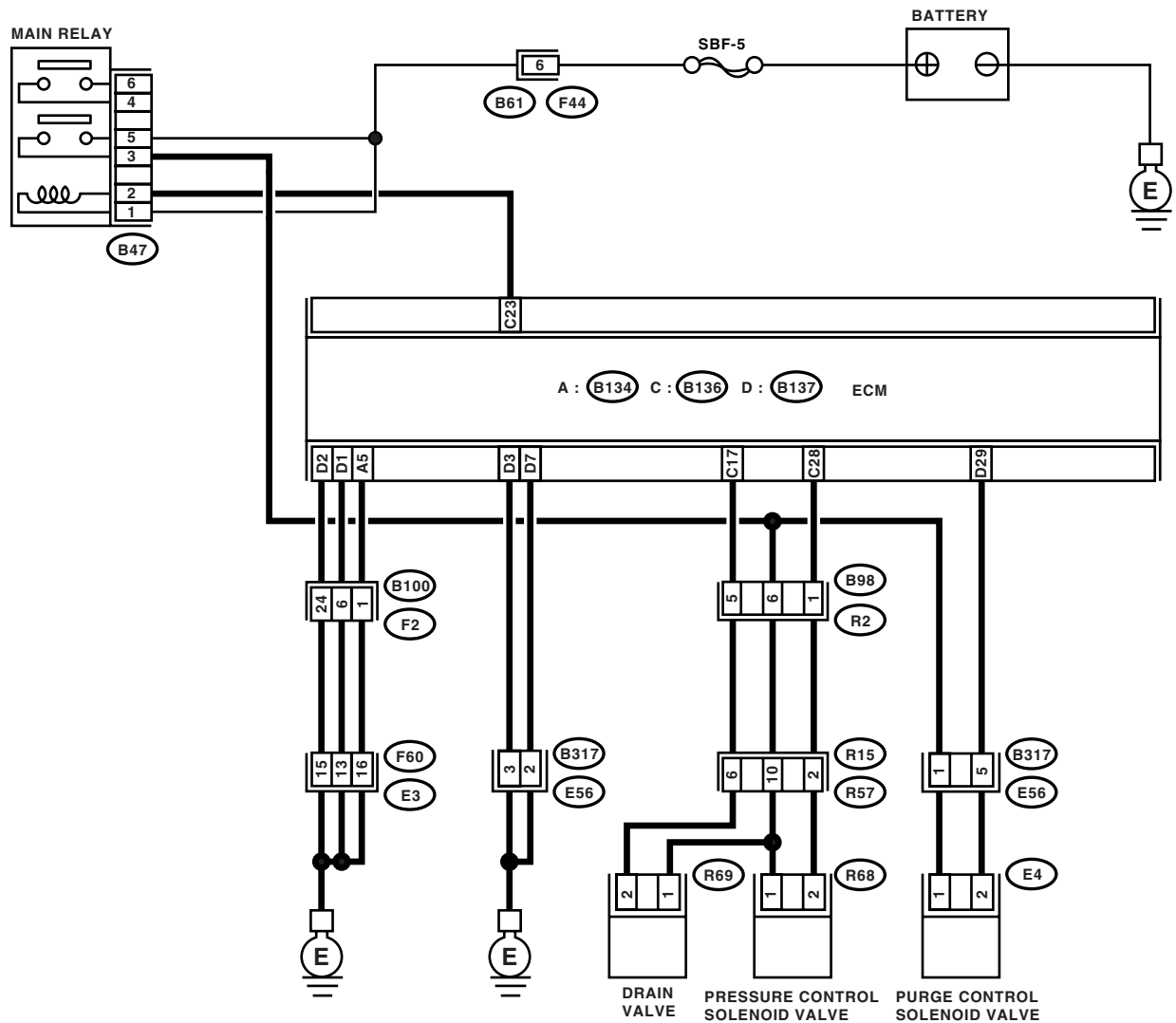
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

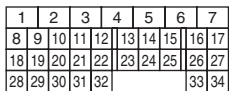
Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

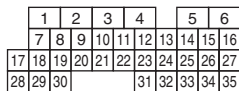
WIRING DIAGRAM:



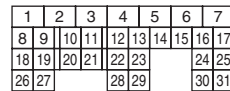
A : B134



C : B136



D : B137



F44



EN-04708

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK FUEL FILLER CAP. 1) Turn ignition switch to OFF. 2) Check the fuel filler cap. NOTE: The DTC is stored in memory if fuel filler cap is or was loose or if the cap chain was caught while tightening.	Is the fuel filler cap tightened securely?	Go to step 3.	Tighten fuel filler cap securely.
3 CHECK FUEL FILLER CAP.	Is the fuel filler cap SUBARU genuine?	Go to step 4.	Replace with a SUBARU genuine fuel filler cap.
4 CHECK FUEL FILLER PIPE SEAL.	Is there any damage to the seal between fuel filler cap and fuel filler pipe?	Repair or replace the fuel filler cap and fuel filler pipe. <Ref. to FU(H4DOTC)-54, Fuel Filler Pipe.>	Go to step 5.
5 CHECK DRAIN VALVE. 1) Connect the test mode connector. 2) Turn ignition switch to ON. 3) Operate the drain valve. NOTE: Drain valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-51, Compulsory Valve Operation Check Mode.>	Does the drain valve operate?	Go to step 6.	Replace the drain valve. <Ref. to EC(H4DOTC)-20, Drain Valve.>
6 CHECK PURGE CONTROL SOLENOID VALVE. Operate the purge control solenoid valve. NOTE: Purge control solenoid valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-51, Compulsory Valve Operation Check Mode.>	Does the purge control solenoid valve operate?	Go to step 7.	Replace the purge control solenoid valve. <Ref. to EC(H4DOTC)-8, Purge Control Solenoid Valve.>
7 CHECK PRESSURE CONTROL SOLENOID VALVE. Operate the pressure control solenoid valve. NOTE: Pressure control solenoid valve operation can also be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-51, Compulsory Valve Operation Check Mode.>	Does the pressure control solenoid valve operate?	Go to step 8.	Replace the pressure control solenoid valve. <Ref. to EC(H4DOTC)-16, Pressure Control Solenoid Valve.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
8 CHECK EVAPORATIVE EMISSION CONTROL SYSTEM LINE. Turn ignition switch to OFF.	Is there a hole of more than 1.0 mm (0.04 in) dia. on evaporation line?	Repair or replace the evaporation line. <Ref. to FU(H4DOTC)-65, Fuel Delivery, Return and Evaporation lines.>	Go to step 9 .
9 CHECK CANISTER.	Is the canister damaged or is there a hole of more than 1.0 mm (0.04 in) dia. in it?	Repair or replace the canister. <Ref. to EC(H4DOTC)-7, Canister.>	Go to step 10 .
10 CHECK FUEL TANK. Remove the fuel tank. <Ref. to FU(H4DOTC)-51, Fuel Tank.>	Is the fuel tank damaged or is there a hole of more than 1.0 mm (0.04 in) dia. in it?	Repair or replace the fuel tank. <Ref. to FU(H4DOTC)-51, Fuel Tank.>	Go to step 11 .
11 CHECK ANY OTHER MECHANICAL TROUBLE IN EVAPORATIVE EMISSION CONTROL SYSTEM.	Are there holes of more than 1.0 mm (0.04 in) dia., cracks, clogging, or disconnections, bend, misconnection of hoses or pipes in evaporative emission control system?	Repair or replace the hoses or pipes.	Contact your SOA Service Center since deterioration of some parts may be the cause.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

BL:DTC P0447 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN

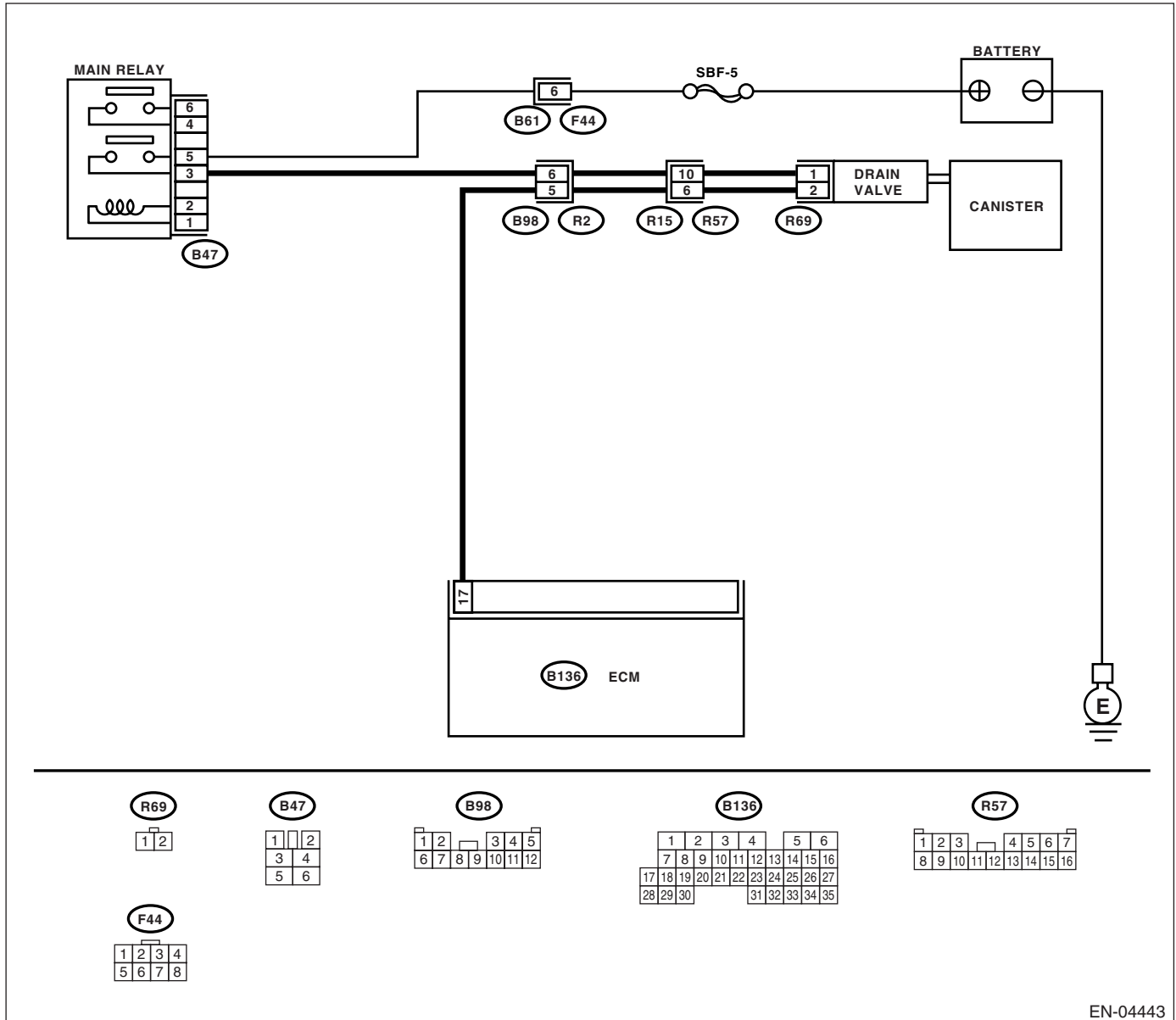
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-139, DTC P0447 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, 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 ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. Connector & terminal (B136) No. 17 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 2.	Go to step 3.
2 CHECK FOR POOR CONTACT. Check for poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	The malfunction indicator light may light up, however, the circuit is returned to the normal status at the moment. (However, the possibility of poor contact still remains.) NOTE: In this case, repair the following: • Poor contact in drain valve connector • Poor contact in ECM connector • Poor contact in coupling connector
3 CHECK HARNESS BETWEEN DRAIN VALVE AND ECM CONNECTOR. 1) Turn ignition switch to OFF. 2) Disconnect the connectors from drain valve and ECM. 3) Measure the resistance of harness between drain valve connector and chassis ground. Connector & terminal (R69) No. 2 — Chassis ground:	Is the resistance more than 1 MΩ?	Go to step 4.	Repair short circuit to ground in harness between ECM and drain valve connector.
4 CHECK HARNESS BETWEEN DRAIN VALVE AND ECM CONNECTOR. Measure the resistance of harness between ECM and drain valve connector. Connector & terminal (B136) No. 17 — (R69) No. 2:	Is the resistance less than 1 Ω?	Go to step 5.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and drain valve connector • Poor contact in coupling connector
5 CHECK DRAIN VALVE. Measure the resistance between drain valve terminals. Terminals No. 1 — No. 2:	Is the resistance 10 — 100 Ω?	Go to step 6.	Replace the drain valve. <Ref. to EC(H4DOTC)-20, Drain Valve.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

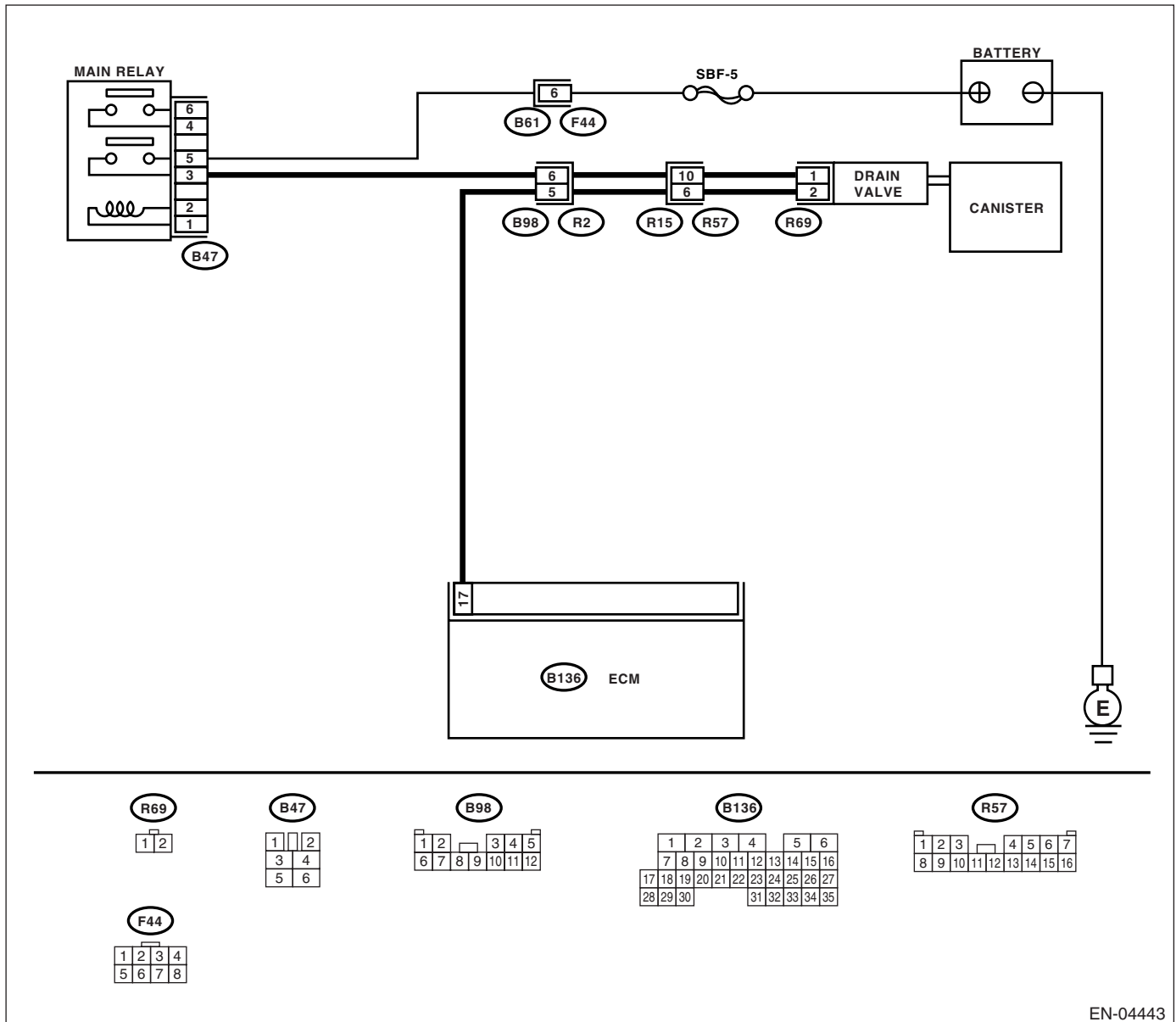
Step	Check	Yes	No
6 CHECK POWER SUPPLY TO DRAIN VALVE. 1) Turn ignition switch to ON. 2) Measure the voltage between drain valve and chassis ground. Connector & terminal (R69) No. 1 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 7.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between main relay and drain valve • Poor contact in coupling connector • Poor contact in main relay connector
7 CHECK FOR POOR CONTACT. Check for poor contact in drain valve connector.	Is there poor contact in drain valve connector?	Repair poor contact in drain valve connector.	Contact your SOA Service Center since deterioration of some parts may be the cause.

BM:DTC P0448 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED**DTC DETECTING CONDITION:**

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-141, DTC P0448 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:

EN-04443

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK INPUT SIGNAL FOR ECM. 1) Turn ignition switch to OFF. 2) Connect the test mode connector at the lower portion of instrument panel (on the driver's side). 3) Turn ignition switch to ON. 4) While operating the drain valve, measure voltage between ECM and chassis ground. NOTE: Drain valve operation can be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-51, Compulsory Valve Operation Check Mode.> Connector & terminal (B136) No. 17 (+) — Chassis ground (-):	Does the resistance change within 0 — 10 V?	Go to step 2.	The malfunction indicator light may light up, however, the circuit is returned to the normal status at the moment. In this case, repair poor contact in ECM connector.
2 CHECK INPUT SIGNAL FOR ECM. 1) Turn ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. Connector & terminal (B136) No. 17 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 4.	Go to step 3.
3 CHECK FOR POOR CONTACT. Check for poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>
4 CHECK HARNESS BETWEEN DRAIN VALVE AND ECM CONNECTOR. 1) Turn ignition switch to OFF. 2) Disconnect the connector from drain valve. 3) Turn ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. Connector & terminal (B136) No. 17 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Repair short circuit to battery in harness between ECM and drain valve connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>	Go to step 5.
5 CHECK DRAIN VALVE. 1) Turn ignition switch to OFF. 2) Measure the resistance between drain valve terminals. Terminals No. 1 — No. 2:	Is the resistance less than 1 Ω ?	Replace the drain valve and ECM. <Ref. to EC(H4DOTC)-20, Drain Valve.> <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>	Go to step 6.
6 CHECK FOR POOR CONTACT. Check for poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>

BN:DTC P0451 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR RANGE/PERFORMANCE

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

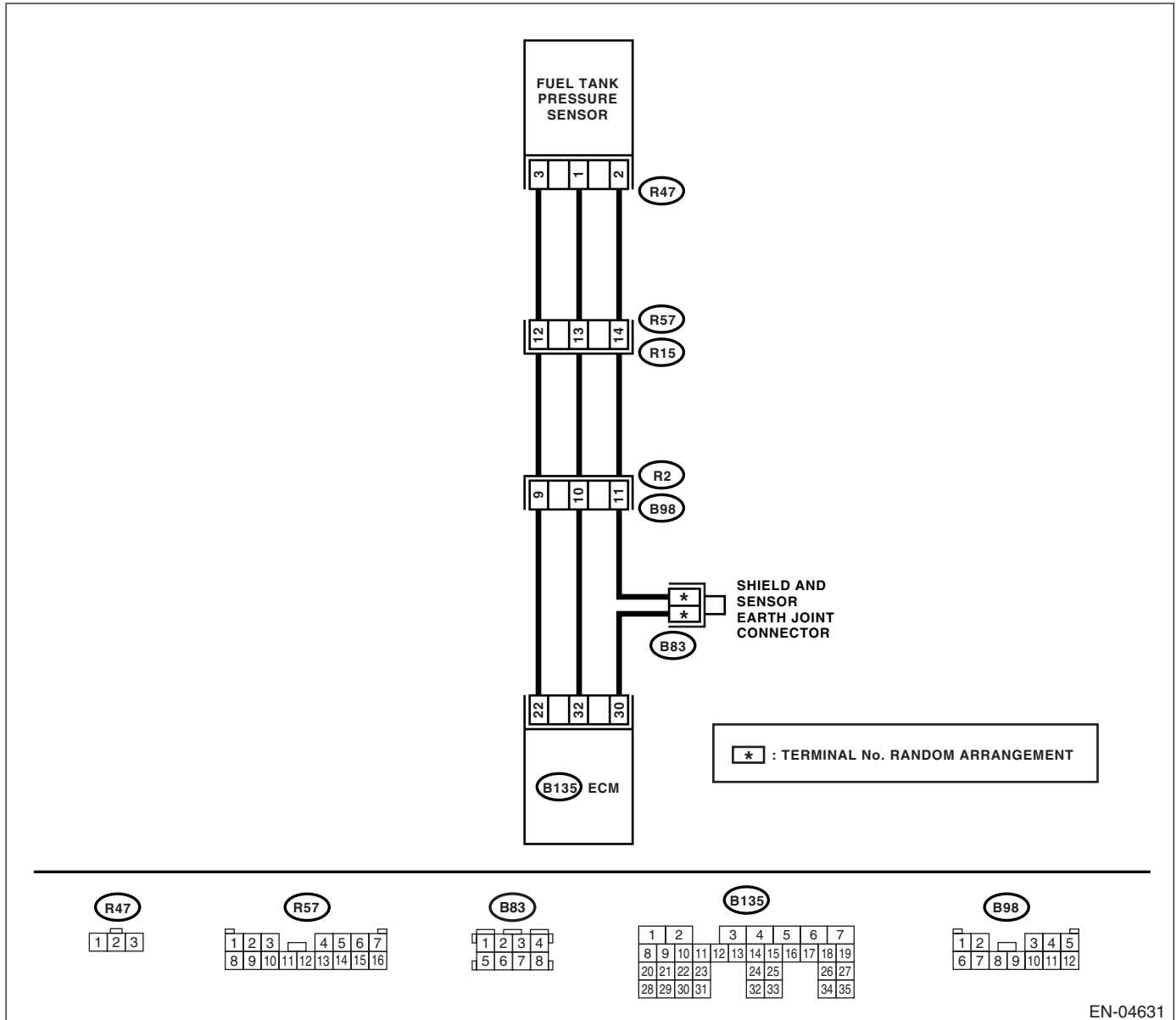
ENGINE (DIAGNOSTICS)

- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-143, DTC P0451 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).>	Go to step 2 .
2 CHECK FUEL FILLER CAP. 1) Turn ignition switch to OFF. 2) Open the fuel filler flap lid.	Is the fuel filler cap tightened securely?	Go to step 3 .	Tighten fuel filler cap securely.
3 CHECK PRESSURE/VACUUM LINE. NOTE: Check the following items. • Disconnection, leakage and clogging of the vacuum hoses and pipes between fuel tank pressure sensor and fuel tank • Disconnection, leakage and clogging of air ventilation hoses and pipes between fuel filler pipe and fuel tank	Is there a fault in pressure/vacuum line?	Repair or replace the hoses and pipes.	Replace the fuel tank pressure sensor. <Ref. to EC(H4DOTC)-15, Fuel Tank Pressure Sensor.>

BO:DTC P0452 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT

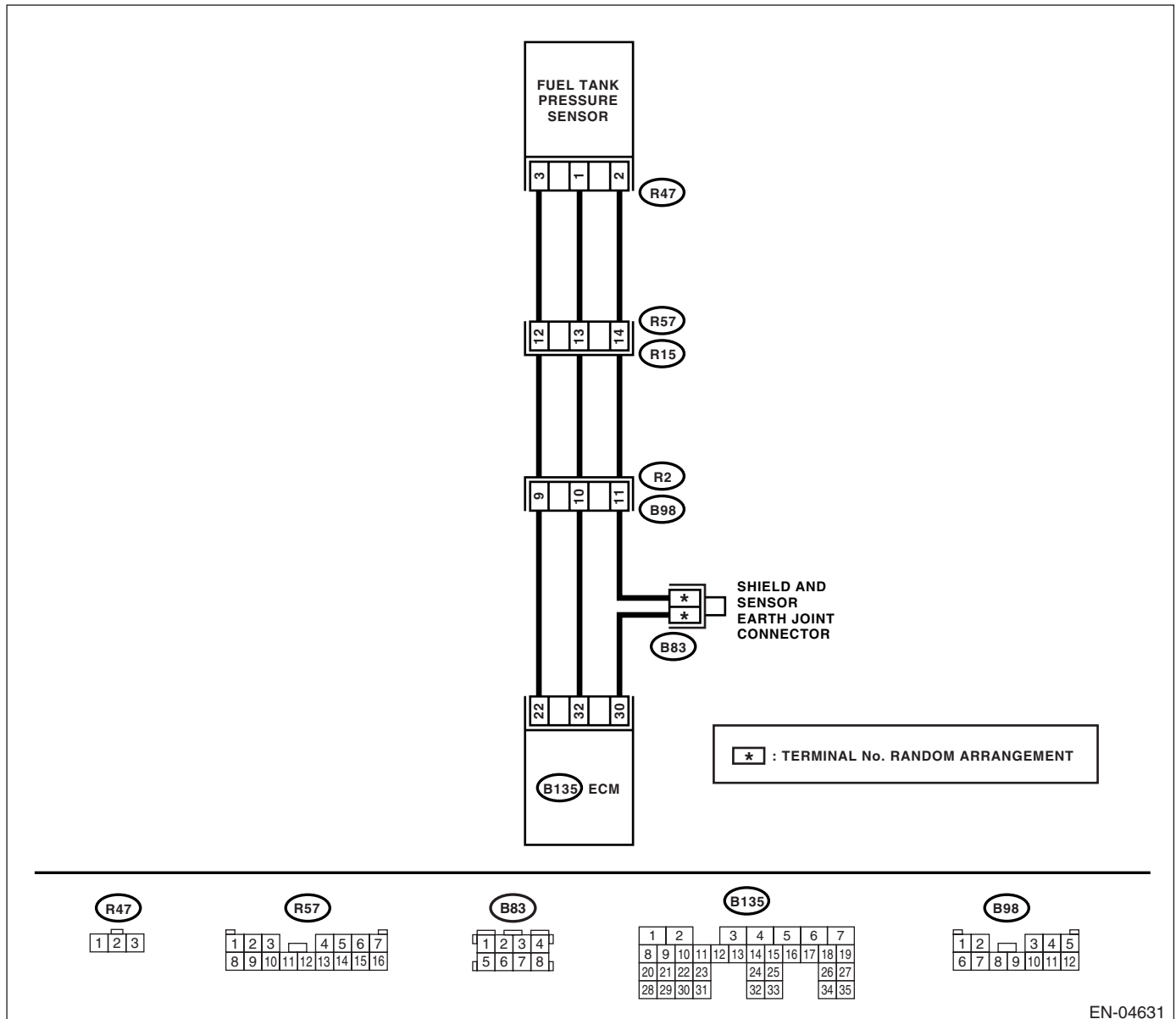
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-145, DTC P0452 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04631

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK CURRENT DATA. 1) Turn ignition switch to OFF. 2) Remove the fuel filler cap. 3) Install the fuel filler cap. 4) Turn ignition switch to ON. 5) Read the data of fuel tank pressure sensor signal using Subaru Select Monitor or the general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the measured value less than -2.8 kPa (-21.0 mmHg, -0.827 inHg)?	Go to step 2.	The malfunction indicator light may light up, however, the circuit is returned to the normal status at the moment.
2 CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 22 (+) — Chassis ground (-):	Is the voltage more than 4.5 V?	Go to step 4.	Go to step 3.
3 CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 22 (+) — Chassis ground (-):	Does the measured value exceed the specified value by shaking the ECM harness and connector?	Repair poor contact in ECM connector.	Contact your SOA Service Center since deterioration of some parts may be the cause.
4 CHECK INPUT SIGNAL FOR ECM. Measure the voltage between ECM and chassis ground. Connector & terminal (B135) No. 32 (+) — 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 fuel tank pressure sensor signal using Subaru Select Monitor. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.>	Does the measured value exceed the specified value by shaking the ECM harness and connector?	Repair poor contact in ECM connector.	Go to step 6.
6 CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS. 1) Turn ignition switch to OFF. 2) Remove the rear seat cushion. 3) Separate rear wiring harness and fuel tank cord. 4) Turn ignition switch to ON. 5) Measure the voltage between rear wiring harness connector and chassis ground. Connector & terminal (R15) No. 12 (+) — Chassis ground (-):	Is the voltage more than 4.5 V?	Go to step 7.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and rear wiring harness connector • Poor contact in coupling connector

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
7 CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS. 1) Turn ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM and rear wiring harness connector. Connector & terminal (B135) No. 30 — (R15) No. 14:	Is the resistance less than 1 Ω ?	Go to step 8.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and rear wiring harness connector • Poor contact in coupling connector • Poor contact in joint connector
8 CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS. Measure the resistance of harness between rear wiring harness connector and chassis ground. Connector & terminal (R15) No. 14 — Chassis ground:	Is the resistance more than 1 M Ω ?	Go to step 9.	Repair short circuit to ground in harness between ECM and rear wiring harness connector.
9 CHECK FUEL TANK CORD. 1) Disconnect the connector from fuel tank pressure sensor. 2) Measure the resistance of fuel tank cord. Connector & terminal (R57) No. 12 — (R47) No. 3:	Is the resistance less than 1 Ω ?	Go to step 10.	Repair open circuit in fuel tank cord.
10 CHECK FUEL TANK CORD. Measure the resistance of fuel tank cord. Connector & terminal (R57) No. 14 — (R47) No. 2:	Is the resistance less than 1 Ω ?	Go to step 11.	Repair open circuit in fuel tank cord.
11 CHECK FUEL TANK CORD. Measure the resistance of harness between fuel tank pressure sensor connector and engine ground. Connector & terminal (R47) No. 1 — Chassis ground:	Is the resistance more than 1 M Ω ?	Go to step 12.	Repair short circuit to ground in fuel tank cord.
12 CHECK FOR POOR CONTACT. Check for poor contact in fuel tank pressure sensor connector.	Is there poor contact in fuel tank pressure sensor connector?	Repair poor contact in fuel tank pressure sensor connector.	Replace the fuel tank pressure sensor. <Ref. to EC(H4DOTC)-15, Fuel Tank Pressure Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

BP:DTC P0453 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT

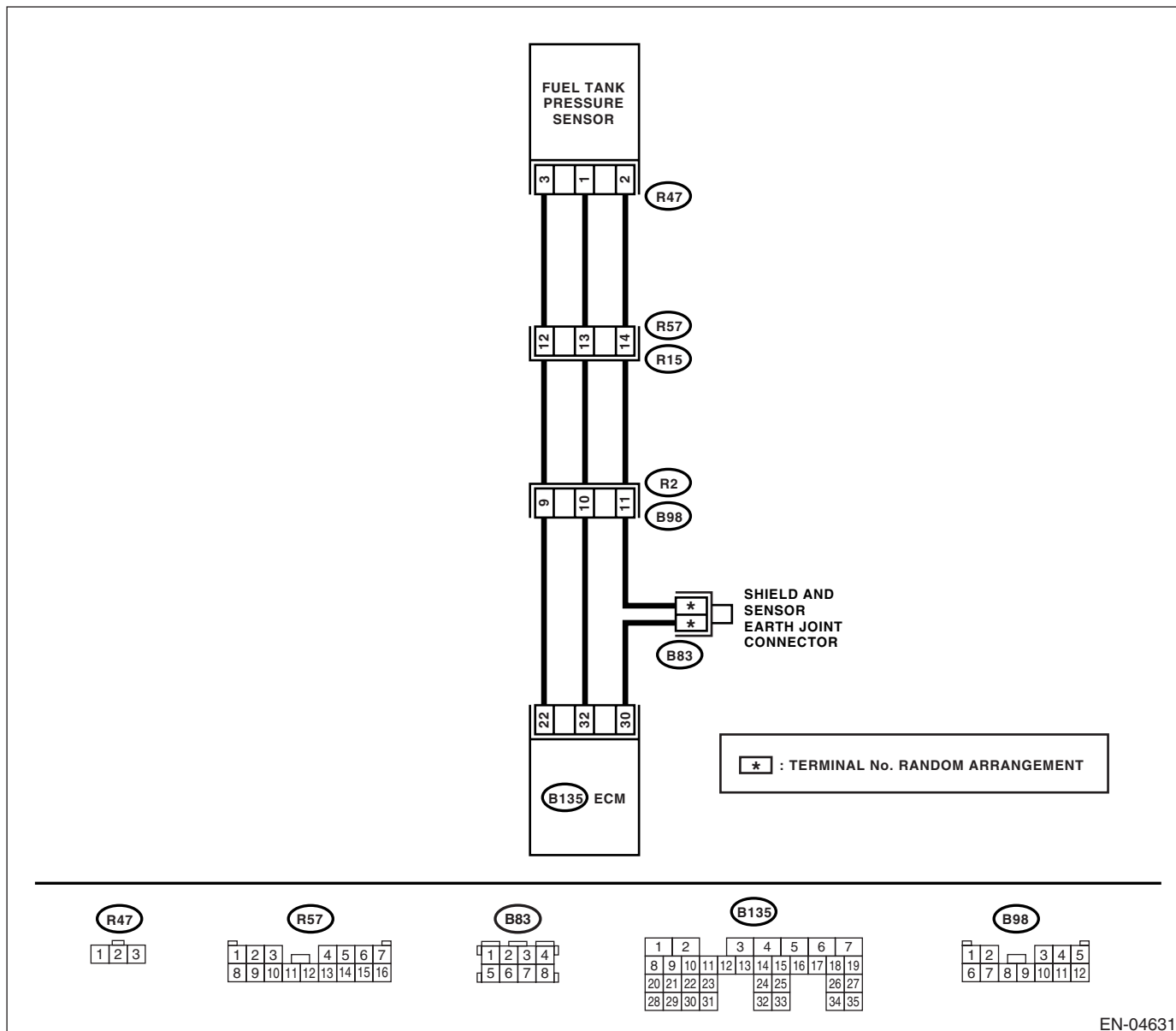
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-147, DTC P0453 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04631

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK CURRENT DATA. 1) Turn ignition switch to OFF. 2) Remove the fuel filler cap. 3) Install the fuel filler cap. 4) Turn ignition switch to ON. 5) Read the data of fuel tank pressure sensor signal using Subaru Select Monitor or the general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the measured value more than 2.8 kPa (21.0 mmHg, 0.827 inHg)	Go to step 11.	Go to step 2.
2 CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 22 (+) — Chassis ground (-):	Is the voltage more than 4.5 V?	Go to step 4.	Go to step 3.
3 CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 22 (+) — Chassis ground (-):	Does the measured value change by shaking the ECM harness and connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>
4 CHECK INPUT SIGNAL FOR ECM. Measure the voltage between ECM and chassis ground. Connector & terminal (B135) No. 32 (+) — 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 fuel tank pressure sensor signal using Subaru Select Monitor. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.>	Does the measured value change by shaking the ECM harness and connector?	Repair poor contact in ECM connector.	Go to step 6.
6 CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS. 1) Turn ignition switch to OFF. 2) Remove the rear seat cushion. 3) Separate rear wiring harness and fuel tank cord. 4) Turn ignition switch to ON. 5) Measure the voltage between rear wiring harness connector and chassis ground. Connector & terminal (R15) No. 12 (+) — Chassis ground (-):	Is the voltage more than 4.5 V?	Go to step 7.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and rear wiring harness connector • Poor contact in coupling connector

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
7 CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS. 1) Turn ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM and rear wiring harness connector. Connector & terminal (B135) No. 30 — (R15) No. 14: (B135) No. 32 — (R15) No. 13:	Is the resistance less than 1 Ω ?	Go to step 8.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and rear wiring harness connector • Poor contact in coupling connector
8 CHECK FUEL TANK CORD. 1) Disconnect the connector from fuel tank pressure sensor. 2) Measure the resistance of fuel tank cord. Connector & terminal (R57) No. 13 — (R47) No. 1:	Is the resistance less than 1 Ω ?	Go to step 9.	Repair open circuit in fuel tank cord.
9 CHECK FUEL TANK CORD. Measure the resistance of fuel tank cord. Connector & terminal (R57) No. 14 — (R47) No. 2:	Is the resistance less than 1 Ω ?	Go to step 10.	Repair open circuit in fuel tank cord.
10 CHECK FOR POOR CONTACT. Check for poor contact in fuel tank pressure sensor connector.	Is there poor contact in fuel tank pressure sensor connector?	Repair poor contact in fuel tank pressure sensor connector.	Replace the fuel tank pressure sensor. <Ref. to EC(H4DOTC)-15, Fuel Tank Pressure Sensor.>
11 CHECK HARNESS BETWEEN ECM AND FUEL TANK PRESSURE SENSOR CONNECTOR. 1) Turn ignition switch to OFF. 2) Disconnect the connector from fuel tank pressure sensor. 3) Turn ignition switch to ON. 4) Read the data of fuel tank pressure sensor signal using Subaru Select Monitor or the general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the measured value more than 2.8 kPa (21.0 mmHg, 0.827 inHg)?	Repair short circuit to battery in harness between ECM and fuel tank pressure sensor connector.	Replace the fuel tank pressure sensor. <Ref. to EC(H4DOTC)-15, Fuel Tank Pressure Sensor.>

BQ:DTC P0456 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-148, DTC P0456 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Fuel odor
- There is a hole of more than 0.5 mm (0.020 in) dia. in evaporation system or fuel tank.

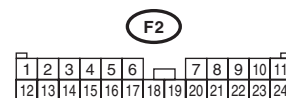
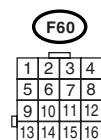
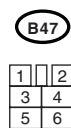
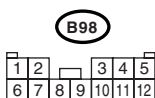
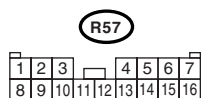
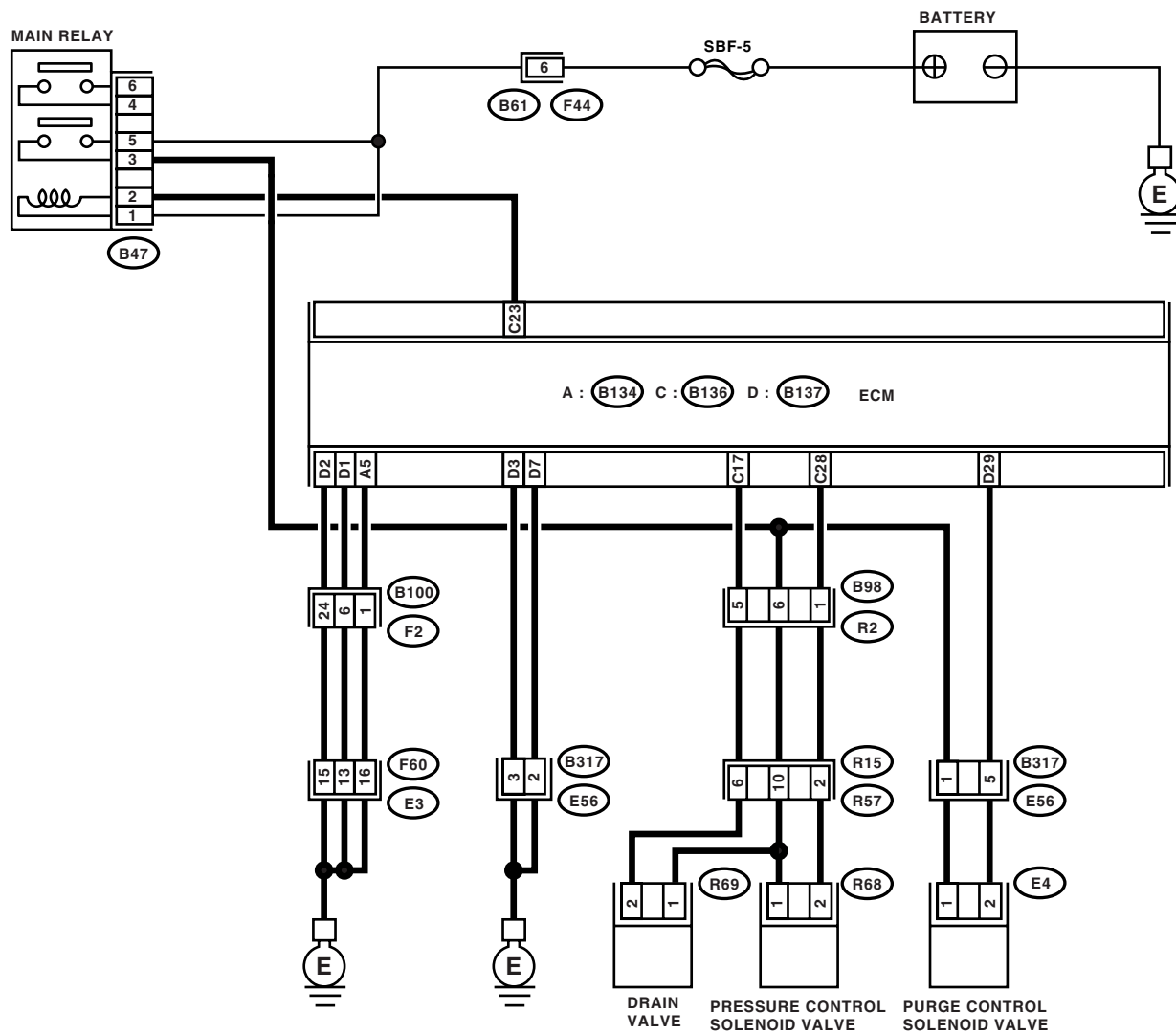
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

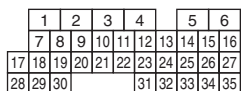
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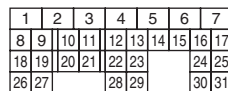
A : B134



C : B136



D : B137



F44



EN-04708

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK FUEL FILLER CAP. 1) Turn ignition switch to OFF. 2) Check the fuel filler cap. NOTE: The DTC is stored in memory if fuel filler cap is or was loose or if the cap chain was caught while tightening.	Is the fuel filler cap tightened securely?	Go to step 3.	Tighten fuel filler cap securely.
3 CHECK FUEL FILLER CAP.	Is the fuel filler cap SUBARU genuine?	Go to step 4.	Replace with a SUBARU genuine fuel filler cap.
4 CHECK FUEL FILLER PIPE SEAL.	Is there any damage to the seal between fuel filler cap and fuel filler pipe?	Repair or replace the fuel filler cap and fuel filler pipe. <Ref. to FU(H4DOTC)-54, Fuel Filler Pipe.>	Go to step 5.
5 CHECK DRAIN VALVE. 1) Connect the test mode connector. 2) Turn ignition switch to ON. 3) Operate the drain valve. NOTE: Drain valve operation can be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-51, Compulsory Valve Operation Check Mode.>	Does the drain valve operate?	Go to step 6.	Replace the drain valve. <Ref. to EC(H4DOTC)-20, Drain Valve.>
6 CHECK PURGE CONTROL SOLENOID VALVE. Operate the purge control solenoid valve. NOTE: Purge control solenoid valve operation can be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-51, Compulsory Valve Operation Check Mode.>	Does the purge control solenoid valve operate?	Go to step 7.	Replace the purge control solenoid valve. <Ref. to EC(H4DOTC)-8, Purge Control Solenoid Valve.>
7 CHECK PRESSURE CONTROL SOLENOID VALVE. Operate the pressure control solenoid valve. NOTE: Pressure control solenoid valve operation can be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-51, Compulsory Valve Operation Check Mode.>	Does the pressure control solenoid valve operate?	Go to step 8.	Replace the pressure control solenoid valve. <Ref. to EC(H4DOTC)-8, Purge Control Solenoid Valve.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
8 CHECK EVAPORATIVE EMISSION CONTROL SYSTEM LINE. Turn ignition switch to OFF.	Is there a hole of more than 0.5 mm (0.020 in) dia. on evaporation line?	Repair or replace the evaporation line. <Ref. to FU(H4DOTC)-65, Fuel Delivery, Return and Evaporation lines.>	Go to step 9 .
9 CHECK CANISTER.	Is the canister damaged or is there a hole of more than 0.5 mm (0.020 in) dia. in it?	Repair or replace the canister. <Ref. to EC(H4DOTC)-7, Canister.>	Go to step 10 .
10 CHECK FUEL TANK. Remove the fuel tank. <Ref. to FU(H4DOTC)-51, Fuel Tank.>	Is the fuel tank damaged or is there a hole of more than 0.5 mm (0.020 in) dia. in it?	Repair or replace the fuel tank. <Ref. to FU(H4DOTC)-51, Fuel Tank.>	Go to step 11 .
11 CHECK ANY OTHER MECHANICAL TROUBLE IN EVAPORATIVE EMISSION CONTROL SYSTEM.	Are there holes of more than 0.5 mm (0.020 in) dia., cracks, clogging, or disconnections, bend, misconnection of hoses or pipes in evaporative emission control system?	Repair or replace the hoses or pipes.	Contact your SOA Service Center since deterioration of some parts may be the cause.

BR:DTC P0457 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-148, DTC P0457 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Fuel odor
- Fuel filler cap is loose or not installed.

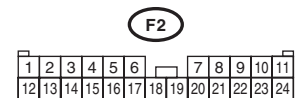
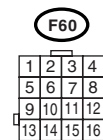
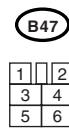
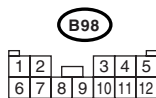
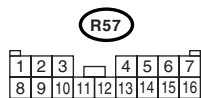
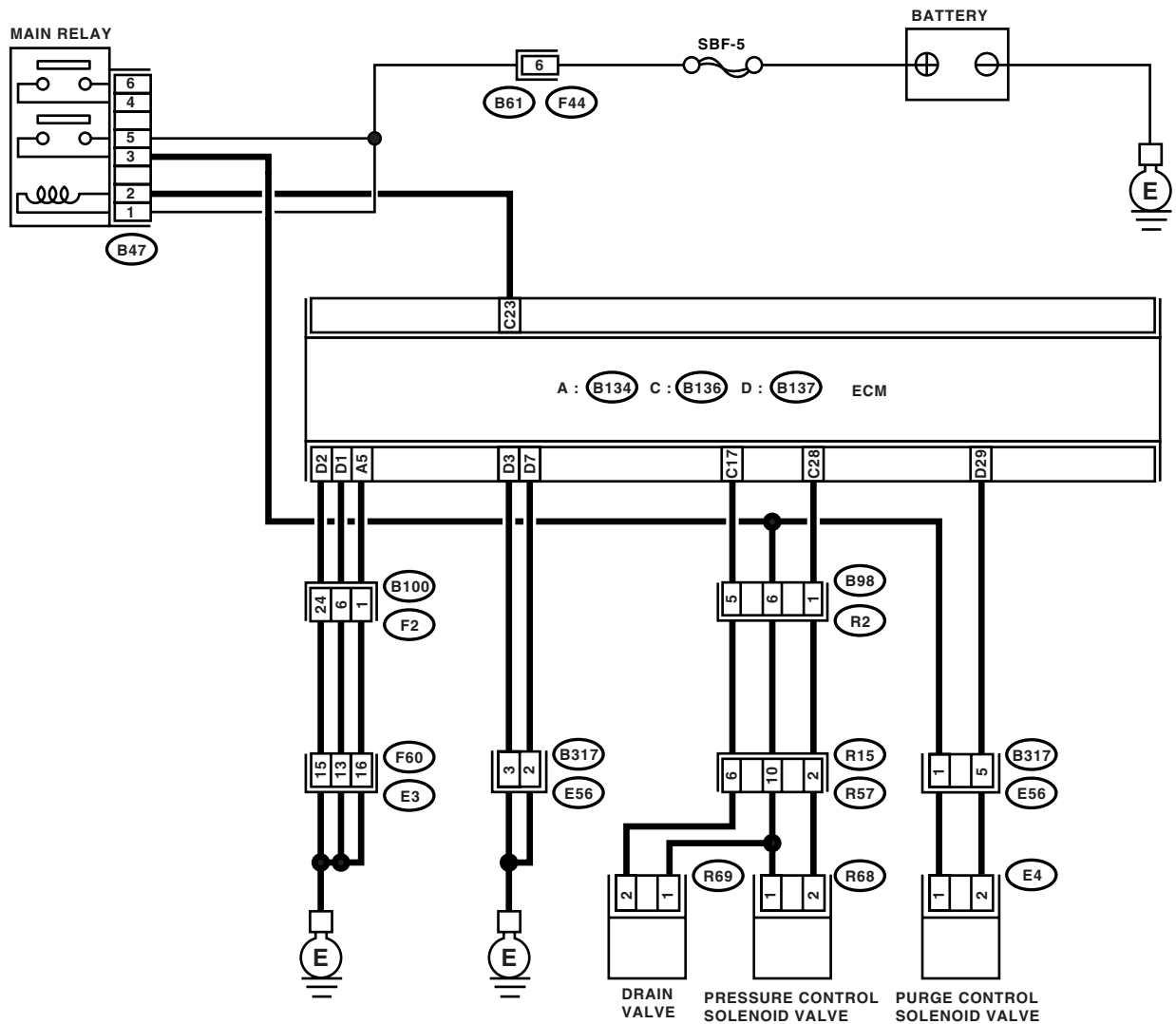
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

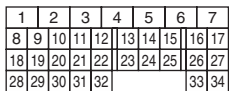
Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

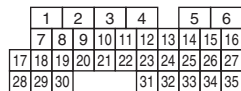
WIRING DIAGRAM:



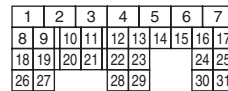
A : B134



C : B136



D : B137



F44



EN-04708

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK FUEL FILLER CAP. 1) Turn ignition switch to OFF. 2) Check the fuel filler cap. NOTE: The DTC is stored in memory if fuel filler cap is or was loose or if the cap chain was caught while tightening.	Is the fuel filler cap tightened securely?	Go to step 3.	Tighten fuel filler cap securely.
3 CHECK FUEL FILLER CAP.	Is the fuel filler cap SUBARU genuine?	Go to step 4.	Replace with a SUBARU genuine fuel filler cap.
4 CHECK FUEL FILLER PIPE SEAL.	Is there any damage to the seal between fuel filler cap and fuel filler pipe?	Repair or replace the fuel filler cap and fuel filler pipe. <Ref. to FU(H4DOTC)-54, Fuel Filler Pipe.>	Go to step 5.
5 CHECK DRAIN VALVE. 1) Connect the test mode connector. 2) Turn ignition switch to ON. 3) Operate the drain valve. NOTE: Drain valve operation can be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-51, Compulsory Valve Operation Check Mode.>	Does the drain valve operate?	Go to step 6.	Replace the drain valve. <Ref. to EC(H4DOTC)-20, Drain Valve.>
6 CHECK PURGE CONTROL SOLENOID VALVE. Operate the purge control solenoid valve. NOTE: Purge control solenoid valve operation can be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).>	Does the purge control solenoid valve operate?	Go to step 7.	Replace the purge control solenoid valve. <Ref. to EC(H4DOTC)-8, Purge Control Solenoid Valve.>
7 CHECK PRESSURE CONTROL SOLENOID VALVE. Operate the pressure control solenoid valve. NOTE: Pressure control solenoid valve operation can be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-51, Compulsory Valve Operation Check Mode.>	Does the pressure control solenoid valve operate?	Go to step 8.	Replace the pressure control solenoid valve. <Ref. to EC(H4DOTC)-8, Purge Control Solenoid Valve.>
8 CHECK CANISTER.	Is the canister damaged?	Repair or replace the canister. <Ref. to EC(H4DOTC)-7, Canister.>	Go to step 9.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
9 CHECK FUEL TANK. Remove the fuel tank. <Ref. to FU(H4DOTC)-51, Fuel Tank.>	Is the fuel tank damaged?	Repair or replace the fuel tank. <Ref. to FU(H4DOTC)-51, Fuel Tank.>	Go to step 10 .
10 CHECK ANY OTHER MECHANICAL TROUBLE IN EVAPORATIVE EMISSION CONTROL SYSTEM.	Are there holes of more than 0.5 mm (0.020 in) dia., cracks, clogging, or disconnections, misconnection of hoses or pipes in evaporative emission control system?	Repair or replace the hoses or pipes.	Contact your SOA Service Center since deterioration of some parts may be the cause.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

BS:DTC P0458 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-149, DTC P0458 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

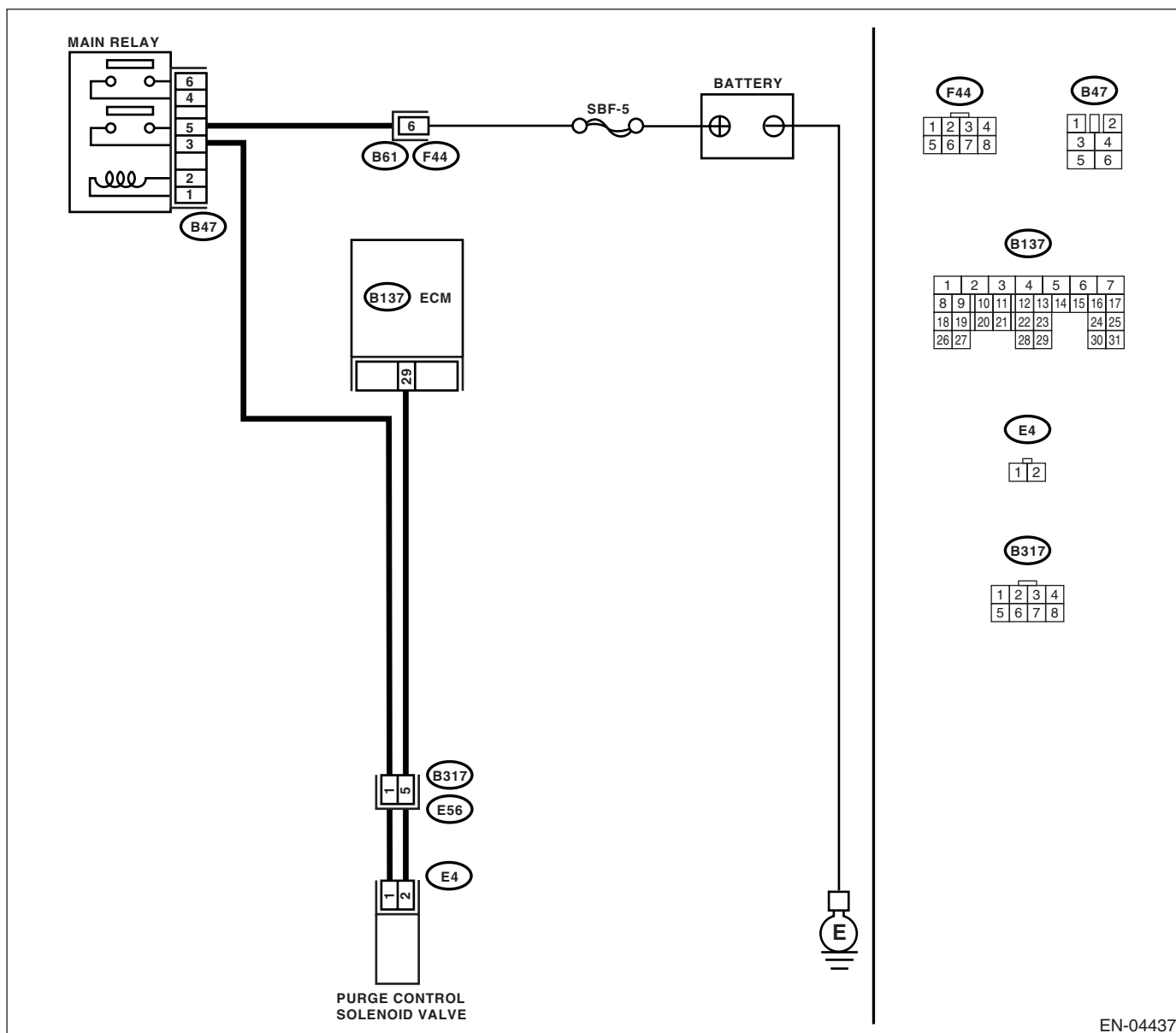
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, 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 ON. 2) Measure the voltage between ECM and chassis ground. Connector & terminal (B137) No. 29 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time.	Go to step 2.
2 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:	Is the resistance more than 1 M Ω ?	Go to step 3.	Repair the ground short circuit in harness between ECM and purge control solenoid valve connector.
3 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. 29 — (E4) No. 2:	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
4 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:	Is the resistance 10 — 100 Ω ?	Go to step 5.	Replace the purge control solenoid valve. <Ref. to EC(H4DOTC)-8, Purge Control Solenoid Valve.>
5 CHECK POWER SUPPLY TO PURGE CONTROL SOLENOID VALVE. 1) Turn the ignition switch to ON. 2) Measure the voltage between purge control solenoid valve and engine ground. Connector & terminal (E4) No. 1 (+) — Engine ground (-):	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.
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 your SOA Service Center since deterioration of some parts may be the cause.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

BT:DTC P0459 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-151, DTC P0459 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

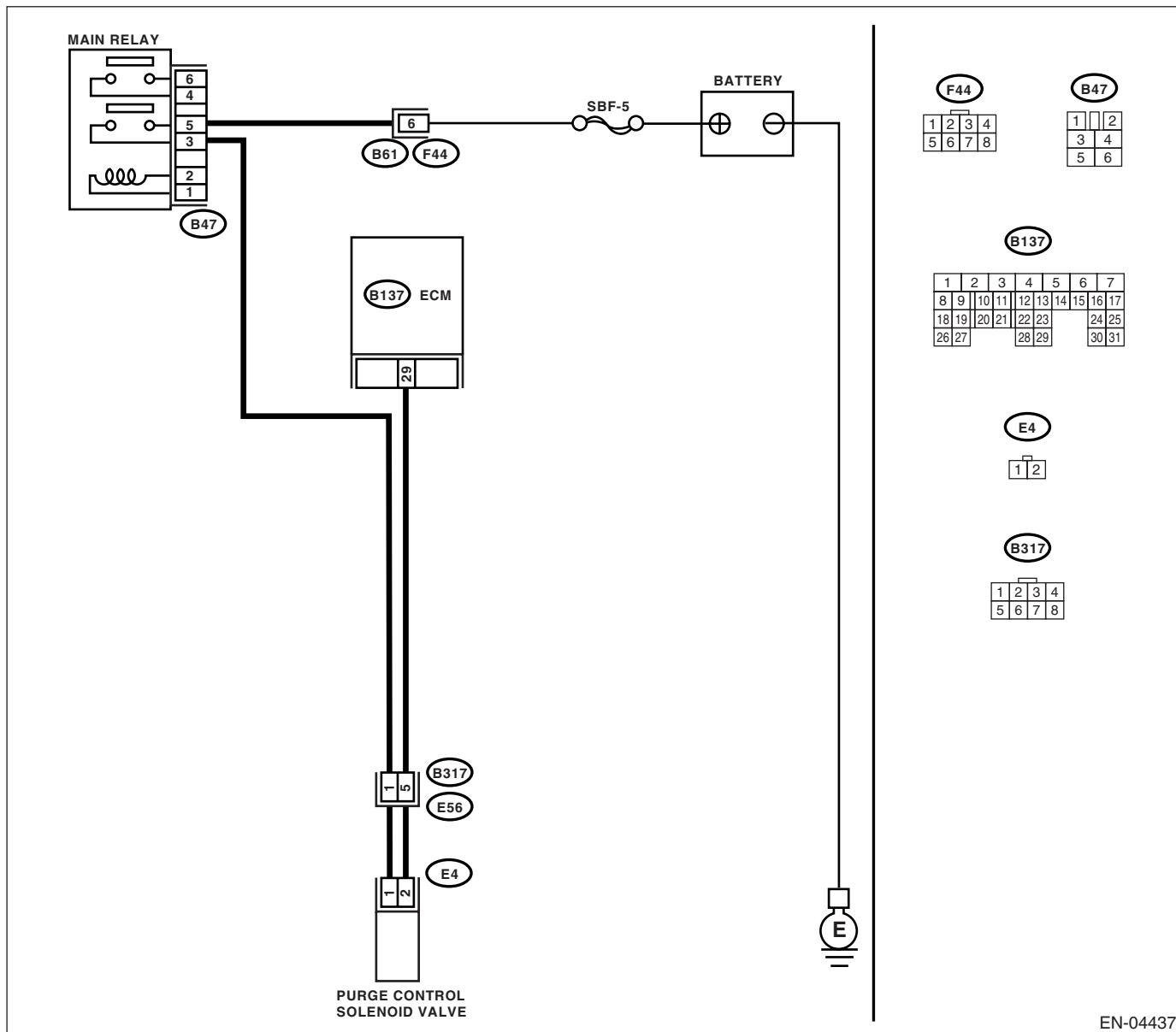
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, 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(H4DOTC)(diag)-51, Compulsory Valve Operation Check Mode.> Connector & terminal (B137) No. 29 (+) — Chassis ground (-):	Is the voltage 0 — 13 V?	Go to step 2.	Even if malfunction indicator light 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. 29 (+) — 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(H4DOTC)-45, Engine Control Module (ECM).>
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. 29 (+) — 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(H4DOTC)-45, Engine Control Module (ECM).>	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(H4DOTC)-8, Purge Control Solenoid Valve.> and ECM <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>	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(H4DOTC)-45, Engine Control Module (ECM).>

BU:DTC P0461 FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE
DTC DETECTING CONDITION:

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

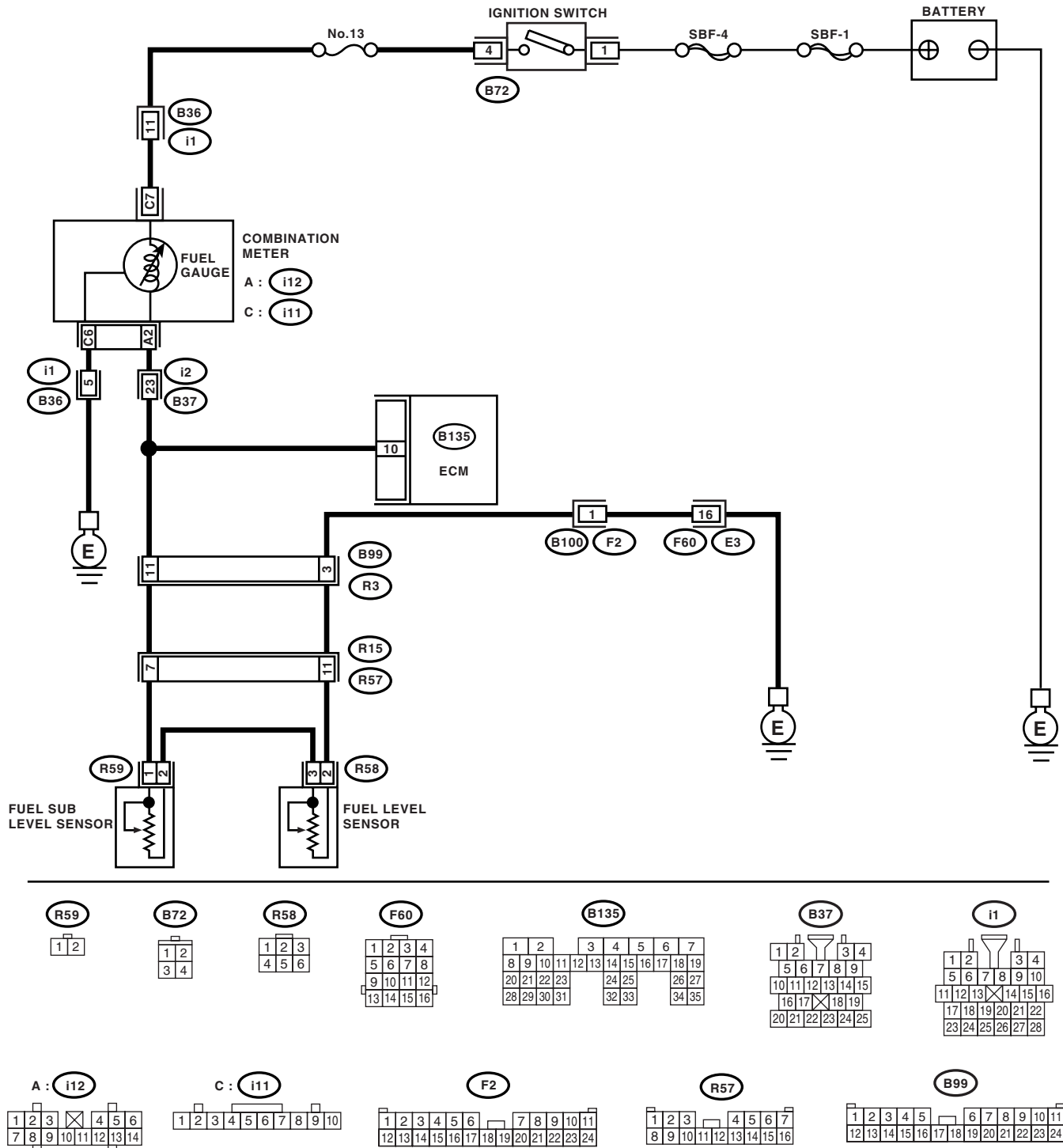
ENGINE (DIAGNOSTICS)

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-153, DTC P0461 FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04665

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-74, 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(H4DOTC)-60, Fuel Level Sensor.> and fuel sub level sensor <Ref. to FU(H4DOTC)-61, Fuel Sub Level Sensor.>

BV:DTC P0462 FUEL LEVEL SENSOR CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-155, DTC P0462 FUEL LEVEL SENSOR CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

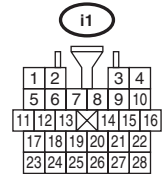
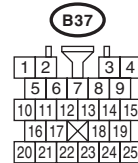
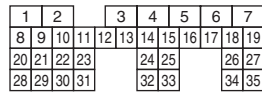
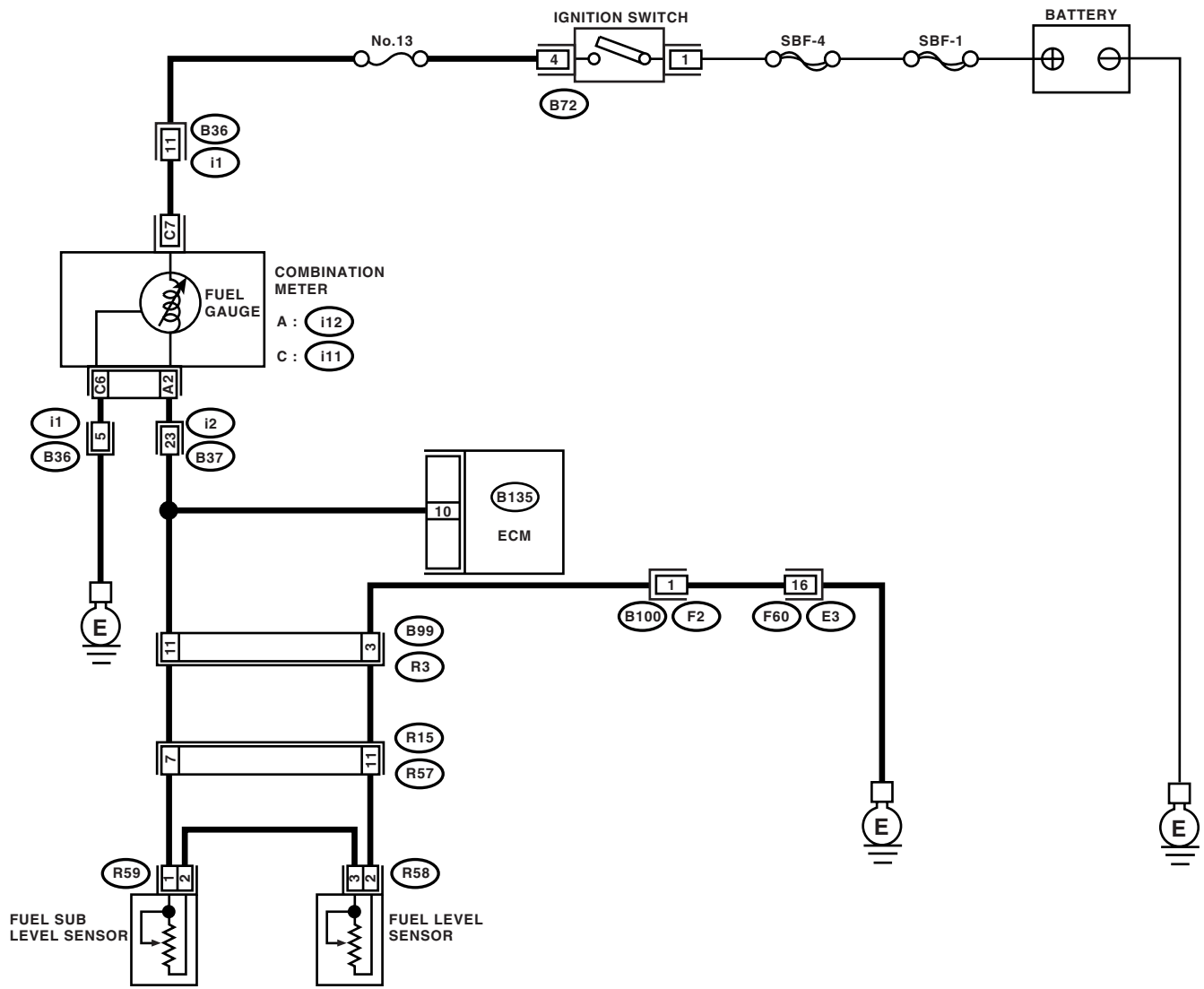
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

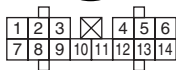
Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

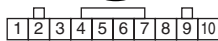
WIRING DIAGRAM:



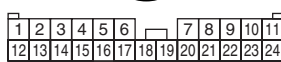
A : i12



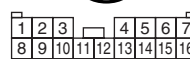
C : i11



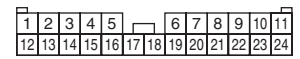
F2



R57



B99



EN-04665

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-3, 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 (B135) No. 10 (+) — Chassis ground (-):	Go to step 4.	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(H4DOTC)(diag)-31, Subaru Select Monitor.>	Repair the poor contact in ECM connector.	Even if malfunction indicator light 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. Connector & terminal (B135) No. 10 (+) — Chassis ground (-):	Go to step 5.	Go to step 6.
5	CHECK HARNESS BETWEEN ECM AND COMBINATION METER. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from connector (i11), (i12) and ECM connector. 3) Measure the resistance between ECM and chassis ground. Connector & terminal (B135) No. 10 — Chassis ground:	Go to step 7.	Repair the ground short circuit in harness between ECM and combination meter connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
6 CHECK HARNESS BETWEEN ECM AND COMBINATION METER. Measure the resistance between ECM and combination meter connector. Connector & terminal (B135) No. 10 — (i12) No. 2:	Is the resistance less than 10 Ω ?	Repair or replace the combination meter. <Ref. to IDI-3, 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
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 M Ω ?	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 M Ω ?	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(H4DOTC)-58, Fuel Pump.> 2) Measure the resistance between fuel level sensor and terminals with its float set to the full position. Terminals No. 2 — No. 3:	Is the resistance 0.5 — 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(H4DOTC)-61, 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 0.5 — 2.5 Ω ?	Repair the poor contact in harness between ECM and combination meter connector.	Replace the fuel sub level sensor.

BW:DTC P0463 FUEL LEVEL SENSOR CIRCUIT HIGH INPUT

DTC DETECTING CONDITION:

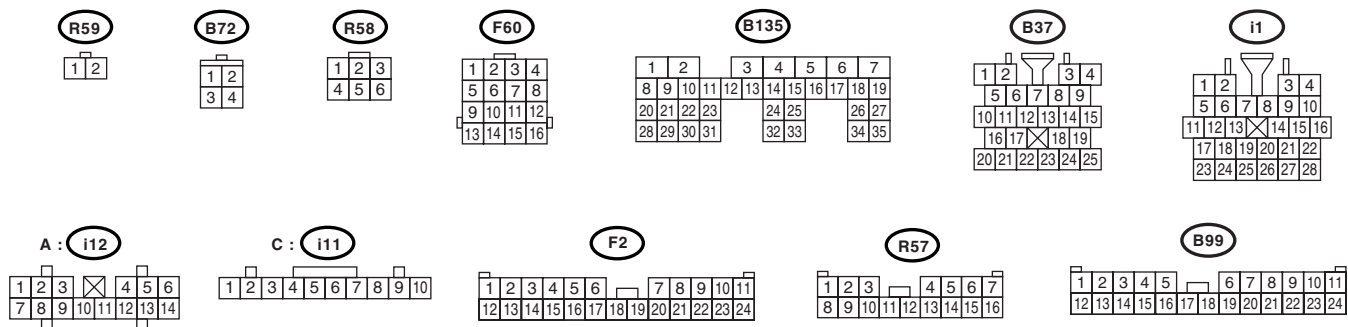
- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-157, DTC P0463 FUEL LEVEL SENSOR CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

ENGINE (DIAGNOSTICS)

The diagram illustrates the electrical connections for the ignition system and fuel gauges. The main power source is the BATTERY, which feeds into the IGNITION SWITCH through a fuse (No. 13) and a relay (B72). The ignition switch is connected to the FUEL GAUGE and the ECM (Engine Control Module). The FUEL GAUGE is also connected to the FUEL LEVEL SENSORS (R59 and R58) and the FUEL SUB LEVEL SENSOR (R57). The ECM is connected to the FUEL GAUGE and the FUEL LEVEL SENSORS. The FUEL GAUGE is also connected to the FUEL SUB LEVEL SENSOR (R57) and the FUEL LEVEL SENSORS (R59 and R58). The FUEL LEVEL SENSORS are connected to the FUEL GAUGE and the FUEL SUB LEVEL SENSOR (R57). The FUEL SUB LEVEL SENSOR (R57) is connected to the FUEL GAUGE and the FUEL LEVEL SENSORS (R59 and R58).



EN-04665

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

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-3, 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 (B135) No. 10 (+) — Chassis ground (-):	Is the voltage more than 4.75 V?	Go to step 3.	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following: • Poor contact in fuel pump connector • Poor contact in coupling connector
3 CHECK INPUT VOLTAGE OF ECM. 1) Turn the ignition switch to OFF. 2) Disconnect the combination meter connector (i11) and ECM connector. 3) Turn the ignition switch to ON. 4) Measure the voltage of harness between ECM and chassis ground. Connector & terminal (B135) No. 10 (+) — Chassis ground (-):	Is the voltage more than 4.75 V?	Repair the battery short circuit between ECM and combination meter connector.	Go to step 4.
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 (B135) No. 10 — (R15) No. 7:	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. 11 — 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
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. 11 — (R58) No. 2:	Is the resistance less than 10 Ω ?	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. Connector & terminal (R58) No. 3 — (R59) No. 2:	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. Connector & terminal (R57) No. 7 — (R59) No. 1:	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(H4DOTC)-58, Fuel Pump.> 2) While moving the fuel level sensor float up and down, measure the resistance between fuel level sensor terminals. Terminals No. 2 — No. 3:	Is the resistance more than 53 Ω ?	Replace the fuel level sensor. <Ref. to FU(H4DOTC)-60, Fuel Level Sensor.>	Go to step 10.
10 CHECK FUEL SUB LEVEL SENSOR. 1) Remove the fuel sub level sensor. <Ref. to FU(H4DOTC)-61, 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. Terminals No. 1 — No. 2:	Is the resistance more than 45 Ω ?	Replace the fuel sub level sensor. <Ref. to FU(H4DOTC)-61, Fuel Sub Level Sensor.>	Replace the combination meter. <Ref. to IDI-10, Combination Meter.>

BX:DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-158, DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

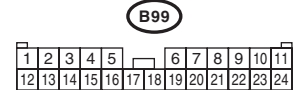
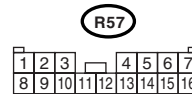
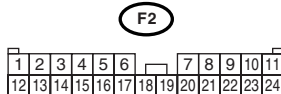
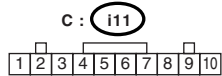
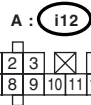
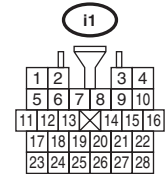
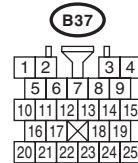
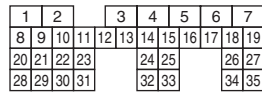
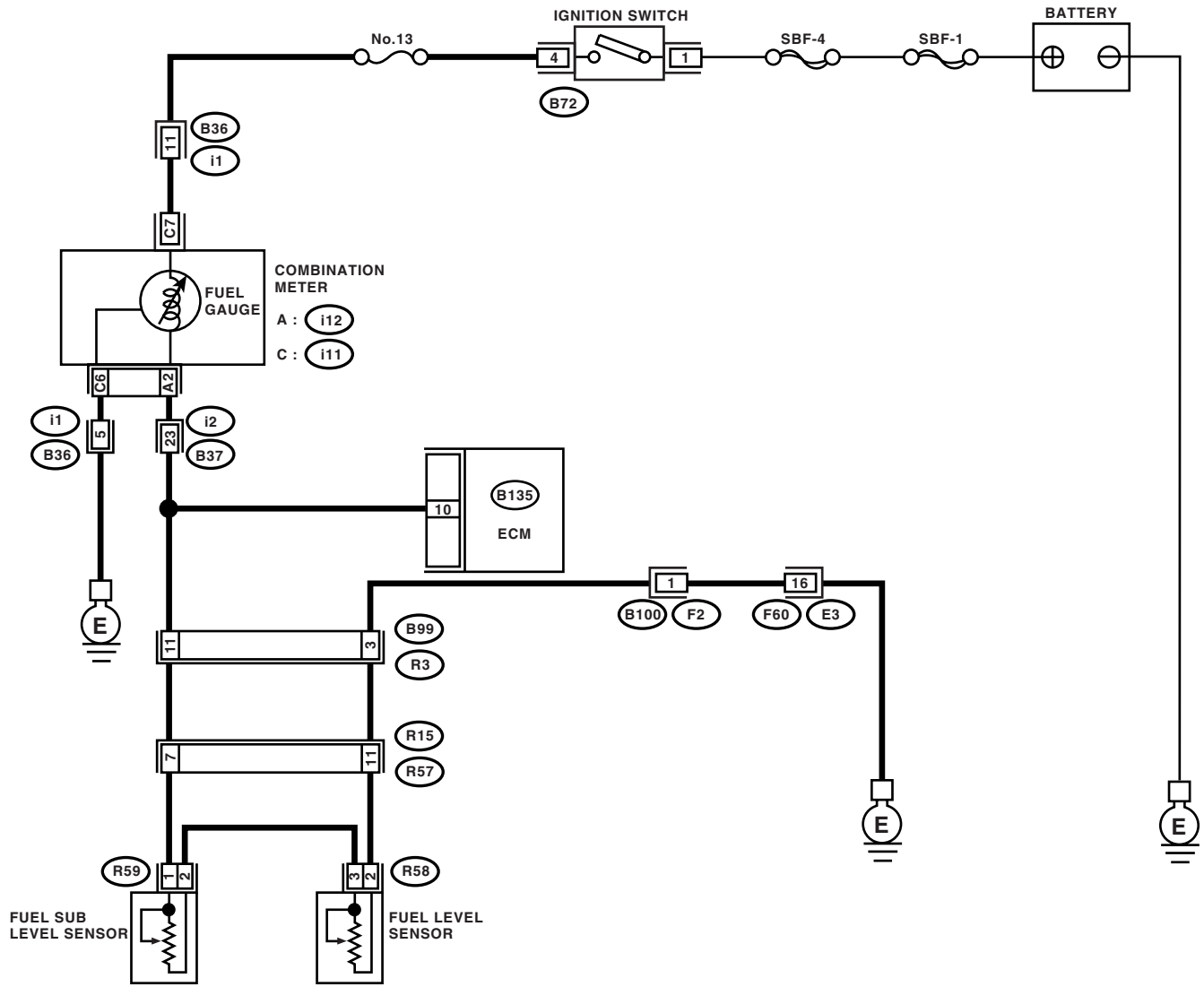
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-04665

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK FUEL LEVEL SENSOR. 1) Remove the fuel pump assembly. <Ref. to FU(H4DOTC)-58, 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. 2:	Does the resistance change smoothly?	Go to step 3.	Replace the fuel level sensor. <Ref. to FU(H4DOTC)-60, Fuel Level Sensor.>
3 CHECK FUEL SUB LEVEL SENSOR. 1) Remove the fuel sub level sensor. <Ref. to FU(H4DOTC)-61, 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?	Repair the poor contact in ECM, combination meter and coupling connectors.	Replace the fuel sub level sensor. <Ref. to FU(H4DOTC)-61, Fuel Sub Level Sensor.>

BY:DTC P0483 COOLING FAN RATIONALITY CHECK

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-161, DTC P0483 COOLING FAN RATIONALITY CHECK, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Occurrence of noise
- Overheating

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

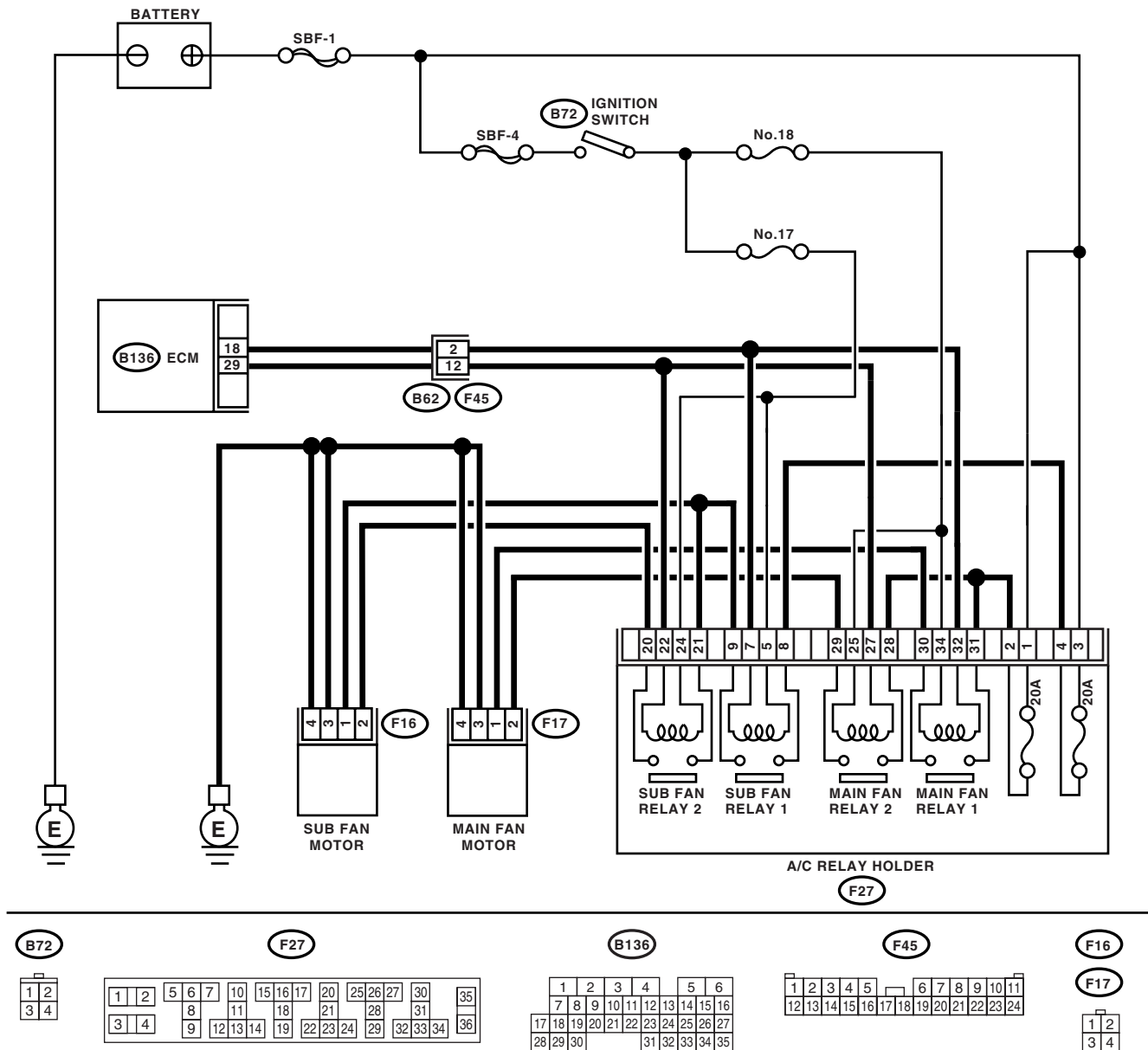
NOTE:

If the vehicle, with the engine idling, is placed very close to a wall or another vehicle, preventing normal cooling function, the OBD system may detect malfunction.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-04379

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).>	Check the radiator fan, fan motor and thermostat. <Ref. to CO(H4DOTC)-28, Radiator Main Fan and Fan Motor.> and <Ref. to CO(H4DOTC)-30, Radiator Sub Fan and Fan Motor.> If thermostat is stuck, replace thermostat.

BZ:DTC P0502 VEHICLE SPEED SENSOR CIRCUIT LOW INPUT

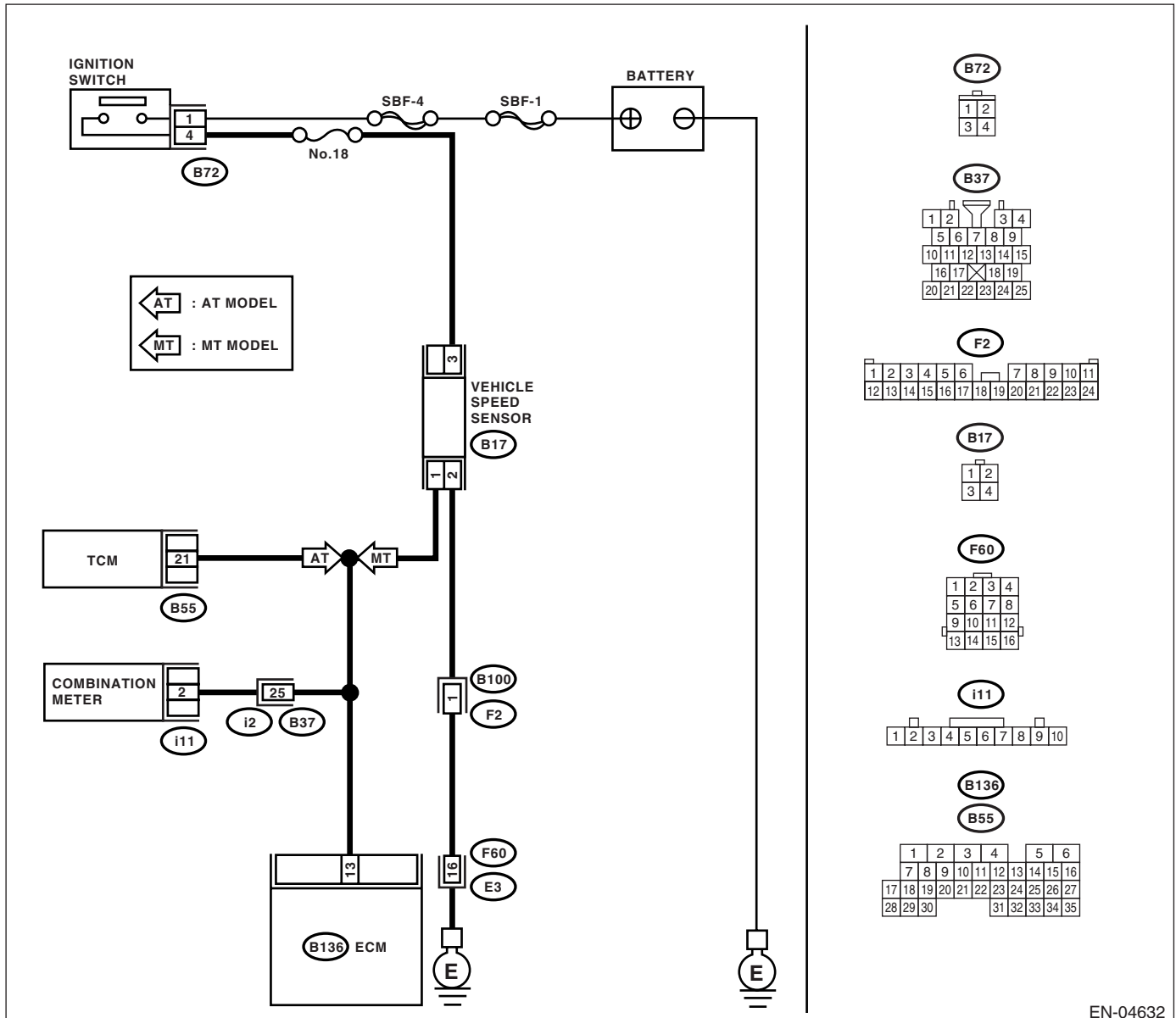
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-162, DTC P0502 VEHICLE SPEED SENSOR CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04632

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK TRANSMISSION TYPE.	Is the transmission type AT?	Go to step 2 .	Go to step 4 .
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 TCM connector and chassis ground. Connector & terminal (B55) No. 21 — Chassis ground:	Is the resistance more than 1 MΩ?	Go to step 3 .	Repair the ground short circuit in harness between ECM and TCM connector.
3 CHECK POOR CONTACT. Check poor contact in TCM connector.	Is there poor contact in TCM connector?	Repair poor contact in TCM connector.	Contact your SOA Service Center since deterioration of some parts may be the cause.
4 CHECK HARENESS BETWEEN VEHICLE SPEED SENSOR AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from vehicle speed sensor and ECM. 3) Measure the resistance of harness between vehicle speed sensor connector and chassis ground. Connector & terminal (B17) No. 1 — Chassis ground:	Is the resistance more than 1 MΩ?	Go to step 5 .	Repair the ground short circuit in harness between vehicle speed sensor and ECM connector.
5 CHECK POOR CONTACT. Check poor contact in the vehicle speed sensor connector.	Is there poor contact in the vehicle speed sensor connector?	Repair poor contact in the vehicle speed sensor connector.	Replace the vehicle speed sensor. <Ref. to 5MT-38, Vehicle Speed Sensor.>

CA:DTC P0503 VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH

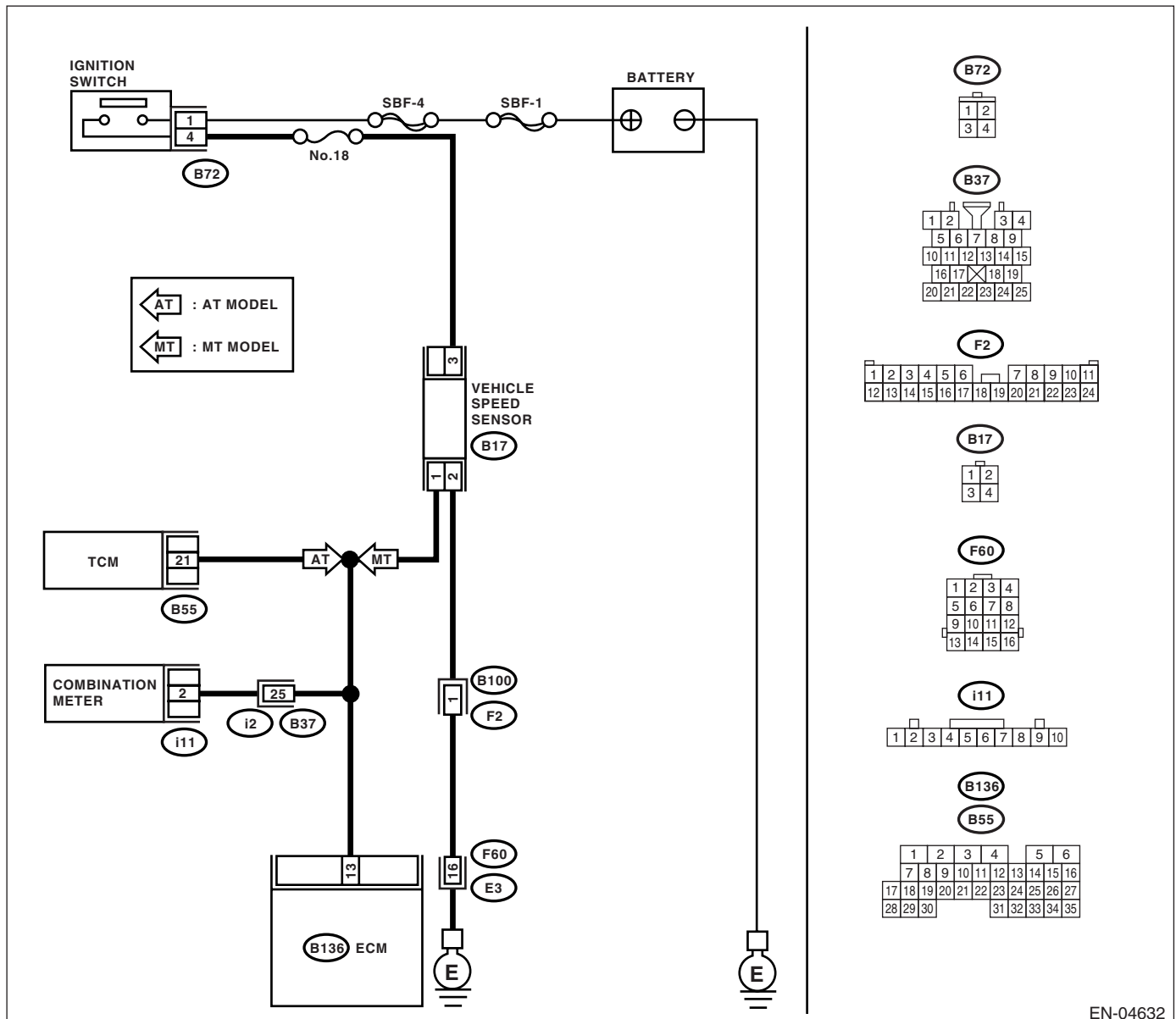
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-163, DTC P0503 VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04632

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No	
1	CHECK TRANSMISSION TYPE.	Is the transmission type AT?	Go to step 2.	Go to step 3.
2	CHECK DTC P0720 ON DISPLAY.	Does the Subaru Select Monitor or general scan tool indicate DTC P0720?	Check the front vehicle speed sensor signal circuit. <Ref. to 4AT(D)(diag)-52, DTC P0720 OUTPUT SPEED SENSOR CIRCUIT, 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. <Ref. to IDI-13, Speedometer.>
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 (B136) No. 13 — (i11) 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

CB:DTC P0506 IDLE CONTROL SYSTEM RPM LOWER THAN EXPECTED

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-165, DTC P0506 IDLE AIR CONTROL SYSTEM RPM LOWER THAN EXPECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Engine is difficult to start.
- Engine does not start.
- Erroneous idling
- Engine stalls.

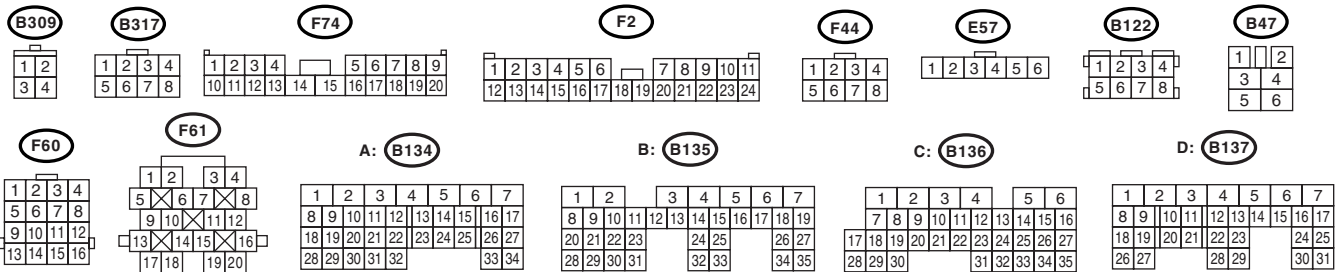
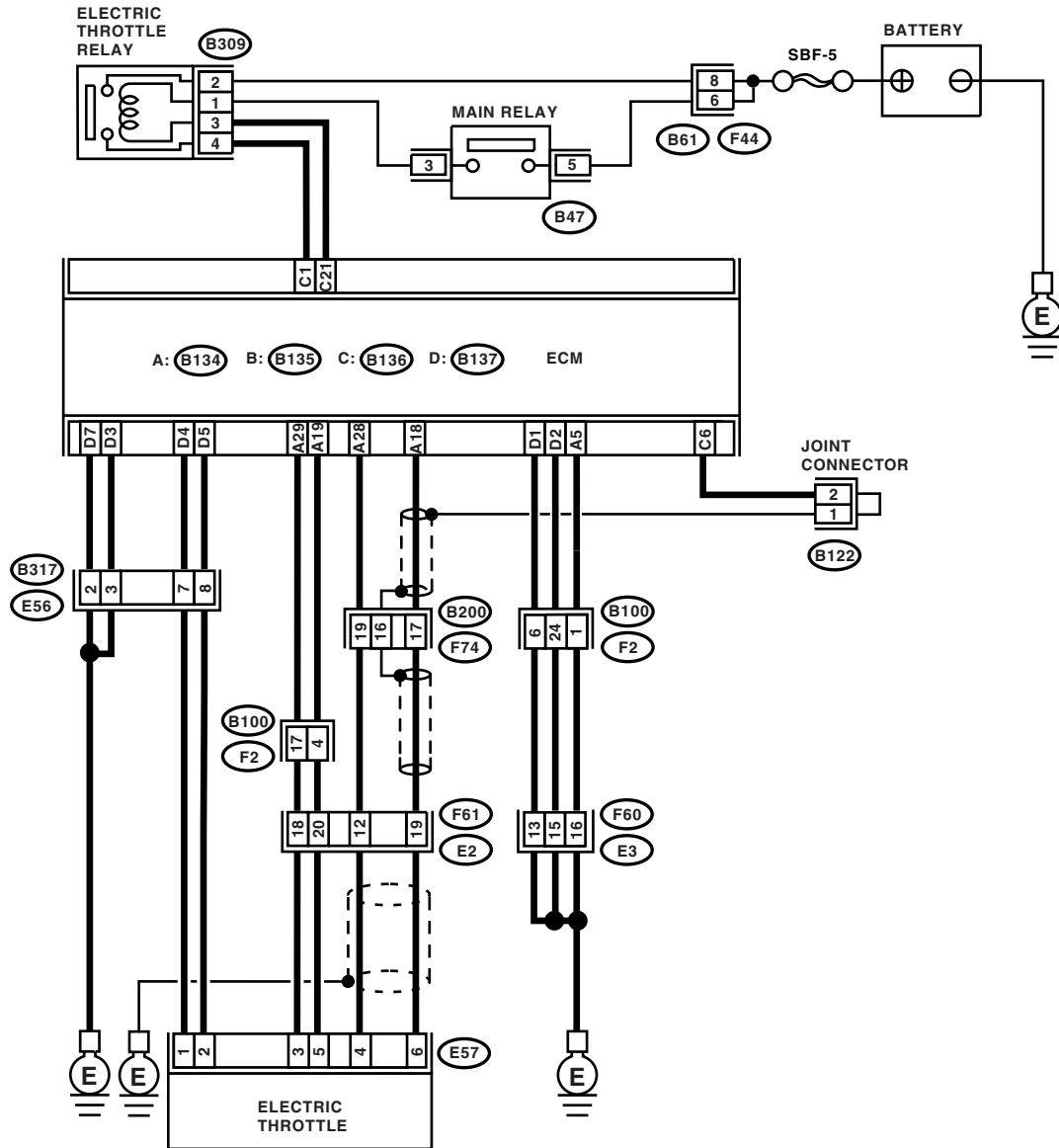
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-04706

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-74, 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 CLEANER ELEMENT. 1) Turn the ignition switch to OFF. 2) Check air cleaner element.	Is there excessive clogging on air cleaner element.	Replace the air cleaner element. <Ref. to IN(H4DOTC)-7, Air Cleaner Element.>	Go to step 3.
3 CHECK ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to OFF. 2) Remove the electronic throttle control. 3) Check the electronic throttle control.	Are there foreign particles in electronic throttle control?	Remove the foreign particles from electronic throttle control.	Perform the diagnosis of DTC P2101.

CC:DTC P0507 IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-167, DTC P0507 IDLE AIR CONTROL SYSTEM RPM HIGHER THAN EXPECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

Engine keeps running at higher revolution than specified idling revolution.

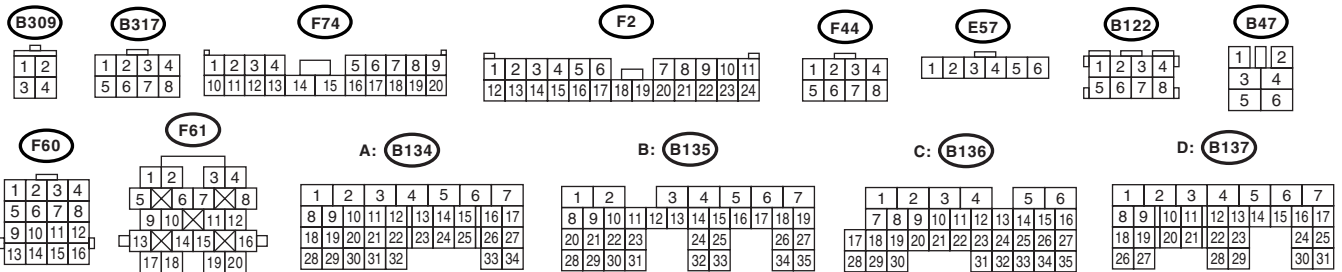
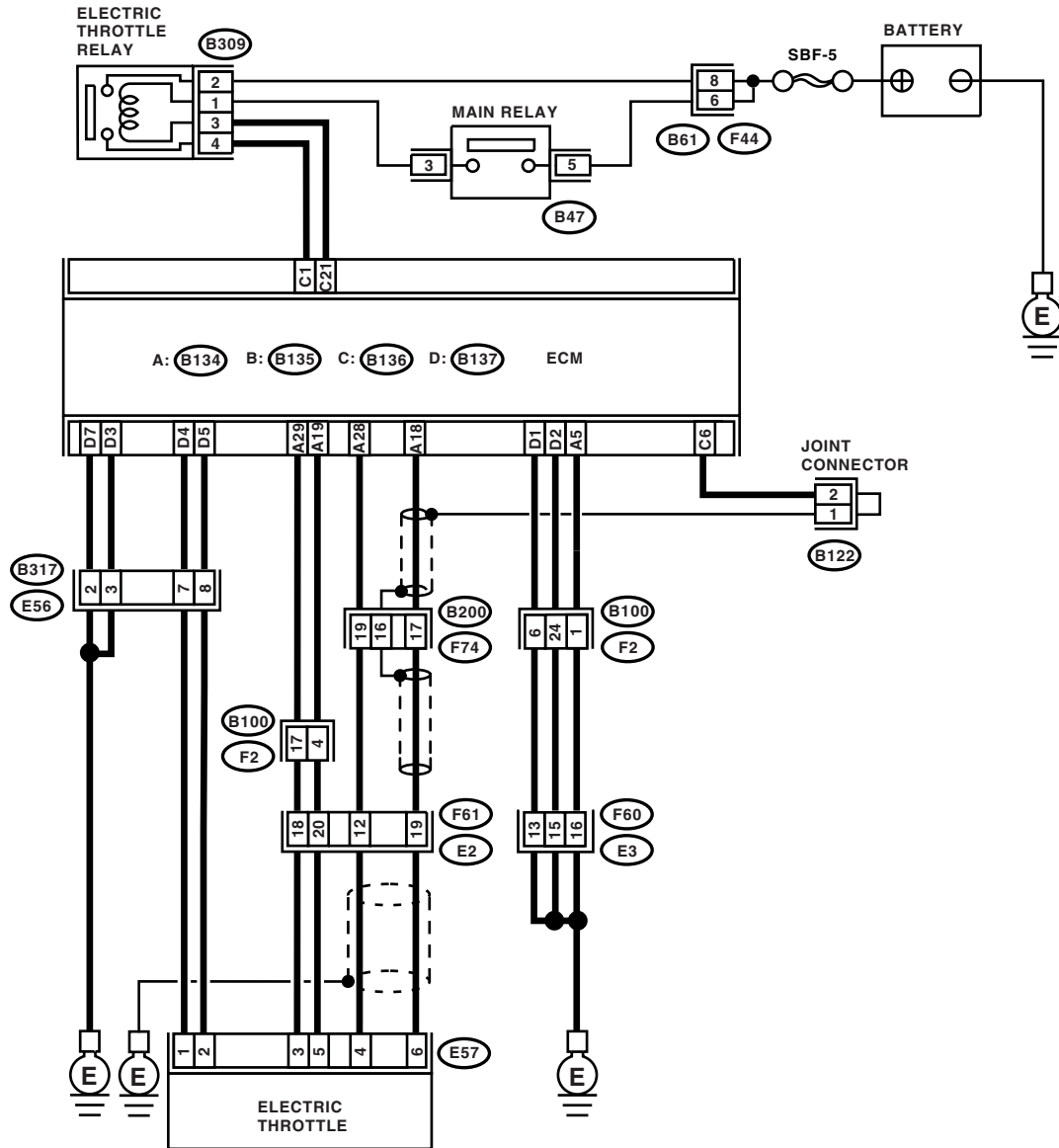
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-04706

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-74, 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 and throttle body • Cracks of intake manifold 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 ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to OFF. 2) Remove the electronic throttle control. 3) Check the electronic throttle control.	Are there foreign particles in electronic throttle control?	Remove the foreign particles from electronic throttle control.	Perform the diagnosis of DTC P2101.

CD:DTC P0512 STARTER REQUEST CIRCUIT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-169, DTC P0512 STARTER REQUEST CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

Failure of engine to start

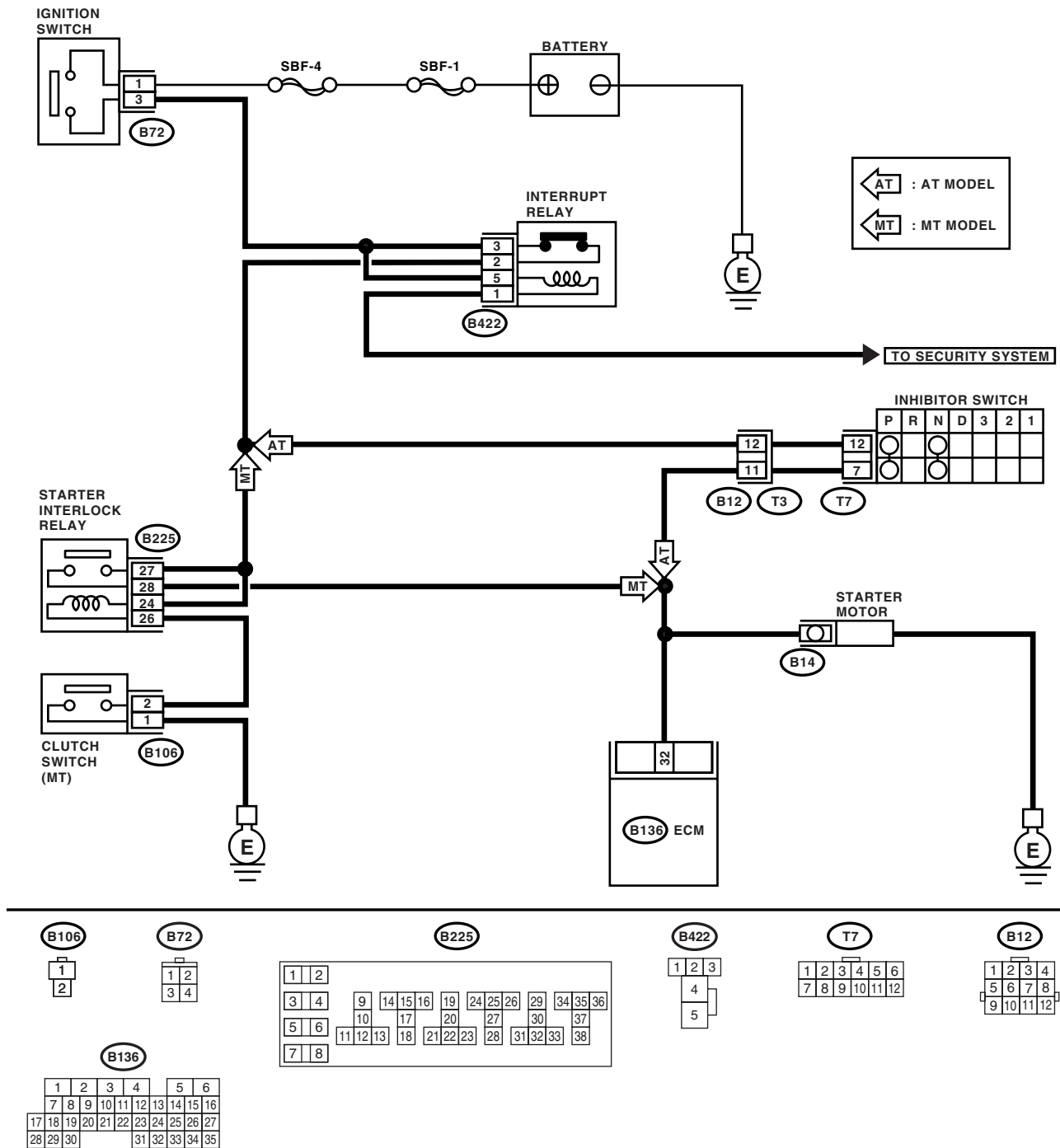
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-04633

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 ON?	Repair the battery short circuit in starter motor circuit. After repair, replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>	Check the starter motor circuit. <Ref. to EN(H4DOTC)(diag)-63, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

CE:DTC P0513 INCORRECT IMMOBILIZER KEY

NOTE:

For the diagnostic procedure, refer to DTC P0513. <Ref. to IM(diag)-21, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CF:DTC P0519 IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-171, DTC P0519 IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Engine keeps running at higher revolution than specified idling revolution.
- Fuel is cut according to fail-safe function.

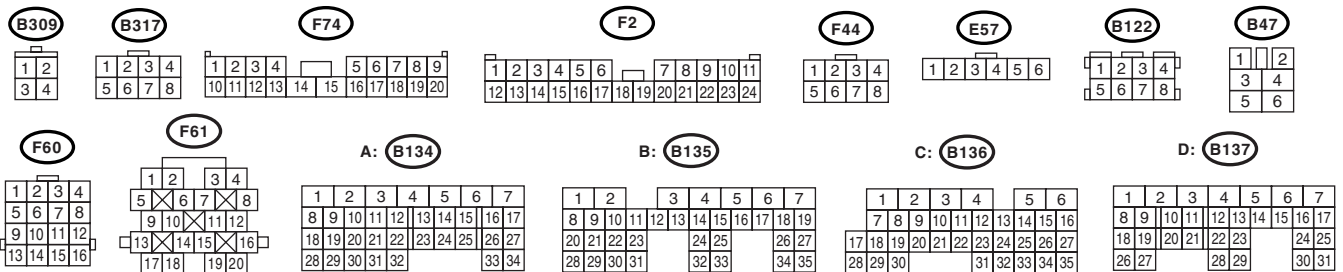
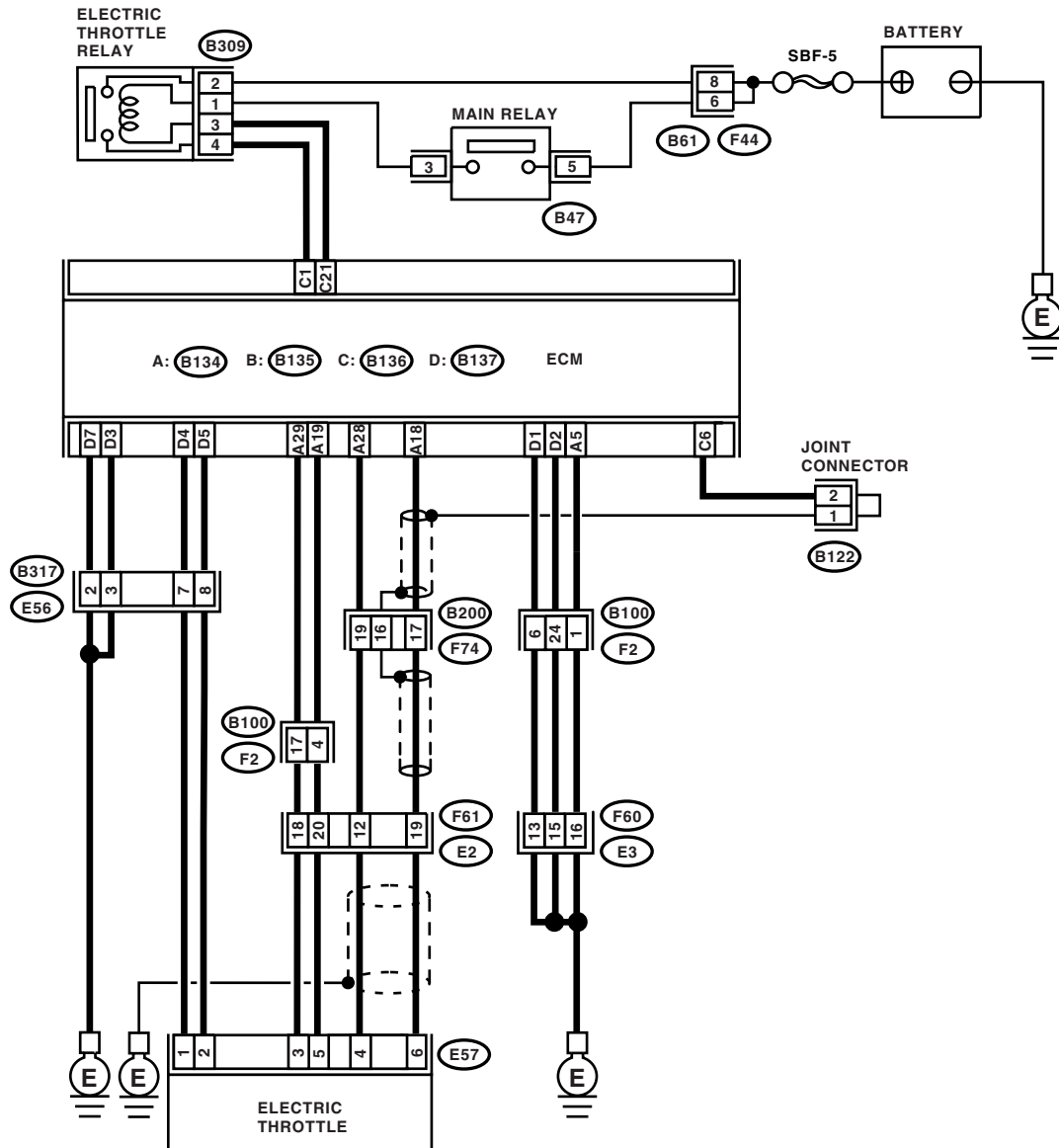
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-04706

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

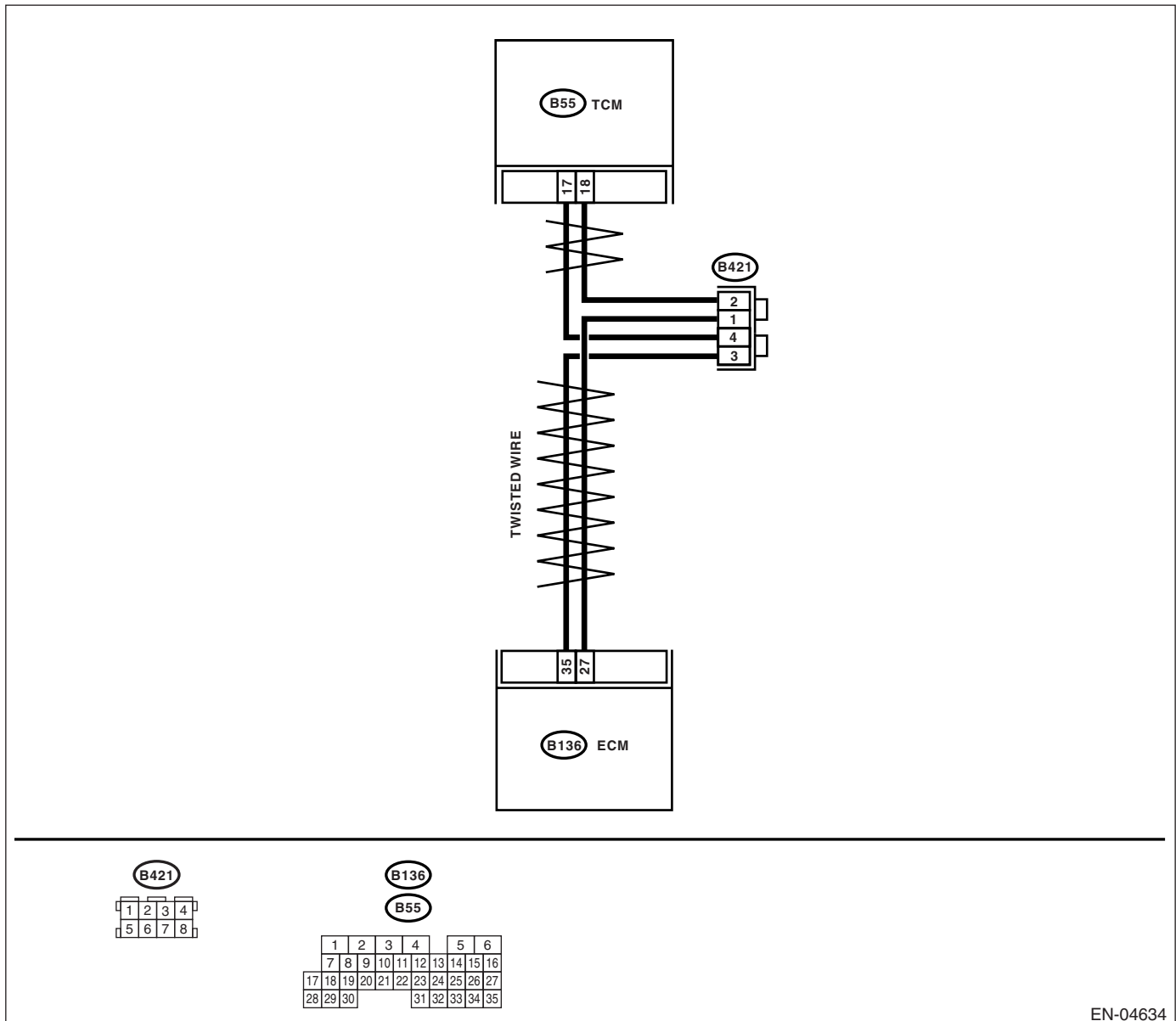
Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0519.	Go to step 2.
2 CHECK AIR INTAKE SYSTEM. 1) Turn 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 ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to OFF. 2) Remove the electronic throttle control. 3) Check the electronic throttle control.	Are foreign particles in electronic throttle control?	Remove the foreign particles from electronic throttle control.	Perform the diagnosis of DTC P2101.

CG:DTC P0600 SERIAL COMMUNICATION LINK**DTC DETECTING CONDITION:**

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-172, DTC P0600 SERIAL COMMUNICATION LINK, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:

EN-04634

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS BETWEEN ECM AND TCM. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from TCM. 4) Measure the resistance between connectors of ECM and TCM. <i>Connector & terminal</i> <i>(B136) No. 27 — (B55) No. 18:</i> <i>(B136) No. 35 — (B55) No. 17:</i>	Is the resistance less than 1 Ω ?	Go to step 2.	Repair the harness connector.
2 CHECK HARNESS BETWEEN ECM AND TCM. Measure the resistance between ECM connector and chassis ground. <i>Connector & terminal</i> <i>(B136) No. 27 — Chassis ground:</i> <i>(B136) No. 35 — Chassis ground:</i>	Is the resistance more than 1 M Ω ?	Go to step 3.	Repair the harness connector.
3 CHECK HARNESS BETWEEN ECM AND TCM. Measure the resistance of ECM connectors. <i>Connector & terminal</i> <i>(B136) No. 27 — (B136) No. 35:</i>	Is the resistance more than 1 M Ω ?	Go to step 4.	Repair the harness connector.
4 CHECK AT SYSTEM STATUS. Check the AT using Subaru Select Monitor.	Does the Subaru Select Monitor display DTC P1718?	Inspect the AT system.	Replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>

CH:DTC P0604 INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-173, DTC P0604 INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Engine does not start.
- Engine stalls.

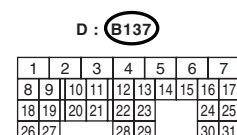
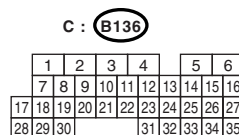
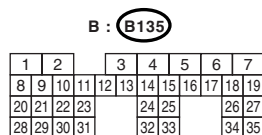
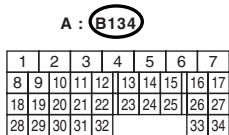
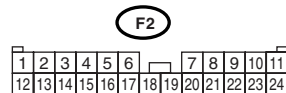
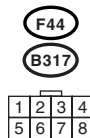
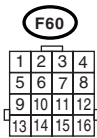
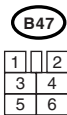
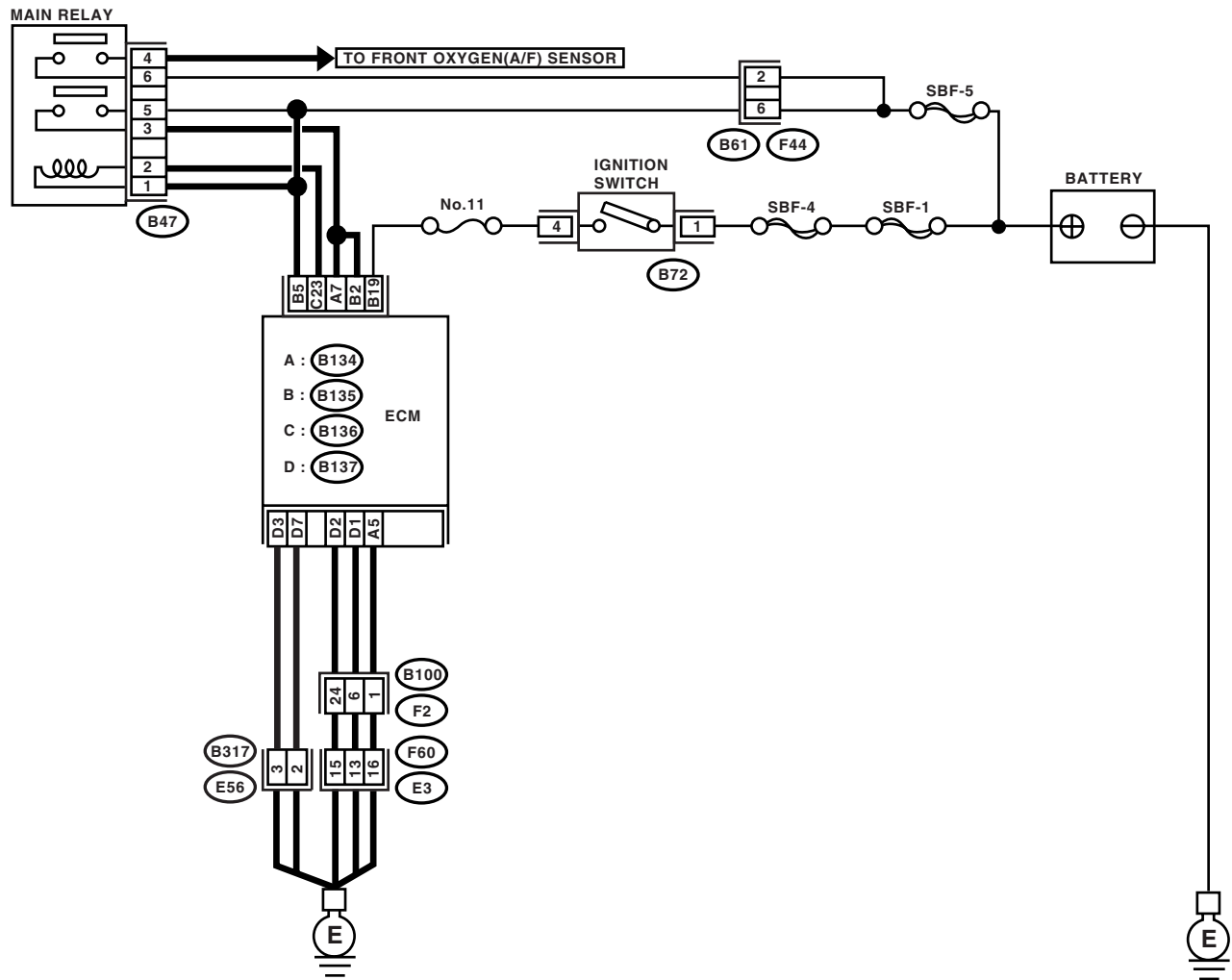
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-04702

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Does the Subaru Select Monitor or general scan tool indicate DTC P0604?	Replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>	A temporary poor contact.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

CI: DTC P0605 INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR

NOTE:

For the diagnostic procedure, refer to DTC P0607. <Ref. to EN(H4DOTC)(diag)-271, DTC P0607 CONTROL MODULE PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CJ:DTC P0607 CONTROL MODULE PERFORMANCE

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-175, DTC P0607 CONTROL MODULE PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

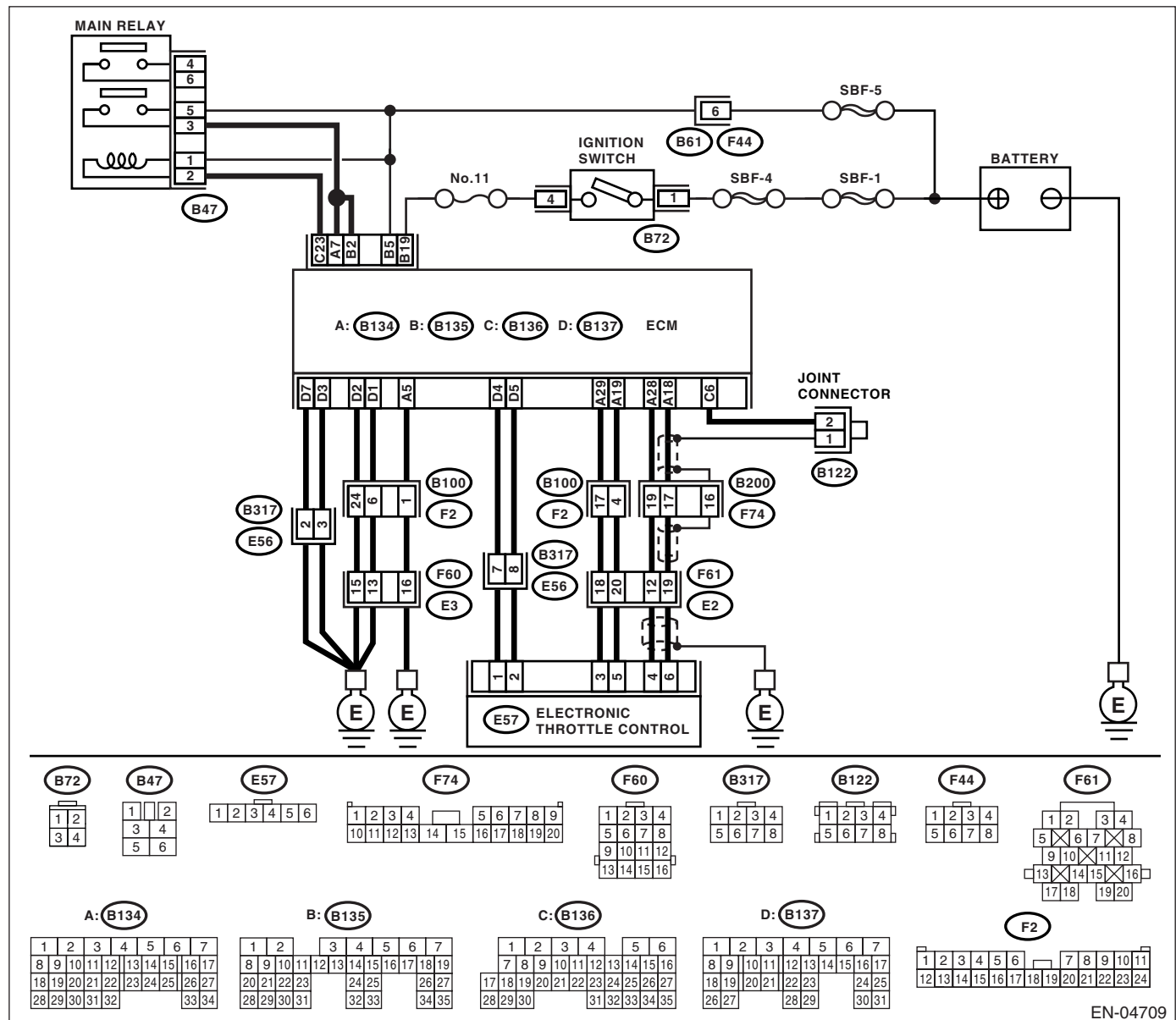
TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04709

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK INPUT VOLTAGE OF ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector and ground. Connector & terminal (B134) No. 7 (+) — Chassis ground (-): (B135) No. 2 (+) — Chassis ground (-):	Is the voltage 10 — 13 V?	Go to step 2.	Repair the open circuit or ground short of power supply circuit.
2 CHECK INPUT VOLTAGE OF ECM. 1) Start the engine. 2) Measure the voltage between ECM connector and ground. Connector & terminal (B134) No. 7 (+) — Chassis ground (-): (B135) No. 2 (+) — Chassis ground (-):	Is the voltage 13 — 15 V?	Go to step 3.	Repair the open circuit or ground short of power supply circuit.
3 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and electronic throttle control. 3) Measure the resistance of harness between ECM and electronic throttle control. Connector & terminal (E57) No. 5 — (B134) No. 19: (E57) No. 3 — (B134) No. 29:	Is the resistance less than 1 Ω ?	Go to step 4.	Repair the open circuit in harness between ECM and electronic throttle control connector.
4 CHECK GROUND HARNESS OF ECM. Measure the voltage between ECM connector and ground. Connector & terminal (B134) No. 5 (+) — Chassis ground (-): (B137) No. 1 (+) — Chassis ground (-): (B137) No. 2 (+) — Chassis ground (-): (B137) No. 3 (+) — Chassis ground (-): (B137) No. 7 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>	Repair the following: • Retighten the engine ground terminal. • Poor contact in ECM connector • Poor contact in coupling connector

CK:DTC P0638 THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1)

NOTE:

For the diagnostic procedure, refer to DTC P2101. <Ref. to EN(H4DOTC)(diag)-350, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CL:DTC P0691 COOLING FAN 1 CONTROL CIRCUIT LOW

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-179, DTC P0691 COOLING FAN 1 CONTROL CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Radiator fan does not operate properly.
- Overheating

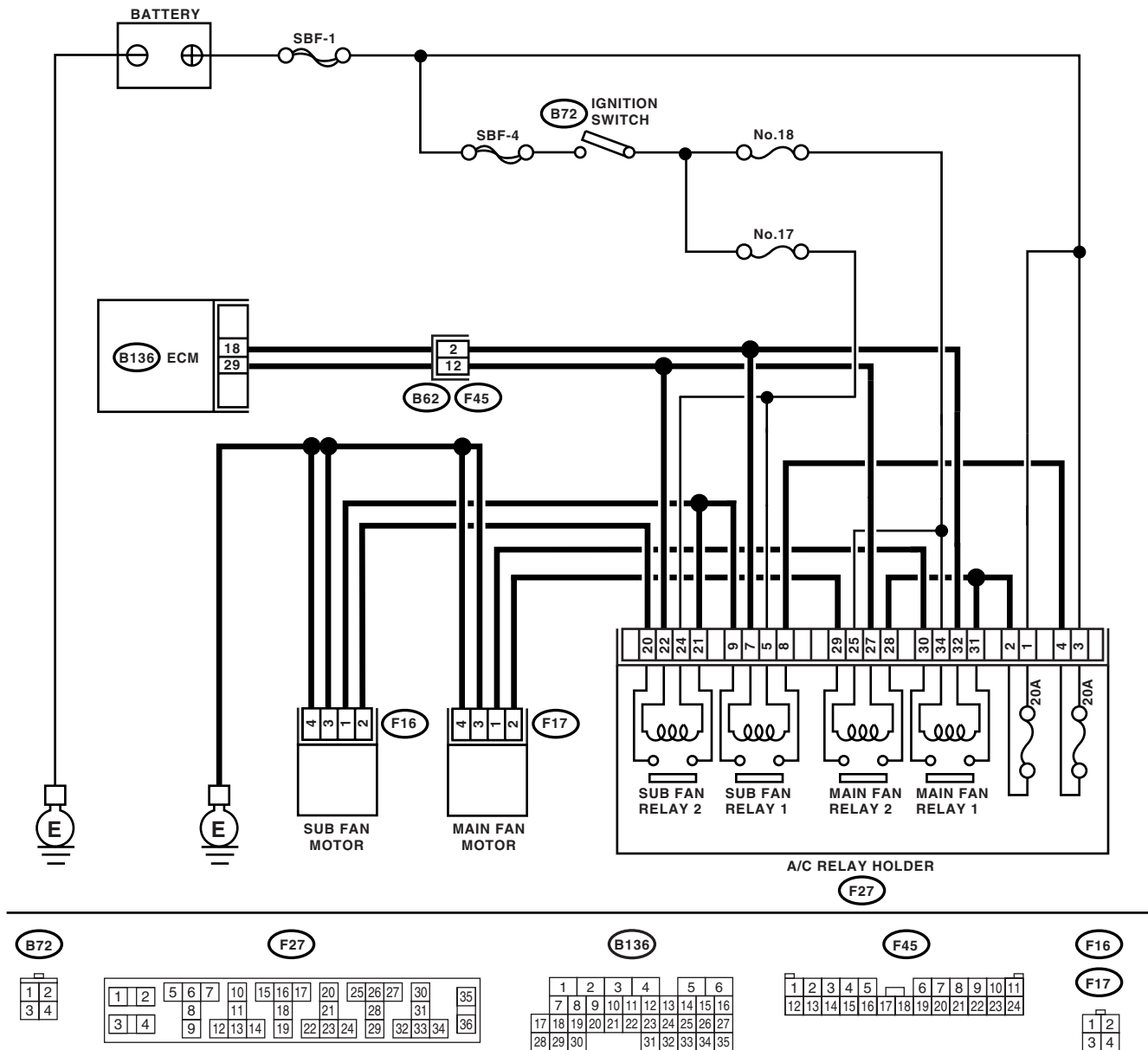
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-04379

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK FOR ANY OTHER DTC ON DISPLAY.	Is DTC P0691 displayed on the Subaru Select Monitor?	Check the radiator fan relay. <Ref. to CO(H4DOTC)-7, Radiator Main Fan System.> <Ref. to CO(H4DOTC)-12, Radiator Sub Fan System.>	A temporary poor contact occurs.

CM:DTC P0692 COOLING FAN 1 CONTROL CIRCUIT HIGH

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-180, DTC P0692 COOLING FAN 1 CONTROL CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Radiator fan does not operate properly.
- Overheating

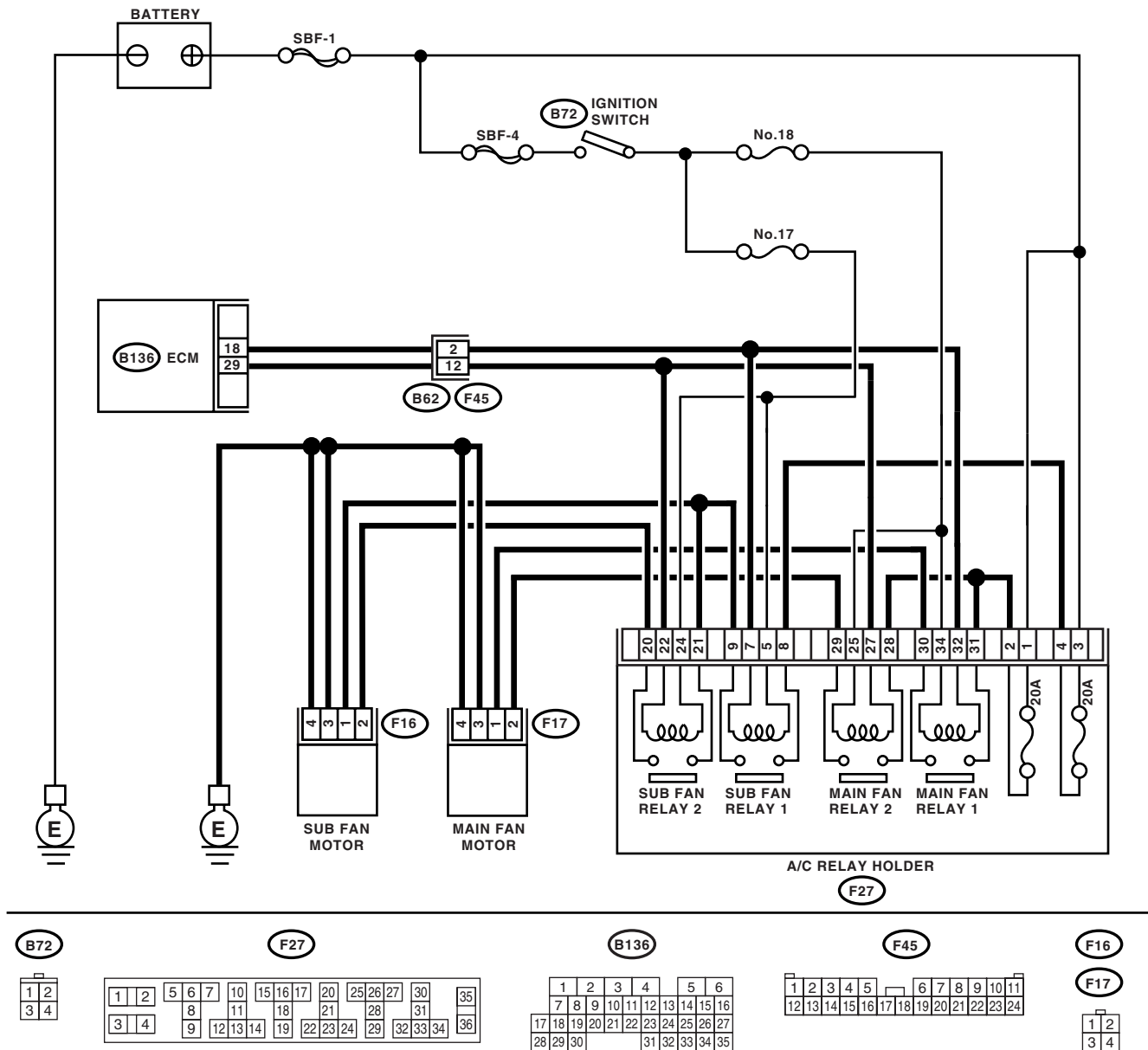
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-04379

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK FOR ANY OTHER DTC ON DISPLAY.	Is DTC P0692 displayed on the Subaru Select Monitor?	Check the radiator fan relay. <Ref. to CO(H4DOTC)-7, Radiator Main Fan System.> <Ref. to CO(H4DOTC)-12, Radiator Sub Fan System.>	A temporary poor contact occurs.

CN:DTC P0700 TRANSMISSION CONTROL SYSTEM (MIL REQUEST)

GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-181, DTC P0700 TRANSMISSION CONTROL SYSTEM (MIL REQUEST), Diagnostic Trouble Code (DTC) Detecting Criteria.>

NOTE:

For the diagnostic procedure, refer to AT section. <Ref. to 4AT(D)(diag)-2, PROCEDURE, Basic Diagnostic Procedure.>

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) Place the select lever except for "N" and "P" positions. 3) Measure the voltage between ECM and chassis ground. Connector & terminal (B136) No. 31 (+) — Chassis ground (-):	Is the voltage 4.5 — 5.5 V?	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time.	Go to step 2.
2 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 (B136) No. 31 — Chassis ground:	Is the resistance more than 1 MΩ?	Go to step 3.	Repair ground short circuit in harness between ECM and transmission harness connector.
3 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 more than 1 MΩ?	Go to step 4.	Repair ground short circuit in harness between transmission harness and inhibitor switch connector.
4 CHECK INHIBITOR SWITCH. Measure the resistance between inhibitor switch connector the receptacle's terminals in selector lever except for "N" position. Terminals No. 7 — No. 12:	Is the resistance more than 1 MΩ?	Go to step 5.	Replace the inhibitor switch. <Ref. to 4AT-48, Inhibitor Switch.>
5 CHECK SELECTOR CABLE CONNECTION.	Is there any fault in selector cable connection to inhibitor switch?	Repair selector cable connection. <Ref. to CS-28, INSPECTION, Select Cable.>	Contact your SOA Service Center since deterioration of some parts may be the cause.

CP:DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW (MT MODEL)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-183, DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW (MT MODEL), Diagnostic Trouble Code (DTC) Detecting Criteria.>

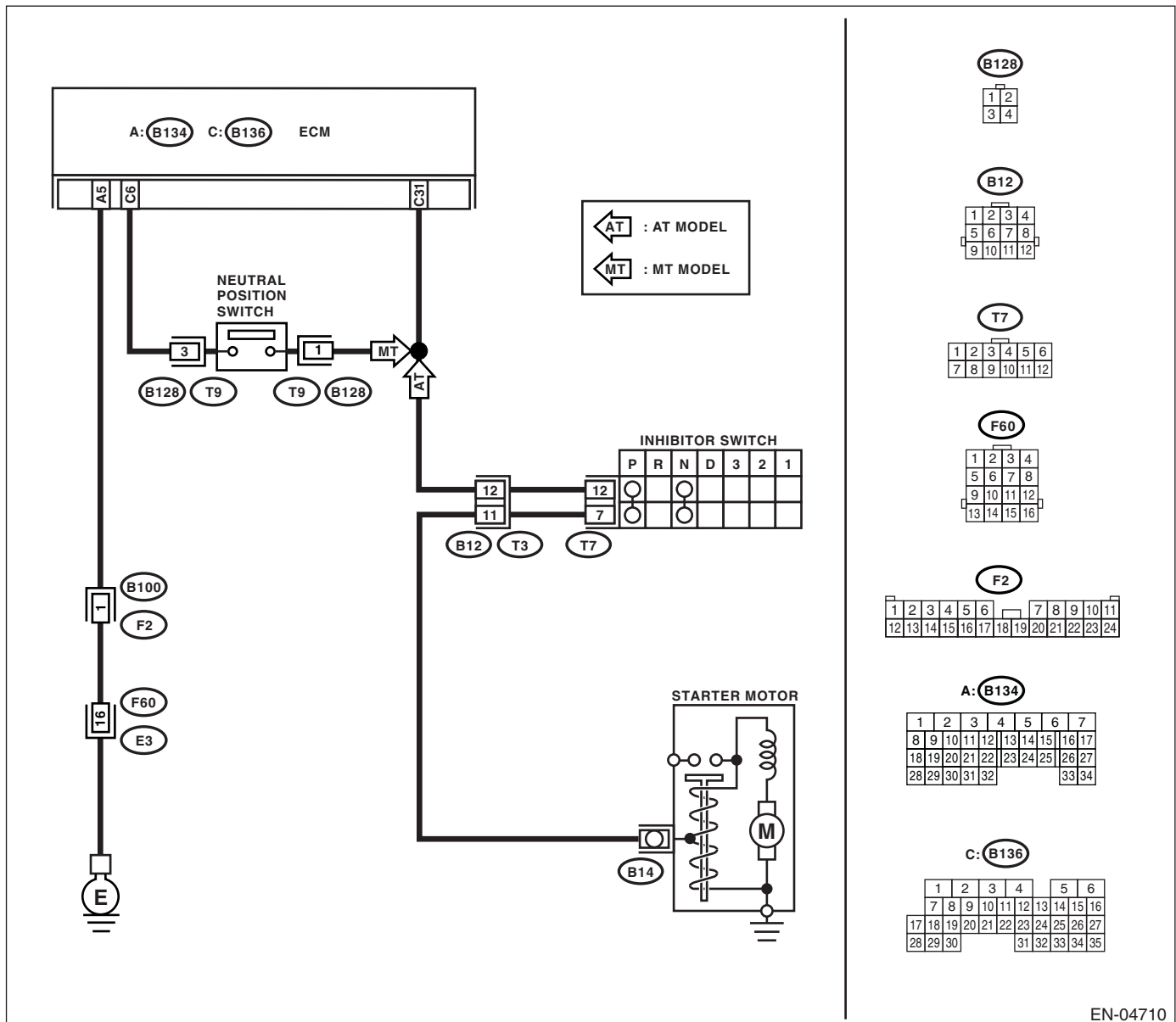
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04710

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) Place the shift lever in a position except for neutral. 3) Measure the voltage between ECM and chassis ground. Connector & terminal (B136) No. 31 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 2.	Go to step 4.
2 CHECK INPUT SIGNAL FOR ECM. 1) Place the shift lever in neutral. 2) Measure the voltage between ECM and chassis ground. Connector & terminal (B136) No. 31 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Go to step 3.	Go to step 4.
3 CHECK POOR CONTACT. Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Contact your SOA Service Center since deterioration of some parts may be the cause.
4 CHECK NEUTRAL POSITION SWITCH. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from transmission harness. 3) Place the shift lever in a position except for neutral. 4) Measure the resistance between transmission harness and connector terminals. Connector & terminal (T9) No. 1 — No. 3:	Is the resistance more than 1 M Ω ?	Go to step 5.	Repair short circuit in transmission harness or replace neutral position switch.
5 CHECK NEUTRAL POSITION SWITCH. 1) Place the shift lever in neutral. 2) Measure the resistance between transmission harness connector terminals.	Is the resistance less than 1 Ω ?	Go to step 6.	Repair short circuit in transmission harness or replace neutral position switch.
6 CHECK HARNESS BETWEEN ECM AND NEUTRAL POSITION SWITCH CONNECTOR. Measure the resistance between ECM and chassis ground. Connector & terminal (B136) No. 31 — Chassis ground:	Is the resistance more than 1 M Ω ?	Go to step 7.	Repair ground short circuit in harness between ECM and transmission harness connector.
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. Connector & terminal (B136) No. 31 — (B128) No. 1:	Is the resistance less than 1 Ω ?	Go to step 8.	Repair open circuit in harness between ECM and transmission harness connector.
8 CHECK HARNESS BETWEEN ECM AND NEUTRAL POSITION SWITCH CONNECTOR. Measure the resistance of harness between transmission harness connector and engine ground. Connector & terminal (B128) No. 1 — Engine ground:	Is the resistance less than 5 Ω ?	Go to step 9.	Repair open circuit between transmission harness connector and engine ground terminal.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step		Check	Yes	No
9	CHECK POOR CONTACT. Check poor contact in transmission harness connector.	Is there poor contact in transmission harness connector?	Repair poor contact in transmission harness connector.	Contact your SOA Service Center since deterioration of some parts may be the cause.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

CQ:DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (AT MODEL)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-184, DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (AT MODEL), Diagnostic Trouble Code (DTC) Detecting Criteria.>

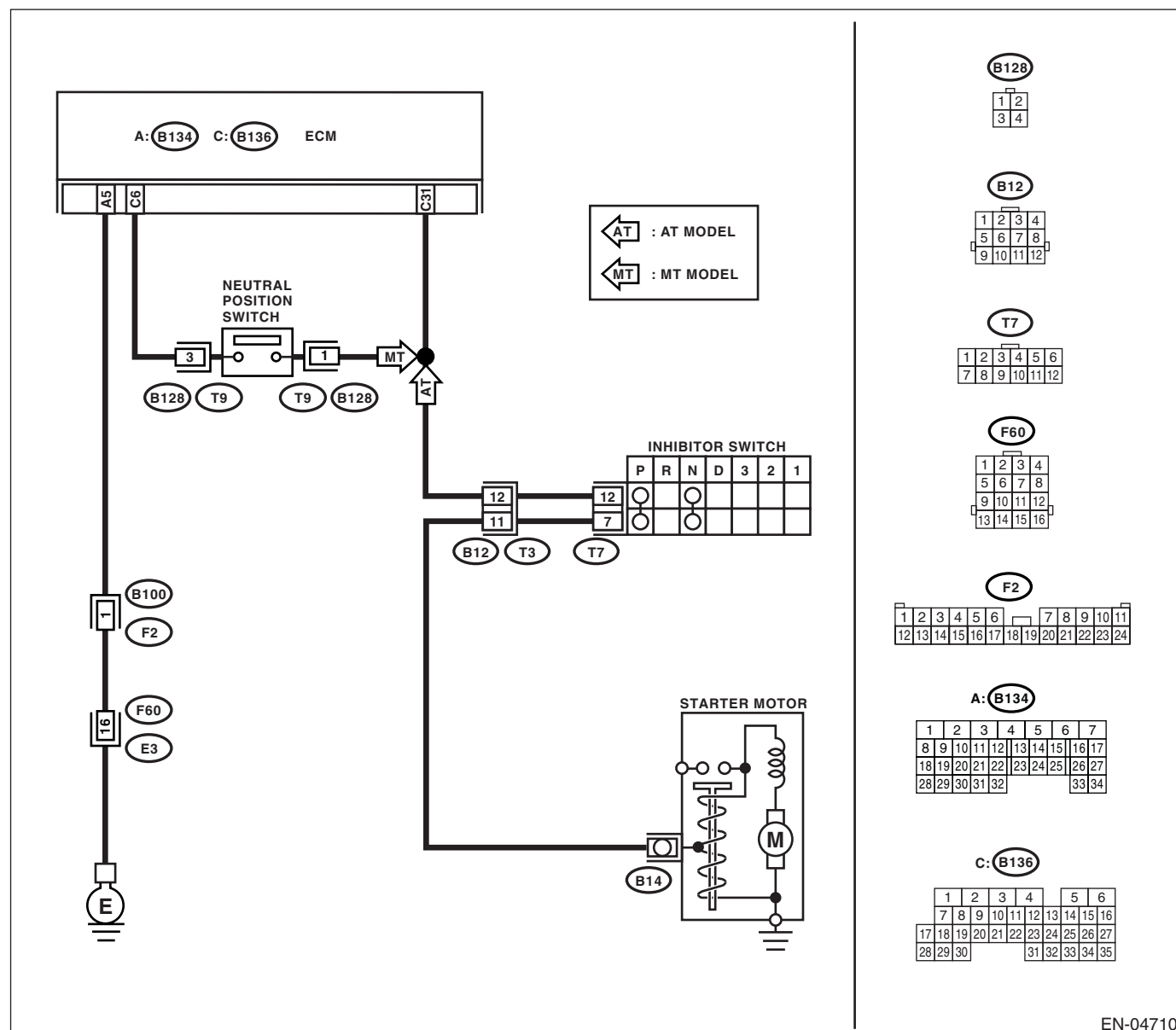
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04710

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. Connector & terminal (B136) No. 31 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Go to step 2.	Go to step 4.
2 CHECK INPUT SIGNAL FOR ECM. Measure the voltage between ECM and chassis ground in selector lever except for "N" and "P" positions. Connector & terminal (B136) No. 31 (+) — Chassis ground (-):	Is the voltage 4.5 — 5.5 V?	Go to step 3.	Go to step 4.
3 CHECK POOR CONTACT. Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Contact your SOA Service Center since deterioration of some parts may be the cause.
4 CHECK INPUT SIGNAL FOR ECM. Measure the voltage between ECM and chassis ground. Connector & terminal (B136) No. 31 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and inhibitor switch connector.	Go to step 5.
5 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 (B136) No. 31 — (T7) No. 12:	Is the resistance less than 1 Ω ?	Go to step 6.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and 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
6 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 7.	Repair open circuit in harness between inhibitor switch connector and starter motor ground line. NOTE: In this case, repair the following: • Open circuit in harness between inhibitor switch connector and starter motor ground line • Poor contact in starter motor connector • Poor contact in starter motor ground • Starter motor
7 CHECK INHIBITOR SWITCH. Measure the resistance between inhibitor switch connector receptacle's terminals in selector lever "N" and "P" positions. <i>Terminals</i> <i>No. 7 — No. 12:</i>	Is the resistance less than 1 Ω ?	Go to step 8.	Replace the inhibitor switch. <Ref. to 4AT-48, Inhibitor Switch.>
8 CHECK SELECT CABLE CONNECTION.	Is there any fault in select cable connection to inhibitor switch?	Repair select cable connection. <Ref. to CS-28, INSPECTION, Select Cable.>	Contact your SOA Service Center since deterioration of some parts may be the cause.

CR:DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (MT MODEL)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-185, DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (MT MODEL), Diagnostic Trouble Code (DTC) Detecting Criteria.>

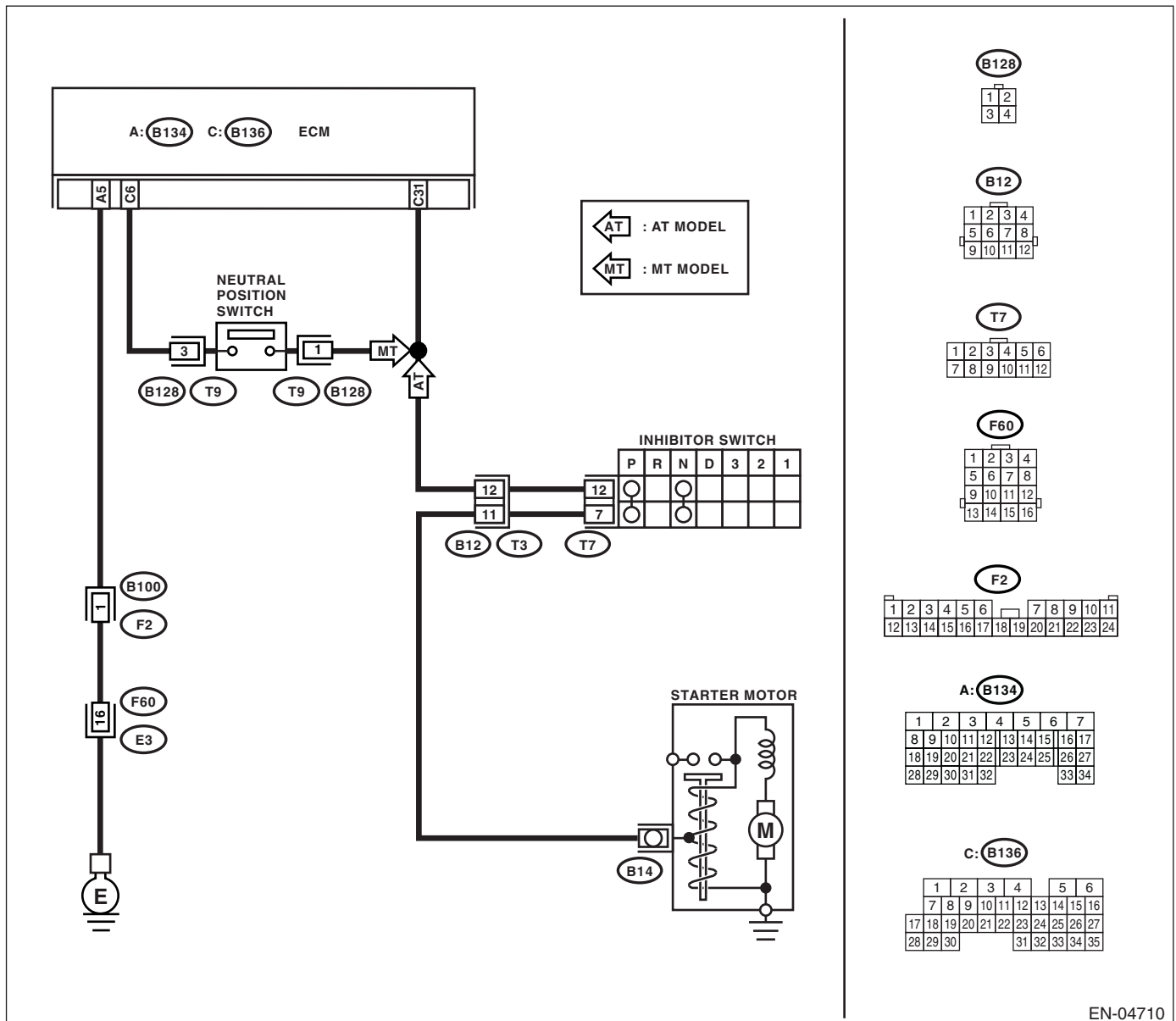
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04710

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

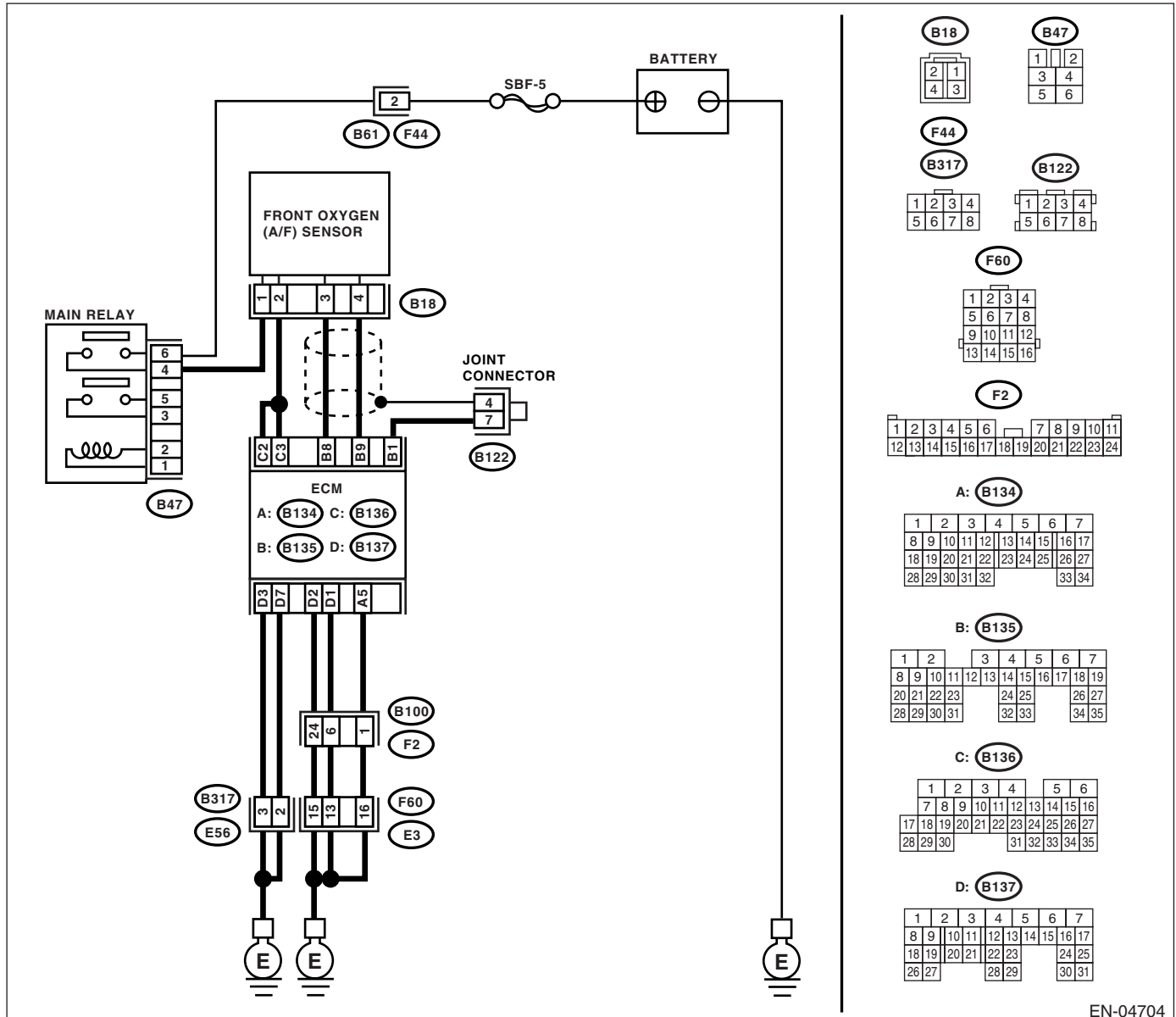
Step	Check	Yes	No
1 CHECK INPUT SIGNAL FOR ECM. 1) Turn the ignition switch to ON. 2) Set the shift lever to except neutral position. 3) Measure the voltage between ECM and chassis ground. Connector & terminal (B136) No. 31 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 2.	Go to step 4.
2 CHECK INPUT SIGNAL FOR ECM. 1) Set the shift lever to neutral position. 2) Measure the voltage between ECM and chassis ground. Connector & terminal (B136) No. 31 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Go to step 3.	Go to step 4.
3 CHECK POOR CONTACT. Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Contact your SOA Service Center since deterioration of some parts may be the cause.
4 CHECK INPUT SIGNAL FOR ECM. 1) Disconnect ECM connector from ECM. 2) Measure the voltage between ECM and chassis ground. Connector & terminal (B136) No. 31 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Repair the battery short circuit in harness between ECM and transmission connector.	Go to step 5.
5 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 (T9). 3) Measure the resistance of harness between ECM and neutral switch connector. Connector & terminal (B136) No. 31 — (B128) No. 1:	Is the resistance less than 1 Ω ?	Go to step 6.	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and transmission harness • Poor contact in transmission harness connector • Poor contact in ECM connector
6 CHECK NEUTRAL POSITION SWITCH GROUND LINE. Measure the resistance of harness between transmission harness connector and engine ground. Connector & terminal (B128) No. 3 — Engine ground:	Is the resistance less than 5 Ω ?	Go to step 7.	Repair the open circuit in harness of neutral position switch ground line.
7 CHECK NEUTRAL POSITION SWITCH. 1) Set the shift lever to except neutral position. 2) Measure the resistance between transmission harness connector receptacle's terminals. Terminals No. 1 — No. 3:	Is the resistance less than 1 Ω ?	Go to step 8.	Replace the neutral position switch.
8 CHECK POOR CONTACT. Check poor contact in the transmission harness connector.	Is there poor contact in the transmission harness connector?	Repair poor contact in transmission harness connector.	Contact your SOA Service Center since deterioration of some parts may be the cause.

CS:DTC P1152 O₂ SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK 1 SENSOR 1)**DTC DETECTING CONDITION:**

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-186, DTC P1152 O₂ SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK1 SENSOR1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:

EN-04704

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

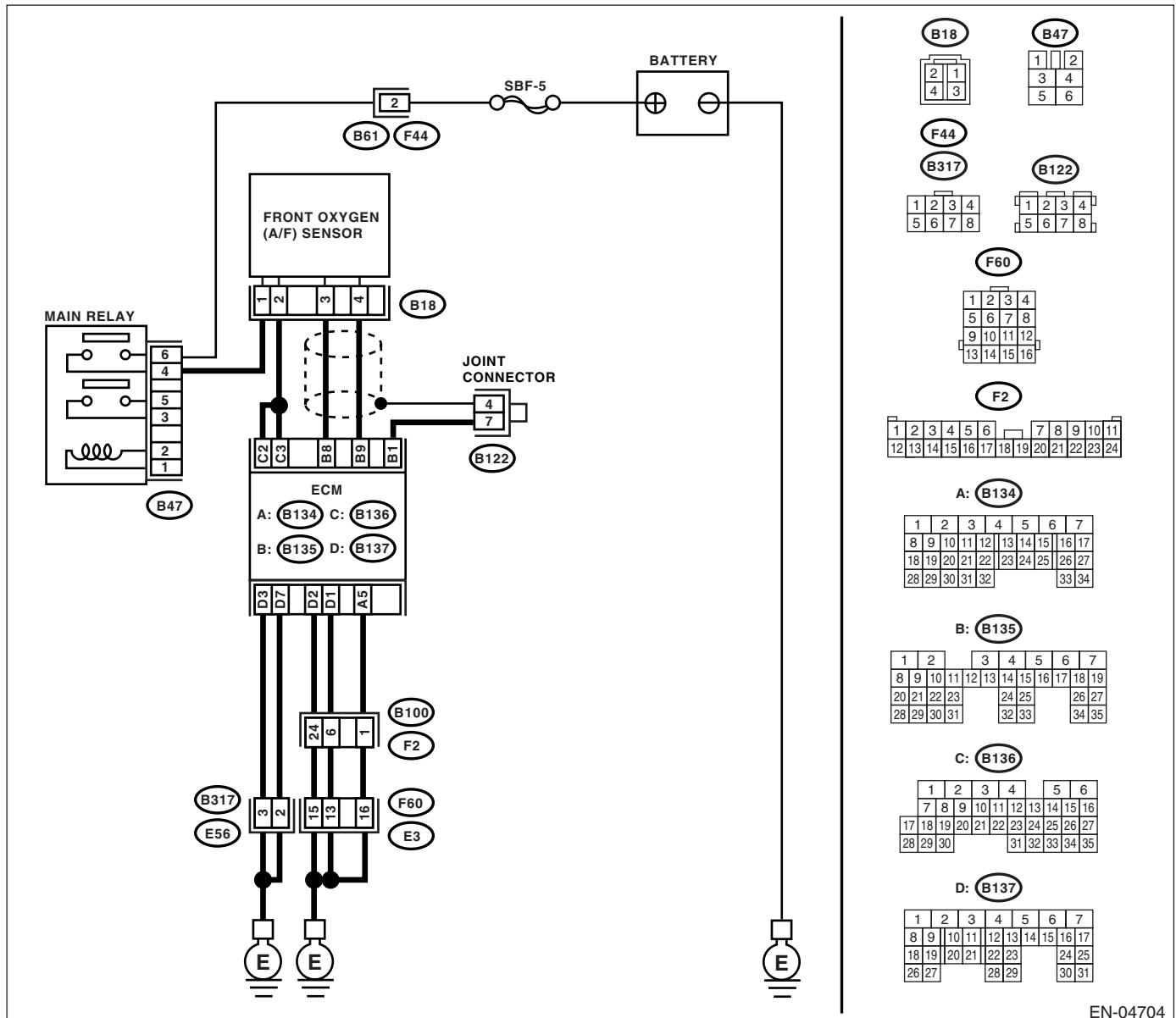
Step	Check	Yes	No
1 CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.	Is there water in connector?	Remove infiltrating water completely.	Go to step 2.
2 CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and front oxygen (A/F) sensor connector. 3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. Connector & terminal (B135) No. 9 — (B18) No. 4: (B135) No. 8 — (B18) No. 3:	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 front oxygen (A/F) sensor connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector
3 CHECK POOR CONTACT. Check poor contact in front oxygen (A/F) sensor connector.	Is there poor contact in front oxygen (A/F) sensor connector?	Repair the poor contact in front oxygen (A/F) sensor connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-41, Front Oxygen (A/F) Sensor.>

CT:DTC P1153 O₂ SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK 1 SENSOR 1)**DTC DETECTING CONDITION:**

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-188, DTC P1153 O₂ SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK1 SENSOR1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:

EN-04704

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.	Is there water in connector?	Remove infiltrating water completely.	Go to step 2.
2 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. Connector & terminal (B135) No. 8 — Chassis ground:	Is the resistance more than 1 MΩ?	Go to step 3.	Repair the ground short 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 ECM connector and chassis ground. Connector & terminal (B135) No. 9 — Chassis ground:	Is the resistance more than 1 MΩ?	Go to step 4.	Repair the ground short circuit in harness between ECM and front oxygen (A/F) sensor connector.
4 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. Connector & terminal (B135) No. 8 (+) — Chassis ground (-):	Is the voltage more than 4.5 V?	Go to step 5.	Go to step 6.
5 CHECK OUTPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 8 (+) — Chassis ground (-):	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(H4DOTC)-45, Engine Control Module (ECM).>	Repair the poor contact in ECM connector.
6 CHECK OUTPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 9 (+) — Chassis ground (-):	Is the voltage more than 4.95 V?	Go to step 7.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-41, Front Oxygen (A/F) Sensor.>
7 CHECK OUTPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 9 (+) — Chassis ground (-):	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(H4DOTC)-45, Engine Control Module (ECM).>	Repair the poor contact in ECM connector.

CU:DTC P1160 RETURN SPRING FAILURE**NOTE:**

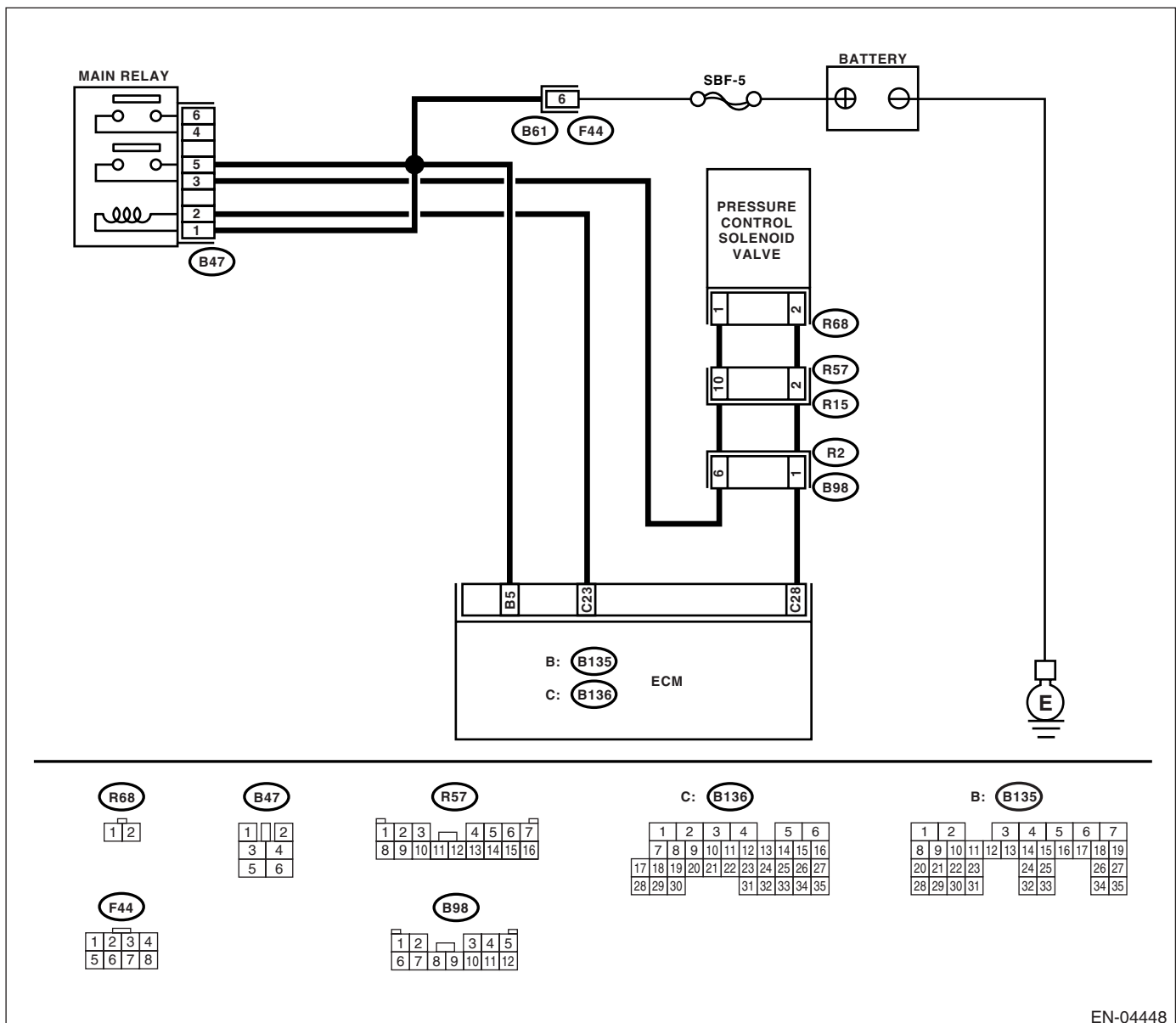
For the diagnostic procedure, refer to DTC P2101. <Ref. to EN(H4DOTC)(diag)-350, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CV:DTC P1400 FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW**DTC DETECTING CONDITION:**

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-192, DTC P1400 FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, 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 ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. Connector & terminal (B136) No. 28 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 2.	Go to step 3.
2 CHECK FOR POOR CONTACT. Check for poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Contact your SOA Service Center since deterioration of some parts may be the cause.
3 CHECK HARNESS BETWEEN PRESSURE CONTROL SOLENOID VALVE AND ECM CONNECTOR. 1) Turn ignition switch to OFF. 2) Disconnect the connectors from pressure control solenoid valve and ECM. 3) Measure the resistance of harness between pressure control solenoid valve connector and chassis ground. Connector & terminal (R68) No. 2 — Chassis ground:	Is the resistance more than 1 M Ω ?	Go to step 4.	Repair short circuit to ground in harness between ECM and pressure control solenoid valve connector.
4 CHECK HARNESS BETWEEN PRESSURE CONTROL SOLENOID VALVE AND ECM CONNECTOR. Measure the resistance of harness between ECM and pressure control solenoid valve connector. Connector & terminal (B136) No. 28 — (R68) No. 2:	Is the resistance less than 1 Ω ?	Go to step 5.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and pressure control solenoid valve connector • Poor contact in coupling connector
5 CHECK PRESSURE CONTROL SOLENOID VALVE. Measure the resistance between pressure control solenoid valve terminals. Terminals No. 1 — No. 2:	Is the resistance 10 — 100 Ω ?	Go to step 6.	Replace the pressure control solenoid valve. <Ref. to EC(H4DOTC)-16, Pressure Control Solenoid Valve.>
6 CHECK POWER SUPPLY TO PRESSURE CONTROL SOLENOID VALVE. 1) Turn ignition switch to ON. 2) Measure the voltage between pressure control solenoid valve and chassis ground. Connector & terminal (R68) No. 1 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 7.	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between main relay and pressure control solenoid valve connector • Poor contact in coupling connector • Poor contact in main relay connector

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
7	CHECK FOR POOR CONTACT. Check for poor contact in pressure control solenoid valve connector.	Is there poor contact in pressure control solenoid valve connector?	Repair poor contact in pressure control solenoid valve connector.
			Contact your SOA Service Center since deterioration of some parts may be the cause.

CW:DTC P1410 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-194, DTC P1410 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN, Diagnostic Trouble Code (DTC) Detecting Criteria.>

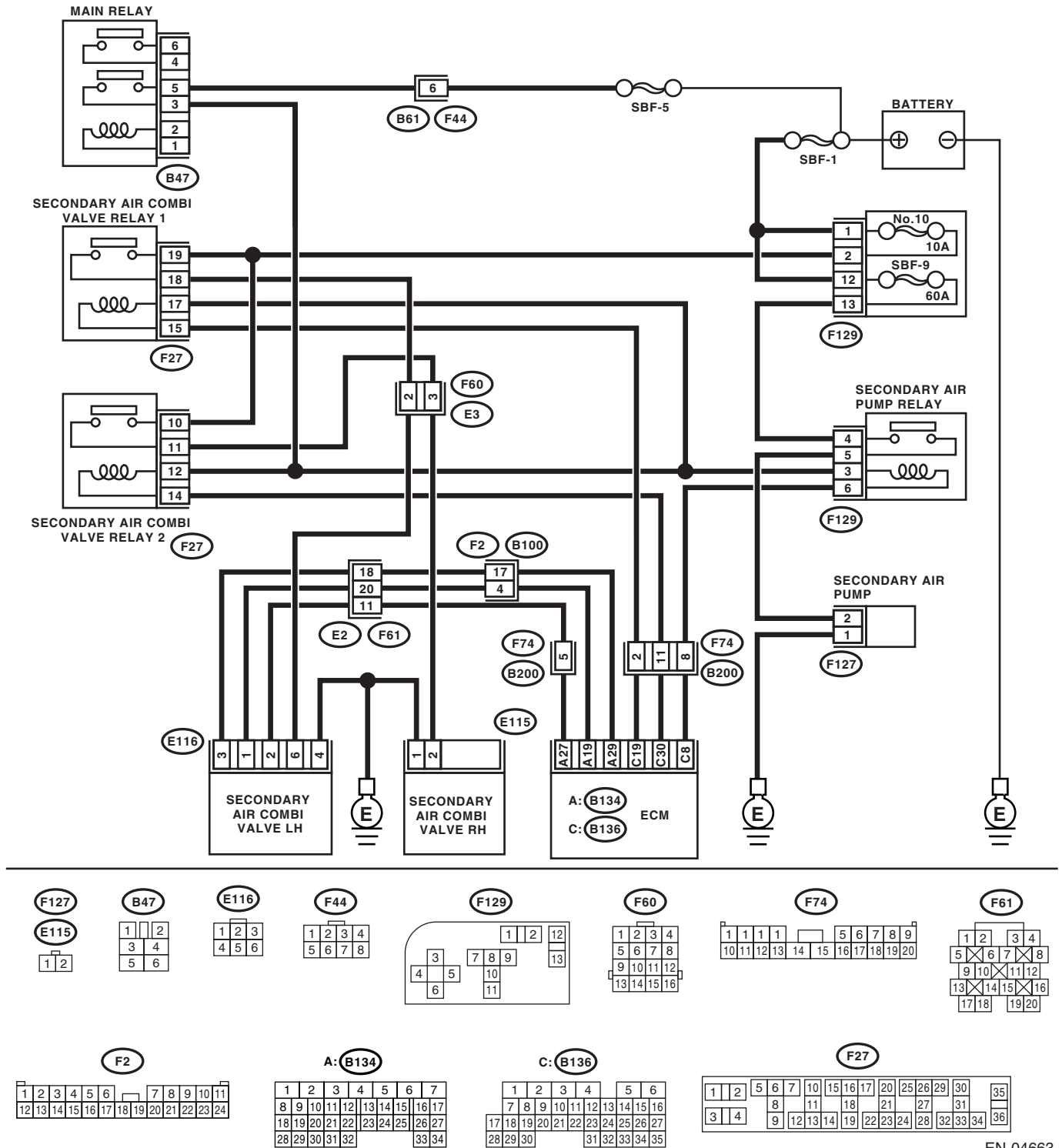
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-04663

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK SECONDARY AIR COMBI VALVE. 1) Remove the secondary air combi valve. 2) Blow air through inlet port of secondary air combi valve and check the pipe connection for air leakage.	Is there air leakage from pipe connection?	Replace the secondary air combi valve which has air leakage. <Ref. to EC(H4DOTC)-10, Secondary Air Combi Valve.>	A temporary poor contact occurs. Check for poor contact of connector.

CX:DTC P1418 SECONDARY AIR INJECTION SYSTEM CONTROL “A” CIRCUIT SHORTED

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-195, DTC P1418 SECONDARY AIR INJECTION SYSTEM CONTROL “A” CIRCUIT SHORTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

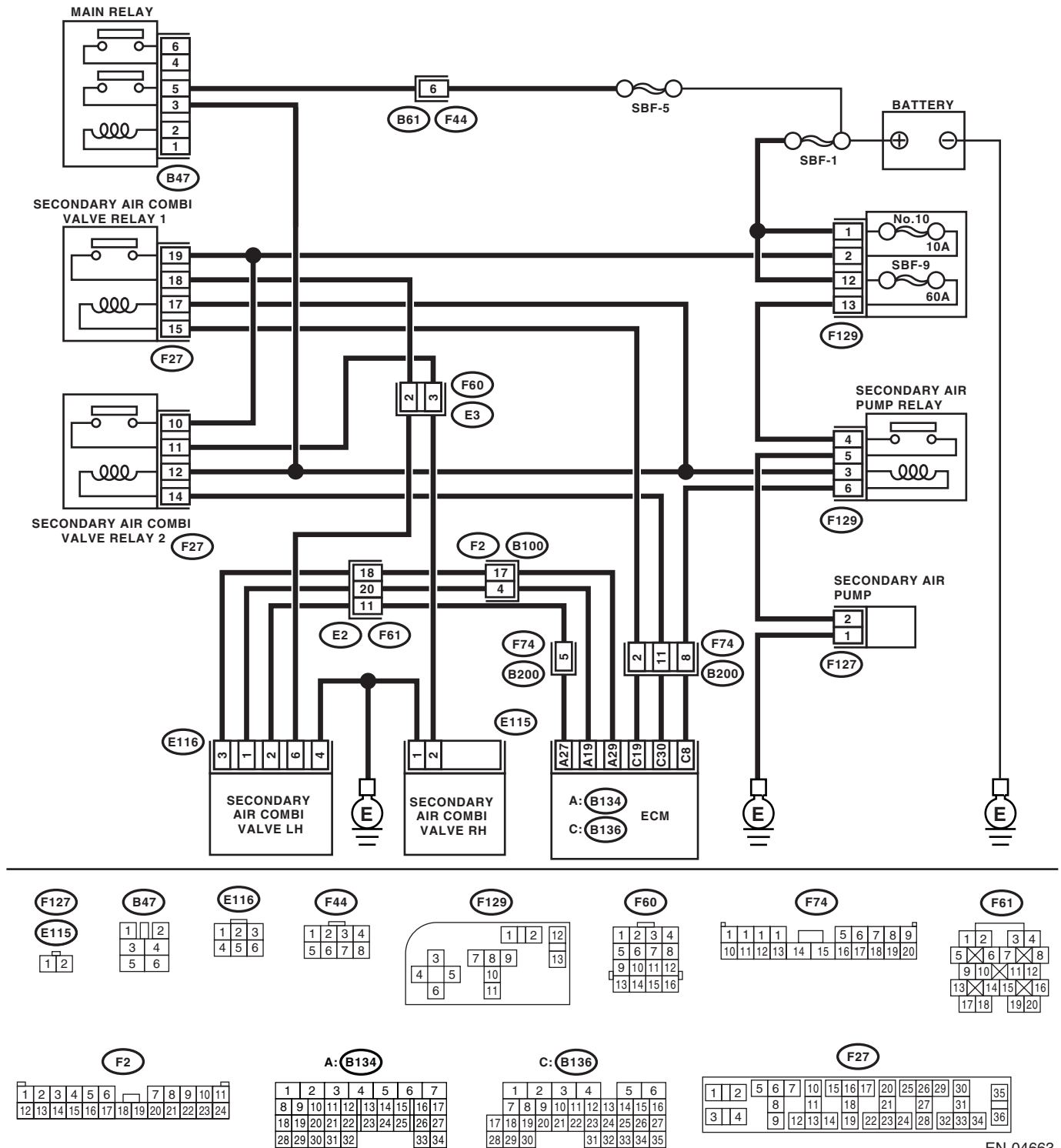
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-04663

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS BETWEEN ECM AND SECONDARY AIR PUMP RELAY. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and secondary air pump relay. 3) Measure the resistance of harness between ECM and secondary air pump relay terminal. <i>Connector & terminal</i> <i>(B136) No. 8 — (F129) No. 6:</i>	Is the resistance less than 1 Ω ?	Go to step 2.	Repair the open circuit in harness between ECM and secondary air pump relay terminal.
2 CHECK HARNESS BETWEEN ECM AND SECONDARY AIR PUMP RELAY. Measure the voltage between ECM and chassis ground. <i>Connector & terminal</i> <i>(B136) No. 8 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Repair the battery short circuit in harness between ECM and secondary air pump relay terminal.	A temporary poor contact occurs. Check for poor contact of connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

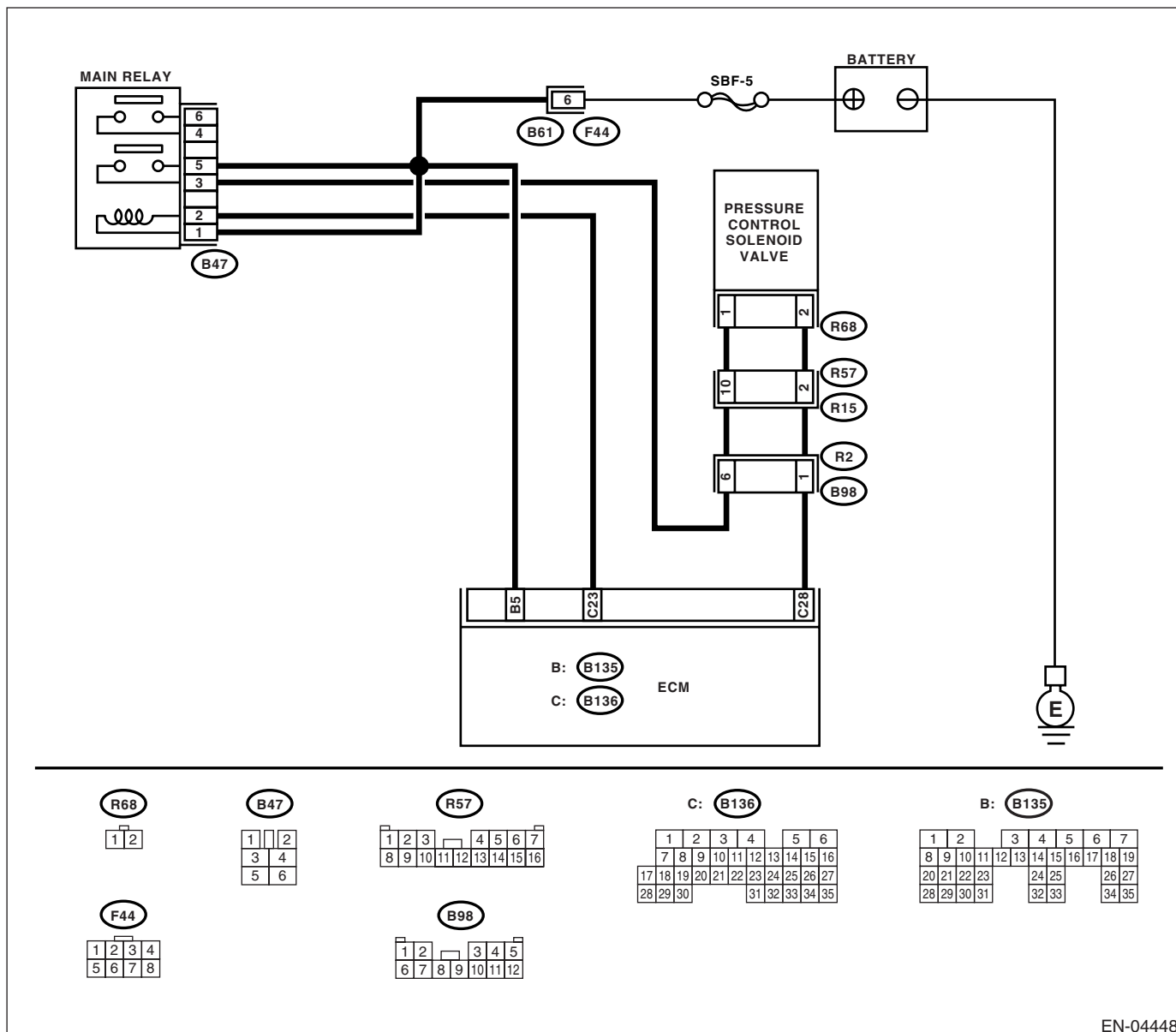
CY:DTC P1420 FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-196, DTC P1420 FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04448

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK INPUT SIGNAL FOR ECM. 1) Turn ignition switch to OFF. 2) Connect the test mode connector at the lower portion of instrument panel (on the driver's side). 3) Turn ignition switch to ON. 4) While operating the pressure control solenoid valve, measure voltage between ECM and chassis ground. NOTE: Pressure control solenoid valve operation can be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-51, Compulsory Valve Operation Check Mode.> Connector & terminal (B136) No. 28 (+) — Chassis ground (-):	Does the voltage value change 0 — 10 V?	Go to step 2.	The malfunction indicator light may light up, however, the circuit is returned to the normal status at the moment. In this case, repair poor contact in ECM connector.
2 CHECK INPUT SIGNAL FOR ECM. 1) Turn ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. Connector & terminal (B136) No. 28 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 4.	Go to step 3.
3 CHECK FOR POOR CONTACT. Check for poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>
4 CHECK HARNESS BETWEEN PRESSURE CONTROL SOLENOID VALVE AND ECM CONNECTOR. 1) Turn ignition switch to OFF. 2) Disconnect the connector from pressure control solenoid valve. 3) Turn ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. Connector & terminal (B136) No. 28 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Repair short circuit to battery in harness between ECM and pressure control solenoid valve connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>	Go to step 5.
5 CHECK PRESSURE CONTROL SOLENOID VALVE. 1) Turn ignition switch to OFF. 2) Measure the resistance between pressure control solenoid valve terminals. Terminals No. 1 — No. 2:	Is the resistance less than 1 Ω ?	Replace the pressure control solenoid valve <Ref. to EC(H4DOTC)-16, Pressure Control Solenoid Valve.> and the ECM <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>.	Go to step 6.
6 CHECK FOR POOR CONTACT. Check for poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

CZ:DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-198, DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>

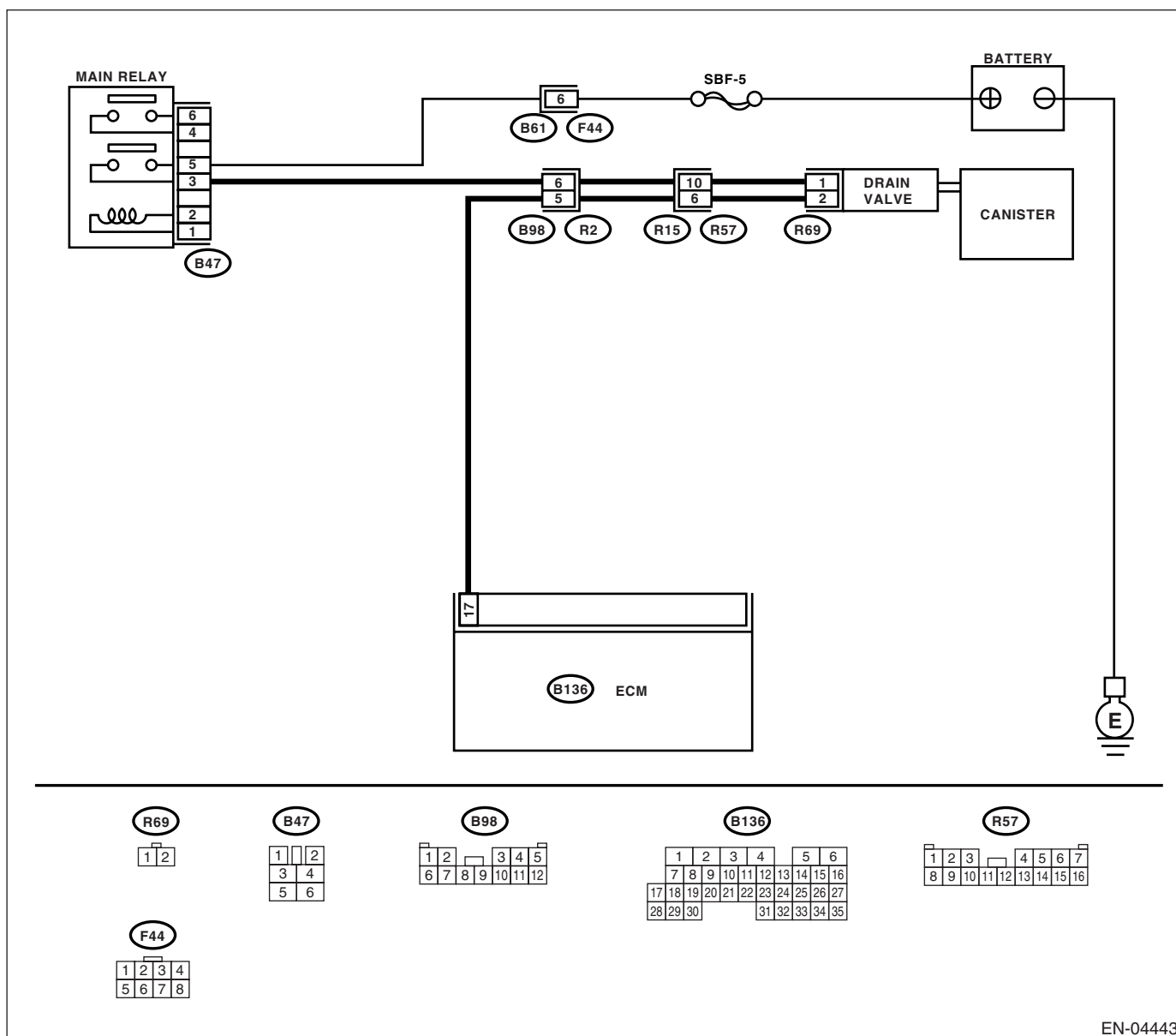
TROUBLE SYMPTOM:

Improper fuel supply

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04443

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK VENT LINE HOSES. Check the following items. • Clogging of vent hoses between canister and drain valve • Clogging of vent hose between drain valve and air filter • Clogging of drain filter	Is there a fault in vent line?	Repair or replace faulty parts.	Go to step 3.
3 CHECK DRAIN VALVE OPERATION. 1) Turn ignition switch to OFF. 2) Connect the test mode connector at the lower portion of instrument panel (on the driver's side). 3) Turn ignition switch to ON. 4) Operate the drain valve. NOTE: Drain valve operation can be executed using Subaru Select Monitor. For the procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-51, Compulsory Valve Operation Check Mode.>	Does the drain valve operate?	Contact your SOA Service Center since deterioration of some parts may be the cause.	Replace the drain valve. <Ref. to EC(H4DOTC)-20, Drain Valve.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

DA:DTC P1491 POSITIVE CRANKCASE VENTILATION (BLOW-BY) FUNCTION PROBLEM

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-200, DTC P1491 POSITIVE CRANKCASE VENTILATION (BLOW-BY) FUNCTION PROBLEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>

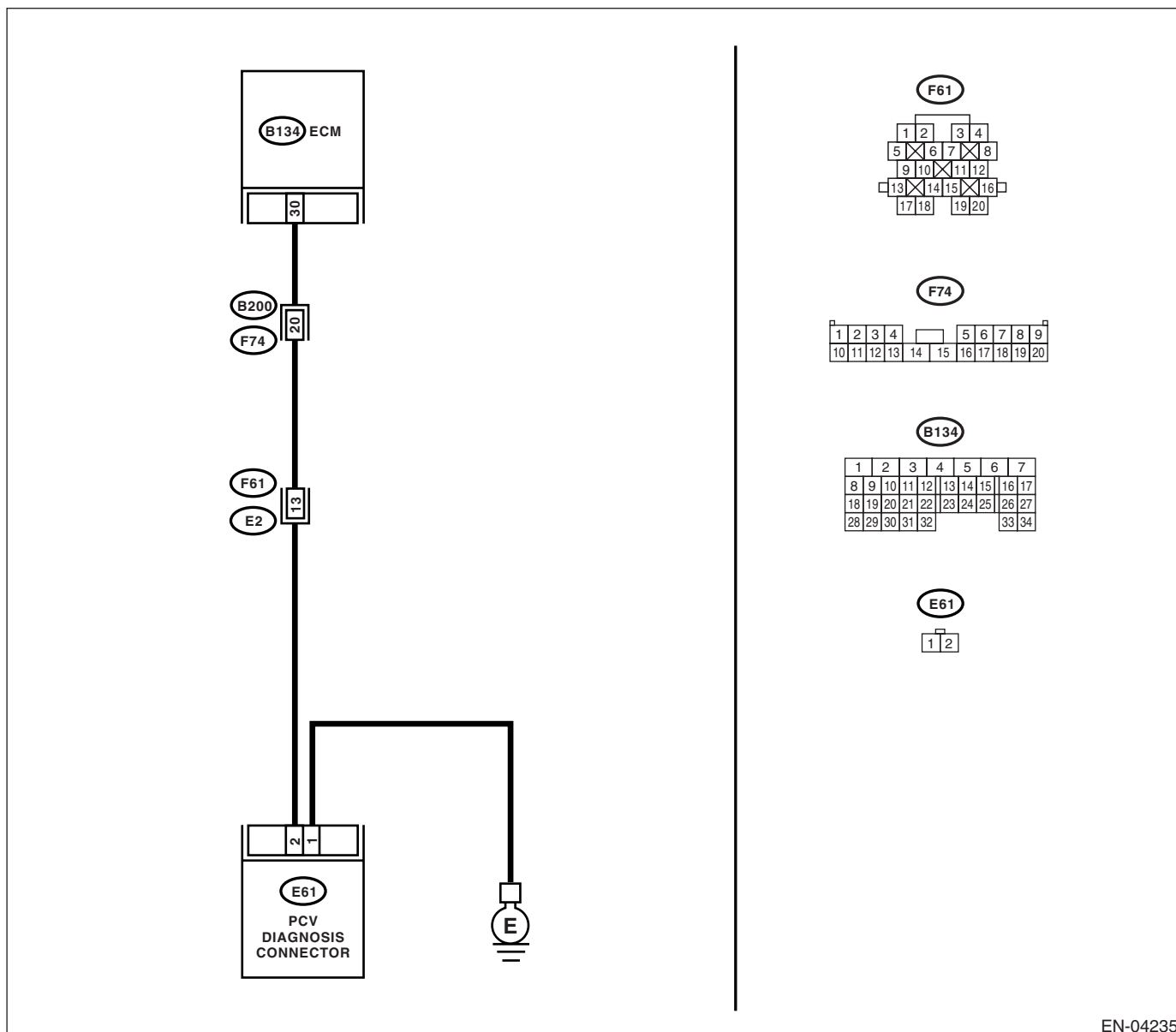
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04235

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK BLOW-BY HOSE. Check the blow-by hose.	Is there disconnection or crack in blow-by hose?	Replace or repair blow-by hose.	Go to step 2.
2 INSPECT HARNESS BETWEEN PCV DIAGNOSIS CONNECTOR AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from PCV diagnosis connector and ECM. 3) Measure the resistance of harness between PCV diagnosis connector and ECM connector. <i>Connector & terminal</i> <i>(B134) No. 30 — (E61) No. 2:</i>	Is the resistance less than 1 Ω ?	Go to step 3.	Repair open circuit in harness between PCV diagnosis connector and ECM.
3 INSPECT HARNESS BETWEEN PCV DIAGNOSIS CONNECTOR AND ECM CONNECTOR. Measure the resistance of harness between PCV diagnosis connector and chassis ground. <i>Connector & terminal</i> <i>(B134) No. 30 — Chassis ground:</i>	Is the resistance more than 1 M Ω ?	Go to step 4.	Repair short circuit to chassis ground in harness between PCV diagnosis connector and ECM.
4 INSPECT PCV DIAGNOSIS CONNECTOR GROUND CIRCUIT. Measure the resistance between PCV diagnosis connector and engine ground. <i>Connector & terminal</i> <i>(B61) No. 1 — Engine ground:</i>	Is the resistance less than 5 Ω ?	Go to step 5.	Repair PCV diagnosis connector ground circuit.
5 INSPECT PCV DIAGNOSIS CONNECTOR. Measure the resistance between PCV diagnosis connector and terminal. <i>Terminals</i> <i>No. 1 — No. 2:</i>	Is the resistance less than 1 Ω ?	Repair poor contact in ECM and PCV diagnosis connector.	Replace PCV diagnosis connector.

DB:DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-202, DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

Failure of engine to start

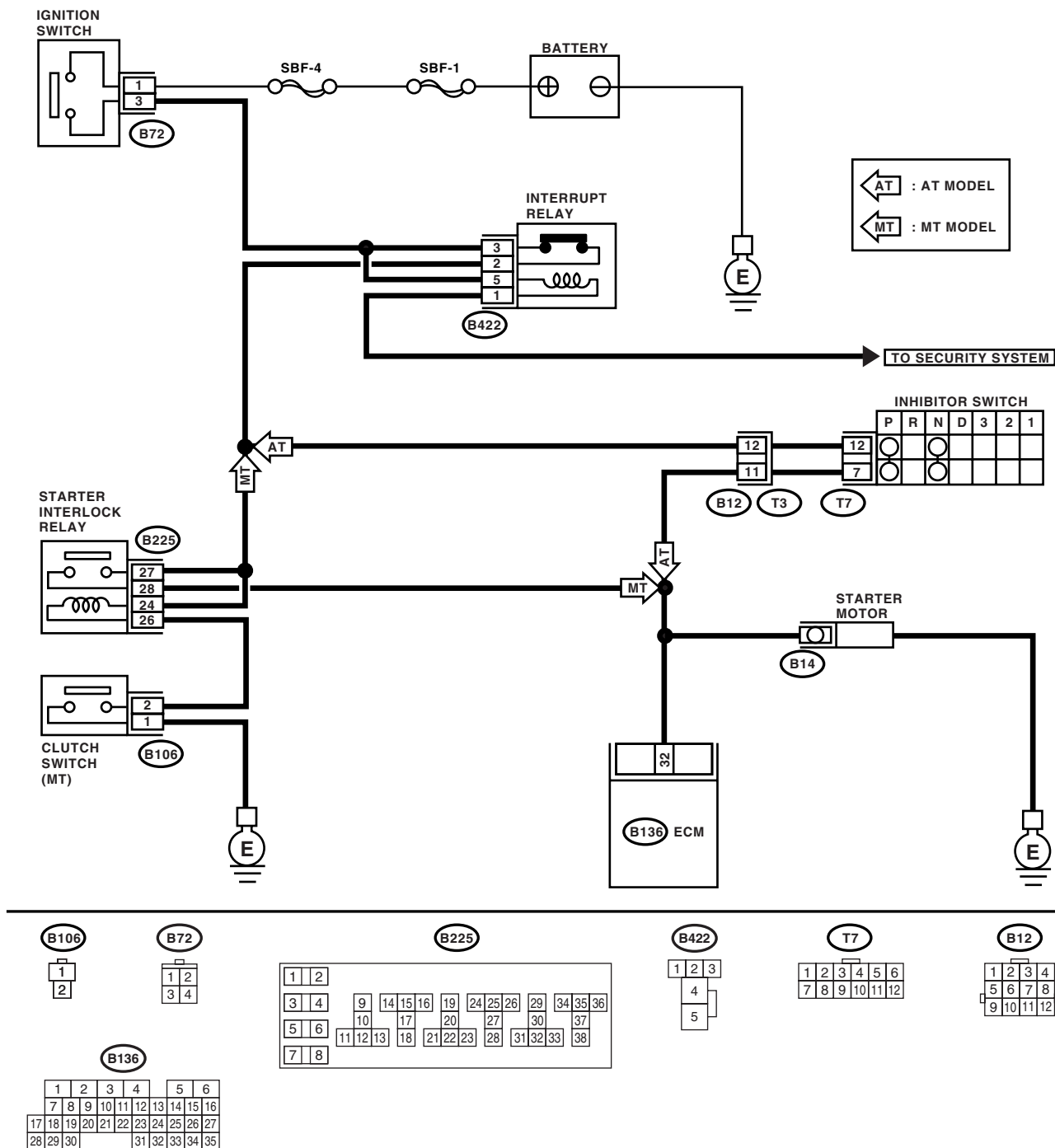
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-04633

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: • 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(H4DOTC)(diag)-63, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

DC:DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-203, DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

ENGINE (DIAGNOSTICS)

Diagram illustrating the wiring for the front oxygen sensor and ignition system. The diagram shows the Main Relay, Ignition Switch, ECM, and Battery connected to various sensors and components.

MAIN RELAY: Terminals 1, 2, 3, 4, 5, 6 are shown. Terminal 4 is connected to the front oxygen sensor. Terminal 2 is connected to the ignition switch. Terminal 1 is connected to the battery.

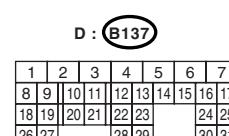
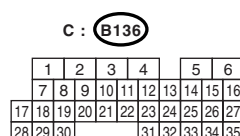
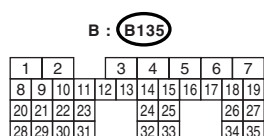
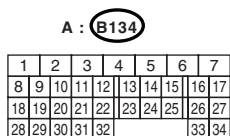
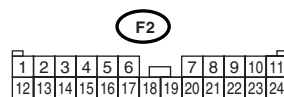
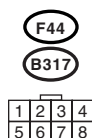
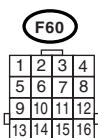
IGNITION SWITCH: Terminals 1, 4 are shown. Terminal 1 is connected to the battery. Terminal 4 is connected to the ignition switch.

ECM (Engine Control Module): Terminals A (B134), B (B135), C (B136), D (B137) are shown. Terminal A is connected to the battery. Terminal B is connected to the ignition switch. Terminal C is connected to the battery. Terminal D is connected to the battery.

BATTERY: Positive (+) and Negative (-) terminals are shown. The positive terminal is connected to the battery.

Other components and connections:

- TO FRONT OXYGEN(A/F) SENSOR:** Connected to terminal 4 of the Main Relay.
- SBF-5:** Connected to terminal 2 of the Main Relay.
- SBF-4:** Connected to terminal 1 of the Ignition Switch.
- SBF-1:** Connected to terminal 1 of the Ignition Switch.
- B61, F44, B72:** Various components connected to the Main Relay and Ignition Switch.
- B100, F2, F60, E3:** Various components connected to the ECM.
- B317, E56:** Various components connected to the ECM.
- E:** Ground connection for the ECM.



EN(H4DOTC)(diag)-306

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 OFF. 2) Measure the voltage between ECM and chassis ground. Connector & terminal (B135) No. 5 (+) — Chassis ground (-):	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. Connector & terminal (B135) No. 5 — 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: • 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)

DD:DTC P1570 ANTENNA

NOTE:

For the diagnostic procedure, refer to DTC P1570. <Ref. to IM(diag)-22, DTC P1570 ANTENNA, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DE:DTC P1571 REFERENCE CODE INCOMPATIBILITY

NOTE:

For the diagnostic procedure, refer to DTC P1571. <Ref. to IM(diag)-15, DTC P1571 REFERENCE CODE INCOMPATIBILITY, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DF:DTC P1572 IMM CIRCUIT FAILURE (EXCEPT ANTENNA CIRCUIT)

NOTE:

For the diagnostic procedure, refer to DTC P1572. <Ref. to IM(diag)-16, DTC P1572 EGI IMMOBILIZER COMMUNICATION (EXCEPT ANTENNA CIRCUIT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DG:DTC P1574 KEY COMMUNICATION FAILURE

NOTE:

For the diagnostic procedure, refer to DTC P1574. <Ref. to IM(diag)-20, DTC P1574 KEY IMMOBILIZER COMMUNICATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DH:DTC P1576 EGI CONTROL MODULE EEPROM

NOTE:

For the diagnostic procedure, refer to DTC P1576. <Ref. to IM(diag)-21, DTC P1576 EGI CONTROL MODULE EEPROM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DI: DTC P1577 IMM CONTROL MODULE EEPROM

NOTE:

For the diagnostic procedure, refer to DTC P1577. <Ref. to IM(diag)-21, DTC P1577 IMM CONTROL MODULE EEPROM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

DJ:DTC P2004 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 1)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-205, DTC P2004 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-74, 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(H4DOTC)-37, Tumble Generator Valve Assembly.>	Clean the tumble generator valve.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

DK:DTC P2005 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 2)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-206, DTC P2005 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK TUMBLE GENERATOR VALVE LH. 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(H4DOTC)-37, Tumble Generator Valve Assembly.>	Clean the tumble generator valve.

**DL:DTC P2006 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED
(BANK 1)****DTC DETECTING CONDITION:**

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-207, DTC P2006 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)" <Ref. to EN(H4DOTC)(diag)-74, 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(H4DOTC)-37, Tumble Generator Valve Assembly.>	Clean the tumble generator valve.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

DM:DTC P2007 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK 2)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-208, DTC P2007 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

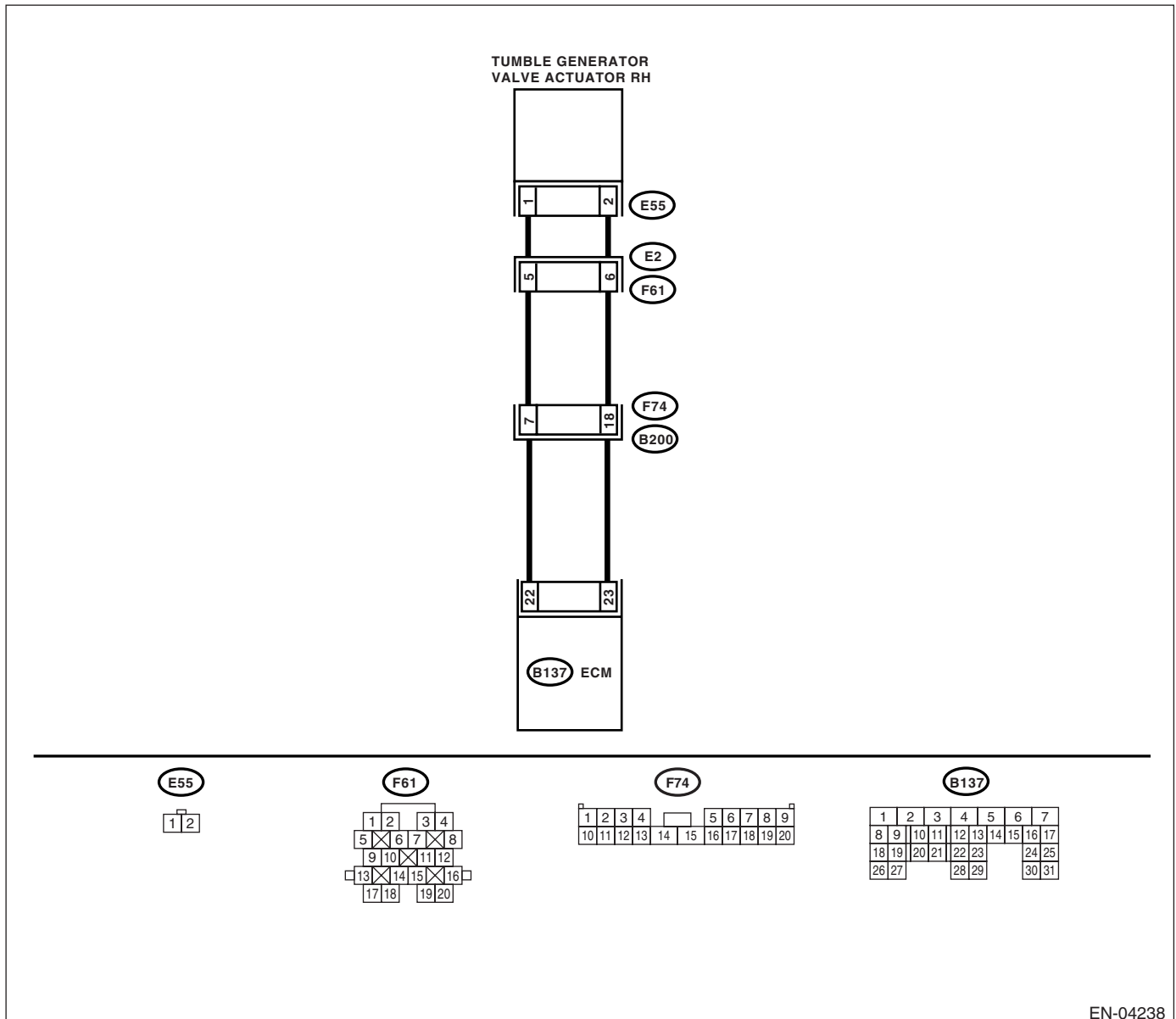
Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK TUMBLE GENERATOR VALVE LH. 1) Remove the tumble generator 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(H4DOTC)-37, Tumble Generator Valve Assembly.>	Clean the tumble generator valve.

**DN:DTC P2008 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN
(BANK 1)****DTC DETECTING CONDITION:**

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-209, DTC P2008 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:

EN-04238

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

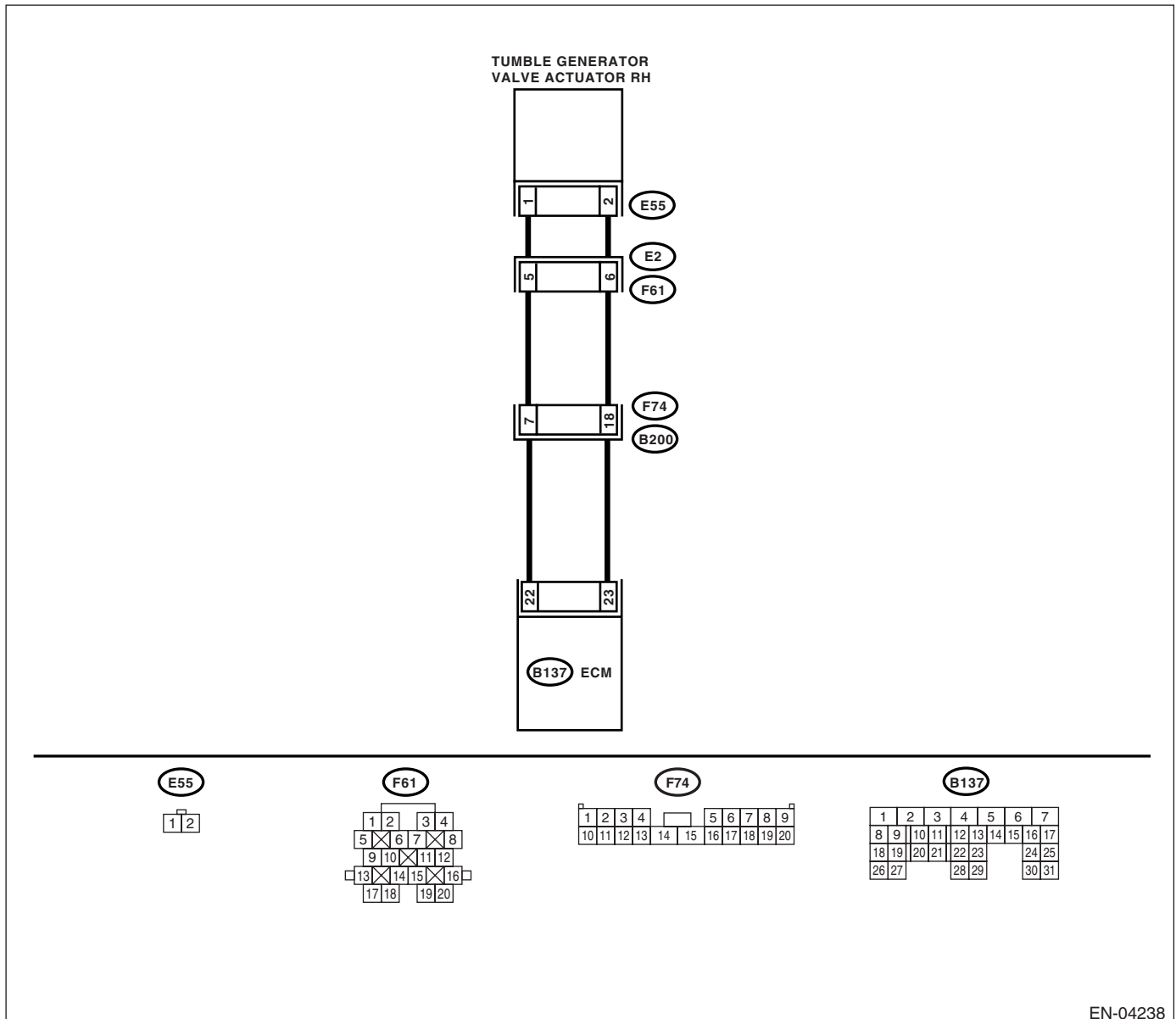
Step	Check	Yes	No
1 CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ACTUATOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from tumble generator valve and ECM connector. 3) Measure the resistance between tumble generator valve actuator and ECM connector. Connector & terminal (E55) No. 1 — (B137) No. 22: (E55) No. 2 — (B137) No. 23:	Is the resistance less than 1 Ω ?	Go to step 2.	Repair the open circuit between ECM and tumble generator valve connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and tumble generator valve actuator connector. • Poor contact in coupling connector.
2 CHECK POOR CONTACT. Check poor contact in tumble generator valve actuator connector.	Is there poor contact in tumble generator valve actuator connector?	Repair the poor contact in tumble generator valve actuator connector.	Replace the tumble generator valve actuator. <Ref. to FU(H4DOTC)-39, Tumble Generator Valve Actuator.>

DO:DTC P2009 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 1)**DTC DETECTING CONDITION:**

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-211, DTC P2009 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ACTUATOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from tumble generator valve connector. 3) Measure the voltage between tumble generator valve actuator and chassis ground. Connector & terminal (E55) No. 1 (+) — Chassis ground (-): (E55) No. 2 (+) — Chassis ground (-):	Is the voltage less than 5 V?	Replace the tumble generator valve actuator. <Ref. to FU(H4DOTC)-39, Tumble Generator Valve Actuator.>	Repair the battery short circuit between ECM and tumble generator valve actuator.

DP:DTC P2011 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN (BANK 2)

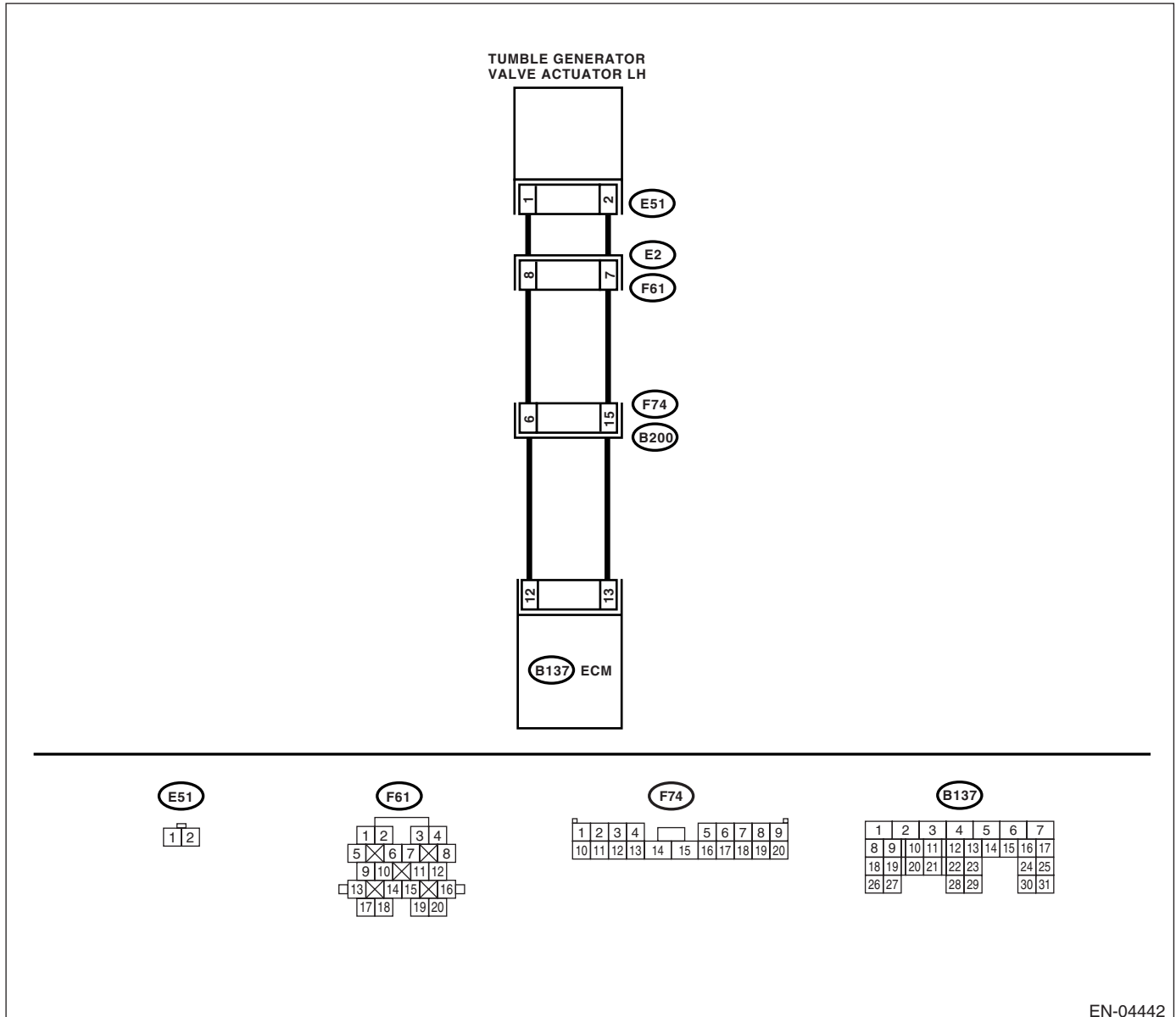
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-213, DTC P2011 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

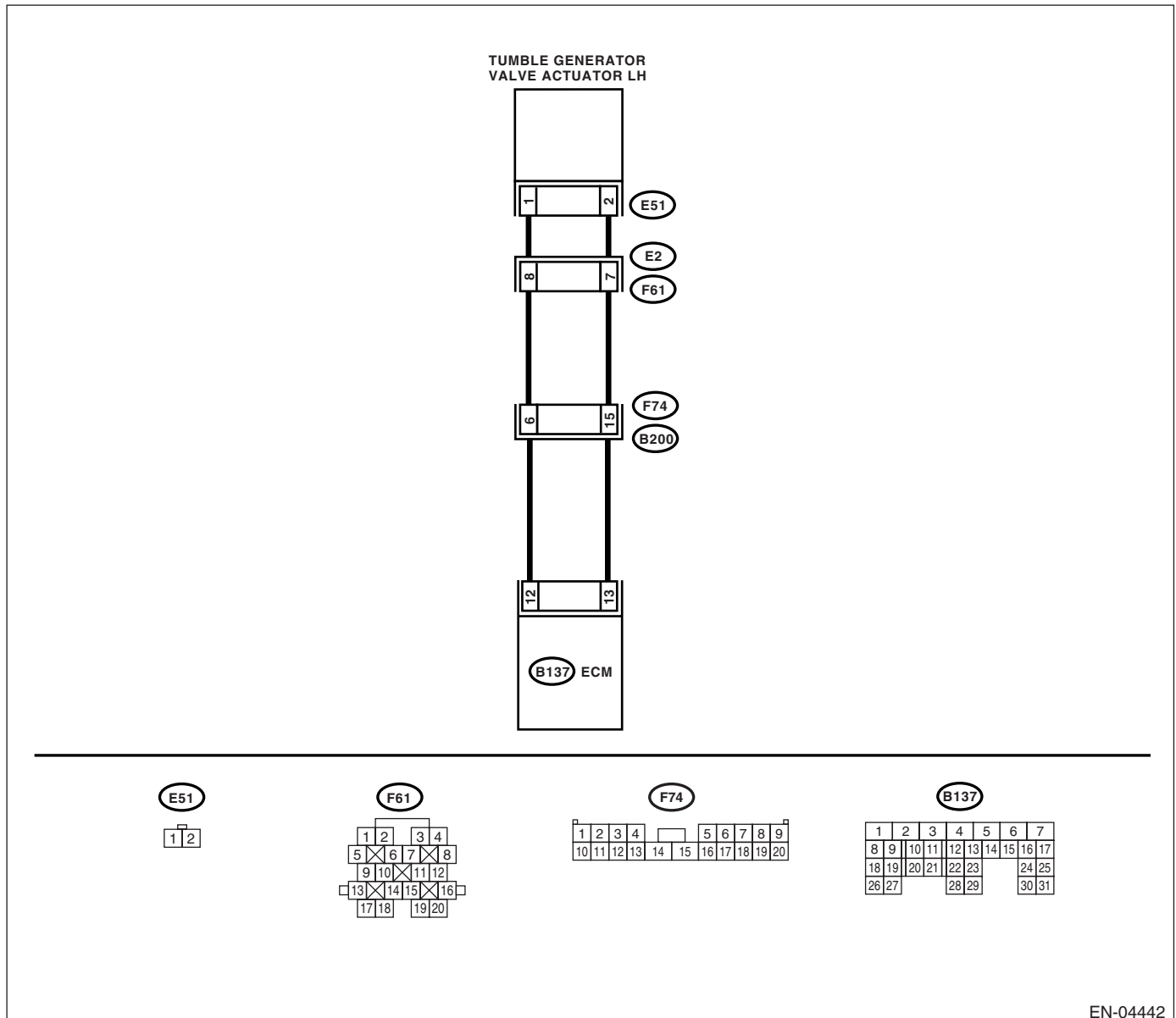
Step	Check	Yes	No
1 CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ACTUATOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from tumble generator valve and ECM connector. 3) Measure the resistance between tumble generator valve actuator and ECM connector. Connector & terminal (E51) No. 1 — (B137) No. 12: (E51) No. 2 — (B137) No. 13:	Is the resistance less than 1 Ω ?	Go to step 2.	Repair the open circuit between ECM and tumble generator valve connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and tumble generator valve actuator connector. • Poor contact in coupling connector
2 CHECK POOR CONTACT. Check poor contact in tumble generator valve actuator connector.	Is there poor contact in tumble generator valve actuator connector?	Repair the poor contact in tumble generator valve actuator connector.	Replace the tumble generator valve actuator. <Ref. to FU(H4DOTC)-39, Tumble Generator Valve Actuator.>

DQ:DTC P2012 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 2)**DTC DETECTING CONDITION:**

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-215, DTC P2012 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ACTUATOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from tumble generator valve connector. 3) Measure the voltage between tumble generator valve actuator and chassis ground. Connector & terminal (E51) No. 1 (+) — Chassis ground (-): (E51) No. 2 (+) — Chassis ground (-):	Is the voltage less than 5 V?	Replace the tumble generator valve actuator. <Ref. to FU(H4DOTC)-39, Tumble Generator Valve Actuator.>	Repair the battery short circuit between ECM and tumble generator valve actuator.

DR:DTC P2016 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT LOW (BANK 1)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-217, DTC P2016 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT LOW (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

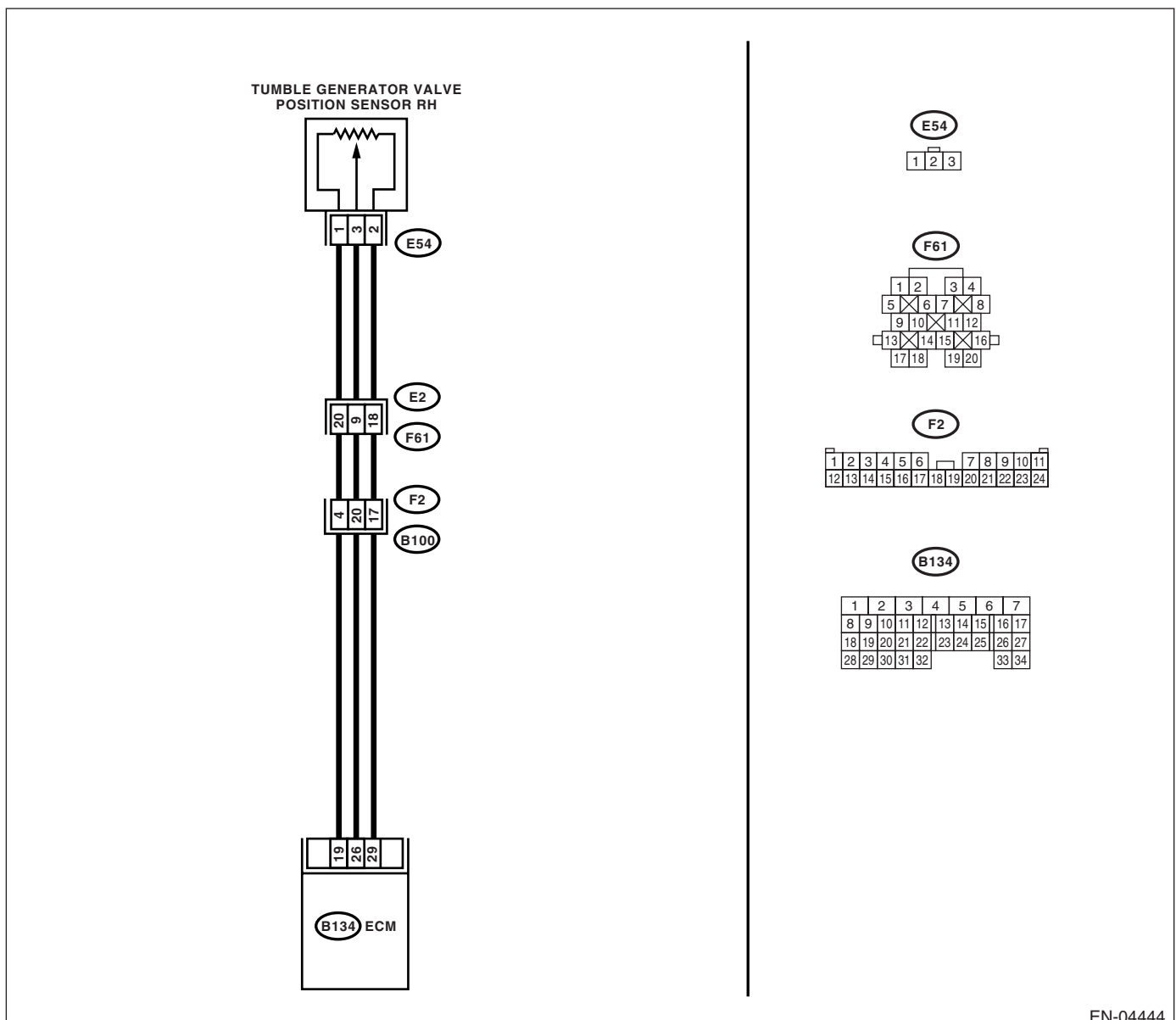
TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04444

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 tumble generator valve position sensor signal using Subaru Select Monitor or general scan tool. NOTE: - Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> - General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the voltage less than 0.1 V?	Go to step 2.	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following: - Poor contact in tumble generator valve position sensor connector - Poor contact in ECM connector - Poor contact in coupling connector
2 CHECK INPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B134) No. 19 (+) — 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 (B134) No. 19 (+) — Chassis ground (-):	Shake the ECM harness and connector, while monitoring value of voltage meter. Does the voltage change?	Repair the poor contact in ECM connector.	Contact your SOA Service Center since deterioration of some parts may be the cause.
4 CHECK INPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B134) No. 26 (+) — 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.	Shake the ECM harness and connector, while monitoring value of Subaru Select Monitor. Does the voltage change?	Repair the poor contact in ECM connector.	Go to step 6.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
6 CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR. 1) Turn 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. Connector & terminal (E54) No. 1 (+) — 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 tumble generator valve position sensor and ECM connector • Poor contact in tumble generator valve position sensor connector • Poor contact in ECM connector • Poor contact in coupling connector • Poor contact in joint connector
7 CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between ECM connector and tumble generator valve position sensor connector. Connector & terminal (B134) No. 26 — (E54) No. 3:	Is the resistance less than 1 Ω ?	Go to step 8.	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between tumble generator valve position sensor and ECM connector • Poor contact in ECM connector • Poor contact in tumble generator valve position sensor connector • Poor contact in coupling connector
8 CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR. Measure the resistance of harness between tumble generator valve position sensor connector and engine ground. Connector & terminal (E54) No. 3 — Engine ground:	Is the resistance more than 1 M Ω ?	Go to step 9.	Repair the ground short circuit in harness between tumble generator valve position sensor and ECM connector.
9 CHECK POOR CONTACT. Check poor contact in tumble generator valve position sensor connector.	Is there poor contact in tumble generator valve position sensor connector?	Repair the poor contact in tumble generator valve position sensor connector.	Replace the tumble generator valve position sensor. <Ref. to FU(H4DOTC)-38, Tumble Generator Valve Position Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

DS:DTC P2017 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT HIGH (BANK 1)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-219, DTC P2017 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT HIGH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

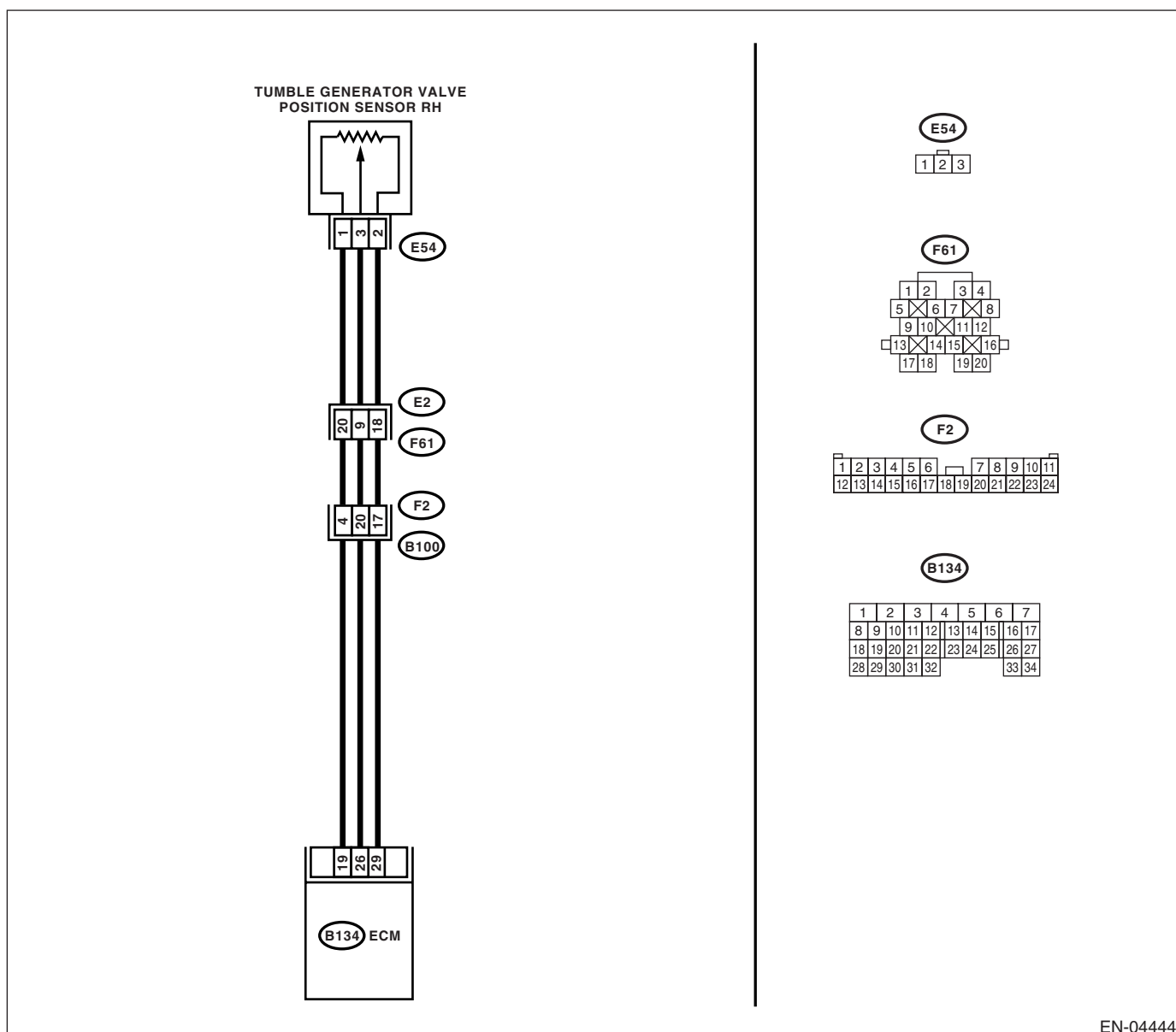
TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04444

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 tumble generator valve position sensor signal using Subaru Select Monitor or general scan tool. NOTE: - Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> - General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the voltage more than 4.9 V?	Go to step 2.	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following: - Poor contact in tumble generator valve position sensor connector - Poor contact in ECM connector - Poor contact in coupling connector
2 CHECK HARNESS BETWEEN TUMBLE GENERATOR VALVE POSITION SENSOR AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from tumble generator valve position sensor. 3) Measure the resistance of harness between tumble generator valve position sensor connector and engine ground. Connector & terminal (E54) No. 2 — Engine ground:	Is the resistance less than 5 Ω ?	Go to step 3.	Repair the harness and connector. NOTE: In this case, repair the following: - Open circuit in harness between tumble generator valve position sensor and ECM connector - Poor contact in coupling connector - Poor contact in joint connector
3 CHECK HARNESS BETWEEN TUMBLE GENERATOR VALVE POSITION SENSOR AND ECM CONNECTOR. 1) Turn the ignition switch to ON. 2) Measure the voltage between tumble generator valve position sensor connector and engine ground. Connector & terminal (E54) No. 3 (+) — Engine ground (-):	Is the voltage more than 4.9 V?	Repair the battery short circuit in harness between tumble generator valve position sensor and ECM connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>	Replace the tumble generator valve position sensor. <Ref. to FU(H4DOTC)-38, Tumble Generator Valve Position Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

DT:DTC P2021 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT LOW (BANK 2)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-221, DTC P2021 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT LOW (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

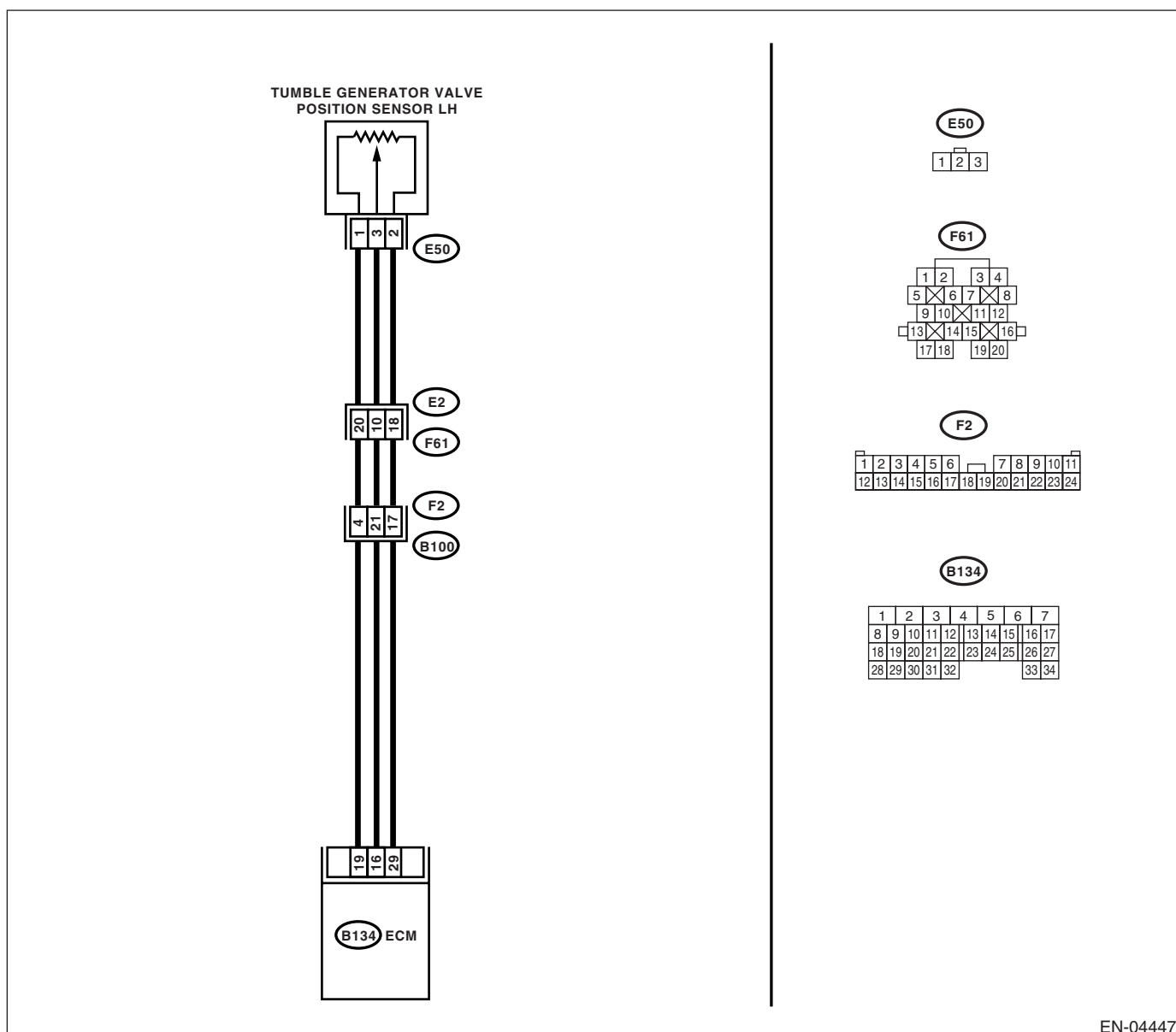
TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04447

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 tumble generator valve position sensor signal using Subaru Select Monitor or general scan tool. NOTE: - Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> - General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the voltage less than 0.1 V?	Go to step 2.	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following: - Poor contact in tumble generator valve position sensor connector - Poor contact in ECM connector - Poor contact in coupling connector
2 CHECK INPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B134) No. 19 (+) — 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. 19 (+) — Chassis ground (-):	Shake the ECM harness and connector, while monitoring value of voltage meter. Does the voltage change?	Repair the poor contact in ECM connector.	Contact your SOA Service Center since deterioration of some parts may be the cause.
4 CHECK INPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B134) No. 16 (+) — 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.	Shake the ECM harness and connector, while monitoring value of Subaru Select Monitor. Does the voltage change?	Repair the poor contact in ECM connector.	Go to step 6.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
6 CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR. 1) Turn 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. Connector & terminal (E50) No. 1 (+) — 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 tumble generator valve position sensor and ECM connector • Poor contact in tumble generator valve position sensor connector • Poor contact in ECM connector • Poor contact in coupling connector • Poor contact in joint connector
7 CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between ECM connector and tumble generator valve position sensor connector. Connector & terminal (B134) No. 16 — (E50) No. 3:	Is the resistance less than 1 Ω ?	Go to step 8.	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between tumble generator valve position sensor and ECM connector • Poor contact in ECM connector • Poor contact in tumble generator valve position sensor connector • Poor contact in coupling connector
8 CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR. Measure the resistance of harness between tumble generator valve position sensor connector and engine ground. Connector & terminal (E50) No. 3 — Engine ground:	Is the resistance more than 1 M Ω ?	Go to step 9.	Repair the ground short circuit in harness between tumble generator valve position sensor and ECM connector.
9 CHECK POOR CONTACT. Check poor contact in tumble generator valve position sensor connector.	Is there poor contact in tumble generator valve position sensor connector?	Repair the poor contact in tumble generator valve position sensor connector.	Replace the tumble generator valve position sensor. <Ref. to FU(H4DOTC)-38, Tumble Generator Valve Position Sensor.>

DU:DTC P2022 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT HIGH (BANK 2)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-223, DTC P2022 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT HIGH (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

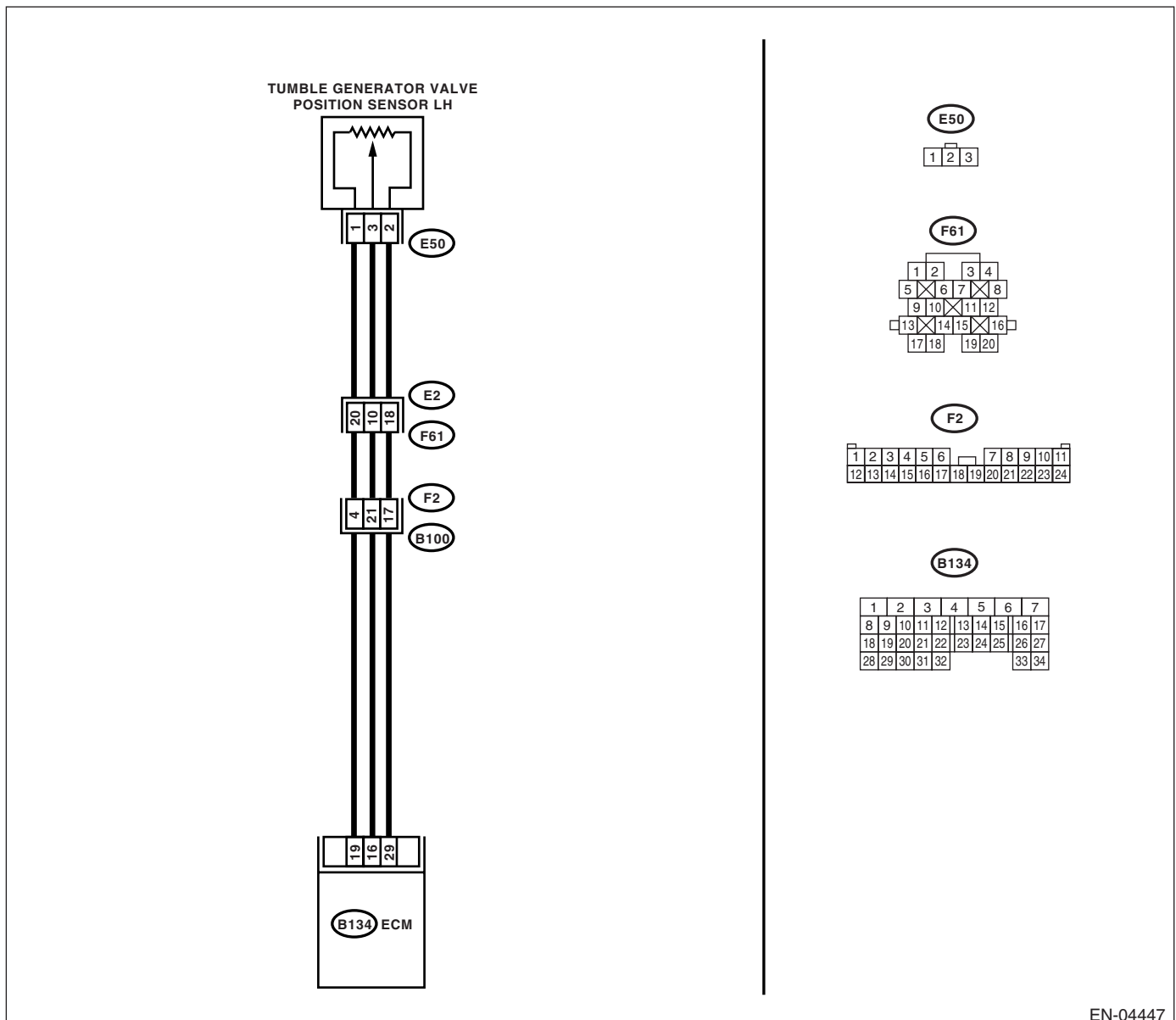
TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04447

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 tumble generator valve position sensor signal using Subaru Select Monitor or general scan tool. NOTE: - Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> - General scan tool For detailed operation procedures, refer to the General Scan Tool Instruction Manual.	Is the voltage more than 4.9 V?	Go to step 2.	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following: - Poor contact in tumble generator valve position sensor connector - Poor contact in ECM connector - Poor contact in coupling connector
2 CHECK HARNESS BETWEEN TUMBLE GENERATOR VALVE POSITION SENSOR AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from tumble generator valve position sensor. 3) Measure the resistance of harness between tumble generator valve position sensor connector and engine ground. Connector & terminal (E50) No. 2 — Engine ground:	Is the resistance less than 5 Ω ?	Go to step 3.	Repair the harness and connector. NOTE: In this case, repair the following: - Open circuit in harness between tumble generator valve position sensor and ECM connector - Poor contact in coupling connector - Poor contact in joint connector
3 CHECK HARNESS BETWEEN TUMBLE GENERATOR VALVE POSITION SENSOR AND ECM CONNECTOR. 1) Turn the ignition switch to ON. 2) Measure the voltage between tumble generator valve position sensor connector and engine ground. Connector & terminal (E50) No. 3 (+) — Engine ground (-):	Is the voltage more than 4.9 V?	Repair the battery short circuit in harness between tumble generator valve position sensor and ECM connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>	Replace the tumble generator valve position sensor. <Ref. to FU(H4DOTC)-38, Tumble Generator Valve Position Sensor.>

DV:DTC P2088 OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 1)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-225, DTC P2088 OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

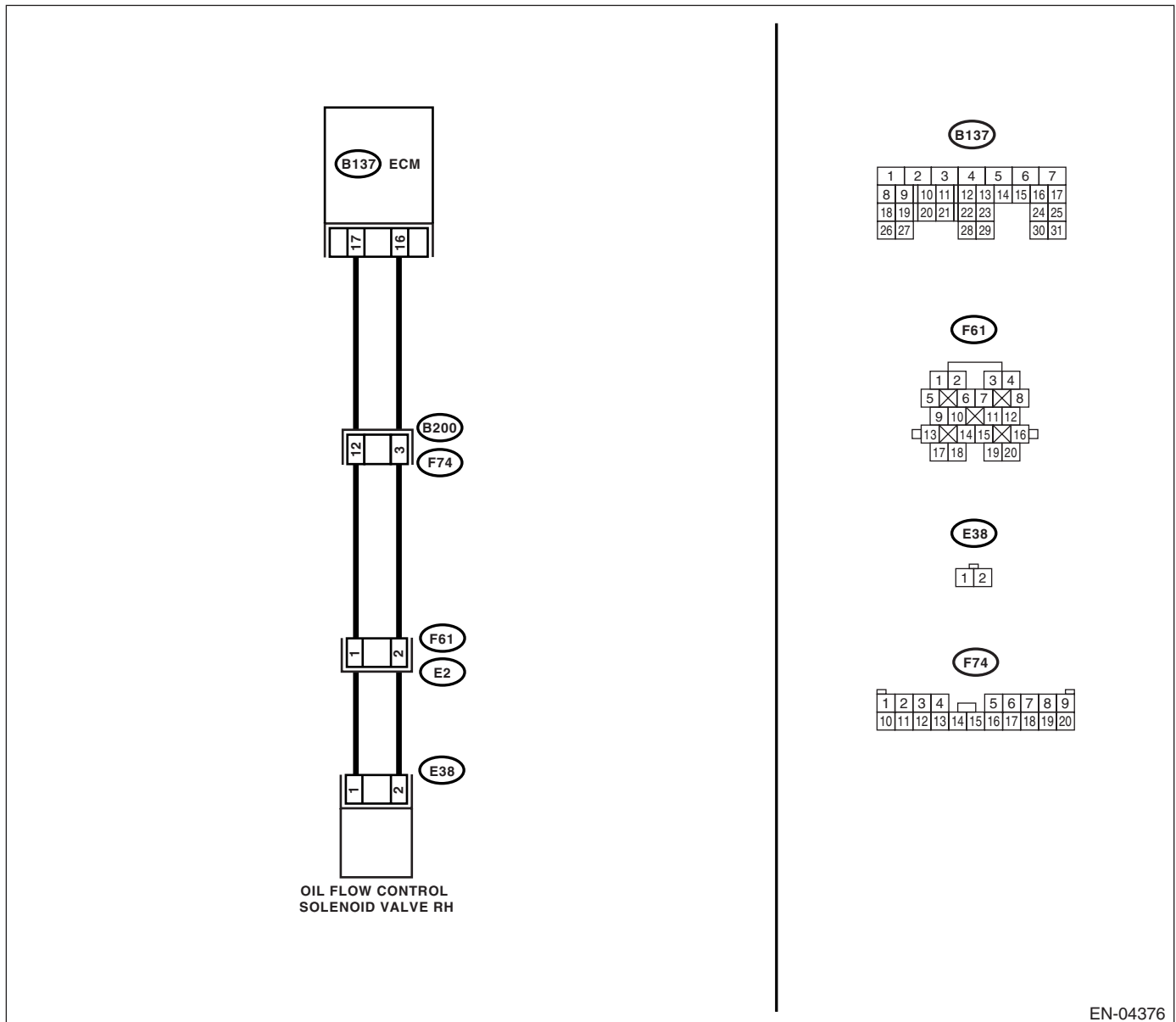
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04376

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and oil flow control solenoid valve. 3) Measure the resistance between ECM and oil flow control solenoid valve. Connector & terminal (B137) No. 17 — (E38) No. 1: (B137) No. 16 — (E38) No. 2:	Is the resistance less than 1 Ω ?	Go to step 2.	Repair the open circuit in harness between ECM and oil flow control solenoid valve connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and oil flow control solenoid valve connector • Poor contact in coupling connector.
2 CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE. Measure the resistance between ECM and oil flow control solenoid valve. Connector & terminal (E38) No. 1 — Engine ground: (E38) No. 2 — Engine ground:	Is the resistance more than 1 M Ω ?	Go to step 3.	Repair the short circuit between ECM and oil flow control solenoid valve connector.
3 CHECK OIL FLOW CONTROL SOLENOID VALVE. 1) Remove the oil flow control solenoid valve. 2) Measure the resistance between oil flow control solenoid valve terminal. Terminals No. 1 — No. 2:	Is the resistance 6 — 12 Ω ?	Repair the poor contact in ECM and oil flow control solenoid valve.	Replace the oil flow control solenoid valve. <Ref. to ME(H4DOTC)-55, Camshaft.>

DW:DTC P2089 OCV SOLENOID VALVE SIGNAL A CIRCUIT SHORT (BANK 1)**DTC DETECTING CONDITION:**

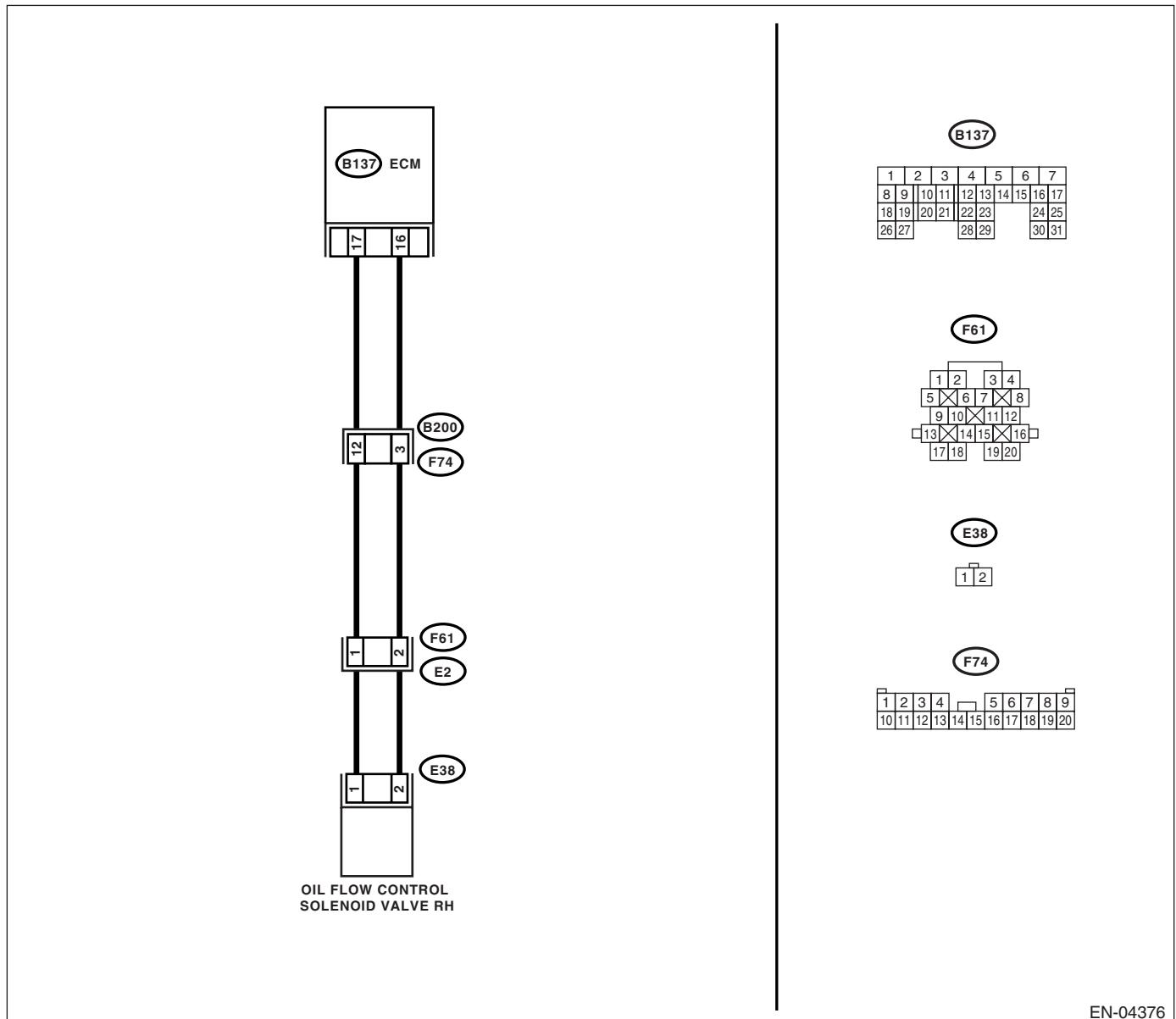
- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-227, DTC P2089 OCV SOLENOID VALVE SIGNAL A CIRCUIT SHORT (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and oil flow control solenoid valve. 3) Measure the resistance between ECM and oil flow control solenoid valve. Connector & terminal (B137) No. 17 — (E38) No. 1: (B137) No. 16 — (E38) No. 2:	Is the resistance less than 1 Ω ?	Go to step 2.	Repair the open circuit in harness between ECM and oil flow control solenoid valve connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and oil flow control solenoid valve connector • Poor contact in coupling connector.
2 CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and oil flow control solenoid valve. 3) Measure the resistance between ECM and oil flow control solenoid valve. Connector & terminal (E38) No. 1 — Engine ground: (E38) No. 2 — Engine ground:	Is the resistance more than 1 M Ω ?	Go to step 3.	Repair the short circuit between ECM and oil flow control solenoid valve connector.
3 CHECK OIL FLOW CONTROL SOLENOID VALVE. 1) Remove the oil flow control solenoid valve. 2) Measure the resistance between oil flow control solenoid valve terminal. Terminals No. 1 — No. 2:	Is the resistance 6 — 12 Ω ?	Repair the poor contact in ECM and oil flow control solenoid valve.	Replace the oil flow control solenoid valve. <Ref. to ME(H4DOTC)-55, Camshaft.>

DX:DTC P2092 OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 2)**DTC DETECTING CONDITION:**

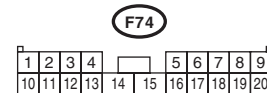
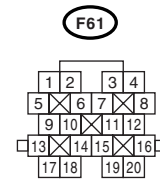
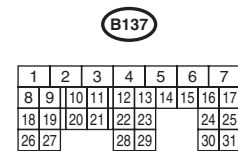
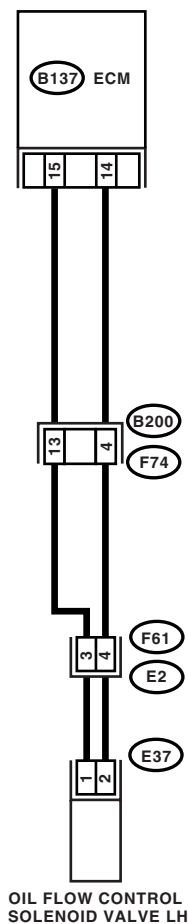
- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-229, DTC P2092 OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:

EN-04377

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and oil flow control solenoid valve. 3) Measure the resistance between ECM and oil flow control solenoid valve. Connector & terminal (B137) No. 15 — (E37) No. 1: (B137) No. 14 — (E37) No. 2:	Is the resistance less than 1 Ω ?	Go to step 2.	Repair the open circuit in harness between ECM and oil flow control solenoid valve connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and oil flow control solenoid valve connector • Poor contact in coupling connector.
2 CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE. Measure the resistance between ECM and oil flow control solenoid valve. Connector & terminal (E37) No. 1 — Engine ground: (E37) No. 2 — Engine ground:	Is the resistance more than 1 M Ω ?	Go to step 3.	Repair the short circuit between ECM and oil flow control solenoid valve connector.
3 CHECK OIL FLOW CONTROL SOLENOID VALVE. 1) Remove the oil flow control solenoid valve. 2) Measure the resistance between oil flow control solenoid valve terminal. Terminals No. 1 — No. 2:	Is the resistance 6 — 12 Ω ?	Repair the poor contact in ECM and oil flow control solenoid valve.	Replace the oil flow control solenoid valve. <Ref. to ME(H4DOTC)-55, Camshaft.>

DY:DTC P2093 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 2)**DTC DETECTING CONDITION:**

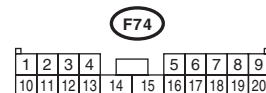
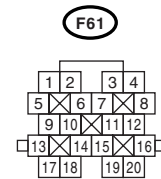
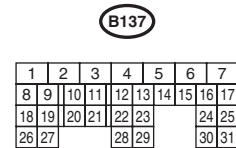
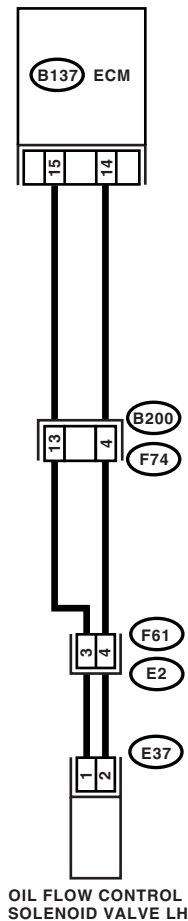
- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-231, DTC P2093 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:

EN-04377

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and oil flow control solenoid valve. 3) Measure the resistance between ECM and oil flow control solenoid valve. Connector & terminal (B137) No. 15 — (E37) No. 1: (B137) No. 14 — (E37) No. 2:	Is the resistance less than 1 Ω ?	Go to step 2.	Repair the open circuit in harness between ECM and oil flow control solenoid valve connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and oil flow control solenoid valve connector • Poor contact in coupling connector.
2 CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and oil flow control solenoid valve. 3) Measure the resistance between ECM and oil flow control solenoid valve. Connector & terminal (E37) No. 1 — Engine ground: (E37) No. 2 — Engine ground:	Is the resistance more than 1 M Ω ?	Go to step 3.	Repair the short circuit between ECM and oil flow control solenoid valve connector.
3 CHECK OIL FLOW CONTROL SOLENOID VALVE. 1) Remove the oil flow control solenoid valve. 2) Measure the resistance between oil flow control solenoid valve terminal. Terminals No. 1 — No. 2:	Is the resistance 6 — 12 Ω ?	Repair the poor contact in ECM and oil flow control solenoid valve.	Replace the oil flow control solenoid valve. <Ref. to ME(H4DOTC)-55, Camshaft.>

DZ:DTC P2096 POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1

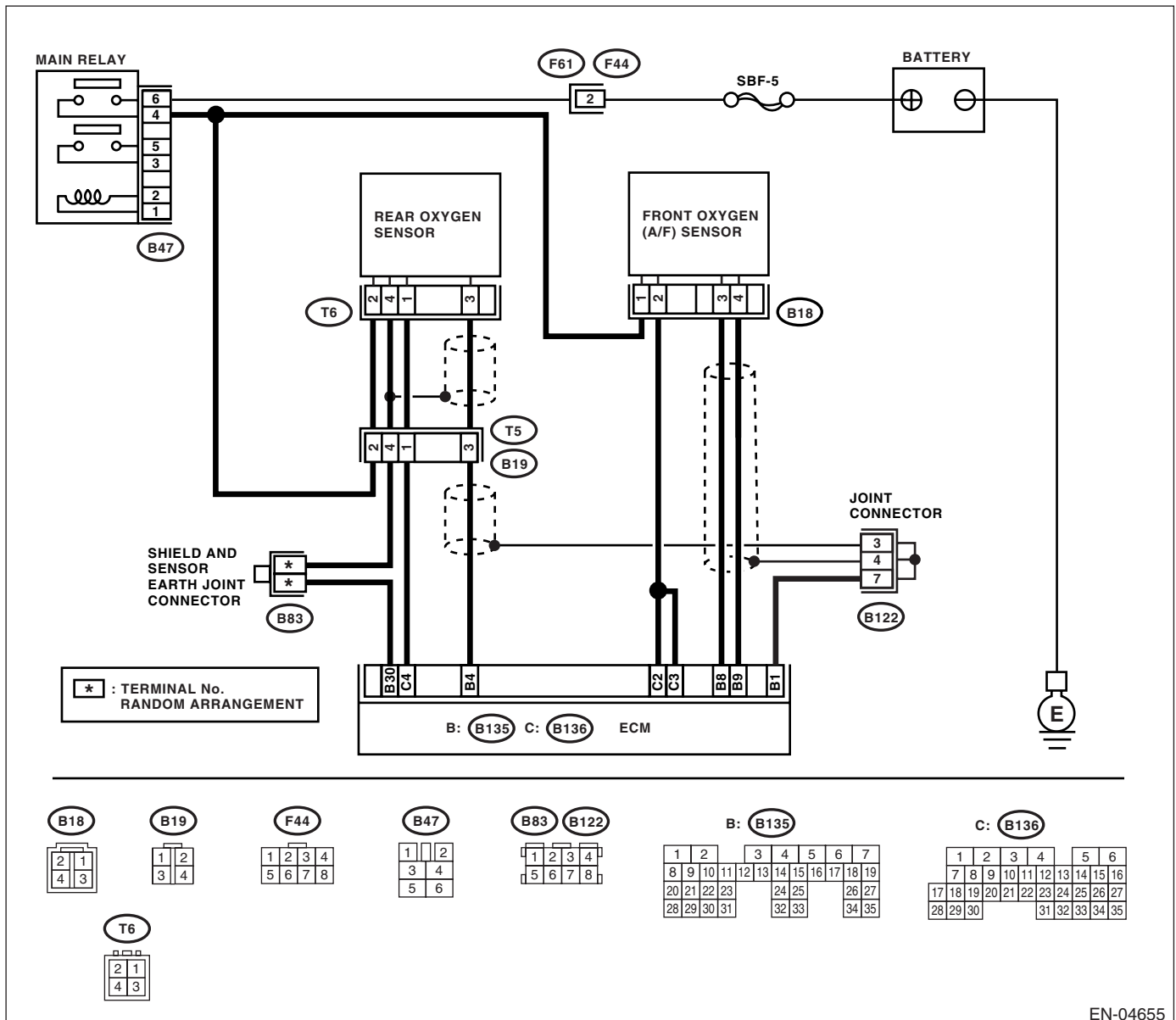
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-233, DTC P2096 POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04655

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK FOR ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P2096.	Go to step 2.
2 CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.	Is there water in connector?	Remove infiltrating water completely.	Go to step 3.
3 CHECK HARNESS BETWEEN ECM AND REAR OXYGEN (A/F) SENSOR CONNECTOR. 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. Connector & terminal (B315) No. 8 — (B18) No. 3: (B315) No. 9 — (B18) No. 4:	Is the measured value 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 ECM and front oxygen (A/F) sensor connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector
4 CHECK HARNESS BETWEEN ECM AND REAR OXYGEN (A/F) SENSOR CONNECTOR. Measure the resistance of harness between ECM connector and chassis ground. Connector & terminal (B315) No. 8 — Chassis ground: (B315) No. 9 — Chassis ground:	Is the measured value more than 1 M Ω ?	Go to step 5.	Repair the ground short circuit in harness between ECM and front oxygen (A/F) sensor connector.
5 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. Connector & terminal (B135) No. 8 (+) — Chassis ground (-):	Is the measured value more than 4.5 V?	Go to step 6.	Go to step 7.
6 CHECK OUTPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 8 (+) — Chassis ground (-):	Is the measured value 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(H4DOTC)-45, Engine Control Module (ECM).>	Repair the poor contact in ECM connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
7 CHECK OUTPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 9 (+) — Chassis ground (-):	Is the measured value more than 4.95 V?	Go to step 8.	Go to step 9.
8 CHECK OUTPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 9 (+) — Chassis ground (-):	Is the measured value 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(H4DOTC)-45, Engine Control Module (ECM).>	Repair the poor contact in ECM connector.
9 CHECK EXHAUST SYSTEM.	Are there holes or loose bolts on exhaust system?	Repair the exhaust system.	Go to step 10.
10 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 11.
11 CHECK FUEL PRESSURE. Warning: - Place “NO FIRE” signs near the working area. - Be careful not to spill fuel on the floor. Measure the fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold. <Ref. to ME(H4DOTC)-28, INSPECTION, Fuel Pressure.> 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 measured value 284 — 314 kPa (2.9 — 3.2 kgf/cm ² , 41 — 46 psi)?	Go to step 12.	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
12 CHECK FUEL PRESSURE. After connecting the pressure regulator vacuum hose, measure fuel pressure. <Ref. to ME(H4DOTC)-28, INSPECTION, Fuel Pressure.> 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. - If out of specification as measured at this step, check or replace the pressure regulator and pressure regulator vacuum hose.	Is the measured value 230 — 260 kPa (2.35 — 2.65 kgf/cm ² , 33 — 38 psi)?	Go to step 13.	Repair the following items. Fuel pressure too high: - Faulty pressure regulator - Clogged fuel return line or bent hose Fuel pressure too low: - Faulty pressure regulator - Improper fuel pump discharge - Clogged fuel supply line

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
13 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 general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool instruction manual.	Is the temperature more than 60°C (140°F)?	Go to step 14.	Replace the engine coolant temperature sensor. <Ref. to FU(H4DOTC)-27, Engine Coolant Temperature Sensor.>
14 CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE. 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 mass air flow and intake air temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool instruction manual.	Is the measured value 2.7 — 4.7 g/s (0.36 — 0.62 lb/m)?	Go to step 15.	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-31, Mass Air Flow and Intake Air Temperature Sensor.>
15 CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR. 1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F). 2) Place the shift lever in neutral position. 3) Turn the A/C switch to OFF. 4) Turn all accessory switches to OFF. 5) Open the front hood. 6) Measure the ambient temperature. 7) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool instruction manual.	Subtract ambient temperature from intake air temperature. Is the obtained value -10 — 50°C (-18 — 90°F)?	Go to step 16.	Check the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-31, Mass Air Flow and Intake Air Temperature Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
16 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 3,000 rpm. (2 minutes at the longest) 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: - For MT model, depress the clutch pedal. - Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> - General scan tool For detailed operation procedure, refer to the general scan tool instruction manual.	Is the measured value more than 490 mV?	Go to step 17.	Go to step 18.
17 CHECK REAR OXYGEN SENSOR DATA. 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and immediately decrease the engine speed from 3,000 rpm. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: - For MT model, depress the clutch pedal. - Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> - General scan tool For detailed operation procedure, refer to the general scan tool instruction manual.	Is the measured value less than 250 mV?	Go to step 19.	Go to step 18.
18 CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.	Is there water in connector?	Remove infiltrating water completely.	Go to step 20.
19 CHECK FRONT OXYGEN (A/F) SENSOR AND REAR OXYGEN SENSOR DATA. 1) Warm-up the engine until the engine coolant temperature exceeds 70°C (158°F), and leave it at idle for more than 5 minutes. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or 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(H4DOTC)(diag)-31, Subaru Select Monitor.> - General scan tool For detailed operation procedure, refer to the general scan tool instruction manual.	Does the voltage keep 0.8 V for more than 5 minutes?	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-41, Front Oxygen (A/F) Sensor.>	Go to step 20.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
20 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. <i>Connector & terminal</i> <i>(B135) No. 4 — (T6) No. 3:</i> <i>(B135) No. 30 — (T6) No. 4:</i>	Is the measured value more than 3 Ω?	Repair open circuit in harness between ECM and rear oxygen sensor connector.	Go to step 21.
21 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. <i>Connector & terminal</i> <i>(T6) No. 3 (+) — Engine ground (-):</i>	Is the measured value within 0.2 to 0.5 V?	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-43, Rear Oxygen Sensor.>	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor connector • Poor contact in ECM connector

EA:DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1

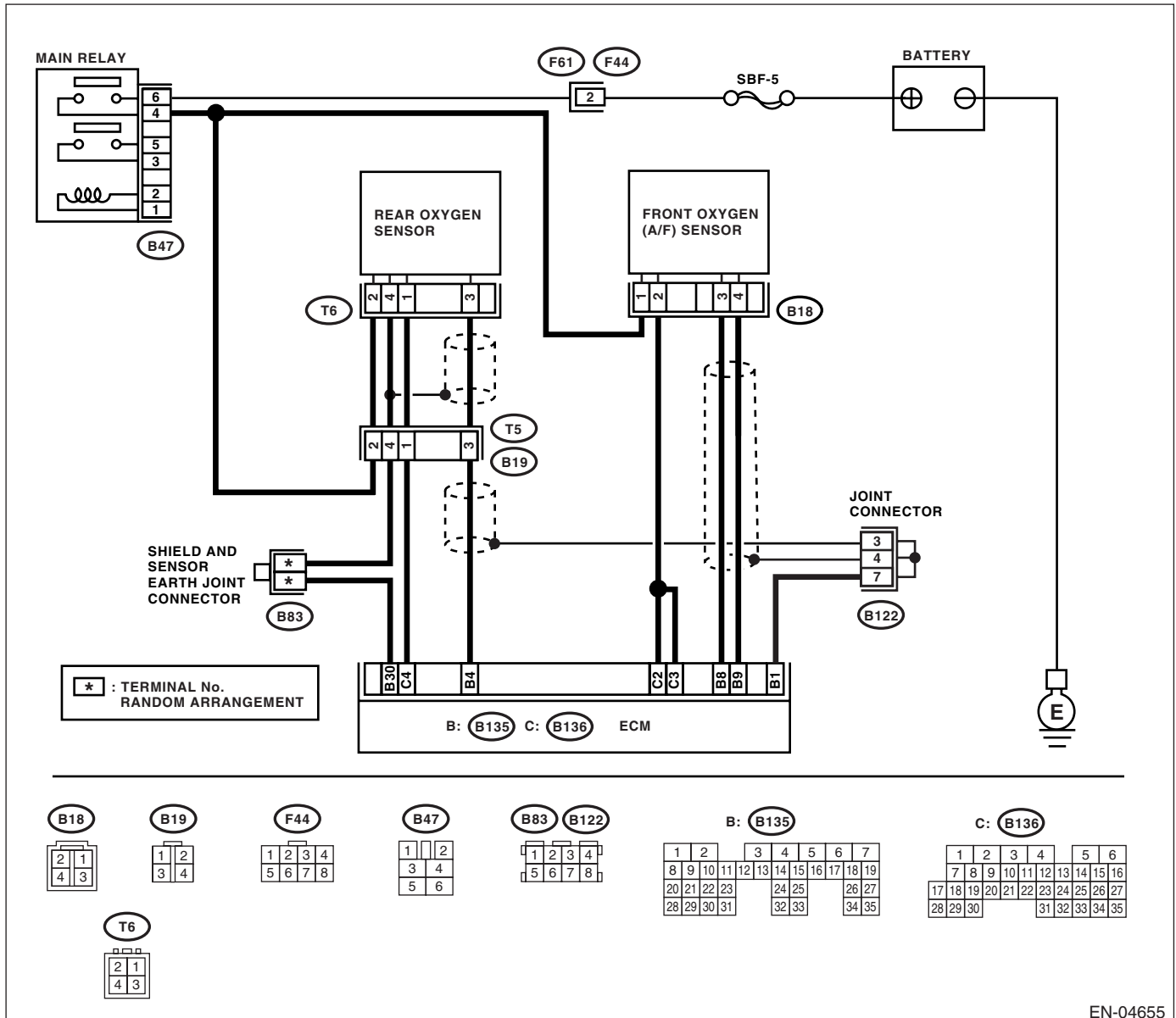
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-235, DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04655

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK FOR ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P2097.	Go to step 2.
2 CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.	Is there water in connector?	Remove infiltrating water completely.	Go to step 3.
3 CHECK HARNESS BETWEEN ECM AND REAR OXYGEN (A/F) SENSOR CONNECTOR. 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. Connector & terminal (B315) No. 8 — (B18) No. 3: (B315) No. 9 — (B18) No. 4:	Is the measured value 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 ECM and front oxygen (A/F) sensor connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector
4 CHECK HARNESS BETWEEN ECM AND REAR OXYGEN (A/F) SENSOR CONNECTOR. Measure the resistance of harness between ECM connector and chassis ground. Connector & terminal (B315) No. 8 — Chassis ground: (B315) No. 9 — Chassis ground:	Is the measured value more than 1 M Ω ?	Go to step 5.	Repair the ground short circuit in harness between ECM and front oxygen (A/F) sensor connector.
5 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. Connector & terminal (B135) No. 8 (+) — Chassis ground (-):	Is the measured value more than 4.5 V?	Go to step 6.	Go to step 7.
6 CHECK OUTPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 8 (+) — Chassis ground (-):	Is the measured value 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(H4DOTC)-45, Engine Control Module (ECM).>	Repair the poor contact in ECM connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
7 CHECK OUTPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 9 (+) — Chassis ground (-):	Is the measured value more than 4.95 V?	Go to step 8.	Go to step 9.
8 CHECK OUTPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 9 (+) — Chassis ground (-):	Is the measured value 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(H4DOTC)-45, Engine Control Module (ECM).>	Repair the poor contact in ECM connector.
9 CHECK EXHAUST SYSTEM.	Are there holes or loose bolts on exhaust system?	Repair the exhaust system.	Go to step 10.
10 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 11.
11 CHECK FUEL PRESSURE. Warning: - Place “NO FIRE” signs near the working area. - Be careful not to spill fuel on the floor. Measure the fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold. <Ref. to ME(H4DOTC)-28, INSPECTION, Fuel Pressure.> 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 measured value 284 — 314 kPa (2.9 — 3.2 kgf/cm ² , 41 — 46 psi)?	Go to step 12.	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
12 CHECK FUEL PRESSURE. After connecting the pressure regulator vacuum hose, measure fuel pressure. <Ref. to ME(H4DOTC)-28, INSPECTION, Fuel Pressure.> 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. - If out of specification as measured at this step, check or replace the pressure regulator and pressure regulator vacuum hose.	Is the measured value 230 — 260 kPa (2.35 — 2.65 kgf/cm ² , 33 — 38 psi)?	Go to step 13.	Repair the following items. Fuel pressure too high: - Faulty pressure regulator - Clogged fuel return line or bent hose Fuel pressure too low: - Faulty pressure regulator - Improper fuel pump discharge - Clogged fuel supply line

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
13 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 general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool instruction manual.	Is the temperature more than 60°C (140°F)?	Go to step 14.	Replace the engine coolant temperature sensor. <Ref. to FU(H4DOTC)-27, Engine Coolant Temperature Sensor.>
14 CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE. 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 mass air flow and intake air temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool instruction manual.	Is the measured value 2.7 — 4.7 g/s (0.36 — 0.62 lb/m)?	Go to step 15.	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-31, Mass Air Flow and Intake Air Temperature Sensor.>
15 CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR. 1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F). 2) Place the shift lever in neutral position. 3) Turn the A/C switch to OFF. 4) Turn all accessory switches to OFF. 5) Open the front hood. 6) Measure the ambient temperature. 7) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool instruction manual.	Subtract ambient temperature from intake air temperature. Is the obtained value -10 — 50°C (-18 — 90°F)?	Go to step 16.	Check the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-31, Mass Air Flow and Intake Air Temperature Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
16 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 3,000 rpm. (2 minutes at the longest) 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: - For MT model, depress the clutch pedal. - Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> - General scan tool For detailed operation procedure, refer to the general scan tool instruction manual.	Is the measured value more than 490 mV?	Go to step 17.	Go to step 18.
17 CHECK REAR OXYGEN SENSOR DATA. 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and immediately decrease the engine speed from 3,000 rpm. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: - For MT model, depress the clutch pedal. - Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.> - General scan tool For detailed operation procedure, refer to the general scan tool instruction manual.	Is the measured value less than 250 mV?	Go to step 19.	Go to step 18.
18 CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.	Is there water in connector?	Remove infiltrating water completely.	Go to step 20.
19 CHECK FRONT OXYGEN (A/F) SENSOR AND REAR OXYGEN SENSOR DATA. 1) Warm-up the engine until the engine coolant temperature exceeds 70°C (158°F), and leave it at idle for more than 5 minutes. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or 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(H4DOTC)(diag)-31, Subaru Select Monitor.> - General scan tool For detailed operation procedure, refer to the general scan tool instruction manual.	Does the voltage keep 0.8 V for more than 5 minutes?	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-41, Front Oxygen (A/F) Sensor.>	Go to step 20.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
20 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. <i>Connector & terminal</i> <i>(B135) No. 4 — (T6) No. 3:</i> <i>(B135) No. 30 — (T6) No. 4:</i>	Is the measured value more than 3 Ω ?	Repair open circuit in harness between ECM and rear oxygen sensor connector.	Go to step 21.
21 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. <i>Connector & terminal</i> <i>(T6) No. 3 (+) — Engine ground (-):</i>	Is the measured value within 0.2 to 0.5 V?	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-43, Rear Oxygen Sensor.>	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor connector • Poor contact in ECM connector

EB:DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-177, DTC P0638 THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.> <Ref. to GD(H4DOTC)-190, DTC P1160 RETURN SPRING FAILURE, Diagnostic Trouble Code (DTC) Detecting Criteria.> <Ref. to GD(H4DOTC)-237, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance
- Engine stalls.

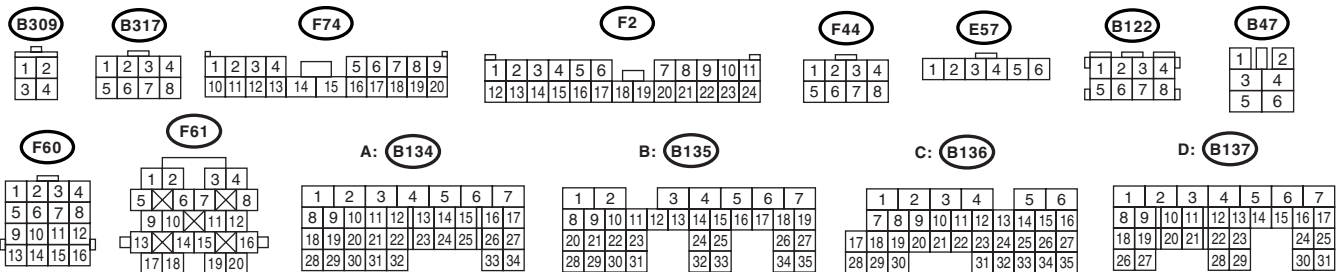
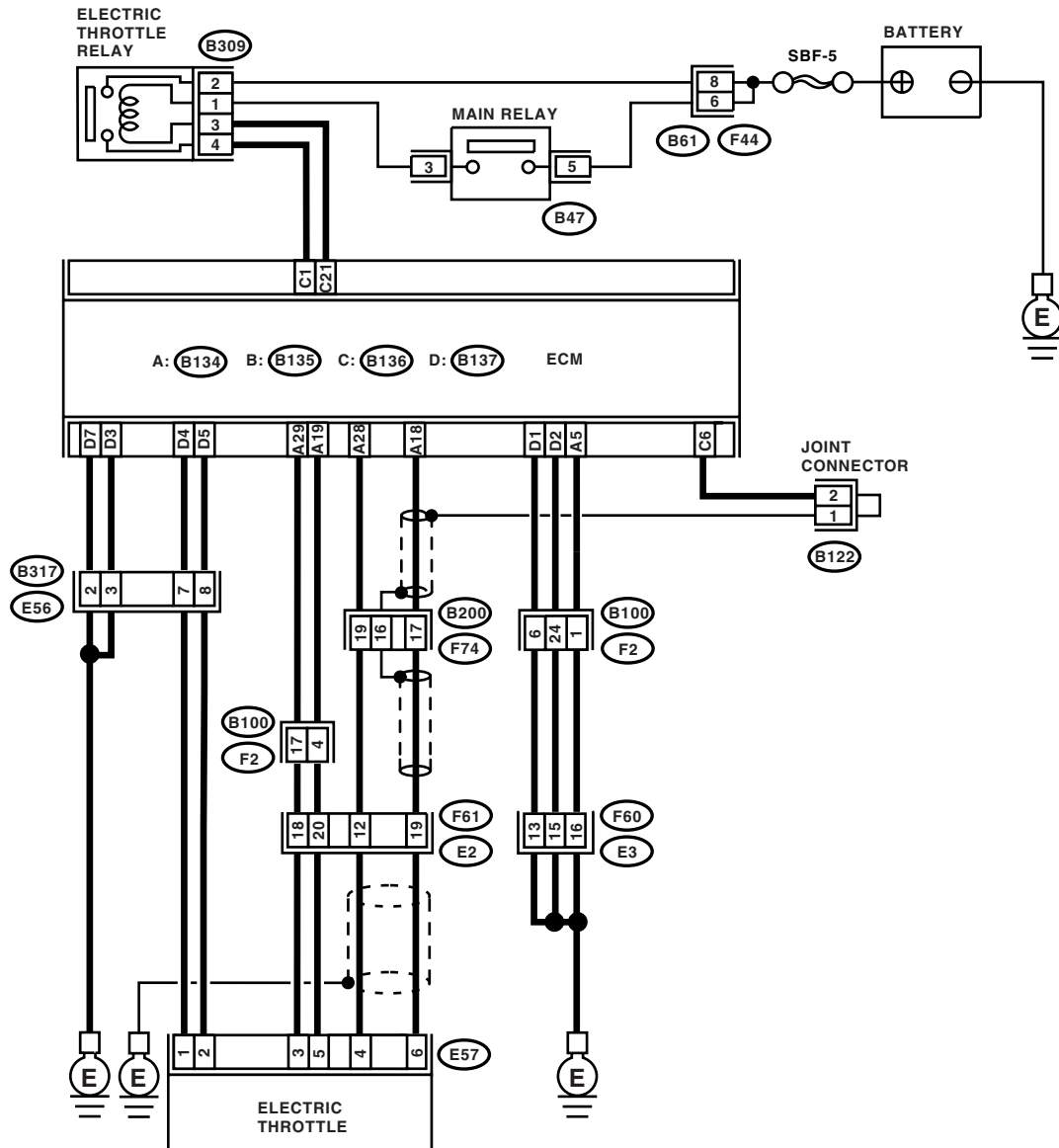
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-04706

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ELECTRONIC THROTTLE CONTROL RELAY. 1) Turn the ignition switch to OFF. 2) Remove the electronic throttle control relay. 3) Connect the battery to electronic throttle control relay terminal No. 1 and No. 3. 4) Measure the resistance between electronic throttle control relay terminals. <i>Terminals</i> <i>No. 2 — No. 4:</i>	Is the resistance less than 1 Ω ?	Go to step 2.	Replace the electronic throttle control relay.
2 CHECK POWER SUPPLY TO ELECTRONIC THROTTLE CONTROL RELAY. 1) Turn the ignition switch to ON. 2) Measure the voltage between electronic throttle control relay connector and engine ground. <i>Connector & terminal</i> <i>(B309) No. 1 (+) — Engine ground (-):</i> <i>(B309) No. 2 (+) — Engine ground (-):</i>	Is the voltage more than 10 V?	Go to step 3.	Repair the open power supply circuit or ground short.
3 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Turn the ignition switch to ON. 4) Measure the voltage between electronic throttle control relay connector and engine ground. <i>Connector & terminal</i> <i>(B309) No. 3 (+) — Engine ground (-):</i>	Is the voltage less than 5 V?	Repair the ground short of harness between ECM and electronic throttle control.	Go to step 4.
4 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to OFF. 2) Measure the resistance between electronic throttle control relay connector and chassis ground. <i>Connector & terminal</i> <i>(B309) No. 3 — Engine ground:</i> <i>(B309) No. 4 — Engine ground:</i>	Is the resistance more than 1 M Ω ?	Go to step 5.	Repair the ground short of harness between ECM and electronic throttle control relay.
5 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY. 1) Turn the ignition switch to OFF. 2) Measure the resistance between electronic throttle control connector and electronic throttle control relay connector. <i>Connector & terminal</i> <i>(B136) No. 1 — (B309) No. 4:</i> <i>(B136) No. 21 — (B309) No. 3:</i>	Is the resistance less than 1 Ω ?	Go to step 6.	Repair the open circuit of harness between ECM and electronic throttle control relay.
6 CHECK OUTPUT VOLTAGE OF SENSOR. 1) Connect all the connectors. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM connector terminals. <i>Connector & terminal</i> <i>(B134) No. 18 (+) — (B134) No. 29 (-):</i> 4) Shake the ECM harness and connector, engine harness connectors (B134, F61), electronic throttle control connector harness while monitoring value of voltage meter.	Is the voltage more than 0.4 V?	Go to step 7.	Go to step 9.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
7 CHECK OUTPUT VOLTAGE OF SENSOR. 1) Connect all the connectors. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM connector terminals. Connector & terminal (B134) No. 28 (+) — (B134) No. 29 (-): 4) Shake the ECM harness and connector, engine harness connectors, electronic throttle control connector harness while monitoring value of voltage meter.	Is the voltage more than 0.8 V?	Go to step 8.	Go to step 9.
8 CHECK POOR CONTACT. Check poor contact between ECM connector and electronic throttle control connector.	Is there poor contact between ECM connector and electronic throttle control connector?	Repair the poor contact.	Go to step 13.
9 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from electronic throttle control. 4) Measure the resistance between ECM connector and electronic throttle control connector. Connector & terminal (B134) No. 19 — (E57) No. 5:	Is the resistance less than 1 Ω ?	Go to step 10.	Repair the open harness connector.
10 CHECK THE HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. Measure the resistance between ECM connector and chassis ground. Connector & terminal (B134) No. 19 — Chassis ground: (B134) No. 18 — Chassis ground: (B134) No. 28 — Chassis ground:	Is the resistance more than 1 M Ω ?	Go to step 11.	Repair the ground short of harness.
11 CHECK POWER SUPPLY TO SENSOR. 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the resistance between electronic throttle control connector and engine ground. Connector & terminal (E57) No. 5 (+) — Engine ground (-): 4) Shake the ECM harness and connector, engine harness connectors, while monitoring value of voltage meter.	Is the voltage 4.5 — 5.5 V?	Go to step 12.	Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>
12 CHECK SHORT OF ECM. 1) Turn the ignition switch to OFF. 2) Measure the resistance between electronic throttle control connector and engine ground. Connector & terminal (E57) No. 4 — Engine ground: (E57) No. 6 — Engine ground:	Is the resistance more than 10 Ω ?	Go to step 13.	Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
13 CHECK OUTPUT VOLTAGE OF SENSOR. 1) Connect all the connectors. 2) Turn the ignition switch to ON. 3) Read the data of main throttle sensor signal, using the Subaru Select Monitor. 4) Shake the ECM harness and connector, engine harness connectors, electronic throttle control connector harness while monitoring value of voltage meter.	Is the voltage 4.63 V?	Go to step 14.	Go to step 16.
14 CHECK OUTPUT VOLTAGE OF SENSOR. 1) Read the data of sub throttle sensor signal, using the Subaru Select Monitor. 2) Shake the ECM harness and connector, engine harness connectors, electronic throttle control connector harness while monitoring value of voltage meter.	Is the voltage 4.73 V?	Go to step 15.	Go to step 16.
15 CHECK POOR CONTACT IN CONNECTORS. Check poor contact in connectors between ECM and electronic throttle control?	Is there poor contact in connectors between ECM and electronic throttle control?	Repair the poor contact in connectors.	Go to step 21.
16 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from electronic throttle control. 4) Measure the resistance between ECM connector and electronic throttle control connector. Connector & terminal (B134) No. 18 — (E57) No. 6: (B134) No. 28 — (E57) No. 4: (B134) No. 29 — (E57) No. 3:	Is the resistance less than 1 Ω ?	Go to step 17.	Repair the open harness connector.
17 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Connect the ECM connector. 2) Measure the resistance between electronic throttle control connector and engine ground. Connector & terminal (E57) No. 3 — Engine ground:	Is the resistance less than 5 Ω ?	Go to step 18.	Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>
18 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to ON. 2) Measure the voltage between electronic throttle control connector and engine ground. Connector & terminal (E57) No. 5 (+) — Engine ground (-): 3) Shake the ECM harness and connector, engine harness connectors, while monitoring value of voltage meter.	Is the voltage more than 10 V?	Go to step 19.	Repair the battery short of harness between ECM connector and electronic throttle control connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
19 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Measure the voltage between electronic throttle control connector and engine ground. Connector & terminal (E57) No. 6 (+) — Engine ground (-): (E57) No. 4 (+) — Engine ground (-): 2) Shake the ECM harness and connector, engine harness connectors, while monitoring value of voltage meter.	Is the voltage less than 10 V?	Go to step 20.	Repair the short of harness between ECM connector and electronic throttle control connector.
20 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to OFF. 2) Remove the ECM. 3) Measure the voltage between ECM connectors. Connector & terminal (B134) No. 18 — (B134) No. 29: (B134) No. 28 — (B134) No. 29:	Is the resistance more than 1 M Ω ?	Go to step 21.	Repair the short of sensor power supply.
21 CHECK OUTPUT VOLTAGE OF SENSOR. 1) Turn the ignition switch to OFF. 2) Connect all the connectors except electronic throttle control replay. 3) Turn the ignition switch to ON. 4) Read the data of main throttle sensor signals, using Subaru Select Monitor.	Is the voltage 0.81 — 0.87 V?	Go to step 22.	Repair the poor contact in electronic throttle control connector. If problem persists, replace the electronic throttle control.
22 CHECK OUTPUT VOLTAGE OF SENSOR. Read the data of sub throttle sensor signals, using Subaru Select Monitor.	Is the voltage 1.64 — 1.70 V?	Go to step 23.	Repair the poor contact in electronic throttle control connector. If problem persists, replace the electronic throttle control.
23 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL MOTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connectors from electronic throttle control. 4) Measure the resistance between ECM connector and electronic throttle control connector. Connector & terminal (B137) No. 4 — (E57) No. 1: (B137) No. 5 — (E57) No. 2:	Is the resistance less than 1 Ω ?	Go to step 24.	Repair the open harness connector.
24 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL MOTOR. 1) Connect the connectors to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control connector and engine ground. Connector & terminal (E57) No. 1 (+) — Engine ground (-): (E57) No. 2 (+) — Engine ground (-):	Is the voltage less than 5 V?	Go to step 25.	Repair the short of harness to power supply circuit between ECM and electronic throttle control.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
25 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL MOTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between electronic throttle control connector and engine ground. <i>Connector & terminal</i> <i>(E57) No. 1 — Engine ground:</i> <i>(E57) No. 2 — Engine ground:</i>	Is the resistance more than 1 MΩ?	Go to step 26.	Repair the short of harness.
26 CHECK ELECTRONIC THROTTLE CONTROL MOTOR HARNESS. Measure the resistance between electronic throttle control connector terminals. <i>Connector & terminal</i> <i>(E57) No. 2 — (E57) No. 1:</i>	Is the resistance more than 1 MΩ?	Go to step 27.	Repair the short of harness.
27 CHECK ELECTRONIC THROTTLE CONTROL GROUND CIRCUIT. Measure the resistance between ECM connector and engine ground. <i>Connector & terminal</i> <i>(B134) No. 5 — Engine ground:</i> <i>(B137) No. 1 — Engine ground:</i> <i>(B137) No. 2 — Engine ground:</i> <i>(B137) No. 3 — Engine ground:</i> <i>(B137) No. 7 — Engine ground:</i>	Is the resistance less than 10 Ω?	Go to step 28.	Repair the open circuit harness.
28 CHECK ELECTRONIC THROTTLE CONTROL. Measure the resistance between electronic throttle control terminals. <i>Terminals</i> <i>No. 1 — No. 2:</i>	Is the resistance less than 50 Ω?	Go to step 29.	Replace the electronic throttle control.
29 CHECK ELECTRONIC THROTTLE CONTROL. Move the throttle valve to the fully open and fully closed positions with fingers. Check the valve returns to the specified position when releasing fingers.	Does the valve return to the specified position? Standard value: 3 mm (0.12 in) from fully closed position	Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>	Replace the electronic throttle control.

EC:DTC P2102 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-239, DTC P2102 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance
- Engine stalls.

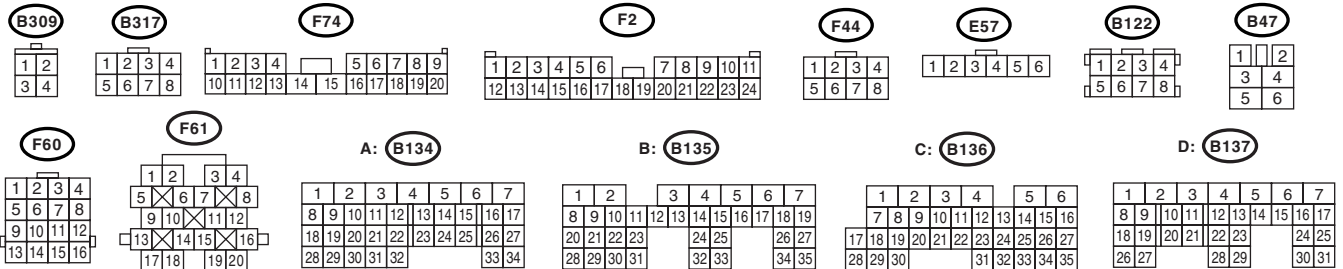
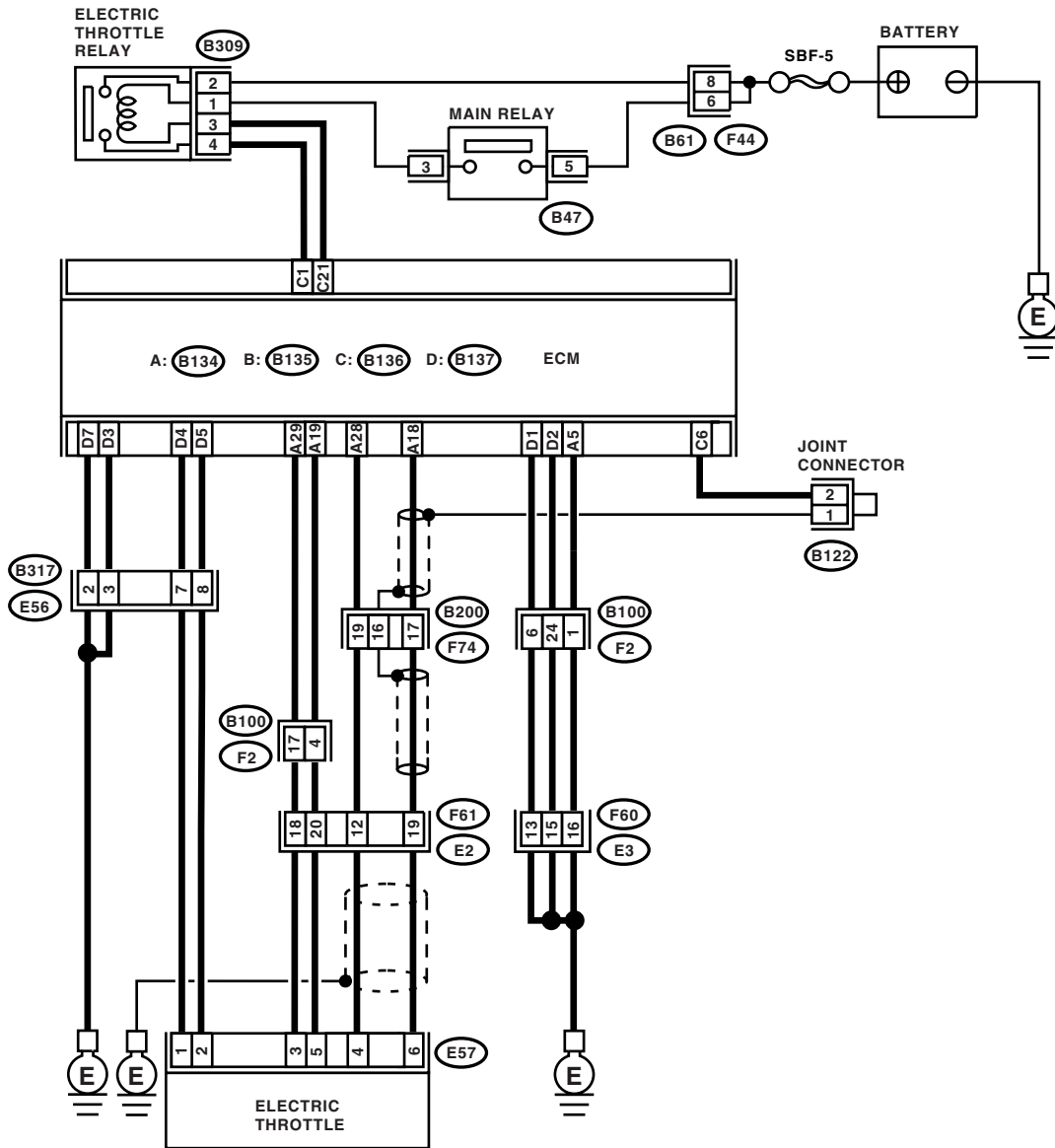
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-04706

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ELECTRONIC THROTTLE CONTROL RELAY. 1) Turn the ignition switch to OFF. 2) Remove the electronic throttle control relay. 3) Connect the battery to electronic throttle control relay terminal No. 1 and No. 3. 4) Measure the resistance between electronic throttle control relay terminals. Connector & terminal No. 2 — No. 4:	Is the resistance less than 1 Ω ?	Go to step 2.	Replace the electronic throttle control relay.
2 CHECK POWER TO ELECTRONIC THROTTLE CONTROL RELAY 1) Turn the ignition switch to ON. 2) Measure the voltage between electronic throttle control relay connector and engine ground. Connector & terminal (B309) No. 1 (+) — Engine ground (-): (B309) No. 2 (+) — Engine ground (-):	Is the voltage more than 10 V?	Go to step 3.	Repair the open power supply circuit or ground short.
3 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Turn the ignition switch to ON. 4) Measure the voltage between electronic throttle control relay connector and engine ground. Connector & terminal (B309) No. 3 (+) — Engine ground (-):	Is the voltage less than 5 V?	Repair the ground short of harness between ECM and electronic throttle control relay.	Go to step 4.
4 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY. 1) Turn the ignition switch to OFF. 2) Measure the resistance between electronic throttle control relay connector and chassis ground. Connector & terminal (B309) No. 3 — Engine ground: (B309) No. 4 — Engine ground:	Is the resistance more than 1 M Ω ?	Go to step 5.	Repair the ground short of harness between ECM and electronic throttle control relay.
5 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY. Measure the resistance between ECM connector and electronic throttle control relay connector. Connector & terminal (B136) No. 21 — (B309) No. 3: (B136) No. 1 — (B309) No. 4:	Is the resistance less than 1 Ω ?	Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>	Repair the open harness between ECM and electronic throttle control relay.

ED:DTC P2103 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-241, DTC P2103 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

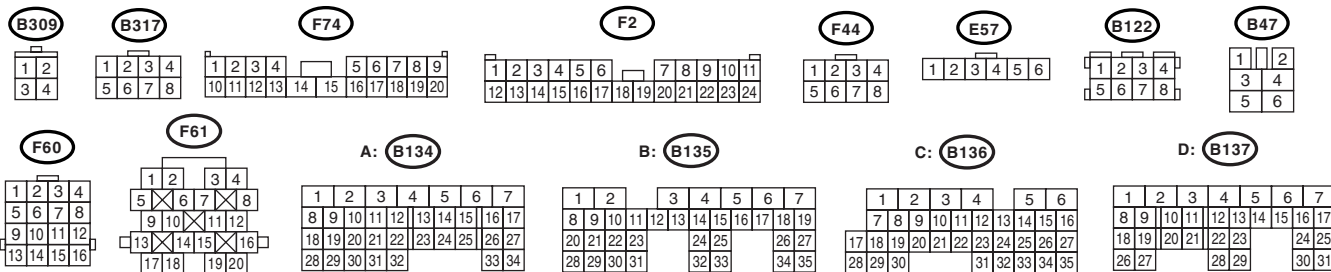
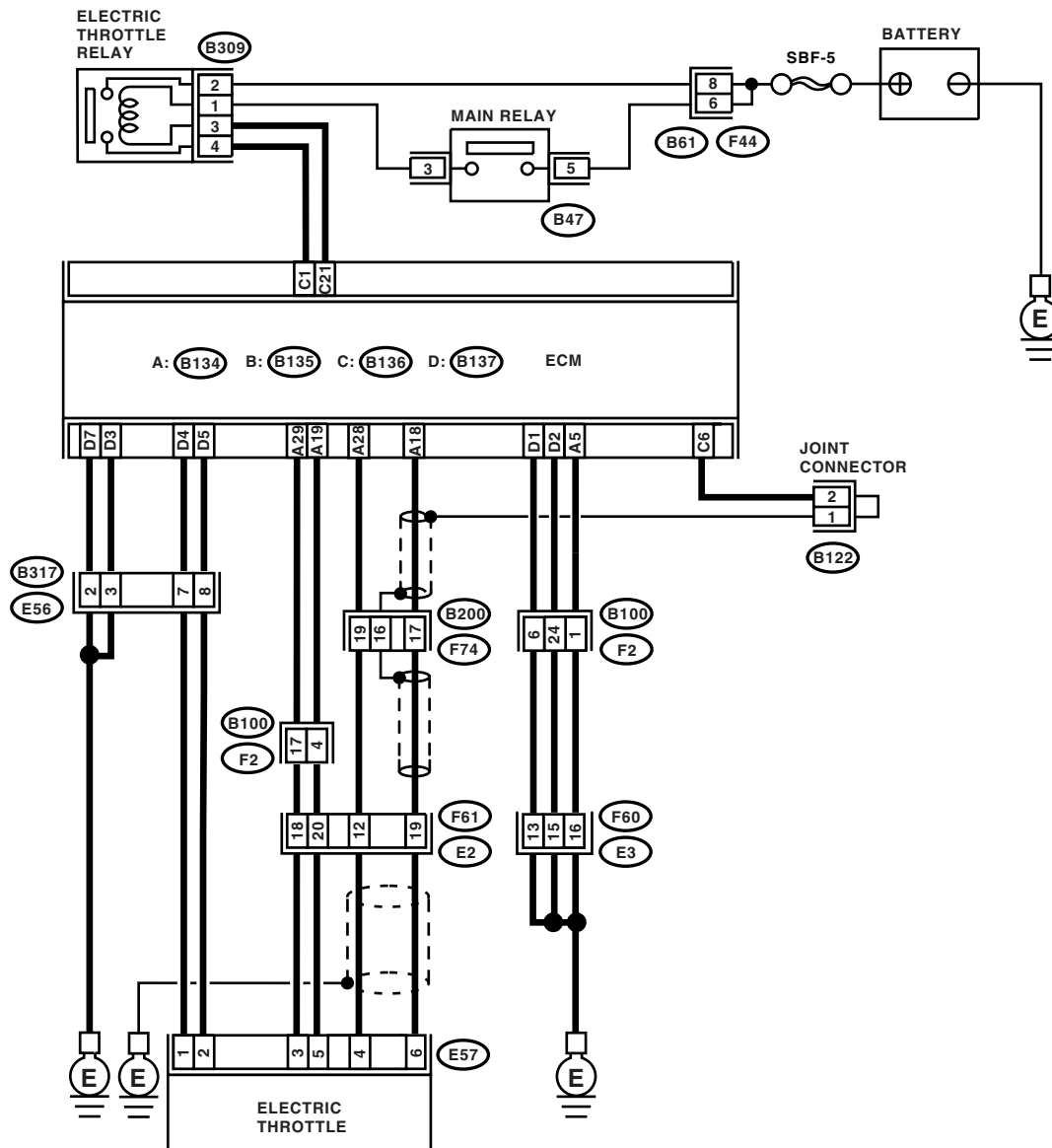
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-04706

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ELECTRONIC THROTTLE CONTROL RELAY. 1) Turn the ignition switch to OFF. 2) Remove the electronic throttle control relay. 3) Measure the resistance between electronic throttle control relay terminals. Terminals No. 2 — No. 4:	Is the resistance more than 1 MΩ?	Go to step 2.	Replace the electronic throttle control relay.
2 CHECK SHORT OF ELECTRONIC THROTTLE CONTROL RELAY POWER SUPPLY CIRCUIT. 1) Turn the ignition switch to ON. 2) Measure the voltage between electronic throttle control relay connector and engine ground. Connector & terminal (B309) No. 4 (+) — Engine ground (-):	Is the voltage more than 5 V?	Repair the short of power supply to harness between ECM and electronic throttle control relay.	Go to step 3.
3 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance between ECM connector and engine ground. Connector & terminal (B136) No. 21 — Engine ground:	Is the resistance more than 1 MΩ?	Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>	Repair the ground short of harness between ECM and electronic throttle control relay.

EE:DTC P2109 THROTTLE/PEDAL POSITION SENSOR “A” MINIMUM STOP PERFORMANCE

NOTE:

For the diagnostic procedure, refer to DTC P2101. <Ref. to GD(H4DOTC)-237, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

EF:DTC P2122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-244, DTC P2122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

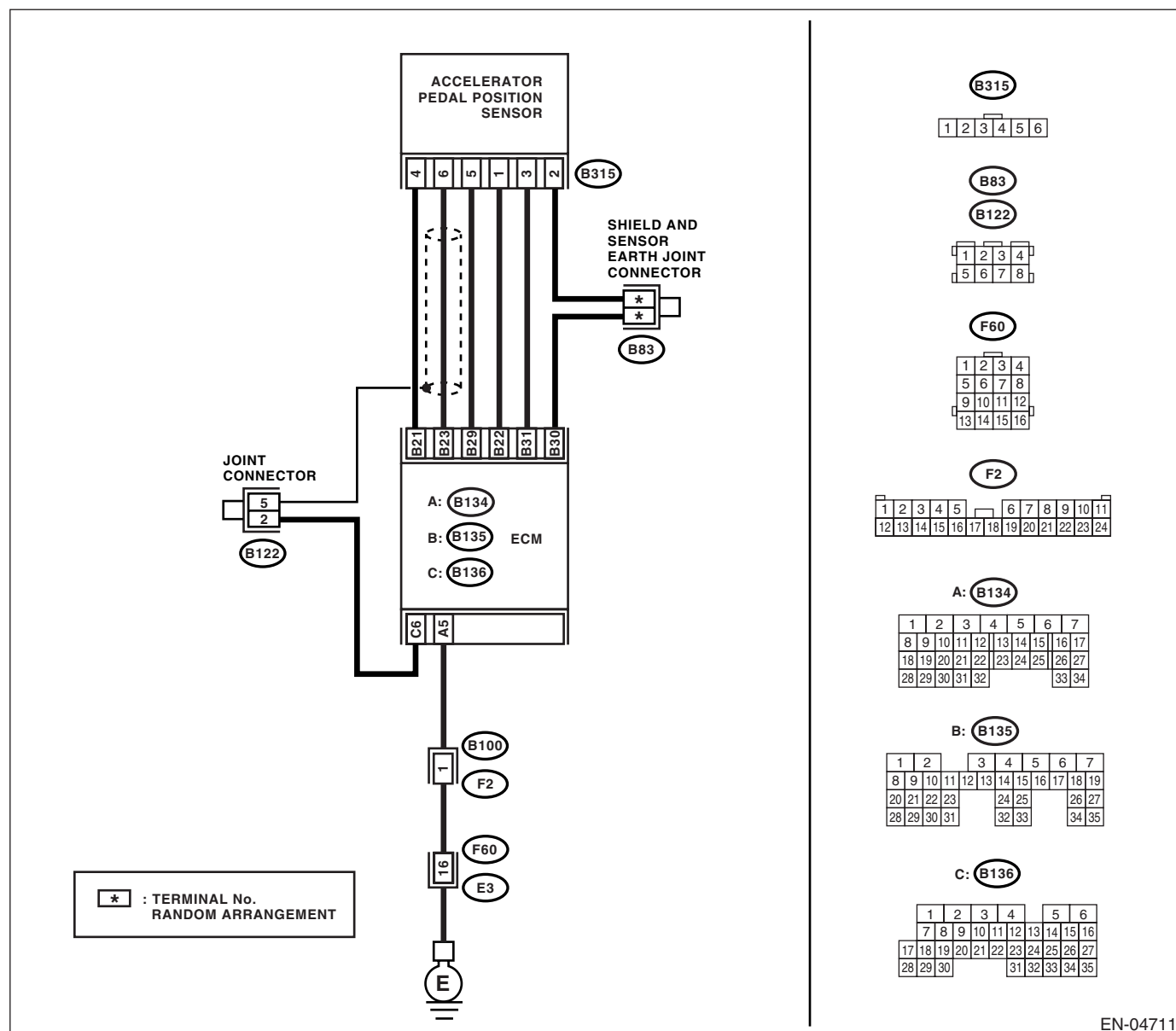
TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04711

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OUTPUT VOLTAGE OF ACCELERATOR PEDAL POSITION SENSOR. 1) Turn the ignition switch to ON. 2) Read the data of main accelerator pedal position sensor signals using Subaru Select Monitor.	Is the voltage more than 0.4 V?	Go to step 2.	Go to step 3.
2 CHECK POOR CONTACT IN CONNECTORS. Check poor contact in connectors between ECM and accelerator pedal position sensor.	Is there poor contact in connectors between ECM and accelerator pedal position sensor?	Repair the poor contact in connectors.	Connector has returned to its normal condition at this time. A temporary poor contact of the connector may be the cause.
3 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from accelerator pedal position sensor. 4) Measure the resistance between ECM connector and accelerator pedal position sensor. Connector & terminal (B135) No. 21 — (B315) No. 4: (B135) No. 23 — (B315) No. 6:	Is the resistance less than 1 Ω ?	Go to step 4.	Repair the open harness connector.
4 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR. Measure the resistance between ECM connector and chassis ground. Connector & terminal (B135) No. 21 — Chassis ground: (B135) No. 23 — Chassis ground:	Is the resistance more than 1 M Ω ?	Go to step 5.	Repair the ground short circuit in harness.
5 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR. 1) Connect the ECM connector. 2) Measure the resistance between accelerator position sensor connector and engine ground. Connector & terminal (B315) No. 5 — Engine ground:	Is the resistance less than 5 Ω ?	Go to step 6.	Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>
6 CHECK ACCELERATOR PEDAL POSITION SENSOR POWER SUPPLY 1) Turn the ignition switch to ON. 2) Measure the voltage between accelerator pedal position sensor connector and engine ground. Connector & terminal (B315) No. 4 (+) — Engine ground (-):	Is the voltage 4.5 — 5.5 V?	Replace the accelerator pedal. <Ref. to SP(H4SO)-3, Accelerator Pedal.>	Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

EG:DTC P2123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT HIGH INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-246, DTC P2123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

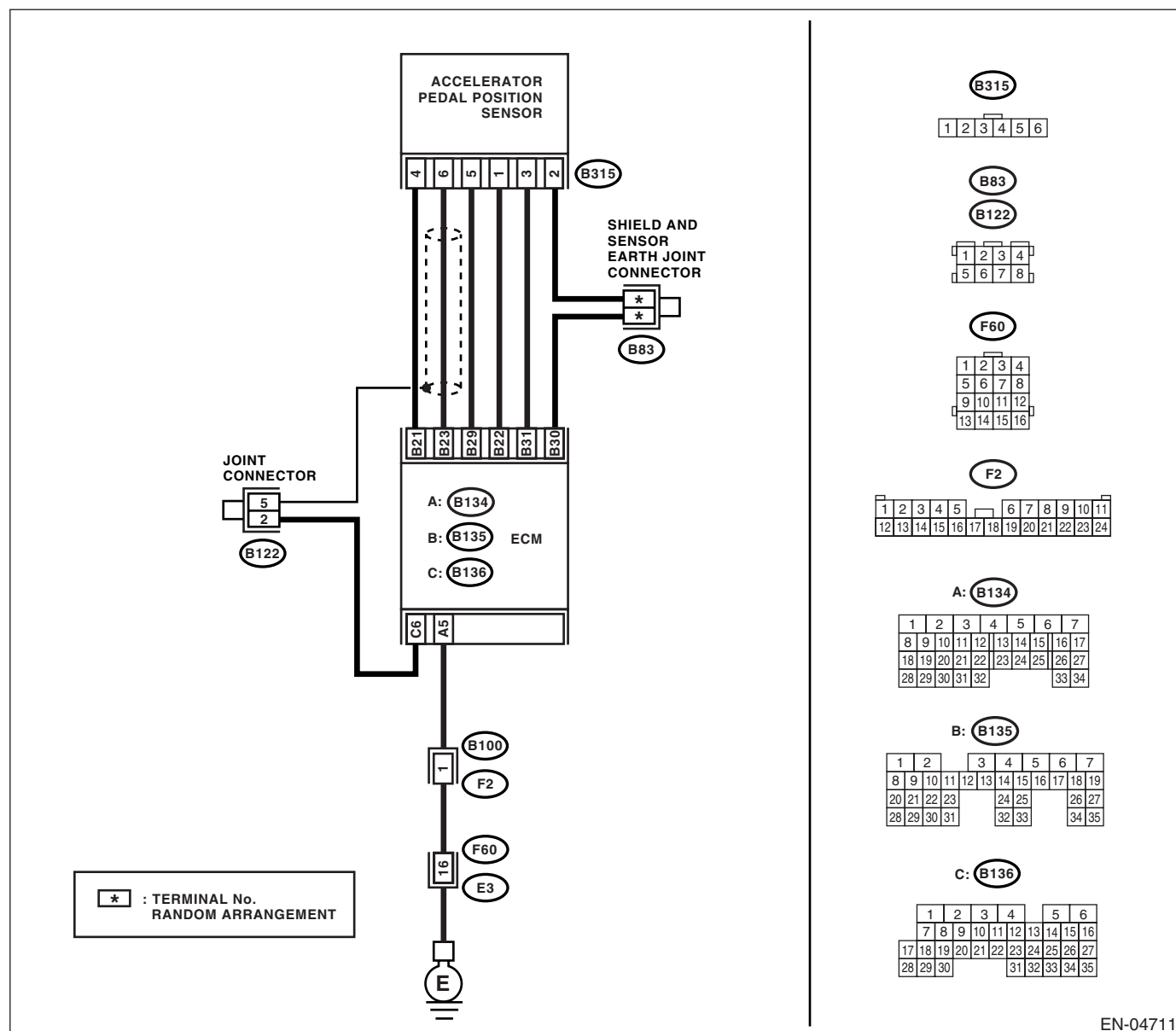
TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04711

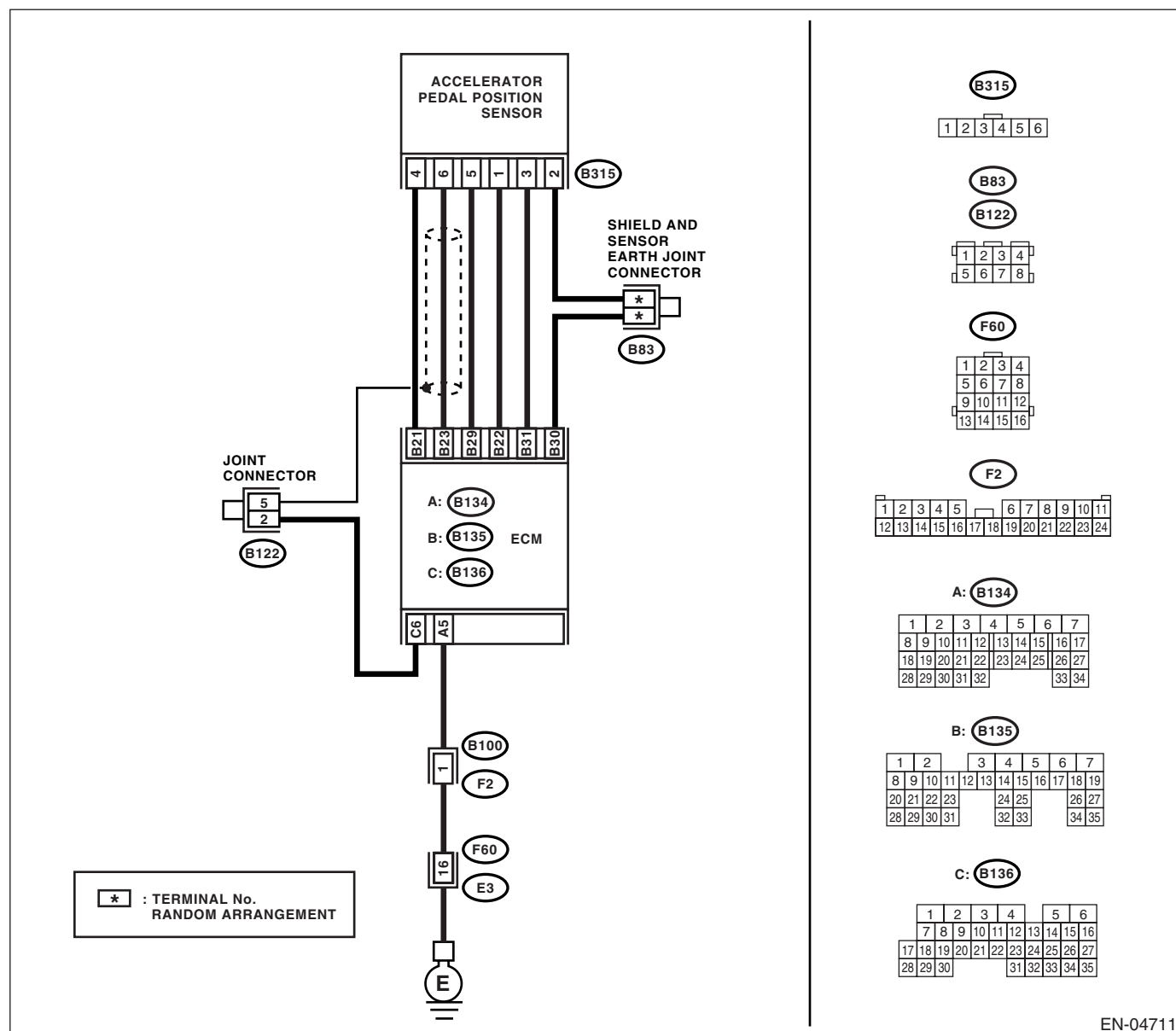
Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OUTPUT VOLTAGE OF ACCELERATOR PEDAL POSITION SENSOR. 1) Turn the ignition switch to ON. 2) Read the data of main accelerator pedal position sensor signals, using Subaru Select Monitor.	Is the voltage less than 4.8 V?	Go to step 2.	Go to step 3.
2 CHECK POOR CONTACT IN CONNECTORS. Check poor contact in connectors between ECM and accelerator pedal position sensor.	Is there any poor contact in connectors between ECM and accelerator pedal position sensor?	Repair the poor contact in connectors.	Connector has returned to its normal condition at this time. A temporary poor contact in the connector might have been the cause.
3 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from accelerator pedal position sensor. 4) Measure the resistance between ECM connector and accelerator pedal position sensor. Connector & terminal (B135) No. 21 — (B315) No. 4: (B135) No. 23 — (B315) No. 6: (B135) No. 29 — (B315) No. 5:	Is the resistance less than 1 Ω ?	Go to step 4.	Repair the open harness connector and trouble cause. Replace the ECM if faulty. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>
4 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR. 1) Connect the ECM connector. 2) Measure the resistance between accelerator pedal position sensor and engine ground. Connector & terminal (B315) No. 5 — Engine ground:	Is the resistance less than 5 Ω ?	Go to step 5.	Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>
5 CHECK POWER SUPPLY TO ACCELERATOR PEDAL POSITION SENSOR. 1) Turn the ignition switch to ON. 2) Measure the voltage between accelerator pedal position sensor connector and engine ground. Connector & terminal (B315) No. 4 (+) — Engine ground (-): 3) Shake the ECM harness and connector, while monitoring value of voltage meter. Check if the voltage is within specification.	Is the voltage 4.5 — 5.5 V?	Go to step 6.	Repair the short circuit in harness between ECM connector and accelerator pedal position sensor connector. Replace the ECM if faulty. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>
6 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR. 1) Turn the ignition switch to OFF. 2) Connect the accelerator pedal position sensor connector. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 23 (+) — Chassis ground (-):	Is the voltage less than 4.8 V?	Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>	Repair the poor contact in accelerator pedal position sensor connector. If problem persists, replace the accelerator pedal. <Ref. to SP(H4SO)-3, Accelerator Pedal.>

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OUTPUT VOLTAGE OF ACCELERATOR PEDAL POSITION SENSOR. 1) Turn the ignition switch to ON. 2) Read the data of sub accelerator pedal position sensor signals using Subaru Select Monitor	Is the voltage more than 0.4 V?	Go to step 2.	Go to step 3.
2 CHECK POOR CONTACT IN CONNECTORS. Check poor contact in connectors between ECM and accelerator pedal position sensor.	Is there any poor contact in connectors between ECM and accelerator pedal position sensor?	Repair the poor contact in connectors.	Connector has returned to its normal condition at this time. A temporary poor contact in the connector might have been the cause.
3 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from accelerator pedal position sensor. 4) Measure the resistance between ECM connector and accelerator pedal position sensor. Connector & terminal (B135) No. 22 — (B315) No. 1: (B135) No. 31 — (B315) No. 3:	Is the resistance less than 1 Ω ?	Go to step 4.	Repair the open harness connector.
4 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR. Measure the resistance between ECM connector and chassis ground. Connector & terminal (B135) No. 22 — Chassis ground: (B135) No. 31 — Chassis ground:	Is the resistance more than 1 M Ω ?	Go to step 5.	Repair the ground short of harness.
5 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR. 1) Connect the ECM connector. 2) Measure the resistance between accelerator position sensor connector and engine ground. Connector & terminal (B315) No. 2 — Engine ground:	Is the resistance less than 5 Ω ?	Go to step 6.	Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>
6 CHECK POWER SUPPLY TO ACCELERATOR PEDAL POSITION SENSOR. 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between accelerator pedal position sensor connector and engine ground. Connector & terminal (B315) No. 1 (+) — Engine ground (-): 4) Shake the ECM harness and connector, while monitoring value of voltage meter.	Is the voltage 4.5 — 5.5 V?	Replace the accelerator pedal. <Ref. to SP(H4SO)-3, Accelerator Pedal.>	Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

EI: DTC P2128 THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT HIGH INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-249, DTC P2128 THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

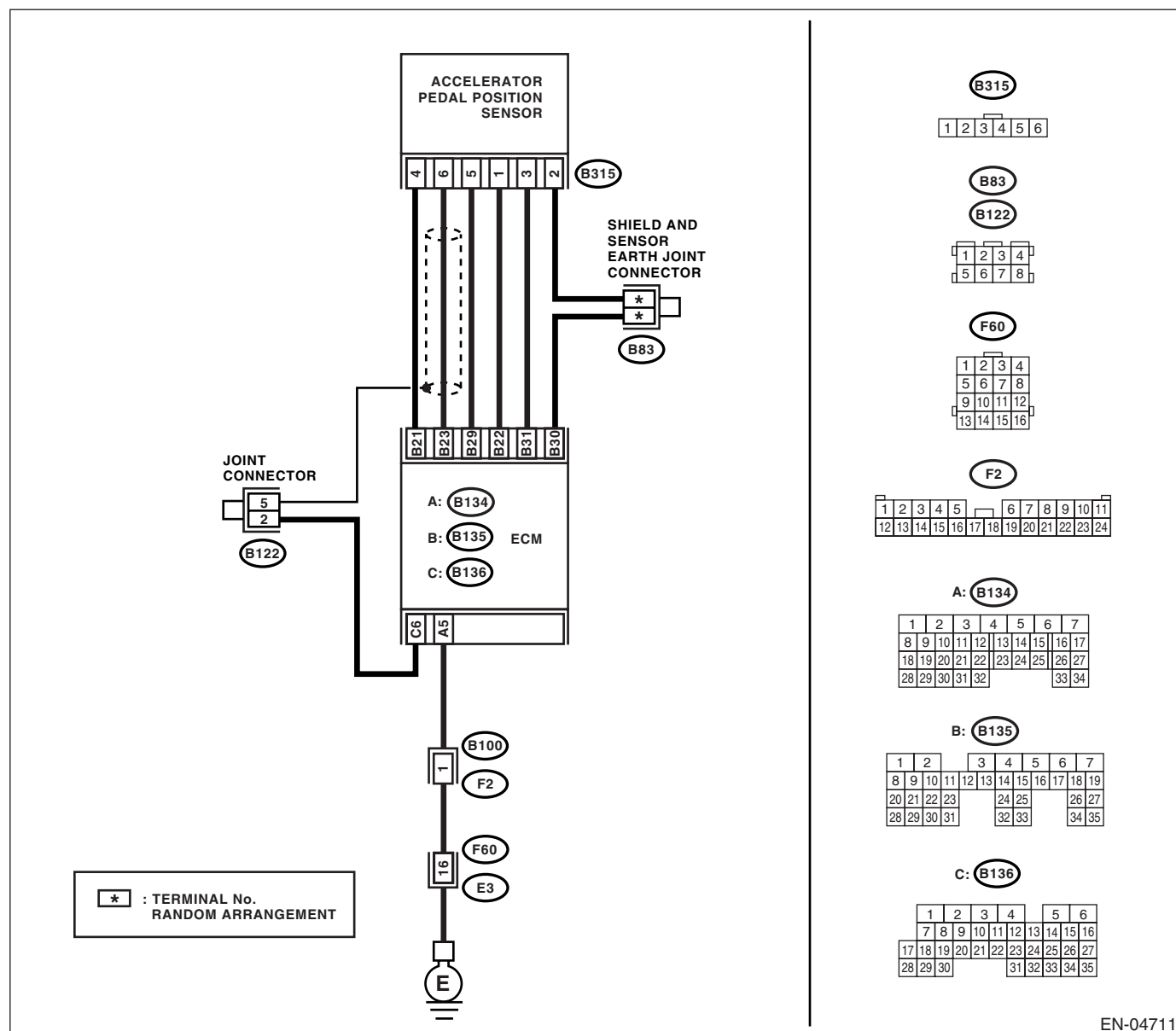
TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04711

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OUTPUT VOLTAGE OF ACCELERATOR PEDAL POSITION SENSOR. 1) Turn the ignition switch to ON. 2) Read the data of sub accelerator pedal position sensor signals, using Subaru Select Monitor.	Is the voltage less than 4.8 V?	Go to step 2.	Go to step 3.
2 CHECK POOR CONTACT IN CONNECTORS. Check poor contact in connectors between ECM and accelerator pedal position sensor.	Is there any poor contact in connectors between ECM and accelerator pedal position sensor?	Repair the poor contact in connectors.	Connector has returned to its normal condition at this time. A temporary poor contact in the connector might have been the cause.
3 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from accelerator pedal position sensor. 4) Measure the resistance between ECM connector and accelerator pedal position sensor. Connector & terminal (B135) No. 30 — (B315) No. 2: (B135) No. 31 — (B315) No. 3: (B135) No. 22 — (B315) No. 1:	Is the resistance less than 1 Ω ?	Go to step 4.	Repair the open harness connector and trouble cause. Replace the ECM if faulty. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>
4 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR. 1) Connect the ECM connector. 2) Measure the resistance between accelerator pedal position sensor connector and engine ground. Connector & terminal (B315) No. 2 — Engine ground:	Is the resistance less than 5 Ω ?	Go to step 5.	Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>
5 CHECK POWER SUPPLY TO ACCELERATOR PEDAL POSITION SENSOR. 1) Turn the ignition switch to ON. 2) Measure the voltage between accelerator pedal position sensor connector and engine ground. Connector & terminal (B315) No. 1 (+) — Engine ground (-):	Is the voltage 4.5 — 5.5 V?	Go to step 6.	Repair the short of harness between ECM connector and accelerator pedal position sensor connector. Replace the ECM if faulty. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>
6 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR. 1) Turn the ignition switch to OFF. 2) Connect the accelerator pedal position sensor connector. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 31 (+) — Chassis ground (-):	Is the voltage less than 4.8 V?	Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>	Repair the poor contact in accelerator pedal position sensor connector. If problem persists, replace the accelerator pedal. <Ref. to SP(H4SO)-3, Accelerator Pedal.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

EJ:DTC P2135 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A”/“B” VOLTAGE CORRELATION

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-250, DTC P2135 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A”/“B” VOLTAGE CORRELATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

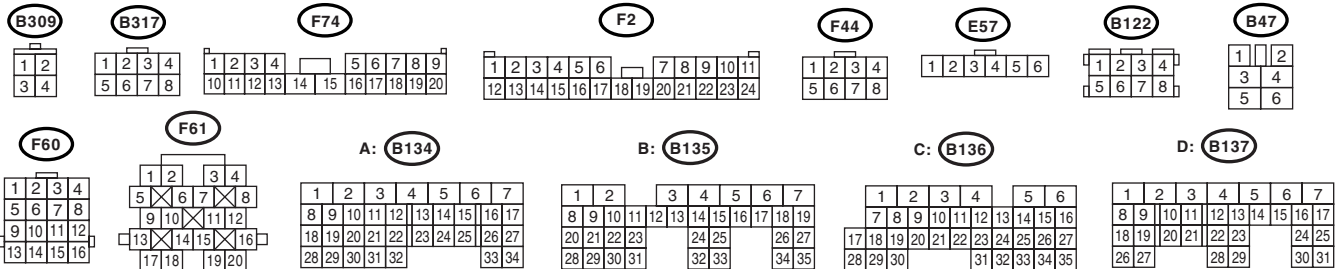
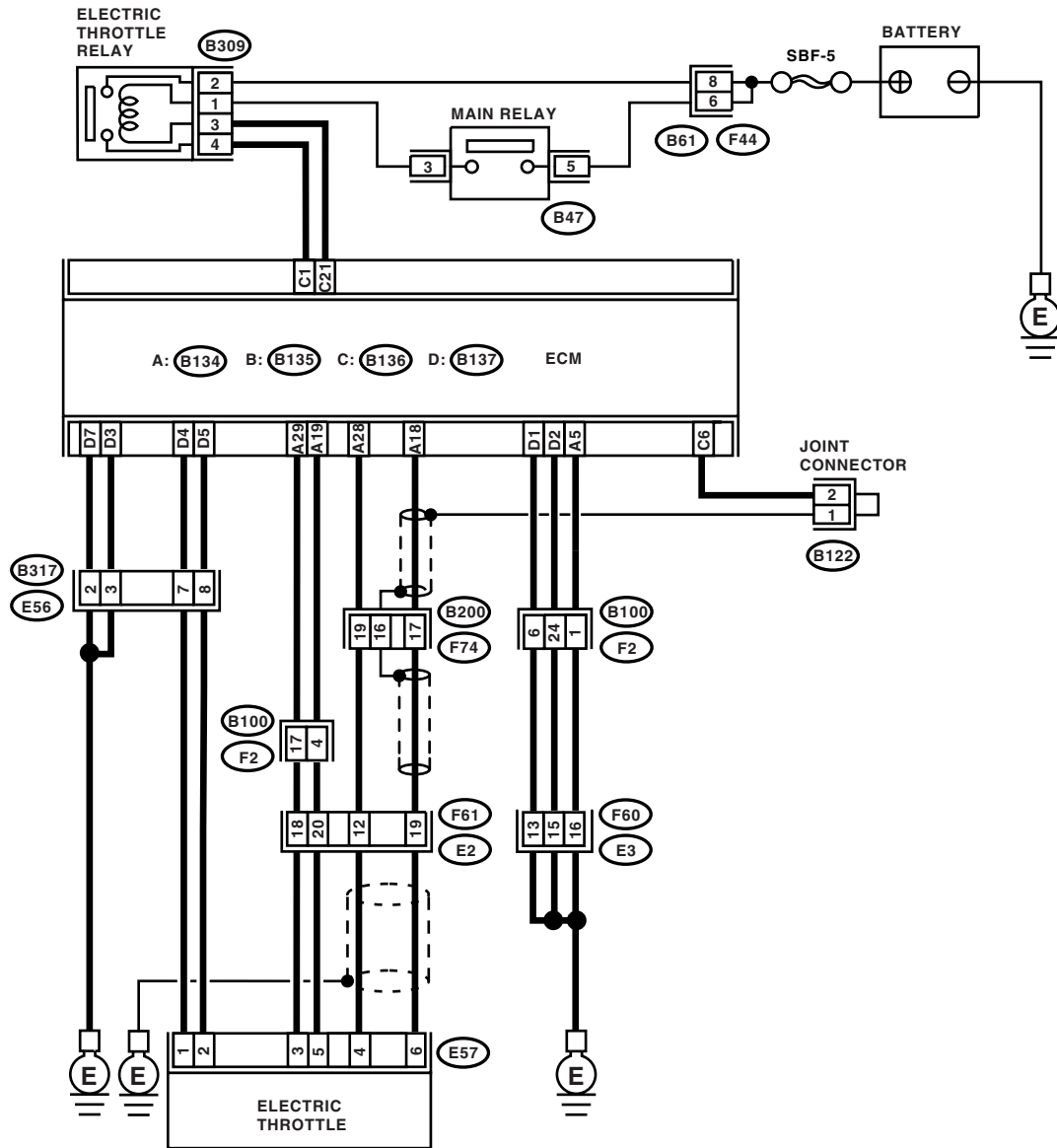
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-04706

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OUTPUT VOLTAGE OF ACCELERATOR PEDAL POSITION SENSOR. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector terminals. Connector & terminal (B134) No. 18 (+) — (B134) No. 29 (-): 3) Shake the ECM harness and connector, engine harness connectors, electronic throttle control connector harness while monitoring value of voltage meter.	Is the voltage more than 0.4 V?	Go to step 2.	Go to step 4.
2 CHECK OUTPUT VOLTAGE OF ACCELERATOR PEDAL POSITION SENSOR. 1) Measure the voltage between ECM connector terminals. Connector & terminal (B134) No. 28 (+) — (B134) No. 29 (-): 2) Shake the ECM harness and connector, engine harness connectors, electronic throttle control connector harness while monitoring value of voltage meter.	Is the voltage more than 0.8 V?	Go to step 3.	Go to step 4.
3 CHECK POOR CONTACT IN CONNECTORS. Check poor contact in connectors between ECM and electronic throttle control.	Is there any poor contact in connectors between ECM and electronic throttle control?	Repair the poor contact in connectors.	Go to step 14.
4 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from electronic throttle control. 4) Measure the resistance between ECM connector and electronic throttle control connector. Connector & terminal (B134) No. 19 — (E57) No. 5:	Is the resistance less than 1 Ω ?	Go to step 5.	Repair the open harness connector.
5 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. Measure the resistance between ECM connector and chassis ground. Connector & terminal (B134) No. 19 — Chassis ground: (B134) No. 18 — Chassis ground: (B134) No. 28 — Chassis ground:	Is the resistance more than 1 M Ω ?	Go to step 6.	Repair the ground short of harness.
6 CHECK POWER SUPPLY TO SENSOR. 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control connector and engine ground. Connector & terminal (E57) No. 5 (+) — Engine ground (-): 4) Shake the ECM harness and connector, engine harness connectors, while monitoring value of voltage meter.	Is the voltage 4.5 — 5.5 V?	Go to step 7.	Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
7 CHECK SHORT OF ECM. 1) Turn the ignition switch to OFF. 2) Measure the resistance between electronic throttle control connector and engine ground. Connector & terminal (E57) No. 4 — Engine ground: (E57) No. 6 — Engine ground:	Is the resistance more than 10 Ω ?	Go to step 8.	Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>
8 CHECK OUTPUT VOLTAGE OF ACCELERATOR PEDAL POSITION SENSOR. 1) Connect all the connectors. 2) Turn the ignition switch to ON. 3) Read the data of main throttle sensor signals, using Subaru Select Monitors. 4) Shake the ECM harness and connector, engine harness connector, electronic throttle control connector harness while monitoring value of voltage meter.	Is the voltage less than 4.63 V?	Go to step 9.	Go to step 11.
9 CHECK OUTPUT VOLTAGE OF ACCELERATOR PEDAL POSITION SENSOR. 1) Read the data of sub throttle sensor signals, using Subaru Select Monitors. 2) Shake the ECM harness and connector, engine harness connector, electronic throttle control connector harness while monitoring value of voltage meter.	Is the voltage less than 4.73 V?	Go to step 10.	Go to step 11.
10 CHECK POOR CONTACT IN CONNECTORS. Check poor contact in connectors between ECM and electronic throttle control.	Is there any poor contact in connectors between ECM and electronic throttle control?	Repair the poor contact in connectors.	Connector has returned to a normal condition at this time. A temporary poor contact in the connector might have been the cause.
11 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from electronic throttle control. 4) Measure the resistance between ECM connector and electronic throttle control connector. Connector & terminal (B134) No. 18 — (E57) No. 6: (B134) No. 28 — (E57) No. 4: (B134) No. 29 — (E57) No. 3:	Is the resistance less than 1 Ω ?	Go to step 12.	Repair the open harness connector.
12 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Connect the ECM connector. 2) Measure the resistance between electronic throttle control connector and engine ground. Connector & terminal (E57) No. 3 — Engine ground:	Is the resistance less than 5 Ω ?	Go to step 13.	Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
13 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control connector and engine ground. Connector & terminal (E57) No. 5 (+) — Engine ground (-): 4) Shake the ECM harness and connector, engine harness connectors, while monitoring value of voltage meter.	Is the voltage more than 10 V?	Go to step 14.	Repair the battery short of harness between ECM connector and electronic throttle control connector.
14 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Measure the voltage between electronic throttle control connector and engine ground. Connector & terminal (E57) No. 4 (+) — Engine ground (-): (E57) No. 6 (+) — Engine ground (-): 2) Shake the ECM harness and connector, engine harness connectors, while monitoring value of voltage meter.	Is the voltage less than 10 V?	Go to step 15.	Repair the short of harness between ECM connector and electronic throttle control connector.
15 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to OFF. 2) Disconnect the electronic throttle control connector. 3) Measure the resistance between ECM connectors. Connector & terminal (B134) No. 18 — (B134) No. 29: (B134) No. 28 — (B134) No. 29:	Is the resistance more than 1 MΩ?	Go to step 16.	Repair the short of power supply sensor.
16 CHECK ELECTRONIC THROTTLE CONTROL HARNESS. 1) Disconnect the connector from ECM. 2) Disconnect the connector from electronic throttle control. 3) Measure the resistance between electronic throttle control connector terminals. Connector & terminal (E57) No. 6 — (E57) No. 4:	Is the resistance more than 1 MΩ?	Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>	Repair the short of harness.

EK:DTC P2138 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D”/“E” VOLTAGE CORRELATION**DTC DETECTING CONDITION:**

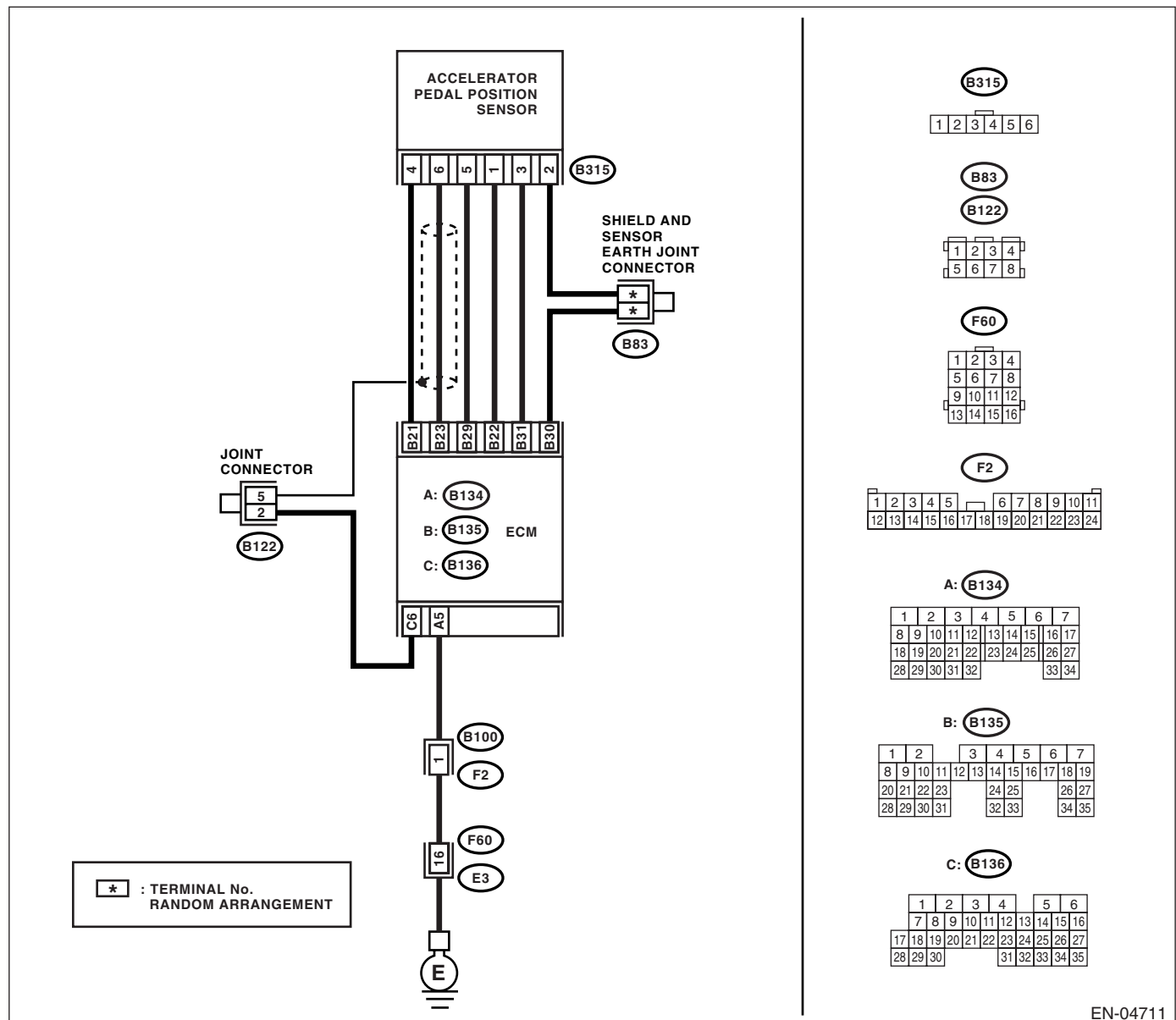
- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-252, DTC P2138 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D”/“E” VOLTAGE CORRELATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:

EN-04711

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OUTPUT VOLTAGE OF ACCELERATOR PEDAL POSITION SENSOR. 1) Turn the ignition switch to ON. 2) Using Subaru Select Monitor, read the data of main accelerator pedal position sensor signals and sub accelerator pedal position sensor signals. NOTE: Subaru Select Monitor For detailed operation procedures, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.>	Is the voltage more than 0.4 V?	Go to step 2.	Go to step 4.
2 CHECK OUTPUT VOLTAGE OF ACCELERATOR PEDAL POSITION SENSOR. Read the data of main accelerator pedal position sensor signals and sub accelerator pedal position sensor signals, using Subaru Select Monitor. NOTE: Subaru Select Monitor For detailed operation procedures, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.>	Is the voltage less than 4.8 V?	Go to step 3.	Go to step 4.
3 CHECK POOR CONTACT IN CONNECTORS. Check poor contact in connectors between ECM and electronic throttle control.	Is there any poor contact in connectors between ECM and electronic throttle control?	Repair the poor contact in connectors.	Connector has returned to a normal condition at this time. A temporary poor contact in the connector might have been the cause.
4 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from accelerator pedal position sensor. 4) Measure the resistance between ECM connector and accelerator pedal position sensor connector. Connector & terminal (B135) No. 21 — (B315) No. 4: (B135) No. 22 — (B315) No. 1: (B135) No. 23 — (B315) No. 6: (B135) No. 29 — (B315) No. 5: (B135) No. 30 — (B315) No. 2: (B135) No. 31 — (B315) No. 3:	Is the resistance less than 1 Ω ?	Go to step 5.	Repair the open harness connector.
5 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR. Measure the resistance between ECM connector and chassis ground. Connector & terminal (B135) No. 21 — Chassis ground: (B135) No. 22 — Chassis ground: (B135) No. 23 — Chassis ground: (B135) No. 31 — Chassis ground:	Is the resistance more than 1 M Ω ?	Go to step 6.	Repair the ground short of harness.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
6 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR. 1) Connect the ECM connector. 2) Measure the resistance between accelerator pedal position sensor and chassis ground. Connector & terminal (B315) No. 5 — Chassis ground: (B315) No. 2 — Chassis ground:	Is the resistance less than 5 Ω ?	Go to step 7.	Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>
7 CHECK POWER SUPPLY TO ACCELERATOR PEDAL POSITION SENSOR. 1) Turn the ignition switch to ON. 2) Measure the voltage between accelerator pedal position sensor connector and chassis ground. Connector & terminal (B315) No. 1 (+) — Chassis ground (-): (B315) No. 4 (+) — Chassis ground (-):	Is the voltage 4.5 — 5.5 V?	Go to step 8.	Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>
8 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR. 1) Turn the ignition switch to OFF. 2) Connect the accelerator pedal position sensor connector. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 23 (+) — Chassis ground (-): (B135) No. 31 (+) — Chassis ground (-):	Is the voltage less than 4.8 V?	Go to step 9.	Repair the poor contact in accelerator pedal position sensor connector. If problem persists, replace the accelerator pedal. <Ref. to SP(H4SO)-3, Accelerator Pedal.>
9 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from accelerator pedal position sensor. 4) Measure the resistance between terminals of accelerator pedal position sensor connector. Connector & terminal (B315) No. 6 — (B315) No. 3:	Is the resistance less than 1 M Ω ?	Repair the poor contact in ECM connector. If problem persists, replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>	Repair the short of harness between accelerator pedal position sensor connector and accelerator pedal position sensor connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

EL:DTC P2227 BAROMETRIC PRESSURE CIRCUIT RANGE/PERFORMANCE

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-254, DTC P2227 BAROMETRIC PRESSURE TOO LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).>	Replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).> NOTE: Atmospheric pressure sensor is built into ECM.

EM:DTC P2228 BAROMETRIC PRESSURE CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-255, DTC P2228 ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).>	Replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).> NOTE: Atmospheric pressure sensor is built into ECM.

EN:DTC P2229 BAROMETRIC PRESSURE CIRCUIT HIGH INPUT**DTC DETECTING CONDITION:**

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-256, DTC P2229 ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-74, List of Diagnostic Trouble Code (DTC).>	Replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).> NOTE: Atmospheric pressure sensor is built into ECM.

EO:DTC P2431 SECONDARY AIR INJECTION SYSTEM AIR FLOW / PRESSURE SENSOR CIRCUIT RANGE / PERFORMANCE**DTC DETECTING CONDITION:**

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-257, DTC P2431 SECONDARY AIR INJECTION SYSTEM AIR FLOW / PRESSURE SENSOR CIRCUIT RANGE / PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

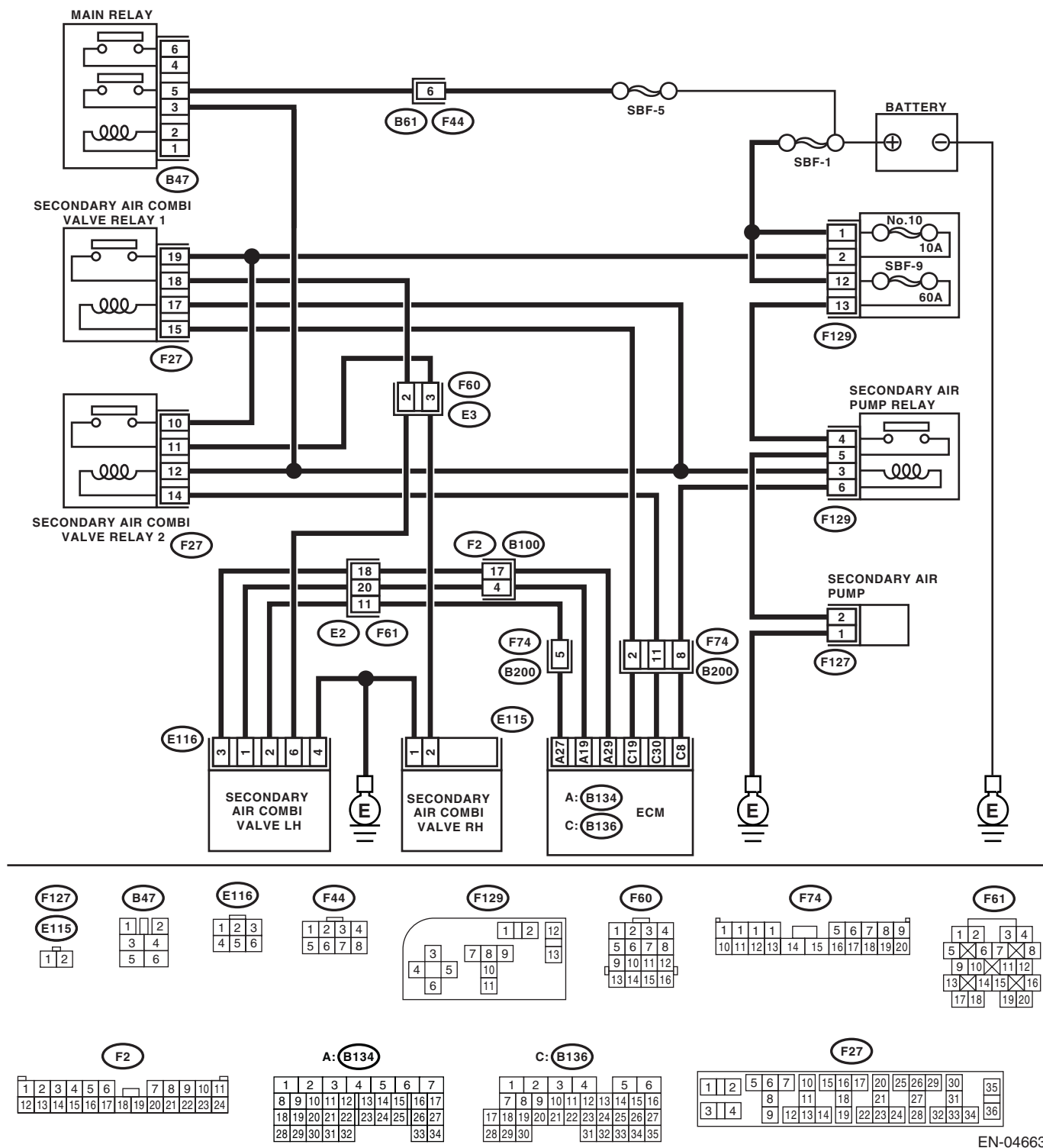
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-04663

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK FOR ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Inspect the relevant DTC.	Go to step 2.
2 CHECK CURRENT DATA. 1) Turn the ignition switch to ON (engine OFF). 2) Using Subaru Select Monitor, read the data of secondary air pipe pressure, intake manifold absolute pressure and atmospheric pressure, and compare them with the actual atmospheric pressure. NOTE: Subaru Select Monitor For detailed operation procedures, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.>	Is the difference between these pressure and actual atmospheric pressure more than 200 mmHg (27 kPa, 8 inHg or 3.9 psig)?	Replace the secondary air combi valve (LH). <Ref. to EC(H4DOTC)-10, Secondary Air Combi Valve.> NOTE: The secondary air pressure sensor is integrated with secondary air combi valve (LH).	A temporary poor contact occurs. Check for poor contact of connector.

EP:DTC P2432 SECONDARY AIR INJECTION SYSTEM AIR FLOW / PRESSURE SENSOR CIRCUIT LOW

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-258, DTC P2432 SECONDARY AIR INJECTION SYSTEM AIR FLOW / PRESSURE SENSOR CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

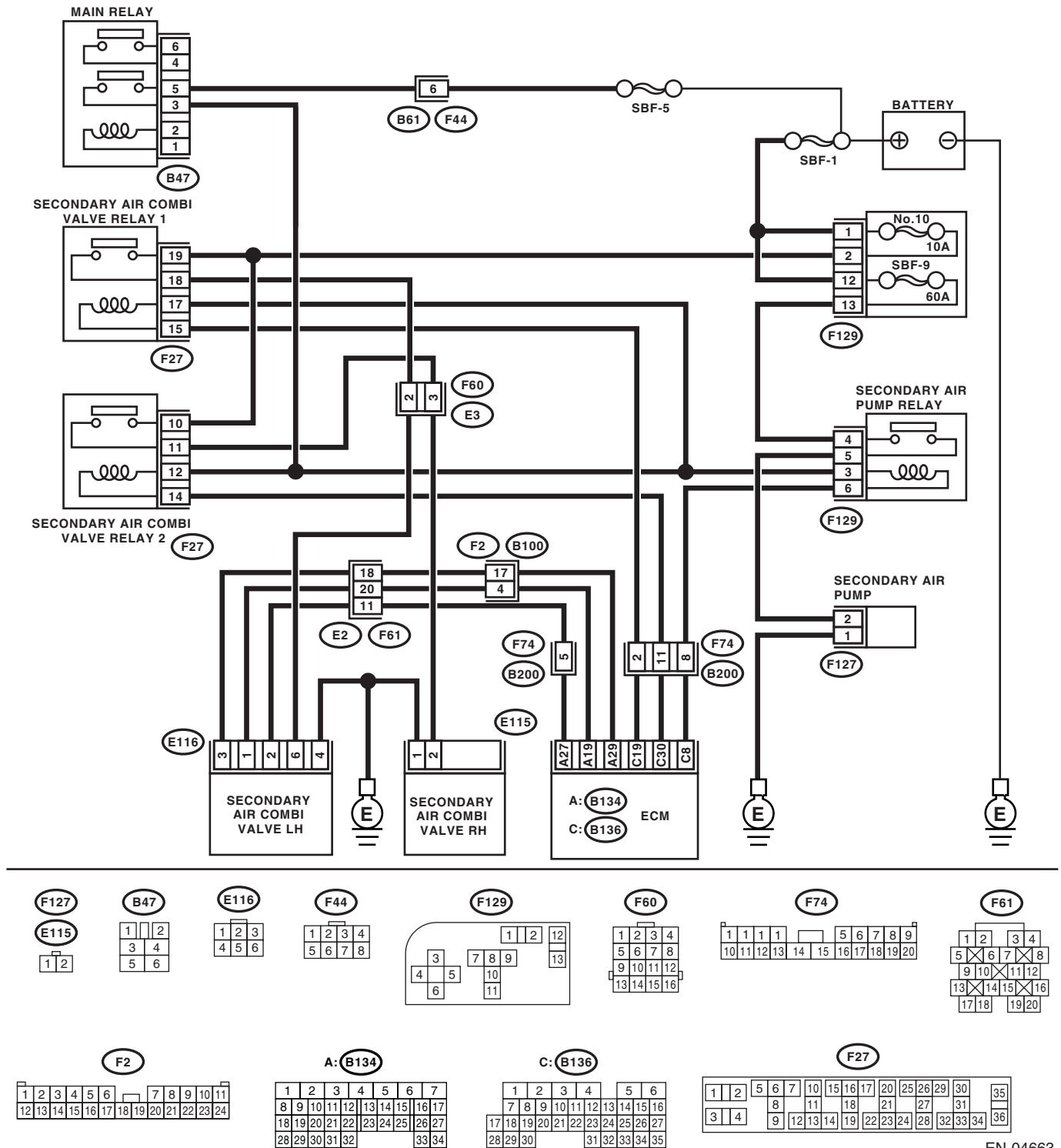
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-04663

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBI VALVE LH CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and secondary air combi valve LH. 3) Measure the resistance of harness between ECM and secondary air combi valve LH connector terminal. Connector & terminal (B134) No. 27 — (E116) No. 2: (B134) No. 19 — (E116) No. 1: (B134) No. 29 — (E116) No. 3:	Is the resistance less than 1 Ω ?	Go to step 2.	Repair the open circuit in harness between ECM and secondary air combi valve LH connector terminal.
2 CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBI VALVE LH CONNECTOR. Measure the resistance of harness between ECM and chassis ground. Connector & terminal (B134) No. 27 — Chassis ground:	Is the resistance more than 1 M Ω ?	A temporary poor contact occurs. Check poor contact in connector.	Repair the ground short circuit in harness between ECM and secondary air combi valve LH connector terminal.

EQ:DTC P2433 SECONDARY AIR INJECTION SYSTEM AIR FLOW / PRESSURE SENSOR CIRCUIT HIGH

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-259, DTC P2433 SECONDARY AIR INJECTION SYSTEM AIR FLOW / PRESSURE SENSOR CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

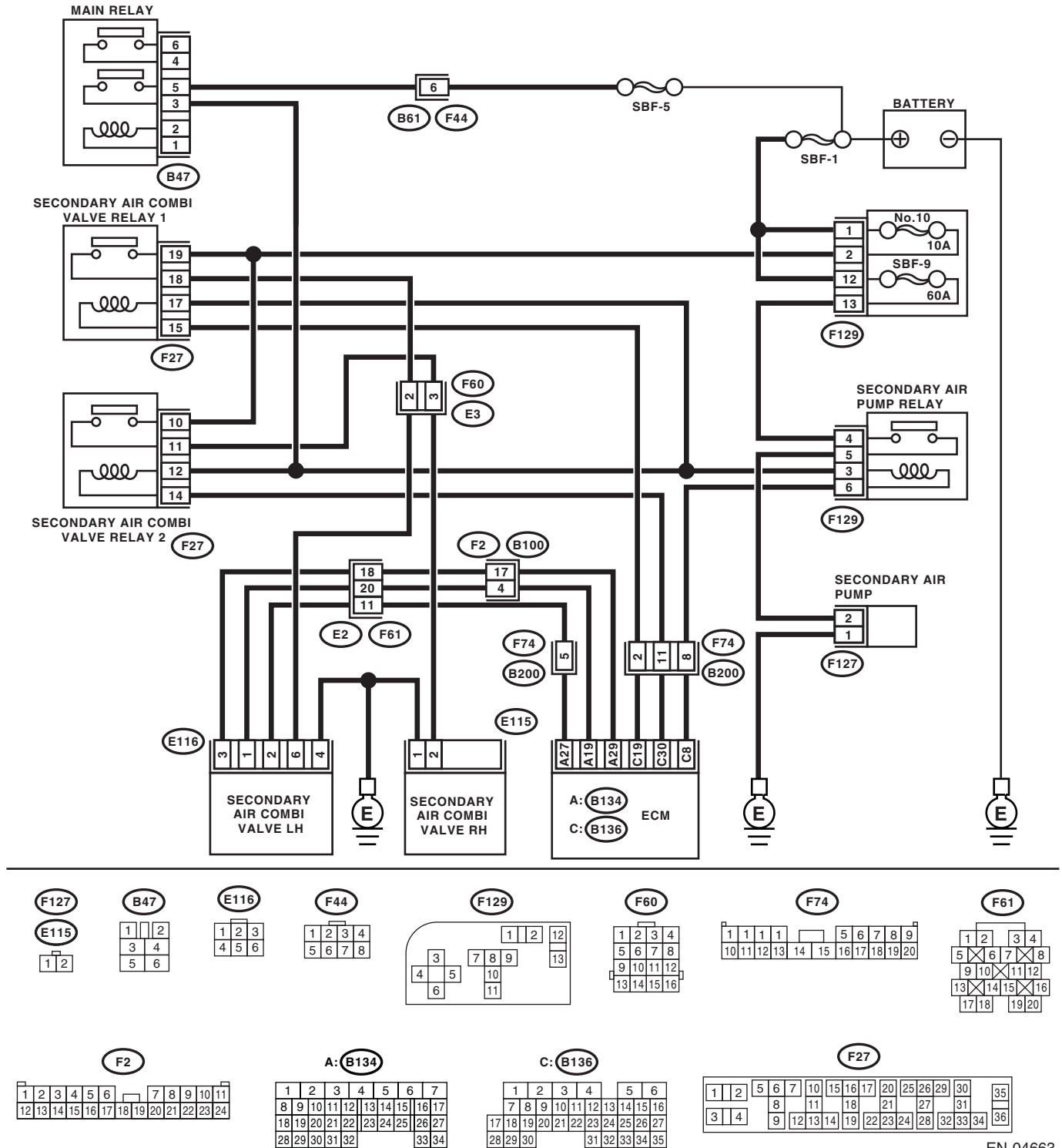
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-04663

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBI VALVE LH CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and secondary air combi valve LH. 3) Measure the resistance of harness between ECM and secondary air combi valve LH connector terminal. Connector & terminal (B134) No. 27 — (E116) No. 2: (B134) No. 19 — (E116) No. 1: (B134) No. 29 — (E116) No. 3:	Is the resistance less than 1 Ω ?	Go to step 2.	Repair the open circuit in harness between ECM and secondary air combi valve LH connector terminal.
2 CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBI VALVE LH CONNECTOR. Measure the resistance of harness between ECM and chassis ground. Connector & terminal (B134) No. 27 (+) — Chassis ground (-):	Is the voltage more than 5 V?	Repair the battery short circuit in harness between ECM and secondary air combi valve LH connector terminal.	A temporary poor contact occurs. Check for poor contact of connector.

ER:DTC P2440 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN (BANK 1)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-260, DTC P2440 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN (BANK1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

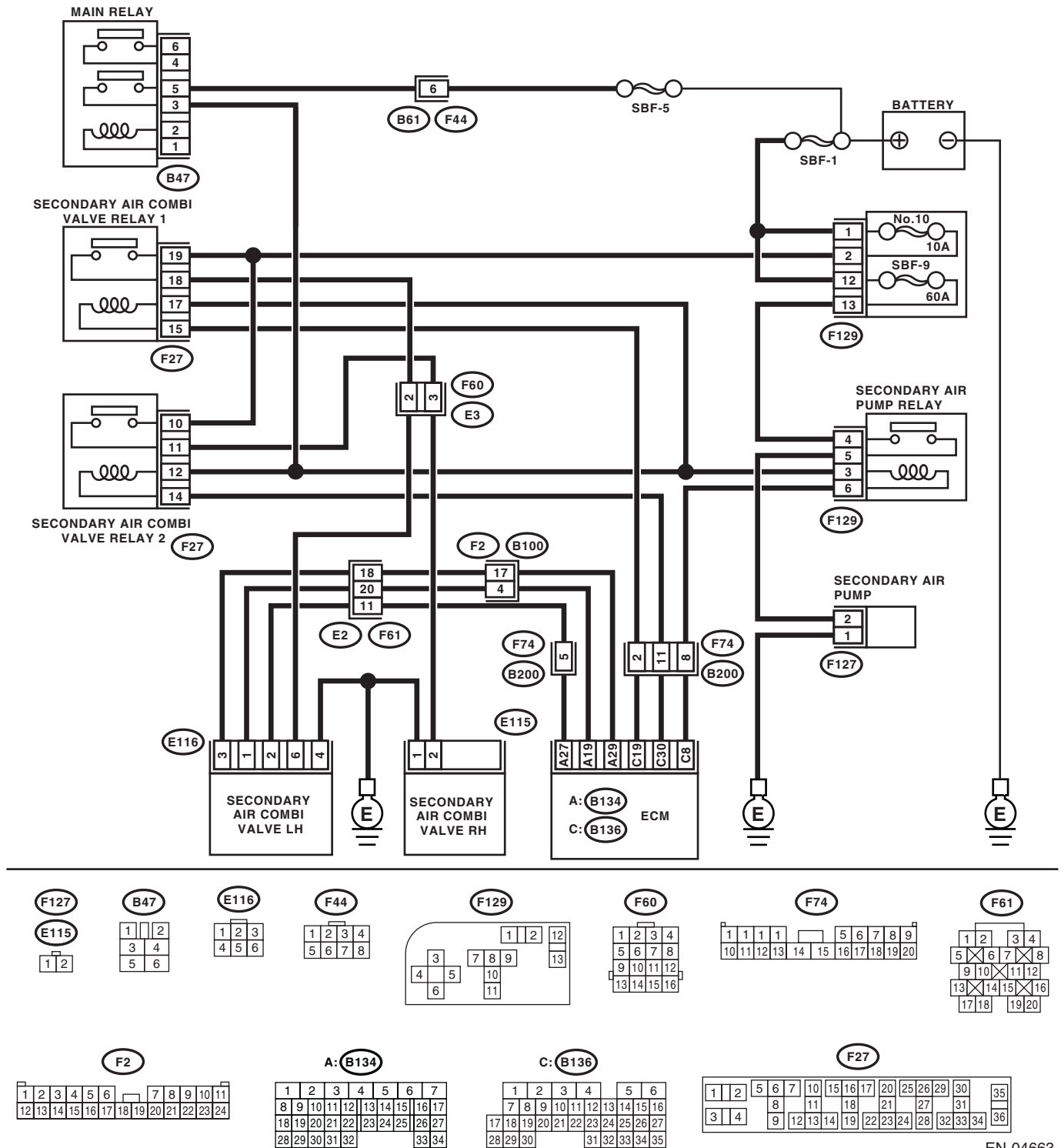
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-04663

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK SECONDARY AIR COMBI VALVE OPERATION. 1) Connect the test mode connector. 2) Turn the ignition switch to ON. 3) Perform the operational check of secondary air combi valve using the Subaru Select Monitor. NOTE: Subaru Select Monitor For detailed operation procedures, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-51, Compulsory Valve Operation Check Mode.>	Does the secondary air combi valve operate?	Go to step 2.	Go to step 4.
2 CHECK DUCT BETWEEN SECONDARY AIR COMBI VALVE AND SECONDARY AIR COMBI VALVE. Check the duct between secondary air combi and secondary air combi valve.	Is the duct damaged or disconnected?	Replace or connect the duct.	Go to step 3.
3 CHECK PIPE BETWEEN SECONDARY AIR COMBI VALVE AND CYLINDER HEAD. Check the pipe between secondary air combi valve and cylinder head.	Is the pipe damaged or disconnected?	Replace or connect the pipe.	A temporary poor contact occurs. Check poor contact in connector.
4 CHECK POWER SUPPLY TO SECONDARY AIR COMBI VALVE. Measure the voltage between secondary air combi valve and chassis ground at the condition of Step 1. Connector & terminal (E115) No. 2 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Replace the secondary air combi valve.	Go to step 5.
5 CHECK HARNESS BETWEEN SECONDARY AIR COMBI VALVE RELAY AND SECONDARY AIR COMBI VALVE CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from secondary air combi valve relay and secondary air combi valve. 3) Measure the resistance of harness between secondary air combi valve relay and secondary air combi valve connector terminal. Connector & terminal (F27) No. 11 — (E115) No. 2:	Is the resistance less than 1 Ω ?	Go to step 6.	Repair the open circuit in harness between secondary air combi valve relay and secondary air combi valve connector terminal.
6 CHECK SECONDARY AIR COMBI VALVE RELAY. 1) Turn the ignition switch to OFF. 2) Remove the secondary air combi valve relay from relay box. 3) Connect the battery to terminals No. 12 and No. 14 of secondary air combi valve relay. 4) Measure the resistance between secondary air combi valve relay terminals. Terminals No. 10 — No. 11:	Is the resistance less than 1 Ω ?	Go to step 7.	Replace the secondary air combi valve relay.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
7 CHECK POWER SUPPLY OF SECONDARY AIR COMBI VALVE RELAY. 1) Turn the ignition switch to ON. 2) Measure the voltage between secondary air combi valve relay connector and chassis ground. <i>Connector & terminal</i> <i>(F27) No. 10 (+) — Chassis ground (-):</i> <i>(F27) No. 12 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Go to step 8.	Repair the open power supply circuit or ground short.
8 CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBI VALVE RELAY CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector of ECM. 3) Measure the resistance of harness between ECM and secondary air combi valve relay connector terminal. <i>Connector & terminal</i> <i>(B136) No. 30 — (F27) No. 14:</i>	Is the resistance less than 1 Ω ?	Replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>	Repair the open circuit in harness between ECM and secondary air combi valve relay connector terminal.

ES:DTC P2441 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK CLOSED (BANK 1)

NOTE:

For the diagnostic procedure, refer to DTC P2440. <Ref. to EN(H4DOTC)(diag)-385, DTC P2440 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

ET:DTC P2442 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN (BANK 2)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-260, DTC P2442 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN (BANK2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

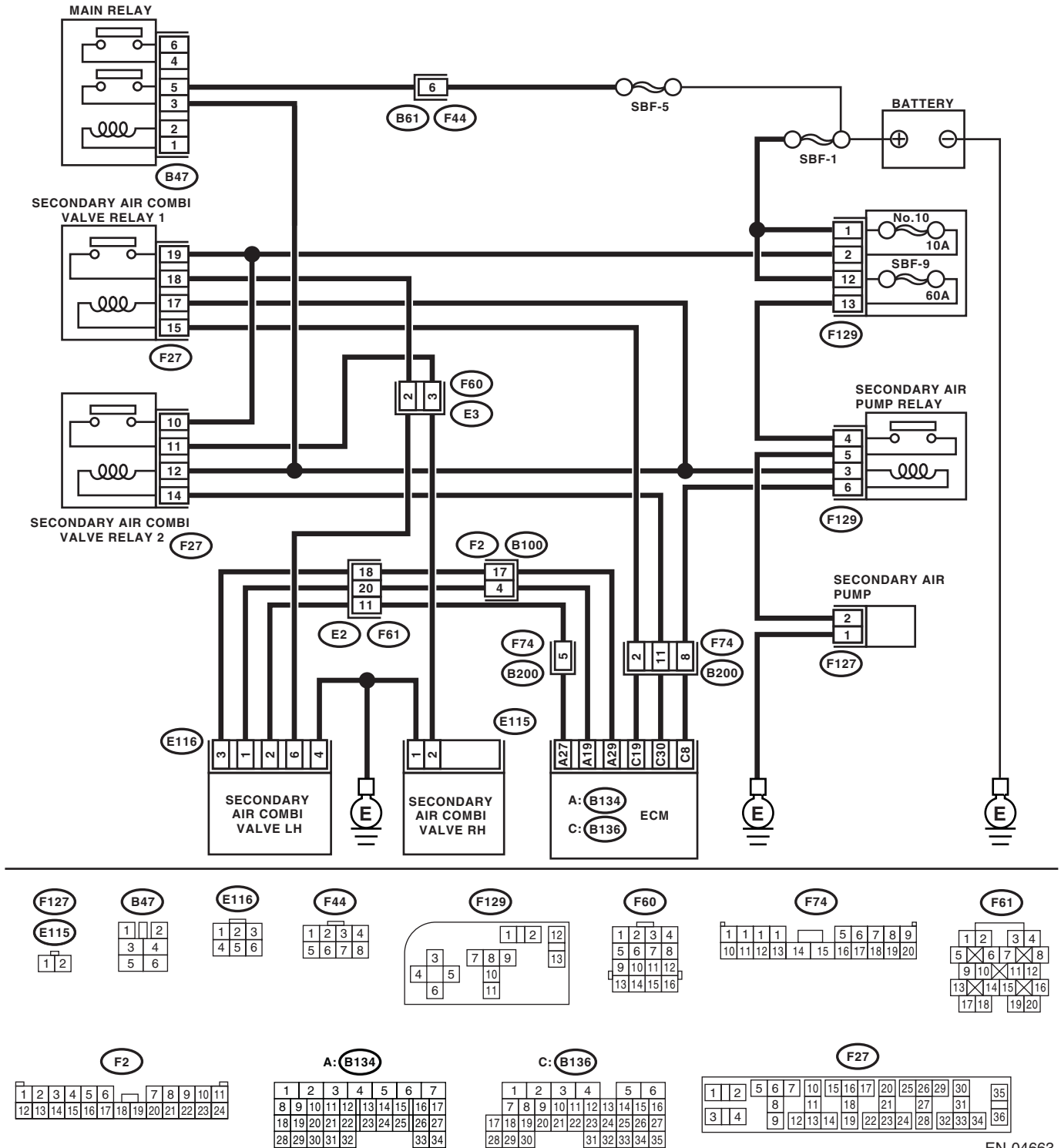
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-04663

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK SECONDARY AIR COMBI VALVE OPERATION. 1) Connect the test mode connector. 2) Turn the ignition switch to ON. 3) Perform the operational check of secondary air combi valve using the Subaru Select Monitor. NOTE: Subaru Select Monitor For detailed operation procedures, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-51, Compulsory Valve Operation Check Mode.>	Does the secondary air combi valve operate?	Go to step 2.	Go to step 4.
2 CHECK DUCT BETWEEN SECONDARY AIR COMBI VALVE AND SECONDARY AIR COMBI VALVE. Check the duct between secondary air combi and secondary air combi valve.	Is the duct damaged or disconnected?	Replace or connect the duct.	Go to step 3.
3 CHECK PIPE BETWEEN SECONDARY AIR COMBI VALVE AND CYLINDER HEAD. Check the pipe between secondary air combi valve and cylinder head.	Is the pipe damaged or disconnected?	Replace or connect the pipe.	A temporary poor contact occurs. Check poor contact in connector.
4 CHECK POWER SUPPLY TO SECONDARY AIR COMBI VALVE. Measure the voltage between secondary air combi valve and chassis ground at the condition of Step 1. Connector & terminal (E116) No. 6 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Replace the secondary air combi valve.	Go to step 5.
5 CHECK HARNESS BETWEEN SECONDARY AIR COMBI VALVE RELAY AND SECONDARY AIR COMBI VALVE CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from secondary air combi valve relay and secondary air combi valve. 3) Measure the resistance of harness between secondary air combi valve relay and secondary air combi valve connector terminal. Connector & terminal (F27) No. 18 — (E116) No. 6:	Is the resistance less than 1 Ω ?	Go to step 6.	Repair the open circuit in harness between secondary air combi valve relay and secondary air combi valve connector terminal.
6 CHECK SECONDARY AIR COMBI VALVE RELAY. 1) Turn the ignition switch to OFF. 2) Remove the secondary air combi valve relay from relay box. 3) Connect the battery to terminals No. 17 and No. 15 of secondary air combi valve relay. 4) Measure the resistance between secondary air combi valve relay terminals. Terminals No. 19 — No. 18:	Is the resistance less than 1 Ω ?	Go to step 7.	Replace the secondary air combi valve relay.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
7 CHECK POWER SUPPLY OF SECONDARY AIR COMBI VALVE RELAY. 1) Turn the ignition switch to ON. 2) Measure the voltage between secondary air combi valve relay connector and chassis ground. <i>Connector & terminal</i> <i>(F27) No. 19 (+) — Chassis ground (-):</i> <i>(F27) No. 17 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Go to step 8.	Repair the open power supply circuit or ground short.
8 CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBI VALVE RELAY CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector of ECM. 3) Measure the resistance of harness between ECM and secondary air combi valve relay connector terminal. <i>Connector & terminal</i> <i>(B136) No. 19 — (F27) No. 15:</i>	Is the resistance less than 1 Ω ?	Replace the ECM. <Ref. to FU(H4DOTC)-45, Engine Control Module (ECM).>	Repair the open circuit in harness between ECM and secondary air combi valve relay connector terminal.

EU:DTC P2443 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK CLOSED (BANK 2)

NOTE:

For the diagnostic procedure, refer to DTC P2442. <Ref. to EN(H4DOTC)(diag)-388, DTC P2442 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

EV:DTC P2444 SECONDARY AIR INJECTION SYSTEM PUMP STUCK ON DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-261, DTC P2444 SECONDARY AIR INJECTION SYSTEM PUMP STUCK ON, Diagnostic Trouble Code (DTC) Detecting Criteria.>

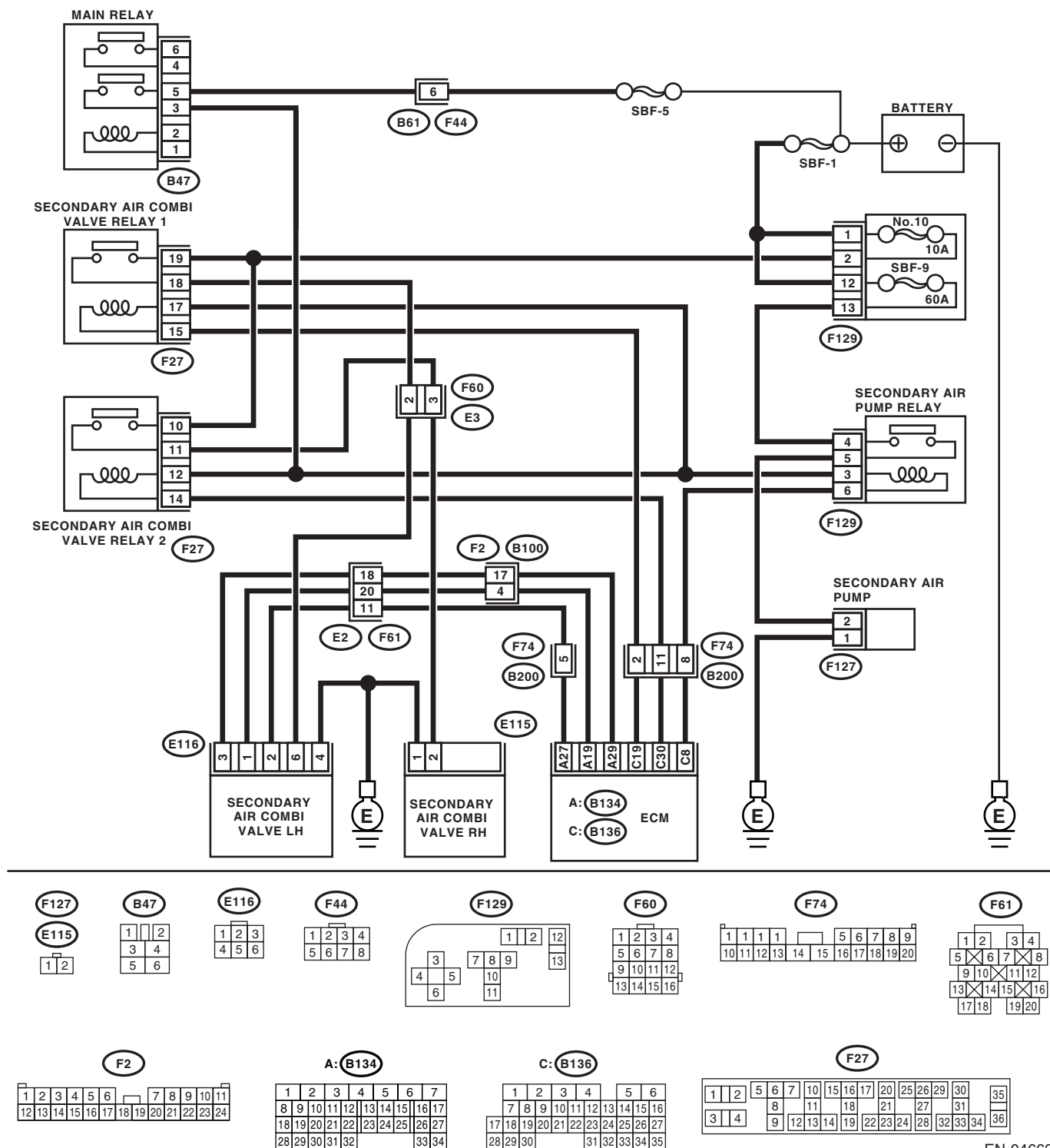
CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-04663

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK SECONDARY AIR PIPE PRESSURE. 1) Turn the ignition switch to ON (engine OFF). 2) Using Subaru Select Monitor, read the data of secondary air pipe pressure, and compare it with atmospheric pressure. NOTE: Subaru Select Monitor For detailed operation procedures, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-31, Subaru Select Monitor.>	Is the difference between its pressure and actual atmospheric pressure more than 6.7 kPa (50 mmHg, 2.0 inHg or 0.97 psig)?	Replace the secondary air combi valve (LH). <Ref. to EC(H4DOTC)-10, Secondary Air Combi Valve.> NOTE: The secondary air pressure sensor is integrated with secondary air combi valve (LH).	Go to step 2.
2 CHECK POWER SUPPLY TO SECONDARY AIR PUMP. 1) Turn the ignition switch to ON (engine OFF). 2) Measure the voltage between secondary air pump and chassis ground. Connector & terminal (F127) No. 2 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 3.	A temporary poor contact occurs. Check for poor contact of connector.
3 CHECK SECONDARY AIR PUMP RELAY. 1) Turn the ignition switch to OFF. 2) Remove the secondary air pump relay from relay box. 3) Measure the resistance between secondary air pump relay terminals. Terminals No. 4 — No. 5:	Is the resistance more than 1 MΩ?	Repair the battery short circuit in harness between secondary air pump relay and secondary air pump connector terminal.	Replace the secondary air pump relay.

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(H4DOTC)-96, Engine Noise.>

Symptom	Problem parts
1. Engine stalls during idling.	1) Electronic throttle control 2) Manifold absolute 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) Electronic throttle control 2) Manifold absolute 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) 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) Electronic throttle control 2) Engine coolant temperature sensor 3) Manifold absolute pressure sensor 4) Mass air flow sensor
4. Poor acceleration	1) Manifold absolute pressure sensor 2) Mass air flow and intake temperature sensor 3) Electronic throttle control 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) Manifold absolute 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) Fuel pump and fuel pump relay
6. Surge	1) Manifold absolute 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

General Diagnostic Table

ENGINE (DIAGNOSTICS)

Symptom	Problem parts
7. Spark knock	1) Manifold absolute 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) Manifold absolute 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 and 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.

General Diagnostic Table

ENGINE (DIAGNOSTICS)

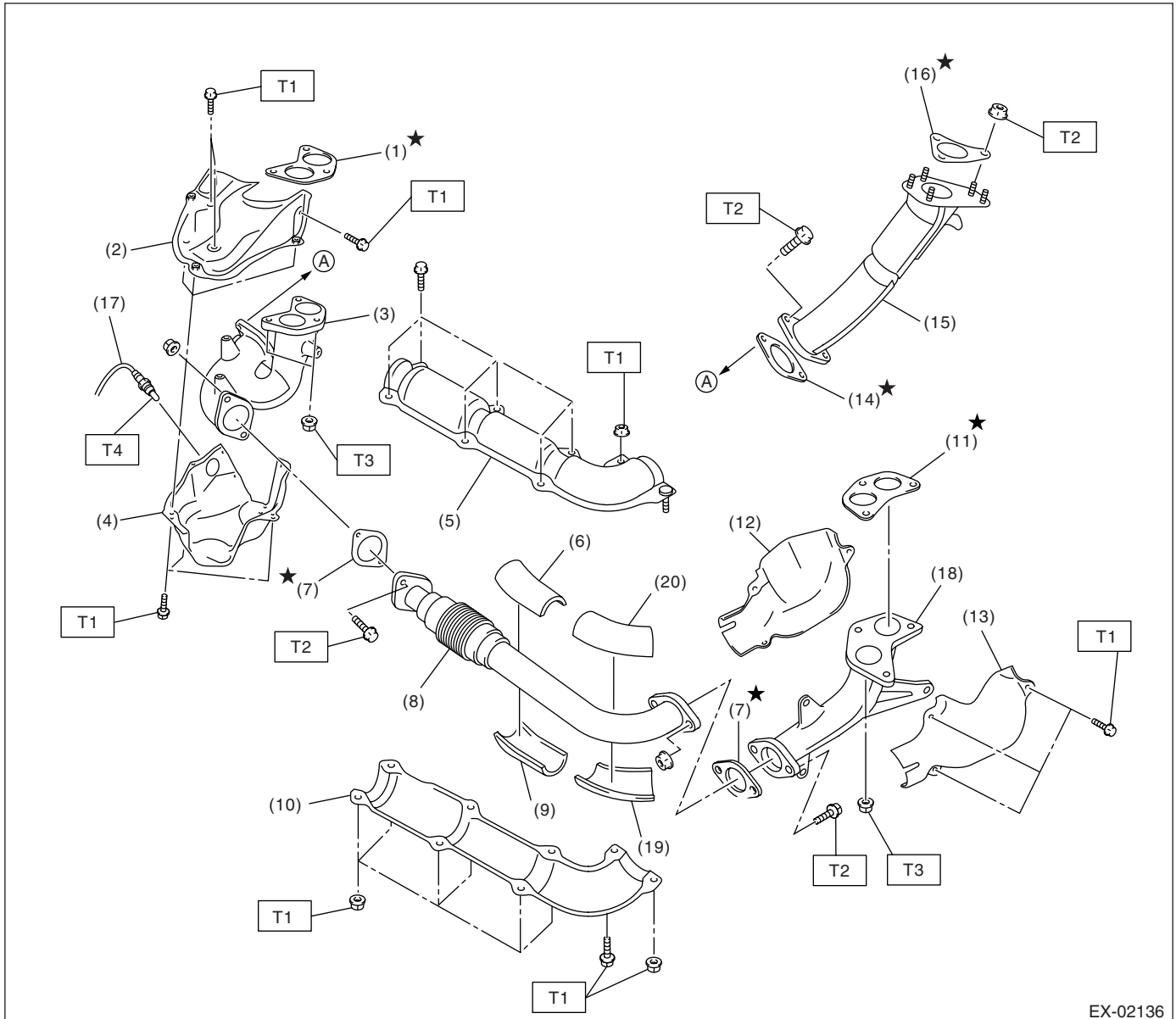
EXHAUST

1. General Description

A: COMPONENT

1. FRONT EXHAUST PIPE

• Turbo model



EX-02136

General Description

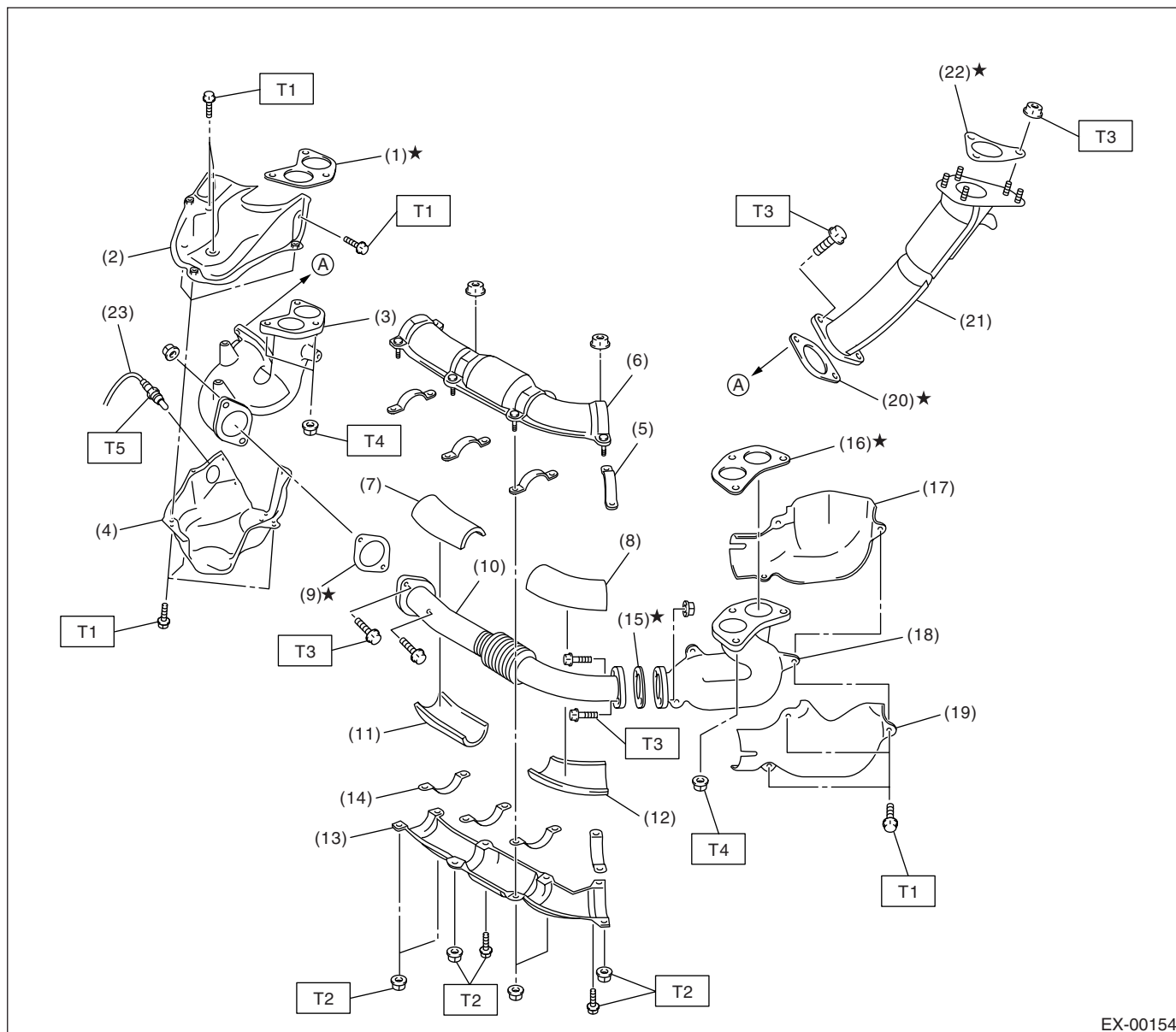
EXHAUST

(1) Gasket	(10) Front exhaust pipe lower cover	(20) Front exhaust pipe upper insulator (LH)
(2) Exhaust manifold upper cover (RH)	(11) Gasket	
(3) Exhaust manifold (RH)	(12) Exhaust manifold upper cover (LH)	
(4) Exhaust manifold lower cover (RH)	(13) Exhaust manifold lower cover (LH)	<i>Tightening torque: N·m (kgf-m, ft-lb)</i>
(5) Front exhaust pipe upper cover	(14) Gasket	<i>T1: 7.5 (0.8, 5.5)</i>
(6) Front exhaust pipe upper insulator (RH)	(15) Turbocharger joint pipe	<i>T2: 35 (3.6, 26)</i>
(7) Gasket	(16) Gasket	<i>T3: 40 (4, 28.9)</i>
(8) Front exhaust pipe	(17) Front oxygen (A/F) sensor	<i>T4: <Ref. to FU(H4DOTC)-41, INSTALLATION, Front Oxygen (A/F) Sensor.></i>
(9) Front exhaust pipe lower insulator (RH)	(18) Exhaust manifold (LH)	
	(19) Front exhaust pipe lower insulator (LH)	

General Description

EXHAUST

• STI model



EX-00154

(1) Gasket	(10) Front exhaust pipe	(20) Gasket
(2) Exhaust manifold upper cover (RH)	(11) Front exhaust pipe lower insulator (RH)	(21) Turbocharger joint pipe
(3) Exhaust manifold (RH)	(12) Front exhaust pipe lower insulator (LH)	(22) Gasket
(4) Exhaust manifold lower cover (RH)	(13) Front exhaust pipe lower cover	(23) Front oxygen (A/F) sensor
(5) Front exhaust pipe upper clamp	(14) Front exhaust pipe lower clamp	
(6) Front exhaust pipe upper cover	(15) Gasket	
(7) Front exhaust pipe upper insulator (RH)	(16) Gasket	
(8) Front exhaust pipe upper insulator (LH)	(17) Exhaust manifold upper cover (LH)	
(9) Gasket	(18) Exhaust manifold (LH)	
	(19) Exhaust manifold lower cover (LH)	

Tightening torque: N·m (kgf-m, ft-lb)

T1: 19 (1.9, 13.7)

T2: 25 (2.5, 18.1)

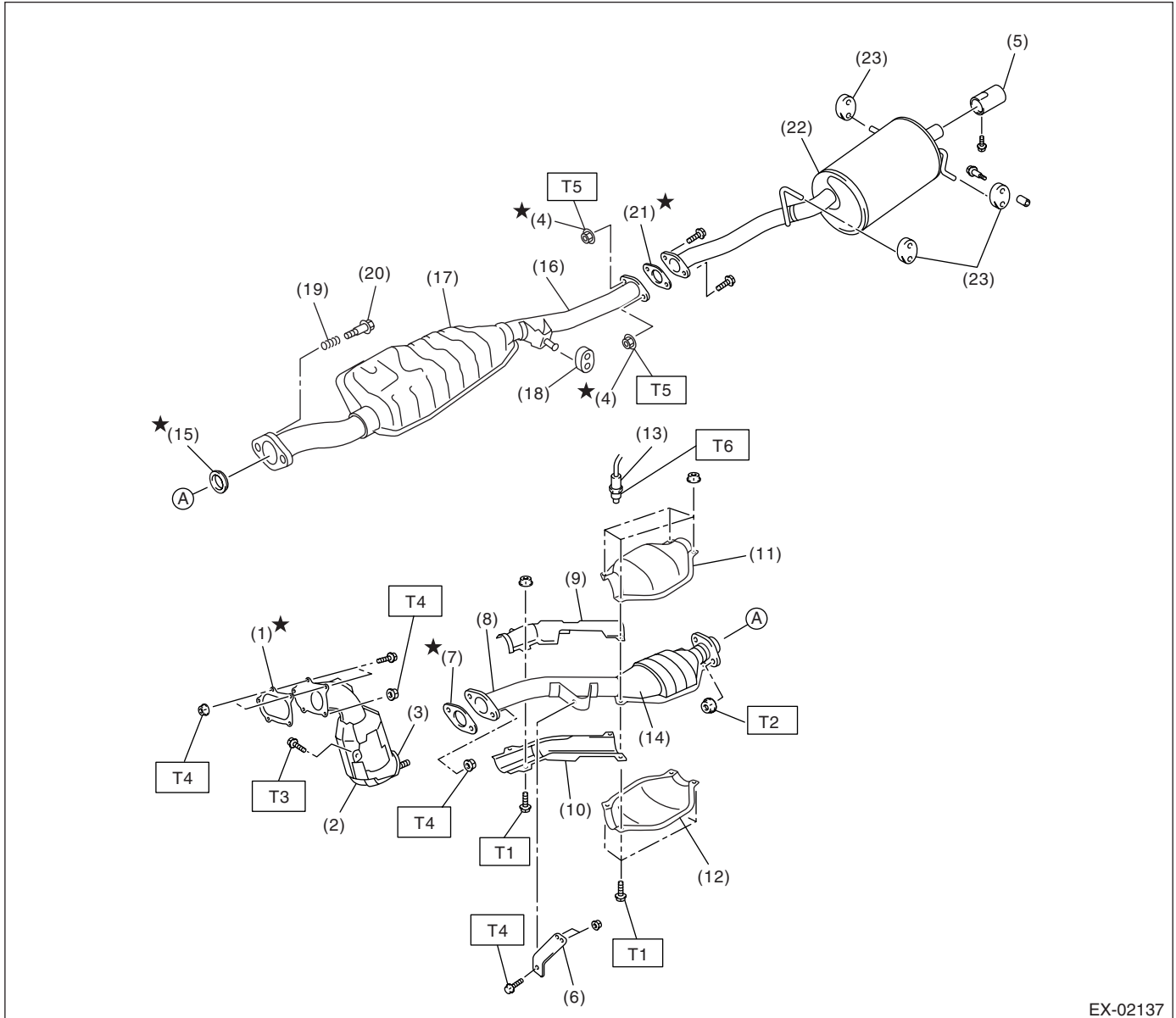
T3: 35 (3.6, 26)

T4: 40 (4, 28.9)

T5: <Ref. to FU(H4DOTC)-41, INSTALLATION, Front Oxygen (A/F) Sensor.>

2. CENTER AND REAR EXHAUST PIPE, AND MUFFLER

• Turbo model



EX-02137

- (1) Gasket
- (2) Front catalytic converter
- (3) Center exhaust pipe (Front)
- (4) Self-locking nut
- (5) Muffler cutter
- (6) Bracket
- (7) Gasket
- (8) Center exhaust pipe (Rear)
- (9) Center pipe upper cover (Rear)
- (10) Center pipe lower cover (Rear)
- (11) Rear catalytic converter upper cover

- (12) Rear catalytic converter lower cover
- (13) Rear oxygen sensor
- (14) Rear catalytic converter
- (15) Gasket
- (16) Rear exhaust pipe
- (17) Chamber
- (18) Cushion rubber
- (19) Spring
- (20) Bolt
- (21) Gasket

- (22) Muffler
- (23) Cushion rubber

Tightening torque: N·m (kgf-m, ft-lb)

T1: 13 (1.3, 9.6)

T2: 18 (1.8, 13)

T3: 30 (3.1, 22.4)

T4: 35 (3.6, 26)

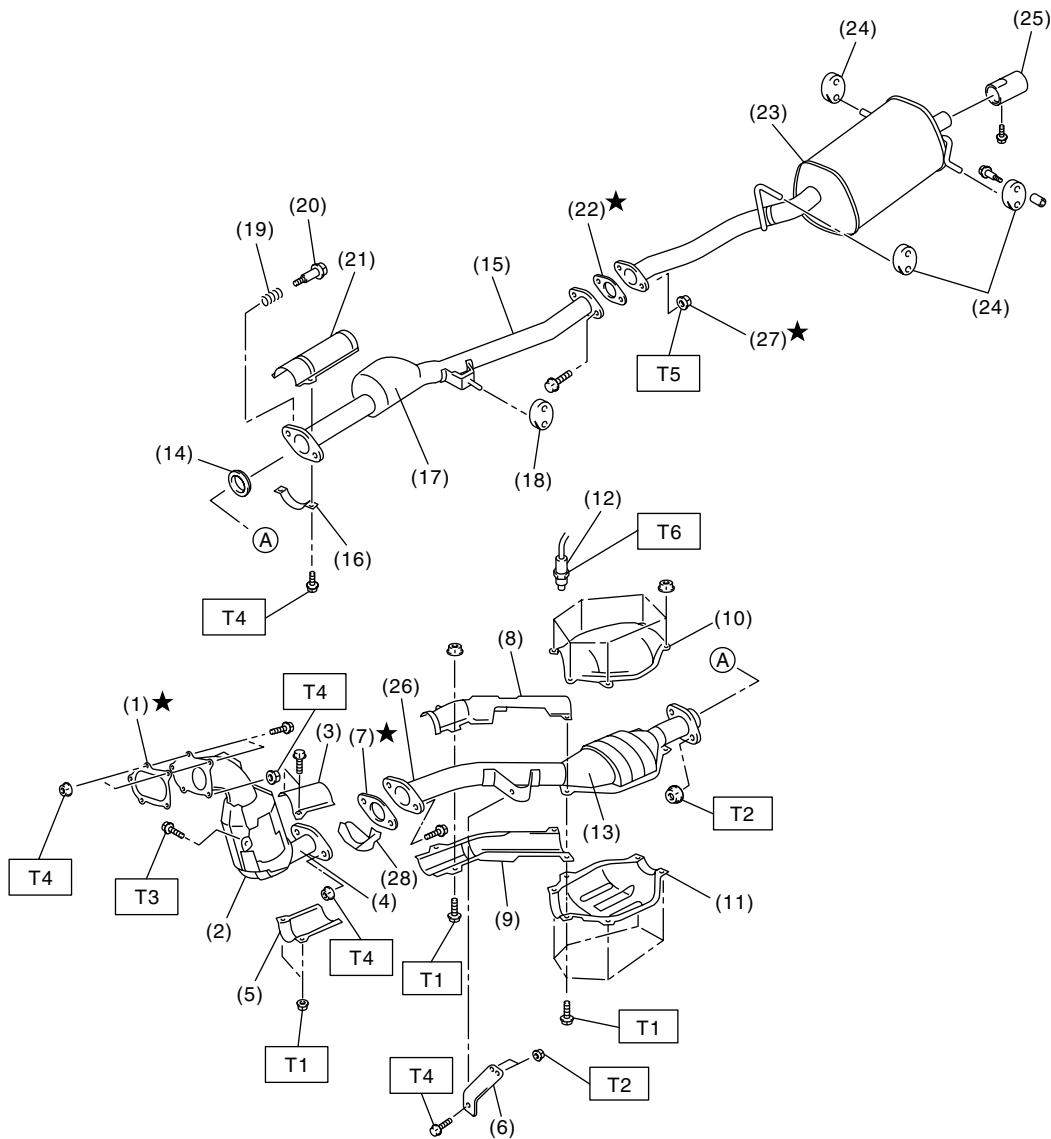
T5: 48 (4.9, 35.4)

T6: <Ref. to FU(H4DOTC)-43, INSTALLATION, Rear Oxygen Sensor.>

General Description

EXHAUST

• STI model



EX-02089

(1) Gasket	(13) Rear catalytic converter	(26) Center exhaust pipe (Rear)
(2) Front catalytic converter	(14) Gasket	(27) Self-locking nut
(3) Center pipe upper cover (Front)	(15) Rear exhaust pipe	
(4) Center exhaust pipe (Front)	(16) Clamp	
(5) Center pipe lower cover (Front)	(17) Chamber	
(6) Bracket	(18) Cushion rubber	
(7) Gasket	(19) Spring	
(8) Center pipe upper cover (Rear)	(20) Bolt	
(9) Center pipe lower cover (Rear)	(21) Rear exhaust pipe upper cover (Front)	
(10) Rear catalytic converter upper cover	(22) Gasket	
(11) Rear catalytic converter lower cover	(23) Muffler	
(12) Rear oxygen sensor	(24) Cushion rubber	
	(25) Muffler cutter	

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

T1: 13 (1.3, 9.6)

T2: 18 (1.8, 13)

T3: 30 (3.1, 22.4)

T4: 35 (3.6, 26)

T5: 48 (4.9, 35.4)

T6: <Ref. to FU(H4DOTC)-43, INSTALLATION, Rear Oxygen Sensor.>

EX(H4DOTC)-6

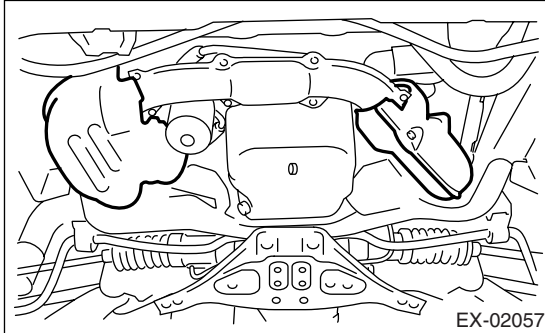
B: CAUTION

- 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 yourself, 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 rigid racks at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.

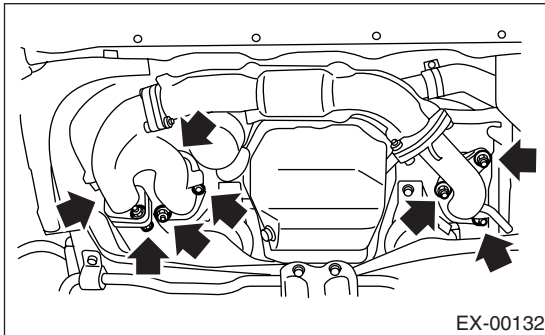
2. Front Exhaust Pipe

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-41, 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).

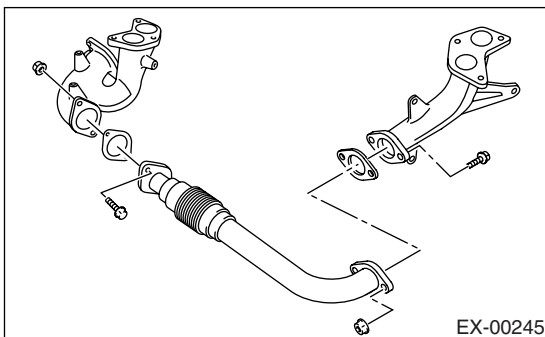


- 6) Remove the bolts and nuts which hold the front exhaust pipe assembly to turbocharger joint pipe.
- 7) While holding the front exhaust pipe assembly with one hand, remove the nuts which hold the front exhaust pipe assembly to cylinder head exhaust port.

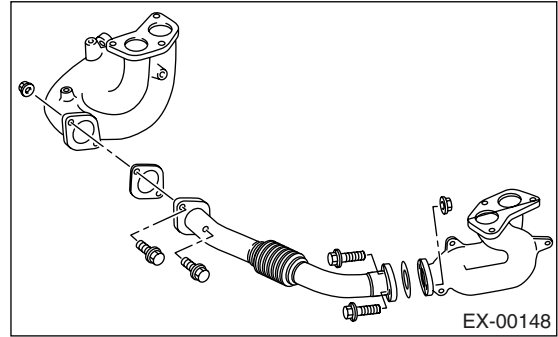


- 8) Remove the front exhaust pipe assembly.
- 9) Remove the covers from exhaust manifold and front exhaust pipe.
- 10) Separate the front exhaust pipe from exhaust manifolds.

- Turbo model



- STI model



B: INSTALLATION

NOTE:

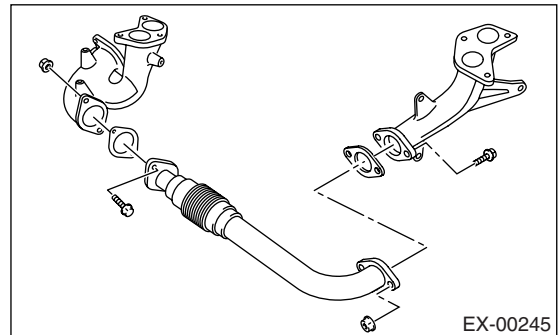
Replace the gaskets with new ones.

- 1) Assemble the front exhaust pipe and exhaust manifolds.

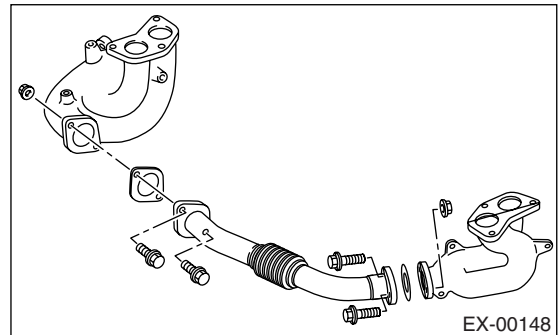
Tightening torque:

35 N·m (3.6 kgf-m, 26 ft-lb)

- Turbo model



- STI model



- 2) Install the front exhaust pipe covers.

Tightening torque:

Turbo model

7.5 N·m (0.8 kgf-m, 5.5 ft-lb)

STI model

25 N·m (2.5 kgf-m, 18.1 ft-lb)

3) Install the upper exhaust manifold cover (RH).

Tightening torque:

Turbo model

7.5 N·m (0.8 kgf-m, 5.5 ft-lb)

STI model

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 ft-lb)

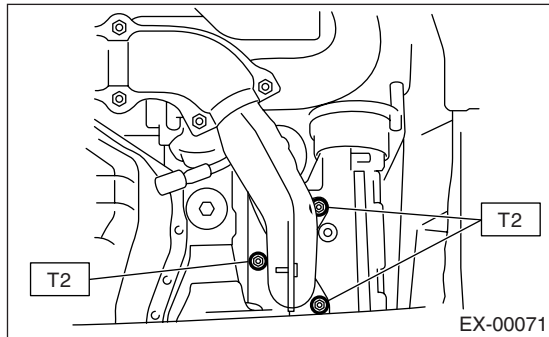
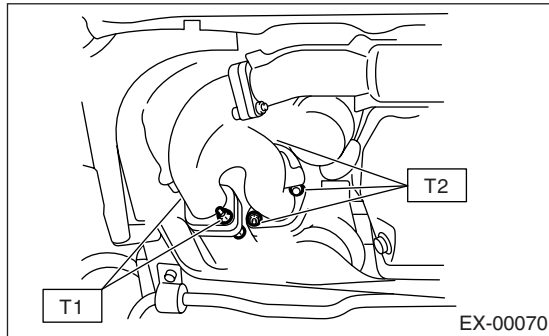
5) Connect the exhaust manifold (RH) to turbo-charger joint pipe.

- Turbo model

Tightening torque:

T1: 35 N·m (3.6 kgf-m, 26 ft-lb)

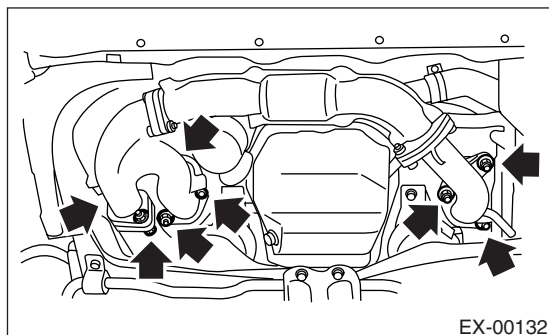
T2: 40 N·m (4 kgf-m, 28.9 ft-lb)



- STI model

Tightening torque:

35 N·m (3.6 kgf-m, 26 ft-lb)



6) Install the upper and lower exhaust manifold covers (LH).

Tightening torque:

Turbo model

7.5 N·m (0.8 kgf-m, 5.5 ft-lb)

STI model

19 N·m (1.9 kgf-m, 13.7 ft-lb)

7) Install the lower exhaust manifold cover (RH).

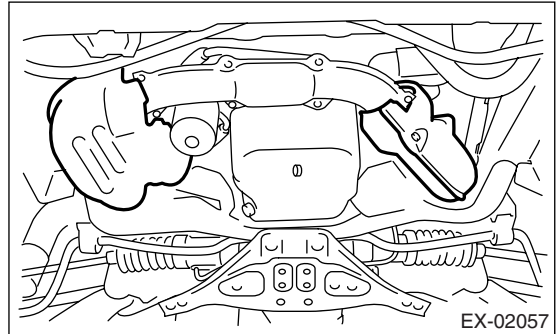
Tightening torque:

Turbo model

7.5 N·m (0.8 kgf-m, 5.5 ft-lb)

STI model

19 N·m (1.9 kgf-m, 13.7 ft-lb)



8) Install the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-41, INSTALLATION, Front Oxygen (A/F) Sensor.>

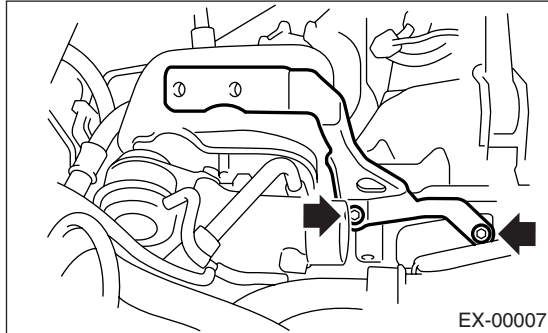
9) Install the under cover.

10) Connect the battery ground cable to battery.

3. Center Exhaust Pipe

A: REMOVAL

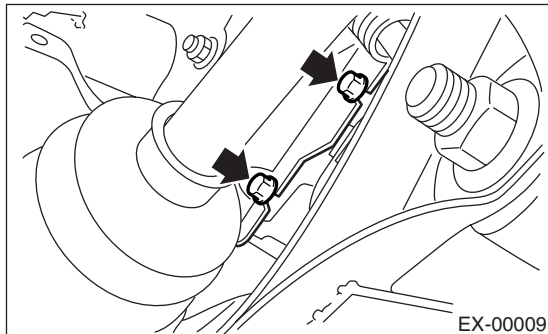
- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from battery.
- 3) Remove the intercooler. <Ref. to IN(H4DOTC)-11, REMOVAL, Intercooler.>
- 4) Remove the intercooler bracket.



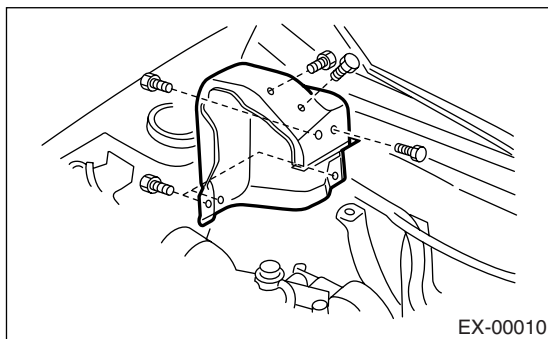
- 5) Lift-up the vehicle.
- 6) Remove the under cover.
- 7) Remove the bolts which install the under side of turbocharger lower cover.

CAUTION:

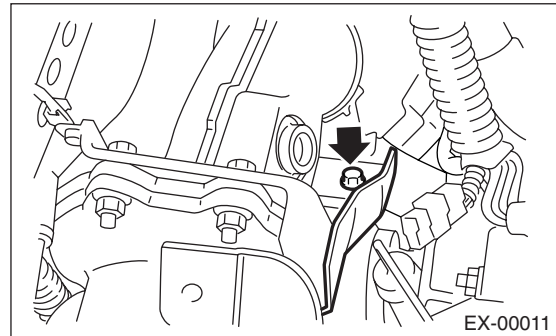
Be careful, the turbocharger and exhaust pipe are hot.



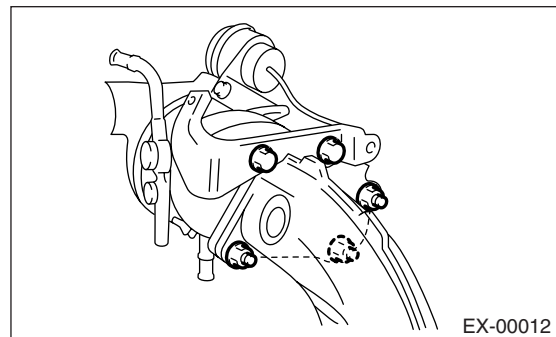
- 8) Lower the vehicle.
- 9) Remove the turbocharger upper cover.



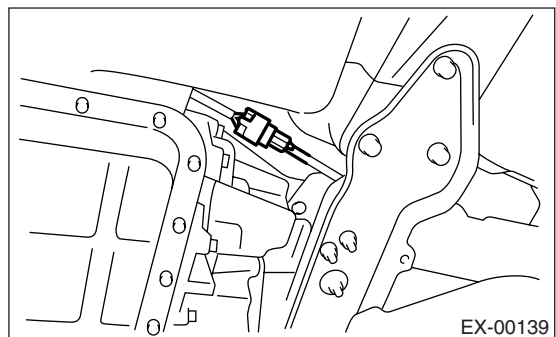
- 10) Remove the bolts which install the upper side of turbocharger lower cover, and remove it.



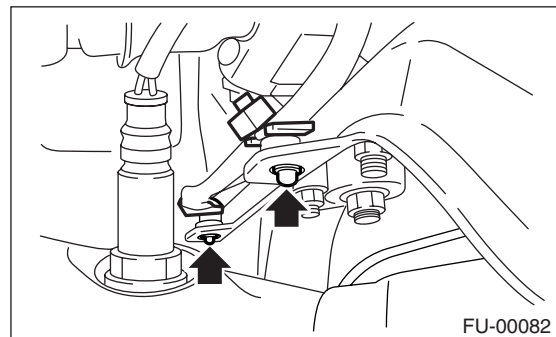
- 11) Separate the center exhaust pipe from turbocharger.



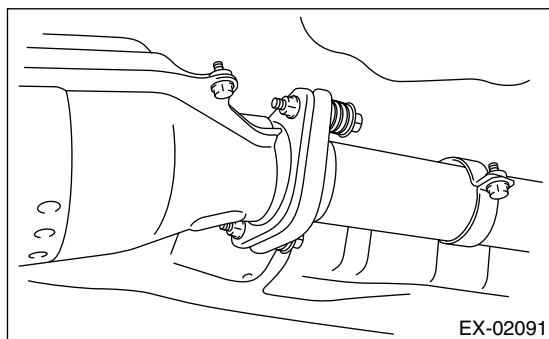
- 12) Lift-up the vehicle.
- 13) Disconnect the connector from rear oxygen sensor.



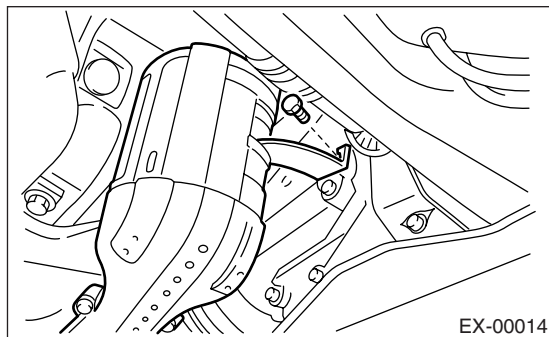
- 14) Vertically draw out the clip from crossmember.



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



- 16) Remove the bolt which holds the center exhaust pipe bracket to transmission.

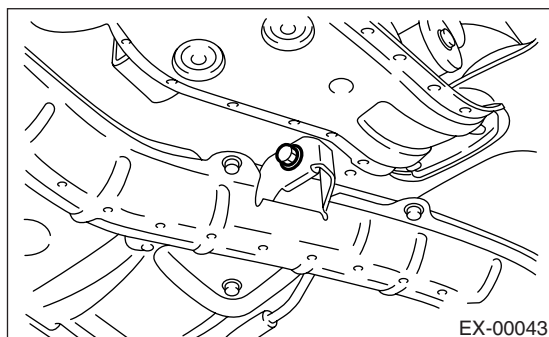


- 17) Remove the intercooler bracket.

- 18) Remove the bolt which holds the center exhaust pipe to hanger bracket.

CAUTION:

Be careful not to pull down the center exhaust pipe.



- 19) Remove the center exhaust pipe.



B: INSTALLATION

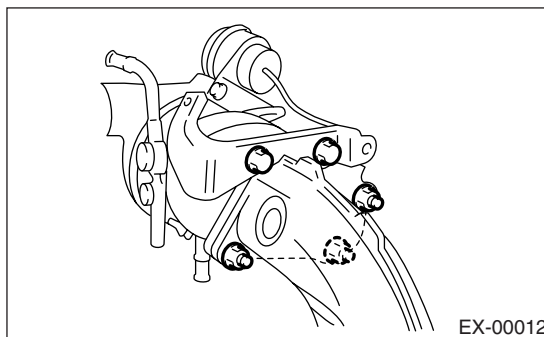
NOTE:

Replace the gaskets with new ones.

- 1) Install the center exhaust pipe and temporarily tighten the bolt which holds the center exhaust pipe to hanger bracket.
- 2) Temporarily tighten the bolt which holds the center pipe to transmission.
- 3) Connect the center exhaust pipe to turbocharger.

Tightening torque:

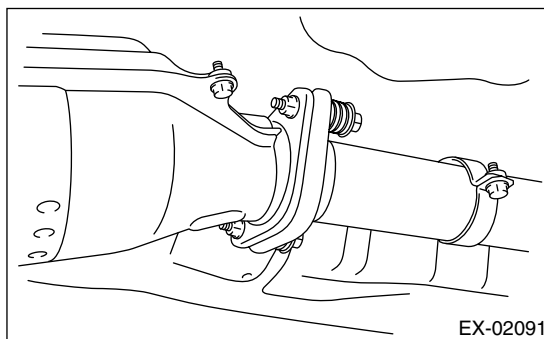
35 N·m (3.6 kgf-m, 26 ft-lb)



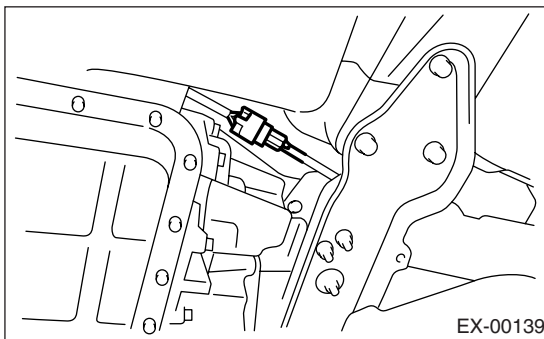
- 4) Install the center exhaust pipe to rear exhaust pipe.

Tightening torque:

18 N·m (1.8 kgf-m, 13 ft-lb)



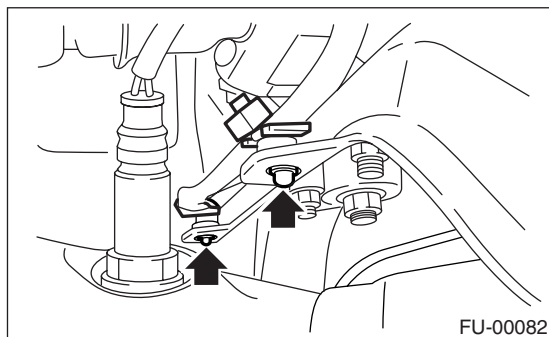
- 5) Connect the connector to rear oxygen sensor.



Center Exhaust Pipe

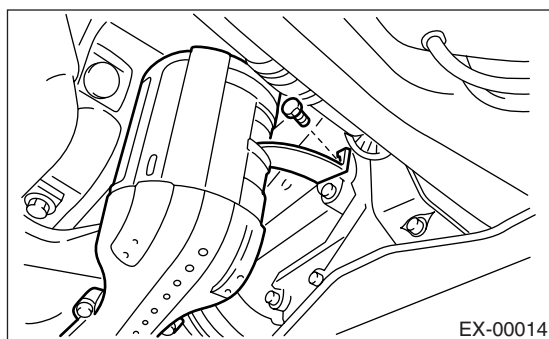
EXHAUST

- 6) Secure the clip on crossmember.



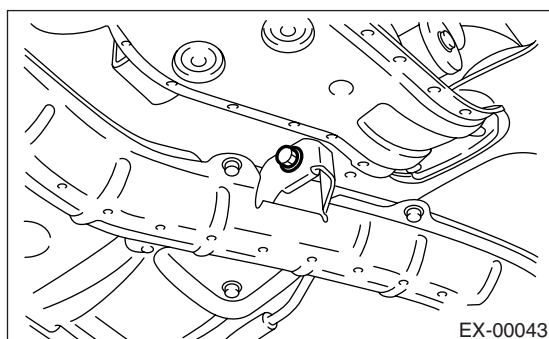
- 7) Tighten the bolt which holds the center exhaust pipe bracket to transmission.

Tightening torque:
30 N·m (3.1 kgf-m, 22.4 ft-lb)



- 8) Tighten the bolt which holds the center exhaust pipe to hanger bracket.

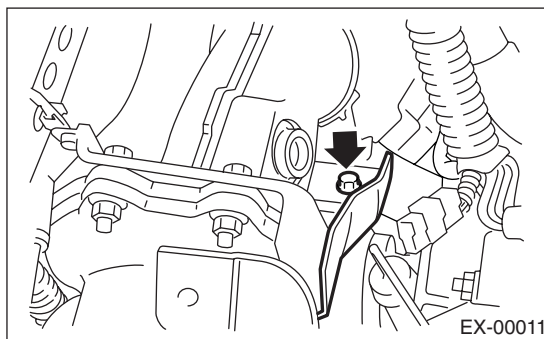
Tightening torque:
35 N·m (3.6 kgf-m, 26 ft-lb)



- 9) Lower the vehicle.

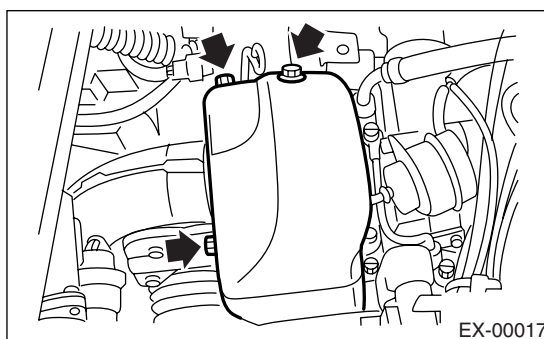
- 10) Place the turbocharger lower cover, and tighten the bolts which install the upper side of lower cover.

Tightening torque:
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)



- 11) Place the turbocharger upper cover, and tighten the bolts which install the upper side of upper cover.

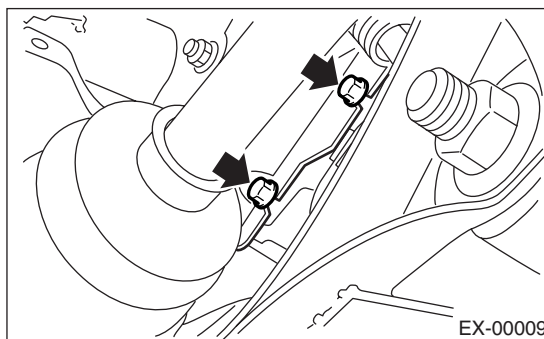
Tightening torque:
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)



- 12) Lift-up the vehicle.

- 13) Tighten the bolts which install the under side of turbocharger lower cover.

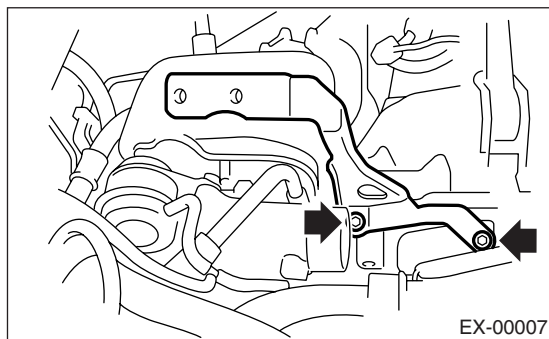
Tightening torque:
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)



- 14) Install the under cover.

- 15) Lower the vehicle.

16) Install the intercooler bracket.

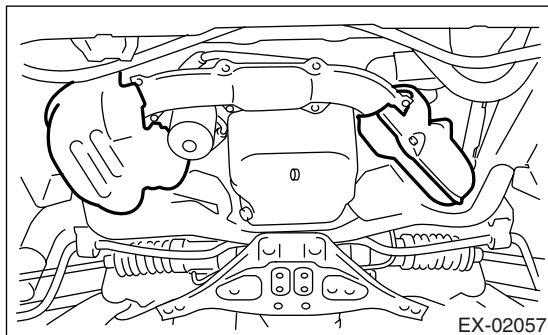


17) Install the intercooler. <Ref. to IN(H4DOTC)-11, INSTALLATION, Intercooler.>

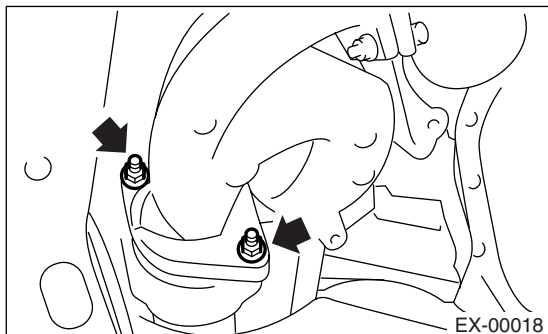
4. Joint Pipe

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-41, REMOVAL, Front Oxygen (A/F) Sensor.>
- 3) Remove the under cover.
- 4) Remove the exhaust manifold lower cover (RH).



- 5) Remove the nuts which hold the front exhaust manifold to joint pipe.



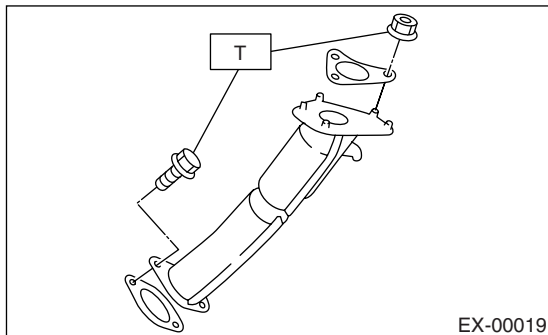
- 6) Remove the center exhaust pipe. <Ref. to EX(H4DOTC)-10, REMOVAL, Center Exhaust Pipe.>
- 7) Remove the turbocharger. <Ref. to IN(H4DOTC)-13, REMOVAL, Turbocharger.>
- 8) Take off the joint pipe in the upward direction.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

T: 35 N·m (3.6 kgf-m, 26 ft-lb)



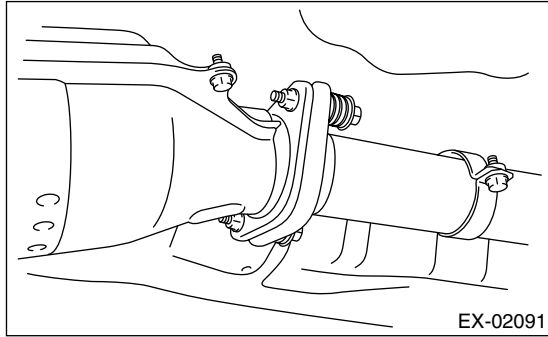
5. Rear Exhaust Pipe

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:

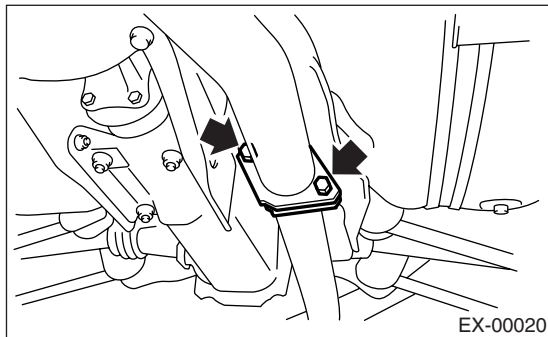
Be careful, the exhaust pipe is hot.



- 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

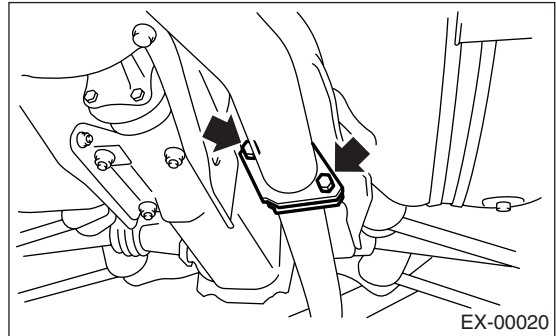
NOTE:

Replace the gaskets and self-locking nut with new ones.

- 1) Install the rear exhaust pipe to muffler.

Tightening torque:

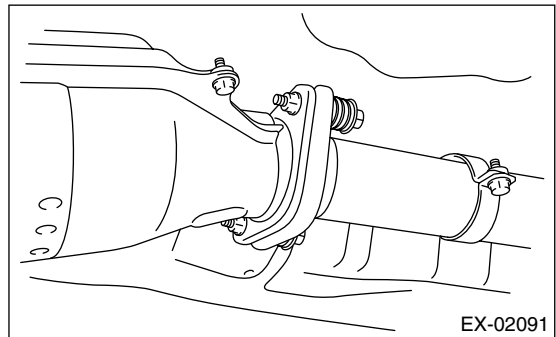
48 N·m (4.9 kgf-m, 35.4 ft-lb)



- 2) Install the rear exhaust pipe to center exhaust pipe.

Tightening torque:

18 N·m (1.8 kgf-m, 13 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.

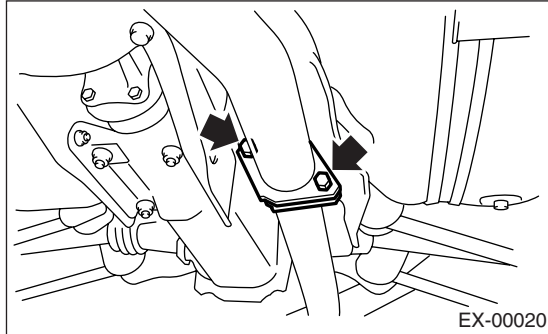
6. Muffler

A: REMOVAL

1) Separate the muffler from rear exhaust pipe.

CAUTION:

Be careful, the exhaust pipe is hot.



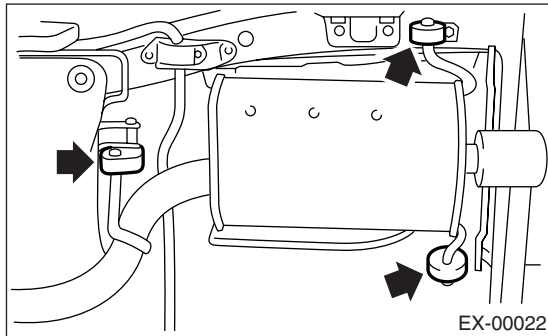
2) Remove the rubber cushions, and detach the muffler.

CAUTION:

Be careful not to drop the muffler during removal.

NOTE:

To facilitate removal, apply a coat of spray type lubricant to the mating area of rubber cushions in advance.



B: INSTALLATION

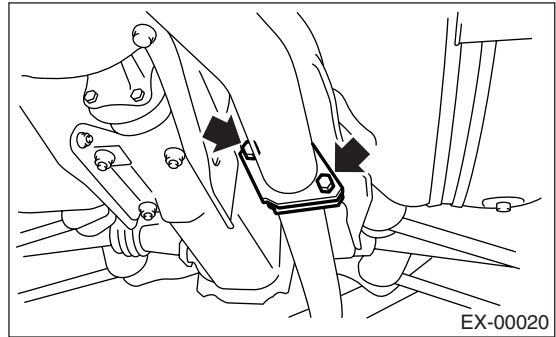
Install in the reverse order of removal.

NOTE:

Replace the gasket and self-locking nut with a new one.

Tightening torque:

48 N·m (4.9 kgf-m, 35.4 ft-lb)



C: INSPECTION

- 1) Make sure there are no exhaust leaks from connections and welds.
- 2) Make sure there are no holes or rusting.
- 3) Make sure the cushion rubber is not worn or cracked.

FUEL INJECTION (FUEL SYSTEMS)

General Description

FUEL INJECTION (FUEL SYSTEMS)

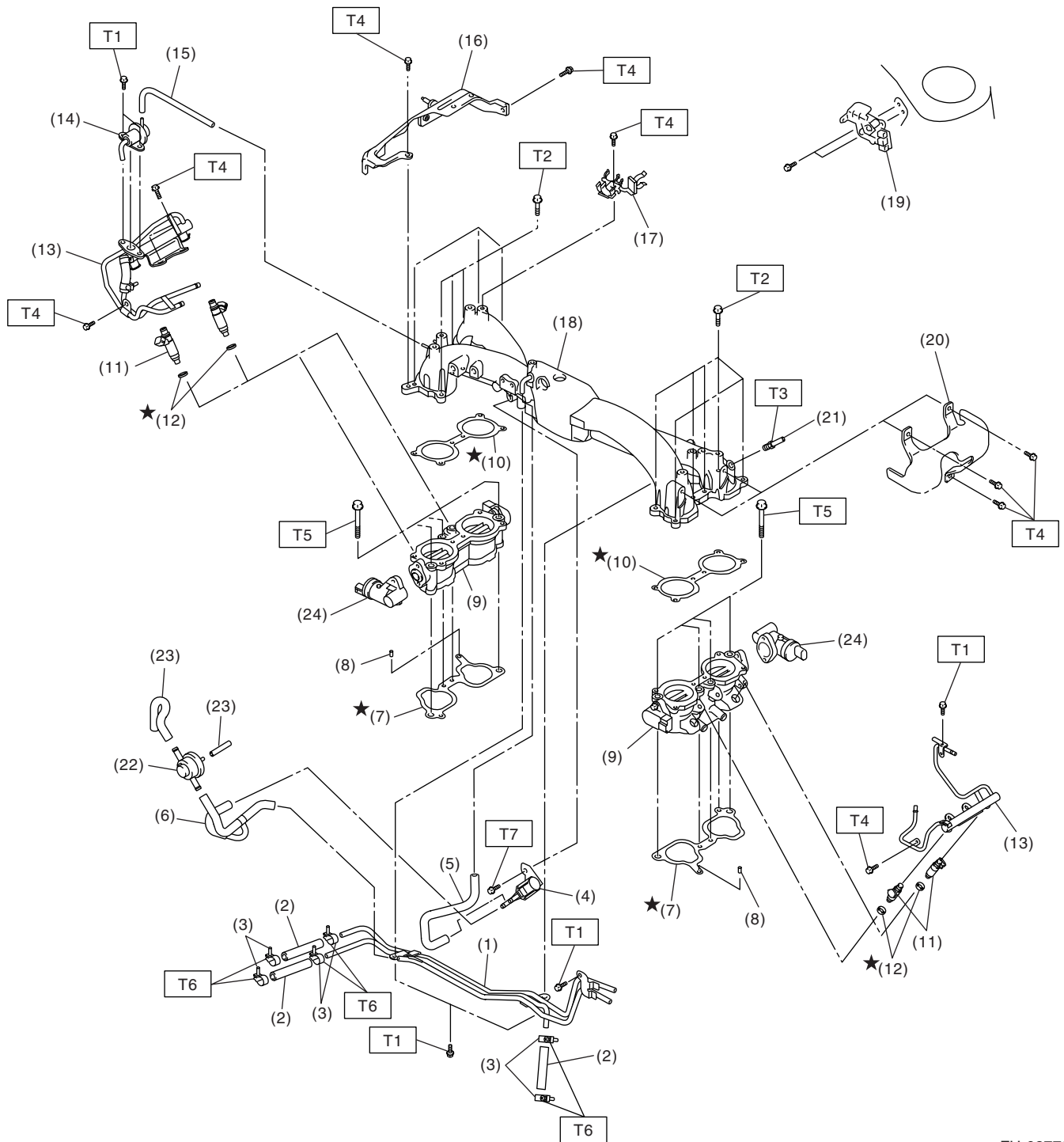
1. General Description

A: SPECIFICATION

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 kgf/cm ² , 65.27 — 98.2 psi)
	Discharge flow	More than 145 ℓ (38.3 US gal, 31.9 Imp gal)/h [12 V at 300 kPa (3.06 kgf/cm ² , 43.5 psi)]
Fuel filter		Cartridge type

B: COMPONENT

1. INTAKE MANIFOLD



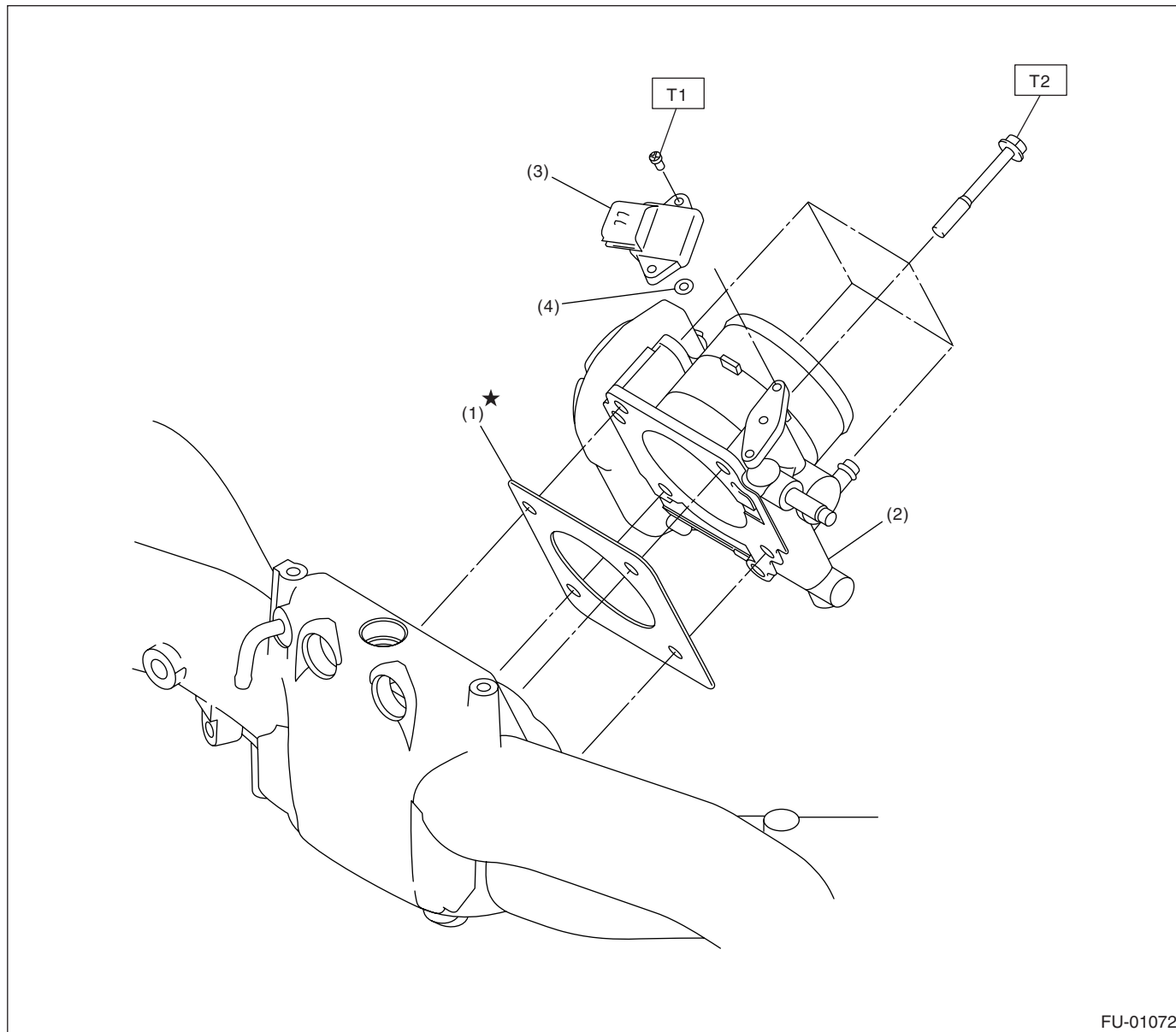
FU-02770

General Description

FUEL INJECTION (FUEL SYSTEMS)

(1) Fuel pipe ASSY	(12) Insulator	(22) Purge valve
(2) Fuel hose	(13) Fuel injector pipe	(23) Purge hose
(3) Clip	(14) Pressure regulator	(24) Tumble generator valve actuator
(4) Purge control solenoid valve	(15) Pressure regulator hose	
(5) Vacuum hose	(16) Fuel pipe protector RH	<i>Tightening torque: N·m (kgf-m, ft-lb)</i>
(6) Vacuum control hose	(17) Blow-by hose stay	<i>T1: 6.4 (0.65, 4.7)</i>
(7) Intake manifold gasket	(18) Intake manifold	<i>T2: 8.25 (0.84, 6.1)</i>
(8) Guide pin	(19) Wastegate control solenoid valve ASSY	<i>T3: 17 (1.73, 12.5)</i>
(9) Tumble generator valve ASSY	(20) Fuel pipe protector LH	<i>T4: 19 (1.94, 13.7)</i>
(10) Tumble generator valve gasket	(21) Nipple	<i>T5: 25 (2.5, 18.1)</i>
(11) Fuel injector		<i>T6: 1.25 (0.13, 0.94)</i>
		<i>T7: 16 (1.6, 11.6)</i>

2. AIR INTAKE SYSTEM



FU-01072

- (1) Gasket
- (2) Throttle body

- (3) Manifold absolute pressure sensor
- (4) O-ring

Tightening torque: N·m (kgf-m, ft-lb)

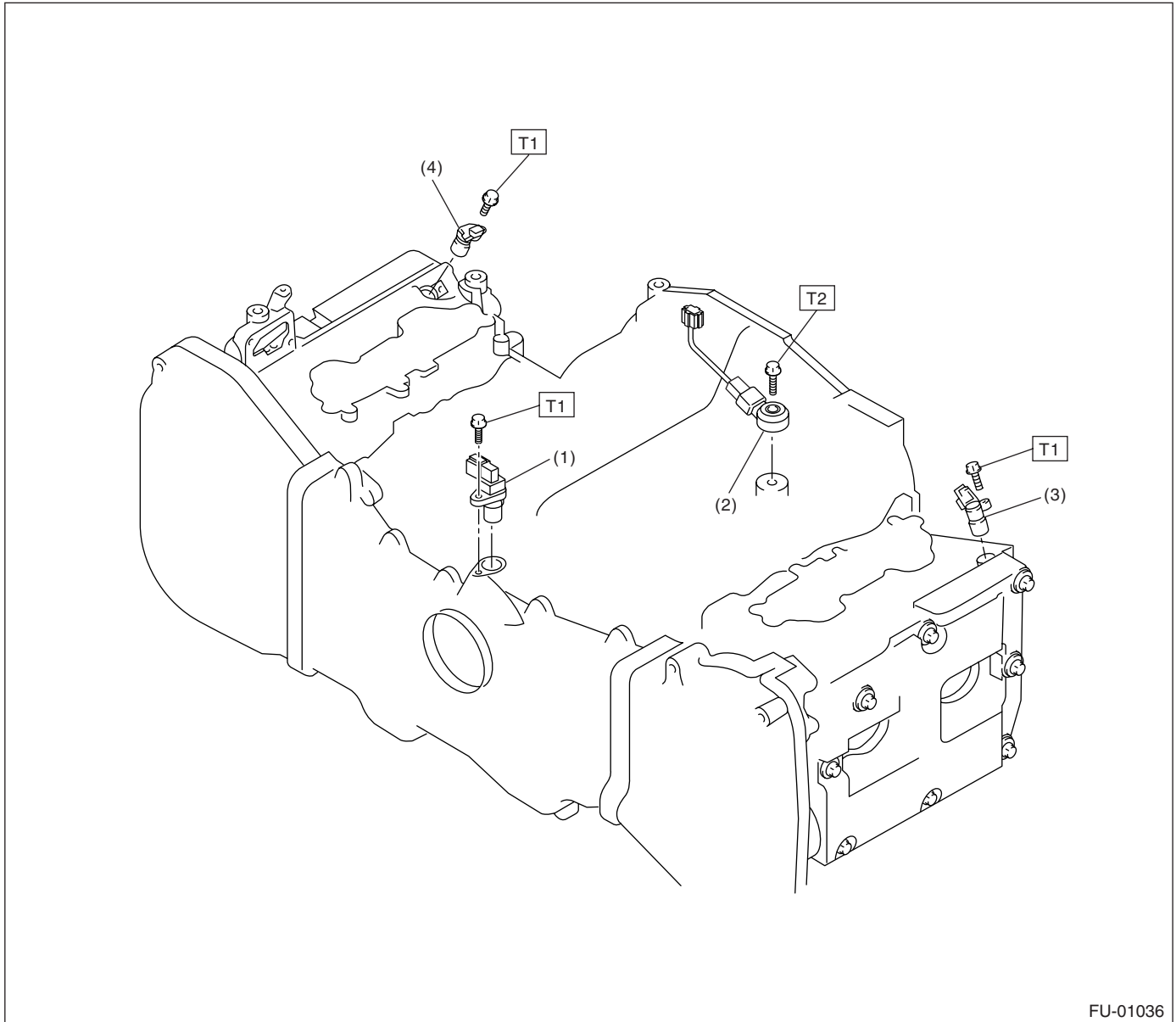
T1: 1.6 (0.16, 1.2)

T2: 8 (0.8, 5.8)

General Description

FUEL INJECTION (FUEL SYSTEMS)

3. CRANKSHAFT POSITION, CAMSHAFT POSITION AND KNOCK SENSORS



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

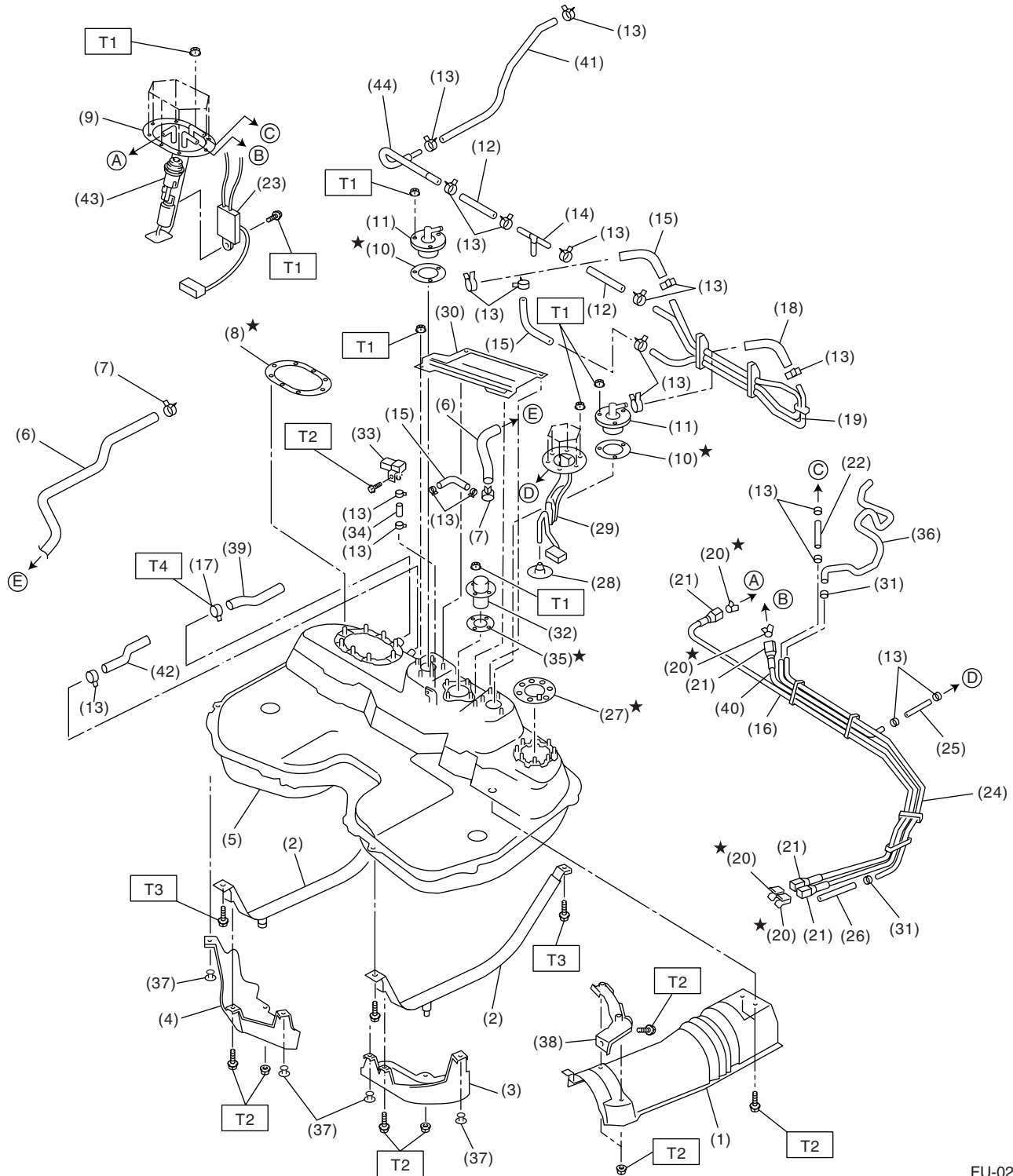
- (3) Camshaft position sensor LH
- (4) Camshaft position sensor RH

Tightening torque: N·m (kgf-m, ft-lb)

T1: 6.4 (0.65, 4.7)

T2: 24 (2.4, 17.4)

4. FUEL TANK



FU-02907

General Description

FUEL INJECTION (FUEL SYSTEMS)

(1) Heat shield cover	(18) Evaporation hose C	(35) Vent valve gasket
(2) Fuel tank band	(19) Evaporation pipe ASSY	(36) Purge hose
(3) Protector LH	(20) Retainer	(37) Clip
(4) Protector RH	(21) Quick connector	(38) Cover bracket
(5) Fuel tank	(22) Jet pump hose A	(39) Fuel filler hose
(6) Canister hose A	(23) Fuel level sensor	(40) Fuel return tube
(7) Clamp	(24) Fuel pipe ASSY	(41) Evaporation hose E
(8) Fuel pump gasket	(25) Jet pump hose B	(42) Evaporation hose F
(9) Fuel pump ASSY	(26) Evaporation hose D	(43) Fuel filter
(10) Fuel cut valve gasket	(27) Fuel sub level sensor gasket	(44) Evaporation pipe
(11) Fuel cut valve	(28) Jet pump filter	
(12) Evaporation hose A	(29) Fuel sub level sensor	
(13) Clip	(30) Protect cover	
(14) Joint pipe	(31) Clip	
(15) Evaporation hose B	(32) Vent valve	
(16) Fuel delivery tube	(33) Fuel tank pressure sensor	
(17) Clamp	(34) Fuel tank pressure sensor hose	

Tightening torque: N·m (kgf-m, ft-lb)

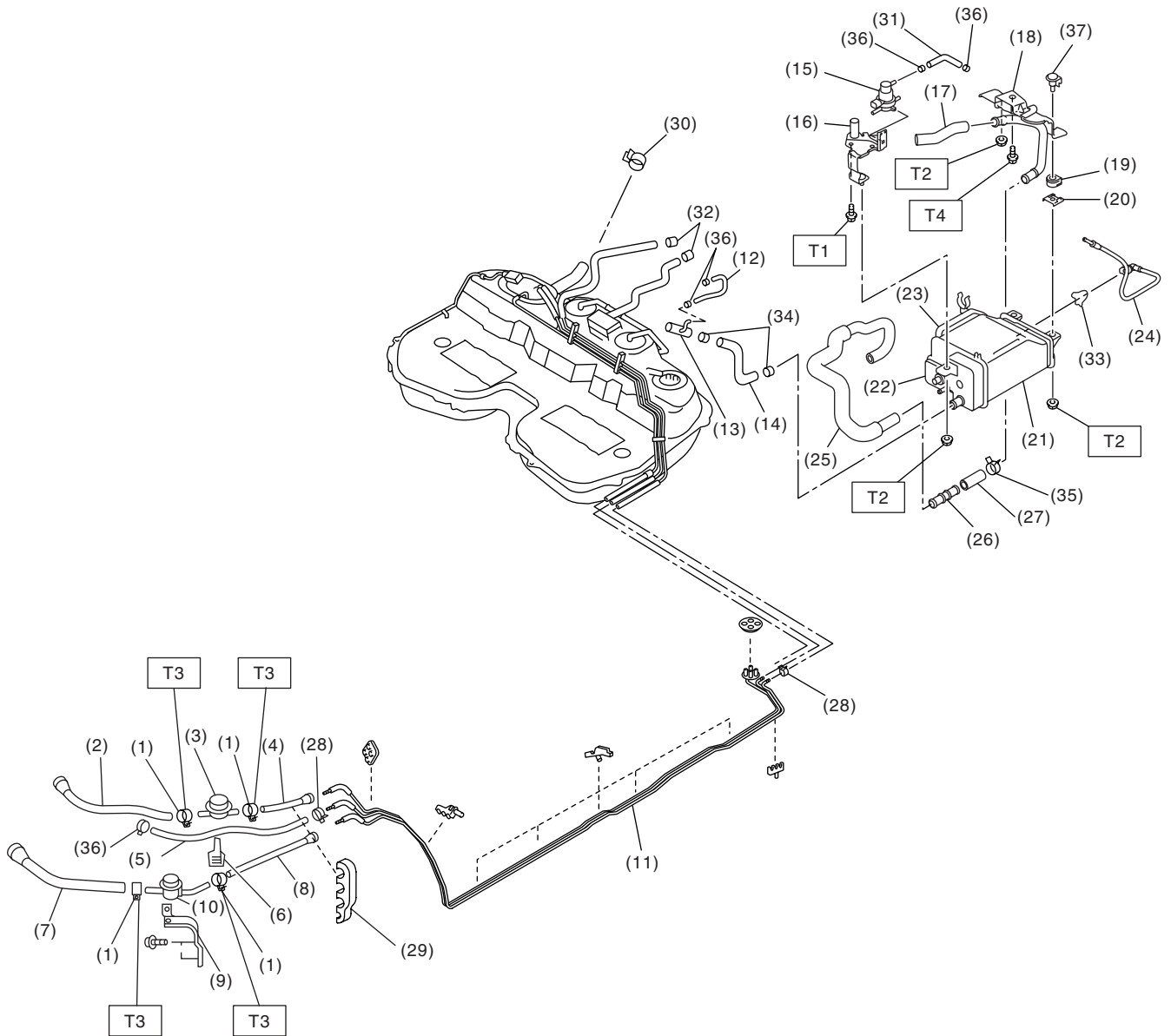
T1: 4.4 (0.45, 3.3)

T2: 7.4 (0.75, 5.4)

T3: 33 (3.4, 25)

T4: 1.96 (0.20, 1.45)

5. FUEL LINE



FU-02888

General Description

FUEL INJECTION (FUEL SYSTEMS)

(1) Clamp	(17) Drain hose C	(32) Clamp
(2) Fuel return hose A	(18) Canister upper bracket	(33) Retainer
(3) Fuel damper valve (return)	(19) Cushion rubber	(34) Clamp
(4) Fuel return hose B	(20) Canister lower bracket	(35) Clamp
(5) Evaporation hose A	(21) Canister	(36) Clamp
(6) Clip	(22) Drain valve	(37) Canister bracket spacer
(7) Fuel delivery hose A	(23) Drain filter	
(8) Fuel delivery hose B	(24) Pressure control solenoid valve tube	
(9) Fuel damper valve bracket	(25) Drain hose A	
(10) Fuel damper valve (delivery)	(26) Connector drain	
(11) Fuel pipe ASSY	(27) Drain hose B	
(12) Evaporation hose B	(28) Clamp	
(13) Joint pipe	(29) Clip	
(14) Canister hose A	(30) Clamp	
(15) Pressure control solenoid valve	(31) Pressure control solenoid valve hose	
(16) Pressure control solenoid valve bracket		

Tightening torque: N·m (kgf-m, ft-lb)

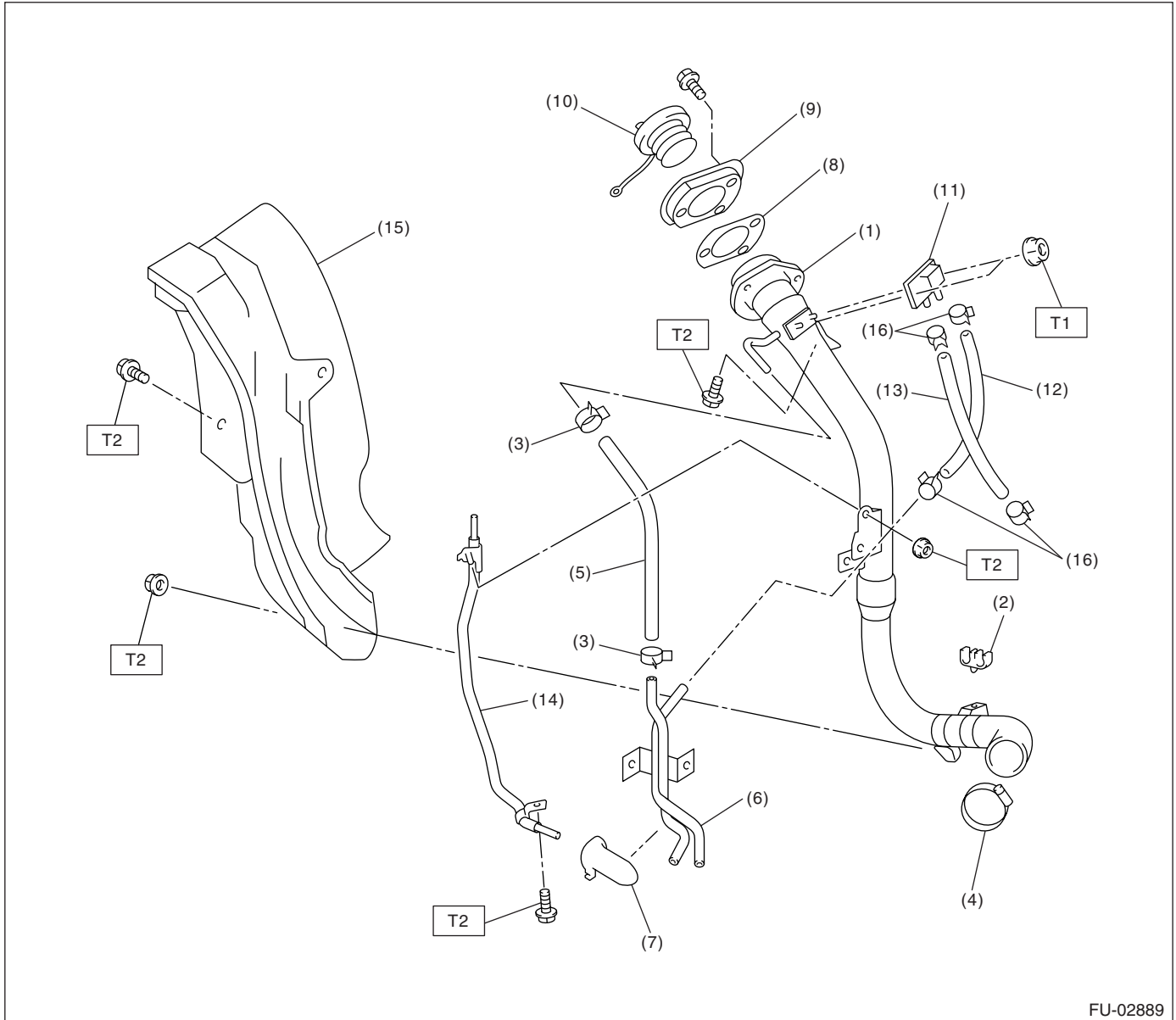
T1: 25 (2.5, 18.1)

T2: 23 (2.3, 16.6)

T3: 1.25 (0.13, 0.94)

T4: 33 (3.4, 25)

6. FUEL FILLER PIPE



FU-02889

(1) Fuel filler pipe ASSY	(8) Filler pipe packing	(15) Fuel filler pipe protector
(2) Evaporation hose holder	(9) Filler ring	(16) Clamp
(3) Clip	(10) Filler cap	
(4) Clamp	(11) Shut valve	
(5) Evaporation hose A	(12) Evaporation hose B	
(6) Evaporation pipe	(13) Evaporation hose C	
(7) Evaporation pipe holder	(14) Joint pipe	

Tightening torque: N·m (kgf-m, ft-lb)

T1: 4.4 (0.45, 3.3)

T2: 7.5 (0.76, 5.5)

General Description

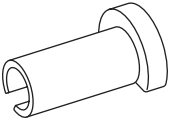
FUEL INJECTION (FUEL SYSTEMS)

C: CAUTION

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

- Be careful not to burn yourself, 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 rigid racks 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.

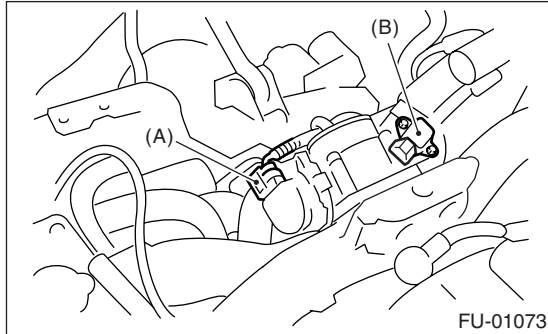
D: PREPARATION TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST42099AE000	42099AE000	CONNECTOR REMOVER	Used for removing quick connector in engine compartment.

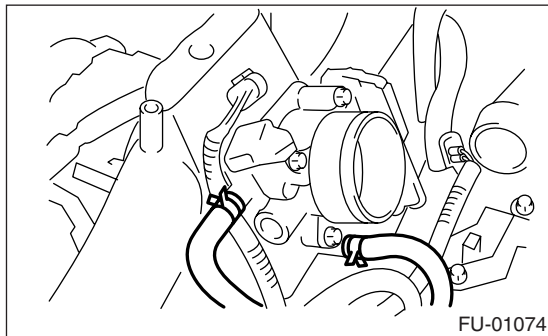
2. Throttle Body

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the intercooler. <Ref. to IN(H4DOTC)-11, REMOVAL, Intercooler.>
- 3) Disconnect the connector from the throttle position sensor (A) and manifold absolute pressure sensor (B).



- 4) Disconnect the engine coolant hoses from the throttle body.



- 5) Remove the bolts which secure the throttle body to intake manifold.

B: INSTALLATION

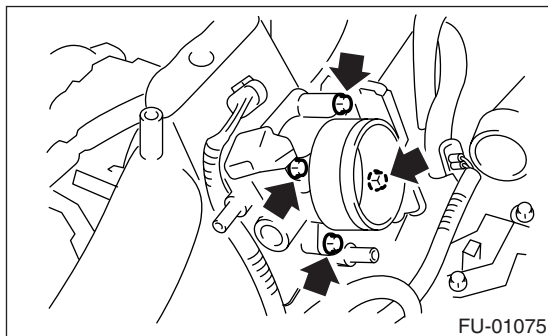
- 1) Install in the reverse order of removal.

NOTE:

Always use a new gasket.

Tightening torque:

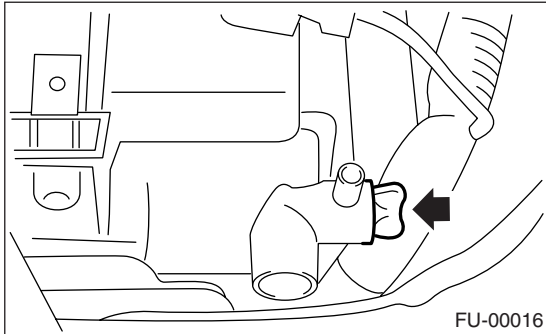
8 N·m (0.8 kgf-m, 5.8 ft-lb)



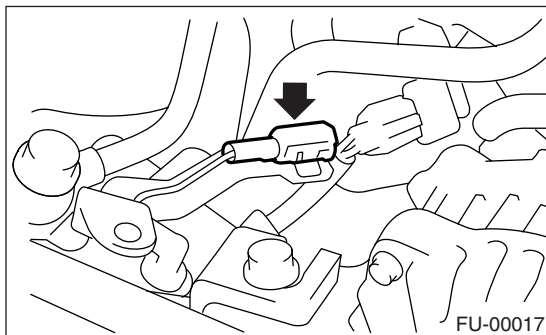
3. Intake Manifold

A: REMOVAL

- 1) Release the fuel pressure. <Ref. to FU(H4DOTC)-50, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
- 2) Disconnect the ground cable from battery.
- 3) Open the fuel filler flap lid and remove the fuel filler cap.
- 4) Lift up the vehicle.
- 5) Remove the under cover.
- 6) Drain the engine coolant about 3.0 ℓ (3.2 US qt, 2.6 Imp qt).



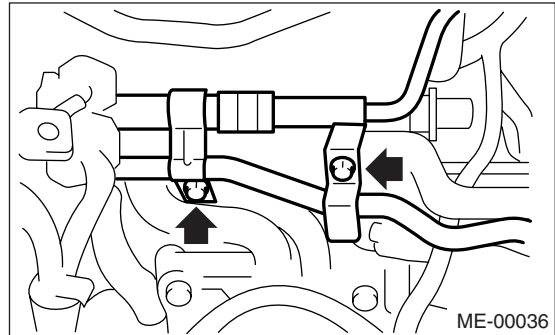
- 7) Remove the air cleaner upper cover and air intake boot. <Ref. to IN(H4DOTC)-8, REMOVAL, Air Cleaner Case.>
- 8) Remove the air cleaner element.
- 9) Remove the intercooler. <Ref. to IN(H4DOTC)-11, REMOVAL, Intercooler.>
- 10) Remove the coolant filler tank. <Ref. to CO(H4DOTC)-33, REMOVAL, Coolant Filler Tank.>
- 11) Remove the power steering pump.
 - (1) Remove the front side V-belt. <Ref. to ME(H4DOTC)-41, REMOVAL, V-belt.>
 - (2) Disconnect the power steering switch connector.



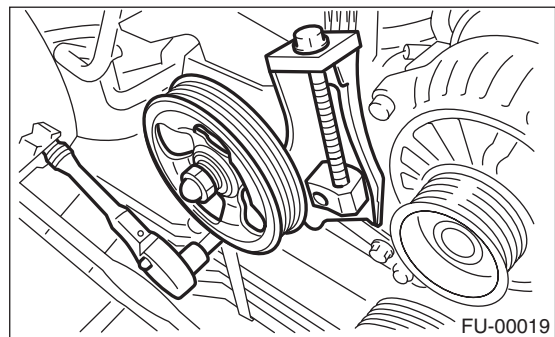
- (3) Remove the bolts which secure the power steering pipe brackets to the intake manifold.

NOTE:

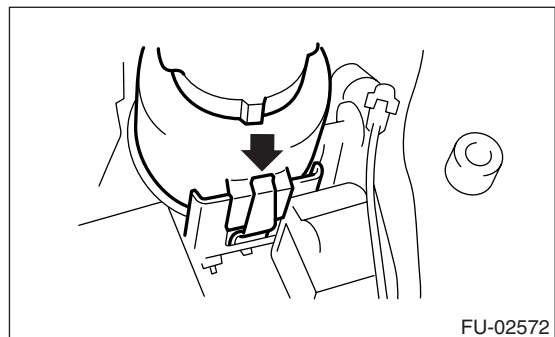
Do not disconnect the power steering hose.



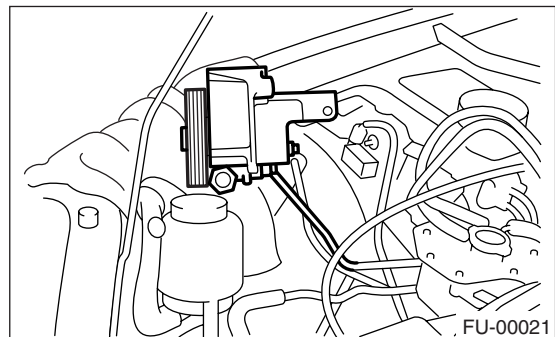
- (4) Remove the bolts which secure the power steering pump bracket.



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



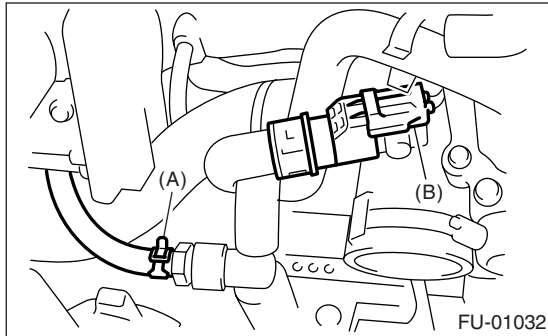
- (6) Place the power steering pump on the right side wheel apron.



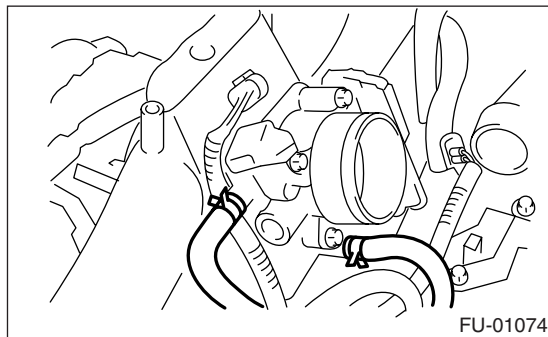
Intake Manifold

FUEL INJECTION (FUEL SYSTEMS)

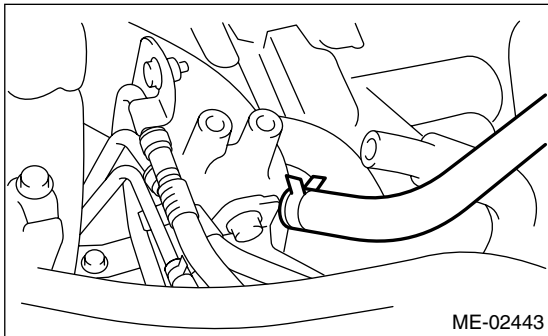
12) Disconnect the emission hose (A) and connector (B) from the PCV hose assembly.



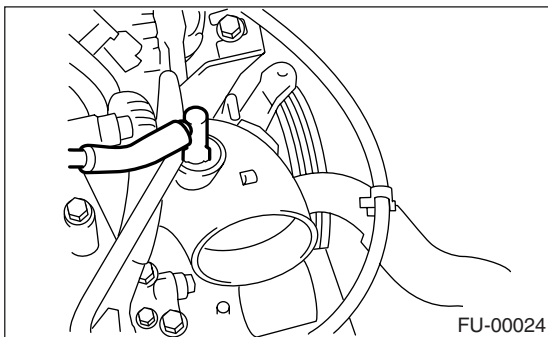
13) Disconnect the engine coolant hoses from the throttle body.



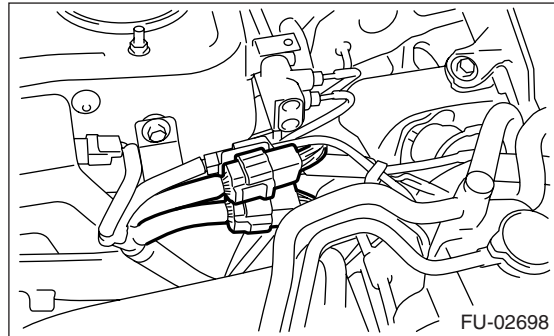
14) Disconnect the brake booster vacuum hose.



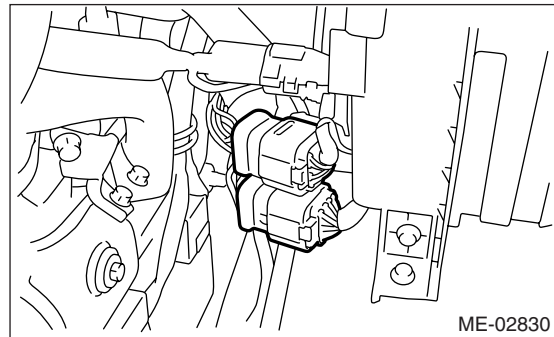
15) Disconnect the pressure hose from the intake duct.



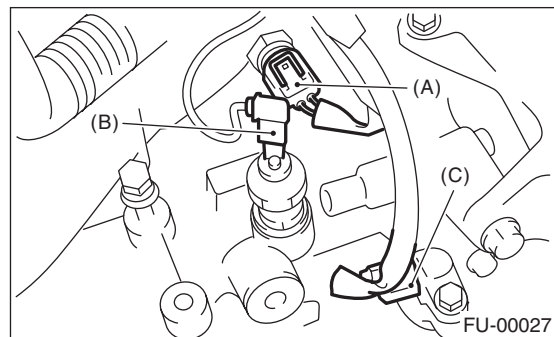
16) Disconnect the engine harness connectors from the bulkhead harness connectors.



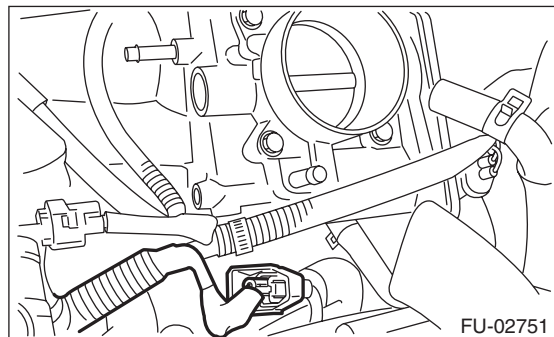
17) Remove the engine harness connector from front harness connector.



18) Disconnect the connectors from the engine coolant temperature sensor (A), oil pressure switch (B) and crankshaft position sensor (C).



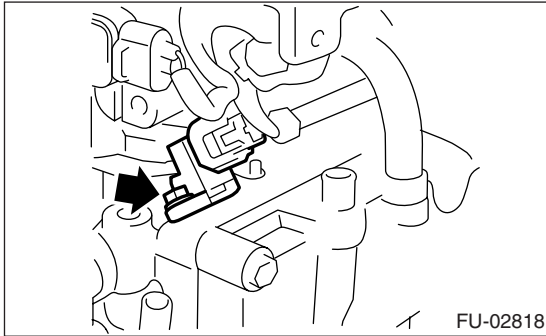
19) Disconnect the knock sensor connector.



Intake Manifold

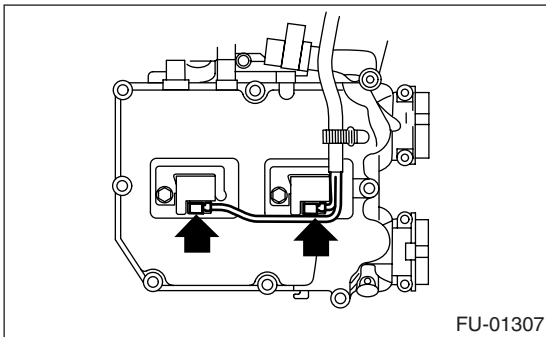
FUEL INJECTION (FUEL SYSTEMS)

20) Disconnect the connector from the camshaft position sensor.

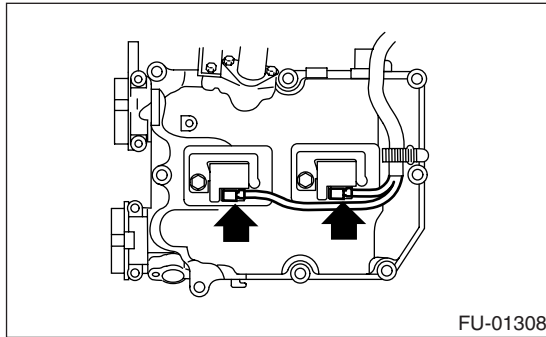


21) Disconnect the connector from the ignition coil and ignitor assembly.

- RH side

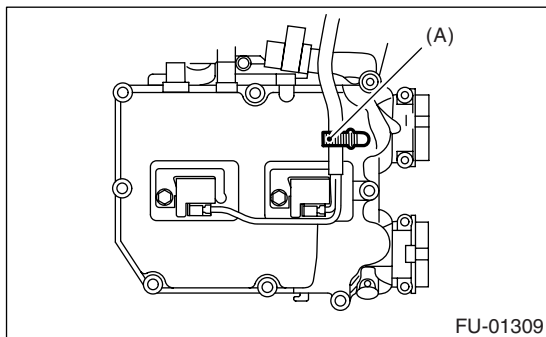


- LH side

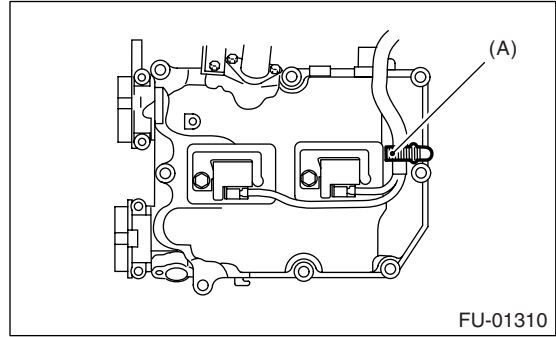


22) Disconnect the engine harness fixed by clip (A) from the rocker cover.

- RH side



- LH side

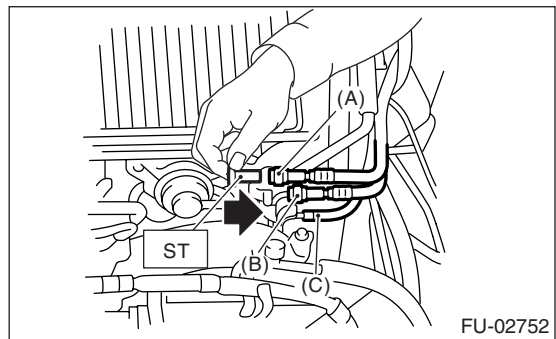


23) Using ST, disconnect fuel hoses from fuel pipes. <Ref. to FU(H4DOTC)-65, REMOVAL, Fuel Delivery, Return and Evaporation lines.>

CAUTION:

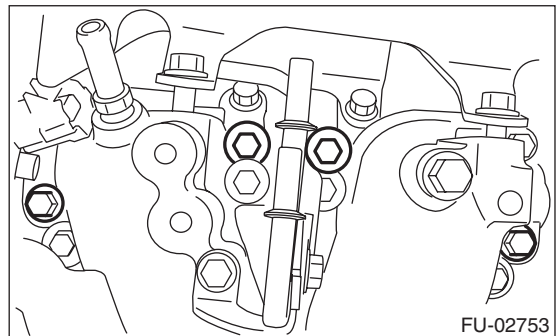
- Be careful not to spill fuel.
- Catch fuel from hoses using a container or cloth.

ST 42099AE000 CONNECTOR REMOVER



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

24) Remove the bolts which secure the intake manifold to the cylinder heads.



25) Remove the intake manifold.

B: INSTALLATION

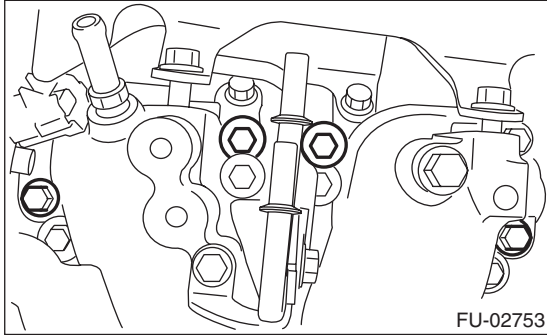
1) Install the intake manifold onto cylinder heads.

NOTE:

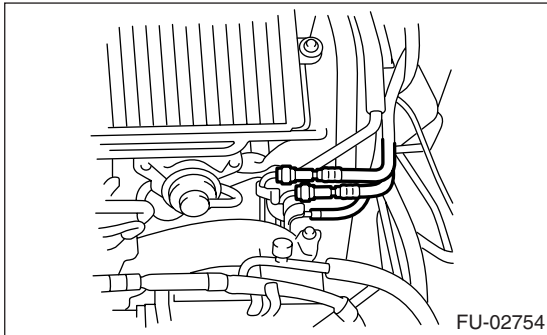
Always use new gaskets.

Tightening torque:

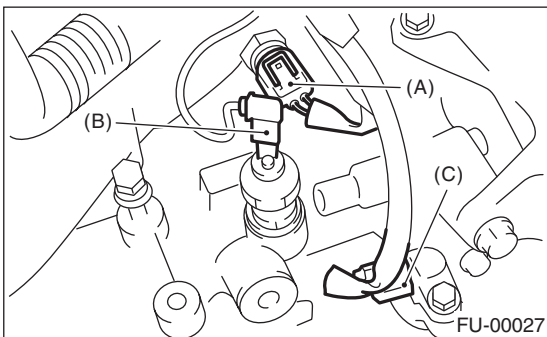
25 N·m (2.5 kgf-m, 18.1 ft-lb)



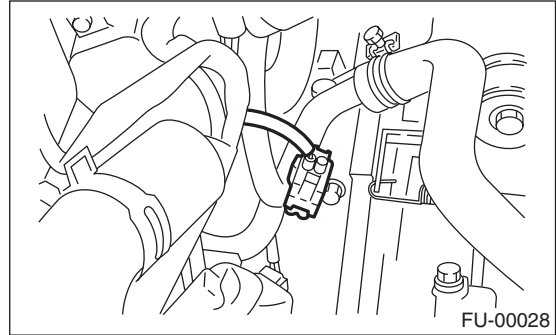
2) Connect the fuel delivery hose, return hose and evaporation hose.



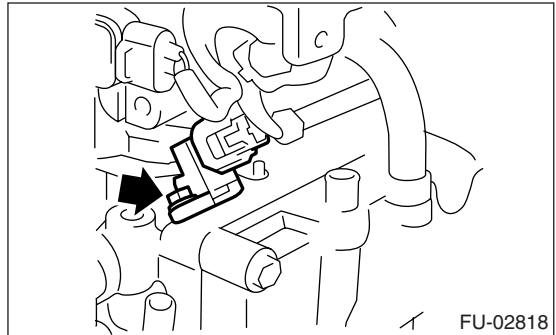
3) Connect the connector to the oil pressure switch (B), crankshaft position sensor (C) and engine coolant temperature sensor (A).



4) Connect the connector to the knock sensor.

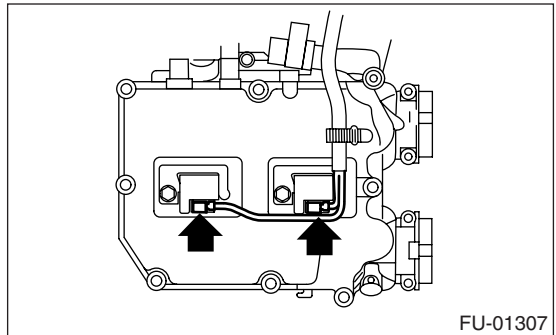


5) Connect the connector to the camshaft position sensor.

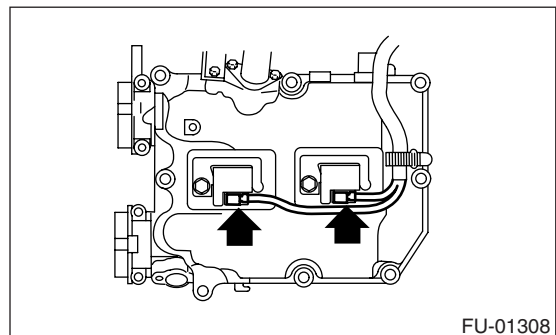


6) Connect the connector to the ignition coil and ignitor assembly.

- RH side



- LH side

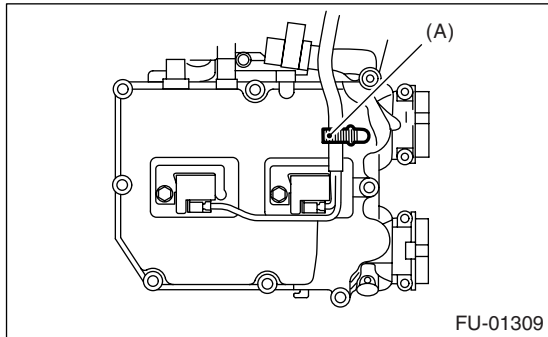


Intake Manifold

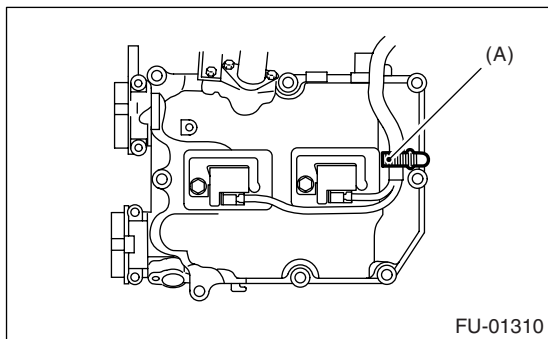
FUEL INJECTION (FUEL SYSTEMS)

7) Connect the engine harness with clip (A) to the rocker cover.

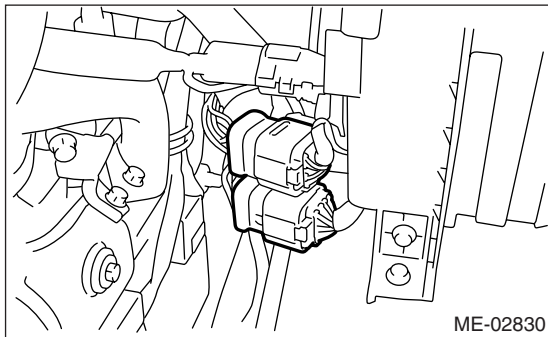
- RH side



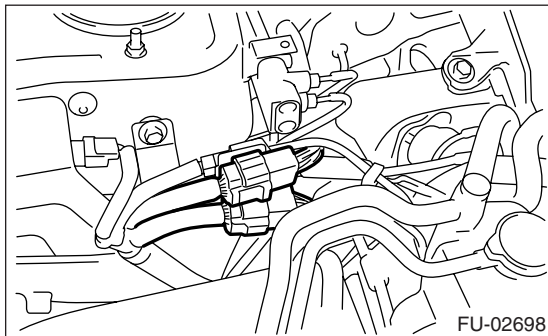
- LH side



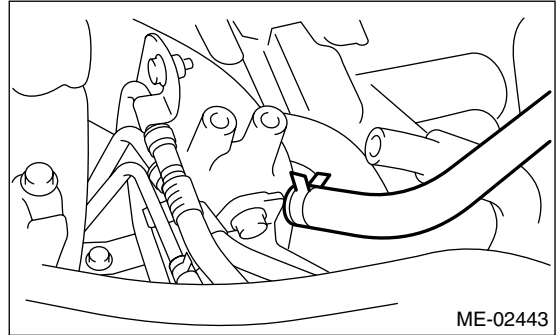
8) Connect the engine harness connector to front harness connector.



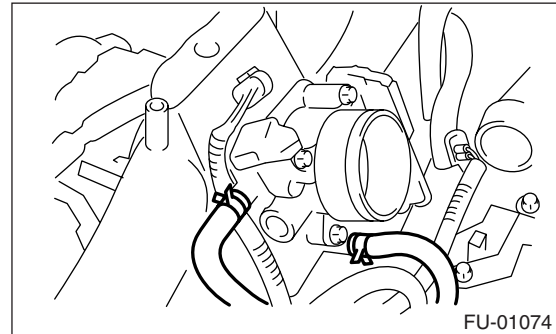
9) Connect the engine harness connector to the bulkhead harness connectors.



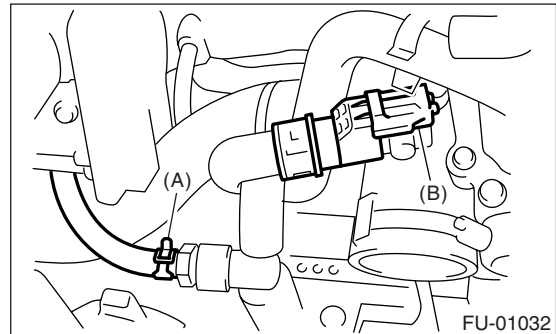
10) Connect the brake booster vacuum hose.



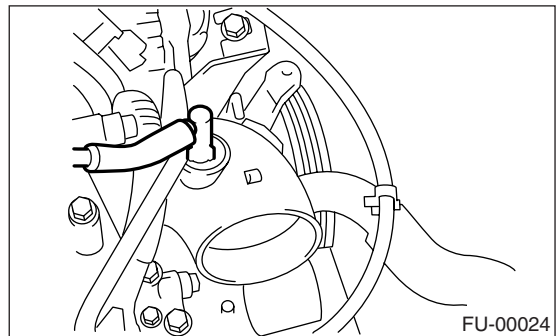
11) Connect the engine coolant hoses to the throttle body.



12) Connect the emission hose (A) and connector (B) to the PCV hose assembly.

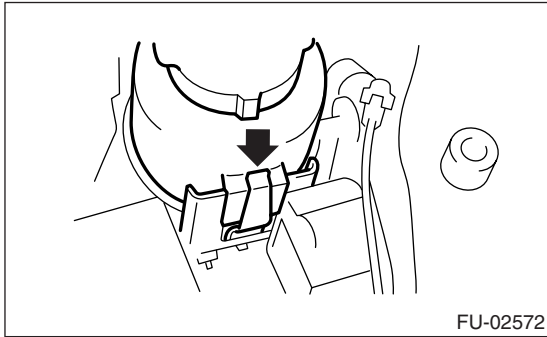


13) Connect the pressure hose to the intake duct.

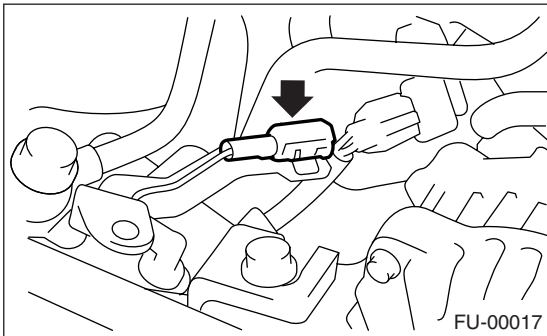


14) Install the power steering pump.

(1) Install the power steering tank on the bracket.



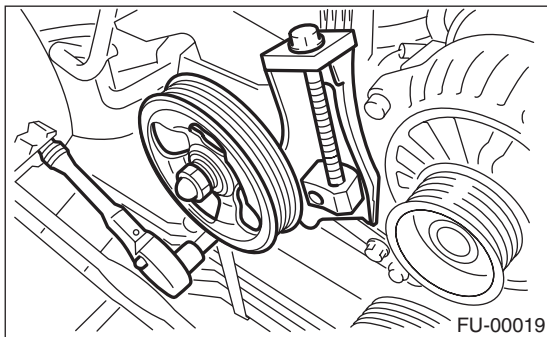
(2) Connect the connector to the power steering pump switch.



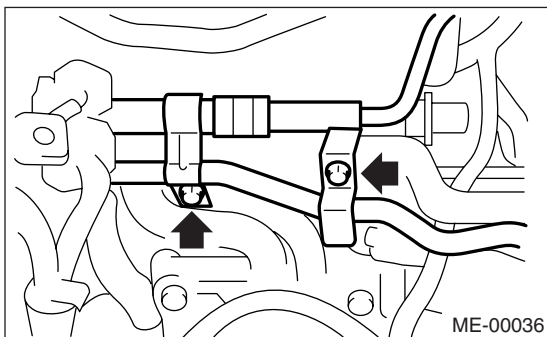
(3) Install the power steering pump, and tighten the bolts.

Tightening torque:

22 N·m (2.2 kgf-m, 15.9 ft-lb)



(4) Install the power steering pipe brackets on the intake manifold RH.



(5) Install the front side V-belt. <Ref. to ME(H4DOTC)-41, REMOVAL, V-belt.>

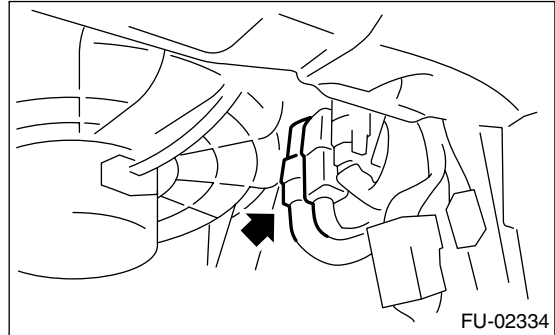
15) Install the coolant filler tank. <Ref. to CO(H4DOTC)-33, INSTALLATION, Coolant Filler Tank.>

16) Install the intercooler. <Ref. to IN(H4DOTC)-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(H4DOTC)-8, INSTALLATION, Air Cleaner Case.>

19) Connect the connector to the fuel pump relay.



20) Connect the battery ground cable to battery.

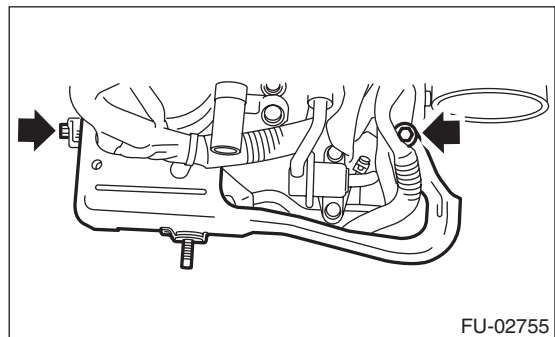
21) Lift up the vehicle.

22) Install the under cover.

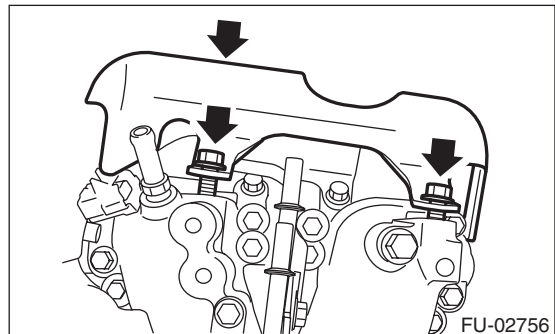
23) Fill the engine coolant. <Ref. to CO(H4DOTC)-17, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

C: DISASSEMBLY

1) Remove the fuel pipe protector RH.



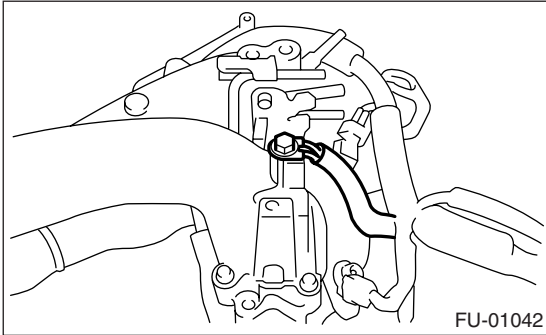
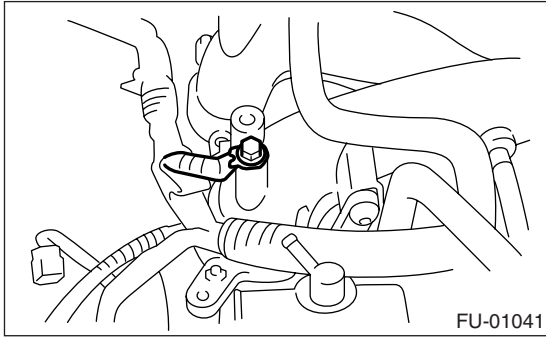
2) Remove the fuel pipe protector LH.



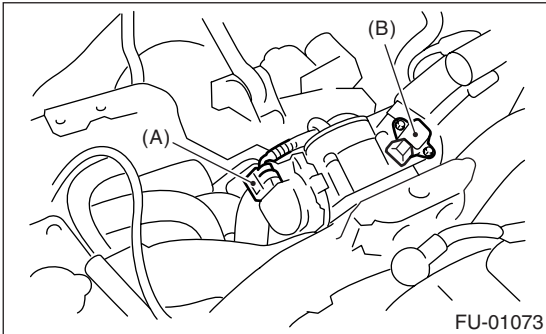
Intake Manifold

FUEL INJECTION (FUEL SYSTEMS)

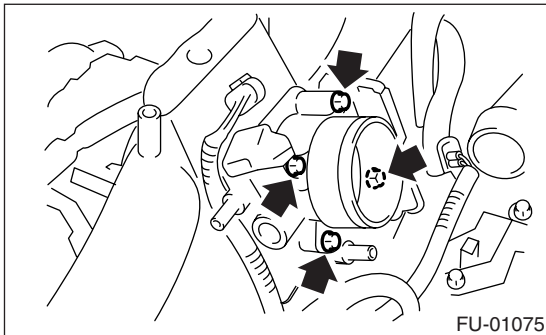
3) Remove the engine ground terminal from the intake manifold.



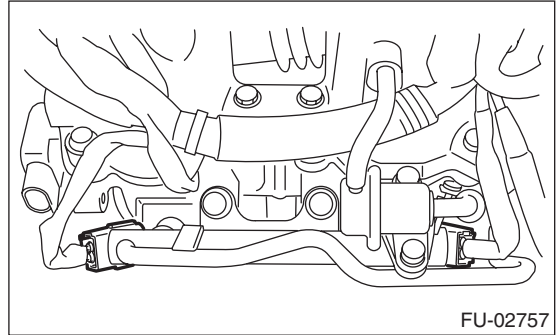
4) Disconnect the connector from the throttle position sensor (A) and manifold absolute pressure sensor (B).



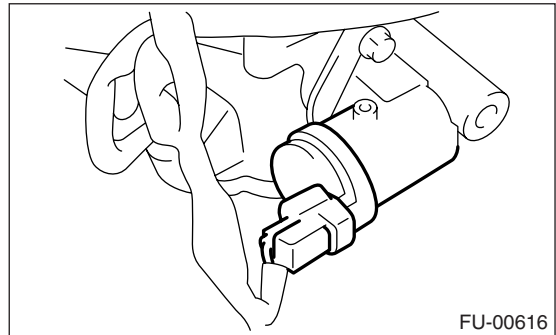
5) Remove the throttle body from the intake manifold.



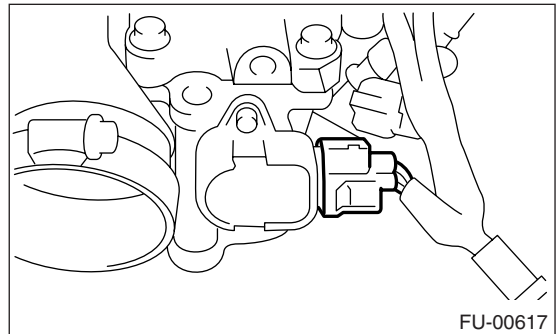
6) Disconnect the connector from the fuel injector.



7) Disconnect the connector from the tumble generator valve actuator.

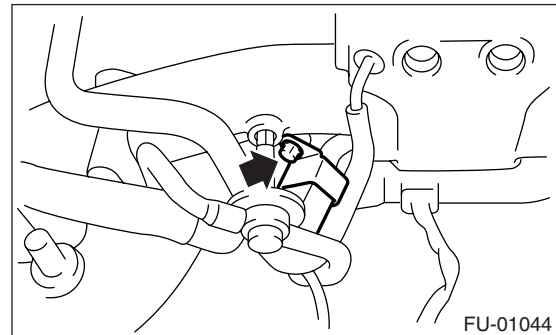


8) Disconnect the connector from the tumble generator valve sensor.



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

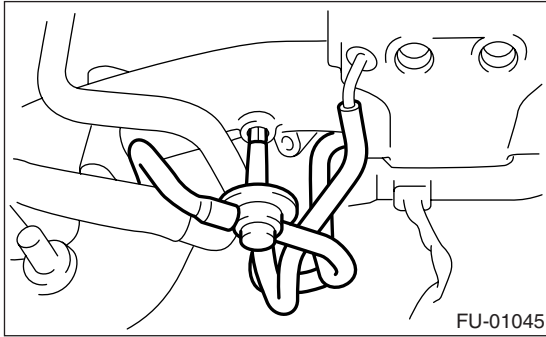
10) Remove the purge control solenoid valve.



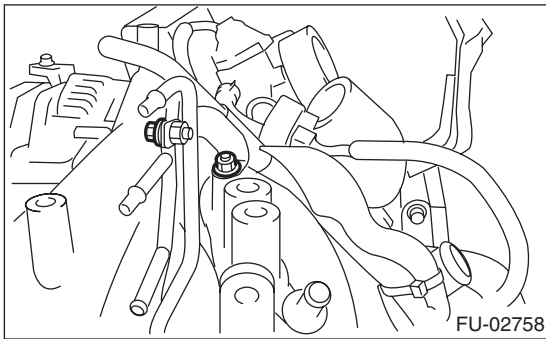
Intake Manifold

FUEL INJECTION (FUEL SYSTEMS)

11) Disconnect the evaporation hose and purge valve from the intake manifold.

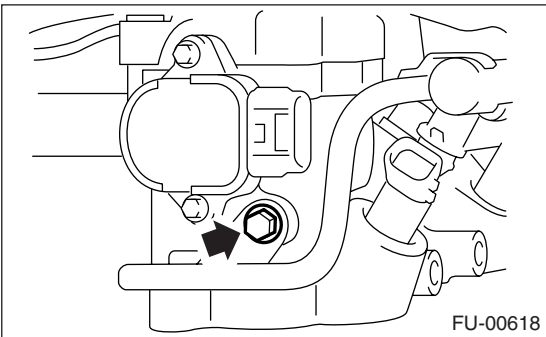
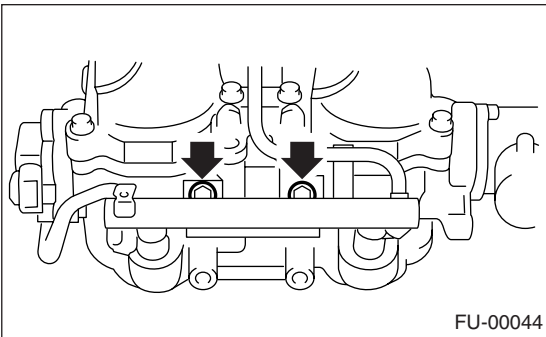


12) Remove the two bolts which hold the fuel pipes on the left side of intake manifold.

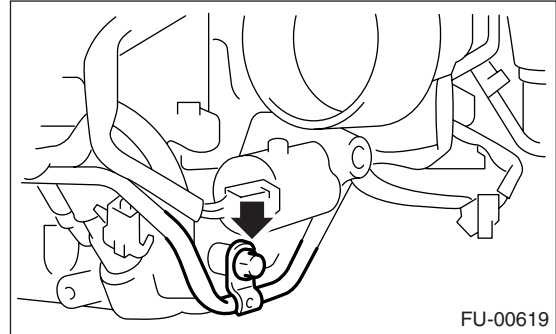
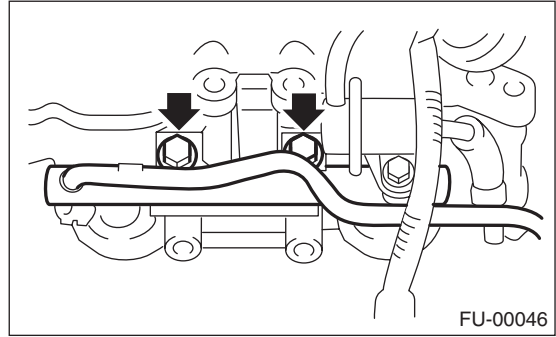


13) Remove the bolt which hold the fuel injector pipe onto intake manifold.

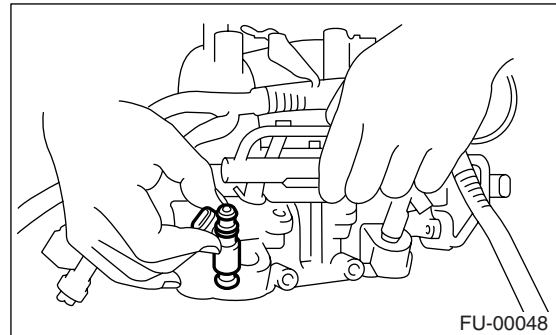
• LH side



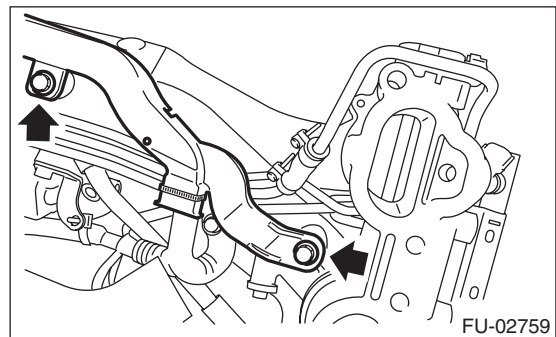
• RH side



14) Remove the fuel injector.



15) Remove the harness bracket which holds the engine harness onto intake manifold.

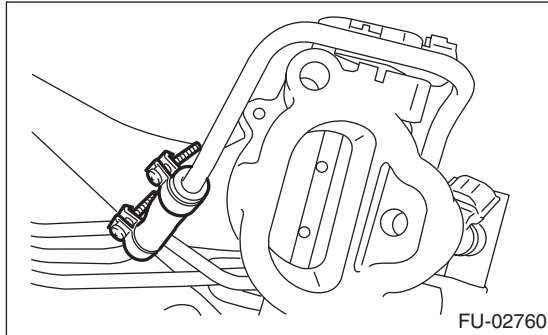


16) Remove the engine harness from the intake manifold.

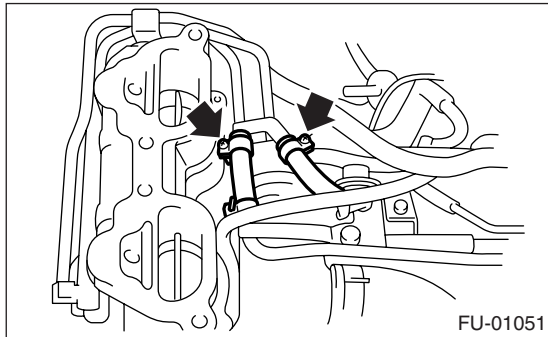
Intake Manifold

FUEL INJECTION (FUEL SYSTEMS)

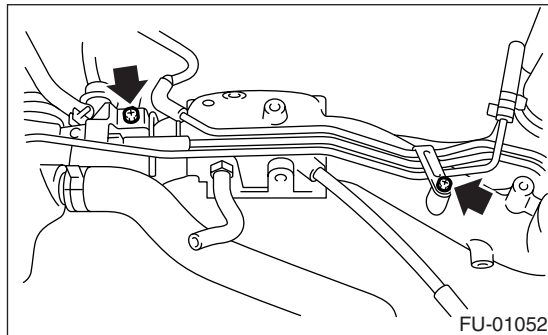
17) Loosen the clamp which holds the front left side fuel hose to fuel injector pipe and remove the pipe from clamp.



18) Loosen the clamp which hold RH side fuel hose to fuel injector pipe, and remove the fuel injector pipe from clamp.

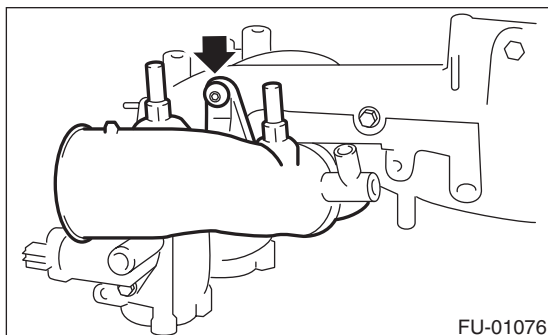


19) Remove the bolts which install the fuel pipe assembly on intake manifold.

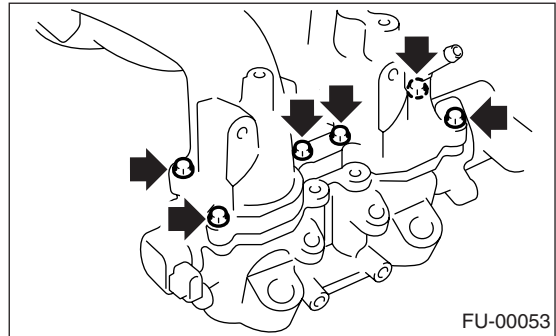


20) Remove the fuel pipe assembly and pressure regulator, from the intake manifold.

21) Remove the intake duct from the intake manifold.



22) Remove the tumble generator valve assembly from the intake manifold.



D: ASSEMBLY

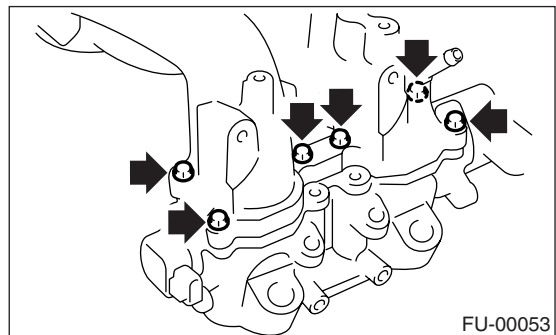
NOTE:

Replace the gasket with a new one.

1) Install the tumble generator valve assembly to the intake manifold.

Tightening torque:

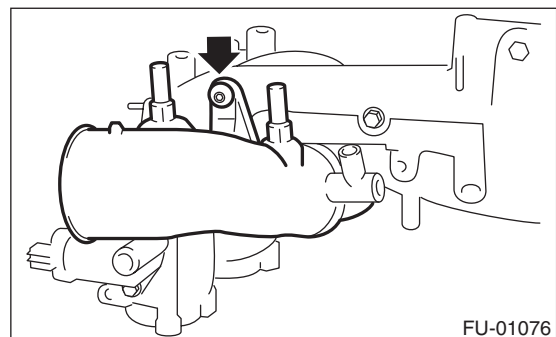
8.25 N·m (0.84 kgf-m, 6.1 ft-lb)



2) Install the air intake duct to the intake manifold.

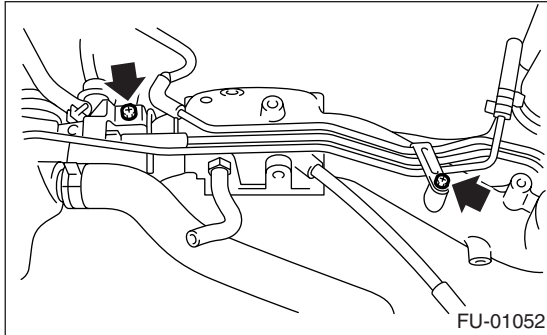
Tightening torque:

19 N·m (1.94 kgf-m, 13.7 ft-lb)



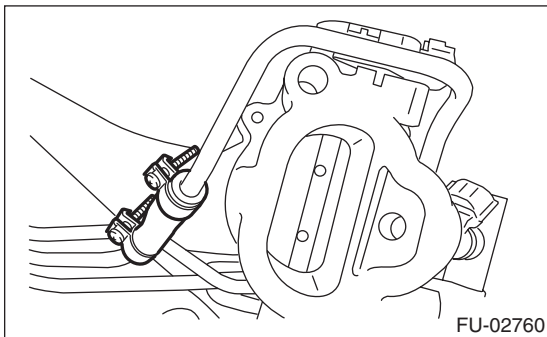
- 3) Install the fuel pipe assembly and pressure regulator to the intake manifold.

Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



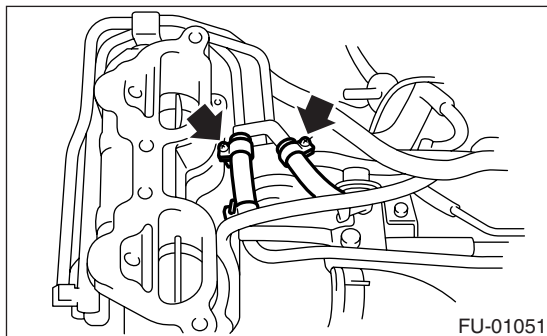
- 4) Install the fuel injector pipe LH.
 5) Connect the left side fuel hose LH to fuel injector pipe, and tighten the clamp screw.

Tightening torque:
1.25 N·m (0.13 kgf-m, 0.94 ft-lb)



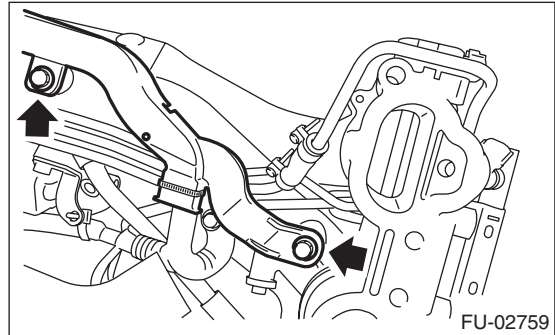
- 6) Install the fuel injector pipe RH.
 7) Connect the fuel hose RH to fuel injector pipe, and tighten the clamp screw.

Tightening torque:
1.25 N·m (0.13 kgf-m, 0.94 ft-lb)

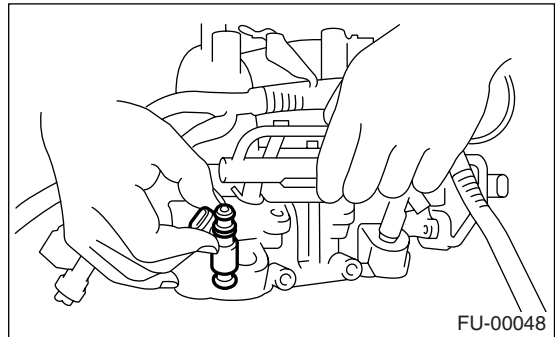


- 8) Install the engine harness to the intake manifold.
 9) Install the harness bracket which holds the engine harness onto intake manifold.

Tightening torque:
19 N·m (1.94 kgf-m, 13.7 ft-lb)



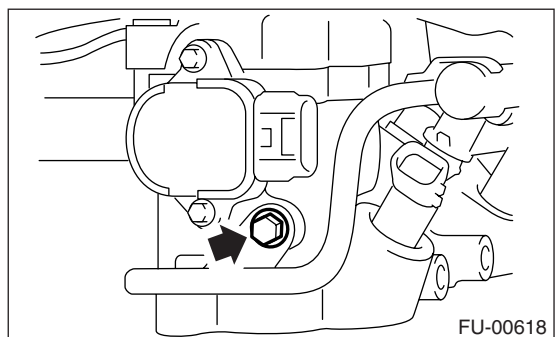
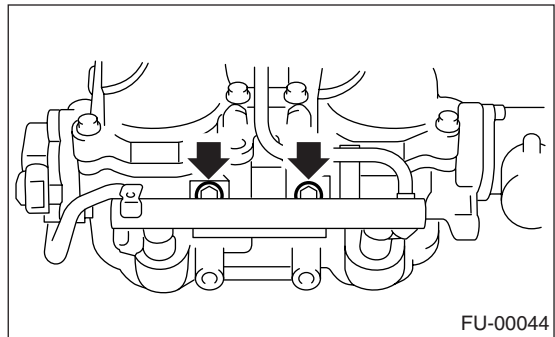
- 10) Install the fuel injector.



- 11) Tighten the bolts which install the fuel injector pipe onto intake manifold.

Tightening torque:
19 N·m (1.94 kgf-m, 13.7 ft-lb)

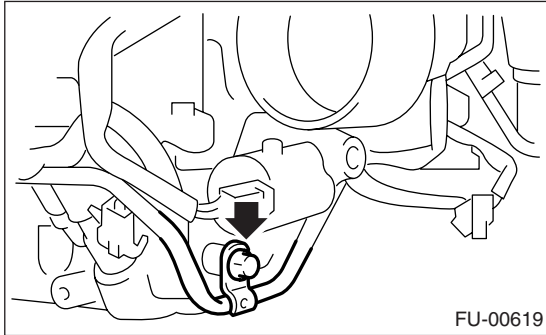
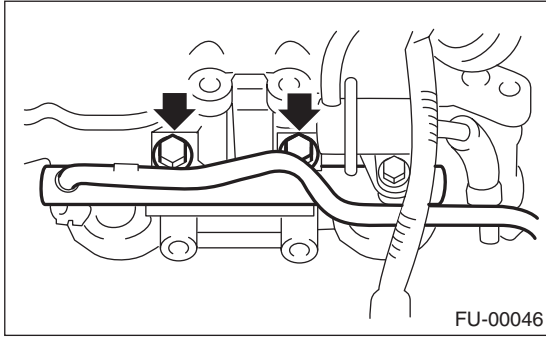
- LH side



Intake Manifold

FUEL INJECTION (FUEL SYSTEMS)

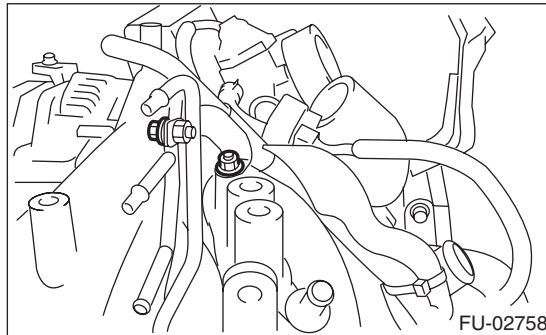
- RH side



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

Tightening torque:

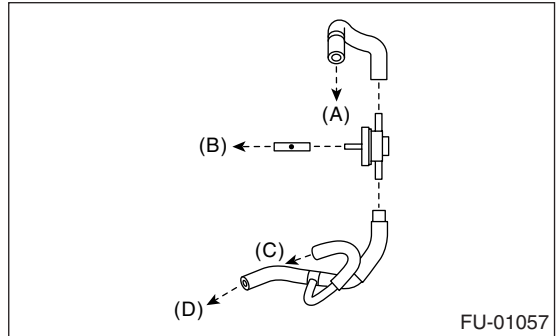
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



13) Connect the evaporation hoses to the purge valve.

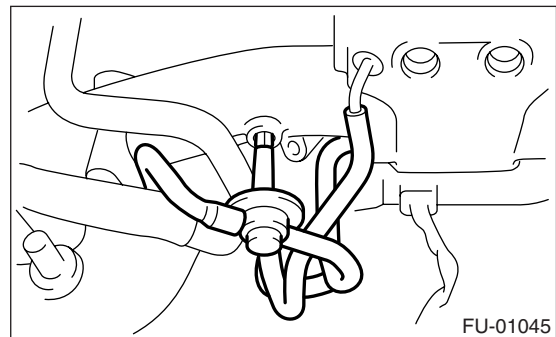
NOTE:

Connect the evaporation hoses as shown in the figure.



- (A) To intake duct
- (B) To intake manifold
- (C) To purge control solenoid valve
- (D) To fuel pipe ASSY

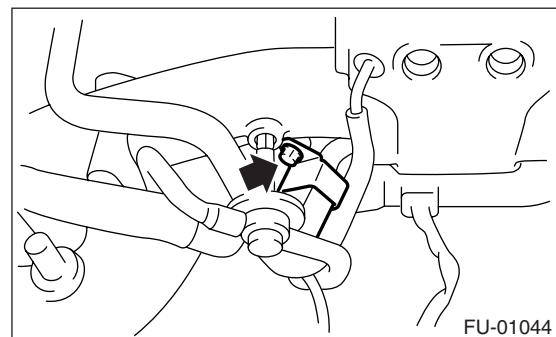
14) Connect the evaporation hose and purge valve to the intake manifold.



15) Install the purge control solenoid valve.

Tightening torque:

16 N·m (1.6 kgf-m, 11.6 ft-lb)



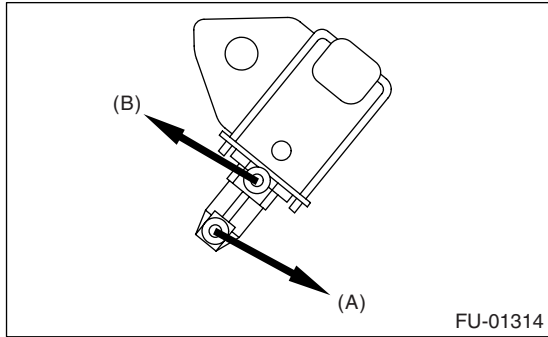
16) Connect the hoses to the purge control solenoid valve.

Intake Manifold

FUEL INJECTION (FUEL SYSTEMS)

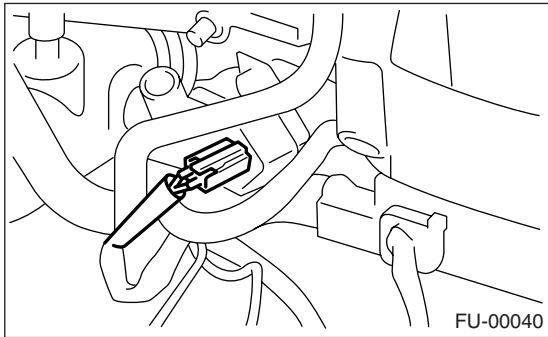
NOTE:

Connect the evaporation hoses as shown in the figure.

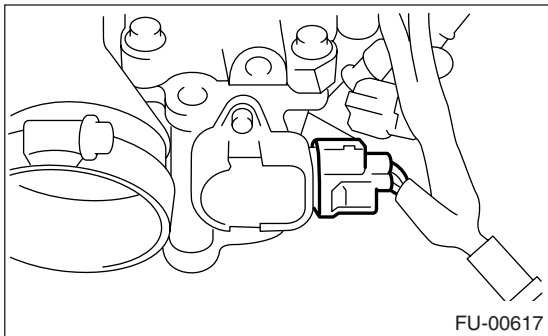


- (A) To purge valve
- (B) To intake manifold

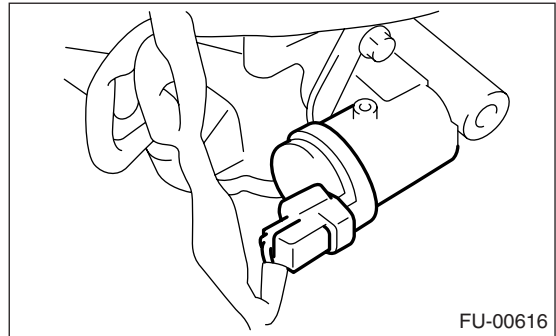
17) Connect the connector to the purge control solenoid valve.



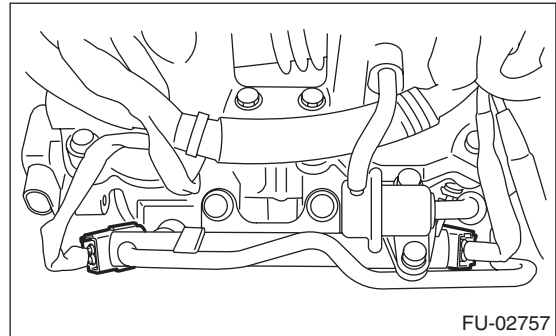
18) Connect the connector to the tumble generator valve sensor.



19) Connect the connector to the tumble generator valve actuator.



20) Connect the connector to the fuel injector.



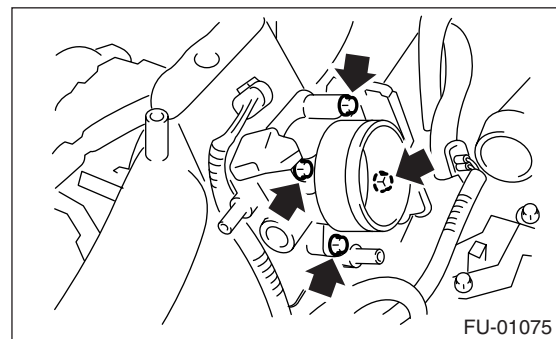
21) Install the throttle body to the intake manifold.

NOTE:

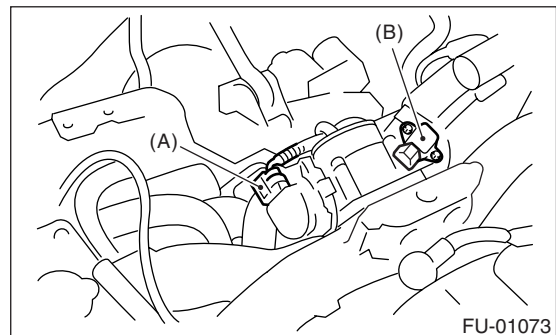
Replace the gasket with a new one.

Tightening torque:

8 N·m (0.8 kgf-m, 5.8 ft-lb)



22) Connect the connector to the throttle position sensor (A) and manifold absolute pressure sensor (B).



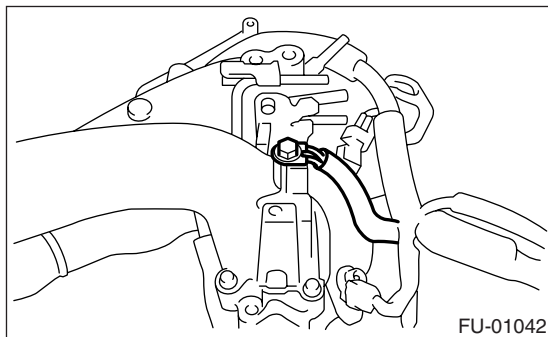
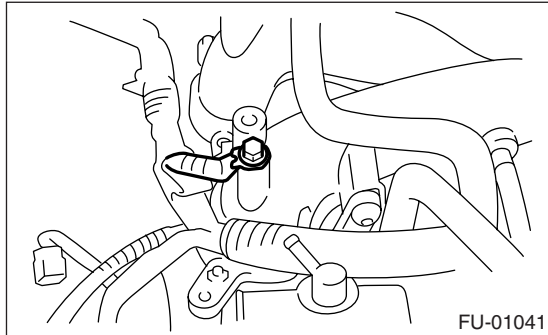
Intake Manifold

FUEL INJECTION (FUEL SYSTEMS)

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

Tightening torque:

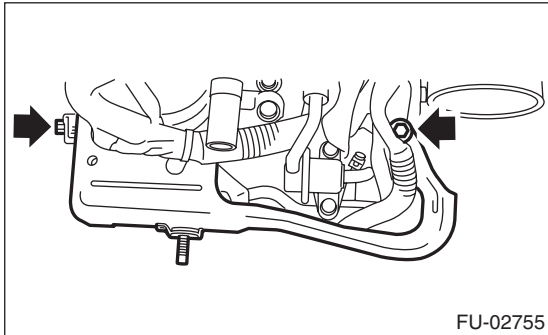
19 N·m (1.94 kgf-m, 13.7 ft-lb)



24) Install the fuel pipe protector RH.

Tightening torque:

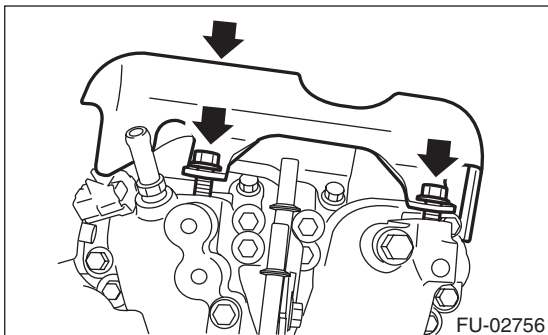
19 N·m (1.94 kgf-m, 13.7 ft-lb)



25) Install the fuel pipe protector LH.

Tightening torque:

19 N·m (1.94 kgf-m, 13.7 ft-lb)



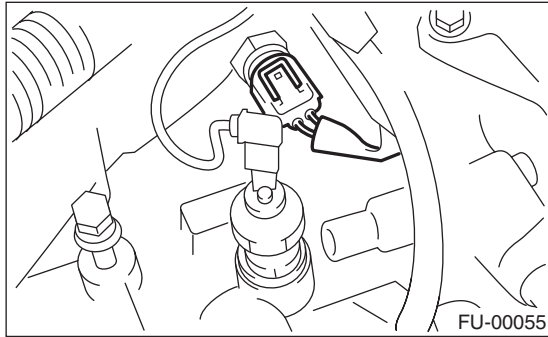
E: INSPECTION

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

4. Engine Coolant Temperature Sensor

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the generator. <Ref. to SC(H4SO)-14, REMOVAL, Generator.>
- 3) Drain the engine coolant. <Ref. to CO(H4DOTC)-17, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
- 4) Disconnect the connector from the engine coolant temperature sensor.



- 5) Remove the engine coolant temperature sensor.

B: INSTALLATION

Install in the reverse order of removal.

NOTE:

Use a new gasket.

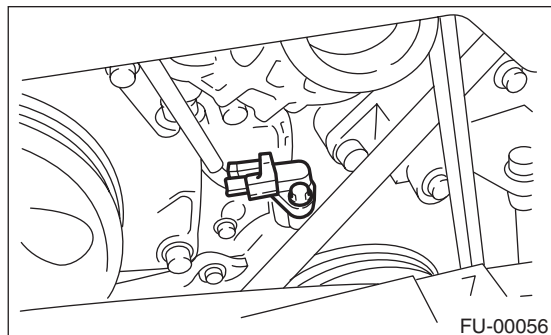
Tightening torque:

18 N·m (1.8 kgf-m, 13.3 ft-lb)

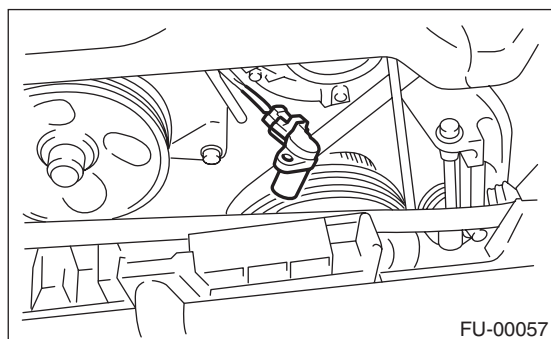
5. Crankshaft Position Sensor

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the bolt which installs the crankshaft position sensor to cylinder block.



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

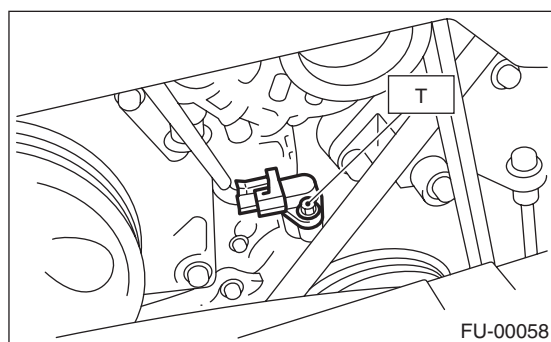


B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

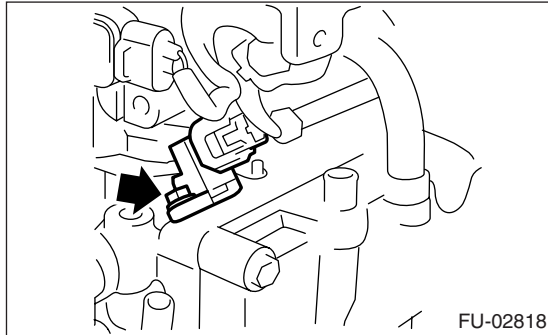
T: 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



6. Camshaft Position Sensor

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Disconnect the connector from the camshaft position sensor RH.
- 3) Remove the camshaft position sensor RH from the rear side of cylinder head.



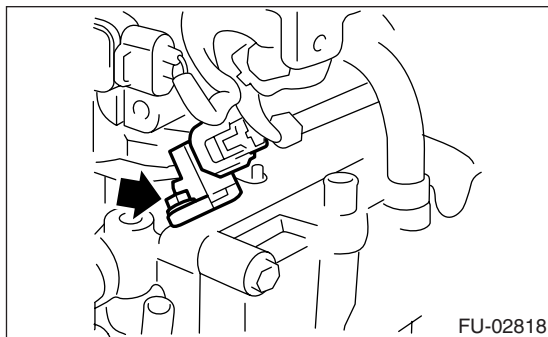
- 4) Remove the camshaft position sensor LH in the same procedure as RH side.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



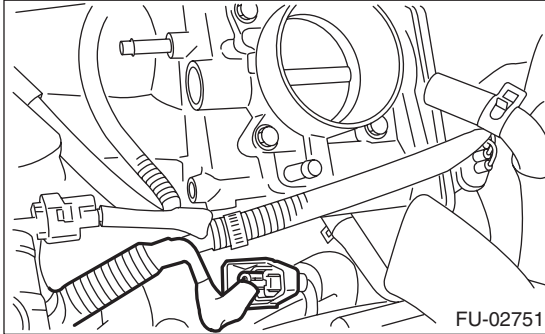
Knock Sensor

FUEL INJECTION (FUEL SYSTEMS)

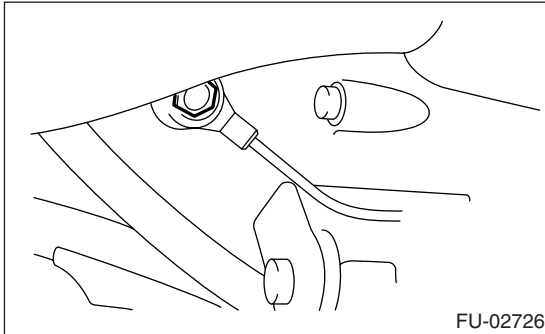
7. Knock Sensor

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the intercooler. <Ref. to IN(H4DOTC)-11, REMOVAL, Intercooler.>
- 3) Disconnect the knock sensor connector.



- 4) Remove the knock sensor from the cylinder block.



B: INSTALLATION

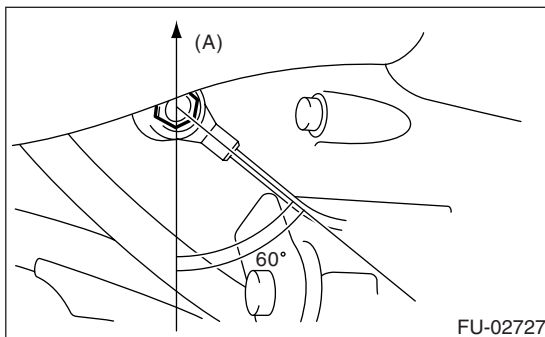
- 1) Install the knock sensor to the cylinder block.

Tightening torque:

24 N·m (2.4 kgf-m, 17.4 ft-lb)

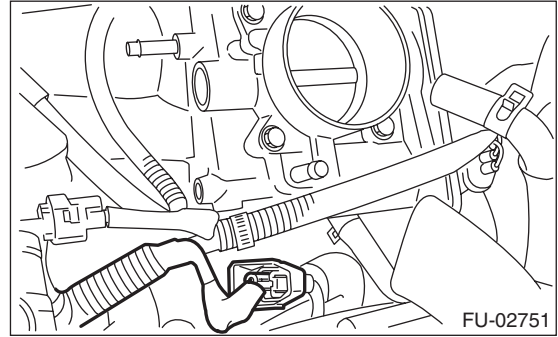
NOTE:

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



(A) Front side

- 2) Connect the knock sensor connector.

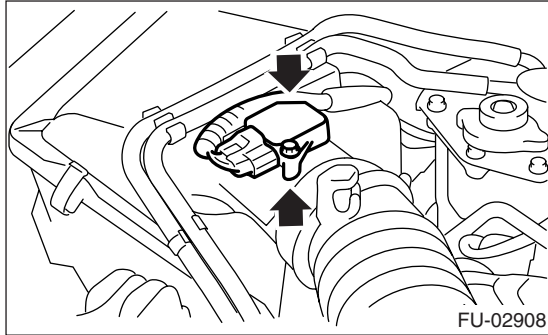


- 3) Install the intercooler. <Ref. to IN(H4DOTC)-11, INSTALLATION, Intercooler.>
- 4) Connect the battery ground cable to battery.

8. Mass Air Flow and Intake Air Temperature Sensor

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Disconnect the connector from 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.

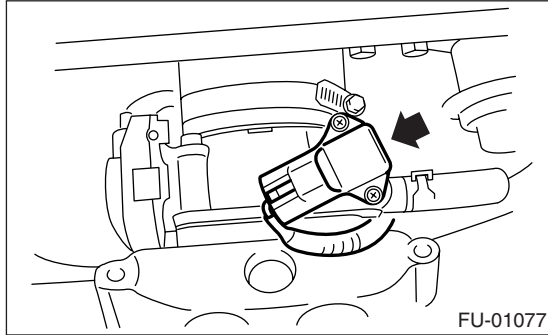
Tightening torque:

1.7 N·m (0.17 kgf-m, 1.3 ft-lb)

9. Manifold Absolute Pressure Sensor

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Disconnect the connectors from manifold absolute pressure sensor.



- 3) Remove the manifold absolute pressure sensor from the throttle body.

B: INSTALLATION

Install in the reverse order of removal.

NOTE:

Replace the O-rings for the manifold absolute pressure sensor with new ones.

Tightening torque:

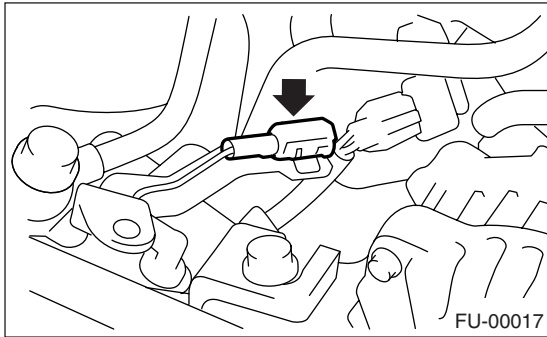
1.6 N·m (0.16 kgf-m, 1.2 ft-lb)

10. Fuel Injector

A: REMOVAL

1. RH SIDE

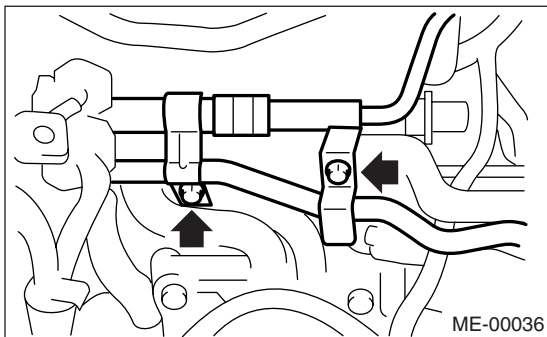
- 1) Release the fuel pressure. <Ref. to FU(H4DOTC)-50, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
- 2) Disconnect the ground cable from battery.
- 3) Open the fuel filler flap lid and remove the fuel filler cap.
- 4) Remove the air cleaner upper cover and air intake boot. <Ref. to IN(H4DOTC)-8, REMOVAL, Air Cleaner Case.>
- 5) Remove the air cleaner element.
- 6) Remove the coolant filler tank. <Ref. to CO(H4DOTC)-33, REMOVAL, Coolant Filler Tank.>
- 7) Remove the power steering pump.
 - (1) Remove the front side V-belt. <Ref. to ME(H4DOTC)-41, REMOVAL, V-belt.>
 - (2) Disconnect the power steering switch connector.



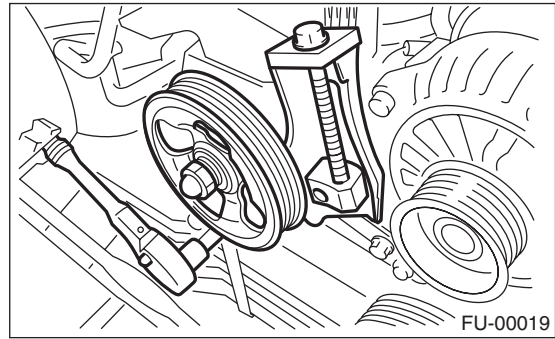
- (3) Remove the bolts which secure the power steering pipe brackets to the intake manifold.

NOTE:

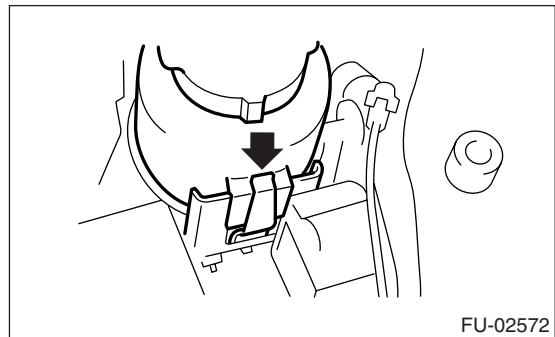
Do not disconnect the power steering hose.



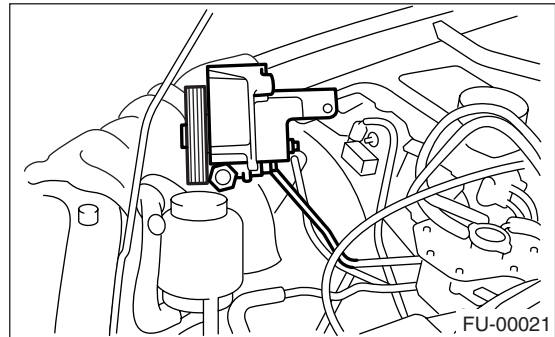
- (4) Remove the bolts which secure the power steering pump bracket.



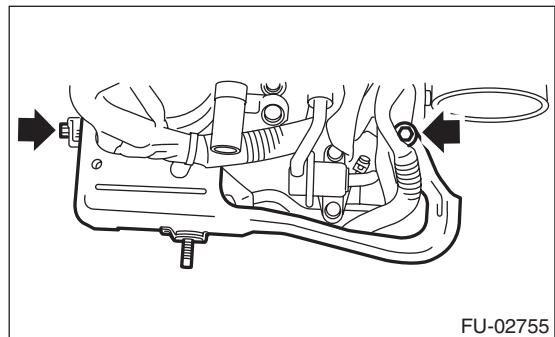
- (5) Remove the power steering tank from the bracket by pulling it upward.



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



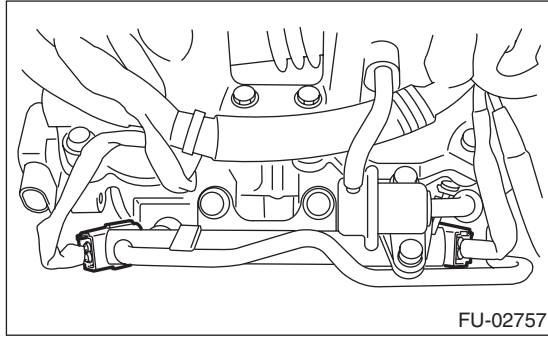
- 8) Remove the fuel pipe protector RH.



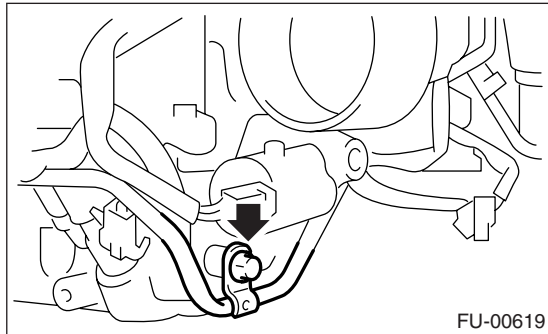
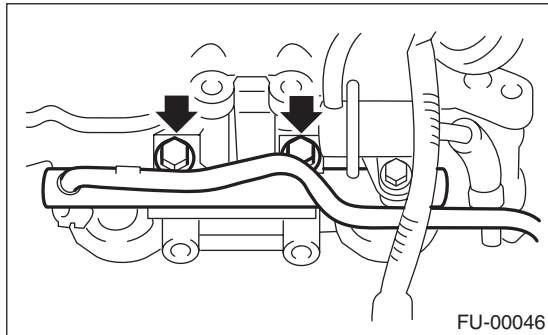
Fuel Injector

FUEL INJECTION (FUEL SYSTEMS)

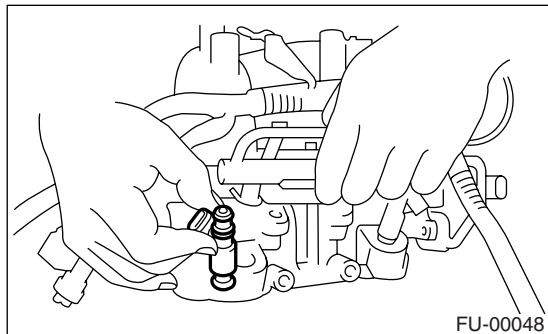
9) Disconnect the connector from the fuel injector.



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



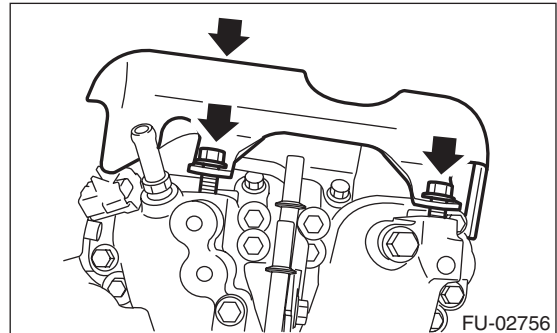
11) Remove the fuel injector while lifting up the fuel injector pipe.



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

4) Remove the intake manifold. <Ref. to FU(H4DOTC)-14, REMOVAL, Intake Manifold.>

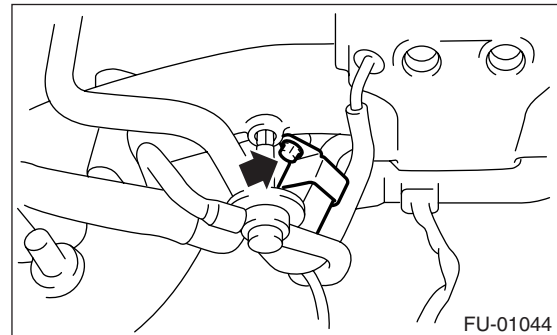
5) Remove the fuel pipe protector LH.



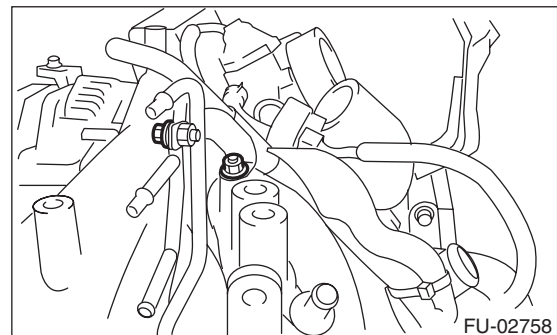
6) Disconnect the connector from the fuel injector.

7) Disconnect the connector from purge control solenoid valve.

8) Remove the purge control solenoid valve.



9) Remove the two bolts which hold the fuel injector pipe to the left side of intake manifold.

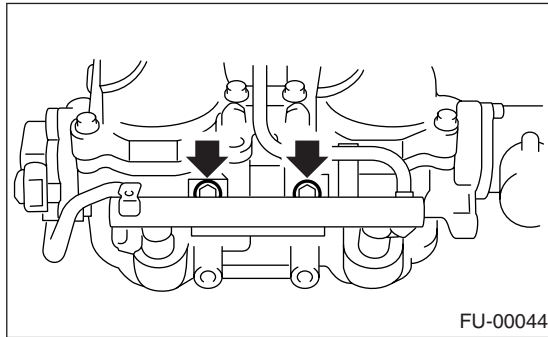
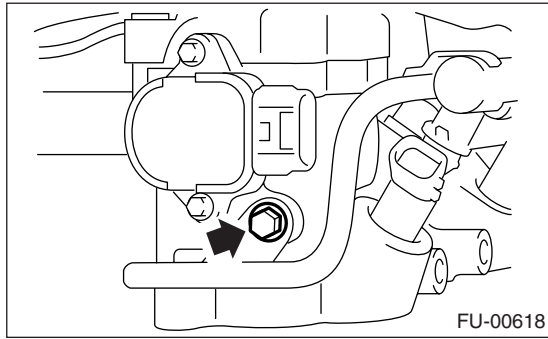


2. LH SIDE

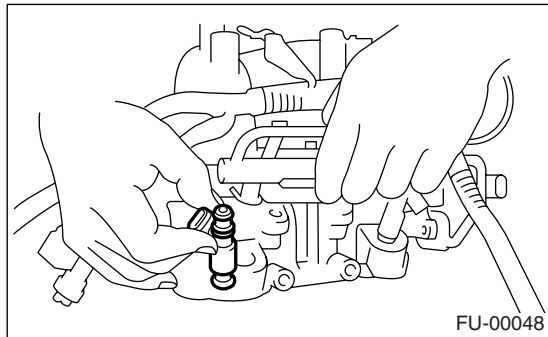
1) Release the fuel pressure. <Ref. to FU(H4DOTC)-50, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>

2) Disconnect the ground cable from battery.

10) Remove the bolt which secure fuel injector pipe to intake manifold.



11) Remove the fuel injector while lifting up the fuel injector pipe.



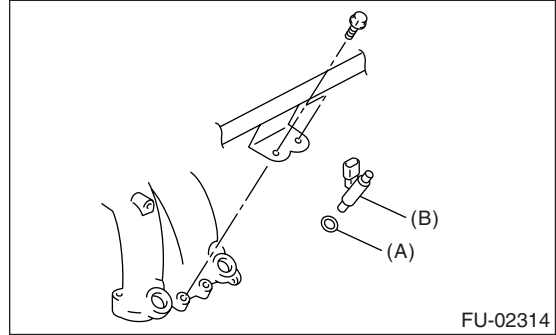
B: INSTALLATION

1. RH SIDE

Install in the reverse order of removal.

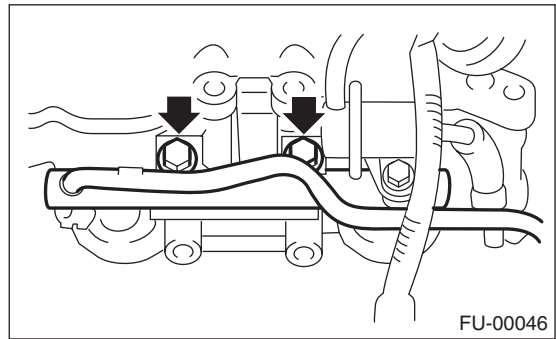
NOTE:

Replace the O-ring and insulators with new ones.

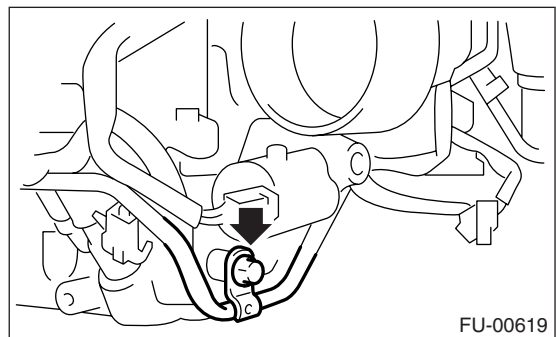


(A) Insulator
(B) Fuel injector

Tightening torque:
19 N·m (1.94 kgf-m, 13.7 ft-lb)



Tightening torque:
19 N·m (1.94 kgf-m, 13.7 ft-lb)

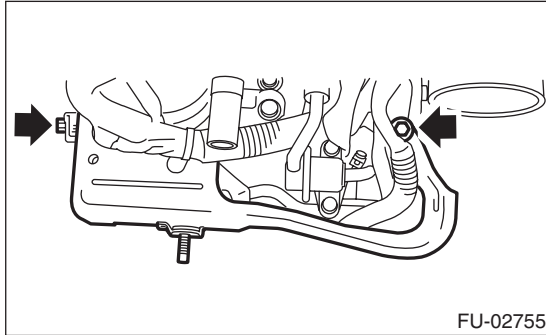


Fuel Injector

FUEL INJECTION (FUEL SYSTEMS)

Tightening torque:

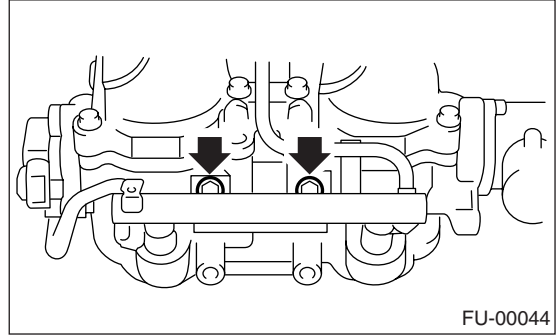
19 N·m (1.94 kgf-m, 13.7 ft-lb)



FU-02755

Tightening torque:

19 N·m (1.94 kgf-m, 13.7 ft-lb)



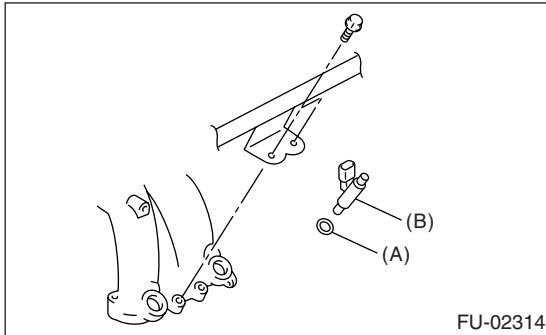
FU-00044

2. LH SIDE

Install in the reverse order of removal.

NOTE:

Replace the O-ring and insulators with new ones.

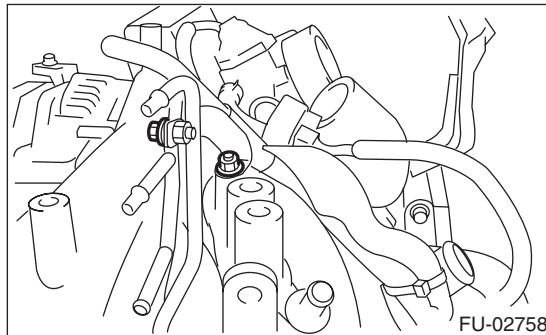


FU-02314

- (A) Insulator
- (B) Fuel injector

Tightening torque:

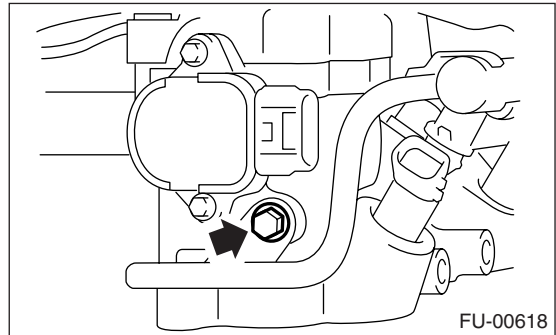
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



FU-02758

Tightening torque:

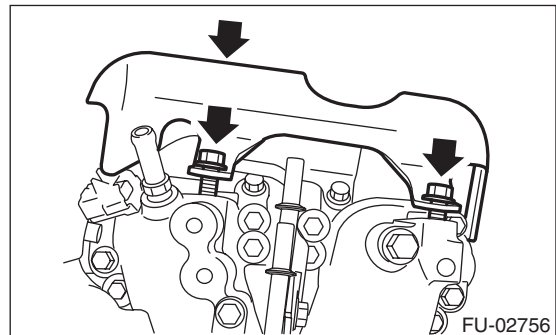
19 N·m (1.94 kgf-m, 13.7 ft-lb)



FU-00618

Tightening torque:

19 N·m (1.94 kgf-m, 13.7 ft-lb)

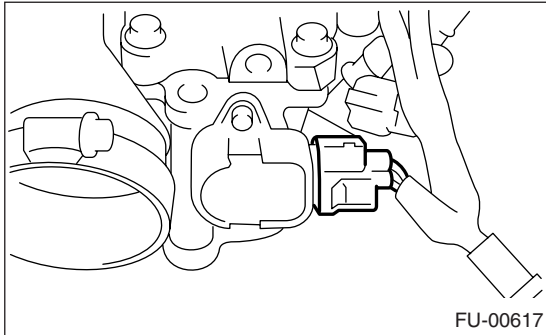


FU-02756

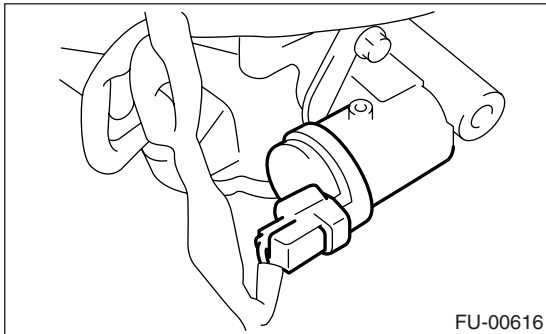
11. Tumble Generator Valve Assembly

A: REMOVAL

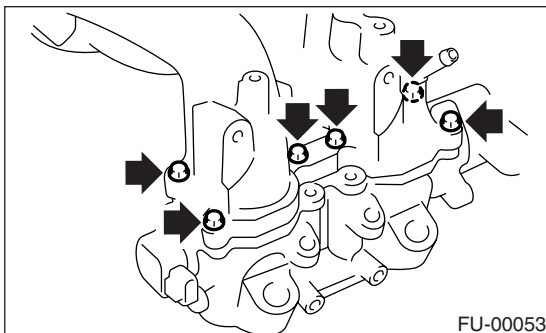
- 1) Release the fuel pressure. <Ref. to FU(H4DOTC)-50, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
- 2) Disconnect the ground cable from battery.
- 3) Open the fuel filler flap lid and remove the fuel filler cap.
- 4) Remove the intake manifold. <Ref. to FU(H4DOTC)-14, REMOVAL, Intake Manifold.>
- 5) Disconnect the connector from the tumble generator valve sensor.



- 6) Disconnect the connector from the tumble generator valve actuator.



- 7) Remove the fuel injector. <Ref. to FU(H4DOTC)-33, REMOVAL, Fuel Injector.>
- 8) Remove the tumble generator valve body from the intake manifold.



B: INSTALLATION

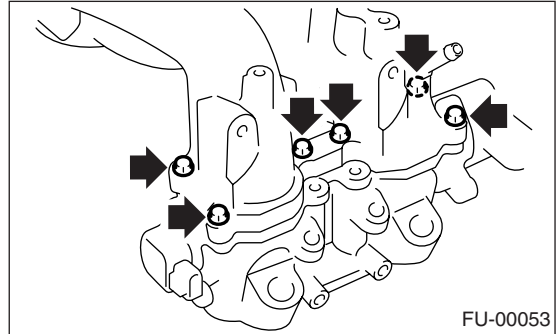
Install in the reverse order of removal.

NOTE:

Always use new gaskets.

Tightening torque:

8.25 N·m (0.84 kgf-m, 6.1 ft-lb)



12.Tumble Generator Valve Position Sensor

A: SPECIFICATION

Do not remove the tumble generator valve position sensor from tumble generator valve assembly, since it cannot be adjusted during installation.

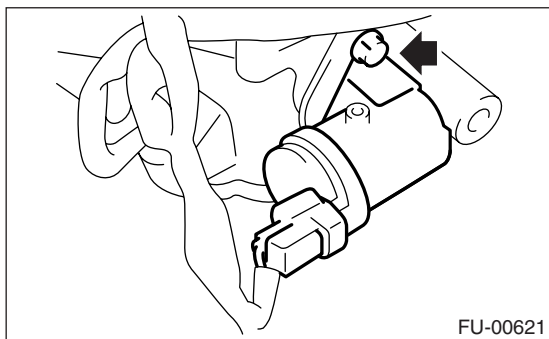
Refer to “Tumble Generator Valve Assembly” for removal and installation procedures. <Ref. to FU(H4DOTC)-37, REMOVAL, Tumble Generator Valve Assembly.> <Ref. to FU(H4DOTC)-37, INSTALLATION, Tumble Generator Valve Assembly.>

13. Tumble Generator Valve Actuator

A: REMOVAL

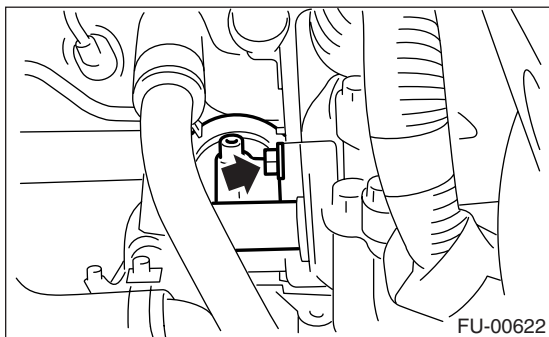
1. RH SIDE

- 1) Release the fuel pressure. <Ref. to FU(H4DOTC)-50, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
- 2) Disconnect the ground cable from battery.
- 3) Open the fuel filler flap lid and remove the fuel filler cap.
- 4) Remove the intake manifold. <Ref. to FU(H4DOTC)-14, REMOVAL, Intake Manifold.>
- 5) Disconnect the connector from tumble generator valve actuator RH.
- 6) Remove the tumble generator valve actuator RH.



2. LH SIDE

- 1) Release the fuel pressure. <Ref. to FU(H4DOTC)-50, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
- 2) Disconnect the ground cable from battery.
- 3) Open the fuel filler flap lid and remove the fuel filler cap.
- 4) Remove the secondary air pump. <Ref. to EC(H4DOTC)-9, REMOVAL, Secondary Air Pump.>
- 5) Disconnect the connector from tumble generator valve actuator LH.
- 6) Remove the tumble generator valve actuator LH.



B: INSTALLATION

1. RH SIDE

Install in the reverse order of removal.

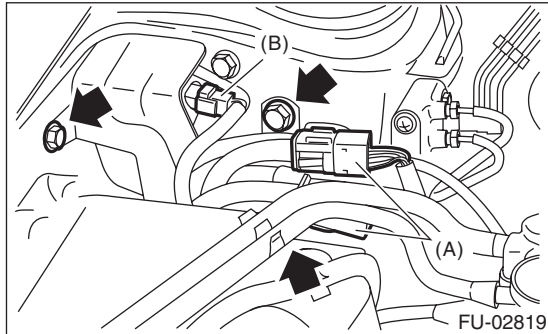
2. LH SIDE

Install in the reverse order of removal.

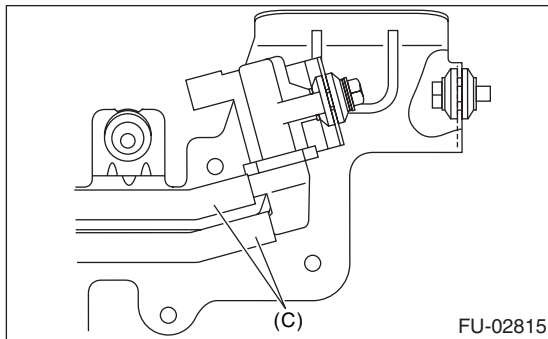
14. Wastegate Control Solenoid Valve

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Disconnect the engine harness connector (A) from bracket.
- 3) Disconnect the connector (B) from wastegate control solenoid valve.
- 4) Remove the bracket from body.



- 5) Disconnect the pressure hoses (C) from wastegate control solenoid valve.



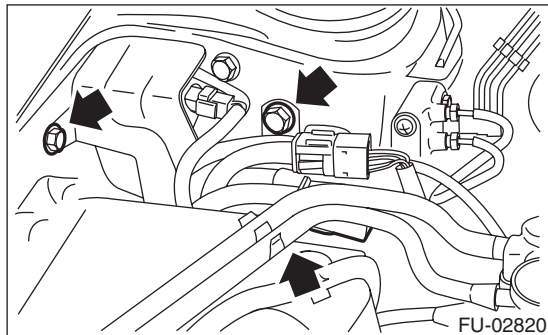
- 6) Remove the wastegate control solenoid valve from bracket.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

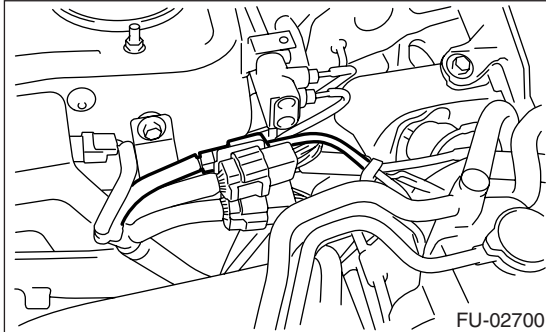
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



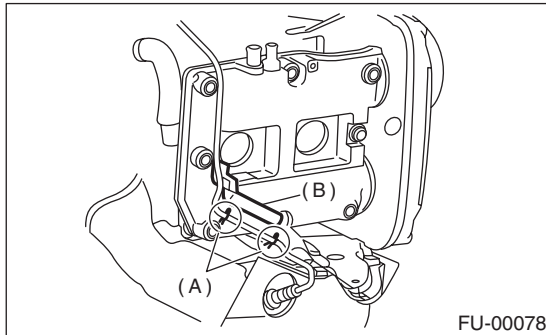
15.Front Oxygen (A/F) Sensor

A: REMOVAL

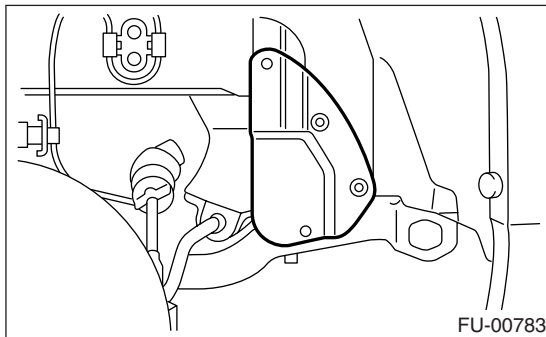
- 1) Disconnect the ground cable from battery.
- 2) Disconnect the connector from the front oxygen (A/F) sensor.



- 3) Disconnect the engine harness fixed by clip (A) from the bracket (B).



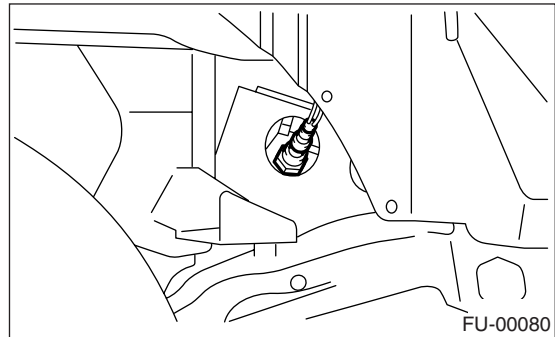
- 4) Remove the front right side wheel.
- 5) Lift-up the vehicle.
- 6) Remove the service hole cover.



- 7) Apply spray type lubricant to the threaded portion of front oxygen (A/F) sensor, and leave it for one minute or more.
- 8) Remove the front oxygen (A/F) sensor.

CAUTION:

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



B: INSTALLATION

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

Anti-seize compound:

NEVER-SEEZ NS-165 or equivalent

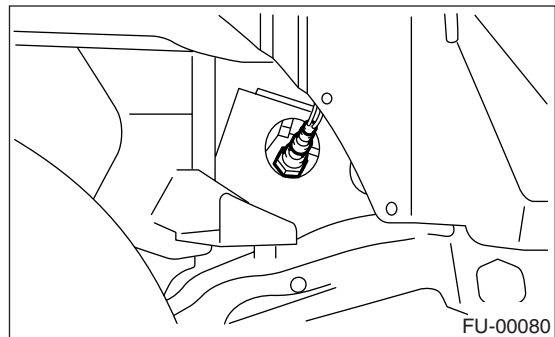
CAUTION:

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

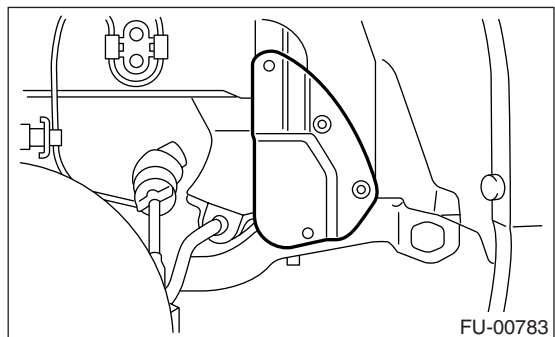
- 2) Install the front oxygen (A/F) sensor.

Tightening torque:

30 N·m (3.1 kgf-m, 22.1 ft-lb)



- 3) Install the service hole cover.

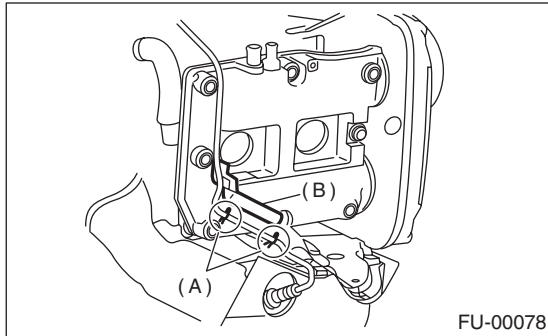


- 4) Lower the vehicle.
- 5) Install the front right side wheel.

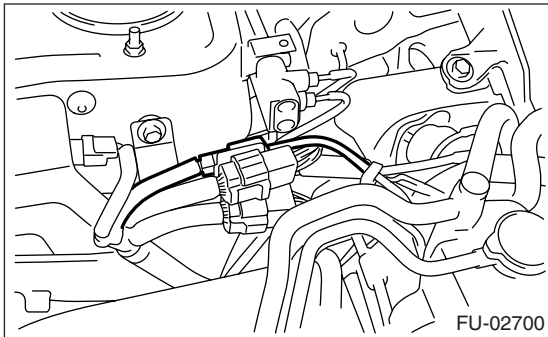
Front Oxygen (A/F) Sensor

FUEL INJECTION (FUEL SYSTEMS)

6) Connect the engine harness to the bracket (B) using clips (A).



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

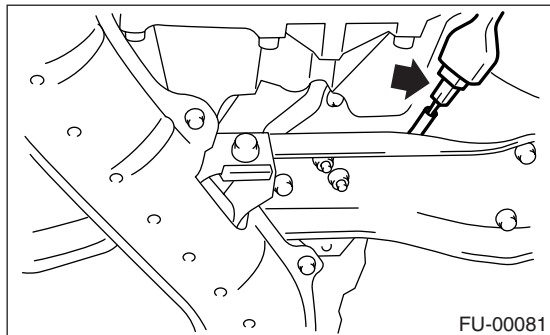


8) Connect the battery ground cable to battery.

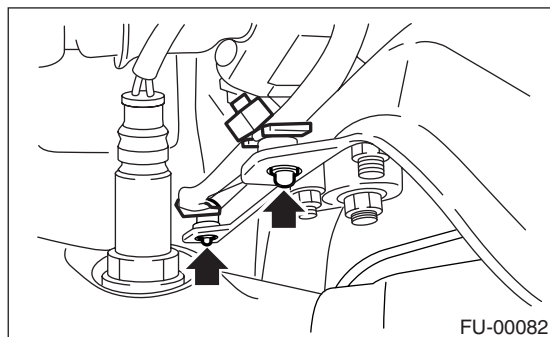
16.Rear Oxygen Sensor

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Lift-up the vehicle.
- 3) Disconnect the connector from the rear oxygen sensor.



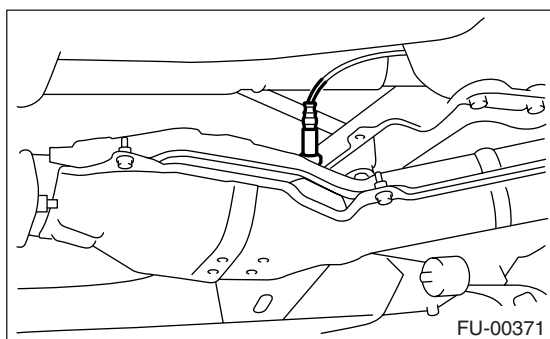
- 4) Remove the clip by pulling out from the upper side of crossmember.



- 5) Apply spray type lubricant to the threaded portion of rear oxygen sensor, and leave it for one minute or more.
- 6) Remove the rear oxygen sensor.

CAUTION:

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



B: INSTALLATION

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

CAUTION:

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

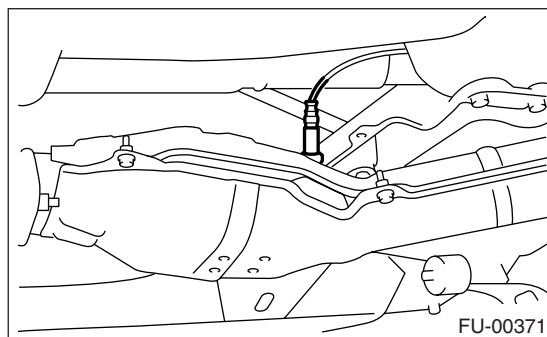
Anti-seize compound:

NEVER-SEEZ NS-165 or equivalent

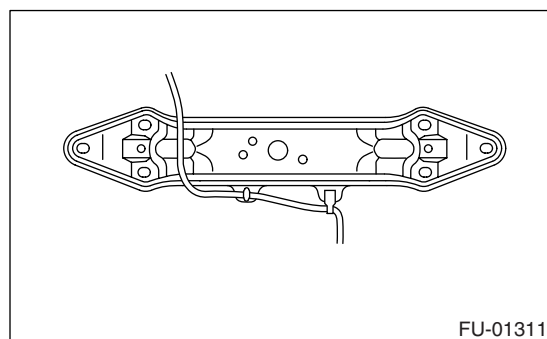
- 2) Install the rear oxygen sensor.

Tightening torque:

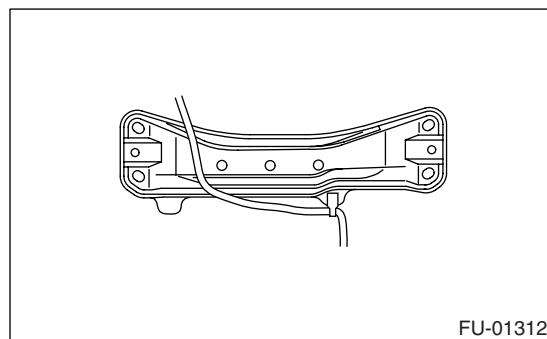
21 N·m (2.1 kgf-m, 15.2 ft-lb)



- AT model



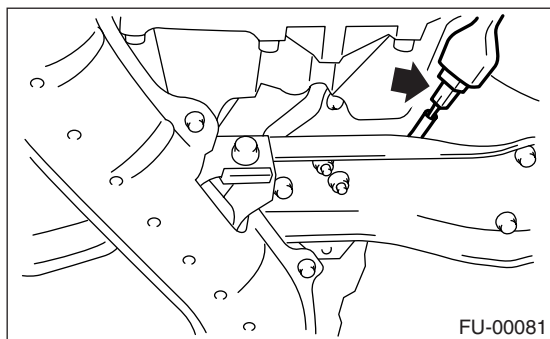
- MT model



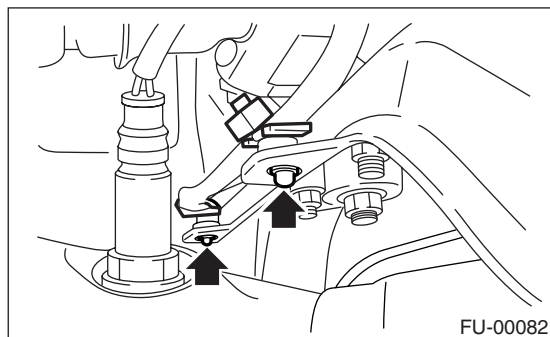
Rear Oxygen Sensor

FUEL INJECTION (FUEL SYSTEMS)

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



- 4) Connect the clip to the crossmember.

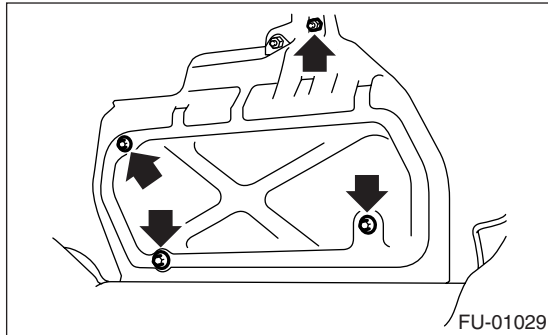


- 5) Lower the vehicle.
6) Connect the battery ground cable to battery.

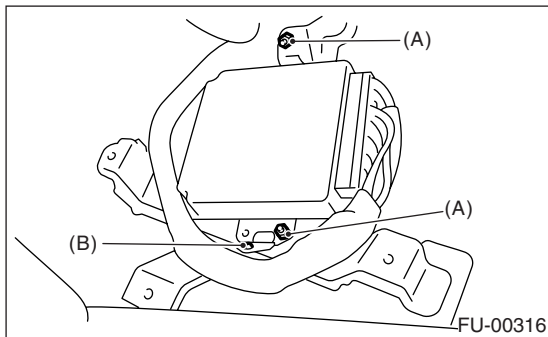
17.Engine Control Module (ECM)

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the lower inner trim of the passenger side. <Ref. to EI-51, REMOVAL, Lower Inner Trim.>
- 3) Detach the floor mat of the front passenger seat.
- 4) Remove the protect cover.



- 5) Remove the nuts (A) which hold ECM to the bracket.
- 6) Remove the clip (B) from the bracket.



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

B: INSTALLATION

Install in the reverse order of removal.

CAUTION:

- When replacing ECM, use of wrong spec. ECM may lead to damage to the fuel injection system.
- When replacing ECM, do not damage the harnesses and connectors.

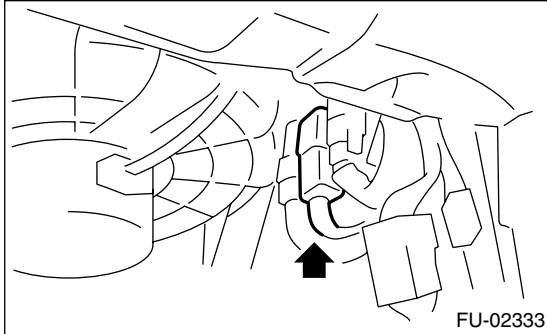
Tightening torque:

5 N·m (0.5 kgf-m, 3.7 ft-lb)

18.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 the relay bracket on the body.
- 4) Disconnect the connectors from the main relay.



- 5) Remove the main relay from the mounting bracket.

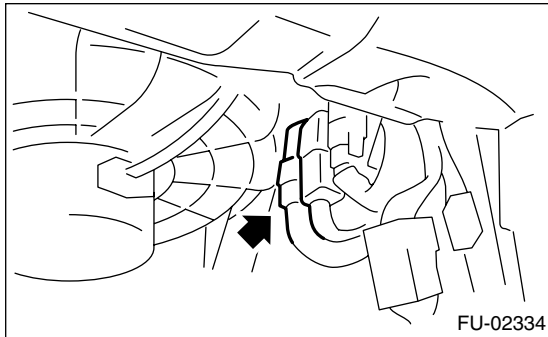
B: INSTALLATION

Install in the reverse order of removal.

19. 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 relay bracket on the body.
- 4) Disconnect the connector from the fuel pump relay.



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

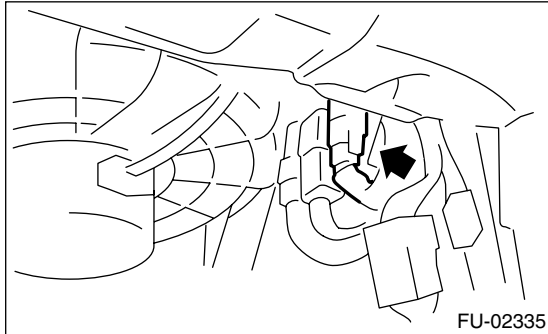
B: INSTALLATION

Install in the reverse order of removal.

20. Electronic Throttle Control 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 relay bracket on the body.
- 4) Disconnect the connector from electronic throttle control relay.



- 5) Remove the electronic throttle control relay from the mounting bracket.

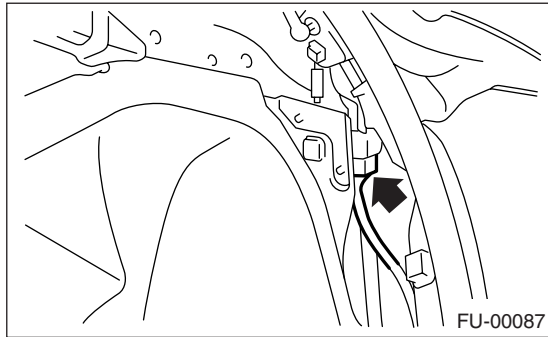
B: INSTALLATION

Install in the reverse order of removal.

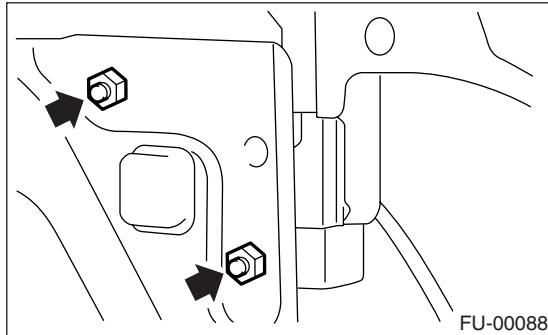
21. Fuel Pump Control Unit

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the rear quarter trim. <Ref. to EI-52, REMOVAL, Rear Quarter Trim.>
- 3) Disconnect the connector from the fuel pump control unit.



- 4) Remove the fuel pump control unit.



B: INSTALLATION

Install in the reverse order of removal.

22. Fuel

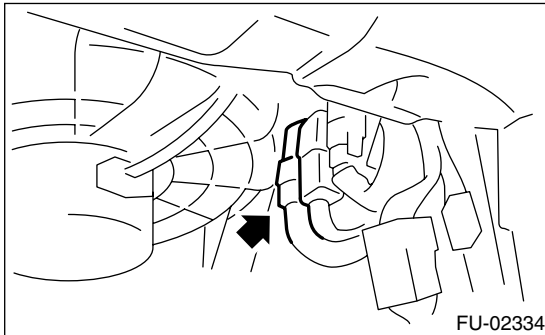
A: PROCEDURE

1. RELEASING OF FUEL PRESSURE

WARNING:

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

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



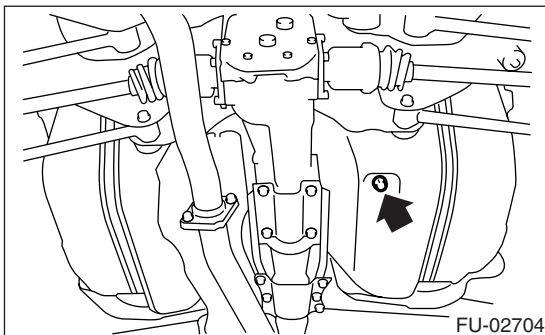
- 2) Start and run the engine until it stalls.
- 3) After the engine stalls, crank it for five more seconds.
- 4) Turn the ignition switch to OFF.

2. DRAINING FUEL

WARNING:

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

- 1) Set the vehicle on the lift.
 - 2) Disconnect the ground cable from battery.
 - 3) Open the fuel filler flap lid and remove the fuel filler cap.
 - 4) Lift-up the vehicle.
 - 5) Drain the fuel from the fuel tank.
- Set a container under the vehicle and remove drain plug from the fuel tank.



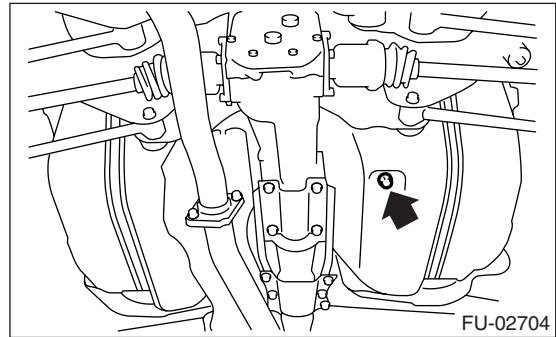
- 6) Tighten the fuel drain plug.

NOTE:

Use a new gasket.

Tightening torque:

26 N·m (2.65 kgf-m, 19.2 ft-lb)



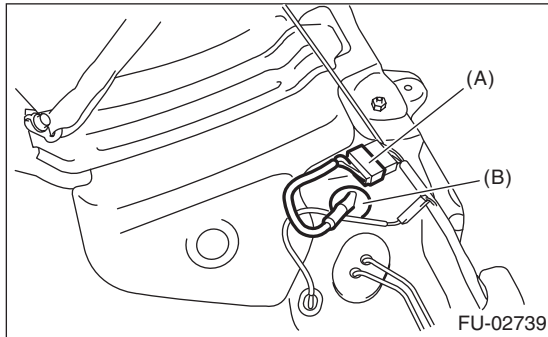
23. Fuel Tank

A: REMOVAL

WARNING:

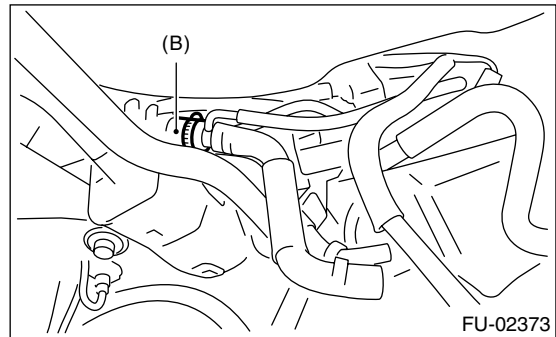
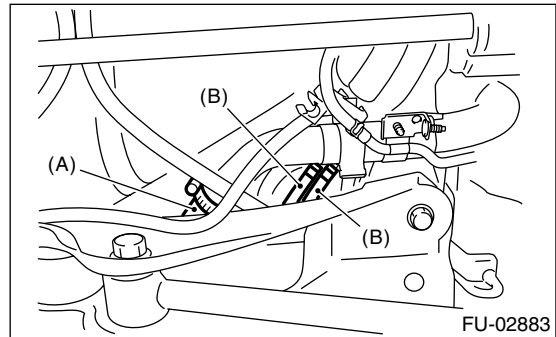
- Place “NO FIRE” signs near the working area.
- Be careful not to spill the fuel.

- 1) Set the vehicle on the lift.
- 2) Release the fuel pressure. <Ref. to FU(H4DOTC)-50, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
- 3) Drain the fuel from the fuel tank. <Ref. to FU(H4DOTC)-50, DRAINING FUEL, PROCEDURE, Fuel.>
- 4) Remove the rear seat.
- 5) Disconnect the connector (A) of rear harness from fuel tank cord.
- 6) Push the grommet (B) which holds the fuel tank cord on floor panel into under the body.

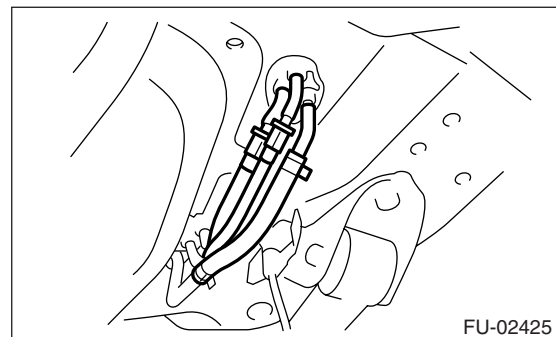


- 7) Remove the rear crossmember. <Ref. to RS-17, REMOVAL, Rear Crossmember.>
- 8) Remove the canister. <Ref. to EC(H4DOTC)-7, REMOVAL, Canister.>
- 9) Disconnect the connector from the pressure control solenoid valve.

- 10) Loosen the clamp, and disconnect the fuel filler hose (A) and evaporation hose (B) from fuel filler pipe.



- 11) Move the clips, and disconnect the quick connector. <Ref. to FU(H4DOTC)-65, REMOVAL, Fuel Delivery, Return and Evaporation lines.>
- 12) Disconnect the fuel hoses.



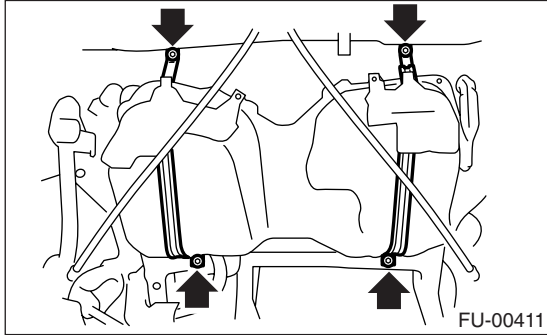
- 13) Support the fuel tank with transmission jack, remove the bolts from bands and dismount the fuel tank from vehicle.

Fuel Tank

FUEL INJECTION (FUEL SYSTEMS)

WARNING:

- A helper is required to perform this work.
- Fuel may be left in the side, which has no drain plug, of the fuel tank. In this case, the tank is imbalanced between right and left sides. Be careful not to drop it when removing.

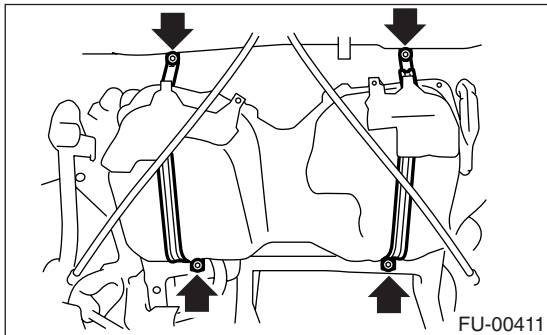


B: INSTALLATION

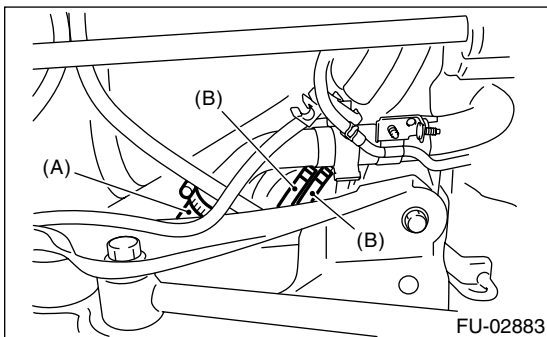
- 1) Support the fuel tank with transmission jack and push the fuel tank harness into the access hole with grommet.
- 2) Set the fuel tank and temporarily tighten the bolts of fuel tank bands.

WARNING:

A helper is required to perform this work.

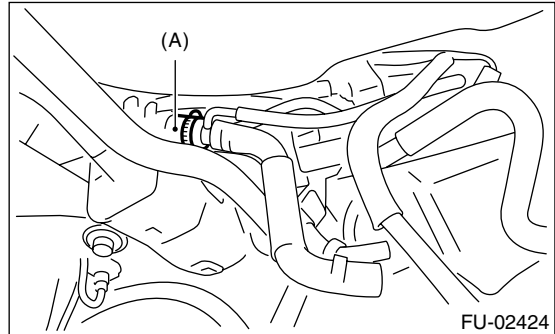


- 3) Insert the fuel filler hose (A) approx. 35 to 40 mm (1.38 to 1.57 in) over the lower end of fuel filler pipe and tighten the clamp.
- 4) Insert the evaporation hose (B) to the lower end of evaporation pipe, and hold the clamp and clip.

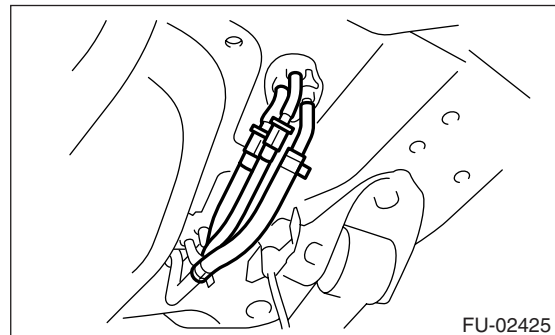


CAUTION:

Do not allow clips to touch hose (A) and rear suspension crossmember.



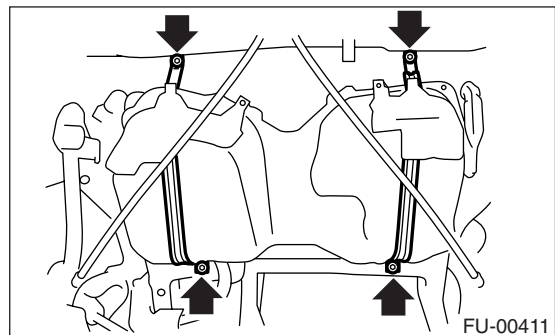
- 5) Connect the fuel hoses, and hold them with clips and quick connector. <Ref. to FU(H4DOTC)-66, INSTALLATION, Fuel Delivery, Return and Evaporation lines.>



- 6) Connect the connector to the pressure control solenoid valve.
- 7) Install the canister. <Ref. to EC(H4DOTC)-7, INSTALLATION, Canister.>
- 8) Tighten the band mounting bolts.

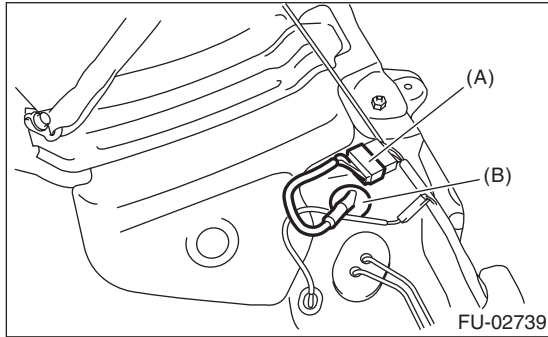
Tightening torque:

33 N·m (3.4 kgf-m, 25 ft-lb)

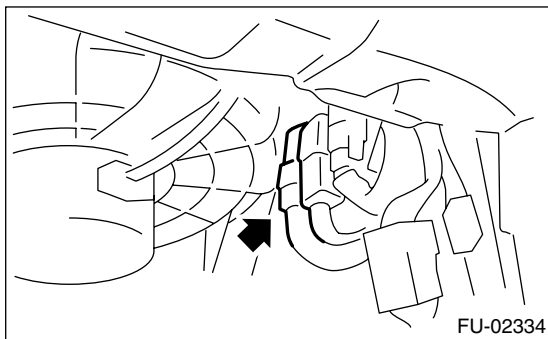


- 9) Install the rear crossmember. <Ref. to RS-17, INSTALLATION, Rear Crossmember.>

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



- 11) Set the rear seat and floor mat.
12) Connect the connector to the 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 the connections are tightened firmly.

Fuel Filler Pipe

FUEL INJECTION (FUEL SYSTEMS)

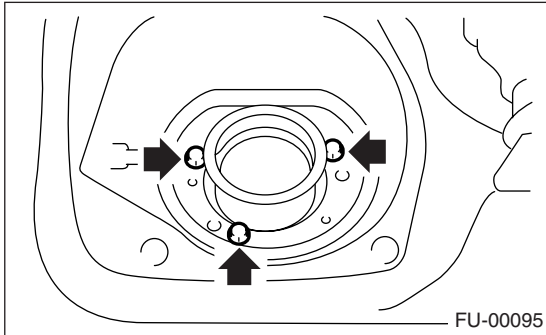
24. Fuel Filler Pipe

A: REMOVAL

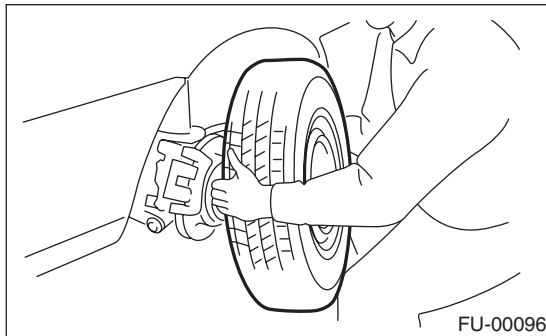
WARNING:

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

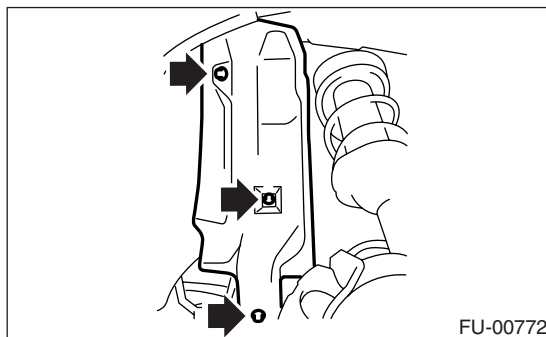
- 1) Disconnect the ground cable from battery.
- 2) Open the fuel filler flap lid and remove the filler cap.
- 3) Remove the screws holding packing in place.



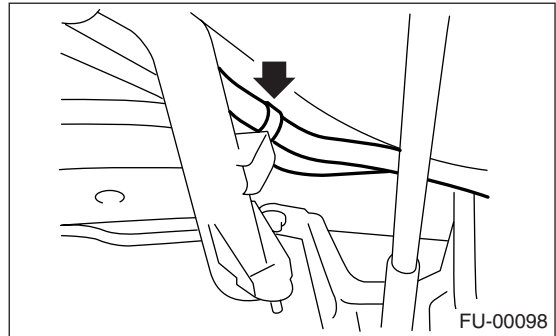
- 4) Lift up the vehicle.
- 5) Remove the rear right side wheel nuts.
- 6) Remove the rear right side wheel.



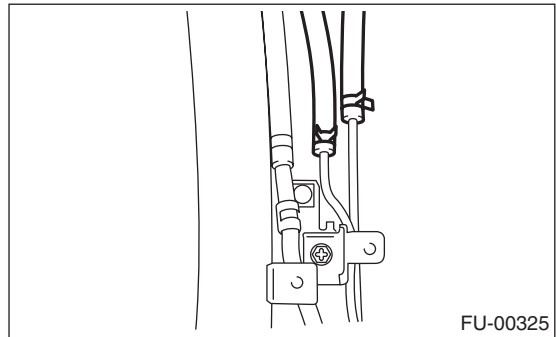
- 7) Drain the fuel from the fuel tank. <Ref. to FU(H4DOTC)-50, DRAINING FUEL, PROCEDURE, Fuel.>
- 8) Remove the fuel filler pipe protector.



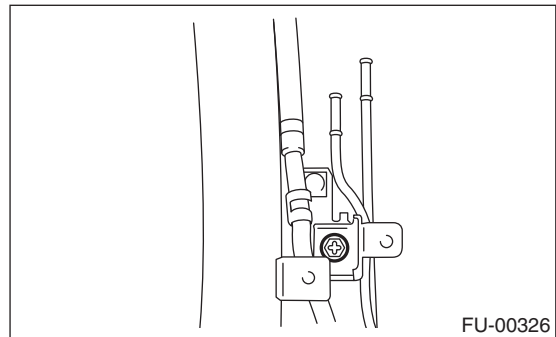
- 9) Separate the evaporation hoses from the clip of fuel filler pipe.



- 10) Disconnect the evaporation hoses from fuel pipes.

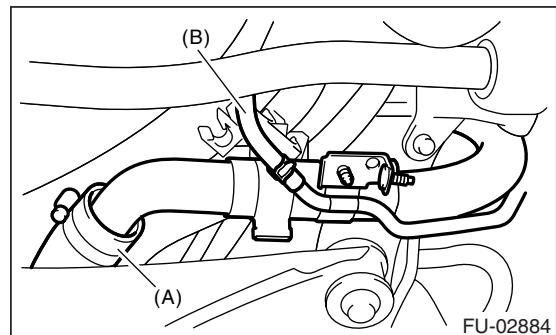


- 11) Remove the bolts which hold the fuel filler pipe bracket on the body.



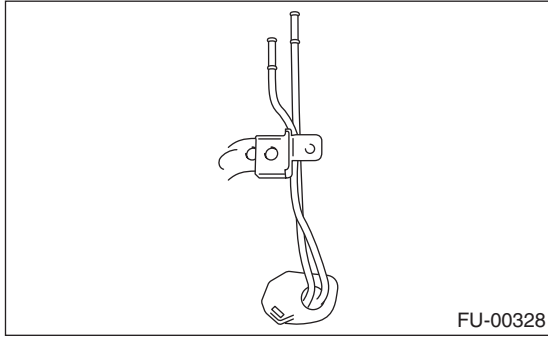
- 12) Loosen the clamp and separate the fuel filler hose (A) from the fuel filler pipe.

- 13) Move the clip and separate the evaporation hose (B).



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

15) Remove the evaporation pipe together with clip from the body.

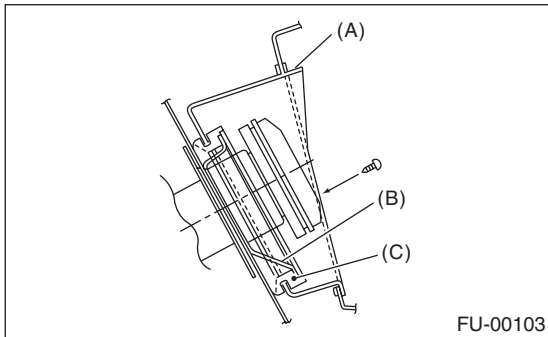


B: INSTALLATION

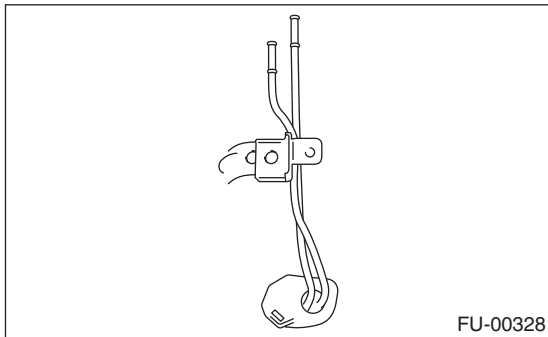
- 1) Open the fuel filler flap lid.
- 2) Set the fuel saucer (A) with rubber packing (C) and insert the fuel filler pipe into hole from the inner side of apron.
- 3) Align the holes in fuel filler pipe neck and set the cup (B), and tighten the screws.

NOTE:

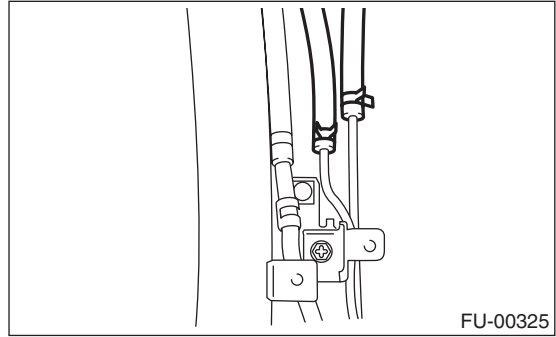
If the edges of rubber packing are folded toward the inside, straighten it with a screwdriver.



4) Install the evaporation pipe.



5) Connect the evaporation hoses to fuel pipes.

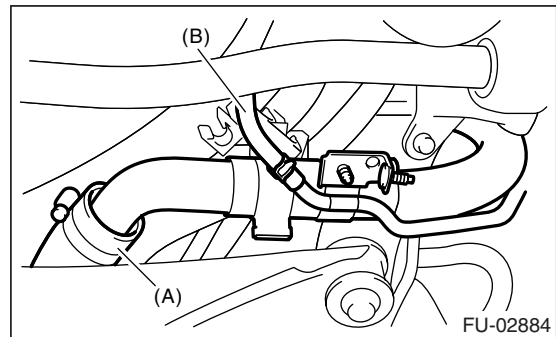


6) Insert the fuel filler hose (A) approximately 35 to 40 mm (1.38 to 1.57 in) over the lower end of fuel filler pipe and tighten the clamp.

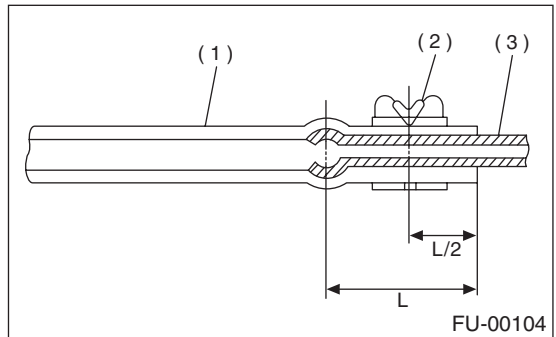
7) Insert the evaporation hose (B) approximately 25 to 30 mm (0.98 to 1.18 in) into the lower end of evaporation pipe and hold the clip.

CAUTION:

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



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



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

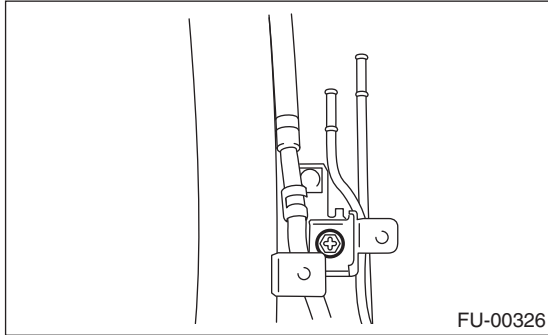
8) Tighten the bolt which holds the fuel filler pipe bracket on the body.

Fuel Filler Pipe

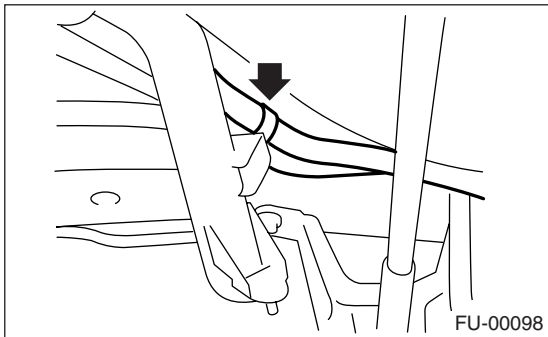
FUEL INJECTION (FUEL SYSTEMS)

Tightening torque:

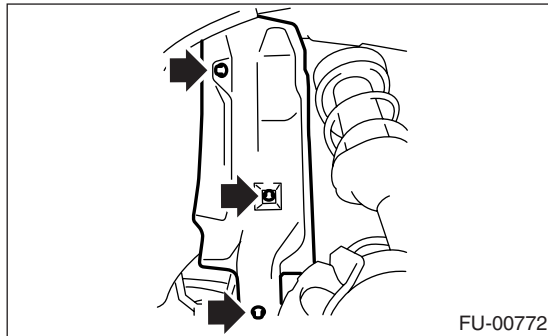
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)



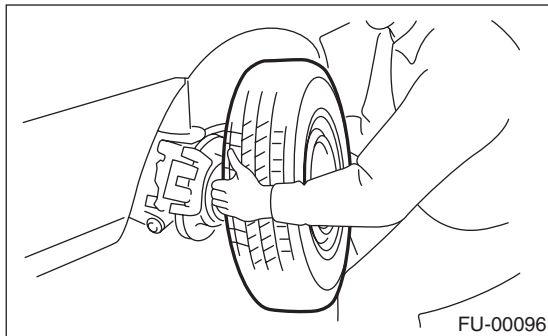
9) Secure the evaporation hose to clip of fuel filler pipe.



10) Install the fuel filler pipe protector.



11) Install the rear right wheel.



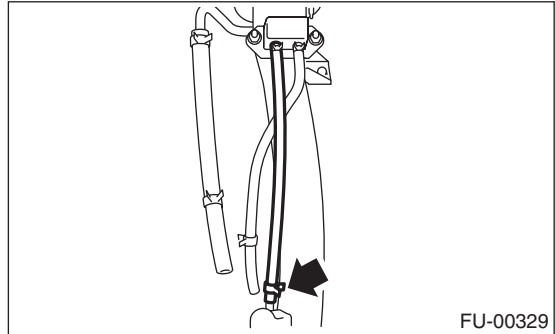
12) Lower the vehicle.

13) Tighten the wheel nuts.

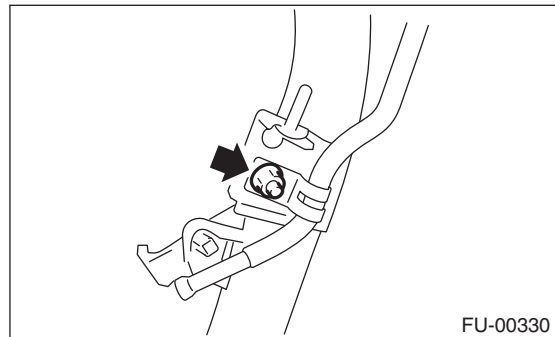
14) Connect the battery ground cable to battery.

C: DISASSEMBLY

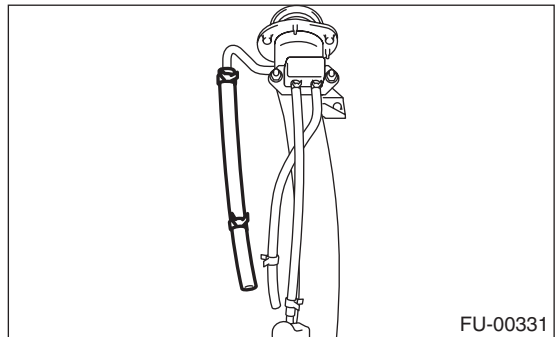
1) Move the clamp, and disconnect the evaporation hose from the joint pipe.



2) Remove the bolt which installs the joint pipe on the fuel filler pipe.



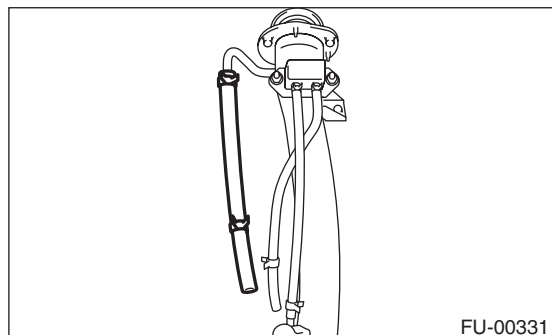
3) Disconnect the evaporation hose from the fuel filler pipe.



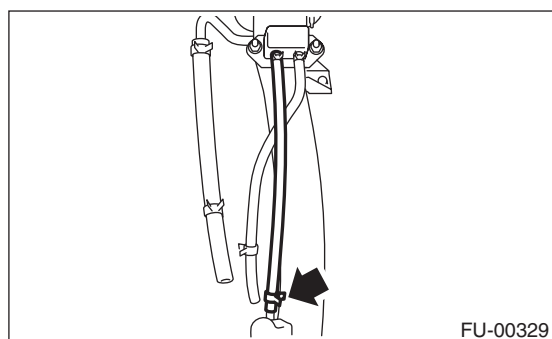
4) Remove the shut valve from the fuel filler pipe.
<Ref. to EC(H4DOTC)-19, REMOVAL, Shut Valve.>

D: ASSEMBLY

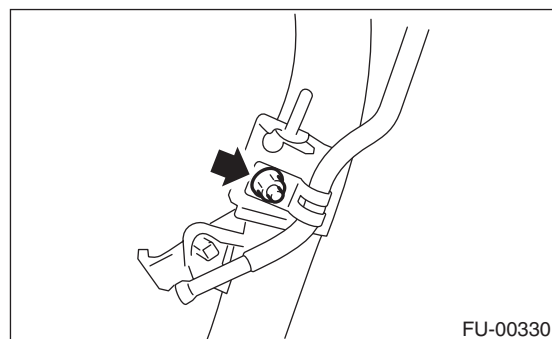
- 1) Install the shut valve on the fuel filler pipe. <Ref. to EC(H4DOTC)-7, INSTALLATION, Canister.>
- 2) Connect the evaporation hose to the fuel filler pipe.



- 3) Connect the evaporation hose to the evaporation pipe.



- 4) Install the evaporation pipe to the fuel filler pipe.



25. Fuel Pump

A: REMOVAL

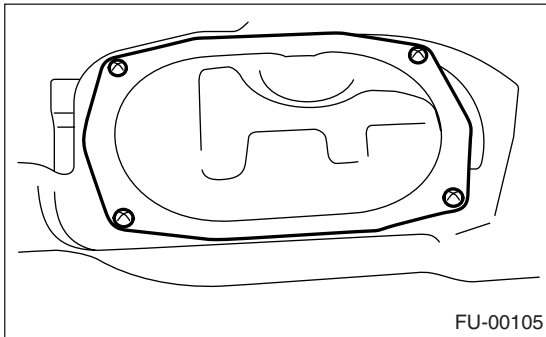
WARNING:

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

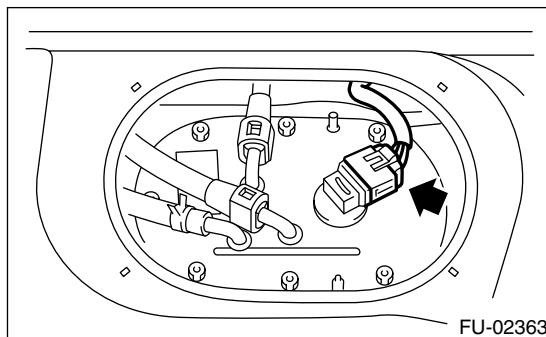
NOTE:

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

- 1) Release the fuel pressure. <Ref. to FU(H4DOTC)-50, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
- 2) Disconnect the ground cable from battery.
- 3) Open the fuel filler flap lid and remove the fuel filler cap.
- 4) Lift up the vehicle.
- 5) Drain the fuel from the fuel tank. <Ref. to FU(H4DOTC)-50, DRAINING FUEL, PROCEDURE, Fuel.>
- 6) Remove the luggage floor mat. <Ref. to EI-61, REMOVAL, Luggage Floor Mat.>
- 7) Remove the service hole cover.

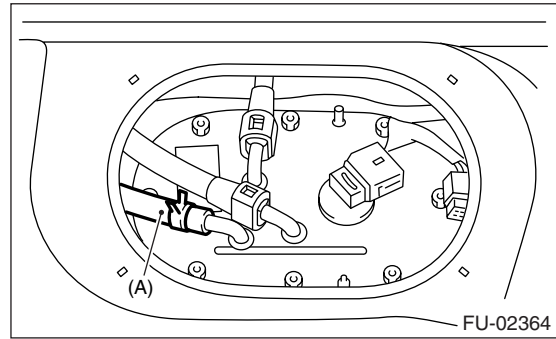


- 8) Disconnect the connector from fuel pump.

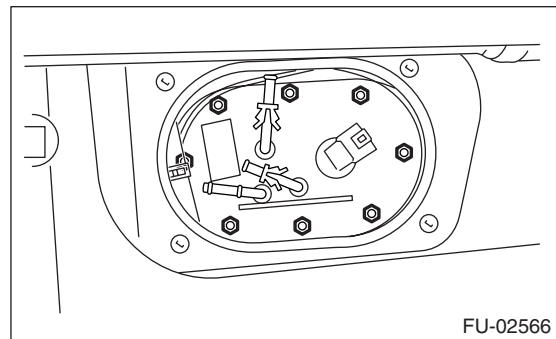


- 9) Disconnect the quick connector and then disconnect the fuel delivery hose and return hose. <Ref. to FU(H4DOTC)-65, REMOVAL, Fuel Delivery, Return and Evaporation lines.>

- 10) Move the clip and then disconnect the jet pump hose (A).



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



- 12) Take off the fuel pump assembly from the fuel tank.

B: INSTALLATION

Install in the reverse order of removal.

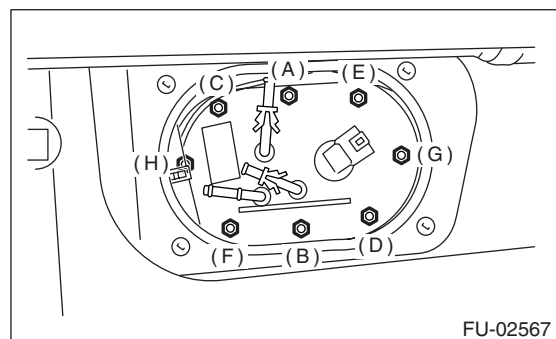
NOTE:

Use a new gasket and retainer.

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

Tightening torque:

4.4 N·m (0.45 kgf-m, 3.3 ft-lb)

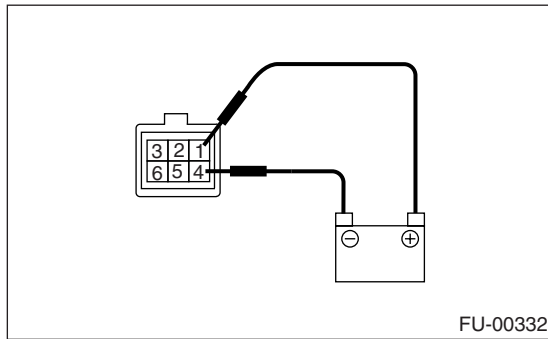


C: INSPECTION

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

WARNING:

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



26. Fuel Level Sensor

A: REMOVAL

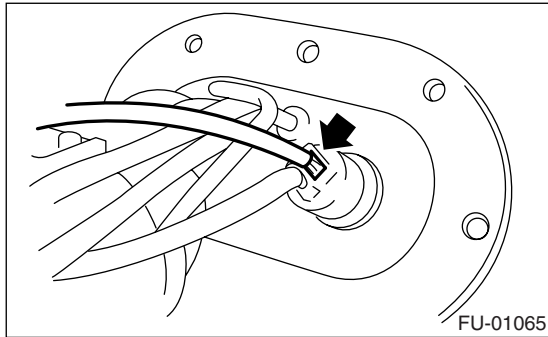
WARNING:

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

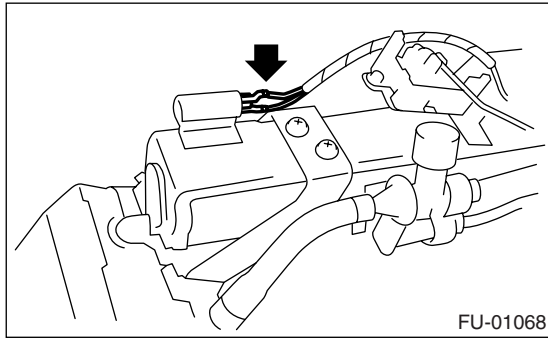
NOTE:

Fuel level sensor is built in fuel pump assembly.

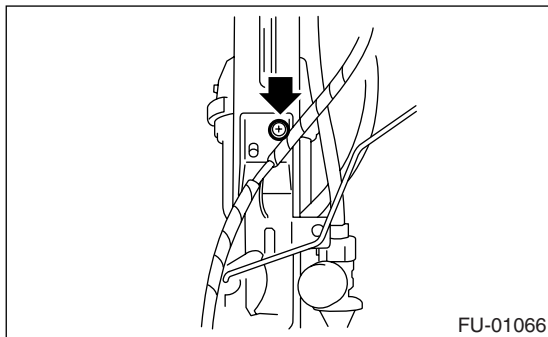
- 1) Remove the fuel pump assembly. <Ref. to FU(H4DOTC)-58, REMOVAL, Fuel Pump.>
- 2) Disconnect the connector from the fuel pump bracket.



- 3) Remove the fuel temperature sensor.



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



B: INSTALLATION

Install in the reverse order of removal.

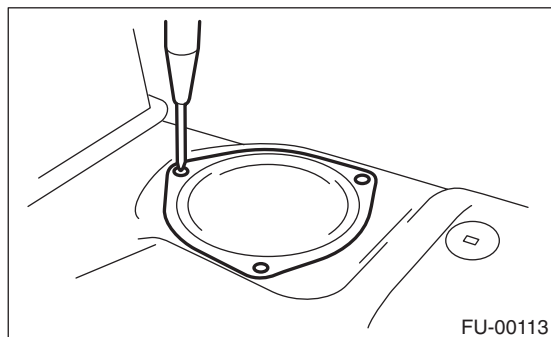
27. Fuel Sub Level Sensor

A: REMOVAL

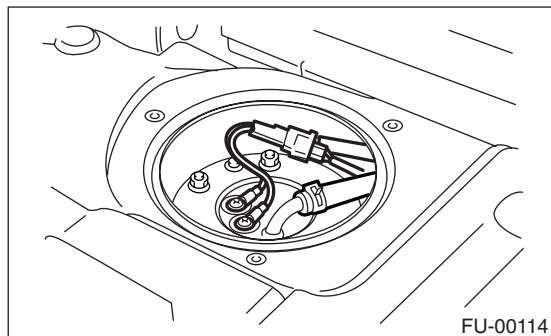
WARNING:

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

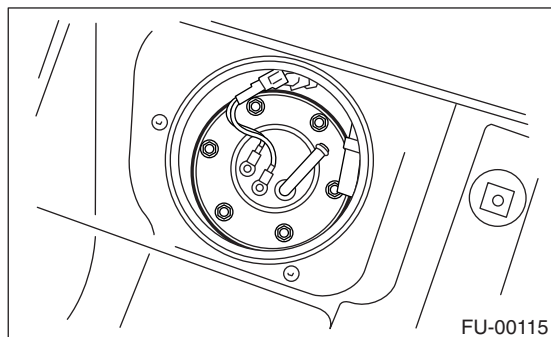
- 1) Disconnect the ground cable from battery.
- 2) Lift up the vehicle.
- 3) Drain the fuel from the fuel tank. <Ref. to FU(H4DOTC)-50, DRAINING FUEL, PROCEDURE, Fuel.>
- 4) Remove the luggage floor mat. <Ref. to EI-61, REMOVAL, Luggage Floor Mat.>
- 5) Remove the service hole cover.



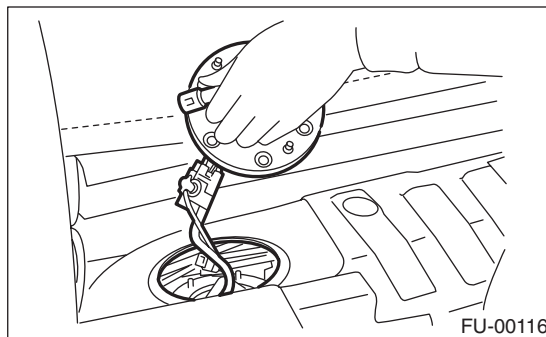
- 6) Disconnect the connector from the fuel sub level sensor.
- 7) Disconnect the fuel jet pump hose.



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



- 9) Remove the fuel sub level sensor.



B: INSTALLATION

Install in the reverse order of removal.

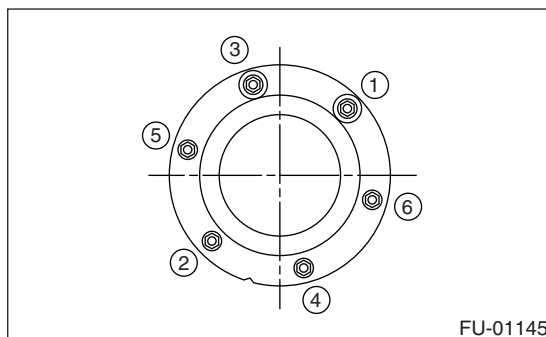
NOTE:

Use a new gasket.

- (1) Ensure the sealing portion is free from fuel or foreign particles before installation.
- (2) Tighten the nuts and bolts to specified torque in the order as shown in the figure.

Tightening torque:

4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



28. Fuel Filter

A: REMOVAL

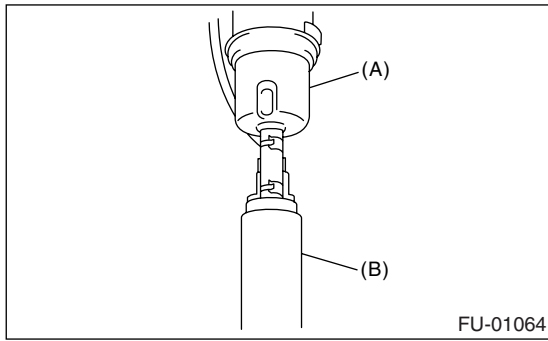
WARNING:

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

NOTE:

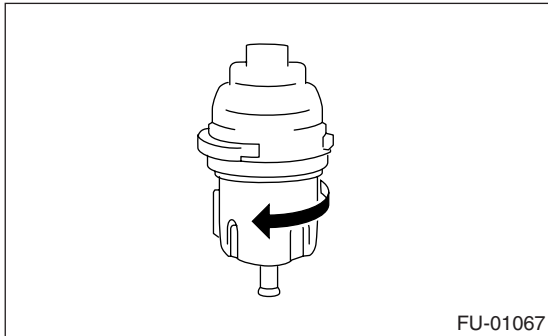
Fuel filter is built into the fuel pump assembly.

- 1) Release the fuel pressure. <Ref. to FU(H4DOTC)-50, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
- 2) Remove the fuel pump assembly. <Ref. to FU(H4DOTC)-58, REMOVAL, Fuel Pump.>
- 3) Remove the fuel pump. <Ref. to FU(H4DOTC)-58, REMOVAL, Fuel Pump.>
- 4) Separate the fuel filter from fuel pump.



- (A) Fuel filter
(B) Fuel pump

- 5) Turn the filter holder around to the arrow direction, and then remove the filter.



B: INSTALLATION

CAUTION:

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

Install in the reverse order of removal.

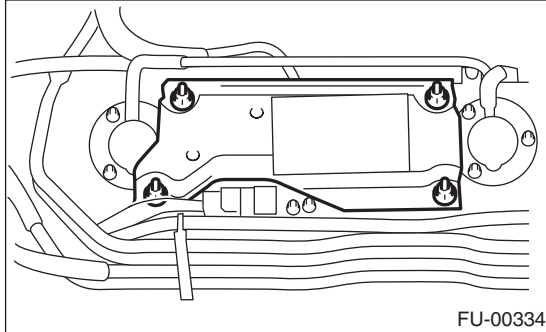
C: INSPECTION

- 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.

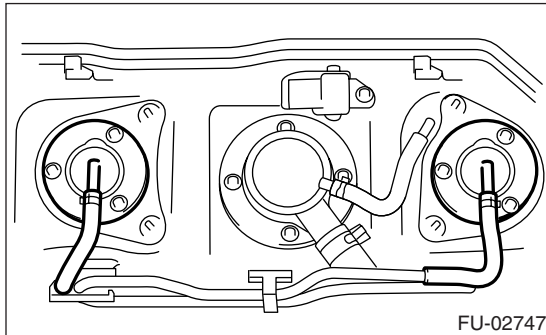
29. Fuel Cut Valve

A: REMOVAL

- 1) Remove the fuel tank. <Ref. to FU(H4DOTC)-51, REMOVAL, Fuel Tank.>
- 2) Remove the protect cover.



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



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

B: INSTALLATION

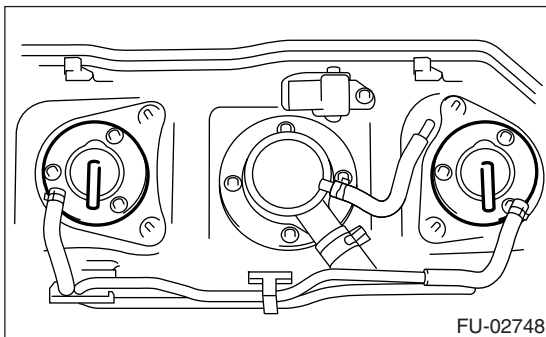
Install in the reverse order of removal.

NOTE:

Use a new gasket.

Tightening torque:

4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



30.Fuel Damper Valve

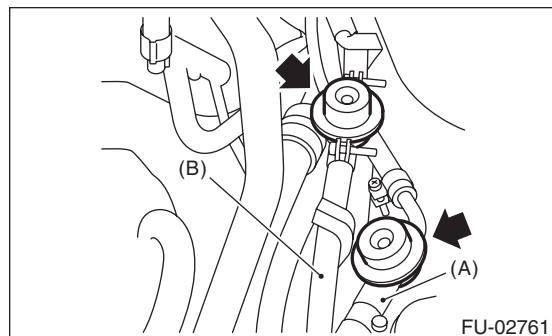
A: REMOVAL

1) Release the fuel pressure. <Ref. to FU(H4DOTC)-50, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>

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

WARNING:

- Be careful not to spill fuel.
- Catch the fuel from hoses using a container or cloth.



B: INSTALLATION

Install in the reverse order of removal.

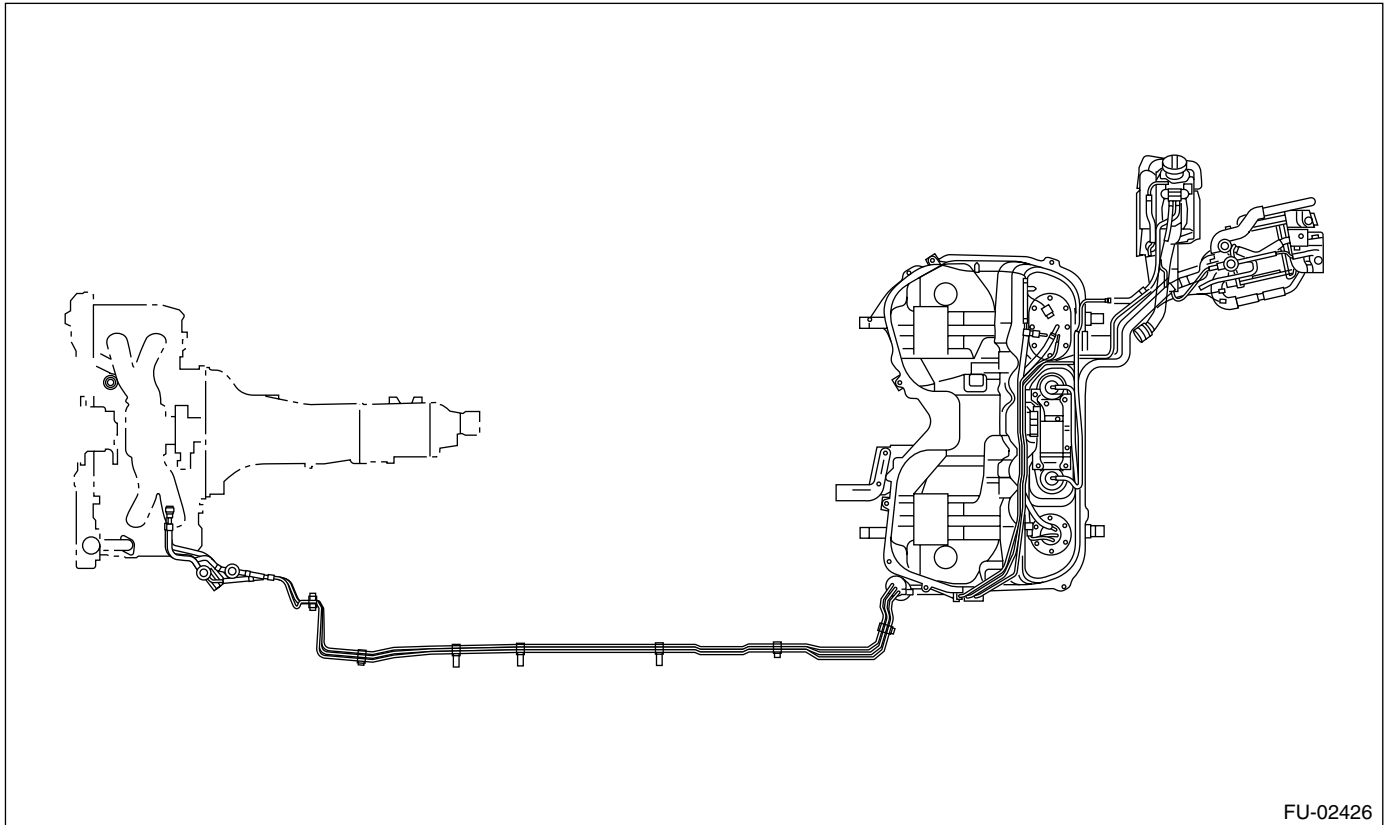
Tightening torque:

1.25 N·m (0.13 kgf-m, 0.94 ft-lb)

31. Fuel Delivery, Return and Evaporation lines

A: REMOVAL

- 1) Set the vehicle on a lift.
- 2) Release the fuel pressure. <Ref. to FU(H4DOTC)-50, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
- 3) Open the fuel filler flap lid and remove the fuel filler cap.
- 4) Remove the floor mat. <Ref. to EI-60, REMOVAL, Floor Mat.>
- 5) Disconnect the fuel delivery pipes and hoses, and disconnect the fuel return pipes and hoses, evaporation pipes and hoses.



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

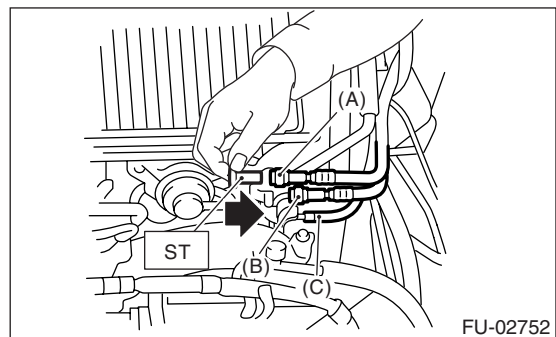
- (1) Disconnect the quick connectors of fuel delivery line and return line by pushing the ST to the direction of arrow.

ST 42099AE000 CONNECTOR REMOVER

- (2) Remove the clip, and disconnect the evaporation hose from pipe.

WARNING:

- Be careful not to spill fuel.
- Catch the fuel from hoses using a container or cloth.



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

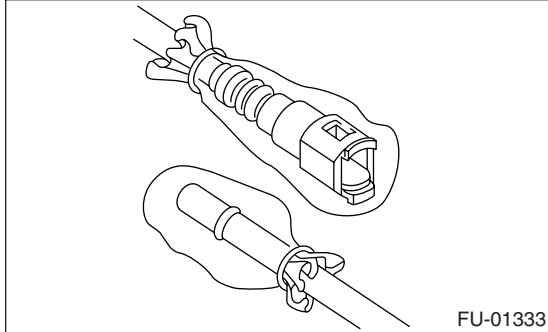
- 7) Lift up the vehicle.

Fuel Delivery, Return and Evaporation lines

FUEL INJECTION (FUEL SYSTEMS)

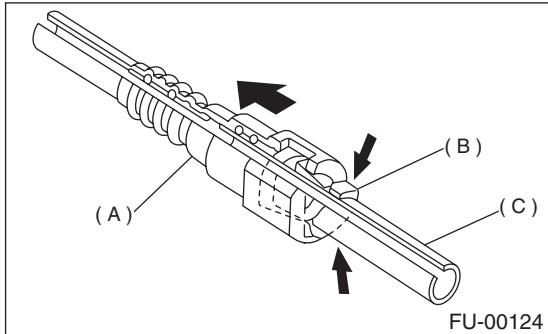
8) Disconnect the quick connector on fuel line.

- (1) Clean the pipe and connector, if they are covered with dust.
- (2) To prevent from damaging or entering foreign matter, wrap the pipes and connectors with plastic bag, etc.



(3) Hold the connector (A) and push retainer (B) down.

(4) Pull out the connector (A) from retainer (B).



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

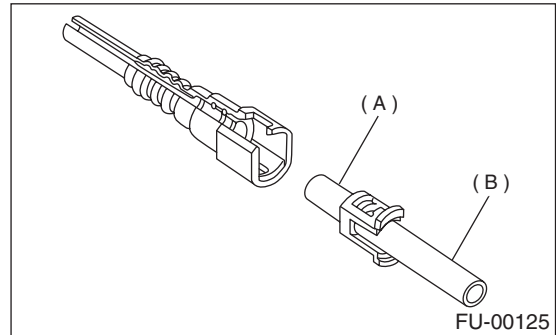
B: INSTALLATION

1) Connect the quick connector on fuel line.

CAUTION:

- Use a new retainer except for use of engine compartment.

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

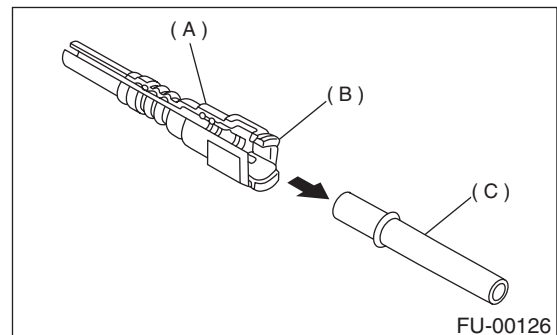


- (A) Seal surface
(B) Pipe

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

NOTE:

At this time, two clicking sounds are heard.



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

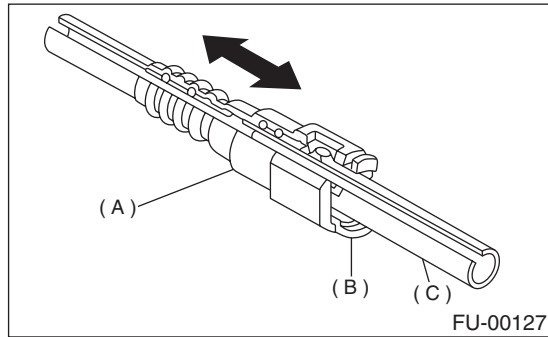
CAUTION:

- Pull the connector to ensure it is connected securely.
- Ensure the two retainer pawls are engaged in their mating positions in the connector.

Fuel Delivery, Return and Evaporation lines

FUEL INJECTION (FUEL SYSTEMS)

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



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

2) Connect the fuel delivery hose and return hose by inserting them into the pipe for 20 to 25 mm (0.79 to 0.98 in) in length.

Type A: When the fitting length is specified.

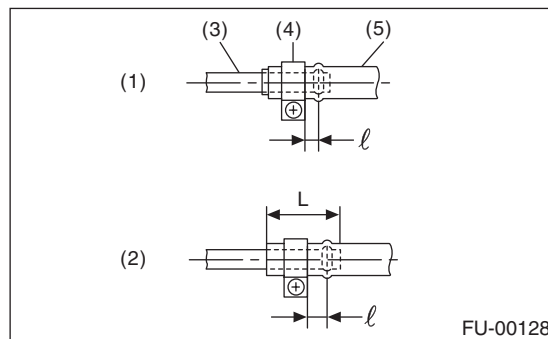
Type B: When the fitting length is not specified.

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

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

CAUTION:

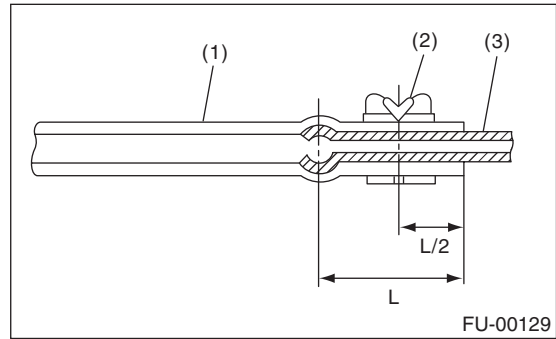
Be sure to inspect hoses and their connections for any leakage of fuel.



- (1) Type A
(2) Type B
(3) Pipe
(4) Clamp
(5) Hose

3) Connect the evaporation hose by inserting it into the pipe for 15 to 20 mm (0.59 to 0.79 in) in length.

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



- (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)

32. Fuel System Trouble in General

A: INSPECTION

Trouble and possible cause		Corrective action
1. Insufficient fuel supply to injector		
1)	Fuel pump does not operate.	
	○ Defective terminal contact.	Inspect contact, especially ground, and tighten it securely.
	○ Trouble in electromagnetic or electronic circuit parts.	Replace the faulty parts.
2)	Lowering of fuel pump function.	Replace the fuel pump.
3)	Clogged dust or water in the fuel filter.	Replace fuel filter, clean or replace fuel tank.
4)	Clogged or bent fuel pipe or hose.	Clean, correct or replace the fuel pipe or hose.
5)	Air is mixed in the fuel system.	Inspect or retighten each connection part.
6)	Clogged or bent air breather tube or pipe.	Clean, correct or replace air breather tube or pipe.
7)	Damaged diaphragm of pressure regulator.	Replace.
2. Leakage or blow out of 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 air breather tube or air vent tube.	Clean, correct or replace air breather tube or air vent tube.
3. Gasoline smell inside of compartment		
1)	Loose joints at air breather tube, air vent tube and fuel filler pipe.	Retightening.
2)	Defective packing air tightness on the fuel saucer.	Correct or replace the packing.
3)	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. Fill fuel fully to prevent those problem. And also drain the water condensation from fuel filter.
- In snow-covered areas, mountainous areas, skiing areas, etc. where ambient temperatures drop below 0°C (32°F) throughout the winter season, use water removing agent in the fuel system to prevent freezing fuel system and accumulating water. Fill the water removing agent at the time when the fuel reduced at half to maintain the advantage.
- When water condensation is noticed in the fuel filter, drain the water from both the fuel filter and fuel tank or use water removing agent in the fuel tank.
- Before using a water removing agent, follow the cautions that noted on the bottle.

GENERAL DESCRIPTION

List of Diagnostic Trouble Code (DTC)

GENERAL DESCRIPTION

1. List of Diagnostic Trouble Code (DTC)

A: LIST

DTC	Description	Index
P0011	Intake Camshaft Position - Timing Over-advanced Or System Performance (Bank 1)	<Ref. to GD(H4DOTC)-10, DTC P0011 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0016	Crankshaft Position - Camshaft Position Correlation (Bank 1)	<Ref. to GD(H4DOTC)-12, DTC P0016 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0018	Crankshaft Position - Camshaft Position Correlation (Bank 2)	<Ref. to GD(H4DOTC)-12, DTC P0018 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0021	Intake Camshaft Position - Timing Over-advanced Or System Performance (Bank 2)	<Ref. to GD(H4DOTC)-12, DTC P0021 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0030	HO2S Heater Control Circuit (Bank 1 Sensor 1)	<Ref. to GD(H4DOTC)-13, DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0031	HO2S Heater Control Circuit Low (Bank 1 Sensor 1)	<Ref. to GD(H4DOTC)-15, DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0032	HO2S Heater Control Circuit High (Bank 1 Sensor 1)	<Ref. to GD(H4DOTC)-17, DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0037	HO2S Heater Control Circuit Low (Bank 1 Sensor 2)	<Ref. to GD(H4DOTC)-19, DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0038	HO2S Heater Control Circuit High (Bank 1 Sensor 2)	<Ref. to GD(H4DOTC)-21, DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0068	Manifold Pressure Sensor Range/Performance	<Ref. to GD(H4DOTC)-23, DTC P0068 MANIFOLD PRESSURE SENSOR RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0101	Mass or Volume Air Flow Circuit Range/Performance	<Ref. to GD(H4DOTC)-25, DTC P0101 MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0102	Mass or Volume Air Flow Circuit Low Input	<Ref. to GD(H4DOTC)-28, DTC P0102 MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0103	Mass or Volume Air Flow Circuit High Input	<Ref. to GD(H4DOTC)-30, DTC P0103 MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0107	Manifold Absolute Pressure/Barometric Pressure Circuit Low Input	<Ref. to GD(H4DOTC)-32, DTC P0107 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0108	Manifold Absolute Pressure/Barometric Pressure Circuit High Input	<Ref. to GD(H4DOTC)-34, DTC P0108 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0111	Intake Air Temperature Circuit Range/Performance	<Ref. to GD(H4DOTC)-36, DTC P0111 INTAKE AIR TEMPERATURE CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0112	Intake Air Temperature Circuit Low Input	<Ref. to GD(H4DOTC)-38, DTC P0112 INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0113	Intake Air Temperature Circuit High Input	<Ref. to GD(H4DOTC)-40, DTC P0113 INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0117	Engine Coolant Temperature Circuit Low Input	<Ref. to GD(H4DOTC)-42, DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

List of Diagnostic Trouble Code (DTC)

GENERAL DESCRIPTION

DTC	Description	Index
P0118	Engine Coolant Temperature Circuit High Input	<Ref. to GD(H4DOTC)-44, DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0122	Throttle/Pedal Position Sensor/Switch "A" Circuit Low Input	<Ref. to GD(H4DOTC)-46, DTC P0122 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0123	Throttle/Pedal Position Sensor/Switch "A" Circuit High Input	<Ref. to GD(H4DOTC)-47, DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0125	Insufficient Coolant Temperature For Closed Loop Fuel Control	<Ref. to GD(H4DOTC)-49, DTC P0125 INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0126	Insufficient Coolant Temperature For Stable Operation	<Ref. to GD(H4DOTC)-51, DTC P0126 INSUFFICIENT COOLANT TEMPERATURE FOR STABLE OPERATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0128	Coolant Thermostat (Coolant Temperature Below Thermostat Regulating Temperature)	<Ref. to GD(H4DOTC)-53, DTC P0128 COOLANT THERMOSTAT (COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0131	O ₂ Sensor Circuit Low Voltage (Bank 1 Sensor 1)	<Ref. to GD(H4DOTC)-55, DTC P0131 O ₂ SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0132	O ₂ Sensor Circuit High Voltage (Bank 1 Sensor 1)	<Ref. to GD(H4DOTC)-57, DTC P0132 O ₂ SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0133	O ₂ Sensor Circuit Slow Response (Bank 1 Sensor 1)	<Ref. to GD(H4DOTC)-58, DTC P0133 O ₂ SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0134	O ₂ Sensor Circuit No Activity Detected (Bank 1 Sensor 1)	<Ref. to GD(H4DOTC)-61, DTC P0134 O ₂ SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0137	O ₂ Sensor Circuit Low Voltage (Bank 1 Sensor 2)	<Ref. to GD(H4DOTC)-62, DTC P0137 O ₂ SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0138	O ₂ Sensor Circuit High Voltage (Bank 1 Sensor 2)	<Ref. to GD(H4DOTC)-64, DTC P0138 O ₂ SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0139	O ₂ Sensor Circuit Slow Response (Bank 1 Sensor 2)	<Ref. to GD(H4DOTC)-65, DTC P0139 O ₂ SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0140	O ₂ Sensor Circuit No Activity Detected (Bank 1 Sensor 2)	<Ref. to GD(H4DOTC)-71, DTC P0140 O ₂ SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0171	System Too Lean (Bank 1)	<Ref. to GD(H4DOTC)-72, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0172	System Too Rich (Bank 1)	<Ref. to GD(H4DOTC)-74, DTC P0172 SYSTEM TOO RICH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0181	Fuel Temperature Sensor "A" Circuit Range/Performance	<Ref. to GD(H4DOTC)-77, DTC P0181 FUEL TEMPERATURE SENSOR "A" CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0182	Fuel Temperature Sensor "A" Circuit Low Input	<Ref. to GD(H4DOTC)-80, DTC P0182 FUEL TEMPERATURE SENSOR "A" CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0183	Fuel Temperature Sensor "A" Circuit High Input	<Ref. to GD(H4DOTC)-82, DTC P0183 FUEL TEMPERATURE SENSOR "A" CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

List of Diagnostic Trouble Code (DTC)

GENERAL DESCRIPTION

DTC	Description	Index
P0222	Throttle/pedal Position Sensor/switch "B" Circuit Low	<Ref. to GD(H4DOTC)-84, DTC P0222 THROTTLE/PEDAL POSITION SENSOR/SWITCH "B" CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0223	Throttle/pedal Position Sensor/switch "B" Circuit High	<Ref. to GD(H4DOTC)-85, DTC P0223 THROTTLE/PEDAL POSITION SENSOR/SWITCH "B" CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0230	Fuel Pump Primary Circuit	<Ref. to GD(H4DOTC)-87, DTC P0230 FUEL PUMP PRIMARY CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0244	Turbo/Super Charger Wastegate Solenoid "A" Range/Performance	<Ref. to GD(H4DOTC)-89, DTC P0244 TURBO/SUPER CHARGER WASTEGATE SOLENOID "A" RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0245	Turbo/Super Charger Wastegate Solenoid "A" Low	<Ref. to GD(H4DOTC)-91, DTC P0245 TURBO/SUPER CHARGER WASTEGATE SOLENOID "A" LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0246	Turbo/Super Charger Wastegate Solenoid "A" High	<Ref. to GD(H4DOTC)-93, DTC P0246 TURBO/SUPER CHARGER WASTEGATE SOLENOID "A" HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0301	Cylinder 1 Misfire Detected	<Ref. to GD(H4DOTC)-95, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0302	Cylinder 2 Misfire Detected	<Ref. to GD(H4DOTC)-100, DTC P0302 CYLINDER 2 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0303	Cylinder 3 Misfire Detected	<Ref. to GD(H4DOTC)-100, DTC P0303 CYLINDER 3 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0304	Cylinder 4 Misfire Detected	<Ref. to GD(H4DOTC)-100, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0327	Knock Sensor 1 Circuit Low Input (Bank 1 or Single Sensor)	<Ref. to GD(H4DOTC)-101, DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0328	Knock Sensor 1 Circuit High Input (Bank 1 or Single Sensor)	<Ref. to GD(H4DOTC)-103, DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0335	Crankshaft Position Sensor "A" Circuit	<Ref. to GD(H4DOTC)-105, DTC P0335 CRANKSHAFT POSITION SENSOR "A" CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0336	Crankshaft Position Sensor "A" Circuit Range/Performance	<Ref. to GD(H4DOTC)-107, DTC P0336 CRANKSHAFT POSITION SENSOR "A" CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0340	Camshaft Position Sensor "A" Circuit (Bank 1 or Single Sensor)	<Ref. to GD(H4DOTC)-109, DTC P0340 CAMSHAFT POSITION SENSOR "A" CIRCUIT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0345	Camshaft Position Sensor "A" Circuit (Bank 2)	<Ref. to GD(H4DOTC)-110, DTC P0345 CAMSHAFT POSITION SENSOR "A" CIRCUIT (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0410	Secondary Air Injection System	<Ref. to GD(H4DOTC)-111, DTC P0410 SECONDARY AIR INJECTION SYSTEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0411	Secondary Air Injection System Incorrect Flow Detected	<Ref. to GD(H4DOTC)-115, DTC P0411 SECONDARY AIR INJECTION SYSTEM INCORRECT FLOW DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0413	Secondary Air Injection System Switching Valve "A" Circuit Open	<Ref. to GD(H4DOTC)-116, DTC P0413 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE "A" CIRCUIT OPEN, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0414	Secondary Air Injection System Switching Valve "A" Circuit Shorted	<Ref. to GD(H4DOTC)-117, DTC P0414 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE "A" CIRCUIT SHORTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0416	Secondary Air Injection System Switching Valve "B" Circuit Open	<Ref. to GD(H4DOTC)-118, DTC P0416 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE "B" CIRCUIT OPEN, Diagnostic Trouble Code (DTC) Detecting Criteria.>

List of Diagnostic Trouble Code (DTC)

GENERAL DESCRIPTION

DTC	Description	Index
P0417	Secondary Air Injection System Switching Valve "B" Circuit Shorted	<Ref. to GD(H4DOTC)-118, DTC P0417 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE "B" CIRCUIT SHORTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0418	Secondary Air Injection System Control "A" Circuit Open	<Ref. to GD(H4DOTC)-119, DTC P0418 SECONDARY AIR INJECTION SYSTEM CONTROL "A" CIRCUIT OPEN, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0420	Catalyst System Efficiency Below Threshold (Bank 1)	<Ref. to GD(H4DOTC)-120, DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0442	Evaporative Emission Control System Leak Detected (Small Leak)	<Ref. to GD(H4DOTC)-123, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0447	Evaporative Emission Control System Vent Control Circuit Open	<Ref. to GD(H4DOTC)-139, DTC P0447 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0448	Evaporative Emission Control System Vent Control Circuit Shorted	<Ref. to GD(H4DOTC)-141, DTC P0448 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0451	Evaporative Emission Control System Pressure Sensor Range/Performance	<Ref. to GD(H4DOTC)-143, DTC P0451 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0452	Evaporative Emission Control System Pressure Sensor Low Input	<Ref. to GD(H4DOTC)-145, DTC P0452 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0453	Evaporative Emission Control System Pressure Sensor High Input	<Ref. to GD(H4DOTC)-147, DTC P0453 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0456	Evaporative Emission Control System Leak Detected (Very Small Leak)	<Ref. to GD(H4DOTC)-148, DTC P0456 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0457	Evaporative Emission Control System Leak Detected (Fuel Cap Loose/Off)	<Ref. to GD(H4DOTC)-148, DTC P0457 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0458	Evaporative Emission Control System Purge Control Valve Circuit Low	<Ref. to GD(H4DOTC)-149, DTC P0458 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0459	Evaporative Emission Control System Purge Control Valve Circuit High	<Ref. to GD(H4DOTC)-151, DTC P0459 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0461	Fuel Level Sensor Circuit Range/Performance	<Ref. to GD(H4DOTC)-153, DTC P0461 FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0462	Fuel Level Sensor Circuit Low Input	<Ref. to GD(H4DOTC)-155, DTC P0462 FUEL LEVEL SENSOR CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0463	Fuel Level Sensor Circuit High Input	<Ref. to GD(H4DOTC)-157, DTC P0463 FUEL LEVEL SENSOR CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0464	Fuel Level Sensor Circuit Intermittent	<Ref. to GD(H4DOTC)-158, DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0483	Cooling Fan Rationality Check	<Ref. to GD(H4DOTC)-161, DTC P0483 COOLING FAN RATIONALITY CHECK, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0502	Vehicle Speed Sensor Circuit Low Input	<Ref. to GD(H4DOTC)-162, DTC P0502 VEHICLE SPEED SENSOR CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0503	Vehicle Speed Sensor Intermittent/Erratic/High	<Ref. to GD(H4DOTC)-163, DTC P0503 VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

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GENERAL DESCRIPTION

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P0506	Idle Control System RPM Lower Than Expected	<Ref. to GD(H4DOTC)-165, DTC P0506 IDLE AIR CONTROL SYSTEM RPM LOWER THAN EXPECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0507	Idle Control System RPM Higher Than Expected	<Ref. to GD(H4DOTC)-167, DTC P0507 IDLE AIR CONTROL SYSTEM RPM HIGHER THAN EXPECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0512	Starter Request Circuit	<Ref. to GD(H4DOTC)-169, DTC P0512 STARTER REQUEST CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0513	Incorrect Immobilizer Key	<Ref. to GD(H4DOTC)-170, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0519	Idle Control System Malfunction (Fail-Safe)	<Ref. to GD(H4DOTC)-171, DTC P0519 IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0600	Serial Communication Link	<Ref. to GD(H4DOTC)-172, DTC P0600 SERIAL COMMUNICATION LINK, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0604	Internal Control Module Random Access Memory (RAM) Error	<Ref. to GD(H4DOTC)-173, DTC P0604 INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0605	Internal Control Module Read Only Memory (ROM) Error	<Ref. to GD(H4DOTC)-174, DTC P0605 INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0607	Control Module Performance	<Ref. to GD(H4DOTC)-175, DTC P0607 CONTROL MODULE PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0638	Throttle Actuator Control Range/Performance (Bank 1)	<Ref. to GD(H4DOTC)-177, DTC P0638 THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0691	Cooling Fan 1 Control Circuit Low	<Ref. to GD(H4DOTC)-179, DTC P0691 COOLING FAN 1 CONTROL CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0692	Cooling Fan 1 Control Circuit High	<Ref. to GD(H4DOTC)-180, DTC P0692 COOLING FAN 1 CONTROL CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0700	Transmission Control System (MIL Request)	<Ref. to GD(H4DOTC)-181, DTC P0700 TRANSMISSION CONTROL SYSTEM (MIL REQUEST), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0851	Neutral Switch Input Circuit Low (AT Model)	<Ref. to GD(H4DOTC)-182, DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW (AT MODEL), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0851	Neutral Switch Input Circuit Low (MT Model)	<Ref. to GD(H4DOTC)-183, DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW (MT MODEL), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0852	Neutral Switch Input Circuit High (AT Model)	<Ref. to GD(H4DOTC)-184, DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (AT MODEL), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0852	Neutral Switch Input Circuit High (MT Model)	<Ref. to GD(H4DOTC)-185, DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (MT MODEL), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1152	O ₂ Sensor Circuit Range/Performance (Low) (Bank 1 Sensor 1)	<Ref. to GD(H4DOTC)-186, DTC P1152 O ₂ SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK1 SENSOR1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1153	O ₂ Sensor Circuit Range/Performance (High) (Bank 1 Sensor 1)	<Ref. to GD(H4DOTC)-188, DTC P1153 O ₂ SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK1 SENSOR1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1160	Return Spring Failure	<Ref. to GD(H4DOTC)-190, DTC P1160 RETURN SPRING FAILURE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1400	Fuel Tank Pressure Control Solenoid Valve Circuit Low	<Ref. to GD(H4DOTC)-192, DTC P1400 FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

List of Diagnostic Trouble Code (DTC)

GENERAL DESCRIPTION

DTC	Description	Index
P1410	Secondary Air Injection System Switching Valve Stuck Open	<Ref. to GD(H4DOTC)-194, DTC P1410 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1418	Secondary Air Injection System Control "A" Circuit Shorted	<Ref. to GD(H4DOTC)-195, DTC P1418 SECONDARY AIR INJECTION SYSTEM CONTROL "A" CIRCUIT SHORTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1420	Fuel Tank Pressure Control Sol. Valve Circuit High	<Ref. to GD(H4DOTC)-196, DTC P1420 FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1443	Vent Control Solenoid Valve Function Problem	<Ref. to GD(H4DOTC)-198, DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1491	Positive Crankcase Ventilation (Blow-By) Function Problem	<Ref. to GD(H4DOTC)-200, DTC P1491 POSITIVE CRANKCASE VENTILATION (BLOW-BY) FUNCTION PROBLEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1518	Starter Switch Circuit Low Input	<Ref. to GD(H4DOTC)-202, DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1560	Back-Up Voltage Circuit Malfunction	<Ref. to GD(H4DOTC)-203, DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1570	Antenna	<Ref. to GD(H4DOTC)-204, DTC P1570 ANTENNA, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1571	Reference Code Incompatibility	<Ref. to GD(H4DOTC)-204, DTC P1571 REFERENCE CODE INCOMPATIBILITY, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1572	IMM Circuit Failure (Except Antenna Circuit)	<Ref. to GD(H4DOTC)-204, DTC P1572 IMM CIRCUIT FAILURE (EXCEPT ANTENNA CIRCUIT), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1574	Key Communication Failure	<Ref. to GD(H4DOTC)-204, DTC P1574 KEY COMMUNICATION FAILURE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1576	EGI Control Module EEPROM	<Ref. to GD(H4DOTC)-204, DTC P1576 EGI CONTROL MODULE EEPROM, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1577	IMM Control Module EEPROM	<Ref. to GD(H4DOTC)-204, DTC P1577 IMM CONTROL MODULE EEPROM, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2004	Intake Manifold Runner Control Stuck Open (Bank 1)	<Ref. to GD(H4DOTC)-205, DTC P2004 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2005	Intake Manifold Runner Control Stuck Open (Bank 2)	<Ref. to GD(H4DOTC)-206, DTC P2005 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2006	Intake Manifold Runner Control Stuck Closed (Bank 1)	<Ref. to GD(H4DOTC)-207, DTC P2006 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2007	Intake Manifold Runner Control Stuck Closed (Bank 2)	<Ref. to GD(H4DOTC)-208, DTC P2007 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2008	Intake Manifold Runner Control Circuit / Open (Bank 1)	<Ref. to GD(H4DOTC)-209, DTC P2008 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2009	Intake Manifold Runner Control Circuit Low (Bank 1)	<Ref. to GD(H4DOTC)-211, DTC P2009 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2011	Intake Manifold Runner Control Circuit / Open (Bank 2)	<Ref. to GD(H4DOTC)-213, DTC P2011 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2012	Intake Manifold Runner Control Circuit Low (Bank 2)	<Ref. to GD(H4DOTC)-215, DTC P2012 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

List of Diagnostic Trouble Code (DTC)

GENERAL DESCRIPTION

DTC	Description	Index
P2016	Intake Manifold Runner Position Sensor / Switch Circuit Low (Bank 1)	<Ref. to GD(H4DOTC)-217, DTC P2016 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT LOW (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2017	Intake Manifold Runner Position Sensor / Switch Circuit High (Bank 1)	<Ref. to GD(H4DOTC)-219, DTC P2017 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT HIGH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2021	Intake Manifold Runner Position Sensor / Switch Circuit Low (Bank 2)	<Ref. to GD(H4DOTC)-221, DTC P2021 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT LOW (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2022	Intake Manifold Runner Position Sensor / Switch Circuit High (Bank 2)	<Ref. to GD(H4DOTC)-223, DTC P2022 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT HIGH (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2088	OCV Solenoid Valve Signal A Circuit Open (Bank 1)	<Ref. to GD(H4DOTC)-225, DTC P2088 OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2089	OCV Solenoid Valve Signal A Circuit Short (Bank 1)	<Ref. to GD(H4DOTC)-227, DTC P2089 OCV SOLENOID VALVE SIGNAL A CIRCUIT SHORT (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2092	OCV Solenoid Valve Signal A Circuit Open (Bank 2)	<Ref. to GD(H4DOTC)-229, DTC P2092 OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2093	Intake Camshaft Position Actuator Control Circuit High (Bank 2)	<Ref. to GD(H4DOTC)-231, DTC P2093 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2096	Post Catalyst Fuel Trim System Too Lean Bank 1	<Ref. to GD(H4DOTC)-233, DTC P2096 POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2097	Post Catalyst Fuel Trim System Too Rich Bank 1	<Ref. to GD(H4DOTC)-235, DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2101	Throttle Actuator Control Motor Circuit Range/Performance	<Ref. to GD(H4DOTC)-237, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2102	Throttle Actuator Control Motor Circuit Low	<Ref. to GD(H4DOTC)-239, DTC P2102 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2103	Throttle Actuator Control Motor Circuit High	<Ref. to GD(H4DOTC)-241, DTC P2103 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2109	Throttle/Pedal Position Sensor "A" Minimum Stop Performance	<Ref. to GD(H4DOTC)-243, DTC P2109 THROTTLE/PEDAL POSITION SENSOR A MINIMUM STOP PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2122	Throttle/Pedal Position Sensor/Switch "D" Circuit Low Input	<Ref. to GD(H4DOTC)-244, DTC P2122 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2123	Throttle/Pedal Position Sensor/Switch "D" Circuit High Input	<Ref. to GD(H4DOTC)-246, DTC P2123 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2127	Throttle/Pedal Position Sensor/Switch "E" Circuit Low Input	<Ref. to GD(H4DOTC)-247, DTC P2127 THROTTLE/PEDAL POSITION SENSOR/SWITCH "E" CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2128	Throttle/Pedal Position Sensor/Switch "E" Circuit High Input	<Ref. to GD(H4DOTC)-249, DTC P2128 THROTTLE/PEDAL POSITION SENSOR/SWITCH "E" CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2135	Throttle/Pedal Position Sensor/Switch "A"/"B" Voltage Correlation	<Ref. to GD(H4DOTC)-250, DTC P2135 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A"/"B" VOLTAGE CORRELATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

List of Diagnostic Trouble Code (DTC)

GENERAL DESCRIPTION

DTC	Description	Index
P2138	Throttle/Pedal Position Sensor/Switch "D"/"E" Voltage Correlation	<Ref. to GD(H4DOTC)-252, DTC P2138 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D"/"E" VOLTAGE CORRELATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2227	Barometric Pressure Too Low	<Ref. to GD(H4DOTC)-254, DTC P2227 BAROMETRIC PRESSURE TOO LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2228	Atmospheric Pressure Sensor Circuit Malfunction (Low Input)	<Ref. to GD(H4DOTC)-255, DTC P2228 ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2229	Atmospheric Pressure Sensor Circuit Malfunction (High Input)	<Ref. to GD(H4DOTC)-256, DTC P2229 ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2431	Secondary Air Injection System Air Flow /Pressure Sensor Circuit Range/Performance	<Ref. to GD(H4DOTC)-257, DTC P2431 SECONDARY AIR INJECTION SYSTEM AIR FLOW / PRESSURE SENSOR CIRCUIT RANGE / PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2432	Secondary Air Injection System Air Flow /Pressure Sensor Circuit Low	<Ref. to GD(H4DOTC)-258, DTC P2432 SECONDARY AIR INJECTION SYSTEM AIR FLOW / PRESSURE SENSOR CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2433	Secondary Air Injection System Air Flow /Pressure Sensor Circuit High	<Ref. to GD(H4DOTC)-259, DTC P2433 SECONDARY AIR INJECTION SYSTEM AIR FLOW / PRESSURE SENSOR CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2440	Secondary Air Injection System Switching Valve Stuck Open (Bank 1)	<Ref. to GD(H4DOTC)-260, DTC P2440 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN (BANK1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2441	Secondary Air Injection System Switching Valve Stuck Closed (Bank 1)	<Ref. to GD(H4DOTC)-260, DTC P2441 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK CLOSED (BANK1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2442	Secondary Air Injection System Switching Valve Stuck Open (Bank 2)	<Ref. to GD(H4DOTC)-260, DTC P2442 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN (BANK2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2443	Secondary Air Injection System Switching Valve Stuck Closed (Bank 2)	<Ref. to GD(H4DOTC)-260, DTC P2443 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK CLOSED (BANK2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2444	Secondary Air Injection System Pump Stuck On	<Ref. to GD(H4DOTC)-261, DTC P2444 SECONDARY AIR INJECTION SYSTEM PUMP STUCK ON, Diagnostic Trouble Code (DTC) Detecting Criteria.>

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

2. Diagnostic Trouble Code (DTC) Detecting Criteria

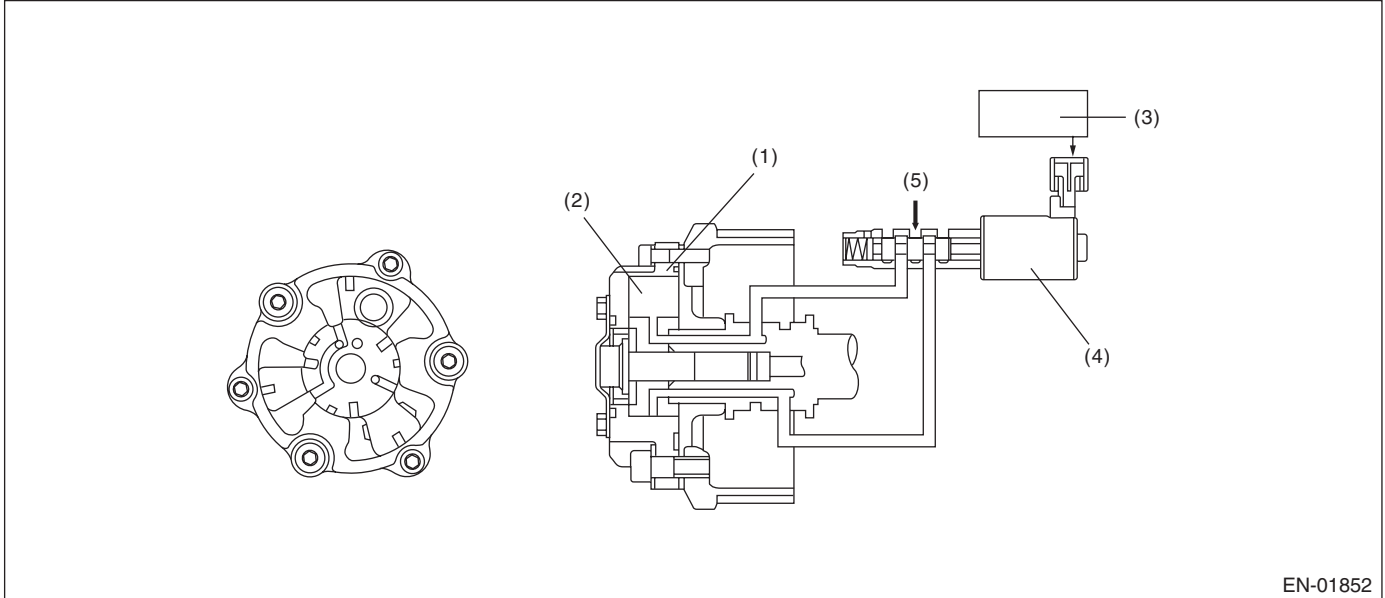
A: DTC P0011 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of AVCS system.

There are two types of diagnosis; crankshaft and camshaft position diagnosis and slow response diagnosis. Perform one of two according to operation status.

2. COMPONENT DESCRIPTION



- (1) AVCS timing controller
- (2) Vane
- (3) Engine control module (ECM)
- (4) Oil flow control solenoid valve
- (5) Oil pressure

3. ENABLE CONDITION

(1) Crankshaft and camshaft position diagnosis

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 10.9 \text{ V}$
Engine coolant temperature	$> 60^{\circ}\text{C}$ (140°F)
Amount of target timing advance	$= 0^{\circ}\text{CA}$
Engine speed	$\geq 500 \text{ rpm}$
AVCS	Not in operation

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

(2) Slow response diagnosis

Secondary Parameters	Enable Conditions
All the secondary parameters can be performed.	More than 1 second
Battery voltage	$\geq 10.9 \text{ V}$
Engine coolant temperature	$> 60^{\circ}\text{C}$ (140°F)
Amount of AVCS target timing advance	$\neq 0^{\circ}\text{CA}$
Engine speed	$\geq 1,300 \text{ rpm}$
AVCS	In operation
Variable amount of target timing advance	$< 1.07^{\circ}\text{CA}$

4. GENERAL DRIVING CYCLE

(1) Crankshaft and camshaft position diagnosis

Always perform the diagnosis continuously after starting the engine while the AVCS is not operated.

(2) Slow response diagnosis

Always perform the diagnosis continuously after starting the engine while the AVCS is operated.

5. DIAGNOSTIC METHOD

(1) Crankshaft and camshaft position diagnosis

Judge NG when standard amount of timing advance is outside of normal range, and judge OK when it is within normal range.

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 20 seconds, and judge OK and clear the NG when the continuous time of not completing the malfunction criteria below becomes more than 1 second.

Judgment Value

Malfunction Criteria	Threshold Value
Standard amount of timing advance	$< -13^{\circ}\text{CA}$ or $> 25^{\circ}\text{CA}$

Time Needed for Diagnosis: 20 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

(2) Slow response diagnosis

Accumulate the AVCS deviation amount in positive and negative while AVCS is operated. Judge NG when cumulative value is large at interval of certain time (30 seconds).

• Abnormality Judgment

Judge OK when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
AVCS target position	$\geq 0^{\circ}\text{CA}$
Cumulative value of AVCS positive deviation	$< 8000^{\circ}\text{CA}$ (R bank) $< 8000^{\circ}\text{CA}$ (L bank)
or	
Cumulative value of AVCS negative deviation	$< -8000^{\circ}\text{CA}$ (R bank) $< -8000^{\circ}\text{CA}$ (L bank)

Time Needed for Diagnosis: 30 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
AVCS target position	$\geq 0^{\circ}\text{CA}$
Cumulative value of AVCS positive deviation	$\leq 8000^{\circ}\text{CA}$ (R bank)
	$\leq 8000^{\circ}\text{CA}$ (L bank)
or	
Cumulative value of AVCS negative deviation	$\geq -8000^{\circ}\text{CA}$ (R bank)
	$\geq -8000^{\circ}\text{CA}$ (L bank)

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

B: DTC P0016 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK 1)

NOTE:

For the diagnostic procedure, refer to DTC P0011. <Ref. to GD(H4DOTC)-10, DTC P0011 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

C: DTC P0018 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK 2)

NOTE:

For the diagnostic procedure, refer to DTC P0011. <Ref. to GD(H4DOTC)-10, DTC P0011 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

D: DTC P0021 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 2)

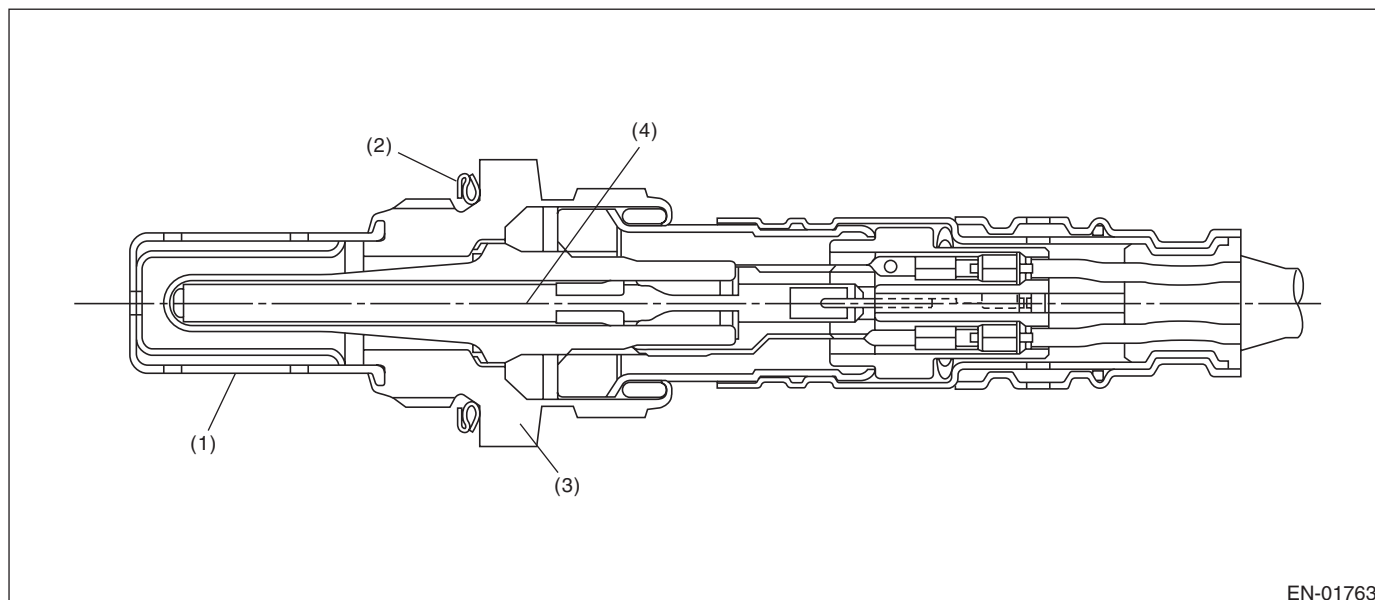
NOTE:

For the diagnostic procedure, refer to DTC P0011. <Ref. to GD(H4DOTC)-10, DTC P0011 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

E: DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1)**1. OUTLINE OF DIAGNOSIS**

Detect the malfunction of front oxygen (A/F) sensor heater.

Judge NG when impedance of front oxygen (A/F) sensor is larger than the standard value by referring to the engine condition such as fuel shut-off in deceleration, etc.

2. COMPONENT DESCRIPTION

- (1) Protection tube
- (2) Gasket
- (3) Sensor housing
- (4) Ceramic heater

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Continuous time which all the following conditions were filled	30 seconds or more
Battery voltage	> 10.9 V
After fuel shut-off	10 seconds or more
Front oxygen (A/F) sensor heater control duty $\geq$ 35%	Experienced
Heater current	Permit

4. GENERAL DRIVING CYCLE

Perform diagnosis continuously in 30 seconds after starting engine.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (10 seconds). Judge OK and clear NG when the continuous time of not completing the malfunction criteria below becomes more than the time needed for diagnosis (10 seconds).

Judgment Value

Malfunction Criteria	Threshold Value
Impedance of front oxygen (A/F) sensor	> 50 Ω

Time Needed for Diagnosis: 10 seconds

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor main learning correction: Not allowed to calculate
- Correction when re-starting at high temperature: Normally minimum value 0.3 → 0
- Purge control: Not allowed to purge

9. ECM OPERATION AT DTC SETTING

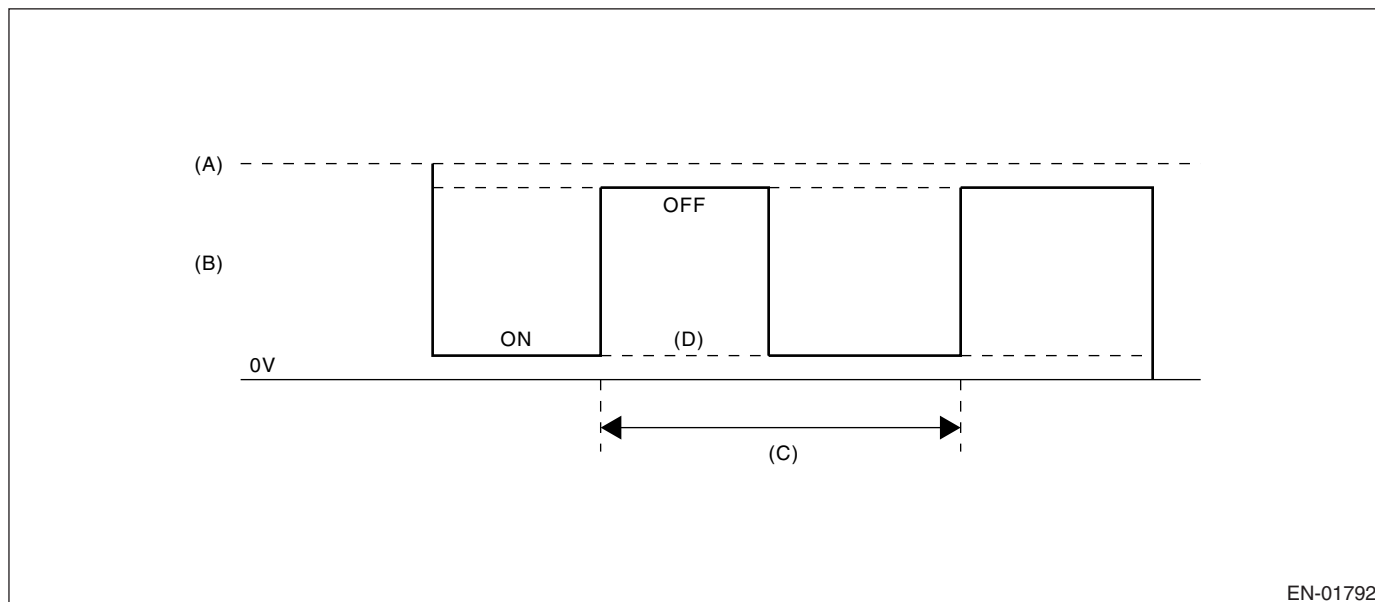
Memorize the freeze frame data. (For test mode \$02)

F: DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1)**1. OUTLINE OF DIAGNOSIS**

Detect the open or short circuit of front oxygen (A/F) sensor heater.

The front oxygen (A/F) sensor heater conducts the duty control. The output terminal voltage at ON becomes 0 V, and the output terminal voltage at OFF becomes battery voltage.

Judge NG when the terminal voltage remains to be Low.

2. COMPONENT DESCRIPTION

(A) Battery voltage	(C) 128 milliseconds
(B) Front oxygen (A/F) sensor heater output voltage	(D) Low abnormality

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 10.9 \text{ V}$

4. GENERAL DRIVING CYCLE

Always perform diagnosis continuously.

5. DIAGNOSTIC METHOD**• Abnormality Judgment**

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 1 second (8 cycles).

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	Low
Front oxygen (A/F) sensor heater control duty	$< 87.5\%$

Time Needed for Diagnosis: 1 second

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

• Normality Judgment

Judge OK and clear the NG when all the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	High

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor activation judgment: Front oxygen (A/F) sensor full activation is not complete, or front oxygen (A/F) sensor half activation is not complete.
- Front oxygen sensor main learning correction: Not allowed to calculate.
- Compensation when starting the engine at high temperature: Make the MIN value to be 0 from 0.3 normally.
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

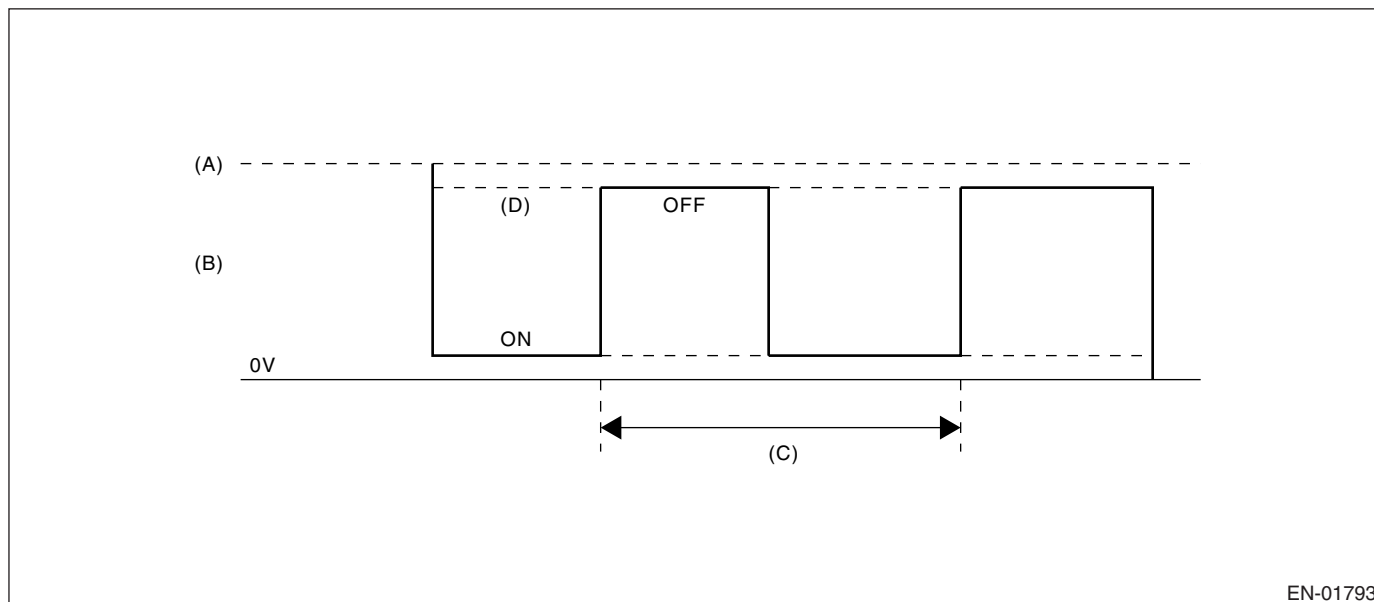
Memorize the freeze frame data. (For test mode \$02)

G: DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1)**1. OUTLINE OF DIAGNOSIS**

Detect the open or short circuit of front oxygen (A/F) sensor heater.

The front oxygen (A/F) sensor heater conducts the duty control. The output terminal voltage at ON becomes 0 V, and the output terminal voltage at OFF becomes battery voltage.

Judge NG when the terminal voltage remains to be High.

2. COMPONENT DESCRIPTION

EN-01793

(A) Battery voltage	(C) 128 milliseconds
(B) Front oxygen (A/F) sensor heater output voltage	(D) High abnormality

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform diagnosis continuously.

5. DIAGNOSTIC METHOD**• Abnormality Judgment**

Judge NG when the continuous time of completing the malfunction criteria below becomes 1 second (8 cycles).

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	High
Front oxygen (A/F) sensor heater control duty	$\geq 12.5\%$

Time Needed for Diagnosis: 1 second

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

• Normality Judgment

Judge OK and clear the NG when all the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	Low

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor activation judgment: Front oxygen (A/F) sensor full activation is not complete, or front oxygen (A/F) sensor half activation is not complete.
- Front oxygen sensor main learning correction: Not allowed to calculate.
- Compensation when starting the engine at high temperature: Make the MIN value to be 0 from 0.3 normally.
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

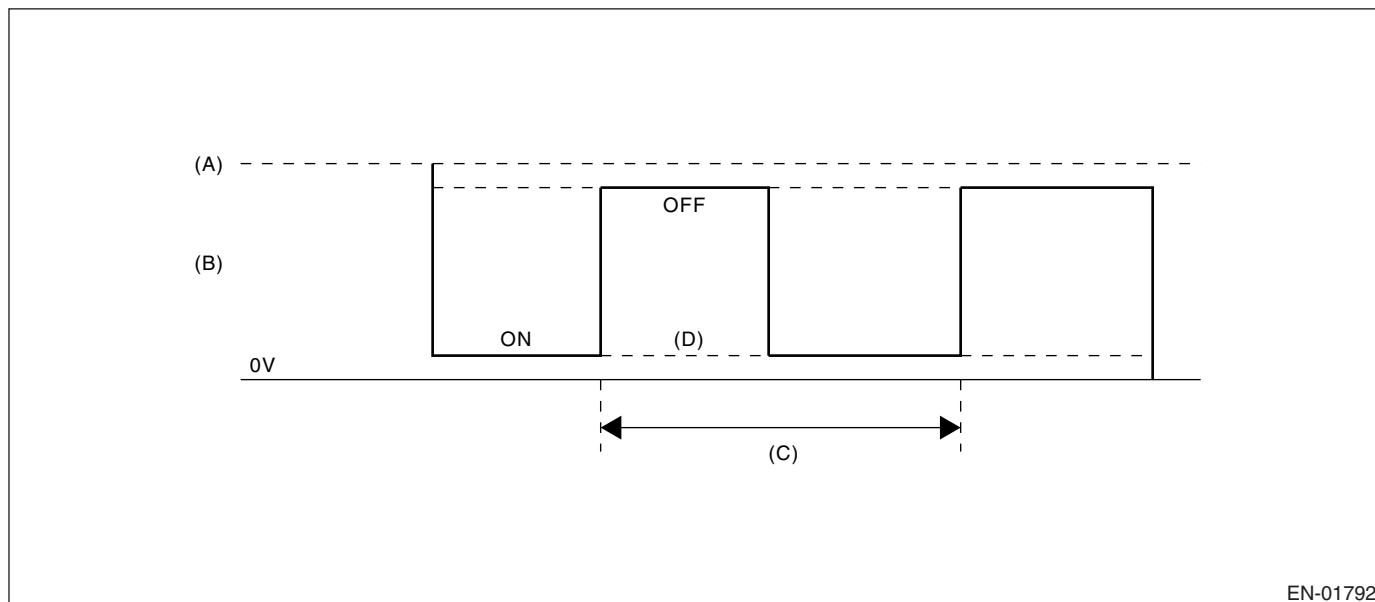
Memorize the freeze frame data. (For test mode \$02)

H: DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2)**1. OUTLINE OF DIAGNOSIS**

Detect open or short circuit of rear oxygen sensor heater.

Rear oxygen sensor heater conducted the duty control, and the output terminal voltage at ON is 0 V and the output terminal voltage at OFF is the battery voltage.

Judge NG when the terminal voltage remains to be Low.

2. COMPONENT DESCRIPTION

(A) Battery voltage	(C) 256 milliseconds (cycles)
(B) Oxygen sensor heater output voltage	(D) Low malfunction

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after engine starting.

5. DIAGNOSTIC METHOD**• Abnormality Judgment**

Judge NG when the continuous time of completing all the malfunction criteria below becomes more than 2,560 millisecond (10 cycles).

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	Low
Rear oxygen sensor heater control duty	< 75%

Time Needed for Diagnosis:2.56 seconds

Malfunction Indicator Light Illumination:Illuminates when malfunction occurs in 2 continuous driving cycles.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

• Normality Judgment

Judge OK and clear the NG when all the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	High

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

Sub feedback control: Not allowed

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

I: DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2)

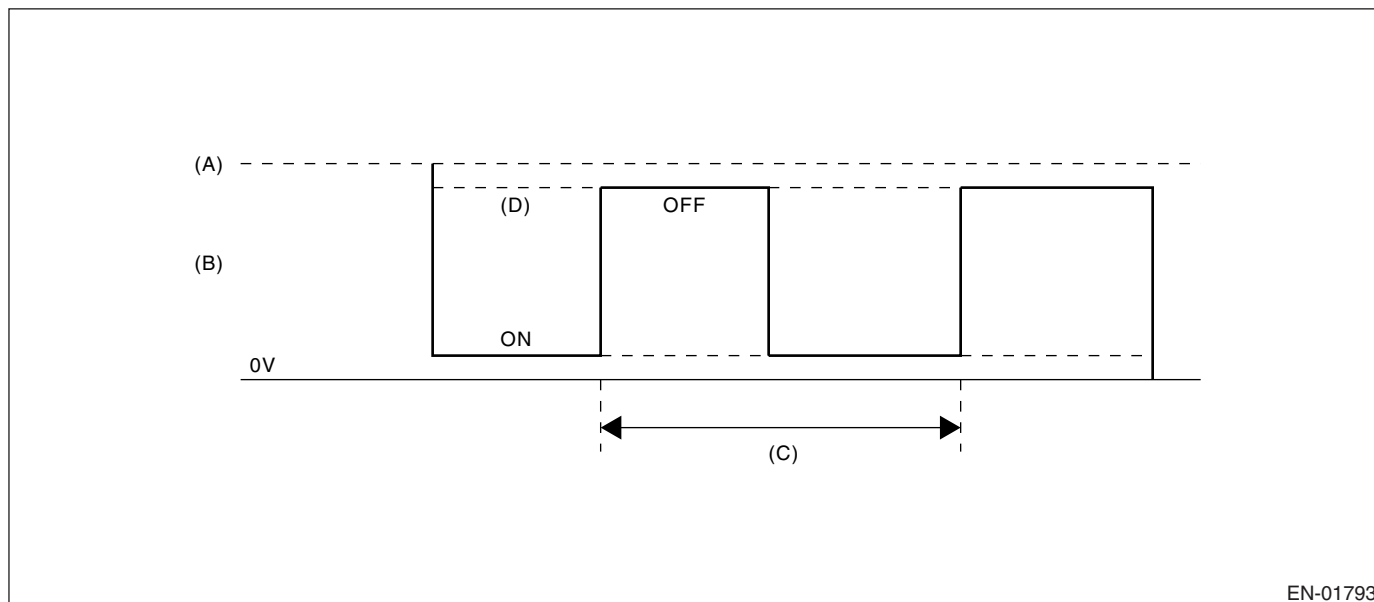
1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of rear oxygen heater.

Rear oxygen heater conducted the duty control, and the output terminal voltage at ON is 0 V and the output terminal voltage at OFF is the battery voltage.

Judge NG when the terminal voltage remains to be High.

2. COMPONENT DESCRIPTION



- (A) Battery voltage
(B) Oxygen sensor heater output voltage
(C) 256 milliseconds (cycles)
(D) High malfunction

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after engine starting.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing all the malfunction criteria below becomes more than 2,560 milliseconds (10 cycles).

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	High
Rear oxygen sensor heater control duty	≥ 25%

Time Needed for Diagnosis:2.56 seconds

Malfunction Indicator Light Illumination:Illuminates when malfunction occurs in 2 continuous driving cycles.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

• Normality Judgment

Judge OK and clear the NG when all the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	Low

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

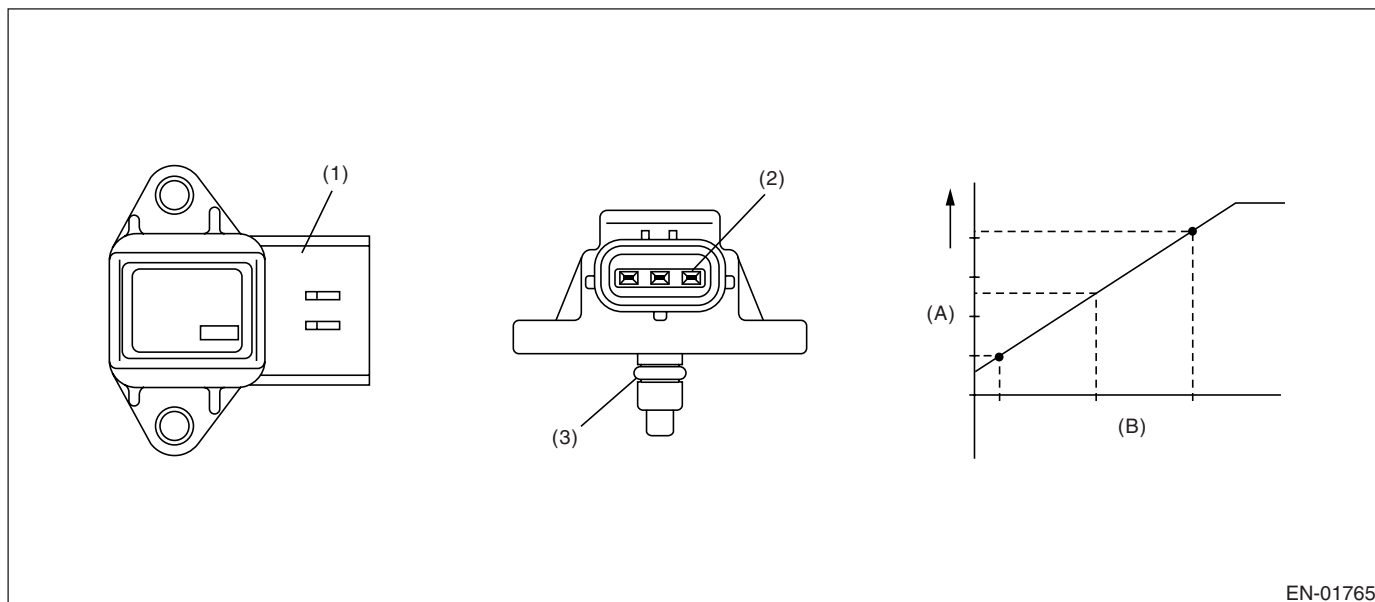
Sub feedback control: Not allowed

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

J: DTC P0068 MANIFOLD PRESSURE SENSOR RANGE/PERFORMANCE**1. OUTLINE OF DIAGNOSIS**

Detect the malfunction of intake manifold pressure sensor output property. Judge NG when the intake air pressure AD value is Low whereas it seemed to be High from the viewpoint of engine condition, or when it is High whereas it seemed to be Low from the engine condition.

2. COMPONENT DESCRIPTION

- (1) Connector
- (2) Terminal
- (3) O-ring

- (A) Output voltage
- (B) Absolute pressure

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	$\geq 70^{\circ}\text{C}$ (158°F)

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after idling.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when either Low side or High side becomes NG. Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Low side	
Engine speed	< 2,500 rpm
Throttle position	≥ 10°
Intake air amount per engine 0.5 rev.	> 1.356 g/rev
Output voltage	< 1.0 V
High side	
Engine speed	600 ↔ 900 rpm
Throttle position	< 1.3°
Intake air amount per engine 0.5 rev.	> 0.4 g/rev
Output voltage	≥ 2.36 V

Time Needed for Diagnosis: 3 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when both Low side and High side become OK. Judge OK when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Low side	
Engine speed	< 2,500 rpm
Throttle position	≥ 10°
Output voltage	≥ 1.0 V
High side	
Engine speed	600 ↔ 900 rpm
Throttle position	< 1.3°
Output voltage	< 2.36 V

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

- Intake manifold pressure sensor process: Estimate the pressure from engine load.
- ISC feedback: Not allowed to calculate the amount of feedback.
- Heavy fuel judgment: Not allowed to carry out the heavy judgment.
- Fuel cut control: Not allowed to cut the over pressure charged fuel.

9. ECM OPERATION AT DTC SETTING

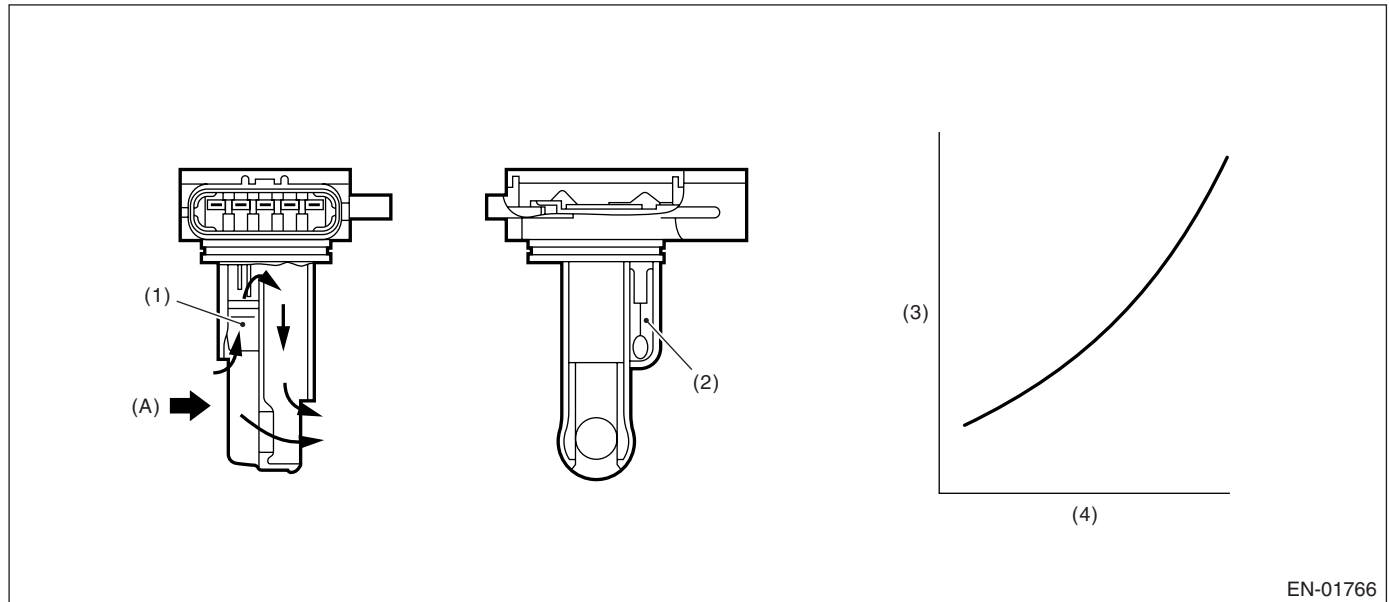
Memorize the freeze frame data. (For test mode \$02)

K: DTC P0101 MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of air flow sensor output property. Judge Low side NG when the air flow voltage indicates low value in spite of the driving condition that the air flow voltage might be high; otherwise, judge High side NG when the air flow voltage indicates high value in spite of the driving condition that the air flow voltage might be low. Judge air flow sensor property NG when the Low side or High side becomes NG.

2. COMPONENT DESCRIPTION



- (1) Air flow sensor
- (2) Intake air temperature sensor
- (3) Voltage (V)
- (4) Intake air volume (kg/s)

(A) Air

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3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	$\geq 70^{\circ}\text{C}$ (158°F)

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after idling.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis.

Judgment Value

Malfunction Criteria	Threshold Value
Low side NG Output voltage Engine speed Throttle angle Intake manifold pressure	< 1.5 V ≥ 2,500 rpm ≥ 15° ≥ 53.3 kPa (400 mmHg, 15.7 inHg)
High side NG 1 Output voltage Engine speed Throttle angle Intake manifold pressure	≥ 1.95 V 600 ↔ 900 rpm < 4.1° < 52.7 kPa (395 mmHg, 15.6 inHg)
High side NG 2 Output voltage Engine speed Throttle angle Intake manifold pressure Diagnosis for fuel system	≥ 1.7 V 600 ↔ 900 rpm < 4.1° < 52.7 kPa (395 mmHg, 15.6 inHg) Rich side malfunction

Time Needed for Diagnosis:

Low side	3 seconds
High side	10 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK the when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Low side NG Output voltage Engine speed Throttle angle Intake manifold pressure	≥ 1.5 V ≥ 2,500 rpm ≥ 15° ≥ 53.3 kPa (400 mmHg, 15.7 inHg)
High side NG Output voltage Engine speed Throttle angle Intake manifold pressure	< 1.95 V 600 ↔ 900 rpm < 4.1° < 52.7 kPa (395 mmHg, 15.6 inHg)

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

- Air flow meter: Engine load is normally calculated by manifold pressure and engine speed; however, calculated only by manifold pressure.
- EVAP conc. learning (fuel): Not allowed to learn.
- Knock compensation:
 - Knock compensation final timing advance and retard value = knock compensation + whole learning compensation value + partial learning compensation value.
 - At normal: knock compensation = 0°CA is fixed.
 - At trouble: knock compensation ≠ 0°CA is fixed. (Retard max. 12°CA at knock.)
 - Not allowed to update the whole learning compensation factor.
 - Not allowed to calculate the partial learning zone compensation value.
- ISC control: Make the open loop compensation to be the given value (1 g/s). Stop calculating the throttle sensor temperature compensation. (Hold the previous value.)
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

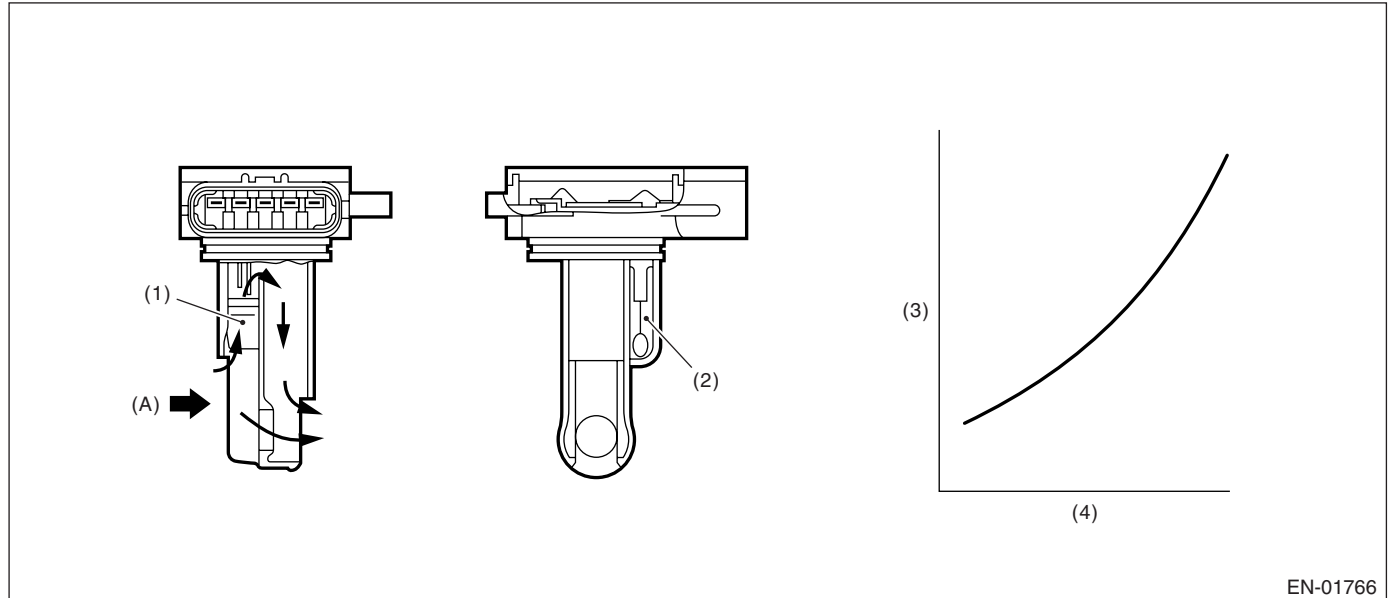
GENERAL DESCRIPTION

L: DTC P0102 MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of air flow sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



- (1) Air flow sensor
 - (2) Intake air temperature sensor
 - (3) Voltage (V)
 - (4) Intake air volume (kg/s)
- (A) Air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≤ 0.2 V

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

- Air flow meter: Engine load is normally calculated by manifold pressure and engine speed; however, calculated only by manifold pressure.
- EVAP conc. learning (fuel): Not allowed to learn.
- Knock compensation:
 - Knock compensation final timing advance and retard value = knock compensation + whole learning compensation value + partial learning compensation value.
 - At normal: knock compensation = 0°CA is fixed.
 - At trouble: knock compensation ≠ 0°CA is fixed. (Retard max. 12°CA at knock.)
 - Not allowed to update the whole learning compensation factor.
 - Not allowed to calculate the partial learning zone compensation value.
- ISC control: Make the open loop compensation to be the given value (1 g/s). Stop calculating the throttle sensor temperature compensation. (Hold the previous value.)
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

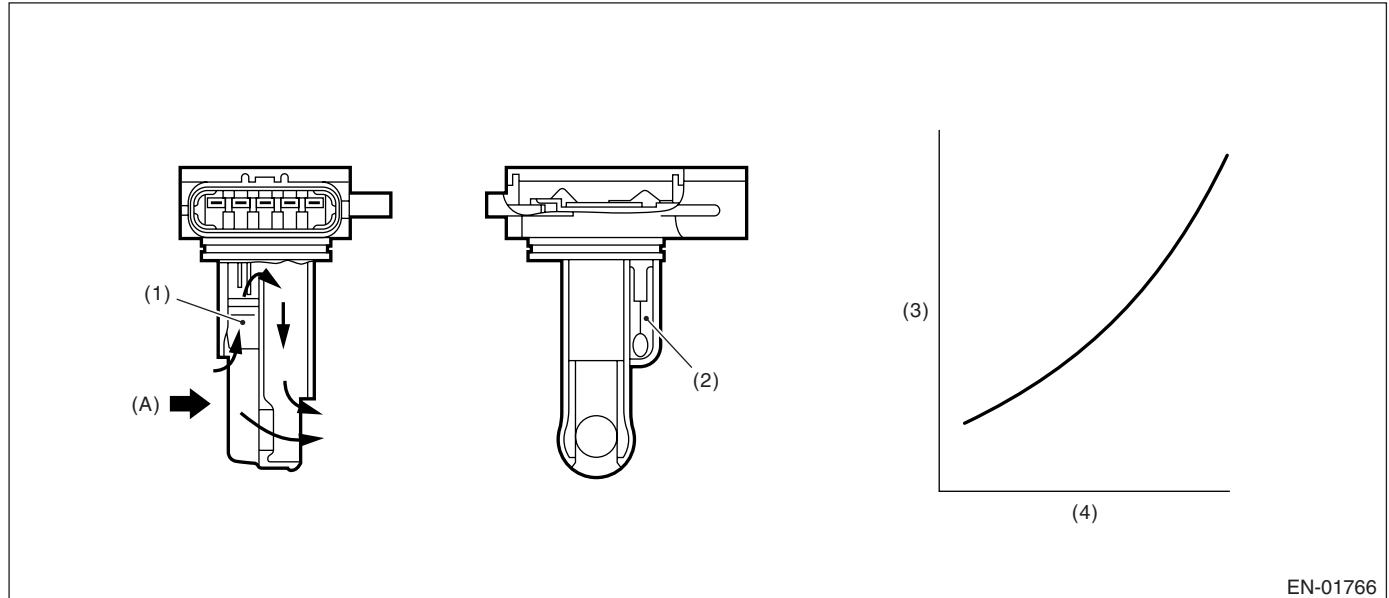
GENERAL DESCRIPTION

M: DTC P0103 MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of air flow sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



- (1) Air flow sensor
 - (2) Intake air temperature sensor
 - (3) Voltage (V)
 - (4) Intake air volume (kg/s)
- (A) Air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time until completing the malfunction criteria below becomes more than 0.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.985 V

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

- Air flow meter: Engine load is normally calculated by manifold pressure and engine speed; however, calculated only by manifold pressure.
- EVAP conc. learning (fuel): Not allowed to learn.
- Knock compensation:
 - Knock compensation final timing advance and retard value = knock compensation + whole learning compensation value + partial learning compensation value.
 - At normal: knock compensation = 0°CA is fixed.
 - At trouble: knock compensation ≠ 0°CA is fixed. (Retard max. 12°CA at knock.)
 - Not allowed to update the whole learning compensation factor.
 - Not allowed to calculate the partial learning zone compensation value.
- ISC control: Make the open loop compensation to be the given value (1 g (0.04 oz)/s). Stop calculating the throttle sensor temperature compensation. (Hold the previous value.)
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

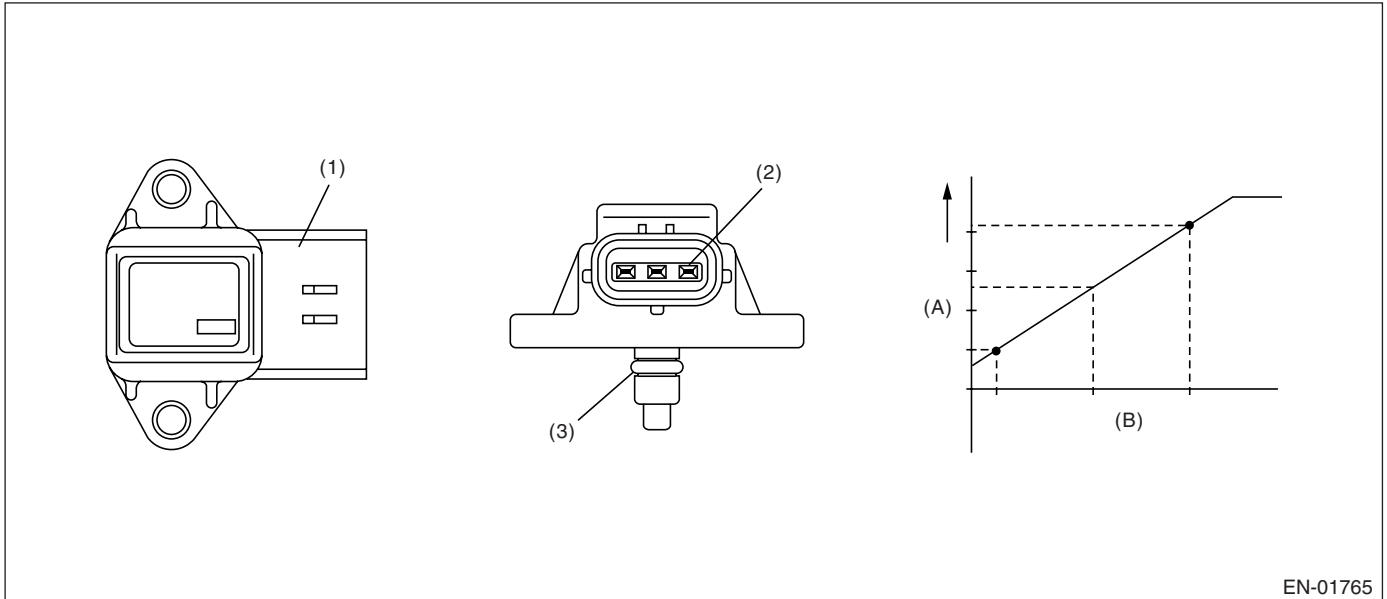
GENERAL DESCRIPTION

N: DTC P0107 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of intake manifold pressure sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



- (1) Connector
- (2) Terminal
- (3) O-ring

- (A) Output voltage
- (B) Absolute pressure

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 10.9 \text{ V}$

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	$< 0.568 \text{ V}$

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

- Intake manifold pressure sensor process: Estimate the pressure from engine load.
- ISC feedback: Not allowed to calculate the amount of feedback.
- Heavy fuel judgment: Not allowed to carry out the heavy judgment.
- Fuel cut control: Not allowed to cut the over pressure charged fuel.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

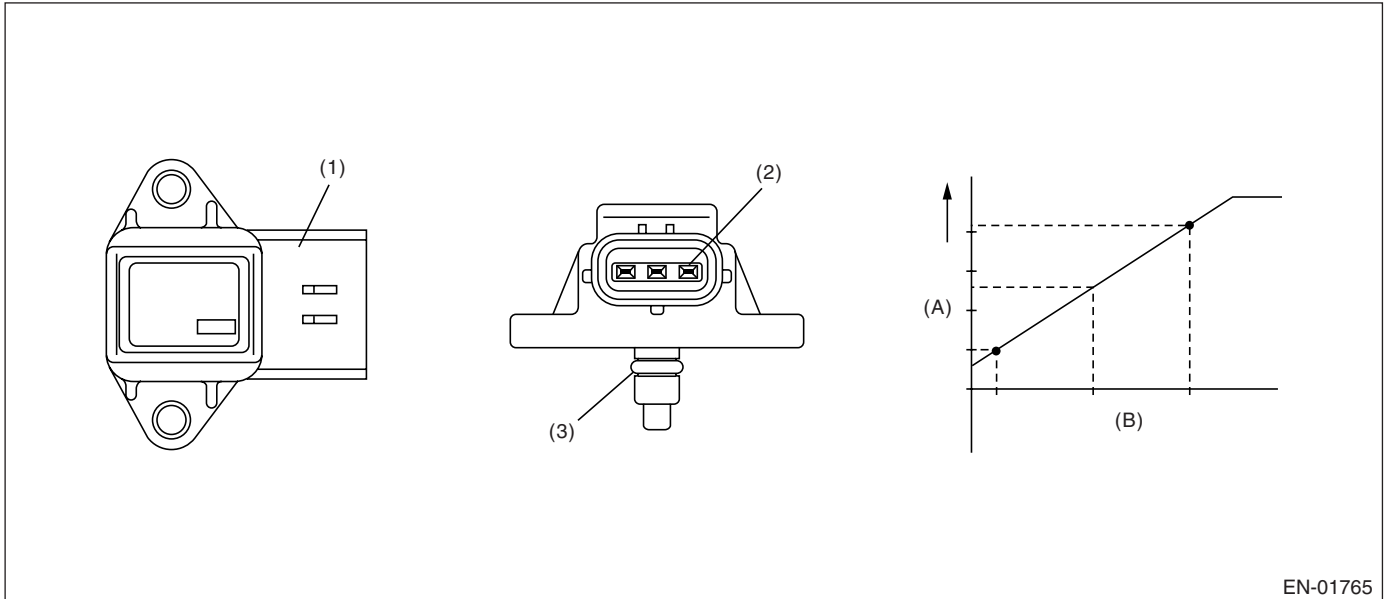
GENERAL DESCRIPTION

O: DTC P0108 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of intake manifold pressure sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



- (1) Connector
- (2) Terminal
- (3) O-ring

- (A) Output voltage
- (B) Absolute pressure

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 10.9 \text{ V}$

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	$\geq 4.93 \text{ V}$

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

- Intake manifold pressure sensor process: Estimate the pressure from engine load.
- ISC feedback: Not allowed to calculate the amount of feedback.
- Heavy fuel judgment: Not allowed to carry out the heavy judgment.
- Fuel cut control: Not allowed to cut the over pressure charged fuel.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

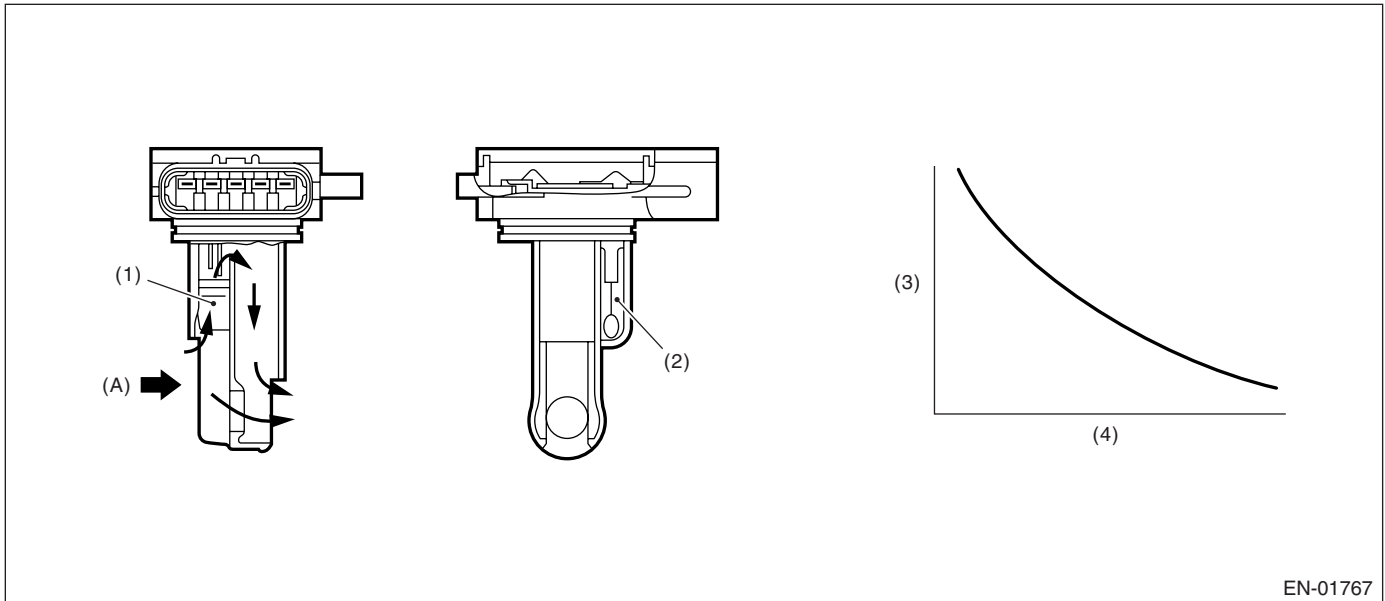
GENERAL DESCRIPTION

P: DTC P0111 INTAKE AIR TEMPERATURE CIRCUIT RANGE/PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of intake air temperature sensor output property. Judge NG when the intake air temperature is not varied whereas it seemed to be varied from the viewpoint of engine condition.

2. COMPONENT DESCRIPTION



- (1) Air flow sensor
 - (2) Intake air temperature sensor
 - (3) Resistance value (Ω)
 - (4) Intake air temperature °C (°F)
- (A) Air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Coolant temp. before engine start	< 30°C (86°F)
Engine coolant temperature	> 95°C (203°F)
Battery voltage	≥ 10.9 V
Continuous time when the vehicle speed is less than 50 km/h (31 MPH)	600 seconds or more

4. GENERAL DRIVING CYCLE

Perform the diagnosis when the vehicle speed condition is completed after idling from starting the cooled engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 1 second.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage difference between Max. and Min.	< 20 mV (It is equal to approx. 0.5°C (0.9°F) around 25° (77°F).)

Time Needed for Diagnosis: 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage difference between Max. and Min.	≥ 20 mV

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

Intake air temperature sensor process: Intake air temperature is fixed at 20°C (68°F).

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

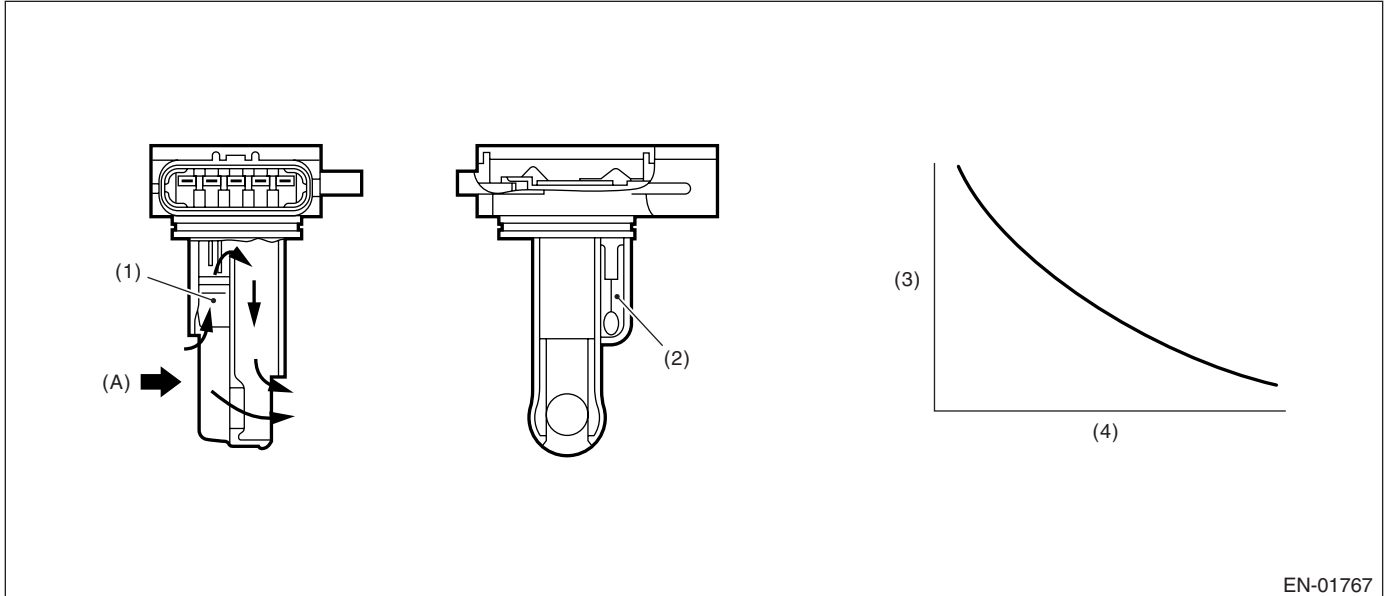
GENERAL DESCRIPTION

Q: DTC P0112 INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of intake air temperature sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



- (1) Air flow sensor
 - (2) Intake air temperature sensor
 - (3) Resistance value (Ω)
 - (4) Intake air temperature °C (°F)
- (A) Air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.165 V
Ignition switch	ON

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 0.165 V
Ignition switch	ON

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

Intake air temperature sensor process: Intake air temperature is fixed at 20°C (68°F).

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

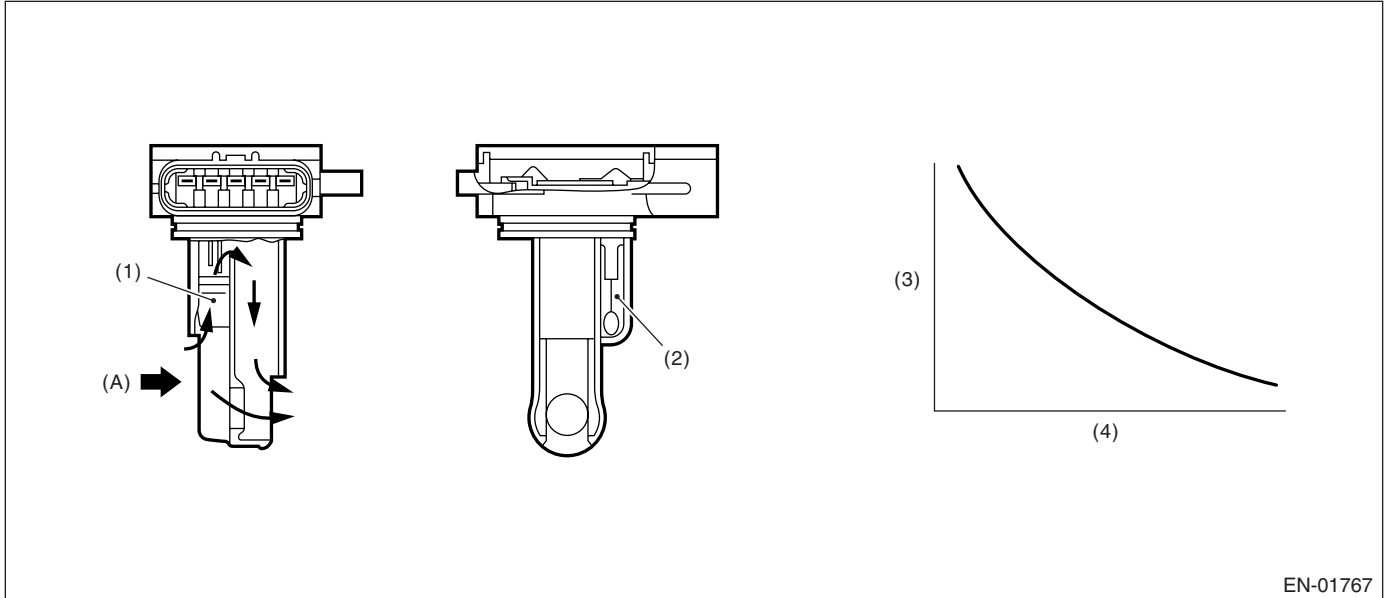
GENERAL DESCRIPTION

R: DTC P0113 INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of intake air temperature sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



- (1) Air flow sensor
 - (2) Intake air temperature sensor
 - (3) Resistance value (Ω)
 - (4) Intake air temperature °C (°F)
- (A) Air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.72 V
Ignition switch	ON

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 0.23 V
Ignition switch	ON

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

Intake air temperature sensor process: Intake air temperature is fixed at 20°C (68°F).

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

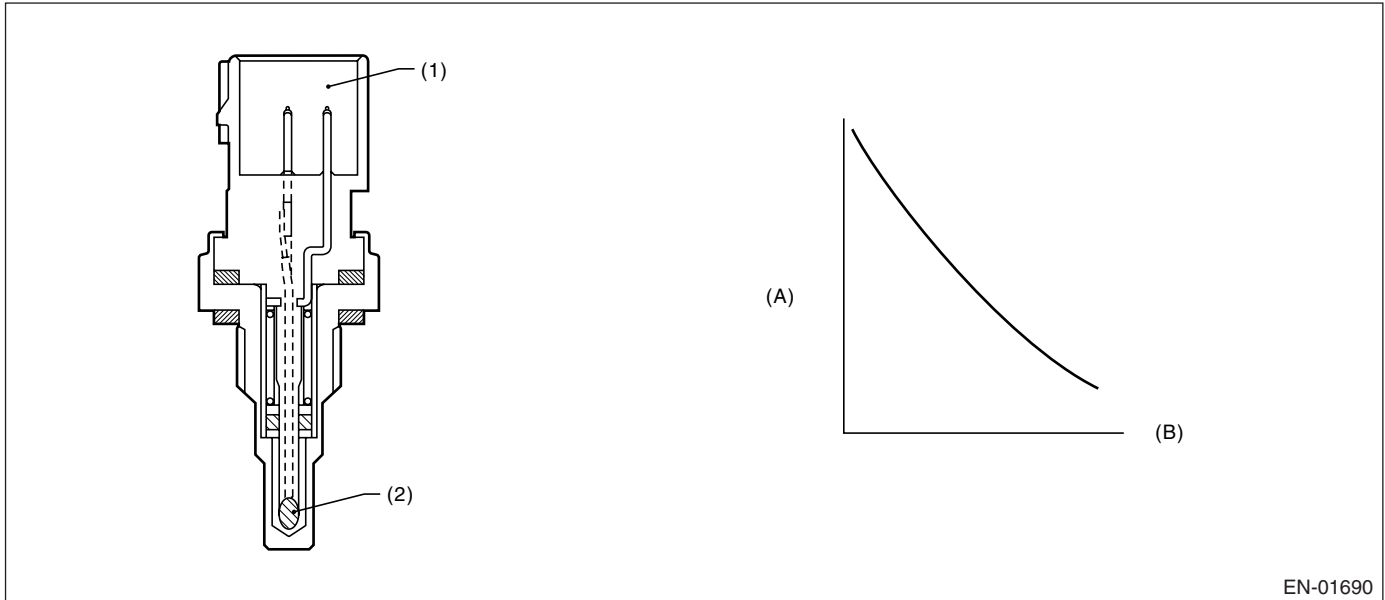
GENERAL DESCRIPTION

S: DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of engine coolant temperature sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



- (1) Connector
(2) Thermistor element

- (A) Resistance value (k Ω)
(B) Temperature $^{\circ}\text{C}$ ($^{\circ}\text{F}$)

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3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.165 V

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

- Engine coolant temperature process: Fix the engine coolant temperature at 70°C (158°F).
- ISC feedback: Calculate the target engine speed setting the engine coolant temperature to 70°C (158°F).
- ISC learning: Not allowed to learn.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.
- Air conditioner control: Not allowed to turn the air conditioner to ON.
- Radiator fan control: Both main and sub fan are in High driving.
- Increase compensation factor at high engine coolant temperature: Increase normally occurs with high temperature and other conditions; however, occurs with other conditions except engine coolant temperature condition.
- AVCS control: Make the oil flow control valve driving output to be Duty=0%.
- Tumble generator valve control: Open the tumble generator valve.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

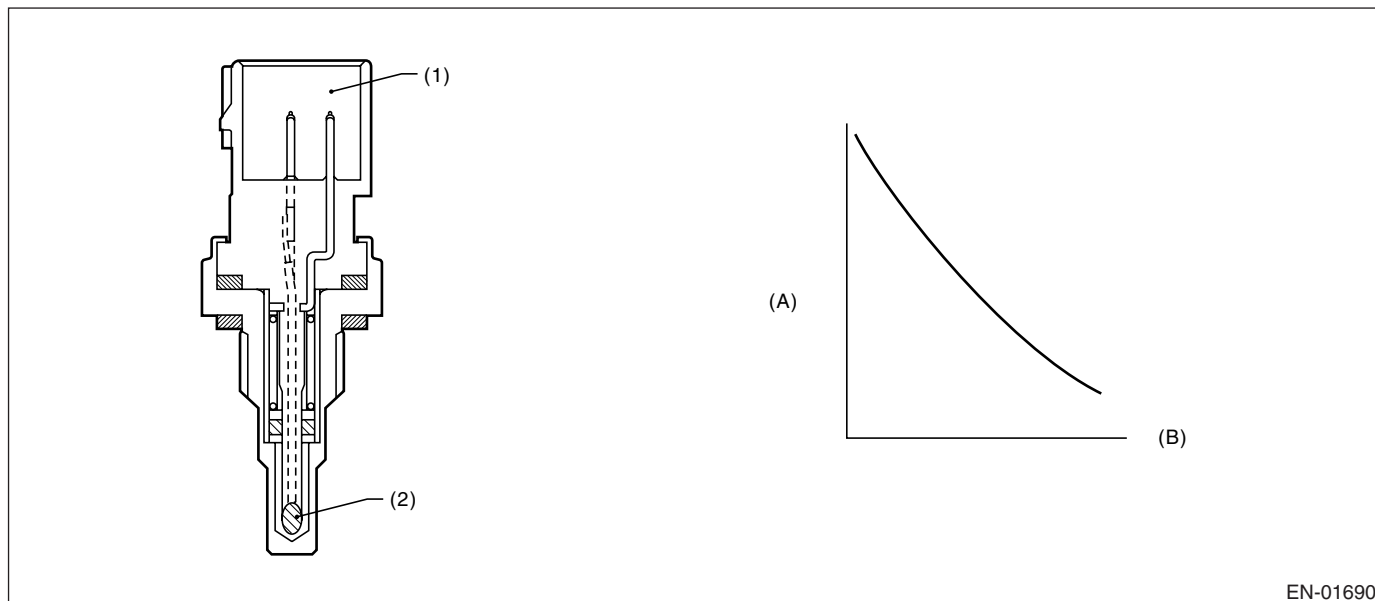
GENERAL DESCRIPTION

T: DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of engine coolant temperature sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



- (1) Connector
(2) Thermistor element

- (A) Resistance value (k Ω)
(B) Temperature °C (°F)

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3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.72 V

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

- Engine coolant temperature process: Fix the engine coolant temperature at 70°C (158°F).
- ISC feedback: Calculate the target engine speed setting the engine coolant temperature to 70°C (158°F).
- ISC learning: Not allowed to learn.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.
- Air conditioner control: Not allowed to turn the air conditioner to ON.
- Radiator fan control: Both main and sub fan are in High driving.
- Increase compensation factor at high engine coolant temperature: Increase normally occurs with high temperature and other conditions; however, occurs with other conditions except engine coolant temperature condition.
- AVCS control: Make the oil flow control valve driving output to be Duty=0%.
- Tumble generator valve control: Open the tumble generator valve.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

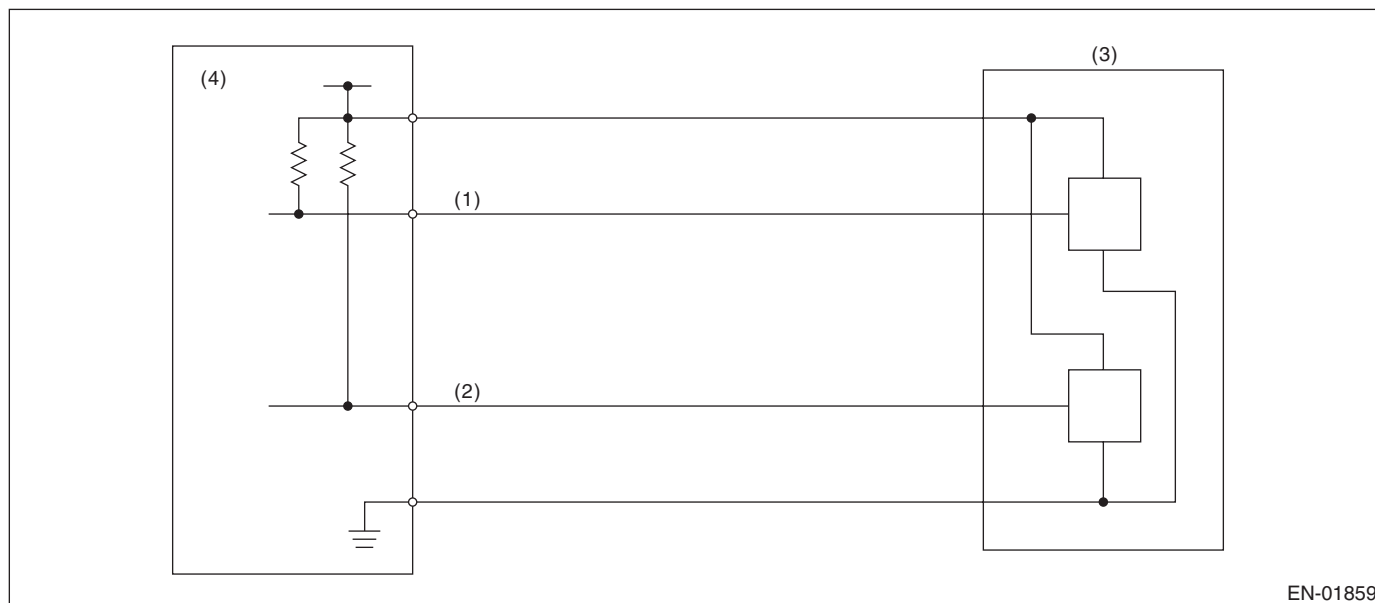
GENERAL DESCRIPTION

U: DTC P0122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle position sensor 1.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Throttle position sensor 1 signal	(3) Throttle position sensor
(2) Throttle position sensor 2 signal	(4) Engine control module (ECM)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	≤ 0.224 V

Time Needed for Diagnosis:24 milliseconds

Malfunction Indicator Light Illumination:Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only with engine stopped)

8. FAIL SAFE

Stop power distribution to electronic throttle control motor. (Throttle opening is fixed to 6°.)

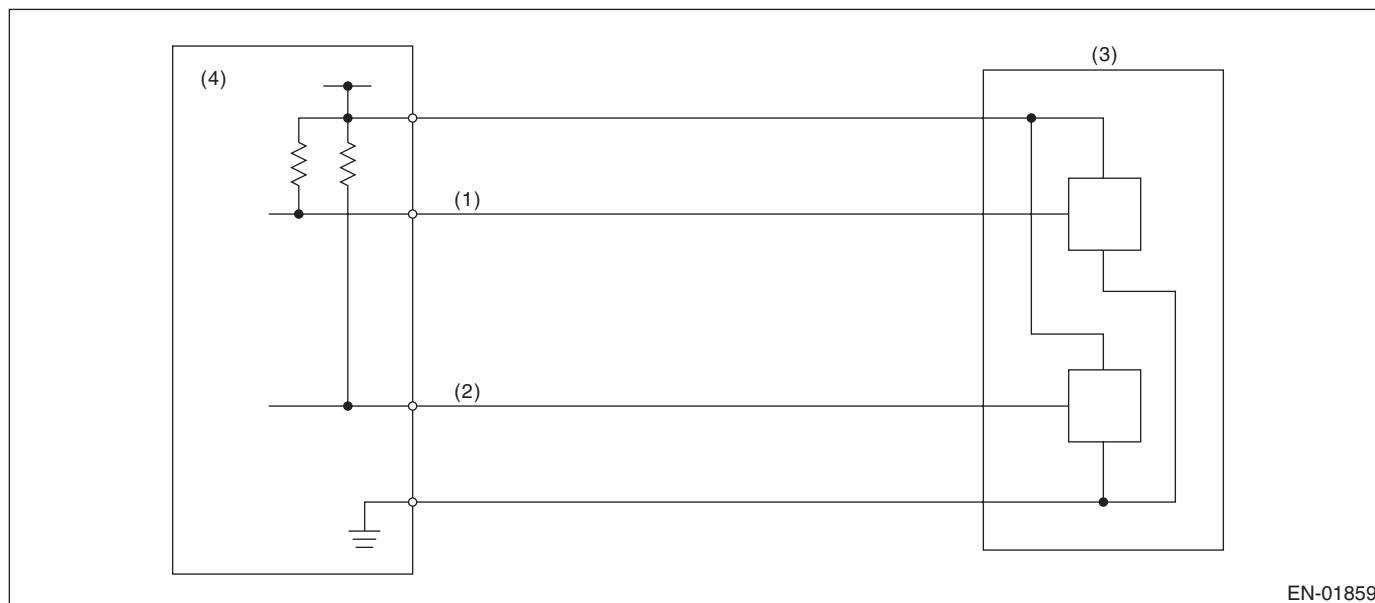
9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

V: DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT HIGH INPUT**1. OUTLINE OF DIAGNOSIS**

Detect the open or short circuit of throttle position sensor 1.

Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION

EN-01859

(1) Throttle position sensor 1 signal

(3) Throttle position sensor

(2) Throttle position sensor 2 signal

(4) Engine control module (ECM)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	≤ 4.851 V

Time Needed for Diagnosis: 24 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only with engine stopped)

8. FAIL SAFE

Stop power distribution to electronic throttle control motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

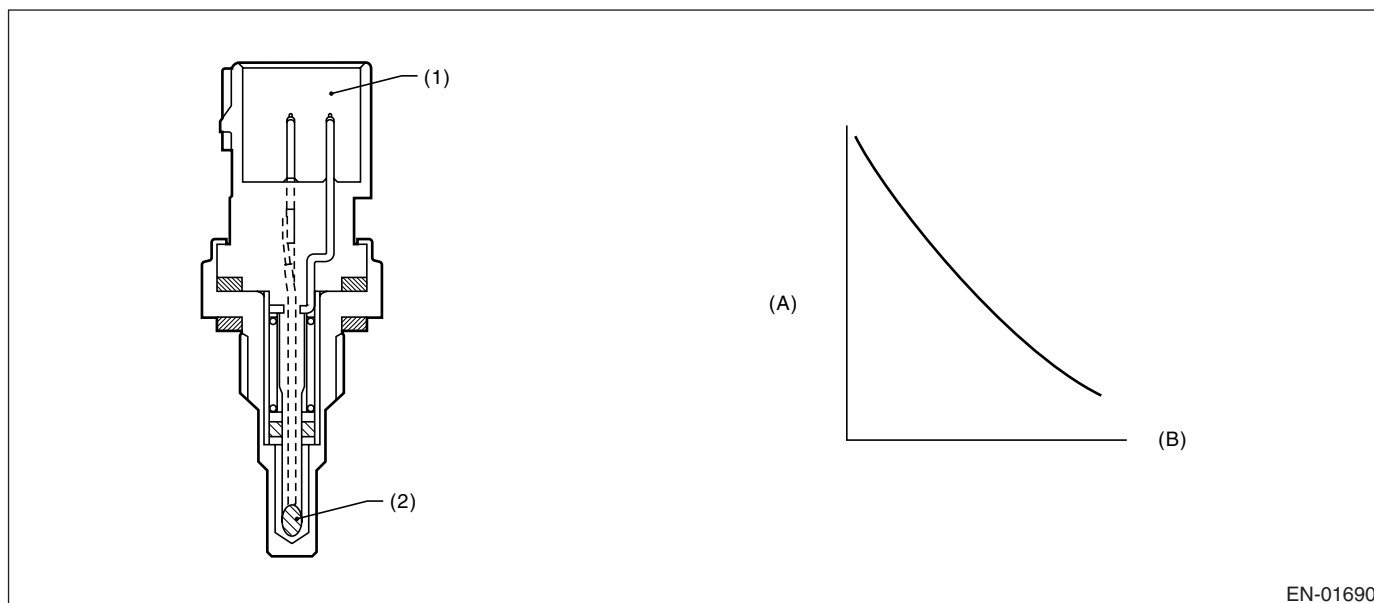
Memorize the freeze frame data. (For test mode \$02)

W: DTC P0125 INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of engine coolant temperature output property. Judge NG when the engine coolant temperature does not rise whereas it seemed to rise from the viewpoint of the engine condition.

2. COMPONENT DESCRIPTION



- (1) Connector
(2) Thermistor element

- (A) Resistance value (kΩ)
(B) Temperature °C (°F)

EN-01690

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	≥ 500 rpm
Battery voltage	> 10.9 V

4. GENERAL DRIVING CYCLE

Perform the diagnosis only once after engine starting.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Engine coolant temperature	< 20°C (68°F)
Timer for diagnosis after engine starting	≥ Timer judgment value after engine starting

Timer for diagnosis after engine starting

a) Timer stop at fuel cut mode.

b) During the driving conditions (except a) above), timer count up by 64 milliseconds + TWCNT milliseconds at every 64 milliseconds.

Where, TWCNT is determined as follows,

TWCNT = 0 at idle switch ON,

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

TWCNT show on the following table at idle switch OFF.

Temperature °C (°F)	Vehicle speed km/h (MPH)							
	0 (0)	8 (4.97)	16 (9.94)	24 (14.9)	32 (19.9)	40 (24.9)	48 (29.8)	56 (34.8)
-20 (-4)	0 ms	37.14 ms	74.27 ms	111.41 ms	126.66 ms	141.91 ms	163.59 ms	185.26 ms
-10 (14)	0 ms	27.39 ms	54.78 ms	82.17 ms	99.65 ms	117.13 ms	135.96 ms	154.80 ms
0 (32)	0 ms	17.65 ms	35.29 ms	52.94 ms	72.64 ms	92.34 ms	108.34 ms	124.33 ms
10 (50)	0 ms	7.90 ms	15.80 ms	23.70 ms	45.63 ms	67.56 ms	80.71 ms	93.87 ms
20 (68)	0 ms	7.90 ms	15.80 ms	23.70 ms	45.63 ms	67.56 ms	80.71 ms	93.87 ms

Judgment value of timer after engine starting

$$t = 451.1 - 25.9 \times T_i$$

T_i is the lowest engine coolant temperature after starting the engine.

Time Needed for Diagnosis: To be determined. (It is varied by the Min. engine coolant temperature and engine conditions such as vehicle speed and engine coolant temperature.)

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Engine coolant temperature	$\geq 20^{\circ}\text{C}$ (68°F)

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

- Engine coolant temperature process: Fix the engine coolant temperature at 70°C (158°F).
- ISC feedback: Calculate the target engine speed setting the engine coolant temperature to 70°C (158°F).
- ISC learning: Not allowed to learn.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.
- Air conditioner control: Not allowed to turn the air conditioner to ON.
- Radiator fan control: Both main and sub fan are in High driving.
- Increase compensation factor at high engine coolant temperature: Increase normally occurs with high temperature and other conditions; however, occurs with other conditions except engine coolant temperature condition.
- AVCS control: Make the oil flow control valve driving output to be Duty=0%.
- Tumble generator valve control: Open the tumble generator valve.

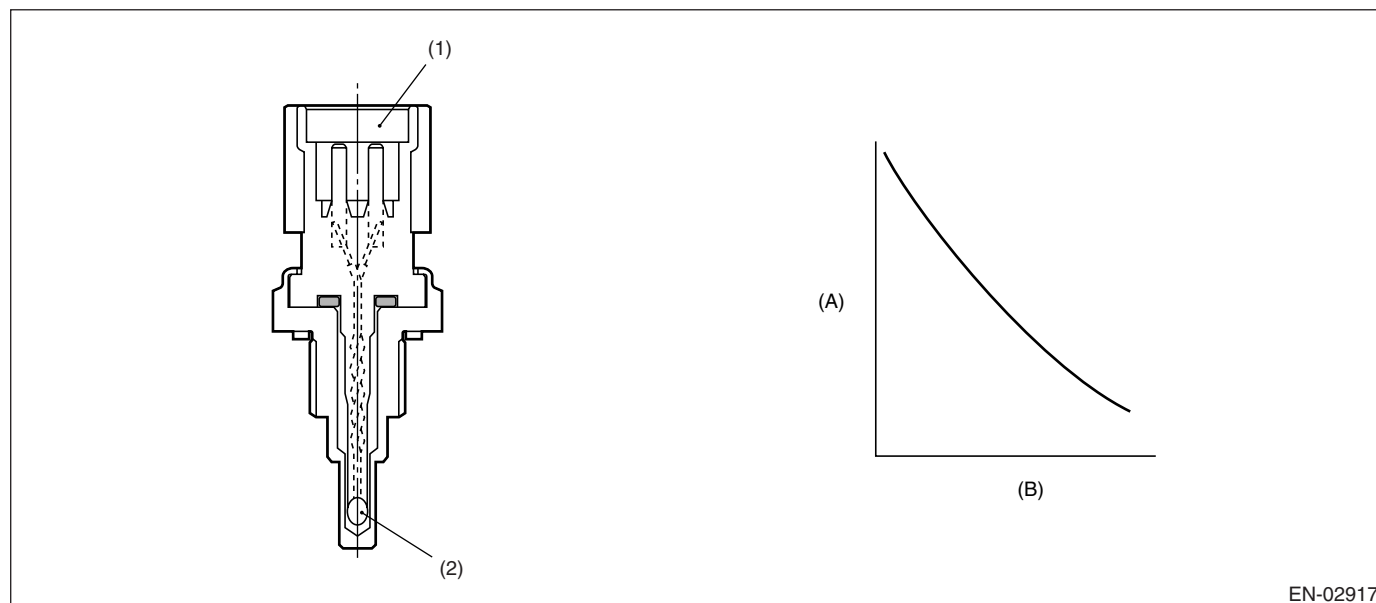
9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

X: DTC P0126 INSUFFICIENT COOLANT TEMPERATURE FOR STABLE OPERATION**1. OUTLINE OF DIAGNOSIS**

Judge NG when the engine coolant temperature sensor output does not change.

Judge NG when the engine coolant temperature sensor output does not change though the vehicle is operated in a manner which is expected to affect the engine coolant temperature.

2. COMPONENT DESCRIPTION

EN-02917

- (1) Connector
(2) Thermistor element

- (A) Resistance value (kΩ)
(B) Temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Filling fuel from stopping engine at the previous time to starting it this time	No
Fuel level	≥ 15 ℓ (3.96 US gal, 3.3 Imp gal)
Engine coolant temperature when stopping engine at the previous time	≥ 70°C (158°F) and < 95°C (203°F)

4. GENERAL DRIVING CYCLE

Perform the diagnosis once after starting the engine.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time of completing the malfunction criteria below becomes more than 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Engine coolant temperature when stopping engine at the previous time – The lowest engine coolant temperature after starting engine	< 2.5°C (36.5°F)
Fuel temperature when stopping engine at the previous time – Fuel temperature	≥ 5°C (41°F)
Intake air temperature – Fuel temperature	< 2.5°C (36.5°F)
Fuel temperature	< 35°C (95°F)

• Normality Judgment

Judge OK when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Engine coolant temperature when stopping engine at the previous time – The lowest engine coolant temperature after starting engine	≥ 2.5°C (36.5°F)

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illuminations: Detect when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

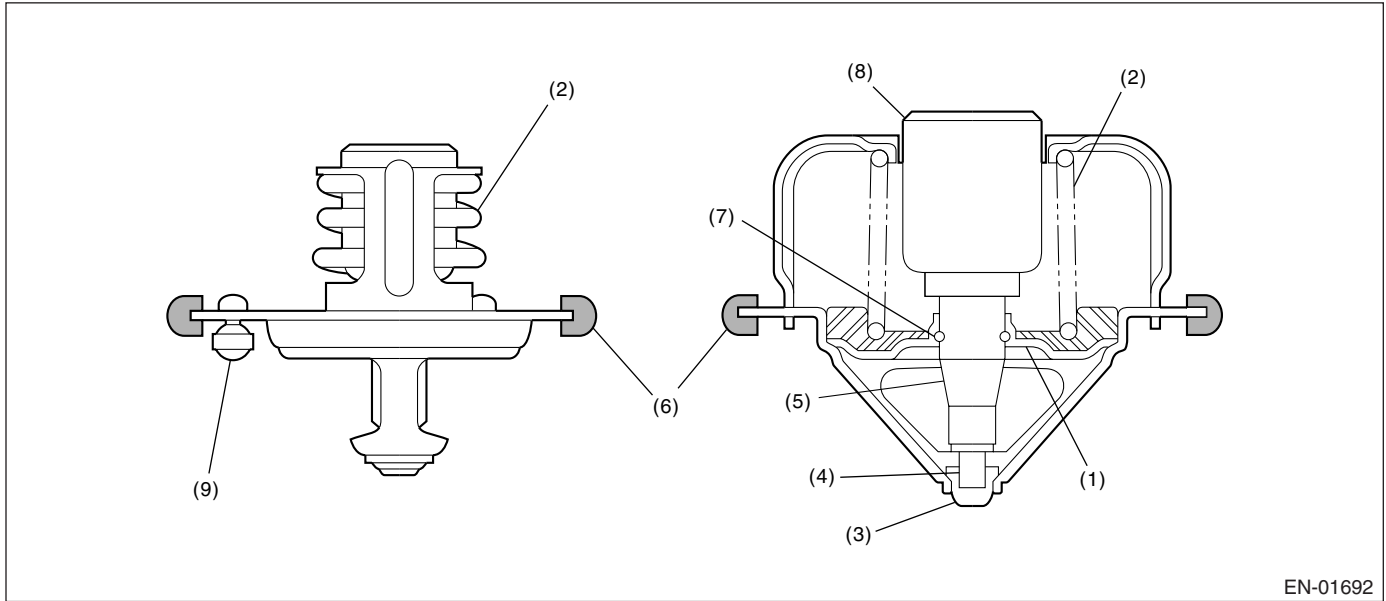
Memorize the freeze frame data. (For test mode \$02)

Y: DTC P0128 COOLANT THERMOSTAT (COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE)

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of thermostat function. Judge NG when the engine coolant temperature is lower than the estimated engine coolant temperature and the difference between them is large. Judge OK when the engine coolant temperature becomes 75°C (167°F) and the difference is small before judging NG.

2. COMPONENT DESCRIPTION



- (1) Valve
- (2) Spring
- (3) Stopper
- (4) Piston
- (5) Guide

- (6) Rubber packing
- (7) Stop ring
- (8) Wax element
- (9) Jiggle valve

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 30 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	$\geq 10.9 \text{ V}$
Estimated ambient air temperature	$\geq -7^{\circ}\text{C}$ (19°F)
Engine coolant temperature at engine starting	$< 55^{\circ}\text{C}$ (131°F)
Estimated engine coolant temperature	$\geq 70^{\circ}\text{C}$ (158°F)
Engine coolant temperature	$< 70^{\circ}\text{C}$ (158°F)
(Estimated – measured) engine coolant temperature	$> 30^{\circ}\text{C}$ (86°F)
Vehicle speed	$\geq 30 \text{ km/h}$

Time Needed for Diagnosis: 30 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	$\geq 10.9 \text{ V}$
Estimated ambient air temperature	$\geq -7^{\circ}\text{C}$ (19°F)
Thermostat malfunction diagnosis	Not finished
Engine coolant temperature at engine starting	$< 55^{\circ}\text{C}$ (131°F)
Engine coolant temperature	$\geq 70^{\circ}\text{C}$ (158°F)
(Estimated – measured) engine coolant temperature	$\leq 30^{\circ}\text{C}$ (68°F)

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

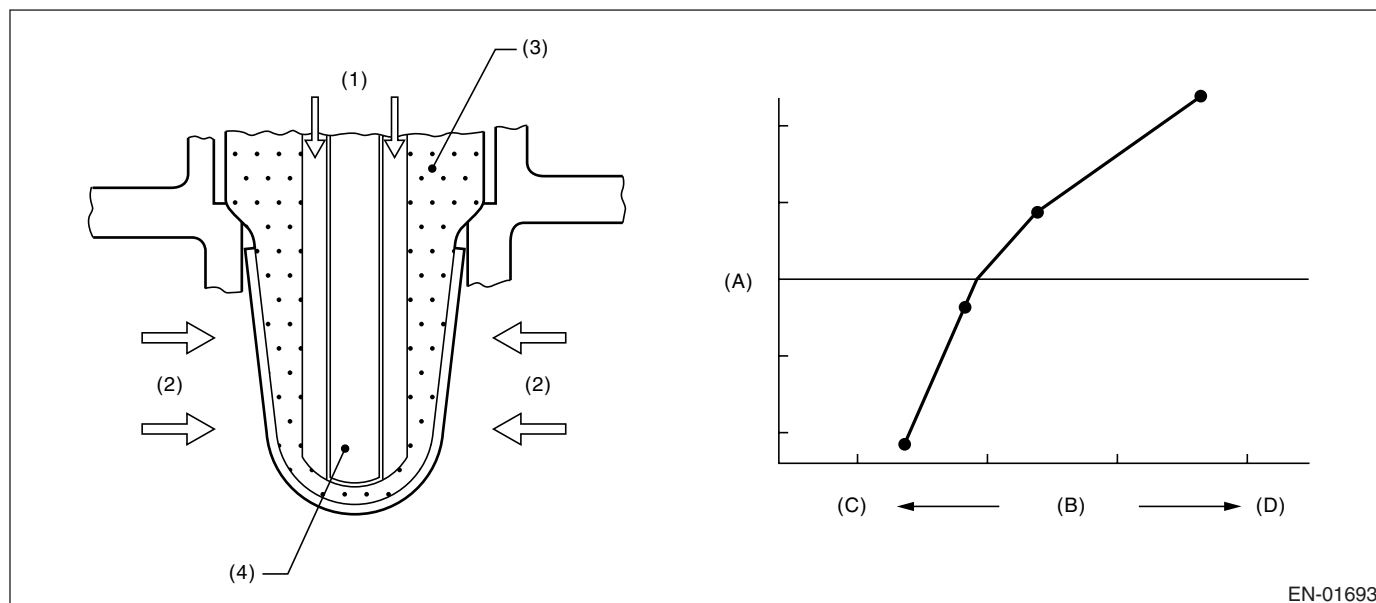
9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

Z: DTC P0131 O₂ SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1)**1. OUTLINE OF DIAGNOSIS**

Detect the open or short circuit of sensor.

Judge NG when the element impressed voltage is out of range, or the element current is out of range.

2. COMPONENT DESCRIPTION

- (1) Atmosphere
- (2) Exhaust
- (3) ZrO₂
- (4) Ceramic heater

- (A) Electromotive force
- (B) Air fuel ratio
- (C) Lean
- (D) Rich

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing any malfunction criteria below becomes more than 1 second.

Judgment Value

Malfunction Criteria	Threshold Value
Input voltage	< 1.8 V
Input current	< -0.01 A

Time Needed for Diagnosis: 1 second

Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor activation judgment: Front oxygen (A/F) sensor full activation is not complete, or front oxygen (A/F) sensor half activation is not complete.
- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- Compensation when starting the engine at high temperature: Make the MIN value to be 0 from 0.3 normally.
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

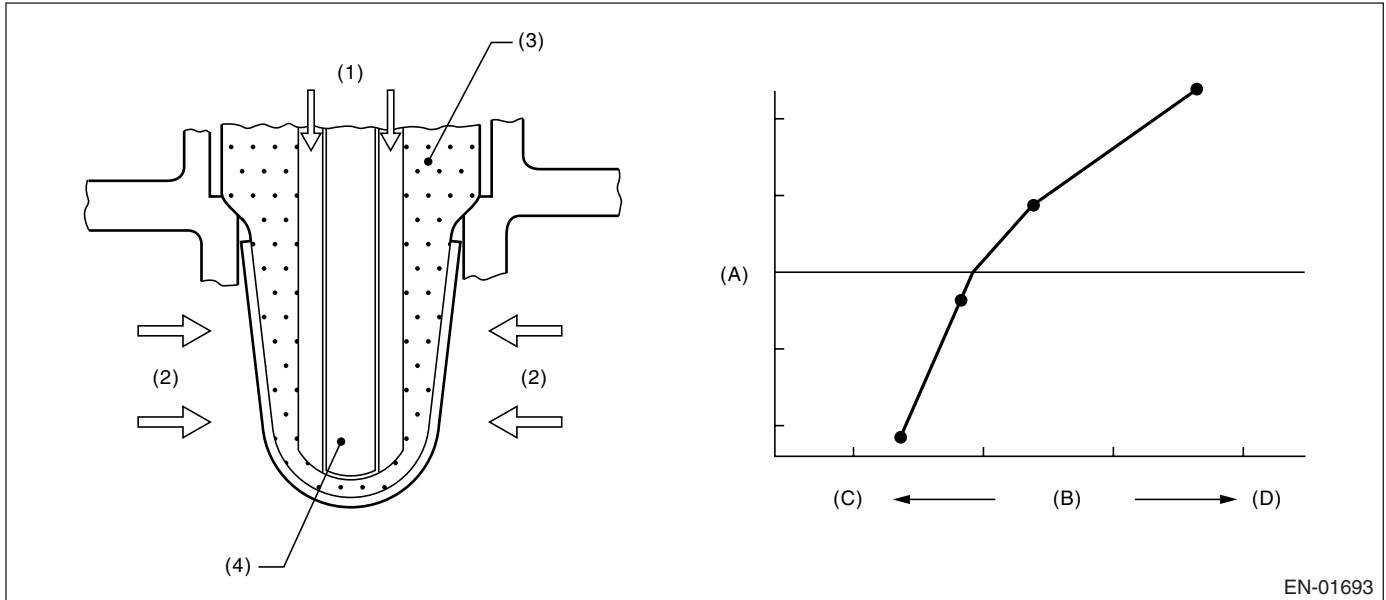
AA:DTC P0132 O₂ SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of sensor.

Judge NG when the element impressed voltage is out of range, or the element current is out of range.

2. COMPONENT DESCRIPTION



(1) Atmosphere	(A) Electromotive force
(2) Exhaust	(B) Air fuel ratio
(3) ZrO ₂	(C) Lean
(4) Ceramic heater	(D) Rich

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing any malfunction criteria below becomes more than 1 second.

Judgment Value

Malfunction Criteria	Threshold Value
Input voltage	≥ 3.8 V
Input current	≥ 0.01 A

Time Needed for Diagnosis: 1 second

Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor activation judgment: Front oxygen (A/F) sensor full activation is not complete, or front oxygen (A/F) sensor half activation is not complete.
- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- Compensation when starting the engine at high temperature: Make the MIN value to be 0 from 0.3 normally.
- Purge control: Not allowed to purge.

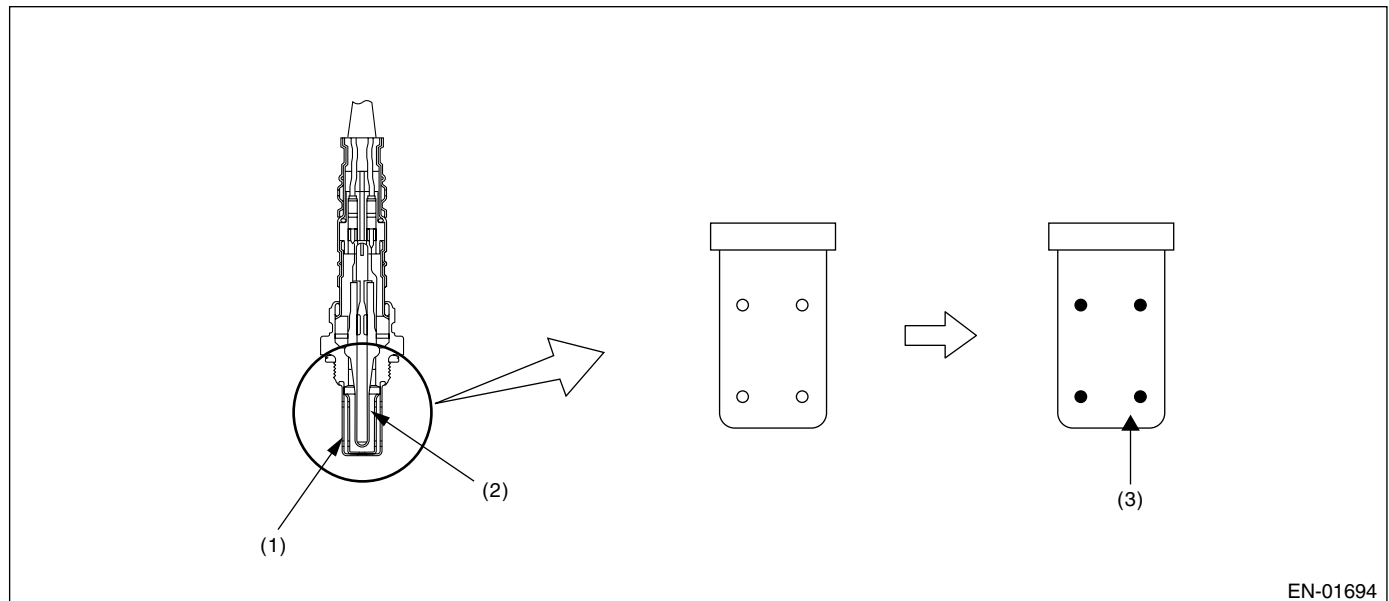
9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

AB:DTC P0133 O₂ SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

Detect time-lag of front oxygen (A/F) sensor response. Front oxygen (A/F) sensor cover has some ventilation holes for exhaust gas. Clogged ventilation holes are diagnosed. When the holes are clogged, the A/F output variation becomes slow comparing with the actual A/F variation because oxygen which reaches the zirconia layer is insufficient. Therefore, if the cover has clogged holes, the rich to lean judgment in ECM is delayed when the change from rich to lean is caused. Judge NG when the actual A/F variation is slow comparing with the ECM control amount.

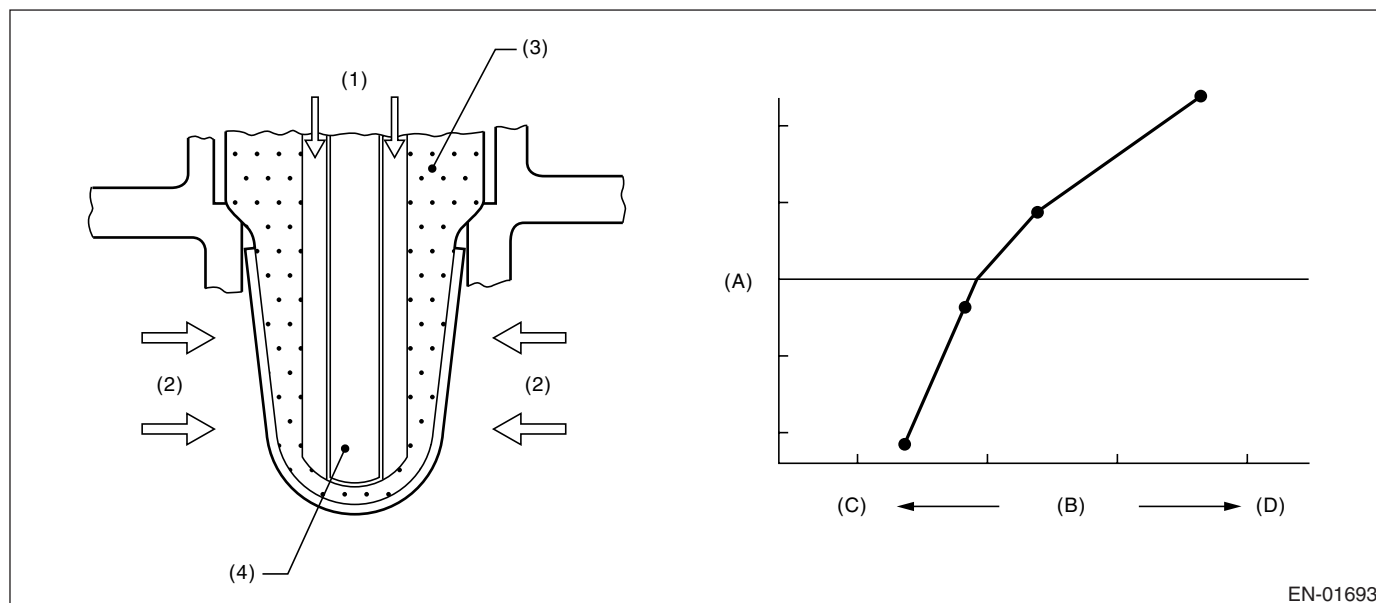


- (1) Cover
- (2) Zirconia
- (3) Clogging

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

2. COMPONENT DESCRIPTION



EN-01693

- (1) Atmosphere
- (2) Exhaust
- (3) ZrO₂
- (4) Ceramic heater

- (A) Electromotive force
- (B) Air fuel ratio
- (C) Lean
- (D) Rich

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Time needed for all secondary parameters in enable conditions	≥ 1 second
Battery voltage	> 10.9 V
Atmospheric pressure	> 75.0 kPa (563 mmHg, 22.2 inHg)
Closed loop control with main feedback	operating
Impedance of front oxygen (A/F) sensor	0 ↔ 50 Ω
After engine starting	120 seconds or more
Engine coolant temperature	≥ 70°C (158°F)
Engine speed	1,000 ↔ 3,200 rpm
Vehicle speed	10 ↔ 120 km/h (6 ↔ 75 MPH)
Amount of intake air	10 ↔ 31 g/s
Engine load change during 0.5 engine rev.	≤ 0.02 g/rev
Learning value of EVAP conc. during purge	≤ 0.2
Accumulated time of operating canister purge	20 seconds or more

4. GENERAL DRIVING CYCLE

Perform diagnosis only once at a constant speed of 10 to 120 km/h (6 to 75 MPH) in 120 seconds after starting the engine.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Integrate the difference of faf in every 128 milliseconds and difference of λ value.

After integrate 1,640 times (210 seconds), calculate the diagnosis value.

Judge NG when the malfunction criteria below are completed. Judge OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
$para_{fca} = td2_{faf}/td2_{lmd}$ where, $td2_{faf}(N) = td2_{faf}(n-1) + d2_{faf}(n) $ $td2_{lmd}(N) = td2_{lmd}(n-1) + d2_{lmd}(n) $ add up for a total of 210 seconds $d2_{faf}(n) = (faf(n) - faf(n-1)) - (faf(n-1) - faf(n-2))$ $d2_{lmd}(n) = (lmd(n) - lmd(n-1)) - (lmd(n-1) - lmd(n-2))$ faf = main feedback compensation coefficient every 128 milliseconds lmd = output lambda every 128 milliseconds	≥ 0.392

Time Needed for Diagnosis: 210 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor main learning correction: Not allowed to calculate.
- Correction when re-starting at high temperature: Normally minimum value $0.3 \rightarrow 0$.
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

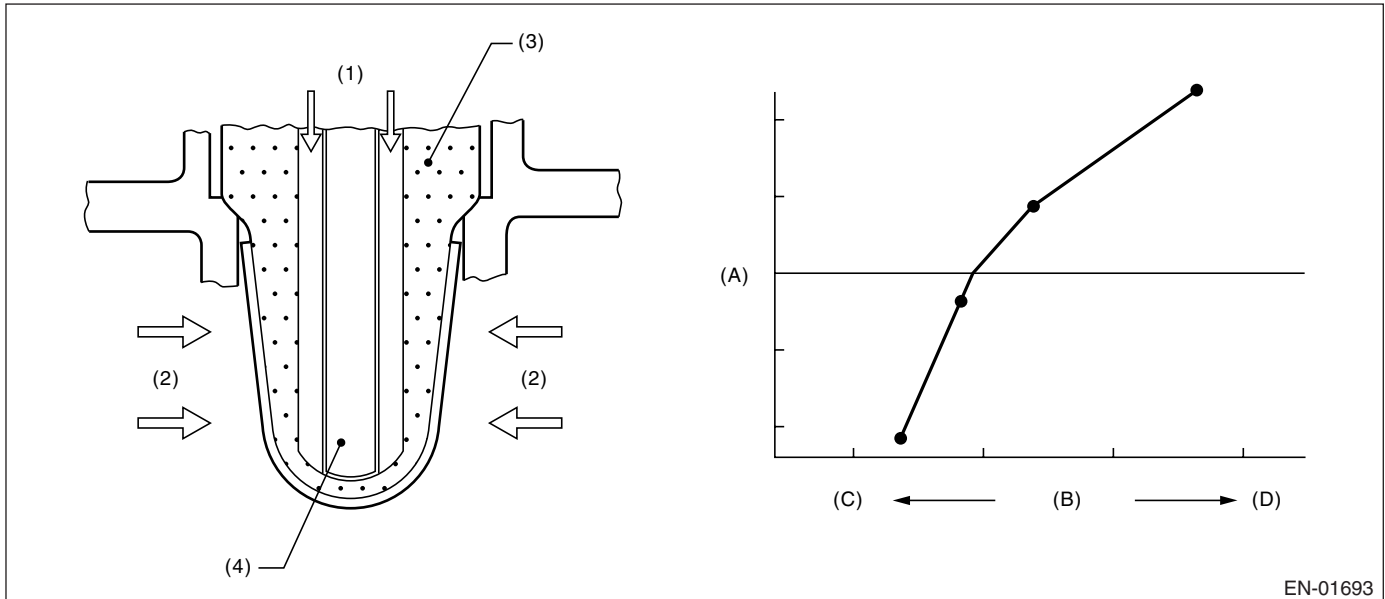
AC:DTC P0134 O₂ SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

Detect the open circuit of sensor.

Judge NG when the element impedance is large.

2. COMPONENT DESCRIPTION



- (1) Atmosphere
- (2) Exhaust
- (3) ZrO₂
- (4) Ceramic heater

- (A) Electromotive force
- (B) Air fuel ratio
- (C) Lean
- (D) Rich

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Voltage	≥ 10.9 V
Time after engine starting	≥ 50 seconds
Cumulative amount of Front oxygen (A/F) sensor heater control duty every 128 milliseconds	$\geq 28,000\%$
Front lambda sensor impedance	$\geq 500 \Omega$

Time Needed for Diagnosis: 5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor activation judgment: Front oxygen (A/F) sensor full activation is not complete, or front oxygen (A/F) sensor half activation is not complete.
- Front oxygen sensor main learning correction: Not allowed to calculate.
- Compensation when starting the engine at high temperature: Make the MIN value to be 0 from 0.3 normally.
- Purge control: Not allowed to purge

9. ECM OPERATION AT DTC SETTING

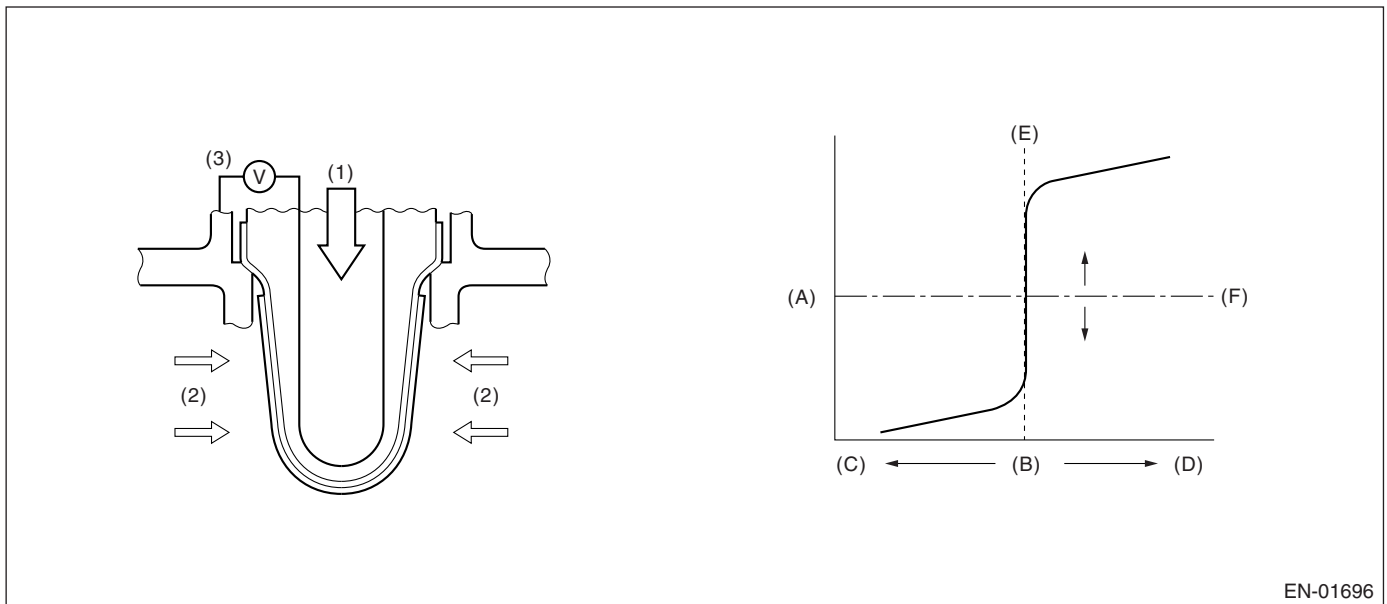
Memorize the freeze frame data. (For test mode \$02)

AD:DTC P0137 O₂ SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2)

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of oxygen sensor power distribution NG. Judge NG when the oxygen sensor voltage is abnormal with considering the operating conditions.

2. COMPONENT DESCRIPTION



- (1) Atmosphere
- (2) Exhaust
- (3) Electromotive force

- (A) Electromotive force
- (B) Air fuel ratio
- (C) Rich
- (D) Lean
- (E) Theoretical air fuel ratio
- (F) Comparative voltage

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

3. ENABLE CONDITION (USED ONLY FOR MALFUNCTION JUDGMENT)

Abnormality Judgement

Secondary Parameters	Enable Conditions
High side	
Secondary air system	Not in operation
Closed loop control of oxygen sensor	In operation
Misfire detection during 200 engine revs.	< 5 times
Compensation factor for front oxygen (A/F) sensor	Not in limit value
Battery voltage	> 10.9 V
Low side 1	
Secondary air system	Not in operation
Closed loop control of oxygen sensor	In operation
Misfire detection during 200 engine revs.	< 5 times
Compensation factor for front oxygen (A/F) sensor	Not in limit value
Battery voltage	> 10.9 V
Amount of intake air	≥ 10 g (0.35 oz)/s
Low side 2	
Secondary air system	Not in operation
Closed loop control of oxygen sensor	In operation
Misfire detection during 200 engine revs.	< 5 times
Compensation factor for front oxygen (A/F) sensor	Not in limit value
Battery voltage	> 10.9 V
Amount of intake air	< 10 g (0.35 oz)/s
Continuous time of rear oxygen heater current	25 seconds or more
Low side 3	
Secondary air system	Not in operation
Closed loop control of oxygen sensor	In operation
Misfire detection during 200 engine revs.	< 5 times
Compensation factor for front oxygen (A/F) sensor	Not in limit value
Battery voltage	> 10.9 V
Amount of intake air	< 10 g (0.35 oz)/s
Continuous time of rear oxygen heater current	25 seconds or more
Fuel cut	Experienced

Normality Judgement

Secondary Parameters	Enable conditions
Secondary air system	No operation
Closed loop control of oxygen sensor	In operation
Misfire detection during 200 engine revs.	< 5 times
Compensation factor for front oxygen (A/F) sensor	Not in limit value
Battery voltage	> 10.9 V

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine at engine steady operation condition.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis. Judge OK when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
High side Max. output voltage without continuity	$\geq 1,200$ mV	P0138
Low side Min. output voltage without continuity	< 30 mV	P0137

Time Needed for Diagnosis:

High side: 2.5 seconds

Low side 1: 20 seconds

Low side 2: 40 seconds

Low side 3: Value of Map

Map

Fuel shut-off time (sec.)	Time Needed for Diagnosis (sec.)
0	40
2	40
10	60

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

Sub feedback control: Not allowed

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

AE:DTC P0138 O₂ SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2)

NOTE:

For the detecting criteria, refer to DTC P0137. <Ref. to GD(H4DOTC)-62, DTC P0137 O₂ SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

AF:DTC P0139 O₂ SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2)

1. OUTLINE OF DIAGNOSIS

Detect the slow response of rear oxygen sensor.

Judge NG when the Rich → Lean response diagnosis or Lean → Rich response diagnosis is NG and judge OK when both response diagnoses are OK.

[Rich → Lean diagnosis response]

(1) When the measured response time is larger than a threshold, since the A/F ratio is rich, the response time of the output change of O₂ sensor when changing from Rich to Lean is measured, and it judges with NG, and when small, it judges with OK.

(2) When O₂ sensor voltage at the time of a fuel shut-off in deceleration return is large (rich), it judges with NG.

[Lean → Rich diagnosis response]

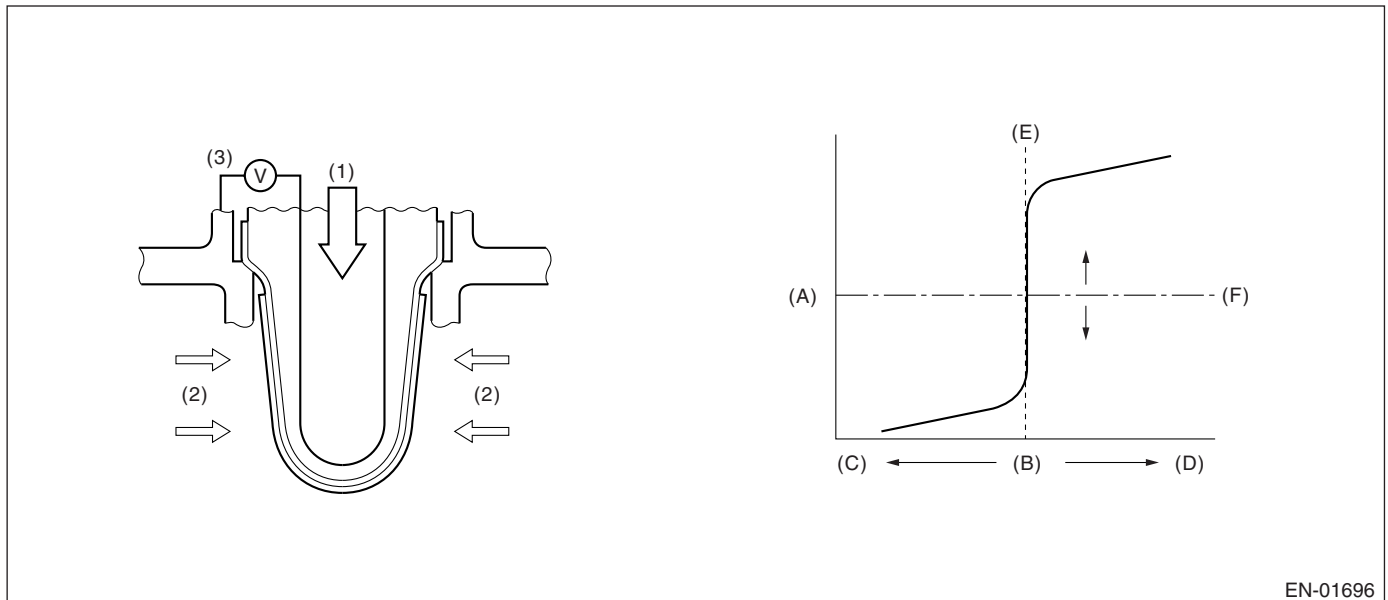
(1) The response time of output change of O₂ sensor when an A/F ratio changes from Lean to Rich is measured, and it is referred to as NG when the measured response time is larger than a threshold.

(2) It is referred to as NG when O₂ sensor voltage after recovery of fuel shut-off in deceleration is small and still small.

Diagnostic Method

Measure the response time of the output change of the oxygen sensor when the A/F ratio changes from rich to lean. And Judge NG when the measured response time is larger than the threshold value.

2. COMPONENT DESCRIPTION



EN-01696

- (1) Atmosphere
- (2) Exhaust
- (3) Electromotive force

- (A) Electromotive force
- (B) Air fuel ratio
- (C) Rich
- (D) Lean
- (E) Theoretical air fuel ratio
- (F) Comparative voltage

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

3. ENABLE CONDITION

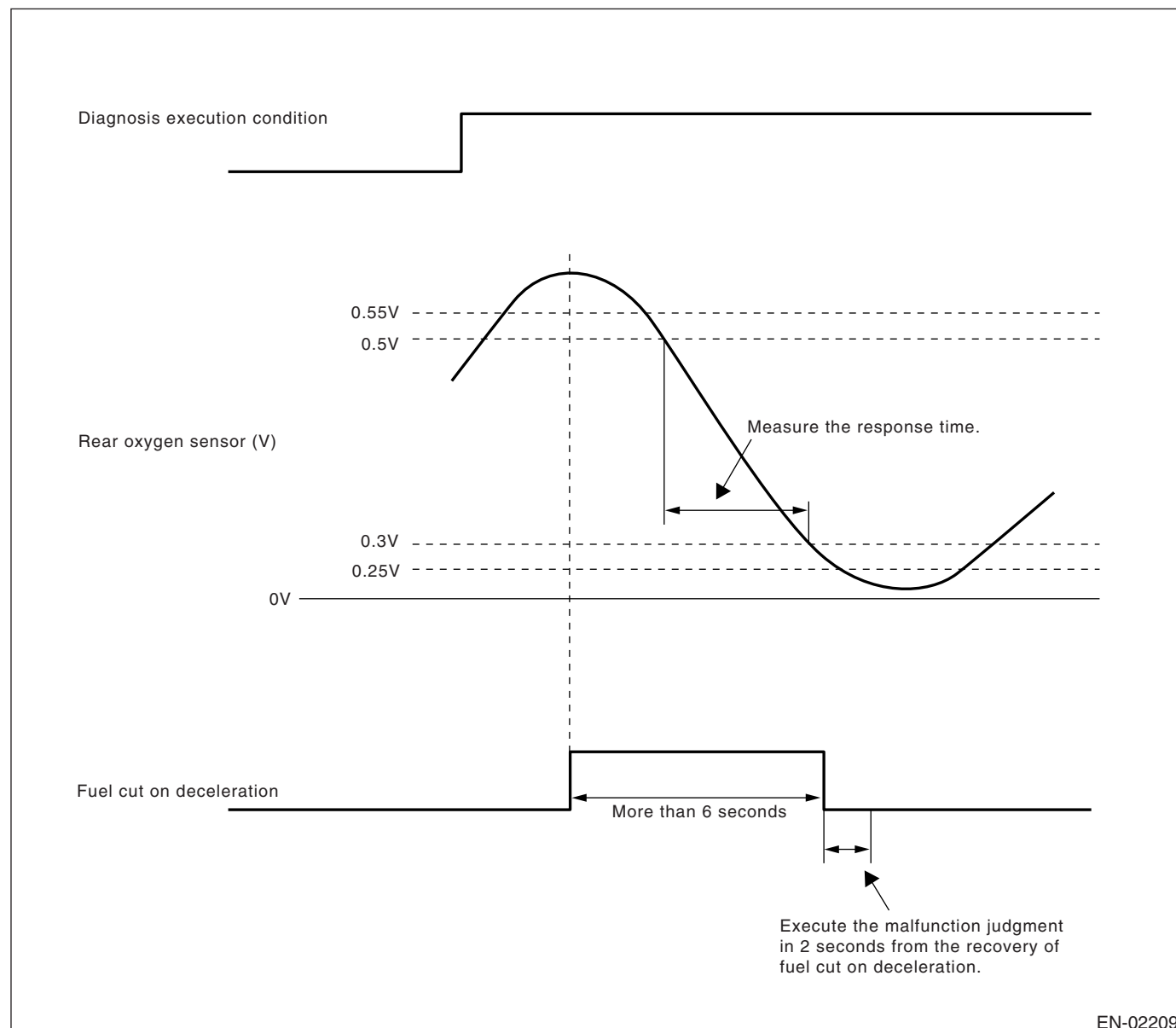
Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
A/F sub feedback control condition	Completed
5 seconds or more fuel shut-off in deceleration	Experienced
After fuel cut	≥ 2 seconds
Cumulative time for current conducted in rear oxygen sensor	≥ 60 s
Continuous time for current conducted in rear oxygen sensor	≥ 30 s
Catalyst warm-up counter	≥ 7,000 times

4. GENERAL DRIVING CYCLE

Perform the diagnosis only once when fuel shut-off in deceleration after rapid acceleration in order to calculate the diagnostic value. (Pay attention to oxygen sensor voltage for the timing of deceleration.)

5. DIAGNOSTIC METHOD

When the rear oxygen sensor output voltage changes from 0.55 V (rich) to 0.25 V (lean), calculate the Min. value of response time regarded as judgment value while the output varies from 0.5 V to 0.3 V.



• Abnormality Judgment

(1) Judge NG when the judgment value is larger than the threshold value after fuel shut-off in deceleration. Response time (Diagnosis value) > Threshold value → Abnormal

NOTE:

Variation time of rear oxygen sensor output voltage is short during fuel shut-off in deceleration. Carry out the NG judgment only after the fuel shut-off in deceleration. As for OK judgment, without the condition of fuel shut-off in deceleration, judge OK if the value is below the threshold value.

Judge NG when the malfunction criteria below are completed in 2 seconds after the recovery of fuel shut-off in deceleration which requires 6 seconds or more.

(2) Judge NG when the O₂ sensor voltage after recovery of fuel shut-off in deceleration is large. Judge NG when fuel shut-off in deceleration is also long (6 sec. or more), and although carried out the fuel shut-off in deceleration cut return, when O₂ sensor voltage is large (more than 0.55V).

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Judgment Value

Malfunction Criteria	Threshold Value
Shortest time change from rich (500 mV O ₂ output) to lean (300 mV) if voltage reduces from 550 mV to 250 mV.	> 0.327 seconds
Time when more than 550 mV	> 2 seconds

Time Needed for Diagnosis: Once

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgement

(1) Judge Normal when the response time (diagnostic value) is smaller than threshold (judgment value) when changing to lean since O₂ sensor voltage.

(2) A normal judging is not carried out.

Judge OK when the following standards value are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Change of the shortest time from rich (500 mV O ₂ output), when voltage decreases from 550 mV to 250 mV to lean (300 mV).	≤ 0.327 seconds

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

Sub feedback control: Not allowed

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

10.ENABLE CONDITION

- Lean → Rich response diagnosis

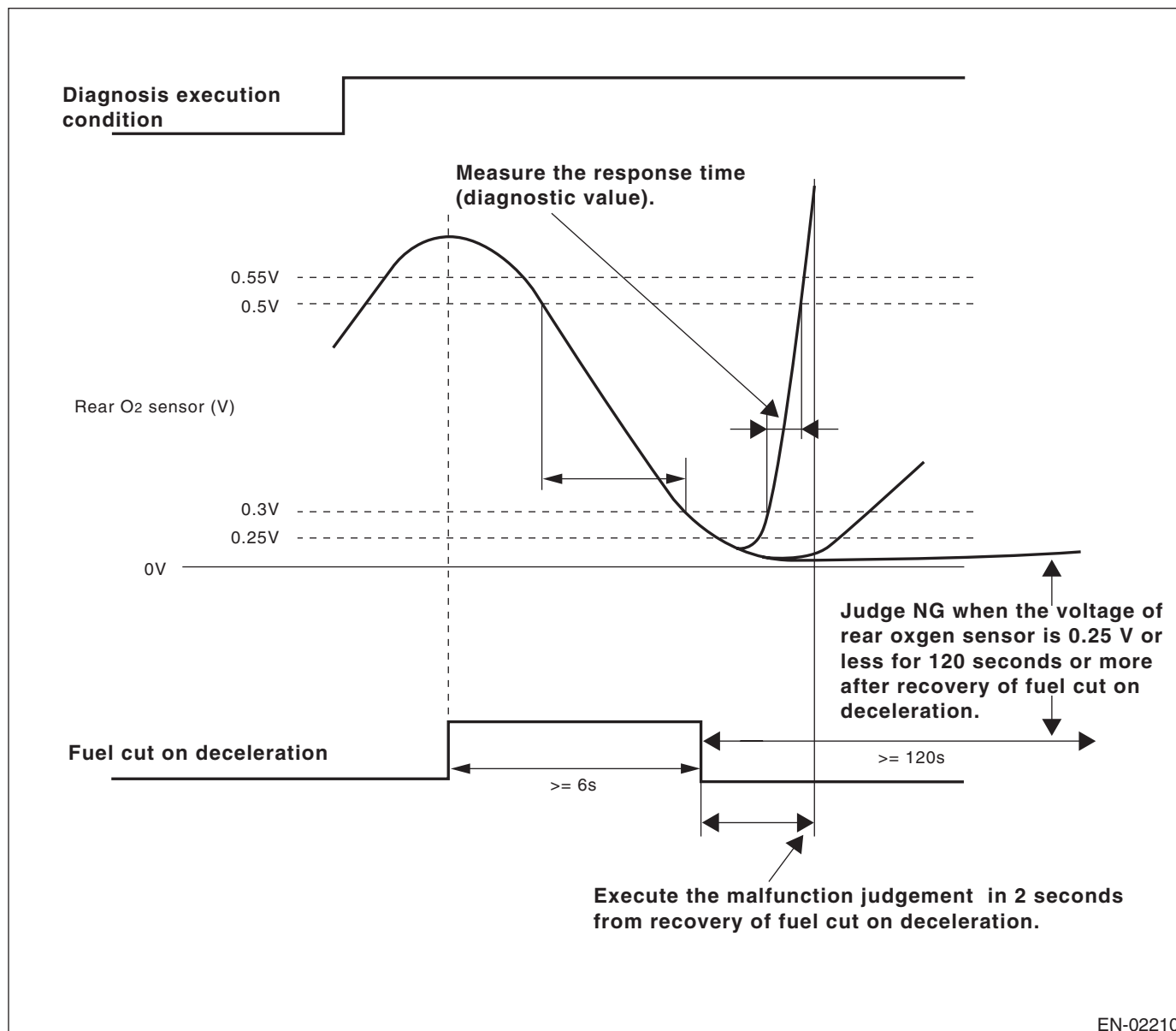
Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
A/F main feedback control condition	Completed
Fuel cut on deceleration ≥ 5 seconds	Experienced
After fuel cut	≥ 2 seconds
Accumulative time of rear oxygen sensor heater energization	≥ 60 seconds
Continuous time of rear oxygen sensor heater energization	≥ 30 seconds

11.GENERAL DRIVING CYCLE

Perform the diagnosis only once when fuel shut-off in deceleration after rapid acceleration. (Pay attention to oxygen sensor voltage for the timing of deceleration.)

12.DIAGNOSTIC METHOD

When the oxygen sensor output voltage changes from 0.25 V (lean) to 0.55 V (rich), calculate the Min. value of response time regarded as judgment value while the output varies from 0.3 V to 0.5 V.



• Abnormality Judgment

(1) Judge NG when the judgment value is larger than the threshold value after recovery of fuel shut-off in deceleration.

Response time (Diagnosis value) > Threshold value → Abnormal

(2) Judge NG when the O₂ sensor voltage after recovery of fuel shut-off in deceleration is small.

Judgment Value

Malfunction Criteria	Threshold Value
Shortest time change from lean (300 mV O ₂ output) to rich (500 mV) if voltage reduces from 500 mV to 250 mV.	> 2 seconds
Or longest time to change to 250 mV	> 120 seconds

Time Needed for Diagnosis: Once

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

• Normality Judgement

(1) Judge Normal when the response time (diagnostic value) is smaller than threshold (judgment value) when changing to lean since O₂ sensor voltage.

Response Time (diagnosis value) $\leq$ Threshold value $\rightarrow$ Normal

(2) A normal judging is not carried out.

Judgment Value

Judge OK when the following standards value are completed.

Malfunction Criteria	Threshold Value
Change of the shortest time from rich (300 mV O ₂ output), when voltage decreases from 550 mV to 250 mV to lean (500 mV).	≤ 2 seconds

13.DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

14.MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

15.FAIL SAFE

Sub feedback control: Not allowed

16.ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

AG:DTC P0140 O₂ SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 2)

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of rear oxygen sensor output property.

Judge Low side NG when the rear oxygen sensor voltage indicates low, otherwise, judge High side NG when the rear oxygen sensor voltage indicates high, in spite of the driving condition that the voltage might move, by referring to the driving condition such as amount of intake air, coolant temperature, main feedback control, fuel shut-off in deceleration, etc.

Judge rear oxygen sensor property NG when the Low side or High side becomes NG.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	≥ 70°C (158°F)
Target output voltage of rear oxygen sensor	≥ 0.6 V
Amount of intake air	10 g (0.35 oz)/sec. or more
Battery voltage	> 10.9 V
Closed loop with oxygen sensor	In operation
Misfire detection during 200 engine revs.	5 times or less
Compensation factor for front oxygen (A/F) sensor	Not in limit value
5 seconds or more fuel shut-off in decel.	Experienced

3. GENERAL DRIVING CYCLE

Perform the diagnosis once after warming-up the engine.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Low side of max. output voltage	< 550 mV
High side of min. output voltage	> 250 mV

Time Needed for Diagnosis: 200 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Low side of max. output voltage	≥ 550 mV
High side of min. output voltage	≤ 250 mV

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. FAIL SAFE

None

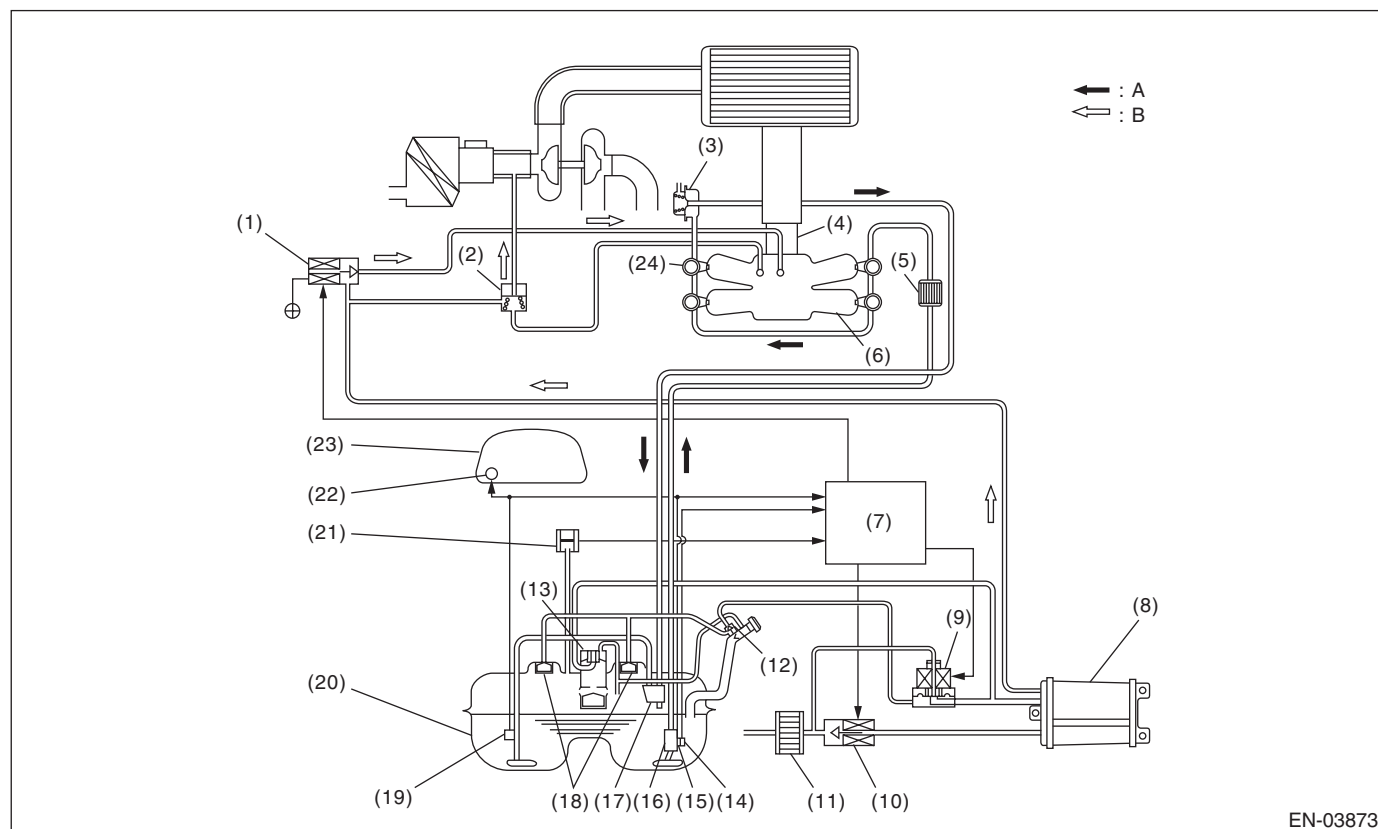
8. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

AH:DTC P0171 SYSTEM TOO LEAN (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect the fuel system malfunction by the amount of main feedback control.



EN-03873

(1) Purge control solenoid valve	(10) Drain valve	(19) Fuel sub level sensor
(2) Purge valve	(11) Drain filter	(20) Fuel tank
(3) Pressure regulator	(12) Shut-off valve	(21) Fuel tank pressure sensor
(4) Throttle body	(13) Vent valve	(22) Fuel gauge
(5) Fuel filter	(14) Fuel temperature sensor	(23) Combination meter
(6) Intake manifold	(15) Fuel level sensor	(24) Fuel injector
(7) Engine control module (ECM)	(16) Fuel pump	(A) Fuel line
(8) Canister	(17) Jet pump	(B) Evaporation fuel line
(9) Pressure control solenoid valve	(18) Fuel cut valve	

• Diagnostic Method

Fuel system is diagnosed by comparing the target air fuel ratio calculated by ECM with the actual air fuel ratio measured by sensor.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
A/F main learning system	In operation
Engine coolant temperature	$\geq 70^{\circ}\text{C}$ (158°F)
Engine load	$\geq$ Value of Map 5
Intake air change during 0.5 engine rev.	≤ 0.02 g/rev

Map 5

Engine speed (rpm)	Idle	800	1,200	1,600	2,000	2,400	2,800	3,200	3,600	4,000	4,400
Measured value (g (oz)/rev)	Non-turbo	0.228 (0.008)	0.22 (0.0078)	0.22 (0.0078)	0.22 (0.0078)	0.228 (0.008)	0.23 (0.0081)	0.234 (0.0083)	0.242 (0.0085)	0.250 (0.0088)	0.250 (0.0088)

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at engine idle or constant vehicle speed after warm-up.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge that the fuel system malfunction occurs when the time during completing the malfunction criteria below continues 50 seconds or more by comparing the diagnosed value (fsobd) with threshold value.

Judgment Value

Malfunction Criteria	Threshold Value
$\text{fsobd} = (\text{sglmd} - \text{tglmda}) + \text{faf} + \text{flaf}$ where, sglmd = measured lambda tglmda = target lambda faf = main feedback compensation coefficient every 64 milliseconds flaf = main feedback learning compensation coefficient	$\geq \text{fsobdL1}$ See Map 4 fsobdL1 = lean side threshold value of fsobd

Map 4 Threshold value for fuel system malfunction criteria

Amount of air (g (oz)/s)	0	2.4 (0.085)	4.7 (0.166)	7 (0.247)	9.4 (0.332)	11.7 (0.413)	14.1 (0.497)
fsobdL1 (%)	40	40	36.9	32.0	27.0	26.5	26.5

Time Needed for Diagnosis: 10 seconds $\times$ 5 times

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK when the malfunction criteria below are continued for 10 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
$\text{fsobd} = (\text{sglmd} - \text{tglmda}) + \text{faf} + \text{flaf}$	$< 19\%$

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When OK with similar drive in 3 driving cycles.
- When "Clear Memory" was performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. FAIL SAFE

Rich side malfunction

- Purge control solenoid valve control: Not allowed to purge.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.

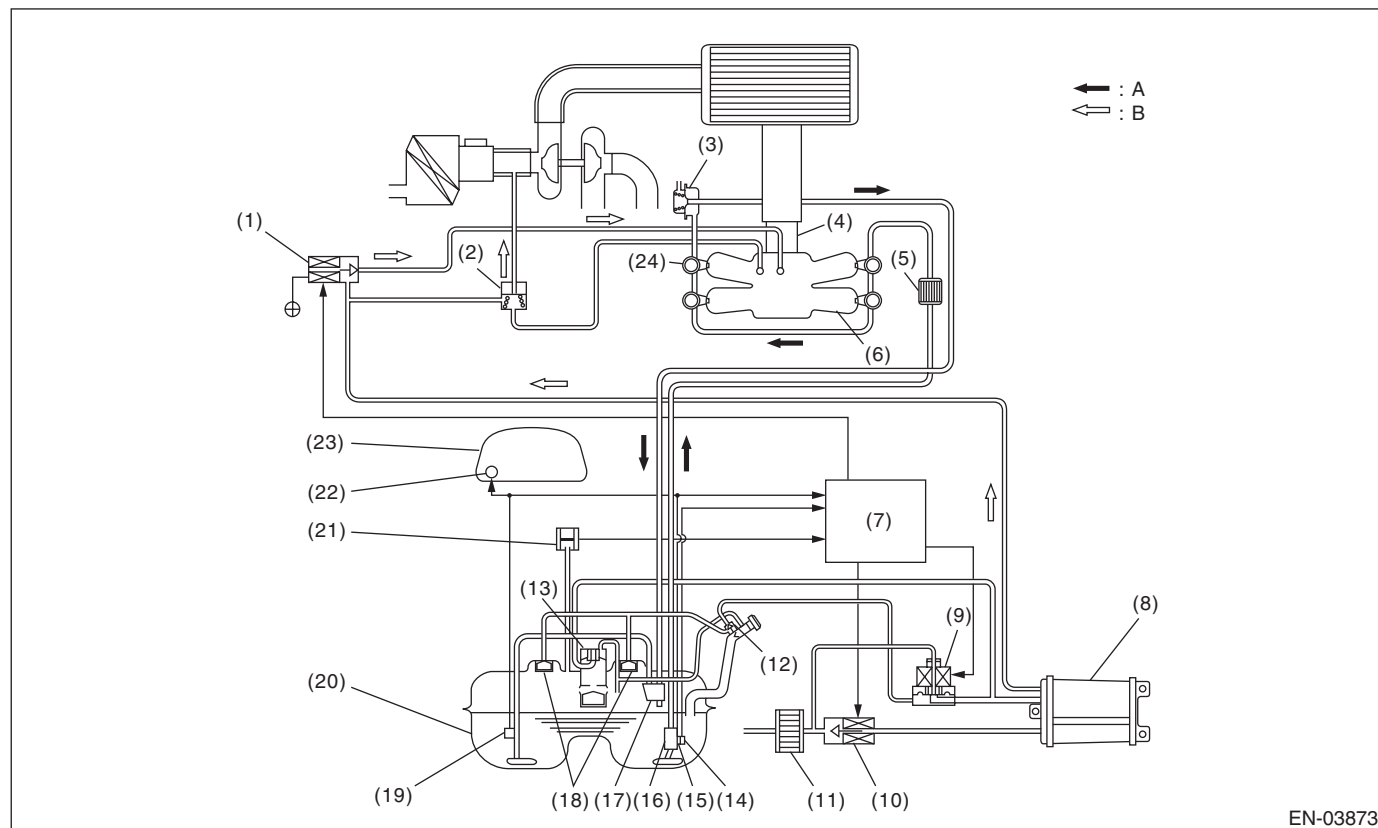
8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

AI: DTC P0172 SYSTEM TOO RICH (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect the fuel system malfunction by the amount of main feedback control.



(1) Purge control solenoid valve	(10) Drain valve	(19) Fuel sub level sensor
(2) Purge valve	(11) Drain filter	(20) Fuel tank
(3) Pressure regulator	(12) Shut-off valve	(21) Fuel tank pressure sensor
(4) Throttle body	(13) Vent valve	(22) Fuel gauge
(5) Fuel filter	(14) Fuel temperature sensor	(23) Combination meter
(6) Intake manifold	(15) Fuel level sensor	(24) Fuel injector
(7) Engine control module (ECM)	(16) Fuel pump	(A) Fuel line
(8) Canister	(17) Jet pump	(B) Evaporation fuel line
(9) Pressure control solenoid valve	(18) Fuel cut valve	

• Diagnostic Method

Fuel system is diagnosed by comparing the target air fuel ratio calculated by ECM with the actual air fuel ratio measured by sensor.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
A/F main learning system	In operation
Engine coolant temperature	$\geq 70^{\circ}\text{C}$ (158°F)
Engine load	$\geq$ Value of Map 5
Intake air change during 0.5 engine rev.	≤ 0.02 g/rev
Learning value of EVAP conc. during purge	≤ 0.1
Cumulative time of canister purge after engine start	20 seconds or more
Continuous period after canister purge starting	30 seconds or more

Map 5

Engine speed (rpm)	Idle	800	1200	1600	2000	2400	2800	3200	3600	4000	4400
Measured value (g (oz)/rev)	Non-turbo	0.228 (0.008)	0.22 (0.0078)	0.22 (0.0078)	0.22 (0.0078)	0.228 (0.008)	0.23 (0.0081)	0.234 (0.0083)	0.242 (0.0085)	0.250 (0.0088)	0.250 (0.0088)

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at engine idle or constant vehicle speed after warm-up.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge that the fuel system malfunction occurs when the time during completing the malfunction criteria below continues 50 seconds or more by comparing the diagnosed value (fsobd) with threshold value.

Judgment Value

Malfunction Criteria	Threshold Value
$\text{fsobd} = (\text{sglmd} - \text{tglmda}) + \text{faf} + \text{flaf}$ where, $\text{sglmd} = \text{measured lambda}$ $\text{tglmda} = \text{target lambda}$ $\text{faf} = \text{main feedback compensation coefficient every 64 milliseconds}$ $\text{flaf} = \text{main feedback learning compensation coefficient}$	$\leq \text{fsobdR1}$ See Map 4 $\text{fsobdR1} = \text{rich side threshold value of fsobd}$

Map 4 Threshold value for fuel system malfunction criteria

Amount of air (g (oz)/s)	0	2.4 (0.085)	4.7 (0.166)	7 (0.247)	9.4 (0.332)	11.7 (0.413)	14.1 (0.497)
fsobdR1 (%)	-40	-40	-36.9	-32.0	-27.0	-27.0	-27.0

Time Needed for Diagnosis: 10 seconds $\times$ 5 times

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK when the malfunction criteria below are continued for 10 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
$\text{fsobd} = (\text{sglmd} - \text{tglmda}) + \text{faf} + \text{flaf}$	$\geq -20\%$

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When OK with similar drive in 3 drive cycles.
- When "Clear Memory" was performed

7. FAIL SAFE

Rich side malfunction

- Purge control solenoid valve control: Not allowed to purge.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.

8. ECM OPERATION AT DTC SETTING

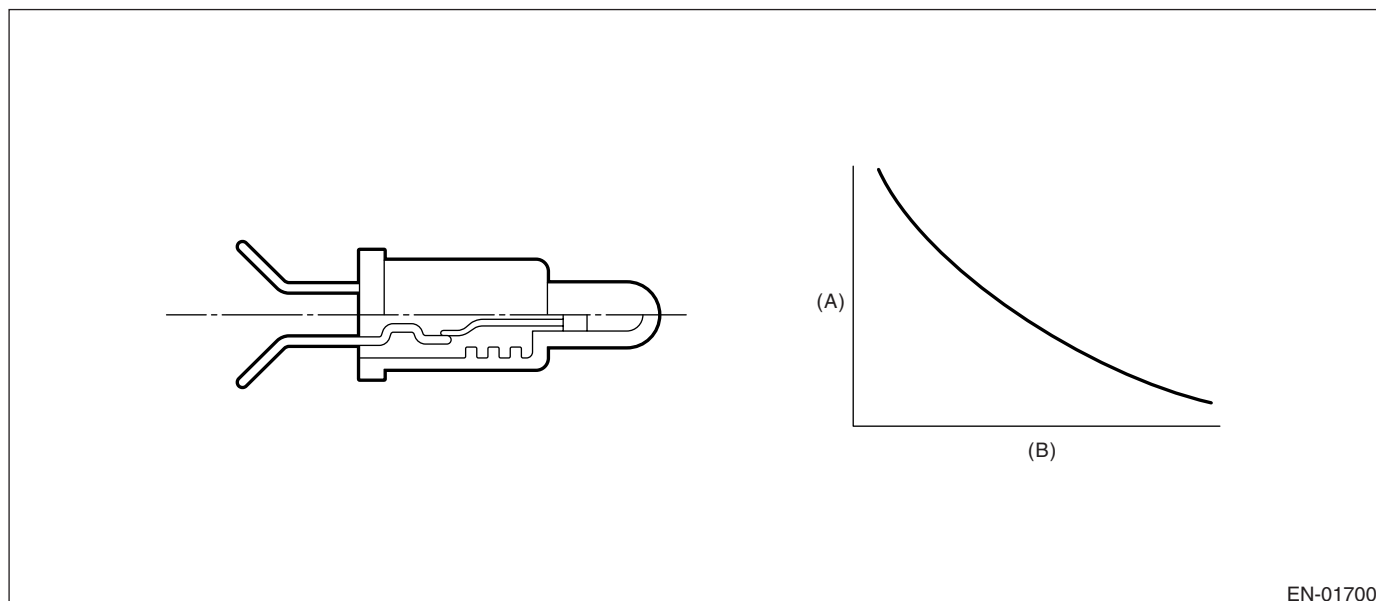
Memorize the freeze frame data. (For test mode \$02)

AJ:DTC P0181 FUEL TEMPERATURE SENSOR “A” CIRCUIT RANGE/PERFORMANCE**1. OUTLINE OF DIAGNOSIS**

Detect the malfunction of fuel temperature sensor output property. Perform the diagnosis in two methods; namely, drift diagnosis and stuck diagnosis. Judge NG when either of them results in NG, and judge OK when both of them result in OK.

• Drift Diagnosis

Normally fuel temperature is lower than engine coolant temperature. When the fuel temperature becomes higher than the engine coolant temperature, the range is considered to be shifted, and make an NG judgment.

2. COMPONENT DESCRIPTION

(A) Resistance value (Ω)

(B) Fuel temperature $^{\circ}\text{C}$ ($^{\circ}\text{F}$)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 120 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Fuel level	$\geq 9 \text{ } \ell$ (2.38 US gal, 1.98 Imp gal)
After engine starting	20 seconds or more
Engine coolant temperature – engine coolant temperature at engine starting	$\geq 10^{\circ}\text{C}$ (18°F)
Fuel temperature – engine coolant temperature	$\geq 10^{\circ}\text{C}$ (18°F)
Battery voltage	$> 10.9 \text{ V}$

Time Needed for Diagnosis: 120 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Fuel level	$\geq 9 \text{ } \ell$ (2.38 US gal, 1.98 Imp gal)
After engine starting	20 seconds or more
Engine coolant temperature – engine coolant temperature at engine starting	$\geq 10^{\circ}\text{C}$ (18°F)
Fuel temperature – engine coolant temperature	$< 10^{\circ}\text{C}$ (18°F)
Battery voltage	$> 10.9 \text{ V}$
Engine coolant temperature	$< 70^{\circ}\text{C}$ (158°F)

• Stuck Diagnosis

If the fuel temperature which might rise along with the engine idling (the cumulative amount of intake air after engine starting is large) does not increase, the engine is considered to be stuck and make an NG judgment.

6. ENABLE CONDITION

Secondary Parameters	Enable Conditions
After engine starting	20 seconds or more
Battery voltage	$> 10.9 \text{ V}$

7. GENERAL DRIVING CYCLE

Always perform diagnosis continuously.

8. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Accumulated amount of intake air	$\geq 550 \text{ kg}$ (1,212.8 lb)
Fuel temperature difference between Max. and Min.	$< 3^{\circ}\text{C}$ (5.4°F)

Time Needed for Diagnosis: To be determined.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Accumulated amount of intake air	≥ 550 kg (1,212.8 lb)
Fuel temperature difference between Max. and Min.	$\geq 3^{\circ}\text{C}$ (5.4°F)

9. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

10.MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

11.FAIL SAFE

None

12.ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

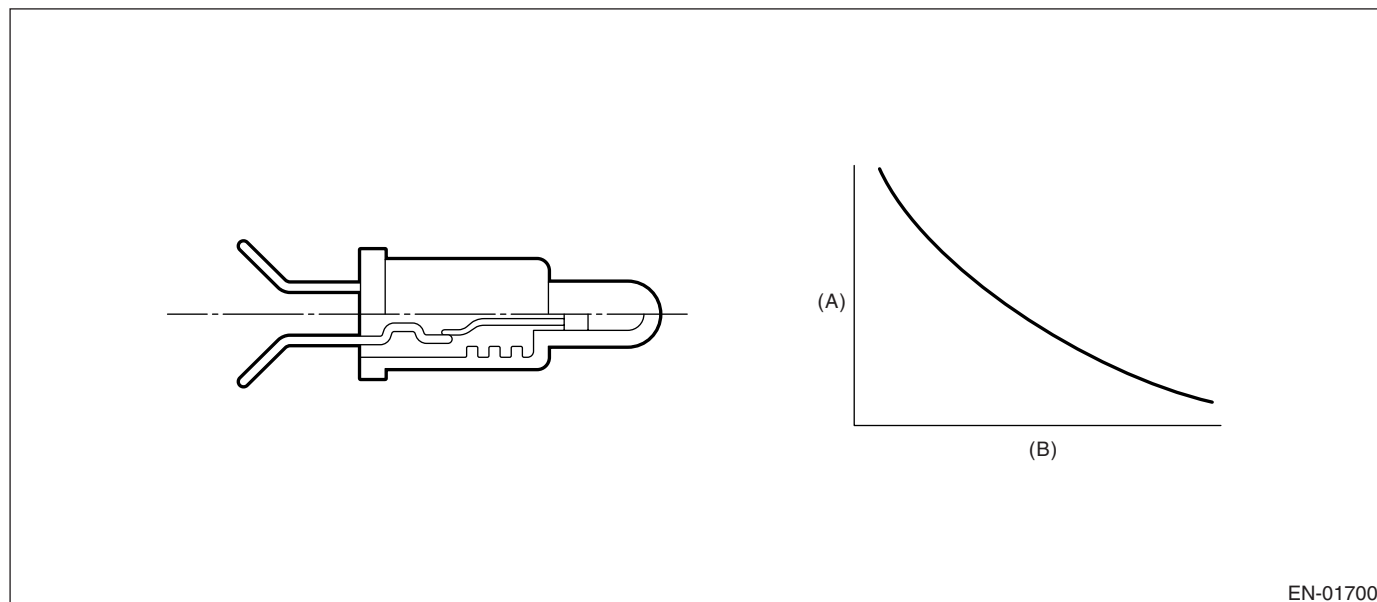
GENERAL DESCRIPTION

AK:DTC P0182 FUEL TEMPERATURE SENSOR “A” CIRCUIT LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel temperature sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



EN-01700

(A) Resistance value (Ω)

(B) Fuel temperature $^{\circ}\text{C}$ ($^{\circ}\text{F}$)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	$< 0.1646 \text{ V}$
Battery voltage	$\geq 10.9 \text{ V}$

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK when the cumulative time until completing the malfunction criteria below becomes more than 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	$\geq 0.1646 \text{ V}$
Battery voltage	$\geq 10.9 \text{ V}$

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

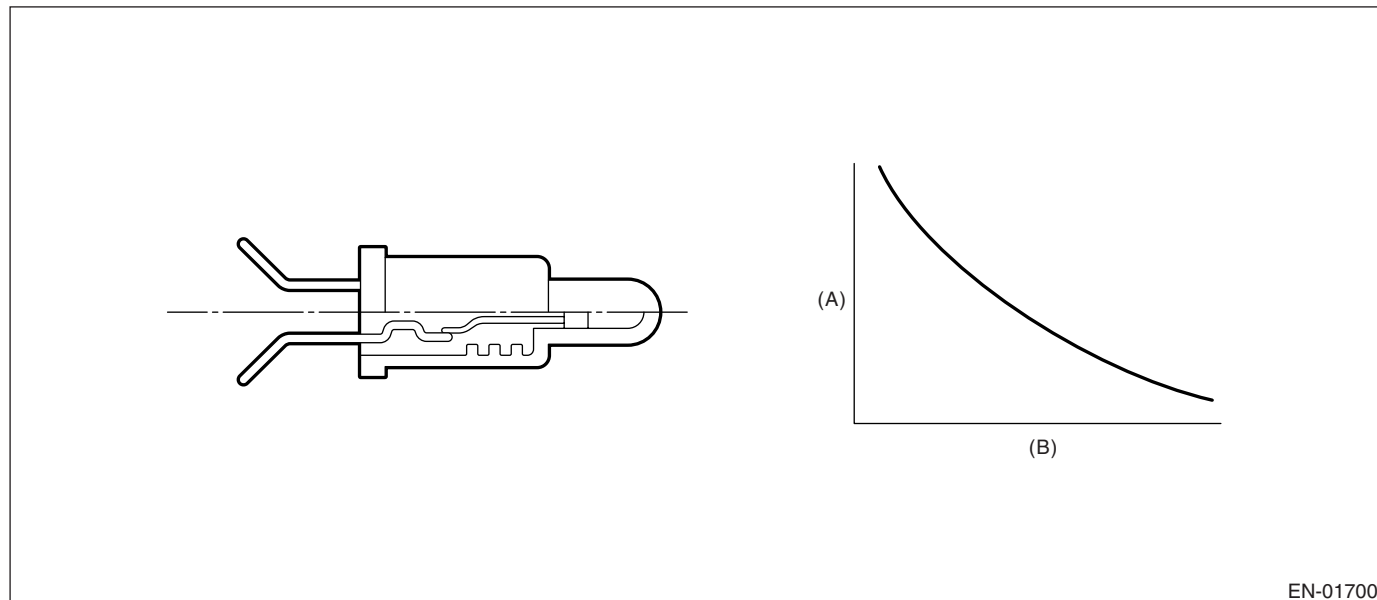
GENERAL DESCRIPTION

AL:DTC P0183 FUEL TEMPERATURE SENSOR “A” CIRCUIT HIGH INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel temperature sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(A) Resistance value (Ω)

(B) Fuel temperature $^{\circ}\text{C}$ ($^{\circ}\text{F}$)

EN-01700

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	$\geq 4.72 \text{ V}$
Battery voltage	$\geq 10.9 \text{ V}$

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK when the cumulative time until completing the malfunction criteria below becomes more than 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	$< 4.72 \text{ V}$
Battery voltage	$\geq 10.9 \text{ V}$

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

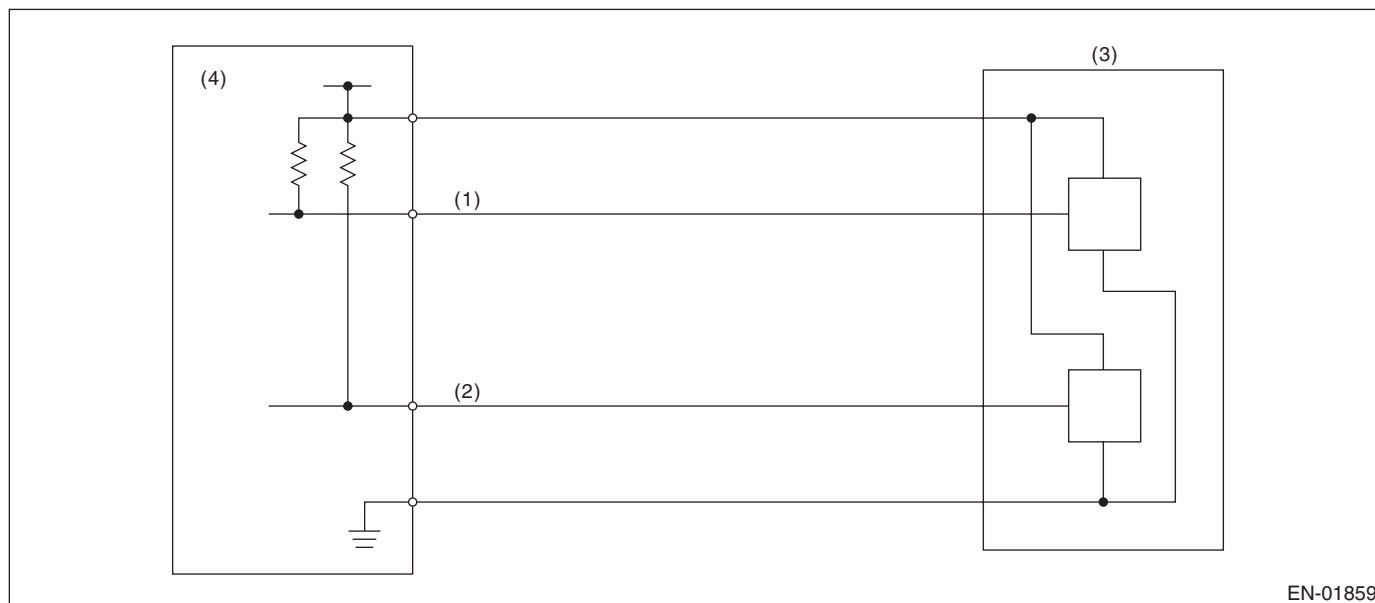
GENERAL DESCRIPTION

AM:DTC P0222 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle position sensor 2.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Throttle position sensor 1 signal

(3) Throttle position sensor

(2) Throttle position sensor 2 signal

(4) Engine control module (ECM)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	> 0.224 V

Time Needed for Diagnosis: 24 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only with engine stopped)

8. FAIL SAFE

Stop power distribution to electronic throttle control motor. (Throttle opening is fixed to 6°.)

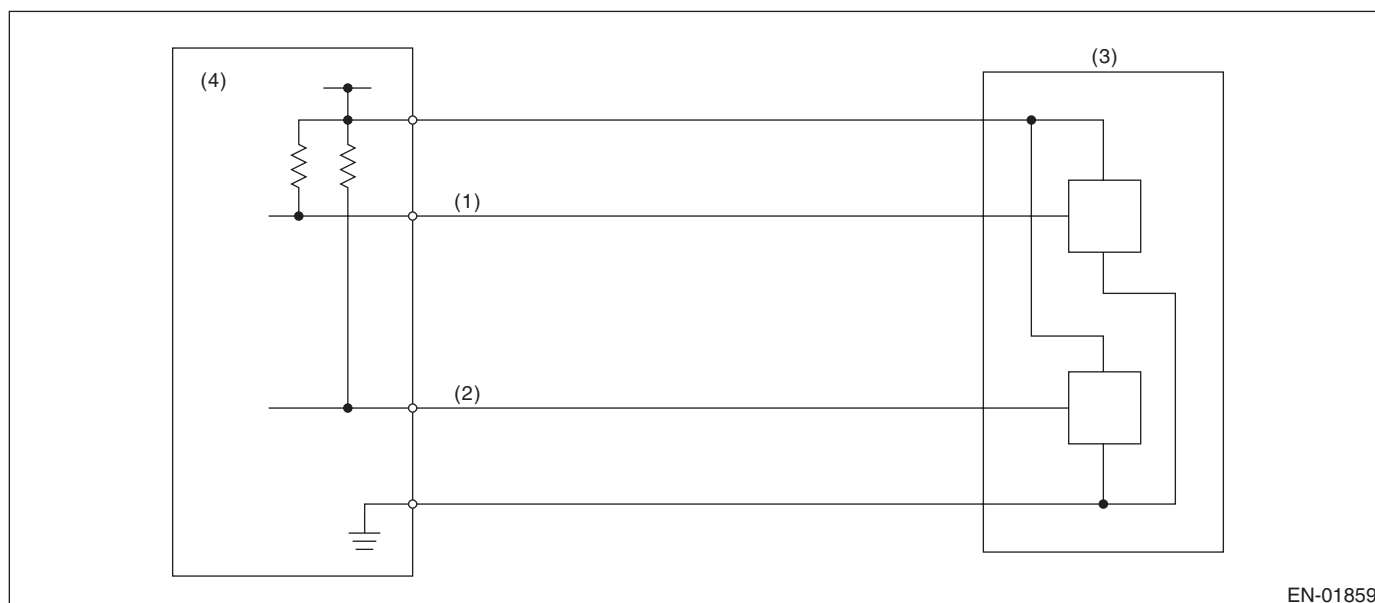
9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

AN:DTC P0223 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT HIGH**1. OUTLINE OF DIAGNOSIS**

Detect the open or short circuit of throttle position sensor 2.

Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION

EN-01859

(1) Throttle position sensor 1 signal

(3) Throttle position sensor

(2) Throttle position sensor 2 signal

(4) Engine control module (ECM)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	< 4.851 V

Time Needed for Diagnosis: 24 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

8. FAIL SAFE

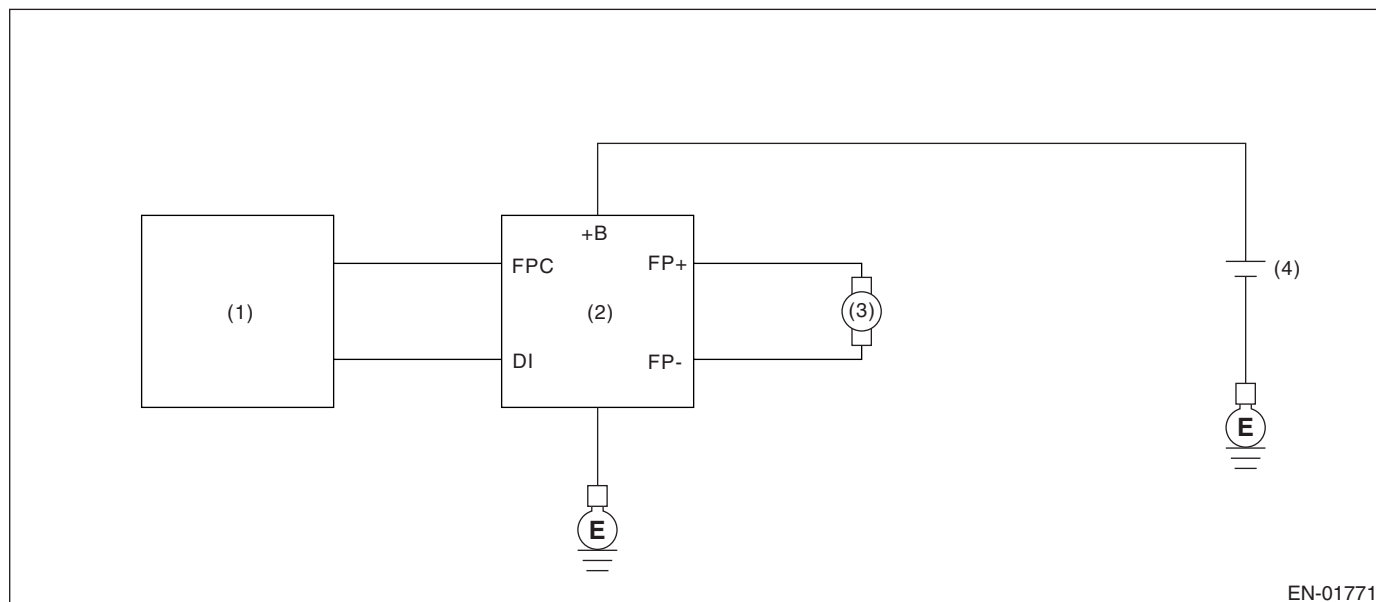
Stop power distribution to electronic throttle control motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

AO:DTC P0230 FUEL PUMP PRIMARY CIRCUIT**1. OUTLINE OF DIAGNOSIS**

Detect the malfunction of fuel pump control unit. Judge NG when the NG signal is sent through a diagnostic line coming from the fuel pump control unit. Fuel pump control unit detects the open or short circuit malfunction for each line, and then sends NG signals if one of them is found NG.

2. COMPONENT DESCRIPTION

- (1) Engine control module (ECM)
- (2) Fuel pump control unit
- (3) Fuel pump
- (4) Battery

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD**• Abnormality Judgment**

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	$\geq 8 \text{ V}$
After engine starting	30 seconds or more
Fuel pump control	ON
Fuel pump control unit output diagnosis signal	Low
Fuel level	$\geq 10 \text{ } \varnothing$ (2.6 US gal, 2.2 Imp gal)

Time Needed for Diagnosis: 2.5 seconds

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 8 V
After engine starting	30 seconds or more
Fuel pump control	ON
Fuel pump control unit output diagnosis signal	High

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

OFF setting may be needed depending on the NG portion.

9. ECM OPERATION AT DTC SETTING

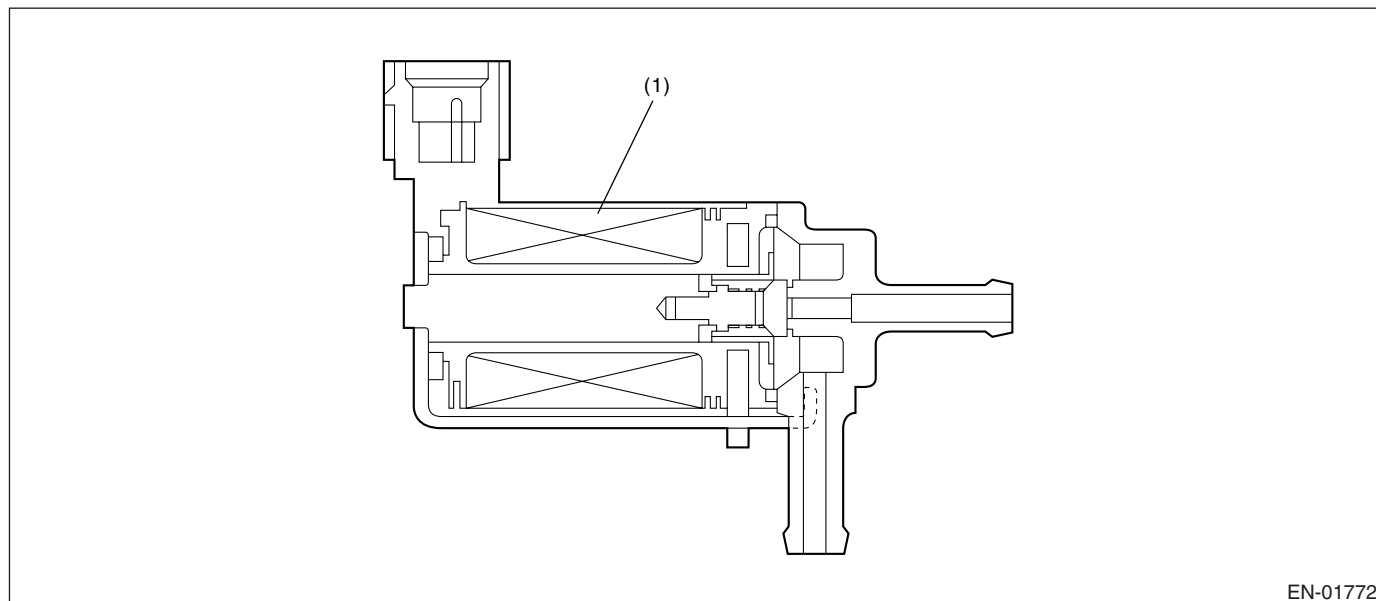
Memorize the freeze frame data. (For test mode \$02)

AP:DTC P0244 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” RANGE/PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of wastegate control solenoid valve function. Judge NG when becoming high wastegate pressure.

2. COMPONENT DESCRIPTION



EN-01772

(1) Coil

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 1 second.

Judgment Value

Malfunction Criteria	Threshold Value
Intake manifold pressure	≥ Map 10

Map 10

Atmospheric pressure (kPa (mmHg, inHg))	58.7 (440, 17.3)	67.2 (504, 19.8)	75.7 (568, 22.4)	84.2 (632, 24.9)	92.8 (696, 27.4)	101.3 (760, 29.9)
NG pressure (kPa (mmHg, inHg))	142.4 (1,068, 42.1)	156.2 (1,172, 46.1)	170.2 (1,277, 50.3)	184.1 (1,381, 54.4)	198.0 (1,485, 58.5)	207.9 (1,560, 61.4)
OK pressure (kPa (mmHg, inHg))	120.0 (900, 35.4)	113.8 (1,004, 33.6)	147.8 (1,109, 43.7)	161.7 (1,213, 47.8)	175.6 (1,317, 51.9)	185.6 (1,392, 54.8)

Time Needed for Diagnosis: 1 second

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• **Normality Judgment**

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Intake manifold pressure	< Map 10

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

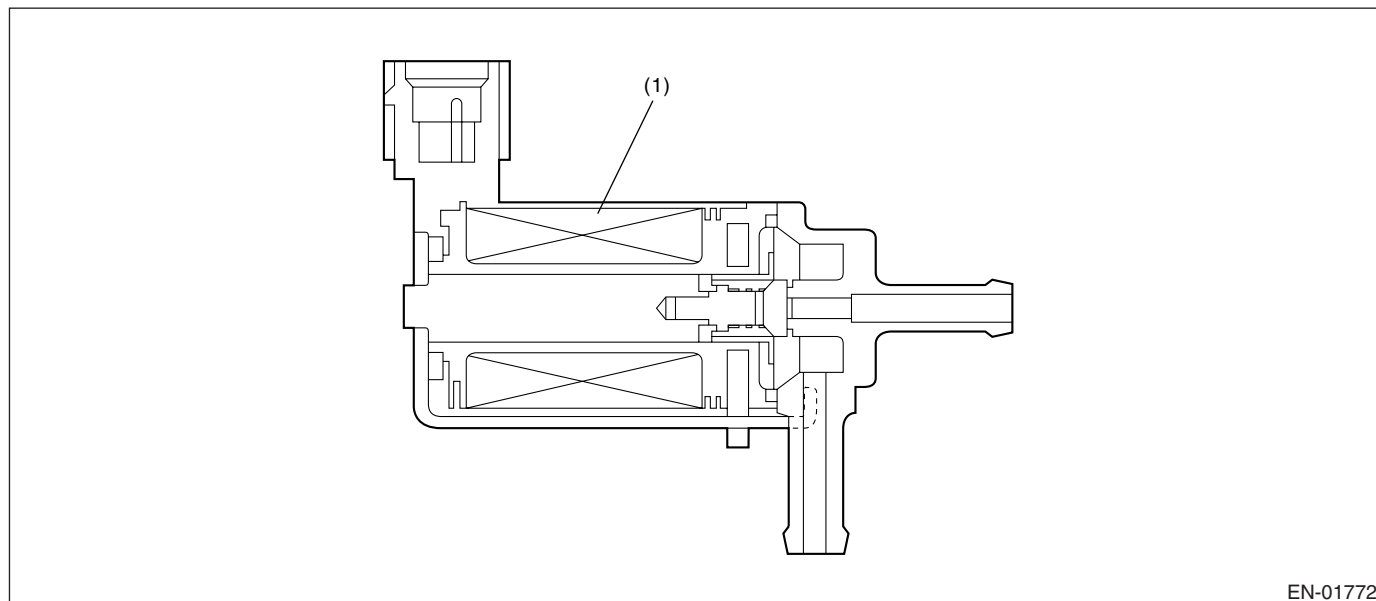
None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

AQ:DTC P0245 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” LOW**1. OUTLINE OF DIAGNOSIS**

Detect the open or short circuit of wastegate control solenoid valve. Judge NG when the terminal output voltage remains Low during outputting the duty signal.

2. COMPONENT DESCRIPTION

(1) Coil

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
After engine starting	1 second or more

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after engine starts.

5. DIAGNOSTIC METHOD**• Abnormality Judgment**

Judge NG when the continuous time until completing the malfunction criteria below becomes more than 655 milliseconds.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal output voltage	Low
Duty ratio for turbocharged pressure control	< 75%

Time Needed for Diagnosis: 655 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK and clear NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal output voltage	High

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

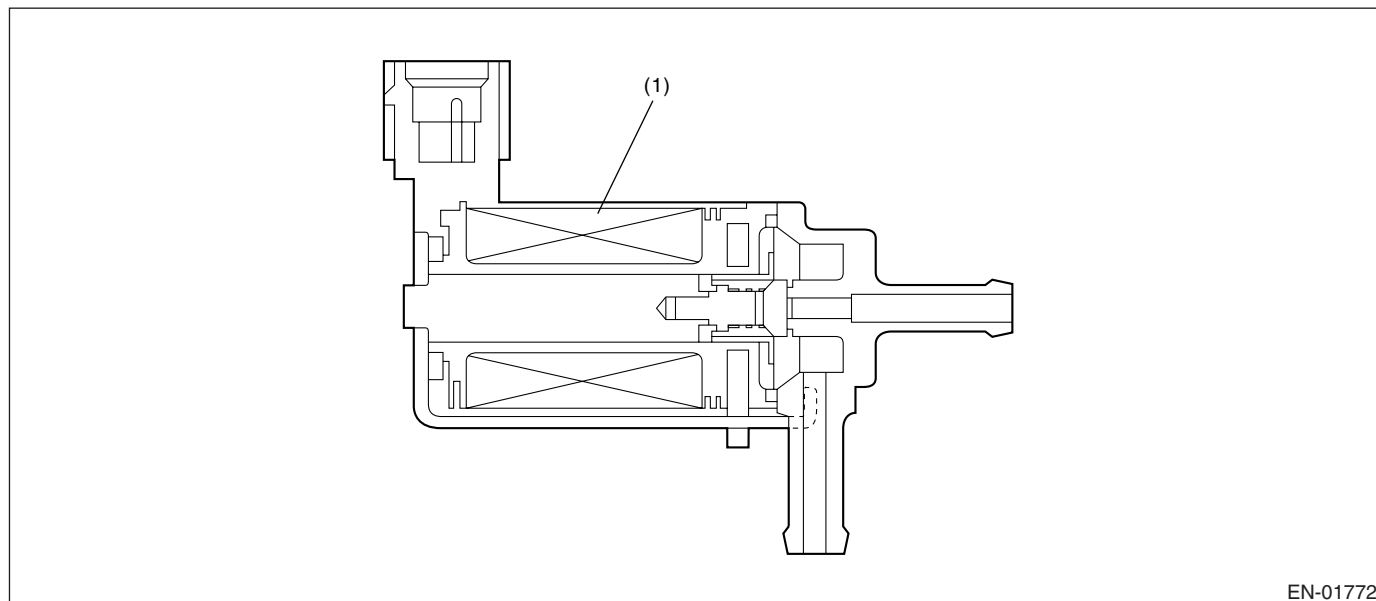
None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

AR:DTC P0246 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” HIGH**1. OUTLINE OF DIAGNOSIS**

Detect the open or short circuit of wastegate control solenoid valve. Judge NG when the terminal output voltage remains Low or High during outputting the duty signal.

2. COMPONENT DESCRIPTION

EN-01772

(1) Coil

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
After engine starting	1 second or more

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after engine starts.

5. DIAGNOSTIC METHOD**• Abnormality Judgment**

Judge NG when the continuous time until completing the malfunction criteria below becomes more than 655 milliseconds.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal output voltage	High
Duty ratio for turbocharged pressure control	> 25%

Time Needed for Diagnosis: 655 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK and clear NG when a malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal output voltage	Low

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

AS:DTC P0301 CYLINDER 1 MISFIRE DETECTED

1. OUTLINE OF DIAGNOSIS

Detect whether the misfire occurred or not. (Revolution fluctuation method) Monitoring the misfire which influences exhaust deterioration (1.5 times of FTP) and catalyst damage is made obligatory by the law. Misfire affecting these two has three patterns below.

- Intermittent misfire (The same cylinder misfires in random, or different cylinders misfire in random.): FTP 1.5 times misfire
- Every time misfire (The same cylinder misfires every time.): FTP 1.5 times misfire, Catalyst damage misfire

The following detecting methods are adopted for these detection.

1) Intermittent misfire: FTP 1.5 times misfire

- 180° Interval Difference Method (MT: 1,800 rpm or less; AT: None)
- 360° Interval Difference Method (whole range)
- 720° Interval Difference Method (3,000 rpm or less)

2) Every time misfire: FTP 1.5 times misfire, Catalyst damage misfire

- 360° Interval Difference Method

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Continuous time for completing all secondary parameters	≥ 1 second
Intake manifold pressure change during 0.5 engine rev.	< 13.3 kPa (100 mmHg, 3.93 inHg) (MT) < 13.3 kPa (100 mmHg, 3.93 inHg) (AT)
Engine speed change	< 1,000 rpm/32 milliseconds
Throttle position change during 16 milliseconds	< 14°
Fuel shut-off function	Not in operation
Atmospheric pressure	≥ 75.0 kPa (563 mmHg, 22.2 inHg)
Fuel level	≥ 9 ℓ (2.38 US gal, 1.98 Imp gal)
Evaporative system leak check	Not in operation
Engine speed	500 — 6,500 rpm
Intake manifold pressure	> Value of Map 3
Battery voltage	≥ 8 V

Map3

MT model

Vehicle Speed < 64.4 km/h (40 MPH)

rpm	700	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	6700
kPa	25.1	24.8	23.3	24.7	24.0	25.6	28.8	30.0	31.6	32.5	37.1	41.9	36.9	51.1
(mmHg, inHg)	(188, 7.40)	(186, 7.32)	(175, 6.89)	(185, 7.30)	(180, 7.09)	(192, 7.56)	(216, 8.51)	(225, 8.86)	(237, 9.33)	(244, 9.60)	(278, 10.96)	(314, 12.4)	(352, 10.90)	(383, 15.1)

Vehicle Speed ≥ 64.4 km/h (40 MPH)

rpm	700	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	6700
kPa	25.1	24.8	23.3	24.7	24.0	25.6	28.8	30.0	31.6	32.5	37.1	41.9	36.9	51.1
(mmHg, inHg)	(188, 7.40)	(186, 7.32)	(175, 6.89)	(185, 7.30)	(180, 7.09)	(192, 7.56)	(216, 8.51)	(225, 8.86)	(237, 9.33)	(244, 9.60)	(278, 10.96)	(314, 12.4)	(352, 10.90)	(383, 15.1)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

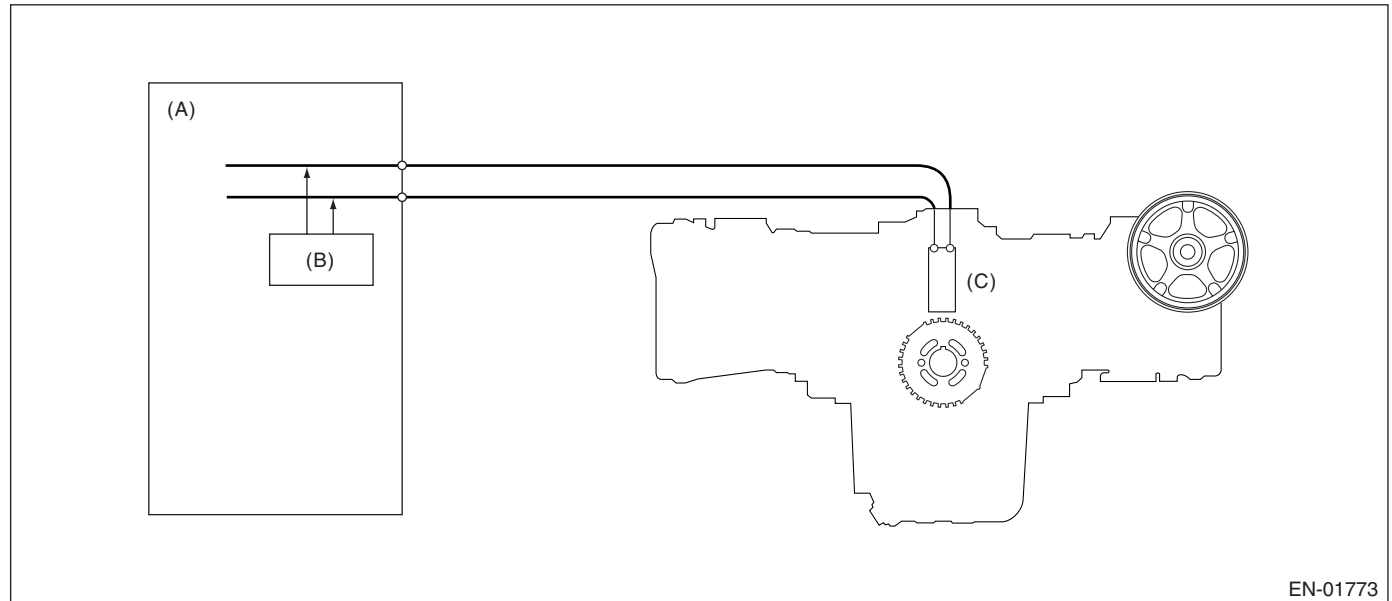
AT model

rpm	700	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	6700
kPa	26.3	24.7	23.6	26.7	27.3	26.1	29.5	31.3	32.7	34.1	38.2	44.0	49.5	53.3
(mmHg,	(197,	(185,	(177,	(200,	(205,	(196,	(221.5,	(235,	(245.5,	(256,	(286.5,	(330,	(371.5,	(400,
inHg)	7.76)	7.28)	6.97)	7.89)	8.07)	7.72)	8.72)	9.25)	9.67)	10.08)	11.28)	13.0)	14.63)	15.74)

3. GENERAL DRIVING CYCLE

- Detecting misfire is able to be carried out in the condition between idling and high revolution.
- Perform the diagnosis continuously.

4. DIAGNOSTIC METHOD



EN-01773

- (A) Engine control module (ECM)
 (B) Diagnosis circuit
 (C) Crankshaft position sensor

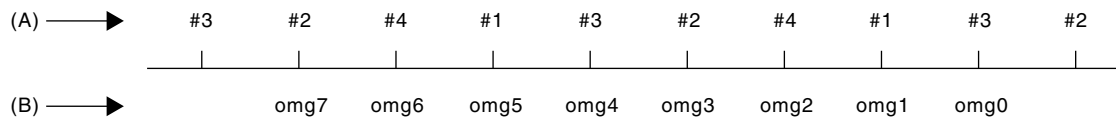
When the misfire occurred, the engine speed is decreased and the crankshaft position speed will change. Calculate the interval difference value (diagnostic value) from crankshaft position speed by the following formula, and judge whether the misfire occurs or not comparing the calculated result with judgment value. Counting the number of misfire up, and if the misfire ratio is higher during 1,000 rev. or 200 rev., judge NG for the corresponding cylinder.

Calculate the diagnostic value (from crankshaft position speed)	→ Misfire detection every single ignition (Compare diagnostic value with judgment value)	→ NG judgment (Judge misfire occurrence required by the law) (Compare number of misfire with judgment)
	• 180° Interval Difference Method • 360° Interval Difference Method • 720° Interval Difference Method	• FTP1.5 times misfire NG judgment • Catalyst damage misfire NG judgment

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

As the following figure, pick out a random cylinder as the standard and name it omg 0. And the former crankshaft position speed is named omg 1, the second former crankshaft position speed is named omg 2, the third is named omg 3, and the following is the same.



EN-01774

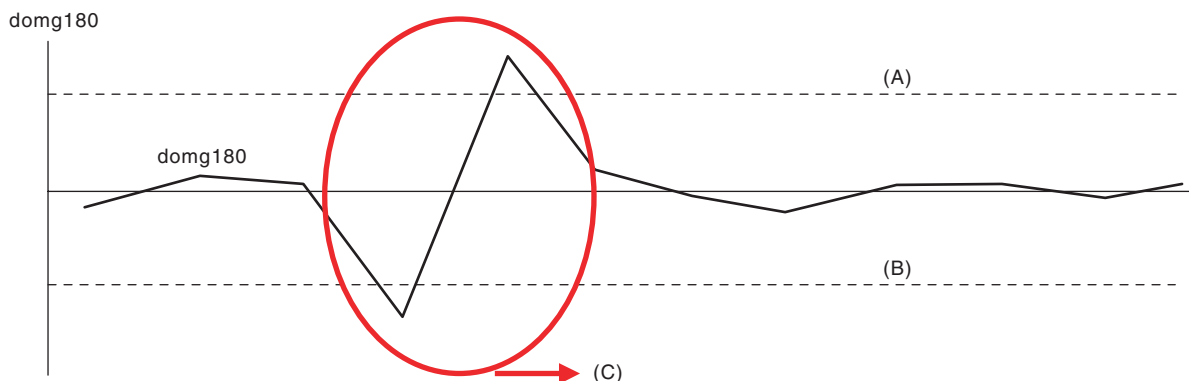
- (A) Ignition order
- (B) Crankshaft position speed

• 180° Interval Difference Method

Diagnosis value $\text{domg180} = (\text{omg} -1 \text{ omg } 0) - (\text{omg } 7 - \text{omg } 1)/6$

Judge misfire occurs in the following cases.

- $\text{domg } 180 > \text{judgment value of positive side}$
- $\text{domg } 180 \leq \text{judgment value of negative side}$
(judgment value before 180°CA)



EN-01775

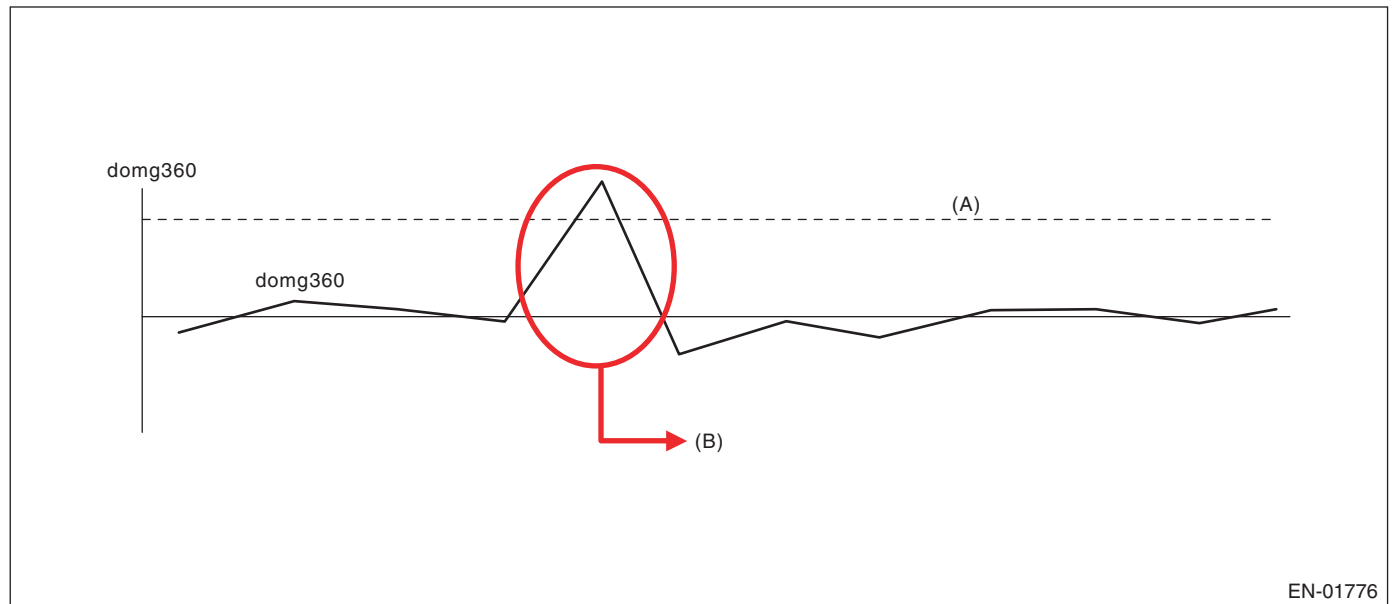
- (A) Threshold value (Judgment value of positive side)
- (B) Threshold value (Judgment value of negative side)
- (C) Judged as misfire

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

• 360° Interval Difference Method

Diagnosis value	$\text{domg } 360 = (\text{omg } 1 - \text{omg } 0) - (\text{omg } 4 - \text{omg } 3)$		
Misfire judgment	$\text{domg } 360 > \text{judgment value}$	→	Misfire occurs

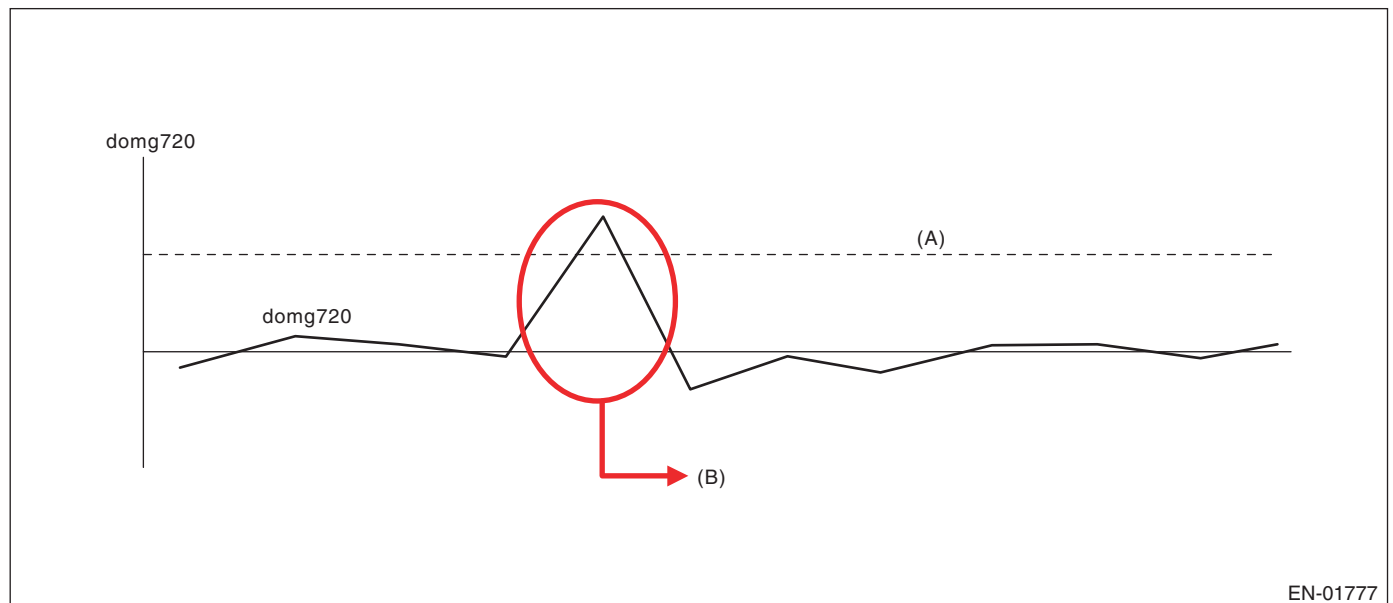


EN-01776

- (A) Threshold value
- (B) Judged as misfire

• 720° Interval Difference Method

Diagnosis value	$\text{domg } 720 = (\text{omg } 1 - \text{omg } 0) - (\text{omg } 7 - \text{omg } 6)$		
Misfire judgment	$\text{domg } 720 > \text{judgment value}$	→	Misfire occurs



EN-01777

- (A) Threshold value
- (B) Judged as misfire

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

- FTP 1.5 times misfire (Misfire occurrence level affecting exhaust gas)

Judgment Value (Judge that malfunction occurs when the misfire ratio is high in 1,000 engine revs.)

Malfunction Criteria	Threshold Value
FTP emission judgment value	> 1.0% in 1,000 revs.

Time Needed for Diagnosis: 1,000 engine revs.

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

- Catalyst damage misfire (Misfire occurrence level damaging catalyst)

Judgment Value (Judge that malfunction occurs when the misfire ratio is high in 200 engine revs. (400 ignitions))

Malfunction Criteria	Threshold Value
Catalyst damage misfire judgment value	See Map 1

Map 1 Fault criteria threshold for misfire which would result in catalyst damage

		AIR INTAKE (g/rev.)									
		0.2	0.4	0.6	0.8	1.0	1.2	1.4	1.6	1.8	2.0
ENGINE SPEED (rpm)	1000	37.0	32.0	28.5	26.0	23.0	21.3	21.3	-	-	-
	1500	35.0	29.5	25.5	22.5	21.3	21.3	21.3	18.0	-	-
	2000	32.0	22.5	22.5	18.3	14.5	10.8	10.0	9.0	8.0	5.0
	2500	29.0	21.8	14.3	11.3	9.8	9.0	8.5	8.0	7.5	5.0
	3000	27.0	21.8	14.5	9.8	9.0	9.0	8.0	7.5	7.0	5.0
	3500	24.5	18.5	10.8	6.8	5.8	5.5	5.0	5.0	5.0	5.0
	4000	-	15.3	10.0	6.8	5.5	5.0	5.0	5.0	5.0	5.0
	4500	-	13.8	8.5	6.3	5.0	5.0	5.0	5.0	5.0	-
	5000	-	13.8	8.5	5.8	5.0	5.0	5.0	5.0	5.0	-
	5500	-	13.5	8.3	5.5	5.0	5.0	5.0	5.0	5.0	-
	6000	-	13.0	8.0	5.3	5.0	5.0	5.0	5.0	5.0	-
	6500	-	12.5	7.5	5.0	5.0	5.0	5.0	5.0	-	-
	6700	-	12.3	7.3	5.0	5.0	5.0	5.0	5.0	-	-

EN-02282

These figures mean the misfire ratio (%) in 400 ignitions; for example, 22.5 (%) means 400 (ignition) × 22.5 (%) = 90 (ignition) or more, so this case is judged misfire.

Time Needed for Diagnosis: 200 engine revs.

Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

7. FAIL SAFE

None

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

AT:DTC P0302 CYLINDER 2 MISFIRE DETECTED

1. OUTLINE OF DIAGNOSIS

For the diagnostic procedure, refer to DTC P0301. <Ref. to GD(H4DOTC)-95, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

AU:DTC P0303 CYLINDER 3 MISFIRE DETECTED

1. OUTLINE OF DIAGNOSIS

For the diagnostic procedure, refer to DTC P0301. <Ref. to GD(H4DOTC)-95, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

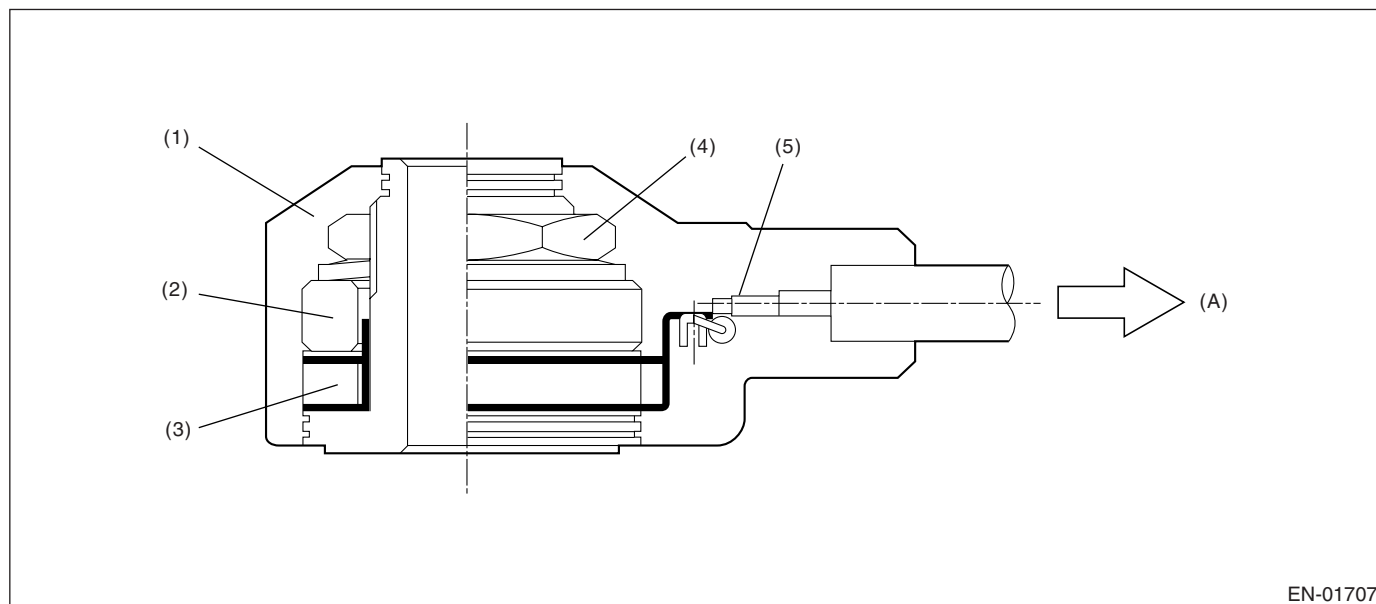
AV:DTC P0304 CYLINDER 4 MISFIRE DETECTED

1. OUTLINE OF DIAGNOSIS

For the diagnostic procedure, refer to DTC P0301. <Ref. to GD(H4DOTC)-95, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

AW:DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR)**1. OUTLINE OF DIAGNOSIS**

Detect the open or short circuit of the knock sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION

- (1) Case
- (2) Weight
- (3) Piezoelectric element
- (4) Nut
- (5) Resistance

(A) To knock sensor harness

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD**• Abnormality Judgment**

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 1 second.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.238 V
Ignition switch	ON

Time Needed for Diagnosis: 1 second

Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

• Normality Judgment

Judge OK and clear NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 0.238 V
Ignition switch	ON

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

Knock compensation:

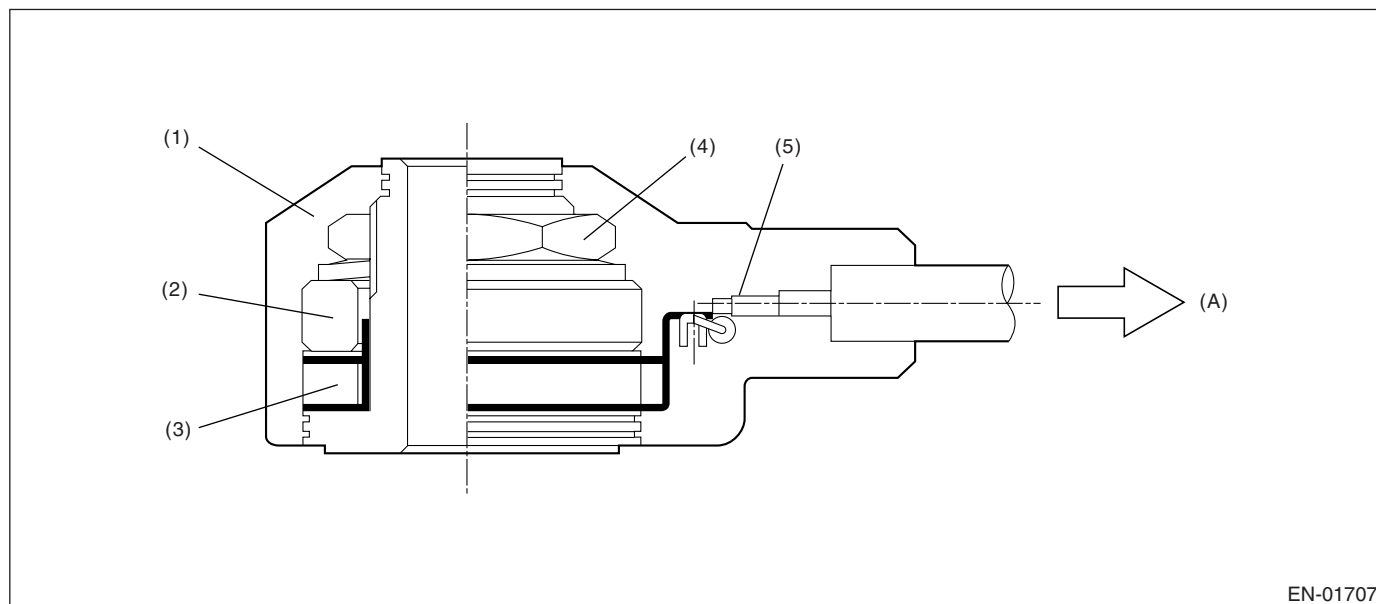
- Knock compensation final timing advance and retard value = knock compensation + whole learning compensation value + partial learning compensation value.
- At normal: knock compensation = 0°CA is fixed.
- At trouble: knock compensation = -5°CA . (Retard 5°CA .)
- Not allowed to update the whole learning compensation factor.
- Not allowed to calculate the partial learning zone compensation value.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

AX:DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR)**1. OUTLINE OF DIAGNOSIS**

Detect the open or short circuit of the knock sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION

- (1) Case
- (2) Weight
- (3) Piezoelectric element
- (4) Nut
- (5) Resistance

(A) To knock sensor harness

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform diagnosis continuously.

5. DIAGNOSTIC METHOD**• Abnormality Judgment**

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 1 second.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	$\geq 4.714 \text{ V}$
Ignition switch	ON

Time Needed for Diagnosis: 1 second

Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

• Normality Judgment

Judge OK and clear NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 4.714 V
Ignition switch	ON

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

Knock compensation:

- Knock compensation final timing advance and retard value = knock compensation + whole learning compensation value + partial learning compensation value.
- At normal: knock compensation = 0°CA is fixed.
- At trouble: knock compensation = -5°CA. (Retard 5°CA.)
- Not allowed to update the whole learning compensation factor.
- Not allowed to calculate the partial learning zone compensation value.

9. ECM OPERATION AT DTC SETTING

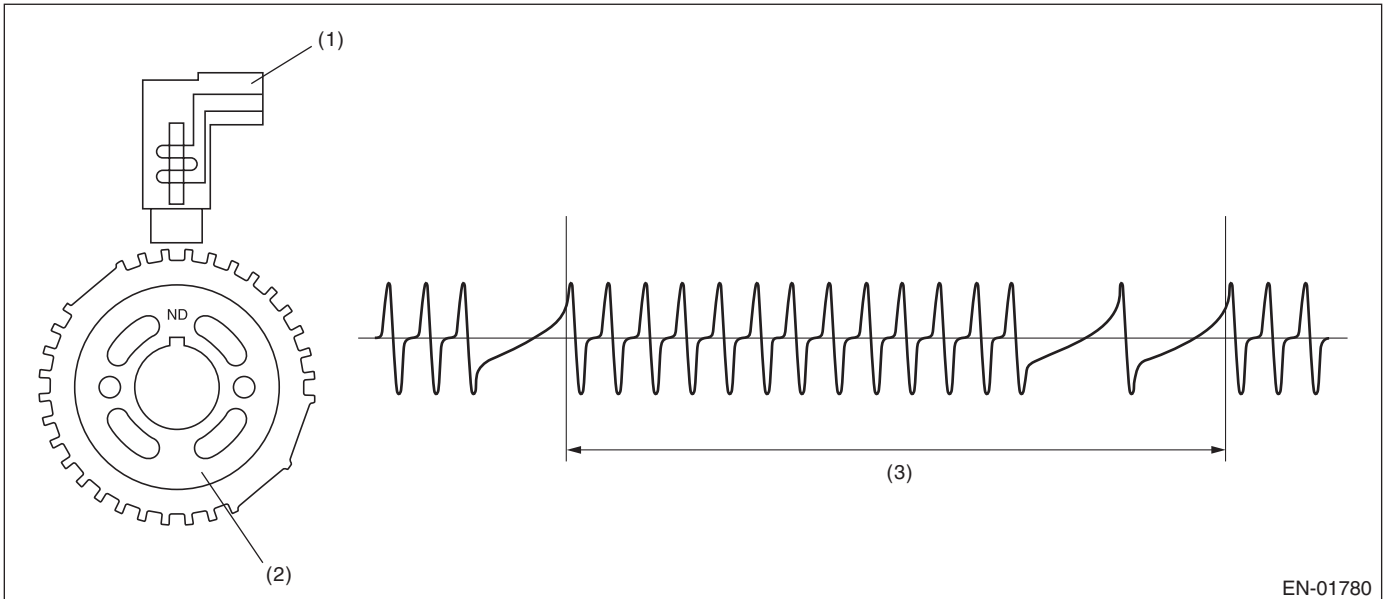
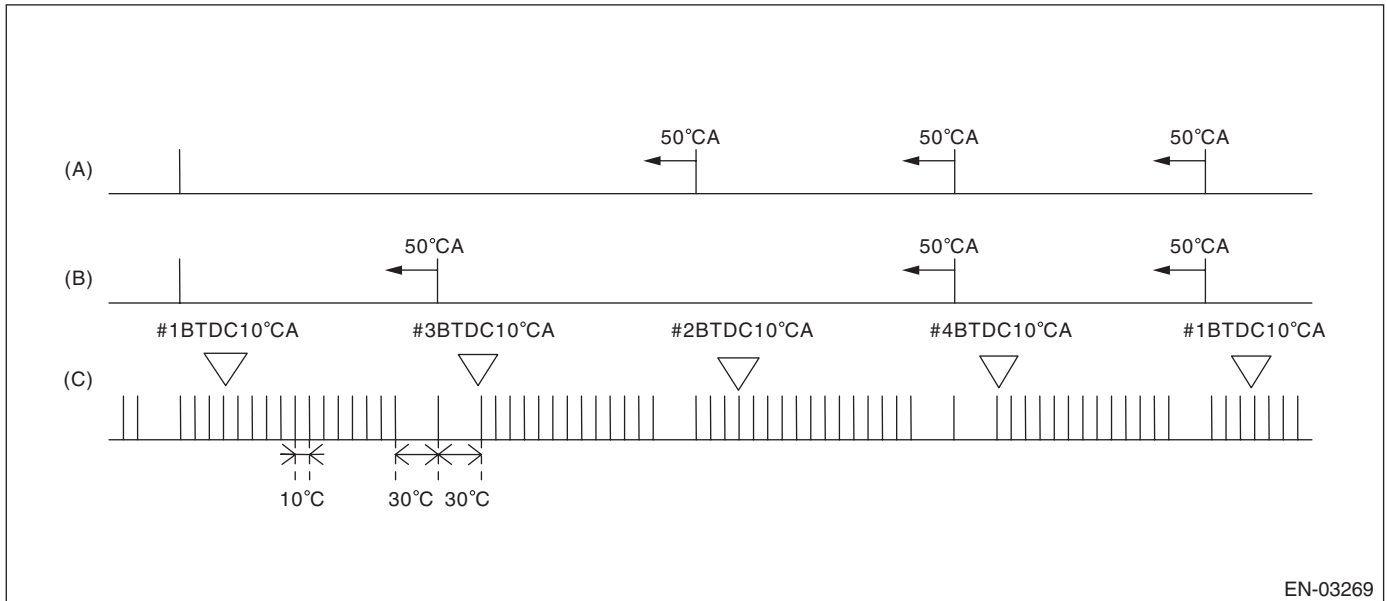
Memorize the freeze frame data. (For test mode \$02)

AY:DTC P0335 CRANKSHAFT POSITION SENSOR “A” CIRCUIT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of crankshaft position sensor. Judge NG when the crankshaft signal does not input regardless of turning the starter.

2. COMPONENT DESCRIPTION



- (1) Crankshaft position sensor
- (2) Crank sprocket
- (3) Crankshaft half-turn

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Starter switch	ON
Crankshaft position sensor signal	Not detected
Battery voltage	≥ 8 V

Time Needed for Diagnosis: 3 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Crankshaft position sensor signal	Input exists
Battery voltage	≥ 8 V

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

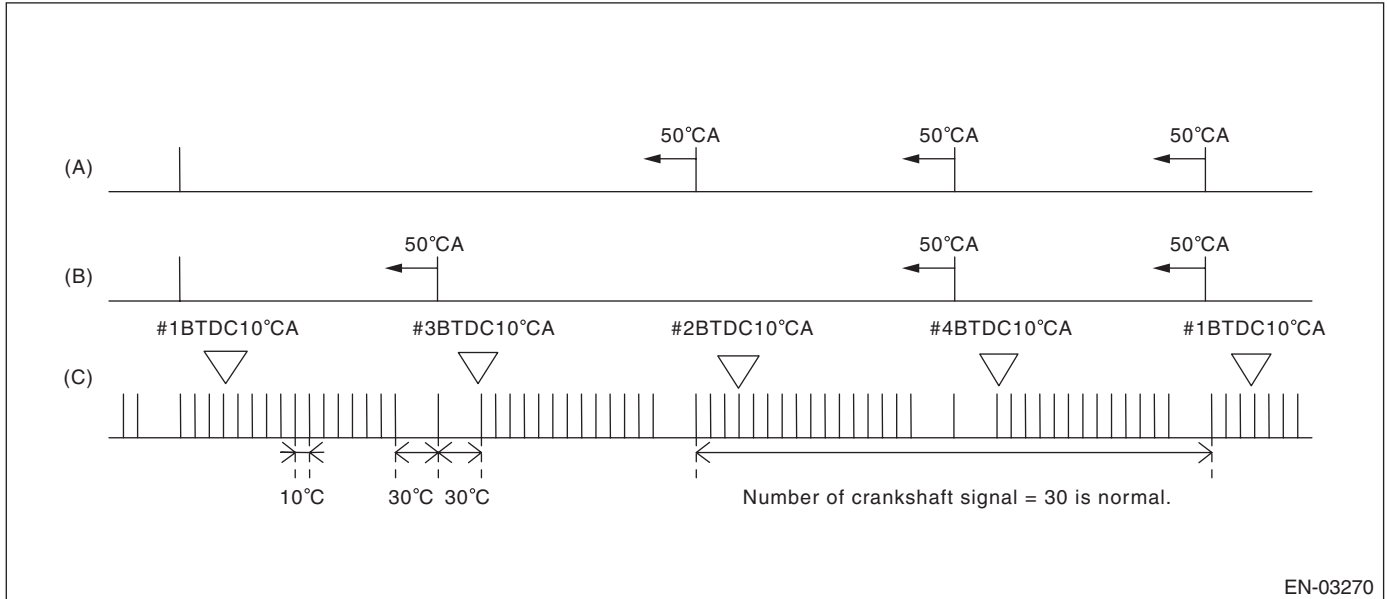
Memorize the freeze frame data. (For test mode \$02)

AZ:DTC P0336 CRANKSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE

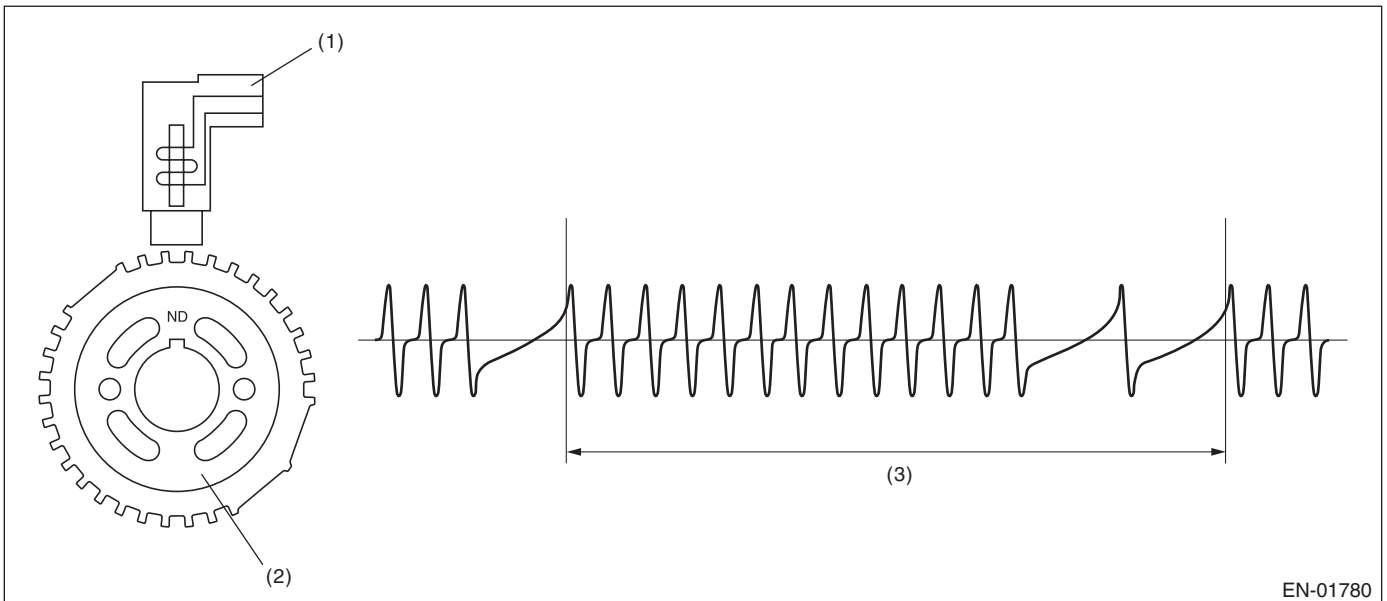
1. OUTLINE OF DIAGNOSIS

Detect the malfunction of crankshaft position sensor output property. Judge NG when the number of crankshaft signal every 1 revolution becomes abnormal.

2. COMPONENT DESCRIPTION



- (A) Camshaft signal RH
- (B) Camshaft signal LH
- (C) Crankshaft signal



- (1) Crankshaft position sensor
- (2) Crank sprocket
- (3) Crankshaft half-turn

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 8 V
Engine speed	$< 3,000$ rpm

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously under 3,000 rpm engine speed.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when all the malfunction criteria below are completed more than 10 times in a row.

Judgment Value

Malfunction Criteria	Threshold Value
Cylinder number distinction	Completed
Amount of crank sensor signal during 1 rev.	Not = 30

Time Needed for Diagnosis: 10 engine revs.

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Cylinder number distinction	Completed
Amount of crank sensor signal during 1 rev.	= 30

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

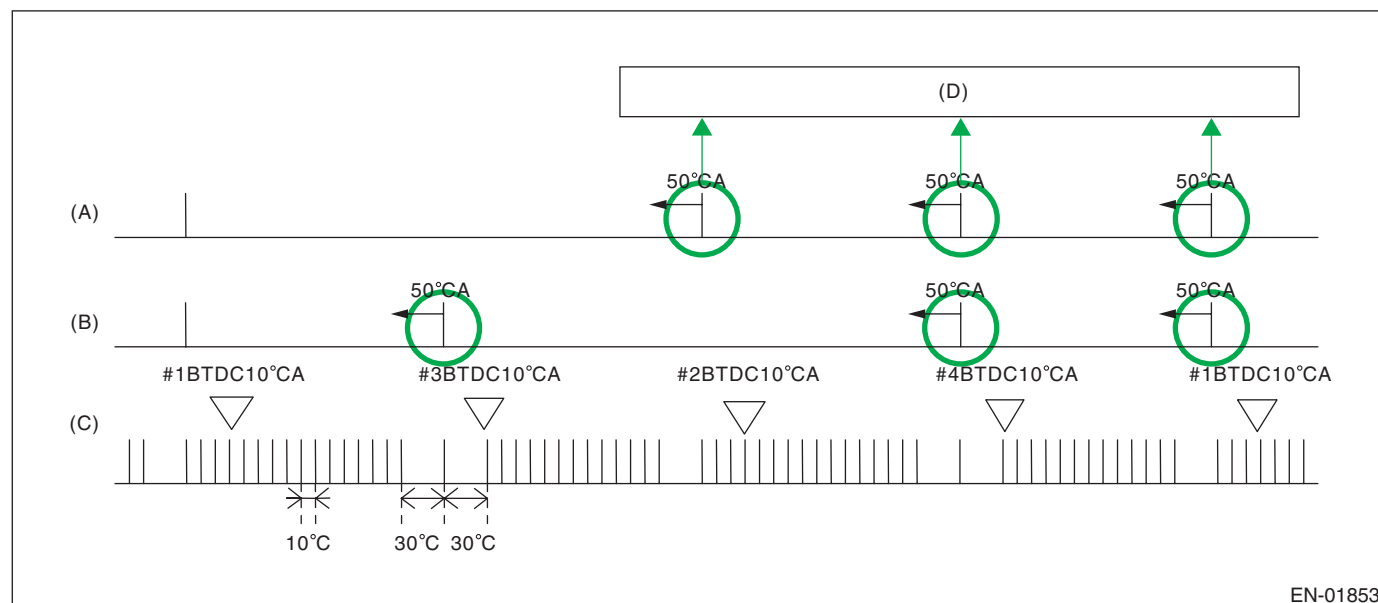
None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

BA:DTC P0340 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR)**1. OUTLINE OF DIAGNOSIS**

Detect the open or short circuit of camshaft position sensor. Judge NG when the number of camshaft signal remains to be abnormal.

2. COMPONENT DESCRIPTION

EN-01853

(A) Camshaft signal RH

(B) Camshaft signal LH

(C) Crankshaft signal

(D) Number of camshaft position signals = Receive camshaft position signal 3 times per tow engine revolutions.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Voltage	≥ 8 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD**• Abnormality Judgment**

The camshaft signal normally enters three times by two rev. of engine speed; however, judge NG when the camshaft signal does not enter three times continuously.

Judge NG when the malfunction criteria below are completed more than 100 rev. of engine speed. Judge OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Number of camshaft sensor signal during 2 rev.	Except 3
Engine speed	≥ 600 rpm

Time Needed for Diagnosis: 100 rev.

Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Number of camshaft angle signal during 2 rev.	3

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

- Ignition timing whole learning compensation:
 - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when IG OFF, and then make the whole learning incomplete.
 - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when making a normality judgment from abnormality judgment, and then make the whole learning incomplete.
- Ignition timing partial learning compensation:
 - Enter the initial value (0°C A) to the compensation value of partial learning zone when IG OFF.
 - Enter the initial value (0°C A) to the compensation value of partial learning zone when making a normality judgment from abnormality judgment.
- AVCS control:
 - Most timing retard learning is not complete or most timing retard learning completion is not experienced.
 - ISC feedback compensation: Do not perform the AVCS actual timing advance compensation.
 - Make the OCV driving Duty to be the given value (9.36%).

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

BB:DTC P0345 CAMSHAFT POSITION SENSOR "A" CIRCUIT (BANK 2)

NOTE:

For diagnostic procedure, refer to DTC P0340. <Ref. to GD(H4DOTC)-109, DTC P0340 CAMSHAFT POSITION SENSOR "A" CIRCUIT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

BC:DTC P0410 SECONDARY AIR INJECTION SYSTEM**1. OUTLINE OF DIAGNOSIS**

Detect leakage or blocking of secondary air injection system.

When the secondary air injection system is operated (pump is ON, right and left combi valves are open), close right and left combi valves, and detect NG by the secondary air supply pipe pressure and flow amount of secondary air pipe.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Presumed ambient temperature	4.4°C (40°F)
Battery voltage	10.9 V
After secondary air injection system is operated	0.6 seconds
Battery voltage	7 V
Atmospheric pressure	563 mmHg
Engine	In operation
(Pressure measuring condition)	
Electric load change - after change (Air conditioning, power steering, lights, rear defroster, heater fan, radiator fan, neutral switch)	More than 5 seconds
Intake air amount	2 g (0.07 oz)/sec. or more and 15 g (0.53 oz)/sec. or less
Engine speed	≥ 800 rpm and ≤ 3,800 rpm
Vehicle speed	≤ 0 km/h
Canister purge duty	≥ 0%
Variable amount of engine speed at every 128 milliseconds	< 40rpm

3. GENERAL DRIVING CYCLE

Perform the diagnosis when the secondary air pump is operated.

4. DIAGNOSTIC METHOD

When the secondary air injection system is operated (pump is operated, right and left combi valves are open), close right and left combi valves respectively as following, and measure the secondary air supply pipe pressure and flow amount of secondary air pipe. Detect NG by 2 methods of pump supply pressure check and flow amount check.

Pump supply pressure check

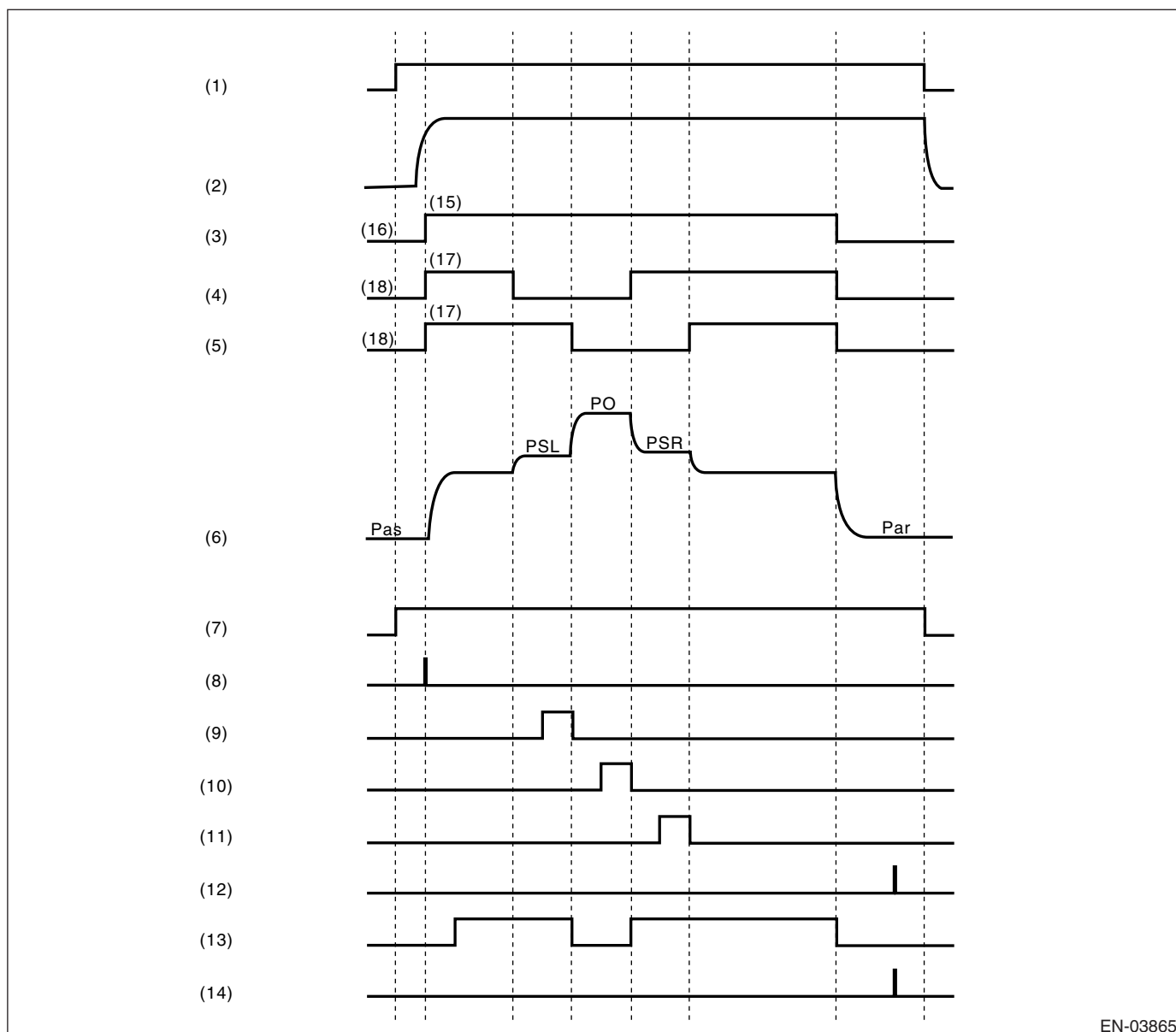
Judge NG for the pump supply pressure when secondary air supply pipe pressure is lower than ambient pressure and judge OK when it is higher, when the secondary air pump is ON.

Flow amount check

When the secondary air injection system is operated (pump is operated, right and left combi valves are open), close right combi valve → close left combi valve → open right combi valve → open left combi valve, measure each secondary air supply pipe pressure (PSL, P0, PSR) and calculate the flow amount of secondary air pipe by these measurements. Detect NG according to flow amount of secondary air pipe.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION



EN-03865

(1) IG	(9) Right bank closure pressure (PSL) measurement	(14) Flow amount check (judgement)
(2) Ne		(15) ON
(3) Secondary air pump is operated	(10) Both banks closure pressure (PO) measurement	(16) OFF
(4) E-COMB valve (right) status		(17) Open
(5) E-COMB valve (left) status	(11) Left bank closure pressure (PSR) measurement	(18) Closed
(6) Secondary air supply pipe pressure (psai)		
(7) Diagnostic Enable Conditions	(12) Ambient pressure after secondary air operation (Par) measurement	
(8) Ambient pressure before secondary air operation (Pas) measurement		
	(13) Pump supply pressure check (judgment)	

Judgment Value

Judge NG when the malfunction criteria below are completed. Judge OK and clear the NG when the malfunction criteria below are not completed.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Pump supply pressure check

Malfunction Criteria	Threshold Value	DTC
Secondary air supply pipe relative pressure	< Value of Map 14	P0410

Map14

Unit: kPa (mmHg, inHg)		Ambient pressure (kPa (mmHg, inHg))							
		69.3 (520, 20.47)	74.6 (560, 22.03)	80.0 (600, 23.63)	85.3 (640, 25.19)	90.6 (680, 26.76)	96.0 (720, 28.35)	101.3 (760, 29.92)	106.6 (800, 31.48)
Battery voltage (V)	10.5	0.93 (7, 0.275)	0.93 (7, 0.275)	0.93 (7, 0.275)	0.93 (7, 0.275)	0.93 (7, 0.275)	0.93 (7, 0.275)	0.93 (7, 0.275)	0.93 (7, 0.275)
	11.5	0.93 (7, 0.275)	0.93 (7, 0.275)	0.93 (7, 0.275)	0.93 (7, 0.275)	0.93 (7, 0.275)	0.93 (7, 0.275)	0.93 (7, 0.275)	0.93 (7, 0.275)
	12.5	0.93 (7, 0.275)	0.93 (7, 0.275)	0.93 (7, 0.275)	0.93 (7, 0.275)	0.93 (7, 0.275)	0.93 (7, 0.275)	0.93 (7, 0.275)	0.93 (7, 0.275)
	13.5	0.93 (7, 0.275)	0.93 (7, 0.275)	0.93 (7, 0.275)	0.93 (7, 0.275)	0.93 (7, 0.275)	0.93 (7, 0.275)	0.93 (7, 0.275)	0.93 (7, 0.275)
	14.5	0.93 (7, 0.275)	0.93 (7, 0.275)	0.93 (7, 0.275)	0.93 (7, 0.275)	0.93 (7, 0.275)	0.93 (7, 0.275)	0.93 (7, 0.275)	0.93 (7, 0.275)
	15.5	0.93 (7, 0.275)	0.93 (7, 0.275)	0.93 (7, 0.275)	0.93 (7, 0.275)	0.93 (7, 0.275)	0.93 (7, 0.275)	0.93 (7, 0.275)	0.93 (7, 0.275)

Flow amount check

Malfunction Criteria	Threshold Value	DTC
Incorrect flow Presumed secondary air flow amount at bank 1 opened or Presumed secondary air flow amount at bank 2 opened Map (P0 vs PSL)	> Value of Map 20 > Value of Map 19	P0411
Bank 1 is stuck open Presumed secondary air flow amount at bank 1 opened and Both banks closure pressure	< Value of Map 16 < Value of Map 18	P2440
Bank 1 is stuck closed Presumed secondary air flow amount at bank 1 opened and Both banks closure pressure	< Value of Map 16 ≥ Value of Map 18	P2441
Bank 2 is stuck open Presumed secondary air flow amount at bank 2 opened and Both banks closure pressure	< Value of Map 15 < Value of Map 18	P2442
Bank 2 is stuck closed Presumed secondary air flow amount at bank 2 opened and Both banks closure pressure	< Value of Map 15 ≥ Value of Map 18	P2443

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Map 15, Map 16

Unit: ℓ /min		Intake air flow (g (oz)/s)								
		7 (0.247)	8 (0.282)	9 (0.317)	10 (0.353)	11 (0.388)	12 (0.423)	13 (0.459)	14 (0.494)	15 (0.529)
Battery voltage (V)	11.0	4.1	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	11.5	4.1	4.1	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	12.0	4.1	4.1	4.1	1.0	1.0	1.0	1.0	1.0	1.0
	12.5	10.0	10.0	10.0	4.1	4.1	4.1	1.0	1.0	1.0
	13.0	17.5	17.5	17.5	10.0	10.0	10.0	4.1	1.0	1.0
	13.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	4.1	4.1
	14.0	17.5	17.5	17.5	17.5	17.5	17.5	17.5	10.0	10.0
	14.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	10.0	10.0

Map 18

Unit: kPa (mmHg, inHg)		Ambient pressure (kPa (mmHg, inHg))							
		69.3 (520, 20.47)	74.6 (560, 22.03)	80.0 (600, 23.63)	85.3 (640, 25.19)	90.6 (680, 26.76)	96.0 (720, 28.35)	101.3 (760, 29.92)	106.6 (800, 31.48)
Battery voltage (V)	10.5	78.0 (585, 23.03)	84.0 (630, 24.80)	90.0 (675, 26.58)	96.0 (720, 28.35)	102.0 (765, 30.13)	108.0 (810, 31.90)	114.0 (855, 33.67)	120.0 (900, 35.44)
	11.5	79.3 (595, 23.42)	85.4 (641, 25.22)	91.6 (687, 27.05)	97.7 (733, 28.86)	103.7 (778, 30.63)	109.8 (824, 32.43)	116.0 (870, 34.26)	122.1 (916, 36.06)
	12.5	80.8 (606, 23.86)	86.9 (652, 25.67)	93.2 (699, 27.53)	99.3 (745, 29.33)	105.6 (792, 31.19)	111.7 (838, 32.99)	118.0 (885, 34.85)	124.2 (932, 36.68)
	13.5	82.1 (616, 24.25)	88.4 (663, 26.11)	94.8 (711, 28.0)	101.0 (758, 29.83)	107.3 (805, 31.69)	113.7 (853, 33.58)	120.0 (900, 35.44)	126.2 (947, 37.27)
	14.5	83.4 (626, 24.63)	89.8 (674, 26.52)	96.2 (722, 28.41)	102.8 (771, 30.36)	109.2 (819, 32.25)	115.6 (867, 34.14)	122.0 (915, 36.03)	128.4 (963, 37.92)
	15.5	84.8 (636, 25.05)	89.8 (685, 26.52)	97.8 (734, 28.89)	104.4 (783, 30.83)	110.9 (832, 32.75)	117.4 (881, 34.67)	124.0 (930, 36.62)	130.5 (979, 38.54)

Map 19, Map 20

Unit: ℓ /min		Intake air flow (g (oz)/s)								
		2.0 (0.071)	4.0 (0.141)	6.0 (0.212)	8.0 (0.282)	10.0 (0.353)	12.0 (0.423)	14.0 (0.494)	16.0 (0.564)	18.0 (0.635)
Battery voltage (V)	10.5	290	290	290	290	290	290	290	290	290
	11.5	330	330	330	330	330	330	330	330	330
	12.5	370	370	370	370	370	370	370	370	370
	13.5	420	420	420	420	420	420	420	420	420
	14.5	470	470	470	470	470	470	470	470	470
	15.5	520	520	520	520	520	520	520	520	520

Time Needed for Diagnosis: 7 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

BD:DTC P0411 SECONDARY AIR INJECTION SYSTEM INCORRECT FLOW DETECTED

NOTE:

For the diagnostic procedure, refer to DTC P0410. <Ref. to GD(H4DOTC)-111, DTC P0410 SECONDARY AIR INJECTION SYSTEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

BE:DTC P0413 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “A” CIRCUIT OPEN

1. OUTLINE OF DIAGNOSIS

Judge NG when the ECM output level is different from the actual terminal level.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
OFF	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Ignition	ON
Terminal voltage when ECM transmits OFF signal	Low

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Ignition	ON
Terminal voltage when ECM transmits OFF signal	High

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

**BF:DTC P0414 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “A”
CIRCUIT SHORTED****1. OUTLINE OF DIAGNOSIS**

Judge NG when the ECM output level is different from the actual terminal level.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
OFF	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD**• Abnormality Judgment**

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Ignition	ON
Terminal voltage when ECM transmits ON signal	High

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Ignition	ON
Terminal voltage when ECM transmits ON signal	Low

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

BG:DTC P0416 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “B” CIRCUIT OPEN

NOTE:

For the diagnostic procedure, refer to DTC P0413. <Ref. to GD(H4DOTC)-116, DTC P0413 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “A” CIRCUIT OPEN, Diagnostic Trouble Code (DTC) Detecting Criteria.>

BH:DTC P0417 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “B” CIRCUIT SHORTED

NOTE:

For the diagnostic procedure, refer to DTC P0414. <Ref. to GD(H4DOTC)-117, DTC P0414 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “A” CIRCUIT SHORTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

BI: DTC P0418 SECONDARY AIR INJECTION SYSTEM CONTROL “A” CIRCUIT OPEN**1. OUTLINE OF DIAGNOSIS**

Judge NG when the ECM output level is different from the actual terminal level.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
OFF	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD**• Abnormality Judgment**

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Ignition	ON
Terminal voltage when ECM transmits OFF signal	Low

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Ignition	ON
Terminal voltage when ECM transmits OFF signal	High

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

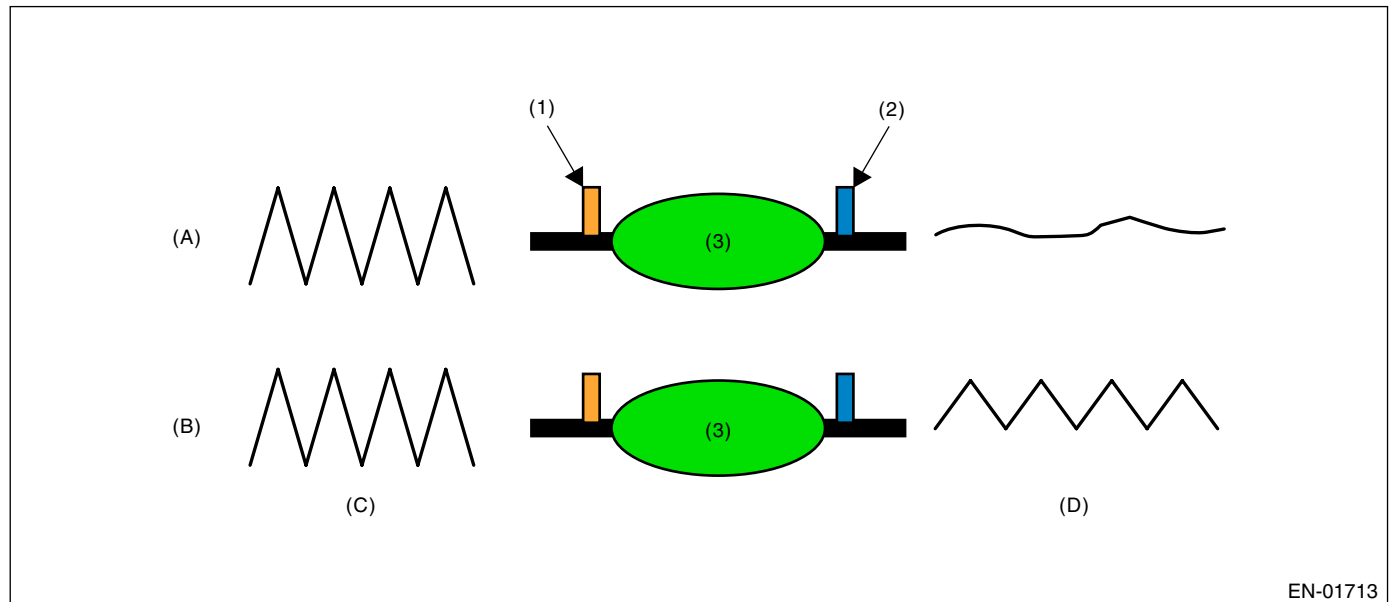
BJ:DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect the deterioration of catalyst function.

Though the rear oxygen sensor output would change slowly with a new catalyst, the sensor output with a deteriorated catalyst becomes high and the inversion time is shortened. For this reason, the catalyst diagnosis is carried out by monitoring the rear oxygen sensor output and comparing it with the front A/F sensor output.

2. COMPONENT DESCRIPTION



- (1) Front oxygen (A/F) sensor
- (2) Rear oxygen sensor
- (3) Catalyst

- (A) Normal
- (B) Deterioration
- (C) Front oxygen (A/F) sensor waveform
- (D) Rear oxygen sensor waveform

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
Atmospheric pressure	> 75.0 kPa (563 mmHg, 22.2 inHg)
Engine coolant temperature	≥ 70°C (158°F)
Catalyst warm-up counter on Map 2	≥ 8,000
Misfire detection during 200 engine revs.	< 5 times
Learning value of evaporation gas density	< 0.20
Sub feedback	Operating
Evaporative system diagnostic	Not in operation
Difference between actual and target time lambda < 0.10	1,000 milliseconds or more
Vehicle speed	≥ 70 km/h (47 MPH)
Amount of intake air	12 ↔ 40 g/s
Engine load change every 0.5 engine revs.	< 0.02 g/rev
Rear O ₂ output change from below 660 mV to over	Experienced after fuel cut
After engine starting	≥ 235 seconds
Purge execution cumulative time after engine starting	≥ 19.9 seconds

• Map 2

Add the following value every 512 milliseconds.

Catalyst warm-up counter ≤ 9,000

Amount of intake air (g/s)	0	5	7.5	10	15	20	25	30	35	40	45	50
Integrated value for warm-up counter	-5	-5	1	11	25	40	57	72	87	100	100	100

Catalyst warm-up counter > 9,000

Amount of intake air (g/s)	0	5	7.5	10	15	20	25	30	35	40	45	50
Integrated value for warm-up counter	-16	-8	-1	3	6	8	9	11	13	14	14	14

4. GENERAL DRIVING CYCLE

Perform the diagnosis once at the constant vehicle speed of 75 km/h (47 MPH) or more after warming up the engine.

5. DIAGNOSTIC METHOD

After the malfunction criteria are completed, calculate the output fluctuation value of front oxygen (A/F) sensor and output fluctuation value of rear oxygen sensor.

Calculate the diagnosis value when the front oxygen (A/F) sensor output fluctuation value more than specified value.

Regard the A/F response properties and diagnosis value as parameters for judgment value.

Judge NG when the malfunction criteria below are completed, and judge OK when they are not completed.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Judgment Value

Malfunction Criteria	Threshold Value
Accumulated variation of output voltage of rear oxygen sensor per 32 milliseconds divided by accumulated variation of lambda of front oxygen (A/F) sensor per 32 milliseconds	≥ 12.6

Time Needed for Diagnosis: 33 — 55 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

None

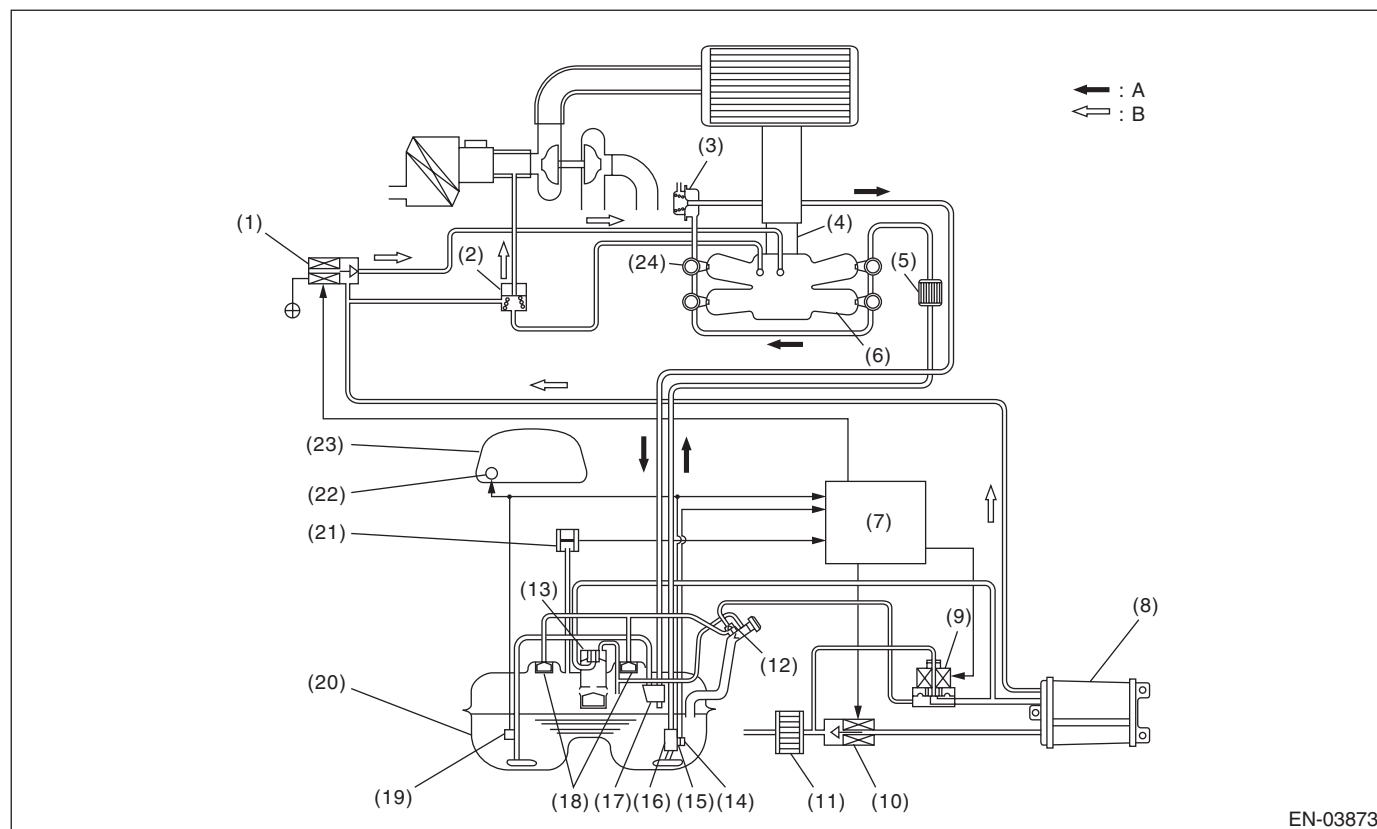
9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

BK:DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECT-ED (SMALL LEAK)

1. OUTLINE OF DIAGNOSIS

Perform the diagnosis of leakage of fuels system and valve functions.



EN-03873

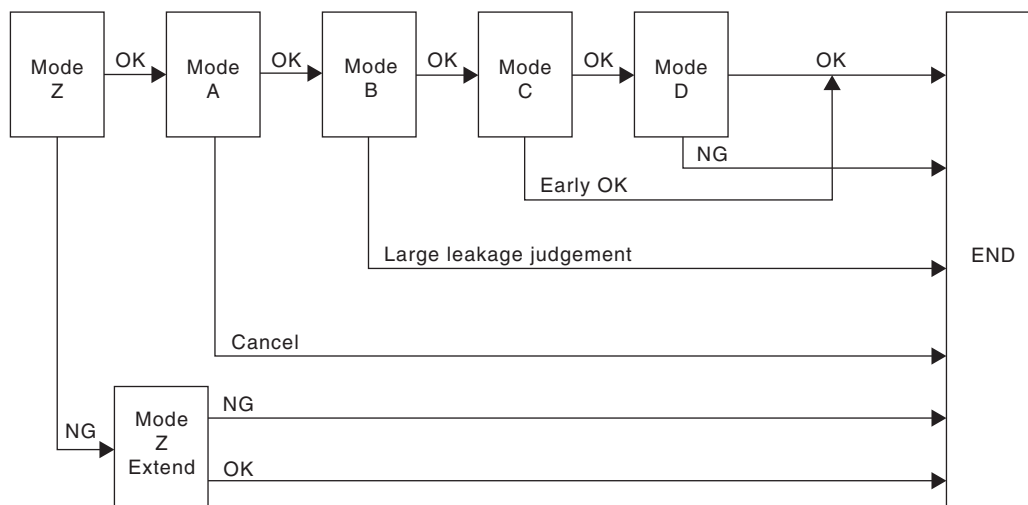
(1) Purge control solenoid valve	(10) Drain valve	(19) Fuel sub level sensor
(2) Purge valve	(11) Drain filter	(20) Fuel tank
(3) Pressure regulator	(12) Shut-off valve	(21) Fuel tank pressure sensor
(4) Throttle body	(13) Vent valve	(22) Fuel gauge
(5) Fuel filter	(14) Fuel temperature sensor	(23) Combination meter
(6) Intake manifold	(15) Fuel level sensor	(24) Fuel injector
(7) Engine control module (ECM)	(16) Fuel pump	(A) Fuel line
(8) Canister	(17) Jet pump	(B) Evaporation fuel line
(9) Pressure control solenoid valve	(18) Fuel cut valve	

In this system diagnosis, filter tank pressure is changed. And leakage and normality & abnormality of valve operation are judged by monitoring the pressure change status using the fuel tank pressure sensor. The diagnosis is performed for 0.04-inch diagnosis in the order of Mode A, Mode B, Mode C and Mode D. For 0.02-inch diagnosis, perform in the order of Mode Y, Mode A, Mode B, Mode C and Mode D.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

0.04-inch Diagnosis



EN-02872

Mode	Mode Description	Diagnosis Period
Mode Z (Purge control solenoid valve open fail diagnosis)	Perform the diagnosis of purge control solenoid valve open fail depending on the magnitude of the tank pressure change after diagnosis started.	3 — 16 seconds
Mode A (Evaluation of EVAP. generation amount)	Calculate the tank pressure change amount (P1).	10 seconds
Mode B (Negative pressure sealed/large leak judgment)	Introduce the intake manifold pressure into the fuel tank. If the tank pressure cannot be reduced, diagnose that there is large leakage.	5 — 25 seconds
Mode C (Pressure increase check/premature OK judgment)	Wait until the tank pressure returns to the target value (Tank pressure when P2 calculation started). If the pressure does not return, perform the premature OK judgment.	1 — 15 seconds
Mode D (Negative pressure change amount measurement/EVAP. leakage diagnosis)	Calculate the tank pressure change amount (P2), and measure the diagnosis value using P1 calculated in Mode A. Perform the EVAP. leakage diagnosis using the diagnosis value.	10 seconds

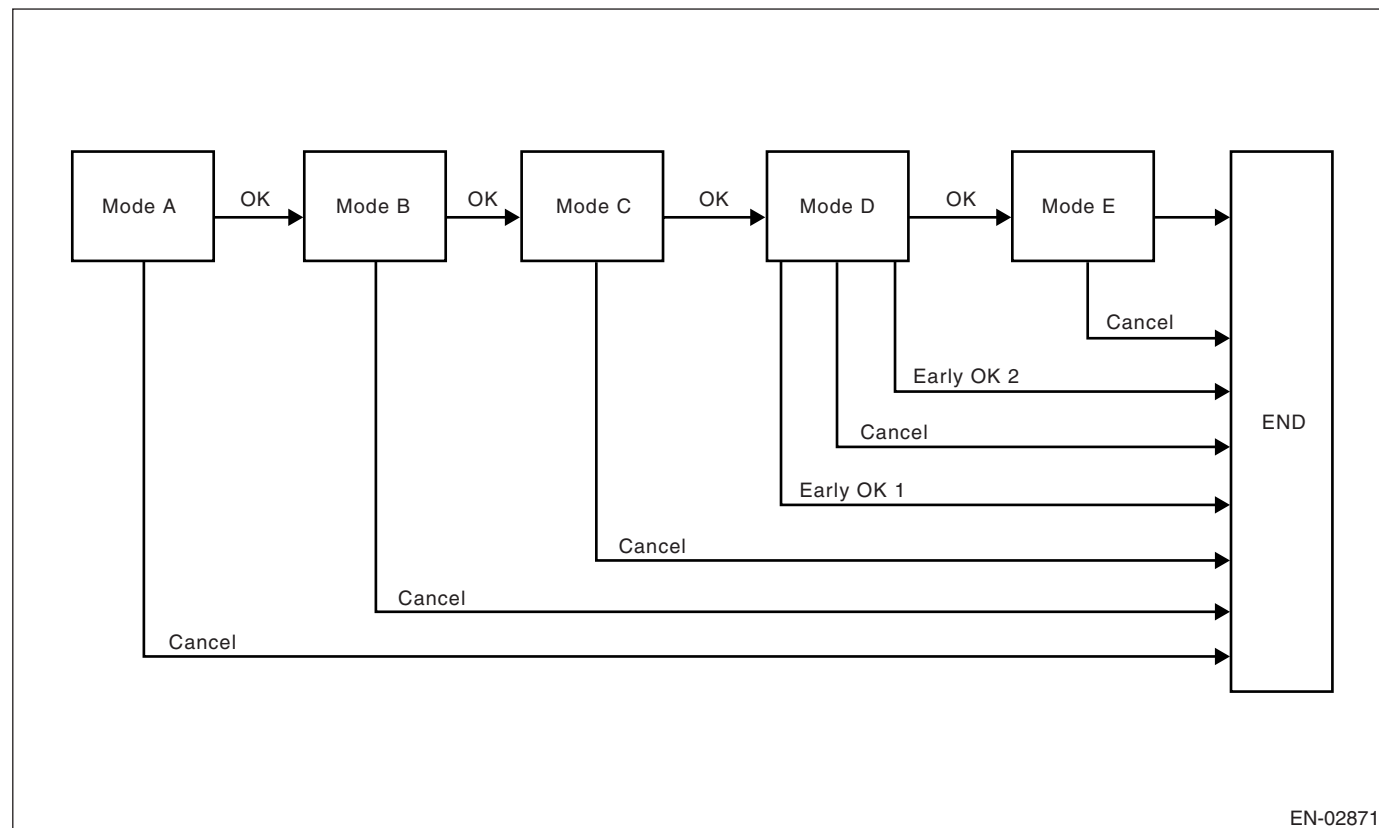
Mode table for Evaporative Emission Control System diagnosis

Mode	Normal conditions	Diagnostic item	DTC
Mode Z	Nearly same as atmospheric pressure (equivalent pressure of 0 kPa (0 mmHg, 0 inHg))	Purge control solenoid valve is judged to be open.	P0457
Mode A	Pressure is in proportion to amount of evaporative emission.	—	—
Mode B	Negative pressure is formed due to intake manifold negative pressure	Large leak	P0457
Mode C	Target pressure is reached.	—	—
Mode D	Pressure change is small.	EVAP system is judged to have large leak [1.0 mm (0.04 in)].	P0442

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

0.02-inch Diagnosis



Mode	Mode Description	Diagnosis Period
Mode A (0 point correction)	Wait until the tank pressure returns to 0 point (around 0 mmHg) when tank pressure is high.	0 — 12 seconds
Mode B (Introduce negative pressure)	Introduce the intake manifold pressure to the fuel tank and reduce the tank pressure to the desired value.	0 — 27 seconds
Mode C (Maintain negative pressure)	Wait until the tank pressure returns to target pressure (start pressure of P2 calculation).	0 — 20 seconds
Mode D (Calculation of negative pressure variation)	Calculate the time until the tank pressure returns the end pressure of P2 calculation. Make advanced OK judgment when the tank pressure does not return the end pressure of P2 calculation.	0 — 200 seconds
Mode E (Calculation of Evaporative gas yield)	Calculate the amount of evaporative gas yield (P1).	0 — 280 seconds

Diagnostic Trouble Code (DTC) Detecting Criteria

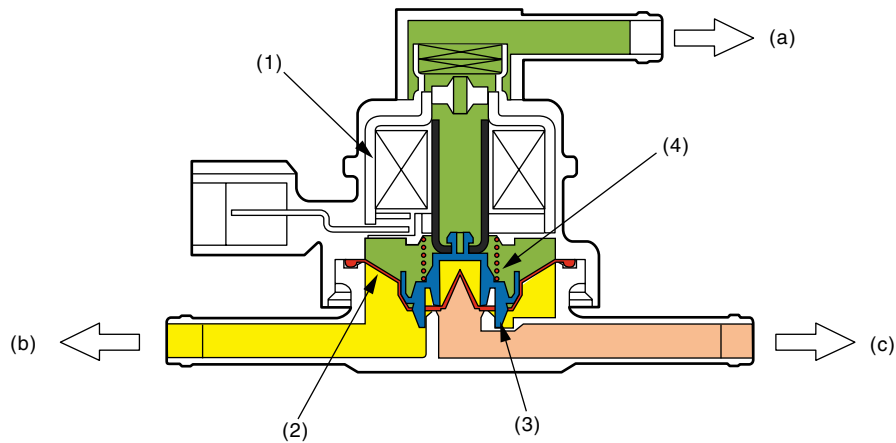
GENERAL DESCRIPTION

2. COMPONENT DESCRIPTION

• Pressure Control Solenoid Valve

Pressure control solenoid valve maintains the fuel tank pressure equal to the atmospheric air pressure. Normally, the solenoid is set to OFF, and the valve mechanically opens and closes in accordance with the difference between the tank pressure and atmospheric air pressure, and the tank pressure and canister pressure.

The solenoid which is set to ON forces to open the valve.



EN-01715

- (1) Solenoid
- (2) Diaphragm
- (3) Valve
- (4) Spring

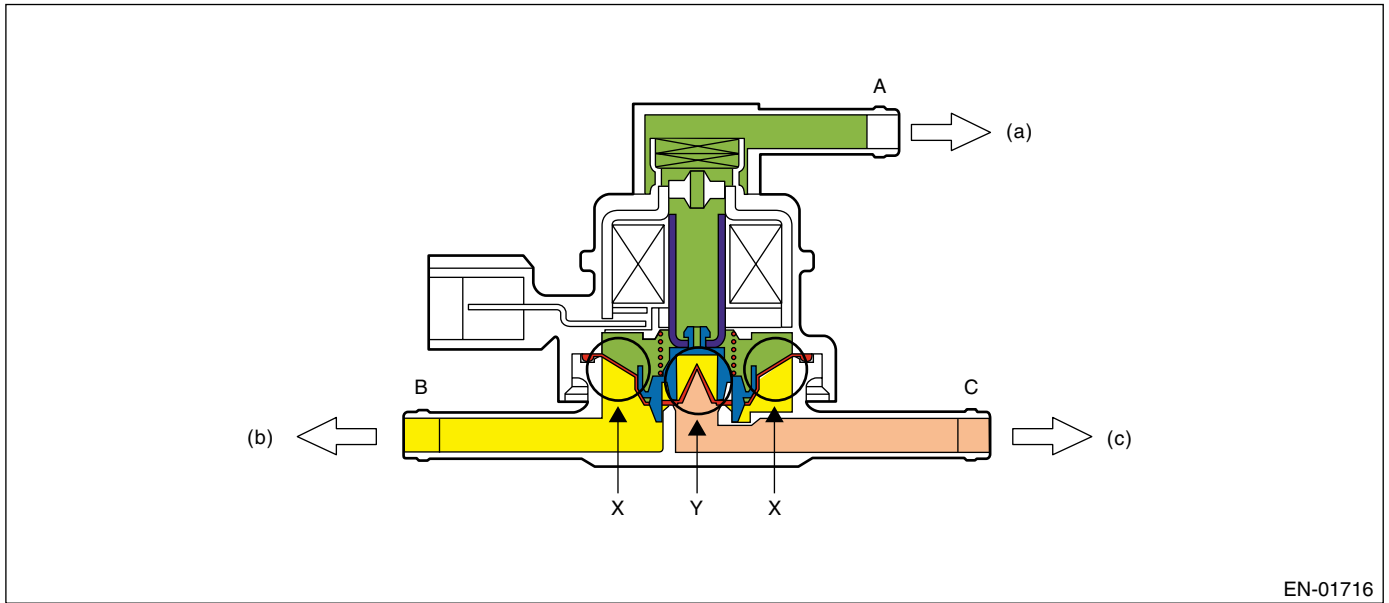
- (a) Atmospheric pressure
- (b) Fuel tank
- (c) Canister

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

• Valve Operation and Air Flow

As in the X parts below, there are the area with atmospheric air pressure above the diaphragm and the area with tank pressure below the diaphragm. Also, as in the Y parts below, there are the area with tank pressure above the diaphragm and the area with canister pressure below the diaphragm. In the table below the air flow from each port in accordance with pressure difference is shown with the atmospheric air pressure port A, tank pressure port B and canister pressure port C.



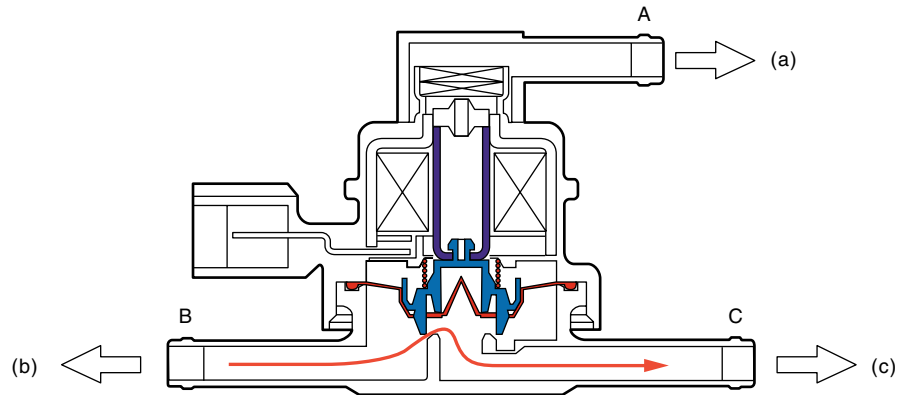
- (a) Atmospheric pressure
- (b) Fuel tank
- (c) Canister

Pressure Status	Flow
A < B (Solenoid OFF)	B → C
B < C (Solenoid OFF)	C → B
Solenoid ON	B ↔ C

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

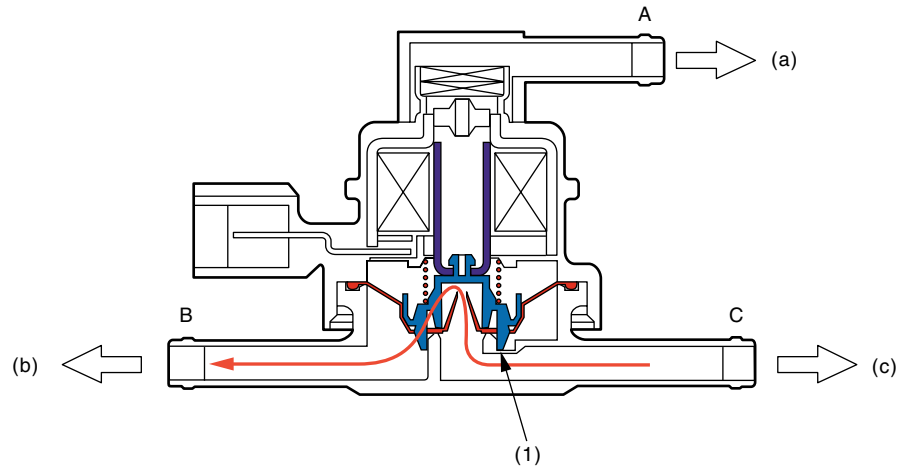
When $A < B$ (Solenoid OFF)



EN-01717

- (a) Atmospheric pressure
- (b) Fuel tank
- (c) Canister

When $B < C$ (Solenoid OFF)



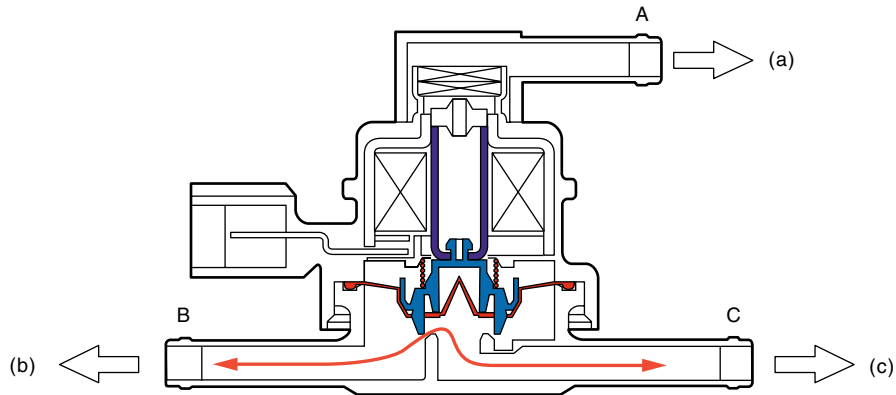
EN-01718

- (1) Valve
- (a) Atmospheric pressure
- (b) Fuel tank
- (c) Canister

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

When solenoid is ON

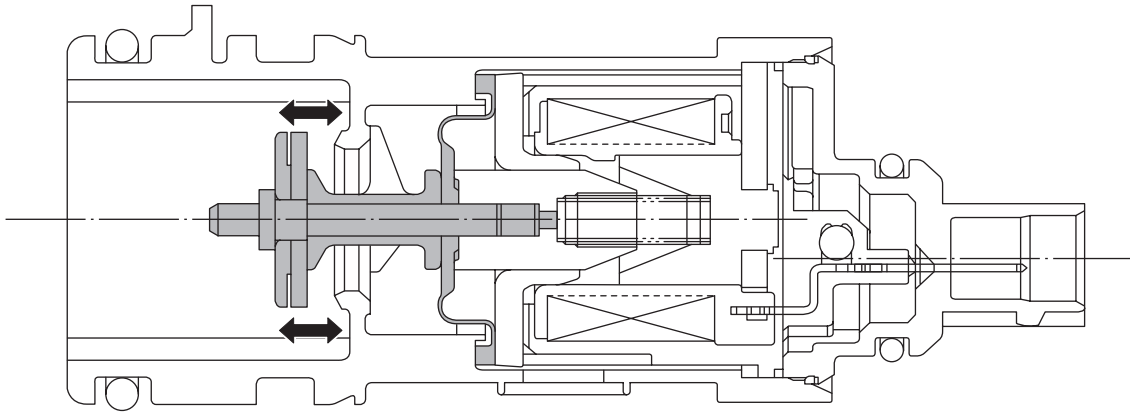


EN-01719

- (a) Atmospheric pressure
- (b) Fuel tank
- (c) Canister

• Drain valve

Drain valve controls the ambient air to be introduced to the canister.



EN-02293

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

3. ENABLE CONDITION

0.04-inch Diagnosis

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 10.9 \text{ V}$
Barometric pressure	$\geq 75.0 \text{ kPa}$ (563 mmHg, 22.2 inHg)
Cumulative time of canister purge	120 seconds or more
After engine starting	856 seconds or more
Learning value of evaporation gas density	≤ 0.04
Engine speed	1,050 $\longleftrightarrow$ 6,500 rpm
Fuel tank pressure	$\geq -1.4 \text{ kPa}$ (-10.7 mmHg , -0.42 inHg)
Intake manifold vacuum (relative pressure)	$< -13.3 \text{ kPa}$ (-100 mmHg , -3.94 inHg)
Vehicle speed	$\geq 32 \text{ km/h}$ (19.9 MPH)
Fuel level	9 $\longleftrightarrow$ 51 $\varnothing$ (2.38 $\longleftrightarrow$ 13.47 US gal, 1.98 $\longleftrightarrow$ 11.22 Imp gal)
Closed air/fuel ratio control	In operation
Fuel temperature	$-10 \longleftrightarrow 45^\circ\text{C}$ (14 $\longleftrightarrow$ 113°F)
Intake air temperature	$\geq -10^\circ\text{C}$ (14°F)
Pressure change per second	$< 0.23 \text{ kPa}$ (1.7 mmHg, 0.07 inHg)
Min. pressure change per second – Max. pressure change per second	$< 0.23 \text{ kPa}$ (1.7 mmHg, 0.07 inHg)
Fuel level change	$< 2.5 \varnothing / 128 \text{ milliseconds}$ (0.66 US gal/128 milliseconds, 0.55 Imp gal/128 milliseconds)
Air fuel ratio	0.76 — 1.25

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

0.02-inch Diagnosis

Secondary Parameters	Enable Conditions
(At starting a diagnosis)	
Evaporation diagnosis	Not completed
Battery voltage	≥ 10.9 V
Atmospheric pressure	≥ 75.0 kPa (563 mmHg, 22.2 inHg)
Since last incomplete diagnosis event of 0.02-inch leakage	
Cancelled at mode A	> 120 seconds
Cancelled at other than mode A	> 600 seconds
Cumulative time of canister purge	120 seconds or more
After engine starting	770 second or more
Fuel temperature	−10 — 70°C (14 — 158°F)
Fuel level	9 — 51 ℓ (2.38 — 13.47 US gal, 1.98 — 11.22 Imp gal)
Intake manifold vacuum (relative pressure)	< −13.3 kPa (−100 mmHg, −3.93 inHg)
Fuel tank pressure	−0.67 — 1.43 kPa (−5 — 10.7 mmHg, −0.20 — 0.42 inHg)
Vehicle speed	≥ 68 km/h (42 MPH)
Closed air/fuel ratio control	In operation
Engine speed	550 ↔ 6,000 rpm
(During diagnosis)	
Fuel level change	≤ Value of Map
Pressure change per second	< 0.06 kPa (0.44 mmHg, 0.02 inHg)
Min. tank pressure change per second – Max. tank pressure change per second	< 0.07 kPa (0.51 mmHg, 0.02 inHg)
Tank pressure change per second	≤ 0.1 kPa (0.75 mmHg, 0.03 inHg)
Pressure change (Mode D)	−0.47 ↔ 0.32 kPa (−3.5 ↔ 2.4 mmHg, −0.14 ↔ 0.09 inHg)
Pressure change (Mode E)	−0.32 ↔ 0.32 kPa (−2.4 ↔ 2.4 mmHg, −0.09 ↔ 0.09 inHg)

Map

Fuel level (ℓ , US gal, Imp gal)	0	10, 2.64, 2.2	20, 5.28, 4.4	30, 7.93, 6.6	40, 10.57, 8.8	50, 13.21, 11	60, 15.85, 13.2
Variation (ℓ , US gal, Imp gal)	4.2, 1.11, 0.92	4.2, 1.11, 0.92	4.1, 1.08, 0.9	4.0, 1.06, 0.88	3.9, 1.03, 0.86	3.8, 1.0, 0.84	3.8, 1.0, 0.84

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

4. GENERAL DRIVING CYCLE

0.04-inch Diagnosis

- Perform the diagnosis only once in more than 856 seconds after the engine start at the constant driving speed of 32 km/h (19.9 MPH) or more.
- Pay attention to the fuel temperature and fuel level.

0.02-inch Diagnosis

- Perform diagnosis in more than 770 seconds after engine start at the constant speed of 68 km/h (42 MPH) or more, and judged OK or NG.
- If not judged OK or NG, repeat the diagnosis.
- Pay attention to the fuel level.

5. DIAGNOSTIC METHOD

• Diagnosing Function of Purge Control Solenoid Valve

DTC

P0457 Evaporative Emission Control System Leak Detected (Fuel Cap Loose/Off)

Purpose of Mode Z

When performing the leakage diagnosis of EVAP system, purge control solenoid valve have to operate normally. Therefore, mode Z is used to diagnose the purge control solenoid valve open fixation.

If purge control solenoid valve open fixation trouble is detected, the evaporation system leakage diagnosis is cancelled.

• Diagnosing function of purge control solenoid valve [P0457]

Purge control solenoid valve functional diagnosis is performed by monitoring the tank pressure in Mode Z.

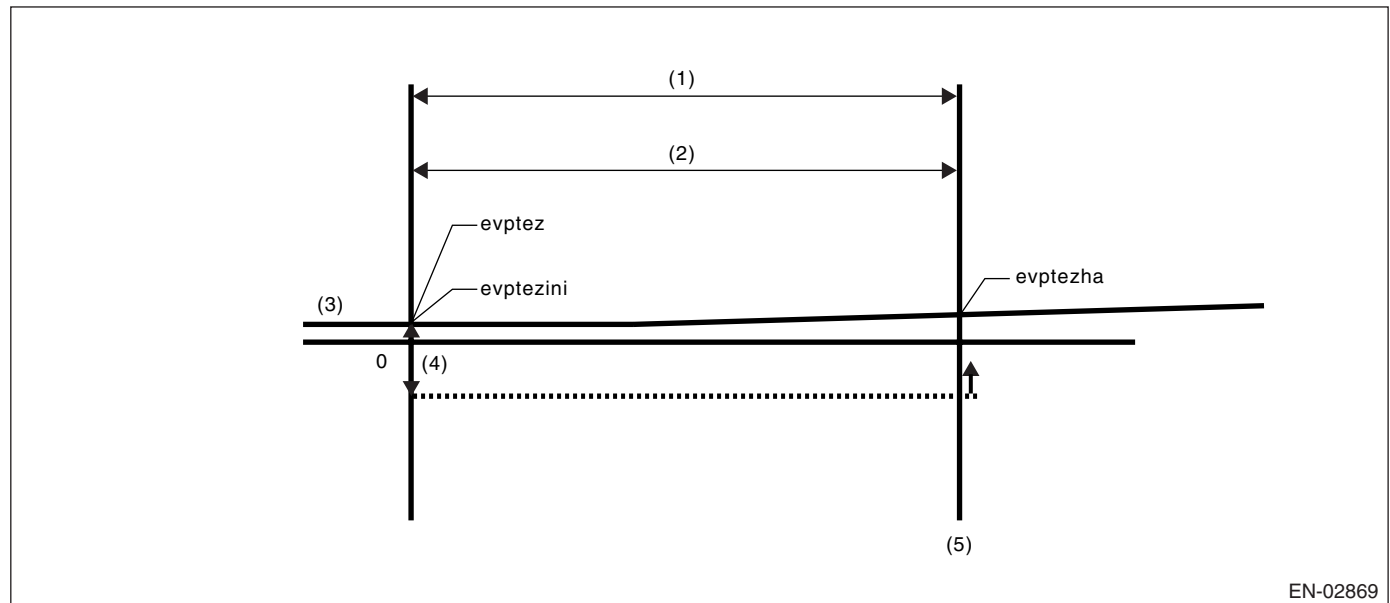
Normality Judgment

Judge OK when the following criteria are satisfied in 3 seconds after Mode Z started, and change to Mode A.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
(Tank pressure when Mode Z started) — (Tank pressure when Mode Z finished)	≤ 0.4 kPa (3 mmHg, 0.12 inHg)	P0457

• Normal



EN-02869

(1) Mode Z	(3) Fuel tank pressure	(5) OK judgement
(2) 3 seconds	(4) 0.4 kPa (3.0 mmHg, 0.12 inHg)	

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Judge normal when the following conditions are completed at once.

- $evptez - evptezha \leq 0.4 \text{ kPa}$ (3.0 mmHg, 0.12 inHg)
- $evptezini - evptezha \leq 0.71 \text{ kPa}$ (5.3 mmHg, 0.21 inHg)

Abnormality Judgment

If OK judgment cannot be made, extend Mode Z 16 seconds more, and judge NG when all the criteria below are completed in 16 seconds.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
(Tank pressure 1 second after Mode Z started) – (Tank pressure when Mode Z finished)	$> 0.6 \text{ kPa}$ (4.5 mmHg, 0.18 inHg)	P0457
Tank pressure when Mode Z started	$\leq 1.43 \text{ kPa}$ (10.7 mmHg, 0.42 inHg)	
Time for no fuel rolling of 2 $\varnothing$ or more	$\geq 40 \text{ seconds}$	

Time Needed for Diagnosis: 16 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

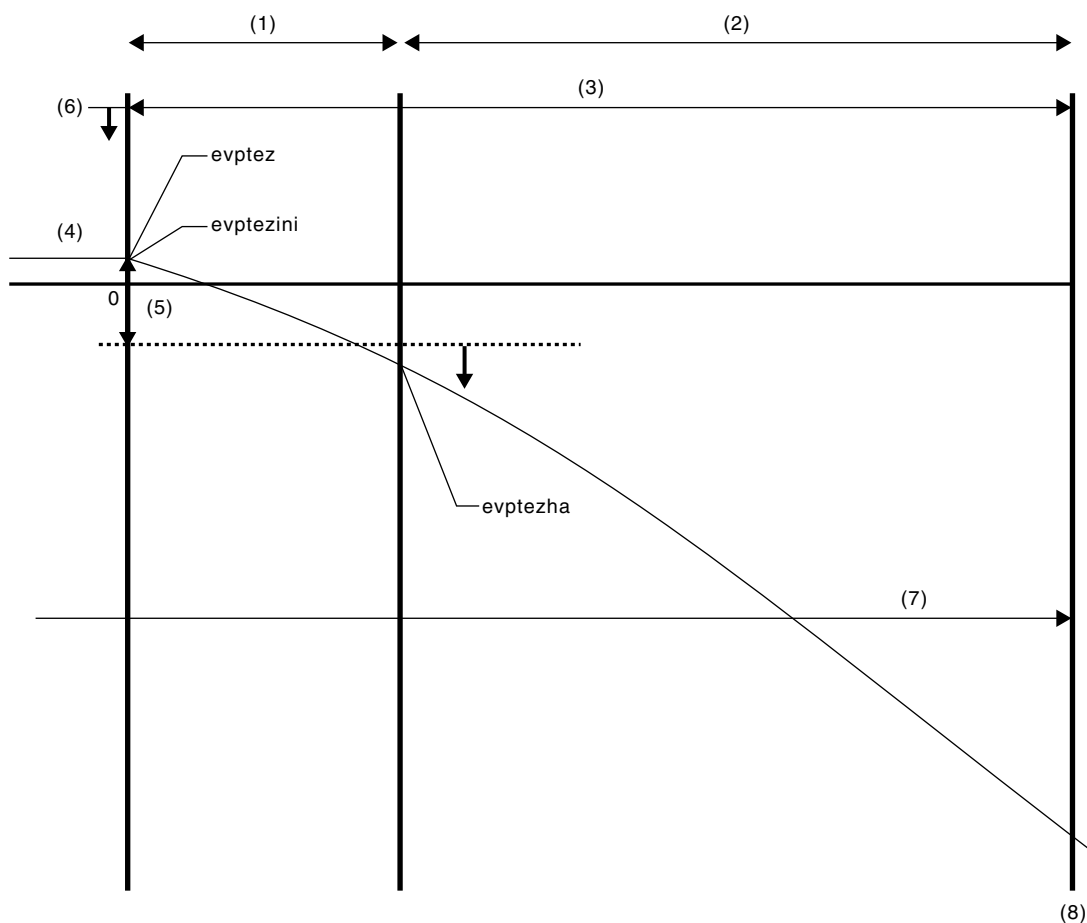
Finish the Evap. diagnosis when making NG judgment for purge control solenoid valve open fixation.

Cancel the Evap. diagnosis when the OK/NG judgment for purge control solenoid valve open fixation cannot be made in Mode Z.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

• Purge control solenoid valve open fixation



EN-02870

(1) Mode Z	(4) Fuel tank pressure	(7) No fuel rolling for more than 40 seconds
(2) Extended mode Z	(5) 0.87 kPa (6.5 mmHg, 0.26 inHg)	(8) NG judgement
(3) 16 seconds	(6) 1.43 kPa (10.7 mmHg, 0.42 inHg)	

- $evptezini, evptez \leq 1.43 \text{ kPa (10.7 mmHg, 0.42 inHg)}$
 - $evptez - evptezha \leq 0.87 \text{ kPa (6.5 mmHg, 0.26 inHg)}$
 - $evptezini - evptezha \leq 0.87 \text{ kPa (6.5 mmHg, 0.26 inHg)}$
 - No fuel rolling of above 2 $\varnothing$ (0.53 US gal, 0.44 Imp gal) for more than 40 seconds.
- Judge normal when all the calculations are completed.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

• Leak Diagnosis

DTC

P0442 Evaporative Emission Control System Leak Detected (small leak)

P0457 Evaporative Emission Control System Leak Detected (fuel cap loose/off)

Diagnostic method

- The diagnostic method consists of creating a sealed vacuum in the fuel tank and then determining the presence of leakage from the speed at which the tank internal pressure returns to atmospheric pressure.
- This diagnostic method consists of 5 steps.

Mode A: (Estimation of evaporation gas yield)

The amount of change of tank pressure (P1) in Mode A is calculated. After calculating P1, change to Mode B.

Mode B: (Seal negative pressure)

Introduce the negative pressure in the intake manifold to the tank.

Approx. 0 → -1.4 kPa (0 → -10.5 mmHg, 0 → -0.41 inHg)

When the pressure above (desired negative pressure) is reached, Mode C is entered.

In this case, if the tank pressure does not become the desired negative pressure, judge that there is a large leakage in the system and judge as large leak (10 or 25 seconds).

Abnormality Judgment

Judge NG (large leak) when the criteria below are completed in the specified time.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
Time before reaching desired negative pressure	≥ 25 seconds	P0457
Or time for Mode B	≥ 10 seconds	
(Min. value of tank pressure during Mode B) – (Tank pressure when Mode B started)	< -0.5 kPa (-4 mmHg, -0.16 inHg)	

Mode C: (Check increasing pressure)

Stop the introduction of negative pressure. (Wait until the tank pressure returns to the start level of P2 calculation.)

Change to Mode D when the tank pressure returns to the start level of P2 calculation.

Judge immediate OK and change to Mode E when it does not return in spite of spending the specified time.

Tank pressure when P2 calculation started	Time for immediate OK judgment
-1.3 kPa (-9.75 mmHg, -0.38 inHg)	15 seconds

Mode D: (Measurement of negative pressure changes)

Monitor the pressure variation in the tank in Mode Z. In this case, the tank pressure increases, that is, the pressure becomes as high as the atmospheric air pressure, because evaporator is generated. However, if any leakage exists, the pressure increases additionally in proportion to this leakage. The pressure variation of this tank is P2.

After calculating P2, perform following small leak diagnosis.

• After Mode D

Assigning P1 and P2, which are tank variations measured in Mode A and Mode B, to the formula below, judge the small leakage of the system. If the measured judgment value exceeds the threshold value, it is judged to be malfunction.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Abnormality Judgment

Judge NG when the criteria below are completed and judge OK and clear the NG when not completed.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
P2 – 1.5 × P1 P2: Change of tank pressure within 16 seconds on Mode D P1: Change of tank pressure within 16 seconds on Mode A	> Value on Map 7. * Threshold value: Figure (Fuel level vs Tank temperature)	P0442

*1.5: Compensation value of the amount of evaporator occurrence. (Because evaporator increases more when becoming negative pressure.)

Map 7 Limit of malfunction criteria as Evap. diagnosis.

Fuel temperature & Fuel level	5°C (41°F)	15°C (59°F)	25°C (77°F)	35°C (95°F)	45°C (113°F)
0 L (0 US gal, 0 Imp gal)	0.49 kPa (3.68 mmHg, 0.14 inHg)	0.49 kPa (3.68 mmHg, 0.14 inHg)	0.53 kPa (3.95 mmHg, 0.16 inHg)	0.54 kPa (4.07 mmHg, 0.16 inHg)	0.56 kPa (4.17 mmHg, 0.16 inHg)
10 L (2.64 US gal, 2.2 Imp gal)	0.49 kPa (3.68 mmHg, 0.14 inHg)	0.49 kPa (3.68 mmHg, 0.14 inHg)	0.53 kPa (3.95 mmHg, 0.16 inHg)	0.54 kPa (4.07 mmHg, 0.16 inHg)	0.56 kPa (4.17 mmHg, 0.16 inHg)
20 L (5.28 US gal, 4.4 Imp gal)	0.50 kPa (3.77 mmHg, 0.15 inHg)	0.51 kPa (3.79 mmHg, 0.15 inHg)	0.53 kPa (4.01 mmHg, 0.16 inHg)	0.56 kPa (4.17 mmHg, 0.16 inHg)	0.57 kPa (4.27 mmHg, 0.17 inHg)
30 L (7.93 US gal, 6.6 Imp gal)	0.51 kPa (3.85 mmHg, 0.15 inHg)	0.52 kPa (3.9 mmHg, 0.15 inHg)	0.54 kPa (4.06 mmHg, 0.16 inHg)	0.57 kPa (4.27 mmHg, 0.17 inHg)	0.60 kPa (4.48 mmHg, 0.18 inHg)
40 L (10.57 US gal, 8.8 Imp gal)	0.65 kPa (4.88 mmHg, 0.19 inHg)	0.65 kPa (4.9 mmHg, 0.19 inHg)	0.66 kPa (4.98 mmHg, 0.20 inHg)	0.71 kPa (5.32 mmHg, 0.21 inHg)	0.76 kPa (5.73 mmHg, 0.23 inHg)
50 L (13.21 US gal, 11.0 Imp gal)	0.794 kPa (5.96 mmHg, 0.235 inHg)	0.794 kPa (5.96 mmHg, 0.235 inHg)	0.794 kPa (5.96 mmHg, 0.235 inHg)	0.85 kPa (6.38 mmHg, 0.25 inHg)	0.88 kPa (6.6 mmHg, 0.26 inHg)
60 L (15.85 US gal, 13.2 Imp gal)	0.794 kPa (5.96 mmHg, 0.235 inHg)	0.794 kPa (5.96 mmHg, 0.235 inHg)	0.794 kPa (5.96 mmHg, 0.235 inHg)	0.85 kPa (6.38 mmHg, 0.25 inHg)	0.88 kPa (6.6 mmHg, 0.26 inHg)

Time Needed for Diagnosis: 30 — 100 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous drive cycles.

Leak diagnosis

DTC

P0456 Evaporative Emission Control System (Very Small Leak)

• Diagnostic method

- The diagnostic method consists of creating a sealed vacuum in the fuel tank and then determining the presence of leakage from the speed at which the tank internal pressure returns to atmospheric pressure.
- This diagnostic method consists of 5 steps.

Mode A: (0 point correction)

Wait until the tank pressure returns to 0 point (around 0 mmHg) when the tank pressure is high. Change to Mode B when the tank pressure becomes 0. Cancel the diagnosis when the tank pressure does not return to 0 point in spite of spending the specified time.

Mode B: (Introduce negative pressure)

Introduce the intake manifold negative pressure to fuel tank.

About 0 → -2.0 kPa (0 mmHg → -15 mmHg, 0 → -0.59 inHg)

Change to Mode C when the tank pressure becomes the pressure (desired negative pressure) above. Cancel the diagnosis when the tank pressure does not become the value above.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Mode C: (Hold negative pressure)

Stop introducing the negative pressure and wait the tank pressure returns to the start level of P2 calculation. Change to Mode D when the tank pressure returns to the start level of P2 calculation or when spending the specified time.

Mode D: (Calculation of negative pressure variation)

Monitor the tank pressure on Mode D, and calculate the tank pressure variation (P2) and time until it returns to the end level of P2 (evpdset). When it returns, change to Mode E. Make advanced OK judgment or cancel depending on the P2 level, when it doesn't return in spite of spending the specified time.

Normality Judgment

Judge OK when the criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Advanced OK judgment #1	
Mode D time	≥ 30 s
Tank pressure	≤ -1.8 kPa (-13.4 mmHg, -0.53 inHg)
Advanced OK judgment #2	
Mode D time	≥ 200 s
P2	≤ 0.9 — 1.3 kPa (7 — 9.6 mmHg, 0.28 — 0.38 inHg)

Mode E: (Calculation of evaporation gas yield)

Calculate the tank pressure variation P1 in time evpdset, judge NG/OK from P1 value. (Gray judgment possible)

Abnormal judgment

Judge NG when the criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
P1	< Map 7 value * Threshold value: map (fuel level vs evpdset)

Map 7 Limit of malfunction criteria as Evap. diagnosis

Time (evpdset) & Fuel level	0 second	30 seconds	80 seconds	100 seconds	150 seconds	200 seconds
0 L (0 US gal, 0 Imp gal)	0 kPa (0 mmHg, 0 inHg)	0.21 kPa (1.6 mmHg, 0.06 inHg)	0.29 kPa (2.2 mmHg, 0.09 inHg)	0.29 kPa (2.2 mmHg, 0.09 inHg)	0.29 kPa (2.2 mmHg, 0.09 inHg)	0.29 kPa (2.2 mmHg, 0.09 inHg)
10 L (2.64 US gal, 2.2 Imp gal)	0 kPa (0 mmHg, 0 inHg)	0.21 kPa (1.6 mmHg, 0.06 inHg)	0.29 kPa (2.2 mmHg, 0.09 inHg)	0.29 kPa (2.2 mmHg, 0.09 inHg)	0.29 kPa (2.2 mmHg, 0.09 inHg)	0.29 kPa (2.2 mmHg, 0.09 inHg)
30 L (7.93 US gal, 6.6 Imp gal)	0 kPa (0 mmHg, 0 inHg)	0.21 kPa (1.6 mmHg, 0.06 inHg)	0.29 kPa (2.2 mmHg, 0.09 inHg)	0.29 kPa (2.2 mmHg, 0.09 inHg)	0.29 kPa (2.2 mmHg, 0.09 inHg)	0 kPa (0 mmHg, 0 inHg)
50 L (13.21 US gal, 11.0 Imp gal)	0 kPa (0 mmHg, 0 inHg)	0.24 kPa (1.8 mmHg, 0.07 inHg)	0.29 kPa (2.2 mmHg, 0.09 inHg)	0.29 kPa (2.2 mmHg, 0.09 inHg)	0 kPa (0 mmHg, 0 inHg)	0 kPa (0 mmHg, 0 inHg)
60 L (15.85 US gal, 13.2 Imp gal)	0 kPa (0 mmHg, 0 inHg)	0.24 kPa (1.8 mmHg, 0.07 inHg)	0.29 kPa (2.2 mmHg, 0.09 inHg)	0.29 kPa (2.2 mmHg, 0.09 inHg)	0 kPa (0 mmHg, 0 inHg)	0 kPa (0 mmHg, 0 inHg)
70 L (18.49 US gal, 15.4 Imp gal)	0 kPa (0 mmHg, 0 inHg)	0.24 kPa (1.8 mmHg, 0.07 inHg)	0.29 kPa (2.2 mmHg, 0.09 inHg)	0.29 kPa (2.2 mmHg, 0.09 inHg)	0 kPa (0 mmHg, 0 inHg)	0 kPa (0 mmHg, 0 inHg)
80 L (21.14 US gal, 17.6 Imp gal)	0 kPa (0 mmHg, 0 inHg)	0.24 kPa (1.8 mmHg, 0.07 inHg)	0.29 kPa (2.2 mmHg, 0.09 inHg)	0.29 kPa (2.2 mmHg, 0.09 inHg)	0 kPa (0 mmHg, 0 inHg)	0 kPa (0 mmHg, 0 inHg)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Normality Judgment

Judge OK when all the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
P1	> Value of Map 8 * Threshold value: Map (Fuel level vs evp- dset)

Map 8

Time (evpdset) & Fuel level	0 second	30 seconds	80 seconds	100 seconds	150 seconds	200 seconds
0 L (0 US gal, 0 Imp gal)	0.16 kPa (1.2 mmHg, 0.05 inHg)	0.37 kPa (2.8 mmHg, 0.11 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)
10 L (2.64 US gal, 2.2 Imp gal)	0.16 kPa (1.2 mmHg, 0.05 inHg)	0.37 kPa (2.8 mmHg, 0.11 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)
30 L (7.93 US gal, 6.6 Imp gal)	0.16 kPa (1.2 mmHg, 0.05 inHg)	0.37 kPa (2.8 mmHg, 0.11 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)
50 L (13.21 US gal, 11.0 Imp gal)	0.16 kPa (1.2 mmHg, 0.05 inHg)	0.40 kPa (3.0 mmHg, 0.12 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)
60 L (15.85 US gal, 13.2 Imp gal)	0.16 kPa (1.2 mmHg, 0.05 inHg)	0.40 kPa (3.0 mmHg, 0.12 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)
70 L (18.49 US gal, 15.4 Imp gal)	0.16 kPa (1.2 mmHg, 0.05 inHg)	0.40 kPa (3.0 mmHg, 0.12 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)
80 L (21.14 US gal, 17.6 Imp gal)	0.16 kPa (1.2 mmHg, 0.05 inHg)	0.40 kPa (3.0 mmHg, 0.12 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)

Time Needed for Diagnosis: 65 — 516 seconds

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

None

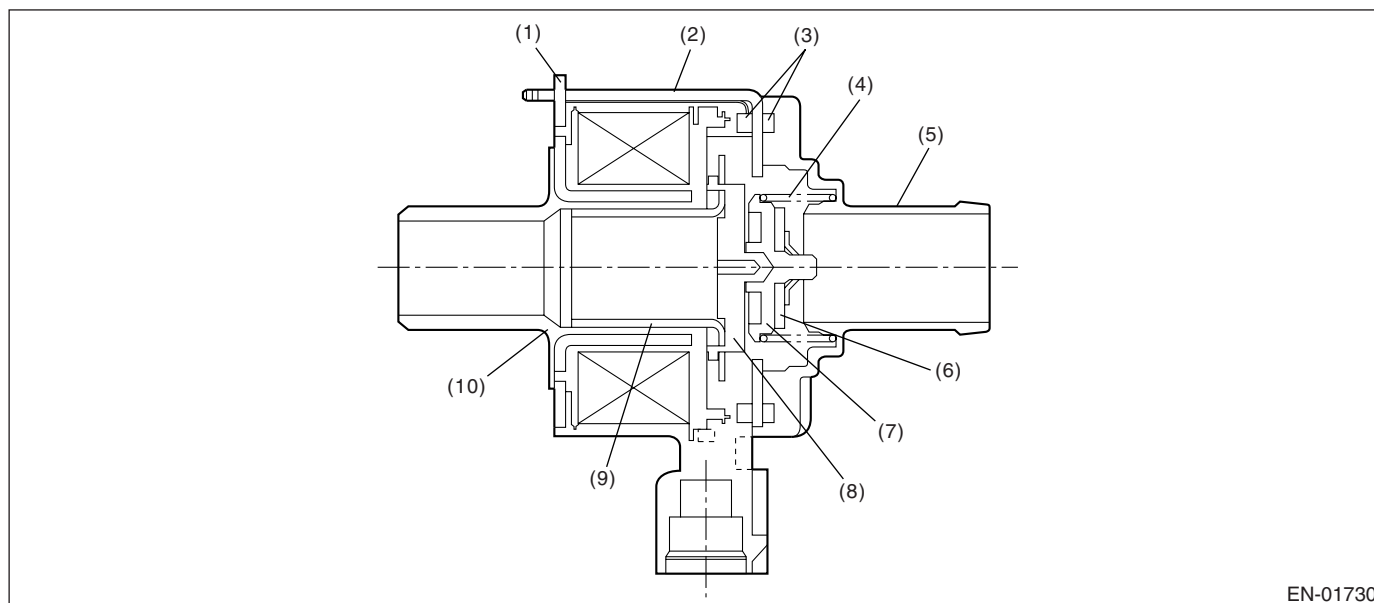
9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

BL:DTC P0447 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN**1. OUTLINE OF DIAGNOSIS**

Detect the open or short circuit of drain valve.

Judge NG when the ECM output level is different from the actual terminal level.

2. COMPONENT DESCRIPTION

(1) Magnetic plate

(2) Yoke

(3) Packing

(4) Spring

(5) Valve seat

(6) Valve

(7) Plate

(8) Retainer

(9) Movable core

(10) Bobbin

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD**• Abnormality Judgment**

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM sends OFF signal	Low

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM sends OFF signal	High

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

Pressure control solenoid valve control: Open the pressure control solenoid valve solenoid.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

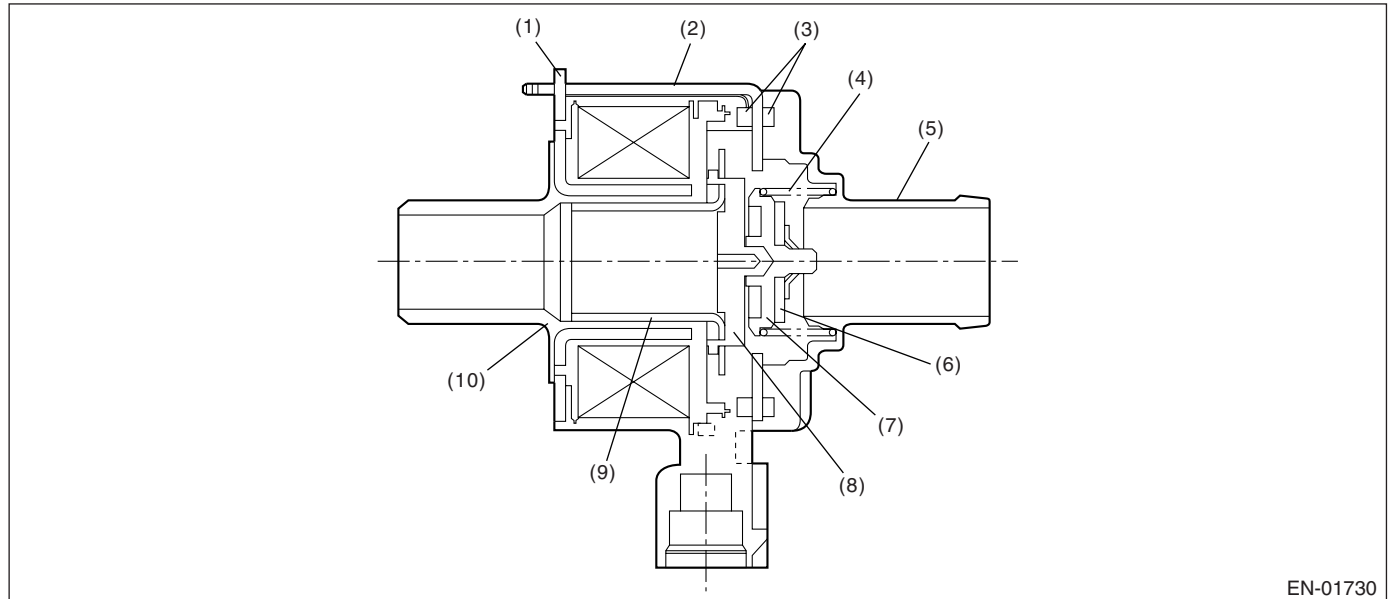
BM:DTC P0448 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of drain valve.

Judge NG when the ECM output level is different from the actual terminal level.

2. COMPONENT DESCRIPTION



EN-01730

(1) Magnetic plate	(5) Valve seat	(9) Movable core
(2) Yoke	(6) Valve	(10) Bobbin
(3) Packing	(7) Plate	
(4) Spring	(8) Retainer	

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	$\geq 10.9 \text{ V}$
After engine starting	1 second or more
Terminal output voltage when ECM sends ON signal	High

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM sends ON signal	Low

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

PCV control: Open the PCV solenoid.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

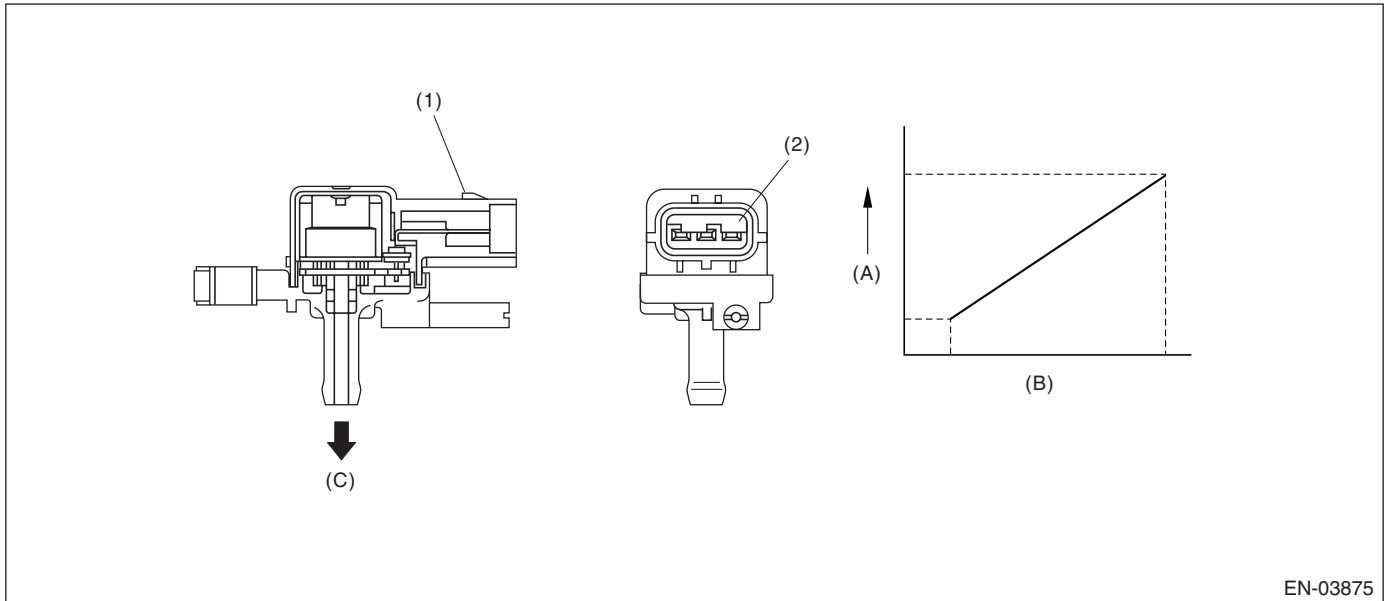
BN:DTC P0451 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR RANGE/PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect the tank pressure sensor output property abnormality.

Judge NG when there is no pressure variation, which should exist in the tank, considering the engine status.

2. COMPONENT DESCRIPTION



EN-03875

- (1) Connector
- (2) Terminal

- (A) Output voltage
- (B) Input voltage
- (C) To fuel tank

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
After starting the engine	60 second or more
Fuel level	$\geq 9 \ell$ (2.38 US gal, 1.98 Imp gal)
Fuel temperature	$< 35^{\circ}\text{C}$ (95°F)
Battery voltage	$\geq 10.9 \text{ V}$
Atmospheric pressure	$> 75.0 \text{ kPa}$ (563 mmHg, 22.2 inHg)
Purge control solenoid valve ON/OFF	Experienced

4. GENERAL DRIVING CYCLE

- Perform the diagnosis continuously in 60 seconds or more after starting the engine.
- Be sure to check the fuel level and fuel temperature.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below is completed.

Judgment Value

Malfunction Criteria	Threshold Value
Number of times when the difference between the Max. fuel level and the Min. fuel level every 60 seconds is 2 ℓ (0.53 US gal, 0.44 Imp gal) or more (with enable condition completed)	≥ 16 times
Max. – Min. tank pressure (with enable condition completed)	< 0.05 kPa (0.375 mmHg, 0.02 inHg)
Max. – Min. fuel temperature (with enable condition completed)	≥ 7°C (13°F)

If the fuel level (Max. – Min.) in every 60 seconds is less than 2 ℓ, extend 60 seconds more and make judgment with the Max. and Min. fuel level in 120 seconds.

If the difference did not appear though the time extended, extend the time (180, 240, 300 seconds) and continue the judgment.

Diagnosis counter will count up when the difference of fuel level (Max. – Min.) is more than 5 ℓ.

Time Needed for Diagnosis: 1 minute × 16 times or more

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in two continuous drive cycles.

• Normality Judgment

Judge OK when the malfunction criteria below is completed.

Judgment Value

Malfunction Criteria	Threshold Value
Max. – Min. tank pressure	≥ 0.05 kPa (0.375 mmHg, 0.02 inHg)

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Purge control solenoid valve control: Purge fixation mode is prohibited.

9. ECM OPERATION AT DTC SETTING

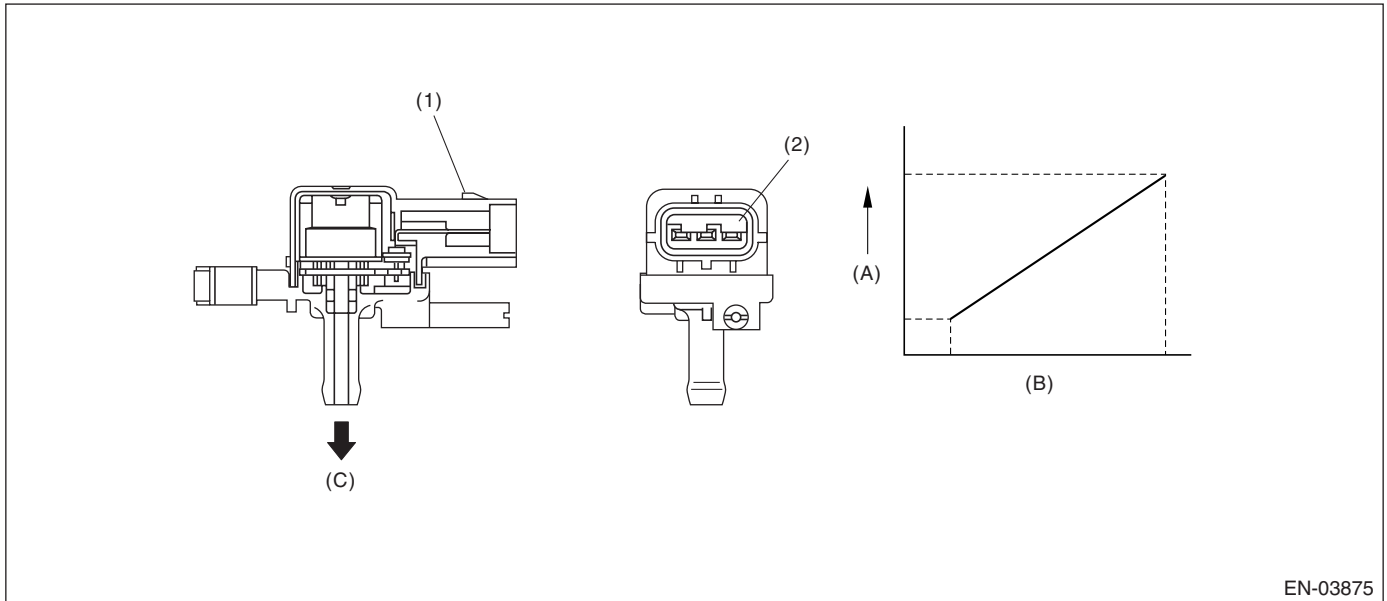
Memorize the freeze frame data. (For test mode \$02)

BO:DTC P0452 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the fuel tank pressure sensor.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



EN-03875

- (1) Connector
- (2) Terminal

- (A) Output voltage
- (B) Input voltage
- (C) To fuel tank

3. ENABLE CONDITION (USED WITH HIGH SIDE NORMAL/ABNORMAL JUDGMENT)

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 15 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	$< -6.82 \text{ kPa}$ (-56.15 mmHg , -2.01 inHg)

Time Needed for Diagnosis: 15 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

• Normality Judgment

Judge OK when the malfunction criteria below is completed.

Judgment Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	≥ -6.82 kPa (-56.15 mmHg, -2.01 inHg)
Feedback lambda coefficient	≥ 0.9

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

Purge control solenoid valve control: Purge fixation mode is prohibited.

9. ECM OPERATION AT DTC SETTING

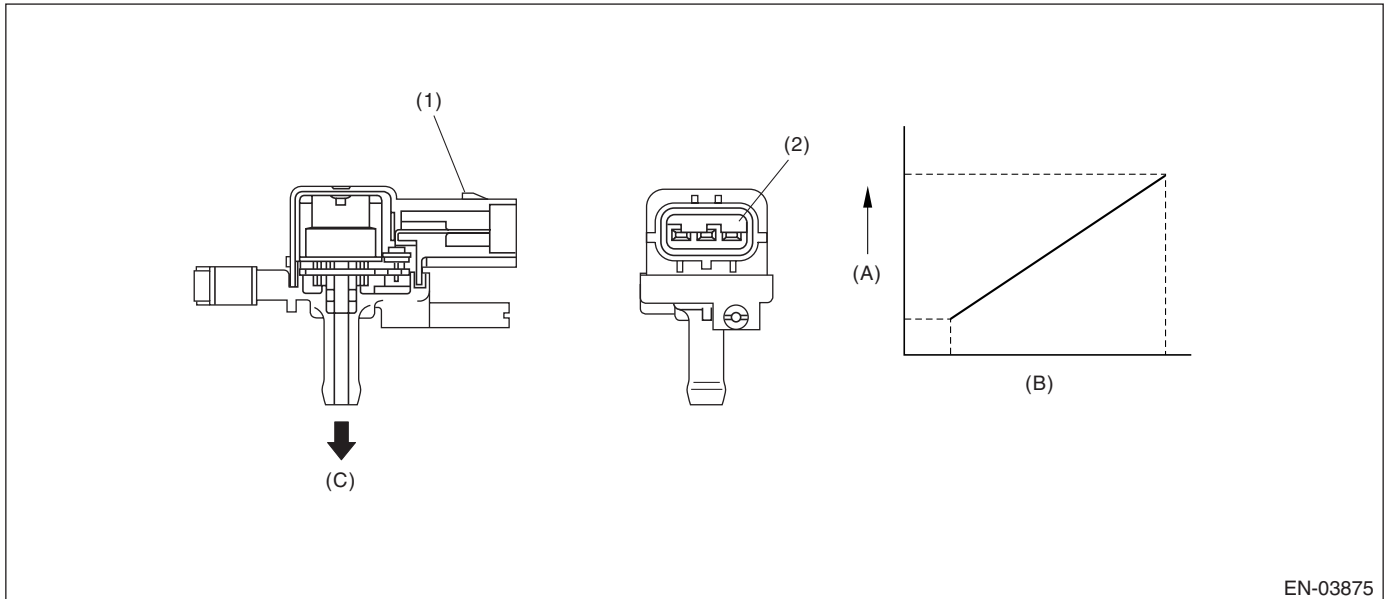
Memorize the freeze frame data. (For test mode \$02)

BP:DTC P0453 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT

1. OUTLINE OF DIAGNOSIS

Detect the breaking/shortage of the fuel tank pressure sensor.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



- (1) Connector
(2) Terminal

- (A) Output voltage
(B) Input voltage
(C) To fuel tank

EN-03875

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Vehicle speed	≥ 2 km/h (1.24 MPH)
All conditions of EVAP canister purge	Complete
Evaporation gas density learning value	≤ 0.08
Main feedback compensation coefficient	≥ 0.9
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously when purging.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time until completing the malfunction criteria below becomes more than 15 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	≥ 7.98 kPa (59.85 mmHg, 2.36 inHg)
Fuel temperature	$< 35^{\circ}\text{C}$ (95°F)
Atmospheric pressure	≥ 75.0 kPa (563 mmHg, 22.2 inHg)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Time Needed for Diagnosis: 15 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• **Normality Judgment**

Judge OK when the malfunction criteria below is completed.

Judgment Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	< 7.98 kPa (59.85 mmHg, 2.36 inHg)

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

Purge control solenoid valve control: Purge fixation mode is prohibited.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

BQ:DTC P0456 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK)

1. OUTLINE OF DIAGNOSIS

For detecting conditions, refer to DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK). <Ref. to GD(H4DOTC)-123, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

BR:DTC P0457 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF)

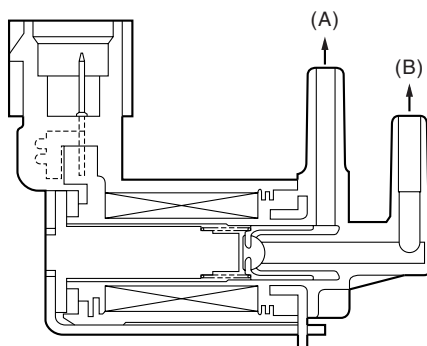
1. OUTLINE OF DIAGNOSIS

For detecting conditions, refer to DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK). <Ref. to GD(H4DOTC)-123, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

BS:DTC P0458 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW**1. OUTLINE OF DIAGNOSIS**

Detect open or short circuit of purge control solenoid valve.

Judge NG when ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION

EN-01733

(A) To intake manifold

(B) To canister

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	$\geq 10.9 \text{ V}$
After engine starting	1 second or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

5. DIAGNOSTIC METHOD**• Abnormality Judgment**

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (2.5 seconds).

Judgment Value

Malfunction Criteria	Threshold Value
Duty ratio of 'ON'	$< 75\%$
Terminal output voltage	Low

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

• Normality Judgment

Judge OK and clear NG when the malfunction criterion below is completed.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal output voltage	High

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

None

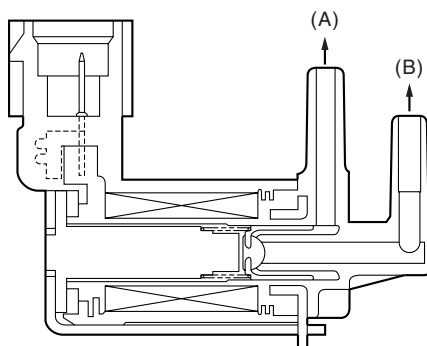
9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

BT:DTC P0459 EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH**1. OUTLINE OF DIAGNOSIS**

Detect open or short circuit of purge control solenoid valve.

Judge NG when ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION

EN-01733

(A) To intake manifold

(B) To canister

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	$\geq 10.9 \text{ V}$
After engine starting	1 second or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

5. DIAGNOSTIC METHOD**• Abnormality Judgment**

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (2.5 seconds).

Judgment Value

Malfunction Criteria	Threshold Value
Duty ratio of 'ON'	$\geq 25\%$
Terminal output voltage	High

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

• Normality Judgment

Judge OK and clear NG when the malfunction criterion below is completed.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal output voltage	Low

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

None

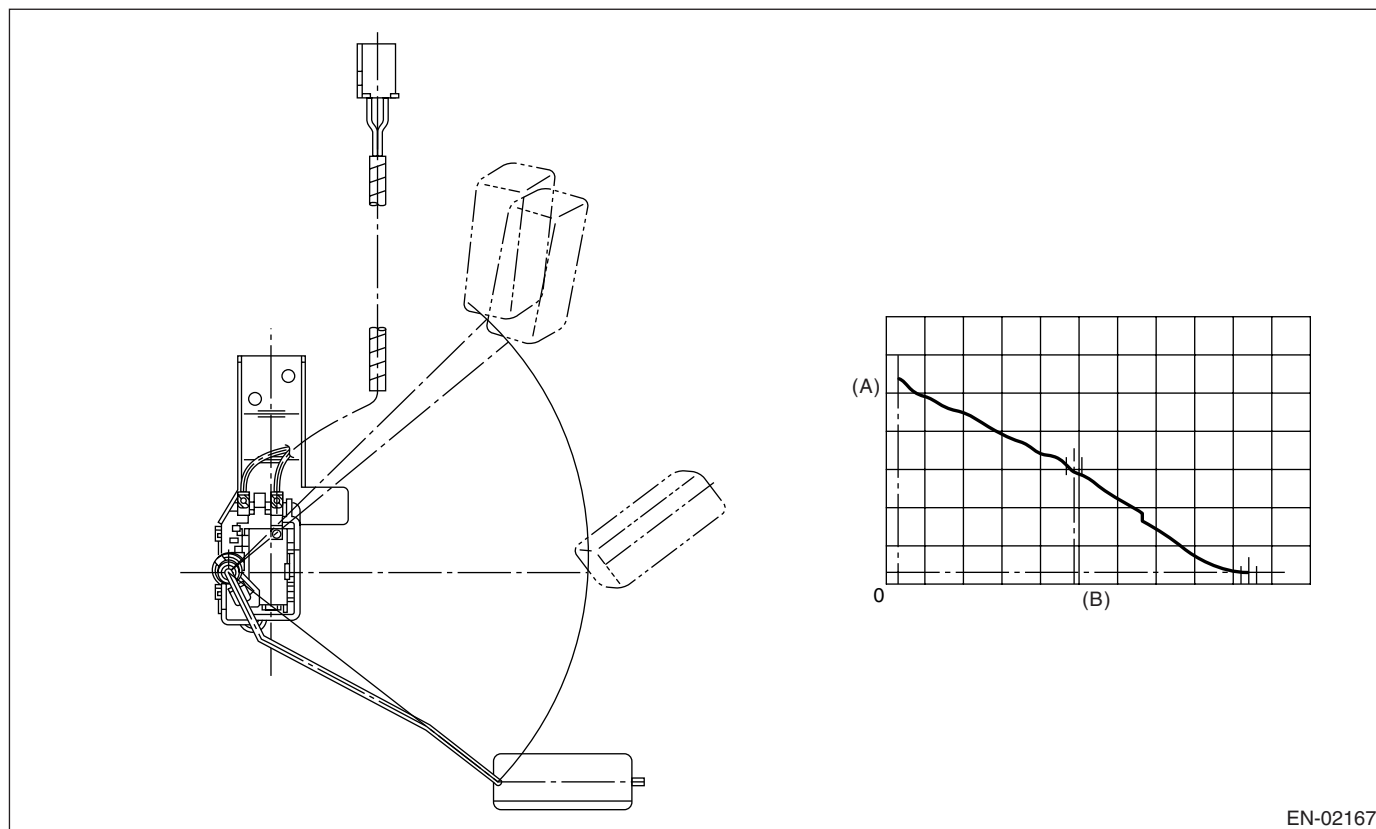
9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

BU:DTC P0461 FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE**1. OUTLINE OF DIAGNOSIS**

Detect the malfunction of fuel level sensor output property.

Judge NG when the fuel level does not vary whereas it seemed to vary be in a usual driving speed.

2. COMPONENT DESCRIPTION

EN-02167

- (A) Fuel level (L)
(B) Resistance (Ω)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD**• Abnormality Judgment**

Judge NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Accumulated amount of intake air	> 331 kg (729.7 lb)
Max. – Min. fuel level output	< 2.6 ℓ (0.69 US gal, 0.57 Imp gal)
Battery voltage	≥ 10.9 V
After engine starting	10 seconds or more

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Time Needed for Diagnosis: To be determined.

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• **Normality Judgment**

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Accumulated amount of intake air	> 331 kg (729.7 lb)
Max. – Min. fuel level output	≥ 2.6 ℓ (0.69 US gal, 0.57 Imp gal)
Battery voltage	≥ 10.9 V
After engine starting	10 seconds or more

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

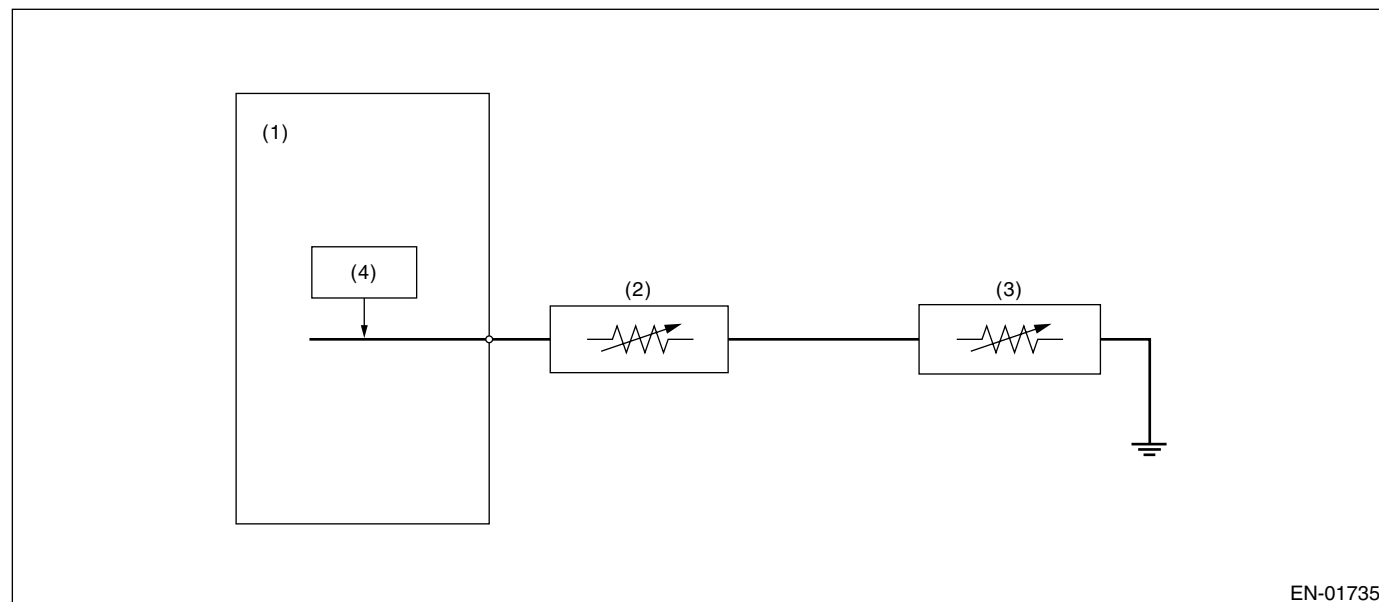
None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

BV:DTC P0462 FUEL LEVEL SENSOR CIRCUIT LOW INPUT**1. OUTLINE OF DIAGNOSIS**

Detect the open or short circuit of fuel level sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION

- (1) Engine control module (ECM)
- (2) Fuel level sensor
- (3) Fuel sub level sensor
- (4) Detecting circuit

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously

5. DIAGNOSTIC METHOD**• Abnormality Judgment**

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (2.5 seconds).

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	$\geq 10.9 \text{ V}$
After engine starting	3 seconds or more
Output voltage	$< 0.035 \text{ V}$

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	3 seconds or more
Output voltage	≥ 0.035 V

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

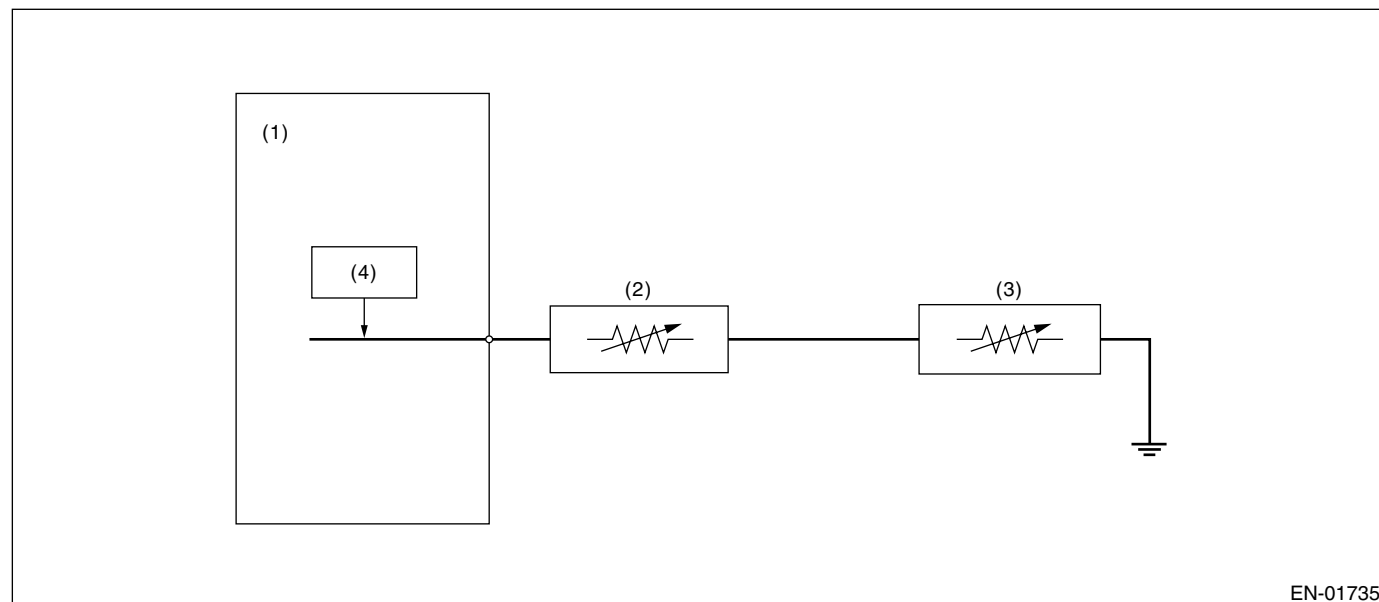
None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

BW:DTC P0463 FUEL LEVEL SENSOR CIRCUIT HIGH INPUT**1. OUTLINE OF DIAGNOSIS**

Detect the open or short circuit of fuel level sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION

- (1) Engine control module (ECM)
- (2) Fuel level sensor
- (3) Fuel sub level sensor
- (4) Detecting circuit

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously

5. DIAGNOSTIC METHOD**• Abnormality Judgment**

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (10 seconds).

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	$\geq 10.9 \text{ V}$
After engine starting	3 seconds or more
Output voltage	$\geq 4.911 \text{ V}$

Time Needed for Diagnosis: 10 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	3 seconds or more
Output voltage	< 4.911 V

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

BX:DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of unstable output from fuel level sensor caused by noise.

Judge NG when the max. value and cumulative value of output voltage variation of fuel level sensor is larger than the threshold value.

2. ENABLE CONDITION

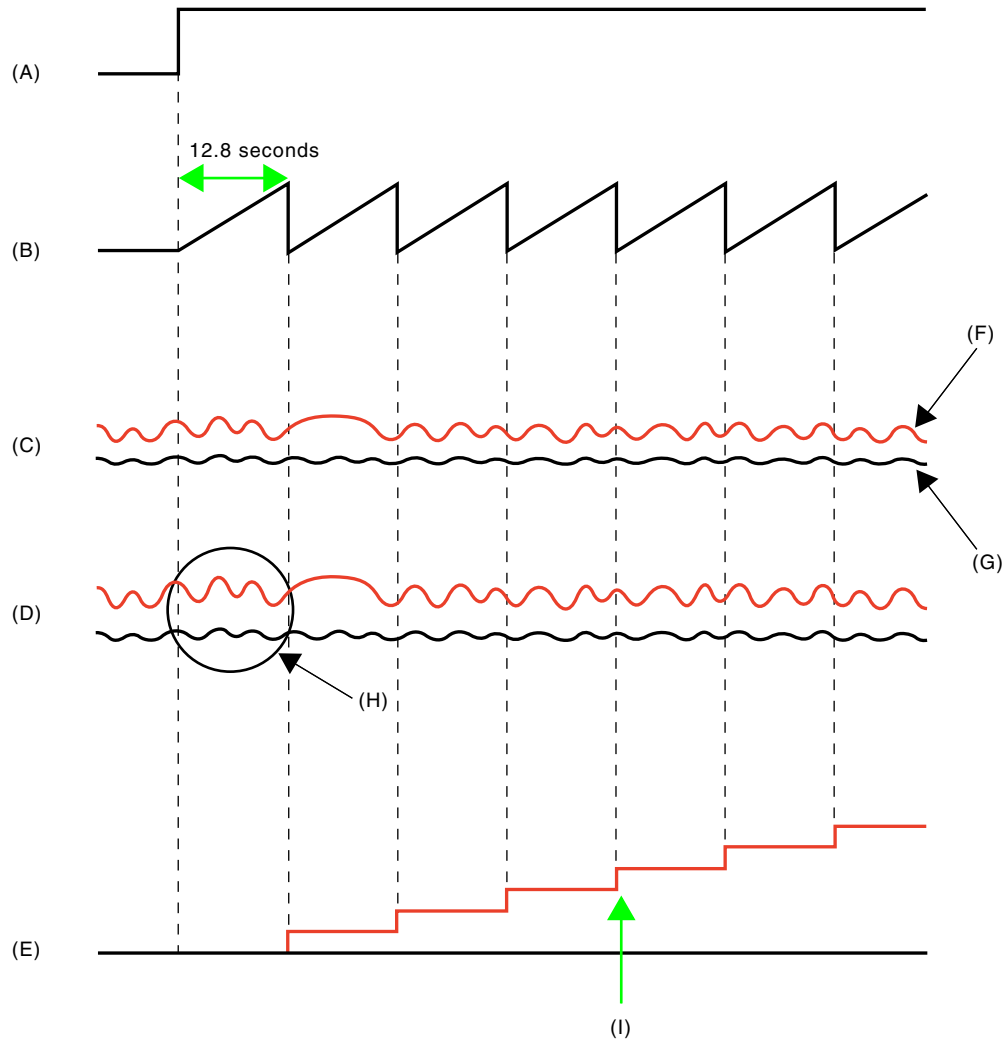
Secondary Parameters	Enable Conditions
Engine speed	≥ 500 rpm
After engine starting	1 second or more
Ignition switch	ON
Battery voltage	> 10.9 V
Idle switch	ON
Fuel level	9 $\longleftrightarrow$ 51 $\varnothing$ (2.4 $\longleftrightarrow$ 13.4 US gal, 1.98 $\longleftrightarrow$ 11.2 Imp gal)
Vehicle speed = 0 km/h (0 MPH)	10 seconds or more

3. GENERAL DRIVING CYCLE

- Perform the diagnosis continuously in idling condition.
- Pay attention to the fuel level.

4. DIAGNOSTIC METHOD

Calculate the Max. value (delflmax) and cumulative value (sumfl) of output voltage variation of fuel level sensor during 12.8 seconds. Judge it normal when both max. and cumulative values are not over the threshold value. Otherwise, when either of them is over the threshold value, count the diagnosis counter up. And judge NG if the counter indicated 4 counts.



EN-01736

- (A) Diagnosis condition
- (B) Diagnosis time
- (C) Fuel level sensor A/D value
- (D) Fuel level output voltage

- (E) Diagnosis counter
- (F) Malfunction
- (G) Normal

- (H) Judge value of DVFLMAX and SUMVFL as maximum
- (I) NG at 4 counts

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

• Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Integrated times of the condition reaching follows, DELFLMAX $\geq$ 0.228 V or SUMVFL $\geq$ 21.8 V where, DELFLMAX is Max. deviation of sensor output during 12.8 seconds. SUMVFL is integrated value of sensor output deviation during 12.8 seconds.	$\geq$ 4 times

Do not count the diagnosis counter up when the following conditions are completed during 12.8 seconds.

Max – Min of tank pressure during 12.8 seconds	$\geq$ 0.05 kPa (0.375 mmHg, 0.01 inHg)
Max – Min of battery voltage during 12.8 seconds	$\geq$ 0.465 V

Time Needed for Diagnosis: 12.8 seconds $\times$ 4 times

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
DELFLMAX SUMVFL Where, DELFLMAX is Max. deviation of sensor output during 12.8 seconds. SUMVFL is integrated value of sensor output deviation during 12.8 seconds.	$<$ 0.228 V $<$ 21.8 V

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

BY:DTC P0483 COOLING FAN RATIONALITY CHECK**1. OUTLINE OF DIAGNOSIS**

Detect the function abnormality of the radiator fan.

Judge NG when the engine coolant temperature slowly decreases even when the radiator fan is rotating.

2. ENABLE CONDITION

Diagnostic enable condition is completed if the radiator fan changes from OFF to ON when all of the conditions below are completed. When one of the conditions below is not completed, the diagnostic enable condition is not completed.

Secondary Parameters	Enable Conditions
Engine Speed	550 — 950 rpm
Idle switch	ON
Vehicle speed	0 km/h (0 MPH)
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously when idling.

4. DIAGNOSTIC METHOD**• Abnormality Judgment**

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 5 minutes.

Judgment Value

Malfunction Criteria	Threshold Value
Engine coolant temperature	≥ 95°C (203°F)
Radiator fan signal change	OFF to ON
Engine coolant temperature	Not decrease

Time Needed for Diagnosis: 5 minutes

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Radiator fan signal change	OFF to ON
Engine coolant temperature	Decrease

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

BZ:DTC P0502 VEHICLE SPEED SENSOR CIRCUIT LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of vehicle speed sensor.

Judge NG when low vehicle speed (0 km/h (0 MPH)) remains whereas it seemed to be in a usual driving speed.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	< 4,000 rpm
Fuel cut in decel.	Operating
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously during fuel cut in deceleration at less than 4,000 rpm in engine speed.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 4 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Vehicle speed	< 1

Time Needed for Diagnosis: 4 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when all malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Vehicle speed	≥ 1
Starter switch	OFF
Time after starter switch ON → OFF	≥ 3 seconds

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

7. FAIL SAFE

- Accelerator sensor signal process: All closed points learning / Not allowed to increase.
- Vehicle speed sensor signal process: Vehicle speed = 10 km/h (6.21 MPH)
- Fuel cut control: Not allowed vehicle speed 0 km/h (0 MPH) fuel cut. Normally the high vehicle speed fuel cut performs on "and" of vehicle speed condition and engine speed, but perform the fuel cut only on engine speed condition (4,800 rpm or more).
- ISC control: Set the open loop compensation to specified value (1 g/s). Not allowed ISC feedback volume calculation.
- Air conditioner control: Not allowed air conditioner cut at accelerating.
- Radiator fan control: Hi driven both main/sub.
- Judge gear ratio: Control as gear fixed on 6th.
- Tumble generator valve control: Open the tumble generator valve.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

CA:DTC P0503 VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH**1. OUTLINE OF DIAGNOSIS**

Detect the open or short circuit of vehicle speed sensor.

Judge NG when high vehicle speed (300 km/h (186.4 MPH) or more) remains whereas it seemed to be in a usual driving speed.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	< 4,000 rpm
Fuel cut in decel.	Operating
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously during fuel cut in deceleration at less than 4,000 rpm in engine speed.

4. DIAGNOSTIC METHOD**• Abnormality Judgment**

Judge NG when the cumulative time of completing the malfunction criteria below becomes more than 4 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Vehicle speed	≥ 300

Time Needed for Diagnosis: 4 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when all malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Vehicle speed	< 300 km/h (186.4 MPH)
Starter switch	OFF
Time after starter switch ON → OFF	≥ 3 seconds

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. FAIL SAFE

- Vehicle speed sensor signal process: Vehicle speed = 10 km/h (6.21 MPH)
- Fuel cut control: Not allowed vehicle speed 0 km/h (0 MPH) fuel cut. Normally the high vehicle speed fuel cut performs on “and” of vehicle speed condition and engine speed, but perform the fuel cut only on engine speed condition (4,800 rpm or more).
- ISC control: Set the open loop compensation to specified value (1 g/s). Not allowed ISC feedback volume calculation.
- Air conditioner control: Not allowed air conditioner cut at accelerating.
- Radiator fan control: Hi driven both main/sub.
- Judge gear ratio: Control as gear fixed on 6th.
- Tumble generator valve control: Open the tumble generator valve.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

CB:DTC P0506 IDLE AIR CONTROL SYSTEM RPM LOWER THAN EXPECTED**1. OUTLINE OF DIAGNOSIS**

Detect the malfunction that actual engine speed is not close to target engine speed during idling.
Judge NG when actual engine speed is not close to target engine speed during idling.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	$\geq 70^{\circ}\text{C}$ (158°F)
Battery voltage	$\geq 10.9\text{ V}$
Atmospheric pressure	$> 75.0\text{ kPa}$ (563 mmHg, 22.2 inHg)
Fuel level	$\geq 9\text{ ℓ}$ (2.38 US gal, 1.98 Imp gal)
After starting engine	10 seconds or more
Feedback in ISC	In operation
Measured lambda	$0.90 \longleftrightarrow 1.1$
After air condition switching ON-OFF, OFF-ON	5 seconds or more
After in-manifold pressure change more than 4 kPa (30 mmHg, 1.2 inHg)	> 5 seconds
After neutral switch ON-OFF event	> 5 seconds
Vehicle speed	0 km/h (0 MPH)

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously during idling.

4. DIAGNOSTIC METHOD**• Abnormality Judgment**

Judge NG when the cumulative time of completing the malfunction criterion below becomes more than the time needed for diagnosis (10 seconds $\times$ 3 times).

Judgment Value

Malfunction Criteria	Threshold Value
Actual – target engine speed	$< -100\text{ rpm}$
Feedback correction for idle air control solenoid valve	Max.

Time Needed for Diagnosis: 10 seconds $\times$ 3 times

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear NG when the continuous time of completing the malfunction criterion below becomes more than the time needed for diagnosis (10 seconds).

Judgment Value

Malfunction Criteria	Threshold Value
Actual – target engine speed	$\geq -100\text{ rpm}$

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. FAIL SAFE

- Heavy fuel judgment: Not allowed to carry out the heavy judgment
- Knock compensation:
 - Knock compensation final timing advance and retard value = knock compensation + whole learning compensation value + partial learning compensation value.
 - At normal: knock compensation = 0°CA is fixed.
 - At trouble: knock compensation ≠ 0°CA is fixed. (Retard max. 12°CA at knock.)
 - Not allowed to update the whole learning compensation factor.
 - Not allowed to calculate the partial learning zone compensation value.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

CC:DTC P0507 IDLE AIR CONTROL SYSTEM RPM HIGHER THAN EXPECTED**1. OUTLINE OF DIAGNOSIS**

Detect the malfunction that actual engine speed is not close to target engine speed during idling.
Judge NG when actual engine speed is not close to target engine speed during idling.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	$\geq 70^{\circ}\text{C}$ (158°F)
Battery voltage	$\geq 10.9\text{ V}$
Atmospheric pressure	$> 75.0\text{ kPa}$ (563 mmHg , 22.2 inHg)
Fuel level	$\geq 9\text{ l}$ (2.38 US gal , 1.98 Imp gal)
After starting engine	10 seconds or more
Feedback in ISC	In operation
Lambda	$0.90 \longleftrightarrow 1.1$
After air condition switching ON-OFF, OFF-ON	5 seconds or more
After in-manifold pressure change more than 4 kPa (30 mmHg, 1.2 inHg)	$> 5\text{ seconds}$
After neutral switch ON-OFF event	$> 5\text{ seconds}$
Vehicle speed	0 km/h (0 MPH)

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously 10 seconds after starting and at idling after warm-up.

4. DIAGNOSTIC METHOD**• Abnormality Judgment**

Judge NG when the continuous time of completing the malfunction criterion below becomes more than the time needed for diagnosis (10 seconds $\times$ 3 times).

Judgment Value

Malfunction Criteria	Threshold Value
Actual – target eng. speed	$\geq 200\text{ rpm}$
Feedback correction for idle air control solenoid valve	Min.

Time Needed for Diagnosis: 10 seconds $\times$ 3 times

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear NG when the continuous time of completing the malfunction criterion below becomes more than the time needed for diagnosis (10 seconds).

Judgment Value

Malfunction Criteria	Threshold Value
Actual – target eng. speed	$< 200\text{ rpm}$

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. FAIL SAFE

- Heavy fuel judgment: Not allowed to carry out the heavy judgment
- Knock compensation:
 - Knock compensation final timing advance and retard value = knock compensation + whole learning compensation value + partial learning compensation value.
 - At normal: knock compensation = 0°CA is fixed.
 - At trouble: knock compensation ≠ 0°CA is fixed. (Retard max. 12°CA at knock.)
 - Not allowed to update the whole learning compensation factor.
 - Not allowed to calculate the partial learning zone compensation value.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

CD:DTC P0512 STARTER REQUEST CIRCUIT**1. OUTLINE OF DIAGNOSIS**

Detect the open or short circuit of starter SW.

Judge ON NG when the starter SW signal remains on.

Judge OFF NG when the engine starts without starter experience.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD**• Abnormality Judgment**

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 minutes.

Judgment Value

Malfunction Criteria	Threshold Value
Engine speed	> 500 rpm
Starter OFF signal	Not detected
Battery voltage	> 8 V

Time Needed for Diagnosis: 180 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge ON OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Starter SW	OFF
Battery voltage	> 8 V

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CE:DTC P0513 INCORRECT IMMOBILIZER KEY

1. OUTLINE OF DIAGNOSIS

DTC	ITEM	OUTLINE OF DIAGNOSIS
P0513	Incorrect Immobilizer Key	Incorrect immobilizer key (Use of key not registered in body integrated module)
P1570	Antenna	Improper antenna
P1571	Reference Code Incompatibility	Unmatched reference code between body integrated module and ECM
P1572	IMM Circuit Failure (Except Antenna Circuit)	Communication malfunction between body integrated module and ECM
P1574	Key Communication Failure	Malfunction of body integrated module that check the key (transponder) ID or transponder failure.
P1576	EGI Control Module EEPROM	Abnormality of ECM
P1577	IMM Control Module EEPROM	Malfunction of body integrated module.
P1578	Meter Failure	Unmatched reference code between body integrated module and combination meter.

2. ENABLE CONDITION

When the engine is started.

3. GENERAL DRIVING CYCLE

Perform the diagnosis only when the engine is started.

4. DIAGNOSTIC METHOD

Jude NG when the outline diagnosis above was completed.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CF:DTC P0519 IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE)

1. OUTLINE OF DIAGNOSIS

Detect the malfunction that engine speed increases more than that in normal condition during idling.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Feedback in ISC	In operation
Vehicle speed	< 4 km/h (2.49 MPH)
After engine starting	1 seconds or more

3. GENERAL DRIVING CYCLE

Always perform diagnosis at less than 4 km/h (2.49 MPH) of vehicle speed.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time until completing the all malfunction criteria below becomes more than the time needed for diagnosis (2 seconds).

Judgment Value

Malfunction Criteria	Threshold Value
Engine speed – target eng. speed	$\geq 1,500$ rpm
Feedback value for ISC	$\leq 0\%$
Engine speed change every 180 degree engine rev.	≥ -5 rpm

Time Needed for Diagnosis: 2 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear NG when the continuous time until completing the malfunction criteria below becomes more than the time needed for diagnosis (5 seconds).

Judgment Value

Malfunction Criteria	Threshold Value
Engine speed – target eng. speed	< 200 rpm

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

Fuel shut-off: Shut-off fuel for only #1 and #2 cylinder, or for all cylinder in accordance with vehicle speed, engine speed, throttle position

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CG:DTC P0600 SERIAL COMMUNICATION LINK

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of CAN communication.

Judge NG when CAN communication becomes impossible, the CAN communication with AT becomes impossible, and the data from AT is not normal.

2. COMPONENT DESCRIPTION

CAN connects between ECM and TCM with high speed.

(Common Specification)

CAN PROTOCOL 2.0B (active)

Frame format: 11 bit ID Frame (Standard frame)

(High Speed CAN)

ISO 11898 compliance

Communication Speed: 500 kbps

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery Voltages	≥ 10.9 V
Starter switch	OFF
Engine	Run

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

5. DIAGNOSTIC METHOD

• JUDGMENT OF MALFUNCTION

Judge NG when any of the malfunction criteria below are completed. Judge OK and clear the NG when the continuous time of not completing all the malfunction criteria below becomes more than the time needed for diagnosis (1 second).

Judgement Value

Malfunction Criteria	Threshold Value
Buss off flag or warning flag	Set
ID cannot be received from TCM	= 500 milliseconds

Time needed for Diagnosis: 1 second

Malfunction Indicator Light Illumination: Illuminates simultaneously when malfunction is detected.

6. DTC CLEAR CONDITION

When the OK driving cycle was completed 40 consecutive times.

When "Clear Memory" was performed.

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 consecutive times.
- When "Clear Memory" was performed.

8. FAIL-SAFE

The angle operation of accelerator position sensor demand target throttle opening calculation

9. ECM OPERATION AT DTC SETTING

Store the freeze frame data. (For test mode \$02)

CH:DTC P0604 INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR**1. OUTLINE OF DIAGNOSIS**

Detect the function abnormality of the micro-computer (RAM).

Normally, zero-clear all the RAM area in the initial routine. And judge NG when the total of all the RAM after the clear is not \$0000.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	OFF → ON

Perform the diagnosis in the initial routine.

3. GENERAL DRIVING CYCLE

Perform the diagnosis immediately after IG key SW is turned ON.

4. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed. Judge OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Result of RAM data addition, after zero initialization	Cannot read

Time Needed for Diagnosis: Undecided

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CI: DTC P0605 INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR

1. OUTLINE OF DIAGNOSIS

Judge NG when SUM value of ROM is out of the standard value.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
SUM value of ROM	Standard value

Time Needed for Diagnosis: To be determined.

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed (Only at engine stop)

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

7. FAIL SAFE

Stop the current to electronic throttle control motor. (Fix the throttle opening angle to 6°.)

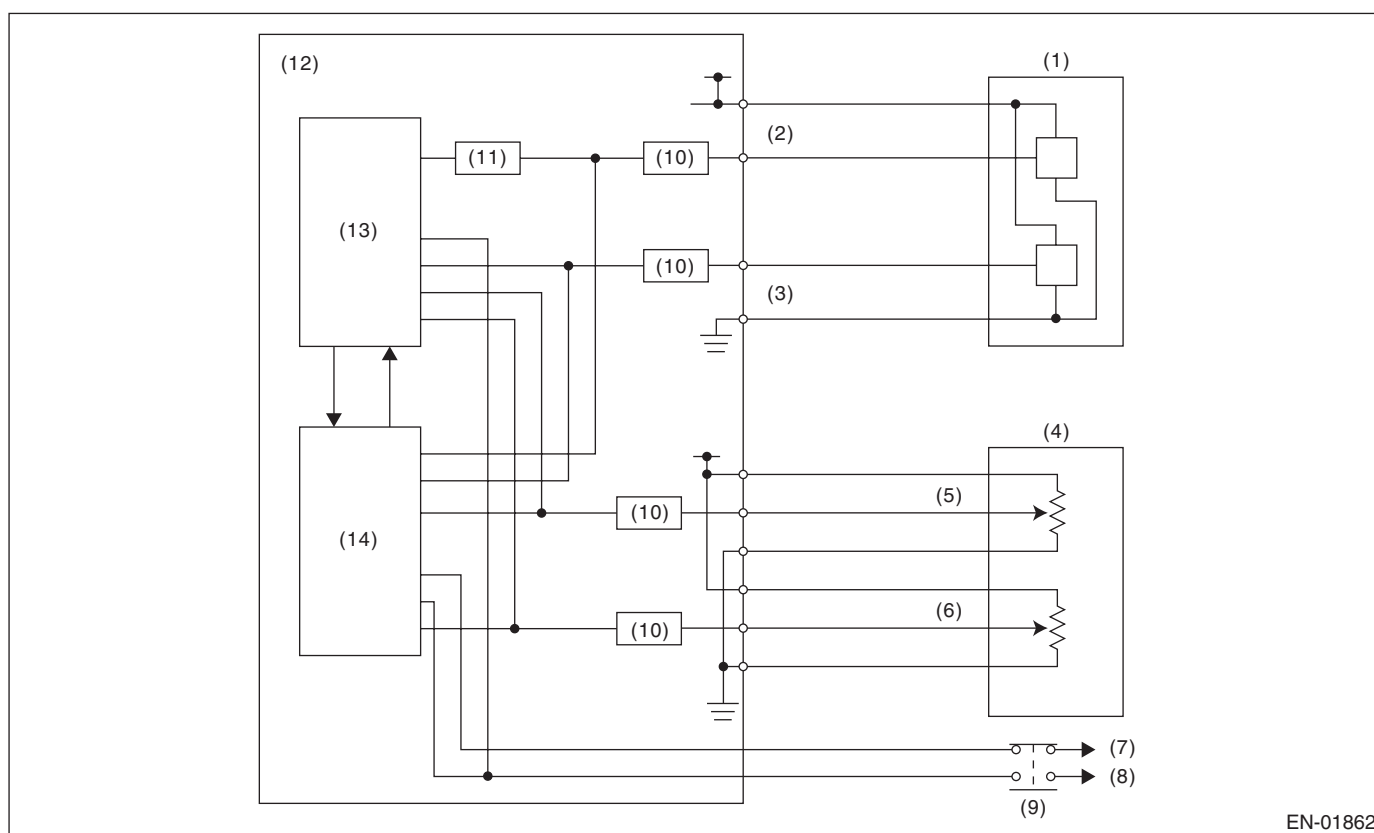
8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

CJ:DTC P0607 CONTROL MODULE PERFORMANCE**1. OUTLINE OF DIAGNOSIS**

Judge NG when either the following is completed.

- When the read value of throttle position sensor 1 signal is mismatched between main CPU and sub CPU.
- When the read value of accelerator position sensor 1 signal is mismatched between main CPU and sub CPU.
- When the sub CPU operates abnormally.
- When the communication between main CPU and sub CPU is abnormal.
- When the input amplifier circuit of throttle position sensor 1 is abnormal.
- When the cruise control cannot be canceled correctly.
- When the signal of brake SW1 and 2 is mismatched.
- When the directed angle from main CPU is abnormal.

2. COMPONENT DESCRIPTION

EN-01862

(1) Throttle position sensor	(6) Accelerator pedal position sensor 2	(11) Amplifier circuit
(2) Throttle position sensor 1	(7) Battery	(12) Engine control module (ECM)
(3) Throttle position sensor 2	(8) Stop light	(13) Sub CPU
(4) Accelerator pedal position sensor	(9) Brake switch	(14) Main CPU
(5) Accelerator pedal position sensor 1	(10) I/F circuit	

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
(1) Ignition switch	ON
(2) Ignition switch	ON
(3) None	—
(4) None	—
(5) Throttle opening angle	
(6) Brake SW (with cruise control)	ON
(7) None	—

4. GENERAL DRIVING CYCLE

- (1) — (4): Always perform the diagnosis continuously.
(5): Always perform the diagnosis continuously on idling.
(6): Perform the diagnosis when the brake pedal is depressed.
(7): Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge OK and clear NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
(1) Difference of CPU on reading value of throttle position sensor signal	Within 0.858 V
(2) Difference of CPU on reading value of accelerator position sensor signal	Within 0.042 V
(3) WD pulse from sub CPU	WD pulse occur
(4) Communication between CPU	Possible to communicate
(5) Difference of signal on connection of amplifier	Within $\times 4 \pm 3^\circ$
(6) Cruise control cancel signal at brake ON	Cruise control cancel signal ON
(7) Brake switch 1, 2 signal	SW 1 and 2 are matched

Time Needed for Diagnosis:

- (1) 250 milliseconds
(2) 250 milliseconds
(3) 200 milliseconds
(4) 200 milliseconds
(5) 24 milliseconds
(6) 250 milliseconds
(7) 200 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

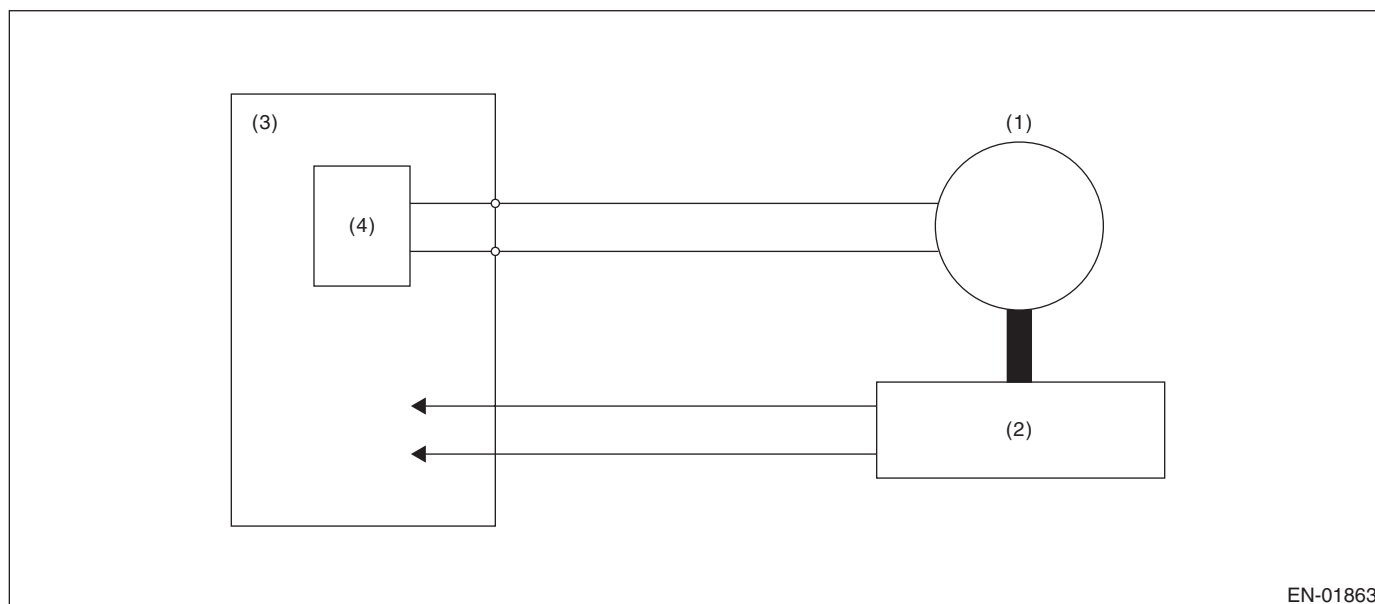
Stop the current to electronic throttle control motor. (Fix the throttle opening angle to 6° .)

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

CK:DTC P0638 THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1)**1. OUTLINE OF DIAGNOSIS**

Judge NG when the target opening angle and actual opening angle is mismatched or the current to motor is more than specified duty for specified time continuously.

2. COMPONENT DESCRIPTION

EN-01863

- (1) Motor (3) Engine control module (ECM)
 (2) Throttle position sensor (4) Drive circuit

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Normal operation of electronic throttle control	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously when the electronic throttle control is operating.

5. DIAGNOSTIC METHOD

Judge OK and clear NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Difference between target opening angle and actual opening angle	Less than 3.5°
Output duty to drive circuit	Less than 95%

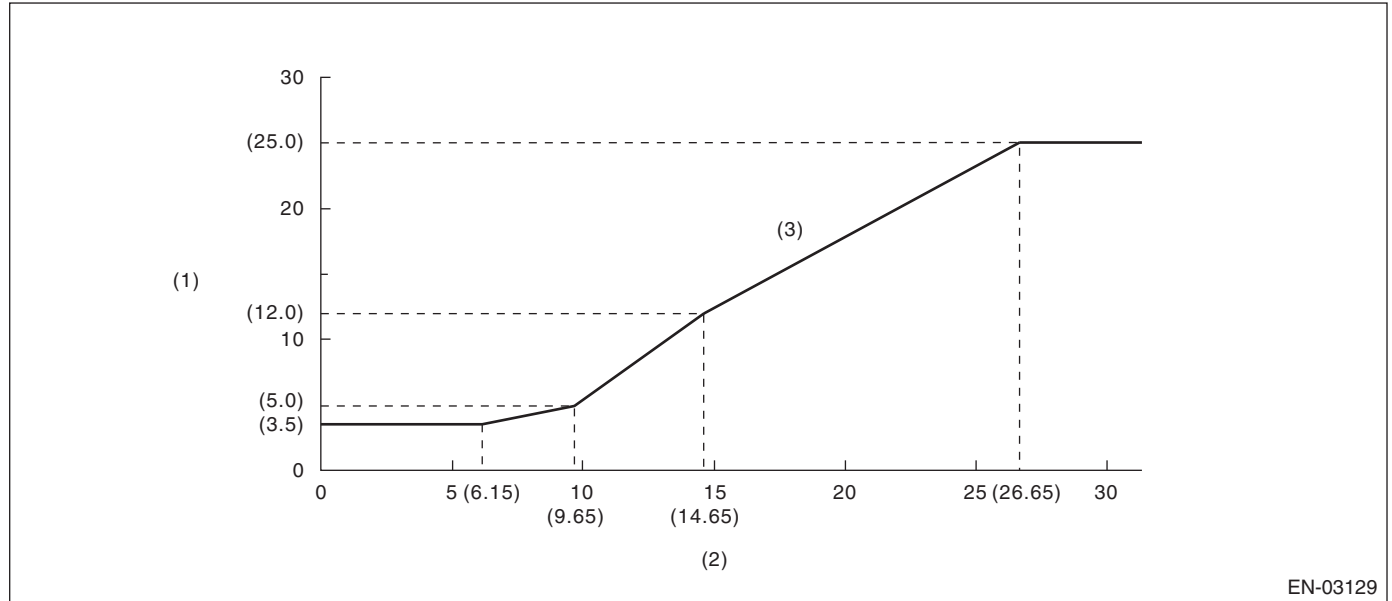
Time Needed for Diagnosis:

Target opening angle and actual opening angle: 250 milliseconds (For NG) 2,000 milliseconds (For OK)
 Output duty to drive circuit: 2,000 milliseconds

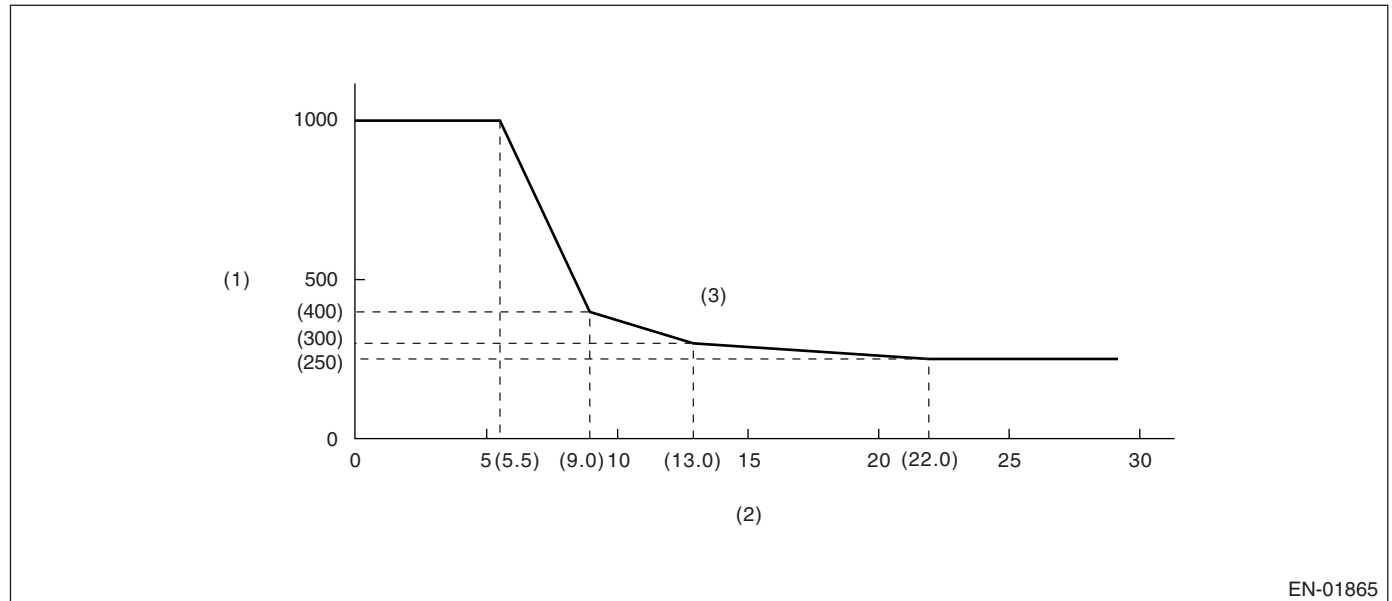
Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Details of Judgment



Details of Judgment (Always 1,000 milliseconds when the actual opening angle $\leq$ target opening angle)



Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed (Only with engine stoppped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only with engine stoppped)

8. FAIL SAFE

Stop the current to electronic throttle control motor. (Fix the throttle opening angle to 6°.)

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

CL:DTC P0691 COOLING FAN 1 CONTROL CIRCUIT LOW**1. OUTLINE OF DIAGNOSIS**

Detect the open or short circuit of the radiator fan circuit.

Judge NG when the ECM output level differs from the actual terminal level.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD**• Abnormality Judgment**

Judge NG when the cumulative time of completing the malfunction criteria below becomes more than 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
After starting the engine	1 seconds or more
Engine speed	≥ 500 rpm
Ignition switch	ON
Battery voltage	≥ 10.9 V
Terminal voltage level when ECM transmits OFF signal	Low level

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
After starting the engine	1 seconds or more
Engine speed	≥ 500 rpm
Ignition switch	ON
Battery voltage	≥ 10.9 V
Terminal voltage level when ECM transmits OFF signal	High level

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

CM:DTC P0692 COOLING FAN 1 CONTROL CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the radiator fan circuit.

Judge NG when the ECM output level differs from the actual terminal level.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time of completing the malfunction criteria below becomes more than 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
After starting the engine	1 seconds or more
Engine speed	≥ 500 rpm
Ignition switch	ON
Battery voltage	≥ 10.9 V
Terminal voltage level when ECM transmits ON signal	High level

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
After starting the engine	1 seconds or more
Engine speed	≥ 500 rpm
Ignition switch	ON
Battery voltage	≥ 10.9 V
Terminal voltage level when ECM transmits ON signal	Low level

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

CN:DTC P0700 TRANSMISSION CONTROL SYSTEM (MIL REQUEST)**1. OUTLINE OF DIAGNOSIS**

AT C/U performs CAN communication. It judges as NG if malfunction is detected.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery Voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Always perform diagnosis continuously.

4. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgement Value

Malfunction Criteria	Threshold Value
MIL light up request from TCM	Set

Time needed for diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates simultaneously when malfunction is detected.

5. DTC CLEAR CONDITION

- When the OK driving cycle was completed 40 consecutive times.
- When "Clear Memory" was performed.

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 consecutive times.
- When "Clear Memory" was performed.

7. FAIL-SAFE

None

8. ECM OPERATION AT DTC SETTING

Store the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CO:DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW (AT MODEL)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the neutral SW.

Judge NG when the ECM neutral terminal input differs from the reception data from TCM.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
After starting the engine	2 seconds or more
Starter switch	OFF

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 2 seconds or more after starting the engine.

4. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 6.5 seconds. Judge OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Neutral switch signal when park/neutral = "OFF" & any other switches = "ON" on AT	Low (ON)

Time Needed for Diagnosis: 6.5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

CP:DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW (MT MODEL)**1. OUTLINE OF DIAGNOSIS**

Judge the open or short circuit of the neutral SW.

Judge NG when there is no change in the neutral SW even if the driving shift was applied. (There is neutral SW ON/OFF inversion from the vehicle speed and engine speed.)

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
After starting the engine	2 seconds or more
Starter switch	OFF

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 2 seconds or more after starting the engine.

4. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed 3 time or more after the neutral SW change. And clear NG if there is change in the neutral SW.

Judgment Value

Malfunction Criteria	Threshold Value
Neutral switch signal (while changing from a to b below)	Low continues
Driving condition change	a) to b)
a) Vehicle speed = 0 km/h (0 MPH) & engine speed 600 — 900 rpm	
b) Vehicle speed ≥ 64 km/h (40 MPH) & engine speed 1,600 — 2,550 rpm	

Time Needed for Diagnosis: 3 monitoring

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

7. FAIL SAFE

Cruise control: Not allowed to command cruise control.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CQ:DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (AT MODEL)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the neutral SW.

Judge NG when the ECM neutral terminal input differs from the reception data from TCM.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	$\geq 10.9 \text{ V}$
After starting the engine	2 seconds or more
Starter switch	OFF

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 2 seconds or more after starting the engine.

4. DIAGNOSTIC METHOD

Judge NG when the continuous time until completing the malfunction criteria below becomes more than 6.5 seconds. Judge OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Neutral switch signal when park/neutral = "ON" & any other switches = "OFF" on AT	High (OFF)

Time Needed for Diagnosis: 6.5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

CR:DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (MT MODEL)**1. OUTLINE OF DIAGNOSIS**

Judge the open or short circuit of the neutral SW.

Judge NG when there is no change in the neutral SW even if the driving shift was applied. (There is neutral SW ON/OFF inversion from the vehicle speed and engine speed.)

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	$\geq 10.9 \text{ V}$
After starting the engine	2 seconds or more
Starter switch	OFF

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 2 seconds or more after starting the engine.

4. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed 3 time or more after the neutral SW change. And clear NG if there is change in the neutral SW.

Judgment Value

Malfunction Criteria	Threshold Value
Neutral switch signal (while changing from a to b below)	High continues
Driving condition change	a) to b)
a) Vehicle speed = 0 km/h (0 MPH) & engine speed 600 — 900 rpm	
b) Vehicle speed $\geq 64 \text{ km/h}$ (39.8 MPH) & engine speed 1,600 — 2,550 rpm	

Time Needed for Diagnosis: 3 monitoring

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CS:DTC P1152 O₂ SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK1 SENSOR1)

1. OUTLINE OF DIAGNOSIS

Detect that lambda value remains Low.

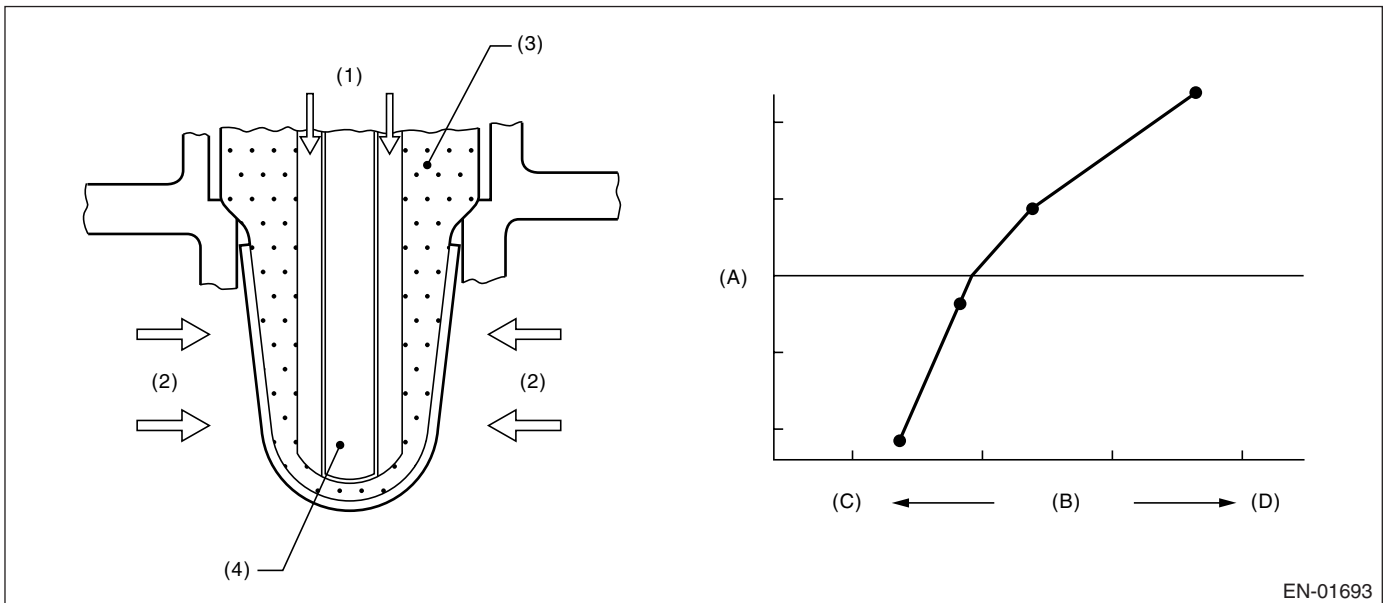
Judge NG when lambda value is abnormal in accordance with lambda value of front oxygen (A/F) sensor and running condition that is vehicle speed, amount of intake air engine coolant temperature, sub feedback control, etc.

Lambda value = Actual air fuel ratio/Theoretical air fuel ratio

Lambda > 1: Lean

Lambda < 1: Rich

2. COMPONENT DESCRIPTION



- (1) Atmosphere
- (2) Exhaust
- (3) ZrO₂
- (4) Ceramic heater

- (A) Electromotive force
- (B) Air fuel ratio
- (C) Lean
- (D) Rich

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
All secondary parameters to be in enable conditions Battery voltage Atmospheric pressure Rear oxygen sensor sub feedback	4 seconds or more > 10.9 V > 75.0 kPa (563 mmHg, 22.2 inHg) Operating
Rear oxygen sensor output voltage – feedback target voltage or rear oxygen sensor sub feedback compensation coefficient or rear oxygen sensor sub feedback compensation coefficient	–0.2 V ↔ 0.1 V On Min. On Max.
After engine starting Engine coolant temperature Vehicle speed Amount of intake air Load change during 0.5 engine rev. Impedance of front oxygen (A/F) sensor Learning value of evaporation gas density Accumulated time of operating canister purge	60 seconds or more ≥ 70°C (158°F) ≥ 20 km/h (12 MPH) ≥ 6 g/s ≤ 0.01 g/rev 0 ↔ 50 Ω ≤ 0.2 20 seconds or more

4. GENERAL DRIVING CYCLE

Perform diagnosis continuously at a constant speed of 20 km/h (12 MPH) or more since 60 seconds after starting the engine.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (10 seconds). Judge OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output lambda when rear oxygen sensor sub feedback compensation coefficient being at not high limit	≤ 0.85

Time Needed for Diagnosis: 10 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor main learning correction: Not allowed to calculate
- Correction when re-starting at high temperature: Normally minimum value 0.3 → 0
- Purge control: Not allowed to purge

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

CT:DTC P1153 O₂ SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK1 SENSOR1)

1. OUTLINE OF DIAGNOSIS

Detect that lambda value remains High.

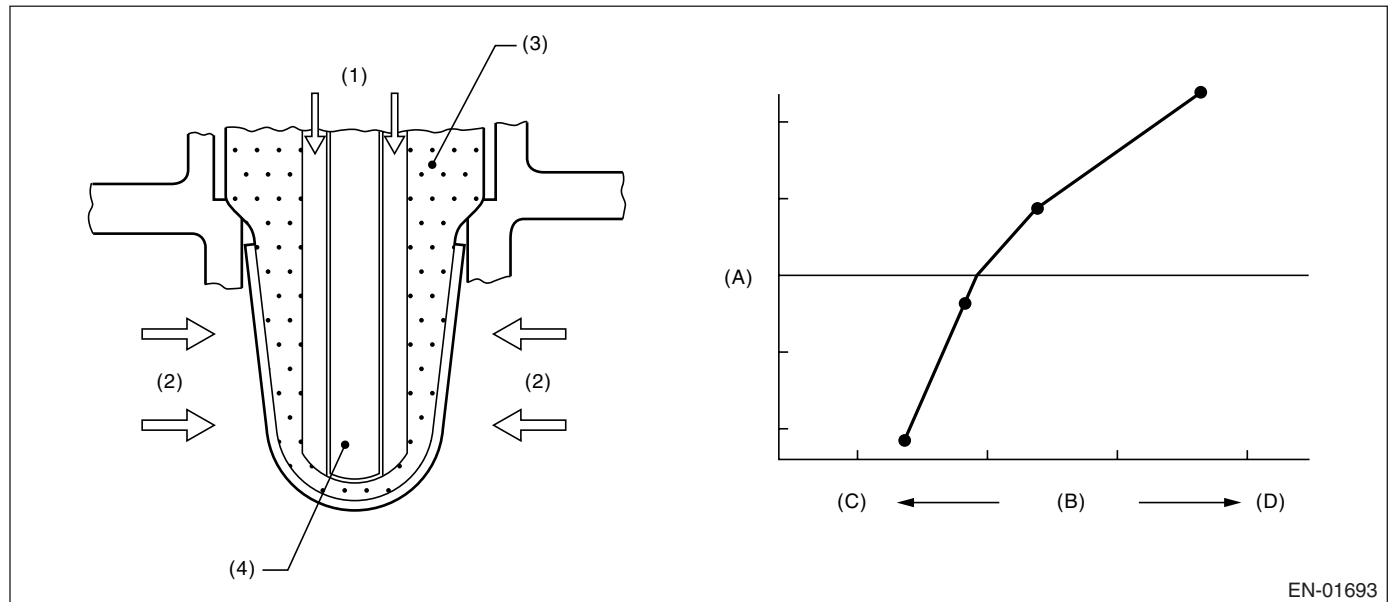
Judge NG when lambda value is abnormal in accordance with lambda value of front oxygen (A/F) sensor and running condition that is vehicle speed, amount of intake air engine coolant temperature, sub feedback control, etc.

Lambda value = Actual air fuel ratio/Theoretical air fuel ratio

Lambda > 1: Lean

Lambda < 1: Rich

2. COMPONENT DESCRIPTION



- (1) Atmosphere
- (2) Exhaust
- (3) ZrO₂
- (4) Ceramic heater

- (A) Electromotive force
- (B) Air fuel ratio
- (C) Lean
- (D) Rich

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
All secondary parameters to be in enable conditions	4 seconds or more
Battery voltage	> 10.9 V
Atmospheric pressure	> 75.0 kPa (563 mmHg, 22.2 inHg)
Rear oxygen sensor sub feedback	Operating
Rear oxygen sensor output voltage – feedback target voltage	–0.2 V ↔ 0.1 V
or rear oxygen sensor sub feedback compensation coefficient	On Min.
or rear oxygen sensor sub feedback compensation coefficient	On Max.
After engine starting	60 seconds or more
Engine coolant temperature	≥ 70°C (158°F)
Vehicle speed	≥ 20 km/h (12 MPH)
Amount of intake air	≥ 6 g/s
Load change during 0.5 engine rev.	≤ 0.02 g/rev
Impedance of front oxygen (A/F) sensor	0 ↔ 50 Ω
Learning value of evaporation gas density	≤ 0.2
Accumulated time of operating canister purge	20 seconds or more

4. GENERAL DRIVING CYCLE

Perform diagnosis continuously at a constant speed of 20 km/h (12 MPH) or more since 60 seconds after starting the engine.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (10 seconds). Judge OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output lambda when rear O ₂ sensor sub feedback compensation coefficient value being at not low limit	≥ 1.15

Time Needed for Diagnosis: 10 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor main learning correction: Not allowed to calculate
- Correction when re-starting at high temperature: Normally minimum value 0.3 → 0
- Purge control: Not allowed to purge

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

9. ECM OPERATION AT DTC SETTING

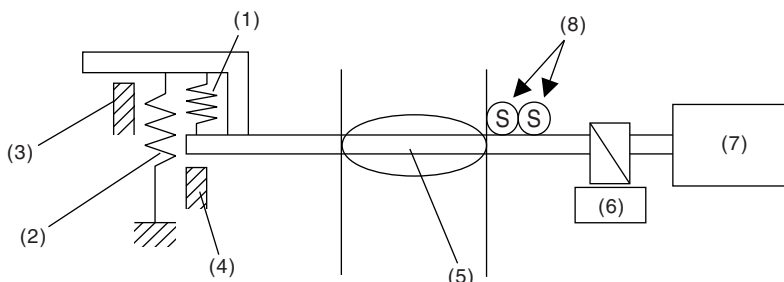
Memorize the freeze frame data. (For test mode \$02)

CU:DTC P1160 RETURN SPRING FAILURE

1. OUTLINE OF DIAGNOSIS

Judge NG when the valve does not move to the close direction with the motor power stopped and the valve open more than the default opening.

2. COMPONENT DESCRIPTION



EN-01866

(1) Opener spring	(4) Full closed stopper	(7) DC motor
(2) Return spring	(5) Throttle valve	(8) Main and sub throttle sensor
(3) Intermediate stopper	(6) Gear	

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Throttle opening angle	OFF
Motor continuity	OFF

4. GENERAL DRIVING CYCLE

- Ignition switch ON → OFF
- Ignition switch OFF → ON (After clear memory only)

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.6 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Opening variation after continuity is set to OFF	< 2°

Time Needed for Diagnosis: 600 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

8. FAIL SAFE

Fix the throttle opening to 6°.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

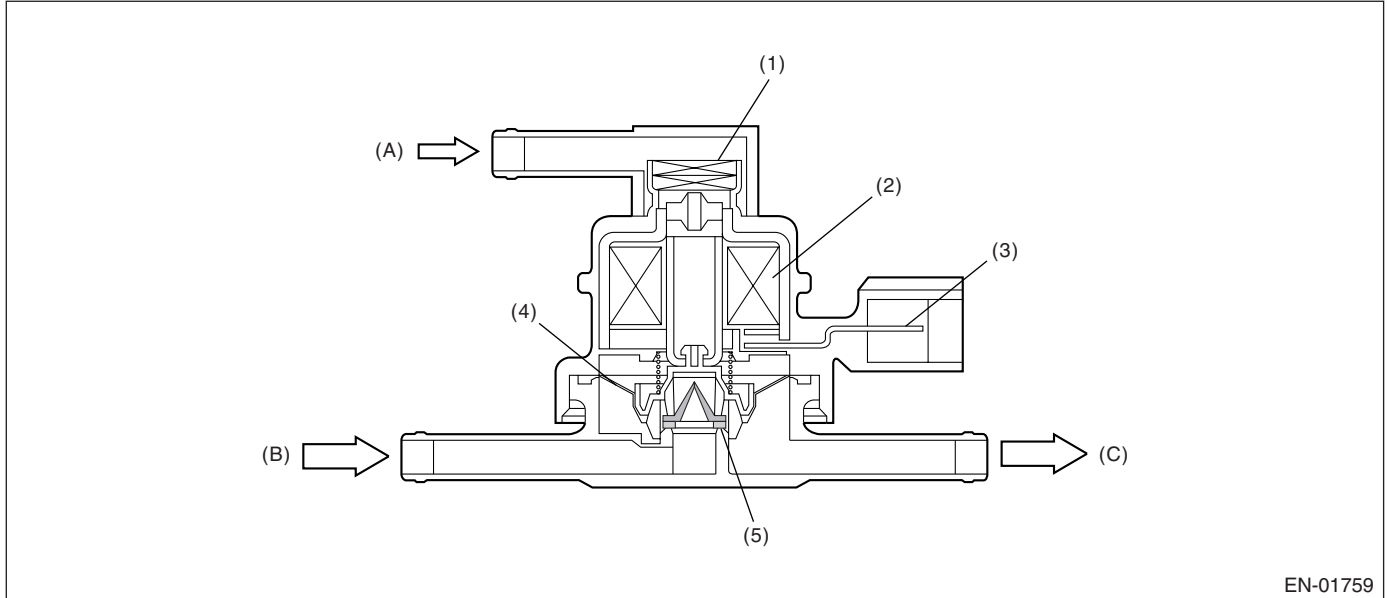
GENERAL DESCRIPTION

CV:DTC P1400 FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of pressure control solenoid valve. Judge NG when ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



- (1) Filter
- (2) Coil
- (3) Connector terminal
- (4) Diaphragm
- (5) Valve

- (A) Atmospheric pressure
- (B) Shut off valve
- (C) To fuel tank

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	$\geq 10.9 \text{ V}$
After engine starting	1 second or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than time needed for diagnosis (2.5 seconds). Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage when ECM outputs off signal	Low

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in two continuous drive cycles.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CW:DTC P1410 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN

1. OUTLINE OF DIAGNOSIS

Always detect the open malfunction of both electromagnetic valve and reed valve of combi valve.
Calculate maximum and minimum values of secondary air supply pipe pressure sensor output voltage during certain period of time after engine starting, and cumulative deviation of output voltage. Judge NG when the difference between max. and min. values, and cumulative deviation are large.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	< 500 rpm
After engine starting	9 seconds or more
After secondary air injection system is stopped	9 seconds or more
Intake air amount	2 g (0.07 oz)/sec. or more and less than 400 g (14.11 oz)/sec.
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously when amount of air flow is large while secondary air pump is not operated after engine starting.

4. DIAGNOSTIC METHOD

Pulsation occurs in secondary air supply pipe pressure sensor output when both electromagnetic valve and reed valve of combi valve have open malfunction. Find this pulsation in the following method, and detect the malfunction.

Calculate maximum (max) and minimum (min) values of secondary air supply pipe pressure sensor output voltage, and cumulative deviation (sum) of output voltage during kCOTIM sec. Compare the difference value between maximum and minimum values with threshold value, and also cumulative value with threshold value. Count up the number of times when both values exceed threshold value. Judge NG when the number of times becomes kCOCOT. Judge OK when both of values do not exceed threshold value or only one of them does.

Judgment Value

Malfunction Criteria	Threshold Value
Difference value between maximum and minimum values of internal pressure in pipe	≥ 0.048 V
Cumulative variation value of internal pressure in pipe at every 4 milliseconds	≥ 24 V
Variation value in ambient pressure	< 4 mmHg

Time Needed for Diagnosis: 10 seconds × 2 times

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

CX:DTC P1418 SECONDARY AIR INJECTION SYSTEM CONTROL “A” CIRCUIT SHORTED**1. OUTLINE OF DIAGNOSIS**

Judge NG when the ECM output level is different from the actual terminal level.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
OFF	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD**• Abnormality Judgment**

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (2.5 seconds).

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Ignition	ON
Terminal voltage when ECM transmits ON signal	High

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Ignition	ON
Terminal voltage when ECM transmits ON signal	Low

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

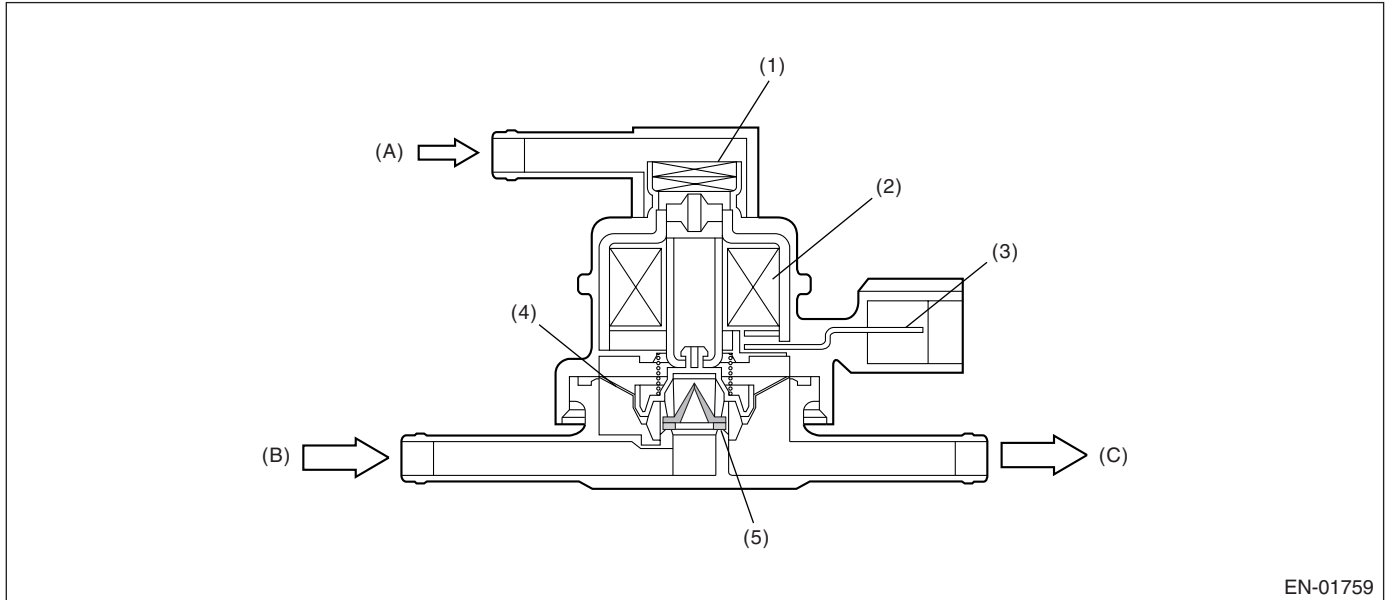
CY:DTC P1420 FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of pressure control solenoid valve.

Judge NG when ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



- (1) Filter
- (2) Coil
- (3) Connector terminal
- (4) Diaphragm
- (5) Valve

- (A) Atmospheric pressure
- (B) Shut off valve
- (C) To fuel tank

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	$\geq 10.9 \text{ V}$
After engine starting	1 second or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than time needed for diagnosis (2.5 seconds). Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage when ECM outputs off signal	High

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in two continuous drive cycles.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

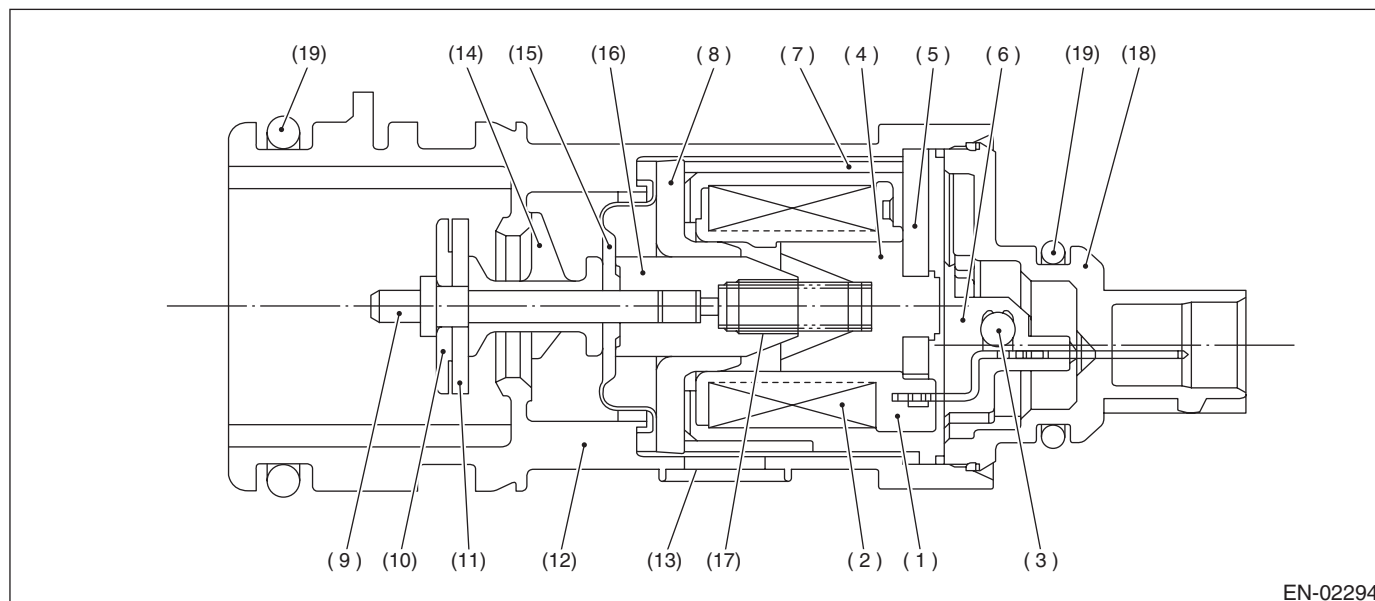
CZ:DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM

1. OUTLINE OF DIAGNOSIS

Detect the drain valve function abnormality.

Judge NG when the fuel tank pressure is small.

2. COMPONENT DESCRIPTION



(1) Bobbin	(11) Valve
(2) Coil	(12) Housing
(3) Diode	(13) Filter
(4) Stator core	(14) Retainer
(5) End plate	(15) Diaphragm
(6) Body	(16) Movable core
(7) Yoke	(17) Spring
(8) Magnetic plate	(18) Cover
(9) Shaft	(19) O-ring
(10) Plate	

3. ENABLE CONDITION

Secondary Parameter	Enable Condition
Drain valve	Open
Battery voltage	$\geq 10.9\text{ V}$
Atmospheric pressure	$\geq 75.0\text{ kPa}$ (563 mmHg, 22.17 inHg)
Tank pressure when starter ON → OFF	$-0.67 \leftrightarrow 1.43\text{ kPa}$ ($-5 \leftrightarrow 10.7\text{ mmHg}$, $-0.20 \leftrightarrow 0.42\text{ inHg}$)

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Tank pressure	≤ -4.0 kPa (-30 mmHg, -1.18 inHg)

Time Needed for Diagnosis: 3 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Tank pressure	> -4.0 kPa (-30 mmHg, -1.18 inHg)
Cumulative time when the malfunction criteria below are completed	≥ 30 seconds
Duty ratio of purge control solenoid valve	Except 0
Fuel temperature	$-10 \longleftrightarrow 45^{\circ}\text{C}$ ($14 \longleftrightarrow 113^{\circ}\text{F}$)
Relative ratio of intake manifold	≤ -26.7 kPa (-200 mmHg, -7.87 inHg)

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

PCV control: Open the PCV solenoid.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

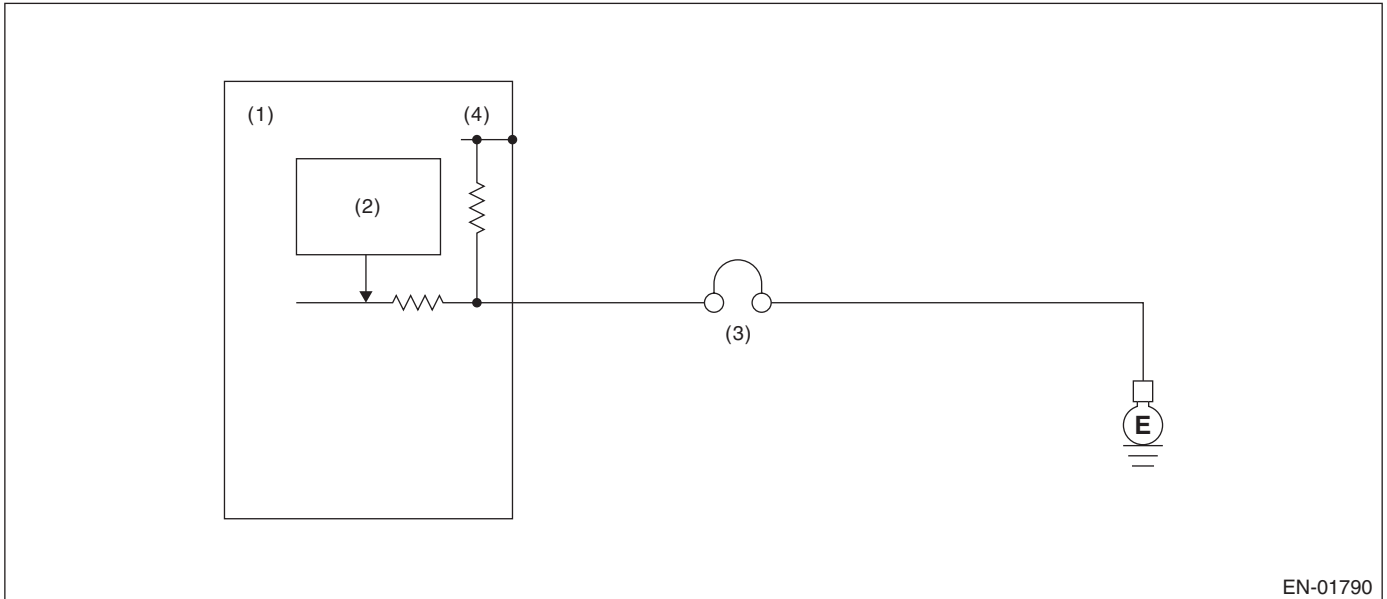
GENERAL DESCRIPTION

DA:DTC P1491 POSITIVE CRANKCASE VENTILATION (BLOW-BY) FUNCTION PROBLEM

1. OUTLINE OF DIAGNOSIS

Detect the blow-by hose release abnormality.
Judge NG when the diagnosis terminal voltage is high.

2. COMPONENT DESCRIPTION



- (1) Engine control module (ECM)
- (2) Detecting circuit
- (3) PCV diagnosis connector
- (4) 5 V

3. ENABLE CONDITION

Secondary Parameter	Enable Condition
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSIS METHOD

• Abnormality Judgment

Judge NG when the continuous time until completing the malfunction criteria below becomes more than 2.5 second.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	> 10.9 V
Positive crankcase ventilation diagnosis terminal voltage	High
Engine speed	≥ 500 rpm

Time Needed for Diagnosis: 2.5 second

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

• Normality Judgment

Judge OK and clear NG when the malfunction criteria below is completed.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	> 10.9 V
Positive crankcase ventilation diagnosis terminal voltage	Low
Engine speed	≥ 500 rpm

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was performed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the diagnosis value and trouble standard value. (For test mode \$06)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

DB:DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of starter SW.

Judge OFF NG when the engine starts without starter SW signal.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge OFF NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Vehicle speed	< 1 km/h (0.62 MPH)
Starter ON signal	Not detected
Engine speed after completing 0.8 seconds or more of engine speed less than 500 rpm	≥ 500 rpm

Time Needed for Diagnosis: 1 second

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OFF OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Starter ON	Experienced
Starter ON diagnosis	Not experienced
Battery voltage	> 8 V

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DC:DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION**1. OUTLINE OF DIAGNOSIS**

Detect open or short circuit of the back-up voltage circuit.

Judge NG when the back-up voltage becomes smaller than the battery voltage.

2. ENABLE CONDITION

Secondary Parameter	Enable Condition
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD**• Abnormality Judgment**

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Voltage of back-up power	$< \text{Battery voltage} \times 0.7$
Battery voltage	$\geq 10.9 \text{ V}$

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear NG when the malfunction criteria below is completed.

Judgment Value

Malfunction Criteria	Threshold Value
Voltage of back-up power supply	$\geq \text{Battery voltage} \times 0.7$
Battery voltage	$\geq 10.9 \text{ V}$

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

DD:DTC P1570 ANTENNA

1. OUTLINE OF DIAGNOSIS

For the detecting criteria, refer to P0513.

<Ref. to GD(H4DOTC)-170, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DE:DTC P1571 REFERENCE CODE INCOMPATIBILITY

1. OUTLINE OF DIAGNOSIS

For the detecting criteria, refer to P0513.

<Ref. to GD(H4DOTC)-170, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DF:DTC P1572 IMM CIRCUIT FAILURE (EXCEPT ANTENNA CIRCUIT)

1. OUTLINE OF DIAGNOSIS

For the detecting criteria, refer to P0513.

<Ref. to GD(H4DOTC)-170, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DG:DTC P1574 KEY COMMUNICATION FAILURE

1. OUTLINE OF DIAGNOSIS

For the detecting criteria, refer to P0513.

<Ref. to GD(H4DOTC)-170, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DH:DTC P1576 EGI CONTROL MODULE EEPROM

1. OUTLINE OF DIAGNOSIS

For the detecting criteria, refer to P0513.

<Ref. to GD(H4DOTC)-170, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DI: DTC P1577 IMM CONTROL MODULE EEPROM

1. OUTLINE OF DIAGNOSIS

For the detecting criteria, refer to P0513.

<Ref. to GD(H4DOTC)-170, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

DJ:DTC P2004 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of tumble generator valve motor function.

Judge open fixing malfunction when the opening degree is large even after finishing the tumble generator valve open driving.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 10.9 \text{ V}$
Engine coolant temperature	$\geq 0^{\circ}\text{C}$ (32°F)
Ambient temperature	$\geq 0^{\circ}\text{C}$ (32°F)

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Tumble generator valve angle	$\geq 67.4^{\circ}$
Tumble generator valve "close" signal output	2.2 seconds or more

Time Needed for Diagnosis: 3 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Tumble generator valve angle	$< 67.4^{\circ}$
Tumble generator valve "close" signal output	2.2 seconds or more

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

7. FAIL SAFE

Tumble generator valve opening

- For tumble generator valve all closing points learning, not allowed to update to the closing side.
- For tumble generator valve all opening points learning, not allowed to update to the opening side.

Tumble generator valve control

- Output the open signal.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

DK:DTC P2005 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 2)

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of tumble generator valve motor function.

Judge open fixing malfunction when the opening degree is large even after finishing the tumble generator valve closing driving.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 10.9 \text{ V}$
Engine coolant temperature	$\geq 0^{\circ}\text{C}$ (32°F)
Ambient temperature	$\geq 0^{\circ}\text{C}$ (32°F)

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Tumble generator valve angle	$\geq 67.4^{\circ}$
Tumble generator valve "close" signal output	2.2 seconds or more

Time Needed for Diagnosis: 3 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Tumble generator valve angle	$< 67.4^{\circ}$
Tumble generator valve "close" signal output	2.2 seconds or more

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

7. FAIL SAFE

Tumble generator valve opening

- For tumble generator valve all closing points learning, not allowed to update to the closing side.
- For tumble generator valve all opening points learning, not allowed to update to the opening side.

Tumble generator valve control

- Output the open signal.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

**DL:DTC P2006 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED
(BANK 1)****1. OUTLINE OF DIAGNOSIS**

Detect the malfunction of tumble generator valve motor function.

Judge close fixing malfunction when the opening degree is small even after finishing the tumble generator valve open driving.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 10.9 \text{ V}$
Engine coolant temperature	$\geq 0^{\circ}\text{C}$ (32°F)
Ambient temperature	$\geq 0^{\circ}\text{C}$ (32°F)

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD**• Abnormality Judgment**

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Tumble generator valve angle	$< 67.4^{\circ}$
Tumble generator valve "open" signal output	2.2 seconds or more

Time Needed for Diagnosis: 3 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Tumble generator valve angle	$\geq 67.4^{\circ}$
Tumble generator valve "open" signal output	2.2 seconds or more

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

7. FAIL SAFE

Tumble generator valve opening

- For tumble generator valve all closing points learning, not allowed to update to the closing side.
- For tumble generator valve all opening points learning, not allowed to update to the opening side.

Tumble generator valve control

- Output the close signal.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

DM:DTC P2007 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK 2)

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of tumble generator valve motor function.

Judge close fixing malfunction when the opening degree is small even after finishing the tumble generator valve open driving.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 10.9 \text{ V}$
Engine coolant temperature	$\geq 0^{\circ}\text{C}$ (32°F)
Ambient temperature	$\geq 0^{\circ}\text{C}$ (32°F)

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Tumble generator valve angle	$< 67.4^{\circ}$
Tumble generator valve "open" signal output	2.2 seconds or more

Time Needed for Diagnosis: 3 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Tumble generator valve angle	$\geq 67.4^{\circ}$
Tumble generator valve "open" signal output	2.2 seconds or more

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

7. FAIL SAFE

Tumble generator valve opening

- For tumble generator valve all closing points learning, not allowed to update to the closing side.
- For tumble generator valve all opening points learning, not allowed to update to the opening side.

Tumble generator valve control

- Output the close signal.

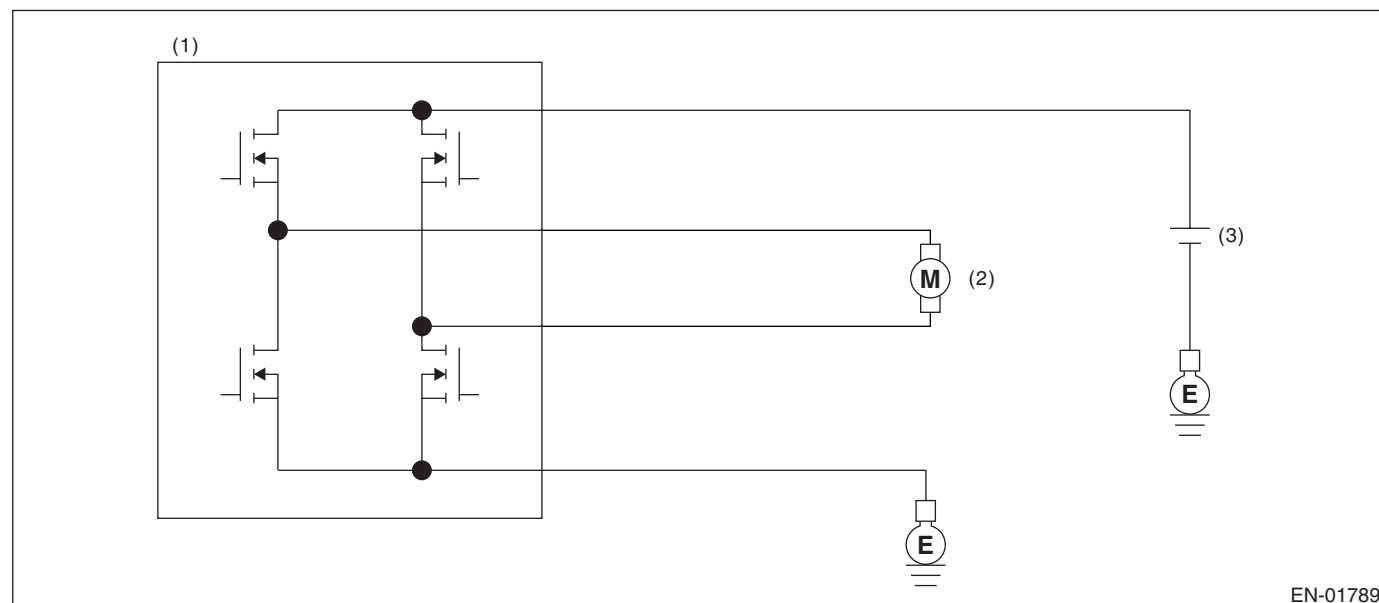
8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

**DN:DTC P2008 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN
(BANK 1)****1. OUTLINE OF DIAGNOSIS**

Detect the open or short circuit of tumble generator valve motor.

Judge NG when the open signal is sent from IC after tumble generator valve driving IC diagnosis.

2. COMPONENT DESCRIPTION

- (1) Engine control module (ECM)
 (2) Tumble generator valve
 (3) Battery

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
ECM output signal	before set ON → OFF
Tumble generator valve ON signal output time	20 milliseconds or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

At the main IC, check the sent signal at each timing which occurs just before the tumble generator valve output is set to ON and OFF, and judge open NG when the open NG signal is sent during 1 second in a row. Judge OK and clear the NG when the OK signal is sent.

Judgment Value

Malfunction Criteria	Threshold Value
Open NG signal input	Low
Overcurrent NG signal input	High

Time Needed for Diagnosis: 10 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Tumble generator valve control: Not allowed to move tumble generator valve.

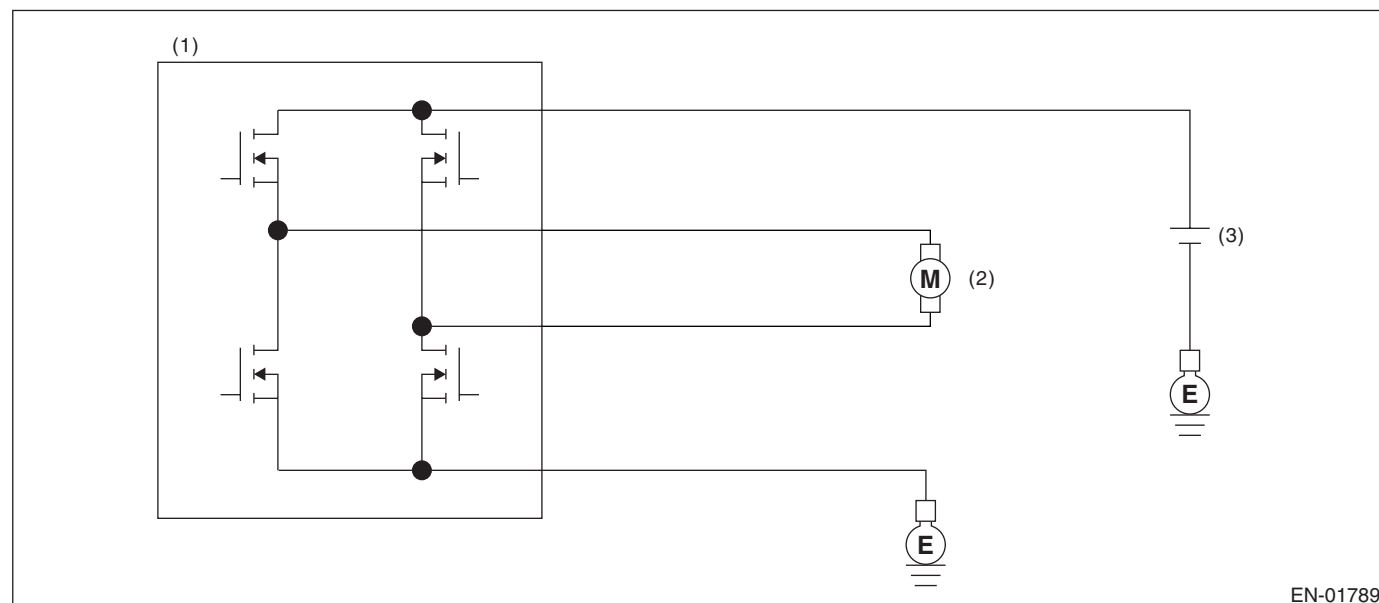
9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DO:DTC P2009 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 1)**1. OUTLINE OF DIAGNOSIS**

Detect the open or short circuit of tumble generator valve motor.

Judge NG when the overcurrent signal is sent from IC after tumble generator valve driving IC diagnosis.

2. COMPONENT DESCRIPTION

- (1) Engine control module (ECM)
 (2) Tumble generator valve
 (3) Battery

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
ECM output signal	Before set ON → OFF
Tumble generator valve ON signal output time	20 milliseconds or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

NG signal is sent to main IC. At the main IC, check the sent signal at each timing which occurs just before the tumble generator valve output is set to ON and OFF, and judge overcurrent NG when the overcurrent NG signal is sent during 1 second in a row. Judge OK and clear the NG when the OK signal is sent.

Judgment Value

Malfunction Criteria	Threshold Value
Open NG signal input	High
Overcurrent NG signal input	Low

Time Needed for Diagnosis: 10 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Tumble generator valve control: Not allowed to move tumble generator valve.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

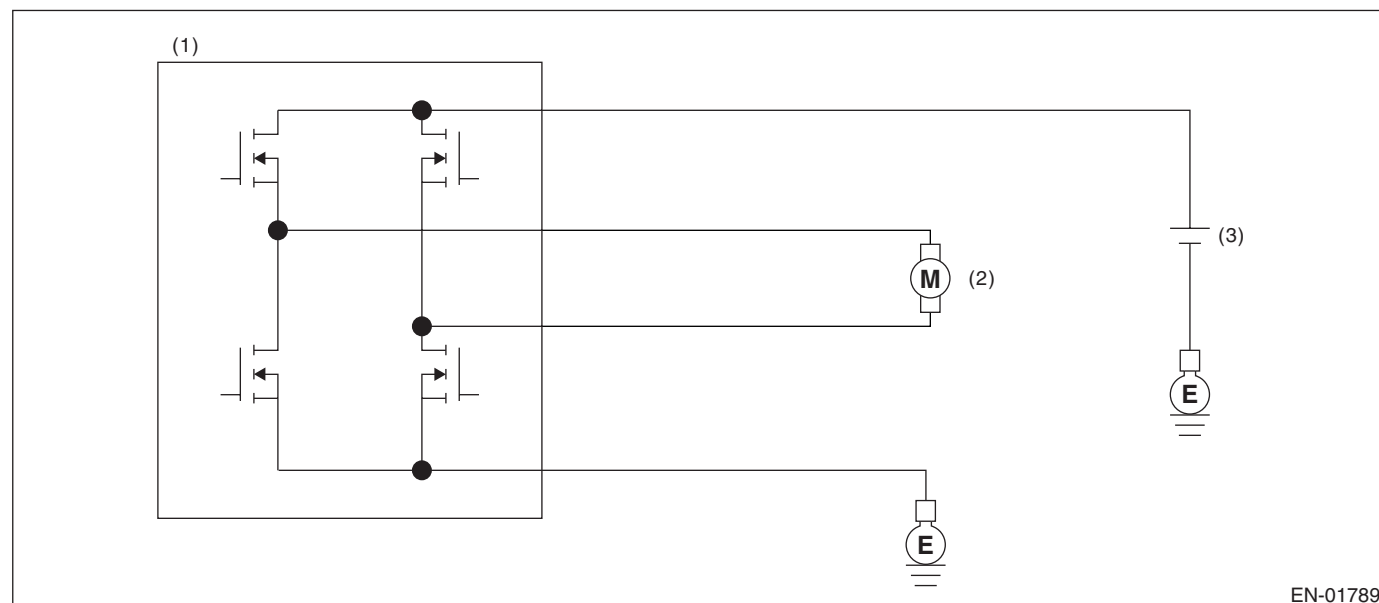
DP:DTC P2011 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN (BANK 2)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of tumble generator valve motor.

Judge NG when the open signal is sent from IC after tumble generator valve driving IC diagnosis.

2. COMPONENT DESCRIPTION



- (1) Engine control module (ECM)
- (2) Tumble generator valve
- (3) Battery

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
ECM output signal	Before set ON → OFF
Tumble generator valve ON signal output time	20 milliseconds or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

At the main IC, check the sent signal at each timing which occurs just before the tumble generator valve output is set to ON and OFF, and judge open NG when the open NG signal is sent during 1 second in a row. Judge OK and clear the NG when the OK signal is sent.

Judgment Value

Malfunction Criteria	Threshold Value
Open NG signal input	Low
Overcurrent NG signal input	High

Time Needed for Diagnosis: 10 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Tumble generator valve control: Not allowed to move tumble generator valve.

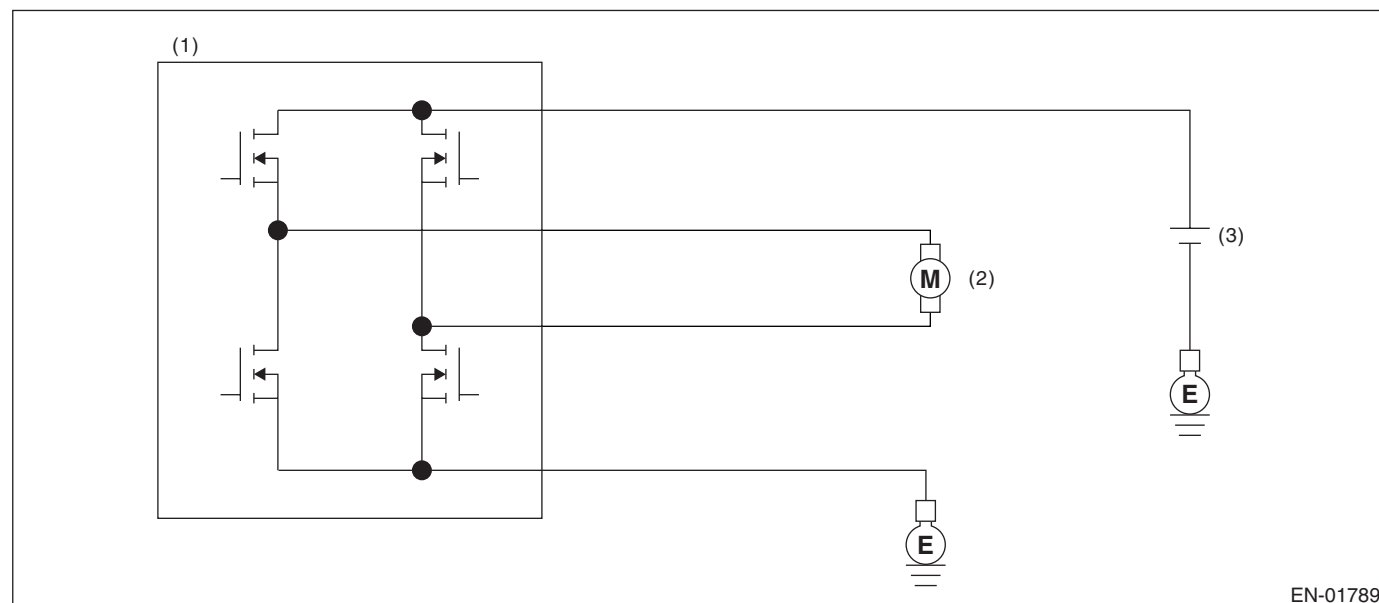
9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DQ:DTC P2012 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 2)**1. OUTLINE OF DIAGNOSIS**

Detect the open or short circuit of tumble generator valve motor.

Judge NG when the overcurrent signal is sent from IC after tumble generator valve driving IC diagnosis.

2. COMPONENT DESCRIPTION

- (1) Engine control module (ECM)
 (2) Tumble generator valve
 (3) Battery

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
ECM output signal	Before set ON → OFF
Tumble generator valve ON signal output time	20 milliseconds or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

NG signal is sent to main IC. At the main IC, check the sent signal at each timing which occurs just before the tumble generator valve output is set to ON and OFF, and judge overcurrent NG when the overcurrent NG signal is sent during 1 second in a row. Judge OK and clear the NG when the OK signal is sent.

Judgment Value

Malfunction Criteria	Threshold Value
Open NG signal input	High
Overcurrent NG signal input	Low

Time Needed for Diagnosis: 10 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Tumble generator valve control: Not allowed to move tumble generator valve.

9. ECM OPERATION AT DTC SETTING

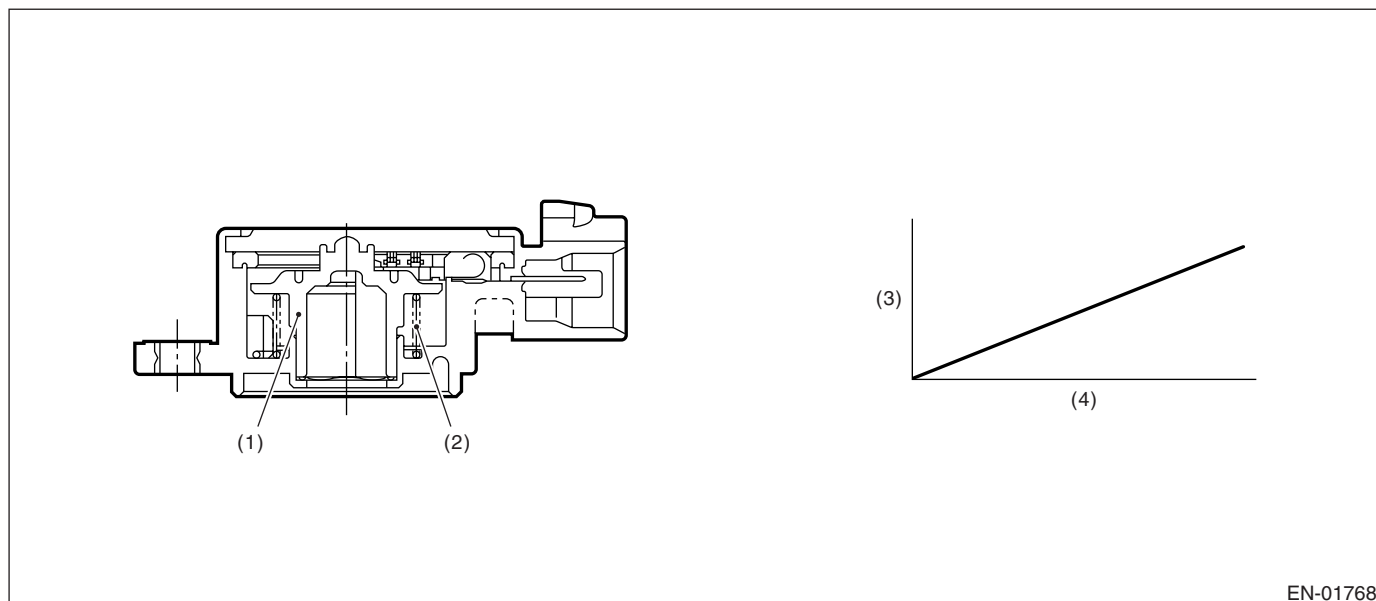
Memorize the freeze frame data. (For test mode \$02)

DR:DTC P2016 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT LOW (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of tumble generator valve position sensor.
Judge NG when the value is out of standard range.

2. COMPONENT DESCRIPTION



- (1) Rotor
- (2) Return spring
- (3) Voltage (V)
- (4) Tumble generator valve angle (°)

EN-01768

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform diagnosis.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (0.5 seconds). Judge OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.167 V

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Tumble generator valve position

- Learning of tumble generator valve position fully closed and date renewed to close side.
- Learning of tumble generator valve position fully opened and date renewed to open side.

9. ECM OPERATION AT DTC SETTING

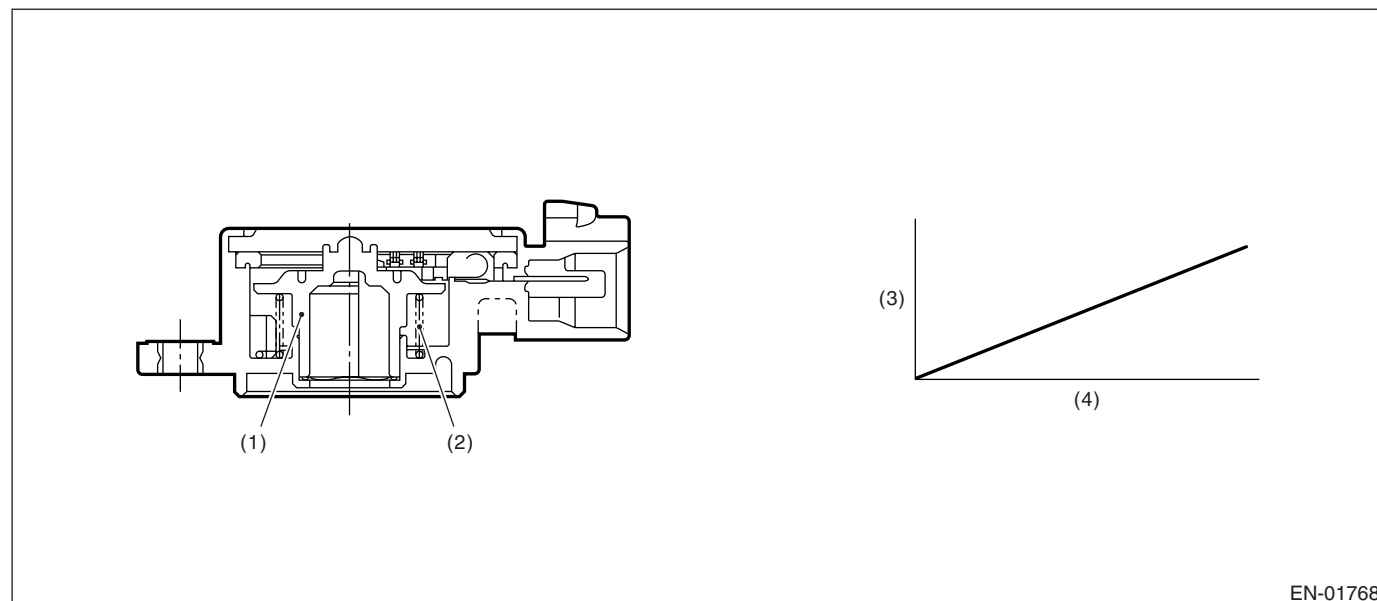
Memorize the freeze frame data. (For test mode \$02)

DS:DTC P2017 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT HIGH (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of tumble generator valve position sensor.
Judge NG when the value is out of standard range.

2. COMPONENT DESCRIPTION



- (1) Rotor
- (2) Return spring
- (3) Voltage (V)
- (4) Tumble generator valve angle (°)

EN-01768

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform diagnosis.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (0.5 seconds). Judge OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.843 V

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

Tumble generator valve position

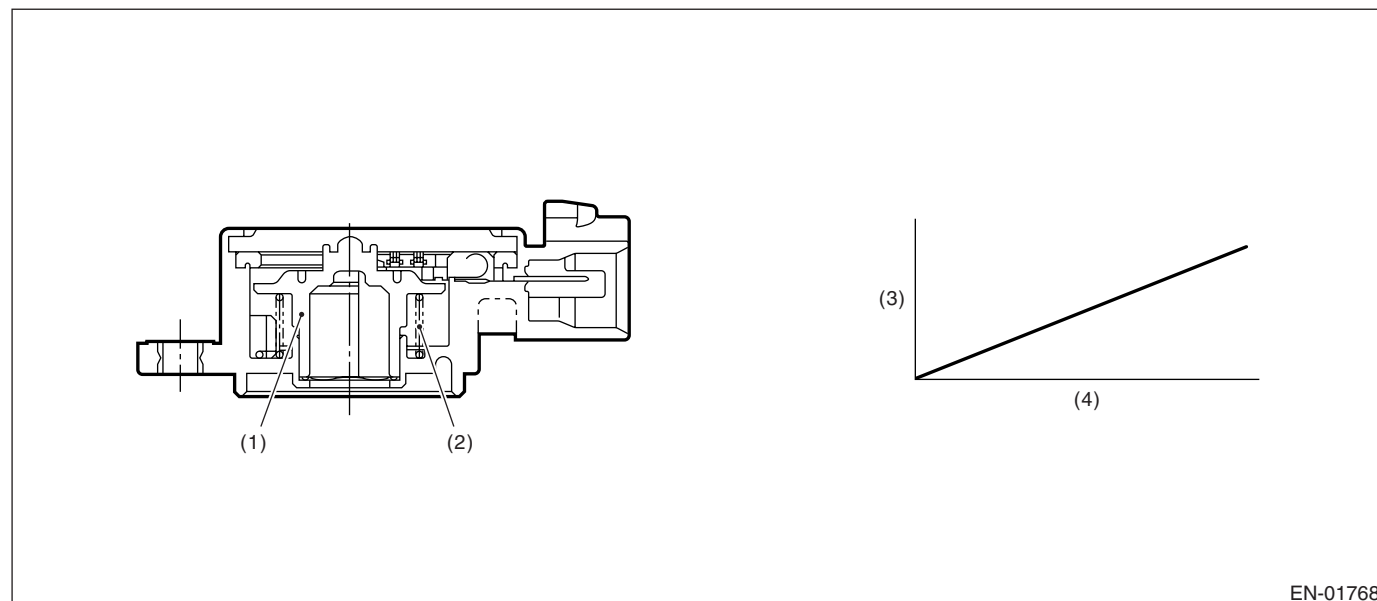
- Learning of tumble generator valve position fully closed and date renewed to close side.
- Learning of tumble generator valve position fully opened and date renewed to open side.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DT:DTC P2021 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT LOW (BANK 2)**1. OUTLINE OF DIAGNOSIS**

Detect open or short circuit of tumble generator valve position sensor.
Judge NG when the value is out of standard range.

2. COMPONENT DESCRIPTION

- (1) Rotor
- (2) Return spring
- (3) Voltage (V)
- (4) Tumble generator valve angle (°)

EN-01768

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform diagnosis.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (0.5 seconds). Judge OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.167 V

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

Tumble generator valve position

- Learning of tumble generator valve position fully closed and date renewed to close side.
- Learning of tumble generator valve position fully opened and date renewed to open side.

9. ECM OPERATION AT DTC SETTING

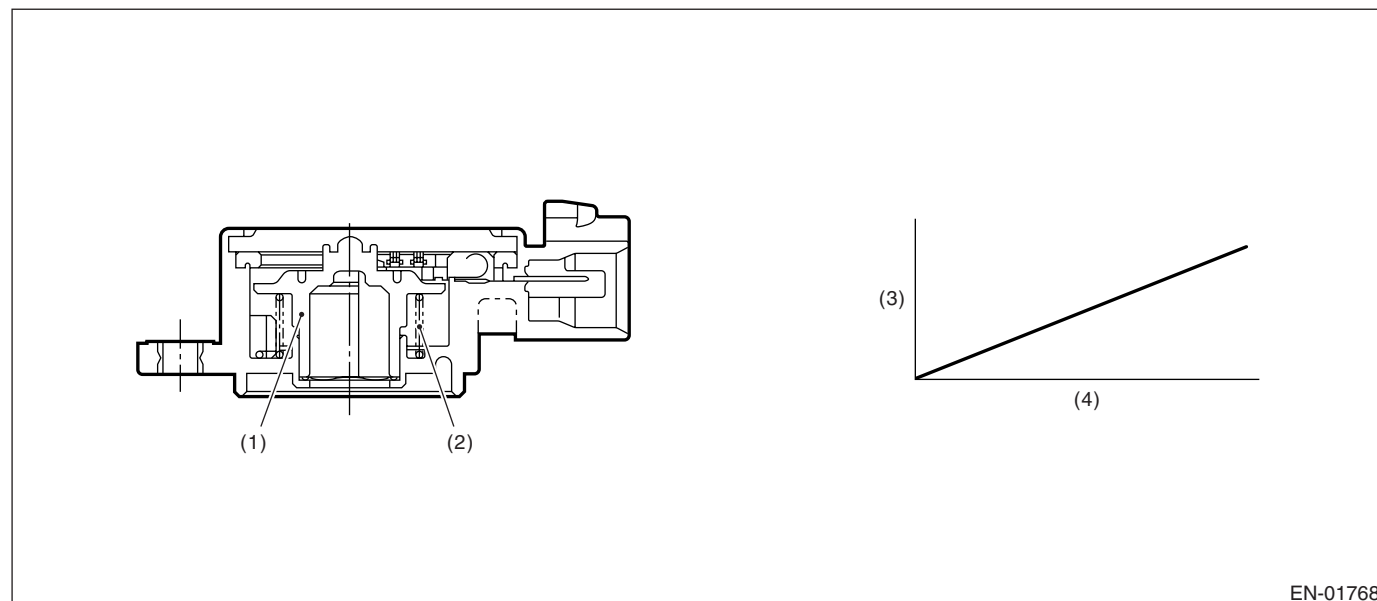
Memorize the freeze frame data. (For test mode \$02)

DU:DTC P2022 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT HIGH (BANK 2)

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of tumble generator valve position sensor.
Judge NG when the value is out of standard range.

2. COMPONENT DESCRIPTION



- (1) Rotor
- (2) Return spring
- (3) Voltage (V)
- (4) Tumble generator valve angle (°)

EN-01768

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform diagnosis.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (0.5 seconds). Judge OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.843 V

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

Tumble generator valve position

- Learning of tumble generator valve position fully closed and date renewed to close side.
- Learning of tumble generator valve position fully opened and date renewed to open side.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DV:DTC P2088 OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 1)**1. OUTLINE OF DIAGNOSIS**

Detect open or short circuit of oil flow control solenoid valve.

Judge open NG when the current flow is small whereas duty signal is large, and judge short NG when the current flow is large whereas duty signal is small.

2. ENABLE CONDITION

Secondary Parameter	Enable Condition
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD**• Abnormality Judgment**

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
OCV solenoid valve duty	$\geq 99.61\%$
OCV solenoid valve present current	< 0.306 A

Time Needed for Diagnosis: 2,000 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Target current value of OCV solenoid valve	$\geq 0.14\%$
Target current value of OCV solenoid valve – Control current value of OCV solenoid valve	≥ 0.08 A

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. FAIL SAFE

- Ignition timing whole learning compensation:
 - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when IG OFF, and then make the whole learning incomplete.
 - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when making a normality judgment from abnormality judgment, and then make the whole learning incomplete.
- Ignition timing partial learning compensation:
 - Enter the initial value (0°CA) to the compensation value of partial learning zone when IG OFF.
 - Enter the initial value (0°CA) to the compensation value of partial learning zone when making a normality judgment from abnormality judgment.
- AVCS control:
 - Most timing retard learning is not complete or most timing retard learning completion is not experienced.
 - ISC feedback compensation: Do not perform the AVCS actual timing advance compensation.
 - Make the OCV driving Duty to be the given value (9.36%).

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DW:DTC P2089 OCV SOLENOID VALVE SIGNAL A CIRCUIT SHORT (BANK 1)**1. OUTLINE OF DIAGNOSIS**

Detect open or short circuit of oil flow control solenoid valve.

Judge open NG when the current flow is small whereas duty signal is large, and judge short NG when the current flow is large whereas duty signal is small.

2. ENABLE CONDITION

Secondary Parameter	Enable Condition
Battery voltage	$\geq 10.9 \text{ V}$

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD**• Abnormality Judgment**

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
OCV solenoid valve duty	$< 0.39\%$
OCV solenoid valve present current	$\geq 0.306 \text{ A}$

Time Needed for Diagnosis: 2,000 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Target current value of OCV solenoid valve – Control current value of OCV solenoid valve	$< 0.08 \text{ A}$

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. FAIL SAFE

- Ignition timing whole learning compensation:
 - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when IG OFF, and then make the whole learning incomplete.
 - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when making a normality judgment from abnormality judgment, and then make the whole learning incomplete.
- Ignition timing partial learning compensation:
 - Enter the initial value (0°CA) to the compensation value of partial learning zone when IG OFF.
 - Enter the initial value (0°CA) to the compensation value of partial learning zone when making a normality judgment from abnormality judgment.
- AVCS control:
 - Most timing retard learning is not complete or most timing retard learning completion is not experienced.
 - ISC feedback compensation: Do not perform the AVCS actual timing advance compensation.
 - Make the OCV driving Duty to be the given value (9.36%).

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DX:DTC P2092 OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 2)**1. OUTLINE OF DIAGNOSIS**

Detect open or short circuit of oil flow control valve solenoid.

Judge open NG when the current flow is small whereas duty signal is large, and judge short NG when the current flow is large whereas duty signal is small.

2. ENABLE CONDITION

Secondary Parameter	Enable Condition
Battery voltage	$\geq 10.9 \text{ V}$

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD**• Abnormality Judgment**

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
OCV control duty	$\geq 99.61\%$
OCV control present current	$< 0.306 \text{ A}$

Time Needed for Diagnosis: 2000 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Target current value of OCV	$\geq 0.14\%$
Target current value of OCV – Control current value of OCV	$\geq 0.08 \text{ A}$

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. FAIL SAFE

- Ignition timing whole learning compensation:
 - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when IG OFF, and then make the whole learning incomplete.
 - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when making a normality judgment from abnormality judgment, and then make the whole learning incomplete.
- Ignition timing partial learning compensation:
 - Enter the initial value (0°CA) to the compensation value of partial learning zone when IG OFF.
 - Enter the initial value (0°CA) to the compensation value of partial learning zone when making a normality judgment from abnormality judgment.
- AVCS control:
 - Most timing retard learning is not complete or most timing retard learning completion is not experienced.
 - ISC feedback compensation: Do not perform the AVCS actual timing advance compensation.
 - Make the OCV driving Duty to be the given value (9.36%).

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DY:DTC P2093 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 2)**1. OUTLINE OF DIAGNOSIS**

Detect open or short circuit of oil flow control valve solenoid.

Judge open NG when the current flow is small whereas duty signal is large, and judge short NG when the current flow is large whereas duty signal is small.

2. ENABLE CONDITION

Secondary Parameter	Enable Condition
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD**• Abnormality Judgment**

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
OCV control duty	$< 0.39\%$
OCV control present current	≥ 0.306 A

Time Needed for Diagnosis: 2000 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear NG when the continuous time of completing the malfunction criteria below becomes more than 2 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Target current value of OCV – Control current value of OCV	< 0.08 A

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. FAIL SAFE

- Ignition timing whole learning compensation:
 - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when IG OFF, and then make the whole learning incomplete.
 - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when making a normality judgment from abnormality judgment, and then make the whole learning incomplete.
- Ignition timing partial learning compensation:
 - Enter the initial value (0°CA) to the compensation value of partial learning zone when IG OFF.
 - Enter the initial value (0°CA) to the compensation value of partial learning zone when making a normality judgment from abnormality judgment.
- AVCS control:
 - Most timing retard learning is not complete or most timing retard learning completion is not experienced.
 - ISC feedback compensation: Do not perform the AVCS actual timing advance compensation.
 - Make the OCV driving Duty to be the given value (9.36%).

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DZ:DTC P2096 POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1

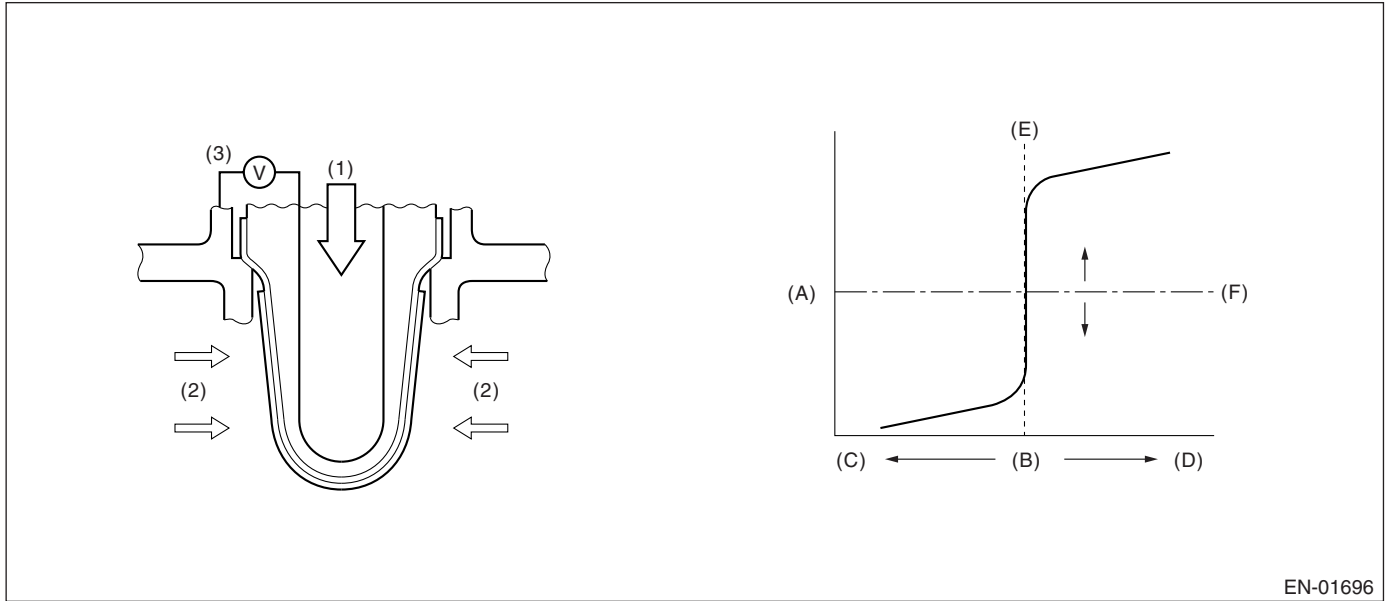
1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel system from the amount of sub feedback control, if it is shifted to rich or lean. If the sub feedback amount from the engine started till ignition switch OFF is shifted to rich or lean, judge as insufficient sub feedback amount.

If insufficient, change the sub feedback amount guard value and shift judge line, and increment the guard operation counter (tentative NG counter).

Judge NG when the guard operation counter (tentative NG counter) exceeds the specified value and sub feedback amount is shifted to rich or lean.

2. COMPONENT DESCRIPTION



EN-01696

- (1) Atmosphere
- (2) Exhaust gas
- (3) Electromotive force

- (A) Electromotive force
- (B) Air fuel ratio
- (C) Rich
- (D) Lean
- (E) Theoretical air fuel ratio
- (F) Comparative voltage

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Continuous time of completing all conditions	1 second or more
Sub feedback learning enable condition	Completed

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at a constant speed at more than approx. 75 km/h (47 MPH).

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria becomes more than 5 seconds.
Judge OK and clear NG when the continuous time of incompleted the malfunction criteria becomes more than 5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Sub feedback learning value	< -0.018

Time Needed for Diagnosis: 5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When OK with similar drive in 3 drive cycles.
- When "Clear Memory" was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

EA:DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1

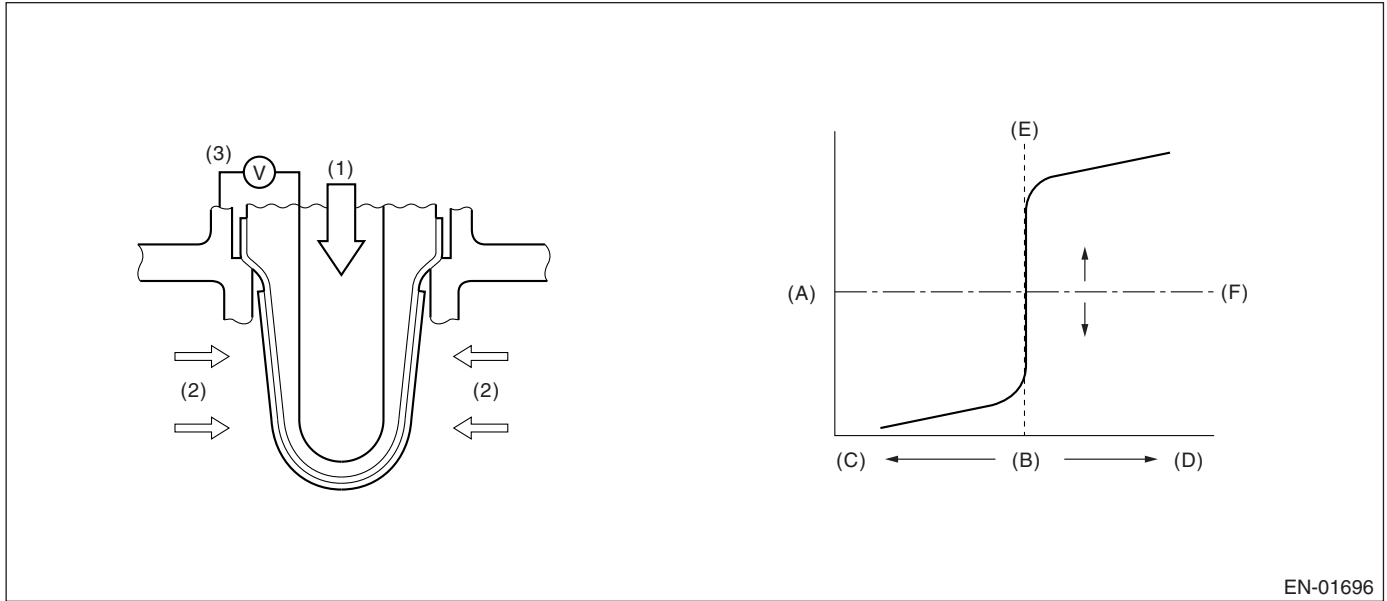
1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel system from the amount of sub feedback control, if it is shifted to rich or lean. If the sub feedback amount from the engine started till ignition switch OFF is shifted to rich or lean, judge as insufficient sub feedback amount.

If insufficient, change the sub feedback amount guard value and shift judge line, and increment the guard operation counter (tentative NG counter).

Judge NG when the guard operation counter (tentative NG counter) exceeds the specified value and sub feedback amount is shifted to rich or lean.

2. COMPONENT DESCRIPTION



EN-01696

- (1) Atmosphere
- (2) Exhaust gas
- (3) Electromotive force

- (A) Electromotive force
- (B) Air fuel ratio
- (C) Rich
- (D) Lean
- (E) Theoretical air fuel ratio
- (F) Comparative voltage

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Continuous time of completing all conditions	1 second or more
Sub feedback learning enable condition	Completed

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at a constant speed at more than approx. 75 km/h (47 MPH).

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 5 seconds.

Judge OK and clear NG when the continuous time of completing the malfunction criteria below becomes more than 5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Sub feedback learning value	≥ 0.018
Count of limits moving to lean	≥ 4 count
Ratio of time for oxygen sensor upper or lower to time or rich time/lean time	≤ 9 (AT model) ≤ 5.7 (MT model)

Time Needed for Diagnosis: 5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous drive cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When OK with similar drive in 3 drive cycles.
- When "Clear Memory" was performed

8. FAIL SAFE

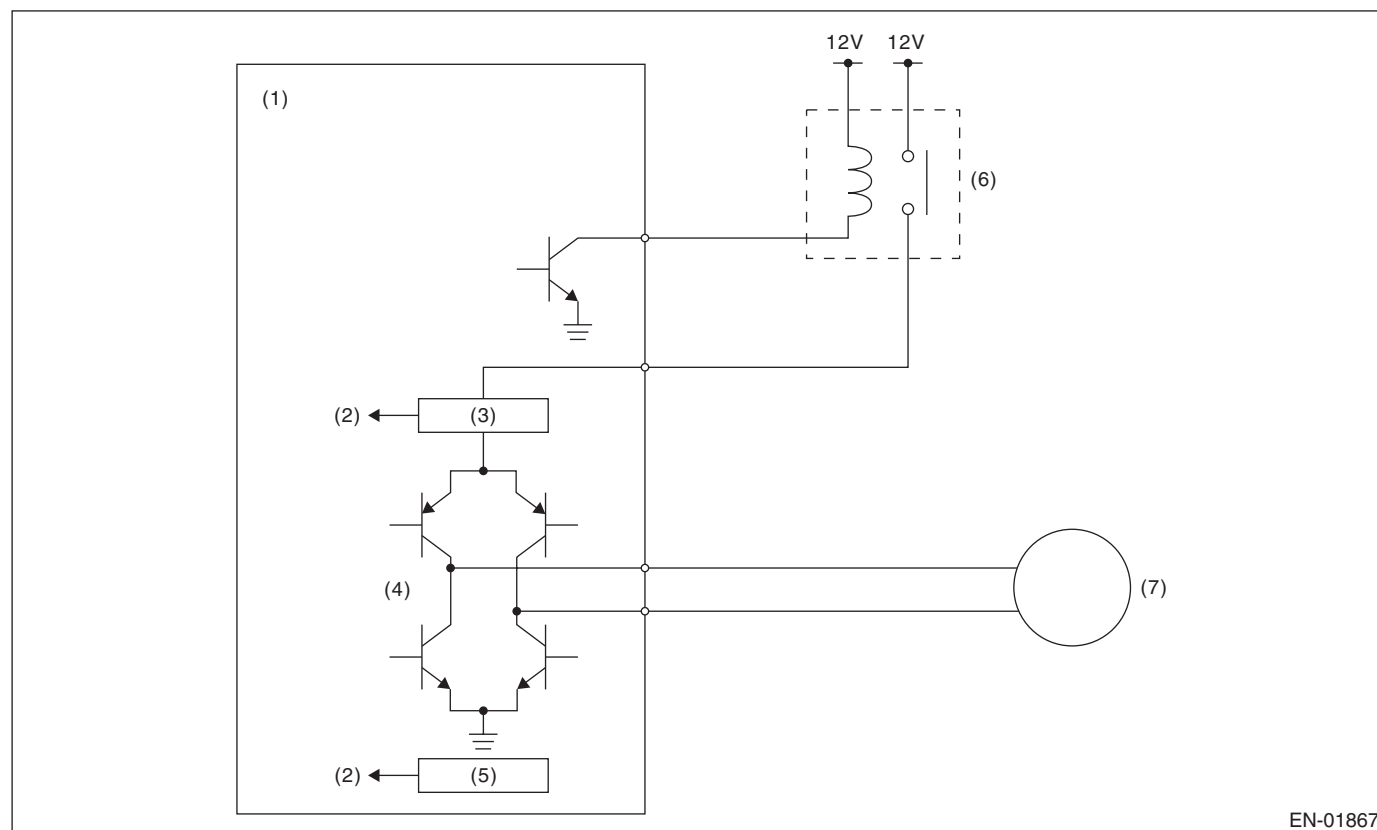
None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

EB:DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE**1. OUTLINE OF DIAGNOSIS**

Judge NG when the motor current becomes large or drive circuit is heated.

2. COMPONENT DESCRIPTION

EN-01867

(1) Engine control unit (ECM)	(4) Drive circuit	(7) Motor
(2) Detection circuit	(5) Temperature detection circuit	
(3) Overcurrent detection circuit	(6) Electronic control throttle relay	

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Under control of electronic control throttle	ON
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD**• Abnormality Judgment**

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Motor current	$\leq 8 \text{ A}$
Drive circuit inner temperature	$\leq 175^{\circ}\text{C}$ (347°F)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Time Needed for Diagnosis:

- 500 milliseconds (NG judgment)
- 2,000 milliseconds (OK judgment)

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

8. FAIL SAFE

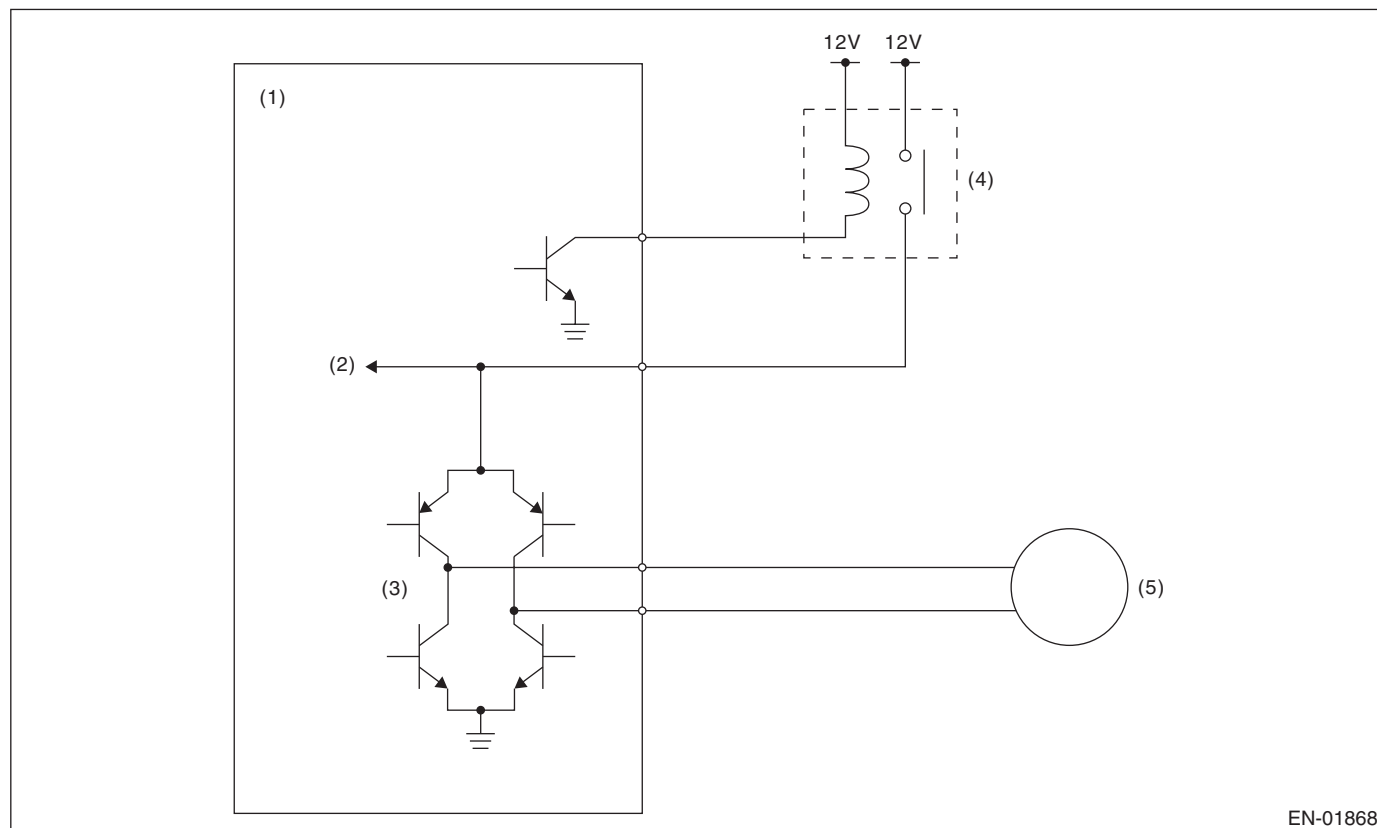
Stop the continuity to the electronic control throttle motor. (Fix the throttle opening angle to 6°.)

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

EC:DTC P2102 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW**1. OUTLINE OF DIAGNOSIS**

Judge NG when the electronic control throttle power is not supplied even when ECM sets the electronic throttle control relay to ON.

2. COMPONENT DESCRIPTION

(1) Engine control module (ECM)

(3) Drive circuit

(5) Motor

(2) Voltage detection circuit

(4) Electronic control throttle relay

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Electronic control throttle relay output	ON
Battery voltage	$\geq 6\text{ V}$

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD**• Abnormality Judgment**

Judge NG when continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Motor power voltage	$\leq 5\text{ V}$

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Time Needed for Diagnosis:

- 400 milliseconds (For NG)
- 2,000 milliseconds (For OK)

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

8. FAIL SAFE

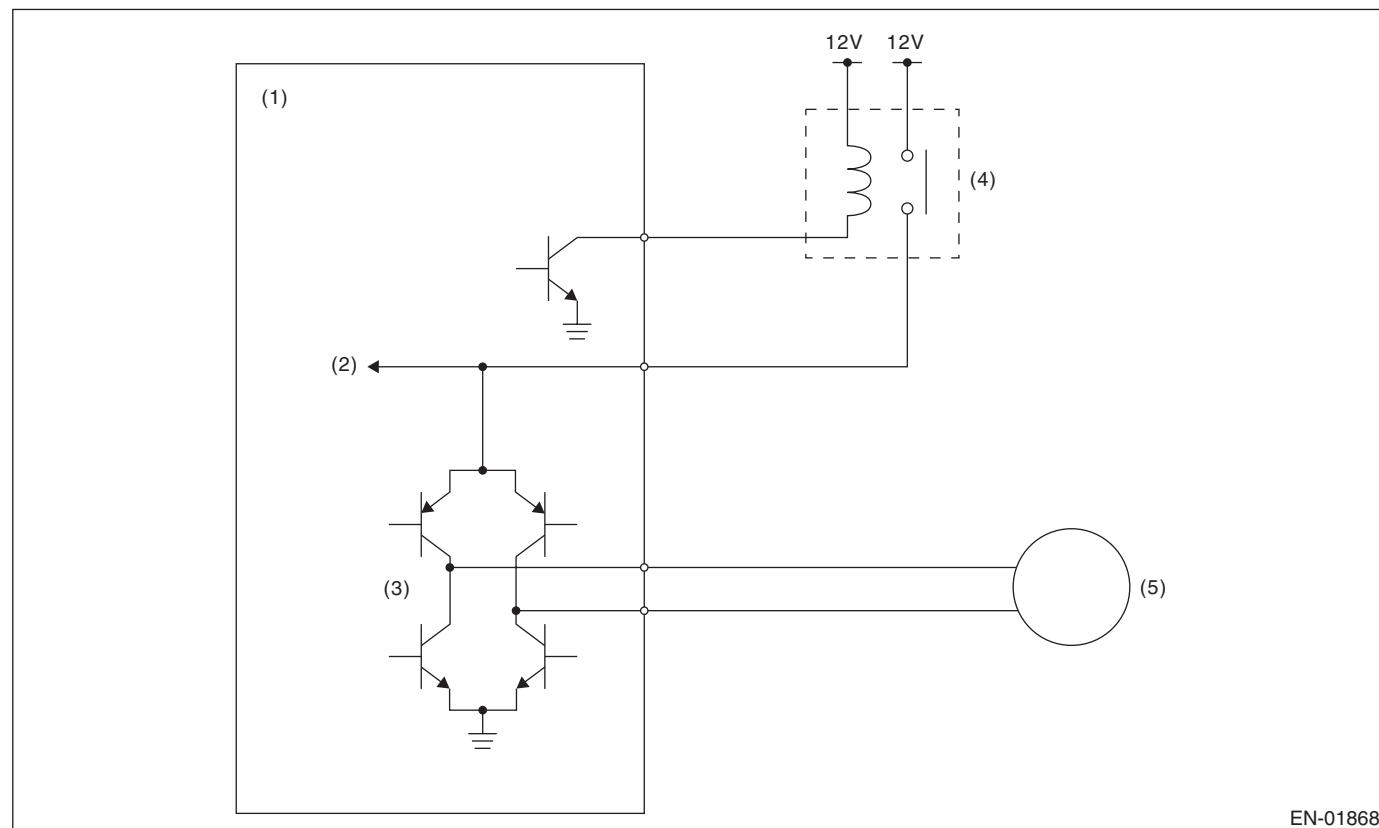
Stop the continuity to the electronic control throttle motor. (Fix the throttle opening angle to 6°.)

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

ED:DTC P2103 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH**1. OUTLINE OF DIAGNOSIS**

Judge NG when the electronic control throttle power is not supplied even when ECM sets the electric throttle control relay to OFF.

2. COMPONENT DESCRIPTION

EN-01868

(1) Engine control module (ECM)

(3) Drive circuit

(5) Motor

(2) Voltage detection circuit

(4) Electronic throttle control relay

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Electronic throttle control relay output	OFF
Battery voltage	$\geq 6\text{ V}$

4. GENERAL DRIVING CYCLE

- Ignition switch ON → OFF
- Ignition switch OFF → ON (After clear memory only)

5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Motor power voltage	$\leq 5\text{ V}$

Time Needed for Diagnosis:

- 600 milliseconds (For NG)
- 400 milliseconds (For OK)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

8. FAIL SAFE

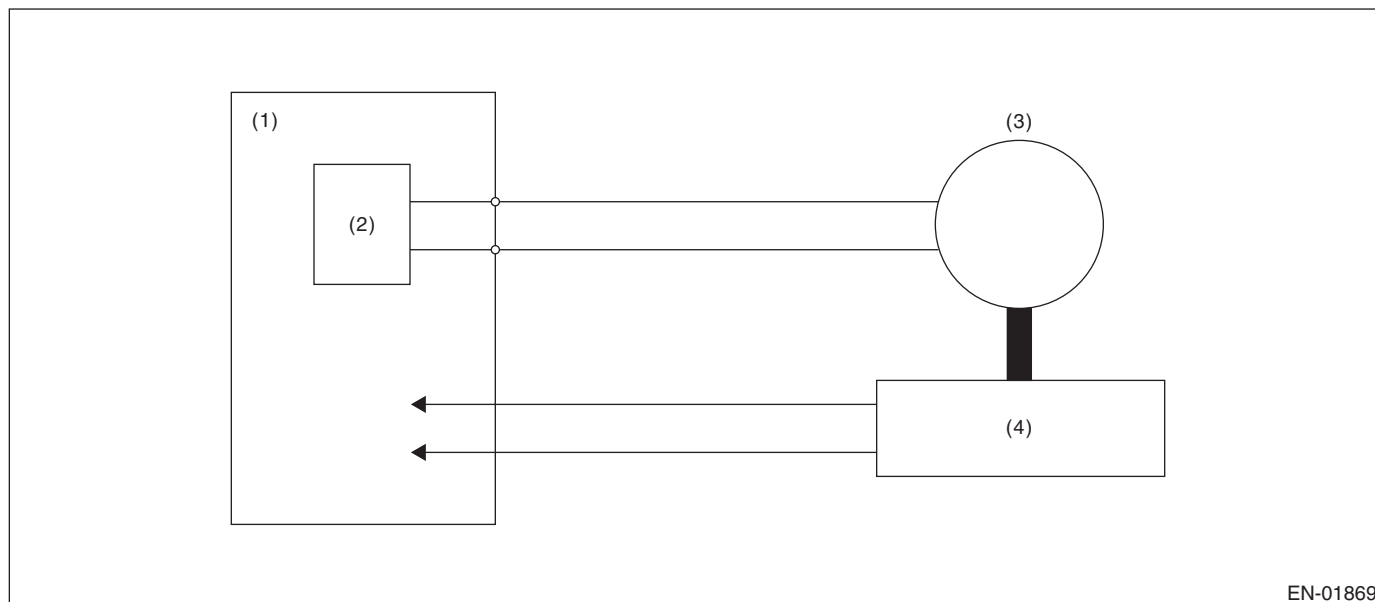
Stop the continuity to the electronic control throttle motor. (Fix the throttle opening angle to 6°.)

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

EE:DTC P2109 THROTTLE/PEDAL POSITION SENSOR A MINIMUM STOP PERFORMANCE**1. OUTLINE OF DIAGNOSIS**

Judge NG when all close point learning cannot conducted or abnormal value is detected.

2. COMPONENT DESCRIPTION

- (1) Engine control module (ECM)
- (2) Drive circuit
- (3) Motor
- (4) Throttle position sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON → OFF
Ignition switch (after clear memory only)	OFF → ON

4. GENERAL DRIVING CYCLE

Perform the diagnosis at all close point learning.

5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Throttle sensor opening angle at all close point learning	10.127° — 19.872°
Throttle opening angle when ignition switch is ON — Minimum stop position for throttle	≥ 1.683°

Time Needed for Diagnosis: 8 — 80 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only with engine stopped)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only with engine stopped)

8. FAIL SAFE

Stop the continuity to the electronic control throttle motor. (Fix the throttle opening angle to 6°.)

9. ECM OPERATION AT DTC SETTING

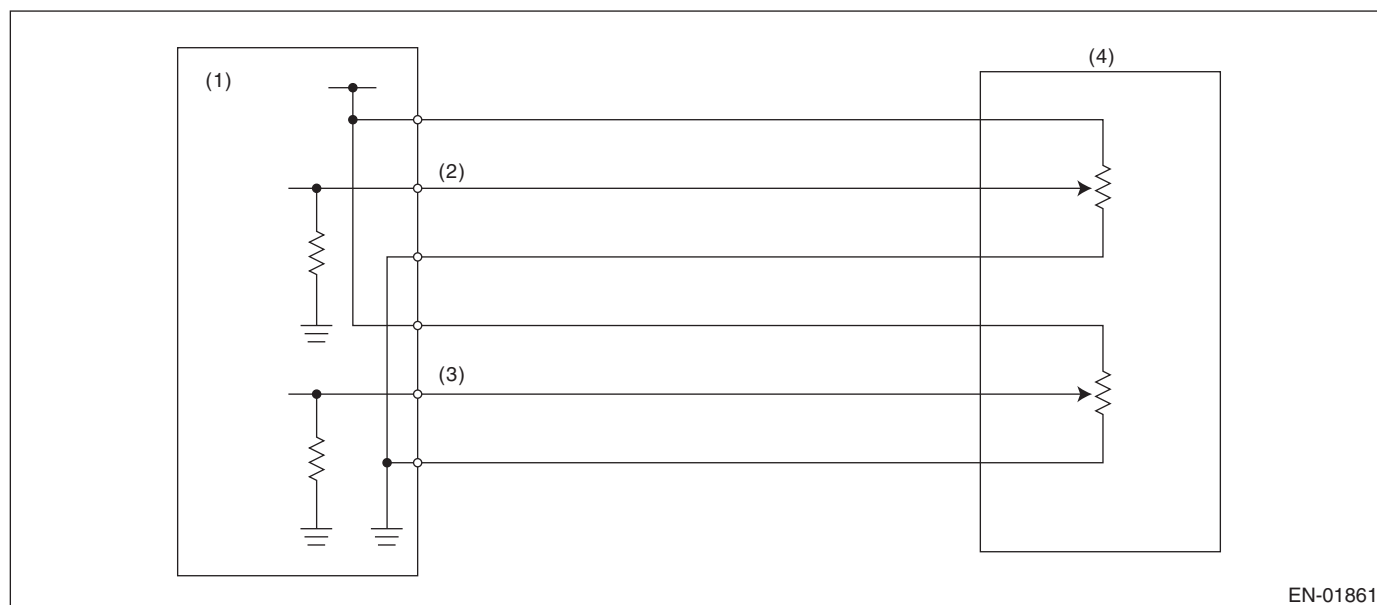
Memorize the freeze frame data. (For test mode \$02)

EF:DTC P2122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of accelerator pedal position sensor 1.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)	(3) Accelerator pedal position sensor 2 signal
(2) Accelerator pedal position sensor 1 signal	(4) Accelerator pedal position sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	≥ 0.219 V

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Time Needed for Diagnosis: 100 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

8. FAIL SAFE

- Single malfunction: Control with normal sensor
- Multi malfunction: Fix the throttle opening angle to 6°.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

GENERAL DESCRIPTION

- GD(H4DOTC)-246**

8. FAIL SAFE

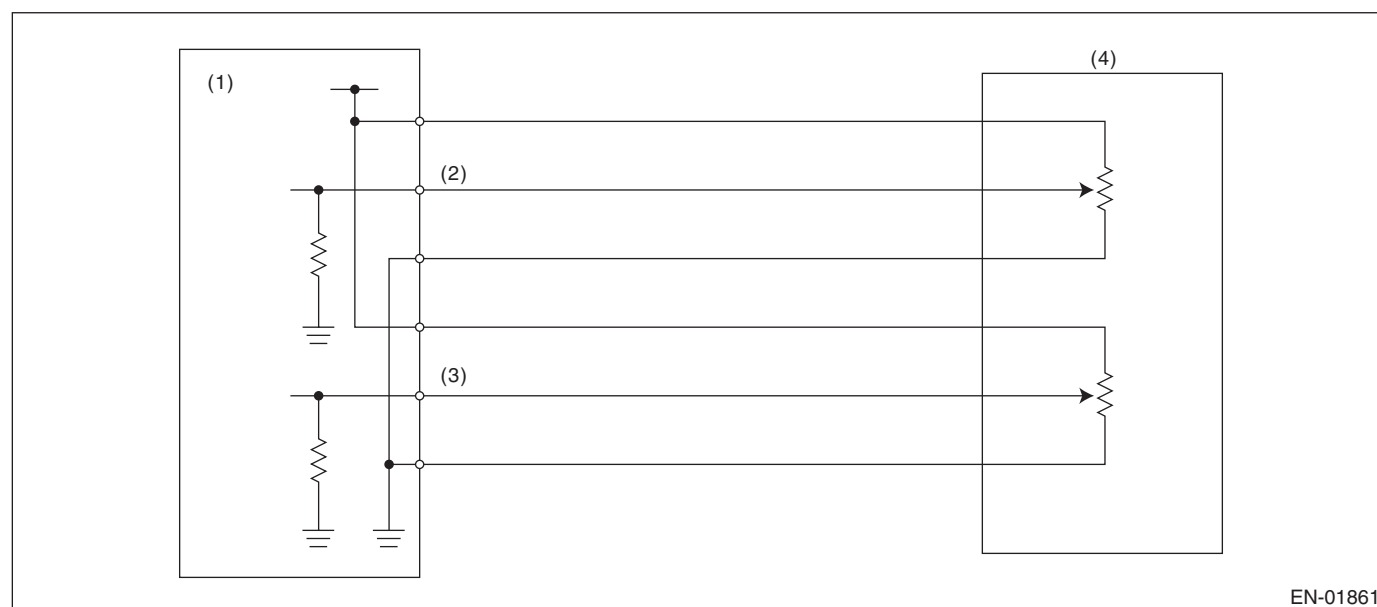
- Single malfunction: Control with normal sensor
- Multi malfunction: Fix the throttle opening angle to 6°.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

EH:DTC P2127 THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT LOW INPUT**1. OUTLINE OF DIAGNOSIS**

Detect the open or short circuit of accelerator pedal position sensor 2.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION

EN-01861

(1) Engine control module (ECM)	(3) Accelerator pedal position sensor 2 signal
(2) Accelerator pedal position sensor 1 signal	(4) Accelerator pedal position sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	≥ 0.219 V

Time Needed for Diagnosis: 100 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

8. FAIL SAFE

- Single malfunction: Control with normal sensor
- Multi malfunction: Fix the throttle opening angle to 6°.

9. ECM OPERATION AT DTC SETTING

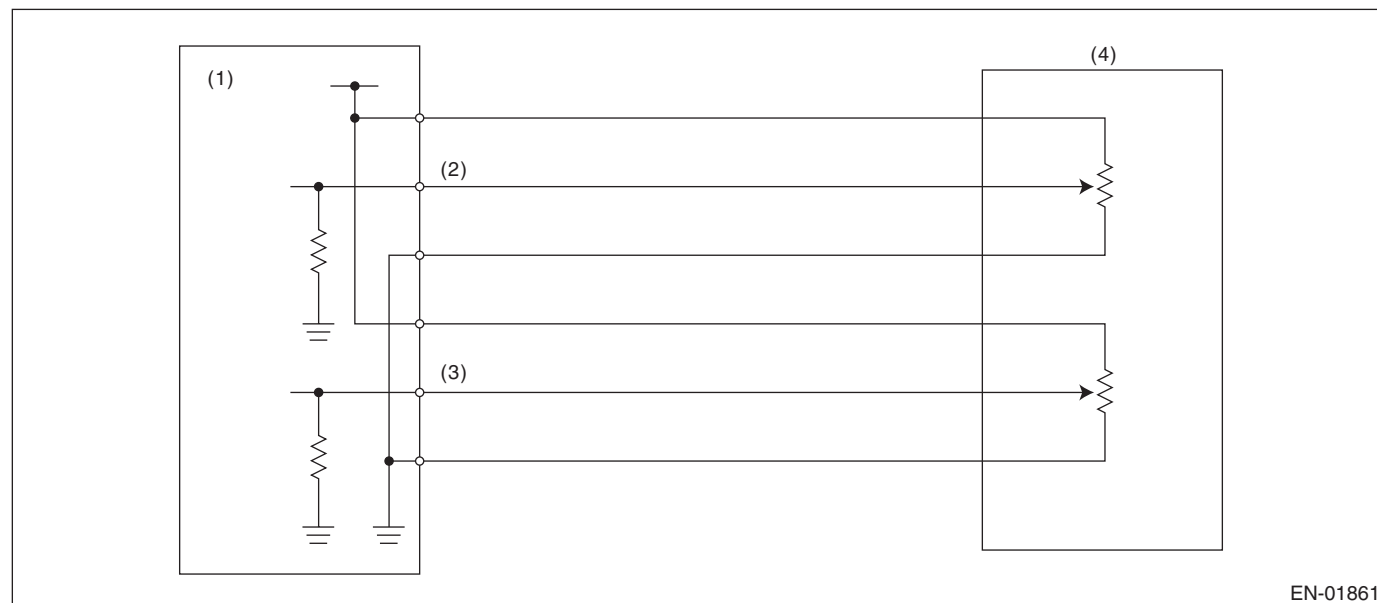
Memorize the freeze frame data. (For test mode \$02)

EI: DTC P2128 THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT HIGH INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of accelerator pedal position sensor 2.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)	(3) Accelerator pedal position sensor 2 signal
(2) Accelerator pedal position sensor 1 signal	(4) Accelerator pedal position sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	≤ 4.781 V

Time Needed for Diagnosis: 100 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only with engine stopped)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

8. FAIL SAFE

- Single malfunction: Control with normal sensor
- Multi malfunction: Fix the throttle opening angle to 6°.

9. ECM OPERATION AT DTC SETTING

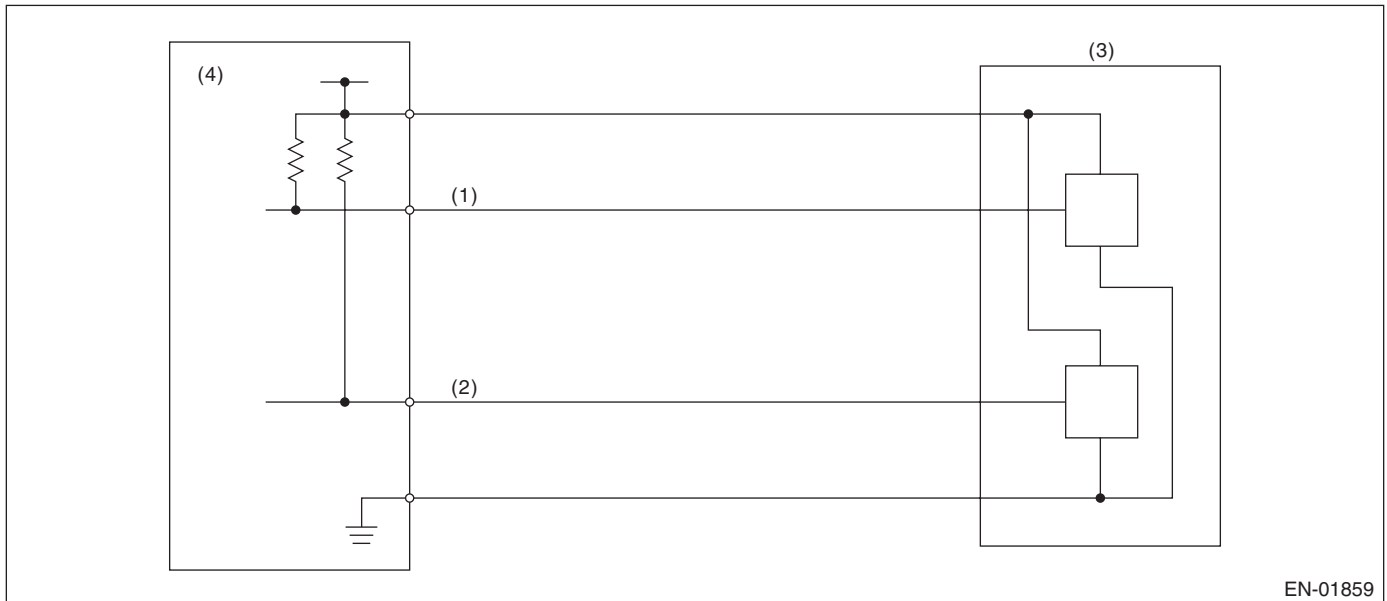
Memorize the freeze frame data. (For test mode \$02)

EJ:DTC P2135 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A”/“B” VOLT-AGE CORRELATION

1. OUTLINE OF DIAGNOSIS

Judge NG when the signal level of throttle position sensor 1 is different from the throttle position sensor 2.

2. COMPONENT DESCRIPTION



(1) Throttle position sensor 1 signal	(3) Throttle position sensor
(2) Throttle position sensor 2 signal	(4) Engine control module (ECM)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

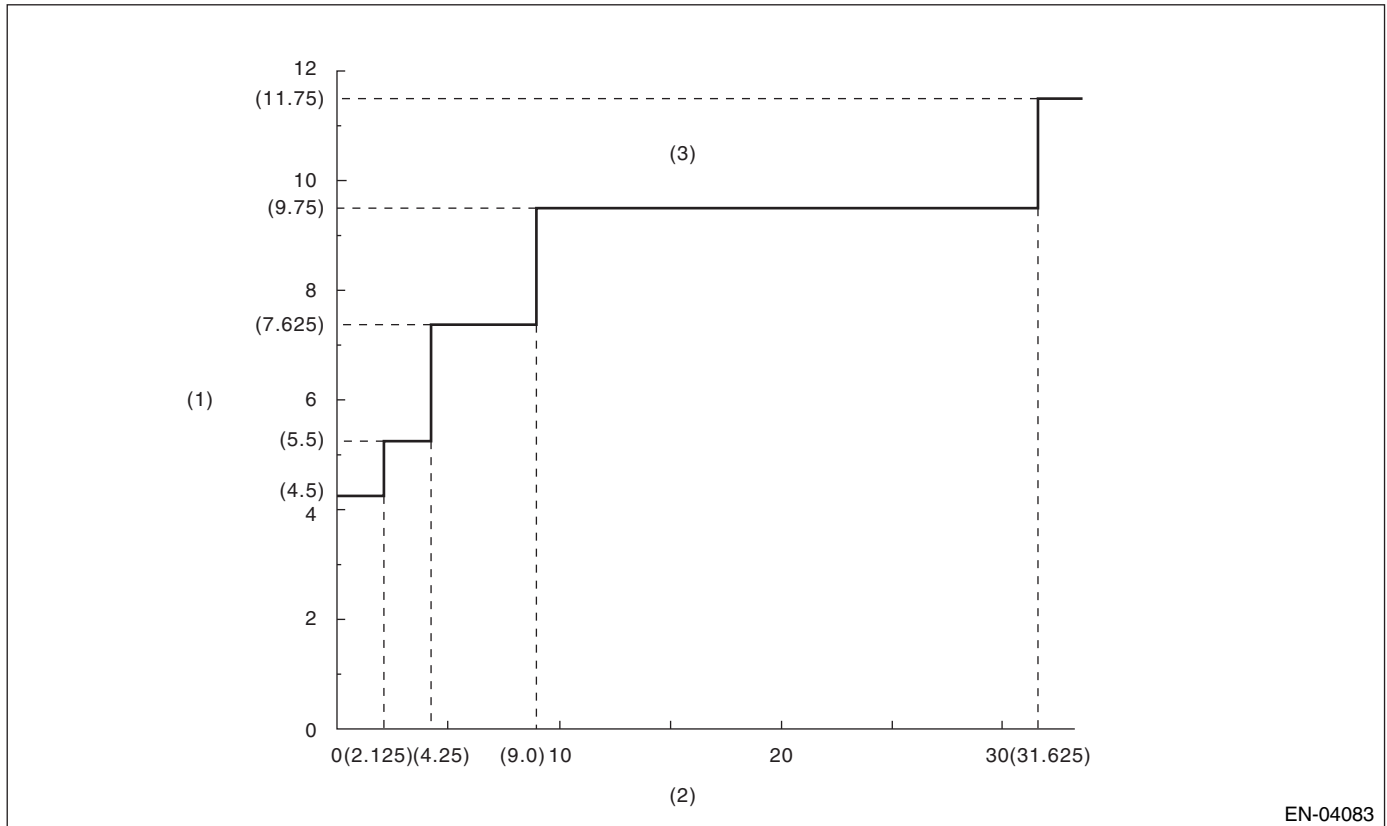
Judgment Value

Malfunction Criteria	Threshold Value
Signal difference between two sensors	≤ 4.25

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Details of Judgment Value



EN-04083

(1) Sensor output difference (°)

(2) Throttle position sensor 1 opening angle (°)

(3) NG area

Time Needed for Diagnosis: 212 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only with engine stopped)

8. FAIL SAFE

Stop the continuity to ETC motor. (Fix the throttle opening angle to 6°.)

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

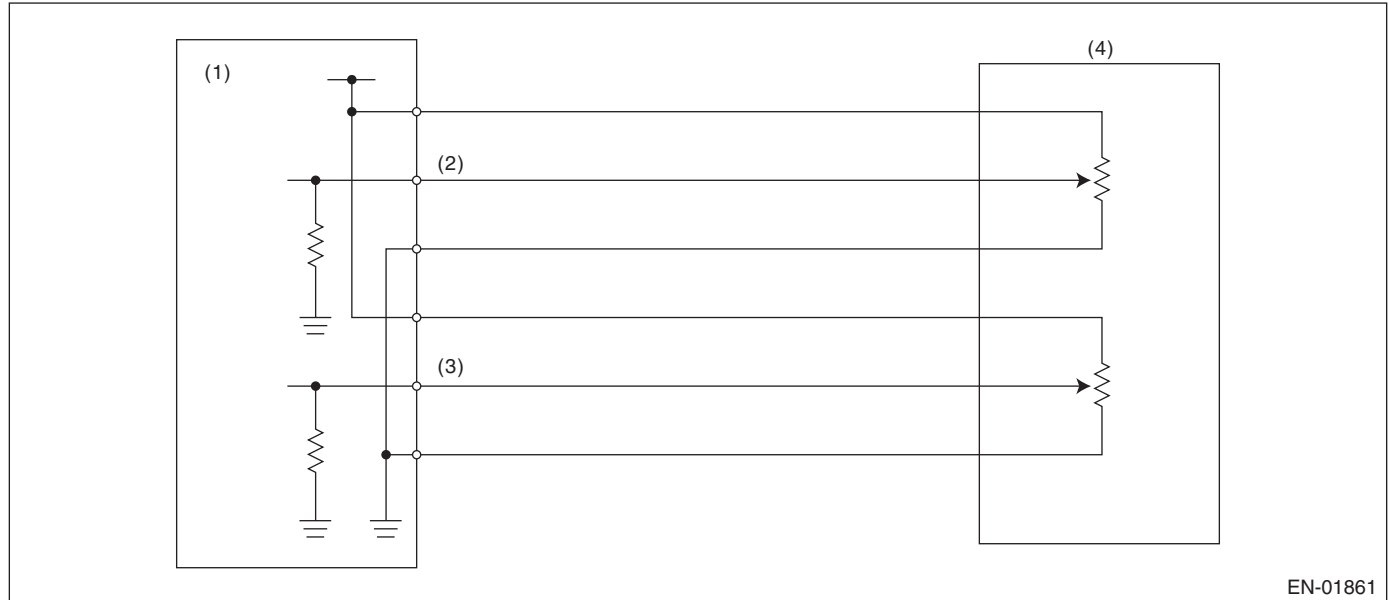
GENERAL DESCRIPTION

EK:DTC P2138 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D”/“E” VOLT-AGE CORRELATION

1. OUTLINE OF DIAGNOSIS

Judge NG when the signal level of throttle position sensor 1 is different from the throttle position sensor 2.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)	(3) Accelerator pedal position sensor 2 signal
(2) Accelerator pedal position sensor 1 signal	(4) Accelerator pedal position sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

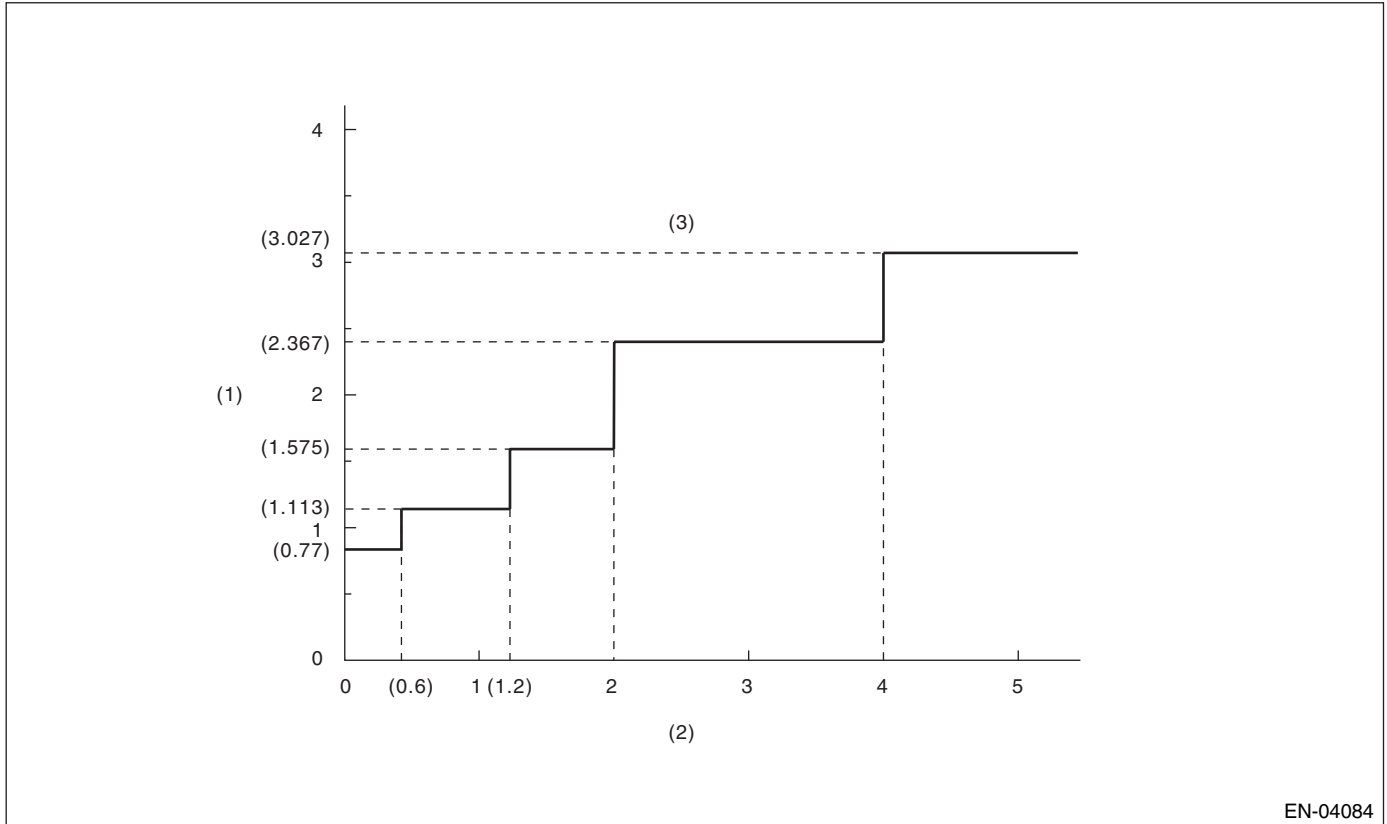
Judgment Value

Malfunction Criteria	Threshold Value
Signal difference between two sensors	$\leq 0.77^\circ$

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Details of Judgment Value



EN-04084

(1) Sensor output difference (°)

(2) Accelerator pedal position sensor
2 opening angle (°)

(3) NG area

Time Needed for Diagnosis:

- 116 milliseconds (For NG)
- 1,000 milliseconds (For OK)

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

Fix the throttle opening angle to 6°.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

EL:DTC P2227 BAROMETRIC PRESSURE TOO LOW

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of atmospheric pressure sensor output property. Judge NG when the atmospheric pressure sensor output is largely different from the intake manifold pressure at engine starting.

2. COMPONENT DESCRIPTION

Atmospheric pressure sensor is built in ECM.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed at engine starting	< 300 rpm
Vehicle speed	< 1 km/h (1 MPH)

4. GENERAL DRIVING CYCLE

Perform the diagnosis once before engine starting with the ignition switch ON.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.3 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Atmospheric – manifold absolute pressure	≥ 26.7 kPa (200 mmHg, 7.88 inHg)
Intake manifold pressure at engine starting – manifold absolute pressure	< 1.33 kPa (10 mmHg, 2.95 inHg)

Time Needed for Diagnosis: 0.3 seconds

Malfunction Indicator Light Illumination: Detect when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the continuous time of completing the malfunction criteria below becomes more than 0.26 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Atmospheric – manifold absolute pressure	< 26.7 kPa (200 mmHg, 7.88 inHg)

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

Atmospheric pressure sensor process: Fix the atmospheric pressure to 101.3 kPa (760 mmHg, 29.8 inHg).

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

EM:DTC P2228 ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (LOW INPUT)**1. OUTLINE OF DIAGNOSIS**

Detect the open or short circuit of atmospheric pressure sensor.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION

Atmospheric pressure sensor is built in ECM.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD**• Abnormality Judgment**

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Output voltage	< 0.118 V

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Output voltage	≥ 0.118 V

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

Atmospheric pressure sensor process: Fix the atmospheric pressure to 101.3 kPa (760 mmHg, 29.9 inHg).

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

EN:DTC P2229 ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (HIGH INPUT)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of atmospheric pressure sensor.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION

Atmospheric pressure sensor is built in ECM.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Output voltage	≥ 4.936 V

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Output voltage	< 4.936 V

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

Atmospheric pressure sensor process: Fix the atmospheric pressure to 101.3 kPa (760 mmHg, 29.9 inHg).

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

EO:DTC P2431 SECONDARY AIR INJECTION SYSTEM AIR FLOW / PRESSURE SENSOR CIRCUIT RANGE / PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of secondary air pressure sensor output property.

Judge NG when the secondary air pressure sensor output is largely different from the intake manifold pressure at engine starting.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed at starting	< 300 rpm
Vehicle speed	< 1 km/h
After secondary air injection system is stopped	More than 3 seconds

3. GENERAL DRIVING CYCLE

Perform the diagnosis with ignition switch ON.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.3 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Secondary air pipe pressure - Intake manifold pressure	≥ 200 mmHg
Intake manifold pressure at starting - Intake manifold pressure	< 10 mmHg

Time Needed for Diagnosis: 0.3 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the continuous time of completing the malfunction criteria below becomes more than 0.26 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Secondary air pipe pressure - Intake manifold pressure	< 200 mmHg

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

EP:DTC P2432 SECONDARY AIR INJECTION SYSTEM AIR FLOW / PRESSURE SENSOR CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Judge NG when out of the standard value.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
OFF	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Output voltage	< 0.568 V

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Output voltage	≥ 0.568 V

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

EQ:DTC P2433 SECONDARY AIR INJECTION SYSTEM AIR FLOW / PRESSURE SENSOR CIRCUIT HIGH**1. OUTLINE OF DIAGNOSIS**

Judge NG when out of the standard value.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
OFF	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD**• Abnormality Judgment**

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Output voltage	≥ 4.921 V

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Output voltage	< 4.921 V

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

ER:DTC P2440 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN (BANK1)

NOTE:

For the diagnostic procedure, refer to DTC P0410. <Ref. to GD(H4DOTC)-111, DTC P0410 SECONDARY AIR INJECTION SYSTEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>

ES:DTC P2441 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK CLOSED (BANK1)

NOTE:

For the diagnostic procedure, refer to DTC P0410. <Ref. to GD(H4DOTC)-111, DTC P0410 SECONDARY AIR INJECTION SYSTEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>

ET:DTC P2442 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN (BANK2)

NOTE:

For the diagnostic procedure, refer to DTC P0410. <Ref. to GD(H4DOTC)-111, DTC P0410 SECONDARY AIR INJECTION SYSTEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>

EU:DTC P2443 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK CLOSED (BANK2)

NOTE:

For the diagnostic procedure, refer to DTC P0410. <Ref. to GD(H4DOTC)-111, DTC P0410 SECONDARY AIR INJECTION SYSTEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>

EV:DTC P2444 SECONDARY AIR INJECTION SYSTEM PUMP STUCK ON**1. OUTLINE OF DIAGNOSIS**

Detect the malfunction (always ON) of secondary air pump.

Judge NG when the secondary air supply pipe pressure is higher than atmospheric pressure.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
OFF	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Judge NG when the secondary air supply pipe pressure is higher than atmospheric pressure though it should become atmospheric pressure with the secondary air pump OFF.

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Presumed ambient temperature	$\geq 4.4^{\circ}\text{C}$ (40°F)
Battery voltage	$\geq 10.9\text{ V}$
After secondary air injection system is operated	More than 0.6 seconds
Battery voltage	$\geq 7\text{ V}$
Atmospheric pressure	$\geq 75.0\text{ kPa}$ (563 mmHg, 22.15 inHg)
Engine	In operation
After secondary air injection system is stopped	More than 3 seconds
Secondary air pipe pressure (absolute pressure)	> Value of Map 22

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Map 22

Unit: kPa (mmHg, inHg)		Ambient pressure (kPa (mmHg, inHg))							
		69.3 (520, 20.47)	74.6 (560, 22.03)	80.0 (600, 23.63)	85.3 (640, 25.19)	90.6 (680, 26.76)	96.0 (720, 28.35)	101.3 (760, 29.92)	106.6 (800, 31.48)
Battery voltage (V)	10.5	78.0 (585, 23.03)	84.0 (630, 24.80)	90.0 (675, 26.58)	96.0 (720, 28.35)	102.0 (765, 30.13)	108.0 (810, 31.90)	114.0 (855, 33.67)	120.0 (900, 35.44)
	11.5	79.3 (595, 23.42)	85.4 (641, 25.22)	91.6 (687, 27.05)	97.7 (733, 28.86)	103.7 (778, 30.63)	109.8 (824, 32.43)	116.0 (870, 34.26)	122.1 (916, 36.06)
	12.5	80.8 (606, 23.86)	86.9 (652, 25.67)	93.2 (699, 27.53)	99.3 (745, 29.33)	105.6 (792, 31.19)	111.7 (838, 32.99)	118.0 (885, 34.85)	124.2 (932, 36.68)
	13.5	82.1 (616, 24.25)	88.4 (663, 26.11)	94.8 (711, 28.0)	101.0 (758, 29.83)	107.3 (805, 31.69)	113.7 (853, 33.58)	120.0 (900, 35.44)	126.2 (947, 37.27)
	14.5	83.4 (626, 24.63)	89.8 (674, 26.52)	96.2 (722, 28.41)	102.8 (771, 30.36)	109.2 (819, 32.25)	115.6 (867, 34.14)	122.0 (915, 36.03)	128.4 (963, 37.92)
	15.5	84.8 (636, 25.05)	89.8 (685, 26.52)	97.8 (734, 28.89)	104.4 (783, 30.83)	110.9 (832, 32.75)	117.4 (881, 34.67)	124.0 (930, 36.62)	130.5 (979, 68.54)

Time Needed for Diagnosis: 5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the continuous time of completing the malfunction criteria below becomes more than 5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Presumed ambient temperature	≥ 4.4°C (40°F)
Battery voltage	≥ 10.9 V
After secondary air injection system is operated	More than 0.6 seconds
Battery voltage	≥ 7 V
Atmospheric pressure	≥ 75.0 kPa (563 mmHg, 22.15 inHg)
Engine	In operation
After secondary air injection system is stopped	More than 3 seconds
Secondary air pipe pressure (absolute pressure)	≤ Value of Map 22

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

IGNITION

General Description

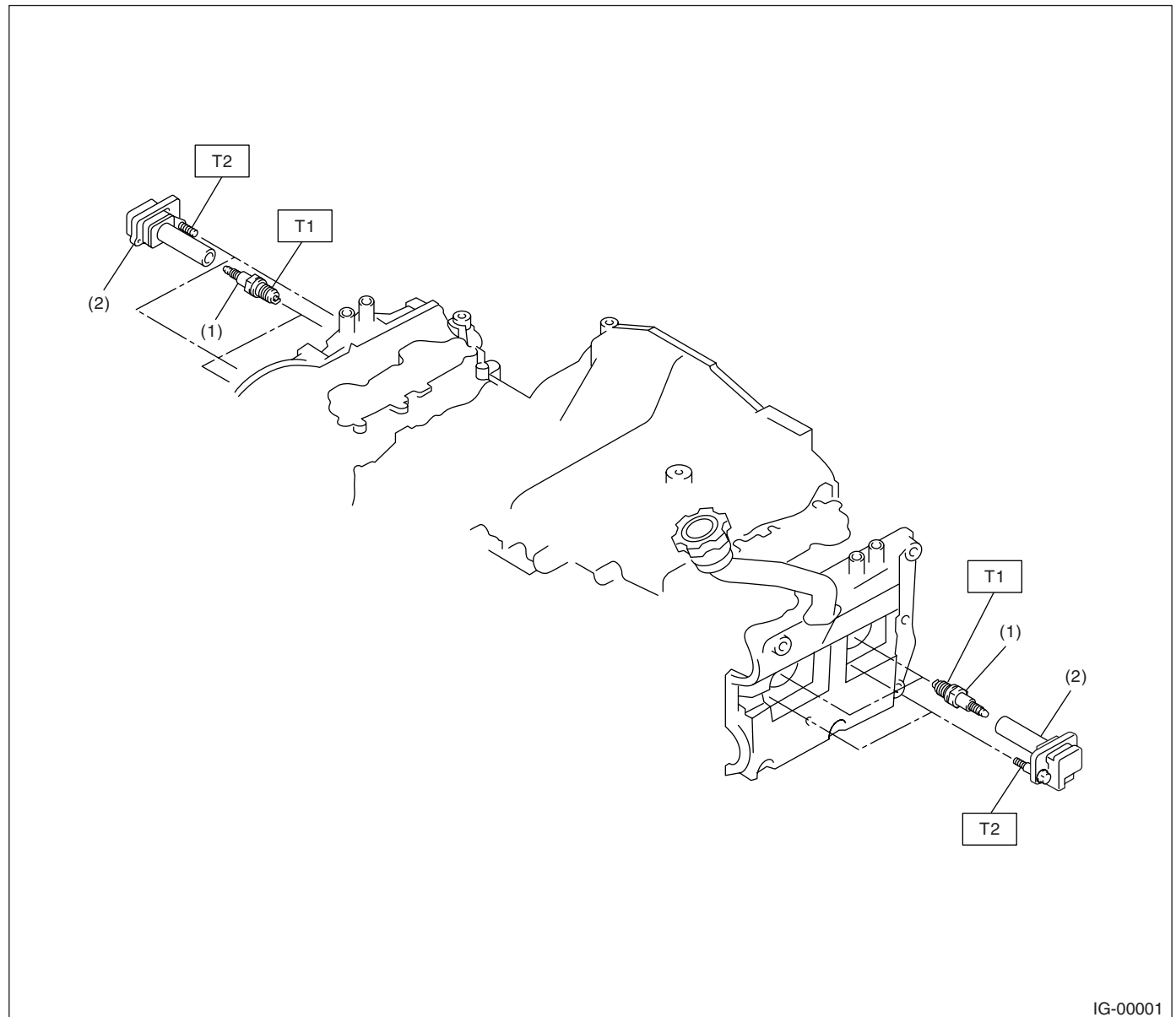
IGNITION

1. General Description

A: SPECIFICATION

Item		Designation
Ignition coil and ignitor assembly	Model	FK0186
	Ignition type	Direct ignition
	Manufacturer	DIAMOND
Spark plug	Type and manufacturer	NGK: ILFR6B
	Thread size (diameter, pitch, length) mm	14, 1.25, 26.5
	Spark plug gap mm (in)	0.7 — 0.8 (0.028 — 0.031)
	Electrode	Iridium

B: COMPONENT



- (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 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 yourself, 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 rigid racks at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.

2. Spark Plug

A: REMOVAL

CAUTION:

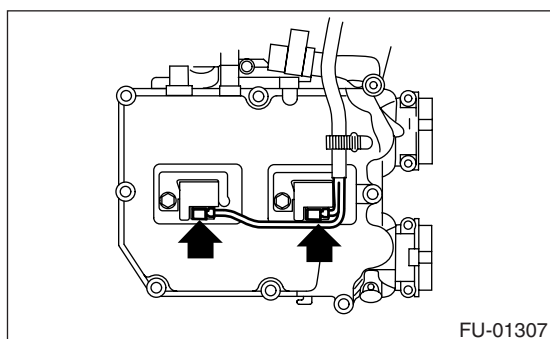
All spark plugs installed on an engine, must be of the same heat range.

Spark plug:

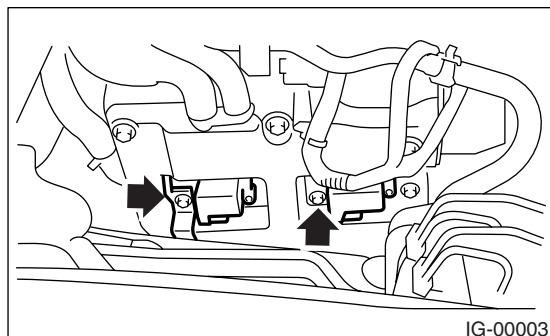
NGK: ILFR6B

1. RH SIDE

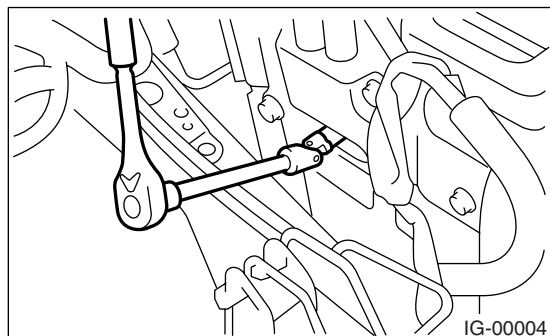
- 1) Disconnect the ground cable from battery.
- 2) Remove the air cleaner lower case. <Ref. to IN(H4DOTC)-8, REMOVAL, Air Cleaner Case.>
- 3) Disconnect the connector from ignition coil and ignitor assembly.



- 4) Remove the ignition coil and ignitor assembly.

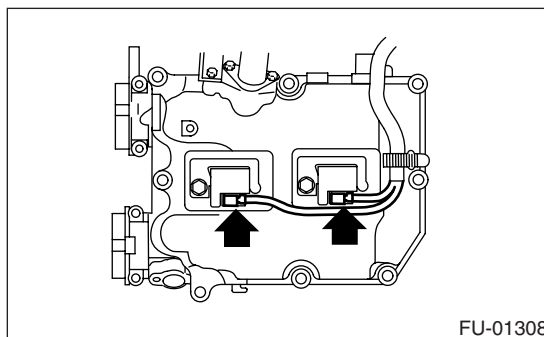


- 5) Remove the spark plugs with the spark plug sockets.

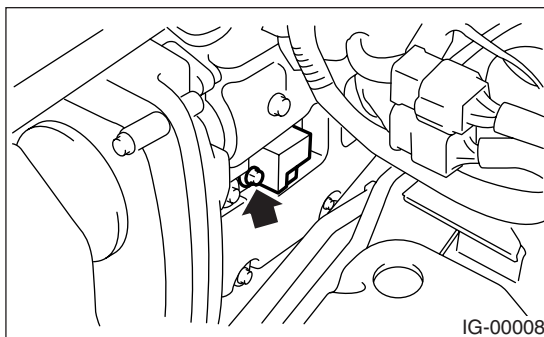


2. LH SIDE

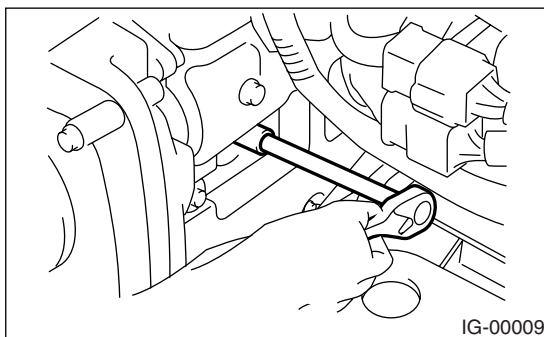
- 1) Remove the battery and battery carrier. <Ref. to SC(H4SO)-20, REMOVAL, Battery.>
- 2) Remove the secondary air pump. <Ref. to EC(H4DOTC)-9, REMOVAL, Secondary Air Pump.>
- 3) Disconnect the connector from ignition coil and ignitor assembly.



- 4) Remove the ignition coil and ignitor assembly.



- 5) Remove the spark plugs with the spark plug sockets.



B: INSTALLATION

1. RH SIDE

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 and ignitor assembly):
16 N·m (1.6 kgf-m, 11.7 ft-lb)

NOTE:

The above torque should be only applied to new spark plugs without oil on their threads. In case their threads are lubricated, the torque should be reduced by approx. 1/3 of the specified torque in order to avoid over-stressing.

2. LH SIDE

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 and ignitor assembly):

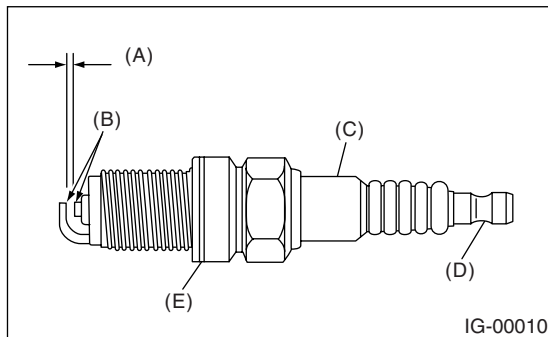
16 N·m (1.6 kgf-m, 11.7 ft-lb)

NOTE:

The above torque should be only applied to new spark plugs without oil on their threads. In case their threads are lubricated, the torque should be reduced by approx. 1/3 of the specified torque in order to avoid over-stressing.

C: INSPECTION

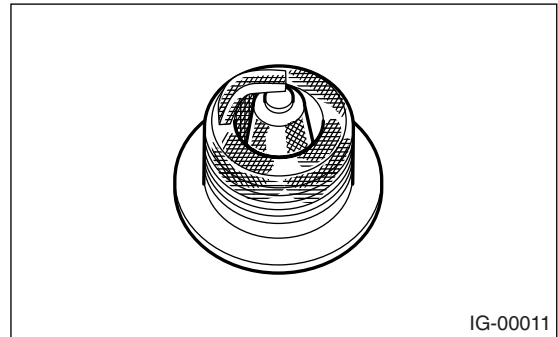
Check the electrodes and inner and outer ceramic insulator of plugs, noting the type of deposits and the degree of electrode erosion.



- (A) Spark plug gap
- (B) Carbon accumulation or wear
- (C) Cracks
- (D) Damage
- (E) Damaged gasket

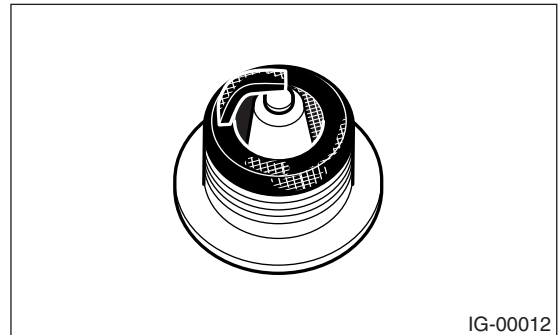
1) Normal:

Brown to grayish-tan deposits and slight electrode wear indicates correct spark plug heat range.



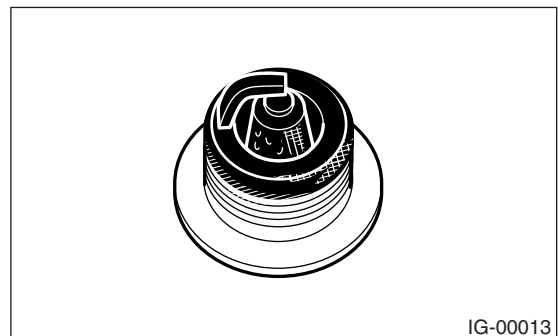
2) Carbon fouled:

Dry fluffy carbon deposits on insulator and electrode are mostly caused by slow speed driving in city, weak ignition, too rich fuel mixture and dirty air cleaner, etc.



3) Oil fouled:

Wet black deposits show oil entrance into combustion chamber through worn rings and pistons or excessive clearance between valve guides and stems.

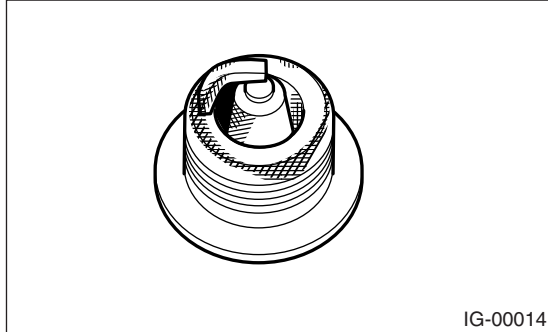


Spark Plug

IGNITION

4) Overheating:

White or light gray insulator with black or 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.



D: ADJUSTMENT

Clean the spark plugs with a wire brush. Clean and remove the carbon or oxide deposits, but do not wear away ceramic insulator.

If deposits are too stubborn, replace the plugs.

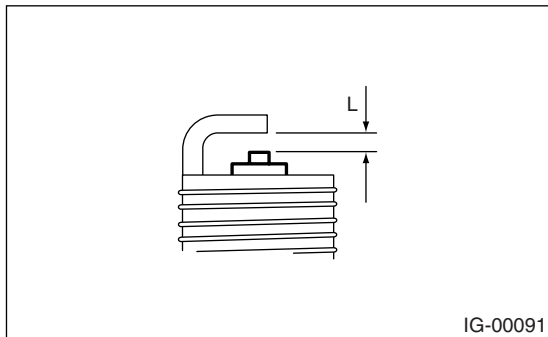
After cleaning the spark plugs, correct the spark plug gap using a gap gauge.

NOTE:

Do not use spark plug cleaners, because the spark plugs are applied with iridium tips.

Spark plug gap L:

0.7 — 0.8 mm (0.028 — 0.031 in)



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(H4DOTC)-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

For inspection, refer to the following. <Ref. to EN(H4DOTC)(diag)-68, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>

Ignition Coil and Ignitor Assembly

IGNITION

INTAKE (INDUCTION)

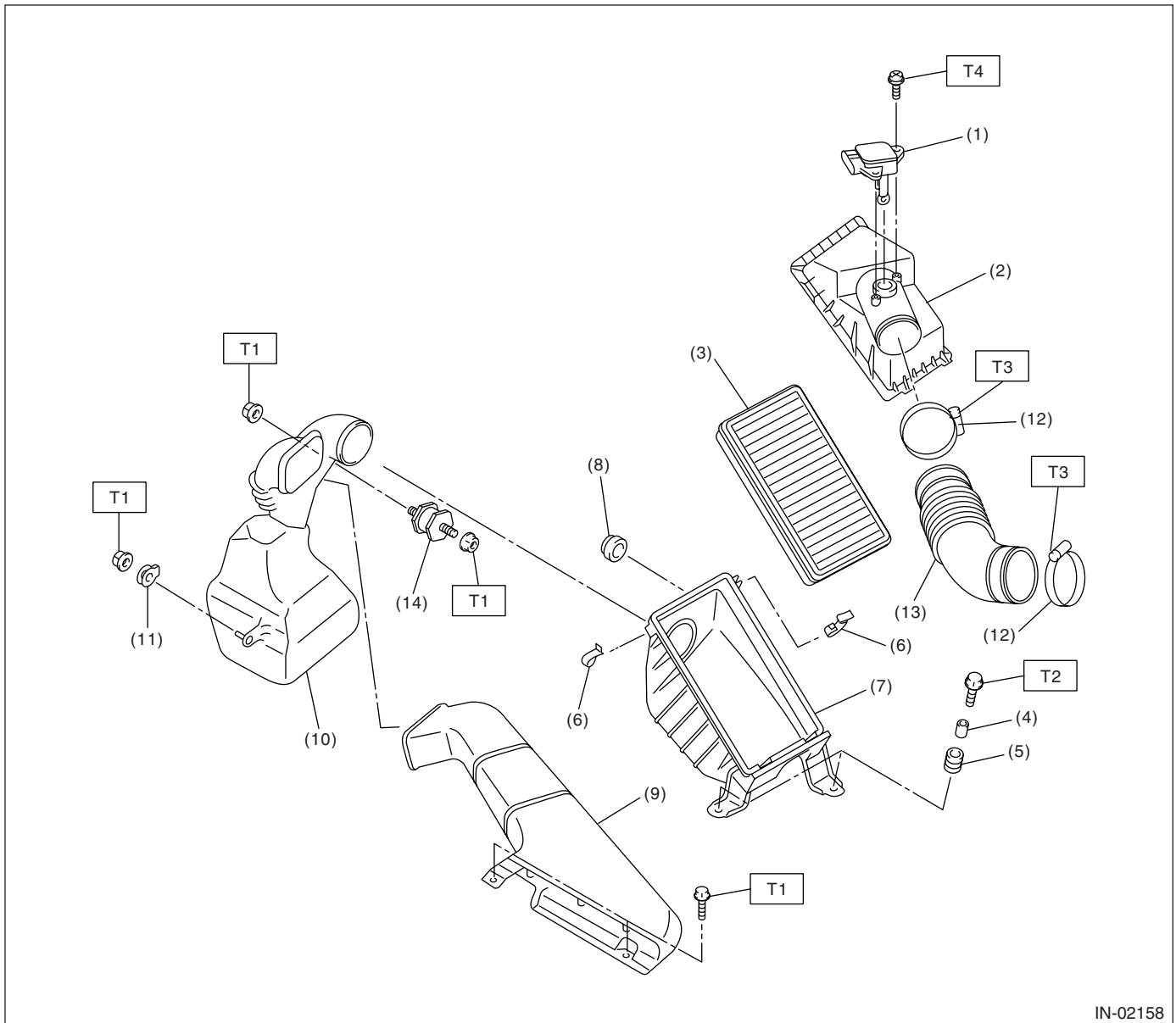
General Description

INTAKE (INDUCTION)

1. General Description

A: COMPONENT

1. AIR CLEANER



IN-02158

(1) Mass air flow and intake air temperature sensor	(7) Air cleaner lower case	(14) Cushion
(2) Air cleaner upper cover	(8) Cushion rubber	
(3) Air cleaner element	(9) Air intake duct	
(4) Spacer	(10) Resonator chamber ASSY	
(5) Bushing	(11) Cushion rubber	
(6) Clip	(12) Clamp	
	(13) Air intake boot	

Tightening torque: N·m (kgf-m, ft-lb)

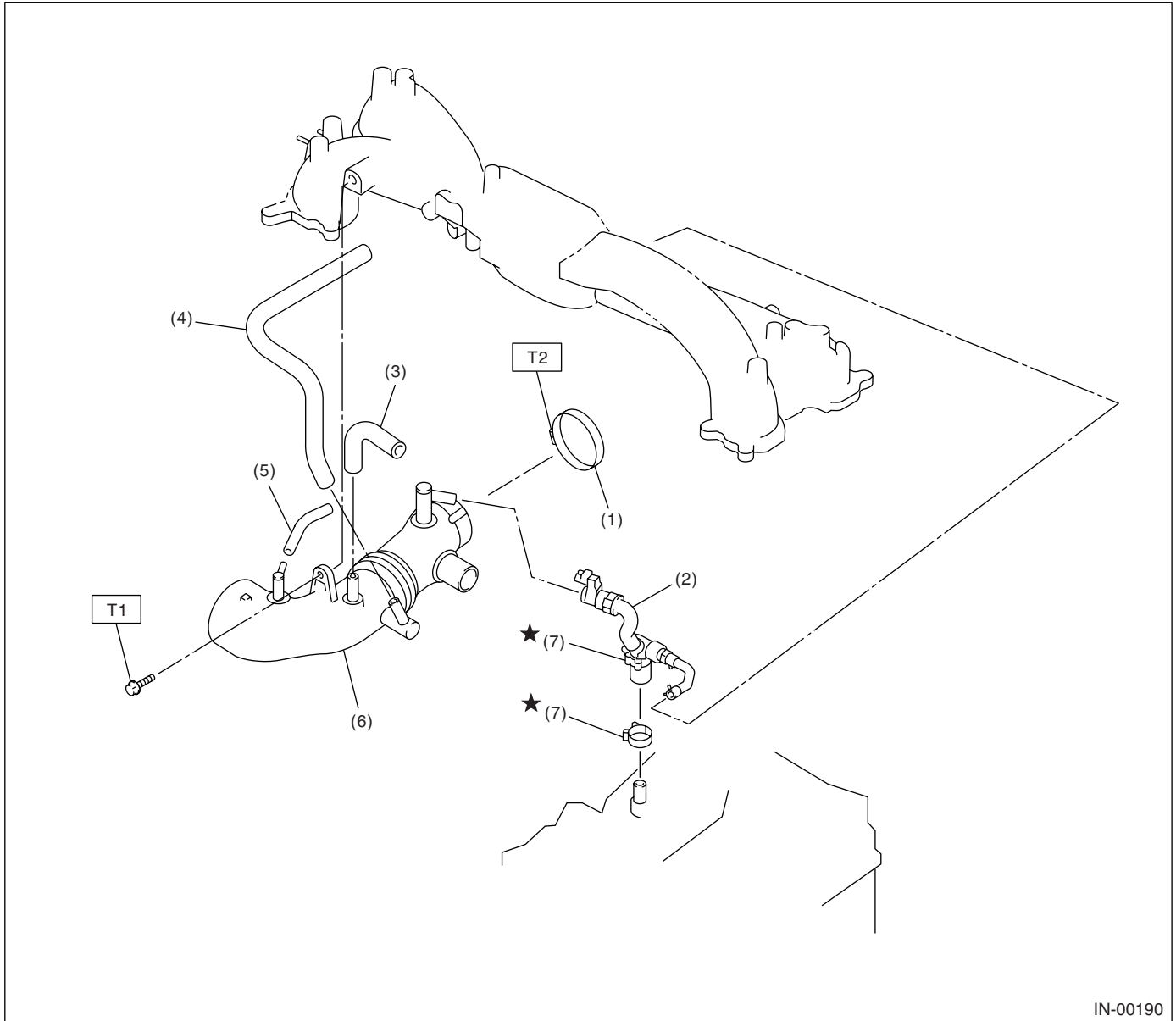
T1: 7.5 (0.76, 5.5)

T2: 33 (3.4, 24.6)

T3: 2.5 (0.25, 1.8)

T4: 1.7 (0.17, 1.2)

2. INTAKE DUCT



IN-00190

(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)

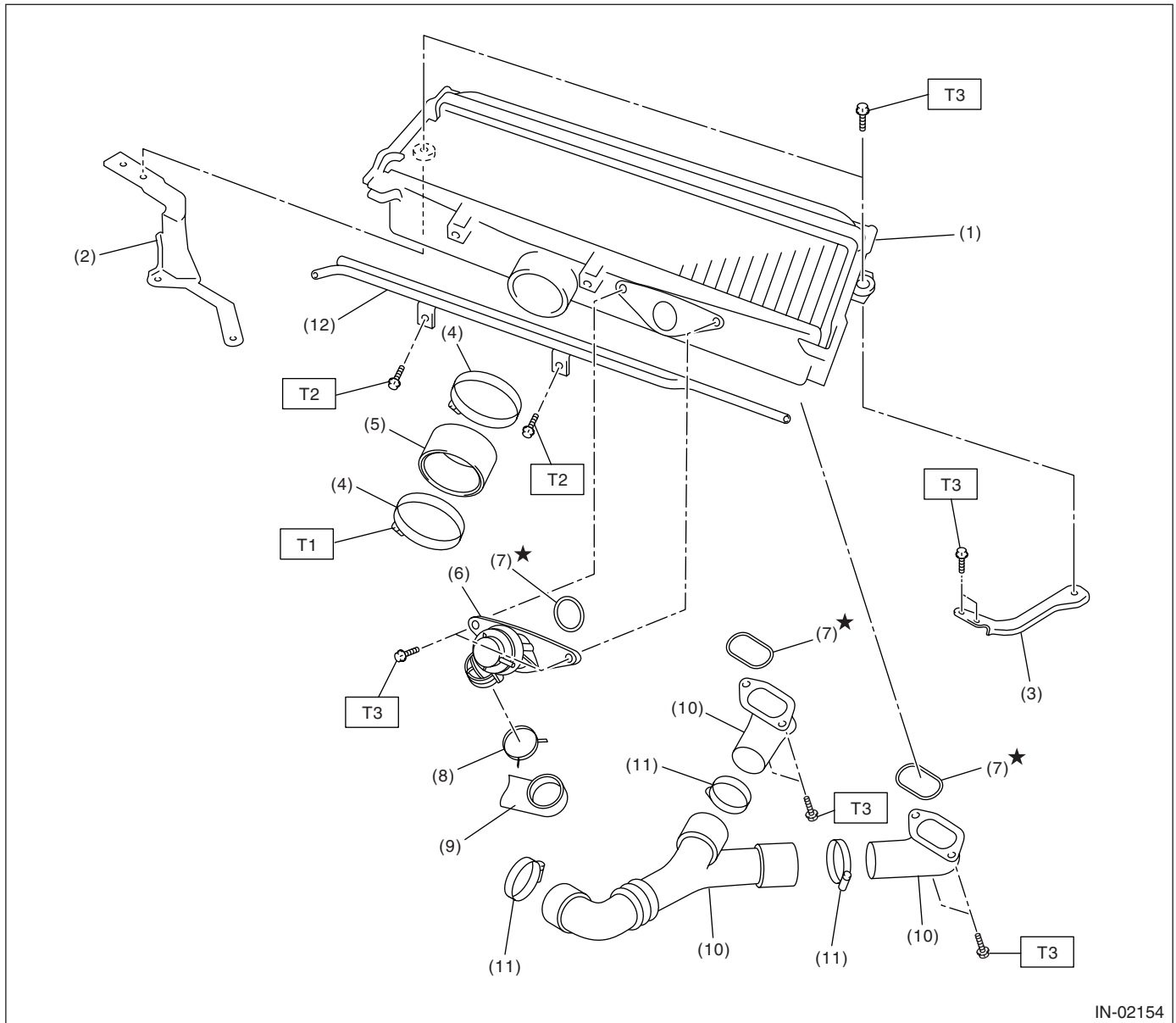
T1: 19 (1.9, 13.7)

T2: 3 (0.3, 2.2)

General Description

INTAKE (INDUCTION)

3. INTERCOOLER



(1) Intercooler	(7) O-ring
(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	(12) PCV pipe

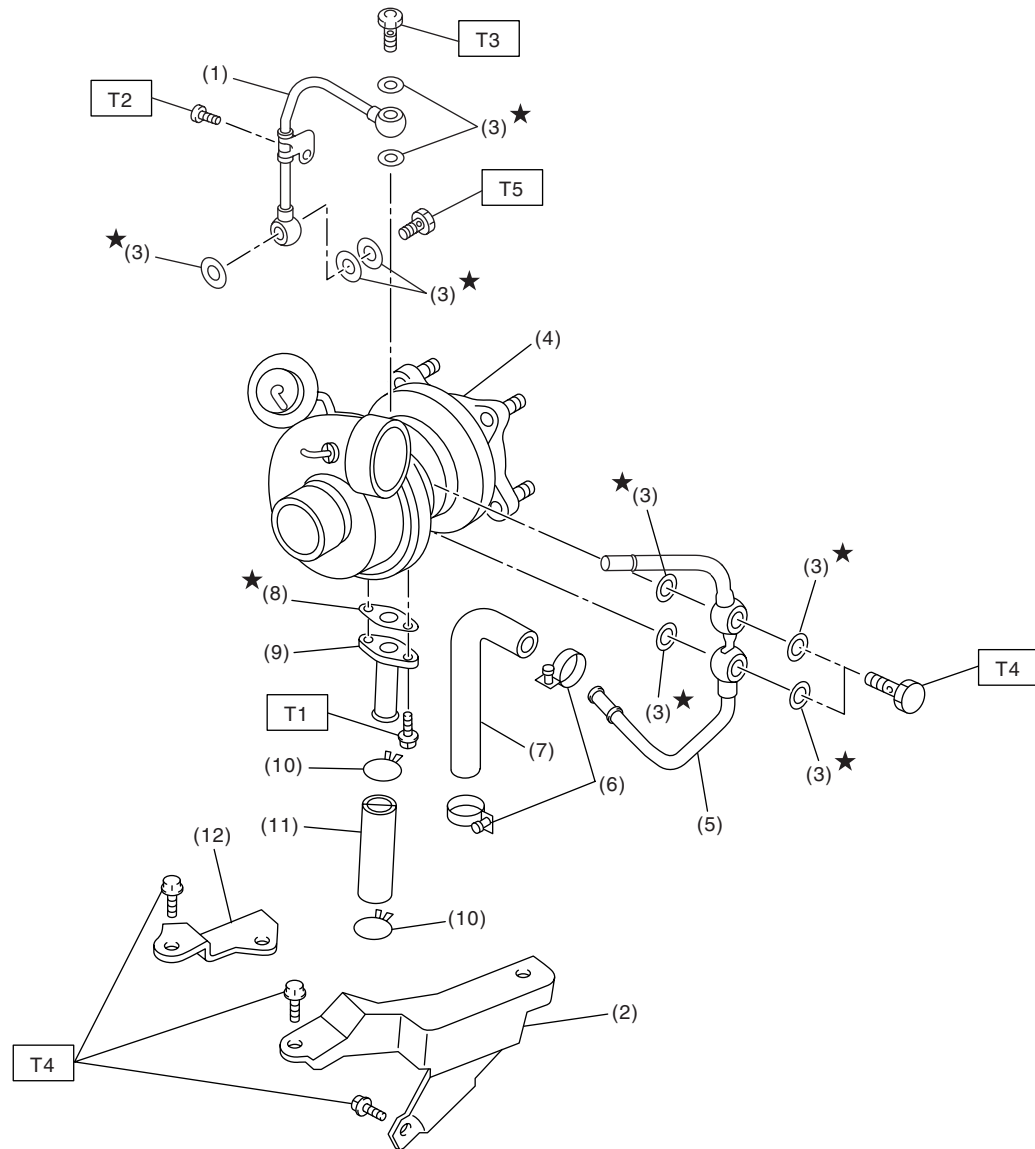
Tightening torque: N·m (kgf-m, ft-lb)

T1: 3 (0.3, 2.2)

T2: 6.3 (0.64, 4.6)

T3: 16 (1.6, 11.6)

4. TURBOCHARGER



IN-02155

(1) Oil inlet pipe A	(7) Engine coolant hose
(2) Turbocharger bracket LH	(8) Gasket
(3) Metal gasket	(9) Oil outlet pipe
(4) Turbocharger	(10) Clip
(5) Water pipe	(11) Oil outlet hose
(6) Clamp	(12) Turbocharger bracket RH

Tightening torque: N·m (kgf-m, ft-lb)**T1: 4.4 (0.45, 3.3)****T2: 4.9 (0.50, 3.6)****T3: 16 (1.6, 11.6)****T4: 33 (3.4, 24.6)****T5: 29 (3.0, 21.7)**

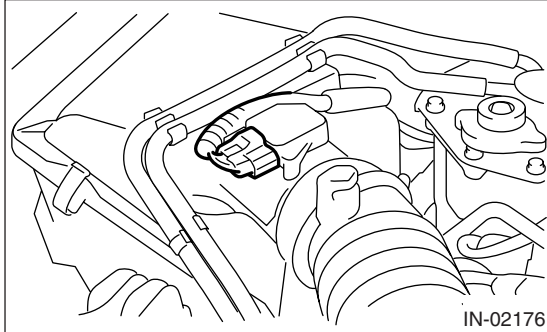
B: CAUTION

- 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 yourself, 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 rigid racks at the specified points.
- Before disconnecting electrical connectors of sensor or units, be sure to disconnect the ground cable from battery.

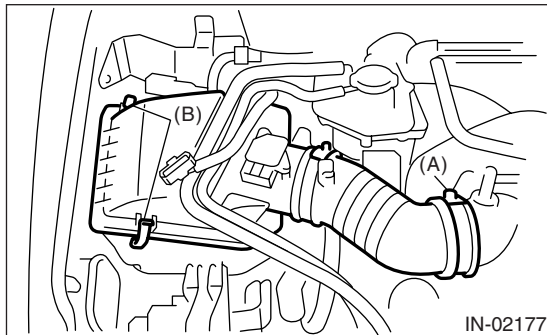
2. Air Cleaner Element

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Disconnect the connector from mass air flow and intake air temperature sensor.



- 3) Loosen the clamp (A) which connects the air intake boot and intake duct.
- 4) Remove the clip (B) from air cleaner upper cover.



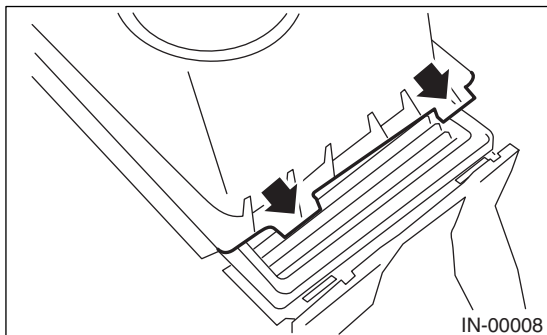
- 5) Remove the air cleaner upper cover.
- 6) Remove the air cleaner element.

B: INSTALLATION

Install in the reverse order of removal.

NOTE:

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



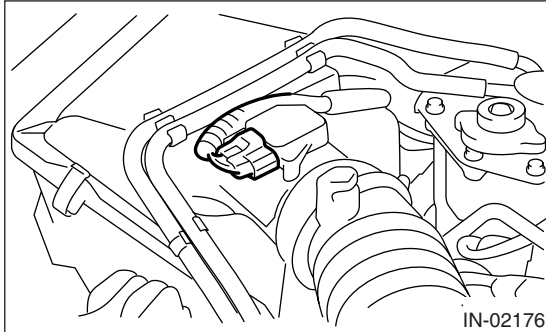
C: INSPECTION

Replace it if excessively damaged or dirty.

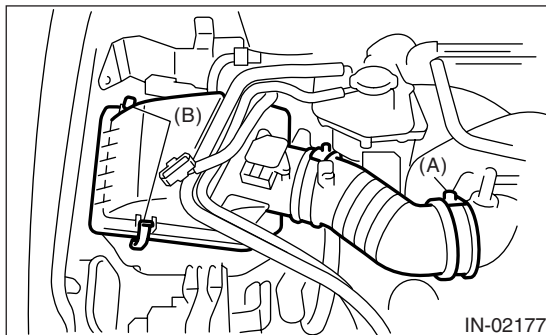
3. Air Cleaner Case

A: REMOVAL

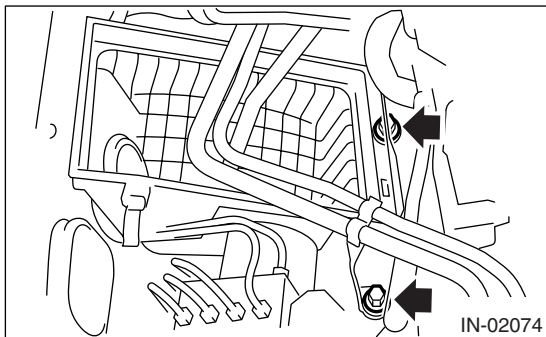
- 1) Disconnect the ground cable from battery.
- 2) Disconnect the connector from mass air flow and intake air temperature sensor.



- 3) Loosen the clamp (A) which connects the air intake boot and intake duct.
- 4) Remove the clip (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.

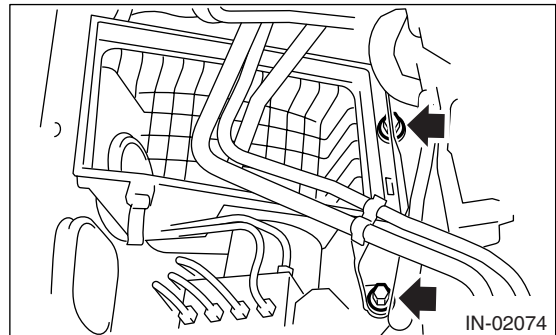


B: INSTALLATION

Install in the reverse order of removal.

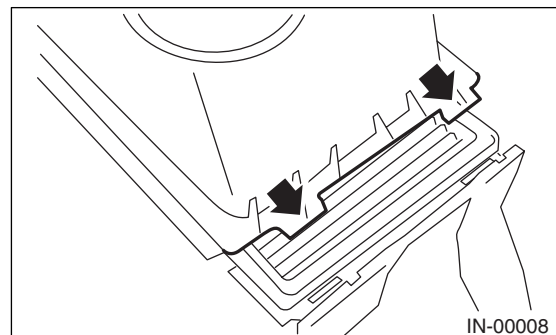
Tightening torque:

33 N·m (3.4 kgf-m, 24.6 ft-lb)



NOTE:

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



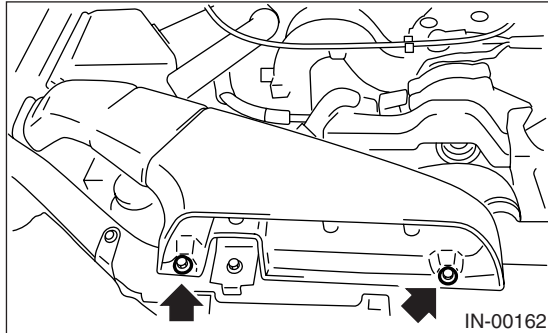
C: INSPECTION

Inspect for cracks and loose connections.

4. Air Intake Duct

A: REMOVAL

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

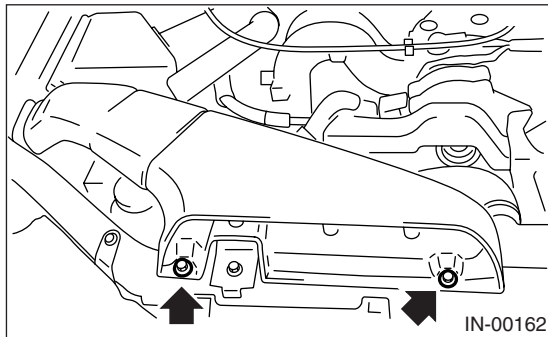


B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

7.5 N·m (0.76 kgf-m, 55 ft-lb)



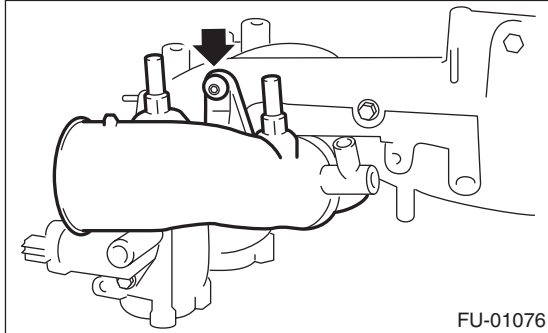
C: INSPECTION

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

5. Intake Duct

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the intake manifold. <Ref. to FU(H4DOTC)-14, REMOVAL, Intake Manifold.>
- 3) Remove the sensor, engine harness and fuel pipe attached to intake manifold. <Ref. to FU(H4DOTC)-19, DISASSEMBLY, Intake Manifold.>
- 4) Remove the intake duct from intake manifold.

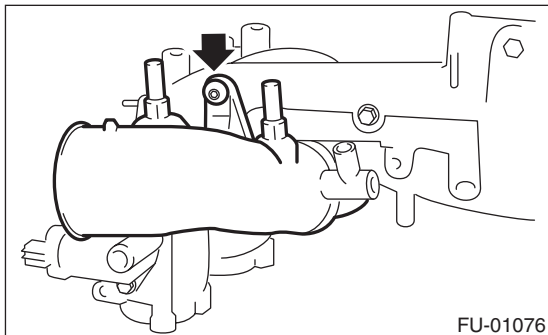


B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

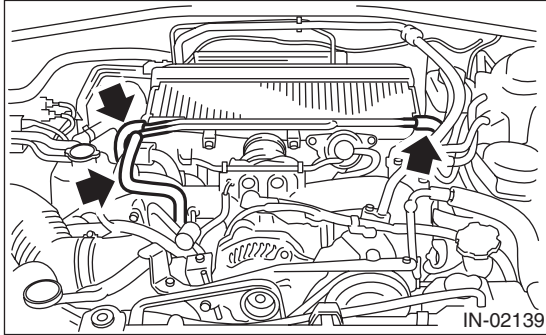
19 N·m (1.9 kgf-m, 13.7 ft-lb)



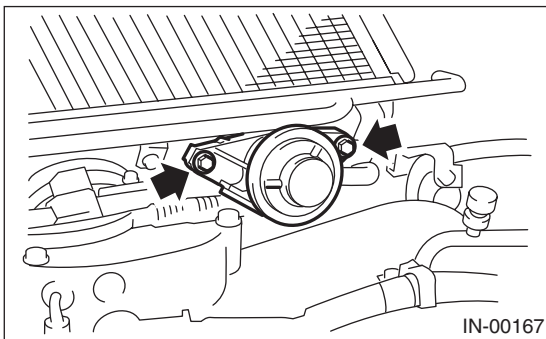
6. Intercooler

A: REMOVAL

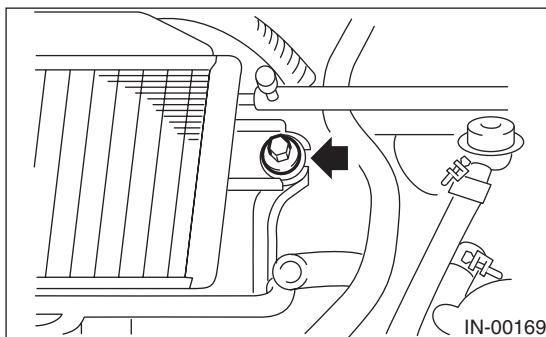
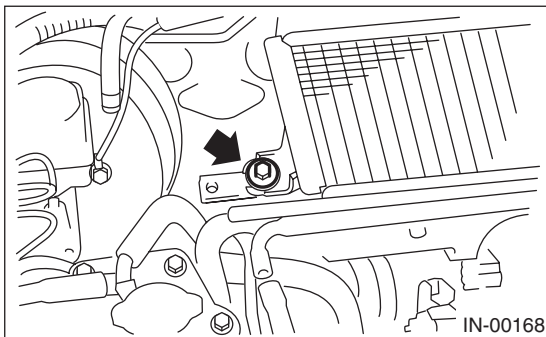
1) Disconnect the PCV hoses from PCV pipe.



2) Remove the air by-pass valve from intercooler.

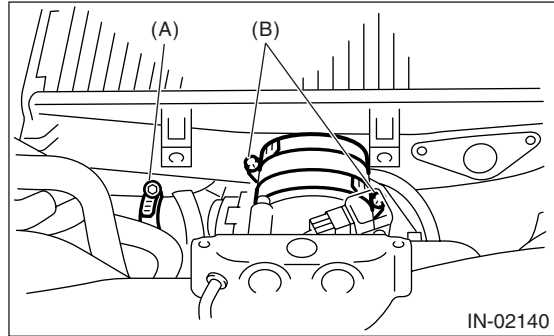


3) Remove the bolts which secure the intercooler to bracket.



4) Loosen the clamp (A) which connects the turbo-charger to intercooler ducts.

5) Loosen the clamp (B) which connects the throttle body to intercooler.



6) Remove the intercooler air duct from turbocharg-er.

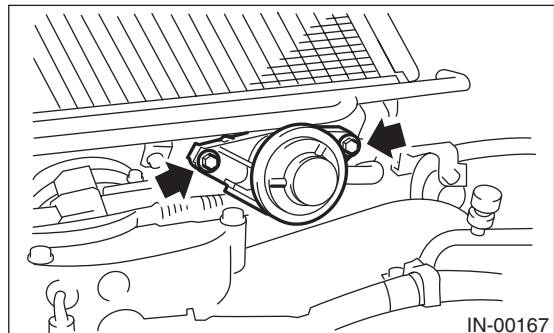
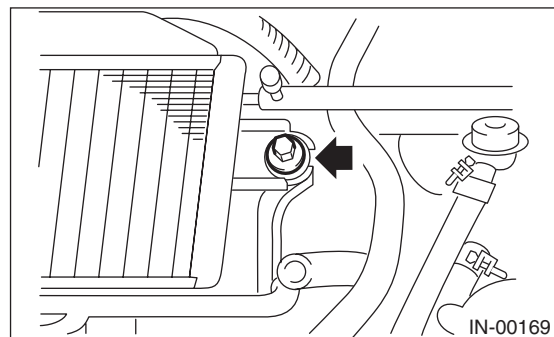
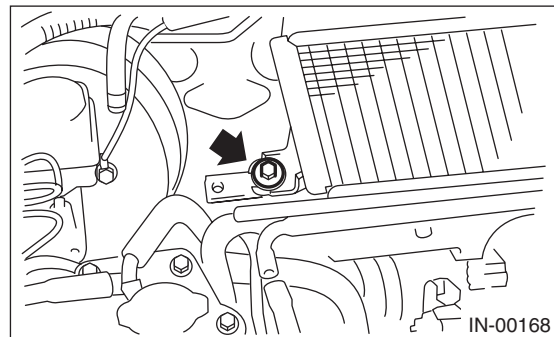
7) Remove the intercooler from throttle body.

B: INSTALLATION

Install in the reverse order of removal.

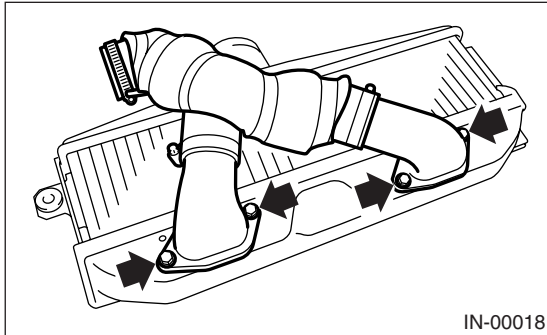
Tightening torque:

16 N·m (1.6 kgf-m, 11.6 ft-lb)

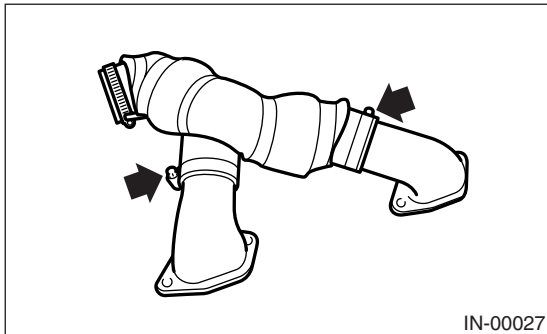


C: DISASSEMBLY

1) Remove the intercooler ducts from intercooler.



2) Separate the intercooler ducts.



D: ASSEMBLY

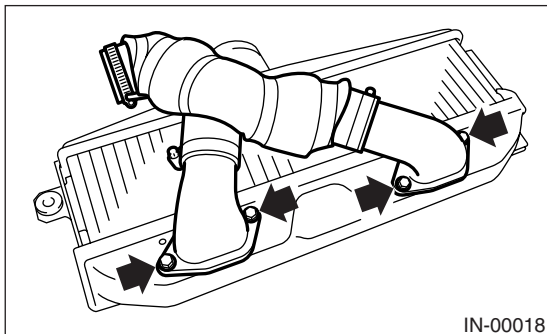
Assemble in the reverse order of disassembly.

NOTE:

Do not let the O-ring bite.

Tightening torque:

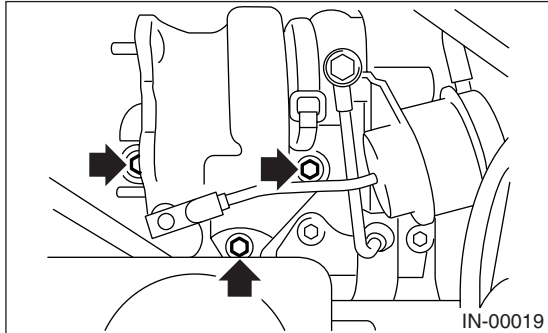
16 N·m (1.6 kgf-m, 11.6 ft-lb)



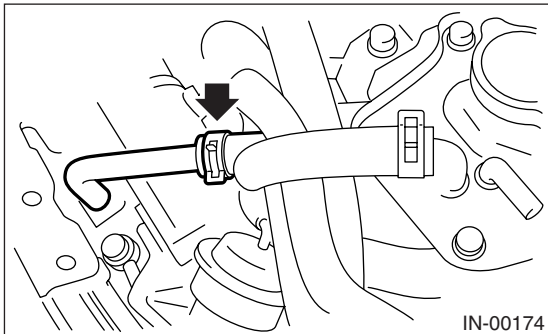
7. Turbocharger

A: REMOVAL

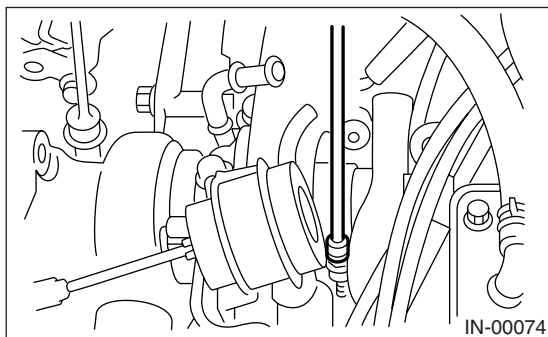
- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from battery.
- 3) Remove the center exhaust pipe. <Ref. to EX(H4DOTC)-10, REMOVAL, Center Exhaust Pipe.>
- 4) Lower the vehicle.
- 5) Disconnect the turbocharger joint pipe from turbo-charger.



- 6) Disconnect the engine coolant hose which is connected to coolant filler tank.

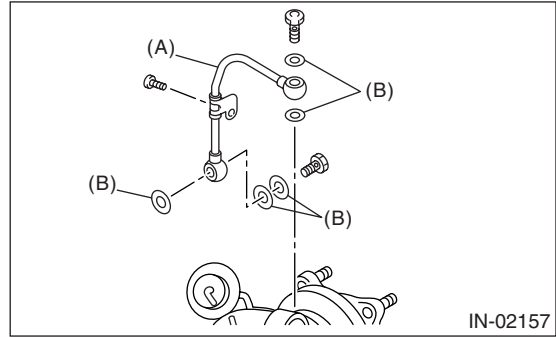


- 7) Loosen the clamp which secures the turbocharger to intake duct.



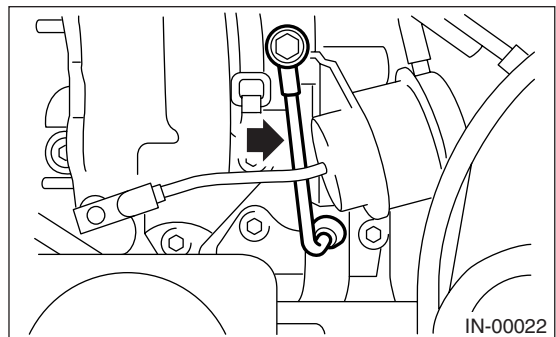
- 8) Remove the bolt which secures the bracket of oil inlet pipe to turbocharger.

- 9) Remove the oil inlet pipe from turbocharger.

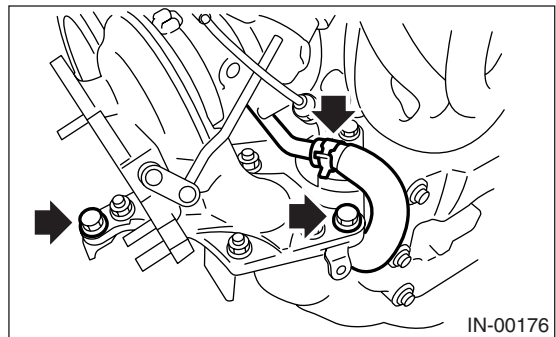


(A) Oil inlet pipe

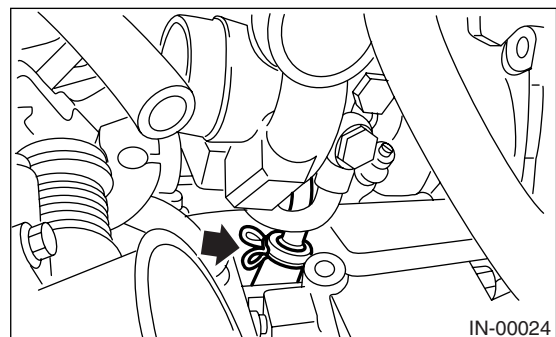
(B) Metal gasket



- 10) Disconnect the engine coolant hose.
- 11) Remove the turbocharger bracket.



- 12) Disconnect the oil outlet hose from pipe.



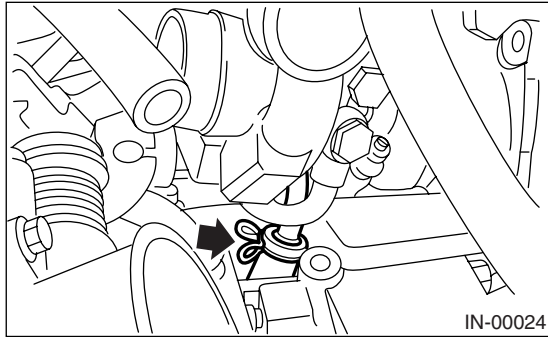
- 13) Take out the turbocharger from engine compartment.

Turbocharger

INTAKE (INDUCTION)

B: INSTALLATION

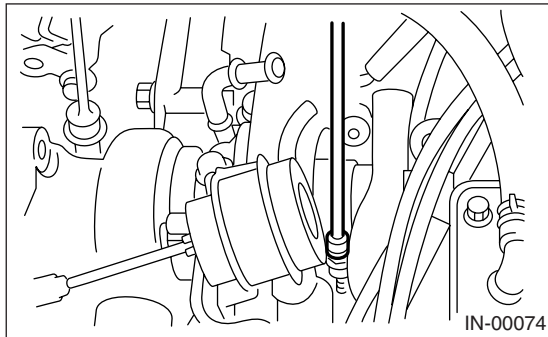
- 1) Connect the oil outlet hose to outlet pipe.



- 2) Install the turbocharger to intake duct.

Tightening torque:

3 N·m (0.3 kgf-m, 2.2 ft-lb)



- 3) Install the oil inlet pipe to turbocharger.

NOTE:

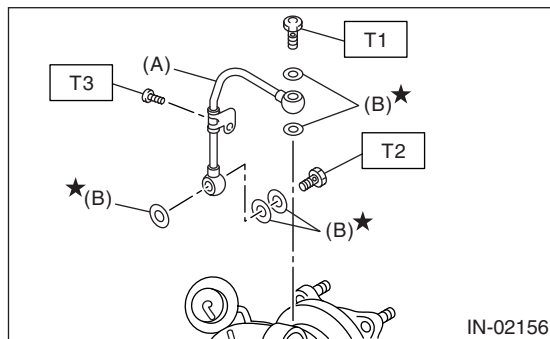
Replace the gasket with new one.

Tightening torque:

T1: 16 N·m (1.6 kgf-m, 11.6 ft-lb)

T2: 29 N·m (3.0 kgf-m, 21.7 ft-lb)

T3: 4.9 N·m (0.50 kgf-m, 3.6 ft-lb)



(A) Oil inlet pipe

(B) Metal gasket

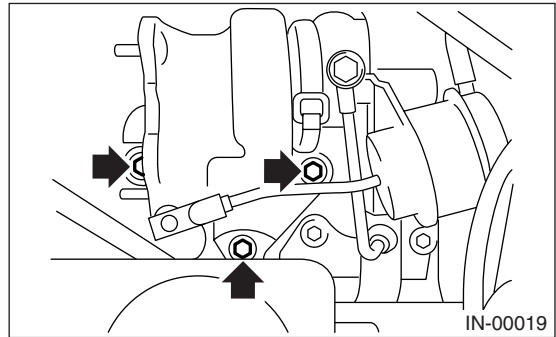
- 4) Install the joint pipe to turbocharger.

NOTE:

Replace the gasket with a new one.

Tightening torque:

35 N·m (3.6 kgf-m, 25.8 ft-lb)

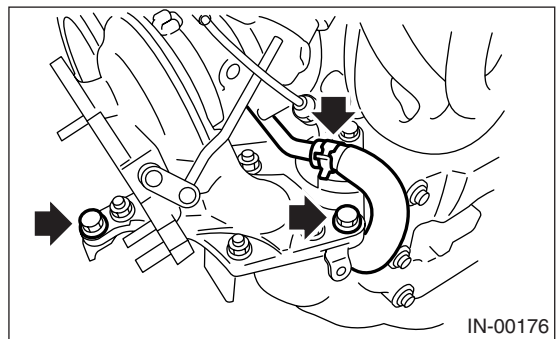


- 5) Connect the engine coolant hose.

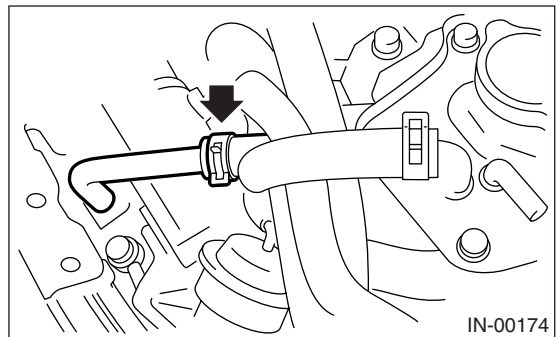
- 6) Install the turbocharger bracket.

Tightening torque:

33 N·m (3.4 kgf-m, 24.6 ft-lb)



- 7) Connect the engine coolant hose which is connected to coolant filler tank.



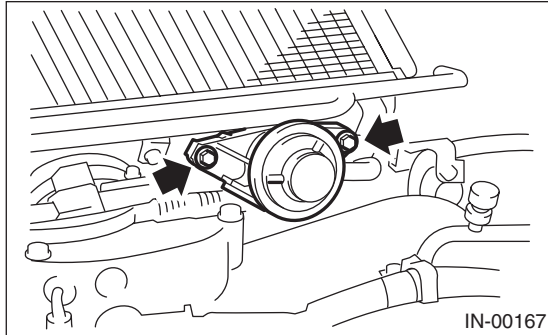
- 8) Lift-up the vehicle.

- 9) Install the center exhaust pipe. <Ref. to EX(H4DOTC)-11, INSTALLATION, Center Exhaust Pipe.>

8. 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

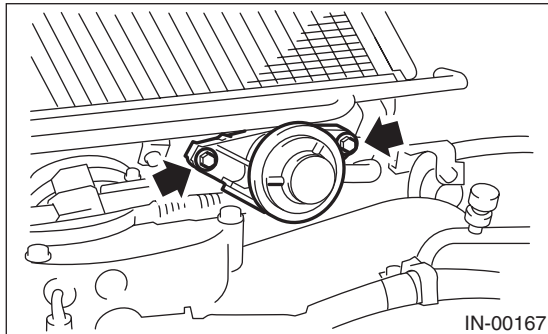
Install in the reverse order of removal.

NOTE:

Do not let the O-ring bite.

Tightening torque:

16 N·m (1.6 kgf-m, 11.6 ft-lb)



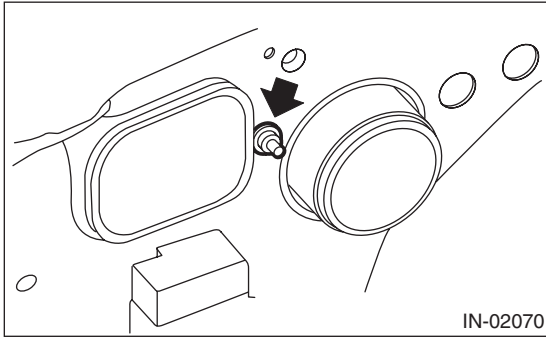
Resonator Chamber

INTAKE (INDUCTION)

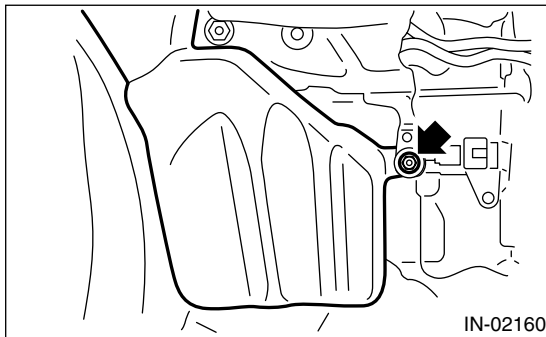
9. Resonator Chamber

A: REMOVAL

- 1) Set the vehicle on a lift.
- 2) Remove the air intake duct. <Ref. to IN(H4DOTC)-9, REMOVAL, Air Intake Duct.>
- 3) Remove the air cleaner lower case. <Ref. to IN(H4DOTC)-8, REMOVAL, Air Cleaner Case.>
- 4) Remove the resonator chamber mounting nut on right side of engine compartment.



- 5) Remove the front wheel RH, and lift up the vehicle.
- 6) Remove the front mud guard RH.
- 7) Remove the resonator chamber from the inside front fender.

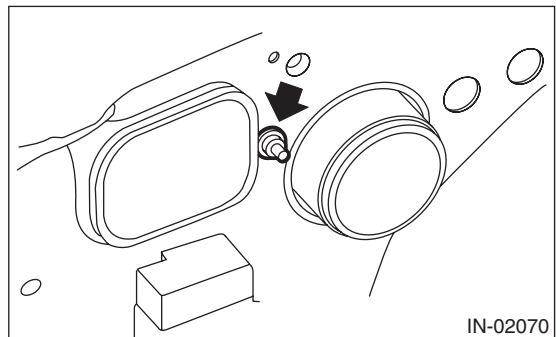
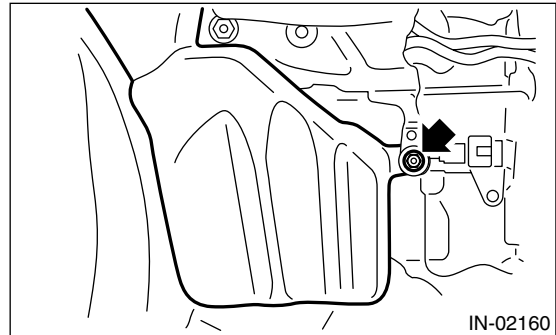


B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

7.5 N·m (0.76 kgf-m, 5.5 ft-lb)



C: INSPECTION

- 1) Inspect for cracks and loose connections.
- 2) Inspect that no foreign objects are mixed in resonator chamber.

LUBRICATION

General Description

LUBRICATION

1. General Description

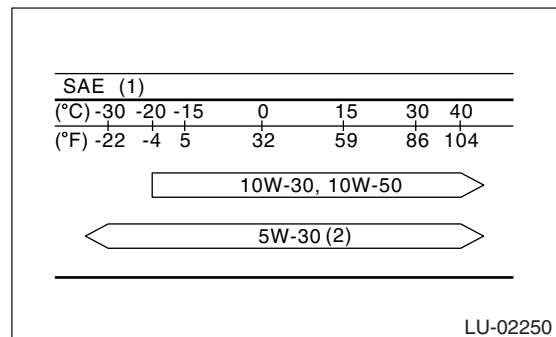
A: SPECIFICATION

Lubrication method				Forced lubrication	
Oil pump	Pump type			Trochoid type	
	Number of teeth	Inner rotor		9	
		Outer rotor		10	
	Outer rotor diameter × thickness			78 × 10 mm (3.07 × 0.39 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 kgf/cm ² , 14 psi)	
			Discharge quantity	4.6 ℓ (4.9 US qt, 4.0 Imp qt)/min.	
5,000 rpm		Discharge pressure	294 kPa (3.0 kgf/cm ² , 43 psi)		
		Discharge quantity	47.0 ℓ (49.7 US qt, 41.4 Imp qt)/min.		
Relief valve operation pressure			588 kPa (6.0 kgf/cm ² , 85 psi)		
Oil filter	Type			Full-flow filter type	
	Filtration area	Diameter 68 mm (2.68 in)		800 cm ² (124 sq in)	
		Diameter 65 mm (2.56 in)		470 cm ² (73 sq in)	
	By-pass valve opening pressure			160 kPa (1.63 kgf/cm ² , 23.2 psi)	
	Outer diameter × width	Diameter 68 mm (2.68 in)		68 × 65 mm (2.68 × 2.56 in)	
		Diameter 65 mm (2.56 in)		65 × 74.4 mm (2.56 × 2.93 in)	
Oil filter to engine thread size			M 20 × 1.5		
Oil pressure switch	Type			Immersed contact point type	
	Working voltage — wattage			12 V — 3.4 W or less	
	Warning light activation pressure			14.7 kPa (0.15 kgf/cm ² , 2.1 psi)	
	Proof pressure			More than 981 kPa (10 kgf/cm ² , 142 psi)	
Engine oil	Capacity (at overhaul)			5.0 ℓ (5.3 US qt, 4.4 Imp qt)	
	When replacing engine oil and oil filter			4.3 ℓ (4.5 US qt, 3.8 Imp qt)	
	When replacing engine oil only			4.0 ℓ (4.2 US qt, 3.5 Imp qt)	

Recommended oil:

API standard SM with the “Energy Conserving” logo is printed.

ILSAC standard, GF4 “Star burst mark” label is on the container.



- (1) SAE viscosity No. and applicable temperature
(2) Recommended

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 standard and SAE viscosity No. designated by SUBARU.

NOTE:

If the vehicle is used in areas with very high temperatures or for other heavy duty applications, the following viscosity oils may be used: API standard: SM or SL

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

C: CAUTION

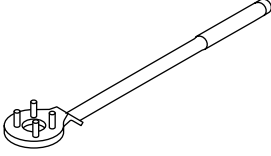
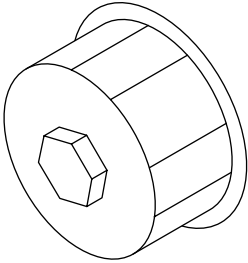
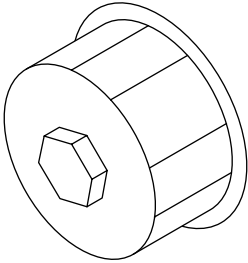
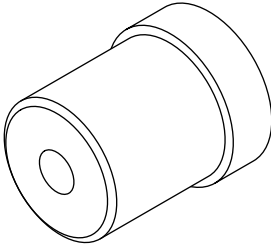
- Wear work clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn yourself, 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 rigid racks at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.

General Description

LUBRICATION

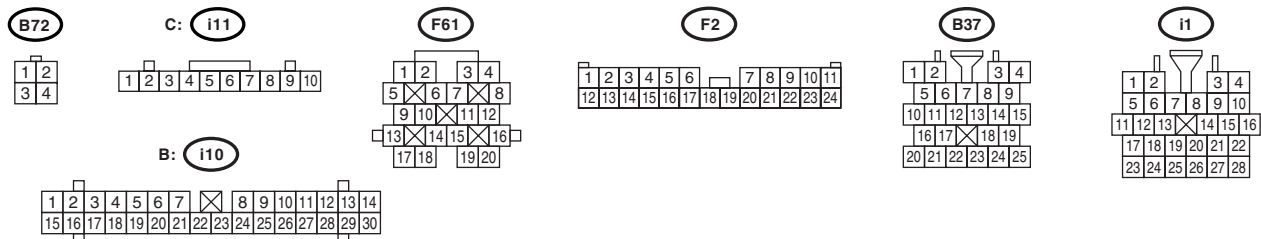
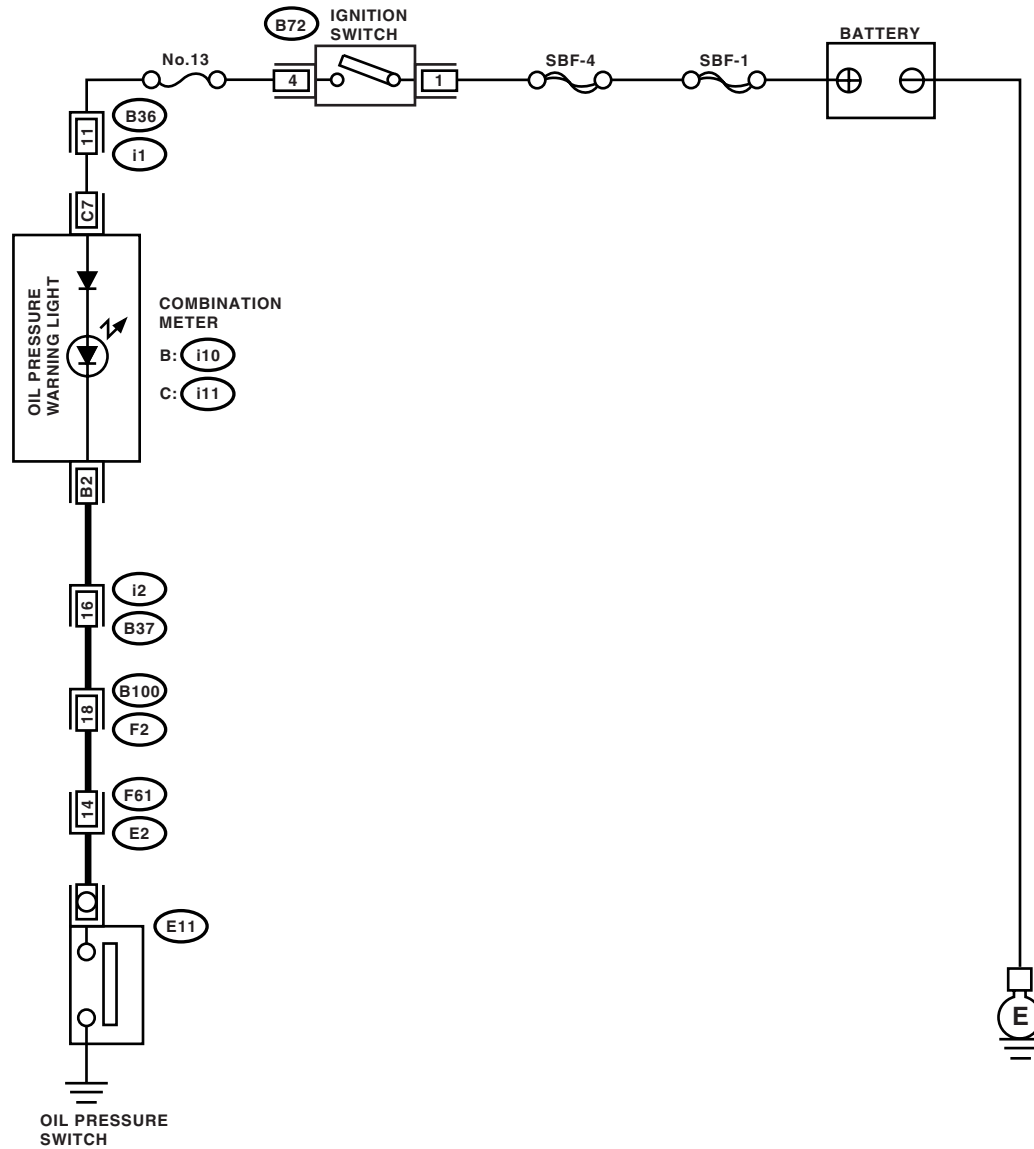
D: PREPARATION TOOL

1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499977100	499977100	CRANK PULLEY WRENCH	Used for stopping rotation of crank pulley when loosening and tightening crank pulley bolt.
 ST18332AA000	18332AA000	OIL FILTER WRENCH	Used for removing and installing oil filter. (Outer diameter: 68 mm (2.68 in))
 ST18332AA010	18332AA010	OIL FILTER WRENCH	Used for removing and installing oil filter. (Outer diameter: 65 mm (2.56 in))
 ST-499587100	499587100	OIL SEAL INSTALLER	Used for installing oil seal to oil pump.

2. Oil Pressure System

A: WIRING DIAGRAM



LU-02125

Oil Pressure System

LUBRICATION

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-3, 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. Connector & terminal (E11) No. 1 (+) — Chassis ground (-):	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. Terminals (i11) No. 7 — (i10) No. 2:	Is the resistance less than 10 Ω ?	Replace the harness connector between combination meter and oil pressure switch.	Repair or replace the combination meter. <Ref. to IDI-3, INSPECTION, Combination Meter System.>

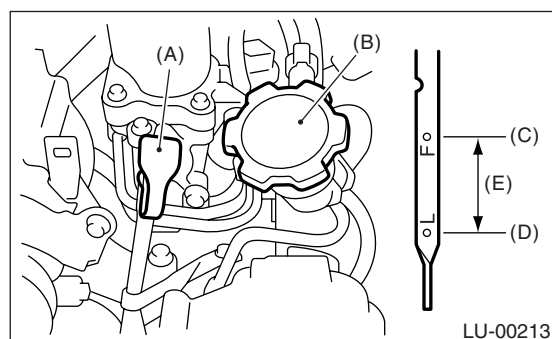
3. Engine Oil

A: INSPECTION

- 1) Park the vehicle on a level surface.
- 2) After turning off the engine, wait a few minutes for oil to drain back into the oil pan before checking the level.
- 3) 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 engine oil.
- 4) Remove the oil level gauge and wipe it clean.
- 5) Reinsert the level gauge all the way. Be sure that the level gauge is correctly inserted and in proper orientation.
- 6) 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.

NOTE:

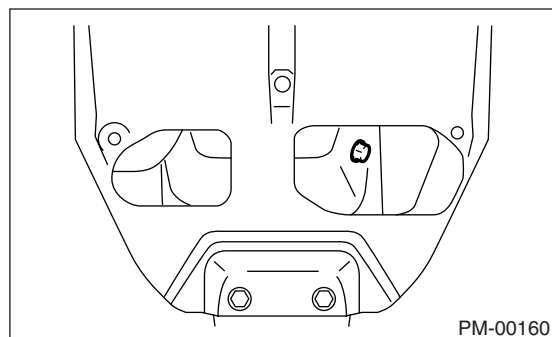
To prevent overfilling the engine oil, do not add oil above "F" line when the engine is cold.



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

B: REPLACEMENT

- 1) Open the engine oil filler cap for quick draining of engine oil.
- 2) Drain the engine oil by loosening the engine oil drain plug.

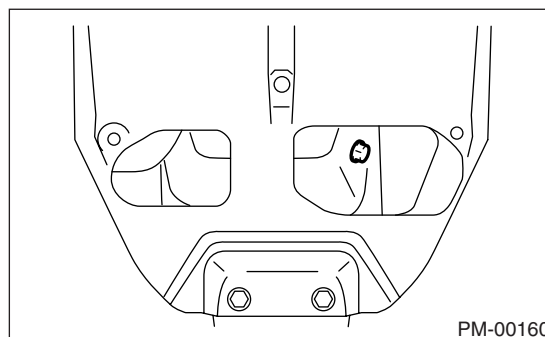


- 3) Replace the drain plug gasket.

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

Tightening torque:

44 N·m (4.5 kgf-m, 32.5 ft-lb)



- 5) Install the service hole cover.
- 6) Use the engine oil of proper quality and viscosity, fill engine oil through the oil filler duct up to upper level on level gauge. Make sure that the vehicle is placed level when checking oil level.

Recommended oil:

API standard SM with the "Energy Conserving" logo is printed.

ILSAC standard, GF4 "Star burst mark" label is on the container.

Engine oil capacity:

Upper level

4.0 ̶ (4.2 US qt, 3.5 Imp qt)

Lower level

3.0 ̶ (3.2 US qt, 2.6 Imp qt)

SAE (1)						
(°C)	-30	-20	-15	0	15	30 40
(°F)	-22	-4	5	32	59	86 104
10W-30, 10W-50						
5W-30 (2)						

- (1) SAE viscosity No. and applicable temperature
- (2) Recommended

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 standard and SAE viscosity No. designated by SUBARU.

Engine Oil

LUBRICATION

NOTE:

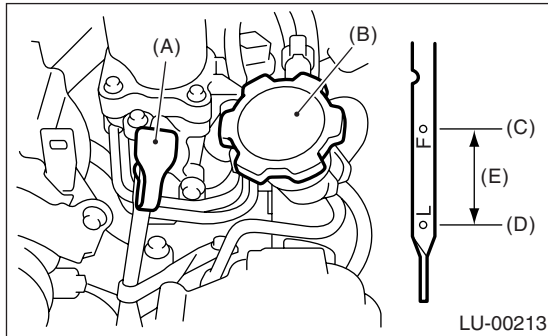
If the vehicle is used in areas with very high temperatures or for other heavy duty applications, the following viscosity oils may be used: API standard: SM or SL

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

7) Close the engine oil filler cap.

8) Start the engine and warm it up for a time.

9) After the engine stops, recheck the oil level. If necessary, add engine oil up to the upper level on level gauge.

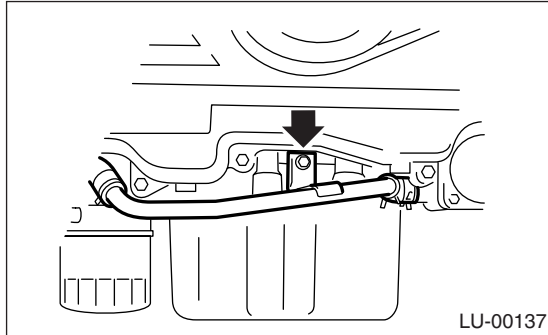


- (A) Oil level gauge
- (B) Engine oil filler cap
- (C) Upper level
- (D) Lower level
- (E) Approx. 1.0 ℓ (1.1 US qt, 0.9 Imp qt)

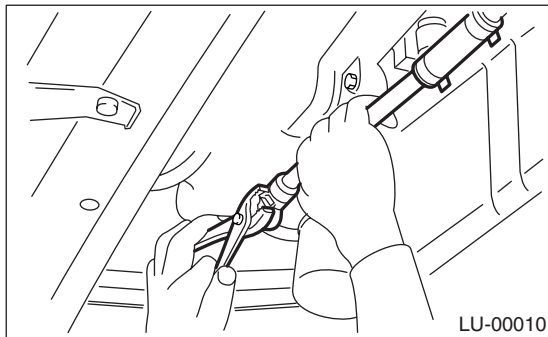
4. Oil Pump

A: REMOVAL

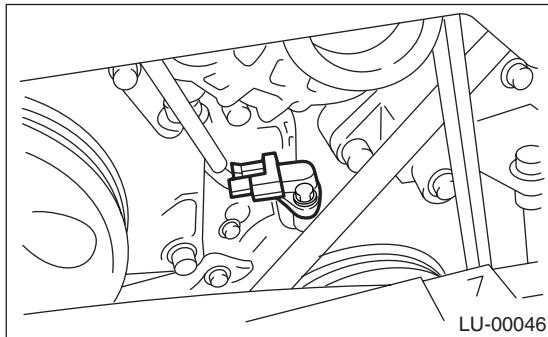
- 1) Disconnect the ground cable from battery.
- 2) Lift-up the vehicle.
- 3) Remove the under cover.
- 4) Remove the bolts which install the water pipe of oil cooler to oil pump.



- 5) Remove the water pipe and hoses between oil cooler and water pump.

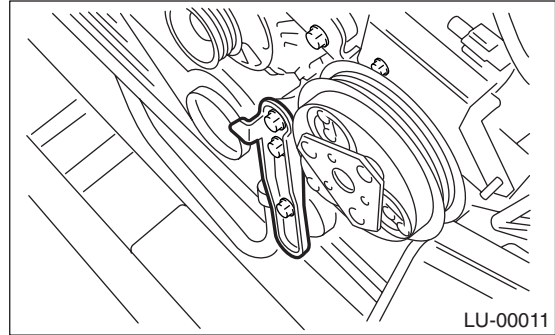


- 6) Remove the radiator. <Ref. to CO(H4DOTC)-23, REMOVAL, Radiator.>
- 7) Remove the crank position sensor.

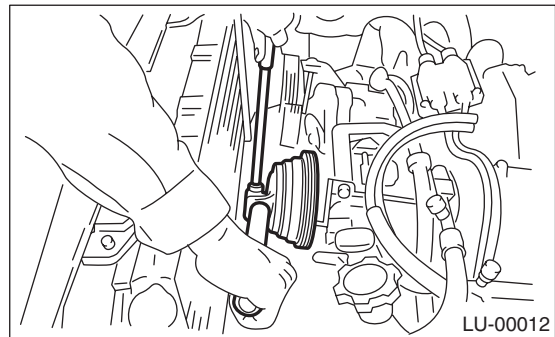


- 8) Remove the V-belts.
<Ref. to ME(H4DOTC)-41, REMOVAL, V-belt.>

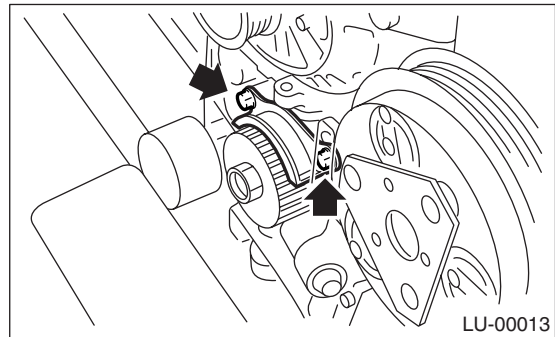
- 9) Remove the rear side V-belt tensioner.



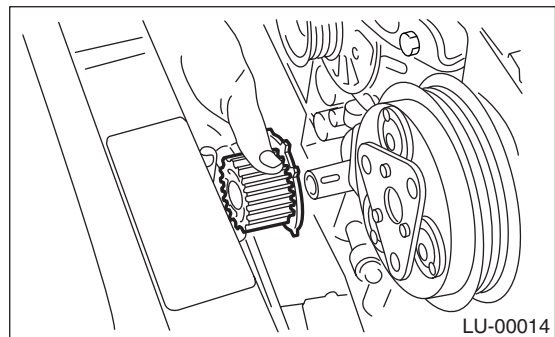
- 10) Remove the crank pulley by using ST.
ST 499977100 CRANK PULLEY WRENCH



- 11) Remove the timing belt. <Ref. to ME(H4DOTC)-45, REMOVAL, Timing Belt.>
- 12) Remove the timing belt guide. (MT model)



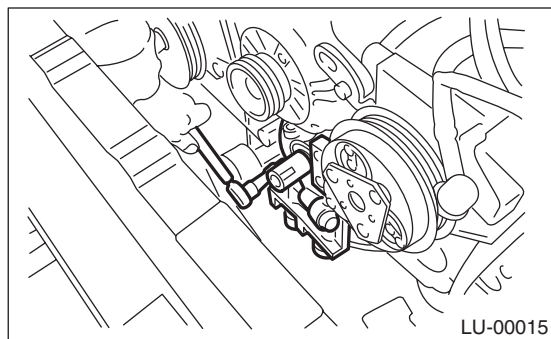
- 13) Remove the water pump. <Ref. to CO(H4DOTC)-19, REMOVAL, Water Pump.>
- 14) Remove the crank sprocket.



Oil Pump

LUBRICATION

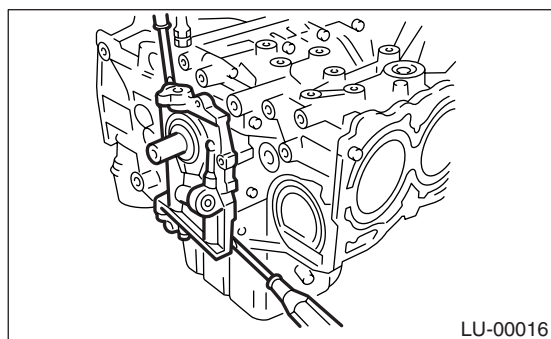
15) Remove the bolts which install the oil pump onto cylinder block.



16) Remove the oil pump using the flat tip screwdriver.

CAUTION:

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



B: INSTALLATION

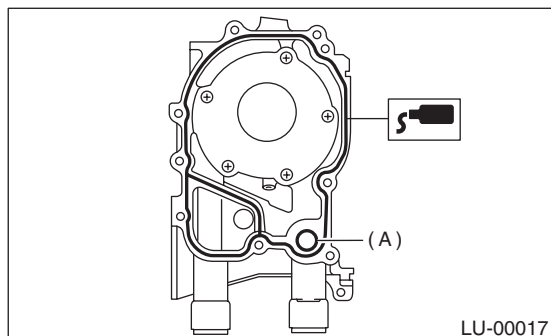
Install in the reverse order of removal.

Do the following:

1) Apply liquid gasket to the matching surfaces of oil pump.

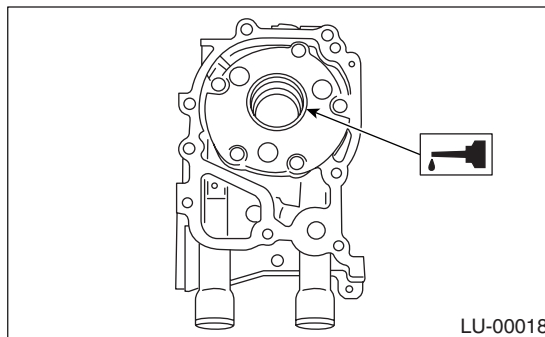
Liquid gasket:

THREE BOND 1215 (Part No. 004403007) 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 the 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.

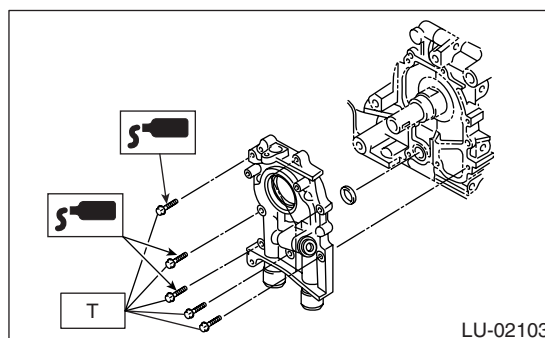
7) Apply liquid gasket to the threaded portion of three bolts.

Liquid gasket:

THREE BOND 1324 (Part No. 004403042) or equivalent

Tightening torque:

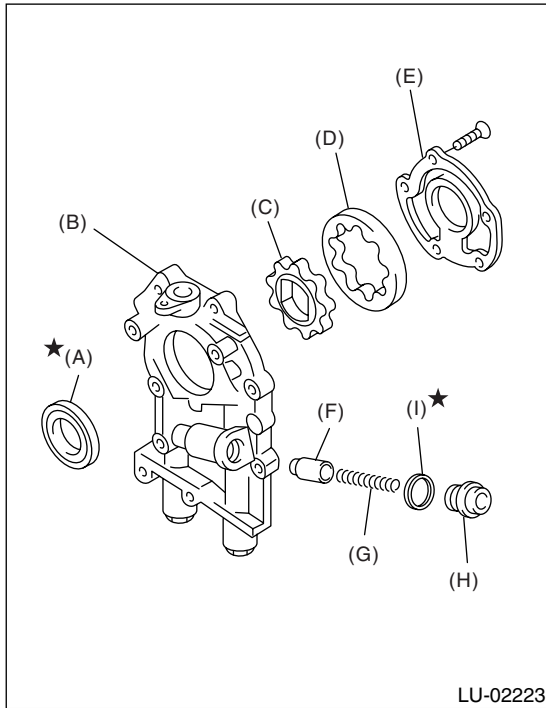
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



C: DISASSEMBLY

Remove the screws which secure the 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 disassembling the oil pump, remove the relief valve.

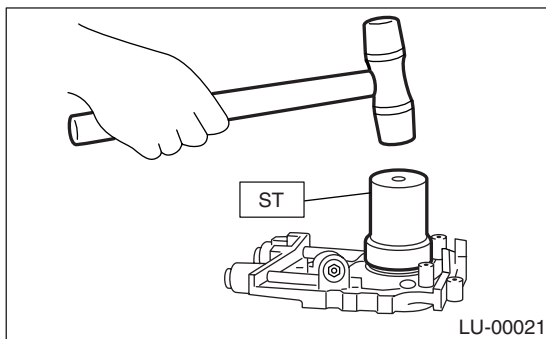


- (A) Oil seal
- (B) Pump case
- (C) Inner rotor
- (D) Outer rotor
- (E) Pump cover
- (F) Relief valve
- (G) Relief valve spring
- (H) Plug
- (I) Gasket

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.

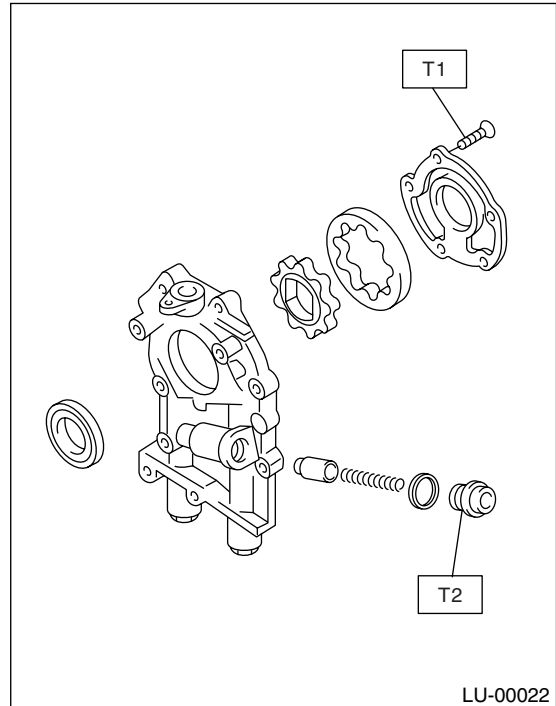
3) Install the inner and outer rotors in their original positions.
4) Install the oil relief valve, relief valve spring and plug.

NOTE:
Use a new gasket.
5) Install the oil pump cover.

Tightening torque:

T1: 5.4 N·m (0.55 kgf-m, 4.0 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.

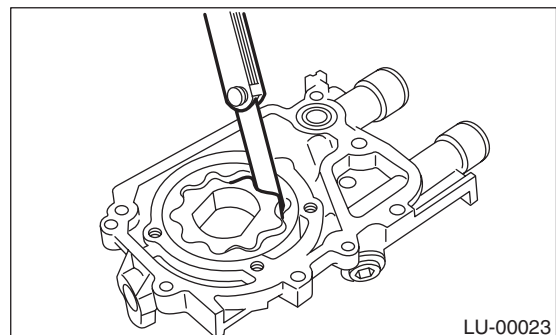
Tip clearance:

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 outer rotor and oil pump rotor housing. If clearance exceeds the limit, replace the rotor.

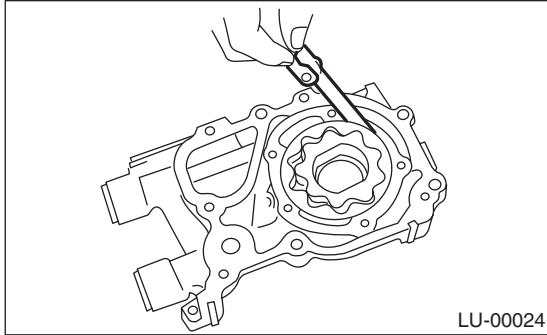
Case clearance:

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.

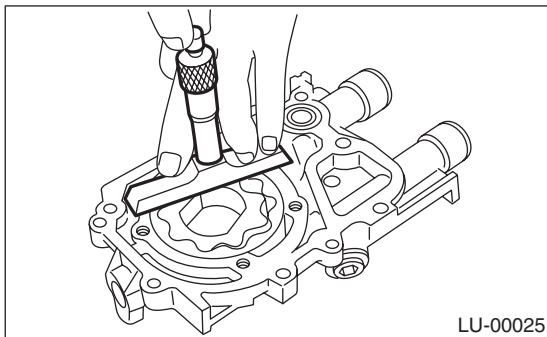
Side clearance:

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

73.7 mm (2.902 in)

Installed length

54.7 mm (2.154 in)

Load when installed

93.1 N (9.49 kgf, 20.88 lbf)

5. OIL PUMP CASE

Check the oil pump case for worn shaft hole, clogged oil passage, worn rotor chamber, cracks, and other faults.

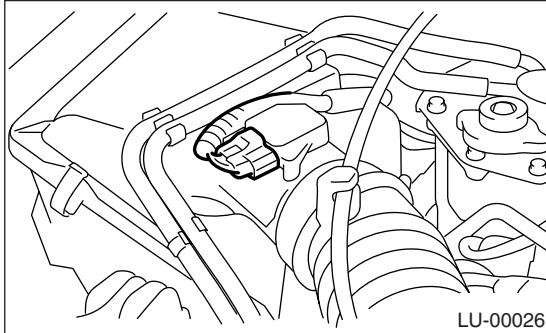
6. OIL SEAL

Check the oil seal lips for deformation, hardening, wear, etc. and replace if defective.

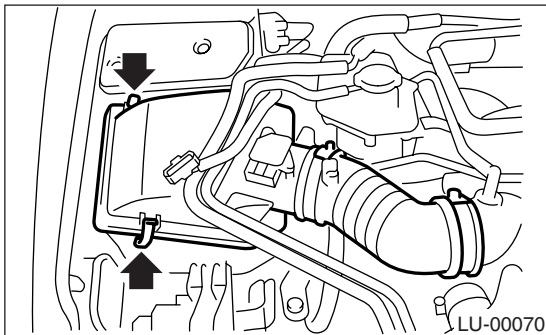
5. Oil Pan and Strainer

A: REMOVAL

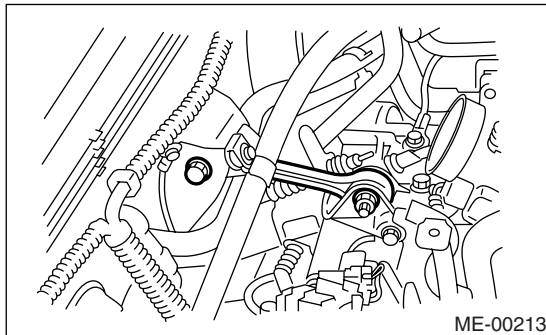
- 1) Set the vehicle on a lift.
- 2) Remove the front wheels.
- 3) Disconnect the ground cable from battery.
- 4) Disconnect the connector from mass air flow and intake air temperature sensor.



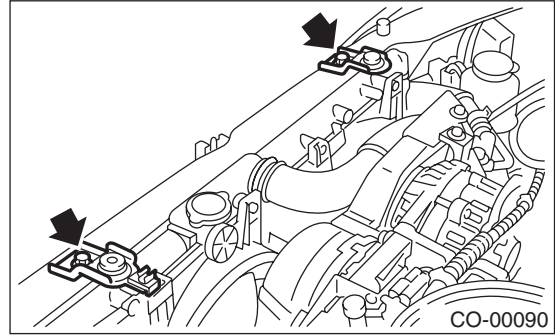
- 5) Remove the air intake boot and air cleaner upper cover.



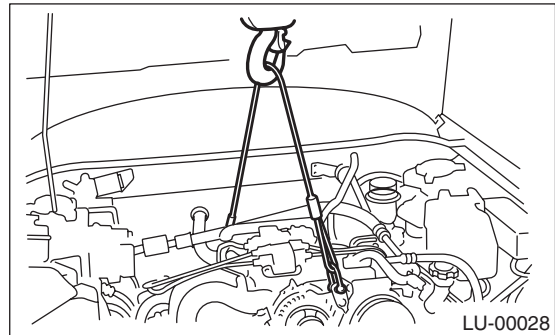
- 6) Remove the intercooler. <Ref. to IN(H4DOTC)-11, REMOVAL, Intercooler.>
- 7) Remove the pitching stopper.



- 8) Remove the radiator upper brackets.



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

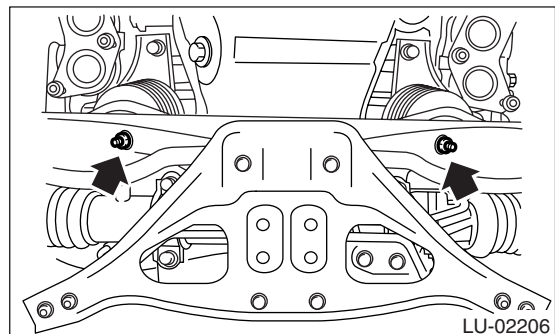


- 10) Lift-up the vehicle.

CAUTION:

When lifting up the vehicle, rise up the wire rope together.

- 11) Remove the under cover.
- 12) Drain the engine oil. <Ref. to LU(H4DOTC)-9, REPLACEMENT, Engine Oil.>
- 13) Remove the front exhaust pipe assembly. <Ref. to EX(H4DOTC)-8, REMOVAL, Front Exhaust Pipe.>
- 14) Remove the nuts which install the front cushion rubber onto front crossmember.



- 15) Remove the bolts which install the oil pan on cylinder block while raising up engine.
- 16) Insert the oil pan cutter blade between cylinder block-to-oil pan clearance.

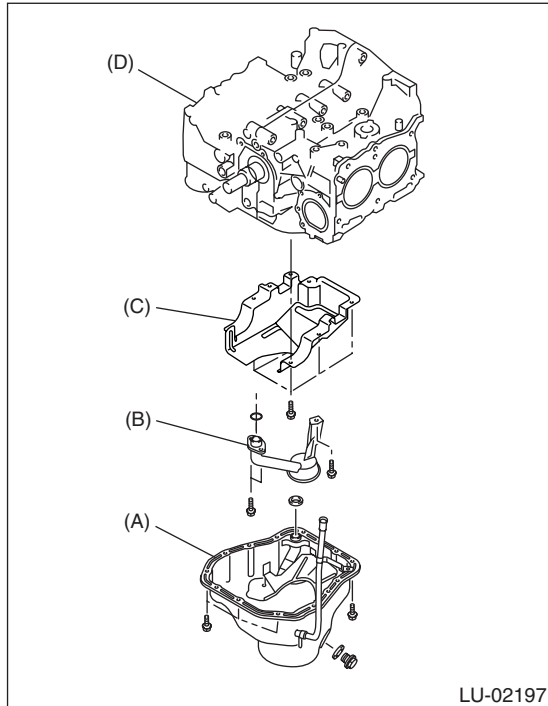
CAUTION:

Do not use a screwdriver or similar tool in place of oil pan cutter.

Oil Pan and Strainer

LUBRICATION

- 17) Remove the oil strainer.
- 18) Remove the baffle plate.



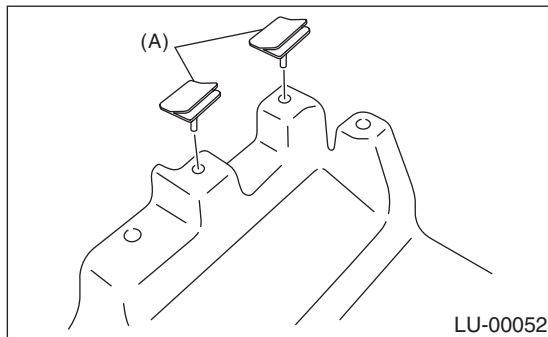
- (A) Oil pan
- (B) Oil strainer
- (C) Baffle plate
- (D) Cylinder block

B: INSTALLATION

CAUTION:

Before installing the oil pan, clean sealant from oil pan and engine block.

- 1) Check the seal (A) is securely installed in baffle plate in the direction as shown in the figure.



- 2) Install the baffle plate.

Tightening torque:

6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

- 3) Install the oil strainer onto baffle plate.

NOTE:

Replace the O-ring with a new one.

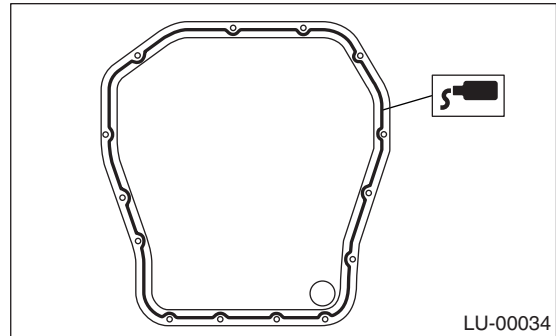
Tightening torque:

10 N·m (1.0 kgf-m, 7.2 ft-lb)

- 4) Apply liquid gasket to the mating surfaces, and then install the oil pan.

Liquid gasket:

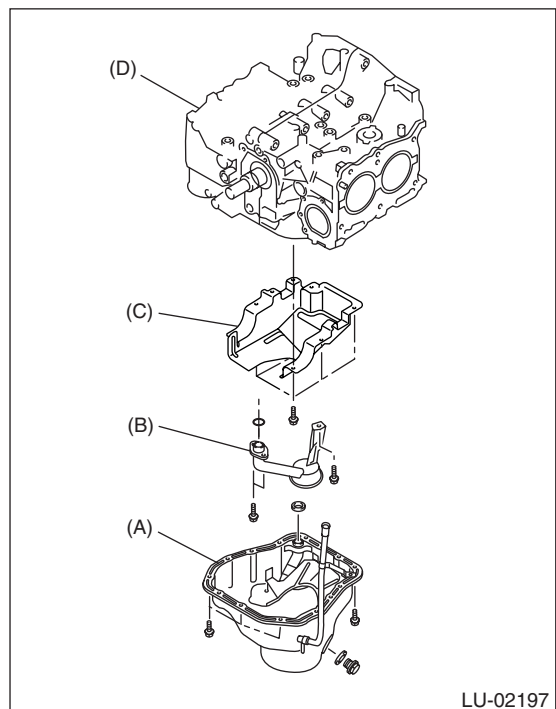
THREE BOND 1207C (Part No. 004403012) or equivalent



- 5) Tighten the bolts which install the oil pan onto engine block.

Tightening torque:

5 N·m (0.5 kgf-m, 3.6 ft-lb)



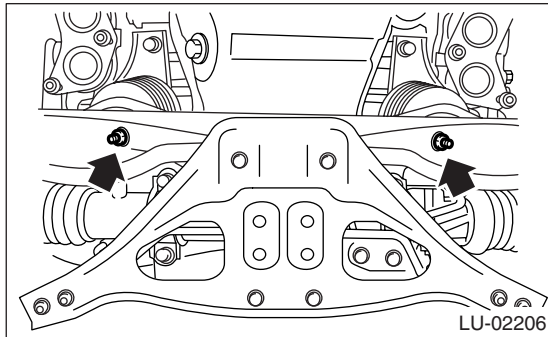
- (A) Oil pan
- (B) Oil strainer
- (C) Baffle plate
- (D) Cylinder block

- 6) Lower the engine onto front crossmember.

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

Tightening torque:

83 N·m (8.5 kgf-m, 61 ft-lb)



8) Install the front exhaust pipe assembly. <Ref. to EX(H4DOTC)-8, INSTALLATION, Front Exhaust Pipe.>

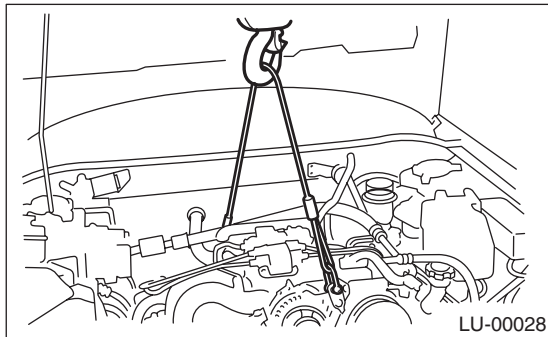
9) Install the under cover.

10) Lower the vehicle.

CAUTION:

When lowering the vehicle, lower the lifting device and wire rope together.

11) Remove the lifting device and steel cables.

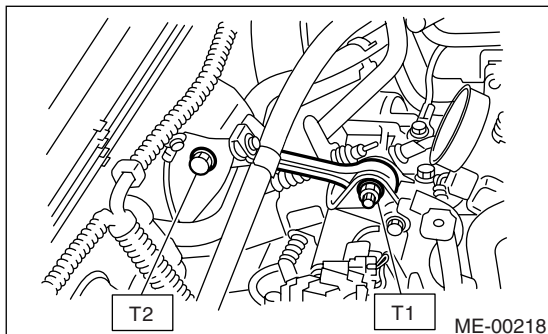


12) Install the pitching stopper.

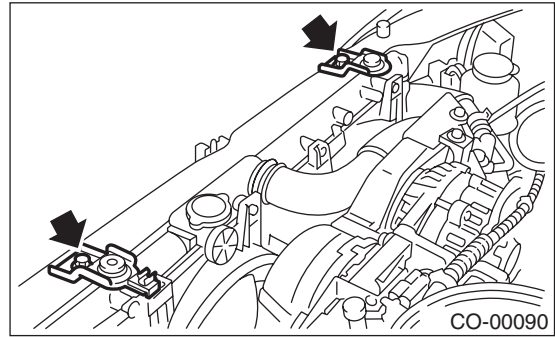
Tightening torque:

T1: 50 N·m (5.1 kgf-m, 36.9 ft-lb)

T2: 58 N·m (5.9 kgf-m, 42.8 ft-lb)

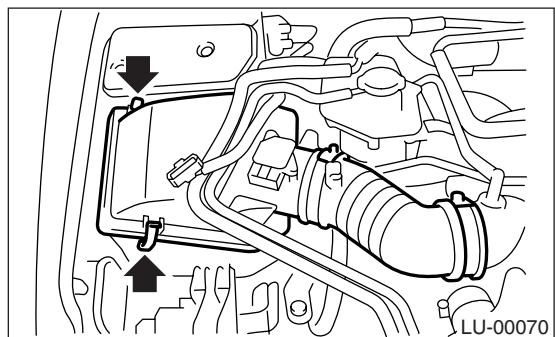


13) Install the radiator upper brackets.

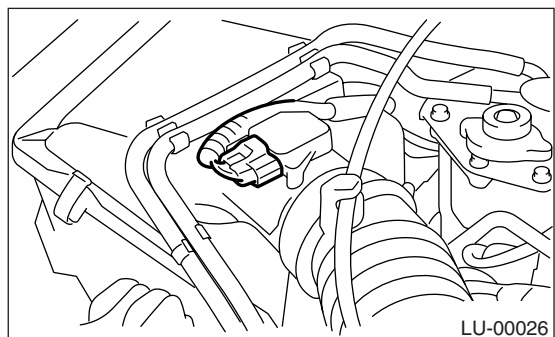


14) Install the intercooler. <Ref. to IN(H4DOTC)-11, INSTALLATION, Intercooler.>

15) Install the air intake boot and air cleaner upper cover.



16) Connect the connector to mass air flow and intake air temperature sensor.



17) Install the front wheels.

18) Connect the battery ground cable to battery.

19) Fill engine oil. <Ref. to LU(H4DOTC)-9, INSPECTION, Engine Oil.>

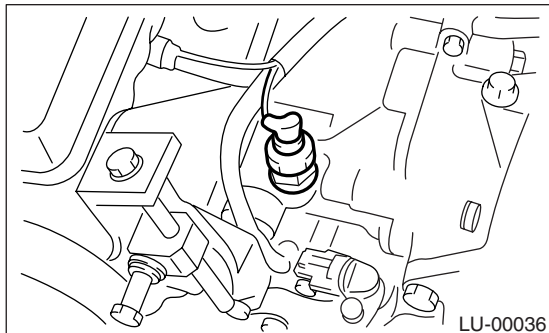
C: INSPECTION

By visual check, make sure the oil pan, oil strainer, oil strainer stay and baffle plate are not damaged.

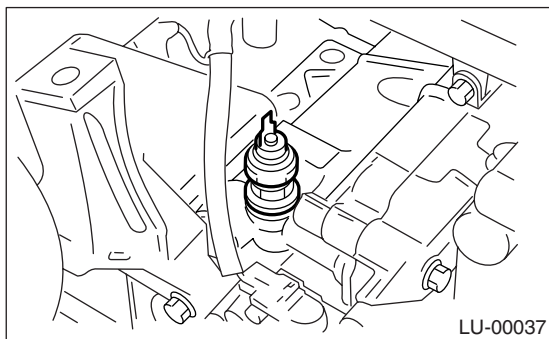
6. Oil Pressure Switch

A: REMOVAL

- 1) Remove the generator from bracket. <Ref. to SC(H4SO)-14, REMOVAL, Generator.>
- 2) Disconnect the terminal from oil pressure switch.



- 3) Remove the oil pressure switch.

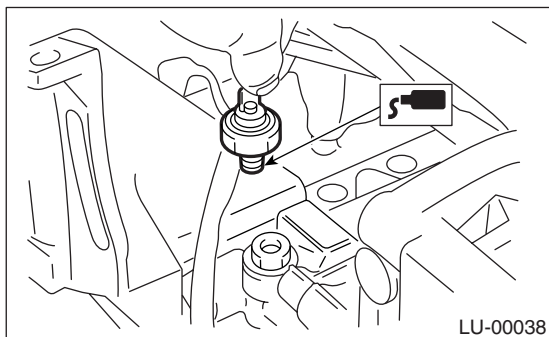


B: INSTALLATION

- 1) Apply liquid gasket to the oil pressure switch threads.

Liquid gasket:

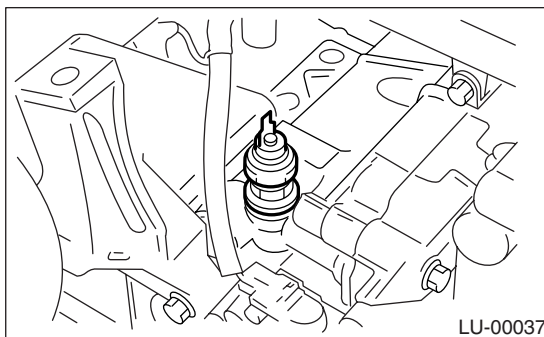
THREE BOND 1324 (Part No. 004403042) or equivalent



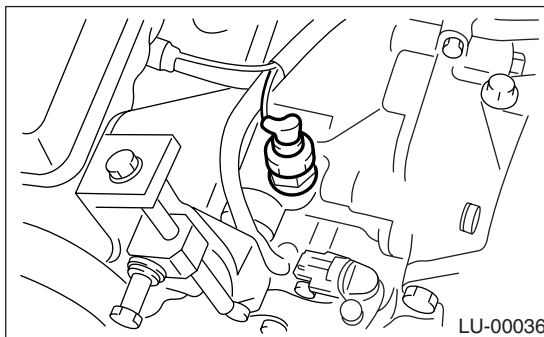
- 2) Install the oil pressure switch onto engine block.

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(H4SO)-14, INSTALLATION, Generator.>

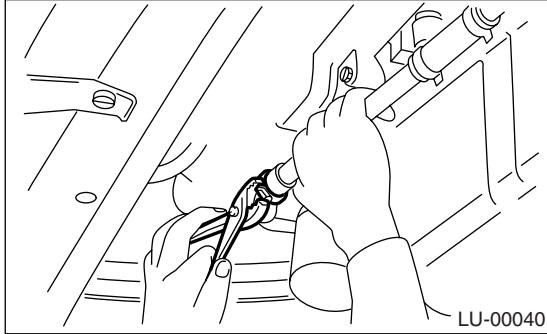
C: INSPECTION

Make sure oil does not leak or seep from where the oil pressure switch is installed.

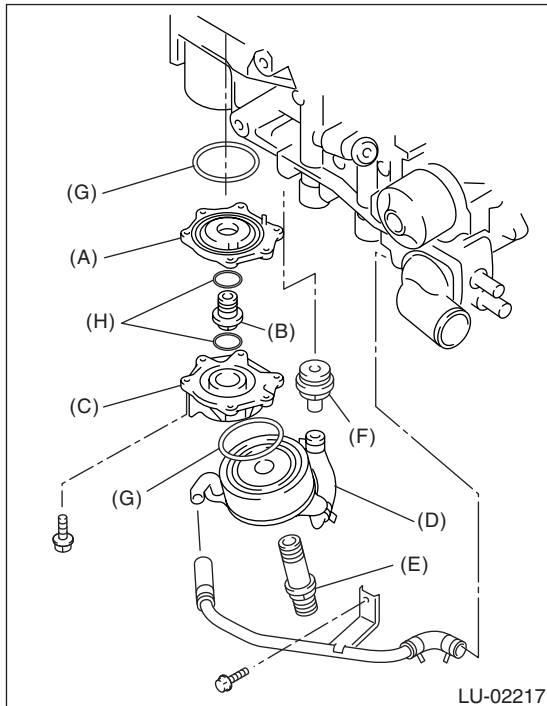
7. Engine Oil Cooler

A: REMOVAL

- 1) Lift-up the vehicle.
- 2) Remove the under cover.
- 3) Drain the engine oil.
- 4) Drain the engine coolant.
- 5) Remove the water by-pass pipe between oil cooler and water pump.



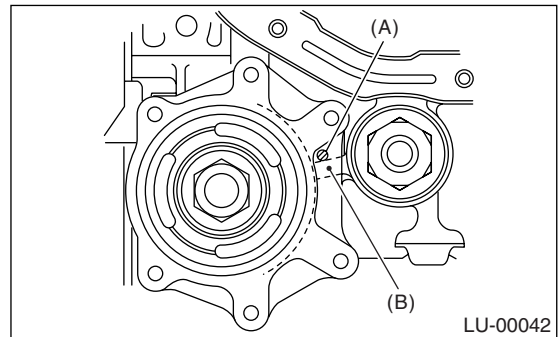
- 6) Remove the engine oil filter. <Ref. to LU(H4DOTC)-21, REMOVAL, Engine Oil Filter.>
- 7) Remove the connector, and then remove the oil cooler.



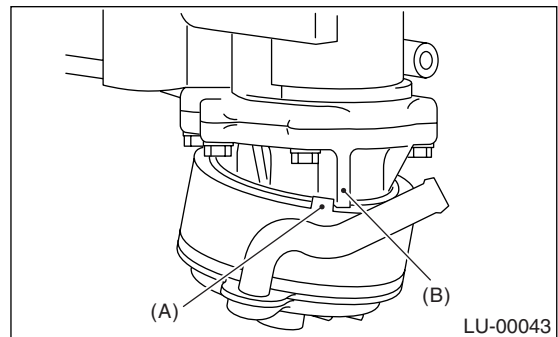
- (A) Adapter A
- (B) Adapter connector
- (C) Adapter B
- (D) Oil cooler
- (E) Oil cooler connector
- (F) Plug
- (G) Gasket
- (H) O-ring

B: INSTALLATION

- 1) Install in the reverse order of removal.
- 2) Contact the knock pin (A) of adapter A to cylinder block rib (B) to install adapter A.



- 3) Install the adapter B.
- 4) Contact the engine oil cooler stopper (A) to adapter B rib (B) to install engine oil cooler.



- 5) Apply liquid gasket to the plug thread when installing it.

Liquid gasket:

THREE BOND 1215 (Part No. 004403007) or equivalent

Tightening torque:

T1: 45 N·m (4.6 kgf-m, 33.2 ft-lb)

T2: 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

T3: 54 N·m (5.5 kgf-m, 40 ft-lb)

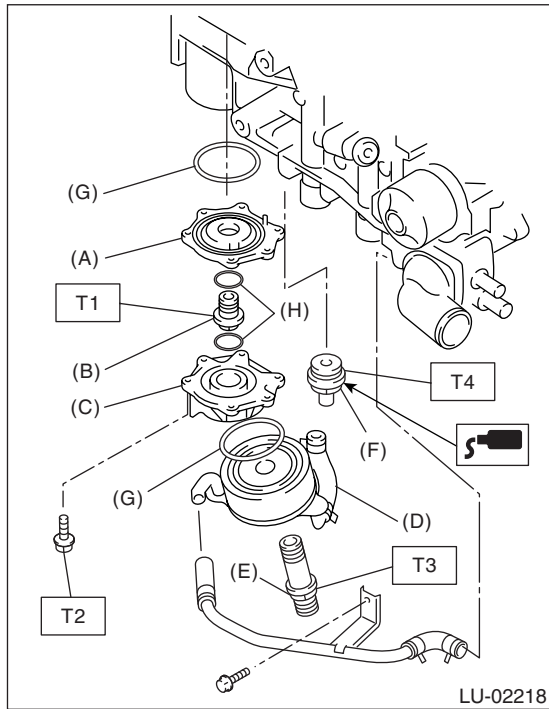
T4: 69 N·m (7.0 kgf-m, 50.9 ft-lb)

Engine Oil Cooler

LUBRICATION

NOTE:

Always use new gasket and O-ring.



- (A) Adapter A
- (B) Adapter connector
- (C) Adapter B
- (D) Oil cooler
- (E) Oil cooler connector
- (F) Plug
- (G) Gasket
- (H) O-ring

C: INSPECTION

- 1) Check 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

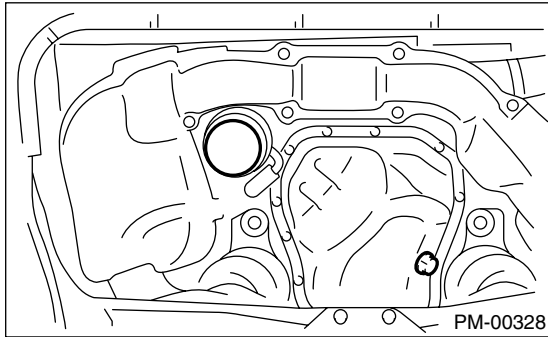
- 1) Lift-up the vehicle.
- 2) Remove the under cover.
- 3) Remove the oil filter with ST.

ST 18332AA000 OIL FILTER WRENCH (Outer diameter: 68 mm (2.68 in))

ST 18332AA010 OIL FILTER WRENCH (Outer diameter: 65 mm (2.56 in))

NOTE:

Standard oil filter is outer diameter of 68 mm (2.68 in). However, SUBARU genuine oil filter having outer diameter of 65 mm (2.56 in) can also be used.



B: INSTALLATION

- 1) Get a new oil filter and apply a thin coat of engine oil to seal rubber.
- 2) Install the oil filter by turning it by hand, being careful not to damage seal rubber.
 - Tighten the oil filter 68 mm (2.68 in) in diameter by approx. 1 rotation more after the seal rubber of oil filter comes in contact with cylinder block or oil cooler. If using a torque wrench, tighten it to 14 N·m (1.4 kgf-m, 10.3 ft-lb).
 - Tighten the oil filter 65 mm (2.56 in) in diameter by approx. 2/3 — 3/4 rotation more after the seal rubber of oil filter comes in contact with cylinder block or oil cooler. If using a torque wrench, tighten it to 12 N·m (1.2 kgf-m, 8.7 ft-lb).

CAUTION:

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(H4DOTC)-9, INSPECTION, Engine Oil.>

Engine Lubrication System Trouble in General

LUBRICATION

9. Engine Lubrication System Trouble in General

A: INSPECTION

Before performing diagnostics, make sure that the engine oil level is correct and no oil leakage exists.

Symptom	Possible cause		Corrective action
1. Warning light remains on.	1) Oil pressure switch failure	Cracked diaphragm or oil leakage within switch	Replace.
		Broken spring or seized contacts	Replace.
	2) Low oil pressure	Clogged oil filter	Replace.
		Malfunction of oil by-pass valve of oil filter	Clean or replace.
		Malfunction of oil relief valve of oil pump	Clean or replace.
		Clogged oil passage	Clean.
		Excessive tip clearance and side clearance of oil pump rotor and gear	Replace.
		Clogged oil strainer or broken pipe	Clean or replace.
	3) No oil pressure	Shortage of engine oil	Replenish.
		Broken pipe of oil strainer	Replace.
		Stuck oil pump rotor	Replace.
2. Warning light does not go on.	1) Malfunction of combination meter		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).

MECHANICAL

General Description

MECHANICAL

1. General Description

A: SPECIFICATION

Engine	Type			Horizontally opposed, liquid cooled, 4-cylinder, 4-stroke gasoline engine	
	Valve arrangement			Belt driven, double overhead camshaft, 4-valve/cylinder	
	Bore × Stroke mm (in)			99.5 × 79.0 (3.92 × 3.11)	
	Piston displacement cm ³ (cu in)			2,457 (149.94)	
	Compression ratio			8.4	
	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	Max. retard	5° ATDC	
			Max. advance	15° BTDC	
		Closing	Max. retard	65° ABDC	
			Max. advance	45° ABDC	
	Exhaust valve timing	Opening		55° BBDC	
		Closing		5° ATDC	
	Valve clearance mm (in)	Intake	STD	0.20±0.02 (0.0079±0.0008)	
		Exhaust	STD	0.35±0.02 (0.0138±0.0008)	
	Idling speed [At neutral position on MT or “P” or “N” range on AT] rpm	No load		MT: 700±100 AT: 700±100	
A/C ON		A/C Refrigerant pressure (LOW)	MT: 725±100 AT: 750±100		
		A/C Refrigerant pressure (HIGH)	MT: 800±100 AT: 825±100		
Firing order			1 → 3 → 2 → 4		
Ignition timing BTDC/rpm	MT model		17°±10°/700		
	AT model		17°±10°/700		

NOTE:

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

Belt tension adjuster	Protrusion of adjuster rod		mm (in)	5.2 — 6.2 (0.205 — 0.244)	
Belt tensioner	Spacer O.D.		mm (in)	17.955 — 17.975 (0.7069 — 0.7077)	
	Tensioner bushing I.D.		mm (in)	18.0 — 18.08 (0.7087 — 0.7118)	
	Clearance between spacer and bushing	mm (in)	STD	0.025 — 0.125 (0.0010 — 0.0049)	
			Limit	0.175 (0.069)	
	Side clearance of spacer	mm (in)	STD	0.2 — 0.55 (0.0079 — 0.0217)	
			Limit	0.81 (0.0319)	

General Description

MECHANICAL

Camshaft	Bend limit		mm (in)	0.020 (0.0008)	
	Thrust clearance		mm (in)	STD	
			Limit	0.068 — 0.116 (0.0027 — 0.0046)	
	Cam lobe height	mm (in)	Intake	STD	46.55 — 46.65 (1.833 — 1.837)
				Limit	46.45(1.829)
			Exhaust	STD	46.75 — 46.85 (1.841 — 1.844)
				Limit	46.65(1.837)
	Journal O.D.	mm (in)	STD	Front	37.946 — 37.963 (1.4939 — 1.4946)
				Center rear	29.946 — 29.963 (1.1790 — 1.1796)
	Oil clearance		mm (in)	STD	0.037 — 0.072 (0.0015 — 0.0028)
Limit				0.10 (0.0039)	
Cylinder head	Surface warpage limit (mating with cylinder head) mm (in)			0.035 (0.0014)	
	Surface grinding limit mm (in)			0.3 (0.012)	
	Standard height mm (in)			127.5 (5.02)	
Valve seat	Refacing angle			90°	
	Contacting width	mm (in)	Intake	STD	0.6 — 1.4 (0.024 — 0.055)
				Limit	1.7 (0.067)
		Exhaust	STD	1.2 — 1.8 (0.047 — 0.071)	
			Limit	2.2 (0.087)	
Valve guide	Inside diameter mm (in)			6.000 — 6.012 (0.2362 — 0.2367)	
	Protrusion above head mm (in)			15.8 — 16.2 (0.622 — 0.638)	
Valve	Head edge thickness	mm (in)	Intake	STD	1.0 — 1.4 (0.039 — 0.055)
				Limit	0.8 (0.031)
		Exhaust	STD	1.3 — 1.7 (0.051 — 0.067)	
			Limit	0.8 (0.031)	
	Stem diameter		mm (in)	Intake	5.955 — 5.970 (0.2344 — 0.2350)
				Exhaust	5.945 — 5.960 (0.2341 — 0.2346)
	Stem oil clear- ance	mm (in)	STD	Intake	0.030 — 0.057 (0.0012 — 0.0022)
				Exhaust	0.040 — 0.067 (0.0016 — 0.0026)
				Limit	— 0.15 (0.0059)
	Overall length		mm (in)	Intake	104.4 (4.110)
Exhaust				104.65 (4.120)	
Valve spring	Free length mm (in)			47.32 (1.863)	
	Squareness			2.5°, 2.1 mm (0.083 in) or less	
	Tension/spring height N (kgf, lbf)/mm (in)		Set	205 — 235 (20.9 — 24.0, 46.1 — 52.8)/36.0 (1.417)	
			Lift	426 — 490 (43.4 — 50.0, 95.8 — 110)/26.50 (1.043)	
Cylinder block	Surface warpage limit (mating with cylinder head) mm (in)			0.025 (0.00098)	
	Surface grinding limit mm (in)			0.1 (0.004)	
	Standard height mm (in)			201.0 (7.91)	
	Inside diameter	mm (in)	STD	A	99.505 — 99.515 (3.9175 — 3.9179)
				B	99.495 — 99.505 (3.9171 — 3.9175)
	Taper		mm (in)	STD	0.015 (0.0006)
				Limit	0.050 (0.0020)
	Out-of-roundness		mm (in)	STD	0.010 (0.0004)
				Limit	0.050 (0.0020)
	Piston clearance		mm (in)	STD	−0.010 — 0.010 (−0.0004 — 0.0004)
				Limit	0.030 (0.0012)
Cylinder enlarging (boring) limit (dia.) mm (in)			To 100.005 (3.937)		

General Description

MECHANICAL

Piston	Outer diameter	mm (in)	STD	A	99.505 — 99.515 (3.9175 — 3.9179)		
				B	99.495 — 99.505 (3.9171 — 3.9175)		
			0.25 (0.0098) OS		99.745 — 99.765 (3.9270 — 3.9278)		
			0.50 (0.0197) OS		99.995 — 100.015 (3.9368 — 3.9376)		
Piston pin	Standard clearance between piston pin and hole in piston		mm (in)	STD	0.004 — 0.008 (0.0002 — 0.0003)		
				Limit	0.020 (0.0008)		
	Degree of fit				Piston pin must be fitted into position with thumb at 20°C (68°F).		
Piston ring	Piston ring gap	mm (in)	Top ring	STD	Outer circle side: 0.20 — 0.25 (0.0079 — 0.0098)		
				Limit	Inner circle side: 0.20 — 0.30 (0.0079 — 0.0117)		
					1.0 (0.039)		
				STD	0.37 — 0.52 (0.015 — 0.020)		
				Limit	1.0 (0.039)		
	Clearance between piston ring and piston ring groove	mm (in)	Top ring	STD	0.20 — 0.50 (0.0079 — 0.0197)		
				Limit	1.5 (0.059)		
			Second ring	STD	0.04 — 0.08 (0.0016 — 0.0031)		
				Limit	0.15 (0.0059)		
Connecting rod	Bend twist per 100 mm (3.94 in) in length		mm (in)	STD	0.03 — 0.05 (0.0012 — 0.0020)		
				Limit	0.05 (0.0020)		
	Side clearance		mm (in)	STD	0.017 — 0.045 (0.0007 — 0.0018)		
				Limit	0.05 (0.0020)		
Connecting rod bearing	Oil clearance		mm (in)	STD	0.017 — 0.045 (0.0007 — 0.0018)		
				Limit	0.05 (0.0020)		
				Thickness at center portion	mm (in)	STD	1.490 — 1.502 (0.0587 — 0.0591)
						0.03 (0.0012) US	1.504 — 1.512 (0.0592 — 0.0595)
			0.05 (0.0020) US	1.514 — 1.522 (0.0596 — 0.0599)			
0.25 (0.0098) US			1.614 — 1.622 (0.0635 — 0.0639)				
Connecting rod bushing	Clearance between piston pin and bushing		mm (in)	STD	0 — 0.022 (0 — 0.0009)		
				Limit	0.030 (0.0012)		

General Description

MECHANICAL

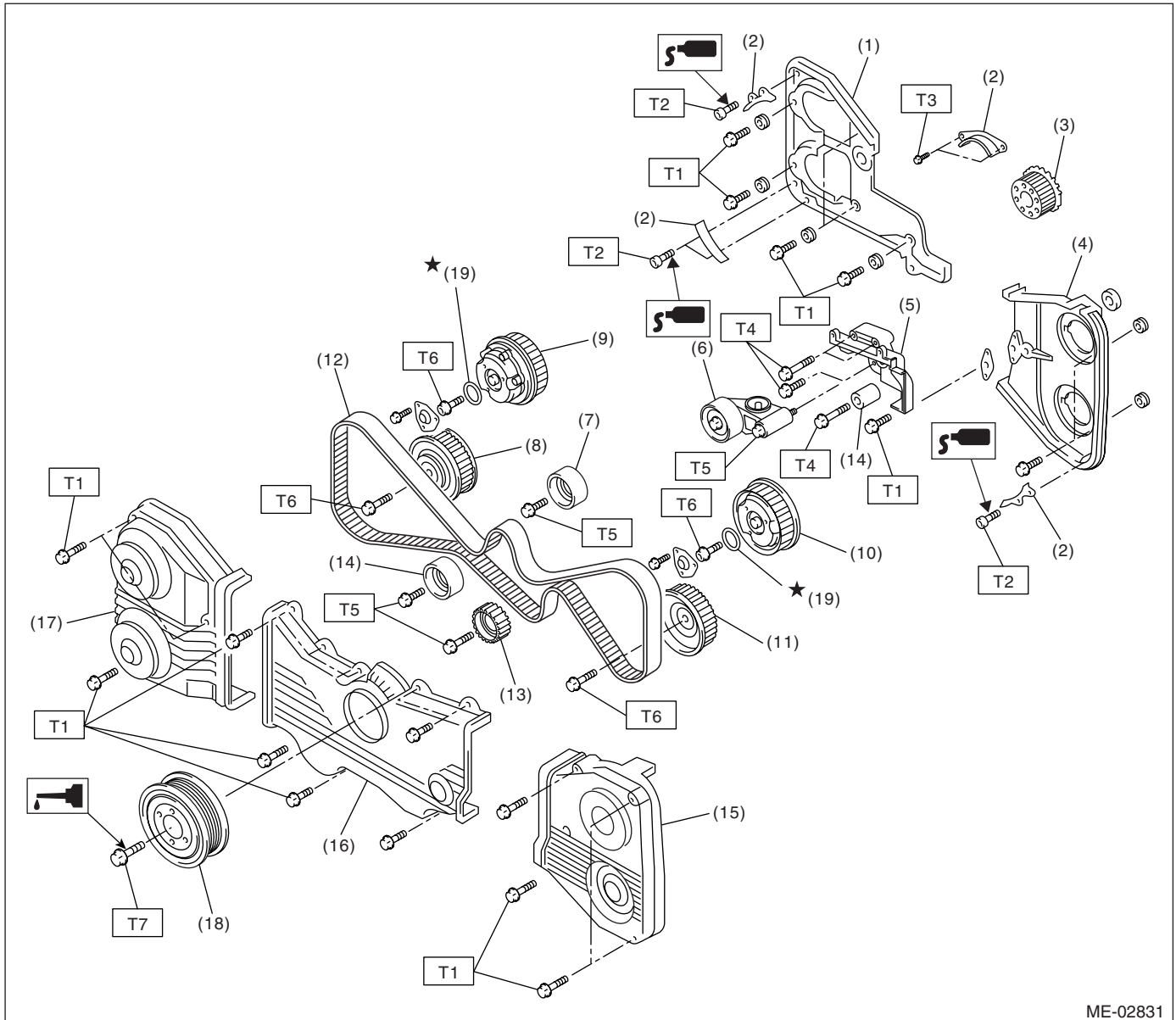
Crankshaft	Bend limit		mm (in)	0.035 (0.0014)	
	Crank pin	mm (in)	Out-of-roundness	0.003 (0.0001)	
			Cylindricity	0.004 (0.0002)	
			Grinding limit (diameter)	To 51.750 (2.0374)	
	Crank journal	mm (in)	Out-of-roundness	0.005 (0.0002)	
			Cylindricity	0.006 (0.0002)	
			Grinding limit (diameter)	To 59.750 (2.3524)	
	Crank pin outer diameter		mm (in)	STD	51.984 — 52.000 (2.0466 — 2.0472)
				0.03 (0.0012) US	51.954 — 51.970 (2.0454 — 2.0461)
				0.05 (0.0020) US	51.934 — 51.950 (2.0447 — 2.0453)
				0.25 (0.0098) US	51.734 — 51.750 (2.0368 — 2.0374)
	Crank journal outer diameter		mm (in)	STD	59.992 — 60.008 (2.3619 — 2.3625)
				0.03 (0.0012) US	59.962 — 59.978 (2.3607 — 2.3613)
				0.05 (0.0020) US	59.942 — 59.958 (2.3599 — 2.3605)
				0.25 (0.0098) US	59.742 — 59.758 (2.3520 — 2.3527)
	Side clearance		mm (in)	STD	0.030 — 0.115 (0.0012 — 0.0045)
				Limit	0.25 (0.0098)
	Oil clearance		mm (in)	STD	0.010 — 0.030 (0.0004 — 0.0012)
				Limit	0.40 (0.0016)
Main bearing	Thickness at center	#1, #3	mm (in)	STD	1.998 — 2.011 (0.0787 — 0.0792)
				0.03 (0.0012) US	2.017 — 2.020 (0.0794 — 0.0795)
				0.05 (0.0020) US	2.027 — 2.030 (0.0798 — 0.0799)
				0.25 (0.0098) US	2.127 — 2.130 (0.0837 — 0.0839)
		#2, #4, #5	mm (in)	STD	2.000 — 2.013 (0.0787 — 0.0793)
				0.03 (0.0012) US	2.019 — 2.022 (0.0795 — 0.0796)
				0.05 (0.0020) US	2.029 — 2.032 (0.0799 — 0.0800)
				0.25 (0.0098) US	2.129 — 2.132 (0.0838 — 0.0839)

General Description

MECHANICAL

B: COMPONENT

1. TIMING BELT



ME-02831

(1) Timing belt cover No. 2 (RH)	(10) Intake cam sprocket (LH)
(2) Timing belt guide (MT model)	(11) Exhaust cam sprocket (LH)
(3) Crank sprocket	(12) Timing belt
(4) Timing belt cover No. 2 (LH)	(13) Belt idler No. 2
(5) Tensioner bracket	(14) Belt idler
(6) Automatic belt tension adjuster ASSY	(15) Timing belt cover (LH)
(7) Belt idler	(16) Front belt cover
(8) Exhaust cam sprocket (RH)	(17) Timing belt cover (RH)
(9) Intake cam sprocket (RH)	(18) Crank pulley
	(19) O-ring

Tightening torque: N·m (kgf-m, ft-lb)

T1: 5 (0.5, 3.6)

T2: 6.4 (0.65, 4.7)

T3: 9.75 (1.0, 7.2)

T4: 24.5 (2.5, 18.1)

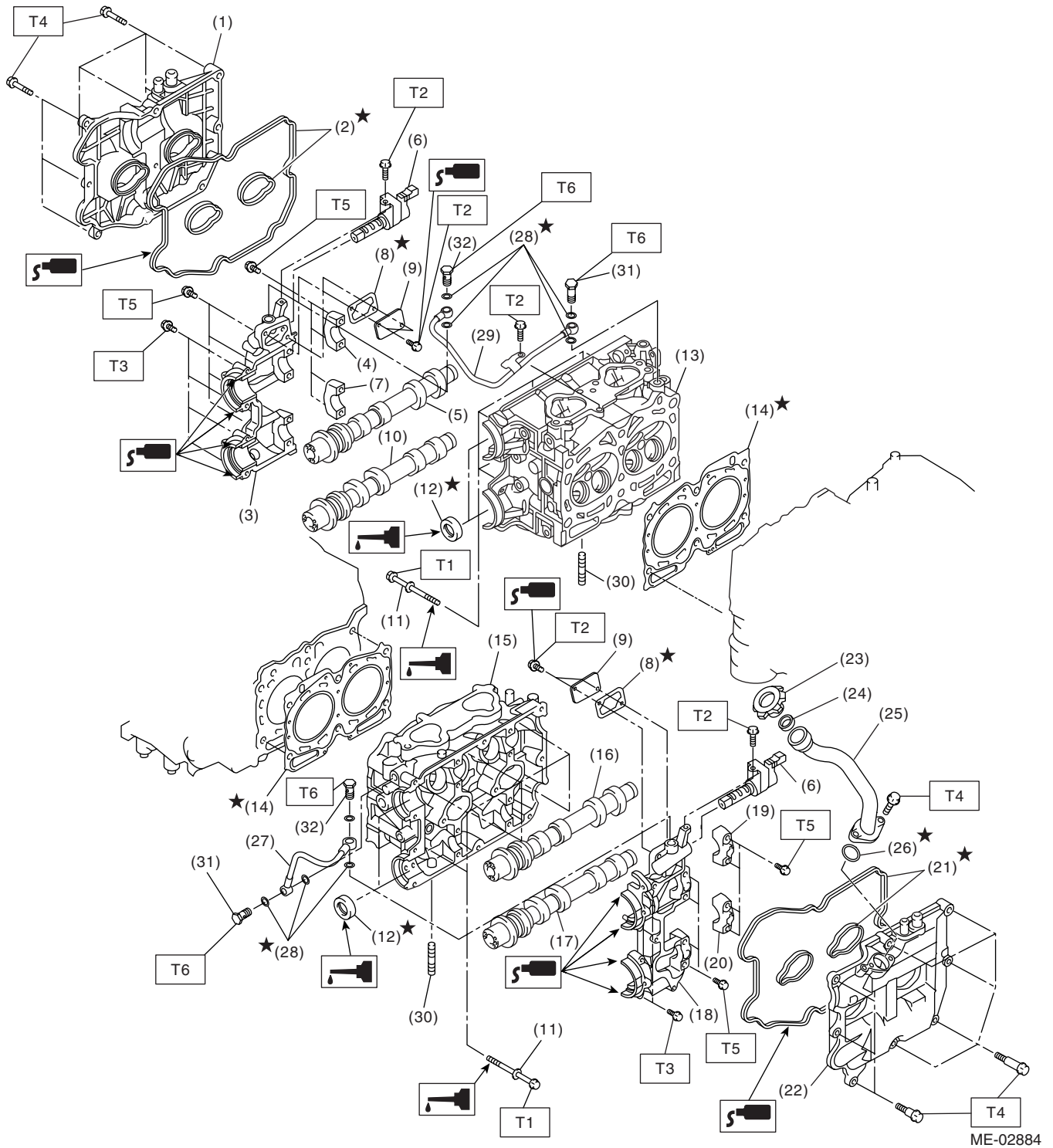
T5: 39 (4.0, 28.9)

T6: <Ref. to ME(H4DOTC)-53, INSTALLATION, Cam Sprocket.>

T7: <Ref. to ME(H4DOTC)-43, INSTALLATION, Crank Pulley.>

ME(H4DOTC)-6

2. CYLINDER HEAD AND CAMSHAFT



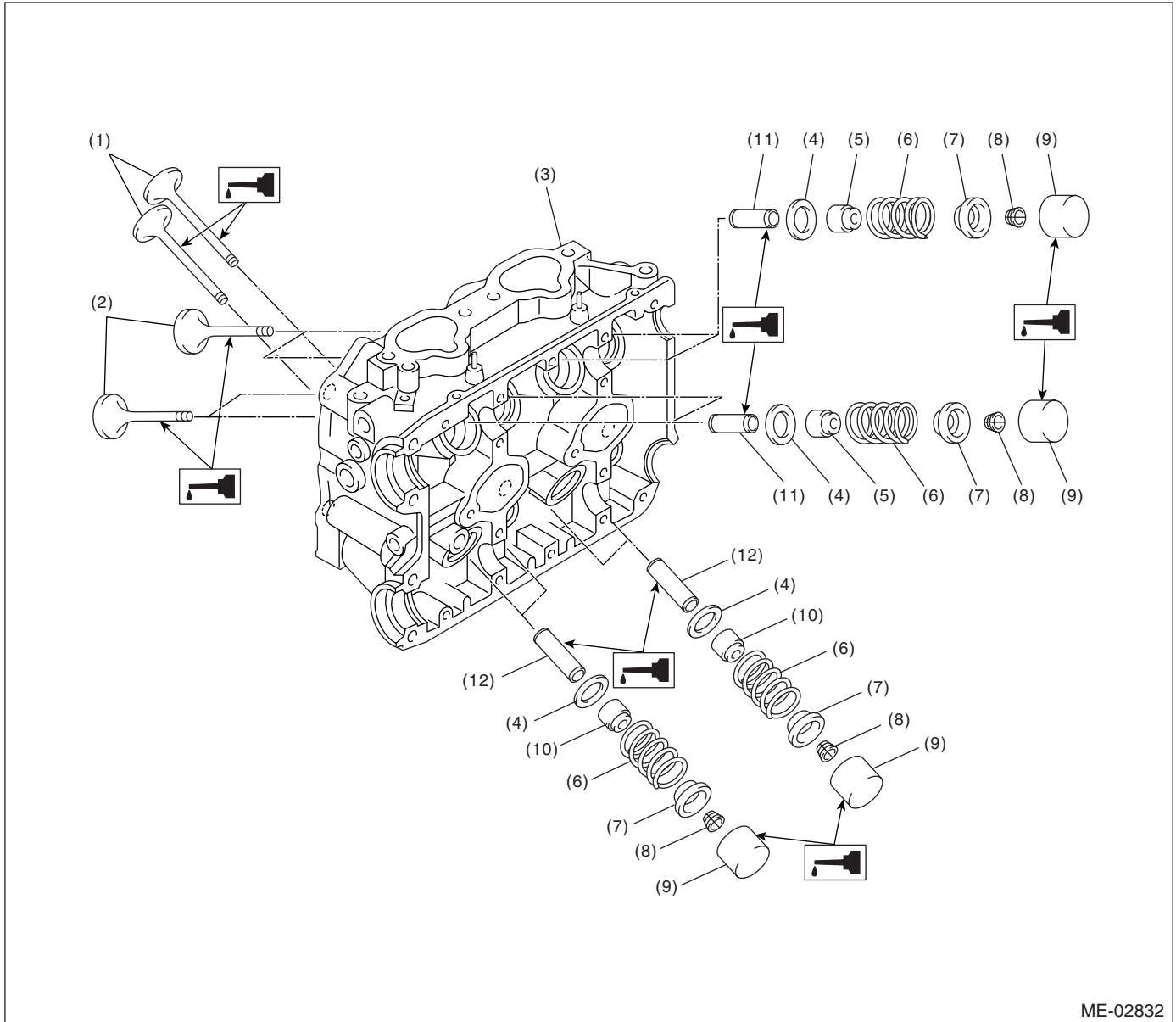
ME-02884

General Description

MECHANICAL

(1) Rocker cover (RH)	(15) Cylinder head (LH)	(30) Stud bolt
(2) Rocker cover gasket (RH)	(16) Intake camshaft (LH)	(31) Union screw with filter (with protrusion)
(3) Intake camshaft cap (Front RH)	(17) Exhaust camshaft (LH)	(32) Union screw without filter (without protrusion)
(4) Intake camshaft cap (Rear RH)	(18) Camshaft cap (Front LH)	
(4) Intake camshaft cap (Rear RH)	(19) Intake camshaft cap (Rear LH)	
(5) Intake camshaft (RH)	(20) Exhaust camshaft cap (Rear LH)	
(6) Oil flow control solenoid valve	(21) Rocker cover gasket (LH)	Tightening torque: N·m (kgf-m, ft-lb)
(7) Exhaust camshaft cap (Rear RH)	(22) Rocker cover (LH)	T1: <Ref. to ME(H4DOTC)-61, INSTALLATION, Cylinder Head.>
(8) Gasket	(23) Oil filler cap	
(9) Oil return cover	(24) Gasket	
(10) Exhaust camshaft (RH)	(25) Oil filler duct	T2: 8 (0.8, 5.9)
(11) Cylinder head bolt	(26) O-ring	T3: 9.75 (1.0, 7.2)
(12) Oil seal	(27) Oil pipe (LH)	T4: 6.4 (0.65, 4.7)
(13) Cylinder head (RH)	(28) Gasket	T5: 20 (2.0, 14.8)
(14) Cylinder head gasket	(29) Oil pipe (RH)	T6: 29 (3.0, 21.4)

3. CYLINDER HEAD AND VALVE ASSEMBLY



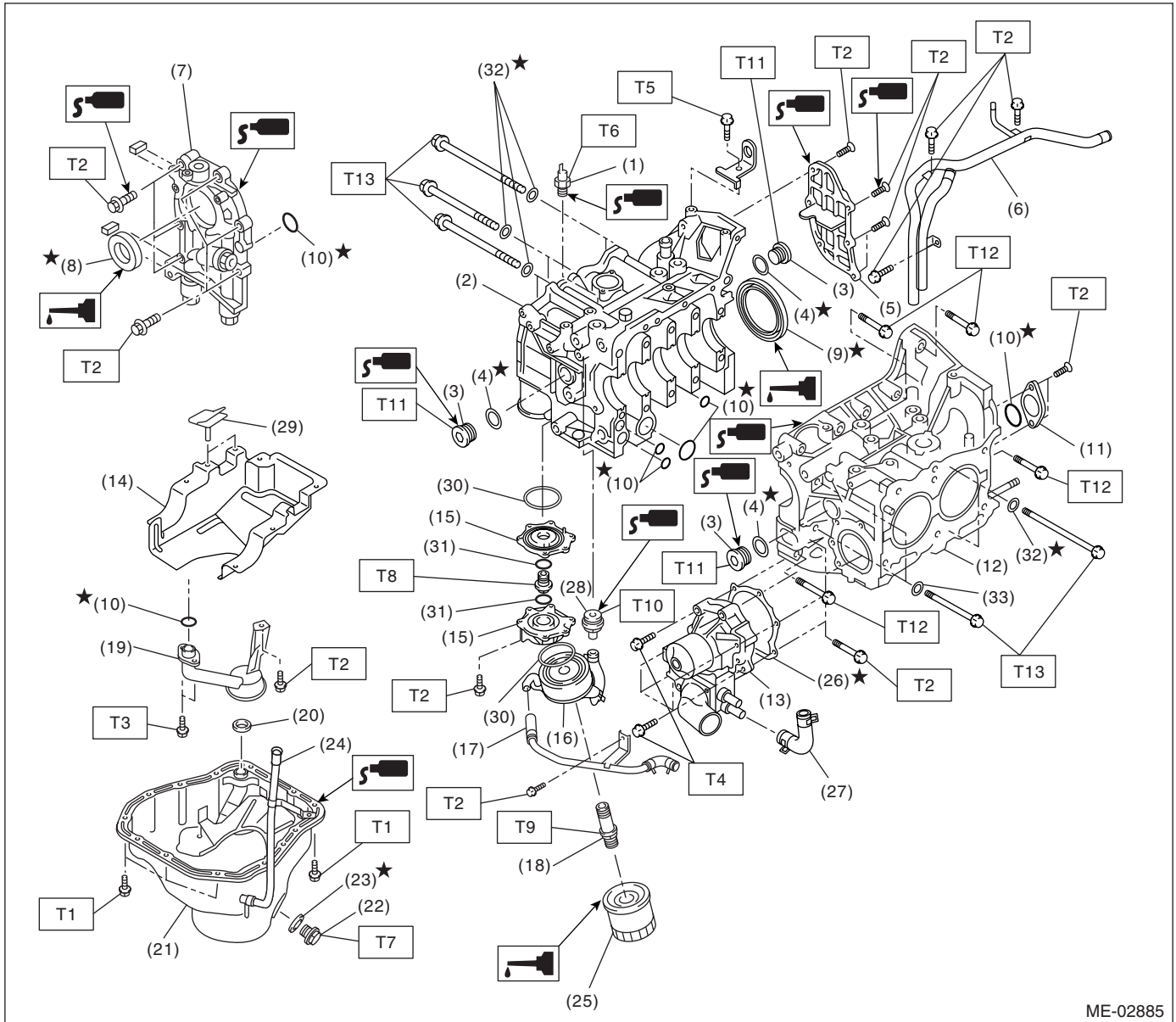
ME-02832

(1) Exhaust valve	(5) Intake valve oil seal	(9) Valve lifter
(2) Intake valve	(6) Valve spring	(10) Exhaust valve oil seal
(3) Cylinder head	(7) Retainer	(11) Intake valve guide
(4) Valve spring seat	(8) Retainer key	(12) Exhaust valve guide

General Description

MECHANICAL

4. CYLINDER BLOCK



ME-02885

General Description

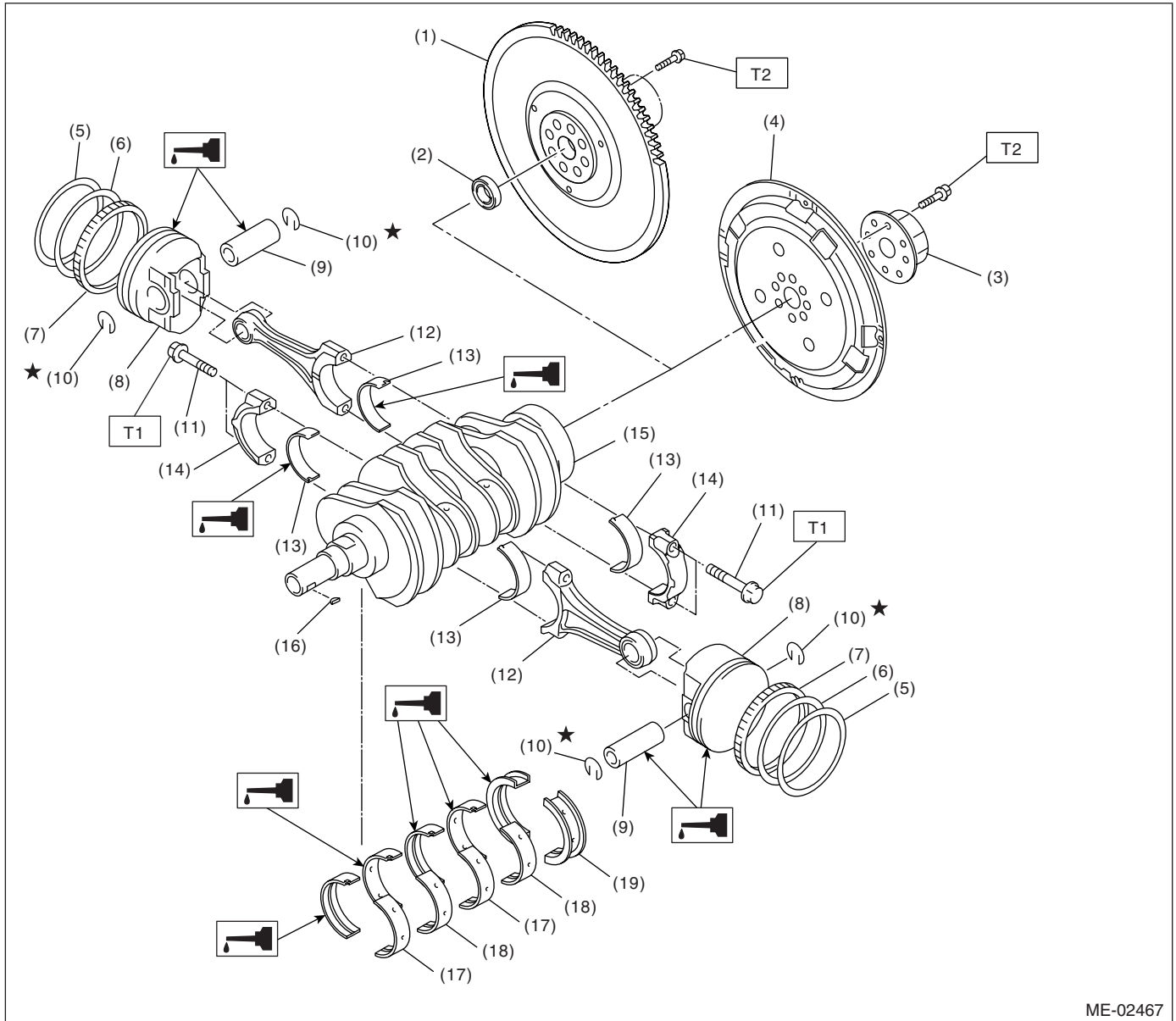
MECHANICAL

(1) Oil pressure switch	(18) Connector	<i>Tightening torque: N·m (kgf-m, ft-lb)</i>
(2) Cylinder block (RH)	(19) Oil strainer	<i>T1: 5 (0.5, 3.6)</i>
(3) Service hole plug	(20) Gasket	<i>T2: 6.4 (0.65, 4.7)</i>
(4) Gasket	(21) Oil pan	<i>T3: 10 (1.0, 7.4)</i>
(5) Oil separator cover	(22) Drain plug	<i>T4: First 12 (1.2, 8.7)</i>
(6) Water by-pass pipe	(23) Metal gasket	<i>Second 12 (1.2, 8.7)</i>
(7) Oil pump	(24) Oil level gauge guide	<i>T5: 16 (1.6, 11.6)</i>
(8) Front oil seal	(25) Oil filter	<i>T6: 25 (2.5, 18.4)</i>
(9) Rear oil seal	(26) Gasket	<i>T7: 44 (4.5, 33)</i>
(10) O-ring	(27) Water pump hose	<i>T8: 45 (4.6, 33)</i>
(11) Service hole cover	(28) Plug	<i>T9: 54 (5.3, 40)</i>
(12) Cylinder block (LH)	(29) Seal	<i>T10: 69 (7.0, 50.9)</i>
(13) Water pump	(30) Gasket	<i>T11: 70 (7.1, 51.6)</i>
(14) Baffle plate	(31) O-ring	<i>T12: <Ref. to ME(H4DOTC)-71,</i>
(15) Adapter	(32) Seal washer	<i>INSTALLATION, Cylinder</i>
(16) Oil cooler	(33) Washer	<i>Block.></i>
(17) Water by-pass pipe		<i>T13: <Ref. to ME(H4DOTC)-71,</i>
		<i>INSTALLATION, Cylinder</i>
		<i>Block.></i>

General Description

MECHANICAL

5. CRANKSHAFT AND PISTON



ME-02467

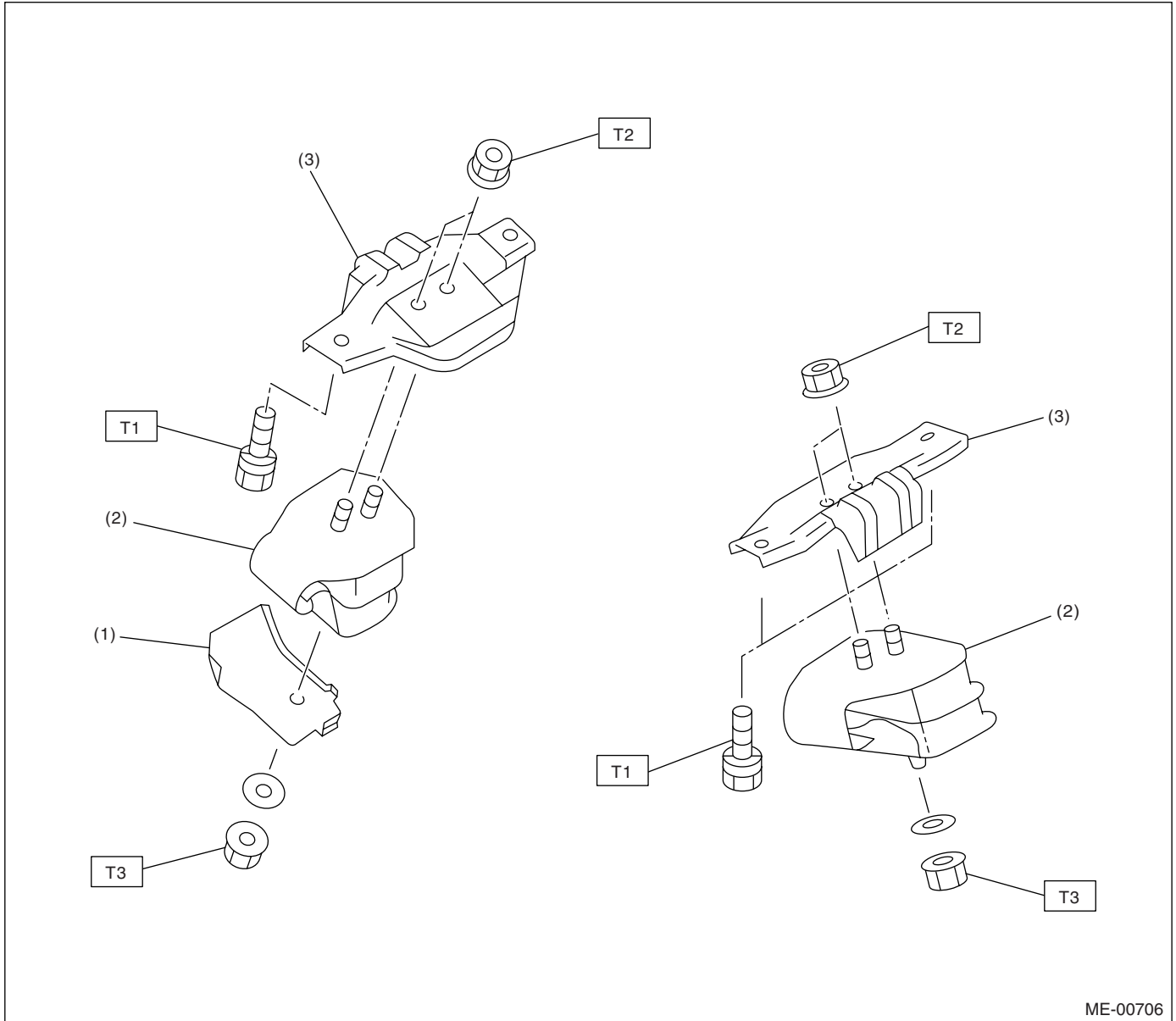
(1) Flywheel (MT model)	(9) Piston pin	(17) Crankshaft bearing #1, #3
(2) Ball bearing (MT model)	(10) Snap ring	(18) Crankshaft bearing #2, #4
(3) Reinforcement (AT model)	(11) Connecting rod bolt	(19) Crankshaft bearing #5
(4) Drive plate (AT model)	(12) Connecting rod	
(5) Top ring	(13) Connecting 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: 52 (5.3, 38.4)

T2: 72 (7.3, 52.8)

6. ENGINE MOUNTING



ME-00706

- (1) Heat shield cover
- (2) Front cushion rubber

- (3) Front engine mounting bracket

Tightening torque: N·m (kgf-m, ft-lb)

T1: 35 (3.6, 25.8)

T2: 42 (4.3, 30.9)

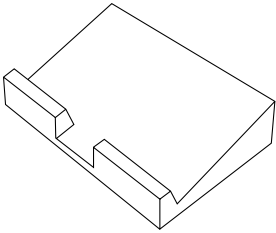
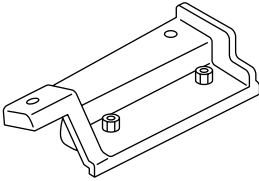
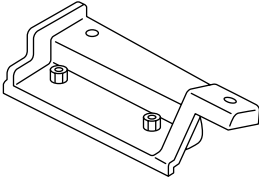
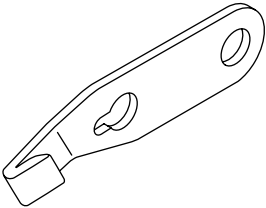
T3: 85 (8.7, 62.7)

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 yourself, 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 rigid racks 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 reinstalled 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.

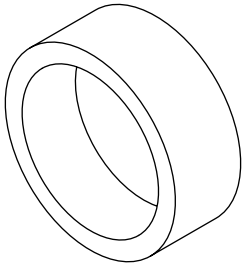
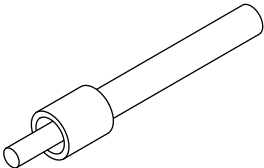
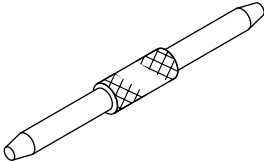
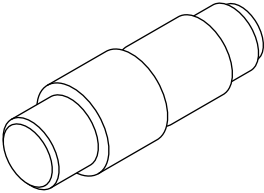
D: PREPARATION TOOL

1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498267600	498267600	CYLINDER HEAD TABLE	- Used for replacing valve guides. - Used for removing and installing valve springs.
 ST-498457000	498457000	ENGINE STAND ADAPTER RH	Used with ENGINE STAND (499817100).
 ST-498457100	498457100	ENGINE STAND ADAPTER LH	Used with ENGINE STAND (499817100).
 ST-498497100	498497100	CRANKSHAFT STOPPER	Used for stopping rotation of flywheel when loosening and tightening crank pulley bolt, etc.

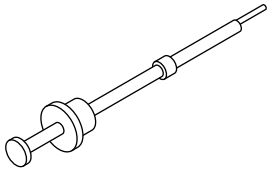
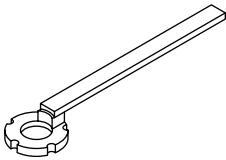
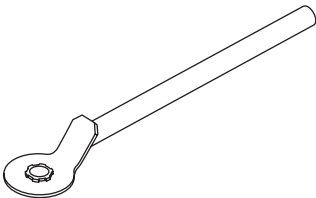
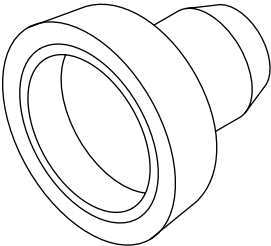
General Description

MECHANICAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498747300	498747300	PISTON GUIDE	Used for installing piston in cylinder.
 ST-498857100	498857100	VALVE OIL SEAL GUIDE	Used for press-fitting of intake and exhaust valve guide oil seals.
 ST-499017100	499017100	PISTON PIN GUIDE	Used for installing piston pin, piston and connecting rod.
 ST-499037100	499037100	CONNECTING ROD BUSHING REMOVER & INSTALLER	Used for removing and installing connecting rod bushing.

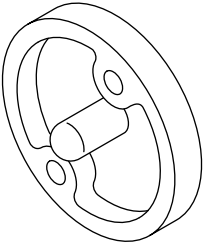
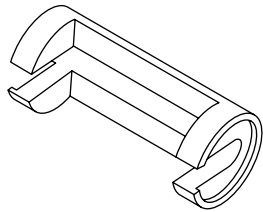
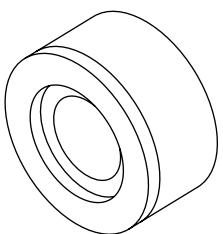
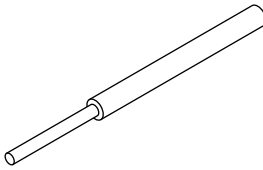
General Description

MECHANICAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499097700	499097700	PISTON PIN REMOVER ASSY	Used for removing piston pin.
 ST-499207400	499207400	CAM SPROCKET WRENCH	Used for removing and installing cam sprocket. (Exhaust side)
 ST-499977500	499977500	CAM SPROCKET WRENCH	Used for removing and installing cam sprocket. (Intake side)
 ST-499587200	499587200	CRANKSHAFT OIL SEAL INSTALLER	• Used for installing crankshaft oil seal. • Used with CRANKSHAFT OIL SEAL GUIDE (499597100).

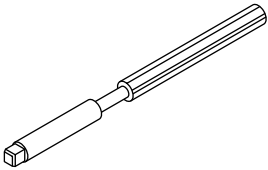
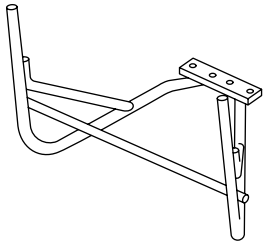
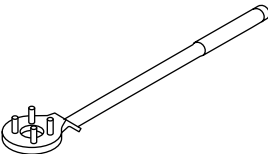
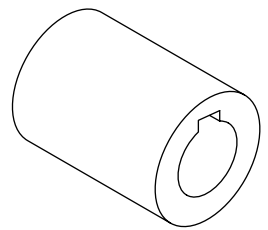
General Description

MECHANICAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499597100	499597100	CRANKSHAFT OIL SEAL GUIDE	- Used for installing crankshaft oil seal. - Used with CRANKSHAFT OIL SEAL INSTALLER (499587200).
 ST-499718000	499718000	VALVE SPRING REMOVER	Used for removing and installing valve spring.
 ST18251AA020	18251AA020	VALVE GUIDE ADJUSTER	Used for installing intake and exhaust valve guides.
 ST-499767200	499767200	VALVE GUIDE REMOVER	Used for removing valve guides.

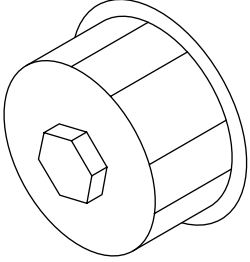
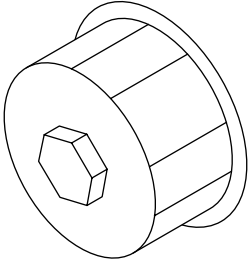
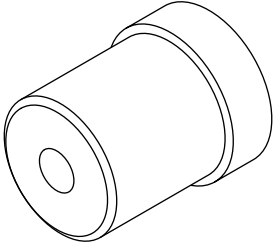
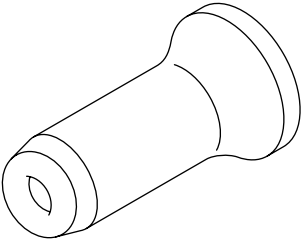
General Description

MECHANICAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499767400	499767400	VALVE GUIDE REAMER	Used for reaming valve guides.
 ST-499817100	499817100	ENGINE STAND	- Stand used for engine disassembly and assembly. - Used with ENGINE STAND ADAPTER RH (498457000) & LH (498457100).
 ST-499977100	499977100	CRANK PULLEY WRENCH	Used for stopping rotation of crank pulley when loosening and tightening crank pulley bolts.
 ST-499987500	499987500	CRANKSHAFT SOCKET	Used for rotating crankshaft.

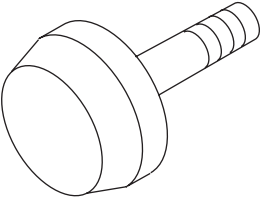
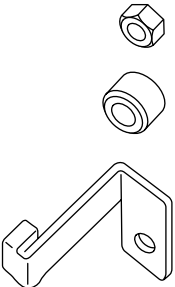
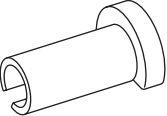
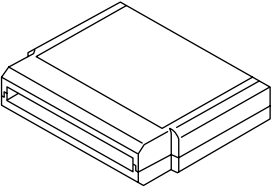
General Description

MECHANICAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18332AA000	18332AA000	OIL FILTER WRENCH	Used for removing and installing oil filter. (Outer diameter: 68 mm (2.68 in))
 ST18332AA010	18332AA010	OIL FILTER WRENCH	Used for removing and installing oil filter. (Outer diameter: 65 mm (2.56 in))
 ST-499587100	499587100	OIL SEAL INSTALLER	Used for installing oil pump oil seal.
 ST-499587600	499587600	OIL SEAL GUIDE	Used for installing camshaft oil seal for DOHC engine.

General Description

MECHANICAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499597200	499597200	OIL SEAL GUIDE	- Used for installing camshaft oil seal for DOHC engine. - Used with OIL SEAL GUIDE (499587600).
 ST-498277200	498277200	STOPPER SET	Used for installing automatic transmission assembly to engine.
 ST42099AE000	42099AE000	CONNECTOR REMOVER	Used for removing quick connector in engine compartment.
 ST18482AA010	18482AA010 (Newly adopted tool)	CARTRIDGE	Troubleshooting for electrical systems.

General Description

MECHANICAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST22771AA030	22771AA030	SUBARU SELECT MONITOR KIT	Troubleshooting for electrical systems.

2. GENERAL TOOL

TOOL NAME	REMARKS
Compression gauge	Used for measuring compression.

E: PROCEDURE

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

- V-belt
- Timing Belt
- Camshaft
- Cylinder Head

2. Compression

A: INSPECTION

CAUTION:

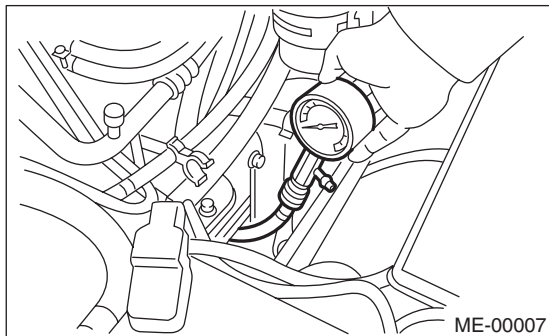
After warming-up, engine becomes very hot. Be careful not to burn yourself during measurement.

- 1) After warming-up the engine, turn the ignition switch to OFF.
- 2) Make sure that the battery is fully charged.
- 3) Release the fuel pressure. <Ref. to FU(H4DOTC)-50, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
- 4) Remove all the spark plugs.
<Ref. to IG(H4DOTC)-4, REMOVAL, Spark Plug.>
- 5) Fully open the throttle valve.
- 6) Check the starter motor for satisfactory performance and operation.
- 7) Fix the compression gauge securely against spark plug hole.

NOTE:

The screw of screw-in type compression gauge (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 gauge needle is steady.



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

Compression (at 200 — 300 rpm):

Standard:

981 — 1,177 kPa (10 — 12 kgf/cm², 142 — 171 psi)

Difference between cylinders

Less than 49 kPa (0.5 kgf/cm², 7 psi)

3. Idle Speed

A: INSPECTION

1) Before checking the idle speed, check the following:

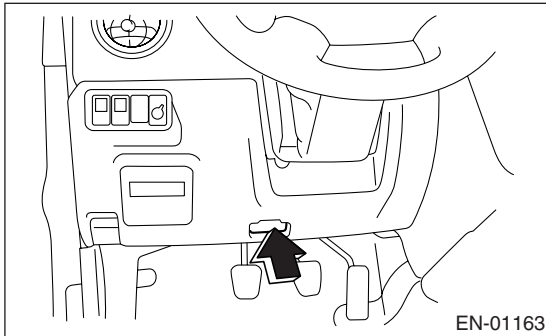
- (1) Ensure the air cleaner element is free from clogging, ignition timing is correct, spark plugs are in good condition, and that the hoses are connected properly.
- (2) Ensure the malfunction indicator light does not illuminate.

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 power switch to ON.

7) Select the {2. Each System Check} in Main Menu.

8) Select the {Engine Control System} in Selection Menu.

9) Select the {1. Current Data Display & Save} in Engine Control System Diagnosis.

10) Select the {1. 12 Data Display} in Data Display Menu.

11) Start the engine, and then read the engine idle speed.

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

Idle speed [No load and gears in neutral]:
700±100 rpm

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]:

When the A/C refrigerant pressure is low

MT: 725±100 rpm

AT: 750±100 rpm

When the A/C refrigerant pressure is high

MT: 800±100 rpm

AT: 825±100 rpm

NOTE:

As idle speed is controlled by the automatic adjustment type, it can not be adjusted manually. If the idle speed is out of specifications, refer to General On-board Diagnosis Table under “Engine Control System”. <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.>

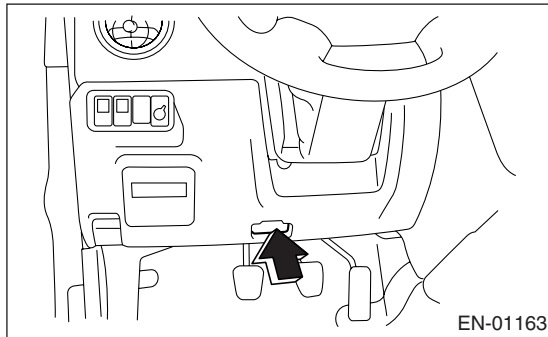
4. Ignition Timing

A: INSPECTION

CAUTION:

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

- 1) 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 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 power 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 check the ignition timing at idle speed.

Ignition timing [BTDC/rpm]:

$17^{\circ} \pm 10^{\circ} / 700$

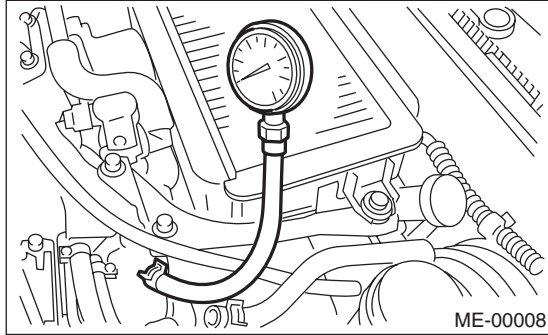
If the timing is not correct, check the ignition control system. Refer to Engine Control System. <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.>

5. Intake Manifold Vacuum

A: INSPECTION

- 1) Warm-up the engine.
- 2) Disconnect the brake vacuum hose from the intake manifold, and then install the vacuum gauge.
- 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.



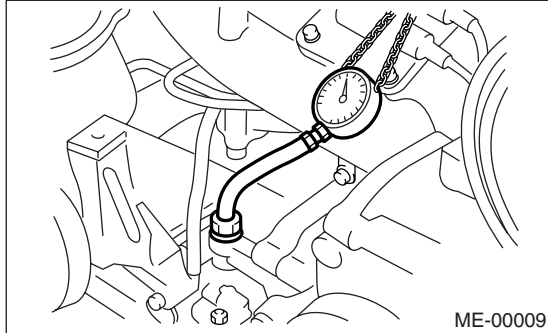
Vacuum pressure (at idling, A/C “OFF”):
Less than –60.0 kPa (–450 mmHg, –17.72 inHg)

Diagnosis of engine condition by measurement of intake 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. Needle intermittently drops to position lower than normal position.	Leakage around cylinder
3. Needle drops suddenly and intermittently from normal position.	Sticky valves
4. 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
5. 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. <Ref. to LU(H4DOTC)-18, REMOVAL, Oil Pressure Switch.>
- 2) Connect the oil pressure gauge hose to cylinder block.
- 3) Connect the battery ground cable to battery.
- 4) Start the engine, and then measure the oil pressure.



Oil pressure:

98 kPa (1.0 kgf/cm², 14 psi) or more at 600 rpm

294 kPa (3.0 kgf/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(H4DOTC)-22, INSPECTION, Engine Lubrication System Trouble in General.>
- If the oil pressure warning light is turned ON and oil pressure is in specification, replace the oil pressure switch. <Ref. to LU(H4DOTC)-22, INSPECTION, Engine Lubrication System Trouble in General.>

NOTE:

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

- 5) After measuring the oil pressure, install the oil pressure switch. <Ref. to LU(H4DOTC)-18, INSTALLATION, Oil Pressure Switch.>

Tightening torque:

25 N·m (2.5 kgf-m, 18.4 ft-lb)

7. Fuel Pressure

A: INSPECTION

WARNING:

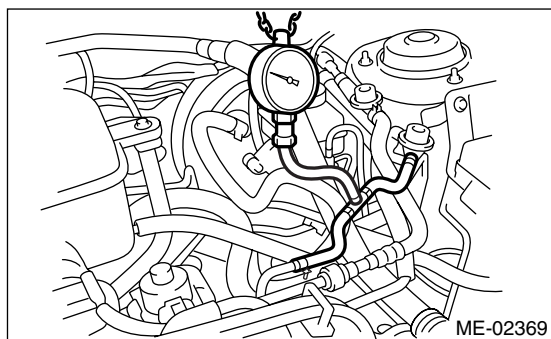
Before removing the fuel pressure gauge, release the fuel pressure.

NOTE:

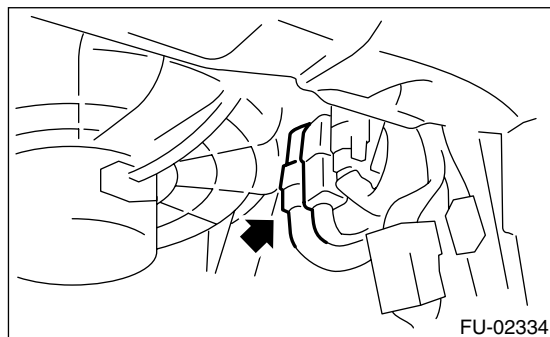
If out of specification, check or replace the pressure regulator and pressure regulator vacuum hose.

1) Release the fuel pressure. <Ref. to FU(H4DOTC)-50, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>

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



3) Connect the connector of fuel pump relay.



4) Start the engine.

5) 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)

6) 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:

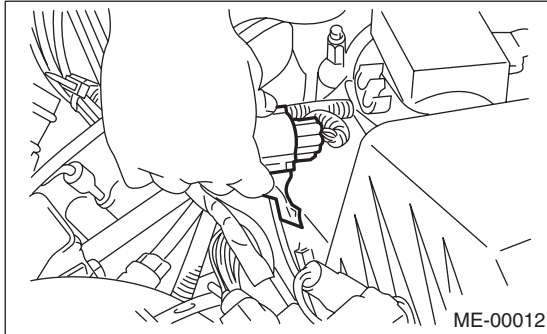
The fuel pressure gauge registers 10 to 20 kPa (0.1 to 0.2 kgf/cm², 1 to 3 psi) higher than standard values during high-altitude operations.

8. Valve Clearance

A: INSPECTION

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

- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from battery.
- 3) Remove the air intake duct. <Ref. to IN(H4DOTC)-9, REMOVAL, Air Intake Duct.>
- 4) Remove the bolts which secure the timing belt cover (RH).
- 5) Lift-up the vehicle.
- 6) Remove the under cover.
- 7) Loosen the remaining bolts which secure the timing belt cover (RH), and then remove the timing 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.

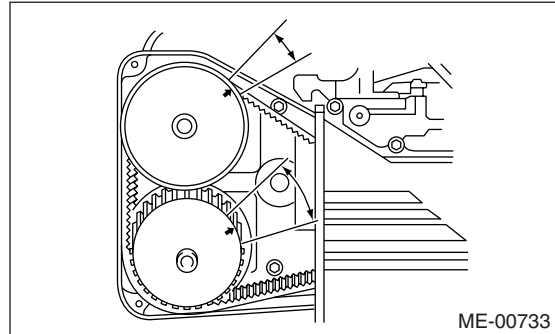


- (2) Remove the air cleaner case. <Ref. to IN(H4DOTC)-8, REMOVAL, Air Cleaner Case.>
- (3) Disconnect the ignition coil connector.
- (4) Remove the ignition coil.
- (5) Place a suitable container under the vehicle.
- (6) Disconnect the PCV hose from rocker cover (RH).
- (7) Remove the bolts, and then remove the rocker cover (RH).
- 10) When inspecting the #2 and #4 cylinders:
 - (1) Disconnect the battery cable, and then remove the battery and battery carrier.
 - (2) Remove the secondary air pump. <Ref. to EC(H4DOTC)-9, REMOVAL, Secondary Air Pump.>
 - (3) Disconnect the ignition coil connector.
 - (4) Remove the ignition coil.
 - (5) Place a suitable container under the vehicle.
 - (6) Disconnect the PCV hose from rocker cover (LH).
 - (7) Remove the bolts, and then remove the rocker cover (LH).

- 11) Turn the crank pulley clockwise until arrow mark on the cam sprocket is set to position shown in the figure.

NOTE:

Turn the crankshaft using socket wrench.



- 12) Measure the #1 cylinder intake valve and #3 cylinder exhaust valve clearance by using thickness gauge (A).

NOTE:

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

Valve clearance:

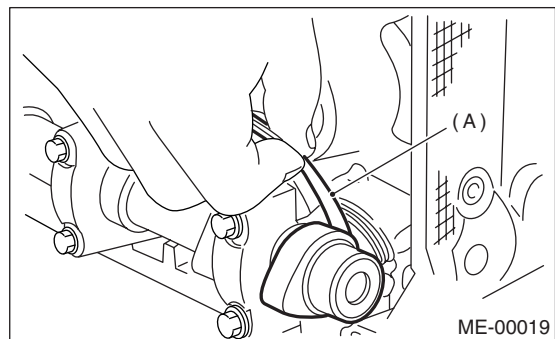
STD

Intake: 0.20 ± 0.02 mm (0.0079 ± 0.0008 in)

Exhaust: 0.35 ± 0.02 mm (0.0138 ± 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.



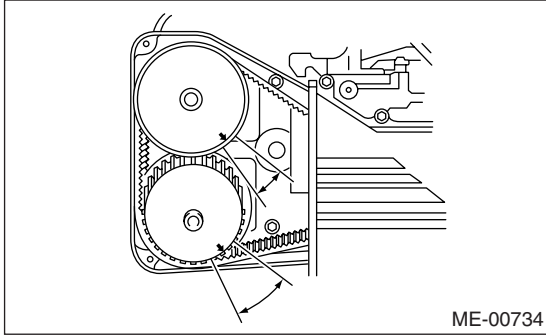
- 13) If necessary, adjust the valve clearance. <Ref. to ME(H4DOTC)-30, ADJUSTMENT, Valve Clearance.>

Valve Clearance

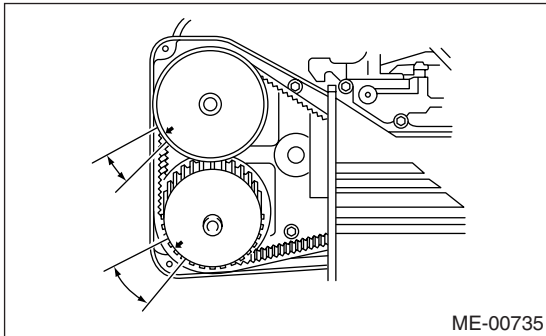
MECHANICAL

14) Further turn the crank pulley clockwise. Using the same procedures described previously, and then measure the valve clearances again.

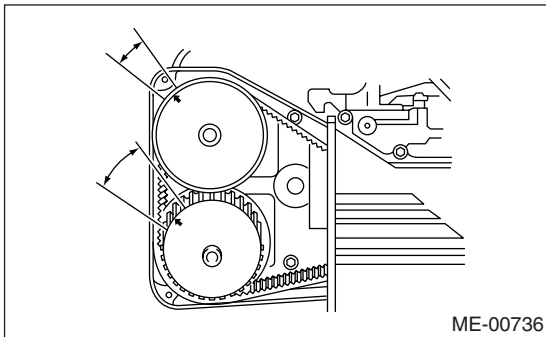
- (1) Set the arrow mark on cam sprocket to position shown in the figure, and then measure the #2 cylinder exhaust valve and #3 cylinder intake valve clearances.



- (2) Set the arrow mark on cam sprocket to position shown in the figure, and then measure the #2 cylinder intake valve and #4 cylinder exhaust valve clearances.



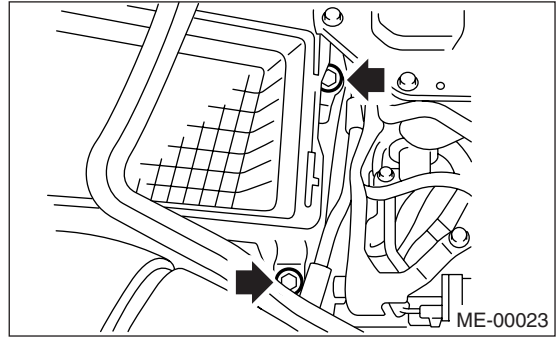
- (3) Set the arrow mark on cam sprocket to position shown in the figure, and then measure the #1 cylinder exhaust valve and #4 cylinder intake valve clearances.



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

Tightening torque:

33 N·m (3.4 kgf-m, 25 ft-lb)



B: ADJUSTMENT

CAUTION:

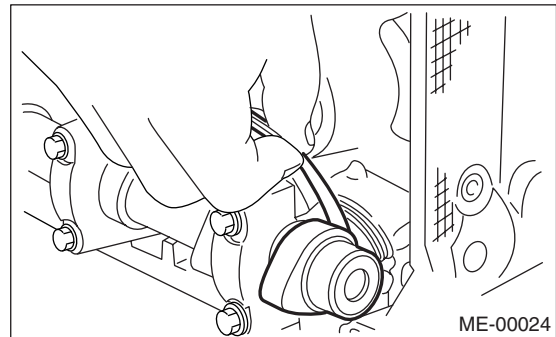
Adjustment of the valve clearance should be performed while engine is cold.

- 1) Measure all valve clearances.

<Ref. to ME(H4DOTC)-29, INSPECTION, Valve Clearance.>

NOTE:

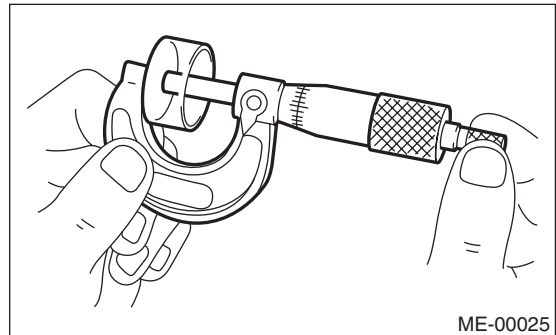
Record each valve clearance after it has been measured.



- 2) Remove the camshaft. <Ref. to ME(H4DOTC)-55, REMOVAL, Camshaft.>

- 3) Remove the valve lifter.

- 4) Measure the thickness of valve lifter with a micrometer.



- 5) Select a shim of suitable thickness using measured valve clearance and valve lifter thickness, by referring to the following table.

Valve Clearance

MECHANICAL

Unit: mm
Intake valve: $S = (V + T) - 0.20$
Exhaust valve: $S = (V + T) - 0.35$
S: Required thickness of valve lifter
V: Measured valve clearance
T: Used valve lifter thickness

Part No.	Thickness mm (in)
13228 AB102	4.68 (0.1843)
13228 AB112	4.69 (0.1846)
13228 AB122	4.70 (0.1850)
13228 AB132	4.71 (0.1854)
13228 AB142	4.72 (0.1858)
13228 AB152	4.73 (0.1862)
13228 AB162	4.74 (0.1866)
13228 AB172	4.75 (0.1870)
13228 AB182	4.76 (0.1874)
13228 AB192	4.77 (0.1878)
13228 AB202	4.78 (0.1882)
13228 AB212	4.79 (0.1886)
13228 AB222	4.80 (0.1890)
13228 AB232	4.81 (0.1894)
13228 AB242	4.82 (0.1898)
13228 AB252	4.83 (0.1902)
13228 AB262	4.84 (0.1906)
13228 AB272	4.85 (0.1909)
13228 AB282	4.86 (0.1913)
13228 AB292	4.87 (0.1917)
13228 AB302	4.88 (0.1921)
13228 AB312	4.89 (0.1925)
13228 AB322	4.90 (0.1929)
13228 AB332	4.91 (0.1933)
13228 AB342	4.92 (0.1937)
13228 AB352	4.93 (0.1941)
13228 AB362	4.94 (0.1945)
13228 AB372	4.95 (0.1949)
13228 AB382	4.96 (0.1953)
13228 AB392	4.97 (0.1957)
13228 AB402	4.98 (0.1961)
13228 AB412	4.99 (0.1965)
13228 AB422	5.00 (0.1969)
13228 AB432	5.01 (0.1972)
13228 AB442	5.02 (0.1976)
13228 AB452	5.03 (0.1980)
13228 AB462	5.04 (0.1984)
13228 AB472	5.05 (0.1988)
13228 AB482	5.06 (0.1992)
13228 AB492	5.07 (0.1996)
13228 AB502	5.08 (0.2000)
13228 AB512	5.09 (0.2004)
13228 AB522	5.10 (0.2008)
13228 AB532	5.11 (0.2012)

Part No.	Thickness mm (in)
13228 AB542	5.12 (0.2016)
13228 AB552	5.13 (0.2020)
13228 AB562	5.14 (0.2024)
13228 AB572	5.15 (0.2028)
13228 AB582	5.16 (0.2031)
13228 AB592	5.17 (0.2035)
13228 AB602	5.18 (0.2039)
13228 AB612	5.19 (0.2043)
13228 AB622	5.20 (0.2047)
13228 AB632	5.21 (0.2051)
13228 AB642	5.22 (0.2055)
13228 AB652	5.23 (0.2059)
13228 AB662	5.24 (0.2063)
13228 AB672	5.25 (0.2067)
13228 AB682	5.26 (0.2071)
13228 AB692	5.27 (0.2075)
13228 AB702	4.38 (0.1724)
13228 AB712	4.40 (0.1732)
13228 AB722	4.42 (0.1740)
13228 AB732	4.44 (0.1748)
13228 AB742	4.46 (0.1756)
13228 AB752	4.48 (0.1764)
13228 AB762	4.50 (0.1771)
13228 AB772	4.52 (0.1780)
13228 AB782	4.54 (0.1787)
13228 AB792	4.56 (0.1795)
13228 AB802	4.58 (0.1803)
13228 AB812	4.60 (0.1811)
13228 AB822	4.62 (0.1819)
13228 AB832	4.64 (0.1827)
13228 AB842	4.66 (0.1835)
13228 AB852	5.29 (0.2083)
13228 AB862	5.31 (0.2091)
13228 AB872	5.33 (0.2098)
13228 AB882	5.35 (0.2106)
13228 AB892	5.37 (0.2114)
13228 AB902	5.39 (0.2122)
13228 AB912	5.41 (0.2126)
13228 AB922	5.43 (0.2138)
13228 AB932	5.45 (0.2146)
13228 AB942	5.47 (0.2154)
13228 AB952	5.49 (0.2161)
13228 AB962	5.51 (0.2169)
13228 AB972	5.53 (0.2177)
13228 AB982	5.55 (0.2185)
13228 AB992	5.57 (0.2193)
13228 AC002	5.59 (0.2201)
13228 AC012	5.61 (0.2209)
13228 AC022	5.63 (0.2217)
13228 AC032	5.65 (0.2224)

Valve Clearance

MECHANICAL

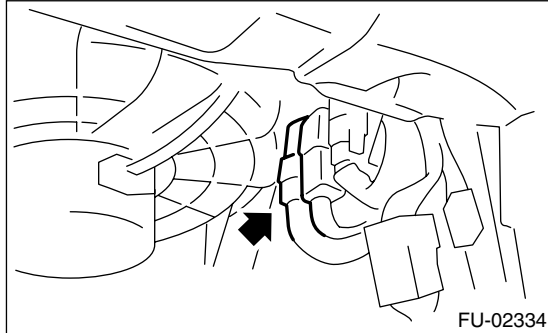
- 6) Inspect all valves for clearance again at this stage. If the valve clearance is not correct, repeat the procedure over again from the first step.
- 7) After inspection, install the related parts in the reverse order of removal.

9. Engine Assembly

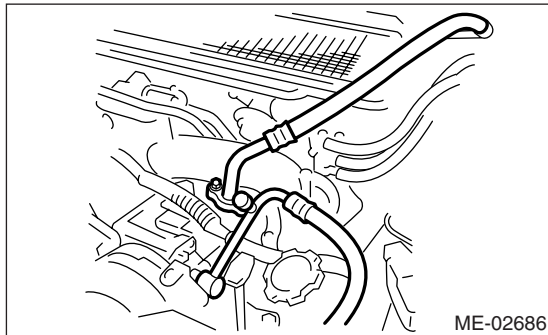
A: REMOVAL

- 1) Set the vehicle on a lift.
- 2) Open the front hood fully, and then support with the hood stay.
- 3) Collect the refrigerant from A/C system. <Ref. to AC-20, Refrigerant Recovery Procedure.>
- 4) Release the fuel pressure. <Ref. to FU(H4DOTC)-50, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>

- (1) Disconnect the fuel pump relay connector.



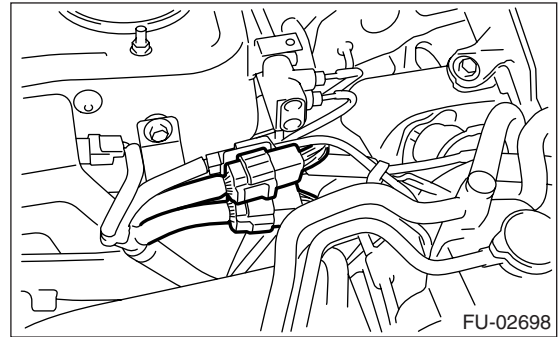
- (2) Start the engine, and run until stalls.
- (3) After the engine stalls, crank it for 5 seconds more.
- (4) Turn the ignition switch to OFF.
- 5) Remove the fuel filler cap.
- 6) Disconnect the ground cable from battery.
- 7) Remove the radiator from vehicle. <Ref. to CO(H4DOTC)-23, REMOVAL, Radiator.>
- 8) Remove the coolant filler tank. <Ref. to CO(H4DOTC)-33, REMOVAL, Coolant Filler Tank.>
- 9) Remove the secondary air pump. <Ref. to EC(H4DOTC)-9, REMOVAL, Secondary Air Pump.>
- 10) Disconnect the A/C pressure hoses from A/C compressor.



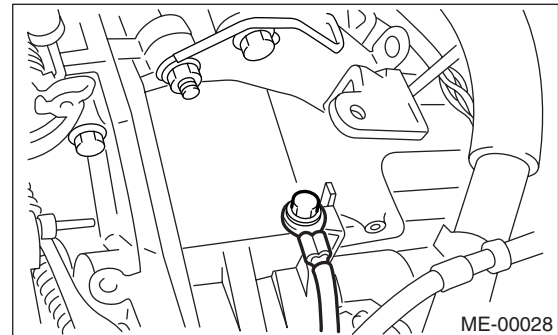
- 11) Remove the intercooler. <Ref. to IN(H4DOTC)-11, REMOVAL, Intercooler.>

- 12) Disconnect the following connectors and cable.

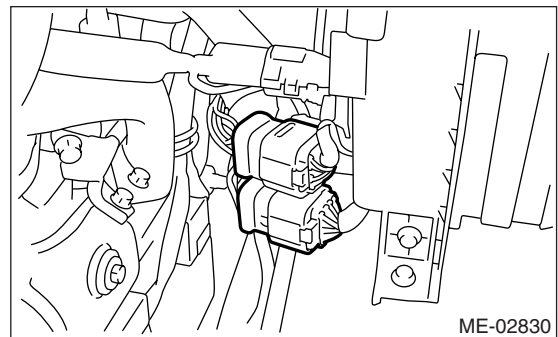
- (1) Engine harness connector



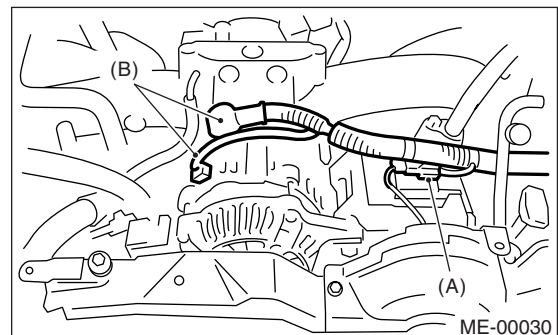
- (2) Engine ground terminal



- (3) Engine harness connector



- (4) Generator connector, terminal and A/C compressor connectors

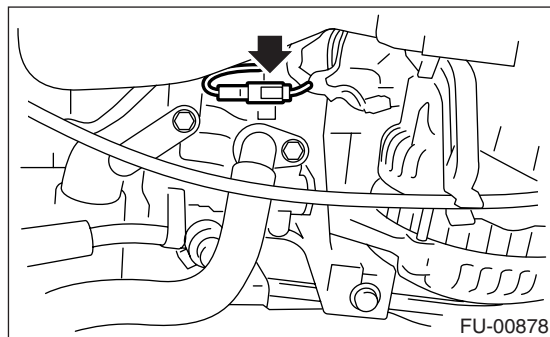


- (A) A/C compressor connector
- (B) Generator connector and terminal

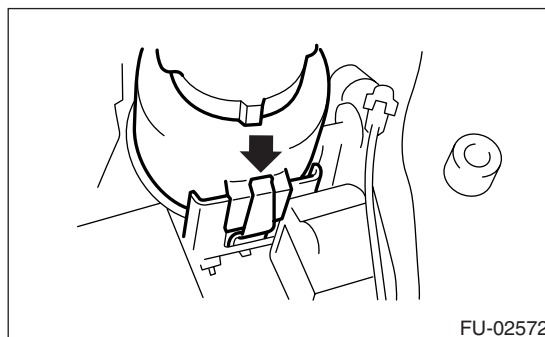
Engine Assembly

MECHANICAL

- (5) Power steering switch connector

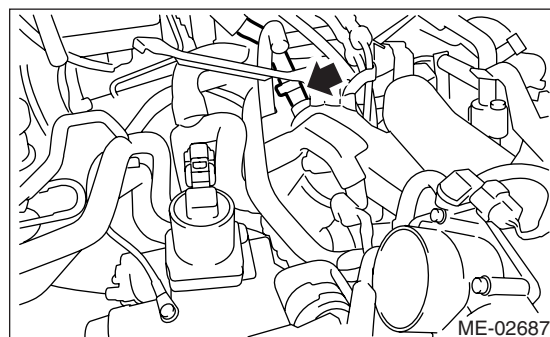


- (4) Remove the reservoir tank from bracket by pulling it upward.



- 13) Disconnect the following hoses.

- (1) Brake booster vacuum hose

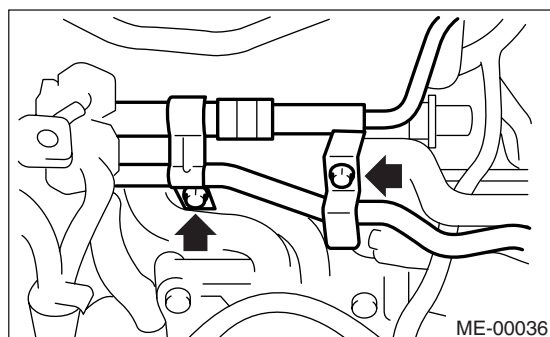


- (2) Heater inlet and outlet hose

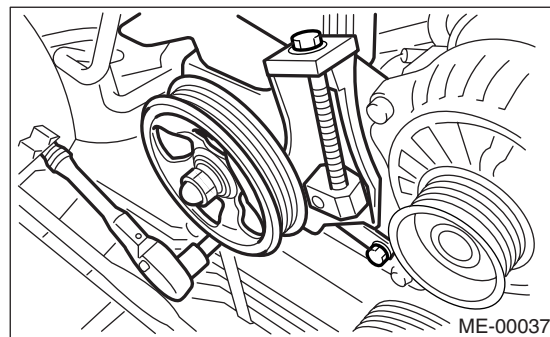
- 14) Remove the power steering pump.

- (1) Remove the front side V-belt. <Ref. to ME(H4DOTC)-41, FRONT SIDE BELT, REMOVAL, V-belt.>

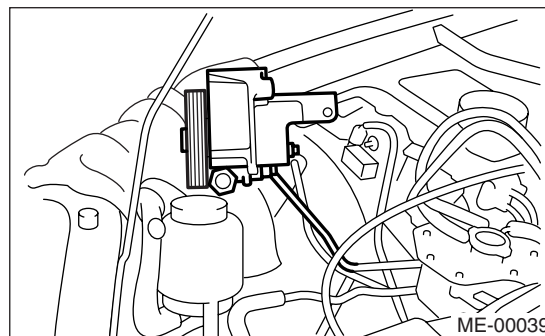
- (2) Remove the power steering pipe with bracket from fuel pipe protector RH.



- (3) Remove the power steering pump.



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

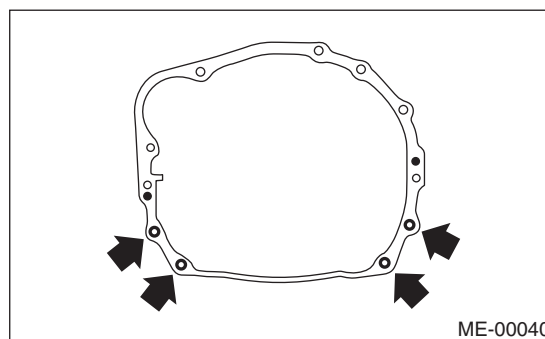


- 15) Lift-up the vehicle.

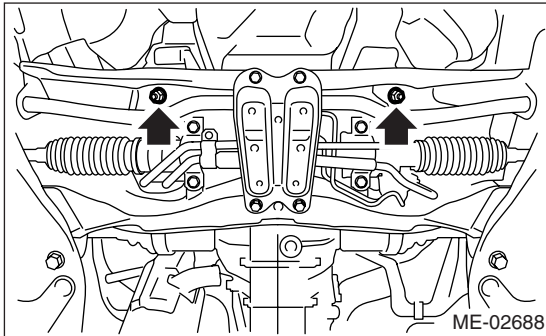
- 16) Remove the ATF cooler pipe from frame. (AT model)

- 17) Remove the center exhaust pipe. <Ref. to EX(H4DOTC)-10, REMOVAL, Center Exhaust Pipe.>

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



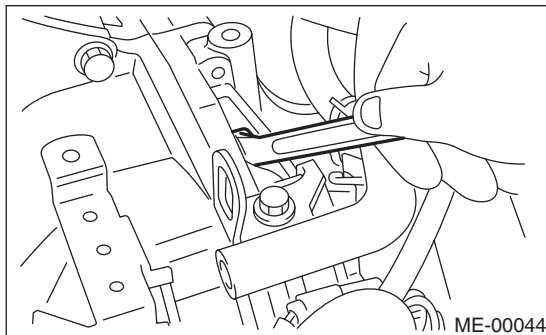
19) Remove the nuts which install the front cushion rubber onto front crossmember.



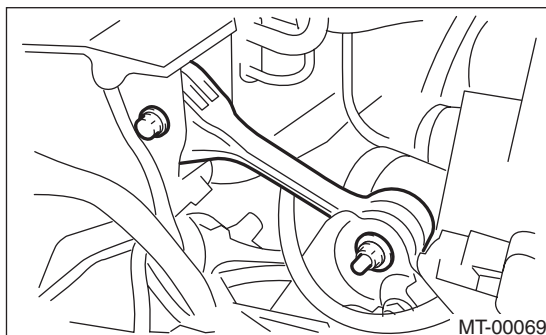
20) Separate the clutch release fork from release bearing. (MT model) <Ref. to CL-18, REMOVAL, Release Bearing and Lever.>

21) 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 the torque converter clutch to drive plate.
- (4) While rotating the crank pulley in the direction of engine rotation little by little using a socket wrench, remove all the bolts.



22) Remove the pitching stopper.

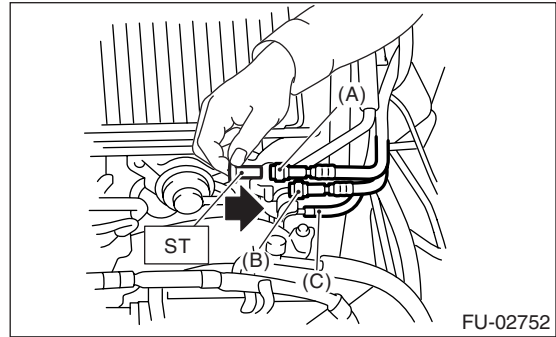


23) Using ST, disconnect fuel hoses from fuel pipes. <Ref. to FU(H4DOTC)-65, REMOVAL, Fuel Delivery, Return and Evaporation lines.>

CAUTION:

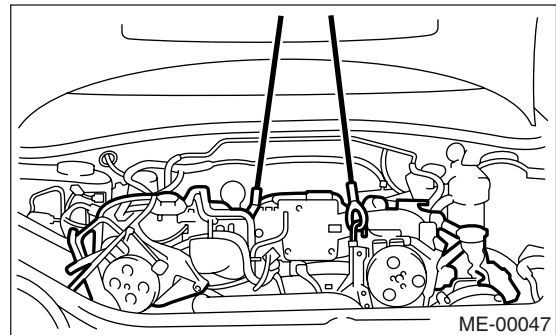
- Be careful not to spill fuel.
- Catch fuel from hoses using a container or cloth.

ST 42099AE000 CONNECTOR REMOVER



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

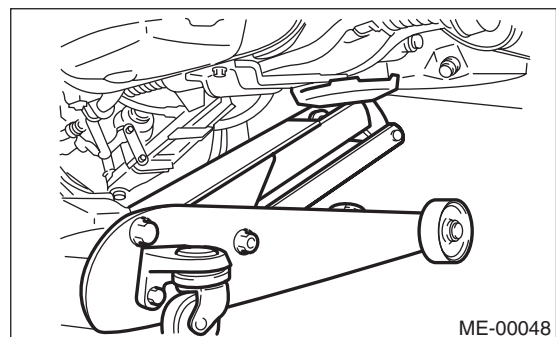
24) Support the engine with a lifting device and wire ropes.



25) Support the transmission with a garage jack.

CAUTION:

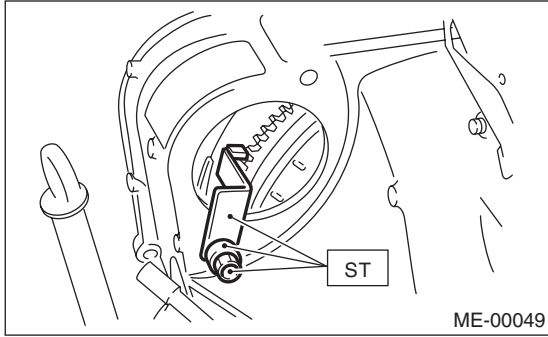
Before moving the engine away from transmission, check to be sure no work has been overlooked. Doing this is very important in order to facilitate re-installation and because transmission lowers under its own weight.



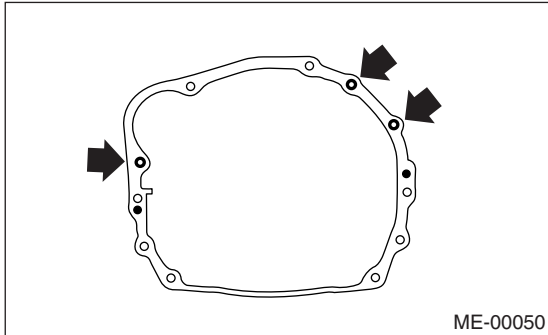
26) Separation of the engine and transmission

- (1) Remove the starter. <Ref. to SC(H4SO)-8, REMOVAL, Starter.>
- (2) Install the ST to torque converter clutch case. (AT model)

ST 498277200 STOPPER SET



(3) Remove the bolts which hold the right upper side of transmission to engine.



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

NOTE:

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

28) Remove the front cushion rubbers.

B: INSTALLATION

- 1) Install the clutch release fork and bearing to transmission. (MT model) <Ref. to CL-18, INSTALLATION, Release Bearing and Lever.>
- 2) Install the front cushion rubbers to engine.

Tightening torque:

35 N·m (3.6 kgf-m, 25.8 ft-lb)

- 3) Install the engine onto transmission.
 - (1) Position the engine in engine compartment, and then align it with the transmission.

NOTE:

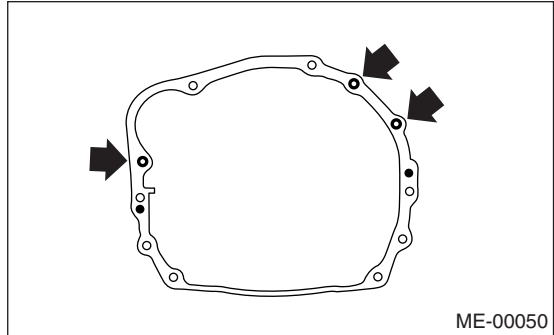
Be careful not to damage the adjacent parts or body panels with crank pulley, oil pressure gauge, etc.

- (2) Apply a small amount of grease to the splines of mainshaft. (MT model)

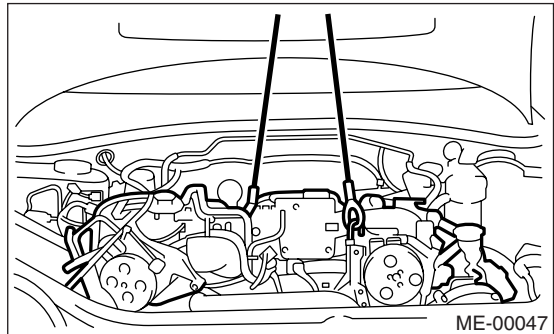
- 4) Tighten the bolts which hold the right upper side of transmission to engine.

Tightening torque:

50 N·m (5.1 kgf-m, 37 ft-lb)



- 5) Remove the lifting device and wire ropes.

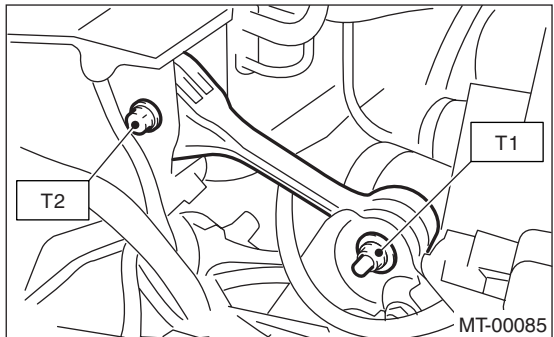


- 6) Remove the garage jack.
- 7) Install the pitching stopper.

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 model)

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(H4SO)-8, INSTALLATION, Starter.>

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

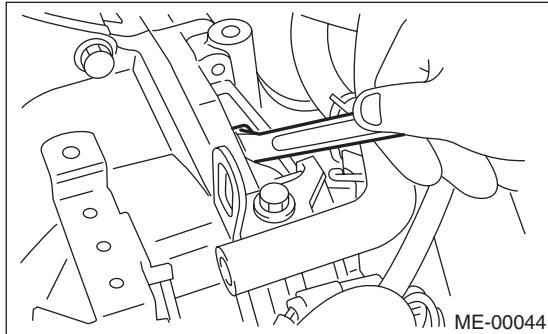
- (1) Tighten the bolts which hold the torque converter clutch to drive plate.
- (2) While rotating the crank pulley in the direction of engine rotation little by little using a socket wrench, remove all the bolts.

CAUTION:

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

Tightening torque:

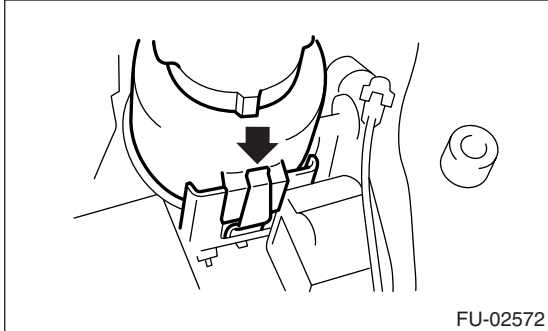
25 N·m (2.5 kgf-m, 18.4 ft-lb)



(3) Install the service hole plug.

11) Install the power steering pump on bracket.

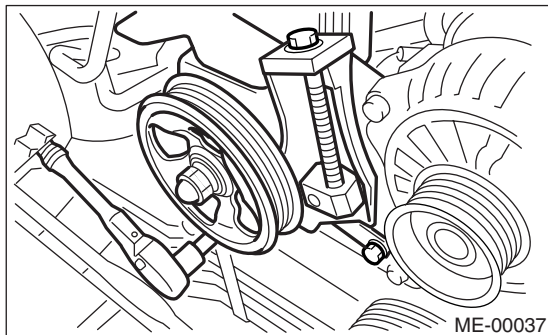
- (1) Install the power steering tank on bracket.



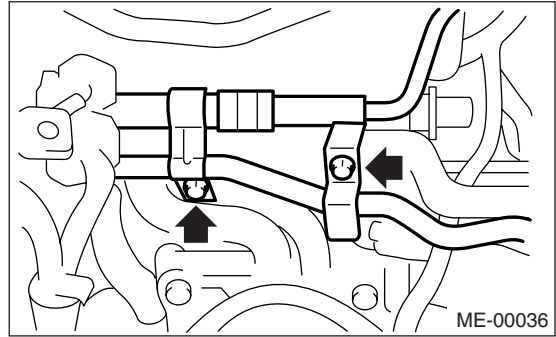
(2) Install the power steering pump.

Tightening torque:

20.1 N·m (2.05 kgf-m, 14.8 ft-lb)



(3) Install the power steering pipe bracket on intake manifold RH.



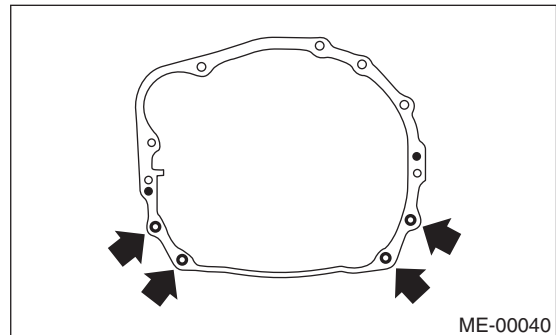
(4) Install the front side V-belt, and adjust it.
<Ref. to ME(H4DOTC)-41, FRONT SIDE BELT, INSTALLATION, V-belt.>

12) Lift-up the vehicle.

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

Tightening torque:

50 N·m (5.1 kgf-m, 37 ft-lb)



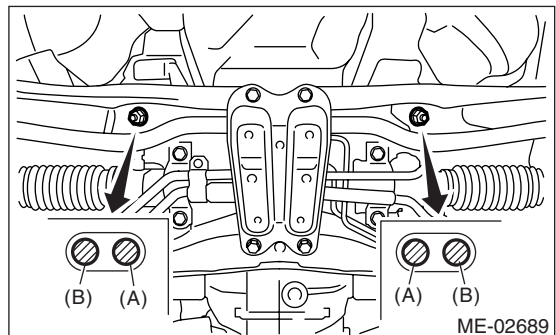
14) Tighten the nuts which install the front cushion rubber onto crossmember.

Tightening torque:

85 N·m (8.7 kgf-m, 62.7 ft-lb)

NOTE:

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



15) Install the ATF cooler pipe to frame. (AT model)

16) Install the center exhaust pipe.

<Ref. to EX(H4DOTC)-11, INSTALLATION, Center Exhaust Pipe.>

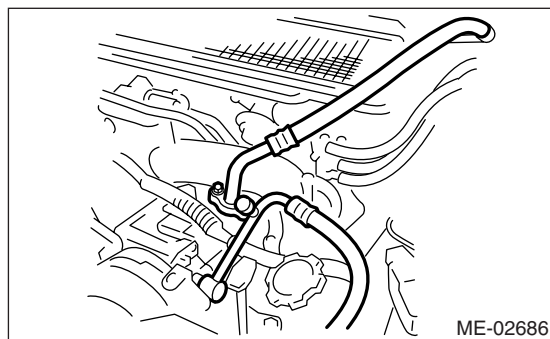
- 17) Lower the vehicle.
- 18) Connect the following hoses:
 - (1) Fuel delivery hose, return hose and evaporation hose
 - (2) Heater inlet and outlet hoses
 - (3) Brake booster vacuum hose
- 19) Connect the following connectors and terminals:
 - (1) Engine ground terminal
 - (2) Engine harness connectors
 - (3) Generator connector and terminal
 - (4) A/C compressor connectors
 - (5) Power steering switch connector
- 20) After connecting each cable, adjust them.
- 21) Install the air intake system.
 - (1) Install the intercooler.
<Ref. to IN(H4DOTC)-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.
- 22) Install the A/C pressure hoses.

NOTE:

Use new O-rings.

Tightening torque:

15 N·m (1.5 kgf-m, 10.8 ft-lb)



- 23) Install the radiator. <Ref. to CO(H4DOTC)-24, INSTALLATION, Radiator.>
- 24) Install the coolant filler tank.
<Ref. to CO(H4DOTC)-33, INSTALLATION, Coolant Filler Tank.>
- 25) Install the secondary air pump. <Ref. to EC(H4DOTC)-9, INSTALLATION, Secondary Air Pump.>
- 26) Install the battery in the vehicle, and then connect the cables.
- 27) Fill engine coolant.
<Ref. to CO(H4DOTC)-17, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
- 28) Charge the A/C system with refrigerant.
<Ref. to AC-21, PROCEDURE, Refrigerant Charging Procedure.>

10.Engine Mounting

A: REMOVAL

- 1) Remove the engine assembly. <Ref. to ME(H4DOTC)-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

35 N·m (3.6 kgf-m, 25.8 ft-lb)

C: INSPECTION

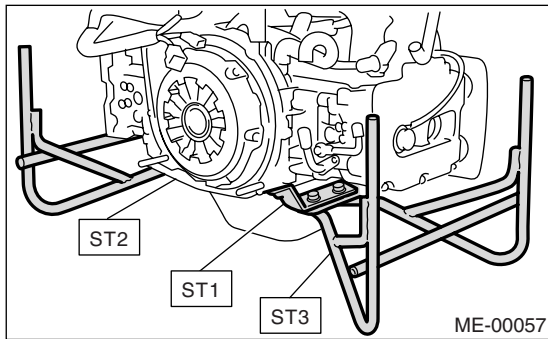
Make sure there are no cracks or other damage.

11.Preparation for Overhaul

A: PROCEDURE

1) After removing the engine from 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

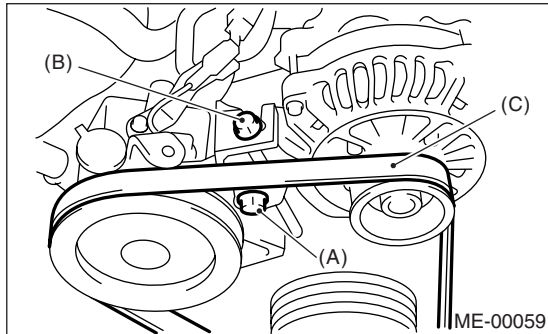
A: REMOVAL

NOTE:

Perform the following procedures with the engine installed to the body.

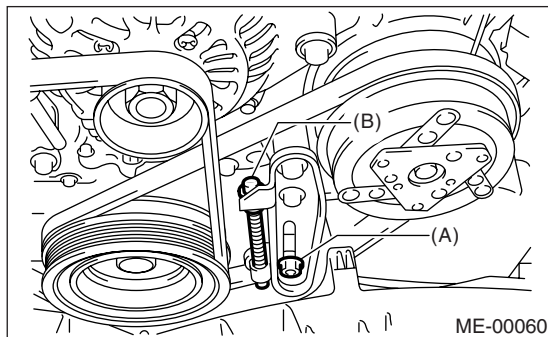
1. FRONT SIDE BELT

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

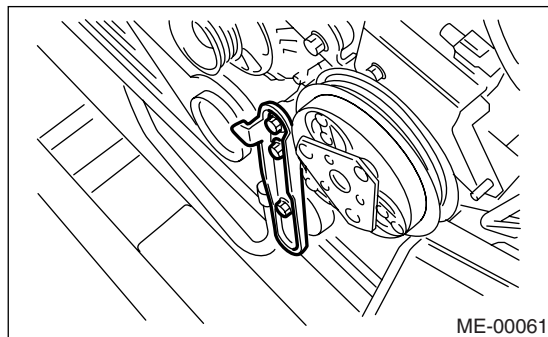


2. REAR SIDE BELT

- 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

NOTE:

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

- 1) Install the V-belt (C), and tighten the slider bolt so as to obtain the specified belt tension. <Ref. to ME(H4DOTC)-41, INSPECTION, V-belt.>
- 2) Tighten the lock bolt (A).
- 3) Tighten the slider bolt (B).

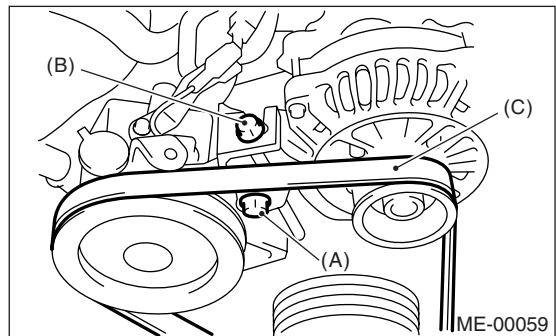
Tightening torque:

Lock bolt through bolt

25 N·m (2.5 kgf-m, 18.4 ft-lb)

Slider bolt:

8 N·m (0.8 kgf-m, 5.9 ft-lb)



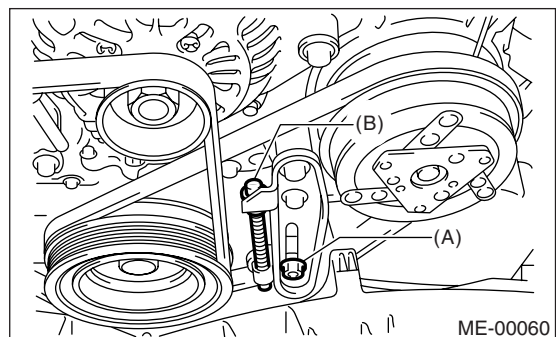
2. REAR SIDE BELT

- 1) Install the belt, and tighten the slider bolt (B) so as to obtain the specified belt tension. <Ref. to ME(H4DOTC)-41, INSPECTION, V-belt.>
- 2) Tighten the lock nut (A).

Tightening torque:

Lock nut (A)

23 N·m (2.3 kgf-m, 17.0 ft-lb)



C: INSPECTION

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

V-belt

MECHANICAL

Belt tension (with belt tension gauge)

(A)

When installing new parts:

640 — 780 N (65 — 80 kgf, 144 — 175 lbf)

At inspection:

490 — 640 N (50 — 65 kgf, 110 — 144 lbf)

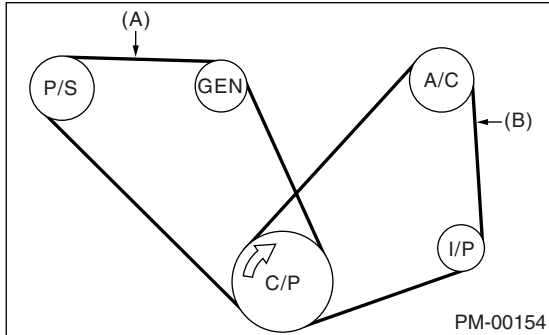
(B)

When installing new parts:

740 — 880 N (75 — 90 kgf, 166 — 198 lbf)

At inspection:

350 — 450 N (36 — 46 kgf, 79 — 101 lbf)



(A) Front side belt

(B) Rear side belt

C/P Crank pulley

GEN Generator

P/S Power steering oil pump pulley

A/C A/C compressor pulley

I/P Idler pulley

Belt tension (without belt tension gauge)

(A)

When installing new parts:

7 — 9 mm (0.276 — 0.354 in)

At inspection:

9 — 11 mm (0.354 — 0.433 in)

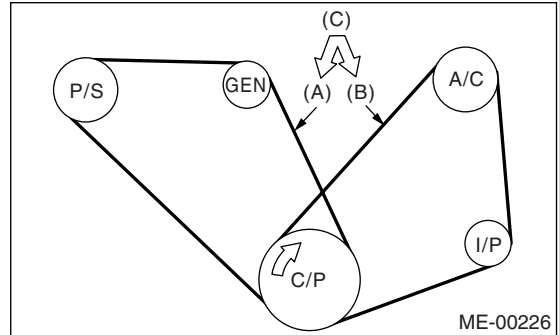
(B)

When installing new parts:

7.5 — 8.5 mm (0.295 — 0.335 in)

At inspection:

9.0 — 10.0 mm (0.354 — 0.394 in)



(A) Front side belt

(B) Rear side belt

(C) 98 N (10 kgf, 22 lbf)

C/P Crank pulley

GEN Generator

P/S Power steering oil pump pulley

A/C Air conditioning compressor pulley

I/P Idler pulley

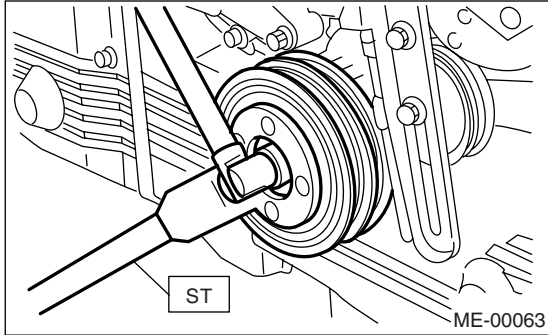
13.Crank Pulley

A: REMOVAL

1) Remove the V-belt. <Ref. to ME(H4DOTC)-41, REMOVAL, V-belt.>

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

ST 499977100 CRANK PULLEY WRENCH



3) Remove the crank pulley.

B: INSTALLATION

1) Install the crank pulley.

2) Install the pulley bolt.

To lock the crankshaft, use ST.

ST 499977100 CRANK PULLEY WRENCH

(1) Clean the crank pulley thread using compressed air.

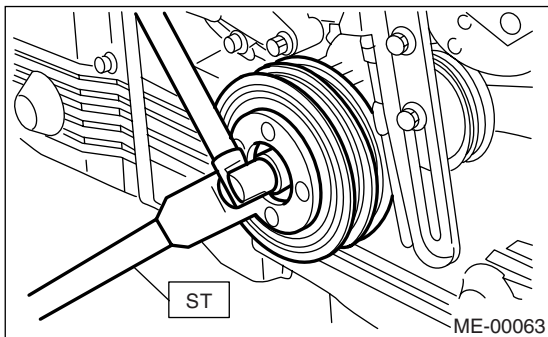
(2) Apply engine oil to the crank pulley bolt seat and thread.

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

(4) Tighten the crank pulley bolts.

Tightening torque:

180 N·m (18.4 kgf-m, 132.8 ft-lb)



3) Confirm that the tightening angle of crank pulley bolt is 65 degrees or more. If the tightening angle of crank pulley bolt is less than 65 degrees, conduct the following procedures.

CAUTION:

If the tightening angle of crank pulley bolt is less than 65 degrees, the bolt should be damaged. In this case, the bolt must be replaced.

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

Crank pulley bolt:

12369AA011

(2) Clean the crankshaft thread using compressed air.

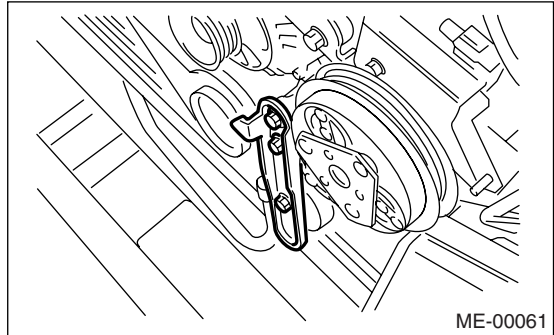
(3) Tighten the bolts temporarily with tightening torque of 44 N·m (4.5 kgf-m, 33 ft-lb).

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

NOTE:

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

4) Install the A/C belt tensioner.



5) Install the V-belt. <Ref. to ME(H4DOTC)-41, INSTALLATION, V-belt.>

C: INSPECTION

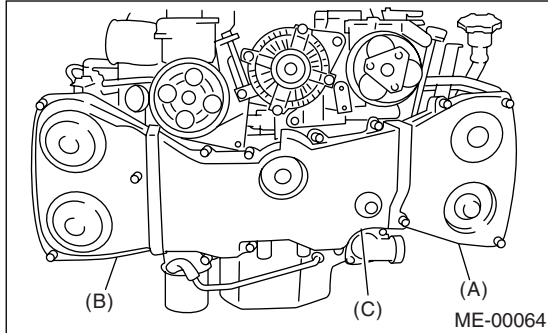
1) Make sure the V-belt is not worn or otherwise damaged.

2) Check the tension of the belt. <Ref. to ME(H4DOTC)-41, INSPECTION, V-belt.>

14. Timing Belt Cover

A: REMOVAL

- 1) Remove the V-belt. <Ref. to ME(H4DOTC)-41, REMOVAL, V-belt.>
- 2) Remove the crank pulley.
<Ref. to ME(H4DOTC)-43, REMOVAL, Crank Pulley.>
- 3) Remove the timing belt cover (LH) (A).
- 4) Remove the timing belt cover (RH) (B).
- 5) Remove the front timing belt cover (C).



B: INSTALLATION

- 1) Install the front timing belt cover (C).

Tightening torque:

5 N·m (0.5 kgf-m, 3.6 ft-lb)

- 2) Install the timing belt cover (RH) (B).

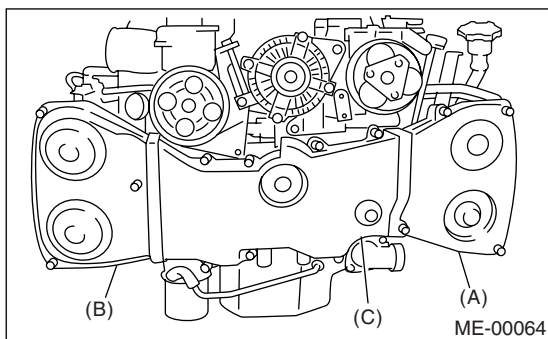
Tightening torque:

5 N·m (0.5 kgf-m, 3.6 ft-lb)

- 3) Install the timing belt cover (LH) (A).

Tightening torque:

5 N·m (0.5 kgf-m, 3.6 ft-lb)



- 4) Install the crank pulley. <Ref. to ME(H4DOTC)-43, INSTALLATION, Crank Pulley.>
- 5) Install the V-belt. <Ref. to ME(H4DOTC)-41, INSTALLATION, V-belt.>

C: INSPECTION

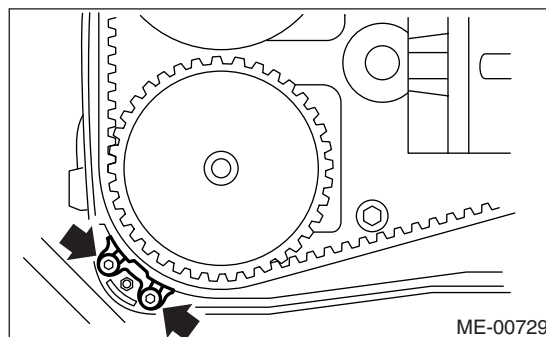
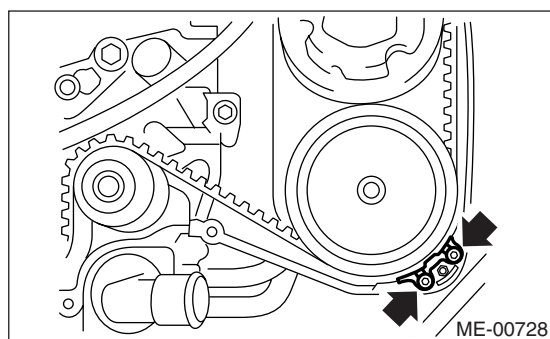
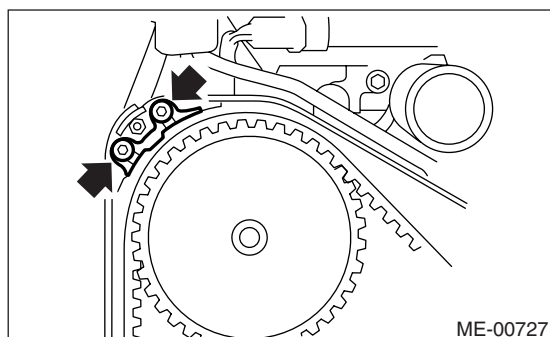
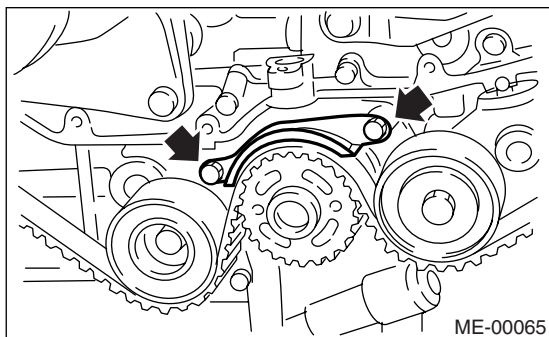
Make sure the cover is not damaged.

15. Timing Belt

A: REMOVAL

1. TIMING BELT

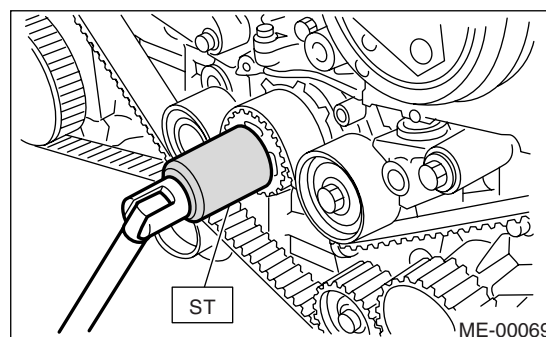
- 1) Remove the V-belt. <Ref. to ME(H4DOTC)-41, REMOVAL, V-belt.>
- 2) Remove the crank pulley. <Ref. to ME(H4DOTC)-43, REMOVAL, Crank Pulley.>
- 3) Remove the timing belt cover. <Ref. to ME(H4DOTC)-44, REMOVAL, Timing Belt Cover.>
- 4) Remove the timing belt guides. (MT model)



- 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 crank sprocket, intake cam sprocket (LH), exhaust cam sprocket (LH), intake cam sprocket (RH) and exhaust cam sprocket (RH) with notches of timing belt cover and cylinder block.

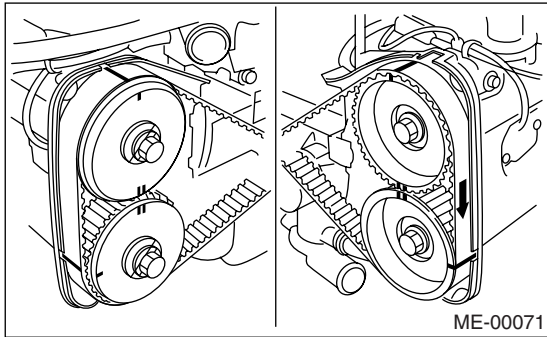
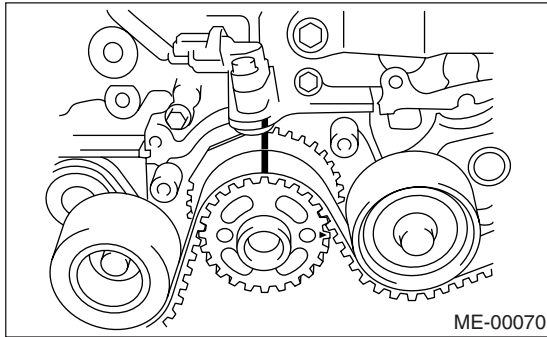
ST 499987500 CRANKSHAFT SOCKET



Timing Belt

MECHANICAL

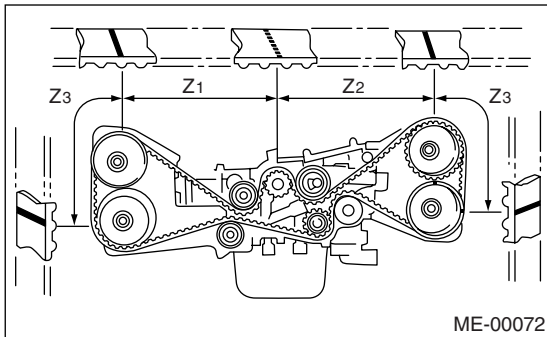
- (2) Using white paint, put alignment and/or arrow marks on the timing belts in relation to the sprockets.



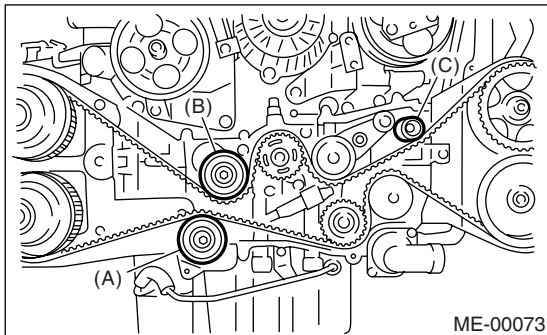
Z₁: 54.5 tooth length

Z₂: 51 tooth length

Z₃: 28 tooth length



- 6) Remove the belt idler (A).



- 7) Remove the timing belt.

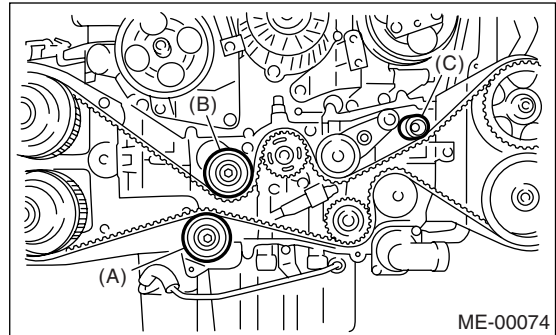
CAUTION:

After the timing belt has been removed, never rotate the intake and exhaust, cam sprocket. If

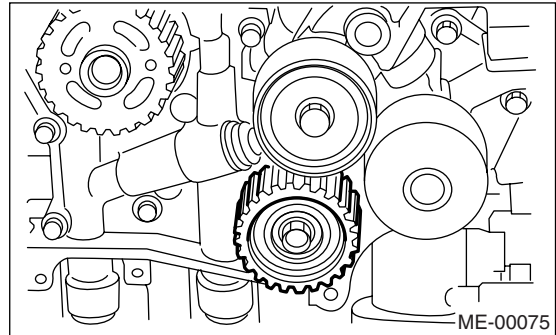
the cam sprocket is rotated, the intake and exhaust valve heads strike together and valve stems are bent.

2. BELT IDLER AND AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY

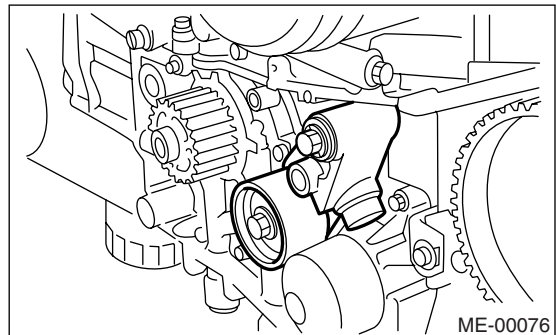
- 1) Remove the belt idler (B) and (C).



- 2) Remove the belt idler No. 2.



- 3) Remove the automatic belt tension adjuster assembly.



B: INSTALLATION

1. AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER

- 1) Preparation for installation of automatic belt tension adjuster assembly:

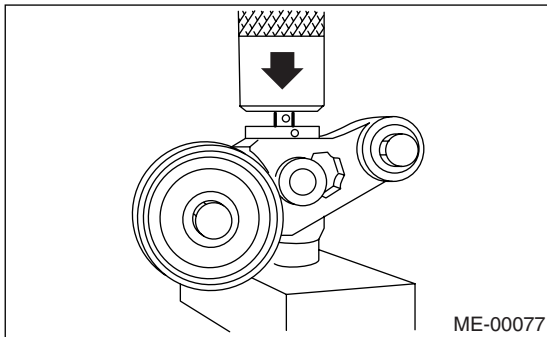
CAUTION:

- 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.

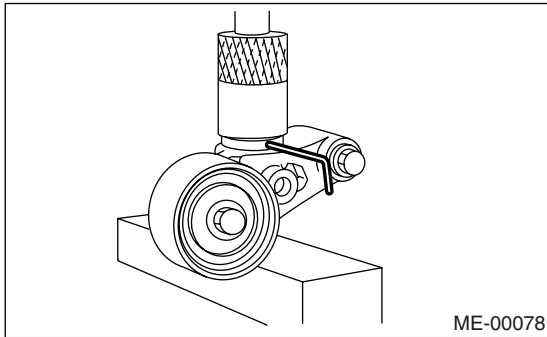
- Press-in the push adjuster rod gradually taking more than 3 minutes.
- Do not allow press pressure to exceed 9,807 N (1,000 kgf, 2,205 lbf).
- Press the adjuster rod as far as the end surface of cylinder. Do not press the adjuster rod into the cylinder. Doing so may damage the cylinder.
- Do not release 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 lbf) or more until the adjuster rod is aligned with the stopper pin hole in the cylinder.



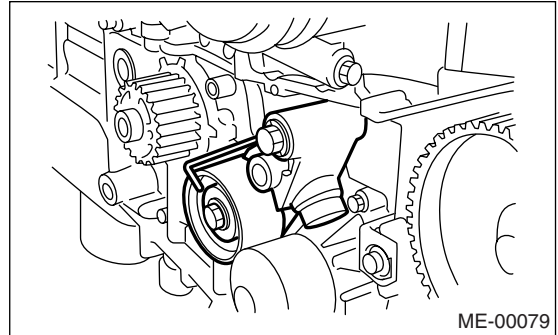
(3) With a 2 mm (0.08 in) dia. stopper pin or a 2 mm (nominal) dia. hex bar wrench inserted into the stopper pin hole in the cylinder, secure the adjuster rod.



2) Install the automatic belt tension adjuster assembly.

Tightening torque:

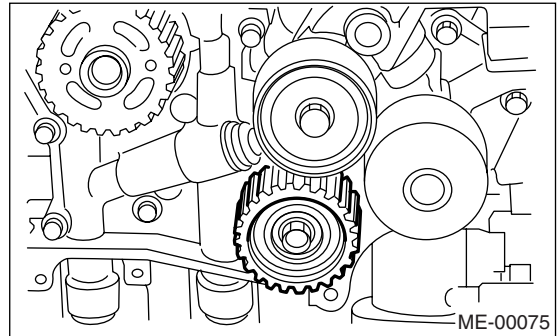
39 N·m (4.0 kgf-m, 28.9 ft-lb)



3) Install the belt idler No. 2.

Tightening torque:

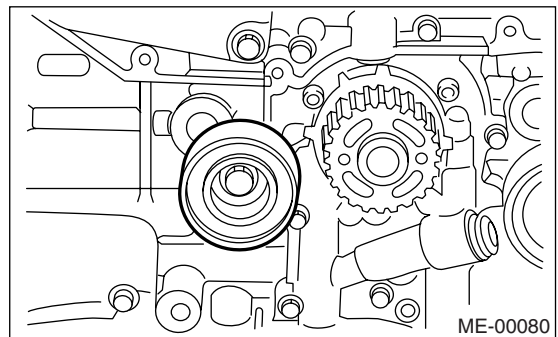
39 N·m (4.0 kgf-m, 28.9 ft-lb)



4) Install the belt idlers.

Tightening torque:

39 N·m (4.0 kgf-m, 28.9 ft-lb)



2. TIMING BELT

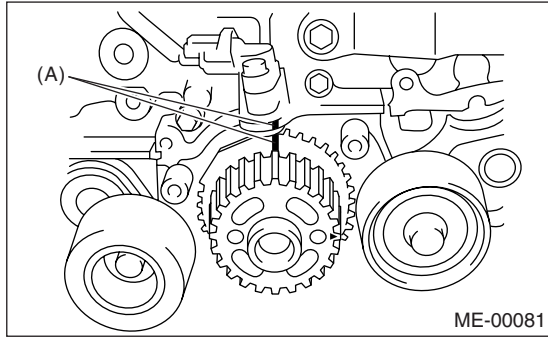
1) Preparation for installation of automatic belt tension adjuster assembly. <Ref. to ME(H4DOTC)-46, AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER, INSTALLATION, Timing Belt.>

Timing Belt

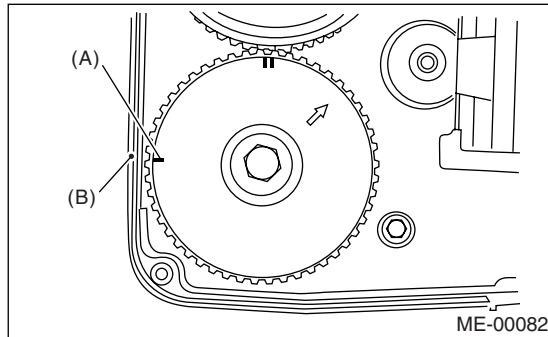
MECHANICAL

2) Crankshaft and cam sprocket alignment

(1) Align mark (A) on the crank sprocket with mark on the oil pump cover at cylinder block.

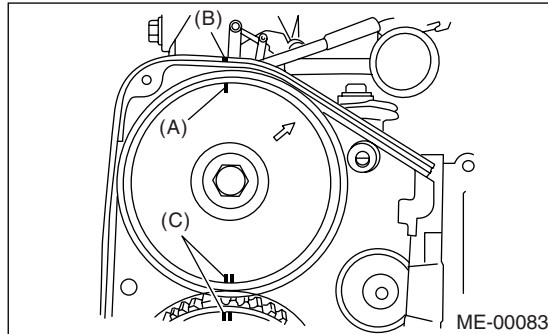


(2) Align single line mark (A) on the exhaust cam sprocket (RH) with notch (B) on timing belt cover.

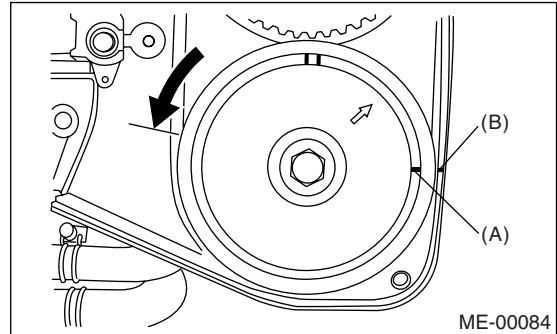


(3) Align single line mark (A) on the intake cam sprocket (RH) with notch (B) on timing belt cover.

(Make sure double lines (C) on intake camshaft and exhaust cam sprockets are aligned.)

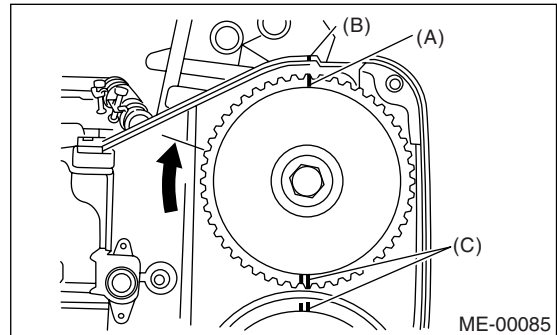


(4) Align single line mark (A) on exhaust cam sprocket (LH) with notch (B) on timing belt cover by turning the sprocket counterclockwise (as viewed from front of engine).



(5) Align the single line mark (A) on intake cam sprocket (LH) with notch (B) on timing belt cover by turning the sprocket clockwise (as viewed from front of engine).

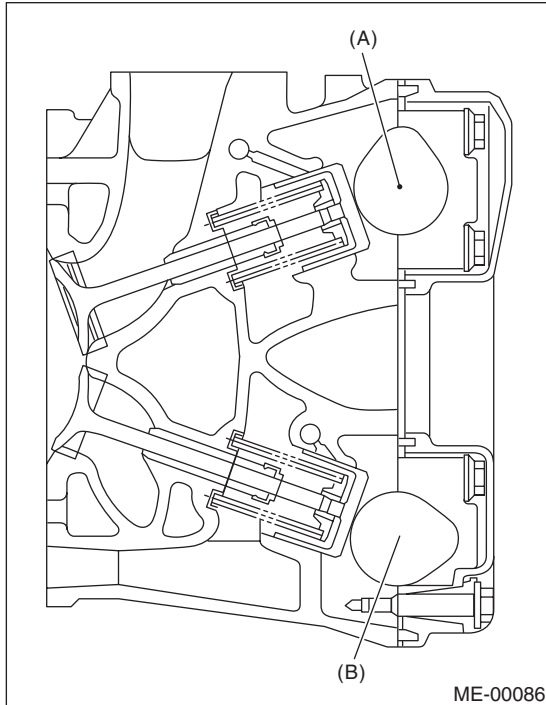
(Ensure the double lines (C) on intake and exhaust cam sprockets are aligned.)



(6) Ensure the camshaft and crank sprockets are positioned properly.

CAUTION:

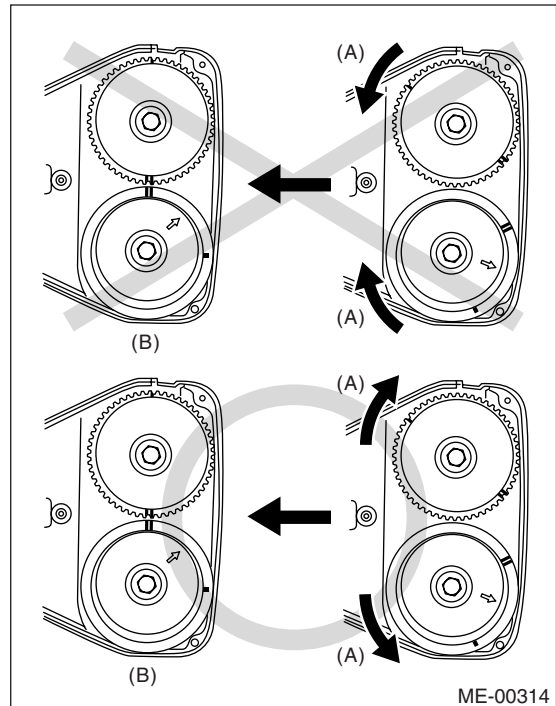
• Intake and exhaust camshafts for this DOHC engine can be independently rotated with the timing belts removed. As can be seen from the figure, if the intake and exhaust valves are lifted simultaneously, their heads will interfere with each other, resulting in bent valves.



(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 camshafts (LH) are held to push their corresponding valves down. (Under this condition, these valves are held lifted.) Camshafts (RH) are held so that their cams do not push valves down.
- Camshafts (LH) 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 by the upper illustration in the figure as this causes both intake and exhaust valves to lift simultaneously, resulting in interference with their heads.



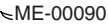
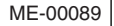
(A) Rotating direction
(B) Timing belt installation position

3) Installation of timing belt

Align the alignment mark on timing belt with marks on sprockets in alphabetical order shown in the figure. While aligning marks, position the timing belt properly.

CAUTION:

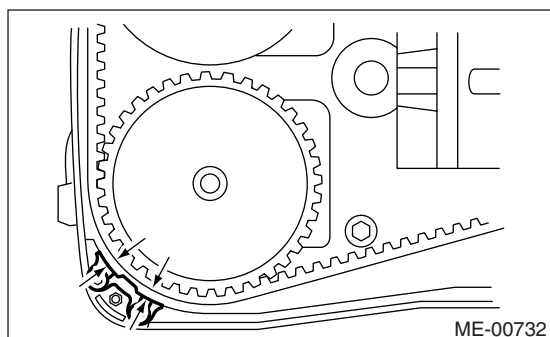
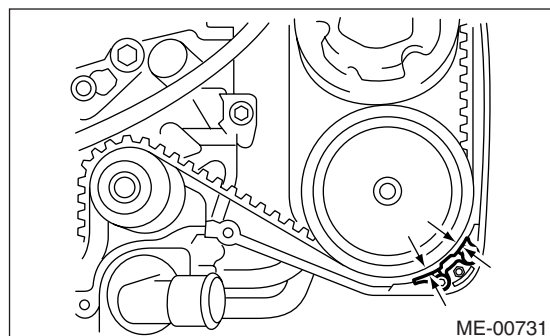
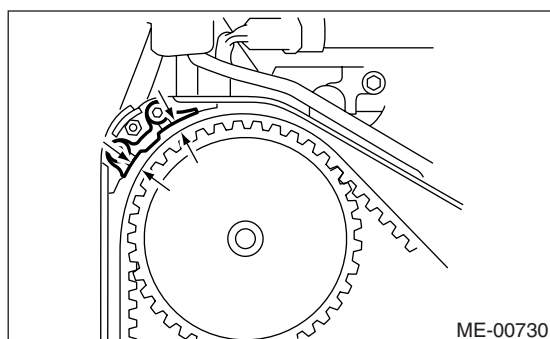
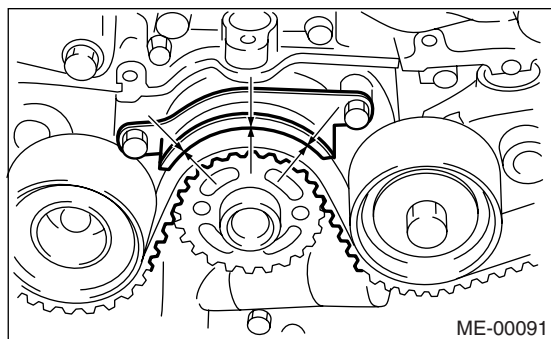
- Disengagement of more than three timing belt teeth may result in interference between the valve and piston.
- Ensure the belt’s rotating direction is correct.



- (2) Check and adjust the clearance between timing belt and timing belt guide.

Clearance:

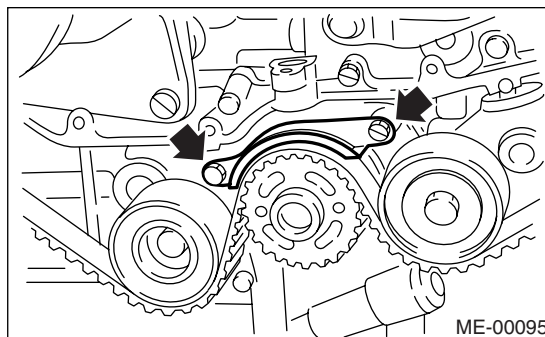
1.0 ± 0.5 mm (0.039 ± 0.020 in)



- (3) Tighten the bolts.

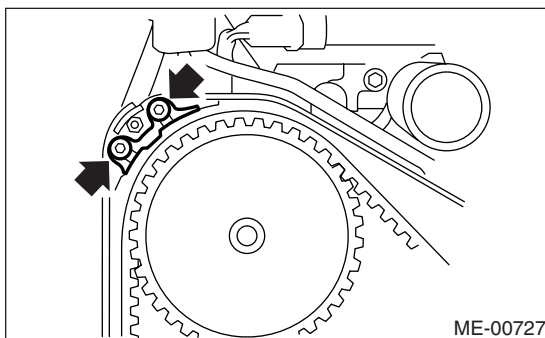
Tightening torque:

9.75 N·m (1.0 kgf·m, 7.2 ft·lb)



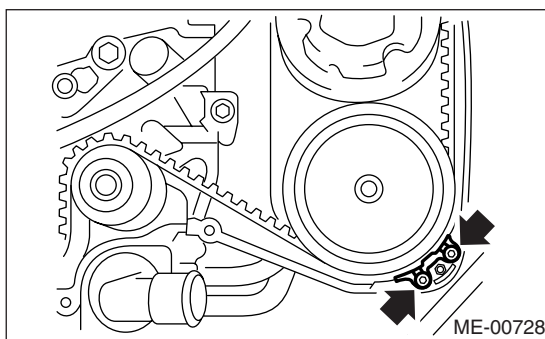
Tightening torque:

6.4 N·m (0.65 kgf·m, 4.7 ft·lb)



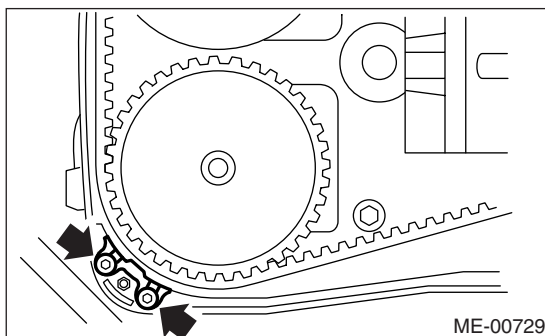
Tightening torque:

6.4 N·m (0.65 kgf·m, 4.7 ft·lb)



Tightening torque:

6.4 N·m (0.65 kgf·m, 4.7 ft·lb)



7) Install the timing belt cover.

<Ref. to ME(H4DOTC)-44, INSTALLATION, Timing Belt Cover.>

8) Install the crank pulley.

<Ref. to ME(H4DOTC)-43, INSTALLATION, Crank Pulley.>

9) Install the V-belt. <Ref. to ME(H4DOTC)-41, 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.

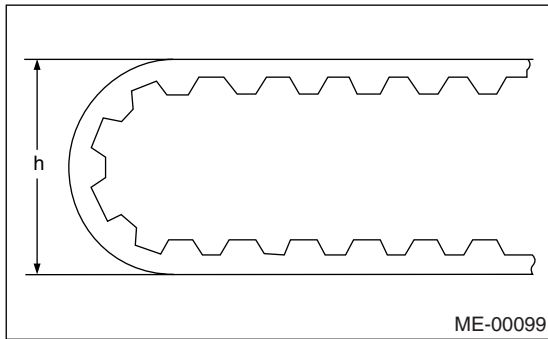
2) Check the condition of back side of timing belt; if any crack is found, replace the timing belt.

CAUTION:

- Be careful not to let oil, grease or coolant contact the timing belt. Remove quickly and thoroughly if this happens.
- Do not bend the timing belt sharply.

Bending diameter h:

60 mm (2.36 in) or more



2. AUTOMATIC BELT TENSION ADJUST-ER

1) Visually check the oil seals for leaks, and rod ends for abnormal wear or scratches. If necessary, replace the automatic belt tension adjuster assembly.

NOTE:

Slight traces of oil at rod's oil seal does not indicate a problem.

2) Check that the adjuster rod does not move when a pressure of 294 N (30 kgf, 66 lbf) 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 lbf), 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 lbf) to it. Check the 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.

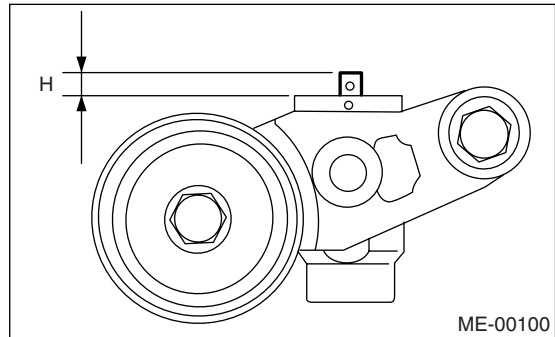
CAUTION:

- 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 lbf).
- 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 belt 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.

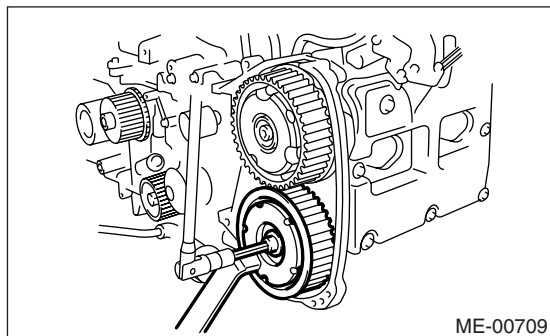
3) Check the belt idler for grease leakage.

16. Cam Sprocket

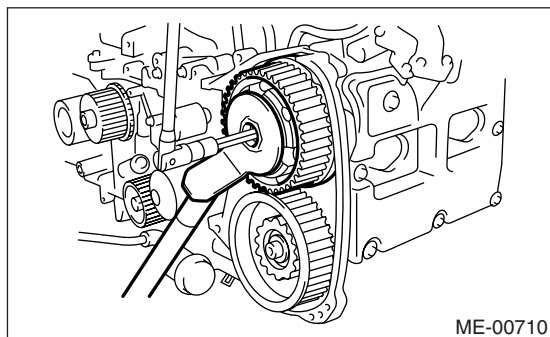
A: REMOVAL

- 1) Remove the V-belt. <Ref. to ME(H4DOTC)-41, REMOVAL, V-belt.>
- 2) Remove the crank pulley. <Ref. to ME(H4DOTC)-43, REMOVAL, Crank Pulley.>
- 3) Remove the timing belt cover. <Ref. to ME(H4DOTC)-44, REMOVAL, Timing Belt Cover.>
- 4) Remove the timing belt. <Ref. to ME(H4DOTC)-45, REMOVAL, Timing Belt.>
- 5) Remove the cam sprockets. To lock the camshaft, use ST.

ST 499207400 CAM SPROCKET WRENCH



ST 499977500 CAM SPROCKET WRENCH



B: INSTALLATION

- 1) Install the cam sprocket. To lock the camshaft, use ST.

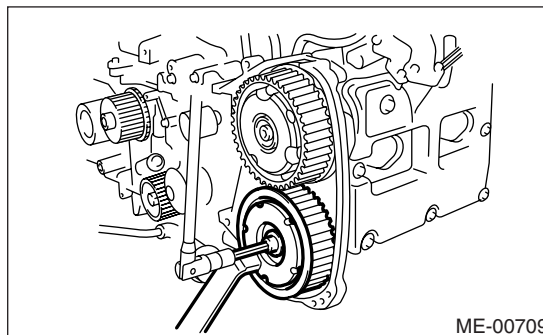
ST 499207400 CAM SPROCKET WRENCH

Tightening torque:

Tighten to 30 N·m (3.1 kgf-m, 22.1 ft-lb), then further tighten by 45°.

NOTE:

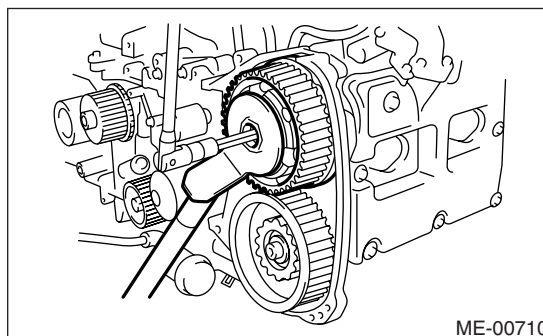
Do not confuse the cam sprockets (RH) and (LH) intake side during installation.



ST 499977500 CAM SPROCKET WRENCH

Tightening torque:

Tighten to 30 N·m (3.1 kgf-m, 22.1 ft-lb), then further tighten by 45°.



- 2) Install the timing belt. <Ref. to ME(H4DOTC)-46, INSTALLATION, Timing Belt.>
- 3) Install the timing belt cover. <Ref. to ME(H4DOTC)-44, INSTALLATION, Timing Belt Cover.>
- 4) Install the crank pulley. <Ref. to ME(H4DOTC)-43, INSTALLATION, Crank Pulley.>
- 5) Install the V-belt. <Ref. to ME(H4DOTC)-41, INSTALLATION, V-belt.>

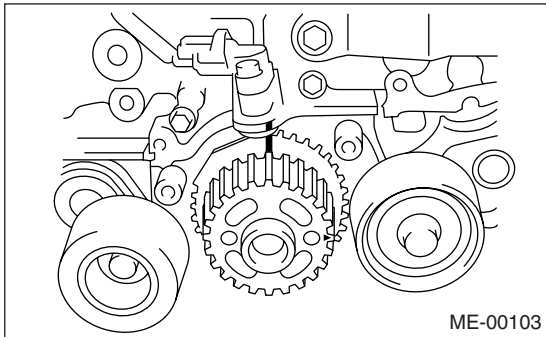
C: INSPECTION

- 1) Check the cam sprocket teeth for abnormal wear and scratches.
- 2) Make sure there is no free play between cam sprocket and key.

17.Crank Sprocket

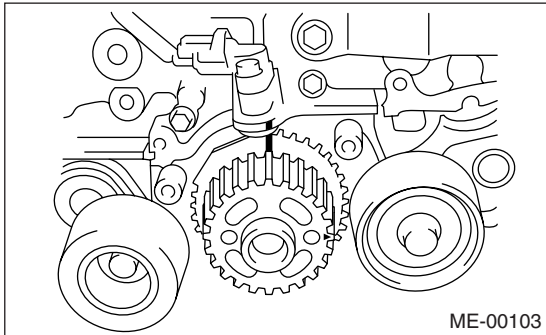
A: REMOVAL

- 1) Remove the V-belt. <Ref. to ME(H4DOTC)-41, REMOVAL, V-belt.>
- 2) Remove the crank pulley.
<Ref. to ME(H4DOTC)-43, REMOVAL, Crank Pulley.>
- 3) Remove the timing belt cover.
<Ref. to ME(H4DOTC)-44, REMOVAL, Timing Belt Cover.>
- 4) Remove the timing belt.
<Ref. to ME(H4DOTC)-45, REMOVAL, Timing Belt.>
- 5) Remove the crank sprocket.



B: INSTALLATION

- 1) Install the crank sprocket.



- 2) Install the timing belt.
<Ref. to ME(H4DOTC)-46, INSTALLATION, Timing Belt.>
- 3) Install the timing belt cover.
<Ref. to ME(H4DOTC)-44, INSTALLATION, Timing Belt Cover.>
- 4) Install the crank pulley. <Ref. to ME(H4DOTC)-43, INSTALLATION, Crank Pulley.>
- 5) Install the V-belt. <Ref. to ME(H4DOTC)-41, INSTALLATION, V-belt.>

C: INSPECTION

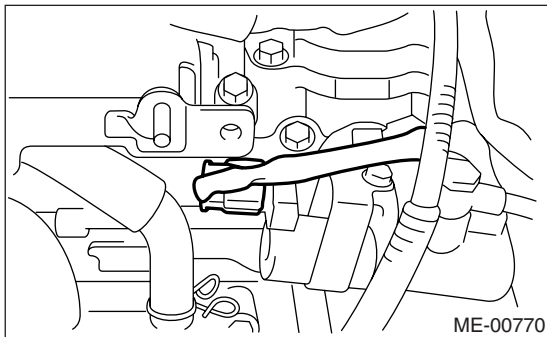
- 1) Check the crank sprocket teeth for abnormal wear and scratches.
- 2) Make sure there is no free play between crank sprocket and key.

3) Check the crank sprocket notch used for sensor for damage and contamination of foreign matter.

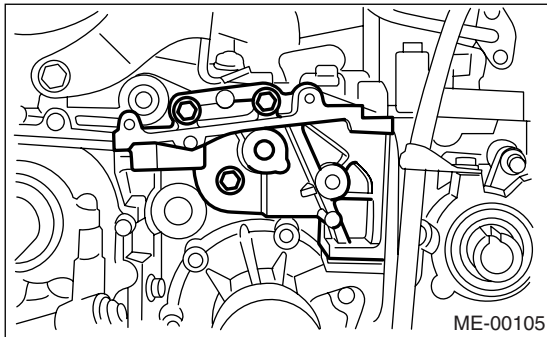
18. Camshaft

A: REMOVAL

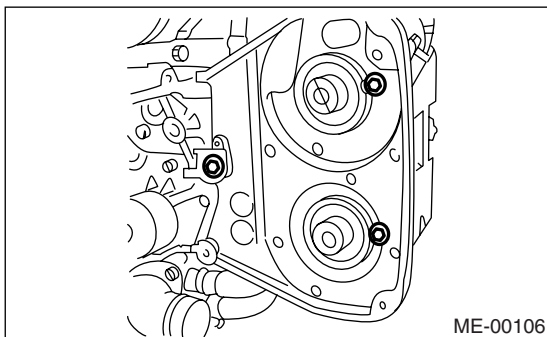
- 1) Remove the V-belt. <Ref. to ME(H4DOTC)-41, REMOVAL, V-belt.>
- 2) Remove the crank pulley. <Ref. to ME(H4DOTC)-43, REMOVAL, Crank Pulley.>
- 3) Remove the timing belt cover.
- <Ref. to ME(H4DOTC)-44, REMOVAL, Timing Belt Cover.>
- 4) Remove the timing belt. <Ref. to ME(H4DOTC)-45, REMOVAL, Timing Belt.>
- 5) Remove the cam sprocket. <Ref. to ME(H4DOTC)-53, REMOVAL, Cam Sprocket.>
- 6) Disconnect the oil flow control solenoid valve assembly connector.



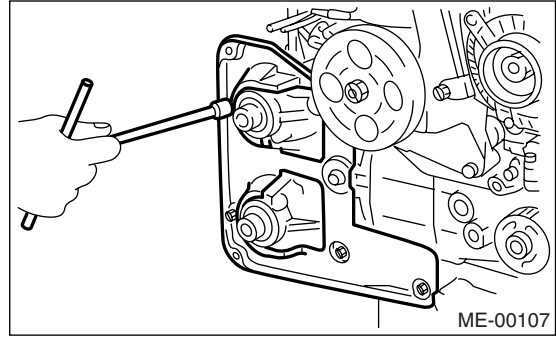
- 7) Remove the tensioner bracket.



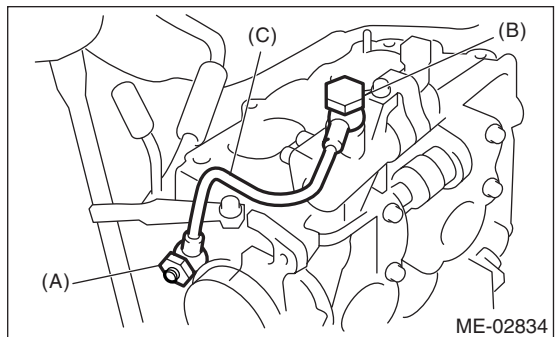
- 8) Remove the timing belt cover No. 2 (LH).



- 9) Remove the timing belt cover No. 2 (RH).

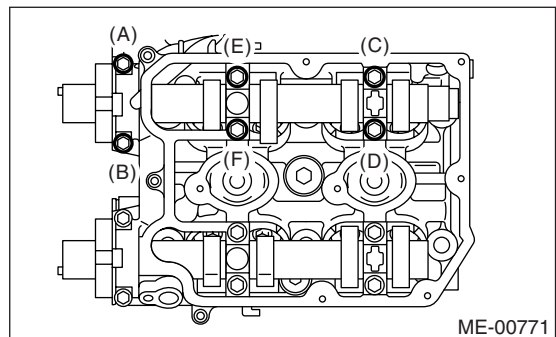


- 10) Remove the spark plug cord.
- 11) Remove the oil level gauge guide. (LH side)
- 12) Remove the rocker cover and gasket.
- 13) Remove the oil pipe.



- (A) Union screw with filter (with protrusion)
- (B) Union screw without filter (without protrusion)
- (C) Oil pipe

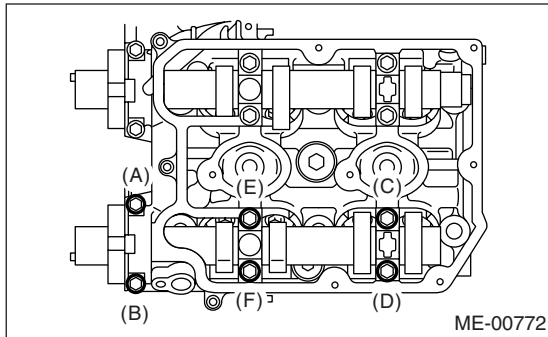
- 14) Loosen the oil flow control solenoid valve assembly and intake camshaft cap bolts equally, a little at a time in alphabetical sequence shown in the figure.



Camshaft

MECHANICAL

15) Loosen the exhaust camshaft cap bolts equally, a little at a time in alphabetical sequence shown in the figure.



16) Remove the oil flow control solenoid valve assembly, intake camshaft cap, and camshaft.

17) Remove the exhaust camshaft cap and camshaft.

NOTE:

Arrange the camshaft caps in order so that they can be installed in their original positions.

18) Similarly, remove the camshafts (RH) and related parts.

B: INSTALLATION

1) Camshaft installation

Apply engine oil to the cylinder head at camshaft bearing installing location before installing the camshaft. Install the camshaft so that each valve is close to or in contact with “base circle” of cam lobe.

NOTE:

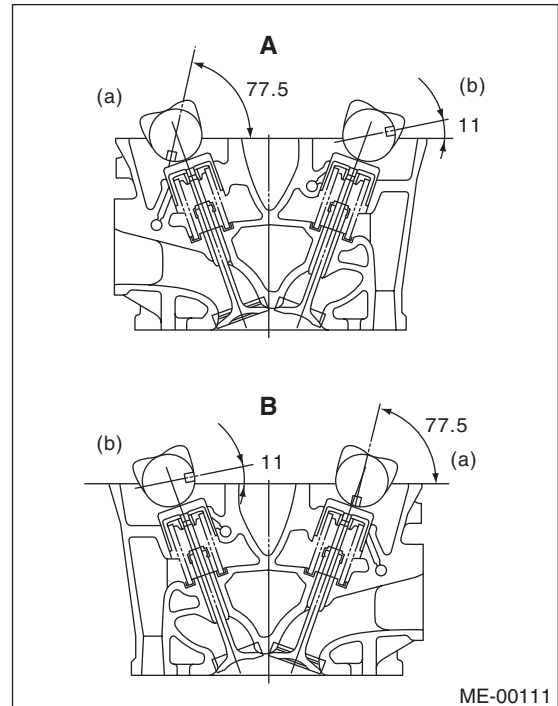
- When the camshafts are positioned as shown in the figure, camshaft (LH) needs to be rotated at a minimum to align with the timing belt during installation.
- Camshaft (RH) need not be rotated when set at the position shown in the figure.

Intake camshaft (LH):

Rotate 80° clockwise.

Exhaust camshaft (LH):

Rotate 45° counterclockwise.



A Cylinder head (LH)

B Cylinder head (RH)

(a) Intake camshaft

(b) Exhaust camshaft

2) Camshaft cap and oil flow control solenoid valve assembly installation

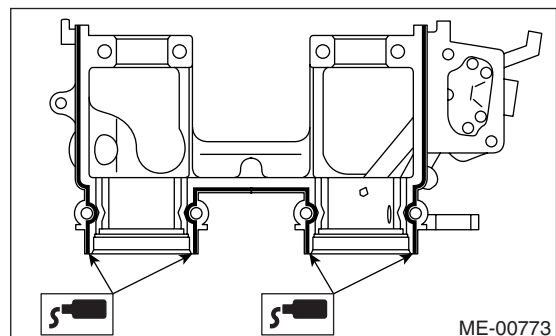
- (1) Apply small amount of liquid gasket to the cap mating surface.

NOTE:

Do not apply liquid gasket excessively. Otherwise, the excessive liquid gasket may come out and flow toward oil seal, resulting in oil leaks.

Liquid gasket:

THREE BOND 1215 (Part No. 004403007) or equivalent



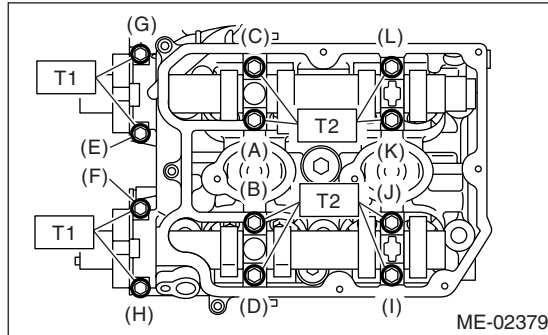
(2) Apply engine oil to the cap bearing surface, and install the cap on camshaft as shown by identification mark.

(3) Gradually tighten the camshaft cap and oil control valve assembly in at least two stages in alphabetical sequence shown in the figure, and then tighten to specified torque.

Tightening torque:

T1: 9.75 N·m (1.0 kgf-m, 7.2 ft-lb)

T2: 20 N·m (2.0 kgf-m, 14.8 ft-lb)



(4) After tightening the camshaft cap, ensure the camshaft rotates only slightly while holding it at "base" circle.

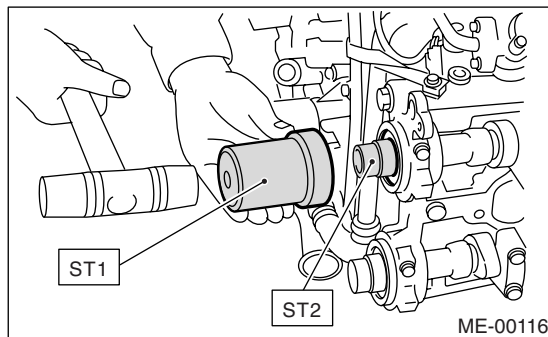
3) Apply engine oil to the outer perimeter and lips of oil seal, and install the oil seal on camshaft using ST1 and ST2.

NOTE:

Use a new oil seal.

ST1 499587600 OIL SEAL GUIDE

ST2 499597200 OIL SEAL GUIDE



4) Rocker cover installation

(1) Install the gasket on rocker cover. Install the peripheral gasket and ignition coil gasket.

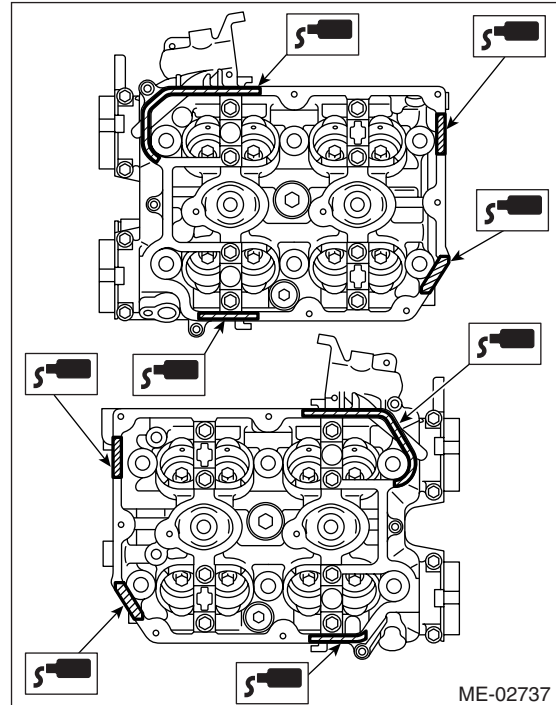
(2) Apply liquid gasket to the designated point of cylinder head.

NOTE:

Apply liquid gasket to the half moon plug portion with sticking out more than 5 mm (0.2 in).

Liquid gasket:

THREE BOND 1215 (Part No. 004403007) or equivalent



(3) Install the rocker cover on cylinder head. Ensure the gasket is properly positioned during installation.

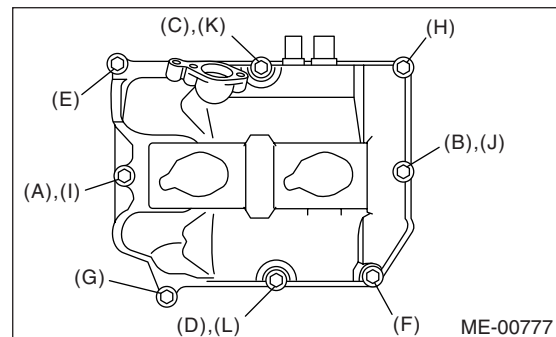
CAUTION:

Use a new rocker cover gasket.

(4) Tighten the rocker cover tightening bolts in alphabetical sequence shown in the figure, and then tighten to specified torque.

Tightening torque:

6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

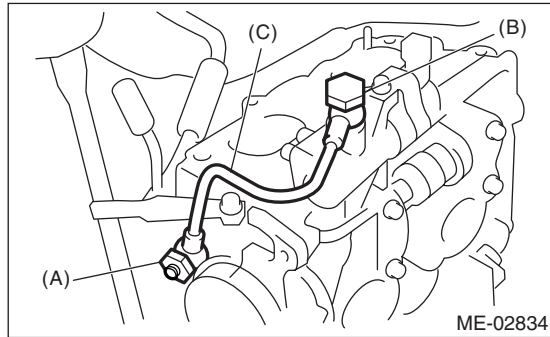


5) Install the oil pipe.

NOTE:

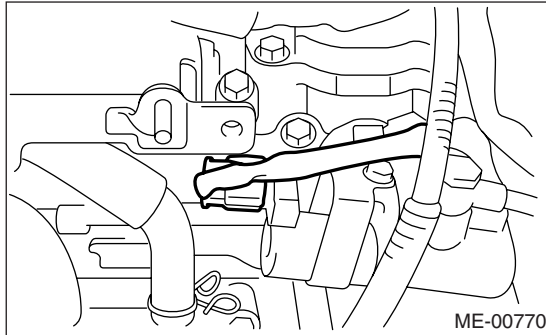
Installing location of the union screw varies depending on with or without filter. Be careful of this.

Tightening torque:
29 N·m (3.0 kgf-m, 21.4 ft-lb)



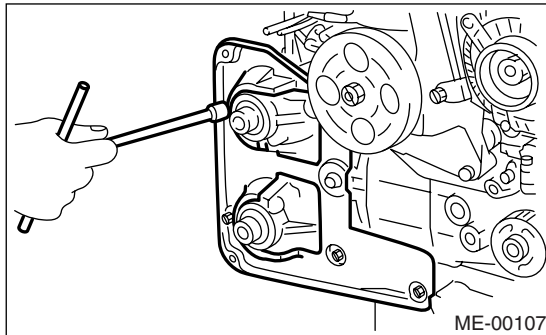
- (A) Union screw with filter (with protrusion)
- (B) Union screw without filter (without protrusion)
- (C) Oil pipe

6) Connect the oil flow control solenoid valve connector.



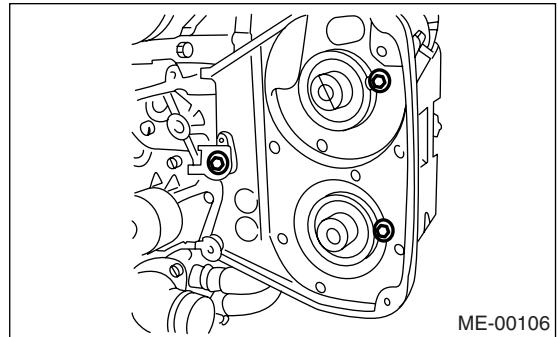
- 7) Similarly, install the parts on RH side.
- 8) Install the timing belt cover No. 2 (RH).

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)



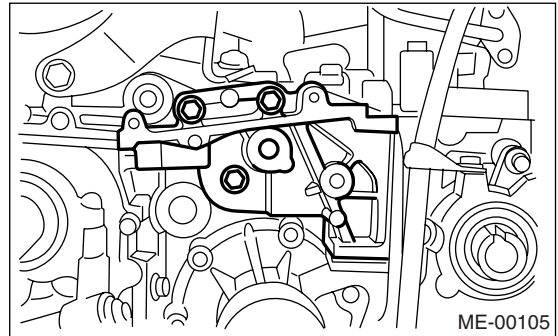
9) Install the timing belt cover No. 2 (LH).

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)



10) Install the tensioner bracket.

Tightening torque:
24.5 N·m (2.5 kgf-m, 18.1 ft-lb)



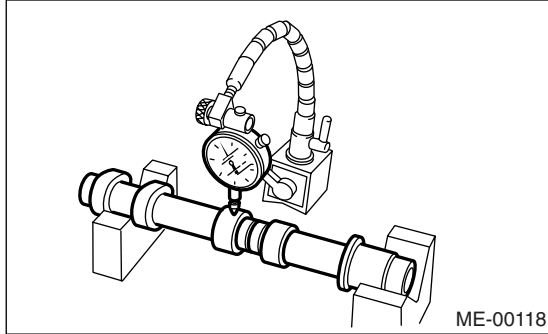
- 11) Install the cam sprocket.
 <Ref. to ME(H4DOTC)-53, INSTALLATION, Cam Sprocket.>
- 12) Install the timing belt. <Ref. to ME(H4DOTC)-46, INSTALLATION, Timing Belt.>
- 13) Install the timing belt cover.
 <Ref. to ME(H4DOTC)-44, INSTALLATION, Timing Belt Cover.>
- 14) Install the crank pulley.
 <Ref. to ME(H4DOTC)-43, INSTALLATION, Crank Pulley.>
- 15) Install the V-belt. <Ref. to ME(H4DOTC)-41, 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 within standard, check the oil clearance.

	Camshaft journal	
	Front	Center, rear
Standard mm (in)	37.946 — 37.963 (1.4939 — 1.4946)	29.946 — 29.963 (1.1790 — 1.1796)

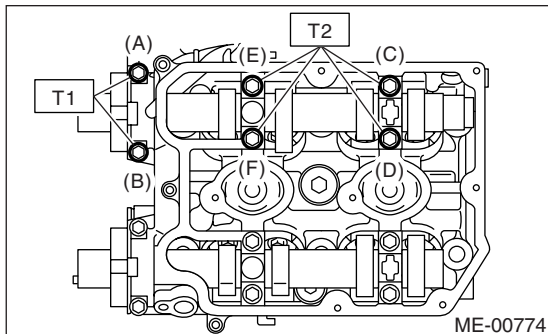
4) Measurement of the camshaft journal oil clearance

- (1) Clean the bearing caps and camshaft journals.
- (2) Place the camshafts on cylinder head. (Without installing the valve rocker.)
- (3) Place a plastigauge across each of the camshaft journals.
- (4) Gradually tighten the cap in at least two stages in alphabetical sequence shown in the figure, and then tighten to specified torque. Do not turn the camshaft.

Tightening torque:

T1: 9.75 N·m (1.0 kgf-m, 7.2 ft-lb)

T2: 20 N·m (2.0 kgf-m, 14.8 ft-lb)



(5) Remove the bearing caps.

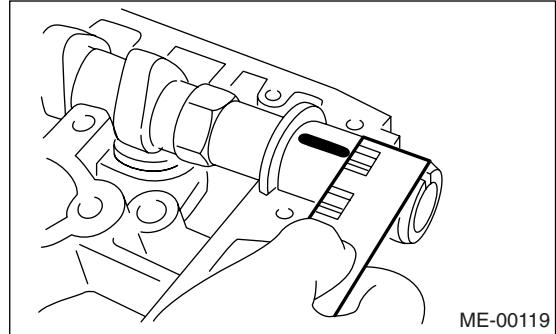
(6) Measure the widest point of the plastigauge on each journal. If the oil clearance exceeds the limit, replace the camshaft. If necessary, replace the camshaft caps and cylinder head as a set.

Standard:

0.037 — 0.072 mm (0.0015 — 0.0028 in)

Limit:

0.10 mm (0.0039 in)



(7) Completely remove the plastigauge.

5) Check the cam face condition, and remove the minor faults by grinding with oil stone. Measure the cam height H. If it exceeds the limit or offset wear occurs, replace the camshaft.

Cam height H:

Standard

Intake

46.55 — 46.65 mm (1.833 — 1.837 in)

Exhaust

46.75 — 46.85 mm (1.841 — 1.844 in)

Limit

Intake

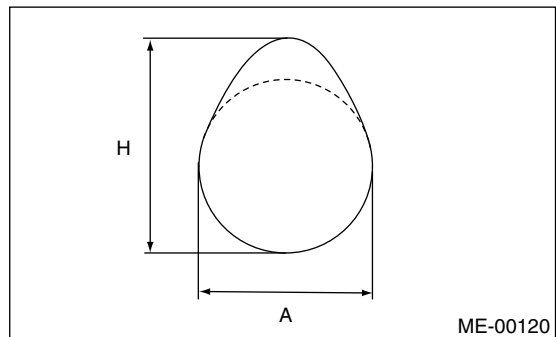
46.45 mm (1.829 in)

Exhaust

46.65 mm (1.837 in)

Cam base circle diameter A:

37.0 mm (1.457 in)



6) Measure the thrust clearance of camshaft with dial gauge. If the thrust clearance exceeds the limit or offset wear occurs, replace the caps and cylinder head as a set. If necessary, replace the camshaft.

Camshaft

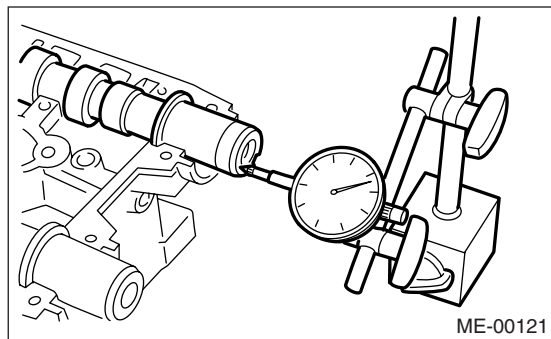
MECHANICAL

Standard:

0.068 — 0.116 mm (0.0027 — 0.0046 in)

Limit:

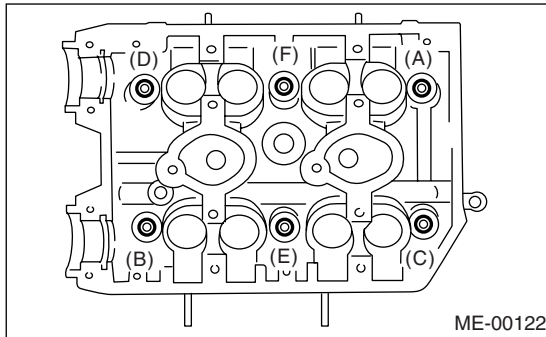
0.14 mm (0.0055 in)



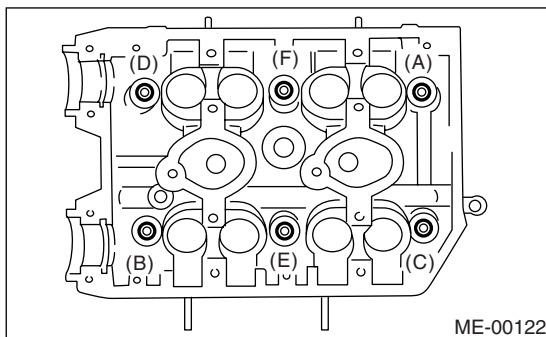
19. Cylinder Head

A: REMOVAL

- 1) Remove the V-belt. <Ref. to ME(H4DOTC)-41, REMOVAL, V-belt.>
- 2) Remove the crank pulley.
<Ref. to ME(H4DOTC)-43, REMOVAL, Crank Pulley.>
- 3) Remove the timing belt cover.
<Ref. to ME(H4DOTC)-44, REMOVAL, Timing Belt Cover.>
- 4) Remove the timing belt.
<Ref. to ME(H4DOTC)-45, REMOVAL, Timing Belt.>
- 5) Remove the cam sprockets.
<Ref. to ME(H4DOTC)-53, REMOVAL, Cam Sprocket.>
- 6) Remove the intake manifold.
<Ref. to FU(H4DOTC)-14, REMOVAL, Intake Manifold.>
- 7) Remove the bolt which installs the A/C compressor bracket on cylinder head.
- 8) Remove the camshaft. <Ref. to ME(H4DOTC)-55, REMOVAL, Camshaft.>
- 9) Remove the cylinder head bolts in alphabetical sequence shown in the figure.
Leave bolts (A) and (D) engaged by three or four threads to prevent the cylinder head from falling.



- 10) While tapping the cylinder head with a plastic hammer, separate it from cylinder block. Remove the bolts (A) and (D) to remove cylinder head.



- 11) Remove the cylinder head gasket.

CAUTION:

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

- 12) Similarly, remove the cylinder head (RH).

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.
 - (3) Tighten all bolts to 69 N·m (7.0 kgf-m, 51 ft-lb) in alphabetical sequence again.
 - (4) Back off all bolts by 180° first; back them off by 180° again in reverse order of installation.
 - (5) Tighten all bolts to 49 N·m (5.0 kgf-m, 36 ft-lb) in alphabetical sequence.
 - (6) Tighten all bolts 80 to 90° in alphabetical sequence.
 - (7) Tighten all bolts by 40 to 45° in alphabetical sequence again.

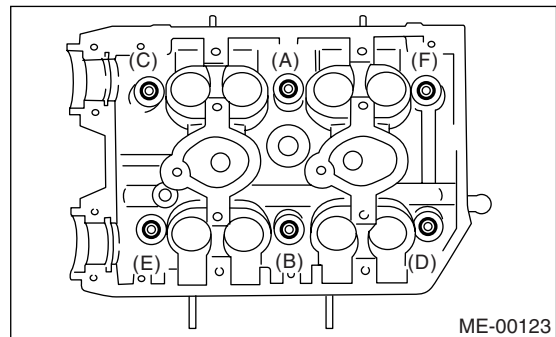
CAUTION:

Do not tighten the bolts by more than 45°.

- (8) Further tighten all bolts (A) and (B) by 40 to 45°.

CAUTION:

Ensure that the total “re-tightening angle” in the previous two steps do not exceed 90°.



- 3) Install the camshaft. <Ref. to ME(H4DOTC)-56, INSTALLATION, Camshaft.>
- 4) Install the A/C compressor bracket on cylinder head.
- 5) Install the intake manifold.
<Ref. to FU(H4DOTC)-17, INSTALLATION, Intake Manifold.>

Cylinder Head

MECHANICAL

- 6) Install the cam sprocket.
<Ref. to ME(H4DOTC)-53, INSTALLATION, Cam Sprocket.>
- 7) Install the timing belt.
<Ref. to ME(H4DOTC)-46, INSTALLATION, Timing Belt.>
- 8) Install the timing belt cover.
<Ref. to ME(H4DOTC)-44, INSTALLATION, Timing Belt Cover.>
- 9) Install the crank pulley.
<Ref. to ME(H4DOTC)-43, INSTALLATION, Crank Pulley.>
- 10) Install the V-belt. <Ref. to ME(H4DOTC)-41, INSTALLATION, V-belt.>

C: DISASSEMBLY

- 1) Remove the valve lifters.
- 2) Compress the valve spring and remove the valve spring retainer key. Remove each valve and valve spring.

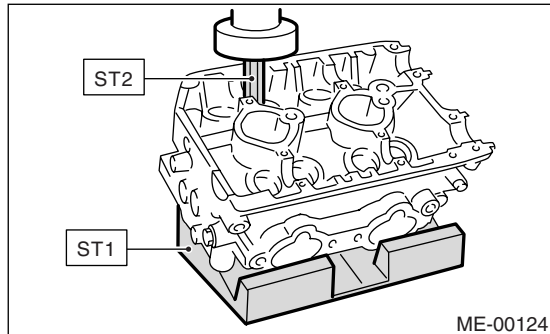
ST1 498267600 CYLINDER HEAD TABLE
ST2 499718000 VALVE SPRING REMOVER

NOTE:

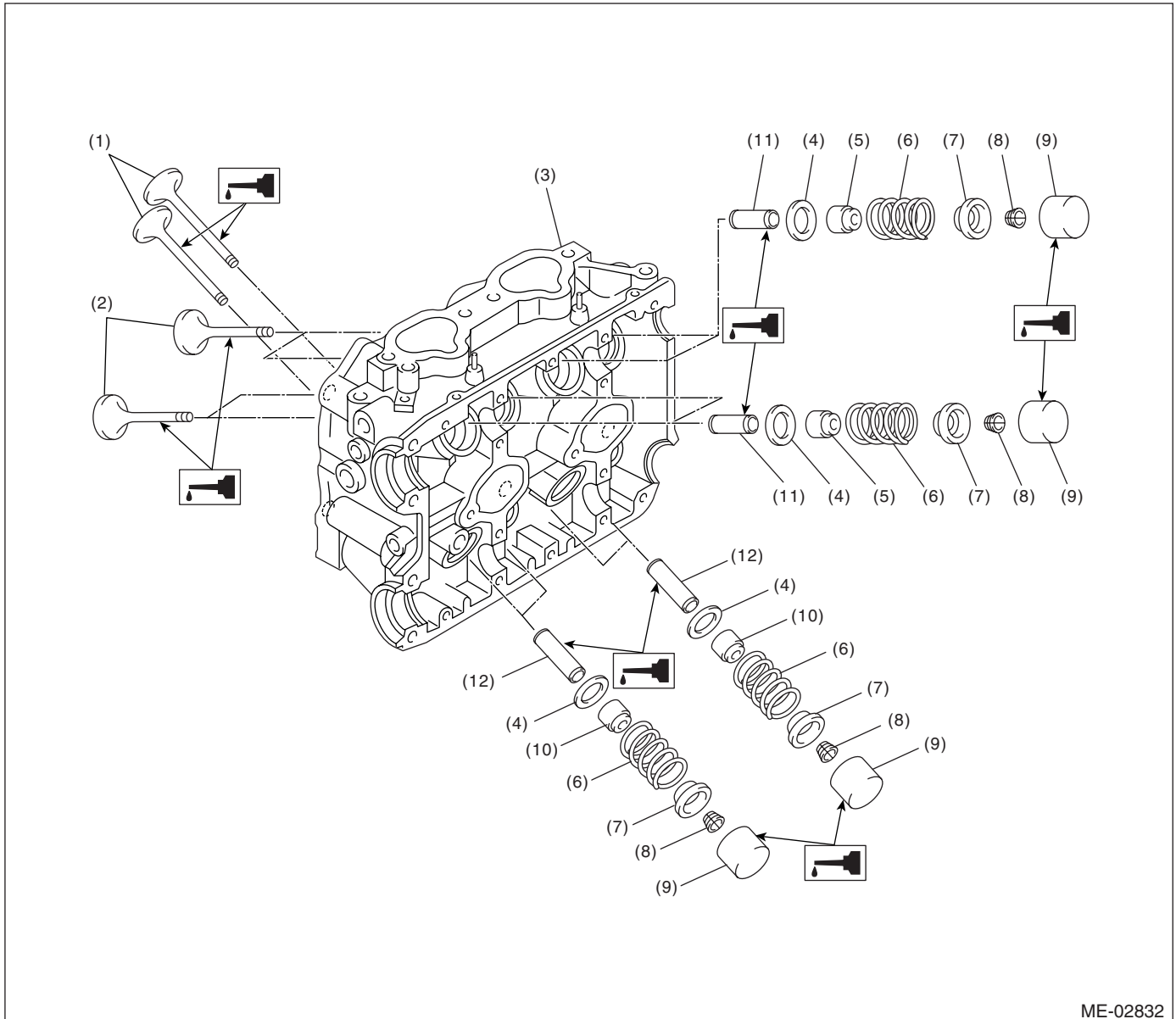
Keep the removed parts in order for re-installing in their original positions.

CAUTION:

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



D: ASSEMBLY



ME-02832

(1) Exhaust valve	(5) Intake valve oil seal	(9) Valve lifter
(2) Intake valve	(6) Valve spring	(10) Exhaust valve oil seal
(3) Cylinder head	(7) Retainer	(11) Intake valve guide
(4) Valve spring seat	(8) Retainer key	(12) Exhaust valve guide

1) Installation of valve spring and valve:

- (1) Coat the stem of each valve with engine oil and insert the valve into valve guide.

NOTE:

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

- (2) Set the cylinder head on ST1.

- (3) Install the valve spring and retainer using ST2.

ST1 498267600 CYLINDER HEAD TABLE

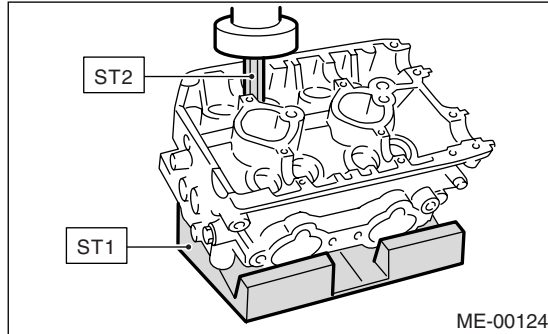
ST2 499718000 VALVE SPRING REMOVER

Cylinder Head

MECHANICAL

NOTE:

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



(4) Compress the valve spring, and then fit the valve spring retainer key.

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

2) Apply oil to the surface of the valve lifter.

3) Install the valve lifter.

E: INSPECTION

1. CYLINDER HEAD

1) Make sure that no crack or other damage exists. In addition to visual inspection, inspect the important areas by means of liquid penetrant tester.

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 0.035 mm (0.0014 in), re-grind the surface with a surface grinder.

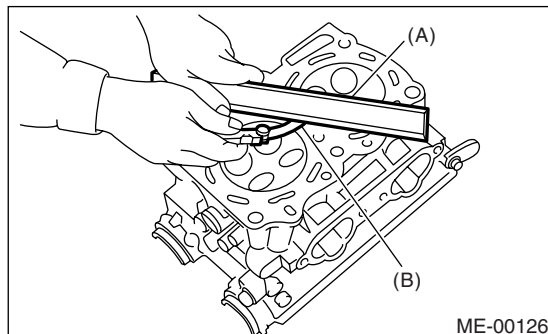
Warping limit:
0.035 mm (0.0014 in)

Grinding limit:
0.3 mm (0.012 in)

Standard height of cylinder head:
127.5 mm (5.02 in)

NOTE:

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



2. VALVE SEAT

Inspect the intake and exhaust valve seats, and then correct the contact surfaces with valve seat cutter if they are defective or when valve guides are replaced.

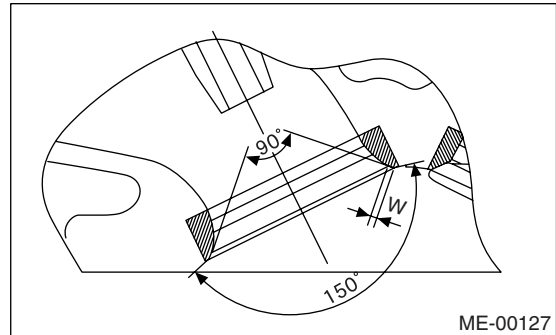
Valve seat contact width W:

Intake

Standard 0.6 — 1.4 mm (0.024 — 0.055 in)
Limit 1.7 mm (0.067 in)

Exhaust

Standard 1.2 — 1.8 mm (0.047 — 0.071 in)
Limit 2.2 mm (0.087 in)



3. VALVE GUIDE

1) Check the clearance between valve guide and stem. The clearance can be checked by measuring the outside diameter of valve stem and the inside diameter of valve guide with outside and inside micrometers respectively.

Clearance between the valve guide and valve stem:

Standard

Intake

0.030 — 0.057 mm (0.0012 — 0.0022 in)

Exhaust

0.040 — 0.067 mm (0.0016 — 0.0026 in)

Limit

0.15 mm (0.0059 in)

2) If the clearance between valve guide and stem exceeds the standard value, replace the valve guide or valve itself whichever shows greater amount of wear. See the following procedure for valve guide replacement.

Valve guide inner diameter:

6.000 — 6.012 mm (0.2362 — 0.2367 in)

Valve stem outer diameters:

Intake

5.955 — 5.970 mm (0.2344 — 0.2350 in)

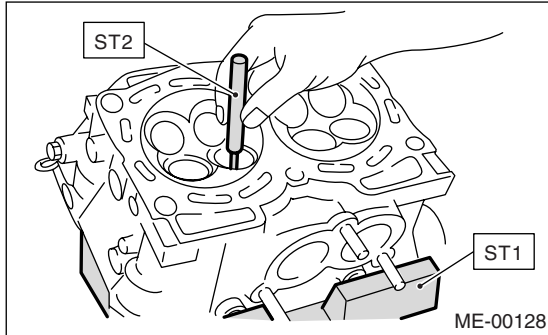
Exhaust

5.945 — 5.960 mm (0.2341 — 0.2346 in)

(1) Place the cylinder head on ST1 with the combustion chamber upward so that valve guides enter the holes in ST1.

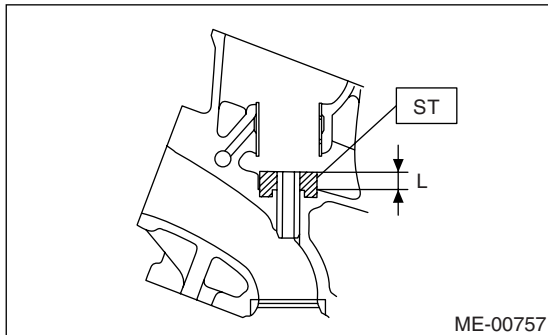
(2) Insert the ST2 into valve guide and press it down to remove the valve guide.

ST1 498267600 CYLINDER HEAD TABLE
ST2 499767200 VALVE GUIDE REMOVER



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

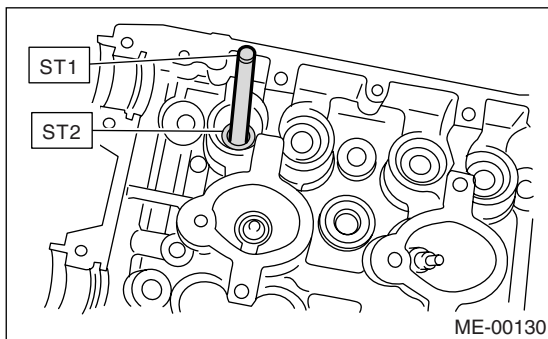
ST 18251AA020 VALVE GUIDE ADJUSTER



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

(5) Put a new valve guide, coated with sufficient oil, in cylinder, and insert ST1 into valve guide. Press in until the valve guide upper end is flush with the upper surface of ST2.

ST1 499767200 VALVE GUIDE REMOVER
ST2 18251AA020 VALVE GUIDE ADJUSTER



(6) Check the valve guide protrusion.

Valve guide protrusion L:

15.8 — 16.2 mm (0.622 — 0.638 in)

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

ST 499767400 VALVE GUIDE REAMER

NOTE:

- Apply engine oil to the reamer when reaming.
- If the inner surface of the valve guide is torn, the edge of the reamer should be slightly ground with an oil stone.
- If the inner surface of the valve guide becomes lustrous and the reamer does not 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 exceeds the standard value.

H:

Intake (A)

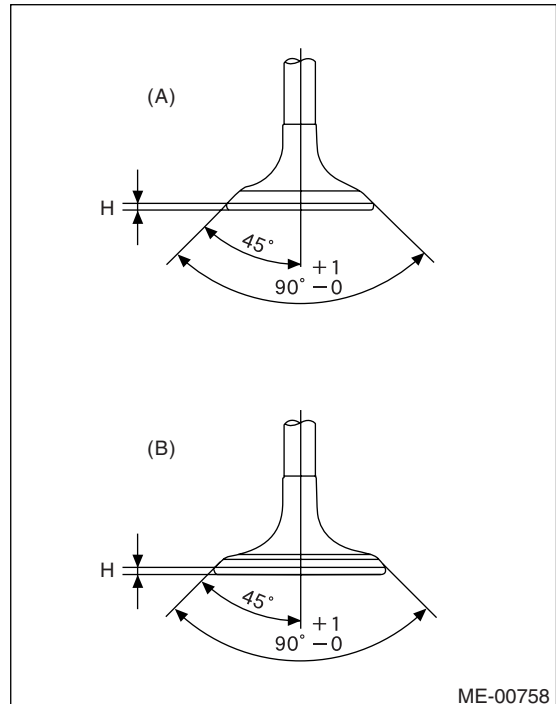
Standard 1.0 — 1.4 mm (0.039 — 0.055 in)

Limit 0.8 mm (0.031 in)

Exhaust (B)

Standard 1.3 — 1.7 mm (0.051 — 0.067 in)

Limit 0.8 mm (0.031 in)



Cylinder Head

MECHANICAL

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.

NOTE:

- Replace the valve oil seal with new one after lapping.
- Intake valve and exhaust valve can be identified by their overall length.

Valve overall length:

Intake (A)

104.4 mm (4.110 in)

Exhaust (B)

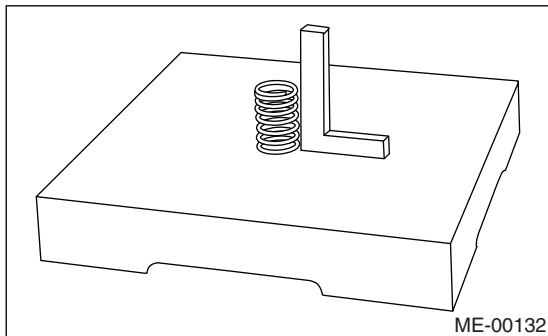
104.65 mm (4.120 in)

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		47.32 mm (1.863 in)
Tension/spring height	Set	205 — 235 N (20.9 — 24.0 kgf, 46.1 — 52.8 lbf)/36.0 mm (1.417 in)
	Lift	426 — 490 N (43.4 — 50.0 kgf, 95.8 — 110 lbf)/26.50 mm (1.043 in)
Squareness		2.5°, 2.1 mm (0.083 in) or less



6. INTAKE AND EXHAUST VALVE OIL SEAL

In the following case, pinch and remove the oil seal from valve using pliers, and then replace it with a new one.

- When the lip is damaged.
- When the spring is out of the specified position.
- When readjusting the surfaces of intake valve and valve sheet.
- When replacing the intake valve guide.

- 1) Place the cylinder head on ST1.
- 2) Using ST2, press-fit the oil seal.

CAUTION:

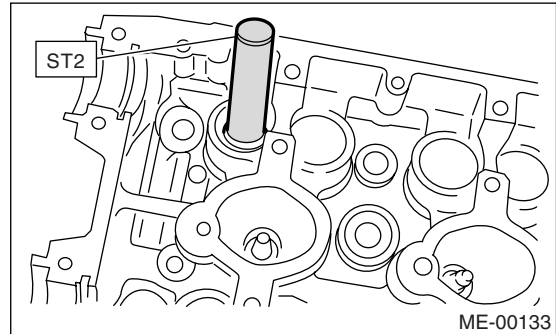
- Apply engine oil to oil seal before press-fitting.
- When press-fitting the oil seal, do not use a hammer or strike in.
- Differentiate between the intake valve oil seal and exhaust valve oil seal by noting their difference in color.

ST1 498267600 CYLINDER HEAD TABLE

ST2 498857100 VALVE OIL SEAL GUIDE

Color of rubber part:

Intake [Gray] Exhaust [Green]

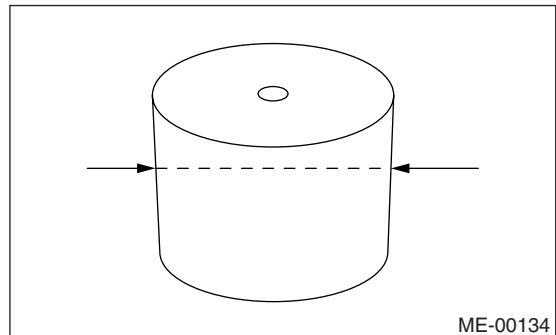


7. VALVE LIFTER

- 1) Visually check the valve lifter.
- 2) Measure the outer diameter of valve lifter.

Outer diameter:

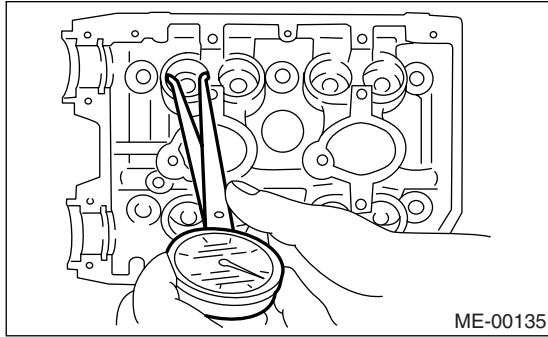
34.959 — 34.975 mm (1.3763 — 1.3770 in)



- 3) Measure the inner diameter of valve lifter mating part on cylinder head.

Inner diameter:

34.994 — 35.016 mm (1.3777 — 1.3786 in)



NOTE:

If difference between outer diameter of valve lifter and inner diameter of valve lifter mating part is over the standard, replace the cylinder head.

Standard:

0.019 — 0.057 mm (0.0007 — 0.0022 in)

Limit:

0.100 mm (0.0039 in)

F: DISPOSAL

CAUTION:

- Metallic sodium is enclosed in the exhaust valve. Metallic sodium is extremely alkaline and may produce severe chemical reactions. Full consideration must therefore be given to the following points when handling or disposing of the valve.
- Since metallic sodium may cause blindness if contacted with the eyes, burns if contacted with the skin, and fire, do not deliberately take the valve apart.

If the valve is damaged, remove the valve and neutralize it by immersing it in water, and dispose of it in the same way that general steel materials are disposed of. The disposal method is described in the following.

- 1) Wearing rubber gloves, remove the damaged valve from the cylinder head.
- 2) Prepare a large receptacle (bucket or other container) in a well ventilated location, and fill the receptacle with water (at least 10 liters).
- 3) Immerse the damaged valve in the receptacle.

CAUTION:

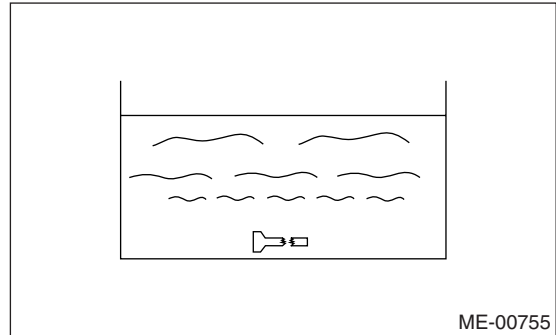
A severe reaction may occur, so stand at least 2 — 3 m from the receptacle. Because the reaction will produce hydrogen gas, moreover, keep the receptacle away from sparks or flames.

4) Once the reaction is completed (about 4 — 5 hours have elapsed), carefully remove the valve using large pincers so that the reaction liquid does not contact your skin, and dispose of it with other parts that are being disposed of.

5) The reaction liquid is a strong alkaline solution, so it must be disposed of in accordance with local regulations.

CAUTION:

Make sure the reaction liquid does not contact your skin. If contact with skin occurs, immediately wash the affected area with large quantities of water.



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(H4DOTC)-14, REMOVAL, Intake Manifold.>

2) Remove the V-belt. <Ref. to ME(H4DOTC)-41, REMOVAL, V-belt.>

3) Remove the crank pulley.

<Ref. to ME(H4DOTC)-43, REMOVAL, Crank Pulley.>

4) Remove the timing belt cover.

<Ref. to ME(H4DOTC)-44, REMOVAL, Timing Belt Cover.>

5) Remove the timing belt.

<Ref. to ME(H4DOTC)-45, REMOVAL, Timing Belt.>

6) Remove the cam sprockets.

<Ref. to ME(H4DOTC)-53, REMOVAL, Cam Sprocket.>

7) Remove the crank sprocket.

<Ref. to ME(H4DOTC)-54, REMOVAL, Crank Sprocket.>

8) Remove the generator and A/C compressor with their brackets.

9) Remove the cylinder head.

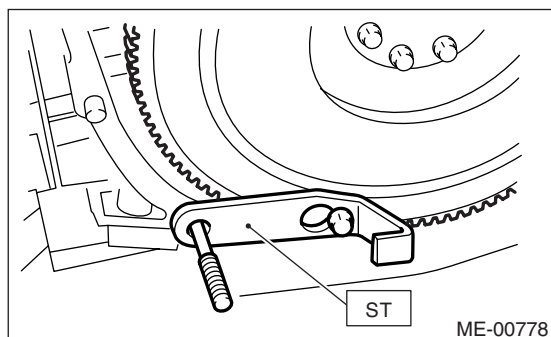
<Ref. to ME(H4DOTC)-61, REMOVAL, Cylinder Head.>

10) Remove the clutch disc and cover. (MT model)
<Ref. to CL-14, REMOVAL, Clutch Disc and Cover.>

11) Remove the flywheel. (MT model)

<Ref. to CL-17, REMOVAL, Flywheel.>

ST 498497100 CRANKSHAFT STOPPER



12) Remove the oil separator cover.

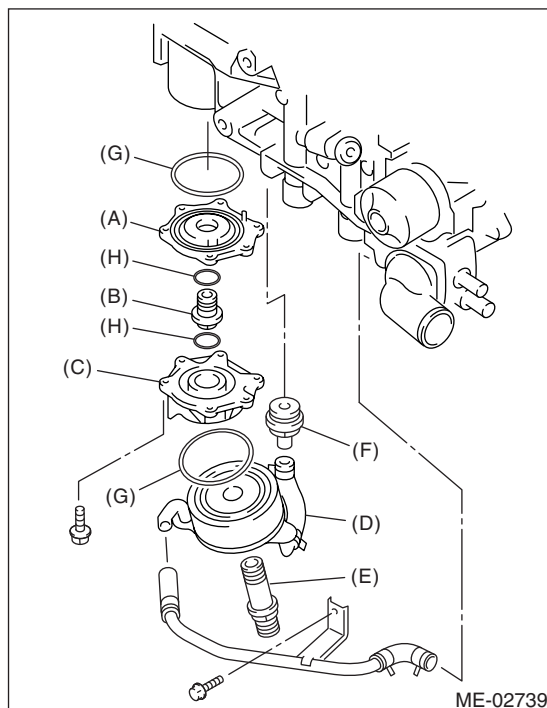
13) Remove the water by-pass pipe for heater.

14) Remove the oil filter.

ST 18332AA010 OIL FILTER WRENCH (Outer diameter: 65 mm (2.56 in))

ST 18332AA000 OIL FILTER WRENCH (Outer diameter: 68 mm (2.68 in))

15) Remove the oil cooler.



- (A) Adapter A
- (B) Adapter connector
- (C) Adapter B
- (D) Oil cooler
- (E) Oil cooler connector
- (F) Plug
- (G) Gasket
- (H) O-ring

16) Remove the water pump.

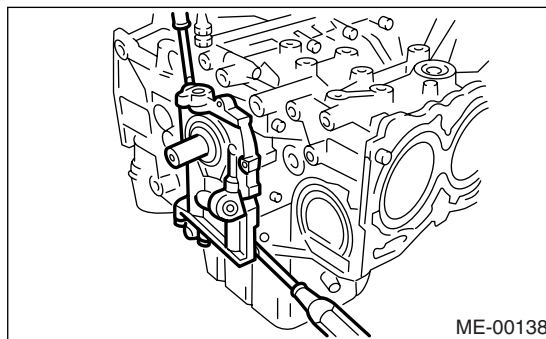
17) Remove the oil pump from cylinder block.

NOTE:

- If disassembling or inspecting the oil pump, loosen the plug of relief valve before removing the oil pump.
- Remove the oil pump from cylinder block. Use a flat tip screwdriver when removing the oil pump.

CAUTION:

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



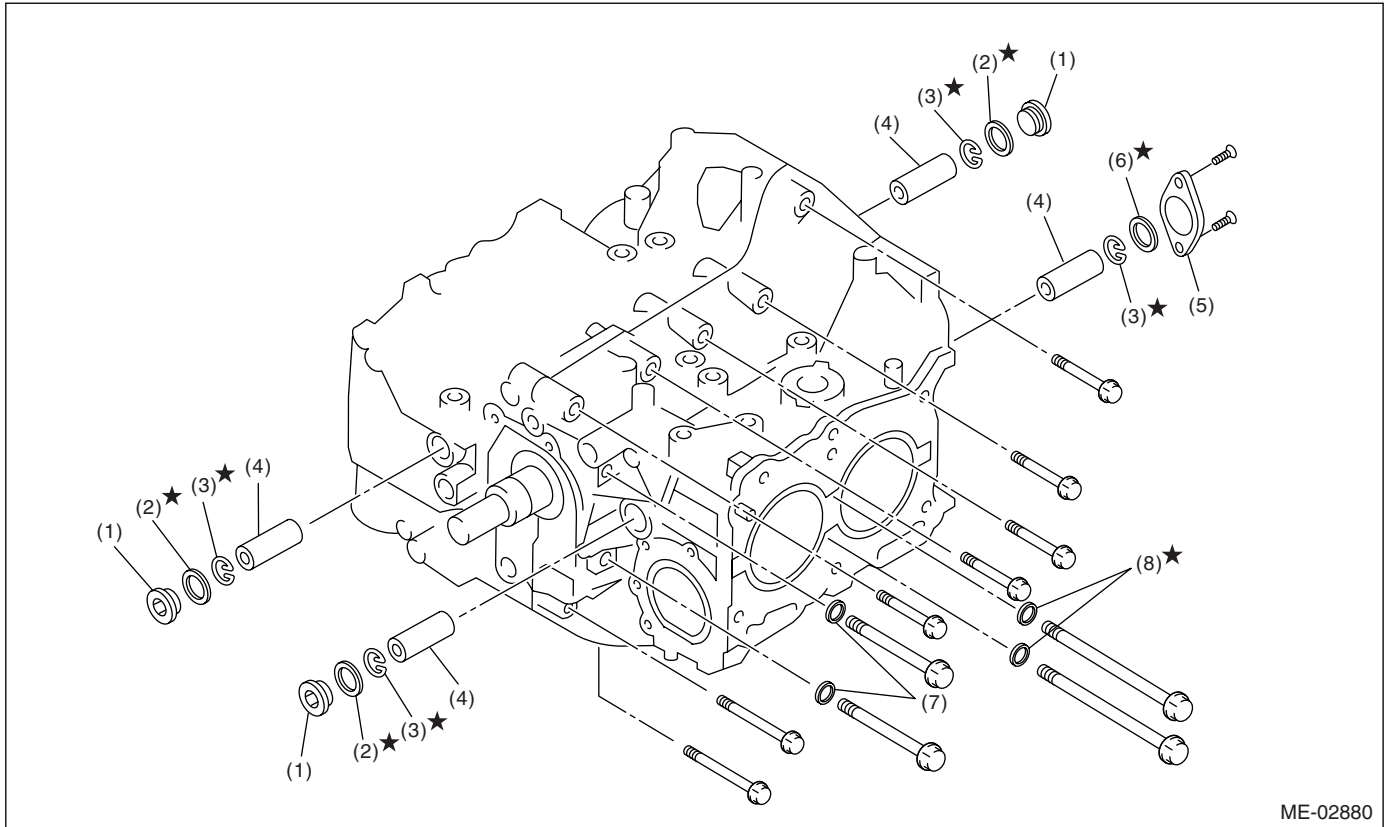
18) Removal of oil pan:

- (1) Turn the cylinder block with #2 and #4 piston sides facing upward.
- (2) Remove the bolts which secure oil pan to cylinder block.
- (3) Insert an oil pan cutter blade between cylinder block-to-oil pan clearance, and then remove the oil pan.

CAUTION:

Do not use a screwdriver or similar tool in place of oil pan cutter.

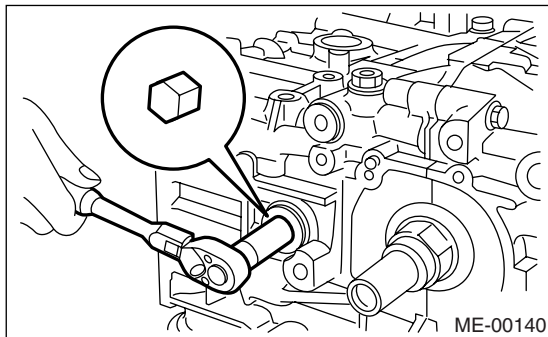
- 19) Remove the oil strainer stay.
- 20) Remove the oil strainer.
- 21) Remove the baffle plate.
- 22) Remove the water pipes.



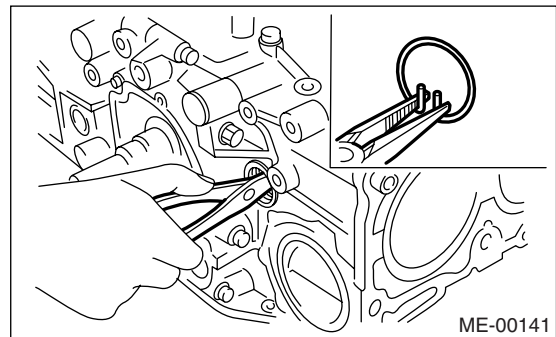
ME-02880

(1) Service hole plug	(4) Piston pin	(7) Washer
(2) Gasket	(5) Service hole cover	(8) Seal washer
(3) Snap ring	(6) O-ring	

23) Remove the service hole cover and service hole plugs using hexagon wrench [14 mm].



24) Rotate the crankshaft to bring #1 and #2 pistons to bottom dead center position, and then remove the piston snap ring through service hole of #1 and #2 cylinders.



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

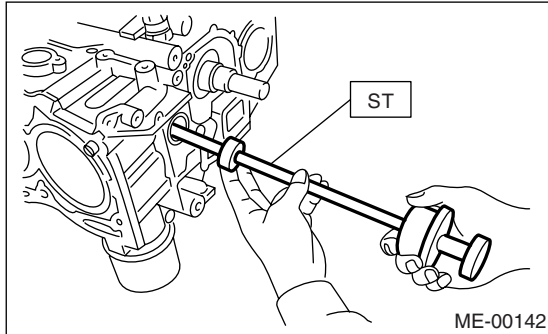
ST 499097700 PISTON PIN REMOVER

Cylinder Block

MECHANICAL

NOTE:

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



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

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

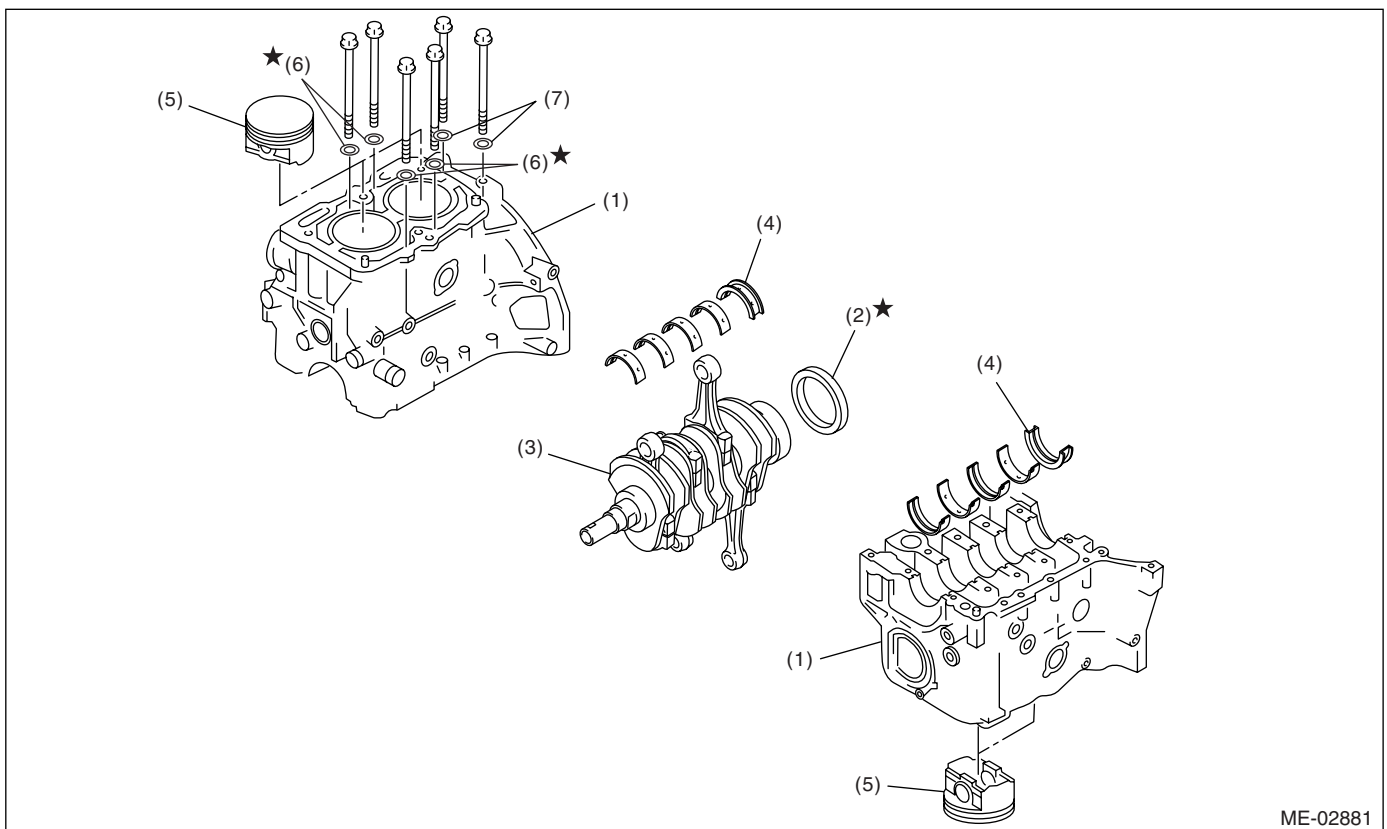
28) Back off the bolts which connect the cylinder block on the side of #1 and #3 cylinders two or three turns.

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

30) Separate the cylinder blocks (LH) and (RH).

NOTE:

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



(1) Cylinder block

(2) Rear oil seal

(3) Crankshaft

(4) Crankshaft bearing

(5) Piston

(6) Seal washer

(7) Washer

31) Remove the rear oil seal.

32) Remove the crankshaft together with connecting rod.

33) Remove the crankshaft bearings from cylinder block using a hammer handle.

NOTE:

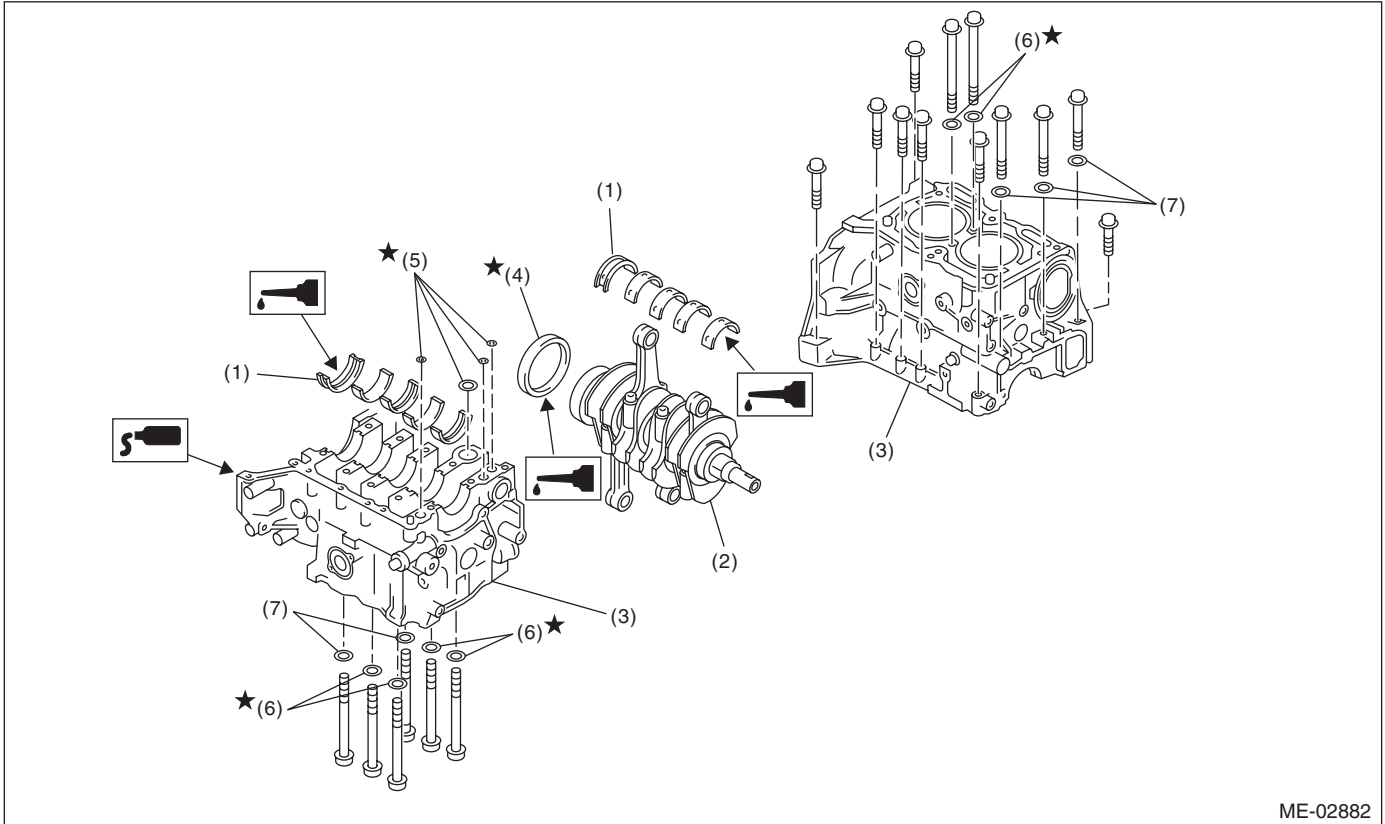
Do not confuse the combination of crankshaft bearings. Press the bearing at the end opposite to locking lip.

34) Draw out each piston from cylinder block using a hammer handle.

NOTE:

Do not confuse the combination of piston and cylinder.

B: INSTALLATION



ME-02882

(1) Crankshaft bearing	(4) Rear oil seal
(2) Crankshaft	(5) O-ring
(3) Cylinder block	(6) Seal washer

- (7) Washer

1) Remove oil in the mating surface of bearing and cylinder block before installation. Also apply engine oil to crankshaft pins.

2) Install the crankshaft bearing to cylinder block, apply engine oil to crankshaft bearing, and position the crankshaft and O-ring on #1 and #3 cylinder block.

3) Apply liquid gasket to the mating surface of #1 and #3 cylinder block, and position #2 and #4 cylinder block.

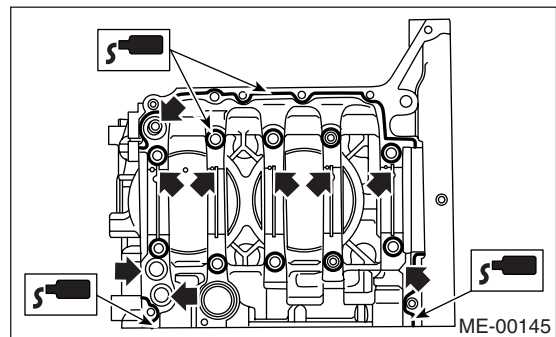
Liquid gasket:

Part No. 004403007

THREE BOND 1215 or equivalent

NOTE:

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

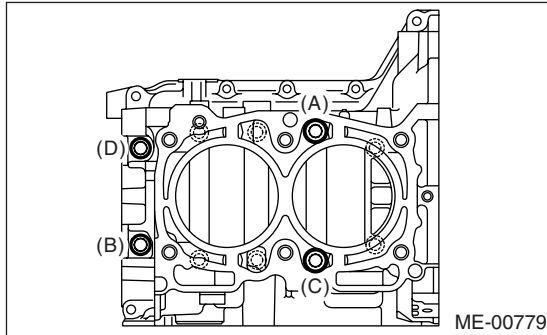


- 4) Apply engine oil to washers and thread of bolts.
5) Tighten the 10 mm cylinder block connecting bolts in alphabetical sequence shown in the figure. (LH side)

Cylinder Block

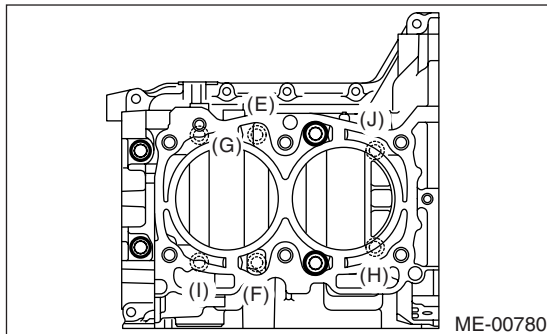
MECHANICAL

Tightening torque:
10 N·m (1.0 kgf-m, 7.4 ft-lb)



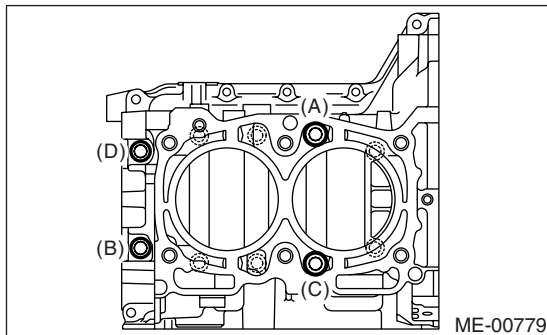
6) Tighten the 10 mm cylinder block connecting bolts in alphabetical sequence shown in the figure. (RH side)

Tightening torque:
10 N·m (1.0 kgf-m, 7.4 ft-lb)



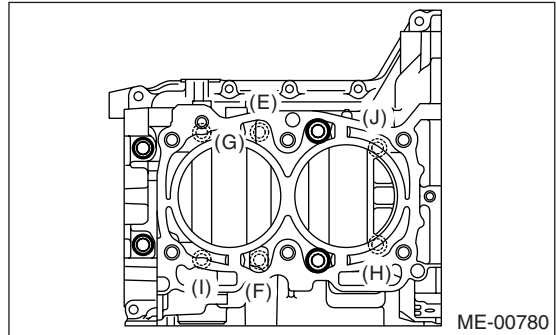
7) Tighten the LH side bolts (A — D) in alphabetical sequence.

Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)

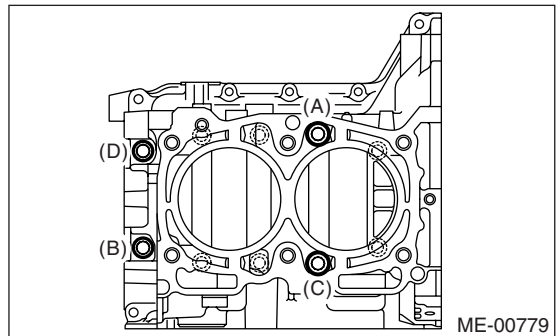


8) Tighten the RH side bolts (E — J) in alphabetical sequence.

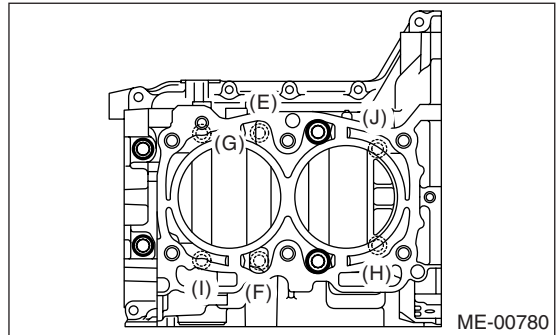
Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)



9) Further tighten the LH side bolts (A — D) in alphabetical sequence, by 90° for (A) and (C), and to 40 N·m (4.1 kgf-m, 29.5 ft-lb) for (B) and (D).



10) Further tighten the RH side bolts (E — J) to 90° in alphabetical sequence.

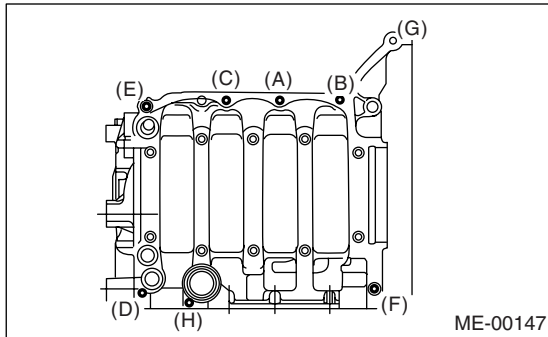


11) Tighten the 8 mm and 6 mm cylinder block connecting bolts in alphabetical sequence shown in the figure.

Tightening torque:

(A)— (G): 25 N·m (2.5 kgf-m, 18.4 ft-lb)

(H): 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



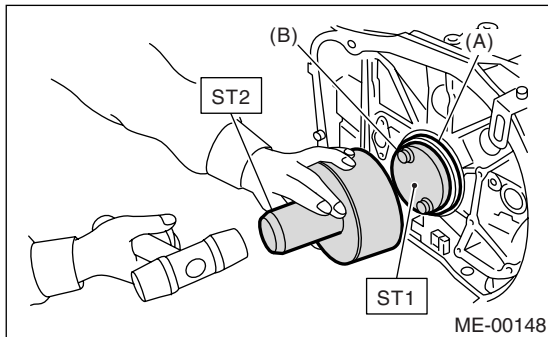
12) Apply engine oil to the outer perimeter of rear oil seal, and install the rear oil seal using ST1 and ST2.

NOTE:

Use a new rear oil seal.

ST1 499597100 CRANKSHAFT OIL SEAL GUIDE

ST2 499587200 CRANKSHAFT OIL SEAL INSTALLER

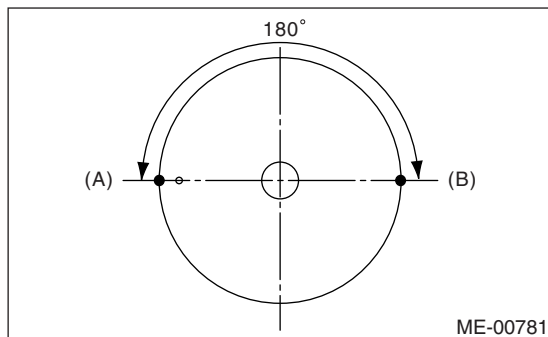


(A) Rear oil seal

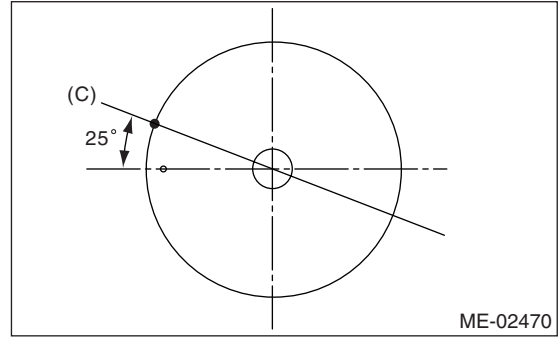
(B) Flywheel attaching bolt

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

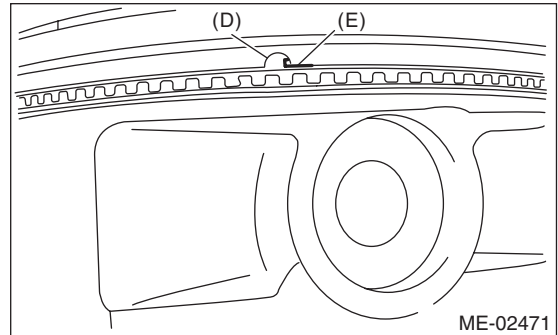
14) Position the second ring gap at 180° on the reverse side for the top ring gap.



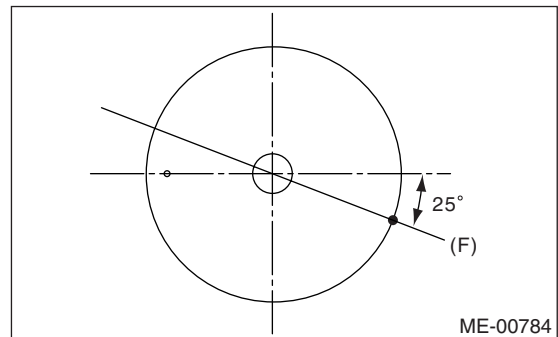
15) Position the upper rail gap at (C) in the figure.



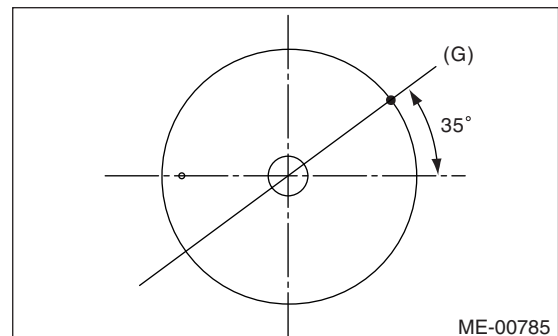
16) Align upper rail spin stopper (E) with piston side surface hole (D).



17) Position the expander gap at (F) in the figure.



18) Position the lower 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.

Cylinder Block

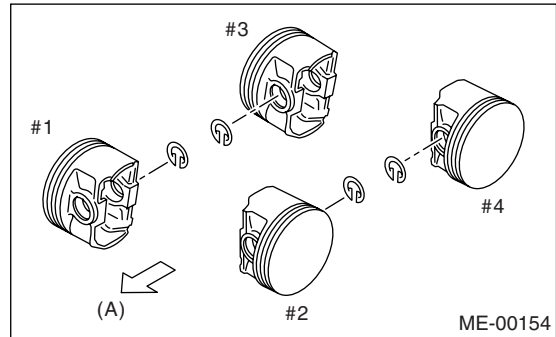
MECHANICAL

19) Install the snap ring.

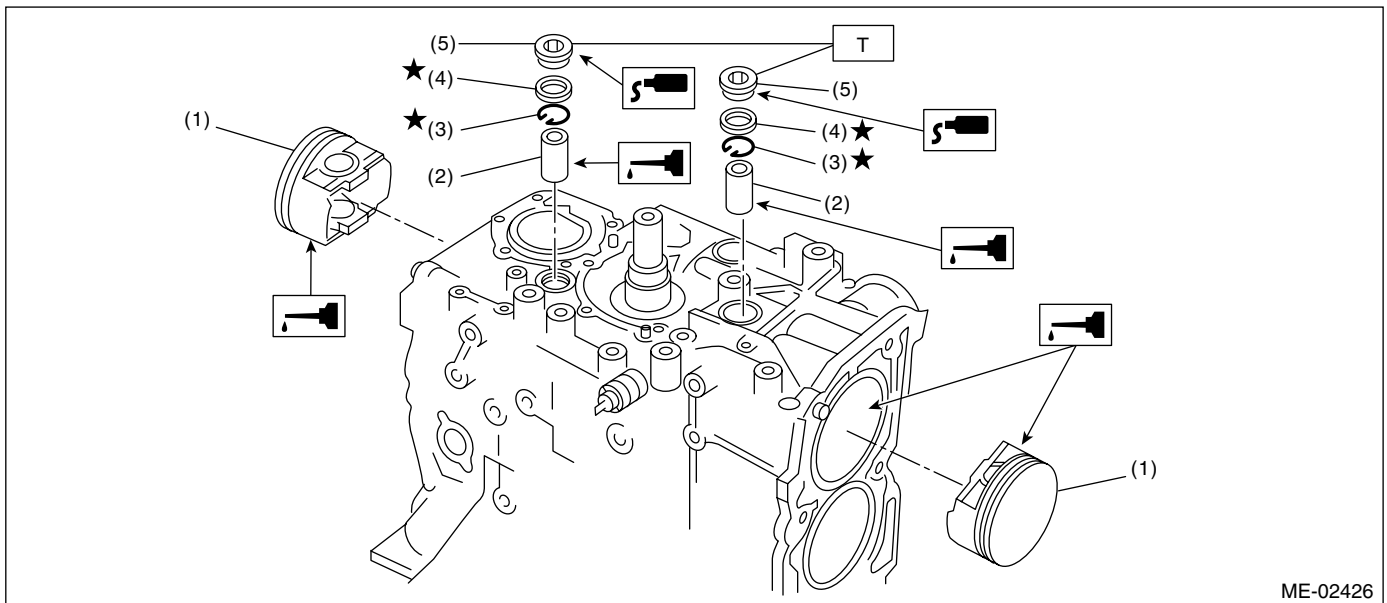
Install the snap rings in piston holes located opposite of service holes in cylinder block, when positioning all pistons in the corresponding cylinders.

NOTE:

Use new snap rings.



(A) Front



(1) Piston	(4) Gasket
(2) Piston pin	(5) Service hole plug
(3) Snap ring	

Tightening torque: N·m (kgf·m, ft·lb)
T: 70 (7.1, 51.6)

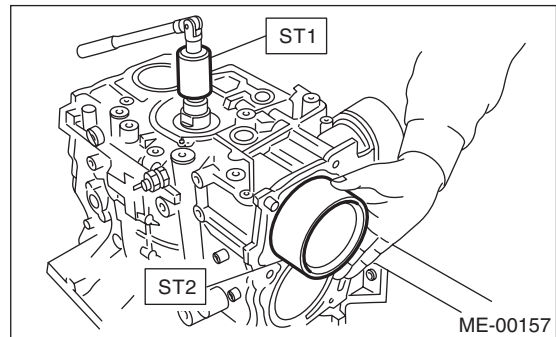
20) Installing the piston

- (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

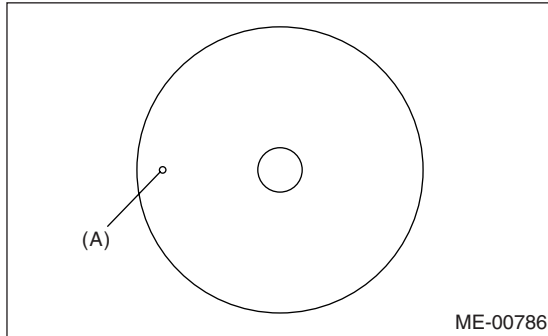
- (3) Apply a coat of engine oil to the pistons and cylinders and insert pistons in their cylinders using ST2.

ST2 498747300 PISTON GUIDE



NOTE:

Piston front mark faces towards the front of the engine.

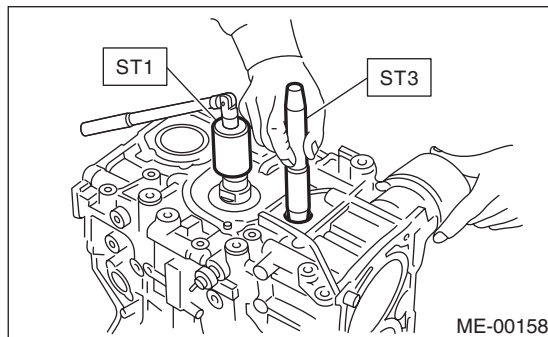


(A) Front mark

21) Installing piston pin

- (1) Apply a coat of engine oil to ST3.
- (2) Insert ST3 into the service hole to align piston pin hole with connecting rod small end.

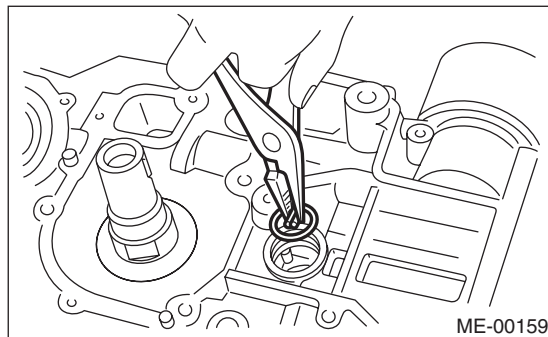
ST3 499017100 PISTON PIN GUIDE



- (3) Apply a coat of engine oil to the piston pin and insert piston pin into piston and connecting rod through service hole.
- (4) Install the snap ring.

NOTE:

Use new snap rings.

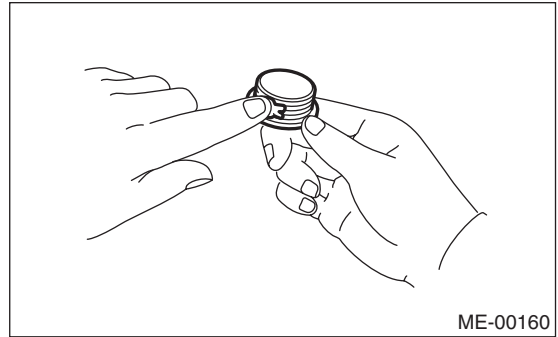


- (5) Apply liquid gasket around the service hole plug.

Liquid gasket:

Part No. 004403010

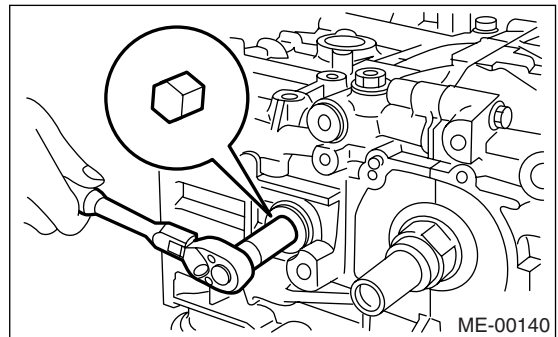
THREE BOND 1105 or equivalent



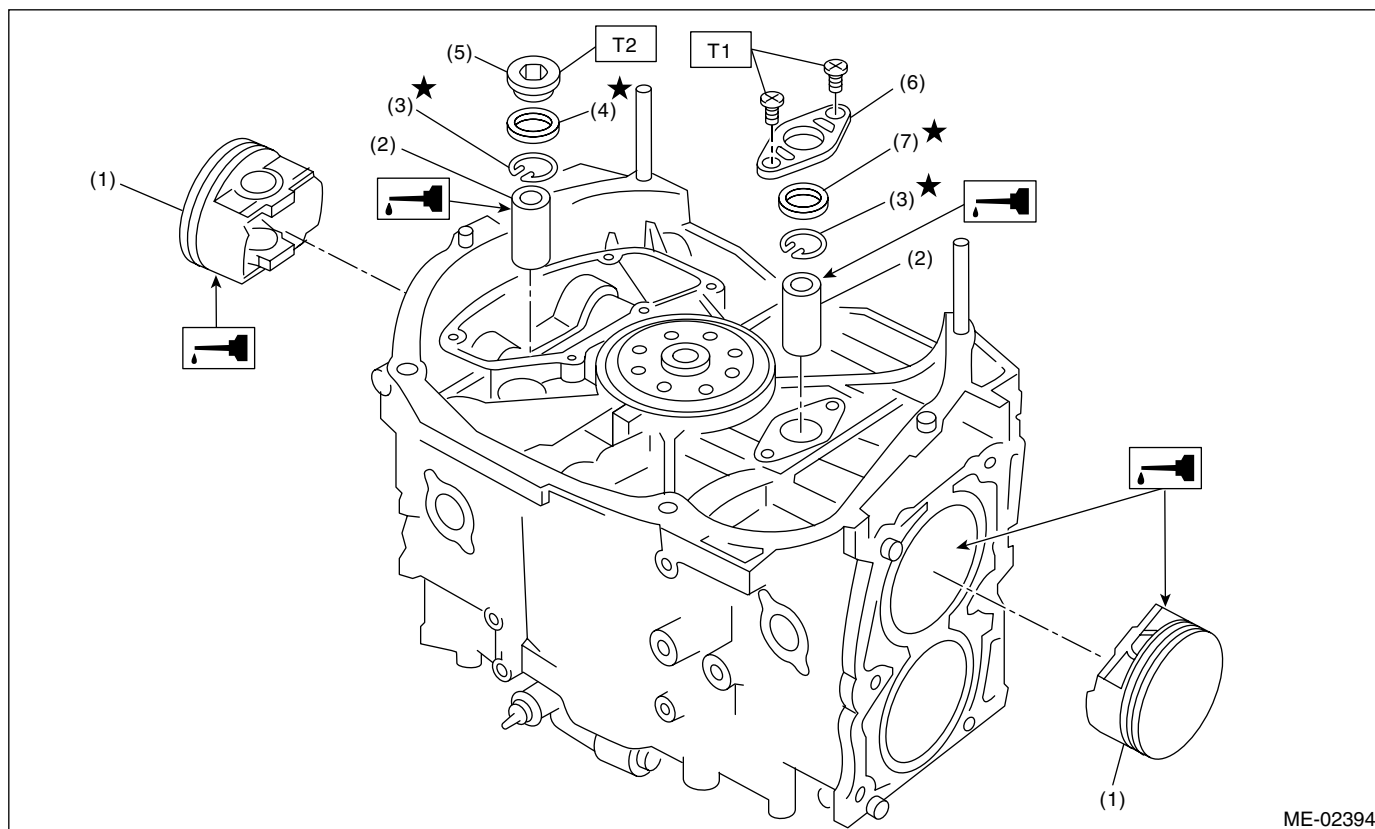
- (6) Install the service hole plug and gasket.

NOTE:

Use a new gasket.



Cylinder Block



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

Tightening torque: N·m (kgf-m, ft-lb)

T1: 6.4 (0.65, 4.7)

T2: 70 (7.1, 51.6)

(7) 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.

22) Install the water pipe.

23) Install the baffle plate.

Tightening torque:

6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

24) Install the oil strainer and O-ring.

Tightening torque:

10 N·m (1.0 kgf-m, 7.4 ft-lb)

25) Install the oil strainer stay.

26) Apply liquid gasket to the matching surfaces, and then install the oil pan.

NOTE:

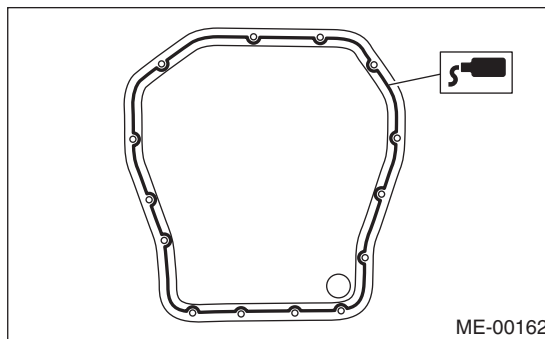
Install it within 20 min. after applying liquid gasket.

Liquid gasket:

Part No. 004403012 THREE BOND 1207C or equivalent

Tightening torque:

5 N·m (0.5 kgf-m, 3.6 ft-lb)



27) Apply liquid gasket to the mating surfaces and threaded portion of bolt (A) as shown in the figure, and then install the oil separator cover.

Liquid gasket:

Mating surface

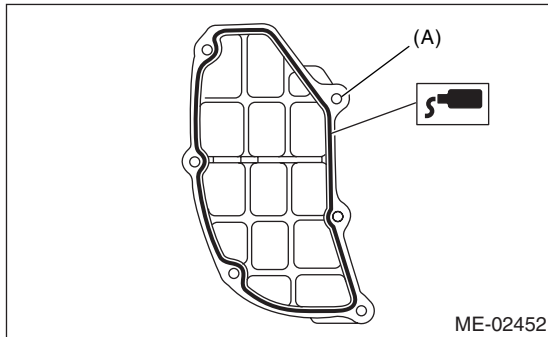
Part No. 004403012 THREE BOND 1207C or equivalent

Threaded portion of bolt (A)

Part No. 004403042 THREE BOND 1324 or equivalent

Tightening torque:

6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



28) Install the flywheel.

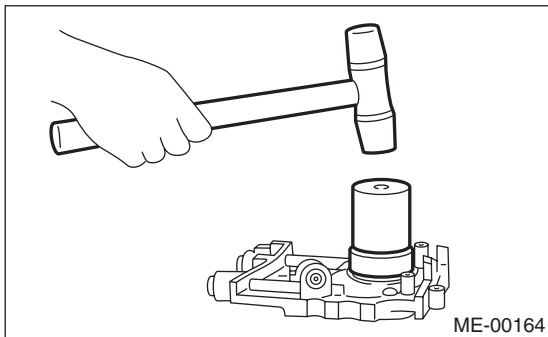
<Ref. to CL-17, INSTALLATION, Flywheel.>

29) Install the clutch disc and cover. <Ref. to CL-14, INSTALLATION, Clutch Disc and Cover.>

30) Installation of oil pump:

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

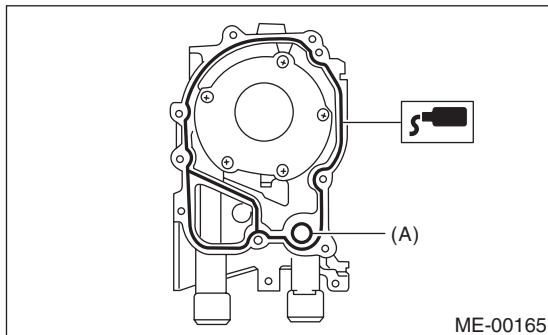
ST 499587100 OIL SEAL INSTALLER



(2) Apply liquid gasket to the matching surface of oil pump.

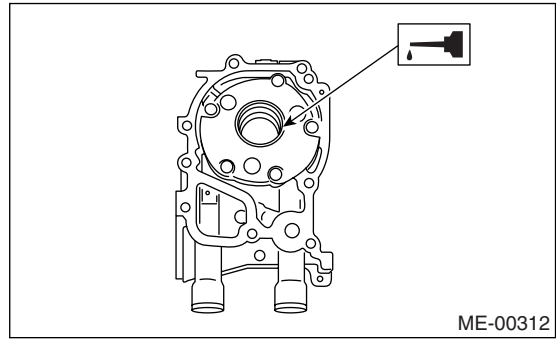
Liquid gasket:

Part No. 004403007 THREE BOND 1215 or equivalent



(A) O-ring

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



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

(5) Apply liquid gasket to the threaded portion of three bolts.

CAUTION:

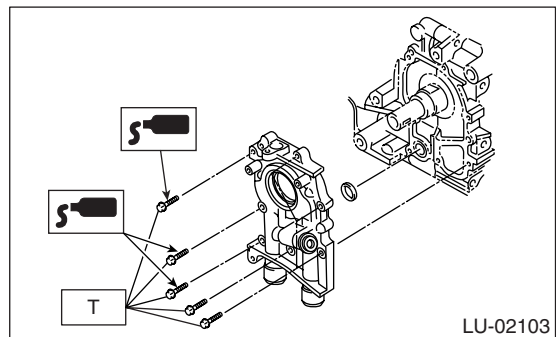
- Do not forget to install the O-ring and seal when installing the oil pump.
- Align the flat surface of oil pump's inner rotor with crankshaft before installation.

Liquid gasket:

THREE BOND 1324 (Part No. 004403042) or equivalent

Tightening torque:

6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



31) 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)

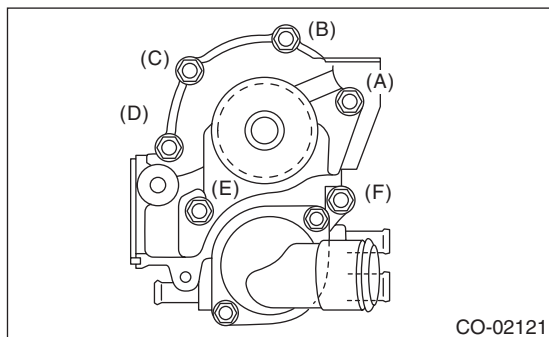
CAUTION:

- Be sure to use a new gasket.

Cylinder Block

MECHANICAL

- When installing the water pump, tighten the bolts in two stages in alphabetical sequence as shown in the figure.



32) Install the water by-pass pipe for heater.

33) Install the oil cooler.

CAUTION:

Use a new O-ring.

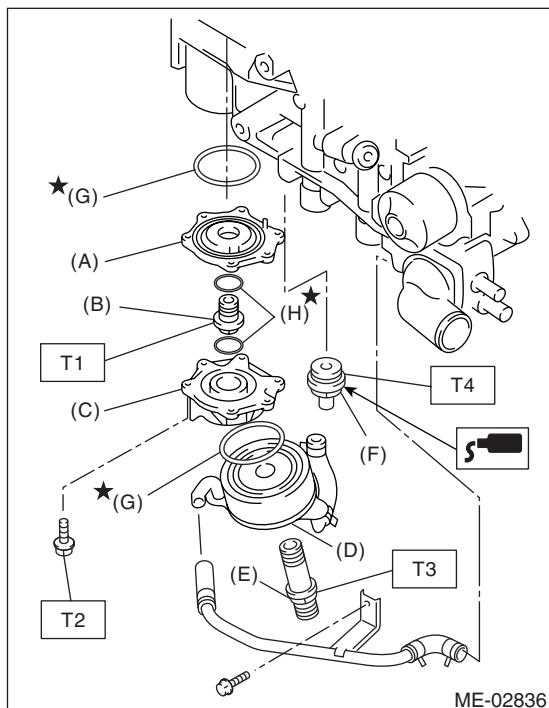
Tightening torque:

T1: 45 N·m (4.6 kgf-m, 33 ft-lb)

T2: 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

T3: 54 N·m (5.3 kgf-m, 40 ft-lb)

T4: 69 N·m (7.0 kgf-m, 50.9 ft-lb)



- (A) Adapter A
- (B) Adapter connector
- (C) Adapter B
- (D) Oil cooler
- (E) Oil cooler connector
- (F) Plug
- (G) Gasket
- (H) O-ring

34) Install the oil filter using ST.

ST 18332AA000 OIL FILTER WRENCH (Outer diameter: 68 mm (2.68 in))

ST 18332AA010 OIL FILTER WRENCH (Outer diameter: 65 mm (2.56 in))

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

- Tighten the oil filter 68 mm (2.68 in) in diameter by approx. 1 rotation more after the seal rubber of oil filter comes in contact with oil cooler. If using a torque wrench, tighten it to 14 N·m (1.4 kgf-m, 10.3 ft-lb).

- Tighten the oil filter 65 mm (2.56 in) in diameter by approx. 2/3 — 3/4 rotation more after the seal rubber of oil filter comes in contact with oil cooler. If using a torque wrench, tighten it to 12 N·m (1.2 kgf-m, 8.8 ft-lb).

CAUTION:

- Do not tighten excessively, or oil may leak.
- Be careful not to use the oil filter 80 mm (3.15 in) in diameter to Turbo model.

36) Install the water by-pass pipe between oil cooler and water pump.

37) Install the water pipe.

NOTE:

Always use a new O-ring.

38) Install the cylinder head.

<Ref. to ME(H4DOTC)-61, INSTALLATION, Cylinder Head.>

39) Install the oil level gauge guide and tighten the attaching bolt (LH side).

40) Install the rocker cover and rocker cover gasket.

NOTE:

Use a new rocker cover gasket.

41) Install the crank sprocket.

<Ref. to ME(H4DOTC)-54, INSTALLATION, Crank Sprocket.>

42) Install the cam sprocket.

<Ref. to ME(H4DOTC)-53, INSTALLATION, Cam Sprocket.>

43) Install the timing belt.

<Ref. to ME(H4DOTC)-46, INSTALLATION, Timing Belt.>

44) Install the timing belt cover.

<Ref. to ME(H4DOTC)-44, INSTALLATION, Timing Belt Cover.>

45) Install the crank pulley.

<Ref. to ME(H4DOTC)-43, INSTALLATION, Crank Pulley.>

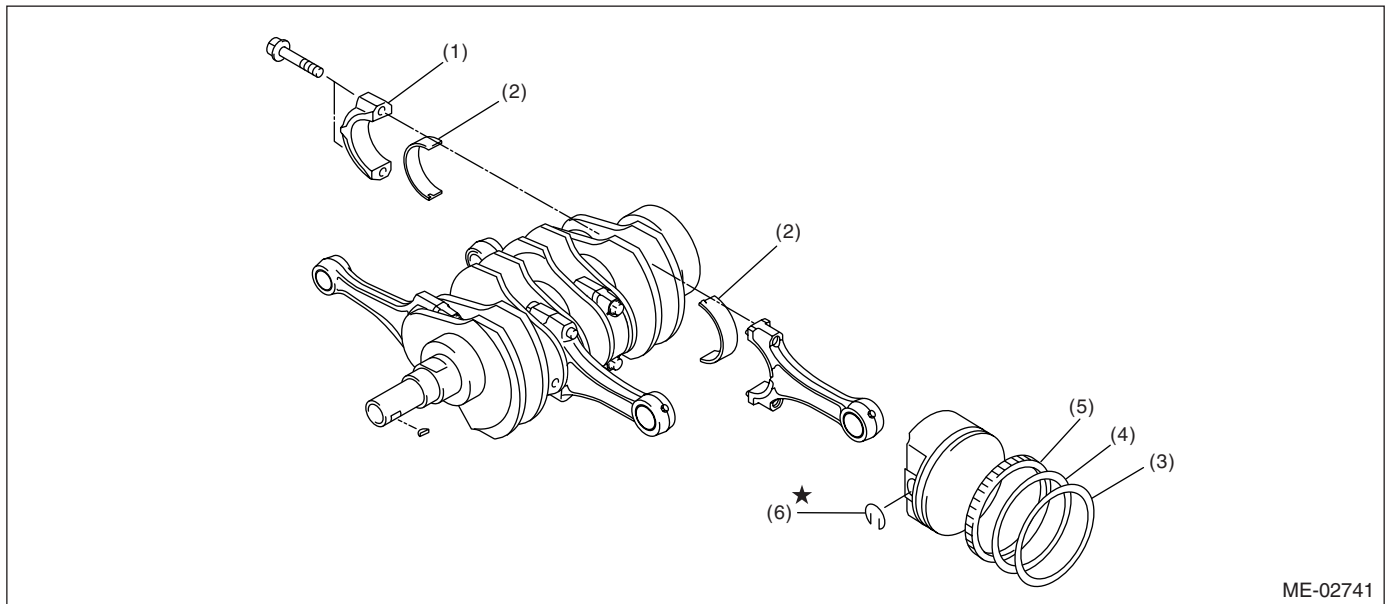
46) Install the generator and A/C compressor brackets on cylinder head.

47) Install the V-belt. <Ref. to ME(H4DOTC)-41, INSTALLATION, V-belt.>

48) Install the intake manifold.

<Ref. to FU(H4DOTC)-14, REMOVAL, Intake Manifold.>

C: DISASSEMBLY



ME-02741

(1) Connecting rod cap

(3) Top ring

(5) Oil ring

(2) Connecting rod bearing

(4) Second ring

(6) Snap ring

1) Remove the connecting rod cap.

2) Remove the connecting rod bearing.

NOTE:

Arrange the removed connecting rod, connecting rod cap and bearing in order to prevent confusion.

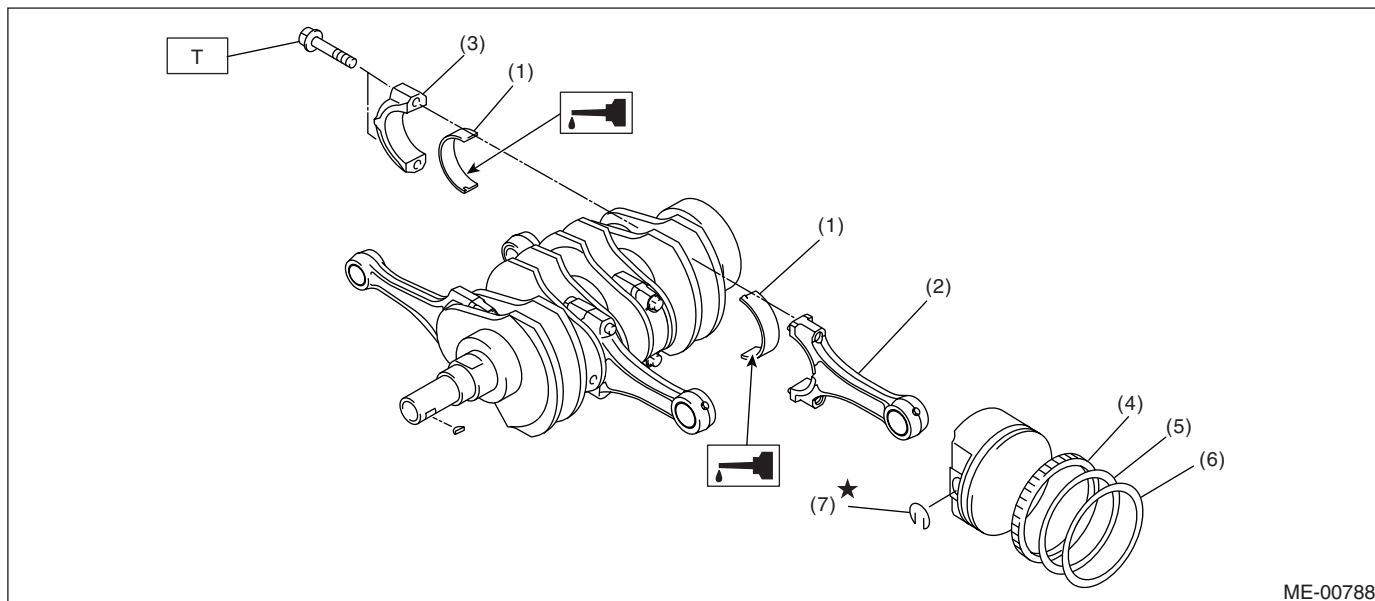
3) Remove the piston rings using the piston ring expander.

4) Remove the oil ring by hand.

NOTE:

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

5) Remove the snap ring.

D: ASSEMBLY

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

Tightening torque: N·m (kgf-m, ft-lb)

T: 52 (5.3, 38.4)

1) Apply oil to the surfaces of the connecting rod bearings. Install the connecting rod bearings on connecting rods and connecting rod caps.

2) Install the connecting rod on crankshaft.

NOTE:

Position each connecting rod with the side marked facing forward.

3) Tighten the connecting rod cap with connecting rod bolt.

Ensure the arrow on connecting rod cap faces the front during installation.

Tightening torque:

52 N·m (5.3 kgf-m, 38.4 ft-lb)

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 bolts, apply oil on the threads.

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

E: INSPECTION**1. CYLINDER BLOCK**

1) Visually check for cracks and damage. Especially, inspect the important parts by means of liquid penetrant tester.

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:

0.025 mm (0.00098 in)

Grinding limit:

0.1 mm (0.004 in)

Standard height of cylinder block:

201.0 mm (7.91 in)

2. CYLINDER AND PISTON

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

NOTE:

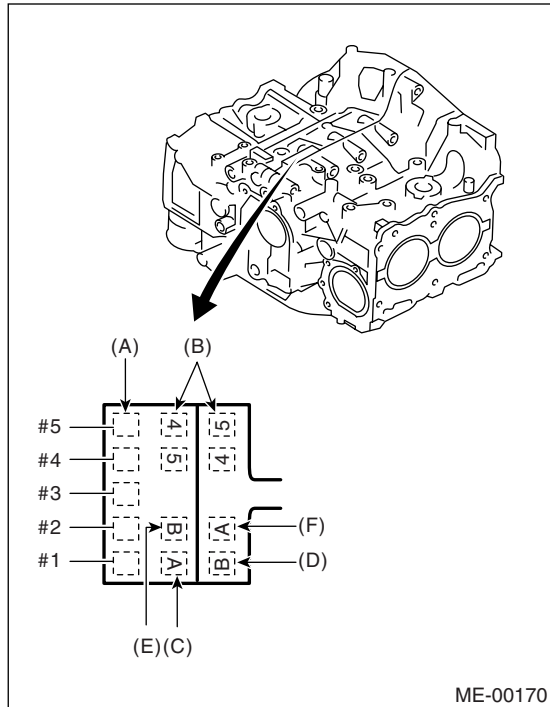
- Measurement should be performed at a temperature of 20°C (68°F).

- Standard sized pistons are classified into two grades, "A" and "B". These grades should be used as a guide line in selecting a standard piston.

Standard diameter:

A: 99.505 — 99.515 mm (3.9175 — 3.9179 in)

B: 99.495 — 99.505 mm (3.9171 — 3.9175 in)



- (A) Main journal size mark
- (B) Cylinder block (RH)-(LH) combination mark
- (C) #1 cylinder bore size mark
- (D) #2 cylinder bore size mark
- (E) #3 cylinder bore size mark
- (F) #4 cylinder bore size mark

2) How to measure the inner diameter of each cylinder

Measure the inner diameter of each cylinder in both the thrust and piston pin directions at the heights shown in the figure, using a cylinder bore gauge.

NOTE:

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

Taper:

Standard

0.015 mm (0.0006 in)

Limit

0.050 mm (0.0020 in)

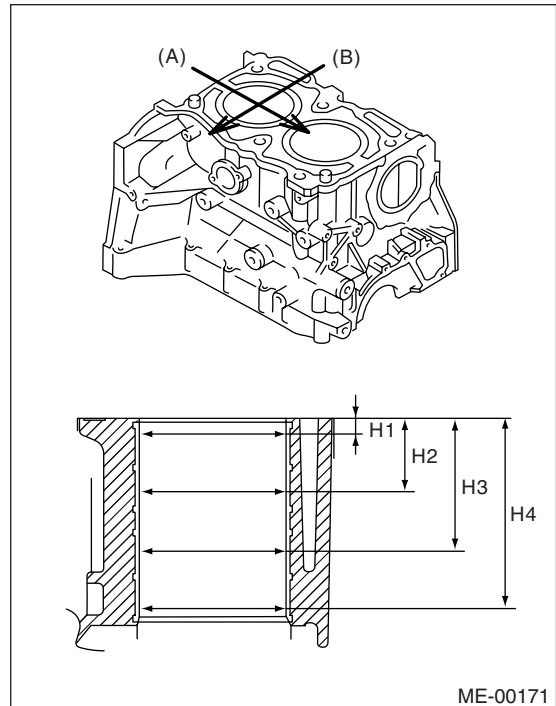
Out-of-roundness:

Standard

0.010 mm (0.0004 in)

Limit

0.050 mm (0.0020 in)



- (A) Piston pin direction
- (B) Thrust direction
- H1: 10 mm (0.39 in)
- H2: 45 mm (1.77 in)
- H3: 80 mm (3.15 in)
- H4: 115 mm (4.53 in)

3) When the piston is to be replaced due to general or cylinder wear, determine a suitable sized piston by measuring the piston clearance.

4) How to measure the outer diameter of each piston:

Measure the outer diameter of each piston at the height shown in the figure. (Thrust direction)

NOTE:

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

Piston grade point H:

38.2 mm (1.50 in)

Cylinder Block

MECHANICAL

Piston outer diameter:

Standard

A: 99.505 — 99.515 mm (3.9175 — 3.9179 in)

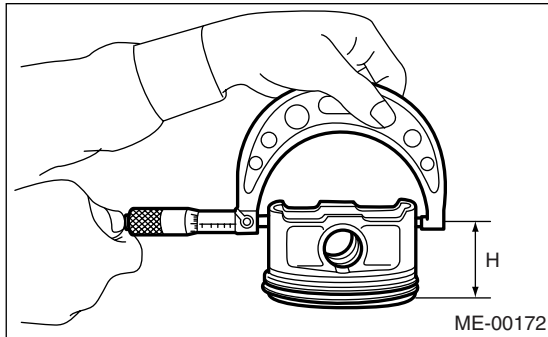
B: 99.495 — 99.505 mm (3.9171 — 3.9175 in)

0.25 mm (0.0098 in) oversize

99.745 — 99.765 mm (3.9270 — 3.9278 in)

0.50 mm (0.0197 in) oversize

99.995 — 100.015 mm (3.9368 — 3.9376 in)



5) Calculate the clearance between cylinder and piston.

NOTE:

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

Cylinder to piston clearance at 20°C (68°F):

Standard

-0.010 — 0.010 mm (-0.0004 — 0.0004 in)

Limit

0.030 mm (0.0012 in)

6) Boring and honing

- (1) If the value of taper, out-of-roundness, or cylinder-to-piston clearance measured exceeds the limit or if there is any damage on the cylinder wall, reboring 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.

NOTE:

Immediately after reboring, the cylinder diameter may differ from its real diameter due to temperature rise. Thus, pay attention to this when measuring the cylinder diameter.

Cylinder enlarging (boring) limit (dia.):

To 100.005 mm (3.937 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(H4DOTC)-80, CYLINDER AND PISTON, INSPECTION, Cylinder Block.>

If any of the clearances is not within specification, replace the piston or bore the cylinder to use an oversize piston.

3) Make sure that the piston pin can be inserted into the piston pin hole with a thumb at 20°C (68°F). Replace if defective.

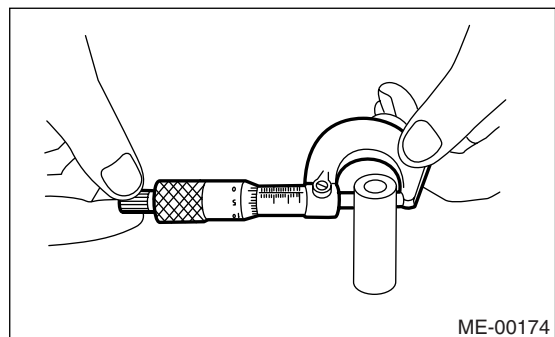
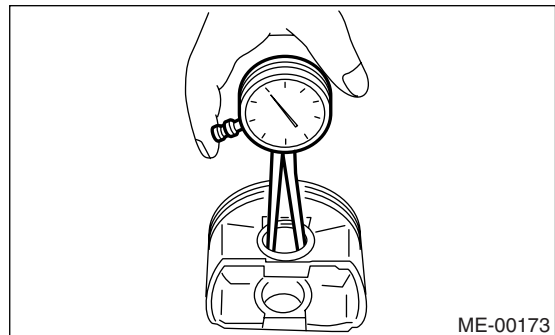
Standard clearance between piston pin and hole in piston:

Standard

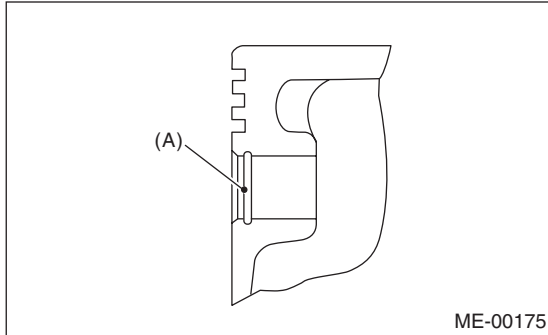
0.004 — 0.008 mm (0.0002 — 0.0003 in)

Limit

0.020 mm (0.0008 in)



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



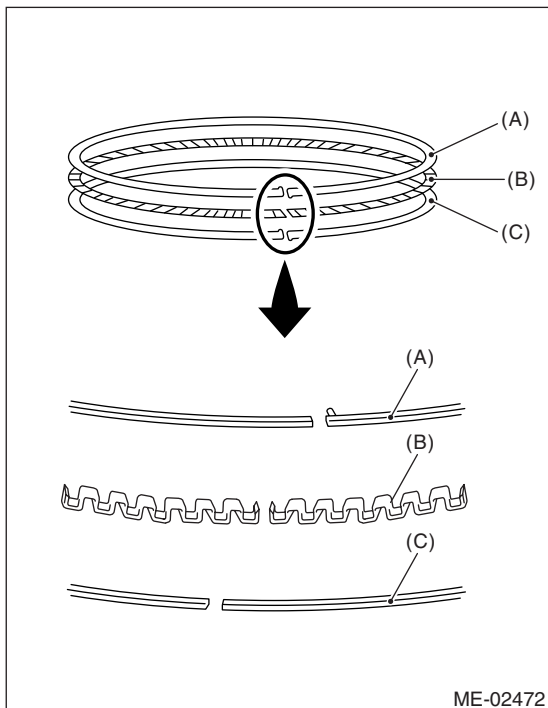
5) Check the piston pin snap ring for distortion, cracks and wear.

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:

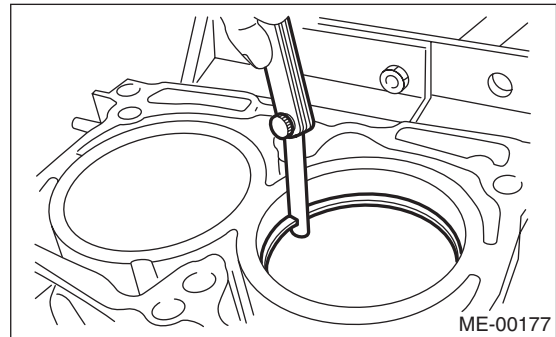
- Marks are shown on the end of top and second rings. When installing the rings to piston, face this mark upward.
- Oil ring consists of upper rail, expander and lower rail. When installing on piston, be careful of each rail's direction.



- (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 closed gap with a thickness gauge.

Unit: mm (in)			
		Standard	Limit
Piston ring closed gap	Top ring	0.20 — 0.25 (0.0079 — 0.0098)	1.0 (0.039)
	Second ring	0.37 — 0.52 (0.015 — 0.020)	1.0 (0.039)
	Oil ring rail	0.20 — 0.50 (0.0079 — 0.0197)	1.5 (0.059)

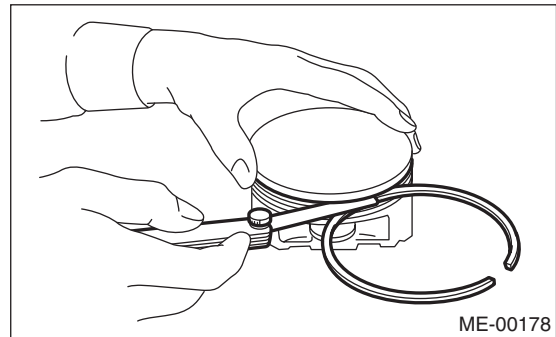


3) Measure the clearance between piston ring and piston ring groove with a thickness gauge.

NOTE:

Before measuring the clearance, clean the piston ring groove and piston ring.

Unit: mm (in)			
		Standard	Limit
Clearance between piston ring and piston ring groove	Top ring	0.040 — 0.080 (0.0016 — 0.0031)	0.15 (0.0059)
	Second ring	0.030 — 0.070 (0.0012 — 0.0028)	0.15 (0.0059)



Cylinder Block

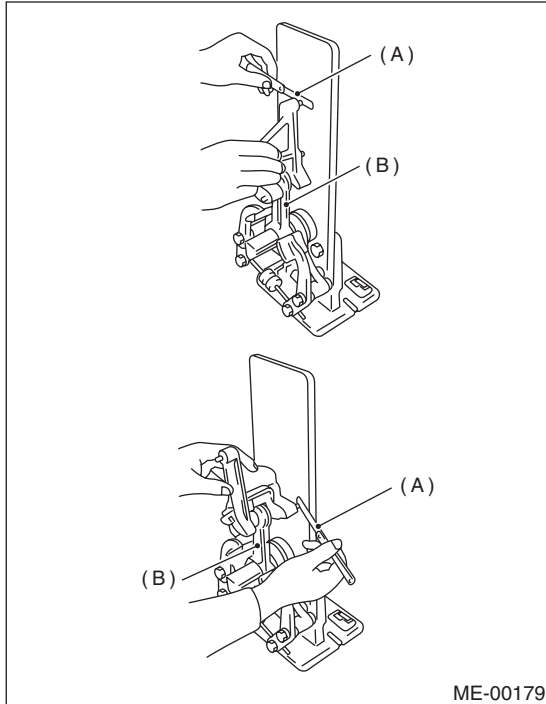
MECHANICAL

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.

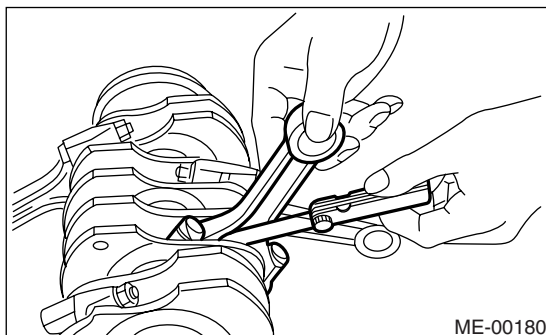
Connecting rod side clearance:

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 the 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

0.017 — 0.045 mm (0.0007 — 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	1.490 — 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 (2.0447 — 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.

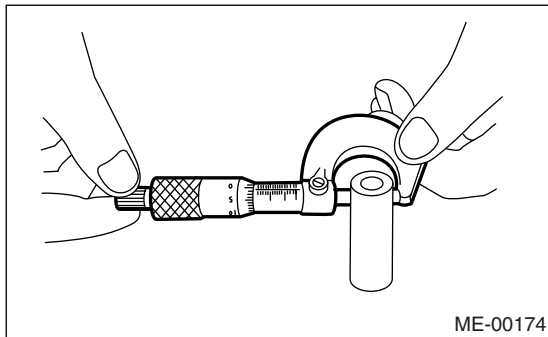
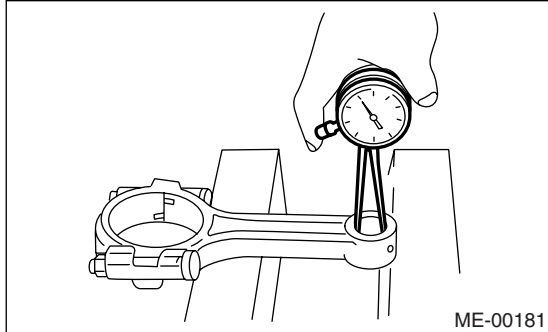
Clearance between piston pin and bushing:

Standard

0 — 0.022 mm (0 — 0.0009 in)

Limit

0.030 mm (0.0012 in)

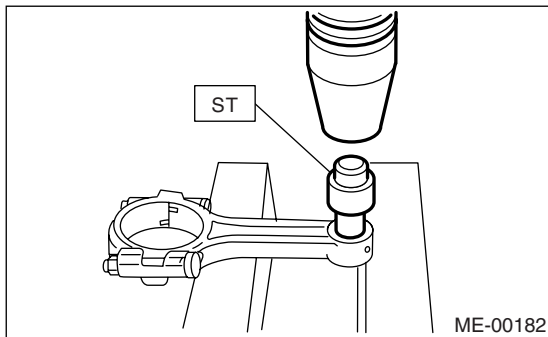


7) Replacement procedure is as follows.

(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 liquid penetrant tester etc., and replace if defective.

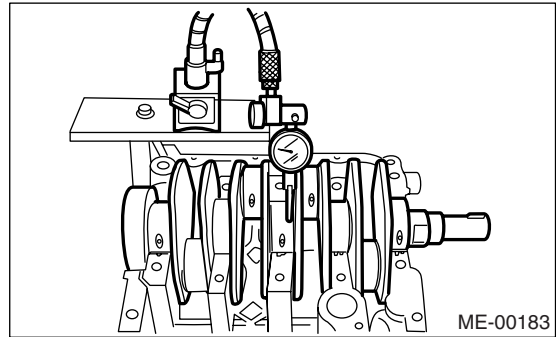
2) Measure the crankshaft bend, and correct or replace if it exceeds the limit.

NOTE:

If a suitable V-block is not available, install the #1 and #5 crankshaft bearing on cylinder block, position the crankshaft on these bearings and measure the crankshaft bend using a dial gauge.

Crankshaft bend limit:

0.035 mm (0.0014 in)



3) Inspect the crank journal and crank pin for wear. If they are not within the specifications, replace the bearing with a suitable (undersize) one, and then replace or recondition the crankshaft as necessary. When grinding the crank journal or crank pin, finish them to specified dimensions according to the undersize bearing to be used.

Crank pin:

Out-of-roundness

0.003 mm (0.0001 in)

Cylindricity

0.004 mm (0.0002 in)

Grinding limit

To 51.750 mm (2.0374 in) dia.

Crank journal:

Out-of-roundness

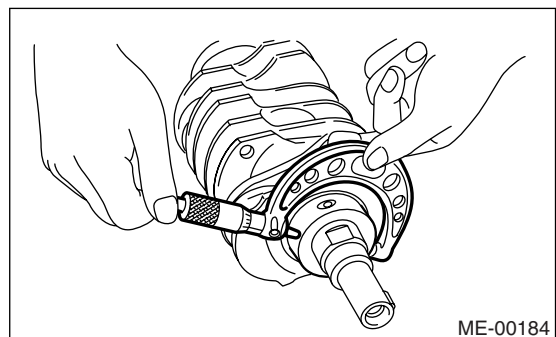
0.005 mm (0.0002 in)

Cylindricity

0.006 mm (0.0002 in)

Grinding limit

To 59.750 mm (2.3524 in) dia.



Cylinder Block

MECHANICAL

Unit: mm (in)				
		Crank journal diameter		Crank pin diameter
		#1, #3	#2, #4, #5	
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)	1.490 — 1.502 (0.0587 — 0.0591)
0.03 (0.0012) undersize	Journal O.D.	59.962 — 59.978 (2.3607 — 2.3613)	59.962 — 59.978 (2.3607 — 2.3613)	51.954 — 51.970 (2.0454 — 2.0461)
	Bearing size (Thickness at center)	2.017 — 2.020 (0.0794 — 0.0795)	2.019 — 2.022 (0.0795 — 0.0796)	1.504 — 1.512 (0.0592 — 0.0595)
0.05 (0.0020) undersize	Journal O.D.	59.942 — 59.958 (2.3599 — 2.3605)	59.942 — 59.958 (2.3599 — 2.3605)	51.934 — 51.950 (2.0447 — 2.0453)
	Bearing size (Thickness at center)	2.027 — 2.030 (0.0798 — 0.0799)	2.029 — 2.032 (0.0799 — 0.0800)	1.514 — 1.522 (0.0596 — 0.0599)
0.25 (0.0098) undersize	Journal O.D.	59.742 — 59.758 (2.3520 — 2.3527)	59.742 — 59.758 (2.3520 — 2.3527)	51.734 — 51.750 (2.0368 — 2.0374)
	Bearing size (Thickness at center)	2.127 — 2.130 (0.0837 — 0.0839)	2.129 — 2.132 (0.0838 — 0.0839)	1.614 — 1.622 (0.0635 — 0.0639)

O.D.: Outer Diameter

4) Measure the side clearance of crankshaft at center bearing. If the clearance exceeds the limit, replace the bearing.

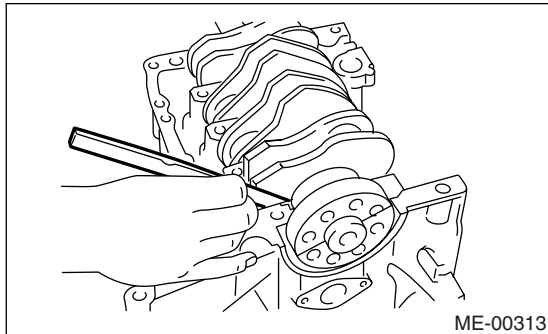
Crankshaft side clearance:

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.

Crankshaft oil clearance:

Standard

0.010 — 0.030 mm (0.0004 — 0.0012 in)

Limit

0.040 mm (0.0016 in)

21.Intake and Exhaust Valve

A: SPECIFICATION

For operations related to intake and exhaust valve, refer to "Cylinder Head".

<Ref. to ME(H4DOTC)-61, REMOVAL, Cylinder Head.> <Ref. to ME(H4DOTC)-61, INSTALLATION, Cylinder Head.>

22.Piston

A: SPECIFICATION

For operations related to piston, refer to “Cylinder Block”.

<Ref. to ME(H4DOTC)-68, REMOVAL, Cylinder Block.> <Ref. to ME(H4DOTC)-71, INSTALLATION, Cylinder Block.>

23.Connecting Rod

A: SPECIFICATION

For operations related to connecting rod, refer to "Cylinder Block".

<Ref. to ME(H4DOTC)-68, REMOVAL, Cylinder Block.> <Ref. to ME(H4DOTC)-71, INSTALLATION, Cylinder Block.>

24.Crankshaft

A: SPECIFICATION

For operations related to crankshaft, refer to “Cylinder Block”.

<Ref. to ME(H4DOTC)-68, REMOVAL, Cylinder Block.> <Ref. to ME(H4DOTC)-71, INSTALLATION, Cylinder Block.>

25.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(H4DOTC)(diag)-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 plug or defective gasket	C
		Loosened cylinder head bolt or defective gasket	C
		Improper valve sealing	C
		Defective valve stem	C
		Worn or broken valve spring	B
		Worn or stuck piston rings, cylinder and piston	C
		Incorrect valve timing	B
		Improper engine oil (low viscosity)	B
3) Initial combustion occurs.	Engine control system <Ref. to EN(H4DOTC)(diag)-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 plug or defective gasket	C
		Loosened cylinder head bolt or defective gasket	C
		Improper valve sealing	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(H4DOTC)(diag)-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 plug or defective gasket	C
		Loosened cylinder head bolt or defective gasket	C
		Improper valve sealing	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(H4DOTC)(diag)-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 plug or defective gasket	B
		Loosened cylinder head bolt or defective gasket	B
		Improper valve sealing	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	Over-heating	C
	Others	Malfunction of evaporative emission control system	A
		Stuck or damaged throttle valve	B

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(H4DOTC)(diag)-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 plug or defective gasket	B
		Loosened cylinder head bolt or defective gasket	B
		Improper valve sealing	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	Over-heating	C
		Over cooling	C
	Others	Malfunction of evaporative emission control system	A
4. Surging	Engine control system <Ref. to EN(H4DOTC)(diag)-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 plug or defective gasket	C
		Loosened cylinder head bolt or defective gasket	C
		Improper valve sealing	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(H4DOTC)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened or cracked vacuum hose	A
	Others	Stuck or damaged throttle valve	A
6. Dieseling (Run-on)	Engine control system <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.>		A
	Cooling system	Overheating	B
	Others	Malfunction of evaporative emission control system	B
7. Afterburning in exhaust system	Engine control system <Ref. to EN(H4DOTC)(diag)-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 plug or defective gasket	C
		Loosened cylinder head bolt or defective gasket	C
		Improper valve sealing	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(H4DOTC)(diag)-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(H4DOTC)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Dirty air cleaner element	A
	Belt	Defective timing	B
	Compression	Incorrect valve clearance	B
		Loosened spark plug or defective gasket	C
		Loosened cylinder head bolt or defective gasket	C
		Improper valve sealing	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

26.Engine Noise

A: INSPECTION

Type of sound	Condition	Possible cause
Regular clicking sound	Sound increases as engine speed increases.	- Valve mechanism is defective. - Incorrect valve clearance - Worn camshaft - Broken valve spring
Heavy and dull clank	Oil pressure is low.	- Worn crankshaft main bearing - Worn connecting rod bearing (big end)
	Oil pressure is normal.	- Loose flywheel mounting bolts - Damaged engine mounting
High-pitched clank (Spark knock)	Sound is noticeable when accelerating with an overload.	- Ignition timing advanced - Accumulation of carbon inside combustion chamber - Wrong spark plug - Improper gasoline
Clank when engine speed is medium (1,000 to 2,000 rpm).	Sound is reduced when fuel injector connector of noisy cylinder is disconnected.	- Worn crankshaft main bearing - Worn bearing of connecting rod (Large end)
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.	- 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.	- Unusually worn valve lifter - Worn cam sprocket - Worn camshaft journal in cylinder head assembly
Squeaky sound	—	Insufficient generator lubrication
Rubbing sound	—	Defective generator brush and rotor contact
Gear scream when starting engine	—	- Defective ignition starter switch - Worn gear and starter pinion
Sound like polishing glass with a dry cloth	—	- Loose drive belt - Defective water pump shaft
Hissing sound	—	- Loss of compression - Air leakage in air intake system, hoses, connections or manifolds
Timing belt noise	—	- Loose timing belt - Belt contacting case or adjacent part
Valve noise	—	Incorrect valve clearance

NOTE*)

When disconnecting the fuel injector connector, the malfunction indicator light illuminates and DTC is stored in ECM memory. Therefore, carry out the clear memory mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and inspection mode <Ref. to EN(H4DOTC)(diag)-40, PROCEDURE, Inspection Mode.> after connecting the fuel injector connector.

STARTING/CHARGING SYSTEMS

1. General Description

A: SPECIFICATION

Specifications for Turbo model are included in SC (H4SO) section. <Ref. to SC(H4SO)-2, General Description.>

SECTION 4

H4DOTC ENGINE

SPEED CONTROL SYSTEMS

1. General Description

A: SPECIFICATION

Specifications for turbo model are the same as SP(H4SO) section. <Ref. to SP(H4SO)-2, General Description.>