ENGINE SECTION 2

FUEL INJECTION (FUEL SYSTEMS)	FU(H4DOTC)
EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)	EC(H4DOTC)
INTAKE (INDUCTION)	IN(H4DOTC)
MECHANICAL	ME(H4DOTC)
EXHAUST	EX(H4DOTC)
COOLING	CO(H4DOTC)
LUBRICATION	LU(H4DOTC)
SPEED CONTROL SYSTEMS	SP(H4DOTC)
IGNITION	IG(H4DOTC)
STARTING/CHARGING SYSTEMS	SC(H4DOTC)
ENGINE (DIAGNOSTICS)	EN(H4DOTC)

This service manual has been prepared to provide SUBARU service personnel with the necessary information and data for the correct maintenance and repair of SUBARU vehicles.
This manual includes the procedures for maintenance, disassembling, reassembling, inspection and adjustment of components and diagnostics for guidance of experienced mechanics.
Please peruse and utilize this manual fully to ensure complete repair work for satisfying our customers by keeping their vehicle in optimum condition. When replacement of parts during repair work is needed, be sure to use SUBARU genuine parts.

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

FUJI HEAVY INDUSTRIES LTD. G1860GE3

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FUEL INJECTION (FUEL SYSTEMS)

FU(H4DOTC)

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1. General Description

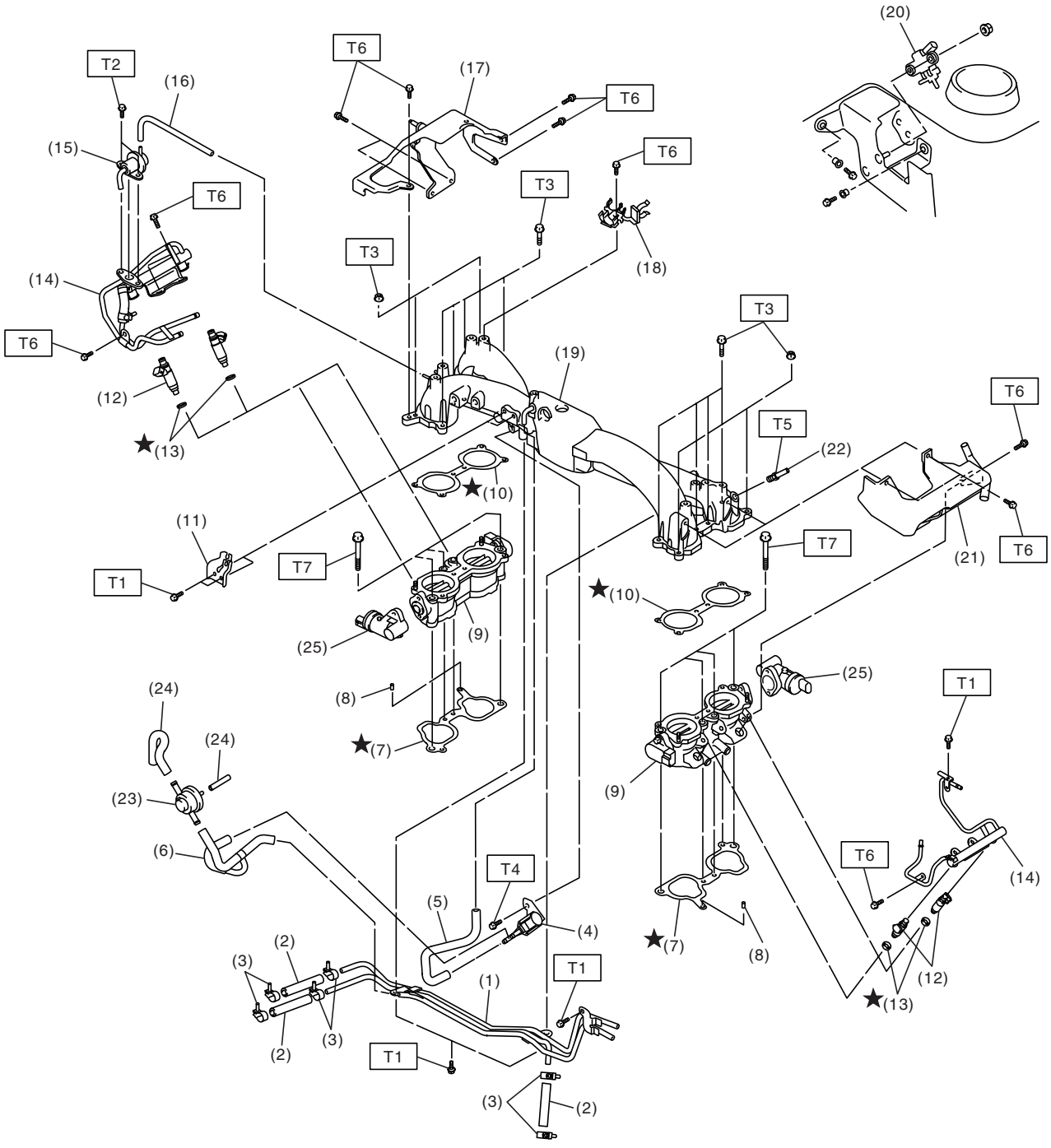
A: SPECIFICATIONS

Fuel tank	Capacity	60 ℓ (15.9 US gal, 13.2 Imp gal)
	Location	Under rear seat
Fuel pump	Type	Impeller
	Shutoff discharge pressure	450 — 677 kPa (4.59 — 6.9 kg/cm^2, 65.27 — 98.2 psi)
	Discharge flow	More than 130 ℓ (34.3 US gal, 28.6 Imp gal)/h [12 V at 300 kPa (3.06 kg/cm^2, 43.5 psi)]
Fuel filter		Cartridge type

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B: COMPONENT

1. INTAKE MANIFOLD



FU-00966

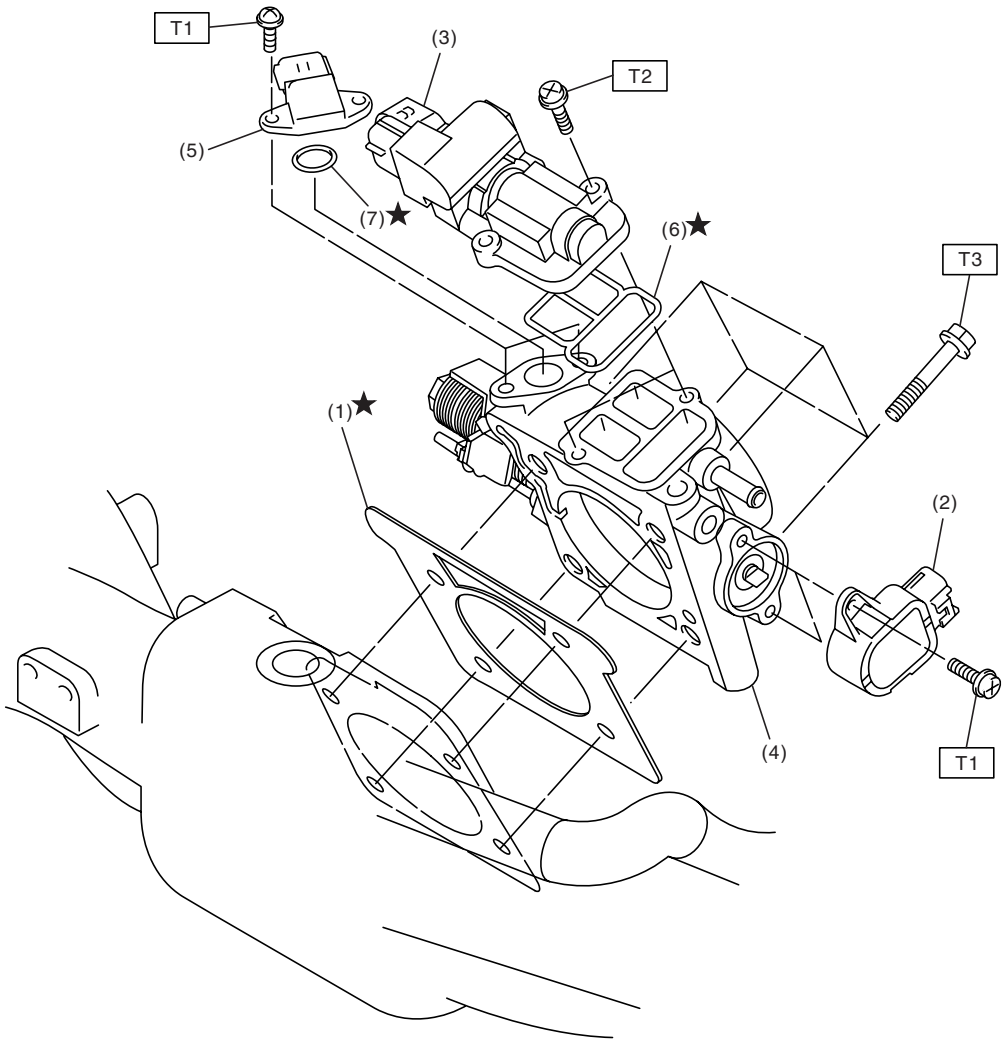
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(1) Fuel pipe ASSY
(2) Fuel hose
(3) Clip
(4) Purge control solenoid valve
(5) Vacuum hose
(6) Vacuum control hose
(7) Intake manifold gasket
(8) Guide pin
(9) Tumble generator valve ASSY (Except STi model)
(10) Gasket
(11) Accelerator cable bracket (MT model)
(12) Fuel injector
(13) Insulator
(14) Fuel injector pipe
(15) Pressure regulator
(16) Pressure regulator hose
(17) Fuel pipe protector RH
(18) Blow-by hose stay
(19) Intake manifold
(20) Wastegate control solenoid valve ASSY
(21) Fuel pipe protector LH
(22) Nipple
(23) Purge valve (Except Australia model)
(24) Purge hose (Except Australia model)
(25) Tumble generator valve actuator (Except STi model)

Tightening torque: N·m (kgf-m, ft-lb)
T1: 5.0 (0.5, 3.6)
T2: 6.4 (0.65, 4.7)
T3: 8.25 (0.84, 6.1)
T4: 16 (1.6, 11.8)
T5: 17 (1.7, 12.5)
T6: 19 (1.9, 14.0)
T7: 25 (2.5, 18.4)

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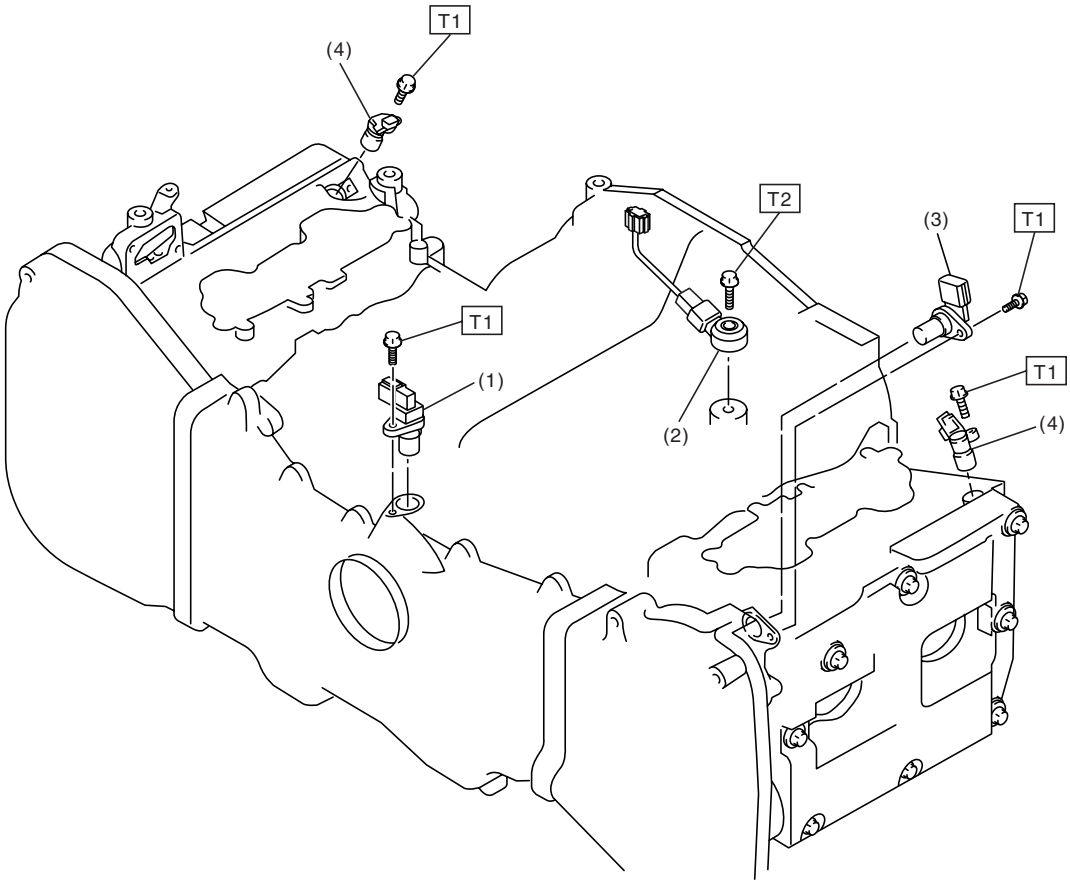
2. AIR INTAKE SYSTEM



(1)	Gasket	(5)	Manifold absolute pressure sensor	***Tightening torque: N·m (kgf-m, ft-lb)***
(2)	Throttle position sensor	(6)	Gasket	***T1: 1.6 (0.16, 1.2)***
(3)	Idle air control solenoid valve	(7)	O-ring	***T2: 2.8 (0.29, 2.1)***
(4)	Throttle body			***T3: 22 (2.2, 16.2)***

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3. CRANKSHAFT POSITION, CAMSHAFT POSITION AND KNOCK SENSORS

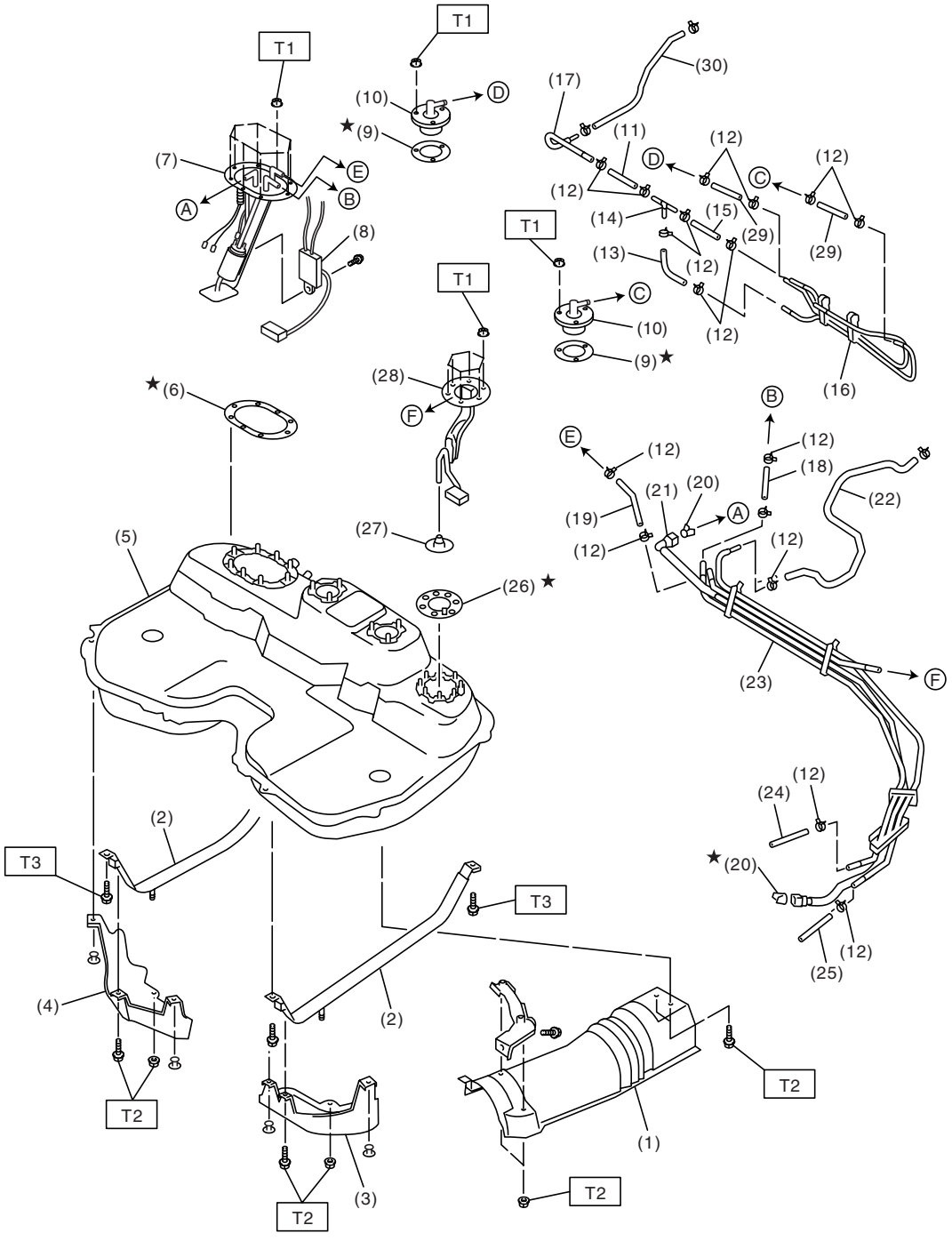


(1) Crankshaft position sensor
(2) Knock sensor
(3) Camshaft position sensor
(4) AVCS camshaft position sensor (STi model and Australia model)

Tightening torque: N·m (kgf-m, ft-lb)
T1: 6.4 (0.65, 4.7)
T2: 24 (2.4, 17.4)

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4. FUEL TANK



FU-00909

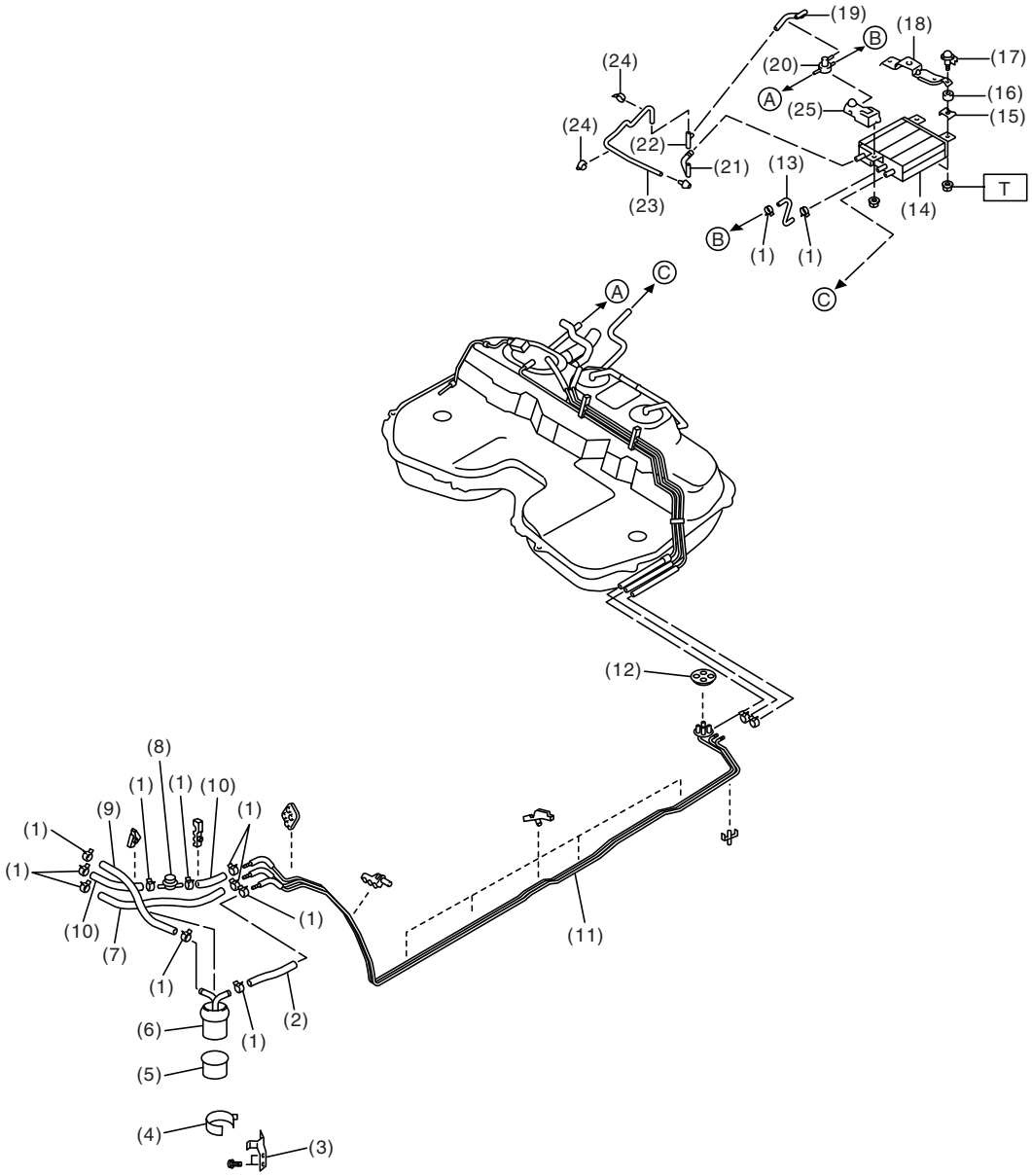
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(1) Heat shield cover
(2) Fuel tank band
(3) Protector LH
(4) Protector RH
(5) Fuel tank
(6) Fuel pump gasket
(7) Fuel pump ASSY
(8) Fuel level sensor
(9) Fuel cut valve gasket
(10) Fuel cut valve
(11) Evaporation hose A
(12) Clip
(13) Evaporation hose B
(14) Joint pipe
(15) Evaporation hose C
(16) Evaporation pipe ASSY
(17) Evaporation pipe
(18) Fuel return hose A
(19) Jet pump hose
(20) Retainer
(21) Quick connector
(22) Evaporation hose D
(23) Fuel pipe ASSY
(24) Fuel return hose B
(25) Evaporation hose E
(26) Fuel sub level sensor gasket
(27) Jet pump filter
(28) Fuel sub level sensor
(29) Evaporation hose F
(30) Evaporation hose G

Tightening torque: N·m (kgf-m, ft-lb)
T1: 4.4 (0.45, 3.3)
T2: 7.4 (0.75, 5.4)
T3: 33 (3.4, 24.3)

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5. FUEL LINE



FU-00516

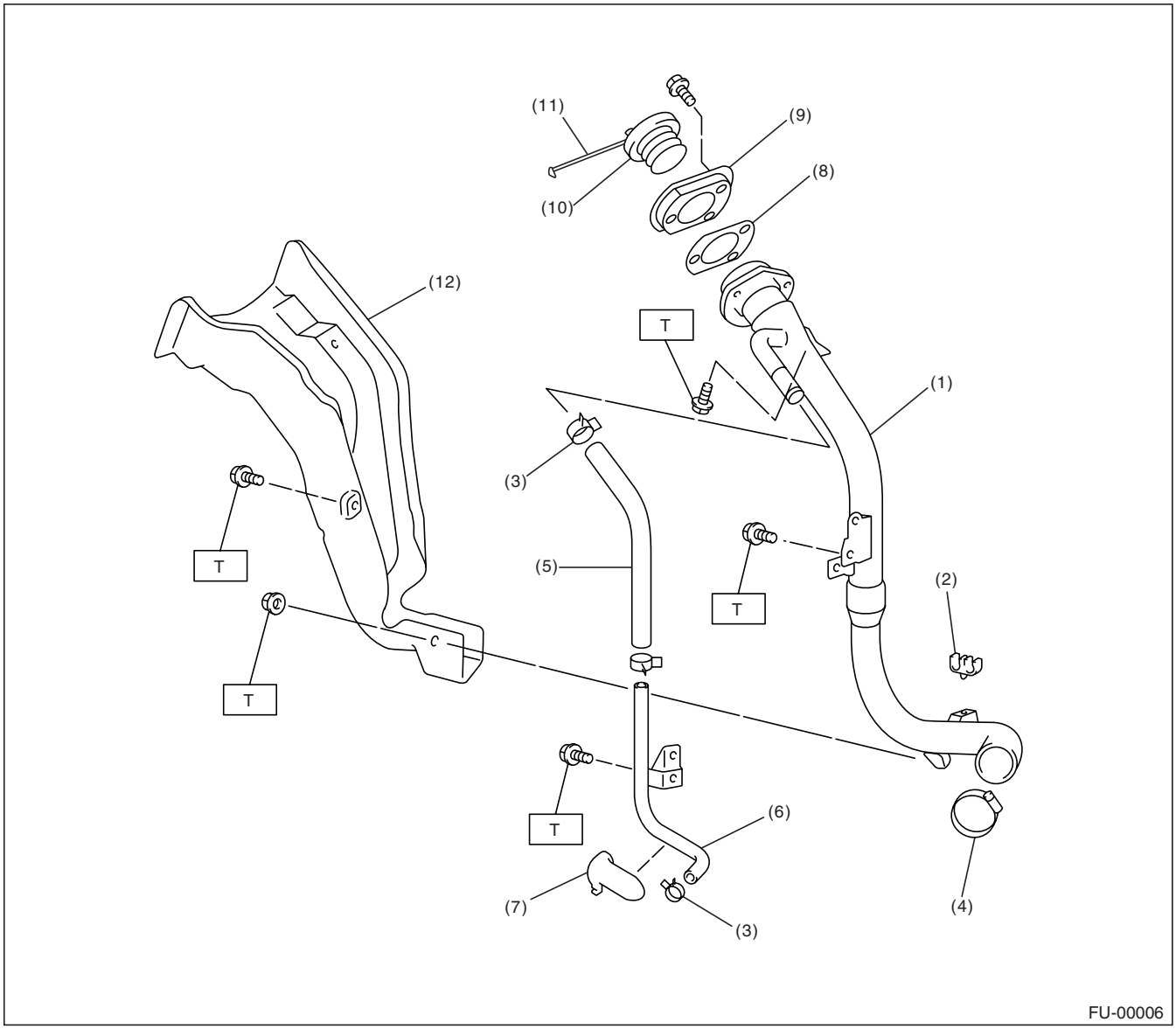
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(1) Clip
(2) Fuel delivery hose A
(3) Fuel filter bracket
(4) Fuel filter holder
(5) Fuel filter cup
(6) Fuel filter
(7) Evaporation hose
(8) Fuel damper
(9) Fuel delivery hose B
(10) Fuel return hose
(11) Fuel pipe ASSY
(12) Grommet
(13) Canister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

Tightening torque: N·m (kgf-m, ft-lb)
T: 23 (2.3, 17.0)

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6. FUEL FILLER PIPE



(1) Fuel filler pipe ASSY
(2) Evaporation hose holder
(3) Clip
(4) Clamp
(5) Air vent hose
(6) Air vent pipe
(7) Air vent pipe holder
(8) Filler pipe packing
(9) Filler ring
(10) Filler cap
(11) Filler cap tether
(12) Filler pipe protector

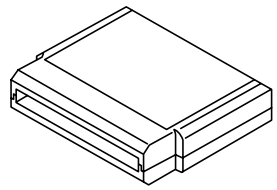
Tightening torque: N·m (kgf-m, ft-lb)
T: 7.5 (0.76, 5.5)

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C: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn your hands, because each part on the vehicle is hot after running.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.
• Place “NO FIRE” signs near the working area.
• Be careful not to spill fuel on the floor.

D: PREPARATION TOOL

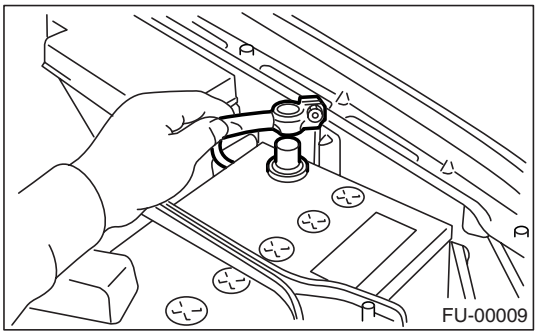
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST24082AA210	24082AA210	CARTRIDGE	Troubleshooting for electrical system.
 ST22771AA030	22771AA030	SUBARU SELECT MONITOR KIT	Troubleshooting for electrical systems. • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

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2. Throttle Body

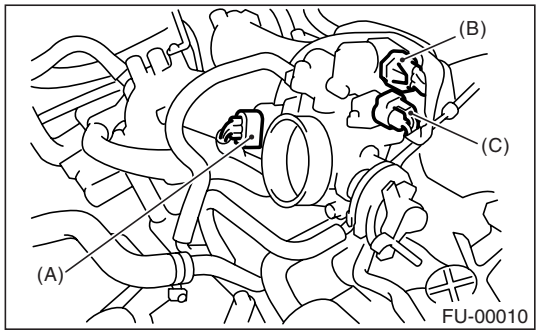
A: REMOVAL

1) Disconnect the ground cable from battery.

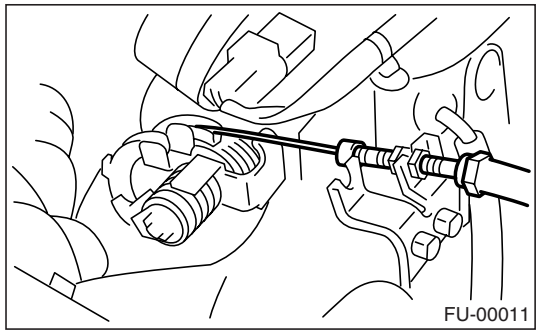


2) Remove the intercooler. <Ref. to IN(H4DOTC)-11, REMOVAL, Intercooler.>

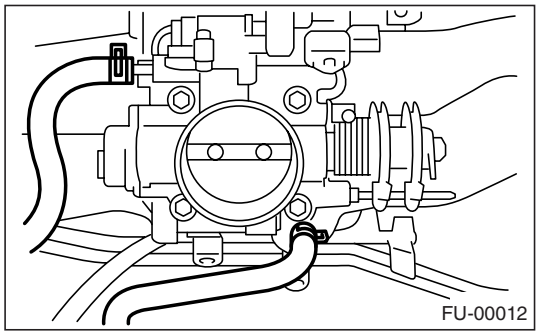
3) Disconnect the connector from the throttle position sensor (A) and idle air control solenoid valve (B) and manifold absolute pressure sensor (C).



4) Disconnect the accelerator cable.



5) Disconnect the engine coolant hoses from throttle body.



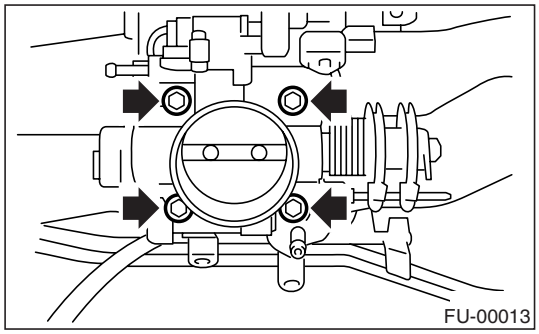
6) Remove the bolts which secure the throttle body to intake manifold.

B: INSTALLATION

1) Install in the reverse order of removal.

NOTE:
Always use a new gasket.

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



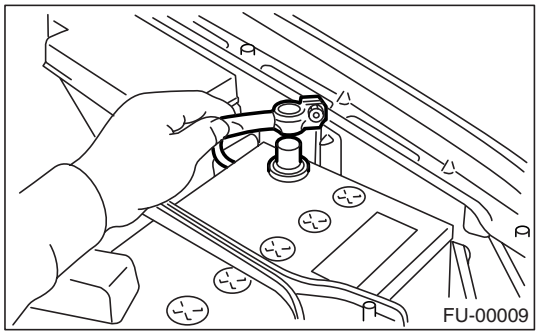
2) Adjust the accelerator cable play. <Ref. to SP(H4SO)-9, INSTALLATION, Accelerator Control Cable.>

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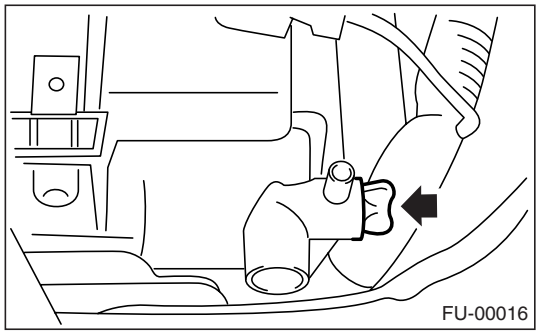
3. Intake Manifold

A: REMOVAL

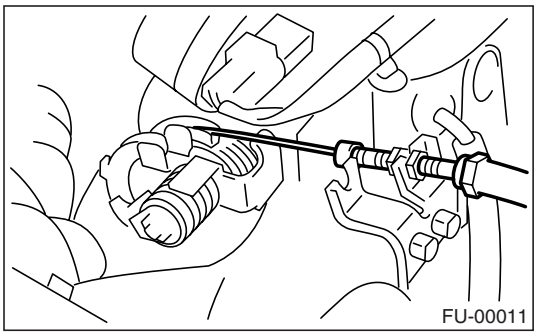
1) Release the fuel pressure. <Ref. to FU(H4DOTC)-53, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
2) Open the fuel filler flap lid and remove the fuel filler cap.
3) Disconnect the ground cable from battery.


FU-00009

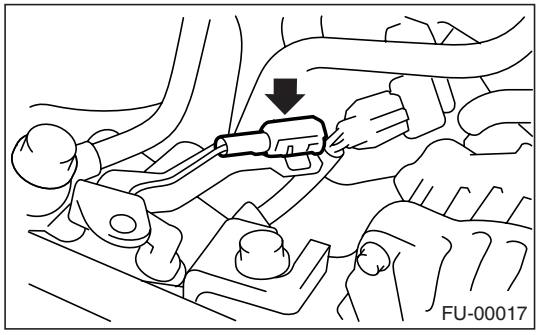
4) Lift-up the vehicle.
5) Remove the under cover.
6) Drain the coolant about 3.0 ℓ (3.2 US qt, 2.6 Imp qt).


FU-00016

7) Remove the air cleaner upper cover and air intake boot. <Ref. to IN(H4DOTC)-8, REMOVAL, Air Cleaner.>
8) Remove the air cleaner element.
9) Remove the intercooler. <Ref. to IN(H4DOTC)-11, REMOVAL, Intercooler.>
10) Disconnect the accelerator cable.

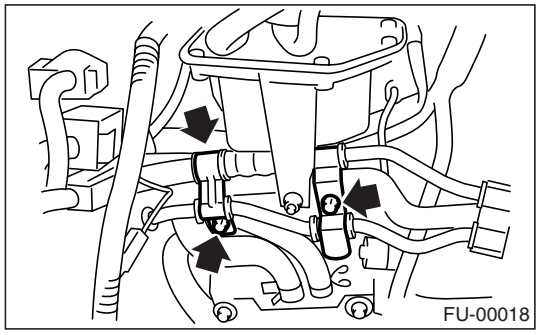

FU-00011

11) Remove the coolant filler tank. <Ref. to CO(H4DOTC)-33, REMOVAL, Coolant Filler Tank.>
12) Remove the power steering pump.
(1) Remove the front side V-belt.
<Ref. to ME(H4DOTC)-55, REMOVAL, V-belt.>
(2) Disconnect the power steering switch connector.

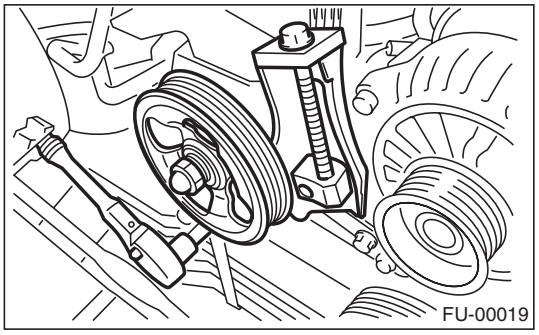

FU-00017

(3) Remove the bolts which secure the power steering pipe brackets to intake manifold.

NOTE:
Do not disconnect the power steering hose.

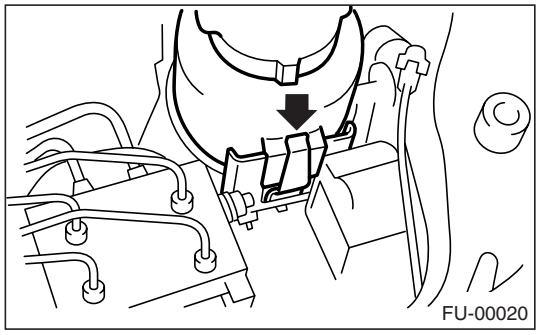

FU-00018

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

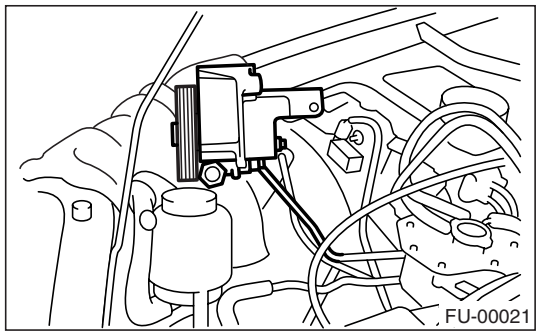

FU-00019

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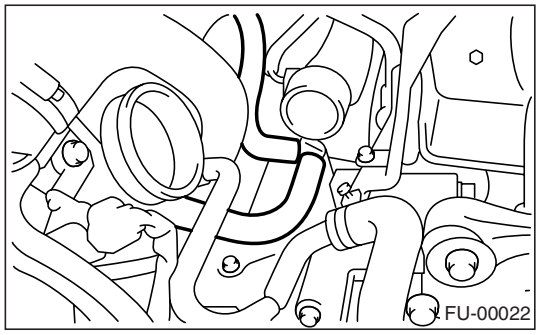
(5) Remove the power steering tank from the bracket by pulling it upward.



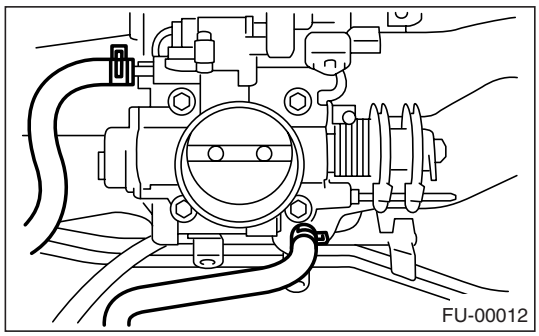
(6) Place the power steering pump on right side wheel apron.



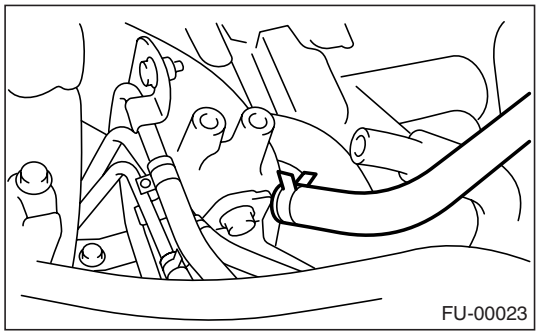
13) Disconnect the emission hose from PCV valve.



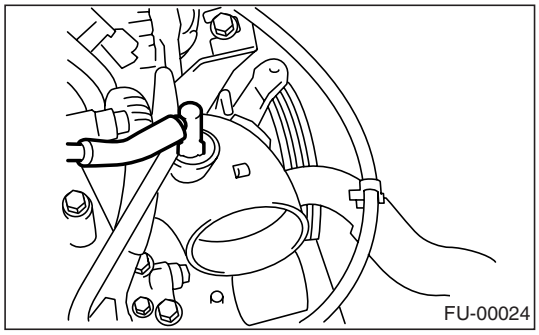
14) Disconnect the engine coolant hoses from throttle body.



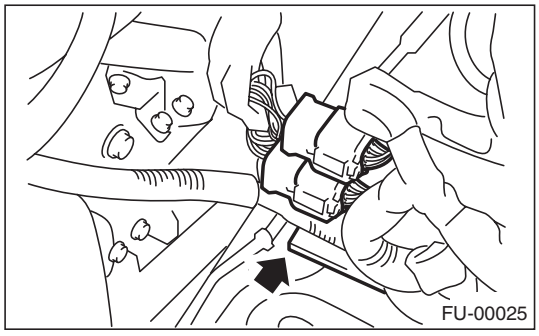
15) Disconnect the brake booster hose.

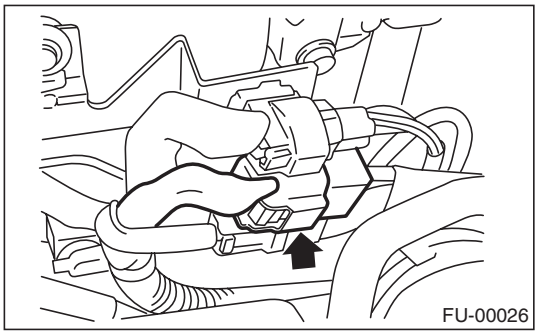


16) Disconnect the pressure hose from intake duct.



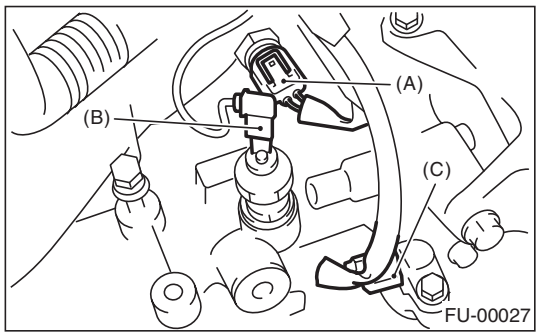
17) Disconnect the engine harness connectors from bulkhead harness connectors.



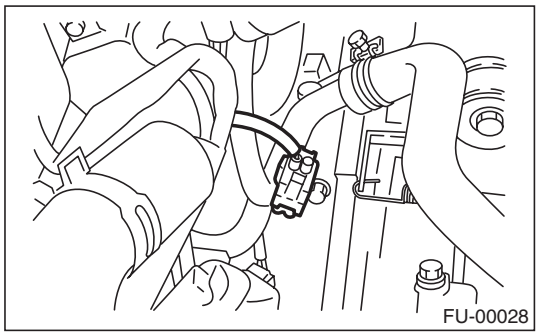


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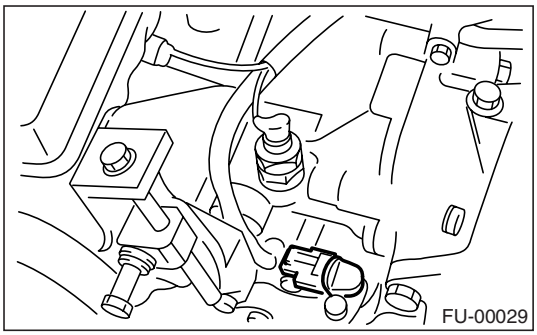
18) Disconnect the connectors from the engine coolant temperature sensor (A), oil pressure switch (B) and crankshaft position sensor (C).



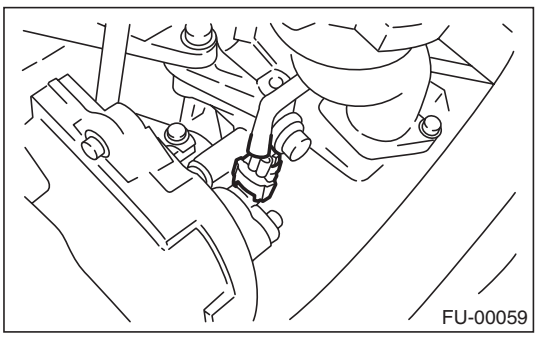
19) Disconnect the knock sensor connector.



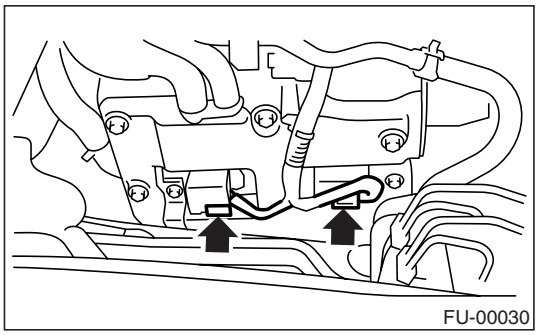
20) Disconnect the connector from crankshaft position sensor.



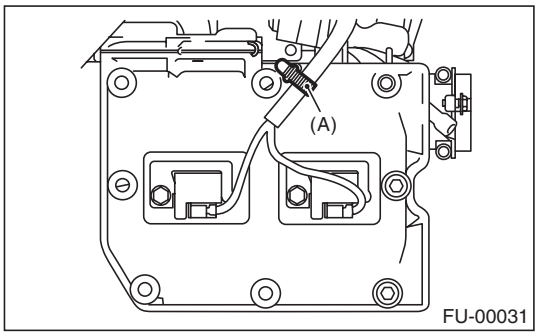
21) Disconnect the connector from camshaft position sensor.



22) Disconnect the connector from ignition coil.

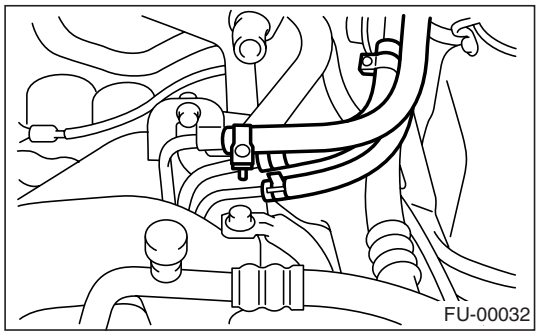


23) Disconnect the engine harness fixed by clip (A) from bracket.

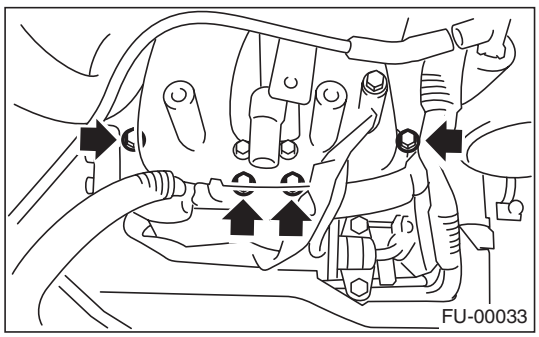


24) Disconnect the fuel delivery hose, return hose and evaporation hose.

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



25) Remove the bolts which secure the intake manifold to cylinder heads.



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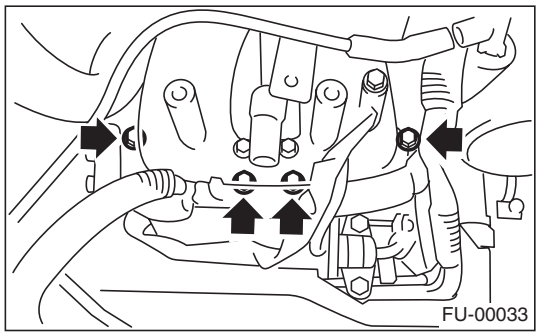
26) Remove the intake manifold.

B: INSTALLATION

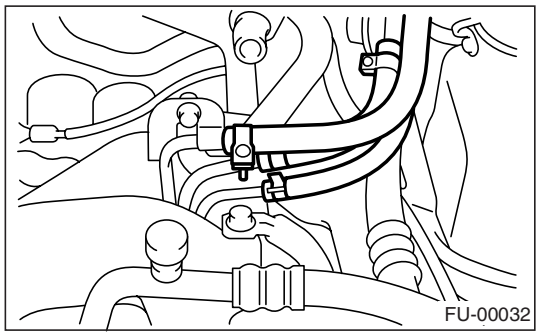
1) Install the intake manifold onto cylinder heads.

NOTE:
Always use new gaskets.

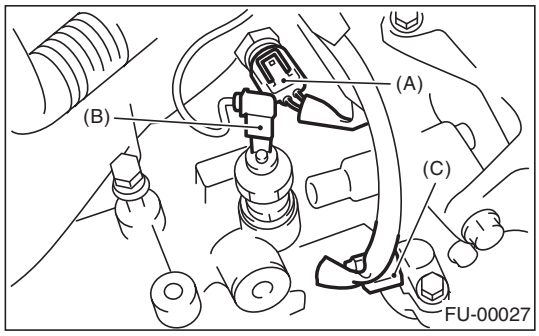
Tightening torque:
25 N·m (2.5 kgf-m, 18.4 ft-lb)



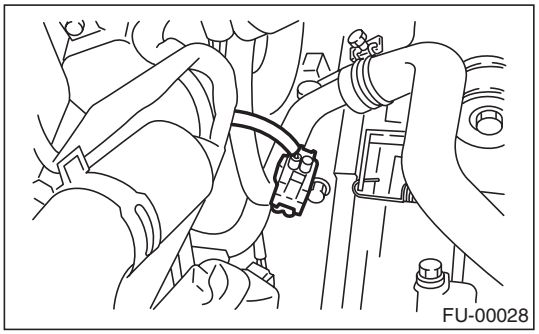
2) Connect the fuel delivery hose, return hose and evaporation hose.



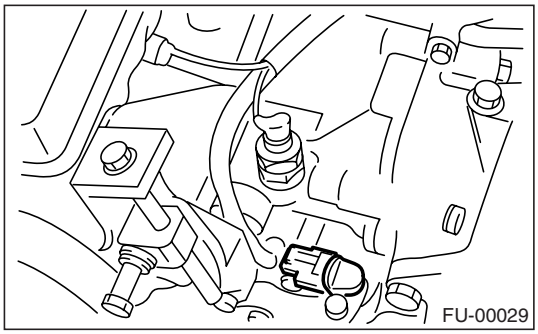
3) Connect the connector to the oil pressure switch (B), crankshaft position sensor (C) and engine coolant temperature sensor (A).



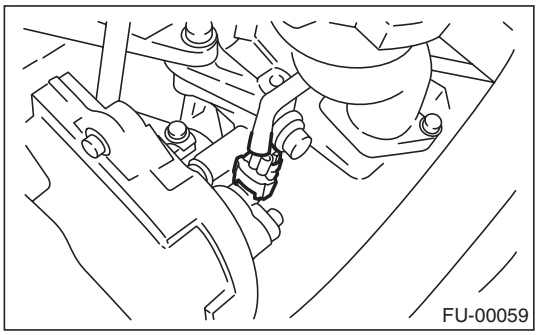
4) Connect the connector to knock sensor.



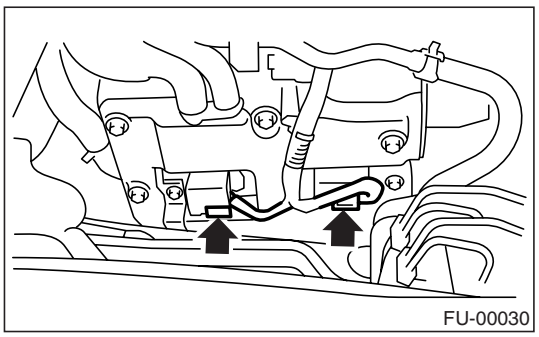
5) Connect the connector to crankshaft position sensor.



6) Connect the connector to camshaft position sensor.

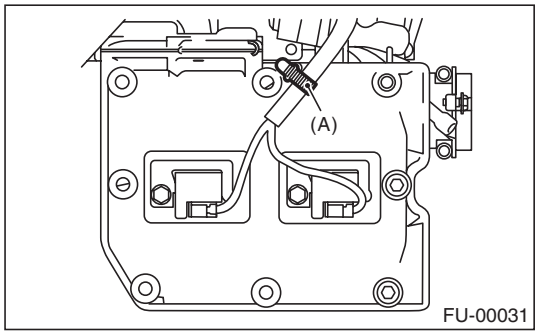


7) Connect the connector to ignition coil.

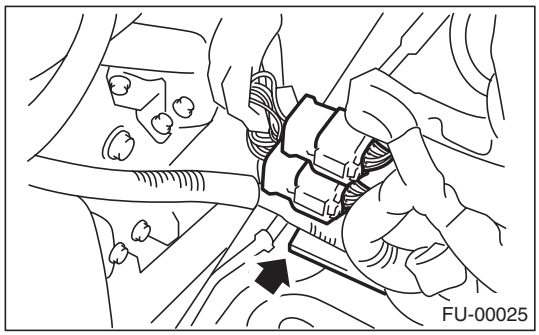


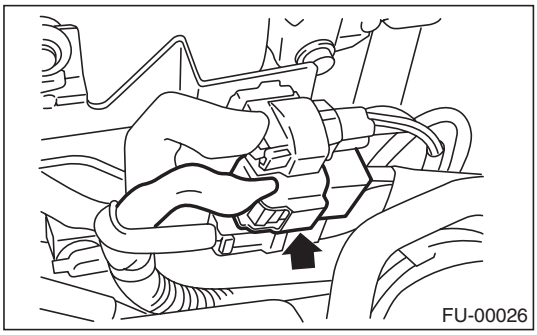
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8) Connect the engine harness with clip (A) to the bracket.

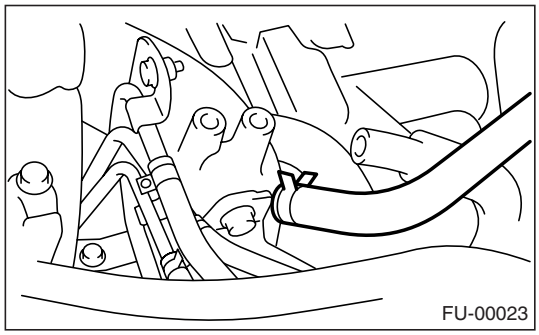


9) Connect the engine harness connector to bulkhead harness connectors.

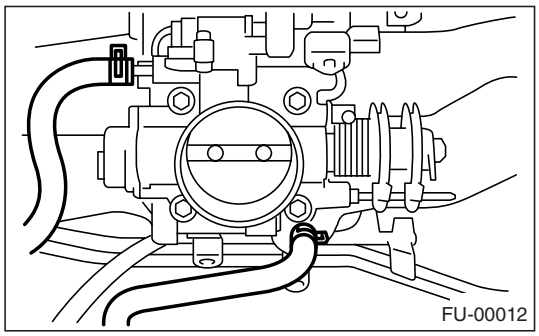




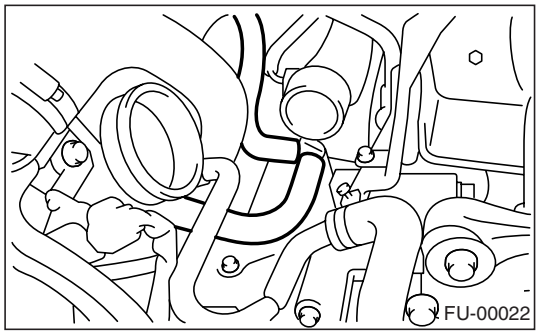
10) Connect the brake booster vacuum hose.



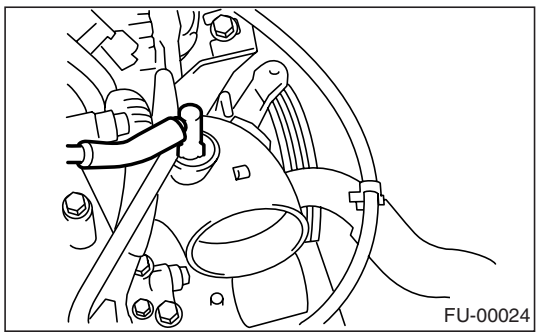
11) Connect the engine coolant hoses to throttle body.



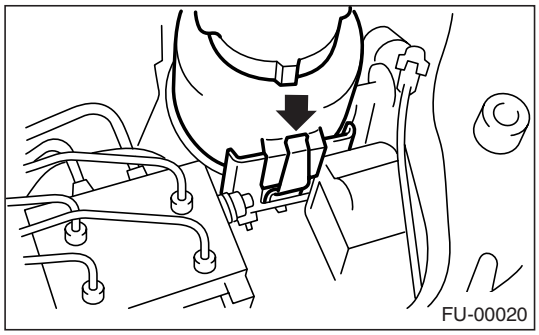
12) Connect the emission hose to PCV valve.



13) Connect the pressure hose to intake duct.

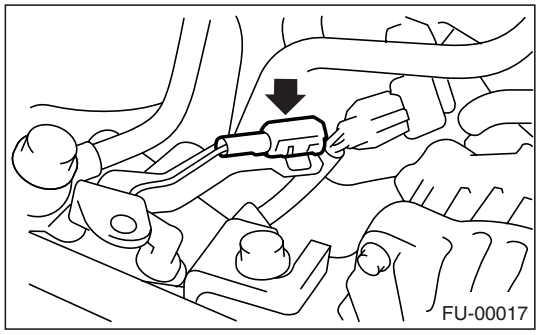


14) Install the power steering pump.
(1) Install the power steering tank on bracket.



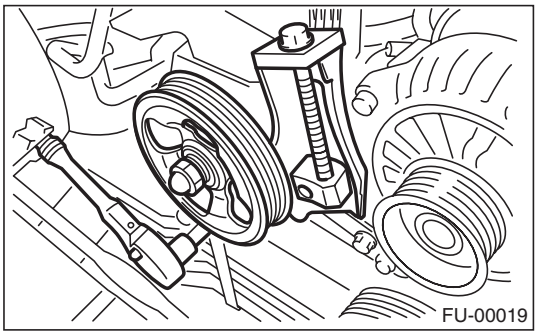
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(2) Connect the connector to the power steering pump switch.

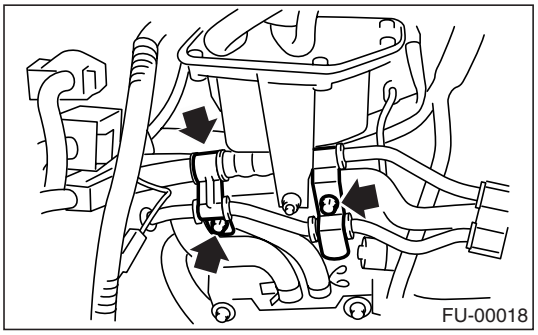


(3) Install the power steering pump, and then tighten the bolts.

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



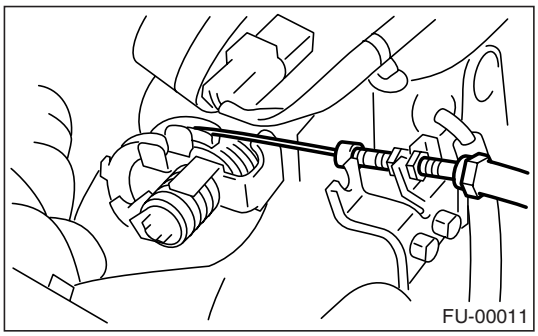
(4) Install the power steering pipe brackets on right side intake manifold.



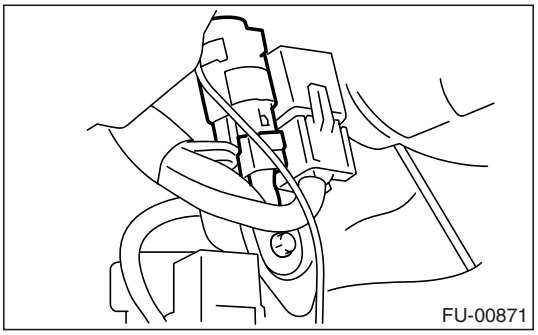
(5) Install the front side V-belt.
<Ref. to ME(H4DOTC)-55, REMOVAL, V-belt.>

15) Install the coolant filler tank. <Ref. to CO(H4DOTC)-33, INSTALLATION, Coolant Filler Tank.>

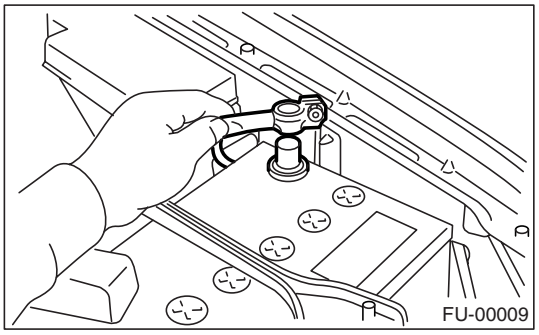
16) Connect the accelerator cable. <Ref. to SP(H4SO)-9, INSTALLATION, Accelerator Control Cable.>



17) Install the intercooler. <Ref. to IN(H4DOTC)-11, INSTALLATION, Intercooler.>
18) Install the air cleaner element.
19) Install the air cleaner upper cover and air intake duct as a unit. <Ref. to IN(H4DOTC)-8, INSTALLATION, Air Cleaner.>
20) Connect the connector to the fuel pump relay.



21) Connect the battery ground cable to battery.

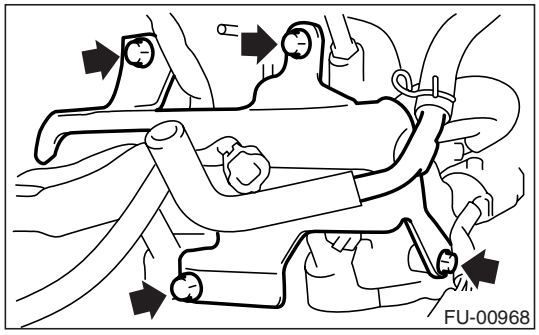


22) Lift-up the vehicle.
23) Install the under cover.
24) Fill the coolant. <Ref. to CO(H4DOTC)-17, FILLING OF ENGINE COOLANT, Engine Coolant.>

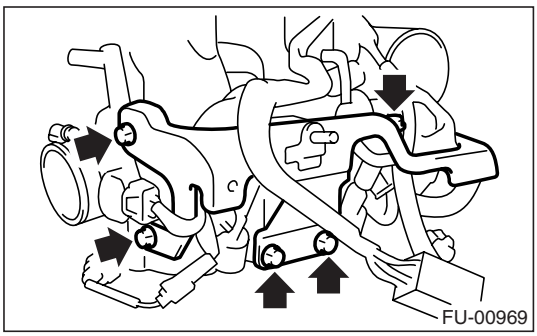
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C: DISASSEMBLY

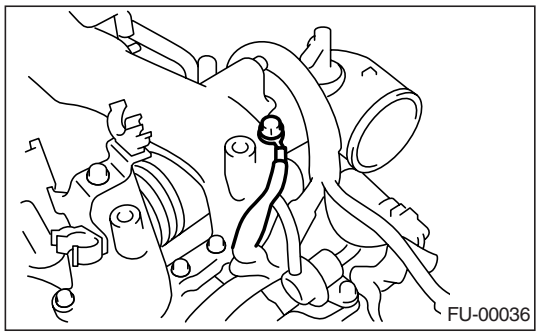
1) Remove the fuel pipe protector LH.

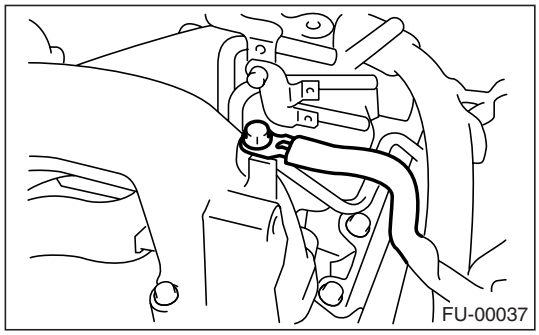


2) Remove the fuel pipe protector RH.



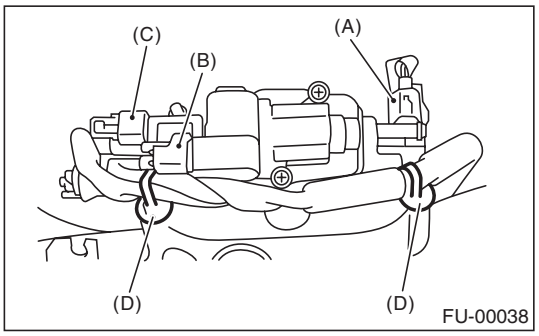
3) Remove the engine ground cable from intake manifold.



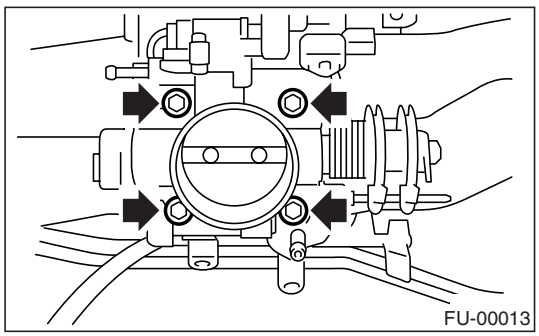


4) Disconnect the connector from the throttle position sensor (A), idle air control solenoid valve (B) and manifold absolute pressure sensor (C).

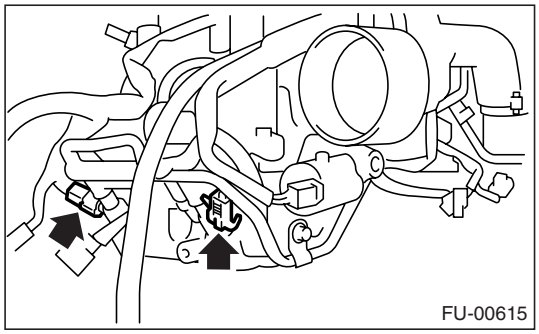
5) Disconnect the engine harness fixed by clip (D) from intake manifold.



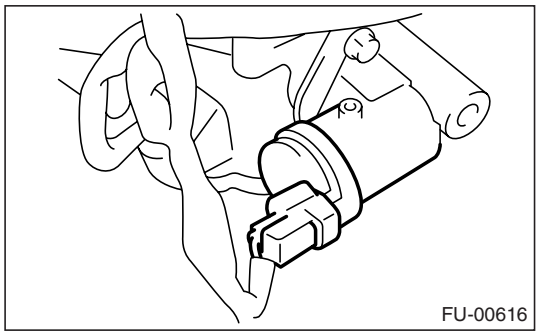
6) Remove the throttle body from intake manifold.



7) Disconnect the connector from fuel injector.

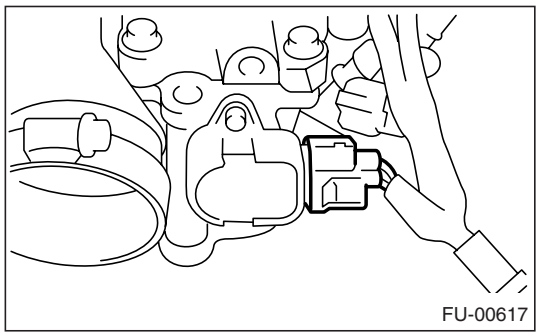


8) Disconnect the connector from tumble generator valve actuator. (Except STi model)

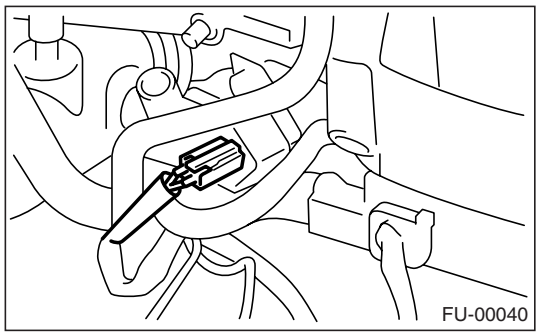


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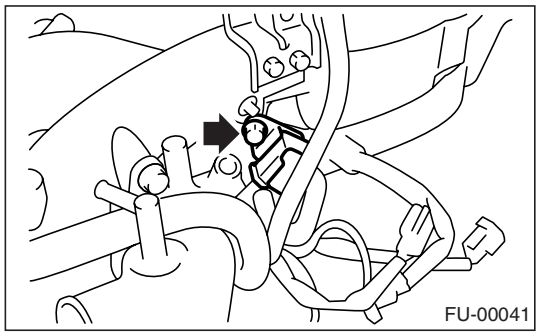
9) Disconnect the connector from tumble generator valve sensor. (Except STi model)



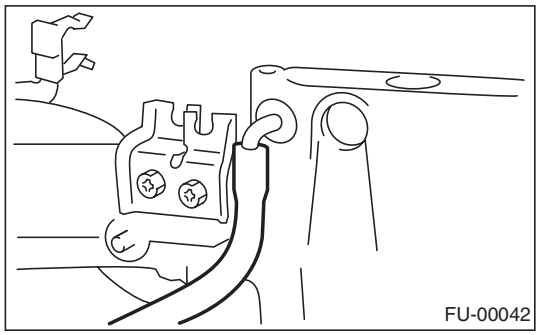
10) Disconnect the connector from purge control solenoid valve.



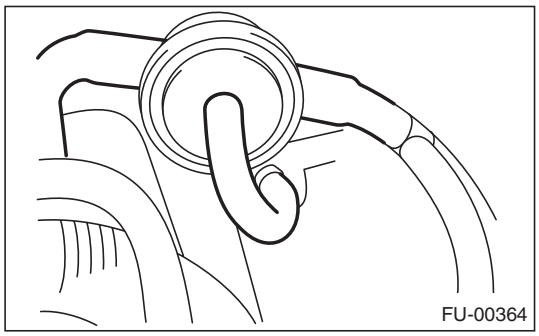
11) Remove the purge control solenoid valve.



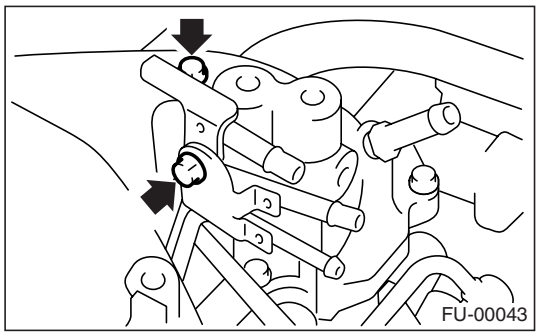
12) Disconnect the evaporation hose from intake manifold.



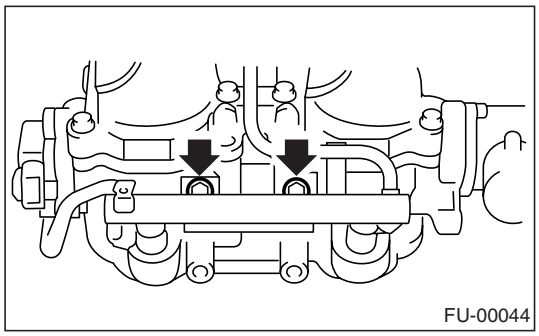
13) Disconnect the evaporation hose from purge valve. (Except Australia model)

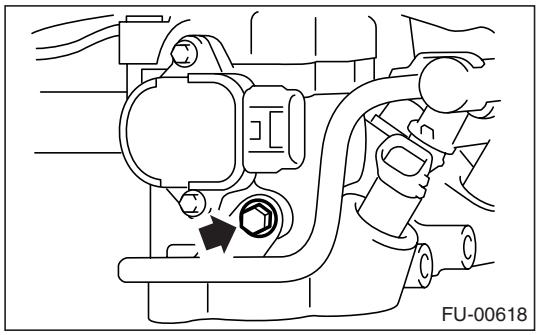


14) Remove the two bolts which hold the fuel pipes on the left side of intake manifold.



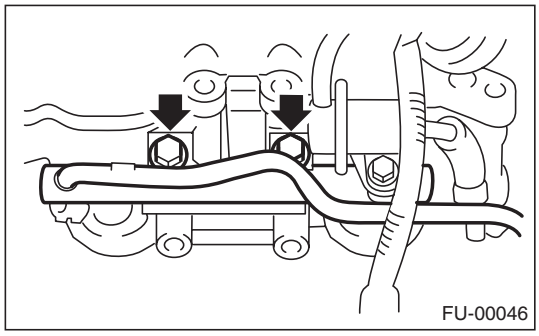
15) Remove the bolts which hold the fuel injector pipe onto intake manifold.
- LH SIDE

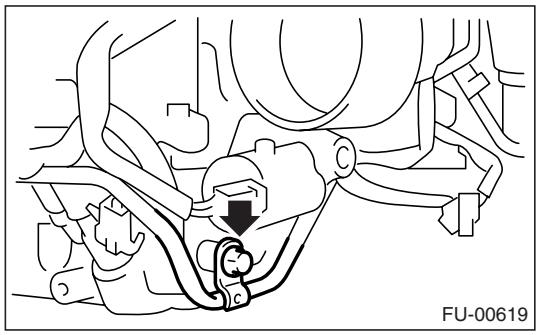




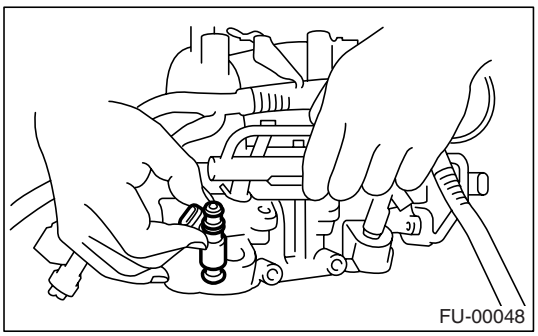
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- RH SIDE

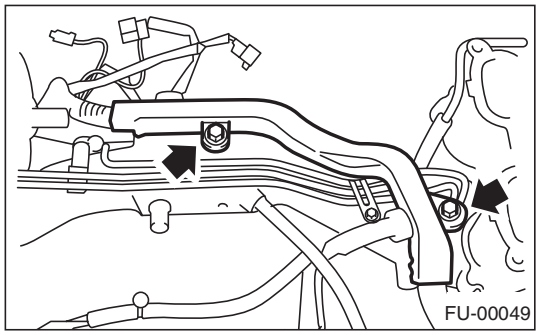




16) Remove the fuel injector.

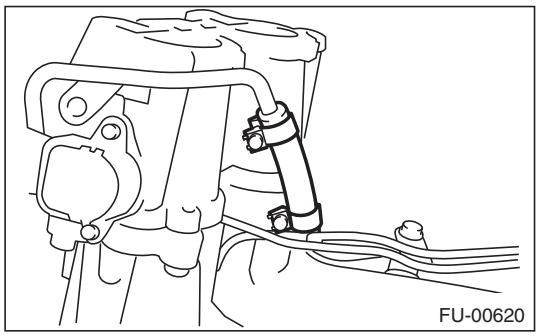


17) Remove the harness bracket which holds the engine harness onto intake manifold.

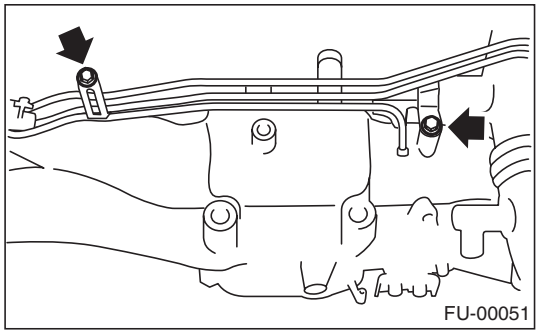


18) Remove the engine harness from intake manifold.

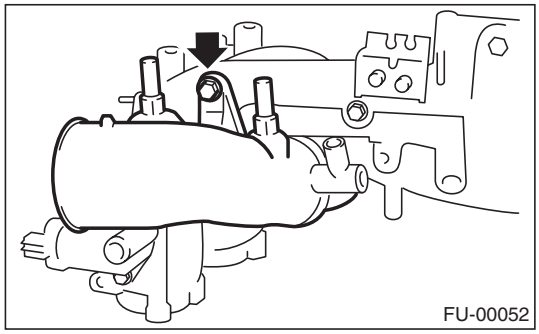
19) Loosen the clamp which holds the front left side fuel hose to injector pipe, and remove the pipe from clamp.



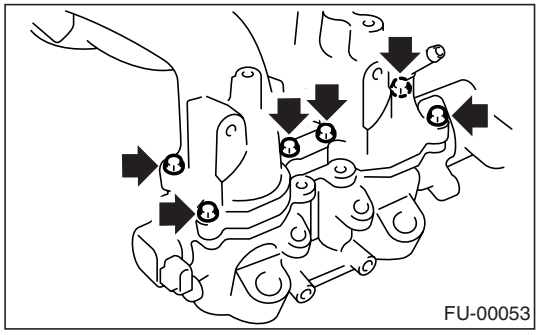
20) Remove the fuel injector pipe LH.
21) Remove the bolts which install the fuel pipe on intake manifold.



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



24) Remove the intake manifold.



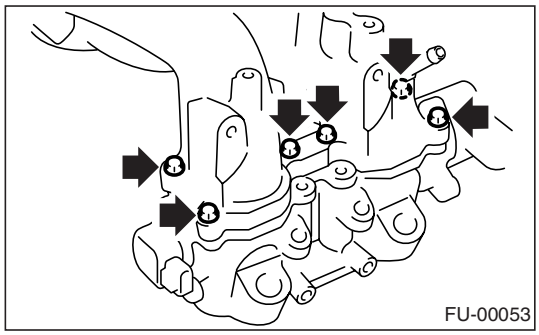
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D: ASSEMBLY

NOTE:
Replace the gasket with a new one.

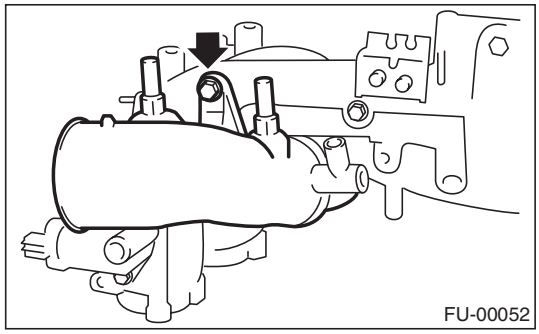
1) Install the intake manifold.

Tightening torque:
8.25 N·m (0.84 kgf-m, 6.1 ft-lb)



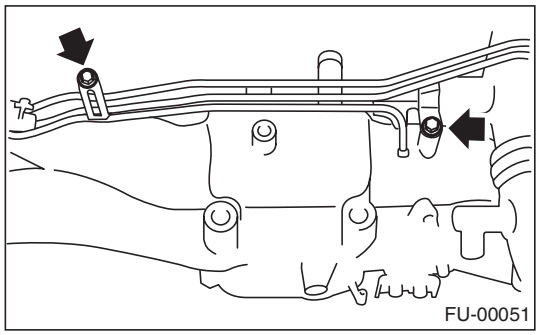
2) Install the air intake duct to intake manifold.

Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)



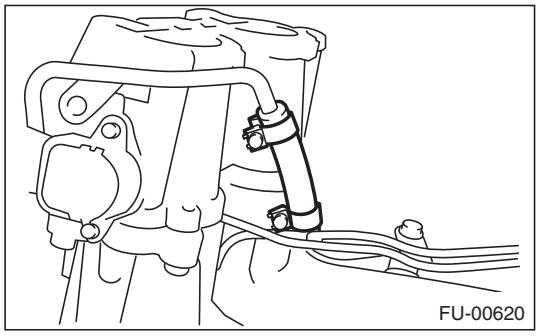
3) Install the fuel pipe assembly and pressure regulator to intake manifold.

Tightening torque:
4.9 N·m (0.5 kgf-m, 3.6 ft-lb)



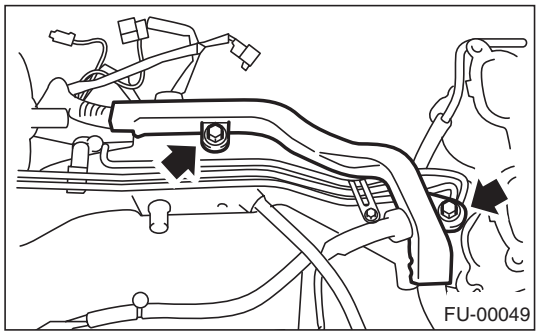
4) Install the fuel injector pipe LH.

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

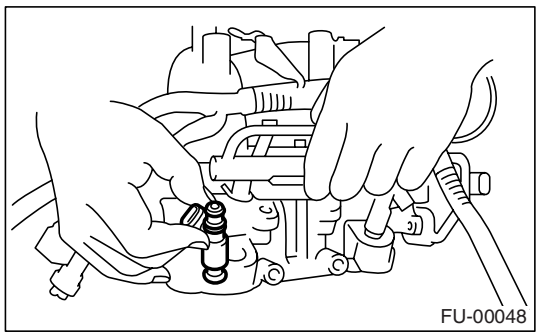


6) Install the engine harness to intake manifold.
7) Install the harness bracket which holds the engine harness onto intake manifold.

Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)



8) Install the fuel injector.

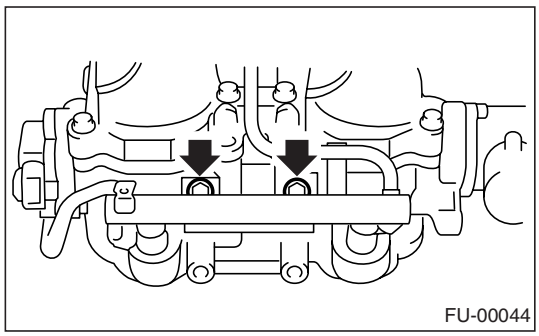


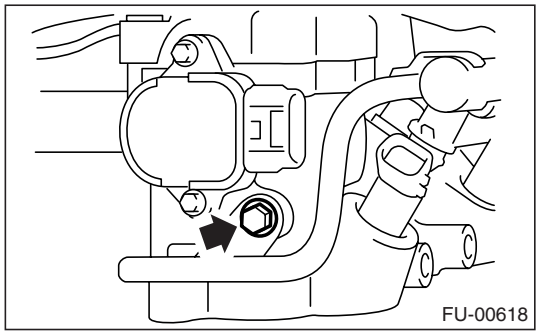
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9) Tighten the bolts which install the fuel injector pipe onto intake manifold.

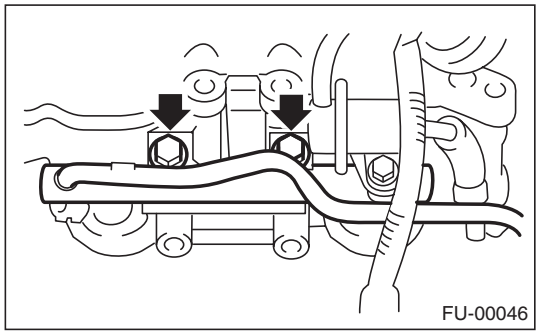
Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)

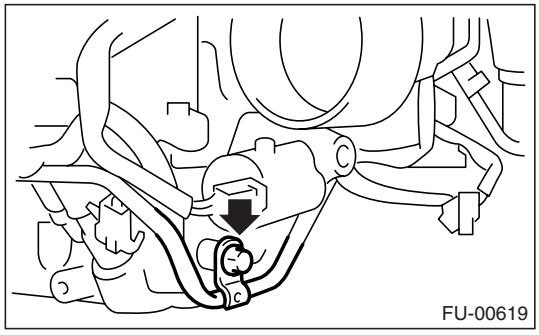
- LH SIDE





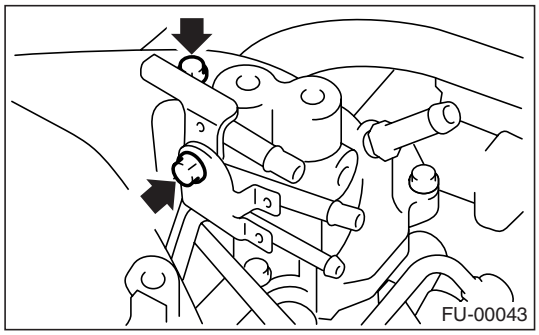
- RH SIDE





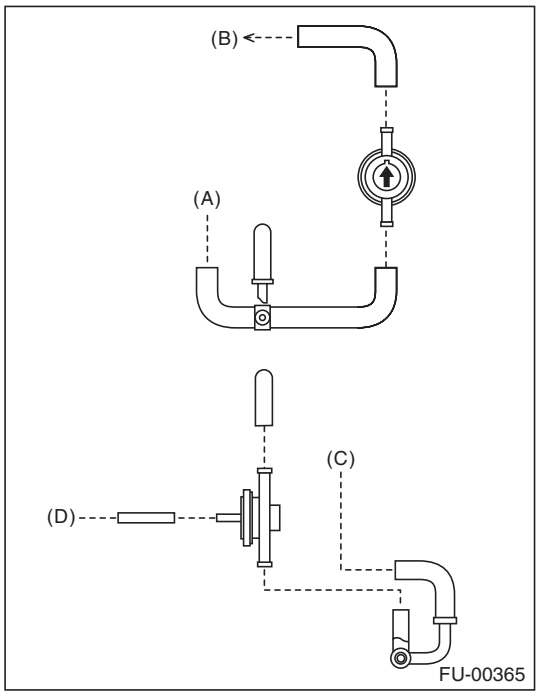
10) Tighten the two bolts which install the fuel pipes on the left side of intake manifold.

Tightening torque:
4.9 N·m (0.5 kgf-m, 3.6 ft-lb)



11) Connect the evaporation hoses to the purge valve. (Except Australia model)

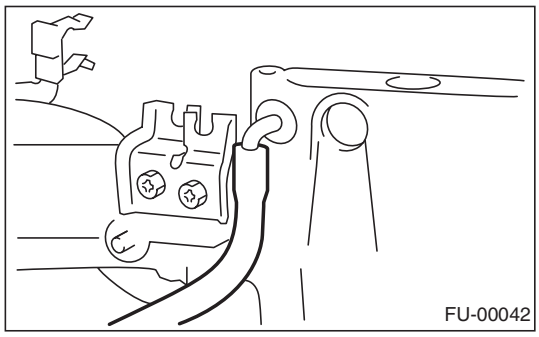
NOTE:
Connect the evaporation hose as shown in the figure.



(A) To fuel pipe ASSY
(B) To intake duct
(C) To purge control solenoid valve
(D) To intake manifold

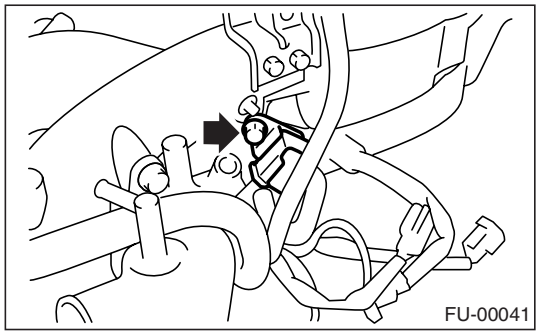
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12) Connect the evaporation hose to intake manifold.



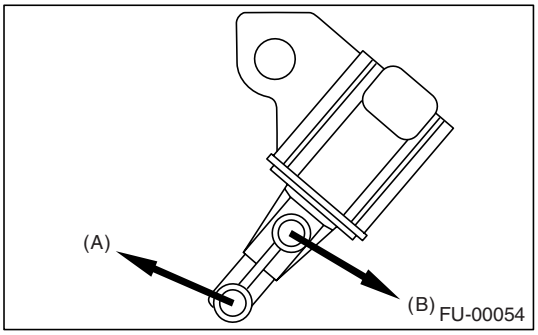
13) Install the purge control solenoid valve.

Tightening torque:
16 N·m (1.6 kgf-m, 11.8 ft-lb)



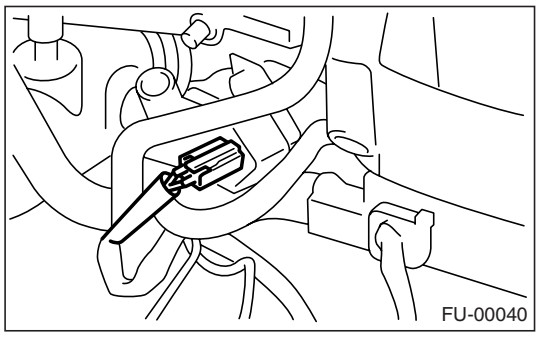
14) Connect the hoses to the purge control solenoid valve.

NOTE:
Connect the evaporation hose as shown in the figure.

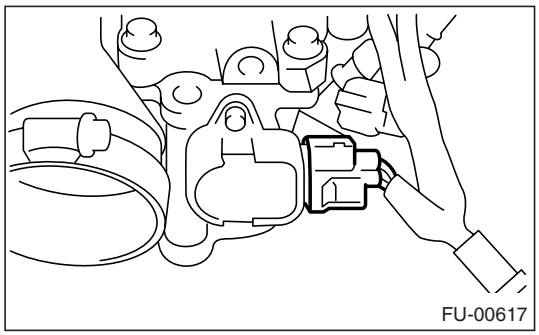


(A) To intake manifold
(B) To fuel pipe (Australia model)
To purge valve (Except STi model)

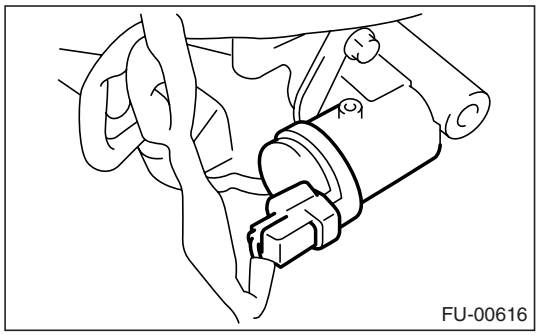
15) Connect the connector to the purge control solenoid valve.



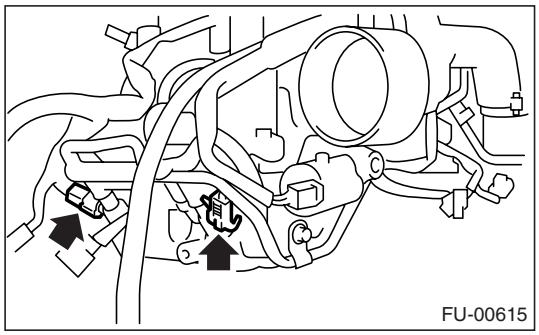
16) Connect the connector to the tumble generator valve sensor. (Except STi model)



17) Connect the connector to the tumble generator valve actuator. (Except STi model)



18) Connect the connector to fuel injector.

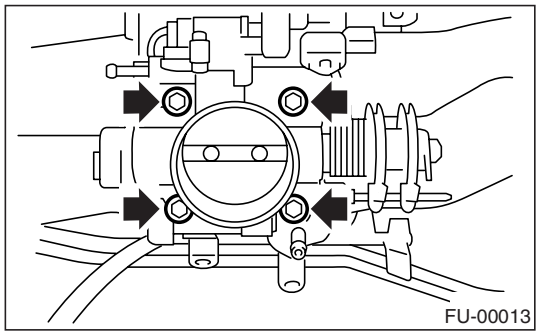


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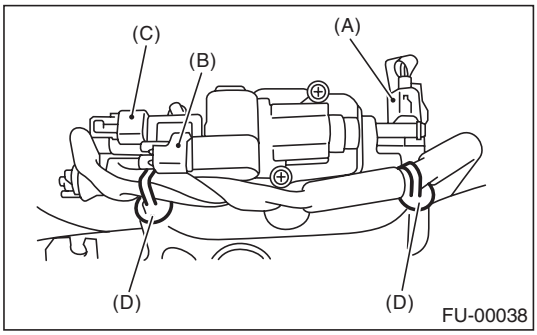
19) Install the throttle body to intake manifold.

NOTE:
Replace the gasket with a new one.

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

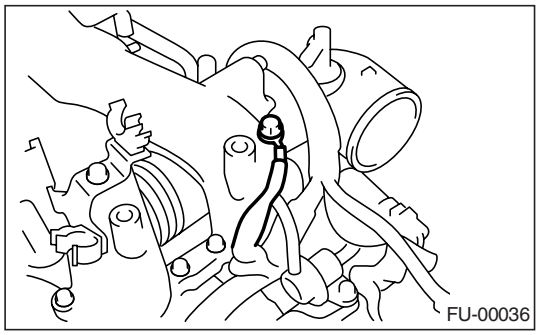


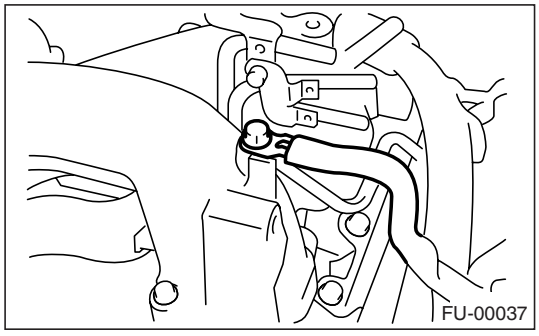
20) Connect the connector to the throttle position sensor (A), idle air control solenoid valve (B) and manifold absolute pressure sensor (C).
21) Connect the engine harness with clip (D) to intake manifold.



22) Install the engine ground cable to intake manifold.

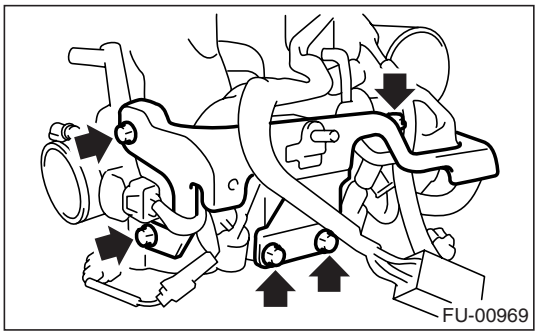
Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)





23) Install the fuel pipe protector RH.

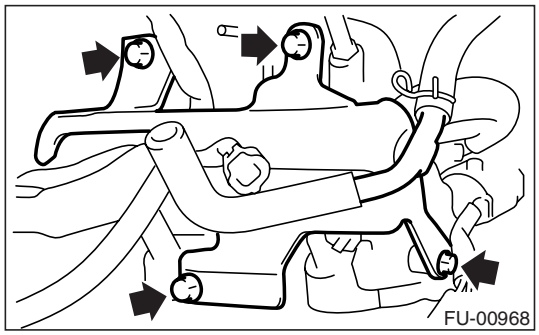
Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)



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24) Install the fuel pipe protector LH.

Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)



E: INSPECTION

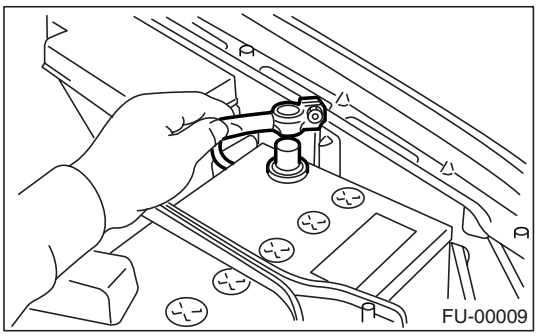
Make sure the fuel pipe and fuel hoses are not cracked and the connections are tightened firmly.

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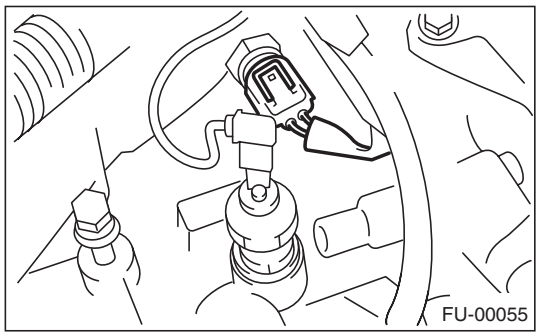
4. Engine Coolant Temperature Sensor

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 engine coolant temperature sensor.



5) Remove the engine coolant temperature sensor.

B: INSTALLATION

Install in the reverse order of removal.

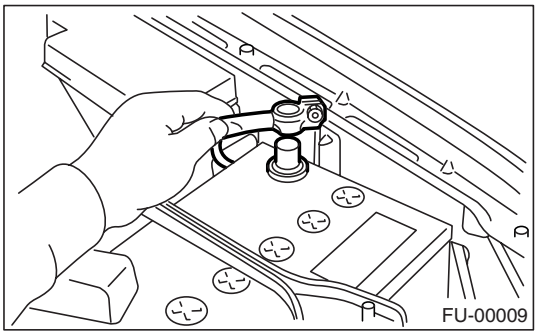
Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)

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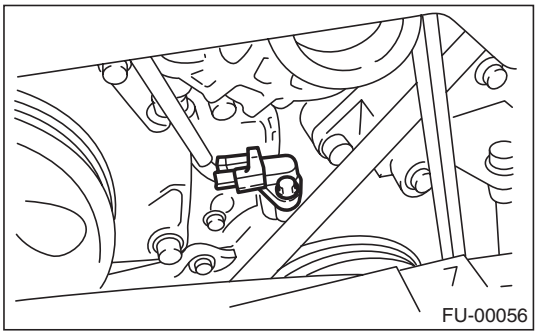
5. Crankshaft Position Sensor

A: REMOVAL

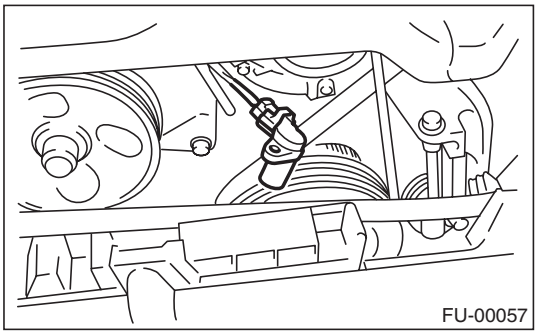
1) Disconnect the ground cable from battery.



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



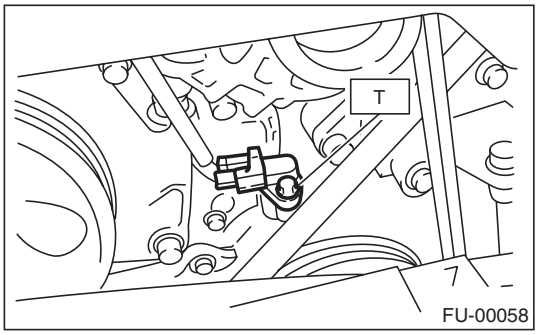
3) Remove the crankshaft position sensor, and disconnect the connector from it.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
T: 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

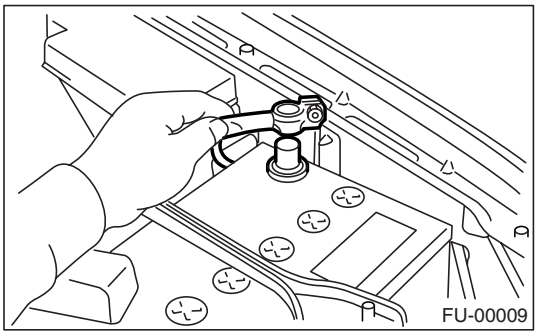


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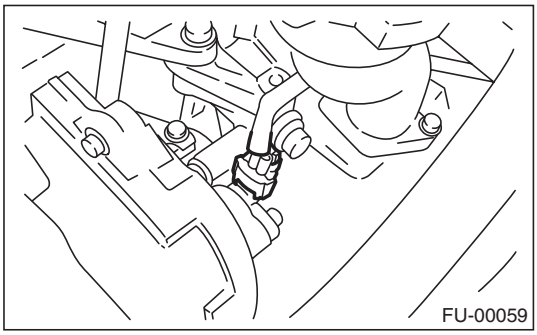
6. Camshaft Position Sensor

A: REMOVAL

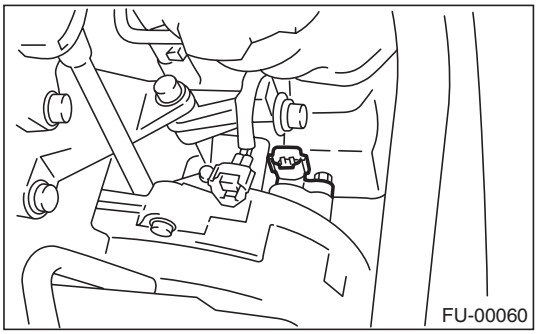
1) Disconnect the ground cable from battery.



2) Disconnect the connector from camshaft position sensor.



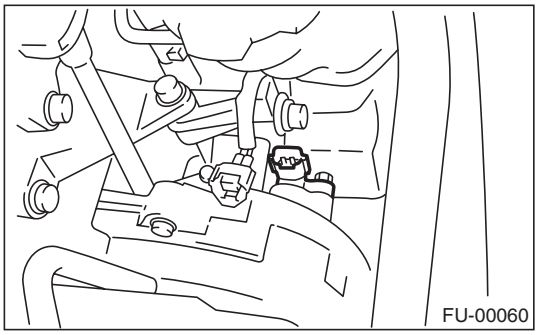
3) Remove the camshaft position sensor from camshaft support LH.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
T: 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



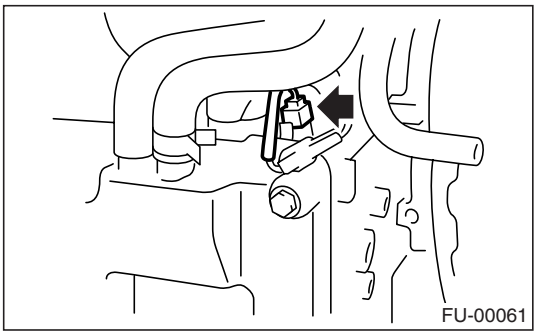
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7. AVCS Camshaft Position Sensor

A: REMOVAL

NOTE:
This component is installed to STi and Australia model.

1) Disconnect the ground cable from battery.
2) Remove the intercooler. <Ref. to IN(H4DOTC)-11, REMOVAL, Intercooler.>
3) Remove the intake manifold. <Ref. to FU(H4DOTC)-14, REMOVAL, Intake Manifold.>
4) Disconnect the AVCS camshaft position sensor connector.
5) Remove the AVCS camshaft position sensor.



B: INSTALLATION

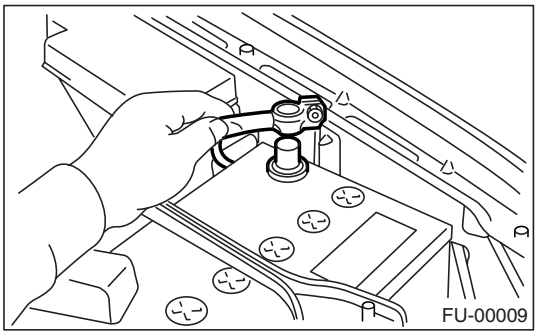
Install in the reverse order of removal.

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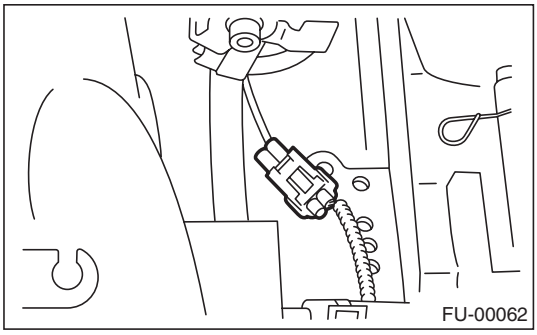
8. Knock Sensor

A: REMOVAL

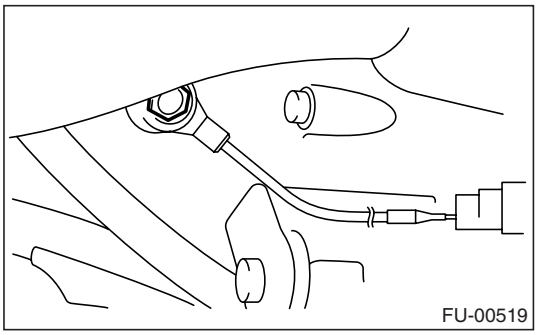
1) Disconnect the ground cable from battery.



2) Remove the intercooler. <Ref. to IN(H4DOTC)-11, REMOVAL, Intercooler.>
3) Disconnect the knock sensor connector.



4) Remove the knock sensor from cylinder block.

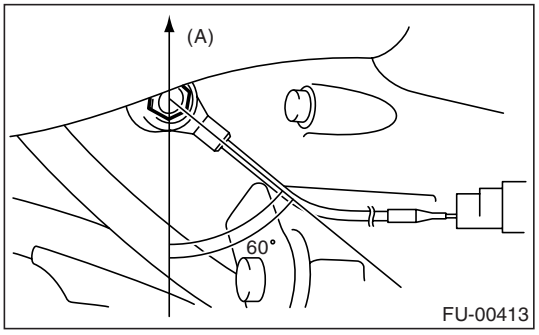


B: INSTALLATION

1) Install the knock sensor to cylinder block.

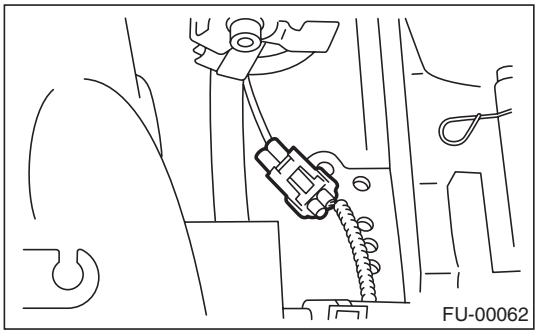
Tightening torque:
24 N·m (2.4 kgf-m, 17.4 ft-lb)

NOTE:
Extraction area of knock sensor cord must be positioned at a 60° angle relative to engine rear.

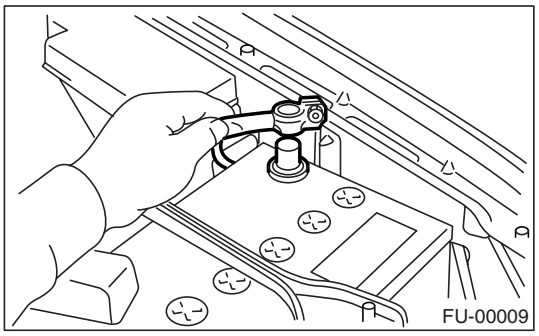


(A) Front side

2) Connect the knock sensor connector.



3) Install the intercooler. <Ref. to IN(H4DOTC)-11, INSTALLATION, Intercooler.>
4) Connect the battery ground cable to battery.

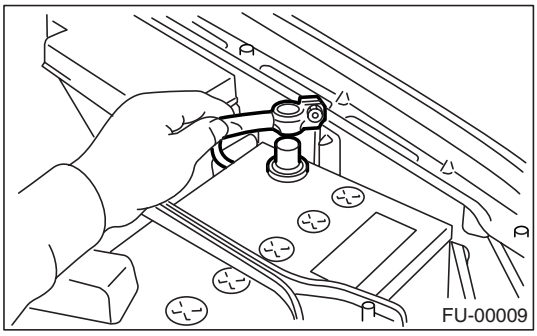


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9. Throttle Position Sensor

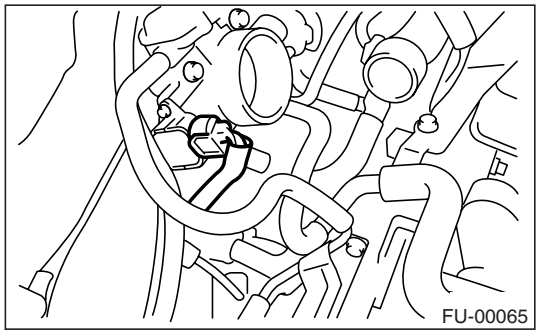
A: REMOVAL

1) Disconnect the ground cable from battery.

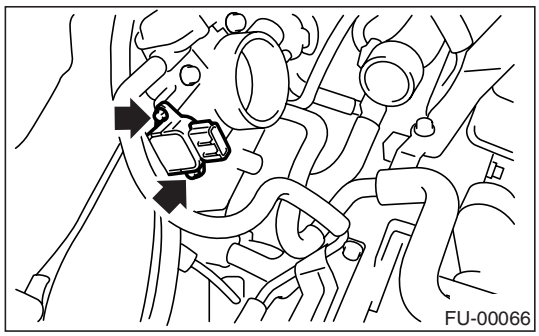


2) Remove the intercooler. <Ref. to IN(H4DOTC)-11, REMOVAL, Intercooler.>

3) Disconnect the connector from throttle position sensor.



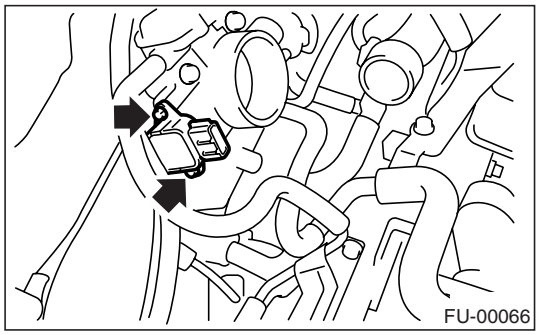
4) Remove the throttle position sensor holding screws, and remove it.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
1.6 N·m (0.16 kgf-m, 1.2 ft-lb)

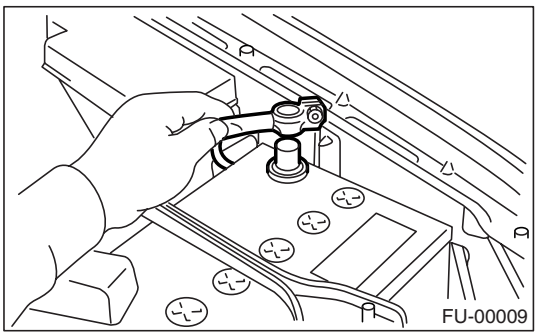


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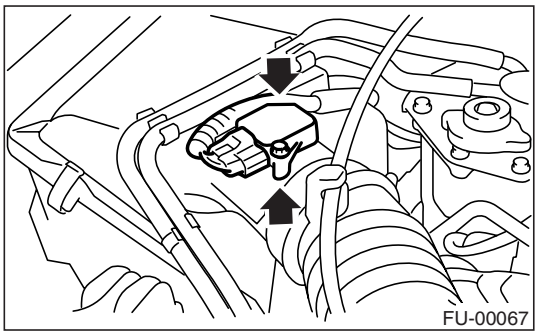
10.Mass Air Flow and Intake Air Temperature Sensor

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.

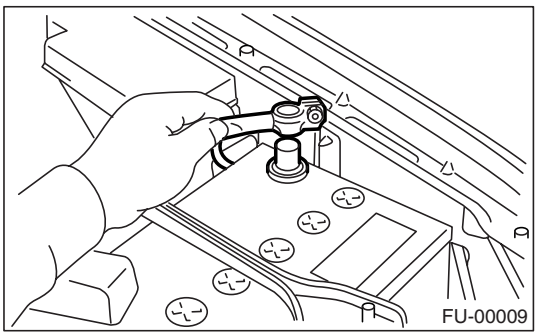
Tightening torque:
1.7 N·m (0.17 kgf-m, 1.2 ft-lb)

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11.Manifold Absolute Pressure Sensor

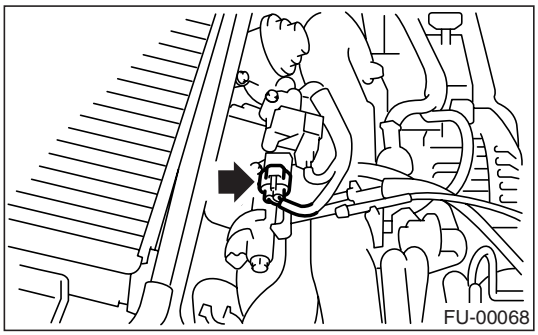
A: REMOVAL

1) Disconnect the ground cable from battery.



2) Remove the idle air control solenoid valve. <Ref. to FU(H4DOTC)-36, REMOVAL, Idle Air Control Solenoid Valve.>

3) Disconnect the connectors from manifold absolute pressure sensor.



4) Remove the manifold absolute pressure sensor from throttle body.

B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Replace the O-rings for manifold absolute pressure sensor with new ones.

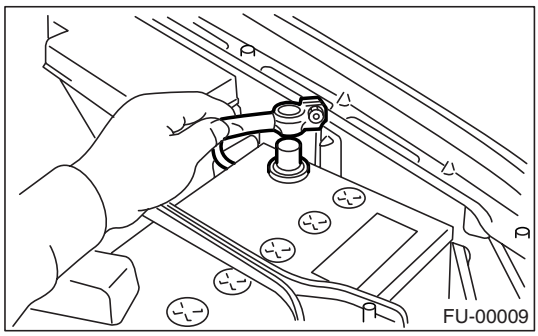
Tightening torque:
1.6 N·m (0.16 kgf-m, 1.2 ft-lb)

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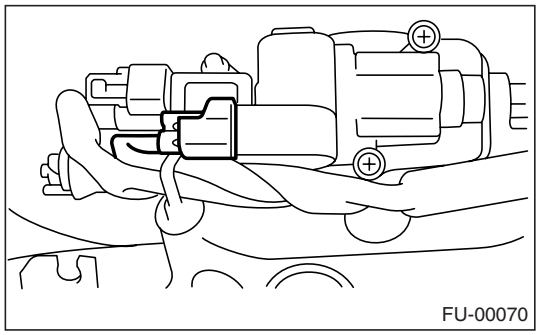
12.Idle Air Control Solenoid Valve

A: REMOVAL

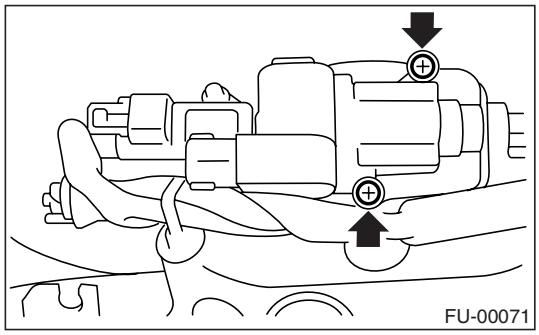
1) Disconnect the ground cable from battery.



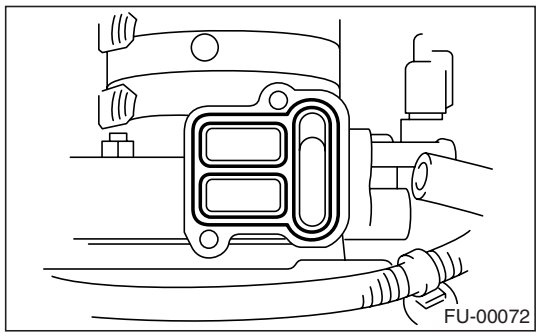
2) Disconnect the connector from idle air control solenoid valve.



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



4) Remove the gasket from throttle body.

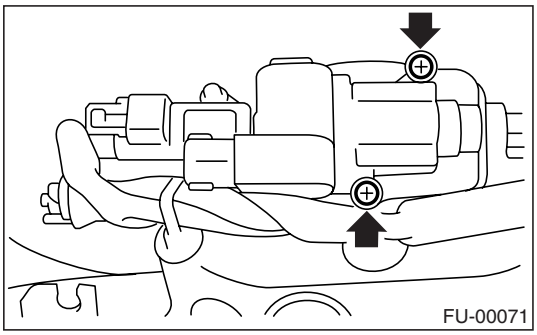


B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Replace the gasket with a new one.

Tightening torque:
2.8 N·m (0.29 kgf-m, 2.1 ft-lb)



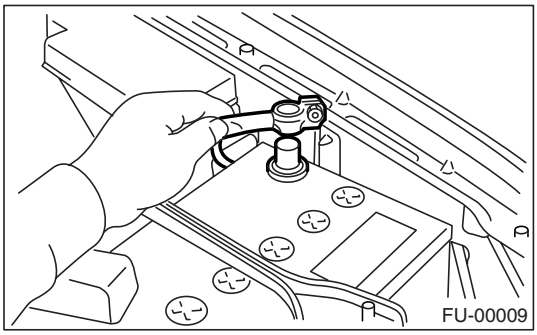
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13.Fuel Injector

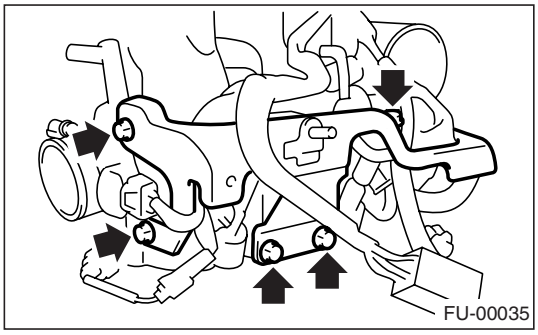
A: REMOVAL

1. RH SIDE

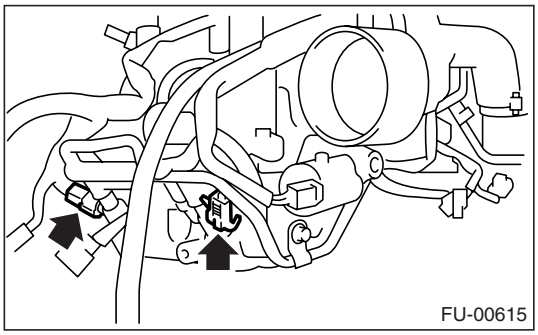
1) Release the fuel pressure. <Ref. to FU(H4DOTC)-53, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
2) Open the fuel filler flap lid and remove the fuel filler cap.
3) Disconnect the ground cable from battery.



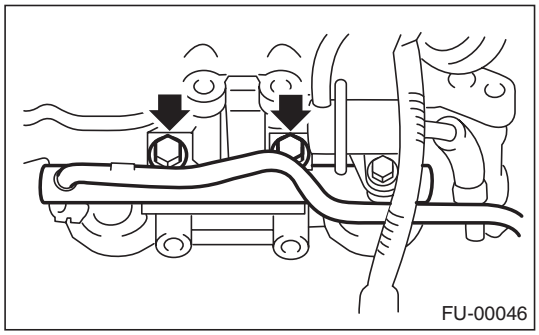
4) Remove the intake manifold. <Ref. to FU(H4DOTC)-14, REMOVAL, Intake Manifold.>
5) Remove the fuel pipe protector RH.

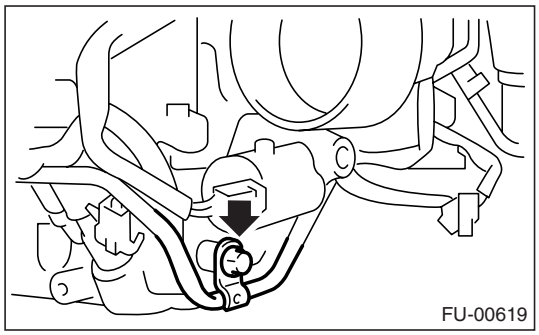


6) Disconnect the connector from fuel injector.

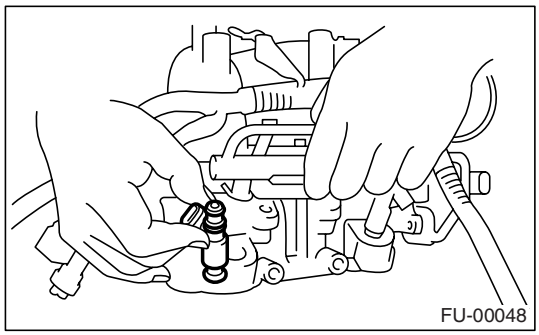


7) Remove the bolts which hold the injector pipe to intake manifold.





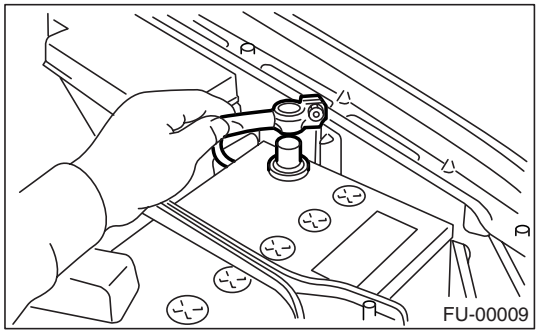
8) Remove the fuel injector while lifting up the fuel injector pipe.



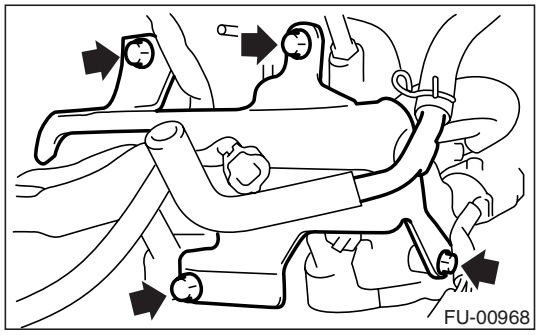
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2. LH SIDE

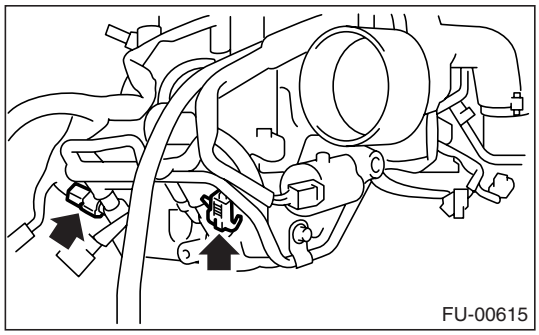
1) Release the fuel pressure. <Ref. to FU(H4DOTC)-53, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
2) Open the fuel filler flap lid and remove the fuel filler cap.
3) Disconnect the ground cable from battery.


FU-00009

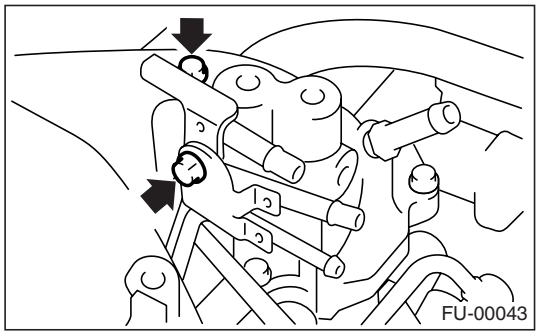
4) Remove the intake manifold. <Ref. to FU(H4DOTC)-14, REMOVAL, Intake Manifold.>
5) Remove the fuel pipe protector LH.

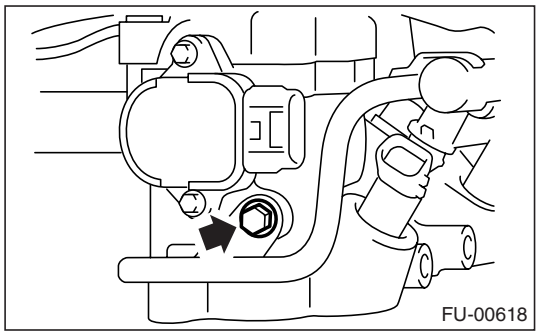

FU-00968

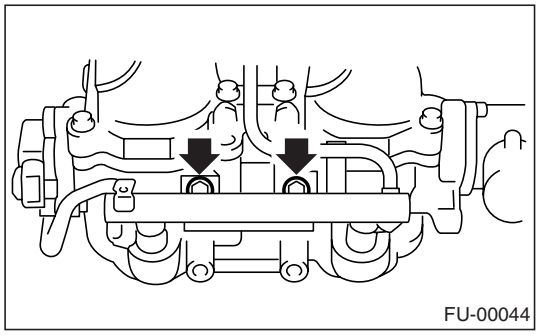
6) Disconnect the connector from fuel injector.


FU-00615

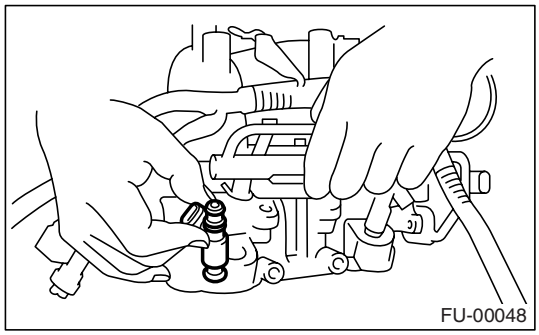
7) Remove the bolts which hold the injector pipe to intake manifold.


FU-00043


FU-00618


FU-00044

8) Remove the fuel injector while lifting up the fuel injector pipe.


FU-00048

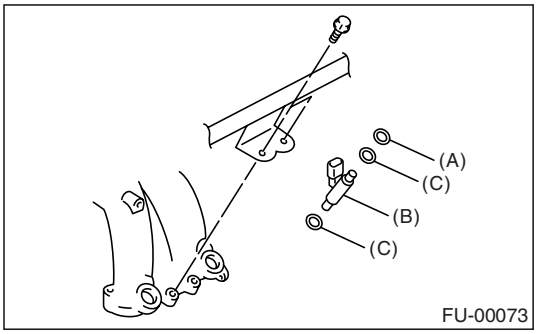
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B: INSTALLATION

1. RH SIDE

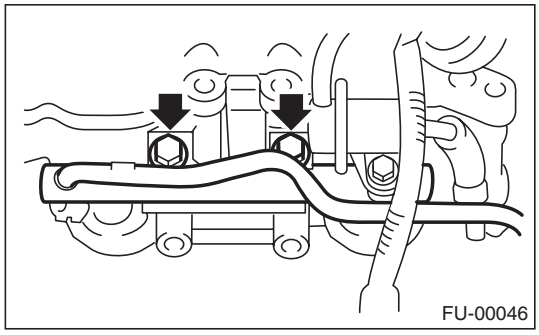
Install in the reverse order of removal.

NOTE:
Replace the O-ring and insulators with new ones.

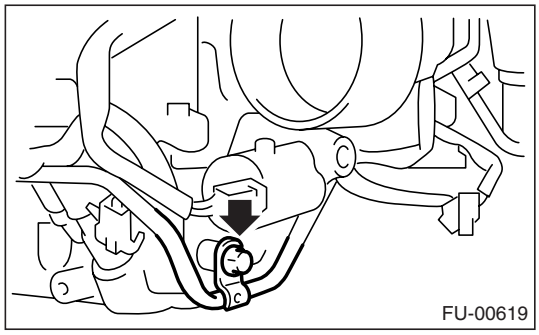


(A) O-ring
(B) Fuel injector
(C) Insulator

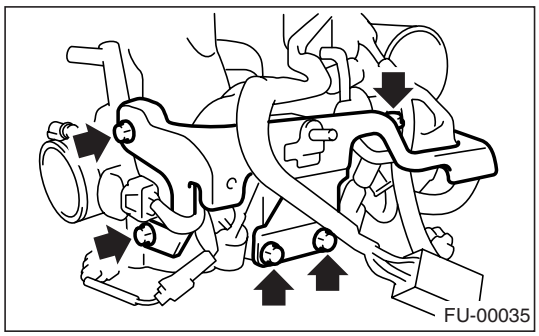
Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)



Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)



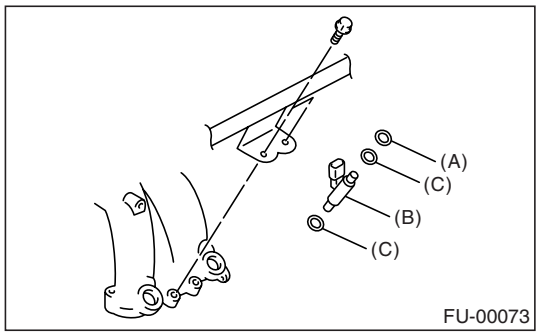
Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)



2. LH SIDE

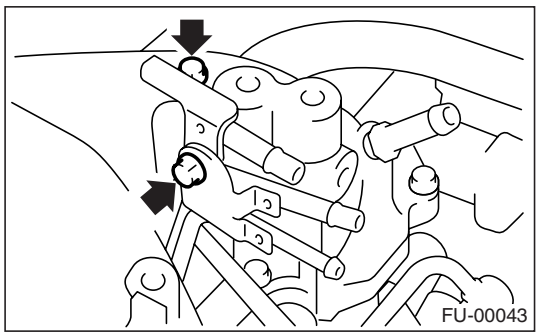
Install in the reverse order of removal.

NOTE:
Replace the O-ring and insulators with new ones.



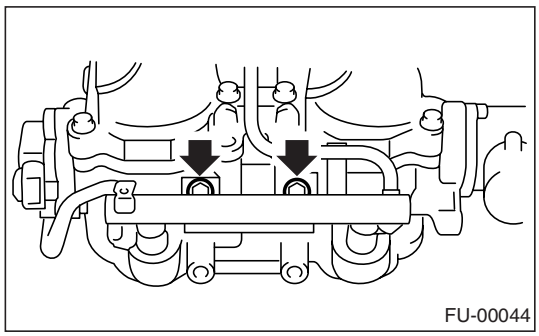
(A) O-ring
(B) Fuel injector
(C) Insulator

Tightening torque:
4.9 N·m (0.5 kgf-m, 3.6 ft-lb)

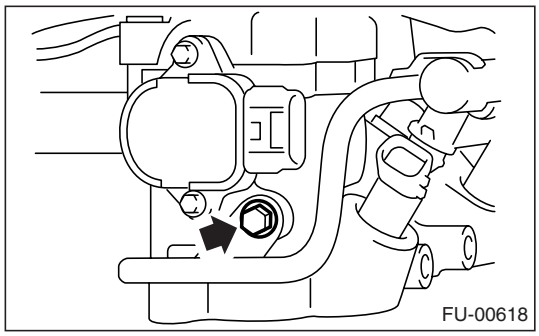


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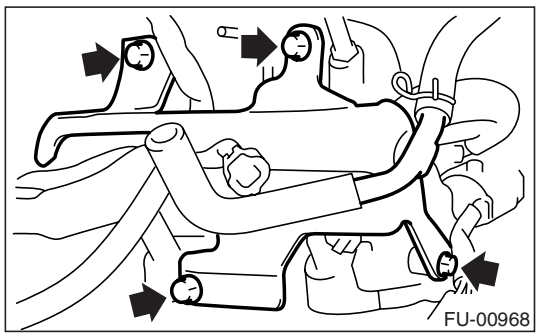
Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)



Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)



Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)



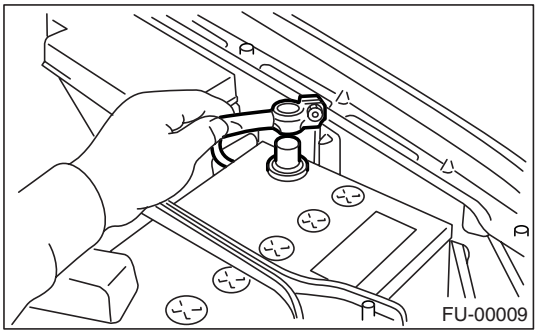
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14.Tumble Generator Valve Assembly

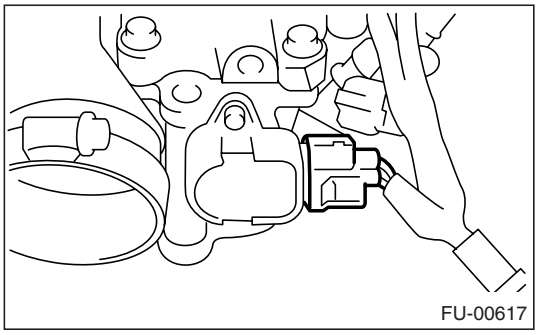
A: REMOVAL

NOTE:
This component is installed to except STi model.

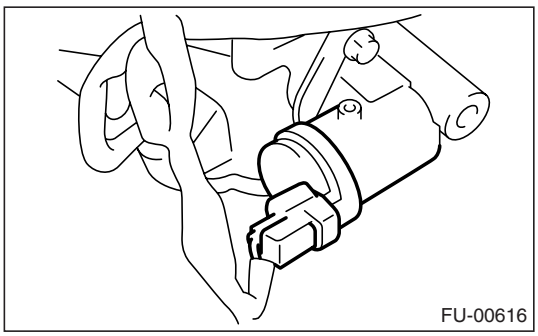
1) Release the fuel pressure. <Ref. to FU(H4DOTC)-53, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
2) Open the fuel filler flap lid, and then remove the fuel filler cap.
3) Disconnect the ground cable from battery.


FU-00009

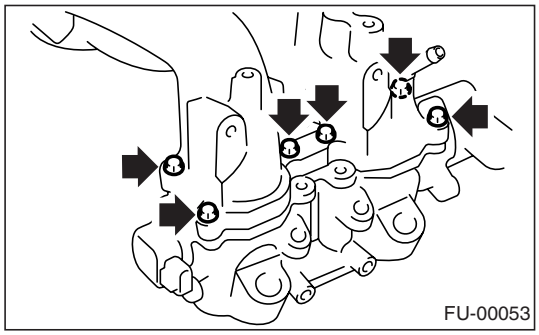
4) Remove the intake manifold. <Ref. to FU(H4DOTC)-14, REMOVAL, Intake Manifold.>
5) Disconnect the connector from tumble generator valve sensor.


FU-00617

6) Disconnect the connector from tumble generator valve actuator.


FU-00616

7) Remove the fuel injector. <Ref. to FU(H4DOTC)-37, REMOVAL, Fuel Injector.>
8) Remove the tumble generator valve body from intake manifold.

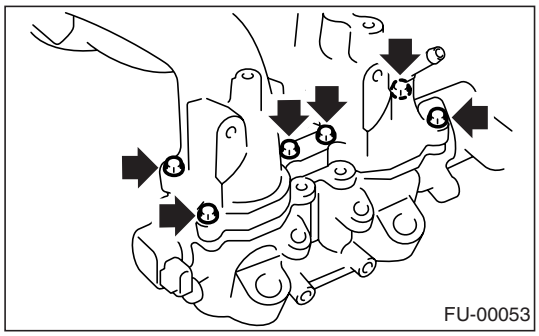

FU-00053

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)


FU-00053

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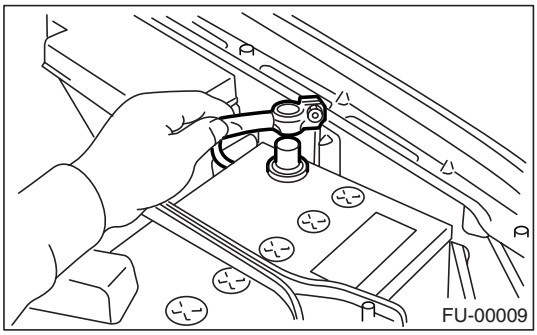
15.Tumble Generator Valve Actuator

A: REMOVAL

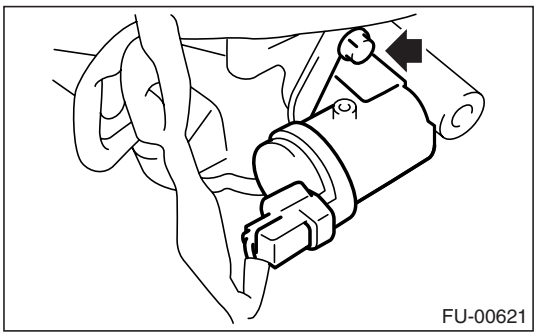
NOTE:
This component is installed to except STi model.

1. RH SIDE

1) Release the fuel pressure. <Ref. to FU(H4DOTC)-53, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
2) Open the fuel filler flap lid and remove the fuel filler cap.
3) Disconnect the ground cable from battery.

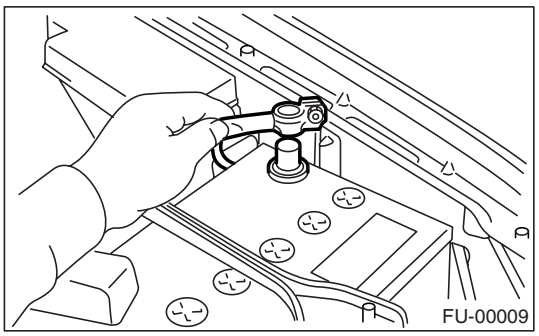


4) Remove the intake manifold. <Ref. to FU(H4DOTC)-14, REMOVAL, Intake Manifold.>
5) Disconnect the connector from tumble generator valve actuator RH.
6) Remove the tumble generator valve RH.

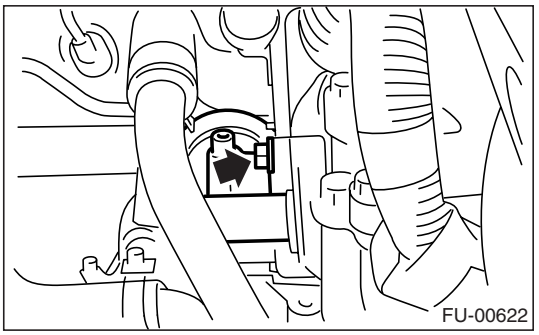


2. LH SIDE

1) Disconnect the ground cable from battery.



2) Disconnect the connector from tumble generator valve LH.
3) Remove the tumble generator valve actuator LH.



B: INSTALLATION

1. RH SIDE

Install in the reverse order of removal.

2. LH SIDE

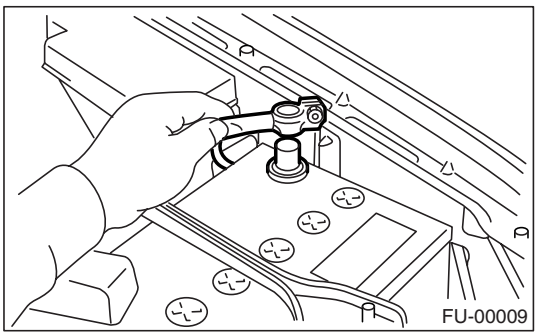
Install in the reverse order of removal.

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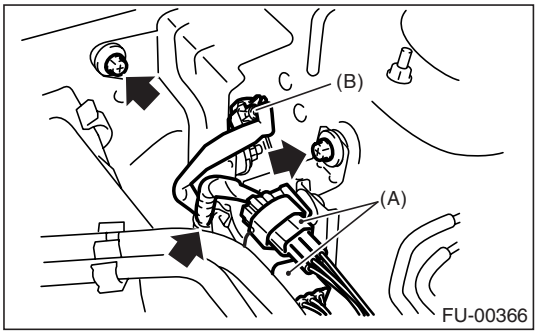
16. Wastegate Control Solenoid Valve

A: REMOVAL

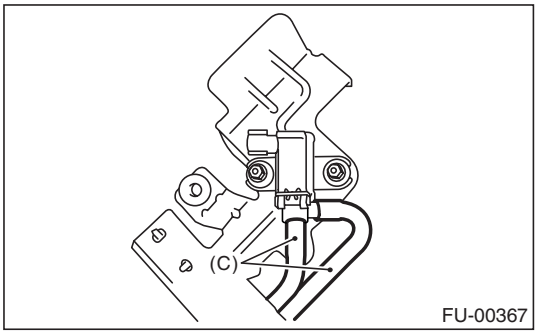
1) Disconnect the ground cable from battery.



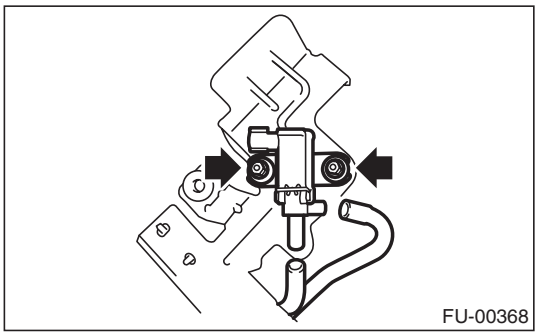
2) Disconnect the engine harness connector (A) from bracket.
3) Disconnect the connector (B) from wastegate control solenoid valve.
4) Remove the bracket from body.



5) Disconnect the pressure hoses (C) from wastegate control solenoid valve.



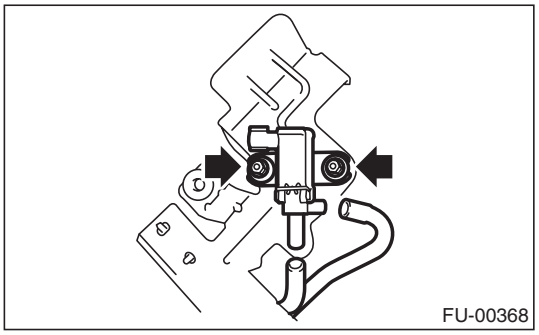
6) Remove the wastegate control solenoid valve from bracket.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

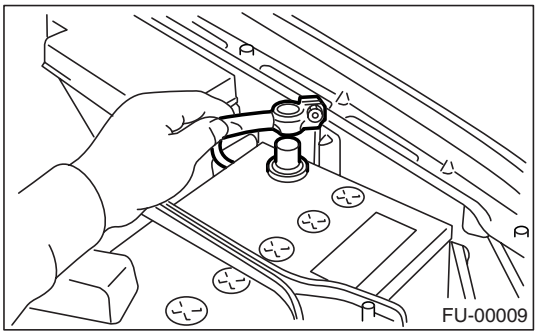


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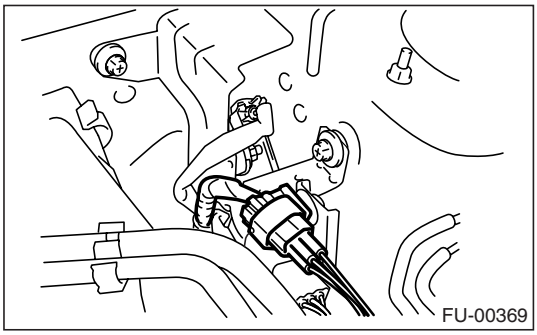
17.Front Oxygen (A/F) Sensor

A: REMOVAL

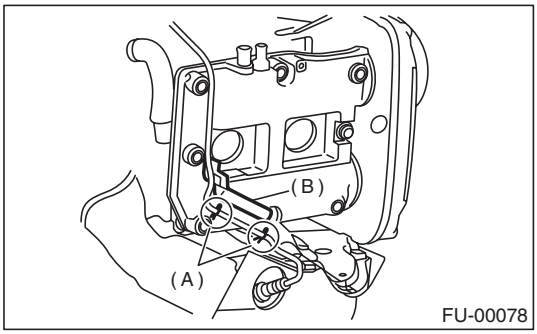
1) Disconnect the ground cable from battery.



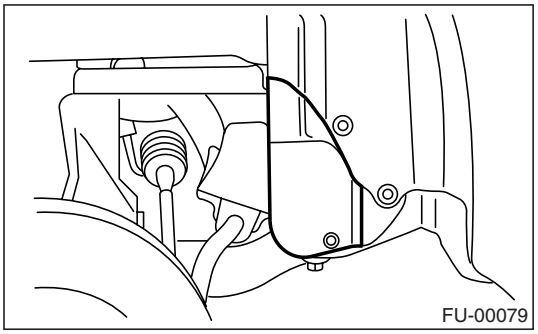
2) Disconnect the connector from front oxygen (A/F) sensor.



3) Disconnect the engine harness fixed by clip (A) from bracket (B).



4) Remove the front right side wheel.
5) Lift-up the vehicle.
6) Remove the service hole cover.

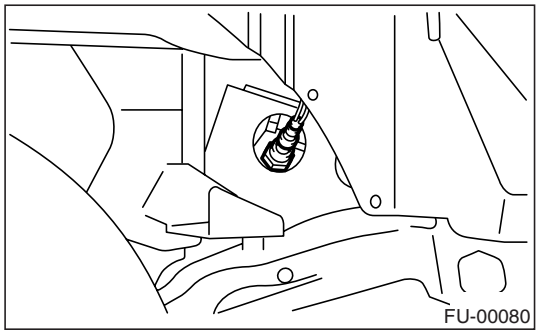


7) Apply SUBARU CRC or its equivalent to the threaded portion of front oxygen (A/F) sensor, and leave it for 1 minute or more.

SUBARU CRC (Part No. 004301003)

8) Remove the front oxygen (A/F) sensor.

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



B: INSTALLATION

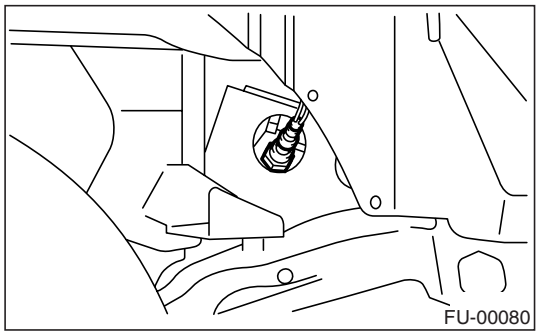
1) Before installing the front oxygen (A/F) sensor, apply anti-seize compound only to the threaded portion of front oxygen (A/F) sensor to make next removal easier.

Anti-seize compound:
SS-30 by JET LUBE

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

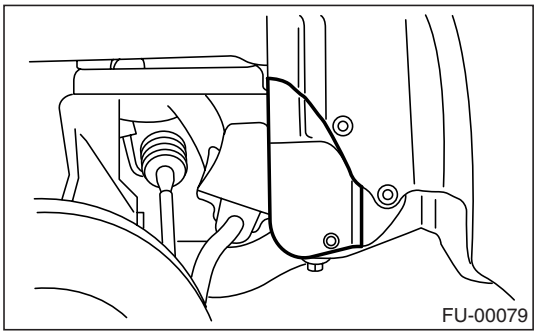
2) Install the front oxygen (A/F) sensor.

Tightening torque:
30 N·m (3.1 kgf-m, 22.1 ft-lb)

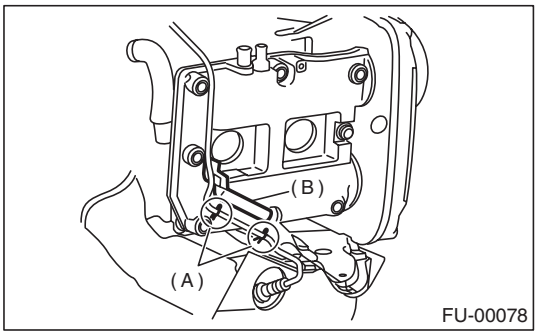


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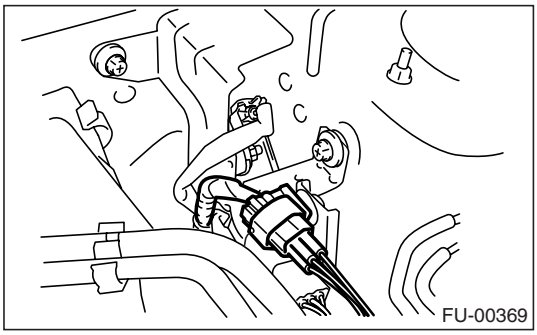
3) Install the service hole cover.



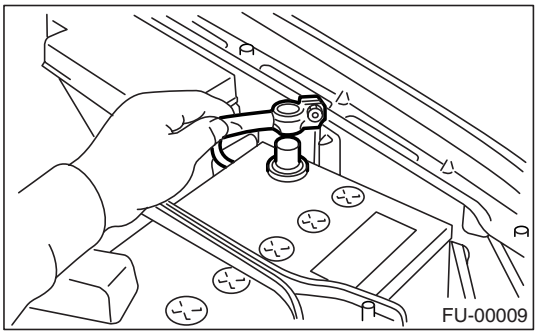
4) Lower the vehicle.
5) Install the front right side wheel.
6) Connect the engine harness with clip (A) to bracket (B).



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



8) Connect the battery ground cable to battery.

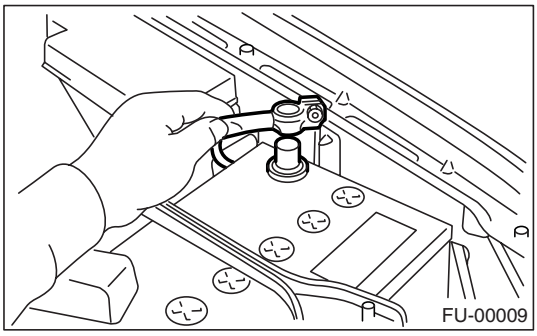


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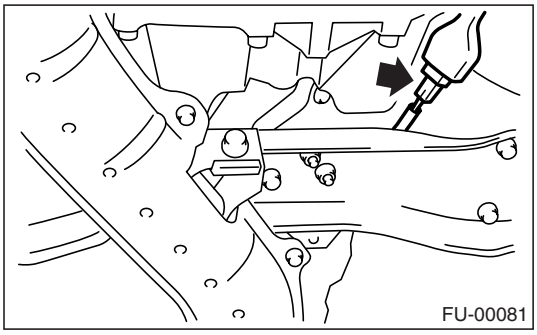
18.Rear Oxygen Sensor

A: REMOVAL

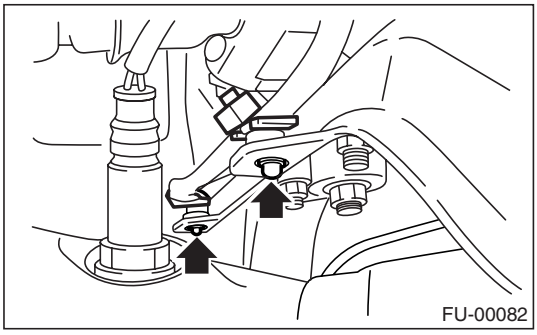
1) Disconnect the ground cable from battery.



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



4) Remove the clip by pulling it out from the upper side of crossmember.

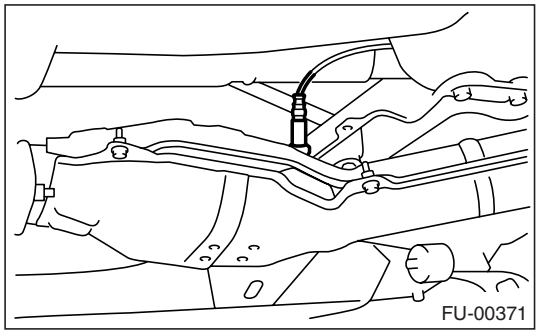


5) Apply SUBARU CRC or its equivalent to the threaded portion of rear oxygen sensor, and leave it for 1 minute or more.

SUBARU CRC (Part No. 004301003)

6) Remove the rear oxygen sensor.

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



B: INSTALLATION

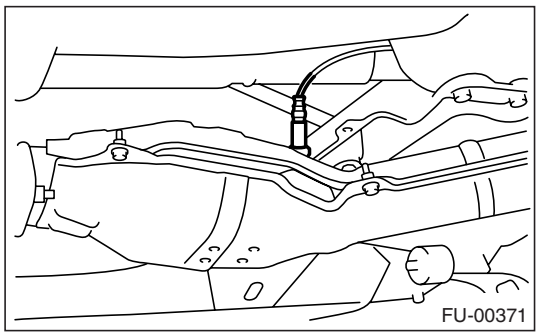
1) Before installing the rear oxygen sensor, apply anti-seize compound only to the threaded portion of rear oxygen sensor to make next removal easier.

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

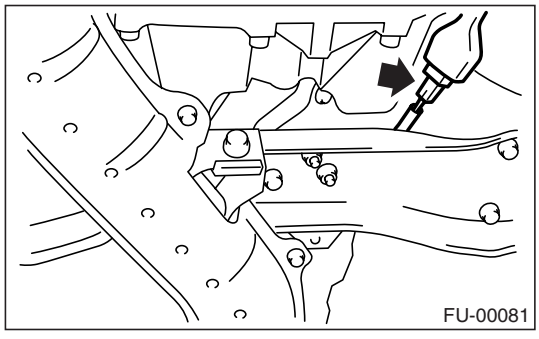
Anti-seize compound:
SS-30 by JET LUBE

2) Install the rear oxygen sensor.

Tightening torque:
21 N·m (2.1 kgf-m, 15.2 ft-lb)

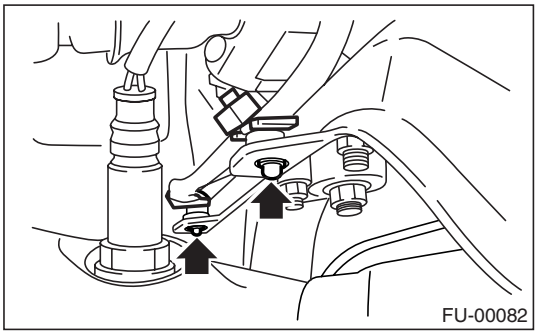


3) Connect the connector to rear oxygen sensor.

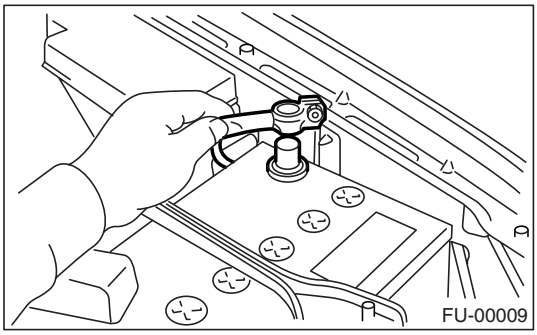


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4) Connect the clip to crossmember.



5) Lower the vehicle.
6) Connect the battery ground cable to battery.



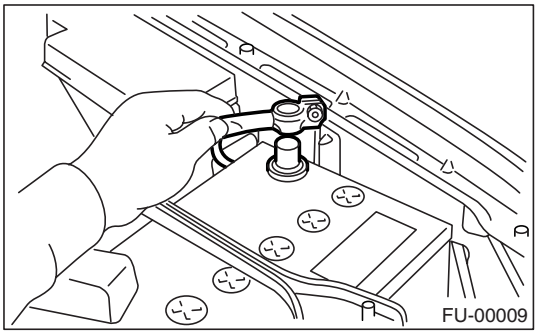
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19.Exhaust Temperature Sensor

A: REMOVAL

NOTE:
This component is installed to except STi and Australia model.

1) Disconnect the ground cable from battery.



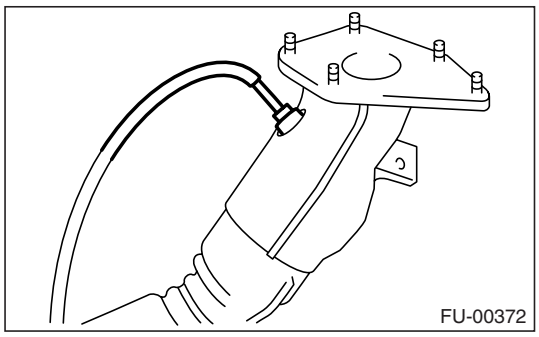
2) Remove the joint pipe. <Ref. to EX(H4DOTC)-13, REMOVAL, Joint Pipe.>

3) Apply SUBARU CRC or its equivalent to the threaded portion of exhaust temperature sensor, and leave it for 1 minute or more.

SUBARU CRC (Part No. 004301003)

4) Remove the exhaust temperature sensor.

CAUTION:
When removing the exhaust temperature sensor, wait until the exhaust pipe cools, otherwise it will damage the exhaust pipe.



B: INSTALLATION

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

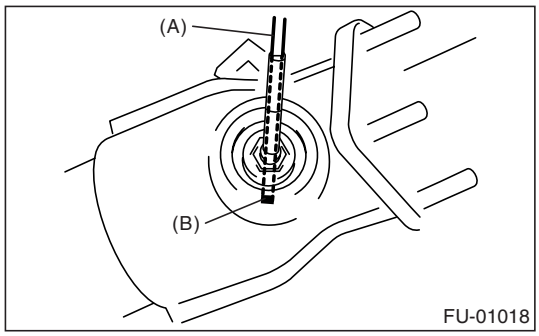
CAUTION:
Never apply anti-seize compound to the protector of exhaust temperature sensor.

Anti-seize compound:
SS-30 by JET LUBE

2) Install the exhaust temperature sensor.

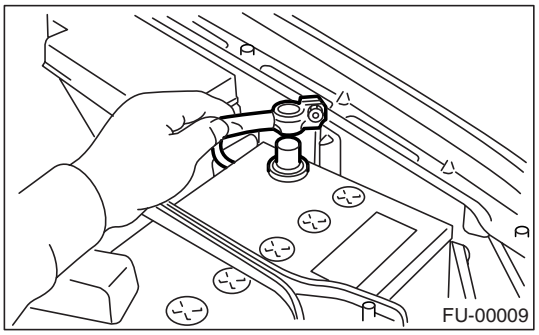
NOTE:
Align the harness (A) direction of exhaust temperature sensor to the marking (B) of joint pipe, and tighten the screws.

Tightening torque:
21 N·m (2.1 kgf-m, 15.2 ft-lb)



3) Install the joint pipe. <Ref. to EX(H4DOTC)-13, INSTALLATION, Joint Pipe.>

4) Connect the battery ground cable to battery.

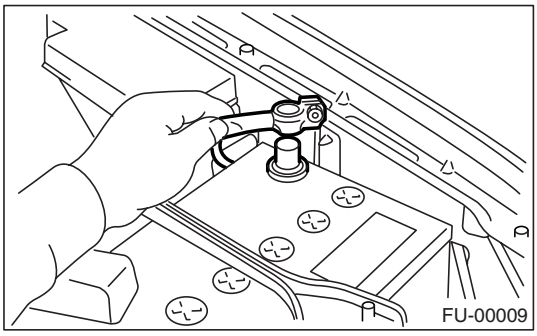


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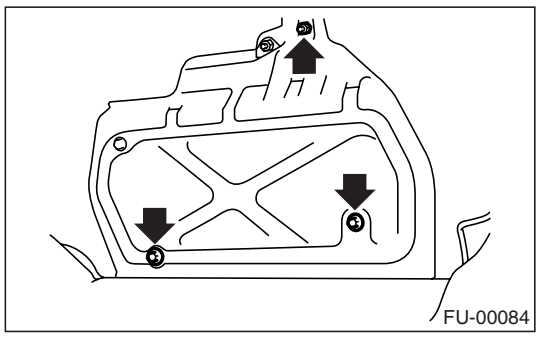
20.Engine Control Module (ECM)

A: REMOVAL

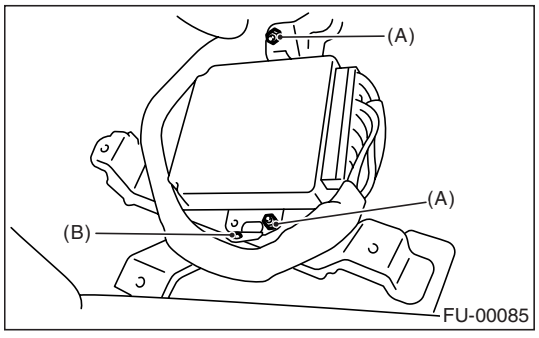
1) Disconnect the ground cable from battery.



2) Remove the lower inner trim of passenger side. <Ref. to EI-47, REMOVAL, Lower Inner Trim.>
3) Detach the floor mat of front passenger seat side.
4) Remove the protect cover.



5) Remove the nuts (A) which hold the ECM to bracket.
6) Remove the clip (B) from bracket.



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

B: INSTALLATION

Install in the reverse order of removal.

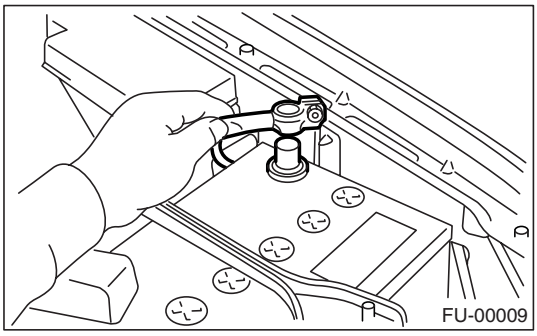
NOTE:
When replacing the ECM, be careful not to use the wrong spec. ECM to avoid any damage to the fuel injection system.

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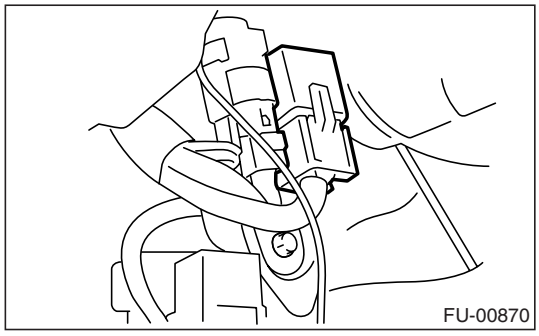
21.Main Relay

A: REMOVAL

1) Disconnect the ground cable from battery.



2) Remove the glove box. <Ref. to EI-39, REMOVAL, Glove Box.>
3) Remove the bolt which holds the main relay bracket on body.
4) Disconnect the connectors from main relay.



B: INSTALLATION

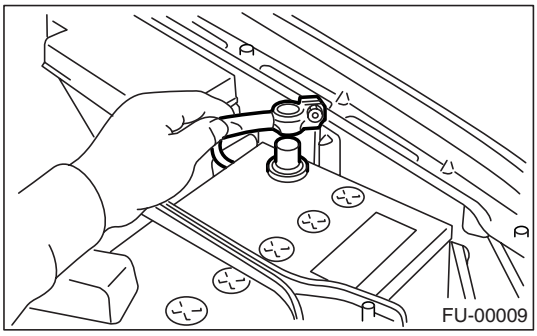
Install in the reverse order of removal.

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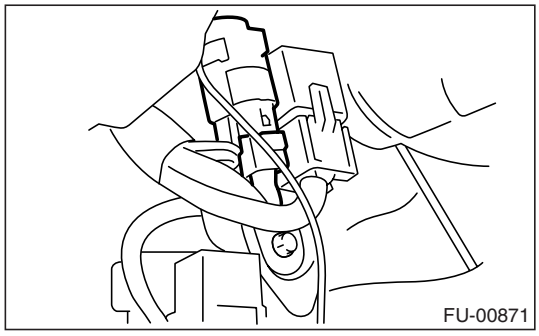
22.Fuel Pump Relay

A: REMOVAL

1) Disconnect the ground cable from battery.



2) Remove the glove box.<Ref. to EI-39, REMOVAL, Glove Box.>
3) Remove the bolt which holds the fuel pump relay bracket on body.
4) Disconnect the connector from fuel pump relay.



5) Remove the fuel pump relay from mounting bracket.

B: INSTALLATION

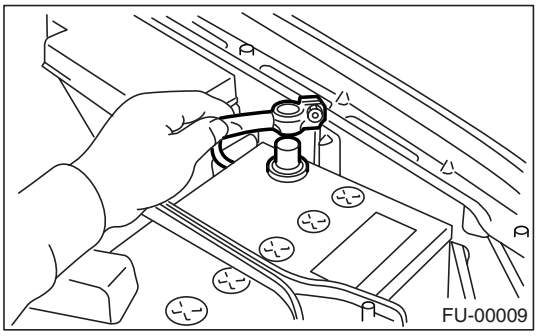
Install in the reverse order of removal.

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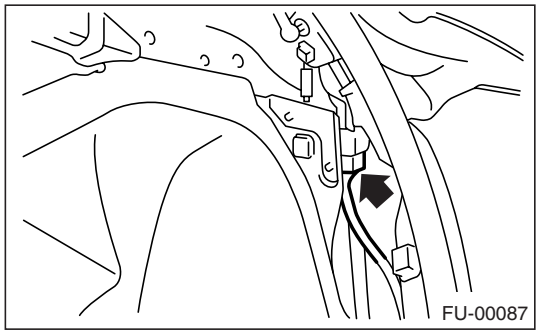
23.Fuel Pump Control Unit

A: REMOVAL

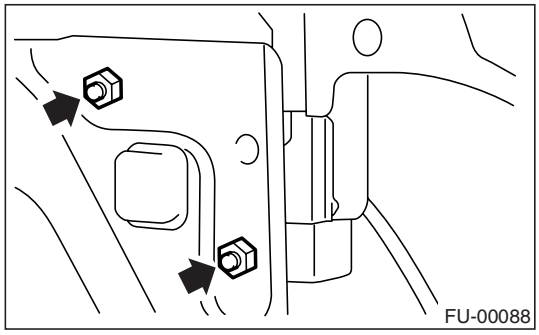
1) Disconnect the ground cable from battery.



2) Remove the rear quarter trim. <Ref. to EI-48, REMOVAL, Rear Quarter Trim.>
3) Disconnect the connector from fuel pump control unit.



4) Remove the fuel pump control unit.



B: INSTALLATION

Install in the reverse order of removal.

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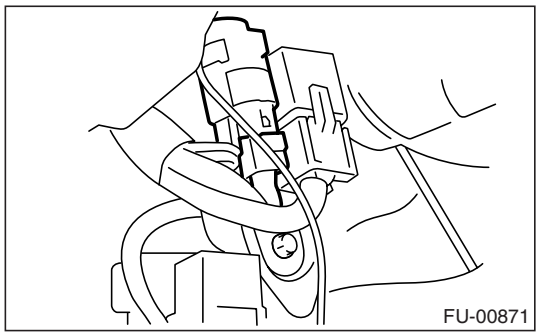
24.Fuel

A: OPERATION

1. RELEASING OF FUEL PRESSURE

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

1) Disconnect the connector from fuel pump relay.

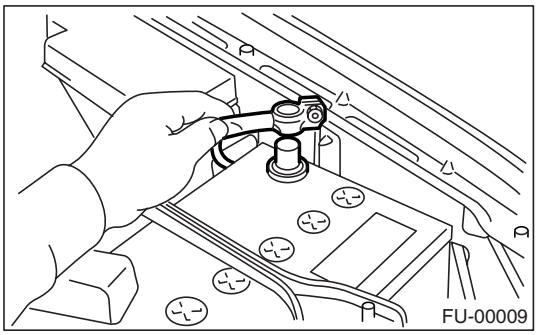


2) Start and run the engine until it stalls.
3) After the engine stalls, crank it for 5 more seconds.
4) Turn the ignition switch to OFF.

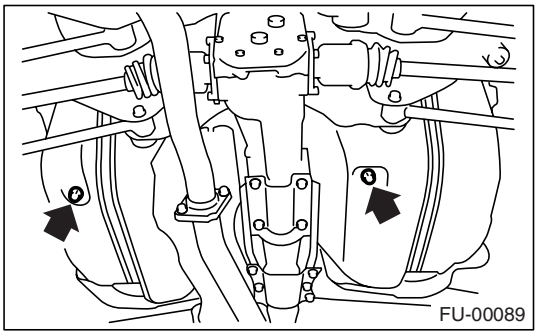
2. DRAINING FUEL

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

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

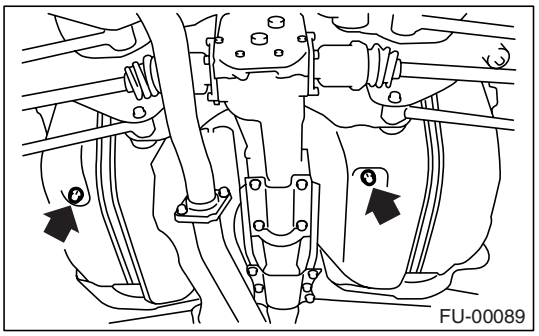


3) Open the fuel filler flap lid and remove the fuel filler cap.
4) Lift-up the vehicle.
5) Drain fuel from the fuel tank.
Set a container under vehicle and remove the drain plug from fuel tank.



6) Tighten the fuel drain plug.

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



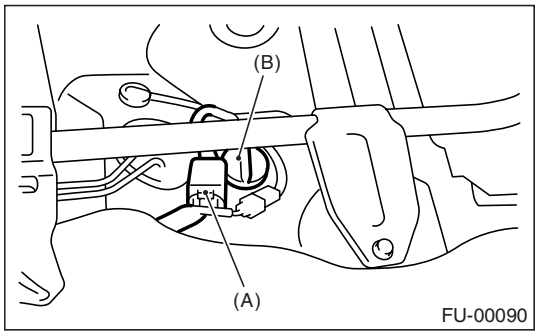
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25.Fuel Tank

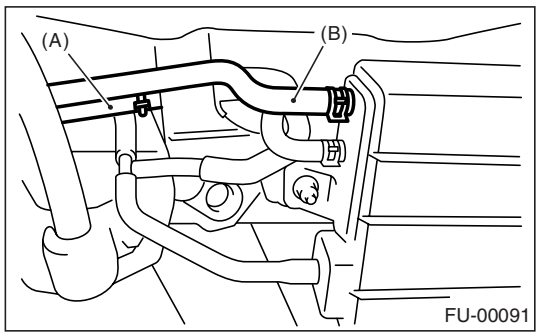
A: REMOVAL

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

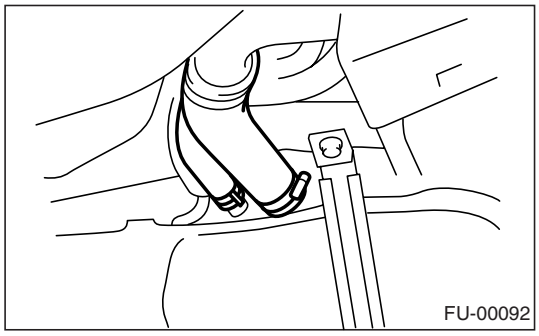
1) Set the vehicle on a lift.
2) Release the fuel pressure. <Ref. to FU(H4DOTC)-53, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
3) Drain fuel from fuel tank. <Ref. to FU(H4DOTC)-53, DRAINING FUEL, OPERATION, Fuel.>
4) Remove the rear seat.
5) Disconnect the connector (A) of fuel tank cord to rear harness.
6) Push the grommet (B) which holds the fuel tank cord on floor panel down under body.



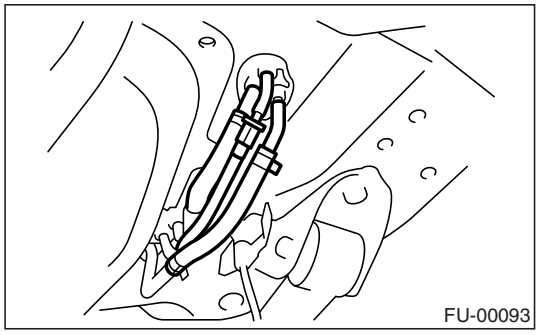
7) Remove the rear crossmember. <Ref. to RS-21, REMOVAL, Rear Crossmember.>
8) Disconnect the two-way valve hose (A) from two-way valve, and disconnect the canister hose (B) from canister.



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

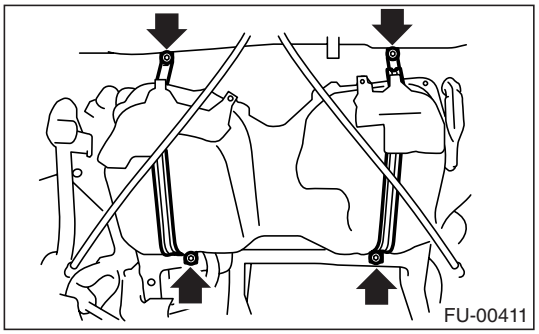


10) Move the clips and disconnect the quick connector. <Ref. to FU(H4DOTC)-69, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>
11) Disconnect the fuel hoses.



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

WARNING:
A helper is required to perform this work.

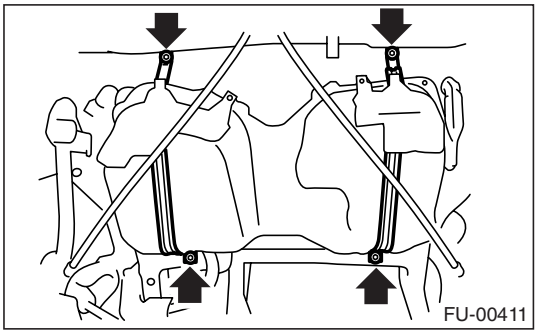


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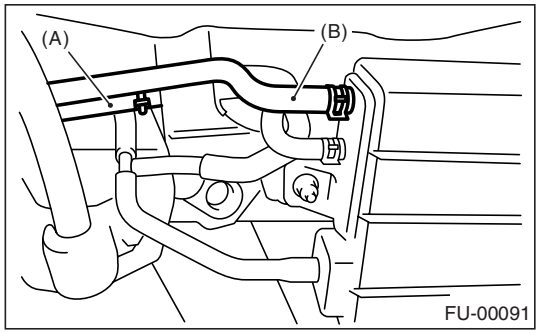
B: INSTALLATION

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

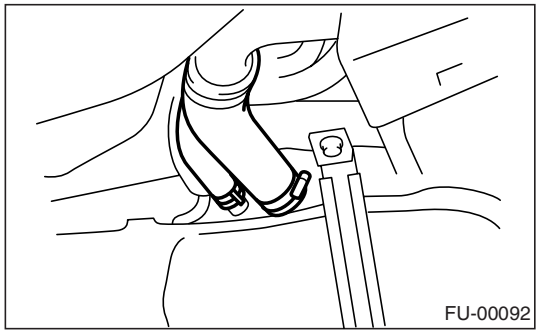
WARNING:
A helper is required to perform this work.



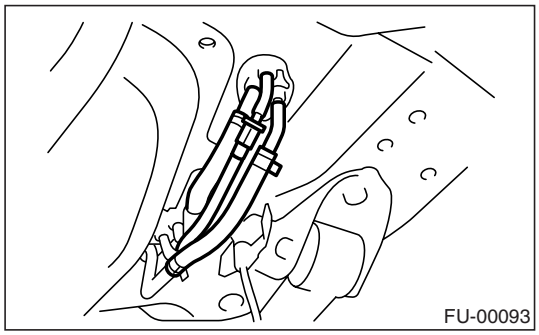
3) Connect the two-way valve hose (A) to two-way valve and connect the canister hose (B) to canister.



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

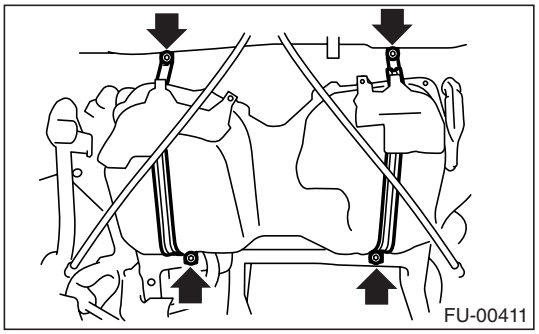


5) Connect the fuel hoses, and secure them with clips and quick connector. <Ref. to FU(H4DOTC)-70, INSTALLATION, Fuel Delivery, Return and Evaporation Lines.>

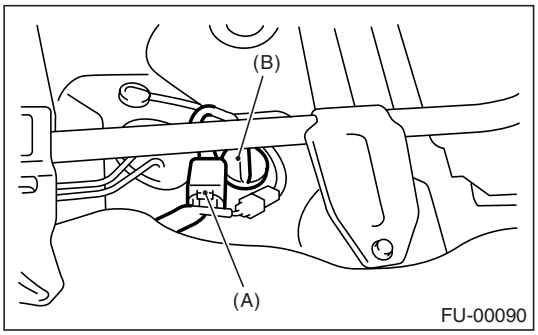


6) Tighten the band mounting bolts.

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



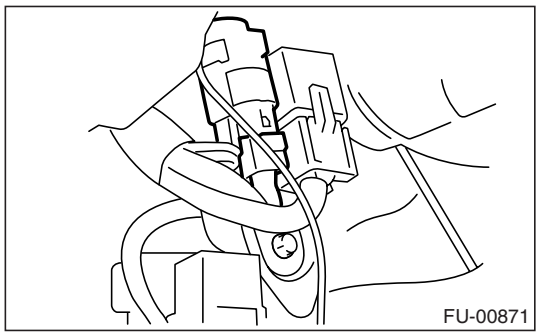
7) Install the rear crossmember. <Ref. to RS-21, INSTALLATION, Rear Crossmember.>
8) Connect the connector (A) to the fuel tank cord, and plug the service hole with grommet (B).



9) Set the rear seat and floor mat.

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10) Connect the connector to the fuel pump relay.



C: INSPECTION

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

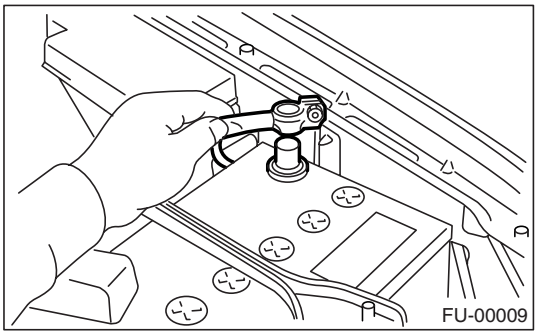
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26.Fuel Filler Pipe

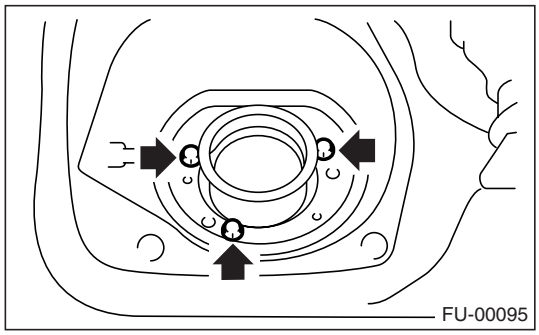
A: REMOVAL

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

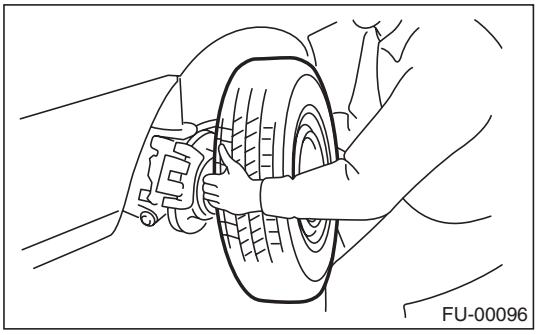
1) Set the vehicle on a lift.
2) Release the fuel pressure. <Ref. to FU(H4DOTC)-53, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
3) Open the fuel filler flap lid and remove the fuel filler cap.
4) Disconnect the ground cable from battery.


FU-00009

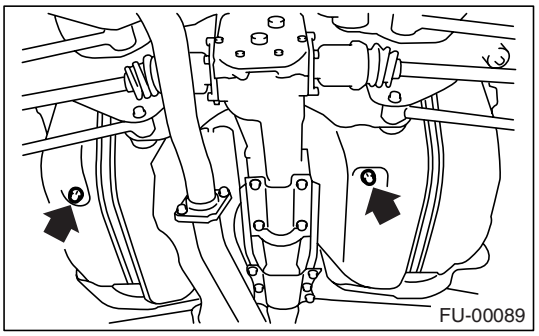
5) Remove the screws holding the packing in place.


FU-00095

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

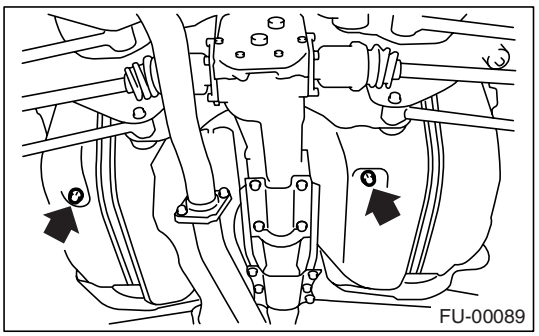

FU-00096

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

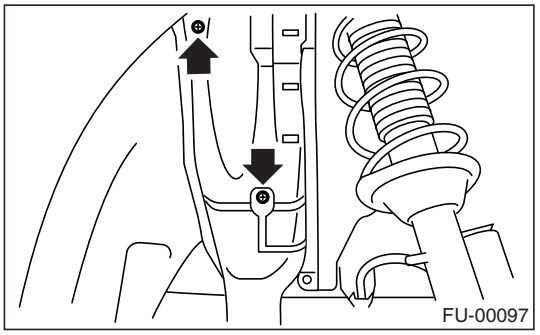

FU-00089

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

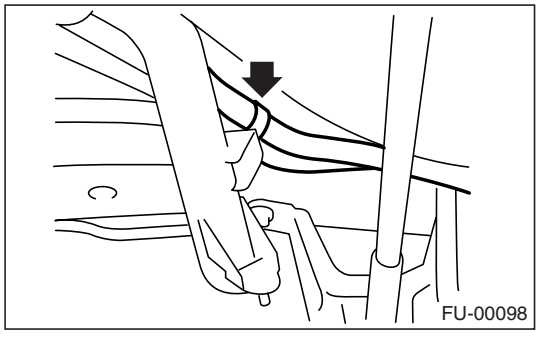
Tightening torque:
26 N·m (2.7 kgf-m, 19.2 ft-lb)


FU-00089

11) Remove the fuel filler pipe protector.

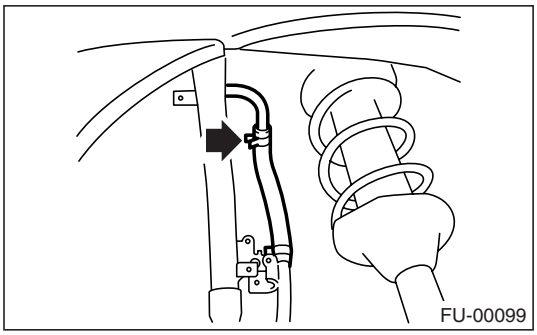

FU-00097

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

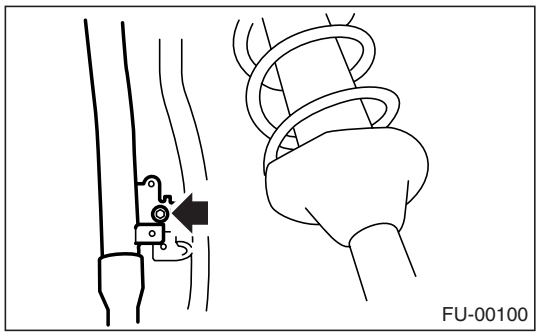

FU-00098

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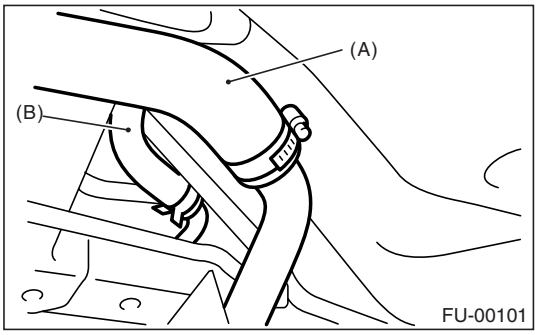
13) Disconnect the air vent hose from fuel filler pipe.



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

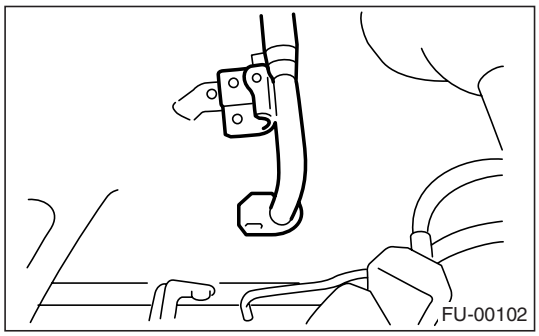


15) Loosen the clamp and separate the fuel filler hose (A) from fuel filler pipe.
16) Move the clip and separate the air vent hose (B).



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

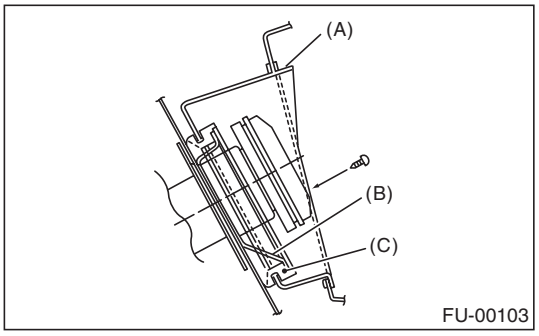
18) Remove the air vent pipe together with clip from body.



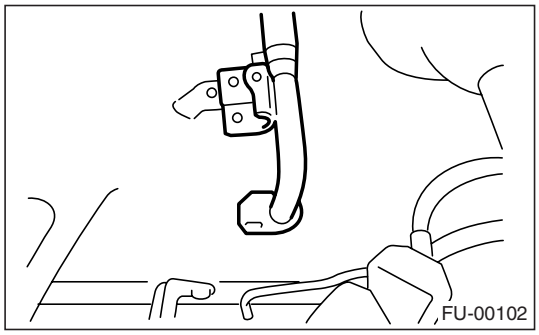
B: INSTALLATION

1) Hold the fuel filler flap open.
2) Set the fuel saucer (A) with rubber packing (C) and insert the fuel filler pipe into hole from the inner side of apron.
3) Align the holes in fuel filler pipe neck, set the cup (B), and then tighten the screws.

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

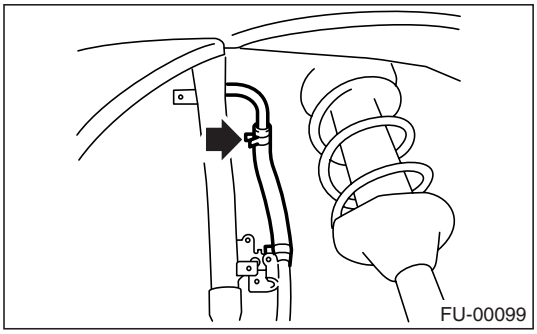


4) Install the air vent pipe.



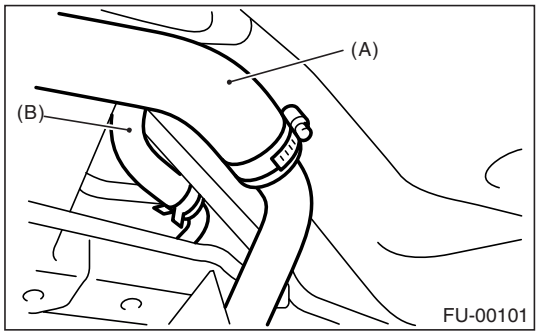
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5) Connect the air vent hose to the fuel filler pipe.



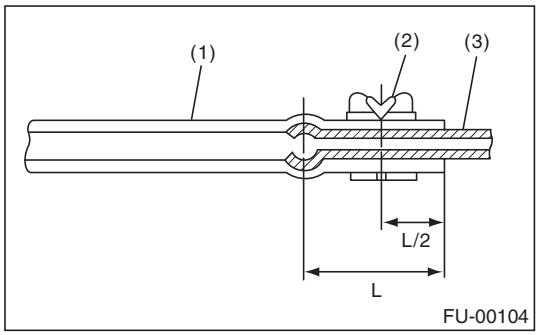
6) Insert the fuel filler hose (A) approx. 35 to 40 mm (1.38 to 1.57 in) over the lower end of fuel filler pipe and tighten the clamp.

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



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

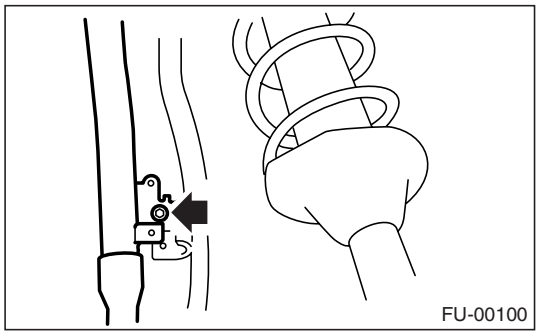
L = 27.5±2.5 mm (1.083±0.098 in)



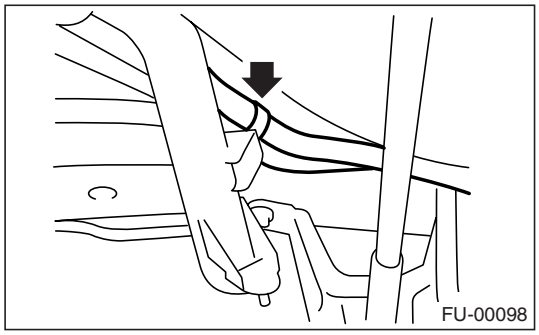
(1) Hose
(2) Clip
(3) Pipe

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

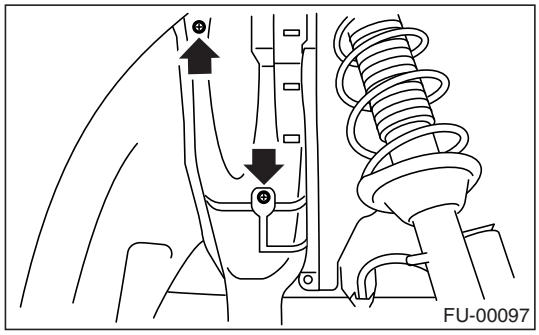
Tightening torque:
7.4 N·m (0.75 kgf-m, 5.4 ft-lb)



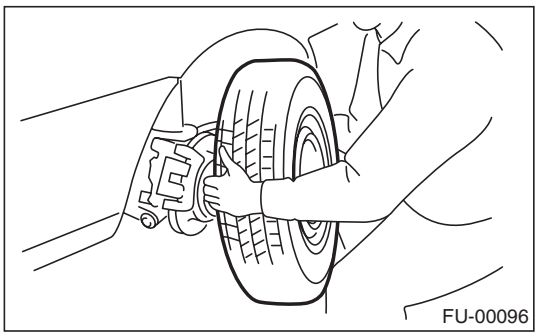
9) Hold the evaporation hoses onto clip of fuel filler pipe.



10) Install the fuel filler pipe protector.



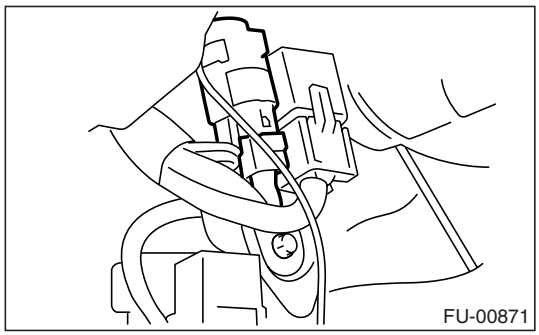
11) Install the rear right wheel.



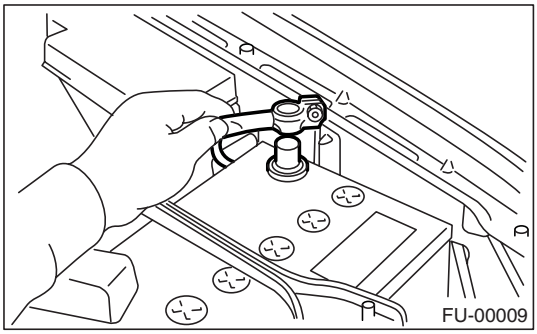
12) Lower the vehicle.
13) Tighten the wheel nuts.

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14) Connect the connector to the fuel pump relay.



15) Connect the battery ground cable to battery.



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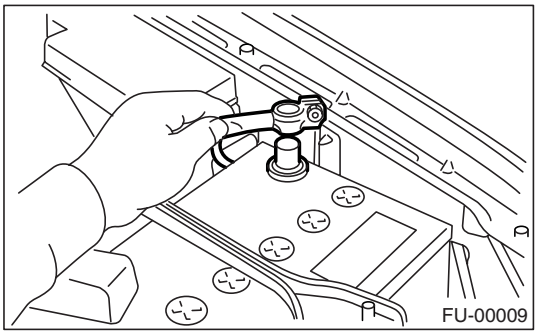
27.Fuel Pump

A: REMOVAL

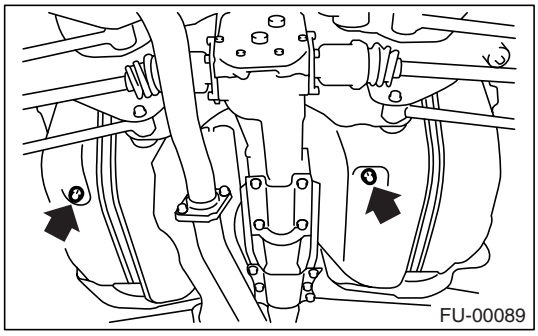
WARNING:
- **Place "NO FIRE" signs near working area.**
- **Be careful not to spill fuel on floor.**

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

1) Release the fuel pressure. <Ref. to FU(H4DOTC)-53, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
2) Open the fuel filler flap lid and remove the fuel filler cap.
3) Disconnect the ground cable from battery.

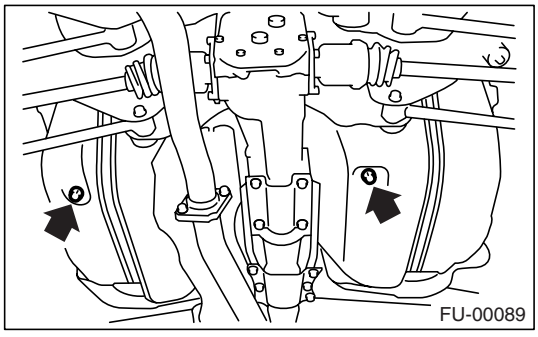

FU-00009

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

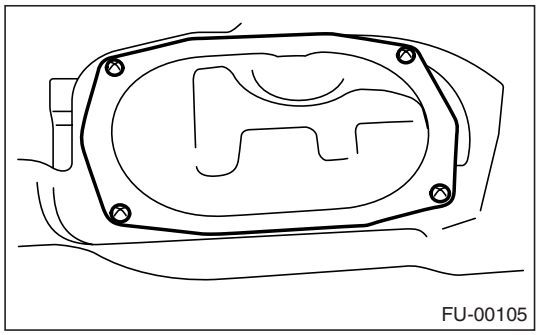

FU-00089

6) Tighten the fuel drain plug.

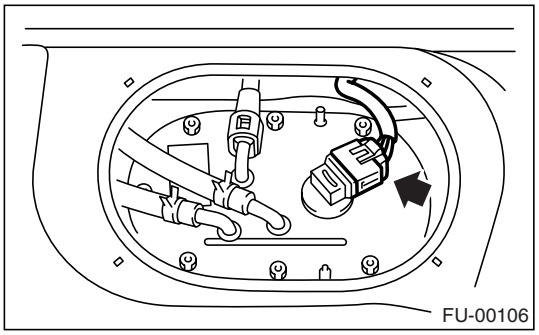
Tightening torque:
26 N·m (2.7 kgf-m, 19.2 ft-lb)


FU-00089

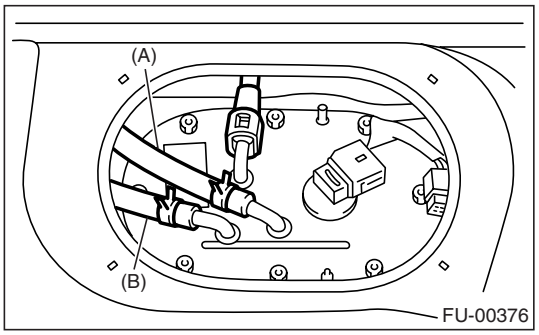
7) Raise the rear seat and turn the floor mat up.
8) Remove the access hole lid.


FU-00105

9) Disconnect the connector from fuel pump.

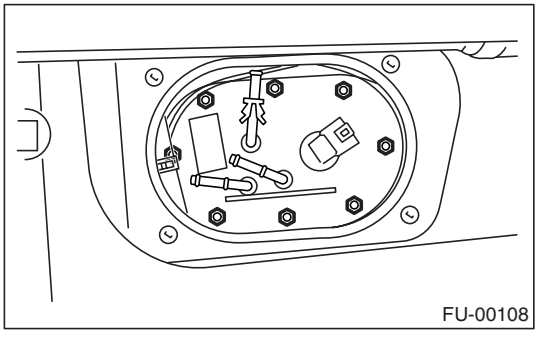

FU-00106

10) Disconnect the quick connector, and disconnect the fuel delivery hose. <Ref. to FU(H4DOTC)-69, Fuel Delivery, Return and Evaporation Lines.>
11) Move the clips, and then disconnect the fuel return hose (A) and jet pump hose (B).



FU-00376

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


FU-00108

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

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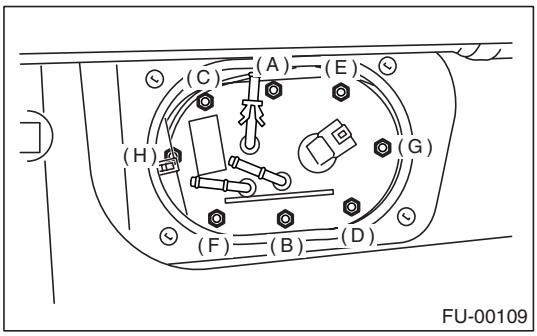
B: INSTALLATION

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

NOTE:
Replace the gaskets with new ones.

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

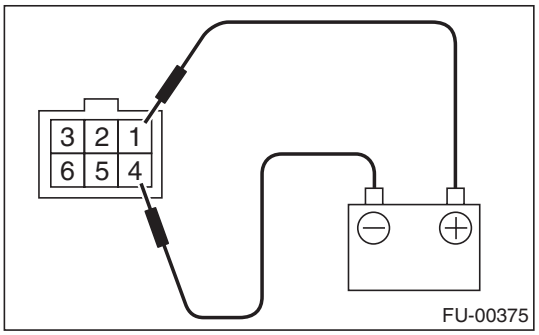
Tightening torque:
4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



C: INSPECTION

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

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



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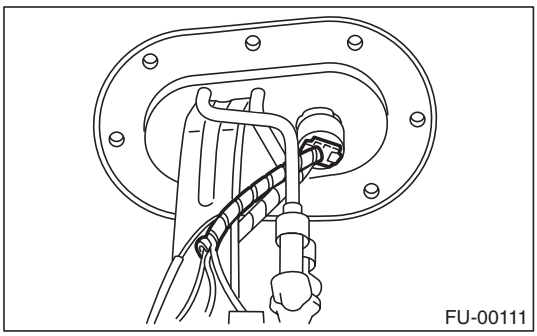
28.Fuel Level Sensor

A: REMOVAL

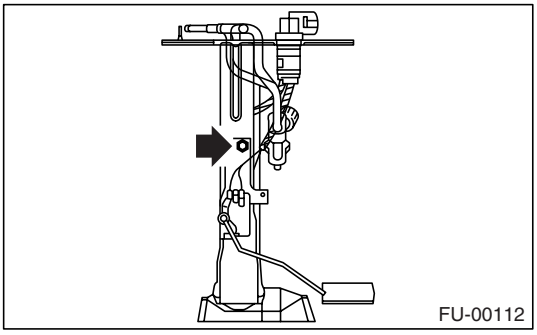
WARNING:
- **Place “NO FIRE” signs near working area.**
- **Be careful not to spill fuel on floor.**

NOTE:
Fuel level sensor is built in fuel pump assembly.

1) Remove the fuel pump assembly. <Ref. to FU(H4DOTC)-61, REMOVAL, Fuel Pump.>
2) Disconnect the connector from fuel pump bracket.



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



B: INSTALLATION

Install in the reverse order of removal.

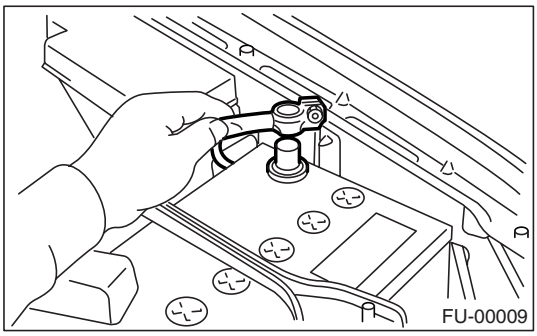
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29.Fuel Sub Level Sensor

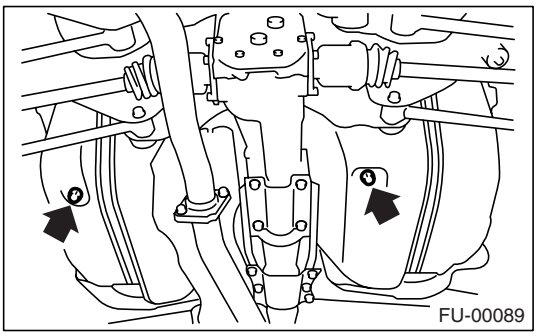
A: REMOVAL

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

1) Disconnect the ground cable from battery.

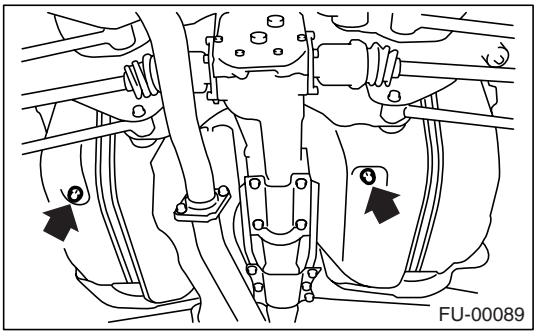

FU-00009

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

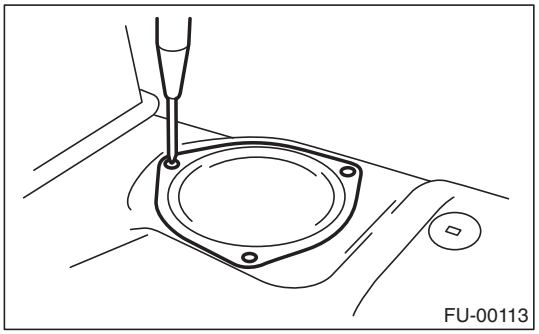

FU-00089

4) Tighten the fuel drain plug.

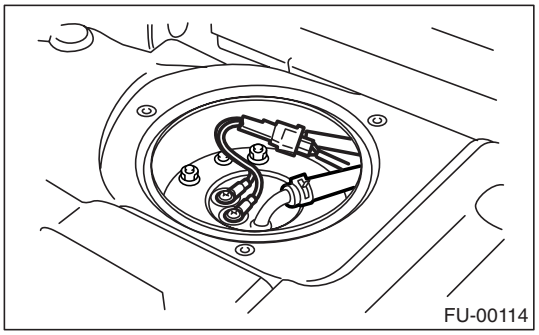
Tightening torque:
26 N·m (2.7 kgf-m, 19.2 ft-lb)


FU-00089

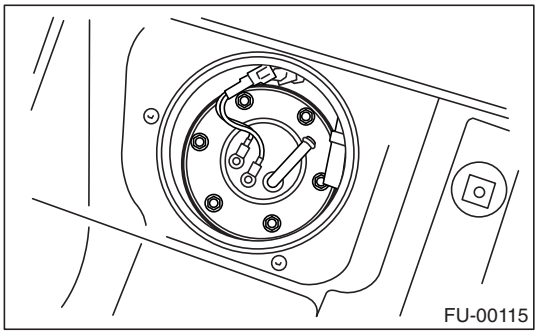
5) Remove the rear seat.
6) Remove the service hole cover.


FU-00113

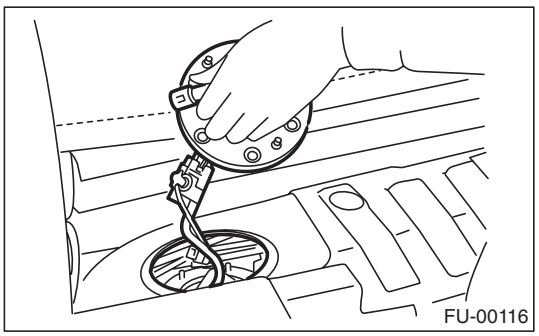
7) Disconnect the connector from fuel sub level sensor.
8) Disconnect the fuel jet pump hose.


FU-00114

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


FU-00115

10) Remove the fuel sub level sensor.

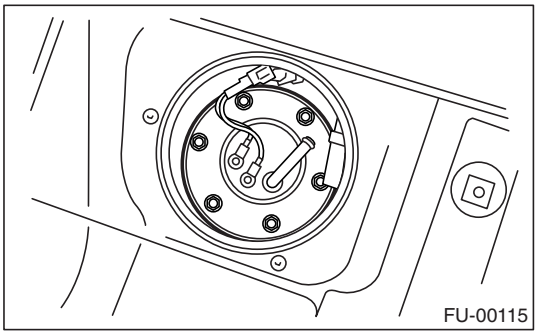

FU-00116

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B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



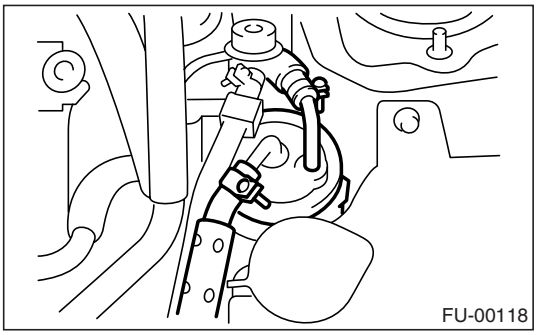
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30.Fuel Filter

A: REMOVAL

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

1) Release the fuel pressure. <Ref. to FU(H4DOTC)-53, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
2) Disconnect the fuel delivery hoses from fuel filter.



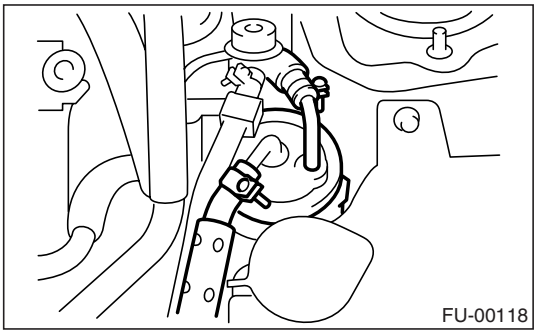
3) Remove the filter from holder.

B: INSTALLATION

CAUTION:
- **If fuel hoses are damaged at connecting portions, replace them with new ones.**
- **If clamps are badly damaged, replace them with new ones.**

1) Install in the reverse order of removal.
2) Tighten the hose clamp screws.

Tightening torque:
1.25 N·m (0.13 kgf-m, 0.94 ft-lb)



C: INSPECTION

1) Check the inside of fuel filter for dirt and water sediment.
2) If it is clogged, or if replacement interval has been reached, replace it.
3) If water is found in it, shake and expel the water from inlet port.

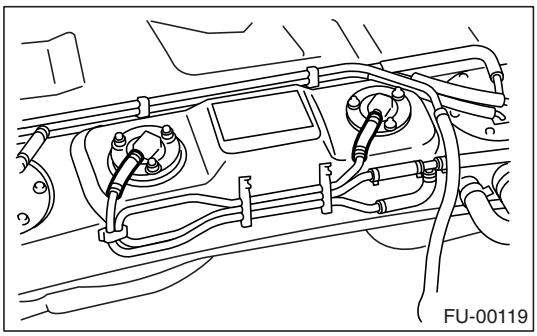
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31.Fuel Cut Valve

A: REMOVAL

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

1) Remove the fuel tank. <Ref. to FU(H4DOTC)-54, REMOVAL, Fuel Tank.>
2) Move the clip and disconnect the evaporation hose from fuel cut valve.

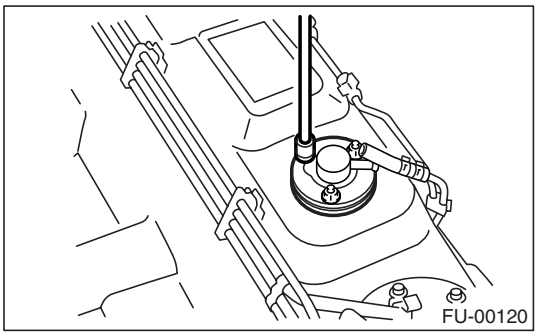


3) Remove the bolts which install the fuel cut valve.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
4.4 N·m (0.45 kgf-m, 3.3 ft-lb)

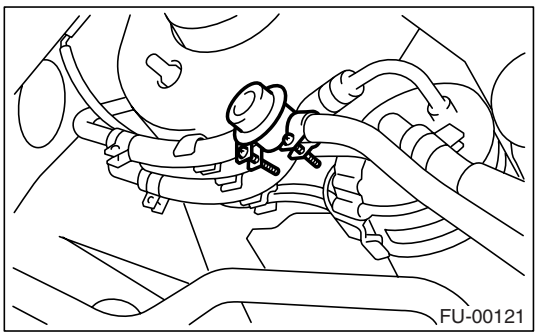


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32.Fuel Damper Valve

A: REMOVAL

1) Release the fuel pressure. <Ref. to FU(H4DOTC)-53, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
2) Remove the fuel damper valve from fuel return line.



B: INSTALLATION

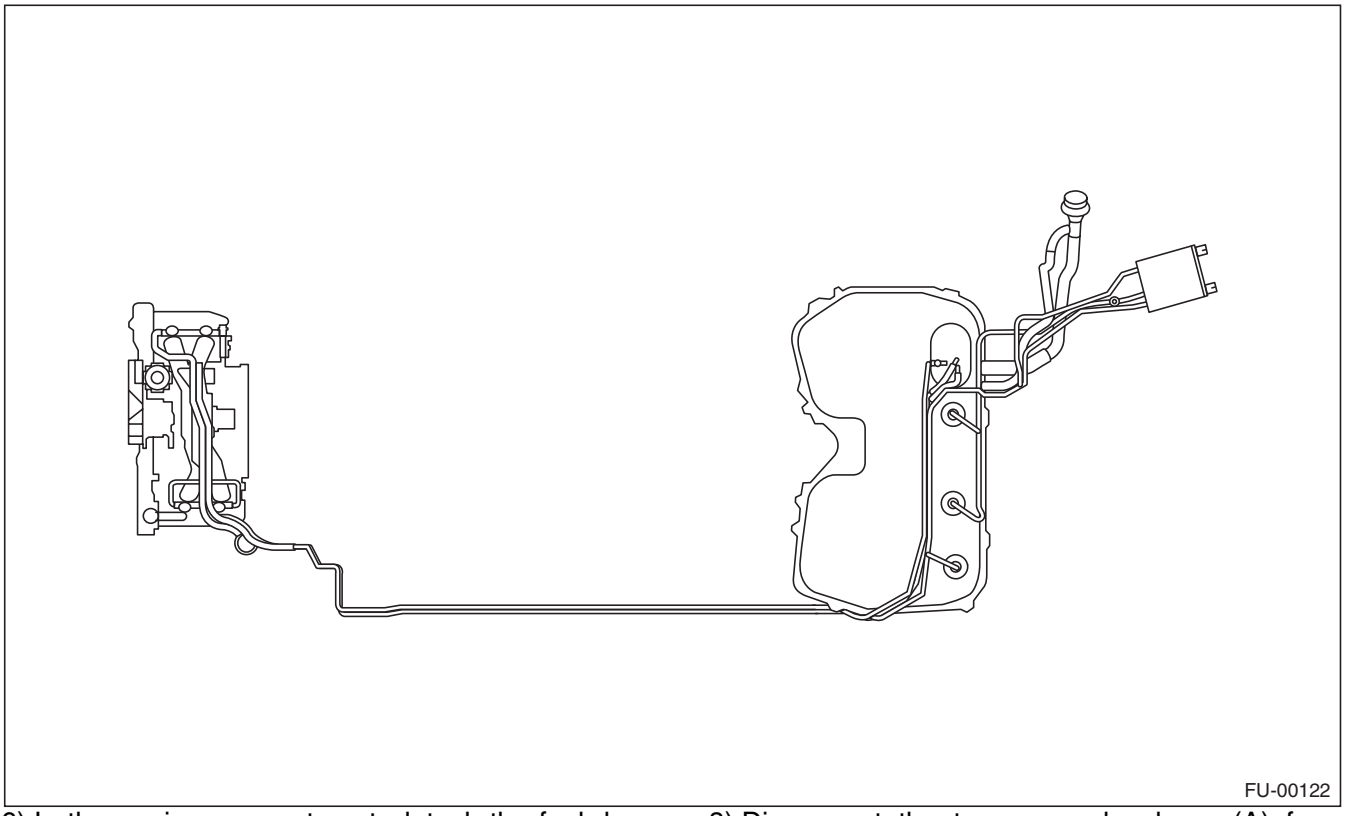
Install in the reverse order of removal.

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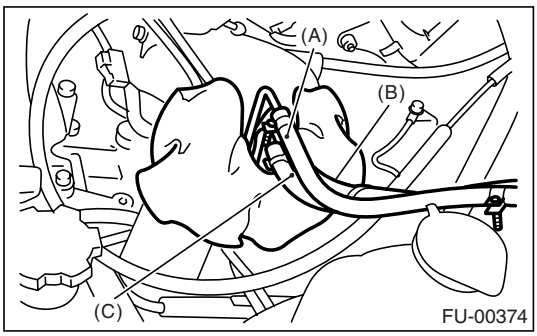
33.Fuel Delivery, Return and Evaporation Lines

A: REMOVAL

1) Set the vehicle on a lift.
2) Release the fuel pressure. <Ref. to FU(H4DOTC)-53, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
3) Open the fuel filler flap lid and remove the fuel filler cap.
4) Remove the floor mat. <Ref. to EI-55, REMOVAL, Floor Mat.>
5) Remove the fuel delivery pipes and hoses, fuel return pipes and hoses, evaporation pipes and hoses.

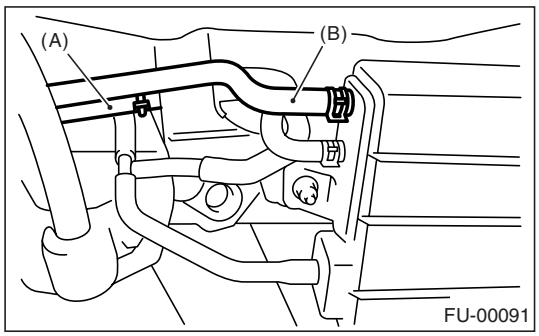

FU-00122

6) In the engine compartment, detach the fuel delivery hoses (A), return hoses (B) and evaporation hoses (C).



FU-00374

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

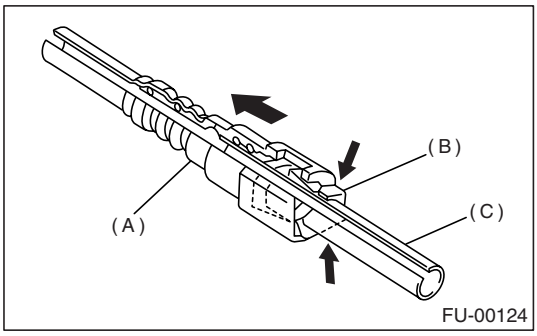


FU-00091

7) Lift-up the vehicle.

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

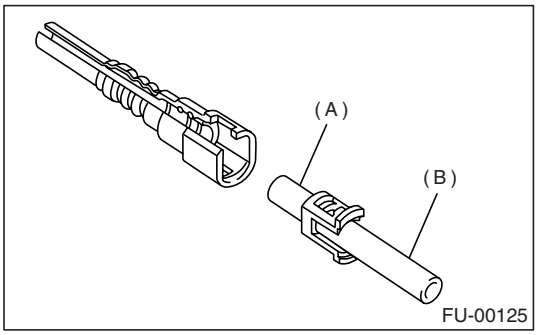


(A) Connector
(B) Retainer
(C) Pipe

B: INSTALLATION

1) Connect the quick connector on fuel delivery line.

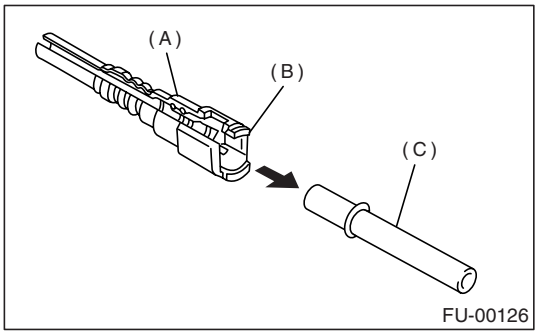
NOTE:
• Replace the retainer with a new one.
• Make sure the connected portion is not damaged or has dust. If necessary, clean the seal surface of pipe.



(A) Seal surface
(B) Pipe

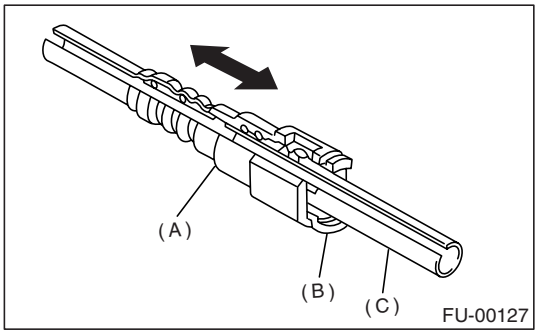
(1) Set the new retainer (B) to connector (A).
(2) Push the pipe into connector completely.

NOTE:
At this time, two clicking sounds are heard.



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

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



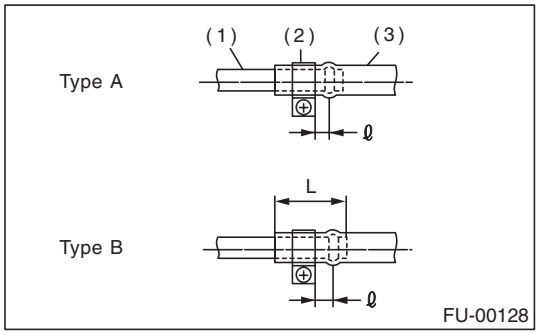
(A) Connector
(B) Retainer
(C) Pipe

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2) Connect the fuel delivery hose to pipe with an overlap of 20 to 25 mm (0.79 to 0.98 in).
Type A: When the fitting length is specified.
Type B: When the fitting length is not specified.

ℓ : 2.5±1.5 mm (0.098±0.059 in)

L: 22.5±2.5 mm (0.886±0.098 in)

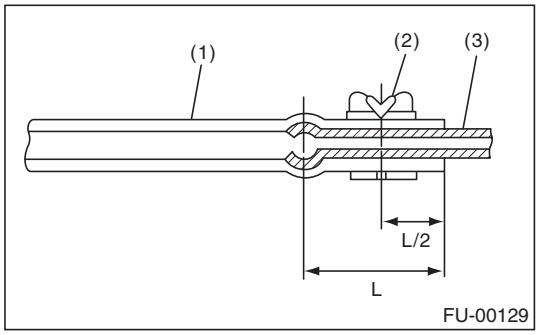


(1) Fitting
(2) Clamp
(3) Hose

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

L = 17.5±2.5 mm (0.689±0.098 in)

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



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

C: INSPECTION

1) Make sure there are no cracks on fuel pipes and fuel hoses.
2) Make sure the fuel pipe and fuel hose connections are tightened firmly.

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34.Fuel System Trouble in General

A: INSPECTION

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

NOTE:
• When the vehicle is left unattended for an extended period of time, water may accumulate in the fuel tank. To prevent water condensation.
(1) Top off the fuel tank or drain the fuel completely.
(2) Drain the water condensation from the fuel filter.
• Refilling the fuel tank.
Refill the fuel tank while there is still some fuel left in the tank.
• Protecting the fuel system against freezing and water condensation.
(3) Cold areas:
In snow-covered areas, mountainous areas, skiing areas, etc. where ambient temperatures drop below 0°C (32°F) throughout the winter season, use an anti-freeze solution in the cooling system. Refueling will also complement the effect of anti-freeze solution each time the fuel level drops to about one-half. After the winter season, drain the water which may have accumulated in the fuel filter and fuel tank in the manner same as that described under “Affected areas” below.
(4) Affected areas:
When the water condensation is notched in the fuel filter, drain the water from both the fuel filter and fuel tank or use a water removing agent (or anti-freeze solution) in the fuel tank.
• Observe the instructions, notes, etc., indicated on the label affixed to the anti-freeze solution (water removing agent) container before use.

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EMISSION CONTROL
(AUX. EMISSION CONTROL DEVICES)
EC(H4DOTC)

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3. Rear Catalytic Converter 4
4. Precatalytic Converter 5
5. Canister 6
6. Purge Control Solenoid Valve 7
7. Two-way Valve 8

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1. General Description

A: CAUTION

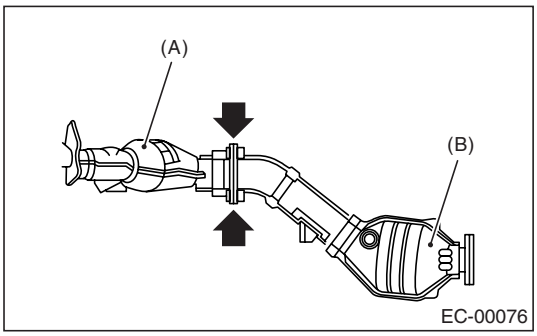
• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn your hands, because each part on the vehicle is hot after running.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.

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2. Front Catalytic Converter

A: REMOVAL

1) Remove the front catalytic converter and center exhaust pipe as a unit. <Ref. to EX(H4DOTC)-9, REMOVAL, Center Exhaust Pipe.>
2) Separate the front catalytic converter (A) from rear catalytic converter (B). (Except for Australia model)



B: INSTALLATION

NOTE:
Replace the gaskets with new ones.
Install in the reverse order of removal.

C: INSPECTION

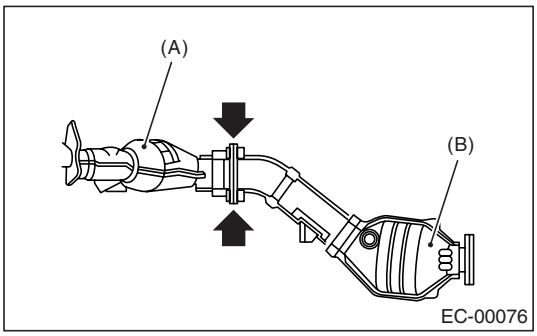
1) Make sure there are no exhaust leaks from connections and welds.
2) Make sure there are no holes or rusting.

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3. Rear Catalytic Converter

A: REMOVAL

1) Remove the rear catalytic converter and center exhaust pipe as a unit. <Ref. to EX(H4DOTC)-9, REMOVAL, Center Exhaust Pipe.>
2) Separate the rear catalytic converter (B) from front catalytic converter (A). (Except for Australia model)



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.

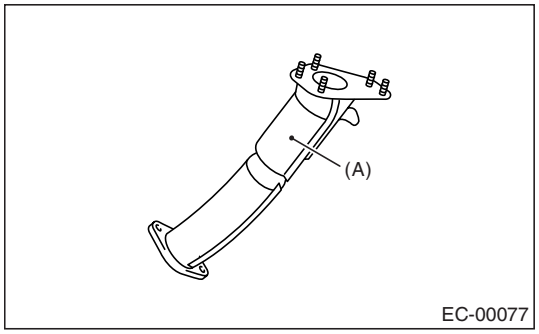
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4. Precatalytic Converter

A: REMOVAL

NOTE:
Precatalytic converter is equipped on models except for STi and Australia model.

Precatalytic converter (A) is built in the joint pipe. Refer to the removal of joint pipe for removal procedure. <Ref. to EX(H4DOTC)-13, REMOVAL, Joint Pipe.>



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

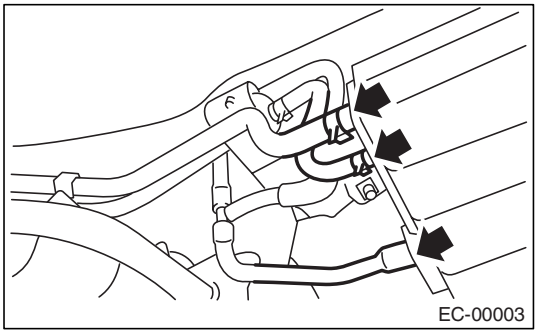
1) Make sure there are no exhaust leaks from connections and welds.
2) Make sure there are no holes or rusting.

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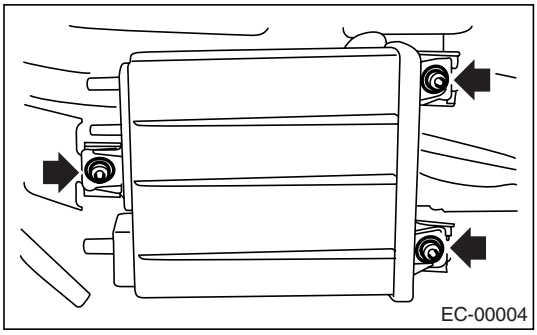
5. Canister

A: REMOVAL

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



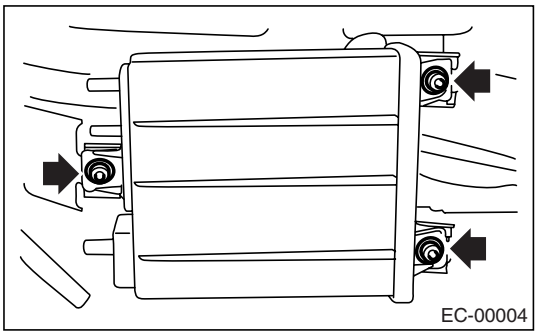
3) Remove the canister from body.



B: INSTALLATION

1) Install in the reverse order of removal.

Tightening torque:
23 N·m (2.3 kgf-m, 17 ft-lb)



C: INSPECTION

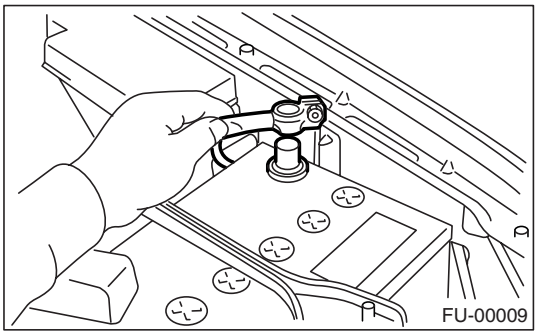
Make sure the canister and canister hoses are not cracked or loose.

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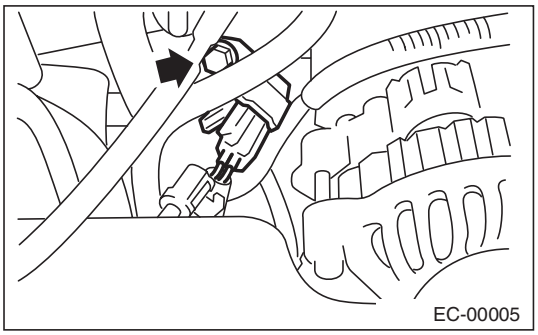
6. Purge Control Solenoid Valve

A: REMOVAL

1) Disconnect the ground cable from battery.



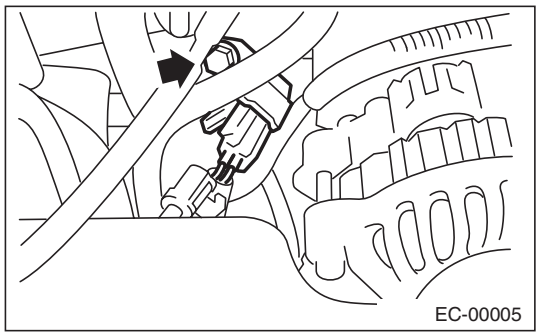
2) Disconnect the connector and hoses from purge control solenoid valve.
3) Remove the bolt which installs the purge control solenoid valve onto intake manifold.



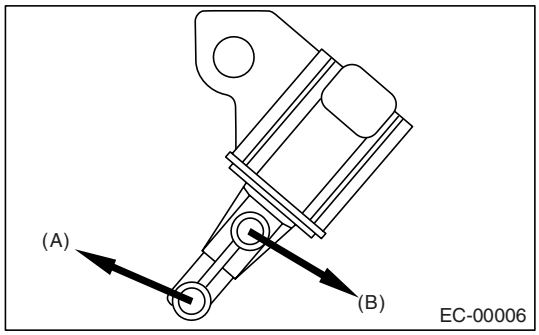
B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
19 N·m (1.9 kgf-m, 13.7 ft-lb)



NOTE:
Connect the evaporation hoses as shown in the figure.



(A) To intake manifold
(B) To purge valve (Except for Australia model)
To fuel pipe (Australia model)

C: INSPECTION

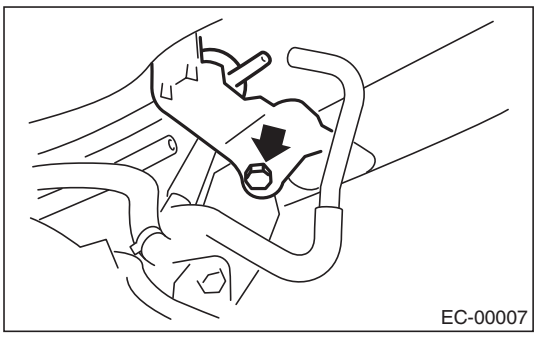
Make sure the hoses are not cracked or loose.

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7. Two-way Valve

A: REMOVAL

1) Lift-up the vehicle.
2) Remove the canister from body. <Ref. to EC(H4DOTC)-6, REMOVAL, Canister.>
3) Remove the two-way valve with bracket as a unit from body.



4) Remove the two-way valve from bracket.

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Make sure that the hoses are not cracked or loose.

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INTAKE (INDUCTION)

IN(H4DOTC)

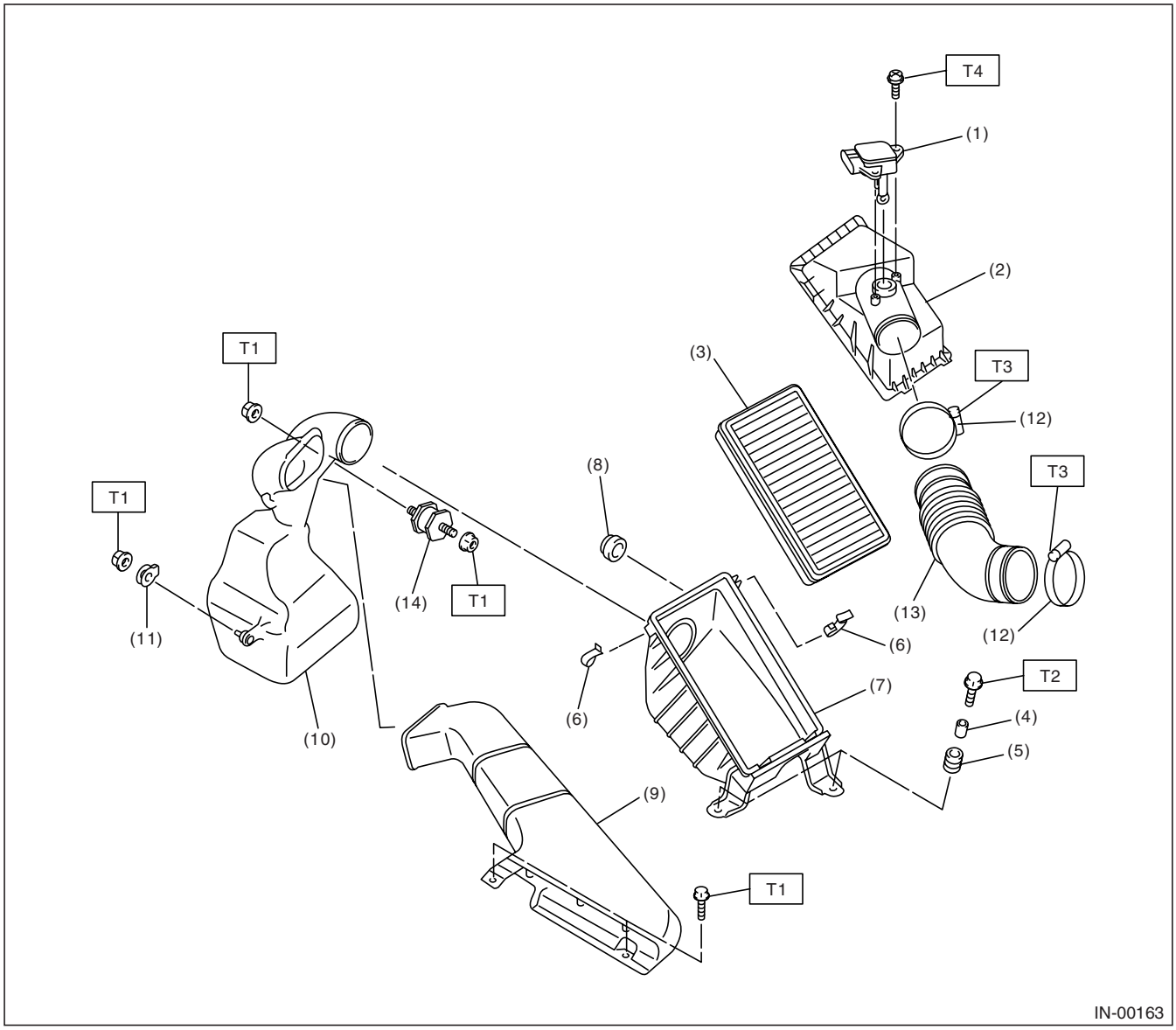
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1. General Description

A: COMPONENT

1. AIR CLEANER

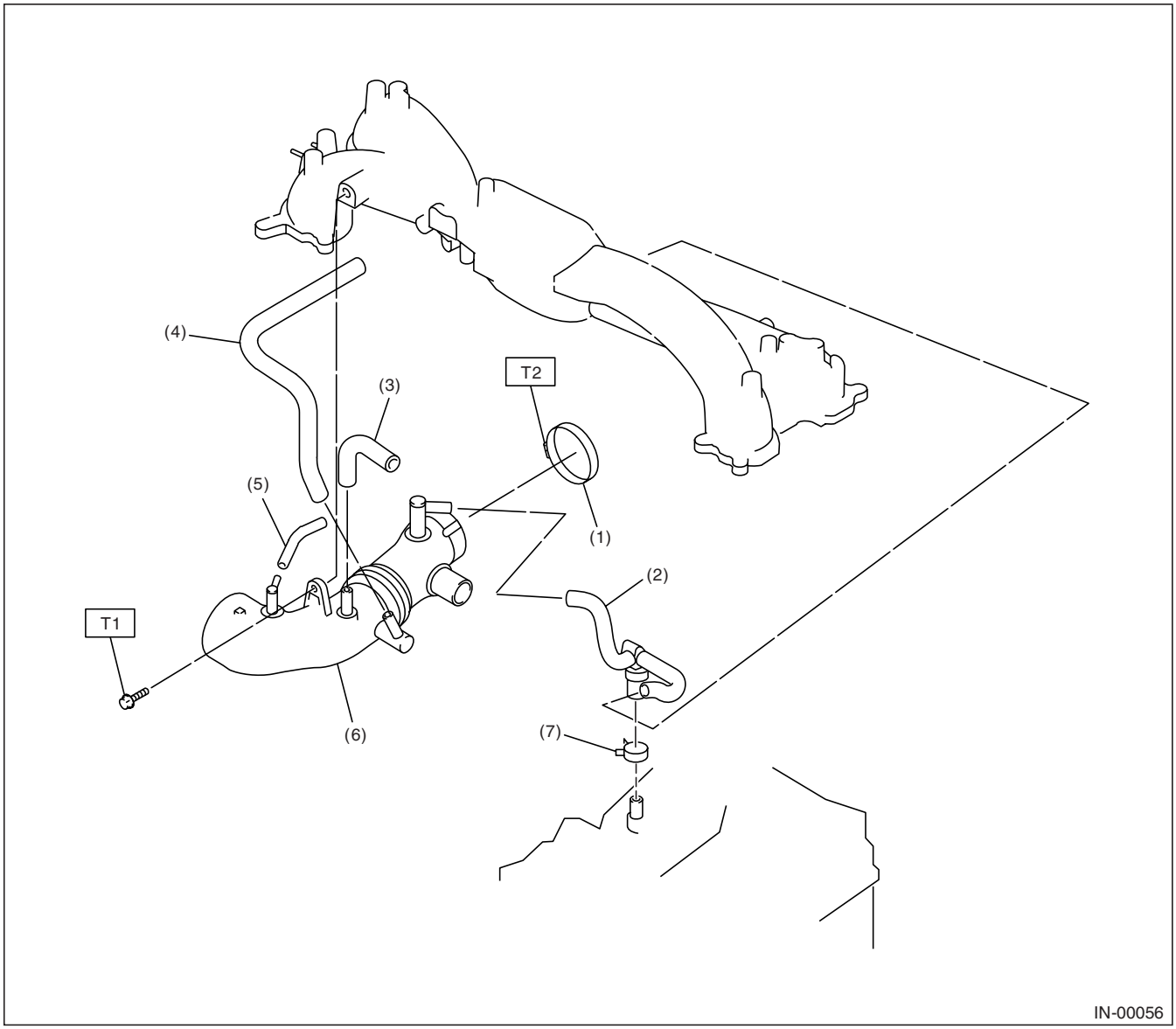


(1) Mass air flow and intake air temperature sensor
(2) Air cleaner upper cover
(3) Air cleaner element
(4) Spacer
(5) Bushing
(6) Clip
(7) Air cleaner lower case
(8) Cushion rubber
(9) Air intake duct
(10) Resonator chamber ASSY
(11) Cushion rubber
(12) Clamp
(13) Air intake boot
(14) Cushion

Tightening torque: N·m (kgf-m, ft-lb)
T1: 7.5 (0.76, 5.5)
T2: 33 (3.4, 24.6)
T3: 2.5 (0.25, 1.8)
T4: 1.7 (0.17, 1.2)

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2. INTAKE DUCT

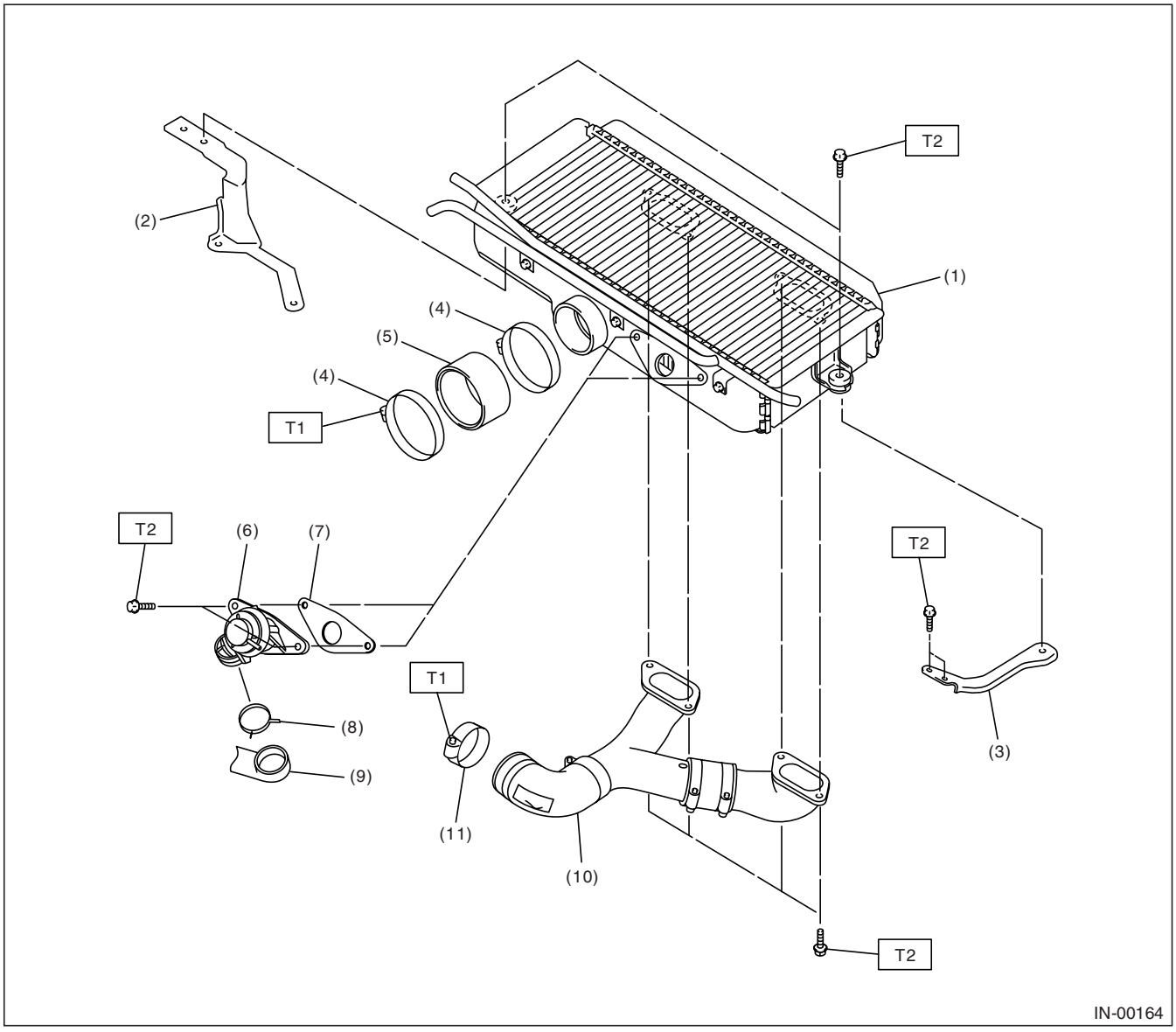


(1) Clamp
(2) PCV hose ASSY
(3) Air by-pass hose A
(4) Air by-pass hose B
(5) Air by-pass hose C
(6) Intake duct
(7) Clamp

Tightening torque: N·m (kgf-m, ft-lb)
T1: 19 (1.9, 13.7)
T2: 3 (0.3, 2.2)

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3. INTERCOOLER

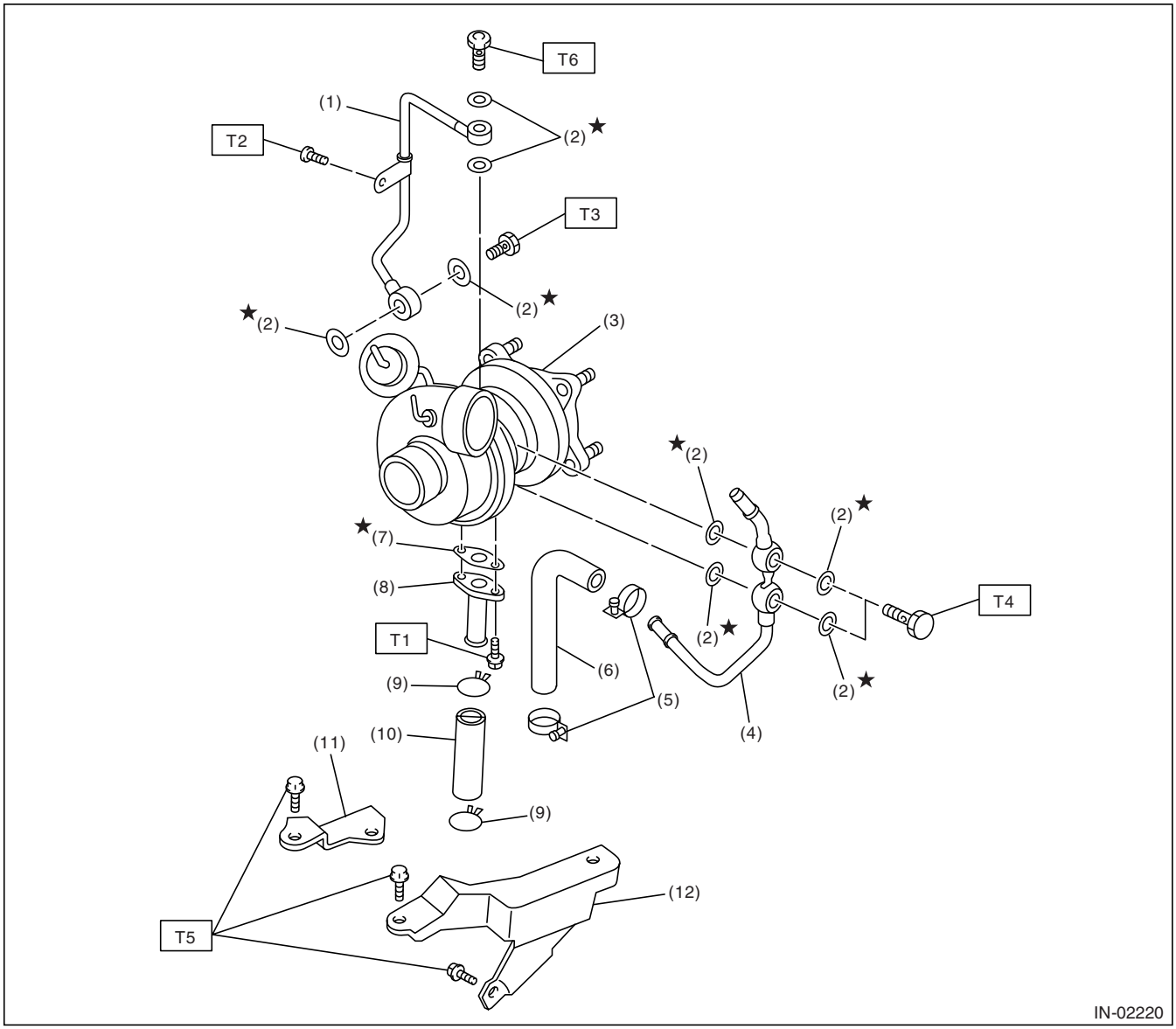


(1) Intercooler
(2) Intercooler bracket RH
(3) Intercooler bracket LH
(4) Clamp
(5) Air intake duct
(6) Air by-pass valve
(7) Gasket
(8) Clamp
(9) Air by-pass hose A
(10) Intercooler duct
(11) Clamp

Tightening torque: N·m (kgf-m, ft-lb)
T1: 3 (0.3, 2.2)
T2: 16 (1.6, 11.6)

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4. TURBOCHARGER

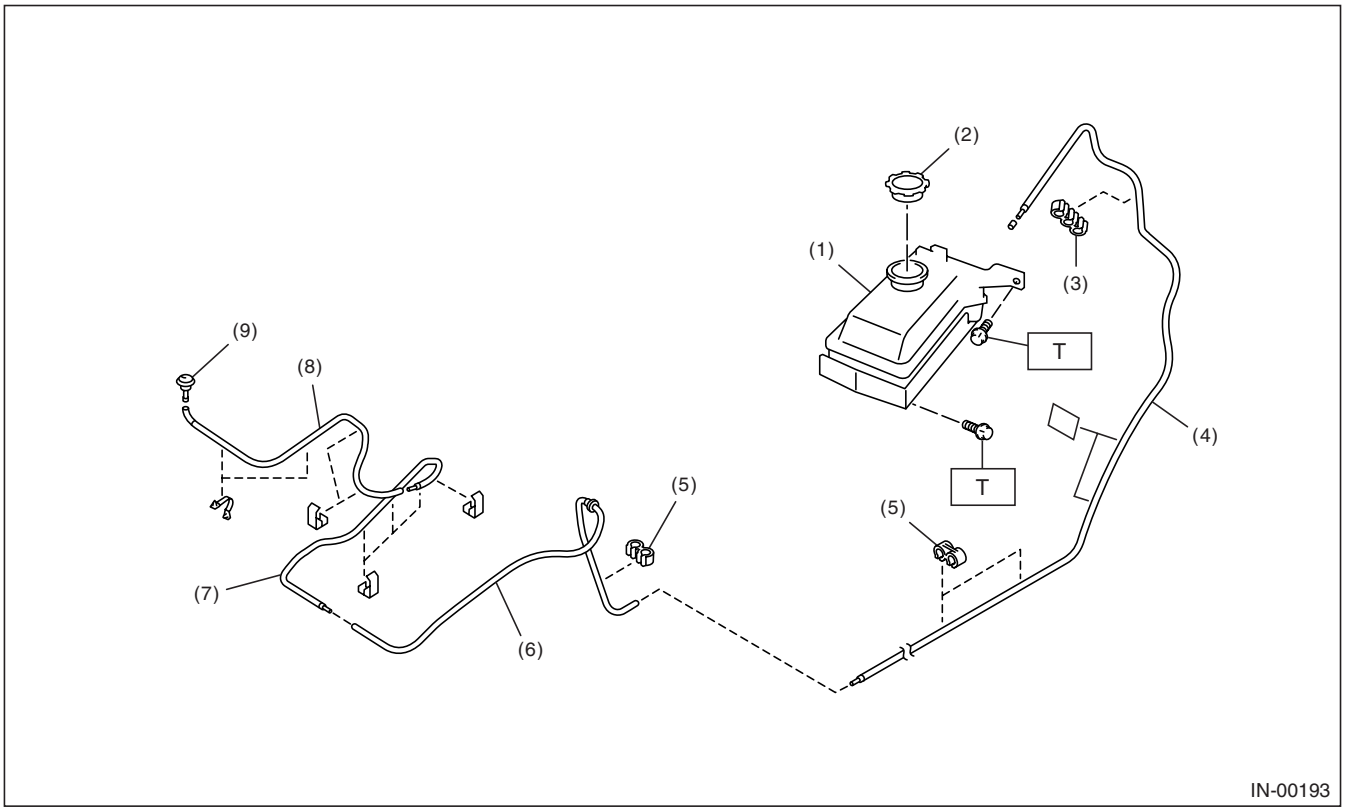


(1)	Oil inlet pipe	(7)	Gasket
(2)	Metal gasket	(8)	Oil outlet pipe
(3)	Turbocharger	(9)	Clip
(4)	Water pipe	(10)	Oil outlet hose
(5)	Clamp	(11)	Turbocharger bracket RH
(6)	Engine coolant hose	(12)	Turbocharger bracket LH

Tightening torque: N·m (kgf-m, ft-lb)
T1: 4.4 (0.45, 3.3)
T2: 4.9 (0.50, 3.6)
T3: 29 (3.0, 21.7)
T4: 33 (3.4, 24.6)
T5: 16 (1.6, 11.6)

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5. INTERCOOLER WATER SPRAY TANK



(1) Water tank ASSY
(2) Water tank cap
(3) Clamp
(4) Rear hose
(5) Clamp
(6) Center hose
(7) Front hose
(8) Intercooler hose
(9) Nozzle

Tightening torque: N·m (kgf-m, ft-lb)
T: 6.0 (0.61, 4.4)

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B: CAUTION

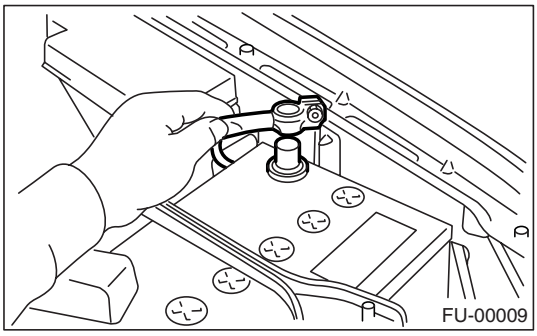
- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
- Be careful not to burn your hands, because each part on the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Before disconnecting electrical connectors of sensor or units, be sure to disconnect the ground cable from battery.

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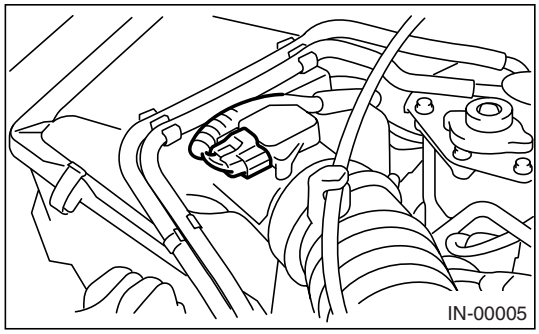
2. Air Cleaner

A: REMOVAL

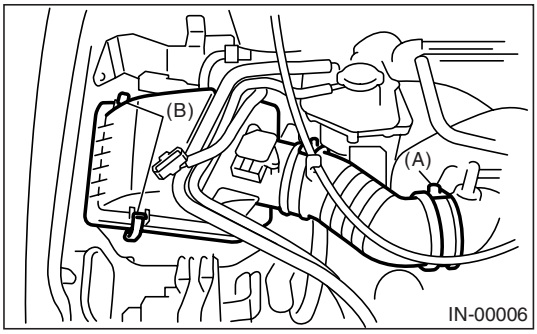
1) Disconnect the ground cable from battery.



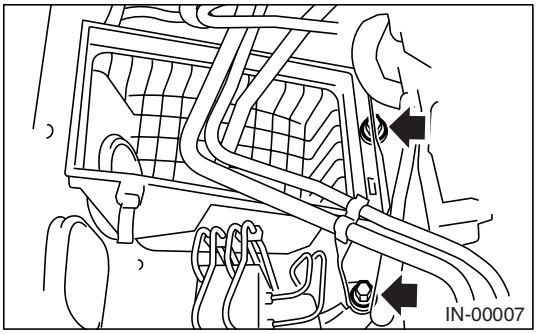
2) Disconnect the connector from mass air flow sensor.



3) Loosen the clamp (A) which connects the air intake boot and intake duct.
4) Remove the clip (B) from air cleaner upper cover.



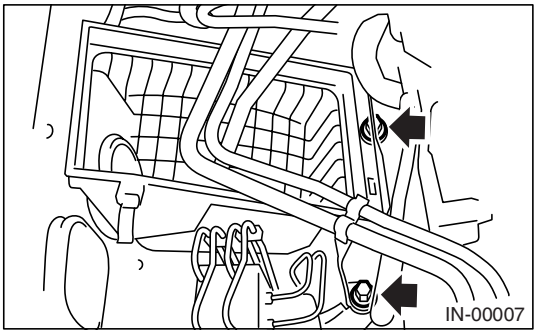
5) Remove the air cleaner upper cover.
6) Remove the air cleaner element.
7) Remove the air cleaner lower case.



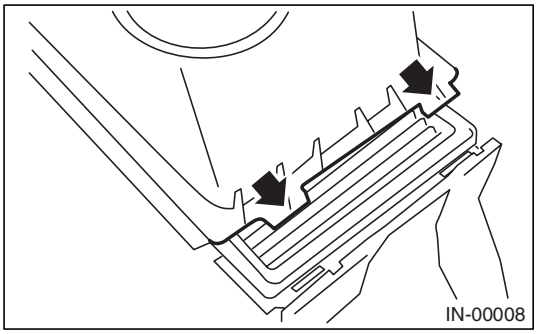
B: INSTALLATION

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

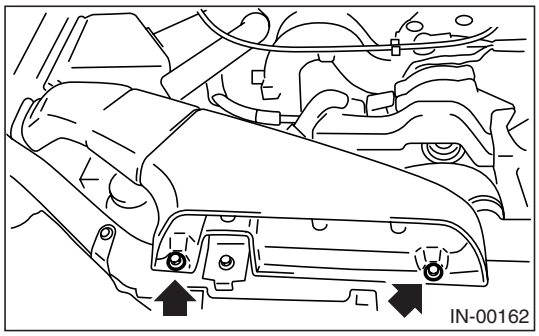
Replace it if excessively damaged or dirty.

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3. Air Intake Duct

A: REMOVAL

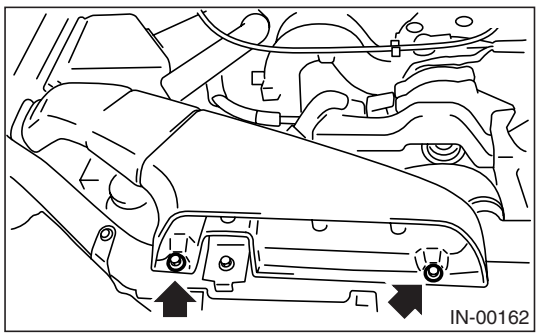
Remove the bolts which install the air intake duct on front side of body.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)



C: INSPECTION

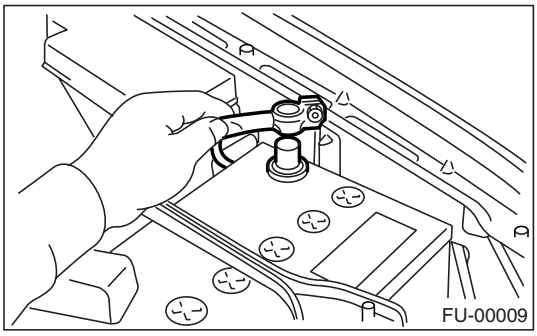
1) Inspect for cracks and loose connections.
2) Inspect that no foreign objects are mixed in air intake duct.

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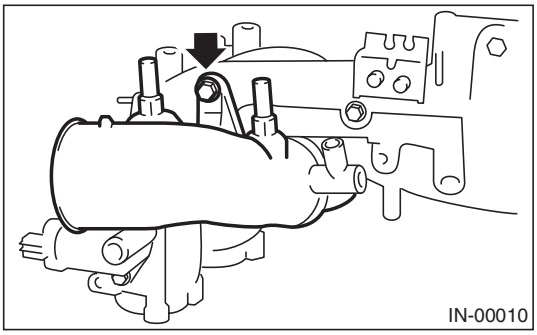
4. Intake Duct

A: REMOVAL

1) Disconnect the ground cable from battery.



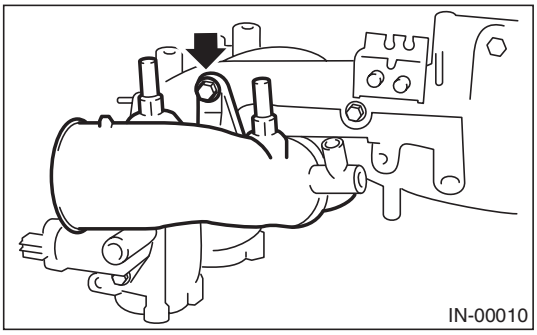
2) Remove the intake manifold. <Ref. to FU(H4DOTC)-14, REMOVAL, Intake Manifold.>
3) Remove the sensor, engine harness and fuel pipe attached to intake manifold. <Ref. to FU(H4DOTC)-20, DISASSEMBLY, Intake Manifold.>
4) Remove the intake duct from intake manifold.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
19 N·m (1.9 kgf-m, 13.7 ft-lb)

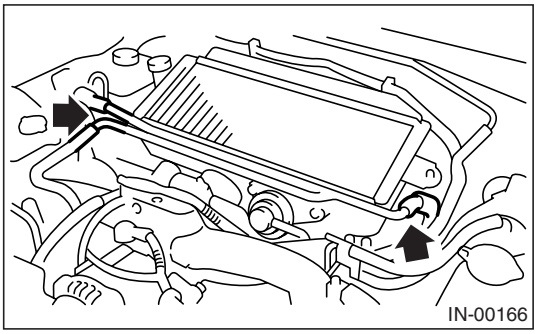


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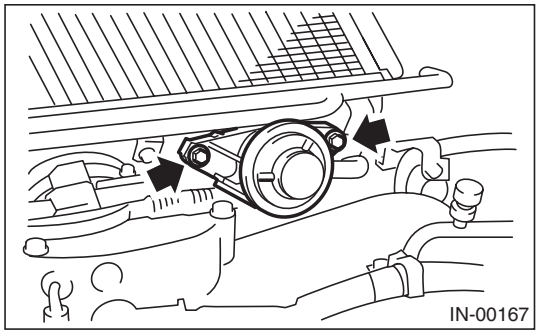
5. Intercooler

A: REMOVAL

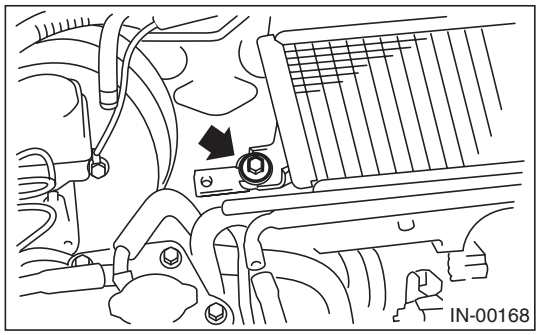
1) Disconnect the air by-pass hoses from intercooler.

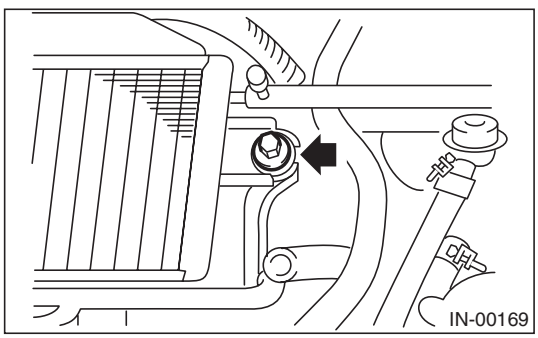


2) Separate the air by-pass valve from intercooler.



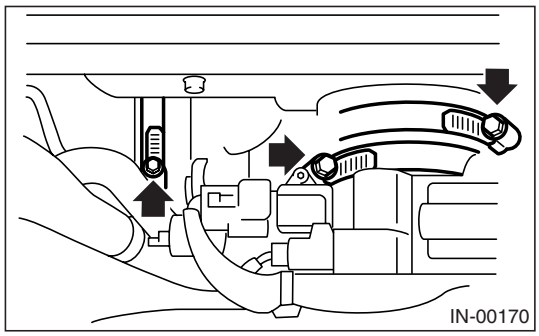
3) Remove the bolts which secure the intercooler to bracket.





4) Separate the intercooler air duct from turbocharger.

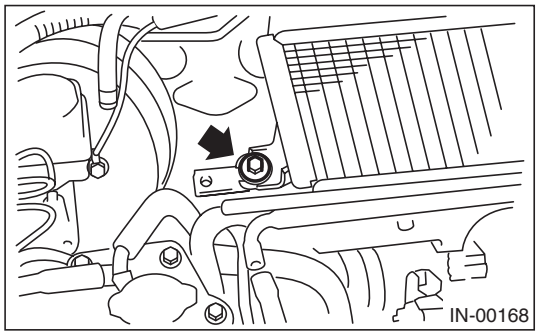
5) Separate the intercooler from throttle body.

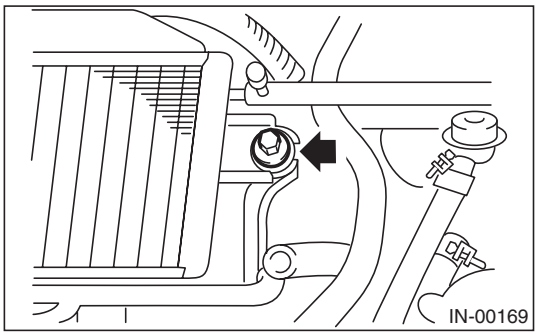


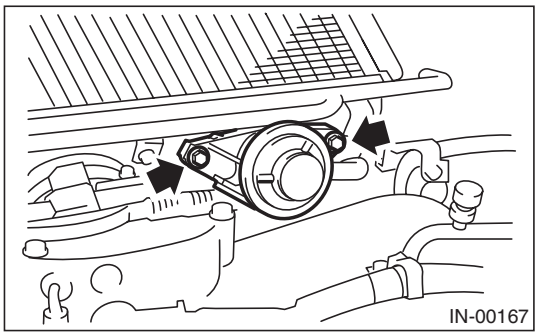
B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
16 N·m (1.6 kgf-m, 11.6 ft-lb)



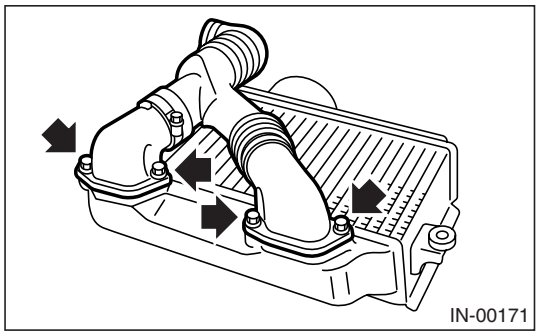




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C: DISASSEMBLY

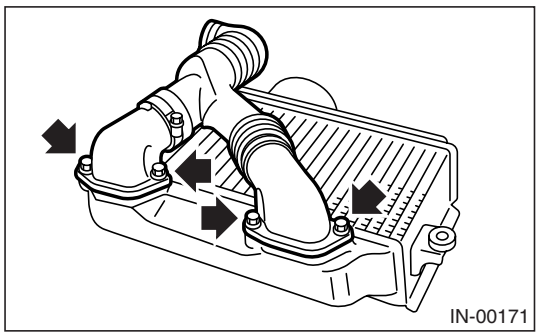
Remove the intercooler ducts from intercooler.



D: ASSEMBLY

Assemble in the reverse order of disassembly.

Tightening torque:
16 N·m (1.6 kgf-m, 11.7 ft-lb)

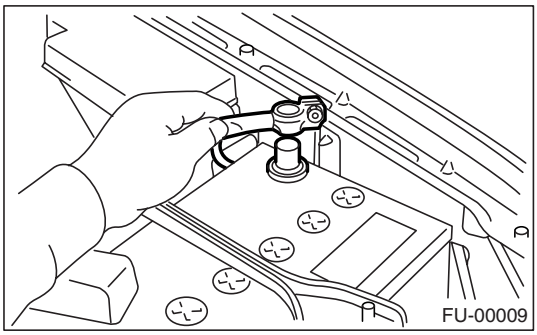


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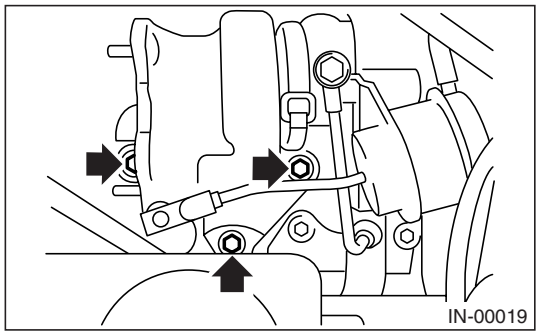
6. Turbocharger

A: REMOVAL

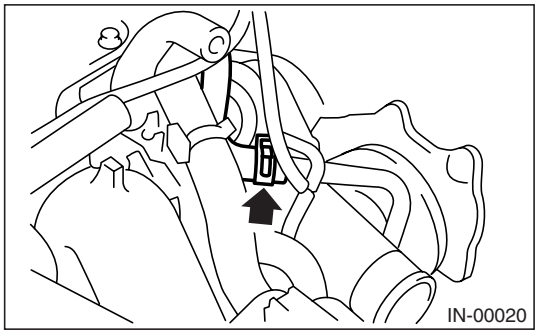
1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.



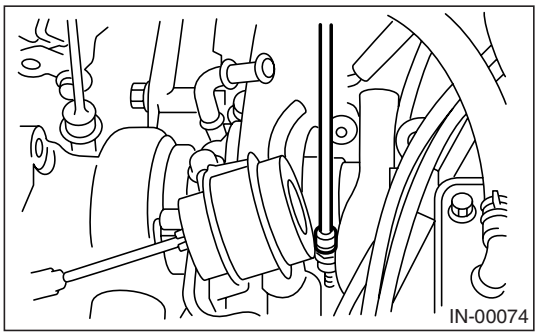
3) Remove the center exhaust pipe. <Ref. to EX(H4DOTC)-9, REMOVAL, Center Exhaust Pipe.>
4) Lower the vehicle.
5) Separate the turbocharger joint pipe from turbocharger.



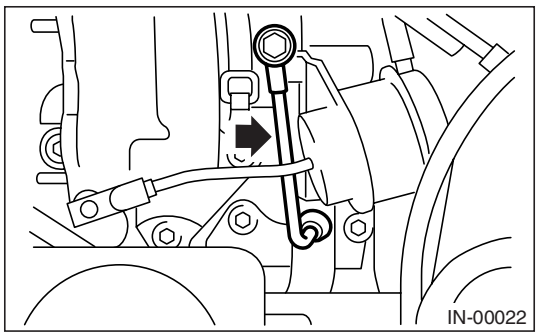
6) Disconnect the engine coolant hose which is connected to coolant filler tank.



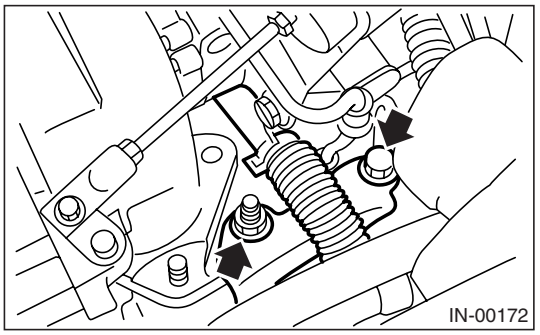
7) Loosen the clamp which secures the turbocharger to intake duct.



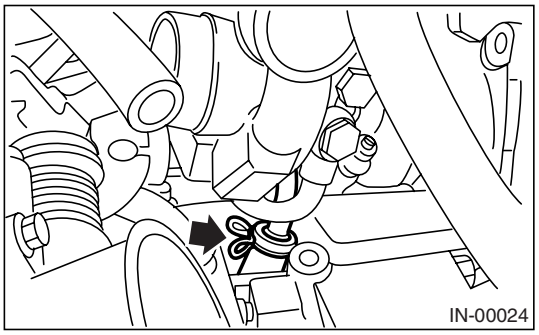
8) Remove the bolt which secures the bracket of oil pipe to turbocharger.
9) Remove the oil pipe from turbocharger.



10) Disconnect the engine coolant hose.
11) Remove the turbocharger bracket.



12) Disconnect the oil outlet hose from pipe.

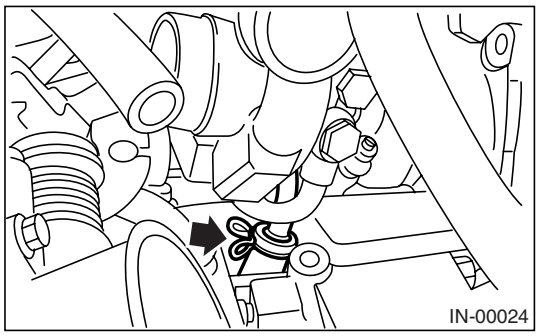


13) Take out the turbocharger from engine compartment.

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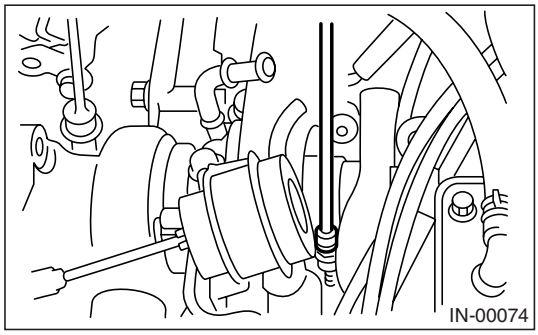
B: INSTALLATION

1) Connect the oil outlet hose to outlet pipe.



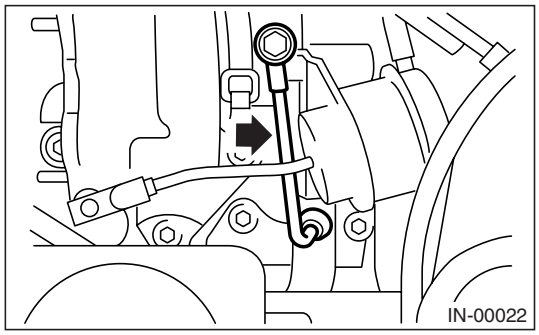
2) Install the turbocharger to intake duct.

Tightening torque:
3 N·m (0.3 kgf-m, 2.2 ft-lb)



3) Install the oil pipe to turbocharger.

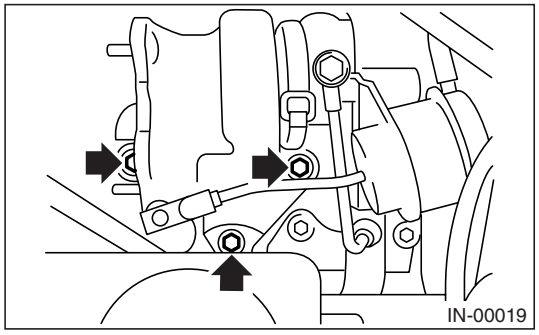
Tightening torque:
16 N·m (1.6 kgf-m, 11.6 ft-lb)



4) Install the joint pipe to turbocharger.

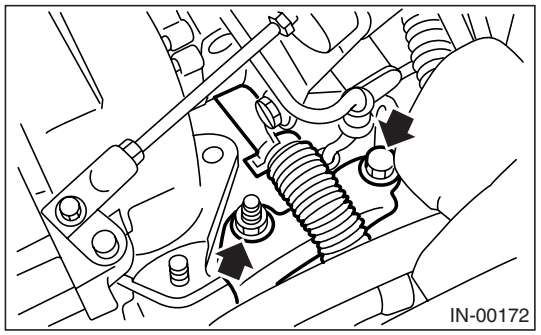
NOTE:
Replace the gasket with a new one.

Tightening torque:
35 N·m (3.6 kgf-m, 25.8 ft-lb)

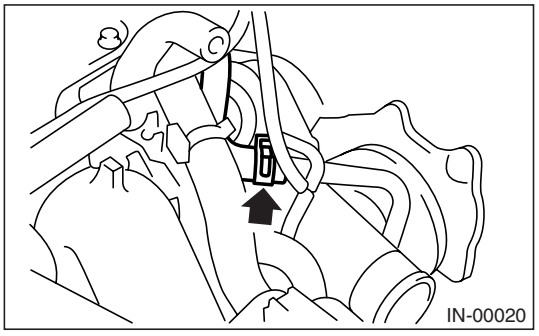


5) Connect the engine coolant hose.
6) Install the turbocharger bracket.

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.



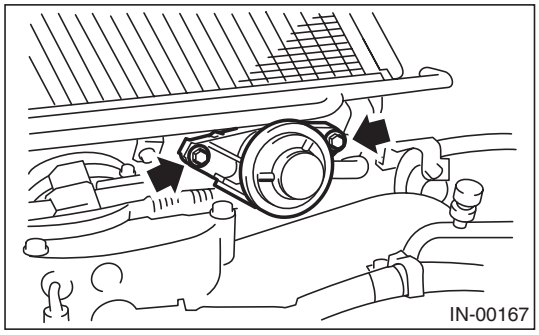
8) Lift-up the vehicle.
9) Install the center exhaust pipe. <Ref. to EX(H4DOTC)-10, INSTALLATION, Center Exhaust Pipe.>

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7. Air By-pass Valve

A: REMOVAL

1) Remove the air by-pass valve from intercooler.

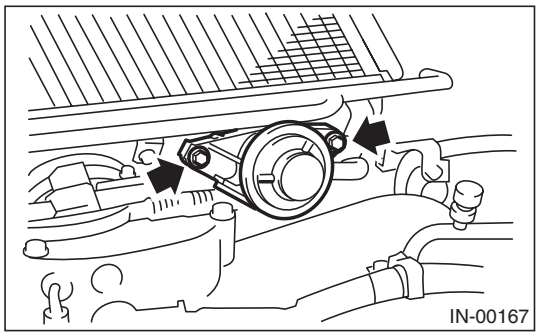


2) Disconnect the air by-pass hoses from air by-pass valve.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
16 N·m (1.6 kgf-m, 11.6 ft-lb)

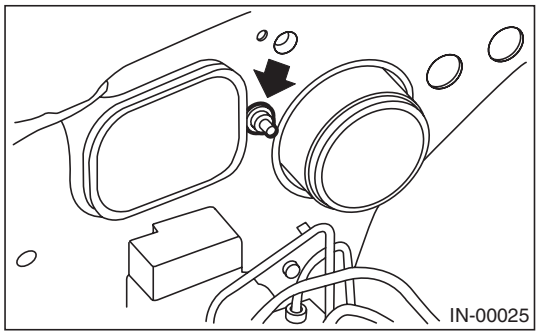


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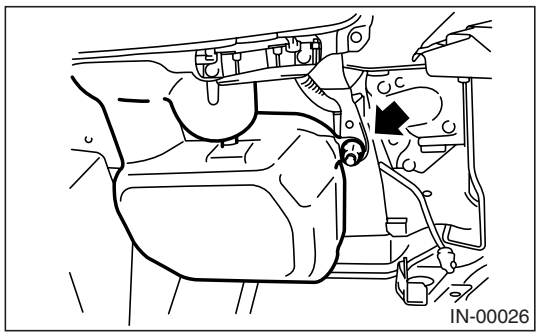
8. Resonator Chamber

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.>
4) Remove the resonator chamber mounting bolt on right side of engine compartment.



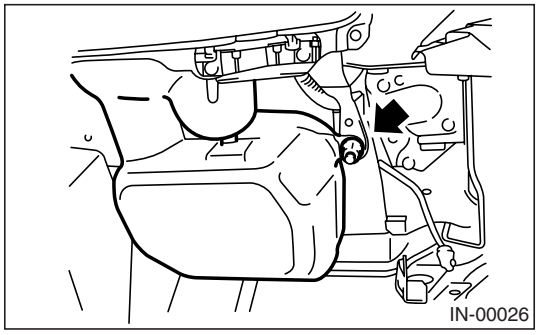
5) Remove the front right tire, and lift up the vehicle.
6) Remove the front mudguard RH.
7) Remove the resonator chamber from the inside front fender.

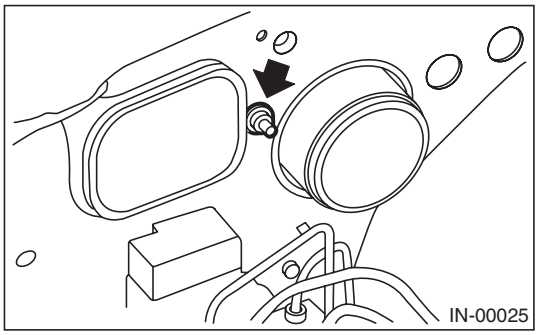


B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)





C: INSPECTION

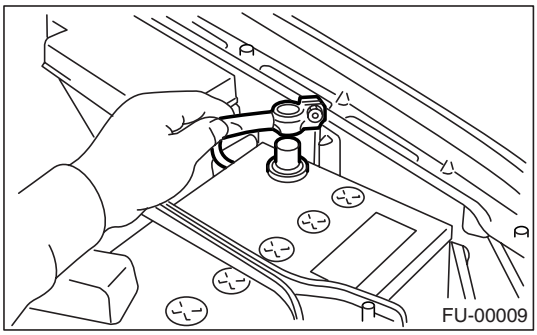
Inspect for cracks and loose connections. Check that no foreign objects are mixed in resonator chamber.

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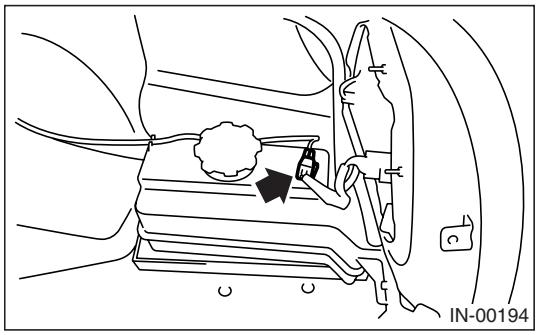
9. Intercooler Water Spray Tank

A: REMOVAL

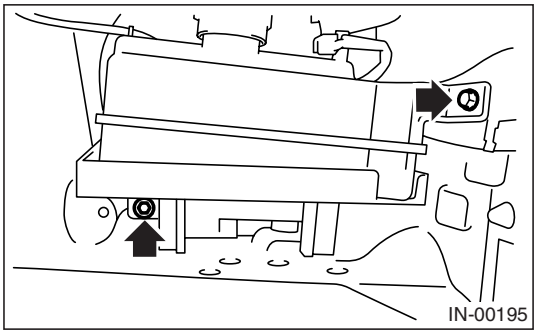
1) Disconnect the ground cable from battery.



2) Remove the trunk trim. <Ref. to EI-54, REMOVAL, Trunk Trim.>
3) Disconnect the water tank connector.



4) Remove the two water tank installation bolts.



5) Remove the hose between body and water tank, then remove the water tank.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
6.0 N·m (0.61 kgf-m, 4.4 ft-lb)

C: INSPECTION

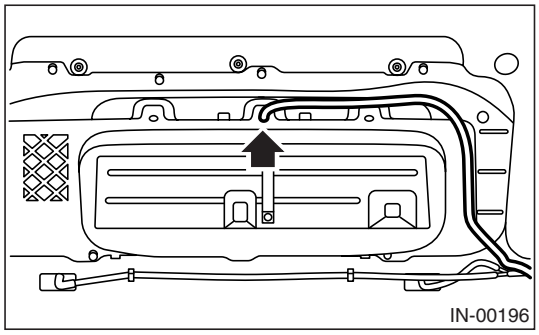
1) Make sure the hose is not deformed, damaged, cracked or clogged.
2) Make sure the water tank is not damaged or cracked

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10.Intercooler Water Spray Nozzle

A: REMOVAL

1) Open the front hood.
2) Disconnect the connecting part of hose.
3) Push the clip of nozzle upward with the clip pressed by fingers from inside of front hood.



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Make sure the hose and nozzle are not deformed, damaged, cracked or clogged.

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MECHANICAL

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1. General Description

A: SPECIFICATIONS

1. DOHC TURBO MODEL (EXCEPT FOR STi AND AUSTRALIA MODEL)

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)	92 × 75 (3.62 × 2.95)
	Piston displacement		cm^3 (cu in)	1,994 (121.67)
	Compression ratio			8.0
	Compression pressure (at 200 — 300 rpm)		kPa (kgf/cm^2, psi)	981 — 1,177 (10 — 12, 142 — 171)
	Number of piston rings			Pressure ring: 2, Oil ring: 1
	Intake valve timing	Opening		BTDC 10°
		Closing		ABDC 50°
	Exhaust valve timing	Opening		BBDC 53°
		Closing		ATDC 7°
	Valve clearance	Intake	mm (in)	0.20±0.02 (0.0079±0.0008)
		Exhaust	mm (in)	0.25±0.02 (0.0098±0.0008)
	Idling speed [At neutral position on MT or “P” or “N” range on AT]		rpm	700±100 (No load) 800±150 (A/C switch ON)
	Firing order			1 → 3 → 2 → 4
	Ignition timing		BTDC/rpm	12°±10°/700

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

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Belt tension adjuster	Protrusion of adjuster rod			5.2 — 6.2 mm (0.205 — 0.244 in)
Belt tensioner	Spacer O.D.			17.955 — 17.975 mm (0.7069 — 0.7077 in)
	Tensioner bush I.D.			18.0 — 18.08 mm (0.7087 — 0.7118 in)
	Clearance between spacer and bush		STD	0.025 — 0.125 mm (0.0010 — 0.0049 in)
			Limit	0.175 mm (0.0069 in)
	Side clearance of spacer		STD	0.2 — 0.55 mm (0.0079 — 0.0217 in)
			Limit	0.81 mm (0.0319 in)
Camshaft	Bend limit			0.020 mm (0.0079 in)
	Thrust clearance		STD	0.040 — 0.080 mm (0.0016 — 0.0031 in)
			Limit	0.10 mm (0.0039 in)
	Cam lobe height	Intake	STD	46.25 — 46.35 mm (1.821 — 1.825 in)
			Limit	46.15 mm (1.817 in)
		Exhaust	STD	46.15 — 46.25 mm (1.817 — 1.821 in)
			Limit	46.05 mm (1.813 in)
	Journal O.D.	STD	Front	37.946 — 37.963 mm (1.4939 — 1.4946 in)
			Center rear	29.946 — 29.963 mm (1.1790 — 1.1796 in)
	Oil clearance		STD	0.037 — 0.072 mm (0.0015 — 0.0028 in)
			Limit	0.10 mm (0.0039 in)
Cylinder head	Surface warpage limit			0.05 mm (0.0020 in)
	Surface grinding limit			0.3 mm (0.012 in)
	Standard height			127.5 mm (5.02 in)
Valve seat	Refacing angle			90°
	Contacting width	Intake	STD	1.0 mm (0.039 in)
			Limit	1.7 mm (0.067 in)
		Exhaust	STD	1.5 mm (0.059 in)
			Limit	2.2 mm (0.087 in)
Valve guide	Inner diameter			6.000 — 6.012 mm (0.2362 — 0.2367 in)
	Protrusion above head			15.8 — 16.2 mm (0.622 — 0.638 in)
Valve	Head edge thickness	Intake	STD	1.2 mm (0.047 in)
			Limit	0.8 mm (0.031 in)
		Exhaust	STD	1.5 mm (0.059 in)
			Limit	0.8 mm (0.031 in)
	Stem diameter		Intake	5.955 — 5.970 mm (0.2344 — 0.2350 in)
			Exhaust	5.945 — 5.960 mm(0.2341 — 0.2346 in)
	Stem oil clearance	STD	Intake	0.030 — 0.057 mm (0.0012 — 0.0022 in)
			Exhaust	0.040 — 0.067 mm (0.0016 — 0.0026 in)
		Limit	—	0.15 mm (0.0059 in)
	Overall length		Intake	104.4 mm (4.110 in)
			Exhaust	104.7 mm (4.122 in)
Valve spring	Free length			47.32 mm (1.8630 in)
	Squareness			2.5°, 2.1 mm (0.083 in)
	Tension/spring height		Set	205 — 235 N (20.9 — 24.0 kgf, 46.1 — 52.8 lb)/ 36.0 mm (1.417 in)
			Lift	426 — 490 N (43.4 — 50.0 kgf, 95.8 — 110 lb)/ 26.5 mm (1.043 in)

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Cylinder block	Surface warpage limit (mating with cylinder head)			0.05 mm (0.0020 in)
	Surface grinding limit			0.1 mm (0.004 in)
	Cylinder bore	STD	A	92.005 — 92.015 mm (3.6222 — 3.6226 in)
			B	91.995 — 92.005 mm (3.6218 — 3.6222 in)
	Taper		STD	0.015 mm (0.0006 in)
			Limit	0.050 mm (0.0020 in)
	Out-of-roundness		STD	0.010 mm (0.0004 in)
			Limit	0.050 mm (0.0020 in)
	Piston clearance		STD	0.010 — 0.030 mm (0.0004 — 0.0012 in)
			Limit	0.050 mm (0.0020 in)
	Enlarging (boring) limit			0.5 mm (0.020 in)
Piston	Outer diameter	STD	A	91.985 — 91.995 mm (3.6214 — 3.6218 in)
			B	91.975 — 91.985 mm (3.6211 — 3.6214 in)
		0.25 mm (0.0098 in) OS		92.225 — 92.235 mm (3.6309 — 3.6313 in)
		0.50 mm (0.0197 in) OS		92.475 — 92.485 mm (3.6407 — 3.6411 in)
Piston pin	Standard clearance between piston pin and hole in piston		STD	0.004 — 0.008 mm (0.0002 — 0.0003 in)
			Limit	0.020 mm (0.0008 in)
	Degree of fit			Piston pin must be fitted into position with thumb at 20°C (68°F).
Piston ring	Piston ring gap	Top ring	STD	0.20 — 0.25 mm (0.0079 — 0.0098 in)
			Limit	1.0 mm (0.039 in)
		Second ring	STD	0.40 — 0.50 mm (0.016 — 0.020 in)
			Limit	1.0 mm (0.039 in)
		Oil ring	STD	0.20 — 0.50 mm (0.0079 — 0.020 in)
			Limit	1.5 mm (0.059 in)
	Clearance between piston ring and piston ring groove	Top ring	STD	0.04 — 0.08 mm (0.0016 — 0.0031 in)
			Limit	0.15 mm (0.0059 in)
		Second ring	STD	0.030 — 0.070 mm (0.0012 — 0.0028 in)
			Limit	0.15 mm (0.0059 in)
Connecting rod	Bend twist per 100 mm (3.94 in) in length		Limit	0.10 mm (0.0039 in)
	Side clearance		STD	0.070 — 0.330 mm (0.0028 — 0.0130 in)
			Limit	0.4 mm (0.016 in)
Connecting rod bearing	Oil clearance		STD	0.020 — 0.046 mm (0.0008 — 0.0018 in)
			Limit	0.05 mm (0.0020 in)
	Thickness at center portion		STD	1.486 — 1.498 mm (0.0585 — 0.0590 in)
			0.03 mm (0.0012 in) US	1.504 — 1.512 mm (0.0592 — 0.0595 in)
			0.05 mm (0.0020 in) US	1.514 — 1.522 mm (0.0596 — 0.0599 in)
			0.25 mm (0.0098 in) US	1.614 — 1.622 mm (0.0635 — 0.0639 in)
Connecting rod bushing	Clearance between piston pin and bushing		STD	0 — 0.022 mm (0 — 0.0009 in)
			Limit	0.030 mm (0.0012 in)

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Crankshaft	Bend limit			0.035 mm (0.0014 in)
	Crank pin and crank journal	Out-of-roundness		0.005 mm (0.0002 in) or less
		Grinding limit		0.25 mm (0.0098 in)
	Crank pin outer diameter		STD	51.984 — 52.000 mm (2.0466 — 2.0472)
			0.03 mm (0.0012 in) US	51.954 — 51.970 mm (2.0454 — 2.0461)
			0.05 mm (0.0020 in) US	51.934 — 51.950 mm (2.0447 — 2.0453)
			0.25 mm (0.0098 in) US	51.734 — 51.750 mm (2.0368 — 2.0374)
	Crank journal outer diameter	#1, #3, #5	STD	59.992 — 60.008 mm (2.3619 — 2.3625 in)
			0.03 mm (0.0012 in) US	59.962 — 59.978 mm (2.3607 — 2.3613 in)
			0.05 mm (0.0020 in) US	59.942 — 59.958 mm (2.3599 — 2.3605 in)
			0.25 mm (0.0098 in) US	59.742 — 59.758 mm (2.3520 — 2.3527 in)
		#2, #4	STD	59.992 — 60.008 mm (2.3619 — 2.3625 in)
			0.03 mm (0.0012 in) US	59.962 — 59.978 mm (2.3607 — 2.3613 in)
			0.05 mm (0.0020 in) US	59.942 — 59.958 mm (2.3599 — 2.3605 in)
			0.25 mm (0.0098 in) US	59.742 — 59.758 mm (2.3520 — 2.3527 in)
	Thrust clearance		STD	0.030 — 0.115 mm (0.0012 — 0.0045 in)
			Limit	0.25 mm (0.0098 in)
	Oil clearance	#1	STD	0.003 — 0.030 mm (0.0001 — 0.0012 in)
			Limit	0.040 mm (0.0016 in)
		#2	STD	0.012 — 0.033 mm (0.0005 — 0.0013 in)
			Limit	0.045 mm (0.0018 in)
		#3	STD	0.003 — 0.030 mm (0.0001 — 0.0012 in)
			Limit	0.040 mm (0.0016 in)
		#4	STD	0.012 — 0.033 mm (0.0005 — 0.0013 in)
			Limit	0.045 mm (0.0018 in)
		#5	STD	0.010 — 0.031 mm (0.0004 — 0.0012 in)
			Limit	0.040 mm (0.0016 in)

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Crankshaft bearing	Crankshaft bearing thickness	#1, #3	STD	1.998 — 2.011 mm (0.0787 — 0.0792 in)
			0.03 mm (0.0012 in) US	2.017 — 2.020 mm (0.0794 — 0.0795 in)
			0.05 mm (0.0020 in) US	2.027 — 2.030 mm (0.0798 — 0.0799 in)
			0.25 mm (0.0098 in) US	2.127 — 2.130 mm (0.0837 — 0.0839 in)
		#2, #4, #5	STD	2.000 — 2.013 mm (0.0787 — 0.0793 in)
			0.03 mm (0.0012 in) US	2.019 — 2.022 mm (0.0795 — 0.0796 in)
			0.05 mm (0.0020 in) US	2.029 — 2.032 mm (0.0799 — 0.0800 in)
			0.25 mm (0.0098 in) US	2.129 — 2.132 mm (0.0838 — 0.0839 in)

2. STi MODEL

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)			92 × 75 (3.62 × 2.95)
	Piston displacement cm^3 (cu in)			1,994 (121.67)
	Compression ratio			8.0
	Compression pressure (at 200 — 300 rpm) kPa (kgf/cm^2, psi)			981 — 1,177 (10 — 12, 142 — 171)
	Number of piston rings			Pressure ring: 2, Oil ring: 1
	Intake valve timing	Opening	Max. retard	ATDC 6°
			Min. advance	BTDC 24°
		Closing	Max. retard	ABDC 68°
			Min. advance	ABDC 38°
	Exhaust valve timing	Opening		BBDC 58°
		Closing		ATDC 10°
	Valve clearance	Intake mm (in)		0.20±0.02 (0.0079±0.0008)
		Exhaust mm (in)		0.25±0.02 (0.0098±0.0008)
	Idling speed [At neutral position on MT] rpm			700±100 (No load) 800±150 (A/C switch ON)
	Firing order			1 → 3 → 2 → 4
	Ignition timing BTDC/rpm			12°±10°/700

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

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Belt tension adjuster	Protrusion of adjuster rod			5.2 — 6.2 mm (0.205 — 0.244 in)
Belt tensioner	Spacer O.D.			17.955 — 17.975 mm (0.7069 — 0.7077 in)
	Tensioner bush I.D.			18.0 — 18.08 mm (0.7087 — 0.7118 in)
	Clearance between spacer and bush		STD	0.025 — 0.125 mm (0.0010 — 0.0049 in)
			Limit	0.175 mm (0.0069 in)
	Side clearance of spacer		STD	0.2 — 0.55 mm (0.0079 — 0.0217 in)
			Limit	0.81 mm (0.0319 in)
Camshaft	Bend limit			0.020 mm (0.0079 in)
	Thrust clearance		STD	0.040 — 0.080 mm (0.0016 — 0.0031 in)
			Limit	0.10 mm (0.0039 in)
	Cam lobe height	Intake	STD	45.25 — 45.35 mm (1.781 — 1.785 in)
			Limit	45.15 mm (1.758 in)
		Exhaust	STD	45.60 — 45.70 mm (1.795 — 1.799 in)
			Limit	45.50 mm (1.791 in)
	Journal O.D.	STD	Front	37.946 — 37.963 mm (1.4939 — 1.4946 in)
			Center rear	29.946 — 29.963 mm (1.1790 — 1.1796 in)
	Oil clearance		STD	0.037 — 0.072 mm (0.0015 — 0.0028 in)
			Limit	0.10 mm (0.0039 in)
Cylinder head	Surface warpage limit			0.05 mm (0.0020 in)
	Surface grinding limit			0.3 mm (0.012 in)
	Standard height			127.5 mm (5.02 in)
Valve seat	Refacing angle			90°
	Contacting width	Intake	STD	1.0 mm (0.039 in)
			Limit	1.7 mm (0.067 in)
		Exhaust	STD	1.5 mm (0.059 in)
			Limit	2.2 mm (0.087 in)
Valve guide	Inner diameter			6.000 — 6.012 mm (0.2362 — 0.2367 in)
	Protrusion above head			15.8 — 16.2 mm (0.622 — 0.638 in)
Valve	Head edge thickness	Intake	STD	1.2 mm (0.047 in)
			Limit	0.8 mm (0.031 in)
		Exhaust	STD	1.5 mm (0.059 in)
			Limit	0.8 mm (0.031 in)
	Stem diameter		Intake	5.955 — 5.970 mm (0.2344 — 0.2350 in)
			Exhaust	5.945 — 5.960 mm (0.2341 — 0.2346 in)
	Stem oil clearance	STD	Intake	0.030 — 0.057 mm (0.0012 — 0.0022 in)
			Exhaust	0.040 — 0.067 mm (0.0016 — 0.0026 in)
		Limit	—	0.15 mm (0.0059 in)
	Overall length		Intake	104.4 mm (4.110 in)
			Exhaust	104.7 mm (4.122 in)
Valve spring	Free length			43.89 mm (1.728 in)
	Squareness			2.5°, 1.9 mm (0.075 in)
	Tension/spring height		Set	205 — 237 N (20.9 — 24.2 kgf, 46.1 — 53.3 lb)/ 36.0 mm (1.417 in)
			Lift	553 — 611 N (56.4 — 62.3 kgf, 124 — 137 lb)/ 26.45 mm (1.041 in)

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Cylinder block	Surface warpage limit (mating with cylinder head)			0.05 mm (0.0020 in)
	Surface grinding limit			0.1 mm (0.004 in)
	Cylinder bore	STD	A	92.005 — 92.015 mm (3.6222 — 3.6226 in)
			B	91.995 — 92.005 mm (3.6218 — 3.6222 in)
	Taper		STD	0.015 mm (0.0006 in)
			Limit	0.050 mm (0.0020 in)
	Out-of-roundness		STD	0.010 mm (0.0004 in)
			Limit	0.050 mm (0.0020 in)
	Piston clearance		STD	0.010 — 0.030 mm (0.0004 — 0.0012 in)
			Limit	0.050 mm (0.0020 in)
	Enlarging (boring) limit			0.5 mm (0.020 in)
Piston	Outer diameter	STD	A	91.985 — 91.995 mm (3.6214 — 3.6218 in)
			B	91.975 — 91.985 mm (3.6211 — 3.6214 in)
		0.25 mm (0.0098 in) OS		92.225 — 92.235 mm (3.6309 — 3.6313 in)
		0.50 mm (0.0197 in) OS		92.475 — 92.485 mm (3.6407 — 3.6411 in)
Piston pin	Standard clearance between piston pin and hole in piston		STD	0.004 — 0.008 mm (0.0002 — 0.0003 in)
			Limit	0.020 mm (0.0008 in)
	Degree of fit			Piston pin must be fitted into position with thumb at 20°C (68°F).
Piston ring	Piston ring gap	Top ring	STD	0.20 — 0.25 mm (0.0079 — 0.0098 in)
			Limit	1.0 mm (0.039 in)
		Second ring	STD	0.40 — 0.50 mm (0.016 — 0.020 in)
			Limit	1.0 mm (0.039 in)
		Oil ring	STD	0.20 — 0.50 mm (0.0079 — 0.020 in)
			Limit	1.5 mm (0.059 in)
	Clearance between piston ring and piston ring groove	Top ring	STD	0.040 — 0.080 mm (0.0016 — 0.0031 in)
			Limit	0.15 mm (0.0059 in)
		Second ring	STD	0.030 — 0.070 mm (0.0012 — 0.0028 in)
			Limit	0.15 mm (0.0059 in)
Connecting rod	Bend twist per 100 mm (3.94 in) in length		Limit	0.10 mm (0.0039 in)
	Side clearance		STD	0.070 — 0.330 mm (0.0028 — 0.0130 in)
			Limit	0.4 mm (0.016 in)
Connecting rod bearing	Oil clearance		STD	0.020 — 0.046 mm (0.0008 — 0.0018 in)
			Limit	0.05 mm (0.0020 in)
	Thickness at center portion		STD	1.486 — 1.498 mm (0.0585 — 0.0590 in)
			0.03 mm (0.0012 in) US	1.504 — 1.512 mm (0.0592 — 0.0595 in)
			0.05 mm (0.0020 in) US	1.514 — 1.522 mm (0.0596 — 0.0599 in)
			0.25 mm (0.0098 in) US	1.614 — 1.622 mm (0.0635 — 0.0639 in)
Connecting rod bushing	Clearance between piston pin and bushing		STD	0 — 0.022 mm (0 — 0.0009 in)
			Limit	0.030 mm (0.0012 in)

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Crankshaft	Bend limit			0.035 mm (0.0014 in)
	Crank pin and crank journal	Out-of-roundness		0.005 mm (0.0002 in) or less
		Grinding limit		0.25 mm (0.0098 in)
	Crank pin outer diameter		STD	51.984 — 52.000 mm (2.0466 — 2.0472)
			0.03 mm (0.0012 in) US	51.954 — 51.970 mm (2.0454 — 2.0461)
			0.05 mm (0.0020 in) US	51.934 — 51.950 mm (2.0447 — 2.0453)
			0.25 mm (0.0098 in) US	51.734 — 51.750 mm (2.0368 — 2.0374)
	Crank journal outer diameter	#1, #3, #5	STD	59.992 — 60.008 mm (2.3619 — 2.3625 in)
			0.03 mm (0.0012 in) US	59.962 — 59.978 mm (2.3607 — 2.3613 in)
			0.05 mm (0.0020 in) US	59.942 — 59.958 mm (2.3599 — 2.3605 in)
			0.25 mm (0.0098 in) US	59.742 — 59.758 mm (2.3520 — 2.3527 in)
		#2, #4	STD	59.992 — 60.008 mm (2.3619 — 2.3625 in)
			0.03 mm (0.0012 in) US	59.962 — 59.978 mm (2.3607 — 2.3613 in)
			0.05 mm (0.0020 in) US	59.942 — 59.958 mm (2.3599 — 2.3605 in)
			0.25 mm (0.0098 in) US	59.742 — 59.758 mm (2.3520 — 2.3527 in)
	Thrust clearance		STD	0.030 — 0.115 mm (0.0012 — 0.0045 in)
			Limit	0.25 mm (0.0098 in)
	Oil clearance	#1	STD	0.003 — 0.030 mm (0.0001 — 0.0012 in)
			Limit	0.040 mm (0.0016 in)
		#2	STD	0.012 — 0.033 mm (0.0005 — 0.0013 in)
			Limit	0.045 mm (0.0018 in)
		#3	STD	0.003 — 0.030 mm (0.0001 — 0.0012 in)
			Limit	0.040 mm (0.0016 in)
		#4	STD	0.012 — 0.033 mm (0.0005 — 0.0013 in)
			Limit	0.045 mm (0.0018 in)
		#5	STD	0.010 — 0.031 mm (0.0004 — 0.0012 in)
			Limit	0.040 mm (0.0016 in)

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Crankshaft bearing	Crankshaft bearing thickness	#1, #3	STD	1.998 — 2.011 mm (0.0787 — 0.0792 in)
			0.03 mm (0.0012 in) US	2.017 — 2.020 mm (0.0794 — 0.0795 in)
			0.05 mm (0.0020 in) US	2.027 — 2.030 mm (0.0798 — 0.0799 in)
			0.25 mm (0.0098 in) US	2.127 — 2.130 mm (0.0837 — 0.0839 in)
		#2, #4, #5	STD	2.000 — 2.013 mm (0.0787 — 0.0793 in)
			0.03 mm (0.0012 in) US	2.019 — 2.022 mm (0.0795 — 0.0796 in)
			0.05 mm (0.0020 in) US	2.029 — 2.032 mm (0.0799 — 0.0800 in)
			0.25 mm (0.0098 in) US	2.129 — 2.132 mm (0.0838 — 0.0839 in)

3. DOHC TURBO MODEL (AUSTRALIA MODEL EXCEPT FOR STi MODEL)

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)			92 × 75 (3.62 × 2.95)
	Piston displacement cm^3 (cu in)			1,994 (121.67)
	Compression ratio			8.0
	Compression pressure (at 200 — 300 rpm) kPa (kgf/cm^2, psi)			1.108 — 1,304 (11 — 13, 161 — 189)
	Number of piston rings			Pressure ring: 2, Oil ring: 1
	Intake valve timing	Opening	Max. retard	ATDC 7°
			Min. advance	BTDC 27°
		Closing	Max. retard	ABDC 67°
			Min. advance	ABDC 33°
	Exhaust valve timing	Opening		BBDC 53°
		Closing		ATDC 7°
	Valve clearance	Intake mm (in)		0.20±0.02 (0.0079±0.0008)
		Exhaust mm (in)		0.25±0.02 (0.0098±0.0008)
	Idling speed [At neutral position on MT, or “P” or “N” position on AT] rpm		MT	650±50 (No load) 800±50 (A/C switch ON)
			AT	700±50 (No load) 820±50 (A/C switch ON)
	Firing order			1 → 3 → 2 → 4
	Ignition timing BTDC/rpm		MT	12°±3°/650
			AT	12°±3°/700

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

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Belt tension adjuster	Protrusion of adjuster rod			5.2 — 6.2 mm (0.205 — 0.244 in)
Belt tensioner	Spacer O.D.			17.955 — 17.975 mm (0.7069 — 0.7077 in)
	Tensioner bush I.D.			18.0 — 18.08 mm (0.7087 — 0.7118 in)
	Clearance between spacer and bush		STD	0.025 — 0.125 mm (0.0010 — 0.0049 in)
			Limit	0.175 mm (0.0069 in)
	Side clearance of spacer		STD	0.2 — 0.55 mm (0.0079 — 0.0217 in)
			Limit	0.81 mm (0.0319 in)
Camshaft	Bend limit			0.020 mm (0.0079 in)
	Thrust clearance		STD	0.040 — 0.080 mm (0.0016 — 0.0031 in)
			Limit	0.10 mm (0.0039 in)
	Cam lobe height	Intake	STD	46.25 — 46.35 mm (1.821 — 1.825 in)
			Limit	46.15 mm (1.817 in)
		Exhaust	STD	46.15 — 46.25 mm (1.817 — 1.821 in)
			Limit	46.05 mm (1.813 in)
	Journal O.D.	STD	Front	37.946 — 37.963 mm (1.4939 — 1.4946 in)
			Center rear	29.946 — 29.963 mm (1.1790 — 1.1796 in)
	Oil clearance		STD	0.037 — 0.072 mm (0.0015 — 0.0028 in)
			Limit	0.10 mm (0.0039 in)
Cylinder head	Surface warpage limit			0.05 mm (0.0020 in)
	Surface grinding limit			0.3 mm (0.012 in)
	Standard height			127.5 mm (5.02 in)
Valve seat	Refacing angle			90°
	Contacting width	Intake	STD	1.0 mm (0.039 in)
			Limit	1.7 mm (0.067 in)
		Exhaust	STD	1.5 mm (0.059 in)
			Limit	2.2 mm (0.087 in)
Valve guide	Inner diameter			6.000 — 6.012 mm (0.2362 — 0.2367 in)
	Protrusion above head			15.8 — 16.2 mm (0.622 — 0.638 in)
Valve	Head edge thickness	Intake	STD	1.2 mm (0.047 in)
			Limit	0.8 mm (0.031 in)
		Exhaust	STD	1.5 mm (0.059 in)
			Limit	0.8 mm (0.031 in)
	Stem diameter		Intake	5.955 — 5.970 mm (0.2344 — 0.2350 in)
			Exhaust	5.945 — 5.960 mm(0.2341 — 0.2346 in)
	Stem oil clearance	STD	Intake	0.030 — 0.057 mm (0.0012 — 0.0022 in)
			Exhaust	0.040 — 0.067 mm (0.0016 — 0.0026 in)
		Limit	—	0.15 mm (0.0059 in)
	Overall length		Intake	104.4 mm (4.110 in)
			Exhaust	104.7 mm (4.122 in)
Valve spring	Free length			47.32 mm (1.8630 in)
	Squareness			2.5°, 2.1 mm (0.083 in)
	Tension/spring height		Set	205 — 235 N (20.9 — 24.0 kgf, 46.1 — 52.8 lb)/ 36.0 mm (1.417 in)
			Lift	426 — 490 N (43.4 — 50.0 kgf, 95.8 — 110 lb)/ 26.5 mm (1.043 in)

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Cylinder block	Surface warpage limit (mating with cylinder head)			0.05 mm (0.0020 in)
	Surface grinding limit			0.1 mm (0.004 in)
	Cylinder bore	STD	A	92.005 — 92.015 mm (3.6222 — 3.6226 in)
			B	91.995 — 92.005 mm (3.6218 — 3.6222 in)
	Taper		STD	0.015 mm (0.0006 in)
			Limit	0.050 mm (0.0020 in)
	Out-of-roundness		STD	0.010 mm (0.0004 in)
			Limit	0.050 mm (0.0020 in)
	Piston clearance		STD	0.010 — 0.030 mm (0.0004 — 0.0012 in)
			Limit	0.050 mm (0.0020 in)
	Enlarging (boring) limit			0.5 mm (0.020 in)
Piston	Outer diameter	STD	A	91.985 — 91.995 mm (3.6214 — 3.6218 in)
			B	91.975 — 91.985 mm (3.6211 — 3.6214 in)
		0.25 mm (0.0098 in) OS		92.225 — 92.235 mm (3.6309 — 3.6313 in)
		0.50 mm (0.0197 in) OS		92.475 — 92.485 mm (3.6407 — 3.6411 in)
Piston pin	Standard clearance between piston pin and hole in piston		STD	0.004 — 0.008 mm (0.0002 — 0.0003 in)
			Limit	0.020 mm (0.0008 in)
	Degree of fit			Piston pin must be fitted into position with thumb at 20°C (68°F).
Piston ring	Piston ring gap	Top ring	STD	0.20 — 0.25 mm (0.0079 — 0.0098 in)
			Limit	1.0 mm (0.039 in)
		Second ring	STD	0.40 — 0.50 mm (0.016 — 0.020 in)
			Limit	1.0 mm (0.039 in)
		Oil ring	STD	0.20 — 0.50 mm (0.0079 — 0.020 in)
			Limit	1.5 mm (0.059 in)
	Clearance between piston ring and piston ring groove	Top ring	STD	0.040 — 0.080 mm (0.0016 — 0.0031 in)
			Limit	0.15 mm (0.0059 in)
		Second ring	STD	0.030 — 0.070 mm (0.0012 — 0.0028 in)
			Limit	0.15 mm (0.0059 in)
Connecting rod	Bend twist per 100 mm (3.94 in) in length		Limit	0.10 mm (0.0039 in)
	Side clearance		STD	0.070 — 0.330 mm (0.0028 — 0.0130 in)
			Limit	0.4 mm (0.016 in)
Connecting rod bearing	Oil clearance		STD	0.020 — 0.046 mm (0.0008 — 0.0018 in)
			Limit	0.05 mm (0.0020 in)
	Thickness at center portion		STD	1.486 — 1.498 mm (0.0585 — 0.0590 in)
			0.03 mm (0.0012 in) US	1.504 — 1.512 mm (0.0592 — 0.0595 in)
			0.05 mm (0.0020 in) US	1.514 — 1.522 mm (0.0596 — 0.0599 in)
			0.25 mm (0.0098 in) US	1.614 — 1.622 mm (0.0635 — 0.0639 in)
Connecting rod bushing	Clearance between piston pin and bushing		STD	0 — 0.022 mm (0 — 0.0009 in)
			Limit	0.030 mm (0.0012 in)

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Crankshaft	Bend limit			0.035 mm (0.0014 in)
	Crank pin and crank journal	Out-of-roundness		0.005 mm (0.0002 in) or less
		Grinding limit		0.25 mm (0.0098 in)
	Crank pin outer diameter		STD	51.984 — 52.000 mm (2.0466 — 2.0472)
			0.03 mm (0.0012 in) US	51.954 — 51.970 mm (2.0454 — 2.0461)
			0.05 mm (0.0020 in) US	51.934 — 51.950 mm (2.0447 — 2.0453)
			0.25 mm (0.0098 in) US	51.734 — 51.750 mm (2.0368 — 2.0374)
	Crank journal outer diameter	#1, #3, #5	STD	59.992 — 60.008 mm (2.3619 — 2.3625 in)
			0.03 mm (0.0012 in) US	59.962 — 59.978 mm (2.3607 — 2.3613 in)
			0.05 mm (0.0020 in) US	59.942 — 59.958 mm (2.3599 — 2.3605 in)
			0.25 mm (0.0098 in) US	59.742 — 59.758 mm (2.3520 — 2.3527 in)
		#2, #4	STD	59.992 — 60.008 mm (2.3619 — 2.3625 in)
			0.03 mm (0.0012 in) US	59.962 — 59.978 mm (2.3607 — 2.3613 in)
			0.05 mm (0.0020 in) US	59.942 — 59.958 mm (2.3599 — 2.3605 in)
			0.25 mm (0.0098 in) US	59.742 — 59.758 mm (2.3520 — 2.3527 in)
	Thrust clearance		STD	0.030 — 0.115 mm (0.0012 — 0.0045 in)
			Limit	0.25 mm (0.0098 in)
	Oil clearance	#1	STD	0.003 — 0.030 mm (0.0001 — 0.0012 in)
			Limit	0.040 mm (0.0016 in)
		#2	STD	0.012 — 0.033 mm (0.0005 — 0.0013 in)
			Limit	0.045 mm (0.0018 in)
		#3	STD	0.003 — 0.030 mm (0.0001 — 0.0012 in)
			Limit	0.040 mm (0.0016 in)
		#4	STD	0.012 — 0.033 mm (0.0005 — 0.0013 in)
			Limit	0.045 mm (0.0018 in)
		#5	STD	0.010 — 0.031 mm (0.0004 — 0.0012 in)
			Limit	0.040 mm (0.0016 in)

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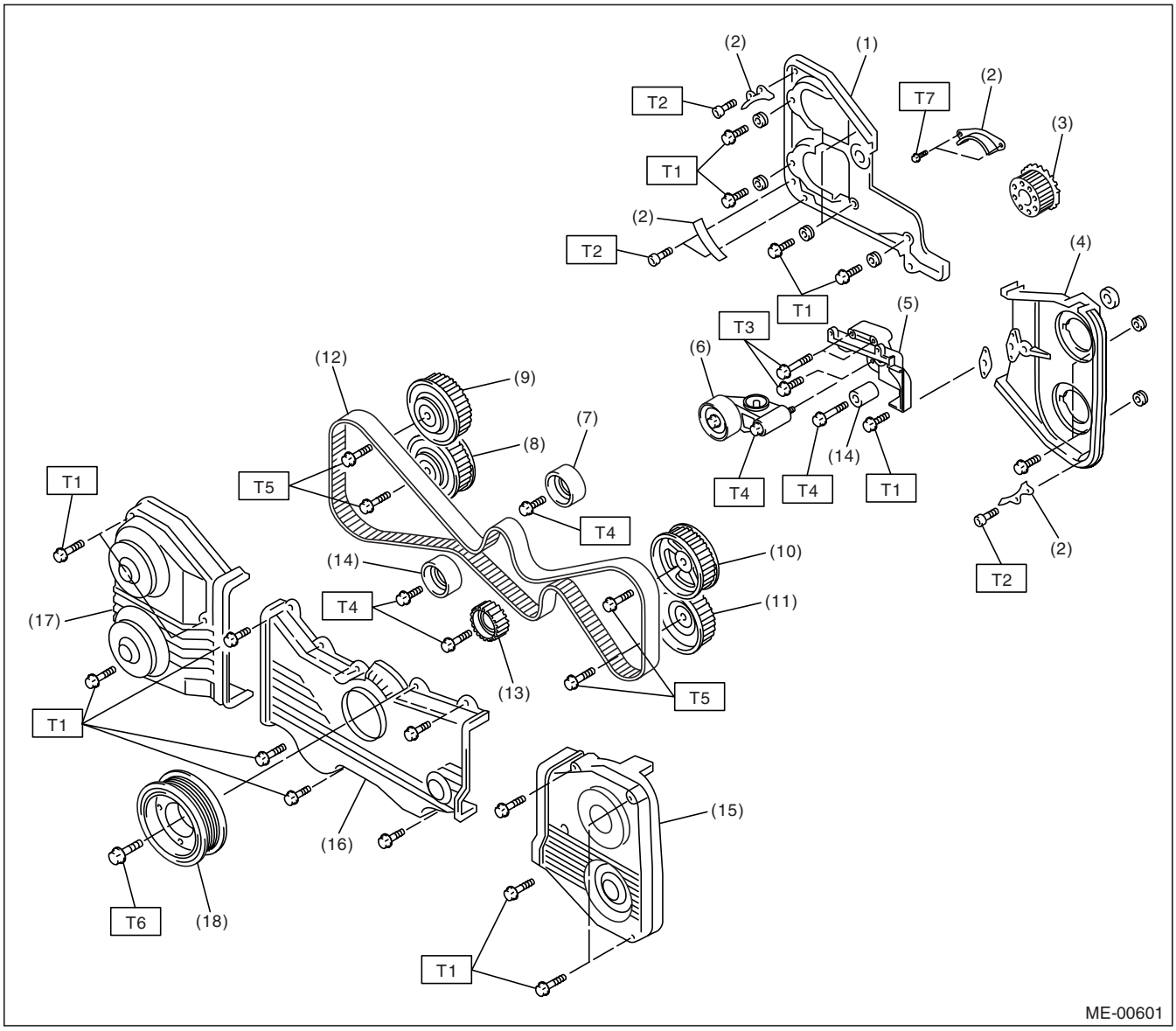
Crankshaft bearing	Crankshaft bearing thickness	#1, #3	STD	1.998 — 2.011 mm (0.0787 — 0.0792 in)
			0.03 mm (0.0012 in) US	2.017 — 2.020 mm (0.0794 — 0.0795 in)
			0.05 mm (0.0020 in) US	2.027 — 2.030 mm (0.0798 — 0.0799 in)
			0.25 mm (0.0098 in) US	2.127 — 2.130 mm (0.0837 — 0.0839 in)
		#2, #4, #5	STD	2.000 — 2.013 mm (0.0787 — 0.0793 in)
			0.03 mm (0.0012 in) US	2.019 — 2.022 mm (0.0795 — 0.0796 in)
			0.05 mm (0.0020 in) US	2.029 — 2.032 mm (0.0799 — 0.0800 in)
			0.25 mm (0.0098 in) US	2.129 — 2.132 mm (0.0838 — 0.0839 in)

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B: COMPONENT

1. TIMING BELT

• EXCEPT FOR STi AND AUSTRALIA MODEL

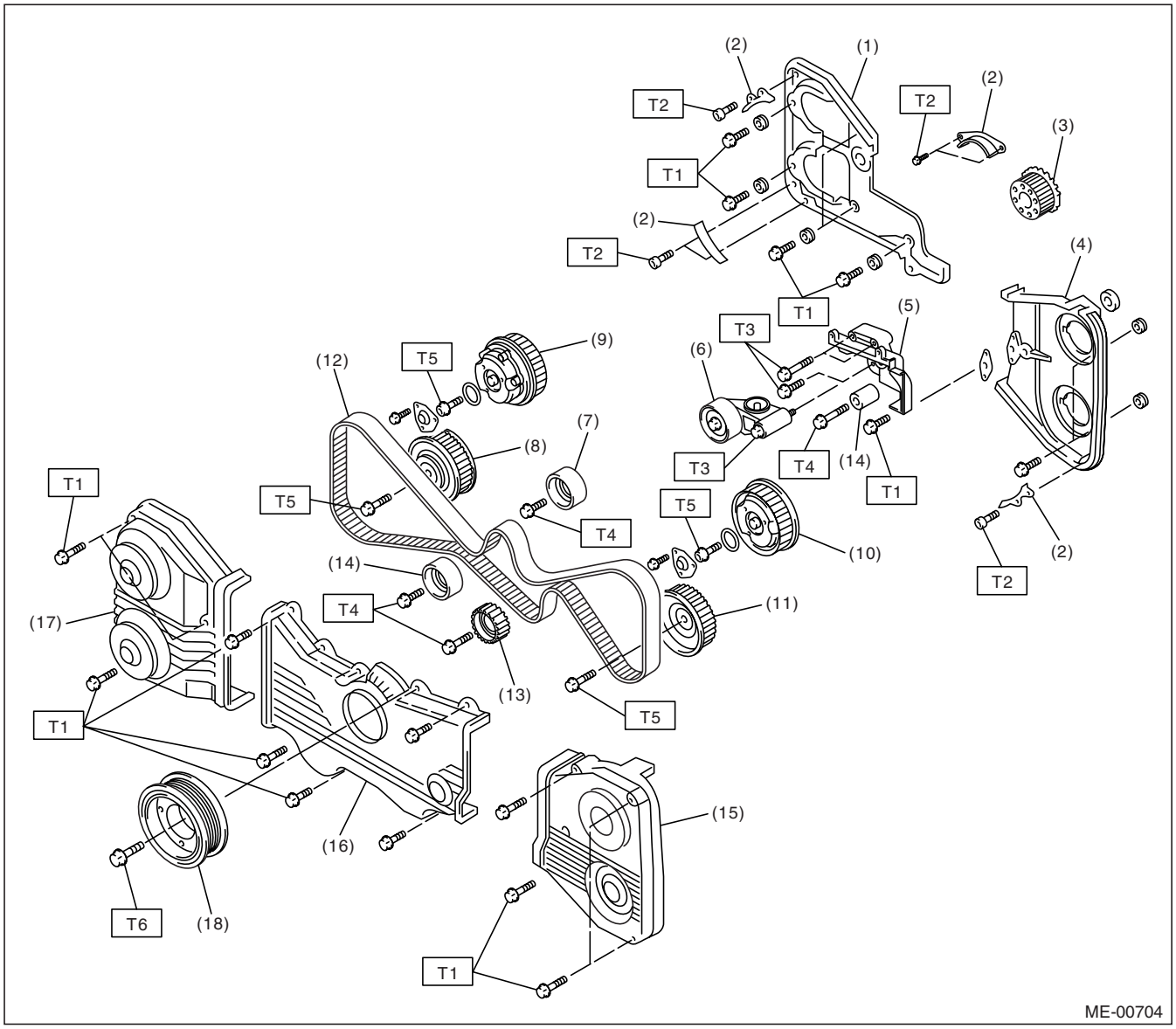


(1) Timing belt cover No. 2 (RH)
(2) Timing belt guide (MT model)
(3) Crankshaft sprocket
(4) Timing belt cover No. 2 (LH)
(5) Tensioner bracket
(6) Automatic belt tension adjuster ASSY
(7) Belt idler
(8) Exhaust camshaft sprocket (RH)
(9) Intake camshaft sprocket (RH)
(10) Intake camshaft sprocket (LH)
(11) Exhaust camshaft sprocket (LH)
(12) Timing belt
(13) Belt idler No. 2
(14) Belt idler
(15) Timing belt cover (LH)
(16) Front belt cover
(17) Timing belt cover (RH)
(18) Crankshaft pulley

Tightening torque: N·m (kgf-m, ft-lb)
T1: 5 (0.5, 3.6)
T2: 6.4 (0.65, 4.7)
T3: 25 (2.5, 18.1)
T4: 39 (4.0, 28.9)
T5: 98 (10, 72.4)
T6: <Ref. to ME(H4DOTC)-58, INSTALLATION, Crankshaft Pulley.>
T7: 10 (1.0, 7.2)

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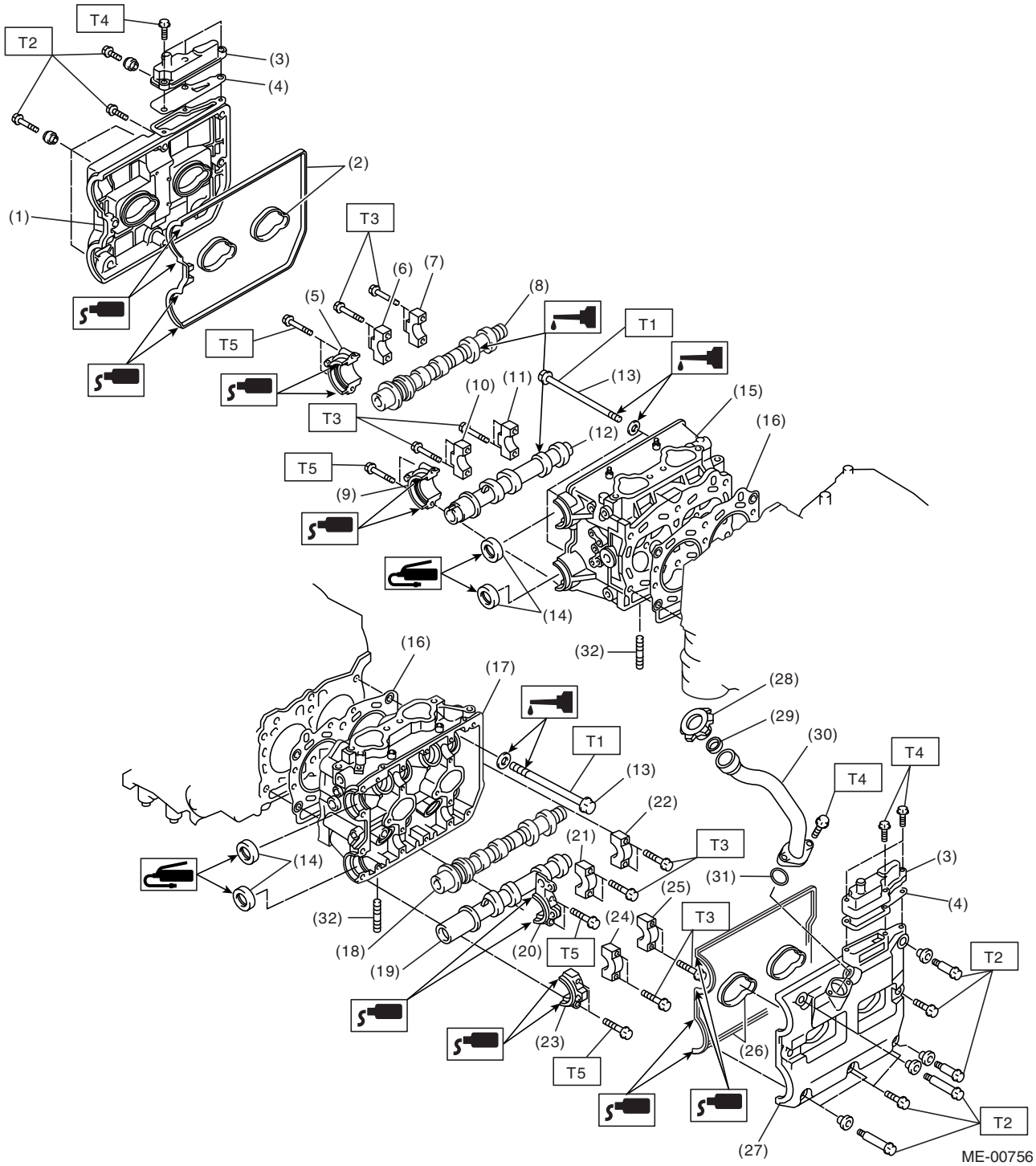
(1) Timing belt cover No. 2 (RH)
(2) Timing belt guide
(3) Crankshaft sprocket
(4) Timing belt cover No. 2 (LH)
(5) Tensioner bracket
(6) Automatic belt tension adjuster ASSY
(7) Belt idler
(8) Exhaust camshaft sprocket (RH)
(9) Intake camshaft sprocket (RH)
(10) Intake camshaft sprocket (LH)
(11) Exhaust camshaft sprocket (LH)
(12) Timing belt
(13) Belt idler No. 2
(14) Belt idler
(15) Timing belt cover (LH)
(16) Front belt cover
(17) Timing belt cover (RH)
(18) Crankshaft pulley

Tightening torque: N·m (kgf-m, ft-lb)
T1: 5 (0.5, 3.6)
T2: 10 (1.0, 7)
T3: 25 (2.5, 18.1)
T4: 39 (4.0, 28.9)
T5: 98 (10, 72.4)
T6: <Ref. to ME(H4DOTC)-58, INSTALLATION, Crankshaft Pulley.>

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2. CYLINDER HEAD AND CAMSHAFT

• EXCEPT FOR STi AND AUSTRALIA MODEL



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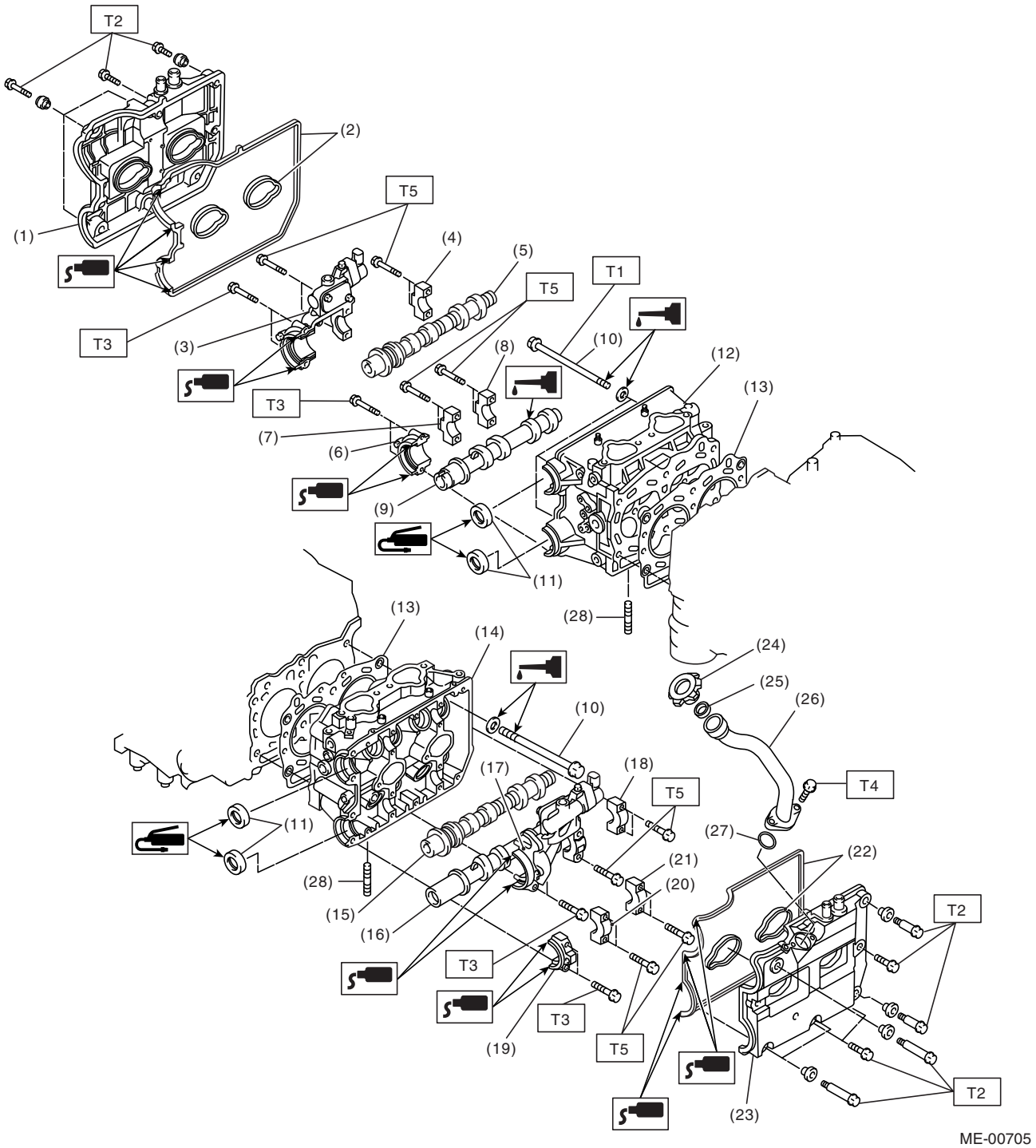
(1) Rocker cover (RH)
(2) Rocker cover gasket (RH)
(3) Oil separator cover
(4) Gasket
(5) Intake camshaft cap (Front RH)
(6) Intake camshaft cap (Center RH)
(7) Intake camshaft cap (Rear RH)
(8) Intake camshaft cap (RH)
(9) Exhaust camshaft cap (Front RH)
(10) Exhaust camshaft cap (Center RH)
(11) Exhaust camshaft cap (Rear RH)
(12) Exhaust camshaft (RH)
(13) Cylinder head bolt
(14) Oil seal
(15) Cylinder head (RH)
(16) Cylinder head gasket
(17) Cylinder head (LH)
(18) Intake camshaft (LH)
(19) Exhaust camshaft (LH)
(20) Intake camshaft cap (Front LH)
(21) Intake camshaft cap (Center LH)
(22) Intake camshaft cap (Rear LH)
(23) Exhaust camshaft cap (Front LH)
(24) Exhaust camshaft cap (Center LH)
(25) Exhaust camshaft cap (Rear LH)
(26) Rocker cover gasket (LH)
(27) Rocker cover (LH)
(28) Oil filler cap
(29) Gasket
(30) Oil filler duct
(31) O-ring
(32) Stud bolt

Tightening torque: N·m (kgf-m, ft-lb)

T1: ***<Ref. to ME(H4DOTC)-81, INSTALLATION, Cylinder Head Assembly.>***
T2: ***5 (0.5, 3.6)***
T3: ***20 (2.0, 14.5)***
T4: ***6.4 (0.65, 4.7)***
T5: ***10 (1.0, 7.2)***

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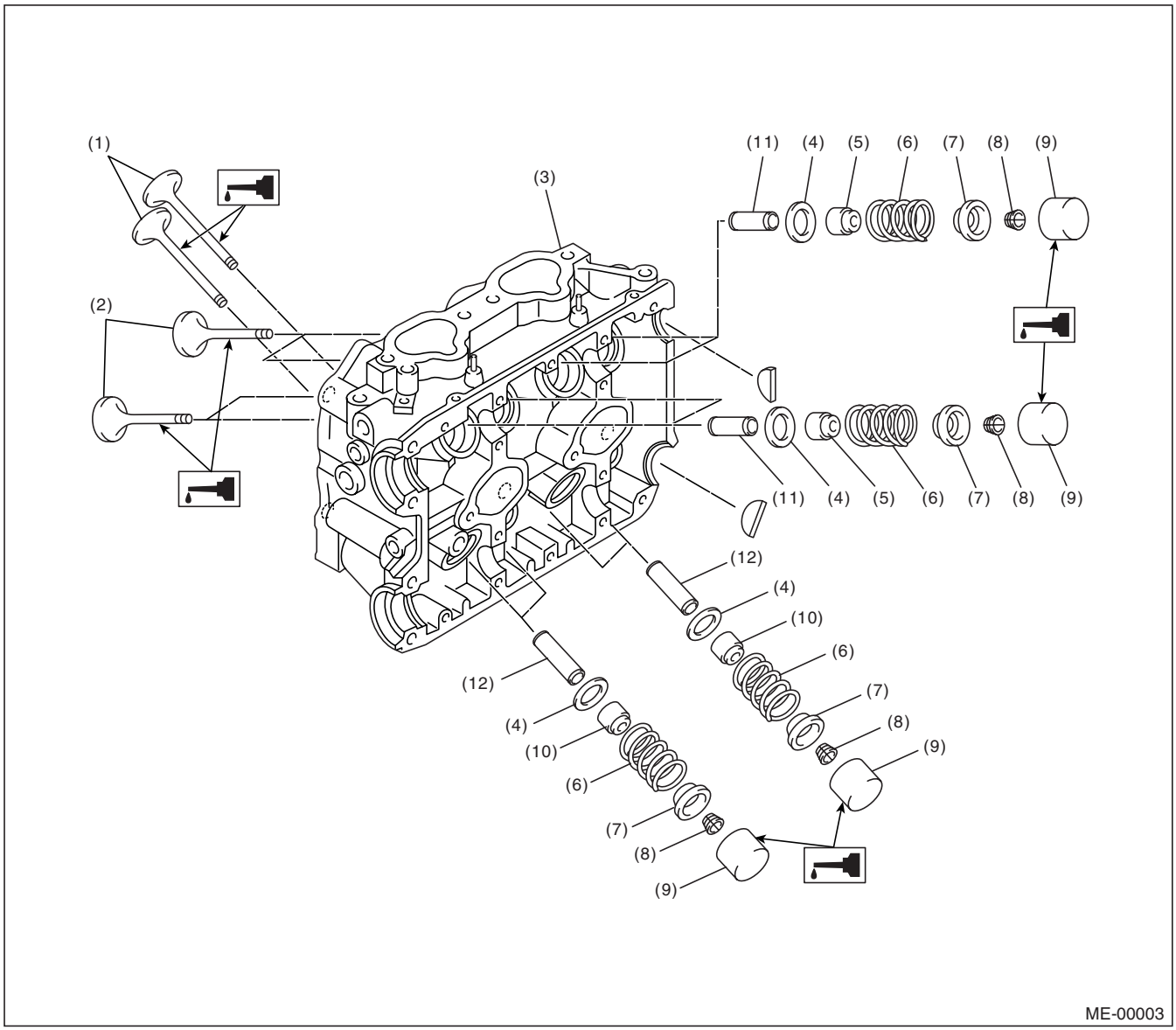
(1) Rocker cover (RH)
(2) Rocker cover gasket (RH)
(3) Variable valve timing solenoid valve assembly (RH)
(4) Intake camshaft cap (RH)
(5) Intake camshaft (RH)
(6) Exhaust camshaft cap (Front RH)
(7) Exhaust camshaft cap (Center RH)
(8) Exhaust camshaft cap (Rear RH)
(9) Exhaust camshaft (RH)
(10) Cylinder head bolt
(11) Oil seal
(12) Cylinder head (RH)
(13) Cylinder head gasket
(14) Cylinder head (LH)
(15) Intake camshaft (LH)
(16) Exhaust camshaft (LH)
(17) Variable valve timing solenoid valve assembly (LH)
(18) Intake camshaft cap (LH)
(19) Exhaust camshaft cap (Front LH)
(20) Exhaust camshaft cap (Center LH)
(21) Exhaust camshaft cap (Rear LH)
(22) Rocker cover gasket (LH)
(23) Rocker cover (LH)
(24) Oil filler cap
(25) Gasket
(26) Oil filler duct
(27) O-ring
(28) Stud bolt

Tightening torque: N·m (kgf-m, ft-lb)

T1: ***<Ref. to ME(H4DOTC)-81, INSTALLATION, Cylinder Head Assembly.>***
T2: ***5 (0.5, 3.6)***
T3: ***10 (1.0, 7)***
T4: ***6.4 (0.65, 4.7)***
T5: ***20 (2.0, 14.5)***

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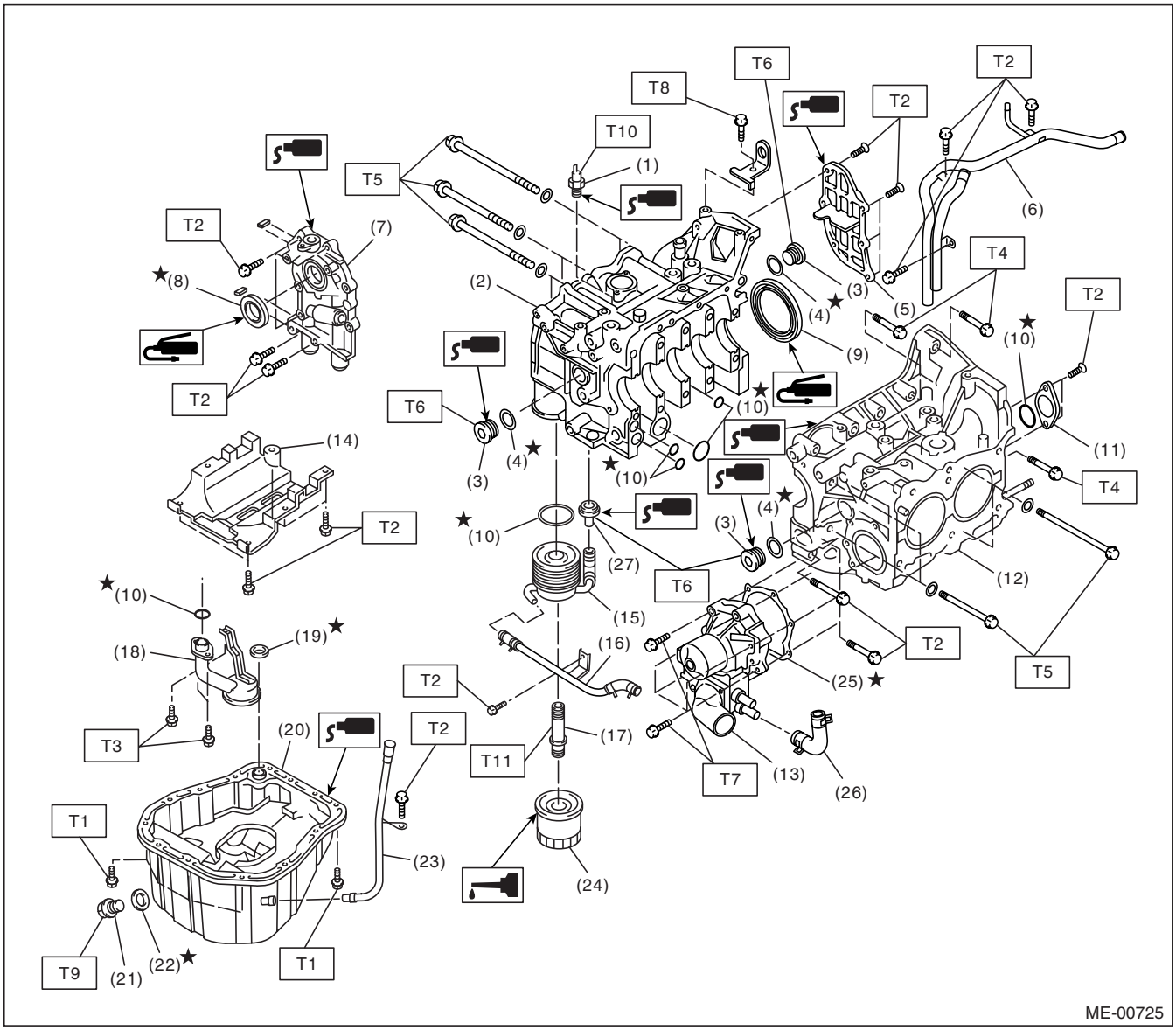
3. CYLINDER HEAD AND VALVE ASSEMBLY



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

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4. CYLINDER BLOCK



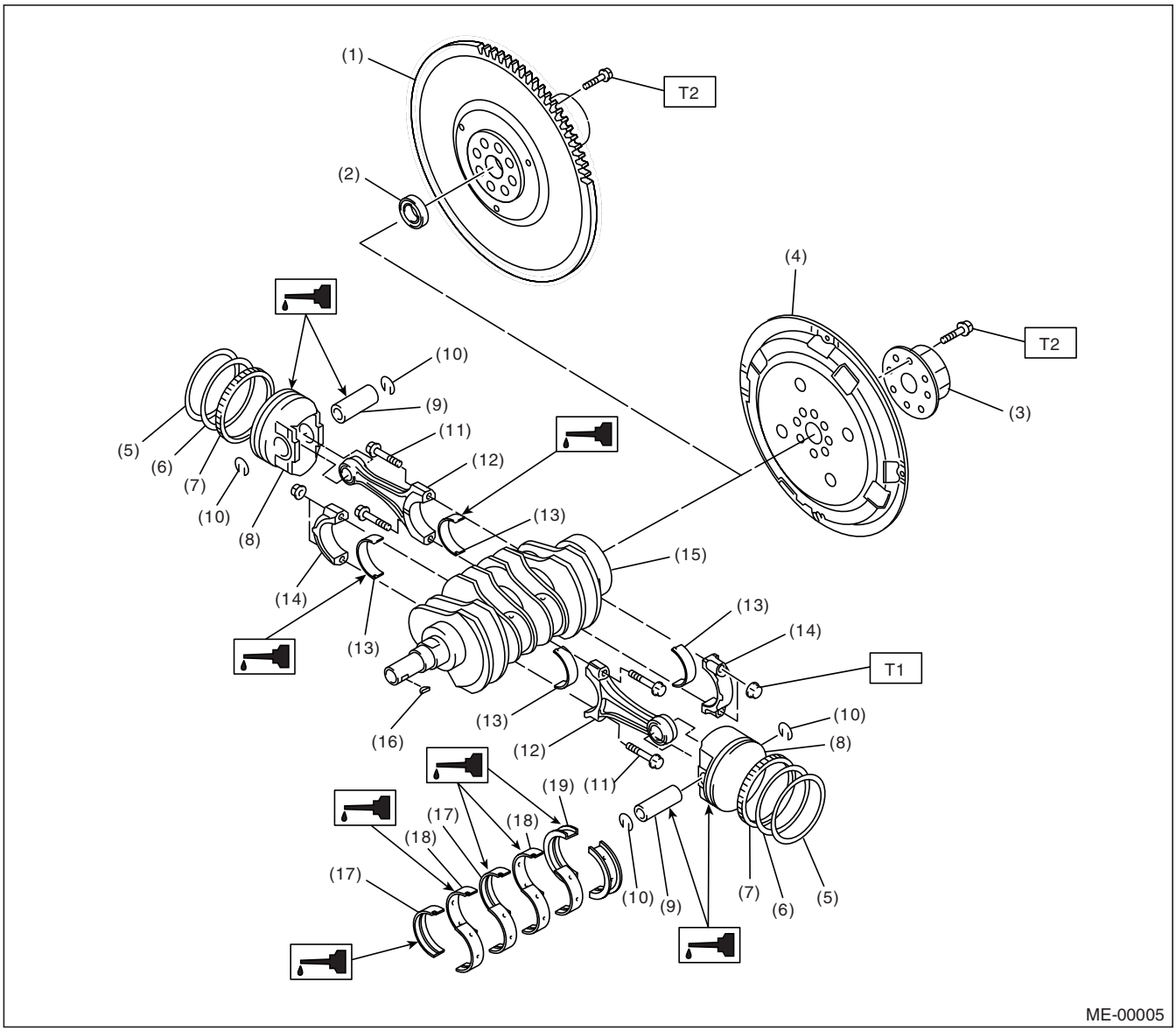
ME-00725

(1) Oil pressure switch
(2) Cylinder block (RH)
(3) Service hole plug
(4) Gasket
(5) Oil separator cover
(6) Water by-pass pipe
(7) Oil pump
(8) Front oil seal
(9) Rear oil seal
(10) O-ring
(11) Service hole cover
(12) Cylinder block (LH)
(13) Water pump
(14) Baffle plate
(15) Oil cooler
(16) Water by-pass pipe
(17) Connector
(18) Oil strainer
(19) Gasket
(20) Oil pan
(21) Drain plug
(22) Metal gasket
(23) Oil level gauge guide
(24) Oil filter
(25) Gasket
(26) Water pump hose
(27) Plug

Tightening torque: N·m (kgf-m, ft-lb)
T1: 5 (0.5, 3.6)
T2: 6.4 (0.65, 4.7)
T3: 10 (1.0, 7.2)
T4: 25 (2.5, 18.1)
T5: <Ref. to ME(H4DOTC)-93, INSTALLATION, Cylinder Block.>
T6: 69 (7.0, 50.9)
T7: First 12 (1.2, 8.7)
Second 12 (1.2, 8.7)
T8: 16 (1.6, 11.6)
T9: 44 (4.5, 33)
T10: 25 (2.5, 18.1)
T11: 54 (5.5, 40)

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5. CRANKSHAFT AND PISTON

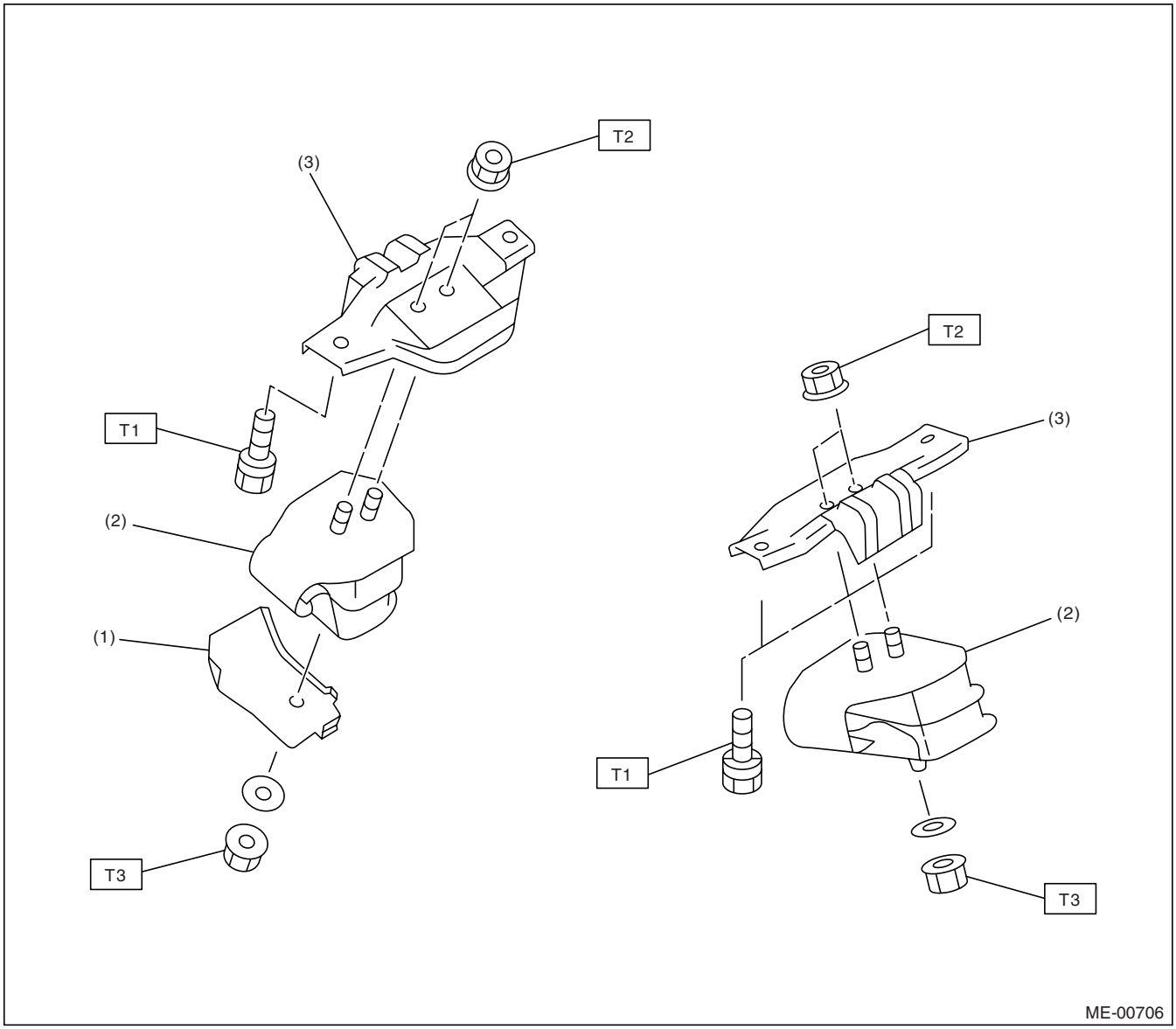


(1) Flywheel (MT model)
(2) Ball bearing (MT model)
(3) Reinforcement (AT model)
(4) Drive plate (AT model)
(5) Top ring
(6) Second ring
(7) Oil ring
(8) Piston
(9) Piston pin
(10) Circlip
(11) Connecting rod bolt
(12) Connecting rod
(13) Connecting rod bearing
(14) Connecting rod cap
(15) Crankshaft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

Tightening torque: N·m (kgf-m, ft-lb)
T1: 45 (4.6, 33.3)
T2: 72 (7.3, 52.8)

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6. ENGINE MOUNTING



(1) Heat shield cover
(2) Front cushion rubber
(3) Front engine mounting bracket

Tightening torque: N·m (kgf-m, ft-lb)
T1: 35 (3.6, 25.8)
T2: 42 (4.3, 30.9)
T3: 85 (8.7, 62.7)

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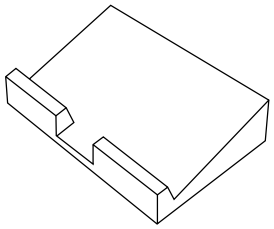
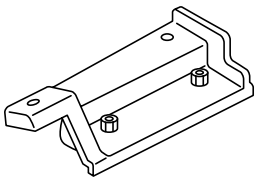
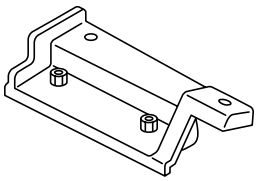
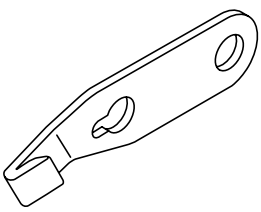
C: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn your hands, because each part in the vehicle is hot after running.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.
• All parts should be thoroughly cleaned, paying special attention to the engine oil passages, pistons and bearings.
• Rotating parts and sliding parts such as piston, bearing and gear should be coated with oil prior to assembly.
• Be careful not to let oil, grease or coolant contact the timing belt, clutch disc and flywheel.
• All removed parts, if to be reused, should be 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.

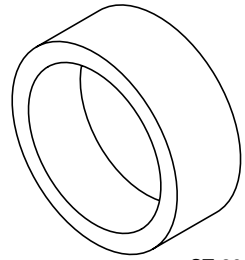
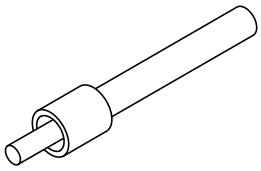
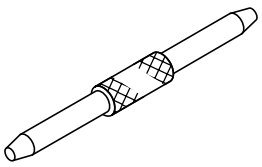
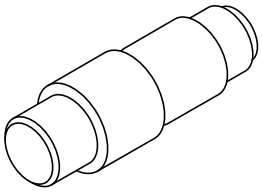
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D: PREPARATION TOOL

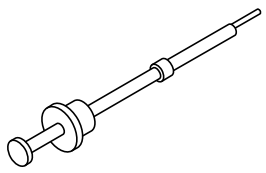
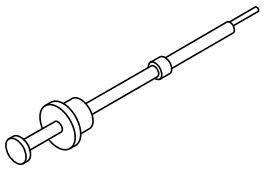
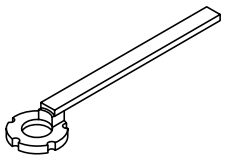
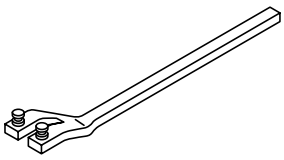
1. SPECIAL TOOLS

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 (499817000).
 ST-498457100	498457100	ENGINE STAND ADAPTER LH	Used with ENGINE STAND (499817000).
 ST-498497100	498497100	CRANKSHAFT STOPPER	Used for stopping rotation of flywheel when loosening and tightening crankshaft pulley bolt, etc.

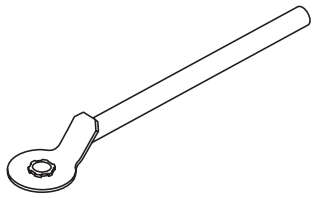
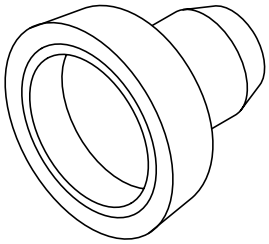
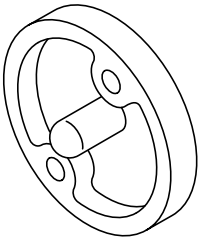
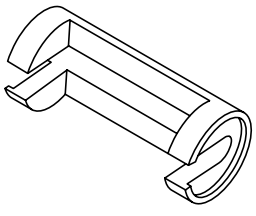
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ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-398744300	398744300	PISTON GUIDE	Used for installing piston in cylinder for 2.0 L engine.
 ST-498857100	498857100	VALVE OIL SEAL GUIDE	Used for press-fitting of intake and exhaust valve guide oil seals.
 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.

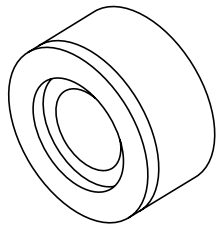
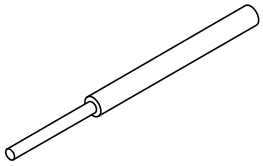
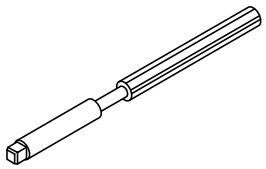
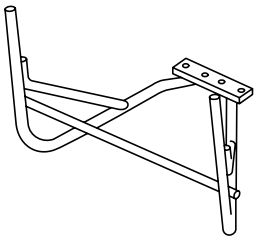
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ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499097600	499097600	PISTON PIN REMOVER ASSY	Used for removing piston pin. (Except for Australia model)
 ST-499097700	499097700	PISTON PIN REMOVER ASSY	Used for removing piston pin. (Australia model except for STi model)
 ST-499207400	499207400	CAMSHAFT SPROCKET WRENCH	Used for removing and installing exhaust camshaft sprocket and intake camshaft sprocket (RH). (Except for STi and Australia model)
 ST18231AA010	18231AA010	CAMSHAFT SPROCKET WRENCH	Used for removing and installing intake camshaft sprocket (LH). (Except for STi and Australia model)

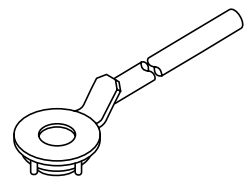
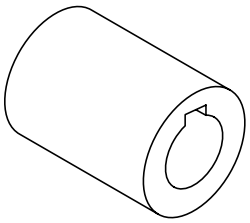
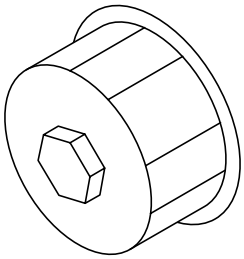
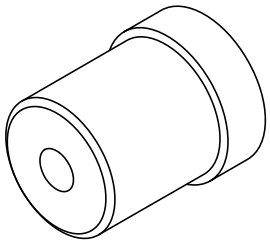
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ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499977500	499977500	CAMSHAFT SPROCKET WRENCH	Used for removing and installing intake camshaft sprocket. (STi and Australia model)
 ST-499587200	499587200	CRANKSHAFT OIL SEAL INSTALLER	• Used for installing crankshaft oil seal. • Used with CRANKSHAFT OIL SEAL GUIDE (499597100).
 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.

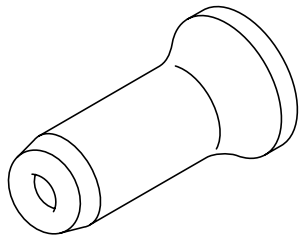
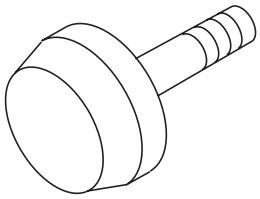
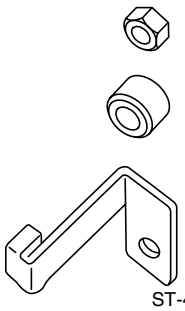
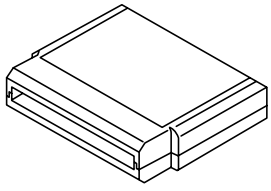
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ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18251AA020	18251AA020	VALVE GUIDE ADJUSTER	Used for installing intake and exhaust valve guides.
 ST-499767200	499767200	VALVE GUIDE REMOVER	Used for removing valve guides.
 ST-499767400	499767400	VALVE GUIDE REAMER	Used for reaming valve guides.
 ST-499817000	499817000	ENGINE STAND	• Stand used for engine disassembly and assembly. • Used with ENGINE STAND ADAPTER RH (498457000) & LH (498457100).

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ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499977400	499977400	CRANKSHAFT PULLEY WRENCH	Used for stopping rotation of crankshaft pulley when loosening and tightening crankshaft pulley bolts.
 ST-499987500	499987500	CRANKSHAFT SOCKET	Used for rotating crankshaft.
 ST-498547000	498547000	OIL FILTER WRENCH	Used for removing and installing the oil filter.
 ST-499587100	499587100	OIL SEAL INSTALLER	Used for installing oil pump oil seal.

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ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499587600	499587600	OIL SEAL INSTALLER	Used for installing camshaft oil seal for DOHC engine.
 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.
 ST24082AA210	24082AA210	CARTRIDGE	Troubleshooting for electrical systems.

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ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST22771AA030	22771AA030	SUBARU SELECT MONITOR KIT	Troubleshooting for electrical systems. • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

2. GENERAL PURPOSE TOOLS

TOOL NAME	REMARKS
Compression Gauge	Used for measuring compression.

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

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2. Compression

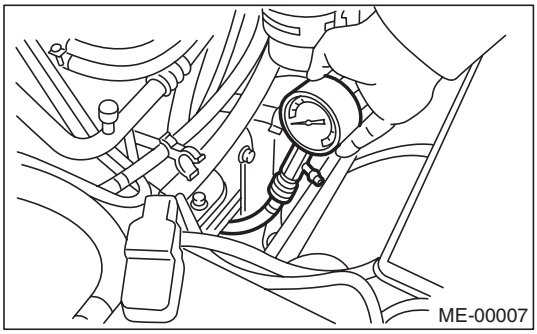
A: INSPECTION

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)-53, RELEASING OF FUEL PRESSURE, OPERATION, 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) Hold the compression gauge tight against spark plug hole.

NOTE:
When using a screw-in type compression gauge, the screw (put into cylinder head spark plug hole) should be less than 18 mm (0.71 in) long.

8) Crank the engine by means of starter motor, and then read the maximum value on the gauge when the pointer is steady.



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

Compression (350 rpm and fully open throttle):

Except for Australia model
Standard
981 — 1,177 kPa (10 — 12 kgf/cm^2, 142 — 171 psi)
Limit
882 kPa (9.0 kgf/cm^2, 128 psi)
Difference between cylinders
Less than 49 kPa (0.5 kgf/cm^2, 7 psi)

Australia model (Except for STi model)
Standard
1.108 — 1,304 kPa (11 — 13 kgf/cm^2, 161 — 189 psi)
Limit
951 kPa (10 kgf/cm^2, 138 psi)
Difference between cylinders
Less than 49 kPa (0.5 kgf/cm^2, 7 psi)

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3. Idle Speed

A: INSPECTION

1. USING SUBARU SELECT MONITOR

1) Before checking the idle speed, check the following:
   (1) Ensure the air cleaner element is free from clogging, ignition timing is correct, spark plugs are in good condition, and that the hoses are connected properly.
   (2) Ensure the malfunction indicator light does not illuminate.
2) Warm-up the engine.
3) Stop the engine, and then turn the ignition switch to OFF.
4) Insert the cartridge to SUBARU SELECT MONITOR.
5) Connect the SUBARU SELECT MONITOR to data link connector.
6) Turn the ignition switch to ON, and SUBARU SELECT MONITOR switch to ON.
7) Select the {2. Each System Check} in Main Menu.
8) Select the {Engine Control System} in Selection Menu.
9) Select the {1. Current Data Display & Save} in Engine Control System Diagnosis.
10) Select the {1.12 Data Display} in Data Display Menu.
11) Start the engine, and then read the engine idle speed.
12) Check the idle speed when unloaded. (With headlights, heater fan, rear defroster, radiator fan, air conditioning, etc. OFF)

Idle speed [No load and gears in neutral]:
Except for Australia model
700±100 rpm
Australia model (Except for STi model)
650±50 rpm (MT model)
700±50 rpm (AT model)

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]:
Except for Australia model
800±150 rpm
Australia model (Except for STi model)
800±50 rpm (MT model)
820±50 rpm (AT model)

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)-2, Basic Diagnostic Procedure.>

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4. Ignition Timing

A: INSPECTION

1. USING SUBARU SELECT MONITOR

1) Before checking the ignition timing speed, check the following:
   (1) Ensure the air cleaner element is free from clogging, spark plugs are in good condition, and that hoses are connected properly.
   (2) Ensure the malfunction indicator light does not illuminate.
2) Warm-up the engine.
3) Stop the engine, and then turn the ignition switch to OFF.
4) Insert the cartridge to SUBARU SELECT MONITOR.
5) Connect the SUBARU SELECT MONITOR to data link connector.
6) Turn the ignition switch to ON, and SUBARU SELECT MONITOR switch to ON.
7) Select the {2. Each System Check} in Main Menu.
8) Select the {Engine Control System} in Selection Menu.
9) Select the {1. Current Data Display & Save} in Engine Control System Diagnosis.
10) Select the {1.12 Data Display} in Data Display Menu.
11) Start the engine and check the ignition timing at idle speed.

Ignition timing [BTDC/rpm]:
Except for Australia model
12°±10°/700
Australia model (Except for STi model)
12°±3°/650 (MT model)
12°±3°/700 (AT model)

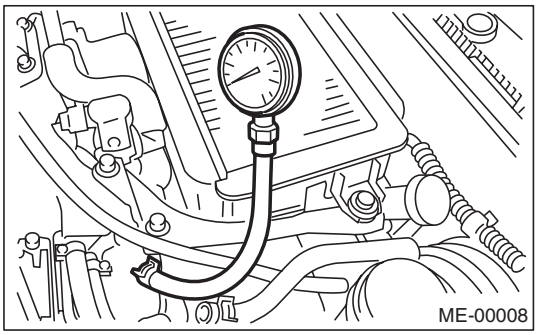
If the timing is not correct, check the ignition control system. Refer to Engine Control System. <Ref. to EN(H4DOTC)-2, Basic Diagnostic Procedure.>

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5. Intake Manifold Vacuum

A: INSPECTION

1) Warm-up the engine.
2) Disconnect the brake vacuum hose, and then install the vacuum gauge to hose fitting on manifold.
3) Keep the engine at the idle speed, and then read the vacuum gauge indication.
By observing the gauge needle movement, the internal condition of engine can be diagnosed as described below.



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

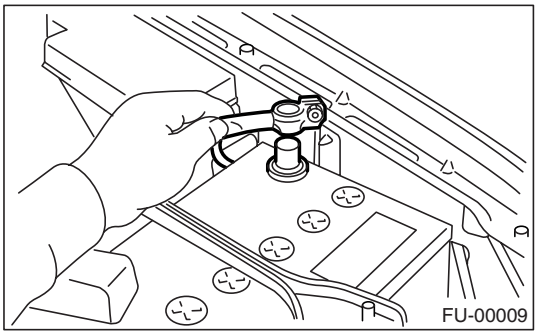
Diagnosis of engine condition by measurement of manifold vacuum	
Vacuum gauge indication	Possible engine condition
1. Needle is steady but lower than normal position. This tendency becomes more evident as engine temperature rises.	Leakage around intake manifold gasket or disconnection or damaged vacuum hose
2. When engine speed is reduced slowly from higher speed, needle stops temporarily when it is lowering or becomes steady above normal position.	Back pressure too high, or exhaust system clogged
3. Needle intermittently drops to position lower than normal position.	Leakage around cylinder
4. Needle drops suddenly and intermittently from normal position.	Sticky valves
5. When engine speed is gradually increased, needle begins to vibrate rapidly at certain speed, and then vibration increases as engine speed increases.	Weak or broken valve springs
6. Needle vibrates above and below normal position in narrow range.	Defective ignition system or throttle chamber idle adjustment

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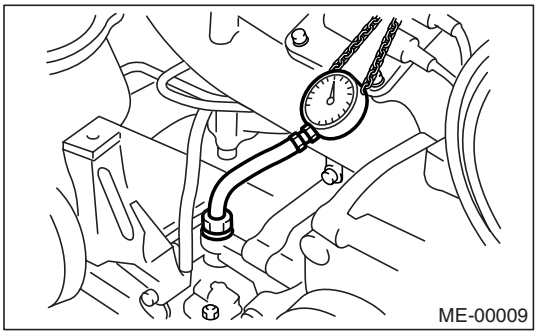
6. Engine Oil Pressure

A: INSPECTION

1) Remove the oil pressure switch from engine cylinder block. <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 kg/cm^2, 14 psi) or more at 800 rpm
294 kPa (3.0 kg/cm^2, 43 psi) or more at 5,000 rpm

- If the oil pressure is out of specification, check oil pump, oil filter and lubrication line. <Ref. to LU(H4DOTC)-21, 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)-21, 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, 18.1 ft-lb)

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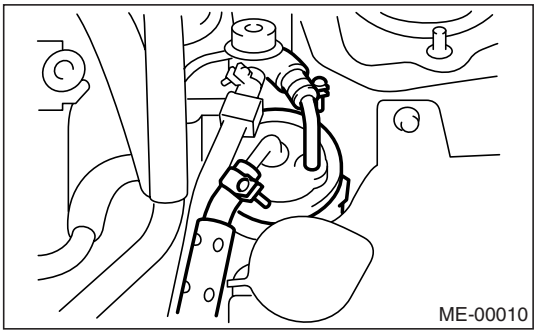
7. Fuel Pressure

A: INSPECTION

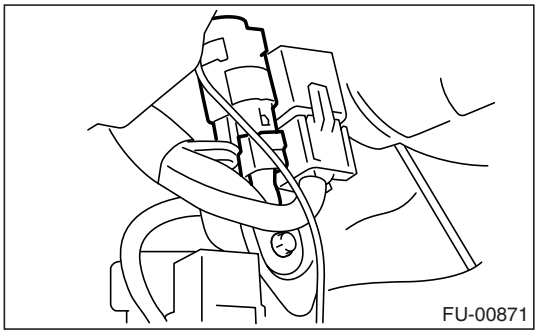
CAUTION:
Before removing the fuel pressure gauge, release the fuel pressure.

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

1) Release the fuel pressure. <Ref. to FU(H4DOTC)-53, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.>
2) Open the fuel flap lid, and then remove the fuel filler cap.
3) Disconnect the fuel delivery hoses from fuel filter, and then connect the fuel pressure gauge.

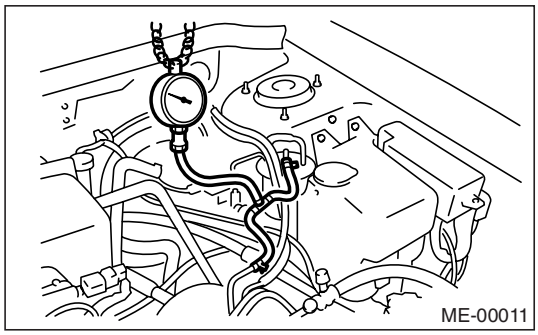


4) Connect the connector of fuel pump relay.



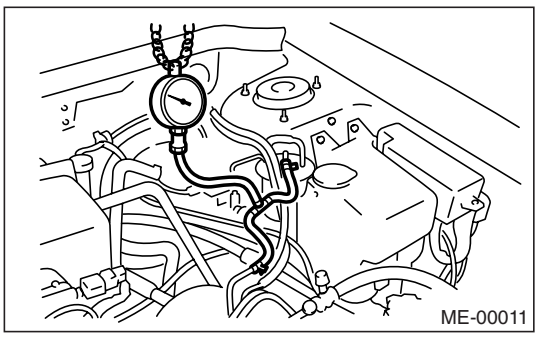
5) Start the engine.
6) Measure the fuel pressure while disconnecting the pressure regulator vacuum hose from intake manifold.

Fuel pressure:
Standard; 284 — 314 kPa (2.9 — 3.2 kgf/cm^2, 41 — 46 psi)



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

Fuel pressure:
Standard; 230 — 260 kPa (2.35 — 2.65 kgf/cm^2, 33 — 38 psi)



NOTE:
The fuel pressure gauge registers 10 to 20 kPa (0.1 to 0.2 kgf/cm^2, 1 to 3 psi) higher than standard values during high-altitude operations.

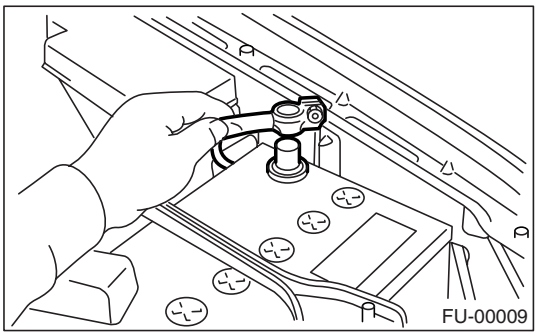
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8. Valve Clearance

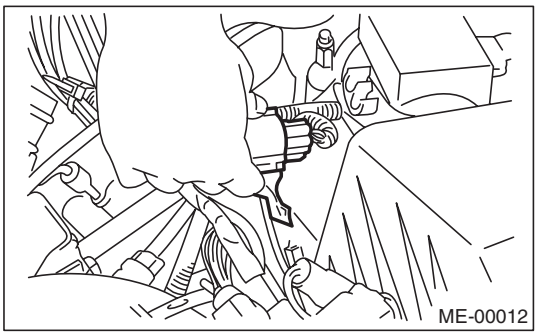
A: INSPECTION

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.

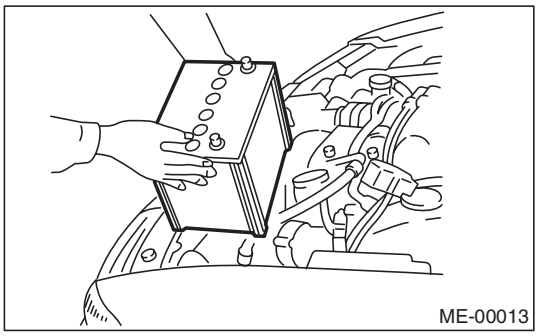


3) Remove the air intake duct. <Ref. to IN(H4DOTC)-9, REMOVAL, Air Intake Duct.>
4) Remove the bolts which secure the timing belt cover (RH).
5) Lift-up the vehicle.
6) Remove the under cover.
7) Loosen the remaining bolts which secure the timing belt cover (RH), and then remove the timing belt cover.
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.

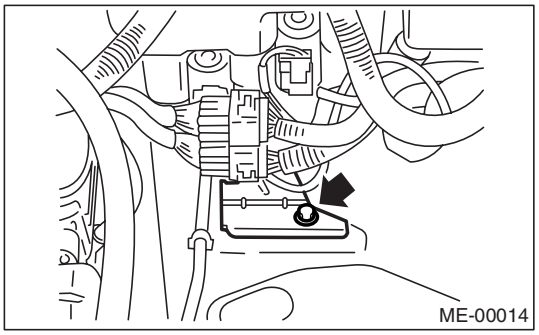


   (2) Remove the air cleaner case. <Ref. to IN(H4DOTC)-8, REMOVAL, Air Cleaner.>
   (3) Disconnect the ignition coil connector.
   (4) Remove the ignition coil.
   (5) Place a suitable container under the vehicle.
   (6) Disconnect the PCV hose from rocker cover (RH).
   (7) Remove the bolts, and then remove the rocker cover (RH).

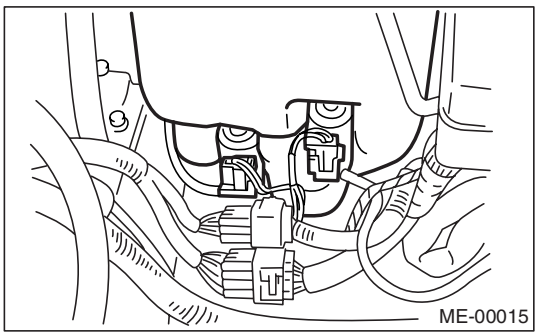
10) When inspecting the #2 and #4 cylinders:
   (1) Disconnect the battery cable, and then remove the battery and battery carrier.



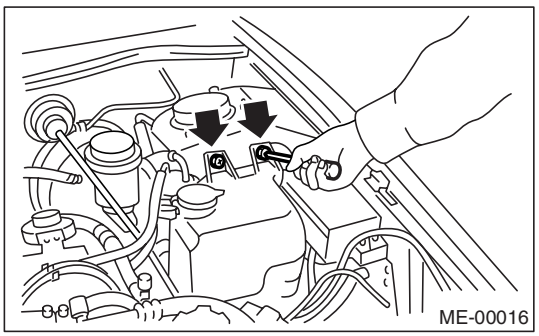
   (2) Remove the bolt which secures the engine harness bracket onto body.



   (3) Disconnect the washer motor connectors.

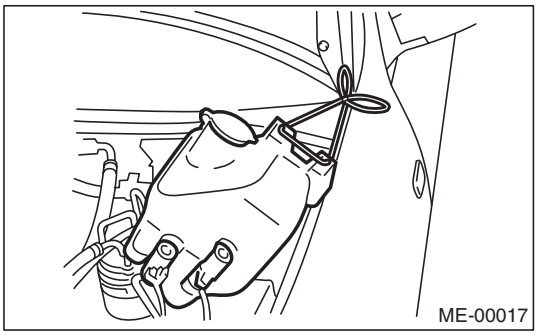


   (4) Remove the washer tank mounting bolts.



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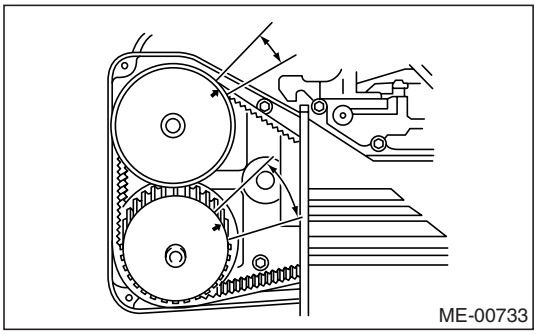
(5) Move the washer tank upward.



(6) Disconnect the ignition coil connector.
(7) Remove the ignition coil.
(8) Place a suitable container under the vehicle.
(9) Disconnect the PCV hose from rocker cover (LH).
(10) Remove the bolts, and then remove the rocker cover (LH).

11) Turn the crankshaft pulley clockwise until arrow mark on the camshaft sprocket is set to position shown in the figure.

NOTE:
Turn the crankshaft using socket wrench.

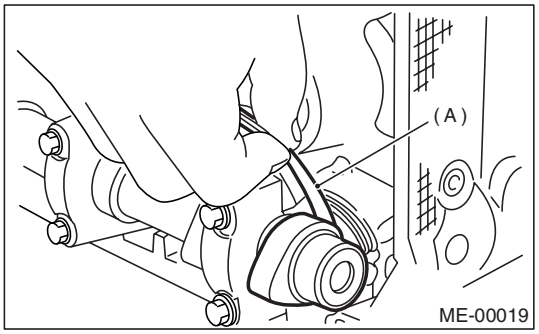


12) Measure the #1 cylinder intake valve and #3 cylinder exhaust valve clearance by using thickness gauge (A).

NOTE:
• Insert the thickness gauge in as horizontal a direction as possible with respect to the shim.
• Measure the exhaust valve clearances while lifting-up the vehicle.

Valve clearance:
Intake: 0.20±0.02 mm (0.0079±0.0008 in)
Exhaust: 0.25±0.02 mm (0.0098±0.0008 in)

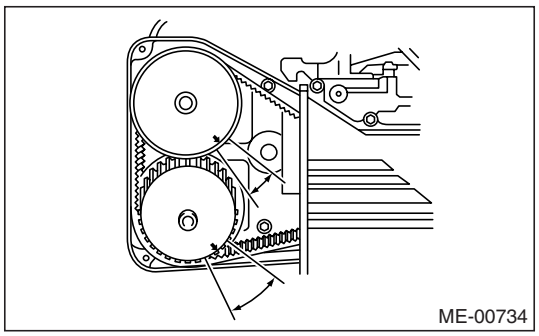
NOTE:
If the measured value is not within specification, take notes of the value in order to adjust the valve clearance later on.



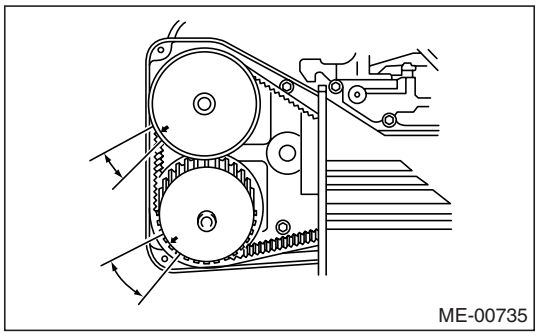
13) If necessary, adjust the valve clearance. <Ref. to ME(H4DOTC)-42, ADJUSTMENT, Valve Clearance.>

14) Further turn the crankshaft pulley clockwise. Using the same procedures described previously, and then measure the valve clearances again.

(1) Set the arrow mark on camshaft sprocket to position shown in the figure, and then measure the #2 cylinder exhaust valve and #3 cylinder intake valve clearances.

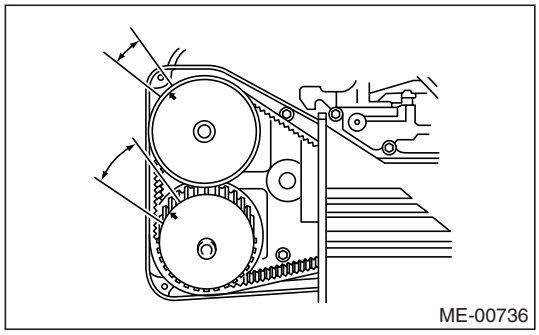


(2) Set the arrow mark on camshaft sprocket to position shown in the figure, and then measure the #2 cylinder intake valve and #4 cylinder exhaust valve clearances.



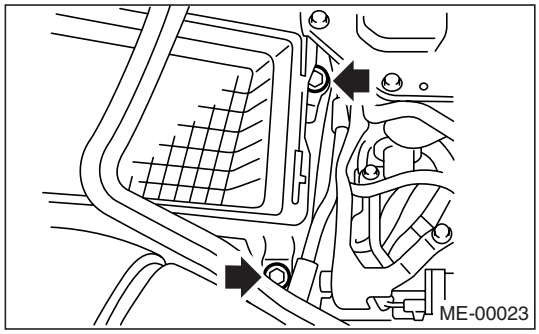
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(3) Set the arrow mark on camshaft sprocket to position shown in the figure, and then measure the #1 cylinder exhaust valve and #4 cylinder intake valve clearances.


ME-00736

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)

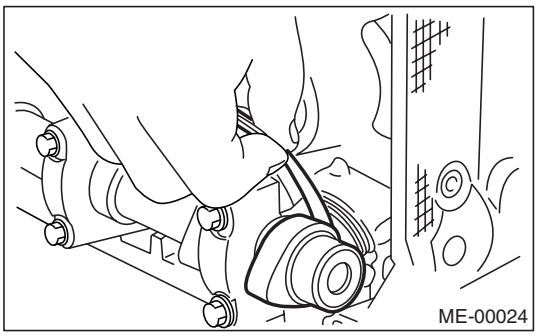

ME-00023

B: ADJUSTMENT

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

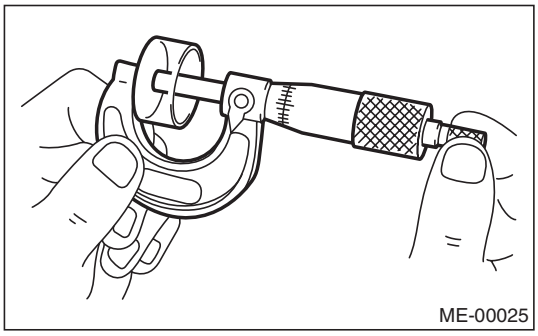
1) Measure all valve clearances. <Ref. to ME(H4DOTC)-40, INSPECTION, Valve Clearance.>

NOTE:
Record each valve clearance after it has been measured.


ME-00024

2) Remove the camshaft. <Ref. to ME(H4DOTC)-72, REMOVAL, Camshaft.>

3) Remove the valve lifter.
4) Measure the thickness of valve lifter with a micrometer.


ME-00025

5) Select a shim of suitable thickness using measured valve clearance and valve lifter thickness, by referring to the following table.

Unit: mm
Intake valve: S =V – 0.20 Exhaust valve: S =V – 0.25
S: Valve lifter thickness to be used V: Measured valve clearance

Part No.	Thickness mm (in)
13228 AB101	4.68 (0.1843)
13228 AB111	4.69 (0.1846)
13228 AB121	4.70 (0.1850)
13228 AB131	4.71 (0.1854)
13228 AB141	4.72 (0.1858)
13228 AB151	4.73 (0.1862)
13228 AB161	4.74 (0.1866)
13228 AB171	4.75 (0.1870)
13228 AB181	4.76 (0.1874)
13228 AB191	4.77 (0.1878)
13228 AB201	4.78 (0.1882)
13228 AB211	4.79 (0.1886)
13228 AB221	4.80 (0.1890)
13228 AB231	4.81 (0.1894)
13228 AB241	4.82 (0.1898)
13228 AB251	4.83 (0.1902)
13228 AB261	4.84 (0.1906)
13228 AB271	4.85 (0.1909)
13228 AB281	4.86 (0.1913)
13228 AB291	4.87 (0.1917)
13228 AB301	4.88 (0.1921)
13228 AB311	4.89 (0.1925)
13228 AB321	4.90 (0.1929)
13228 AB331	4.91 (0.1933)
13228 AB341	4.92 (0.1937)
13228 AB351	4.93 (0.1941)
13228 AB361	4.94 (0.1945)
13228 AB371	4.95 (0.1949)
13228 AB381	4.96 (0.1953)

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Part No.	Thickness mm (in)
13228 AB391	4.97 (0.1957)
13228 AB401	4.98 (0.1961)
13228 AB411	4.99 (0.1965)
13228 AB421	5.00 (0.1969)
13228 AB431	5.01 (0.1972)
13228 AB441	5.02 (0.1976)
13228 AB451	5.03 (0.1980)
13228 AB461	5.04 (0.1984)
13228 AB471	5.05 (0.1988)
13228 AB481	5.06 (0.1992)
13228 AB491	5.07 (0.1996)
13228 AB501	5.08 (0.2000)
13228 AB511	5.09 (0.2004)
13228 AB521	5.10 (0.2008)
13228 AB531	5.11 (0.2012)
13228 AB541	5.12 (0.2016)
13228 AB551	5.13 (0.2020)
13228 AB561	5.14 (0.2024)
13228 AB571	5.15 (0.2028)
13228 AB581	5.16 (0.2031)
13228 AB591	5.17 (0.2035)
13228 AB601	5.18 (0.2039)
13228 AB611	5.19 (0.2043)
13228 AB621	5.20 (0.2047)
13228 AB631	5.21 (0.2051)
13228 AB641	5.22 (0.2055)
13228 AB651	5.23 (0.2059)
13228 AB661	5.24 (0.2063)
13228 AB671	5.25 (0.2067)
13228 AB681	5.26 (0.2071)
13228 AB691	5.27 (0.2075)
13228 AB701	4.38 (0.1724)
13228 AB711	4.40 (0.1732)
13228 AB721	4.42 (0.1740)
13228 AB731	4.44 (0.1748)
13228 AB741	4.46 (0.1756)
13228 AB751	4.48 (0.1764)
13228 AB761	4.50 (0.1771)
13228 AB771	4.52 (0.1780)
13228 AB781	4.54 (0.1787)
13228 AB791	4.56 (0.1795)
13228 AB801	4.58 (0.1803)
13228 AB811	4.60 (0.1811)
13228 AB821	4.62 (0.1819)
13228 AB831	4.64 (0.1827)
13228 AB841	4.66 (0.1835)
13228 AB851	5.29 (0.2083)
13228 AB861	5.31 (0.2091)
13228 AB871	5.33 (0.2098)
13228 AB881	5.35 (0.2106)
13228 AB891	5.37 (0.2114)

Part No.	Thickness mm (in)
13228 AB901	5.39 (0.2122)
13228 AB911	5.41 (0.2123)
13228 AB921	5.43 (0.2138)
13228 AB931	5.45 (0.2146)
13228 AB941	5.47 (0.2154)
13228 AB951	5.49 (0.2161)
13228 AB961	5.51 (0.2169)
13228 AB971	5.53 (0.2177)
13228 AB981	5.55 (0.2185)
13228 AB991	5.57 (0.2193)
13228 AC001	5.59 (0.2201)
13228 AC011	5.61 (0.2209)
13228 AC021	5.63 (0.2217)
13228 AC031	5.65 (0.2224)

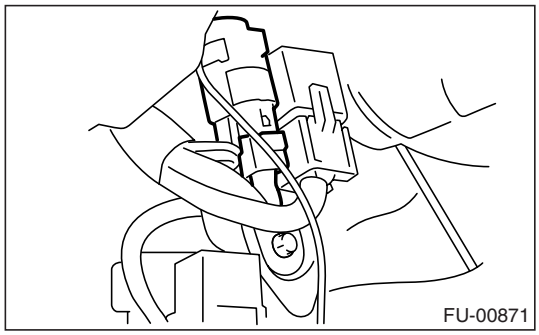
6) Inspect all valves for clearance again at this stage. If the valve clearance is not correct, repeat the procedure over again from the first step.
7) After inspection, install the related parts in the reverse order of removal.

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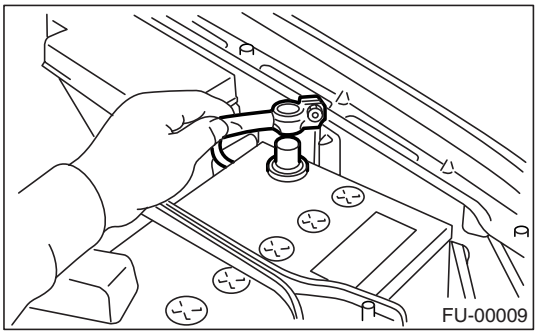
9. Engine Assembly

A: REMOVAL

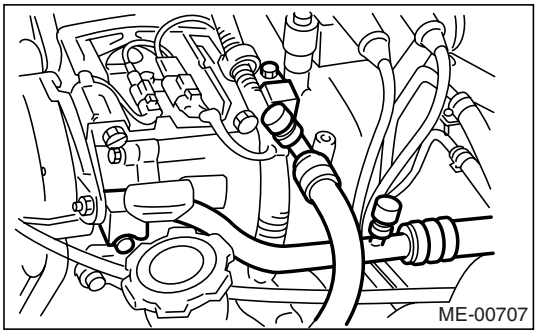
1) Set the vehicle on a lift.
2) Open the front hood fully, and then support with the hood stay.
3) Collect the refrigerant from A/C system.
4) Release the fuel pressure.
   (1) Disconnect the fuel pump relay connector.



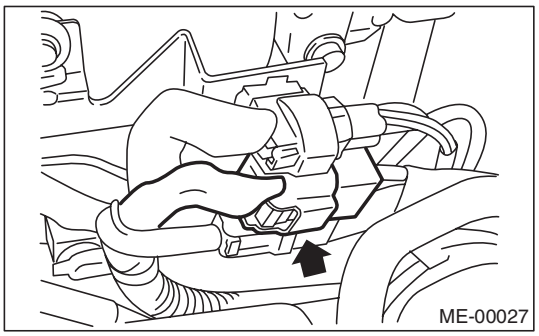
   (2) Start the engine, and run until stalls.
   (3) After the engine stalls, crank it for 5 seconds more.
   (4) Turn the ignition switch to OFF.
5) Remove the filler cap.
6) Disconnect the ground cable from battery.



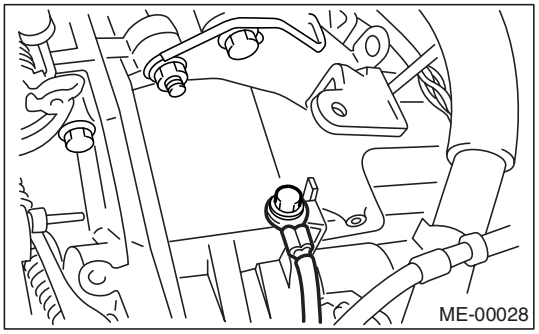
7) Remove the radiator from vehicle. <Ref. to CO(H4DOTC)-23, REMOVAL, Radiator.>
8) Remove the coolant filler tank. <Ref. to CO(H4DOTC)-33, REMOVAL, Coolant Filler Tank.>
9) Disconnect the A/C pressure hoses from A/C compressor.



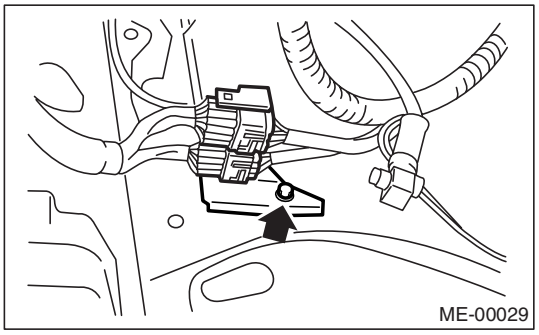
10) Remove the intercooler. <Ref. to IN(H4DOTC)-11, REMOVAL, Intercooler.>
11) Disconnect the following connectors and cable.
   (1) Engine harness connector



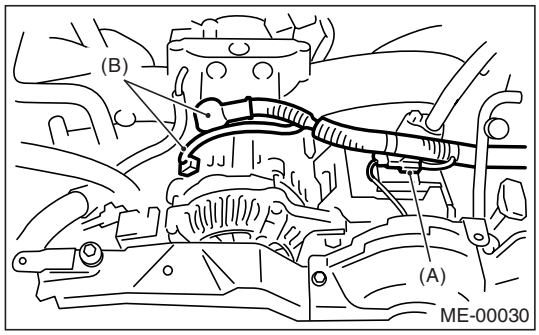
   (2) Engine ground terminal



   (3) Engine harness connector



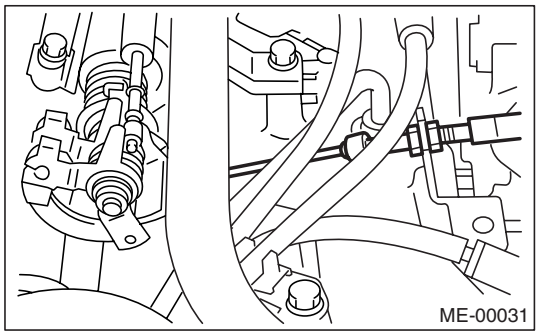
   (4) Generator connector, terminal and A/C compressor connectors



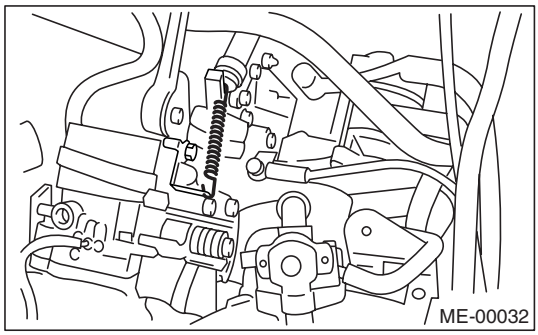
   (A) A/C compressor connector
   (B) Generator connector and terminal

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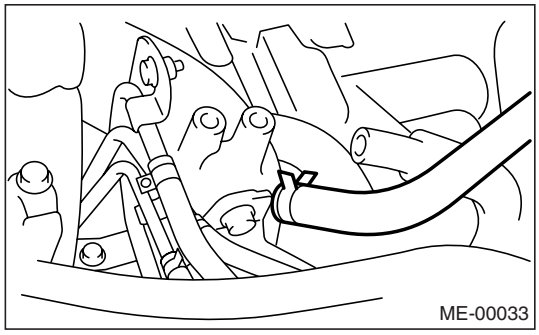
(5) Accelerator cable (MT model)



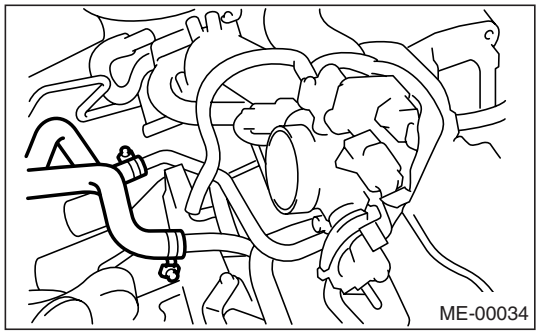
(6) Clutch release spring (MT model)



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

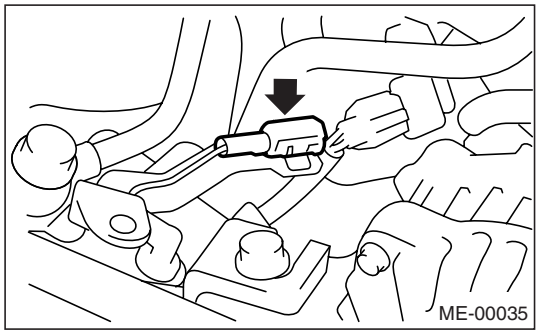


(2) Heater inlet outlet hose

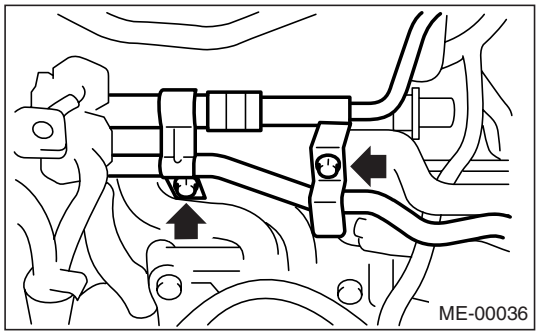


13) Remove the power steering pump from bracket.
(1) Loosen the lock bolt and slider bolt, and then remove the front side V-belt. <Ref. to ME(H4DOTC)-55, FRONT SIDE BELT, REMOVAL, V-belt.>

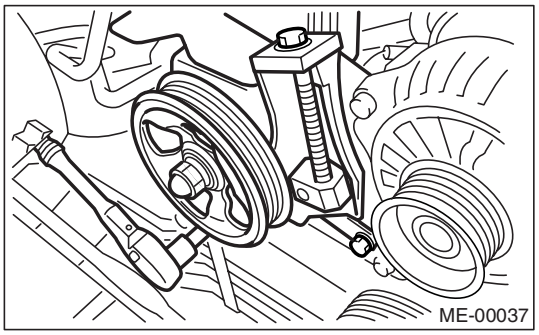
(2) Disconnect the power steering switch connector.



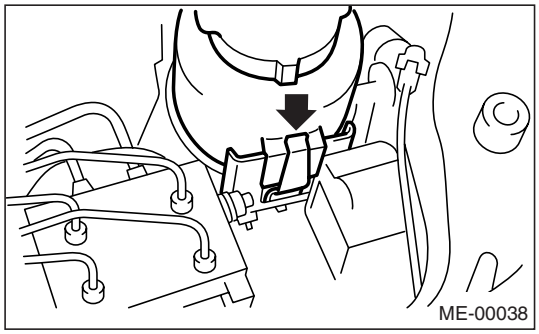
(3) Remove the pipe with bracket from intake manifold.



(4) Remove the power steering pump from engine.

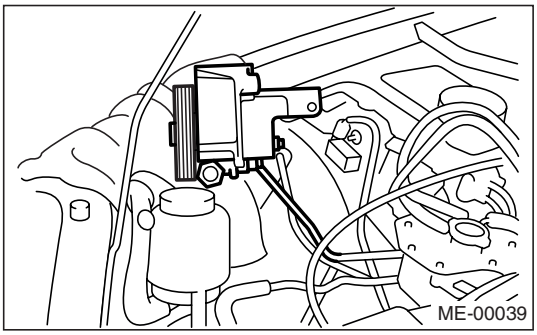


(5) Remove the power steering tank from bracket by pulling it upward.

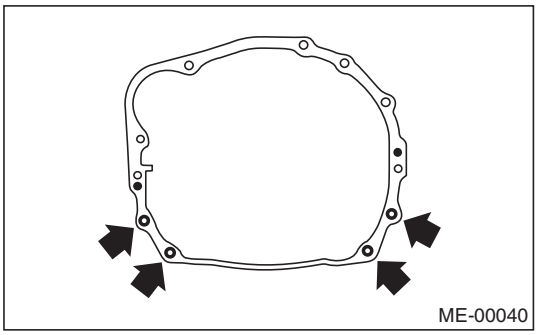


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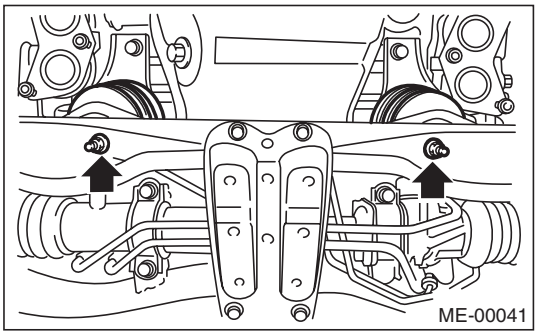
(6) Place the power steering pump on right side wheel apron.



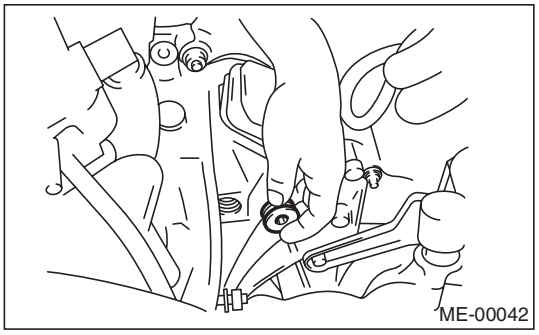
14) Lift-up the vehicle.
15) Remove the ATF cooler pipe from frame. (AT model)
16) Remove the center exhaust pipe. <Ref. to EX(H4DOTC)-9, REMOVAL, Center Exhaust Pipe.>
17) Remove the nuts which hold the lower side of transmission to engine.



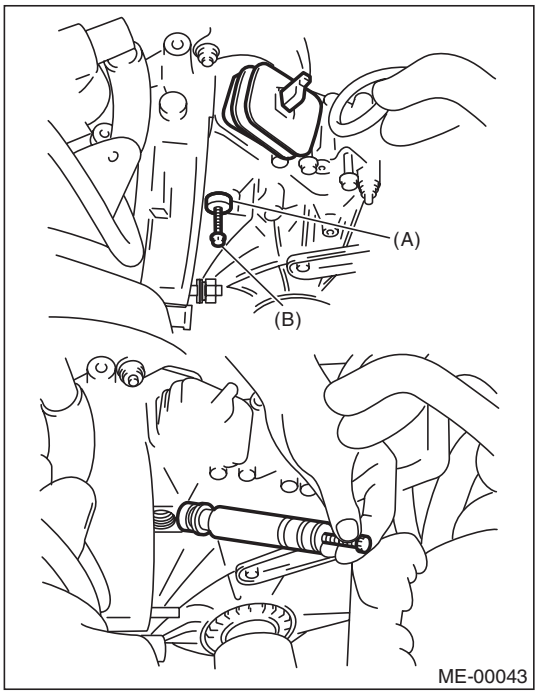
18) Remove the nuts which install the front cushion rubber onto front crossmember.



19) Lower the vehicle.
20) Separate the clutch release fork from release bearing. (MT model)
(1) Remove the clutch operating cylinder from transmission.
(2) Remove the plug using a 10 mm hexagon wrench.



(3) Screw the 6 mm dia. bolt into release fork shaft, and remove it.



(A) Shaft
(B) Bolt

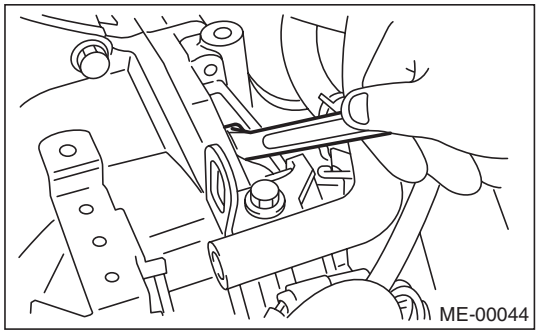
(4) Raise the release fork, and then unfasten the release bearing tabs to free release fork.

NOTE:
Step (4) is required to prevent interference with engine when removing the engine from transmission.

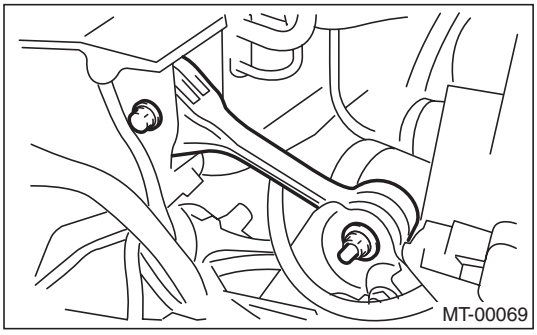
21) Separate the torque converter clutch from drive plate. (AT model)
(1) Lower the vehicle.
(2) Remove the service hole plug.
(3) Remove the bolts which hold the torque converter clutch to drive plate.

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(4) Remove the other bolts while rotating the engine using socket wrench.

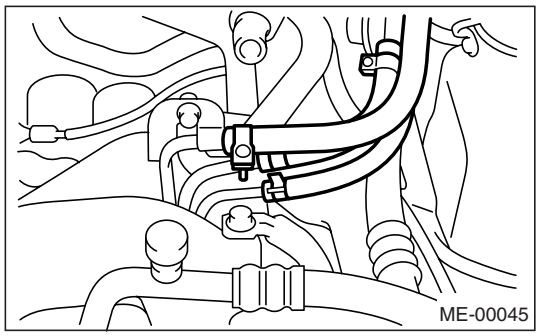


22) Remove the pitching stopper.

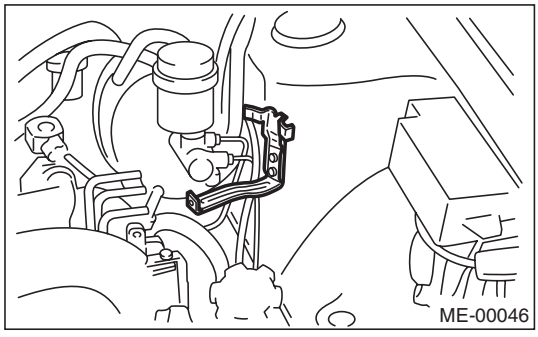


23) Disconnect the fuel delivery hose, return hose and evaporation hose.

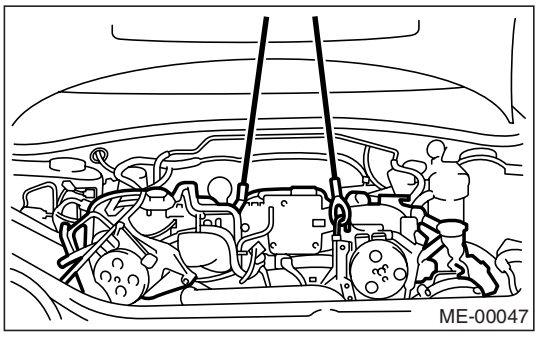
NOTE:
- Catch fuel from the hose into container.
- Disconnect the hose with its end wrapped with cloth to prevent fuel from splashing.



24) Remove the fuel filter and bracket.

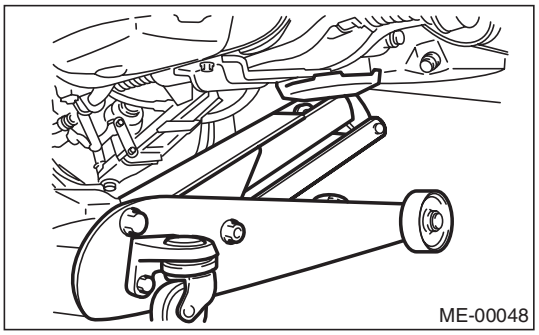


25) Support the engine with a lifting device and wire ropes.



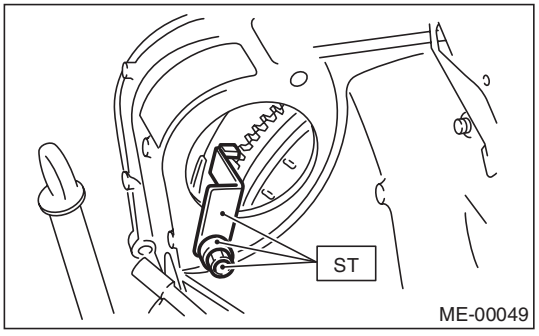
26) Support the transmission with a garage jack.

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



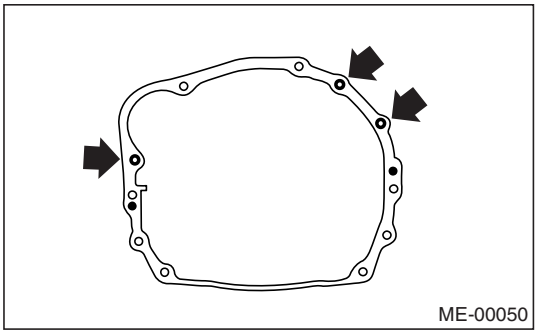
27) Separation of the engine and transmission.
(1) Remove the starter. <Ref. to SC(H4SO)-7, REMOVAL, Starter.>
(2) Install the ST to torque converter clutch case. (AT model)

ST 498277200 STOPPER SET



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(3) Remove the bolts which hold the right upper side of transmission to engine.



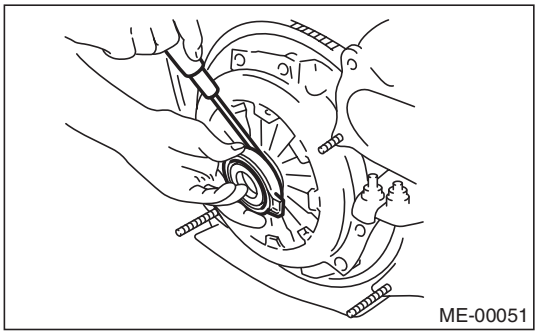
28) Remove the engine from vehicle.
(1) Slightly raise the engine.
(2) Raise the transmission with garage jack.
(3) Move the engine horizontally until the main-shaft is withdrawn from clutch cover.
(4) Slowly move the engine away from engine compartment.

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

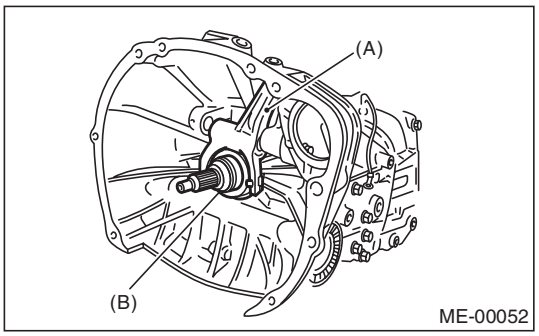
29) Remove the front cushion rubbers.

B: INSTALLATION

1) Install the clutch release fork and bearing onto transmission. (MT model)
(1) Remove the release bearing from clutch cover with flat type screw driver.



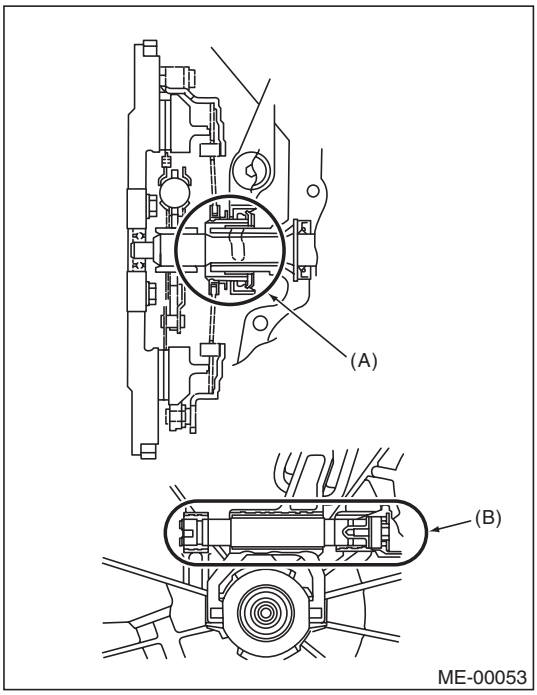
(2) Install the release bearing on transmission.
(3) Install the release fork into release bearing tab.



(A) Release fork
(B) Release bearing

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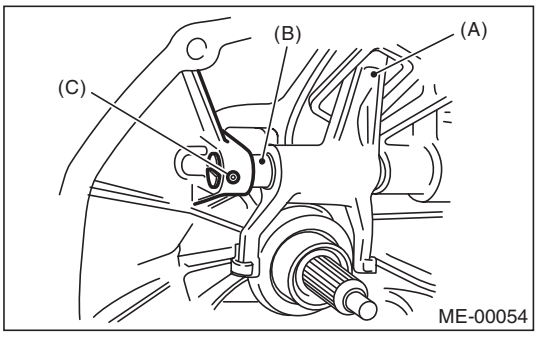
(4) Apply grease to the specified points.
- Spline FX2200
- Shaft SUNLIGHT 2



(A) Spline (FX2200)
(B) Shaft (SUNLIGHT 2)

(5) Insert the release fork shaft into release fork.

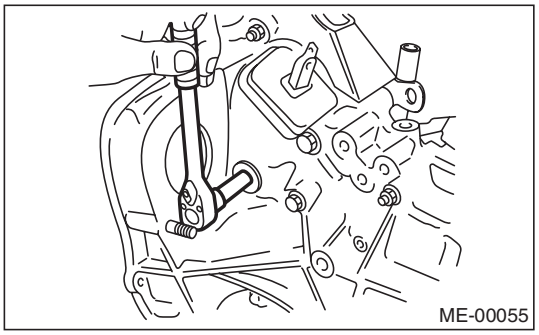
CAUTION:
Make sure the cutout portion of release fork shaft contacts spring pin.



(A) Release fork
(B) Release shaft
(C) Spring pin

(6) Tighten the plug.

Tightening torque:
44 N·m (4.5 kgf-m, 32.5 ft-lb)



2) Install the front cushion rubbers to engine.

Tightening torque:
35 N·m (3.6 kgf-m, 25.8 ft-lb)

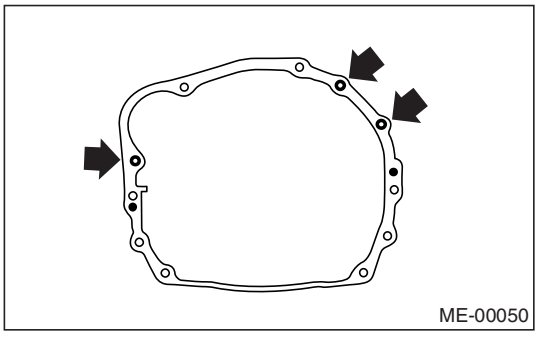
3) Install the engine onto transmission.
(1) Position the engine in engine compartment, and then align it with the transmission.

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.

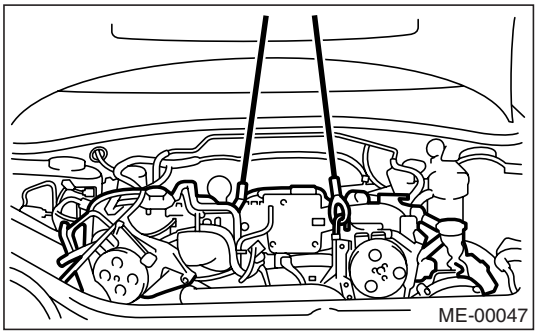
Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)



5) Remove the lifting device and wire ropes.

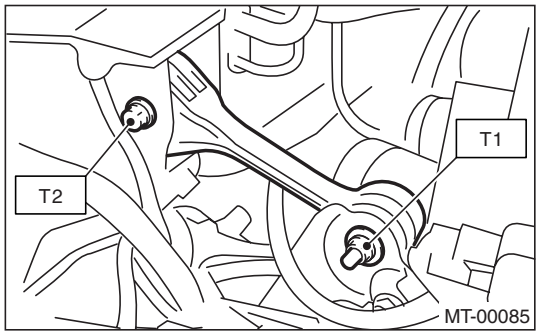
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6) Remove the garage jack.



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)

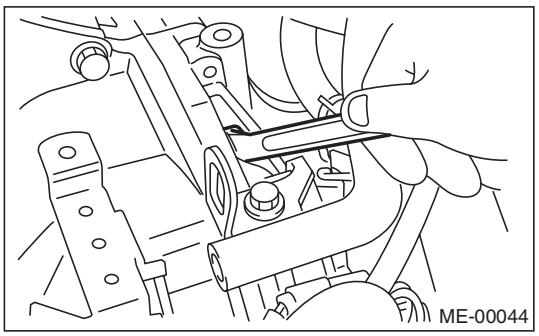
NOTE:
Be careful not to drop the ST into torque converter clutch case when removing ST.
ST 498277200 STOPPER SET

9) Install the starter. <Ref. to SC(H4SO)-7, 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) Tighten other bolts while rotating the engine by using ST.

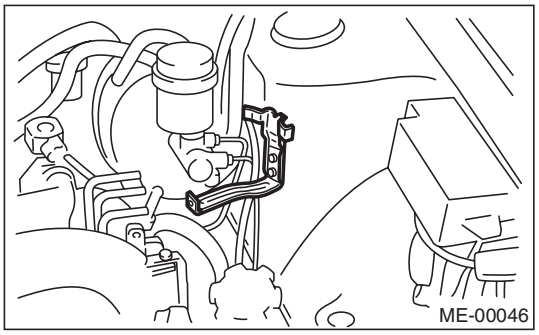
CAUTION:
Be careful not to drop bolts into the torque converter clutch housing.
ST 499977300 CRANKSHAFT PULLEY WRENCH

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)

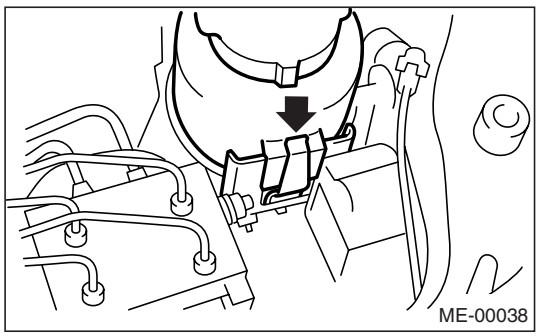


(3) Clog the service hole with plug.

11) Install the fuel filter and bracket.

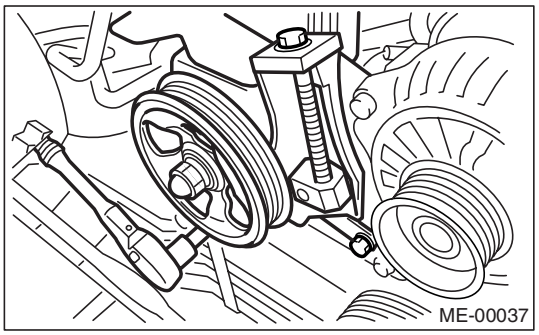


12) Install the power steering pump on bracket.
(1) Install the power steering tank on bracket.



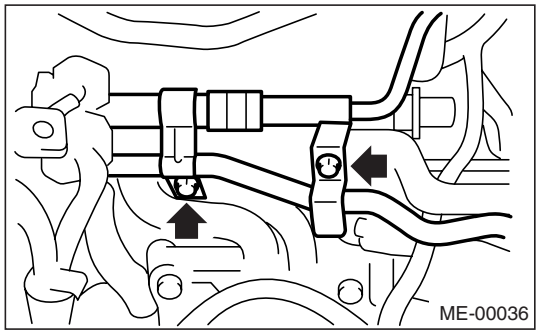
(2) Install the power steering pump.

Tightening torque:
20.1 N·m (2.05 kgf-m, 14.8 ft-lb)

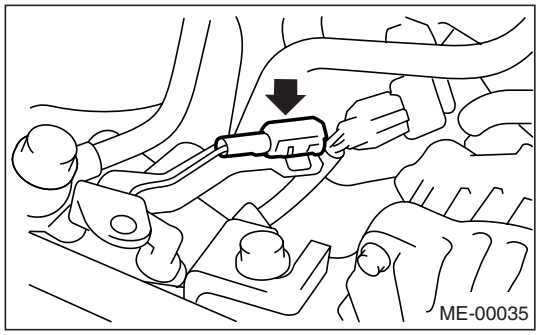


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(3) Install the power steering pipe bracket on intake manifold RH.



(4) Connect the power steering switch connector.

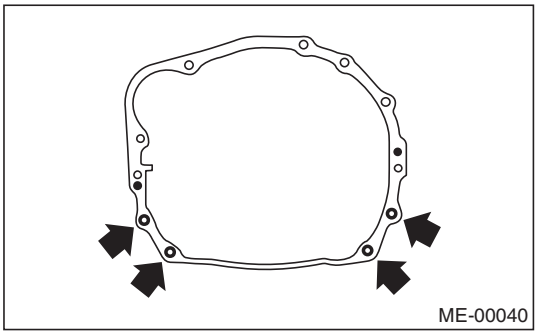


(5) Install the front side V-belt, and adjust it. <Ref. to ME(H4DOTC)-55, FRONT SIDE BELT, INSTALLATION, V-belt.>

13) Lift-up the vehicle.

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

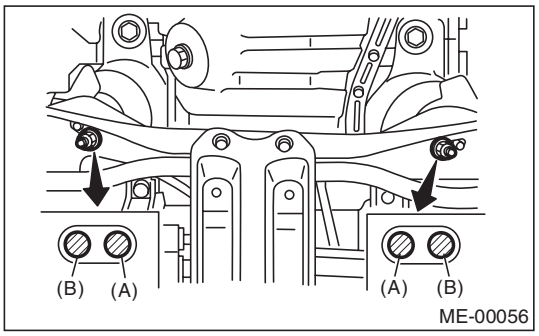
Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)



15) Tighten the nuts which install 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.



16) Install the ATF cooler pipe to frame. (AT model)

17) Install the center exhaust pipe.
<Ref. to EX(H4DOTC)-10, INSTALLATION, Center Exhaust Pipe.>

18) Lower the vehicle.

19) Connect the following hoses:
(1) Fuel delivery hose, return hose and evaporation hose
(2) Heater inlet and outlet hoses
(3) Brake booster vacuum hose

20) Connect the following connectors and terminals:
(1) Engine ground terminal
(2) Engine harness connectors
(3) Generator connector and terminal
(4) A/C compressor connectors

21) Connect the following cables:
(1) Accelerator cable
(2) Clutch release spring

22) After connecting each cable, adjust them.

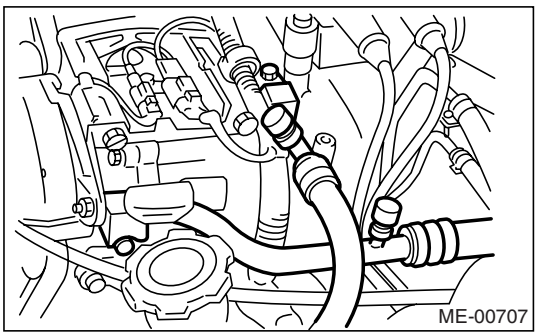
23) Install the air intake system.
(1) Install the intercooler. <Ref. to IN(H4DOTC)-11, INSTALLATION, Intercooler.>
(2) Install the air cleaner element and air cleaner upper cover.
(3) Install the engine harness connector bracket.
(4) Install the filler hose to air cleaner case.

24) Install the A/C pressure hoses.

NOTE:
Use new O-rings.

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Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



25) Install the radiator. <Ref. to CO(H4DOTC)-24, INSTALLATION, Radiator.>
26) Install the coolant filler tank. <Ref. to CO(H4DOTC)-33, INSTALLATION, Coolant Filler Tank.>
27) Install the window washer tank.
28) Install the battery in the vehicle, and then connect the cables.
29) Fill coolant.
<Ref. to CO(H4DOTC)-17, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
30) Charge the A/C system with refrigerant.
<Ref. to AC-22, OPERATION, Refrigerant Charging Procedure.>
31) Remove the front hood stay, and close the front hood.
32) Take off the vehicle from lift arms.

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10.Engine Mounting

A: REMOVAL

1) Remove the engine assembly. <Ref. to ME(H4DOTC)-44, 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.

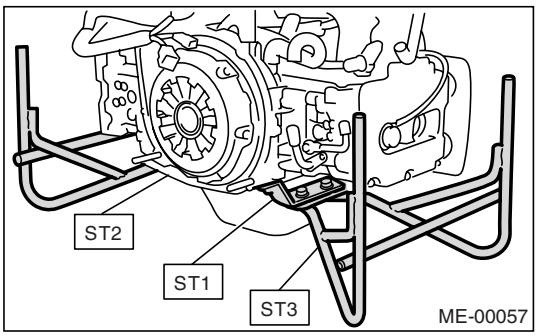
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11.Preparation for Overhaul

A: PROCEDURE

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

ST1	498457000	ENGINE STAND ADAPTER RH
ST2	498457100	ENGINE STAND ADAPTER LH
ST3	499817000	ENGINE STAND



2) In this section the procedures described under each index are all connected and stated in order. It will be the complete procedure for overhauling of the engine itself when you go through all steps in the process.
Therefore, in this section, to conduct the particular procedure within the flow of a section, you need to go back and conduct the procedure described previously in order to do that particular procedure.

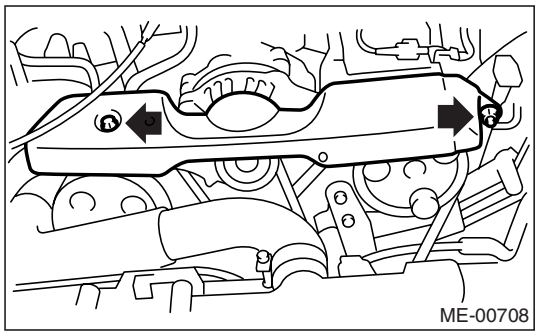
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12.V-belt

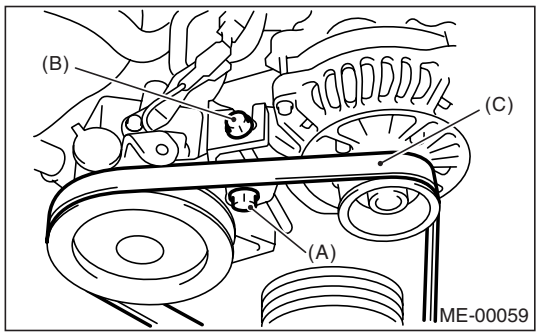
A: REMOVAL

1. FRONT SIDE BELT

1) Remove the V-belt cover.

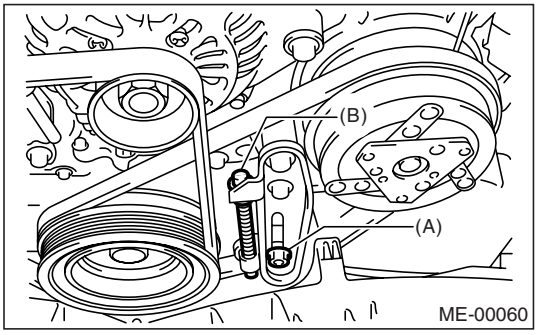


2) Loosen the lock bolt (A).
3) Loosen the slider bolt (B).
4) Remove the front side belt (C).

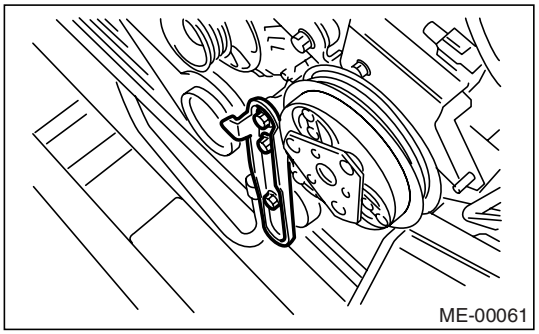


2. REAR SIDE BELT

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



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



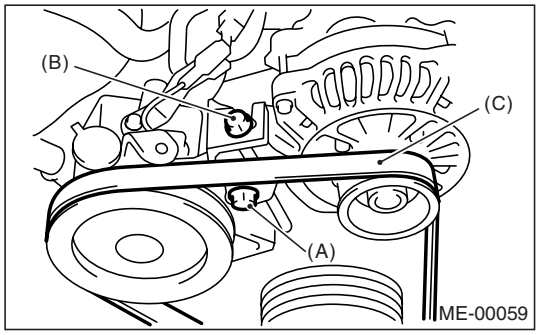
B: INSTALLATION

1. FRONT SIDE BELT

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

1) Install the belt (C), and tighten the slider bolt so as to obtain the specified belt tension <Ref. to ME(H4DOTC)-56, INSPECTION, V-belt.>
2) Tighten the lock bolt (A).
3) Tighten the slider bolt (B).

Tightening torque:
Lock bolt through bolt:
25 N·m (2.5 kgf-m, 18.1 ft-lb)
Slider bolt:
8 N·m (0.8 kgf-m, 5.5 ft-lb)



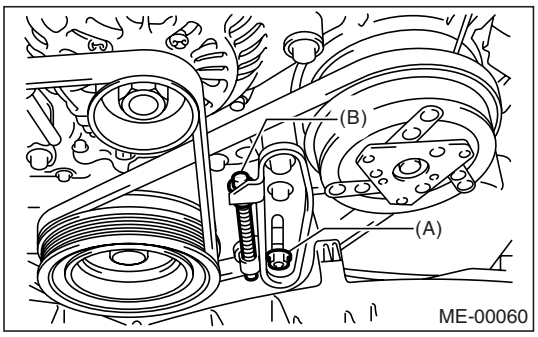
4) Idle the engine for approx. 5 min. to normalize the V-belt. (With using tension gauge)
5) Stop the engine, and then check the belt tension and adjust it. (With using tension gauge)
6) Idle the engine for approx. 1 min. to normalize the V-belt. (With using tension gauge)
7) Stop the engine, and then check the belt tension is within specified value. (With using tension gauge)
8) Adjust the belt tension until the value within specification. (With using tension gauge)

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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)-56, INSPECTION, V-belt.>
2) Tighten the lock nut (A).

Tightening torque:
Lock nut (A);
22.6 N·m (2.3 kgf-m, 16.6 ft-lb)



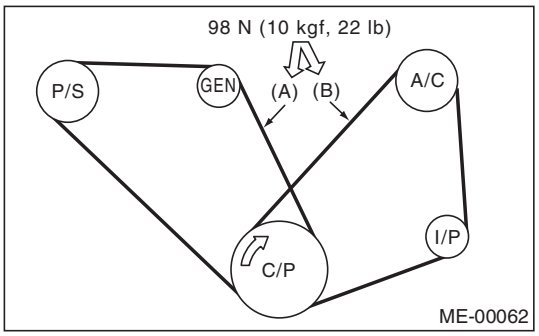
3) Idle the engine for approx. 5 min. to normalize the V-belt. (With using tension gauge)
4) Stop the engine, and then check the belt tension and adjust it. (With using tension gauge)
5) Idle the engine for approx. 1 min. to normalize the V-belt. (With using tension gauge)
6) Stop the engine, and then check the belt tension is within specified value. (With using tension gauge)
7) Adjust the belt tension until the value within specification. (With using tension gauge)

C: INSPECTION

1. WITHOUT USING BELT TENSION GAUGE

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

Belt tension
(A)
replaced: 7 — 9 mm (0.276 — 0.354 in)
reused: 9 — 11 mm (0.354 — 0.433 in)
(B)*
replaced: 7.5 — 8.5 mm (0.295 — 0.335 in)
reused: 9.0 — 10.0 mm (0.354 — 0.394 in)
****: with air conditioner***



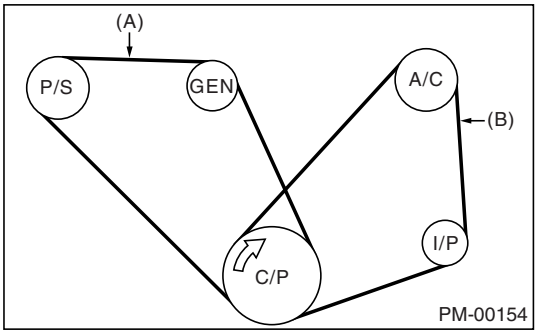
C/P	Crankshaft pulley
GEN	Generator
P/S	Power steering oil pump pulley
A/C	Air conditioning compressor pulley
I/P	Idler pulley

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2. WITH USING BELT TENSION GAUGE

1) Replace the belts, if cracks, fraying or wear is found.
2) Remove the V-belt cover and radiator reservoir tank.
3) Check the belt tension using belt tension gauge. And adjust it if necessary by changing the generator installing position and/or idler pulley installing position.

Belt tension
(A) 490 — 640 N (50 — 65 kgf, 110 — 144 lb)
(B) 350 — 450 N (36 — 46 kgf, 79 — 101 lb)



(A) Front side belt
(B) Rear side belt
C/P Crankshaft pulley
GEN Generator
P/S Power steering oil pump pulley
A/C A/C compressor pulley
I/P Idler pulley

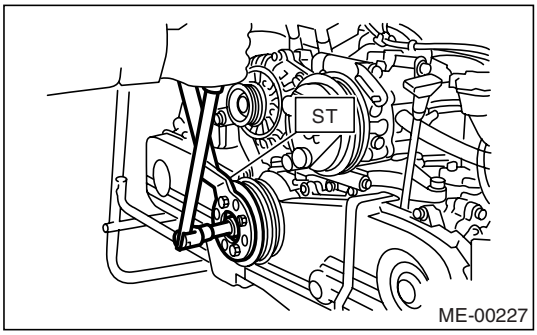
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13.Crankshaft Pulley

A: REMOVAL

1) Remove the V-belt. <Ref. to ME(H4DOTC)-55, REMOVAL, V-belt.>
2) Remove the crankshaft pulley bolt. To lock the crankshaft, use ST.

ST 499977400 CRANKSHAFT PULLEY WRENCH



3) Remove the crankshaft pulley.

B: INSTALLATION

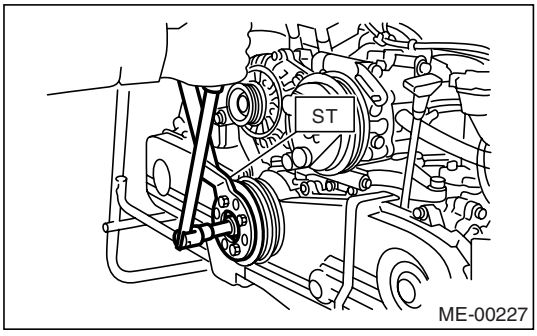
1) Install the crankshaft pulley.
2) Install the pulley bolt.

To lock the crankshaft, use ST.

ST 499977400 CRANKSHAFT PULLEY WRENCH

(1) Clean the crankshaft pulley thread using an air gun.
(2) Apply engine oil to the crankshaft pulley bolt seat and thread.
(3) Tighten the bolts temporarily with tightening torque of 44 N·m (4.5 kgf-m, 33 ft-lb).
(4) Tighten the crankshaft pulley bolts.

Tightening torque:
127 N·m (13 kgf-m, 94.0 ft-lb)



3) Confirm that the tightening angle of crankshaft pulley bolt is 45 degrees or more. If the tightening angle of crankshaft pulley bolt is less than 45 degrees, conduct the following procedures.

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

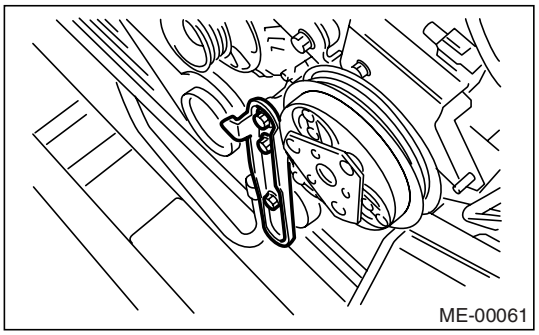
(1) Replace the crankshaft pulley bolts and clean them.

Crankshaft pulley bolt:
12369AA011

(2) Clean the crankshaft thread using an air gun.
(3) Tighten the bolts temporarily with tightening torque of 44 N·m (4.5 kgf-m, 33 ft-lb).
(4) Tighten the crankshaft pulley bolts keeping them in an angle between 45 degrees and 60 degrees.

NOTE:
Conduct the tightening procedures by confirming the turning angle of crankshaft 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)-55, INSTALLATION, V-belt.>

C: INSPECTION

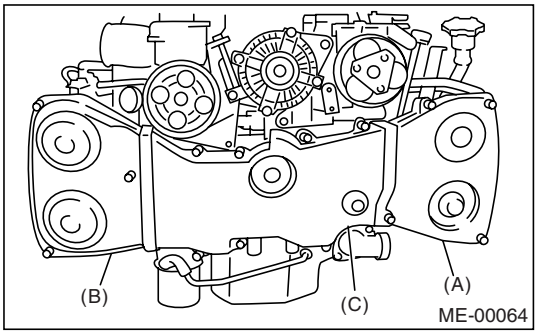
1) Make sure the V-belt is not worn or otherwise damaged.
2) Check the tension of the belt. <Ref. to ME(H4DOTC)-56, INSPECTION, V-belt.>

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14.Timing Belt Cover

A: REMOVAL

1) Remove the V-belt. <Ref. to ME(H4DOTC)-55, REMOVAL, V-belt.>
2) Remove the crankshaft pulley. <Ref. to ME(H4DOTC)-58, REMOVAL, Crankshaft 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).

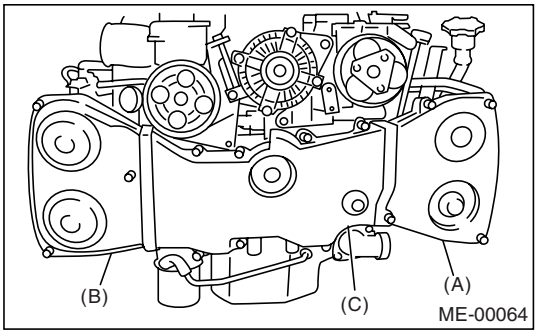
Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)

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 crankshaft pulley. <Ref. to ME(H4DOTC)-58, INSTALLATION, Crankshaft Pulley.>
5) Install the V-belt. <Ref. to ME(H4DOTC)-55, INSTALLATION, V-belt.>

C: INSPECTION

Make sure the cover is not damaged.

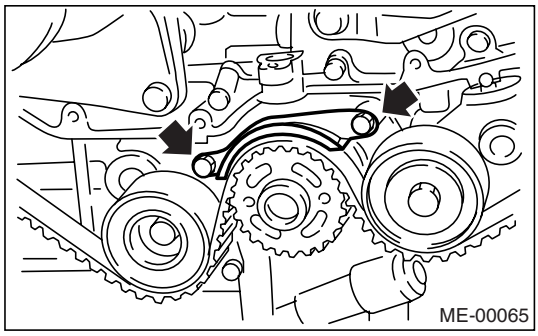
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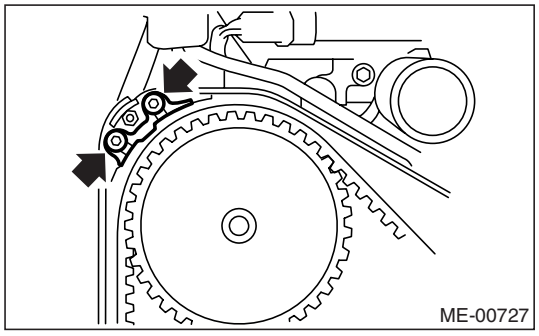
15.Timing Belt Assembly

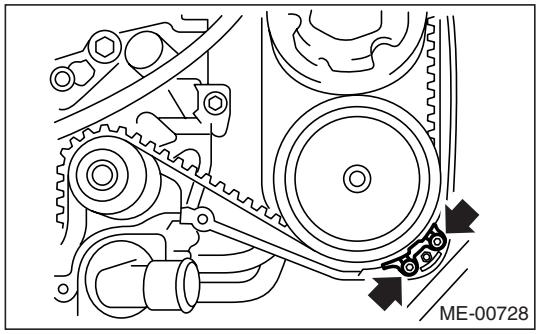
A: REMOVAL

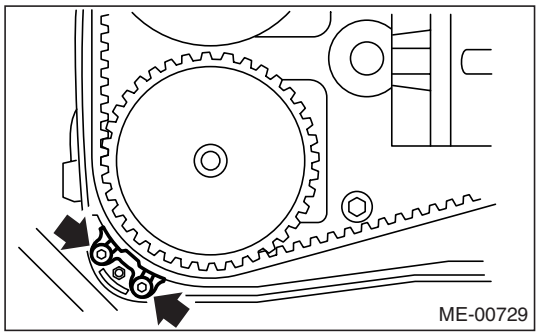
1. TIMING BELT

1) Remove the V-belt. <Ref. to ME(H4DOTC)-55, REMOVAL, V-belt.>
2) Remove the crankshaft pulley. <Ref. to ME(H4DOTC)-58, REMOVAL, Crankshaft Pulley.>
3) Remove the timing belt cover. <Ref. to ME(H4DOTC)-59, REMOVAL, Timing Belt Cover.>
4) Remove the timing belt guides. (MT model)



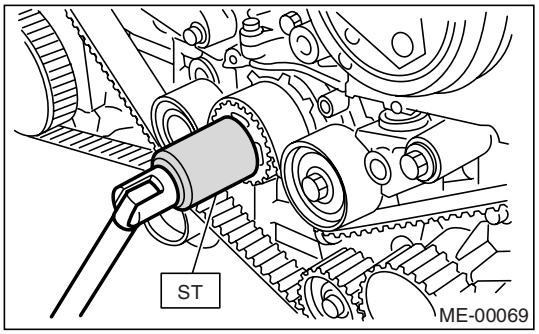






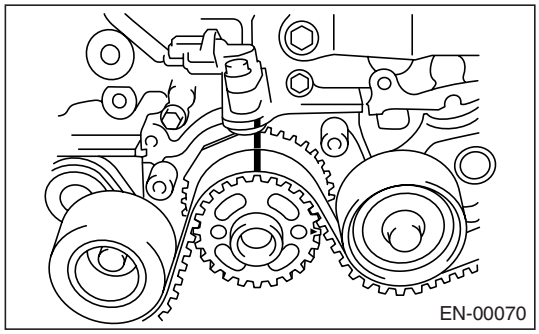
5) If the alignment mark and/or arrow mark (which indicates rotation direction) on timing belt fade away, put new marks before removing the timing belt as follows:
   (1) Turn the crankshaft using ST, and align the alignment marks on crankshaft sprocket, intake camshaft sprocket (LH), exhaust camshaft sprocket (LH), intake camshaft sprocket (RH) and exhaust camshaft sprocket (RH) with notches of timing belt cover and cylinder block.

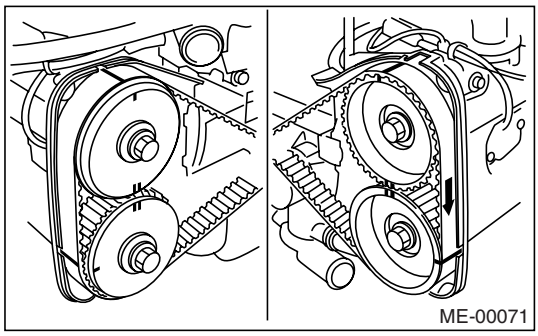
ST 499987500 CRANKSHAFT SOCKET



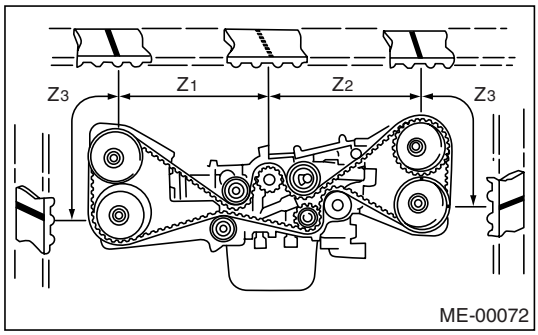
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(2) Using white paint, put alignment and/or arrow marks on the timing belts in relation to the sprockets.

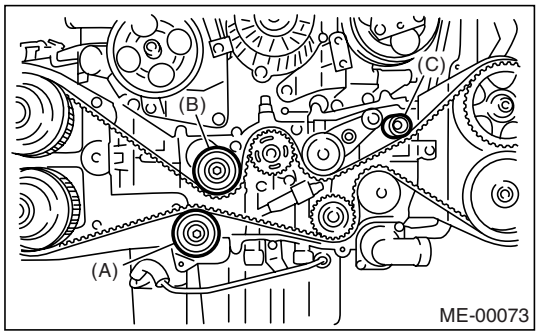




Z_1: 54.5 tooth length
Z_2: 51 tooth length
Z_3: 28 tooth length



6) Remove the belt idler (A).

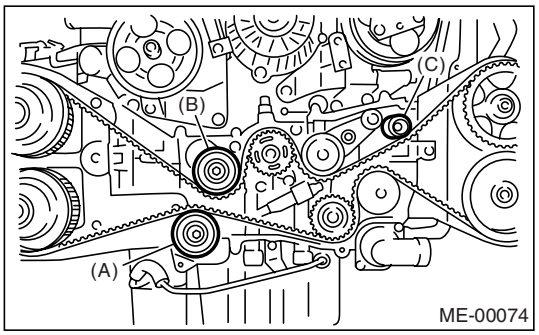


7) Remove the timing belt.

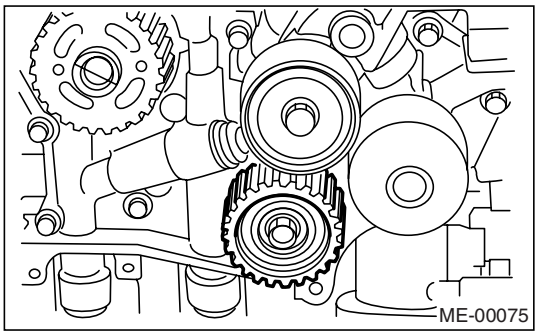
CAUTION:
After the timing belt has been removed, never rotate the intake and exhaust, camshaft sprocket. If the camshaft sprocket is rotated, the intake and exhaust valve heads strike together and valve stems are bent.

2. BELT IDLER AND AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY

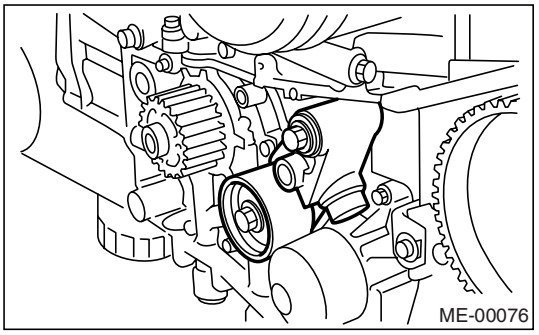
1) Remove the belt idler (B) and (C).



2) Remove the belt idler No. 2.



3) Remove the automatic belt tension adjuster assembly.



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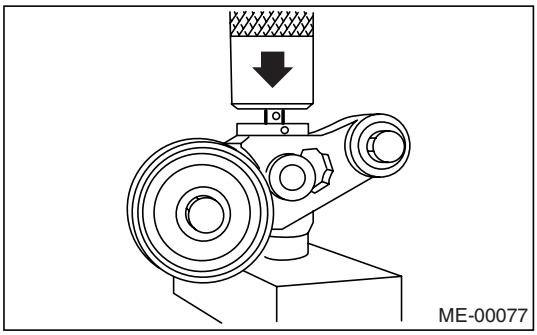
B: INSTALLATION

1. AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER

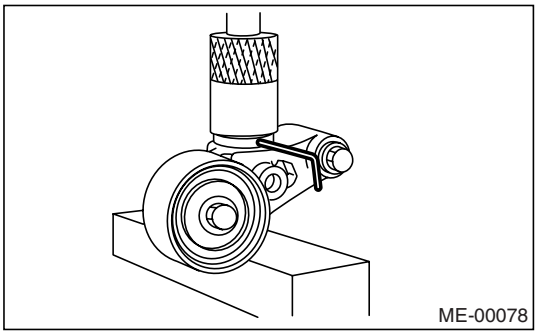
1) Preparation for installation of automatic belt tension adjuster assembly:

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

(1) Attach the automatic belt tension adjuster assembly to the vertical pressing tool.
(2) Slowly move the adjuster rod down with a pressure of 294 N (30 kgf, 66 lb) until the adjuster rod is aligned with the stopper pin hole in the cylinder.

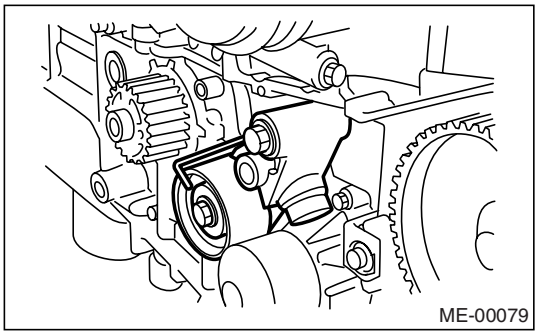

ME-00077

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


ME-00078

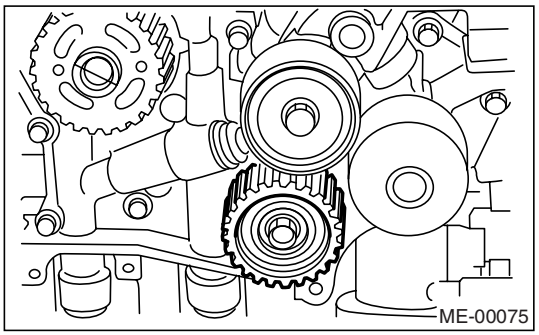
2) Install the automatic belt tension adjuster assembly.

Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)


ME-00079

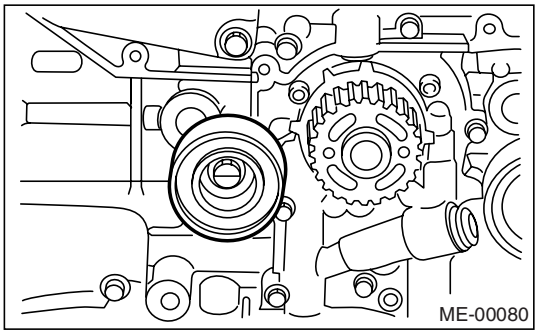
3) Install the belt idler No. 2.

Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)


ME-00075

4) Install the belt idler.

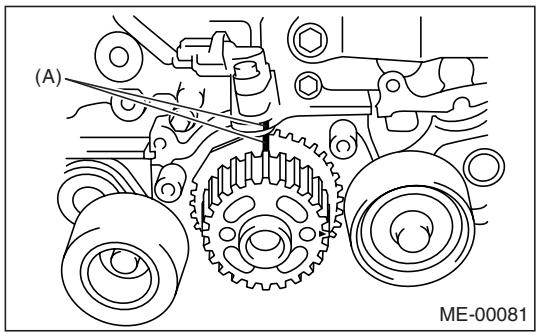
Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)


ME-00080

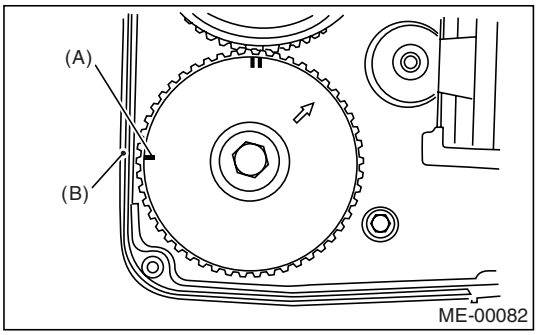
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2. TIMING BELT

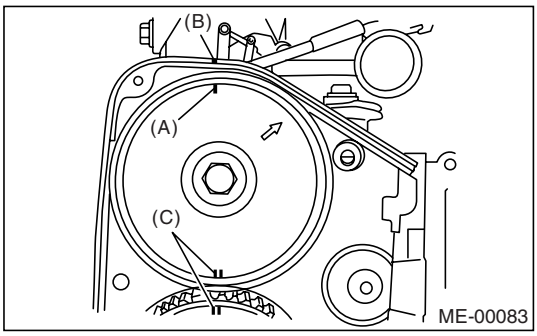
1) Preparation for installation of automatic belt tension adjuster assembly. <Ref. to ME(H4DOTC)-62, AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER, Timing Belt Assembly.>
2) Crankshaft and camshaft sprocket alignment.
(1) Align mark (A) on the crankshaft sprocket with mark on the oil pump cover at cylinder block.



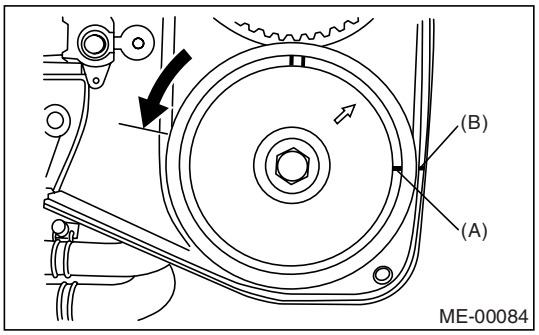
(2) Align single line mark (A) on the exhaust camshaft sprocket (RH) with notch (B) on timing belt cover.



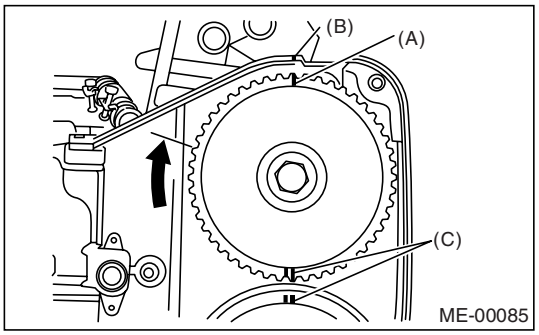
(3) Align single line mark (A) on the intake camshaft sprocket (RH) with notch (B) on timing belt cover.
(Make sure double lines (C) on intake camshaft and exhaust camshaft sprockets are aligned.)



(4) Align single line mark (A) on exhaust camshaft sprocket (LH) with notch (B) on timing belt cover by turning the sprocket counterclockwise (as viewed from front of engine).



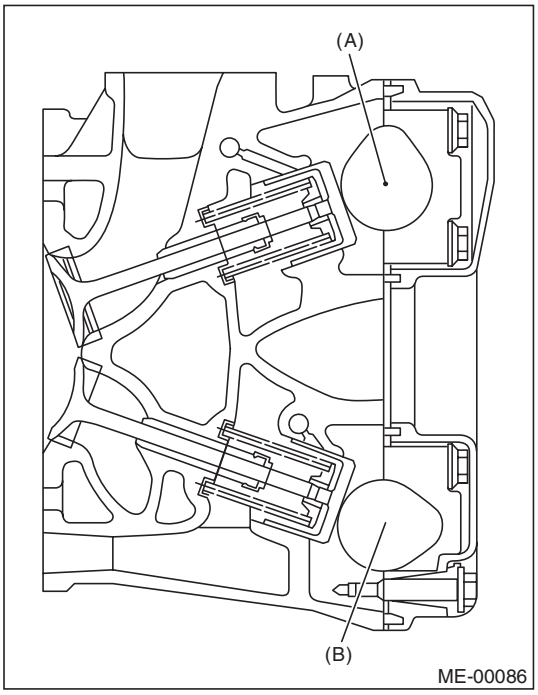
(5) Align the single line mark (A) on intake camshaft sprocket (LH) with notch (B) on timing belt cover by turning the sprocket clockwise (as viewed from front of engine).
Ensure the double lines (C) on intake and exhaust camshaft sprockets are aligned.



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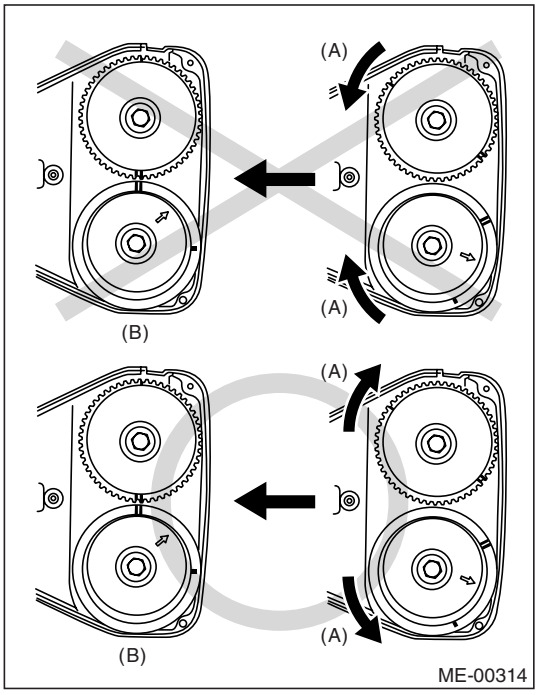
(6) Ensure the camshaft and crankshaft sprockets are positioned properly.

CAUTION:
• Intake and exhaust camshafts for this DOHC engine can be independently rotated with the timing belts removed. As can be seen from the figure, if the intake and exhaust valves are lifted simultaneously, their heads will interfere with each other, resulting in bent valves.



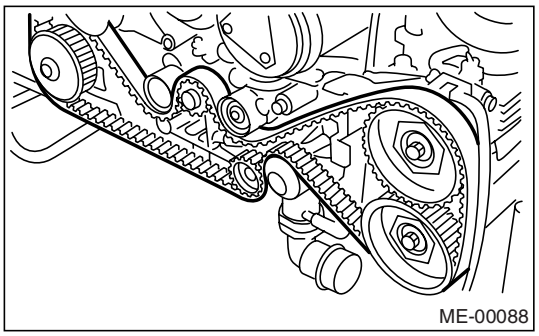
(A) Intake camshaft
(B) Exhaust camshaft

• When the timing belts are not installed, four camshafts are held at the "zero-lift" position, where all cams on camshafts do not push the intake and exhaust valves down. (Under this condition, all valves remain unlifted.)
• When the camshafts are rotated to install the timing belts, #2 intake and #4 exhaust cam of 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 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

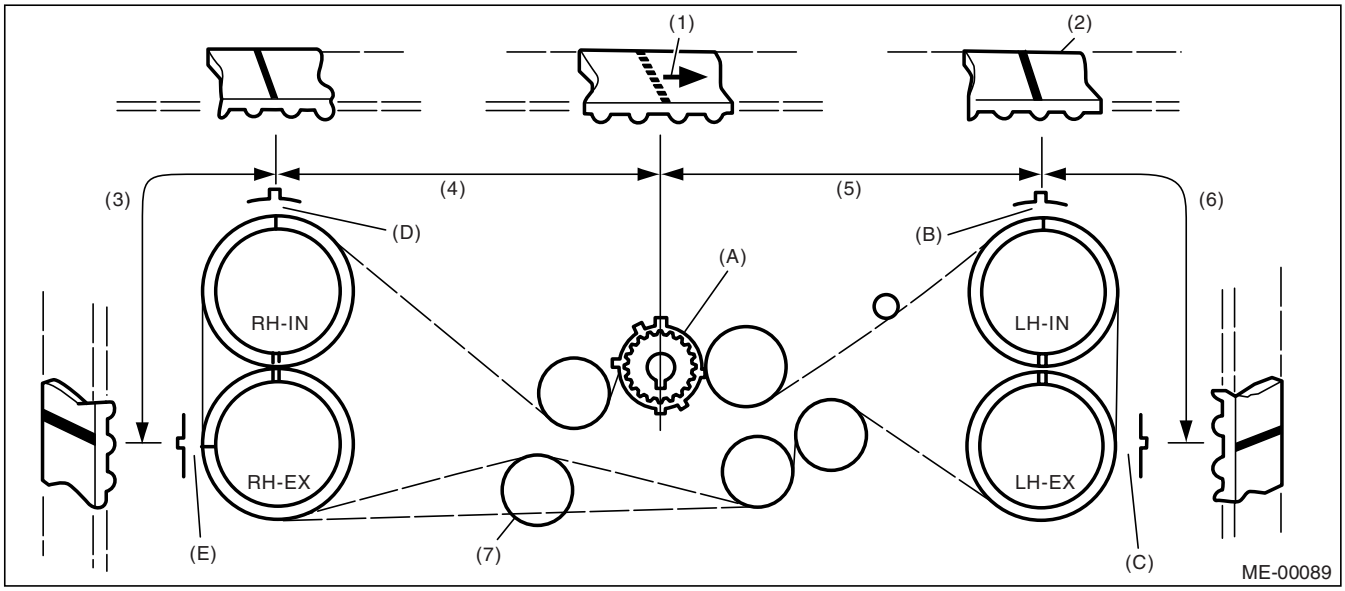
3) Installation of timing belt:



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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.

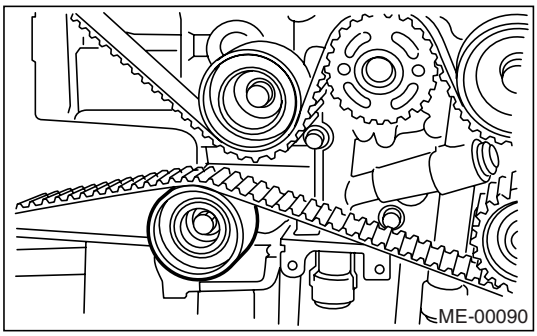


(1) Arrow mark
(2) Timing belt
(3) 28 tooth length
(4) 54.5 tooth length
(5) 51 tooth length
(6) 28 tooth length
(7) Install it in the end

4) Install the belt idlers.

Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)

NOTE:
Make sure that the marks on the timing belt and sprockets are aligned.

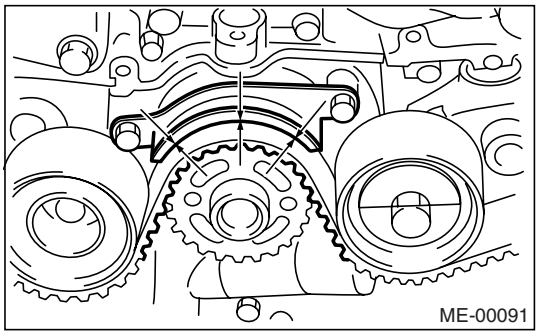


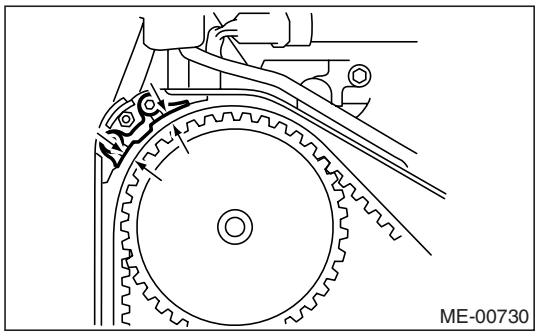
5) After ensuring that the marks on the timing belt and sprockets are aligned, remove the stopper pin from tensioner adjuster.

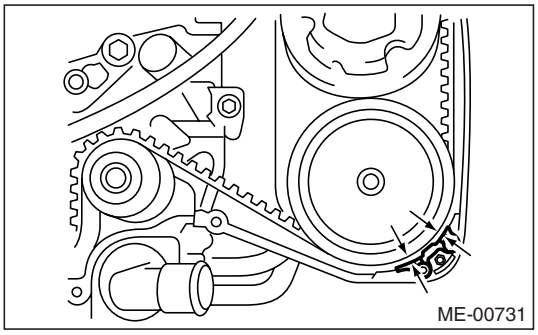
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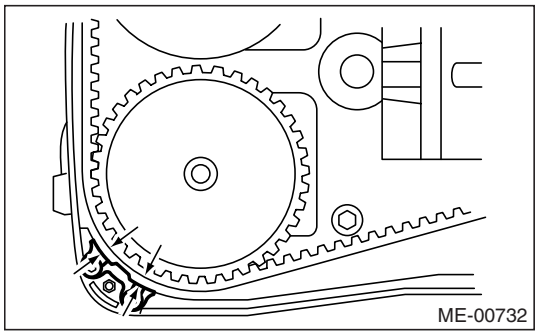
6) Install the timing belt guide. (MT model)
   (1) Temporarily tighten the bolts.
   (2) Check and adjust the clearance between timing belt and timing belt guide.

Clearance:
1.0±0.5 mm (0.039±0.020 in)


ME-00091

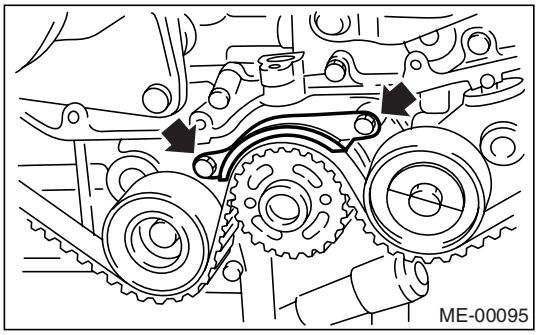

ME-00730


ME-00731

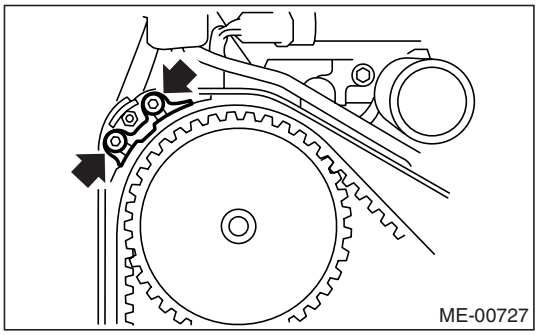

ME-00732

   (3) Tighten the bolts.

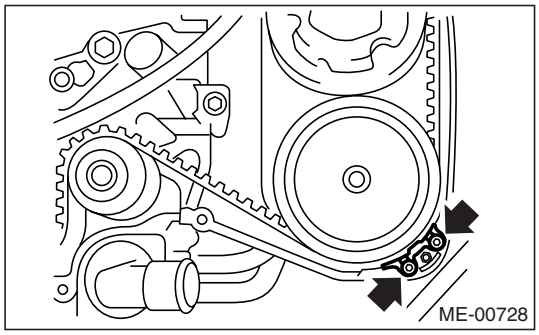
Tightening torque:
10 N·m (1.0 kgf-m, 7.2 ft-lb)


ME-00095

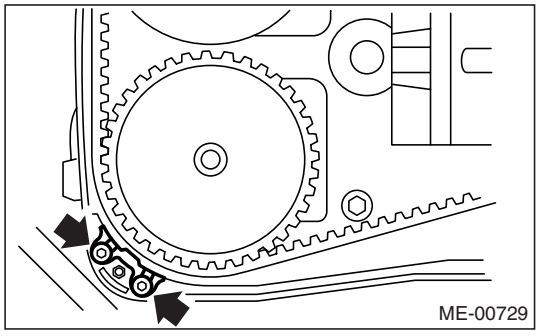
Tightening torque:
6.4 N·m (0.7 kgf-m, 5.1 ft-lb)


ME-00727

Tightening torque:
6.4 N·m (0.7 kgf-m, 5.1 ft-lb)


ME-00728

Tightening torque:
6.4 N·m (0.7 kgf-m, 5.1 ft-lb)


ME-00729

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7) Install the timing belt cover. <Ref. to ME(H4DOTC)-59, INSTALLATION, Timing Belt Cover.>
8) Install the crankshaft pulley. <Ref. to ME(H4DOTC)-58, INSTALLATION, Crankshaft Pulley.>
9) Install the V-belt. <Ref. to ME(H4DOTC)-55, INSTALLATION, V-belt.>

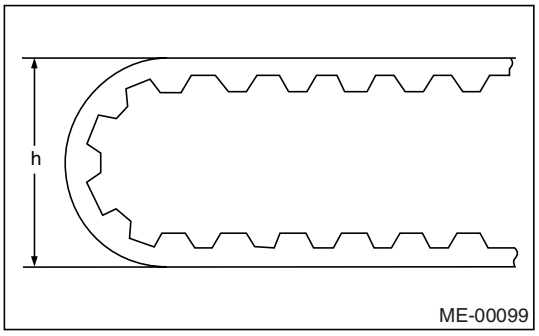
C: INSPECTION

1. TIMING BELT

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

NOTE:
• Be careful not to let oil, grease or coolant contact the belt. Remove quickly and thoroughly if this happens.
• Do not bend the belt sharply.

Bending radius: h
60 mm (2.36 in) or more



2. AUTOMATIC BELT TENSION ADJUSTER

1) Visually check the oil seals for leaks, and rod ends for abnormal wear or scratches. If necessary, replace the automatic belt tension adjuster assembly.

NOTE:
Slight traces of oil at rod's oil seal does not indicate a problem.

2) Check that the adjuster rod does not move when a pressure of 294 N (30 kgf, 66 lb) is applied to it. This is to check adjuster rod stiffness.
3) If the adjuster rod is not stiff and moves freely when applying 294 N (30 kgf, 66 lb), check it using the following procedures:
(1) Slowly press the adjuster rod down to the end surface of the cylinder. Repeat this motion 2 or 3 times.
(2) With the adjuster rod moved all the way up, apply a pressure of 294 N (30 kgf, 66 lb) to it. Check the adjuster rod stiffness.
(3) If the adjuster rod is not stiff and moves down, replace the automatic belt tension adjuster assembly with a new one.

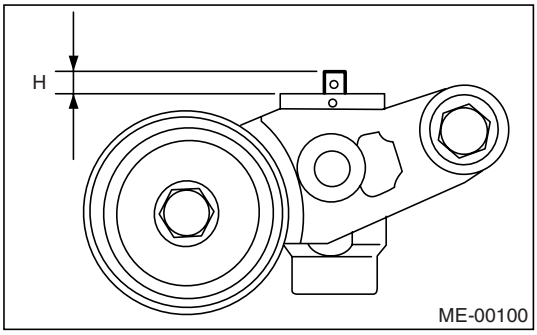
NOTE:
• Always use a vertical type pressing tool to move the adjuster rod down.
• Do not use a lateral type vise.

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• Push the adjuster rod vertically.
• Press-in the push adjuster rod gradually taking more than 3 minutes.
• Do not allow press pressure to exceed 9,807 N (1,000 kgf, 2,205 lb).
• Press the adjuster rod as far as the end surface of the cylinder. Do not press the adjuster rod into the cylinder. Doing so may damage the cylinder.

4) Measure the extension of rod beyond the body. If it is not within specifications, replace with a new one.

Rod extension: H
5.7±0.5 mm (0.224±0.020 in)



3. BELT TENSION PULLEY

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

4. BELT IDLER

1) Check the 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.

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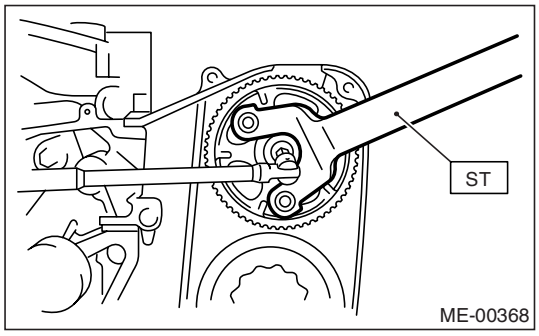
16.Camshaft Sprocket

A: REMOVAL

1. EXCEPT FOR STi AND AUSTRALIA MODEL

1) Remove the V-belt. <Ref. to ME(H4DOTC)-55, REMOVAL, V-belt.>
2) Remove the crankshaft pulley. <Ref. to ME(H4DOTC)-58, REMOVAL, Crankshaft Pulley.>
3) Remove the timing belt cover. <Ref. to ME(H4DOTC)-59, REMOVAL, Timing Belt Cover.>
4) Remove the timing belt assembly. <Ref. to ME(H4DOTC)-60, REMOVAL, Timing Belt Assembly.>
5) Remove the camshaft position sensor. <Ref. to FU(H4DOTC)-30, REMOVAL, Camshaft Position Sensor.>
6) Remove the camshaft sprockets. To lock the camshaft, use ST.

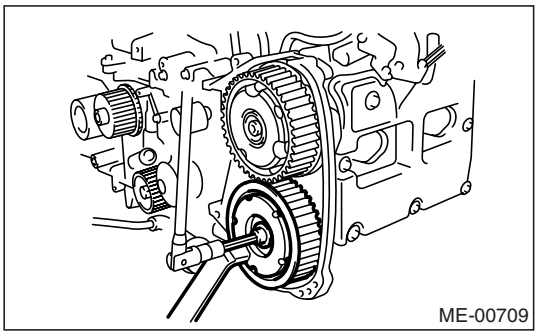
ST 18231AA010 CAMSHAFT SPROCKET WRENCH (INTAKE LH)
ST 499207400 CAMSHAFT SPROCKET WRENCH (Except INTAKE LH)



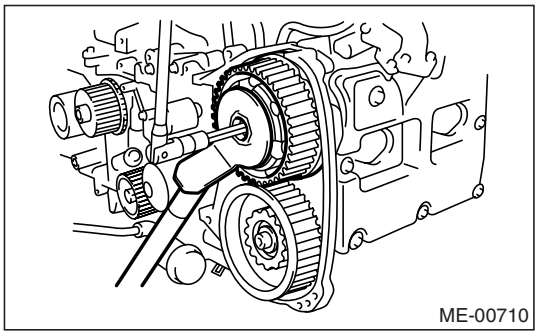
2. STi AND AUSTRALIA MODEL

1) Remove the V-belt. <Ref. to ME(H4DOTC)-55, REMOVAL, V-belt.>
2) Remove the crankshaft pulley. <Ref. to ME(H4DOTC)-58, REMOVAL, Crankshaft Pulley.>
3) Remove the timing belt cover. <Ref. to ME(H4DOTC)-59, REMOVAL, Timing Belt Cover.>
4) Remove the timing belt assembly. <Ref. to ME(H4DOTC)-60, REMOVAL, Timing Belt Assembly.>
5) Remove the camshaft position sensor. <Ref. to FU(H4DOTC)-30, REMOVAL, Camshaft Position Sensor.>
6) Remove the camshaft sprockets. To lock the camshaft, use ST.

ST 499207400 CAMSHAFT SPROCKET WRENCH



ST 499977500 CAMSHAFT SPROCKET WRENCH



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B: INSTALLATION

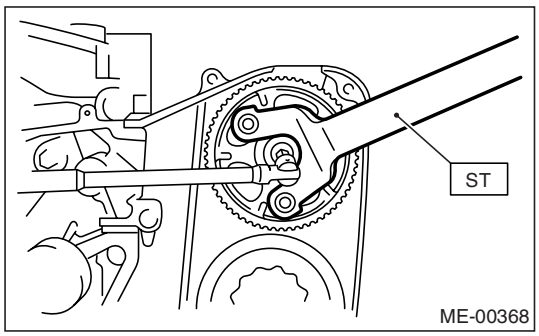
1. EXCEPT FOR STi AND AUSTRALIA MODEL

1) Install the camshaft sprocket. To lock the camshaft, use ST.

ST	18231AA010	CAMSHAFT SPROCKET WRENCH (INTAKE LH)
ST	499207400	CAMSHAFT SPROCKET WRENCH (Except INTAKE LH)

Tightening torque:
98 N·m (10 kgf-m, 72.4 ft-lb)

NOTE:
Do not confuse the camshaft sprockets (RH) and (LH) intake side during installation. The camshaft sprocket (LH) is identified by a projection used to monitor camshaft position sensor.



2) Install the camshaft position sensor. <Ref. to FU(H4DOTC)-30, INSTALLATION, Camshaft Position Sensor.>
3) Install the timing belt assembly. <Ref. to ME(H4DOTC)-62, INSTALLATION, Timing Belt Assembly.>
4) Install the timing belt cover. <Ref. to ME(H4DOTC)-59, INSTALLATION, Timing Belt Cover.>
5) Install the crankshaft pulley. <Ref. to ME(H4DOTC)-58, INSTALLATION, Crankshaft Pulley.>
6) Install the V-belt. <Ref. to ME(H4DOTC)-55, INSTALLATION, V-belt.>

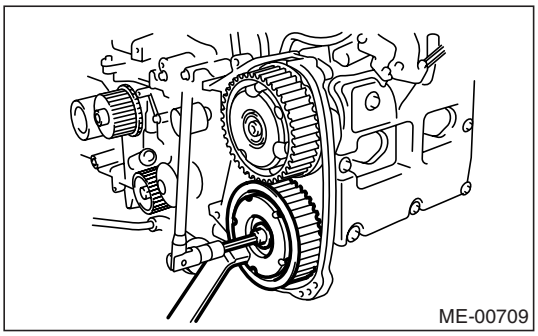
2. STi AND AUSTRALIA MODEL

1) Install the camshaft sprocket No. 1 and No. 2. To lock the camshaft, use ST.

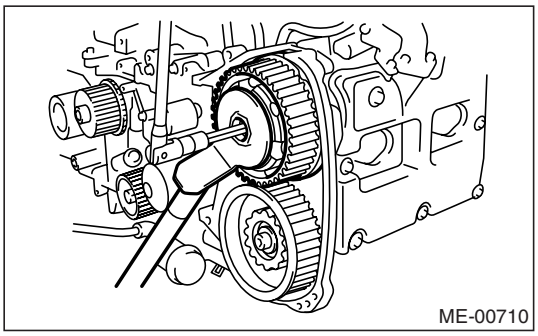
ST	499207400	CAMSHAFT SPROCKET WRENCH

Tightening torque:
98 N·m (10 kgf-m, 72.4 ft-lb)

NOTE:
Do not confuse camshaft sprockets (RH) and (LH) during installation. The camshaft sprocket No. 2 is identified by a projection used to monitor camshaft position sensor.



ST	499977500	CAMSHAFT SPROCKET WRENCH



2) Install the camshaft position sensor. <Ref. to FU(H4DOTC)-30, INSTALLATION, Camshaft Position Sensor.>
3) Install the timing belt assembly. <Ref. to ME(H4DOTC)-62, INSTALLATION, Timing Belt Assembly.>
4) Install the timing belt cover. <Ref. to ME(H4DOTC)-59, INSTALLATION, Timing Belt Cover.>
5) Install the crankshaft pulley. <Ref. to ME(H4DOTC)-58, INSTALLATION, Crankshaft Pulley.>
6) Install the V-belt. <Ref. to ME(H4DOTC)-55, INSTALLATION, V-belt.>

C: INSPECTION

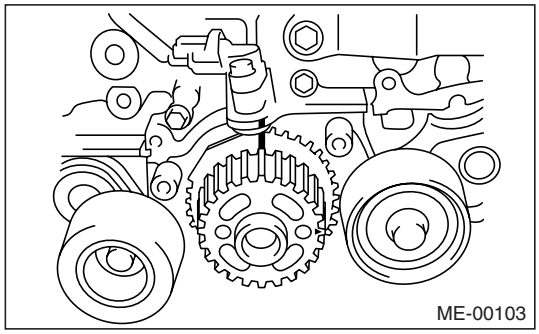
1) Check the sprocket teeth for abnormal wear and scratches.
2) Make sure there is no free play between sprocket and key.
3) Check the crankshaft sprocket notch used for sensor for damage and contamination of foreign matter.

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17.Crankshaft Sprocket

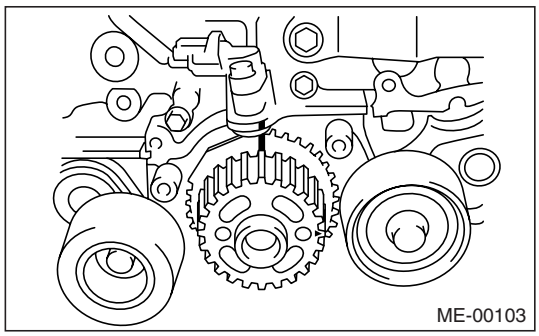
A: REMOVAL

1) Remove the V-belt. <Ref. to ME(H4DOTC)-55, REMOVAL, V-belt.>
2) Remove the crankshaft pulley. <Ref. to ME(H4DOTC)-58, REMOVAL, Crankshaft Pulley.>
3) Remove the timing belt cover. <Ref. to ME(H4DOTC)-59, REMOVAL, Timing Belt Cover.>
4) Remove the timing belt assembly. <Ref. to ME(H4DOTC)-60, REMOVAL, Timing Belt Assembly.>
5) Remove the camshaft sprocket. <Ref. to ME(H4DOTC)-69, REMOVAL, Camshaft Sprocket.>
6) Remove the crankshaft sprocket.



B: INSTALLATION

1) Install the crankshaft sprocket.



2) Install the camshaft sprocket. <Ref. to ME(H4DOTC)-70, INSTALLATION, Camshaft Sprocket.>
3) Install the timing belt assembly. <Ref. to ME(H4DOTC)-62, INSTALLATION, Timing Belt Assembly.>
4) Install the timing belt cover. <Ref. to ME(H4DOTC)-59, INSTALLATION, Timing Belt Cover.>
5) Install the crankshaft pulley. <Ref. to ME(H4DOTC)-58, INSTALLATION, Crankshaft Pulley.>
6) Install the V-belt. <Ref. to ME(H4DOTC)-55, INSTALLATION, V-belt.>

C: INSPECTION

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

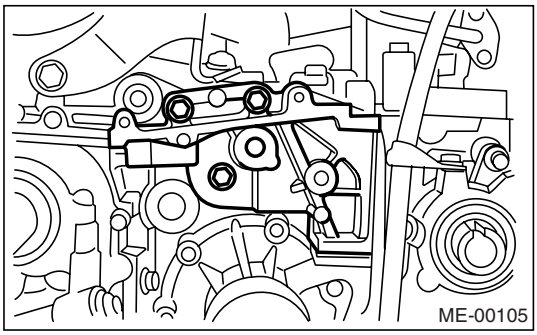
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18.Camshaft

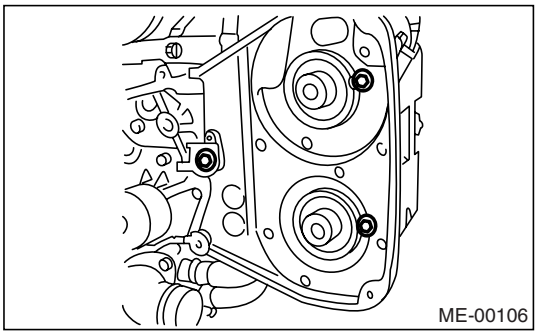
A: REMOVAL

1. EXCEPT FOR STi AND AUSTRALIA MODEL

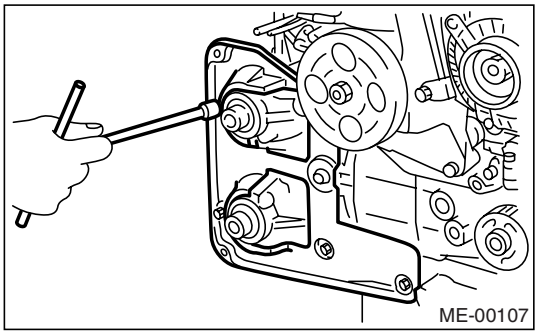
1) Remove the V-belt. <Ref. to ME(H4DOTC)-55, REMOVAL, V-belt.>
2) Remove the crankshaft pulley. <Ref. to ME(H4DOTC)-58, REMOVAL, Crankshaft Pulley.>
3) Remove the timing belt cover. <Ref. to ME(H4DOTC)-59, REMOVAL, Timing Belt Cover.>
4) Remove the timing belt assembly. <Ref. to ME(H4DOTC)-60, REMOVAL, Timing Belt Assembly.>
5) Remove the camshaft sprocket. <Ref. to ME(H4DOTC)-69, REMOVAL, Camshaft Sprocket.>
6) Remove the crankshaft sprocket. <Ref. to ME(H4DOTC)-71, REMOVAL, Crankshaft Sprocket.>
7) Remove the tensioner bracket.


ME-00105

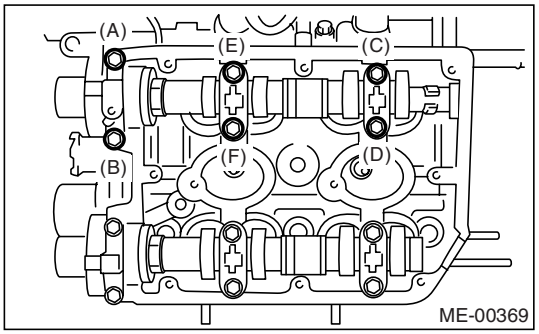
8) Remove the timing belt cover No. 2 (LH).


ME-00106

9) Remove the timing belt cover No.2 (RH).

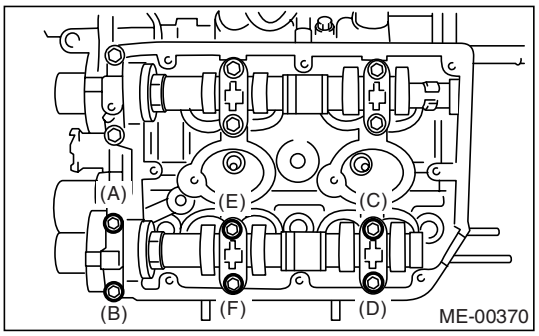

ME-00107

10) Disconnect the ignition coil connector.
11) Remove the ignition coil.
12) Remove the rocker cover and gasket.
13) Loosen the intake camshaft cap bolts equally, a little at a time in alphabetical sequence shown in the figure.



ME-00369

14) Remove the camshaft cap and intake camshaft.
15) Loosen the exhaust camshaft cap bolts equally, a little at a time in alphabetical sequence shown in the figure.



ME-00370

16) Remove the camshaft caps and exhaust camshaft.

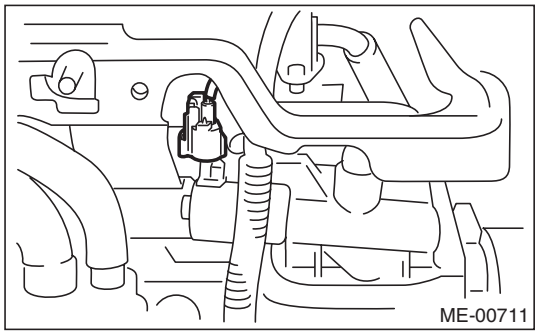
NOTE:
Arrange the camshaft caps in order so that they can be installed in their original positions.

17) Similarly, remove the camshafts (RH) and related parts.

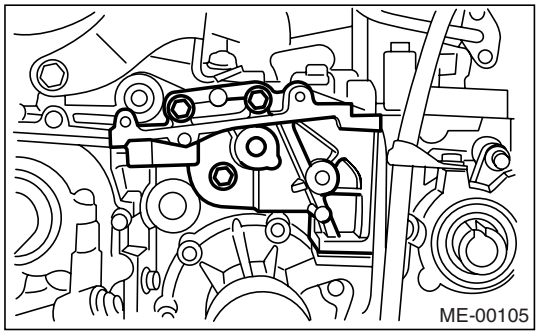
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2. STi AND AUSTRALIA MODEL

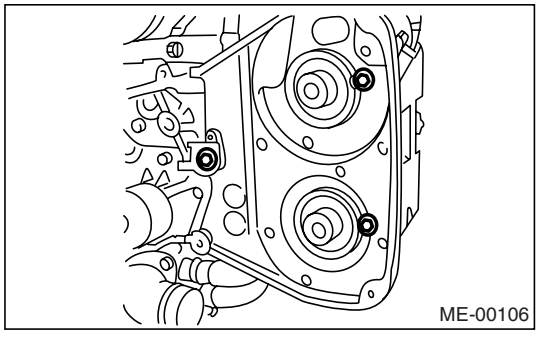
1) Remove the V-belt. <Ref. to ME(H4DOTC)-55, INSTALLATION, V-belt.>
2) Remove the crankshaft pulley. <Ref. to ME(H4DOTC)-58, REMOVAL, Crankshaft Pulley.>
3) Remove the timing belt cover. <Ref. to ME(H4DOTC)-59, REMOVAL, Timing Belt Cover.>
4) Remove the timing belt assembly. <Ref. to ME(H4DOTC)-60, REMOVAL, Timing Belt Assembly.>
5) Remove the camshaft sprocket. <Ref. to ME(H4DOTC)-69, REMOVAL, Camshaft Sprocket.>
6) Remove the crankshaft sprocket. <Ref. to ME(H4DOTC)-71, REMOVAL, Crankshaft Sprocket.>
7) Disconnect the variable valve timing solenoid valve assembly connector.


ME-00711

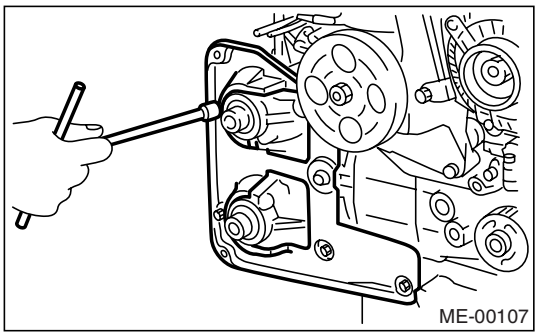
8) Remove the tensioner bracket.


ME-00105

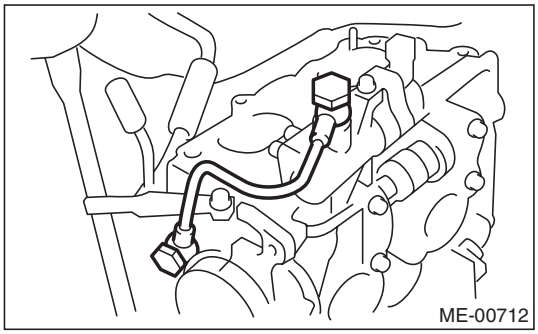
9) Remove the timing belt cover No. 2 (LH).


ME-00106

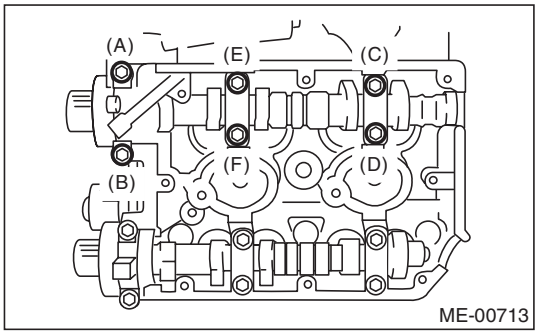
10) Remove the timing belt cover No.2 (RH).


ME-00107

11) Remove the spark plug cord.
12) Remove the oil level gauge guide. (LH side)
13) Remove the rocker cover and gasket.
14) Remove the oil pipe.


ME-00712

15) Loosen the variable valve timing solenoid valve assembly and intake camshaft cap bolts equally, a little at a time in alphabetical sequence shown in the figure.

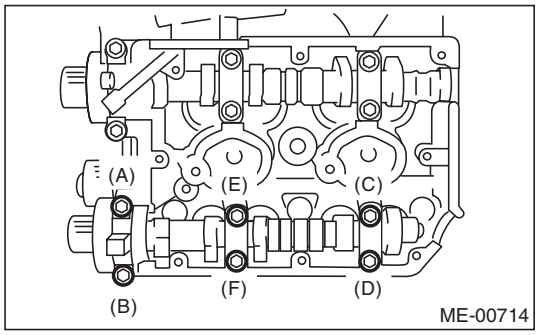


ME-00713

16) Remove the variable valve timing solenoid valve assembly, intake camshaft cap, and camshaft.

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17) Loosen the exhaust camshaft cap bolts equally, a little at a time in alphabetical sequence shown in the figure.



18) Remove the exhaust camshaft cap and camshaft.

NOTE:
Arrange the camshaft caps in order so that they can be installed in their original positions.

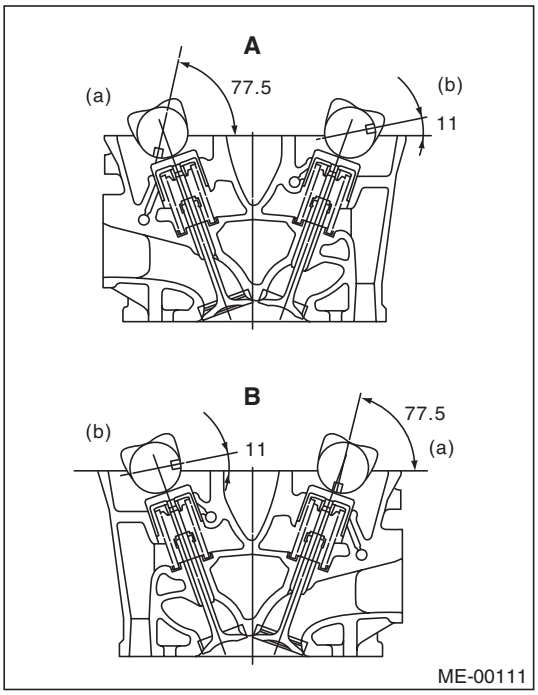
19) Similarly, remove the camshafts (RH) and related parts.

B: INSTALLATION

1. EXCEPT FOR STi AND AUSTRALIA MODEL

1) Camshaft installation:
Apply engine oil to the cylinder head at camshaft bearing location before installing the camshaft. Install the camshaft so that each valves is close to or in contact with “base circle” of cam lobe.

NOTE:
• When the camshafts are positioned as shown in the figure, camshafts need to be rotated at a minimum to align with the timing belt during installation.
• Camshaft (RH) need not be rotated when set at the position shown in the figure.
Intake camshaft (LH): Rotate 80° clockwise.
Exhaust camshaft (LH): Rotate 45° counterclockwise.



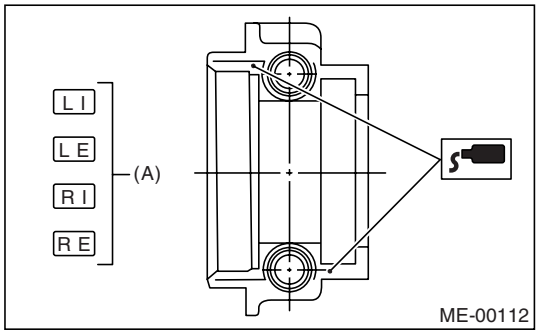
A Cylinder head (LH)
B Cylinder head (RH)
(a) Intake camshaft
(b) Exhaust camshaft

2) Camshaft cap installation:
(1) Apply fluid packing sparingly to the cap mating surface.

NOTE:
Do not apply fluid packing excessively. Failure to do so may cause excess packing to come out and flow toward oil seal, resulting in oil leaks.

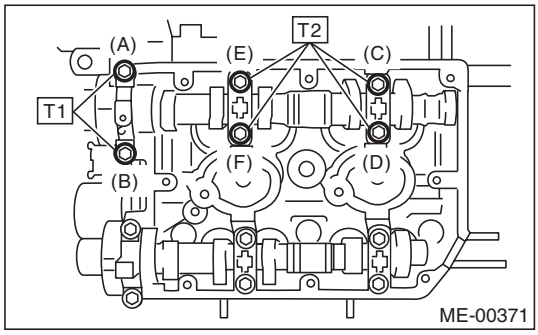
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Fluid packing:
Part No. 004403007
THREE BOND 1215 or equivalent



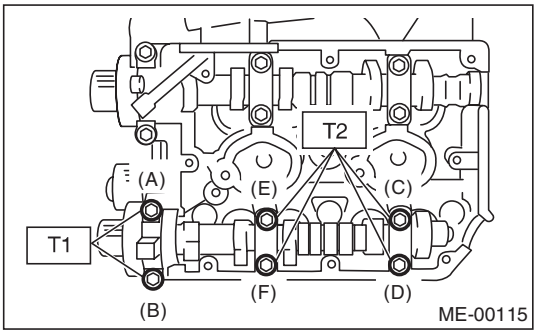
(2) Apply engine oil to cap bearing surface and install the cap on camshaft as shown by identification mark (A).
(3) Gradually tighten the camshaft cap in at least two stages in alphabetical sequence shown in the figure, and then tighten to specified torque.

Tightening torque:
T1: 10 N·m (1.0 kgf-m, 7.2 ft-lb)
T2: 20 N·m (2.0 kgf-m, 14.5 ft-lb)



(4) Similarly, tighten the cap on exhaust side.
After tightening the cap, ensure the camshaft rotates only slightly while holding it at “base” circle.

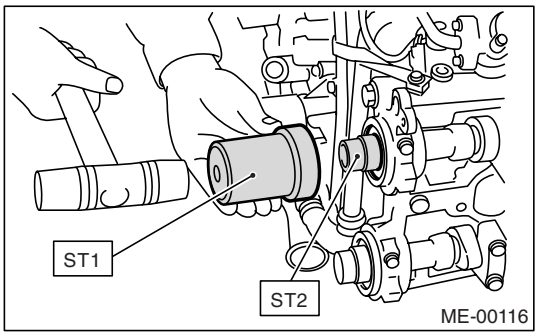
Tightening torque:
T1: 10 N·m (1.0 kgf-m, 7.2 ft-lb)
T2: 20 N·m (2.0 kgf-m, 14.5 ft-lb)



3) Camshaft oil seal installation:
Apply grease to the new oil seal lips and press onto the front end of camshaft by using ST1 and ST2.

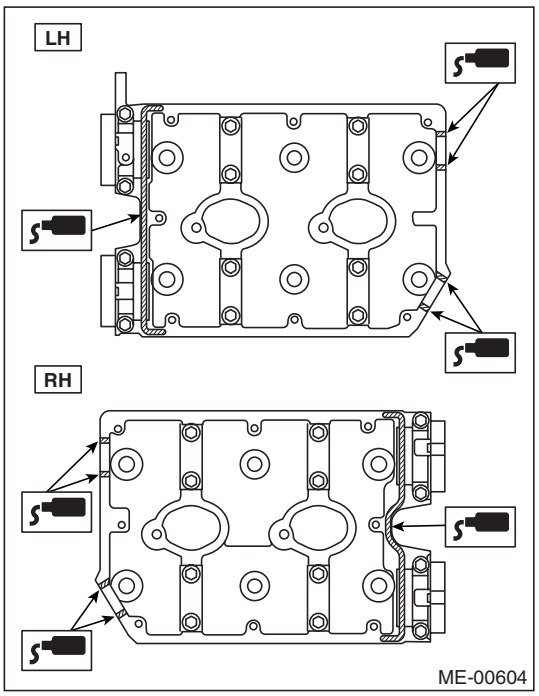
NOTE:
Use a new oil seal.

ST1	499587600	OIL SEAL INSTALLER
ST2	499597200	OIL SEAL GUIDE



4) Rocker cover installation:
(1) Install the gasket on rocker cover.
Install the peripheral gasket and ignition coil gasket.
(2) Apply fluid packing to the indicated portion on rocker cover.

Fluid packing:
Part No. 004403007
THREE BOND 1215 or equivalent

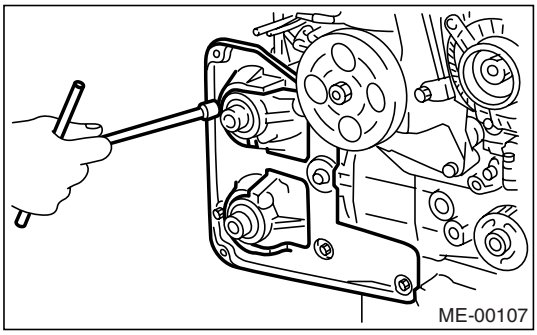


(3) Install the rocker cover on cylinder head.
Ensure the gasket is properly positioned during installation.
5) Install the ignition coil.
6) Connect the ignition coil connector.

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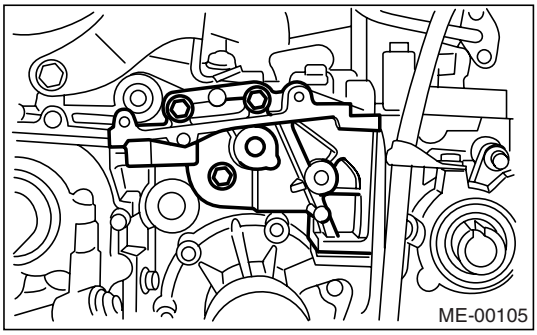
7) Similarly, install the parts on right-hand side.
8) Install the timing belt cover No. 2 (RH).

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)



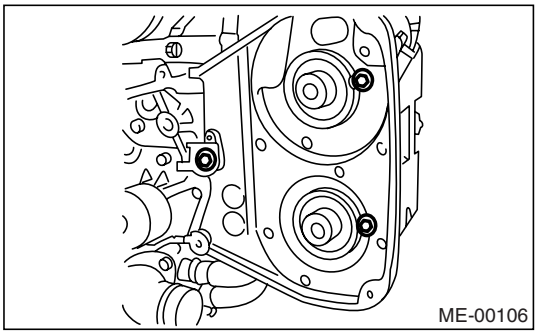
9) Install the tensioner bracket.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



10) Install the timing belt cover No. 2 (LH).

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)

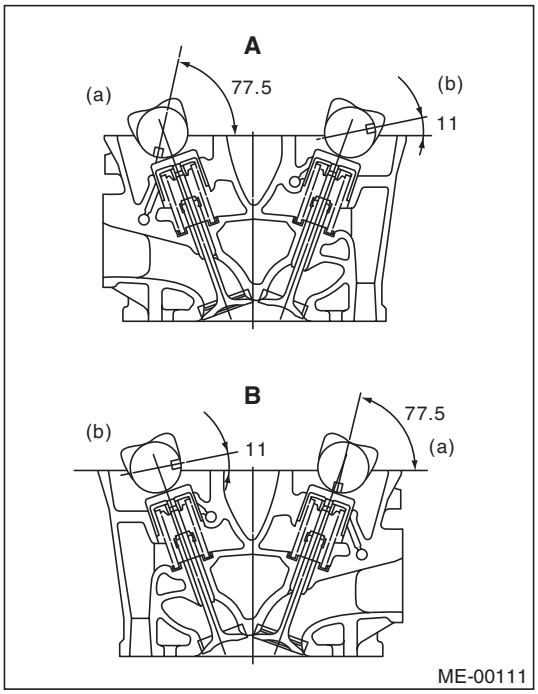


11) Install the crankshaft sprocket. <Ref. to ME(H4DOTC)-71, INSTALLATION, Crankshaft Sprocket.>
12) Install the camshaft sprockets. <Ref. to ME(H4DOTC)-70, INSTALLATION, Camshaft Sprocket.>
13) Install the timing belt assembly. <Ref. to ME(H4DOTC)-62, INSTALLATION, Timing Belt Assembly.>
14) Install the timing belt cover. <Ref. to ME(H4DOTC)-59, INSTALLATION, Timing Belt Cover.>
15) Install the crankshaft pulley. <Ref. to ME(H4DOTC)-58, INSTALLATION, Crankshaft Pulley.>
16) Install the V-belt. <Ref. to ME(H4DOTC)-55, INSTALLATION, V-belt.>

2. STi AND AUSTRALIA MODEL

1) Camshaft installation:
Apply engine oil to cylinder head at camshaft bearing 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, camshafts need to be rotated at a minimum to align with the timing belt during installation.
• Camshaft (RH) need not be rotated when set at position shown in the figure.
Intake camshaft (LH): Rotate 80° clockwise.
Exhaust camshaft (LH): Rotate 45° counterclockwise.



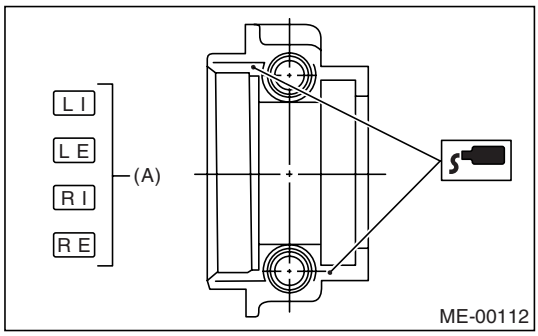
A Cylinder head (LH)
B Cylinder head (RH)
(a) Intake camshaft
(b) Exhaust camshaft

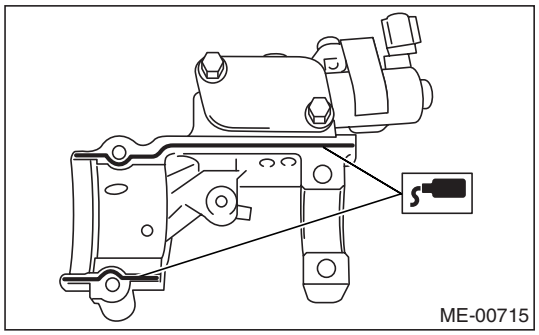
2) Camshaft cap and variable valve timing solenoid valve assembly installation:
(1) Apply fluid packing sparingly to cap mating surface.

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NOTE:
Do not apply fluid packing excessively. Failure to do so may cause excess packing to come out and flow toward the oil seal, resulting in oil leaks.

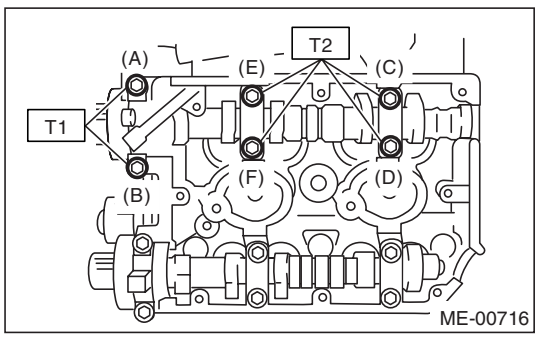
Fluid packing:
Part No. 004403007
THREE BOND 1215 or equivalent





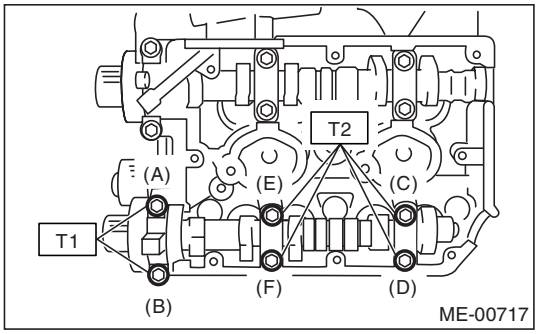
(2) Apply engine oil to cap bearing surface and install the cap on camshaft as shown by identification mark (A).
(3) Gradually tighten the camshaft cap and oil control valve assembly in at least two stages in alphabetical sequence shown in the figure, and then tighten to specified torque.

Tightening torque:
T1: 10 N·m (1.0 kgf-m, 7 ft-lb)
T2: 20 N·m (2.0 kgf-m, 14.5 ft-lb)



(4) Similarly, tighten cap on the exhaust side.
After tightening cap, ensure the camshaft rotates only slightly while holding it at “base” circle.

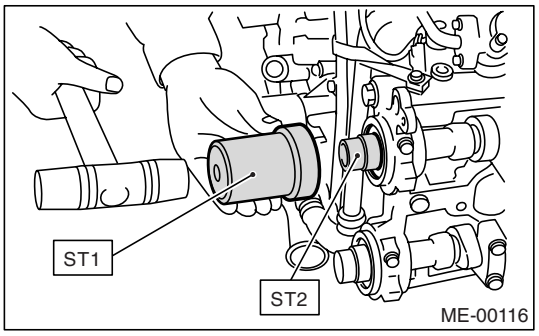
Tightening torque:
T1: 10 N·m (1.0 kgf-m, 7 ft-lb)
T2: 20 N·m (2.0 kgf-m, 14.5 ft-lb)



3) Camshaft oil seal installation:
Apply grease to new oil seal lips and press onto front end of camshaft by using ST1 and ST2.

NOTE:
Use a new oil seal.

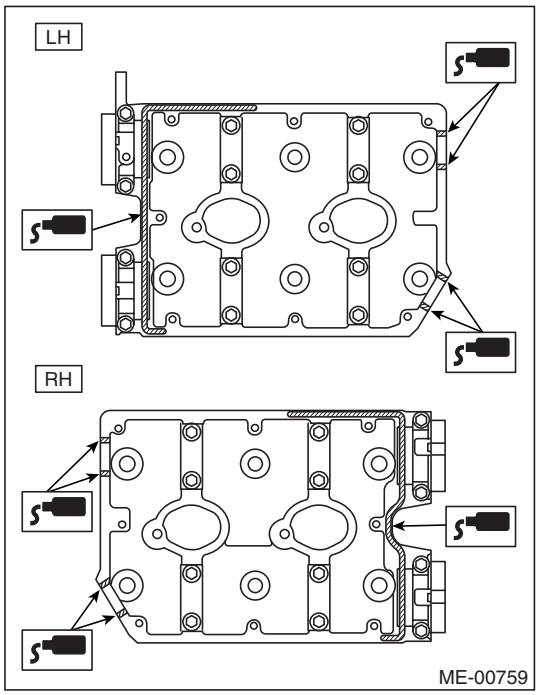
ST1	499587600	OIL SEAL GUIDE
ST2	499597200	OIL SEAL GUIDE



4) Rocker cover installation:
(1) Install the gasket on rocker cover.
Install the peripheral gasket and ignition coil gasket.
(2) Apply fluid packing to four front open edges of peripheral gasket.

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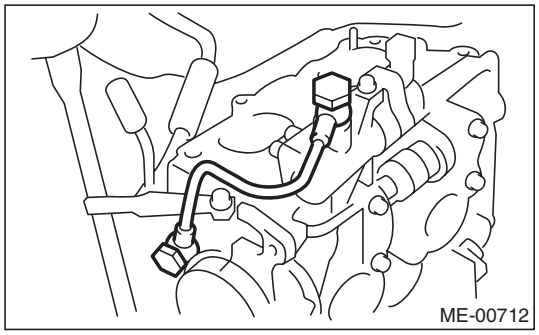
Fluid packing:
Part No. 004403007
THREE BOND 1215 or equivalent



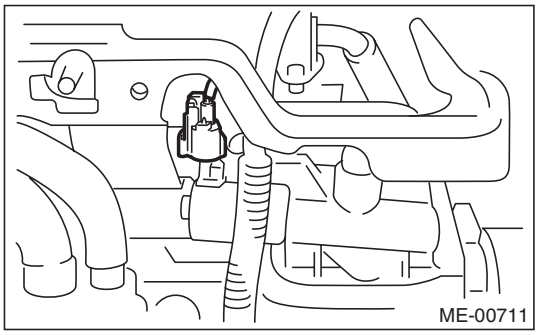
(3) Install the rocker cover on cylinder head. Ensure the gasket is properly positioned during installation.

5) Install the oil pipe.

Tightening torque:
30 N·m (3.1 kgf-m, 22.1 ft-lb)

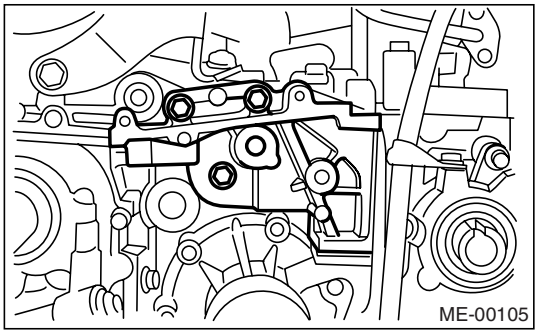


6) Connect the variable valve timing solenoid valve connector.



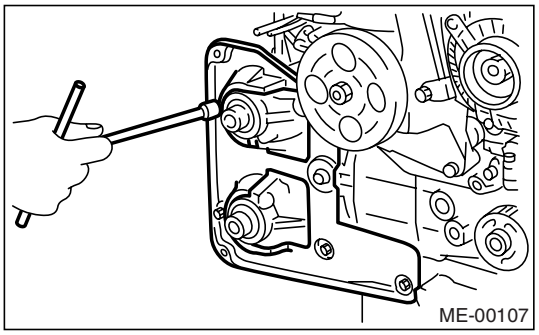
7) Install the spark plug cord.
8) Similarly, install the parts on right-hand side.
9) Install the tensioner bracket.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



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

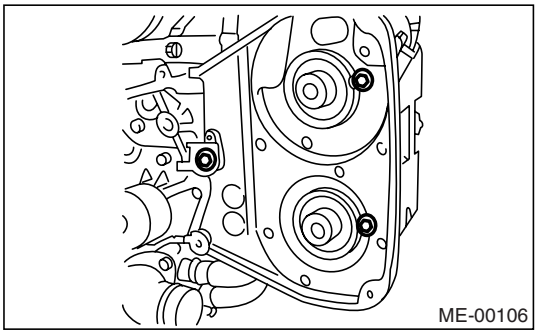
Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)



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

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)

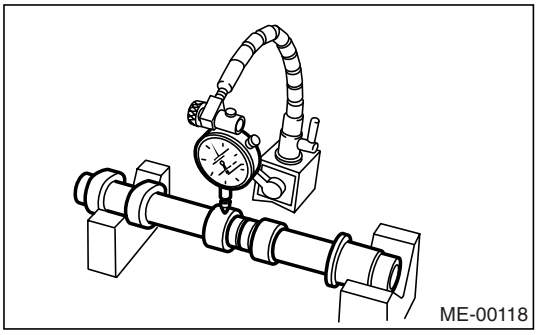


12) Install the crankshaft sprocket. <Ref. to ME(H4DOTC)-70, INSTALLATION, Camshaft Sprocket.>
13) Install the camshaft sprockets. <Ref. to ME(H4DOTC)-70, INSTALLATION, Camshaft Sprocket.>
14) Install the timing belt assembly. <Ref. to ME(H4DOTC)-62, INSTALLATION, Timing Belt Assembly.>
15) Install the timing belt cover. <Ref. to ME(H4DOTC)-59, INSTALLATION, Timing Belt Cover.>
16) Install the crankshaft pulley. <Ref. to ME(H4DOTC)-58, INSTALLATION, Crankshaft Pulley.>
17) Install the V-belt. <Ref. to ME(H4DOTC)-55, INSTALLATION, V-belt.>

C: INSPECTION

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

Limit:
0.020 mm (0.0008 in)

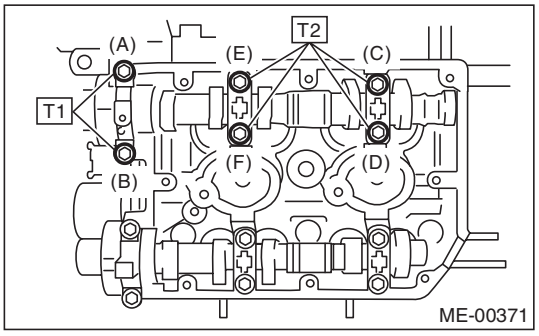


2) Check the journal for damage and wear. Replace if faulty.
3) Measure the outside diameter of camshaft journal. If the journal diameter is not as specified, check the oil clearance.

	Camshaft journal	
	Front	Center, rear
Standard	37.946 — 37.963 mm (1.4939 — 1.4946 in)	29.946 — 29.963 mm (1.1790 — 1.1796 in)

4) Measurement of the camshaft journal oil clearance:
(1) Clean the bearing caps and camshaft journals.
(2) Place the camshafts on cylinder head.
(Without installing the valve rocker.)
(3) Place a plastigauge across each of the camshaft journals.
(4) Gradually tighten the cap in at least two stages in alphabetical sequence shown in the figure, and then tighten to specified torque.
Do not turn the camshaft.

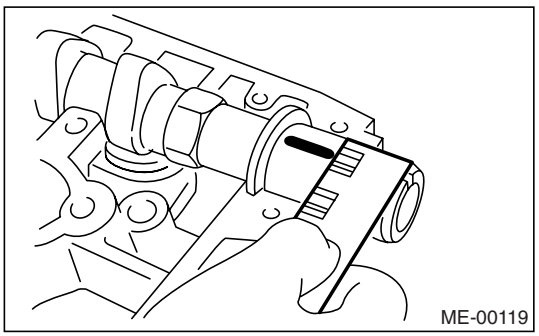
Tightening torque:
T1: 10 N·m (1.0 kgf-m, 7.2 ft-lb)
T2: 20 N·m (2.0 kgf-m, 14.5 ft-lb)



(5) Remove the bearing caps.
(6) Measure the widest point of plastigauge on each journal.
If the oil clearance exceeds the limit, replace the camshaft. If necessary, replace the camshaft caps and cylinder head as a set.

Standard:
0.037 — 0.072 mm (0.0015 — 0.0028 in)

Limit:
0.10 mm (0.0039 in)



(7) Completely remove the plastigauge.

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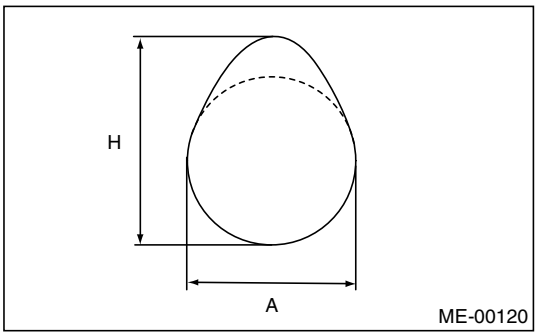
5) Check the cam face condition; remove the minor faults by grinding with oil stone. Measure the cam height H, replace if the limit has been exceeded.

Cam height: H

Standard:
• Except for STi model
Intake:
46.25 — 46.35 mm (1.821 — 1.825 in)
Exhaust:
46.15 — 46.25 mm (1.817 — 1.821 in)
• STi model
Intake:
45.25 — 45.35 mm (1.781 — 1.785 in)
Exhaust:
45.60 — 45.70 mm (1.795 — 1.799 in)

Limit:
• Except for STi model
Intake:
46.15 mm (1.817 in)
Exhaust:
46.05 mm (1.813 in)
• STi model
Intake:
45.15 mm (1.778 in)
Exhaust:
45.50 mm (1.791 in)

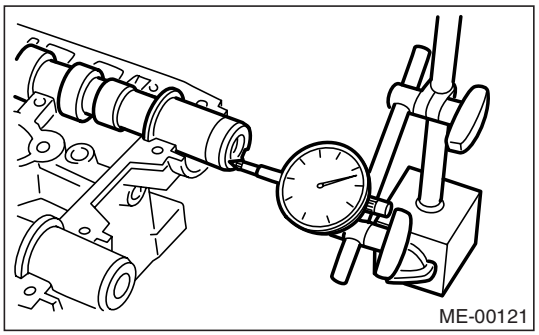
Cam base circle diameter A:
37.0 mm (1.457 in)



6) Measure the thrust clearance of camshaft with dial gauge. If the clearance exceeds the limit, replace the caps and cylinder head as a set. If necessary, replace the camshaft.

Standard:
0.040 — 0.080 mm (0.0016 — 0.0031 in)

Limit:
0.1 mm (0.004 in)

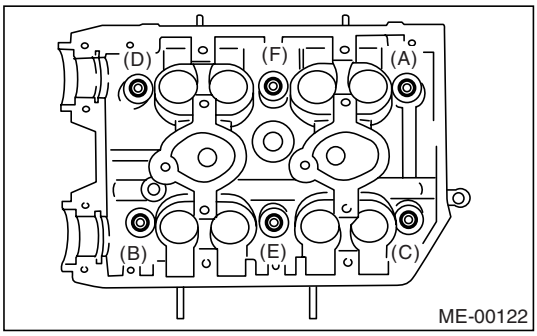


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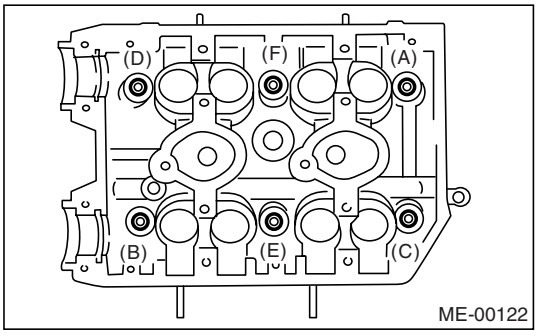
19.Cylinder Head Assembly

A: REMOVAL

1) Remove the V-belt. <Ref. to ME(H4DOTC)-55, REMOVAL, V-belt.>
2) Remove the crankshaft pulley. <Ref. to ME(H4DOTC)-58, REMOVAL, Crankshaft Pulley.>
3) Remove the timing belt cover. <Ref. to ME(H4DOTC)-59, REMOVAL, Timing Belt Cover.>
4) Remove the timing belt assembly. <Ref. to ME(H4DOTC)-60, REMOVAL, Timing Belt Assembly.>
5) Remove the camshaft sprocket. <Ref. to ME(H4DOTC)-69, REMOVAL, Camshaft 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)-72, REMOVAL, Camshaft.>
9) Remove the cylinder head bolts in alphabetical sequence shown in the figure.
Leave bolts (A) and (D) engaged by three or four threads to prevent the cylinder head from falling.



10) While tapping the cylinder head with a plastic hammer, separate it from cylinder block.
Remove the bolts (A) and (D) to remove cylinder head.



11) Remove the cylinder head gasket.

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

12) Similarly, remove the cylinder head (RH).

B: INSTALLATION

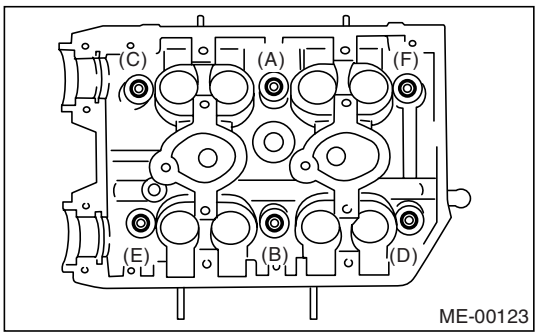
1) Install the cylinder head and gaskets on cylinder block.

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

2) Tighten the cylinder head bolts.
   (1) Apply a coat of engine oil to the washers and bolt threads.
   (2) Tighten all bolts to 29 N·m (3.0 kgf-m, 22 ft-lb) in alphabetical sequence.
   (3) Tighten all bolts to 69 N·m (7.0 kgf-m, 51 ft-lb) in alphabetical sequence again.
   (4) Back off all bolts by 180° first; back them off by 180° again in reverse order of installation.
   (5) Tighten all bolts to 39 N·m (4.0 kgf-m, 29 ft-lb) in alphabetical sequence.
   (6) Tighten all bolts 80 to 90° in alphabetical sequence.
   (7) Tighten all bolts by 40 to 45° in alphabetical sequence again.

NOTE:
Do not tighten the bolts by more than 45°.
   (8) Further tighten all bolts (A) and (B) by 40 to 45°.

NOTE:
Ensure that the total “re-tightening angle” in the previous two steps do not exceed 90°.



3) Install the camshaft. <Ref. to ME(H4DOTC)-74, 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.>
6) Install the camshaft sprocket. <Ref. to ME(H4DOTC)-70, INSTALLATION, Camshaft Sprocket.>
7) Install the timing belt assembly. <Ref. to ME(H4DOTC)-62, INSTALLATION, Timing Belt Assembly.>

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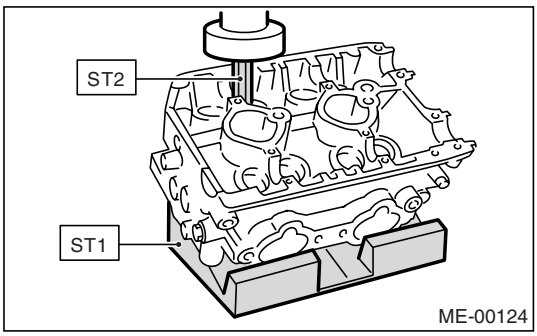
8) Install the timing belt cover. <Ref. to ME(H4DOTC)-59, INSTALLATION, Timing Belt Cover.>
9) Install the crankshaft pulley. <Ref. to ME(H4DOTC)-58, INSTALLATION, Crankshaft Pulley.>
10) Install the V-belt. <Ref. to ME(H4DOTC)-55, INSTALLATION, V-belt.>

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.

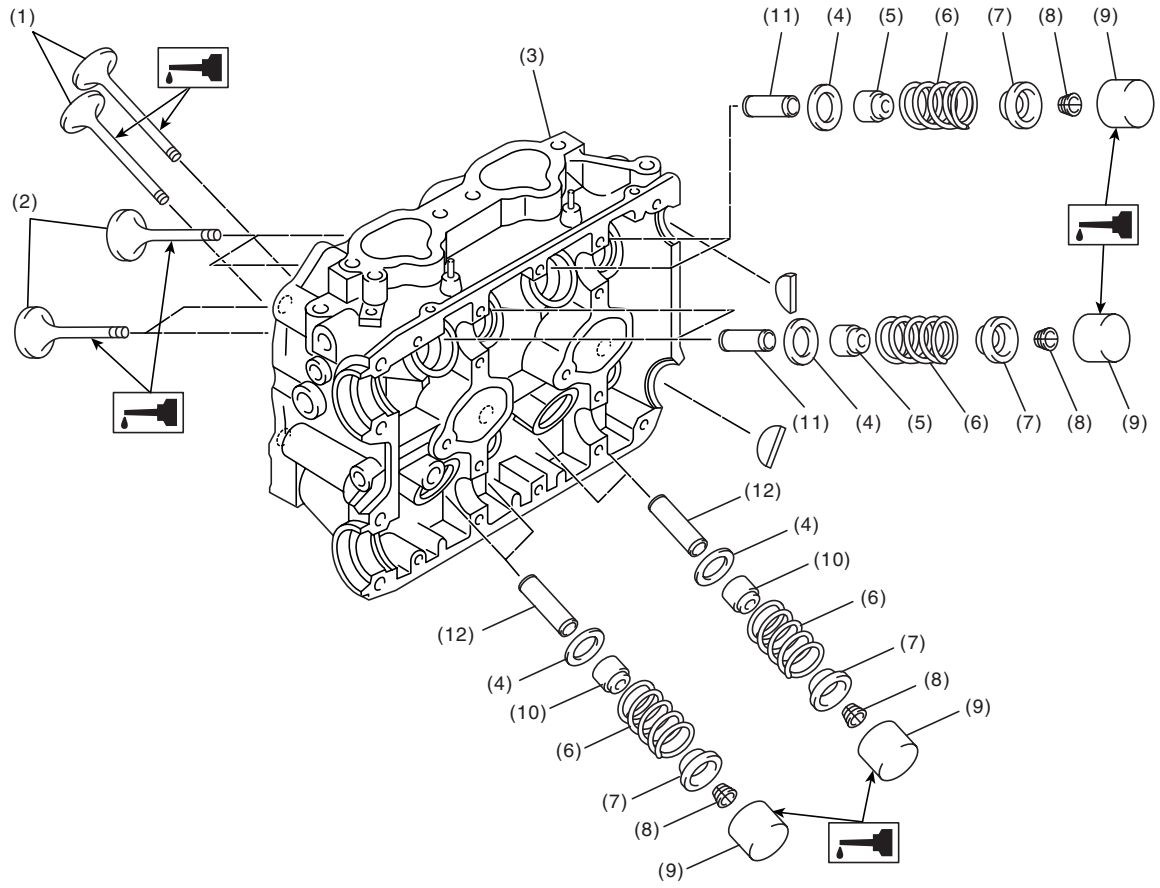
ST1 498267600 CYLINDER HEAD TABLE
ST2 499718000 VALVE SPRING REMOVER

NOTE:
• Keep the removed parts in order for re-installing in their original positions.
• 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.



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D: ASSEMBLY



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

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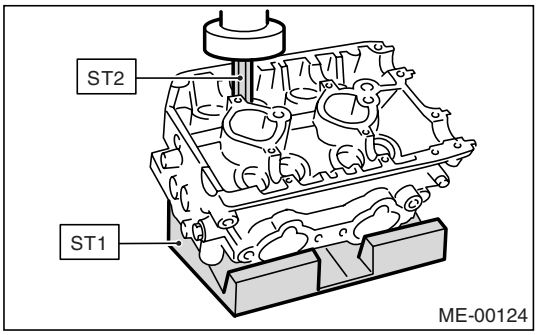
1) Installation of valve spring and valve:
(1) Coat the stem of each valve with engine oil and insert the valve into valve guide.

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

(2) Set the cylinder head on ST1.
(3) Install the valve spring and retainer using ST2.

ST1 498267600 CYLINDER HEAD TABLE
ST2 499718000 VALVE SPRING REMOVER

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



(4) Compress the valve spring, and then fit the valve spring retainer key.
(5) After installing, tap the valve spring retainers lightly with wooden hammer for better seating.

2) Apply oil to the surface of the valve lifter.
3) Install the valve lifter.

E: INSPECTION

1. CYLINDER HEAD

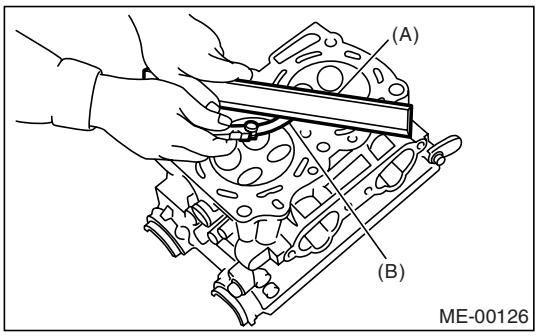
1) Make sure that no crack or other damage exists. In addition to visual inspection, inspect the important areas by means of red check.
2) Measure the warping of the cylinder head surface that mates with crankcase by using a straight edge (A) and thickness gauge (B).
If the warping exceeds 0.05 mm (0.0020 in), regrind the surface with a surface grinder.

Warping limit:
0.05 mm (0.0020 in)

Grinding limit:
0.3 mm (0.012 in)

Standard height of cylinder head:
127.5 mm (5.02 in)

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

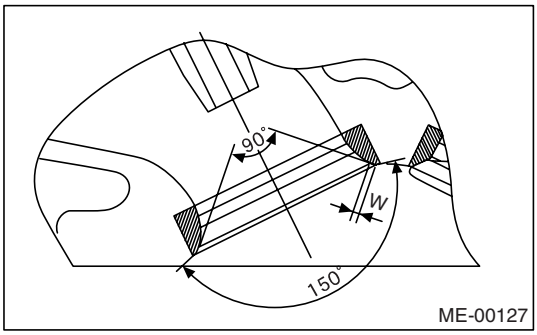


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2. VALVE SEAT

Inspect the intake and exhaust valve seats, and then correct the contact surfaces with valve seat cutter if they are defective or when valve guides are replaced.

Valve seat width: W
Intake
Standard
1.0 mm (0.039 in)
Limit
1.7 mm (0.067 in)
Exhaust
Standard
1.5 mm (0.059 in)
Limit
2.2 mm (0.087 in)



3. VALVE GUIDE

1) Check the clearance between valve guide and stem. The clearance can be checked by measuring the outside diameter of valve stem and the inside diameter of valve guide with outside and inside micrometers respectively.

Clearance between the valve guide and valve stem:

Standard
Intake
0.030 — 0.057 mm (0.0012 — 0.0022 in)
Exhaust
0.040 — 0.067 mm (0.0016 — 0.0026 in)

Limit
0.15 mm (0.0059 in)

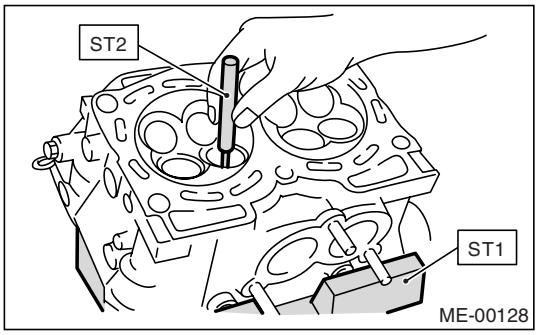
2) If the clearance between valve guide and stem exceeds the limit, replace the valve guide or valve itself whichever shows greater amount of wear. See the following procedure for valve guide replacement.

Valve guide inner diameter:
6.000 — 6.012 mm (0.2362 — 0.2367 in)

Valve stem outer diameters:
• DOHC turbo model
Intake
5.955 — 5.970 mm (0.2344 — 0.2350 in)
Exhaust
5.945 — 5.960 mm (0.2341 — 0.2346 in)

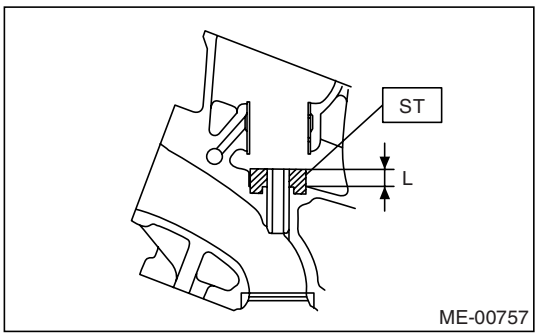
(1) Place the cylinder head on ST1 with the combustion chamber upward so that valve guides enter the holes in ST1.
(2) Insert the ST2 into valve guide and press it down to remove the valve guide.

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

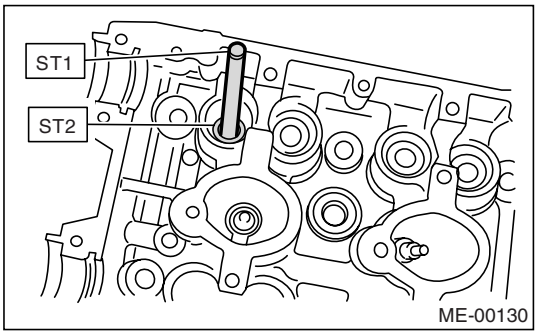


(4) Before installing a new valve guide, make sure that neither scratches nor damages exist on the inside surface of the valve guide holes in cylinder head.

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(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 499767200VALVE 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.

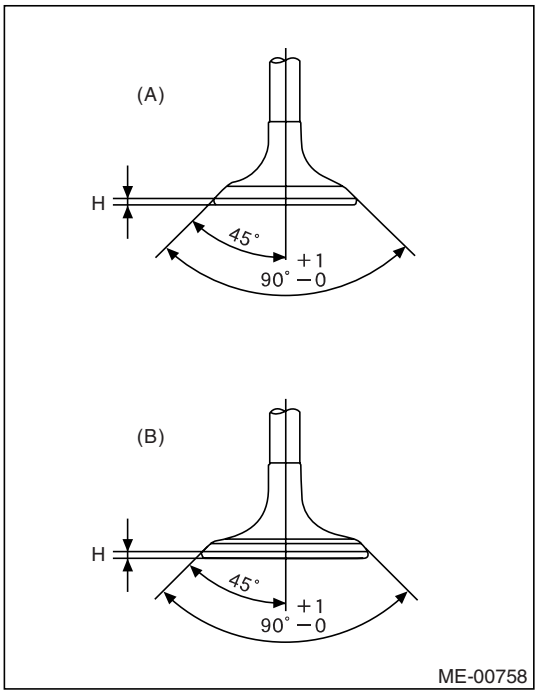
(8) Recheck the contact condition between valve and valve seat after replacing the valve guide.

4. INTAKE AND EXHAUST VALVE

1) Inspect the flange and stem of valve, and replace if damaged, worn, or deformed, or if “H” is less than the specified limit.

H:
Intake (A)
Standard
1.2 mm (0.047 in)
Limit
0.8 mm (0.031 in)
Exhaust (B)
Standard
1.5 mm (0.059 in)
Limit
0.8 mm (0.031 in)

Valve overall length:
Intake (A)
104.4 mm (4.110 in)
Exhaust (B)
104.7 mm (4.122 in)



2) Put a small amount of grinding compound on the seat surface and lap the valve and seat surface. Install a new intake valve oil seal after lapping.

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5. VALVE SPRINGS

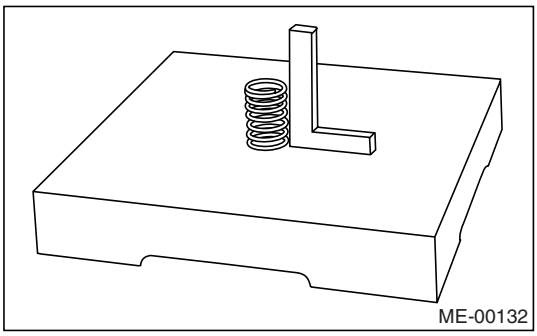
1) Check the valve springs for damage, free length, and tension. Replace the valve spring if it is not within specifications presented in the table.
2) To measure the squareness of valve spring, stand the spring on a surface plate and measure its deflection at the top using a try square.

- Except for STi model

		Valve spring
Free length		47.32 mm (1.863 in)
Tension/spring height	Set	205 — 235 N (20.9 — 24.0 kgf, 41.6 — 52.8 lb) /36.0 mm (1.417 in)
	Lift	426 — 490 N (43.4 — 50.0 kgf, 95.8 — 110 lb) /26.5 mm (1.04 in)
Squareness		2.5°, 2.1 mm (0.083 in)

- STi model

		Valve spring
Free length		43.89 mm (1.728 in)
Tension/spring height	Set	205 — 237 N (20.9 — 24.2 kgf, 46.1 — 53.3 lb) /36.0 mm (1.417 in)
	Lift	553 — 611 N (56.4 — 62.3 kgf, 124 — 137 lb) /26.45 mm (1.041 in)
Squareness		2.5°, 1.9 mm (0.075 in)


ME-00132

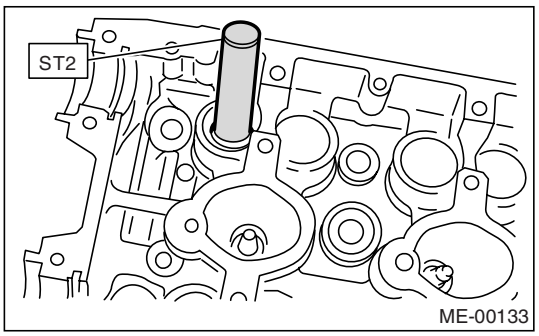
6. INTAKE AND EXHAUST VALVE OIL SEAL

Replace the oil seal with a new one, if the lip is damaged or spring out of place, or when the surfaces of intake valve and valve seat are reconditioned or intake valve guide is replaced.
1) Place the cylinder head on ST1.
2) Press in the oil seal to the specified dimension indicated in the figure by using ST2.
ST1 498267600 CYLINDER HEAD TABLE
ST2 498857100 VALVE OIL SEAL GUIDE

NOTE:
- Apply engine oil to oil seal before press-fit.
- Differentiate between the intake valve oil seal and exhaust valve oil seal by noting their difference in color.

Color of rubber part:
Intake [Black]
Exhaust [Brown]

Color of spring part:
Intake [Silver]
Exhaust [Silver]



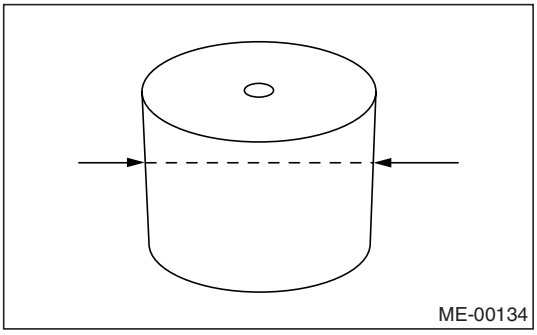
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7. VALVE LIFTER

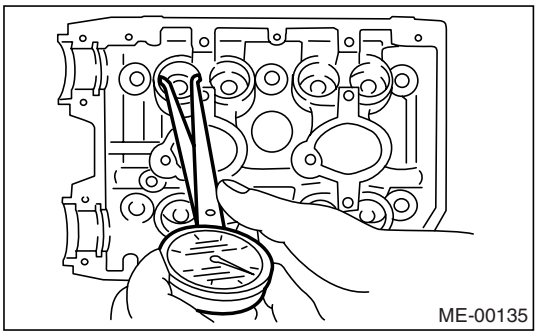
1) Visually check the valve lifter.
2) Measure the outer diameter of valve lifter.

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 limit, replace the cylinder head.

Standard:
0.019 — 0.057 mm (0.0007 — 0.0022 in)

Limit:
0.100 mm (0.0039 in)

F: DISPOSAL

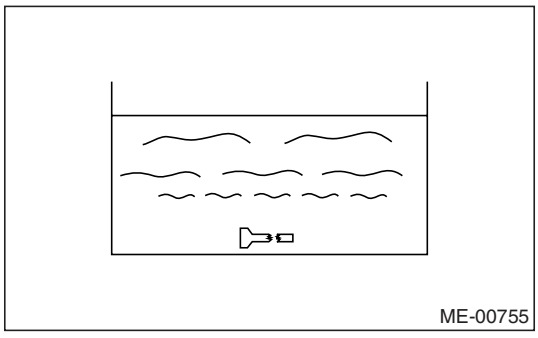
CAUTION:
• Metallic sodium is enclosed in the exhaust valve. Metallic sodium is extremely alkaline and may produce severe chemical reactions. Full consideration must therefore be given to the following points when handling or disposing of the valve.
• Since metallic sodium may cause blindness if contacted with the eyes, burns if contacted with the skin, and fire, do not deliberately take the valve apart.

1) If the valve is damaged, remove the valve and neutralize it by immersing it in water, and dispose of it in the same way that general steel materials are disposed of. The disposal method is described in the following.
(1) Wearing rubber gloves, remove the damaged valve from the cylinder head.
(2) Prepare a large receptacle (bucket or other container) in a well ventilated location, and fill the receptacle with water (at least 10 liters).
(3) Immerse the damaged valve in the receptacle.

CAUTION:
A severe reaction may occur, so stand at least 2 — 3 m from the receptacle. Because the reaction will produce hydrogen gas, moreover, keep the receptacle away from sparks or flames.

(4) Once the reaction is completed (about 4 — 5 hours have elapsed), carefully remove the valve using large pincers so that the reaction liquid does not contact your skin, and dispose of it with other parts that are being disposed of.
(5) The reaction liquid is a strong alkaline solution, so it must be disposed of in accordance with local regulations.

CAUTION:
Make sure the reaction liquid does not contact your skin. If contact with skin occurs, immediately wash the affected area with large quantities of water.



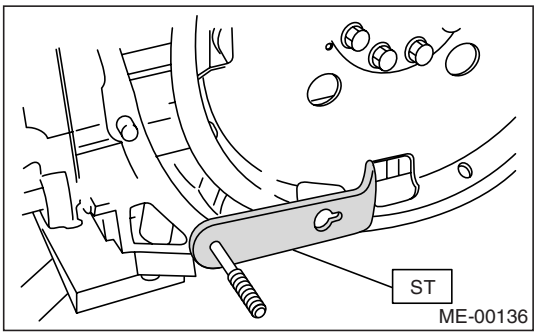
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20.Cylinder Block

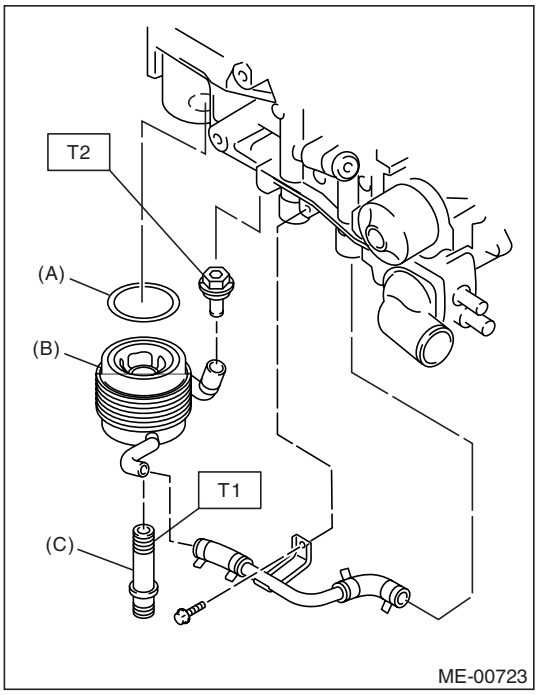
A: REMOVAL

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)-55, REMOVAL, V-belt.>
3) Remove the crankshaft pulley. <Ref. to ME(H4DOTC)-58, REMOVAL, Crankshaft Pulley.>
4) Remove the timing belt cover. <Ref. to ME(H4DOTC)-59, REMOVAL, Timing Belt Cover.>
5) Remove the timing belt assembly. <Ref. to ME(H4DOTC)-60, REMOVAL, Timing Belt Assembly.>
6) Remove the camshaft sprocket. <Ref. to ME(H4DOTC)-69, REMOVAL, Camshaft Sprocket.>
7) Remove the crankshaft sprocket. <Ref. to ME(H4DOTC)-71, REMOVAL, Crankshaft Sprocket.>
8) Remove the generator and A/C compressor with their brackets.
9) Remove the cylinder head assembly. <Ref. to ME(H4DOTC)-81, REMOVAL, Cylinder Head Assembly.>
10) Remove the clutch disc and cover. (MT model) <Ref. to CL-20, REMOVAL, Clutch Disc and Cover.>
11) Remove the flywheel. (MT model) <Ref. to CL-24, REMOVAL, Flywheel.>
12) Remove the drive plate. (AT model)
Using the ST, lock crankshaft.
ST 498497100 CRANKSHAFT STOPPER



13) Remove the oil separator cover.
14) Remove the water by-pass pipe for heater.
15) Remove the oil filter.
ST 498547000 OIL FILTER WRENCH
16) Remove the oil cooler.



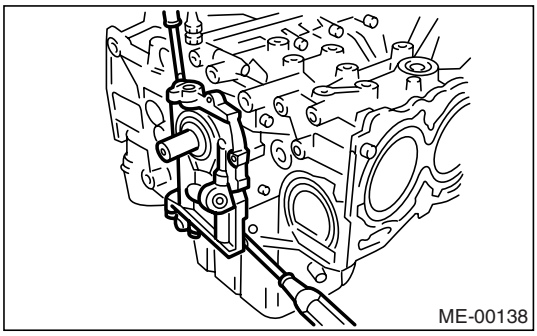
(A) Gasket
(B) Oil cooler
(C) Oil cooler connector

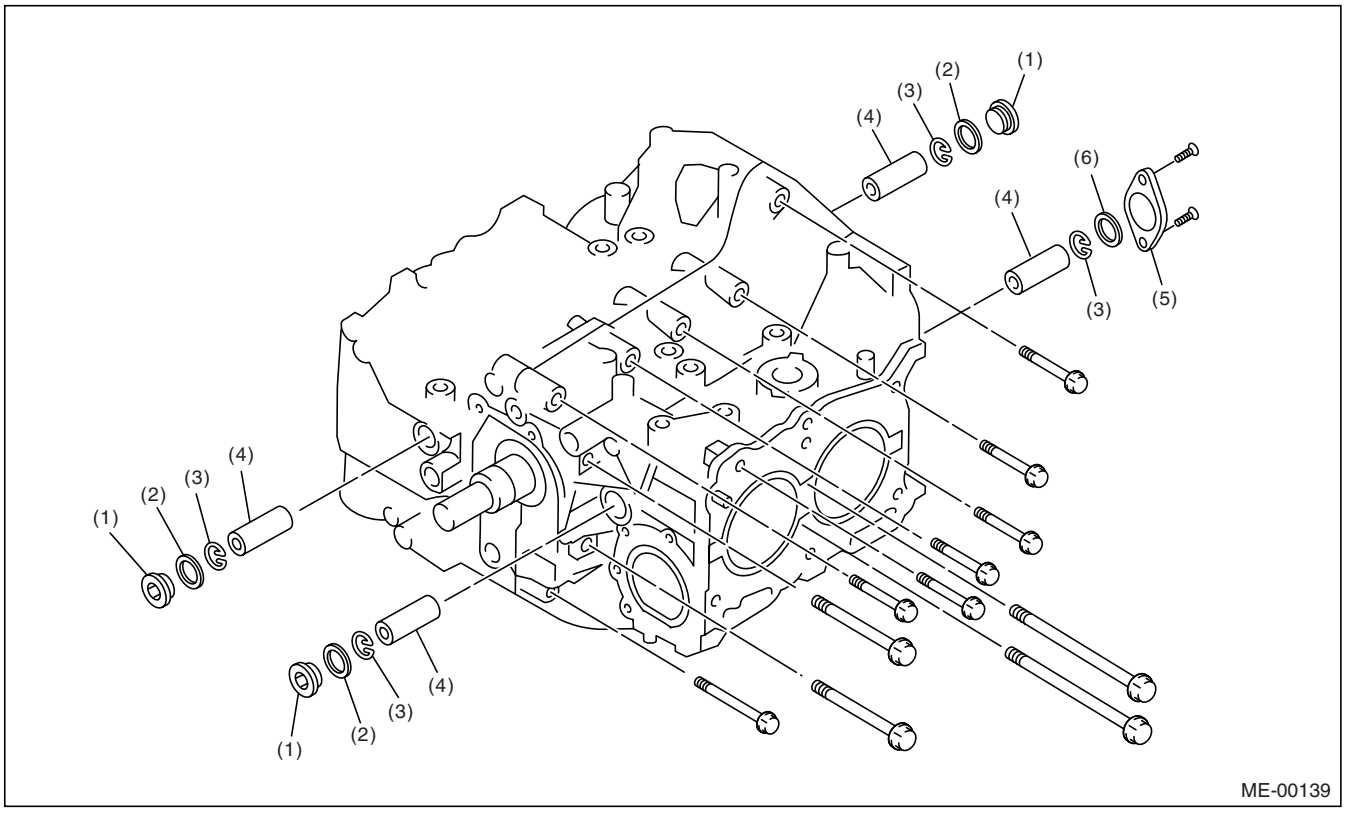
17) Removal of oil pan:
(1) Turn the cylinder block with #2 and #4 piston sides facing upward.
(2) Remove the bolts which secure oil pan to cylinder block.
(3) Insert an oil pan cutter blade between cylinder block-to-oil pan clearance, and then remove the oil pan.
Do not use a screwdriver or similar tool in place of oil pan cutter.
18) Remove the oil strainer stay.
19) Remove the oil strainer.
20) Remove the baffle plate.
21) Remove the water pipes.
22) Remove the water pump.

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23) Remove the oil pump from cylinder block.
Use a flat-bladed screwdriver as shown in the figure when removing the oil pump.

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

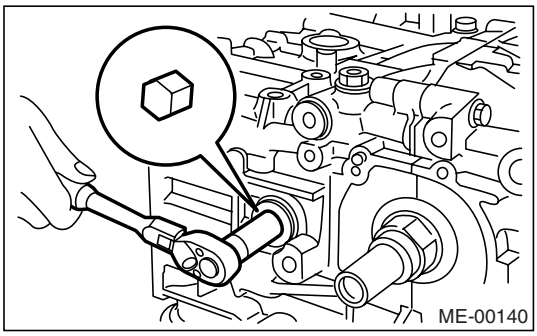




(1) Service hole plug
(2) Gasket
(3) Circlip
(4) Piston pin
(5) Service hole cover
(6) O-ring

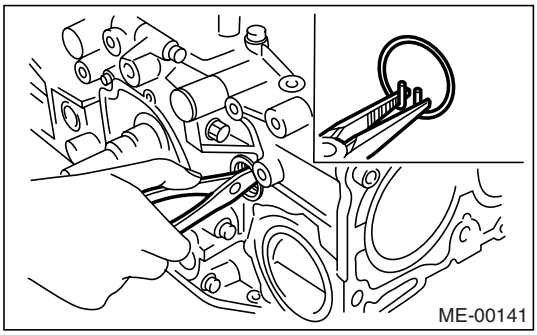
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24) Remove the service hole cover and service hole plugs using hexagon wrench [14 mm (0.55 in)].



25) Rotate the crankshaft to bring #1 and #2 pistons to bottom dead center position, and then remove the piston circlip through service hole of #1 and #2 cylinders.

ST 499897200 PISTON CIRCLIP PLIERS

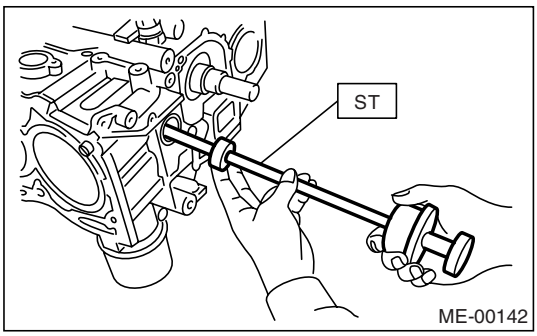


26) Draw out the piston pin from #1 and #2 pistons using ST.

ST 499097700 PISTON PIN REMOVER (Australia model except for STi model)

ST 499097600 PISTON PIN REMOVER (Except for Australia model)

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



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

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

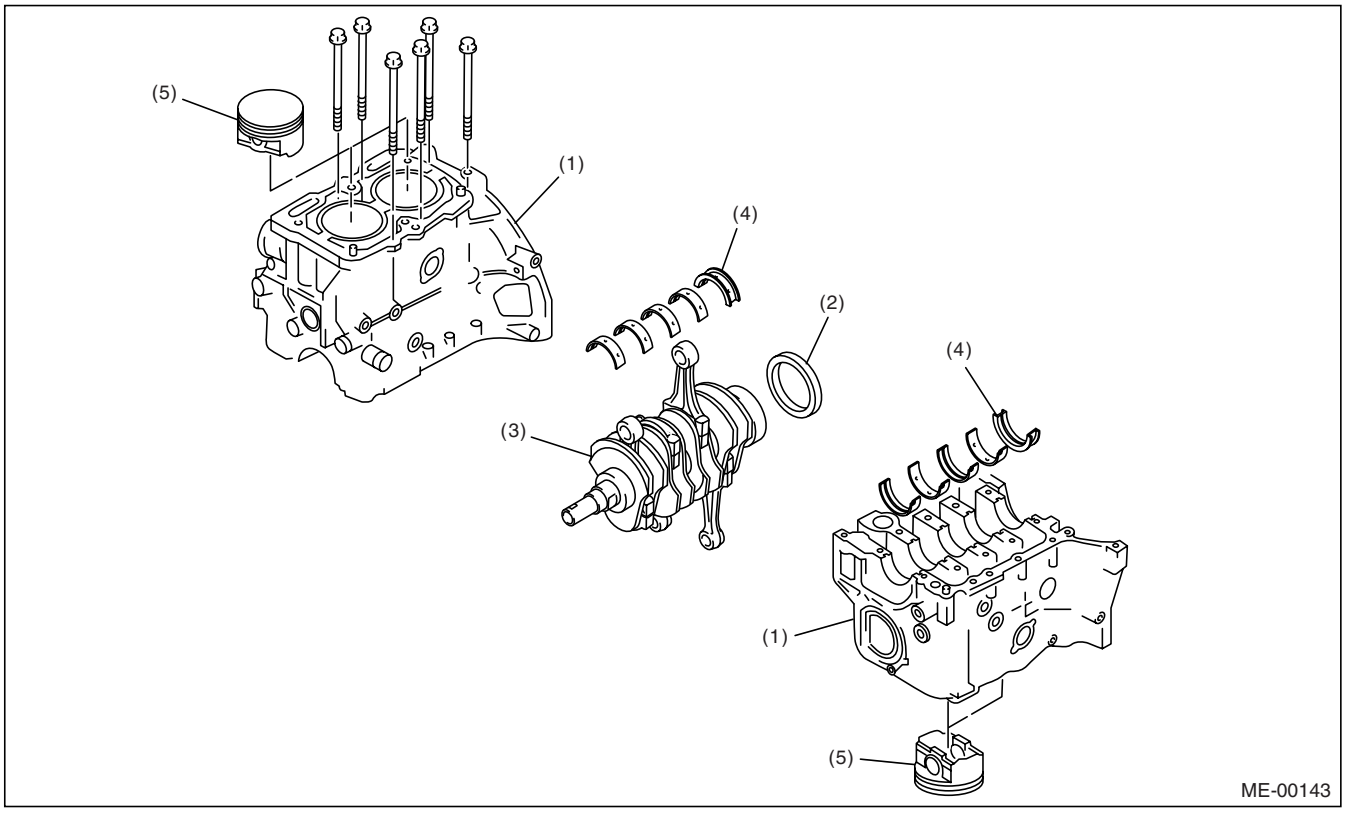
29) Back off the bolts which connect the cylinder block on the side of #1 and #3 cylinders two or three turns.

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

31) Separate the cylinder blocks (LH) and (RH).

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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

32) Remove the rear oil seal.
33) Remove the crankshaft together with connecting rod.
34) Remove the crankshaft bearings from cylinder block using a hammer handle.

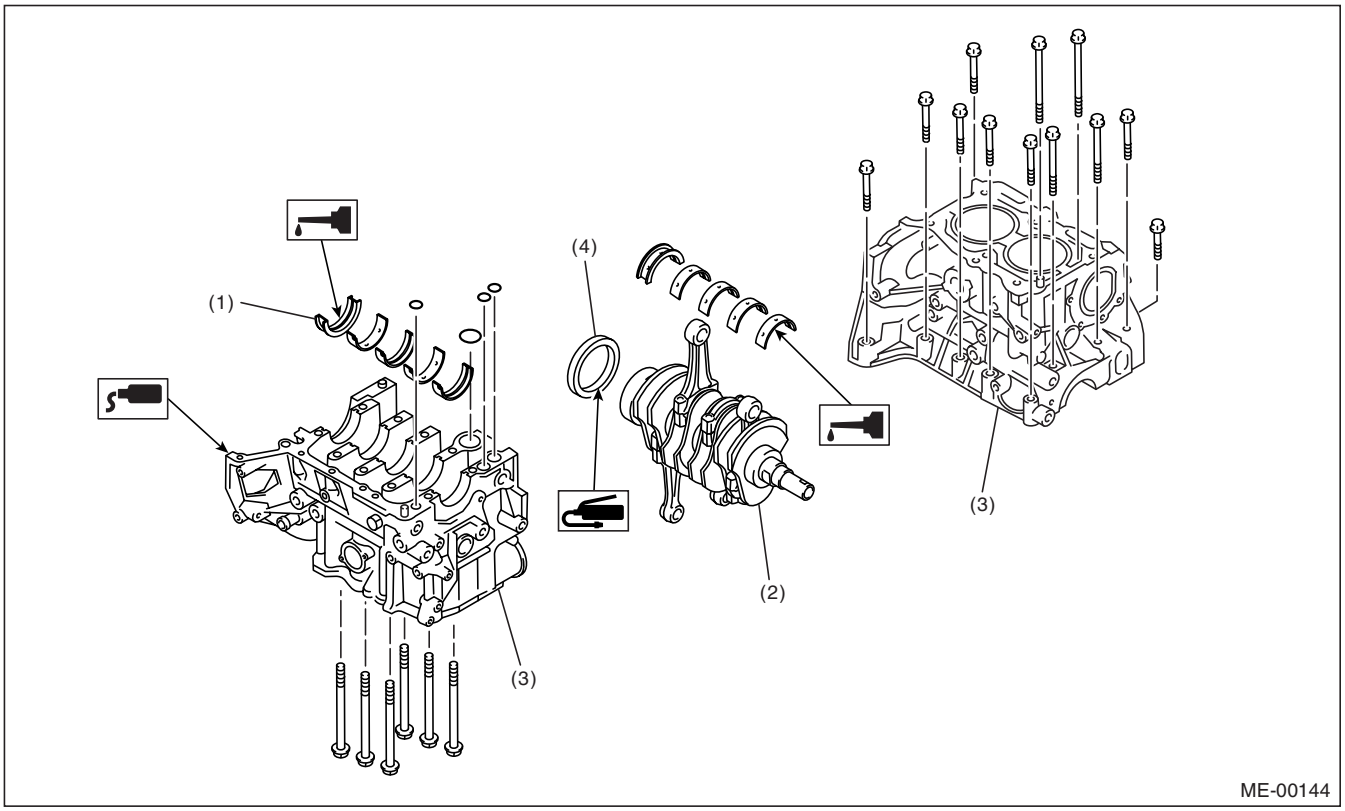
NOTE:
Do not confuse the combination of crankshaft bearings.
Press the bearing at the end opposite to locking lip.

35) Draw out each piston from cylinder block using a wooden bar or hammer handle.

NOTE:
Do not confuse the combination of piston and cylinder.

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B: INSTALLATION

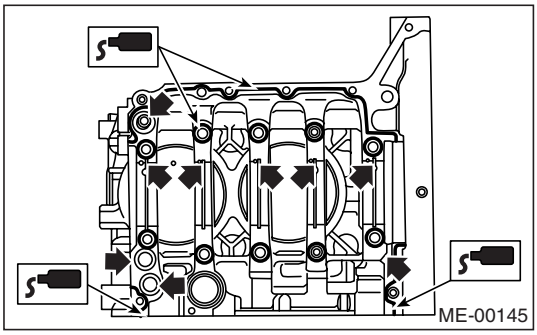


(1) Crankshaft bearing
(2) Crankshaft
(3) Cylinder block
(4) Rear oil seal

1) Remove oil in the mating surface of bearing and cylinder block before installation. Also apply a coat of engine oil to crankshaft pins.
2) Position the crankshaft on #2 and #4 cylinder block.
3) Apply fluid packing to the mating surface of #1 and #3 cylinder block, and position it on #2 and #4 cylinder block.

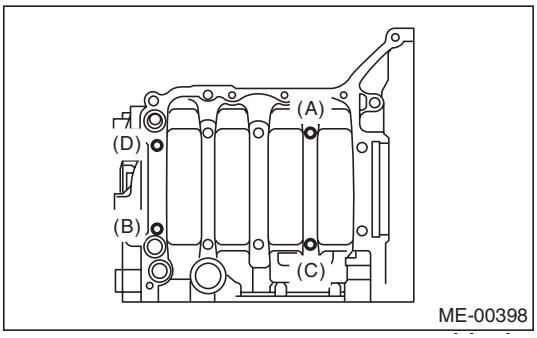
Fluid packing:
Part No. 004403007
THREE BOND 1215 or equivalent

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



4) Tighten the 10 mm cylinder block connecting bolts in alphabetical sequence shown in the figure. (LH side)

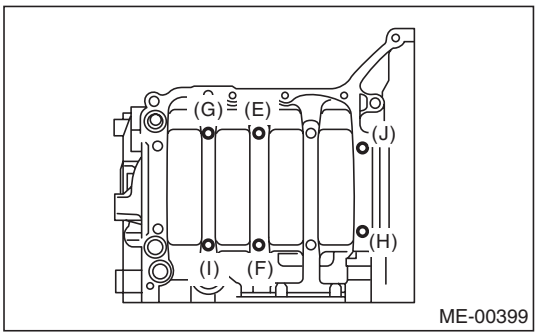
Tightening torque:
15 N·m (1.5 kgf-m, 10.8 ft-lb)



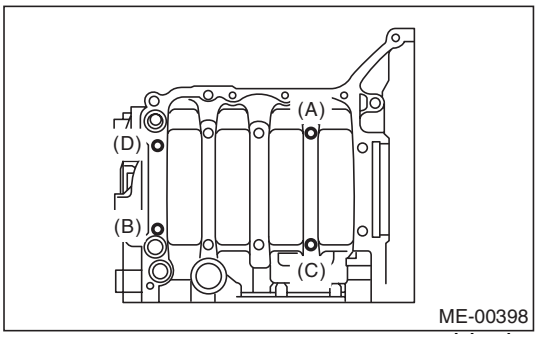
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5) Tighten the 10 mm cylinder block connecting bolts in alphabetical sequence shown in the figure. (RH side)

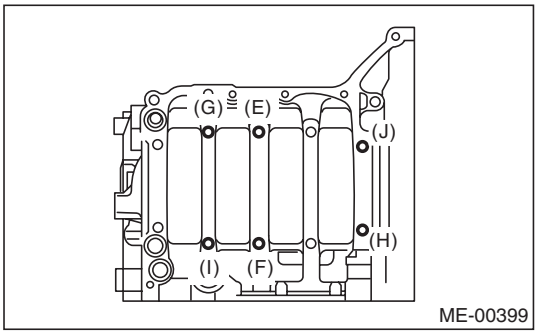
Tightening torque:
15 N·m (1.5 kgf-m, 10.8 ft-lb)



6) Further tighten the LH side bolts (A — D) to 90° in alphabetical sequence.

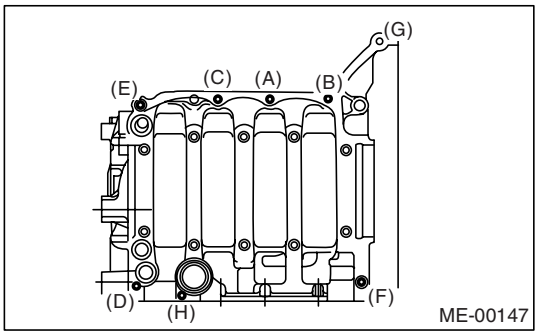


7) Further tighten the RH side bolts (E — J) to 90° in alphabetical sequence.



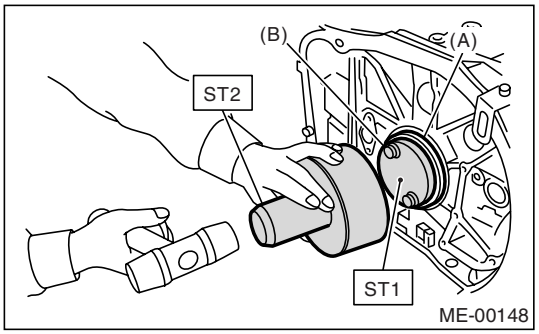
8) Tighten the 8 mm and 6 mm cylinder block connecting bolts in alphabetical sequence shown in the figure.

Tightening torque:
(A) — (G): 25 N·m (2.5 kgf-m, 18.1 ft-lb)
(H): 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



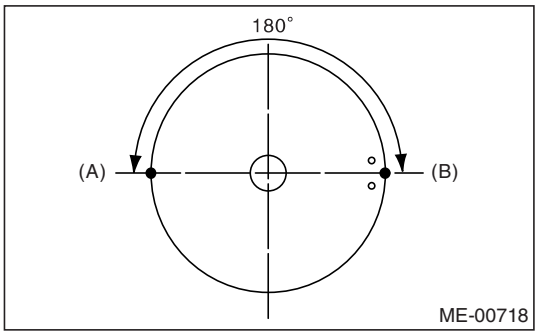
9) Install the rear oil seal using ST1 and ST2.

ST1	499597100	CRANKSHAFT OIL SEAL GUIDE
ST2	499587200	CRANKSHAFT OIL SEAL INSTALLER



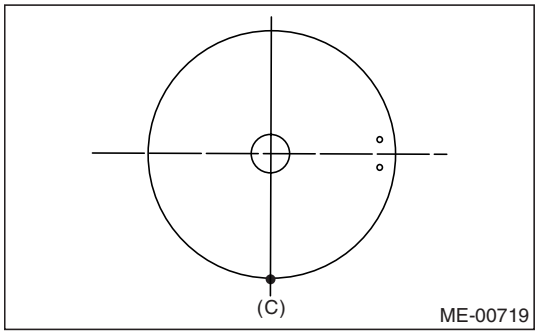
(A) Rear oil seal
(B) Flywheel attaching bolt

10) Position the top ring gap at (A) or (B) in the figure.
11) Position the second ring gap at 180° on the reverse side for the top ring gap.

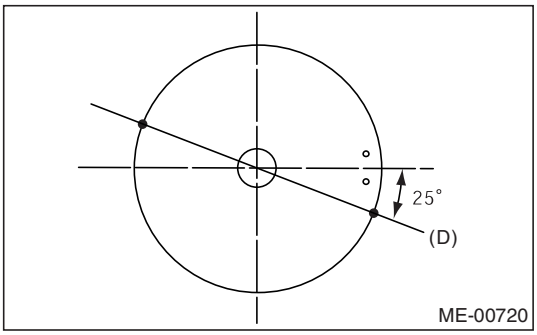


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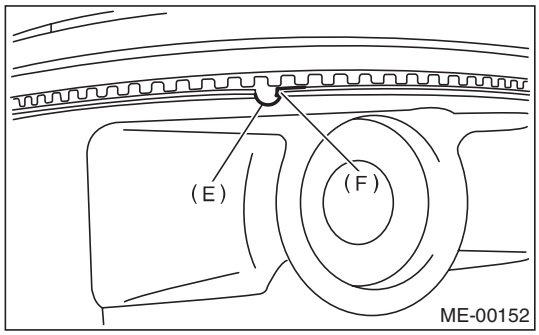
12) Position the expander gap at (C) in the figure.



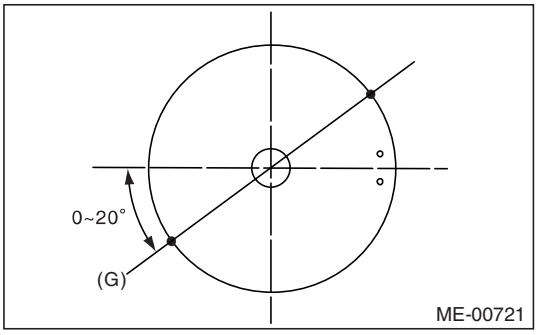
13) Position the lower rail gap at (D) in the figure.



14) Align lower rail spin stopper (F) with piston side surface hole (E).



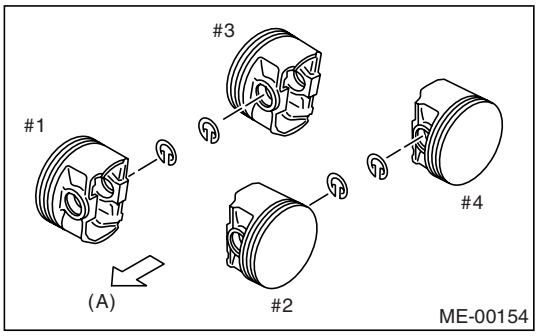
15) Position the upper rail gap at (G) in the figure.



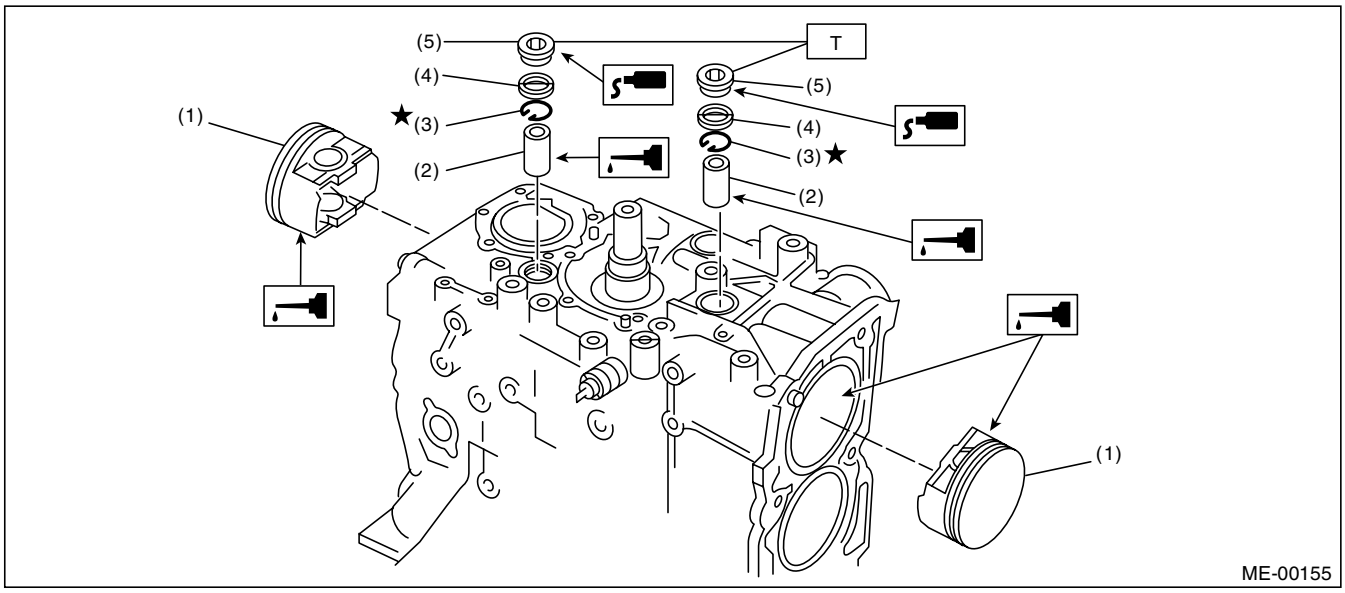
NOTE:
- Ensure ring gaps do not face the same direction.
- Ensure ring gaps are not within the piston skirt area.

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

NOTE:
Use new circlips.



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

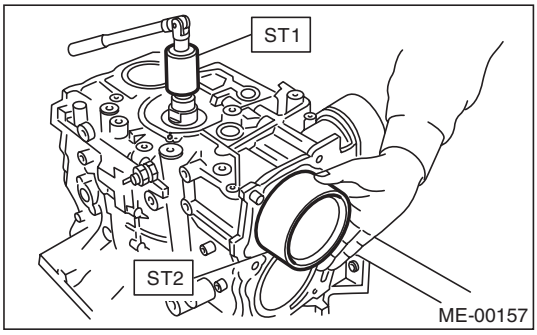
Tightening torque: N·m (kgf-m, ft-lb)
T: 70 (7.1, 51.4)

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

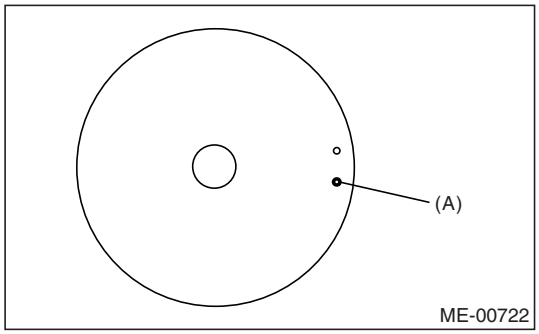
ST1 499987500 CRANKSHAFT SOCKET

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

ST2 398744300 PISTON GUIDE



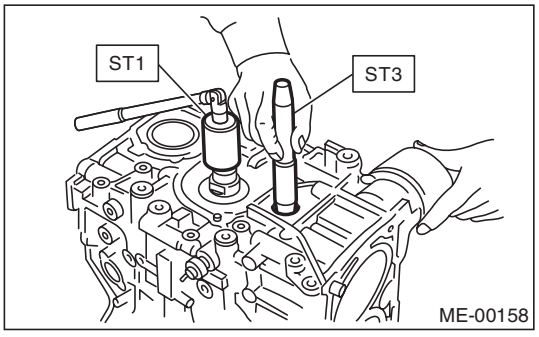
NOTE:
Piston front mark faces towards the front of the engine.



(A) Front mark

18) Installing piston pin:
(1) Apply a coat of engine oil to ST3, and then insert the ST3 into service hole to align piston pin hole with connecting rod small end.

ST3 499017100 PISTON PIN GUIDE

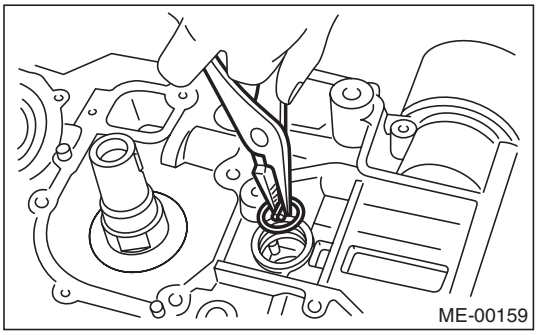


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(2) Apply a coat of engine oil to the piston pin and insert piston pin into piston and connecting rod through service hole.
(3) Using the ST, install the circlip.

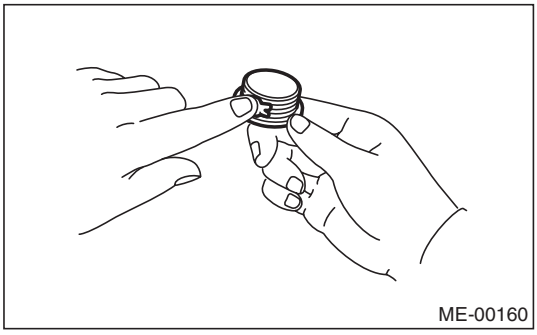
ST 499897200 PISTON CIRCLIP PLIERS

NOTE:
Use new circlips.


ME-00159

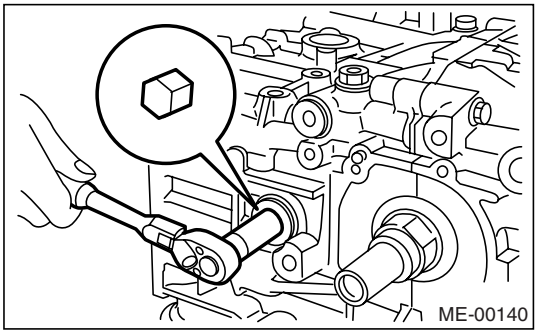
(4) Apply fluid packing around the service hole plug.

Fluid packing:
Part No. 004403007
THREE BOND 1215 or equivalent

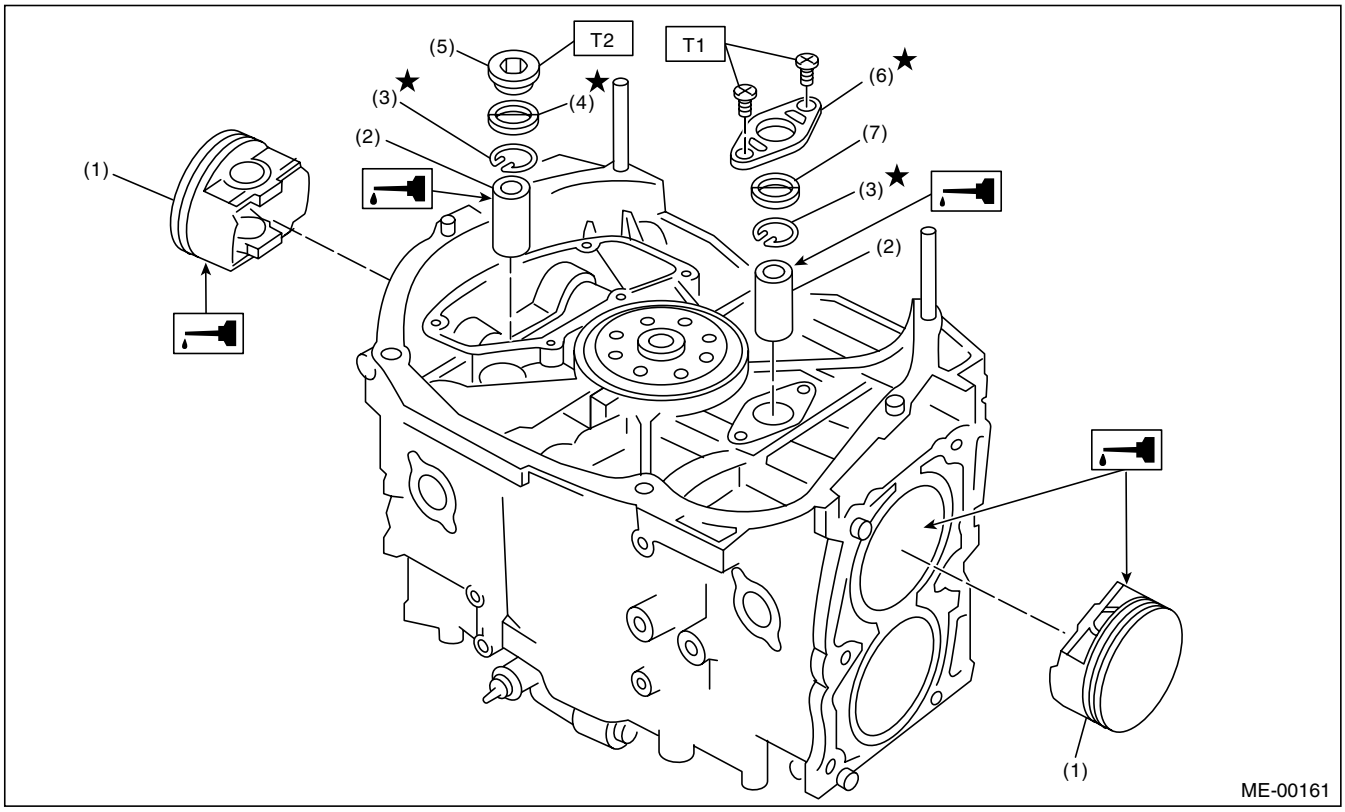

ME-00160

(5) Install the service hole plug and gasket.

NOTE:
Use a new gasket.


ME-00140

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

Tightening torque: N·m (kgf-m, ft-lb)
T1: 6.4 (0.65, 4.7)
T2: 70 (7.1, 51.4)

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

19) Install the water pipe.
20) Install the baffle plate.

Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

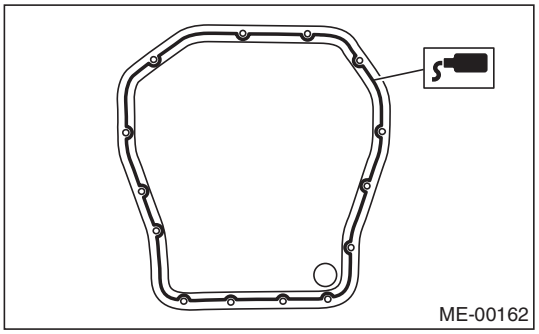
21) Install the oil strainer and O-ring

Tightening torque:
10 N·m (1.0 kgf-m, 7 ft-lb)

22) Install the oil strainer stay.

23) Apply fluid packing to the matching surfaces, and then install the oil pan.

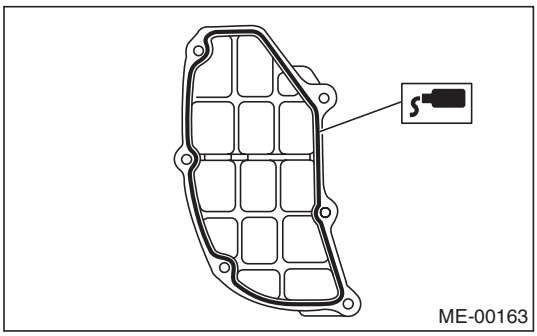
Fluid packing:
Part No. 004403007
THREE BOND 1215 or equivalent



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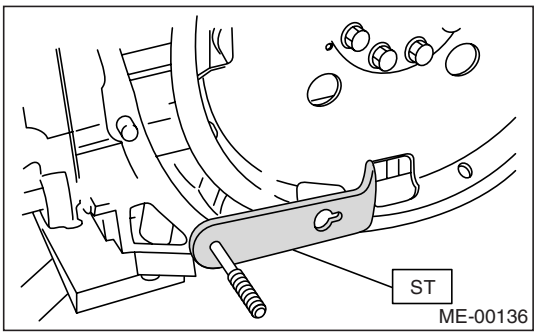
24) Apply fluid packing to the matching surfaces, and then install the oil separator cover.

Fluid packing:
Part No. 004403007
THREE BOND 1215 or equivalent

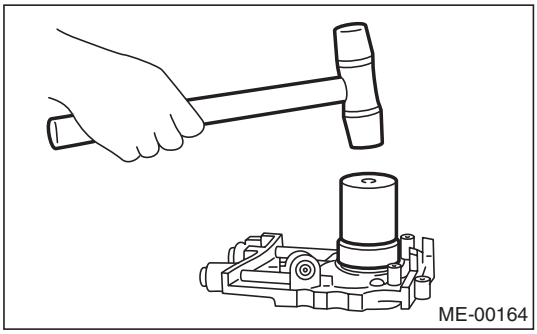


25) Install the drive plate. (AT model)
To lock the crankshaft, use ST.
ST 498497100 CRANKSHAFT STOPPER

Tightening torque:
72 N·m (7.3 kgf-m, 52.8 ft-lb)

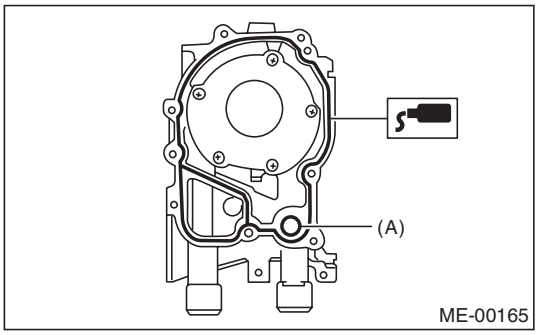


26) Install the flywheel. (MT model) <Ref. to CL-24, INSTALLATION, Flywheel.>
27) Install the clutch disc and cover. (MT model) <Ref. to CL-20, INSTALLATION, Clutch Disc and Cover.>
28) Installation of oil pump:
(1) Discard the front oil seal after removal. Replace with a new one using the ST.
ST 499587100 OIL SEAL INSTALLER



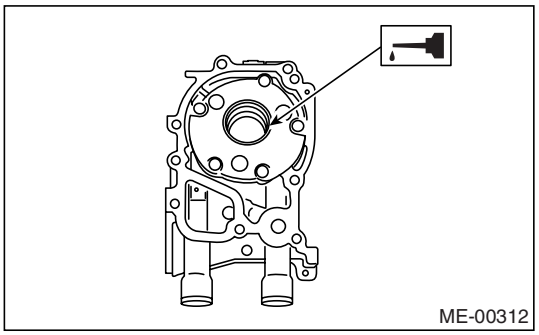
(2) Apply fluid packing to the matching surface of oil pump.

Fluid packing:
Part No. 004403007
THREE BOND 1215 or equivalent



(A) O-ring

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



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

Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

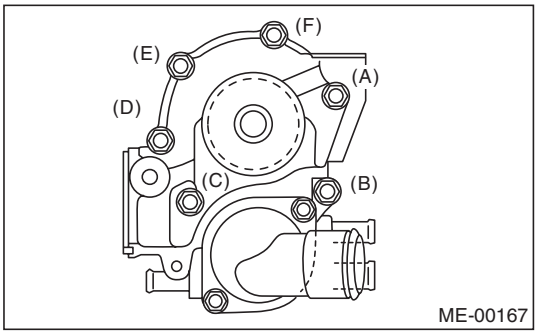
NOTE:
• Do not forget to install the O-ring and seal when installing the oil pump.
• Align the flat surface of oil pump's inner rotor with crankshaft before installation.

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29) Install the water pump and gasket.

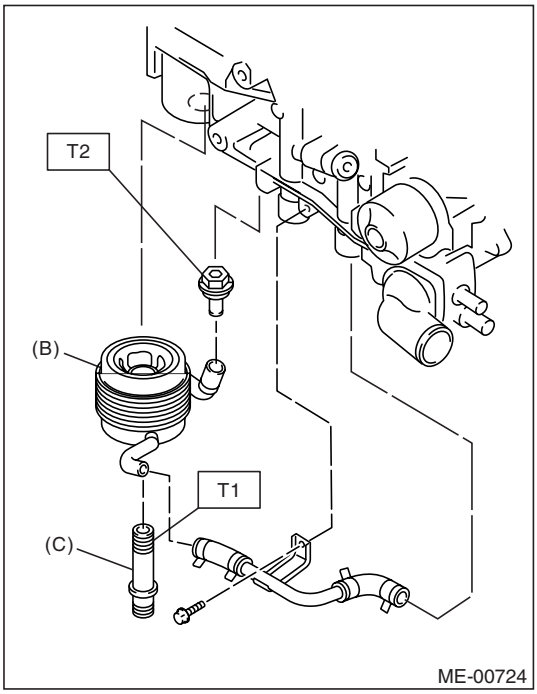
Tightening torque:
First; 12 N·m (1.2 kgf-m, 8.7 ft-lb)
Second; 12 N·m (1.2 kgf-m, 8.7 ft-lb)

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



30) Install the water by-pass pipe for heater.
31) Install the oil cooler.

Tightening torque:
T1: 54 N·m (5.5 kgf-m, 40 ft-lb)
T2: 69 N·m (7.0 kgf-m, 50.6 ft-lb)



(A) O-ring
(B) Oil cooler
(C) Oil cooler connector

32) Install the oil filter using ST.
ST 498547000 OIL FILTER WRENCH

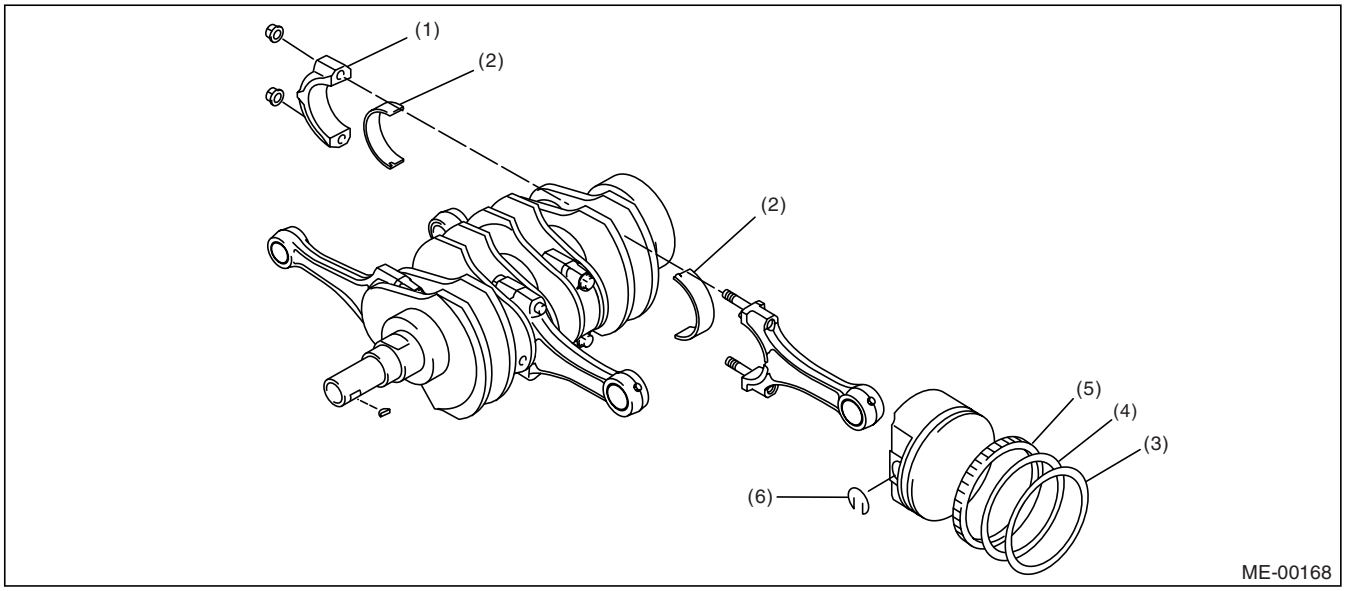
33) Install the water by-pass pipe between oil cooler and water pump.
34) Install the water pipe.

NOTE:
Always use a new O-ring.

35) Install the cylinder head assembly. <Ref. to ME(H4DOTC)-81, INSTALLATION, Cylinder Head Assembly.>
36) Install the oil level gauge guide and tighten the attaching bolt (LH side).
37) Install the rocker cover.
38) Install the crankshaft sprocket. <Ref. to ME(H4DOTC)-71, INSTALLATION, Crankshaft Sprocket.>
39) Install the camshaft sprocket. <Ref. to ME(H4DOTC)-70, INSTALLATION, Camshaft Sprocket.>
40) Install the timing belt assembly. <Ref. to ME(H4DOTC)-62, INSTALLATION, Timing Belt Assembly.>
41) Install the timing belt cover. <Ref. to ME(H4DOTC)-59, INSTALLATION, Timing Belt Cover.>
42) Install the crankshaft pulley. <Ref. to ME(H4DOTC)-58, INSTALLATION, Crankshaft Pulley.>
43) Install the generator and A/C compressor brackets on cylinder head.
44) Install the V-belt. <Ref. to ME(H4DOTC)-55, INSTALLATION, V-belt.>
45) Install the intake manifold. <Ref. to FU(H4DOTC)-14, REMOVAL, Intake Manifold.>

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C: DISASSEMBLY



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

1) Remove the connecting rod cap.
2) Remove the connecting rod bearing.

NOTE:
Arrange the removed connecting rod, connecting rod cap and bearing in order to prevent confusion.

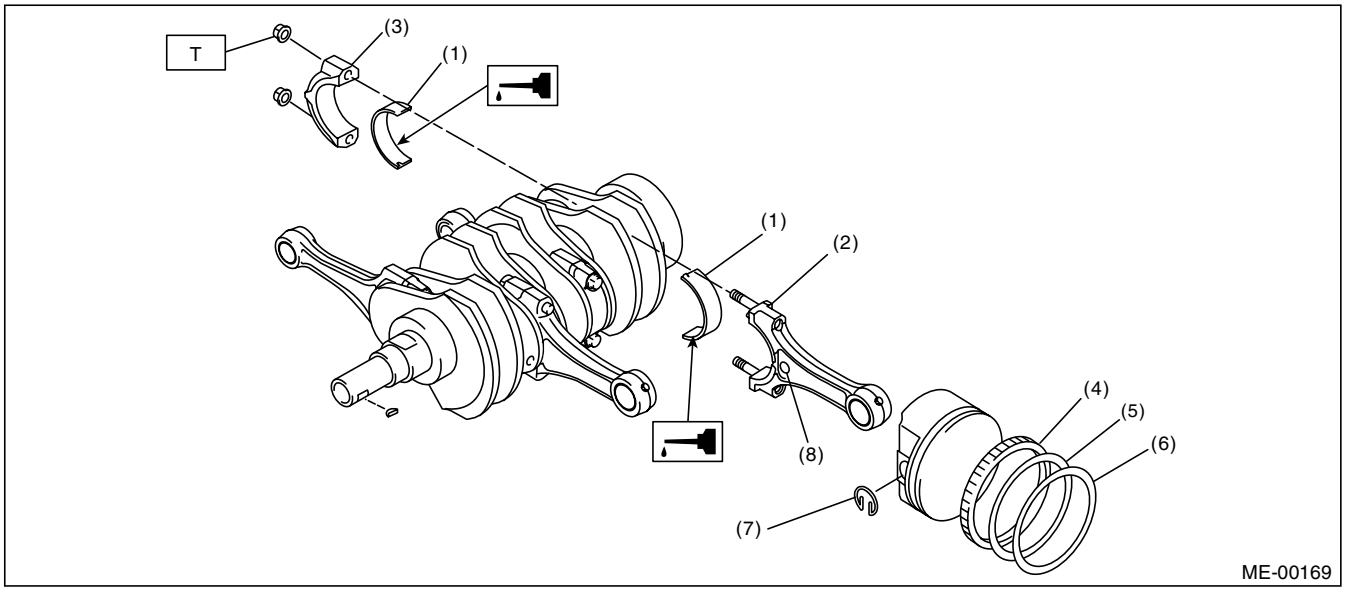
3) Remove the piston rings using the piston ring expander.
4) Remove the oil ring by hand.

NOTE:
Arrange the removed piston rings in proper order to prevent confusion.

5) Remove the circlip.

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D: ASSEMBLY



(1) Connecting rod bearing
(2) Connecting rod
(3) Connecting rod cap
(4) Oil ring
(5) Second ring
(6) Top ring
(7) Circlip
(8) Side mark

Tightening torque: N·m (kgf-m, ft-lb)
T: 45 (4.6, 33)

1) Apply oil to the surfaces of the connecting rod bearings. Install the connecting rod bearings on connecting rods and connecting rod caps.
2) Install the connecting rod on crankshaft.

NOTE:
Position each connecting rod with the side marked facing forward.

3) Install the connecting rod cap with connecting rod nut.
Ensure the arrow on connecting rod cap faces the front during installation.

NOTE:
• Each connecting rod has its own mating cap. Make sure that they are assembled correctly by checking their matching number.
• When tightening the connecting rod nuts, apply oil on the threads.

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

E: INSPECTION

1. CYLINDER BLOCK

1) Visually check for cracks and damage. Especially, inspect the important parts by means of red lead check.
2) Check the oil passages for clogging.
3) Inspect the crankcase surface that mates with cylinder head for warping by using a straight edge, and correct by grinding if necessary.

Warping limit:
0.05 mm (0.0020 in)

Grinding limit:
0.1 mm (0.004 in)

Standard height of cylinder block:
201.0 mm (7.91 in)

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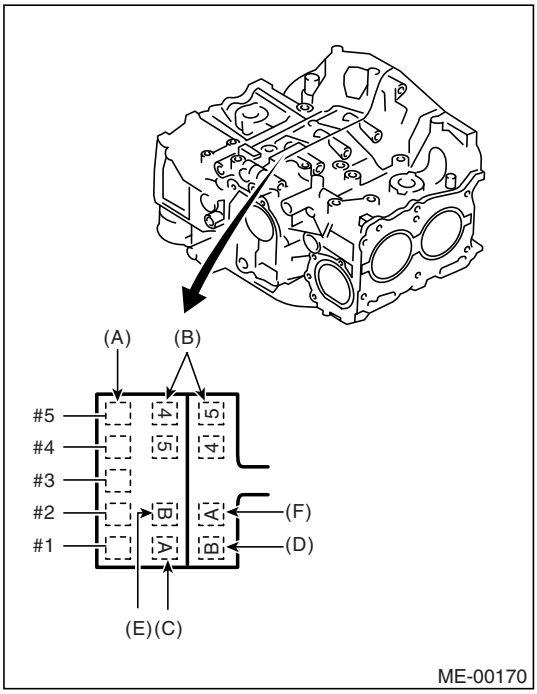
2. CYLINDER AND PISTON

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).

NOTE:
Standard sized pistons are classified into two grades, “A” and “B”. These grades should be used as a guide line in selecting a standard piston.

Standard diameter:
A: 92.005 — 92.015 mm (3.6222 — 3.6226 in)
B: 91.995 — 92.005 mm (3.6218 — 3.6222 in)



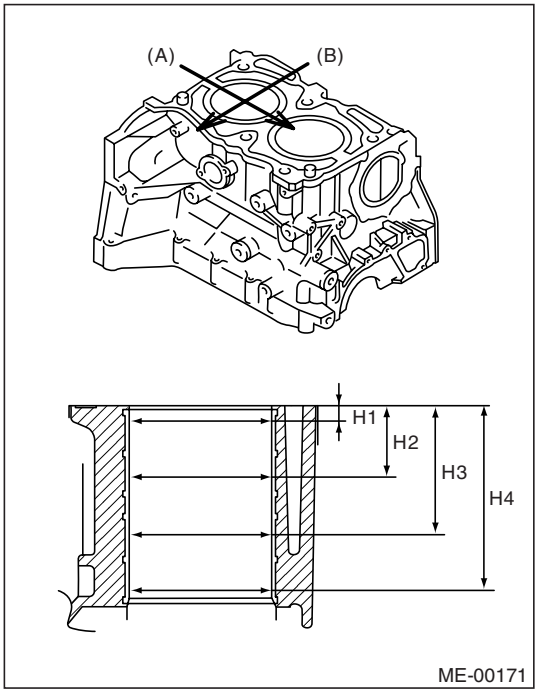
(A) Main journal size mark
(B) Cylinder block (RH)-(LH) combination mark
(C) #1 cylinder bore size mark
(D) #2 cylinder bore size mark
(E) #3 cylinder bore size mark
(F) #4 cylinder bore size mark

2) How to measure the inner diameter of each cylinder:
Measure the inner diameter of each cylinder in both the thrust and piston pin directions at the heights shown in the figure, using a cylinder bore gauge.

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.

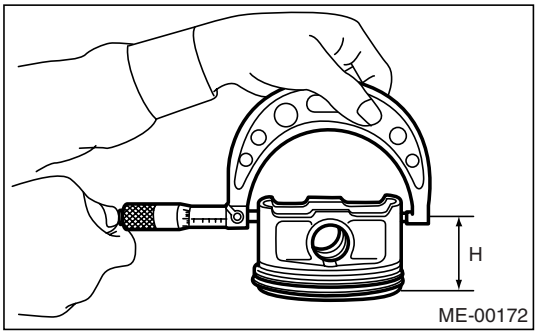
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4) How to measure the outer diameter of each piston:
Measure the outer diameter of each piston at the height shown in the figure. (Thrust direction)

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

Piston grade point H:
40.0 mm (1.57 in)

Piston outer diameter:
Standard
A: 91.985 — 91.995 mm
(3.6214 — 3.6218 in)
B: 91.975 — 91.985 mm
(3.6211 — 3.6214 in)
0.25 mm (0.0098 in) oversize
92.225 — 92.235 mm
(3.6309 — 3.6313 in)
0.50 mm (0.0197 in) oversize
92.475 — 92.485 mm
(3.6407 — 3.6411 in)



5) Calculate the clearance between cylinder and piston.

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

Cylinder to piston clearance at 20°C (68°F):
Standard
0.010 — 0.030 mm (0.0004 — 0.0012 in)
Limit
0.050 mm (0.0020 in)

6) Boring and honing:
(1) If the value of taper, out-of-roundness, or cylinder-to-piston clearance measured exceeds the specified limit or if there is any damage on the cylinder wall, 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.

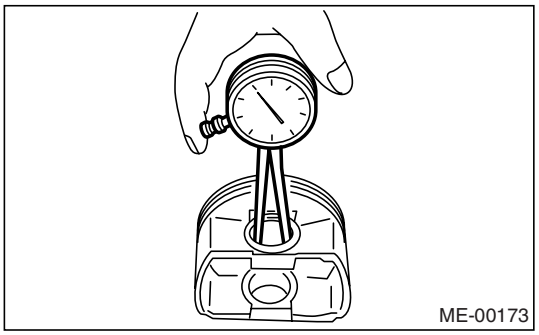
NOTE:
Immediately after reboring, the cylinder diameter may differ from its real diameter due to temperature rise. Thus, pay attention to this when measuring the cylinder diameter.

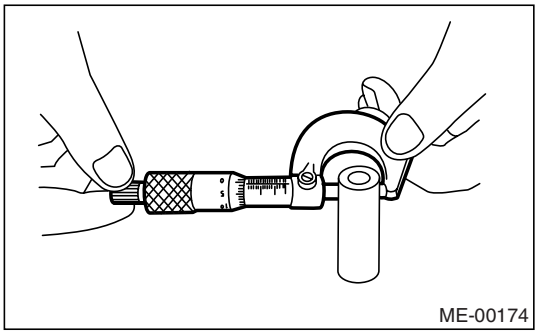
Limit of cylinder enlarging (boring):
0.5 mm (0.020 in)

3. PISTON AND PISTON PIN

1) Check the pistons and piston pins for damage, cracks, and wear and the piston ring grooves for wear and damage. Replace if defective.
2) Measure the piston-to-cylinder clearance at each cylinder. <Ref. to ME(H4DOTC)-103, 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.

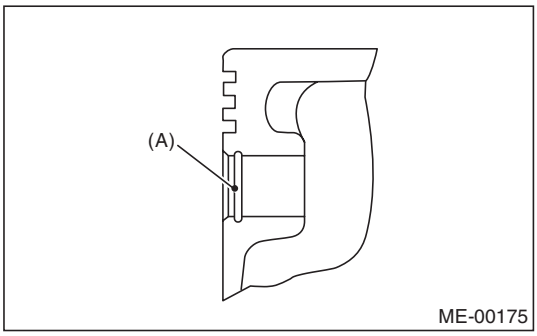
Standard clearance between piston pin and hole in piston:
Standard
0.004 — 0.008 mm (0.0002 — 0.0003 in)
Limit
0.020 mm (0.0008 in)





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

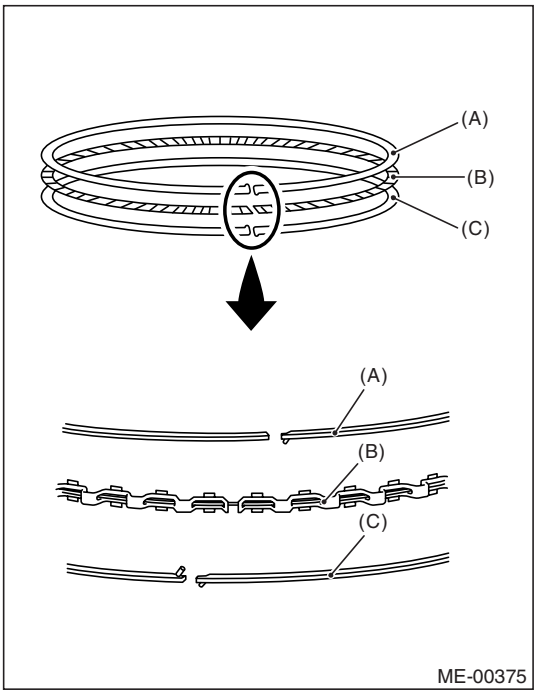


5) Check the piston pin circlip for distortion, cracks and wear.

4. PISTON RING

1) If the piston ring is broken, damaged, or worn, or if its tension is insufficient, or when the piston is replaced, replace the piston ring with a new one of the same size as the piston.

NOTE:
• Marks are shown on the end of top and second rings. When installing the rings to piston, face this mark upward.
• Oil ring consists of upper rail, expander and lower rail. When installing on piston, be careful of each rail's direction.

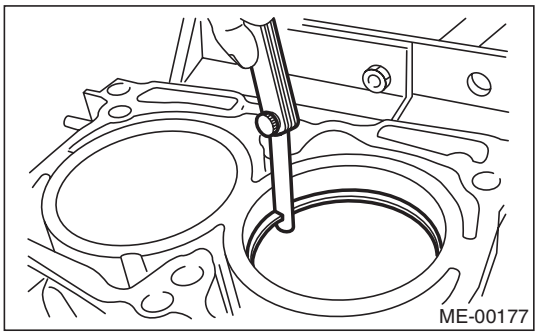


(A) Upper rail
(B) Expander
(C) Lower rail

2) Squarely place the piston ring and oil ring in cylinder, and then measure the piston ring gap with a thickness gauge.

Unit: mm (in)

		Standard	Limit
Piston ring gap	Top ring	0.20 — 0.25 (0.0079 — 0.0098)	1.0 (0.039)
	Second ring	0.35 — 0.50 (0.0138 — 0.0197)	1.0 (0.039)
	Oil ring rail	0.20 — 0.50 (0.0079 — 0.0197)	1.5 (0.059)

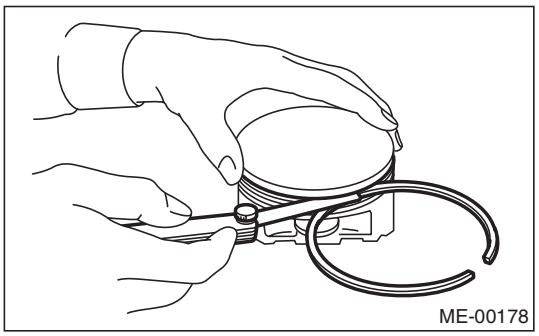


3) Measure the clearance between piston ring and piston ring groove with a thickness gauge.

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)

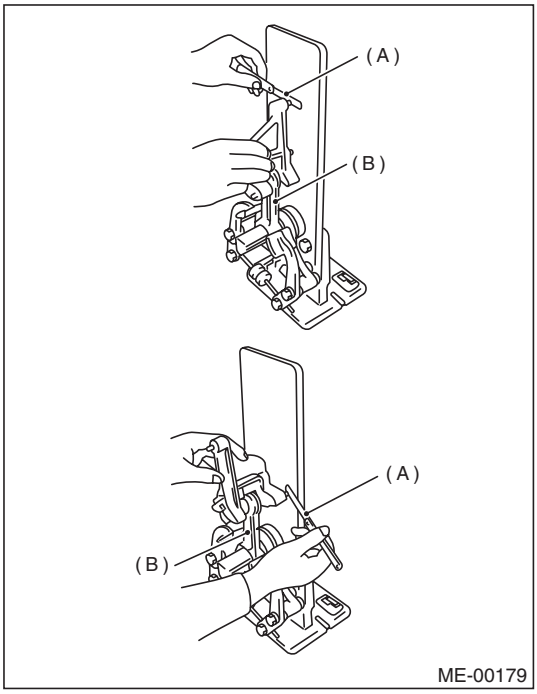


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5. CONNECTING ROD

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.

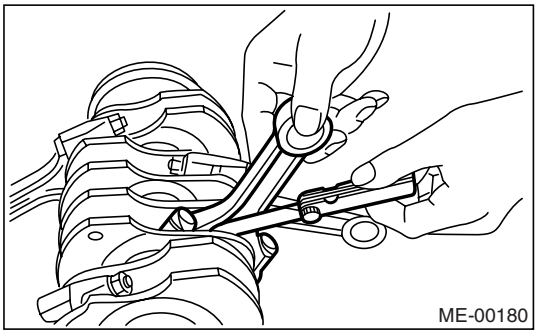
Limit of bend or twist per 100 mm (3.94 in) in length:
0.10 mm (0.0039 in)



(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
0.40 mm (0.016 in)



4) Inspect the connecting rod bearing for scar, peeling, seizure, melting, wear, etc.
5) Measure the oil clearance on individual connecting rod bearings by means of plastigauge. If any oil clearance is not within specification, replace the defective bearing with a new one of standard size or undersize as necessary. (See the table below.)

Connecting rod oil clearance:
Standard
0.020 — 0.046 mm (0.0008 — 0.0018 in)
Limit
0.050 mm (0.0020 in)

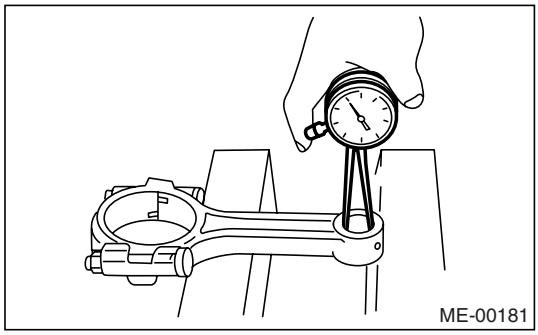
Unit: mm (in)

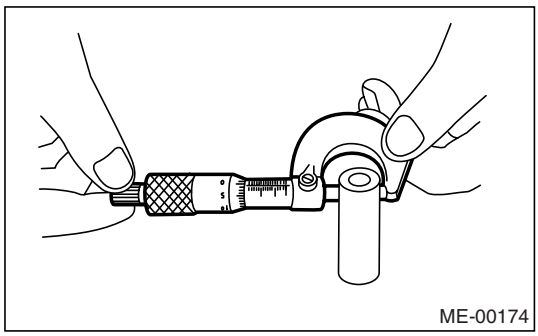
Bearing	Bearing size (Thickness at center)	Outer diameter of crank pin
Standard	1.486 — 1.498 (0.0585 — 0.0590)	51.984 — 52.000 (2.0466 — 2.0472)
0.03 (0.0012) undersize	1.504 — 1.512 (0.0592 — 0.0595)	51.954 — 51.970 (2.0454 — 2.0461)
0.05 (0.0020) undersize	1.514 — 1.522 (0.0596 — 0.0599)	51.934 — 51.950 (2.0447 — 2.0453)
0.25 (0.0098) undersize	1.614 — 1.622 (0.0635 — 0.0639)	51.734 — 51.750 (2.0368 — 2.0374)

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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.

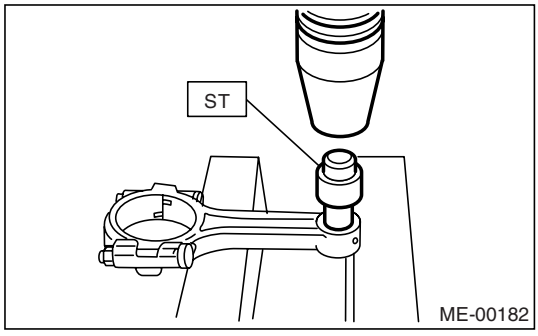
Clearance between piston pin and bushing:
Standard
0 — 0.022 mm (0 — 0.0009 in)
Limit
0.030 mm (0.0012 in)


ME-00181


ME-00174

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



ME-00182

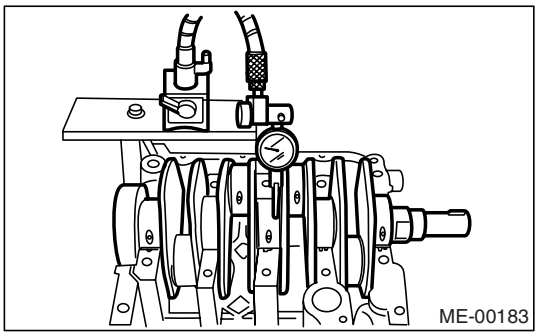
(3) Make two 3 mm (0.12 in) holes in bushing. Ream the inside of bushing.
(4) After the completion of reaming, clean the bushing to remove chips.

6. CRANKSHAFT AND CRANKSHAFT BEARING

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

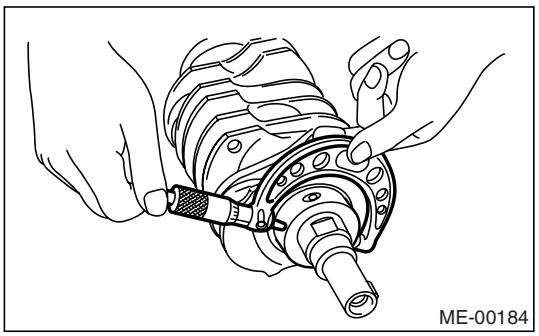
NOTE:
If a suitable V-block is not available, install the #1 and #5 crankshaft bearing on cylinder block, position the crankshaft on these bearings and measure the crankshaft bend using a dial gauge.

Crankshaft bend limit:
0.035 mm (0.0014 in)


ME-00183

3) Inspect the crank journal and crank pin for wear. If they are not within the specifications, replace the bearing with a suitable (undersize) one, and then replace or recondition the crankshaft as necessary. When grinding the crank journal or crank pin, finish them to specified dimensions according to the undersize bearing to be used.

Crank pin and crank journal:
Out-of-roundness
0.005 mm (0.0002 in) or less
Taper limit
0.07 mm (0.0028 in)
Grinding limit
0.250 mm (0.0098 in)


ME-00184

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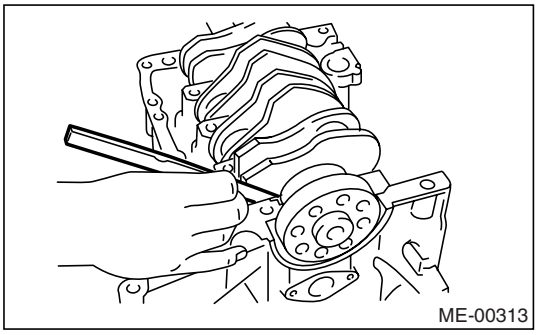
Unit: mm (in)

		Crank journal diameter		Crank pin diameter
		#1, #3, #5	#2, #4	
Standard	Journal O.D.	59.992 — 60.008 (2.3619 — 2.3625)	59.992 — 60.008 (2.3619 — 2.3625)	51.984 — 52.000 (2.0466 — 2.0472)
	Bearing size (Thickness at center)	1.998 — 2.011 (0.0787 — 0.0792)	2.000 — 2.013 (0.0787 — 0.0793)	1.486 — 1.498 (0.0585 — 0.0590)
0.03 (0.0012) undersize	Journal O.D.	59.962 — 59.978 (2.3607 — 2.3613)	59.962 — 59.978 (2.3607 — 2.3613)	51.954 — 51.970 (2.0454 — 2.0461)
	Bearing size (Thickness at center)	2.017 — 2.020 (0.0794 — 0.0795)	2.019 — 2.022 (0.0795 — 0.0796)	1.504 — 1.512 (0.0592 — 0.0595)
0.05 (0.0020) undersize	Journal O.D.	59.942 — 59.958 (2.3599 — 2.3605)	59.942 — 59.958 (2.3599 — 2.3605)	51.934 — 51.950 (2.0447 — 2.0453)
	Bearing size (Thickness at center)	2.027 — 2.030 (0.0798 — 0.0799)	2.029 — 2.032 (0.0799 — 0.0800)	1.514 — 1.522 (0.0596 — 0.0599)
0.25 (0.0098) undersize	Journal O.D.	59.742 — 59.758 (2.3520 — 2.3527)	59.742 — 59.758 (2.3520 — 2.3527)	51.734 — 51.750 (2.0368 — 2.0374)
	Bearing size (Thickness at center)	2.127 — 2.130 (0.0837 — 0.0839)	2.129 — 2.132 (0.0838 — 0.0839)	1.614 — 1.622 (0.0635 — 0.0639)

O.D.: Outer Diameter

4) Measure the thrust clearance of crankshaft at center bearing. If the clearance exceeds the limit, replace the bearing.

Crankshaft thrust clearance:
Standard
0.030 — 0.115 mm (0.0012 — 0.0045 in)
Limit
0.25 mm (0.0098 in)


ME-00313

5) Inspect individual crankshaft bearings for signs of flaking, seizure, melting, and wear.

6) Measure the oil clearance on each crankshaft bearing by means of plastigauge. If the measurement is not within the specification, replace the defective bearing with an undersize one, and replace or recondition the crankshaft as necessary.

Unit: mm (in)

Crankshaft oil clearance		
#1	STD	0.003 — 0.030 (0.0001 — 0.0012)
	Limit	0.040 (0.0016)
#2	STD	0.012 — 0.033 (0.0005 — 0.0013)
	Limit	0.045 (0.0018)
#3	STD	0.003 — 0.030 (0.0001 — 0.0012)
	Limit	0.040 (0.0016)
#4	STD	0.012 — 0.033 (0.0005 — 0.0013)
	Limit	0.045 (0.0018)
#5	STD	0.010 — 0.031 (0.0004 — 0.0012)
	Limit	0.040 (0.0016)

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21.Intake and Exhaust Valve

A: REMOVAL AND INSTALLATION

For operations related to intake and exhaust valve, refer to “19. Cylinder Head.” <Ref. to ME(H4DOTC)-81, REMOVAL, Cylinder Head Assembly.> and <Ref. to ME(H4DOTC)-81, INSTALLATION, Cylinder Head Assembly.>

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22.Piston

A: REMOVAL AND INSTALLATION

For operations related to piston, refer to “20. Cylinder Block.” <Ref. to ME(H4DOTC)-89, REMOVAL, Cylinder Block.> and <Ref. to ME(H4DOTC)-93, INSTALLATION, Cylinder Block.>

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23.Connecting Rod

A: REMOVAL AND INSTALLATION

For operations related to connecting rod, refer to “20. Cylinder Block.” <Ref. to ME(H4DOTC)-89, REMOVAL, Cylinder Block.> and <Ref. to ME(H4DOTC)-93, INSTALLATION, Cylinder Block.>

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24.Crankshaft

A: REMOVAL AND INSTALLATION

For operations related to crankshaft, refer to “20. Cylinder Block.” <Ref. to ME(H4DOTC)-89, REMOVAL, Cylinder Block.> and <Ref. to ME(H4DOTC)-93, INSTALLATION, Cylinder Block.>

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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)-2, Basic Diagnostic Procedure.>		A
	Fuel line	Defective fuel pump and relay	A
		Lack of or insufficient fuel	B
	Belt	Defective	B
		Defective timing	B
	Compression	Incorrect valve clearance	C
		Loosened spark plugs or defective gasket	C
		Loosened cylinder head bolts or defective gasket	C
		Improper valve seating	C
		Defective valve stem	C
		Worn or broken valve spring	B
		Worn or stuck piston rings, cylinder and piston	C
		Incorrect valve timing	B
		Improper engine oil (low viscosity)	B
3) Initial combustion occurs.	Engine control system <Ref. to EN(H4DOTC)-2, Basic Diagnostic Procedure.>		A
	Intake system	Defective intake manifold gasket	B
		Defective throttle body gasket	B
	Fuel line	Defective fuel pump and relay	C
		Clogged fuel line	C
		Lack of or insufficient fuel	B
	Belt	Defective	B
		Defective timing	B
	Compression	Incorrect valve clearance	C
		Loosened spark plugs or defective gasket	C
		Loosened cylinder head bolts or defective gasket	C
		Improper valve seating	C
		Defective valve stem	C
		Worn or broken valve spring	B
		Worn or stuck piston rings, cylinder and piston	C
		Incorrect valve timing	B
		Improper engine oil (low viscosity)	B

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TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
4) Engine stalls after initial combustion.	Engine control system <Ref. to EN(H4DOTC)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened or cracked intake duct	B
		Loosened or cracked PCV hose	C
		Loosened or cracked vacuum hose	C
		Defective intake manifold gasket	B
		Defective throttle body gasket	B
		Dirty air cleaner element	C
	Fuel line	Clogged fuel line	C
		Lack of or insufficient fuel	B
	Belt	Defective	B
		Defective timing	B
	Compression	Incorrect valve clearance	C
		Loosened spark plugs or defective gasket	C
		Loosened cylinder head bolts or defective gasket	C
		Improper valve seating	C
		Defective valve stem	C
		Worn or broken valve spring	B
		Worn or stuck piston rings, cylinder and piston	C
		Incorrect valve timing	B
		Improper engine oil (low viscosity)	B
2. Rough idle and engine stall	Engine control system <Ref. to EN(H4DOTC)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened or cracked intake duct	A
		Loosened or cracked PCV hose	A
		Loosened or cracked vacuum hose	A
		Defective intake manifold gasket	B
		Defective throttle body gasket	B
		Defective PCV valve	C
		Loosened oil filler cap	B
		Dirty air cleaner element	C
	Fuel line	Defective fuel pump and relay	C
		Clogged fuel line	C
		Lack of or insufficient fuel	B
	Belt	Defective timing	C
	Compression	Incorrect valve clearance	B
		Loosened spark plugs or defective gasket	B
		Loosened cylinder head bolts or defective gasket	B
		Improper valve seating	B
		Defective valve stem	C
		Worn or broken valve spring	B
		Worn or stuck piston rings, cylinder and piston	B
		Incorrect valve timing	A
		Improper engine oil (low viscosity)	B
	Lubrication system	Incorrect oil pressure	B
		Defective rocker cover gasket	C
	Cooling system	Overheating	C
	Others	Malfunction of evaporative emission control system	A
		Stuck or damaged throttle valve	B
		Accelerator cable out of adjustment	C

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TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
3. Low output, hesitation and poor acceleration	Engine control system <Ref. to EN(H4DOTC)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened or cracked intake duct	A
		Loosened or cracked PCV hose	A
		Loosened or cracked vacuum hose	B
		Defective intake manifold gasket	B
		Defective throttle body gasket	B
		Defective PCV valve	B
		Loosened oil filler cap	B
		Dirty air cleaner element	A
	Fuel line	Defective fuel pump and relay	B
		Clogged fuel line	B
		Lack of or insufficient fuel	C
	Belt	Defective timing	B
	Compression	Incorrect valve clearance	B
		Loosened spark plugs or defective gasket	B
		Loosened cylinder head bolts or defective gasket	B
		Improper valve seating	B
		Defective valve stem	C
		Worn or broken valve spring	B
		Worn or stuck piston rings, cylinder and piston	C
		Incorrect valve timing	A
		Improper engine oil (low viscosity)	B
	Lubrication system	Incorrect oil pressure	B
	Cooling system	Overheating	C
		Over cooling	C
	Others	Malfunction of evaporative emission control system	A
4. Surging	Engine control system <Ref. to EN(H4DOTC)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened or cracked intake duct	A
		Loosened or cracked PCV hose	A
		Loosened or cracked vacuum hose	A
		Defective intake manifold gasket	B
		Defective throttle body gasket	B
		Defective PCV valve	B
		Loosened oil filler cap	B
		Dirty air cleaner element	B
	Fuel line	Defective fuel pump and relay	B
		Clogged fuel line	B
		Lack of or insufficient fuel	C
	Belt	Defective timing	B
	Compression	Incorrect valve clearance	B
		Loosened spark plugs or defective gasket	C
		Loosened cylinder head bolts or defective gasket	C
		Improper valve seating	C
		Defective valve stem	C
		Worn or broken valve spring	C
		Worn or stuck piston rings, cylinder and piston	C
		Incorrect valve timing	A
		Improper engine oil (low viscosity)	B
	Cooling system	Overheating	B
	Others	Malfunction of evaporative emission control system	C

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TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
5. Engine does not return to idle.	Engine control system <Ref. to EN(H4DOTC)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened or cracked vacuum hose	A
	Others	Stuck or damaged throttle valve	A
		Accelerator cable out of adjustment	B
6. Dieseling (Run-on)	Engine control system <Ref. to EN(H4DOTC)-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)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened or cracked intake duct	C
		Loosened or cracked PCV hose	C
		Loosened or cracked vacuum hose	B
		Defective PCV valve	B
		Loosened oil filler cap	C
	Belt	Defective timing	B
	Compression	Incorrect valve clearance	B
		Loosened spark plugs or defective gasket	C
		Loosened cylinder head bolts or defective gasket	C
		Improper valve seating	B
		Defective valve stem	C
		Worn or broken valve spring	C
		Worn or stuck piston rings, cylinder and piston	C
		Incorrect valve timing	A
	Lubrication system	Incorrect oil pressure	C
	Cooling system	Over cooling	C
	Others	Malfunction of evaporative emission control system	C
8. Knocking	Engine control system <Ref. to EN(H4DOTC)-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

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TROUBLE	PROBLEM PARTS, ETC.	POSSIBLE CAUSE	RANK
10. Excessive fuel consumption	Engine control system <Ref. to EN(H4DOTC)-2, Basic Diagnostic Procedure.>		A
	Intake system	Dirty air cleaner element	A
	Belt	Defective timing	B
	Compression	Incorrect valve clearance	B
		Loosened spark plugs or defective gasket	C
		Loosened cylinder head bolts or defective gasket	C
		Improper valve seating	B
		Defective valve stem	C
		Worn or broken valve spring	C
		Worn or stuck piston rings, cylinder and piston	B
		Incorrect valve timing	B
	Lubrication system	Incorrect oil pressure	C
	Cooling system	Over cooling	C
	Others	Accelerator cable out of adjustment	B

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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 valve rocker • Worn camshaft • Broken valve spring
Heavy and dull clank	Oil pressure is low.	• Worn crankshaft main bearing • Worn connecting rod bearing (big end)
	Oil pressure is normal.	• Loose flywheel mounting bolts • Damaged engine mounting
High-pitched clank (Spark knock)	Sound is noticeable when accelerating with an overload.	• Ignition timing advanced • Accumulation of carbon inside combustion chamber • Wrong spark plug • Improper gasoline
Clank when engine speed is medium (1,000 to 2,000 rpm).	Sound is reduced when fuel injector connector of noisy cylinder is disconnected. (NOTE*)	• Worn crankshaft main bearing • Worn bearing at crankshaft end of connecting rod
Knocking sound when engine is operating under idling speed and engine is warm	Sound is reduced when fuel injector connector of noisy cylinder is disconnected. (NOTE*)	• Worn cylinder liner and piston ring • Broken or stuck piston ring • Worn piston pin and hole at piston end of connecting rod
	Sound is not reduced if each fuel injector connector is disconnected in turn. (NOTE*)	• Unusually worn valve lifter • Worn cam gear • Worn camshaft journal bore in crankcase
Squeaky sound	—	• Insufficient generator lubrication
Rubbing sound	—	• Defective generator brush and rotor contact
Gear scream when starting engine	—	• Defective ignition starter switch • Worn gear and starter pinion
Sound like polishing glass with a dry cloth	—	• Loose drive belt • Defective water pump shaft
Hissing sound	—	• Loss of compression • Air leakage in air intake system, hoses, connections or manifolds
Timing belt noise	—	• Loose timing belt • Belt contacting case/adjacent part
Valve tappet noise	—	• Incorrect valve clearance

NOTE*:
When disconnecting the fuel injector connector, Malfunction Indicator Light illuminates and DTC is stored in ECM memory.
Therefore, carry out the CLEAR MEMORY MODE <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(H4DOTC)-40, OPERATION, Inspection Mode.> after connecting the fuel injector connector.

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EXHAUST

EX(H4DOTC)

Page

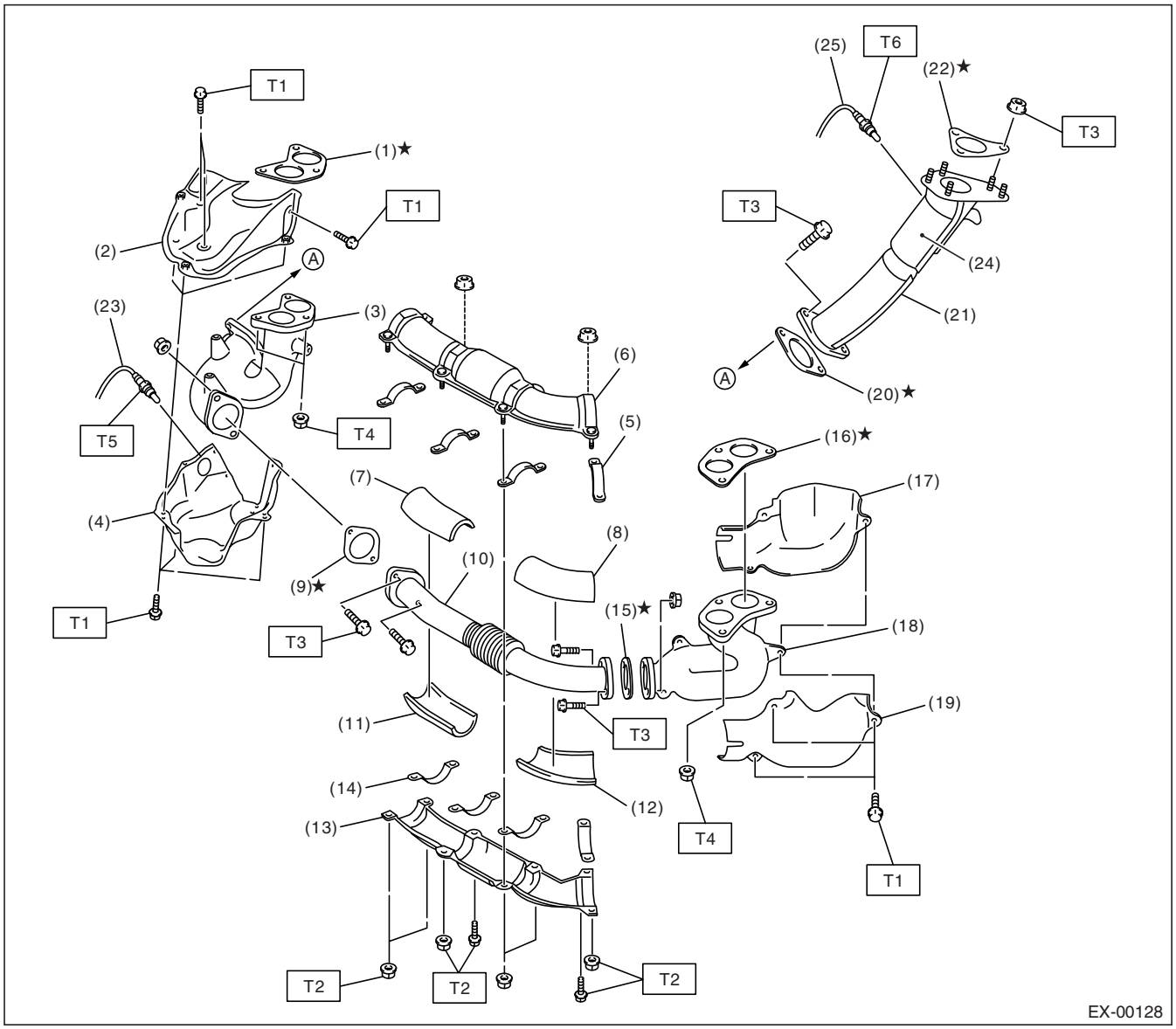
1. General Description 2
2. Front Exhaust Pipe 7
3. Center Exhaust Pipe 9
4. Joint Pipe 13
5. Rear Exhaust Pipe 14
6. Muffler 15

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1. General Description

A: COMPONENT

1. FRONT EXHAUST PIPE



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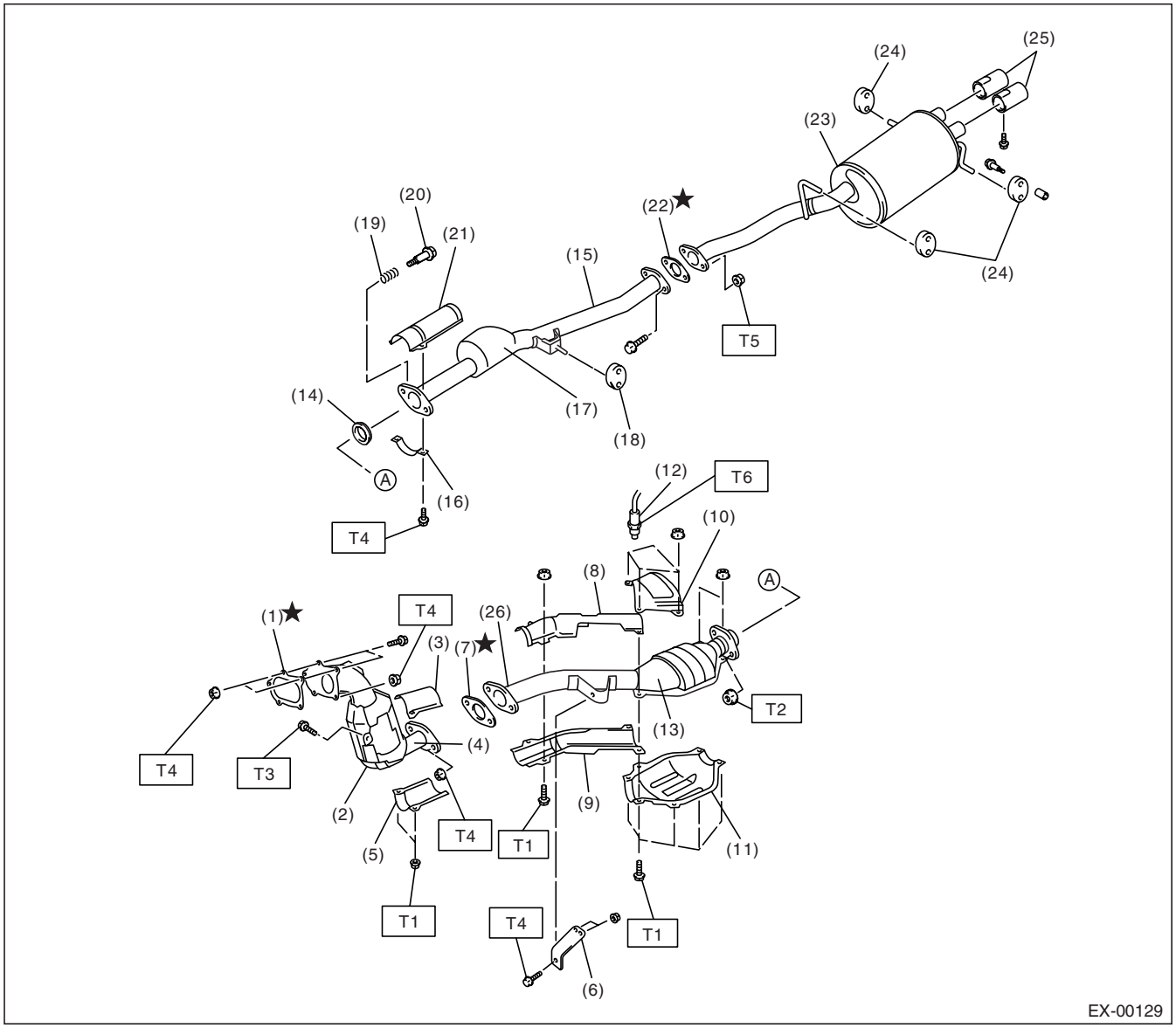
(1) Gasket
(2) Exhaust manifold upper cover (RH)
(3) Exhaust manifold (RH)
(4) Exhaust manifold lower cover (RH)
(5) Front exhaust pipe upper clamp
(6) Front exhaust pipe upper cover
(7) Front exhaust pipe upper insulator (RH)
(8) Front exhaust pipe upper insulator (LH)
(9) Gasket
(10) Front exhaust pipe
(11) Front exhaust pipe lower insulator (RH)
(12) Front exhaust pipe lower insulator (LH)
(13) Front exhaust pipe lower cover
(14) Front exhaust pipe lower clamp
(15) Gasket
(16) Gasket
(17) Exhaust manifold upper cover (LH)
(18) Exhaust manifold (LH)
(19) Exhaust manifold lower cover (LH)
(20) Gasket
(21) Turbocharger joint pipe
(22) Gasket
(23) Front oxygen (A/F) sensor
(24) Precatalytic converter (Except Australia model and STi model)
(25) Exhaust temperature sensor (Except Australia model and STi model)

Tightening torque: N·m (kgf-m, ft-lb)
T1: 19 (1.9, 13.7)
T2: 25 (2.5, 18.1)
T3: 35 (3.6, 26.0)
T4: 40 (4, 28.9)
T5: <Ref. to FU(H4DOTC)-44, INSTALLATION, Front Oxygen (A/F) Sensor.>
T6: <Ref. to FU(H4DOTC)-48, INSTALLATION, Exhaust Temperature Sensor.>

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2. CENTER AND REAR EXHAUST PIPE, AND MUFFLER

• EXCEPT AUSTRALIA MODEL



EX-00129

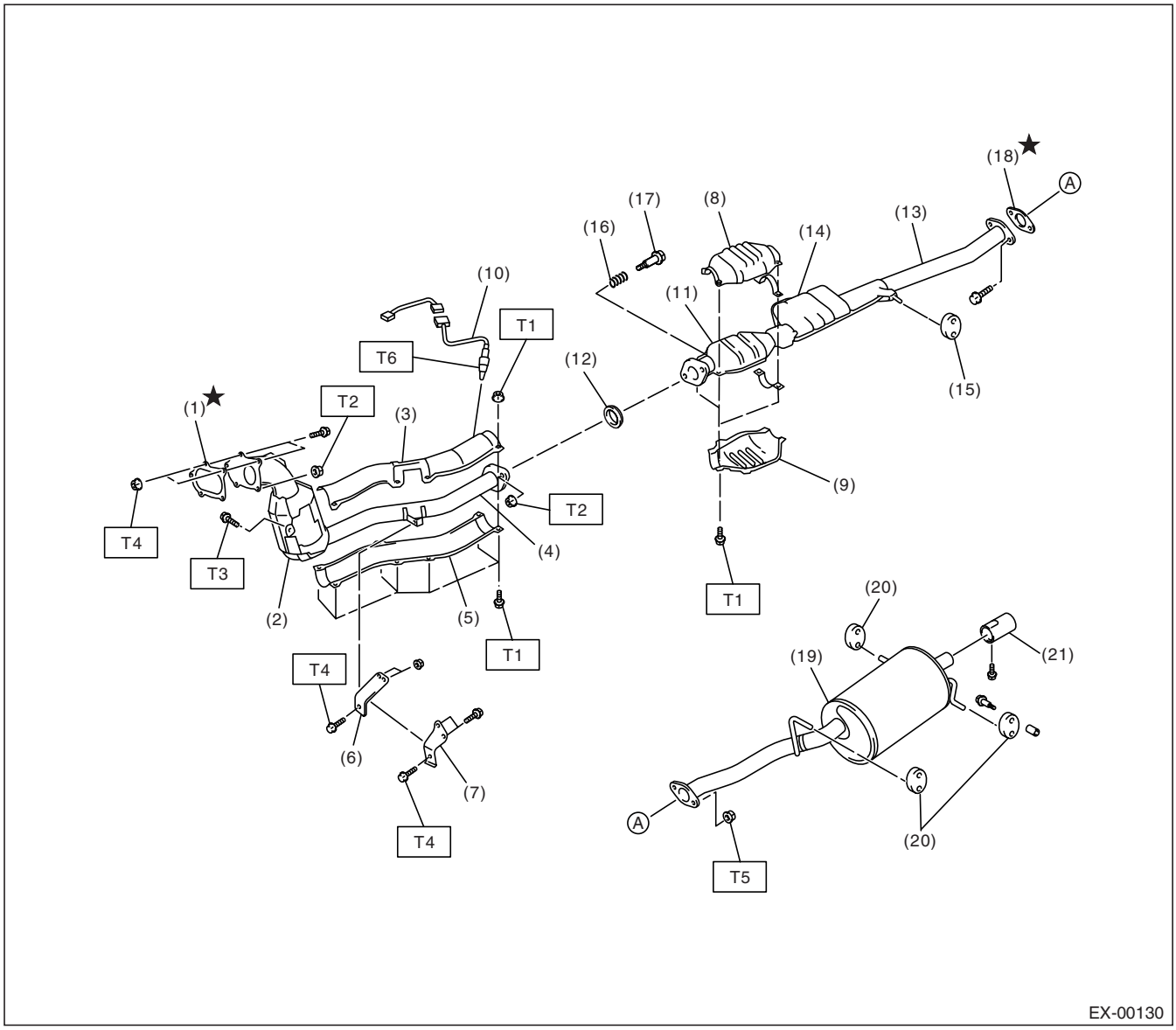
(1) Gasket
(2) Front catalytic converter
(3) Center pipe upper cover (Front)
(4) Center exhaust pipe (Front)
(5) Center pipe lower cover (Front)
(6) Bracket
(7) Gasket
(8) Center pipe upper cover (Rear)
(9) Center pipe lower cover (Rear)
(10) Rear catalytic converter upper cover
(11) Rear catalytic converter lower cover
(12) Rear oxygen sensor
(13) Rear catalytic converter
(14) Gasket
(15) Rear exhaust pipe
(16) Clamp
(17) Chamber
(18) Cushion rubber
(19) Spring
(20) Bolt
(21) Rear exhaust pipe upper cover (Front)
(22) Gasket
(23) Muffler
(24) Cushion rubber
(25) Muffler cutter
(26) Center exhaust pipe (Rear)

Tightening torque: N·m (kgf-m, ft-lb)

T1: 13 (1.3, 9.6)
T2: 18 (1.8, 13.0)
T3: 30 (3.1, 22.4)
T4: 35 (3.6, 26.0)
T5: 48 (4.9, 35.4)
T6: <Ref. to FU(H4DOTC)-46, INSTALLATION, Rear Oxygen Sensor.>

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• AUSTRALIA MODEL



EX-00130

(1) Gasket
(2) Front catalytic converter
(3) Upper center pipe cover
(4) Center exhaust pipe
(5) Center pipe lower cover
(6) Bracket (MT vehicles only)
(7) Bracket (AT vehicles only)
(8) Rear catalytic converter upper cover
(9) Rear catalytic converter lower cover
(10) Rear oxygen sensor
(11) Rear catalytic converter
(12) Gasket
(13) Rear exhaust pipe
(14) Chamber
(15) Cushion rubber
(16) Spring
(17) Bolt
(18) Gasket
(19) Muffler
(20) Cushion rubber
(21) Muffler cutter

Tightening torque: N·m (kgf-m, ft-lb)
T1: 13 (1.3, 9.6)
T2: 18 (1.8, 13.0)
T3: 30 (3.1, 22.4)
T4: 35 (3.6, 26.0)
T5: 48 (4.9, 35.4)
T6: <Ref. to FU(H4DOTC)-46, INSTALLATION, Rear Oxygen Sensor.>

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B: CAUTION

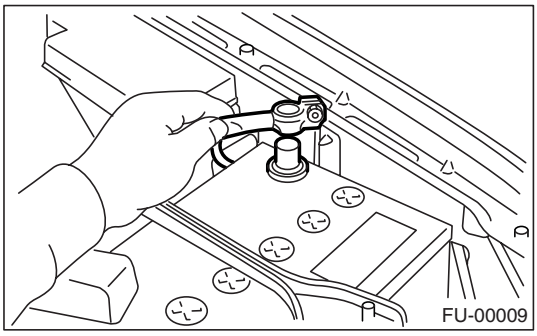
• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn your hands, because each part on the vehicle is hot after running.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.

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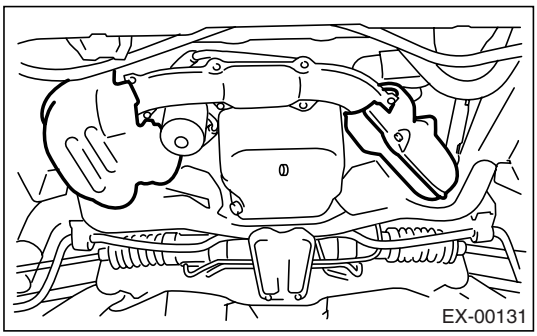
2. Front Exhaust Pipe

A: REMOVAL

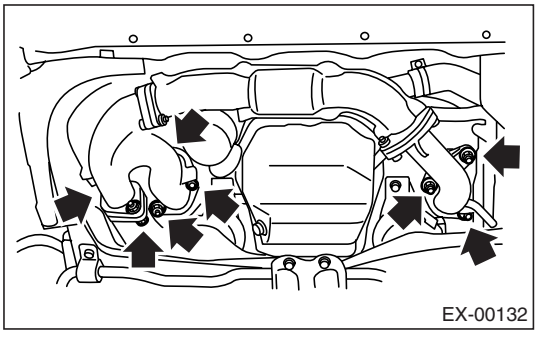
1) Disconnect the ground cable from battery.



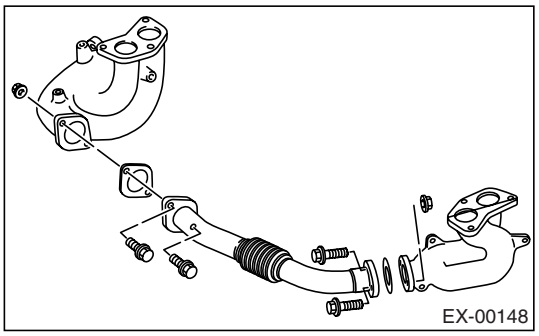
2) Remove the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-44, REMOVAL, Front Oxygen (A/F) Sensor.>
3) Remove the under cover.
4) Remove the lower exhaust manifold cover (RH).
5) Remove the lower and upper exhaust manifold covers (LH).



6) Remove the bolts and nuts which hold 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.

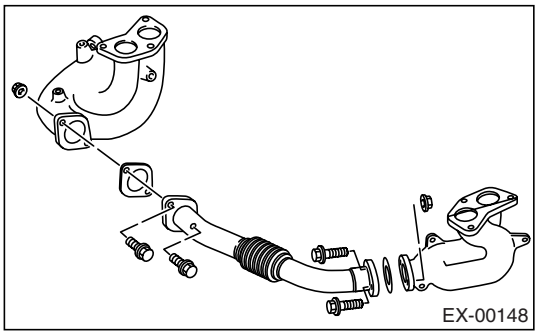


B: INSTALLATION

NOTE:
Replace the gaskets with new ones.

1) Assemble the front exhaust pipe and exhaust manifolds.

Tightening torque:
35 N·m (3.6 kgf-m, 26.0 ft-lb)



2) Install the front exhaust pipe covers.

Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)

3) Install the upper exhaust manifold cover (RH).

Tightening torque:
19 N·m (1.9 kgf-m, 13.7 ft-lb)

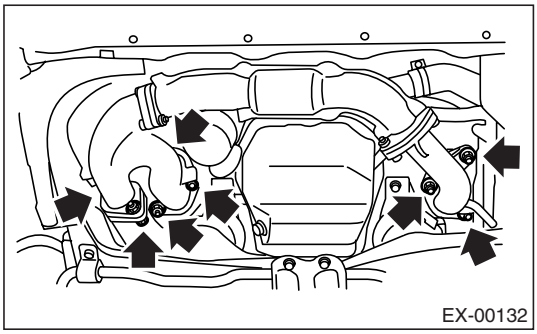
4) Install the front exhaust pipe assembly.

Tightening torque:
35 N·m (3.6 kgf-m, 26.0 ft-lb)

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5) Connect the exhaust manifold (RH) to turbo-charger joint pipe.

Tightening torque:
35 N·m (3.6 kgf-m, 26.0 ft-lb)

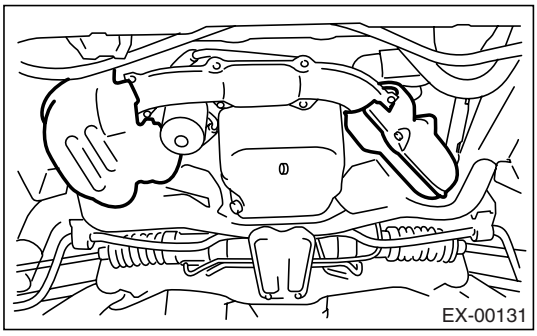

EX-00132

6) Install the upper and lower exhaust manifold covers (LH).

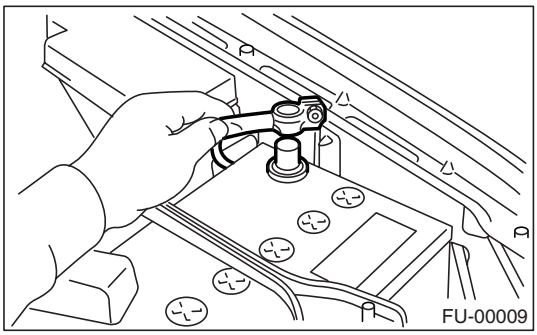
Tightening torque:
19 N·m (1.9 kgf-m, 13.7 ft-lb)

7) Install the lower exhaust manifold cover (RH).

Tightening torque:
19 N·m (1.9 kgf-m, 13.7 ft-lb)


EX-00131

8) Install the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-44, INSTALLATION, Front Oxygen (A/F) Sensor.>
9) Install the under cover.
10) Connect the battery ground cable to battery.

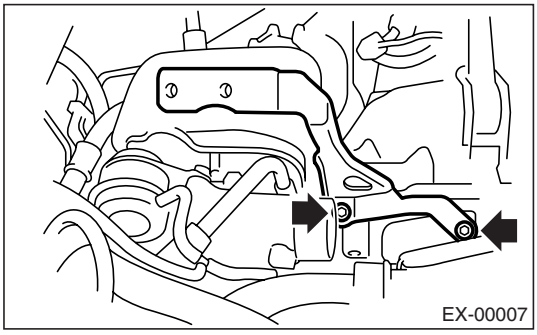

FU-00009

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3. Center Exhaust Pipe

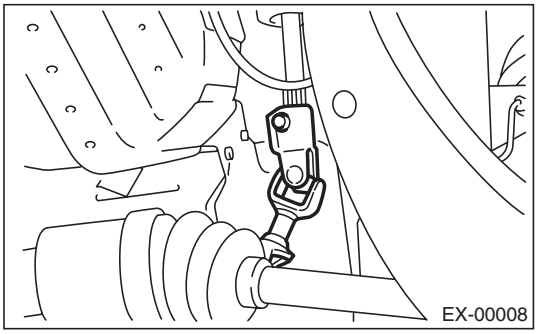
A: REMOVAL

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.


EX-00007

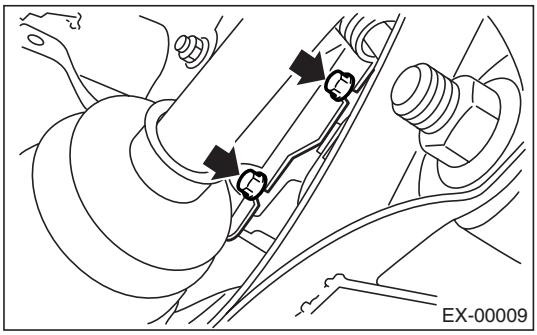
5) Lift-up the vehicle.
6) Remove the under cover.
7) Remove the universal joint bolts and then remove the universal joint (RHD model).

CAUTION:
Scribe alignment marks on the universal joint so that it can be reassembled at the original serration.

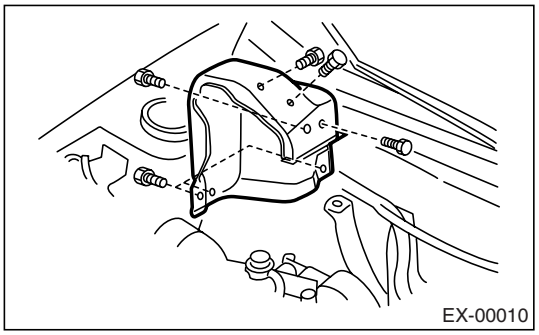

EX-00008

8) Remove the bolts which install the lower side of turbocharger upper cover.

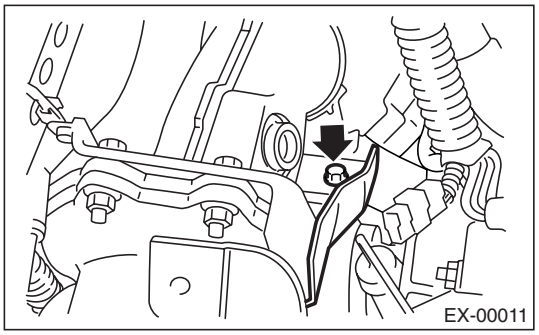
CAUTION:
Be careful, the turbocharger and exhaust pipe are hot.


EX-00009

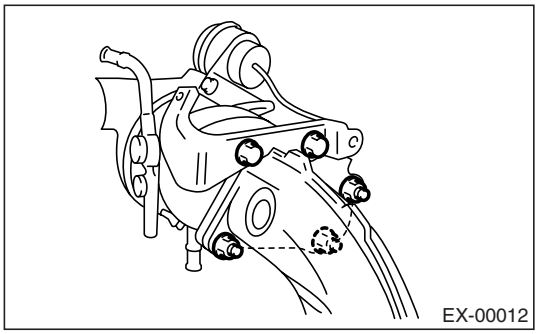
9) Lower the vehicle.
10) Remove the turbocharger upper cover.


EX-00010

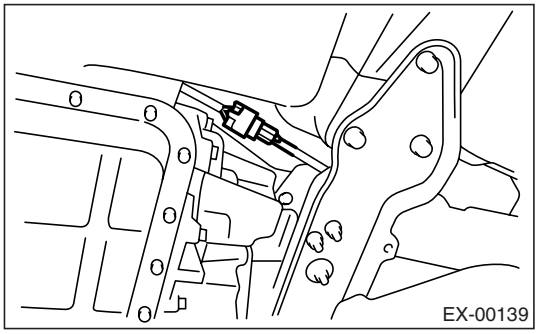
11) Remove the bolts which install the lower upper side of turbocharger upper cover, and remove it.


EX-00011

12) Separate the center exhaust pipe from turbocharger.

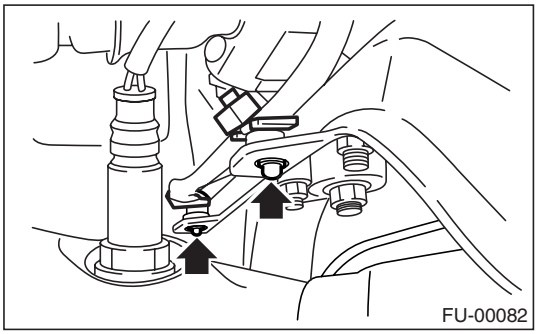

EX-00012

13) Lift-up the vehicle.
14) Disconnect the connector from rear oxygen sensor.

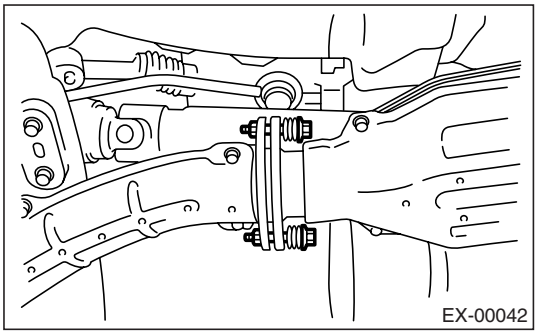

EX-00139

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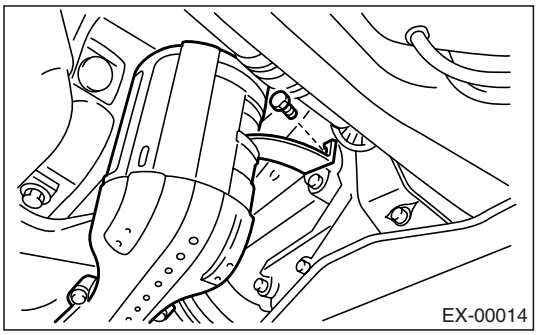
15) Vertically draw out the clip from crossmember.



16) Separate the center exhaust pipe from rear exhaust pipe.

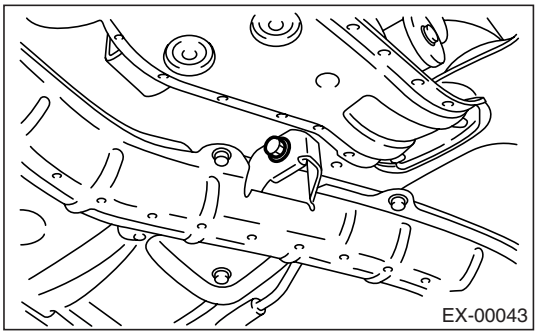


17) Remove the bolt which holds the center exhaust pipe bracket to transmission.

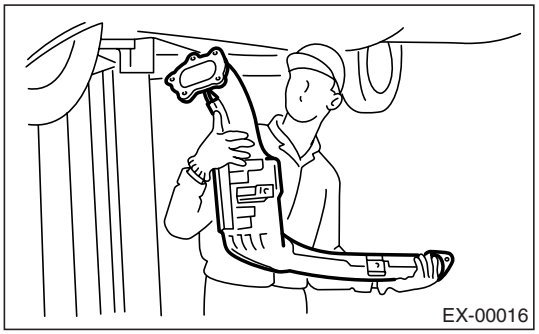


18) Remove the intercooler bracket.
19) Remove the bolt which holds the center exhaust pipe to hanger bracket.

CAUTION:
Be careful not to pull down the center exhaust pipe.



20) Remove the center exhaust pipe.

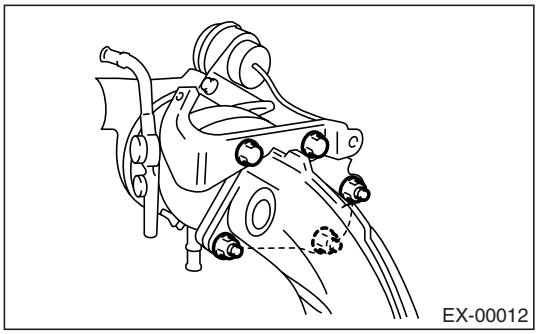


B: INSTALLATION

NOTE:
Replace the gaskets with new ones.

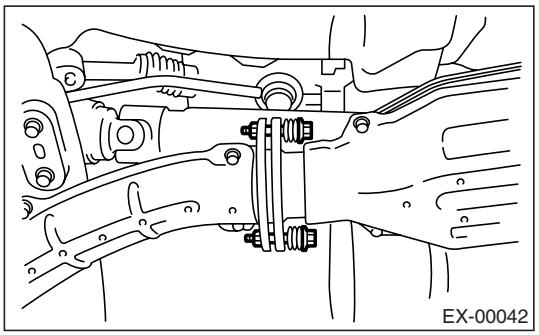
1) Install the center exhaust pipe and temporarily tighten the bolt which holds the center exhaust pipe to hanger bracket.
2) Temporarily tighten the bolt which holds the center pipe to transmission.
3) Connect the center exhaust pipe to turbocharger.

Tightening torque:
35 N·m (3.6 kgf-m, 26.0 ft-lb)



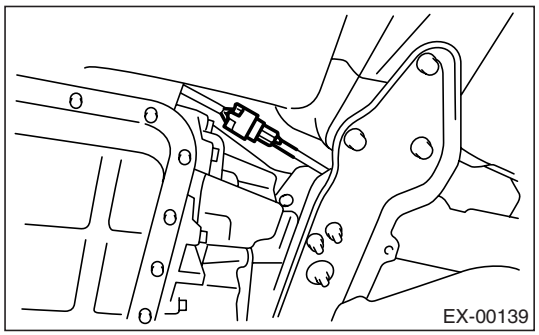
4) Install the center exhaust pipe to rear exhaust pipe.

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

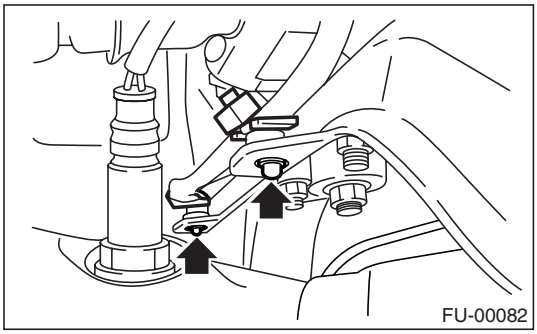


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5) Connect the connector to rear oxygen sensor.

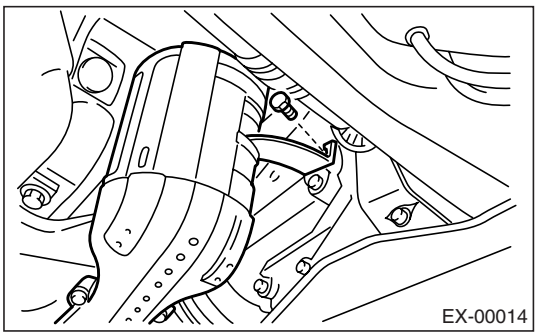


6) Secure the clip on crossmember.



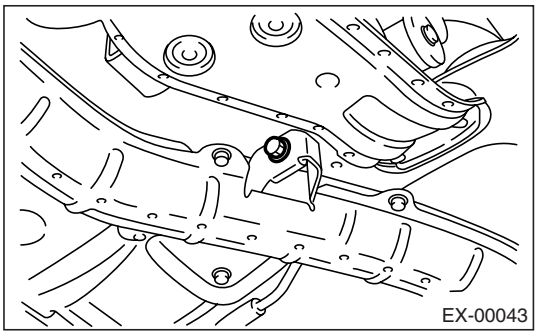
7) Tighten the bolt which holds the center exhaust pipe bracket to transmission.

Tightening torque:
30 N·m (3.1 kgf-m, 22.4 ft-lb)



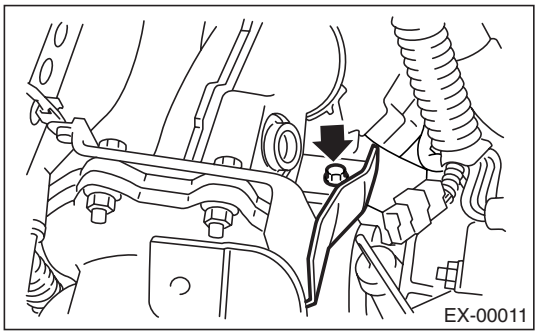
8) Tighten the bolt which holds the center exhaust pipe to hanger bracket.

Tightening torque:
35 N·m (3.6 kgf-m, 26.0 ft-lb)



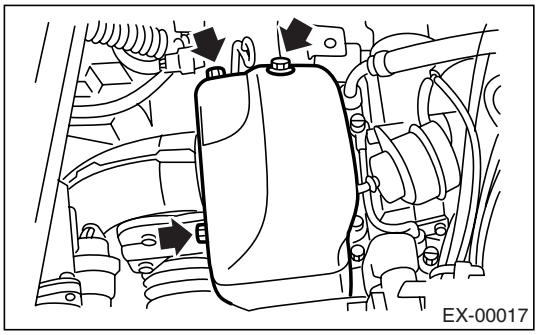
9) Lower the vehicle.
10) Place the turbocharger lower cover, and tighten the bolts which install the upper side of lower cover.

Tightening torque:
7.4 N·m (0.75 kgf-m, 5.4 ft-lb)



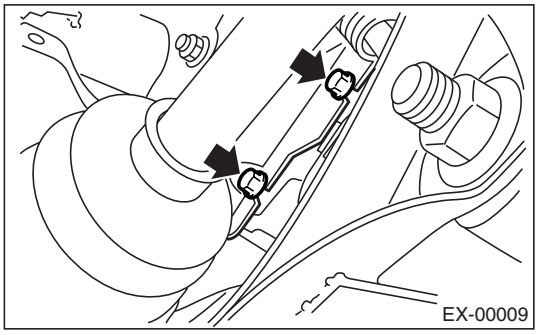
11) Place the turbocharger upper cover, and tighten the bolts which install the upper side of upper cover.

Tightening torque:
7.4 N·m (0.75 kgf-m, 5.4 ft-lb)



12) Lift-up the vehicle.
13) Tighten the bolts which install the under side of turbocharger upper cover.

Tightening torque:
7.4 N·m (0.75 kgf-m, 5.4 ft-lb)



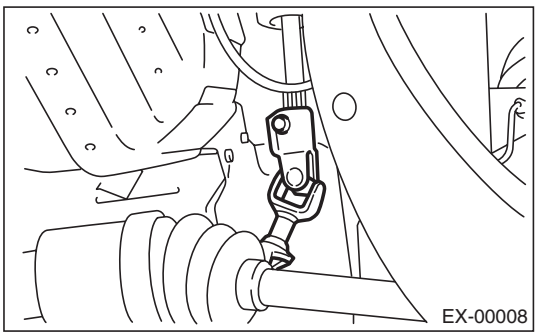
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14) Install the universal joint (RHD model).
(1) Align the bolt hole on long yoke side of universal joint with the cutout at serrated section of shaft end, and insert the universal joint.
(2) Align the bolt hole on short yoke side of universal joint with the cutout at serrated section of gearbox assembly. Lower the universal joint completely.
(3) Temporarily tighten the bolt on short yoke side. Raise the universal joint to make sure the bolt is properly passing through the cutout at serrated section.
(4) Tighten the bolt on long yoke side, then that on the short yoke side.

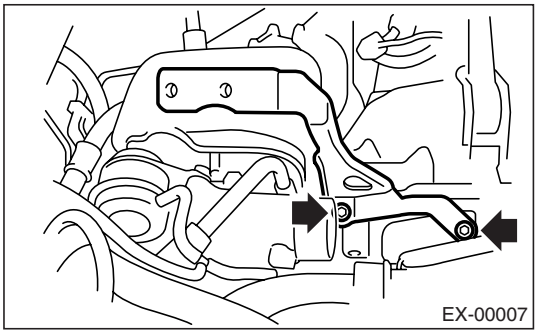
Tightening torque:
24 N·m (2.4 kgf-m, 17.4 ft-lb)

CAUTION:
• Make sure that the universal joint bolts are tightened through notches in shaft serration.
• Excessively large tightening torque of universal joint bolts may lead to heavy steering wheel operation.

Standard clearance between gearbox to DOJ:
More than 15 mm (0.59 in)



15) Install the under cover.
16) Lower the vehicle.
17) Install the intercooler bracket.



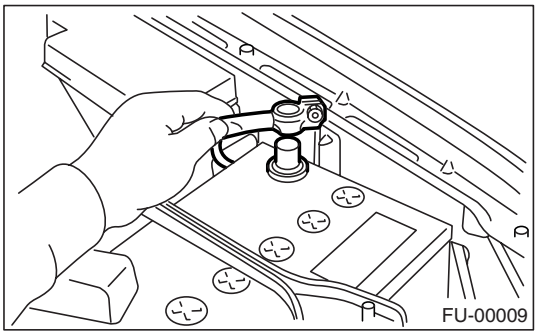
18) Install the intercooler. <Ref. to IN(H4DOTC)-11, INSTALLATION, Intercooler.>
19) Align the center of roll connector. <Ref. to AB-11, ROLL CONNECTOR, INSPECTION, Inspection Locations After a Collision.>

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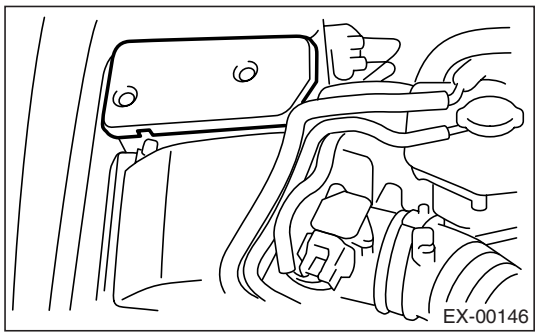
4. Joint Pipe

A: REMOVAL

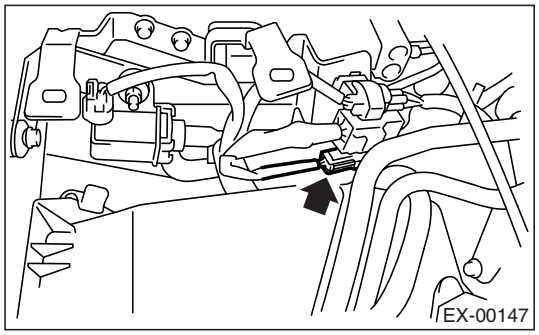
1) Disconnect the ground cable from battery.



2) Remove the solenoid valve cover.



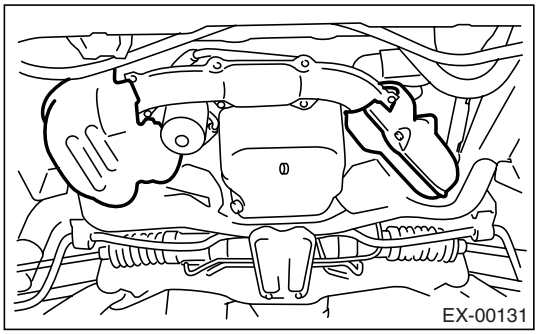
3) Disconnect the exhaust temperature sensor connector.



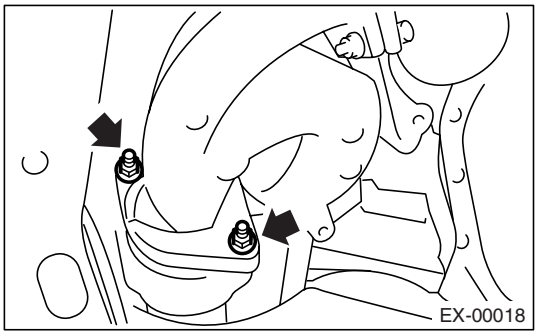
4) Remove the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-44, REMOVAL, Front Oxygen (A/F) Sensor.>

5) Remove the under cover.

6) Remove the lower exhaust manifold cover (RH).



7) Remove the nuts which hold the front exhaust manifold to joint pipe.



8) Remove the center exhaust pipe. <Ref. to EX(H4DOTC)-9, REMOVAL, Center Exhaust Pipe.>

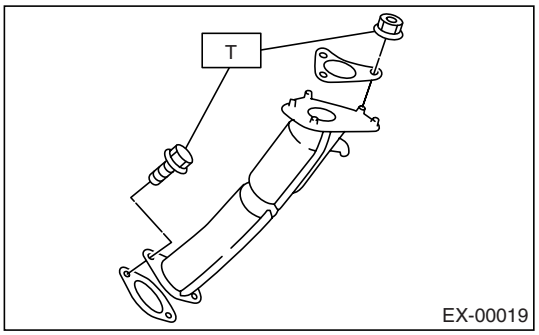
9) Remove the turbocharger. <Ref. to IN(H4DOTC)-13, REMOVAL, Turbocharger.>

10) Take off the joint pipe in the upward direction.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
T: 35 N·m (3.6 kgf-m, 26.0 ft-lb)

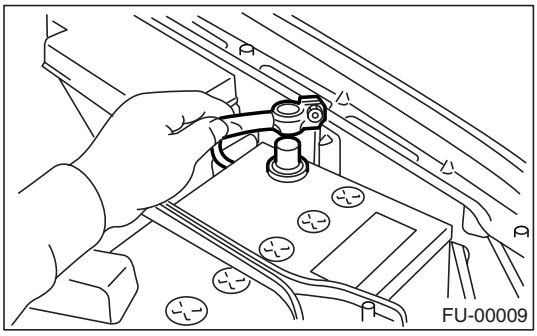


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5. Rear Exhaust Pipe

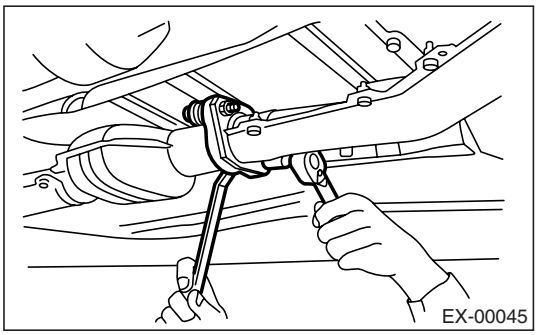
A: REMOVAL

1) Disconnect the ground cable from battery.



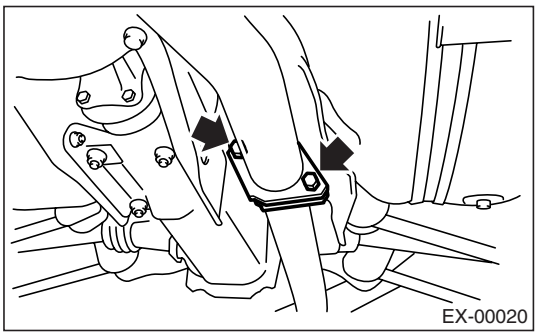
2) Lift-up the vehicle.
3) Separate the rear exhaust pipe from center exhaust pipe.

CAUTION:
Be careful, the exhaust pipe is hot.



4) Separate the rear exhaust pipe from muffler.

CAUTION:
Be careful not to pull down the rear exhaust pipe.



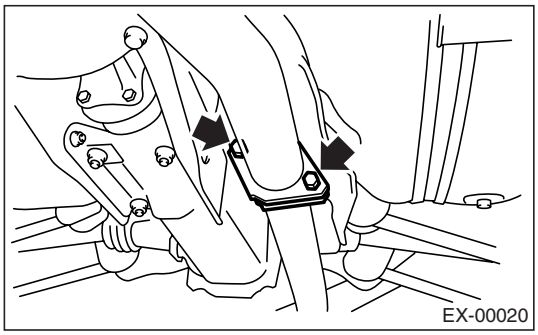
5) Remove the rear exhaust pipe.

B: INSTALLATION

NOTE:
Replace the gaskets with new ones.

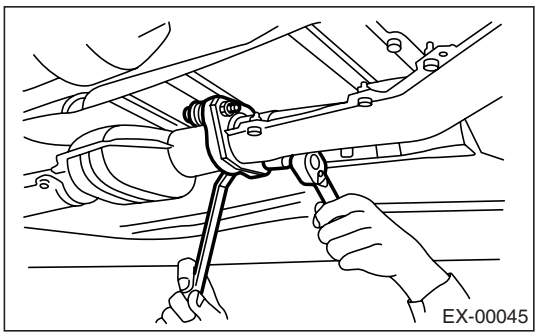
1) Install the rear exhaust pipe to muffler.

Tightening torque:
48 N·m (4.9 kgf-m, 35.4 ft-lb)

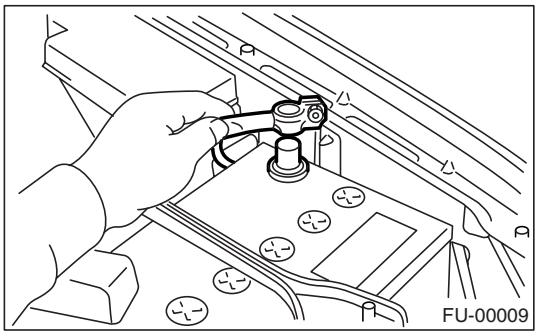


2) Install the rear exhaust pipe to center exhaust pipe.

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



3) Lower the vehicle.
4) Connect the battery ground cable to battery.



C: INSPECTION

1) Make sure there are no exhaust leaks from connections and welds.
2) Make sure there are no holes or rusting.
3) Make sure the cushion rubber is not worn or cracked.

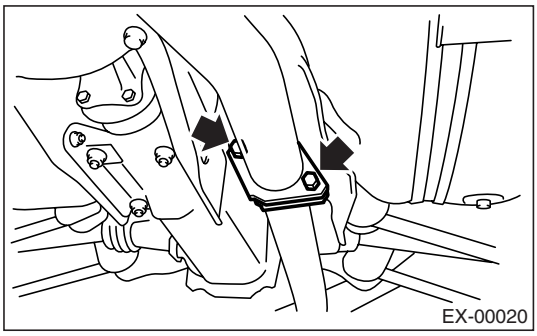
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6. Muffler

A: REMOVAL

1) Separate the muffler from rear exhaust pipe.

CAUTION:
Be careful, the exhaust pipe is hot.

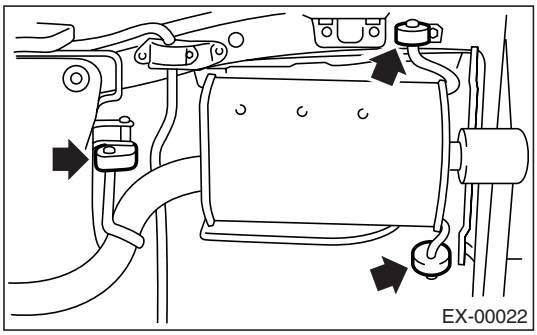


2) Remove the rubber cushions, and detach the muffler.

CAUTION:
Be careful not to drop the muffler during removal.

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

SUBARU CRC (Part No. 004301003)

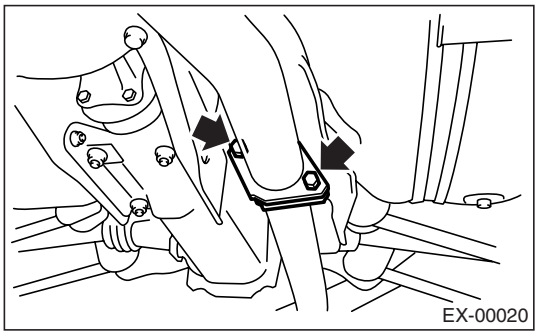


B: INSTALLATION

1) Install in the reverse order of removal.

NOTE:
Replace the gasket with a new one.

Tightening torque:
48 N·m (4.9 kgf-m, 35.4 ft-lb)



C: INSPECTION

1) Make sure there are no exhaust leaks from connections and welds.
2) Make sure there are no holes or rusting.
3) Make sure the cushion rubber is not worn or cracked.

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MUFFLER

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COOLING

CO(H4DOTC)

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1. General Description

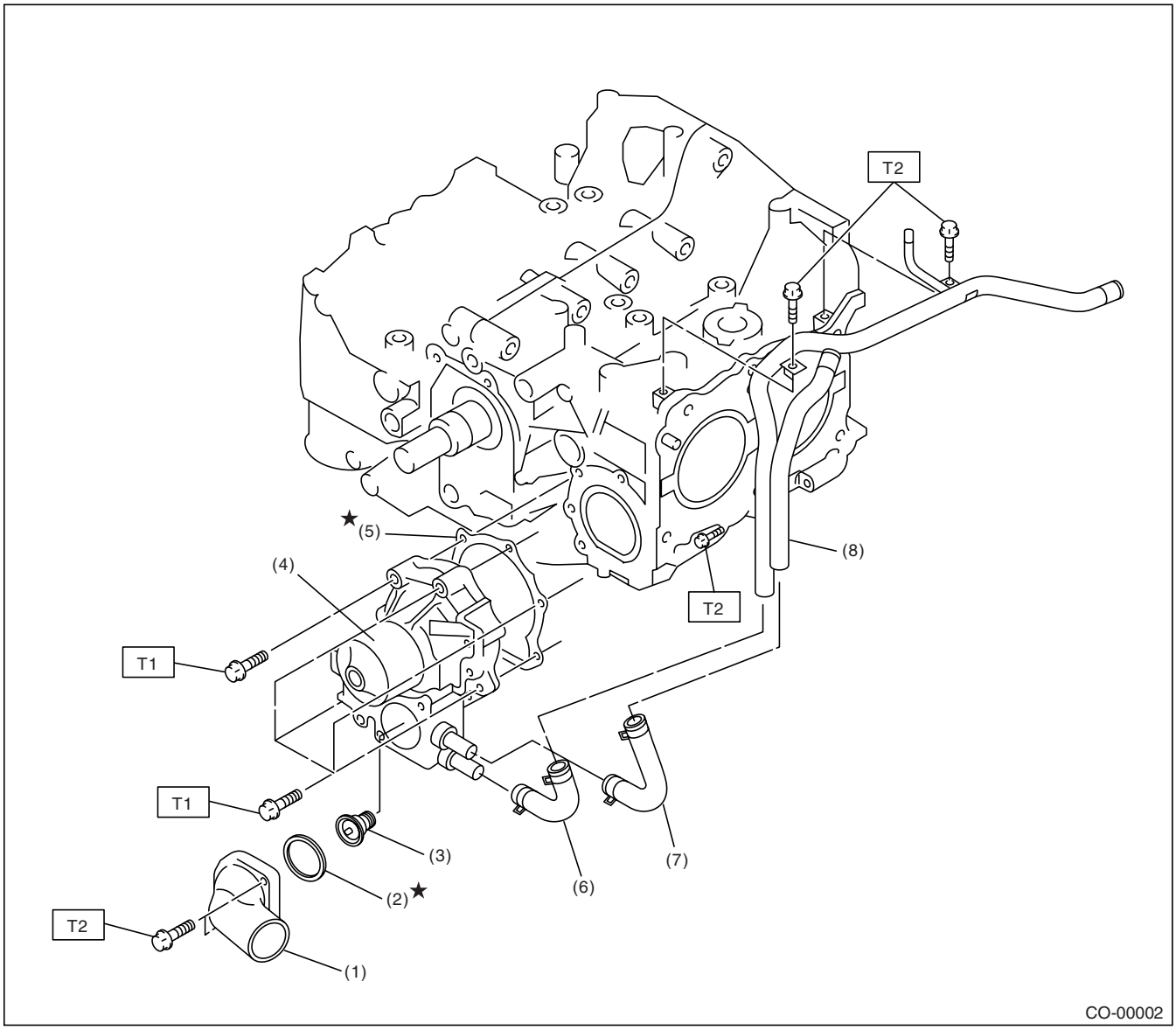
A: SPECIFICATIONS

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 (8.03, 6.69) MT: Approx. 7.7 (8.14, 6.78)
Water pump	Type		Centrifugal impeller type
	Discharge performance I	Discharge	20 ℓ (5.3 US gal, 4.4 Imp gal)/min.
		Pump speed—Discharge pressure	760 rpm — 2.9 kPa (0.3 mAq)
		Engine coolant temperature	85°C (185°F)
	Discharge performance II	Discharge	100 ℓ (26.4 US gal, 22.0 Imp gal)/min.
		Pump speed—Discharge pressure	3,000 rpm — 49.0 kPa (5.0 mAq)
		Engine coolant temperature	85°C (185°F)
	Discharge performance III	Discharge	200 ℓ (52.8 US gal, 44.0 Imp gal)/min.
		Pump speed—Discharge pressure	6,000 rpm — 225.4 kPa (23.0 mAq)
		Engine coolant temperature	85°C (185°F)
	Impeller diameter		76 mm (2.99 in)
	Number of impeller vanes		8
	Pump pulley diameter		60 mm (2.36 in)
	Clearance between impeller and case	Standard	0.5 — 0.7 mm (0.020 — 0.028 in)
		Limit	1.0 mm (0.039 in)
	“Thrust” runout of impeller end		0.5 mm (0.020 in)
Thermostat	Type		Wax pellet type
	Starts to open		76 — 80°C (169 — 176°F)
	Fully opened		91°C (196°F)
	Valve lift		9.0 mm (0.354 in) or more/91°C (196°F)
	Valve bore		35 mm (1.38 in)
Radiator fan	Motor	Main fan	120 W
		Sub fan	120 W
	Fan diameter × Blade		320 mm (11.81 in) × 5 (main fan) 320 mm (11.81 in) × 7 (sub fan)
Radiator	Type		Down flow, pressure type
	Core dimensions	Width × Height × Thickness	AT: 691.5 × 340 × 16 mm (27.22 × 13.39 × 0.63 in) MT: 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 kg/cm^2, 16±2 psi) Below: −1.0 to −4.9 kPa (−0.01 to −0.05 kg/cm^2, −0.1 to −0.7 psi)
		Radiator side	Above only: 137±14.7 kPa (1.40±0.15 kg/cm^2, 20±2.1 psi)
	Fins		Corrugated fin type
Reservoir tank	Capacity		0.5 ℓ (0.5 US qt, 0.4 Imp qt)

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B: COMPONENT

1. WATER PUMP

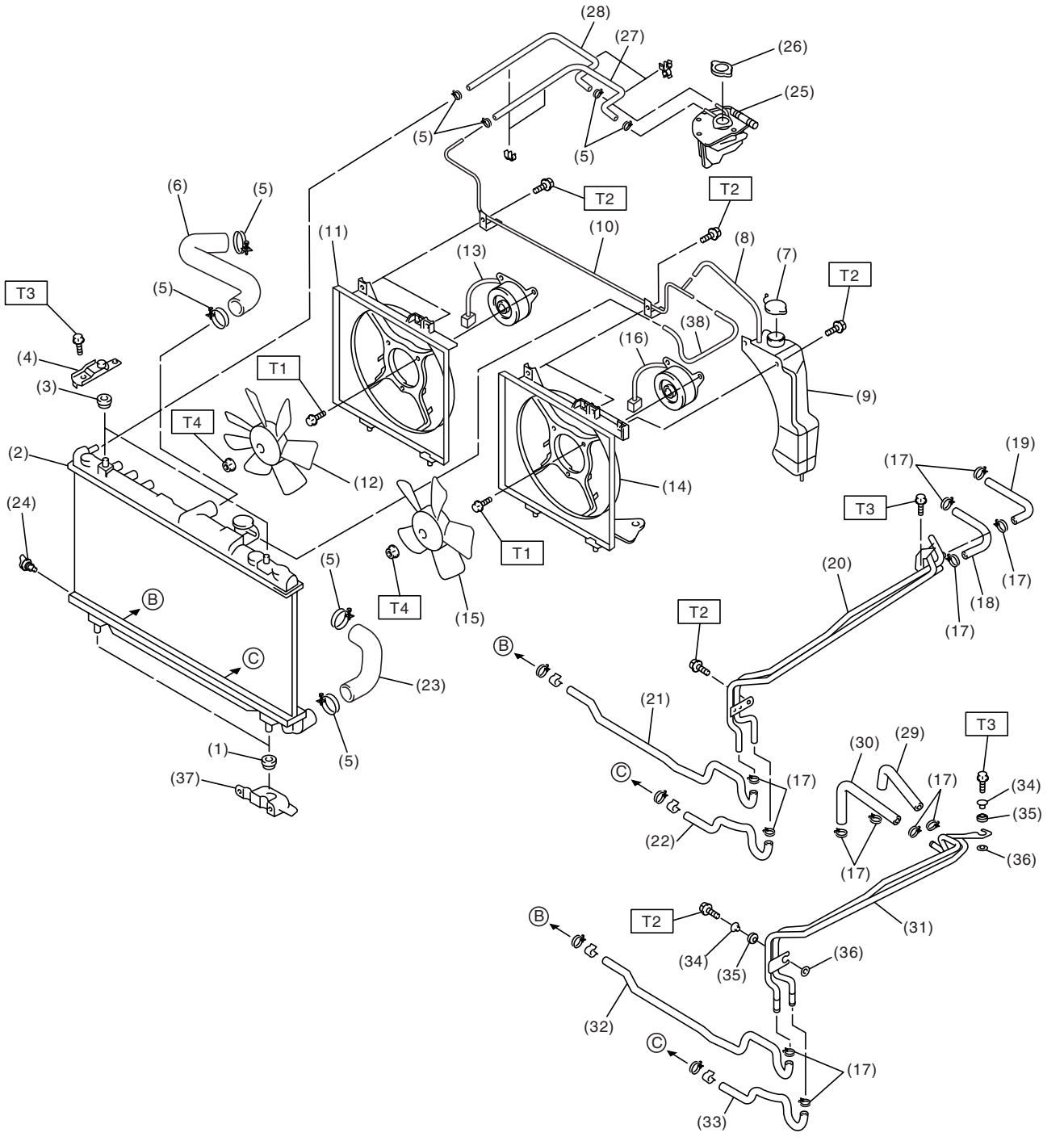


(1) Thermostat cover
(2) Gasket
(3) Thermostat
(4) Water pump ASSY
(5) Gasket
(6) Heater by-pass hose
(7) Coolant filler tank by-pass hose
(8) Water by-pass pipe

Tightening torque: N·m (kgf-m, ft-lb)
T1: First 12 (1.2, 8.7)
Second 12 (1.2, 8.7)
T2: 6.5 (0.66, 4.8)

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2. RADIATOR AND RADIATOR FAN



CO-00206

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(1) Radiator lower cushion
(2) Radiator
(3) Radiator upper cushion
(4) Radiator upper bracket
(5) Clamp
(6) Radiator inlet hose
(7) Engine coolant reservoir tank cap
(8) Overflow hose A
(9) Engine coolant reservoir tank
(10) Overflow pipe
(11) Radiator sub fan shroud
(12) Radiator sub fan
(13) Radiator sub fan motor
(14) Radiator main fan shroud
(15) Radiator main fan
(16) Radiator main fan motor
(17) ATF hose clamp (AT model)
(18) ATF inlet hose A (AT model)
(19) ATF outlet hose A (AT model)
(20) ATF pipe (AT model)
(21) ATF inlet hose B (AT model)
(22) ATF outlet hose B (AT model)
(23) Radiator outlet hose
(24) Radiator drain plug
(25) Engine coolant filler tank
(26) Radiator cap (engine coolant filler tank cap)
(27) Engine overflow hose
(28) Engine air breather hose
(29) Oil cooler inlet hose A (MT model with oil cooler)
(30) Oil cooler outlet hose A (MT model with oil cooler)
(31) Oil cooler pipe (MT model with oil cooler)
(32) Oil cooler inlet hose B (MT model with oil cooler)
(33) Oil cooler outlet hose B (MT model with oil cooler)
(34) Spacer (MT model with oil cooler)
(35) Cushion (MT model with oil cooler)
(36) Setting washer (MT model with oil cooler)
(37) Radiator lower bracket
(38) Overflow hose B

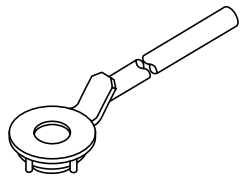
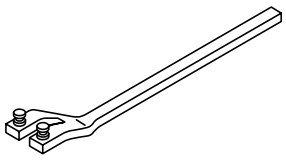
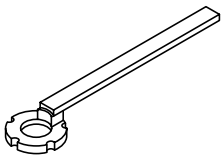
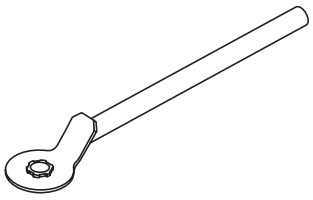
Tightening torque: N·m (kgf-m, ft-lb)
T1: 4.4 (0.45, 3.3)
T2: 7.5 (0.76, 5.5)
T3: 18 (1.8, 13.0)
T4: 3.4 (0.35, 2.5)

C: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn your hands, because each part in the vehicle is hot after running.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.

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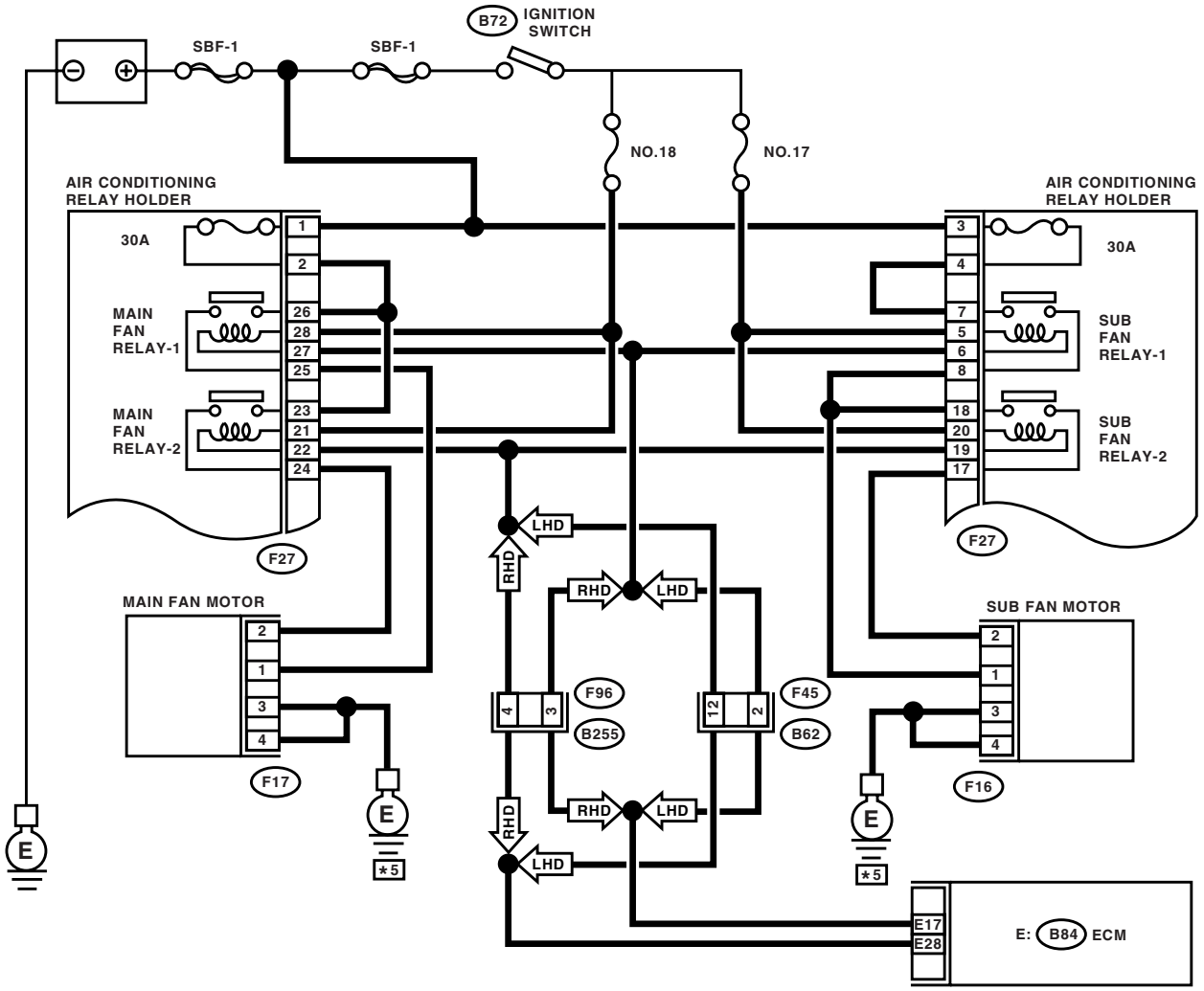
D: PREPARATION TOOL

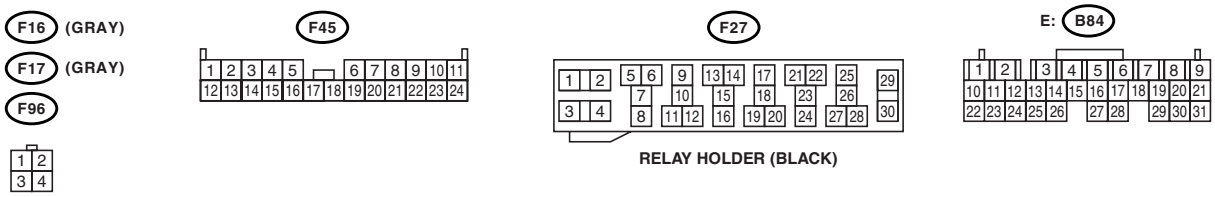
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499977400	499977400	CRANKSHAFT PULLEY WRENCH	Used for stopping crankshaft pulley when loosening and tightening crankshaft pulley bolts.
 ST18231AA010	18231AA010	CAMSHAFT SPROCKET WRENCH	Used for removing and installing intake camshaft sprocket. (Except for STi and Australia model)
 ST-499207400	499207400	CAMSHAFT SPROCKET WRENCH	Used for removing and installing exhaust camshaft sprocket.
 ST-499977500	499977500	CAMSHAFT SPROCKET WRENCH	Used for removing and installing intake camshaft sprocket. (STi and Australia model)

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2. Radiator Main Fan System

A: SCHEMATIC





CO-00207

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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.

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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. 26 (+) — 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. 28 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **12.**	Go to step **11.**
9	**CHECK 30 A FUSE.** 1)Remove the 30 A fuse from A/C relay holder. 2)Check the condition of fuse.	Is the fuse blown out?	Replace the fuse.	Go to step **10.**
10	**CHECK POWER SUPPLY TO A/C RELAY HOLDER 30 A FUSE TERMINAL.** Measure the voltage of harness between A/C relay holder 30 A fuse terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 1 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair the open circuit in harness between 30 A fuse and main fan relay terminal.	Repair the open circuit in harness between main fuse box connector and 30 A fuse terminal.
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. 26 — No. 25:***	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. 27 and No. 28 of main fan relay1. 2)Measure the resistance of main fan relay1. ***Terminals*** ***No. 26 — No. 25:***	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. 25:***	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.
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. 27 — (B84) No. 17:***	Is the resistance less than 1 Ω?	Go to step **16.**	Repair the open circuit in harness between main fan relay and ECM.

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	Step	Check	Yes	No
16	**CHECK POOR CONTACT.** Check poor contact in connector between main fan and ECM.	Is there poor contact in connector between main fan motor and ECM?	Repair the poor contact connector.	Record the DTC. Repair the trouble cause. <Ref. to EN(H4DOTC)-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. 1 of main fan motor connector.	Does the main fan rotate?	Repair the poor contact in main fan motor connector.	Replace the main fan motor with a new one.
20	**CHECK POWER SUPPLY TO MAIN FAN RELAY2.** 1)Turn the ignition switch to OFF. 2)Remove the main fan relay2 from A/C relay holder. 3)Measure the voltage between main fan relay2 terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 23 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **21.**	Go to step **22.**
21	**CHECK POWER SUPPLY TO MAIN FAN RELAY2.** 1)Turn the ignition switch to ON. 2)Measure the voltage between main fan relay2 terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 21 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **25.**	Go to step **24.**
22	**CHECK 30 A FUSE.** 1)Remove the 30 A fuse from A/C relay holder. 2)Check the condition of fuse.	Is the fuse blown out?	Replace the fuse.	Go to step **23.**
23	**CHECK POWER SUPPLY TO A/C RELAY HOLDER 30 A FUSE TERMINAL.** Measure the voltage of harness between A/C relay holder 30 A fuse terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 1 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair the open circuit in harness between 30 A fuse and main fan relay terminal.	Repair the open circuit in harness between main fuse box connector and 30 A fuse terminal.

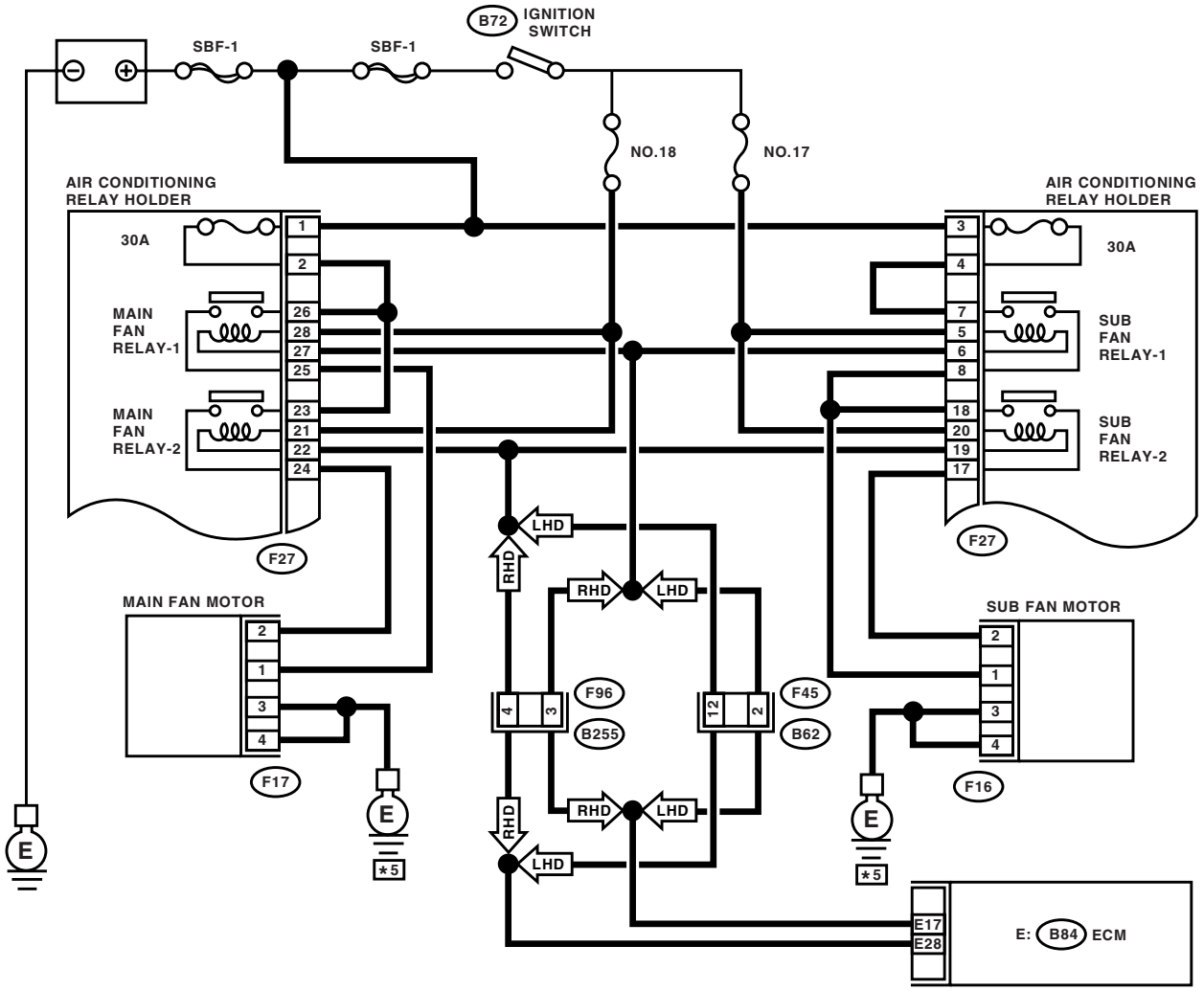
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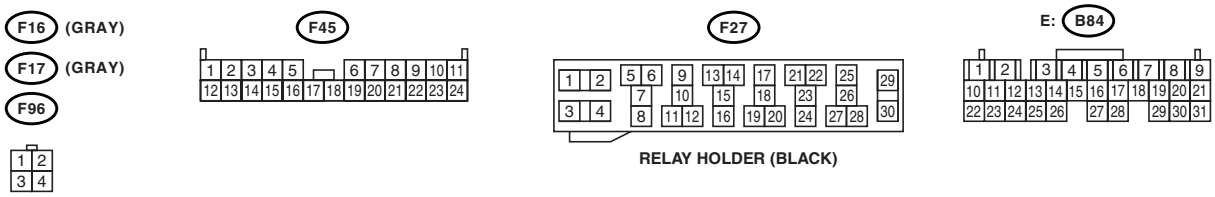
Step		Check	Yes	No
24	**CHECK FUSE.** 1)Turn the ignition switch to OFF. 2)Remove the fuse No. 18 from joint box. 3)Check the condition of fuse.	Is the fuse blown out?	Replace the fuse.	Repair the open circuit in harness between main fan relay and ignition switch.
25	**CHECK MAIN FAN RELAY.** 1)Turn the ignition switch to OFF. 2)Remove the main fan relay2. 3)Measure the resistance of main fan relay2. ***Terminals*** ***No. 23 — No. 24:***	Is the resistance more than 1 MΩ?	Go to step **26.**	Replace the main fan relay.
26	**CHECK MAIN FAN RELAY.** 1)Connect the battery to terminals No. 21 and No. 22 of main fan relay1. 2)Measure the resistance of main fan relay2. ***Terminals*** ***No. 23 — No. 24:***	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. 24:***	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. 22 — (B84) No. 28:***	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)-39, Read Diagnostic Trouble Code (DTC).>

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3. Radiator Sub Fan System

A: SCHEMATIC





CO-00207

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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 main fan system is okay.	Go to step **17.**
3	**CHECK POWER SUPPLY TO SUB FAN MOTOR.** **CAUTION:** **Be careful not to overheat the engine during repair.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from sub fan motor. 3)Start the engine, and warm it up until engine coolant temperature increases over 96°C (205°F). 4)Stop the engine and turn ignition switch to ON. 5)Measure the voltage between sub fan motor connector and chassis ground. ***Connector & terminal*** ***(F16) No. 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 MAIN 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 main fan rotate?	Repair the poor contact in sub fan motor connector.	Replace the sub fan motor with a new one.

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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. 7 (+) — 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 30 A FUSE.** 1)Remove the 30 A fuse from A/C relay holder. 2)Check the condition of fuse.	Is the fuse blown out?	Replace the fuse.	Go to step **10.**
10	**CHECK POWER SUPPLY TO A/C RELAY HOLDER 30 A FUSE TERMINAL.** Measure the voltage of harness between A/C relay holder 30 A fuse terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 3 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair the open circuit in harness between 30 A fuse and sub fan relay terminal.	Repair the open circuit in harness between sub fuse box connector and 30 A fuse terminal.
11	**CHECK FUSE.** 1)Turn the ignition switch to OFF. 2)Remove the fuse No. 17 from joint box. 3)Check the condition of fuse.	Is the fuse blown out?	Replace the fuse.	Repair the open circuit in harness between sub fan relay and ignition switch.
12	**CHECK SUB FAN RELAY.** 1)Turn the ignition switch to OFF. 2)Remove the main fan relay1. 3)Measure the resistance of sub fan relay1. ***Terminals*** ***No. 7 — No. 8:***	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. 6 and No. 5 of sub fan relay1. 2)Measure the resistance of sub fan relay. ***Terminals*** ***No. 7 — No. 8:***	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. 8:***	Is the resistance less than 1 Ω?	Go to step **15.**	Repair the open circuit in harness between sub fan motor connector and sub fan relay terminal.
15	**CHECK HARNESS BETWEEN SUB FAN RELAY AND ECM.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ECM. 3)Measure the resistance of harness between sub fan relay connector and ECM connector. ***Connector & terminal*** ***(F27) No. 6 — (B84) No. 17:***	Is the resistance less than 1 Ω?	Go to step **16.**	Repair the open circuit in harness between sub fan relay and ECM.

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	Step	Check	Yes	No
16	**CHECK POOR CONTACT.** Check poor contact in connector between sub fan and ECM.	Is there poor contact in connector between sub fan motor and ECM?	Repair the poor contact connector.	Record the DTC. Repair the trouble cause. <Ref. to EN(H4DOTC)-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 main fan rotate?	Repair the poor contact in sub fan motor connector.	Replace the sub fan motor with a new one.
20	**CHECK POWER SUPPLY TO SUB FAN RELAY2.** 1)Turn the ignition switch to OFF. 2)Remove the sub fan relay2 from A/C relay holder. 3)Measure the voltage between sub fan relay2 terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 18 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **21.**	Go to step **22.**
21	**CHECK POWER SUPPLY TO SUB FAN RELAY2.** 1)Turn the ignition switch to ON. 2)Measure the voltage between sub fan relay2 terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 20 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **23.**	Go to step **24.**
22	**CHECK 30 A FUSE.** 1)Remove the 30 A fuse from A/C relay holder. 2)Check the condition of fuse.	Is the fuse blown out?	Replace the fuse.	Go to step **23.**
23	**CHECK POWER SUPPLY TO A/C RELAY HOLDER 30 A FUSE TERMINAL.** Measure the voltage of harness between A/C relay holder 30 A fuse terminal and chassis ground. ***Connector & terminal*** ***(F27) No. 3 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair the open circuit in harness between 30 A fuse and sub fan relay terminal.	Repair the open circuit in harness between sub fuse box connector and 30 A fuse terminal.

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Step		Check	Yes	No
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 main fan relay2. ***Terminals*** ***No. 18 — No. 17:***	Is the resistance more than 1 MΩ?	Go to step **26.**	Replace the sub fan relay.
26	**CHECK MAIN FAN RELAY.** 1)Connect the battery to terminals No. 19 and No. 20 of sub fan relay2. 2)Measure the resistance of main fan relay2. ***Terminals*** ***No. 18 — No. 17:***	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. 17:***	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. 19 — (B84) No. 28:***	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)-39, Read Diagnostic Trouble Code (DTC).>

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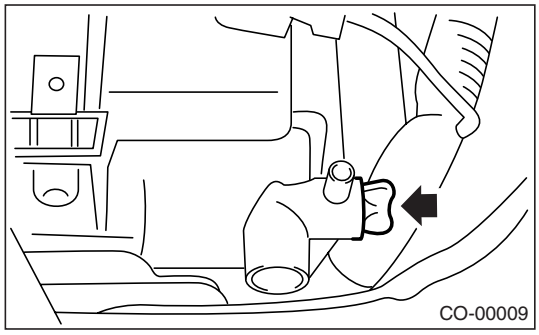
4. Engine Coolant

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.



4) Install the drain cock.

2. FILLING OF ENGINE COOLANT

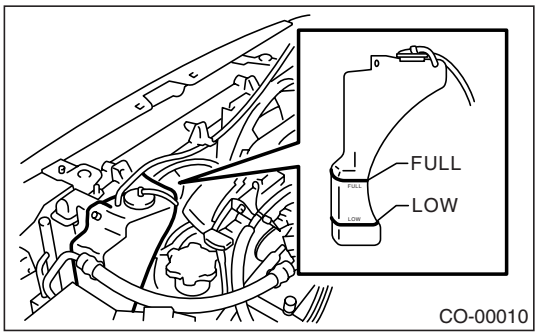
1) Fill engine coolant into the coolant filler tank up to filler neck position.

Coolant capacity (fill up to "FULL" level):
AT model
Approx. 7.6 ℓ (8.03 US qt, 6.69 Imp qt)
MT model
Approx. 7.7 ℓ (8.14 US qt, 6.78 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.

2) Fill engine coolant into the reservoir tank up to Full level.



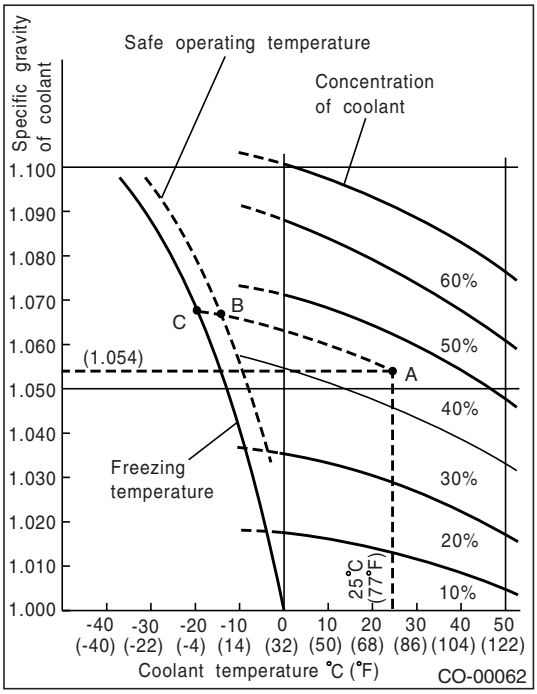
3) Warm-up the engine completely for more than 5 minutes at 2,000 to 3,000 rpm.
4) If the engine coolant level drops in coolant filler tank, add engine coolant to filler neck position.
5) If the engine coolant level drops from Full level of reservoir tank, add engine coolant to Full level.
6) Attach the coolant filler tank cap and reservoir tank cap properly.

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B: INSPECTION

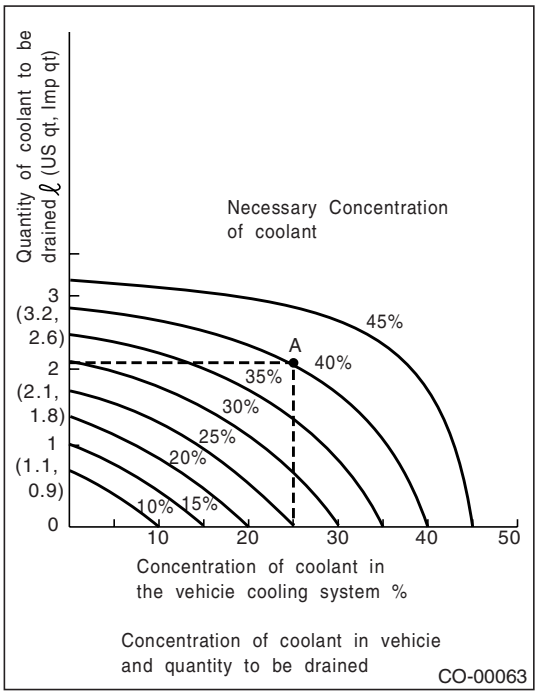
1. RELATIONSHIP OF SUBARU COOLANT CONCENTRATION AND FREEZING TEMPERATURE

The concentration and safe operating temperature of the SUBARU coolant is shown in the diagram. Measuring the temperature and specific gravity of the coolant will provide this information.
[Example]
If the coolant temperature is 25°C (77°F) and its specific gravity is 1.054, the concentration is 45% (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.

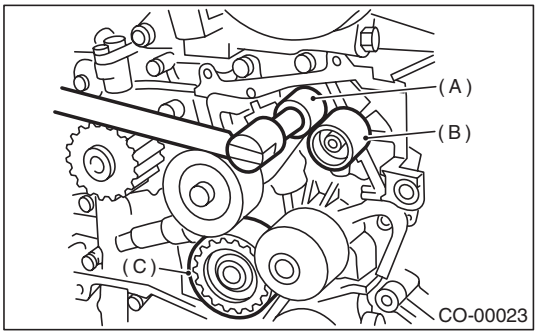


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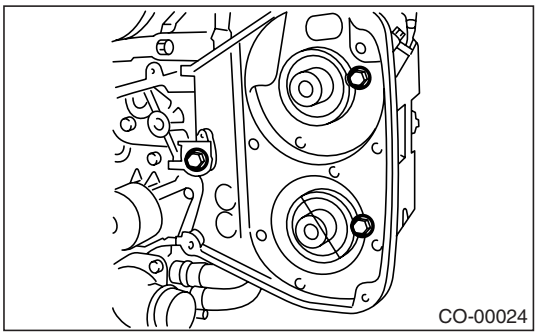
5. Water Pump

A: REMOVAL

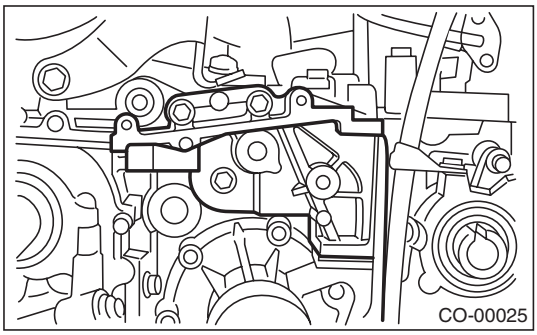
1) Remove the radiator. <Ref. to CO(H4DOTC)-23, REMOVAL, Radiator.>
2) Remove the V-belts. <Ref. to ME(H4DOTC)-55, REMOVAL, V-belt.>
3) Remove the timing belt. <Ref. to ME(H4DOTC)-60, REMOVAL, Timing Belt Assembly.>
4) Remove the automatic belt tension adjuster (A).
5) Remove the belt idler (B).
6) Remove the belt idler No. 2 (C).



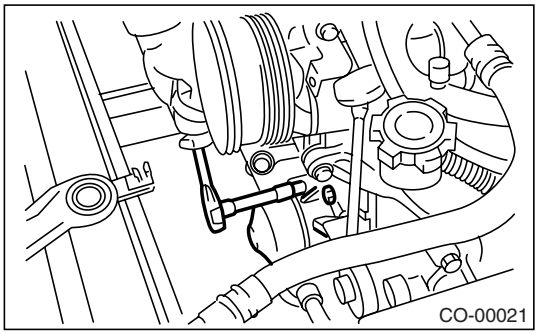
7) Remove the camshaft position sensor. <Ref. to FU(H4DOTC)-30, REMOVAL, Camshaft Position Sensor.>
8) Remove the camshaft sprockets (LH) by using ST. <Ref. to ME(H4DOTC)-69, REMOVAL, Camshaft Sprocket.>
9) Remove the belt cover No. 2 (LH).



10) Remove the tensioner bracket.



11) Disconnect the hose from water pump.
12) Remove the water pump.

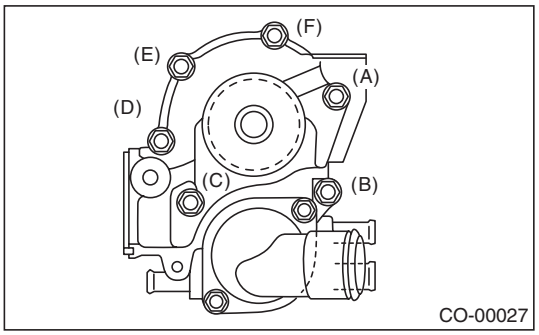


B: INSTALLATION

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

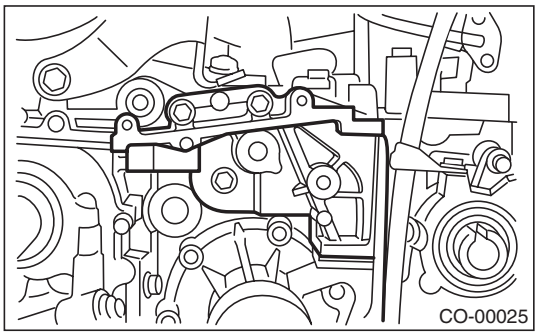
NOTE:
- Replace the gasket with a new one.
- When installing the water pump, tighten bolts in two stages in alphabetical sequence as shown in the figure.

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.

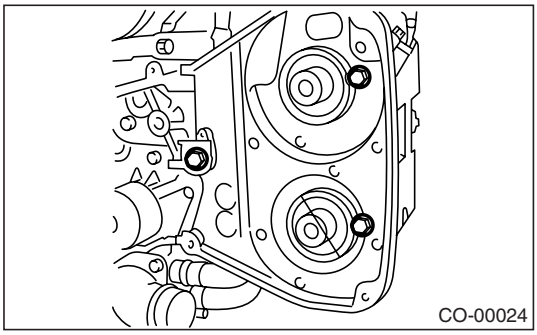
Tightening torque:
25 N·m (2.5 kgf-m, 18.1 ft-lb)



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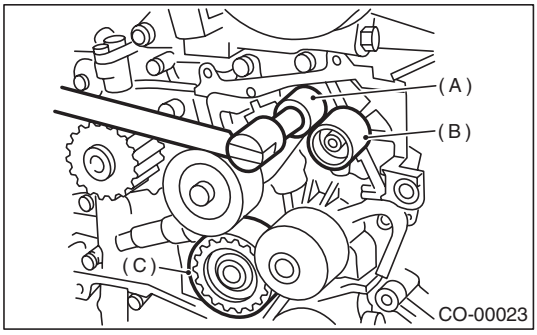
4) Install the belt cover No. 2 (LH).

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)



5) Install the camshaft sprockets (LH) by using ST. <Ref. to ME(H4DOTC)-70, INSTALLATION, Camshaft Sprocket.>
6) Install the camshaft position sensor. <Ref. to FU(H4DOTC)-30, 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)-62, AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER, INSTALLATION, Timing Belt Assembly.>

Tightening torque:
39 N·m (4.0 kgf-m, 28.9 ft-lb)

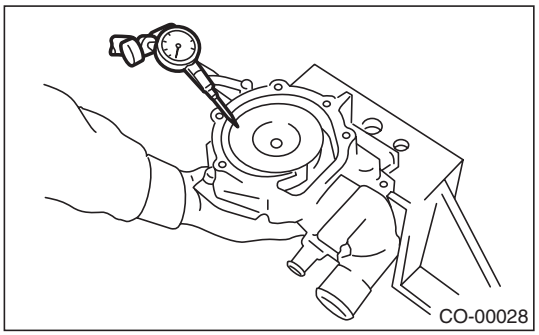


10) Install the timing belt. <Ref. to ME(H4DOTC)-63, TIMING BELT, INSTALLATION, Timing Belt Assembly.>
11) Install the V-belts. <Ref. to ME(H4DOTC)-55, INSTALLATION, V-belt.>
12) Install the radiator. <Ref. to CO(H4DOTC)-24, INSTALLATION, Radiator.>

C: INSPECTION

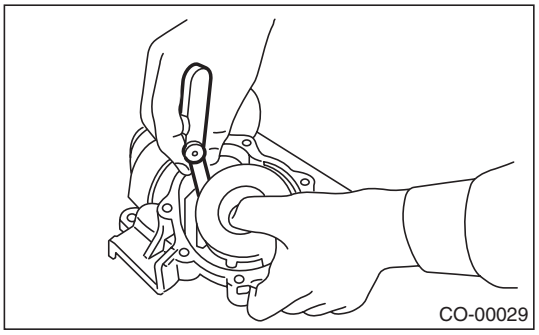
1) Check the water pump bearing for smooth rotation.
2) Check the water pump pulley for abnormalities.
3) Using a dial gauge, measure the impeller runout in thrust direction while rotating the pulley.

"Thrust" runout limit:
0.5 mm (0.020 in)



4) Check the clearance between impeller and pump case.

Clearance between impeller and pump case:
Standard
0.5 — 0.7 mm (0.020 — 0.028 in)
Limit
1.0 mm (0.039 in)



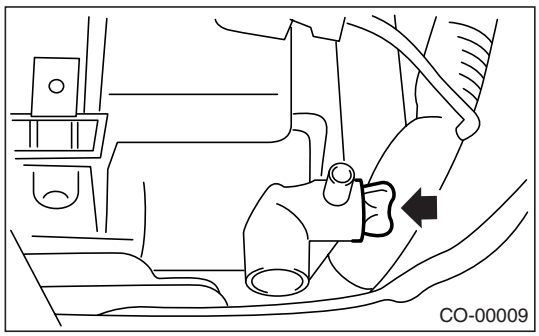
5) After water pump installation, check the pulley shaft for engine coolant leaks. If leaks are noted, replace the water pump assembly.

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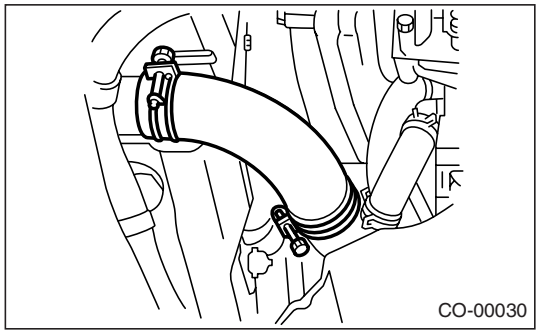
6. Thermostat

A: REMOVAL

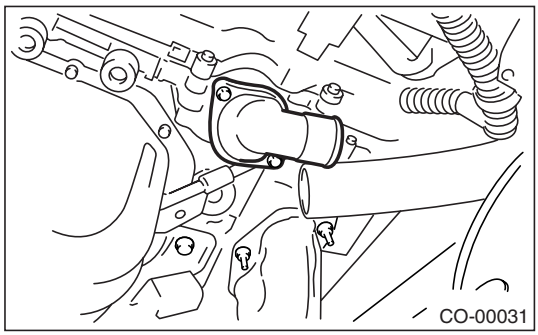
1) Set the vehicle on a lift.
2) Lift-up the vehicle.
3) Remove the under cover.
4) Drain the engine coolant completely. <Ref. to CO(H4DOTC)-17, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>



5) Disconnect the radiator outlet hose.



6) Remove the thermostat cover and gasket, and then pull out the thermostat.

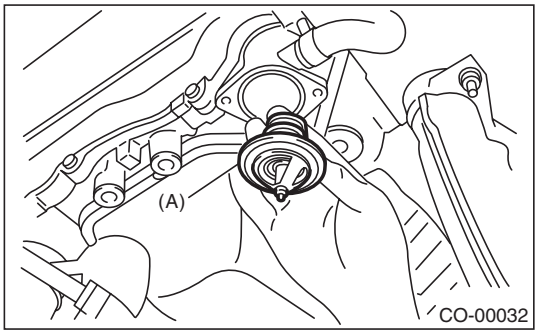


B: INSTALLATION

1) Install the thermostat in water pump, and then install the thermostat cover together with a gasket.

NOTE:
• When reinstalling the thermostat, use a new gasket.
• The thermostat must be installed with the jiggle pin (A) facing to front side.

Tightening torque:
6.5 N·m (0.65 kgf-m, 4.7 ft-lb)



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

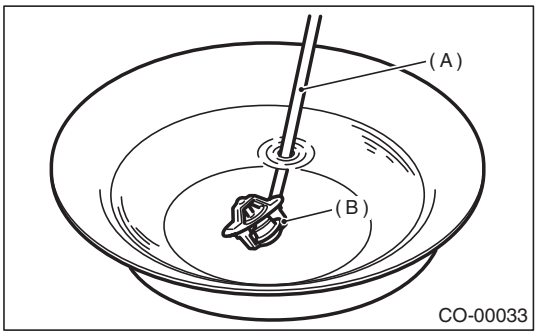
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C: INSPECTION

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.

Starts to open:
76 — 80°C (169 — 176°F)

Fully opens:
91°C (196°F)



(A) Thermometer
(B) Thermostat

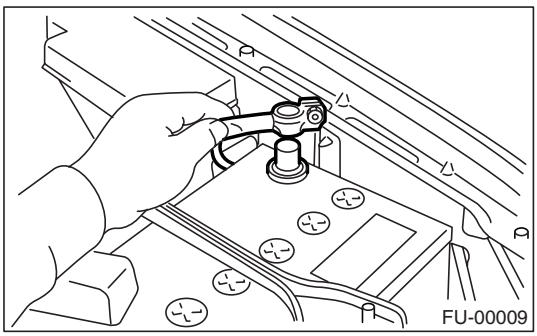
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7. Radiator

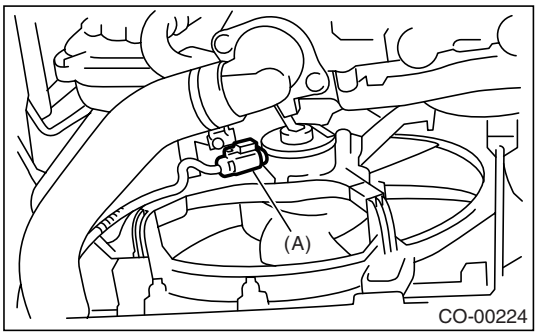
A: REMOVAL

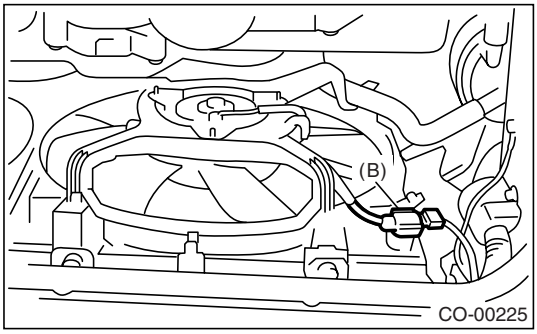
WARNING:
The radiator is pressurized. Wait until the engine cools down before working on the radiator.

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

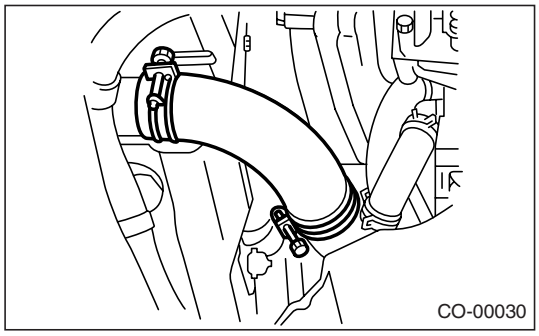


3) Lift-up the vehicle.
4) Remove the under cover.
5) Drain the engine coolant completely. <Ref. to CO(H4DOTC)-17, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
6) Disconnect the connectors of radiator main fan motor (A) and sub fan motor (B).

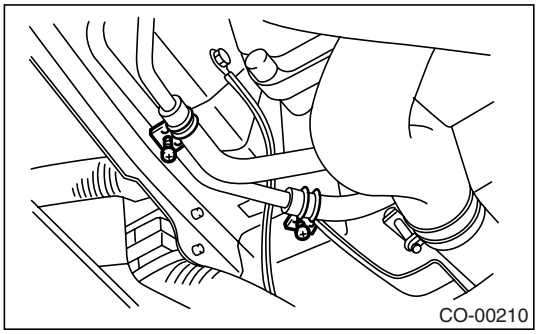




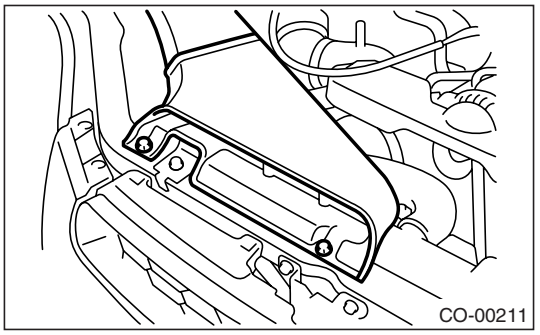
7) Disconnect the radiator outlet hose from thermostat cover.



8) 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.
9) Disconnect the oil cooler hose from oil cooler pipe. (MT model with oil cooler)
Install the cap to prevent oil from leaking.

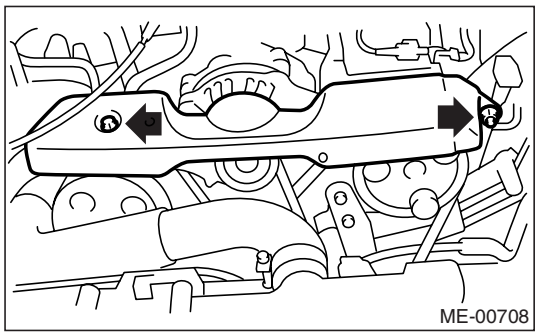


10) Lower the vehicle.
11) Remove the air intake duct.

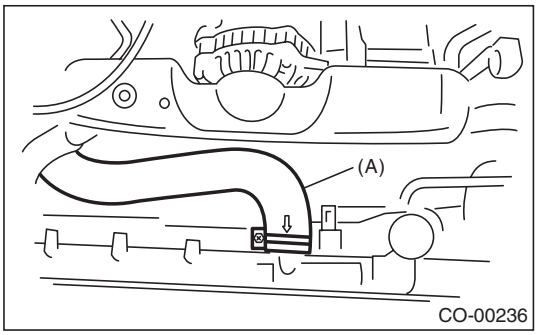


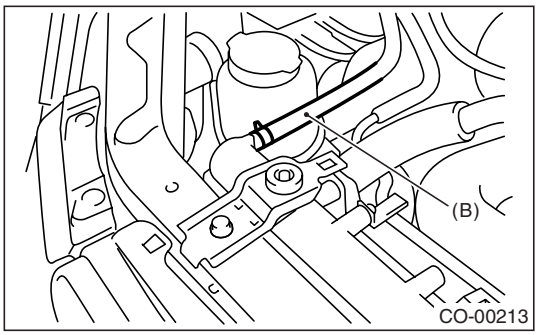
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12) Remove the V-belt covers.

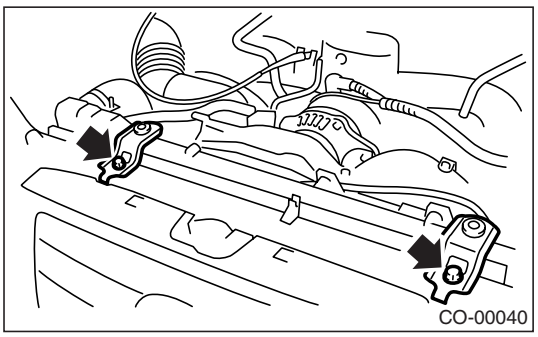


13) Disconnect the overflow hose.
14) Remove the reservoir tank. <Ref. to CO(H4DOTC)-32, REMOVAL, Reservoir Tank.>
15) Disconnect the radiator inlet hose (A) and water tank hose (B) from radiator.





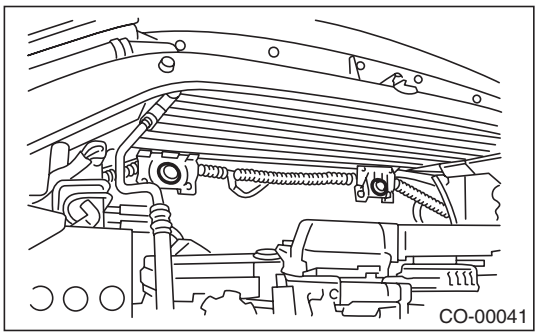
16) Remove the radiator upper brackets.



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

B: INSTALLATION

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

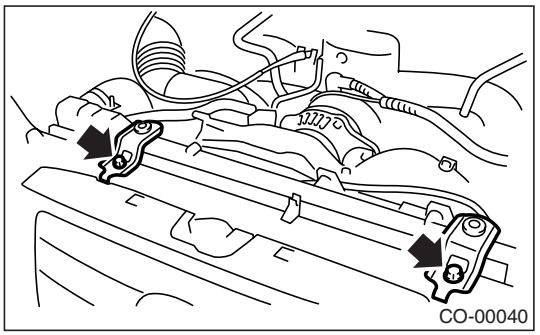


2) Install the radiator to vehicle.

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

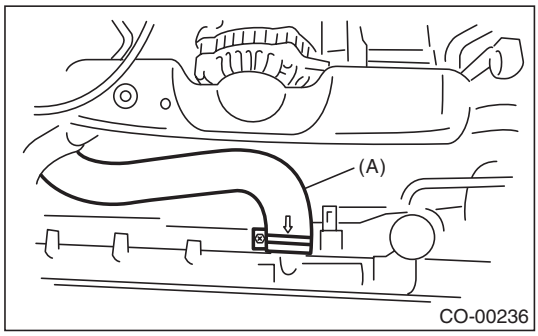
3) Install the radiator brackets, and then tighten the bolts.

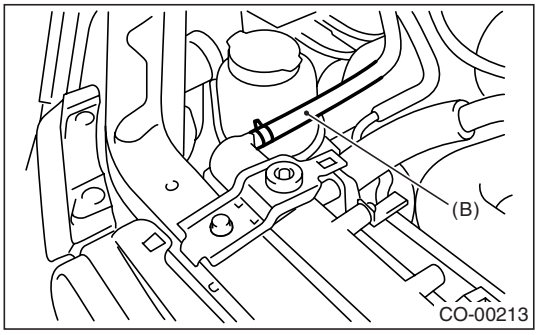
Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)



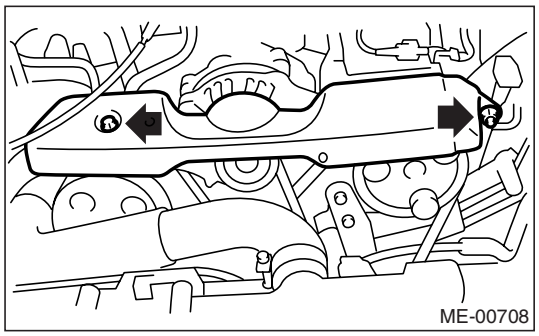
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4) Connect the radiator inlet hose (A) and water tank hose (B).



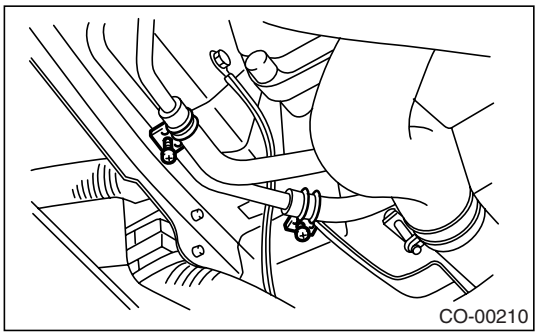


5) Install the reservoir tank. <Ref. to CO(H4DOTC)-32, INSTALLATION, Reservoir Tank.>
6) Connect the overflow hose.
7) Install the V-belt cover.

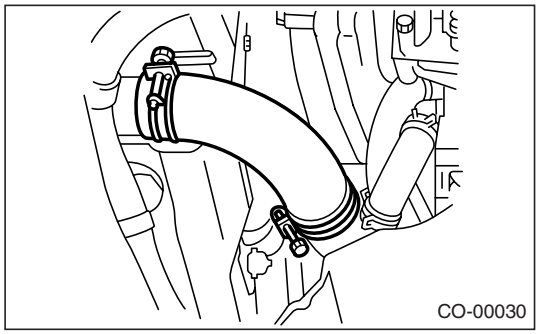


8) Install the air intake duct.
<Ref. to IN(H4DOTC)-9, INSTALLATION, Air Intake Duct.>
9) Lift-up the vehicle.
10) Connect the ATF cooler hoses. (AT model).

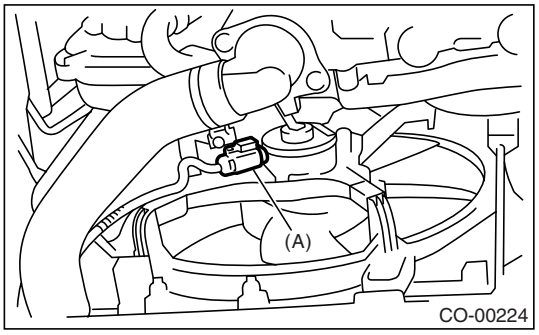
11) Connect the oil cooler hose. (MT model with oil cooler)

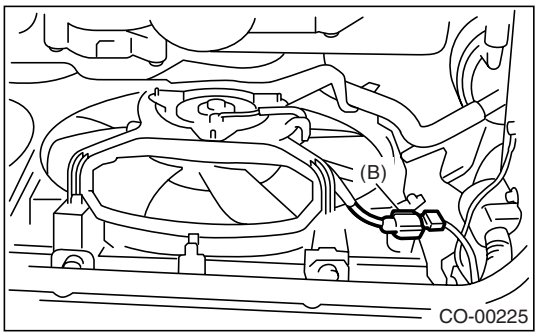


12) Connect the radiator outlet hose.



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

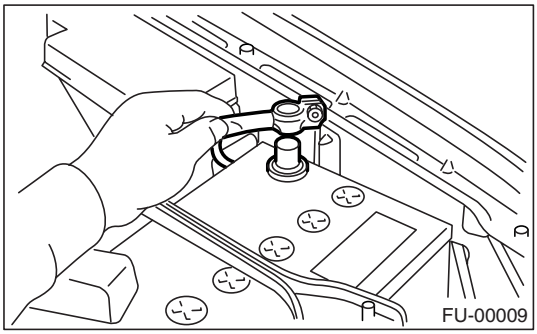




14) Install the under cover.
15) Lower the vehicle.

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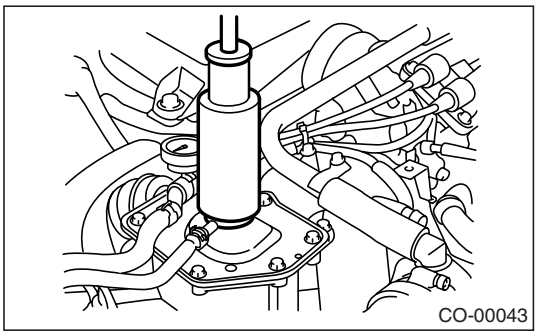
16) Connect the battery ground cable to battery.



17) Fill engine coolant. <Ref. to CO(H4DOTC)-17, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
18) Check the ATF level. <Ref. to 4AT-31, 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 kg/cm^2, 18 psi) to the radiator to check if:
(1) Engine coolant leaks at/around radiator.
(2) Engine coolant leaks at/around hoses or connections.

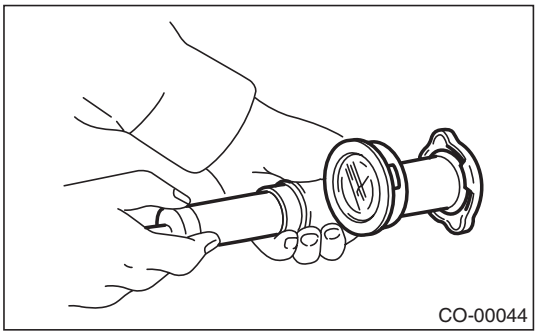
CAUTION:
• Inspection must be carried out at the side of coolant filler tank, not at the side of radiator.
• Engine should be turned off.
• Wipe engine coolant from check points in advance.
• Be careful to prevent engine coolant from spurting out when removing the tester.
• Be careful also not to deform the filler neck of coolant filler tank when installing or removing tester.

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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 kg/cm^2, 14 — 18 psi)

Service limit pressure:

83 kPa (0.85 kg/cm^2, 12 psi)

Radiator side

Standard pressure:

122 — 152 kPa (1.24 — 1.55 kg/cm^2, 18 — 22 psi)

Service limit pressure:

112 kPa (1.14 kg/cm^2, 16 psi)

CAUTION:

• Be sure to remove foreign matter and rust from the cap in advance otherwise, results of pressure test will be incorrect.

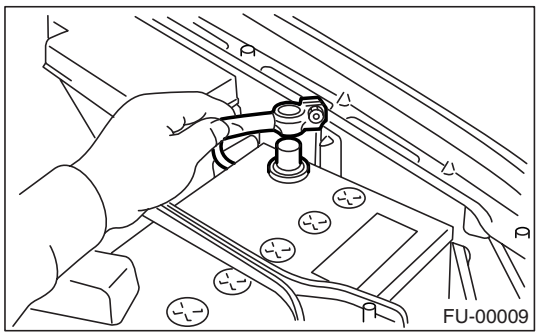
• Do not mix up the coolant filler tank side cap with radiator side cap.

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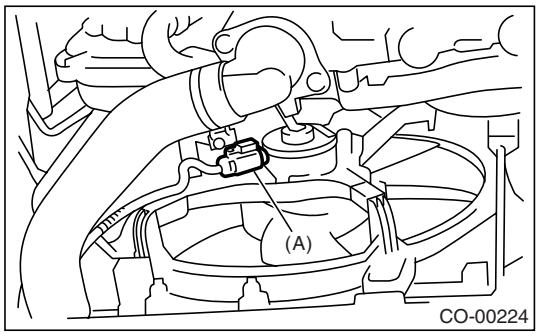
9. Radiator Main Fan and Fan Motor

A: REMOVAL

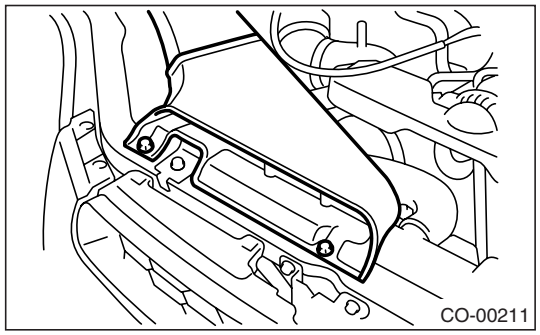
1) Disconnect the ground cable from battery.



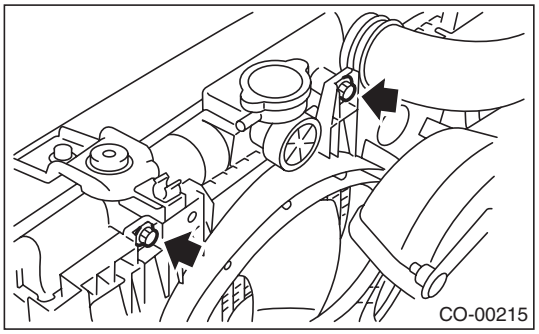
2) Lift-up the vehicle.
3) Remove the under cover.
4) Disconnect the connector of main fan motor (A).



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.

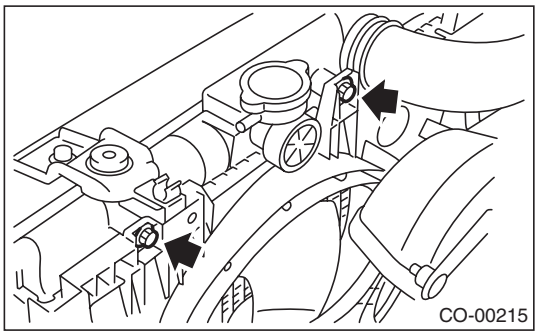


B: INSTALLATION

Install in the reverse order of removal.

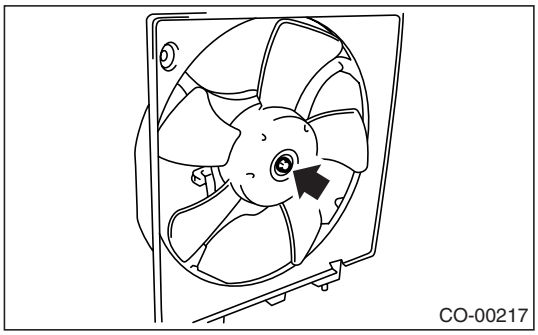
NOTE:
When the main fan motor assembly cannot be installed as is, loosen the sub fan motor assembly securing bolts to install it.

Tightening torque:
4.9 N·m (0.50 kgf-m, 3.6 ft-lb)



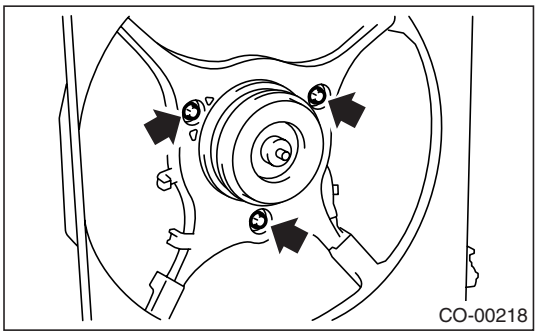
C: DISASSEMBLY

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



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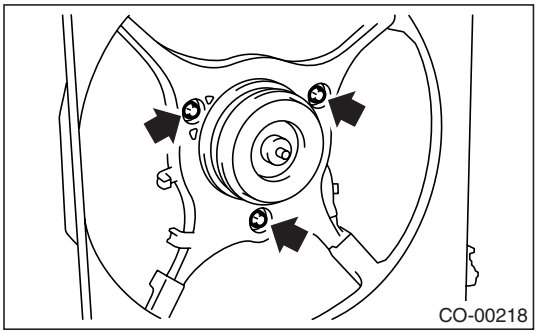
2) Remove the bolts which install the fan motor onto shroud.



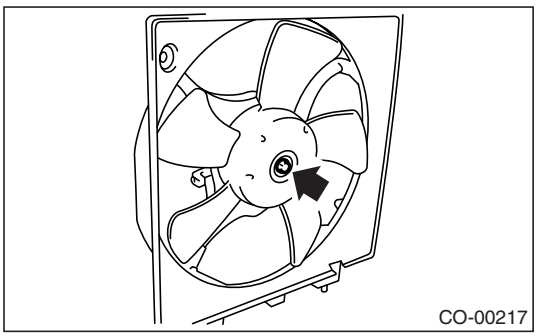
D: ASSEMBLY

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)

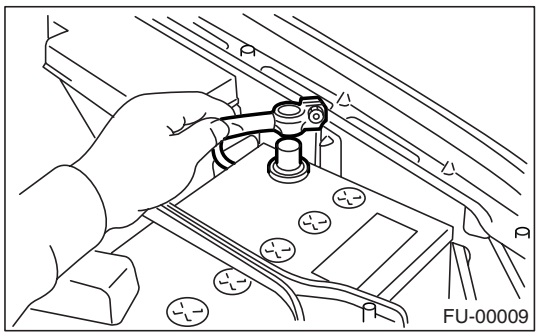


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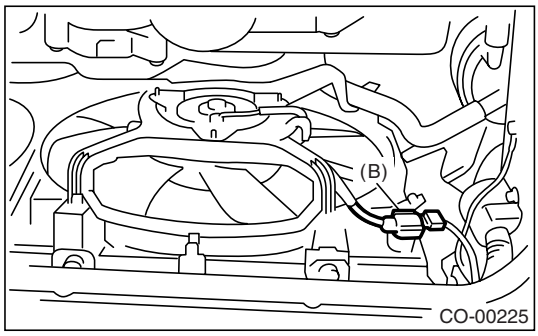
10. Radiator Sub Fan and Fan Motor

A: REMOVAL

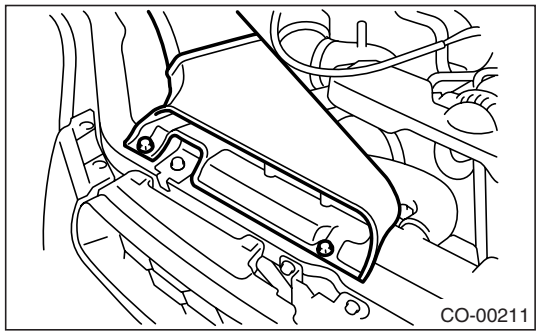
1) Disconnect the ground cable from battery.



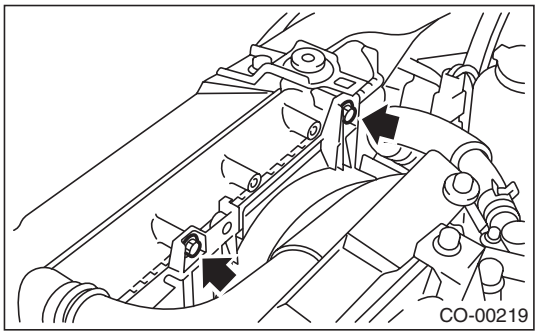
2) Lift-up the vehicle.
3) Remove the under cover.
4) Disconnect the connector of sub fan motor (B).



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



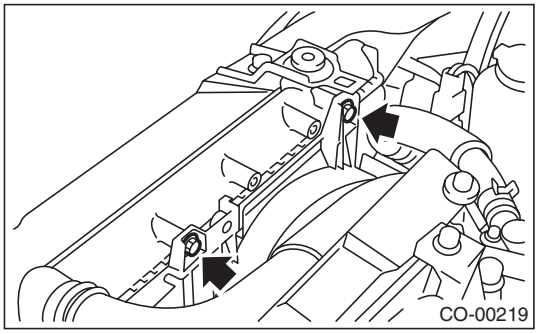
7) Remove the bolts which hold the sub fan shroud to radiator.
8) Remove the overflow pipe.
9) Remove the radiator sub fan shroud through the under side of vehicle.



B: INSTALLATION

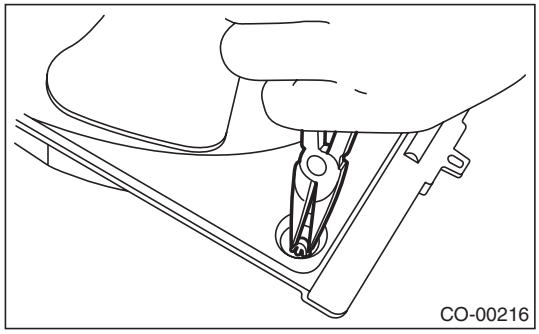
Install in the reverse order of removal.

Tightening torque:
4.9 N·m (0.50 kgf-m, 3.6 ft-lb)



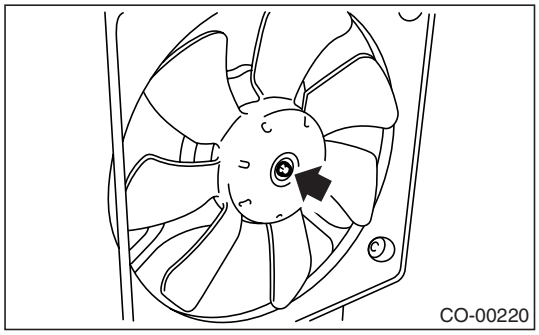
C: DISASSEMBLY

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

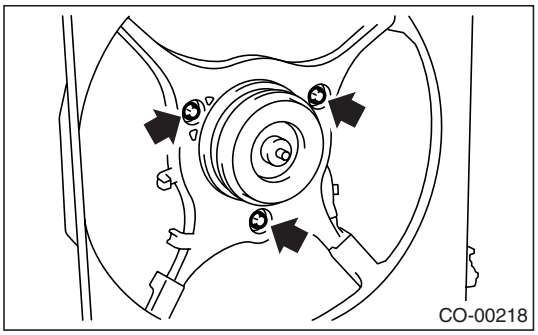


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2) Remove the nut which holds the fan itself onto fan motor and shroud assembly.



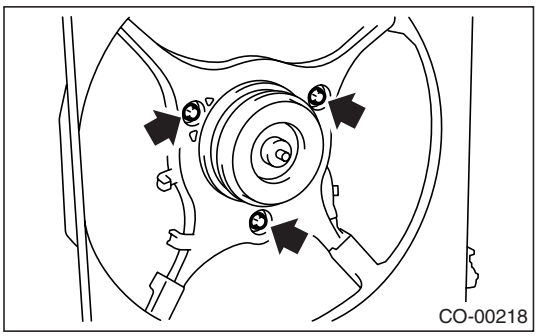
3) Remove the bolts which install the fan motor onto shroud.



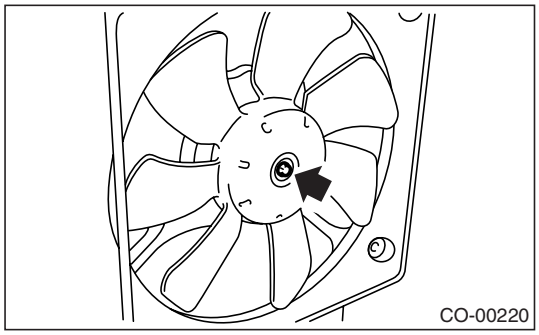
D: ASSEMBLY

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)

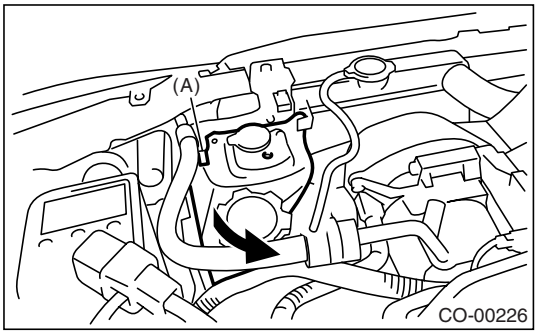


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11.Reservoir Tank

A: REMOVAL

1) Disconnect the overflow hose from the radiator filler neck position.
2) Pull out the reservoir tank to 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.

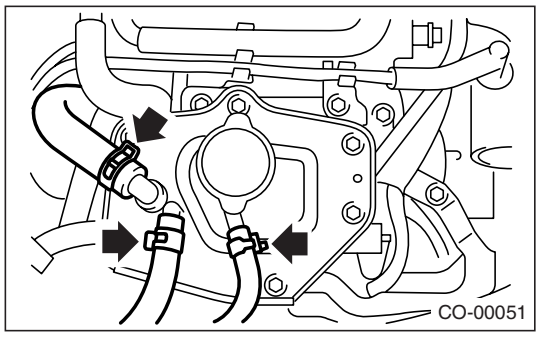
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12.Coolant Filler Tank

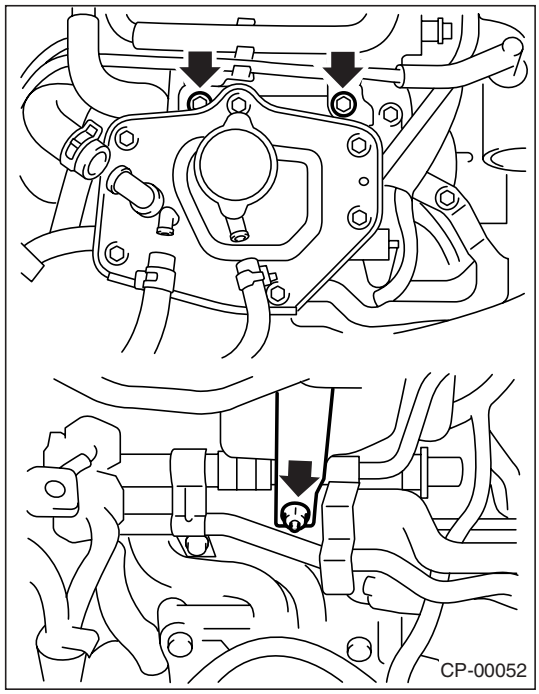
A: REMOVAL

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.>
3) Remove the air cleaner element.
4) Disconnect the engine coolant hoses from coolant filler tank.



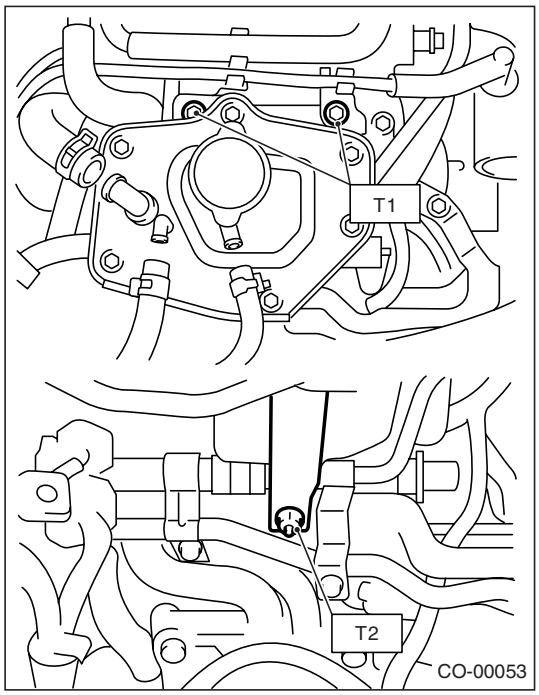
5) Remove the bolts and nut which install the coolant filler tank.
6) Disconnect the engine coolant hose which connects the under side of coolant filler tank.
7) Remove the coolant filler tank.



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.>

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13.Engine Cooling System Trouble in General

A: INSPECTION

Trouble	Possible cause	Corrective action
Over-heating	a. Insufficient engine coolant	Replenish the engine coolant, inspect for leakage, and repair.
	b. Loose timing belt	Repair or replace the timing belt tensioner.
	c. Oil on drive belt	Replace.
	d. Malfunction of thermostat	Replace.
	e. Malfunction of water pump	Replace.
	f. Clogged engine coolant passage	Clean.
	g. Improper ignition timing	Inspect and repair the ignition control system. <Ref. to EN(H4DOTC)-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)-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. Defective thermostat	Replace.
	p. Malfunction of radiator fan	Inspect the radiator fan relay, engine coolant temperature sensor or radiator motor and replace there.
Over-cooling	a. Atmospheric temperature extremely low	Partly cover the radiator front area.
	b. Defective thermostat	Replace.
Engine coolant leaks.	a. Loosened or damaged connecting units on hoses	Repair or replace.
	b. Leakage from water pump	Replace.
	c. Leakage from water pipe	Repair or replace.
	d. Leakage around cylinder head gasket	Retighten the cylinder head bolts or replace gasket.
	e. Damaged or cracked cylinder head and crankcase	Repair or replace.
	f. Damaged or cracked thermostat case	Repair or replace.
	g. Leakage from radiator	Repair or replace.
Noise	a. Defective drive belt	Replace.
	b. Defective radiator fan	Replace.
	c. Defective water pump bearing	Replace the water pump.
	d. Defective water pump mechanical seal	Replace the water pump.

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LUBRICATION

LU(H4DOTC)

		Page
1.	General Description	2
2.	Oil Pressure System	6
3.	Engine Oil	8
4.	Oil Pump	10
5.	Oil Pan and Strainer	14
6.	Oil Pressure Switch	18
7.	Engine Oil Cooler	19
8.	Engine Oil Filter	20
9.	Engine Lubrication System Trouble in General	21

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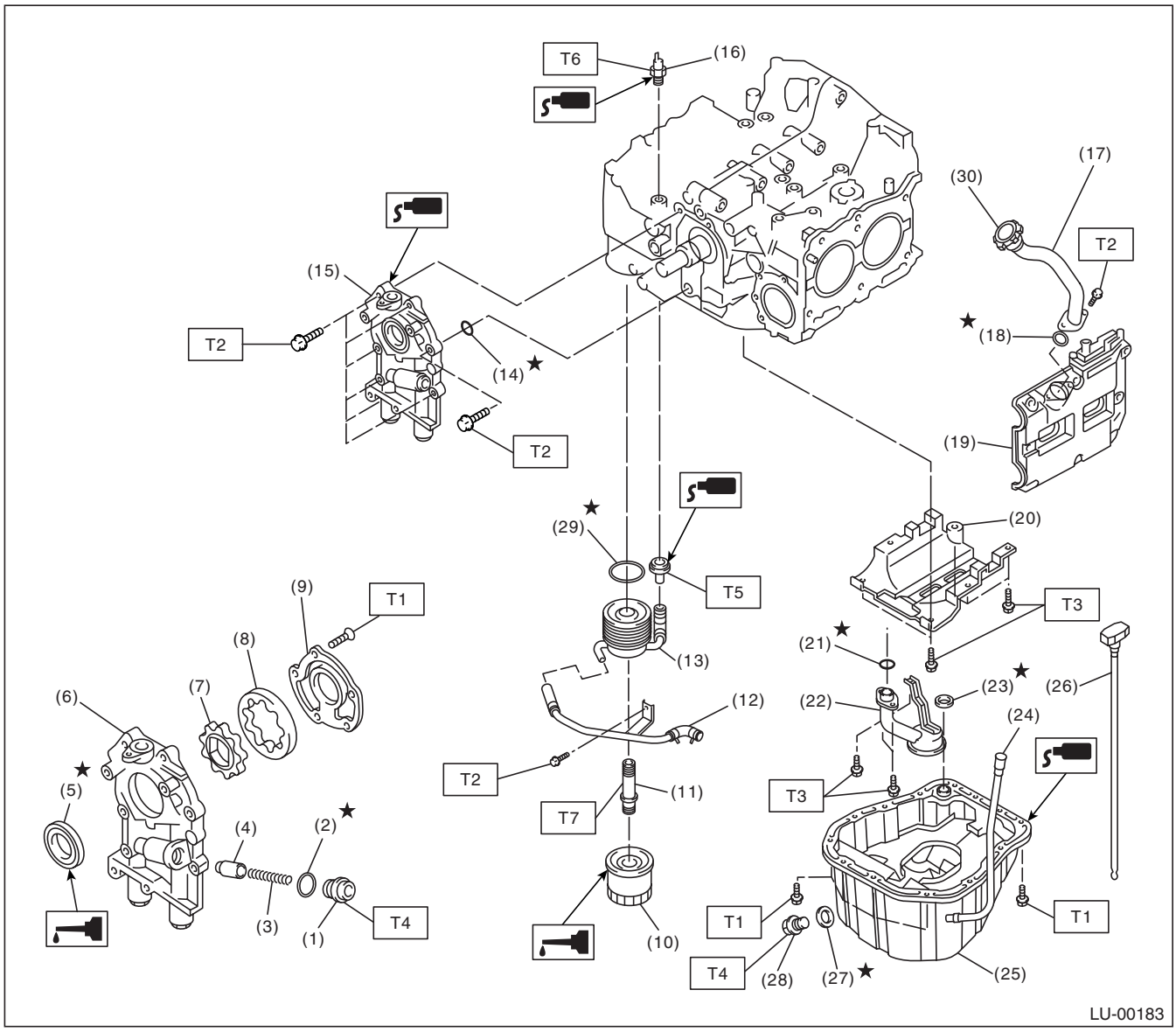
1. General Description

A: SPECIFICATIONS

Lubrication method				Forced lubrication
Oil pump	Pump type			Trochoid type
	Number of teeth	Inner rotor		9
		Outer rotor		10
	Outer rotor diameter × thickness			78 × 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 kg/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 kg/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 kg/cm^2, 85 psi)
Oil filter	Type			Full-flow filter type
	Filtration area			760 cm^2 (118 sq in)
	By-pass valve opening pressure			157 kPa (1.60 kg/cm^2, 22.8 psi)
	Outer diameter × width			80 × 70 mm (3.15 × 2.76 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 kg/cm^2, 2.1 psi)
	Proof pressure			More than 981 kPa (10 kg/cm^2, 142 psi)
Oil capacity (at replacement)				4.5 ℓ (4.8 US qt, 4.0 Imp qt)

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B: COMPONENT



(1) Plug
(2) Gasket
(3) Relief valve spring
(4) Relief valve
(5) Oil seal
(6) Oil pump case
(7) Inner rotor
(8) Outer rotor
(9) Oil pump cover
(10) Oil filter
(11) Oil cooler connector (Model with oil cooler)
(12) Water by-pass pipe (Model with oil cooler)
(13) Oil cooler (Model with oil cooler)
(14) O-ring
(15) Oil pump ASSY
(16) Oil pressure switch
(17) Oil filler duct
(18) O-ring
(19) Rocker cover
(20) Baffle plate
(21) O-ring
(22) Oil strainer
(23) Gasket
(24) Oil level gauge guide
(25) Oil pan
(26) Oil level gauge
(27) Metal gasket
(28) Drain plug
(29) O-ring
(30) Oil filler cap

Tightening torque: N·m (kgf-m, ft-lb)
T1: 5 (0.5, 3.6)
T2: 6.4 (0.65, 4.7)
T3: 10 (1.0, 7.0)
T4: 44 (4.5, 32.5)
T5: 69 (7.0, 50.9)
T6: 25 (2.5, 18.1)
T7: 54 (5.5, 40)

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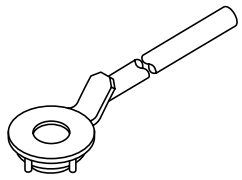
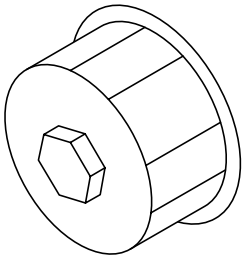
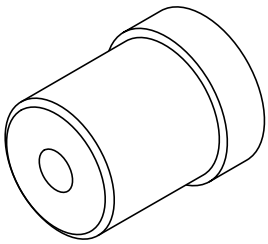
C: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn your hands, because each part in the vehicle is hot after running.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.

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D: PREPARATION TOOL

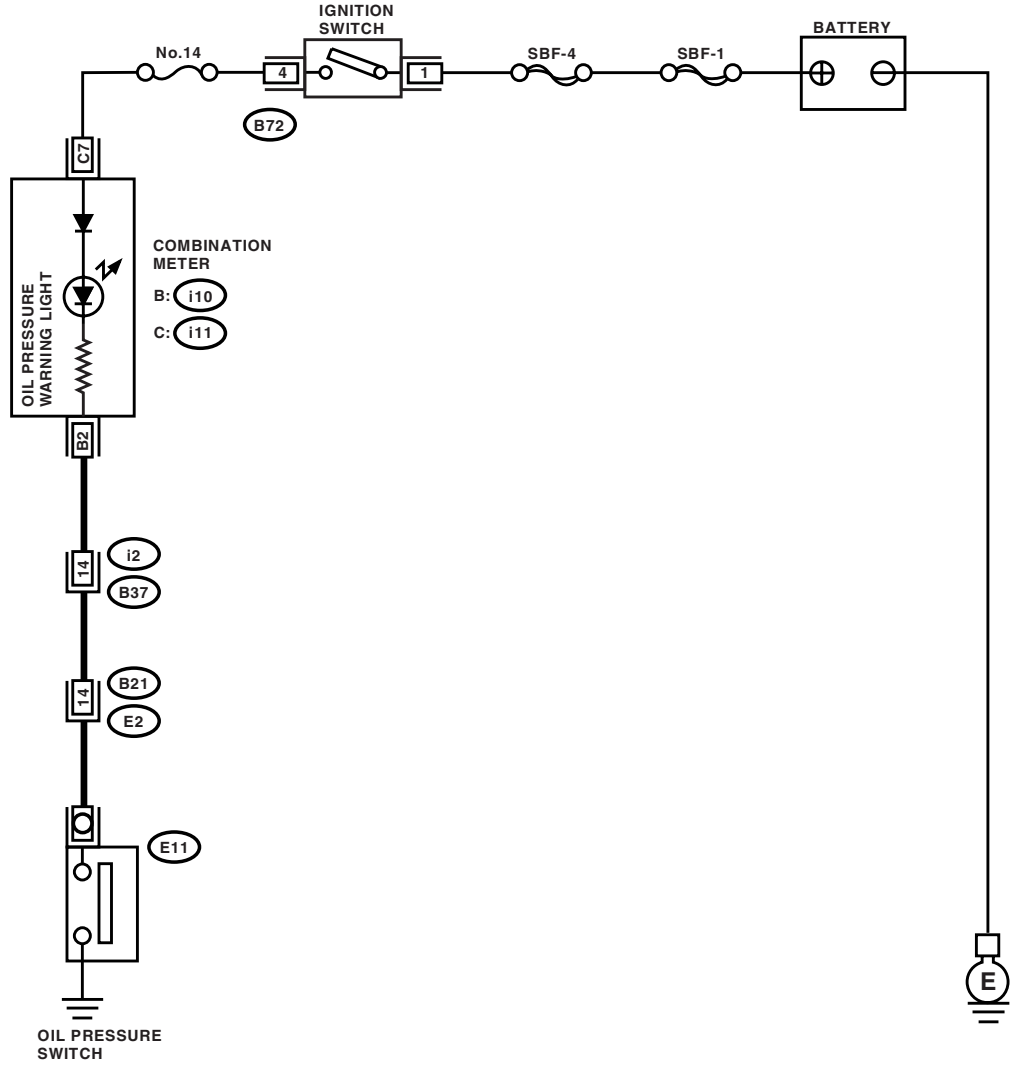
1. SPECIAL TOOLS

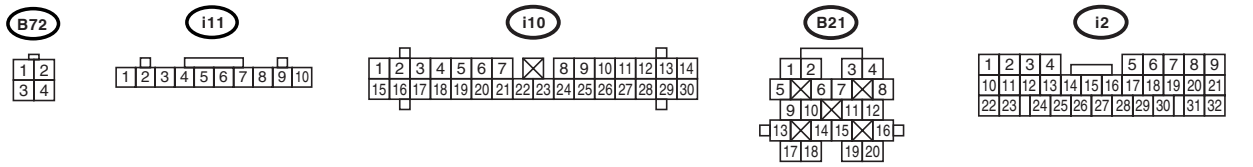
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499977400	499977400	CRANKSHAFT PULLEY WRENCH	Used for stopping rotation of crankshaft pulley when loosening and tightening crankshaft pulley bolt.
 ST-498547000	498547000	OIL FILTER WRENCH	Used for removing and installing oil filter.
 ST-499587100	499587100	OIL SEAL INSTALLER	Used for installing oil pump oil seal.

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2. Oil Pressure System

A: SCHEMATIC





LU-00207

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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*** ***No. C7 — No. B2:***	Is the resistance less than 10 Ω?	Replace the harness connector between combination meter and oil pressure switch.	Repair or replace the combination meter.

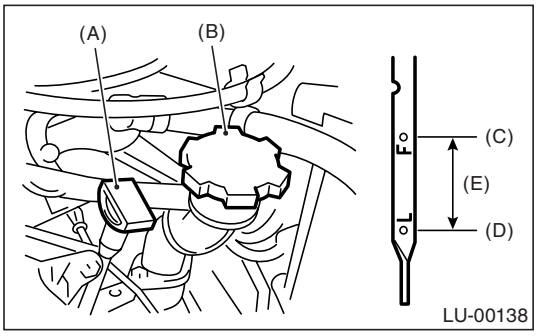
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3. Engine Oil

A: INSPECTION

1) Park the vehicle on a level surface.
2) Remove the oil level gauge and wipe it clean.
3) Reinsert the level gauge all the way. Be sure that the level gauge is correctly inserted and in proper orientation.
4) Remove it again and note the reading. If the engine oil level is below the “L” line, add oil to bring the level up to “F” line.
5) After turning off the engine, wait a few minutes for oil to drain back into the oil pan before checking the level.
6) Just after driving or while the engine is warm, engine oil level may show in the range between the “F” line and notch mark. This is caused by thermal expansion of engine oil.

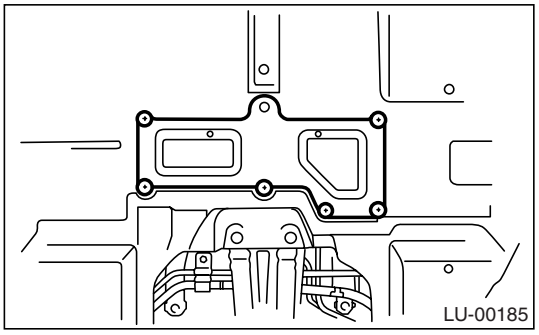
NOTE:
To prevent overfilling the engine oil, do not add oil above “F” line when the engine is cold.



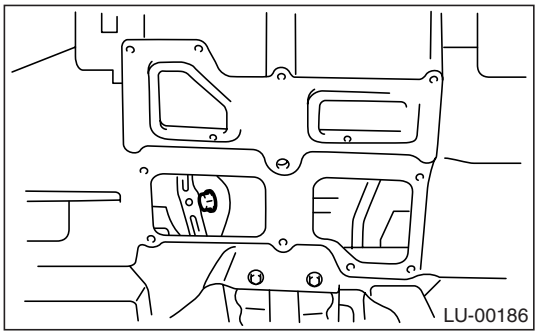
(A) Oil level gauge
(B) Engine oil filler cap
(C) Upper level
(D) Lower level
(E) Approx. 1.0 ℓ (1.1 US qt, 0.9 Imp qt)

B: REPLACEMENT

1) Open the engine oil filler cap for quick draining of engine oil.
2) Remove the clips of service hole cover.

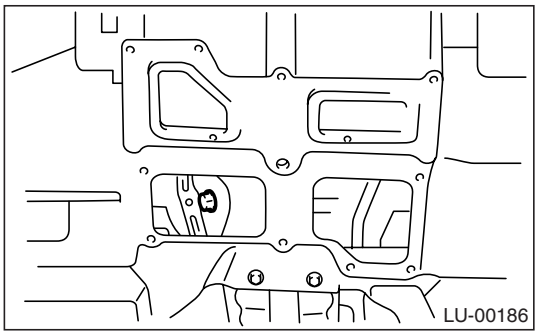


3) Drain the engine oil by loosening the engine oil drain plug.



4) Replace the drain plug gasket.
5) Tighten the engine oil drain plug after draining engine oil.

Tightening torque:
44 N·m (4.5 kgf-m, 32.5 ft-lb)

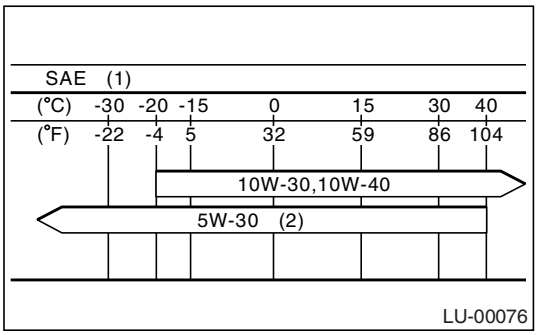


6) Install the service hole cover.
7) Fill engine oil through the filler pipe up to upper level on level gauge. Make sure that the vehicle is placed level when checking oil level. Use the engine oil of proper quality and viscosity, selected in accordance with the table in figure.

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Recommended oil
API classification
SL or SJ or SH with the words "Energy Conserving or Energy conserving II", CCMC specification G4 or G5, ACEA specification A1, A2 or A3, or New API mark displayed on the container (If it is impossible to get SL or SJ or SH grade, you may use SG grade.)

Engine oil capacity:
Upper level
4.5 ℓ (4.8 US qt, 4.0 Imp qt)
Lower level
3.5 ℓ (3.7 US qt, 3.1 Imp qt)



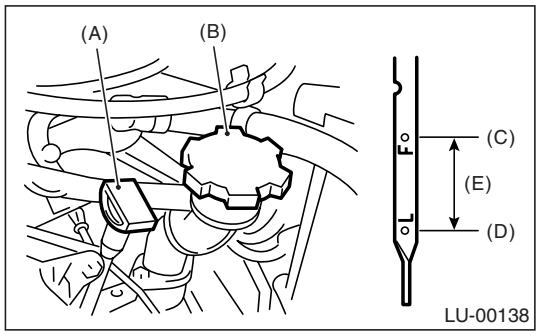
(1) SAE Viscosity No. and Applicable Temperature
(2) PREFERRED

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

CAUTION:
When replenishing oil, it does not matter if the oil to be added is a different brand from that in the engine; however, use oil having the API classification 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 classification: SL or SJ or SH
SAE Viscosity No.: 30, 40, 10W-50, 20W-40, 20W-50.

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



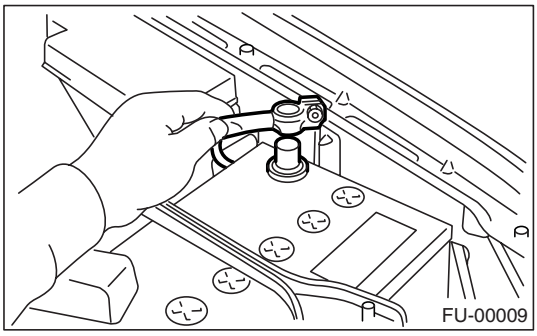
(A) Oil level gauge
(B) Engine oil filler cap
(C) Upper level
(D) Lower level
(E) Approx. 1.0 ℓ (1.1 US qt, 0.9 Imp qt)

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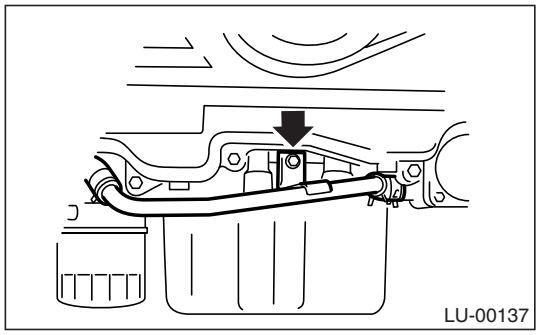
4. Oil Pump

A: REMOVAL

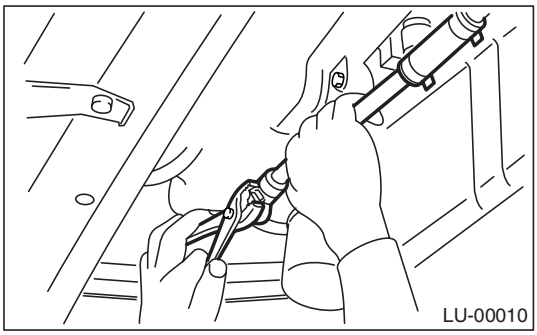
1) Disconnect the ground cable from battery.



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.

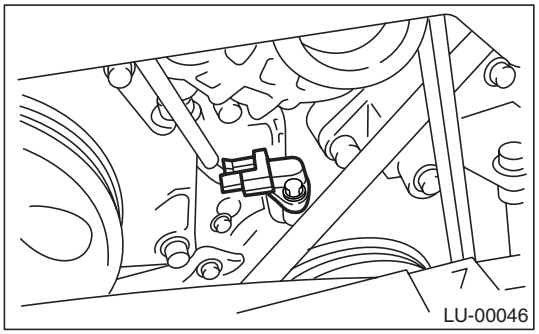


5) Remove the water pipe and hoses between oil cooler and water pump.

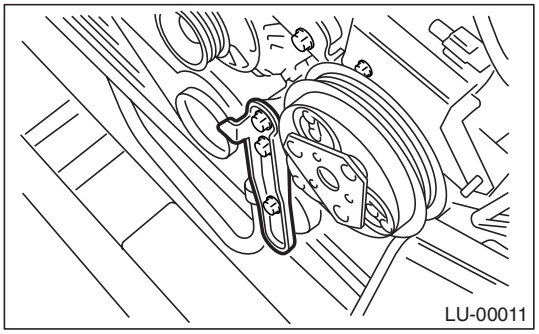


6) Remove the radiator. <Ref. to CO(H4SO)-21, REMOVAL, Radiator.>

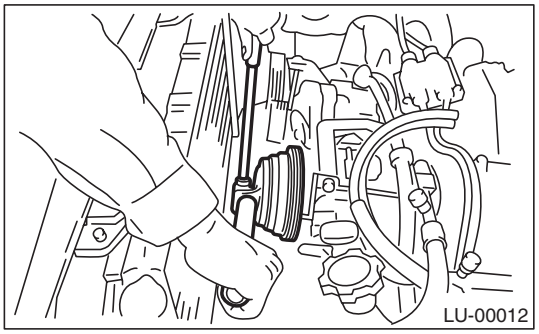
7) Remove the crankshaft position sensor.



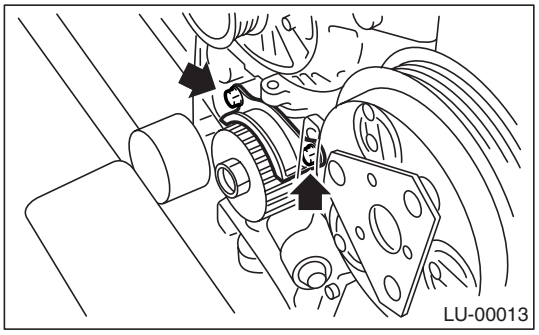
8) Remove the V-belts.
<Ref. to ME(H4DOTC)-55, REMOVAL, V-belt.>
9) Remove the rear side V-belt tensioner.



10) Remove the crankshaft pulley by using ST.
<Ref. to ME(H4DOTC)-58, REMOVAL, Crankshaft Pulley.>

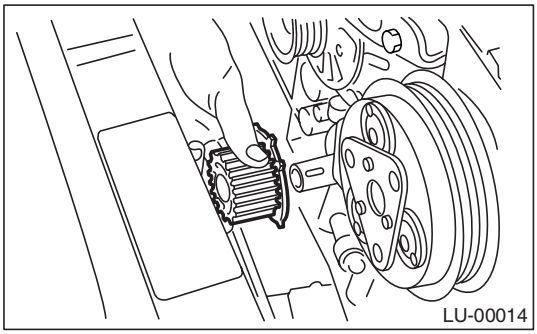


11) Remove the water pump. <Ref. to CO(H4SO)-16, REMOVAL, Water Pump.>
12) Remove the timing belt guide. (MT model)

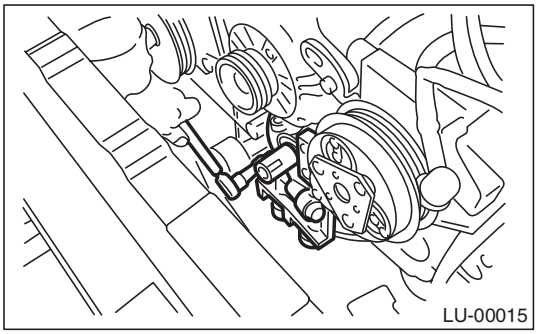


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13) Remove the crankshaft sprocket.

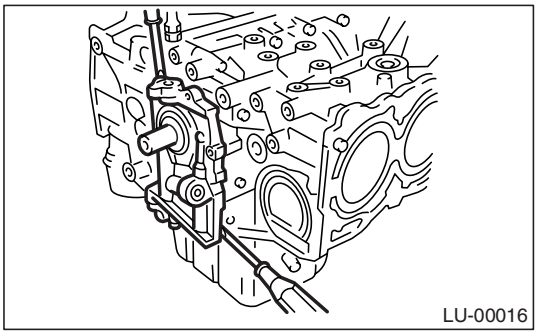


14) Remove the bolts which install the oil pump onto cylinder block.



15) Remove the oil pump using the flat tip screwdriver.

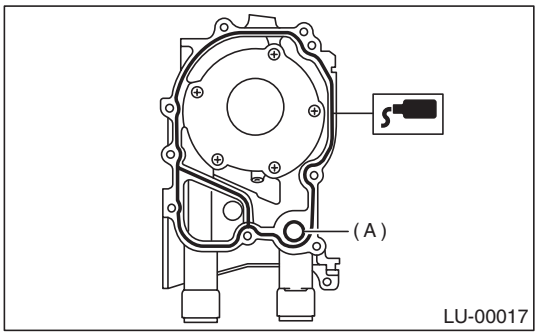
CAUTION:
Be careful not to scratch the mating surfaces of cylinder block and oil pump.



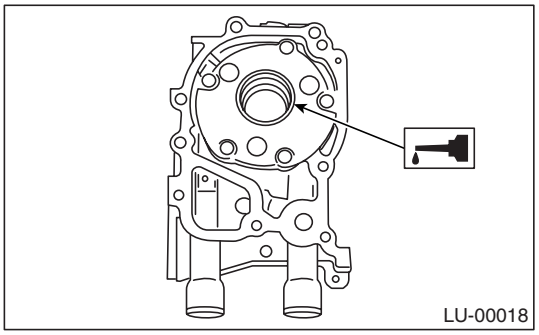
B: INSTALLATION

Install in the reverse order of removal.
Do the following:
1) Apply fluid packing to the matching surfaces of oil pump.

Fluid packing:
THREE BOND 1215 (Part No. 004403007) or equivalent



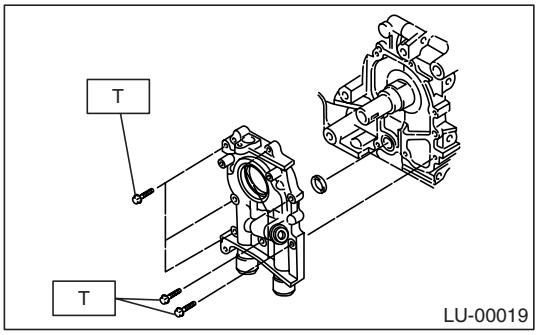
2) Replace the O-ring (A) with a new one.
3) Apply a coat of engine oil to the inside of oil seal.



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.

Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

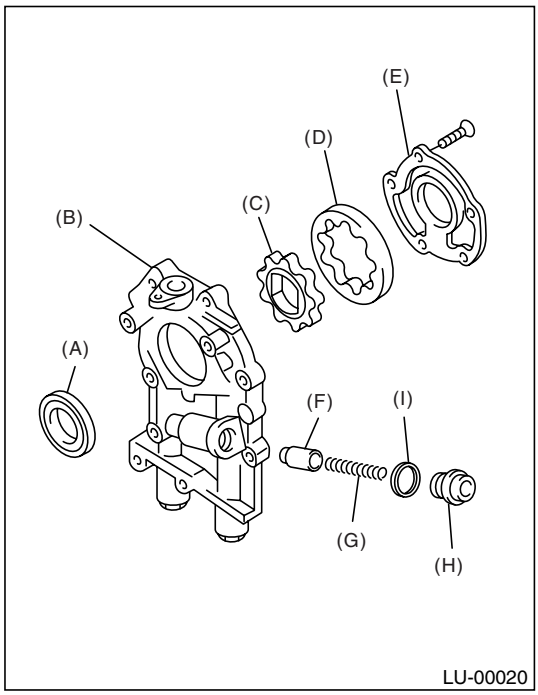


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C: DISASSEMBLY

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.

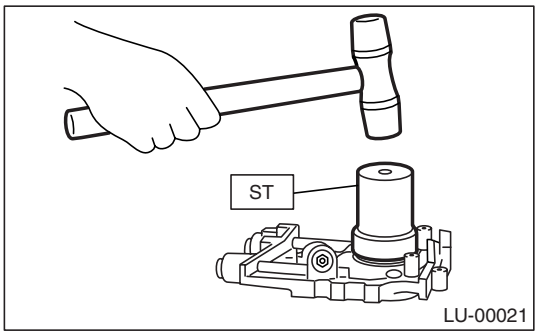


(A) Oil seal
(B) Pump case
(C) Inner rotor
(D) Outer rotor
(E) Pump cover
(F) Relief valve
(G) Relief valve spring
(H) Plug
(I) Gasket

D: ASSEMBLY

1) Install the front oil seal by using ST.
ST 499587100 OIL SEAL INSTALLER

NOTE:
Use a new oil seal.

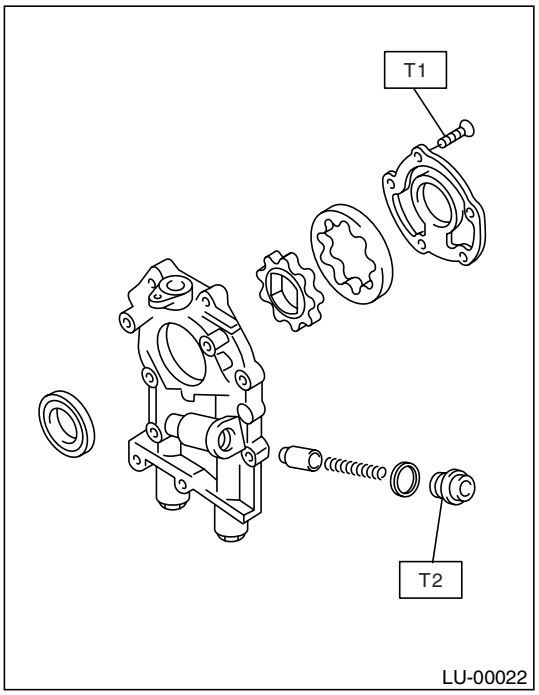


2) Apply a coat of engine oil to the inner and outer rotors.
3) Install the inner and outer rotors in their original positions.
4) Install the oil relief valve, relief valve spring and plug.

NOTE:
Use a new gasket.

5) Install the oil pump cover.

Tightening torque:
T1: 5 N·m (0.5 kgf-m, 3.6 ft-lb)
T2: 44 N·m (4.5 kgf-m, 32.5 ft-lb)



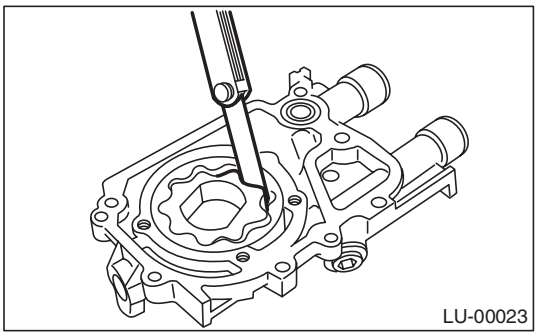
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E: INSPECTION

1. TIP CLEARANCE

Measure the tip clearance of rotors. If clearance exceeds the limit, replace the rotors as a matched set.

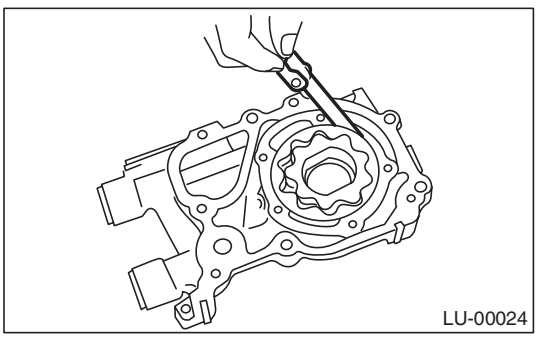
Tip clearance:
Standard
0.04 — 0.14 mm (0.0016 — 0.0055 in)
Limit
0.18 mm (0.0071 in)


LU-00023

2. CASE CLEARANCE

Measure the clearance between outer rotor and oil pump rotor housing. If clearance exceeds the limit, replace the rotor.

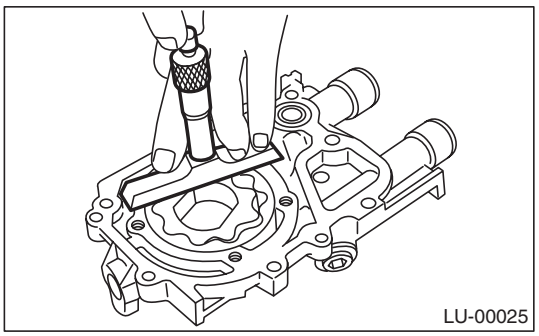
Case clearance:
Standard
0.10 — 0.175 mm (0.0039 — 0.0069 in)
Limit
0.20 mm (0.0079 in)


LU-00024

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)


LU-00025

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 lb)

5. OIL PUMP CASE

Check the oil pump case for worn shaft hole, clogged oil passage, worn rotor chamber, cracks, and other faults.

6. OIL SEAL

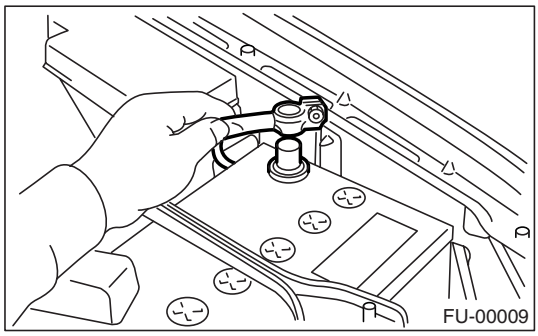
Check the oil seal lips for deformation, hardening, wear, etc. and replace if defective.

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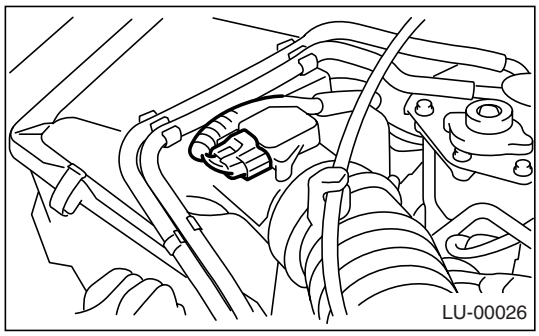
5. Oil Pan and Strainer

A: REMOVAL

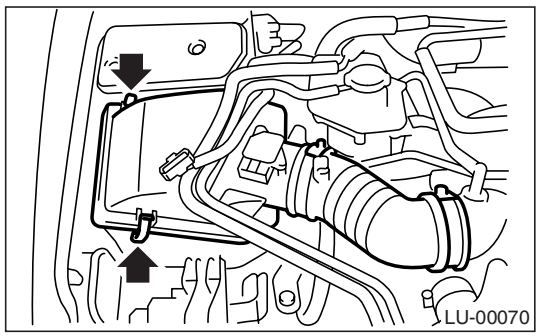
1) Set the vehicle on a lift.
2) Remove the front wheels.
3) Disconnect the ground cable from battery.



4) Disconnect the connector from mass air flow sensor.

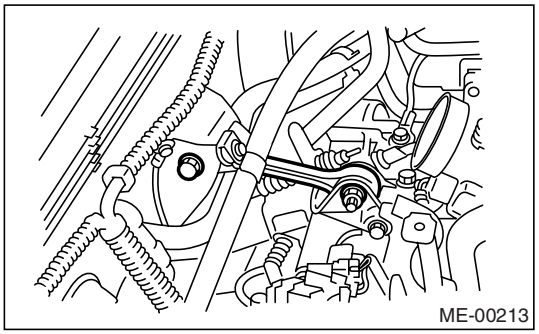


5) Remove the air intake boot and air cleaner upper cover.

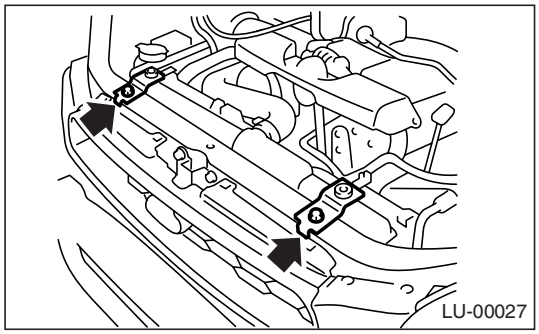


6) Remove the intercooler. <Ref. to IN(H4DOTC)-11, REMOVAL, Intercooler.>

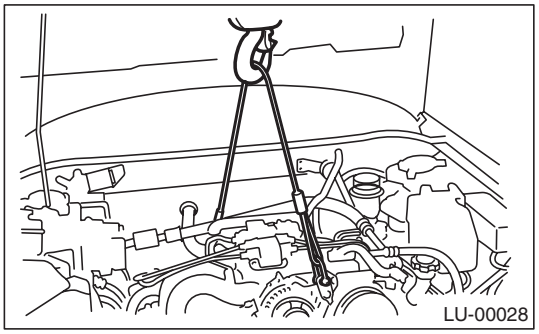
7) Remove the pitching stopper.



8) Remove the radiator upper brackets.



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



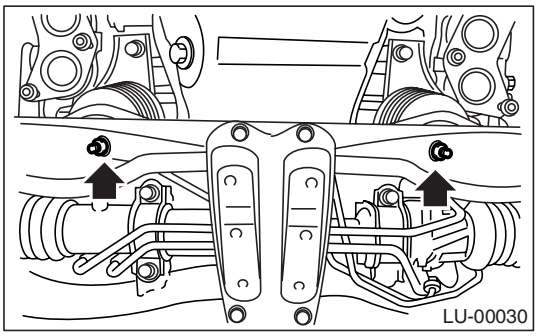
10) Lift-up the vehicle.

CAUTION:
When lifting up the vehicle, rise up the wire rope together.

11) Remove the under cover.
12) Drain the engine oil.

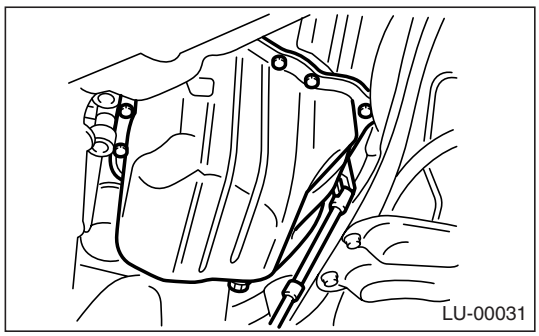
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13) Remove the nuts which install the front cushion rubber onto front crossmember.

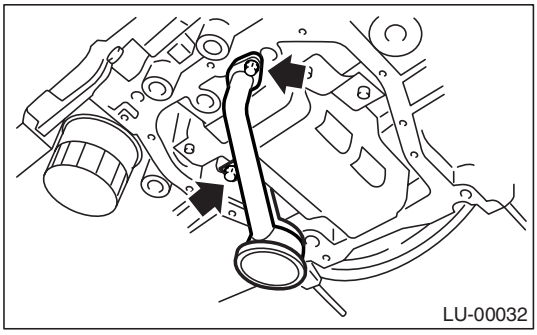

LU-00030

14) Remove the bolts which install the oil pan on cylinder block while raising up engine.
15) Insert the oil pan cutter blade between cylinder block-to-oil pan clearance.

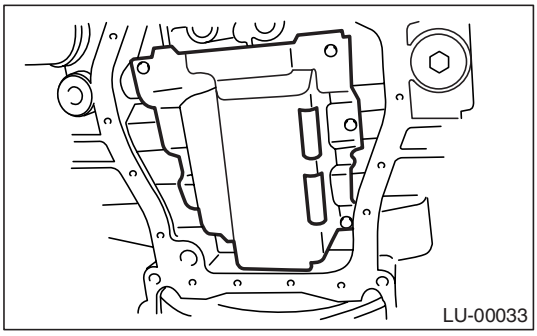
CAUTION:
Do not use a screwdriver or similar tool in place of oil pan cutter.


LU-00031

16) Remove the oil strainer.


LU-00032

17) Remove the baffle plate.

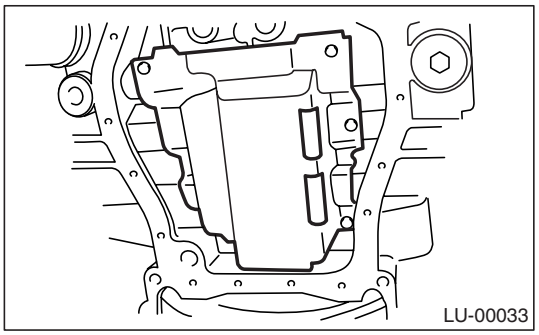

LU-00033

B: INSTALLATION

CAUTION:
Before installing the oil pan, clean sealant from oil pan and engine block.

1) Install the baffle plate.

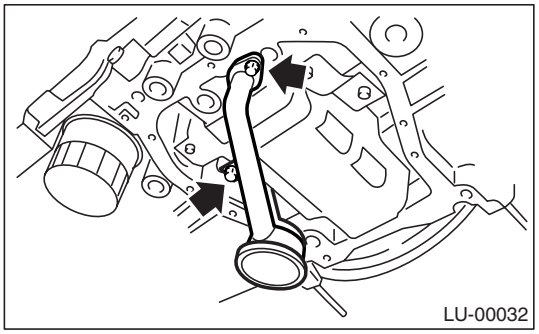
Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)


LU-00033

2) Install the oil strainer onto baffle plate.

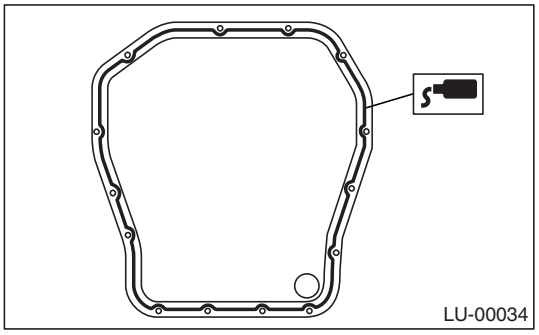
NOTE:
Replace the O-ring with a new one.

Tightening torque:
10 N·m (1.0 kgf-m, 7.2 ft-lb)


LU-00032

3) Apply fluid packing to the mating surfaces, and then install the oil pan.

Fluid packing:
THREE BOND 1215 (Part No. 004403007) or equivalent

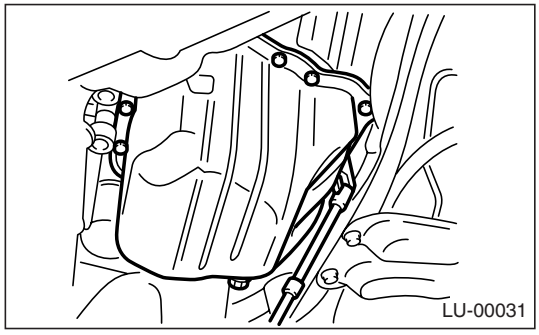


LU-00034

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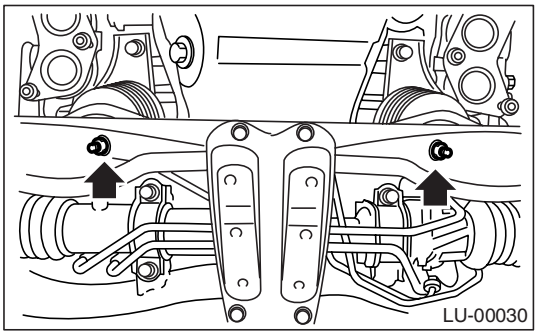
4) Tighten the bolts which install the oil pan onto engine block.

Tightening torque:
5 N·m (0.5 kgf-m, 3.6 ft-lb)



5) Lower the engine onto front crossmember.
6) Tighten the nuts which install the front cushion rubber onto front crossmember.

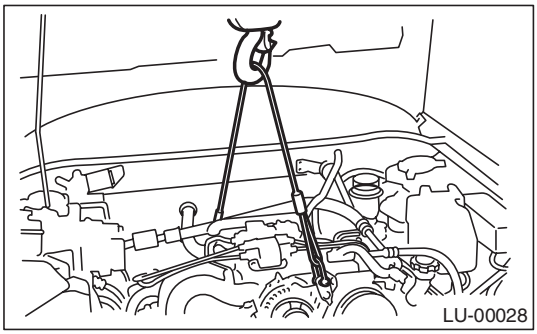
Tightening torque:
83 N·m (8.5 kgf-m, 61 ft-lb)



7) Install the under cover.
8) Lower the vehicle.

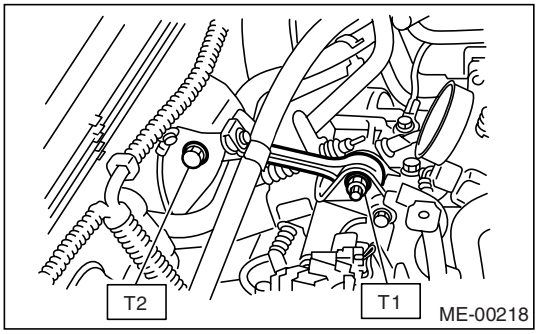
CAUTION:
When lowering the vehicle, lower the lifting device and wire rope together.

9) Remove the lifting device and steel cables.

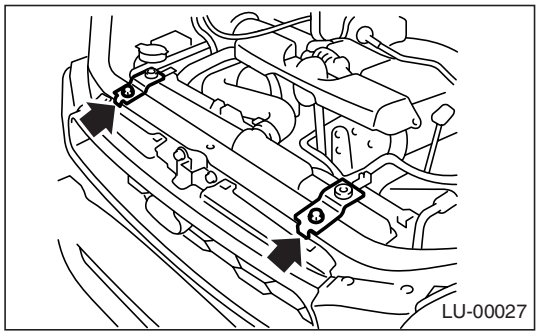


10) Install the pitching stopper.

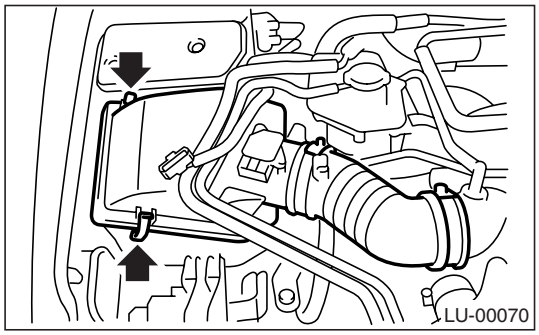
Tightening torque:
T1: 50 N·m (5.1 kgf-m, 36.9 ft-lb)
T2: 58 N·m (5.9 kgf-m, 42.8 ft-lb)



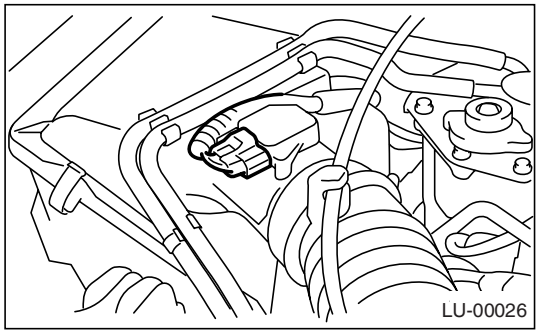
11) Install the radiator upper brackets.



12) Install the intercooler. <Ref. to IN(H4DOTC)-11, INSTALLATION, Intercooler.>
13) Install the air intake boot and air cleaner upper cover.

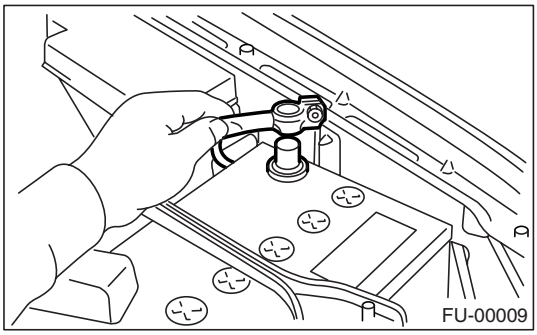


14) Connect the connector to mass air flow sensor.



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15) Install the front wheels.
16) Connect the battery ground cable to battery.



17) Fill engine oil. <Ref. to LU(H4DOTC)-8, INSPECTION, Engine Oil.>

C: INSPECTION

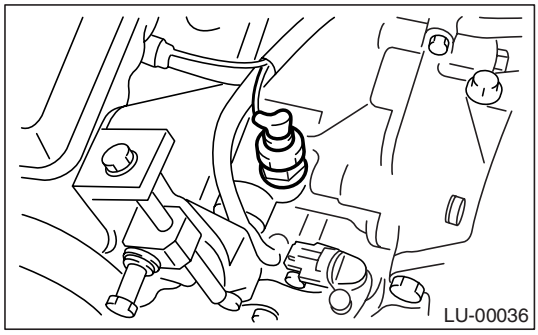
By visual check, make sure the oil pan, oil strainer, oil strainer stay and baffle plate are not damaged.

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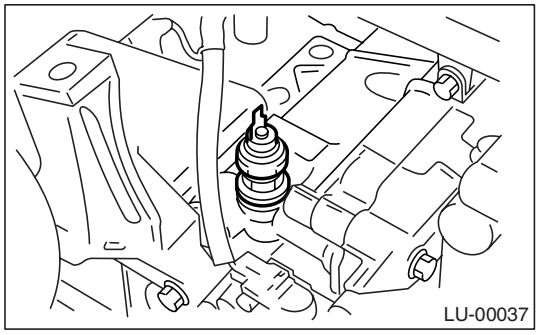
6. Oil Pressure Switch

A: REMOVAL

1) Remove the generator from bracket. <Ref. to SC(H4SO)-14, REMOVAL, Generator.>
2) Disconnect the terminal from oil pressure switch.



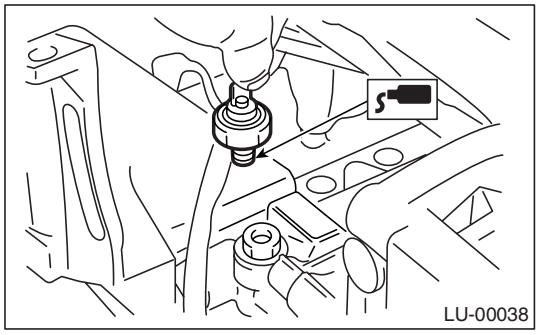
3) Remove the oil pressure switch.



B: INSTALLATION

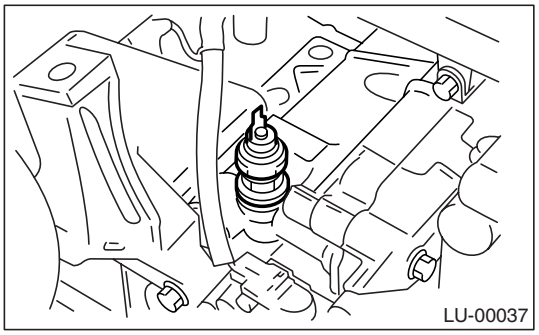
1) Apply fluid packing to the oil pressure switch threads.

Fluid packing:
THREE BOND 1324 (Part No. 004403007) or equivalent

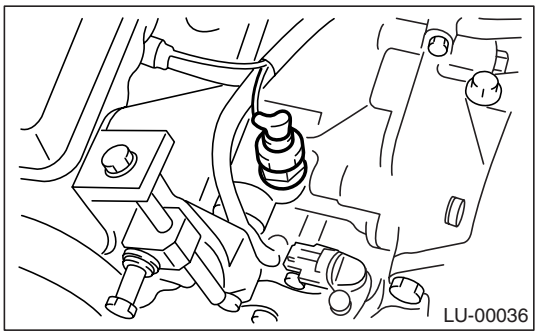


2) Install the oil pressure switch onto engine block.

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

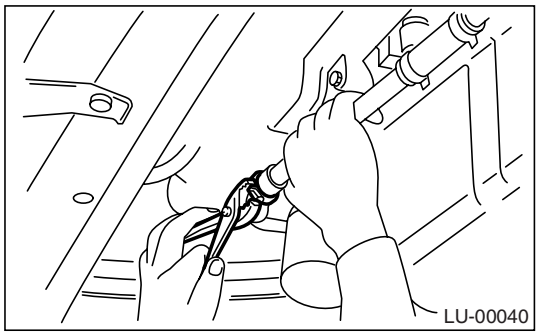
Make sure oil does not leak or seep from where the oil pressure switch is installed.

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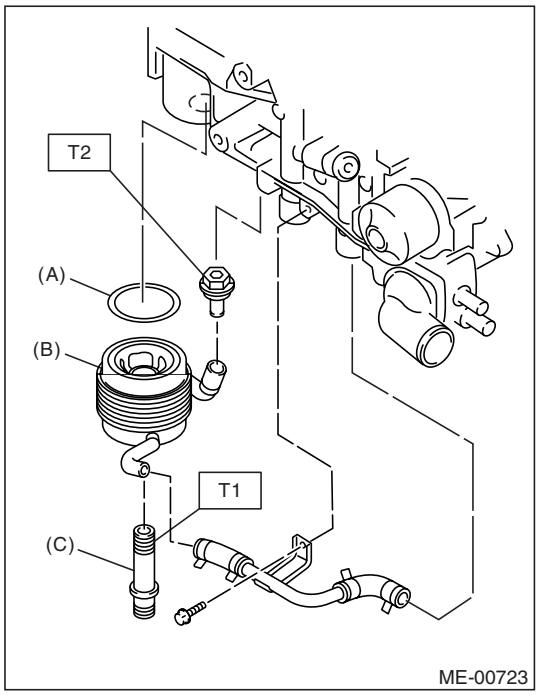
7. Engine Oil Cooler

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)-20, REMOVAL, Engine Oil Filter.>
7) Remove the connector, and then remove the oil cooler.



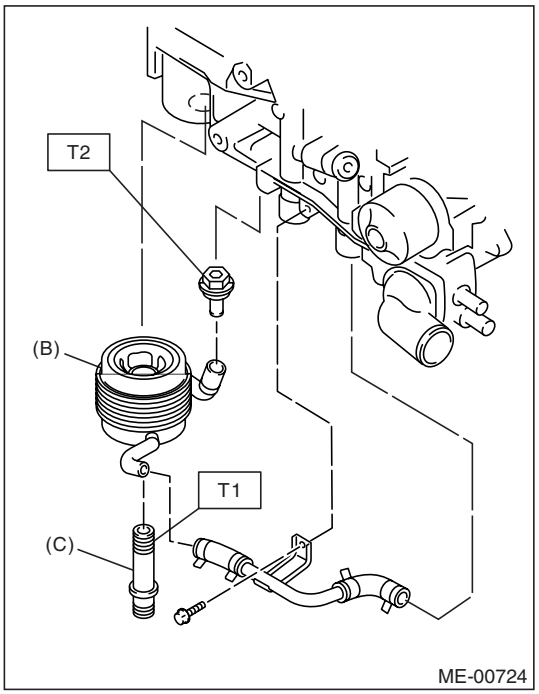
(A) O-ring
(B) Oil cooler
(C) Oil cooler connector

B: INSTALLATION

1) Install in the reverse order of removal.

Tightening torque:
T1: 54 N·m (5.5 kgf-m, 40 ft-lb)
T2: 69 N·m (7.0 kgf-m, 50.6 ft-lb)

NOTE:
Always use a new O-ring.



C: INSPECTION

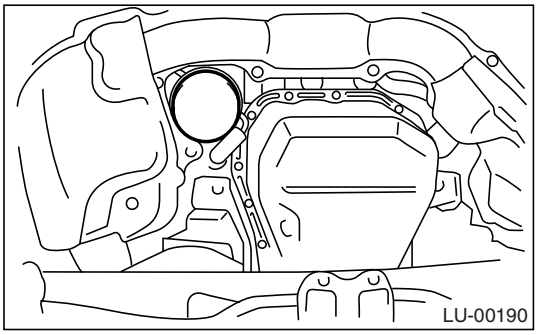
1) Check the coolant passages are not clogged using air blow method.
2) Check the mating surfaces of cylinder block, O-ring groove and oil filter for damage.

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8. Engine Oil Filter

A: REMOVAL

1) Remove the under cover.
2) Remove the oil filter with ST.
ST 498547000 OIL FILTER WRENCH



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.
3) Tighten more (approx. 2/3 to 3/4 turn) after the seal rubber contacts the oil pump case. Do not tighten excessively, or oil may leak.

C: INSPECTION

1) After installing the oil filter, run the engine and make sure that no oil is leaking around seal rubber.

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

2) Check the engine oil level. <Ref. to LU(H4DOTC)-8, INSPECTION, Engine Oil.>

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9. Engine Lubrication System Trouble in General

A: INSPECTION

Before performing diagnostics, make sure that the engine oil level is correct and no oil leakage exists.

Trouble	Possible cause		Corrective action
1. Warning light remains on.	1) Oil pressure switch failure	Cracked diaphragm or oil leakage within switch	Replace.
		Broken spring or seized contacts	Replace.
	2) Low oil pressure	Clogged oil filter	Replace.
		Malfunction of oil by-pass valve of oil filter	Clean or replace.
		Malfunction of oil relief valve of oil pump	Clean or replace.
		Clogged oil passage	Clean.
		Excessive tip clearance and side clearance of oil pump rotor and gear	Replace.
		Clogged oil strainer or broken pipe	Clean or replace.
	3) No oil pressure	Insufficient engine oil	Replenish.
		Broken pipe of oil strainer	Replace.
		Stuck oil pump rotor	Replace.
2. Warning light does not go on.	1) Poor contact of switch contact points		Replace.
	2) 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).

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SPEED CONTROL SYSTEMS

SP(H4DOTC)

Page
1. General Description 2

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1. General Description

A: SPECIFICATION

Specifications for Turbo model is included in SP (H4SO) section. <Ref. to SP(H4SO)-2, General Description.>

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IGNITION

IG(H4DOTC)

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1. General Description 2
2. Spark Plug.....4
3. Ignition Coil & Ignitor ASSY 7

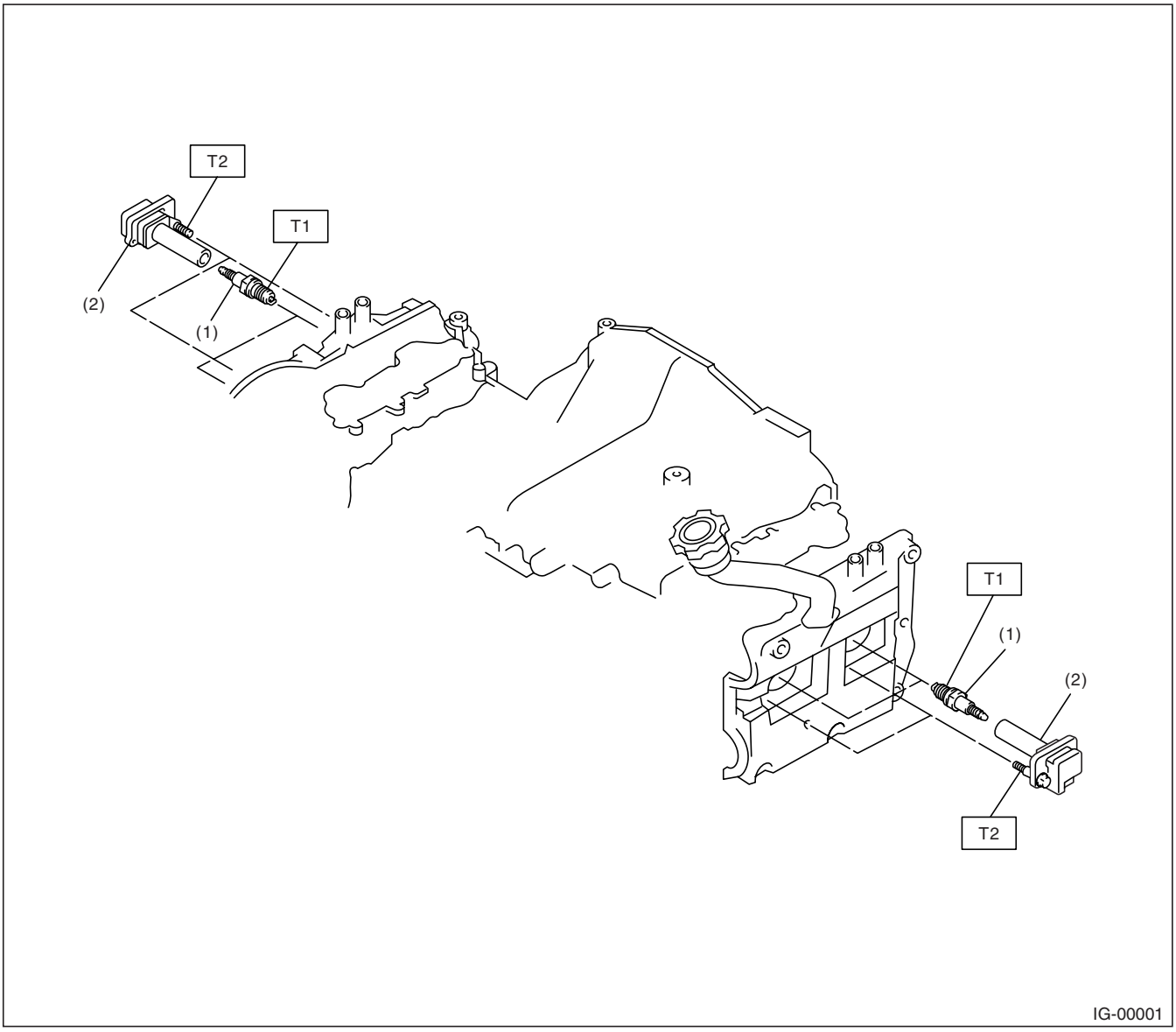
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1. General Description

A: SPECIFICATIONS

Item			Designation
Ignition coil & ignitor assembly	Model		FK0186
	Ignition type		Direct ignition
	Manufacturer		DIAMOND
Spark plug	Type and manufacturer		NGK: PFR6G
	Thread size	mm	14, P = 1.25
	Spark plug gap	mm (in)	0.7 — 0.8 (0.028 — 0.031)
	Electrode		Platinum

B: COMPONENT



(1) Spark plug
(2) Ignition coil & ignitor ASSY

Tightening torque: N·m (kgf-m, ft-lb)
T1: 21 (2.1, 15.2)
T2: 16 (1.6, 11.7)

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C: CAUTION

• Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust or dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly, and replacement.
• Be careful not to burn your hands, because each part on the vehicle is hot after running.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or safety stands at the specified points.
• Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.

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2. Spark Plug

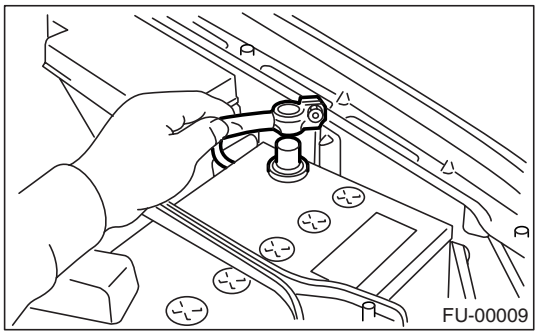
A: REMOVAL

CAUTION:
All spark plugs installed on an engine, must be of the same heat range.

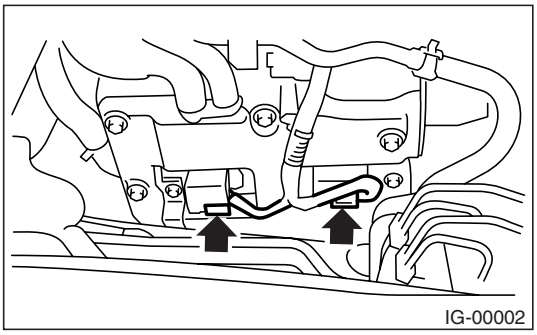
Spark plug:
NGK: PFR6G

1. RH SIDE

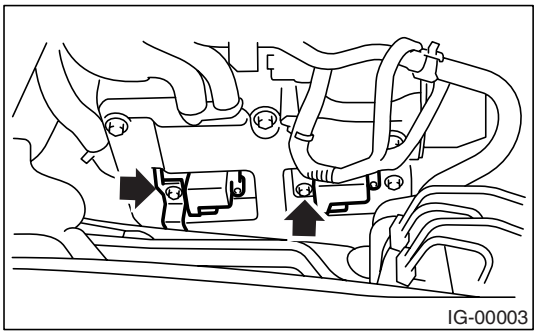
1) Disconnect the ground cable from battery.



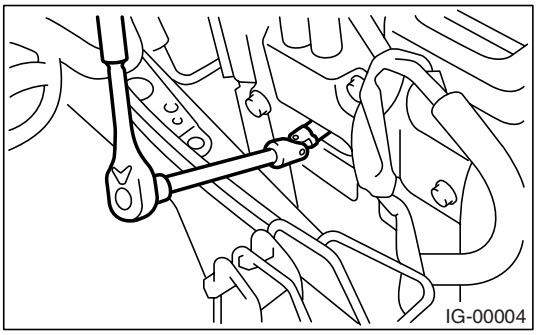
2) Remove the air cleaner lower case. <Ref. to IN(H4DOTC)-8, REMOVAL, Air Cleaner.>
3) Disconnect the connector from ignition coil.



4) Remove the ignition coil.

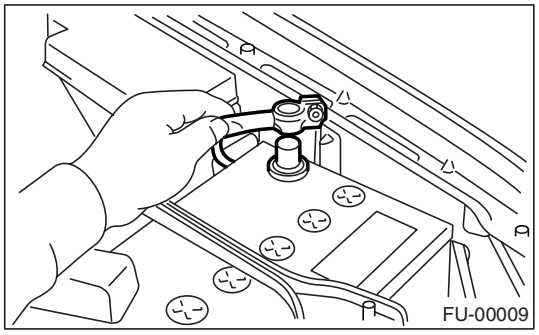


5) Remove the spark plugs with the spark plug sockets.

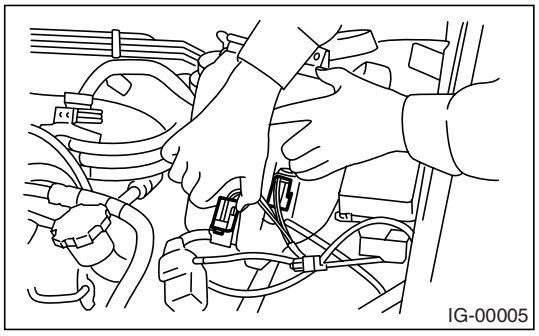


2. LH SIDE

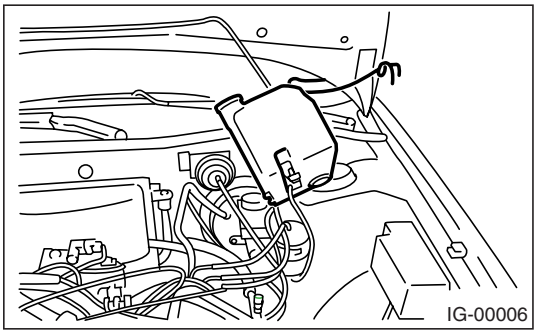
1) Disconnect the battery cables, and then remove the battery and battery carrier.



2) Disconnect the washer motor connector.

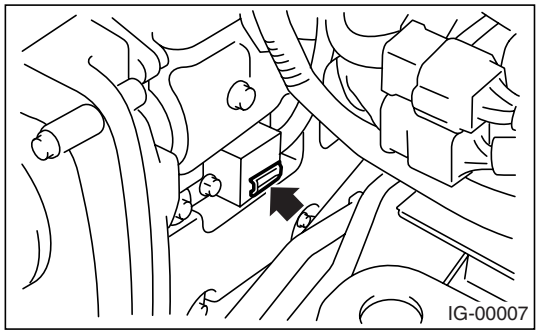


3) Disconnect the rear window glass washer hose from washer motor, then plug connection with a suitable cap.
4) Remove the two bolts which hold washer tank, then take the tank away from working area.

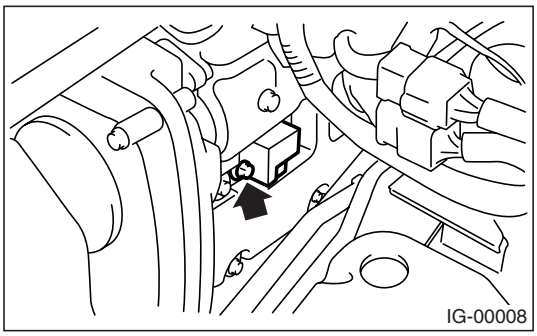


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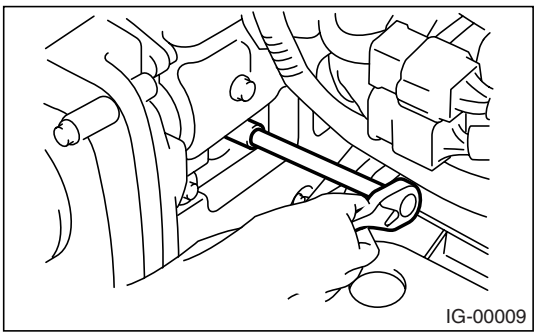
5) Disconnect the connector from ignition coil.



6) Remove the ignition coil.



7) Remove the spark plugs with the spark plug sockets.



B: INSTALLATION

1. RH SIDE

1) Install in the reverse order of removal.

Tightening torque (Spark plug):
21 N·m (2.1 kgf-m, 15.2 ft-lb)

Tightening torque (Ignition coil):
16 N·m (1.6 kgf-m, 11.7 ft-lb)

NOTE:
The above torque should be only applied to new spark plugs without oil on their threads.
In case their threads are lubricated, the torque should be reduced by approx. 1/3 of the specified torque in order to avoid over-stressing.

2. LH SIDE

1) Install in the reverse order of removal.

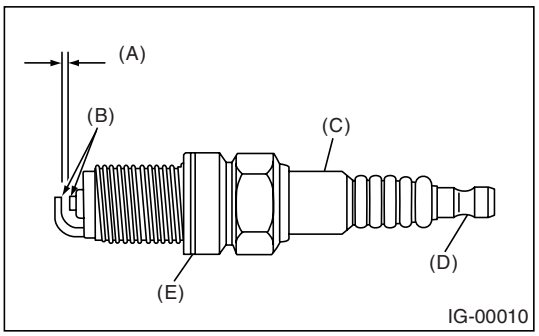
Tightening torque (Spark plug):
21 N·m (2.1 kgf-m, 15.2 ft-lb)

Tightening torque (Ignition coil):
16 N·m (1.6 kgf-m, 11.7 ft-lb)

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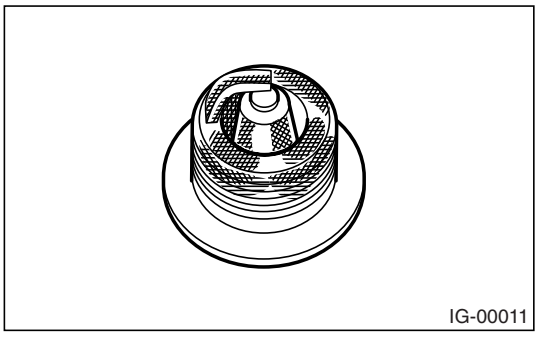
C: INSPECTION

Check the electrodes and inner and outer porcelain of plugs, noting the type of deposits and the degree of electrode erosion.



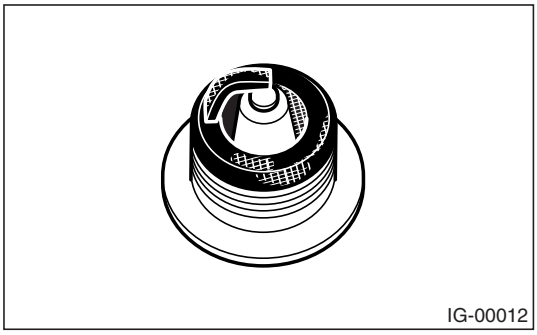
(A) Spark plug gap
(B) Carbon accumulation or wear
(C) Cracks
(D) Damage
(E) Damaged gasket

1) Normal:
Brown to grayish-tan deposits and slight electrode wear indicates correct spark plug heat range.

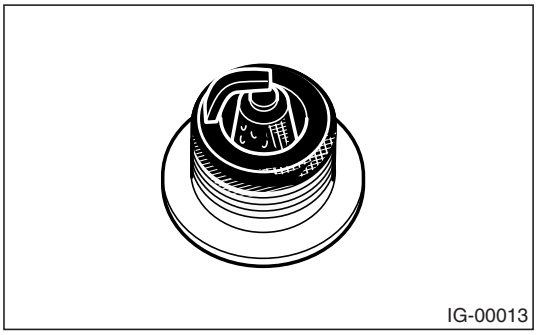


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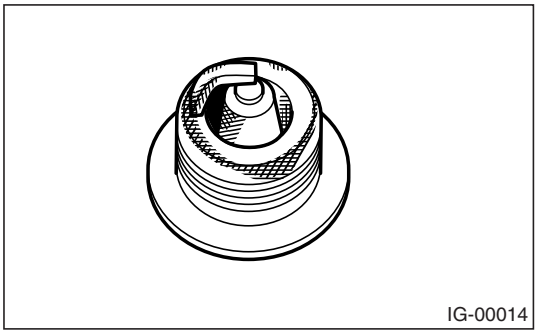
2) Carbon fouled:
Dry fluffy carbon deposits on insulator and electrode are mostly caused by slow speed driving in city, weak ignition, too rich fuel mixture, dirty air cleaner, etc.
It is advisable to replace with plugs having hotter heat range.



3) Oil fouled:
Wet black deposits show excessive oil entrance into combustion chamber through worn rings and pistons or excessive clearance between valve guides and stems. If the same condition remains after repair, use a hotter plug.



4) Overheating:
White or light gray insulator with black or brown spots and bluish burnt electrodes indicates engine overheating. Moreover, the appearance results from incorrect ignition timing, loose spark plugs, wrong selection of fuel, hotter range plug, etc. It is advisable to replace with plugs having colder heat range.

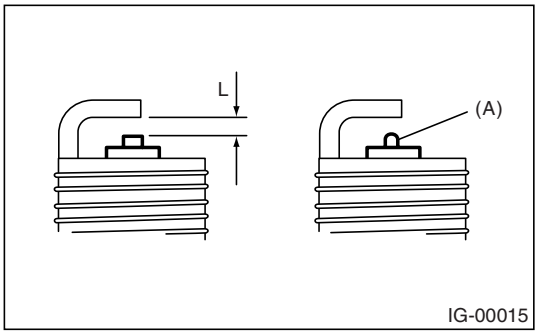


D: ADJUSTMENT

Clean the spark plugs with a wire brush. Clean and remove the carbon or oxide deposits, but do not wear away porcelain.
If deposits are too stubborn, replace the plugs.
After cleaning the spark plugs, correct the spark plug gap using a gap gauge.

NOTE:
Do not use spark plug cleaners, because the spark plugs are applied with platinum tips.

Spark plug gap: L
0.7 — 0.8 mm (0.028 — 0.031 in)



NOTE:
Replace with a new spark plug if this area (A) is worn to “ball” shape.

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3. Ignition Coil & Ignitor ASSY

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

1) 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)-67, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>

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IGNITION COIL & IGNITOR ASSY

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STARTING/CHARGING SYSTEMS

SC(H4DOTC)

Page

1. General Description 2

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1. General Description

A: SPECIFICATION

Specifications for Turbo model is included in SC (H4SO) section. <Ref. to SC(H4SO)-2, General Description.>

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ENGINE (DIAGNOSTICS)

EN(H4DOTC)

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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)-4, CHECK, Check List for Interview.> 2)Start the engine.	Does the engine start?	Go to step **2.**	Inspection using "Diagnostics for Engine Start Failure". <Ref. to EN(H4DOTC)-60, 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)-314, General Diagnostic Table.>
3	**CHECK INDICATION OF DTC ON DISPLAY.** 1)Turn the ignition switch to OFF. 2)Connect the Subaru Select Monitor or OBD-II general scan tool to data link connector. 3)Turn the ignition switch to ON and the Subaru Select Monitor or OBD-II general scan tool switch to ON. 4)Read the DTC on Subaru Select Monitor or OBD-II general scan tool.	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC?	Record the DTC code. Repair the trouble cause. <Ref. to EN(H4DOTC)-75, List of Diagnostic Trouble Code (DTC).> Go to step **4.**	Repair the related parts. NOTE: If a DTC is not shown on display although malfunction indicator light illuminates, perform diagnostics of malfunction indicator light circuit or combination meter. <Ref. to EN(H4DOTC)-51, Malfunction Indicator Light.>
4	**PERFORM THE DIAGNOSIS.** 1)Perform the clear memory mode. <Ref. to EN(H4DOTC)-48, Clear Memory Mode.> 2)Perform the inspection mode. <Ref. to EN(H4DOTC)-40, Inspection Mode.>	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC?	Inspect using "Diagnostics Procedure with Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)-82, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Complete the diagnosis.

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2. AUTOMATIC TRANSMISSION

When DTC about automatic transmission is shown on display, carry out the following basic check. After that, carry out the replacement or repair work.
1) ATF level check <Ref. to 4AT-31, Automatic Transmission Fluid.>
2) Differential gear oil level check <Ref. to 4AT-32, Differential Gear Oil.>
3) ATF leak check <Ref. to 4AT-31, Automatic Transmission Fluid.>
4) Differential gear oil leak check <Ref. to 4AT-32, Differential Gear Oil.>
5) Stall test <Ref. to 4AT-34, Stall Test.>
6) Line pressure test <Ref. to 4AT-37, Line Pressure Test.>
7) Transfer clutch pressure test <Ref. to 4AT-38, Transfer Clutch Pressure Test.>
8) Time lag test <Ref. to 4AT-36, Time Lag Test.>
9) Road test <Ref. to 4AT-33, Road Test.>
10) Shift characteristics <Ref. to 4AT-38, Transfer Clutch Pressure Test.>

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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	km/h (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		

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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:
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

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3. General Description

A: CAUTION

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

CAUTION:
• All airbag system wiring harness and 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.

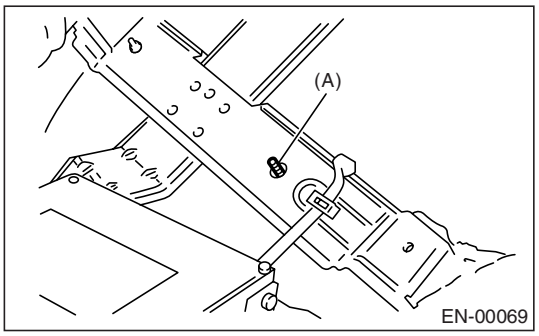
5) Poor contact has been identified as a primary cause of this problem. To measure the voltage and/or resistance of individual sensors or all electrical control modules at the harness side connector, use a tapered pin with a diameter of less than 0.64 mm (0.025 in). Do not insert the pin more than 5 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.

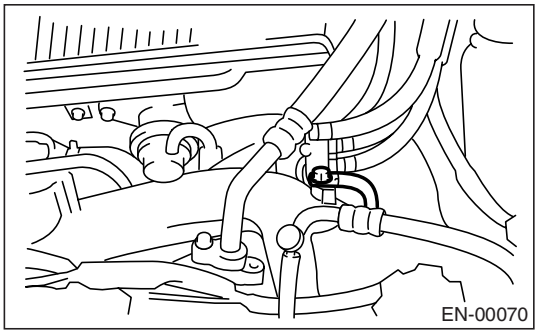
7) The connectors to each sensor in the engine compartment and the harness connectors on the engine side and body side are all designed to be waterproof. However, it is still necessary to take care not to allow water to get into the connectors when washing the vehicle, or when servicing the vehicle on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

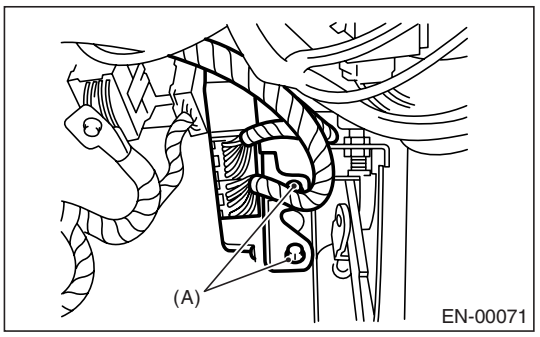


(A) Stud bolt

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) Use the TCM mounting stud bolts at the grounding point, when measuring voltage and resistance inside the passenger compartment.



(A) Stud bolt

11) Every MFI-related part is a precision part. Do not drop them.

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

CAUTION:
• The antenna must be kept as far apart as possible from the control unit.
(The ECM is located under the steering column, inside of the instrument panel lower trim panel.)
• The antenna feeder must be placed as far 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.

13) Before disconnecting the fuel hose, disconnect the fuel pump connector and crank the engine for more than 5 seconds to release pressure in the fuel system. If the engine starts during this operation, run it until it stops.
14) Problems in the electronic-controlled automatic transmission may be caused by failure of the engine, the electronic control system, the transmission proper, or by a combination of these. These three causes must be distinguished clearly when performing diagnostics.
15) Diagnostics should be conducted by rotating with simple, easy operations and proceeding to complicated, difficult operations. The most important thing in diagnostics is to understand the customer's complaint, and distinguish between the three causes.
16) On 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.

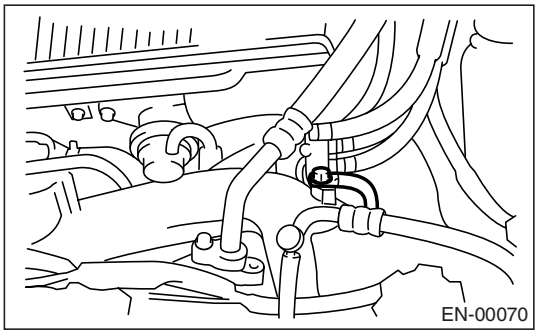
Standard voltage: 12 V

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 complex electronic control. Malfunction indicator light in combination meter indicates occurrence of a fault or trouble.
• Further, against such a failure or sensors as may disable the drive, the fail-safe function is provided to ensure the minimal driveability.
• The OBD system incorporated with the vehicles within this engine family complies with Section 1968.1, California Code of Regulations (OBD-II regulation). The OBD system monitors the components and the system malfunction listed in Engine Section which affects on emissions.
• When the system decides that a malfunction occurs, malfunction indicator light illuminates. At the same time of malfunction indicator light illumination 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.

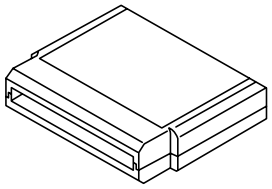
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• If the OBD system detects the various malfunctions including the fault of fuel trim or misfire, the OBD system first stores freeze frame engine conditions about the fuel trim or misfire.
• When the malfunction does not occur again for three consecutive driving cycles, malfunction indicator light is turned off, but DTC remains at on-board computer.
• The OBD-II system is capable of communication with a general scan tool (OBD-II general scan tool) formed by ISO 9141 CARB.
• The OBD-II diagnostics procedure is different from usual diagnostics procedure. When troubleshooting model with OBD-II, connect the Subaru Select Monitor or the OBD-II general scan tool to the vehicle.

2. ENGINE AND EMISSION CONTROL SYSTEM

• The Multipoint Fuel Injection (MFI) system is a system that supplies the optimum air-fuel mixture to the engine for all the various operating conditions through the use of the latest electronic technology.
With this system fuel, which is pressurized at a constant pressure, is injected into the intake air passage of the cylinder head. The injection quantity of fuel is controlled by an intermittent injection system where the electro-magnetic injection valve (fuel injector) opens only for a short period of time, depending on the quantity of air required for one cycle of operation. In actual operation, the injection quantity is determined by the duration of an electric pulse applied to the fuel injector and this permits simple, yet highly precise metering of the fuel.
• Further, all the operating conditions of the engine are converted into electric signals, and this results in additional features of the system, such as large improved adaptability, easier addition of compensating element, etc.
The MFI system also has the following features:
- Reduced emission of harmful exhaust gases.
- Reduced in fuel consumption.
- Increased engine output.
- Superior acceleration and deceleration.
- Superior startability and warm-up performance in cold weather since compensation is made for coolant and intake air temperature.

D: PREPARATION TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST24082AA210	24082AA210	CARTRIDGE	Troubleshooting for electrical systems.
 ST22771AA030	22771AA030	SUBARU SELECT MONITOR KIT	Troubleshooting for electrical systems. • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

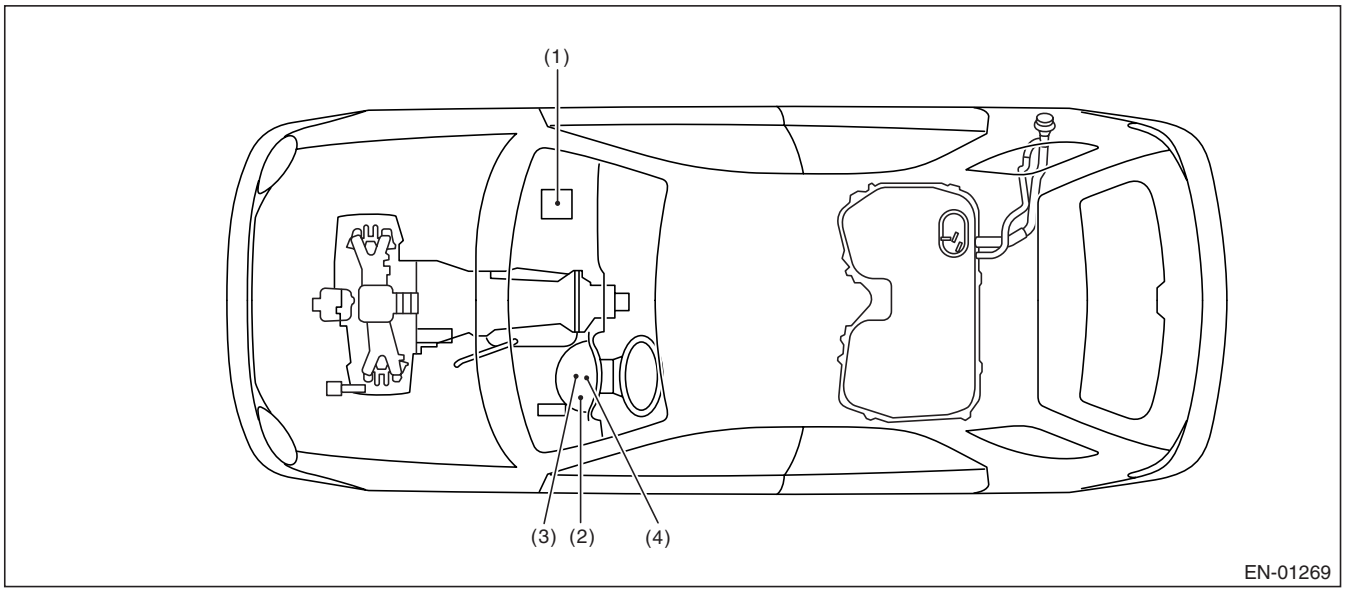
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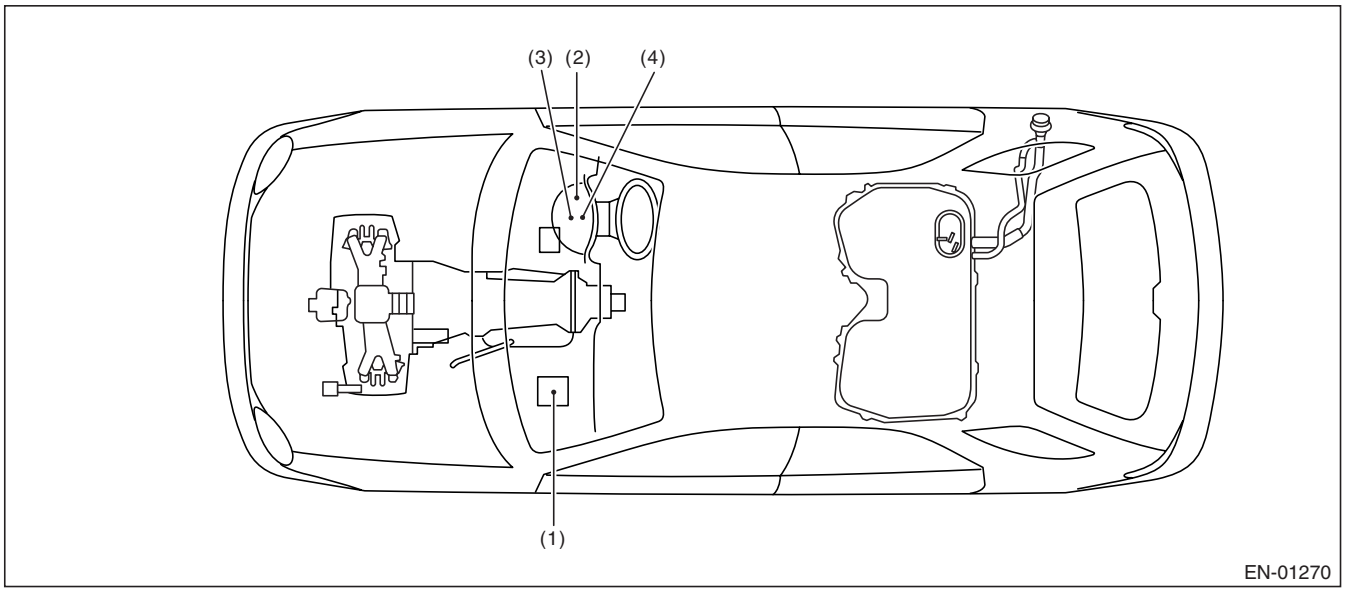
4. Electrical Components Location

A: LOCATION

1. ENGINE

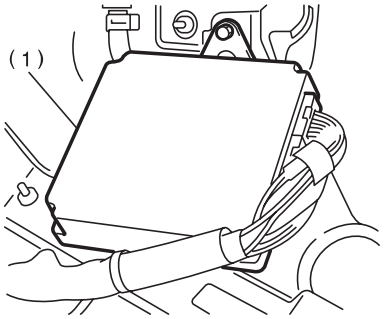
• Module



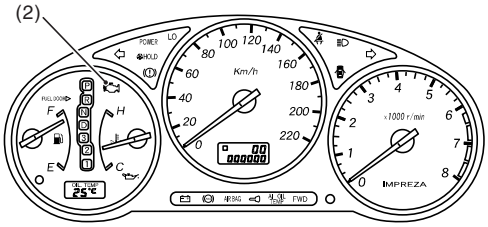


(1) Engine control module (ECM)
(2) Malfunction indicator light
(3) Test mode connector
(4) Data link connector

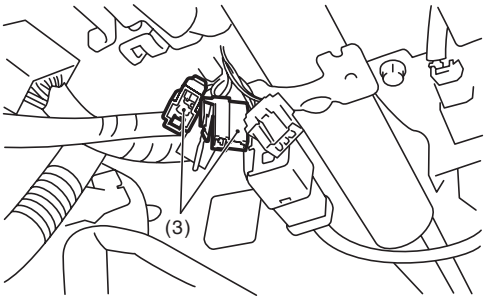
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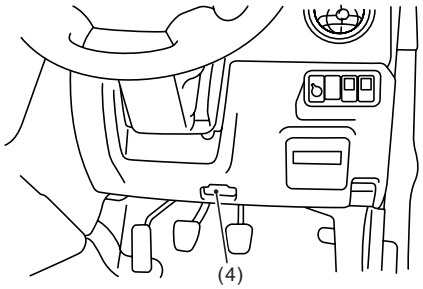
EN-00156



EN-01271



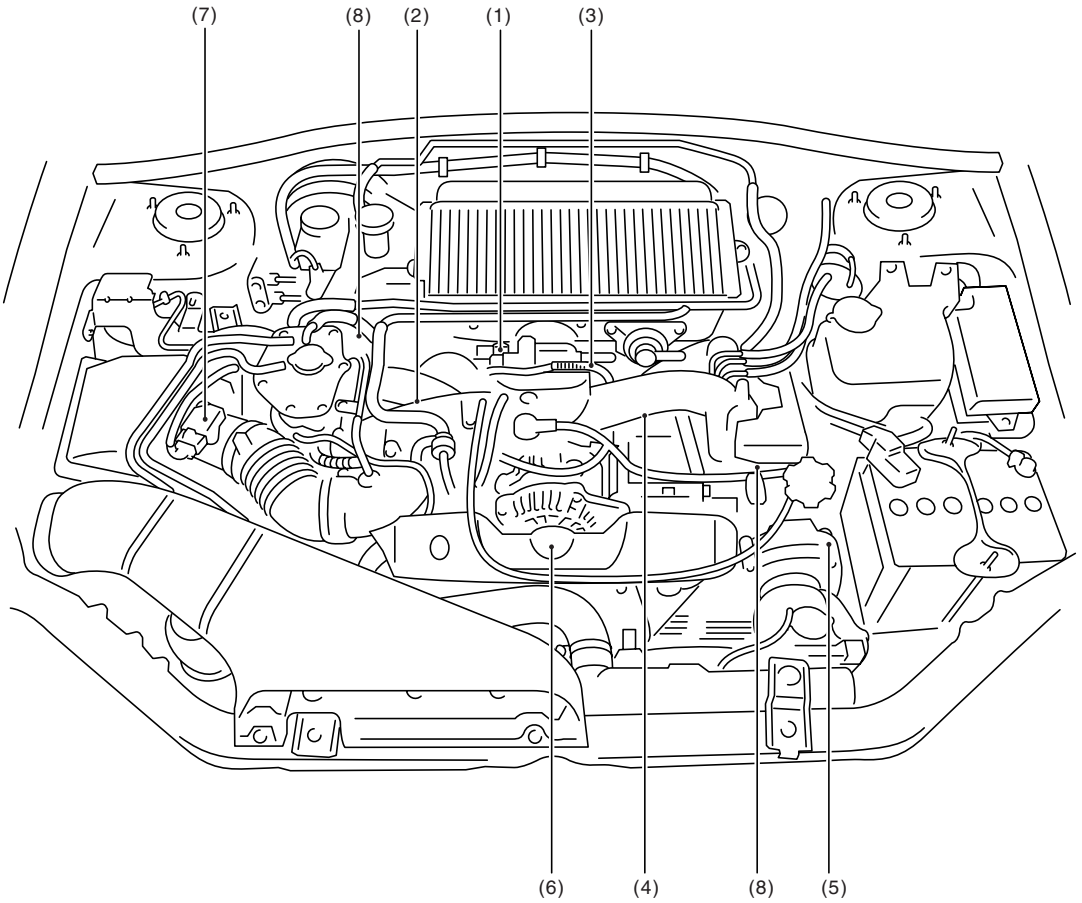
EN-01272



EN-01273

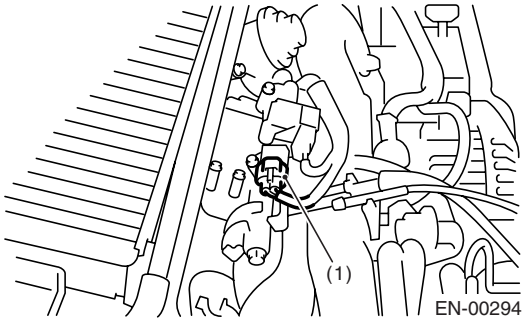
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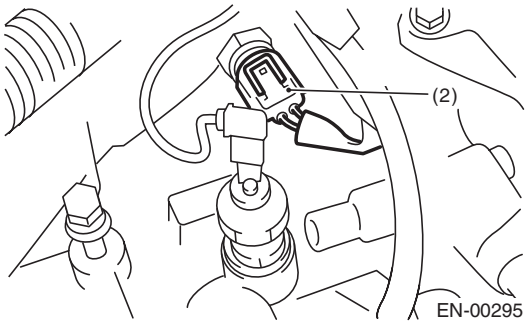
• **Sensor**

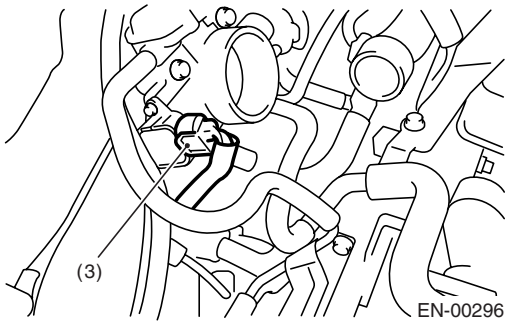


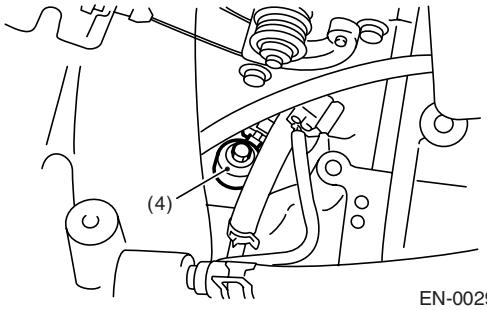
(1) Manifold absolute pressure sensor
(2) Engine coolant temperature sensor
(3) Throttle position sensor
(4) Knock sensor
(5) Camshaft position sensor
(6) Crankshaft position sensor
(7) Mass air flow and intake air temperature sensor
(8) Tumble generator valve position sensor

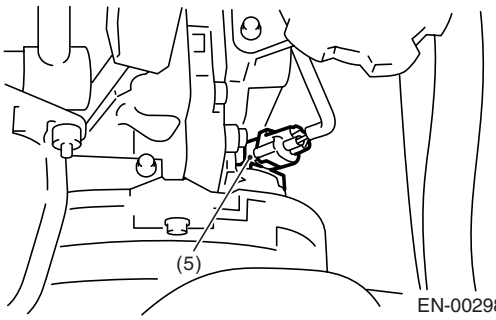
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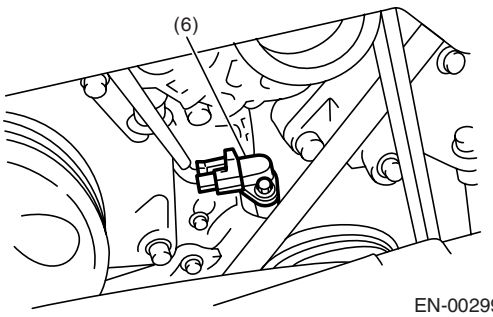


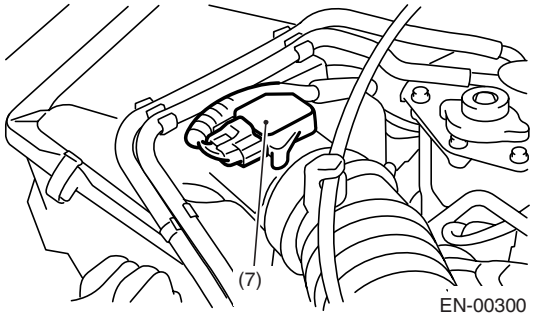


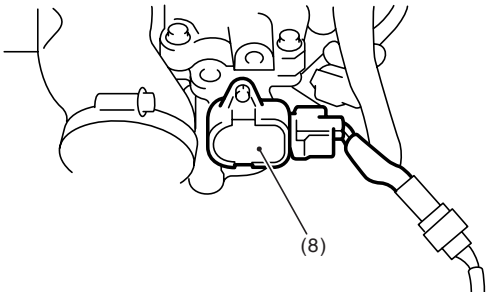






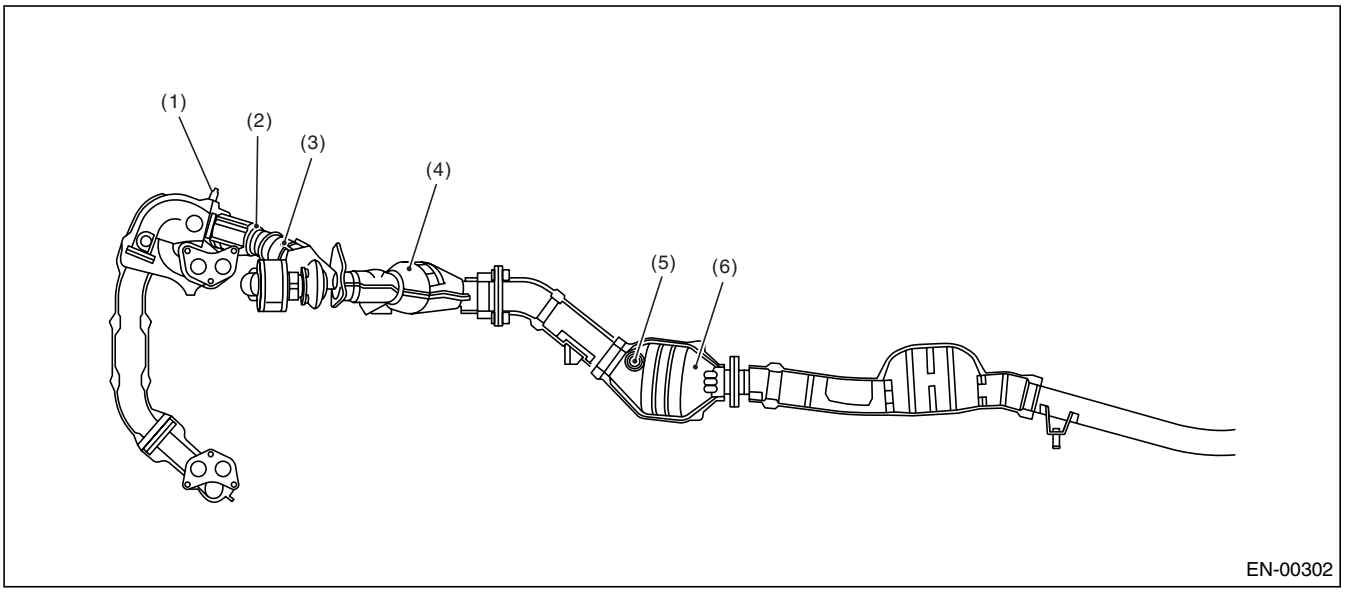




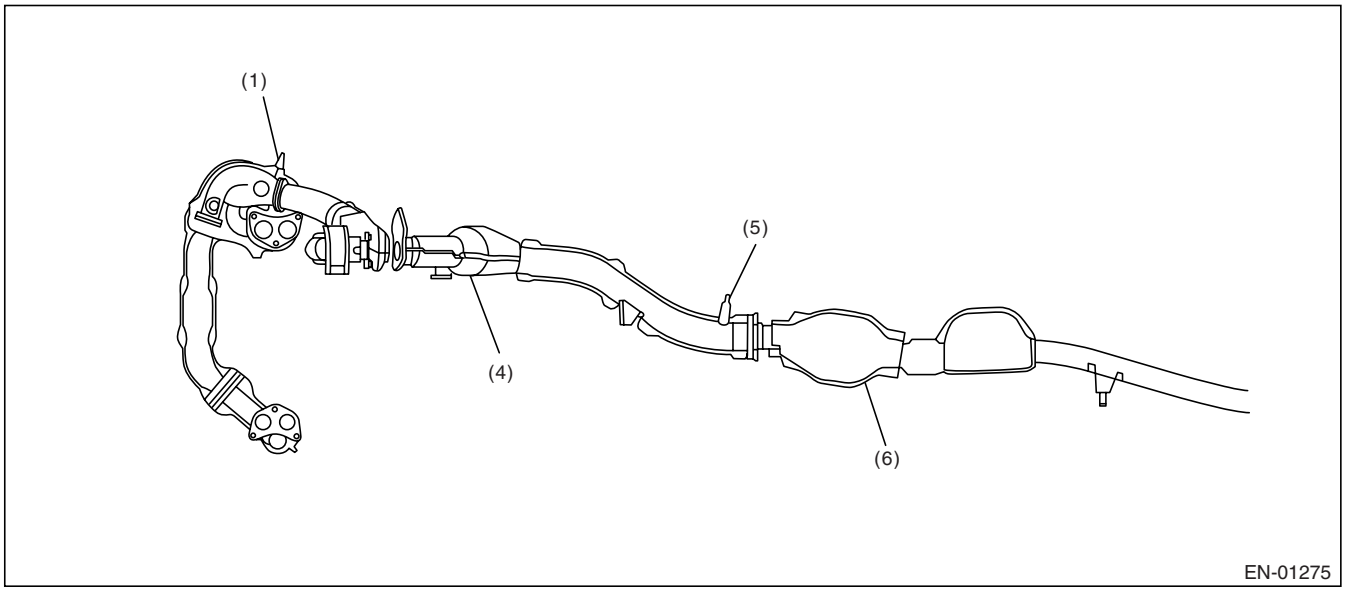


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• Except for Australia model

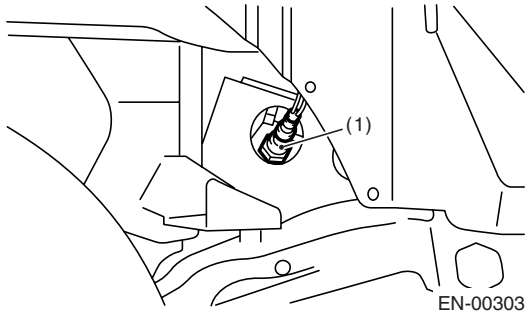


• For Australia model except for STi

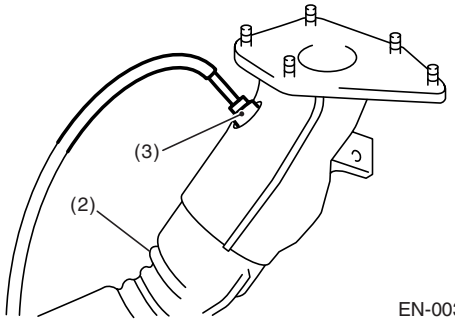


(1) Front oxygen (A/F) sensor
(2) Precatalytic converter (Except for Australia DOHC Turbo model and STi model)
(3) Exhaust temperature sensor (Except for Australia DOHC Turbo model and STi model)
(4) Front catalytic converter
(5) Rear oxygen sensor (Except for Australia model)
(6) Rear catalytic converter

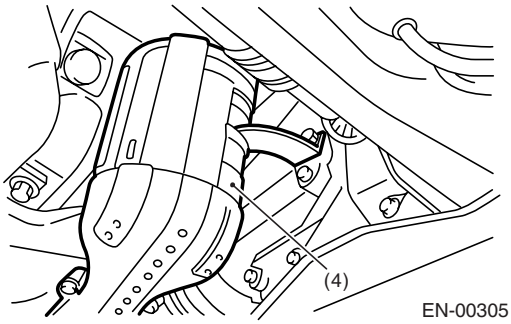
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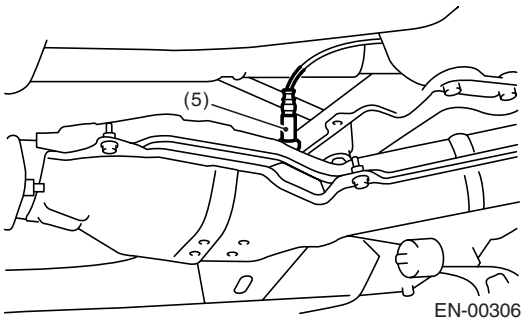
EN-00303



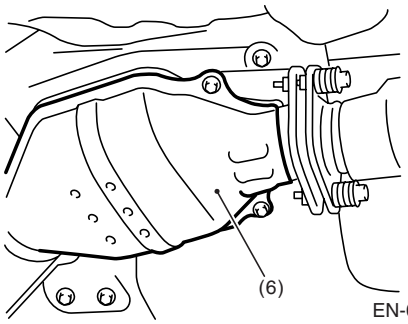
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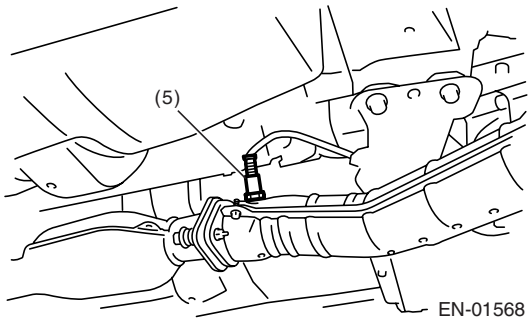
EN-00305



EN-00306

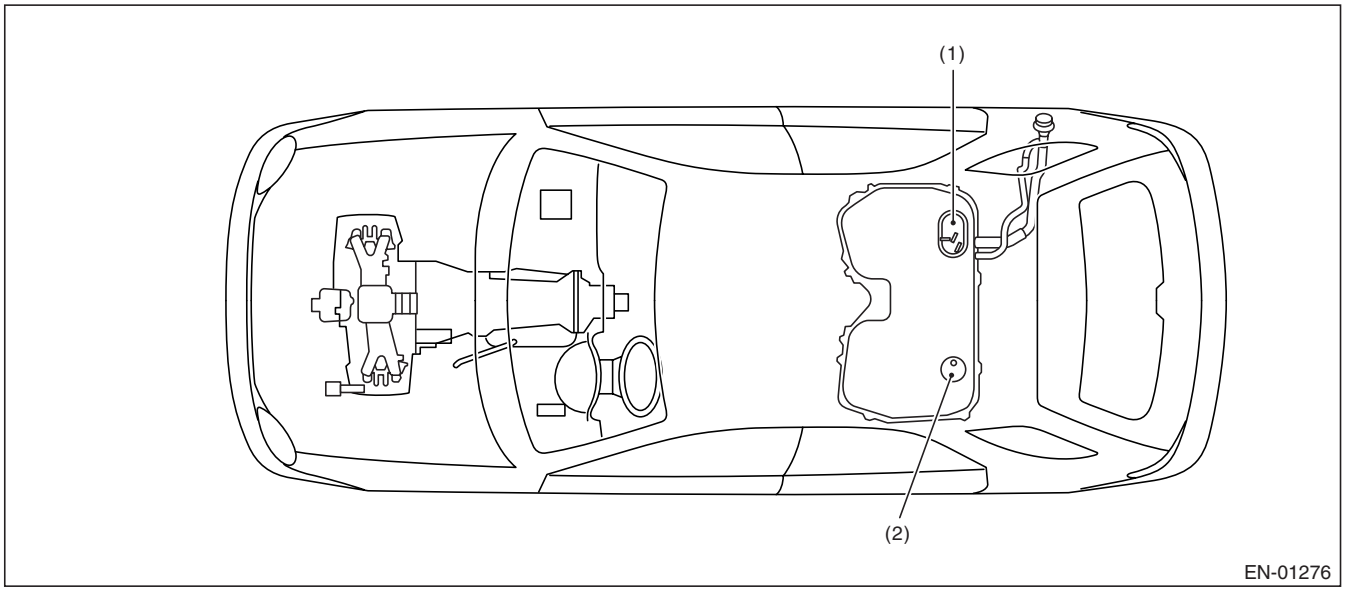


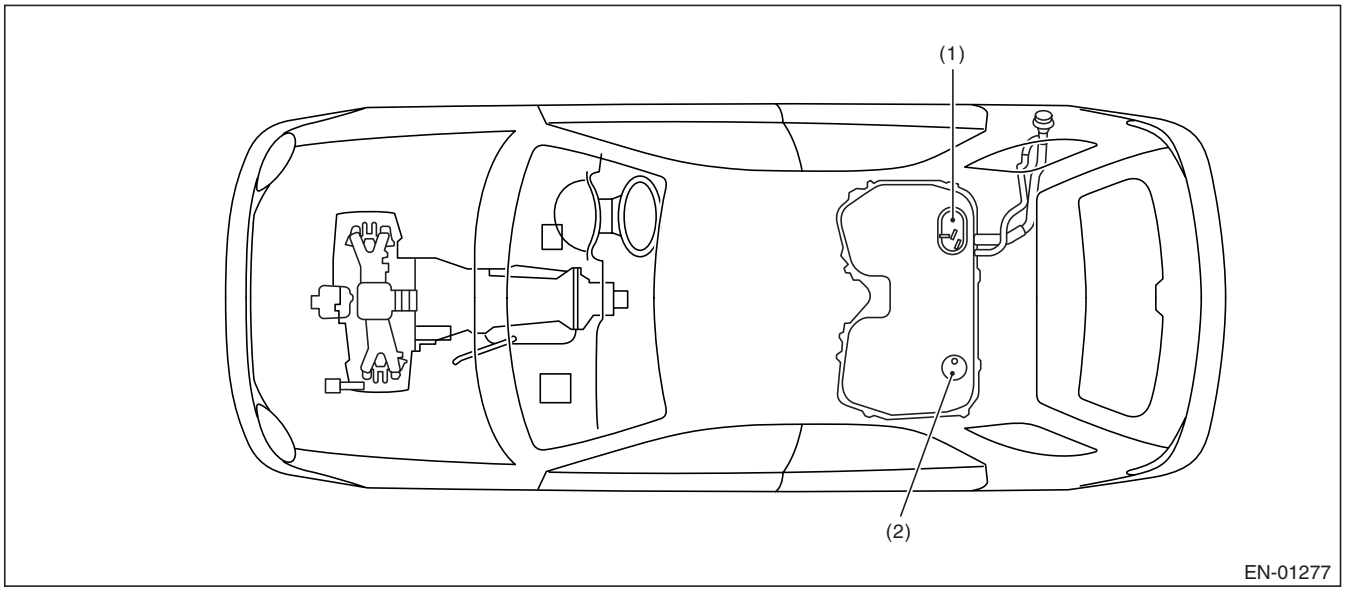
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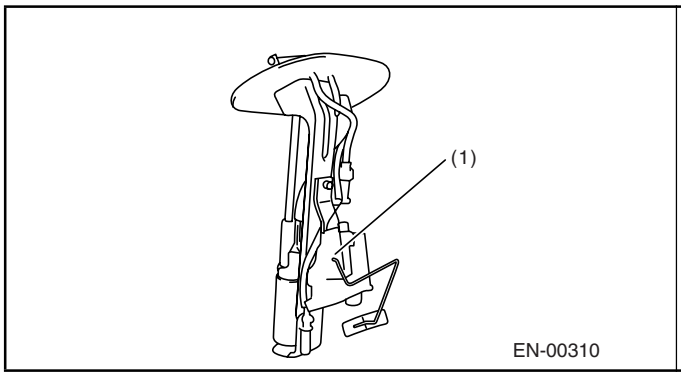
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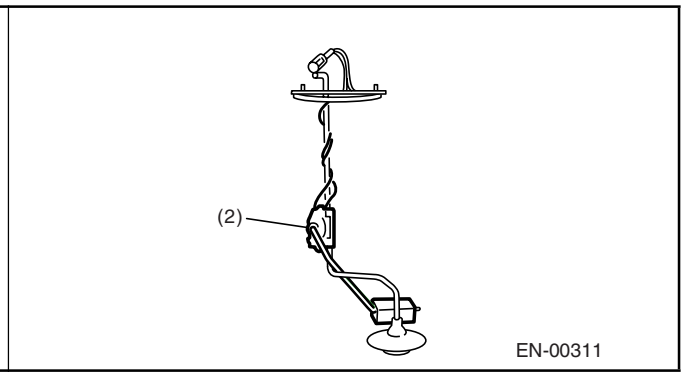
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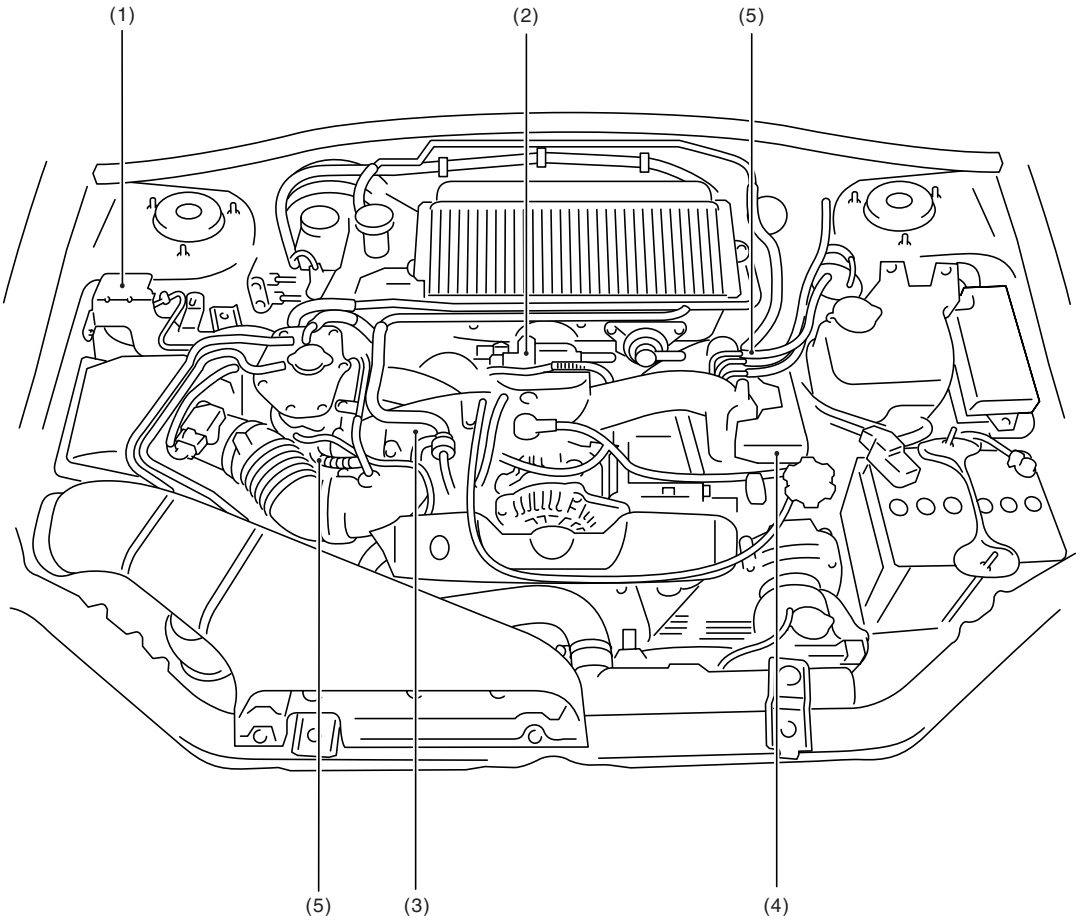
(1) Fuel level sensor (2) Fuel sub level sensor





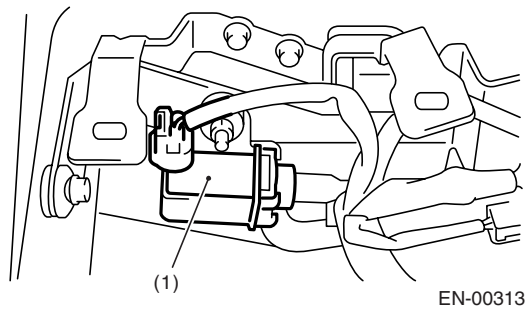
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• Solenoid Valve, Actuator, Emission Control System Parts and Ignition System Parts

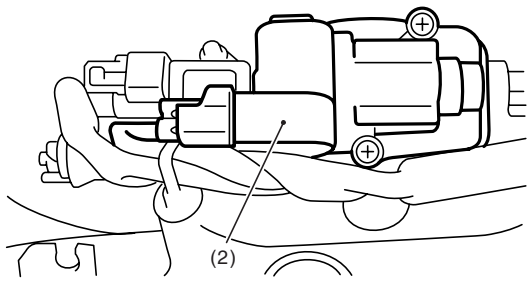


(1) Wastegate control solenoid valve
(2) Idle air control solenoid valve
(3) Purge control solenoid valve
(4) Ignition coil
(5) Tumble generator valve actuator

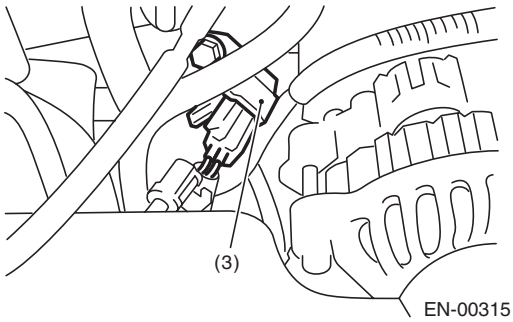
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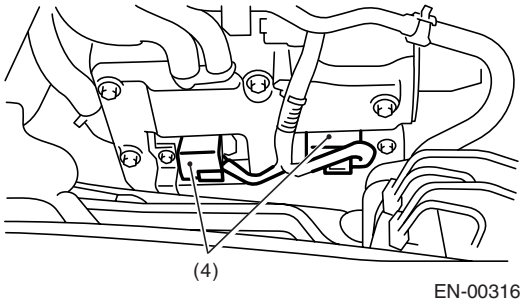
EN-00313



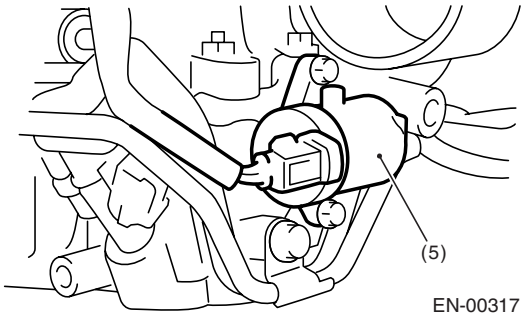
EN-00314



EN-00315



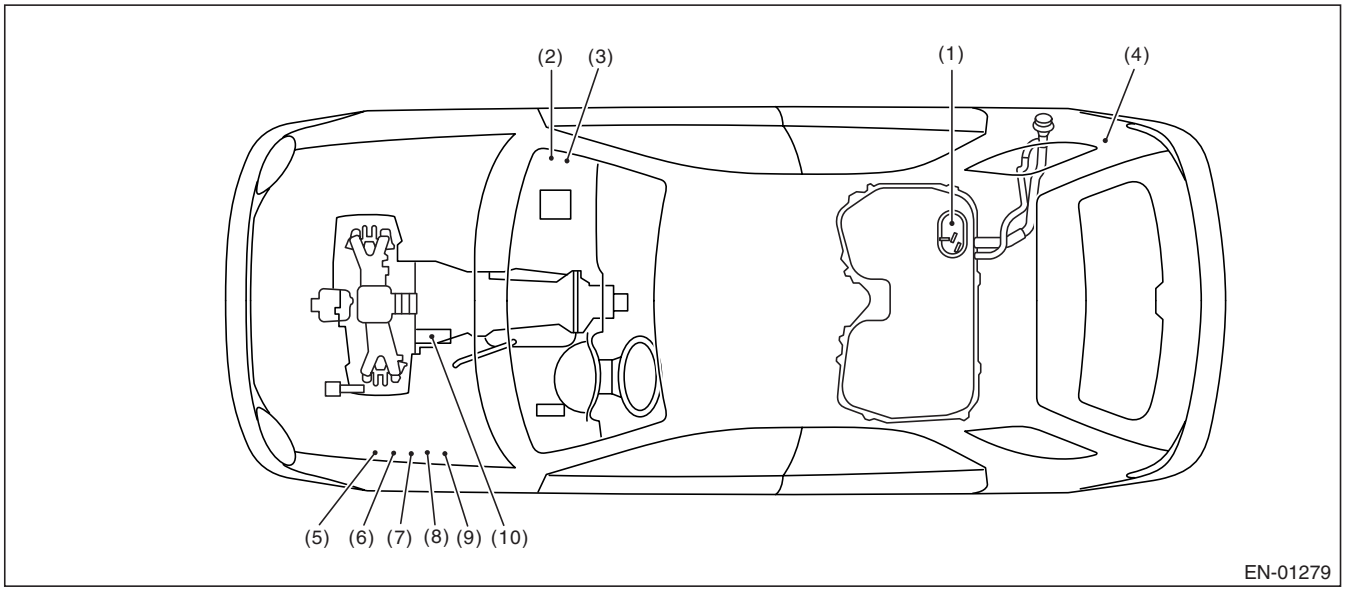
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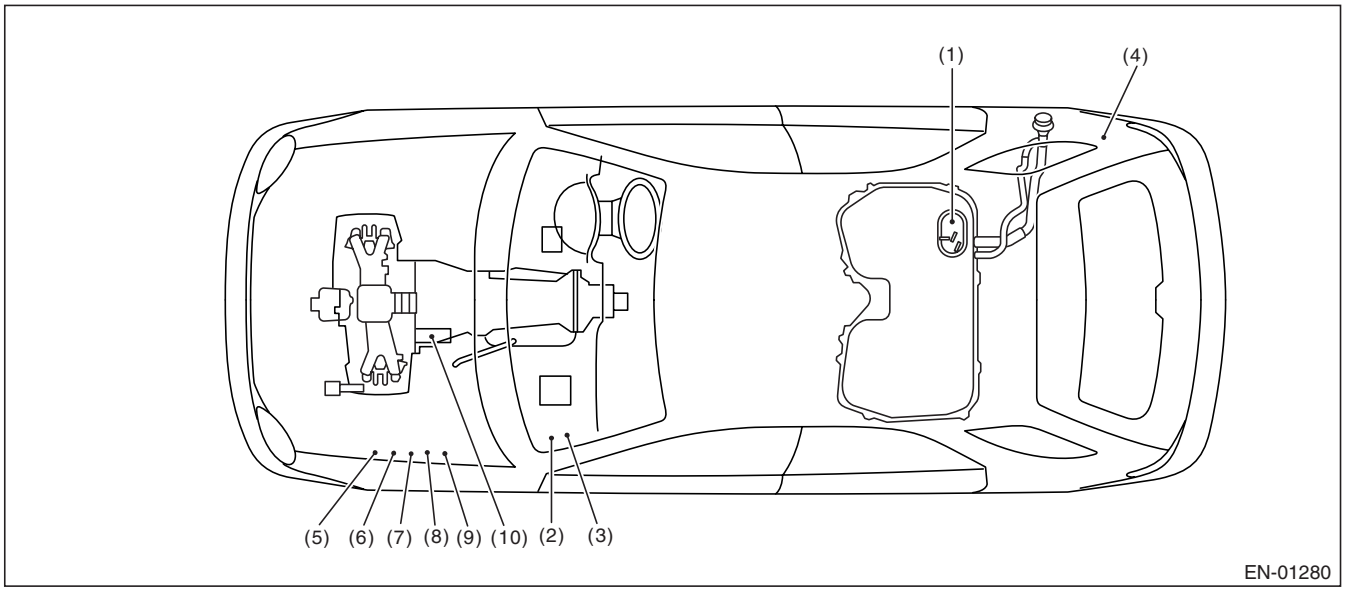


EN-00317

SUBARU.

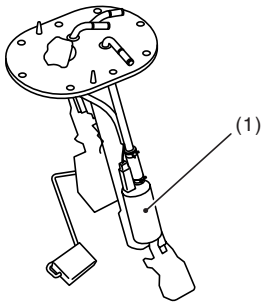
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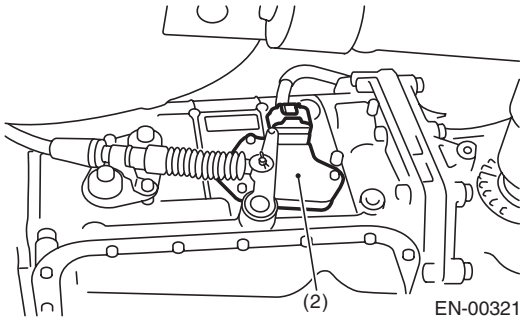


(1) Fuel pump
(2) Inhibitor switch
(3) Main relay
(4) Fuel pump relay
(5) Fuel pump control unit
(6) Radiator main fan relay 1
(7) Radiator main fan relay 2
(8) Radiator sub fan relay 1
(9) Radiator sub fan relay 2
(10) Starter

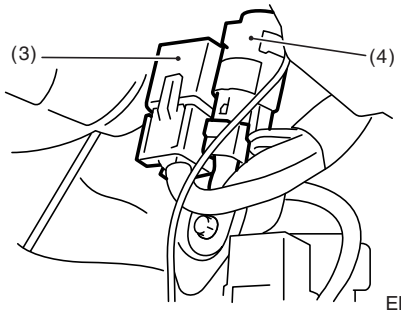
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EN-00320



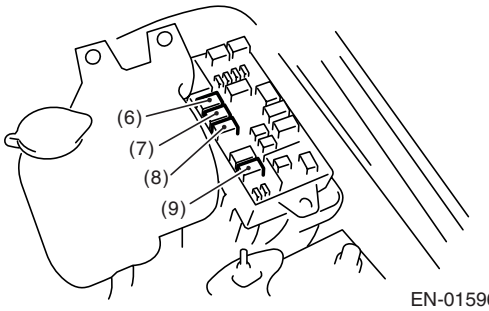
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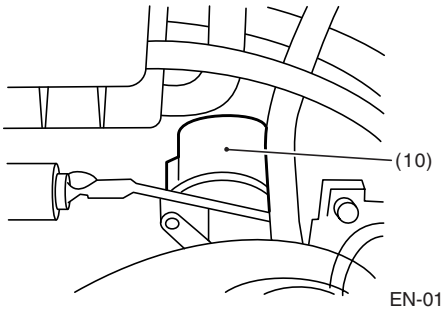
EN-01281



EN-01282



EN-01596

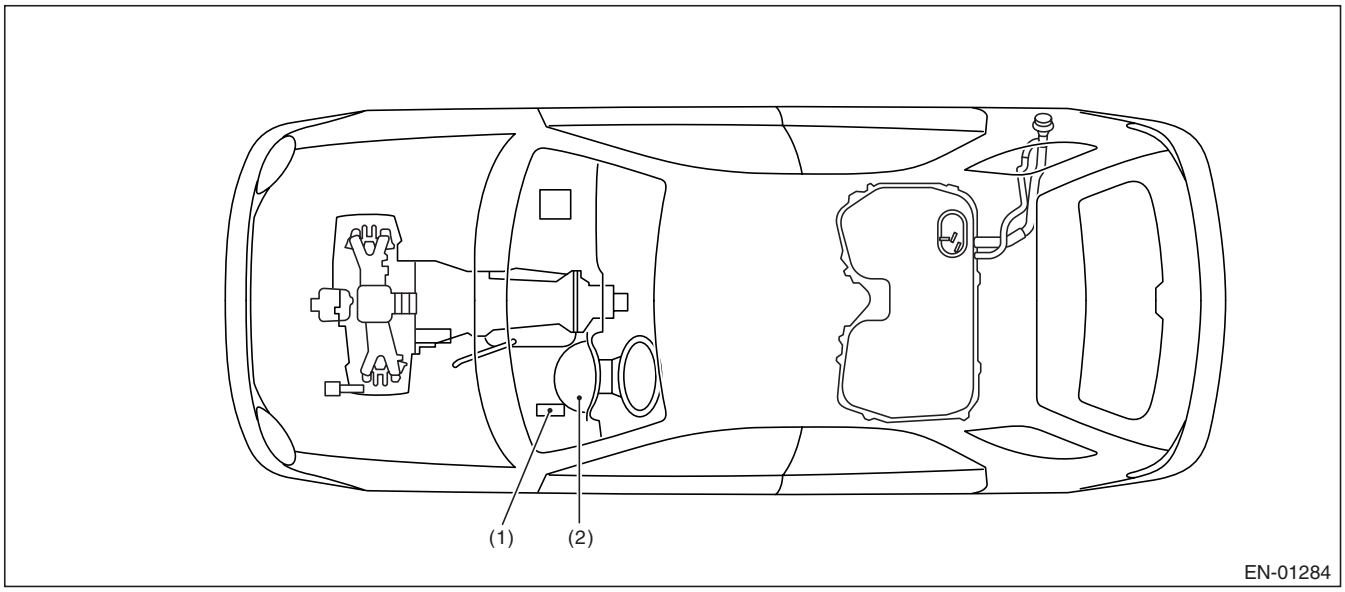


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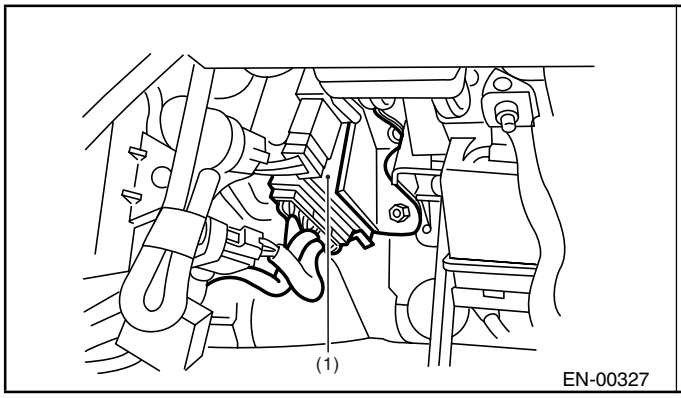
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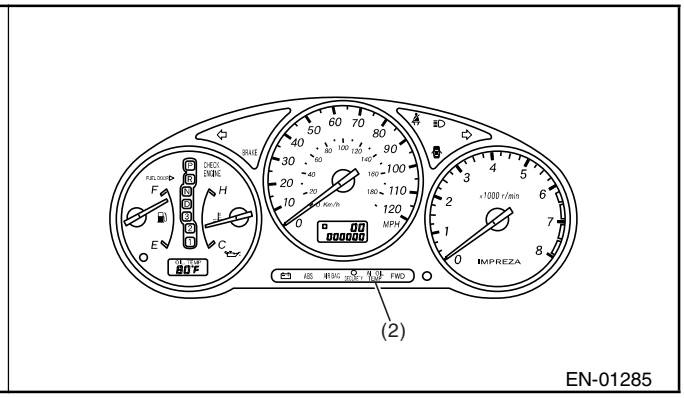
2. TRANSMISSION

• Module



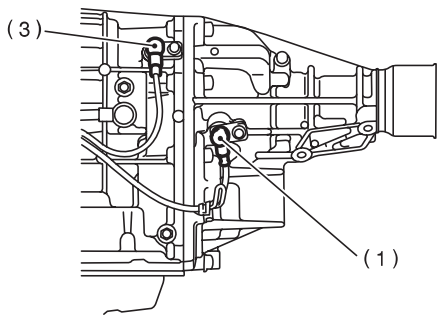
(1) Transmission control module (TCM) (for AT model)
(2) AT diagnostic indicator light (for AT model)



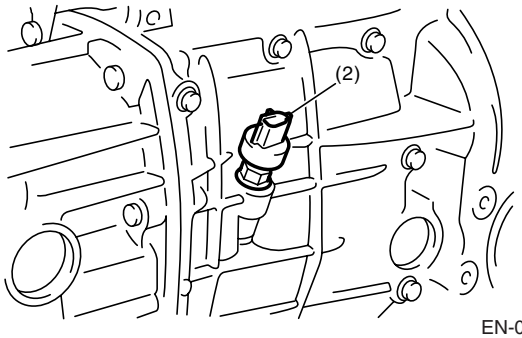


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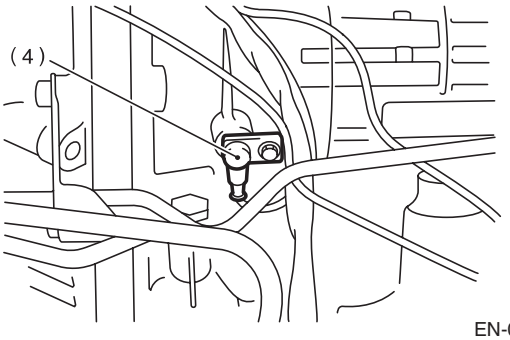
• **Sensor**



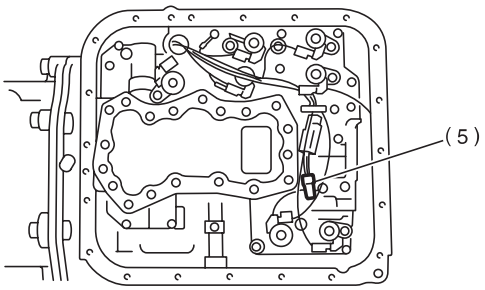
EN-00184



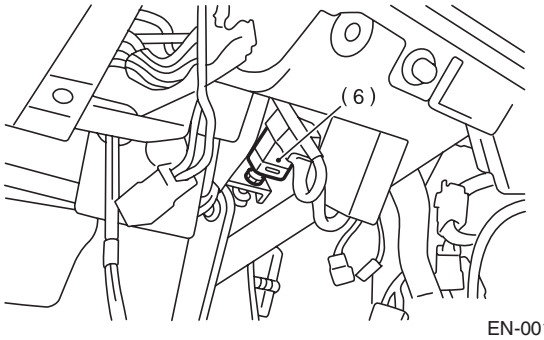
EN-00107



EN-00186



EN-00187



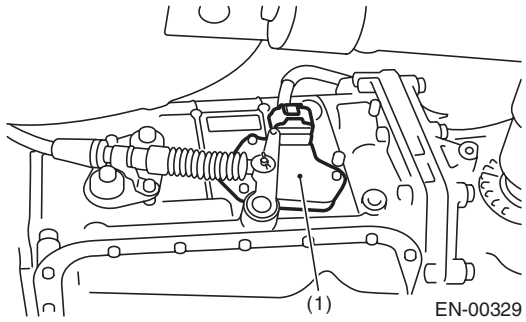
EN-00188

SUBARU.

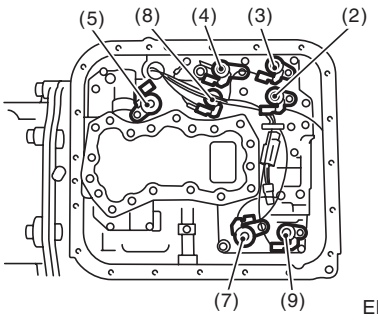
(1) Rear vehicle speed sensor (for AT model)
(2) Front vehicle speed sensor (for MT model)
(3) Front vehicle speed sensor (for AT model)
(4) Torque converter turbine speed sensor (for AT model)
(5) ATF temperature sensor (for AT model)
(6) Brake light switch

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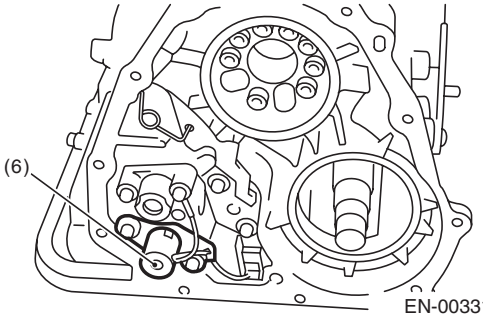
• Solenoid Valve and Switch (AT model)



EN-00329



EN-00330

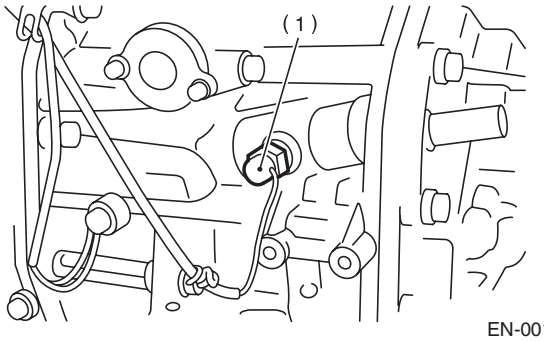


EN-00331

SUBARU.

(1) Inhibitor switch
(2) Shift solenoid valve 1
(3) Shift solenoid valve 2
(4) Line pressure duty solenoid
(5) Lock-up duty solenoid
(6) Transfer duty solenoid
(7) 2-4 brake duty solenoid
(8) Low clutch timing solenoid valve
(9) 2-4 brake timing solenoid valve

• Solenoid Valve and Switch (MT model)



EN-00192

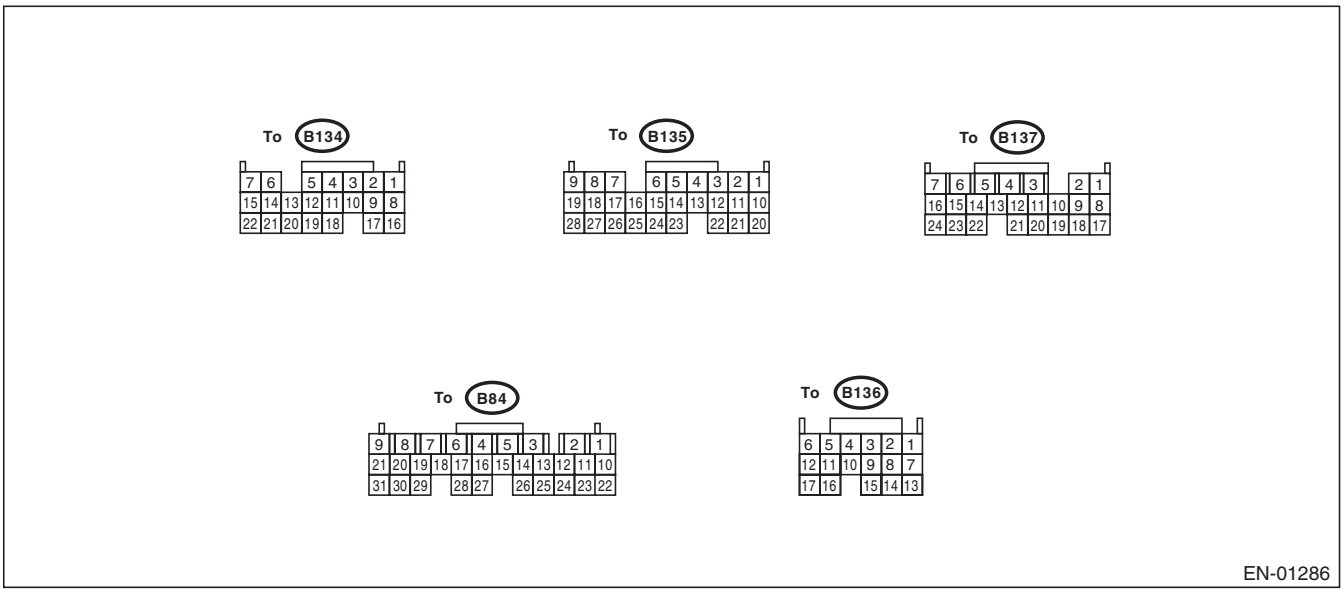
SUBARU.

(1) Neutral position switch

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

A: ELECTRICAL SPECIFICATION



Content		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (Engine OFF)	Engine ON (Idling)	
Crankshaft position sensor	Signal (+)	B135	2	0	–7 — +7	Sensor output waveform
	Signal (–)	B135	11	0	0	—
	Shield	B135	21	0	0	—
Camshaft position sensor	Signal (+)	B135	1	0	–7 — +7	Sensor output waveform
	Signal (–)	B135	10	0	0	—
	Shield	B135	21	0	0	—
Throttle position sensor	Signal	B135	7	Fully closed: 0.2 — 1.0 Fully opened: 4.2 — 4.7		—
	Power supply	B135	9	5	5	—
	GND (sensor)	B135	19	0	0	—
Rear oxygen sensor	Signal	B135	17	0	0 — 0.9	—
	Shield	B135	26	0	0	—
	GND (sensor)	B135	19	0	0	—
Front oxygen (A/F) sensor heater	Signal 1	B84	5	0 — 1.0	0 — 1.0	—
	Signal 2	B84	4	0 — 1.0	0 — 1.0	—
Rear oxygen sensor heater signal		B137	13	0 — 1.0	0 — 1.0	—
Engine coolant temperature sensor	Signal	B135	18	1.0 — 1.4	1.0 — 1.4	After warm-up the engine.
	GND (sensor)	B135	19	0	0	After warm-up the engine.
Vehicle speed signal		B134	1	0 or 5	0 or 5	“5” and “0” are repeatedly displayed when vehicle is driven.

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ENGINE CONTROL MODULE (ECM) I/O SIGNAL

Content		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (Engine OFF)	Engine ON (Idling)	
Generator signal		B84	11	ON: 1, or less OFF: 10 — 13	ON: 1, or less OFF: 10 — 13	Waveform
Mass air flow sensor	Signal	B136	13	—	0.3 — 4.5	—
	Shield	B136	8	0	0	—
	GND	B136	7	0	0	—
Intake air temperature sensor signal		B135	27	—	—	—
Exhaust gas temperature sensor	Signal	B135	16	—	—	—
	GND (sensor)	B135	19	0	0	—
Tumble generator valve position sensor RH	Signal	B135	23	Fully closed: 0.2 — 1.0 Fully opened: 4.2 — 4.7		—
	Power supply	B135	9	5	5	—
	GND (sensor)	B135	19	0	0	—
Tumble generator valve position sensor LH	Signal	B135	13	Fully closed: 0.2 — 1.0 Fully opened: 4.2 — 4.7		—
	Power supply	B135	9	5	5	—
	GND (sensor)	B135	19	0	0	—
Tumble generator valve RH (open)		B136	4	0 or 5	0 or 5	—
Tumble generator valve RH (close)		B136	5	0 or 5	0 or 5	—
Tumble generator valve LH (open)		B136	10	0 or 5	0 or 5	—
Tumble generator valve LH (close)		B136	11	0 or 5	0 or 5	—
Wastegate control solenoid valve		B84	24	10 — 13	13 — 14	—
Starter switch		B134	16	0	0	Cranking: 8 — 14
A/C switch		B134	6	ON: 10 — 13 OFF: 0	ON: 13 — 14 OFF: 0	—
Ignition switch		B134	14	10 — 13	13 — 14	—
Neutral position switch		B134	8	ON: 12±0.5 OFF: 0		Switch is ON when gear is in neutral position.
Test mode connector		B134	5	5	5	When connected: 0
Knock sensor	Signal	B135	4	2.8	2.8	—
	Shield	B135	22	0	0	—
Back-up power supply		B84	10	10 — 13	13 — 14	Ignition switch “OFF”: 10 — 13
Control unit power supply		B84	2	10 — 13	13 — 14	—
		B84	3	10 — 13	13 — 14	—
Sensor power supply		B135	9	5	5	—
Line end check 1		B134	10	0	0	—
Ignition control	#1	B137	24	0	13 — 14	Waveform
	#2	B137	23	0	13 — 14	Waveform
	#3	B137	22	0	13 — 14	Waveform
	#4	B137	21	0	13 — 14	Waveform

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Content		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (Engine OFF)	Engine ON (Idling)	
Fuel injector	#1	B84	1	10 — 13	1 — 14	Waveform
	#2	B137	6	10 — 13	1 — 14	Waveform
	#3	B137	5	10 — 13	1 — 14	Waveform
	#4	B137	4	10 — 13	1 — 14	Waveform
Idle air control solenoid valve	Signal	B137	10	0 or 13 — 14	0 or 13 — 14	Waveform
Fuel pump control unit	Signal 1	B134	13	—	—	—
	Signal 2	B137	16	—	—	—
A/C relay control		B84	27	ON: 0.5, or less OFF: 10 — 13	ON: 0.5, or less OFF: 13 — 14	—
Radiator fan relay 1 control		B84	17	ON: 0.5, or less OFF: 10 — 13	ON: 0.5, or less OFF: 13 — 14	—
Radiator fan relay 2 control		B84	28	ON: 0.5, or less OFF: 10 — 13	ON: 0.5, or less OFF: 13 — 14	Model with A/C only
Malfunction indicator lamp		B84	15	—	—	Light “ON”: 1, or less Light “OFF”: 10 — 14
Engine speed output		B137	9	—	0 — 13, or more	Waveform
Purge control solenoid valve		B84	16	ON: 1, or less OFF: 10 — 13	ON: 1, or less OFF: 13 — 14	—
Manifold absolute pressure sensor	Signal	B135	8	1.7 — 2.4	1.1 — 1.6	—
	Power supply	B135	9	5	5	
	GND (sensor)	B135	19	0	0	
Fuel level sensor		B135	25	0.12 — 4.75	0.12 — 4.75	—
Small light switch		B134	17	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
Blower fan switch		B134	9	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
Rear defogger switch		B134	3	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
Power steering oil pressure switch		B135	24	10 — 13	ON: 0 OFF: 13 — 14	—
Wiper switch		B135	12	ON: 10 — 13 OFF: 0	ON: 13 — 14 OFF: 0	—
Front oxygen (A/F) sensor signal (+)		B84	29	2.8 — 3.2	2.8 — 3.2	—
Front oxygen (A/F) sensor signal (–)		B84	19	2.4 — 2.7	2.4 — 2.7	—
Front oxygen (A/F) sensor shield		B84	18	0	0	—
SSM/GST communication line		B134	21	Less than 1 ←→ More than 4	Less than 1 ←→ More than 4	—
Torque control 1 signal		B134	19	More than 4	More than 4	—
Torque control 2 signal		B134	18	More than 4	More than 4	—
Torque control cut signal		B137	14	8	8	—
AT diagnosis input signal		B135	20	Less than 1 ←→ More than 4	Less than 1 ←→ More than 4	Waveform
AT load signal		B135	28	4.3 — 4.4	0.9 — 1.4	—
GND (sensors)		B135	19	0	0	—

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Content	Connector No.	Terminal No.	Signal (V)		Note
			Ignition SW ON (Engine OFF)	Engine ON (Idling)	
GND (injectors)	B137	8	0	0	—
GND (ignition system)	B137	18	0	0	—
GND (power supply)	B137	17	0	0	—
	B134	22	0	0	—
GND (control systems)	B134	7	0	0	—
	B134	15	0	0	—
GND (oxygen sensor heater 1)	B84	9	0	0	—
GND (oxygen sensor heater 2)	B84	8	0	0	—

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6. Engine Condition Data

A: ELECTRICAL SPECIFICATION

Content	Specified data
Engine load	1.6 — 2.9 (%): Idling
	6.4 — 12.8 (%): 2,500 rpm racing

Measuring condition:
- After warm-up the engine.
- Gear position is in neutral position.
- A/C is turned to OFF.
- All accessory switches are turned to OFF.

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7. Transmission Control Module (TCM) I/O Signal

A: ELECTRICAL SPECIFICATION

<Ref. to 4AT-13, Transmission Control Module (TCM) I/O Signal.>

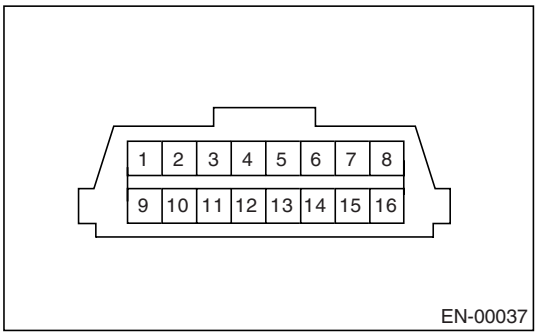
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8. Data Link Connector

A: NOTE

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

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



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

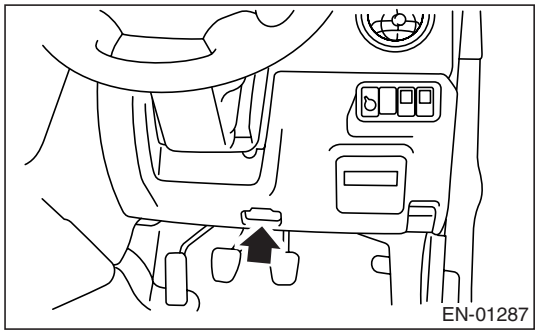
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9. OBD-II General Scan Tool

A: OPERATION

1. HOW TO USE OBD-II GENERAL SCAN TOOL

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



3) Using the OBD-II general scan tool, call up DTC and freeze frame data.
OBD-II general scan tool functions consist of:
(1) MODE $01: Current powertrain diagnostic data
(2) MODE $02: Powertrain freeze frame data
(3) MODE $03: Emission-related powertrain DTC
(4) MODE $04: Clear/Reset emission-related diagnostic information
Read out the data according to repair procedures. (For detailed operation procedures, refer to the OBD-II General Scan Tool Operation Manual.)

NOTE:
For details concerning DTC, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H4DOTC)-75, List of Diagnostic Trouble Code (DTC).>

2. MODE $01 (CURRENT POWERTRAIN DIAGNOSTIC DATA)

Refers to data denoting the current operating condition of analog input/output, digital input/output and/or the powertrain system.
A list of the support data and PID (Parameter Identification) codes are shown in the following table.

PID	Data	Unit of measure
01	Number of emission-related powertrain DTC and malfunction indicator light status	ON/OFF
03	Fuel system control status	—
04	Calculated engine load value	%
05	Engine coolant temperature	°C
06	Short term fuel trim	%
07	Long term fuel trim	%
0B	Intake manifold absolute pressure	kPa
0C	Engine revolution	rpm
0D	Vehicle speed	km/h
0E	Ignition timing advance	°
0F	Intake air temperature	°C
10	Air flow rate from manifold absolute pressure sensor	g/sec
11	Throttle valve opening angle	%
13	Check whether oxygen sensor is installed.	—
15	Oxygen sensor output voltage and short term fuel trim associated with oxygen sensor—bank 2	V and %
24	A/F sensor 1 output voltage and short term fuel trim associated with A/F sensor 1	V and %
1C	On-board diagnosis system	—

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

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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

NOTE:
Refer to OBD-II general scan tool manufacturer's instruction manual to access freeze frame data (MODE $02).

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

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

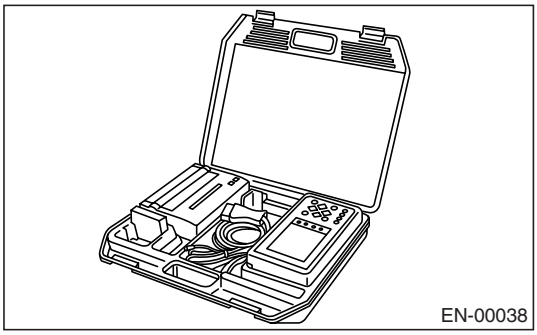
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10.Subaru Select Monitor

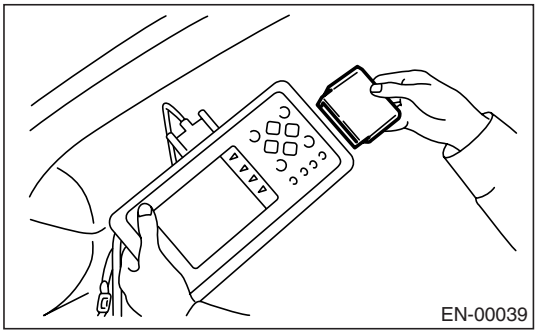
A: OPERATION

1. HOW TO USE SUBARU SELECT MONITOR

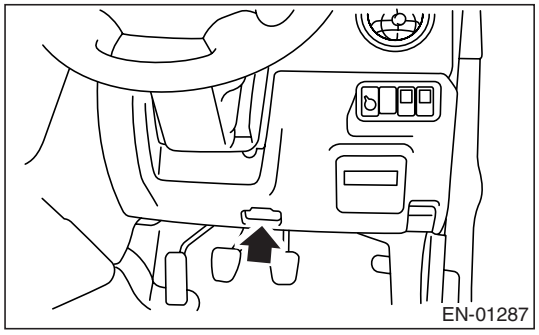
1) Prepare the Subaru Select Monitor kit. <Ref. to EN(H4DOTC)-8, PREPARATION TOOL, General Description.>



2) Connect the diagnosis cable to Subaru Select Monitor.
3) Insert the cartridge into Subaru Select Monitor. <Ref. to EN(H4DOTC)-8, PREPARATION TOOL, General Description.>



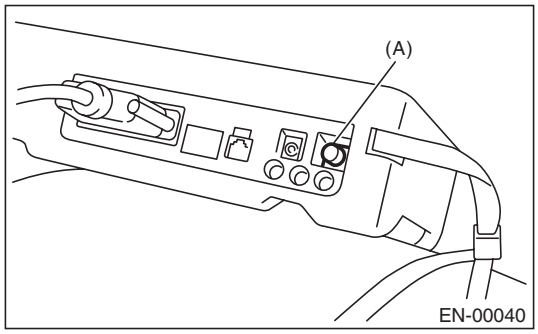
4) Connect the Subaru Select Monitor to data link connector.
(1) Data link connector is located in the lower portion of instrument panel (on the driver's side).



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

CAUTION:
Do not connect the scan tools except for Subaru Select Monitor and OBD-II general scan tool.

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



(A) Power switch

6) Using the Subaru Select Monitor, call up the 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)-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)-39, Read Diagnostic Trouble Code (DTC).>

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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.

Contents	Display	Unit of measure
Battery voltage	Battery Voltage	V
Vehicle speed signal	Vehicle Speed	km/h or MPH
Engine speed signal	Engine Speed	rpm
Engine coolant temperature signal	Coolant Temp.	°C or °F
Ignition timing signal	Ignition Timing	deg
Throttle position signal	Throttle Opening Angle	%
Throttle position signal	Throttle Sensor Voltage	V
Injection pulse width	Fuel Injection #1 Pulse	ms
Idle air control signal	ISC Valve Duty Ratio	%
Alternator duty control signal	ALT Duty	%
Fuel pump duty control signal	Fuel Pump Duty	%
A/F sensor current	A/F Sensor #1 Current	mA
A/F sensor resistance	A/F Sensor #1 Resistance	Ω
Front oxygen (A/F) sensor output signal	A/F Sensor #1	—
Rear oxygen sensor output signal	Rear O_2 Sensor	V
Short term fuel trim	A/F Correction #1	%
Knock sensor signal	Knocking Correction	deg
Atmospheric absolute pressure signal	Atmosphere Pressure	mmHg or kPa or inHg or psi
Intake manifold relative pressure signal	Mani. Relative Pressure	mmHg or kPa or inHg or psi
Intake manifold absolute pressure signal	Mani. Absolute Pressure	mmHg or kPa or inHg or psi
A/F correction (short term fuel trim) by rear oxygen sensor	A/F Correction #3	%
Long term whole fuel trim	A/F Learning #1	%
Front oxygen (A/F) sensor heater current	A/F Heater Current 1	A
Rear oxygen sensor heater voltage	Rear O_2 Heater Voltage	V
Canister purge control solenoid valve duty ratio	CPC Valve Duty Ratio	%
Primary supercharged pressure control signal	Primary Control	%
Tumble generator valve position sensor signal (right side)	TGV Position Sensor R	V
Tumble generator valve position sensor signal (left side)	TGV Position Sensor L	V
Tumble generator valve drive signal	TGV Drive	OPEN or CLOSE
Fuel level signal	Fuel Level	V
Intake air temperature signal	Intake Air Temp.	°C or °F
Learned ignition timing	Learned Ignition Timing	deg
Mass air flow sensor signal	Mass Air Flow	g/s
Mass air flow sensor signal	Air Flow Sensor Voltage	V
Valve timing signal	VVT Adv. Ang. Amount R	deg
Valve timing signal	VVT Adv. Ang. Amount L	deg
Variable valve timing solenoid valve signal	OCV Duty R	%
Variable valve timing solenoid valve signal	OCV Duty L	%

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Contents	Display	Unit of measure
Variable valve timing solenoid valve current	OCV Current R	mA
Variable valve timing solenoid valve current	OCV Current L	mA
AT/MT identification signal	AT Vehicle ID Signal	AT or MT
Test mode signal	Test Mode Signal	ON or OFF
Electric load switch signal	Electric Load Signal	ON or OFF
Air fuel ratio control system for Bank 1	Fuel System For Bank 1	—
Ignition switch signal	Ignition Switch	ON or OFF
Test mode connector signal	Test Mode Signal	ON or OFF
Neutral position switch signal	Neutral Position Switch	ON or OFF
Air conditioning switch signal	A/C Switch	ON or OFF
Air conditioning signal	A/C Compressor Signal	ON or OFF
Radiator main fan relay signal	Radiator Fan Relay #1	ON or OFF
Fuel pump relay signal	Fuel Pump Relay	ON or OFF
Knocking signal	Knocking Signal	ON or OFF
Radiator sub fan relay signal	Radiator Fan Relay #2	ON or OFF
Power steering switch signal	P/S Switch	ON or OFF
Engine torque control signal #1	Torque Control Signal #1	ON or OFF
Engine torque control signal #2	Torque Control Signal #2	ON or OFF
Engine torque control permission signal	Torque Permission Signal	ON or OFF
Rear oxygen sensor rich signal	Rear O_2 Rich Signal	ON or OFF
Starter switch signal	Starter Switch	ON or OFF
Idle switch signal	Idle Switch	ON or OFF
Crankshaft position sensor signal	Crankshaft Position Sig.	ON or OFF
Camshaft position sensor signal	Camshaft Position Sig.	ON or OFF
Rear defogger switch signal	Rear Defogger SW	ON or OFF
Blower fan switch signal	Blower Fan SW	ON or OFF
Small light switch signal	Light Switch	ON or OFF
Tumble generator valve output signal	TGV Output	ON or OFF

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

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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
Number of DTC	Number of DTC	—
Malfunction indicator light status	MI (MIL)	Complete or incomplete
Monitoring test of misfire	Misfire monitoring	Complete or incomplete
Monitoring test of fuel system	Fuel system monitoring	Complete or incomplete
Monitoring test of comprehensive component	Component monitoring	Complete or incomplete
Test of catalyst	Catalyst Diagnosis	Complete or incomplete
Test of heated catalyst	Heated catalyst	No support
Test of evaporative emission purge control system	Evaporative purge system	No support
Test of secondary air system	Secondary air system	No support
Test of air conditioning system refrigerant	A/C system refrigerant	No support
Test of oxygen sensor	Oxygen sensor	Complete or incomplete
Test of oxygen sensor heater	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	—
Engine load data	Calculated load value	%
Engine coolant temperature signal	Coolant Temp.	°C or °F
Short term fuel trim by front oxygen (A/F) sensor	Short term fuel trim B1	%
Long term fuel trim by front oxygen (A/F) sensor	Long term fuel trim B1	%
Intake manifold absolute pressure signal	Mani. Absolute Pressure	mmHg or kPa or inHg or psi
Engine speed signal	Engine Speed	rpm
Vehicle speed signal	Vehicle Speed	km/h or MPH
Ignition timing advance for #1 cylinder	Ignition timing adv. #1	°
Intake air temperature signal	Intake Air Temp.	°C or °F
Intake air amount	Mass Air Flow	g/s
Throttle position signal	Throttle Opening Angle	%
A/F sensor equipment	A/F sensor	—
Rear oxygen sensor output signal	Oxygen Sensor #12	V
Air fuel ratio correction by rear oxygen sensor	Short term fuel trim #12	%
On-board diagnostic system	OBD System	—
A/F sensor output signal	A/F sensor #11	V
A/F lambda signal	A/F sensor #11	—

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

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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 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 {Freeze Frame Data} and press the [YES] key.
• A list of the support data is shown in the following table.

Contents	Display	Unit of measure
DTC for freeze frame data	Freeze frame data	DTC
Air fuel ratio control system for bank 1	Fuel system for Bank1	ON or OFF
Engine load data	Engine Load	%
Engine coolant temperature signal	Coolant Temp.	°C or °F
Short term fuel trim by front oxygen (A/F) sensor	Short term fuel trim B1	%
Long term fuel trim by front oxygen (A/F) sensor	Long term fuel trim B1	%
Intake manifold absolute pressure signal	Mani. Absolute Pressure	mmHg, kPa, inHg or psi
Engine speed signal	Engine Speed	rpm
Vehicle speed signal	Vehicle Speed	km/h or MPH
Air fuel ratio control system for bank 1	Fuel System for Bank 1	—
Ignition timing advance for #1 cylinder	Ignition timing adv. #1	°
Intake air temperature signal	Intake Air Temp.	°C or °F
Intake air amount	Mass Air Flow	g/s
Throttle position signal	Throttle Opening Angle	%

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

7. READ OXYGEN SENSOR MONITORING TEST RESULTS DATA FOR ENGINE. (OBD MODE)

1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
3) Press the [YES] key after 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 {O_2 Sensor Monitor} and press the [YES] key.
6) On the «O_2 Sensor Select» display screen, select the {Bank 1-Sensor1} or {Bank 1-Sensor2} and press the [YES] key.
• Bank 1-Sensor1 indicates the front oxygen or A/F sensor, and Bank 1-Sensor2 indicates the rear oxygen sensor.
• A list of the support data is shown in the following table.

Contents	Display	Unit of measure
Oxygen sensor for monitoring test	<O_2 Sensor Monitor (-------)>	—
Rich to lean oxygen sensor threshold voltage	Rich to lean sensor volt	V
Lean to rich oxygen sensor threshold voltage	Lean to rich sensor volt	V
Low oxygen sensor voltage for switch time calculation	Low sensor voltage	V
High oxygen sensor voltage for switch time calculation	High sensor voltage	V
Rich to lean oxygen sensor switch time	Rich to lean switch time	sec
Lean to rich oxygen sensor switch time	Lean to rich switch time	sec
Maximum oxygen sensor voltage for test cycle	Maximum sensor Voltage	V
Minimum oxygen sensor voltage for test cycle	Minimum sensor Voltage	V

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

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8. LED OPERATION MODE FOR ENGINE

1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
3) Press the [YES] key after 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.

Contents	Display	Message	LED "ON" requirements
Ignition switch signal	Ignition Switch	ON or OFF	When ignition switch is turned to ON.
Test mode connector signal	Test Mode Signal	ON or OFF	When test mode connector is connected.
Neutral position switch signal	Neutral SW	ON or OFF	When neutral position signal is entered.
Air conditioning switch signal	A/C SW	ON or OFF	When air conditioning switch is turned ON.
Air conditioning relay signal	A/C Relay	ON or OFF	When air conditioning relay is in function.
Radiator main fan relay signal	Radiator Fan Relay #1	ON or OFF	When radiator main fan relay is in function.
Knocking signal	Knocking Signal	ON or OFF	When knocking signal is entered.
Radiator sub fan relay signal	Radiator Fan Relay #2	ON or OFF	When radiator sub fan relay is in function.
Engine torque control signal #1	Torque Control Signal #1	ON or OFF	When engine torque control signal 1 is entered.
Engine torque control signal #2	Torque Control Signal #2	ON or OFF	When engine torque control signal 2 is entered.
Engine torque control permission signal	Torque Control Permit	ON or OFF	When engine torque control permission signal is entered.
Rear oxygen sensor rich signal	Rear O_2 Rich Signal	ON or OFF	When rear oxygen sensor mixture ratio is rich.
Starter switch signal	Starter Switch Signal	ON or OFF	When starter switch signal is entered.
Idle switch signal	Idle Switch Signal	ON or OFF	When idle switch signal is entered.
Crankshaft position sensor signal	Crankshaft Position Sig.	ON or OFF	When crankshaft position sensor signal is entered.
Camshaft position sensor signal	Camshaft Position Sig.	ON or OFF	When camshaft position sensor signal is entered.
Power steering switch signal	P/S SW	ON or OFF	When power steering switch is entered.
Rear defogger switch signal	Rear Defogger SW	ON or OFF	When rear defogger switch is turned ON.
Blower fan switch signal	Blower Fan SW	ON or OFF	When blower fan switch is turned ON.
Light switch signal	Light SW	ON or OFF	When small light switch is turned ON.
AT/MT identification signal	AT Vehicle ID Signal	ON or OFF	When AT vehicle is checked.
Tumble generator valve actuator signal	TGV Signal	ON or OFF	When TGV actuator signal is entered.
Tumble generator valve drive signal	TGV Drive	ON or OFF	When TGV moves and valve opens.

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

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9. READ CURRENT DATA FOR AT

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

Contents	Display	Unit of measure
Battery voltage	Battery Voltage	V
Rear vehicle speed sensor signal	Rear Wheel Speed	km/h or MPH
Front vehicle speed sensor signal	Front Wheel Speed	km/h or MPH
Engine speed signal	Engine Speed	rpm
Automatic transmission fluid temperature signal	ATF Temp.	°C or °F
Mass air flow sensor signal	Air Flow Sensor Voltage	V
Throttle position signal	Throttle Sensor Voltage	V
Gear position	Gear Position	—
Line pressure control duty ratio	Line Pressure Duty Ratio	%
Lock up clutch control duty ratio	Lock Up Duty Ratio	%
Transfer clutch control duty ratio	Transfer Duty Ratio	%
Power supply for throttle position sensor	Throttle Sensor Power	V
Torque converter turbine speed signal	Turbine Revolution Speed	rpm
2-4 brake timing pressure control duty ratio	Brake Clutch Duty Ratio	%
Stop lamp switch signal	Stop Light Switch	ON or OFF
Anti lock brake system signal	ABS Signal	ON or OFF
Cruise control system signal	Cruise Control Signal	ON or OFF
Neutral/Parking range signal	N/P Range Signal	ON or OFF
Reverse range signal	R Range Signal	ON or OFF
Drive range signal	D Range Signal	ON or OFF
3rd range signal	3rd Range Signal	ON or OFF
2nd range signal	2nd Range Signal	ON or OFF
1st range signal	1st Range Signal	ON or OFF
Shift control solenoid A	Shift Solenoid #1	ON or OFF
Shift control solenoid B	Shift Solenoid #2	ON or OFF
Torque control output signal #1	Torque Control Signal #1	ON or OFF
Torque control output signal #2	Torque Control Signal #2	ON or OFF
Torque control cut signal	Torque Control Cut Sig.	ON or OFF
2-4 brake timing control solenoid valve	2-4 Brake Timing Sol.	ON or OFF
Low clutch timing control solenoid valve	Low Clutch Timing Sol.	ON or OFF
Automatic transmission diagnosis indicator lamp	Diagnosis Lamp	ON or OFF

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

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11.Read Diagnostic Trouble Code (DTC)

A: OPERATION

1. SUBARU SELECT MONITOR (NORMAL MODE)

1) On the «Main Menu» display screen, select the {Each System Check} and press 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)-75, List of Diagnostic Trouble Code (DTC).>

2. SUBARU SELECT MONITOR (OBD MODE)

1) On the «Main Menu» display screen, select the {2. Each System Check} and press 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)-75, List of Diagnostic Trouble Code (DTC).>

3. OBD-II 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)-75, List of Diagnostic Trouble Code (DTC).>

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

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12.Inspection Mode

A: OPERATION

Carry out trouble diagnosis shown in the following DTC table.
When performing trouble diagnosis which is not shown in the DTC table, refer to the next item Drive cycle. <Ref. to EN(H4DOTC)-46, Drive Cycle.>

DTC	Item	Condition
P0011	"A" Camshaft Position-Timing Over-Advanced or System Performance (Bank 1)	—
P0021	"A" Camshaft Position-Timing Over-Advanced or System Performance (Bank 2)	—
P0030	HO2S Heater Control Circuit (Bank 1 Sensor 1)	—
P0031	HO2S Heater Control Circuit Low (Bank 1 Sensor 1)	—
P0032	HO2S Heater Control Circuit High (Bank 1 Sensor 1)	—
P0037	HO2S Heater Control Circuit Low (Bank 1 Sensor 2)	—
P0038	HO2S Heater Control Circuit High (Bank 1 Sensor 2)	—
P0068	Manifold Absolute Pressure/Barometric Pressure Circuit Range/Performance	—
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	—
P0111	Intake Air Temperature Circuit Range/Performance	—
P0112	Intake Air Temperature Circuit Low Input	—
P0113	Intake Air Temperature Circuit High Input	—
P0117	Engine Coolant Temperature Circuit Low Input	—
P0118	Engine Coolant Temperature Circuit High Input	—
P0122	Throttle/Pedal Position Sensor/Switch "A" Circuit Low Input	—
P0123	Throttle/Pedal Position Sensor/Switch "A" Circuit High Input	—
P0129	Atmospheric Pressure Sensor Circuit Range/Performance	—
P0130	O_2 Sensor Circuit (Bank 1 Sensor 1)	—
P0134	O_2 Sensor Circuit No Activity Detected (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)	—
P0171	System too Lean (Bank 1)	—
P0172	System too Rich (Bank 1)	—
P0230	Fuel Pump Primary Circuit	—
P0245	Turbo/Super Charger Wastegate Solenoid "A" Low	—
P0246	Turbo/Super Charger Wastegate Solenoid "A" High	—
P0327	Knock Sensor 1 Circuit Low Input (Bank 1 or Single Sensor)	—
P0328	Knock Sensor 1 Circuit High Input (Bank 1 or Single Sensor)	—
P0335	Crankshaft Position Sensor "A" Circuit	—
P0336	Crankshaft Position Sensor "A" Circuit Range/Performance	—
P0340	Camshaft Position Sensor "A" Circuit (Bank 1 or Single Sensor)	—
P0341	Camshaft Position Sensor "A" Circuit Range/Performance (Bank 1 or Single Sensor)	—
P0365	Camshaft Position Sensor "B" Circuit (Bank 1)	—
P0390	Camshaft Position Sensor "B" Circuit (Bank 2)	—
P0458	Evaporative Emission Control System Purge Control Valve Circuit Low	—
P0462	Fuel Level Sensor Circuit Low Input	—
P0463	Fuel Level Sensor Circuit High Input	—
P0464	Fuel Level Sensor Circuit Intermittent	—

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DTC	Item	Condition
P0502	Vehicle Speed Sensor Circuit Low Input	—
P0503	Vehicle Speed Sensor Intermittent/Erratic/High	—
P0508	Idle Control System Circuit Low	—
P0509	Idle Control System Circuit High	—
P0512	Starter Request Circuit	—
P0513	Incorrect Immobilizer Key	—
P0519	Idle Control System Malfunction (Fail-Safe)	—
P0558	Generator Circuit Low Input	—
P0559	Generator Circuit High Input	—
P0565	Cruise Control On Signal	—
P0604	Internal Control Module Random Access Memory (RAM) Error	—
P0691	Cooling Fan 1 Control Circuit Low	—
P0692	Cooling Fan 1 Control Circuit High	—
P0703	Torque Converter/Brake Switch “B” Circuit	—
P0705	Transmission Range Sensor Circuit (PRNDL Input)	—
P0710	Transmission Fluid Temperature Sensor Circuit	—
P0716	Torque Converter Turbine Speed Sensor	—
P0720	Output Speed Sensor Circuit	—
P0726	Engine Speed Input Circuit Range/Performance	—
P0731	Gear 1 Incorrect Ratio	—
P0732	Gear 2 Incorrect Ratio	—
P0733	Gear 3 Incorrect Ratio	—
P0734	Gear 4 Incorrect Ratio	—
P0741	Torque Converter Clutch Circuit Performance or Stuck Off	—
P0743	Torque Converter Clutch Circuit Electrical	—
P0748	Pressure Control Solenoid “A” Electrical	—
P0753	Shift Solenoid “A” Electrical	—
P0758	Shift Solenoid “B” Electrical	—
P0771	Low Clutch Timing Solenoid	—
P0778	Pressure Control Solenoid “B” Electrical	—
P0785	Shift/Timing Solenoid	—
P0851	Neutral Switch Input Circuit Low	—
P0852	Neutral Switch Input Circuit High	—
P0864	TCM Communication Circuit Range/Performance	—
P0865	TCM Communication Circuit Low	—
P0866	TCM Communication Circuit High	—
P1086	Tumble Generated Valve Position Sensor 2 Circuit Low	—
P1087	Tumble Generated Valve Position Sensor 2 Circuit High	—
P1088	Tumble Generated Valve Position Sensor 1 Circuit Low	—
P1089	Tumble Generated Valve Position Sensor 1 Circuit High	—
P1090	Tumble Generated Valve System 1 (Valve Open)	Engine coolant temperature is –5 — 5°C (–41 — 41°F) at engine start.
P1091	Tumble Generated Valve System 1 (Valve Close)	—
P1092	Tumble Generated Valve System 2 (Valve Open)	Engine coolant temperature is –5 — 5°C (–41 — 41°F) at engine start.
P1093	Tumble Generated Valve System 2 (Valve Close)	—
P1094	Tumble Generated Valve Signal 1 Circuit Malfunction (Open)	—
P1095	Tumble Generated Valve Signal 1 Circuit Malfunction (Short)	—
P1096	Tumble Generated Valve Signal 2 Circuit Malfunction (Open)	—
P1097	Tumble Generated Valve Signal 2 Circuit Malfunction (Short)	—
P1110	Atmospheric Pressure sensor circuit malfunction (Low input)	—
P1111	Atmospheric Pressure sensor circuit malfunction (High input)	—

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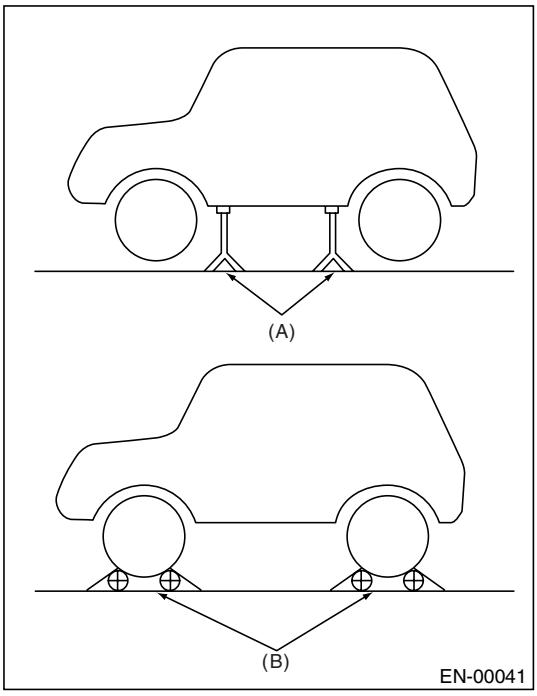
DTC	Item	Condition
P1134	A/F Sensor Micro-Computer Problem	—
P1152	O_2 Sensor Circuit Range/Performance (Low) (Bank1 Sensor1)	—
P1153	O_2 Sensor Circuit Range/Performance (High) (Bank1 Sensor1)	—
P1306	OCV Solenoid Valve Signal 1 Circuit Malfunction (Open)	—
P1307	OCV Solenoid Valve Signal 1 Circuit Malfunction (Short)	—
P1308	OCV Solenoid Valve Signal 2 Circuit Malfunction (Open)	—
P1309	OCV Solenoid Valve Signal 2 Circuit Malfunction (Short)	—
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	—
P1698	Engine Torque Control Cut Signal Circuit Low Input	—
P1699	Engine Torque Control Cut Signal Circuit High Input	—
P1700	Throttle Position Sensor	—
P1711	Engine Torque Control Signal 1 Circuit Malfunction	—
P1712	Engine Torque Control Signal 2 Circuit Malfunction	—

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1. PREPARATION FOR THE INSPECTION MODE

1) Make sure that the fuel remains approx. half amount [20 — 40 ℓ (5.3 — 10.6 US gal, 4.4 — 8.8 Imp gal)] and the battery voltage is 12 V or more.
2) Raise the vehicle using a garage jack and place on safety stands or drive the vehicle onto free rollers.

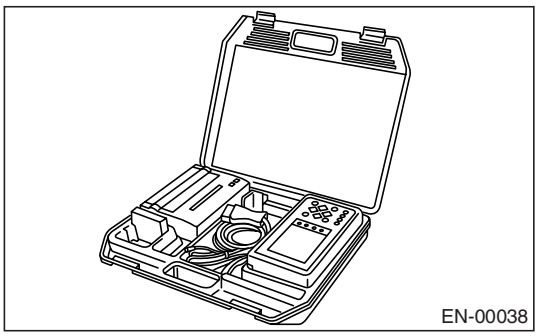
WARNING:
• Before raising the vehicle, ensure the parking brake is applied.
• Do not use a pantograph jack in place of a safety stand.
• Secure a rope or wire to the front and rear towing or tie-down hooks to prevent the lateral runout of front wheels.
• Do not abruptly depress/release the clutch pedal or accelerator pedal during works even when engine is operating at low speeds since this may cause vehicle to jump off free rollers.
• In order to prevent the vehicle from slipping due to vibration, do not place any wooden blocks or similar items between the safety stands and the vehicle.
• Since the rear wheels will also rotate, do not place anything near them. Also, make sure that nobody goes in front of the vehicle.



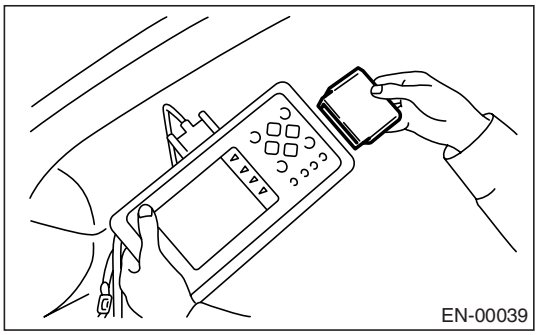
(A) Safety stand
(B) Free rollers

2. SUBARU SELECT MONITOR

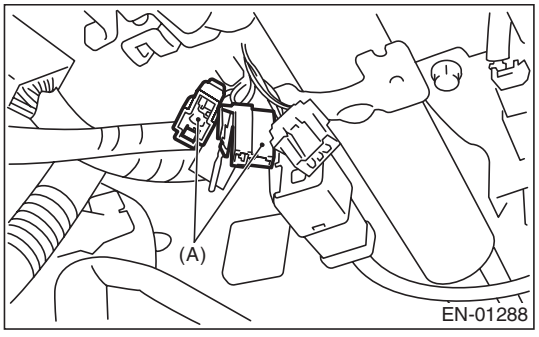
1) Clearing the memory, check for any remaining unresolved trouble data. <Ref. to EN(H4DOTC)-48, Clear Memory Mode.>
2) Warm up the engine.
3) Prepare the Subaru Select Monitor kit. <Ref. to EN(H4DOTC)-8, PREPARATION TOOL, General Description.>



4) Connect the diagnosis cable to Subaru Select Monitor.
5) Insert the cartridge into Subaru Select Monitor. <Ref. to EN(H4DOTC)-8, PREPARATION TOOL, General Description.>



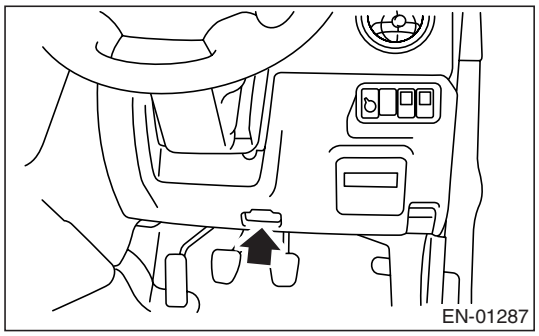
6) Connect the test mode connector (A) at the lower portion of instrument panel (on the driver's side).



(A) Test mode connector

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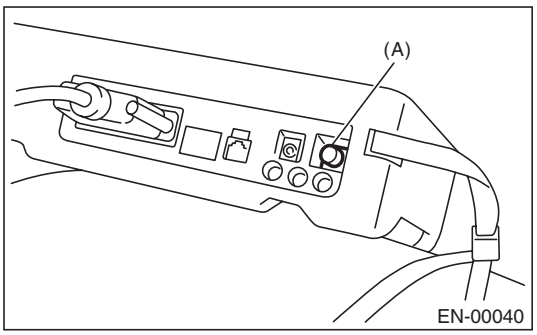
7) Connect the Subaru Select Monitor to data link connector.
(1) Connect the Subaru Select Monitor to data link connector located in the lower portion of the instrument panel (on the driver's side).



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

CAUTION:
Do not connect the scan tools except for Subaru Select Monitor and OBD-II general scan tool.

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



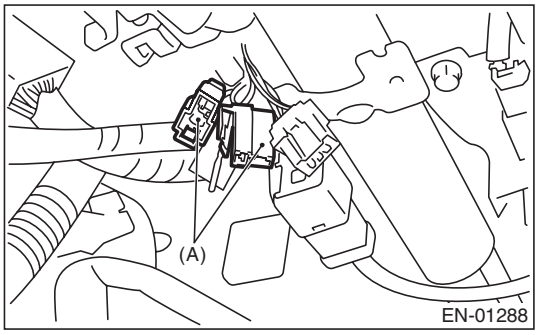
(A) Power switch

9) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
10) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
11) Press the [YES] key after the information of engine type is displayed.
12) On the «Engine Diagnosis» display screen, select the {Dealer Check Mode Procedure} and press the [YES] key.
13) When the “Perform Inspection (Dealer Check) Mode?” is shown on the display screen, press the [YES] key.
14) Perform subsequent procedures as instructed on the display screen.
• If trouble still remains in the memory, the corresponding 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)-75, List of Diagnostic Trouble Code (DTC).>
• Release the parking brake.
• The speed difference between front and rear wheels may light either the ABS warning light, but this indicates no malfunctions. When the engine control diagnosis is finished, perform the ABS memory clearance procedure of self-diagnosis system.

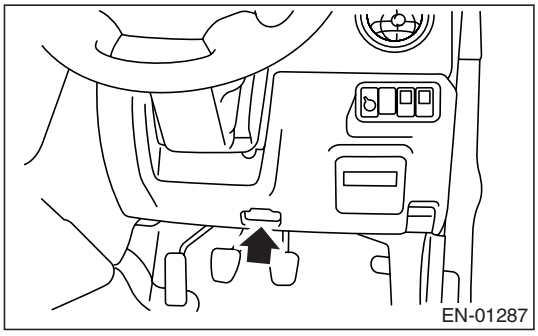
3. OBD-II GENERAL SCAN TOOL

1) After performing the diagnostics and clearing memory, check for any remaining unresolved trouble data: <Ref. to EN(H4DOTC)-48, Clear Memory Mode.>
2) Warm up the engine.
3) Connect the test mode connector (A) at the lower side of instrument panel (on the driver's side).



4) Connect the OBD-II general scan tool to its data link connector in the lower portion of instrument panel (on the driver's side).

CAUTION:
Do not connect the scan tools except for Subaru Select Monitor and OBD-II general scan tool.



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5) 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)

6) Using the select lever or shift lever, turn the “P” position switch and “N” position switch to ON.
7) Depress the brake pedal to turn brake switch ON. (AT model)
8) Keep the engine speed in 2,500 — 3,000 rpm range for 40 seconds.
9) 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.

10) Using the OBD-II general scan tool, check for DTC and record the result(s).

NOTE:
• For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.
• For detailed concerning DTC, refer to the List of Diagnostic Trouble Code (DTC).
<Ref. to EN(H4DOTC)-75, List of Diagnostic Trouble Code (DTC).>

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13.Drive Cycle

A: OPERATION

There are three drive patterns for the trouble diagnosis. Driving in the specified pattern allows to diagnose malfunctioning items listed below. After the malfunctioning items listed below are repaired, always check whether they correctly resume their functions by driving in the required drive pattern.

1. PREPARATION FOR THE DRIVE CYCLE

1) Make sure that the fuel remains approx. half amount [20 — 40 ℓ (5.3 — 10.6 US gal, 4.4 — 8.8 Imp gal)], and battery voltage is 12 V or more.
2) After performing the diagnostics and cleaning memory, check for any remaining unresolved trouble data. <Ref. to EN(H4DOTC)-48, Clear Memory Mode.>
3) Separate 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. 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.
*P0133	O_2 Sensor Circuit Slow Response (Bank 1 Sensor 1)	—
*P0420	Catalyst System Efficiency Below Threshold (Bank 1)	—
P0459	Evaporative Emission Control System Purge Control Valve Circuit High	—
P0461	Fuel Level Sensor Circuit Range/Performance	—
P0545	Exhaust Gas Temperature Sensor Circuit Low-Bank1	—
P0546	Exhaust Gas Temperature Sensor Circuit High-Bank1	—
P1312	Exhaust Gas Temperature Sensor Malfunction	Engine coolant temperature is less than 30°C (86°F) at engine start.

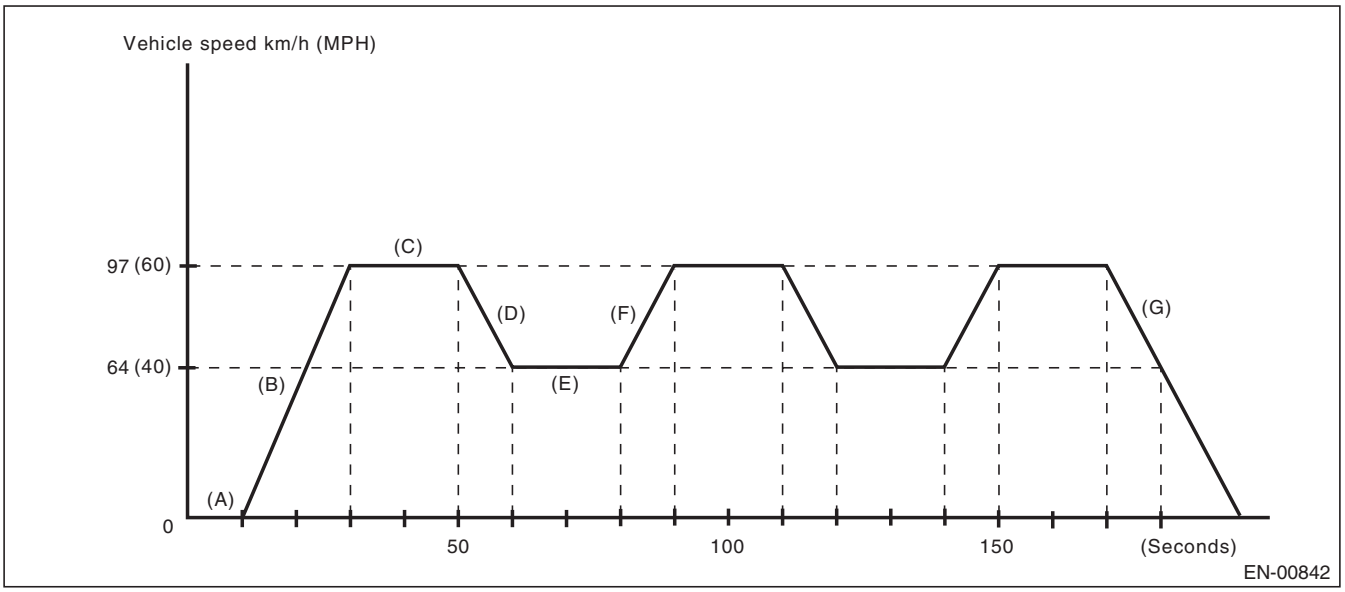
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3. IDLE FOR 10 MINUTES

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

DTC	Item	Condition
*P0483	Cooling Fan Rationality Check	—
*P0506	Idle Control System RPM Lower Than Expected	—
*P0507	Idle Control System RPM Higher Than Expected	—

4. DRIVE ACCORDING TO THE FOLLOWING DRIVE PATTERN



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

DTC	Item	Condition
*P0121	Throttle/Pedal Position Sensor/Switch “A” Circuit Range/Performance	—
*P0139	O_2 Sensor Circuit Slow Response (Bank 1 Sensor 2)	—
*P0301	Cylinder 1 Misfire Detected	In some cases, diagnosis may complete at once.
*P0302	Cylinder 2 Misfire Detected	In some cases, diagnosis may complete at once.
*P0303	Cylinder 3 Misfire Detected	In some cases, diagnosis may complete at once.
*P0304	Cylinder 4 Misfire Detected	In some cases, diagnosis may complete at once.
*P0101	Mass or Volume Air Flow Circuit Range/Performance	—
P0244	Turbo/Super Charger Wastegate Solenoid “A” Range/Performance	—
P1301	Misfire Detected (High Temperature Exhaust Gas)	—
P1544	Exhaust Gas Temperature Too High	—

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14.Clear Memory Mode

A: OPERATION

1. SUBARU SELECT MONITOR (NORMAL MODE)

1) On the «Main Menu» display screen, select the {2. Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
3) Press the [YES] key after 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 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 to OFF.

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

3. OBD-II GENERAL SCAN TOOL

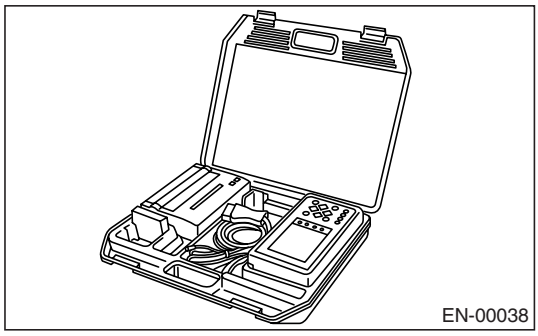
For clear memory procedures using the OBD-II general scan tool, refer to the OBD-II General Scan Tool Instruction Manual.

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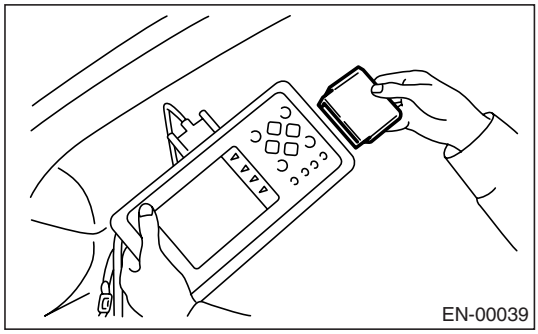
15.Compulsory Valve Operation Check Mode

A: OPERATION

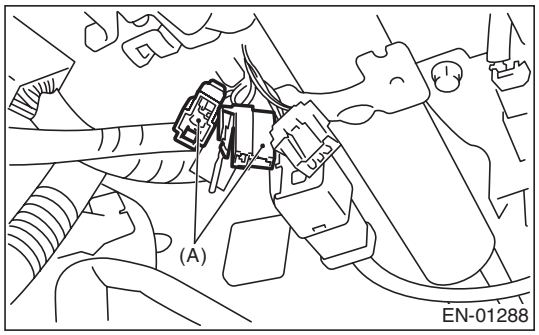
1) Prepare the Subaru Select Monitor kit. <Ref. to EN(H4DOTC)-8, PREPARATION TOOL, General Description.>



2) Connect the diagnosis cable to Subaru Select Monitor.
3) Insert the cartridge into Subaru Select Monitor. <Ref. to EN(H4DOTC)-8, PREPARATION TOOL, General Description.>

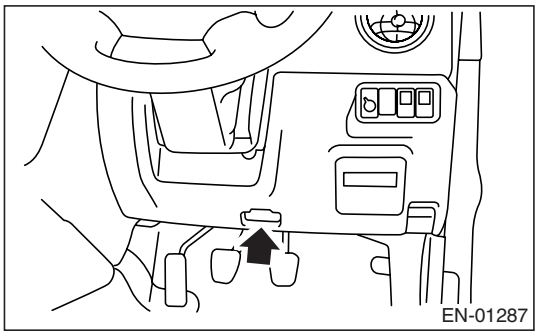


4) Connect the test mode connector (A) at the lower portion of instrument panel (on the driver's side).



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

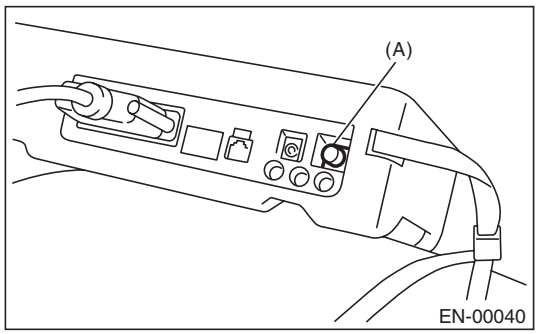
(1) Connect the Subaru Select Monitor to data link connector located in the lower portion of instrument panel (on the driver's side).



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

CAUTION:
Do not connect scan tools except for the Subaru Select Monitor and OBD-II general scan tool.

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



(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.

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

Contents	Display
Compulsory fuel pump relay operation check	Fuel Pump Relay
Compulsory radiator fan relay operation check	Radiator Fan Relay
Compulsory air conditioning relay operation check	A/C Compressor Relay
Compulsory purge control solenoid valve operation check	CPC Solenoid Valve

NOTE:
• The following parts will be displayed but not functional because they are not installed on the vehicle.

Display
EGR Solenoid Valve
ASV Solenoid Valve
PCV Solenoid Valve
Vent Control Solenoid Valve
FICD Solenoid
Pressure Switching Sol. 1
Pressure Switching Sol. 2
AAI Solenoid Valve
Fuel Tank Sensor Control Valve

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

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16.Malfunction Indicator Light

A: PROCEDURE

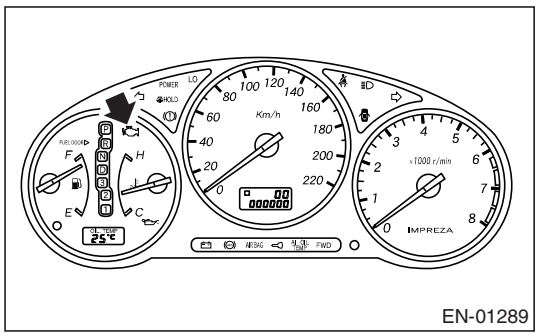
1. Activation of check malfunction indicator light. <Ref. to EN(H4DOTC)-52, ACTIVATION OF MALFUNCTION INDICATOR LIGHT, Malfunction Indicator Light.>
↓
2. Check that the malfunction indicator light does not come on. <Ref. to EN(H4DOTC)-53, MALFUNCTION INDICATOR LIGHT DOES NOT COME ON., Malfunction Indicator Light.>
↓
3. Check that the malfunction indicator light does not go off. <Ref. to EN(H4DOTC)-55, 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)-56, 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)-58, MALFUNCTION INDICATOR LIGHT REMAINS BLINKING AT A CYCLE OF 3 HZ., Malfunction Indicator Light.>

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B: ACTIVATION OF MALFUNCTION INDICATOR LIGHT

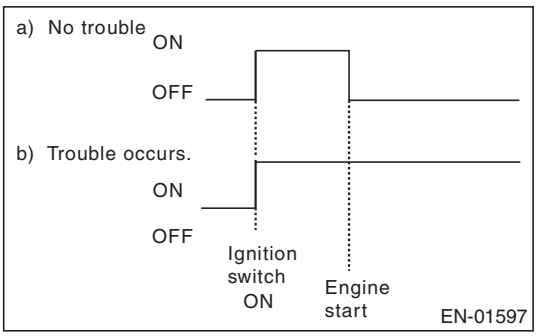
1) When the ignition switch is turned to ON (engine off), the malfunction indicator light in the combination meter illuminates.

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)-53, MALFUNCTION INDICATOR LIGHT DOES NOT COME ON., Malfunction Indicator Light.>

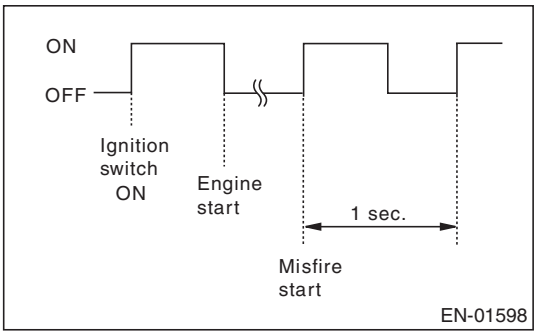


(A) Malfunction indicator light

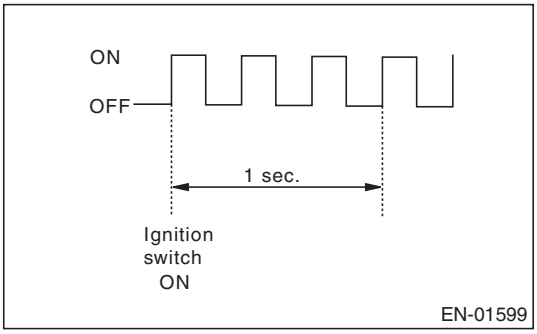
2) After starting the engine, the malfunction indicator light goes out. If it does not, either the engine or the emission control system is malfunctioning.



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.



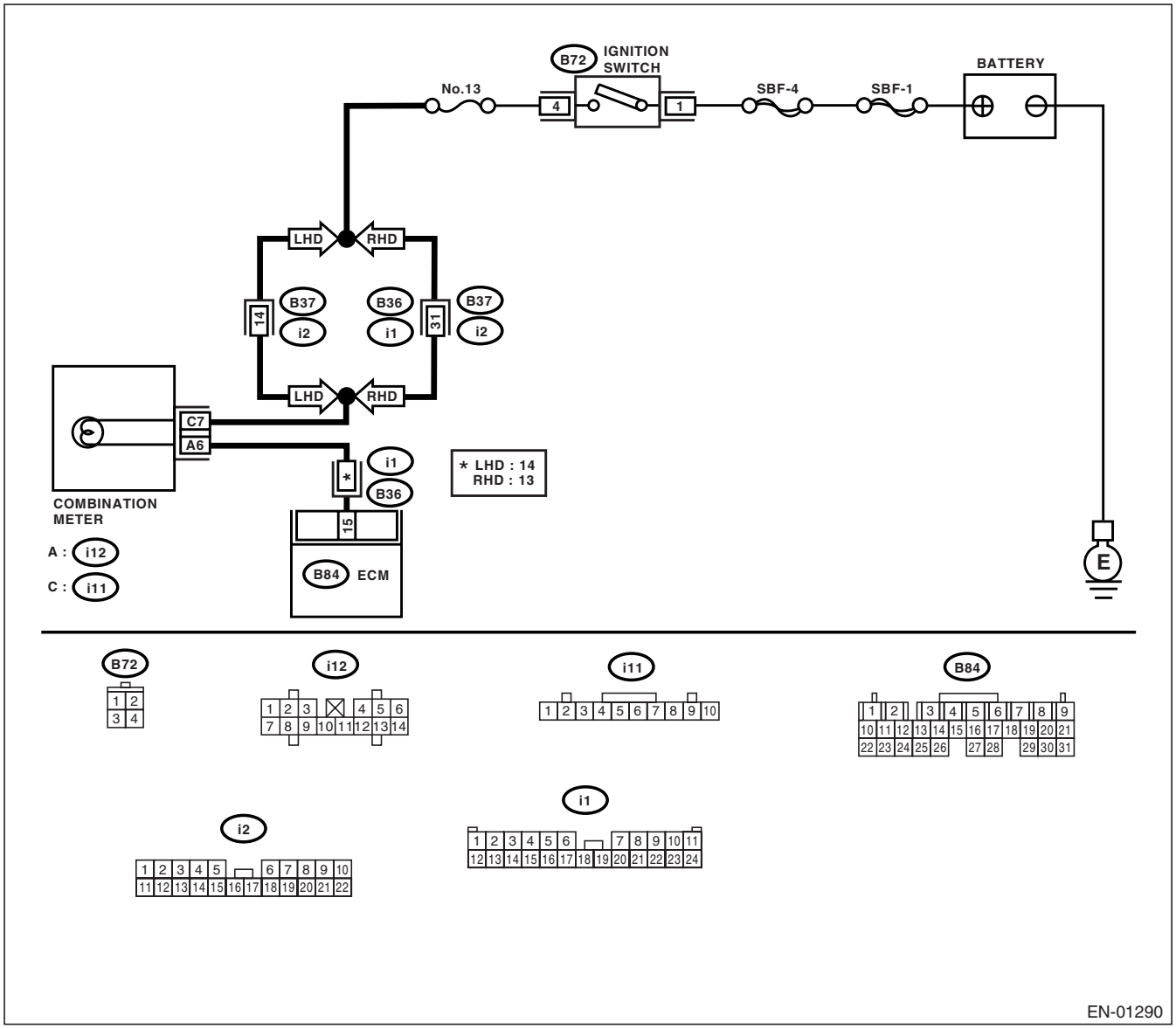
4) When the ignition switch is turned to ON (engine off) or to START with the test mode connector connected, the malfunction indicator light blinks at a cycle of 3 Hz.



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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:**



	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*** ***(B84) No. 15 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **4.**	Go to step **2.**
2	**CHECK POOR CONTACT.**	Does the malfunction indicator light come on when shaking or pulling ECM connector and harness?	Repair the poor contact in ECM connector.	Go to step **3.**

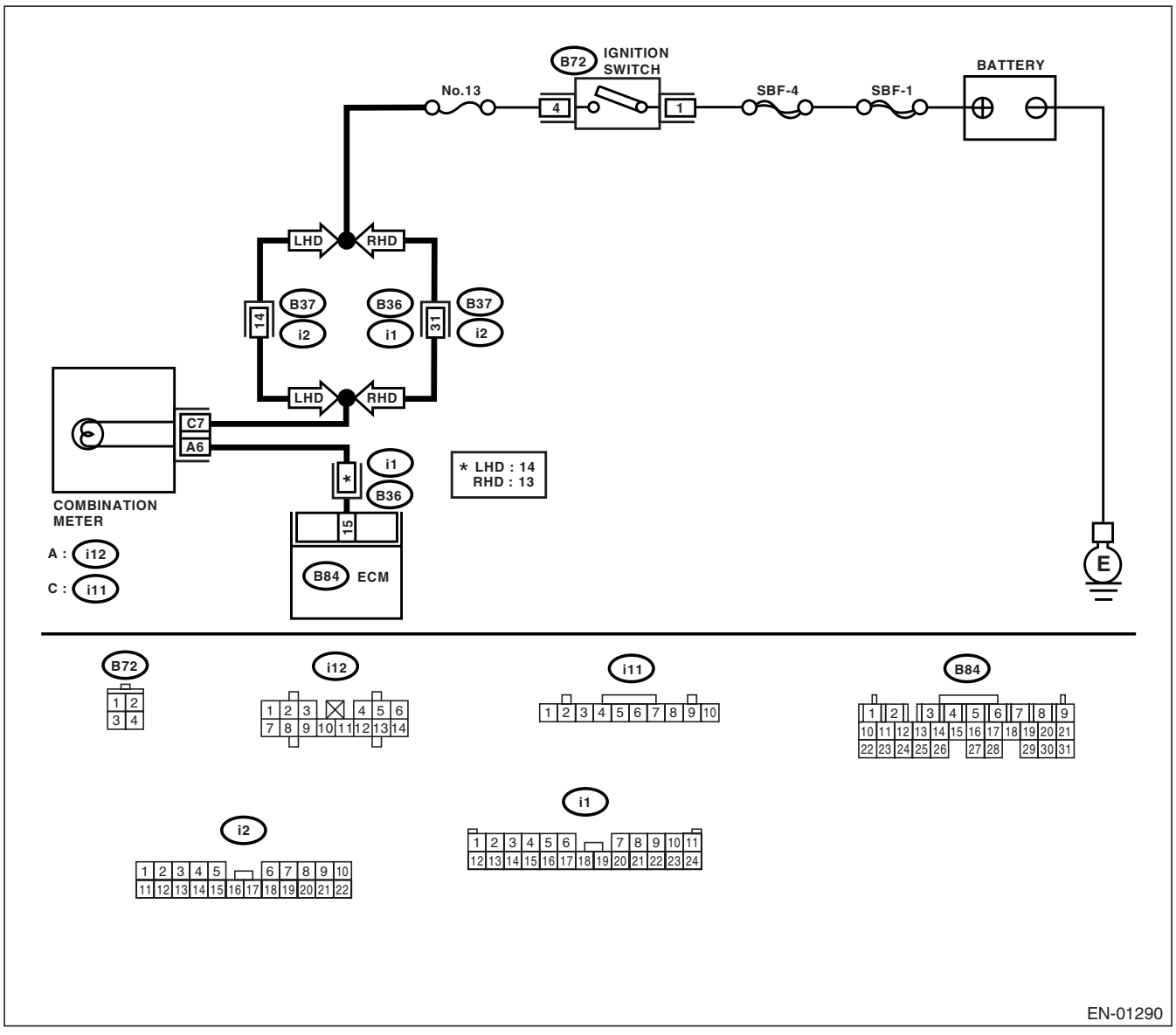
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	Step	Check	Yes	No
3	**CHECK ECM CONNECTOR.**	Is the ECM connector correctly connected?	Replace the ECM. <Ref. to FU(H4DOTC)-49, Engine Control Module (ECM).>	Repair the connection of ECM connector.
4	**CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Remove the combination meter. <Ref. to IDI-11, Combination Meter Assembly.> 3)Disconnect the connector from ECM and combination meter. 4)Measure the resistance of harness between ECM and combination meter connector. ***Connector & terminal*** ***(B84) No. 15 — (i12) No. 6:***	Is the resistance less than 1 Ω?	Go to step **5.**	Repair the harness and connector. NOTE: In this case, repair the following: • 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-11, Combination Meter Assembly.>	Check the following and repair if necessary. NOTE: • Blown out fuse (No. 14) • Open or short circuit in harness between fuse (No. 14) and battery terminal • Poor contact in ignition switch connector

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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 OBD-II general scan tool display.
- **WIRING DIAGRAM:**

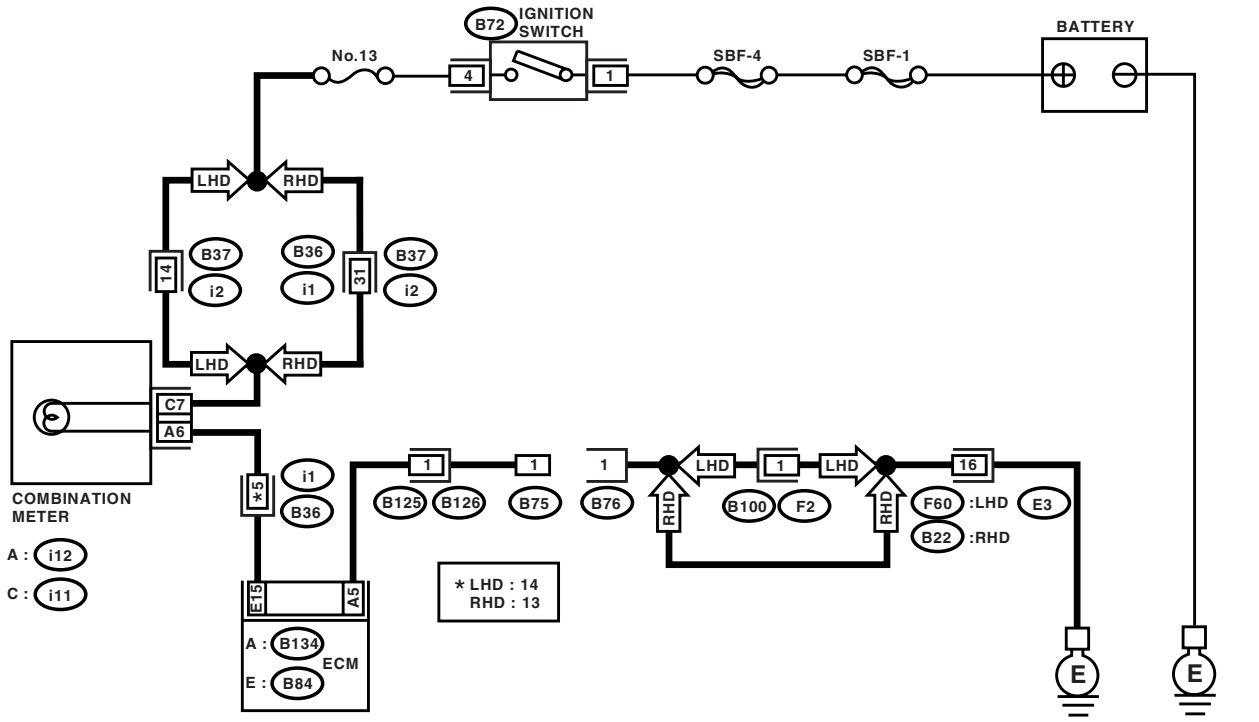


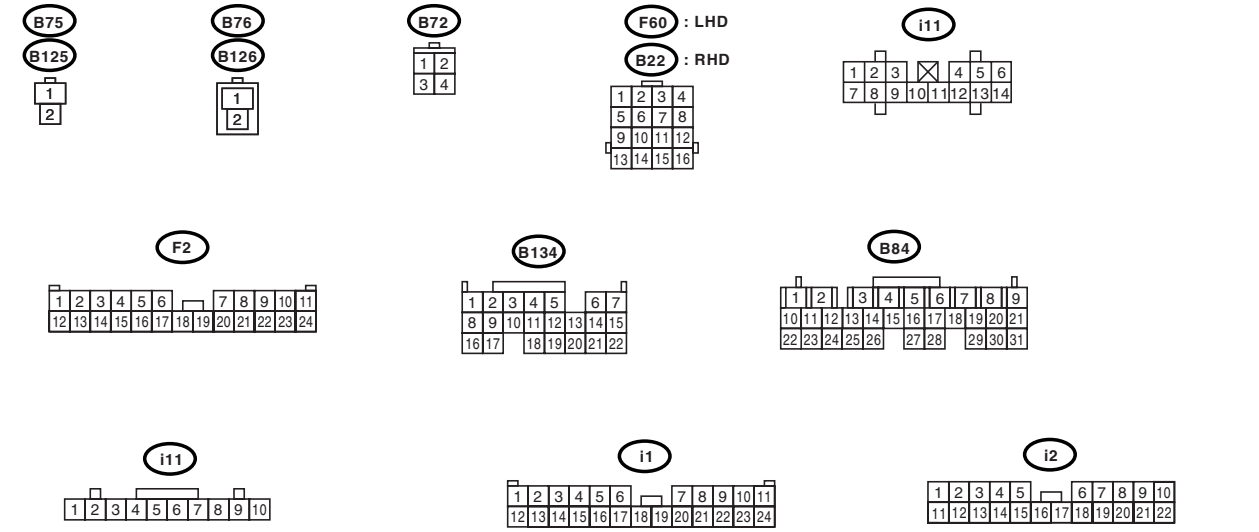
Step		Check	Yes	No
1	**CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ECM. 3)Turn the ignition switch to ON.	Does the malfunction indicator light come on?	Repair the short circuit in harness between combination meter and ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-49, Engine Control Module (ECM).>

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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:**





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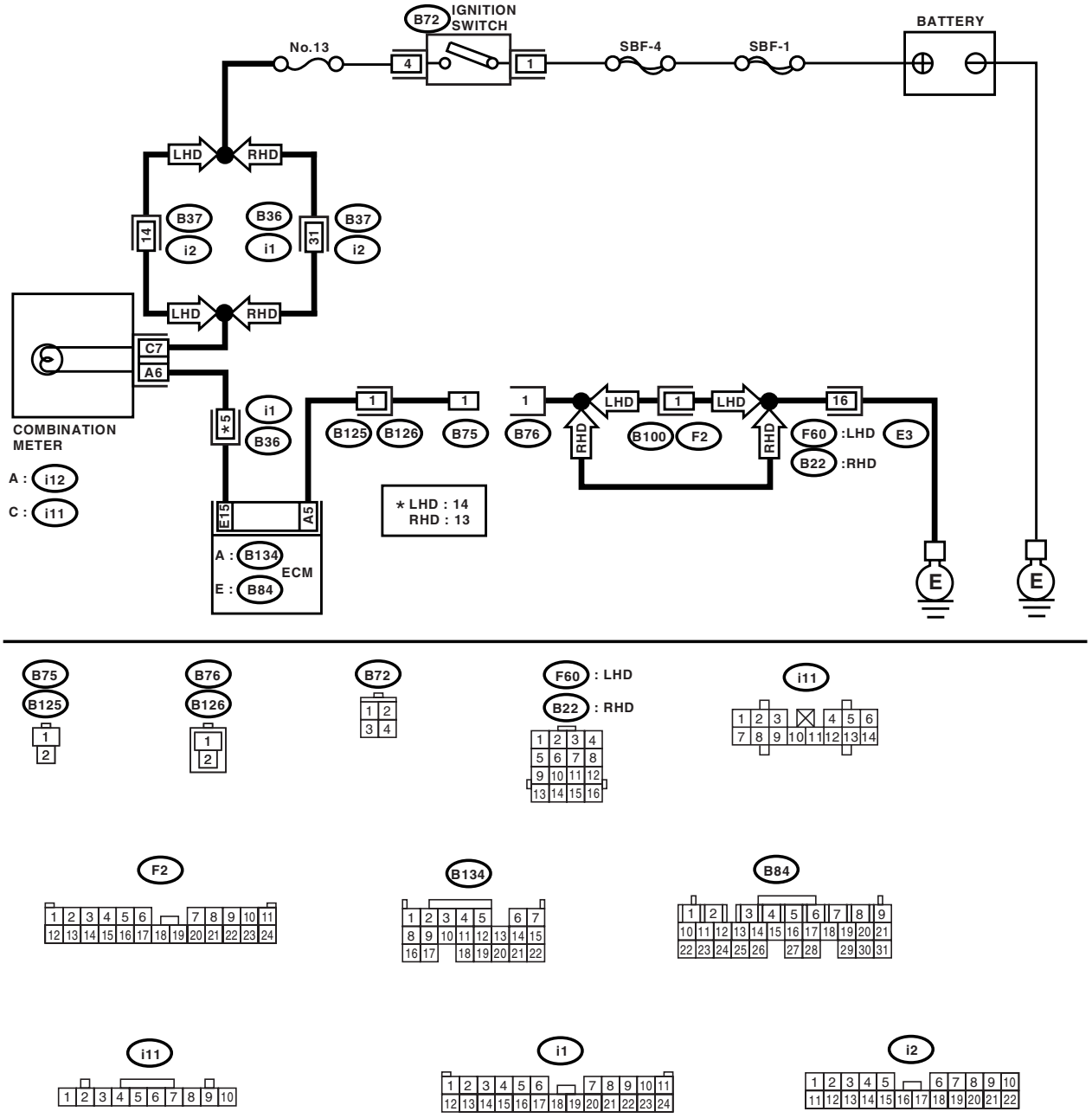
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	Step	Check	Yes	No
1	**CHECK STATUS OF MALFUNCTION INDICATOR LIGHT.** 1)Turn the ignition switch to OFF. 2)Disconnect the test mode connector. 3)Turn the ignition switch to ON. (engine OFF)	Does the malfunction indicator light come on?	Go to step **2.**	Repair the malfunction indicator light circuit. <Ref. to EN(H4DOTC)-53, 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 CHASSIS GROUND.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ECM. 3)Measure the resistance of harness between test mode connector and chassis ground. ***Connector & terminal*** ***(B76) No. 1 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between test mode connector and chassis ground
4	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Go to step **5.**
5	**CHECK HARNESS BETWEEN ECM AND TEST MODE CONNECTOR.** 1)Connect the test mode connector. 2)Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 5 — Chassis ground:***	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)-49, Engine Control Module (ECM).>

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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-01291

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	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.
2	**CHECK HARNESS BETWEEN ECM CONNECTOR AND ENGINE GROUNDING TERMINAL.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ECM. 3)Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 5 — Chassis ground:***	Is the resistance less than 5 Ω?	Repair the short circuit in harness between ECM and test mode connector.	Replace the ECM. <Ref. to FU(H4DOTC)-49, Engine Control Module (ECM).>

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17.Diagnostics for Engine Starting Failure

A: PROCEDURE

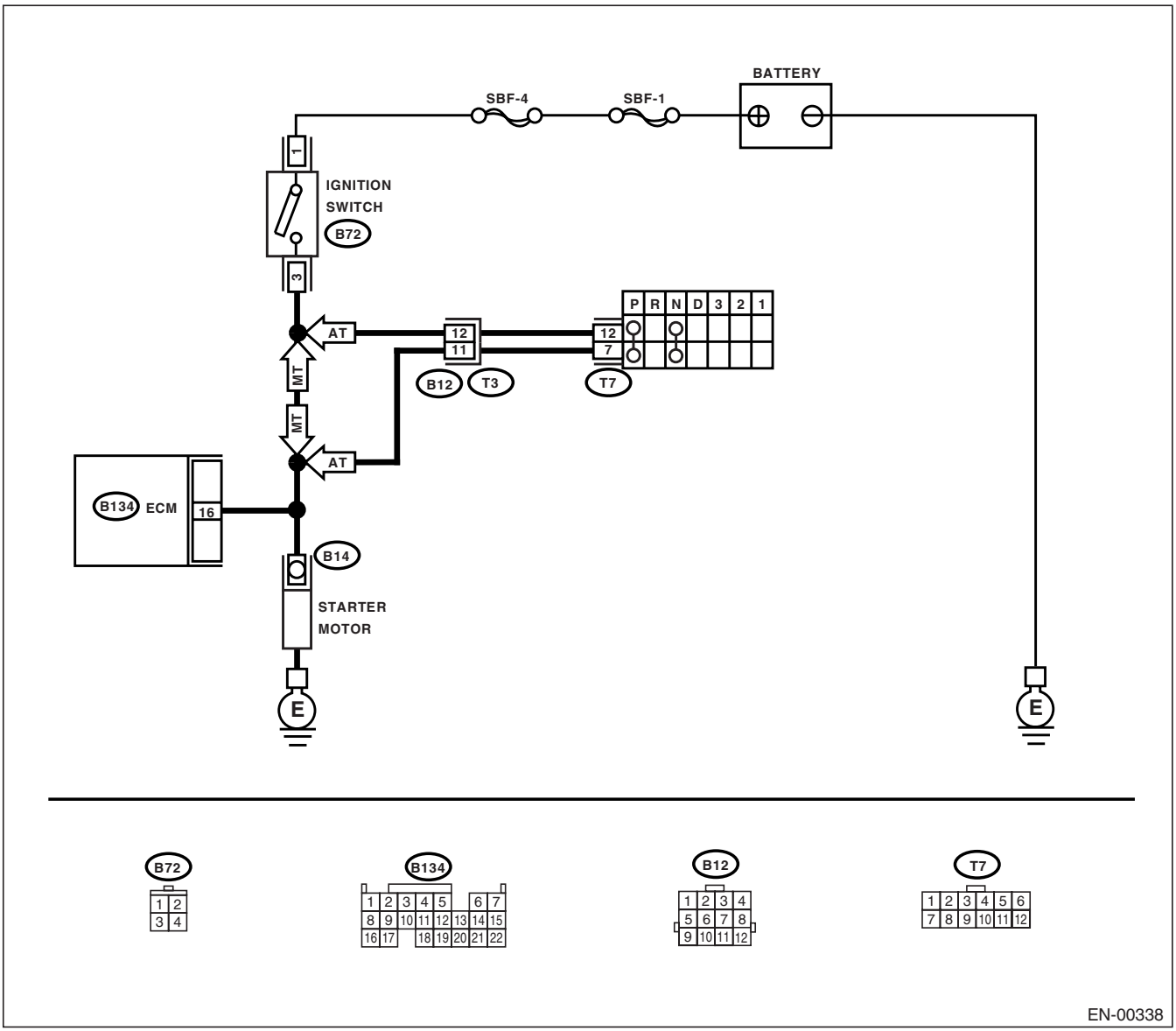
1. Inspection of starter motor circuit. <Ref. to EN(H4DOTC)-61, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
2. Inspection of ECM power supply and ground line. <Ref. to EN(H4DOTC)-63, CONTROL MODULE POWER SUPPLY AND GROUND LINE, Diagnostics for Engine Starting Failure.>
↓
3. Inspection of ignition control system. <Ref. to EN(H4DOTC)-67, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>
↓
4. Inspection of fuel pump circuit. <Ref. to EN(H4DOTC)-70, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
5. Inspection of fuel injector circuit. <Ref. to EN(H4DOTC)-72, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

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B: STARTER MOTOR CIRCUIT

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN(H4DOTC)-48, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**



Step		Check	Yes	No
1	**CHECK OPERATION OF STARTER MOTOR.**	Does the starter motor operate?	Go to step **2.**	Go to step **3.**
2	**CHECK DTC.**	Is the DTC displayed? <Ref. to EN(H4DOTC)-39, OPERATION, Read Diagnostic Trouble Code (DTC).>	Using the List of Diagnostic Trouble Code (DTC), check the appropriate DTC. <Ref. to EN(H4DOTC)-75, List of Diagnostic Trouble Code (DTC).>	Go to step **3.**

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DIAGNOSTICS FOR ENGINE STARTING FAILURE

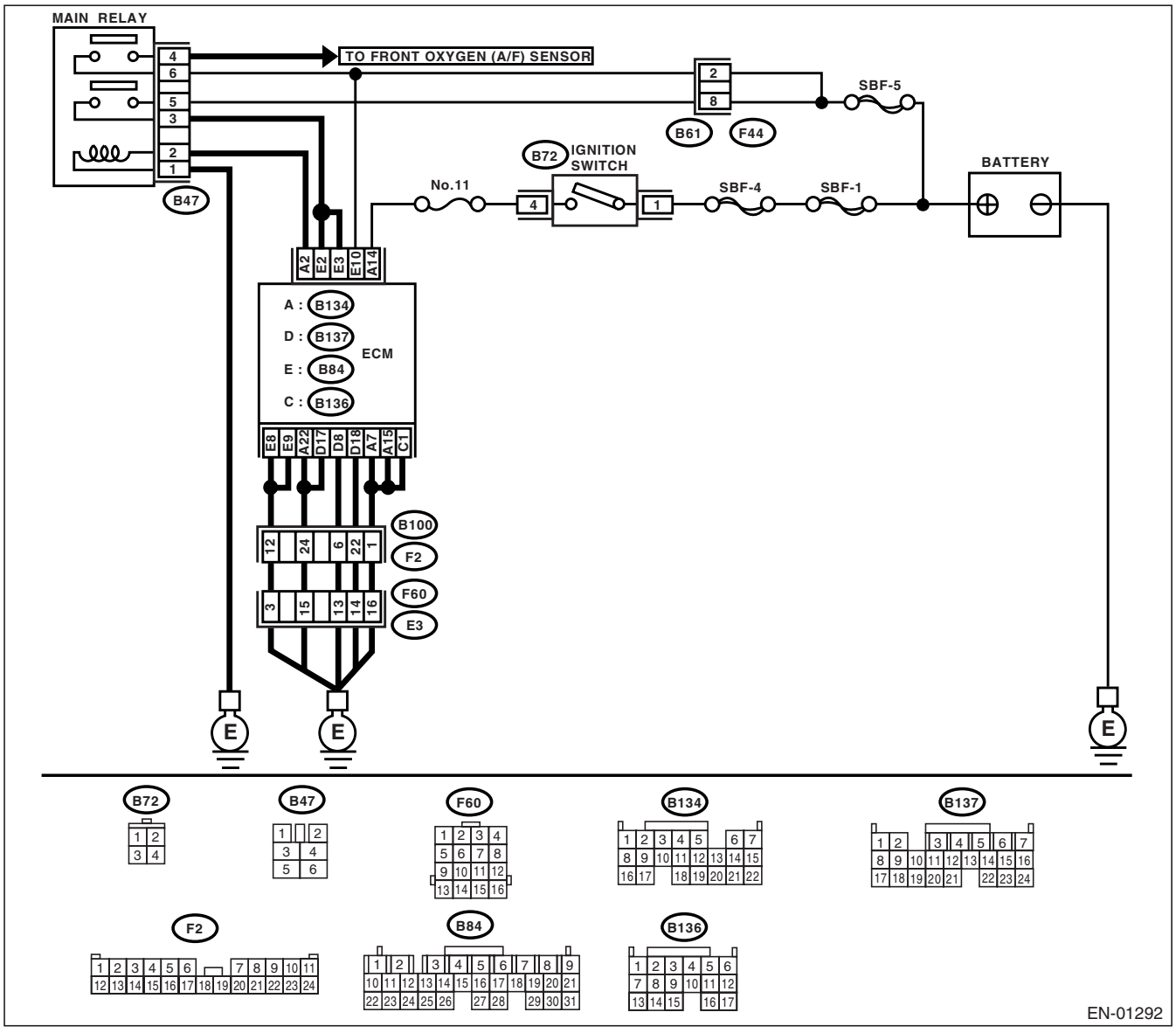
	Step	Check	Yes	No
3	**CHECK INPUT SIGNAL FOR STARTER MOTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from starter motor. 3)Turn the ignition switch to START. 4)Measure the power supply voltage between starter motor connector terminal and engine ground. ***Connector & terminal*** ***(B14) No. 1 (+) — Engine ground (−):***	Is the voltage more than 10 V?	Go to step **4.**	Go to step **5.**
4	**CHECK GROUND CIRCUIT OF STARTER MOTOR.** 1)Turn the ignition switch to OFF. 2)Measure the resistance of ground cable between ground cable terminal and engine ground.	Is the resistance less than 5 Ω?	Check the starter motor. <Ref. to SC(H4SO)-7, Starter.>	Repair the open circuit of ground cable.
5	**CHECK HARNESS BETWEEN BATTERY AND IGNITION SWITCH CONNECTOR.** 1)Ignition the switch to OFF. 2)Disconnect the connector from ignition switch. 3)Measure the power supply voltage between ignition switch connector and chassis ground. ***Connector & terminal*** ***(B72) No. 1 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **6.**	Check the following, repair if necessary. • Fuse is blown out. • Open circuit in harness between ignition switch and battery.
6	**CHECK HARNESS BETWEEN BATTERY AND IGNITION SWITCH CONNECTOR.** 1)Connect the connector to ignition switch. 2)Turn the ignition switch to START. 3)Measure the voltage between ignition switch and chassis ground. ***Connector & terminal*** ***(B72) No. 3 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair the open circuit between ignition switch and starter motor circuit.	Go to step **7.**
7	**CHECK POOR CONTACT.** Check poor contact in ignition switch connector.	Is there poor contact in ignition switch connector?	Repair the poor contact in ignition switch connector.	Replace the ignition switch.

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C: CONTROL MODULE POWER SUPPLY AND GROUND LINE

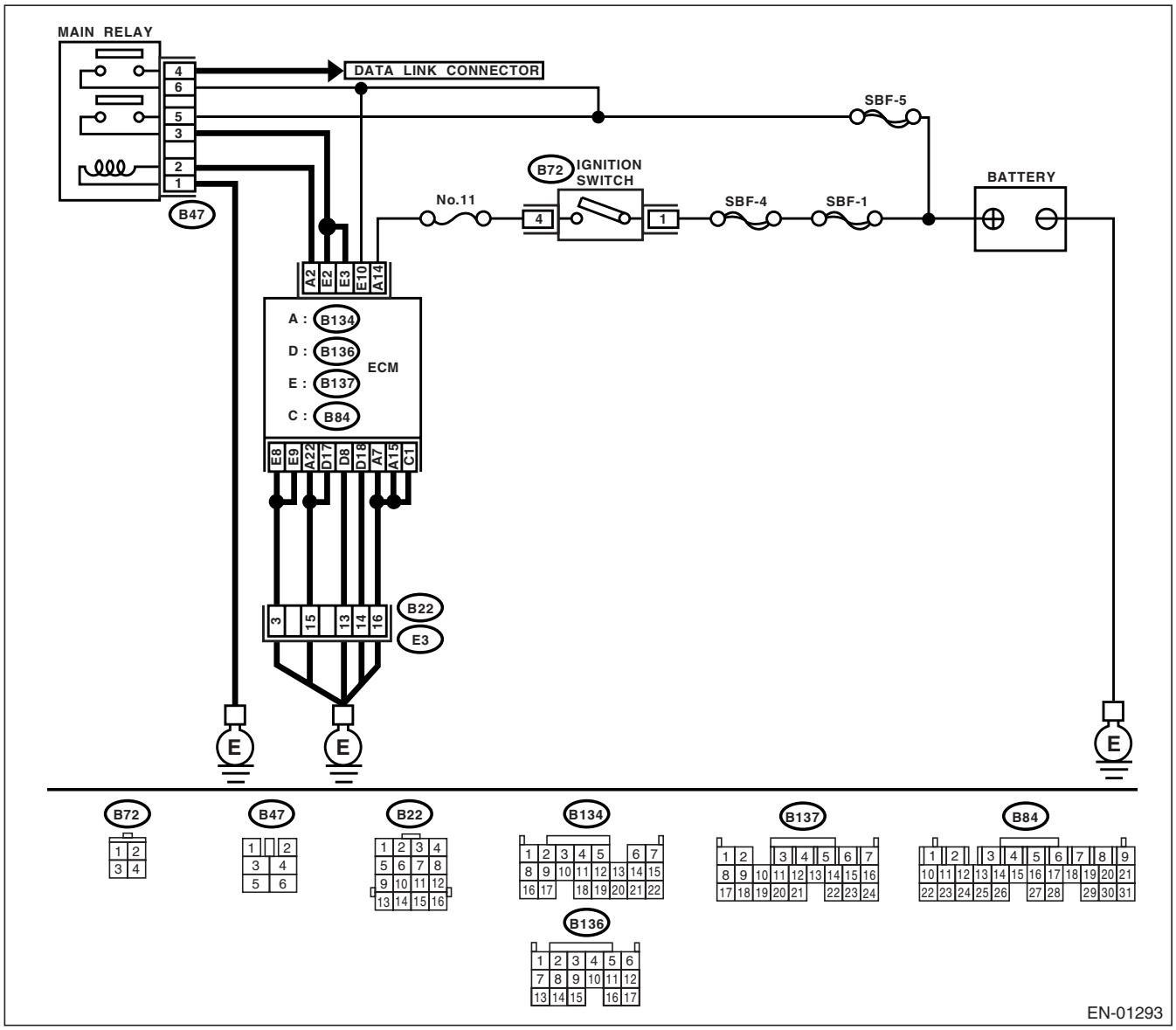
CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN(H4DOTC)-48, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**
- **LHD model**



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- **RHD model**



Step		Check	Yes	No
1	**CHECK MAIN RELAY.** 1)Turn the ignition switch to OFF. 2)Remove the main relay. 3)Connect the battery to main relay terminals No. 1 and No. 2. 4)Measure the resistance between main relay terminals. ***Terminals*** ***No. 3 — No. 5:*** ***No. 4 — No. 6:***	Is the resistance less than 10 Ω?	Go to step **2.**	Replace the main relay.

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	Step	Check	Yes	No
2	**CHECK GROUND CIRCUIT OF ECM.** 1)Disconnect the connector from ECM. 2)Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 7 — Chassis ground:*** ***(B134) No. 15 — Chassis ground:*** ***(B134) No. 22 — Chassis ground:*** ***(B136) No. 1 — Chassis ground:*** ***(B137) No. 8 — Chassis ground:*** ***(B137) No. 17 — Chassis ground:*** ***(B137) No. 18 — Chassis ground:*** ***(B84) No. 8 — Chassis ground:*** ***(B84) No. 9 — 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.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B84) No. 10 (+) — Chassis ground (–):*** ***(B134) No. 14 (+) — 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 HARNESS BETWEEN ECM AND MAIN RELAY CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 2 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair the ground short circuit in harness between ECM connector and main relay connector, and then replace ECM.
5	**CHECK OUTPUT VOLTAGE FROM ECM.** 1)Connect the connector to ECM. 2)Turn the ignition switch to ON. 3)Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 2 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **6.**	Replace the ECM. <Ref. to FU(H4DOTC)-49, Engine Control Module (ECM).>
6	**CHECK INPUT VOLTAGE OF MAIN RELAY.** Check the voltage between main relay connector and chassis ground. ***Connector & terminal*** ***(B47) No. 2 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **7.**	Repair the open circuit in harness between ECM connector and main relay connector.
7	**CHECK GROUND CIRCUIT OF MAIN RELAY.** 1)Turn the ignition switch to OFF. 2)Measure the resistance between main relay connector and chassis ground. ***Connector & terminal*** ***(B47) No. 1 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **8.**	Repair the open circuit between main relay and chassis ground.
8	**CHECK INPUT VOLTAGE OF MAIN RELAY.** Measure the voltage between main relay connector and chassis ground. ***Connector & terminal*** ***(B47) No. 5 (+) — Chassis ground (–):*** ***(B47) No. 6 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Go to step **9.**	Repair the open or ground short circuit in harness of power supply circuit.

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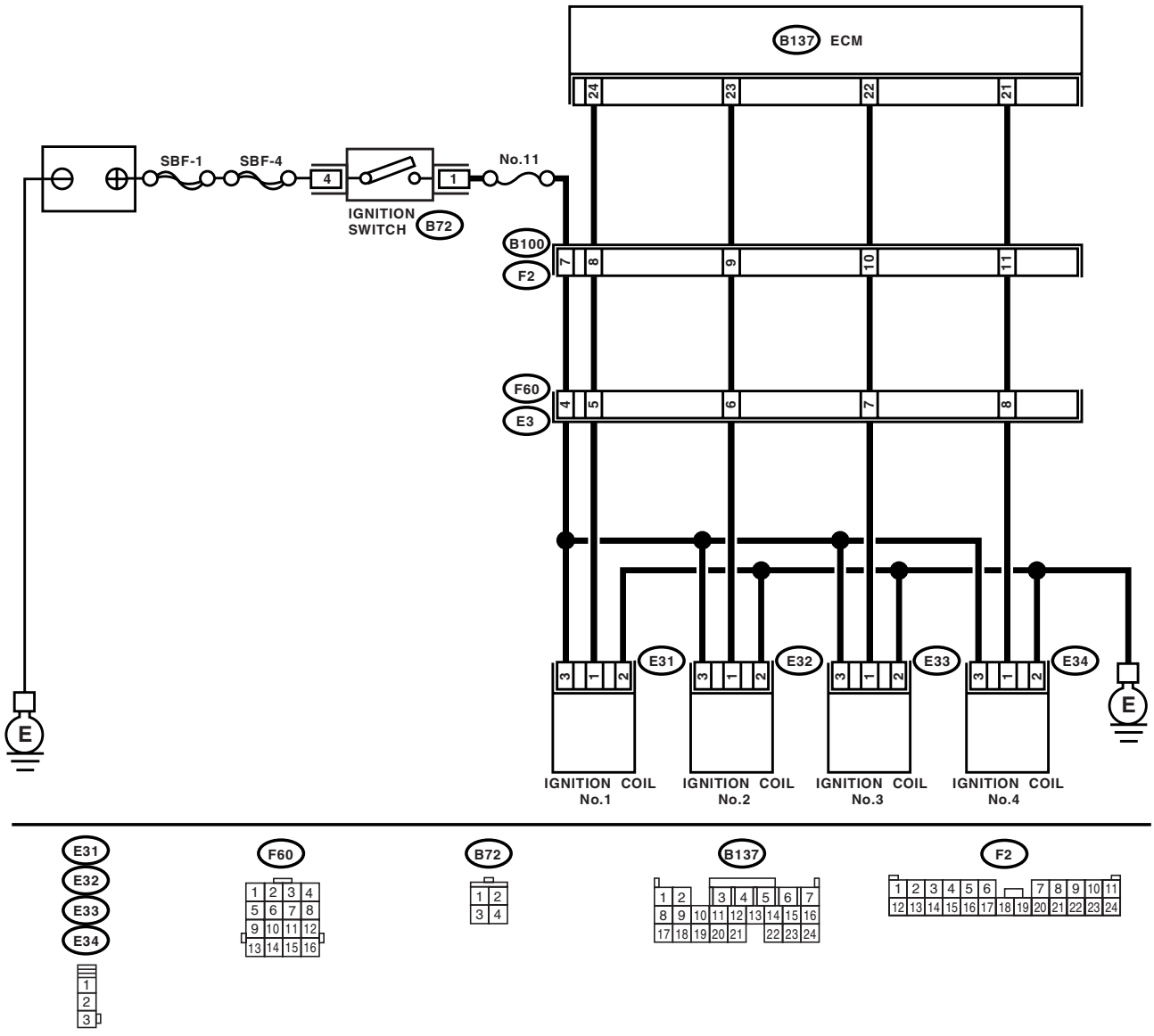
Step		Check	Yes	No
9	**CHECK INPUT VOLTAGE OF ECM.** 1)Connect the main relay connector. 2)Turn the ignition switch to ON. 3)Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B84) No. 2 (+) — Chassis ground (–):*** ***(B84) No. 3 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Check the ignition control system. <Ref. to EN(H4DOTC)-67, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>	Repair the open or ground short circuit in harness between ECM connector and main relay connector.

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D: IGNITION CONTROL SYSTEM

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN(H4DOTC)-48, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

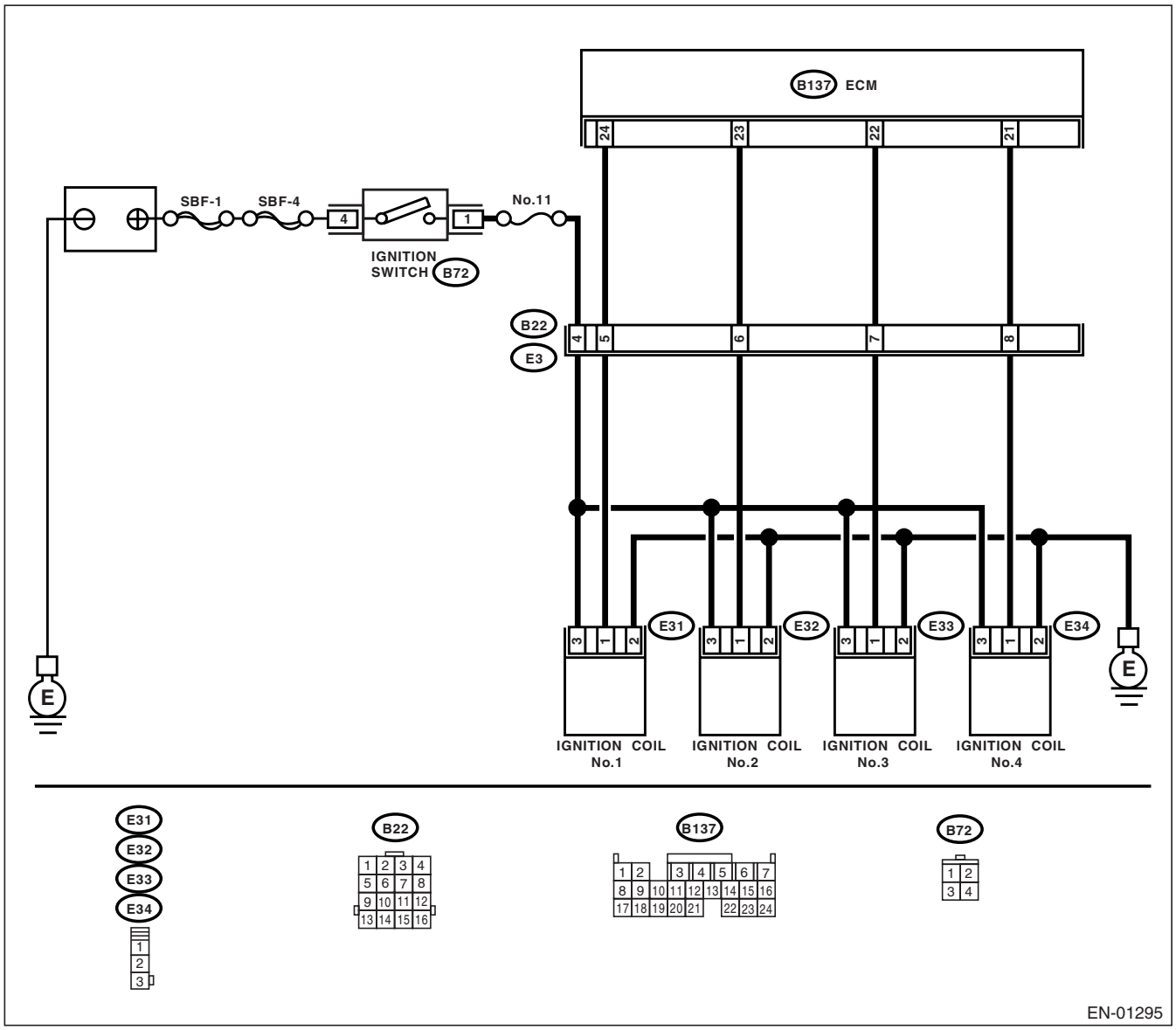
- **WIRING DIAGRAM:**
- **LHD model**



EN-01294

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- **RHD model**



	Step	Check	Yes	No
1	**CHECK SPARK PLUG CONDITION.** 1)Remove the spark plug. <Ref. to IG(H4DOTC)-5, 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. 2)Release the fuel pressure. <Ref. to FU(H4DOTC)-53, RELEASING OF FUEL PRESSURE, OPERATION, Fuel.> 3)Contact the spark plug's thread portion on engine. 4)While opening the throttle valve fully, crank engine to check that spark occurs at each cylinder.	Does spark occur at each cylinder?	Check the fuel pump system. <Ref. to EN(H4DOTC)-70, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>	Go to step **3.**

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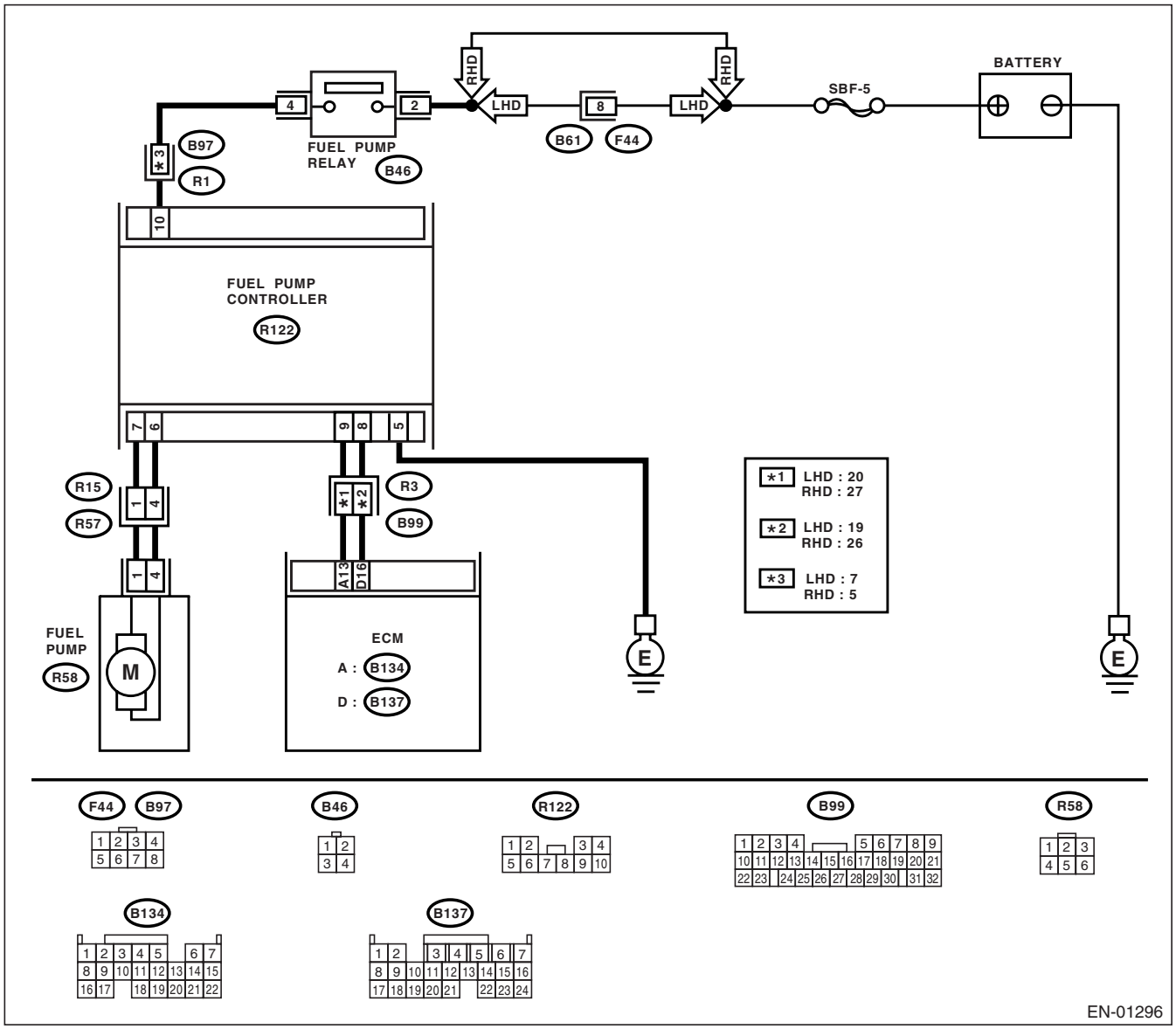
	Step	Check	Yes	No
3	**CHECK POWER SUPPLY CIRCUIT FOR IGNITION COIL & IGNITOR ASSEMBLY.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ignition coil & ignitor assembly. 3)Turn the ignition switch to ON. 4)Measure the power supply voltage between ignition coil & ignitor assembly connector and engine ground. ***Connector & terminal*** ***(E31) No. 3 (+) — Engine ground (−):*** ***(E32) No. 3 (+) — Engine ground (−):*** ***(E33) No. 3 (+) — Engine ground (−):*** ***(E34) No. 3 (+) — Engine ground (−):***	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 & ignitor assembly, and ignition switch connector • Poor contact in coupling connectors
4	**CHECK HARNESS OF IGNITION COIL & IGNITOR ASSEMBLY GROUND CIRCUIT.** 1)Turn the ignition switch to OFF. 2)Measure the resistance between ignition coil & ignitor assembly connector and engine ground. ***Connector & terminal*** ***(E31) No. 2 — Engine ground:*** ***(E32) No. 2 — Engine ground:*** ***(E33) No. 2 — Engine ground:*** ***(E34) No. 2 — Engine ground:***	Is the 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 & ignitor assembly connector and engine grounding terminal
5	**CHECK HARNESS BETWEEN ECM AND IGNITION COIL & IGNITOR ASSEMBLY CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ECM. 3)Disconnect the connector from ignition coil & ignitor assembly. 4)Measure the resistance of harness between ECM and ignition coil & ignitor assembly connector. ***Connector & terminal*** ***(B137) No. 21 — (E34) No. 1:*** ***(B137) No. 22 — (E33) No. 1:*** ***(B137) No. 23 — (E32) No. 1:*** ***(B137) No. 24 — (E31) 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 & ignitor assembly connector • Poor contact in coupling connector
6	**CHECK HARNESS BETWEEN ECM AND IGNITION COIL & IGNITOR ASSEMBLY CONNECTOR.** Measure the resistance of harness between ECM and engine ground. ***Connector & terminal:*** ***(B137) No. 21 — Engine ground:*** ***(B137) No. 22 — Engine ground:*** ***(B137) No. 23 — Engine ground:*** ***(B137) No. 24 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **7.**	Repair the ground short circuit in harness between ECM and ignition coil & ignitor assembly connector.
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.

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E: FUEL PUMP CIRCUIT

CAUTION:
After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN(H4DOTC)-48, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**



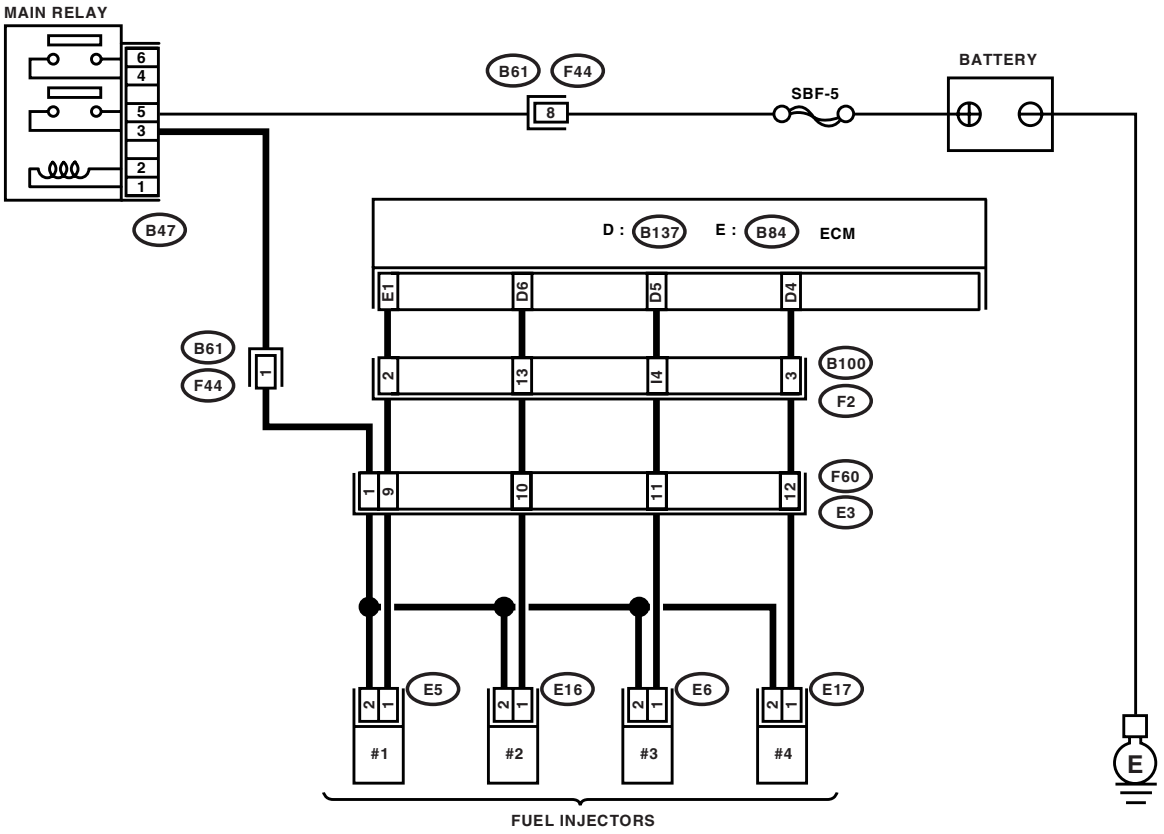
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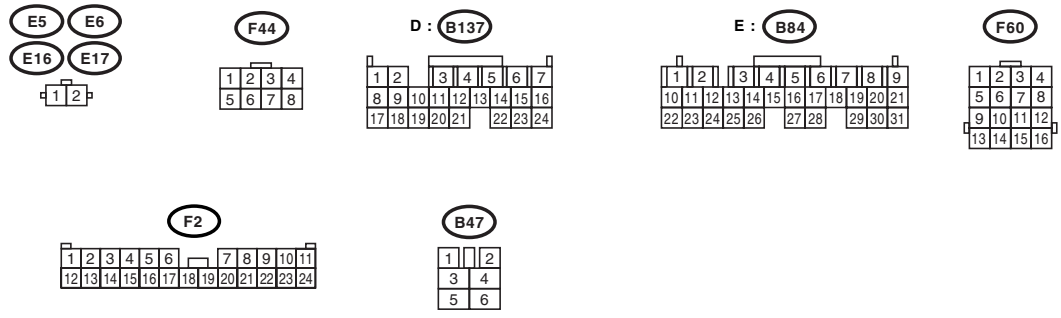
	Step	Check	Yes	No
1	**CHECK OPERATING SOUND OF FUEL PUMP.** Make sure that the fuel pump is in operation for 2 seconds when turning ignition switch to ON. NOTE: Fuel pump operation check can also be executed using the Subaru Select Monitor. For the procedure, refer to “Compulsory Valve Operation Check Mode”. <Ref. to EN(H4DOTC)-49, Compulsory Valve Operation Check Mode.>	Does the fuel pump produce “operating” sound?	Check the fuel injector circuit. <Ref. to EN(H4DOTC)-72, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>	Display the DTC. <Ref. to EN(H4DOTC)-39, OPERATION, Read Diagnostic Trouble Code (DTC).>

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F: FUEL INJECTOR CIRCUIT

CAUTION:
- **Check or repair only faulty parts.**
- **After repair or replacement of faulty parts, conduct CLEAR MEMORY MODE <Ref. to EN(H4DOTC)-48, Clear Memory Mode.> and INSPECTION MODE <Ref. to EN(H4DOTC)-40, Inspection Mode.>.**
- **WIRING DIAGRAM:**
- **LHD model**

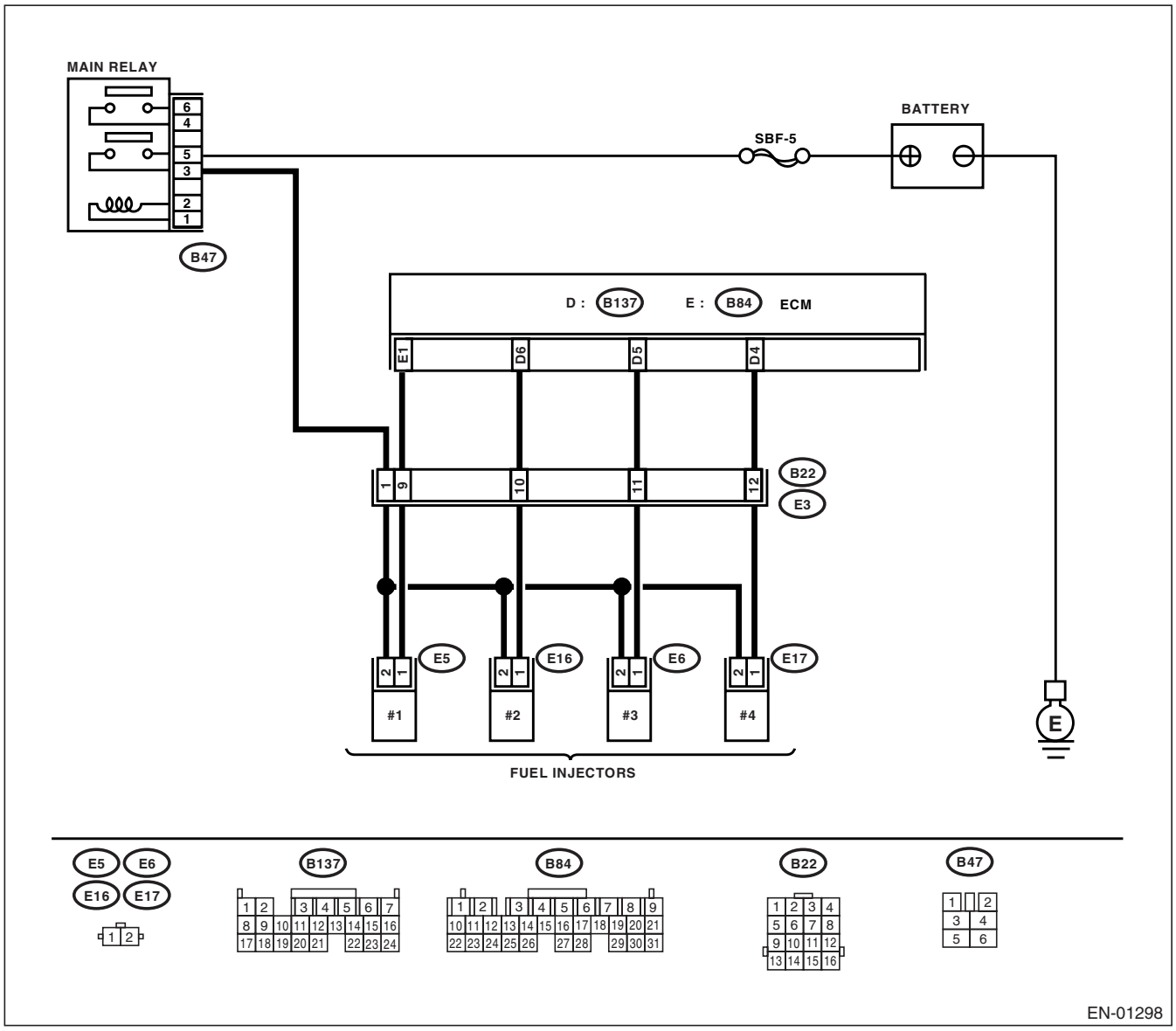




EN-01297

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- **RHD model**



	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)-39, INSPECTION, Fuel Pressure.>	Go to step **2.**

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	Step	Check	Yes	No
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*** ***#1 (E5) No. 2 (+) — Engine ground (–):*** ***#2 (E16) No. 2 (+) — Engine ground (–):*** ***#3 (E6) No. 2 (+) — Engine ground (–):*** ***#4 (E17) No. 2 (+) — Engine ground (–):***	Is the voltage more than 10 V?	Go to step **3.**	Repair 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*** ***(B84) No. 1 — (E5) No. 1:*** ***(B137) No. 6 — (E16) No. 1:*** ***(B137) No. 5 — (E6) No. 1:*** ***(B137) No. 4 — (E6) No. 1:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the harness and connector. NOTE: In this case, repair the following: • 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*** ***(B84) No. 1 — Chassis ground:*** ***(B137) No. 6 — Chassis ground:*** ***(B137) No. 5 — Chassis ground:*** ***(B137) No. 4 — Chassis ground:***	Is the resistance less than 1 Ω?	Repair the ground short circuit in harness between ECM and fuel injector connector.	Go to step **5.**
5	**CHECK EACH FUEL INJECTOR.** 1)Turn the ignition switch to OFF. 2)Measure the resistance between each fuel injector terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 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)-314, INSPECTION, General Diagnostic Table.>

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18.List of Diagnostic Trouble Code (DTC)

A: LIST

DTC	Item	Index
P0011	“A” Camshaft Position - Timing Over-Advanced or System Performance (Bank 1)	<Ref. to EN(H4DOTC)-82, DTC P0011 — “A” CAMSHAFT POSITION-TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0021	“A” Camshaft Position - Timing Over-Advanced or System Performance (Bank 2)	<Ref. to EN(H4DOTC)-83, DTC P0021 — “A” 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)-84, 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)-86, 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)-89, 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)-91, 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)-94, 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)-96, DTC P0068 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0101	Mass or Volume Air Flow Circuit Range/Performance	<Ref. to EN(H4DOTC)-99, 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)-101, 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)-104, 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)-106, DTC P0107 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0108	Manifold Absolute Pressure/Barometric Pressure Circuit High Input	<Ref. to EN(H4DOTC)-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)-112, 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)-114, 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)-116, DTC P0113 — INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0117	Engine Coolant Temperature Circuit Low Input	<Ref. to EN(H4DOTC)-119, 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)-121, DTC P0118 — ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

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LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

DTC	Item	Index
P0121	Throttle/Pedal Position Sensor/ Switch “A” Circuit Range/Performance	<Ref. to EN(H4DOTC)-124, DTC P0121 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0122	Throttle/Pedal Position Sensor/ Switch “A” Circuit Low Input	<Ref. to EN(H4DOTC)-126, 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)-130, 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)-133, DTC P0125 — INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0129	Atmospheric Pressure Sensor Circuit Range/Performance	<Ref. to EN(H4DOTC)-134, DTC P0129 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0130	O_2 Sensor Circuit (Bank 1 Sensor 1)	<Ref. to EN(H4DOTC)-135, DTC P0130 — O2 SENSOR CIRCUIT (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)-137, DTC P0133 — O2 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)-138, DTC P0134 — O2 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)-139, DTC P0137 — O2 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)-142, DTC P0138 — O2 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)-145, DTC P0139 — O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0171	System too Lean (Bank 1)	<Ref. to EN(H4DOTC)-146, DTC P0171 — SYSTEM TOO LEAN (BANK 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0172	System too Rich (Bank 1)	<Ref. to EN(H4DOTC)-147, DTC P0172 — SYSTEM TOO RICH (BANK 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0230	Fuel Pump Primary Circuit	<Ref. to EN(H4DOTC)-150, 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)-153, 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)-155, 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)-157, 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)-159, DTC P0301 — CYLINDER 1 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0302	Cylinder 2 misfire detected	<Ref. to EN(H4DOTC)-159, DTC P0302 — CYLINDER 2 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0303	Cylinder 3 misfire detected	<Ref. to EN(H4DOTC)-159, DTC P0303 — CYLINDER 3 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0304	Cylinder 4 misfire detected	<Ref. to EN(H4DOTC)-160, DTC P0304 — CYLINDER 4 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

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DTC	Item	Index
P0327	Knock Sensor 1 Circuit Low Input (Bank 1 or Single Sensor)	<Ref. to EN(H4DOTC)-166, 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)-168, 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)-170, 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)-172, 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)-174, DTC P0340 — CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0341	Camshaft Position Sensor “A” Circuit Range/Performance (Bank 1 or Single Sensor)	<Ref. to EN(H4DOTC)-176, DTC P0341 — CAMSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE (BANK 1 OR SINGLE SENSOR) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0365	Camshaft Position Sensor “B” Circuit (Bank 1)	<Ref. to EN(H4DOTC)-179, DTC P0365 — CAMSHAFT POSITION SENSOR “B” CIRCUIT (BANK 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0390	Camshaft Position Sensor “B” Circuit (Bank 2)	<Ref. to EN(H4DOTC)-181, DTC P0390 — CAMSHAFT POSITION SENSOR “B” CIRCUIT (BANK 2) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0420	Catalyst System Efficiency Below Threshold (Bank 1)	<Ref. to EN(H4DOTC)-183, DTC P0420 — CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0458	Evaporative Emission Control System Purge Control Valve Circuit Low	<Ref. to EN(H4DOTC)-185, 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)-187, 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)-189, 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)-191, 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)-194, 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)-197, DTC P0464 — FUEL LEVEL SENSOR CIRCUIT INTERMITTENT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0483	Cooling Fan Rationality Check	<Ref. to EN(H4DOTC)-199, DTC P0483 — COOLING FAN RATIONALITY CHECK —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0502	Vehicle Speed Sensor Circuit Low Input	<Ref. to EN(H4DOTC)-202, 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)-204, 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)-206, DTC P0506 — IDLE CONTROL SYSTEM RPM LOWER THAN EXPECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

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LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

DTC	Item	Index
P0507	Idle Control System RPM Higher Than Expected	<Ref. to EN(H4DOTC)-208, DTC P0507 — IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0508	Idle Control System Circuit Low	<Ref. to EN(H4DOTC)-210, DTC P0508 — IDLE CONTROL SYSTEM CIRCUIT LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0509	Idle Control System Circuit High	<Ref. to EN(H4DOTC)-212, DTC P0509 — IDLE CONTROL SYSTEM CIRCUIT HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0512	Starter Request Circuit	<Ref. to EN(H4DOTC)-214, DTC P0512 — STARTER REQUEST CIRCUIT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0513	Incorrect Immobilizer Key	<Ref. to IM-15, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostics Chart with Diagnostic Trouble Code (DTC).>
P0519	Idle Control System Malfunction (Fail-Safe)	<Ref. to EN(H4DOTC)-216, DTC P0519 — IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0545	Exhaust Gas Temperature Sensor Circuit Low-Bank 1	<Ref. to EN(H4DOTC)-218, DTC P0545 — EXHAUST GAS TEMPERATURE SENSOR CIRCUIT LOW-BANK 1 —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0546	Exhaust Gas Temperature Sensor Circuit High-Bank 1	<Ref. to EN(H4DOTC)-220, DTC P0546 — EXHAUST GAS TEMPERATURE SENSOR CIRCUIT HIGH-BANK 1 —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0558	Generator Circuit Low Input	<Ref. to EN(H4DOTC)-222, DTC P0558 — GENERATOR CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0559	Generator Circuit High Input	<Ref. to EN(H4DOTC)-223, DTC P0559 — GENERATOR CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0565	Cruise Control On Signal	<Ref. to EN(H4DOTC)-225, DTC P0565 — CRUISE CONTROL ON SIGNAL —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0604	Internal Control Module Random Access Memory (RAM) Error	<Ref. to EN(H4DOTC)-227, DTC P0604 — INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0691	Cooling Fan 1 Control Circuit Low	<Ref. to EN(H4DOTC)-229, 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)-233, DTC P0692 — COOLING FAN 1 CONTROL CIRCUIT HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0703	Torque Converter/Brake Switch “B” Circuit	<Ref. to EN(H4DOTC)-236, DTC P0703 — TORQUE CONVERTER/BRAKE SWITCH “B” CIRCUIT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0705	Transmission Range Sensor Circuit (PRNDL Input)	<Ref. to 4AT-109, CHECK INHIBITOR SWITCH, Diagnostic Procedure without Diagnostic Trouble Code (DTC).>
P0710	Transmission Fluid Temperature Sensor Circuit	<Ref. to 4AT-45, DTC 27 ATF TEMPERATURE SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0716	Torque Converter Turbine Speed Sensor	<Ref. to 4AT-57, DTC 36 TORQUE CONVERTER TURBINE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0720	Output Speed Sensor Circuit	<Ref. to 4AT-53, DTC 33 FRONT VEHICLE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0726	Engine Speed Input Circuit Range/ Performance	<Ref. to 4AT-41, DTC 11 ENGINE SPEED SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0731	Gear 1 Incorrect Ratio	<Ref. to EN(H4DOTC)-238, DTC P0731 — GEAR 1 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0732	Gear 2 Incorrect Ratio	<Ref. to EN(H4DOTC)-238, DTC P0732 — GEAR 2 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0733	Gear 3 Incorrect Ratio	<Ref. to EN(H4DOTC)-238, DTC P0733 — GEAR 3 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0734	Gear 4 Incorrect Ratio	<Ref. to EN(H4DOTC)-239, DTC P0734 — GEAR 4 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

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DTC	Item	Index
P0741	Torque Converter Clutch Circuit Performance or Stuck Off	<Ref. to EN(H4DOTC)-240, DTC P0741 — TORQUE CONVERTER CLUTCH CIRCUIT PERFORMANCE OR STUCK OFF —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0743	Torque Converter Clutch Circuit Electrical	<Ref. to 4AT-82, DTC 77 LOCK-UP DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0748	Pressure Control Solenoid “A” Electrical	<Ref. to 4AT-76, DTC 75 LINE PRESSURE DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0753	Shift Solenoid “A” Electrical	<Ref. to 4AT-64, DTC 71 SHIFT SOLENOID 1, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0758	Shift Solenoid “B” Electrical	<Ref. to 4AT-67, DTC 72 SHIFT SOLENOID 2, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0771	Low Clutch Timing Solenoid	<Ref. to 4AT-70, DTC 73 LOW CLUTCH TIMING SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0778	Pressure Control Solenoid “B” Electrical	<Ref. to 4AT-79, DTC 76 2-4 BRAKE DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0785	Shift/Timing Solenoid	<Ref. to 4AT-73, DTC 74 2-4 BRAKE TIMING SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0851	Neutral Switch Input Circuit Low	<Ref. to EN(H4DOTC)-242, DTC P0851 — NEUTRAL SWITCH INPUT CIRCUIT LOW (AT MODEL) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> or <Ref. to EN(H4DOTC)-244, 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)-247, DTC P0852 — NEUTRAL SWITCH INPUT CIRCUIT HIGH (AT MODEL) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> or <Ref. to EN(H4DOTC)-250, DTC P0852 — NEUTRAL SWITCH INPUT CIRCUIT HIGH (MT MODEL) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0864	TCM Communication Circuit Range/Performance	<Ref. to EN(H4DOTC)-252, DTC P0864 — TCM COMMUNICATION CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0865	TCM Communication Circuit Low	<Ref. to EN(H4DOTC)-254, DTC P0865 — TCM COMMUNICATION CIRCUIT LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0866	TCM Communication Circuit High	<Ref. to EN(H4DOTC)-256, DTC P0866 — TCM COMMUNICATION CIRCUIT HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1086	Tumble Generated Valve Position Sensor 2 Circuit Low	<Ref. to EN(H4DOTC)-258, DTC P1086 — TUMBLE GENERATED VALVE POSITION SENSOR 2 CIRCUIT LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1087	Tumble Generated Valve Position Sensor 2 Circuit High	<Ref. to EN(H4DOTC)-262, DTC P1087 — TUMBLE GENERATED VALVE POSITION SENSOR 2 CIRCUIT HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1088	Tumble Generated Valve Position Sensor 1 Circuit Low	<Ref. to EN(H4DOTC)-265, DTC P1088 — TUMBLE GENERATED VALVE POSITION SENSOR 1 CIRCUIT LOW —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1089	Tumble Generated Valve Position Sensor 1 Circuit High	<Ref. to EN(H4DOTC)-269, DTC P1089 — TUMBLE GENERATED VALVE POSITION SENSOR 1 CIRCUIT HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1090	Tumble Generated Valve System 1 (Valve Open)	<Ref. to EN(H4DOTC)-272, DTC P1090 — TUMBLE GENERATED VALVE SYSTEM 1 (VALVE OPEN) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1091	Tumble Generated Valve System 1 (Valve Close)	<Ref. to EN(H4DOTC)-272, DTC P1091 — TUMBLE GENERATED VALVE SYSTEM 1 (VALVE CLOSE) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1092	Tumble Generated Valve System 2 (Valve Open)	<Ref. to EN(H4DOTC)-273, DTC P1092 — TUMBLE GENERATED VALVE SYSTEM 2 (VALVE OPEN) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

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LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

DTC	Item	Index
P1093	Tumble Generated Valve System 2 (Valve Close)	<Ref. to EN(H4DOTC)-273, DTC P1093 — TUMBLE GENERATED VALVE SYSTEM 2 (VALVE CLOSE) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1094	Tumble Generated Valve Signal 1 Circuit Malfunction (Open)	<Ref. to EN(H4DOTC)-274, DTC P1094 — TUMBLE GENERATED VALVE SIGNAL 1 CIRCUIT MALFUNCTION (OPEN) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1095	Tumble Generated Valve Signal 1 Circuit Malfunction (Short)	<Ref. to EN(H4DOTC)-276, DTC P1095 — TUMBLE GENERATED VALVE SIGNAL 1 CIRCUIT MALFUNCTION (SHORT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1096	Tumble Generated Valve Signal 2 Circuit Malfunction (Open)	<Ref. to EN(H4DOTC)-278, DTC P1096 — TUMBLE GENERATED VALVE SIGNAL 2 CIRCUIT MALFUNCTION (OPEN) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1097	Tumble Generated Valve Signal 2 Circuit Malfunction (Short)	<Ref. to EN(H4DOTC)-280, DTC P1097 — TUMBLE GENERATED VALVE SIGNAL 2 CIRCUIT MALFUNCTION (SHORT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1110	Atmospheric Pressure Sensor Circuit Malfunction (Low Input)	<Ref. to EN(H4DOTC)-281, DTC P1110 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1111	Atmospheric Pressure Sensor Circuit Malfunction (High Input)	<Ref. to EN(H4DOTC)-281, DTC P1111 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1134	A/F Sensor Micro-Computer Problem	<Ref. to EN(H4DOTC)-282, DTC P1134 — A/F SENSOR MICRO-COMPUTER PROBLEM —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1152	O_2 Sensor Circuit Range/Performance (Low) (Bank1 Sensor1)	<Ref. to EN(H4DOTC)-283, DTC P1152 — O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK1 SENSOR1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1153	O_2 Sensor Circuit Range/Performance (High) (Bank1 Sensor1)	<Ref. to EN(H4DOTC)-285, DTC P1153 — O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK1 SENSOR1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1301	Misfire Detected (High Temperature Exhaust Gas)	<Ref. to EN(H4DOTC)-287, DTC P1301 — MISFIRE DETECTED (HIGH TEMPERATURE EXHAUST GAS) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1306	OCV Solenoid Valve Signal 1 Circuit Malfunction (Open)	<Ref. to EN(H4DOTC)-289, DTC P1306 — OCV SOLENOID VALVE SIGNAL 1 CIRCUIT MALFUNCTION (OPEN) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1307	OCV Solenoid Valve Signal 1 Circuit Malfunction (Short)	<Ref. to EN(H4DOTC)-291, DTC P1307 — OCV SOLENOID VALVE SIGNAL 1 CIRCUIT MALFUNCTION (SHORT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1308	OCV Solenoid Valve Signal 2 Circuit Malfunction (Open)	<Ref. to EN(H4DOTC)-293, DTC P1308 — OCV SOLENOID VALVE SIGNAL 2 CIRCUIT MALFUNCTION (OPEN) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1309	OCV Solenoid Valve Signal 2 Circuit Malfunction (Short)	<Ref. to EN(H4DOTC)-295, DTC P1309 — OCV SOLENOID VALVE SIGNAL 2 CIRCUIT MALFUNCTION (SHORT) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1312	Exhaust Gas Temperature Sensor Malfunction	<Ref. to EN(H4DOTC)-297, DTC P1312 — EXHAUST GAS TEMPERATURE SENSOR MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1518	Starter Switch Circuit Low Input	<Ref. to EN(H4DOTC)-299, DTC P1518 — STARTER SWITCH CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1544	Exhaust Gas Temperature Too High	<Ref. to EN(H4DOTC)-301, DTC P1544 — EXHAUST GAS TEMPERATURE TOO HIGH —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1560	Back-Up Voltage Circuit Malfunction	<Ref. to EN(H4DOTC)-303, DTC P1560 — BACK-UP VOLTAGE CIRCUIT MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

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DTC	Item	Index
P1570	Antenna	<Ref. to IM-16, DTC P1570 ANTENNA, Diagnostics Chart with Diagnostic Trouble Code (DTC).>
P1571	Reference Code Incompatibility	<Ref. to IM-18, DTC P1571 REFERENCE CODE INCOMPATIBILITY, Diagnostics Chart with Diagnostic Trouble Code (DTC).>
P1572	IMM Circuit Failure (Except Antenna Circuit)	<Ref. to IM-19, DTC P1572 IMM CIRCUIT FAILURE (EXCEPT ANTENNA CIRCUIT), Diagnostics Chart with Diagnostic Trouble Code (DTC).>
P1574	Key Communication Failure	<Ref. to IM-23, DTC P1574 KEY COMMUNICATION FAILURE, Diagnostics Chart with Diagnostic Trouble Code (DTC).>
P1576	EGI Control Module EEPROM	<Ref. to IM-23, DTC P1576 EGI CONTROL MODULE EEPROM, Diagnostics Chart with Diagnostic Trouble Code (DTC).>
P1577	IMM Control Module EEPROM	<Ref. to IM-23, DTC P1577 IMM CONTROL MODULE EEPROM, Diagnostics Chart with Diagnostic Trouble Code (DTC).>
P1698	Engine Torque Control Cut Signal Circuit Low Input	<Ref. to EN(H4DOTC)-306, DTC P1698 — ENGINE TORQUE CONTROL CUT SIGNAL CIRCUIT LOW INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1699	Engine Torque Control Cut Signal Circuit High Input	<Ref. to EN(H4DOTC)-308, DTC P1699 — ENGINE TORQUE CONTROL CUT SIGNAL CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1700	Throttle Position Sensor	<Ref. to 4AT-48, DTC 31 THROTTLE POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1711	Engine Torque Control Signal 1 Circuit Malfunction	<Ref. to EN(H4DOTC)-310, DTC P1711 — ENGINE TORQUE CONTROL SIGNAL 1 CIRCUIT MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1712	Engine Torque Control Signal 2 Circuit Malfunction	<Ref. to EN(H4DOTC)-312, DTC P1712 — ENGINE TORQUE CONTROL SIGNAL 2 CIRCUIT MALFUNCTION —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

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19.Diagnostic Procedure with Diagnostic Trouble Code (DTC)

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

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Engine stalls.
  - Erroneous idling

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, 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)-75, 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 operating angle and variable valve timing solenoid valve duty output using Subaru Select Monitor and OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the AVCS operating angle more than approx. 0°C and the variable valve timing solenoid valve duty output more than approx. 10%?	Inspect the following items and repair or replace if necessary. • Engine oil (amount, contamination) • Oil pipe (clog) • variable valve timing 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.

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B: DTC P0021 — "A" CAMSHAFT POSITION-TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 2) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Engine stalls.
  - Erroneous idling

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, 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)-75, 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 operating angle and variable valve timing solenoid valve duty output using Subaru Select Monitor and OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the AVCS operating angle more than approx. 0°C and the variable valve timing solenoid valve duty output more than approx. 10%?	Inspect the following items and repair or replace if necessary. • Engine oil (amount, contamination) • Oil pipe (clog) • variable valve timing 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.

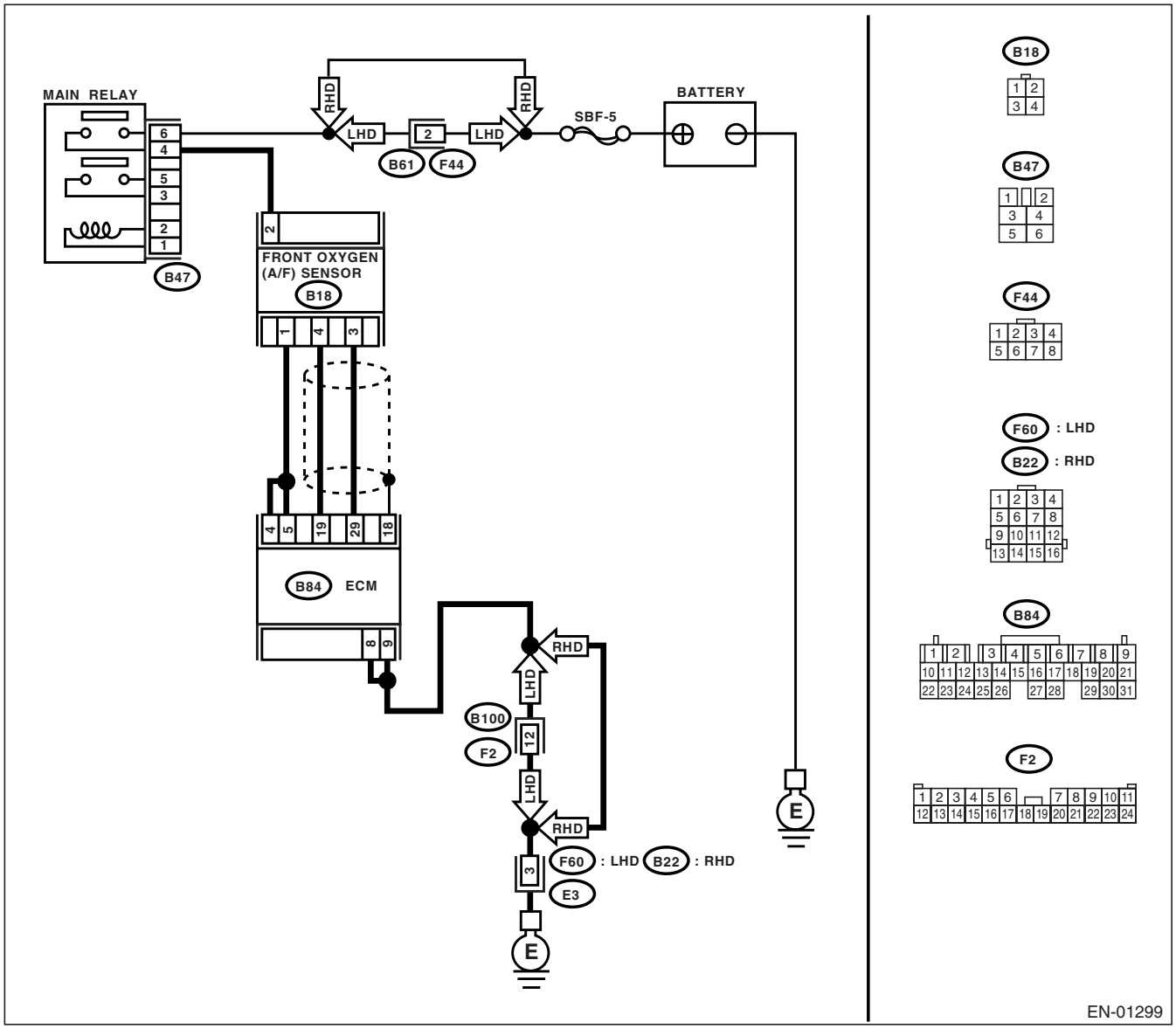
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C: DTC P0030 — HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**



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	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*** ***(B84) No. 5 — (B18) No. 1:*** ***(B84) No. 4 — (B18) No. 1:***	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*** ***(B84) No. 19 — (B18) No. 4:*** ***(B84) No. 29 — (B18) No. 3:***	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. 2:***	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)-44, Front Oxygen (A/F) Sensor.>
5	**CHECK POOR CONTACT.** Check the poor contact in ECM and front oxygen (A/F) sensor connector.	Is there poor contact in ECM or front oxygen (A/F) sensor connector?	Repair the poor contact in ECM or front oxygen (A/F) sensor connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-44, Front Oxygen (A/F) Sensor.>

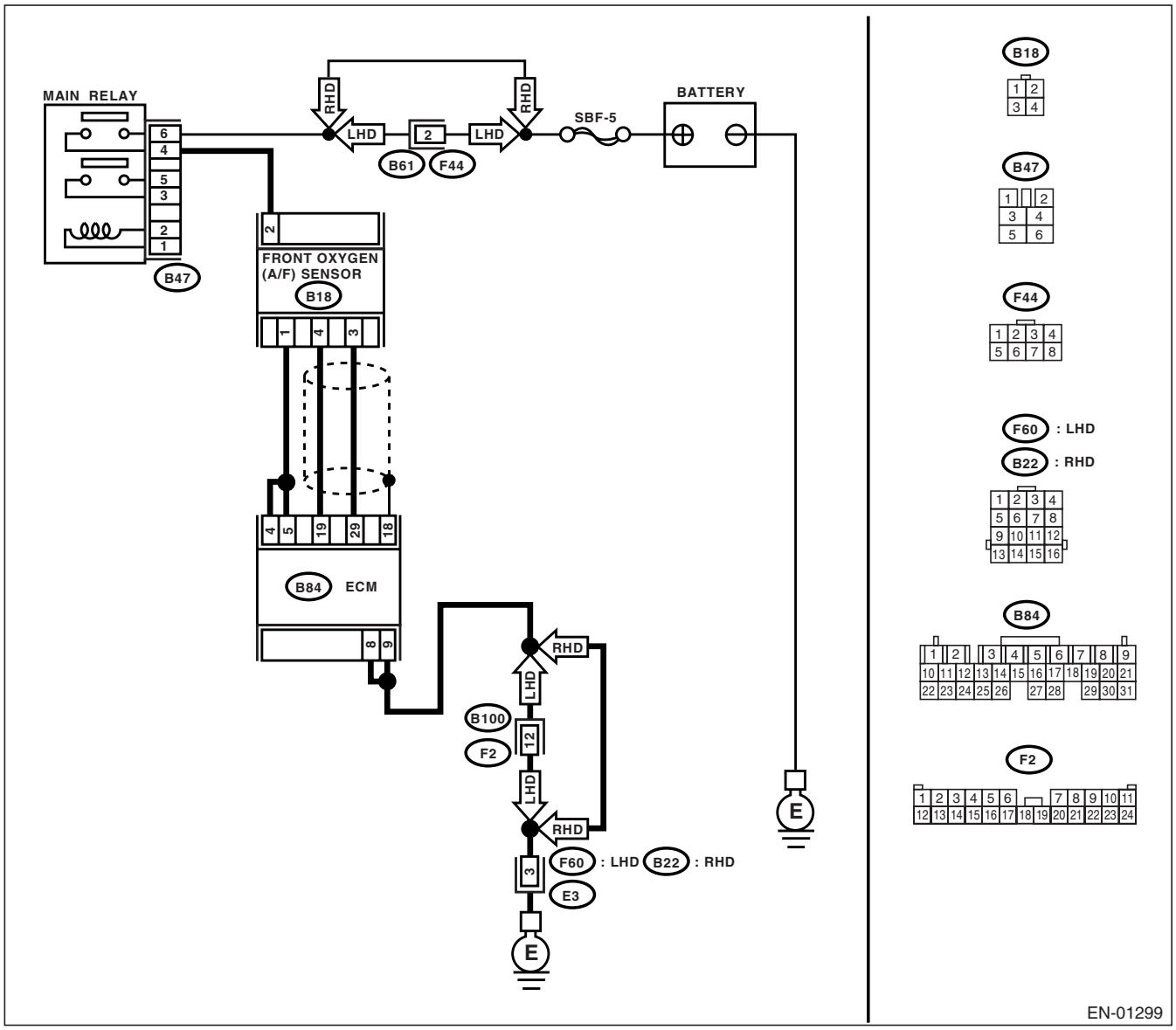
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D: DTC P0031 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**



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	Step	Check	Yes	No
1	**CHECK POWER SUPPLY TO FRONT OXYGEN (A/F) SENSOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from front oxygen (A/F) sensor. 3)Turn the ignition switch to ON. 4)Measure the voltage between front oxygen (A/F) sensor connector and engine ground. ***Connector & terminal*** ***(B18) No. 2 (+) — Engine ground (−):***	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*** ***(B84) No. 8 — Chassis ground:*** ***(B84) No. 9 — 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 OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.> •OBD-II scan tool For detailed operation procedures, refer to the OBD-II 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*** ***(B84) No. 4 (+) — 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*** ***(B84) 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 **6.**
6	**CHECK OUTPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B84) No. 5 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **8.**	Go to step **7.**

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	Step	Check	Yes	No
7	**CHECK OUTPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B84) No. 5 (+) — 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 **8.**
8	**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)-44, Front Oxygen (A/F) Sensor.>

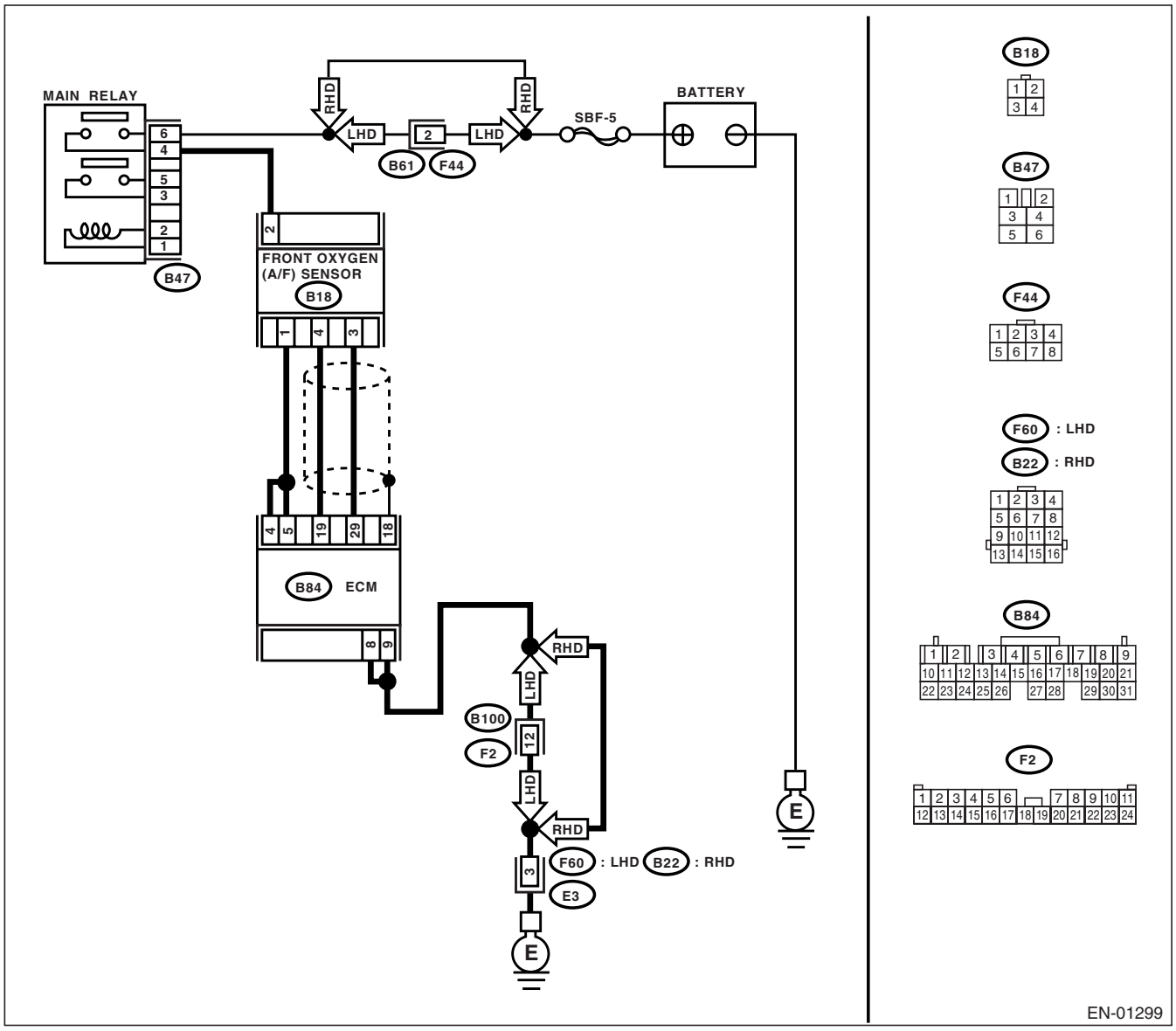
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E: DTC P0032 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1)Turn the ignition switch to ON. 2)Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B84) No. 4 (+) — Chassis ground (−):*** ***(B84) No. 5 (+) — Chassis ground (−):***	Is the voltage more than 8 V?	Go to step **3.**	Go to step **2.**

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	Step	Check	Yes	No
2	**CHECK FRONT OXYGEN (A/F) SENSOR HEATER CURRENT.** 1)Turn the ignition switch to OFF. 2)Repair the battery short circuit in harness between ECM and front oxygen (A/F) sensor connector. 3)Turn the ignition switch to ON. 4)Read the data of front oxygen (A/F) sensor heater current using Subaru Select Monitor or the OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the current more than 2.3 A?	Replace the ECM. <Ref. to FU(H4DOTC)-49, Engine Control Module (ECM).>	END
3	**CHECK OUTPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B84) No. 4 (+) — Chassis ground (−):*** ***(B84) No. 5 (+) — 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.	END

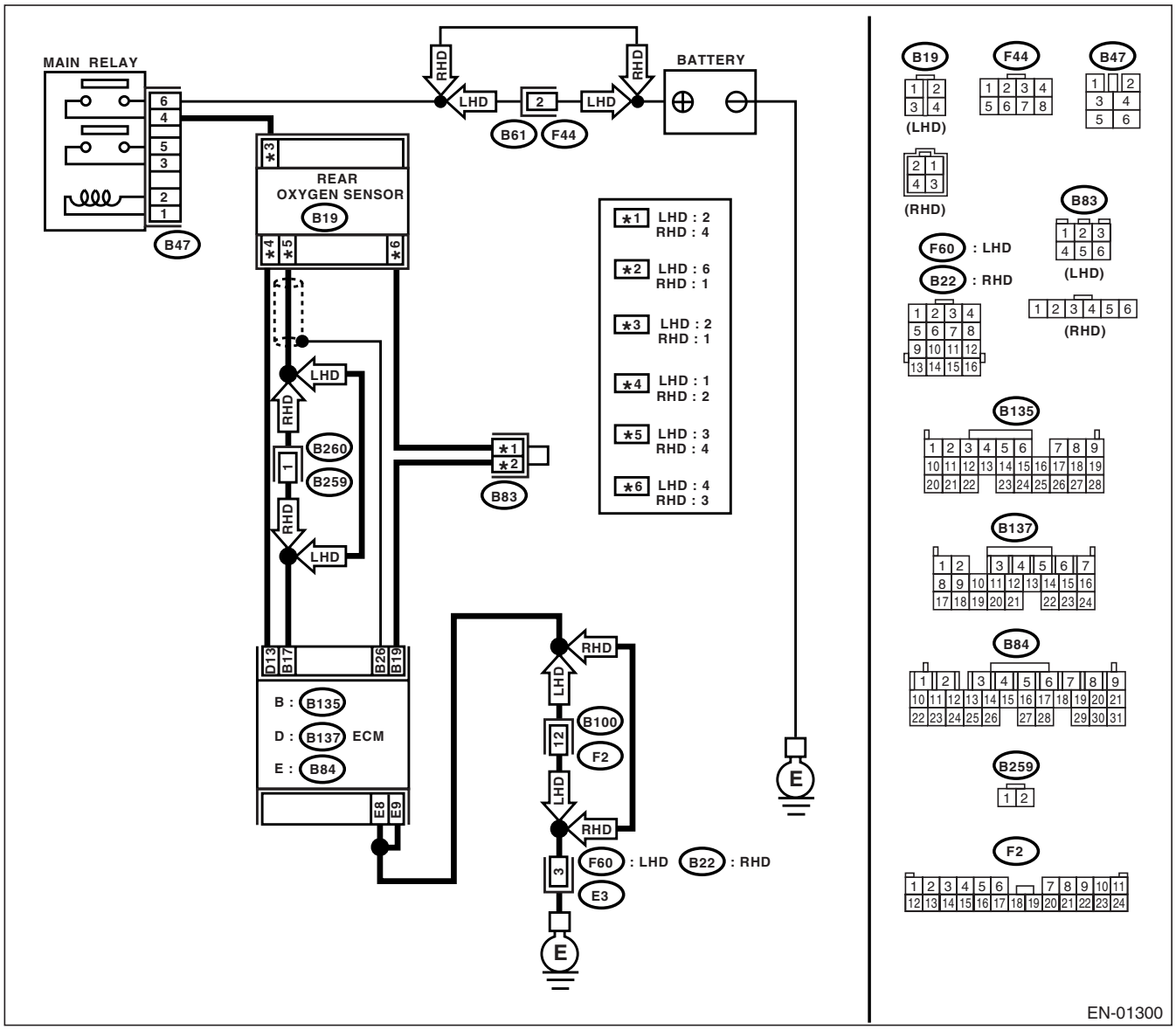
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F: DTC P0037 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2)

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**



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	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*** ***(B84) No. 8 — Chassis ground:*** ***(B84) No. 9 — 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 OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.> •OBD-II scan tool For detailed operation procedures, refer to the OBD-II 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*** ***(B137) No. 13 (+) — 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*** ***(B137) No. 13 (+) — 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*** ***(B137) No. 13 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Replace the ECM. <Ref. to FU(H4DOTC)-49, 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)-49, Engine Control Module (ECM).>

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	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*** ***LHD model*** ***(B19) No. 2 (+) — Chassis ground (−):*** ***RHD model*** ***(B19) No. 1 (+) — 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)-46, Rear Oxygen Sensor.>

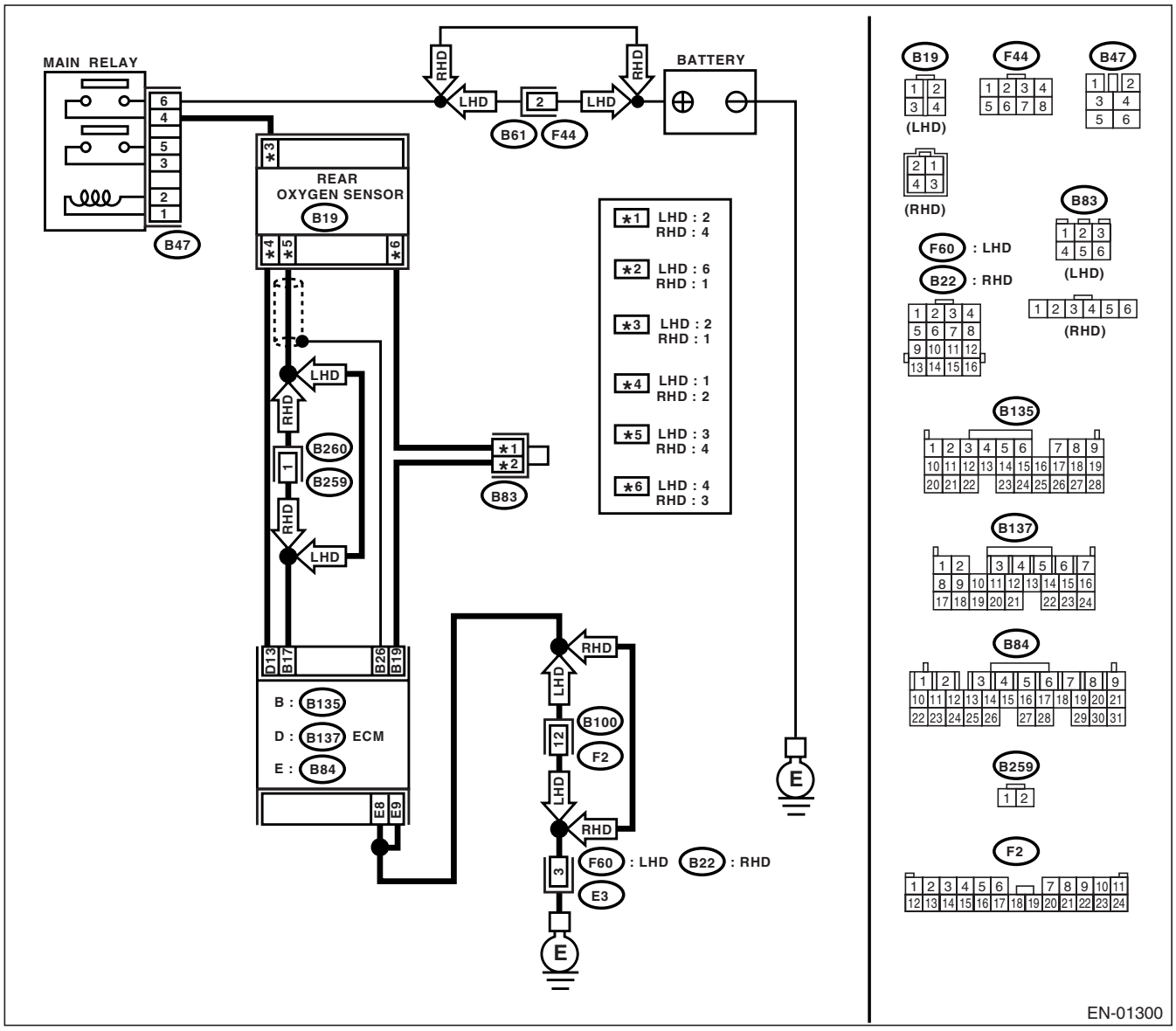
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G: DTC P0038 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**



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*** ***(B137) No. 13 (+) — Chassis ground (−):***	Is the voltage more than 8 V?	Go to step **2.**	Go to step **3.**

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	Step	Check	Yes	No
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 OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the current more than 7 A?	Replace the ECM. <Ref. to FU(H4DOTC)-49, Engine Control Module (ECM).>	END
3	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	END

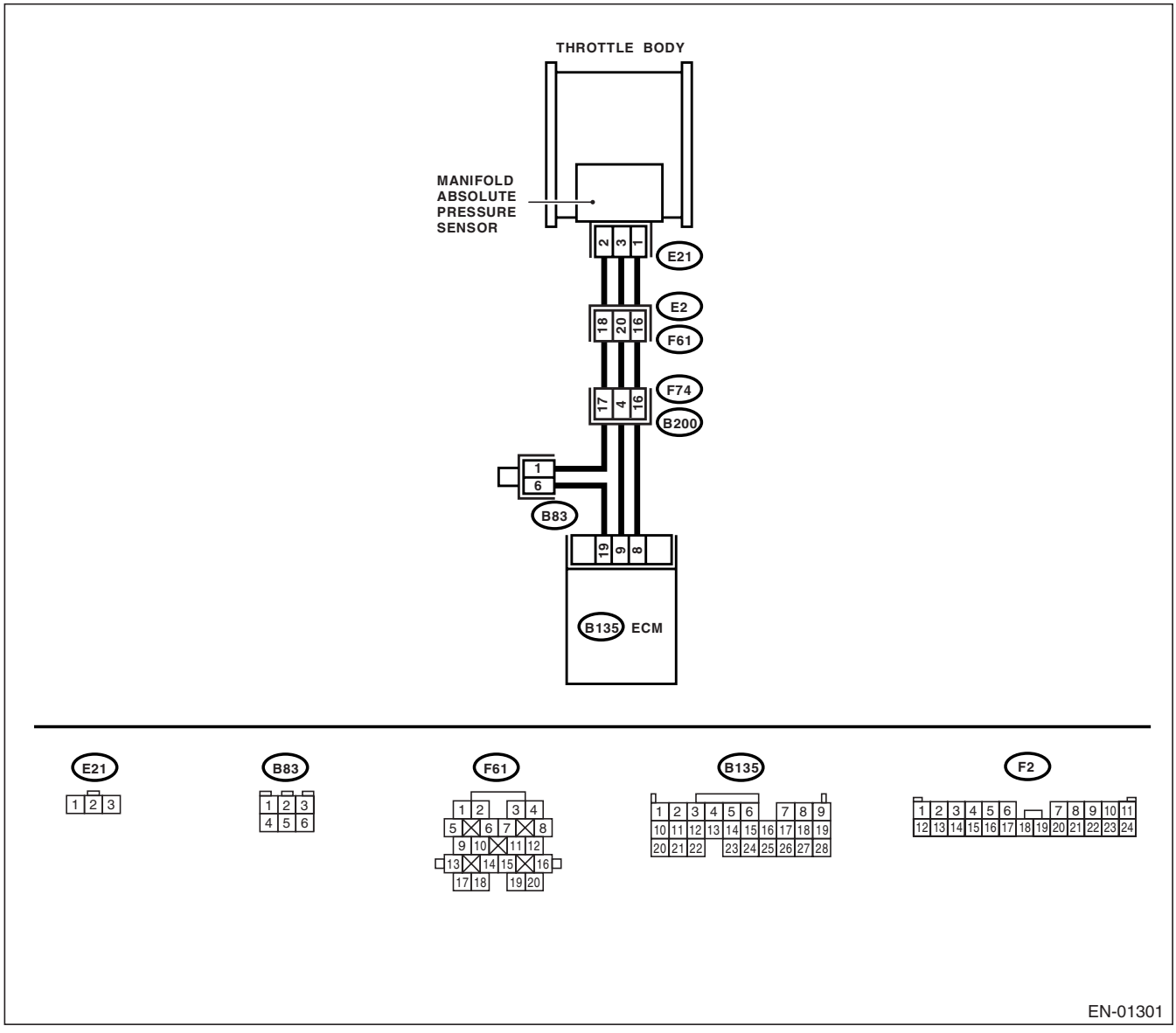
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H: DTC P0068 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT RANGE/PERFORMANCE —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Failure of engine to start

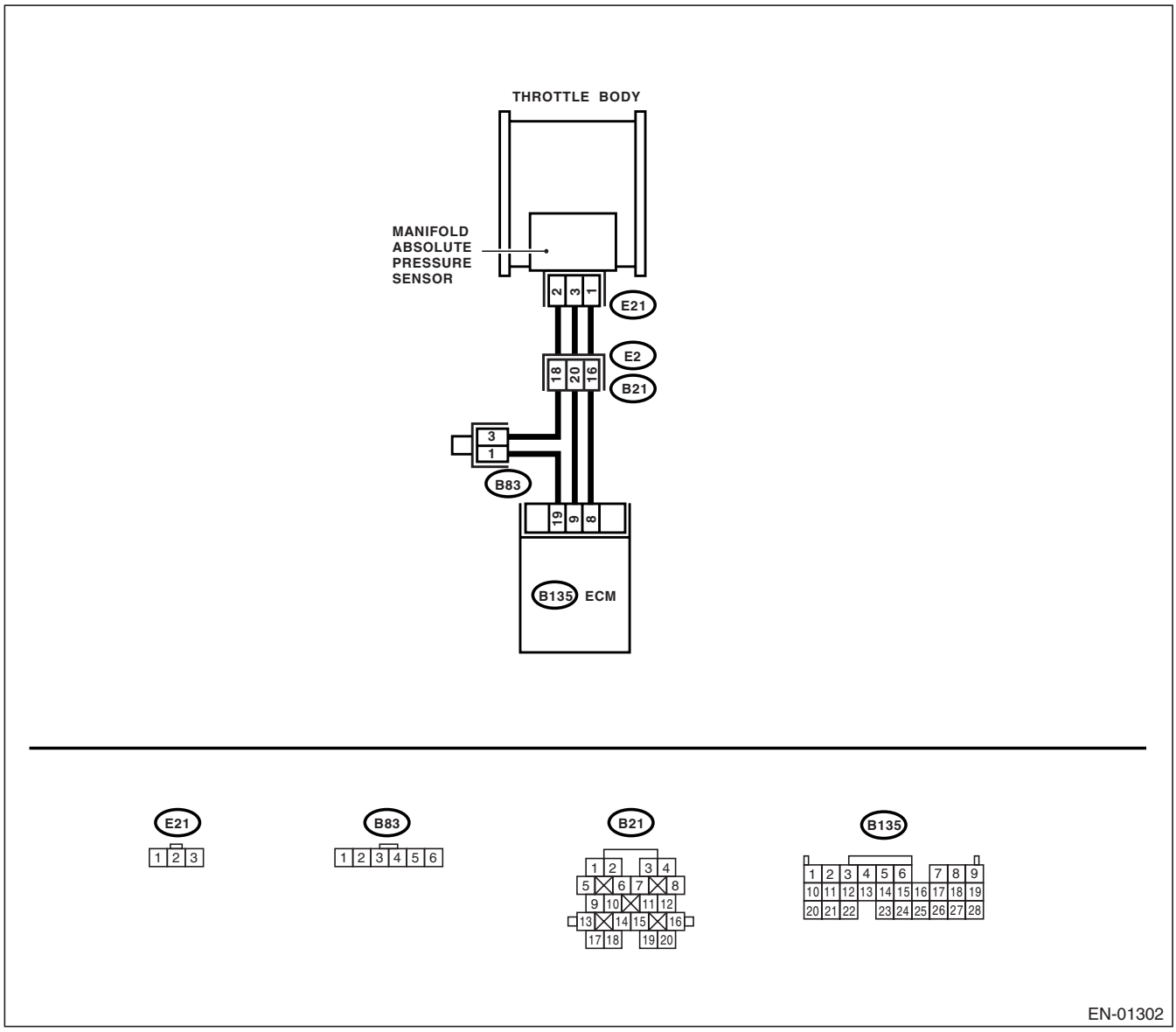
CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**
- **LHD model**



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- **RHD model**



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	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)-32, 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)-124, DTC P0121 — THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT RANGE/PERFORMANCE —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0106.
2	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC. "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)-75, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0106.	Go to step **3.**
3	**CHECK CONDITION OF 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)-35, Manifold Absolute Pressure Sensor.>	Tighten the throttle body installation bolt securely.

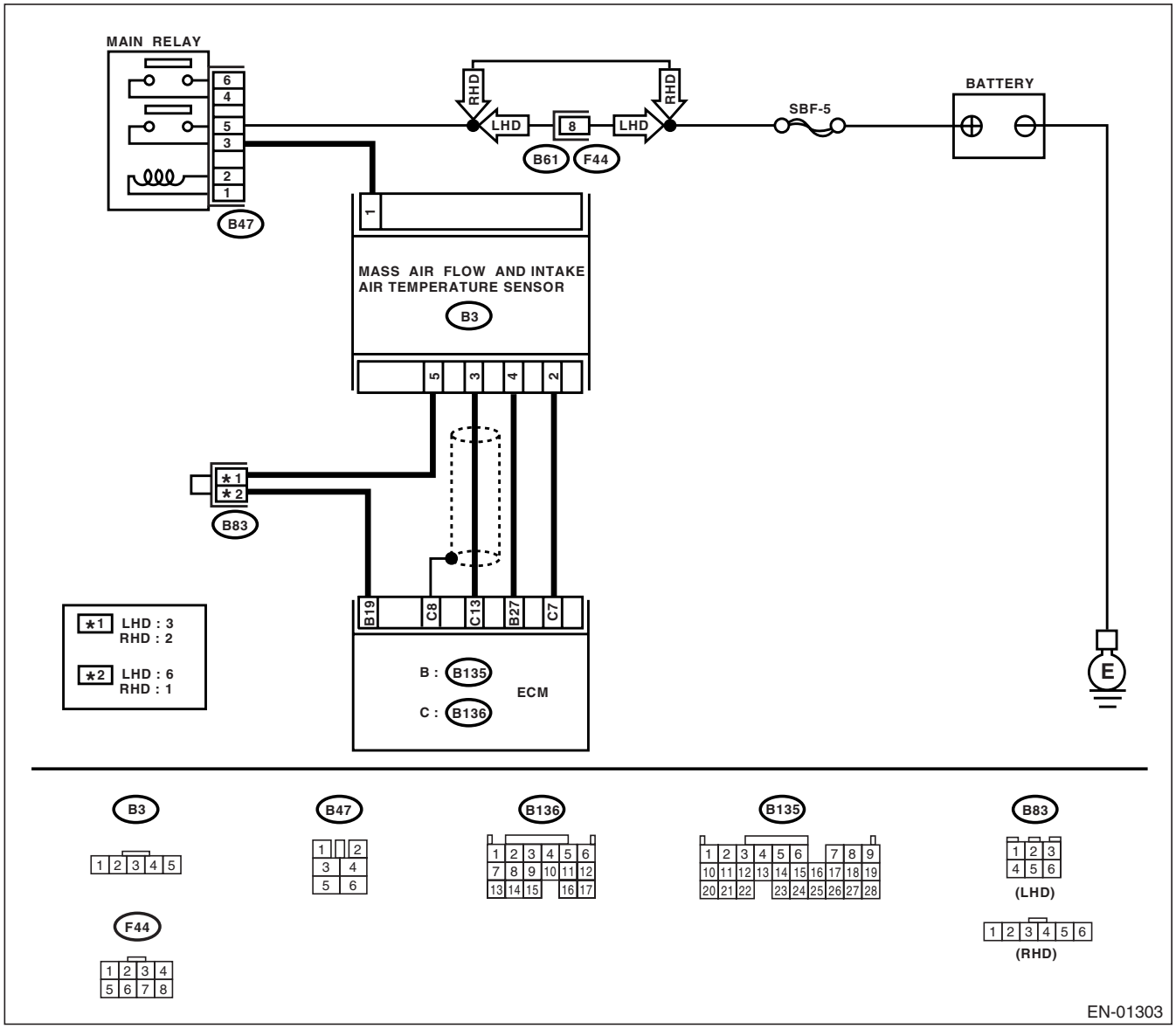
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I: DTC P0101 — MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**



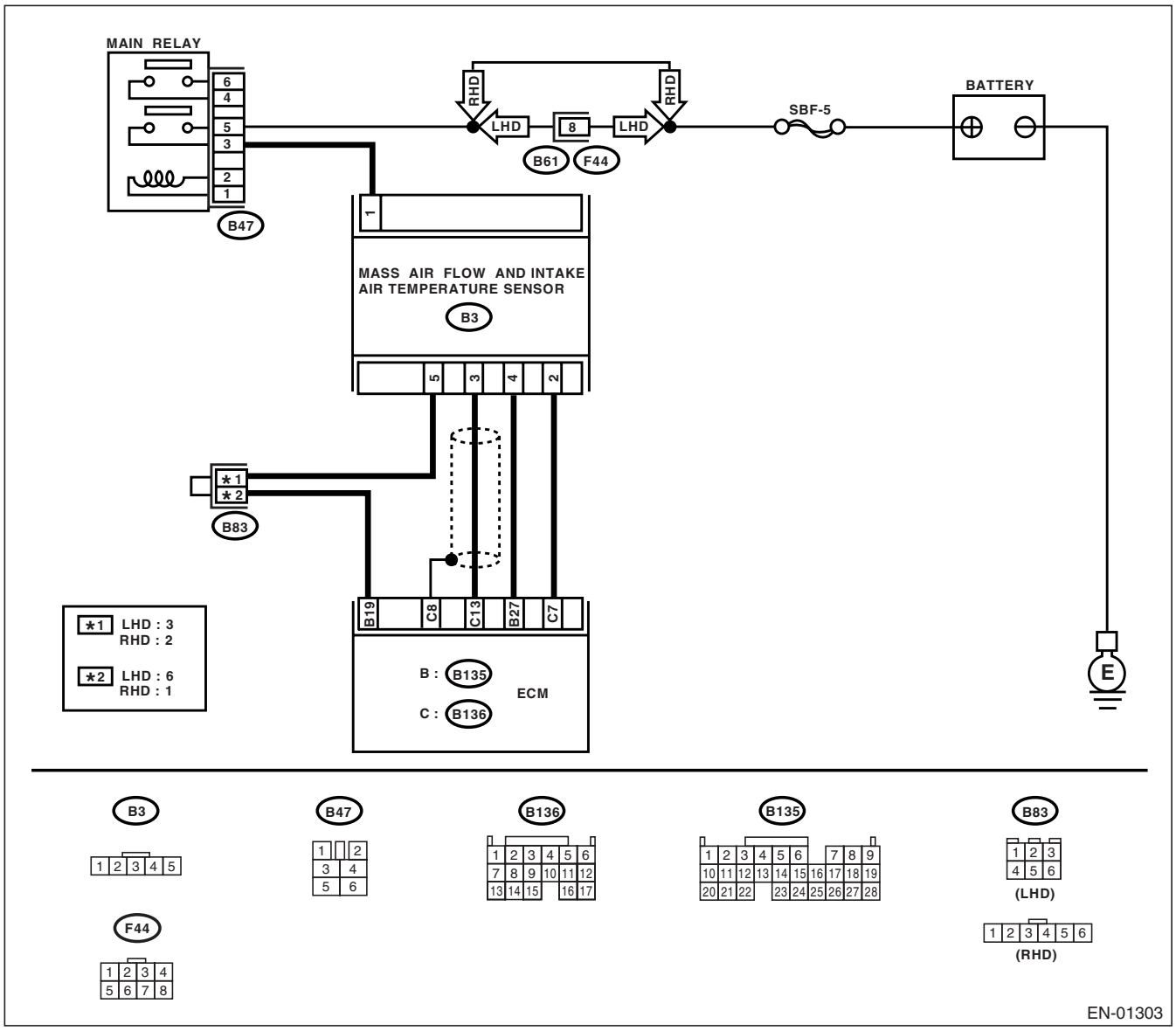
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Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)-75, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0101.	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-34, Mass Air Flow and Intake Air Temperature Sensor.>

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J: DTC P0102 — MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.
  - Poor driving performance
- **WIRING DIAGRAM:**



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	Step	Check	Yes	No
1	**CONNECT SUBARU SELECT MONITOR OR THE OBD-II GENERAL SCAN TOOL, AND READ DATA.** 1)Turn the ignition switch to OFF. 2)Connect the Subaru Select Monitor or OBD-II general scan tool to data link connector. 3)Turn the ignition switch to ON and Subaru Select Monitor or the OBD-II general scan tool switch to ON. 4)Start the engine. 5)Read the mass air flow sensor voltage using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II 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*** ***(B136) No. 13 (+) — Chassis ground (−):***	Is the voltage less than 0.2 V?	Go to step **4.**	Go to step **3.**
3	**CHECK INPUT SIGNAL FOR ECM (USING SUBARU SELECT MONITOR).** Measure 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 Subaru distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4	**CHECK POWER SUPPLY TO MASS AIR FLOW SENSOR.** 1)Turn 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.

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	Step	Check	Yes	No
5	**CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW SENSOR CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ECM. 3)Measure the resistance of harness between ECM and mass air flow sensor connector. ***Connector & terminal*** ***(B136) No. 13 — (B3) No. 3:*** ***(B136) No. 7 — (B3) No. 2:*** ***(B135) No. 19 — (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.
6	**CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW SENSOR CONNECTOR** Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 13 — Chassis ground:*** ***(B136) No. 7 — Chassis ground:*** ***(B135) No. 19 — Chassis ground:***	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)-34, Mass Air Flow and Intake Air Temperature Sensor.>

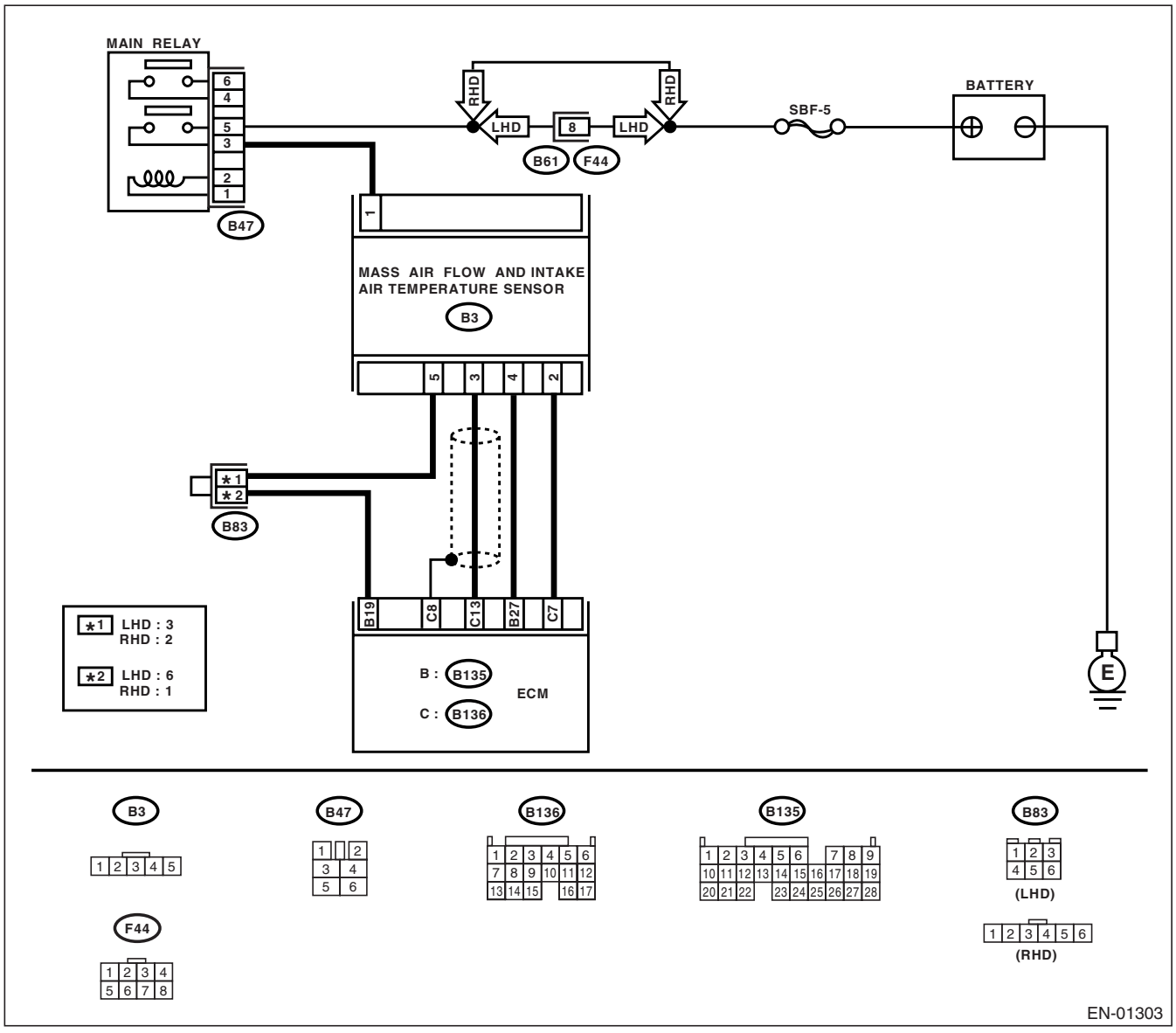
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K: DTC P0103 — MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**



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	Step	Check	Yes	No
1	**CONNECT SUBARU SELECT MONITOR OR THE OBD-II GENERAL SCAN TOOL, AND READ DATA.** 1)Turn the ignition switch to OFF. 2)Connect the Subaru Select Monitor or OBD-II general scan tool to data link connector. 3)Turn the ignition switch to ON and Subaru Select Monitor or OBD-II general scan tool switch to ON. 4)Start the engine. 5)Read the mass air flow sensor voltage using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II 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 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 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 sensor connector. ***Connector & terminal*** ***(B3) No. 2 — (B136) No. 7:***	Is the resistance less than 1 Ω?	Replace the mass air flow sensor.<Ref. to FU(H4DOTC)-34, Mass Air Flow and Intake Air Temperature Sensor.>	Repair the open harness between mass air flow sensor connector and ECM connector.

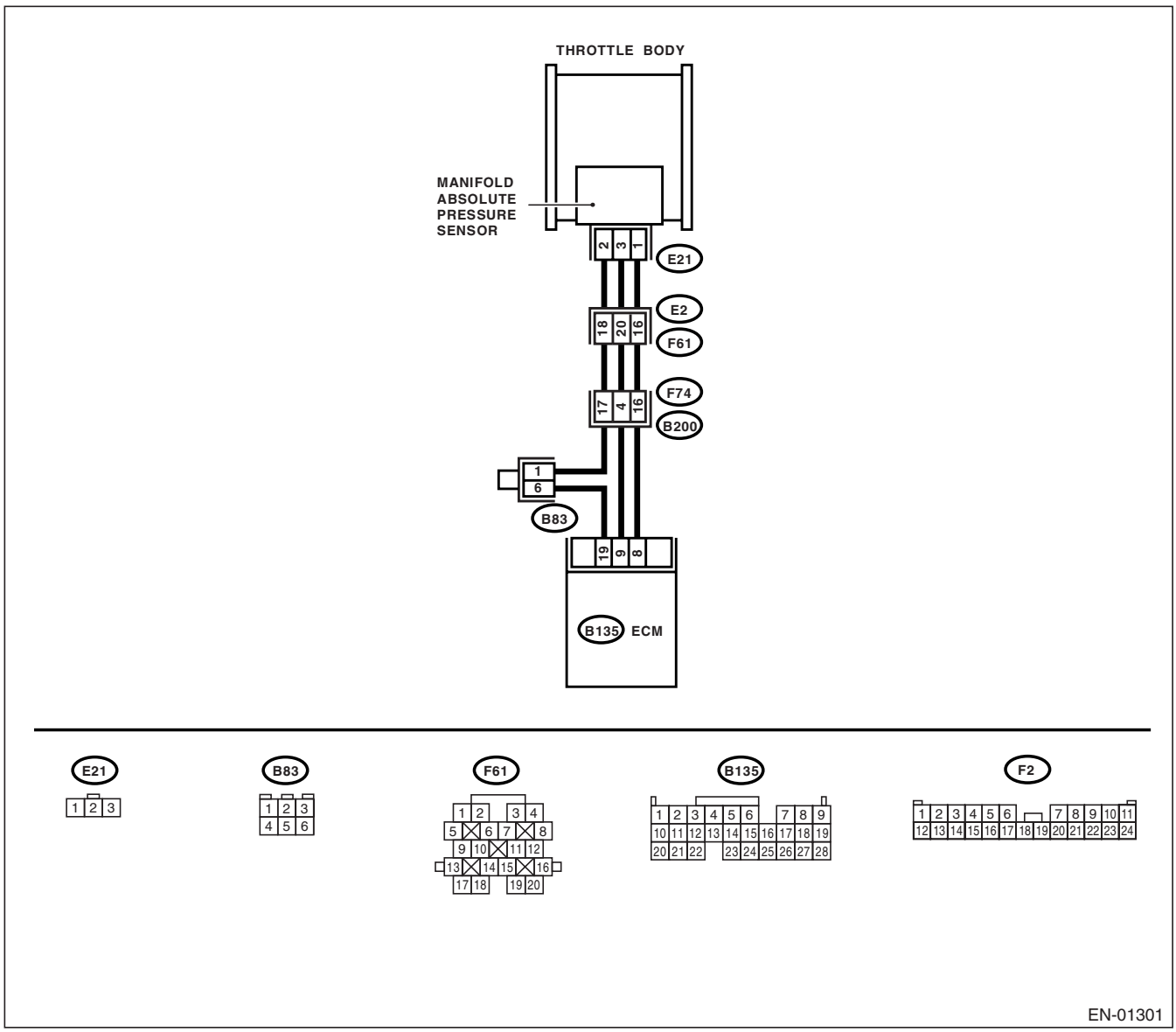
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L: DTC P0107 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

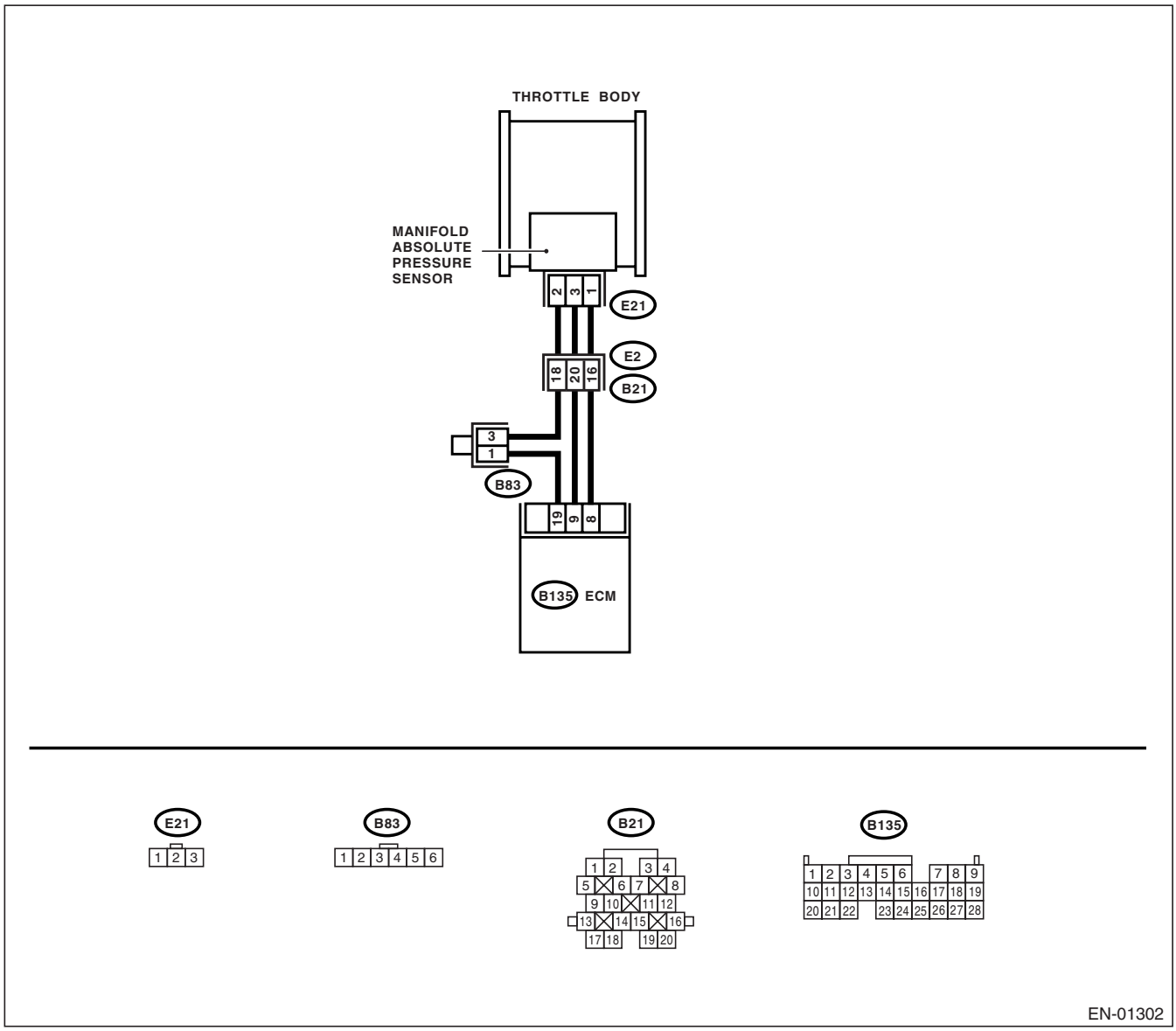
CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**
- **LHD model**



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- **RHD model**



	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 9 (+) — Chassis ground (−):***	Is the voltage more than 4.5 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*** ***(B135) No. 9 (+) — 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 Subaru distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

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	Step	Check	Yes	No
3	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 8 (+) — Chassis ground (−):***	Is the voltage less than 0.7 V?	Go to step **4.**	Contact your Subaru distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
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*** ***(B135) No. 19 — (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 MΩ?	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)-35, Manifold Absolute Pressure Sensor.>

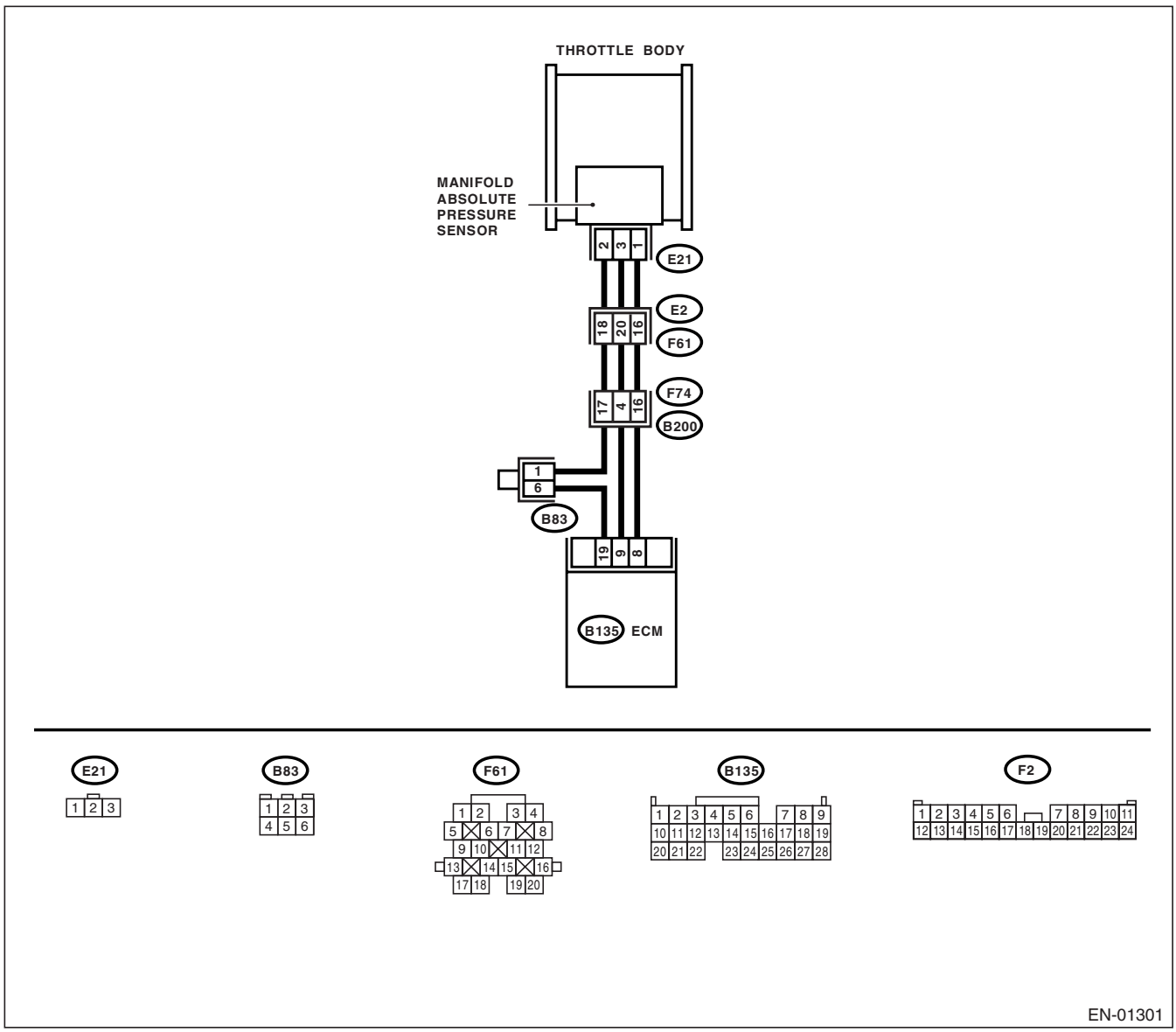
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M: DTC P0108 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

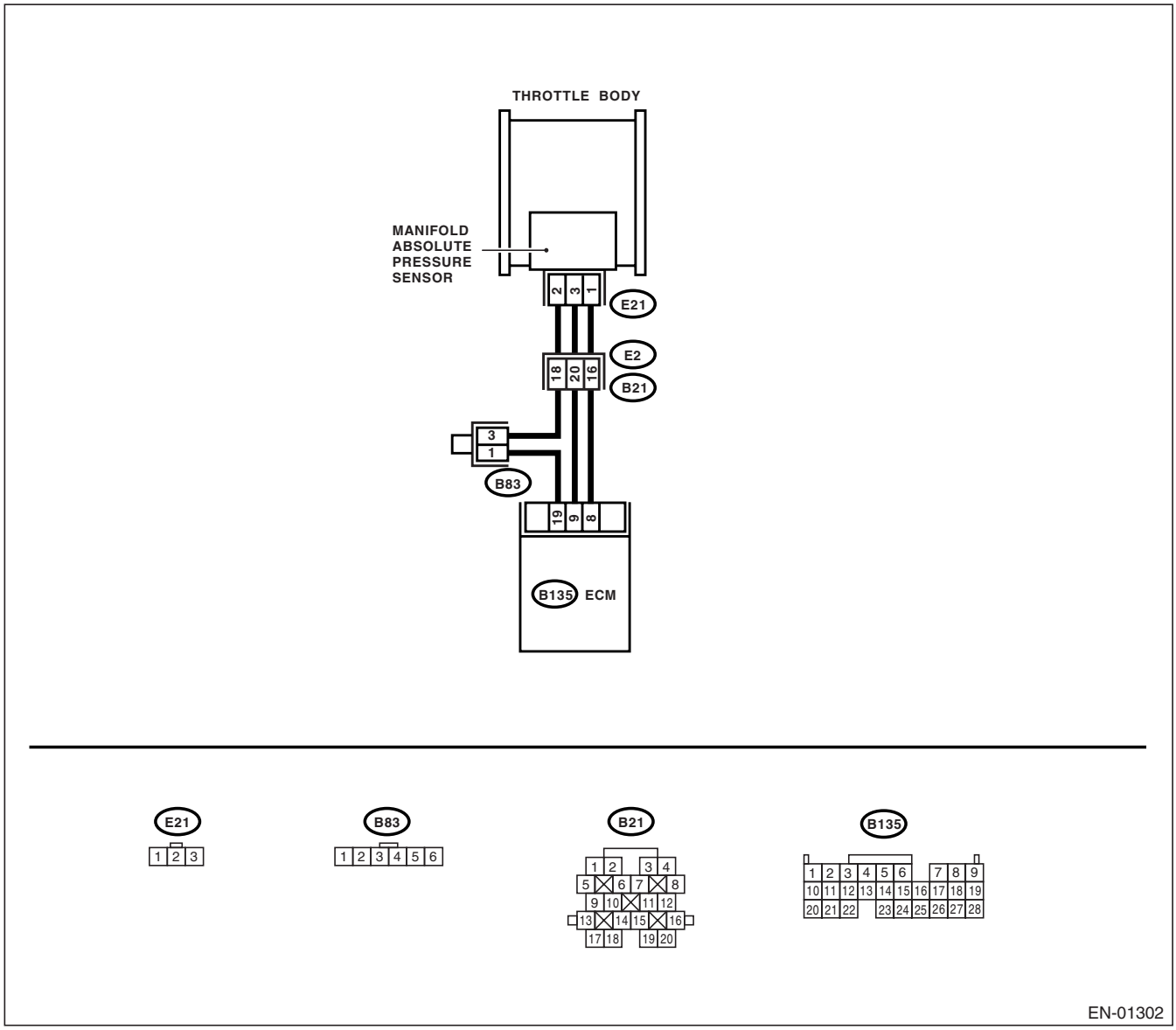
CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**
- **LHD model**



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- **RHD model**



	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 9 (+) — Chassis ground (−):***	Is the voltage more than 4.5 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*** ***(B135) No. 9 (+) — 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 Subaru distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

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	Step	Check	Yes	No
3	**CHECK INPUT SIGNAL FOR ECM.** 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 **4.**	Contact your Subaru distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
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*** ***(B135) No. 8 — (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*** ***(B135) No. 19 — (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)-35, Manifold Absolute Pressure Sensor.>

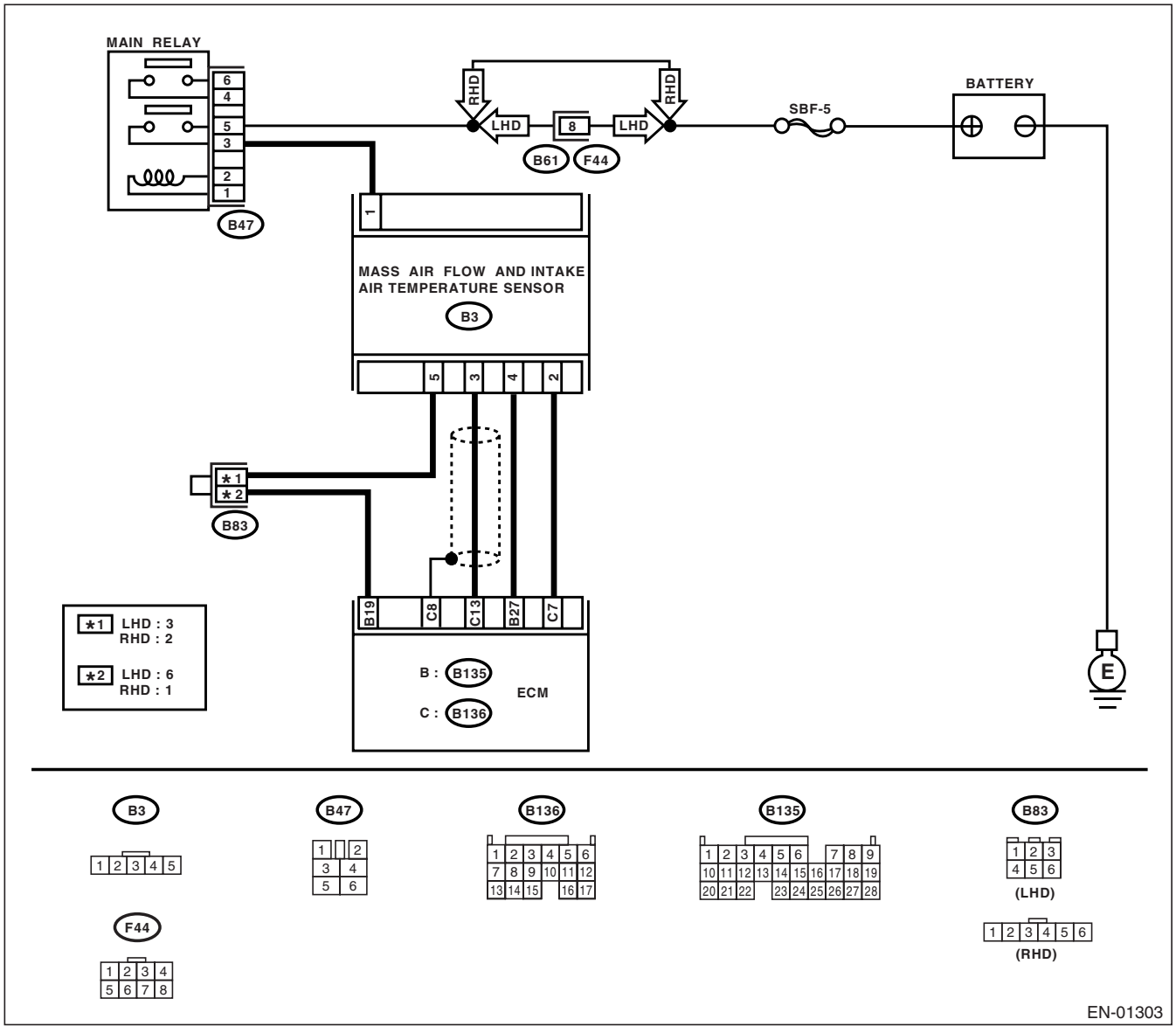
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N: DTC P0111 — INTAKE AIR TEMPERATURE CIRCUIT RANGE/PERFORMANCE —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**



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	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)-75, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0111.	Go to step **2.**
2	**CHECK ENGINE COOLANT TEMPERATURE.** 1)Start the engine and warm it up completely. 2)Measure the engine coolant temperature using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the engine coolant temperature 75°C (167°F) — 95°C (203°F)?	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-34, Mass Air Flow and Intake Air Temperature Sensor.>	Inspect the DTC P0125 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)-75, List of Diagnostic Trouble Code (DTC).>

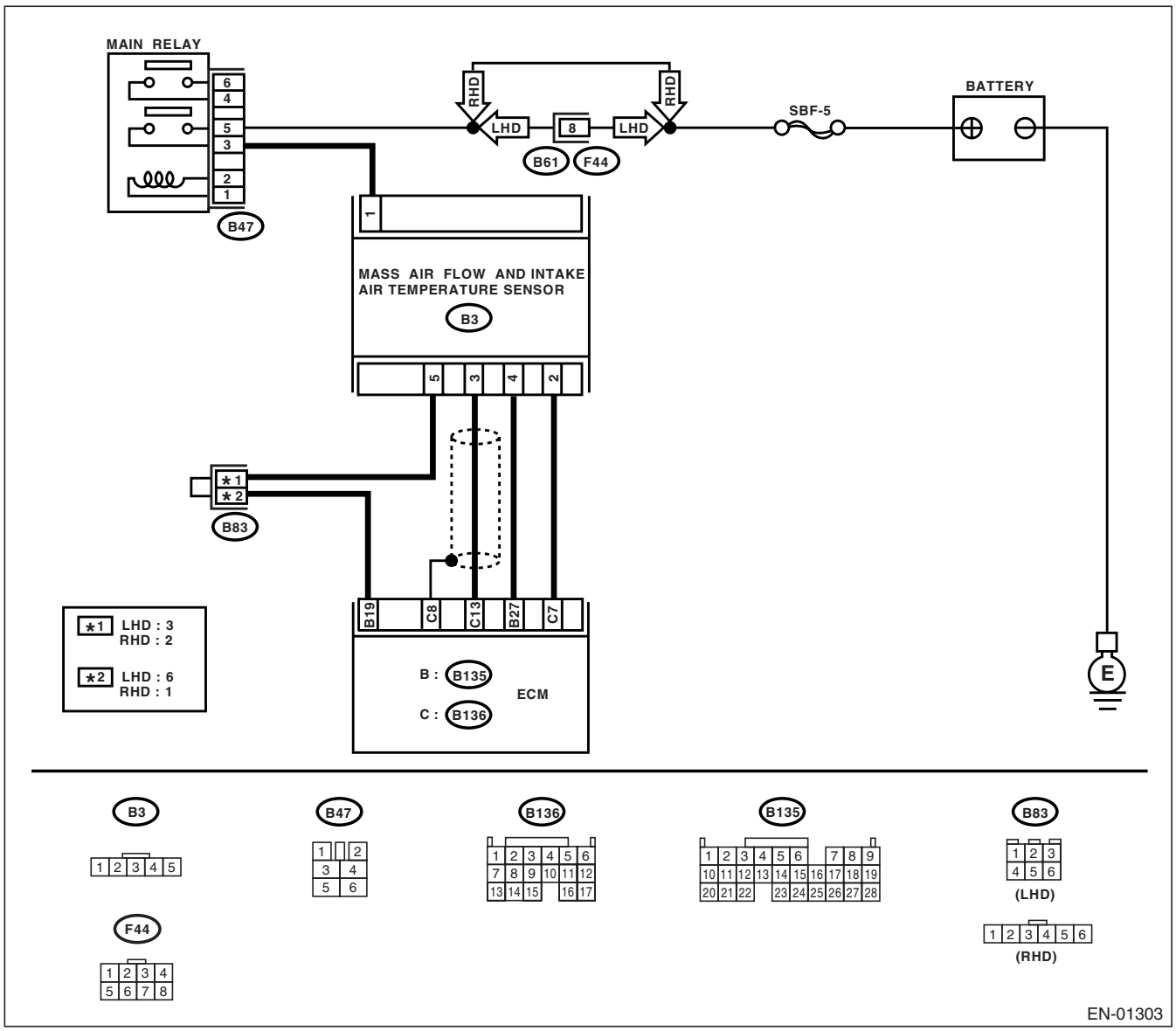
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O: DTC P0112 — INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**



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	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 OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II 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 OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II 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)-34, 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.

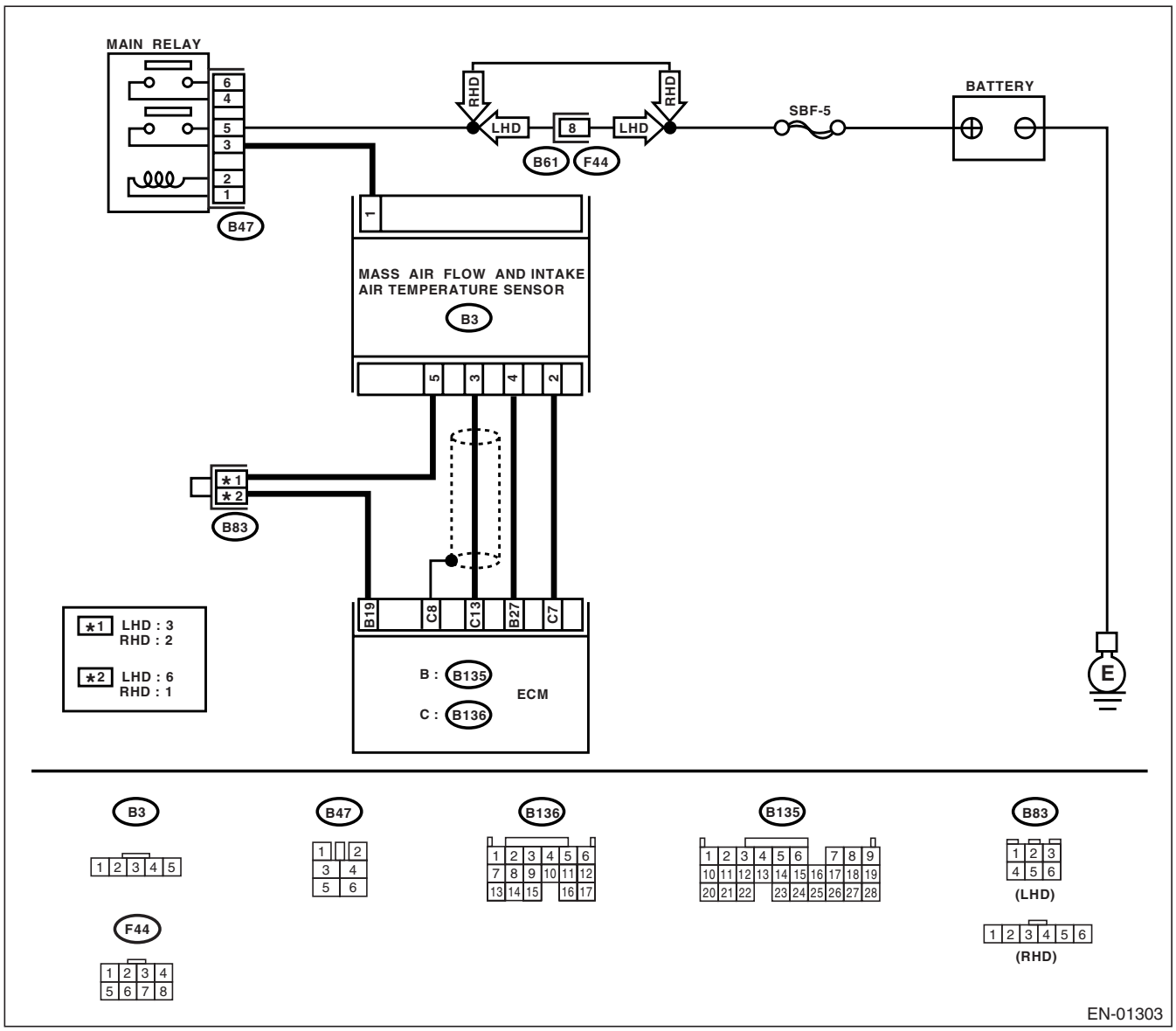
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P: DTC P0113 — INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**



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	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 OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II 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

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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)-34, 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

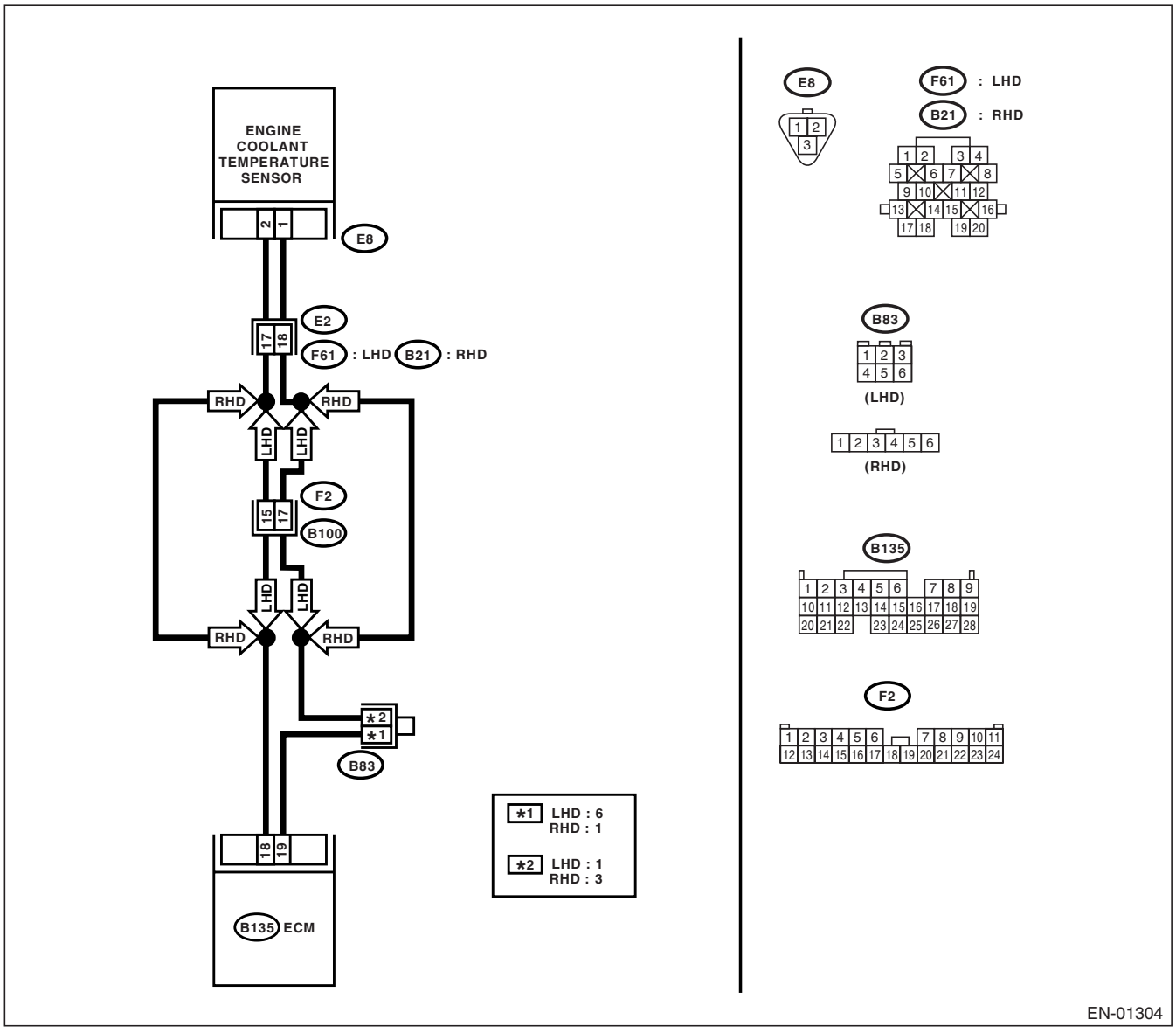
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Q: DTC P0117 — ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Hard to start
  - Erroneous idling
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**



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	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 OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II 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 OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the temperature less than –40°C (–40°F)?	Replace the engine coolant temperature sensor. <Ref. to FU(H4DOTC)-28, Engine Coolant Temperature Sensor.>	Repair the ground short circuit in harness between engine coolant temperature sensor and ECM connector.

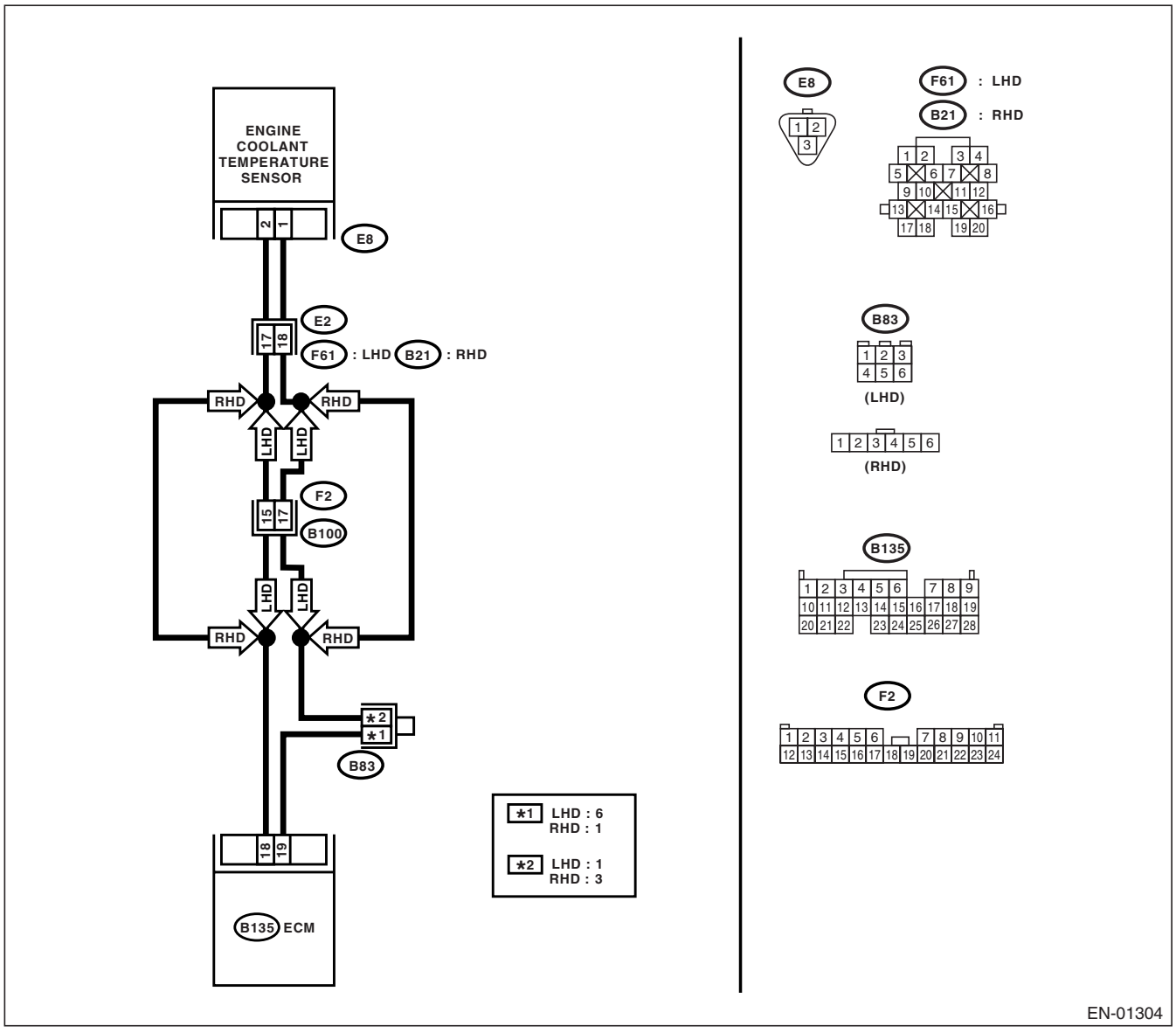
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R: DTC P0118 — ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Hard to start
  - Erroneous idling
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**



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	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 OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II 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

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	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)-28, 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

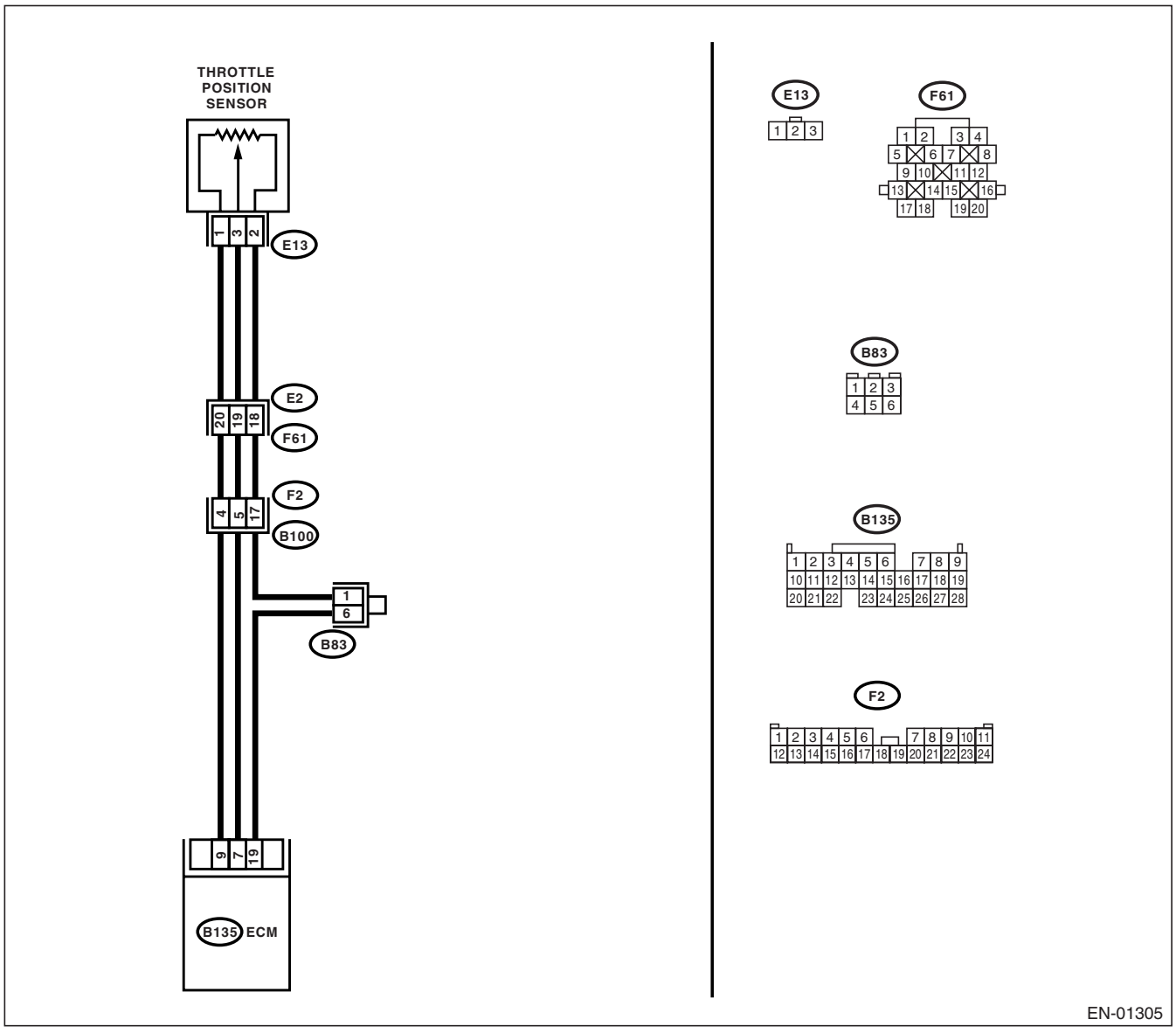
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S: DTC P0121 — THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT RANGE/PERFORMANCE —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.
  - Poor driving performance
  - Fuel is cut.

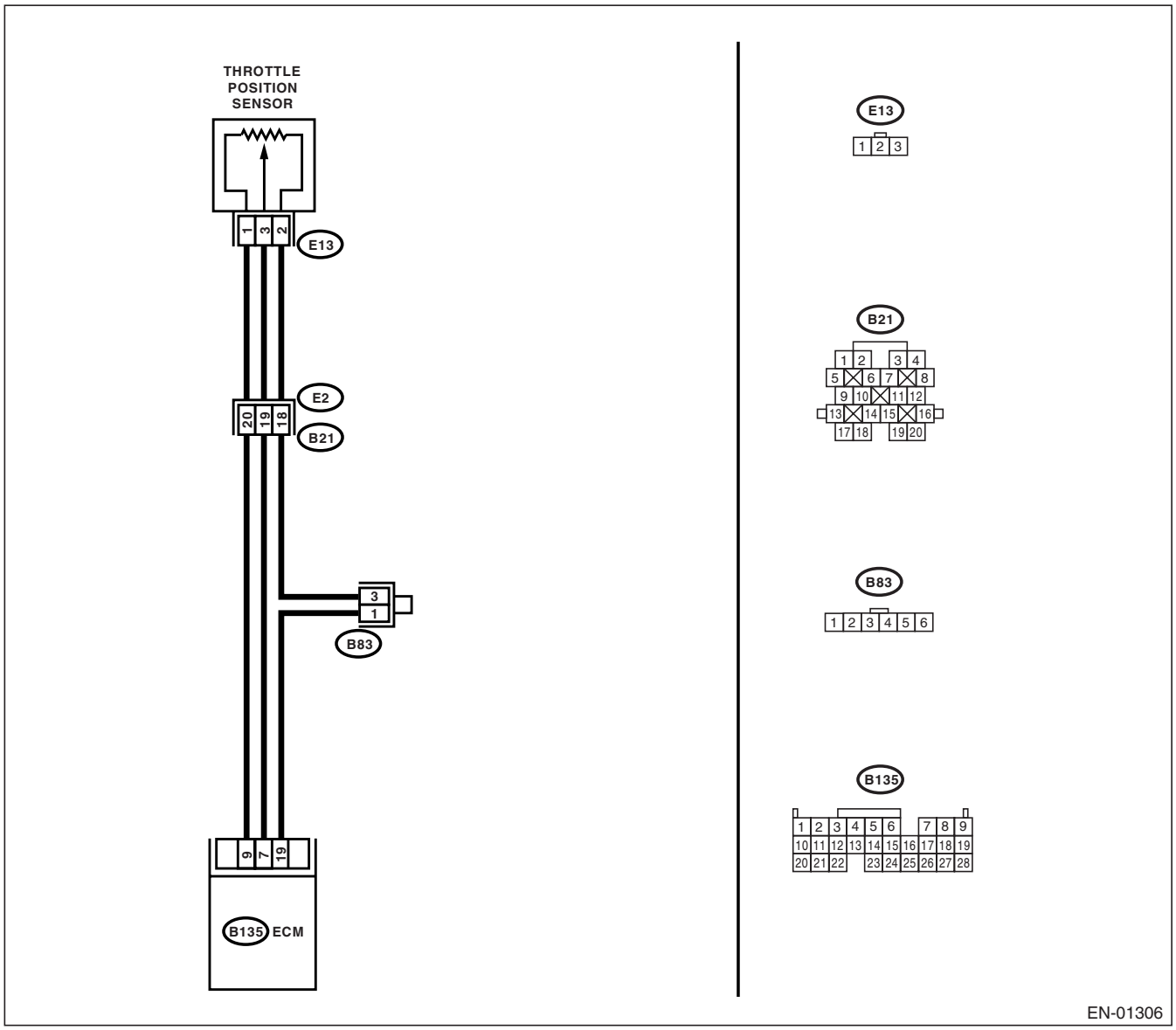
CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**
- **LHD model**



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- **RHD model**



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)-75, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0121.	Replace the throttle position sensor. <Ref. to FU(H4DOTC)-33, Throttle Position Sensor.>

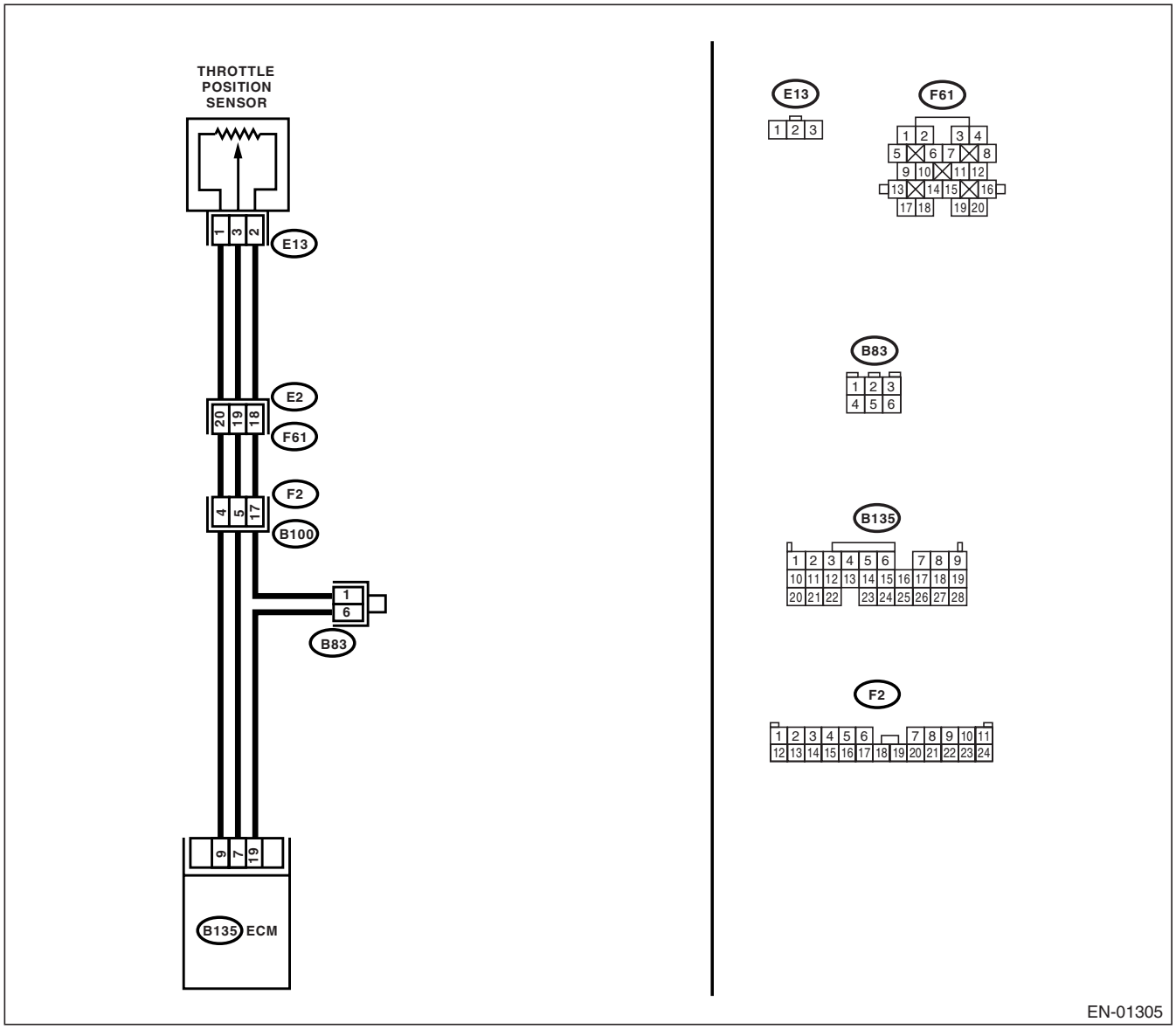
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T: DTC P0122 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.
  - Poor driving performance

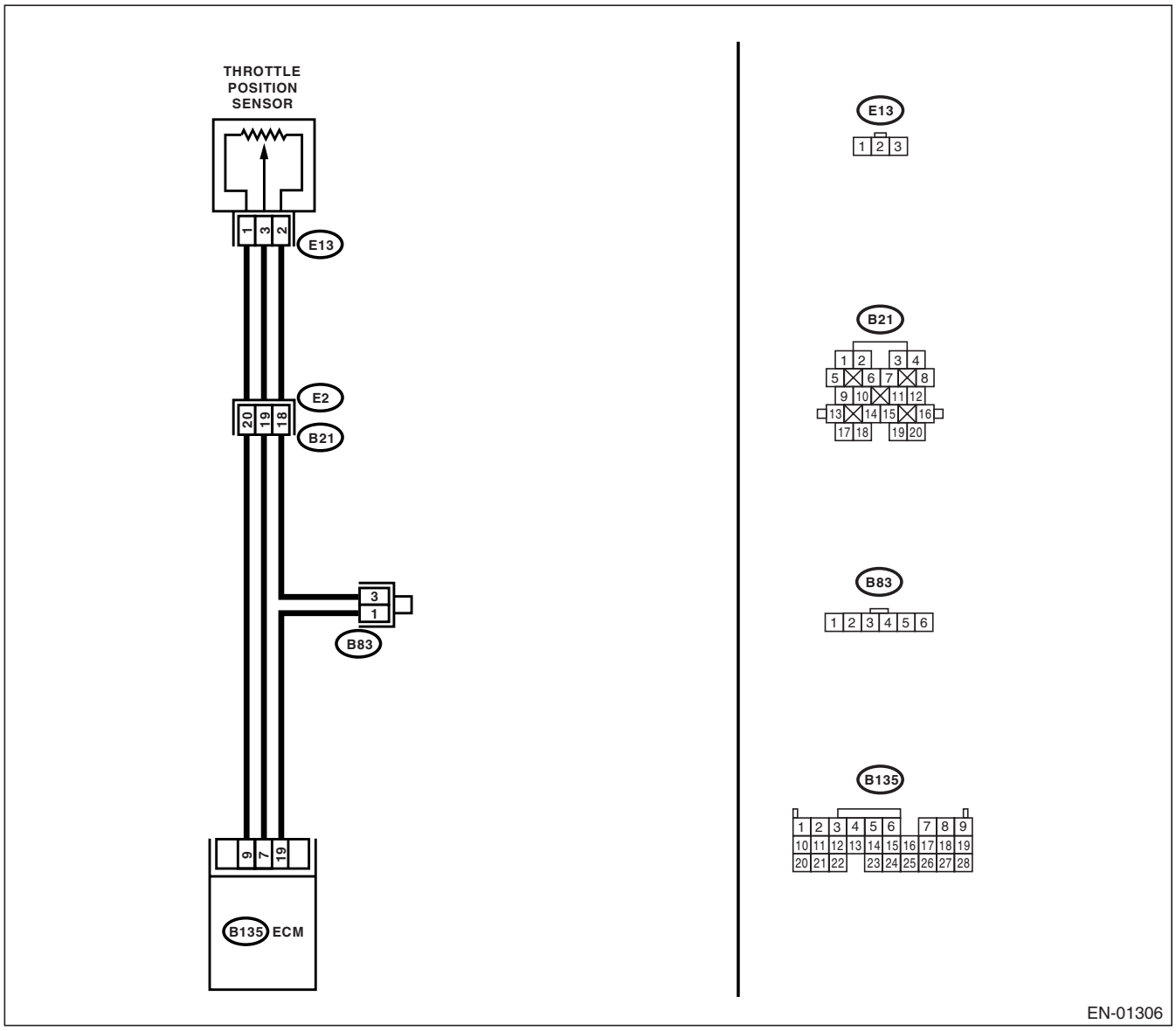
CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**
- **LHD model**



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- **RHD model**



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	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1)Start the engine. 2)Read the data of throttle position sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the voltage less than 0.15 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 throttle position sensor connector • Poor contact in ECM connector • Poor contact in coupling connector
2	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground while throttle valve is fully closed. ***Connector & terminal*** ***(B135) No. 9 (+) — Chassis ground (−):***	Is the voltage more than 4.5 V?	Go to step **4.**	Go to step **3.**
3	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 9 (+) — Chassis ground (−):***	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 Subaru distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 7 (+) — Chassis ground (−):***	Is the voltage less than 0.15 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.**

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	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN ECM AND THROTTLE POSITION SENSOR CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from throttle position sensor. 3)Turn the ignition switch to ON. 4)Measure the voltage between throttle position sensor connector and engine ground. ***Connector & terminal*** ***(E13) 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 throttle position sensor and ECM connector • Poor contact in throttle position sensor connector • Poor contact in ECM connector • Poor contact in coupling connector • Poor contact in joint connector
7	**CHECK HARNESS BETWEEN ECM AND THROTTLE POSITION SENSOR CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Measure the resistance of harness between ECM connector and throttle position sensor connector. ***Connector & terminal*** ***(B135) No. 7 — (E13) No. 3:***	Is the resistance less than 1 Ω?	Go to step **8.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between throttle position sensor and ECM connector • Poor contact in ECM connector • Poor contact in throttle position sensor connector • Poor contact in coupling connector
8	**CHECK HARNESS BETWEEN ECM AND THROTTLE POSITION SENSOR CONNECTOR.** Measure the resistance of harness between throttle position sensor connector and engine ground. ***Connector & terminal*** ***(E13) No. 3 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **9.**	Repair the ground short circuit in harness between throttle position sensor and ECM connector.
9	**CHECK POOR CONTACT.** Check poor contact in throttle position sensor connector.	Is there poor contact in throttle position sensor connector?	Repair the poor contact in throttle position sensor connector.	Replace the throttle position sensor. <Ref. to FU(H4DOTC)-33, Throttle Position Sensor.>

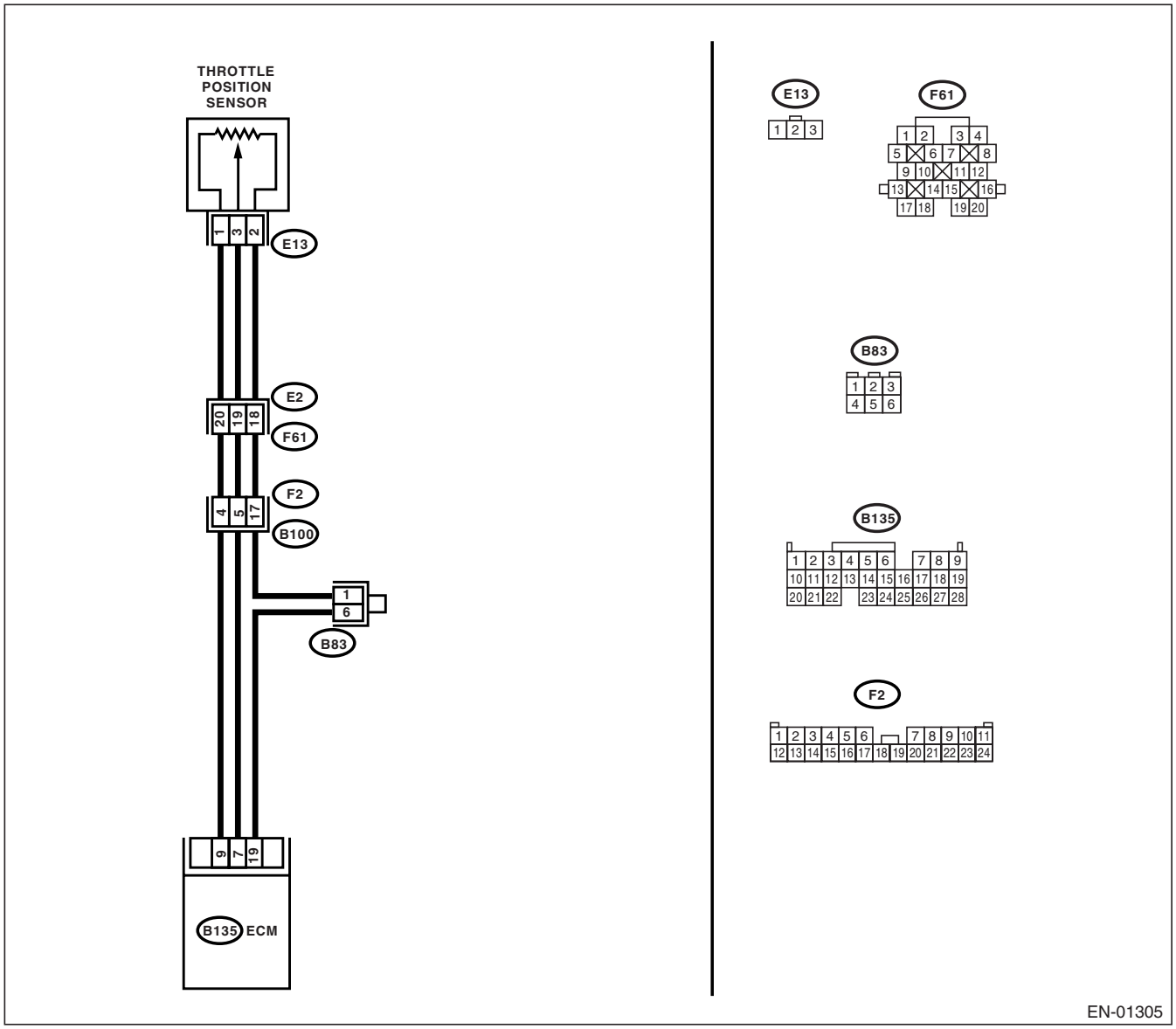
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U: DTC P0123 — THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.
  - Poor driving performance

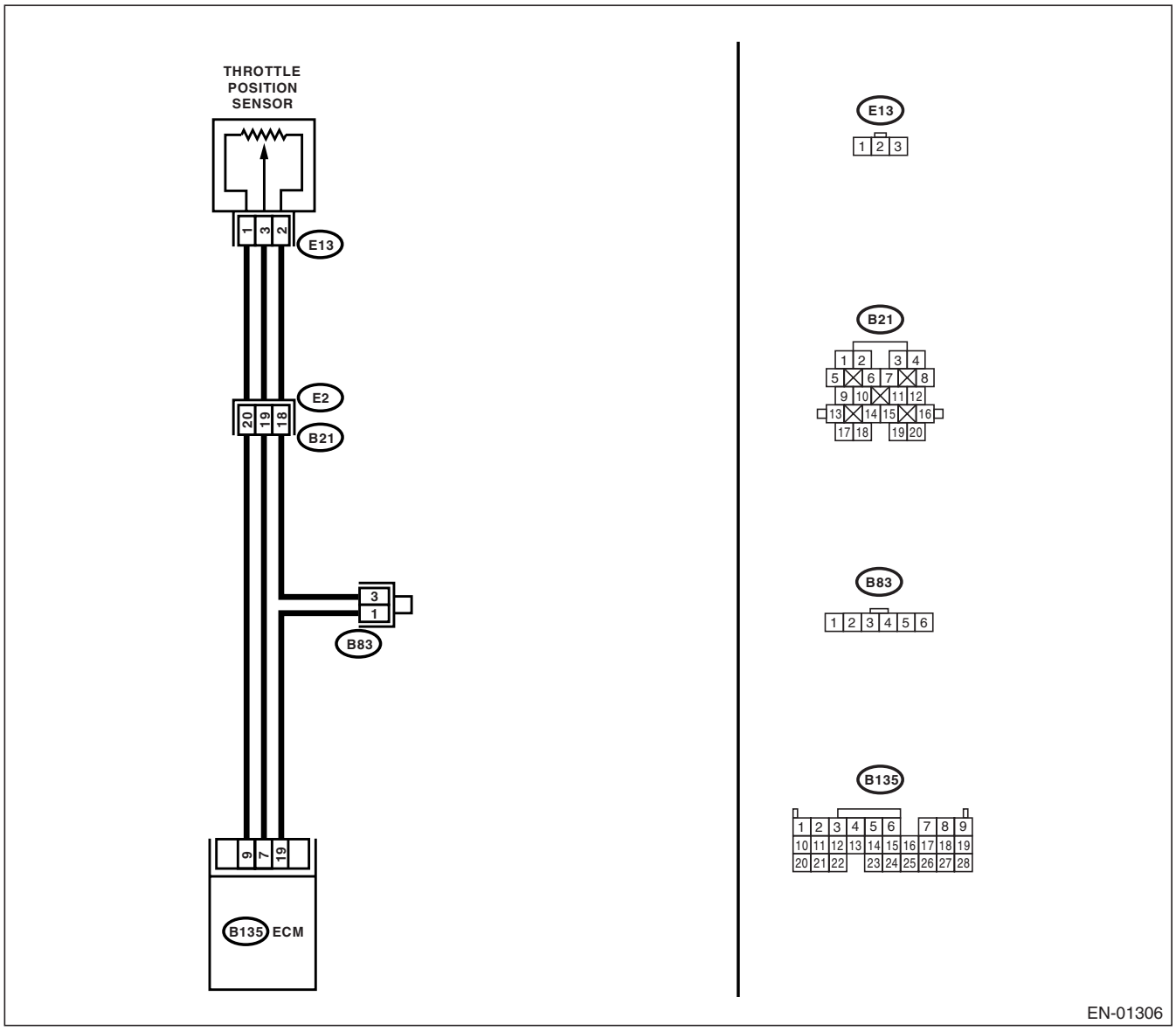
CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**
- **LHD model**



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- **RHD model**



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	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1)Start the engine. 2)Read the data of throttle position sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the voltage more than 4.7 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 throttle position sensor connector • Poor contact in ECM connector • Poor contact in coupling connector
2	**CHECK HARNESS BETWEEN THROTTLE POSITION SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from throttle position sensor. 3)Measure the resistance of harness between throttle position sensor connector and engine ground. ***Connector & terminal*** ***(E13) 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 throttle position sensor and ECM connector • Poor contact in coupling connector • Poor contact in joint connector
3	**CHECK HARNESS BETWEEN THROTTLE POSITION SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to ON. 2)Measure the voltage between throttle position sensor connector and engine ground. ***Connector & terminal*** ***(E13) No. 3 (+) — Engine ground (−):***	Is the voltage more than 4.7 V?	Repair the battery short circuit in harness between throttle position sensor and ECM connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-49, Engine Control Module (ECM).>	Replace the throttle position sensor. <Ref. to FU(H4DOTC)-33, Throttle Position Sensor.>

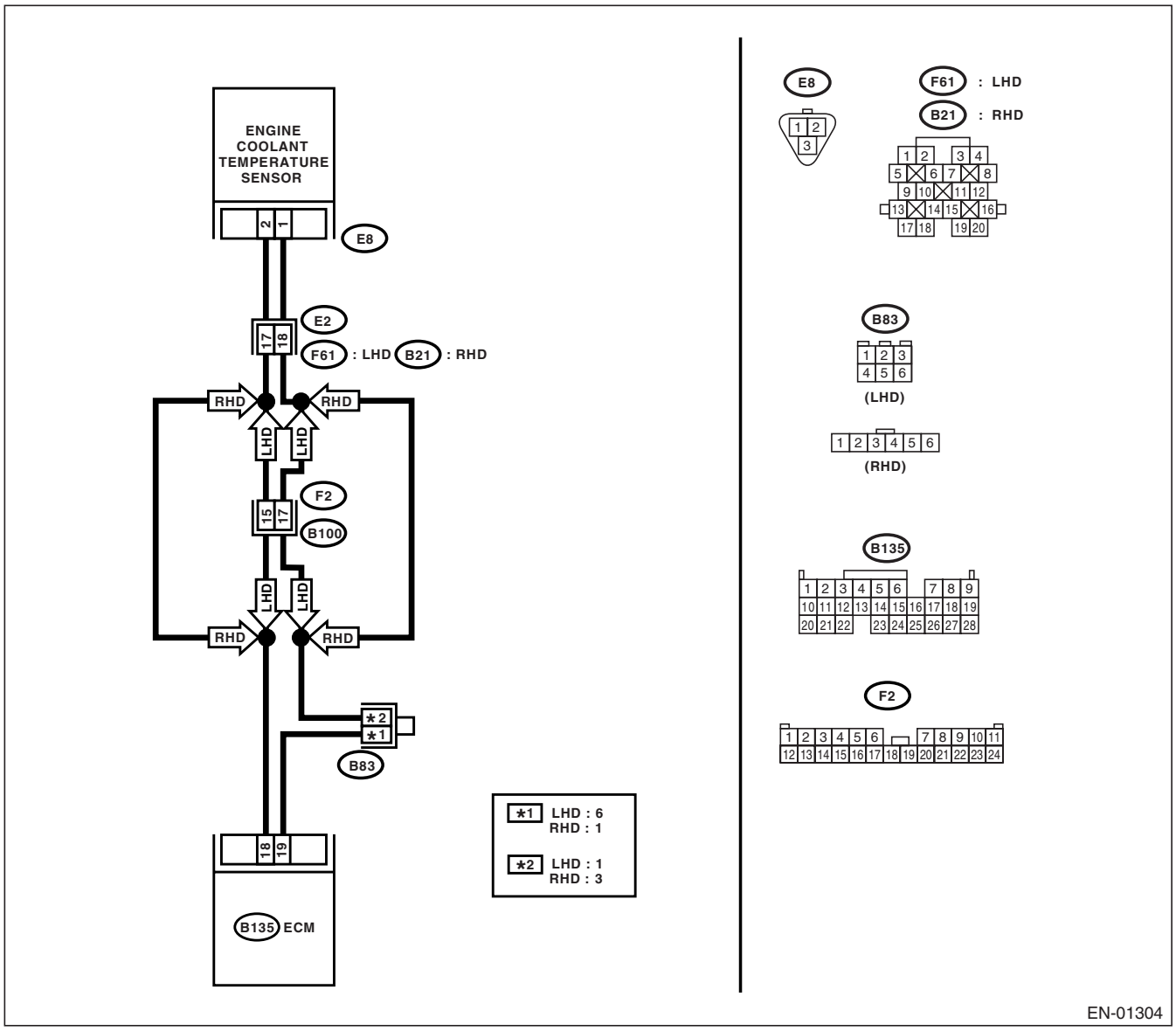
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V: DTC P0125 — INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Engine will not return to idling.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**



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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)-75, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0125.	Go to step **2.**
2	**CHECK ENGINE COOLING SYSTEM.** NOTE: Check the following items. •Thermostat open stuck •Coolant level •Coolant freeze •Tire diameter	Is there a fault in engine cooling system?	Replace the thermostat. <Ref. to CO(H4SO)-19, Thermostat.>	Replace the engine coolant temperature sensor. <Ref. to FU(H4DOTC)-28, Engine Coolant Temperature Sensor.>

W: DTC P0129 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, 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)-75, List of Diagnostic Trouble Code (DTC).> NOTE: It is not necessary to inspect DTC P0129.	Replace the ECM. <Ref. to FU(H4DOTC)-49, Engine Control Module (ECM).> NOTE: Atmospheric pressure sensor is built into ECM.

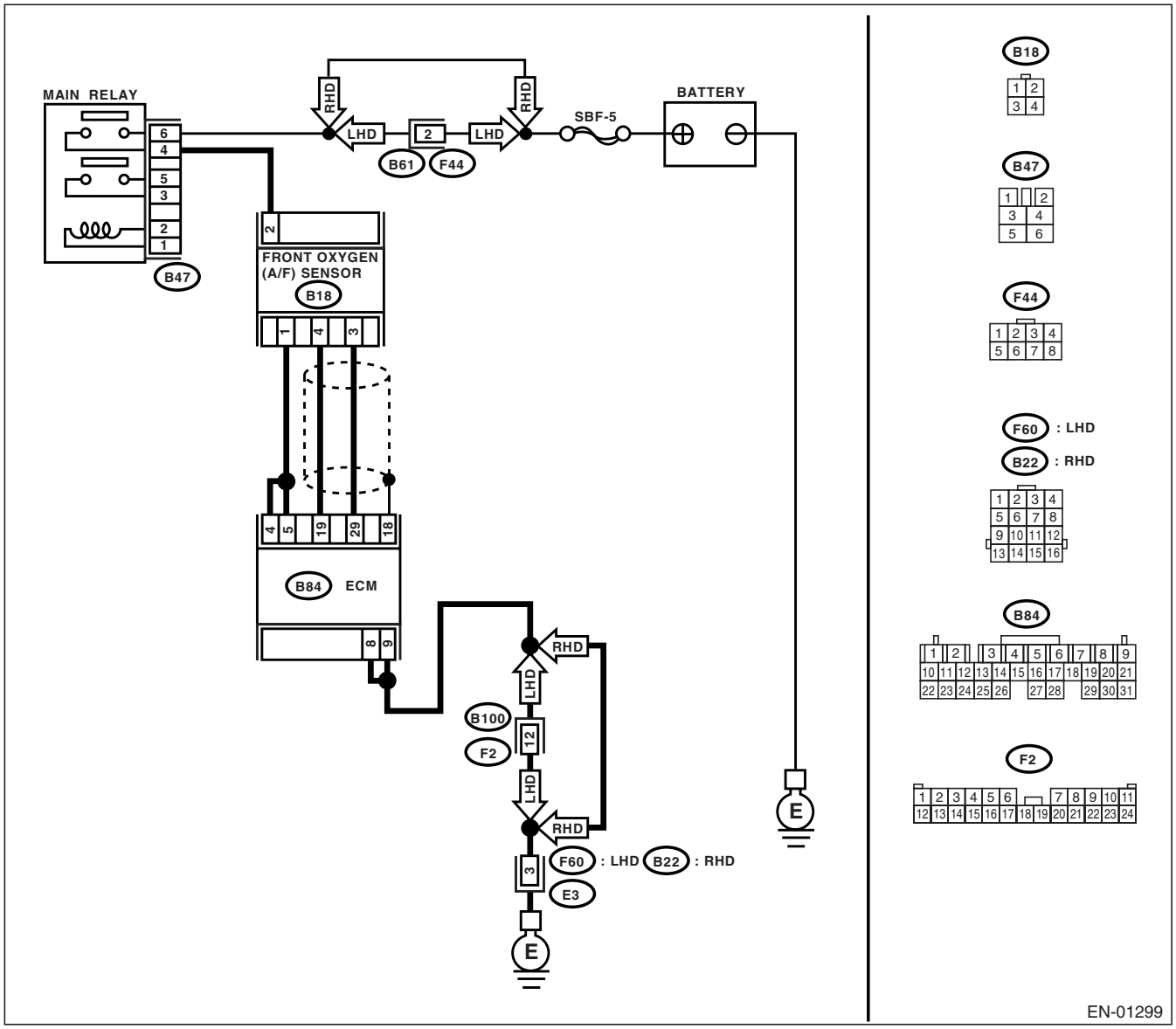
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X: DTC P0130 — O_2 SENSOR CIRCUIT (BANK 1 SENSOR 1) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**



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	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)-75, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK FRONT (A/F) OXYGEN SENSOR DATA.** 1)Start the engine. 2)While observing the Subaru Select Monitor or OBD-II general scan tool screen, warm-up the engine until coolant temperature is above 70°C (158°F). If the engine is already warmed-up, operate at idle speed for at least 1 minute. 3)Read the data of front oxygen (A/F) sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value 0.85 — 1.15 (in idling)?	Go to step **3.**	Go to step **4.**
3	**CHECK REAR OXYGEN SENSOR SIGNAL.** 1)Race the engine at speeds from idling to 5,000 rpm for a total of 5 cycles. NOTE: To increase the engine speed to 5,000 rpm, slowly depress accelerator pedal, taking approx. 5 seconds, and quickly release accelerator pedal to decrease engine speed. 2)Operate the LED operation mode for engine. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "LED OPERATION MODE FOR ENGINE". <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.>	Does the LED of {Rear O_2 Rich Signal} blink?	Repair the poor contact in front oxygen (A/F) sensor and rear oxygen sensor connector.	Check the rear oxygen sensor circuit. <Ref. to FU(H4DOTC)-46, Rear Oxygen Sensor.>
4	**CHECK EXHAUST SYSTEM.** Check the exhaust system parts. NOTE: Check the following items. •Loose installation of portions •Damage (crack, hole etc.) of parts •Looseness of front oxygen (A/F) sensor •Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor	Is there a fault in exhaust system?	Repair or replace the faulty parts.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-44, Front Oxygen (A/F) Sensor.>

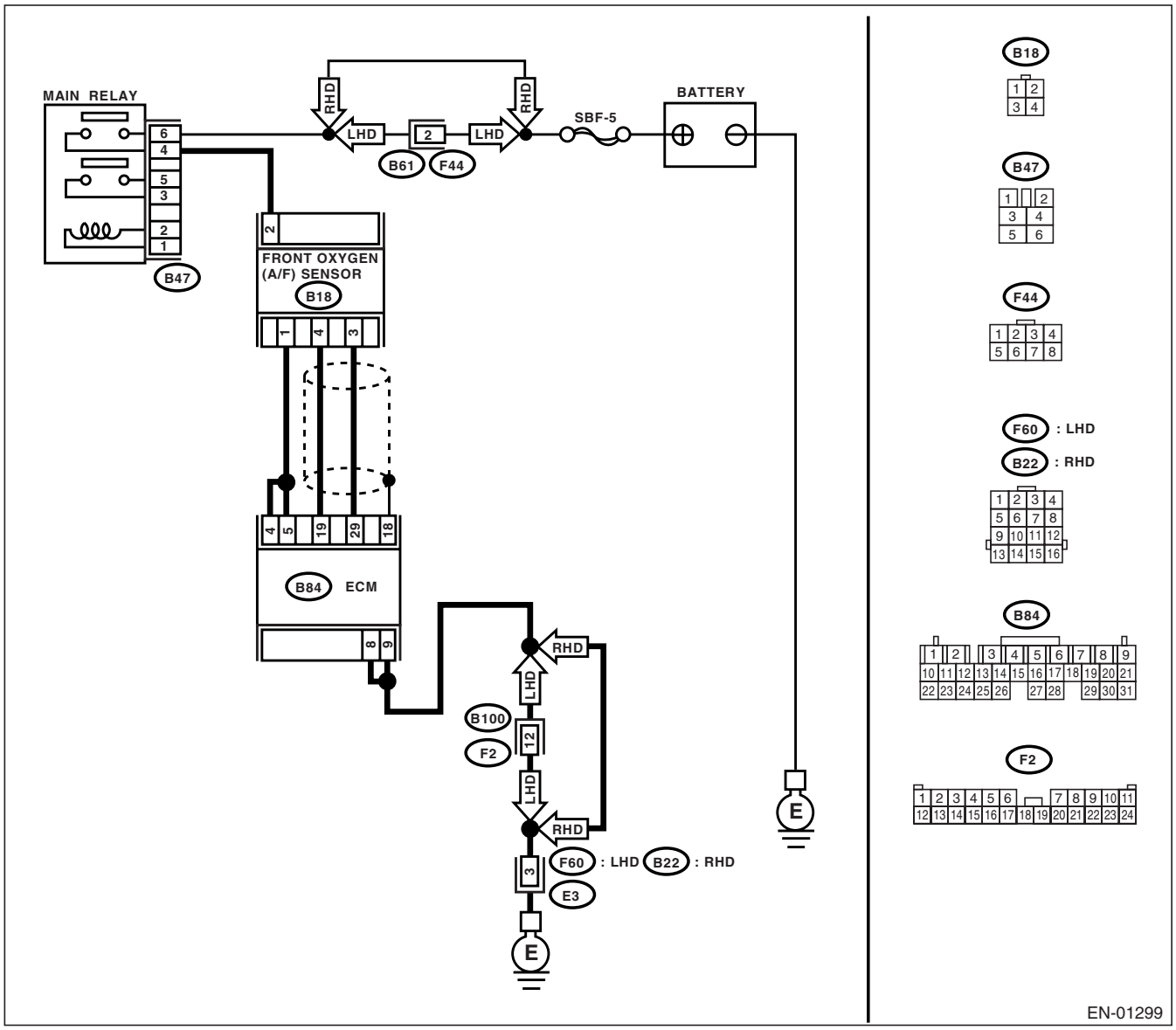
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Y: DTC P0133 — O_2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1)

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**



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	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)-75, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0133.	Go to step **2.**
2	**CHECK EXHAUST SYSTEM.** NOTE: Check the following items. •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)-44, Front Oxygen (A/F) Sensor.>

Z: DTC P0134 — O_2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1) —

NOTE:
For the diagnostic procedure, refer to DTC P0130. <Ref. to EN(H4DOTC)-135, DTC P0130 — O2 SENSOR CIRCUIT (BANK 1 SENSOR 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

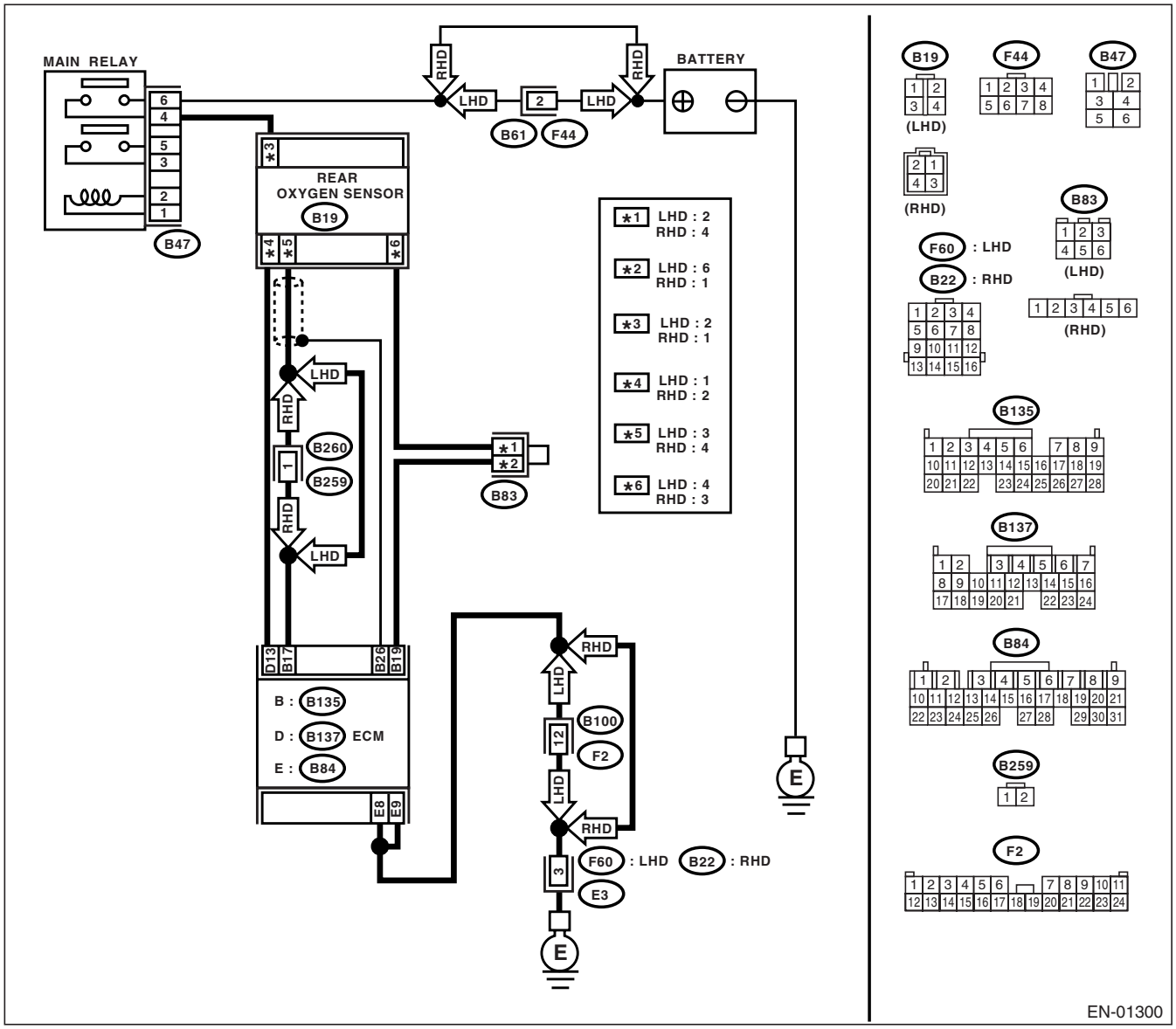
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AA:DTC P0137 — O_2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**



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	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)-75, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK REAR OXYGEN SENSOR DATA.** 1)Warm-up the engine until engine coolant temperature is above 70°C (158°F), and keep the engine speed at 2,000 rpm to 3,000 rpm for 2 minutes. 2)Read the data of rear oxygen sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Does the value fluctuate?	Go to step **6.**	Go to step **3.**
3	**CHECK REAR OXYGEN SENSOR DATA.** Read the data of rear oxygen sensor signal using Subaru Select Monitor or OBD-II general scan tool.	Is the voltage 0.2 — 0.4 V?	Go to step **4.**	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-46, Rear Oxygen Sensor.>
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*** ***LHD model*** ***(B135) No. 17 — (B19) No. 3:*** ***RHD model*** ***(B135) No. 17 — (B19) No. 4:***	Is the resistance more than 3 Ω?	Repair the open circuit in harness between ECM and rear oxygen sensor connector.	Go to step **5.**
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*** ***LHD model*** ***(B19) No. 3 (+) — Engine ground (−):*** ***RHD model*** ***(B19) No. 4 (+) — Engine ground (−):***	Is the voltage more than 0.2 V?	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-46, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor connector • Poor contact in ECM connector

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Step		Check	Yes	No
6	**CHECK EXHAUST SYSTEM.** Check the exhaust system parts. NOTE: Check the following items. •Loose installation of portions •Damage (crack, hole etc.) of parts •Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor	Is there a fault in exhaust system?	Repair or replace the faulty parts.	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-46, Rear Oxygen Sensor.>

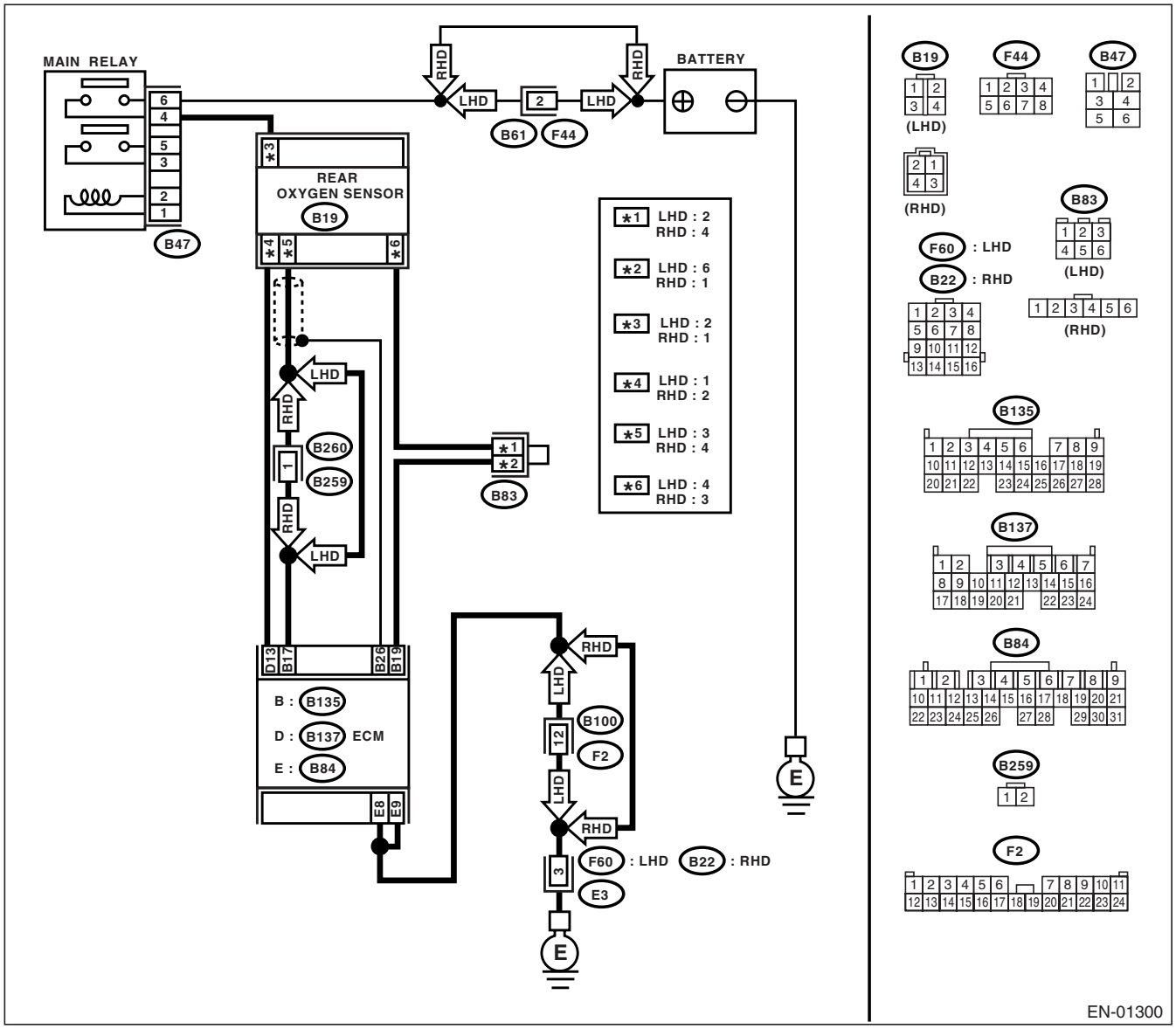
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AB:DTC P0138 — O_2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**



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	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)-75, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK REAR OXYGEN SENSOR DATA.** 1)Warm-up the engine until engine coolant temperature is above 70°C (158°F), and keep the engine speed at 2,000 rpm to 3,000 rpm for 2 minutes. 2)Read the data of rear oxygen sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA SHOWN ON DISPLAY FOR ENGINE". <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Does the value fluctuate?	Go to step **6.**	Go to step **3.**
3	**CHECK REAR OXYGEN SENSOR DATA.** Read the data of rear oxygen sensor signal using Subaru Select Monitor or OBD-II general scan tool.	Is the voltage 0.2 — 0.4 V?	Go to step **4.**	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-46, Rear Oxygen Sensor.>
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*** ***LHD model*** ***(B135) No. 17 — (B19) No. 3:*** ***RHD model*** ***(B135) No. 17 — (B19) No. 4:***	Is the resistance more than 3 Ω?	Repair the open circuit in harness between ECM and rear oxygen sensor connector.	Go to step **5.**
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*** ***LHD model*** ***(B19) No. 3 (+) — Engine ground (−):*** ***RHD model*** ***(B19) No. 4 (+) — Engine ground (−):***	Is the voltage more than 0.2 V?	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-46, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor connector • Poor contact in ECM connector

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	Step	Check	Yes	No
6	**CHECK EXHAUST SYSTEM.** Check the exhaust system parts. NOTE: Check the following items. •Loose installation of portions •Damage (crack, hole etc.) of parts •Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor	Is there a fault in exhaust system?	Repair or replace the faulty parts.	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-46, Rear Oxygen Sensor.>

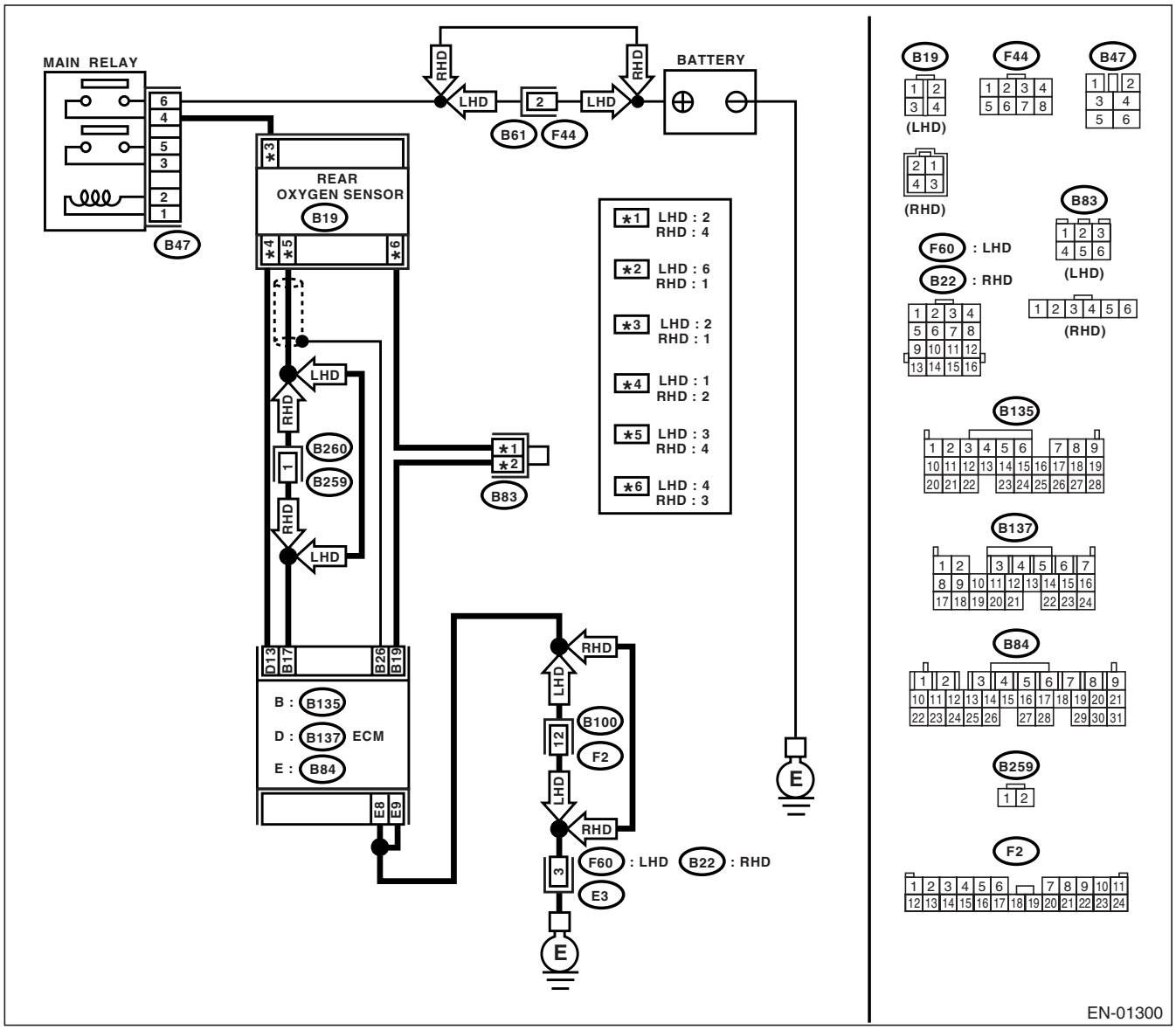
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AC:DTC P0139 — O_2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2)

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**



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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)-75, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0139.	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-46, Rear Oxygen Sensor.>

AD:DTC P0171 — SYSTEM TOO LEAN (BANK 1) —

NOTE:
For the diagnostic procedure, refer to DTC P0172. <Ref. to EN(H4DOTC)-147, DTC P0172 — SYSTEM TOO RICH (BANK 1) —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

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AE:DTC P0172 — SYSTEM TOO RICH (BANK 1) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK EXHAUST SYSTEM.**	Are there holes or loose bolts on exhaust system?	Repair the exhaust system.	Go to step **2.**
2	**CHECK AIR INTAKE SYSTEM.**	Are there holes, loose bolts or disconnection of hose on air intake system?	Repair the air intake system.	Go to step **3.**
3	**CHECK FUEL PRESSURE.** **Warning:** **•Place "NO FIRE" signs near the working area.** **•Be careful not to spill fuel on the floor.** 1)Release the fuel pressure. (1) Disconnect the connector from fuel pump relay. (2) Start the engine and run it until it stalls. (3) After the engine stalls, crank it for 5 more seconds. (4) Turn the ignition switch to OFF. 2)Connect the connector to fuel pump relay. 3)Disconnect the fuel delivery hose from fuel filter, and connect fuel pressure gauge. 4)Install the fuel filler cap. 5)Start the engine and idle while gear position is neutral. 6)Measure the fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold. **Warning:** **Before removing the fuel pressure gauge, release fuel pressure.** NOTE: If the fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again.	Is the measured value 284 — 314 kPa (2.9 — 3.2 kg/cm^2, 41 — 46 psi)?	Go to step **4.**	Repair the following items. Fuel pressure too high: • Clogged fuel return line or bent hose Fuel pressure too low: • Improper fuel pump discharge • Clogged fuel supply line

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	Step	Check	Yes	No
4	**CHECK FUEL PRESSURE.** After connecting the pressure regulator vacuum hose, measure 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 206 — 235 kPa (2.1 — 2.4 kg/cm^2, 30 — 34 psi)?	Go to step **5.**	Repair the following items. Fuel pressure too high: • Faulty pressure regulator • Clogged fuel return line or bent hose Fuel pressure too low: • Faulty pressure regulator • Improper fuel pump discharge • Clogged fuel supply line
5	**CHECK ENGINE COOLANT TEMPERATURE SENSOR.** 1)Start the engine and warm-up completely. 2)Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II 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)-28, 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 OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Is the measured value within the followings? Ignition ON: 73.3 — 106.6 kPa (550 — 800 mmHg, 21.65 — 31.50 inHg) Idling: 24.0 — 41.3 kPa (180 — 310 mmHg, 7.09 — 12.20 inHg)	Go to step **7.**	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-34, Mass Air Flow and Intake Air Temperature Sensor.>

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	Step	Check	Yes	No
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 OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedure, refer to the OBD-II General Scan Tool Instruction Manual.	Subtract ambient temperature from intake air temperature. Is the obtained value −10°C — 50°C (14°F — 122°F)?	Contact your Subaru distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.	Check the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-34, Mass Air Flow and Intake Air Temperature Sensor.>

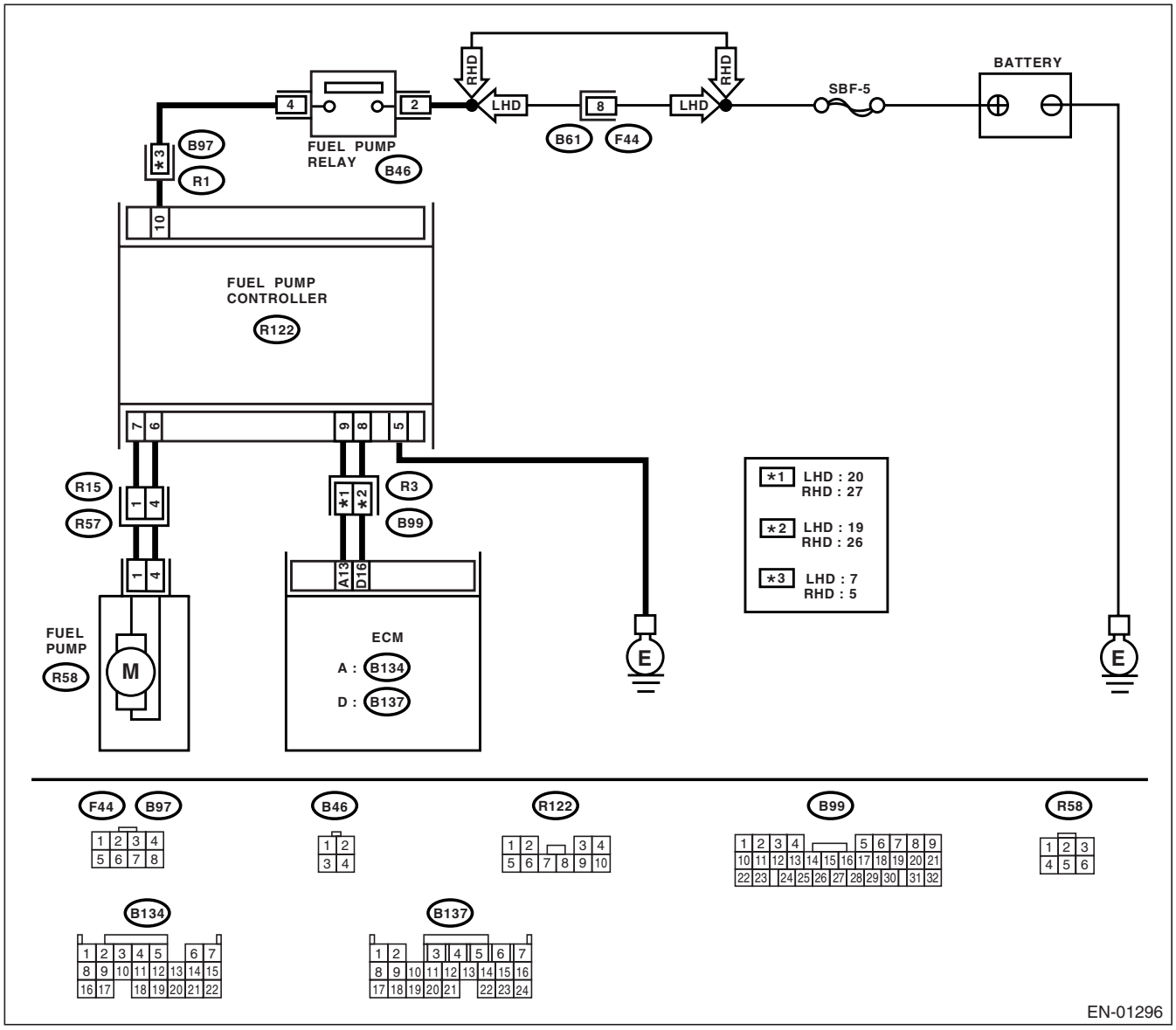
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AF:DTC P0230 — FUEL PUMP PRIMARY CIRCUIT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**



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	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. 10 (+) — 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. 5 — 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. 7 — (R58) No. 1:*** ***(R122) No. 6 — (R58) No. 4:***	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. 7 — Chassis ground:*** ***(R122) No. 6 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair the ground short circuit between fuel pump control unit and fuel pump.

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	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. 9 — (B134) No. 13:*** ***(R122) No. 8 — (B137) No. 16:***	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. 9 — Chassis ground:*** ***(R122) No. 8 — Chassis ground:***	Is the resistance more than 1 MΩ?	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.	Replace the fuel pump control unit. <Ref. to FU(H4DOTC)-52, Fuel Pump Control Unit.>

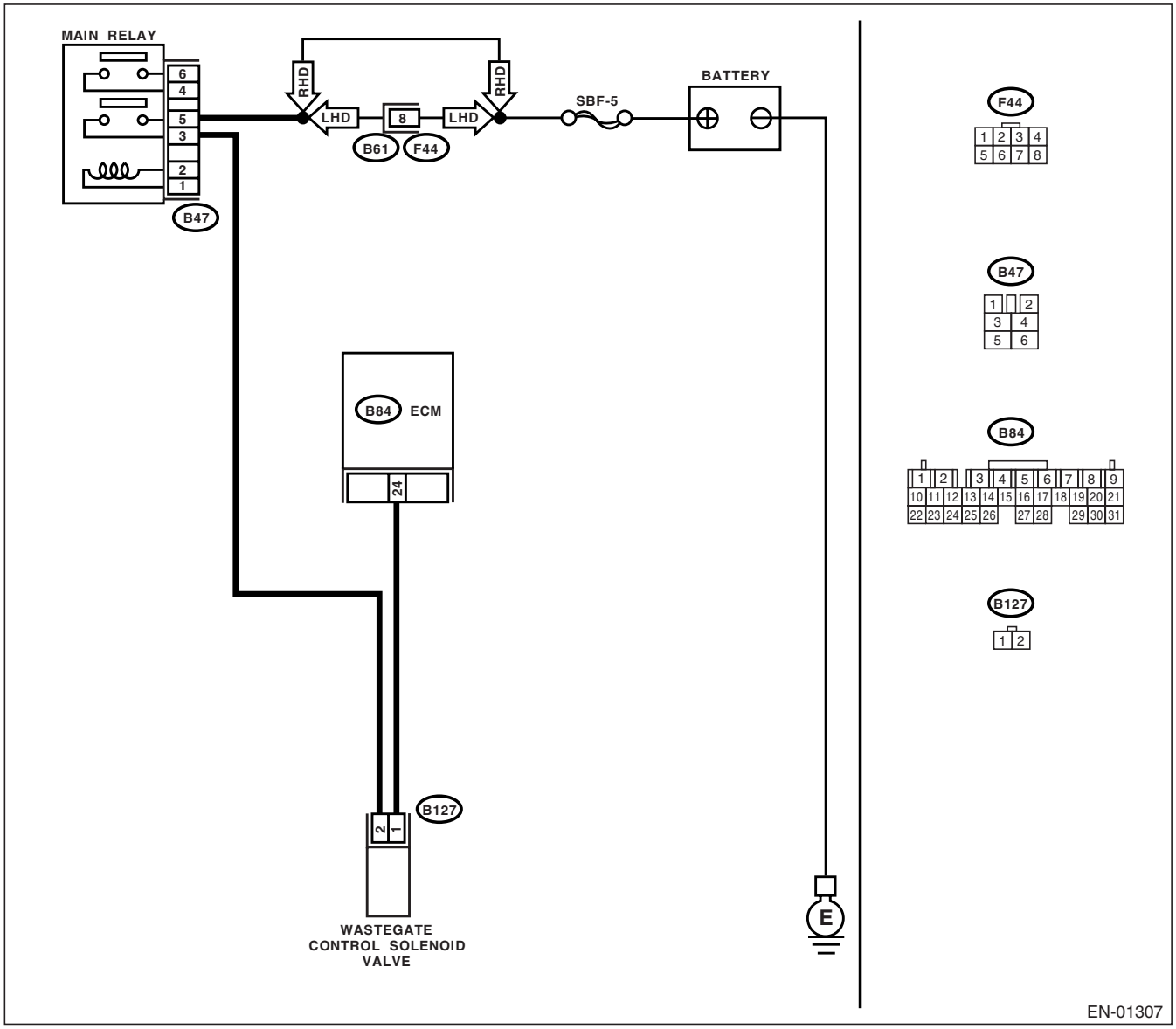
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AG:DTC P0244 — TURBO/SUPER CHARGER WASTEGATE SOLENOID "A" RANGE/PERFORMANCE —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**



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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)-75, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0244.	Replace the wastegate control solenoid valve. <Ref. to FU(H4DOTC)-43, Wastegate Control Solenoid Valve.>

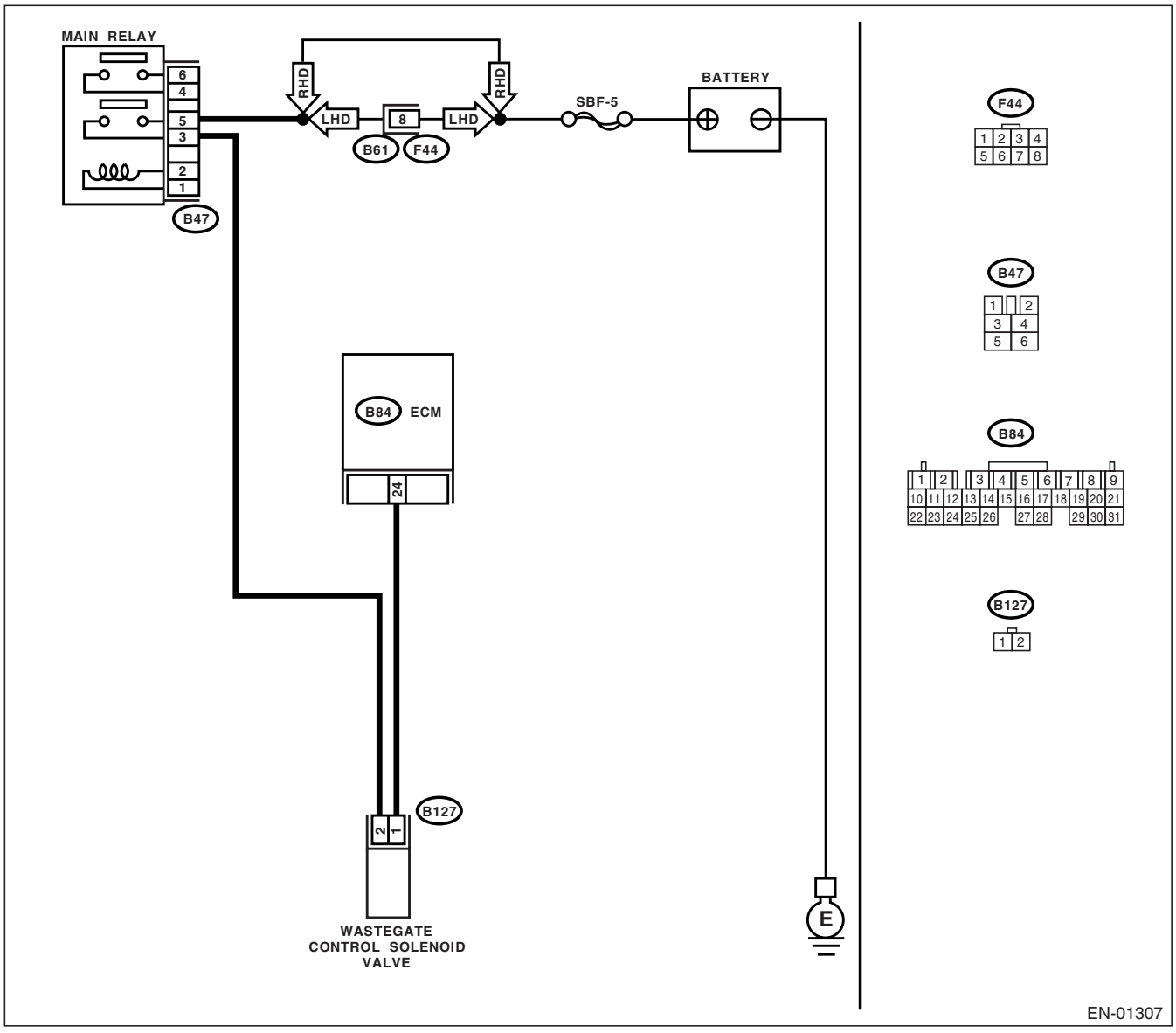
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AH:DTC P0245 — TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” LOW —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Erroneous idling

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**



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	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*** ***(B84) No. 24 (+) — 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*** ***(B84) No. 24 — (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 — 40 Ω?	Go to step **5.**	Replace the wastegate control solenoid valve. <Ref. to FU(H4DOTC)-43, Wastegate Control Solenoid Valve.>
5	**CHECK POWER SUPPLY TO WASTEGATE CONTROL SOLENOID VALVE.** 1)Turn the ignition switch to ON. 2)Measure the voltage between wastegate control solenoid valve and engine ground. ***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 Subaru distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

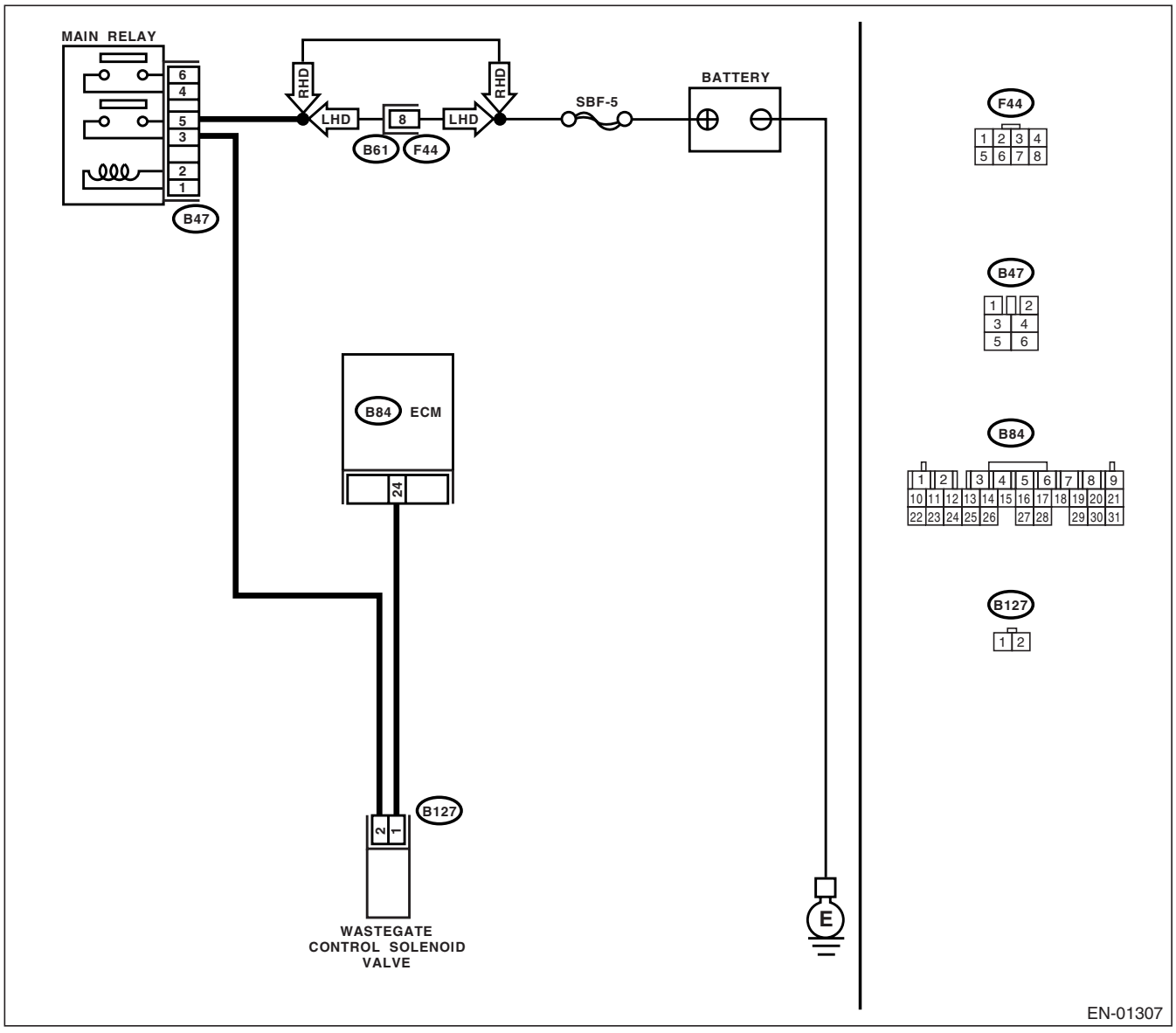
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AI: DTC P0246 — TURBO/SUPER CHARGER WASTEGATE SOLENOID "A" HIGH —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Erroneous idling

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**



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	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*** ***(B84) No. 24 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **3.**	Go to step **2.**
2	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-49, 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*** ***(B84) No. 24 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair the battery short circuit in harness between ECM and wastegate control solenoid valve connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-49, 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)-43, Wastegate Control Solenoid Valve.> and ECM <Ref. to FU(H4DOTC)-49, 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)-49, Engine Control Module (ECM).>

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AJ:DTC P0301 — CYLINDER 1 MISFIRE DETECTED —

NOTE:
For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(H4DOTC)-160, DTC P0304 — CYLINDER 4 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AK:DTC P0302 — CYLINDER 2 MISFIRE DETECTED —

NOTE:
For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(H4DOTC)-160, DTC P0304 — CYLINDER 4 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AL:DTC P0303 — CYLINDER 3 MISFIRE DETECTED —

NOTE:
For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(H4DOTC)-160, DTC P0304 — CYLINDER 4 MISFIRE DETECTED —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

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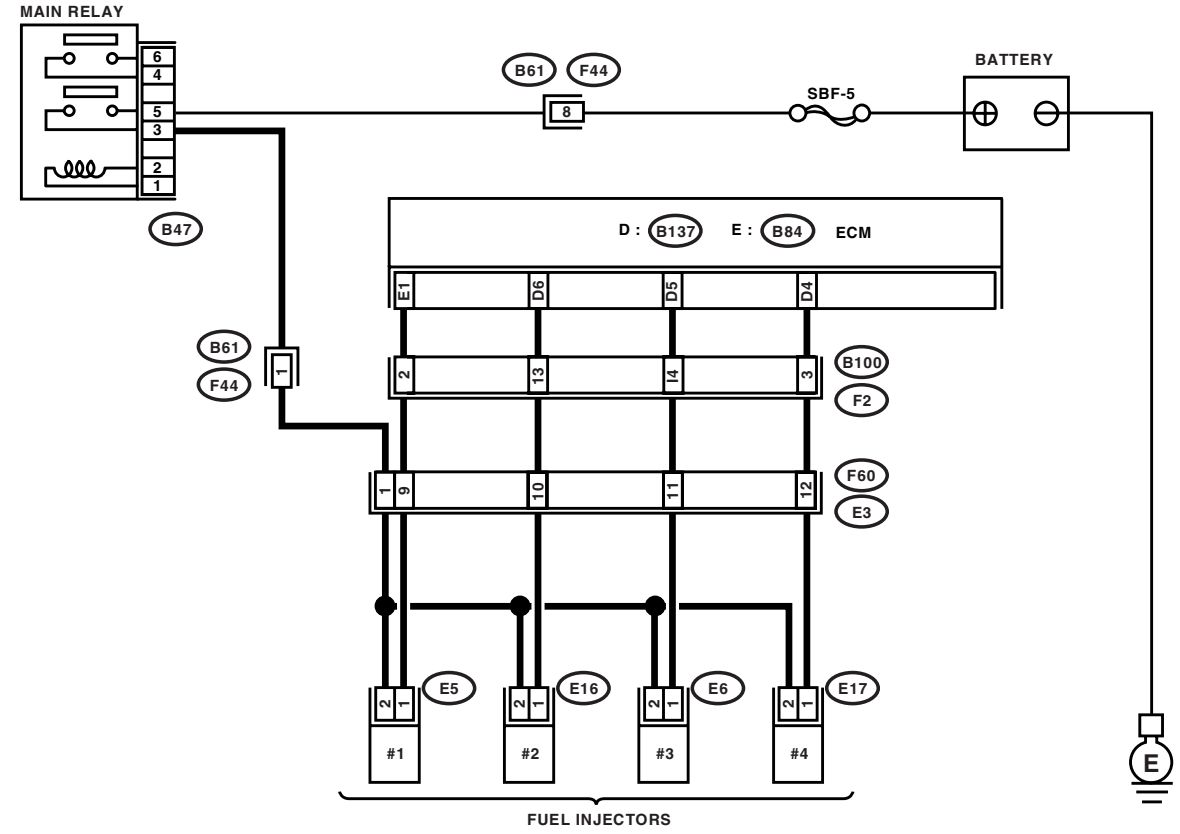
AM:DTC P0304 — CYLINDER 4 MISFIRE DETECTED —

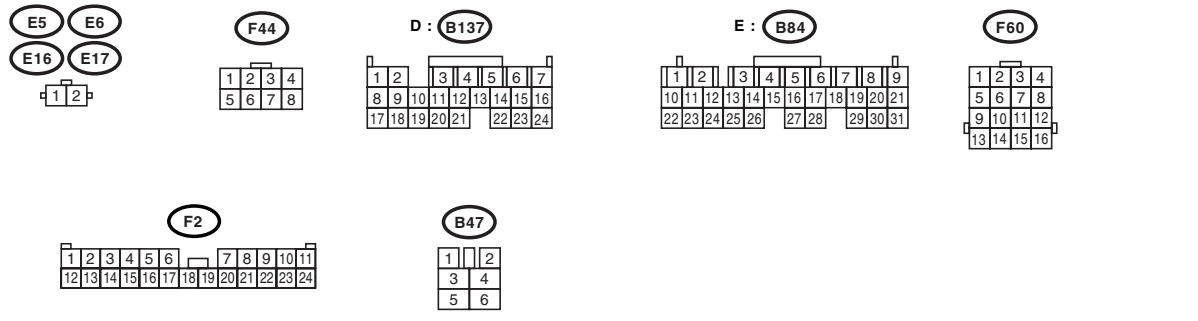
- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
  - Immediately at fault recognition (A misfire which could damage catalyst occurs.)
- **TROUBLE SYMPTOM:**
  - Engine stalls.
  - Erroneous idling
  - Rough driving

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

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- **WIRING DIAGRAM:**
- **LHD model**

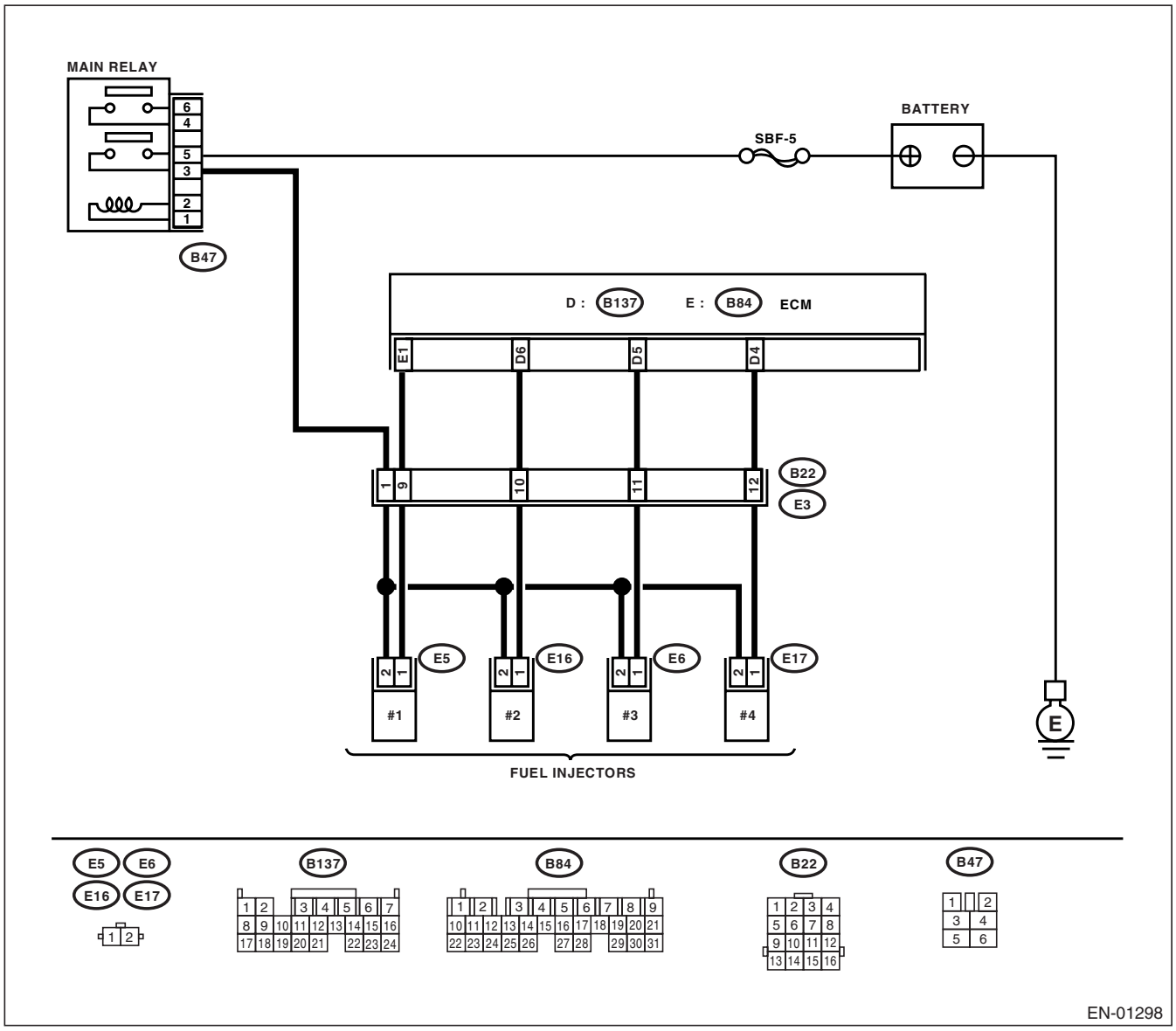




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- **RHD model**



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)-75, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**

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	Step	Check	Yes	No
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 (B84) No. 1 (+) — Chassis ground (−):*** ***#2 (B137) No. 6 (+) — Chassis ground (−):*** ***#3 (B137) No. 5 (+) — Chassis ground (−):*** ***#4 (B137) No. 4 (+) — 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 ECM connector and engine ground on faulty cylinders. ***Connector & terminal*** ***#1 (E5) No. 1 — Engine ground:*** ***#2 (E16) No. 1 — Engine ground:*** ***#3 (E6) No. 1 — Engine ground:*** ***#4 (E17) No. 1 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Repair the ground short circuit in harness between fuel injector and ECM connector.
4	**CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR.** Measure the resistance of harness connector between ECM connector and fuel injector on faulty cylinders. ***Connector & terminal*** ***#1 (B84) No. 1 — (E5) No. 1:*** ***#2 (B137) No. 6 — (E16) No. 1:*** ***#3 (B137) No. 5 — (E6) No. 1:*** ***#4 (B137) No. 4 — (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 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)-37, Fuel Injector.>

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	Step	Check	Yes	No
6	**CHECK POWER SUPPLY LINE.** 1)Turn the ignition switch to ON. 2)Measure the voltage between fuel injector and engine ground on faulty cylinders. ***Connector & terminal*** ***#1 (E5) No. 2 (+) — Engine ground (–):*** ***#2 (E16) No. 2 (+) — Engine ground (–):*** ***#3 (E6) No. 2 (+) — Engine ground (–):*** ***#4 (E17) No. 2 (+) — Engine ground (–):***	Is the voltage more than 10 V?	Repair 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 (B84) No. 1 (+) — Chassis ground (–):*** ***#2 (B137) No. 6 (+) — Chassis ground (–):*** ***#3 (B137) No. 5 (+) — Chassis ground (–):*** ***#4 (B137) No. 4 (+) — 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)-49, 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)-37, Fuel Injector.> and ECM <Ref. to FU(H4DOTC)-49, 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 CRANKSHAFT SPROCKET.** Remove the timing belt cover.	Is the crankshaft sprocket rusted or does it have broken teeth?	Replace the crankshaft sprocket. <Ref. to ME(H4DOTC)-71, Crankshaft Sprocket.>	Go to step **11.**

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	Step	Check	Yes	No
11	**CHECK INSTALLATION CONDITION OF TIMING BELT.** Turn the crankshaft, and align alignment mark on crankshaft 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)-60, Timing Belt Assembly.>	Go to step **12.**
12	**CHECK FUEL LEVEL.**	Is the fuel meter indication higher than the “Lower” level?	Go to step **13.**	Replenish the fuel so fuel meter indication is higher than the “Lower” level. After replenishing fuel; Go to step **13.**
13	**CHECK STATUS OF MALFUNCTION INDICATOR LIGHT.** 1)Clear the memory using Subaru Select Monitor. <Ref. to EN(H4DOTC)-48, 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)-146, DTC P0171 — SYSTEM TOO LEAN (BANK 1) — , Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

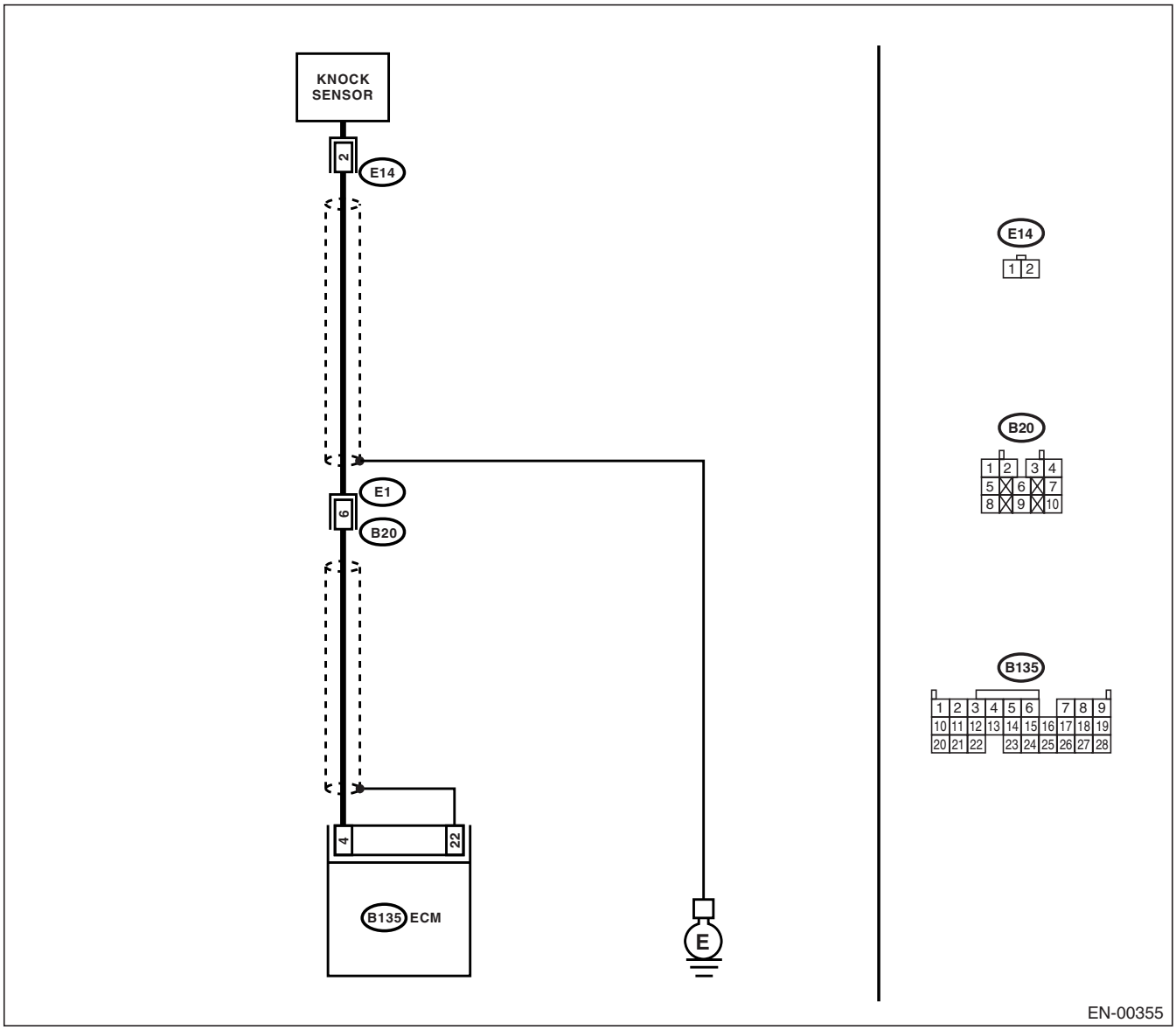
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AN:DTC P0327 — KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Poor driving performance
  - Knocking occurs.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**



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	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*** ***(B135) No. 4 — Chassis ground:***	Is the resistance more than 700 kΩ?	Go to step **2.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between knock sensor and ECM connector • Poor contact in knock sensor connector • Poor contact in coupling connector
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. 2 — Engine ground:***	Is the resistance more than 700 kΩ?	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)-32, Knock Sensor.>	Tighten the knock sensor installation bolt securely.

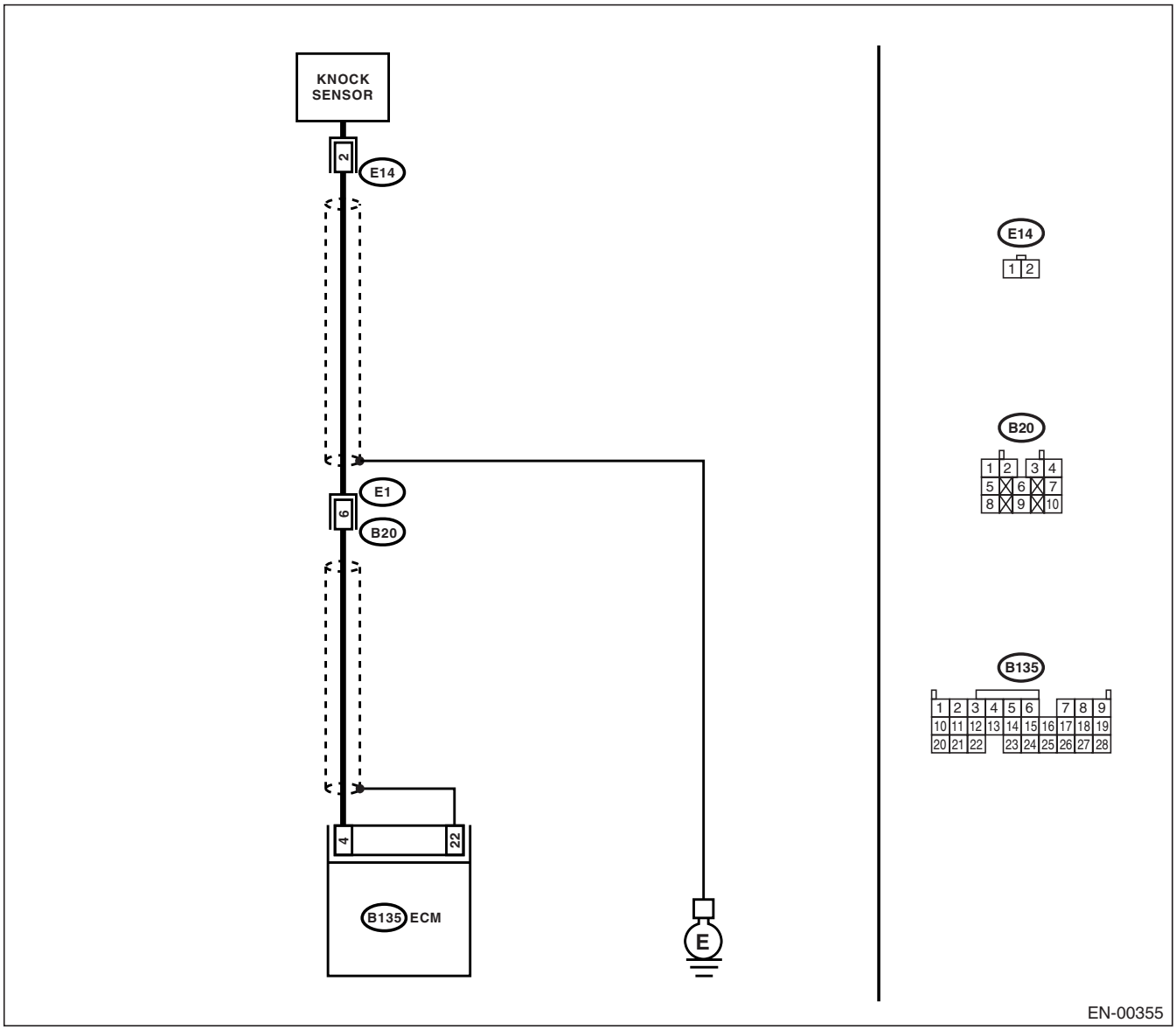
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AO:DTC P0328 — KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Poor driving performance
  - Knocking occurs.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**



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	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*** ***(B135) No. 4 — Chassis ground:***	Is the resistance less than 400 kΩ?	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. 2 — Engine ground:***	Is the resistance less than 400 kΩ?	Replace the knock sensor. <Ref. to FU(H4DOTC)-32, 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*** ***(B135) No. 4 (+) — 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.

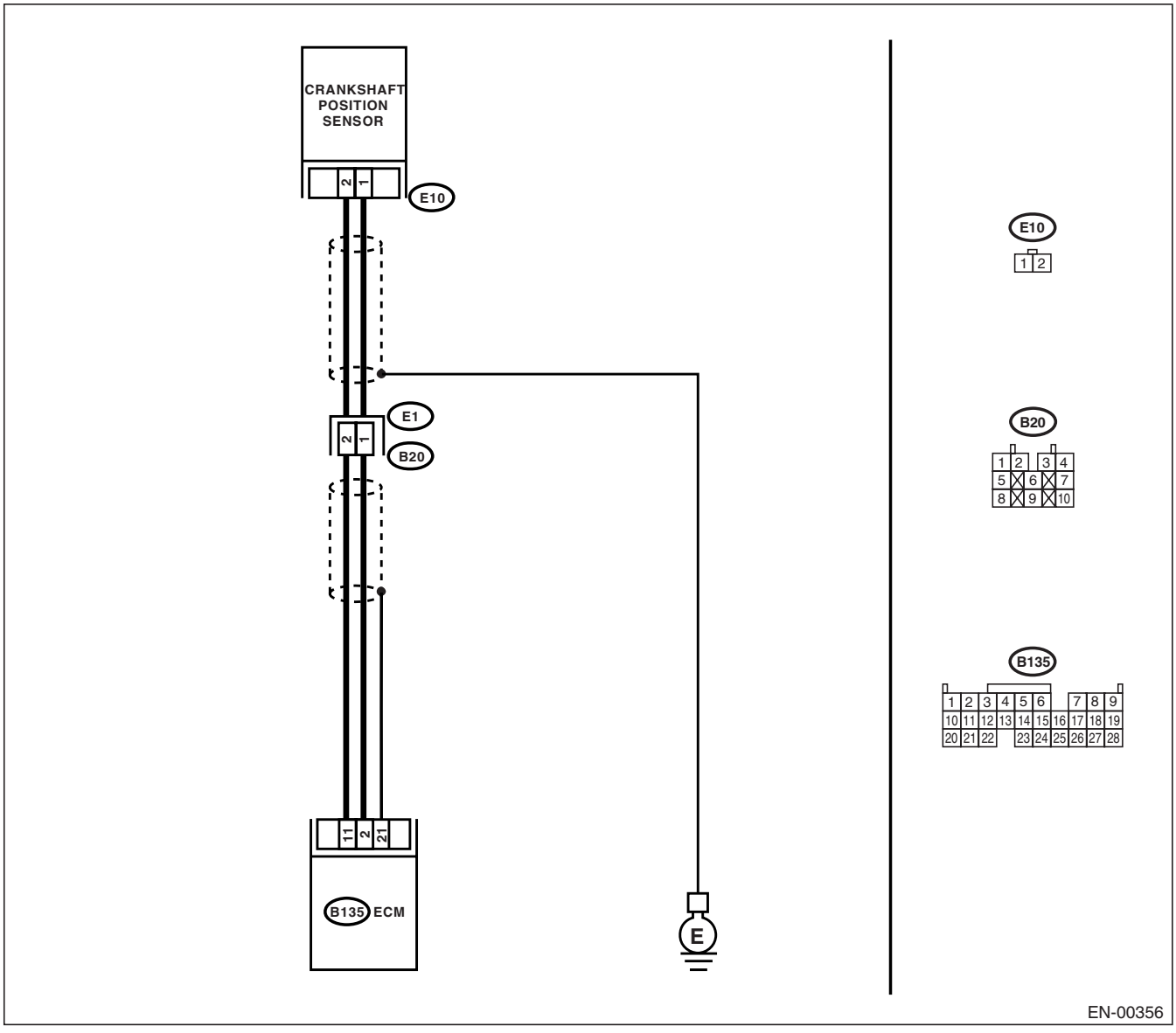
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AP:DTC P0335 — CRANKSHAFT POSITION SENSOR “A” CIRCUIT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Engine stalls.
  - Failure of engine to start

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**



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	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)-29, Crankshaft Position Sensor.>

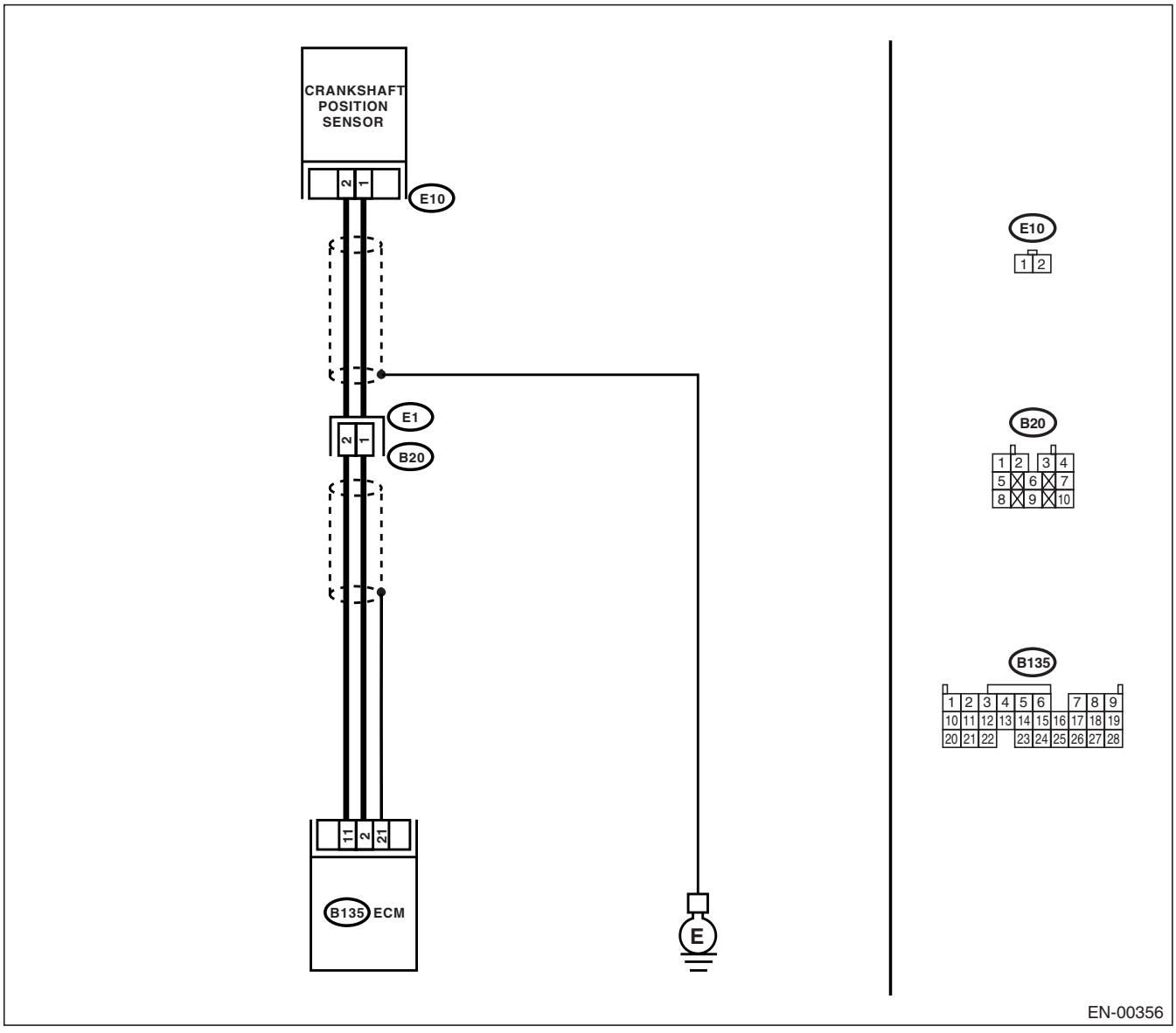
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AQ:DTC P0336 — CRANKSHAFT POSITION SENSOR “A” CIRCUIT RANGE/ PERFORMANCE —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Engine stalls.
  - Failure of engine to start

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**



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	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)-75, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK CONDITION OF CRANKSHAFT POSITION SENSOR.** Turn the ignition switch to OFF.	Is the crankshaft position sensor installation bolt tightened securely?	Go to step **3.**	Tighten the crankshaft position sensor installation bolt securely.
3	**CHECK CRANKSHAFT SPROCKET.** Remove the front belt cover.	Are the crankshaft sprocket teeth cracked or damaged?	Replace the crankshaft sprocket. <Ref. to FU(H4DOTC)-29, Crankshaft Position Sensor.>	Go to step **4.**
4	**CHECK INSTALLATION CONDITION OF TIMING BELT.** Turn the crankshaft, and align alignment mark on crankshaft 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)-60, Timing Belt Assembly.>	Replace the crankshaft position sensor. <Ref. to FU(H4DOTC)-29, Crankshaft Position Sensor.>

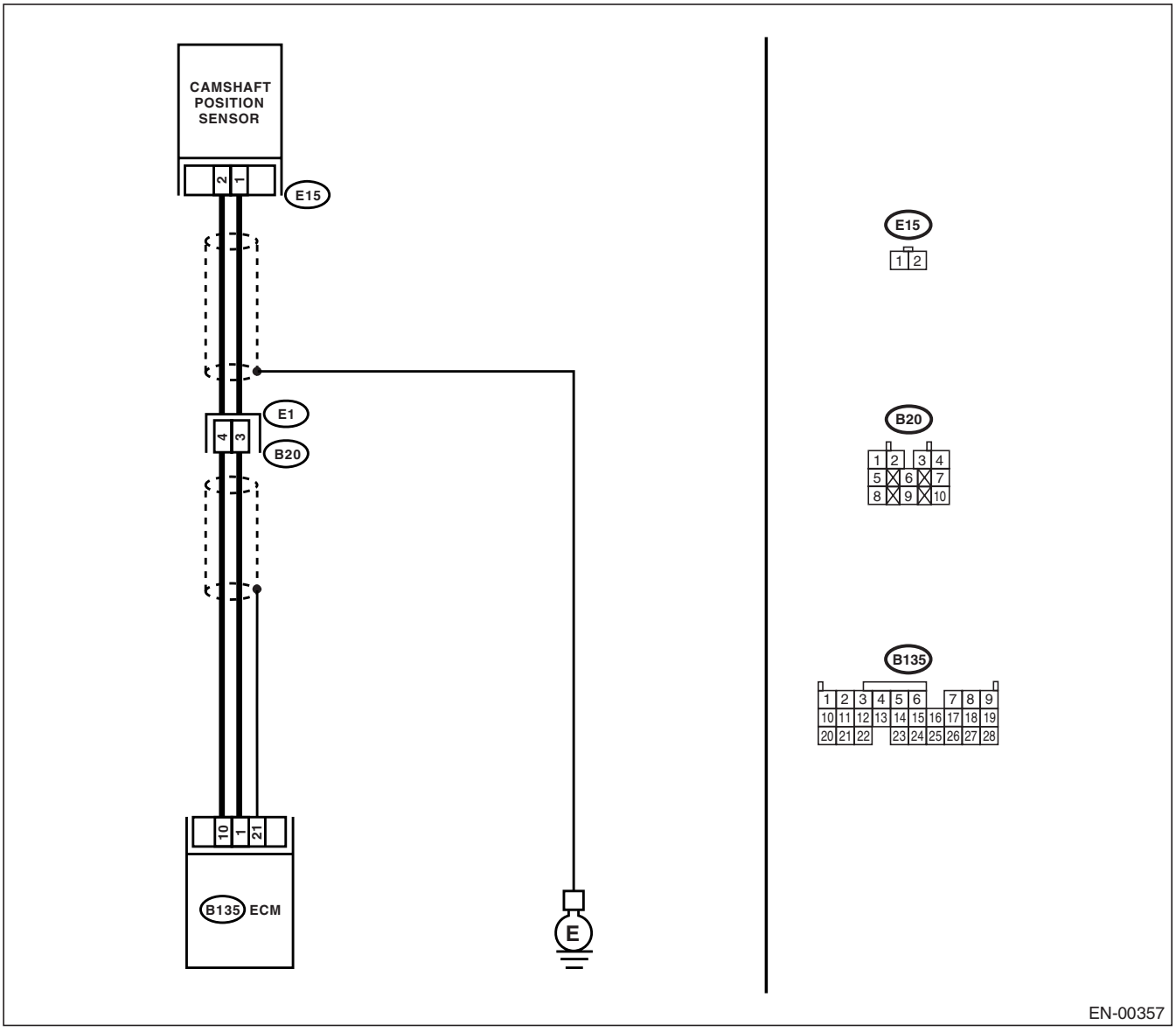
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AR:DTC P0340 — CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Engine stalls.
  - Failure of engine to start

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**



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	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from camshaft position sensor. 3)Measure the resistance of harness between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E15) No. 1 — Engine ground:***	Is the resistance more than 100 kΩ?	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between camshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector	Go to step **2.**
2	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR.** Measure the resistance of harness between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E15) No. 1 — Engine ground:***	Is the resistance less than 10 Ω?	Repair the ground short circuit in harness between camshaft position sensor and ECM connector. NOTE: The harness between both connectors are shielded. Repair the ground short circuit in harness together with shield.	Go to step **3.**
3	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR.** Measure the resistance of harness between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E15) No. 2 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **4.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between camshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector
4	**CHECK CONDITION OF CAMSHAFT POSITION SENSOR.**	Is the camshaft position sensor installation bolt tightened securely?	Go to step **5.**	Tighten the camshaft position sensor installation bolt securely.
5	**CHECK CAMSHAFT POSITION SENSOR.** 1)Remove the camshaft position sensor. 2)Measure the resistance between connector terminals of camshaft position sensor. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 1 — 4 kΩ?	Repair the poor contact in camshaft position sensor connector.	Replace the camshaft position sensor. <Ref. to FU(H4DOTC)-30, Camshaft Position Sensor.>

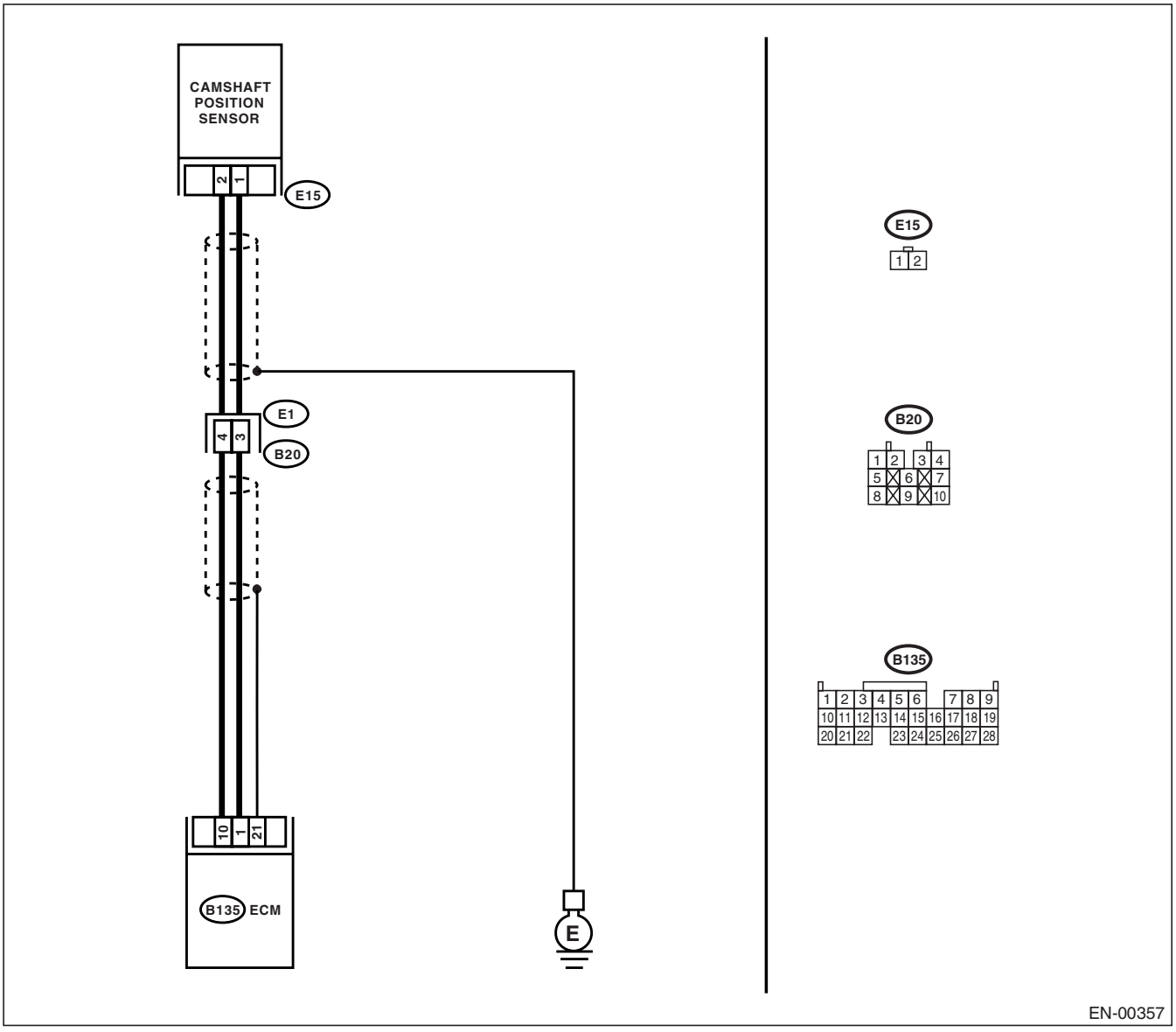
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AS:DTC P0341 — CAMSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE (BANK 1 OR SINGLE SENSOR) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Engine stalls.
  - Failure of engine to start

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**



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	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)-75, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from camshaft position sensor. 3)Measure the resistance of harness between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E15) No. 1 — Engine ground:***	Is the resistance more than 100 kΩ?	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between camshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector	Go to step **3.**
3	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR.** Measure the resistance of harness between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E15) No. 1 — Engine ground:***	Is the resistance less than 10 Ω?	Repair the ground short circuit in harness between camshaft position sensor and ECM connector. NOTE: The harness between both connectors are shielded. Repair ground short circuit in harness together with shield.	Go to step **4.**
4	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR.** Measure the resistance of harness between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E15) No. 2 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **5.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between camshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector
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.

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	Step	Check	Yes	No
6	**CHECK CAMSHAFT POSITION SENSOR.** 1)Remove the camshaft position sensor. 2)Measure the resistance between connector terminals of camshaft position sensor. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 1 — 4 kΩ?	Go to step **7.**	Replace the camshaft position sensor. <Ref. to FU(H4DOTC)-30, Camshaft Position Sensor.>
7	**CHECK CONDITION OF CAMSHAFT POSITION SENSOR.** Turn the ignition switch to OFF.	Is the camshaft position sensor installation bolt tightened securely?	Go to step **8.**	Tighten the camshaft position sensor installation bolt securely.
8	**CHECK CAMSHAFT SPROCKET.** Remove the front belt cover. <Ref. to ME(H4DOTC)-59, Timing Belt Cover.>	Are the camshaft sprocket teeth cracked or damaged?	Replace the camshaft sprocket. <Ref. to ME(H4DOTC)-69, Camshaft Sprocket.>	Go to step **9.**
9	**CHECK INSTALLATION CONDITION OF TIMING BELT.** Turn the camshaft, and align alignment mark on camshaft sprocket with alignment mark on timing belt cover LH.	Is the timing belt dislocated from its proper position?	Repair the installation condition of timing belt. <Ref. to ME(H4DOTC)-60, Timing Belt Assembly.>	Replace the camshaft position sensor. <Ref. to FU(H4DOTC)-30, Camshaft Position Sensor.>

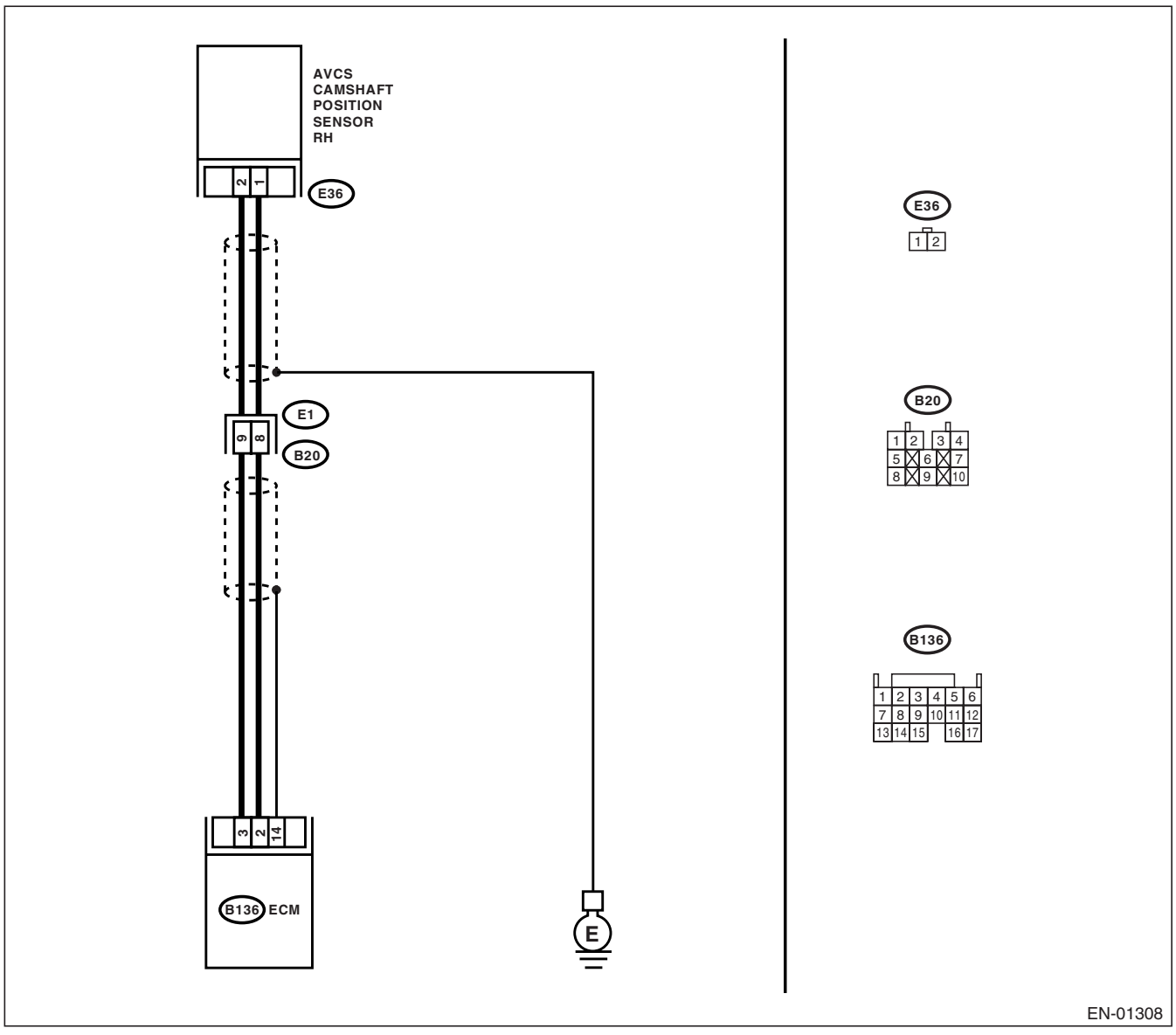
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AT:DTC P0365 — CAMSHAFT POSITION SENSOR “B” CIRCUIT (BANK 1) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Engine stalls.
  - Failure of engine to start

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**



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	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1)Start the engine. 2)Measure the ignition timing advance using Subaru Select Monitor or OBD-II general scan tool, while running the vehicle at approx. 30 km/h (19 MPH). NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.> •OBD-II scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Does the ignition timing advance smoothly change, according to engine output change? Idling: −2 — +2° Vehicle running: −2 — +50°	Repair the poor contact in connector. NOTE: In this case, repair the following: • Poor contact in AVCS camshaft position sensor • Poor contact in ECM connector	Go to step **2.**
2	**CHECK HARNESS BETWEEN AVCS CAMSHAFT POSITION SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from AVCS camshaft position sensor and ECM. 3)Measure the resistance of harness between AVCS camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E36) No. 1 — (B84) No. 2:*** ***(E36) No. 2 — (B84) 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 AVCS camshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector
3	**CHECK HARNESS BETWEEN AVCS CAMSHAFT POSITION SENSOR AND ECM CONNECTOR.** Measure the resistance of harness between AVCS camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E36) No. 1 — Engine ground:*** ***(E36) No. 2 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Repair the ground short circuit in harness between AVCS camshaft position sensor and ECM connector. NOTE: The harness between both connectors are shielded. Repair the ground short circuit in harness together with shield.
4	**CHECK CONDITION OF AVCS CAMSHAFT POSITION SENSOR.**	Is the AVCS camshaft position sensor installation bolt tightened securely?	Go to step **5.**	Tighten the AVCS camshaft position sensor installation bolt securely.
5	**CHECK AVCS CAMSHAFT POSITION SENSOR.** 1)Remove the AVCS camshaft position sensor. 2)Measure the resistance between connector terminals of AVCS camshaft position sensor. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 1 — 4 kΩ?	Check oil pressure passage and stuck of variable valve timing solenoid valve.	Replace the AVCS camshaft position sensor. <Ref. to FU(H4DOTC)-31, AVCS Camshaft Position Sensor.>

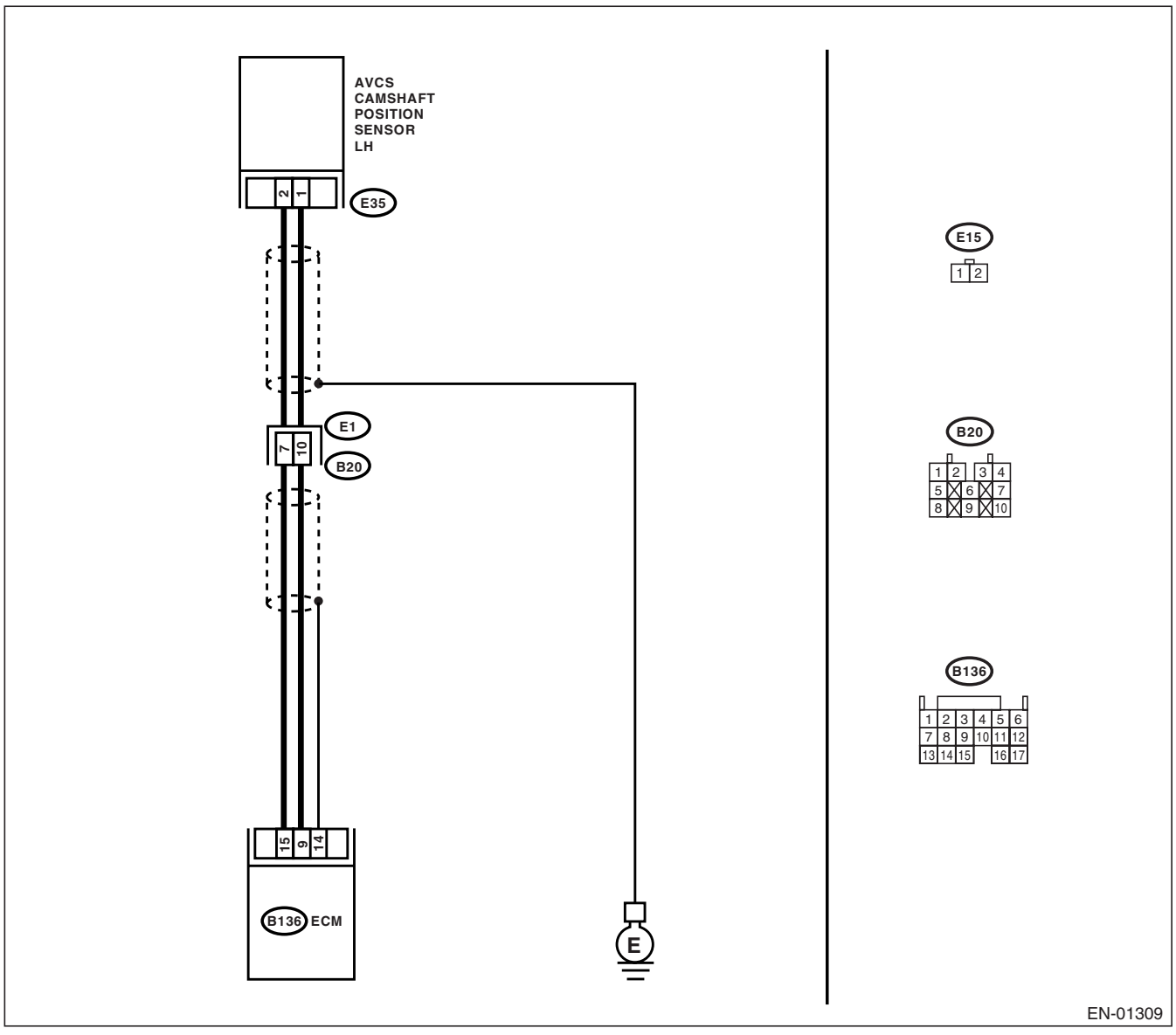
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AU:DTC P0390 — CAMSHAFT POSITION SENSOR “B” CIRCUIT (BANK 2) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Engine stalls.
  - Failure of engine to start

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**



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	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1)Start the engine. 2)Measure the ignition timing advance using Subaru Select Monitor or OBD-II general scan tool, while running the vehicle at approx. 30 km/h (19 MPH). NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.> •OBD-II scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Does the ignition timing advance smoothly change, according to engine output change? Idling: −2 — +2° Vehicle running: −2 — +50°	Repair the poor contact in connector. NOTE: In this case, repair the following: • Poor contact in AVCS camshaft position sensor • Poor contact in ECM connector	Go to step **2.**
2	**CHECK HARNESS BETWEEN AVCS CAMSHAFT POSITION SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from AVCS camshaft position sensor and ECM. 3)Measure the resistance of harness between AVCS camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E35) No. 1 — (B136) No. 9:*** ***(E35) No. 2 — (B136) No. 15:***	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 AVCS camshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector
3	**CHECK HARNESS BETWEEN AVCS CAMSHAFT POSITION SENSOR AND ECM CONNECTOR.** Measure the resistance of harness between AVCS camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E35) No. 1 — Engine ground:*** ***(E35) No. 2 — Engine ground:***	Is the resistance more than 1M Ω?	Go to step **4.**	Repair the ground short circuit in harness between AVCS camshaft position sensor and ECM connector. NOTE: The harness between both connectors are shielded. Repair the ground short circuit in harness together with shield.
4	**CHECK CONDITION OF AVCS CAMSHAFT POSITION SENSOR.**	Is the AVCS camshaft position sensor installation bolt tightened securely?	Go to step **5.**	Tighten the AVCS camshaft position sensor installation bolt securely.
5	**CHECK AVCS CAMSHAFT POSITION SENSOR.** 1)Remove the AVCS camshaft position sensor. 2)Measure the resistance between connector terminals of AVCS camshaft position sensor. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 1 — 4 kΩ?	Check oil pressure passage and stuck of variable valve timing solenoid valve.	Replace the AVCS camshaft position sensor. <Ref. to FU(H4DOTC)-31, AVCS Camshaft Position Sensor.>

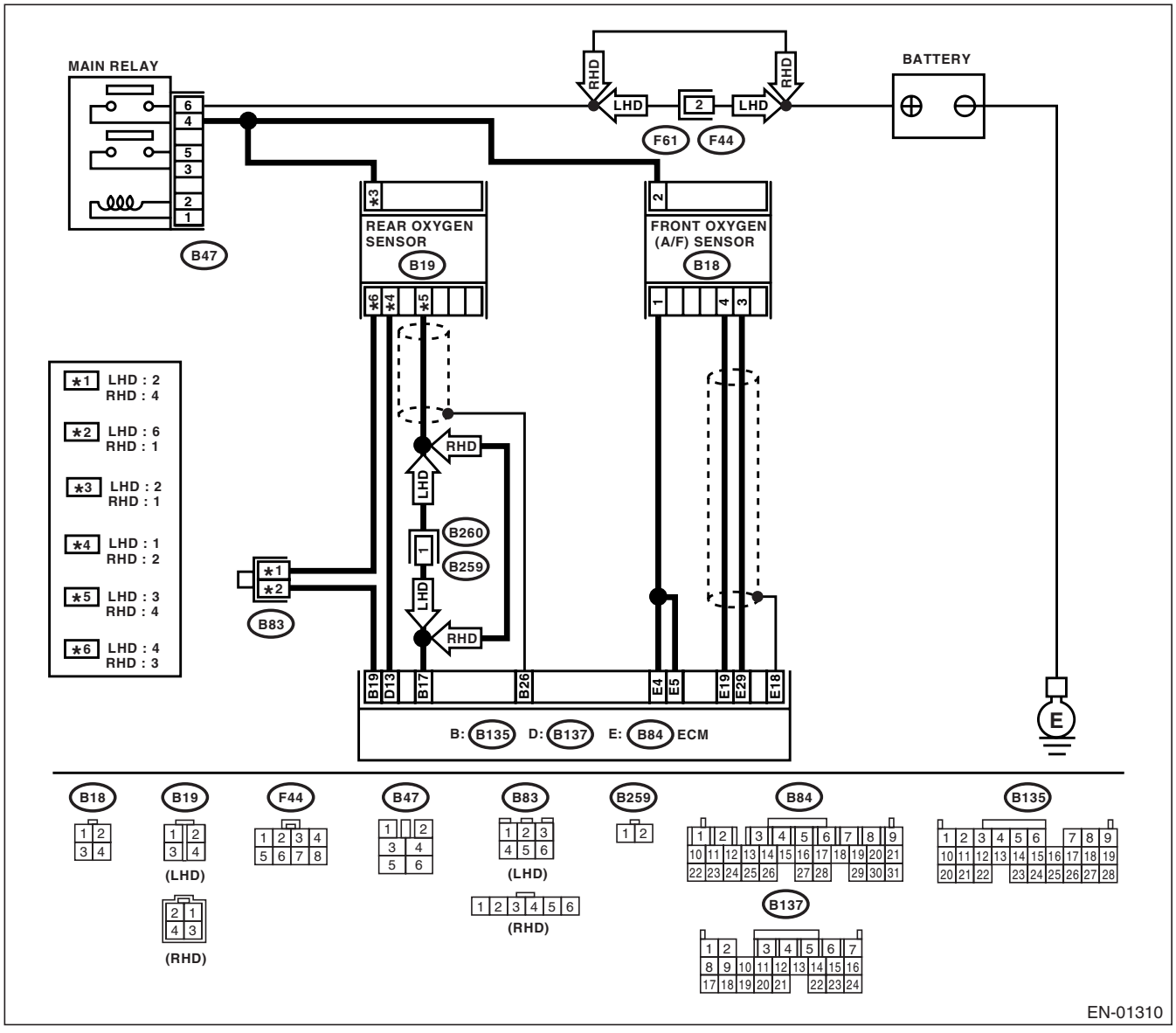
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AV:DTC P0420 — CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Engine stalls.
  - Idle mixture is out of specifications.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**



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	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)-75, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0420.	Go to step **2.**
2	**CHECK EXHAUST SYSTEM.** Check for gas leaks or air suction caused by loose or dislocated nuts and bolts, and open hole at exhaust pipes. NOTE: Check the following positions. •Between cylinder head and front exhaust pipe •Between front exhaust pipe and front catalytic converter •Between front catalytic converter and rear catalytic converter	Is there a fault in exhaust system?	Repair or replace the exhaust system. <Ref. to EX(H4DOTC)-2, General Description.>	Go to step **3.**
3	**CHECK REAR CATALYTIC CONVERTER.** Separate the rear catalytic converter from rear exhaust pipe.	Is there damage at rear face of rear catalyst?	Replace the front catalytic converter. <Ref. to EC(H4DOTC)-3, Front Catalytic Converter.> and rear catalytic converter <Ref. to EC(H4DOTC)-4, Rear Catalytic Converter.>	Go to step **4.**
4	**CHECK FRONT CATALYTIC CONVERTER.** Remove the front catalytic converter.	Is there damage at rear face or front face of front catalyst?	Replace the front catalytic converter. <Ref. to EC(H4DOTC)-3, Front Catalytic Converter.>	Contact your Subaru distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

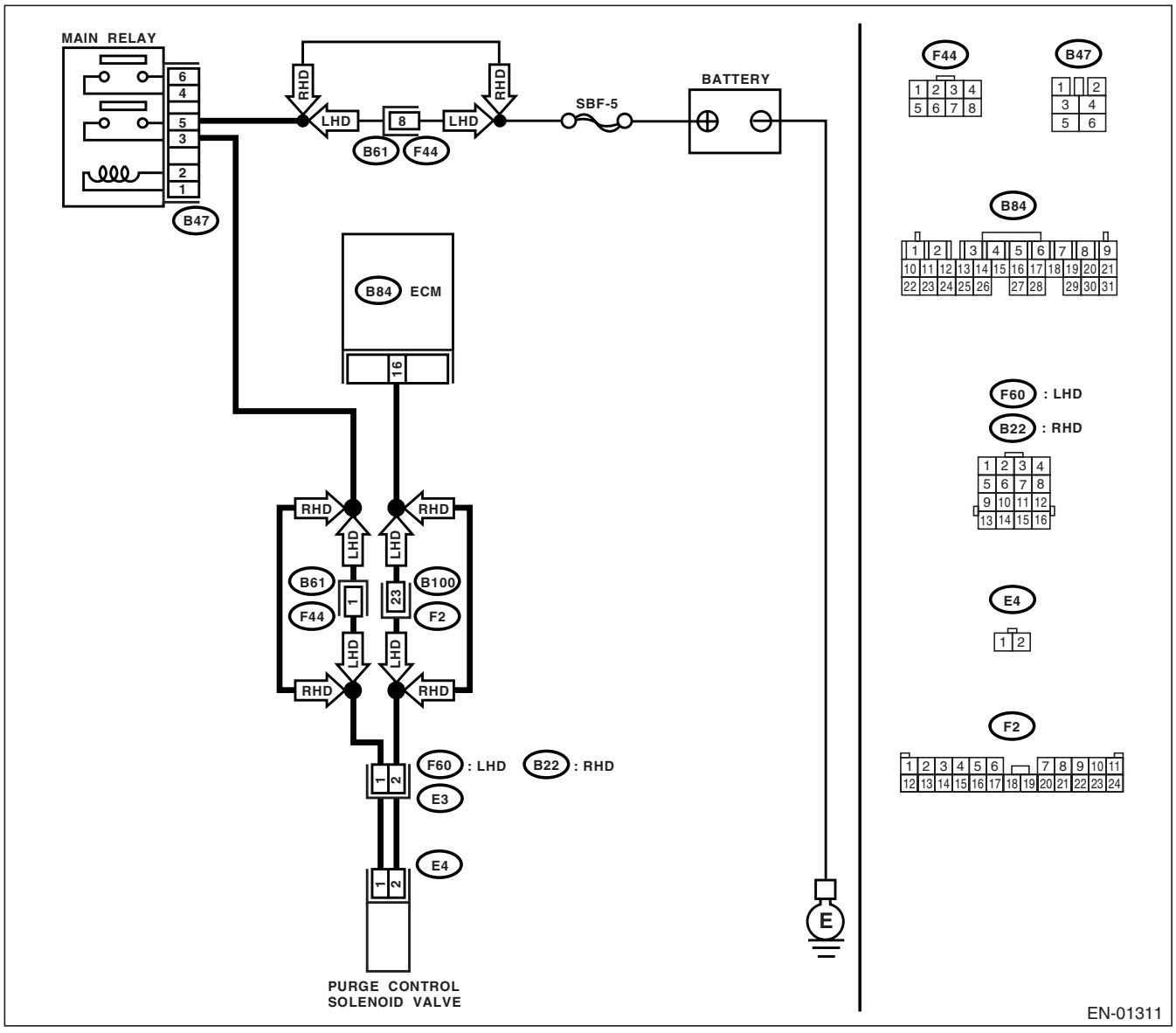
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AW:DTC P0458 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Erroneous idling

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**



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	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*** ***(B84) No. 16 (+) — 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 MΩ?	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*** ***(B84) No. 16 — (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)-7, 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 Subaru distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

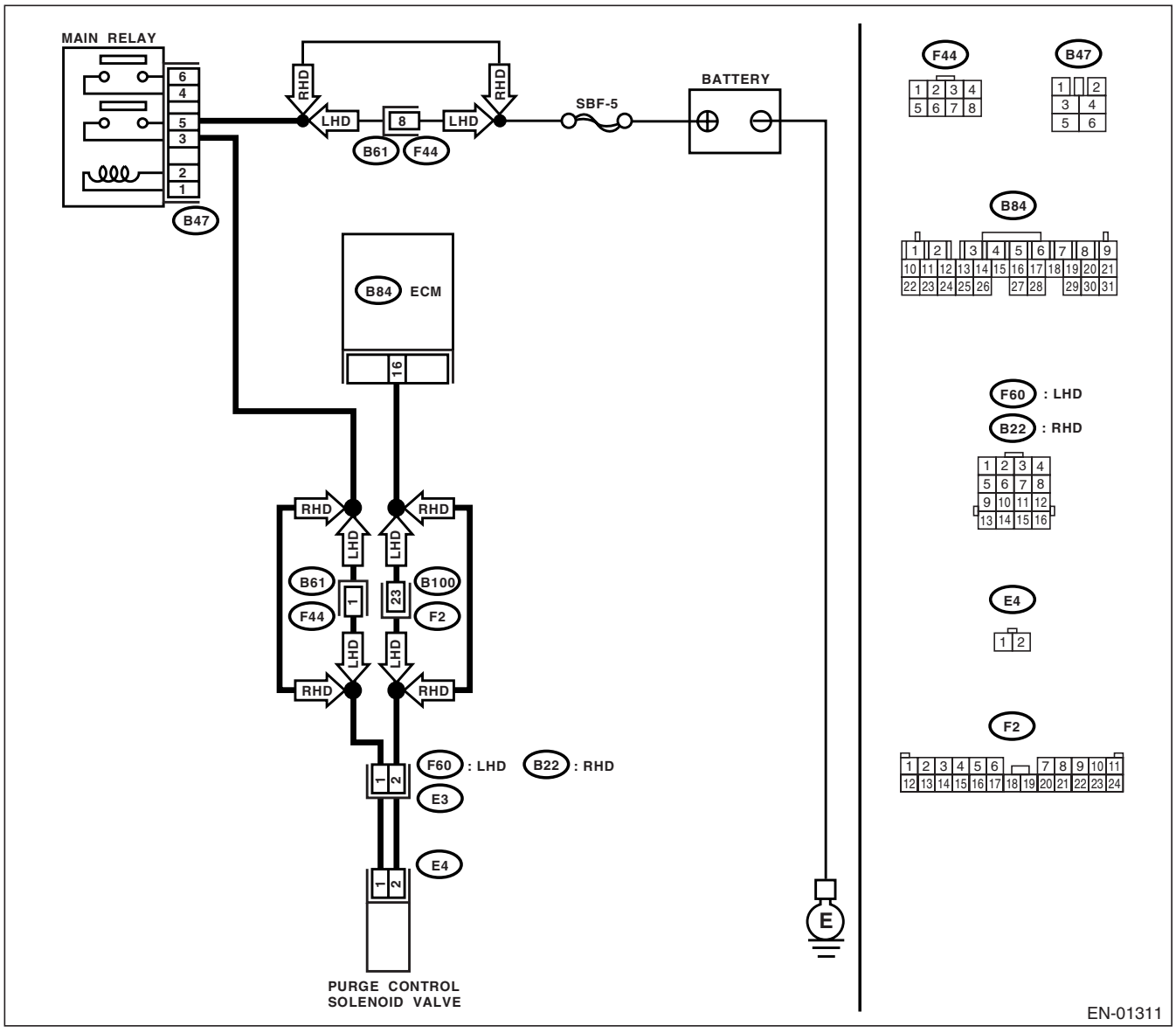
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AX:DTC P0459 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Erroneous idling

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**



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	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)-49, Compulsory Valve Operation Check Mode.> ***Connector & terminal*** ***(B84) No. 16 (+) — 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*** ***(B84) No. 16 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **4.**	Go to step **3.**
3	**CHECK POOR CONTACT.** Check the poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-49, 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*** ***(B84) No. 16 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair the battery short circuit in harness between ECM and purge control solenoid valve connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-49, 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)-7, Purge Control Solenoid Valve.> and ECM <Ref. to FU(H4DOTC)-49, 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)-49, Engine Control Module (ECM).>

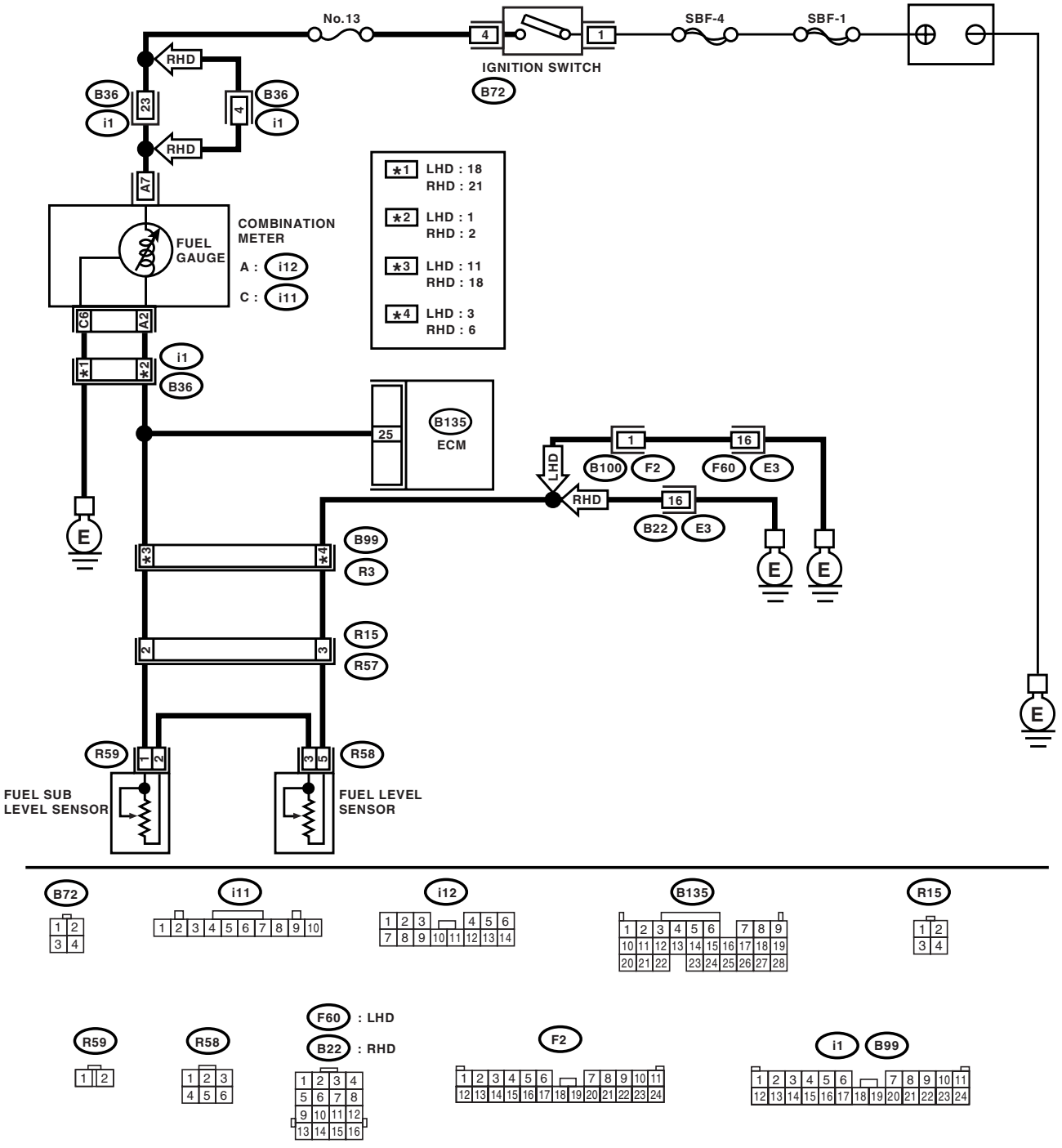
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AY:DTC P0461 — FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**



EN-01312

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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)-75, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0461.	Replace the fuel level sensor. <Ref. to FU(H4DOTC)-63, Fuel Level Sensor.> and fuel sub level sensor <Ref. to FU(H4DOTC)-64, Fuel Sub Level Sensor.>

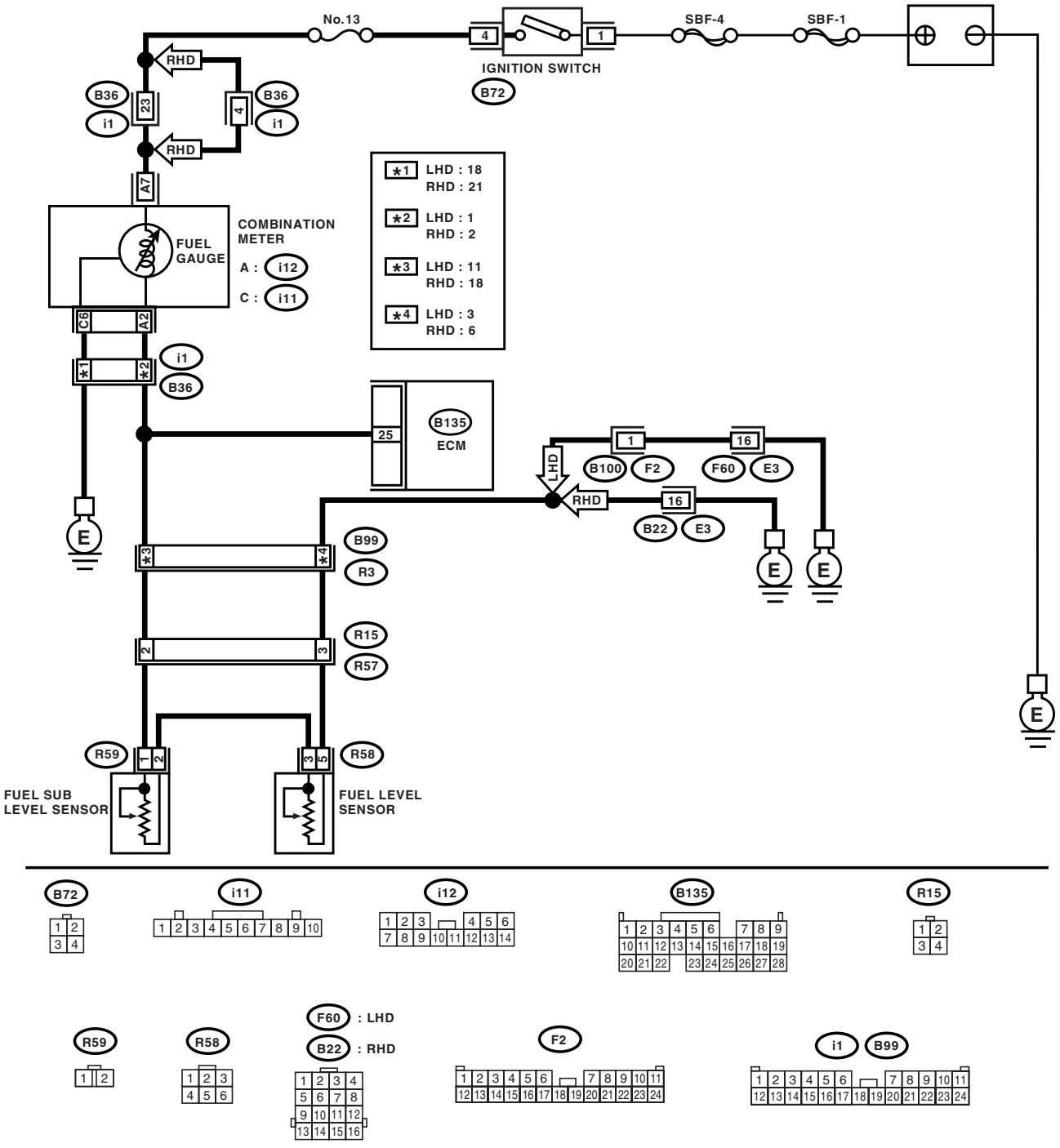
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AZ:DTC P0462 — FUEL LEVEL SENSOR CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**



EN-01312

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	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. 25 (+) — Chassis ground (−):***	Is the voltage less than 0.12 V?	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)-32, Subaru Select Monitor.>	Shake the ECM harness and connector, while monitoring value of Subaru Select Monitor. Does the voltage change?	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. 25 (+) — Chassis ground (−):***	Is the voltage more than 0.12 V?	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 (i10), (i11) and ECM connector. 3)Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 25 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **7.**	Repair the ground short circuit in harness between ECM and combination meter connector.
6	**CHECK HARNESS BETWEEN ECM AND COMBINATION METER.** Measure the resistance between ECM and combination meter connector. ***Connector & terminal*** ***(B135) No. 25 — (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

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	Step	Check	Yes	No
7	**CHECK FUEL TANK CORD.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from fuel sub level sensor. 3)Measure the resistance between fuel sub level sensor and chassis ground. ***Connector & terminal*** ***(R59) No. 1 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **8.**	Repair the ground short circuit in fuel tank cord.
8	**CHECK FUEL TANK CORD.** 1)Disconnect the connector from fuel pump assembly. 2)Measure the resistance between fuel pump assembly and chassis ground. ***Connector & terminal*** ***(R59) No. 2 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **9.**	Repair the ground short circuit in fuel tank cord.
9	**CHECK FUEL LEVEL SENSOR.** 1)Remove the fuel pump assembly. <Ref. to FU(H4DOTC)-61, Fuel Pump.> 2)Measure the resistance between fuel level sensor and terminals with its float set to the full position. ***Terminals*** ***No. 3 — No. 5:***	Is the resistance 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)-64, 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.

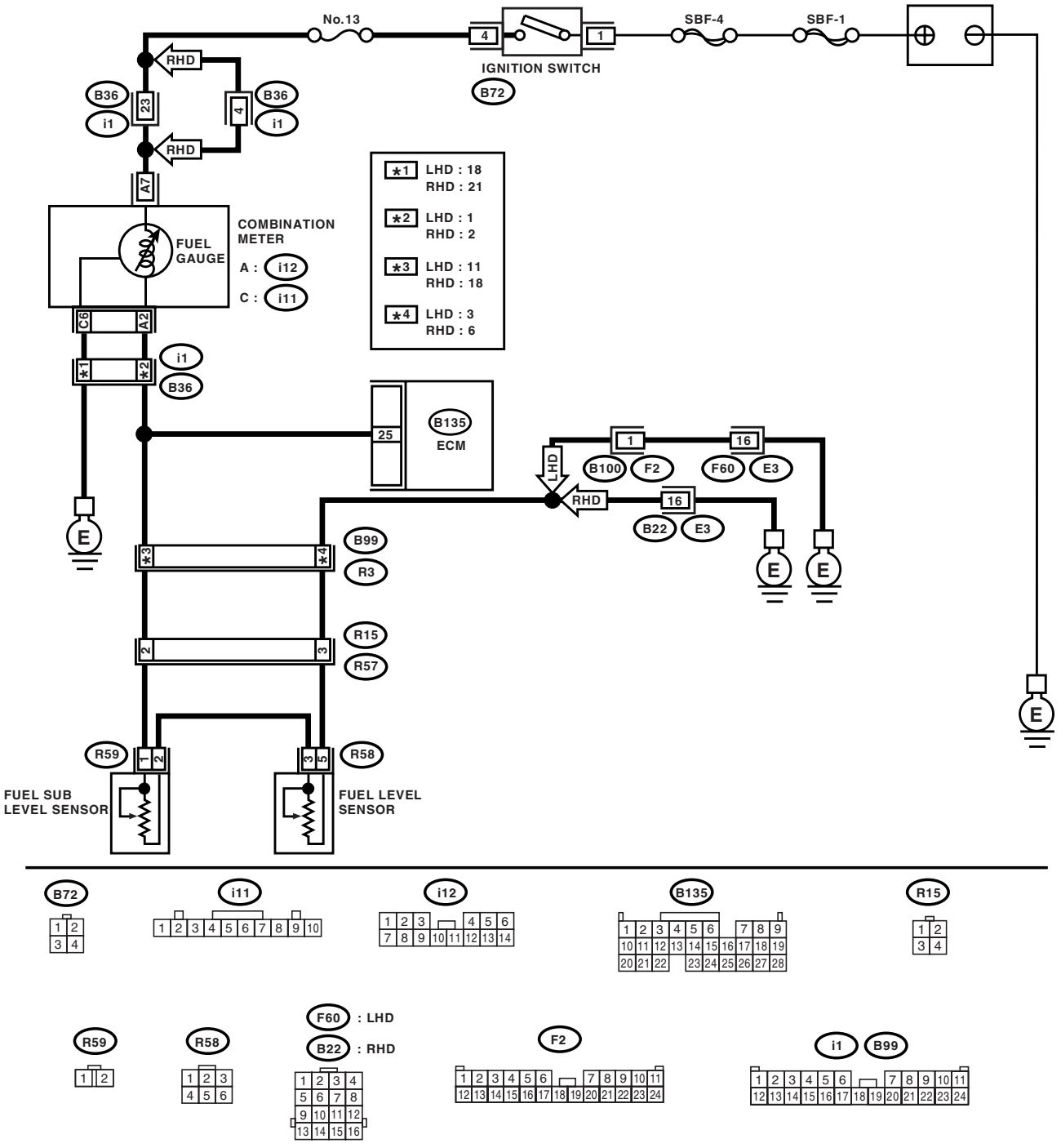
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BA:DTC P0463 — FUEL LEVEL SENSOR CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**



EN-01312

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	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. 25 (+) — 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. 25 (+) — Chassis ground (−):***	Is the voltage more than 4.75 V?	Go to step **4.**	Repair the battery short circuit between ECM and combination meter connector.
4	**CHECK HARNESS BETWEEN ECM AND FUEL TANK CORD.** 1)Turn the ignition switch to OFF. 2)Separate the fuel tank cord connector (R57) and rear wiring harness connector (R15). 3)Measure the resistance between ECM and fuel tank cord. ***Connector & terminal*** ***(B135) No. 25 — (R15) No. 2:***	Is the resistance less than 5 Ω?	Go to step **5.**	Repair the open circuit between ECM and fuel tank cord.
5	**CHECK HARNESS BETWEEN FUEL TANK CORD AND CHASSIS GROUND.** Measure the resistance between fuel tank cord and chassis ground. ***Connector & terminal*** ***(R15) No. 6 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **6.**	Repair the open circuit between fuel tank cord and chassis ground. NOTE: In this case, repair the following: Poor contact in coupling connectors
6	**CHECK FUEL TANK CORD.** 1)Disconnect the connector from fuel level sensor. 2)Measure the resistance between fuel level sensor and coupling connector. ***Connector & terminal*** ***(R57) No. 6 — (R58) No. 5:***	Is the resistance less than 10 Ω?	Go to step **7.**	Repair the open circuit between coupling connector and fuel level sensor.

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	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. 2 — (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)-61, Fuel Pump.> 2)While moving the fuel level sensor float up and down, measure the resistance between fuel level sensor terminals. ***Terminals*** ***No. 3 — No. 5:***	Is the resistance more than 53 Ω?	Replace the fuel level sensor. <Ref. to FU(H4DOTC)-63, Fuel Level Sensor.>	Go to step **10.**
10	**CHECK FUEL SUB LEVEL SENSOR.** 1)Remove the fuel sub level sensor. <Ref. to FU(H4DOTC)-64, 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)-64, Fuel Sub Level Sensor.>	Replace the combination meter. <Ref. to IDI-11, Combination Meter Assembly.>

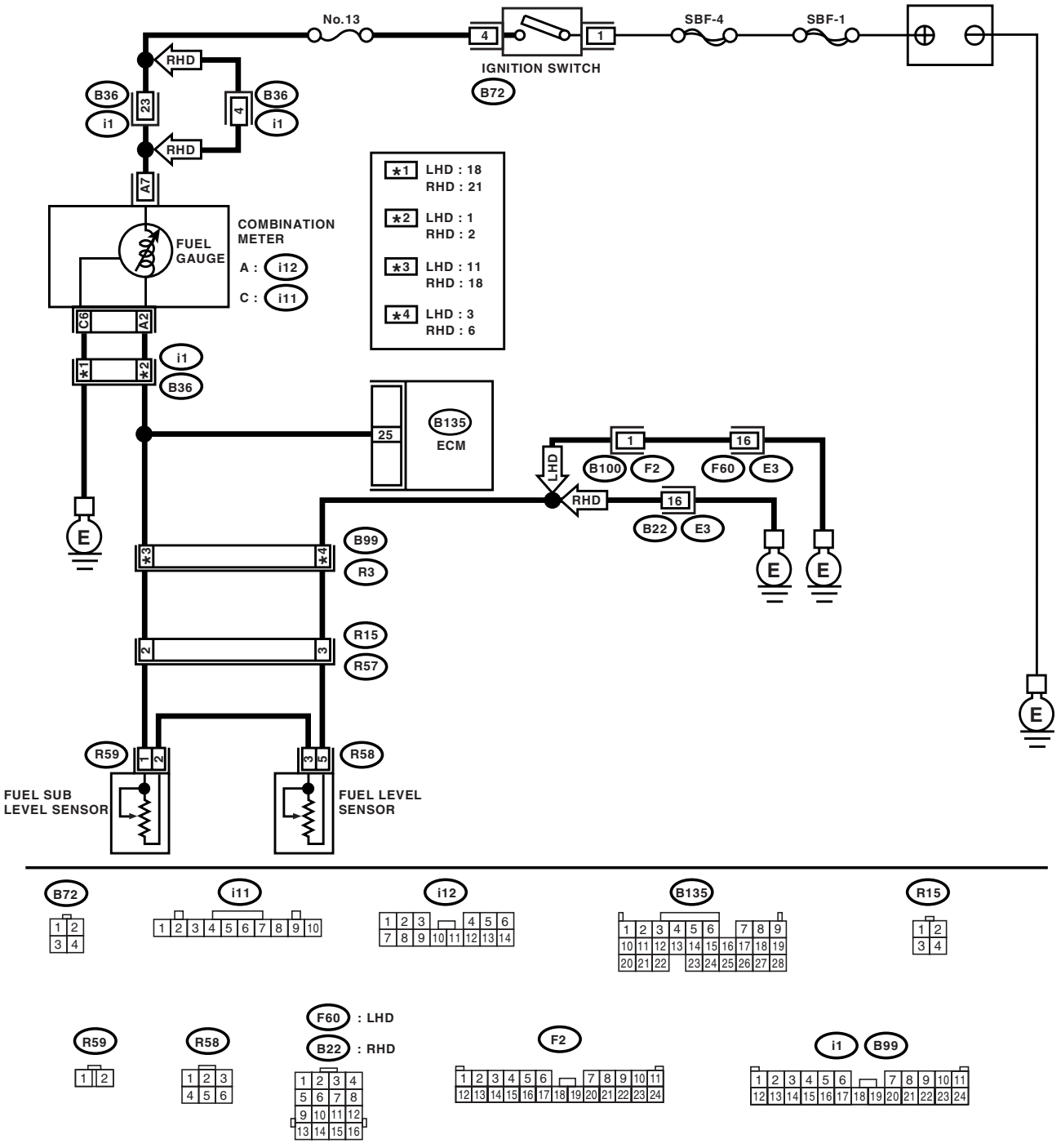
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BB:DTC P0464 — FUEL LEVEL SENSOR CIRCUIT INTERMITTENT —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**



EN-01312

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	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)-75, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK FUEL LEVEL SENSOR.** 1)Remove the fuel pump assembly. <Ref. to FU(H4DOTC)-61, Fuel Pump.> 2)While moving the fuel level sensor float up and down, make sure that the resistance between fuel level sensor terminals changes smoothly. ***Terminals*** ***No. 3 — No. 5:***	Does the resistance change smoothly approx. 0.5 Ω — 52 Ω?	Go to step **3.**	Replace the fuel level sensor. <Ref. to FU(H4DOTC)-63, Fuel Level Sensor.>
3	**CHECK FUEL SUB LEVEL SENSOR.** 1)Remove the fuel sub level sensor. <Ref. to FU(H4DOTC)-64, 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 approx. 0.5 Ω — 44 Ω?	Repair the poor contact in ECM, combination meter and coupling connectors.	Replace the fuel sub level sensor. <Ref. to FU(H4DOTC)-64, Fuel Sub Level Sensor.>

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BC:DTC P0483 — COOLING FAN RATIONALITY CHECK —

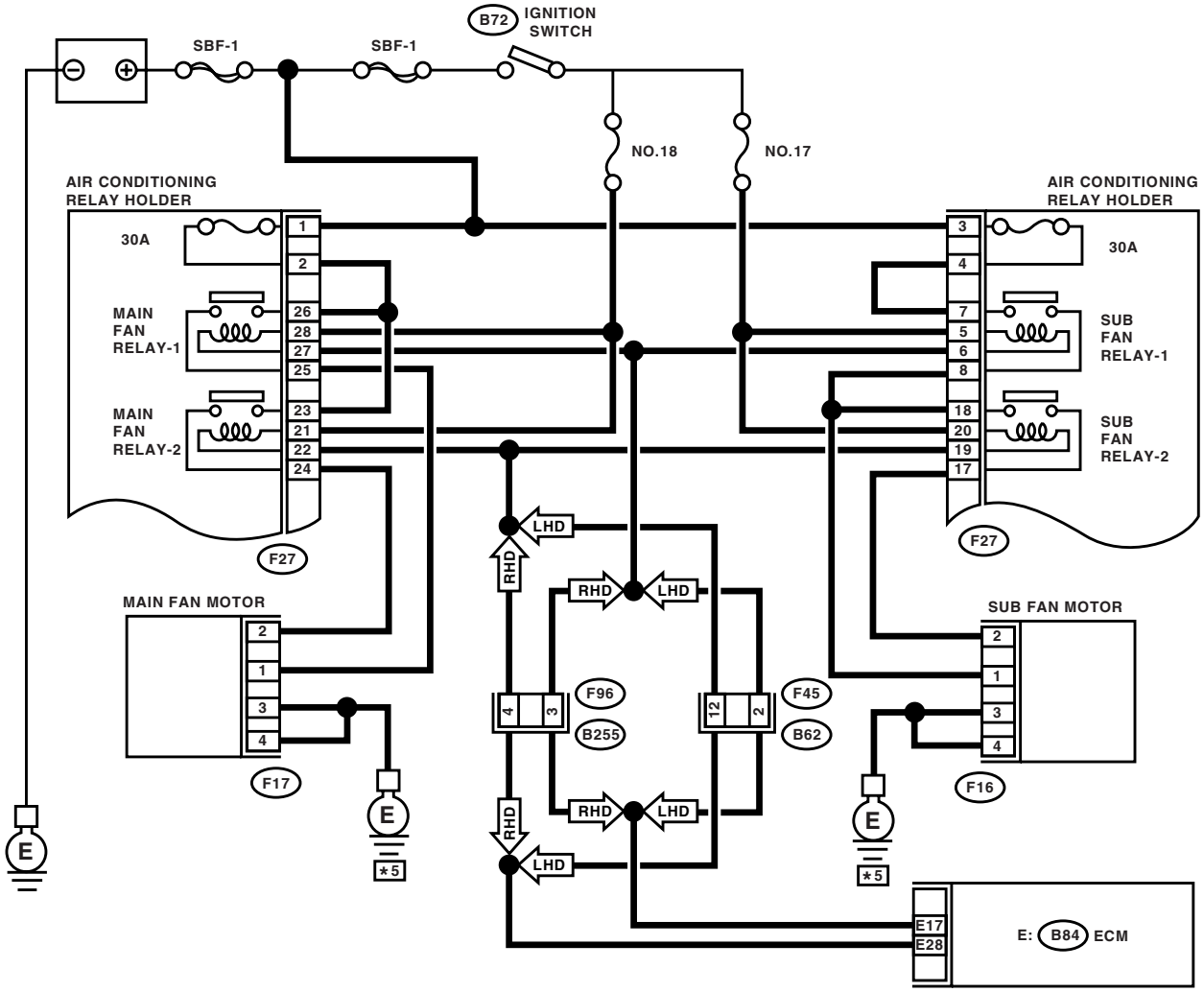
- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Occurrence of noise
  - Overheating

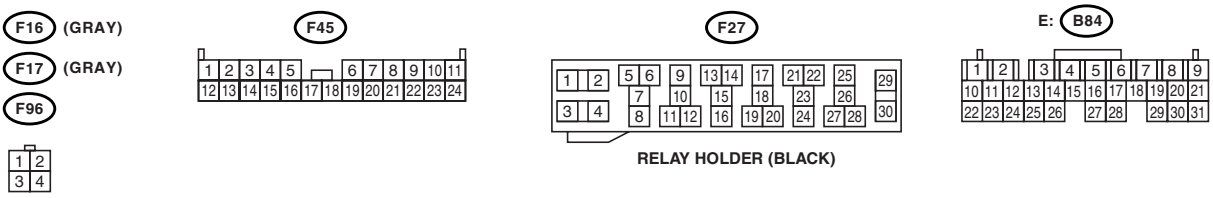
CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

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.

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- **WIRING DIAGRAM:**





CO-00207

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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)-75, List of Diagnostic Trouble Code (DTC).>	Check the radiator fan, fan motor and thermostat. <Ref. to CO(H4SO)-25, Radiator Main Fan and Fan Motor.> and <Ref. to CO(H4SO)-26, Radiator Sub Fan and Fan Motor.> If thermostat is stuck, replace thermostat.

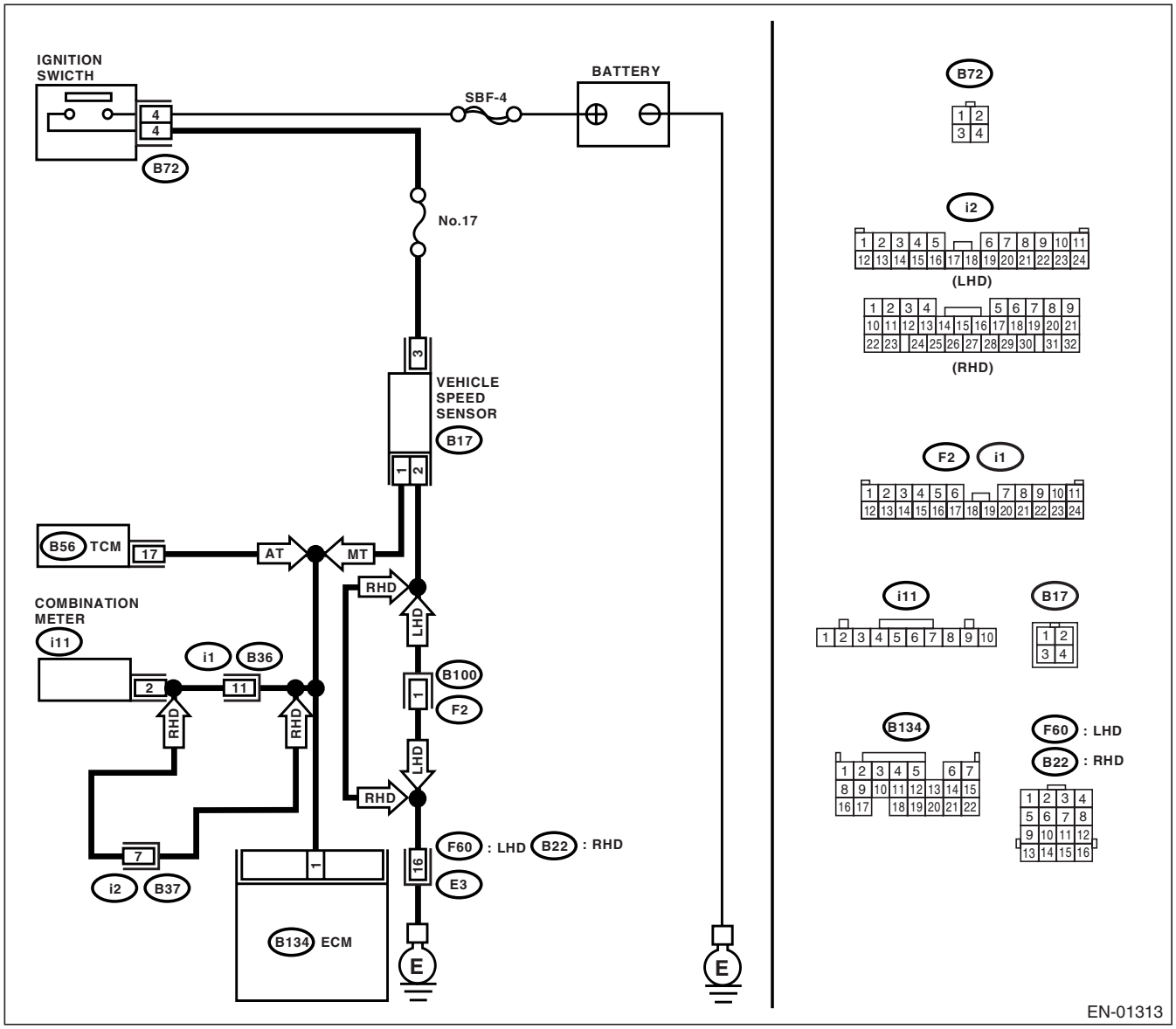
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BD:DTC P0502 — VEHICLE SPEED SENSOR CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**



Step		Check	Yes	No
1	**CHECK TRANSMISSION TYPE.**	Is the transmission type AT?	Go to step **2.**	Go to step **4.**

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	Step	Check	Yes	No
2	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from ECM and TCM. 3)Measure the resistance of harness between TCM connector and chassis ground. ***Connector & terminal*** ***(B56) No. 17 — 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 Subaru distributor service.
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-51, Vehicle Speed Sensor.>

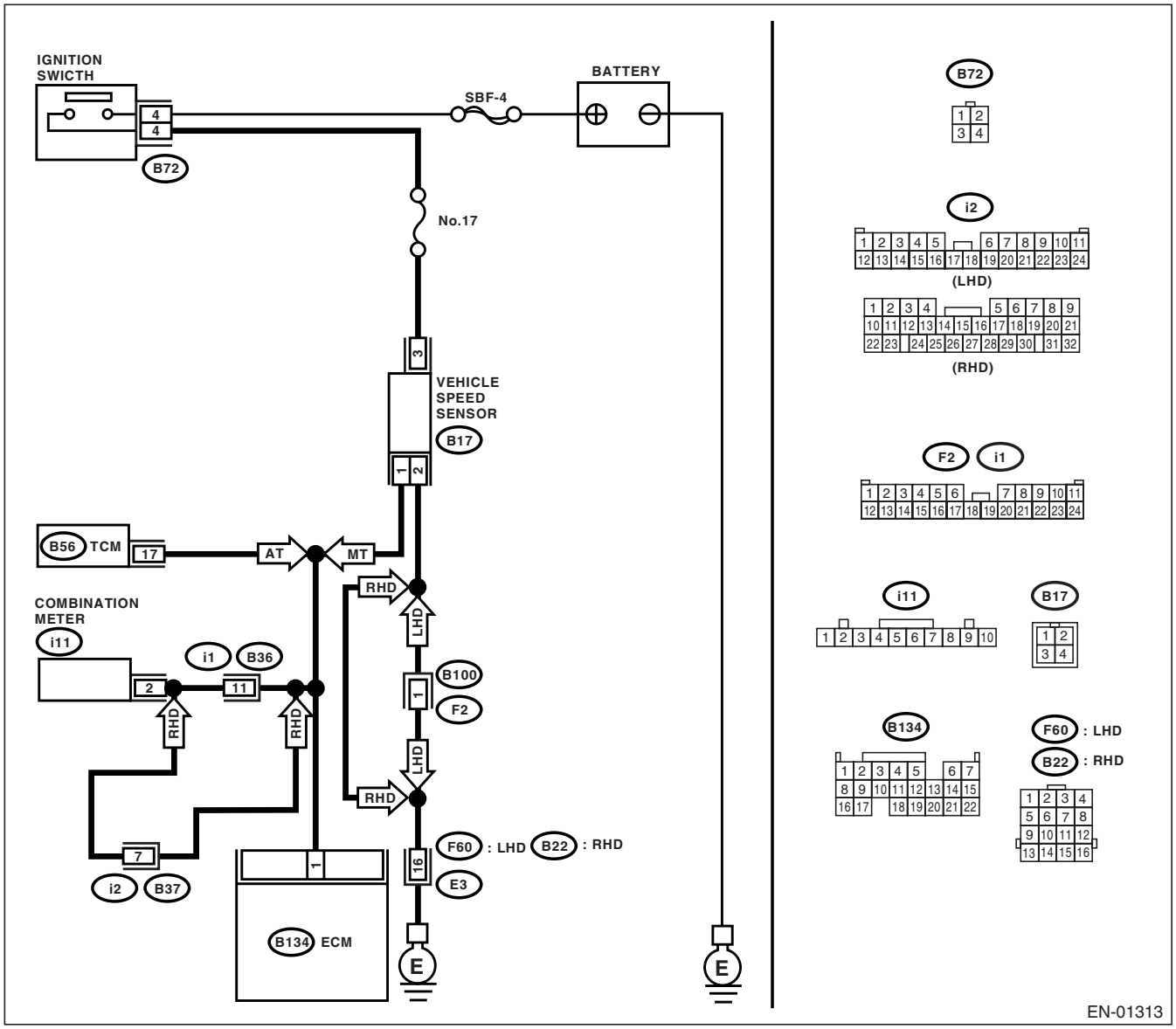
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BE:DTC P0503 — VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**



Step		Check	Yes	No
1	**CHECK TRANSMISSION TYPE.**	Is the transmission type AT?	Go to step **2.**	Go to step **3.**

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	Step	Check	Yes	No
2	**CHECK DTC P0720 ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0720?	Check the front vehicle speed sensor signal circuit. <Ref. to 4AT-53, DTC 33 FRONT VEHICLE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Go to step **3.**
3	**CHECK SPEEDOMETER OPERATION IN COMBINATION METER.**	Does the speedometer operate normally?	Go to step **4.**	Check the speedometer. <Ref. to IDI-14, 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*** ***(B134) No. 1 — (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

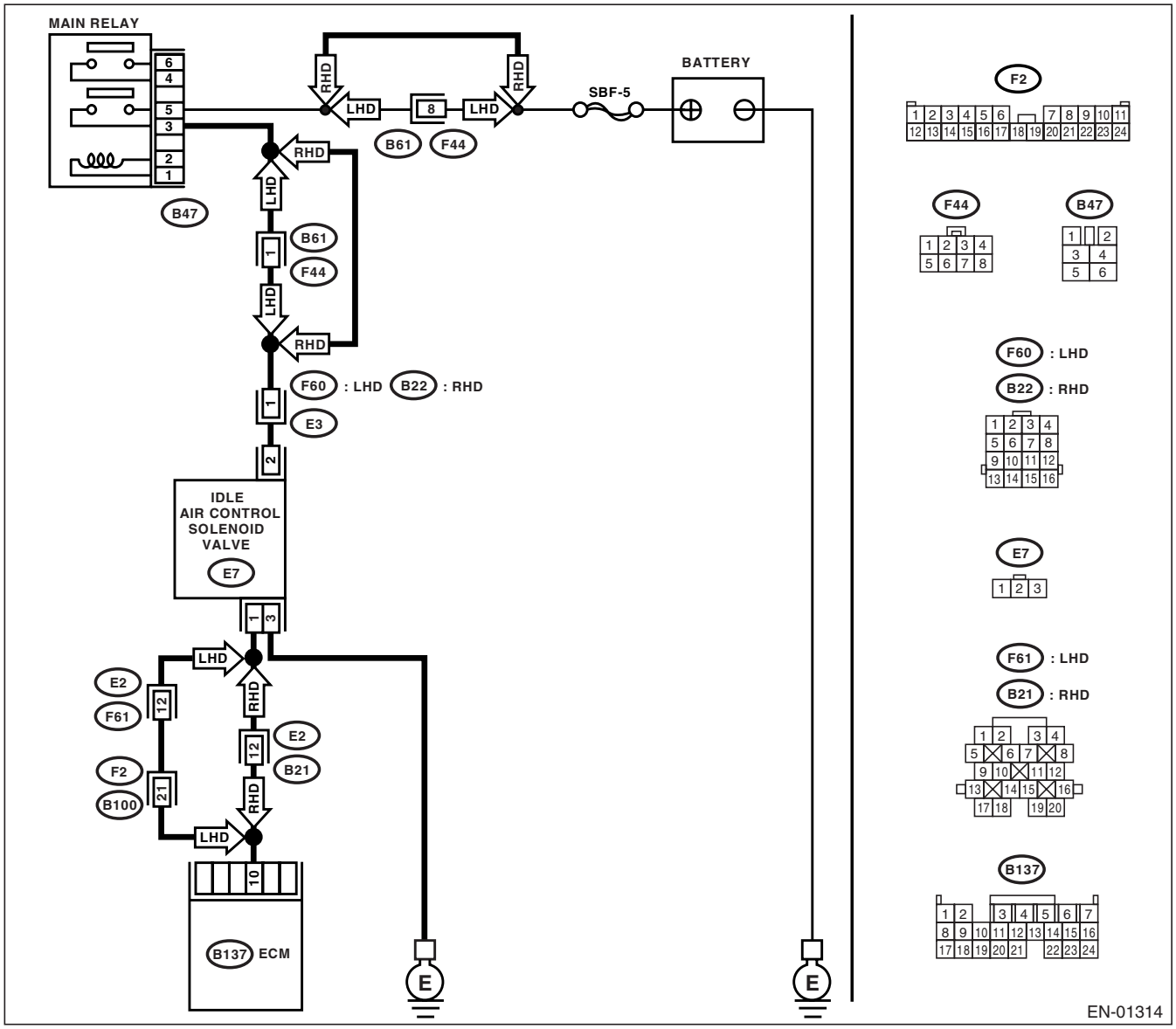
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BF:DTC P0506 — IDLE CONTROL SYSTEM RPM LOWER THAN EXPECTED —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Engine is difficult to start.
  - Engine does not start.
  - Erroneous idling
  - Engine stalls.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**



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	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)-75, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0506.	Go to step **2.**
2	**CHECK IDLE AIR CONTROL SOLENOID VALVE.** 1)Turn the ignition switch to OFF. 2)Remove the idle air control solenoid valve from throttle body. <Ref. to FU(H4DOTC)-36, REMOVAL, Idle Air Control Solenoid Valve.> 3)Using an air gun, force air into the idle air control solenoid valve by-pass air inlet. Confirm that forced air subsequently escapes from both main air passage and assist air passage.	Does air flow out?	Go to step **4.**	Replace the idle air control solenoid valve. <Ref. to FU(H4DOTC)-36, Idle Air Control Solenoid Valve.> After replace, Go to step **3.**
3	**CHECK IDLE AIR CONTROL SOLENOID VALVE DUTY RATIO.** 1)Turn the ignition switch to ON. 2)Start the engine, and warm-up the engine. 3)Turn all accessory switches to OFF. 4)Read the data of idle air control solenoid valve duty ratio using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedures, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the duty ratio more than 60 %?	Go to step **4.**	END.
4	**CHECK BY-PASS AIR LINE.** 1)Turn the ignition switch to OFF. 2)Remove the idle air control solenoid valve from throttle body. <Ref. to FU(H4DOTC)-36, REMOVAL, Idle Air Control Solenoid Valve.> 3)Remove the throttle body to intake manifold. <Ref. to FU(H4DOTC)-13, REMOVAL, Throttle Body.> 4)Using an air gun, force air into the solenoid valve installation area and throttle valve interior. Confirm that forced air subsequently escapes from both these areas.	Does air flow out?	Replace the idle air control solenoid valve. <Ref. to FU(H4DOTC)-36, Idle Air Control Solenoid Valve.>	Replace the throttle body. <Ref. to FU(H4DOTC)-13, Throttle Body.>

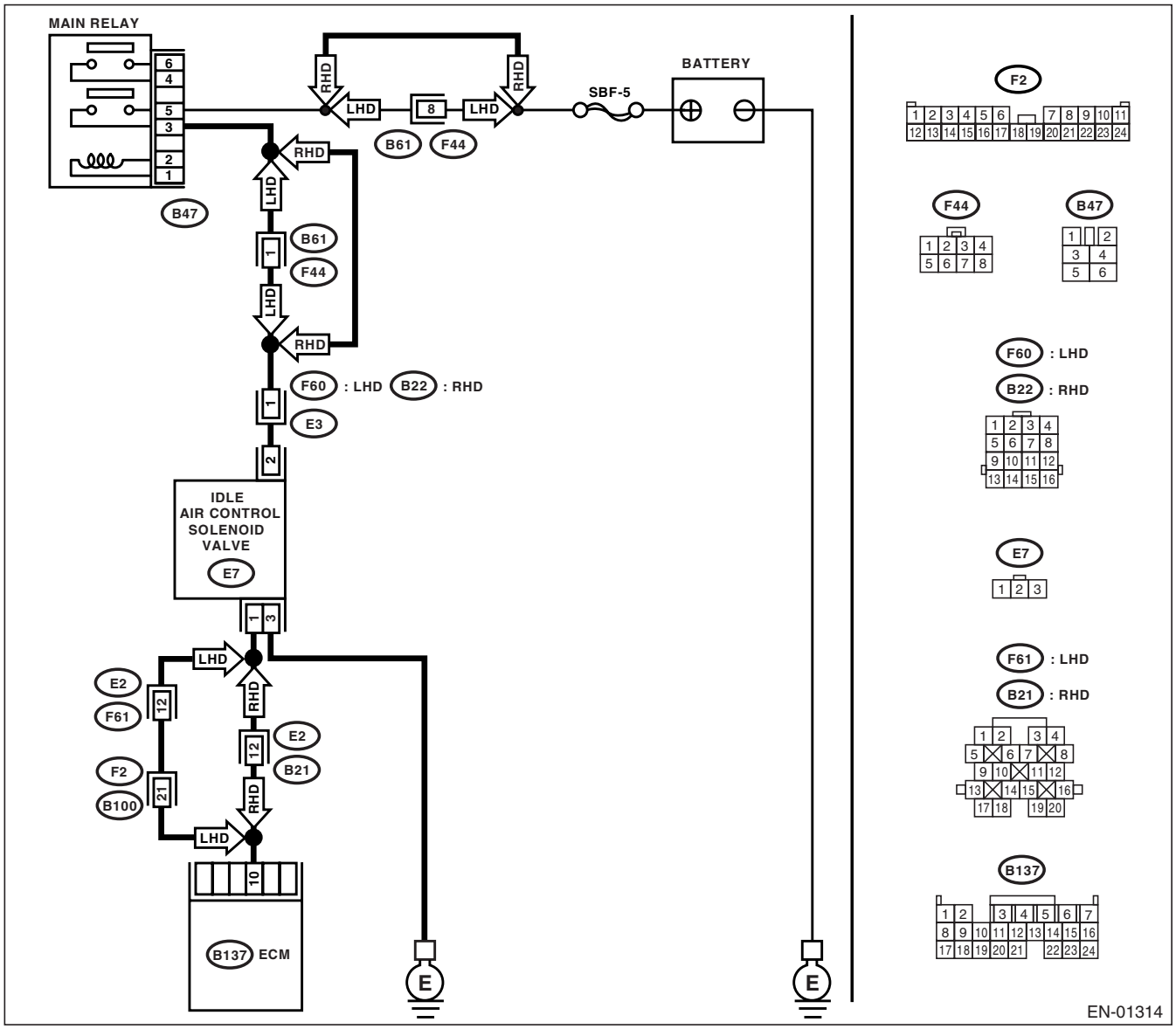
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BG:DTC P0507 — IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Engine keeps running at higher revolution than specified idling revolution.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**



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	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)-75, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0507.	Go to step **2.**
2	**CHECK THROTTLE CABLE.**	Does the throttle cable have play for adjustment?	Go to step **3.**	Adjust the throttle cable. <Ref. to SP(H4SO)-9, INSTALLATION, Accelerator Control Cable.>
3	**CHECK AIR INTAKE SYSTEM.** 1)Turn the ignition switch to ON. 2)Start the engine, and idle it. 3)Check the following items. •Loose installation of intake manifold, idle air control solenoid valve and throttle body •Cracks of intake manifold gasket, idle air control solenoid valve gasket and throttle body gasket •Disconnections of vacuum hoses	Is there a fault in air intake system?	Repair the air suction and leaks.	Replace the idle air control solenoid valve. <Ref. to FU(H4DOTC)-36, Idle Air Control Solenoid Valve.>

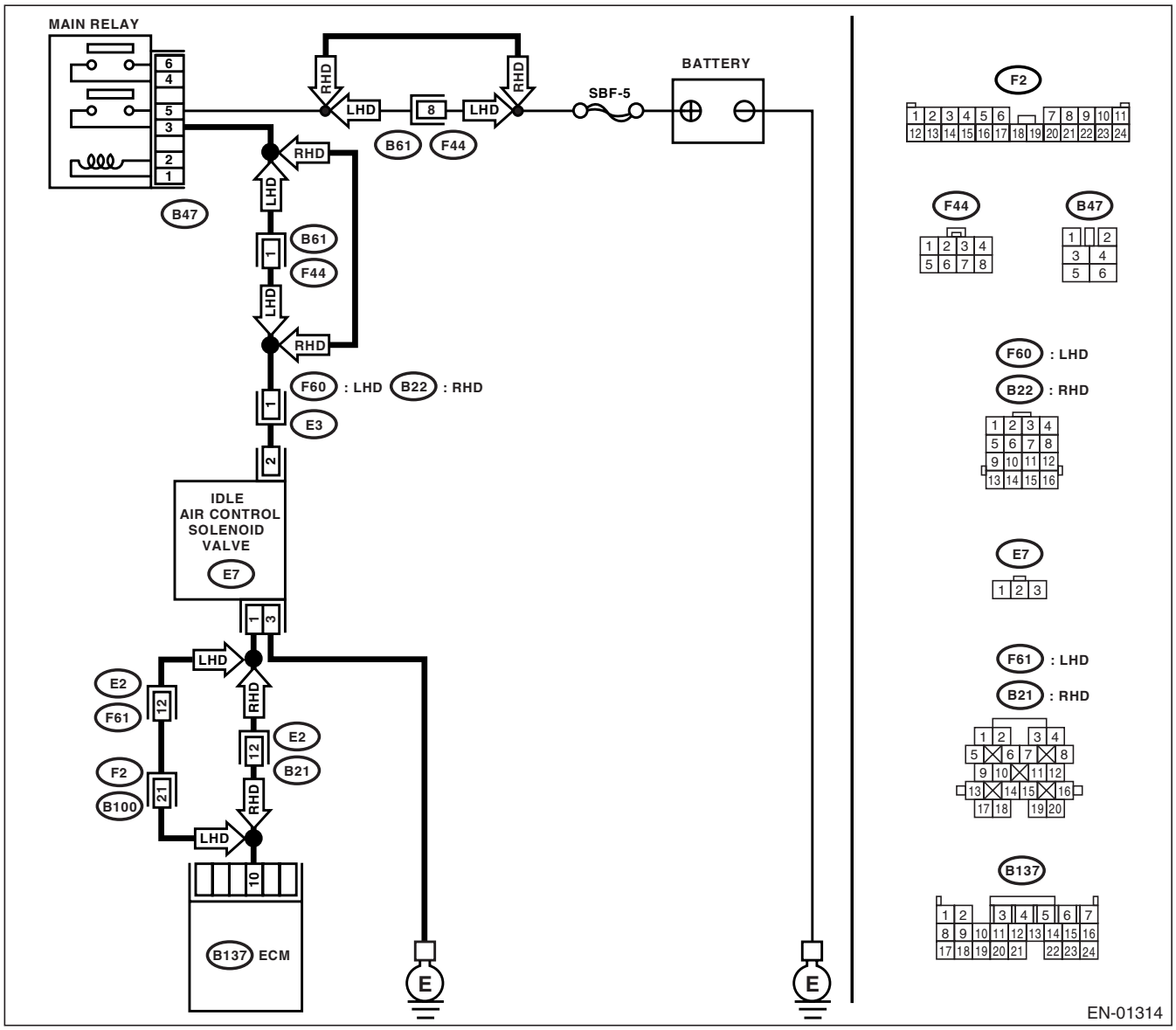
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BH:DTC P0508 — IDLE CONTROL SYSTEM CIRCUIT LOW —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.
  - Engine breathing

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**



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	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. 10 (+) — Chassis ground (−):***	Is the voltage more than 3 V?	Repair the poor contact in ECM connector.	Go to step **2.**
2	**CHECK POWER SUPPLY TO IDLE AIR CONTROL SOLENOID VALVE.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from idle air control solenoid valve. 3)Turn the ignition switch to ON. 4)Measure the voltage between idle air control solenoid valve and engine ground. ***Connector & terminal*** ***(E7) No. 2 (+) — Engine ground (−):***	Is the voltage more than 10 V?	Go to step **3.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between idle air control solenoid valve and main relay connector • Poor contact in coupling connector
3	**CHECK HARNESS BETWEEN ECM AND IDLE AIR CONTROL SOLENOID VALVE CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ECM. 3)Measure the resistance of harness between ECM and idle air control solenoid valve connector. ***Connector & terminal*** ***(B137) No. 10 — (E7) No. 1:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and idle air control solenoid valve connector • Poor contact in coupling connector
4	**CHECK HARNESS BETWEEN ECM AND IDLE AIR CONTROL SOLENOID VALVE CONNECTOR.** Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 10 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair the ground short circuit in harness between ECM and idle air control solenoid valve connector.
5	**CHECK GROUND CIRCUIT OF IDLE AIR CONTROL SOLENOID VALVE.** Measure the resistance of harness between idle air control solenoid valve connector and engine ground. ***Connector & terminal*** ***(E7) No. 3 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **6.**	Repair the open circuit in harness between idle air control solenoid valve connector and engine ground cable.
6	**CHECK POOR CONTACT.** Check poor contact in ECM and idle air control solenoid valve connectors.	Is there poor contact in ECM and idle air control solenoid valve connectors?	Repair the poor contact in ECM and idle air control solenoid valve connectors.	Replace the idle air control solenoid valve. <Ref. to FU(H4DOTC)-36, Idle Air Control Solenoid Valve.>

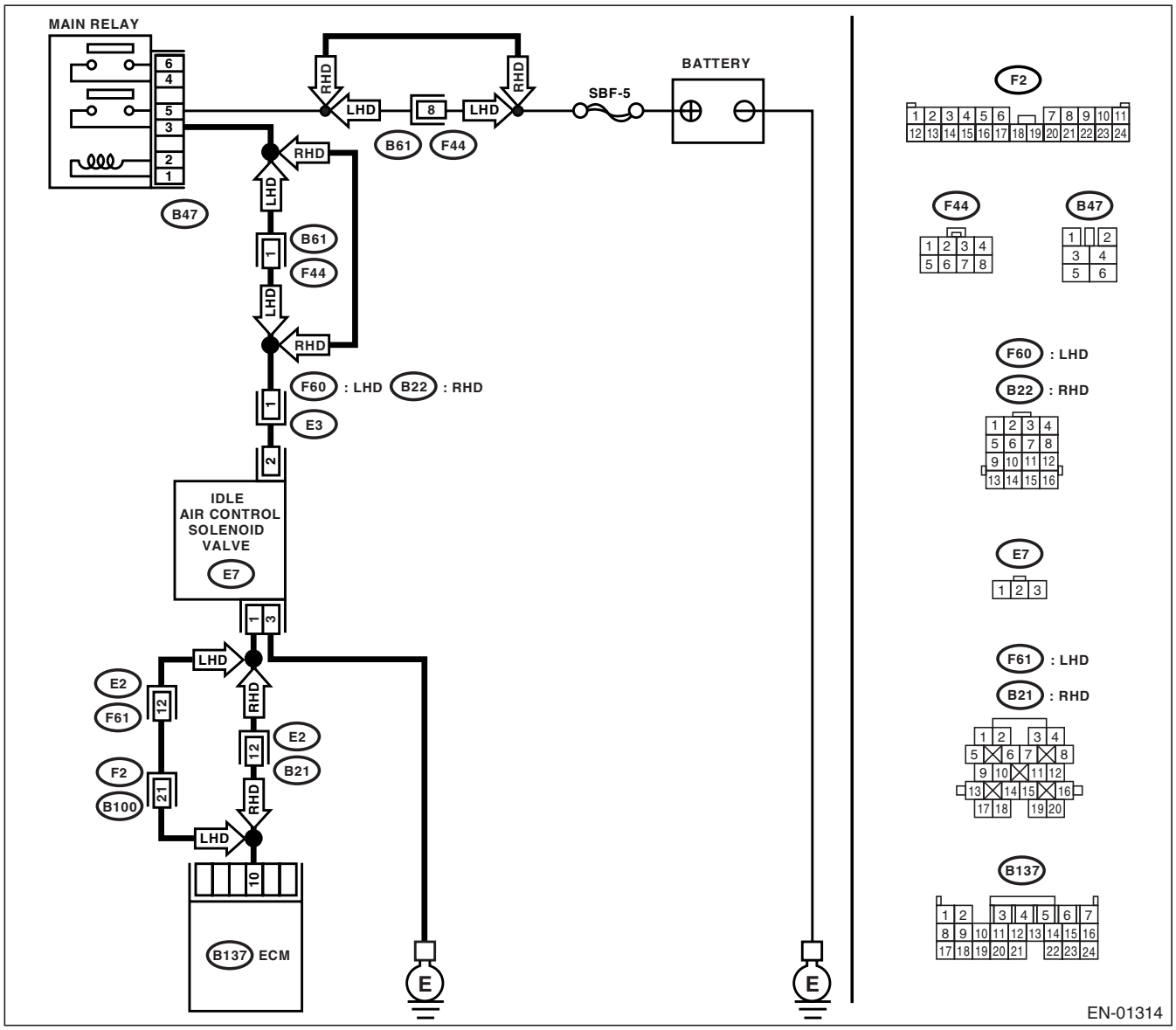
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BI: DTC P0509 — IDLE CONTROL SYSTEM CIRCUIT HIGH —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.
  - Engine breathing

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**



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	Step	Check	Yes	No
1	**CHECK THROTTLE CABLE.**	Does the throttle cable have play for adjustment?	Go to step **2.**	Adjust the throttle cable. <Ref. to SP(H4SO)-9, INSTALLATION, Accelerator Control Cable.>
2	**CHECK OUTPUT SIGNAL FROM ECM.** 1)Turn the ignition switch to ON. 2)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 10 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **3.**	Go to step **4.**
3	**CHECK OUTPUT SIGNAL FROM ECM.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from idle air control solenoid valve. 3)Turn the ignition switch to ON. 4)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 10 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair the battery short circuit in harness between ECM and idle air control solenoid valve connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-49, Engine Control Module (ECM).>	Replace the idle air control solenoid valve. <Ref. to FU(H4DOTC)-36, Idle Air Control Solenoid Valve.> and ECM <Ref. to FU(H4DOTC)-49, Engine Control Module (ECM).>
4	**CHECK OUTPUT SIGNAL FROM ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 10 (+) — 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 idle air control solenoid valve connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-49, Engine Control Module (ECM).>	Contact your Subaru distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

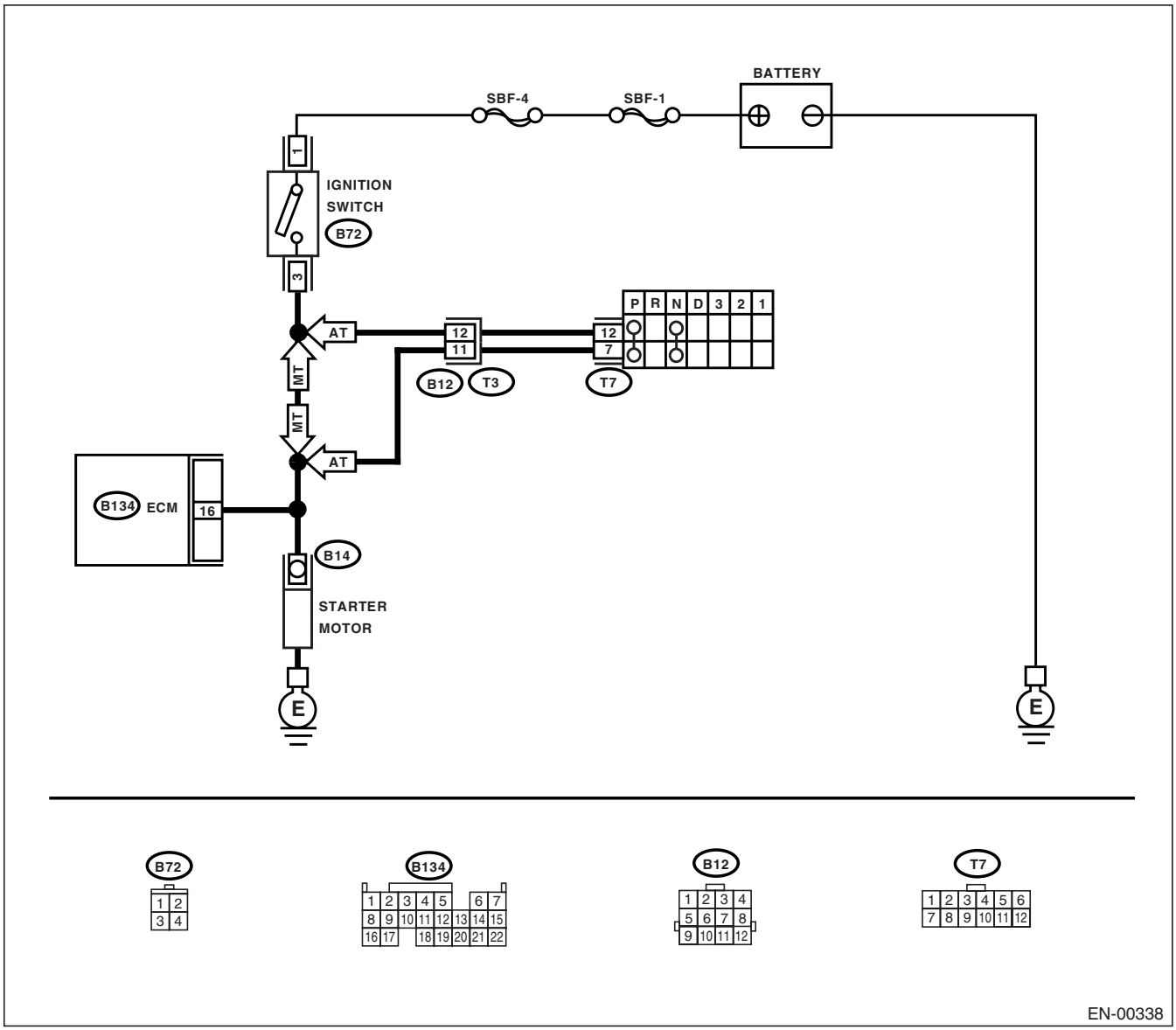
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BJ:DTC P0512 — STARTER REQUEST CIRCUIT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Failure of engine to start

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**



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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)-49, Engine Control Module (ECM).>	Check the starter motor circuit. <Ref. to EN(H4DOTC)-61, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

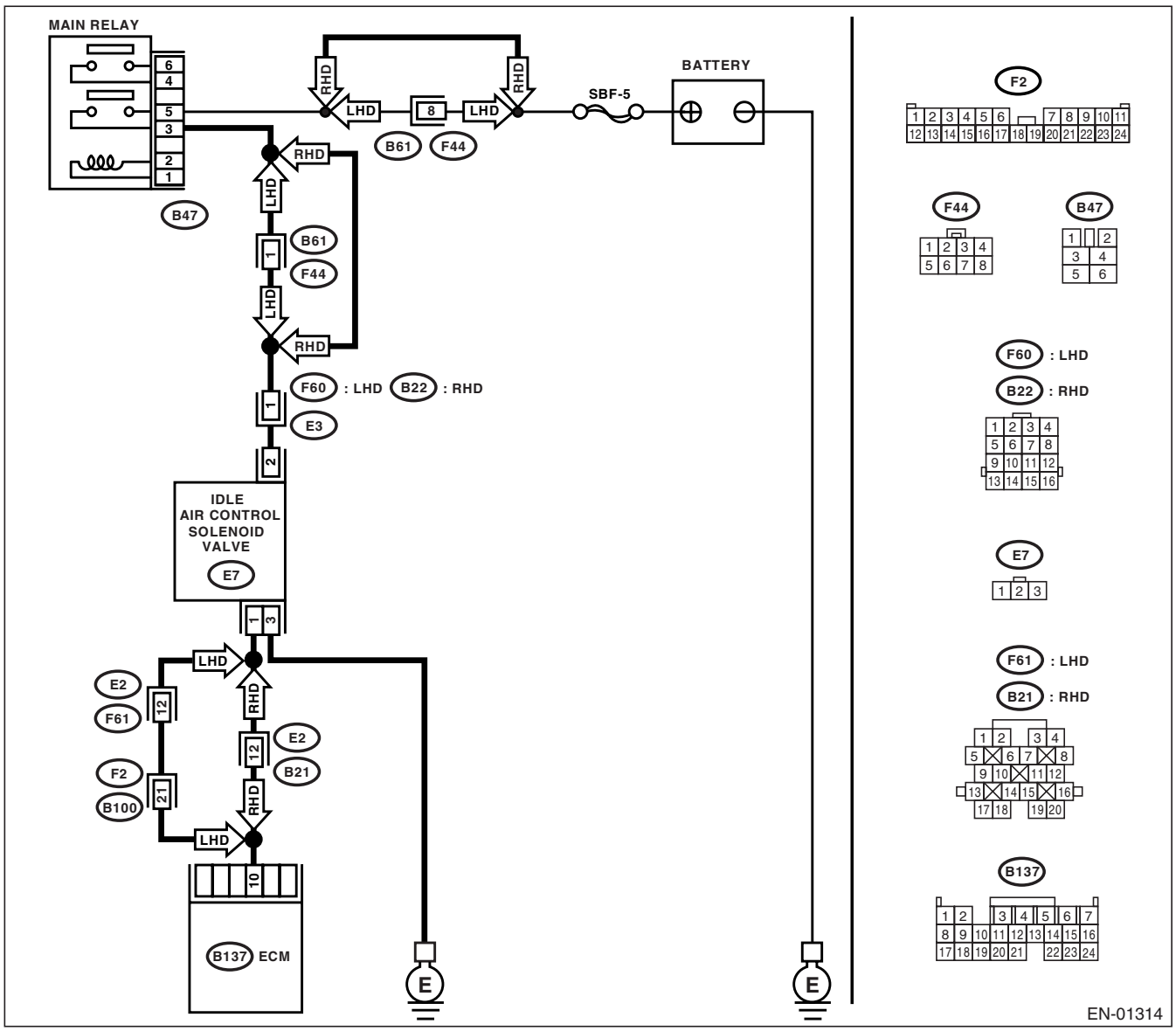
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BK:DTC P0519 — IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Engine keeps running at higher revolution than specified idling revolution.
  - Fuel is cut according to fail-safe function.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**



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	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)-75, 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 THROTTLE CABLE.**	Does the throttle cable have play for adjustment?	Go to step **4.**	Adjust the throttle cable. <Ref. to SP(H4SO)-9, INSTALLATION, Accelerator Control Cable.>
4	**CHECK AIR BY-PASS LINE.** 1)Turn the ignition switch to OFF. 2)Remove the idle air control solenoid valve from throttle body. <Ref. to FU(H4DOTC)-36, Idle Air Control Solenoid Valve.> 3)Confirm that there are no foreign particles in by-pass air line.	Are foreign particles in by-pass air line?	Remove the foreign particles from by-pass air line.	Replace the idle air control solenoid valve. <Ref. to FU(H4DOTC)-36, Idle Air Control Solenoid Valve.>

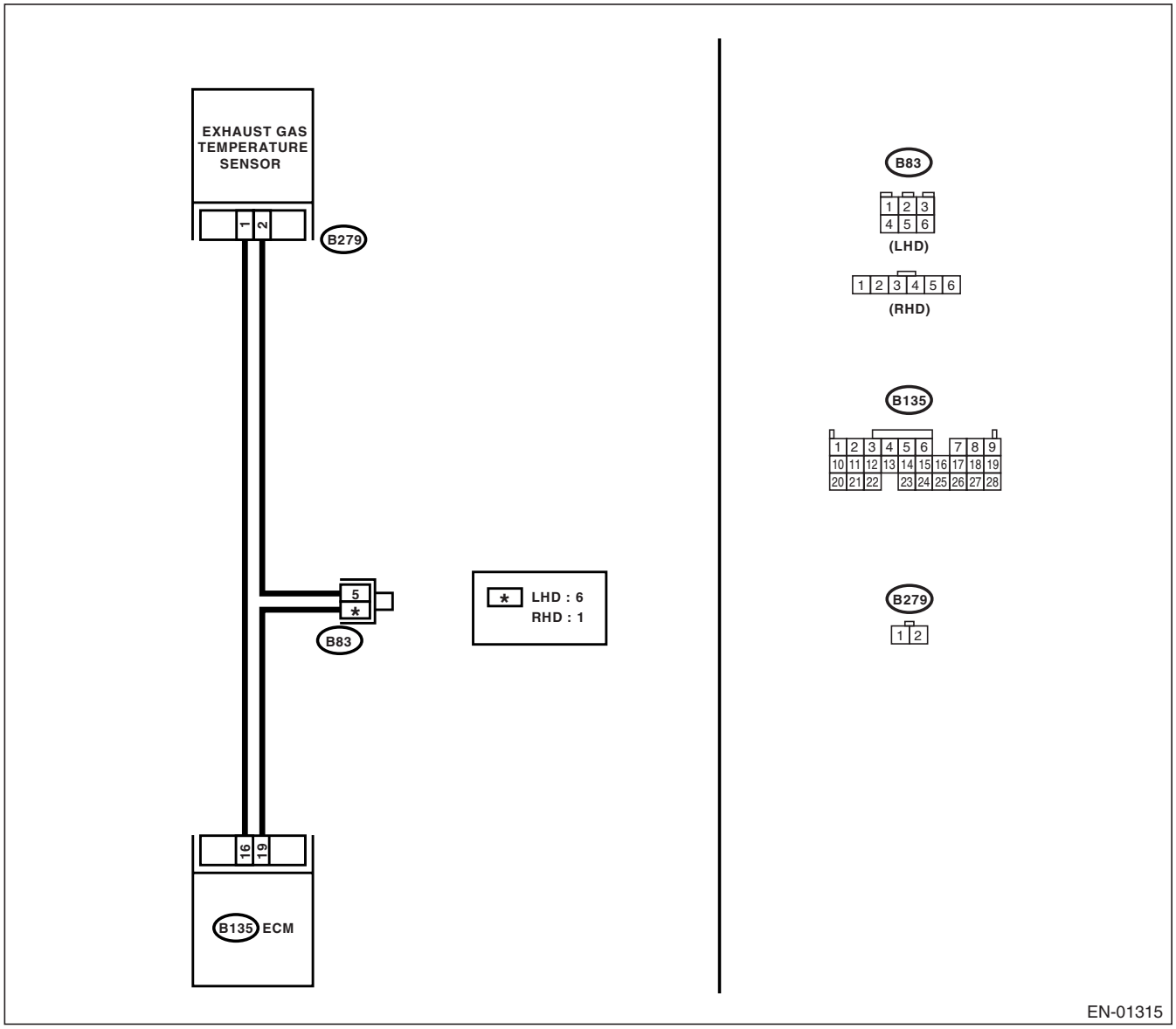
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BL:DTC P0545 — EXHAUST GAS TEMPERATURE SENSOR CIRCUIT LOW-BANK 1 —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Hard to start
  - Erroneous idling
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**



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	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1)Start the engine. 2)Read the data of exhaust gas temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the temperature more than 1200°C (2192°F)?	Go to step **2.**	Repair the poor contact. NOTE: In this case, repair the following: • Poor contact in exhaust gas temperature sensor • Poor contact in ECM • Poor contact in joint connector
2	**CHECK HARNESS BETWEEN EXHAUST GAS TEMPERATURE SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from exhaust gas temperature sensor. 3)Turn the ignition switch to ON. 4)Read the data of exhaust gas temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the temperature less than 372°C (702°F)?	Replace the exhaust gas temperature sensor. <Ref. to FU(H4DOTC)-48, Exhaust Temperature Sensor.>	Repair the ground short circuit in harness between exhaust gas temperature sensor and ECM connector.

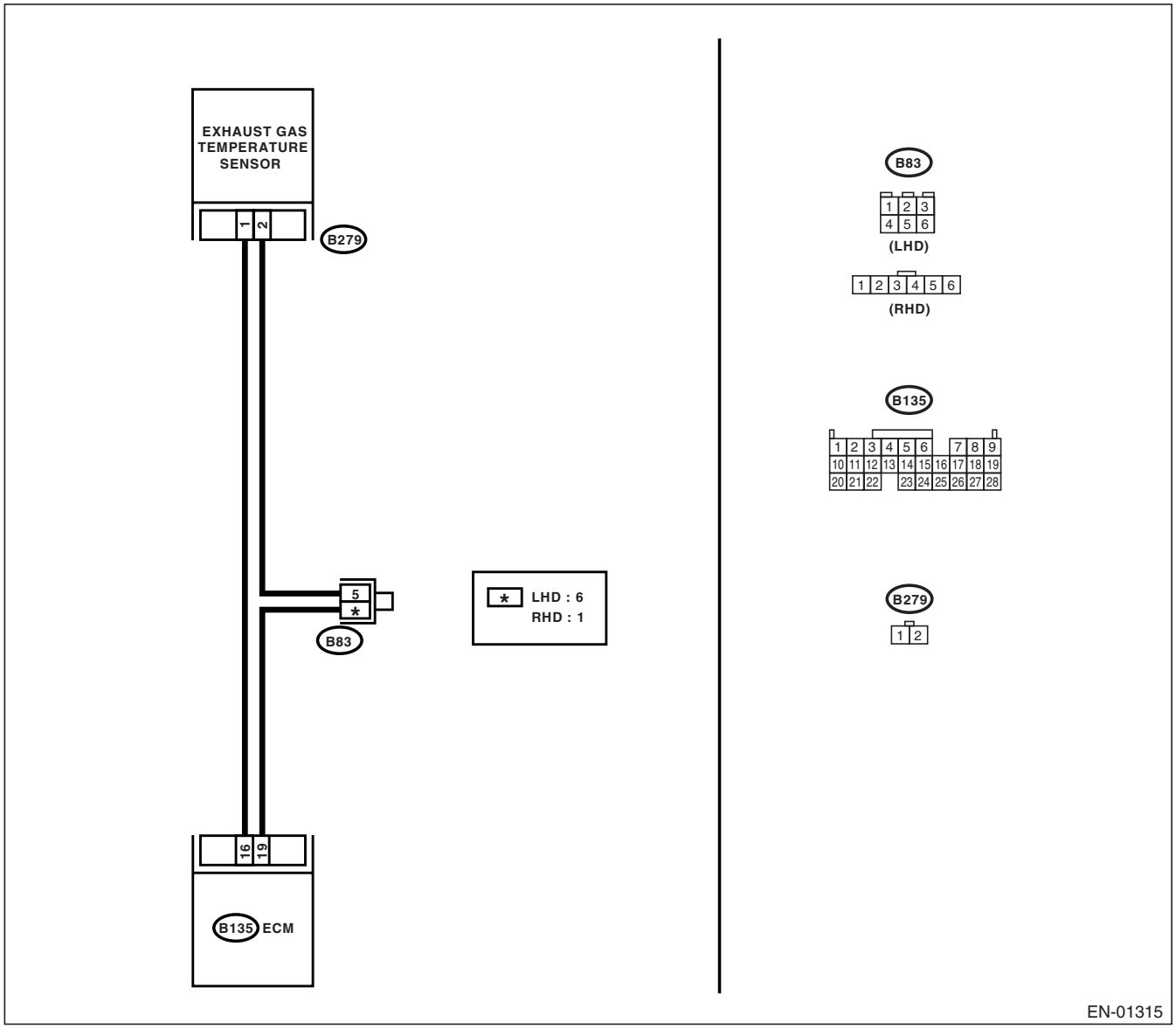
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BM:DTC P0546 — EXHAUST GAS TEMPERATURE SENSOR CIRCUIT HIGH-BANK 1 —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Hard to start
  - Erroneous idling
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**



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Step		Check	Yes	No
1	**CHECK CURRENT DATA.** 1)Start the engine. 2)Read the data of exhaust gas temperature sensor signal using Subaru Select Monitor or OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II General Scan Tool Instruction Manual.	Is the temperature less than 372°C (702°F)?	Go to step **2.**	Repair the poor contact. NOTE: In this case, repair the following: • Poor contact in exhaust gas temperature sensor • Poor contact in ECM • Poor contact in joint connector
2	**CHECK HARNESS BETWEEN EXHAUST GAS TEMPERATURE SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from exhaust gas temperature sensor. 3)Measure the voltage between exhaust gas temperature sensor connector and engine ground. ***Connector & terminal*** ***(B279) No. 1 (+) — Engine ground (−):***	Is the voltage more than 10 V?	Repair the battery short circuit in harness between ECM and exhaust gas temperature sensor connector.	Go to step **3.**
3	**CHECK HARNESS BETWEEN EXHAUST GAS TEMPERATURE SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to ON. 2)Measure the voltage between exhaust gas temperature sensor connector and engine ground. ***Connector & terminal*** ***(B279) No. 1 (+) — Engine ground (−):***	Is the voltage more than 10 V?	Repair the battery short circuit in harness between ECM and exhaust gas temperature sensor connector.	Go to step **4.**
4	**CHECK HARNESS BETWEEN EXHAUST GAS TEMPERATURE SENSOR AND ECM CONNECTOR.** Measure the voltage between exhaust gas temperature sensor connector and engine ground. ***Connector & terminal*** ***(B279) No. 1 (+) — Engine ground (−):***	Is the voltage more than 4 V?	Go to step **5.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and exhaust gas temperature sensor connector • Poor contact in exhaust gas temperature sensor connector • Poor contact in ECM connector • Poor contact in joint connector

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Step		Check	Yes	No
5	**CHECK HARNESS BETWEEN EXHAUST GAS TEMPERATURE SENSOR AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Measure the resistance of harness between exhaust gas temperature sensor connector and engine ground. ***Connector & terminal*** ***(B279) No. 2 — Engine ground:***	Is the resistance less than 5 Ω?	Replace the exhaust gas temperature sensor. <Ref. to FU(H4DOTC)-48, Exhaust Temperature Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and exhaust gas temperature sensor connector • Poor contact in exhaust gas temperature sensor connector • Poor contact in ECM connector • Poor contact in joint connector

BN:DTC P0558 — GENERATOR CIRCUIT LOW INPUT —

CAUTION:
For diagnostic procedure, refer to DTC P0559. <Ref. to EN(H4DOTC)-223, DTC P0559 — GENERATOR CIRCUIT HIGH INPUT —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>.

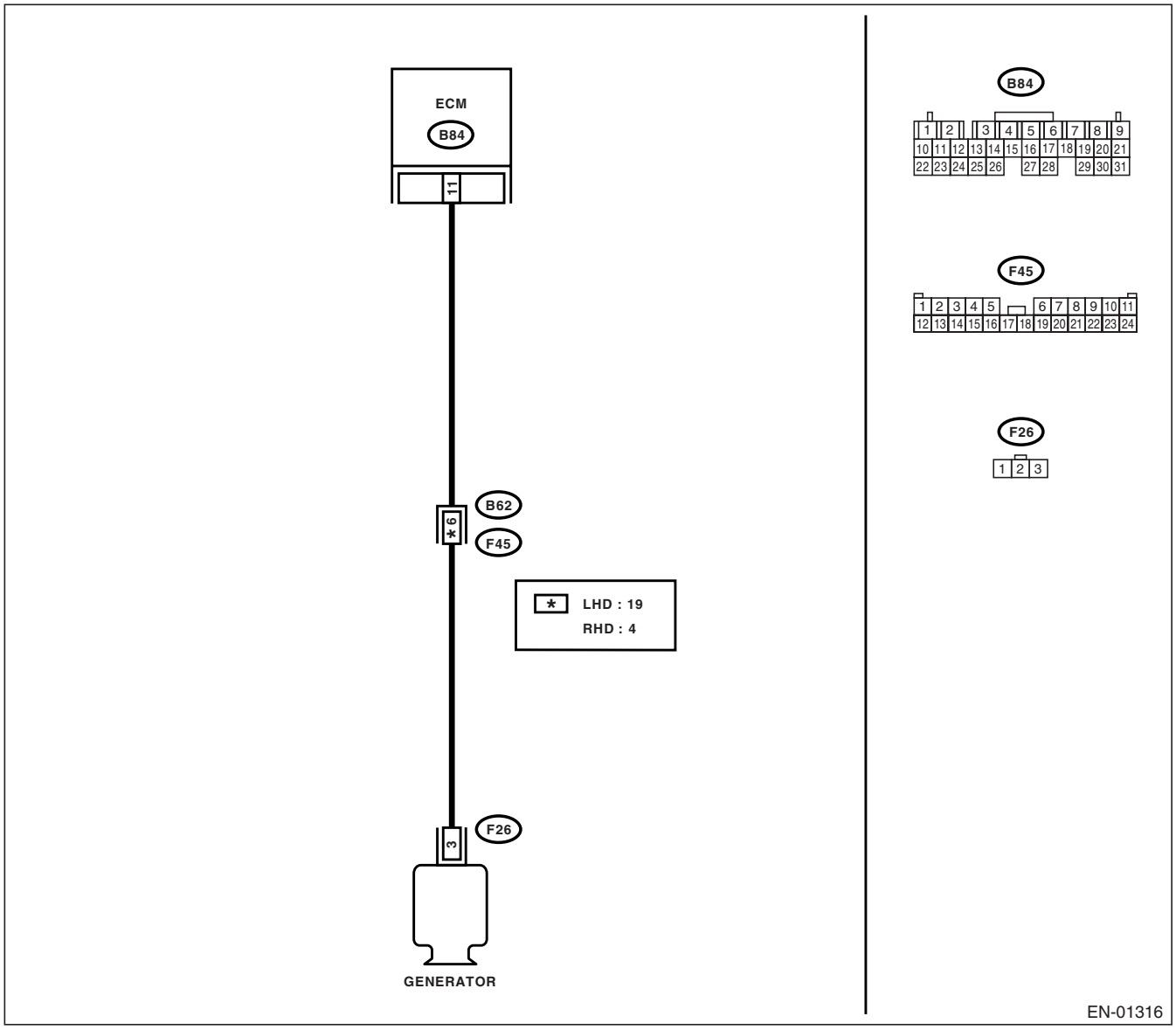
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BO:DTC P0559 — GENERATOR CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**



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	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN GENERATOR AND ECM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from generator and ECM. 3)Measure the resistance of harness between generator connector and engine ground. ***Connector & terminal*** ***(F26) No. 3 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **2.**	Repair the ground short circuit in harness between ECM and purge control solenoid valve connector.
2	**CHECK HARNESS BETWEEN GENERATOR AND ECM CONNECTOR.** Measure the resistance of harness between ECM and generator of harness connector. ***Connector & terminal*** ***(B84) No. 11 — (F26) No. 3:***	Is the resistance less than 1 Ω?	Repair poor contact in connector.	Repair the open circuit in harness between ECM and generator connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and generator connector • Poor contact in coupling connector

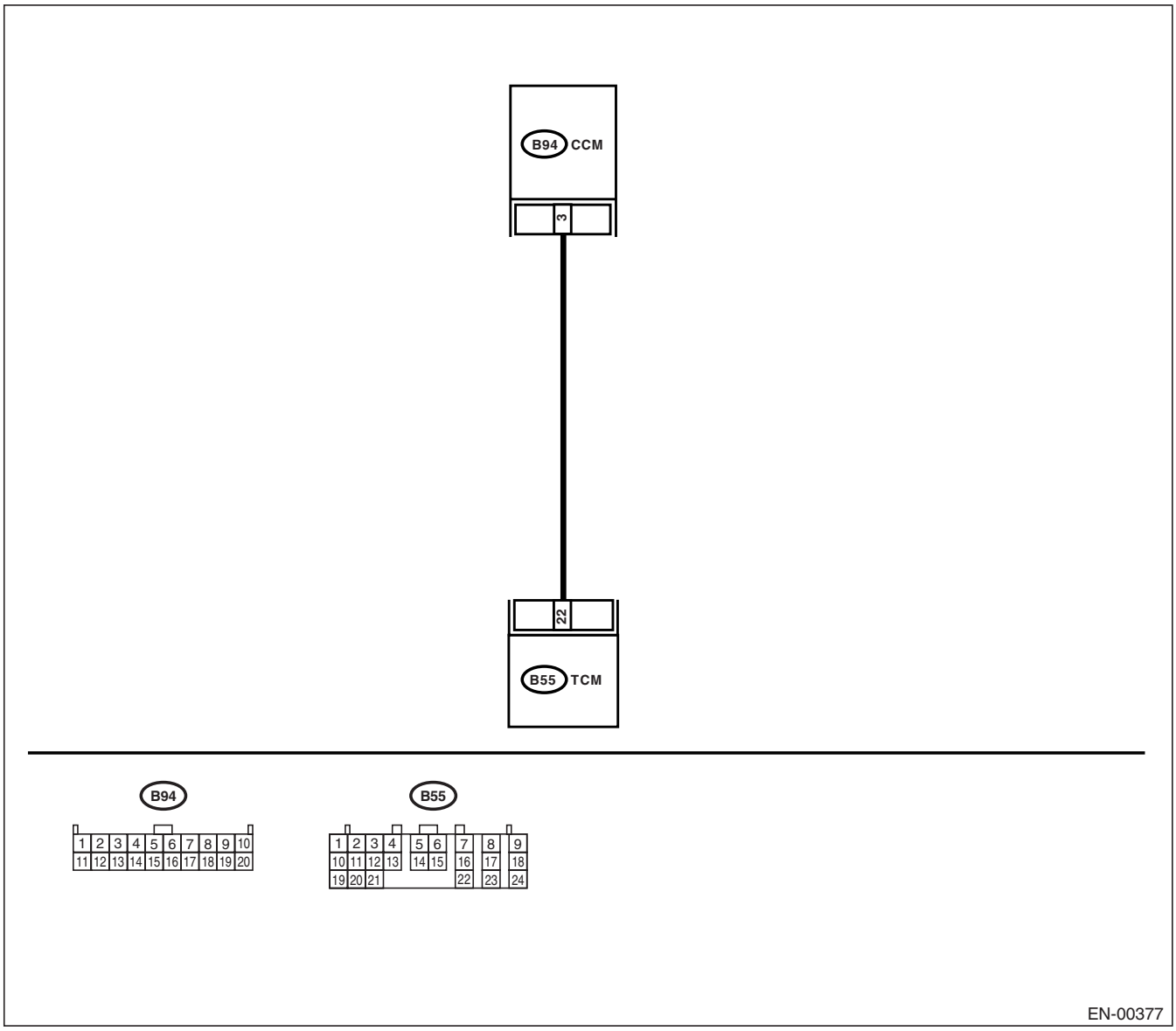
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BP:DTC P0565 — CRUISE CONTROL ON SIGNAL —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**



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	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN TCM AND CCM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from TCM and CCM. 3)Measure the resistance of harness between TCM and CCM connector. ***Connector & terminal*** ***(B55) No. 22 — (B94) No. 3:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit in harness between TCM and CCM connector.
2	**CHECK HARNESS BETWEEN TCM AND CCM CONNECTOR.** Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 22 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair the short circuit in harness between TCM and CCM connector.
3	**CHECK INPUT SIGNAL FOR TCM.** 1)Connect the connector to TCM and CCM. 2)Lift-up the vehicle or set the vehicle on free rollers. **CAUTION:** **Raise all wheels off ground.** 3)Start the engine. 4)Turn the cruise control main switch to ON. 5)Move the select lever to “D” range and slowly increase vehicle speed to 50 km/h (31 MPH). 6)Turn the cruise control command switch to ON. 7)Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 22 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **4.**	Check the cruise control command switch circuit. <Ref. to CC-8, INSPECTION, Cruise Control Command Switch.>
4	**CHECK POOR CONTACT.** Check poor contact in TCM connector.	Is there poor contact in TCM connector?	Repair the poor contact in TCM connector.	Replace the TCM. <Ref. to 4AT-70, Transmission Control Module (TCM).>

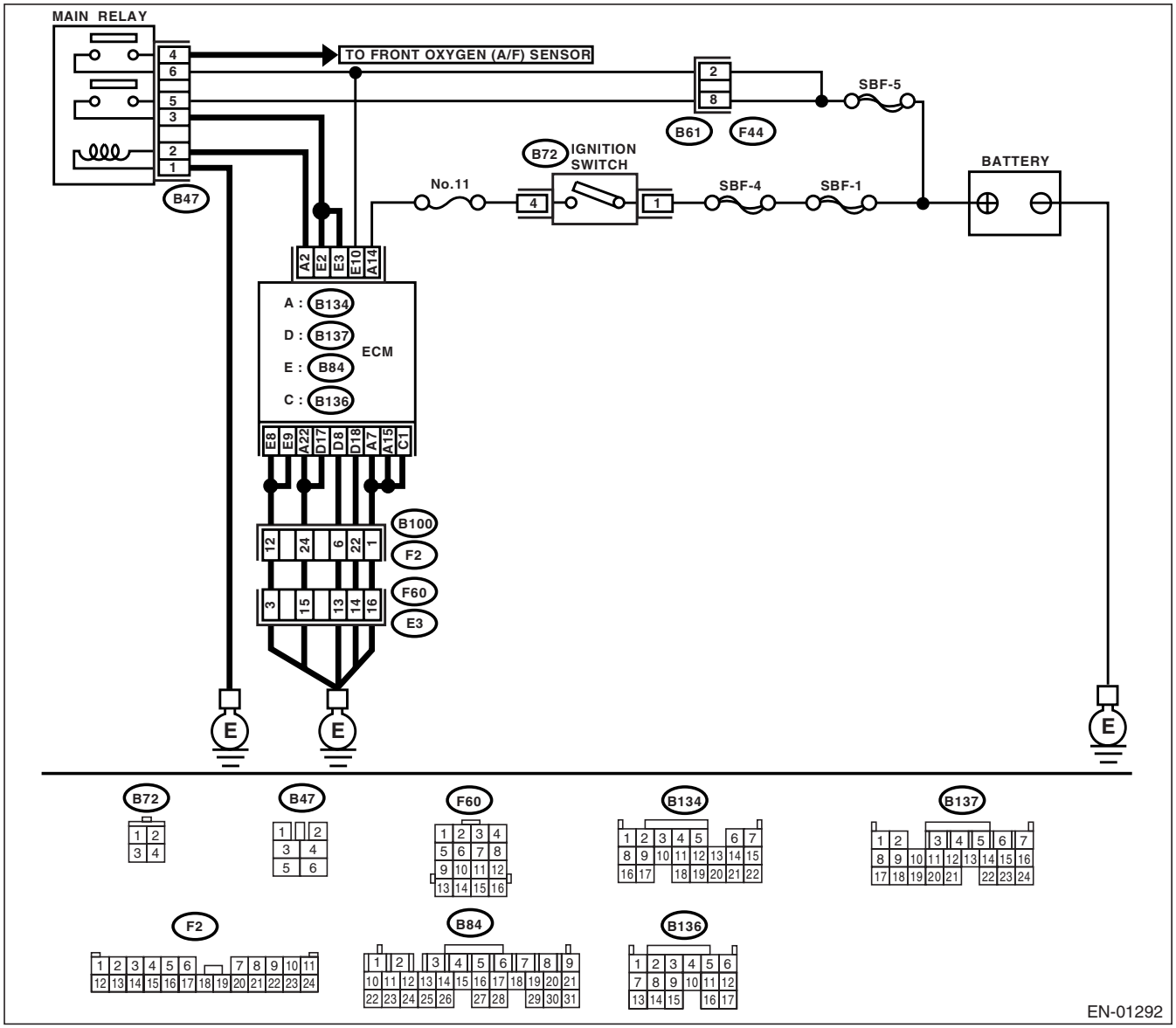
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BQ:DTC P0604 — INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Engine does not start.
  - Engine stalls.

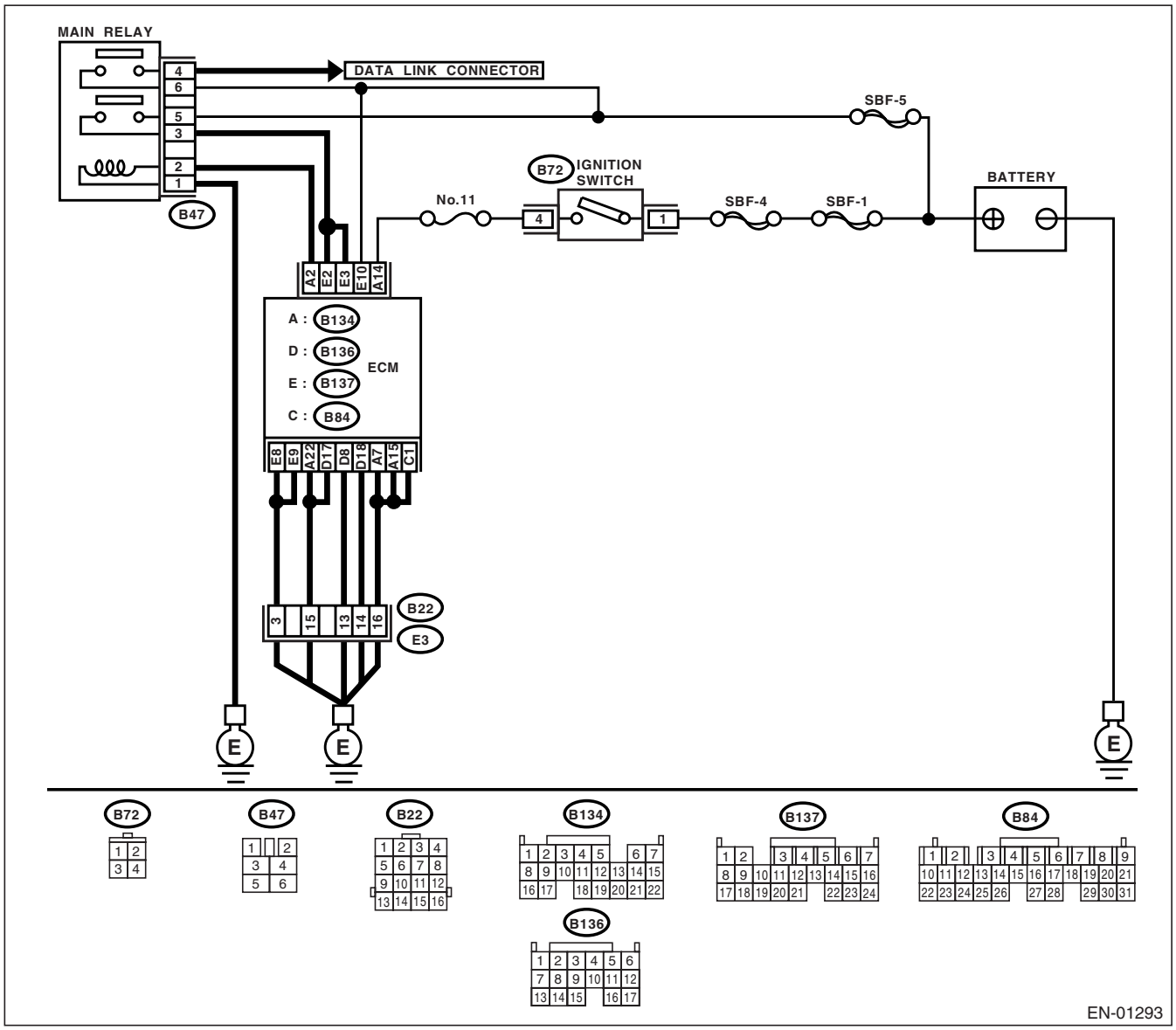
CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**
- **LHD model**



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- **RHD model**



Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P0604?	Replace the ECM. <Ref. to FU(H4DOTC)-49, Engine Control Module (ECM).>	A temporary poor contact.

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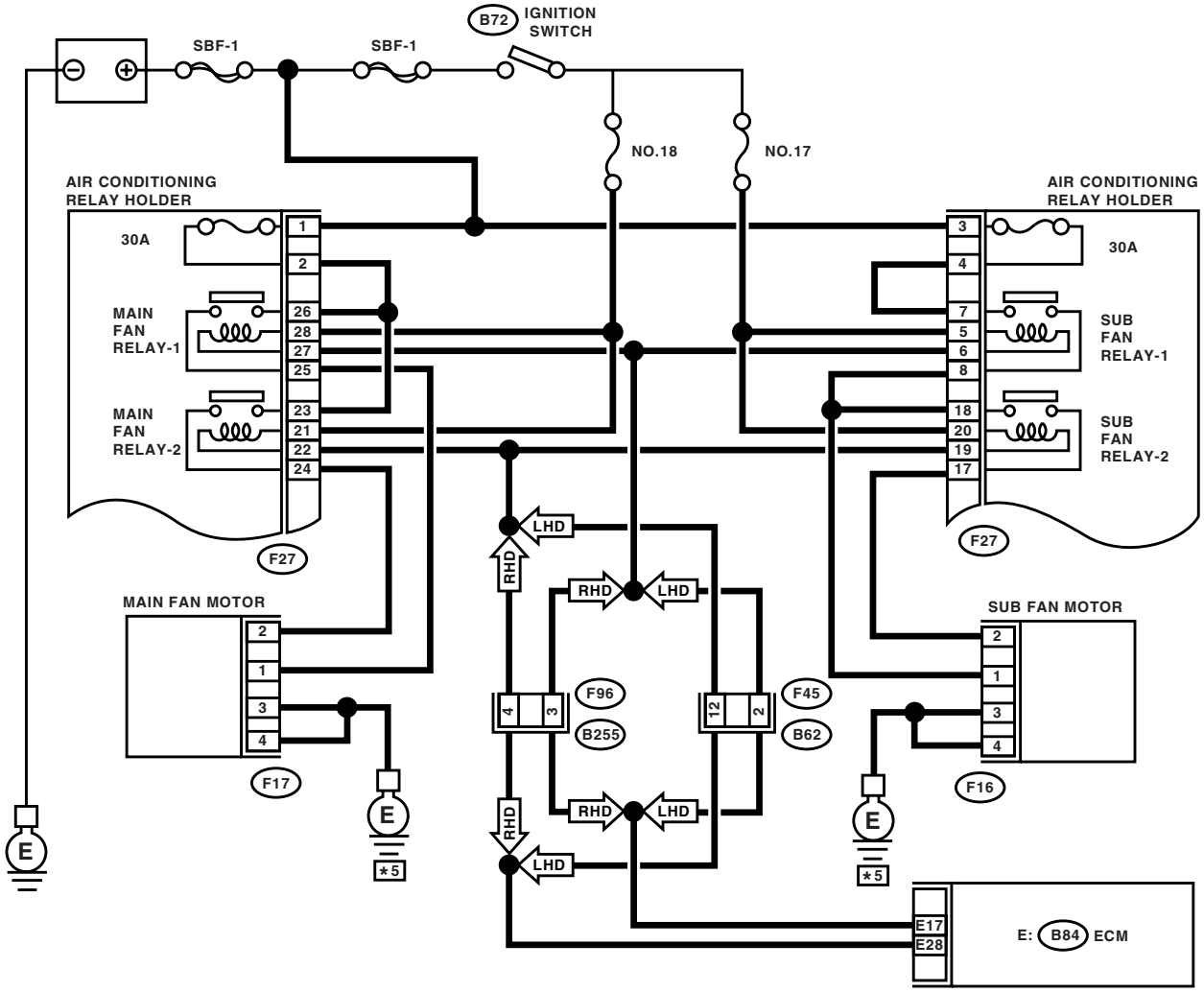
BR:DTC P0691 — COOLING FAN 1 CONTROL CIRCUIT LOW —

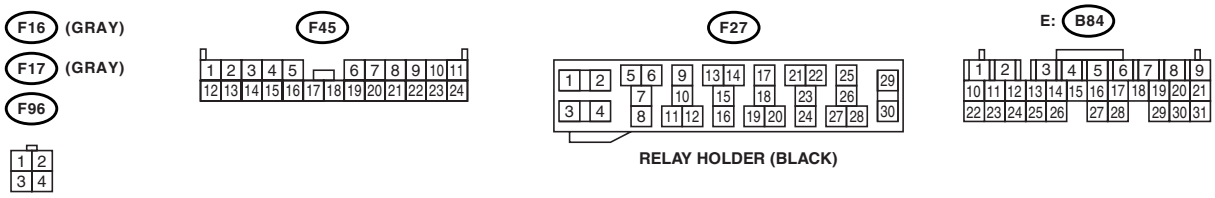
- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Radiator fan does not operate properly.
  - Overheating

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, OPERATION, Inspection Mode.>.

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- **WIRING DIAGRAM:**





CO-00207

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	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1)Turn the ignition switch to OFF. 2)Connect the test mode connector. 3)Turn the ignition switch to ON. 4)While operating the radiator fan relay, measure voltage between ECM terminal and ground. NOTE: Radiator fan relay operation can be executed using Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.> ***Connector & terminal*** ***(B84) No. 17 (+) — Chassis ground (−):*** ***(B84) No. 28 (+) — Chassis ground (−):***	Does the voltage change 0 — 10 V?	Repair poor contact in ECM connector.	Go to step **2.**
2	**CHECK GROUND SHORT CIRCUIT IN RADIATOR FAN RELAY CONTROL CIRCUIT.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from ECM. 3)Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B84) No. 17 — Chassis ground:*** ***(B84) No. 28 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair ground short circuit in radiator fan relay control circuit.
3	**CHECK POWER SUPPLY FOR RELAY.** 1)Remove the fan relay 1 and fan relay 2 from A/C relay holder. 2)Turn the ignition switch to ON. 3)Measure the voltage between fuse and relay box (F/B) connector and chassis ground. ***Connector & terminal*** ***(F27) No. 27 (+) — Chassis ground (−):*** ***(F27) No. 22 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **4.**	Repair open circuit in harness between ignition switch and fuse and relay box (F/B) connector.
4	**CHECK FAN RELAY 1.** 1)Turn the ignition switch to OFF. 2)Measure the resistance between fan relay 1 terminals. ***Terminals*** ***No. 27 — No. 28:***	Is the resistance 87 — 107 Ω?	Go to step **5.**	Replace the fan relay 1.
5	**CHECK FAN RELAY 2.** 1)Turn the ignition switch to OFF. 2)Measure the resistance between fan relay 2 terminals. ***Terminals*** ***No. 22 — No. 21:***	Is the resistance 87 — 107 Ω?	Go to step **6.**	Replace the fan relay 2.
6	**CHECK OPEN CIRCUIT IN FAN RELAY CONTROL CIRCUIT.** Measure the resistance of harness between ECM and fan relay connector. ***Connector & terminal*** ***(B84) No. 17 — (F27) No. 28:*** ***(B84) No. 28 — (F27) No. 21:***	Is the resistance less than 1 Ω?	Go to step **7.**	Repair harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and fan relay connector • Poor contact in coupling connector

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	Step	Check	Yes	No
7	**CHECK POOR CONTACT.** Check poor contact in ECM or fan relay connector.	Is there poor contact in ECM or fan relay connector?	Repair poor contact in ECM or fan relay connector.	Contact your Subaru distributor service.

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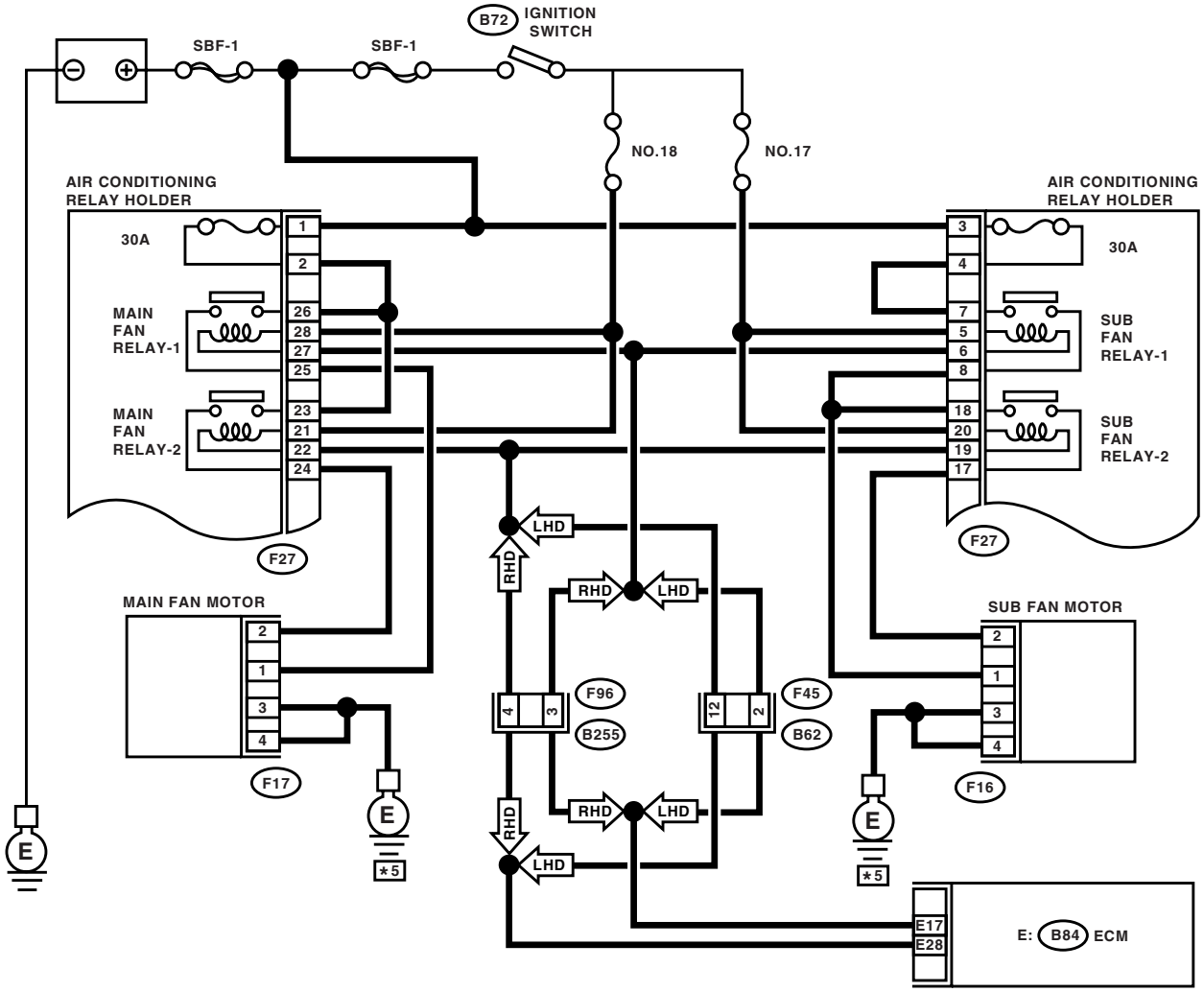
BS:DTC P0692 — COOLING FAN 1 CONTROL CIRCUIT HIGH —

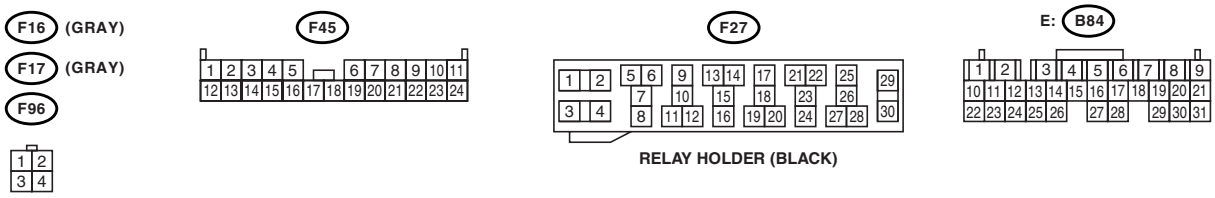
- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Radiator fan does not operate properly.
  - Overheating

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

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- **WIRING DIAGRAM:**





CO-00207

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	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1)Turn the ignition switch to OFF. 2)Connect the test mode connector. 3)Turn the ignition switch to ON. 4)While operating the radiator fan relay, measure the voltage between ECM and chassis ground. NOTE: Radiator fan relay operation can be executed using the Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)-49, Compulsory Valve Operation Check Mode.> ***Connector & terminal*** ***(B84) No. 17 (+) — Chassis ground (−):*** ***(B84) No. 28 (+) — Chassis ground (−):***	Does the voltage change 0 — 10 V?	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.	Go to step **2.**
2	**CHECK SHORT CIRCUIT IN RADIATOR FAN RELAY CONTROL CIRCUIT.** 1)Turn the ignition switch to OFF. 2)Remove the fan relay 1, fan relay 2 and fan mode relay. 3)Disconnect the test mode connector. 4)Turn the ignition switch to ON. 5)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B84) No. 17 (+) — Chassis ground (−):*** ***(B84) No. 28 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair the battery short circuit in radiator fan relay control circuit. After repair, replace the ECM. <Ref. to FU(H4DOTC)-49, Engine Control Module (ECM).>	Go to step **3.**
3	**CHECK FAN RELAY 1.** 1)Turn the ignition switch to OFF. 2)Remove the fan relay 1. 3)Measure the resistance between fan relay 1 terminals. ***Terminals*** ***No. 25 — No. 26:***	Is the resistance less than 1 Ω?	Replace the fan relay 1 and ECM. <Ref. to FU(H4DOTC)-49, Engine Control Module (ECM).>	Go to step **4.**
4	**CHECK FAN RELAY 2.** 1)Remove the fan relay 2. 2)Measure the resistance between fan relay 2 terminals. ***Terminals*** ***No. 23 — No. 24:***	Is the resistance less than 1 Ω?	Replace the fan relay 2 and ECM. <Ref. to FU(H4DOTC)-49, 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)-49, Engine Control Module (ECM).>

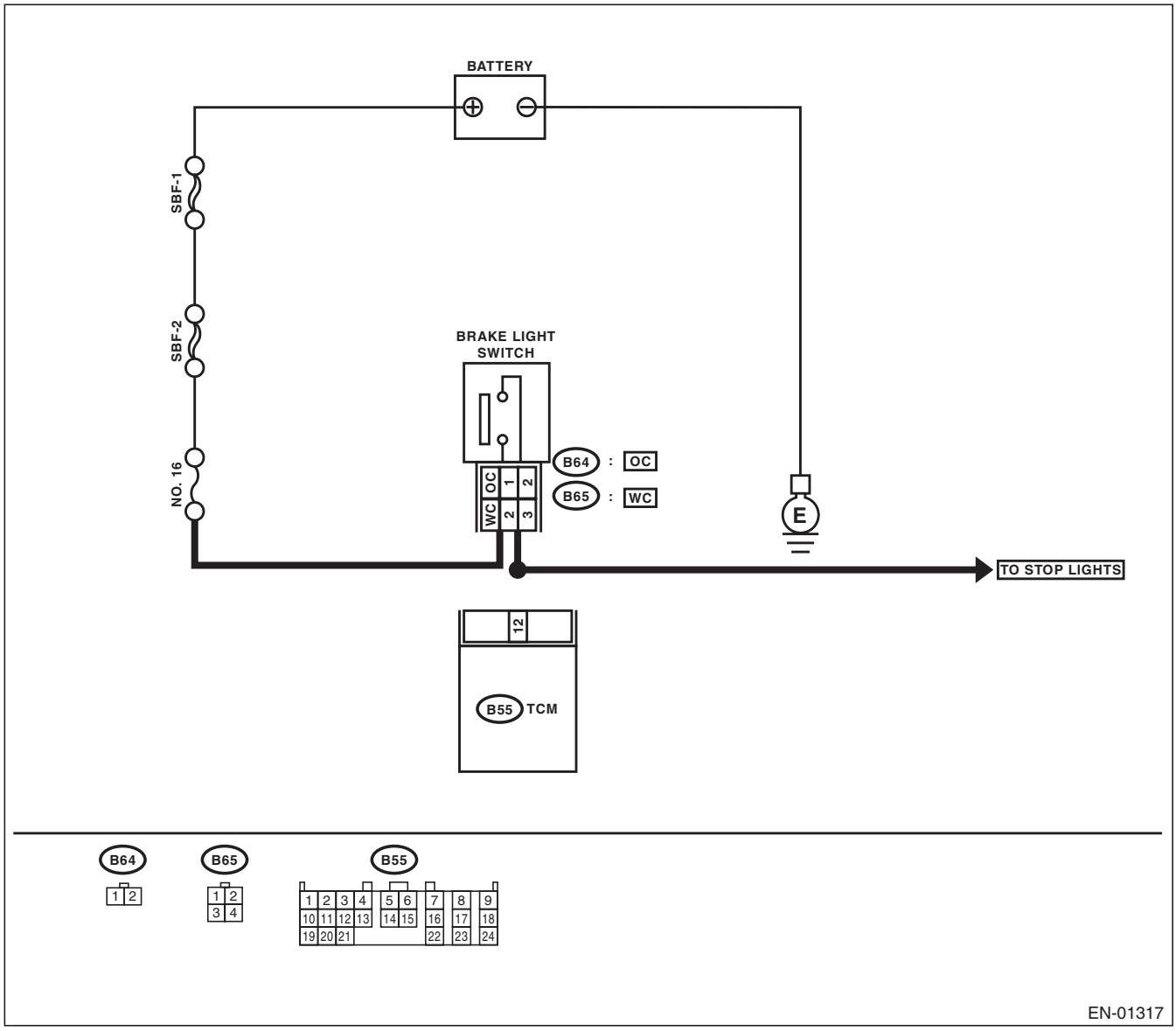
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BT:DTC P0703 — TORQUE CONVERTER/BRAKE SWITCH “B” CIRCUIT —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**



Step		Check	Yes	No
1	**CHECK OPERATION OF BRAKE LIGHT.**	Does the brake light come on when depressing the brake pedal?	Go to step **2.**	Repair or replace the brake light circuit.

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	Step	Check	Yes	No
2	**CHECK HARNESS BETWEEN TCM AND BRAKE LIGHT SWITCH CONNECTOR.** 1)Disconnect the connectors from TCM and brake light switch. 2)Measure the resistance of harness between TCM and brake light switch connector. ***Connector & terminal*** ***MODEL WITH CRUISE CONTROL*** ***(B55) No. 12 — (B65) No. 3:*** ***MODEL WITHOUT CRUISE CONTROL*** ***(B55) No. 12 — (B64) No. 2:***	Is the resistance less than 1 Ω?	Go to step **3.**	Repair or replace the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between TCM and brake light switch connector • Poor contact in TCM connector • Poor contact in brake light switch connector
3	**CHECK HARNESS BETWEEN TCM AND BRAKE LIGHT SWITCH CONNECTOR.** Measure the resistance of harness between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 12 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Repair the ground short circuit in harness between TCM and brake light switch connector.
4	**CHECK INPUT SIGNAL FOR TCM.** 1)Connect the connectors to TCM and brake light switch. 2)Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 12 (+) — Chassis ground (−):***	Is the voltage less than 1 V when releasing the brake pedal?	Go to step **5.**	Adjust or replace the brake light switch. <Ref. to LI-8, STOP LIGHT SWITCH, INSPECTION, Stop Light System.>
5	**CHECK INPUT SIGNAL FOR TCM.** Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B55) No. 12 (+) — Chassis ground (−):***	Is the voltage more than 10 V when depressing the brake pedal?	Go to step **6.**	Adjust or replace the brake light switch. <Ref. to LI-8, STOP LIGHT SWITCH, INSPECTION, Stop Light System.>
6	**CHECK POOR CONTACT.** Check poor contact in TCM connector.	Is there poor contact in TCM connector?	Repair the poor contact in TCM connector.	Replace the TCM. <Ref. to 4AT-70, Transmission Control Module (TCM).>

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BU:DTC P0731 — GEAR 1 INCORRECT RATIO —

NOTE:
For the diagnostic procedure, refer to DTC P0734. <Ref. to EN(H4DOTC)-239, DTC P0734 — GEAR 4 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BV:DTC P0732 — GEAR 2 INCORRECT RATIO —

NOTE:
For the diagnostic procedure, refer to DTC P0734. <Ref. to EN(H4DOTC)-239, DTC P0734 — GEAR 4 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BW:DTC P0733 — GEAR 3 INCORRECT RATIO —

NOTE:
For the diagnostic procedure, refer to DTC P0734. <Ref. to EN(H4DOTC)-239, DTC P0734 — GEAR 4 INCORRECT RATIO —, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

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BX:DTC P0734 — GEAR 4 INCORRECT RATIO —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Shift point too high or too low; engine brake not effective in “3” range; excessive shift shock; excessive tight corner “braking”

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**

	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)-75, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK THROTTLE POSITION SENSOR CIRCUIT.** Check the throttle position sensor circuit. <Ref. to 4AT-48, DTC 31 THROTTLE POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble in throttle position sensor circuit?	Repair or replace the throttle position sensor circuit.	Go to step **3.**
3	**CHECK FRONT VEHICLE SPEED SENSOR CIRCUIT.** Check the front vehicle speed sensor circuit. <Ref. to 4AT-53, DTC 33 FRONT VEHICLE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble in front vehicle speed sensor circuit?	Repair or replace the vehicle speed sensor 2 circuit.	Go to step **4.**
4	**CHECK TORQUE CONVERTER TURBINE SPEED SENSOR CIRCUIT.** Check the torque converter turbine speed sensor circuit. <Ref. to 4AT-57, DTC 36 TORQUE CONVERTER TURBINE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble in torque converter turbine speed sensor circuit?	Repair or replace the torque converter turbine speed sensor circuit.	Go to step **5.**
5	**CHECK POOR CONTACT.** Check poor contact in TCM connector.	Is there poor contact in TCM connector?	Repair the poor contact in TCM connector.	Go to step **6.**
6	**CHECK MECHANICAL TROUBLE.** Check mechanical trouble in automatic transmission.	Is there any mechanical trouble in automatic transmission?	Repair or replace the automatic transmission. <Ref. to 4AT-33, INSPECTION, Road Test.>	Replace the TCM. <Ref. to 4AT-70, Transmission Control Module (TCM).>

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BY:DTC P0741 — TORQUE CONVERTER CLUTCH CIRCUIT PERFORMANCE OR STUCK OFF —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - No lock-up (after engine warm-up)
  - No shift or excessive tight corner “braking”

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, 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)-75, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK LOCK-UP DUTY SOLENOID CIRCUIT.** Check the lock-up duty solenoid circuit. <Ref. to 4AT-82, DTC 77 LOCK-UP DUTY SOLENOID, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble in lock-up duty solenoid circuit?	Repair or replace the lock-up duty solenoid circuit.	Go to step **3.**
3	**CHECK THROTTLE POSITION SENSOR CIRCUIT.** Check the throttle position sensor circuit. <Ref. to 4AT-48, DTC 31 THROTTLE POSITION SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble in throttle position sensor circuit?	Repair or replace the throttle position sensor circuit.	Go to step **4.**
4	**CHECK TORQUE CONVERTER TURBINE SPEED SENSOR CIRCUIT.** Check the torque converter turbine speed sensor circuit. <Ref. to 4AT-57, DTC 36 TORQUE CONVERTER TURBINE SPEED SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble in torque converter turbine speed sensor circuit?	Repair or replace the torque converter turbine speed sensor circuit.	Go to step **5.**
5	**CHECK ENGINE SPEED INPUT CIRCUIT.** Check the engine speed input circuit. <Ref. to 4AT-41, DTC 11 ENGINE SPEED SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble in engine speed input circuit?	Repair or replace the engine speed input circuit.	Go to step **6.**
6	**CHECK INHIBITOR SWITCH CIRCUIT.** Check the inhibitor switch circuit. <Ref. to 4AT-109, CHECK INHIBITOR SWITCH, Diagnostic Procedure without Diagnostic Trouble Code (DTC).>	Is there any trouble in inhibitor switch circuit?	Repair or replace the inhibitor switch circuit.	Go to step **7.**
7	**CHECK BRAKE LIGHT SWITCH CIRCUIT.** Check the brake light switch circuit. <Ref. to 4AT-101, CHECK BRAKE SWITCH, Diagnostic Procedure without Diagnostic Trouble Code (DTC).>	Is there any trouble in brake light switch circuit?	Repair or replace the brake light switch circuit.	Go to step **8.**

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	Step	Check	Yes	No
8	**CHECK ATF TEMPERATURE SENSOR CIRCUIT.** Check the ATF temperature sensor circuit. <Ref. to 4AT-45, DTC 27 ATF TEMPERATURE SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Is there any trouble in ATF temperature sensor circuit?	Repair or replace the ATF temperature sensor circuit.	Go to step **9.**
9	**CHECK POOR CONTACT.** Check poor contact in TCM connector.	Is there poor contact in TCM connector?	Repair the poor contact in TCM connector.	Go to step **10.**
10	**CHECK MECHANICAL TROUBLE.** Check mechanical trouble in automatic transmission.	Is there any mechanical trouble in automatic transmission?	Repair or replace the automatic transmission. <Ref. to 4AT-33, INSPECTION, Road Test.>	Replace the TCM. <Ref. to 4AT-70, Transmission Control Module (TCM).>

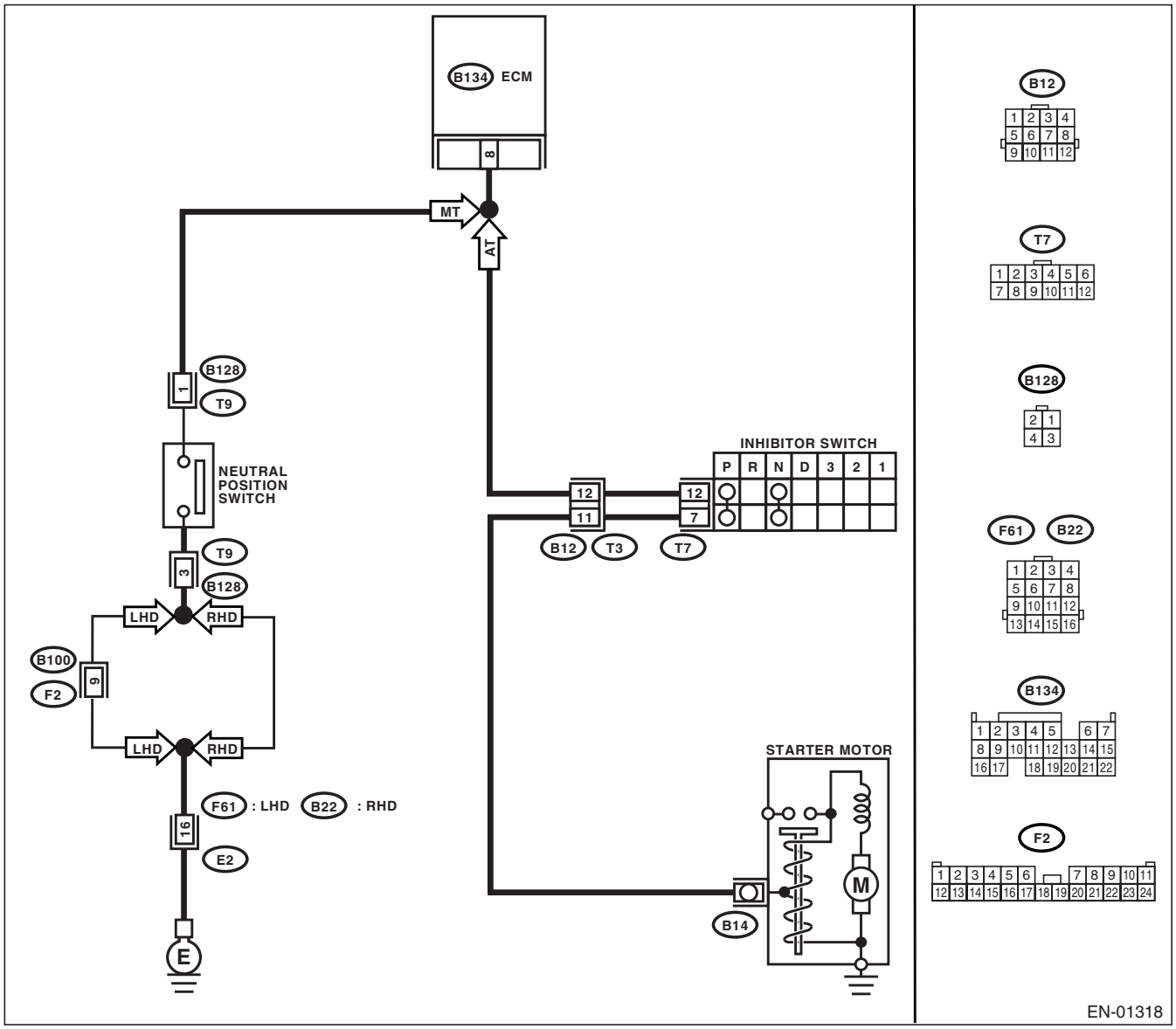
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BZ:DTC P0851 — NEUTRAL SWITCH INPUT CIRCUIT LOW (AT MODEL) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Erroneous idling

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, OPERATION.>.

- **WIRING DIAGRAM:**



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	Step	Check	Yes	No
1	**CHECK DTC P0705 ON DISPLAY.**	Is DTC P0705 indicated?	Inspect DTC P0705 using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H4DOTC)-75, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK INPUT SIGNAL FOR ECM.** 1)Turn the ignition switch to ON. 2)Place the select lever except for “N” and “P” positions. 3)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 8 (+) — 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 **3.**
3	**CHECK HARNESS BETWEEN ECM AND TRANSMISSION HARNESS CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from ECM and transmission harness connector (T3). 3)Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 8 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Repair ground short circuit in harness between ECM and transmission harness connector.
4	**CHECK TRANSMISSION HARNESS CONNECTOR.** 1)Disconnect 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 **5.**	Repair ground short circuit in harness between transmission harness and inhibitor switch connector.
5	**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 **6.**	Replace the inhibitor switch. <Ref. to 4AT-48, Inhibitor Switch.>
6	**CHECK SELECTOR CABLE CONNECTION.**	Is there any fault in selector cable connection to inhibitor switch?	Repair selector cable connection. <Ref. to CS-14, INSPECTION, Select Cable.>	Contact your Subaru distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

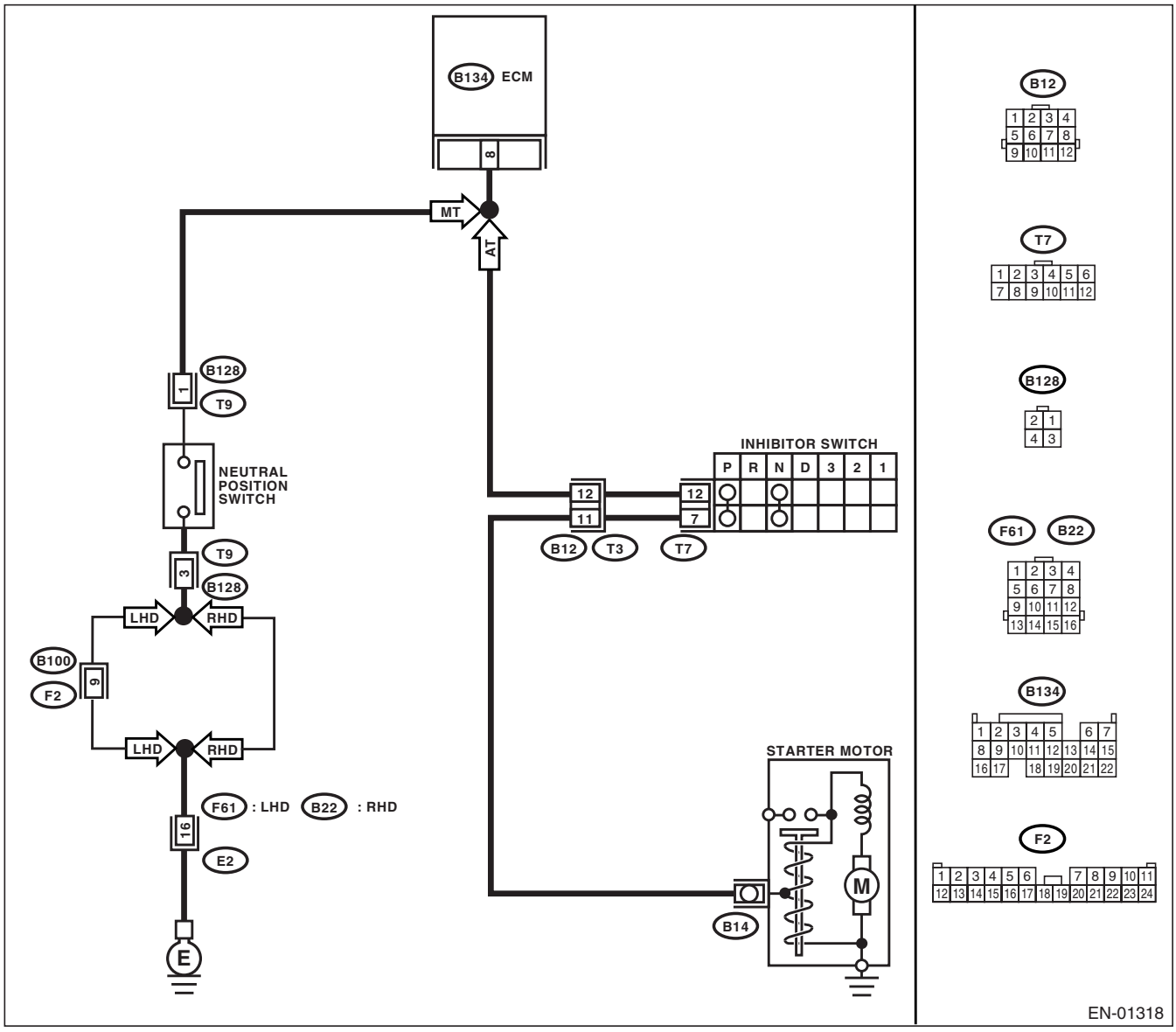
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CA:DTC P0851 — NEUTRAL SWITCH INPUT CIRCUIT LOW (MT MODEL) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Erroneous idling

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



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	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** 1)Turn the ignition switch to ON. 2)Place the shift lever in neutral. 3)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 8 (+) — 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 a position except for neutral. 2)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 8 (+) — 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 Subaru distributor service.
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 neutral. 4)Measure the resistance between transmission harness and connector terminals. ***Connector & terminal*** ***(T9) No. 1 — No. 3:***	Is the resistance more than 1 MΩ?	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 a position except for neutral. 2)Measure the resistance between transmission harness connector terminals. ***Terminals*** ***No. 1 — No. 3:***	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*** ***(B134) No. 8 — Chassis ground:***	Is the resistance more than 1 MΩ?	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*** ***(B134) No. 8 — (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.

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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 Subaru distributor service.

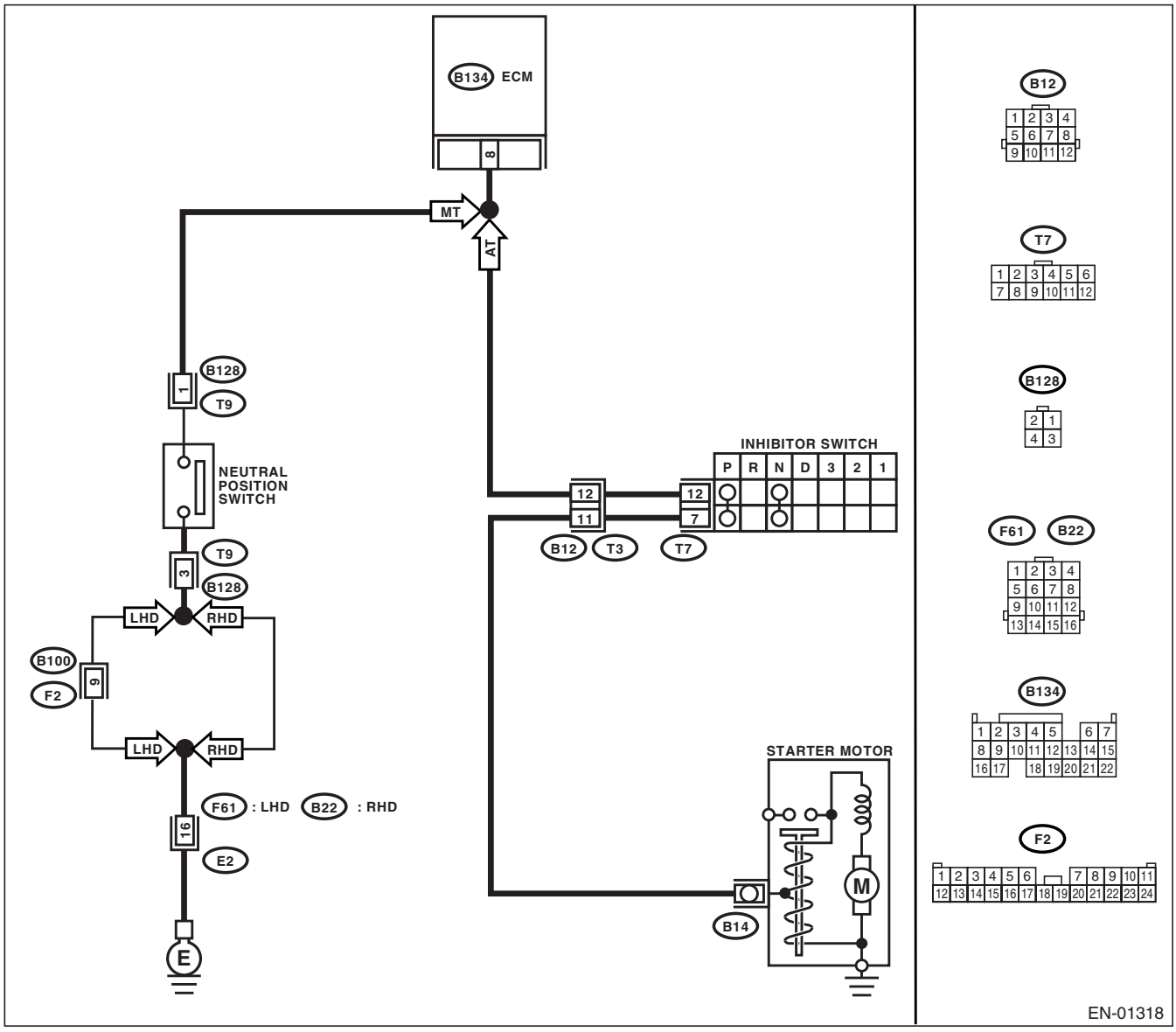
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CB:DTC P0852 — NEUTRAL SWITCH INPUT CIRCUIT HIGH (AT MODEL) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Erroneous idling

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



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	Step	Check	Yes	No
1	**CHECK DTC P0705 ON DISPLAY.**	Is DTC P0705 indicated?	Inspect DTC P0705 using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H4DOTC)-75, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK INPUT SIGNAL FOR ECM.** 1)Turn the ignition switch to ON. 2)Measure the voltage between ECM and chassis ground in selector lever “N” and “P” positions. ***Connector & terminal*** ***(B134) No. 8 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **3.**	Go to step **5.**
3	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM and chassis ground in selector lever except for “N” and “P” positions. ***Connector & terminal*** ***(B134) No. 8 (+) — Chassis ground (−):***	Is the voltage 4.5 — 5.5 V?	Go to step **4.**	Go to step **5.**
4	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Contact your Subaru distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
5	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 8 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair battery short circuit in harness between ECM and inhibitor switch connector.	Go to step **6.**
6	**CHECK HARNESS BETWEEN ECM AND INHIBITOR SWITCH CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from ECM and inhibitor switch. 3)Measure the resistance of harness between ECM and inhibitor switch connector. ***Connector & terminal*** ***(B134) No. 8 — (T7) No. 12:***	Is the resistance less than 1 Ω?	Go to step **7.**	Repair 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

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	Step	Check	Yes	No
7	**CHECK INHIBITOR SWITCH GROUND LINE.** Measure the resistance of harness between inhibitor switch connector and engine ground. ***Connector & terminal*** ***(T7) No. 7 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **8.**	Repair open circuit in harness between inhibitor switch connector and starter motor ground line. NOTE: In this case, repair the following: • Open circuit in harness between inhibitor switch connector and starter motor ground line • Poor contact in starter motor connector • Poor contact in starter motor ground • Starter motor
8	**CHECK INHIBITOR SWITCH.** Measure the resistance between inhibitor switch connector receptacle's terminals in selector lever “N” and “P” positions. ***Terminals*** ***No. 7 — No. 12:***	Is the resistance less than 1 Ω?	Go to step **9.**	Replace the inhibitor switch. <Ref. to 4AT-48, Inhibitor Switch.>
9	**CHECK SELECTOR CABLE CONNECTION.**	Is there any fault in selector cable connection to inhibitor switch?	Repair selector cable connection. <Ref. to CS-14, INSPECTION, Select Cable.>	Contact your Subaru distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

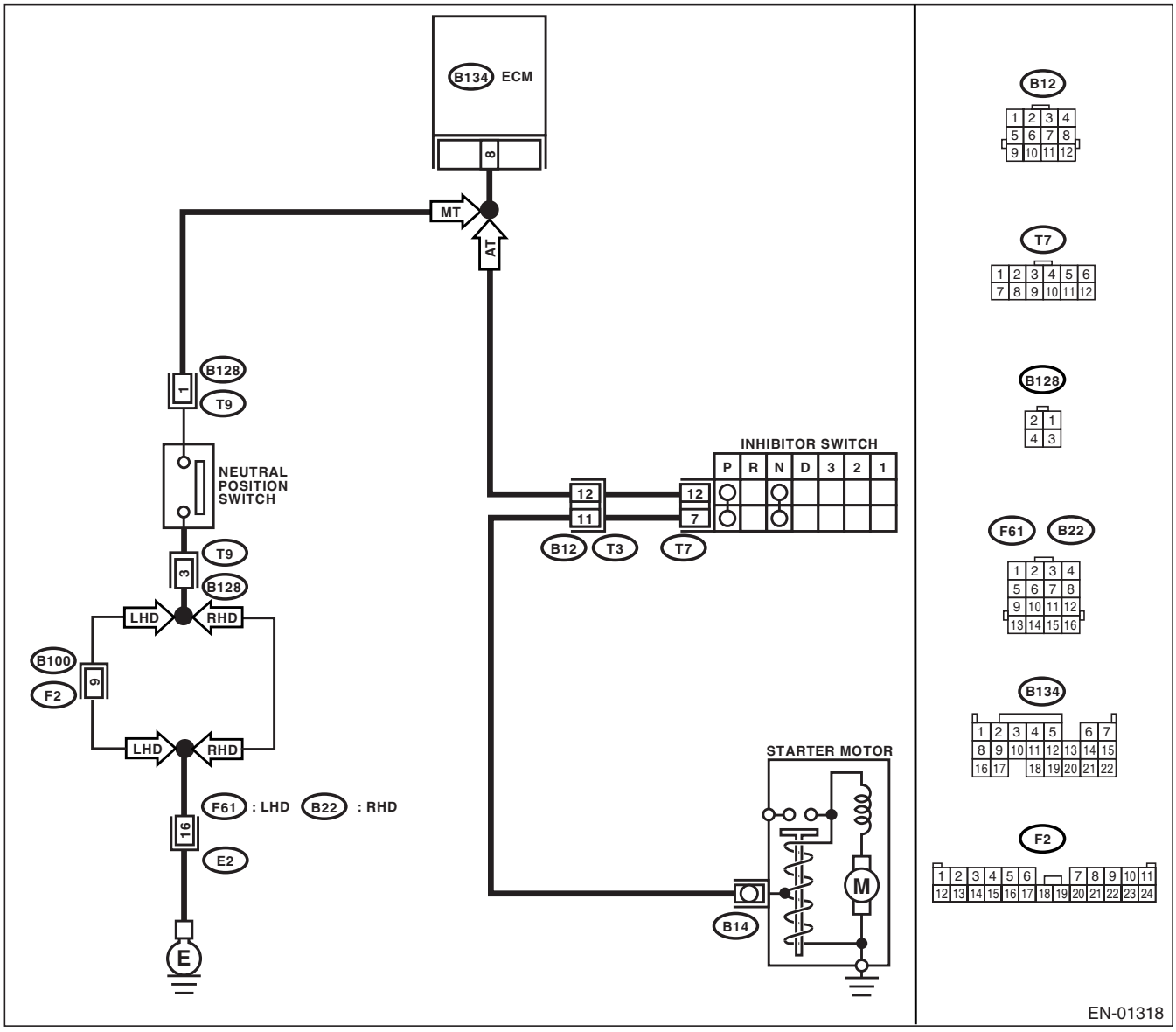
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CC:DTC P0852 — NEUTRAL SWITCH INPUT CIRCUIT HIGH (MT MODEL) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Erroneous idling

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, OPERATION, Inspection Mode.>.

- **WIRING DIAGRAM:**



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	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*** ***(B134) No. 8 (+) — Chassis ground (−):***	Is the voltage less than 1 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*** ***(B134) No. 8 (+) — Chassis ground (−):***	Is the voltage more than 10 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 Subaru distributor service.
4	**CHECK INPUT SIGNAL FOR ECM.** 1)Disconnect ECM connector from ECM. 2)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 8 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair the battery short circuit in harness between ECM and 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*** ***(B134) No. 8 — (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 Subaru distributor service.

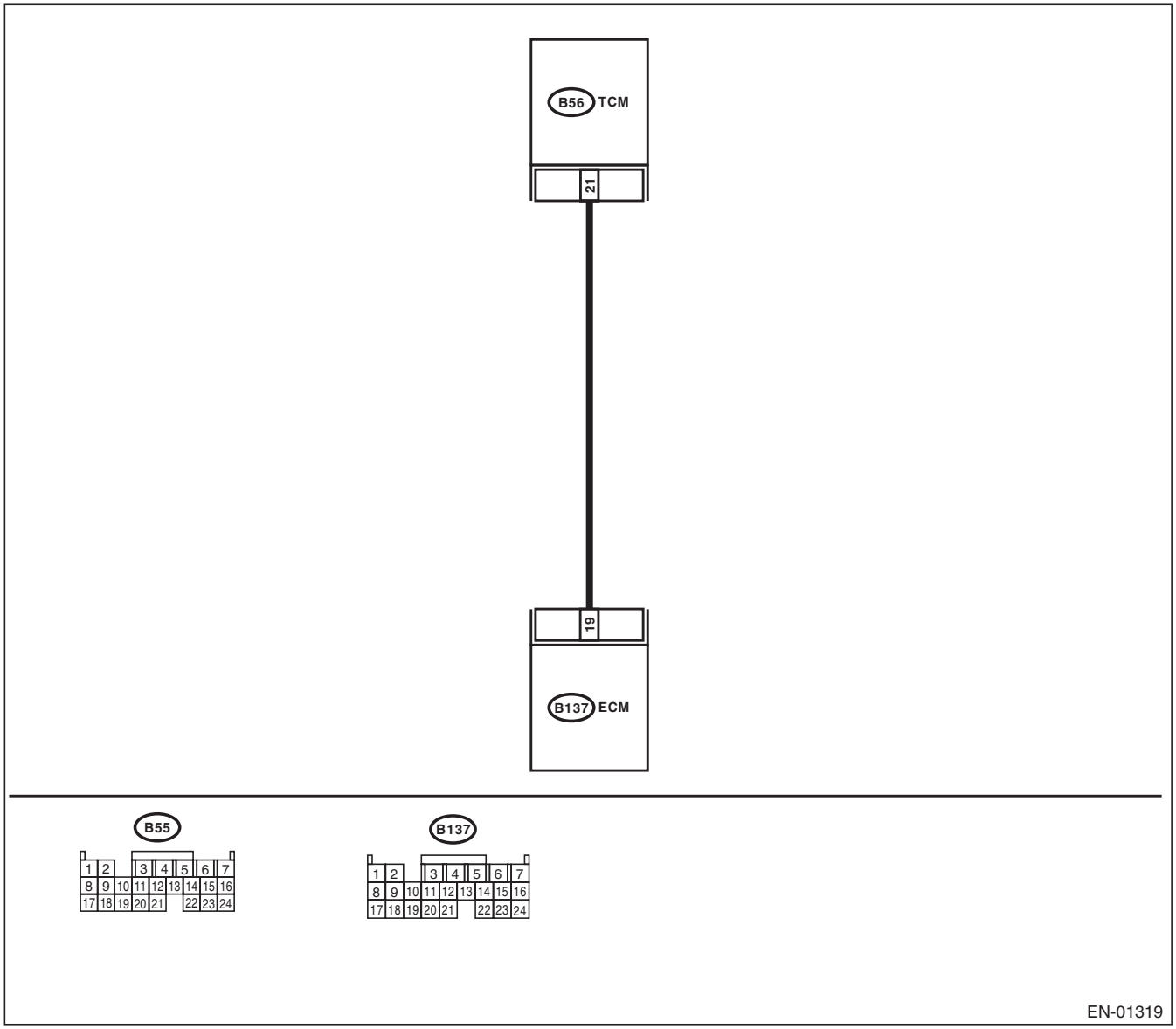
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CD:DTC P0864 — TCM COMMUNICATION CIRCUIT RANGE/PERFORMANCE —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**



	Step	Check	Yes	No
1	**CHECK DRIVING CONDITION.** 1)Start and warm-up the engine until the radiator fan makes one complete rotation. 2)Drive the vehicle.	Is the AT shift control functioning properly?	Go to step **2.**	Replace the TCM. <Ref. to 4AT-70, Transmission Control Module (TCM).>

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Step		Check	Yes	No
2	CHECK ACCESSORY.	Are car phone and/or CB installed on vehicle?	Repair the grounding line of car phone or CB system.	Replace the TCM. <Ref. to 4AT-70, Transmission Control Module (TCM).>

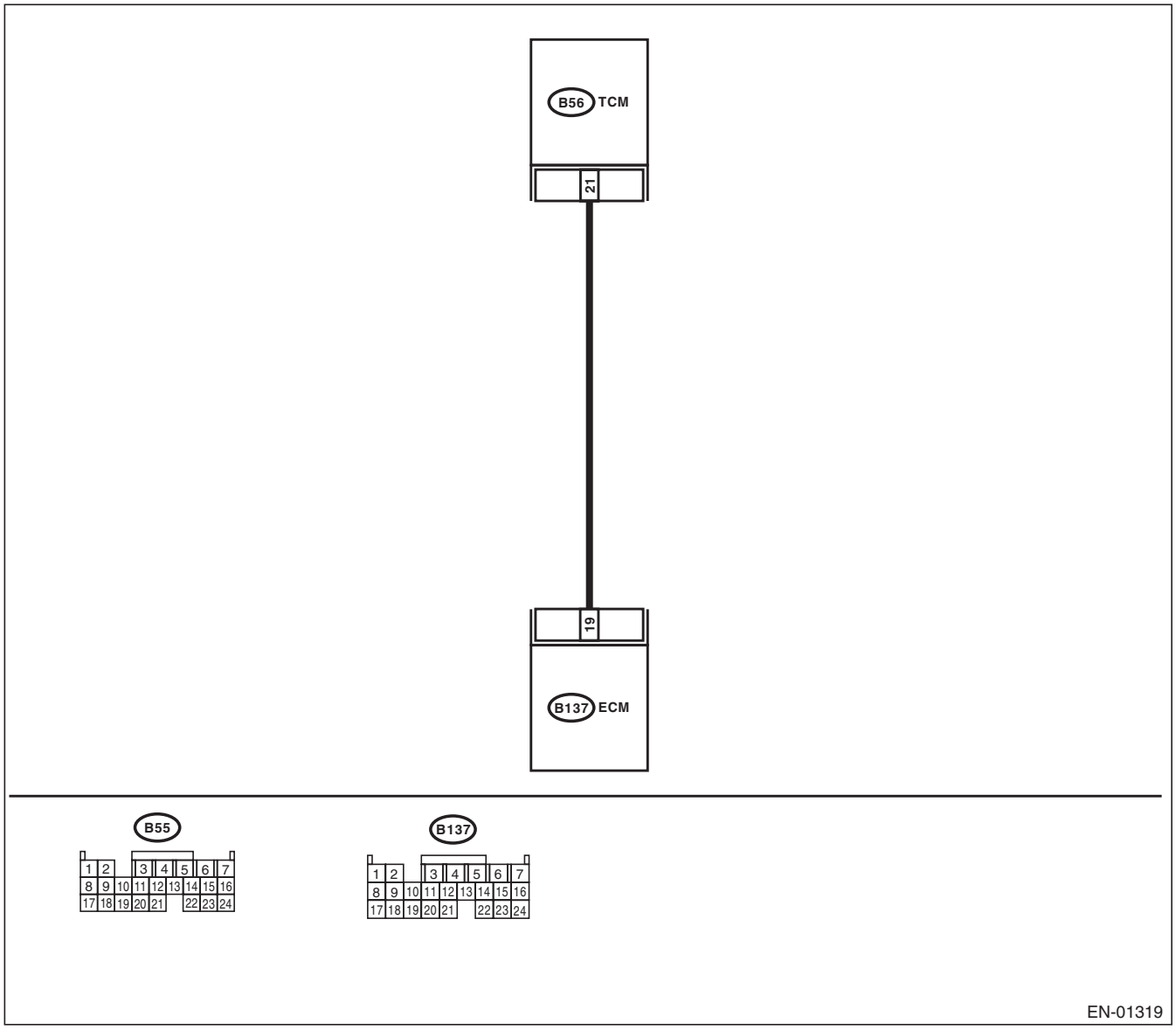
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CE:DTC P0865 — TCM COMMUNICATION CIRCUIT LOW —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**



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	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** 1)Turn the ignition switch to ON. 2)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 19 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **2.**	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. NOTE: In this case, repair the following: • Poor contact in ECM connector • Poor contact in TCM connector
2	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ECM and TCM. 3)Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 19 — Chassis ground:***	Is the resistance less than 10 Ω?	Repair the ground short circuit in harness between ECM and TCM connector.	Go to step **3.**
3	**CHECK OUTPUT SIGNAL FOR ECM.** 1)Connect the connector to ECM. 2)Turn the ignition switch to ON. 3)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 19 (+) — Chassis ground (−):***	Is the voltage more than 5 V?	Go to step **4.**	Repair the poor contact in ECM connector.
4	**CHECK DTC FOR AUTOMATIC TRANSMISSION.** Read the DTC for automatic transmission. <Ref. to 4AT-24, Read Diagnostic Trouble Code (DTC).>	Does the DTC appear for automatic transmission?	Inspect the DTC for automatic transmission. <Ref. to 4AT-41, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Replace the TCM. <Ref. to 4AT-70, Transmission Control Module (TCM).>

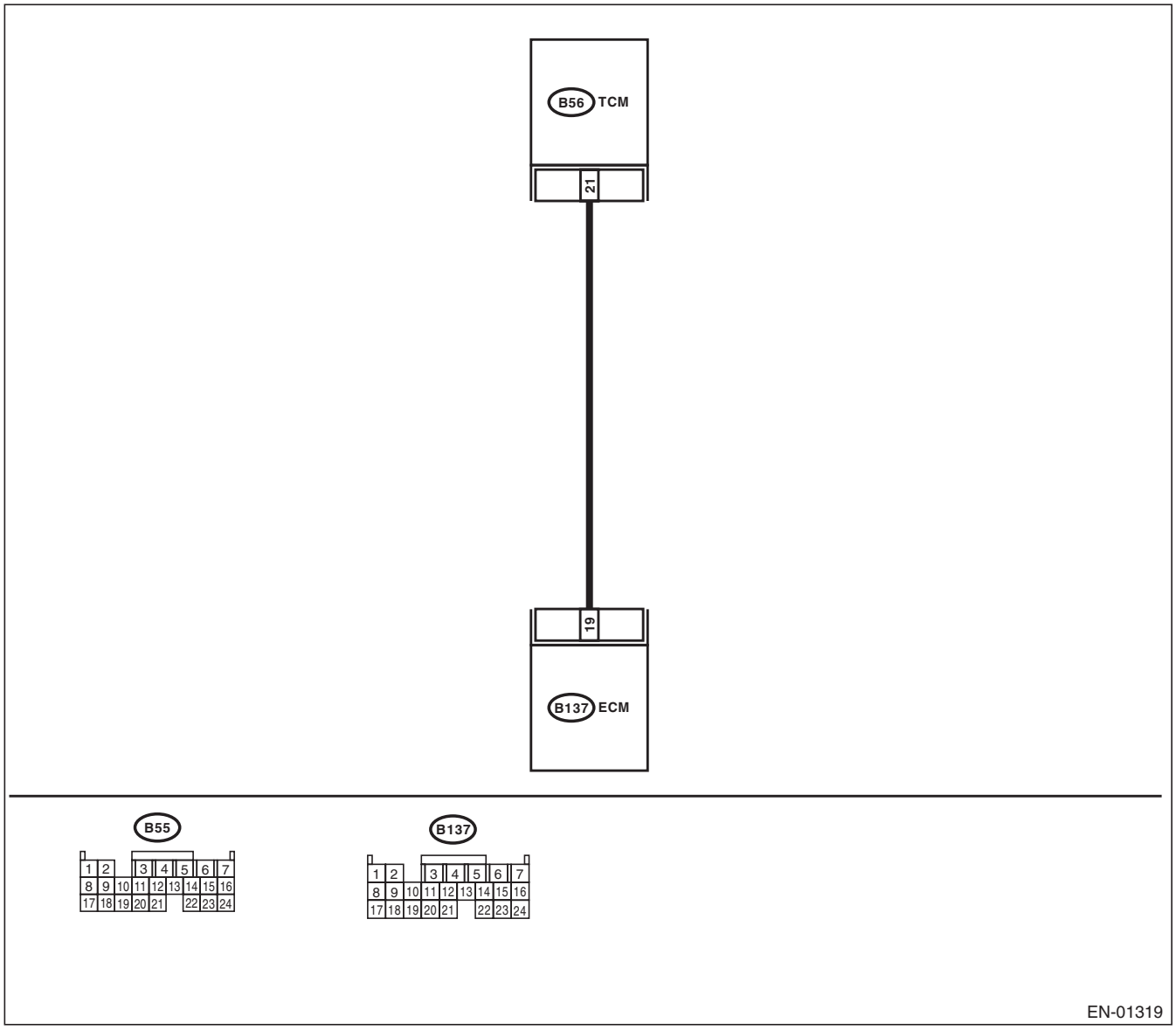
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CF:DTC P0866 — TCM COMMUNICATION CIRCUIT HIGH —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**



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	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** 1)Turn the ignition switch to ON. 2)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 19 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair the battery short circuit in harness between ECM and TCM connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-49, Engine Control Module (ECM).>	Go to step **2.**
2	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 19 (+) — Chassis ground (−):***	Is the voltage more than 4 V?	Go to step **5.**	Go to step **3.**
3	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 19 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Repair the poor contact in ECM connector.	Go to step **4.**
4	**CHECK OUTPUT SIGNAL FROM ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 19 (+) — Chassis ground (−):***	Does the voltage change between 1 and 4 V while monitoring the value with voltage meter?	Even if malfunction indicator light lights up, the circuit has returned to a normal condition at this time. NOTE: In this case, repair the following: • Poor contact in ECM connector • Poor contact in TCM connector	Contact your Subaru distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
5	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** Measure the voltage between TCM and chassis ground. ***Connector & terminal*** ***(B56) No. 21 (+) — Chassis ground (−):***	Is the voltage more than 4 V?	Go to step **6.**	Repair the open circuit in harness between ECM and TCM connector.
6	**CHECK POOR CONTACT.** Check poor contact in TCM connector.	Is there poor contact in TCM connector?	Repair the poor contact in TCM connector.	Check the TCM power supply line and grounding line.

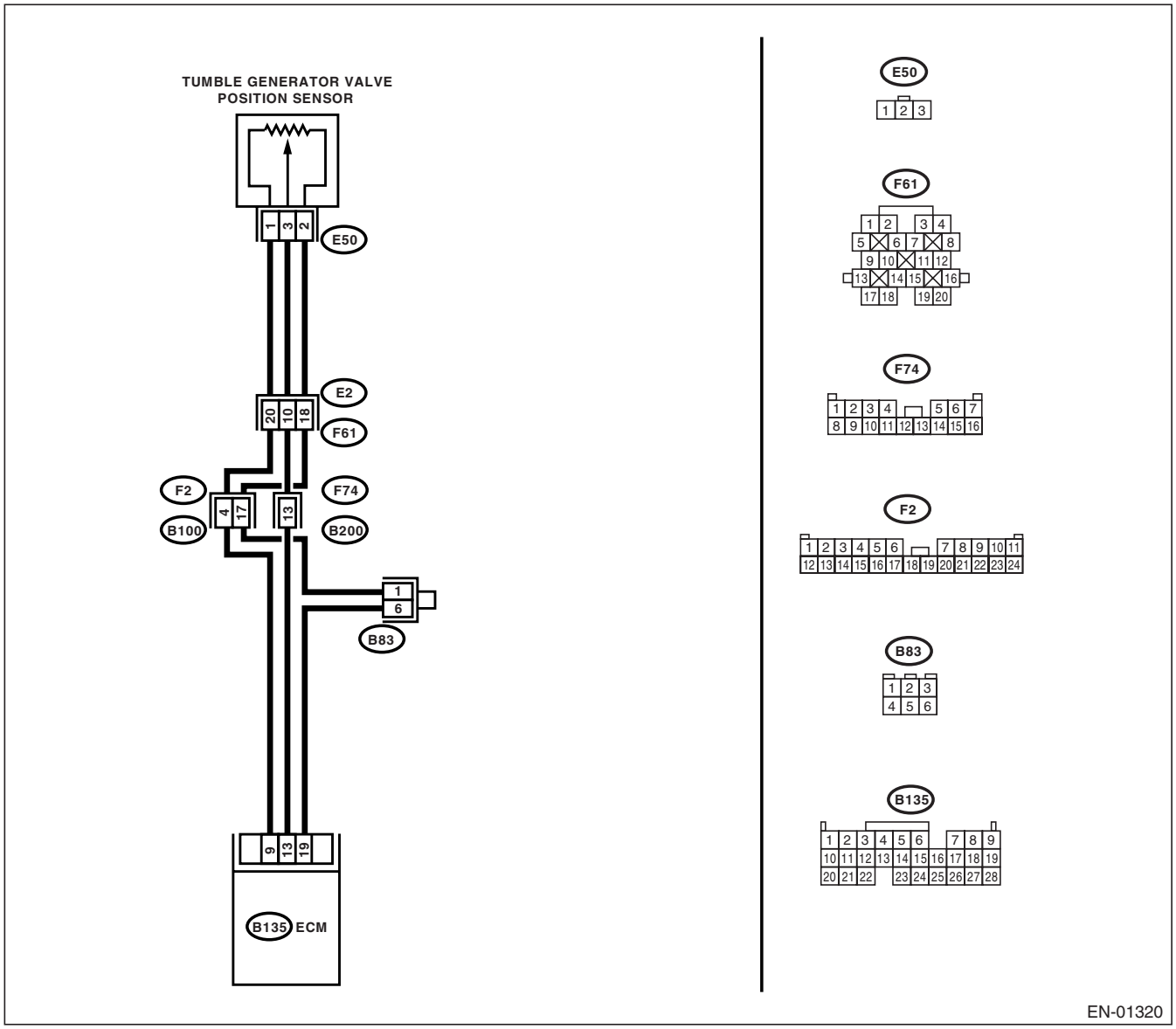
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CG: DTC P1086 — TUMBLE GENERATED VALVE POSITION SENSOR 2 CIRCUIT LOW —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.
  - Poor driving performance

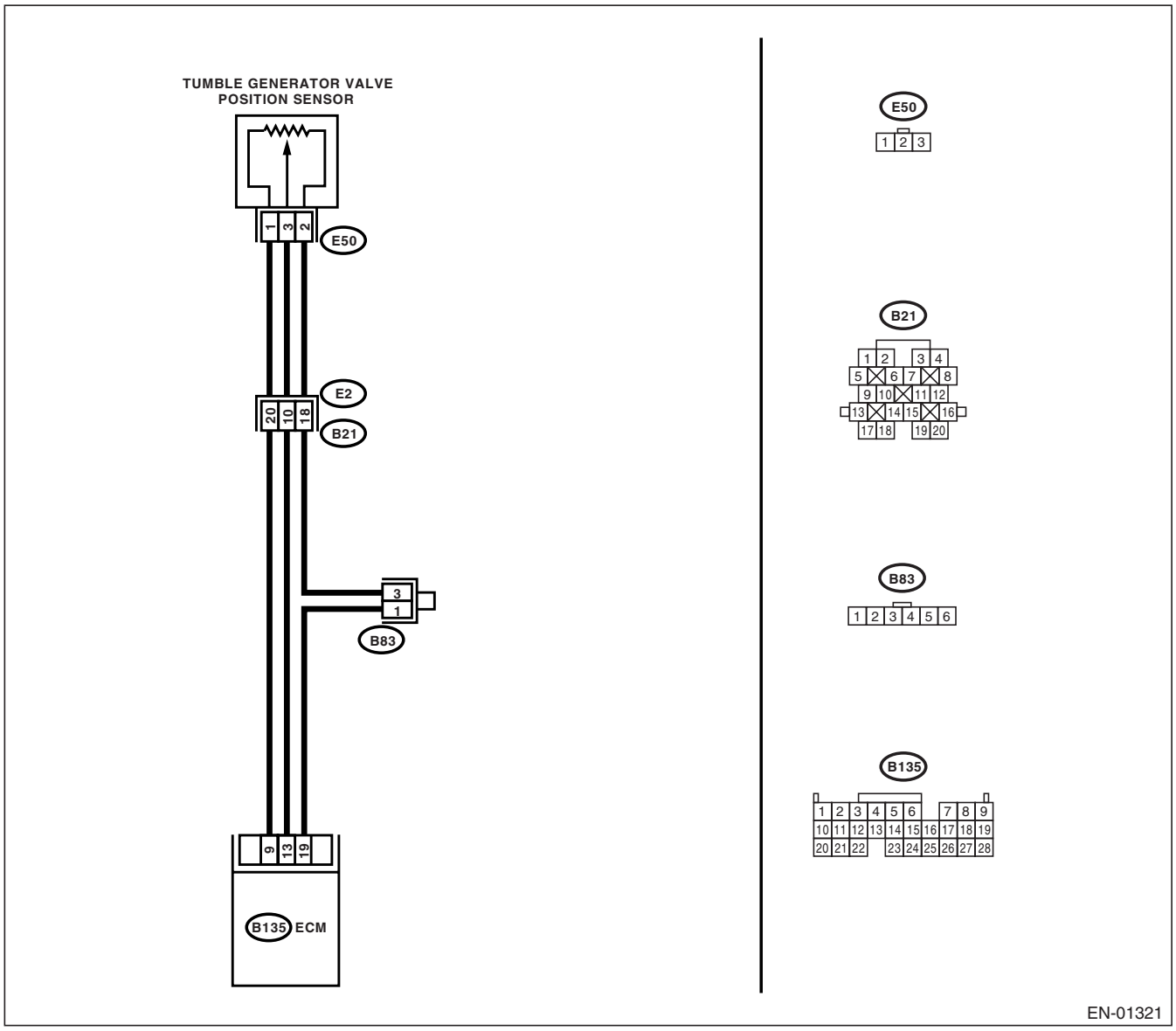
CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**
- **LHD model**



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- **RHD model**



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	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 OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II 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*** ***(B135) No. 9 (+) — Chassis ground (−):***	Is the voltage more than 4.5 V?	Go to step **4.**	Go to step **3.**
3	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 9 (+) — Chassis ground (−):***	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 Subaru distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 13 (+) — Chassis ground (−):***	Is the voltage less than 0.1 V?	Go to step **6.**	Go to step **5.**
5	**CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR)** Measure the voltage between ECM connector and chassis ground.	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.**

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	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*** ***(B135) No. 13 — (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 MΩ?	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 assembly. <Ref. to FU(H4DOTC)-41, Tumble Generator Valve Assembly.>

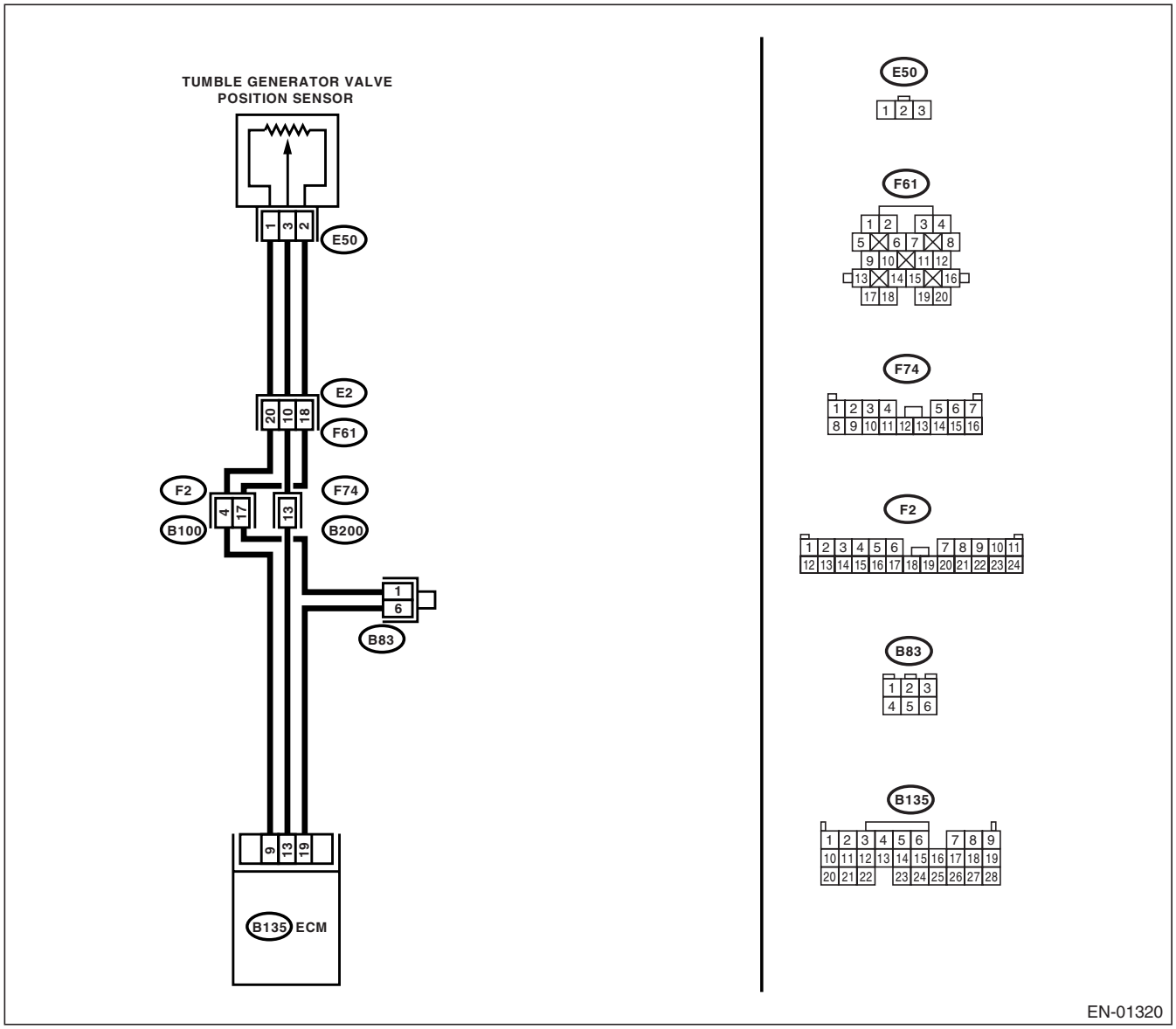
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CH:DTC P1087 — TUMBLE GENERATED VALVE POSITION SENSOR 2 CIRCUIT HIGH —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.
  - Poor driving performance

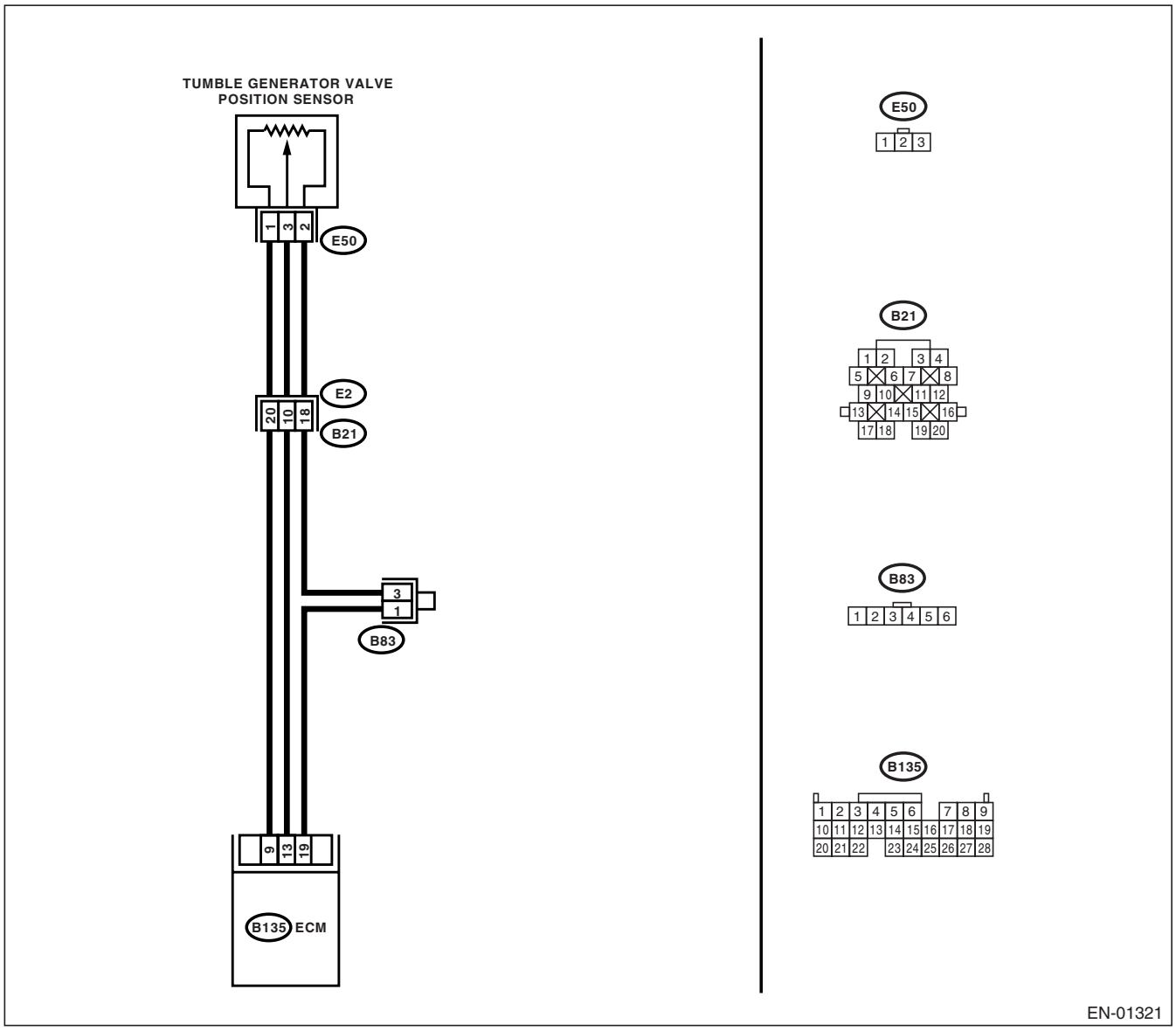
CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**
- **LHD model**



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- **RHD model**



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	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 OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II 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)-49, Engine Control Module (ECM).>	Replace the tumble generator valve assembly. <Ref. to FU(H4DOTC)-41, Tumble Generator Valve Assembly.>

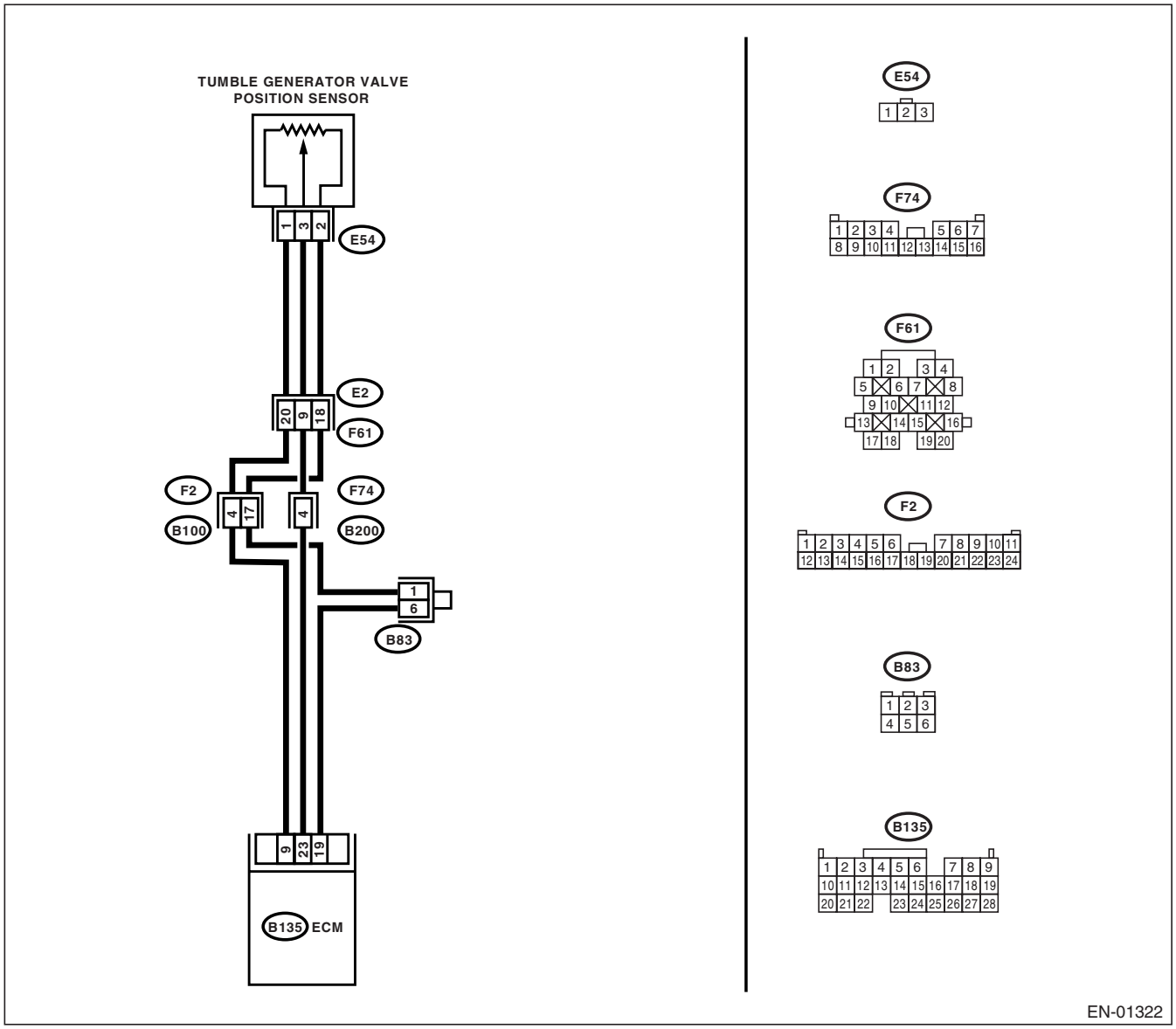
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CI: DTC P1088 — TUMBLE GENERATED VALVE POSITION SENSOR 1 CIRCUIT LOW —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.
  - Poor driving performance

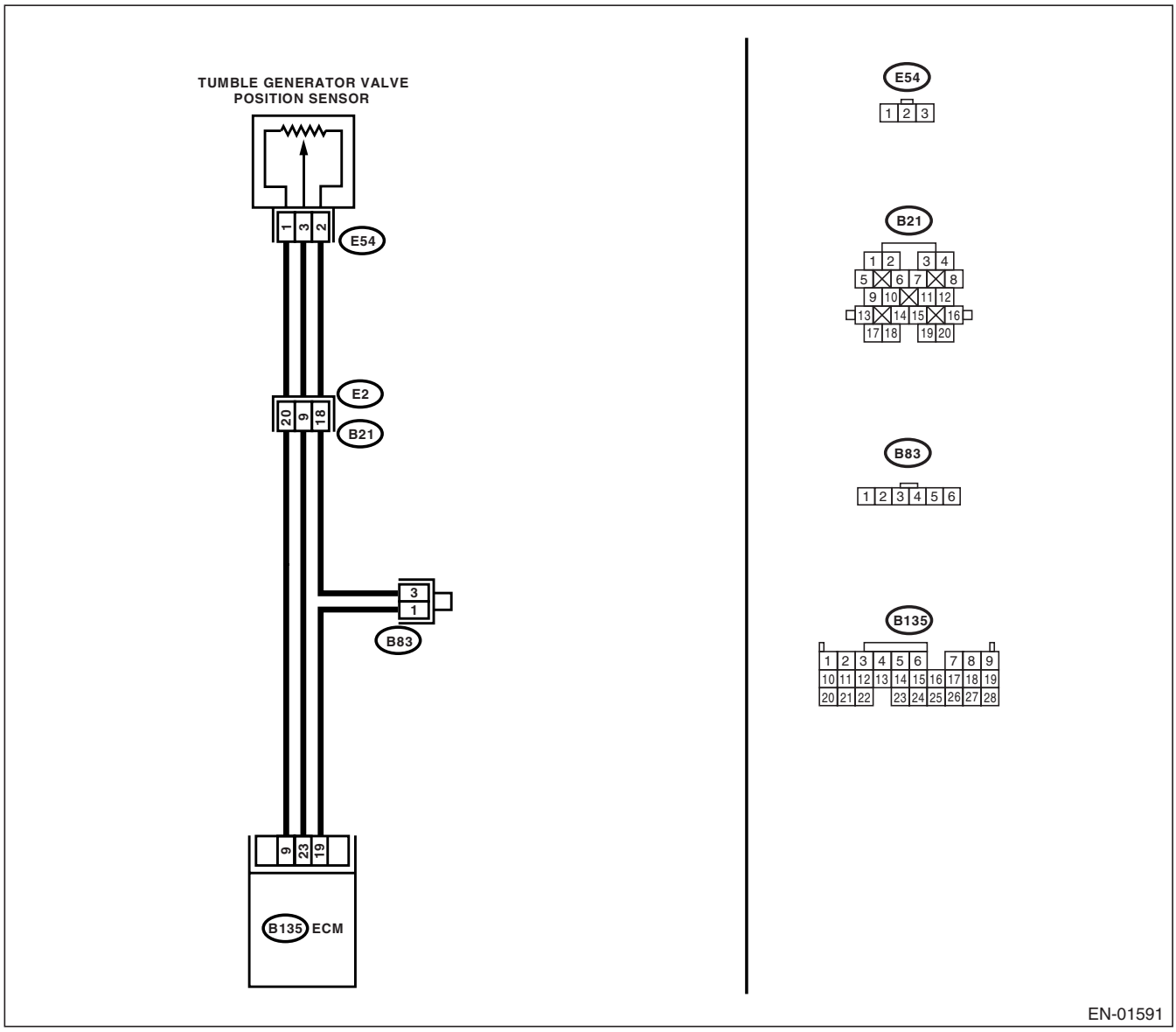
CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**
- **LHD model**



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- **RHD model**



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	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 OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II 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*** ***(B135) No. 9 (+) — Chassis ground (−):***	Is the voltage more than 4.5 V?	Go to step **4.**	Go to step **3.**
3	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 9 (+) — Chassis ground (−):***	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 Subaru distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.
4	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 23 (+) — Chassis ground (−):***	Is the voltage less than 0.1 V?	Go to step **6.**	Go to step **5.**
5	**CHECK INPUT SIGNAL FOR ECM. (USING SUBARU SELECT MONITOR)** Measure 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.**

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	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*** ***(B135) No. 23 — (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 MΩ?	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 assembly. <Ref. to FU(H4DOTC)-41, Tumble Generator Valve Assembly.>

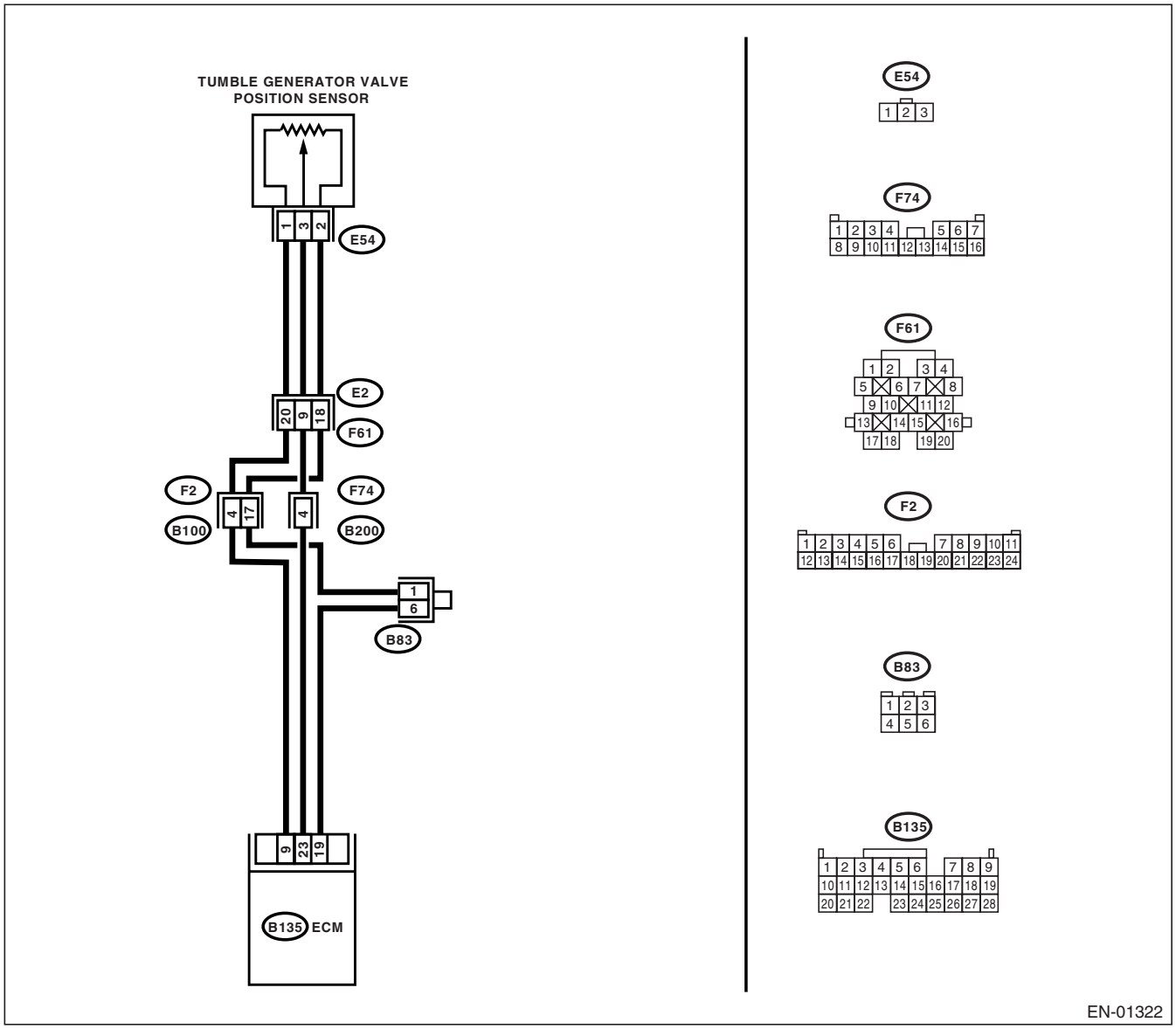
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CJ:DTC P1089 — TUMBLE GENERATED VALVE POSITION SENSOR 1 CIRCUIT HIGH —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.
  - Poor driving performance

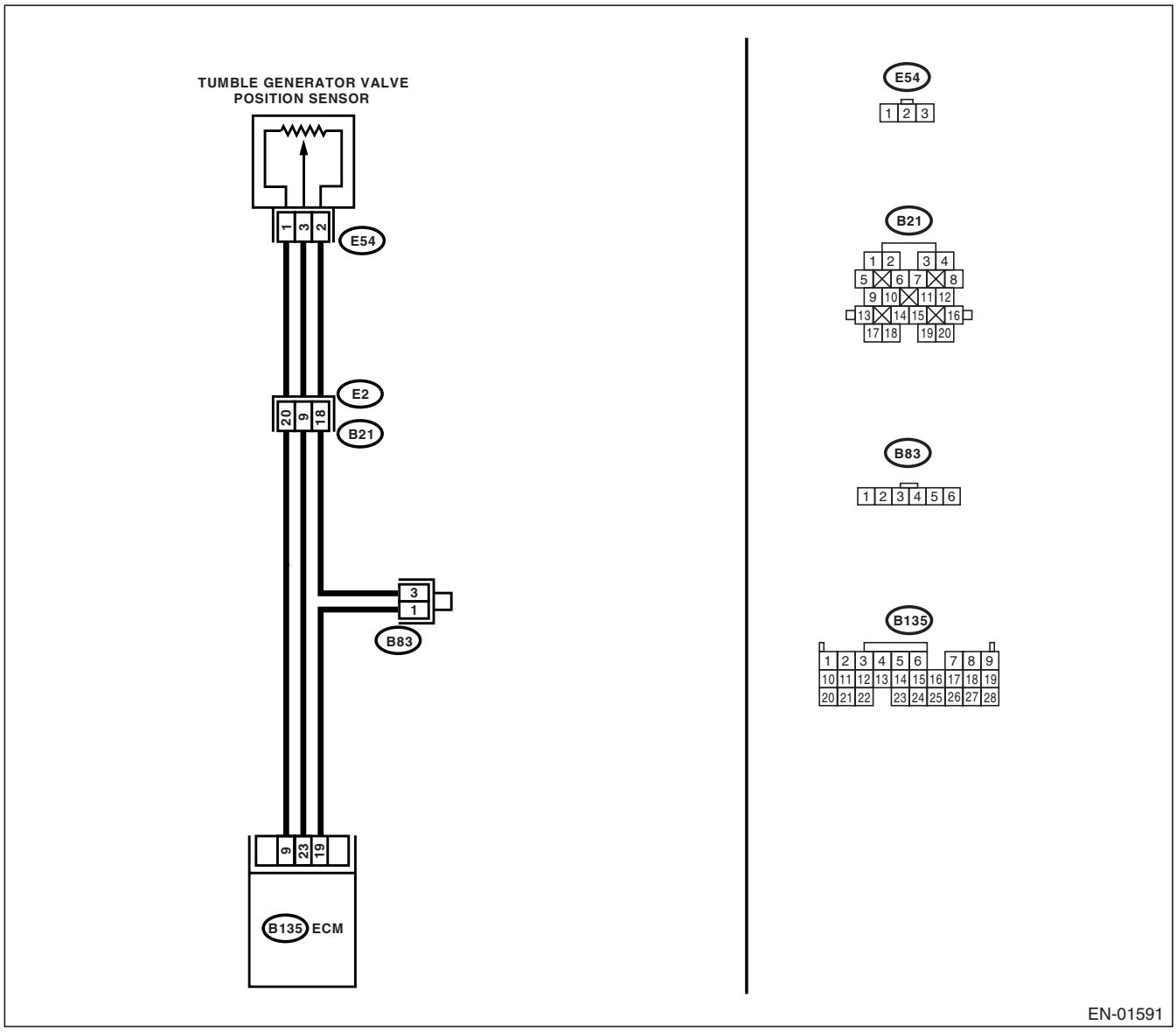
CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**
- **LHD model**



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- **RHD model**



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	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 OBD-II general scan tool. NOTE: •Subaru Select Monitor For detailed operation procedure, refer to the "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)-32, Subaru Select Monitor.> •OBD-II general scan tool For detailed operation procedures, refer to the OBD-II 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)-49, Engine Control Module (ECM).>	Replace the tumble generator valve assembly. <Ref. to FU(H4DOTC)-41, Tumble Generator Valve Assembly.>

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CK:DTC P1090 — TUMBLE GENERATED VALVE SYSTEM 1 (VALVE OPEN) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, 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)-75, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK TUMBLE GENERATOR VALVE RH.** 1)Remove the tumble generator valve assembly. 2)Check the tumble generator valve body.	Does the tumble generator valve move smoothly? (No dirt or foreign materials clogged)	Replace the tumble generator valve assembly. <Ref. to FU(H4DOTC)-41, Tumble Generator Valve Assembly.>	Clean the tumble generator valve.

CL:DTC P1091 — TUMBLE GENERATED VALVE SYSTEM 1 (VALVE CLOSE) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, 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)-75, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK TUMBLE GENERATOR VALVE RH.** 1)Remove the tumble generator valve assembly. 2)Check the tumble generator valve body.	Does the tumble generator valve move smoothly? (No dirt or foreign materials clogged)	Replace the tumble generator valve assembly. <Ref. to FU(H4DOTC)-41, Tumble Generator Valve Assembly.>	Clean the tumble generator valve.

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CM:DTC P1092 — TUMBLE GENERATED VALVE SYSTEM 2 (VALVE OPEN) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, 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)-75, 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)-41, Tumble Generator Valve Assembly.>	Clean the tumble generator valve.

CN:DTC P1093 — TUMBLE GENERATED VALVE SYSTEM 2 (VALVE CLOSE) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, 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)-75, 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)-41, Tumble Generator Valve Assembly.>	Clean the tumble generator valve.

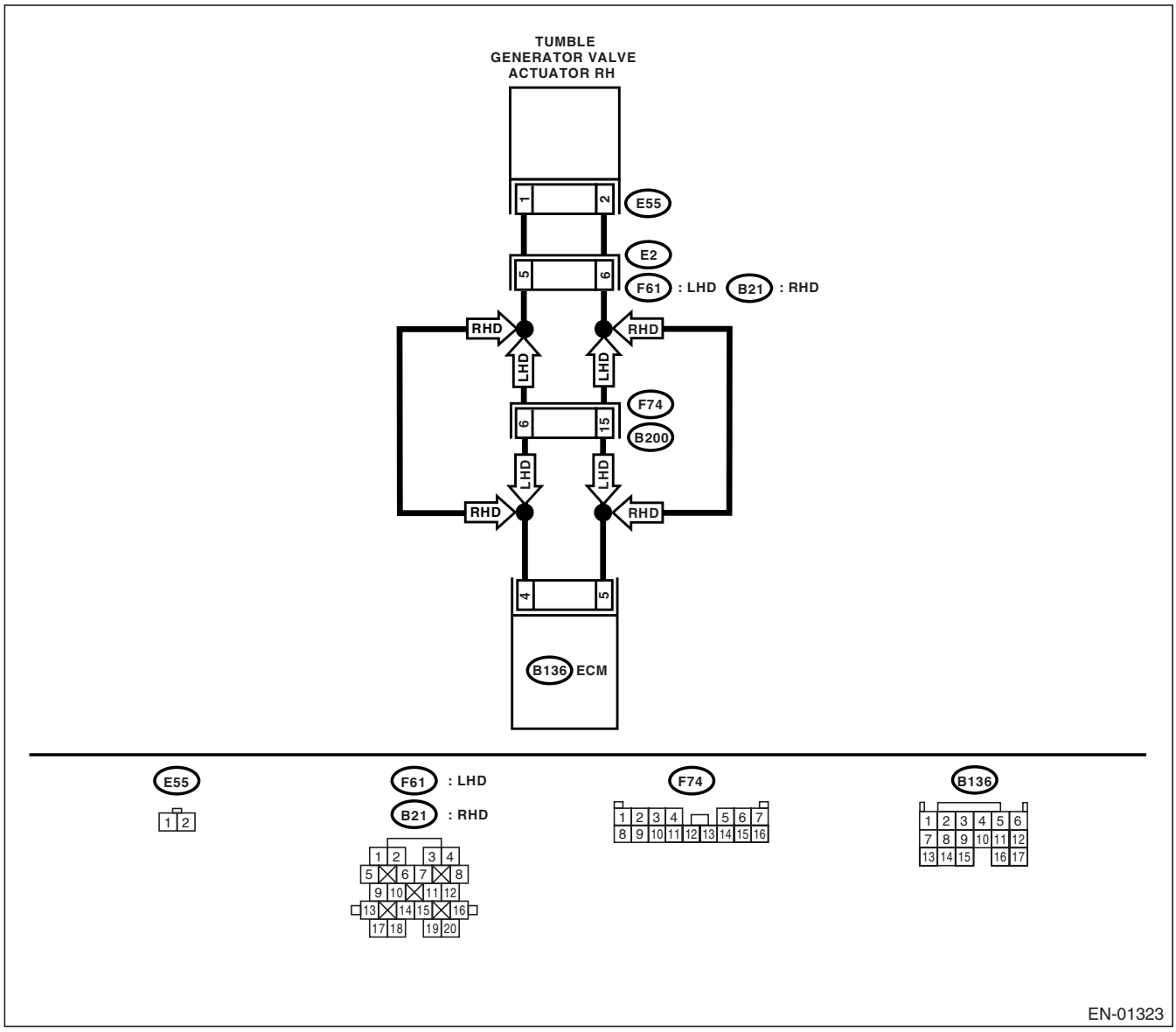
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CO:DTC P1094 — TUMBLE GENERATED VALVE SIGNAL 1 CIRCUIT MALFUNCTION (OPEN) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**



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	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 — (B136) No.4:*** ***(E55) No. 2 — (B136) No.5:***	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 assembly. <Ref. to FU(H4DOTC)-41, Tumble Generator Valve Assembly.>

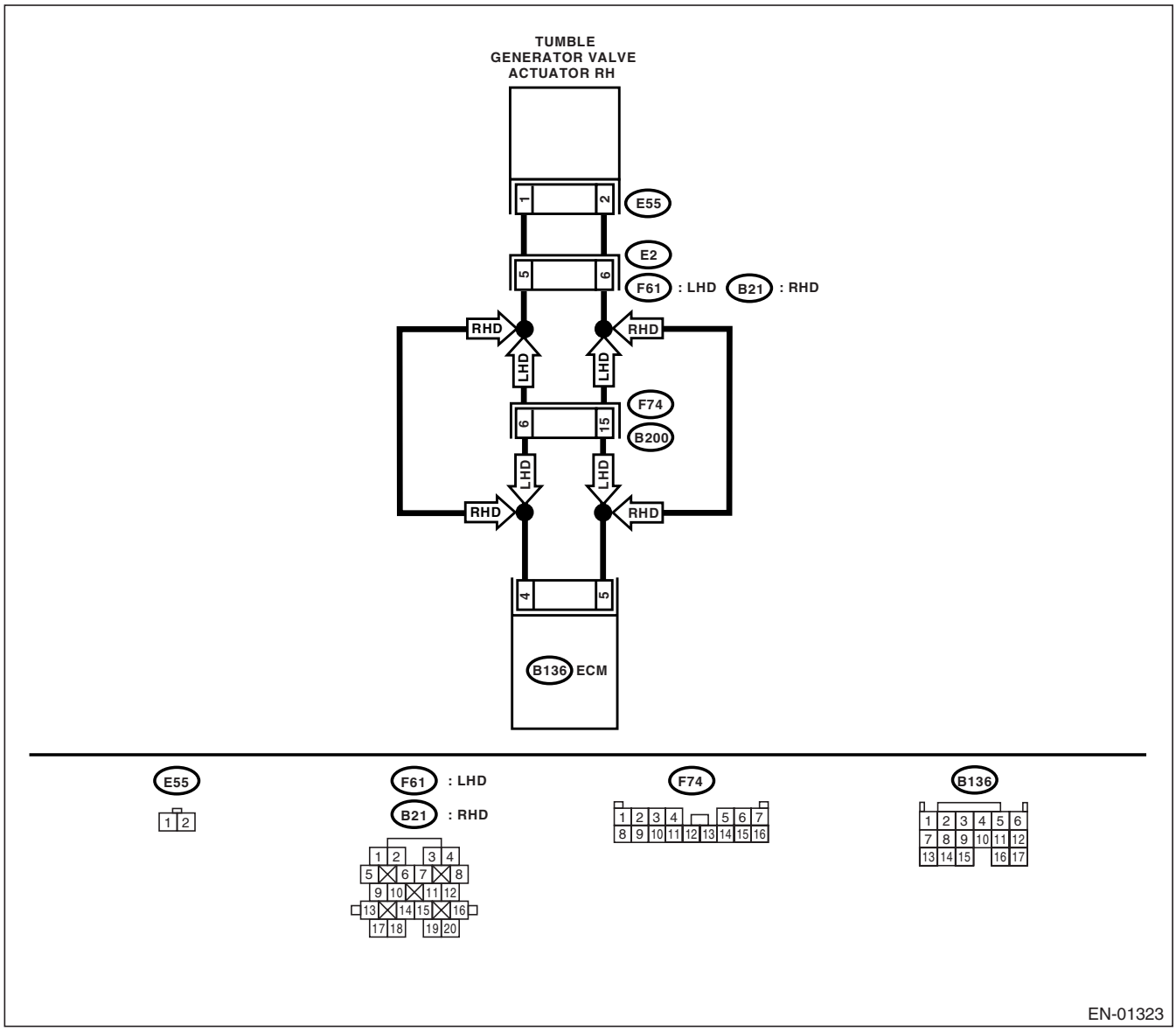
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CP:DTC P1095 — TUMBLE GENERATED VALVE SIGNAL 1 CIRCUIT MALFUNCTION (SHORT) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**



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	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 assembly. <Ref. to FU(H4DOTC)-41, Tumble Generator Valve Assembly.>	Repair the battery short circuit between ECM and tumble generator valve actuator.

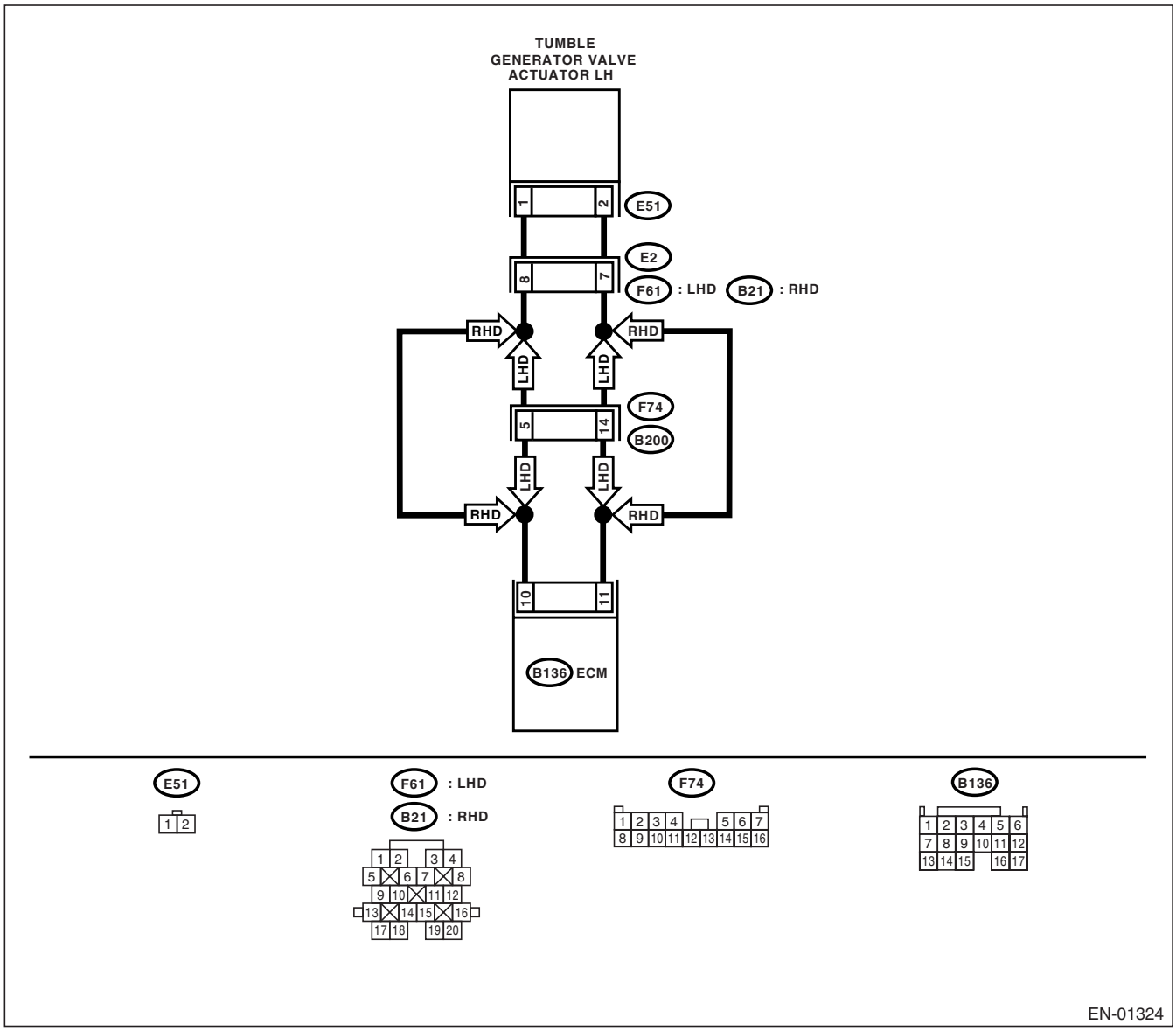
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CQ:DTC P1096 — TUMBLE GENERATED VALVE SIGNAL 2 CIRCUIT MALFUNCTION (OPEN) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**



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	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 — (B136) No. 10:*** ***(E51) No. 2 — (B136) No. 11:***	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 assembly. <Ref. to FU(H4DOTC)-41, Tumble Generator Valve Assembly.>

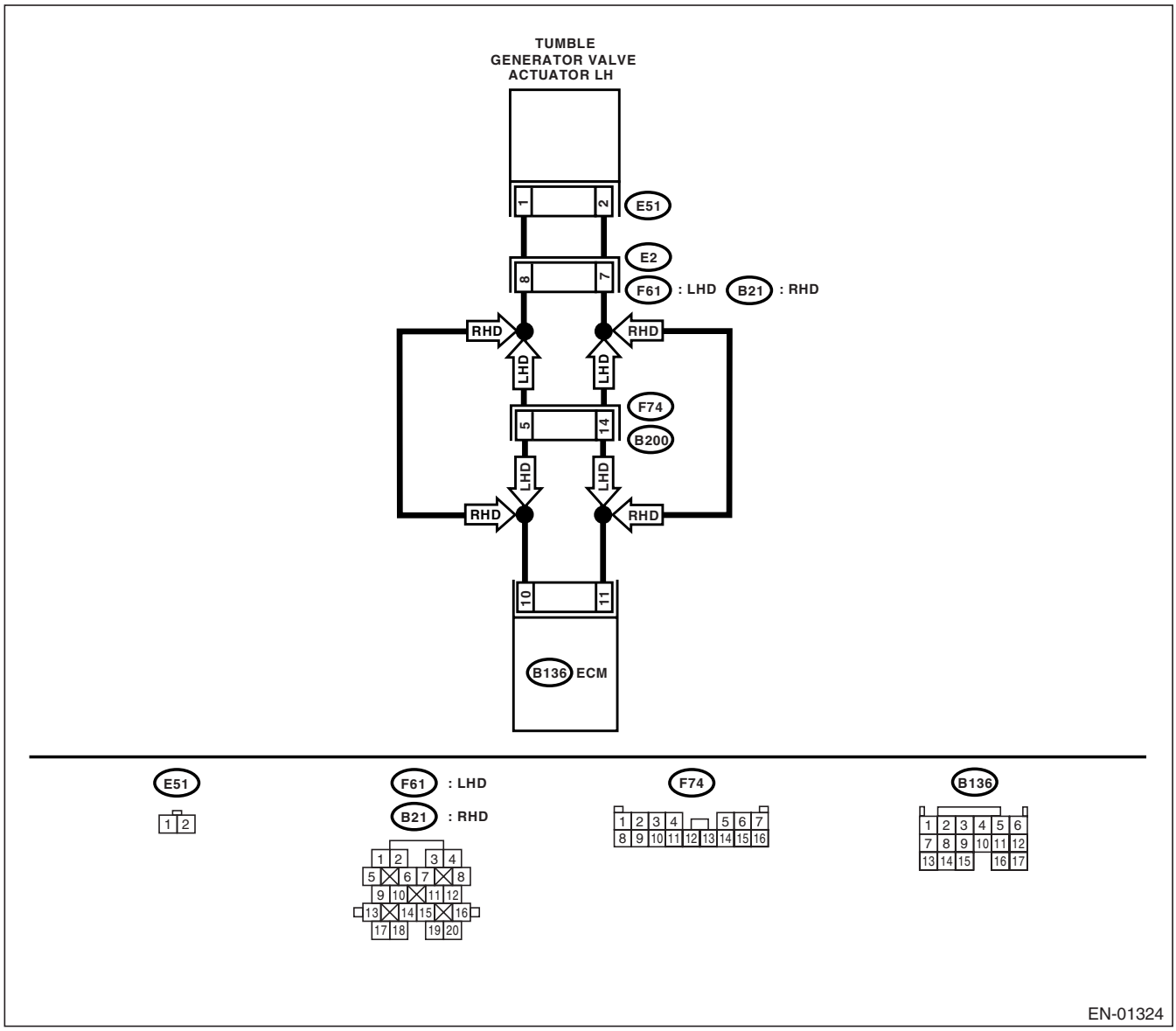
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CR:DTC P1097 — TUMBLE GENERATED VALVE SIGNAL 2 CIRCUIT MALFUNCTION (SHORT) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**



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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 assembly. <Ref. to FU(H4DOTC)-41, Tumble Generator Valve Assembly.>	Repair the battery short circuit between ECM and tumble generator valve actuator.

CS:DTC P1110 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (LOW INPUT) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P1110?	Replace the ECM. <Ref. to FU(H4DOTC)-49, Engine Control Module (ECM).> NOTE: Atmospheric pressure sensor is built into ECM.	A temporary poor contact.

CT:DTC P1111 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (HIGH INPUT) —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

Step		Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P1111?	Replace the ECM. <Ref. to FU(H4DOTC)-49, Engine Control Module (ECM).> NOTE: Atmospheric pressure sensor is built into ECM.	A temporary poor contact.

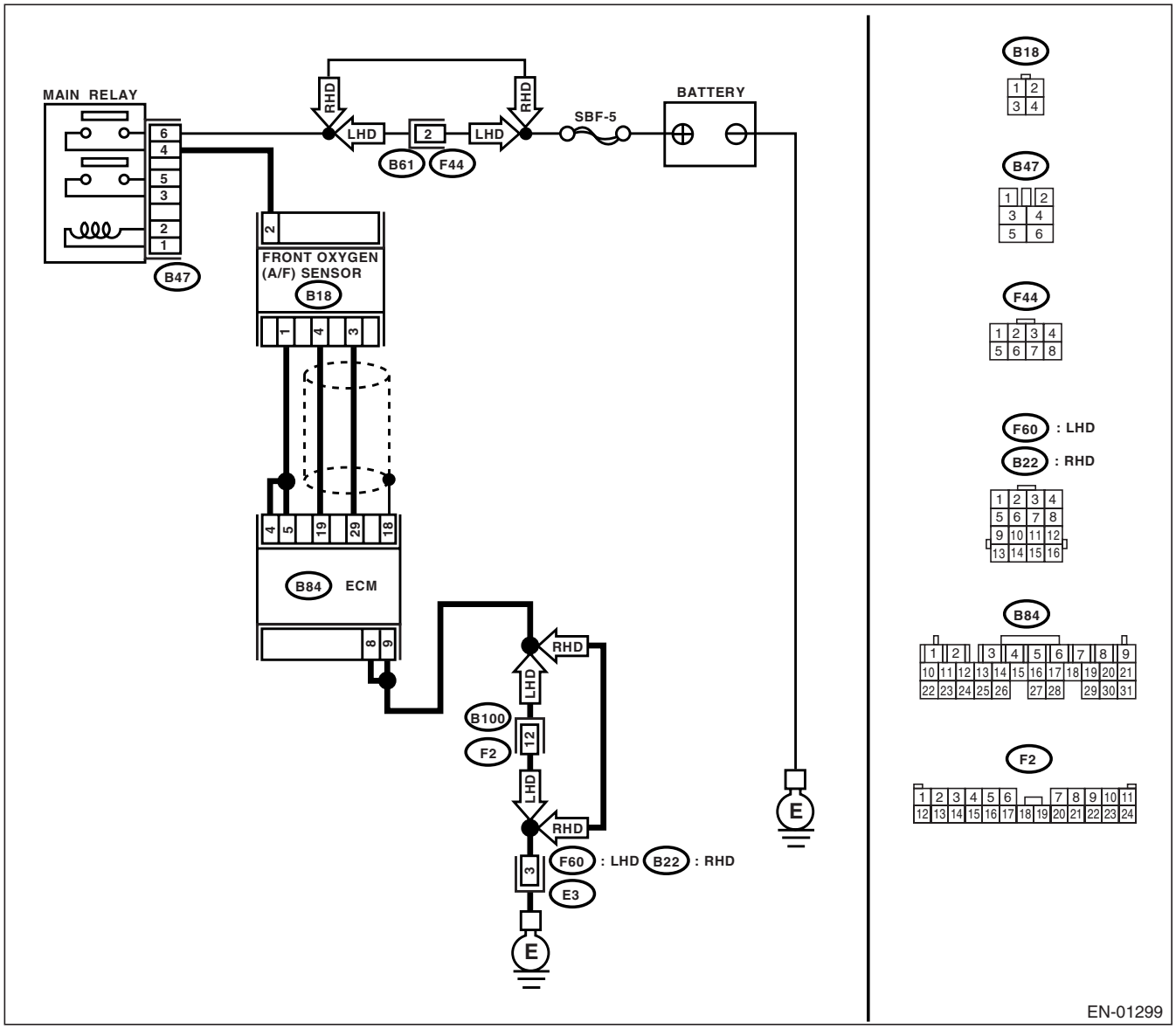
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CU:DTC P1134 — A/F SENSOR MICRO-COMPUTER PROBLEM —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**



Step	Check	Yes	No
1 **CHECK ANY OTHER DTC ON DISPLAY.**	Does the Subaru Select Monitor or OBD-II general scan tool indicate DTC P1134?	Replace the ECM. <Ref. to FU(H4DOTC)-49, Engine Control Module (ECM).>	A temporary poor contact.

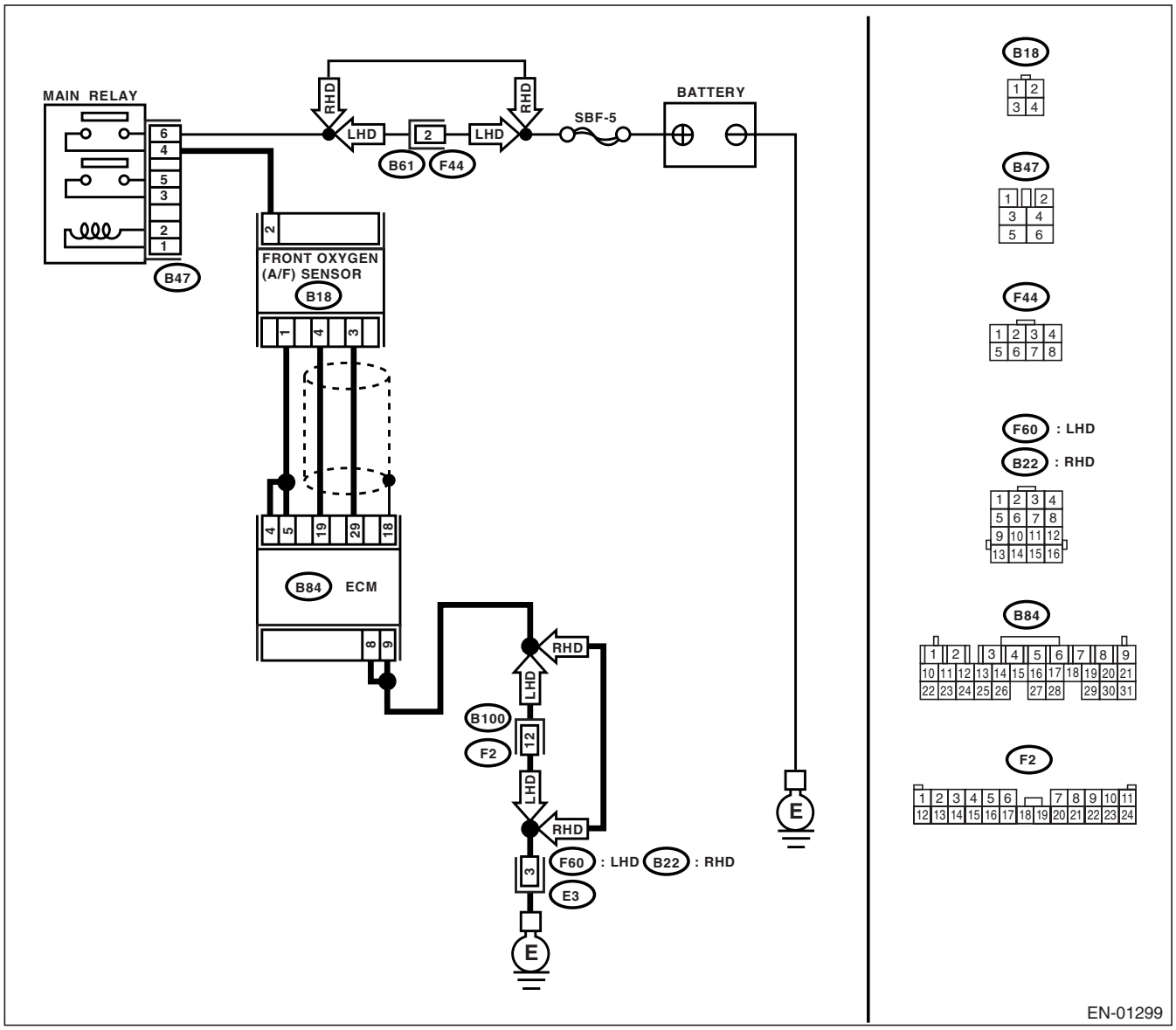
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CV: DTC P1152 — O_2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK1 SENSOR1) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**



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	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*** ***(B84) No. 29 — (B18) No. 3:*** ***(B84) No. 19 — (B18) No. 4:***	Is the resistance less than 1 Ω?	Go to step **2.**	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
2	**CHECK POOR CONTACT.** Check poor contact in front oxygen (A/F) sensor connector.	Is there poor contact in front oxygen (A/F) sensor connector?	Repair the poor contact in front oxygen (A/F) sensor connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-44, Front Oxygen (A/F) Sensor.>

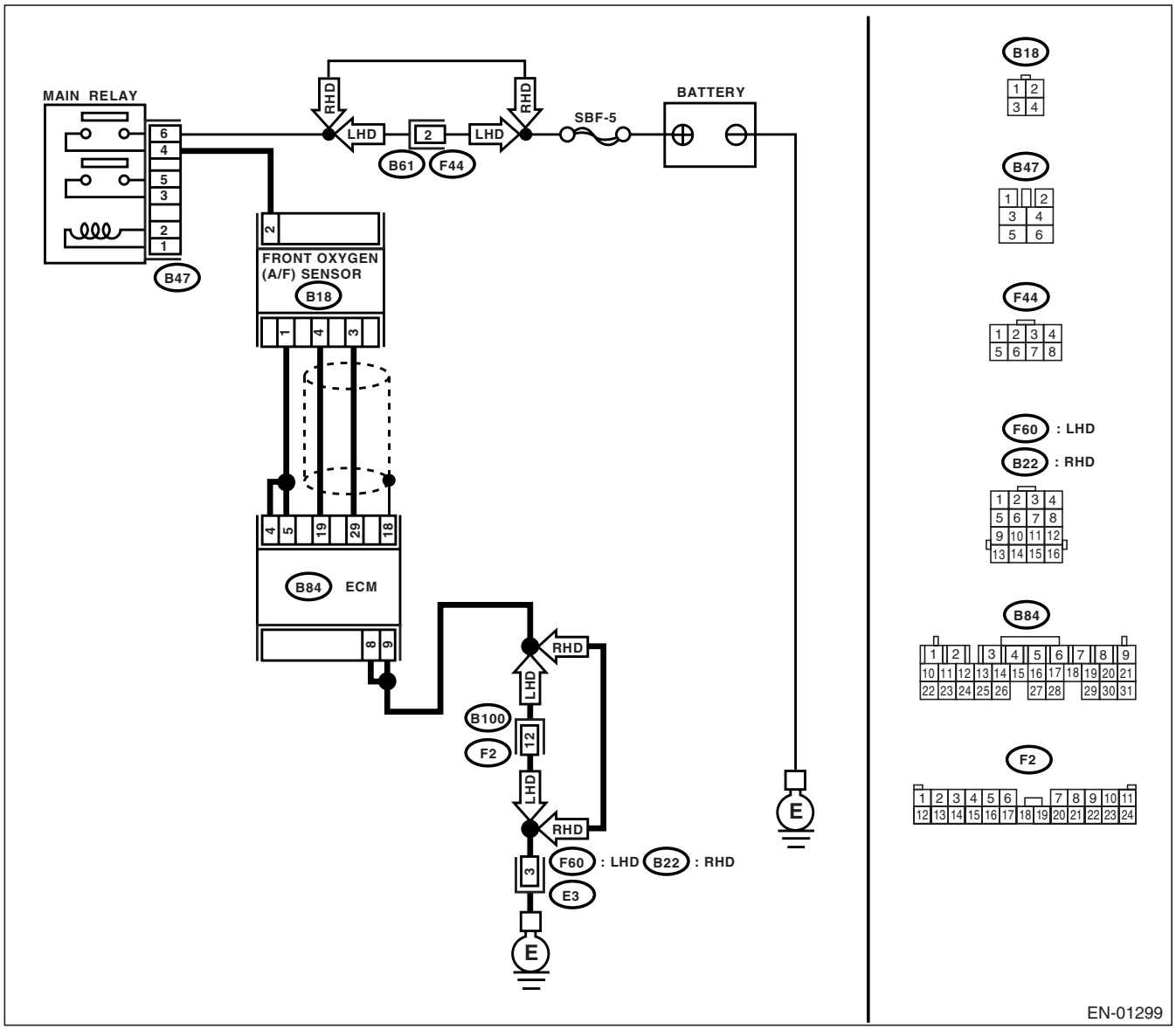
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CW: DTC P1153 — O_2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK1 SENSOR1) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**



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	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ECM and front oxygen (A/F) sensor. 3)Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B84) No. 19 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **2.**	Repair the ground short circuit in harness between ECM and front oxygen (A/F) sensor connector.
2	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B84) No. 29 — 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 OUTPUT SIGNAL FOR ECM.** 1)Connect the connector to ECM and front oxygen (A/F) sensor. 2)Turn the ignition switch to ON. 3)Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B84) No. 19 (+) — Chassis ground (−):***	Is the voltage more than 4.5 V?	Go to step **4.**	Go to step **5.**
4	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B84) No. 19 (+) — 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)-49, Engine Control Module (ECM).>	Repair the poor contact in ECM connector.
5	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B84) No. 29 (+) — Chassis ground (−):***	Is the voltage more than 4.95 V?	Go to step **6.**	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-44, Front Oxygen (A/F) Sensor.>
6	**CHECK OUTPUT SIGNAL FOR ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B84) No. 29 (+) — 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)-49, Engine Control Module (ECM).>	Repair the poor contact in ECM connector.

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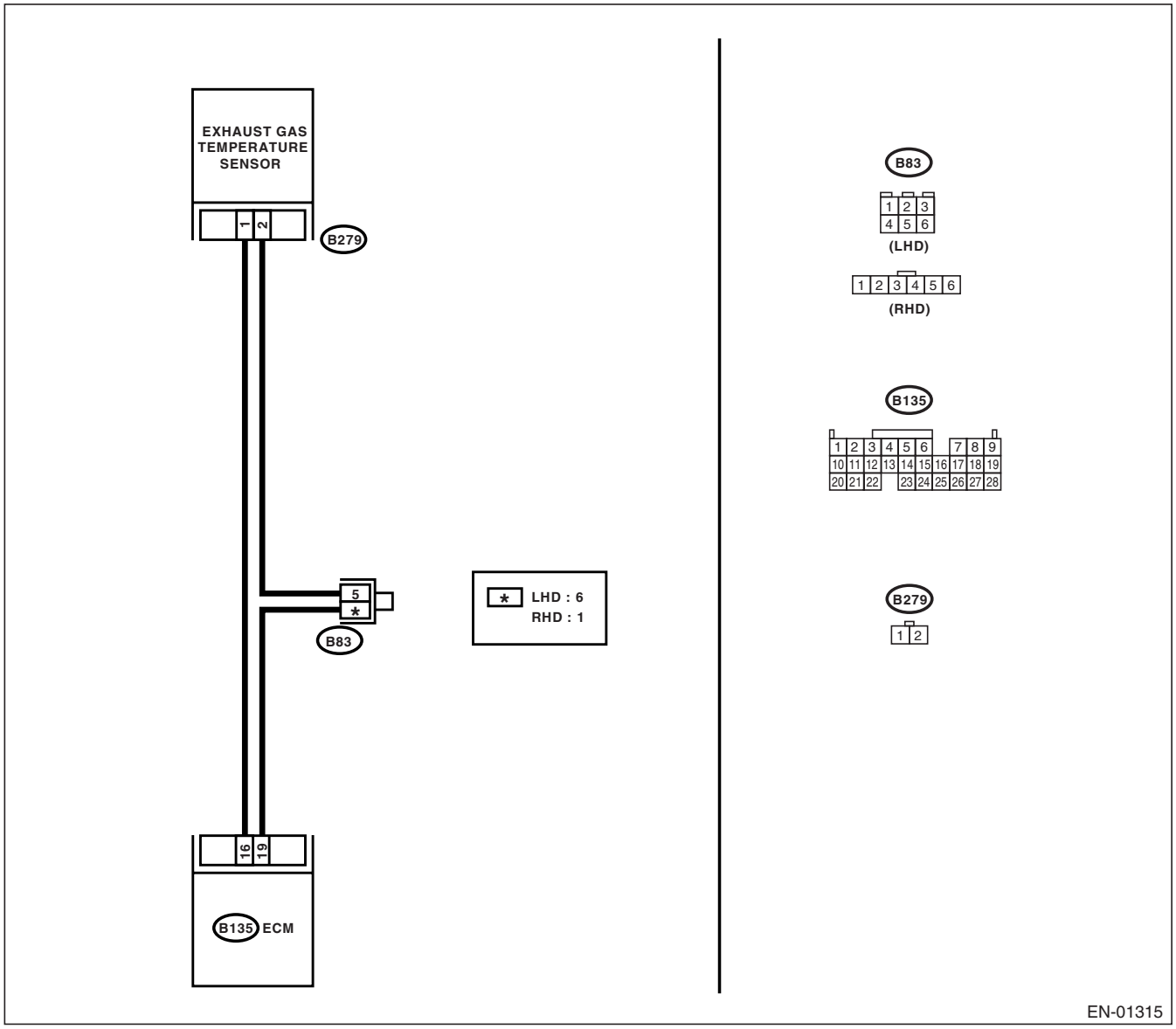
CX:DTC P1301 — MISFIRE DETECTED (HIGH TEMPERATURE EXHAUST GAS)

—

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Engine stalls.
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**



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Step		Check	Yes	No
1	**CHECK ANY OTHER DTC.** Conduct the troubleshooting for all DTC P0301, P0302, P0303 and P0304. <Ref. to EN(H4DOTC)-75, List of Diagnostic Trouble Code (DTC).>	Does failure for repair or replacement exist?	Repair or replace the failure, then replace precatalytic converter.	Contact your Subaru distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

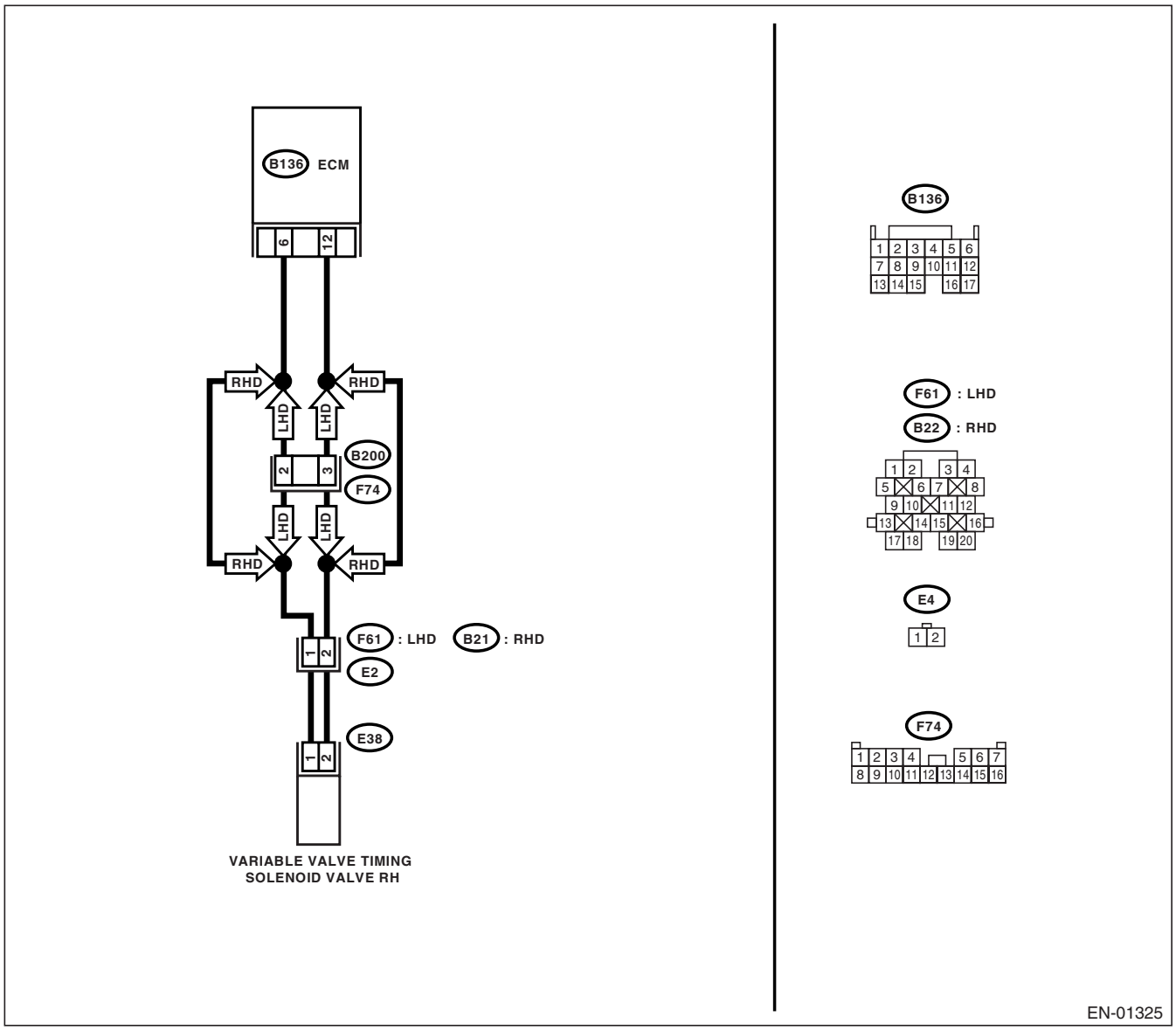
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CY:DTC P1306 — OCV SOLENOID VALVE SIGNAL 1 CIRCUIT MALFUNCTION (OPEN) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Erroneous idling

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**



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	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND VARIABLE VALVE TIMING SOLENOID VALVE.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ECM and variable valve timing solenoid valve. 3)Measure the resistance between ECM and variable valve timing solenoid valve. ***Connector & terminal*** ***(B136) No. 6 — (E38) No. 1:*** ***(B136) No. 12 — (E38) No. 2:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit in harness between ECM and variable valve timing solenoid valve connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and variable valve timing solenoid valve connector • Poor contact in coupling connector.
2	**CHECK HARNESS BETWEEN ECM AND VARIABLE VALVE TIMING SOLENOID VALVE.** Measure the resistance between ECM and variable valve timing solenoid valve. ***Connector & terminal*** ***(E38) No. 1 — Engine ground:*** ***(E38) No. 2 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair the short circuit between ECM and variable valve timing solenoid valve connector.
3	**CHECK VARIABLE VALVE TIMING SOLENOID VALVE.** 1)Remove the variable valve timing solenoid valve. 2)Measure the resistance between variable valve timing solenoid valve terminal. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 6 — 12 Ω?	Repair the poor contact in ECM and variable valve timing solenoid valve.	Replace the variable valve timing solenoid valve. <Ref. to ME(H4DOTC)-72, Camshaft.>

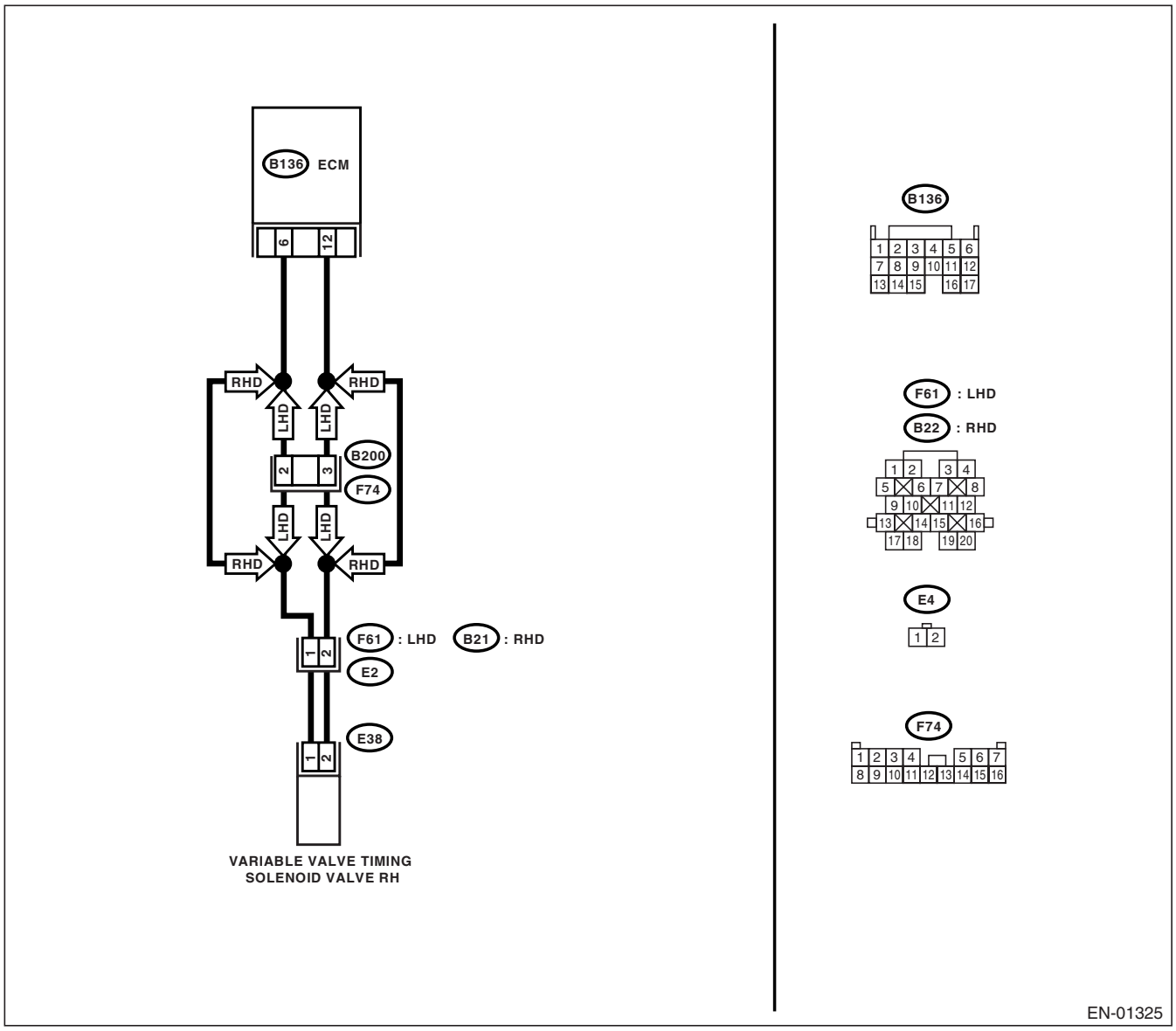
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CZ:DTC P1307 — OCV SOLENOID VALVE SIGNAL 1 CIRCUIT MALFUNCTION (SHORT) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Erroneous idling

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**



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	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND VARIABLE VALVE TIMING SOLENOID VALVE.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ECM and variable valve timing solenoid valve. 3)Measure the resistance between ECM and variable valve timing solenoid valve. ***Connector & terminal*** ***(B136) No. 6 — (E38) No. 1:*** ***(B136) No. 12 — (E38) No. 2:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit in harness between ECM and variable valve timing solenoid valve connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and variable valve timing solenoid valve connector • Poor contact in coupling connector.
2	**CHECK HARNESS BETWEEN ECM AND VARIABLE VALVE TIMING SOLENOID VALVE.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ECM and variable valve timing solenoid valve. 3)Measure the resistance between ECM and variable valve timing solenoid valve. ***Connector & terminal*** ***(E38) No. 1 — Engine ground:*** ***(E38) No. 2 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair the short circuit between ECM and variable valve timing solenoid valve connector.
3	**CHECK VARIABLE VALVE TIMING SOLENOID VALVE.** 1)Remove the variable valve timing solenoid valve. 2)Measure the resistance between variable valve timing solenoid valve terminal. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 6 — 12 Ω?	Repair the poor contact in ECM and variable valve timing solenoid valve.	Replace the variable valve timing solenoid valve. <Ref. to ME(H4DOTC)-72, Camshaft.>

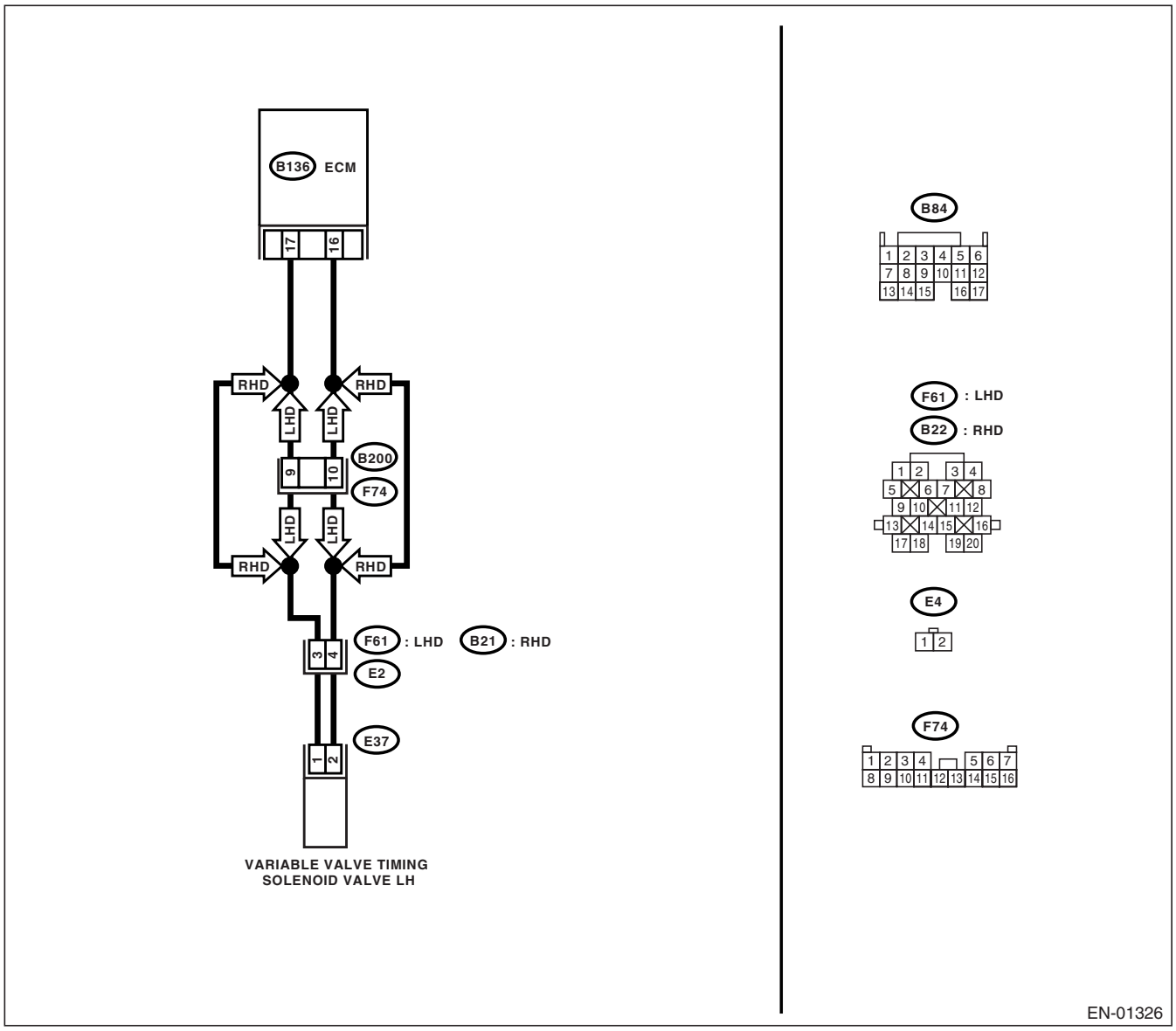
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DA:DTC P1308 — OCV SOLENOID VALVE SIGNAL 2 CIRCUIT MALFUNCTION (OPEN) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Erroneous idling

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**



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	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND VARIABLE VALVE TIMING SOLENOID VALVE.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ECM and variable valve timing solenoid valve. 3)Measure the resistance between ECM and variable valve timing solenoid valve. ***Connector & terminal*** ***(B136) No. 17 — (E37) No. 1:*** ***(B136) No. 16 — (E37) No. 2:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit in harness between ECM and variable valve timing solenoid valve connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and variable valve timing solenoid valve connector • Poor contact in coupling connector.
2	**CHECK HARNESS BETWEEN ECM AND VARIABLE VALVE TIMING SOLENOID VALVE.** Measure the resistance between ECM and variable valve timing solenoid valve. ***Connector & terminal*** ***(E37) No. 1 — Engine ground:*** ***(E37) No. 2 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair the short circuit between ECM and variable valve timing solenoid valve connector.
3	**CHECK VARIABLE VALVE TIMING SOLENOID VALVE.** 1)Remove the variable valve timing solenoid valve. 2)Measure the resistance between variable valve timing solenoid valve terminal. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 6 — 12 Ω?	Repair the poor contact in ECM and variable valve timing solenoid valve.	Replace the variable valve timing solenoid valve. <Ref. to ME(H4DOTC)-72, Camshaft.>

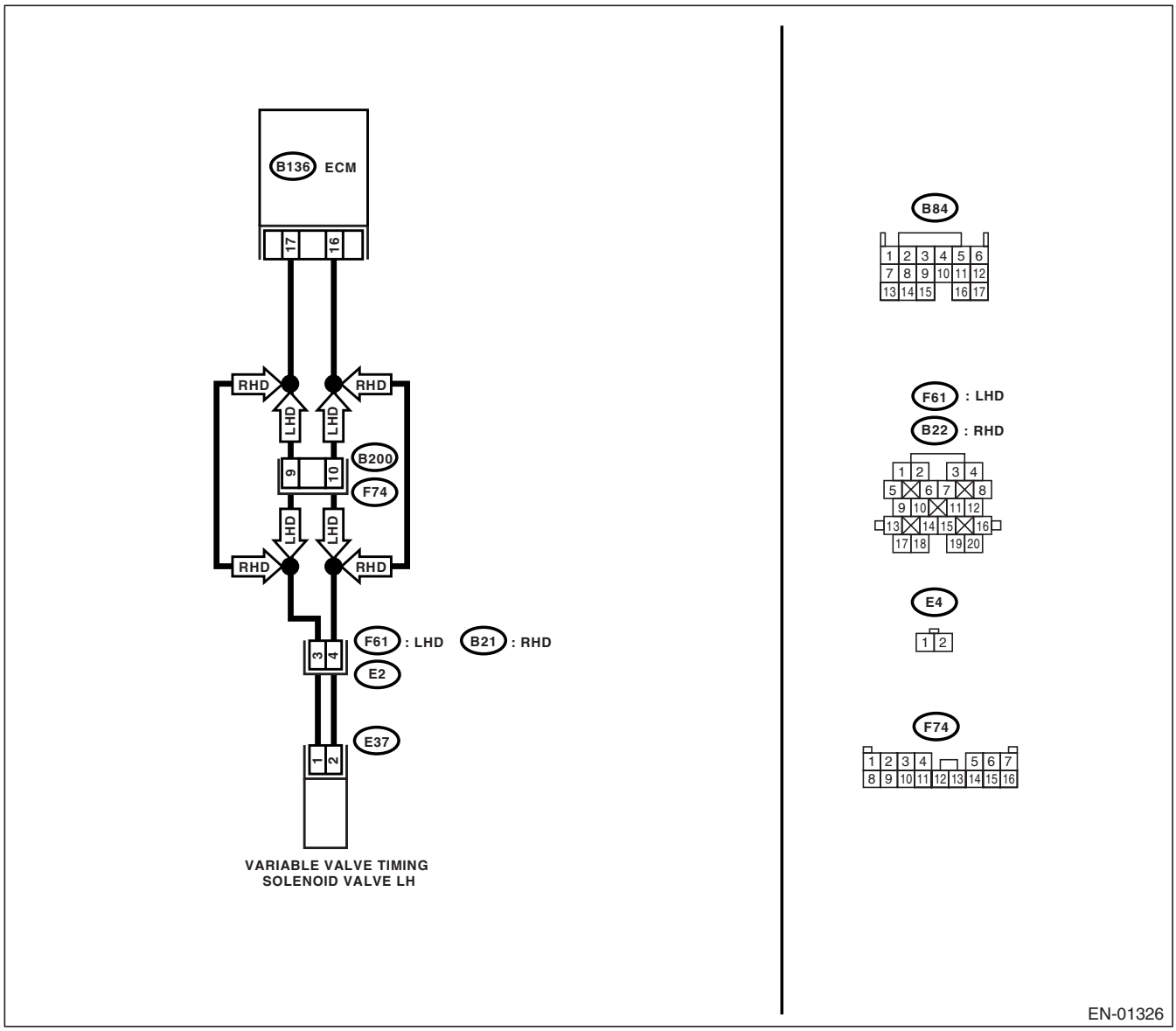
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DB:DTC P1309 — OCV SOLENOID VALVE SIGNAL 2 CIRCUIT MALFUNCTION (SHORT) —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Erroneous idling

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**



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	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND VARIABLE VALVE TIMING SOLENOID VALVE.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ECM and variable valve timing solenoid valve. 3)Measure the resistance between ECM and variable valve timing solenoid valve. ***Connector & terminal*** ***(B136) No. 17 — (E37) No. 1:*** ***(B136) No. 16 — (E37) No. 2:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit in harness between ECM and variable valve timing solenoid valve connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and variable valve timing solenoid valve connector • Poor contact in coupling connector.
2	**CHECK HARNESS BETWEEN ECM AND VARIABLE VALVE TIMING SOLENOID VALVE.** 1)Turn the ignition switch to OFF. 2)Disconnect the connector from ECM and variable valve timing solenoid valve. 3)Measure the resistance between ECM and variable valve timing solenoid valve. ***Connector & terminal*** ***(E37) No. 1 — Engine ground:*** ***(E37) No. 2 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair the short circuit between ECM and variable valve timing solenoid valve connector.
3	**CHECK VARIABLE VALVE TIMING SOLENOID VALVE.** 1)Remove the variable valve timing solenoid valve. 2)Measure the resistance between variable valve timing solenoid valve terminal. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 6 — 12 Ω?	Repair the poor contact in ECM and variable valve timing solenoid valve.	Replace the variable valve timing solenoid valve. <Ref. to ME(H4DOTC)-72, Camshaft.>

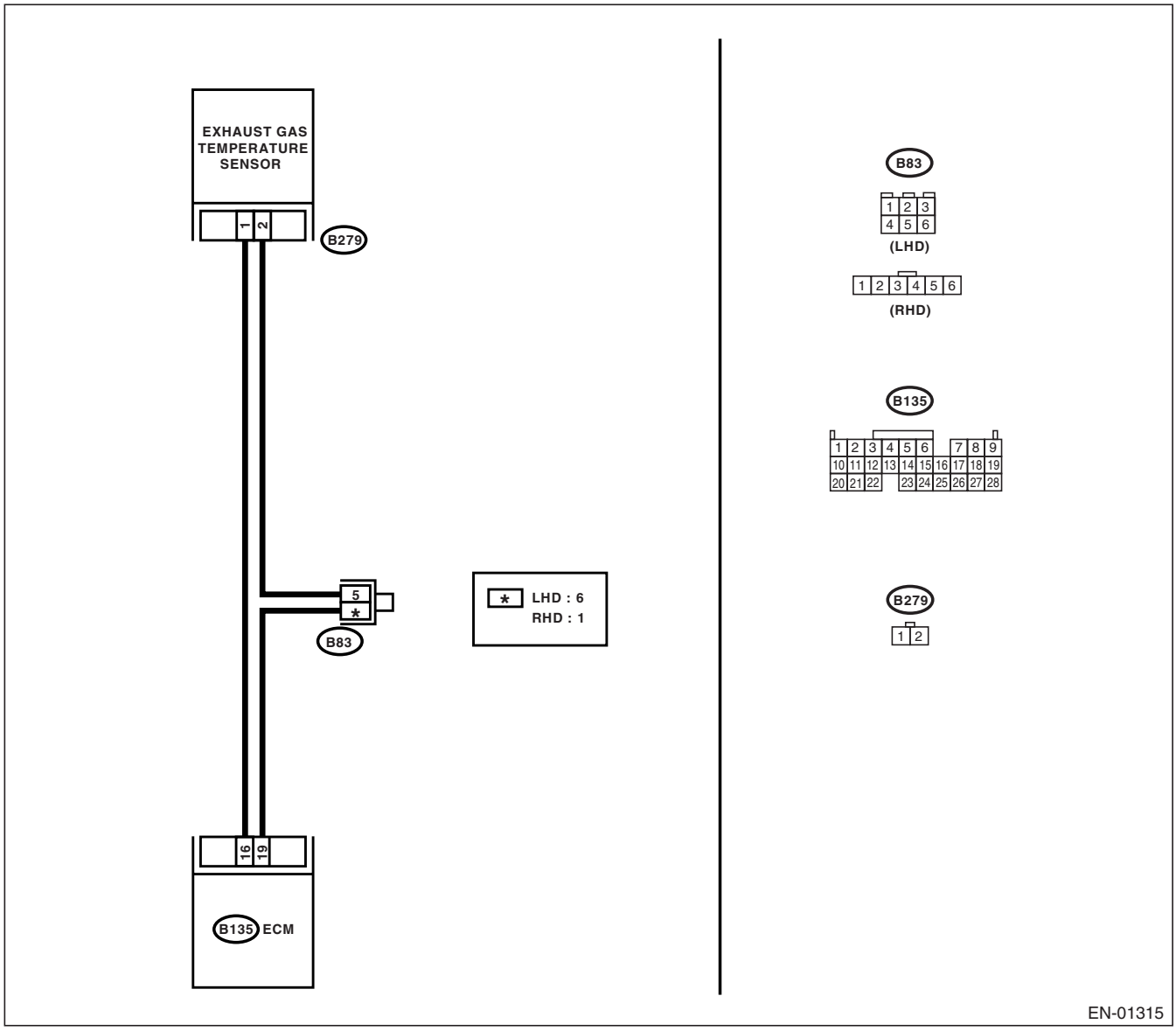
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DC:DTC P1312 — EXHAUST GAS TEMPERATURE SENSOR MALFUNCTION —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**



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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)-75, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P1312.	Replace the exhaust gas temperature sensor. <Ref. to FU(H4DOTC)-48, Exhaust Temperature Sensor.>

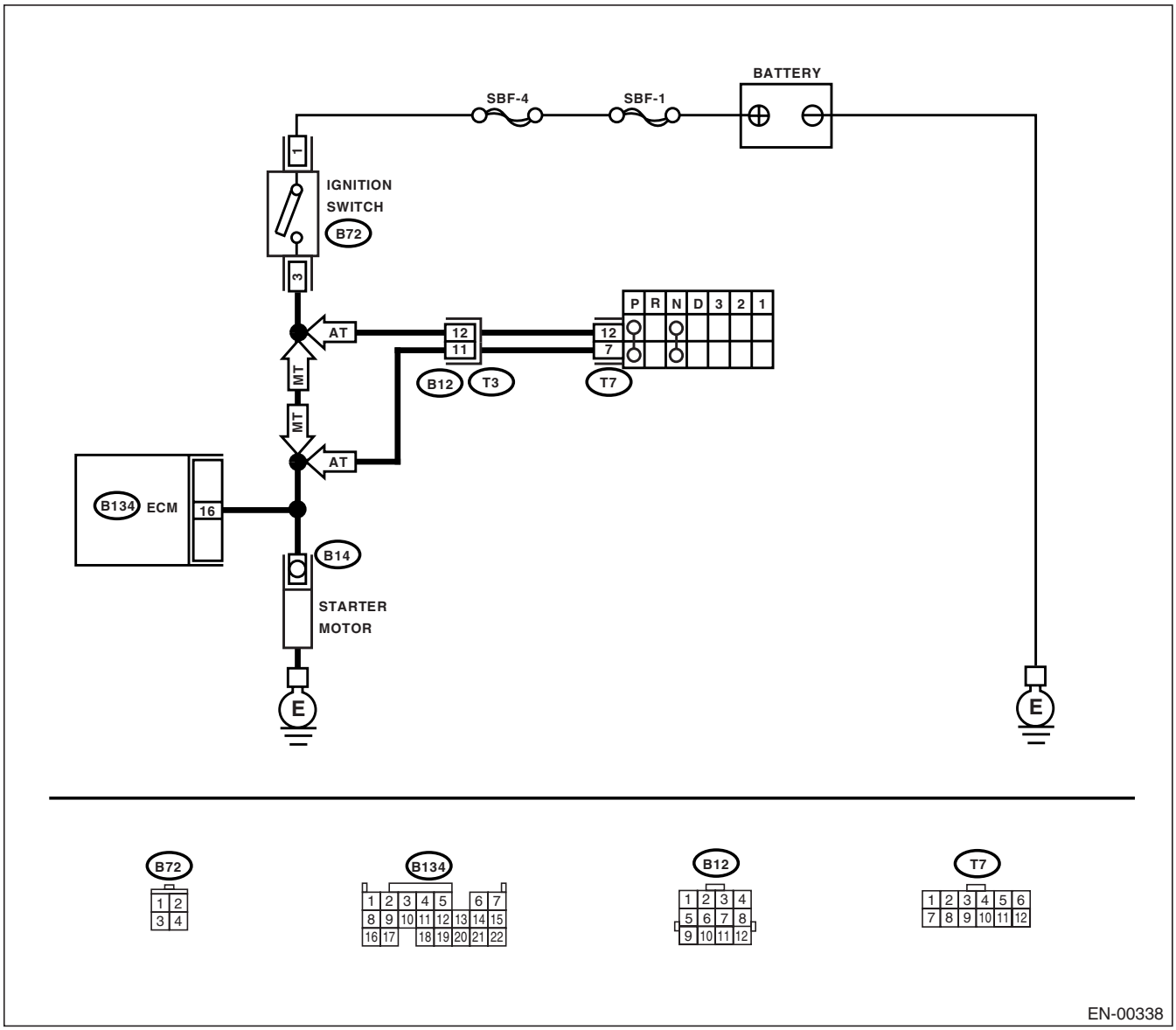
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DD:DTC P1518 — STARTER SWITCH CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Failure of engine to start

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**



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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)-61, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

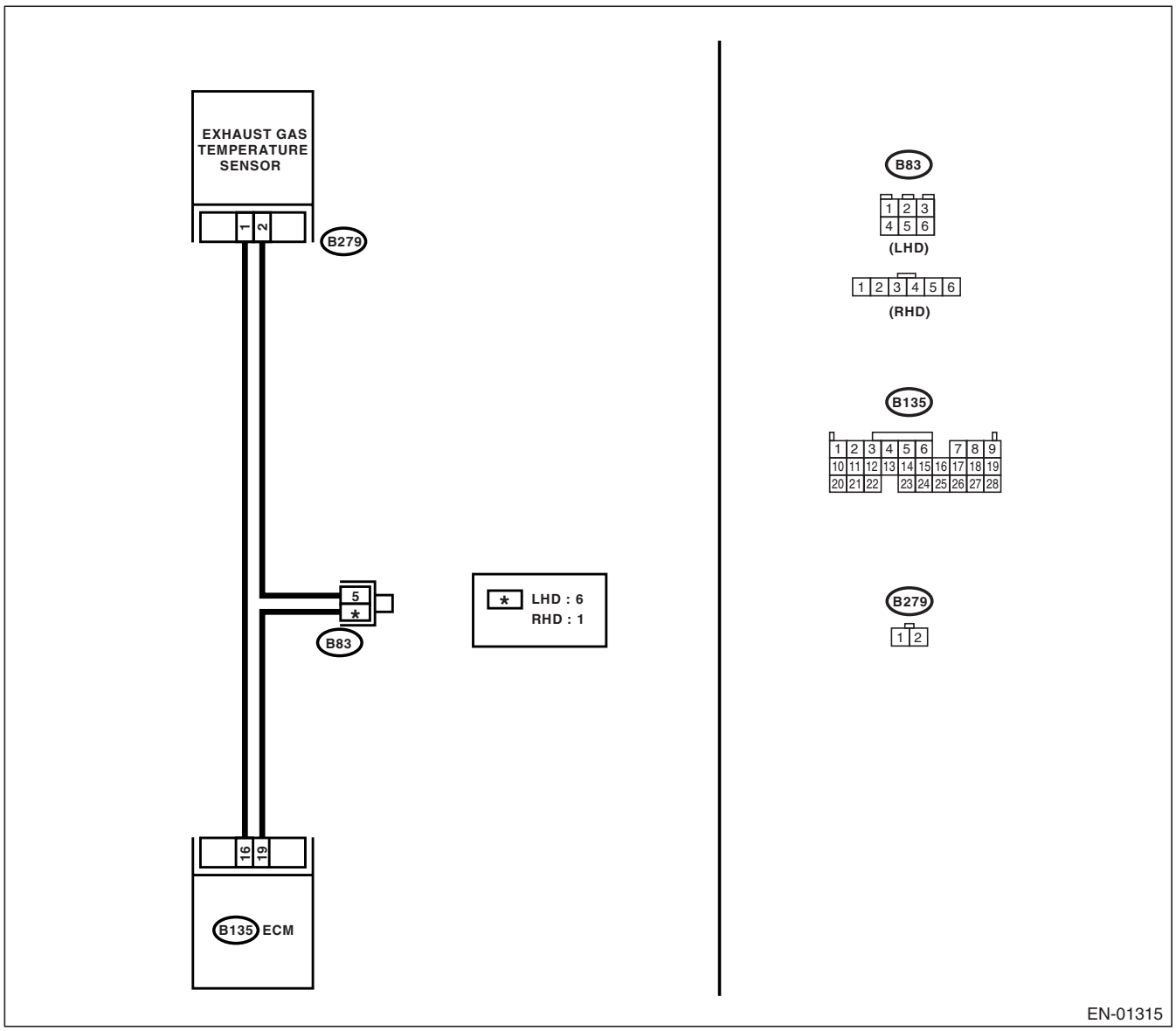
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DE:DTC P1544 — EXHAUST GAS TEMPERATURE TOO HIGH —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition
- **TROUBLE SYMPTOM:**
  - Erroneous idling
  - Poor driving performance

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**



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	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)-75, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P1544.	Go to step **2.**
2	**CHECK EXHAUST SYSTEM.** Check the exhaust system parts. NOTE: Check the following items. •Loose installation of exhaust manifold •Cracks or hole of exhaust manifold •Loose installation of front oxygen (A/F) sensor	Is there a fault in exhaust system?	Repair or replace the failure, then replace precatalytic converter.	Contact your Subaru distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

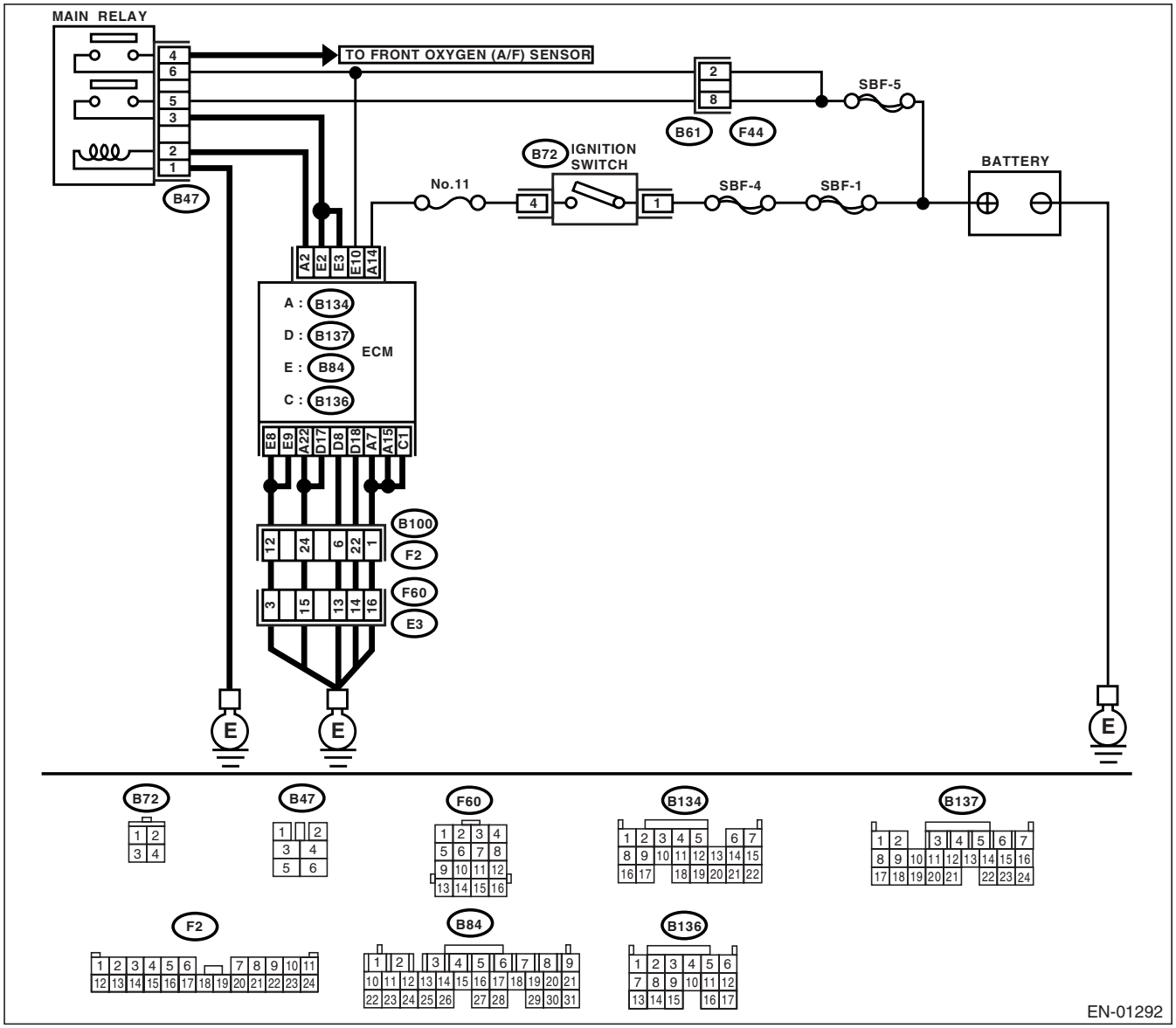
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DF:DTC P1560 — BACK-UP VOLTAGE CIRCUIT MALFUNCTION —

- **DTC DETECTING CONDITION:**
  - Immediately at fault recognition

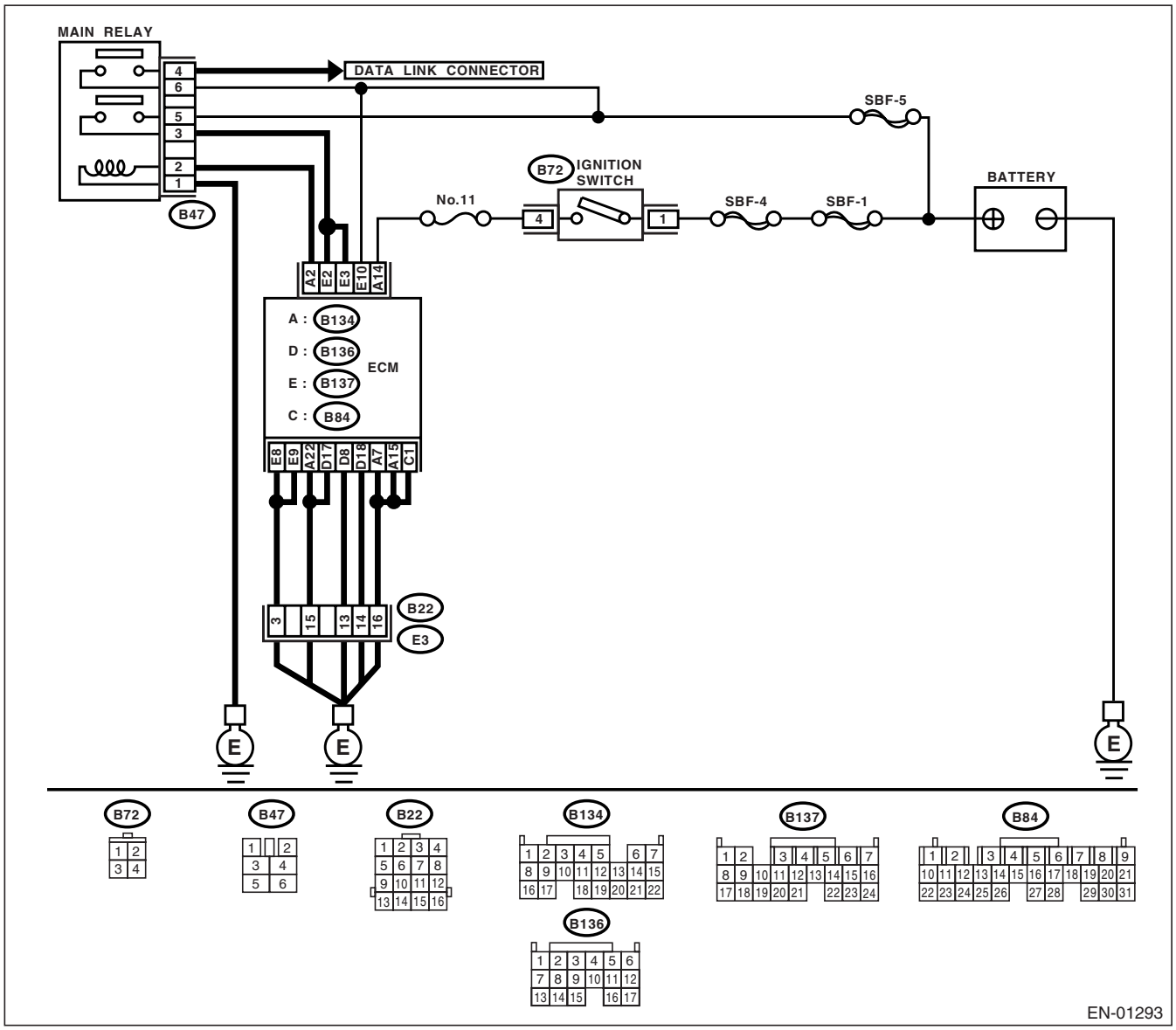
CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**
- **LHD model**



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- **RHD model**



	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*** ***(B137) No. 10 (+) — 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*** ***(B137) No. 10 — 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.**

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Step	Check	Yes	No
3 CHECK FUSE SBF-5.	Is the fuse blown?	Replace the fuse.	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit in harness between ECM and battery • Poor contact in ECM connector • Poor contact in battery terminal

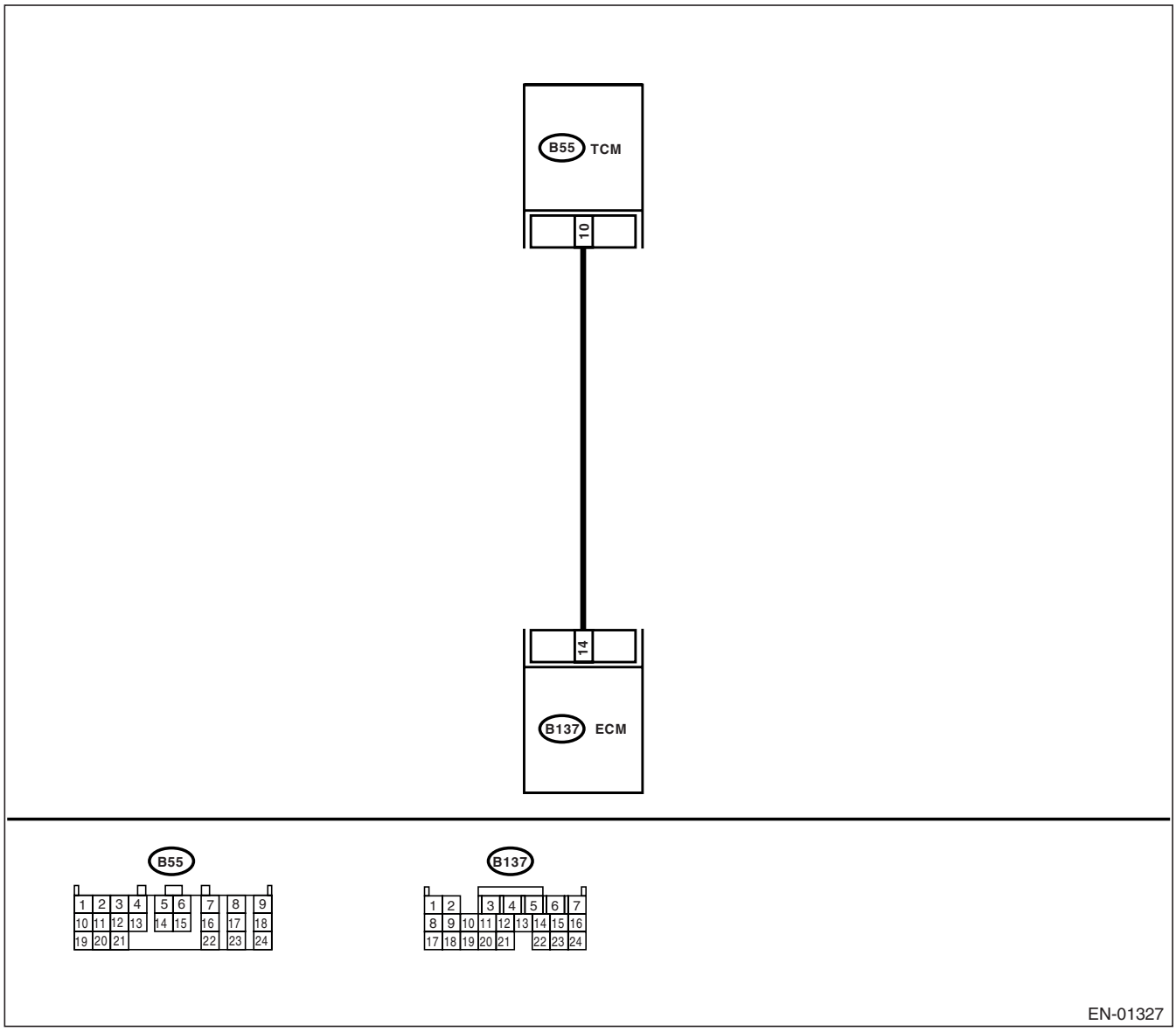
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DG:DTC P1698 — ENGINE TORQUE CONTROL CUT SIGNAL CIRCUIT LOW INPUT —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**



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	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1)Start the engine and warm-up engine. 2)Turn the ignition switch to OFF. 3)Turn the ignition switch to ON. 4)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 14 (+) — Chassis ground (−):***	Is the voltage more than 3 V?	Repair the poor contact in ECM connector.	Go to step **2.**
2	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from ECM and TCM. 3)Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 14 — 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 HARNESS BETWEEN ECM AND TCM CONNECTOR.** Measure the resistance of harness between ECM and TCM connector. ***Connector & terminal*** ***(B137) No. 14 — (B55) No. 20:***	Is the resistance less than 1 Ω?	Repair the poor contact in ECM or TCM connector.	Repair the open circuit in harness between ECM and TCM connector.

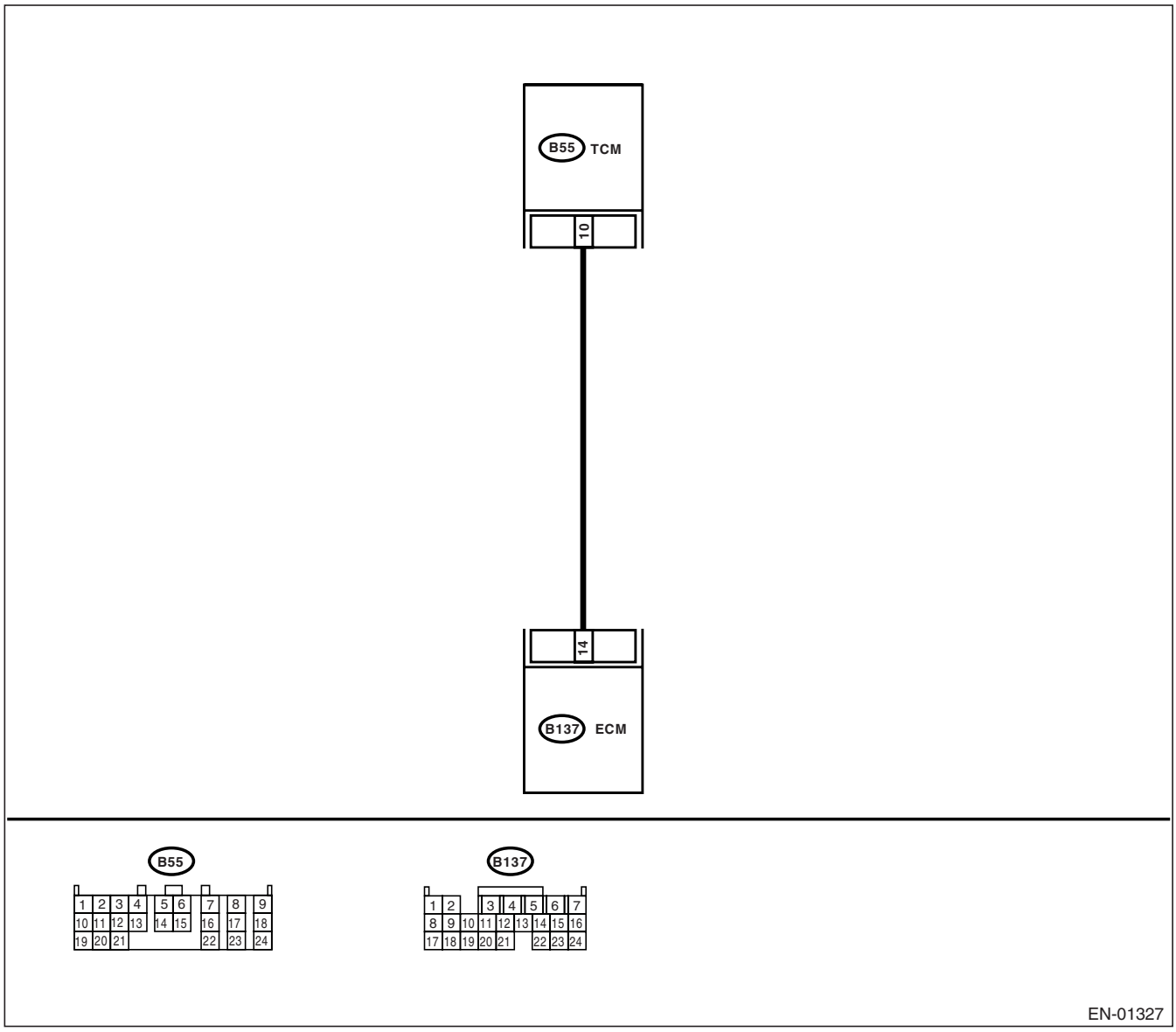
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DH:DTC P1699 — ENGINE TORQUE CONTROL CUT SIGNAL CIRCUIT HIGH INPUT —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**



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	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1)Start the engine and warm-up engine. 2)Turn the ignition switch to OFF. 3)Disconnect the connector from TCM. 4)Turn the ignition switch to ON. 5)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 14 (+) — Chassis ground (−):***	Is the voltage less than 3 V?	Go to step **2.**	Repair the battery short circuit in harness between ECM and TCM connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-49, Engine Control Module (ECM).>
2	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 14 (+) — Chassis ground (−):***	Shake the ECM harness and connector, while monitoring value of voltage meter. Is the voltage more than 10 V?	Repair the battery short circuit in harness between ECM and TCM connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-49, Engine Control Module (ECM).>	Contact your Subaru distributor service. NOTE: Inspection by DTM is required, because probable cause is deterioration of multiple parts.

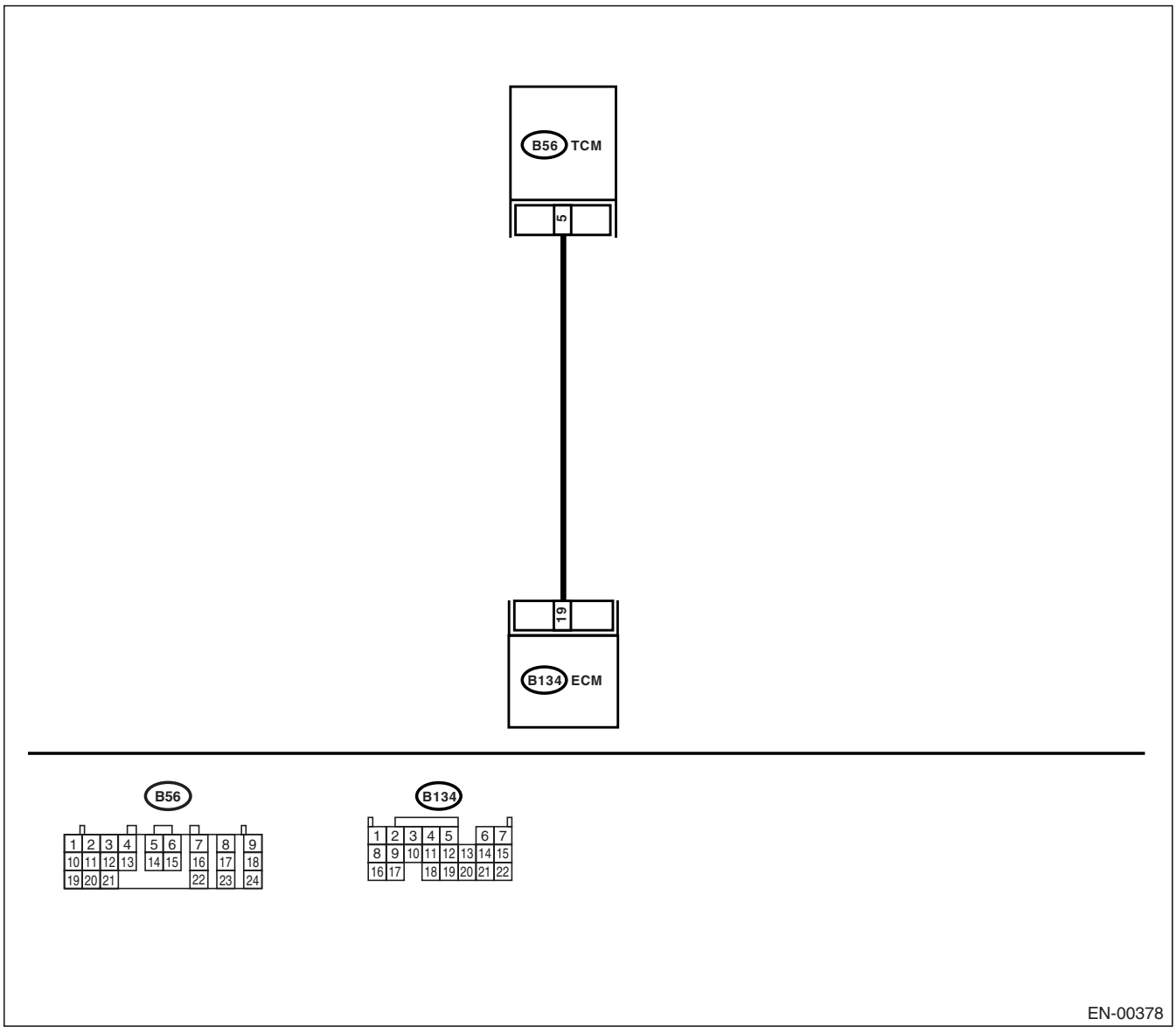
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DI: DTC P1711 — ENGINE TORQUE CONTROL SIGNAL 1 CIRCUIT MALFUNCTION —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Excessive shift shock

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**



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	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** 1)Turn the ignition switch to ON. 2)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 19 (+) — Chassis ground (−):***	Is the voltage more than 4.5 V?	Go to step **2.**	Go to step **4.**
2	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 19 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair the battery short circuit in harness between ECM and TCM connector.	Go to step **3.**
3	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-49, Engine Control Module (ECM).>
4	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from ECM and TCM. 3)Measure the resistance of harness between ECM and TCM connector. ***Connector & terminal*** ***(B134) No. 19 — (B56) No. 5:***	Is the resistance less than 1 Ω?	Go to step **5.**	Repair the open circuit in harness between ECM and TCM connector.
5	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 19 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **6.**	Repair the ground short circuit in harness between ECM and TCM connector.
6	**CHECK POOR CONTACT.** Check poor contact in TCM connector.	Is there poor contact in TCM connector?	Repair the poor contact in TCM connector.	Replace the TCM. <Ref. to 4AT-70, Transmission Control Module (TCM).>

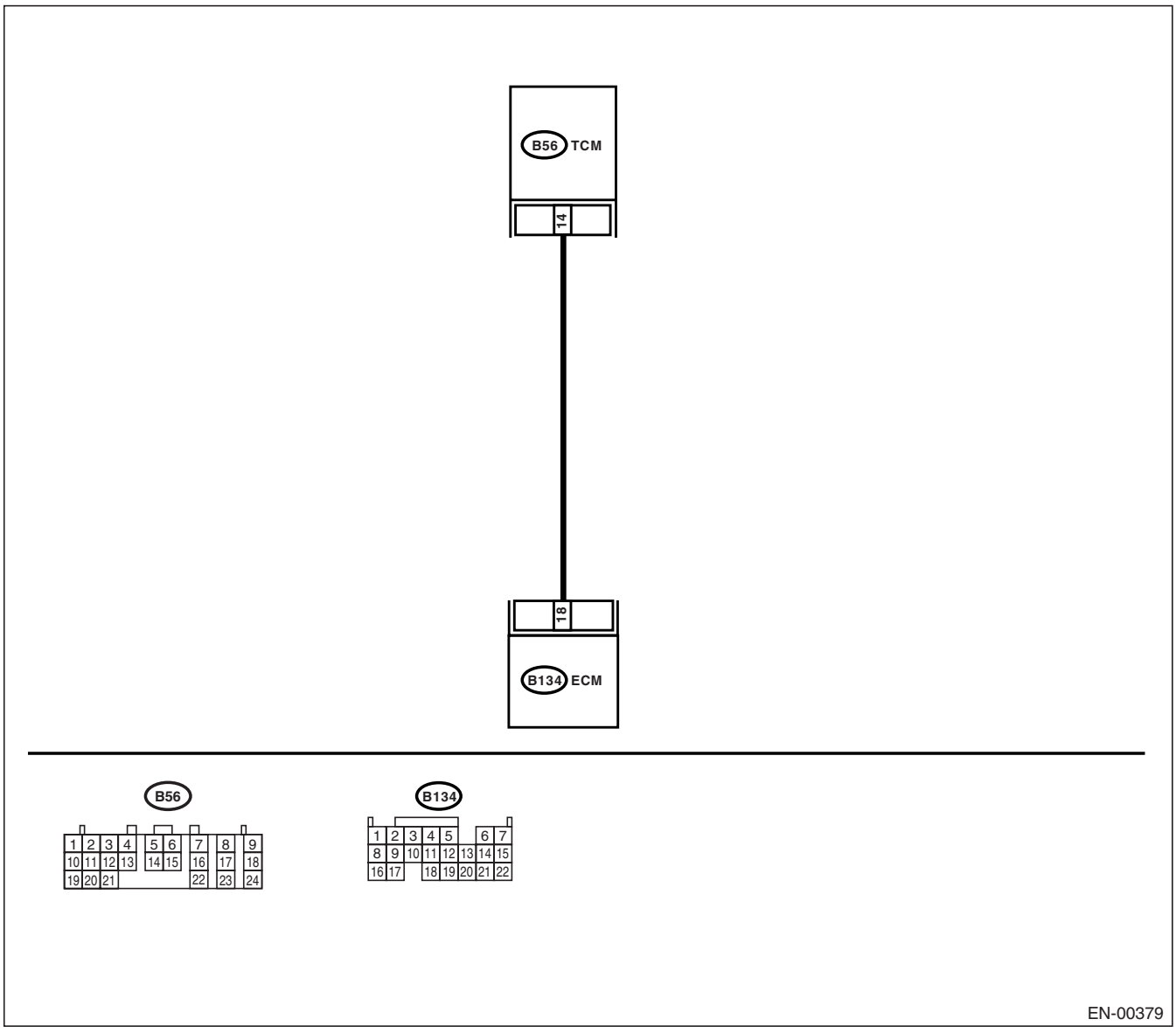
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DJ:DTC P1712 — ENGINE TORQUE CONTROL SIGNAL 2 CIRCUIT MALFUNCTION —

- **DTC DETECTING CONDITION:**
  - Two consecutive driving cycles with fault
- **TROUBLE SYMPTOM:**
  - Excessive shift shock

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H4DOTC)-48, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)-40, Inspection Mode.>.

- **WIRING DIAGRAM:**



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	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FOR ECM.** 1)Turn the ignition switch to ON. 2)Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 18 (+) — Chassis ground (−):***	Is the voltage more than 4.5 V?	Go to step **2.**	Go to step **4.**
2	**CHECK INPUT SIGNAL FOR ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 18 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair the battery short circuit in harness between ECM and TCM connector.	Go to step **3.**
3	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-49, Engine Control Module (ECM).>
4	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** 1)Turn the ignition switch to OFF. 2)Disconnect the connectors from ECM and TCM. 3)Measure the resistance of harness between ECM and TCM connector. ***Connector & terminal*** ***(B134) No. 18 — (B56) No. 4:***	Is the resistance less than 1 Ω?	Go to step **5.**	Repair the open circuit in harness between ECM and TCM connector.
5	**CHECK HARNESS BETWEEN ECM AND TCM CONNECTOR.** Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 18 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **6.**	Repair the ground short circuit in harness between ECM and TCM connector.
6	**CHECK POOR CONTACT.** Check poor contact in TCM connector.	Is there poor contact in TCM connector?	Repair the poor contact in TCM connector.	Replace the TCM. <Ref. to 4AT-70, Transmission Control Module (TCM).>

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20.General Diagnostic Table

A: INSPECTION

1. ENGINE

NOTE:
Malfunction of parts other than those listed is also possible. <Ref. to ME(H4DOTC)-113, Engine Trouble in General.>

Symptom	Problem parts
1. Engine stalls during idling.	1) Idle air control solenoid valve 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) Idle air control solenoid valve 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) Throttle position sensor 9) Crankshaft position sensor (*3) 10) Camshaft position sensor (*3) 11) Oxygen sensor 12) Fuel pump and fuel pump relay
3. Engine does not return to idle.	1) Idle air control solenoid valve 2) Engine coolant temperature sensor 3) Accelerator cable (*6) 4) Throttle position sensor 5) Manifold absolute pressure sensor 6) Mass air flow sensor
4. Poor acceleration	1) Manifold absolute pressure sensor 2) Mass air flow and intake temperature sensor 3) Throttle position sensor 4) Fuel injection parts (*4) 5) Fuel pump and fuel pump relay 6) Engine coolant temperature sensor (*2) 7) Crankshaft position sensor (*3) 8) Camshaft position sensor (*3) 9) A/C switch and A/C cut relay 10) Engine torque control signal circuit 11) Ignition parts (*1)
5. Engine stalls or engine sags or hesitates at acceleration.	1) 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) Throttle position sensor 9) Fuel pump and fuel pump relay

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Symptom	Problem parts
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
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 & ignitor assembly and spark plug.
*2: Indicate the symptom occurring only in cold temperatures.
*3: Ensure the secure installation.
*4: Check fuel injector, fuel pressure regulator and fuel filter.
*5: Inspect air leak in air intake system.
*6: Adjust accelerator cable.

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