ENGINE SECTION 3

FUEL INJECTION (FUEL SYSTEMS)	FU(H6DO)
EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)	EC(H6DO)
IINTAKE (INDUCTION)	IN(H6DO)
MECHANICAL	ME(H6DO)
EXHAUST	EX(H6DO)
COOLING	CO(H6DO)
LUBRICATION	LU(H6DO)
SPEED CONTROL SYSTEMS	SP(H6DO)
IGNITION	IG(H6DO)
STARTING/CHARGING SYSTEMS	SC(H6DO)
ENGINE (DIAGNOSTICS)	EN(H6DO)(diag)

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.

G2360GE4

FUEL INJECTION (FUEL SYSTEMS)

FU(H6DO)

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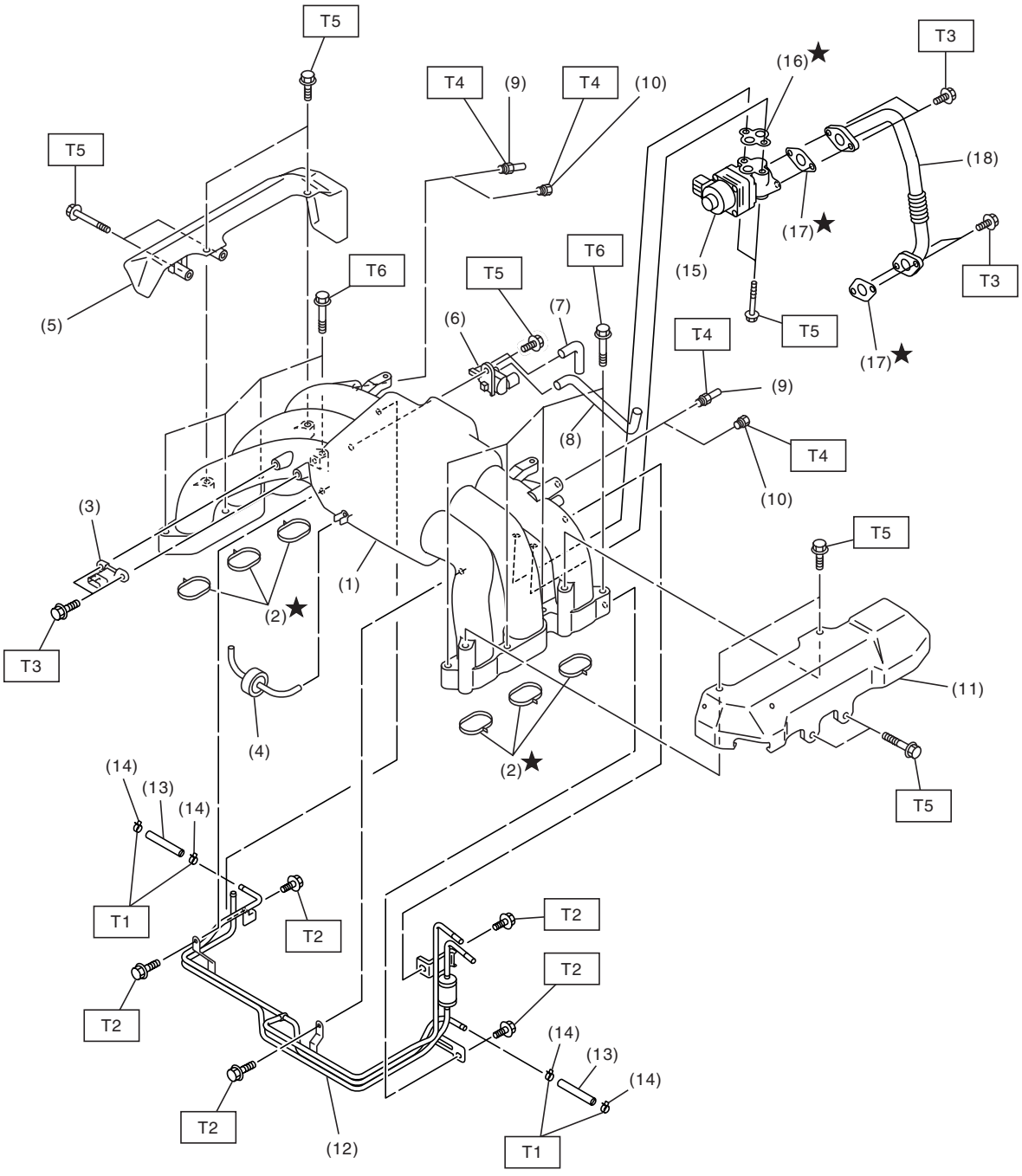
1. General Description

A: SPECIFICATION

Fuel tank	Capacity	64 ℓ (16.9 US gal, 14.1 Imp gal)
	Location	Under rear seat
Fuel pump	Type	Impeller
	Shutoff discharge pressure	550 — 850 kPa (5.61 — 8.67 kgf/cm^2, 79.8 — 123.3 psi)
	Discharge rate	More than 125 ℓ (33 US gal, 27.5 Imp gal)/h [12 V at 300 kPa (3.06 kgf/cm^2, 43.5 psi)]
Fuel filter		In-tank type

B: COMPONENT

1. INTAKE MANIFOLD

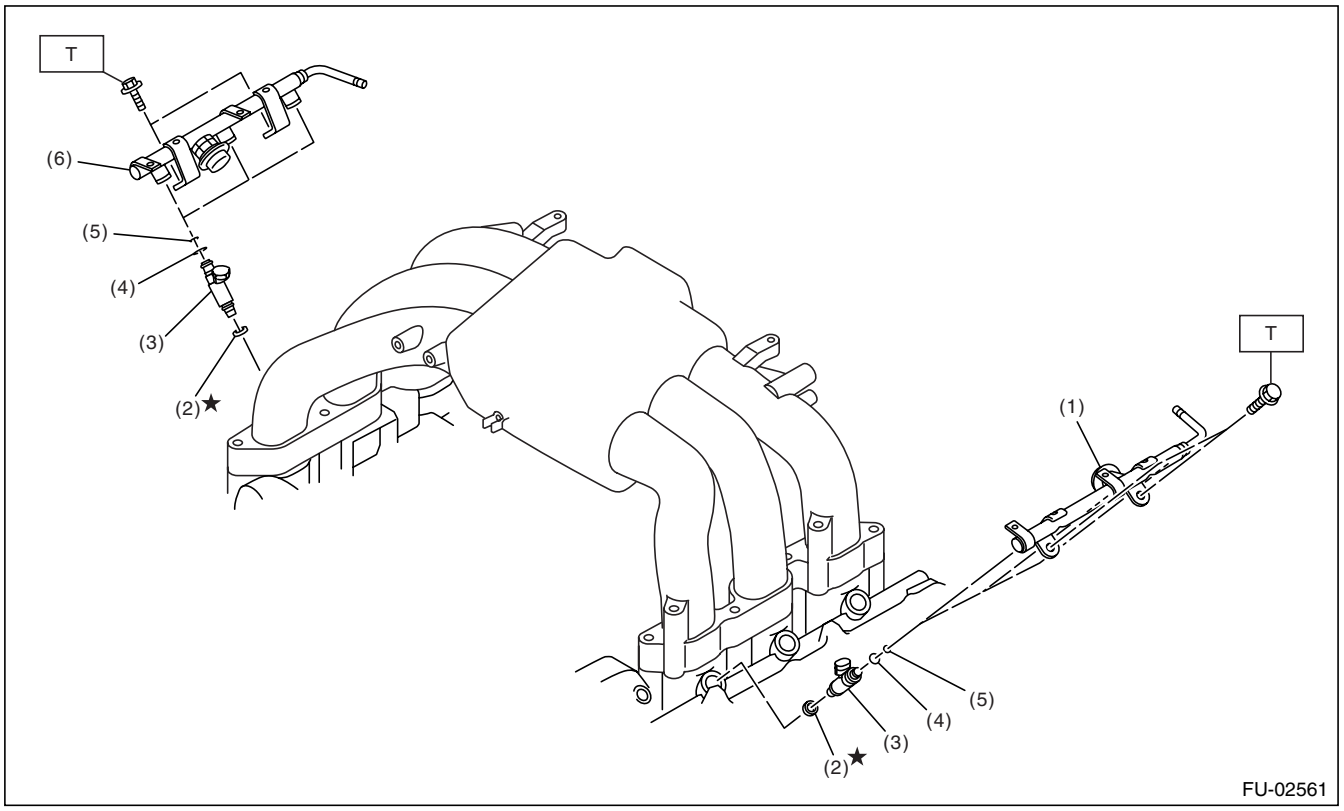


FU-02107

(1)	Intake manifold	(10)	Plug
(2)	O-ring	(11)	Fuel pipe protector LH
(3)	Manifold absolute pressure sensor	(12)	Fuel pipe ASSY
(4)	Filter	(13)	Hose
(5)	Fuel pipe protector RH	(14)	Clamp
(6)	Purge control solenoid valve	(15)	EGR valve (Except for KA model)
(7)	Hose	(16)	Gasket (Except for KA model)
(8)	Hose	(17)	Gasket (Except for KA model)
(9)	Nipple	(18)	EGR pipe (Except for KA model)

Tightening torque: N·m (kgf-m, ft-lb)
T1: 1.25 (0.13, 0.94)
T2: 5 (0.5, 3.7)
T3: 6.4 (0.65, 4.7)
T4: 17 (1.7, 12.5)
T5: 19 (1.9, 14)
T6: 25 (2.5, 18)

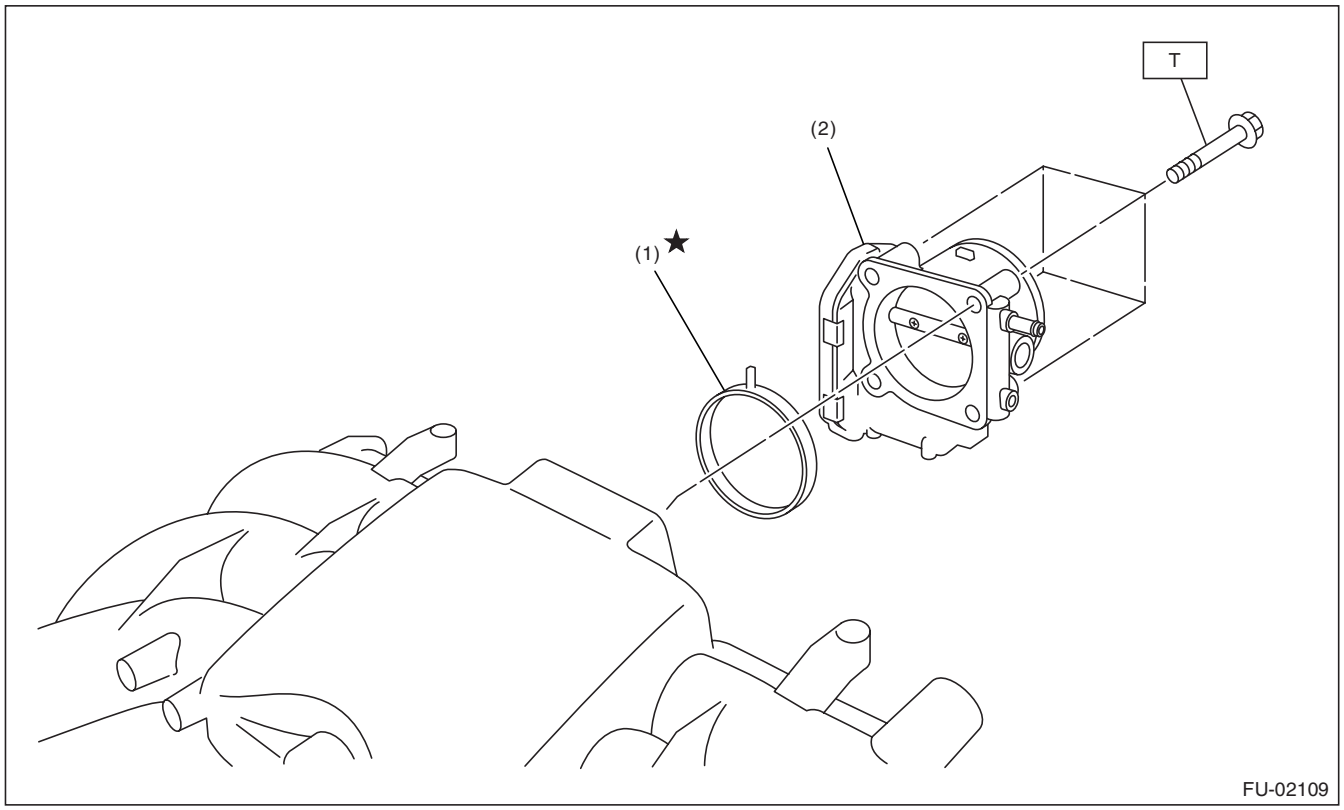
2. FUEL INJECTOR



(1)	Fuel injector pipe LH	(4)	Injection rubber
(2)	Insulator	(5)	O-ring
(3)	Fuel injector	(6)	Fuel injector pipe RH

Tightening torque: N·m (kgf-m, ft-lb)
T: 19 (1.9, 14)

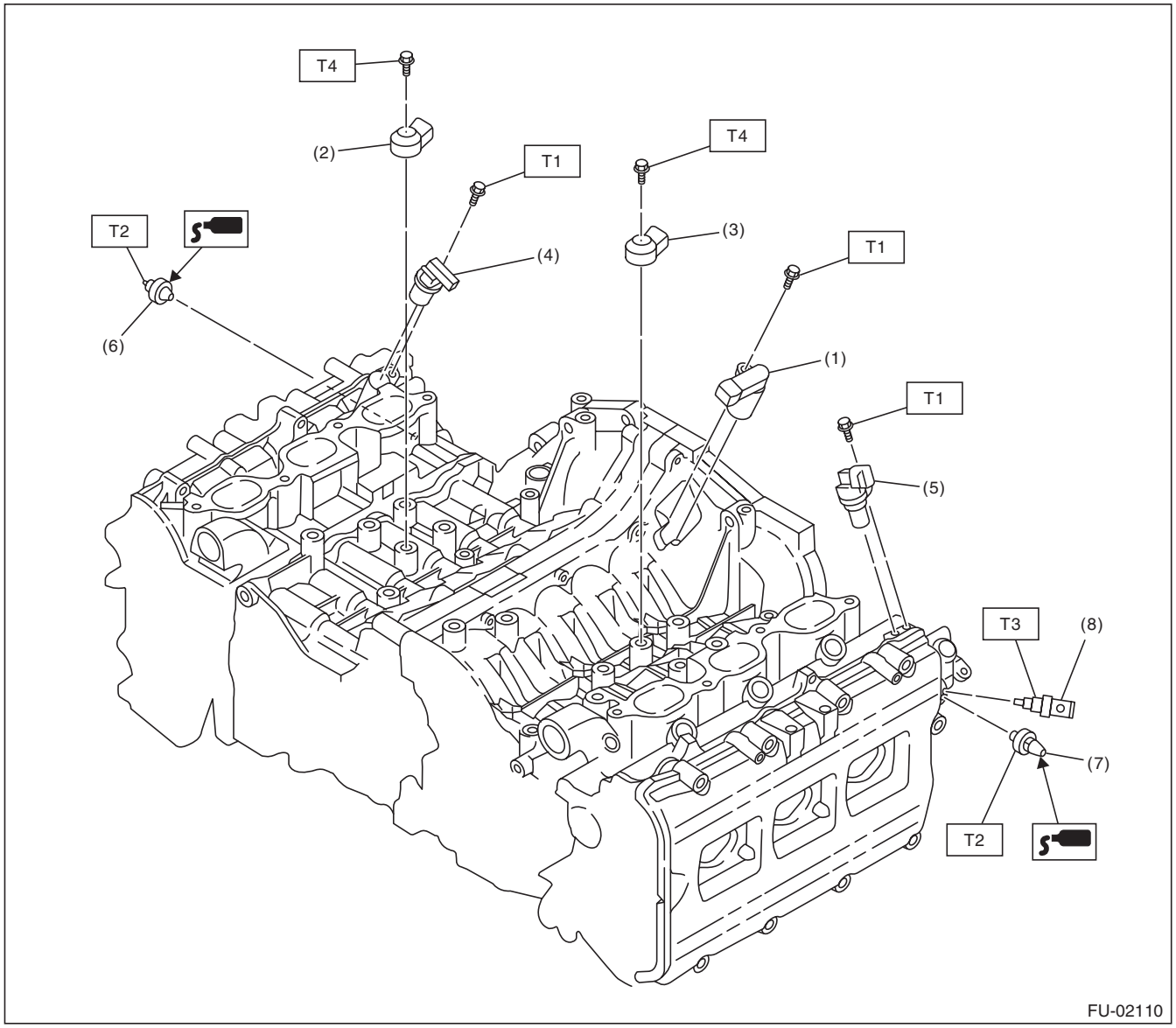
3. AIR INTAKE SYSTEM



(1) O-ring
(2) Throttle body

Tightening torque: N·m (kgf-m, ft-lb)
T: 8 (0.8, 5.9)

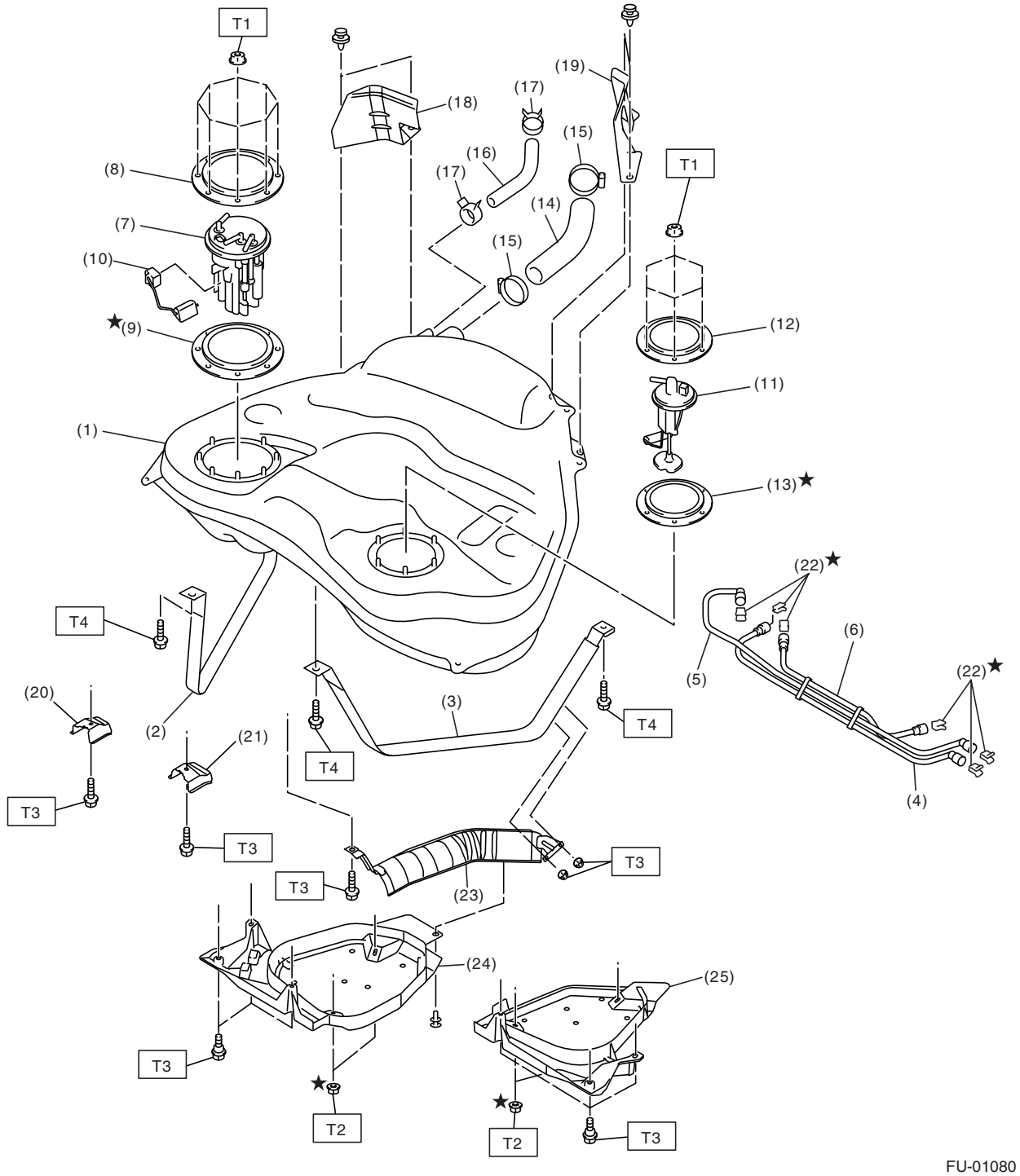
4. CRANKSHAFT POSITION, CAMSHAFT POSITION AND KNOCK SENSORS



(1)	Crankshaft position sensor	(6)	Variable valve lift diagnosis oil pressure switch RH
(2)	Knock sensor RH	(7)	Variable valve lift diagnosis oil pressure switch LH
(3)	Knock sensor LH	(8)	Oil temperature sensor
(4)	Camshaft position sensor RH		
(5)	Camshaft position sensor LH		

Tightening torque: N·m (kgf-m, ft-lb)
T1: 6.4 (0.65, 4.7)
T2: 17 (1.7, 12.5)
T3: 18 (1.8, 13)
T4: 25 (2.5, 18)

5. FUEL TANK

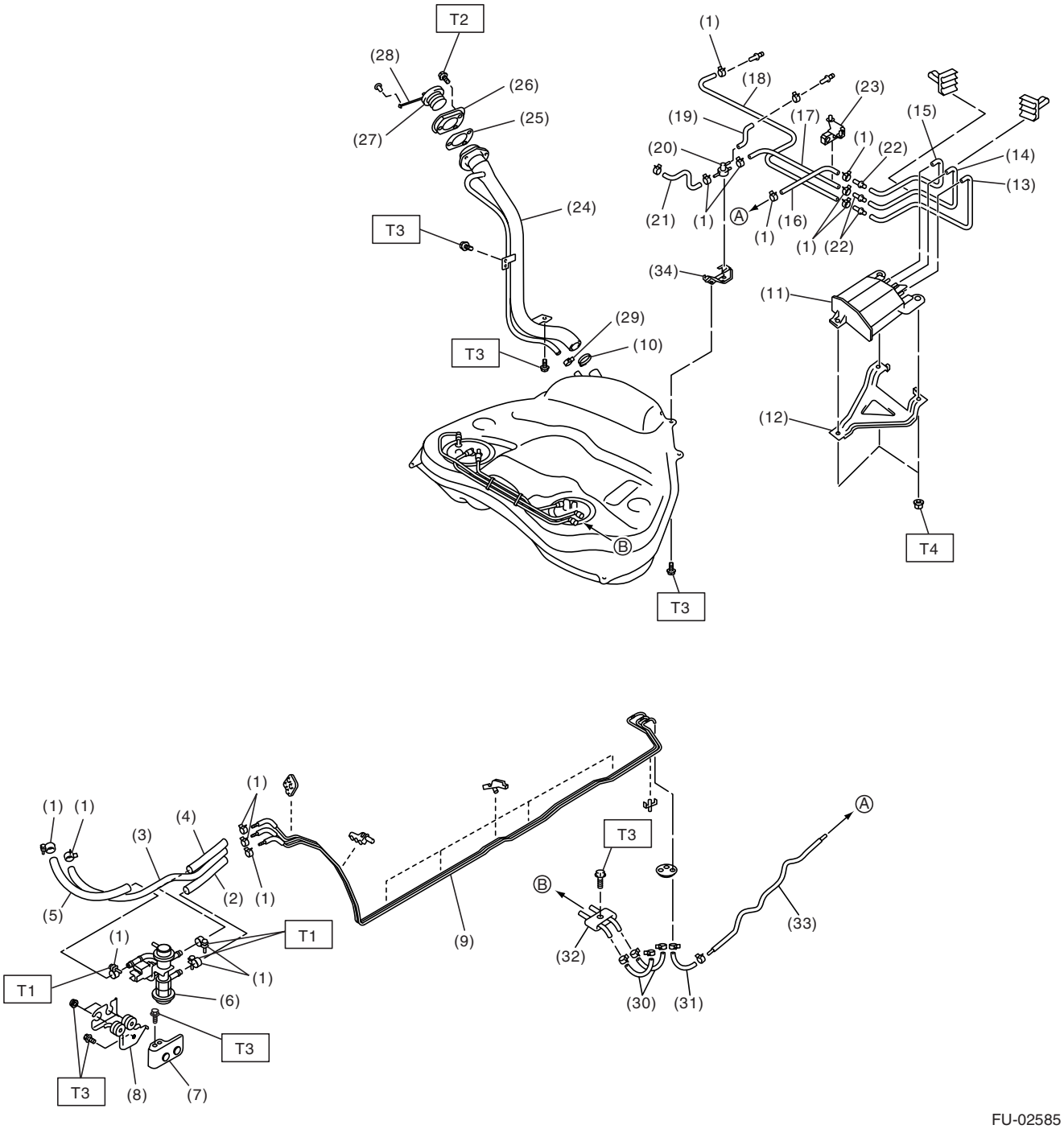


FU-01080

(1) Fuel tank
(2) Fuel tank band RH
(3) Fuel tank band LH
(4) Delivery tube
(5) Return tube
(6) Jet pump tube
(7) Fuel pump ASSY
(8) Fuel pump upper plate
(9) Fuel pump gasket
(10) Fuel level sensor
(11) Fuel sub level sensor
(12) Fuel sub level sensor upper plate
(13) Fuel sub level sensor gasket
(14) Fuel filler hose
(15) Clamp
(16) Vent hose
(17) Clip
(18) Fuel tank protector RH (Rear)
(19) Fuel tank protector LH (Rear)
(20) Stopper RH
(21) Stopper LH
(22) Retainer
(23) Heat shield cover
(24) Fuel tank protector RH (Front)
(25) Fuel tank protector LH (Front)

Tightening torque: N·m (kgf-m, ft-lb)
T1: 4.4 (0.45, 3.2)
T2: 9 (0.9, 6.6)
T3: 17.5 (1.78, 12.9)
T4: 33 (3.4, 24.3)

6. FUEL LINE



FU-02585

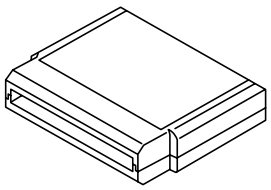
(1) Clip
(2) Fuel return hose
(3) Evaporation hose
(4) Fuel delivery hose A
(5) Fuel delivery hose B
(6) Fuel bypass valve
(7) Bracket
(8) Bracket
(9) Fuel pipe ASSY
(10) Clamp
(11) Canister
(12) Canister protector (Sedan model)
(13) Canister drain hose A
(14) Two-way valve hose A
(15) Purge hose A
(16) Purge hose B
(17) Two-way valve hose B
(18) Canister drain hose B
(19) Two-way valve drain hose
(20) Two-way valve
(21) Two-way valve hose C
(22) Connector
(23) Evaporation hose holder
(24) Fuel filler pipe ASSY
(25) Filler pipe packing
(26) Filler ring
(27) Filler cap
(28) Tether
(29) Clip
(30) Fuel hose
(31) Purge hose C
(32) Connector
(33) Purge pipe
(34) Two-way valve bracket

Tightening torque: N·m (kgf-m, ft-lb)
T1: 1.25 (0.13, 0.94)
T2: 4.4 (0.45, 3.2)
T3: 7.5 (0.76, 5.5)
T4: 8.3 (0.85, 6.1)

C: CAUTION

• Wear work clothing, including a cap, protective goggles, and protective shoes during operation.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust and dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
• Be careful not to burn yourself, because each part on the vehicle is hot after running.
• Be sure to tighten fasteners including bolts and nuts to specified torque.
• Place shop jacks or rigid racks at the specified points.
• Before disconnecting 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.

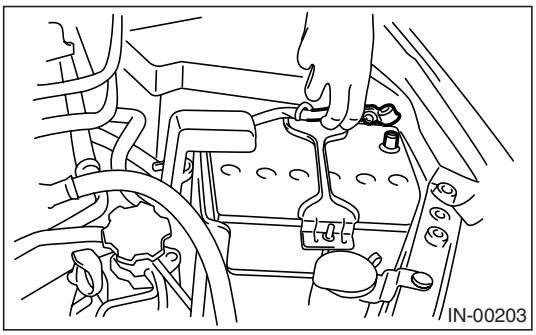
D: PREPARATION TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18482AA000	18482AA000 (Newly adopted tool)	CARTRIDGE	Troubleshooting for electrical system.
ST22771AA030	22771AA030	SUBARU SELECT MONITOR KIT	Troubleshooting for electrical system. • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

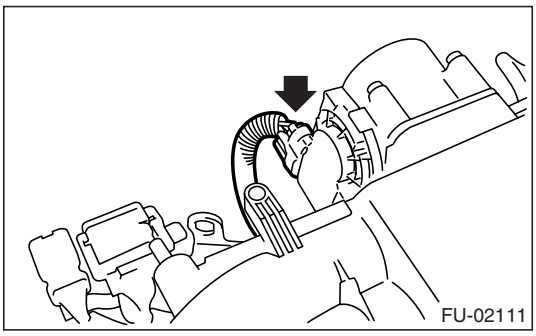
2. Throttle Body

A: REMOVAL

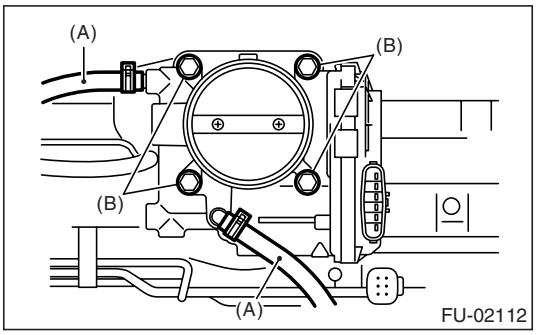
1) Remove the collector cover.
2) Disconnect the ground cable from battery.



3) Remove the air intake chamber. <Ref. to IN(H6DO)-7, REMOVAL, Air Intake Chamber.>
4) Disconnect the connector from the throttle position sensor.



5) Disconnect the engine coolant hoses (A) from throttle body.
6) Remove the bolts (B) which secure throttle body to intake manifold.



B: INSTALLATION

Install in the reverse order of removal.

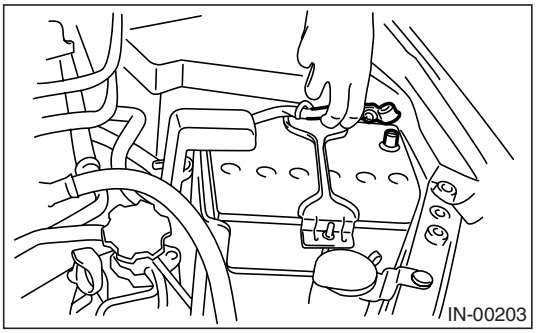
NOTE:
Use a new O-ring.

Tightening torque:
8 N·m (0.8 kgf-m, 5.9 ft-lb)

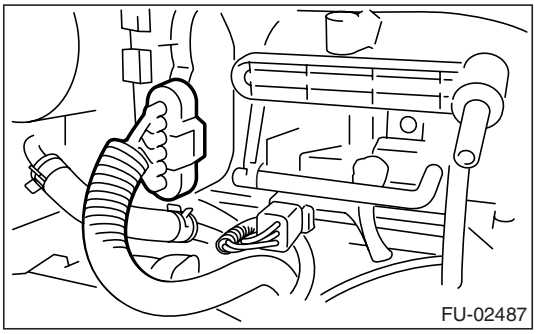
3. Intake Manifold

A: REMOVAL

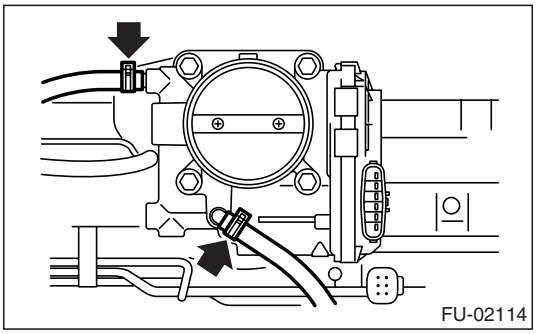
1) Remove the collector cover.
2) Release the fuel pressure. <Ref. to FU(H6DO)-39, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
3) Open fuel filler flap lid, and remove fuel filler cap.
4) Disconnect the ground cable from battery.



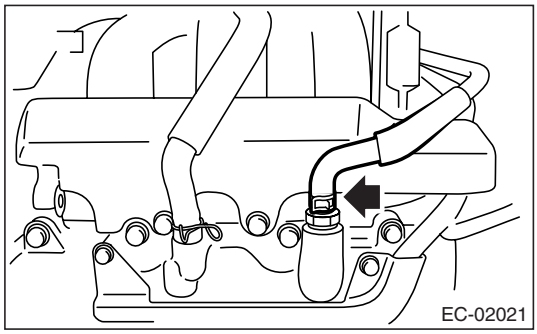
5) Remove the air cleaner case and air intake chamber. <Ref. to IN(H6DO)-5, REMOVAL, Air Cleaner Case.> <Ref. to IN(H6DO)-7, REMOVAL, Air Intake Chamber.>
6) Remove the generator. <Ref. to SC(H4SO 2.0)-14, REMOVAL, Generator.>
7) Disconnect the connector from throttle body.



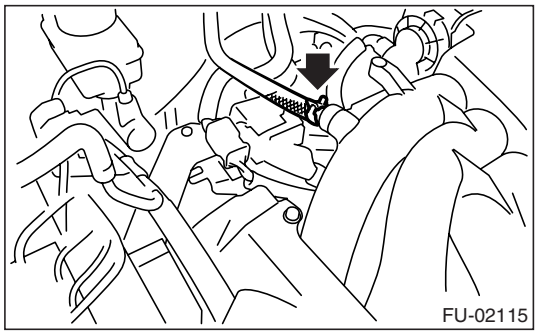
8) Disconnect the engine coolant hoses from throttle body.



9) Disconnect the PCV hose.

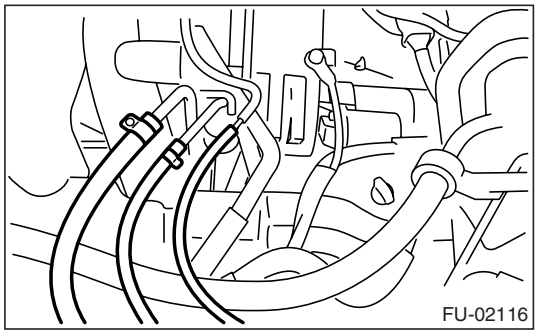


10) Disconnect the brake booster hose.



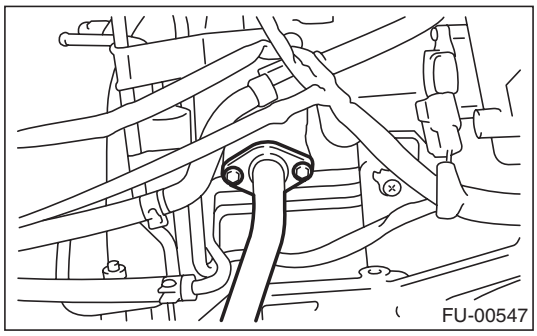
11) Disconnect the fuel hose from fuel pipe.

WARNING:
• Be careful not to spill fuel.
• Catch the fuel from hoses using a container or cloth.

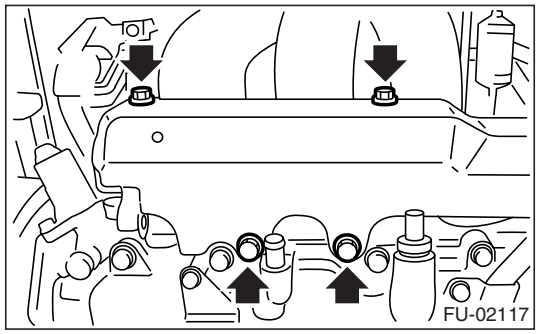


12) Remove the EGR pipe from EGR valve. (Except for KA model)

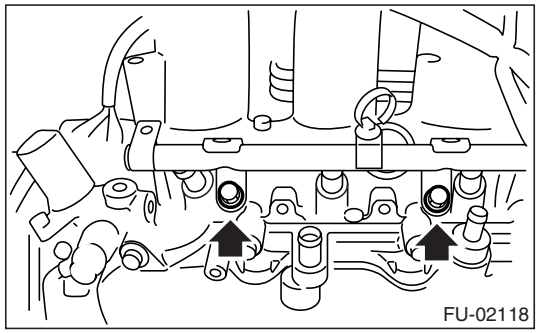
NOTE:
Be careful not to drop the gaskets.



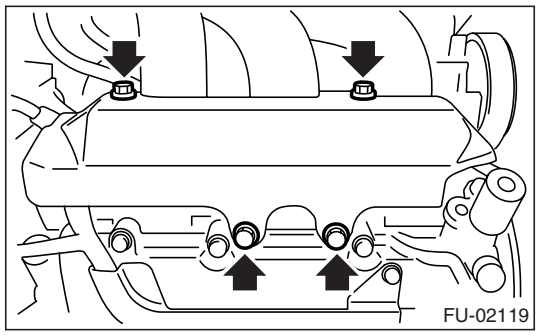
13) Remove the fuel pipe protector LH.



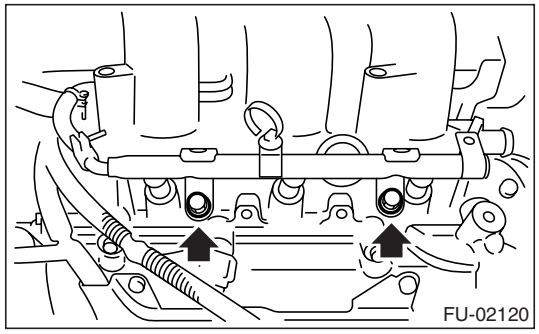
14) Remove the engine harness from fuel injector pipe LH.
15) Remove the bolts which hold fuel injector pipe LH to cylinder head.



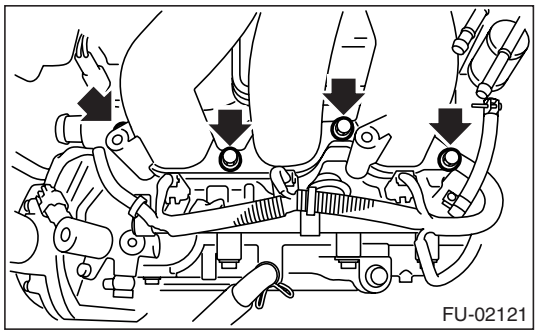
16) Remove the fuel pipe protector RH.



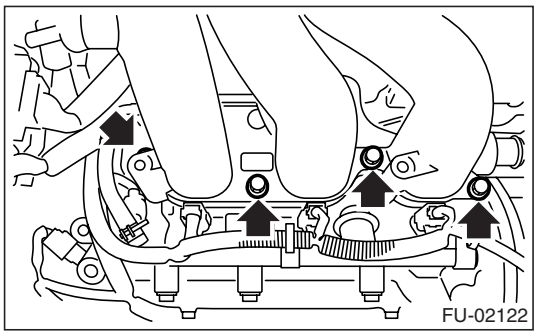
17) Remove the engine harness from fuel injector pipe RH.
18) Remove the bolts which hold fuel injector pipe RH to cylinder head.



19) Remove the bolts which hold intake manifold to cylinder head.
• LH side



• RH side



20) Remove the intake manifold.

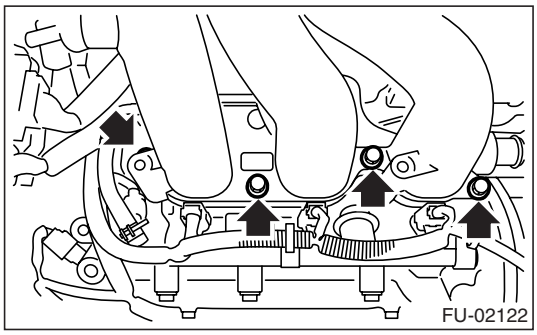
B: INSTALLATION

1) Install the intake manifold onto cylinder heads.

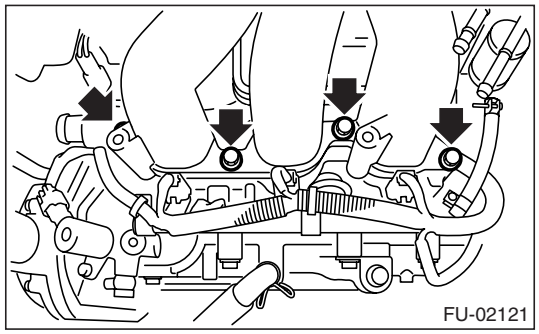
NOTE:
Use a new O-ring.

Tightening torque:
25 N·m (2.5 kgf-m, 18 ft-lb)

• RH side

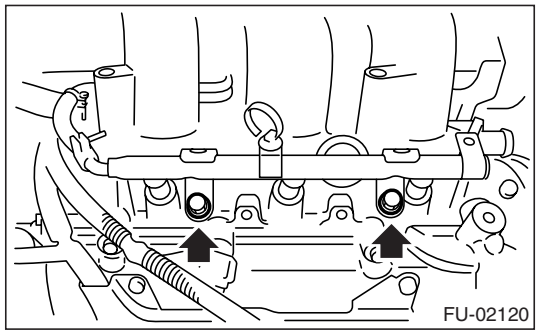


- LH side



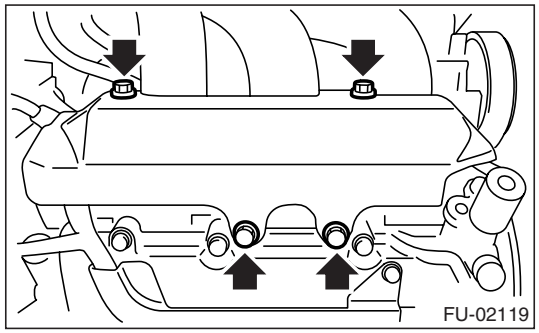
2) Install the bolts which hold fuel injector pipe RH to cylinder head.

Tightening torque:
19 N·m (1.9 kgf-m, 14 ft-lb)



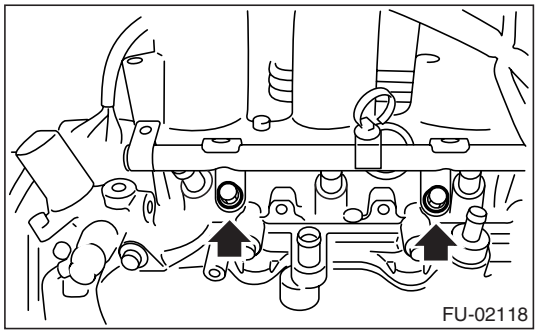
3) Install the engine harness to fuel injector pipe RH.
4) Install the fuel pipe protector RH.

Tightening torque:
19 N·m (1.9 kgf-m, 14 ft-lb)



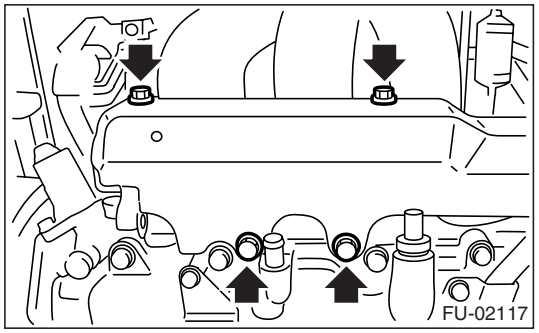
5) Install the bolts which hold fuel injector pipe LH to cylinder head.

Tightening torque:
19 N·m (1.9 kgf-m, 14 ft-lb)



6) Install the engine harness to fuel injector pipe LH.
7) Install the fuel pipe protector LH.

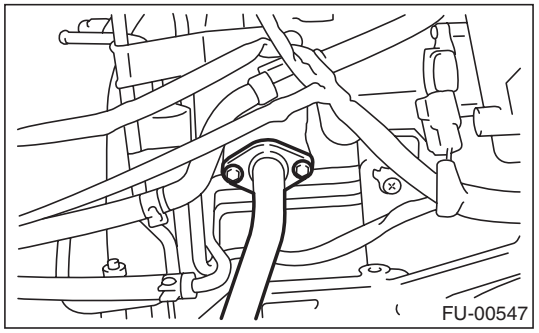
Tightening torque:
19 N·m (1.9 kgf-m, 14 ft-lb)



8) Install the EGR pipe to EGR valve. (Except for KA model)

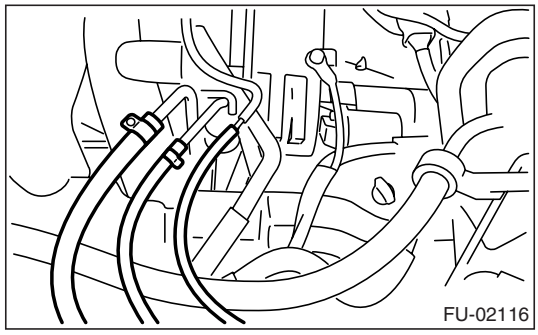
NOTE:
Use a new gasket.

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

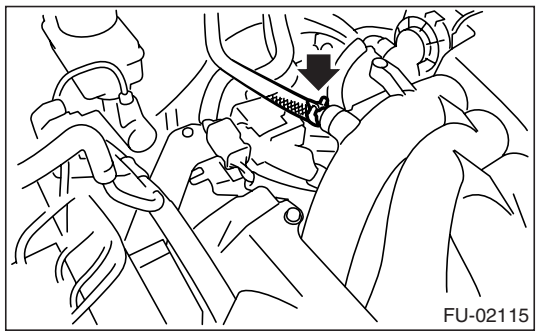


9) Connect the fuel hoses to fuel pipe.

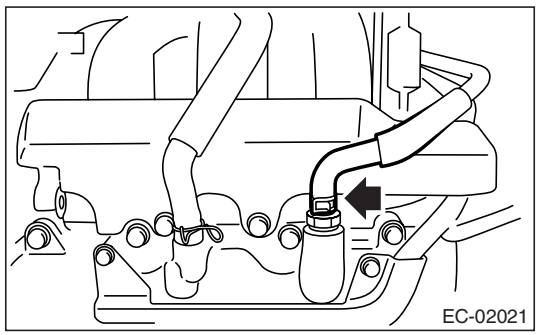
Tightening torque:
1.25 N·m (0.13 kgf-m, 0.94 ft-lb)


FU-02116

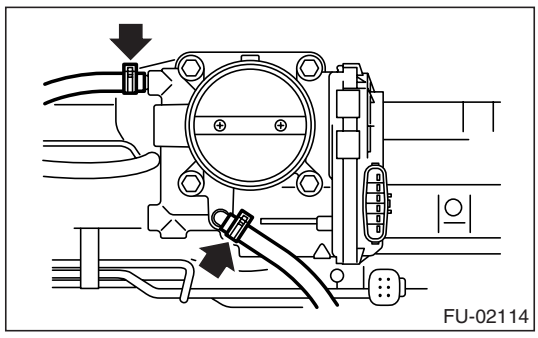
10) Connect the brake booster hose.


FU-02115

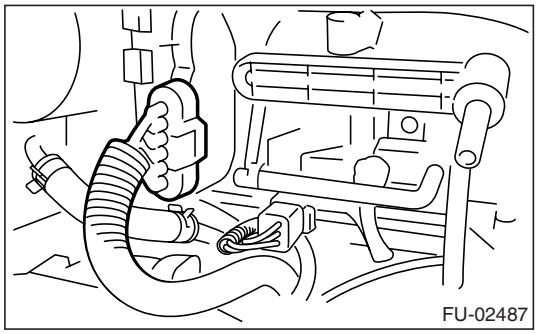
11) Connect the PCV hose.


EC-02021

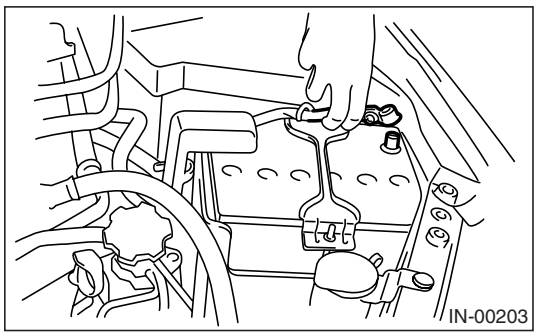
12) Connect the engine coolant hoses to throttle body.


FU-02114

13) Connect the connector to throttle body.


FU-02487

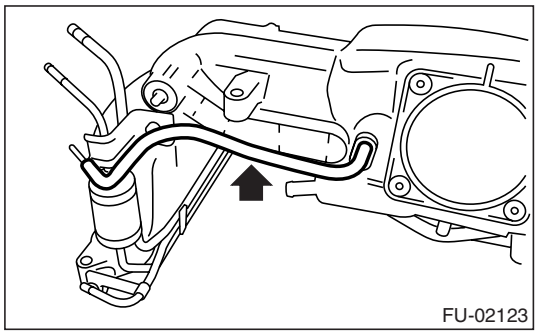
14) Install the generator. <Ref. to SC(H4SO 2.0)-14, INSTALLATION, Generator.>
15) Install the air cleaner case and air intake chamber. <Ref. to IN(H6DO)-6, INSTALLATION, Air Cleaner Case.> <Ref. to IN(H6DO)-7, INSTALLATION, Air Intake Chamber.>
16) Install the fuse of fuel pump to main fuse box.
17) Connect the ground cable to battery.


IN-00203

18) Install the collector cover.

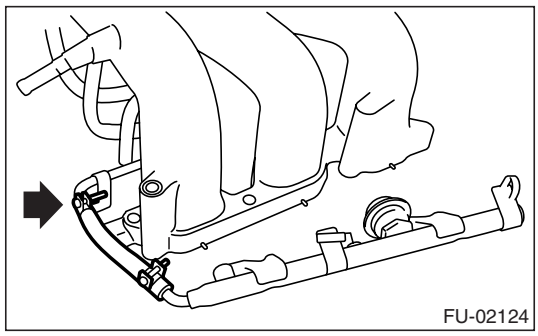
C: DISASSEMBLY

1) Remove the engine harness from intake manifold.
2) Remove the throttle body. <Ref. to FU(H6DO)-11, REMOVAL, Throttle Body.>
3) Remove the EGR valve. <Ref. to FU(H6DO)-25, REMOVAL, EGR Valve.>
4) Disconnect the pressure regulator vacuum hose from intake manifold.

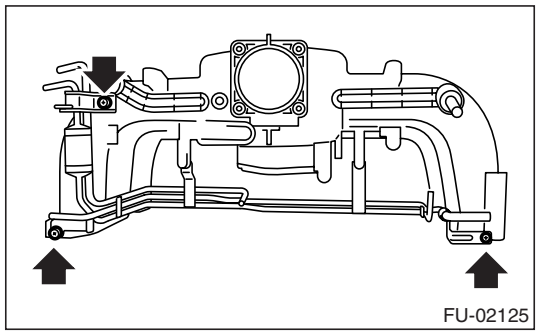

FU-02123

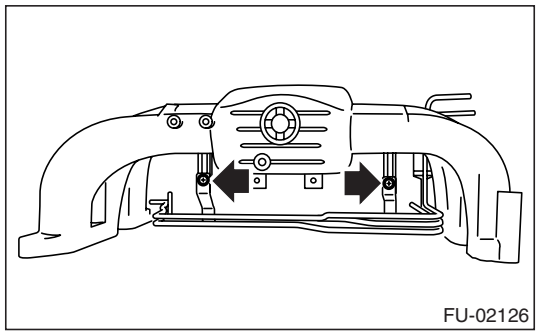
5) Remove the manifold absolute pressure sensor. <Ref. to FU(H6DO)-23, REMOVAL, Manifold Absolute Pressure Sensor.>

6) Remove the purge control solenoid valve. <Ref. to EC(H6DO)-7, REMOVAL, Purge Control Solenoid Valve.>
7) Loosen the clamp which holds fuel injector pipe to fuel hose, and then disconnect the pipe from fuel hose.


FU-02124

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


FU-02125


FU-02126

D: ASSEMBLY

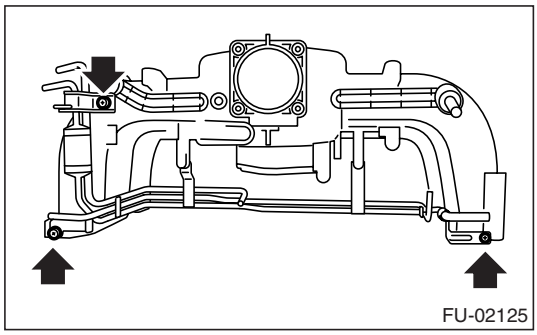
NOTE:
When assembling the nipple, apply liquid gasket.

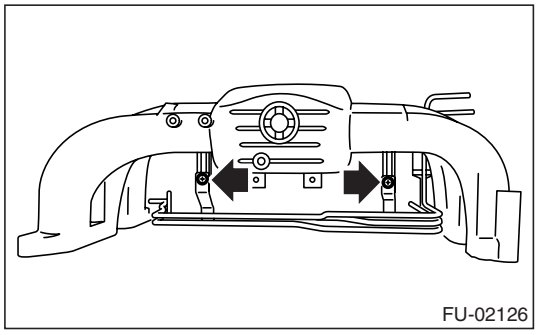
Liquid gasket:
THREE BOND 1105 (Part No. 004403010)

Tightening torque:
17 N·m (1.7 kgf-m, 12.5 ft-lb)

1) Tighten the bolt which installs fuel pipes on intake manifold.

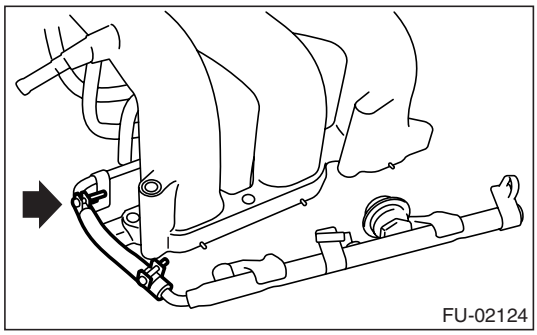
Tightening torque:
5 N·m (0.5 kgf-m, 3.7 ft-lb)


FU-02125


FU-02126

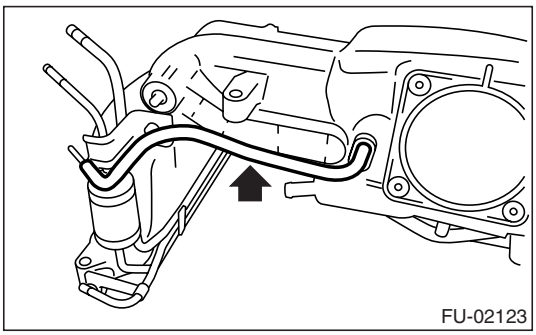
2) Connect the fuel injector pipe to fuel hose, and tighten the clamp screw.

Tightening torque:
1.25 N·m (1.9 kgf-m, 0.94 ft-lb)


FU-02124

3) Install the purge control solenoid valve. <Ref. to EC(H6DO)-7, INSTALLATION, Purge Control Solenoid Valve.>

4) Install the manifold absolute pressure sensor. <Ref. to FU(H6DO)-23, INSTALLATION, Manifold Absolute Pressure Sensor.>
5) Connect the pressure regulator vacuum hose to intake manifold.



6) Install the EGR valve. <Ref. to FU(H6DO)-25, INSTALLATION, EGR Valve.>
7) Install the throttle body to intake manifold. <Ref. to FU(H6DO)-11, INSTALLATION, Throttle Body.>
8) Install the engine harness to intake manifold.

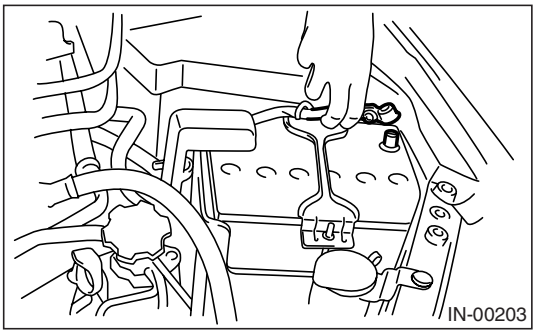
E: INSPECTION

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

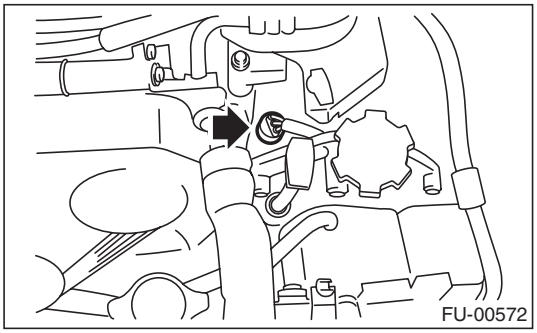
4. Engine Coolant Temperature Sensor

A: REMOVAL

1) Remove the collector cover.
2) Disconnect the ground cable from battery.



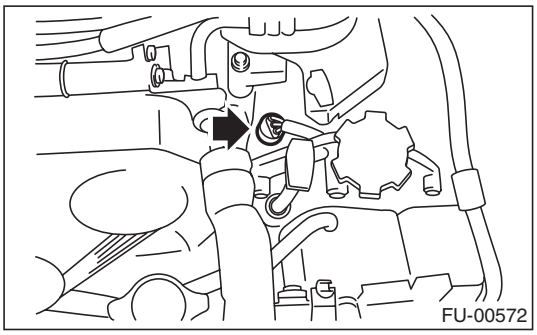
3) Disconnect the connectors from engine coolant temperature sensor.
4) Remove the engine coolant temperature sensor.



B: INSTALLATION

Install in the reverse order of removal.

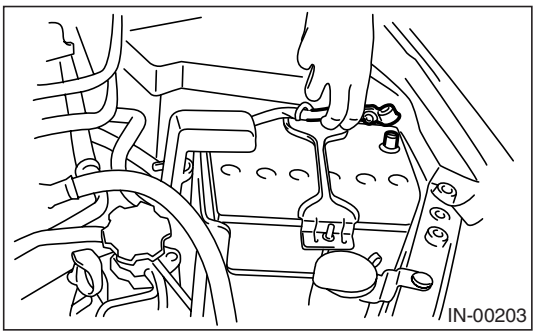
Tightening torque:
18 N·m (1.8 kgf-m, 13 ft-lb)



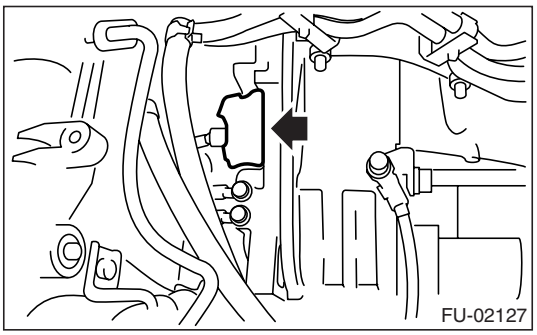
5. Crankshaft Position Sensor

A: REMOVAL

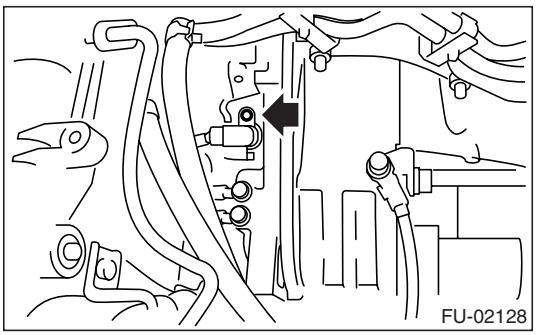
1) Remove the collector cover.
2) Disconnect the ground cable from battery.



3) Remove the air intake chamber. <Ref. to IN(H6DO)-7, REMOVAL, Air Intake Chamber.>
4) Remove the service hole cover.



5) Remove the crankshaft position sensor.

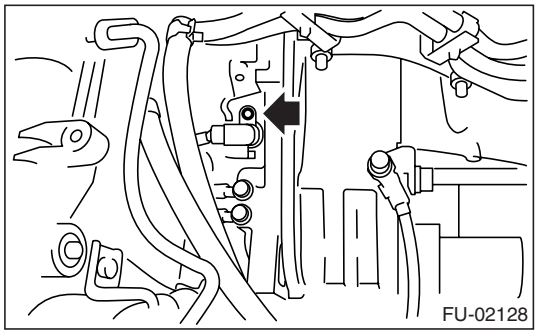


6) Disconnect the connector from crankshaft position sensor.

B: INSTALLATION

Install in the reverse order of removal.

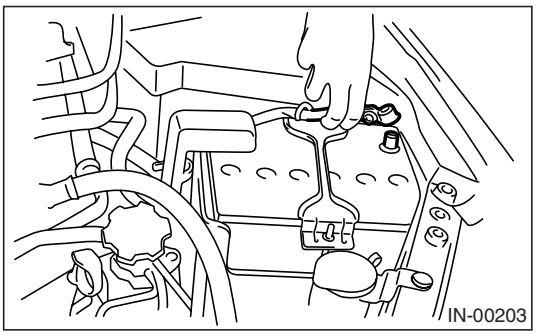
Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



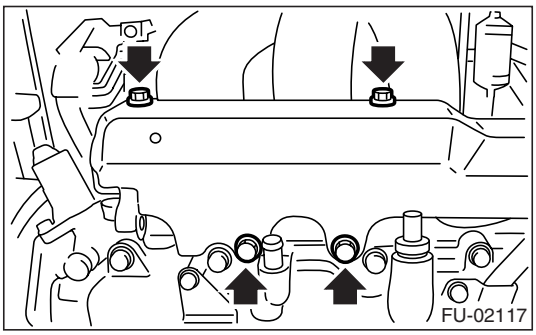
6. Camshaft Position Sensor

A: REMOVAL

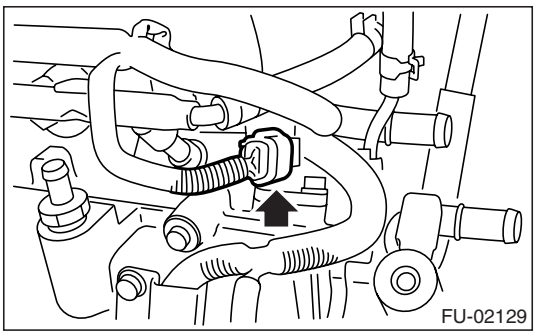
1) Remove the collector cover.
2) Disconnect the ground cable from battery.



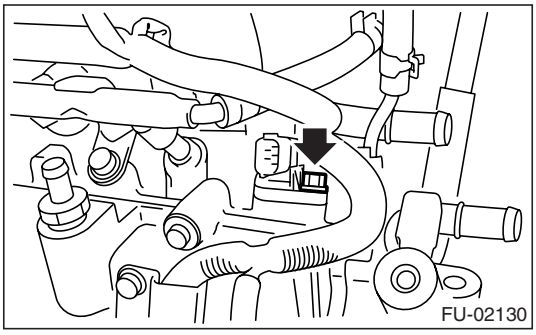
3) Remove the generator harness from fuel pipe protector LH.
4) Remove the fuel pipe protector LH.



5) Disconnect the connector from camshaft position sensor LH.



6) Remove the camshaft position sensor LH.



7) Remove the camshaft position sensor RH in the same procedure as LH.

B: INSTALLATION

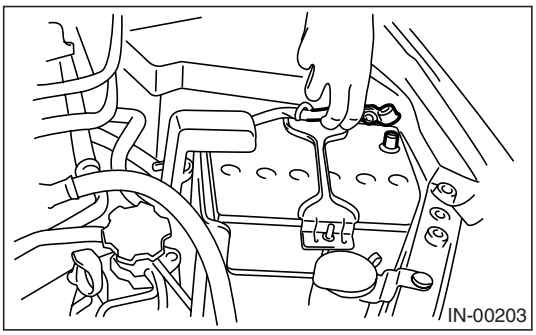
Install in the reverse order of removal.

Tightening torque:
Camshaft position sensor
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)
Fuel pipe protector
19 N·m (1.9 kgf-m, 14 ft-lb)

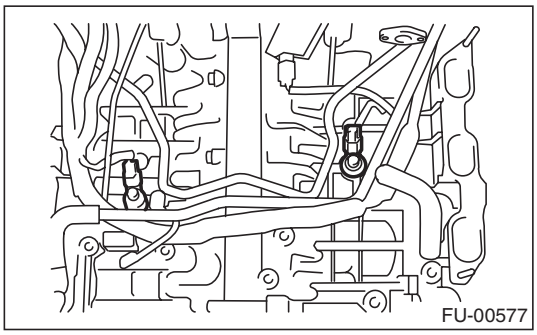
7. Knock Sensor

A: REMOVAL

1) Remove the collector cover.
2) Disconnect the ground cable from battery.



3) Remove the intake manifold.
<Ref. to FU(H6DO)-12, REMOVAL, Intake Manifold.>
4) Disconnect the knock sensor connector.
5) Remove the knock sensor from cylinder block.

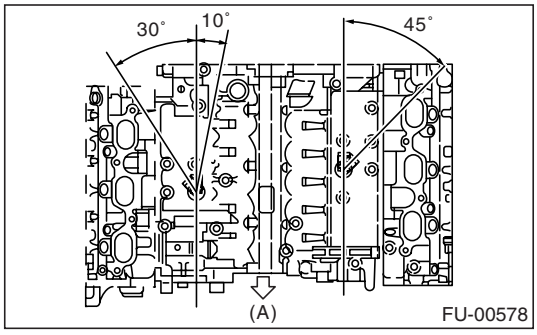


B: INSTALLATION

1) Install the knock sensor to cylinder block.

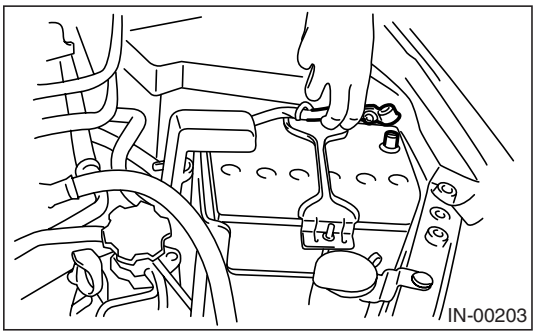
Tightening torque:
25 N·m (2.5 kgf-m, 18 ft-lb)

NOTE:
For the knock sensor's installation angle, refer to the figure below.



(A) Forward

2) Connect the knock sensor connector.
3) Install the intake manifold. <Ref. to FU(H6DO)-13, INSTALLATION, Intake Manifold.>
4) Connect the ground cable to battery.



5) Install the collector cover.

8. Throttle Position Sensor

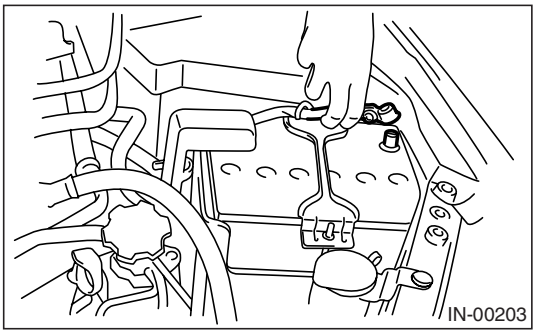
A: SPECIFICATION

Throttle body is a non-disassembled part, so do not remove the throttle position sensor from throttle body.
Refer to “Throttle Body” for removal and installation procedure. <Ref. to FU(H6DO)-11, REMOVAL, Throttle Body.> <Ref. to FU(H6DO)-11, INSTALLATION, Throttle Body.>

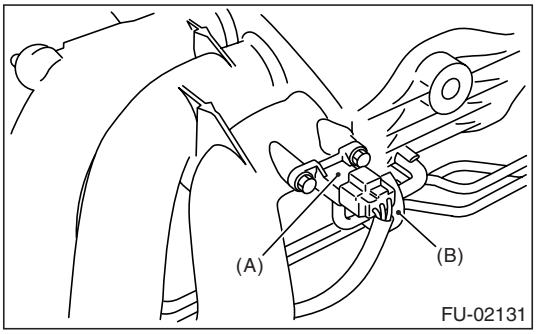
9. Manifold Absolute Pressure Sensor

A: REMOVAL

1) Remove the collector cover.
2) Disconnect the ground cable from battery.



3) Disconnect the connector from manifold pressure sensor (A), and remove the filter assembly (B) from intake manifold.



4) Remove the manifold absolute pressure sensor from intake manifold.

B: INSTALLATION

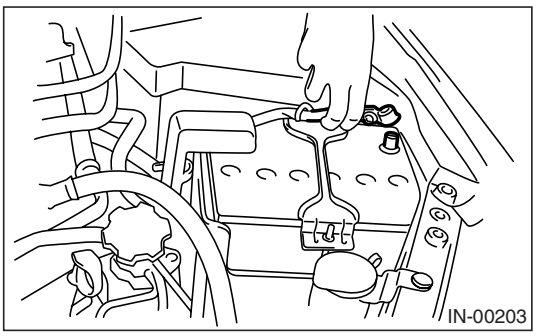
Install in the reverse order of removal.

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

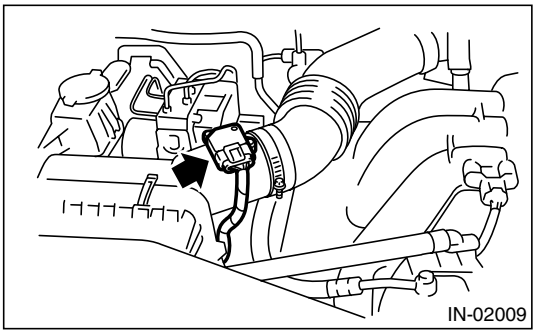
10.Mass Air Flow and Intake Air Temperature Sensor

A: REMOVAL

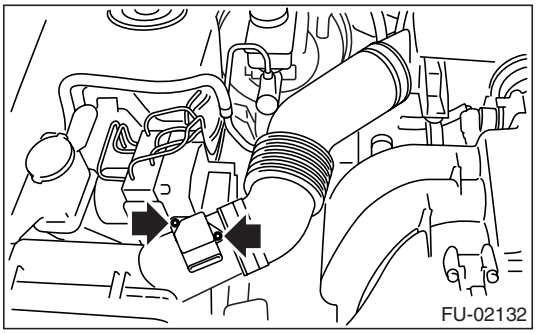
1) Disconnect the ground cable from battery.



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.

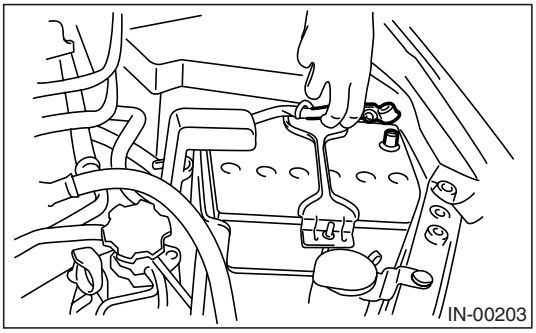
Tightening torque:
1 N·m (0.1 kgf-m, 0.7 ft-lb)

11.EGR Valve

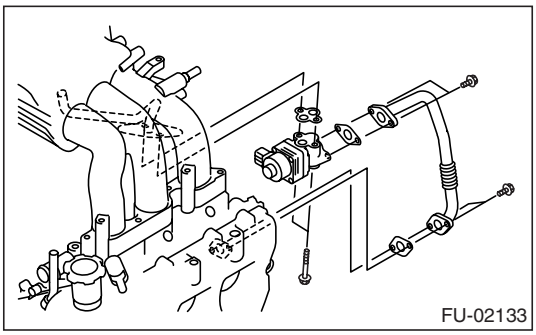
A: REMOVAL

NOTE:
Model except for KA is equipped with EGR valve.

1) Remove the collector cover.
2) Disconnect the ground cable from battery.



3) Remove the air intake chamber.
<Ref. to IN(H6DO)-7, REMOVAL, Air Intake Chamber.>
4) Remove the starter. <Ref. to SC(H4SO 2.0)-6, REMOVAL, Starter.>
5) Remove the EGR pipe from EGR valve and cylinder head.
6) Remove the EGR valve from intake manifold.



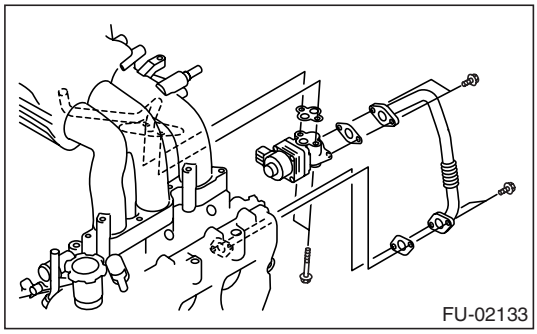
7) Disconnect the connector from EGR valve.

B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Use a new gasket.

Tightening torque:
EGR valve
19 N·m (1.9 kgf-m, 14 ft-lb)
EGR Pipe
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

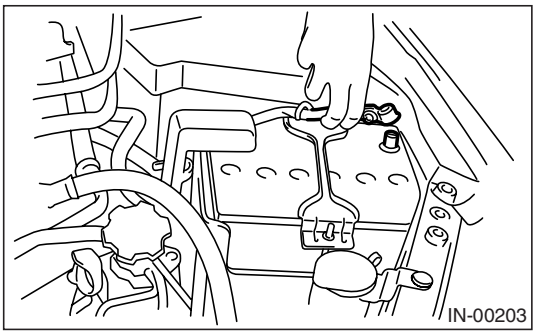


12.Fuel Injector

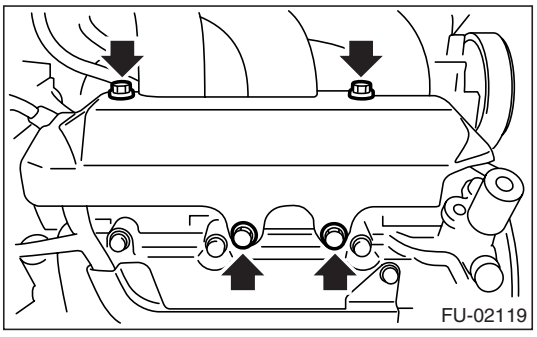
A: REMOVAL

1. RH SIDE

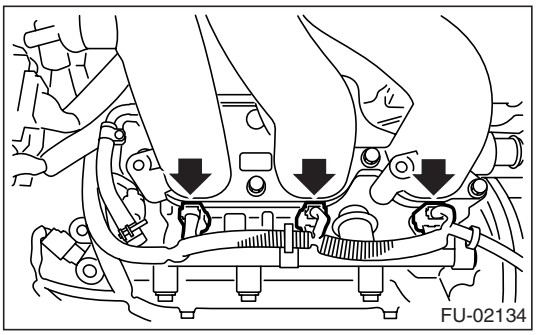
1) Remove the collector cover.
2) Release the fuel pressure. <Ref. to FU(H6DO)-39, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
3) Open fuel filler flap lid, and remove fuel filler cap.
4) Disconnect the ground cable from battery.



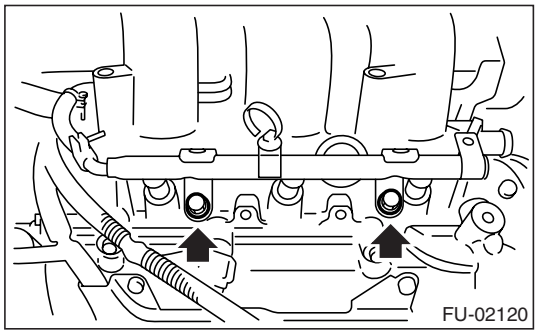
5) Remove the air cleaner case. <Ref. to IN(H6DO)-5, REMOVAL, Air Cleaner Case.>
6) Remove the fuel pipe protector RH.



7) Disconnect the connector from fuel injector.



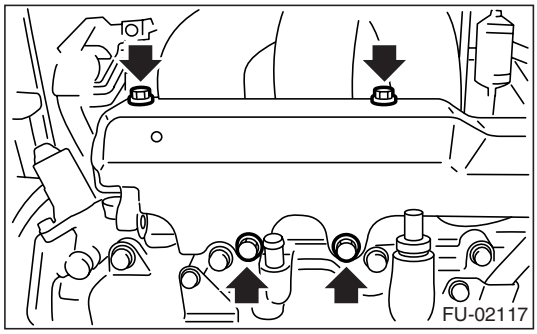
8) Remove the engine harness from fuel injector pipe RH.
9) Remove the bolts which hold fuel injector pipe to intake manifold.



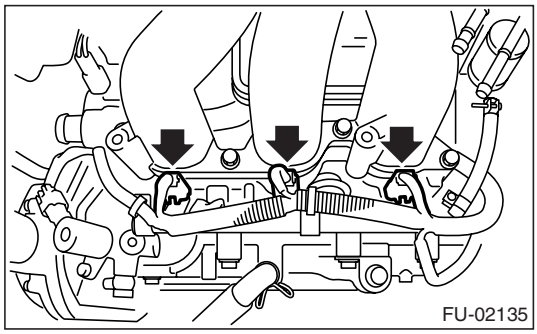
10) Remove the fuel injector while lifting up the fuel injector pipe.

2. LH SIDE

1) Remove the collector cover.
2) Release the fuel pressure. <Ref. to FU(H6DO)-39, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
3) Open fuel filler flap lid, and remove fuel filler cap.
4) Remove the battery.
5) Remove the generator harness from fuel pipe protector LH.
6) Remove the fuel pipe protector LH.

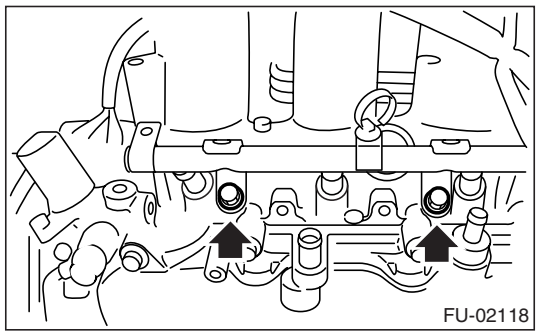


7) Disconnect the connector from fuel injector.



8) Remove the engine harness from fuel injector pipe LH.

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



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

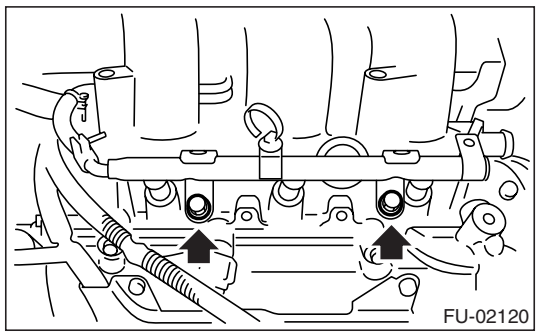
B: INSTALLATION

1. RH SIDE

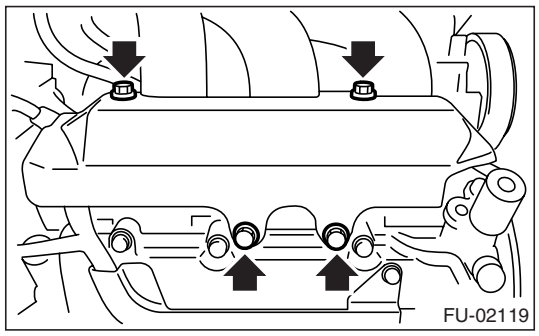
Install in the reverse order of removal.

NOTE:
Use a new O-ring.

Tightening torque:
19 N·m (1.9 kgf-m, 14 ft-lb)



Tightening torque:
19 N·m (1.9 kgf-m, 14 ft-lb)

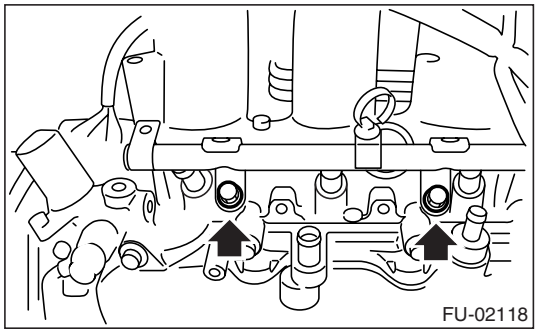


2. LH SIDE

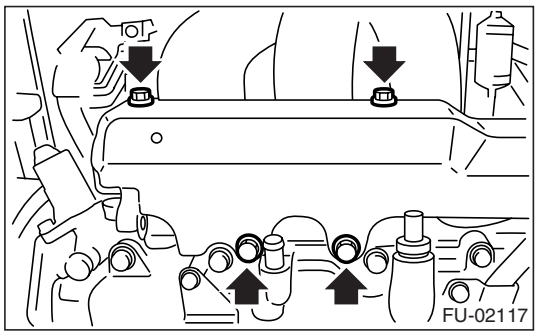
Install in the reverse order of removal.

NOTE:
Use a new O-ring.

Tightening torque:
19 N·m (1.9 kgf-m, 14 ft-lb)



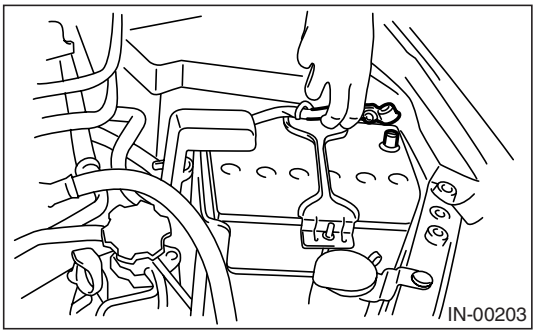
Tightening torque:
19 N·m (1.9 kgf-m, 14 ft-lb)



13. Variable Valve Lift Diagnosis Oil Pressure Switch

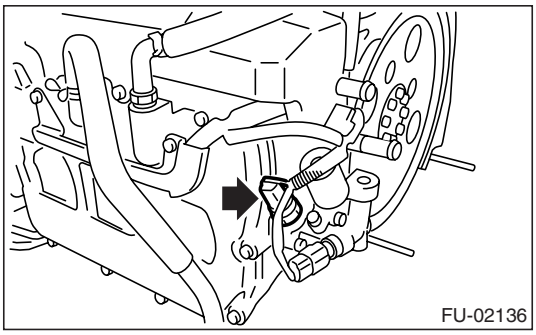
A: REMOVAL

1) Remove the collector cover.
2) Disconnect the ground cable from battery.

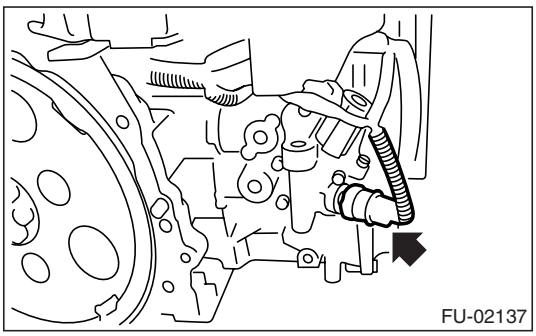


3) Remove the air intake chamber. <Ref. to IN(H6DO)-7, REMOVAL, Air Intake Chamber.>
4) Disconnect the connector from variable valve lift diagnosis oil pressure switch.
5) Remove the variable valve lift diagnosis oil pressure switch.

- LH side



- RH side



B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Apply liquid gasket to variable valve lift diagnosis oil pressure switch threads.

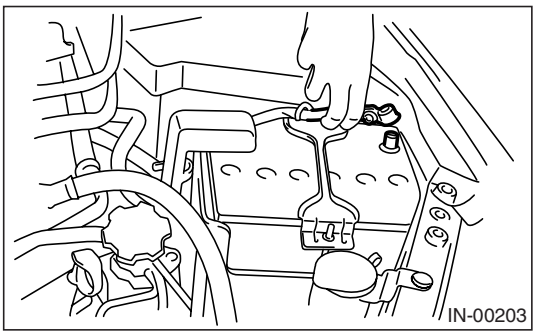
Liquid gasket:
THREE BOND 1324 (Part No. 004403042) or equivalent

Tightening torque:
17 N·m (1.7 kgf-m, 12.5 ft-lb)

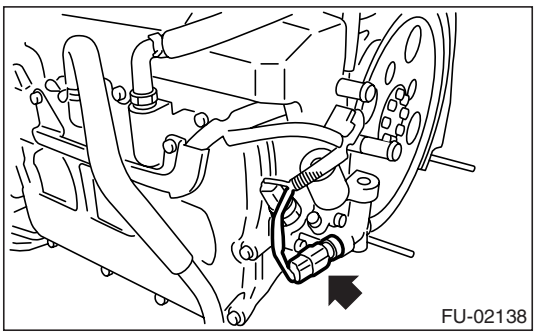
14.Oil Temperature Sensor

A: REMOVAL

1) Remove the collector cover.
2) Disconnect the ground cable from battery.



3) Remove the air intake chamber. <Ref. to IN(H6DO)-7, REMOVAL, Air Intake Chamber.>
4) Disconnect the connector from oil temperature sensor.
5) Remove the oil temperature sensor.



B: INSTALLATION

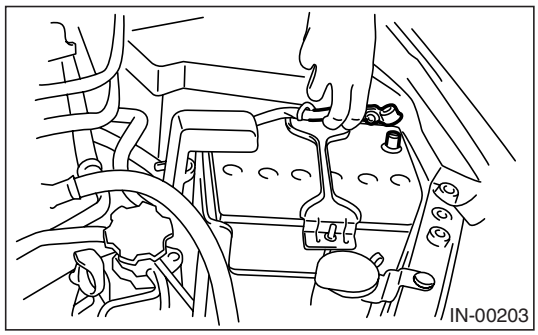
Install in the reverse order of removal.

Tightening torque:
18 N·m (1.8 kgf-m, 13 ft-lb)

15.Front Oxygen (A/F) Sensor

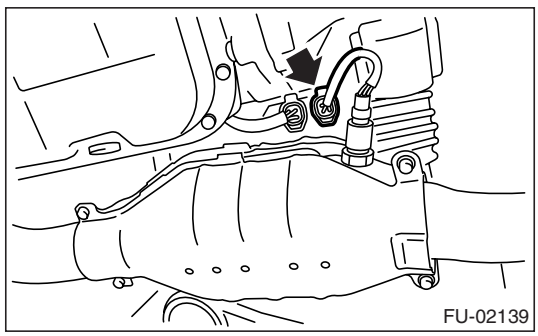
A: REMOVAL

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

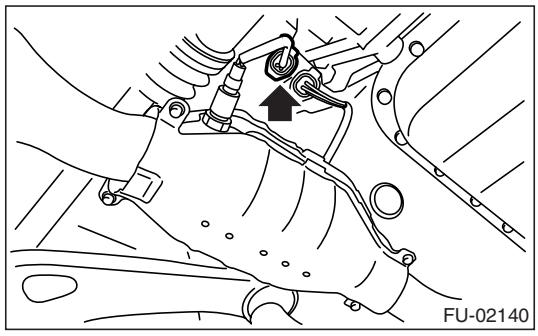


3) Lift-up the vehicle.
4) Disconnect the connector of front oxygen (A/F) sensor.

- LH side



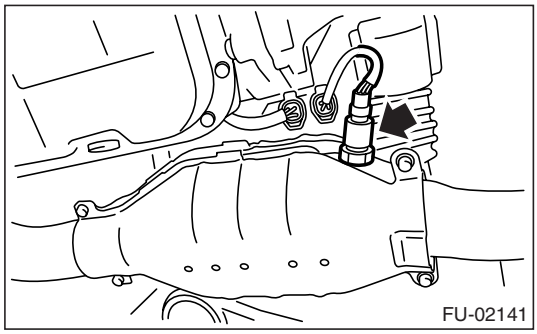
- RH side



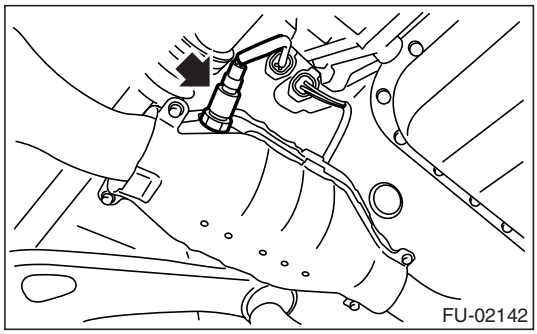
5) Apply spray-type lubricant to the threaded portion of front oxygen (A/F) sensor, and leave it for one minute or more.
6) Remove the front oxygen (A/F) sensor.

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

- LH side



- RH side



B: INSTALLATION

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

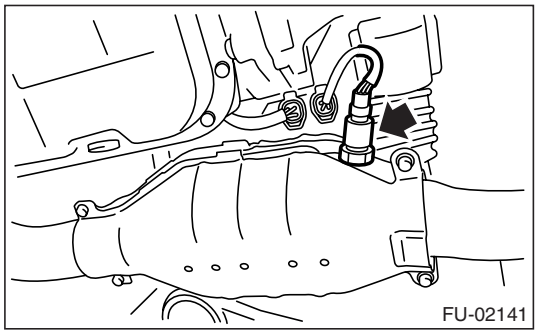
Anti-seize compound:
SS-30 JET LUBE

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

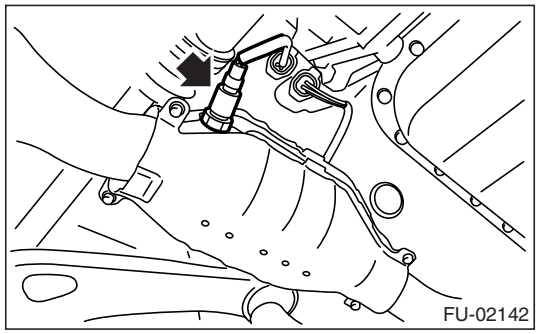
2) Install the front oxygen (A/F) sensor.

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

- LH side

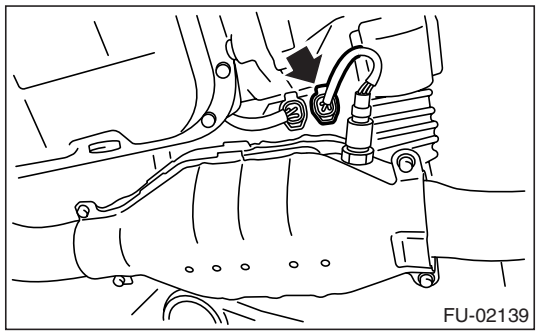


- RH side

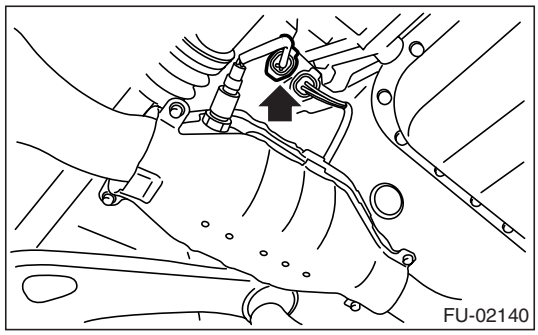


3) Connect the connector of front oxygen (A/F) sensor.

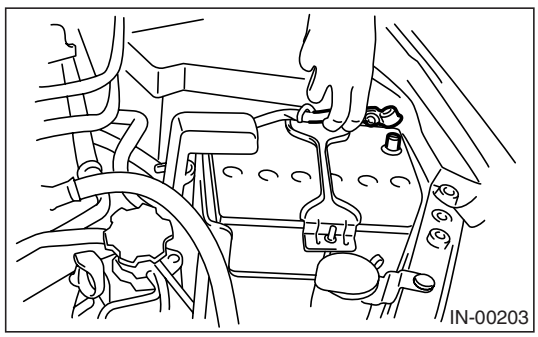
- LH side



- RH side



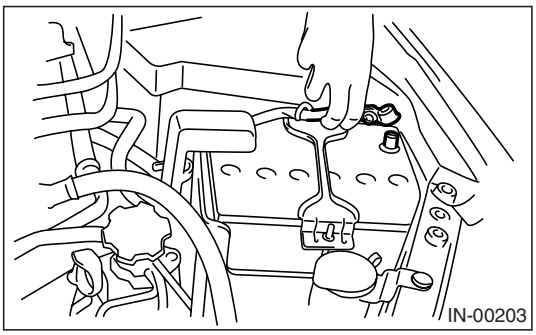
4) Lower the vehicle.
5) Connect the ground cable to battery.



16.Rear Oxygen Sensor

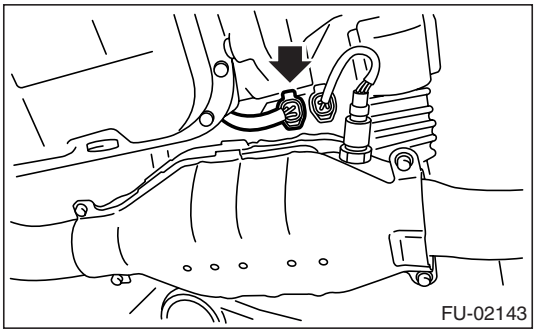
A: REMOVAL

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

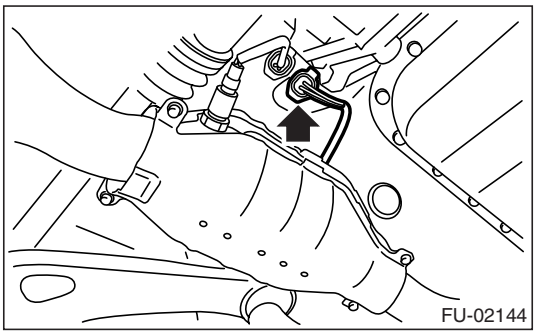


3) Lift-up the vehicle.
4) Disconnect the connector from rear oxygen sensor.

- LH side



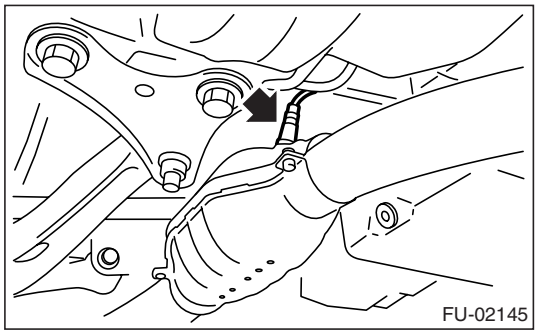
- RH side



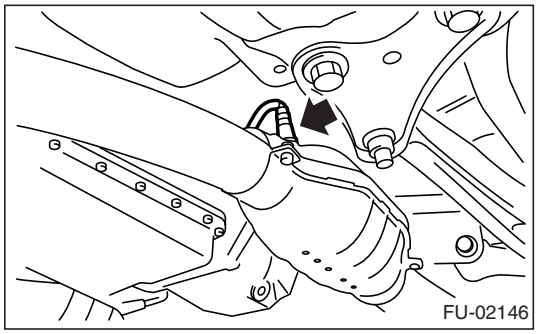
5) Remove the clip which holds harness.
6) Apply spray-type lubricant to the threaded portion of rear oxygen sensor, and leave it for one minute or more.
7) Remove the rear oxygen sensor.

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

- LH side



- RH side



B: INSTALLATION

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

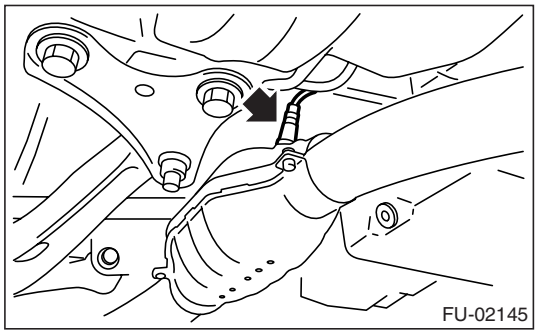
Anti-seize compound:
SS-30 JET LUBE

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

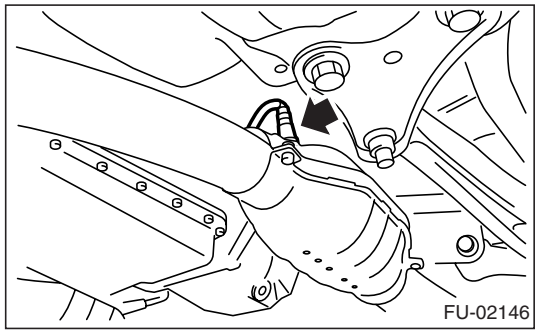
2) Install the rear oxygen sensor.

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

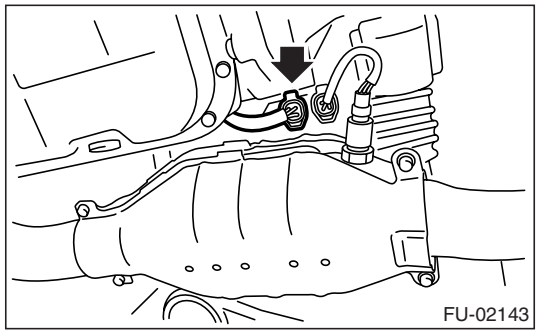
- LH side



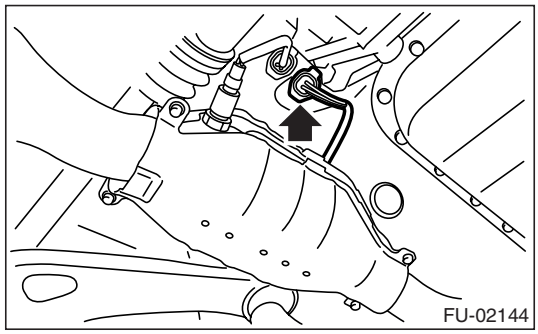
• RH side



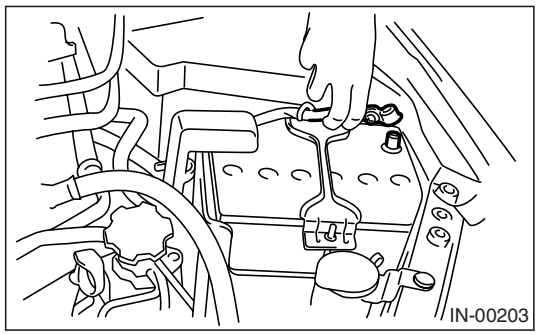
3) Hold the harness with clip.
4) Connect the connector to rear oxygen sensor.
• LH side



• RH side



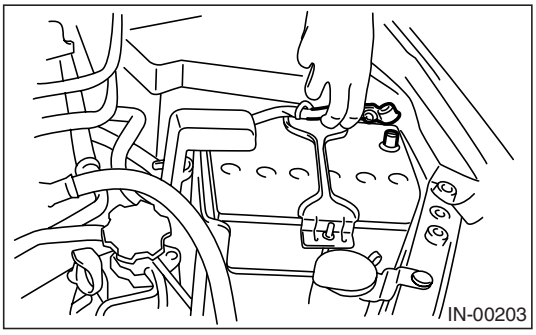
5) Lower the vehicle.
6) Connect the ground cable to battery.



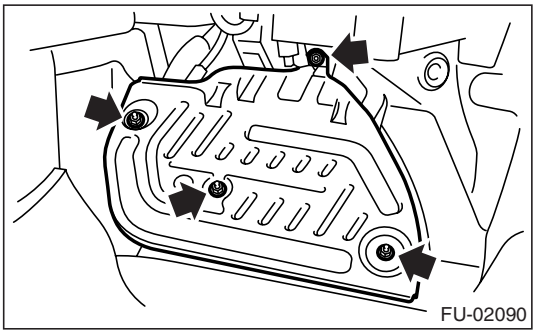
17. Engine Control Module (ECM)

A: REMOVAL

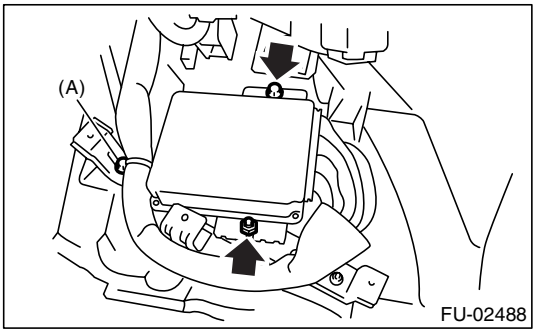
1) Disconnect the ground cable from battery.



2) Remove the lower inner trim of passenger's side.
<Ref. to EI-60, REMOVAL, Lower Inner Trim.>
3) Detach the floor mat of passenger's seat.
4) Remove the protect cover.



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



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

B: INSTALLATION

Install in the reverse order of removal.

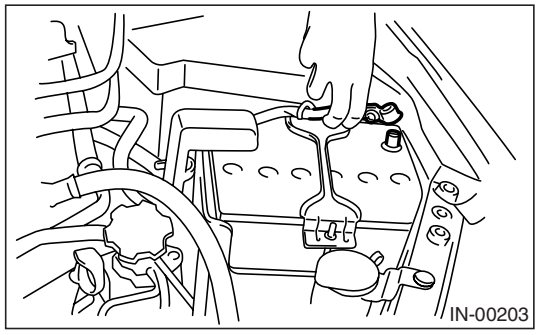
CAUTION:
• When replacing the ECM, be careful not to use the wrong spec. ECM to avoid any damage on the fuel injection system.
• When replacing the ECM, be careful not to damage the harnesses and connectors.
• When replacing the ECM, immobilizer system must be registered. For doing so, all ignition keys and ID cards need to be prepared. Refer to "IMMOBILIZER TEACHING OPERATION MANUAL"

Tightening torque:
5 N·m (0.5 kgf-m, 3.7 ft-lb)

18.Main Relay

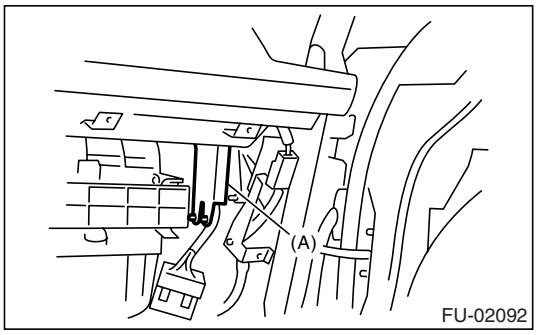
A: REMOVAL

1) Disconnect the ground cable from battery.

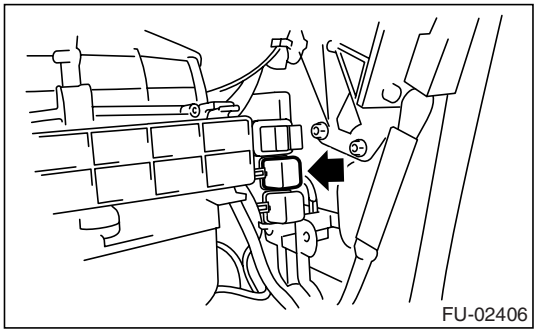


2) Remove the glove box. <Ref. to EI-51, REMOVAL, Glove Box.>

3) Remove the harness cover (A).



4) Disconnect the connector from main relay.



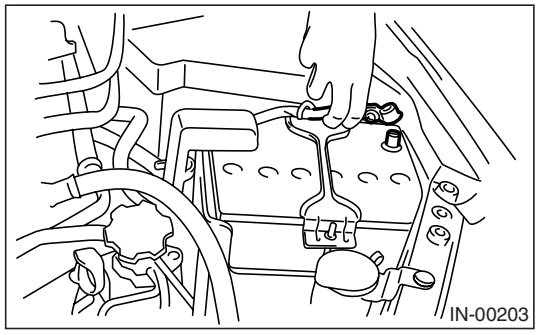
B: INSTALLATION

Install in the reverse order of removal.

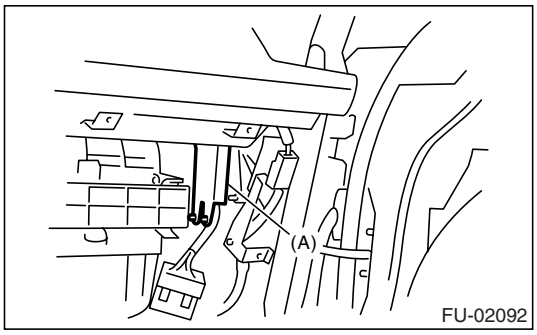
19.Fuel Pump Relay

A: REMOVAL

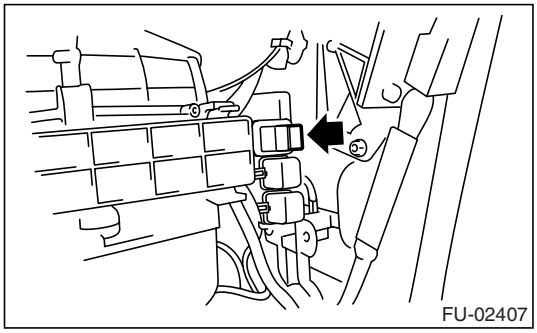
1) Disconnect the ground cable from battery.



2) Remove the glove box. <Ref. to EI-51, REMOVAL, Glove Box.>
3) Remove the harness cover (A).



4) Disconnect the connector from fuel pump relay.



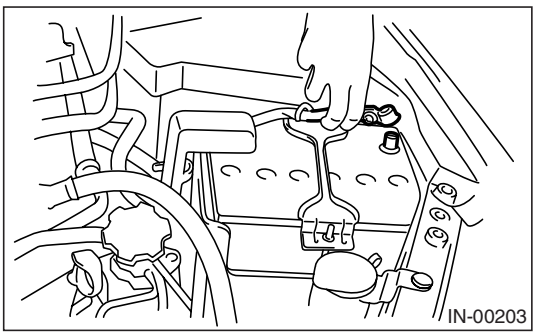
B: INSTALLATION

Install in the reverse order of removal.

20. Electronic Throttle Control Relay

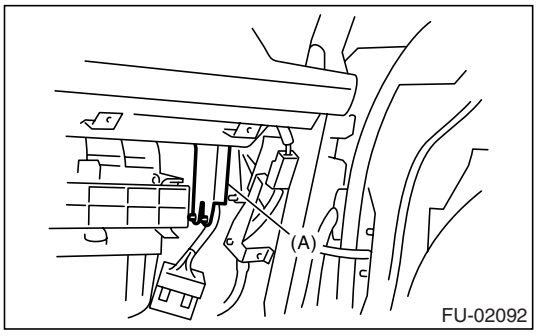
A: REMOVAL

1) Disconnect the ground cable from battery.

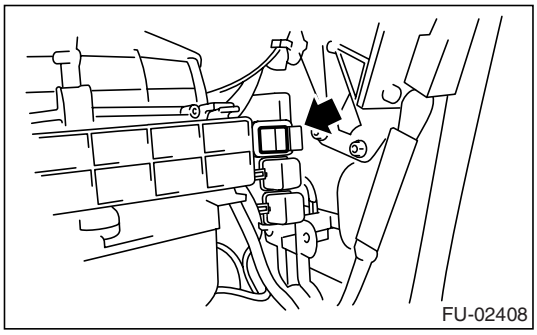


2) Remove the glove box. <Ref. to EI-51, REMOVAL, Glove Box.>

3) Remove the harness cover (A).



4) Disconnect the connector from electronic throttle control relay.



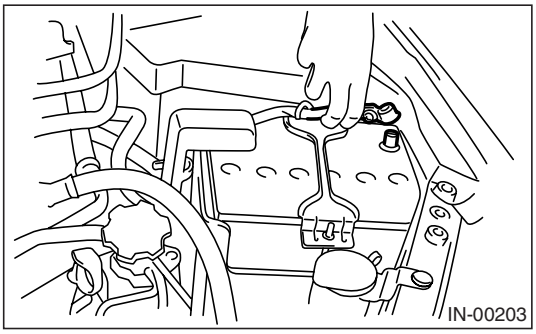
B: INSTALLATION

Install in the reverse order of removal.

21.Fuel Pump Control Unit

A: REMOVAL

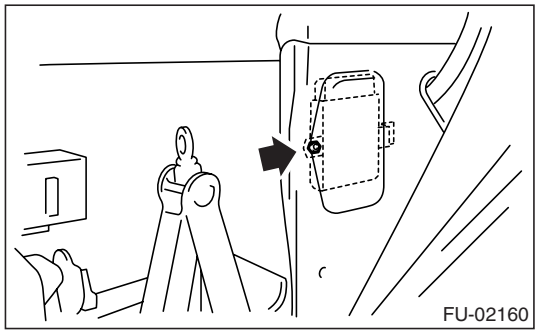
1) Disconnect the ground cable from battery.



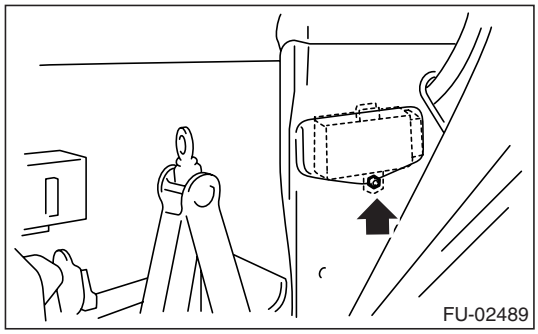
2) Remove the rear quarter trim. <Ref. to EI-63, REMOVAL, Rear Quarter Trim.>

3) Remove the fuel pump control unit.

- Wagon model



- Sedan model



4) Disconnect the connector from fuel pump control unit.

B: INSTALLATION

Install in the reverse order of removal.

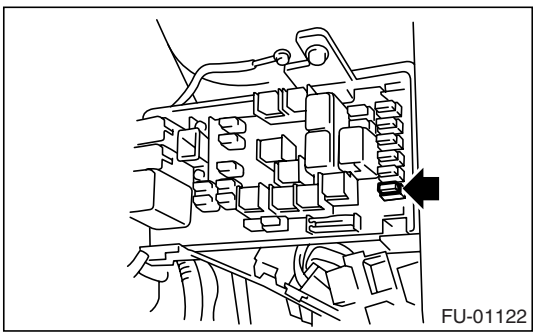
22. Fuel

A: PROCEDURE

1. RELEASING OF FUEL PRESSURE

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

1) Remove the fuse of fuel pump from main fuse box.

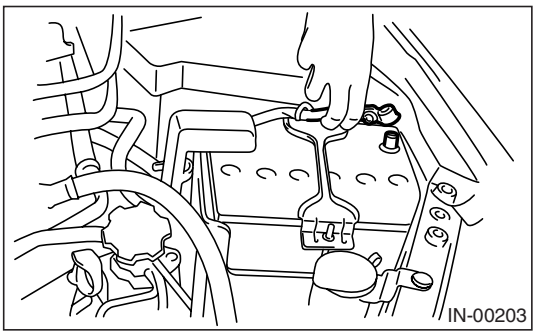


2) Start the engine and run until it stalls.
3) After the engine stalls, crank it for five more seconds.
4) Turn the ignition switch to OFF.

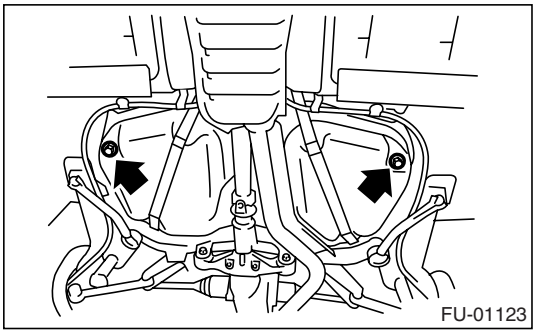
2. DRAINING FUEL

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

1) Set the vehicle on 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) Remove the fuel tank protector.
6) Set a container under the vehicle and remove the drain plug from fuel tank to drain fuel from fuel tank.



7) Tighten the fuel drain plug.

NOTE:
Use a new gasket.

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

8) Install the fuel tank protector.

NOTE:
Use a new nut.

Tightening torque:
Nut
9 N·m (0.9 kgf-m, 6.6 ft-lb)
Bolt
17.5 N·m (1.78 kgf-m, 12.9 ft-lb)

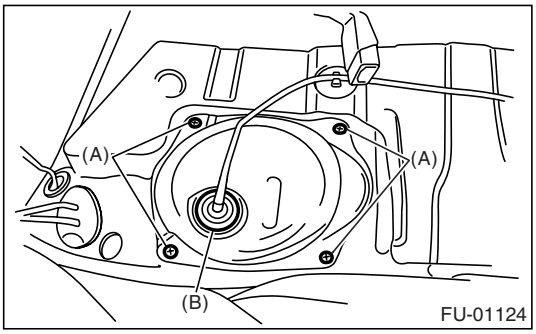
9) Lower the vehicle.

23. Fuel Tank

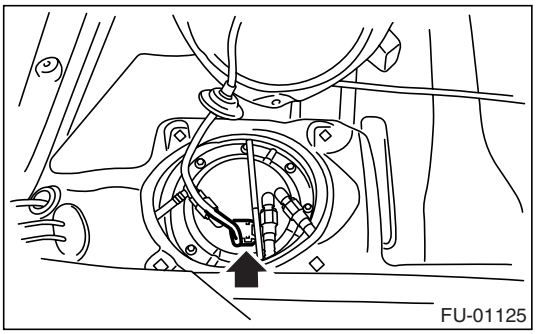
A: REMOVAL

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

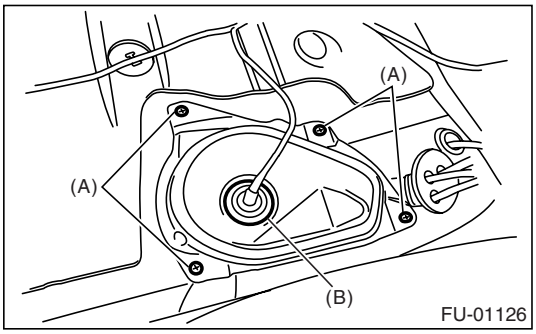
1) Set the vehicle on a lift.
2) Release the fuel pressure. <Ref. to FU(H6DO)-39, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
3) Drain fuel from fuel tank.
<Ref. to FU(H6DO)-39, DRAINING FUEL, PROCEDURE, Fuel.>
4) Remove the rear seat.
5) Remove the service hole cover of fuel pump.
   (1) Remove the bolts (A).
   (2) Push the grommet (B) down and remove service hole cover.



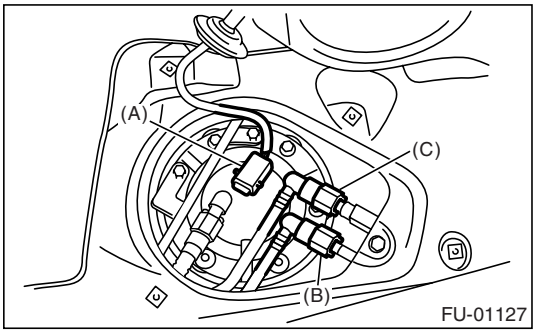
6) Disconnect the connector from fuel pump.



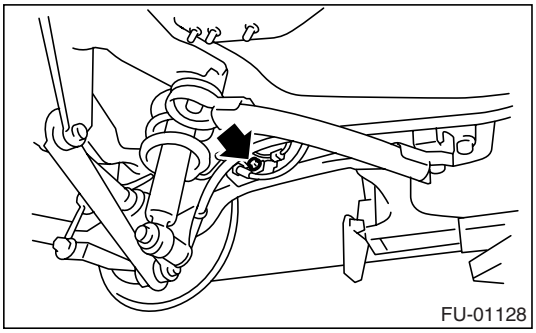
7) Remove the service hole cover of fuel sub level sensor.
   (1) Remove the bolts (A).
   (2) Push the grommet (B) down and remove service hole cover.



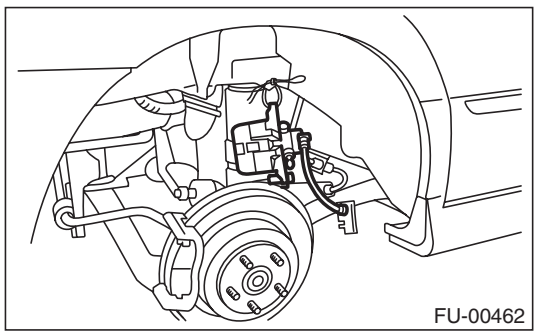
8) Disconnect the connector (A) from fuel sub level sensor.
9) Disconnect the quick connector of the fuel delivery (B) and return hose (C). <Ref. to FU(H6DO)-54, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>



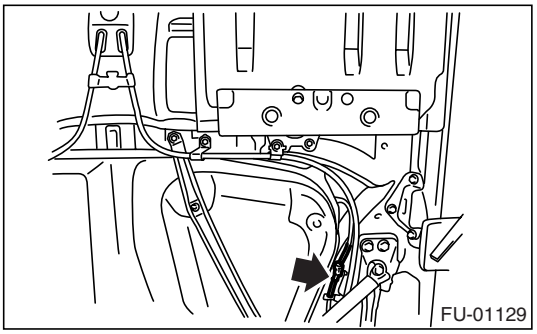
10) Lift-up the vehicle.
11) Remove the rear wheels.
12) Remove the bolts which secure the rear brake hose installation bracket.



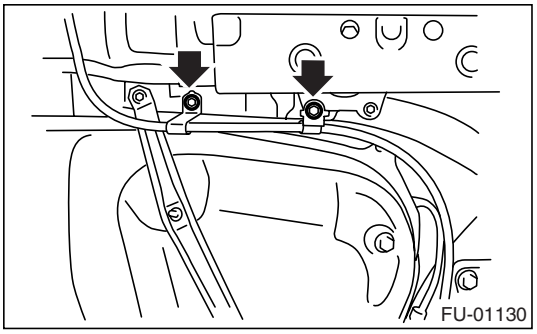
13) Remove the rear brake caliper and tie it to the vehicle body side.

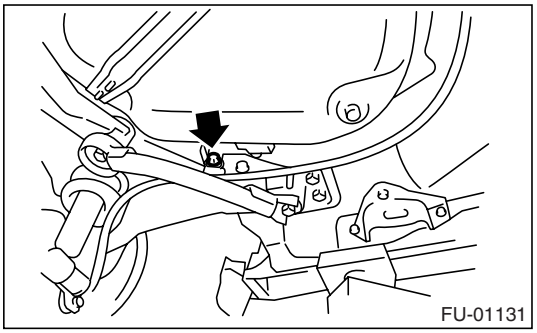


14) Remove the parking brake cable from parking brake assembly. <Ref. to PB-6, REMOVAL, Parking Brake Assembly (Rear Disc Brake).>
15) Remove the rear exhaust pipe.
<Ref. to EX(H6DO)-7, REMOVAL, Rear Exhaust Pipe.>
16) Remove the propeller shaft. <Ref. to DS-10, REMOVAL, Propeller Shaft.>
17) Remove the heat shield cover.
18) Disconnect the connector from rear ABS wheel speed sensor.



19) Remove the bolts which install the parking brake cable clamp.

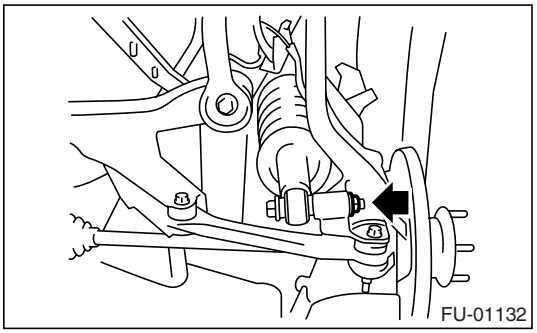




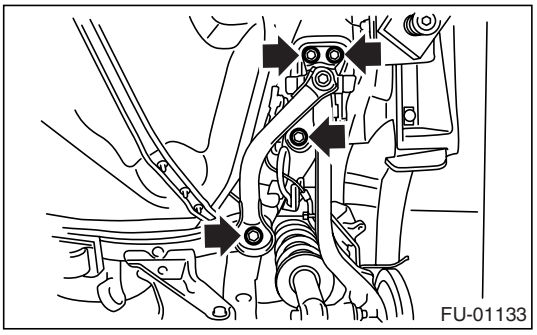
20) Remove the rear suspension assembly.

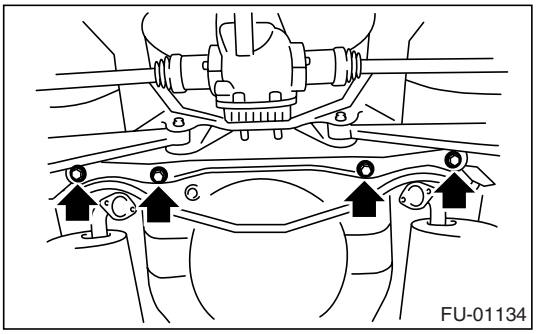
CAUTION:
A helper is required to perform this work.

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



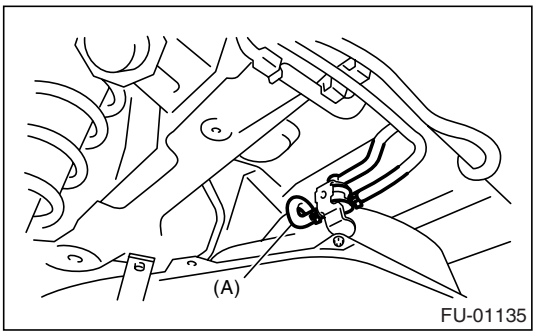
(3) Remove the bolts which secure the rear suspension assembly to body.



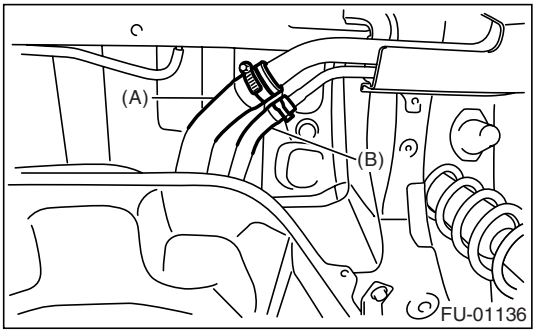


(4) Remove the rear suspension assembly.

21) Disconnect the two-way valve hose (A) from two-way valve, and then remove the two-way valve from bracket.

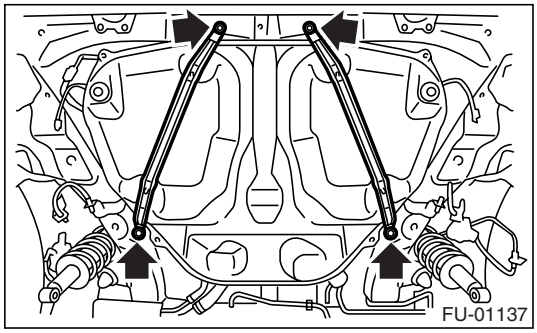


22) Loosen the clamp and disconnect the fuel filler hose (A) and vent hose (B) from fuel filler pipe.



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

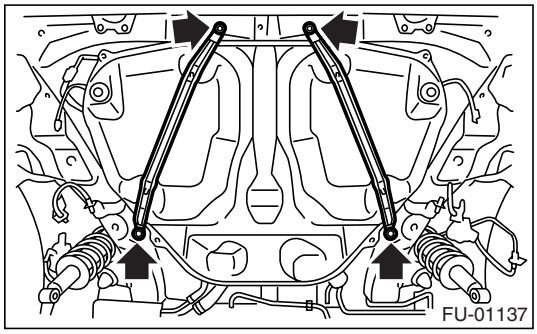
CAUTION:
A helper is required to perform this work.



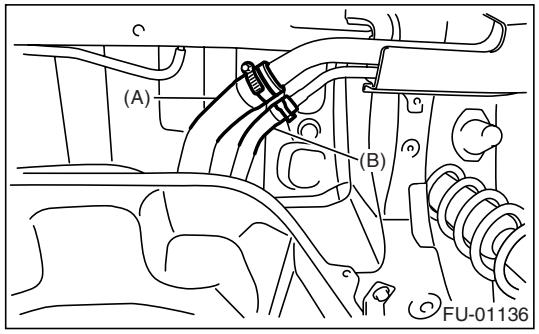
B: INSTALLATION

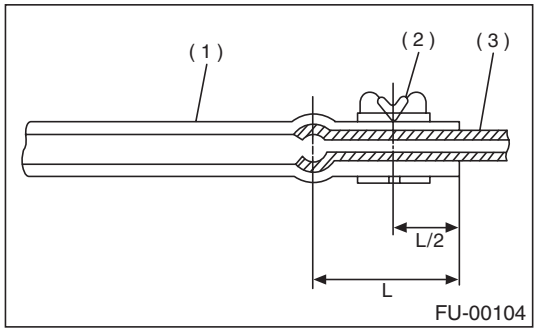
1) Support the fuel tank with transmission jack, set the fuel tank, and then temporarily tighten the bolts of fuel tank band.

CAUTION:
A helper is required to perform this work.



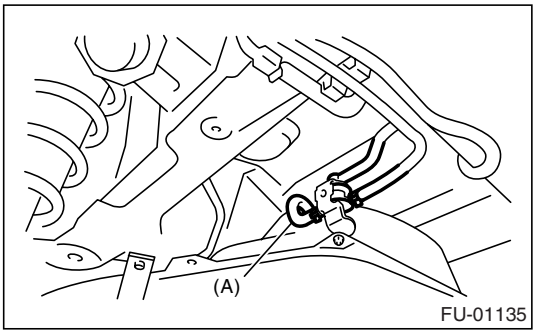
2) Correctly insert the fuel filler hose (A) and vent hose (B) to specified position, and then tighten the clamp.





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

3) Install the two-way valve to bracket, and connect the two-way valve hose (A) to two-way valve.



4) Tighten the bolts of fuel tank band.

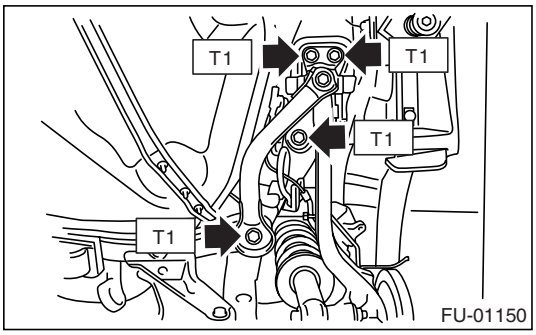
Tightening torque:
33 N·m (3.4 kgf-m, 24.3 ft-lb)

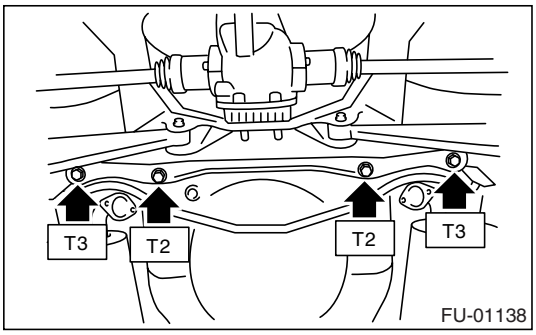
5) Install the rear suspension assembly.

CAUTION:
A helper is required to perform this work.

(1) Support the rear differential with transmission jack.
(2) Support the rear suspension assembly, and then tighten the bolts which secure the rear suspension assembly to body.

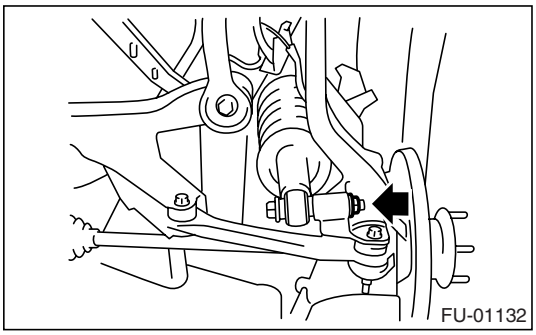
Tightening torque:
T1: 125 N·m (12.7 kgf-m, 92 ft-lb)
T2: 65 N·m (6.2 kgf-m, 48 ft-lb)
T3: 175 N·m (17.8 kgf-m, 129 ft-lb)





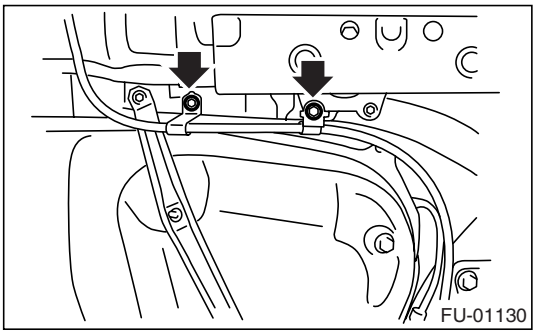
(3) Tighten the bolts which install the rear shock absorber to rear suspension arm. <Ref. to RS-11, INSTALLATION, Rear Arm.>

Tightening torque:
62 N·m (6.3 kgf-m, 46 ft-lb)

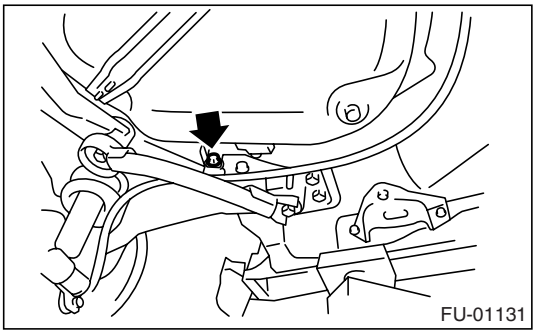


6) Tighten the bolts which install the parking brake cable clamp.

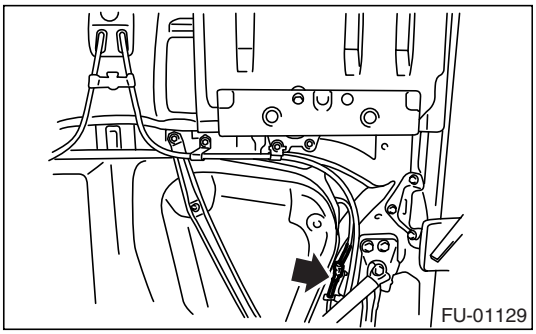
Tightening torque:
18 N·m (1.8 kgf-m, 13 ft-lb)



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

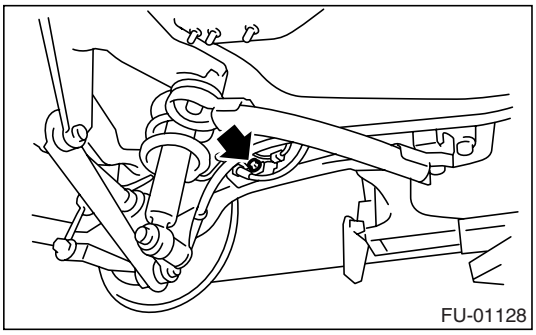


7) Connect the connector to rear ABS wheel speed sensor.



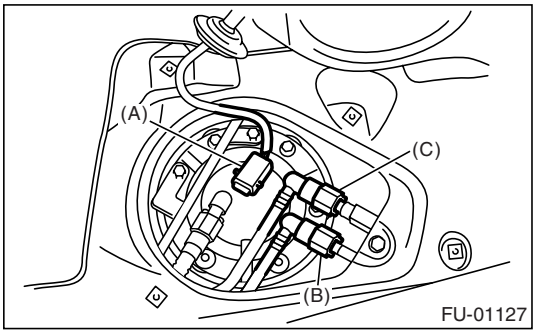
8) Install the heat shield cover.
9) Install the propeller shaft. <Ref. to DS-11, INSTALLATION, Propeller Shaft.>
10) Install the rear exhaust pipe. <Ref. to EX(H6DO)-7, INSTALLATION, Rear Exhaust Pipe.>
11) Lower the vehicle.
12) Connect the parking brake cable to parking brake assembly. <Ref. to PB-7, INSTALLATION, Parking Brake Assembly (Rear Disc Brake).>
13) Install the rear brake caliper.
14) Tighten the bolt which secures rear brake hose installation bracket.

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

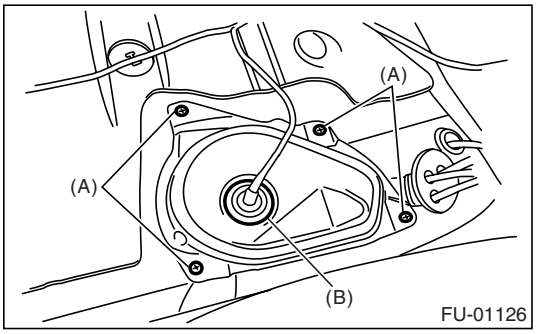


15) Install the rear wheels.
16) Lower the vehicle.
17) Connect the connector (A) to fuel sub level sensor.
18) Connect the quick connector to the fuel delivery (B) and return hose (C). <Ref. to FU(H6DO)-55, INSTALLATION, Fuel Delivery, Return and Evaporation Lines.>

NOTE:
Be careful not to misconnect the delivery side and return side.

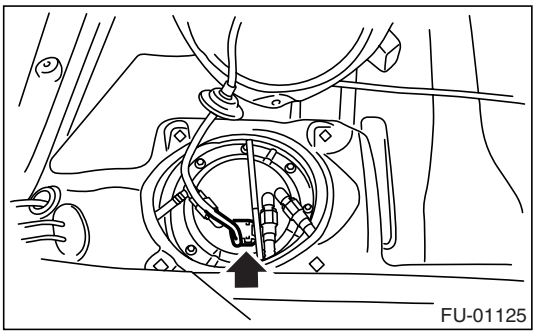


19) Install the service hole cover of fuel sub level sensor.

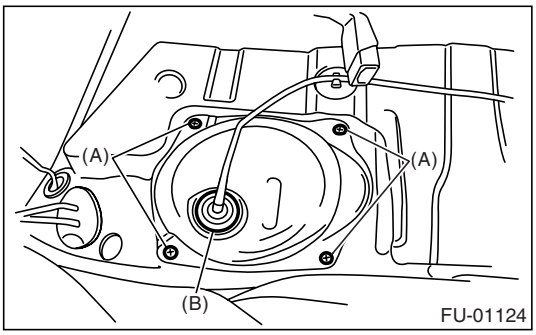


(A) Bolt
(B) Grommet

20) Connect the connector to fuel pump.



21) Install the service hole cover of fuel pump.



(A) Bolt
(B) Grommet

22) Install the rear seat.
23) Install the fuse of fuel pump to main fuse box.

C: INSPECTION

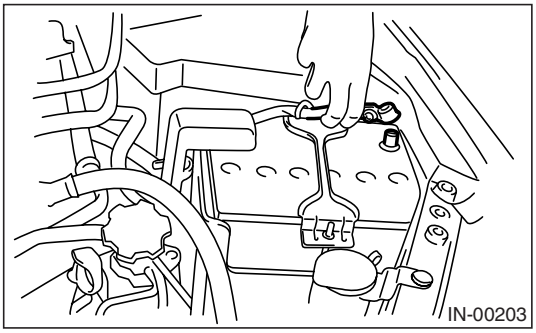
1) Check that the fuel tank is not holed, cracked or otherwise damaged.
2) Make sure that the fuel pipe and fuel hose are not cracked and those connections are tight.

24.Fuel Filler Pipe

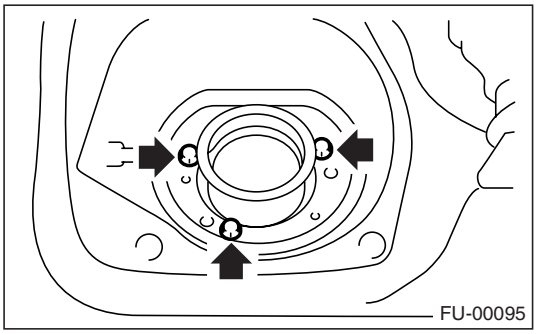
A: REMOVAL

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

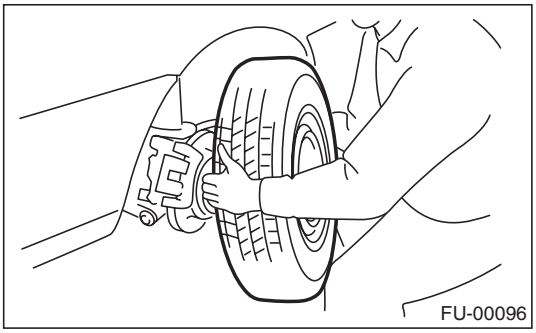
1) Disconnect the ground cable from battery.



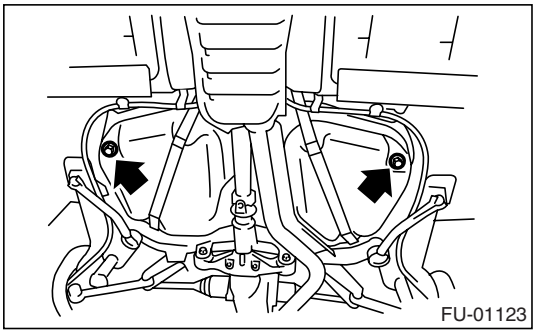
2) Open the fuel filler flap lid, and remove the filler cap.
3) Remove the screws which secure the packing.



4) Lift-up the vehicle.
5) Remove the rear wheel RH.



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

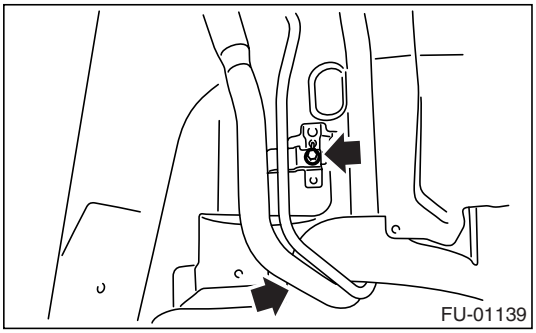


7) Tighten the fuel drain plug.

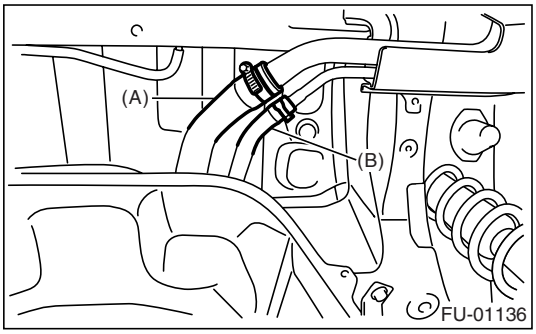
NOTE:
Use a new gasket.

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

8) Remove the mud guard. <Ref. to EI-29, REMOVAL, Mud Guard.>
9) Remove the rear sub frame. <Ref. to RS-23, REMOVAL, Rear Sub Frame.>
10) Remove the bolts which hold the fuel filler pipe bracket on the body.



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

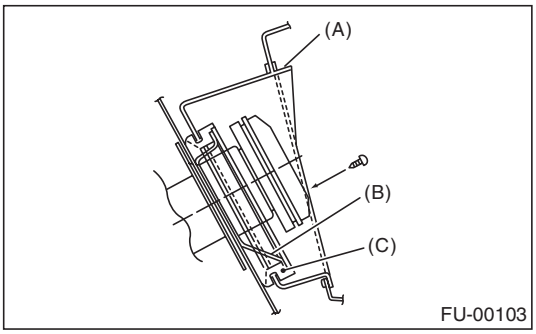


12) Remove the fuel filler pipe to under side of the vehicle.

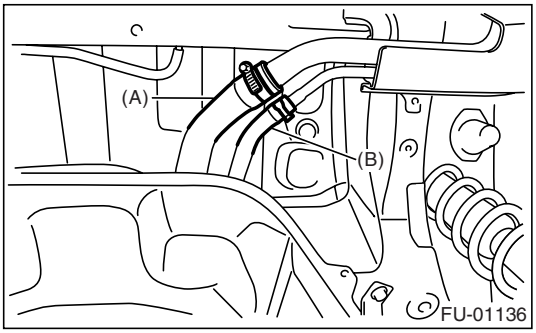
B: INSTALLATION

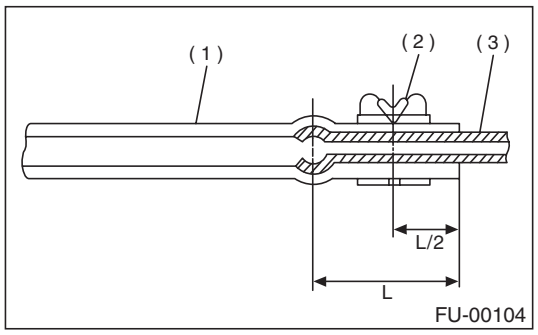
1) Open the fuel filler flap lid.
2) Set the fuel saucer (A) with rubber packing (C) and insert the fuel filler pipe into hole from the inner side of apron.
3) Align the holes in fuel filler pipe neck and set the cup (B), and tighten the screws.

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



4) Correctly insert the fuel filler hose (A) and vent hose (B) to specified position, and then tighten the clamp.

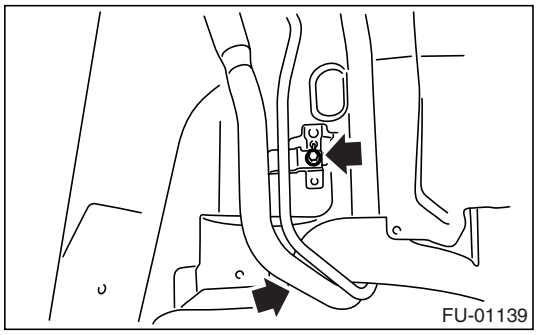




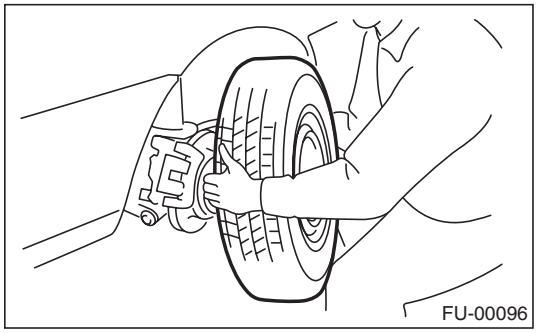
(1) Hose
(2) Clip or clamp
(3) Pipe

5) Tighten the bolts which hold the fuel filler pipe bracket on the body.

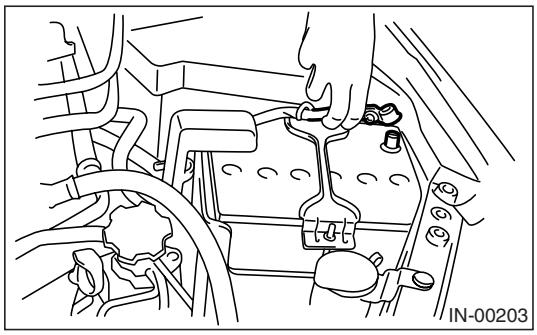
Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)



6) Install the rear sub frame. <Ref. to RS-23, INSTALLATION, Rear Sub Frame.>
7) Install the mud guard. <Ref. to EI-29, INSTALLATION, Mud Guard.>
8) Install the rear wheel RH.



9) Lower the vehicle.
10) Connect the ground cable to battery.



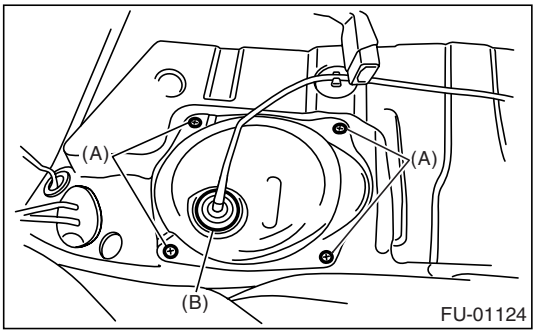
25.Fuel Pump

A: REMOVAL

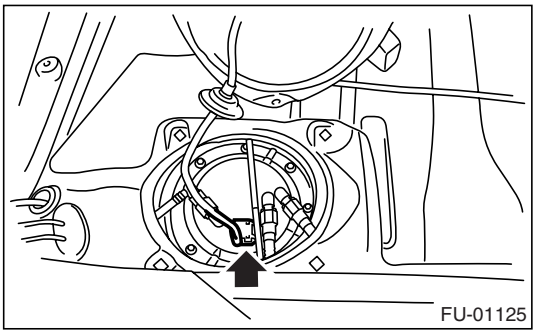
WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel on the floor.**
- **Reduce the fuel in the fuel tank to less than 3/4 beforehand. Be careful that fuel may spill when the fuel is more than 3/4.**

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

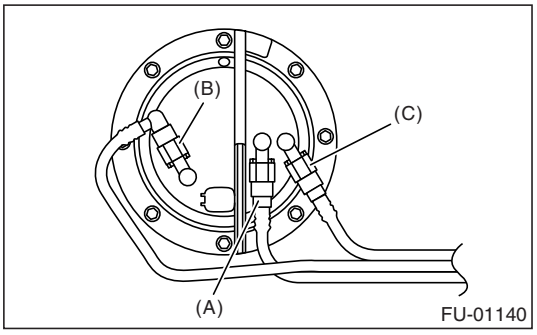
1) Release the fuel pressure. <Ref. to FU(H6DO)-39, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Drain fuel. <Ref. to FU(H6DO)-39, DRAINING FUEL, PROCEDURE, Fuel.>
3) Remove the rear seat.
4) Remove the service hole cover.
   (1) Remove the bolts (A).
   (2) Push the grommet (B) down and remove service hole cover.



5) Disconnect the connector from fuel pump.



6) Disconnect the quick connector and then disconnect the fuel delivery hose, return hose and jet pump hose. <Ref. to FU(H6DO)-54, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>
7) Remove the nuts which install the fuel pump assembly to fuel tank.



(A) Delivery hose
(B) Return hose
(C) Jet pump hose

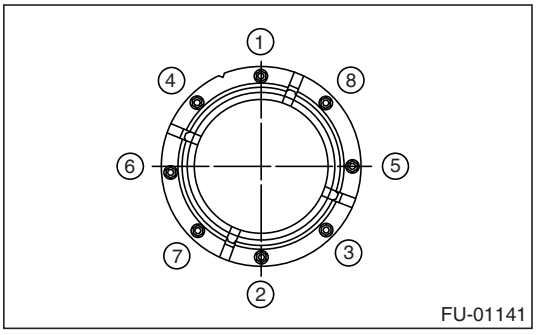
8) Remove the fuel pump assembly from fuel tank.

B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Use a new gasket.
(1) Ensure the sealing portion is free from fuel or foreign particles before installation.
(2) Tighten the nuts to specified torque in the order as shown in the figure.

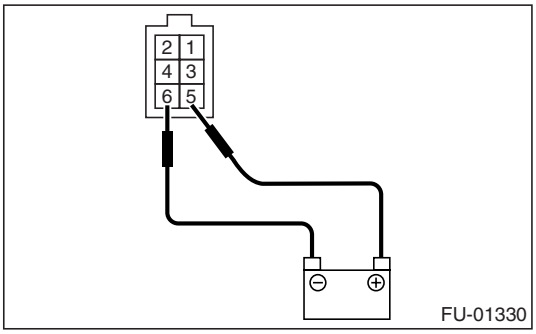
Tightening torque:
4.4 N·m (0.45 kgf-m, 3.2 ft-lb)



C: INSPECTION

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

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



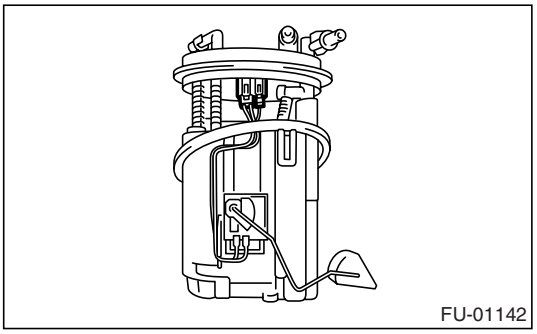
26.Fuel Level Sensor

A: REMOVAL

WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel on the floor.**
- **Reduce the fuel in the fuel tank to less than 3/4 beforehand. Be careful that fuel may spill when the fuel is more than 3/4.**

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

1) Remove the fuel pump assembly. <Ref. to FU(H6DO)-48, REMOVAL, Fuel Pump.>
2) Disconnect the connector from fuel pump bracket.



3) Remove the fuel level sensor.

B: INSTALLATION

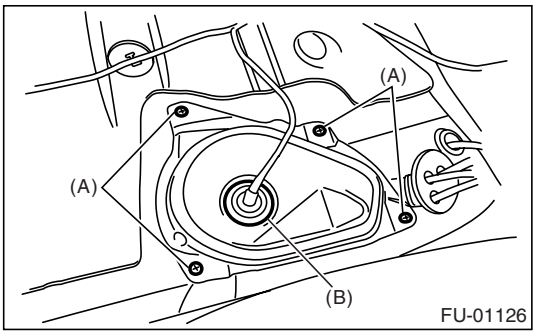
Install in the reverse order of removal.

27.Fuel Sub Level Sensor

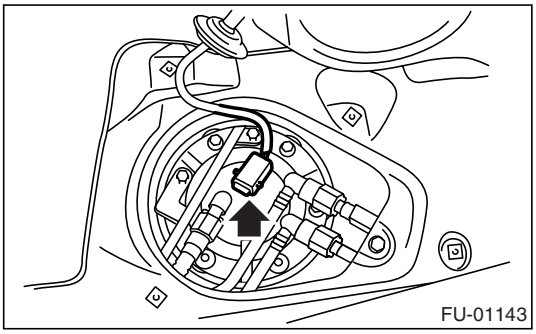
A: REMOVAL

WARNING:
- **Place "NO FIRE" signs near the working area.**
- **Be careful not to spill fuel on the floor.**
- **Reduce the fuel in the fuel tank to less than 3/4 beforehand. Be careful that fuel may spill when the fuel is more than 3/4.**

1) Drain fuel. <Ref. to FU(H6DO)-39, DRAINING FUEL, PROCEDURE, Fuel.>
2) Remove the rear seat.
3) Remove the service hole cover.
   (1) Remove the bolts (A).
   (2) Push the grommet (B) down and remove the service hole cover.

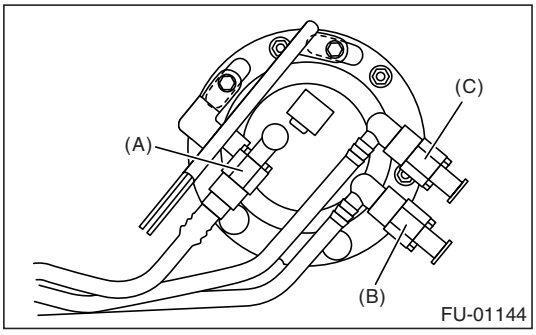


4) Disconnect the connector from fuel sub level sensor.



5) Disconnect the quick connector and then disconnect the fuel delivery hose, return hose and jet pump hose. <Ref. to FU(H6DO)-54, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>

6) Remove the nuts and bolts which install the fuel sub level sensor on fuel tank.



(A) Jet pump hose
(B) Delivery hose
(C) Return hose

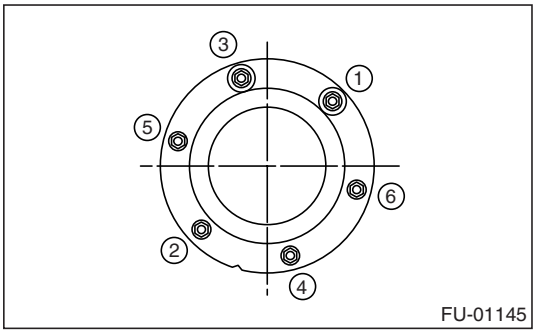
7) Remove the fuel sub level sensor.

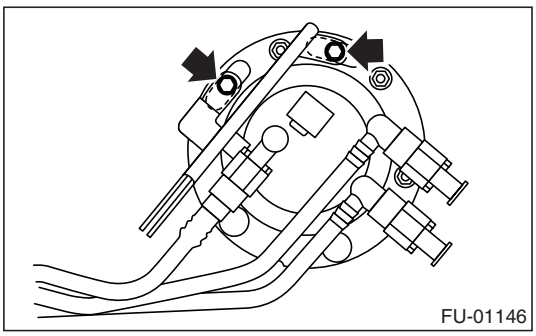
B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Use a new gasket.
(1) Ensure the sealing portion is free from fuel or foreign particles before installation.
(2) Tighten the nuts and bolts to specified torque in the order as shown in the figure.

Tightening torque:
4.4 N·m (0.45 kgf-m, 3.2 ft-lb)





28.Fuel Filter

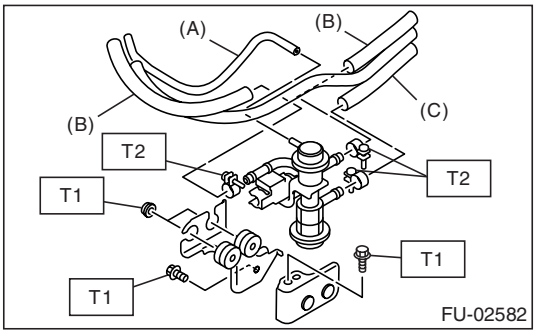
A: SPECIFICATION

Fuel filter forms a single unit with fuel pump.
Refer to Fuel Pump for removal and installation procedures. <Ref. to FU(H6DO)-48, REMOVAL, Fuel Pump.>
<Ref. to FU(H6DO)-48, INSTALLATION, Fuel Pump.>

29.Fuel Bypass Valve

A: REMOVAL

1) Release the fuel pressure. <Ref. to FU(H6DO)-39, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Disconnect the pressure regulator vacuum hose.
3) Disconnect the fuel delivery line and return line from fuel bypass valve.
4) Remove the fuel bypass valve from vehicle.



(A) Pressure regulator vacuum hose
(B) Fuel delivery line
(C) Fuel return line

B: INSTALLATION

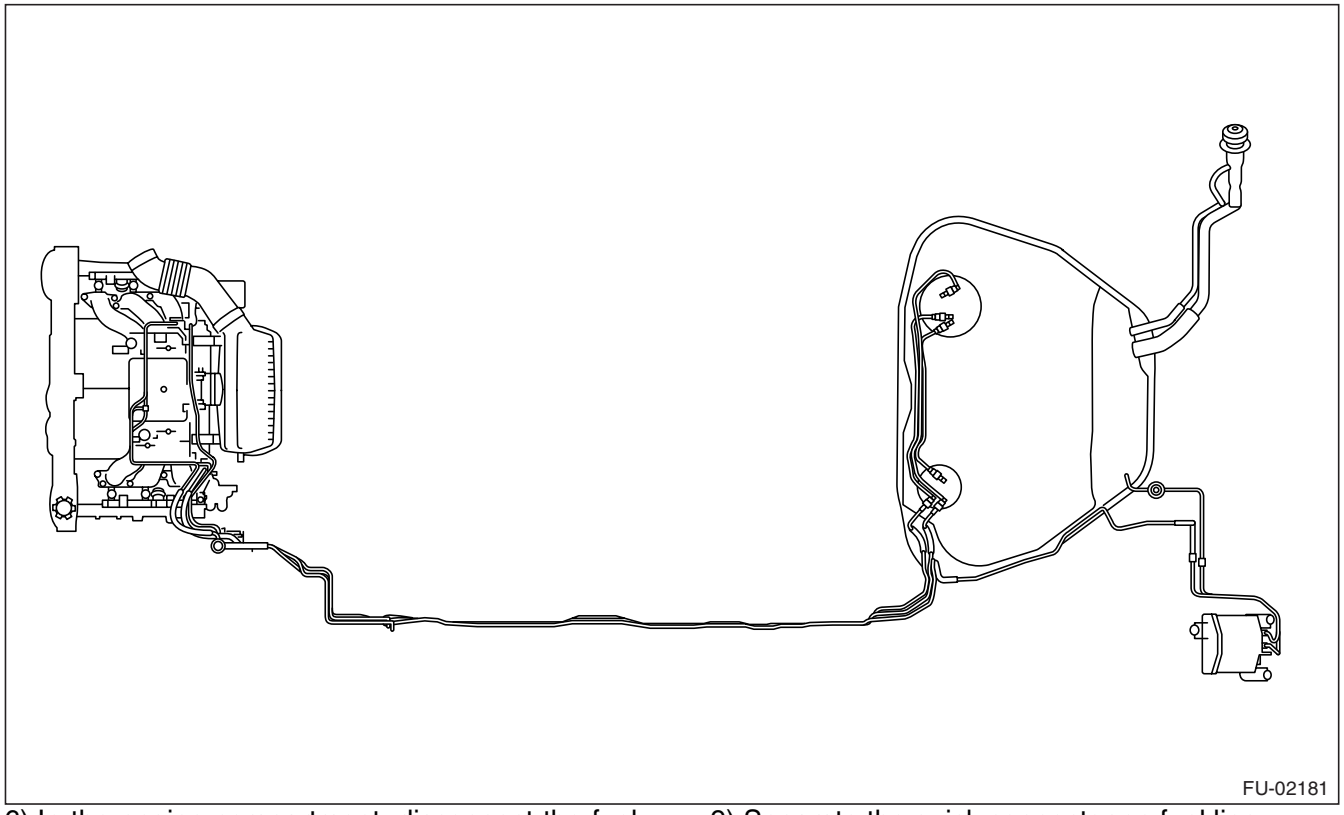
Install in the reverse order of removal.

Tightening torque:
T1: 7.5 N·m (0.76 kgf-m, 5.5 ft-lb)
T2: 1.25 N·m (0.13 kgf-m, 0.94 ft-lb)

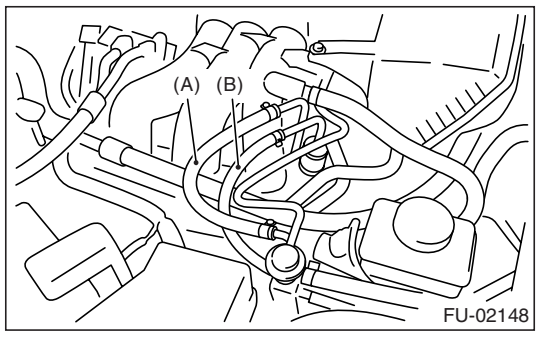
30. Fuel Delivery, Return and Evaporation Lines

A: REMOVAL

1) Set the vehicle on a lift.
2) Release the fuel pressure. <Ref. to FU(H6DO)-39, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
3) Open fuel filler flap lid, and remove fuel filler cap.
4) Remove the floor mat. <Ref. to EI-73, REMOVAL, Floor Mat.>
5) Disconnect the fuel delivery pipes and hoses, and then disconnect the fuel return pipes and hoses, evaporation pipes and hoses.


FU-02181

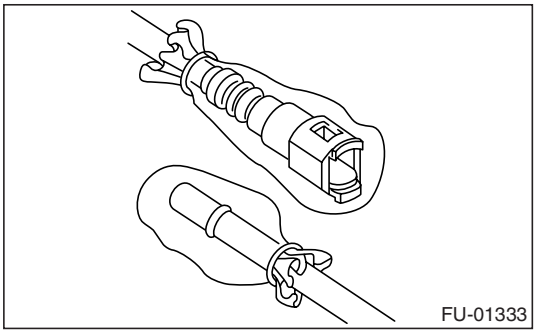
6) In the engine compartment, disconnect the fuel delivery hoses, return hoses, and evaporation hose.



FU-02148

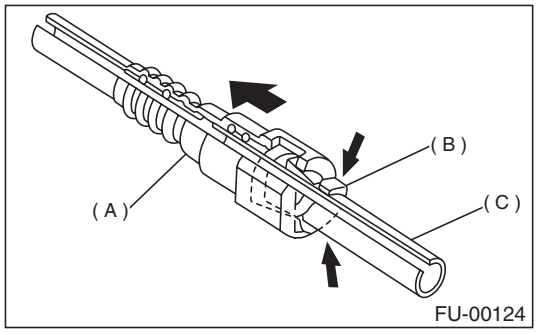
(A) Fuel delivery hose
(B) Evaporation hose

7) Lift-up the vehicle.
8) Remove the fuel tank. <Ref. to FU(H6DO)-40, REMOVAL, Fuel Tank.>
9) Separate the quick connector on fuel line.
(1) Clean the pipe and connector, if they are covered with dust.
(2) To prevent from damaging or entering foreign matter, wrap the pipes and connectors with plastic bag, etc.


FU-01333

(3) Hold the connector and push retainer down.
(4) Pull out the connector from retainer.

CAUTION:
Replace new retainer.

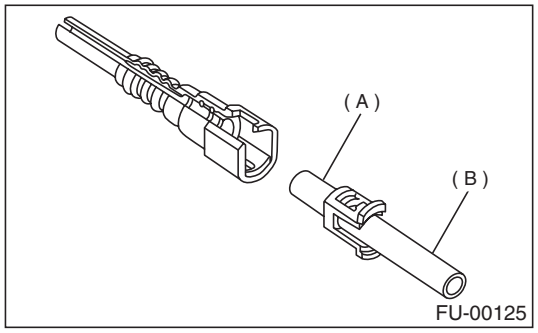


(A) Connector
(B) Retainer
(C) Pipe

B: INSTALLATION

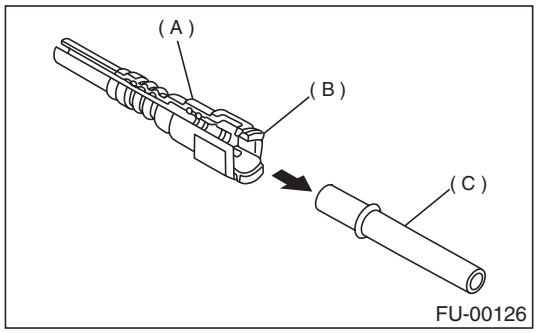
1) Connect the quick connector of fuel line.

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



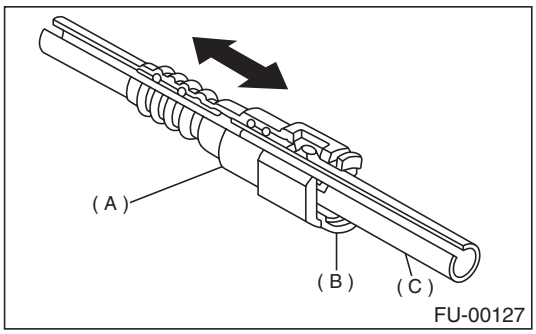
(A) Seal surface
(B) Pipe

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



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

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



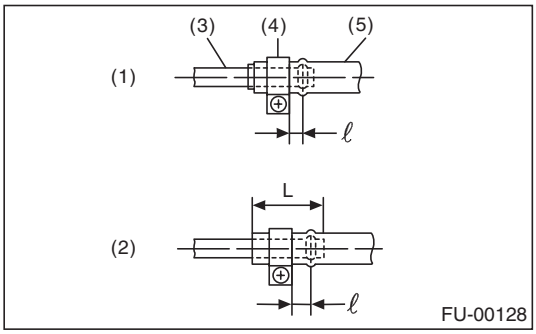
(A) Connector
(B) Retainer
(C) Pipe

2) Connect the fuel delivery hose and return hose to the pipe with an overlap of 20 to 25 mm (0.79 to 0.98 in).
Type A: When the amount to be inserted is specified.
Type B: When the amount to be inserted 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)

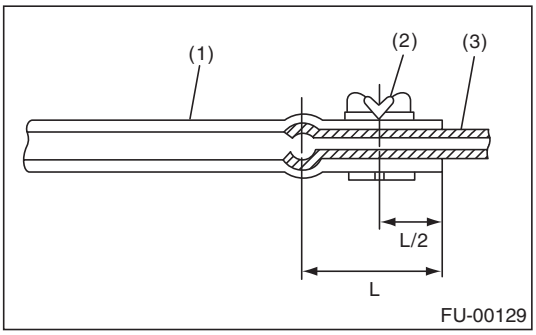
CAUTION:
Be sure to inspect the hoses and their connections for fuel leakage.



(1) Type A
(2) Type B
(3) Pipe
(4) Clamp
(5) Hose

3) Connect the evaporation hose to the pipe with an overlap of 15 to 20 mm (0.59 to 0.79 in).

L = 17.5±2.5 mm (0.689±0.098 in)



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

C: INSPECTION

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

31.Fuel System Trouble in General

A: INSPECTION

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

NOTE:
• When the vehicle is left unused for an extended period of time, water may accumulate in the fuel tank. Fill fuel fully to prevent those problem. And also drain the water condensation from fuel filter.
• In snow-covered areas, mountainous areas, skiing areas, etc. where ambient temperatures drop below 0°C (32°F) throughout the winter season, use water removing agent in the fuel system to prevent freezing fuel system and accumulating water. Fill the water removing agent each time the fuel is reduced to half to maintain the advantage.
• When water condensation is noticed in the fuel filter, drain the water from both the fuel filter and fuel tank or use water removing agent in the fuel tank.
• Before using water removing agent, follow the cautions noted on the bottle.

EMISSION CONTROL
(AUX. EMISSION CONTROL DEVICES)
EC(H6DO)

Page

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2. Front Catalytic Converter 3
3. Rear Catalytic Converter 4
4. EGR Valve 5
5. Canister 6
6. Purge Control Solenoid Valve 7
7. Two-way Valve 8
8. PCV Valve 9

1. General Description

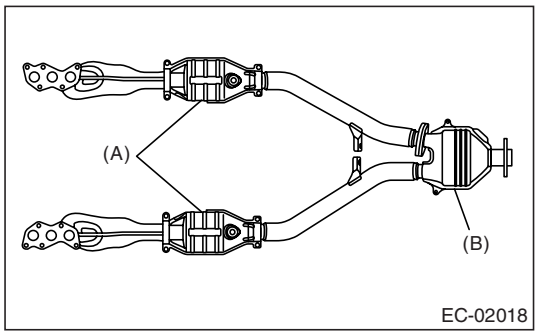
A: CAUTION

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

2. Front Catalytic Converter

A: REMOVAL

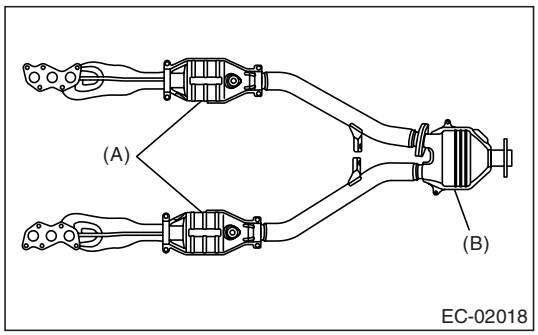
The front and rear catalytic converters are integrated into front exhaust pipe as one unit; therefore, refer to “Front Exhaust Pipe” for removal procedure. <Ref. to EX(H6DO)-4, REMOVAL, Front Exhaust Pipe.>



(A) Front catalytic converter
(B) Rear catalytic converter

B: INSTALLATION

The front and rear catalytic converters are integrated into front exhaust pipe as one unit; therefore, refer to “Front Exhaust Pipe” for installation procedure. <Ref. to EX(H6DO)-5, INSTALLATION, Front Exhaust Pipe.>



(A) Front catalytic converter
(B) Rear catalytic converter

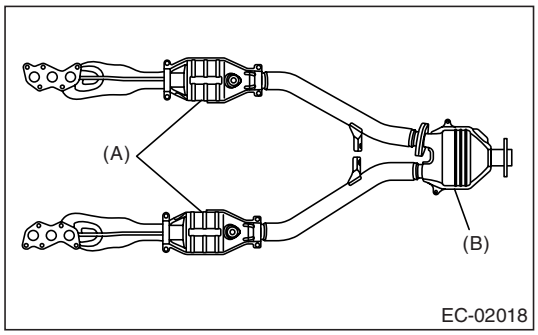
C: INSPECTION

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

3. Rear Catalytic Converter

A: REMOVAL

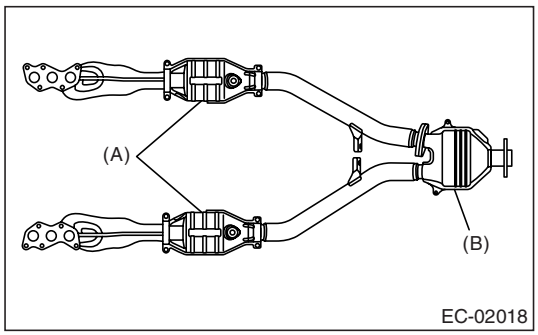
The front and rear catalytic converters are integrated into front exhaust pipe as one unit; therefore, refer to “Front Exhaust Pipe” for removal procedure. <Ref. to EX(H6DO)-4, REMOVAL, Front Exhaust Pipe.>



(A) Front catalytic converter
(B) Rear catalytic converter

B: INSTALLATION

The front and rear catalytic converters are integrated into front exhaust pipe as one unit; therefore, refer to “Front Exhaust Pipe” for installation procedure. <Ref. to EX(H6DO)-5, INSTALLATION, Front Exhaust Pipe.>



(A) Front catalytic converter
(B) Rear catalytic converter

C: INSPECTION

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

4. EGR Valve

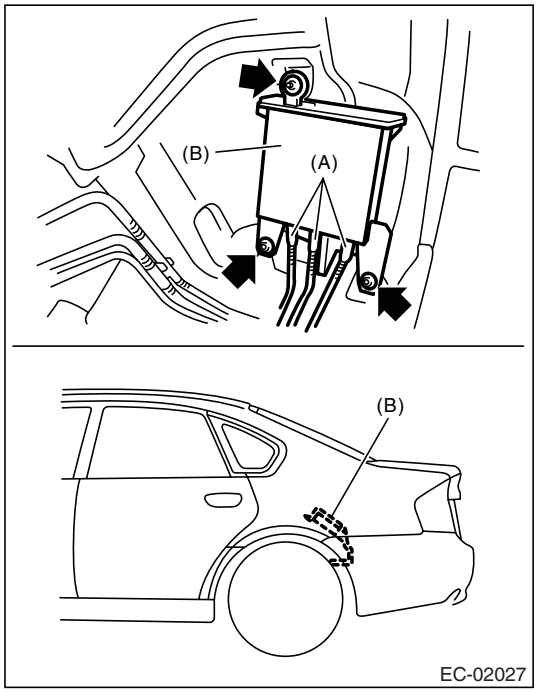
A: SPECIFICATION

Refer to “EGR valve” for removal and installation.
<Ref. to FU(H6DO)-25, EGR Valve.>

5. Canister

A: REMOVAL

1) Lift-up the vehicle.
2) Remove the rear wheel LH.
3) Remove the mud guard LH.
4) Remove the protector. (Sedan model)
5) Disconnect the quick connector (A).
6) Remove the canister (B) from body.

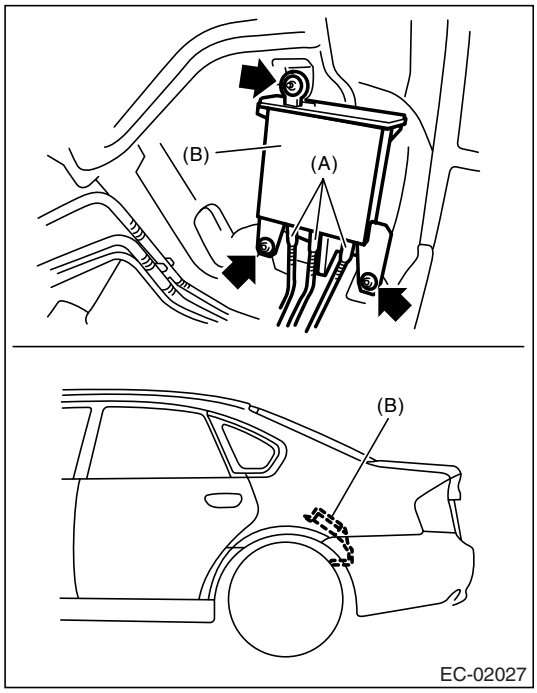


B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Make sure there are no damage or dust on the connection of quick connector. If necessary, clean the seal surface of pipe.

Tightening torque:
8.3 N·m (0.85 kgf-m, 6.1 ft-lb)



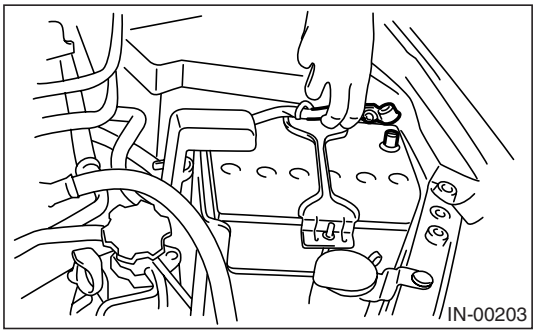
C: INSPECTION

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

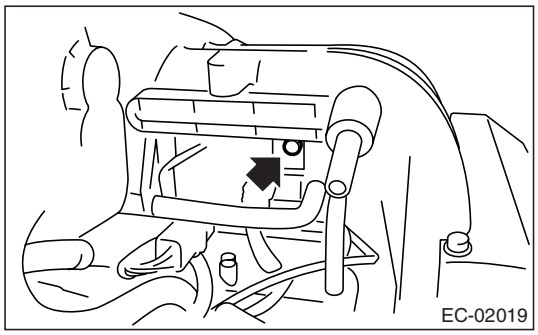
6. Purge Control Solenoid Valve

A: REMOVAL

1) Remove the collector cover.
2) Disconnect the ground cable from battery.



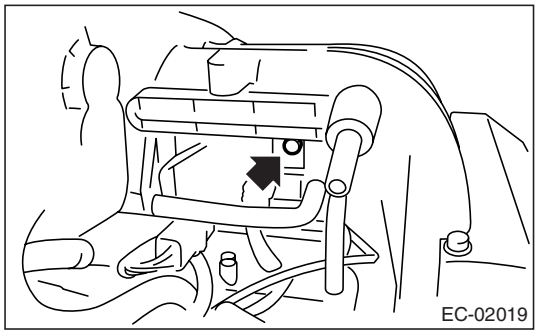
3) Remove the air intake chamber. <Ref. to IN(H6DO)-7, REMOVAL, Air Intake Chamber.>
4) Disconnect the connector and hoses of purge control solenoid valve, and then remove the purge control solenoid valve.



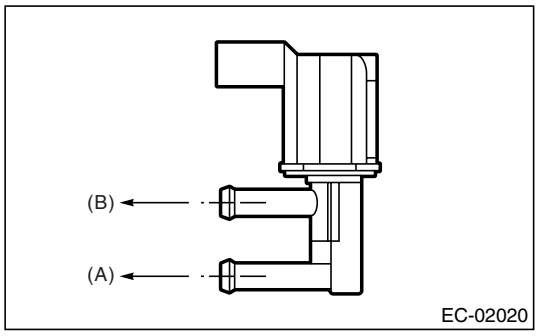
B: INSTALLATION

Install in the reverse order of removal.

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



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



(A) To fuel pipe (Evaporation line)
(B) To intake manifold

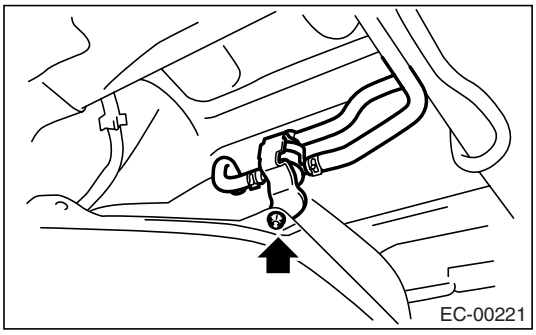
C: INSPECTION

Make sure the hoses are not cracked or loose.

7. Two-way Valve

A: REMOVAL

1) Lift-up the vehicle.
2) Disconnect the evaporation hoses from two-way valve.
3) Remove the two-way valve as a unit with bracket from body.



4) Remove the two-way valve from bracket.

B: INSTALLATION

Install in the reverse order of removal.

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

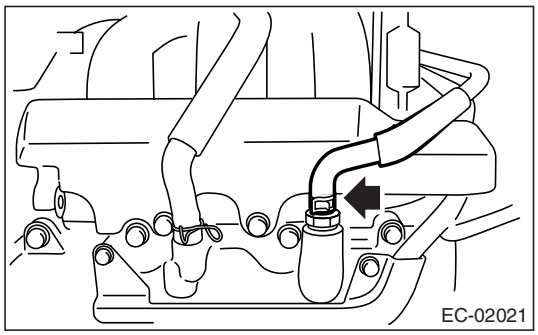
C: INSPECTION

Make sure the hoses are not cracked or loose.

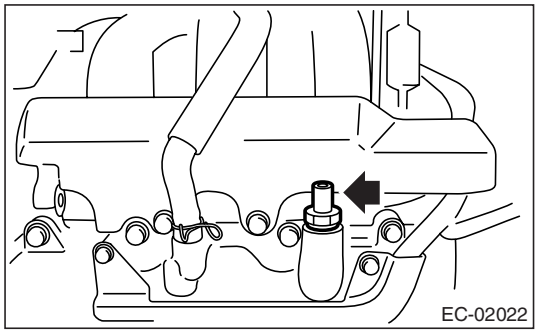
8. PCV Valve

A: REMOVAL

1) Disconnect the PCV hose.



2) Remove the PCV valve from rocker cover.



B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Apply liquid gasket to the bolt threads of PCV valve.

Liquid gasket:
THREE BOND 1105 (Part No. 004403010)

Tightening torque:
25 N·m (2.5 kgf-m, 18 ft-lb)

INTAKE (INDUCTION)

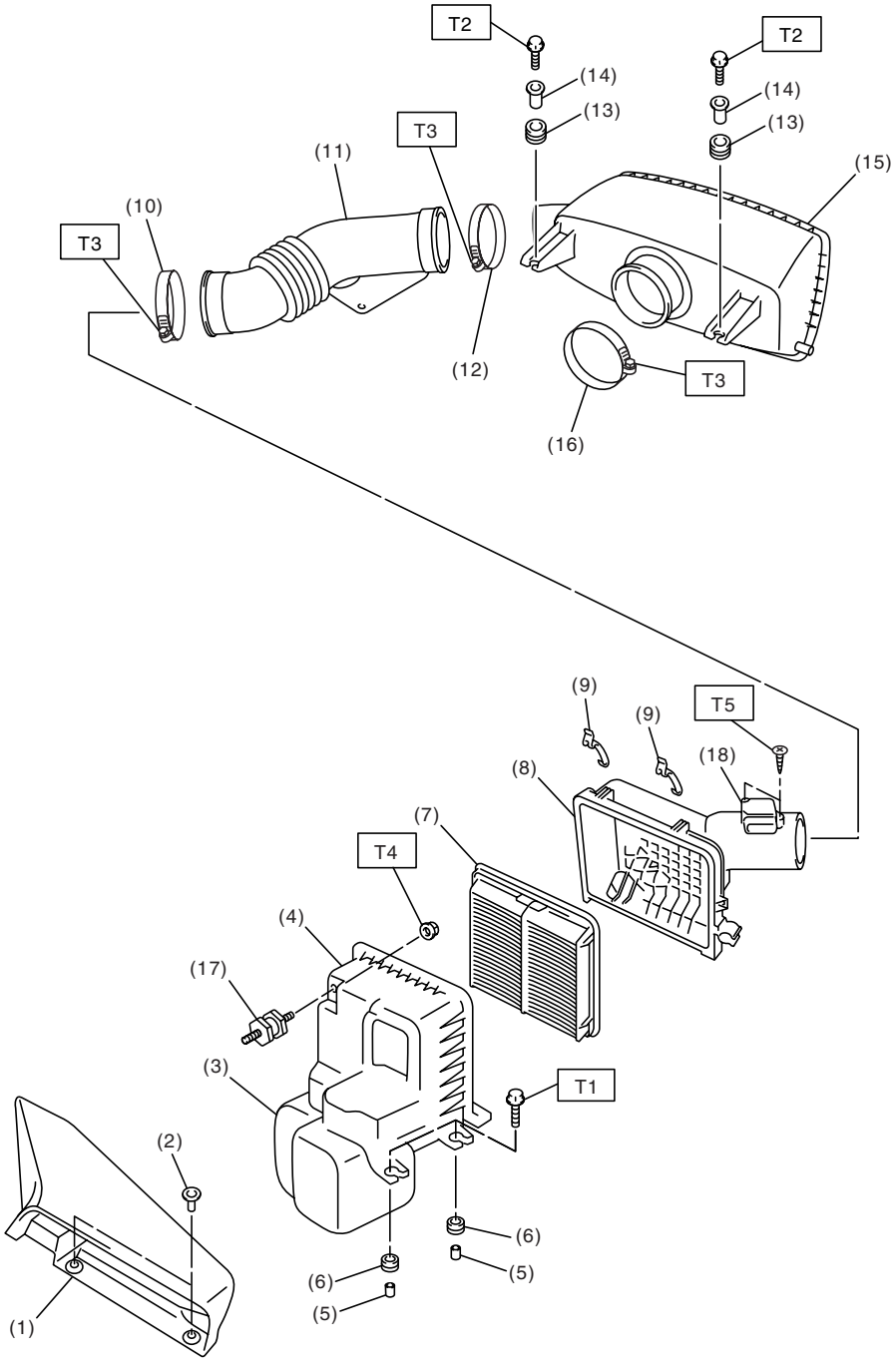
IN(H6DO)

Page

1. General Description 2
2. Air Cleaner Element 4
3. Air Cleaner Case 5
4. Air Intake Chamber 7
5. Air Intake Duct 8
6. Resonator Chamber 9

1. General Description

A: COMPONENT



IN-02008

(1) Air intake duct
(2) Clip
(3) Resonator chamber
(4) Air cleaner case (front)
(5) Spacer
(6) Cushion
(7) Air cleaner element
(8) Air cleaner case (rear)
(9) Clip
(10) Clamp
(11) Intake duct
(12) Clamp
(13) Cushion
(14) Spacer
(15) Air intake chamber
(16) Clamp
(17) Cushion
(18) Mass air flow and intake air temperature sensor

Tightening torque: N·m (kgf-m, ft-lb)	
T1:	*6.0 (0.6, 4.4)*
T2:	*6.4 (0.65, 4.7)*
T3:	*3.0 (0.3, 2.2)*
T4:	*7.5 (0.76, 5.5)*
T5:	*1.0 (0.10, 0.7)*

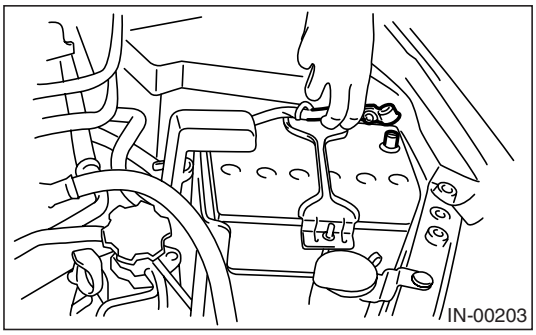
B: CAUTION

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

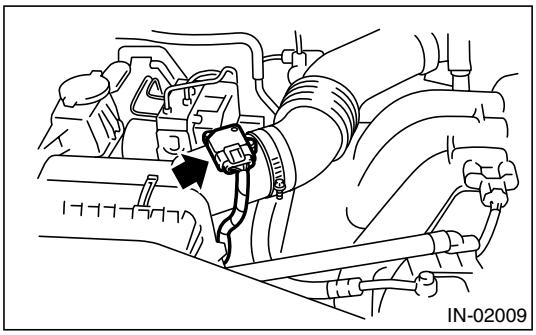
2. Air Cleaner Element

A: REMOVAL

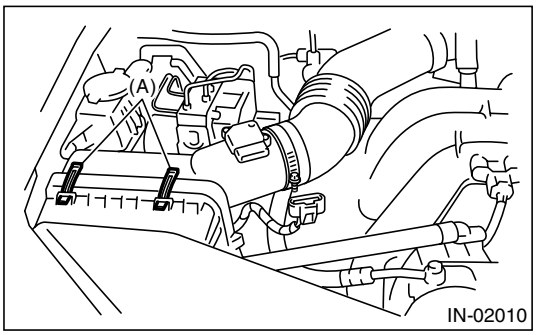
1) Disconnect the ground cable from battery.



2) Disconnect the connector from mass air flow and intake air temperature sensor.



3) Remove the clip (A) from the upper side of air cleaner case.



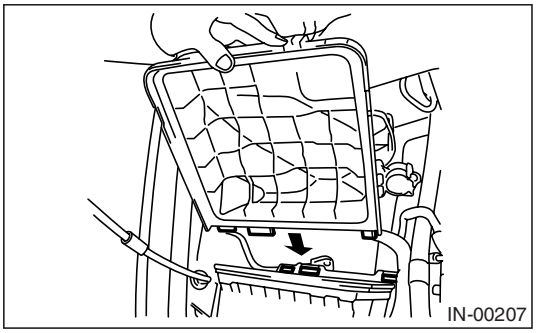
4) Pull the air cleaner case (rear) to the rearward of vehicle, and then remove the air cleaner element.

NOTE:
Be careful that the power steering hose is secured to the under side of air cleaner case (rear).

B: INSTALLATION

Install in the reverse order of removal.

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



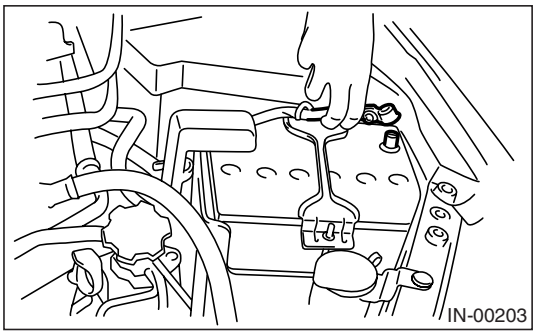
C: INSPECTION

Replace if excessively damaged or dirty.

3. Air Cleaner Case

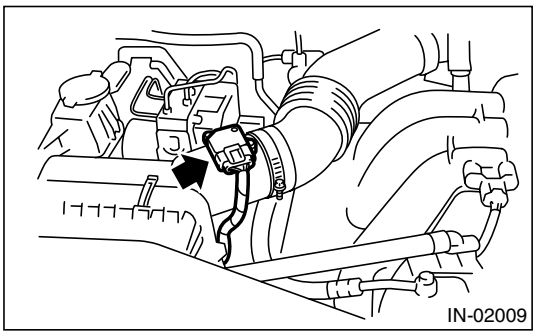
A: REMOVAL

1) Disconnect the ground cable from battery.



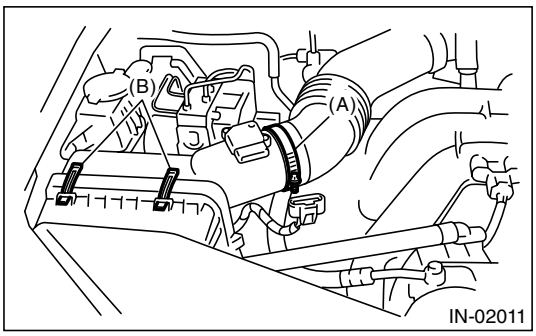
2) Remove the air intake duct. <Ref. to IN(H6DO)-8, REMOVAL, Air Intake Duct.>

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

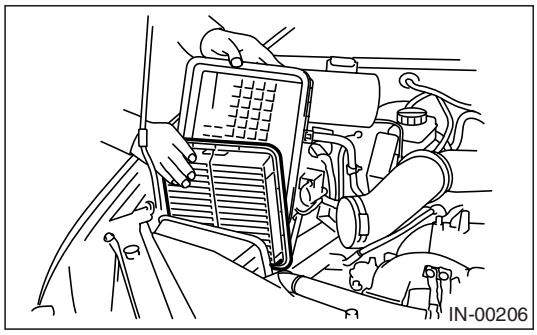


4) Loosen the clamp (A) which connects air cleaner case to intake duct.

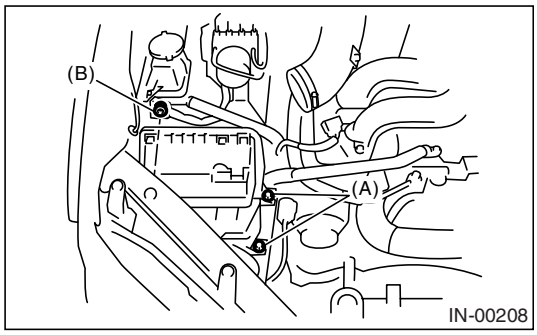
5) Remove the clip (B) from the upper side of air cleaner case.



6) Remove the air cleaner case (rear) and air cleaner element.



7) Remove the bolt (A) and nut (B) which hold air cleaner case on the body.

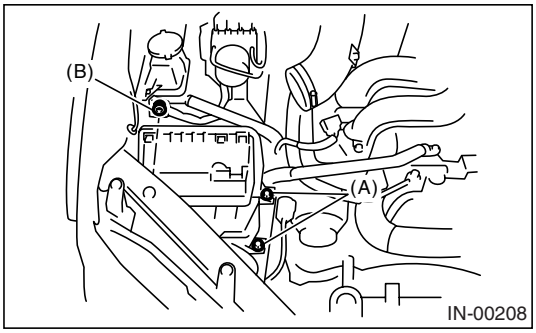


8) Remove the air cleaner case (front).

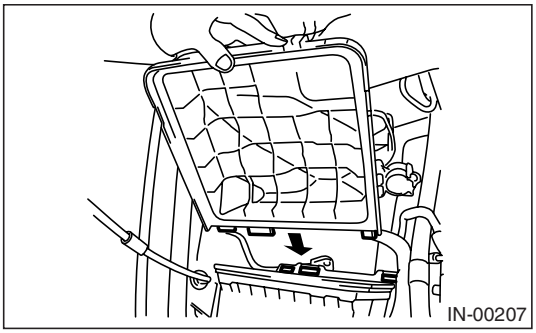
B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
Bolt (A): 6.0 N·m (0.6 kgf-m, 4.4 ft-lb)
Nut (B): 7.5 N·m (0.76 kgf-m, 5.5 ft-lb)



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



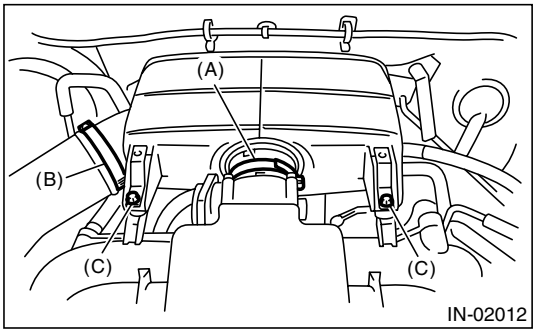
C: INSPECTION

Check for cracks or loose connection.

4. Air Intake Chamber

A: REMOVAL

1) Remove the collector cover.
2) Loosen the clamp (A) which connects air intake chamber to throttle body.
3) Loosen the clamp (B) which connects intake duct to air intake chamber.
4) Remove the bolt (C) which secures air intake chamber to the stay.

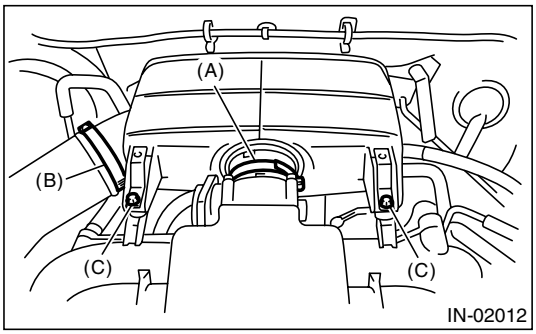


5) Disconnect one part of blow-by hose, and remove the air intake chamber.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:
Clamp (A), (B)
3.0 N·m (0.3 kgf-m, 2.2 ft-lb)
Bolt (C)
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



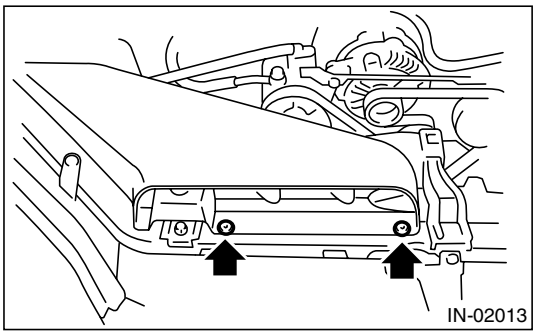
C: INSPECTION

1) Check for cracks or loose connections.
2) Inspect that no foreign objects in the air intake chamber.

5. Air Intake Duct

A: REMOVAL

1) Remove the clips which install air intake duct on the front side of body.
2) Remove the air intake duct.



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

1) Check for cracks or loose connections.
2) Inspect that no foreign objects in the air intake duct.

6. Resonator Chamber

A: REMOVAL

Refer to “Air Cleaner Case” for removal procedure because the resonator chamber forms a single unit with air cleaner case. <Ref. to IN(H6DO)-5, REMOVAL, Air Cleaner Case.>

B: INSTALLATION

Refer to “Air Cleaner Case” for installation procedure because the resonator chamber forms a single unit with air cleaner case. <Ref. to IN(H6DO)-6, INSTALLATION, Air Cleaner Case.>

C: INSPECTION

Check for cracks or loose connections.

MECHANICAL

ME(H6DO)

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1. General Description

A: SPECIFICATION

Engine	Cylinder arrangement			Horizontally opposed, liquid cooled, 6-cylinder, 4-stroke gasoline engine
	Valve system mechanism			Chain driven, double overhead camshaft, 4-valve / cylinder
	Bore × Stroke mm (in)			89.2 × 80 (3.512 × 3.150)
	Displacement cm^3 (cu in)			3,000 (183)
	Compression ratio			10.7
	Compression pressure (350 rpm and fully open throttle): kPa (kgf/cm^2, psi)			1,275 — 1,471 (13.0 — 15.0, 185 — 213)
	Number of piston rings			Pressure ring: 2, Oil ring: 1
	Intake valve timing	Min. advance	Open	BTDC 47°
			Close	ABDC 23°
		Max. retard	Open	ATDC 3°
			Close	ABDC 73°
	Exhaust valve timing		Open	BBDC 60°
			Close	ATDC 6°
	Valve clearance mm (in)	Intake		$0.20^{+0.04}_{-0.06}$ ($0.0079^{+0.0016}_{-0.0024}$)
		Exhaust		0.35±0.05 (0.0138±0.020)
	Idle speed [“P” or “N” range] rpm		No load	650±50
			A/C ON	770±50
	Ignition order			1 → 6 →3 → 2 → 5 → 4
	Ignition timing BTDC/rpm			15°±8°/650

NOTE:
OS: Oversize US: undersize

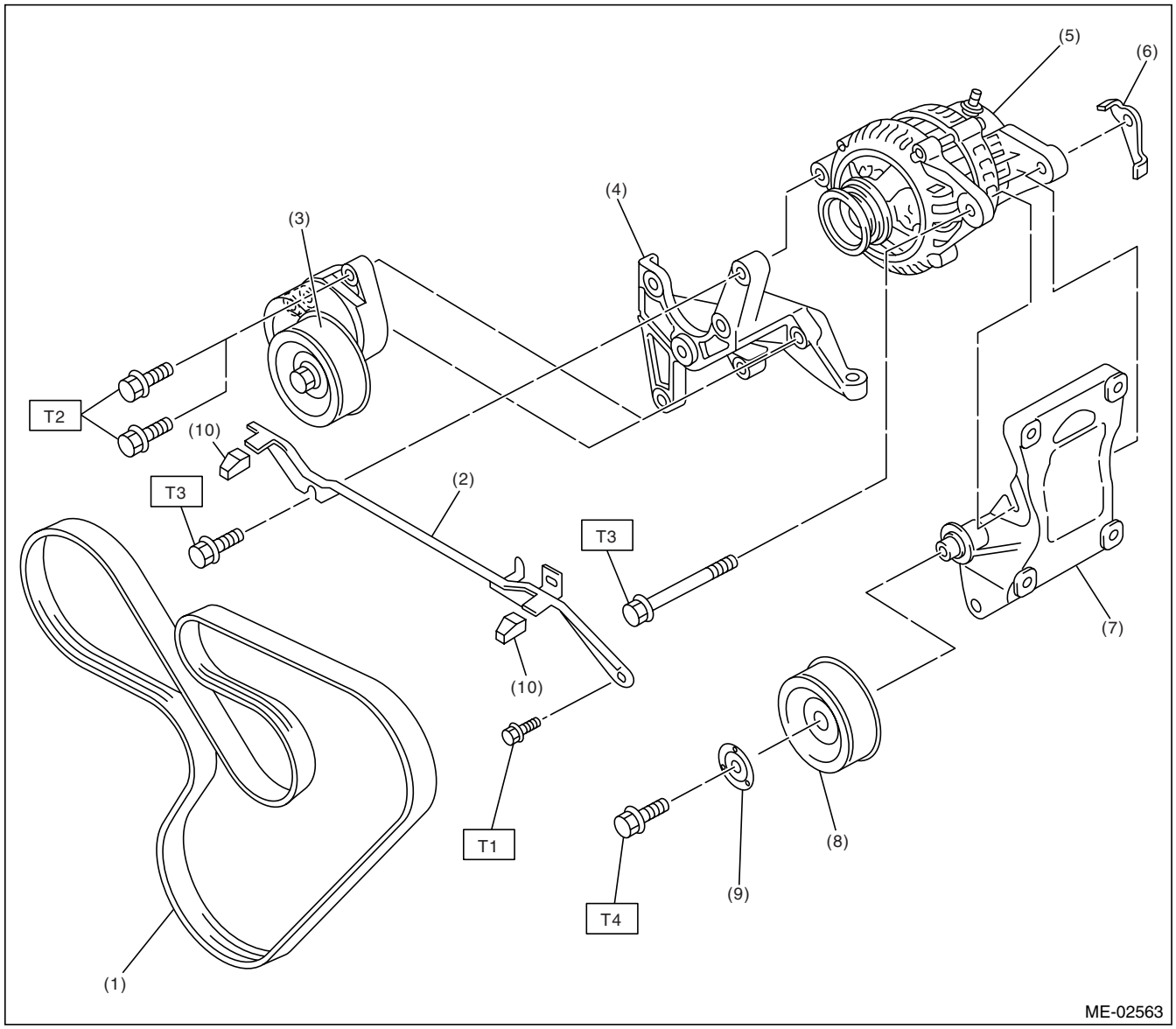
Camshaft	Thrust clearance mm (in)	Intake		Standard	0.075 — 0.135 (0.0030 — 0.0053)
		Exhaust		Standard	0.030 — 0.090 (0.0012 — 0.0035)
	Cam lobe height mm (in)	Intake	HIGH	Standard	42.09 — 42.19 (1.6571 — 1.6610)
			LOW1	Standard	38.14 — 38.24 (1.5016 — 1.5055)
			LOW2	Standard	34.94 — 35.04 (1.3756 — 1.3795)
		Exhaust		Standard	41.65 — 41.75 (1.6398 — 1.6437)
	Cam base circle diameter mm (in)	Intake	HIGH	Standard	32.00 (1.2598)
			LOW1	Standard	31.84 (1.2535)
			LOW2	Standard	31.84 (1.2535)
		Exhaust		Standard	32.00 (1.2598)
	Journal O.D. mm (in)	Front		Standard	37.946 — 37.963 (1.4939 — 1.4946)
		Except for front		Standard	25.946 — 25.963 (1.0215 — 1.0222)
	Oil clearance mm (in)			Standard	0.037 — 0.072 (0.0015 — 0.0028)
Cylinder head	Flatness mm (in)			Standard	0.02 (0.0008)
	Inner diameter of valve lifter hole mm (in)				32.994 — 33.016 (1.2990 — 1.2998)
	Standard height mm (in)				124±0.05 (4.88±0.0020)
Valve seat	Refacing angle				90°
	Contacting width mm (in)	Intake		Standard	1.0 (0.039)
		Exhaust		Standard	1.5 (0.059)
Valve guide	Inside diameter mm (in)				5.500 — 5.512 (0.2165 — 0.2170)
	Protrusion above head mm (in)				11.4 — 11.8 (0.449 — 0.465)

Valve	Head edge thickness mm (in)	Intake		Standard	1.0 (0.039)
		Exhaust		Standard	1.2 (0.047)
	Stem outer diameter mm (in)	Intake			5.455 — 5.470 (0.2148 — 0.2154)
		Exhaust			5.445 — 5.460 (0.2144 — 0.2150)
	Stem oil clearance	Intake		Standard	0.030 — 0.057 (0.0012 — 0.0022)
		Exhaust		Standard	0.040 — 0.067 (0.0016 — 0.0026)
	Overall length mm (in)	Intake			99.7 (3.925)
		Exhaust			105.2 (4.142)
	Outer diameter of valve lifter mm (in)				32.959 — 32.975 (1.2976 — 1.2982)
Valve spring	Free length mm (in)	Intake		Inner	39.55 (1.5571)
				Outer	41.18 (1.6213)
		Exhaust			46.32 (1.8236)
	Squareness	Intake		Inner	2.5°, 1.7 mm (0.067 in)
				Outer	2.5°, 1.8 mm (0.071 in)
		Exhaust			2.5°, 2.0 mm (0.079 in)
Cylinder block	Standard height mm (in)				202 (7.95)
	Cylinder inner diameter mm (in)	Stan-dard		A	89.205 — 89.215 (3.5120 — 3.5124)
				B	89.195 — 89.205 (3.5116 — 3.5120)
	Cylindricality mm (in)			Standard	0.030 (0.0012)
	Out-of-roundness mm (in)			Standard	0.010 (0.0004)
	Piston clearance mm (in)			Standard	–0.010 — 0.010 (–0.0004 — 0.0004)
Piston	Outer diameter mm (in)	Standard		A	89.205 — 89.215 (3.5120 — 3.5124)
				B	89.195 — 89.205 (3.5116 — 3.5120)
		0.25 (0.0098) OS			89.445 — 89.465 (3.5215 — 3.5222)
		0.50 (0.0197) OS			89.695 — 89.715 (3.5313 — 3.5321)
	Inner diameter of piston pin hole			Standard	22.000 — 22.006 (0.8661 — 0.8664)
Piston pin	Outer diameter mm (in)			Standard	21.994 — 22.000 (0.8659 — 0.8661)
	Standard clearance between piston and piston pin mm (in)			Standard	0.004 — 0.008 (0.0002 — 0.0003)
Piston ring	Ring closed gap mm (in)	Top ring		Standard	0.20 — 0.35 (0.0079 — 0.0138)
		Second ring		Standard	0.35 — 0.50 (0.0138 — 0.0197)
		Oil ring		Standard	0.20 — 0.60 (0.0079 — 0.0236)
	Ring groove gap mm (in)	Top ring		Standard	0.040 — 0.080 (0.0016 — 0.0031)
		Second ring		Standard	0.030 — 0.070 (0.0012 — 0.0028)
		Oil ring		Standard	0.045 — 0.125 (0.0018 — 0.0049)
Connecting rod	Thrust clearance mm (in)			Standard	0.070 — 0.330 (0.0028 — 0.0130)
Bearing of large end	Oil clearance mm (in)			Standard	0.016 — 0.043 (0.0006 — 0.0017)
	Bearing size (Thickness at center) mm (in)	Standard			1.490 — 1.506 (0.0587 — 0.0593)
		0.03 (0.0012) US			1.509 — 1.513 (0.0594 — 0.0596)
		0.05 (0.0020) US			1.519 — 1.523 (0.0598 — 0.0600)
		0.25 (0.0098) US			1.619 — 1.623 (0.0637 — 0.0639)
Bushing of small end	Clearance between piston pin and bushing mm (in)			Standard	0 — 0.022 (0 — 0.0009)

Crankshaft	Crank pin and crank journal	Out-of-roundness mm (in)		0.005 (0.0002)
		Cylindricality mm (in)		0.006 (0.0002)
	Crank pin outer diameter mm (in)		Standard	51.984 — 52.000 (2.0466 — 2.0472)
			0.03 (0.0012) US	51.954 — 51.970 (2.0454 — 2.0461)
			0.05 (0.0020) US	51.934 — 51.950 (2.0446 — 2.0453)
			0.25 (0.0098) US	51.734 — 51.750 (2.0368 — 2.0374)
	Crank journal outer diameter mm (in)	#1, #3, #5, #7	Standard	63.992 — 64.008 (2.5194 — 2.5200)
			0.03 (0.0012) US	63.962 — 63.978 (2.5182 — 2.5188)
			0.05 (0.0020) US	63.942 — 63.958 (2.5174 — 2.5180)
			0.25 (0.0098) US	63.742 — 63.758 (2.5095 — 2.5102)
		#2, #4, #6	Standard	63.992 — 64.008 (2.5194 — 2.5200)
			0.03 (0.0012) US	63.962 — 63.978 (2.5182 — 2.5188)
			0.05 (0.0020) US	63.942 — 63.958 (2.5174 — 2.5180)
			0.25 (0.0098) US	63.742 — 63.758 (2.5095 — 2.5102)
	Thrust clearance mm (in)		Standard	0.030 — 0.115 (0.0012 — 0.0045)
	Oil clearance mm (in)		Standard	0.010 — 0.030 (0.0004 — 0.0012)
Main bearing	Bearing size (Thickness at center) mm (in)	#1, #3, #5, #7	Standard	1.992 — 2.005 (0.0784 — 0.0789)
			0.03 (0.0012) US	2.011 — 2.014 (0.0792 — 0.0793)
			0.05 (0.0020) US	2.021 — 2.024 (0.0796 — 0.0797)
			0.25 (0.0098) US	2.121 — 2.124 (0.0835 — 0.0836)
		#2, #4, #6	Standard	1.996 — 2.009 (0.0786 — 0.0791)
			0.03 (0.0012) US	2.015 — 2.018 (0.0793 — 0.0794)
			0.05 (0.0020) US	2.025 — 2.028 (0.0797 — 0.0798)
			0.25 (0.0098) US	2.125 — 2.128 (0.0837 — 0.0838)

B: COMPONENT

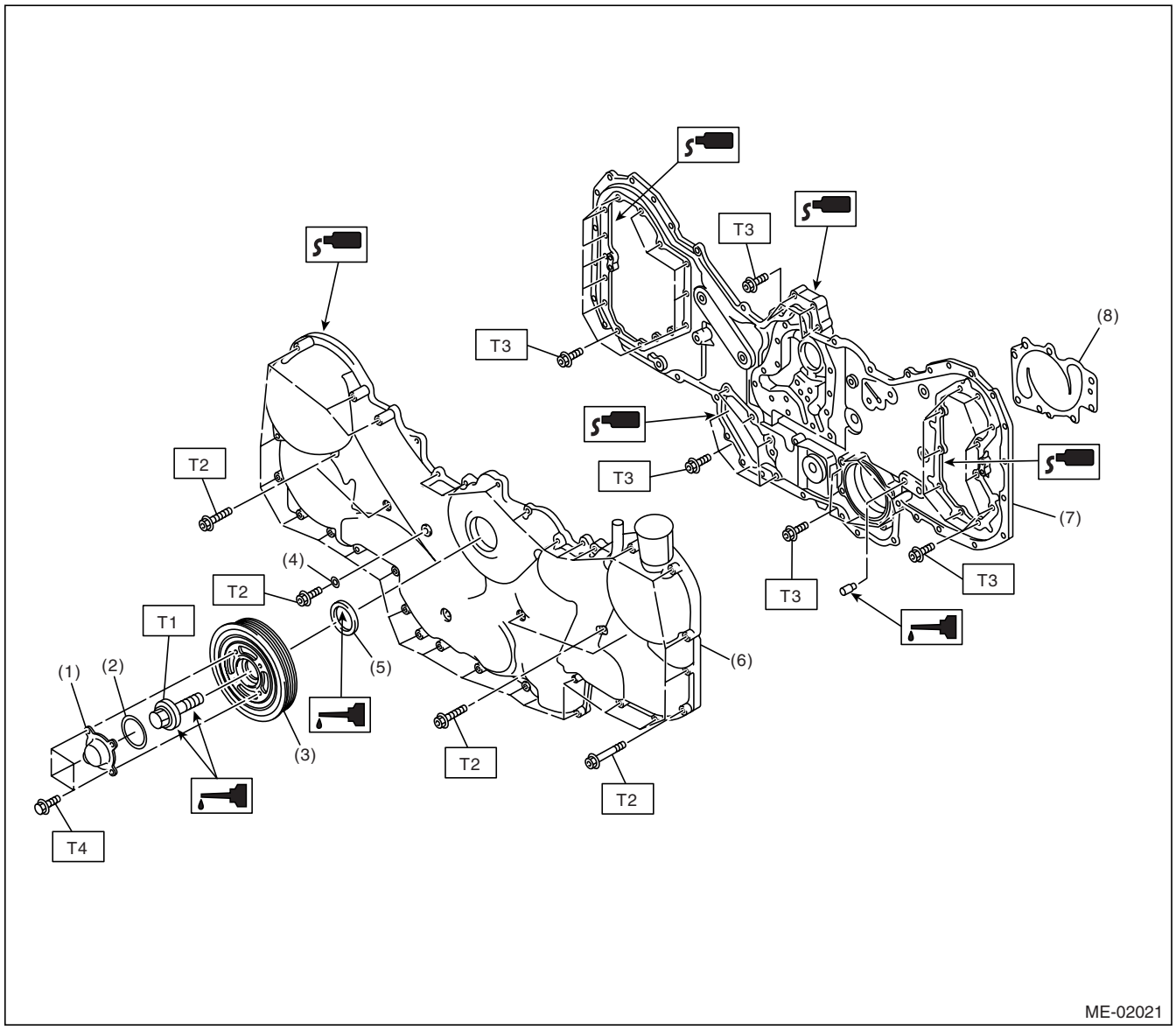
1. V-BELT



(1)	V-belt	(6)	Generator plate	
(2)	Collector cover bracket	(7)	A/C compressor stay	
(3)	Belt tension adjuster ASSY	(8)	Idler pulley	
(4)	Power steering pump bracket	(9)	Idler pulley cover	
(5)	Generator	(10)	Cushion	

Tightening torque: N·m (kgf-m, ft-lb)
T1: 6.4 (0.65, 4.7)
T2: 20 (2.0, 14)
T3: 25 (2.5, 18.4)
T4: 33 (3.4, 24.3)

2. TIMING CHAIN COVER



(1) Crank pulley cover
(2) O-ring
(3) Crank pulley
(4) Sealing washer
(5) Oil seal
(6) Front chain cover
(7) Rear chain cover
(8) Water pump gasket

Tightening torque: N·m (kgf-m, ft-lb)

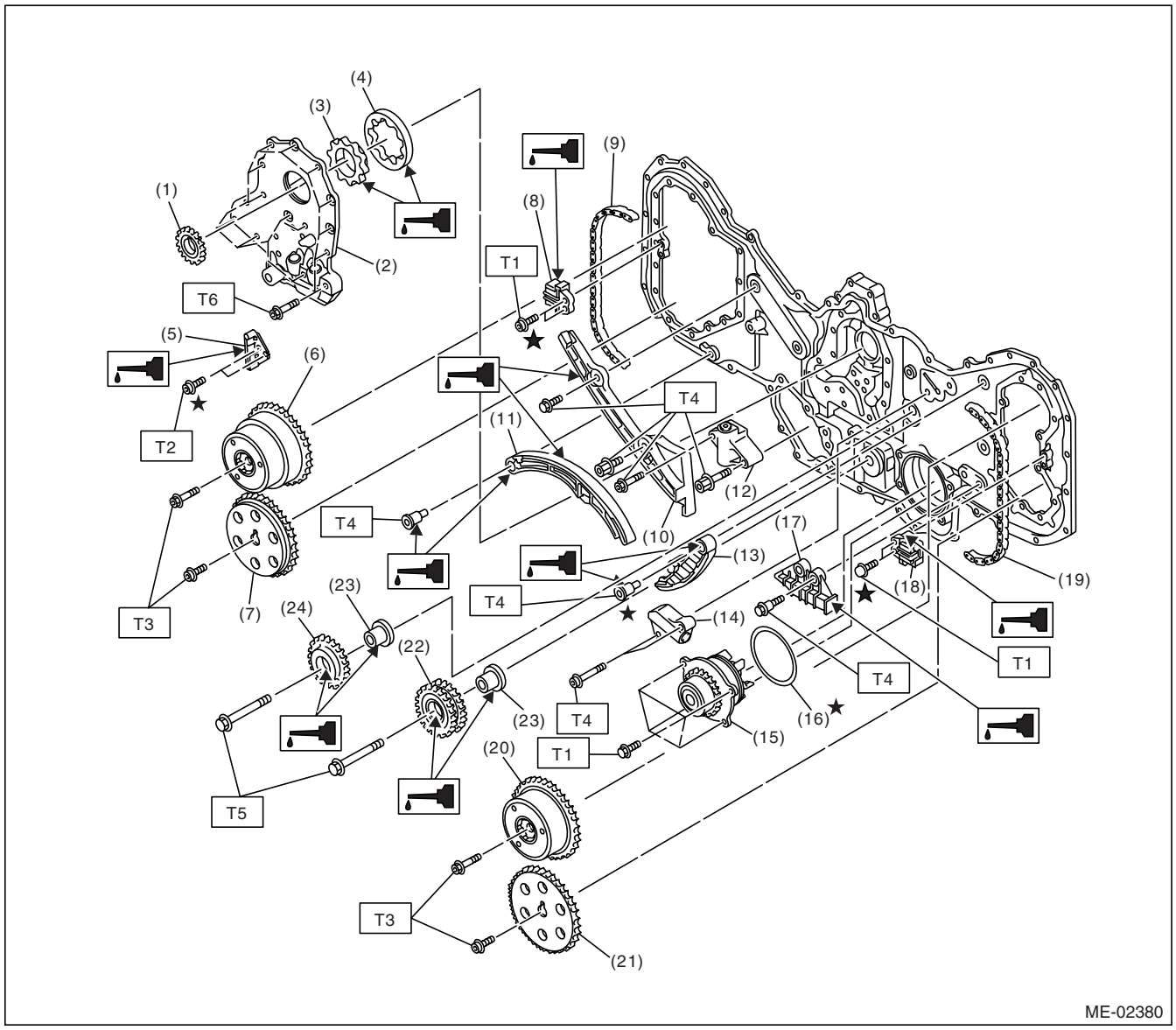
T1: <Ref. to ME(H6DO)-44, Crank Pulley.>

T2: <Ref. to ME(H6DO)-45, Front Chain Cover.>

T3: <Ref. to ME(H6DO)-54, Rear Chain Cover.>

T4: 6.4 (0.65, 4.7)

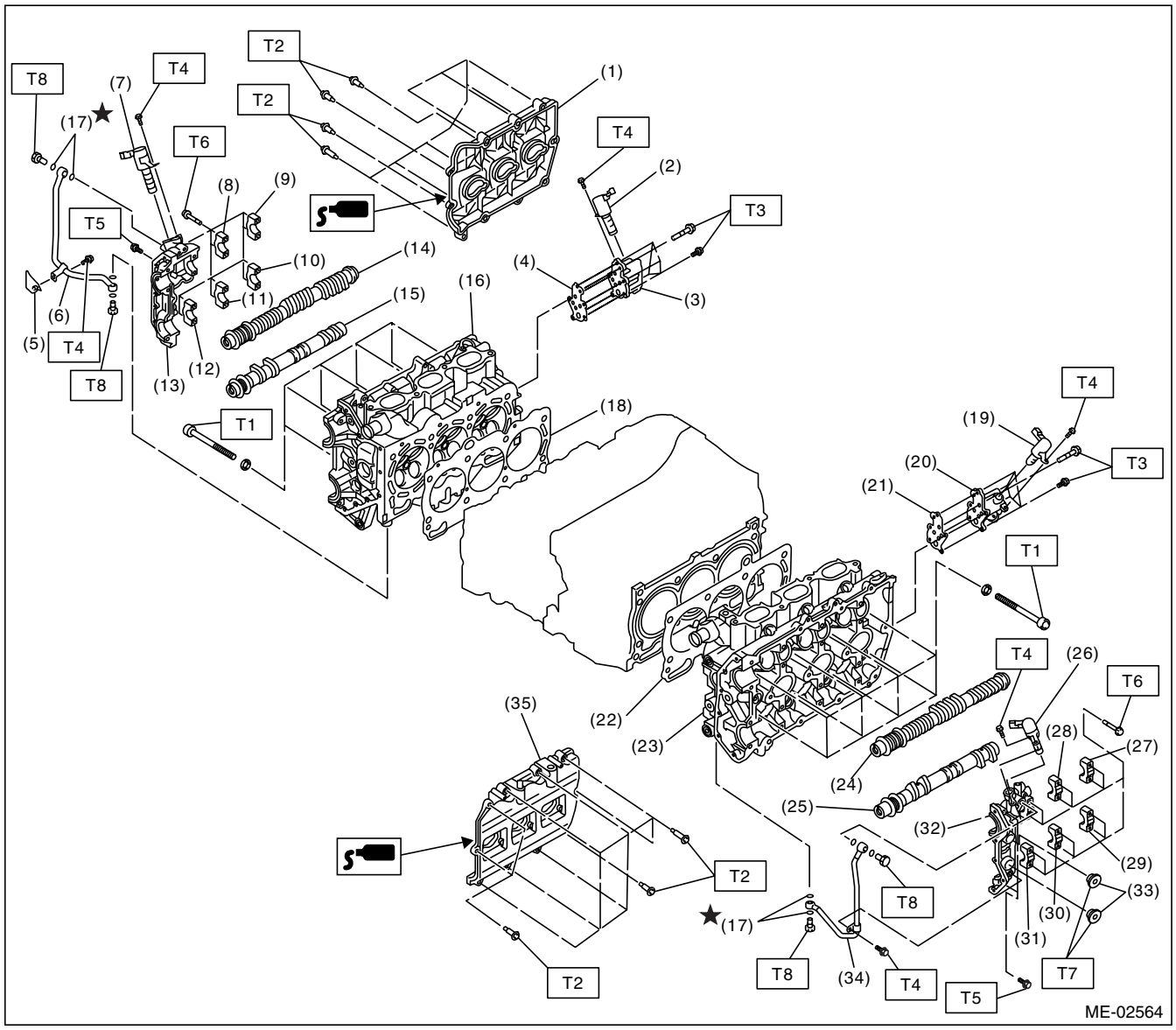
3. TIMING CHAIN



(1) Crank sprocket
(2) Oil relief case
(3) Inner rotor
(4) Outer rotor
(5) Chain guide (center)
(6) Intake cam sprocket (RH)
(7) Exhaust cam sprocket (RH)
(8) Chain guide (RH: between cams)
(9) Timing chain (RH)
(10) Chain guide (RH)
(11) Chain tensioner lever (RH)
(12) Chain tensioner (RH)
(13) Chain tensioner lever (LH)
(14) Chain tensioner (LH)
(15) Water pump
(16) O-ring
(17) Chain guide (LH)
(18) Chain guide (LH: between cams)
(19) Timing chain (LH)
(20) Intake cam sprocket (LH)
(21) Exhaust cam sprocket (LH)
(22) Idler sprocket (lower)
(23) Idler sprocket collar
(24) Idler sprocket (upper)

Tightening torque: N·m (kgf-m, ft-lb)
T1*: *6.4 (0.65, 4.7)
T2: 7.8 (0.8, 5.8)
T3: <Ref. to ME(H6DO)-52, Cam Sprocket.>
T4: 16 (1.6, 11.8)
T5: 69 (7.0, 50.6)
T6: <Ref. to LU(H6DO)-8, Oil Pump.>

4. CYLINDER HEAD AND CAMSHAFT

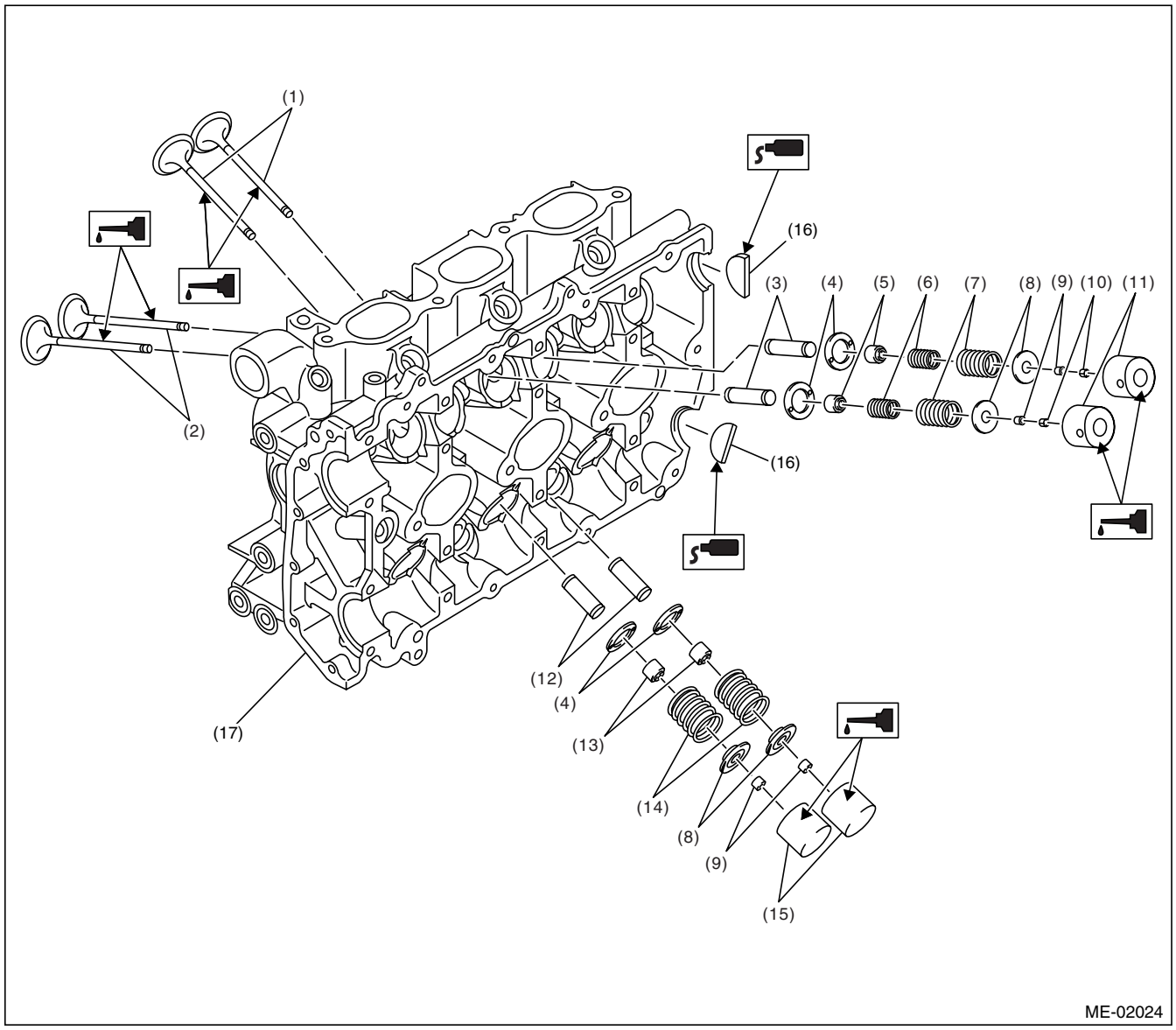


(1) Rocker cover (RH)
(2) Oil switching solenoid valve (RH)
(3) Oil switching solenoid valve holder (RH)
(4) Oil switching solenoid valve gasket
(5) Rear chain cover
(6) Oil pipe (RH)
(7) Oil flow control solenoid valve (RH)
(8) Intake camshaft cap (Center RH)
(9) Intake camshaft cap (Rear RH)
(10) Exhaust camshaft cap (Rear RH)
(11) Exhaust camshaft cap (Center RH)
(12) Exhaust camshaft cap (Front RH)
(13) Front camshaft cap (RH)
(14) Intake camshaft (RH)
(15) Exhaust camshaft (RH)
(16) Cylinder head (RH)
(17) Gasket
(18) Cylinder head gasket (RH)
(19) Oil switching solenoid valve (LH)
(20) Oil switching solenoid valve holder (LH)
(21) Oil switching solenoid valve gasket
(22) Cylinder head gasket (LH)
(23) Cylinder head (LH)
(24) Intake camshaft (LH)
(25) Exhaust camshaft (LH)
(26) Oil flow control solenoid valve (LH)
(27) Intake camshaft cap (Rear LH)
(28) Intake camshaft cap (Center LH)
(29) Exhaust camshaft cap (Rear LH)
(30) Exhaust camshaft cap (Center LH)
(31) Exhaust camshaft cap (Front LH)
(32) Front camshaft cap (LH)
(33) Plug
(34) Oil pipe (LH)
(35) Rocker cover (LH)

Tightening torque: N·m (kgf-m, ft-lb)

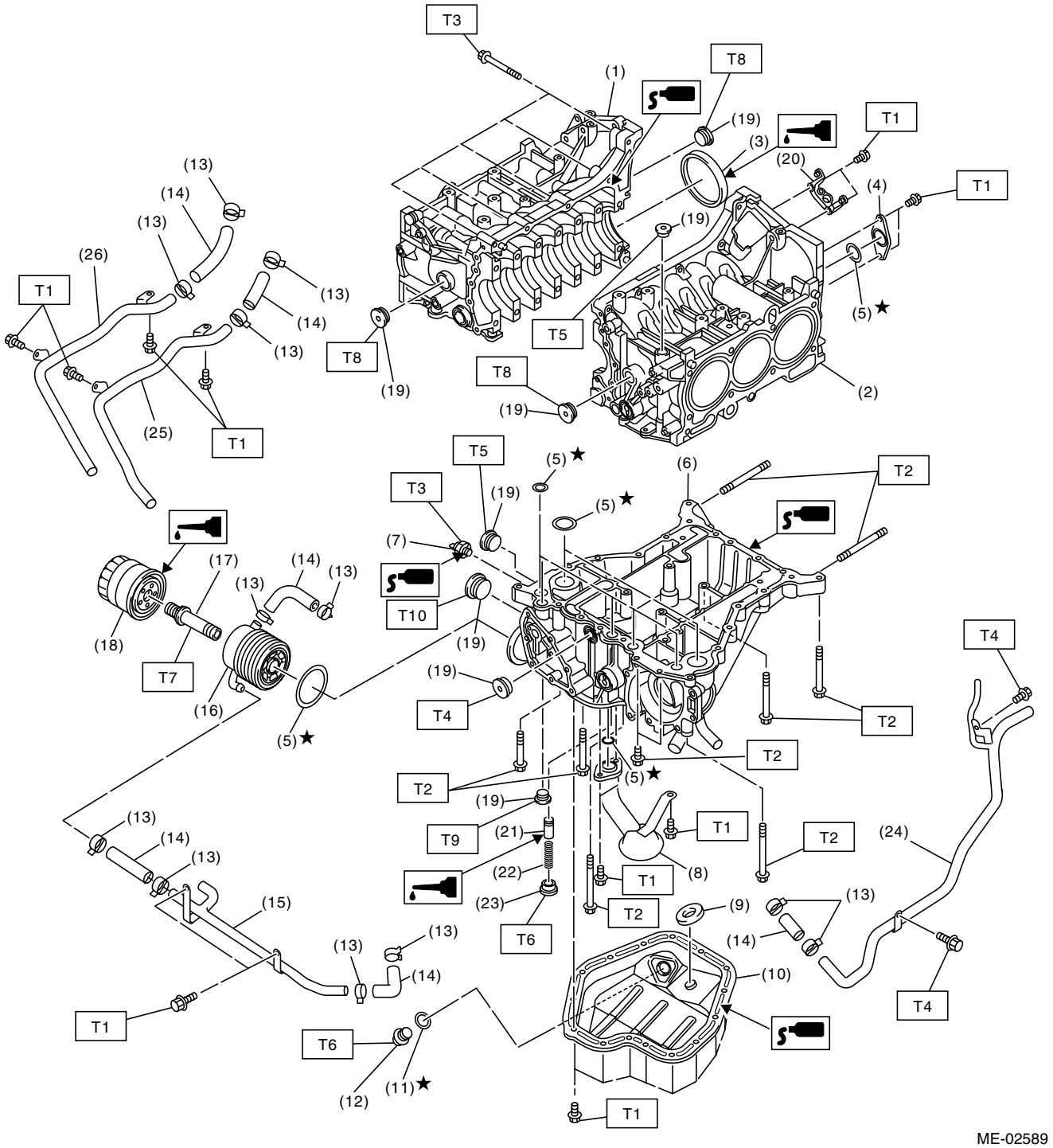
T1:	***<Ref. to ME(H6DO)-60, Cylinder Head.>***
T2:	***<Ref. to ME(H6DO)-56, Camshaft.>***
T3:	***<Ref. to ME(H6DO)-80, Oil Switching Solenoid Valve.>***
T4:	***6.4 (0.65, 4.7)***
T5:	***9.75 (1.0, 7.2)***
T6:	***16 (1.6, 11.8)***
T7:	***60 (6.1, 44)***
T8:	***29 (3.01, 21.8)***

5. CYLINDER HEAD AND VALVE ASSEMBLY



(1) Exhaust valve
(2) Intake valve
(3) Intake valve guide
(4) Valve spring seat
(5) Intake valve stem seal
(6) Valve spring (Inner)
(7) Valve spring (Outer)
(8) Retainer
(9) Retainer key
(10) Shim
(11) Valve lifter (Intake)
(12) Exhaust valve guide
(13) Exhaust valve stem seal
(14) Valve spring
(15) Valve lifter (Exhaust)
(16) Cylinder head plug
(17) Cylinder Head

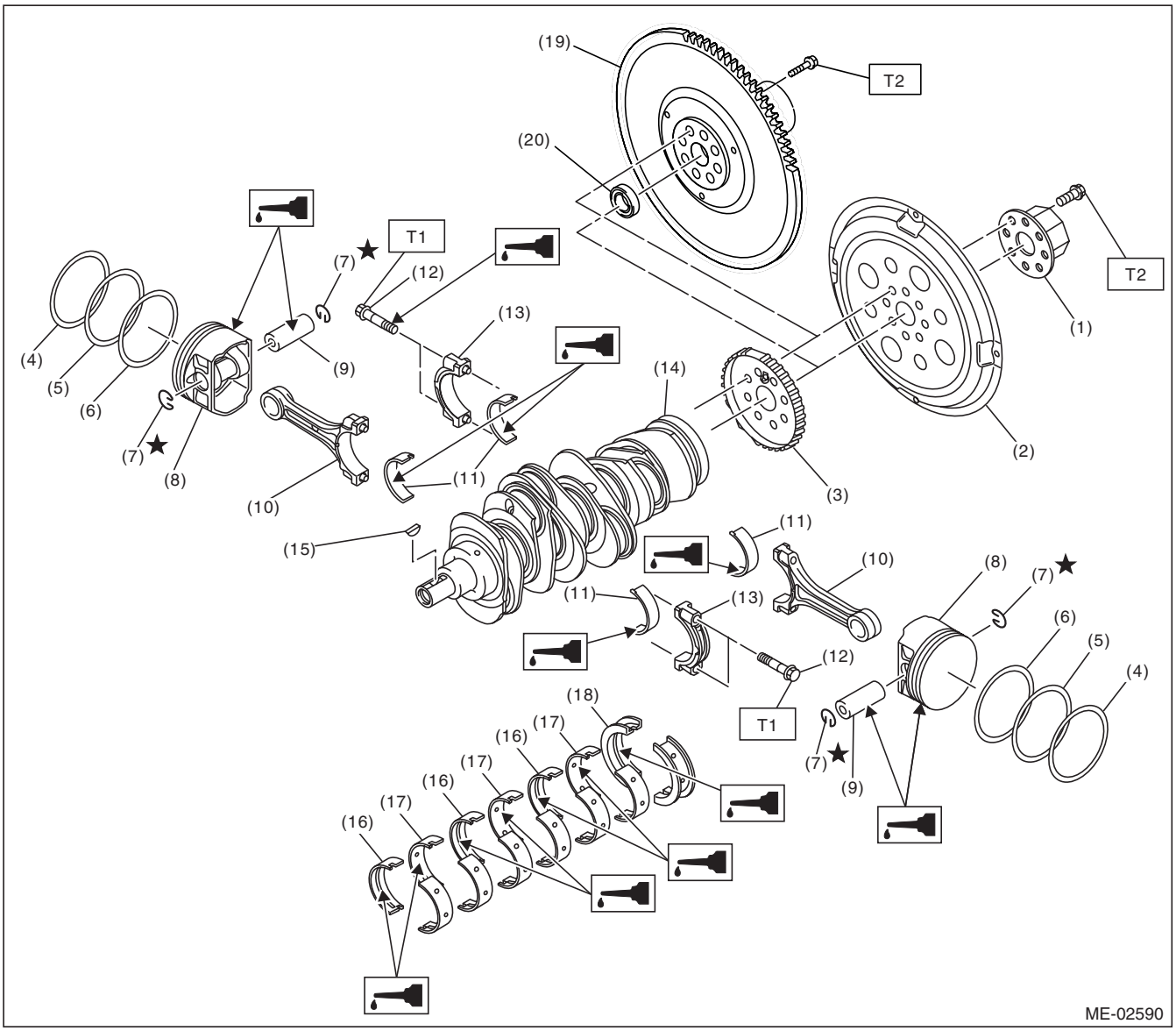
6. CYLINDER BLOCK



(1) Cylinder block (RH)
(2) Cylinder block (LH)
(3) Rear oil seal
(4) Service hole cover
(5) O-ring
(6) Oil pan upper
(7) Oil pressure switch
(8) Oil strainer
(9) Magnet
(10) Oil pan lower
(11) Metal gasket
(12) Drain plug
(13) Clamp
(14) Hose
(15) Oil cooler pipe
(16) Oil cooler
(17) Oil cooler connector
(18) Oil filter
(19) Plug
(20) Crankshaft position sensor holder
(21) Relief valve
(22) Relief valve spring
(23) Plug
(24) Water pipe
(25) Water pipe (Model with ATF warmer)
(26) Water pipe (MT model)

Tightening torque: N·m (kgf-m, ft-lb)
T1: 6.4 (0.65, 4.7)
T2: 18 (1.8, 13.3)
T3: 25 (2.5, 18.4)
T4: 16 (1.6, 11.8)
T5: 37 (3.8, 27)
T6: 44 (4.5, 33)
T7: 54 (5.5, 40)
T8: 70 (7.1, 52)
T9: 23 (2.3, 17)
T10: 90 (9.2, 67)

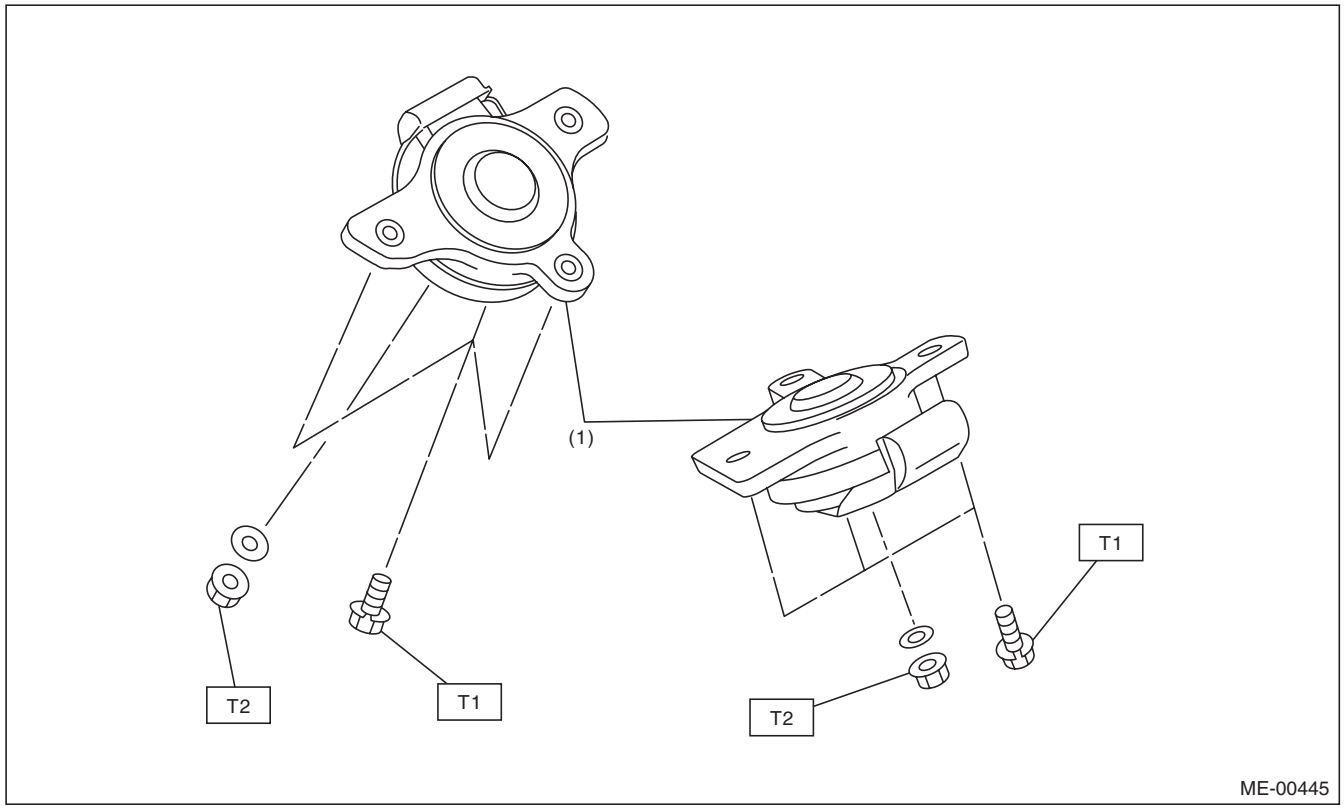
7. CRANKSHAFT AND PISTON



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

Tightening torque: N·m (kgf-m, ft-lb)
T1: 53 (5.4, 39)
T2: 81 (8.3, 60)

8. ENGINE MOUNTING



(1) Front cushion rubber

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

C: CAUTION

- Wear work clothing, including a cap, protective goggles and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- Be careful not to burn yourself, because each part on the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Before disconnecting connectors of sensors or units, be sure to disconnect the ground cable from battery.
- All parts should be thoroughly cleaned, paying special attention to 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 not to stain seats and windows with coolant or oil. Place a cover over fender, as required, for protection.
- Prior to starting work, prepare the following:

Service tools, clean cloth, containers to catch coolant and oil, wire ropes, chain hoist, transmission jacks, etc.

- Lift-up or lower the vehicle when necessary. Make sure to support the correct positions.

D: PREPARATION TOOL

1. SPECIAL TOOL

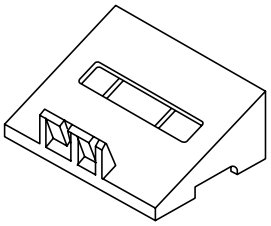
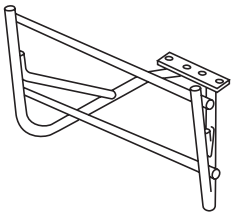
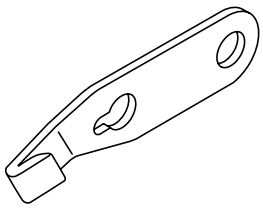
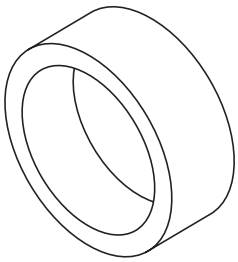
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18250AA010	18250AA010	CYLINDER HEAD TABLE	• Used for replacing valve guides. • Used for removing and installing valve spring.
 ST18232AA000	18232AA000	ENGINE STAND	Used for disassembling and assembling engine.
 ST-498497100	498497100	CRANKSHAFT STOPPER	Used for stopping rotation of flywheel or drive plate when loosening / tightening crank pulley bolt.
 ST18254AA000	18254AA000	PISTON GUIDE	Used for installing piston in cylinder.

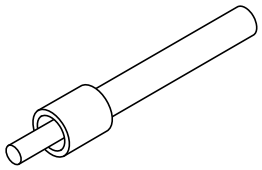
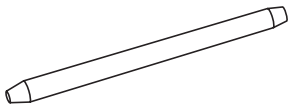
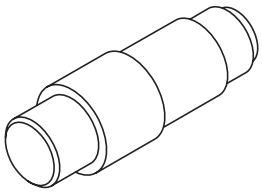
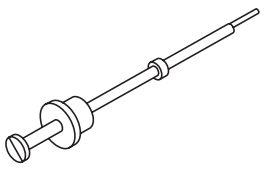
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499585500	499585500	VALVE OIL SEAL GUIDE	Used for press-fitting of intake and exhaust valve guide oil seals.
 ST18253AA000	18253AA000	PISTON PIN GUIDE	Used for installing piston pin, piston and connecting rod.
 ST18350AA000	18350AA000	CONNECTING ROD BUSHING REMOVER AND INSTALLER	Used for removing and installing connecting rod bushing.
 ST-499097500	499097500	PISTON PIN REMOVER ASSY	Used for removing piston pin.

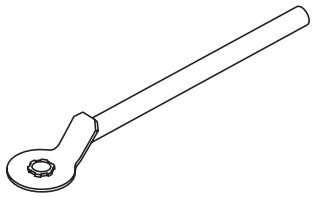
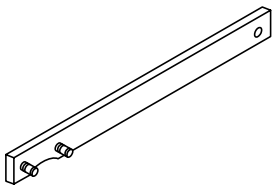
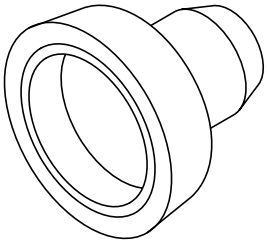
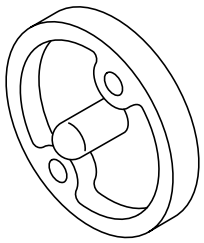
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499977500	499977500	CAM SPROCKET WRENCH	Used for removing and installing intake cam sprocket.
 ST18231AA020	18231AA020	CAM SPROCKET WRENCH	Used for removing and installing exhaust cam sprocket.
 ST-499587200	499587200	CRANKSHAFT OIL SEAL INSTALLER	• Used 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).

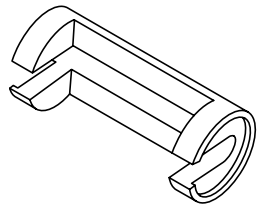
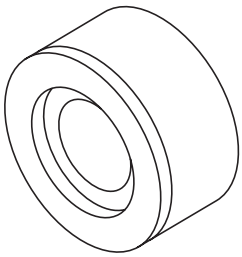
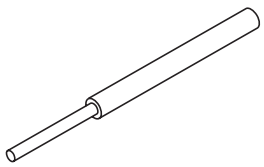
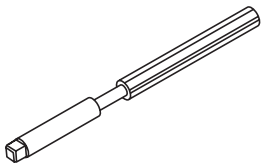
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499718000	499718000	VALVE SPRING REMOVER	Used for removing and installing valve spring.
 ST18251AA040	18251AA040	VALVE GUIDE ADJUSTER	Used for installing valve guides.
 ST-499765700	499765700	VALVE GUIDE REMOVER	Used for removing valve guides.
 ST-499765900	499765900	VALVE GUIDE REAMER	Used for reaming valve guides.

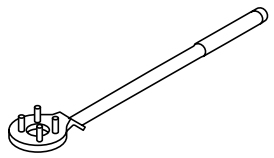
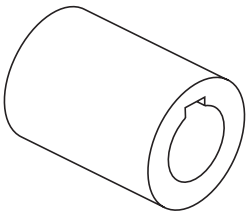
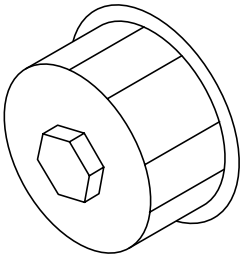
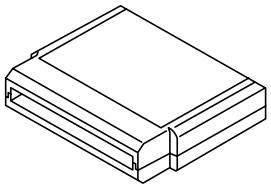
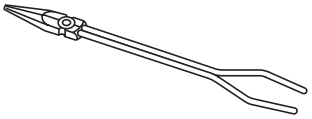
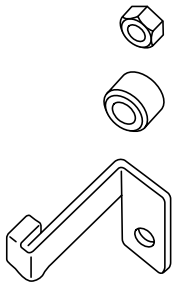
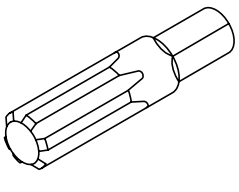
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499977100	499977100	CRANK PULLEY WRENCH	Used for stopping rotation of crank pulley when loosening / tightening crank pulley bolt.
 ST18252AA000	18252AA000	CRANKSHAFT SOCKET	Used for rotating crankshaft.
 ST-498547000	498547000	OIL FILTER WRENCH	Used for removing and installing oil filter.
 ST18482AA000	18482AA000 (Newly adopted tool)	CARTRIDGE	Troubleshooting for electrical system.

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
ST22771AA030	22771AA030	SUBARU SELECT MONITOR KIT	Troubleshooting for electrical system. • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)
 ST18233AA000	18233AA000	PISTON PIN SNAP RING PLIERS	Used for removing and installing snap ring of piston pin.
 ST-498277200	498277200	STOPPER SET	Used for installing automatic transmission assembly to engine.
 ST-499057000	499057000	TORX PLUS®	Used for removing and installing drive plate of flywheel (dual mass flywheel type).

2. GENERAL TOOL

TOOL NAME	REMARKS
Compression gauge	Used for measuring compression.

E: PROCEDURE

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

- Camshaft
- Cylinder head

2. Compression

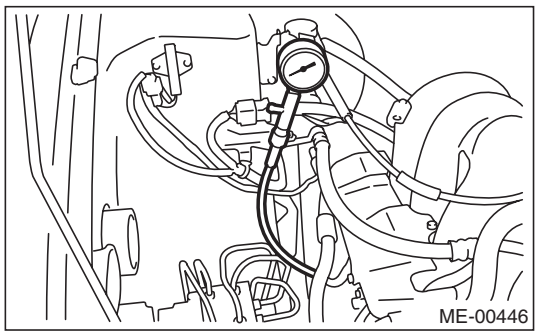
A: INSPECTION

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

1) After warming-up the engine, turn the ignition switch to OFF.
2) Make sure that the battery is fully charged.
3) Release the fuel pressure.
<Ref. to FU(H6DO)-39, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
4) Remove all the spark plugs. <Ref. to IG(H6DO)-4, REMOVAL, Spark Plug.>
5) Check the starter motor for satisfactory performance and operation.
6) Hold the compression gauge tightly against the 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.

7) Fully open the throttle valve.
8) Crank the engine by means of the starter motor, and read the maximum value on the gauge when the gauge needle is steady.



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

Compression (350 rpm and fully opened throttle):
Standard
1,275 — 1,471 kPa (13.0 — 15.0 kgf/cm^2, 185 — 213 psi)
Limit
1,128 kPa (11.5 kgf/cm^2, 164 psi)

3. Idle Speed

A: INSPECTION

1) Before checking the idle speed, check the following:
   (1) Ensure the air cleaner element is free from clogging, ignition timing is correct, spark plugs are in good condition, and hoses are connected properly.
   (2) Ensure the malfunction indicator light does not illuminate.
2) Idle the engine.
3) Stop the engine, and 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 the Subaru Select Monitor power switch to ON.
7) Select {Each System Check} in Main Menu.
8) Select {Engine} in Selection Menu.
9) Select {Current Data Display & Save} in Engine Control System Diagnosis.
10) Select {Data Display} in Data Display Menu.
11) Start the engine, and read the engine idle speed.
12) Check the idle speed when no-loaded. (Headlight, heater fan, rear defroster, radiator fan, A/C, etc. are OFF.)

Idle speed [No load and gears in "N" or "P" range]:
650±50 rpm

13) Check the idle speed when loaded. (Turn the A/C switch to "ON" and operate the compressor for at least one minute before measurement.)

Idle speed [A/C "ON" and gears in "N" or "P" range]:
770±50 rpm

NOTE:
Idle speed cannot be adjusted manually, because idle speed is automatically adjusted. If the idle speed is out of specifications, refer to General Diagnostic Table under "Engine Control System". <Ref. to EN(H6DO)(diag)-2, Basic Diagnostic Procedure.>

4. Ignition Timing

A: INSPECTION

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

1) Before checking the ignition timing, check the following:
   (1) Ensure the air cleaner element is free from clogging, spark plugs are in good condition, and hoses are connected properly.
   (2) Ensure the malfunction indicator light does not illuminate.
2) Idle the engine.
3) Stop the engine, and 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 the Subaru Select Monitor power switch to ON.
7) Select {Each System Check} in Main Menu.
8) Select {Engine} in Selection Menu.
9) Select {Current Data Display & Save} in Engine Control System Diagnosis.
10) Select {Data Display} in Data Display Menu.
11) Start the engine and check the ignition timing at idle speed.

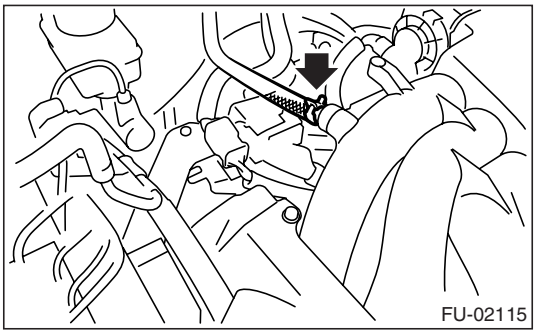
Ignition timing [BTDC/rpm]:
15°±8°/650

If the timing is not correct, check the ignition control system. Refer to “Engine Control System”. <Ref. to EN(H6DO)(diag)-2, Basic Diagnostic Procedure.>

5. Intake Manifold Vacuum

A: INSPECTION

1) Idle the engine.
2) Disconnect the brake vacuum hose from the intake manifold, and then install the vacuum gauge.
3) Keep the engine at idle speed and read the vacuum gauge indication.
By observing the vacuum gauge needle movement, the internal condition of the engine can be diagnosed with the following procedures.



Vacuum pressure (at idling, A/C "OFF"):
–60.0 kPa (–450 mmHg, –17.72 inHg) or less

Diagnosis of engine condition by measurement of intake manifold vacuum	
Vacuum gauge indication	Possible engine condition
1. Needle is steady but lower than normal position. This tendency becomes more evident as engine temperature rises.	Air leakage around intake manifold gasket, disconnection or damage of vacuum hose
2. Needle intermittently drops to position lower than normal position.	Leakage around cylinder
3. Needle drops suddenly and intermittently from normal position.	Valve anchoring
4. When engine speed is gradually increased, needle begins to vibrate rapidly at certain speed, and then vibration increases as engine speed increases.	Weak or broken valve spring
5. Needle vibrates above and below normal position in narrow range.	Defective ignition system or throttle chamber idle adjustment

6. Engine Oil Pressure

A: INSPECTION

1) Remove the oil pressure switch from cylinder block. <Ref. to LU(H6DO)-13, REMOVAL, Oil Pressure Switch.>
2) Connect the oil pressure gauge hose to cylinder block.
3) Connect the ground cable to battery.
4) Start the engine, and measure the oil pressure.

OIL pressure (at oil temperature of 80°C (176°F)):
Standard (at 600 rpm)
135 kPa (1.4 kgf/cm^2, 20 psi)
Standard (at 5,000 rpm)
500 kPa (5.1 kgf/cm^2, 73 psi)

CAUTION:
• If the oil pressure is out of standard, check the oil pump, oil filter and lubrication line. <Ref. to LU(H6DO)-17, INSPECTION, Engine Lubrication System Trouble in General.>
• If the oil pressure warning light comes on and oil pressure is within standard, replace the oil pressure switch. <Ref. to LU(H6DO)-17, INSPECTION, Engine Lubrication System Trouble in General.>

5) After measuring the oil pressure, install the oil pressure switch. <Ref. to LU(H6DO)-13, INSTALLATION, Oil Pressure Switch.>

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

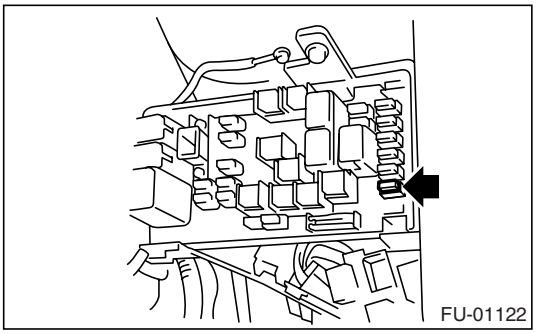
7. Fuel Pressure

A: INSPECTION

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

NOTE:
When the fuel pressure is out of standard, check or replace the pressure regulator and pressure regulator vacuum hose.

1) Release the fuel pressure.
<Ref. to FU(H6DO)-39, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
2) Open the fuel filler flap lid, and remove the fuel filler cap.
3) Disconnect the fuel delivery hose and connect fuel pressure gauge.
4) Install the fuse of fuel pump to main fuse box.



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

Fuel pressure:
Standard: 333 — 363 kPa (3.4 — 3.7 kgf/cm^2, 48 — 53 psi)

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

Fuel pressure:
Standard: 279 — 309 kPa (2.85 — 3.15 kgf/cm^2, 40 — 45 psi)

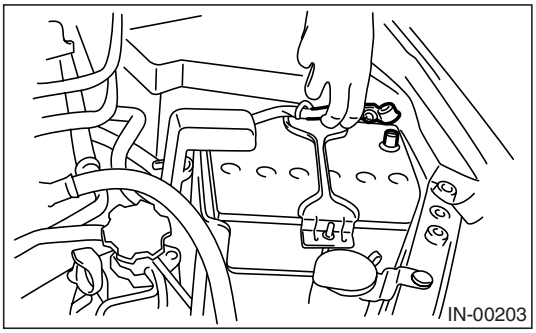
NOTE:
The fuel pressure gauge indicates 10 to 20 kPa (0.1 to 0.2 kgf/cm^2, 1 to 3 psi) higher than standard during high-altitude operations.

8. Valve Clearance

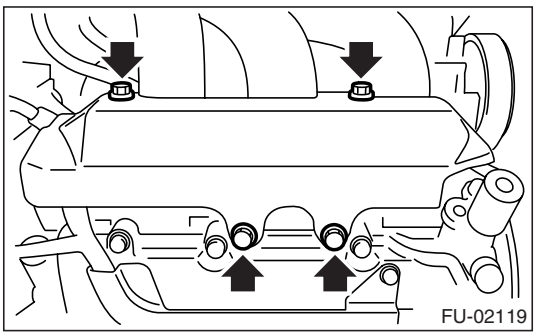
A: INSPECTION

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

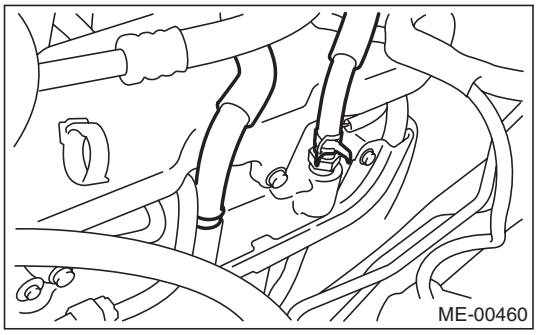
1) Set the vehicle on a lift.
2) Remove the collector cover.
3) Disconnect the ground cable from battery.



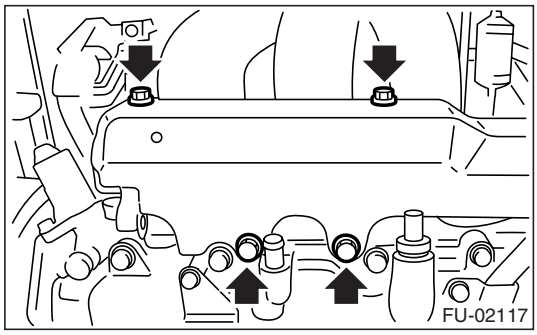
4) Lift-up the vehicle.
5) Remove the under cover.
6) Lower the vehicle.
7) When inspecting RH side cylinders:
   (1) Remove the air intake duct and air cleaner case. <Ref. to IN(H6DO)-8, REMOVAL, Air Intake Duct.> <Ref. to IN(H6DO)-5, REMOVAL, Air Cleaner Case.>
   (2) Remove the fuel tank protector (RH).



   (3) Disconnect the connector of oil pressure switch.
   (4) Remove the ignition coil. <Ref. to IG(H6DO)-7, REMOVAL, Ignition Coil.>
   (5) Remove the rocker cover (RH).
8) When inspecting LH side cylinders:
   (1) Disconnect the battery cable, and then remove the battery and battery carrier.
   (2) Disconnect the PCV hose and blow-by hose from rocker cover (LH).

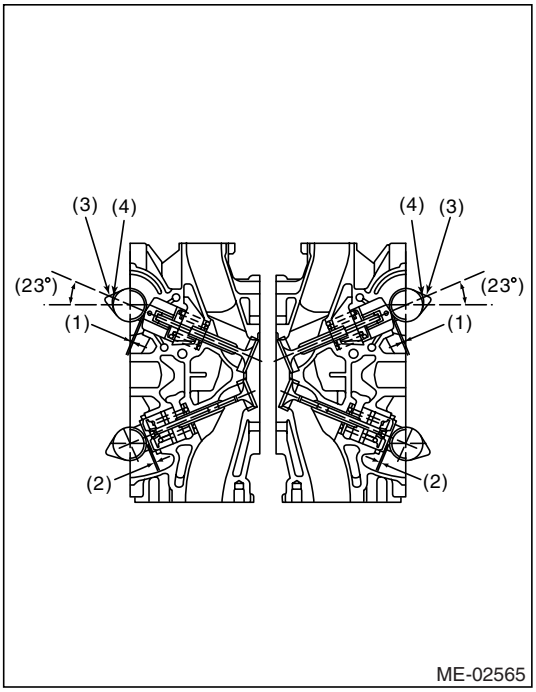


   (3) Remove the fuel pipe protector (LH).



   (4) Remove the ignition coil. <Ref. to IG(H6DO)-7, REMOVAL, Ignition Coil.>
   (5) Remove the rocker cover (LH).

9) Turn the crankshaft clockwise until the cam is set to position shown in the figure.



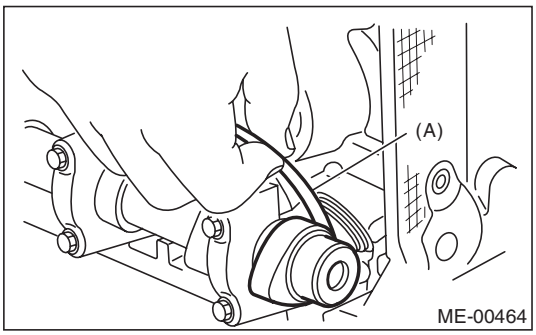
(1) Valve clearance (Intake side)
(2) Valve clearance (Exhaust side)
(3) High lift cam
(4) Low lift cam

10) Measure the clearance of intake valve and exhaust valve using thickness gauge (A).

NOTE:
• Measure it within the range of ±30° for specified position that shown in the figure.
• Measure it in low lift cam for intake side.
• Insert the thickness gauge in direction as horizontal as possible with respect to the valve lifter.

Valve clearance:
Intake
0.20 $^{+0.04}_{-0.06}$ mm (0.0079 $^{+0.0016}_{-0.0024}$ in)
Exhaust
0.35±0.05 mm (0.0138±0.0020 in)

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



11) If necessary, adjust the valve clearance. <Ref. to ME(H6DO)-29, ADJUSTMENT, Valve Clearance.>
12) Further turn the crank pulley clockwise and then measure the valve clearances again.
13) After inspection, install the related parts in the reverse order of removal.

B: ADJUSTMENT

1. INTAKE SIDE

CAUTION:
• Adjustment of valve clearance should be performed while engine is cold.
• Do not wear gloves during removal and installation of valve lifter.
• Do not use the valve lifter which got high impact due to drop, etc.
• When installing the valve lifter, align the anti-rotation of valve lifter with groove on cylinder head, and then insert the valve lifter.

1) Measure all valve clearances.
<Ref. to ME(H6DO)-28, INSPECTION, Valve Clearance.>

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

2) Remove the camshaft. <Ref. to ME(H6DO)-56, REMOVAL, Camshaft.>
3) Remove the valve lifter.
4) Remove the shim from valve lifter.
5) Check the thickness of shim by stamped mark on the side of shim which is removed.

6) Select a shim of suitable thickness from the following table using the measured valve clearance and shim thickness.

Unit: (mm)
S = (V + T) − 0.20
S: Required shim thickness V: Measured valve clearance T: Shim thickness to be used

Part No.	Thickness mm (in)
13218AK890	1.92 (0.0756)
13218AK900	1.94 (0.0764)
13218AK910	1.96 (0.0772)
13218AK920	1.98 (0.0780)
13218AK930	2.00 (0.0787)
13218AK940	2.02 (0.0795)
13218AK950	2.04 (0.0803)
13218AK960	2.06 (0.0811)
13218AK970	2.07 (0.0815)
13218AK980	2.08 (0.0819)
13218AK990	2.09 (0.0823)
13218AL000	2.10 (0.0827)
13218AL010	2.11 (0.0831)
13218AL020	2.12 (0.0835)
13218AL030	2.13 (0.0839)
13218AL040	2.14 (0.0843)
13218AL050	2.15 (0.0846)
13218AL060	2.16 (0.0850)
13218AL070	2.17 (0.0854)
13218AL080	2.18 (0.0858)
13218AL090	2.19 (0.0862)
13218AL100	2.20 (0.0866)
13218AL110	2.21 (0.0870)
13218AL120	2.22 (0.0874)
13218AL130	2.23 (0.0878)
13218AL140	2.24 (0.0882)
13218AL150	2.25 (0.0886)
13218AL160	2.26 (0.0890)
13218AL170	2.27 (0.0894)
13218AL180	2.28 (0.0898)
13218AL190	2.29 (0.0902)
13218AL200	2.30 (0.0906)
13218AL210	2.31 (0.0909)
13218AL220	2.32 (0.0913)
13218AL230	2.33 (0.0917)
13218AL240	2.34 (0.0921)
13218AL250	2.35 (0.0925)
13218AL260	2.36 (0.0929)
13218AL270	2.37 (0.0933)
13218AL280	2.38 (0.0937)
13218AL290	2.39 (0.0941)
13218AL300	2.40 (0.0945)
13218AL310	2.41 (0.0949)
13218AL320	2.42 (0.0953)
13218AL330	2.43 (0.0957)
13218AL340	2.44 (0.0961)
13218AL350	2.45 (0.0965)
13218AL360	2.46 (0.0969)
13218AL370	2.47 (0.0972)
13218AL380	2.48 (0.0976)
13218AL390	2.49 (0.0980)
13218AL400	2.50 (0.0984)
13218AL410	2.51 (0.0988)
13218AL420	2.52 (0.0992)
13218AL430	2.53 (0.0996)
13218AL440	2.54 (0.1000)
13218AL450	2.55 (0.1004)
13218AL460	2.56 (0.1008)
13218AL470	2.57 (0.1012)
13218AL480	2.58 (0.1016)
13218AL490	2.59 (0.1020)
13218AL500	2.60 (0.1024)
13218AL510	2.61 (0.1028)
13218AL520	2.62 (0.1032)
13218AL530	2.64 (0.1039)
13218AL540	2.66 (0.1047)
13218AL550	2.68 (0.1055)
13218AL560	2.70 (0.1063)
13218AL570	2.72 (0.1071)
13218AL580	2.74 (0.1079)
13218AL590	2.76 (0.1087)

2. EXHAUST SIDE

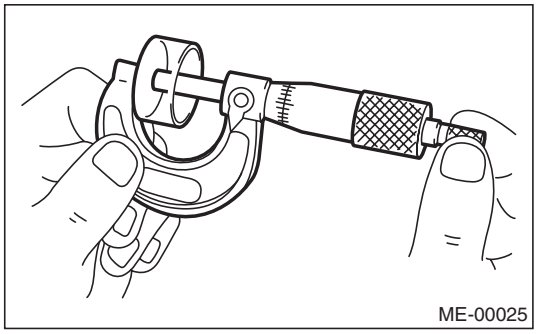
CAUTION:
• Adjustment of valve clearance should be performed while engine is cold.
• Do not wear gloves during removal and installation of valve lifter.
• Do not use the valve lifter which got high impact due to drop, etc.

1) Measure all valve clearances.
<Ref. to ME(H6DO)-28, INSPECTION, Valve Clearance.>

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

2) Remove the camshaft. <Ref. to ME(H6DO)-56, REMOVAL, Camshaft.>
3) Remove the valve lifter.

4) Measure the thickness of valve lifter using a micrometer.



5) Select a valve lifter of suitable thickness from the following table using the measured valve clearance and valve lifter thickness.

Unit: (mm)
S = (V + T) − 0.35
S: Valve lifter thickness required V: Measured valve clearance T: Valve lifter thickness to be used

Part No.	Thickness mm (in)
13228AD180	4.32 (0.1701)
13228AD190	4.34 (0.1709)
13228AD200	4.36 (0.1717)
13228AD210	4.38 (0.1724)
13228AD220	4.40 (0.1732)
13228AD230	4.42 (0.1740)
13228AD240	4.44 (0.1748)
13228AD250	4.46 (0.1756)
13228AD260	4.48 (0.1764)
13228AD270	4.50 (0.1772)
13228AD280	4.52 (0.1780)
13228AD290	4.54 (0.1787)
13228AD300	4.56 (0.1795)
13228AD310	4.58 (0.1803)
13228AD320	4.60 (0.1811)
13228AC580	4.62 (0.1819)
13228AC590	4.63 (0.1823)
13228AC600	4.64 (0.1827)
13228AC610	4.65 (0.1831)
13228AC620	4.66 (0.1835)
13228AC630	4.67 (0.1839)
13228AC640	4.68 (0.1843)
13228AC650	4.69 (0.1846)
13228AC660	4.70 (0.1850)
13228AC670	4.71 (0.1854)
13228AC680	4.72 (0.1858)
13228AC690	4.73 (0.1862)
13228AC700	4.74 (0.1866)
13228AC710	4.75 (0.1870)
13228AC720	4.76 (0.1874)
13228AC730	4.77 (0.1878)
13228AC740	4.78 (0.1882)
13228AC750	4.79 (0.1886)
13228AC760	4.80 (0.1890)
13228AC770	4.81 (0.1894)
13228AC780	4.82 (0.1898)
13228AC790	4.83 (0.1902)
13228AC800	4.84 (0.1906)
13228AC810	4.85 (0.1909)
13228AC820	4.86 (0.1913)
13228AC830	4.87 (0.1917)
13228AC840	4.88 (0.1921)
13228AC850	4.89 (0.1925)
13228AC860	4.90 (0.1929)
13228AC870	4.91 (0.1933)
13228AC880	4.92 (0.1937)
13228AC890	4.93 (0.1941)
13228AC900	4.94 (0.1945)
13228AC910	4.95 (0.1949)
13228AC920	4.96 (0.1953)
13228AC930	4.97 (0.1957)
13228AC940	4.98 (0.1961)
13228AC950	4.99 (0.1965)
13228AC960	5.00 (0.1969)
13228AC970	5.01 (0.1972)
13228AC980	5.02 (0.1976)
13228AC990	5.03 (0.1980)
13228AD000	5.04 (0.1984)
13228AD010	5.05 (0.1988)
13228AD020	5.06 (0.1992)
13228AD030	5.07 (0.1996)
13228AD040	5.08 (0.2000)
13228AD050	5.09 (0.2004)
13228AD060	5.10 (0.2008)
13228AD070	5.11 (0.2012)
13228AD080	5.12 (0.2016)
13228AD090	5.13 (0.2020)
13228AD100	5.14 (0.2024)
13228AD110	5.15 (0.2028)
13228AD120	5.16 (0.2032)
13228AD130	5.17 (0.2035)
13228AD140	5.18 (0.2039)
13228AD150	5.19 (0.2043)
13228AD160	5.20 (0.2047)
13228AD170	5.21 (0.2051)
13228AD330	5.23 (0.2059)
13228AD340	5.25 (0.2067)
13228AD350	5.27 (0.2075)
13228AD360	5.29 (0.2083)
13228AD370	5.31 (0.2091)
13228AD380	5.33 (0.2098)

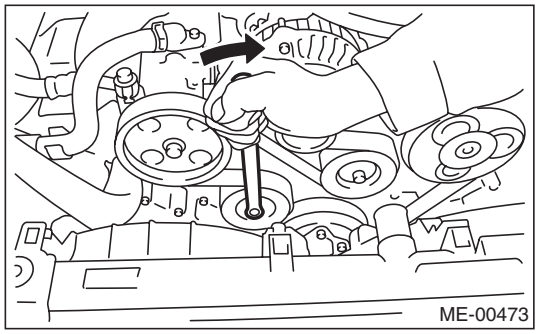
Valve Clearance

Part No.	Thickness mm (in)
13228AD390	5.35 (0.2106)
13228AD400	5.37 (0.2114)
13228AD410	5.39 (0.2122)
13228AD420	5.41 (0.2130)
13228AD430	5.43 (0.2138)
13228AD440	5.45 (0.2146)
13228AD450	5.47 (0.2154)
13228AD460	5.49 (0.2161)
13228AD470	5.51 (0.2169)
13228AD480	5.53 (0.2177)
13228AD490	5.55 (0.2185)
13228AD500	5.57 (0.2193)
13228AD510	5.59 (0.2201)

9. V-belt

A: REMOVAL

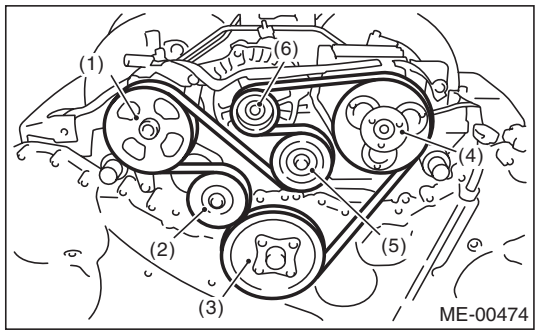
1) Install the tool to belt tension adjuster assembly installation bolt.
2) Rotate the tool clockwise and loosen the V-belt to remove.



3) Remove the V-belt cover.

B: INSTALLATION

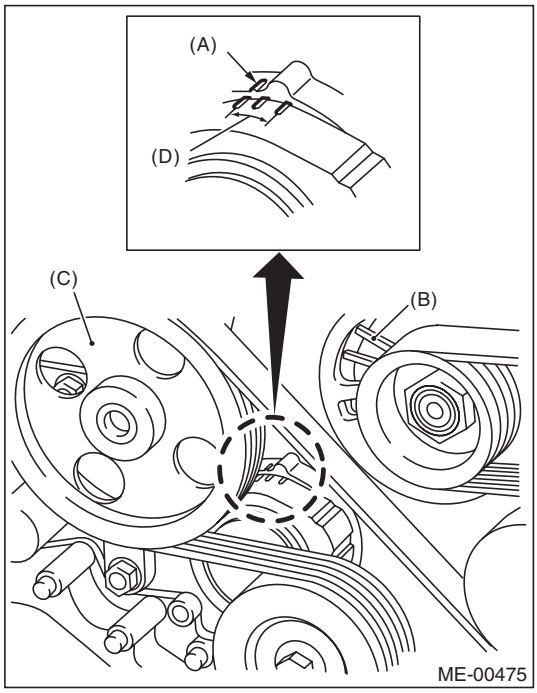
Install in the reverse order of removal.



(1) Power steering oil pump pulley
(2) Belt tension adjuster ASSY
(3) Crank pulley
(4) A/C compressor
(5) Belt idler
(6) Generator

C: INSPECTION

1) Replace the V-belt, if cracks, fraying or wear is found.
2) Make sure that the V-belt automatic belt tension indicator (A) is within the range (D).

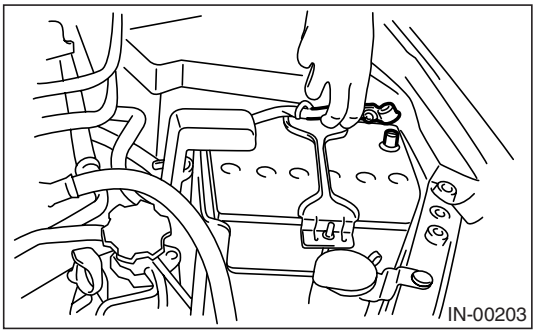


(A) Indicator
(B) Generator
(C) Power steering oil pump pulley
(D) Service limit

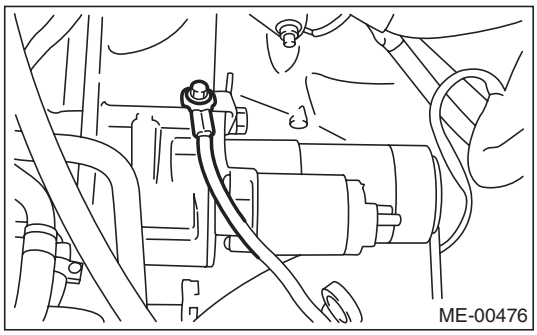
10.Engine Assembly

A: REMOVAL

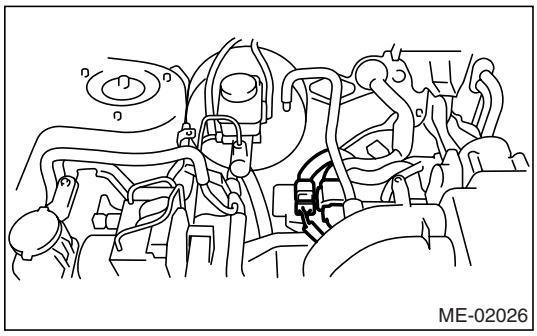
1) Set the vehicle on a lift.
2) Open the front hood fully and support it with front food stay.
3) Remove the collector cover.
4) Collect the refrigerant from A/C system. <Ref. to AC-20, PROCEDURE, Refrigerant Recovery Procedure.>
5) Release the fuel pressure.
<Ref. to FU(H6DO)-39, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
6) Remove the fuel filler cap.
7) Disconnect the ground cable from battery.



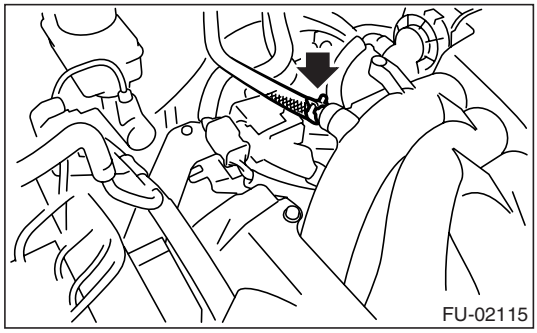
8) Remove the air intake duct, air cleaner case and air intake chamber.
<Ref. to IN(H6DO)-8, REMOVAL, Air Intake Duct.> <Ref. to IN(H6DO)-5, REMOVAL, Air Cleaner Case.> <Ref. to IN(H6DO)-7, REMOVAL, Air Intake Chamber.>
9) Remove the radiator from vehicle. <Ref. to CO(H6DO)-16, REMOVAL, Radiator.>
10) Remove the V-belts. <Ref. to ME(H6DO)-33, REMOVAL, V-belt.>
11) Disconnect the A/C pressure hoses from A/C compressor. <Ref. to AC-39, REMOVAL, Hose and Tube.>
12) Disconnect the following connectors:
(1) Engine ground terminals



(2) Engine harness connectors

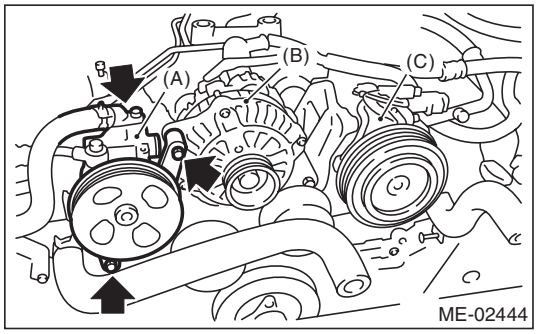


(3) Generator connector, terminal and A/C compressor connector
(4) Power steering switch connector
13) Disconnect the following hoses:
(1) Brake booster vacuum hose



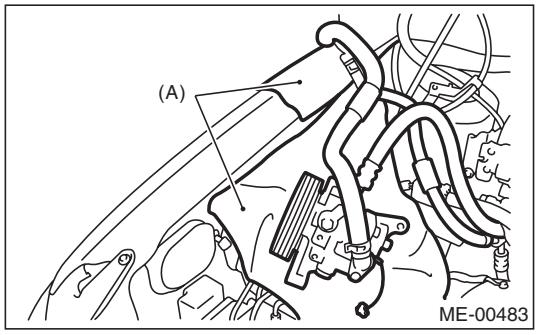
(2) Heater inlet and outlet hoses
(3) Pressure regulator vacuum hose
14) Remove the power steering pump.

NOTE:
Do not disconnect the hose and pipe from pump body.



(A) Power steering pump
(B) Generator
(C) A/C compressor

15) Place the power steering pump onto right side wheel apron.

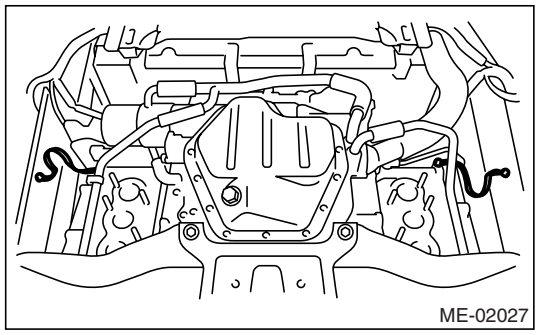


(A) Cloth

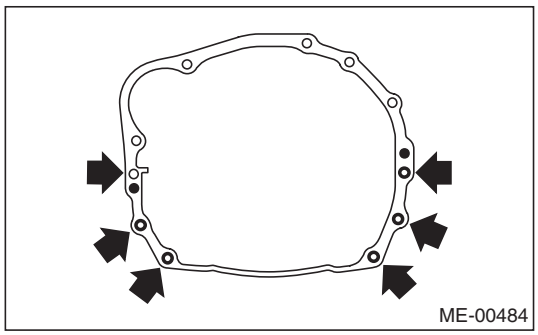
16) Lift-up the vehicle.
17) Remove the under cover.
18) Remove the front exhaust pipe.
<Ref. to EX(H6DO)-4, REMOVAL, Front Exhaust Pipe.>

NOTE:
Be careful not to let the front exhaust pipe interfere with water pipes on engine side.

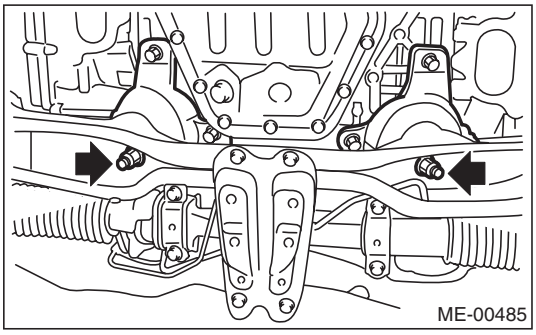
19) Remove the ground cable.



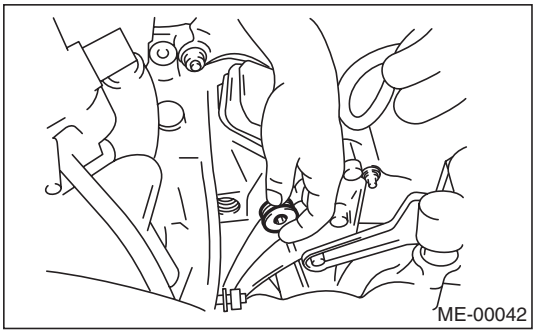
20) Remove the bolts and nuts which hold lower side of transmission to engine.



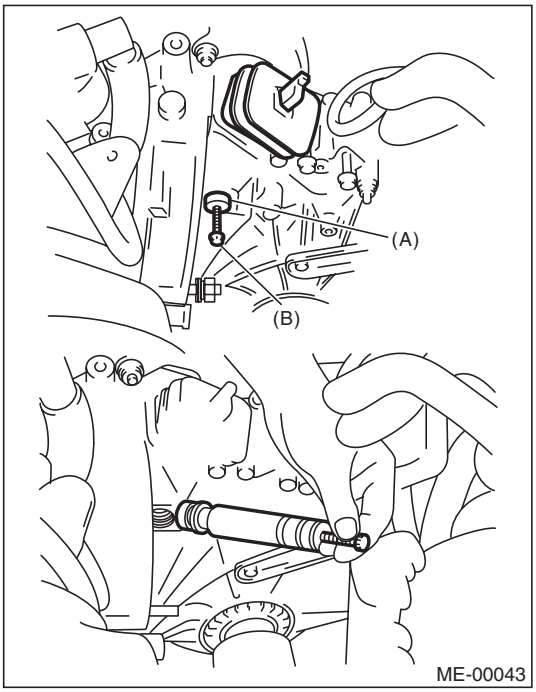
21) Remove the nuts which install front cushion rubber onto front crossmember.



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



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

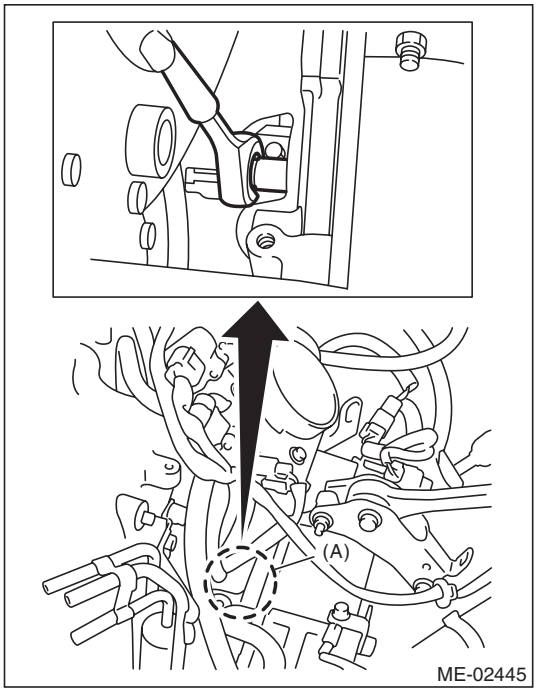


(A) Release fork shaft
(B) Bolt

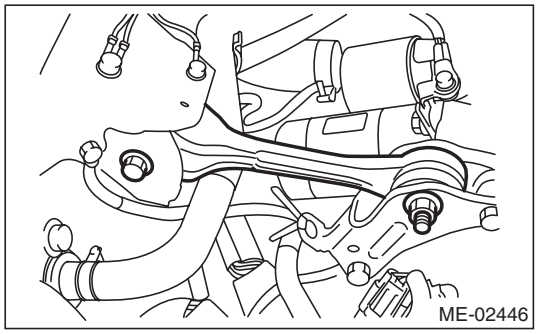
(4) Raise the release fork, and then unfasten the release bearing tabs to remove release fork.

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

24) Separate the torque converter clutch from drive plate. (AT model)
(1) Lower the vehicle.
(2) Remove the service hole plug (A).
(3) Remove the bolts which hold torque converter clutch to drive plate.
(4) Remove other bolts while rotating the engine using socket wrench.

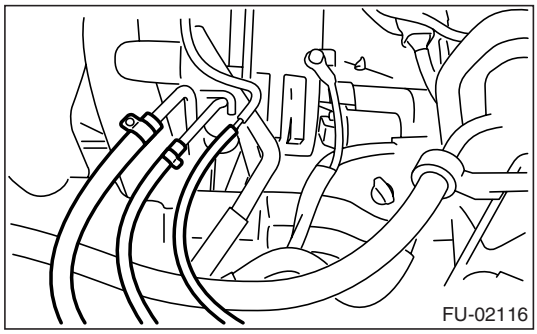


25) Remove the pitching stopper.



26) Disconnect the fuel delivery hose and evaporation hose.

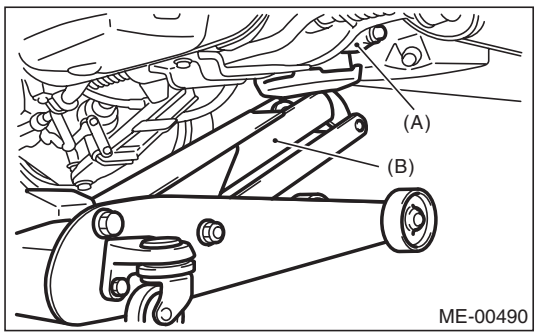
CAUTION:
• Collect fuel from the hose into container.
• Disconnect the hose with its end wrapped with cloth to prevent fuel from splashing.



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

28) Support the transmission with a garage jack.

CAUTION:
Doing this is very important because the transmission lowers for its own weight. This work is also of great importance for facilitating reinstallation.

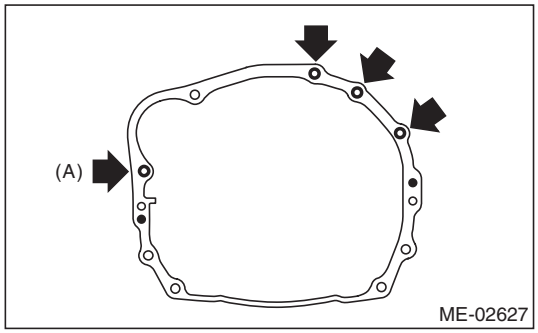


(A) Transmission
(B) Garage jack

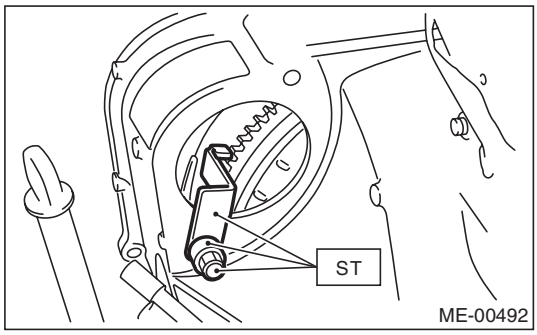
CAUTION:
Before removing the engine away from transmission, check to be sure no work has been overlooked.

29) Separation of engine and transmission:
(1) Remove the starter. <Ref. to SC(H4SO 2.0)-6, REMOVAL, Starter.>
(2) Remove the bolts which hold upper side of transmission to engine.

NOTE:
Tighten the bolt (A) as shown in the figure together with starter. (MT model)



30) Install the ST to converter case. (AT model)
ST 498277200 STOPPER SET



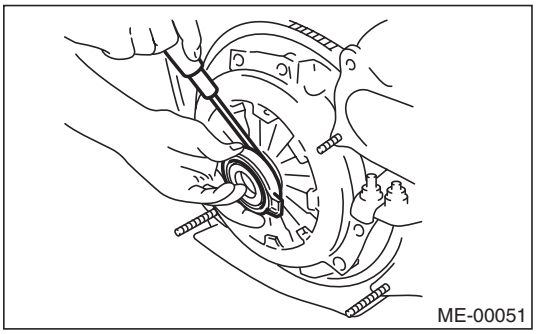
31) Remove the engine from vehicle.
(1) Slightly raise the engine.
(2) Raise the transmission with garage jack.
(3) Move the engine horizontally until main shaft is withdrawn from clutch cover.
(4) Slowly move the engine away from engine compartment.

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

32) Remove the front cushion rubbers.

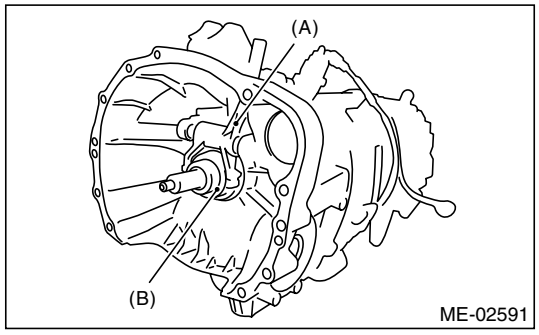
B: INSTALLATION

1) Install the clutch release fork and bearing onto the transmission. (MT model)
(1) Remove the release bearing from clutch cover with a flat tip screwdriver.



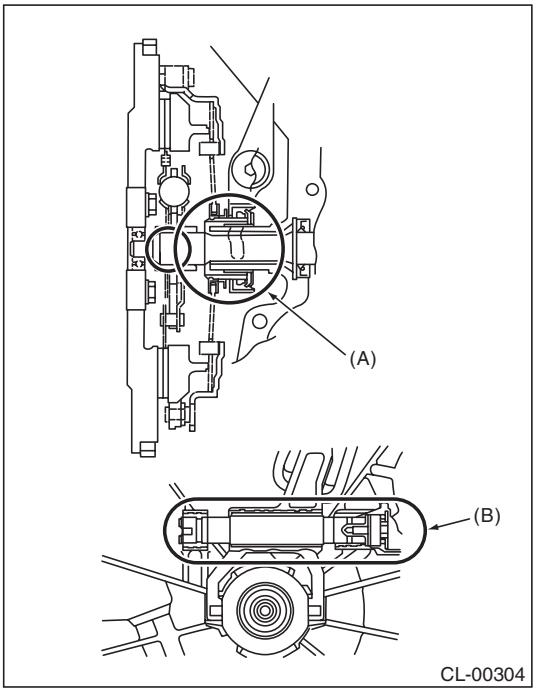
(2) Install the release bearing onto transmission.

(3) Install the release fork into release bearing tab.



(A) Release fork
(B) Release bearing

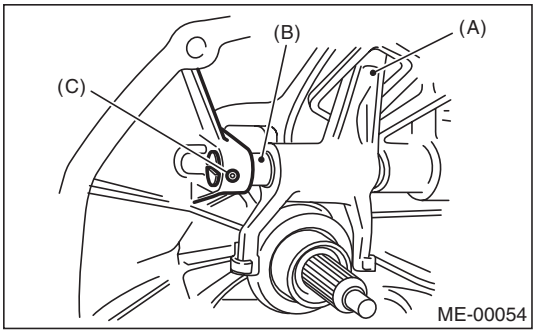
(4) Apply grease to the specified points.
- Spline: FX2200
- Shaft: SUNLIGHT 2 (Part No. 003602010)



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

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

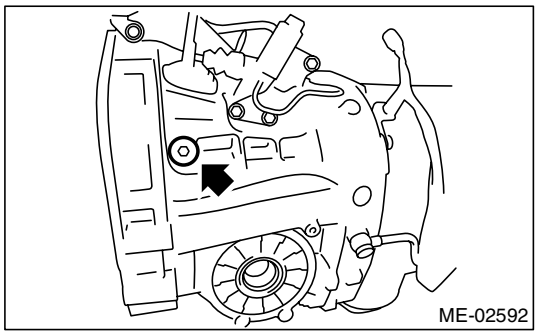
CAUTION:
Make sure the cutout portion of release fork shaft contacts spring pin.



(A) Release fork
(B) Release fork 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 to transmission.

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

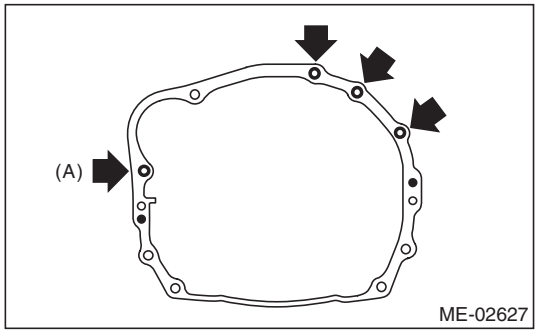
NOTE:
Be careful not to damage adjacent parts or body panels with crank pulley, oil pressure gauge, etc.

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

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

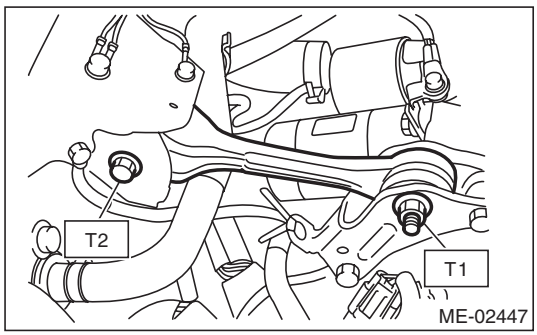
NOTE:
Tighten the bolt (A) as shown in the figure together with starter. (MT model)

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



5) Remove the lifting device and wire ropes.
6) Remove the garage jack.
7) Install the pitching stopper.

Tightening torque:
T1: 50 N·m (5.1 kgf-m, 36.9 ft-lb)
T2: 58 N·m (5.9 kgf-m, 42.8 ft-lb)



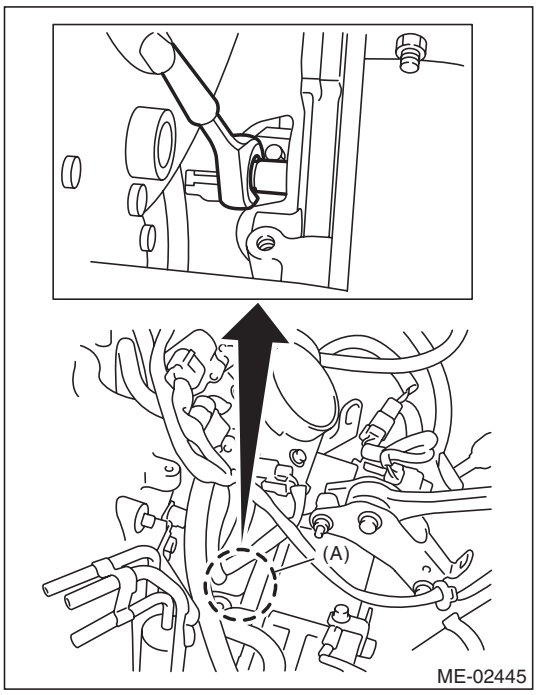
8) Remove the ST from converter case. (AT model)

NOTE:
Be careful not to drop the ST into the converter case when removing the ST.

ST 498277200 STOPPER SET

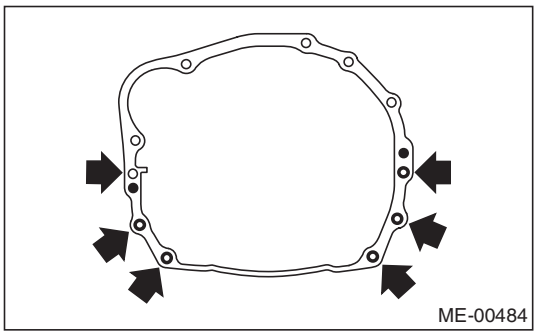
9) Install the starter. <Ref. to SC(H4SO 2.0)-6, INSTALLATION, Starter.>
10) Install the torque converter clutch to drive plate. (AT model)
(1) Tighten the bolts which hold torque converter clutch to drive plate.
(2) Tighten other bolts while rotating the engine using a socket wrench.

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



(3) Install the service hole plug (A) to prevent foreign matters from being mixed.
11) Install the power steering pump. <Ref. to PS-83, INSTALLATION, Oil Pump.>
12) Lift-up the vehicle.
13) Tighten the bolts and nuts which hold lower side of the transmission to engine.

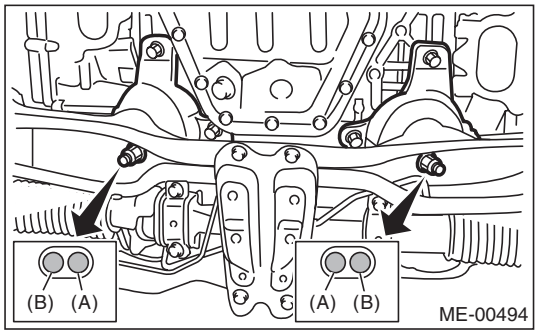
Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)



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

Tightening torque:
85 N·m (8.7 kgf-m, 62.7 ft-lb)

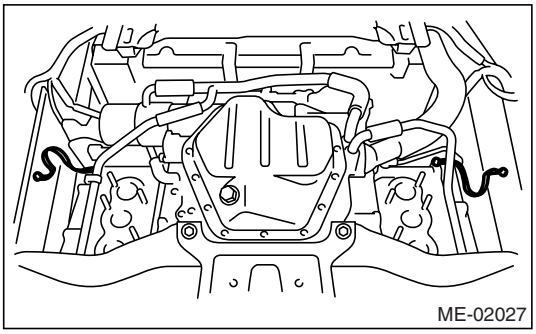
NOTE:
Make sure the front cushion rubber mounting bolts (A) and locator (B) are securely installed.



15) Install the front exhaust pipe.
<Ref. to EX(H6DO)-5, INSTALLATION, Front Exhaust Pipe.>

NOTE:
• Be careful not to let the front exhaust pipe interfere with water pipes and crossmember on engine side.
• Be careful not to scratch the flange surface of front exhaust pipe with stud bolt on engine.

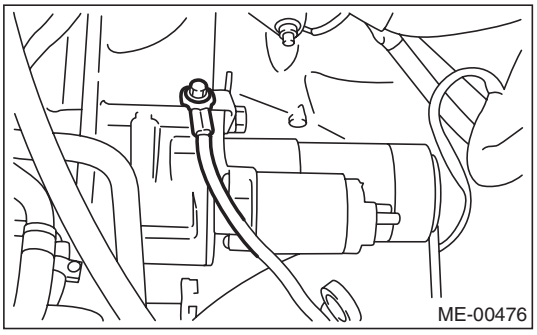
16) Connect the ground cable.



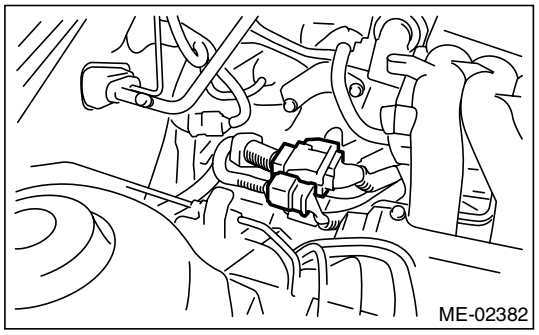
17) Install the under cover.
18) Lower the vehicle.
19) Connect the following hoses.
(1) Fuel delivery hose and evaporation hose
(2) Heater inlet and outlet hoses
(3) Brake booster vacuum hose
(4) Pressure regulator vacuum hose

20) Connect the following connectors:
(1) Engine ground terminals

Tightening torque:
14 N·m (1.4 kgf-m, 10.1 ft-lb)



(2) Engine harness connectors



(3) Generator connector and terminal
(4) A/C compressor connector
(5) Power steering switch connector

21) Install the A/C pressure hoses.
<Ref. to AC-39, INSTALLATION, Hose and Tube.>
22) Install the V-belts. <Ref. to ME(H6DO)-33, INSTALLATION, V-belt.>
23) Install the radiator to vehicle. <Ref. to CO(H6DO)-17, INSTALLATION, Radiator.>
24) Install the air intake duct, air cleaner case and air intake chamber. <Ref. to IN(H6DO)-8, INSTALLATION, Air Intake Duct.> <Ref. to IN(H6DO)-6, INSTALLATION, Air Cleaner Case.> <Ref. to IN(H6DO)-7, INSTALLATION, Air Intake Chamber.>
25) Install the battery in the vehicle and connect cables.
26) Fill engine coolant.
<Ref. to CO(H6DO)-11, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
27) Check the ATF level and replenish it if necessary.
<Ref. to 5AT-28, INSPECTION, Automatic Transmission Fluid.>
28) Charge the A/C system with refrigerant. <Ref. to AC-21, PROCEDURE, Refrigerant Charging Procedure.>
29) Install the collector cover.

30) Remove the front hood stay, and close the front hood.
31) Take off the vehicle from a lift.

C: INSPECTION

1) Check the pipes and hoses are installed firmly.
2) Check the engine coolant and ATF are at specified levels.
3) Start the engine and check for leaks of fuel, exhaust gas, engine coolant, etc. Also check for noise and vibrations.

11.Engine Mounting

A: REMOVAL

1) Remove the engine assembly. <Ref. to ME(H6DO)-34, REMOVAL, Engine Assembly.>
2) Remove the engine mounting from engine assembly.

B: INSTALLATION

Install in the reverse order of removal.

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

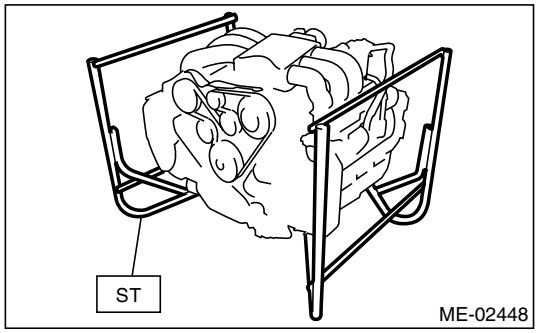
C: INSPECTION

Make sure that there are no cracks or other damages.

12.Preparation for Overhaul

A: REMOVAL

1) Remove the engine assembly. <Ref. to ME(H6DO)-34, REMOVAL, Engine Assembly.>
2) Set the engine on ST.
ST 18232AA000 ENGINE STAND

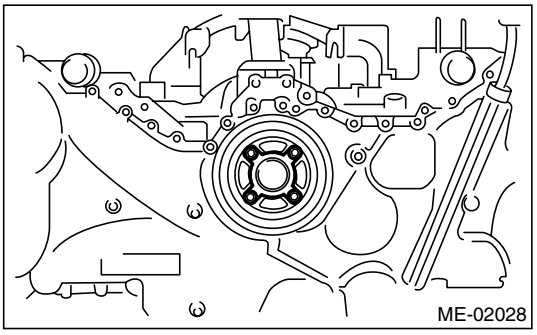


3) Before servicing overhaul, remove the sensor, pipe and hose that installed to engine.
(1) Remove the intake manifold. <Ref. to FU(H6DO)-12, REMOVAL, Intake Manifold.>
(2) Remove the generator. <Ref. to SC(H4SO 2.0)-14, REMOVAL, Generator.>
(3) Remove the A/C compressor. <Ref. to AC-34, REMOVAL, Compressor.>
(4) Disconnect the water pipe and hose.
(5) Disconnect the engine harness.
(6) Remove the spark plug. <Ref. to IG(H6DO)-4, REMOVAL, Spark Plug.>
(7) Remove the camshaft position sensor. <Ref. to FU(H6DO)-20, REMOVAL, Camshaft Position Sensor.>
(8) Remove the crankshaft position sensor. <Ref. to FU(H6DO)-19, REMOVAL, Crankshaft Position Sensor.>
(9) Remove the knock sensor. <Ref. to FU(H6DO)-21, REMOVAL, Knock Sensor.>
(10)Remove the engine coolant temperature sensor. <Ref. to FU(H6DO)-18, REMOVAL, Engine Coolant Temperature Sensor.>
(11)Remove the oil pressure switch. <Ref. to LU(H6DO)-13, REMOVAL, Oil Pressure Switch.>
(12)Remove the oil filter. <Ref. to LU(H6DO)-14, REMOVAL, Engine Oil Filter.>
(13)Remove the oil cooler. <Ref. to LU(H6DO)-15, REMOVAL, Engine Oil Cooler.>

13.Crank Pulley

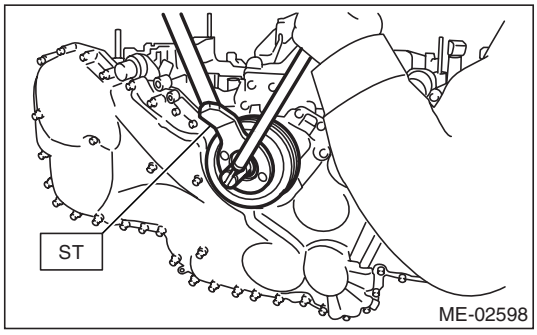
A: REMOVAL

1) Remove the crank pulley cover.



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

ST 499977100 CRANK PULLEY WRENCH



3) Remove the crank pulley.

B: INSTALLATION

1) Install the crank pulley.

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

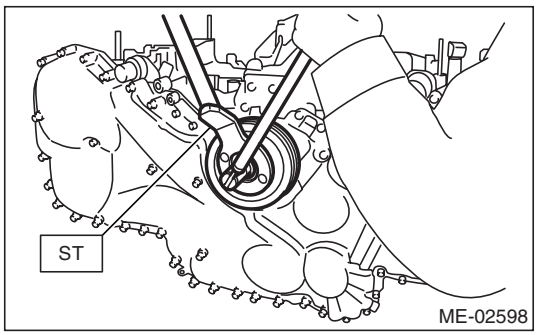
ST 499977100 CRANK PULLEY WRENCH

(1) Clean the crank pulley thread using compressed air.

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

(3) Tighten the crank pulley bolts.

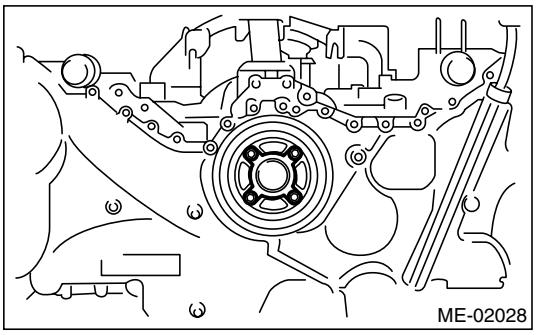
Tightening torque:
178 N·m (18.1 kgf-m, 131 ft-lb)



3) Install the crank pulley cover.

NOTE:
Assemble the O-ring to crank pulley cover.

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



C: INSPECTION

1) Check the crank pulley cover for oil and air leakage.

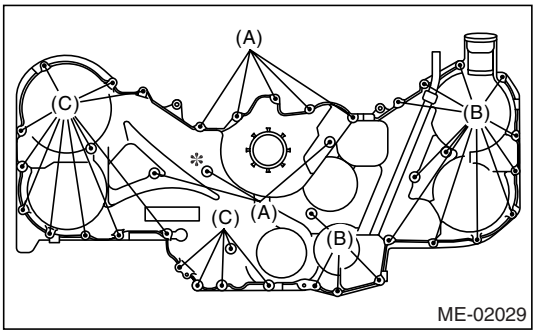
2) Check the crank pulley for looseness.

14.Front Chain Cover

A: REMOVAL

1) Remove the crank pulley. <Ref. to ME(H6DO)-44, REMOVAL, Crank Pulley.>
2) Remove the front chain cover.

NOTE:
Chain cover installation bolt has three different sizes. To prevent the confusion in installation, keep these bolts on container individually.



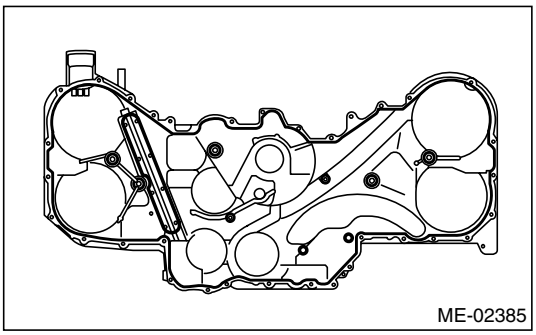
(A) M6 × 16
(B) M6 × 30
(C) M6 × 45
*: Sealing washer

B: INSTALLATION

1) Remove the used liquid gasket from mating surface, and degrease it.
2) Apply liquid gasket to the mating surface of front chain cover.

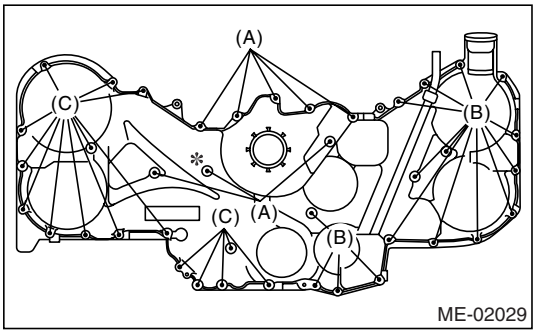
Liquid gasket:
THREE BOND 1280B (Part No. K0877YA018)

Applying liquid gasket diameter:
2.5±0.5 mm (0.098±0.020 in)



3) Install the front chain cover. Temporarily tighten the bolts.

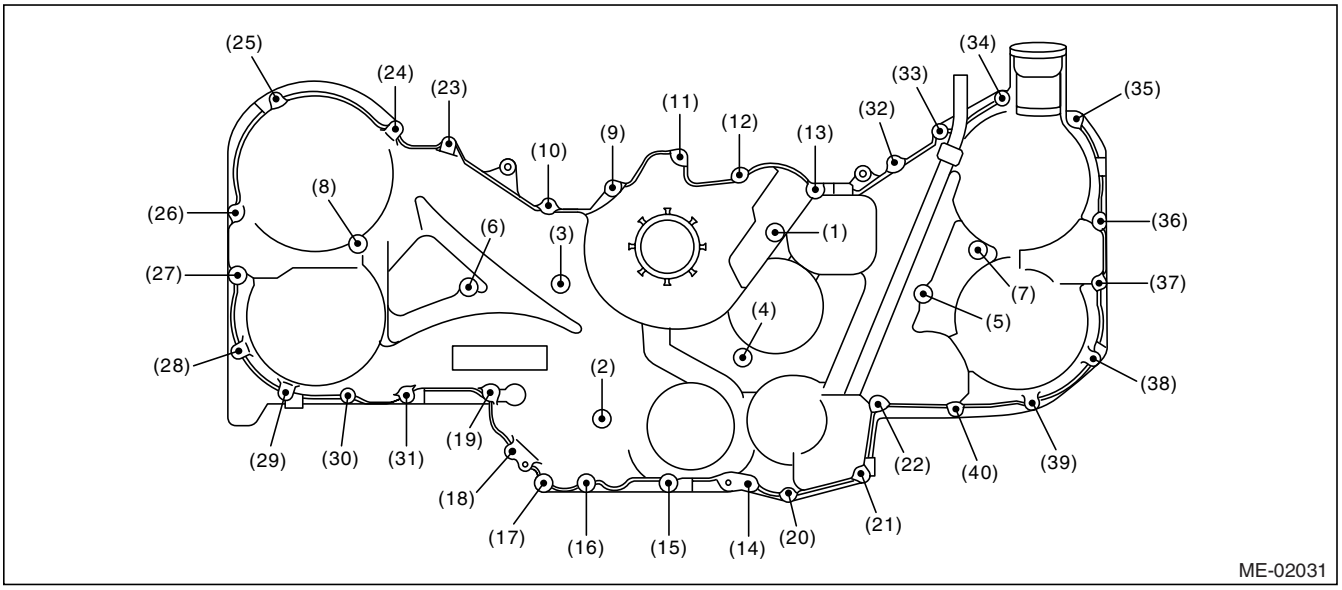
CAUTION:
Do not install the bolts in wrong place.



(A) M6 × 16
(B) M6 × 30
(C) M6 × 45
*: Sealing washer

4) Tighten the bolts in the numerical order as shown in the figure.

Tightening torque:
6.6 N·m (0.67 kgf-m, 4.8 ft-lb)



5) Install the crank pulley. <Ref. to ME(H6DO)-44, INSTALLATION, Crank Pulley.>

C: INSPECTION

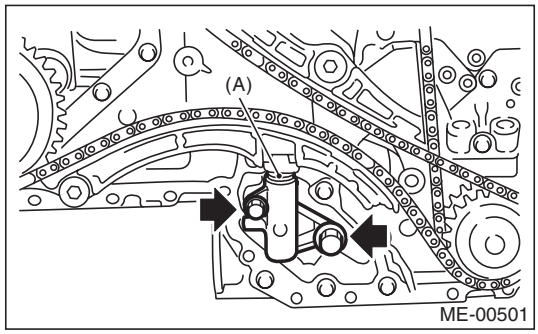
Check the cover surface for scratch and damage.
Check for oil leakage on cover mating surface and installation part of crank pulley.

15.Timing Chain Assembly

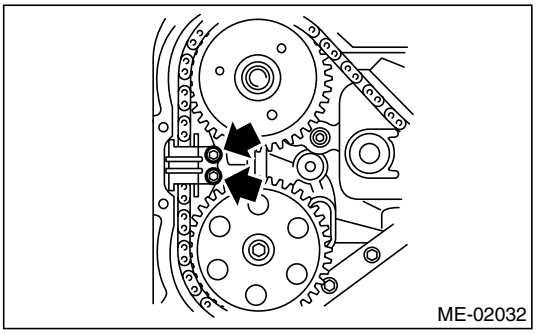
A: REMOVAL

1) Remove the crank pulley. <Ref. to ME(H6DO)-44, REMOVAL, Crank Pulley.>
2) Remove the front chain cover. <Ref. to ME(H6DO)-45, REMOVAL, Front Chain Cover.>
3) Remove the chain tensioner (RH).

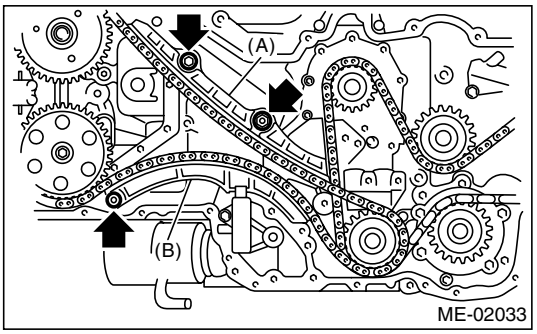
NOTE:
Be careful not to come out the plunger (A).



4) Remove the chain guide (RH: between cams).



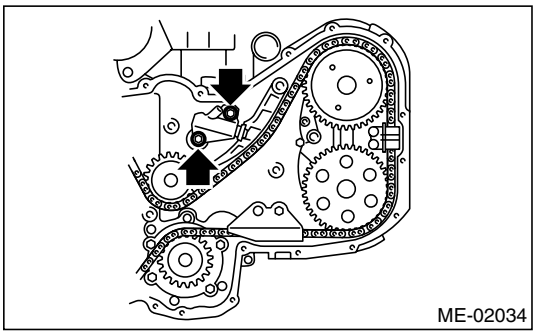
5) Remove the chain guide (RH).
6) Remove the chain tensioner lever (RH).



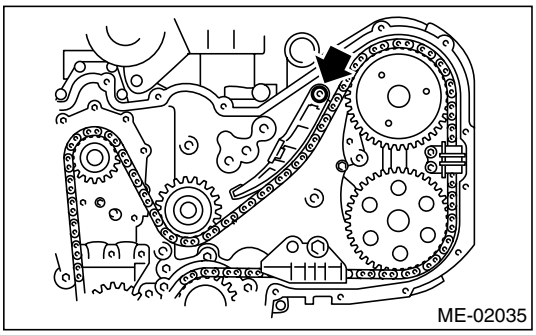
(A) Chain guide (RH)
(B) Chain tensioner lever (RH)

7) Remove the timing chain (RH).
8) Remove the chain tensioner (LH).

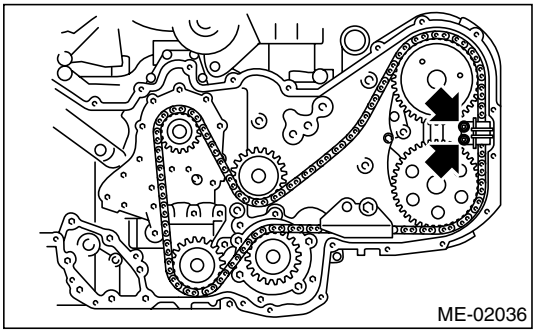
NOTE:
Be careful not to come out the plunger.



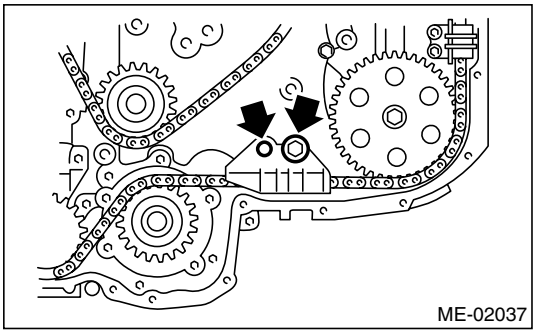
9) Remove the chain tensioner lever (LH).



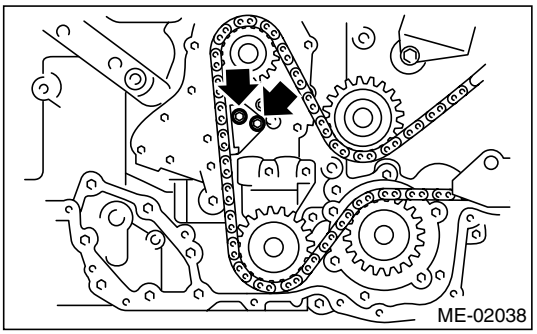
10) Remove the chain guide (LH: between cams).



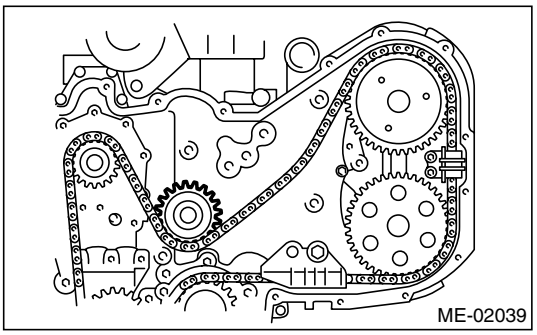
11) Remove the chain guide (LH).



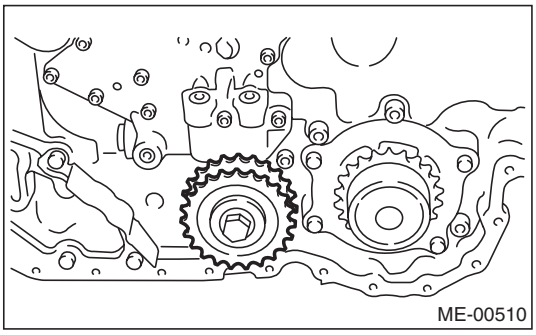
12) Remove the chain guide (center).



13) Remove the idler sprocket (upper).



14) Remove the timing chain (LH).
15) Remove the idler sprocket (lower).

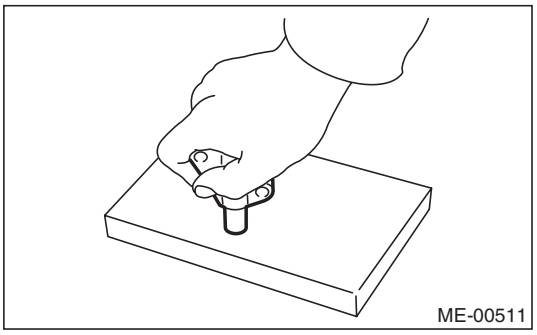


B: INSTALLATION

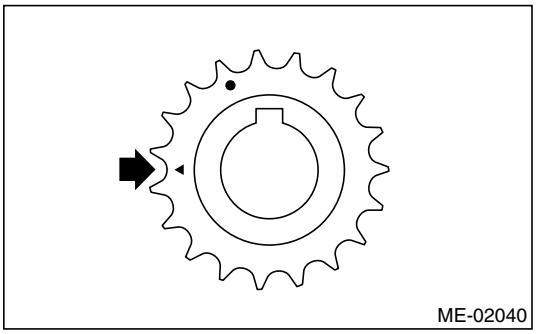
NOTE:
• Be careful that the foreign matter is not into or onto assembled component during installation.
• Apply engine oil to the chain guide, chain tensioner lever and idler sprocket when installing.

1) Preparation for chain tensioner installation
   (1) Insert the screw, spring pin and tension rod into tensioner body.
   (2) While depressing the tensioner onto rubber mat, twist it to shorten tension rod. Then insert the thin pin into the hole between tension rod and tension body to keep shortened.

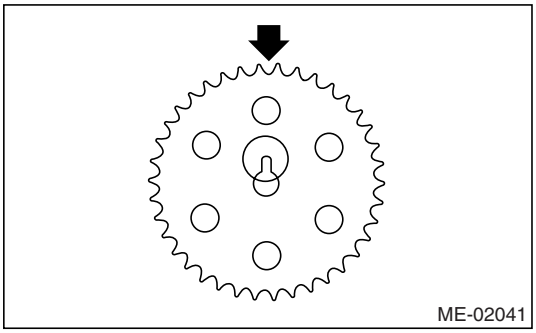
NOTE:
Work on the rubber mat or other anti-skid materials.



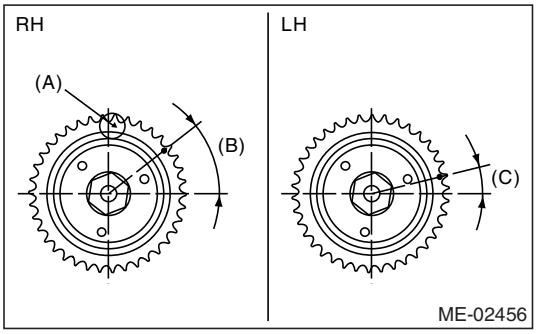
2) Using the ST, align the “Top mark” on crank sprocket to 9 o’clock position as shown in the figure
ST 18252AA000 CRANKSHAFT SOCKET



3) Using the ST, align the key groove on exhaust cam sprocket to 12 o’clock position as shown in the figure



4) Align the intake cam sprocket as shown in the figure.



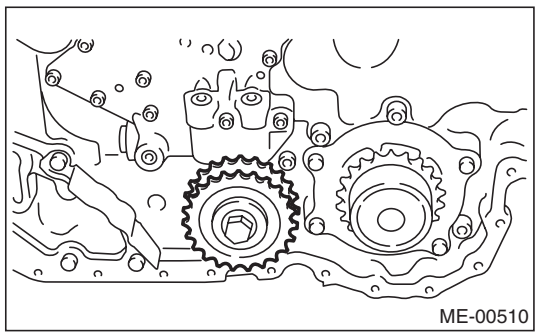
(A) Top mark
(B) 40°
(C) 15°

5) Turn the crank sprocket clockwise, align the "Top mark" to 12 o'clock position. (Piston #1 is in TDC position)

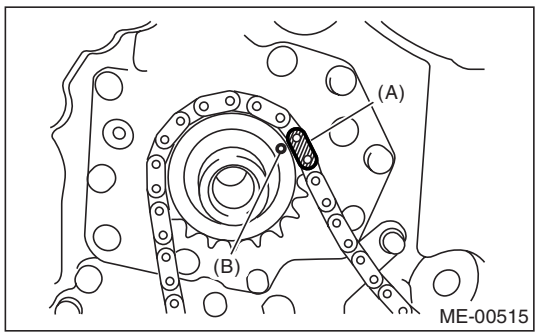
NOTE:
Do not rotate the crank shaft and cam sprocket before completing timing chain installation.

6) Install the idler sprocket (lower).

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



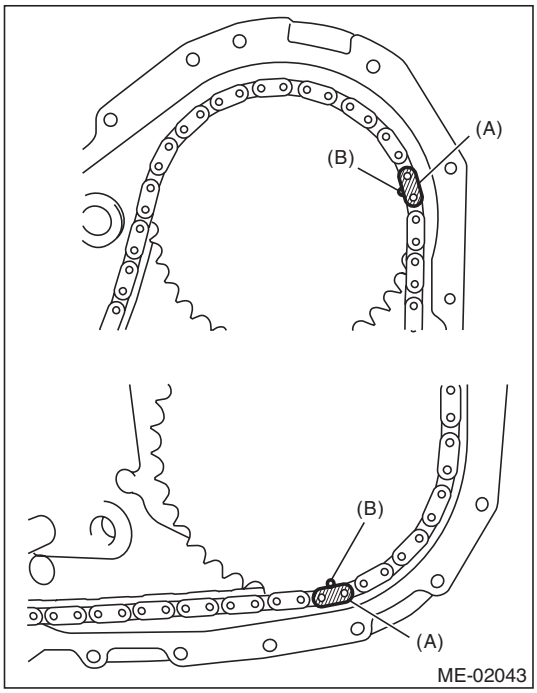
7) Install the timing chain (LH).
(1) Align the timing mark (B) on the crank sprocket with mark (A) on the timing chain (LH).



(A) Gold
(B) Mark

(2) Install the timing chain (LH) to the idler sprocket (lower), water pump, exhaust cam sprocket (LH) and intake cam sprocket (LH) in this order.

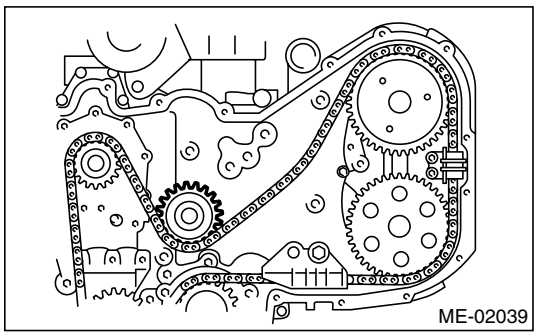
NOTE:
Check that the mark on timing chain (A) and cam sprocket (B) is aligned as same as aligned on crank sprocket.



(A) Blue
(B) Mark

(3) Install the idler sprocket (upper).

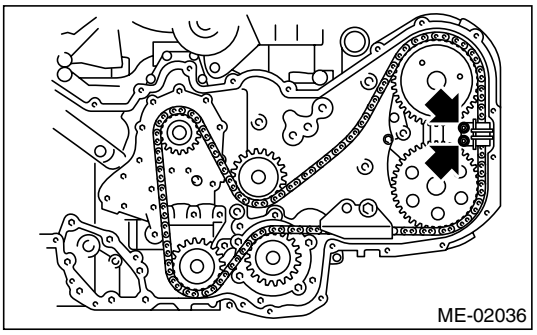
Tightening torque:
69 N·m (7.0 kgf-m, 50.6 ft-lb)



(4) Install the chain guide (LH: between cams).

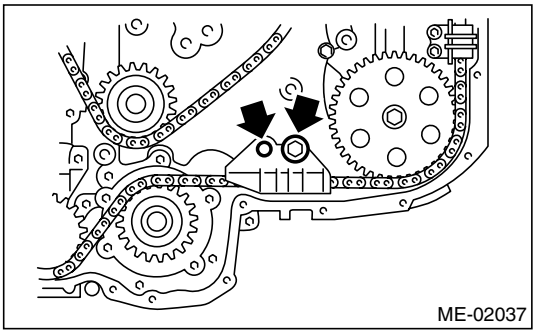
Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

NOTE:
Use a new installing bolt.



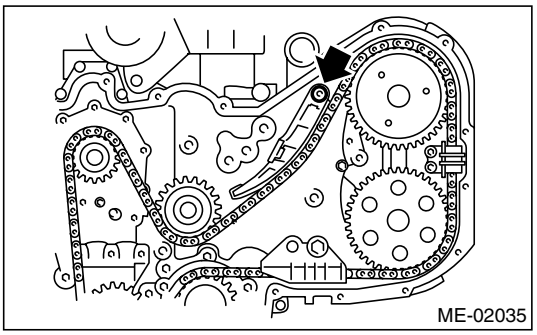
(5) Install the chain guide (LH).

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



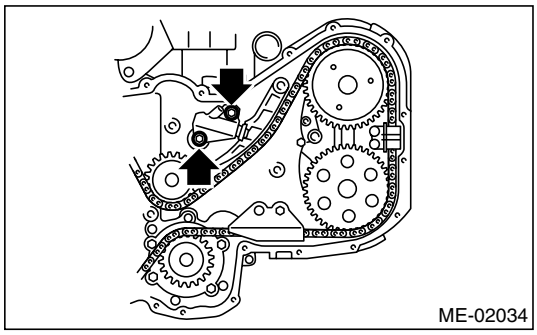
(6) Install the chain tensioner lever (LH).

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

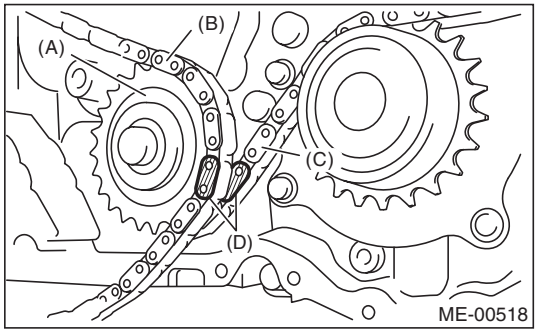


(7) Install the chain tensioner (LH).

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



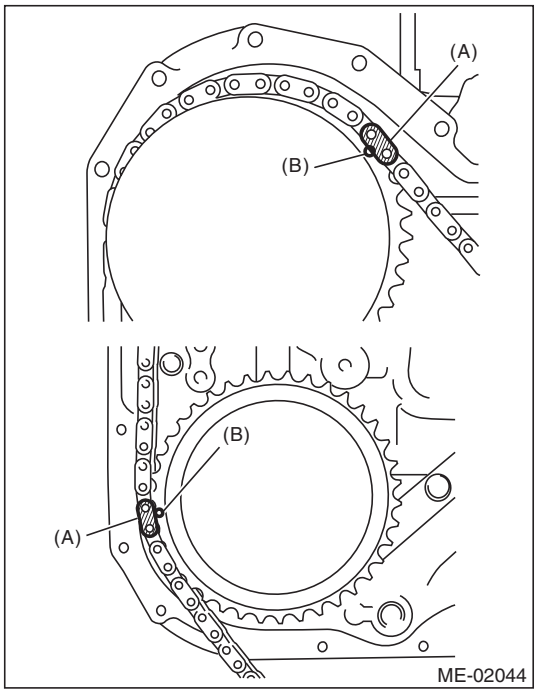
8) Install the timing chain (RH).
(1) Align the marks of timing chain LH and RH on the idler sprocket (lower).



(A) Idler sprocket (lower)
(B) Timing chain (RH)
(C) Timing chain (LH)
(D) Blue

(2) Install the timing chain (RH) to the intake cam sprocket (RH) and exhaust cam sprocket (RH) in this order.

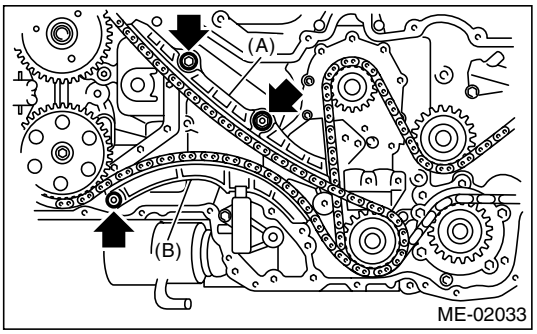
NOTE:
Check that the mark on timing chain (A) and cam sprocket (B) is aligned as same as aligned on crank sprocket.



(A) Gold
(B) Mark

(3) Install the chain guide (RH).
(4) Install the chain tensioner lever (RH).

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

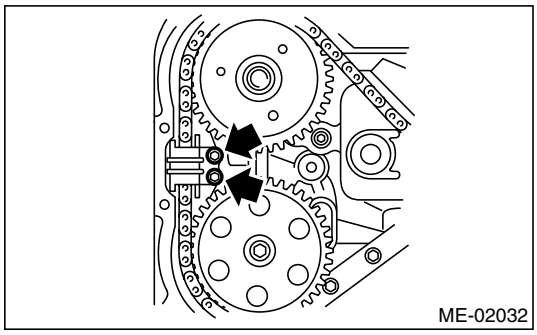


(A) Chain guide (RH)
(B) Chain tensioner lever (RH)

(5) Install the chain guide (RH: between cams).

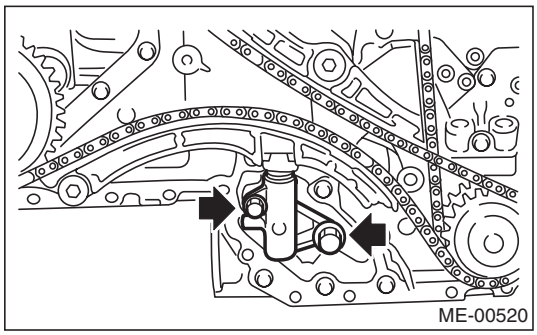
Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

NOTE:
Use a new installing bolt.



(6) Install the chain tensioner (RH).

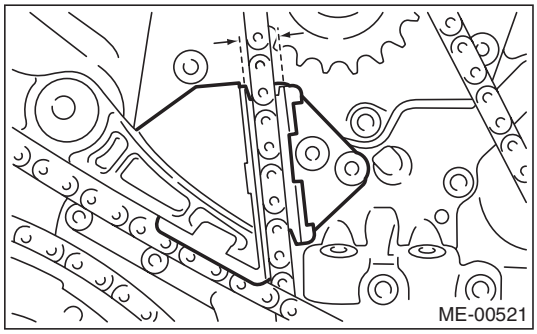
Tightening torque:
16 N·m (1.6 kgf-m, 11.8 ft-lb)



(7) Adjust the clearance between chain guide (RH) and chain guide (center) within 8.4 — 8.6 mm (0.331 — 0.339 in). Install the chain guide (center).

Tightening torque:
7.8 N·m (0.8 kgf-m, 5.8 ft-lb)

NOTE:
Use a new installing bolt.

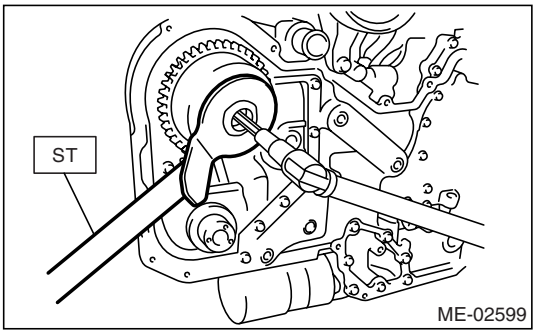


(8) Check that each mark on the sprocket and timing chain is matched, and then draw out the stopper pin from chain tensioner.

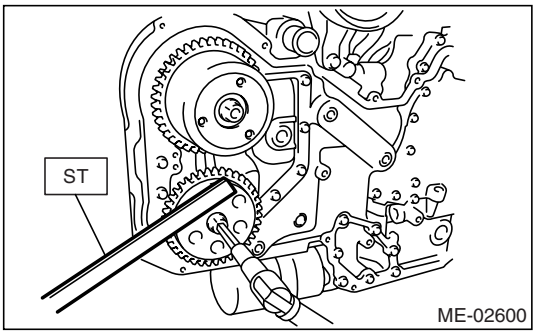
16.Cam Sprocket

A: REMOVAL

1) Remove the crank pulley. <Ref. to ME(H6DO)-44, REMOVAL, Crank Pulley.>
2) Remove the front chain cover. <Ref. to ME(H6DO)-45, REMOVAL, Front Chain Cover.>
3) Remove the timing chain assembly.
<Ref. to ME(H6DO)-47, REMOVAL, Timing Chain Assembly.>
4) Remove the cam sprocket. To lock the camshaft, use the ST.
ST 499977500 CAM SPROCKET WRENCH



ST 18231AA020 CAM SPROCKET WRENCH



B: INSTALLATION

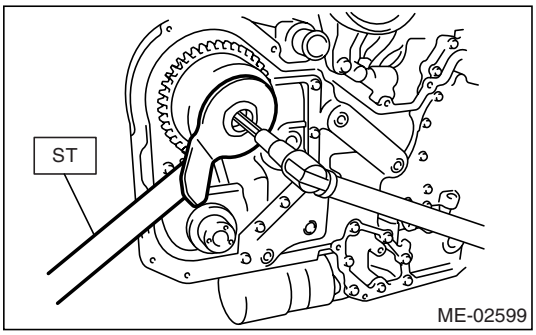
1) Install the cam sprocket. To lock the camshaft, use the ST.

Tightening torque:
29.5 N·m (3.01 kgf-m, 21.8 ft-lb)

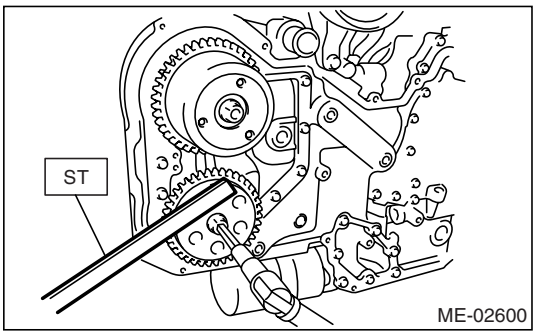
2) Further tighten the bolt.

Tightening angle:
Intake side
45°±5°
Exhaust side
25°±5°

ST 499977500 CAM SPROCKET WRENCH



ST 18231AA020 CAM SPROCKET WRENCH



3) Install the timing chain assembly.
<Ref. to ME(H6DO)-48, INSTALLATION, Timing Chain Assembly.>
4) Install the front chain cover.
<Ref. to ME(H6DO)-45, INSTALLATION, Front Chain Cover.>
5) Install the crank pulley. <Ref. to ME(H6DO)-44, INSTALLATION, Crank Pulley.>

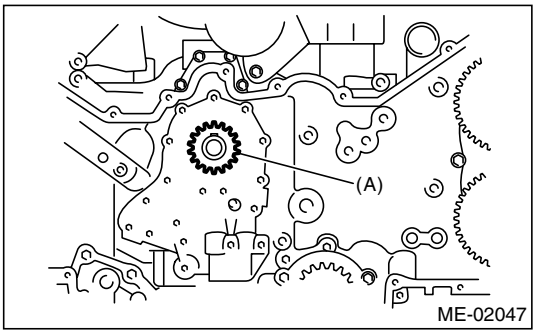
C: INSPECTION

1) Check the cam sprocket teeth for abnormal wear and scratches.
2) Make sure there is no free play between cam sprocket and key.

17.Crank Sprocket

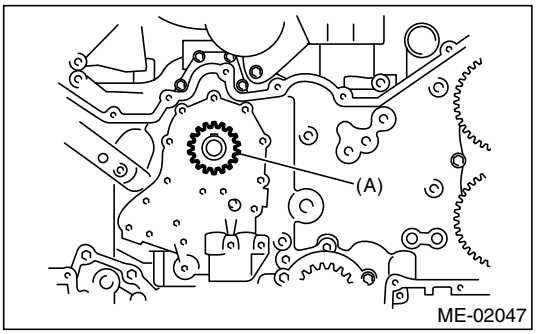
A: REMOVAL

1) Remove the crank pulley. <Ref. to ME(H6DO)-44, REMOVAL, Crank Pulley.>
2) Remove the front chain cover. <Ref. to ME(H6DO)-45, REMOVAL, Front Chain Cover.>
3) Remove the timing chain assembly.
<Ref. to ME(H6DO)-47, REMOVAL, Timing Chain Assembly.>
4) Remove the cam sprocket. <Ref. to ME(H6DO)-52, REMOVAL, Cam Sprocket.>
5) Remove the crank sprocket (A).



B: INSTALLATION

1) Install the crank sprocket (A).



2) Install the cam sprocket. <Ref. to ME(H6DO)-52, INSTALLATION, Cam Sprocket.>
3) Install the timing chain assembly.
<Ref. to ME(H6DO)-48, INSTALLATION, Timing Chain Assembly.>
4) Install the front chain cover.
<Ref. to ME(H6DO)-45, INSTALLATION, Front Chain Cover.>
5) Install the crank pulley. <Ref. to ME(H6DO)-44, INSTALLATION, Crank Pulley.>

C: INSPECTION

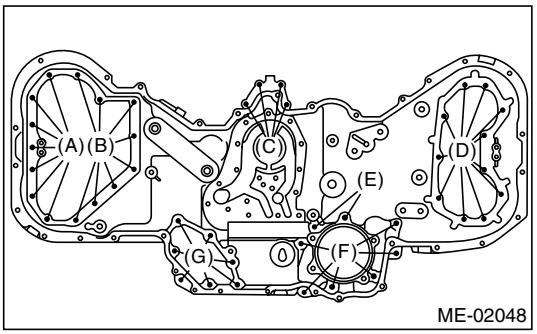
1) Check the crank sprocket teeth for abnormal wear and scratches.
2) Make sure there is no free play between crank sprocket and key.

18.Rear Chain Cover

A: REMOVAL

1) Remove the crank pulley. <Ref. to ME(H6DO)-44, REMOVAL, Crank Pulley.>
2) Remove the front chain cover. <Ref. to ME(H6DO)-45, REMOVAL, Front Chain Cover.>
3) Remove the timing chain. <Ref. to ME(H6DO)-47, REMOVAL, Timing Chain Assembly.>
4) Remove the cam sprocket. <Ref. to ME(H6DO)-52, REMOVAL, Cam Sprocket.>
5) Remove the crank sprocket.
6) Remove the oil pump. <Ref. to LU(H6DO)-8, REMOVAL, Oil Pump.>
7) Remove the water pump. <Ref. to CO(H6DO)-13, REMOVAL, Water Pump.>
8) Remove the rear chain cover.

NOTE:
Installation bolt has seven different sizes. To prevent the confusion in installation, keep these bolts on container individually.



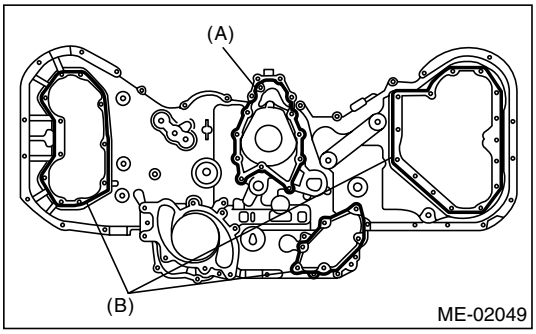
(A) M6 × 14
(B) M6 × 18 (Silver)
(C) M6 × 30
(D) M6 × 18
(E) M8 × 40
(F) M8 × 30
(G) M6 × 22

B: INSTALLATION

1) Remove the used liquid gasket from mating surface, and degrease it.
2) Apply liquid gasket to the mating surface of rear chain cover.

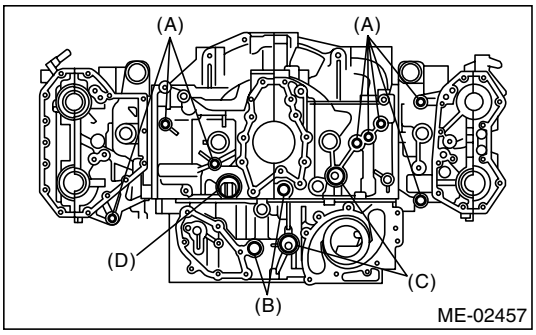
Liquid gasket:
THREE BOND 1280B (Part No. K0877YA018)

Applying liquid gasket diameter:
(A) 1.0±0.5 mm (0.039±0.020 in)
(B) 3.0±1.0 mm (0.118±0.039 in)



3) Install the O-ring.

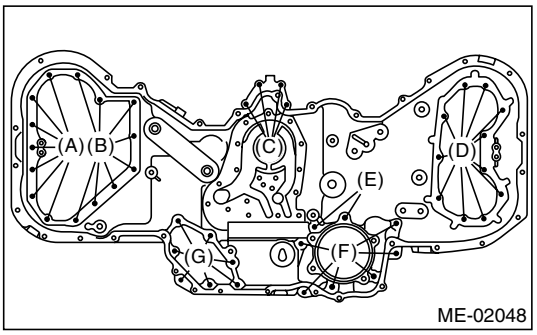
NOTE:
- Do not reuse the O-ring.
- Do not install the O-ring in wrong place.



(A) 14.2 × 1.9
(B) 19.2 × 2.4
(C) 25 × 2
(D) 31.2 × 1.9

4) Temporarily tighten the rear chain cover.

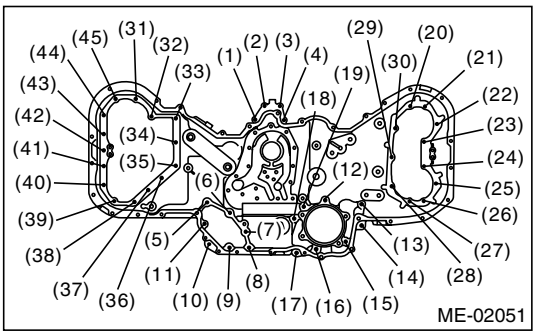
NOTE:
Do not install the bolts in wrong place.



(A) M6 × 14
(B) M6 × 18 (Silver)
(C) M6 × 30
(D) M6 × 18
(E) M8 × 40
(F) M8 × 30
(G) M6 × 22

5) Tighten the bolts in the numerical order as shown in the figure.

Tightening torque:
(1) — (11): 9 N·m (0.9 kgf-m, 6.5 ft-lb)
(12) — (19): 20 N·m (2.0 kgf-m, 14 ft-lb)
(20) — (30): 9 N·m (0.9 kgf-m, 6.5 ft-lb)
(31) — (38): 12 N·m (1.2 kgf-m, 8.7 ft-lb)
(39) — (45): 9 N·m (0.9 kgf-m, 6.5 ft-lb)

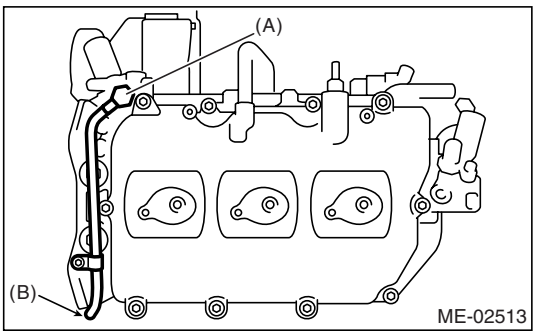


6) Install the water pump. <Ref. to CO(H6DO)-13, INSTALLATION, Water Pump.>
7) Install the oil pump. <Ref. to LU(H6DO)-8, INSTALLATION, Oil Pump.>
8) Install the crank sprocket.
9) Install the cam sprocket. <Ref. to ME(H6DO)-52, INSTALLATION, Cam Sprocket.>
10) Install the timing chain. <Ref. to ME(H6DO)-48, INSTALLATION, Timing Chain Assembly.>
11) Install the front chain cover.
<Ref. to ME(H6DO)-45, INSTALLATION, Front Chain Cover.>
12) Install the crank pulley. <Ref. to ME(H6DO)-44, INSTALLATION, Crank Pulley.>

19.Camshaft

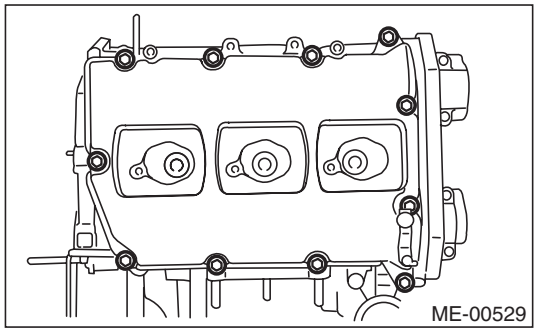
A: REMOVAL

1) Remove the crank pulley. <Ref. to ME(H6DO)-44, REMOVAL, Crank Pulley.>
2) Remove the front chain cover. <Ref. to ME(H6DO)-45, REMOVAL, Front Chain Cover.>
3) Remove the timing chain assembly.
<Ref. to ME(H6DO)-47, REMOVAL, Timing Chain Assembly.>
4) Remove the cam sprocket.
<Ref. to ME(H6DO)-52, REMOVAL, Cam Sprocket.>
5) Remove the crank sprocket.
<Ref. to ME(H6DO)-53, REMOVAL, Crank Sprocket.>
6) Remove the rear chain cover.
<Ref. to ME(H6DO)-54, REMOVAL, Rear Chain Cover.>
7) Disconnect the oil pipe.

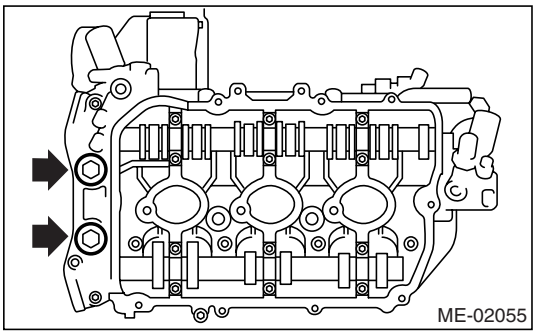


(A) Bolt without filter (with white mark)
(B) Bolt with filter (without white mark)

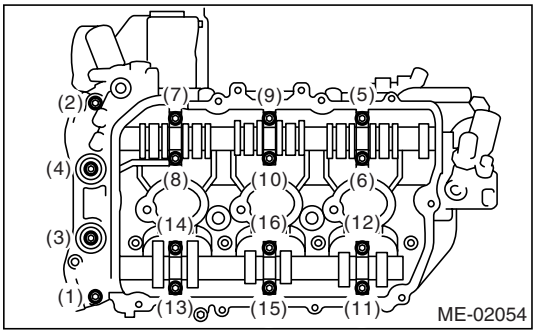
8) Remove the rocker cover (LH).



9) Remove the plugs (LH).



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



11) Remove the camshaft caps and camshaft (LH).

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

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

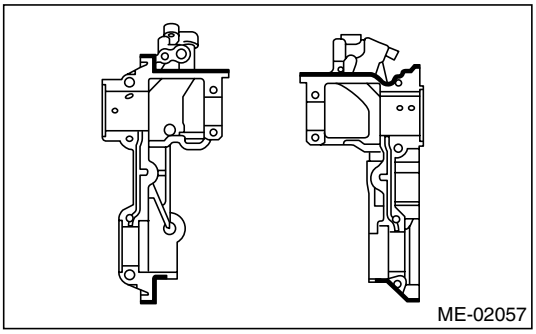
B: INSTALLATION

1) Apply engine oil to camshaft journals, and install the camshaft.
2) Install the camshaft cap.
   (1) Apply liquid gasket sparingly to back side of front camshaft cap as shown in the figure.

CAUTION:
Do not apply liquid gasket excessively. Applying excessively may cause excess gasket to come out and flow toward cam journal, resulting in engine burnt.

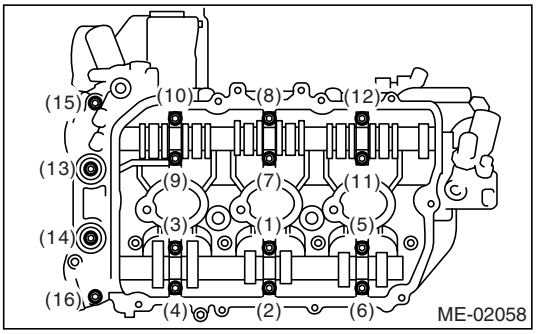
Liquid gasket:
THREE BOND 1280B (Part No. K0877YA018)

Applying liquid gasket diameter:
2.0±0.5 mm (0.079±0.020 in)



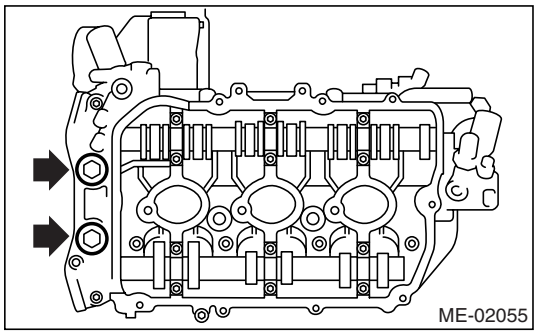
   (2) Apply engine oil to cap bearing surface, and install the cap to camshaft.
   (3) Tighten the rocker cover bolts in the numerical order as shown in the figure.

Tightening torque:
(1) — (12) 16 N·m (1.6 kgf-m, 11.8 ft-lb)
(13) — (16) 9.75 N·m (1.0 kgf-m, 7.2 ft-lb)



3) Install the plugs.

Tightening torque:
60 N·m (6.1 kgf-m, 44 ft-lb)

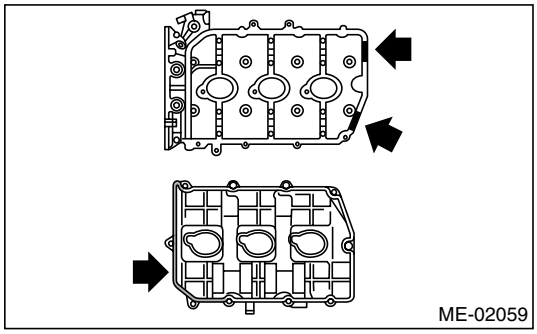


4) Install the rocker cover.
   (1) Apply liquid gasket sparingly to the mating surface of cylinder head and rocker cover as shown in the figure.

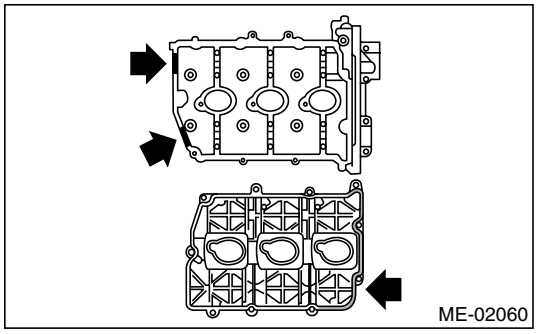
CAUTION:
Do not apply liquid gasket excessively. Applying excessively may cause excess gasket to come out and flow toward cam journal, resulting in engine burnt.

Liquid gasket:
THREE BOND 1280B (Part No. K0877YA018)

- LH side



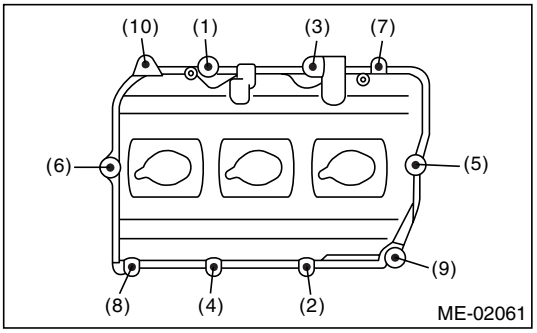
- RH side



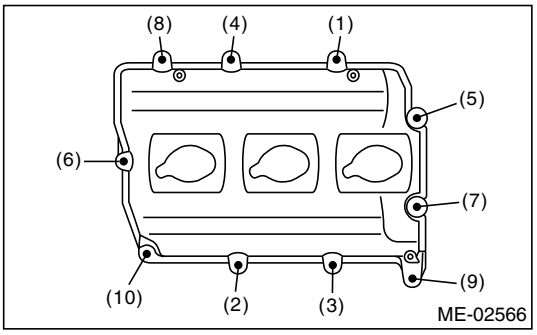
(2) Tighten the rocker cover bolts in the numerical order as shown in the figure.

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

- LH side



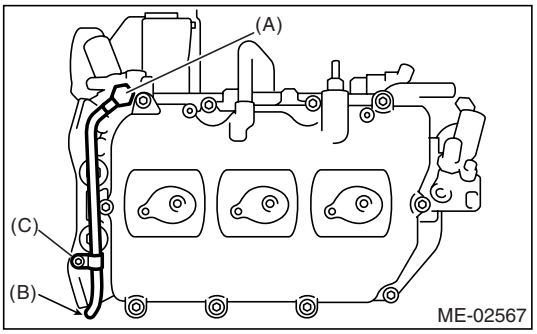
- RH side



5) Connect the oil pipe.

CAUTION:
• Be careful not to mistake the location of (A) and (B).
• Use a new gasket.

Tightening torque:
(A), (B)
29 N·m (3.01 kgf-m, 21.8 ft-lb)
(C)
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

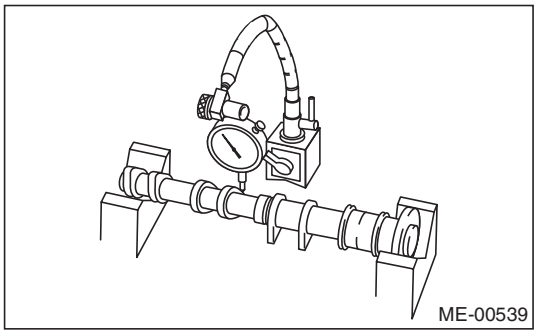


(A) Bolt without filter (with white mark)
(B) Bolt with filter (without white mark)
(C) Oil pipe bolt

6) Install the rear chain cover. <Ref. to ME(H6DO)-54, INSTALLATION, Rear Chain Cover.>
7) Install the crank sprocket.
<Ref. to ME(H6DO)-53, INSTALLATION, Crank Sprocket.>
8) Install the cam sprocket.
<Ref. to ME(H6DO)-52, INSTALLATION, Cam Sprocket.>
9) Install the timing chain assembly.
<Ref. to ME(H6DO)-48, INSTALLATION, Timing Chain Assembly.>
10) Install the front chain cover.
<Ref. to ME(H6DO)-45, INSTALLATION, Front Chain Cover.>
11) Install the crank pulley.
<Ref. to ME(H6DO)-44, INSTALLATION, Crank Pulley.>

C: INSPECTION

1) Measure the bend of camshaft. Repair or replace if bended.



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

	Camshaft journal	
	Front	Except for front
Standard mm (in)	37.946 — 37.963 (1.4939 — 1.4946)	25.946 — 25.963 (1.0215 — 1.0222)

4) Measurement of the camshaft journal oil clearance.

(1) Clean the bearing caps and camshaft journals.

(2) Place the camshafts on the cylinder head. (Without installing the valve rocker.)

(3) Place a plastigauge across each of the camshaft journals.

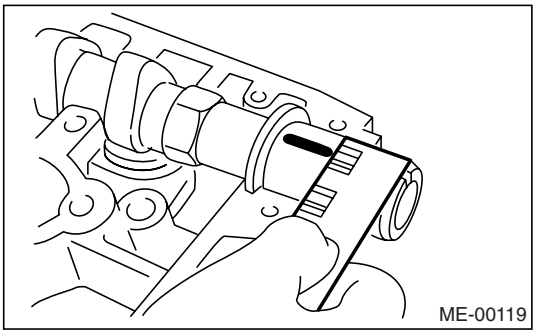
(4) Install the bearing cap.

NOTE:
Do not turn the camshaft.

(5) Remove the bearing caps.

(6) Measure the widest point of the plastigauge on each journal. If oil clearance exceeds the standard, 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)



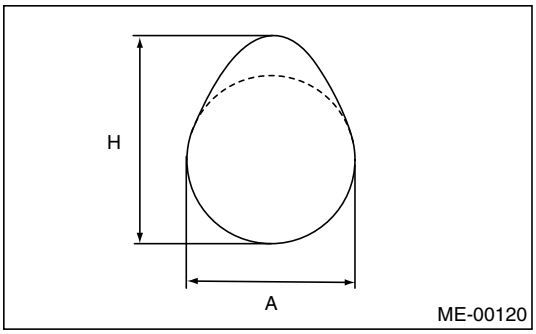
(7) Completely remove the plastigauge.

5) Check the cam face condition, and remove the minor faults by grinding with oil stone. Measure the cam height H. If it exceeds the standard or offset wearing is emitted, replace it.

Cam height H:

Standard
Intake
HIGH: 42.09 — 42.19 mm (1.6571 — 1.6610 in)
Intake
LOW1: 38.14 — 38.24 mm (1.5016 — 1.5055 in)
Intake
LOW2: 34.94 — 35.04 mm (1.3756 — 1.3795 in)
Exhaust
41.65 — 41.75 mm (1.6398 — 1.6437 in)

Cam base circle diameter A:
Intake
HIGH: 32.0 mm (1.2598 in)
Intake
LOW1: 31.84 mm (1.2535 in)
Intake
LOW2: 31.84 mm (1.2535 in)
Exhaust
32.0 mm (1.2598 in)



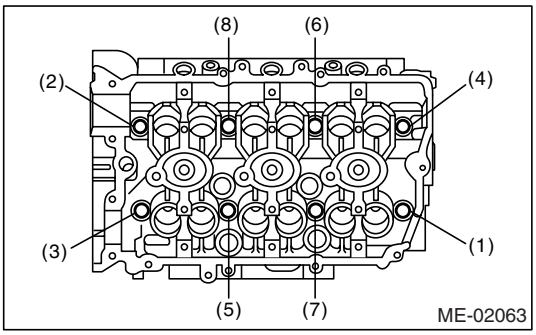
6) Measure the thrust clearance of camshaft with dial gauge. If the thrust clearance exceeds the standard or offset wearing is emitted, replace the camshaft caps and cylinder head as a set. If necessary, replace the camshaft.

Standard:
Intake
0.075 — 0.135 mm (0.0030 — 0.0053 in)
Exhaust
0.030 — 0.090 mm (0.0012 — 0.0035 in)

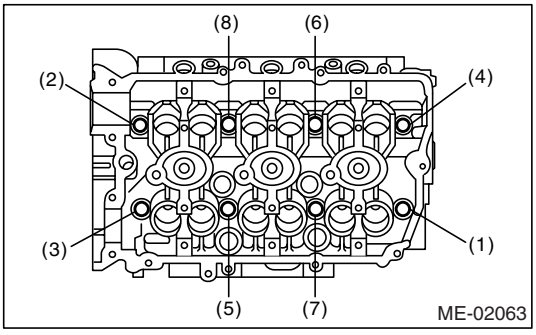
20.Cylinder Head

A: REMOVAL

1) Remove the crank pulley. <Ref. to ME(H6DO)-44, REMOVAL, Crank Pulley.>
2) Remove the front chain cover. <Ref. to ME(H6DO)-45, REMOVAL, Front Chain Cover.>
3) Remove the timing chain assembly.
<Ref. to ME(H6DO)-47, REMOVAL, Timing Chain Assembly.>
4) Remove the cam sprocket.
<Ref. to ME(H6DO)-52, REMOVAL, Cam Sprocket.>
5) Remove the crank sprocket.
<Ref. to ME(H6DO)-53, REMOVAL, Crank Sprocket.>
6) Remove the rear chain cover.
<Ref. to ME(H6DO)-54, REMOVAL, Rear Chain Cover.>
7) Remove the camshaft. <Ref. to ME(H6DO)-56, REMOVAL, Camshaft.>
8) Remove the cylinder head bolts in the numerical order as shown in the figure.
Leave bolts (2) and (4) engaged by three or four threads to prevent the cylinder head from falling.



9) While tapping the cylinder head with a plastic hammer, separate it from cylinder block.
10) Remove the bolts (2) and (4) to remove the cylinder head.



11) Remove the cylinder head gasket.

CAUTION:
Be careful not to scratch the mating surface of cylinder head and cylinder block.

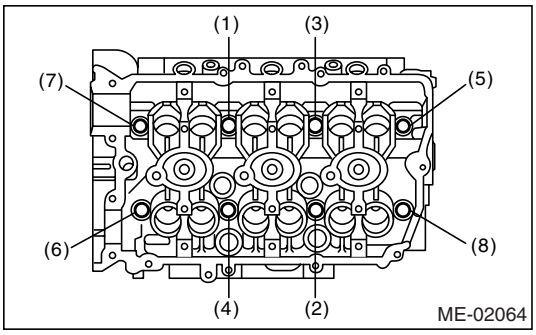
12) Similarly, remove the cylinder head (RH).

B: INSTALLATION

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

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

2) Tighten the cylinder head bolts.
(1) Apply a coat of engine oil to washers and cylinder head bolt threads.
(2) Install the cylinder head to cylinder block, and then tighten the bolts with torque of 20 N·m (2.0 kgf-m, 14 ft-lb) in numerical sequence as shown in the figure.
(3) Tighten the bolts with torque of 50 N·m (5.1 kgf-m, 37 ft-lb) in numerical sequence as shown in the figure.
(4) Back off all bolts by 180° in reverse order of installation, and back them off again by 180°.
(5) Tighten the bolts with torque of 20 N·m (2.0 kgf-m, 14 ft-lb) in numerical sequence as shown in the figure.
(6) Tighten the bolts (1) — (4) with torque of 48 N·m (4.9 kgf-m, 35.4 ft-lb) in numerical sequence.
(7) Tighten the bolts (5) — (8) with torque of 44 N·m (4.5 kgf-m, 33 ft-lb) in numerical sequence.
(8) Tighten the bolts 90° in the numerical order as shown in the figure.
(9) Tighten the bolt (1) — (4) by 45° in the numerical order.



3) Install the camshaft. <Ref. to ME(H6DO)-57, INSTALLATION, Camshaft.>
4) Install the rear chain cover. <Ref. to ME(H6DO)-54, INSTALLATION, Rear Chain Cover.>
5) Install the crank sprocket.
<Ref. to ME(H6DO)-53, INSTALLATION, Crank Sprocket.>
6) Install the cam sprocket.
<Ref. to ME(H6DO)-52, INSTALLATION, Cam Sprocket.>

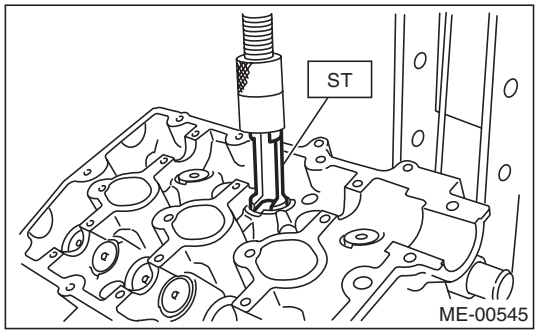
7) Install the timing chain assembly.
<Ref. to ME(H6DO)-48, INSTALLATION, Timing Chain Assembly.>
8) Install the front chain cover.
<Ref. to ME(H6DO)-45, INSTALLATION, Front Chain Cover.>
9) Install the crank pulley.
<Ref. to ME(H6DO)-44, INSTALLATION, Crank Pulley.>

C: DISASSEMBLY

1) Set the cylinder head on ST.
ST 18250AA010 CYLINDER HEAD TABLE
2) Remove the valve lifter.
3) Set the ST on valve spring retainer. Compress the valve spring and remove the valve spring retainer key. Remove each valve and valve spring.
ST 499718000 VALVE SPRING REMOVER

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

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



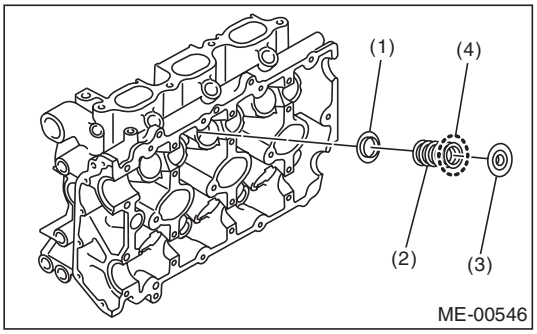
D: ASSEMBLY

1) Installation of valve spring and valve
(1) Set the cylinder head on ST.
ST 18250AA010 CYLINDER HEAD TABLE
(2) 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.

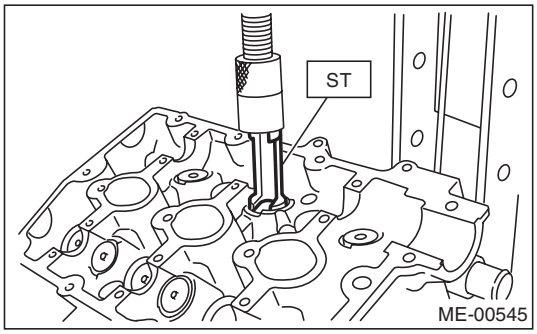
(3) Install the valve spring and retainer.

NOTE:
- Be sure to install the valve spring with its close-coiled end facing the seat on cylinder head.
- For the valve spring on intake side, install two of them (inner and outer).
- Install the valve spring with the painted side facing to retainer.



(1) Valve spring seat
(2) Valve spring
(3) Retainer
(4) Painted face

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



(5) Compress the valve spring and install the valve spring retainer key.
(6) After installing, tap the valve spring retainers lightly with a wooden hammer for better seating.
2) Apply oil to the surface of the valve lifter and valve shim.
3) Install the valve lifter and valve shim.

E: INSPECTION

1. CYLINDER HEAD

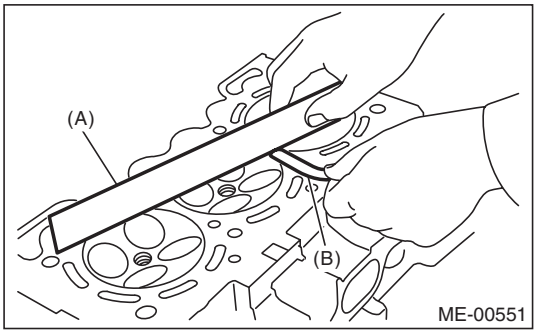
1) Make sure that crack or other damages do not exist. In addition to visual inspection, inspect important areas using liquid penetrant tester. Check that there are no marks of gas leaking or water leaking on gasket installing surface.
2) Set the cylinder head on ST.
ST 18250AA010 CYLINDER HEAD TABLE

3) Measure the flatness of the cylinder head surface that mates with crankcase using a straight edge (A) and thickness gauge (B).

Flatness:
Standard
0.02 mm (0.0008 in)

Standard height of cylinder head:
124±0.05 mm (4.88±0.0020 in)

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



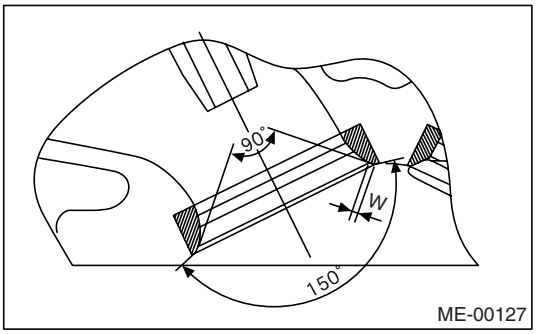
2. VALVE SEAT

Inspect the intake and exhaust valve seats, and correct the contact surfaces with a 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)

Exhaust
Standard
1.5 mm (0.059 in)



3. VALVE GUIDE

1) Check the clearance between valve guide and stem. The clearance can be checked by measuring the outer diameter of valve stem and inner diameter of valve guide respectively with a micrometer.

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)

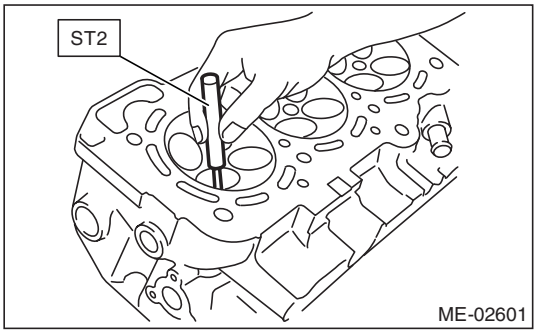
2) If the clearance between valve guide and stem exceeds the standard, replace the valve guide or valve itself whichever shows greater amount of wear or damaged and etc. See the following procedure for valve guide replacement.

Valve guide inner diameter:
5.500 — 5.512 mm (0.2165 — 0.2170 in)

Valve stem outer diameter:
Intake
5.455 — 5.470 mm (0.2148 — 0.2154 in)
Exhaust
5.445 — 5.460 mm (0.2144 — 0.2150 in)

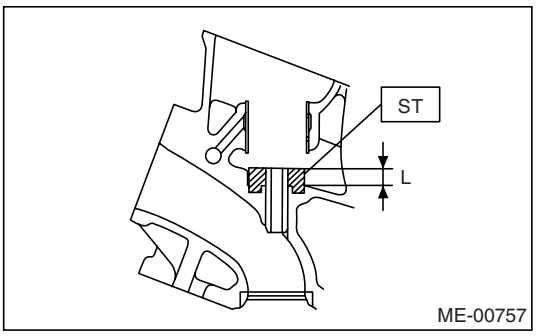
(1) Place the cylinder head on ST1 with the combustion chamber upward so that valve guides fit the holes in ST1.
(2) Insert the ST2 into valve guide and press it down to remove the valve guide.

ST1 18250AA010 CYLINDER HEAD TABLE
ST2 499765700 VALVE GUIDE REMOVER



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

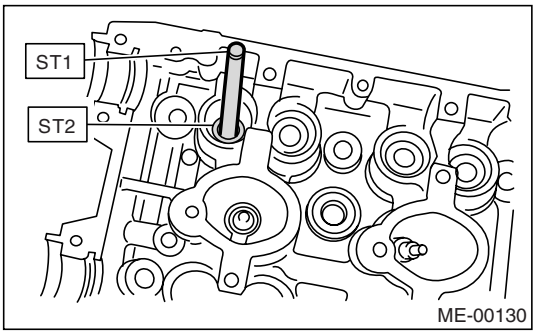
ST 18251AA040 VALVE GUIDE ADJUSTER



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

(5) Put a new valve guide, coated with sufficient oil, in cylinder, and insert the ST1 into valve guide. Press in until the valve guide upper end is flush with the upper surface of ST2.

ST1 499765700 VALVE GUIDE REMOVER
ST2 18251AA040 VALVE GUIDE ADJUSTER



(6) Check the valve guide protrusion.

Valve guide protrusion L:
11.4 — 11.8 mm (0.449 — 0.465 in)

(7) Ream the inside of valve guide using ST. Put the reamer in valve guide, and rotate the reamer slowly clockwise while pushing it lightly. Bring the reamer back while rotating it clockwise. After reaming, clean the valve guide to remove chips.

ST 499765900 VALVE GUIDE REAMER

NOTE:
• Apply engine oil to the reamer when reaming.
• If the inner surface of the valve guide is torn, the edge of the reamer should be slightly ground with an oil stone.
• If the inner surface of the valve guide becomes lustrous and the reamer does not chip, use a new reamer or remedy the reamer.

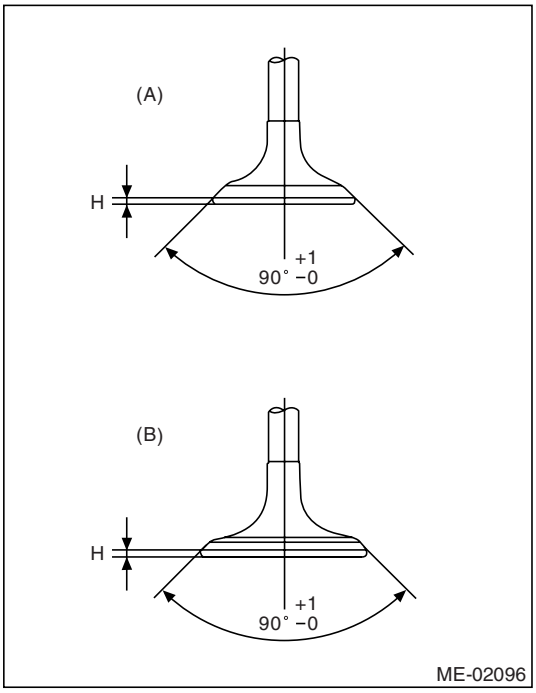
(8) Recheck the contact condition between valve and valve seat after replacing the valve guide.

4. INTAKE AND EXHAUST VALVE

1) Inspect the flange and stem of valve, and replace if damaged, worn or deformed, or if “H” exceeds the standard or offset wearing is emitted.

H:
Intake (A)
Standard: 1.0 mm (0.039 in)
Exhaust (B)
Standard: 1.2 mm (0.047 in)

Valve overall length:
Intake (A)
99.7 mm (3.925 in)
Exhaust (B)
105.2 mm (4.142 in)



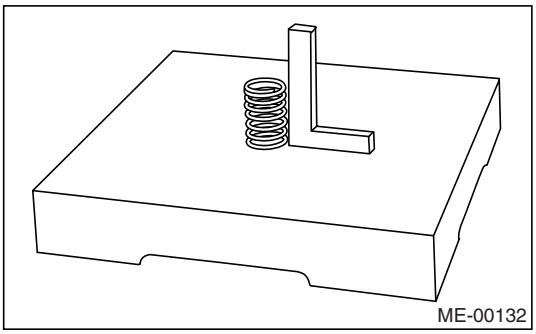
2) Put a small amount of grinding compound on the seat surface, and lap the valve and seat surface. Install a new intake valve oil seal after lapping.

5. VALVE SPRING

1) Check the valve springs for damage, free length, and tension. Replace the valve spring if it is not within the standard presented in the table.

Free length mm (in)	Intake	Inner	39.55 (1.5571)
		Outer	41.18 (1.6213)
	Exhaust		46.32 (1.8236)
Squareness	Intake	Inner	2.5°, 1.7 mm (0.067 in)
		Outer	2.5°, 1.8 mm (0.071 in)
	Exhaust		2.5°, 2.0 mm (0.079 in)

2) To measure the squareness of the valve spring, stand the spring on a surface plate and measure its deflection at the top of spring using a try square.



6. INTAKE AND EXHAUST VALVE OIL SEAL

In the following case, pinch and remove the oil seal from valve using pliers, and then replace it with a new one.

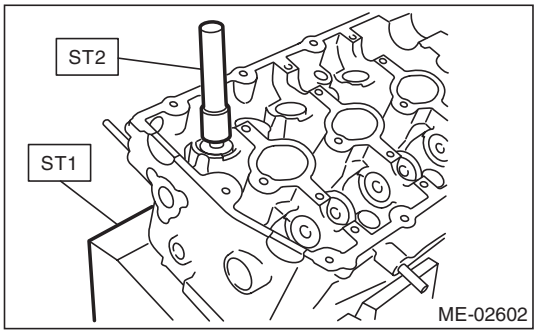
- When the lip is damaged.
- When the spring is out of the specified position.
- When readjusting the surfaces of intake valve and valve sheet.
- When replacing the intake valve guide.

1) Set the cylinder head on ST1.
2) Press-fit the oil seal to the specified dimension indicated in the figure using ST2.

ST1 18250AA010 CYLINDER HEAD TABLE
ST2 499585500 VALVE OIL SEAL GUIDE

NOTE:

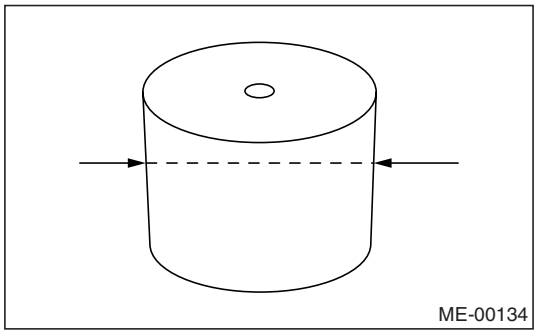
- Apply engine oil to oil seal before force-fitting.
- When press-fitting the oil seal, do not use a hammer or strike in.



7. VALVE LIFTER

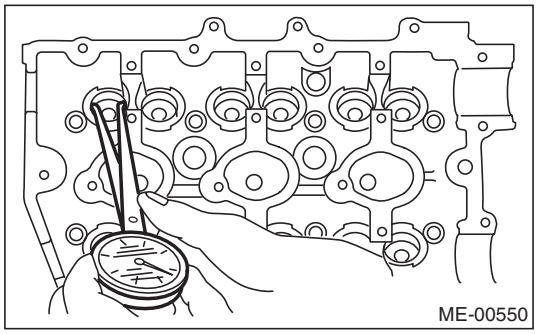
1) Check the valve lifter visually.
2) Measure the outer diameter of valve lifter.

Outer diameter:
32.959 — 32.975 mm (1.2976 — 1.2982 in)



3) Measure the inner diameter of valve lifter hole of cylinder head.

Inner diameter:
32.994 — 33.016 mm (1.2990 — 1.2998 in)



NOTE:
If difference between outer diameter of valve lifter and inner diameter of valve lifter hole is out of the standard or offset wearing is emitted, replace the cylinder head.

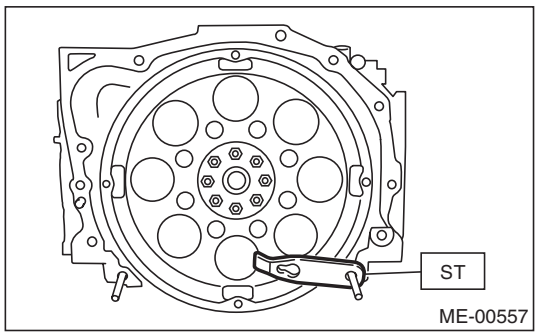
Standard:
0.019 — 0.057 mm (0.0007 — 0.0022 in)

21.Cylinder Block

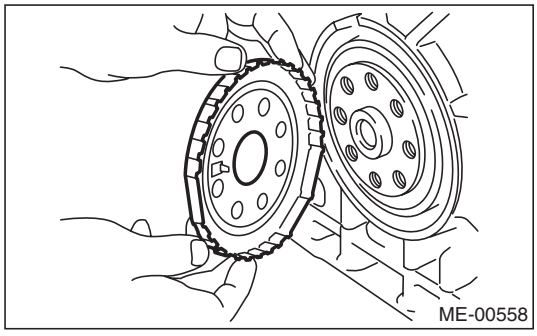
A: REMOVAL

NOTE:
Before conducting this procedure, drain engine oil completely.

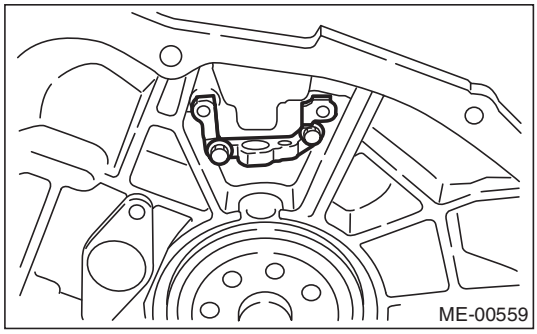
1) Remove the crank pulley. <Ref. to ME(H6DO)-44, REMOVAL, Crank Pulley.>
2) Remove the front chain cover. <Ref. to ME(H6DO)-45, REMOVAL, Front Chain Cover.>
3) Remove the timing chain assembly.
<Ref. to ME(H6DO)-47, REMOVAL, Timing Chain Assembly.>
4) Remove the cam sprocket.
<Ref. to ME(H6DO)-52, REMOVAL, Cam Sprocket.>
5) Remove the crank sprocket.
<Ref. to ME(H6DO)-53, REMOVAL, Crank Sprocket.>
6) Remove the rear chain cover.
<Ref. to ME(H6DO)-54, REMOVAL, Rear Chain Cover.>
7) Remove the camshaft. <Ref. to ME(H6DO)-56, REMOVAL, Camshaft.>
8) Remove the cylinder head. <Ref. to ME(H6DO)-60, REMOVAL, Cylinder Head.>
9) Remove the clutch disc and cover. <Ref. to CL-16, REMOVAL, Clutch Disc and Cover.>
10) Remove the flywheel. (MT model)
<Ref. to CL-21, REMOVAL, Flywheel.>
11) Remove the drive plate using ST. (AT model)
ST1 498497100 CRANKSHAFT STOPPER
ST2 499057000 TORX PLUS®



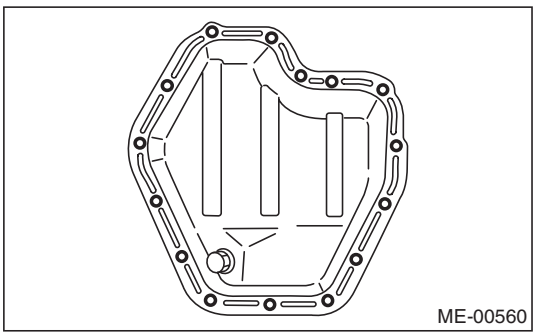
12) Remove the crankshaft position sensor plate.



13) Remove the crankshaft position sensor bracket.



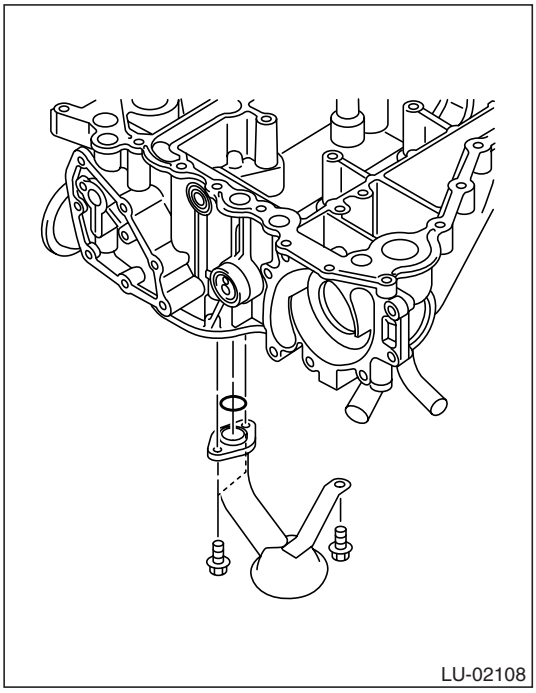
14) Rotate the engine to set oil pan upper.
15) Remove the bolts which secure oil pan lower to oil pan upper.



16) Insert an oil pan cutter blade between cylinder block-to-oil pan clearance and remove the oil pan.

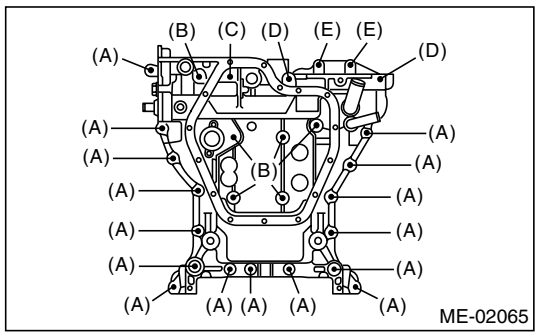
CAUTION:
Do not use a screwdriver or similar tool in place of oil pan cutter.

17) Remove the oil strainer.



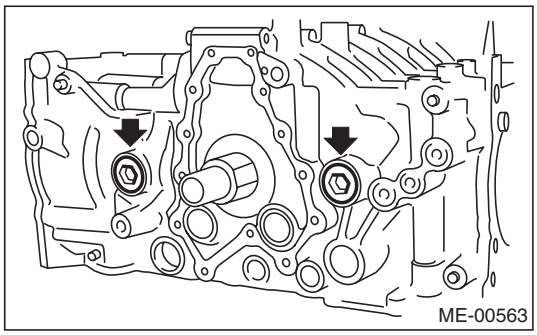
18) Remove the bolts which install oil pan upper onto cylinder block.

NOTE:
Installation bolt has seven different sizes. To prevent the confusion in installation, keep these bolts on container individually.



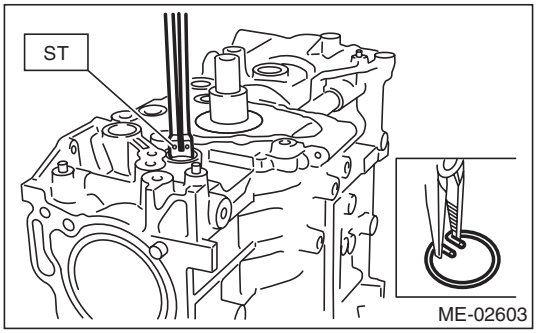
(A) M8 × 40
(B) M8 × 65
(C) M8 × 85
(D) M8 × 130
(E) M8 × 24

19) Remove the service hole cover and service hole plugs using a hexagon wrench.



20) Rotate the crankshaft to bring #1 and #2 pistons to bottom dead center position, then remove the piston snap ring through service hole of #1 and #2 cylinders using ST.

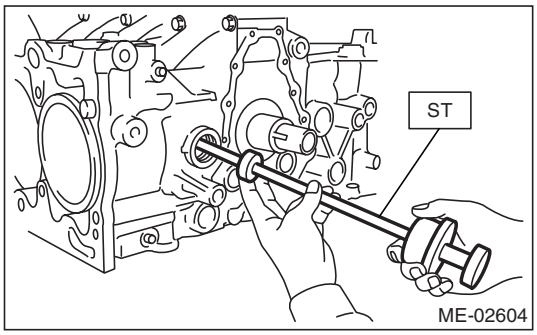
ST 18233AA000 PISTON PIN SNAP RING PLIERS



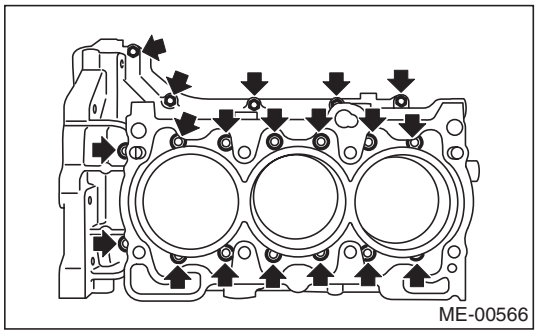
21) Draw out the piston pins from #1 and #2 pistons using ST.

ST 499097500 PISTON PIN REMOVER ASSY

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



22) Similarly remove the piston pins from #3, #4, #5 and #6 pistons.
23) Remove the bolts which secure cylinder block.



24) Separate the cylinder block (LH) and (RH).

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

25) Remove the rear oil seal.
26) Remove the crankshaft together with connecting rod.
27) 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.

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

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

B: INSTALLATION

1) After setting the cylinder block to ST, install the crankshaft bearing.
ST 18232AA000 ENGINE STAND

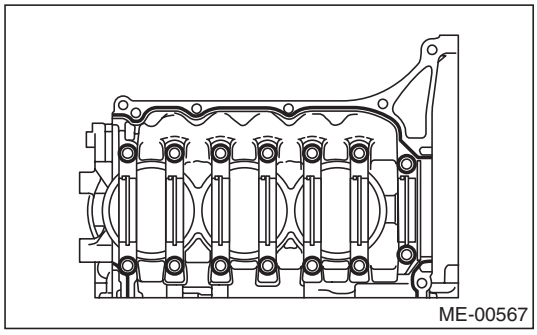
NOTE:
Remove oil on the mating surface of bearing and cylinder block before installation. Apply a coat of engine oil to crankshaft pins.

2) Position the crankshaft and connecting rod on the #2, #4 and #6 cylinder block.
3) Apply liquid gasket to the mating surface of #1, #3 and #5 cylinder block, and position it on #2, #4 and #6 cylinder block.

Liquid gasket:
THREE BOND 1215 (Part No. 004403007)

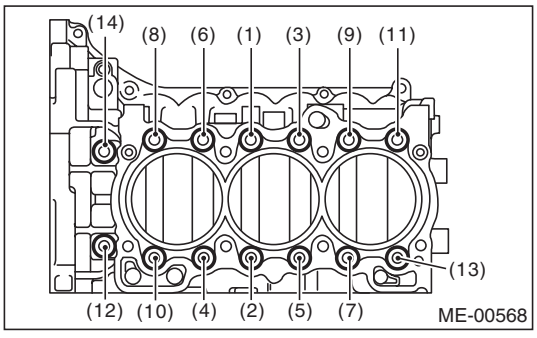
NOTE:
Do not allow liquid gasket to run over to O-ring grooves, oil passages, bearing grooves, etc.

Applying liquid gasket diameter:
1.0±0.2 mm (0.039±0.008 in)



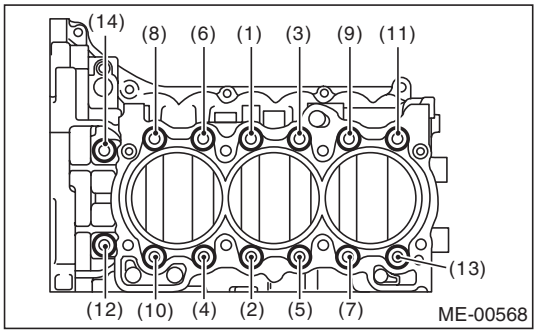
4) Apply a coat of engine oil to washers and bolt threads.
5) Tighten all bolts in the numerical order as shown in the figure.

Tightening torque:
(1) — (11), (13): 25 N·m (2.5 kgf-m, 18.4 ft-lb)
(12), (14): 20 N·m (2.0 kgf-m, 14 ft-lb)

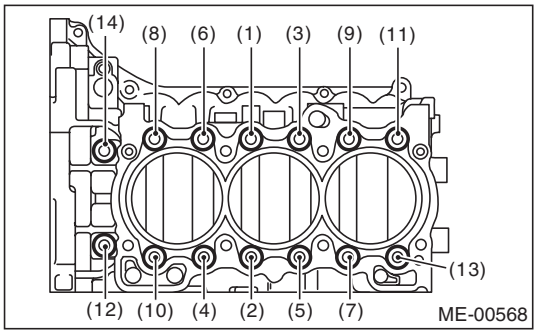


6) Retighten all bolts in the numerical order as shown in the figure.

Tightening torque:
(1) — (11), (13): 25 N·m (2.5 kgf-m, 18.4 ft-lb)
(12), (14): 20 N·m (2.0 kgf-m, 14 ft-lb)



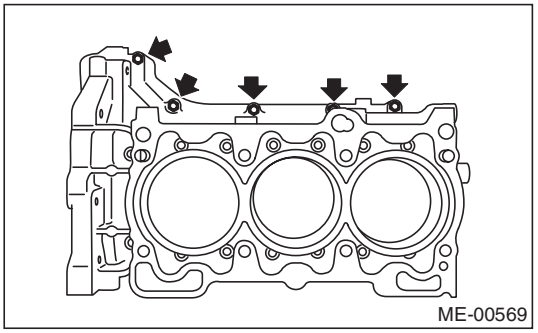
7) Tighten all bolts 90 — 110° in the numerical order as shown in the figure.



8) Install the upper bolt to cylinder block.

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

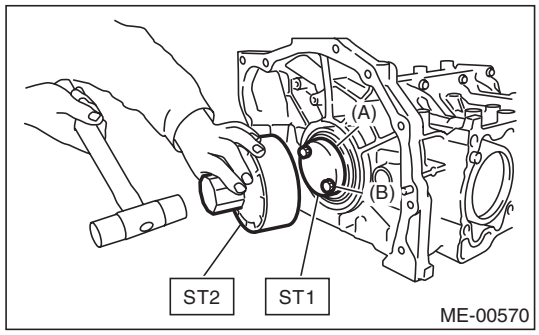
NOTE:
Remove the liquid gasket which is running over to sealing surface between cylinder block and rear chain cover, cylinder block and oil pan upper, after tightening the bolts which combine the cylinder block.



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

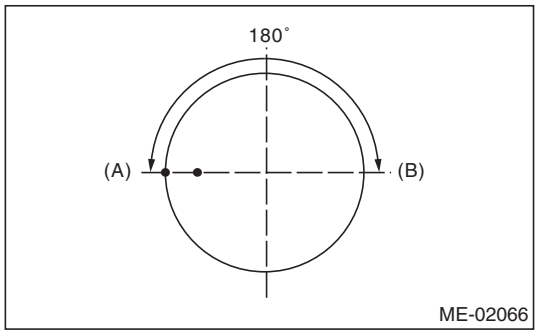
ST1	499597100	CRANKSHAFT OIL SEAL GUIDE
ST2	499587200	CRANKSHAFT OIL SEAL INSTALLER

NOTE:
Apply engine oil to the pressing-in portion.

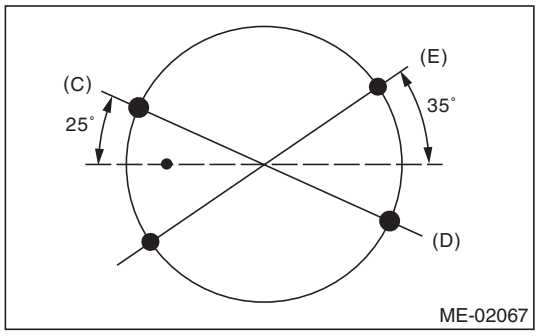


(A) Rear oil seal
(B) Drive plate installation bolt

10) Position the top ring gap at (A) in the figure.
11) Position the second ring gap at (B).



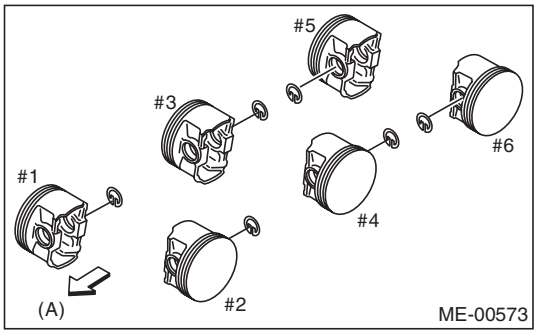
12) Position the upper rail gap at (C) in the figure.
13) Position the expander gap at (D) in the figure.
14) Position the lower rail gap at (E) in the figure.



CAUTION:
• Ensure ring gaps do not face the same direction.
• Ensure ring gaps are not within the piston skirt area.
• Ensure R mark faces to top side of piston.

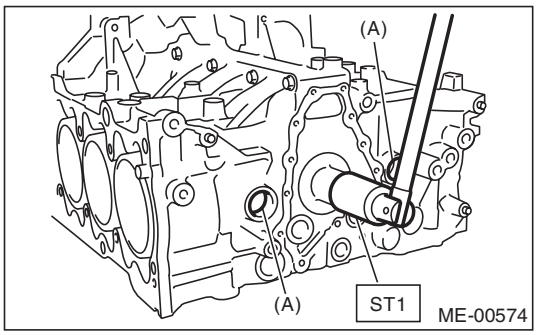
15) Install the snap ring.
Install snap rings in the piston holes located opposite to the service holes in cylinder block, when positioning all pistons in the corresponding cylinders.

NOTE:
Use new snap rings.

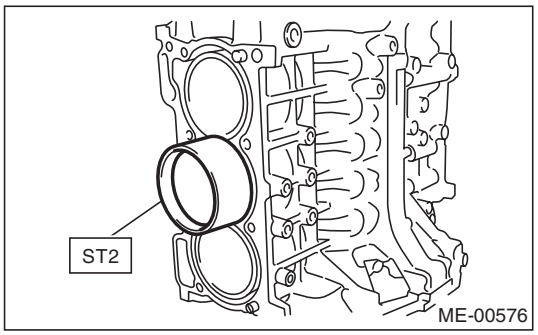


(A) Forward

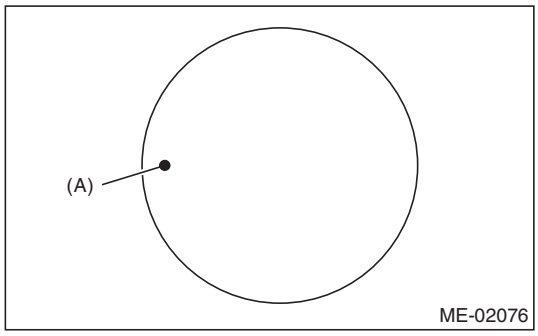
16) Installation of piston.
(1) Using the ST1, turn the crankshaft so that #3 and #4 connecting rods small end are set on the service hole (A).
ST1 18252AA000 CRANKSHAFT SOCKET



(2) Apply a thin coat of engine oil to piston and cylinder.
(3) Using the ST2, press-fit the piston into cylinder.
ST2 18254AA000 PISTON GUIDE

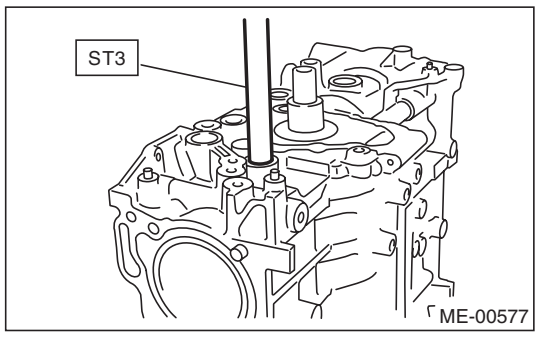


NOTE:
Let the piston front mark (A) face towards the front of engine.



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

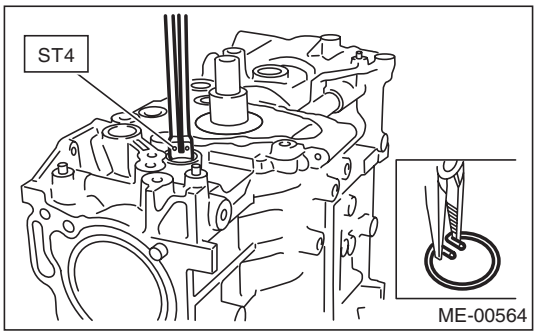
ST3 18253AA000 PISTON GUIDE



(2) Apply a coat of engine oil to piston pin, and insert the piston pin into piston and connecting rod through service hole.
(3) Using the ST4, install the snap ring.

ST4 18233AA000 PISTON PIN SNAP RING PLIERS

NOTE:
Use new snap rings.



(4) Similarly install the #1, #2, #5 and #6 pistons.

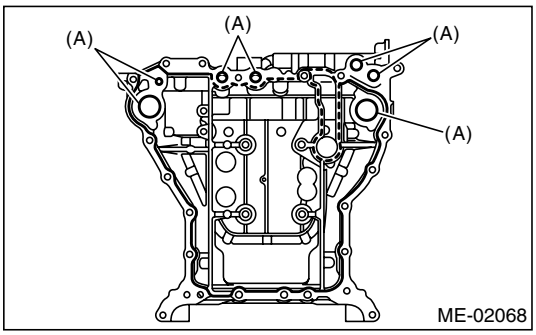
18) Install the service hole plug and O-ring.

NOTE:
Use a new O-ring.

19) Apply liquid gasket to the mating surface of oil pan upper.

Liquid gasket:
THREE BOND 1280B (Part No. K0877YA018)

Applying liquid gasket diameter:
Full line part
3.0±1.0 mm (0.12±0.04 in)
Broken line part
1.0 mm (0.04 in)

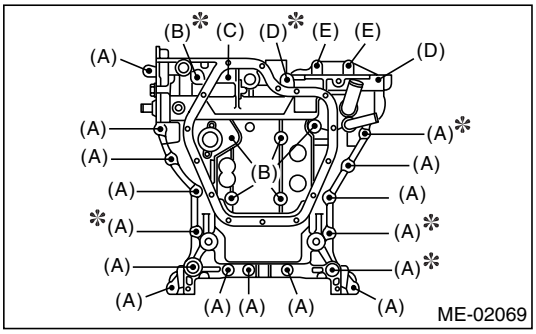


(A) O-ring

NOTE:
Use a new O-ring.

20) Temporarily tighten the oil pan upper.

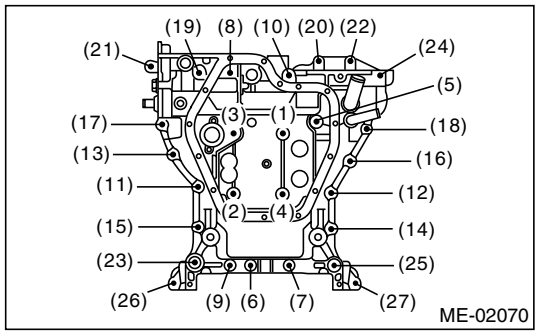
NOTE:
Do not install the bolts in wrong place.



(A) M8 × 40
(B) M8 × 65
(C) M8 × 85
(D) M8 × 130
(E) M8 × 24
*: Coating

21) Tighten the oil pan upper installing bolts in the numerical order as shown in the figure.

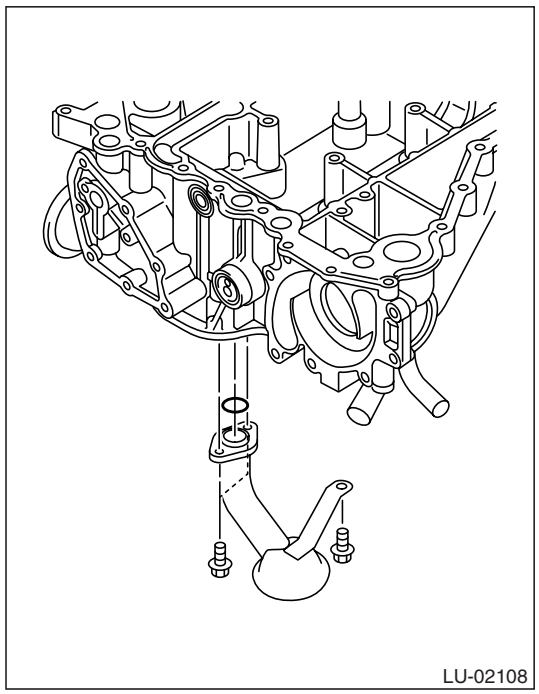
Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)



22) Install the oil strainer.

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

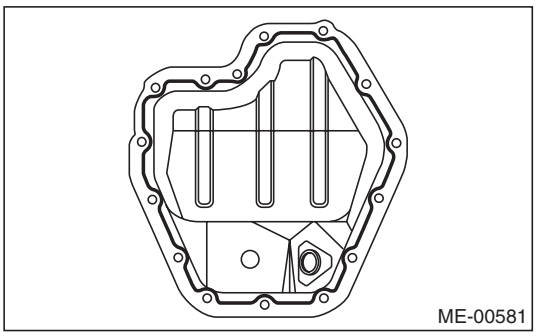
NOTE:
Use a new O-ring.



23) Apply liquid gasket to the matching surface of oil pan lower.

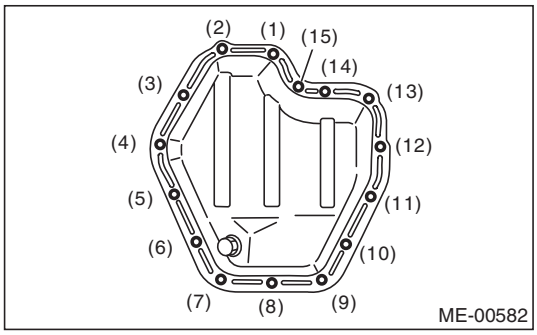
Liquid gasket:
THREE BOND 1280B (Part No. K0877YA018)

Applying liquid gasket diameter:
5.0±1.0 mm (0.20±0.04 in)



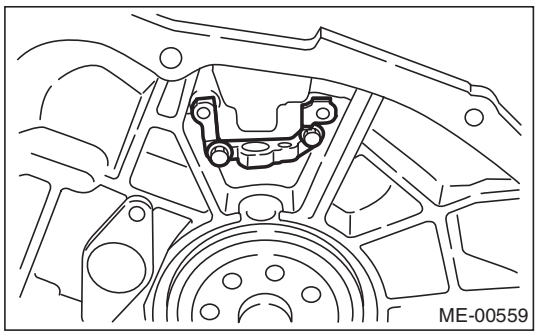
24) Tighten the oil pan lower installing bolts in the numerical order as shown in the figure.

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

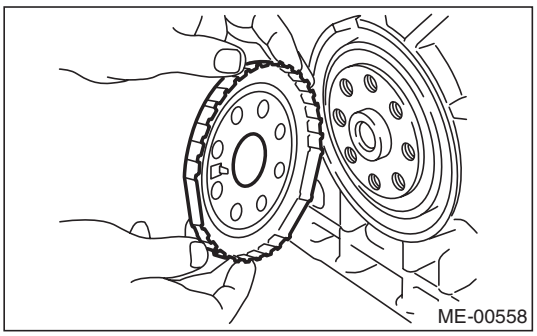


25) Install the crankshaft sensor bracket.

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

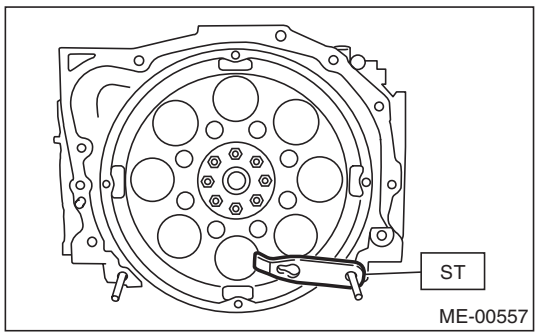


26) Install the crankshaft sensor plate.



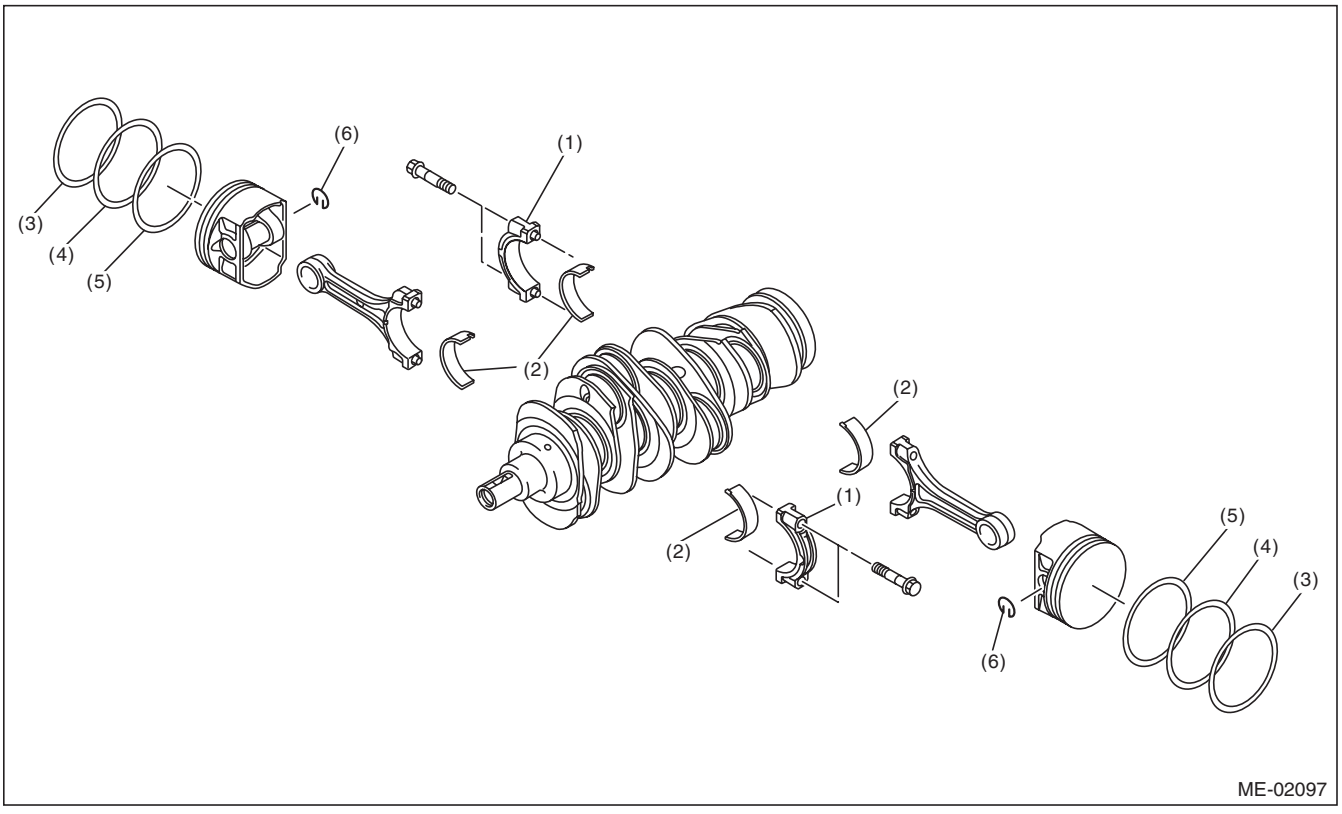
27) Install the flywheel. <Ref. to CL-21, INSTALLATION, Flywheel.>
28) Install the clutch disc and cover. <Ref. to CL-16, INSTALLATION, Clutch Disc and Cover.>
29) Install the drive plate using ST. (AT model)
ST1 498497100 CRANKSHAFT STOPPER
ST2 499057000 TORX PLUS®

Tightening torque:
81 N·m (8.3 kgf-m, 60 ft-lb)



30) Install the cylinder head. <Ref. to ME(H6DO)-60, INSTALLATION, Cylinder Head.>
31) Install the camshaft. <Ref. to ME(H6DO)-57, INSTALLATION, Camshaft.>
32) Install the rear chain cover. <Ref. to ME(H6DO)-54, INSTALLATION, Rear Chain Cover.>
33) Install the crank sprocket.
<Ref. to ME(H6DO)-53, INSTALLATION, Crank Sprocket.>
34) Install the cam sprocket. <Ref. to ME(H6DO)-52, INSTALLATION, Cam Sprocket.>
35) Install the timing chain assembly.
<Ref. to ME(H6DO)-48, INSTALLATION, Timing Chain Assembly.>
36) Install the front chain cover.
<Ref. to ME(H6DO)-45, INSTALLATION, Front Chain Cover.>
37) Install the crank pulley.
<Ref. to ME(H6DO)-44, INSTALLATION, Crank Pulley.>

C: DISASSEMBLY



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

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

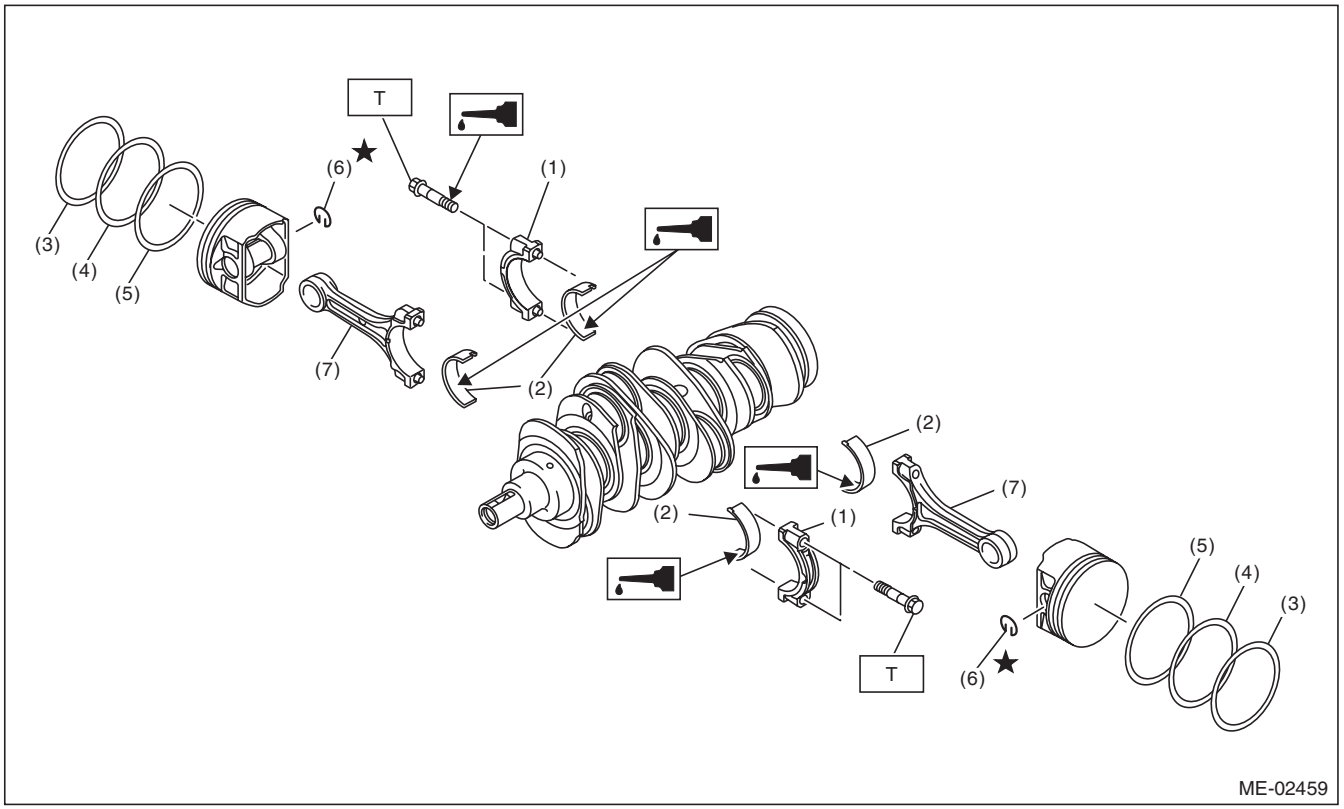
NOTE:
Arrange the removed connecting rod, connecting rod cap and bearing in order, to prevent confusion.

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

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

5) Remove the snap ring.

D: ASSEMBLY



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

Tightening torque: N·m (kgf-m, ft-lb)
T: 53 (5.4, 39)

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.
Ensure the arrow mark on connecting rod cap facing front during installation.

CAUTION:
• Each connecting rod has its own mating cap. Make sure that they are assembled correctly by checking their matching number.

• When tightening the connecting rod bolts, apply oil on the threads and flange end.

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

E: INSPECTION

1. CYLINDER BLOCK

1) Visually check for cracks and damage. Especially, inspect the important parts using liquid penetrant tester.
2) Check the oil passages for clogging.
3) Inspect the crankcase surface that mates with cylinder head for warping by using a straight edge.

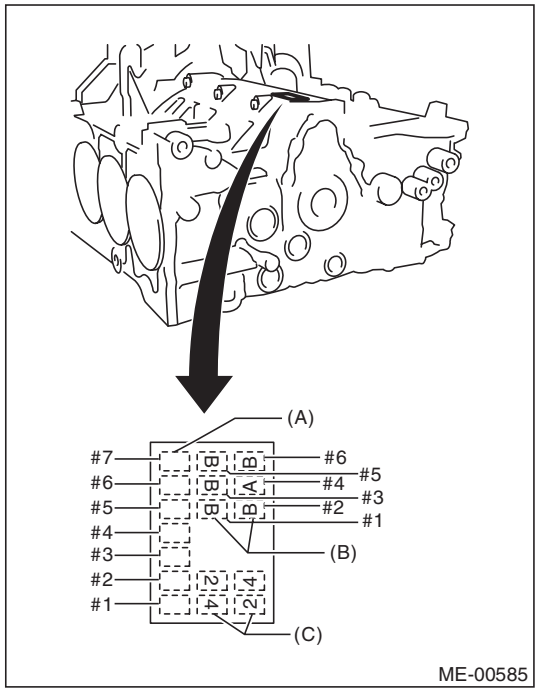
Standard height of cylinder block:
202 mm (7.95 in)

2. CYLINDER AND PISTON

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

NOTE:
• Measurement should be performed at a temperature of 20°C (68°F).
• Standard sized pistons are classified into two grades, "A" and "B". These grades should be used as guide lines in selecting a standard piston.

Standard diameter:
A: 89.205 — 89.215 mm (3.5120 — 3.5124 in)
B: 89.195 — 89.205 mm (3.5116 — 3.5120 in)



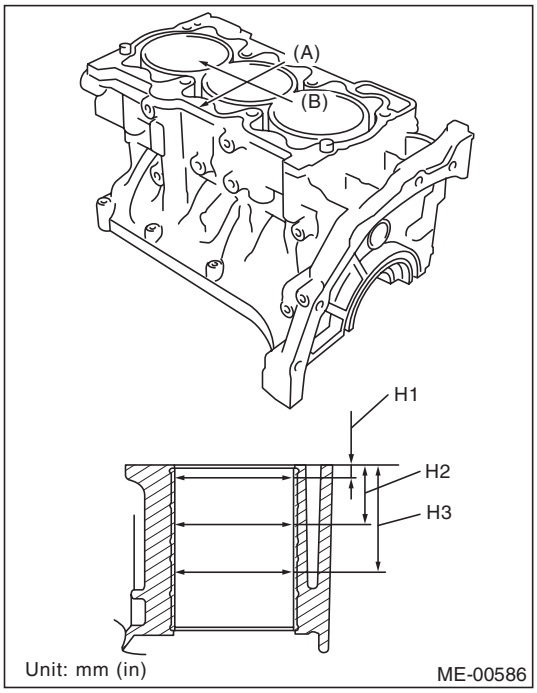
(A) Main journal size mark
(B) Cylinder bore size mark
(C) Cylinder block (RH) – (LH) combination mark

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

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

Cylindricality:
Standard
0.030 mm (0.0012 in)

Out-of-roundness:
Standard
0.010 mm (0.0004 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)

3) When the piston is to be replaced due to general or cylinder wear, select a suitable sized piston by measuring the piston clearance.
4) How to measure the outer diameter of each cylinder.
Measure the outer diameter of each piston at the height as shown in the figure. (Thrust direction)

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

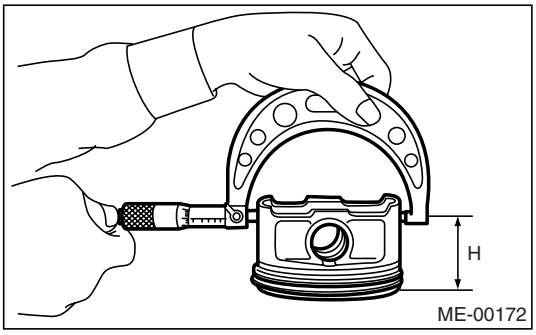
Piston grade point H:
37.3 mm (1.4685 in)

Piston outer diameter:

Standard
(A): 89.205 — 89.215 mm (3.5120 — 3.5124 in)
(B): 89.195 — 89.205 mm (3.5116 — 3.5120 in)

0.25 mm (0.0098 in) oversize
89.445 — 89.465 mm (3.5215 — 3.5222 in)

0.50 mm (0.0197 in) oversize
89.695 — 89.715 mm (3.5313 — 3.5321 in)



5) Calculate the clearance between cylinder and piston.

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

Cylinder to piston clearance at 20°C (68°F):
Standard
–0.010 — 0.010 mm (–0.0004 — 0.0004 in)

6) Boring and honing
(1) If the value of cylindricality, out-of-roundness, or cylinder-to-piston clearance measured is out of standard or if there is any damage on the cylinder wall, rebore it to use an oversize piston.

CAUTION:
When any of the cylinders needs reboring, all other cylinders must be bored at the same time, and use oversize pistons. Do not perform boring on one cylinder only. Nor use an oversize piston for one cylinder only.

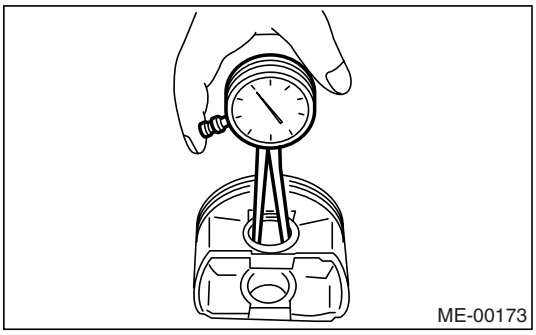
(2) If the cylinder inner diameter exceeds 89.715 mm (3.5321 in) after boring and honing, replace the crankcase.

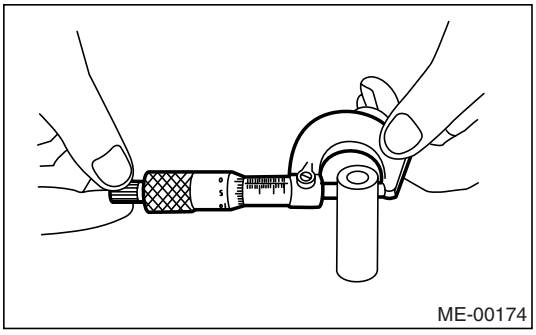
NOTE:
Immediately after reboring, the cylinder diameter may differ from its real diameter due to temperature rise. Thus, pay attention to this when measuring the cylinder diameter.

3. PISTON AND PISTON PIN

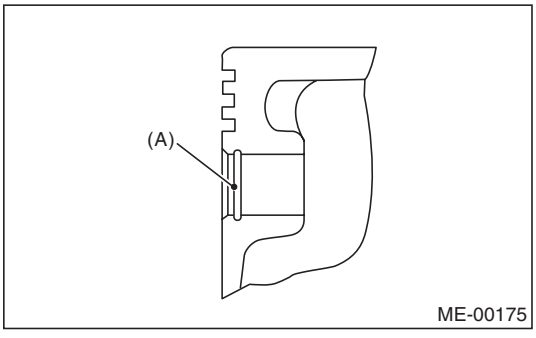
1) Check the pistons and piston pins for damage, cracks and wear, and the piston ring grooves for wear and damage. Replace if defective.
2) Measure the piston-to-cylinder clearance at each cylinder. <Ref. to ME(H6DO)-73, CYLINDER AND PISTON, INSPECTION, Cylinder Block.> If any of the clearances is not within standard, 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 hole in piston and piston pin:
Standard
0.004 — 0.008 mm (0.0002 — 0.0003 in)





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

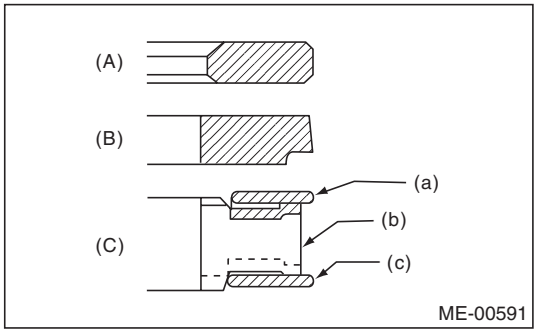


5) Check the piston pin snap ring for distortion, cracks and wear.

4. PISTON RING

1) If the piston ring is broken, damaged or worn, or if its tension is insufficient, or when the piston is replaced, replace the piston ring with a new one of the same size as the piston.

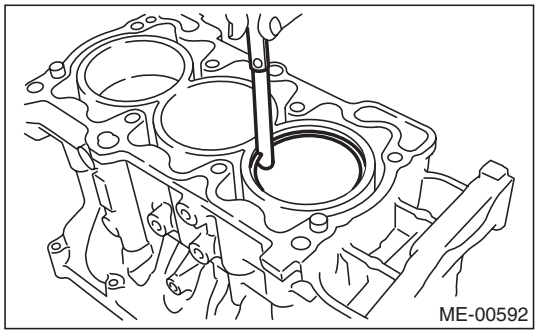
CAUTION:
• Marks are displayed on the end of top and second rings. When installing the rings to the piston, face those marks upward.
• Oil ring consists of the upper rail, expander and lower rail. When installing on piston, be careful of each rail's direction.



(A) Top ring
(B) Second ring
(C) Oil ring
(a) Upper rail
(b) Expander
(c) Lower rail

2) Squarely place the piston ring and oil ring in cylinder, and measure the piston ring gap with a thickness gauge.

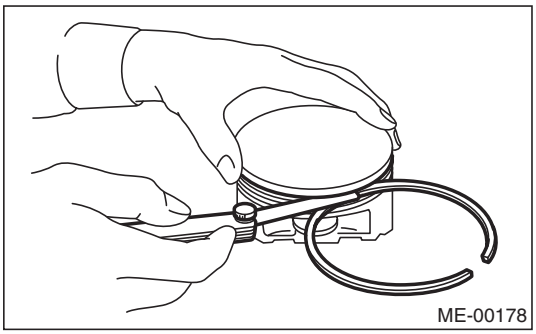
		Standard mm (in)
Piston ring gap	Top ring	0.20 — 0.35 (0.0079 — 0.0138)
	Second ring	0.35 — 0.50 (0.0138 — 0.0197)
	Oil ring	0.20 — 0.60 (0.0079 — 0.0236)



3) Measure the clearance between piston ring and piston ring groove using thickness gauge.

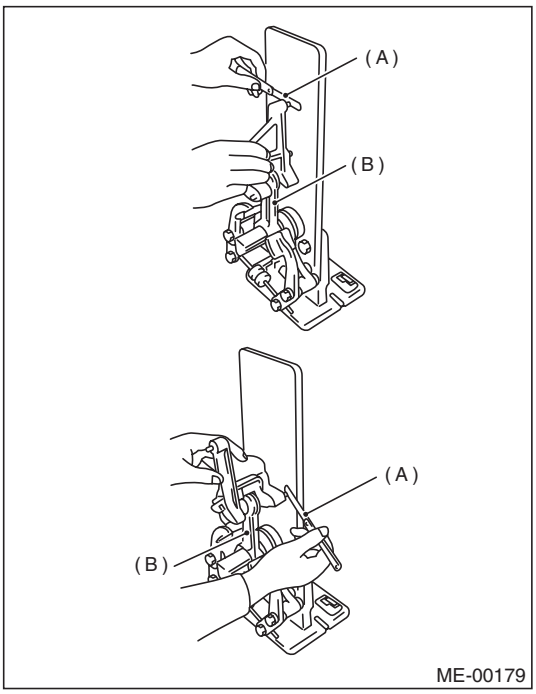
NOTE:
Before measuring the clearance, clean the piston ring groove and piston ring.

		Standard mm (in)
Clearance between piston ring and piston ring groove	Top ring	0.040 — 0.080 (0.0016 — 0.0031)
	Second ring	0.030 — 0.070 (0.0012 — 0.0028)
Clearance between oil ring and oil ring groove		0.045 — 0.125 (0.0018 — 0.0049)



5. CONNECTING ROD

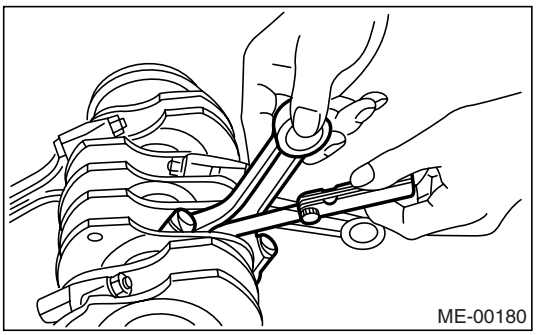
1) Replace the connecting rod, if the large or small end thrust surface is damaged.
2) Check for bend or twist using a connecting rod aligner. Replace the connecting rod if it has the bend or twist.



(A) Thickness gauge
(B) Connecting rod

3) Install the connecting rod fitted with bearing to crankshaft and measure the thrust clearance. If the thrust clearance exceeds the standard or offset wearing is emitted, replace the connecting rod.

Connecting rod thrust clearance:
Standard
0.070 — 0.330 mm (0.0028 — 0.0130 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 the oil clearance is not within the standard, replace the defective bearing with a new one of standard size or undersize as necessary. (See the table below.)

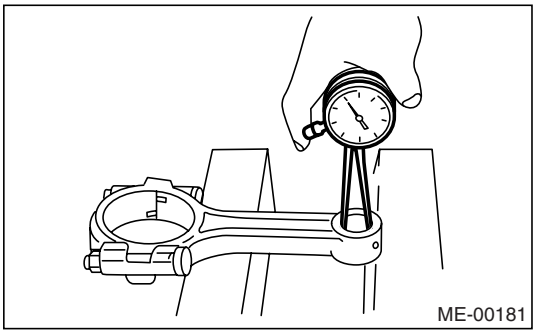
Connecting rod oil clearance:
Standard
0.016 — 0.043 mm (0.0006 — 0.0017 in)

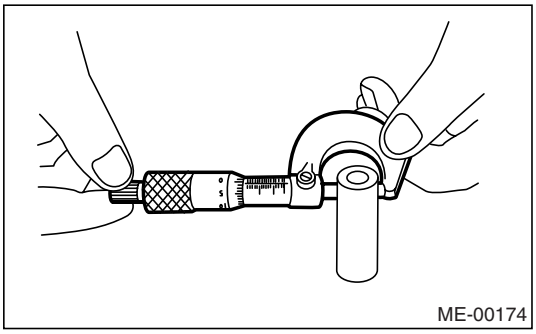
Unit: mm (in)

Bearing	Bearing size (Thickness at center)	Outer diameter of crank pin
Standard	1.490 — 1.506 (0.0587 — 0.0593)	51.984 — 52.000 (2.0466 — 2.0472)
0.03 (0.0012) undersize	1.509 — 1.513 (0.0594 — 0.0596)	51.954 — 51.970 (2.0454 — 2.0461)
0.05 (0.0020) undersize	1.519 — 1.523 (0.0598 — 0.0600)	51.934 — 51.950 (2.0446 — 2.0453)
0.25 (0.0098) undersize	1.619 — 1.623 (0.0637 — 0.0639)	51.734 — 51.750 (2.0368 — 2.0374)

6) Inspect the bushing at connecting rod small end, and replace if worn or damaged. Also measure the piston pin clearance at the connecting rod small end.

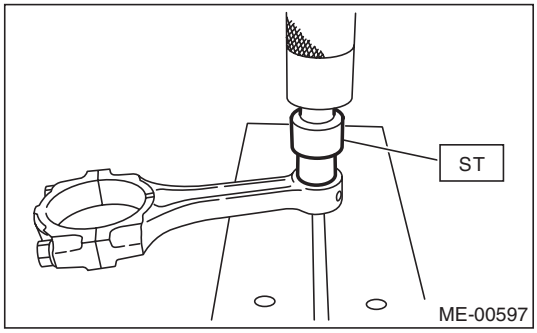
Clearance between piston pin and bushing:
Standard
0 — 0.022 mm (0 — 0.0009 in)





7) Replacement procedure is as follows.
(1) Remove the bushing from connecting rod with ST and press.
(2) Press the bushing with ST after applying oil on the periphery of bushing.

ST 18350AA000 CONNECTING ROD BUSHING REMOVER AND INSTALLER

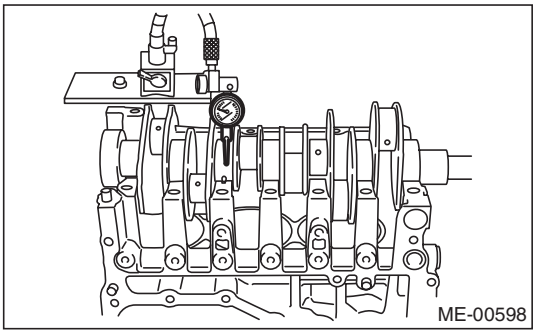


(3) Make two 3 mm (0.12 in) holes in bushing. Ream the inside of bushing.
(4) After completion of reaming, clean the bushing to remove chips.

6. CRANKSHAFT AND CRANKSHAFT BEARING

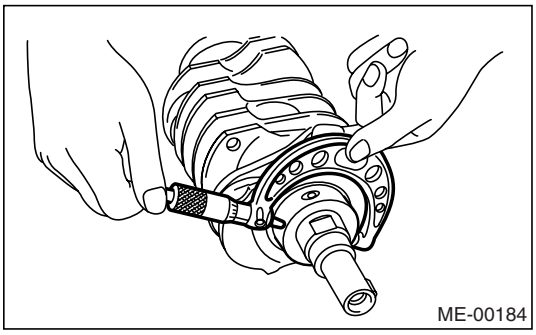
1) Clean the crankshaft completely, and check it for cracks using liquid penetrant tester. Replace if defective.
2) Check the crankshaft for bend, and repair or replace if needed. Repair or replace if bended.

NOTE:
If a suitable V-block is not available, install #1 and #5 crankshaft bearing on cylinder block, position the crankshaft on these bearings, and then measure the crankshaft bend using a dial gauge.



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 replace or recondition crankshaft as necessary. When grinding the crank journal or crank pin, finish them to the specified dimensions according to the undersize bearing to be used.

Crank pin and crank journal:
Out-of-roundness
0.005 mm (0.0002 in)
Cylindricality
0.006 mm (0.0002 in)

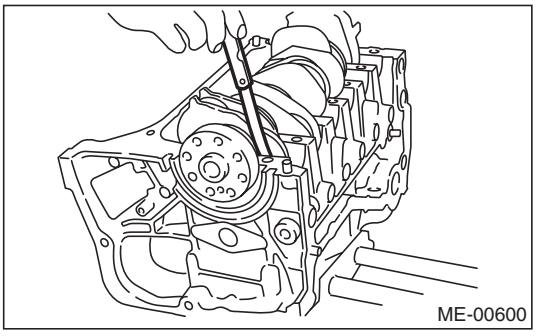


Unit: mm (in)

		Crank journal diameter		Crank pin outer diameter
		#1, #3, #5, #7	#2, #4, #6	
Standard	Journal O.D.	63.992 — 64.008 (2.5194 — 2.5200)		51.984 — 52.000 (2.0466 — 2.0472)
	Bearing size (Thickness at center)	1.992 — 2.005 (0.0784 — 0.0789)	1.996 — 2.009 (0.0786 — 0.0791)	1.490 — 1.506 (0.0587 — 0.0593)
0.03 (0.0012) undersize	Journal O.D.	63.962 — 63.978 (2.5182 — 2.5188)		51.954 — 51.970 (2.0454 — 2.0461)
	Bearing size (Thickness at center)	2.011 — 2.014 (0.0792 — 0.0793)	2.015 — 2.018 (0.0793 — 0.0794)	1.509 — 1.513 (0.0594 — 0.0596)
0.05 (0.0020) undersize	Journal O.D.	63.942 — 63.958 (2.5174 — 2.5180)		51.934 — 51.950 (2.0446 — 2.0453)
	Bearing size (Thickness at center)	2.021 — 2.024 (0.0796 — 0.0797)	2.025 — 2.028 (0.0797 — 0.0798)	1.519 — 1.523 (0.0598 — 0.0600)
0.25 (0.0098) undersize	Journal O.D.	63.742 — 63.758 (2.5095 — 2.5102)		51.734 — 51.750 (2.0368 — 2.0374)
	Bearing size (Thickness at center)	2.121 — 2.124 (0.0835 — 0.0836)	2.125 — 2.128 (0.0837 — 0.0838)	1.619 — 1.623 (0.0637 — 0.0639)

4) Measure the thrust clearance of crankshaft at center bearing. If thrust clearance exceeds the standard, replace the bearing.

Crankshaft thrust clearance:
Standard
0.030 — 0.115 mm (0.0012 — 0.0045 in)



5) Inspect individual crankshaft bearings for signs of flaking, seizure, melting, and wear.
6) Measure the oil clearance on each crankshaft bearing using plastigauge. If the oil clearance is not within the standard, replace the defective bearing with an undersize one, and replace or recondition the crankshaft as necessary.

Crankshaft oil clearance:
Standard
0.010 — 0.030 mm (0.0004 — 0.0012 in)

22. Oil Flow Control Solenoid Valve

A: REMOVAL

Oil flow control solenoid valve is a unit with camshaft cap.
Refer to “Camshaft” for removal. <Ref. to ME(H6DO)-56, REMOVAL, Camshaft.>

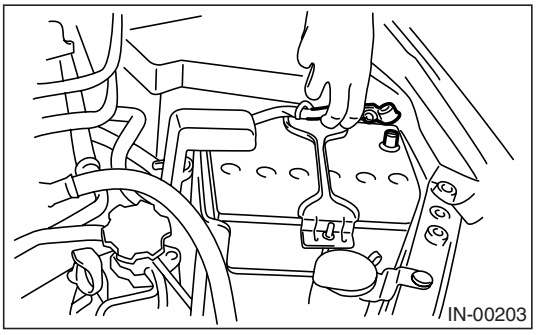
B: INSTALLATION

Install in the reverse order of removal.

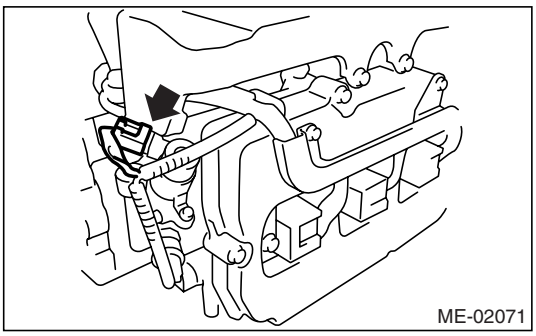
23.Oil Switching Solenoid Valve

A: REMOVAL

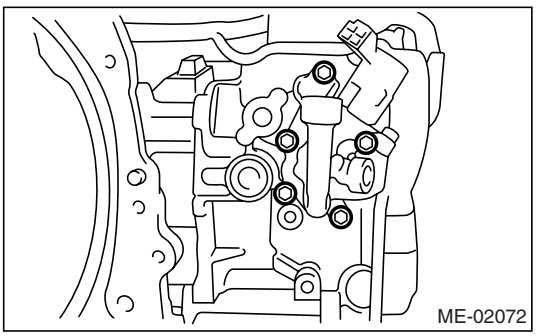
1) Disconnect the ground cable from battery.



2) Remove the air intake chamber.
<Ref. to IN(H6DO)-7, REMOVAL, Air Intake Chamber.>
3) Disconnect the connector from oil switching solenoid valve.



4) Remove the oil switching solenoid valve.
5) Remove the variable valve lift diagnosis oil pressure switch.
<Ref. to FU(H6DO)-28, REMOVAL, Variable Valve Lift Diagnosis Oil Pressure Switch.>
6) Remove the oil temperature sensor.
<Ref. to FU(H6DO)-29, REMOVAL, Oil Temperature Sensor.>
7) Remove the oil flow control solenoid valve holder from cylinder head.

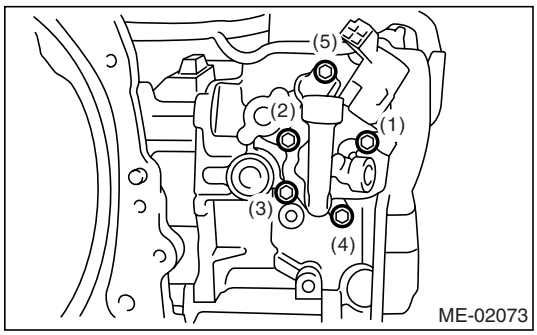


B: INSTALLATION

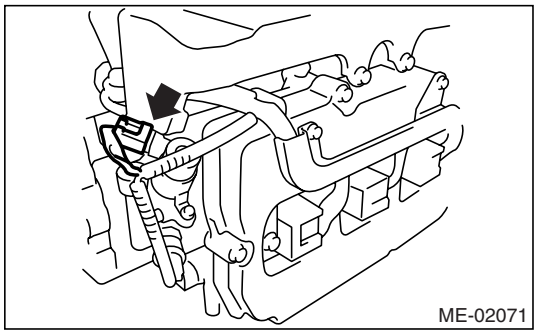
1) Install the oil switching solenoid valve holder.

NOTE:
Always use new gasket.

(1) Temporarily tighten the bolts by tightening torque of 5 — 10 N·m (0.5 — 1.0 kgf-m, 3.7 — 7.4 ft-lb) in order indicated in the figure.
(2) Tighten the bolts by tightening torque of 10±0.5 N·m (1.0±0.05 kgf-m, 7.4±0.37 ft-lb) in order indicated in the figure.



2) Install the oil temperature sensor.
<Ref. to FU(H6DO)-29, INSTALLATION, Oil Temperature Sensor.>
3) Install the variable valve lift diagnosis oil pressure switch.
<Ref. to FU(H6DO)-28, INSTALLATION, Variable Valve Lift Diagnosis Oil Pressure Switch.>
4) Install the oil switching solenoid valve.
5) Connect the connector to oil switching solenoid valve.

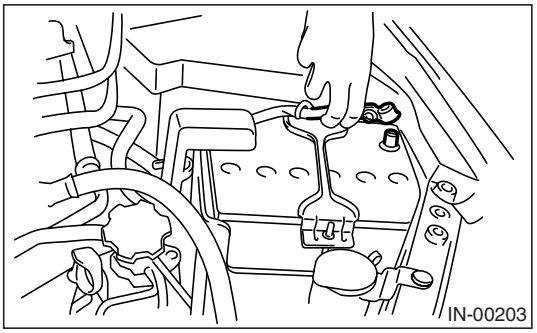


6) Install the air intake chamber.
<Ref. to IN(H6DO)-7, INSTALLATION, Air Intake Chamber.>

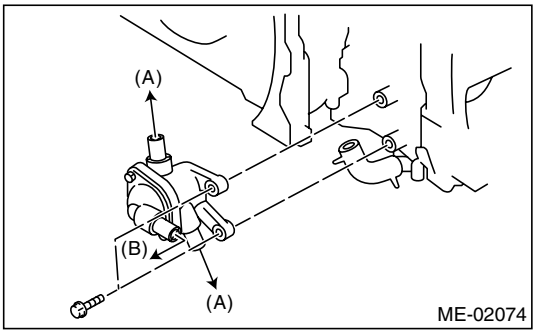
24.ATF Warmer Cock

A: REMOVAL

1) Set the vehicle on a lift.
2) Remove the collector cover.
3) Disconnect the ground cable from battery.



4) Lift-up the vehicle.
5) Remove the under cover.
6) Remove the front exhaust pipe.
<Ref. to EX(H6DO)-4, REMOVAL, Front Exhaust Pipe.>
7) Disconnect the water hose from ATF warmer cock.
8) Remove the ATF warmer cock from cylinder head.

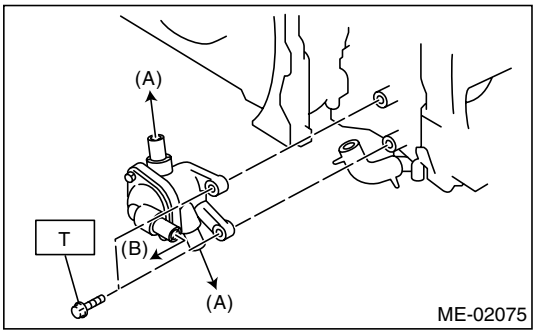


(A) Water pipe
(B) ATF warmer

B: INSTALLATION

Install in the reverse order of removal.

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



(A) Water pipe
(B) ATF warmer

C: INSPECTION

Replace the thermostat if the valve does not close completely at an ambient temperature or if the following test shows unsatisfactory results.

• Inspection method

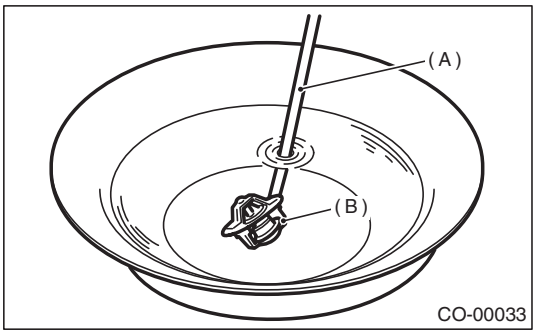
Immerse the thermostat and a thermometer in water. Raise water temperature gradually, and measure the temperature and valve lift when the valve begins to open and when the valve is fully opened. During the test, agitate the water for even temperature distribution. The measured value should meet the specification.

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

Starting temperature to open:
69 — 73°C (156 — 163°F)

Fully opens:
84°C (183°F)

Valve lift:
8.0 mm (0.315 in) or more



(A) Thermometer
(B) Thermostat

25.Intake And Exhaust Valve

A: SPECIFICATION

Refer to “Cylinder Head” for removal and installation procedures of intake and exhaust valves. <Ref. to ME(H6DO)-60, REMOVAL, Cylinder Head.> <Ref. to ME(H6DO)-60, INSTALLATION, Cylinder Head.>

26.Piston

A: SPECIFICATION

Refer to “Cylinder Block” for removal and installation procedures of pistons. <Ref. to ME(H6DO)-65, REMOVAL, Cylinder Block.> <Ref. to ME(H6DO)-67, INSTALLATION, Cylinder Block.>

27.Connecting Rod

A: SPECIFICATION

Refer to “Cylinder Block” for removal and installation procedures of connecting rod.
<Ref. to ME(H6DO)-65, REMOVAL, Cylinder Block.> <Ref. to ME(H6DO)-67, INSTALLATION, Cylinder Block.>

28.Crankshaft

A: SPECIFICATION

Refer to “Cylinder Block” for removal and installation procedures of crankshaft. <Ref. to ME(H6DO)-65, REMOVAL, Cylinder Block.> <Ref. to ME(H6DO)-67, INSTALLATION, Cylinder Block.>

29.Engine Trouble in General

A: INSPECTION

NOTE:
“RANK” shown in the chart refers to the possibility of the cause of trouble in order (“Very often” to “Rarely”)
A — Very often
B — Sometimes
C — Rarely

Symptom	Problem parts, etc.	Possible cause	Rank
1. Engine does not start.			
1) Starter does not turn.	Starter	Defective battery-to-starter harness	B
		Defective starter switch	C
		Defective inhibitor switch or neutral position switch	C
		Defective starter	B
	Battery	Poor terminal connection	A
		Run-down battery	A
		Defective charging system	B
	Friction	Seizure of crankshaft and connecting rod bearing	C
		Seized camshaft	C
		Seized or stuck piston and cylinder	C
2) Initial combustion does not occur.	Starter	Defective starter	C
	Engine control system <Ref. to EN(H6DO)(diag)-2, Basic Diagnostic Procedure.>		A
	Fuel line	Defective fuel pump and relay	A
		Lack of or insufficient fuel	B
	Chain	Trouble	B
		Defective timing	B
	Compression	Incorrect valve clearance	C
		Loosened spark plug or defective gasket	C
		Loosened cylinder head bolt or defective gasket	C
		Improper valve sealing	C
		Defective valve stem	C
		Worn or broken valve spring	B
		Worn or stuck piston rings, cylinder and piston	C
		Incorrect valve timing	B
		Improper engine oil (low viscosity)	B
		Trouble of tappet	C
		Trouble of tappet. In case noise occurs with valve moving. Or the harness involved to oil switching solenoid valve, variable valve lift diagnosis oil pressure switch and variable valve lift has trouble in a past.	B

Symptom	Problem parts, etc.	Possible cause	Rank
3) Initial combustion occurs.	Engine control system <Ref. to EN(H6DO)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Defective intake manifold gasket	B
		Defective throttle body gasket	B
	Fuel line	Defective fuel pump and relay	C
		Clogged fuel line	C
		Lack of or insufficient fuel	B
	Chain	Trouble	B
		Defective timing	B
	Compression	Incorrect valve clearance	C
		Loosened spark plug or defective gasket	C
		Loosened cylinder head bolt or defective gasket	C
		Improper valve sealing	C
		Defective valve stem	C
		Worn or broken valve spring	B
		Worn or stuck piston rings, cylinder and piston	C
		Incorrect valve timing	B
		Improper engine oil (low viscosity)	B
		Trouble of tappet	C
		Trouble of tappet. In case noise occurs with valve moving. Or the harness involved to oil switching solenoid valve, variable valve lift diagnosis oil pressure switch and variable valve lift has trouble in a past.	B
4) Engine stalls after initial combustion.	Engine control system <Ref. to EN(H6DO)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened or cracked intake duct	B
		Loosened or cracked PCV hose	C
		Loosened or cracked vacuum hose	C
		Defective intake manifold gasket	B
		Defective throttle body gasket	B
		Dirty air cleaner element	C
	Fuel line	Clogged fuel line	C
		Lack of or insufficient fuel	B
	Chain	Trouble	B
		Defective timing	B
	Compression	Incorrect valve clearance	C
		Loosened spark plug or defective gasket	C
		Loosened cylinder head bolt or defective gasket	C
		Improper valve sealing	C
		Defective valve stem	C
		Worn or broken valve spring	B
		Worn or stuck piston rings, cylinder and piston	C
		Incorrect valve timing	B
		Improper engine oil (low viscosity)	B
		Trouble of tappet	C
		Trouble of tappet. In case noise occurs with valve moving. Or the harness involved to oil switching solenoid valve, variable valve lift diagnosis oil pressure switch and variable valve lift has trouble in a past.	B

Symptom	Problem parts, etc.	Possible cause	Rank
2. Rough idle and engine stall	Engine control system <Ref. to EN(H6DO)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened or cracked intake duct	A
		Loosened or cracked PCV hose	A
		Loosened or cracked vacuum hose	A
		Defective intake manifold gasket	B
		Defective throttle body gasket	B
		Defective PCV valve	C
		Loosened oil filler cap	B
		Dirty air cleaner element	C
	Fuel line	Defective fuel pump and relay	C
		Clogged fuel line	C
		Lack of or insufficient fuel	B
	Chain	Defective timing	C
	Compression	Incorrect valve clearance	B
		Loosened spark plug or defective gasket	B
		Loosened cylinder head bolt or defective gasket	B
		Improper valve sealing	B
		Defective valve stem	C
		Worn or broken valve spring	B
		Worn or stuck piston rings, cylinder and piston	B
		Incorrect valve timing	A
		Improper engine oil (low viscosity)	B
		Trouble of tappet	C
		Trouble of tappet. In case noise occurs with valve moving. Or the harness involved to oil switching solenoid valve, variable valve lift diagnosis oil pressure switch and variable valve lift has trouble in a past.	B
	Lubrication system	Incorrect oil pressure	B
		Defective rocker cover gasket	C
	Cooling system	Overheating	C
	Other	Evaporative emission control system malfunction	A
		Stuck or damaged throttle valve	B

Symptom	Problem parts, etc.	Possible cause	Rank
3. Low output, hesitation and poor acceleration	Engine control system <Ref. to EN(H6DO)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened or cracked intake duct	A
		Loosened or cracked PCV hose	A
		Loosened or cracked vacuum hose	B
		Defective intake manifold gasket	B
		Defective throttle body gasket	B
		Defective PCV valve	B
		Loosened oil filler cap	B
		Dirty air cleaner element	A
	Fuel line	Defective fuel pump and relay	B
		Clogged fuel line	B
		Lack of or insufficient fuel	C
	Chain	Defective timing	B
	Compression	Incorrect valve clearance	B
		Loosened spark plug or defective gasket	B
		Loosened cylinder head bolt or defective gasket	B
		Improper valve sealing	B
		Defective valve stem	C
		Worn or broken valve spring	B
		Worn or stuck piston rings, cylinder and piston	C
		Incorrect valve timing	A
		Improper engine oil (low viscosity)	B
		Trouble of tappet	C
		Trouble of tappet. In case noise occurs with valve moving. Or the harness involved to oil switching solenoid valve, variable valve lift diagnosis oil pressure switch and variable valve lift has trouble in a past.	B
	Lubrication system	Incorrect oil pressure	B
	Cooling system	Overheating	C
		Over-cooling	C
	Other	Evaporative emission control system malfunction	A

Symptom	Problem parts, etc.	Possible cause	Rank
4. Surging	Engine control system <Ref. to EN(H6DO)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened or cracked intake duct	A
		Loosened or cracked PCV hose	A
		Loosened or cracked vacuum hose	A
		Defective intake manifold gasket	B
		Defective throttle body gasket	B
		Defective PCV valve	B
		Loosened oil filler cap	B
		Dirty air cleaner element	B
	Fuel line	Defective fuel pump and relay	B
		Clogged fuel line	B
		Lack of or insufficient fuel	C
	Chain	Defective timing	B
	Compression	Incorrect valve clearance	B
		Loosened spark plug or defective gasket	C
		Loosened cylinder head bolt or defective gasket	C
		Improper valve sealing	C
		Defective valve stem	C
		Worn or broken valve spring	C
		Worn or stuck piston rings, cylinder and piston	C
		Incorrect valve timing	A
		Improper engine oil (low viscosity)	B
		Trouble of tappet	C
		Trouble of tappet. In case noise occurs with valve moving. Or the harness involved to oil switching solenoid valve, variable valve lift diagnosis oil pressure switch and variable valve lift has trouble in a past.	B
	Cooling system	Overheating	B
	Other	Evaporative emission control system malfunction	C
5. Engine does not return to idle.	Engine control system <Ref. to EN(H6DO)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened or cracked vacuum hose	A
	Other	Stuck or damaged throttle valve	A
6. Dieseling (Run-on)	Engine control system <Ref. to EN(H6DO)(diag)-2, Basic Diagnostic Procedure.>		A
	Cooling system	Overheating	B
	Other	Evaporative emission control system malfunction	B

Symptom	Problem parts, etc.	Possible cause	Rank
7. After burning in exhaust system	Engine control system <Ref. to EN(H6DO)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened or cracked intake duct	C
		Loosened or cracked PCV hose	C
		Loosened or cracked vacuum hose	B
		Defective PCV valve	B
		Loosened oil filler cap	C
	Chain	Defective timing	B
	Compression	Incorrect valve clearance	B
		Loosened spark plug or defective gasket	C
		Loosened cylinder head bolt or defective gasket	C
		Improper valve sealing	B
		Defective valve stem	C
		Worn or broken valve spring	C
		Worn or stuck piston rings, cylinder and piston	C
		Incorrect valve timing	A
		Trouble of tappet	C
		Trouble of tappet. In case noise occurs with valve moving. Or the harness involved to oil switching solenoid valve, variable valve lift diagnosis oil pressure switch and variable valve lift has trouble in a past.	B
	Lubrication system	Incorrect oil pressure	C
	Cooling system	Over-cooling	C
	Other	Evaporative emission control system malfunction	C
8. Knocking	Engine control system <Ref. to EN(H6DO)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened oil filler cap	B
	Chain	Defective timing	B
	Compression	Incorrect valve clearance	C
		Incorrect valve timing	B
		Trouble of tappet	C
		Trouble of tappet. In case noise occurs with valve moving. Or the harness involved to oil switching solenoid valve, variable valve lift diagnosis oil pressure switch and variable valve lift has trouble in a past.	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

Symptom	Problem parts, etc.	Possible cause	Rank
10. Excessive fuel consumption	Engine control system <Ref. to EN(H6DO)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Dirty air cleaner element	A
	Chain	Defective timing	B
	Compression	Incorrect valve clearance	B
		Loosened spark plug or defective gasket	C
		Loosened cylinder head bolt or defective gasket	C
		Improper valve sealing	B
		Defective valve stem	C
		Worn or broken valve spring	C
		Worn or stuck piston rings, cylinder and piston	B
		Incorrect valve timing	B
		Trouble of tappet	C
		Trouble of tappet. In case noise occurs with valve moving. Or the harness involved to oil switching solenoid valve, variable valve lift diagnosis oil pressure switch and variable valve lift has trouble in a past.	B
	Lubrication system	Incorrect oil pressure	C
	Cooling system	Over-cooling	C

30.Engine Noise

A: INSPECTION

Type of sound	Condition	Possible cause
Regular clicking sound	Sound increases as engine speed increases.	• Defective valve mechanism • Incorrect valve clearance • Worn valve rocker • Worn camshaft • Broken valve spring • Trouble of tappet
Heavy and dull clank	Oil pressure is low.	• Worn camshaft main bearing • Worn connecting rod bearing (large end)
	Oil pressure is normal.	Damaged engine mounting
High-pitched clank	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 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	—	• Insufficient compression • Air leakage in air intake system, hoses, connections or manifolds
Timing belt noise	—	• Loose timing belt • Belt contacting with case/adjacent part
Valve tappet noise	—	• Incorrect valve clearance • Trouble of tappet

NOTE*)
When disconnecting the fuel injector connector, the malfunction indicator light illuminates and DTC is stored in ECM memory. Therefore, carry out the clear memory mode <Ref. to EN(H6DO)(diag)-41, OPERATION, Clear Memory Mode.> and inspection mode <Ref. to EN(H6DO)(diag)-34, PROCEDURE, Inspection Mode.> after connecting the fuel injector connector.

EXHAUST

EX(H6DO)

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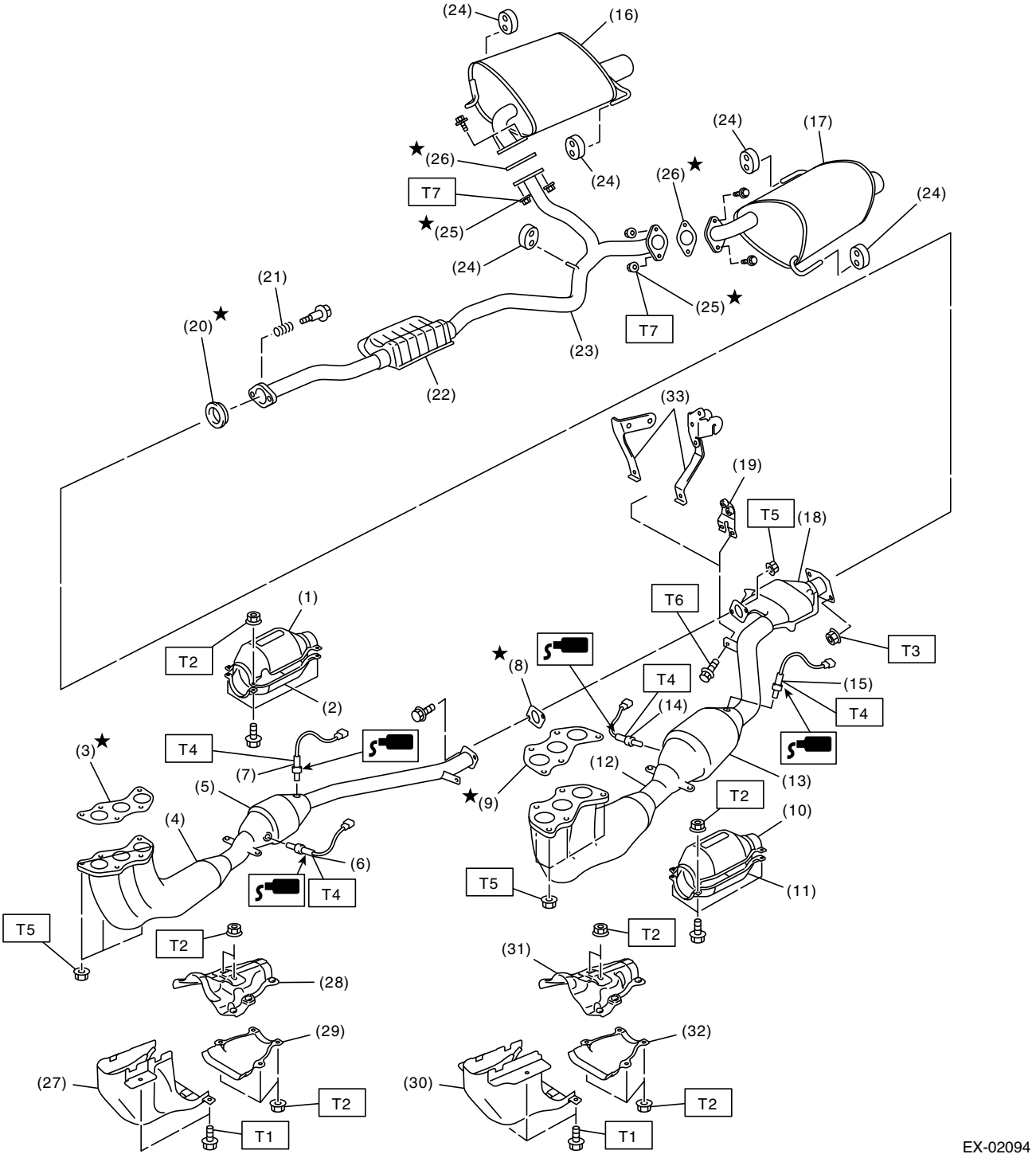
1. General Description

A: COMPONENT



(1) Front catalytic converter upper cover (RH)
(2) Front catalytic converter lower cover (RH)
(3) Gasket
(4) Front exhaust pipe (RH)
(5) Front catalytic converter (RH)
(6) Front oxygen (A/F) sensor (RH)
(7) Rear oxygen sensor (RH)
(8) Gasket
(9) Gasket
(10) Front catalytic converter upper cover (LH)
(11) Front catalytic converter lower cover (LH)
(12) Front exhaust pipe (LH)
(13) Front catalytic converter (LH)
(14) Front oxygen (A/F) sensor (LH)
(15) Rear oxygen sensor (LH)
(16) Muffler (RH)
(17) Muffler (LH)
(18) Rear catalytic converter
(19) Bracket (AT model)
(20) Gasket
(21) Spring
(22) Chamber
(23) Rear exhaust pipe
(24) Cushion rubber
(25) Self-locking nut
(26) Gasket
(27) Front exhaust pipe cover (RH) (MT model)
(28) Front exhaust pipe upper cover (RH) (MT model)
(29) Front exhaust pipe lower cover (RH) (MT model)
(30) Front exhaust pipe cover (LH) (MT model)
(31) Front exhaust pipe upper cover (LH) (MT model)
(32) Front exhaust pipe lower cover (LH) (MT model)
(33) Bracket (MT model)

Tightening torque: N·m (kgf-m, ft-lb)
T1: 7.5 (0.76, 5.5)
T2: 13 (1.3, 9.4)
T3: 18 (1.8, 13.0)
T4: 21 (2.1, 15.2)
T5: 30 (3.1, 22.4)
T6: 35 (3.6, 26.0)
T7: 48 (4.9, 35.4)

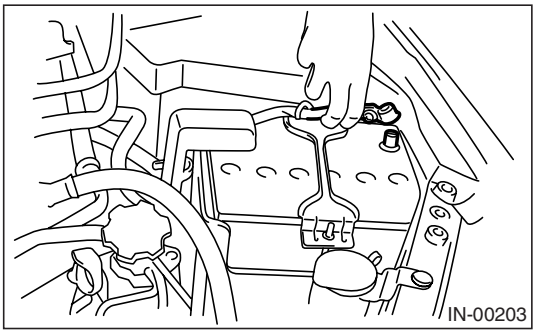
B: CAUTION

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

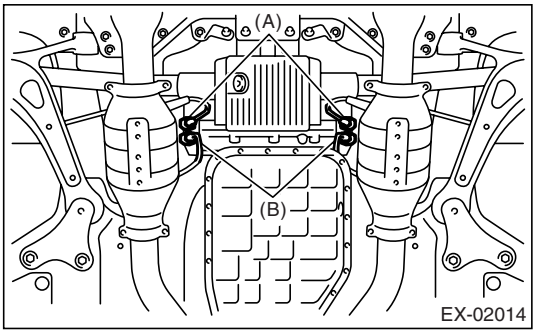
2. Front Exhaust Pipe

A: REMOVAL

1) Disconnect the ground cable from battery.

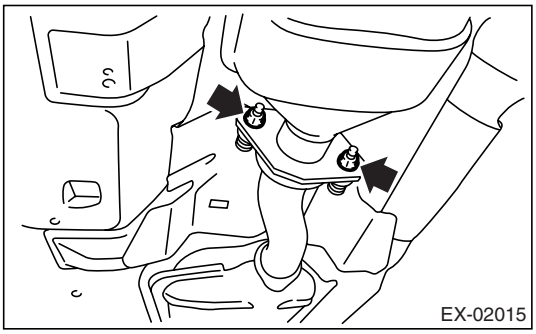


2) Lift-up the vehicle.
3) Remove the under cover.
4) Remove the front oxygen (A/F) sensor connector (A) and rear oxygen sensor connector (B).

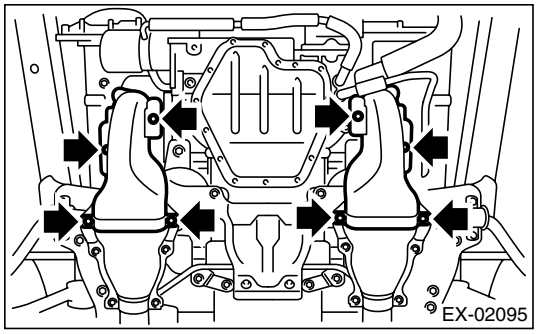


5) Separate the front exhaust pipe from rear exhaust pipe.

CAUTION:
Be careful, because the exhaust pipe is hot.

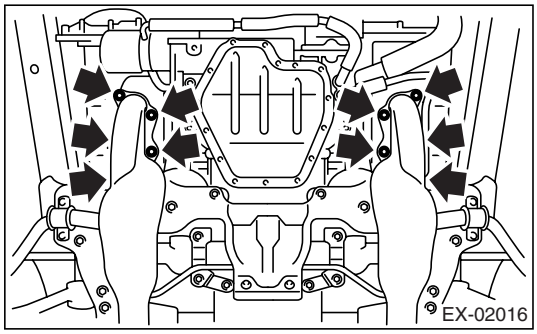


6) Remove the front exhaust pipe cover. (MT model)

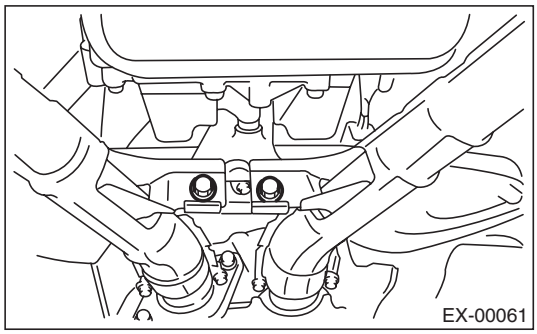


7) Remove the nuts which hold front exhaust pipe onto cylinder heads.

CAUTION:
Be careful not to pull down the rear exhaust pipe assembly.



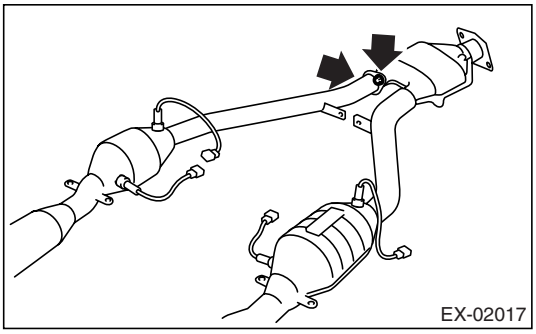
8) Remove the bolts which hold front exhaust pipe assembly to hanger bracket.



9) Remove the front exhaust pipe assembly from vehicle.

CAUTION:
• Be careful not to let the front exhaust pipe assembly fall off when removing, as it is quite heavy.
• After removing the front and center exhaust pipe assembly, do not apply excessive pulling force on the rear exhaust pipe.

10) Separate the front exhaust pipe (RH) from front exhaust pipe assembly.



11) Remove the front oxygen (A/F) sensor and rear oxygen sensor. <Ref. to FU(H6DO)-30, REMOVAL, Front Oxygen (A/F) Sensor.> <Ref. to FU(H6DO)-32, REMOVAL, Rear Oxygen Sensor.>

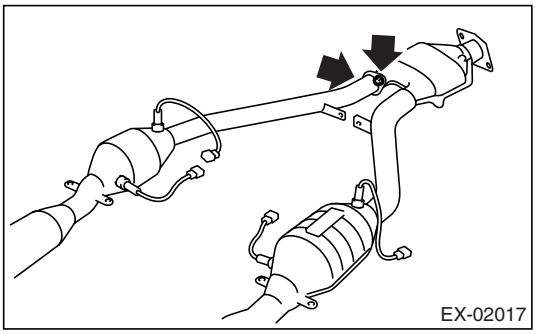
B: INSTALLATION

1) Install the front oxygen (A/F) sensor and rear oxygen sensor. <Ref. to FU(H6DO)-30, INSTALLATION, Front Oxygen (A/F) Sensor.> <Ref. to FU(H6DO)-32, INSTALLATION, Rear Oxygen Sensor.>

2) Install the front exhaust pipe (RH) to front exhaust pipe assembly.

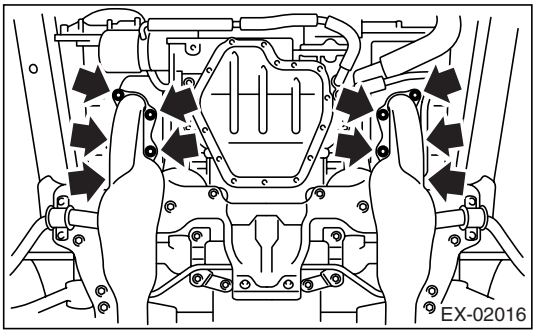
NOTE:
Use a new gasket.

Tightening torque:
30 N·m (3.1 kgf-m, 22.4 ft-lb)



3) Install the front exhaust pipe assembly to vehicle.

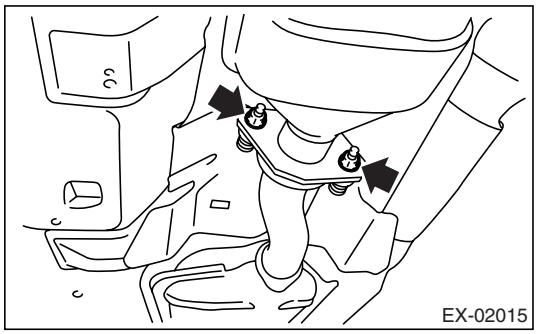
4) Temporarily tighten the nuts which hold front exhaust pipe assembly to cylinder heads.



5) Install the front exhaust pipe assembly to rear exhaust pipe.

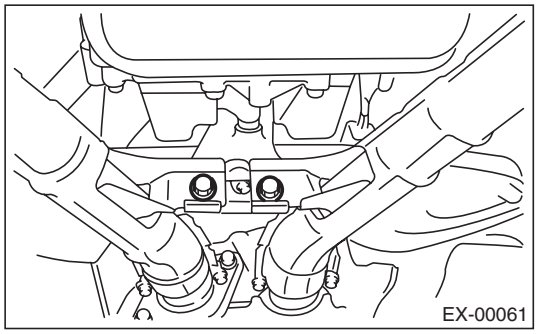
NOTE:
Use a new gasket.

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



6) Tighten the bolts which hold front exhaust pipe assembly to hanger bracket.

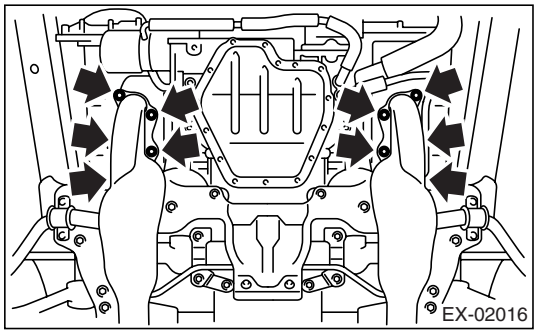
Tightening torque:
35 N·m (3.6 kgf-m, 26.0 ft-lb)



7) Tighten the nuts which hold front exhaust pipe assembly to cylinder heads.

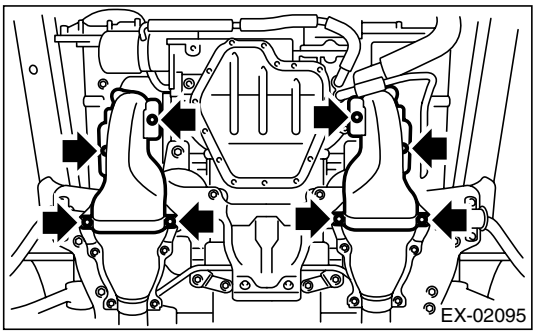
NOTE:
Use a new gasket.

Tightening torque:
30 N·m (3.1 kgf-m, 22.4 ft-lb)

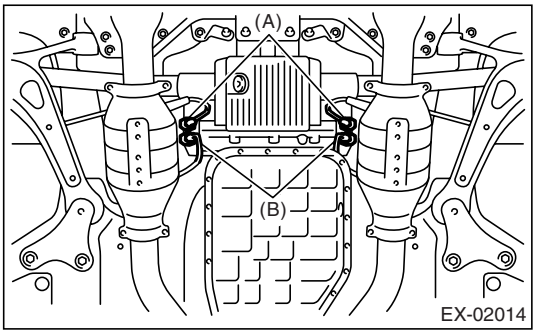


8) Install the front exhaust pipe cover. (MT model)

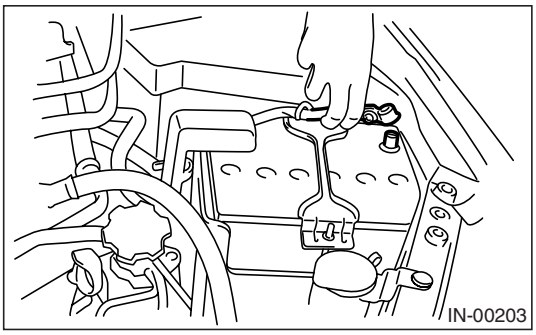
Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)



9) Install the under cover.
10) Connect the front oxygen (A/F) sensor connector (A) and rear oxygen sensor connector (B).



11) Lower the vehicle.
12) Connect the ground cable to battery.



C: INSPECTION

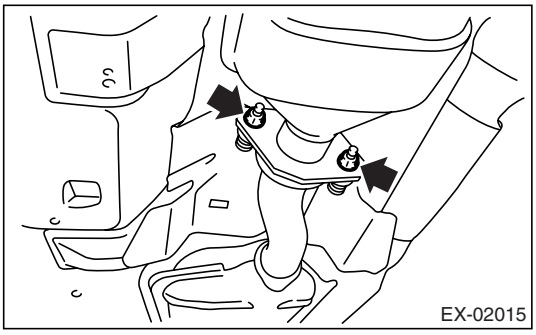
1) Check the connections and welds for exhaust leaks.
2) Check for hole or rust.

3. Rear Exhaust Pipe

A: REMOVAL

1) Separate the rear exhaust pipe from front exhaust pipe.

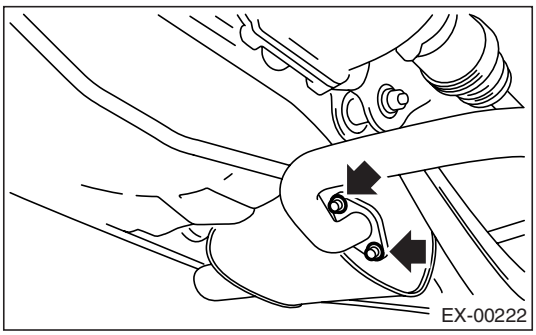
CAUTION:
Be careful, because the exhaust pipe is hot.



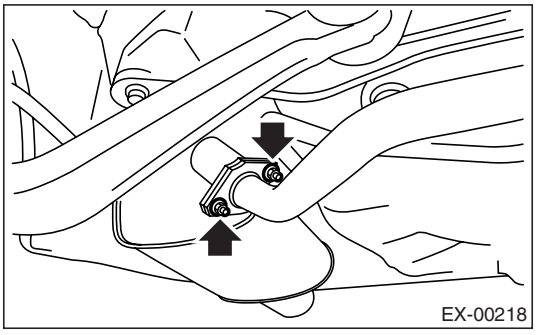
2) Separate the rear exhaust pipe from muffler.

CAUTION:
Be careful not to pull down the rear exhaust pipe.

- LH side

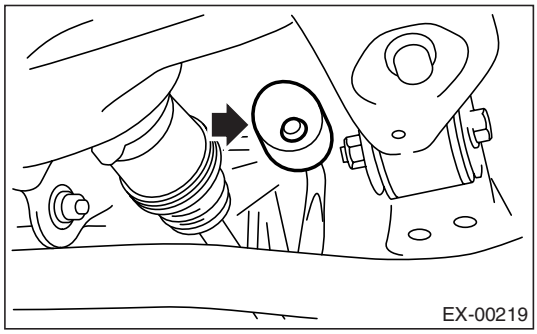


- RH side



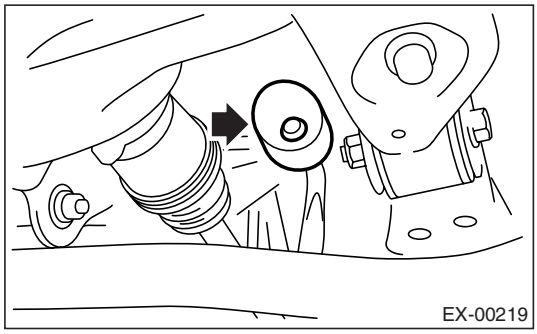
3) Apply a coat of spray type lubricant to the mating area of cushion rubber.

4) Remove the rear exhaust pipe bracket from cushion rubber.



B: INSTALLATION

1) Apply a coat of spray type lubricant to the mating area of cushion rubber.
2) Install the rear exhaust pipe bracket to cushion rubber.

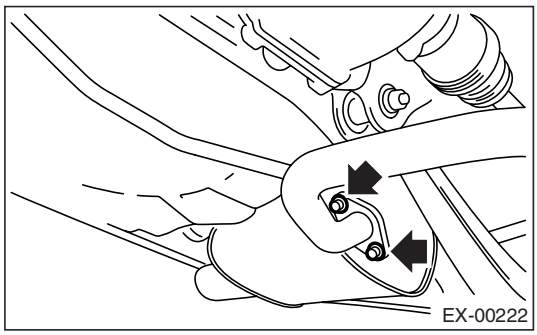


3) Install the rear exhaust pipe to muffler.

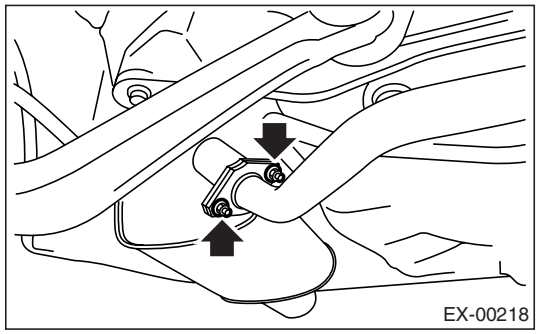
NOTE:
Use a new gasket and self-locking nut.

Tightening torque:
48 N·m (4.9 kgf-m, 35.4 ft-lb)

- LH side



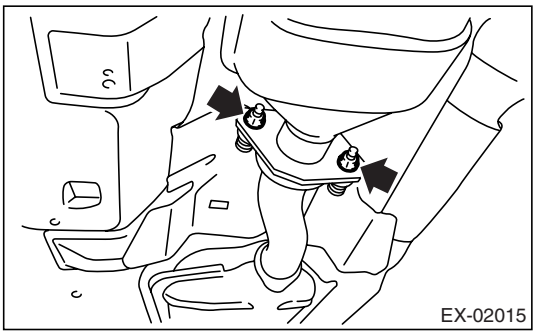
- RH side



4) Install the rear exhaust pipe to center exhaust pipe.

NOTE:
Use a new gasket.

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



C: INSPECTION

1) Check the connections and welds for exhaust leaks.
2) Check for hole or rust.
3) Check the cushion rubber for wear or crack.

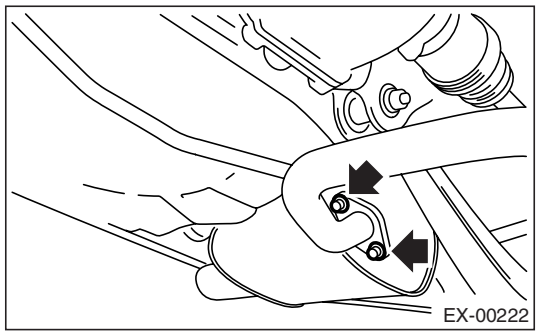
4. Muffler

A: REMOVAL

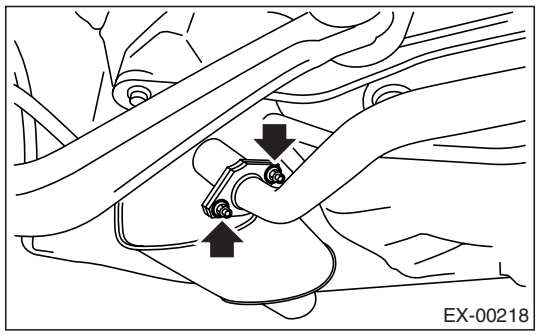
1) Separate the muffler from rear exhaust pipe.

CAUTION:
Be careful, because the exhaust pipe is hot.

- LH side

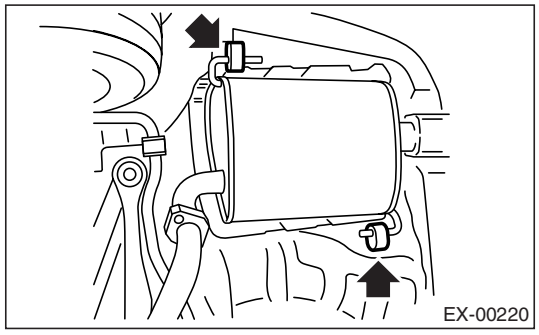


- RH side

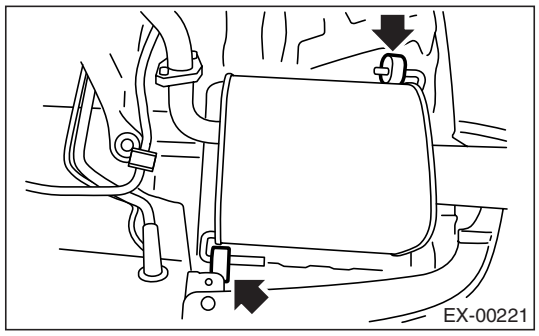


2) Apply a coat of spray type lubricant to the mating area of cushion rubber.

- LH side



- RH side



3) Remove the front and rear cushion rubber, and then remove the muffler.

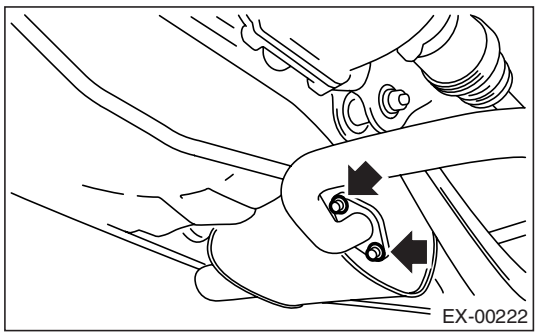
B: INSTALLATION

Install in the reverse order of removal.

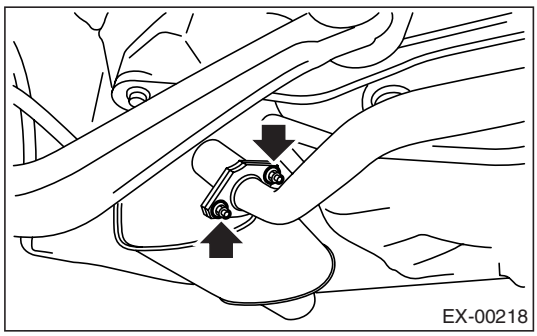
NOTE:
Use a new gasket and self-locking nut.

Tightening torque:
48 N·m (4.9 kgf-m, 35.4 ft-lb)

- LH side



- RH side



C: INSPECTION

1) Check the connections and welds for exhaust leaks.
2) Check for hole or rust.
3) Check the cushion rubber for wear or crack.

Muffler

COOLING

CO(H6DO)

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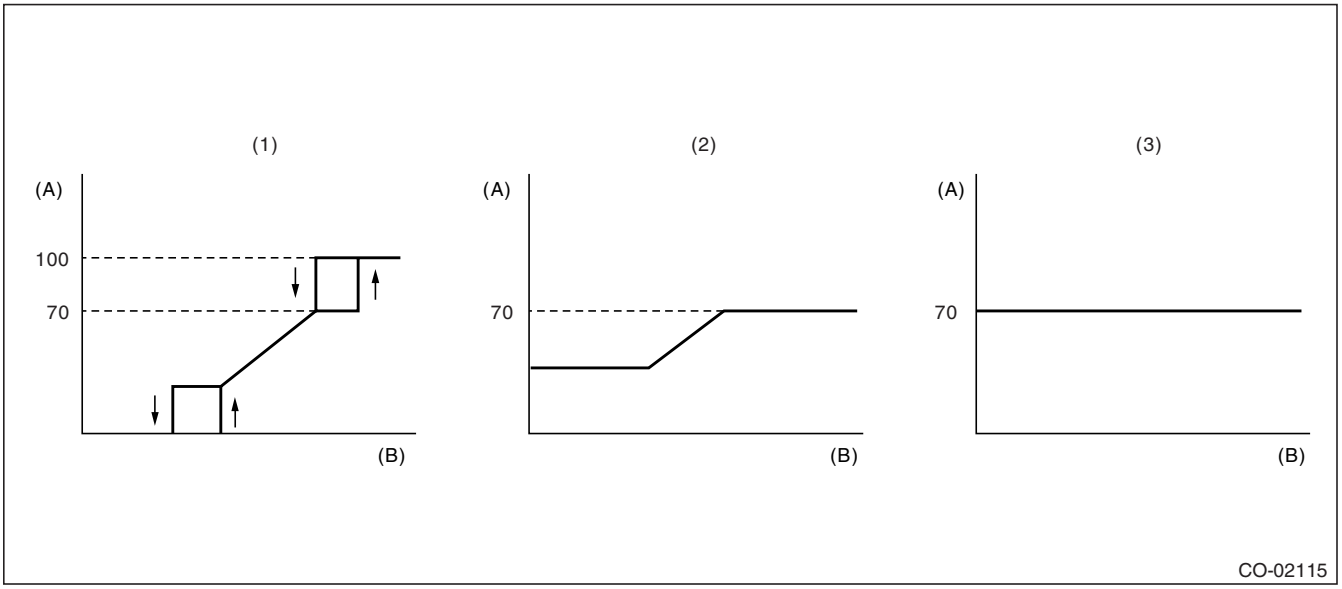
1. General Description

A: SPECIFICATION

Cooling system				Electric fan + Forced engine coolant circulation system
Total engine coolant capacity	MT		ℓ (US qt, Imp qt)	7.3 (7.7, 6.4)
	AT	Without ATF warmer	ℓ (US qt, Imp qt)	7.2 (7.6, 6.3)
		With ATF warmer (LHD)	ℓ (US qt, Imp qt)	7.7 (8.1, 6.8)
		With ATF warmer (RHD)	ℓ (US qt, Imp qt)	7.8 (8.2, 6.9)
Water pump	Type			Centrifugal impeller type
	Discharge performance I	Discharge amount	ℓ (US gal, Imp gal)/min	320 (84.5, 70.4)
		Pump speed — Discharge pressure		5,500 rpm — 176.5 kPa (18 mAq)
		Engine coolant temperature		80°C (176°F)
	Impeller diameter		mm (in)	73.2 (2.88)
	Number of impeller vanes			6
	Number of pump sprocket teeth			22
Thermostat	Type			Wax pellet type
	Starting temperature to open			80 — 84°C (176 — 183°F)
	Fully opens			95°C (203°F)
	Valve lift		mm (in)	9.0 (0.354) or more
	Valve bore		mm (in)	35 (1.38)
Radiator fan	Motor input	Main fan	W	160
		Sub fan	W	160
	Fan diameter / Blades	Main fan		320 mm (12.6 in) / 5
		Sub fan		320 mm (12.6 in) / 7
Radiator	Type			Down flow, pressure type
	Core dimensions	Width × Height × Thickness	mm (in)	690 × 349 × 16 (27.17 × 13.74 × 0.63)
	Pressure range in which cap valve is open		kPa (kgf/cm^2, psi)	Above: 108±15 (1.1±0.15, 16±2) Below: The atmospheric pressure or less
	Fins			Corrugated fin type
Reservoir tank	Capacity		ℓ (US qt, Imp qt)	0.45 (0.48, 0.40)

A/C compressor	A/C middle pressure switch	Engine coolant temperature		
		Increase: Less than 95°C (203°F) Decrease: Less than 93°C (199°F)	Increase: 95 — 101°C (203 — 214°F) Decrease: 93 — 99°C (199 — 210°F)	Increase: More than 102°C (216°F) Decrease: More than 100°C (212°F)
OFF		0%	See fig. (1)	100%
ON	OFF	See fig. (2)		100%
	ON	See fig. (3)		100%



(A) Fan speed (%)

(B) Water temperature

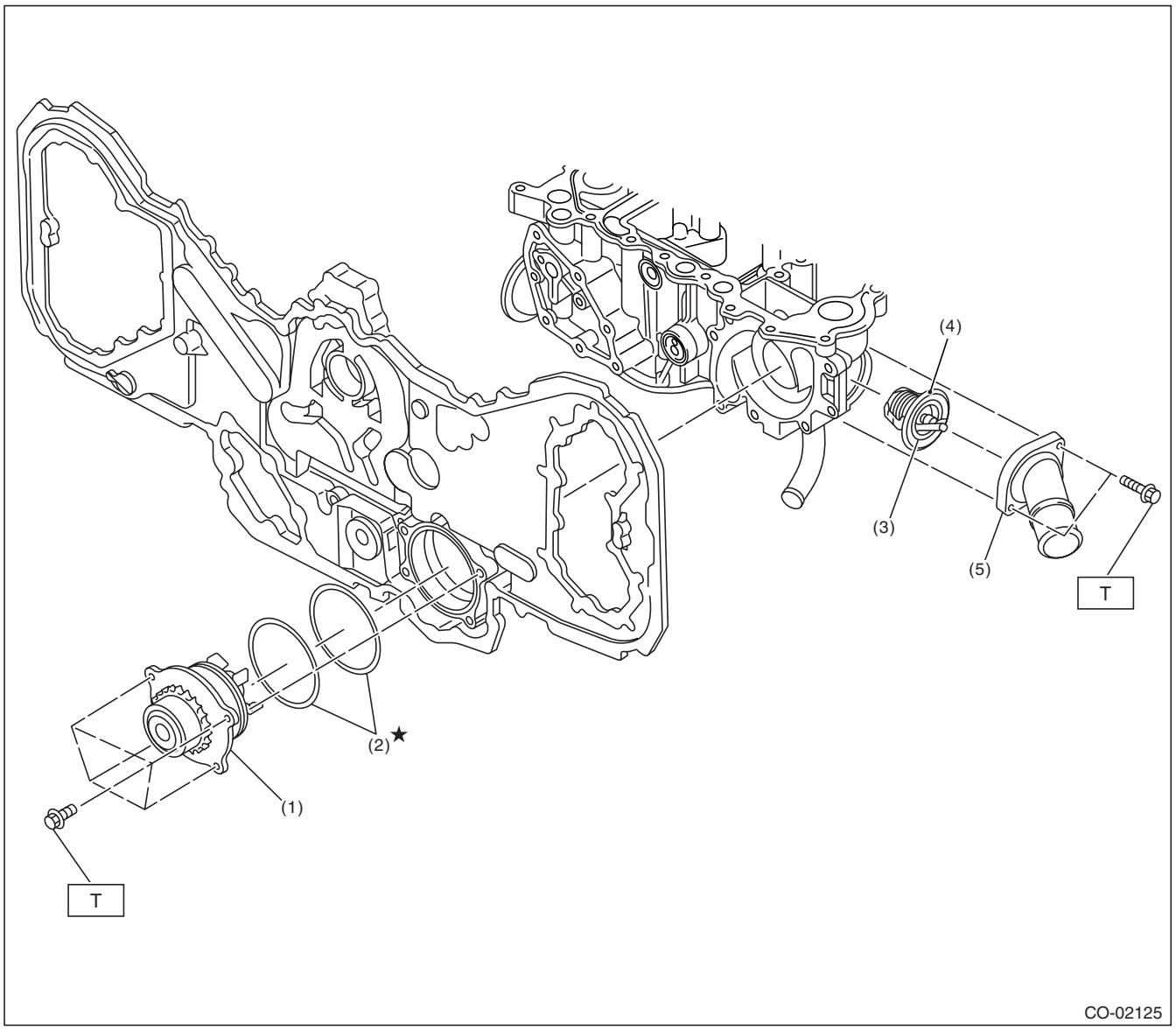
(1) A/C OFF control

(2) A/C ON control (A/C middle pressure switch OFF)

(3) A/C ON control (A/C middle pressure switch ON)

B: COMPONENT

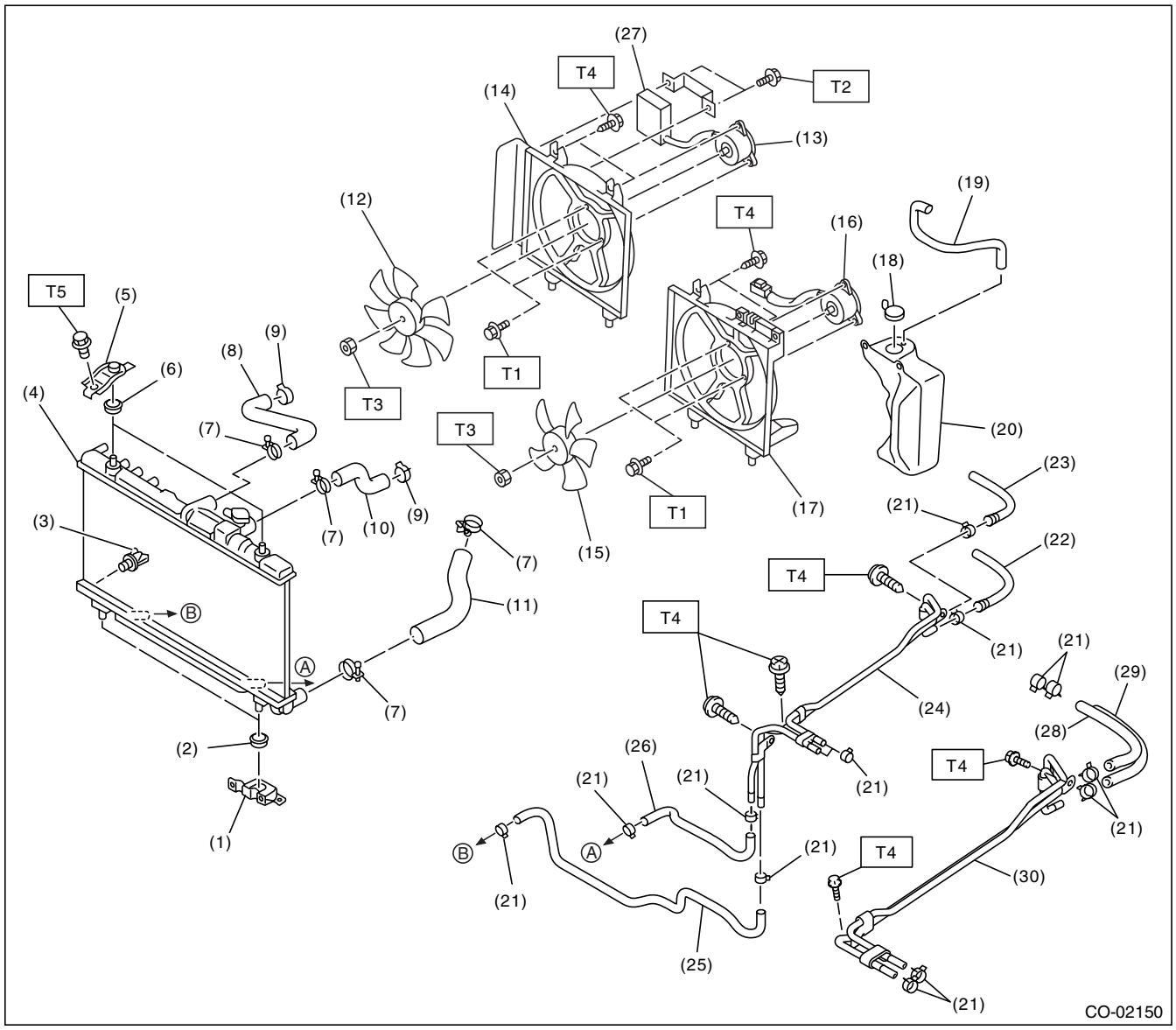
1. WATER PUMP



(1) Water pump ASSY
(2) O-ring
(3) Thermostat
(4) Gasket
(5) Thermostat cover

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

2. RADIATOR AND RADIATOR FAN



(1) Radiator lower bracket
(2) Radiator lower cushion
(3) Engine coolant drain cock
(4) Radiator
(5) Radiator upper bracket
(6) Radiator upper cushion
(7) Clamp
(8) Radiator inlet hose A
(9) Clamp
(10) Radiator inlet hose B
(11) Radiator outlet hose
(12) Radiator sub fan
(13) Radiator sub fan motor
(14) Radiator sub fan shroud
(15) Radiator main fan
(16) Radiator main fan motor
(17) Radiator main fan shroud
(18) Engine coolant reservoir tank cap
(19) Over flow hose
(20) Engine coolant reservoir tank
(21) ATF hose clamp
(22) ATF hose A (Model without ATF warmer)
(23) ATF hose B (Model without ATF warmer)
(24) ATF pipe (Model without ATF warmer)
(25) ATF hose C (Model without ATF warmer)
(26) ATF hose D (Model without ATF warmer)
(27) Radiator fan control unit
(28) ATF hose A (Model with ATF warmer)
(29) ATF hose B (Model with ATF warmer)
(30) ATF pipe (Model with ATF warmer)

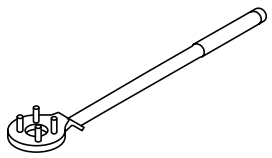
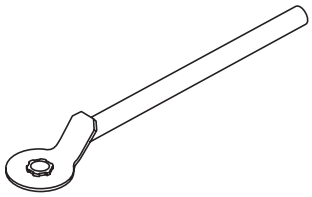
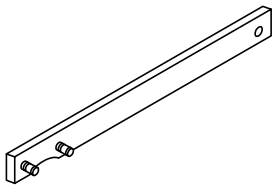
Tightening torque: N·m (kgf-m, ft-lb)	
T1:	*3.8 (0.39, 2.8)*
T2:	*5.4 (0.55, 4)*
T3:	*6.2 (0.63, 4.6)*
T4:	*7.5 (0.76, 5.5)*
T5:	*12 (1.2, 8.9)*

C: CAUTION

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

D: PREPARATION TOOL

1. SPECIAL TOOL

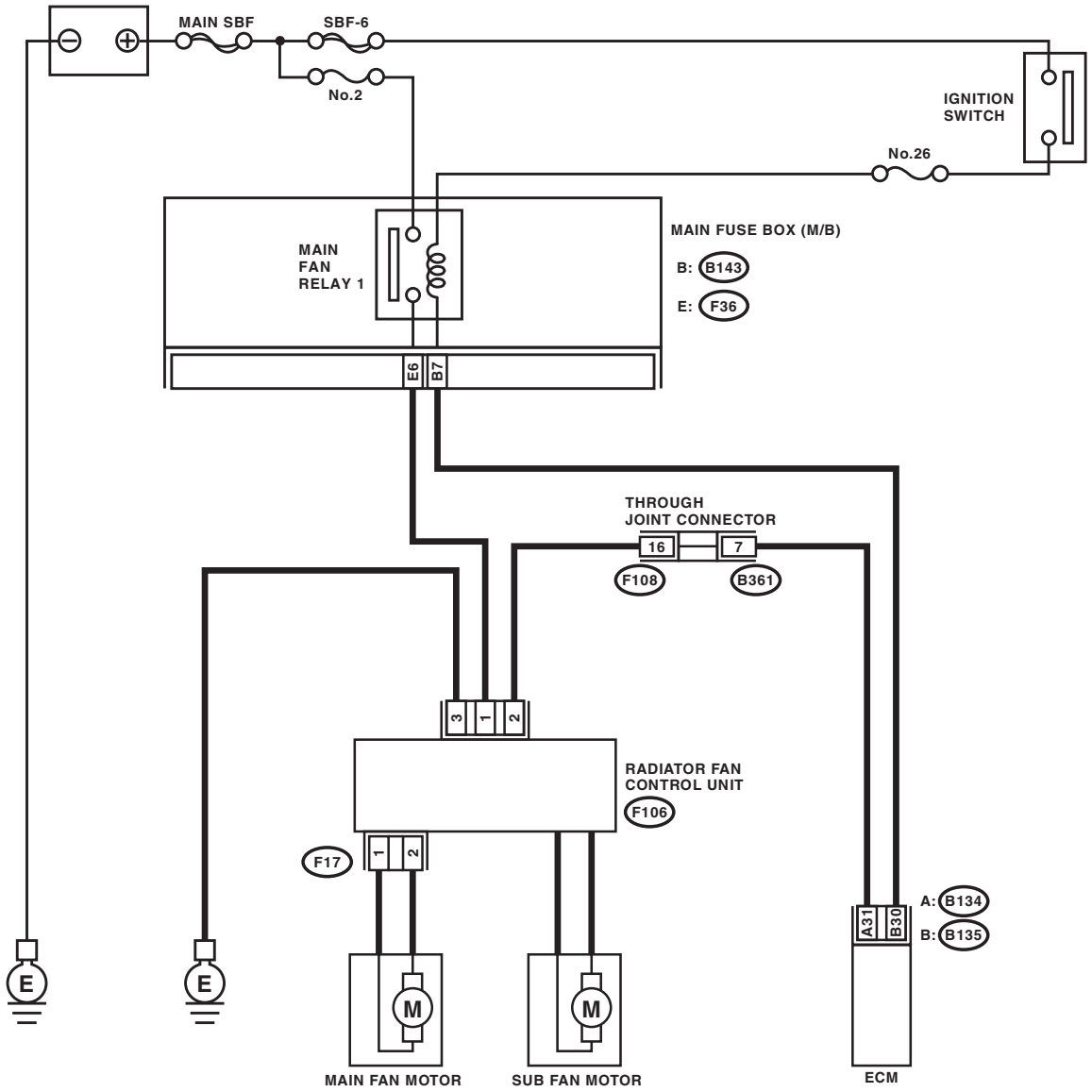
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499977100	499977100	CRANK PULLEY WRENCH	Used for stopping rotation of crank pulley when loosening and tightening crank pulley bolts.
 ST-499977500	499977500	CAM SPROCKET WRENCH	Used for removing and installing intake cam sprocket.
 ST18231AA020	18231AA020	CAM SPROCKET WRENCH	Used for removing and installing exhaust cam sprocket.

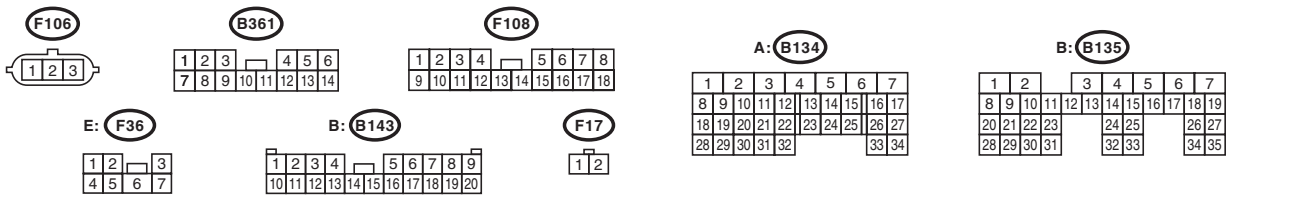
2. GENERAL TOOL

TOOL NAME	REMARKS
Radiator cap tester	Used for measuring pressure.

2. Radiator Fan System

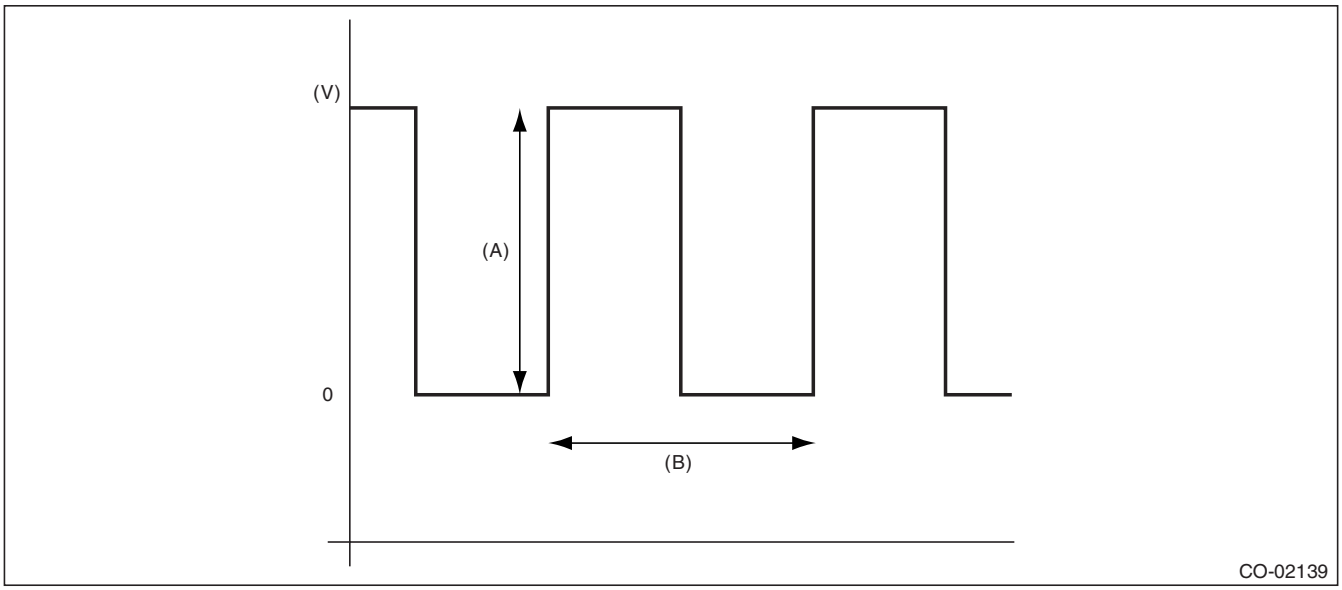
A: WIRING DIAGRAM





CO-02163

B: RADIATOR FAN CONTROL OUTPUT WAVEFORM



(A) 5 V (B) 4 ms

C: INSPECTION

DETECTING CONDITION:

- Engine coolant temperature is more than 93°C (199°F).
- A/C switch is turned OFF.
- Vehicle speed is below 19 km/h (12 MPH).

TROUBLE SYMPTOMS:

Radiator main fan and sub fan do not rotate under the above conditions.

	Step	Check	Yes	No
1	**CHECK MAIN FAN RELAY 1.** 1) Turn the ignition switch to OFF. 2) Remove the main fan relay 1 from main fuse box. 3) Measure the resistance of terminal in main fan relay 1 switch.	Is the resistance more than 1 MΩ?	Go to step **2.**	Replace the main fan relay 1.
2	**CHECK MAIN FAN RELAY 1.** 1) Connect the battery to terminal of main fan relay 1 coil. 2) Measure the resistance between terminals of main fan relay 1 switch.	Is the resistance less than 1 Ω?	Go to step **3.**	Replace the main fan relay 1.
3	**CHECK POWER SUPPLY FOR ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM terminal and chassis ground. ***Connector & terminal*** ***(B135) No. 30 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **4.**	Repair the power supply line.

	Step	Check	Yes	No
4	**CHECK POWER SUPPLY FOR RADIATOR FAN CONTROL UNIT.** 1) Turn the ignition switch to OFF. 2) Connect the connector to ECM. 3) Disconnect the connector from radiator fan control unit. 4) Turn the ignition switch to ON. 5) Measure the voltage between radiator fan control unit terminal and chassis ground. ***Connector & terminal*** ***(F106) No. 1 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **5.**	Repair the power supply line.
5	**CHECK HARNESS BETWEEN ECM AND RADIATOR FAN CONTROL UNIT.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between radiator fan control unit and ECM connector. ***Connector & terminal*** ***(B134) No. 31 — (F106) No. 2:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair the open circuit in harness between ECM and radiator fan control unit.
6	**CHECK RADIATOR FAN CONTROL UNIT AND GROUND CIRCUIT.** 1) Connect the connector to ECM and radiator fan control unit. 2) Measure the resistance between radiator fan control unit connector and chassis ground. ***Connector & terminal*** ***(F106) No. 3 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **7.**	Repair the open circuit in harness between radiator fan control unit connector and chassis ground.
7	**CHECK FAN MOTOR.** 1) Disconnect the connector from radiator fan control unit. 2) Connect the battery positive (+) terminal to terminal No. 1 of radiator fan control unit, and the ground (−) terminal to terminal No. 3.	Does the fan motor rotate?	Go to step **8.**	Replace the fan motor which does not rotate.
8	**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) Check the output waveform using oscilloscope. <Ref. to CO(H6DO)-9, RADIATOR FAN CONTROL OUTPUT WAVEFORM, Radiator Fan System.> ***Connector & terminal*** ***(B134) No. 31 (+) — Chassis ground (−):***	Is waveform being output?	Replace the radiator fan control unit. <Ref. to CO(H6DO)-26, Radiator Fan Control Unit.>	Replace the ECM. <Ref. to FU(H6DO)-34, Engine Control Module (ECM).>

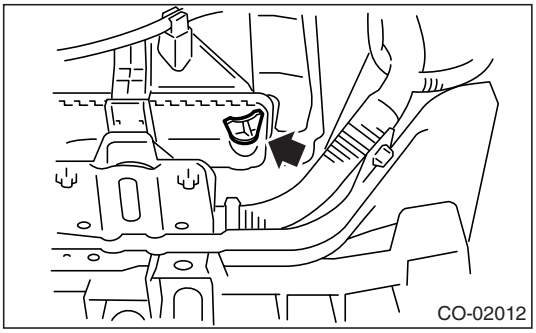
3. Engine Coolant

A: REPLACEMENT

1. DRAINING OF ENGINE COOLANT

1) Lift-up the vehicle.
2) Remove the under cover.
3) Remove the drain plug to drain engine coolant into container.

NOTE:
Remove the radiator cap so that engine coolant will drain faster.



4) Install the drain plug.

2. FILLING OF ENGINE COOLANT

1) Pour engine coolant into the radiator up to the filler neck position.

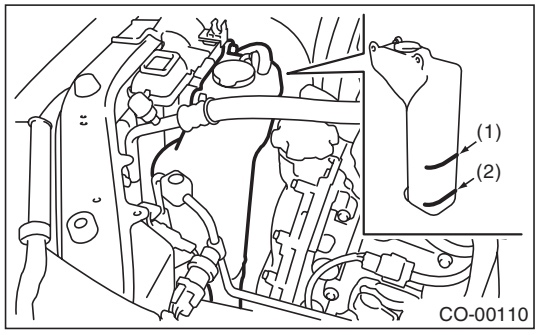
Coolant capacity (fill up to "FULL" level):

MT model
7.3 ℓ (7.7 US qt, 6.4 Imp qt)

AT model
Model without ATF warmer
7.2 ℓ (7.6 US qt, 6.3 Imp qt)
Model with ATF warmer (LHD)
7.7 ℓ (8.1 US qt, 6.8 Imp qt)
Model with ATF warmer (RHD)
7.8 ℓ (8.2 US qt, 6.9 Imp qt)

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

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



(1) FULL
(2) LOW

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

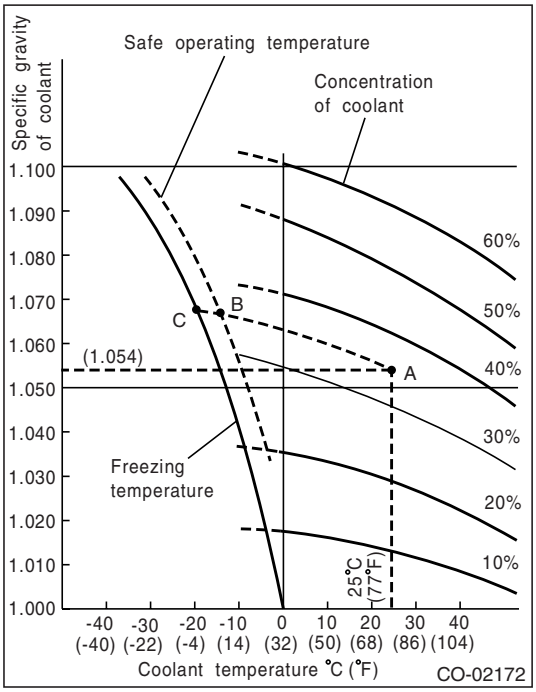
NOTE:
• Be careful with the engine coolant temperature gauge to prevent overheating.
• If the radiator hose becomes harden with the pressure of engine coolant, air bleeding operation seems to be almost completed.

9) Stop the engine and wait until engine coolant temperature lowers to 30°C (86°F).
10) Open the radiator cap. If the engine coolant level drops, add engine coolant into radiator up to the filler neck position and reservoir tank to the "FULL" level.
11) Attach the radiator cap and reservoir tank cap properly.
12) Set the heater setting to maximum hot position and the blower speed setting to "LO" and start the engine. Perform racing at less than 3,000 rpm. If the flowing sound is heard from the heater core, repeat the procedures from 8).

B: INSPECTION

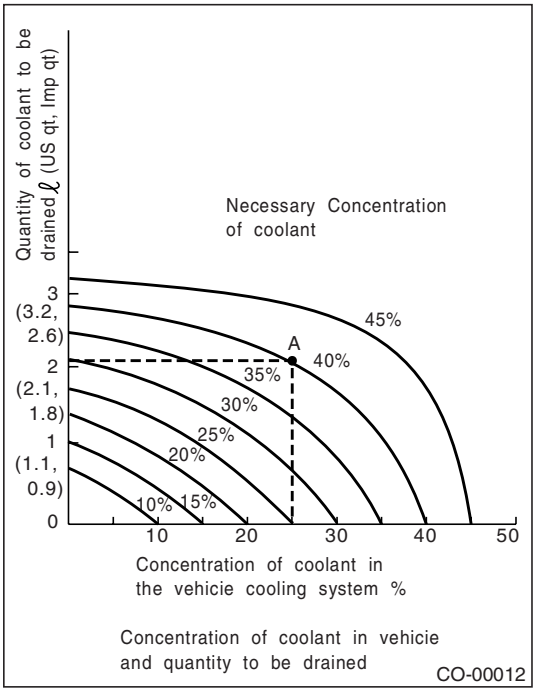
1. RELATIONSHIP OF SUBARU COOLANT CONCENTRATION AND FREEZING TEMPERTAURE

The concentration and safe operating temperature of 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), its specific gravity is 1.054 and the concentration is 35% (point A), the safe operating temperature is −14°C (7°F) (point B), and the freezing temperature is −20°C (−4°F) (point C).



2. PROCEDURE TO ADJUST THE CONCENTRATION OF THE COOLANT

To adjust the concentration of coolant according to temperature, find the proper fluid concentration in the above diagram and replace the necessary amount of coolant with 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.

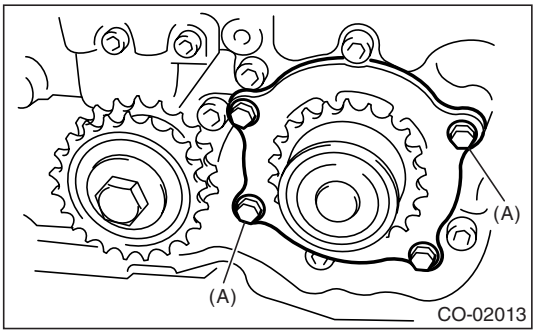


4. Water Pump

A: REMOVAL

1) Remove the radiator. <Ref. to CO(H6DO)-16, REMOVAL, Radiator.>
2) Remove the V-belts.
<Ref. to ME(H6DO)-33, REMOVAL, V-belt.>
3) Remove the front chain cover.
<Ref. to ME(H6DO)-45, REMOVAL, Front Chain Cover.>
4) Remove the timing chain assembly.
<Ref. to ME(H6DO)-47, REMOVAL, Timing Chain Assembly.>
5) Remove the water pump.

NOTE:
When the water pump cannot be removed easier, screw-in the bolt (A) to the screw part to remove water pump.



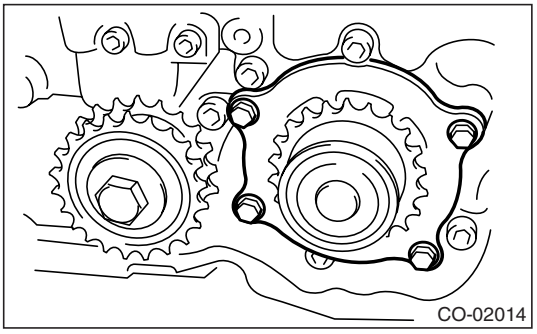
B: INSTALLATION

1) Install the water pump to rear chain cover.

NOTE:
Apply engine coolant to O-ring.

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

NOTE:
- Use a new O-ring.
- Apply engine coolant to O-ring to install water pump easier.



2) Install the timing chain assembly.
<Ref. to ME(H6DO)-48, INSTALLATION, Timing Chain Assembly.>
3) Install the front chain cover.
<Ref. to ME(H6DO)-45, INSTALLATION, Front Chain Cover.>
4) Install the V-belts.
<Ref. to ME(H6DO)-33, INSTALLATION, V-belt.>
5) Install the radiator. <Ref. to CO(H6DO)-17, INSTALLATION, Radiator.>
6) Fill with engine coolant. <Ref. to CO(H6DO)-11, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

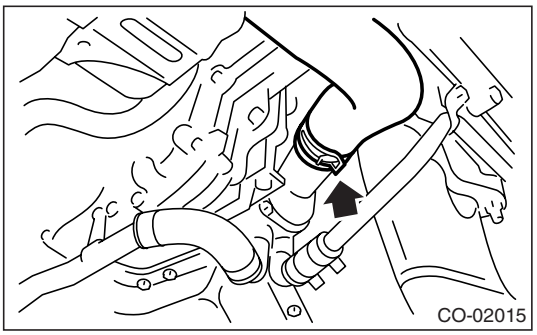
C: INSPECTION

1) Check the water pump bearing for smooth rotation.
2) Check the water pump sprocket for abnormalities.

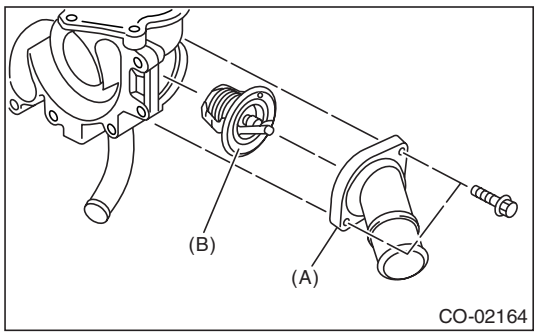
5. Thermostat

A: REMOVAL

1) Set the vehicle on a lift.
2) Lift-up the vehicle.
3) Remove the under cover.
4) Drain engine coolant completely.
<Ref. to CO(H6DO)-11, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
5) Disconnect the radiator outlet hose from thermostat cover.



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



(A) Thermostat cover
(B) Thermostat

B: INSTALLATION

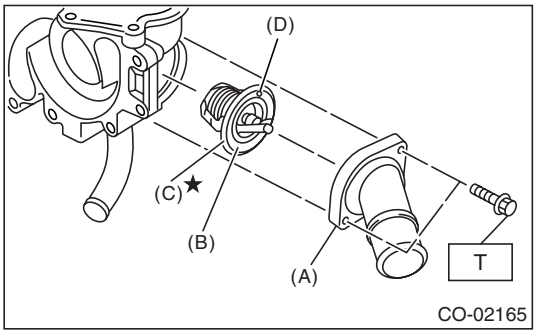
1) Install a gasket to thermostat.

NOTE:
Use a new gasket.

2) Install the thermostat and thermostat cover.

NOTE:
The thermostat must be installed with the jiggle pin facing to the up side.

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



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

3) Connect the radiator outlet hose to thermostat cover.
4) Install the under cover.
5) Lower the vehicle.
6) Fill with engine coolant. <Ref. to CO(H6DO)-11, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

C: INSPECTION

Replace the thermostat if the valve does not close completely at an ambient temperature or if the following test shows unsatisfactory results.

• Inspection method

Immerse the thermostat and a thermometer in water. Raise water temperature gradually, and measure the temperature and valve lift when the valve begins to open and when the valve is fully opened. During the test, agitate the water for even temperature distribution. The measured value should meet the specification.

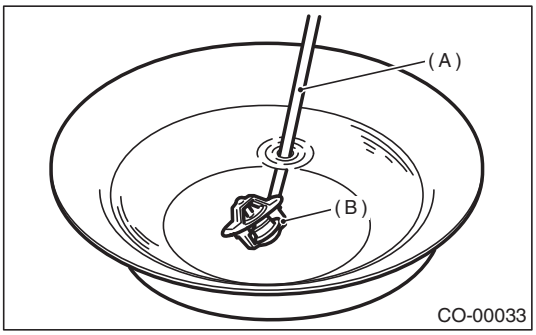
NOTE:
• Leave the thermostat in the boiling water for more than five minutes before measuring the valve lift.

• Hold the thermostat with a wire or the like to avoid contacting with the bottom of container.

Starting temperature to open:
80 — 84°C (176 — 183°F)

Fully opens:
95°C (203°F)

Valve lift:
9.0 mm (0.354 in) or more



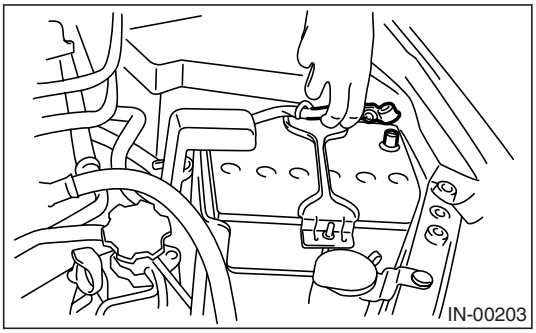
(A) Thermometer
(B) Thermostat

6. Radiator

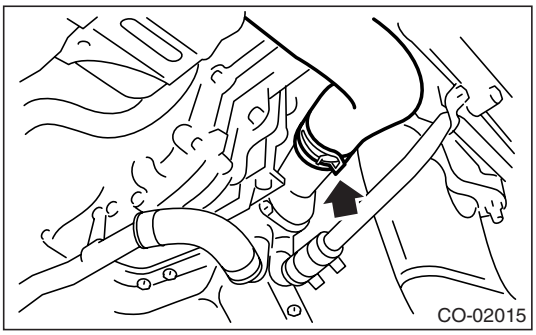
A: REMOVAL

CAUTION:
Wait until the engine cools down before working since the radiator is pressurized.

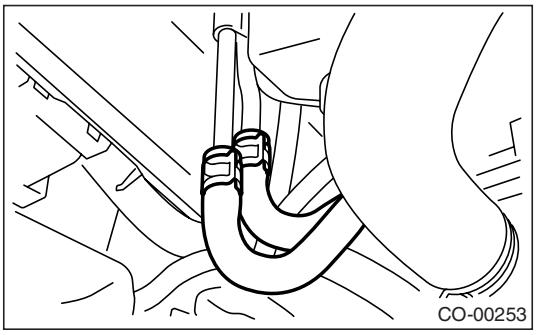
1) Set the vehicle on a lift.
2) Remove the collector cover.
3) Disconnect the ground cable from battery.



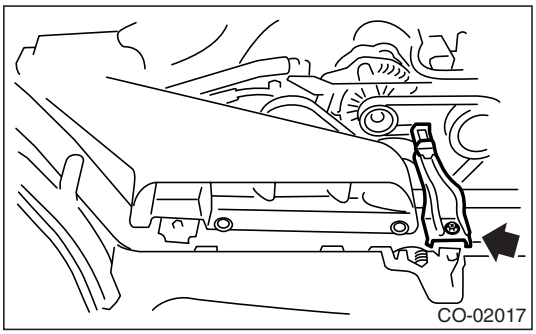
4) Lift-up the vehicle.
5) Remove the under cover.
6) Drain engine coolant completely.
<Ref. to CO(H6DO)-11, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
7) Disconnect the outlet hose from radiator.



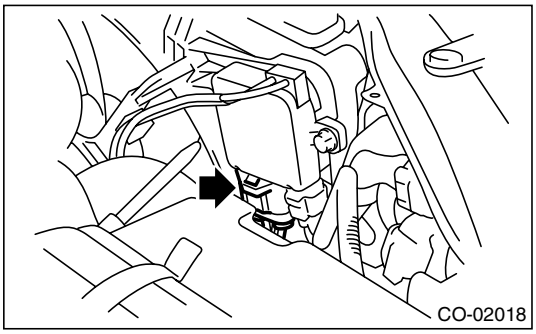
8) Disconnect the ATF hose from radiator. (Model without ATF warmer)



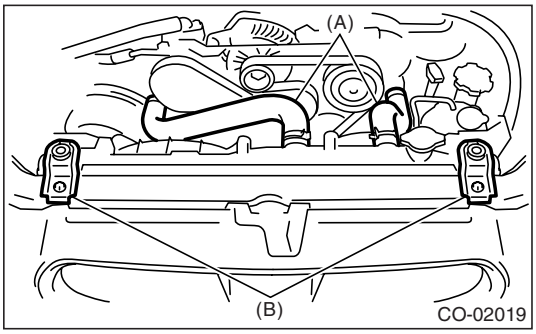
9) Lower the vehicle.
10) Remove the hood stay holder.



11) Remove the air intake duct. <Ref. to IN(H6DO)-8, REMOVAL, Air Intake Duct.>
12) Disconnect the connector from radiator fan control unit.



13) Remove the reservoir tank. <Ref. to CO(H6DO)-25, REMOVAL, Reservoir Tank.>
14) Disconnect the inlet hose from radiator.
15) Remove the radiator upper brackets.

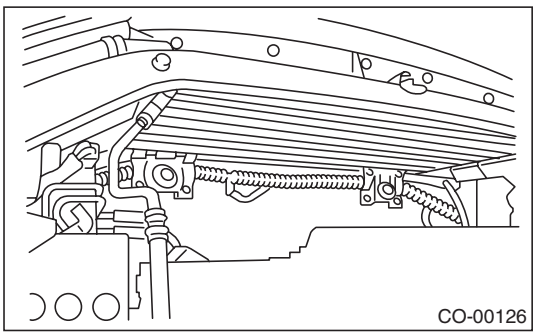


(A) Radiator inlet hose
(B) Radiator upper bracket

16) Lift the radiator up and away from vehicle.

B: INSTALLATION

1) Attach the radiator lower cushions to holes on the vehicle.



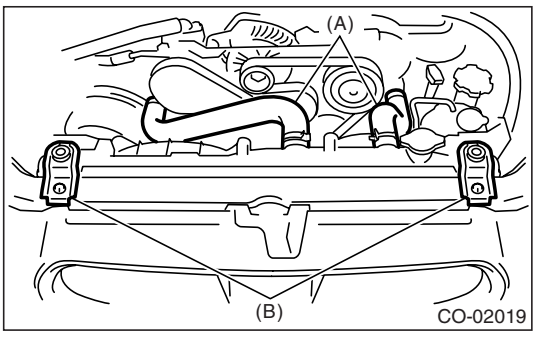
2) Install the radiator to vehicle.

NOTE:
Make pins on the lower side of radiator be fitted into the radiator lower cushions on body side.

3) Install the radiator upper brackets and tighten the bolts.

Tightening torque:
12 N·m (1.2 kgf-m, 8.9 ft-lb)

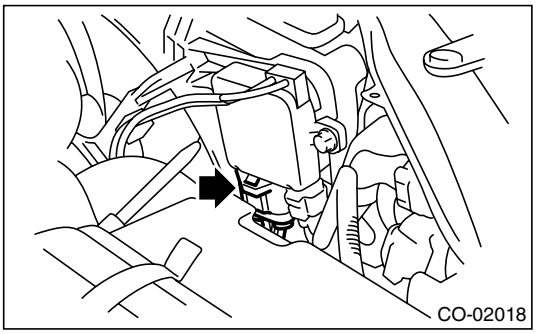
4) Connect the radiator inlet hose.



(A) Radiator inlet hose
(B) Radiator upper bracket

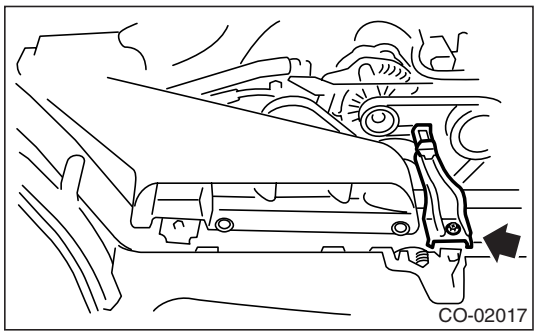
5) Install the reservoir tank. <Ref. to CO(H6DO)-25, INSTALLATION, Reservoir Tank.>

6) Connect the connector to radiator fan control unit.



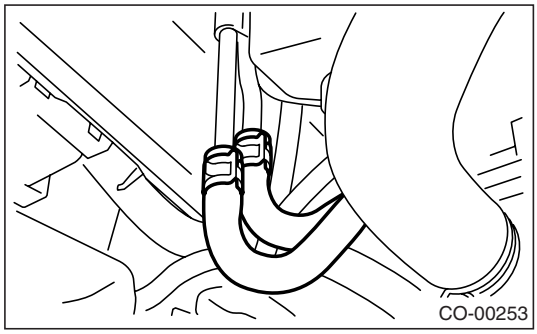
7) Install the air intake duct.
<Ref. to IN(H6DO)-8, INSTALLATION, Air Intake Duct.>

8) Install the hood stay holder.

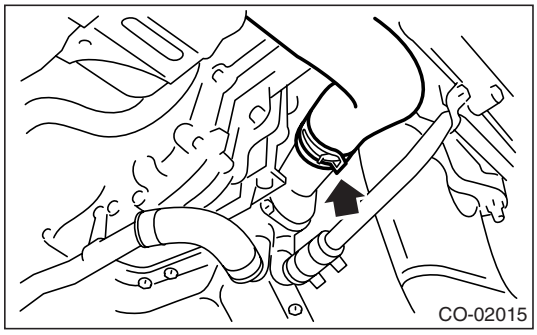


9) Lift-up the vehicle.

10) Connect the ATF hoses. (Model without ATF warmer)



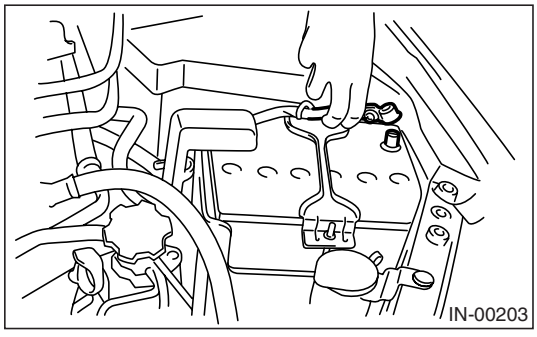
11) Connect the radiator outlet hose.



12) Install the under cover.

13) Lower the vehicle.

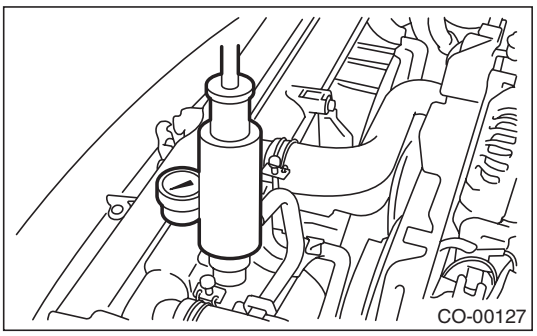
14) Connect the ground cable to battery.



15) Fill engine coolant.
<Ref. to CO(H6DO)-11, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
16) Check the ATF level.
<Ref. to 5AT-28, INSPECTION, Automatic Transmission Fluid.>
17) Install the collector cover.

C: INSPECTION

1) Remove the radiator cap, top off the radiator with coolant, and then attach the tester in place of cap.



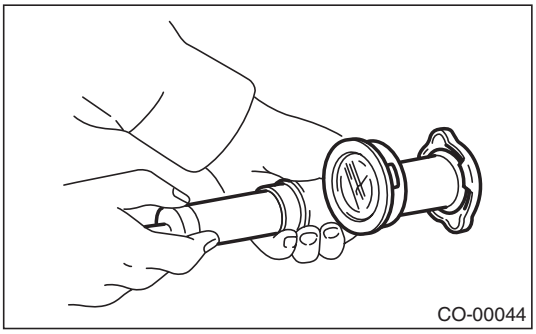
2) Apply a pressure of 157 kPa (1.6 kgf/cm^2, 23 psi) to the radiator to check if:
- Engine coolant leaks at/around radiator.
- Engine coolant leaks at/around hoses or connections.

CAUTION:
- **Engine should be turned off.**
- **Wipe engine coolant from check points in advance.**
- **Be careful to prevent engine coolant from spurting out when removing tester.**
- **Be careful not to deform the filler neck of radiator when installing or removing the tester.**

7. Radiator Cap

A: INSPECTION

1) Attach the radiator cap to tester.



2) Increase pressure until the tester gauge pointer stops. Radiator cap is functioning properly if it holds the service limit pressure for five to six seconds.

Specified pressure:
93—123 kPa (0.95—1.25 kgf/cm^2, 14—18 psi)

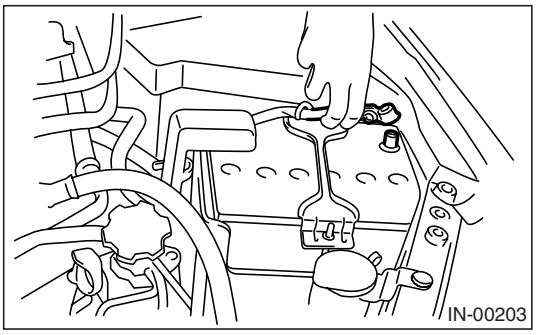
Service limit pressure:
83 kPa (0.85 kgf/cm^2, 12 psi)

CAUTION:
Be sure to remove foreign matter and rust from the cap in advance, otherwise results of pressure test will be incorrect.

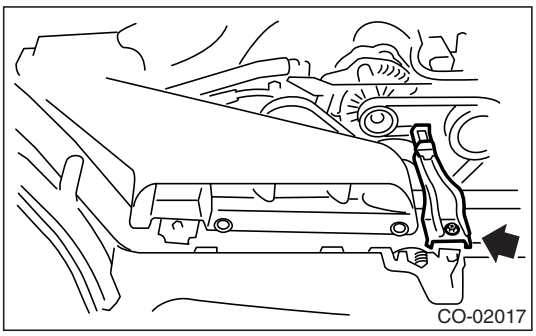
8. Radiator Main Fan and Fan Motor

A: REMOVAL

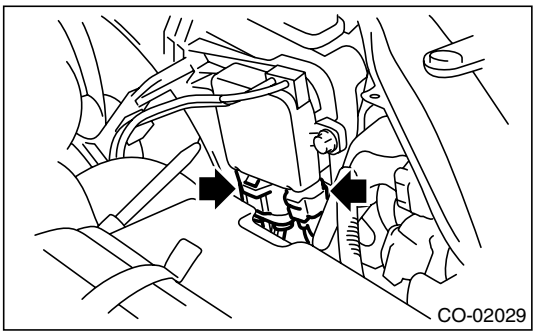
1) Set the vehicle on a lift.
2) Remove the collector cover.
3) Disconnect the ground cable from battery.



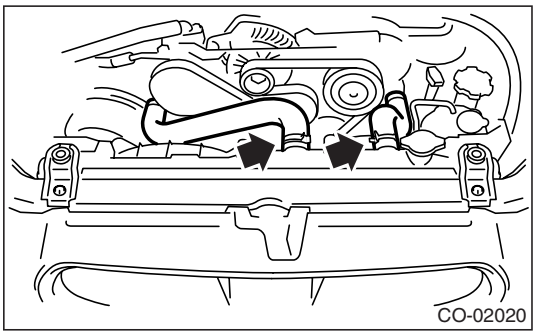
4) Remove the hood stay holder.



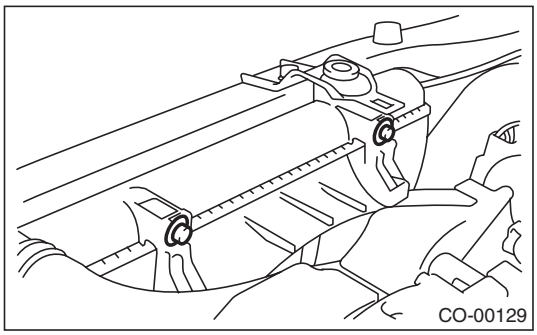
5) Remove the air intake duct. <Ref. to IN(H6DO)-8, REMOVAL, Air Intake Duct.>
6) Disconnect the connector from radiator fan control unit.



7) Lift-up the vehicle.
8) Remove the under cover.
9) Drain engine coolant completely.
<Ref. to CO(H6DO)-11, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
10) Disconnect the ATF hose from the clip of radiator main fan shroud. (model without ATF warmer)
11) Remove the radiator main fan motor harness from clip.
12) Lower the vehicle.
13) Remove the reservoir tank. <Ref. to CO(H6DO)-25, REMOVAL, Reservoir Tank.>
14) Disconnect the inlet hose from radiator.

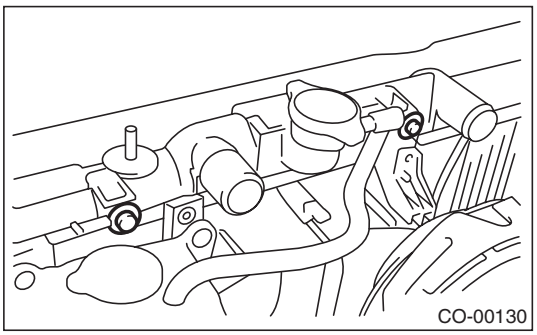


15) Remove the radiator sub fan motor assembly.



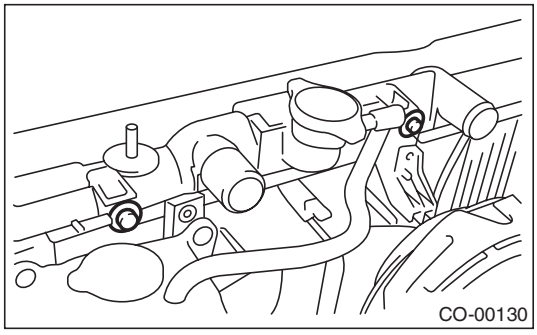
16) Remove the radiator main fan motor assembly.

NOTE:
When removing the main fan assembly with lifting it up, the main fan shroud contacts to inlet part of engine coolant. To avoid contacting it, move the main fan assembly to sub fan assembly side before removal.

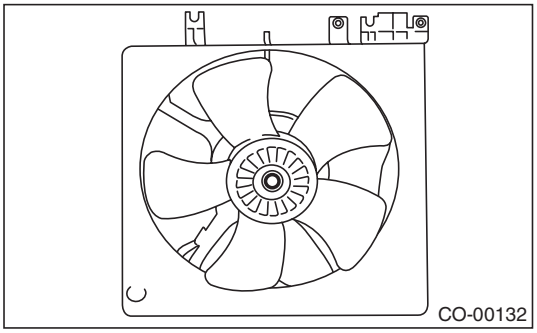


B: INSTALLATION
Install in the reverse order of removal.

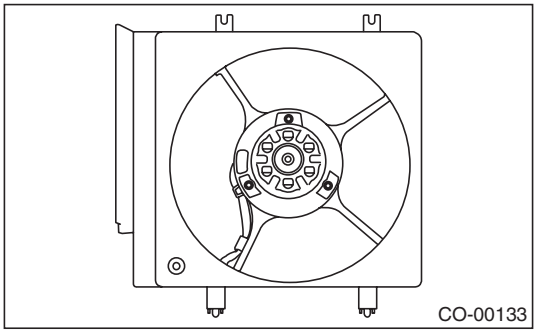
Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)


CO-00130

C: DISASSEMBLY
1) Remove the nut which holds fan itself onto fan motor and shroud assembly.

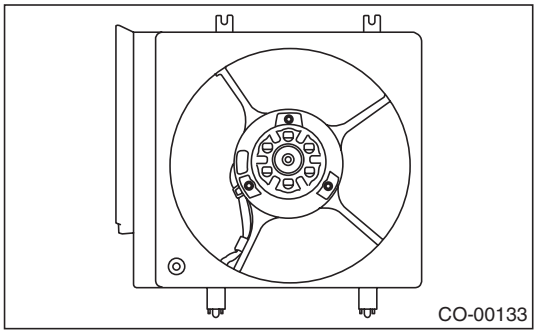

CO-00132

2) Remove the screws which hold the fan motor onto shroud.

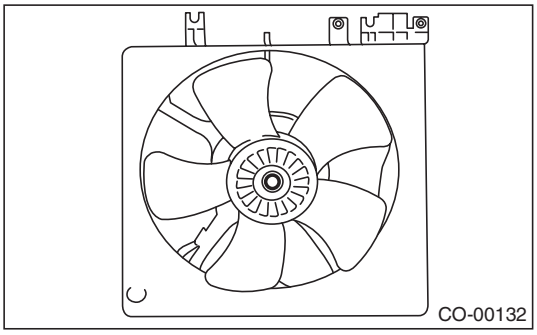

CO-00133

D: ASSEMBLY
Assemble in the reverse order of disassembly.

Tightening torque:
3.8 N·m (0.39 kgf-m, 2.8 ft-lb)

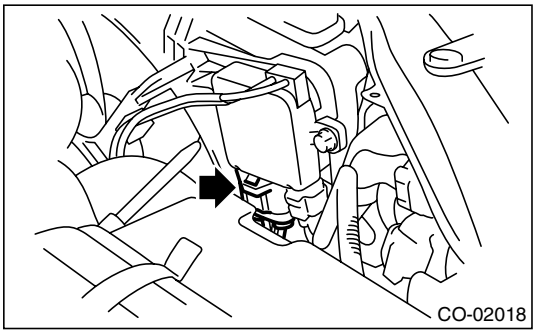

CO-00133

Tightening torque:
6.2 N·m (0.63 kgf-m, 4.6 ft-lb)

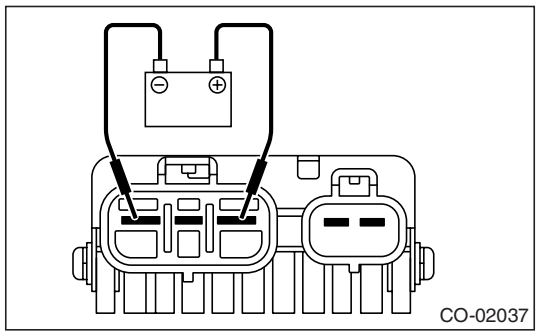

CO-00132

E: INSPECTION
1) Disconnect the connector from radiator fan control unit.

NOTE:
Do not remove the main fan motor harness connector.


CO-02018

2) Connect the battery to radiator fan control unit as shown in the figure.

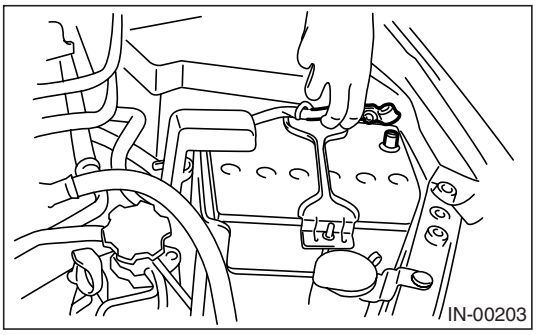


3) Check the fan motor for normal operation. If it does not operate, replace the fan motor.

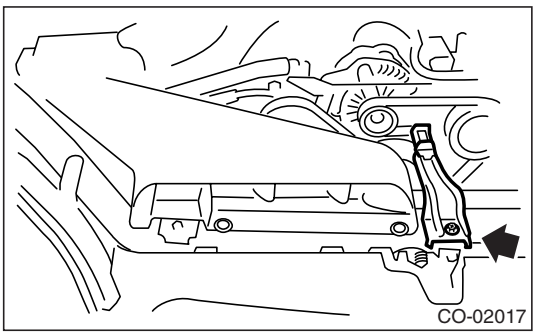
9. Radiator Sub Fan and Fan Motor

A: REMOVAL

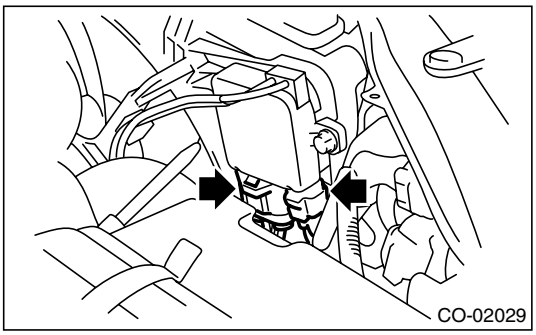
1) Set the vehicle on a lift.
2) Remove the collector cover.
3) Disconnect the ground cable from battery.



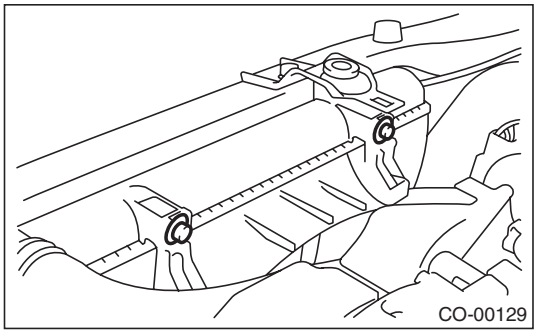
4) Remove the hood stay holder.



5) Remove the air intake duct. <Ref. to IN(H6DO)-8, REMOVAL, Air Intake Duct.>
6) Disconnect the connector from radiator fan control unit.



7) Remove the bolts which hold sub fan shroud to radiator.

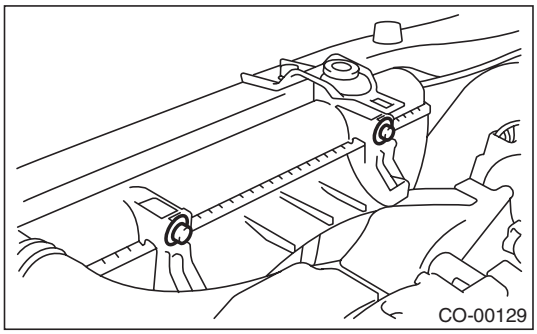


8) Lift-up the vehicle.
9) Remove the under cover.
10) Remove the radiator sub fan shroud through the under side of vehicle.

B: INSTALLATION

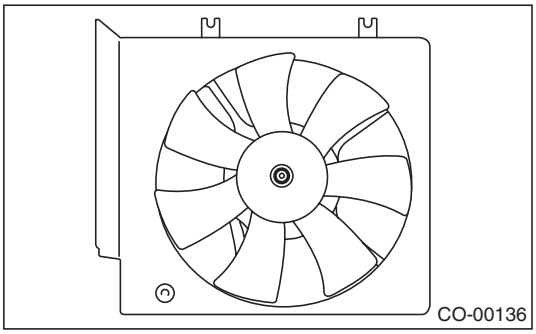
Install in the reverse order of removal.

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

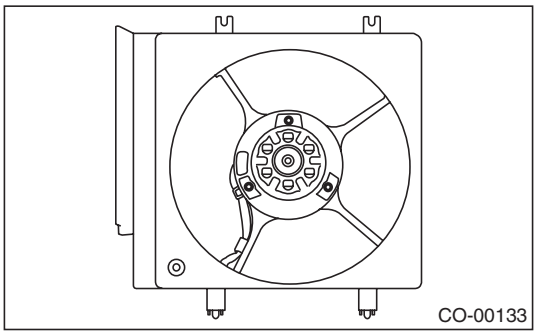


C: DISASSEMBLY

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



2) Remove the screws which hold the fan motor onto shroud.


CO-00133

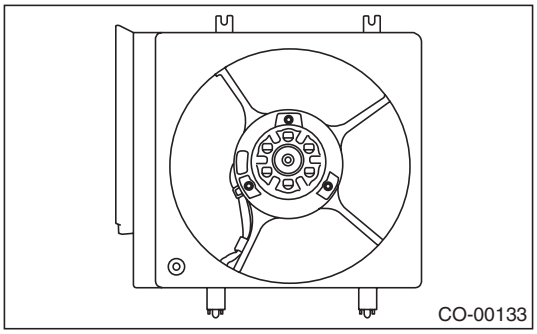
3) Remove the bolt which holds radiator fan control unit onto shroud.

D: ASSEMBLY

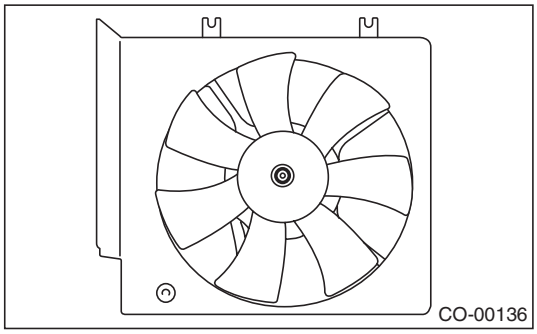
Assemble in the reverse order of disassembly.

Radiator fan control unit bolt tightening torque:
5.4 N·m (0.55 kgf-m, 4 ft-lb)

Tightening torque:
3.8 N·m (0.39 kgf-m, 2.8 ft-lb)


CO-00133

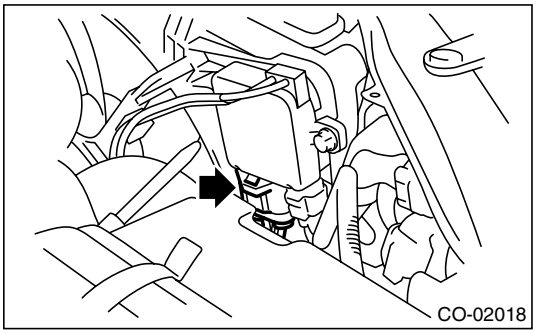
Tightening torque:
6.2 N·m (0.63 kgf-m, 4.6 ft-lb)


CO-00136

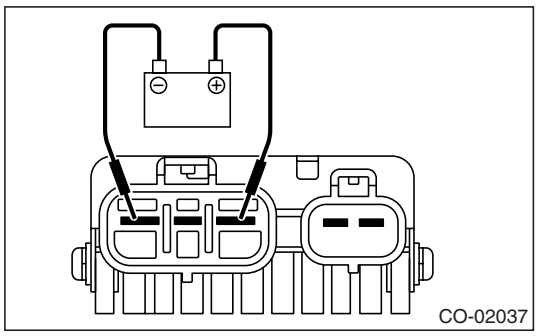
E: INSPECTION

1) Disconnect the connector from radiator fan control unit.

NOTE:
Do not remove the main fan motor harness connector.


CO-02018

2) Connect the battery to radiator fan control unit as shown in the figure.

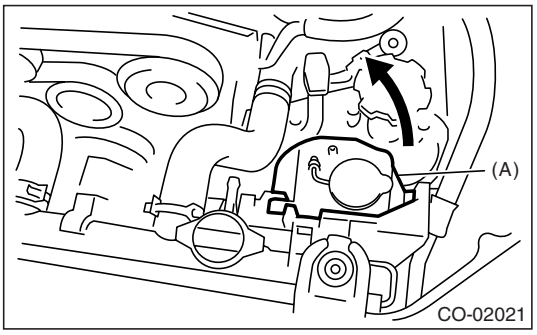

CO-02037

3) Check the fan motor for normal operation. If it does not operate, replace the fan motor.

10.Reservoir Tank

A: REMOVAL

1) Disconnect the over flow hose.
2) Pull out the reservoir tank to the direction of arrow while pushing the pawl (A).



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

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

11.Radiator Fan Control Unit

A: SPECIFICATION

Radiator fan control unit forms a unit with radiator sub fan motor. Refer to “Radiator Sub Fan and Fan Motor” for removal and installation procedures.
<Ref. to CO(H6DO)-23, REMOVAL, Radiator Sub Fan and Fan Motor.> <Ref. to CO(H6DO)-23, INSTALLATION, Radiator Sub Fan and Fan Motor.> <Ref. to CO(H6DO)-23, DISASSEMBLY, Radiator Sub Fan and Fan Motor.> <Ref. to CO(H6DO)-24, ASSEMBLY, Radiator Sub Fan and Fan Motor.>

12.Engine Cooling System Trouble in General

A: INSPECTION

Trouble	Possible cause	Corrective action
Overheating	a. Insufficient engine coolant	Replenish engine coolant, inspect for leakage, and repair it if necessary.
	b. Defective thermostat	Replace.
	c. Malfunction of water pump	Replace.
	d. Clogged engine coolant passage	Clean.
	e. Improper ignition timing	Inspect and repair the ignition control system. <Ref. to EN(H6DO)(diag)-2, PROCEDURE, Basic Diagnostic Procedure.>
	f. Clogged or leaking radiator	Clean, repair or replace.
	g. Improper engine oil in engine coolant	Check, repair or replace the parts around engine.
	h. Air/fuel mixture ratio too lean	Inspect and repair the fuel injection system. <Ref. to EN(H6DO)(diag)-2, PROCEDURE, Basic Diagnostic Procedure.>
	i. Excessive back pressure in exhaust system	Clean or replace.
	j. Insufficient clearance between piston and cylinder	Adjust or replace.
	k. Slipping clutch	Correct or replace.
	l. Dragging brake	Adjust.
	m. Faulty transmission gear oil	Replace.
	n. Malfunction of radiator fan	Inspect radiator fan relay, engine coolant temperature sensor or fan motor and replace them.
Over-cooling	a. Ambient temperature extremely low	Partly cover radiator front area.
	b. Defective thermostat	Replace.
Engine coolant leaks	a. Loosened or damaged connecting units on hoses	Correct or replace.
	b. Leakage from water pump	Replace.
	c. Leakage from water pipe	Correct or replace.
	d. Leakage around cylinder head gasket	Retighten cylinder head bolts or replace gasket.
	e. Damaged or cracked cylinder head and crankcase	Correct or replace.
	f. Damaged or cracked thermostat case	Correct or replace.
	g. Leakage from radiator	Correct or replace.
Noise	a. Defective drive belt	Replace.
	b. Defective radiator fan	Replace.
	c. Defective water pump bearing	Replace water pump.
	d. Defective water pump mechanical seal	Replace water pump.

LUBRICATION

LU(H6DO)

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5.	Oil Pump Relief Valve	10
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7.	Oil Pressure Switch	13
8.	Engine Oil Filter	14
9.	Engine Oil Cooler	15
10.	Engine Lubrication System Trouble in General	17

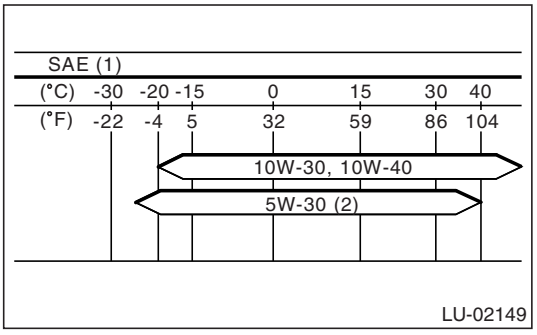
1. General Description

A: SPECIFICATION

Lubrication method				Forced lubrication
Oil Pump	Pump type			Trochoid type
	Number of teeth	Inner rotor		7
		Outer rotor		8
	Outer rotor diameter × thickness		mm (in)	86 × 13 (3.39 × 0.51)
	Tip clearance between inner and outer rotors		mm (in)	0.04 — 0.14 (0.0016 — 0.0055)
	Side clearance between inner rotor and pump case		mm (in)	0.020 — 0.046 (0.0008 — 0.0018)
	Case clearance between outer rotor and pump case		mm (in)	0.110 — 0.175 (0.0043 — 0.0069)
Oil filter	Filter type			Full-flow filter type
	Filtration area		cm^2 (sq in)	1,300 (201.5)
	By-pass valve opening pressure		kPa (kgf/cm^2, psi)	160 (1.63, 23.2)
	Outer diameter × width		mm (in)	80 × 75 (3.15 × 2.95)
	Installation screw specifications			M20 × 1.5
Relief valve working pressure			kPa (kgf/cm^2, psi)	708 (7.2, 102.7)
Oil pressure switch	Type			Immersed contact point type
	Working voltage — wattage			12 V — 3.4 W or less
	Warning light activation pressure		kPa (kgf/cm^2, psi)	15 (0.15, 2.2)
	Proof pressure		kPa (kgf/cm^2, psi)	980 (10.0, 142) or more
Engine oil	Capacity (at overhaul)		ℓ (US qt, Imp qt)	7.2 (7.6, 6.3)
	When replacing engine oil and oil filter		ℓ (US qt, Imp qt)	5.7 (6.0, 5.0)
	When replacing engine oil only		ℓ (US qt, Imp qt)	5.5 (5.8, 4.8)

Recommended oil

For the API standard SL and SJ, use the logo mark with "Energy Conserving" (If the SL, SJ grade is not available, use SH grade).
ACEA standard A1, A2 or A3
ILSAC standard GF-3 "Star burst mark" label on the container

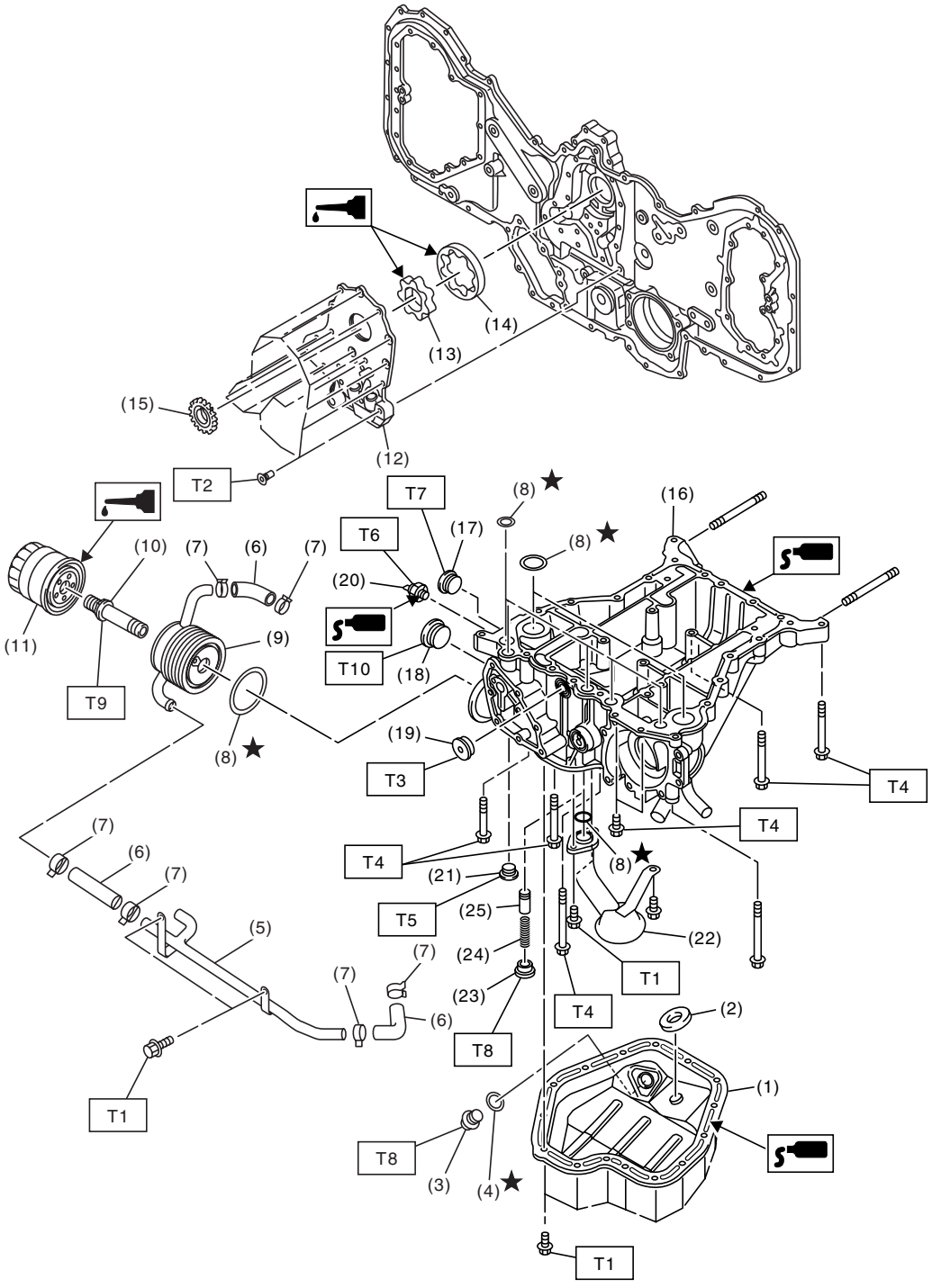


(1) SAE viscosity No. and applicable temperature
(2) Recommended

CAUTION:
When replenishing oil, it does not matter if the oil to be added is a different brand from that in the engine; however, use oil having the API standard and SAE viscosity No. designated by SUBARU.

NOTE:
If the vehicle is used in areas with very high temperatures or for other heavy duty applications, the following viscosity oils must be used: API standard: SL or SJ
SAE viscosity No.: 30, 40, 10W-50, 20W-40, 20W-50

B: COMPONENT



LU-02150

(1) Oil pan lower
(2) Magnet
(3) Drain plug
(4) Gasket
(5) Oil cooler pipe
(6) Hose
(7) Clamp
(8) O-ring
(9) Oil cooler
(10) Oil cooler connector
(11) Oil filter
(12) Oil pump cover
(13) Inner rotor
(14) Outer rotor
(15) Crank sprocket
(16) Oil pan upper
(17) Plug
(18) Plug
(19) Plug
(20) Oil pressure switch
(21) Plug
(22) Oil strainer
(23) Plug
(24) Relief valve spring
(25) Relief valve

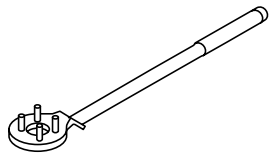
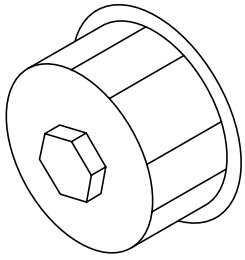
Tightening torque: N·m (kgf-m, ft-lb)	
T1:	*6.4 (0.65, 4.7)*
T2:	*<Ref. to LU(H6DO)-8, INSTALLATION, Oil Pump.>*
T3:	*16 (1.6, 12)*
T4:	*18 (1.8, 13)*
T5:	*23 (2.3, 17)*
T6:	*25 (2.5, 18.4)*
T7:	*37 (3.8, 27)*
T8:	*44 (4.5, 32.5)*
T9:	*54 (5.5, 40)*
T10:	*90 (9.2, 66)*

C: CAUTION

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

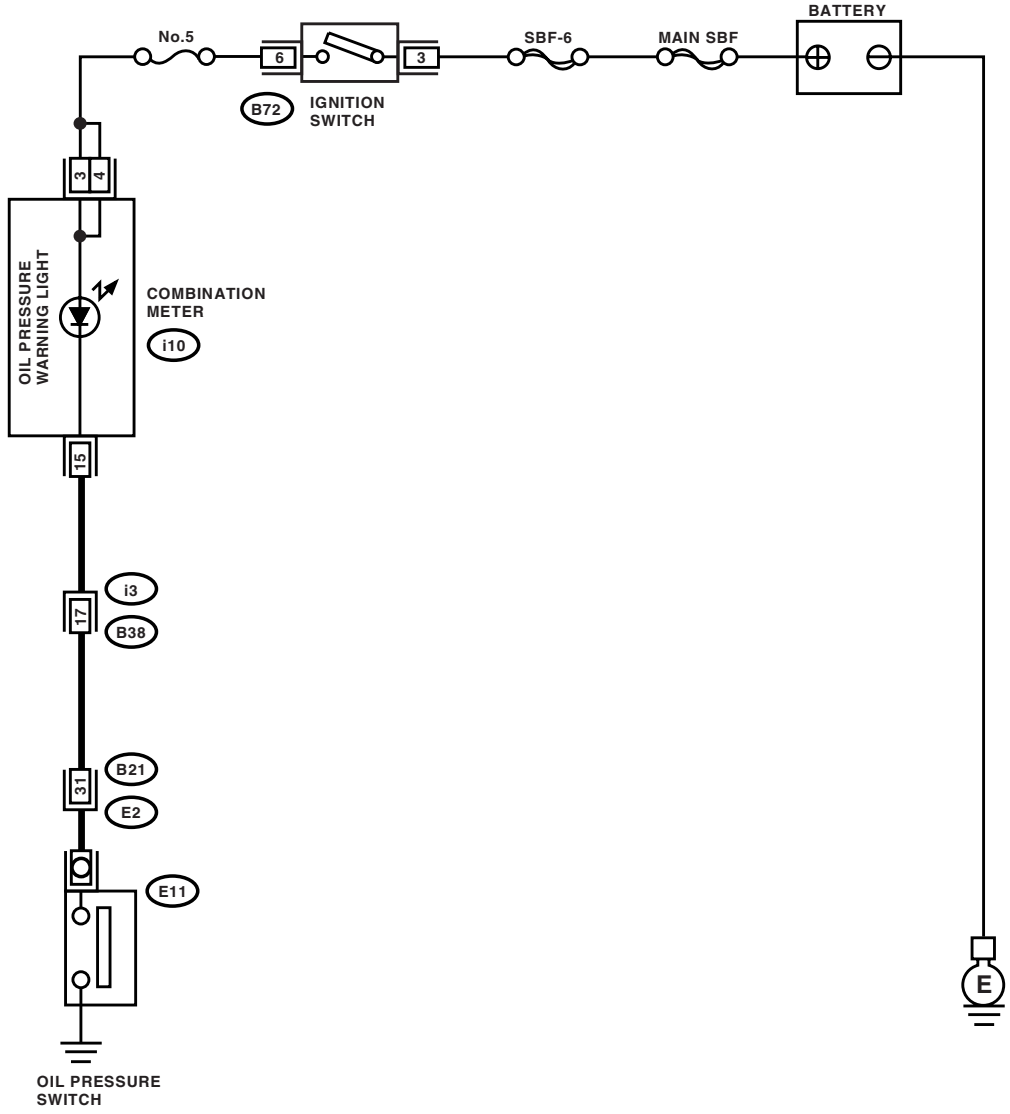
D: PREPARATION TOOL

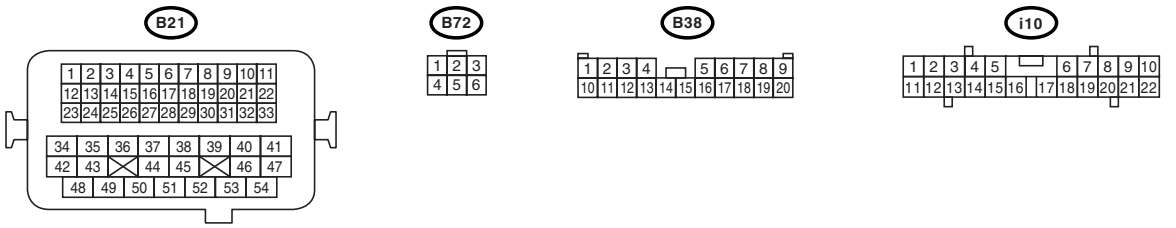
1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499977100	499977100	CRANK PULLEY WRENCH	Used for stopping rotation of crank pulley when removing and tightening crank pulley bolt.
 ST-498547000	498547000	OIL FILTER WRENCH	Used for removing and installing oil filter.

2. Oil Pressure System

A: WIRING DIAGRAM





LU-02155

B: INSPECTION

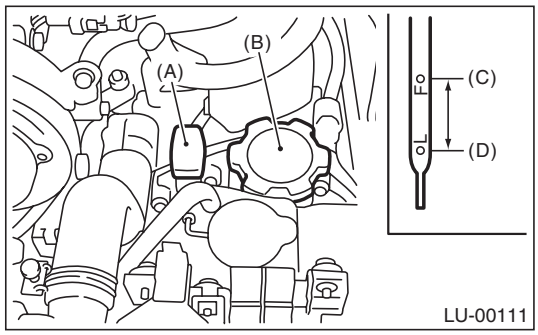
	Step	Check	Yes	No
1	**CHECK COMBINATION METER.** 1) Turn the ignition switch to ON. (Engine OFF) 2) Check the warning light of combination meter.	Does the warning light illuminate?	Go to step **2.**	Repair or replace the combination meter. <Ref. to IDI-3, INSPECTION, Combination Meter System.>
2	**CHECK 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 to ON. 4) Measure the voltage in harness between oil pressure switch 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*** ***(i10) No. 4 — (i10) No. 15:*** ***(i10) No. 3 — (i10) No. 15:***	Is the resistance less than 10 Ω?	Replace the harness connector between combination meter and oil pressure switch.	Repair or replace the combination meter. <Ref. to IDI-3, INSPECTION, Combination Meter System.>

3. Engine Oil

A: INSPECTION

1) Park the vehicle on a level surface.
2) Remove the oil level gauge and wipe it clean.
3) Reinsert the oil level gauge all the way. Be sure that the oil level gauge is correctly inserted and properly orientated.
4) Remove the oil level gauge again and check the engine oil level. If the engine oil level is below the "L" line, add oil to bring the level up to the "F" line.
5) After turning off the engine, wait a few minutes for the oil to return to the oil pan before checking the level.

NOTE:
To prevent overfilling of engine oil, do not add oil above the "F" line when the engine is cold.

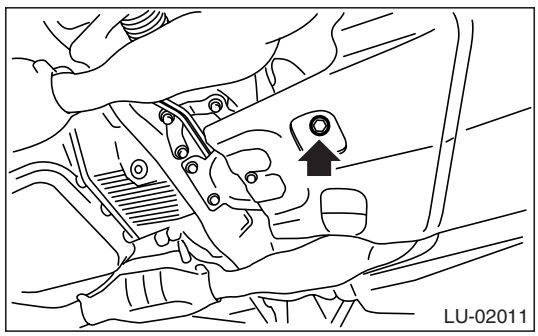


(A) Oil level gauge
(B) Engine oil filler cap
(C) Upper level
(D) Lower level

B: REPLACEMENT

1) Open the engine oil filler cap for quick draining of the engine oil.
2) Lift-up the vehicle.
3) Drain the engine oil by loosening the engine oil drain plug.

NOTE:
Prepare the container for draining of engine oil.



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

NOTE:
Use a new drain plug gasket.

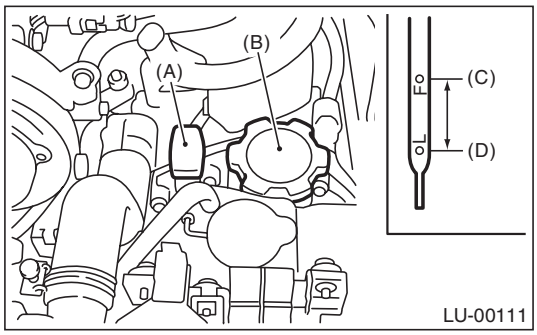
Tightening torque:
44 N·m (4.5 kgf-m, 32.5 ft-lb)

5) Using engine oil of proper quality and viscosity, fill engine oil through the oil filler duct to the upper level on oil level gauge. Make sure that the vehicle is parked on a level surface when checking oil level.

Recommended oil:
Refer to "SPECIFICATION" for the recommended oil. <Ref. to LU(H6DO)-2, SPECIFICATION, General Description.>

Engine oil capacity (when replacing engine oil):
5.5 ℓ (5.8 US qt, 4.8 Imp qt)

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

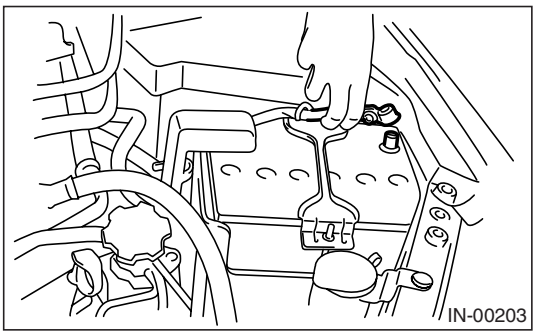


(A) Oil level gauge
(B) Engine oil filler cap
(C) Upper level
(D) Lower level

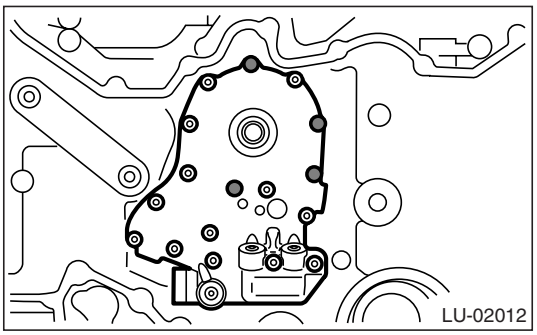
4. Oil Pump

A: REMOVAL

1) Remove the collector cover.
2) Disconnect the ground cable from battery.



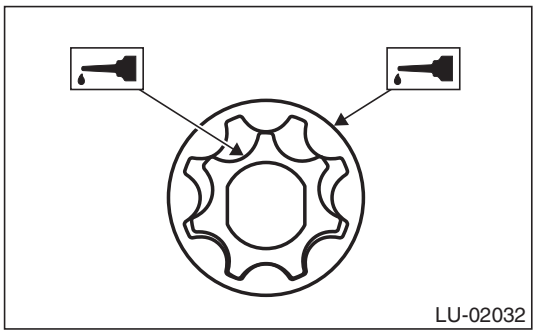
3) Lift-up the vehicle.
4) Remove the under cover.
5) Drain the engine coolant. <Ref. to CO(H6DO)-11, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
6) Lower the vehicle.
7) Remove the radiator. <Ref. to CO(H6DO)-16, REMOVAL, Radiator.>
8) Remove the V-belt. <Ref. to ME(H6DO)-33, REMOVAL, V-belt.>
9) Remove the front chain cover. <Ref. to ME(H6DO)-45, REMOVAL, Front Chain Cover.>
10) Remove the timing chain. <Ref. to ME(H6DO)-47, REMOVAL, Timing Chain Assembly.>
11) Remove the crank sprocket.
12) Remove the oil pump cover.



13) Remove the inner rotor and outer rotor.

B: INSTALLATION

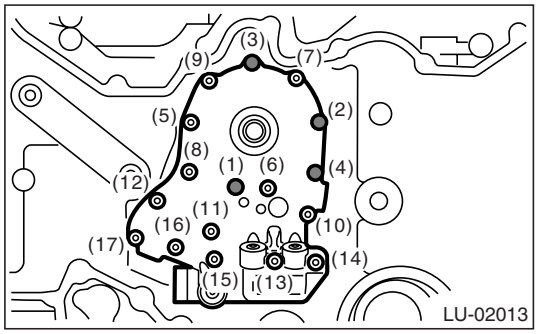
1) Apply a coat of engine oil to the entire area of inner rotor and outer rotor.



2) Fit the inner rotor with its flat surface aligned with crankshaft, install the inner rotor, and then install the outer rotor.
3) Install the oil pump cover.
4) Tighten the bolts in the numerical order as shown in the figure.

CAUTION:
Ensure that the bolts are installed in correct position.

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



Bolt installing position	Bolt dimension
(1) and (3)	6 × 14 × 14
(2) and (4)	6 × 35 × 18
(5), (6), (7), (8), (9), (10) and (11)	6 × 35 × 15
(12), (15), (16) and (17)	6 × 16 × 16
(13) and (14)	6 × 26 × 15

5) Install the crank sprocket.
6) Install the timing chain. <Ref. to ME(H6DO)-48, INSTALLATION, Timing Chain Assembly.>
7) Install the front chain cover. <Ref. to ME(H6DO)-45, INSTALLATION, Front Chain Cover.>
8) Install the V-belt. <Ref. to ME(H6DO)-33, INSTALLATION, V-belt.>
9) Install the radiator. <Ref. to CO(H6DO)-17, INSTALLATION, Radiator.>
10) Install the under cover.

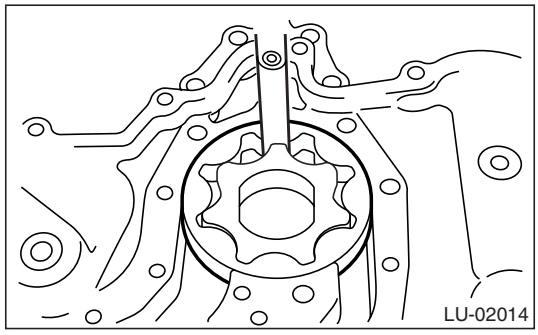
11) Fill engine coolant.
<Ref. to CO(H6DO)-11, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

C: INSPECTION

1. TIP CLEARANCE

Measure the tip clearance of rotors. If the clearance exceeds the specification, replace the rotors as a matched set.

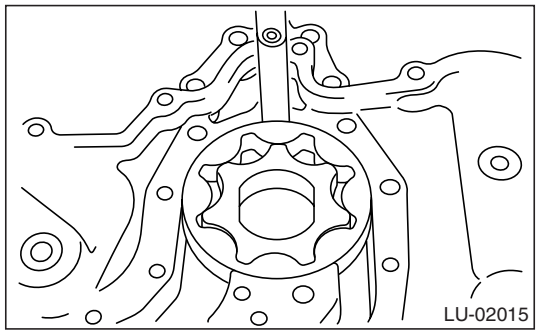
Tip clearance:
Specification
0.04 — 0.14 mm (0.0016 — 0.0055 in)



2. CASE CLEARANCE

Measure the clearance between outer rotor and rear chain cover rotor housing. If the clearance exceeds the specification, replace the outer rotor.

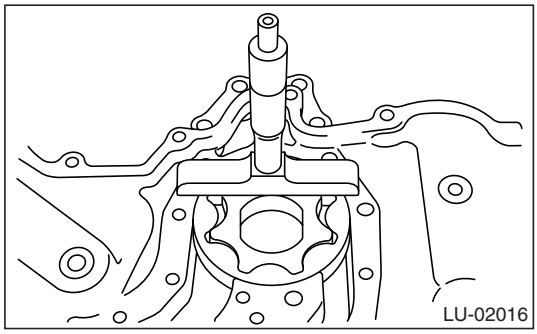
Case clearance:
Specification
0.110 — 0.175 mm (0.0043 — 0.0069 in)



3. SIDE CLEARANCE

Measure the clearance between oil pump inner rotor and rear chain cover. If the clearance exceeds the specification, replace the rotors as a matched set.

Side clearance:
Specification
0.020 — 0.046 mm (0.0008 — 0.0018 in)



4. OIL PUMP CASE

Check the worn shaft hole, clogged oil passage, crank and other parts for fault.

5. Oil Pump Relief Valve

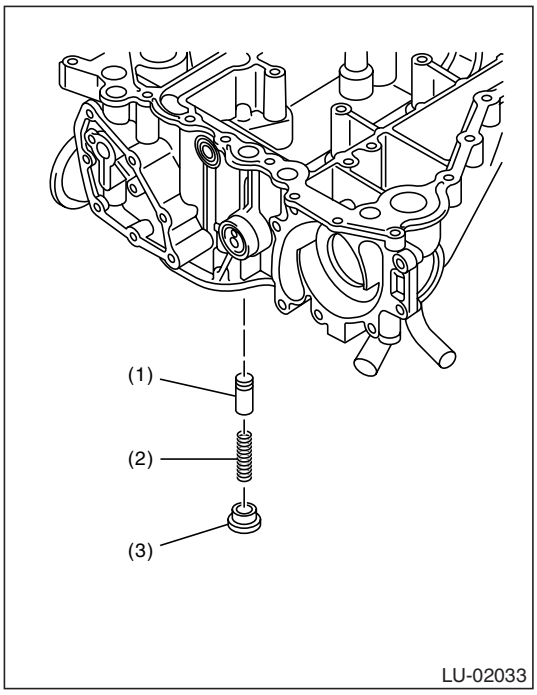
A: REMOVAL

1. REAR CHAIN COVER SIDE

Oil pump relief valve is integrated into oil pump cover as one unit; therefore, refer to “Oil Pump” for removal procedure. <Ref. to LU(H6DO)-8, REMOVAL, Oil Pump.>

2. OIL PAN UPPER SIDE

1) Remove the oil pan. <Ref. to LU(H6DO)-11, REMOVAL, Oil Pan and Strainer.>
2) Remove the plug, relief valve spring and relief valve.



(1) Relief valve
(2) Relief valve spring
(3) Plug

B: INSTALLATION

1. REAR CHAIN COVER SIDE

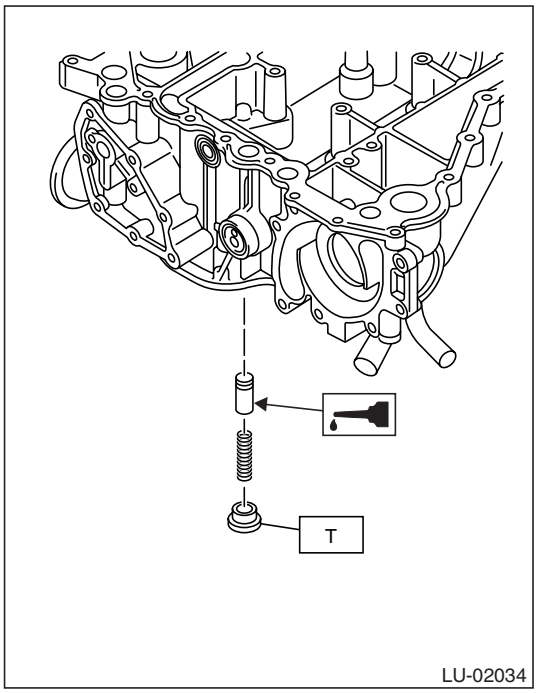
Oil pump relief valve is integrated into oil pump cover as one unit; therefore, refer to “Oil Pump” for installation procedure. <Ref. to LU(H6DO)-8, INSTALLATION, Oil Pump.>

2. OIL PAN UPPER SIDE

1) Install the relief valve, relief valve spring and plug.

NOTE:
Apply a coat of engine oil to the relief valve.

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



2) Install the oil pan. <Ref. to LU(H6DO)-11, INSTALLATION, Oil Pan and Strainer.>

C: INSPECTION

Check the worn shaft hole of oil pump relief valve case, clogged oil passage, crankcase and other parts for fault.

6. Oil Pan and Strainer

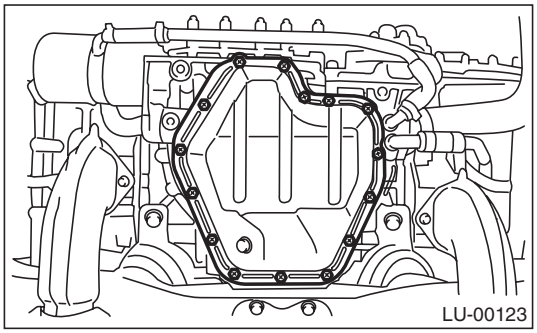
A: REMOVAL

NOTE:
Before removing the oil pan upper, remove the engine from vehicle. <Ref. to ME(H6DO)-34, REMOVAL, Engine Assembly.> <Ref. to ME(H6DO)-65, REMOVAL, Cylinder Block.>

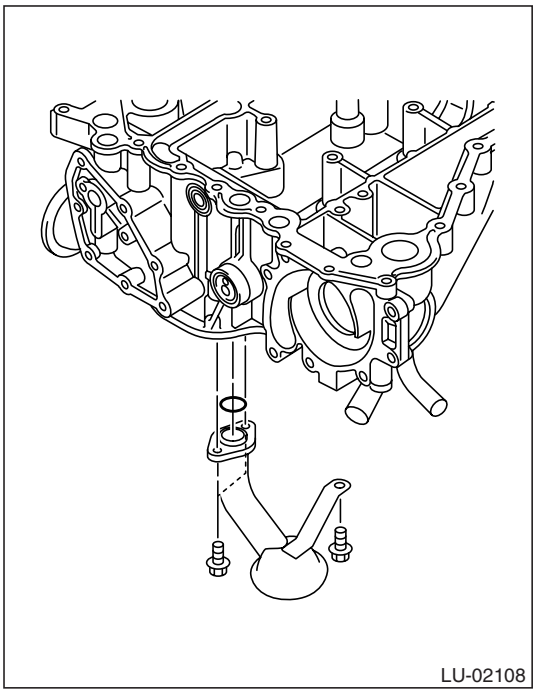
1) Set the vehicle on a lift.
2) Lift-up the vehicle.
3) Remove the under cover.
4) Drain the engine oil. <Ref. to LU(H6DO)-7, REPLACEMENT, Engine Oil.>
5) Insert the oil pan cutter blade between oil pan upper and oil pan lower.

CAUTION:
Do not use a screwdriver or similar tool in place of oil pan cutter.

6) Remove the oil pan lower.


LU-00123

7) Remove the oil strainer.


LU-02108

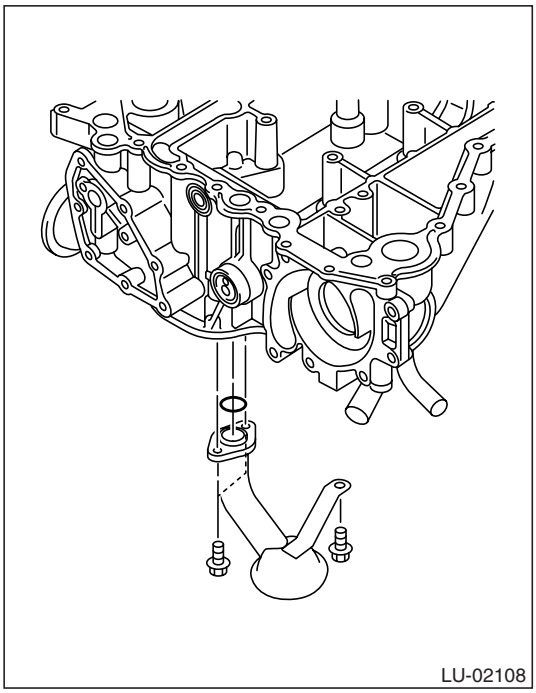
B: INSTALLATION

CAUTION:
Before installing the oil pan, wipe clean the mating surface of oil pan lower and oil pan upper.

1) Install the oil strainer onto oil pan upper.

NOTE:
Replace the O-ring with a new one.

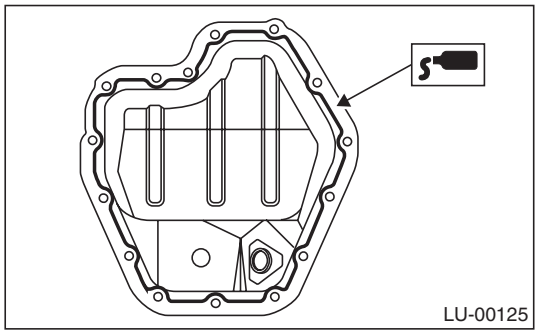
Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)


LU-02108

2) Apply liquid gasket to the mating surfaces, and install the oil pan.

Liquid gasket:
THREE BOND 1280B (Part No. K0877YA018)

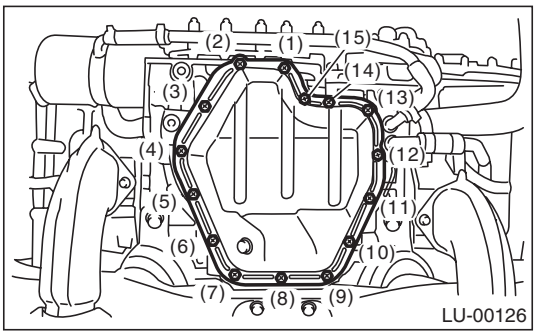
Liquid gasket applying diameter:
5.0±1.0 mm (0.197±0.039 in)



LU-00125

3) Tighten the oil pan lower installing bolts in the numerical order as shown in the figure.

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



4) Install the under cover.
5) Fill engine oil. <Ref. to LU(H6DO)-7, INSPECTION, Engine Oil.>

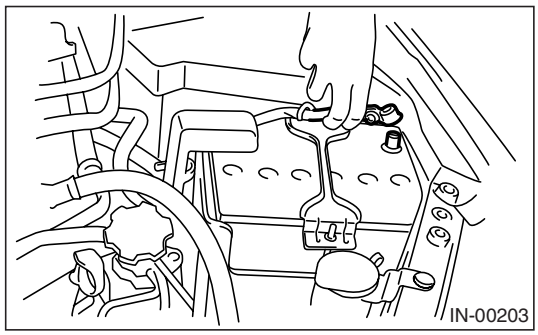
C: INSPECTION

Visually check the oil pan, oil strainer and oil strainer stay for damage.

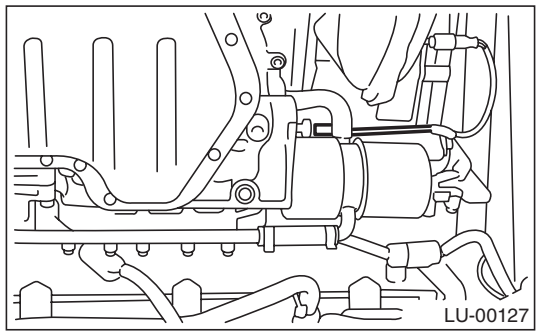
7. Oil Pressure Switch

A: REMOVAL

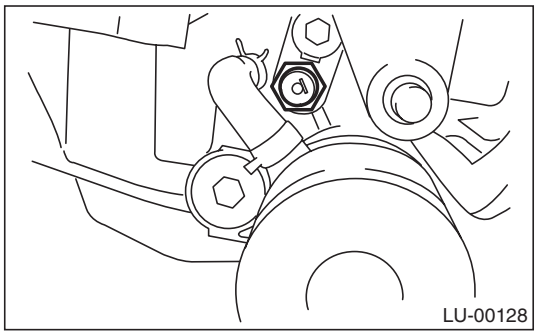
1) Set the vehicle on a lift.
2) Disconnect the ground cable from battery.



3) Lift-up the vehicle.
4) Remove the under cover.
5) Disconnect the terminal from oil pressure switch.



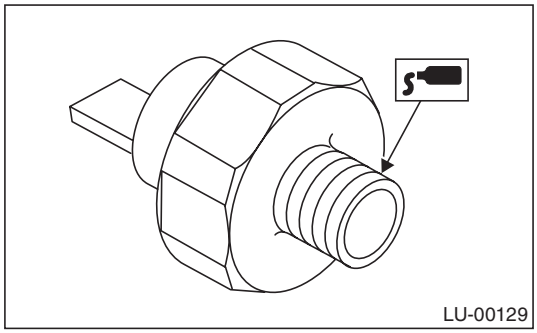
6) Remove the oil pressure switch.



B: INSTALLATION

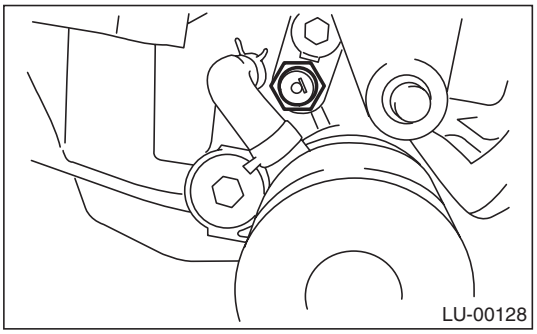
1) Apply liquid gasket to the oil pressure switch threads.

Liquid gasket:
THREE BOND 1324 (Part No. 004403042) or equivalent

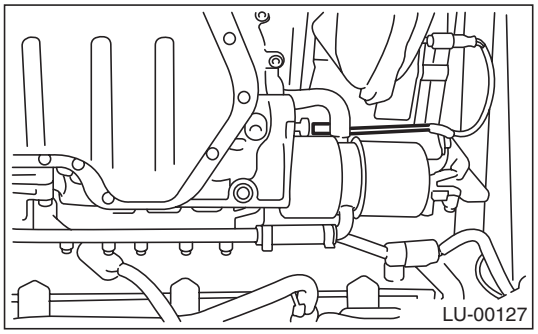


2) Install the oil pressure switch.

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



3) Connect the terminal of oil pressure switch.



4) Install the under cover.

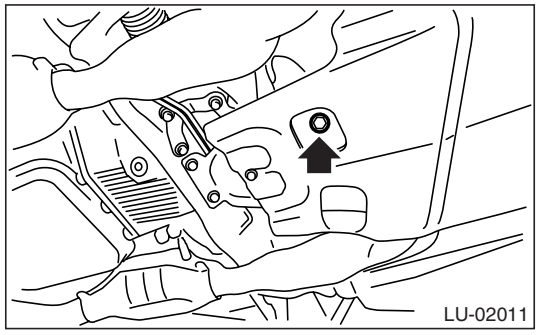
C: INSPECTION

Check that no oil is leaking or seeping from where the oil pressure switch is installed.

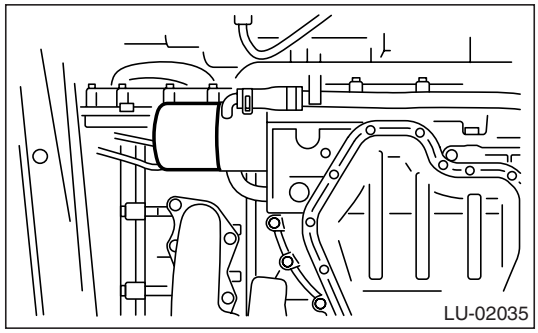
8. Engine Oil Filter

A: REMOVAL

1) Lift-up the vehicle.
2) Drain the engine oil by removing engine oil drain plug.



3) Remove the under cover.
4) Remove the oil filter using ST.
ST 4985447000 OIL FILTER WRENCH



B: INSTALLATION

1) Clean the oil filter installing surface of oil cooler.
2) Obtain a new oil filter and apply a thin coat of engine oil to the seal rubber.
3) Install the oil filter turning it by hand, being careful not to damage the seal rubber.
4) Tighten further (approx. 3/4 turn) after the seal rubber contacts oil cooler. Do not tighten excessively, or oil may leak.
5) Install the under cover.
6) Lower the vehicle.
7) Fill engine oil. <Ref. to LU(H6DO)-7, INSPECTION, Engine Oil.>

C: INSPECTION

1) After installing the oil filter, run engine and make sure that no oil is leaking around the seal rubber.

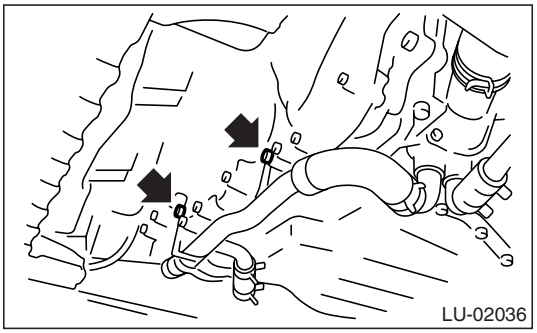
NOTE:
The filter element and filter case are permanently jointed; therefore, interior cleaning is not necessary.

2) Check the engine oil level. <Ref. to LU(H6DO)-7, INSPECTION, Engine Oil.>

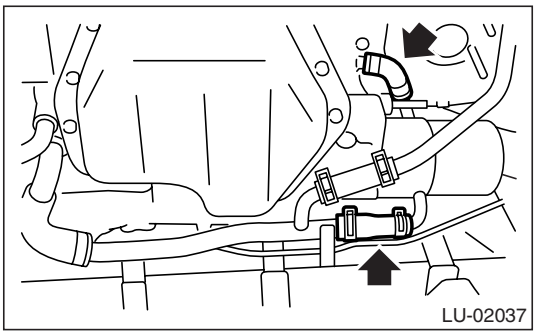
9. Engine Oil Cooler

A: REMOVAL

1) Lift-up the vehicle.
2) Remove the under cover.
3) Drain the engine coolant.
<Ref. to CO(H6DO)-11, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
4) Drain the engine oil. <Ref. to LU(H6DO)-7, REPLACEMENT, Engine Oil.>
5) Remove the bolts which hold water pipe to engine.

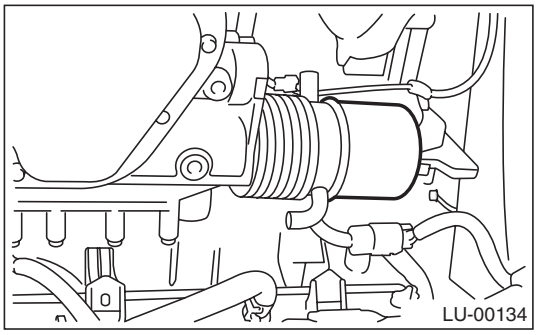

LU-02036

6) Disconnect the water hose from oil cooler.

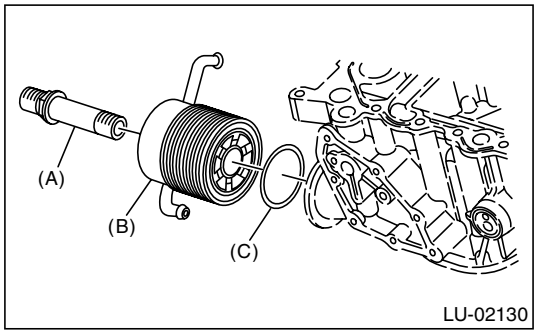

LU-02037

7) Remove the oil filter using ST. <Ref. to LU(H6DO)-14, REMOVAL, Engine Oil Filter.>
ST 498547000 OIL FILTER WRENCH

NOTE:
Set a container under the vehicle.


LU-00134

8) Remove the oil cooler connector and remove oil cooler.



LU-02130

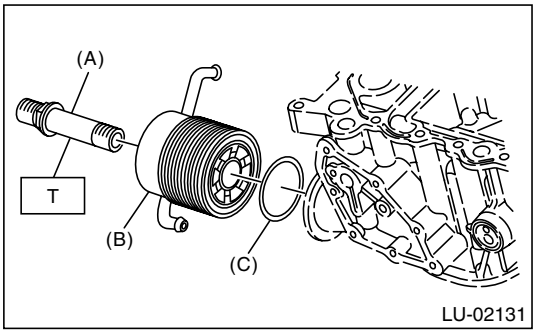
(A) Oil cooler connector
(B) Oil cooler
(C) O-ring

B: INSTALLATION

1) Install the oil cooler to oil pan upper with oil cooler connector.

Tightening torque:
T: 54 N·m (5.5 kgf-m, 40 ft-lb)

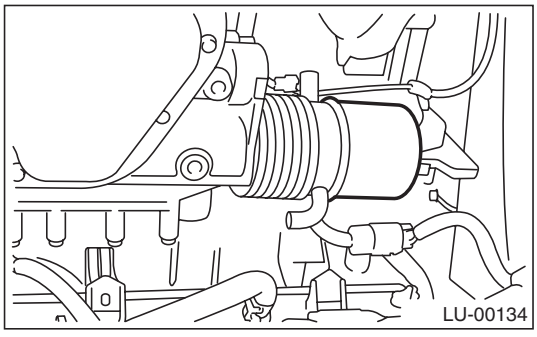
NOTE:
Use a new O-ring.



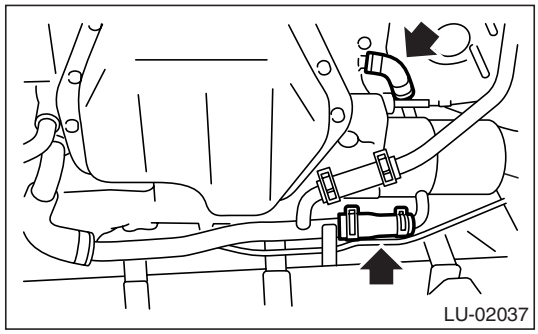
LU-02131

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

2) Install the oil filter. <Ref. to LU(H6DO)-14, INSTALLATION, Engine Oil Filter.>

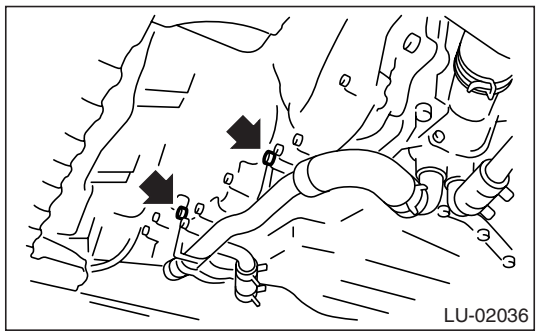

LU-00134

3) Connect the water hose.



4) Install the water pipe onto engine.

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



5) Fill engine oil. <Ref. to LU(H6DO)-7, REPLACEMENT, Engine Oil.>
6) Fill engine coolant. <Ref. to CO(H6DO)-11, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
7) Check the engine oil level. <Ref. to LU(H6DO)-7, INSPECTION, Engine Oil.>

C: INSPECTION

1) Check that the coolant passages are not clogged using compressed air.
2) Check the O-ring installing surfaces of oil pan upper and oil filter for damage.

10.Engine Lubrication System Trouble in General

A: INSPECTION

Before performing diagnosis, make sure that the engine oil level is correct and no oil leakage exists.

Symptom	Possible cause		Corrective action
1. Warning light remains on.	1) Oil pressure switch failure	Cracked diaphragm or oil leakage within switch	Replace.
		Broken spring or seized contacts	Replace.
	2) Low oil pressure	Clogging of oil filter	Replace.
		Malfunction of oil by-pass valve in oil filter	Clean or replace.
		Malfunction of oil relief valve in oil pump	Clean or replace.
		Clogged oil passage	Clean.
		Excessive tip clearance and side clearance between oil pump rotor and gear	Replace.
		Clogged oil strainer or broken pipe	Clean or replace.
	3) No oil pressure	Insufficient engine oil amount	Replenish.
		Broken pipe of oil strainer	Replace.
		Stuck oil pump rotor	Replace.
2. Warning light does not come on.	1) Malfunction of combination meter		Replace.
	2) Poor contact in switch contact points		Replace.
	3) Disconnection of wiring		Repair.
3. Warning light flickers momentarily.	1) Poor contact at terminals		Repair.
	2) Defective wiring harness		Repair.
	3) Low oil pressure		Check for the same possible causes as listed in 1) — 2).

SPEED CONTROL SYSTEMS

SP(H6DO)

Page

1. General Description 2

1. General Description

A: SPECIFICATION

Specifications for 3.0 L DOHC non-turbo model are the same as 2.0 L SOHC model. <Ref. to SP(H4SO 2.0)-2, General Description.>

IGNITION

IG(H6DO)

Page

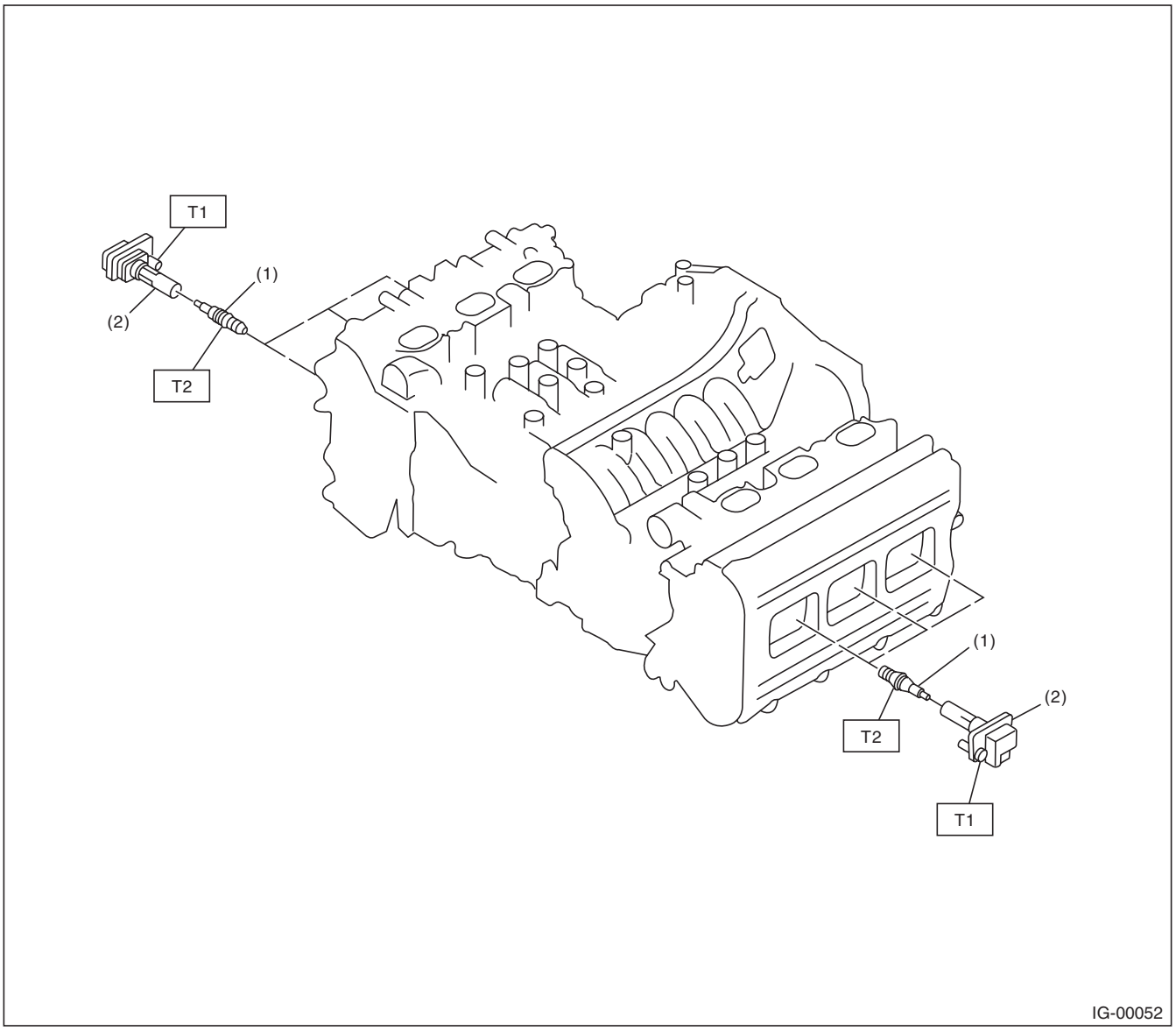
1. General Description 2
2. Spark Plug.....4
3. Ignition Coil 7

1. General Description

A: SPECIFICATION

Item		Specifications
Ignition coil	Model	FK0140 · FK0333
	Ignition system	Independent ignition coil
	Manufacturer	Diamond Electric
Spark plug	Manufacturer and type	NGK: ILFR6B
	Thread size (diameter, pitch, length) mm	14, 1.25, 26.5
	Spark plug gap mm (in)	0.7 — 0.8 (0.028 — 0.031)
	Electrode	Iridium

B: COMPONENT



(1) Spark plug
(2) Ignition coil

Tightening torque: N·m (kgf-m, ft-lb)
T1: 16 (1.6, 11.7)
T2: 21 (2.1, 15.2)

C: CAUTION

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

2. Spark Plug

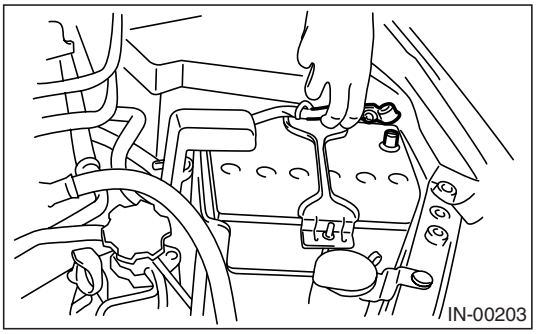
A: REMOVAL

CAUTION:
All spark plugs installed on an engine must be of the same heat range.

Spark plug:
NGK: ILFR6B

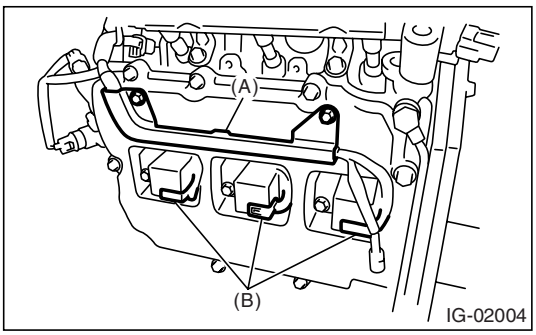
1. RH SIDE

1) Remove the collector cover.
2) Disconnect the ground cable from battery.



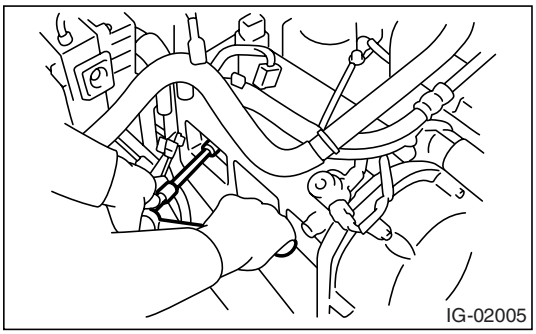
3) Remove the air cleaner case.
<Ref. to IN(H6DO)-5, REMOVAL, Air Cleaner Case.>
4) Remove the bracket.
5) Disconnect the connector from ignition coil.
6) Remove the ignition coil.

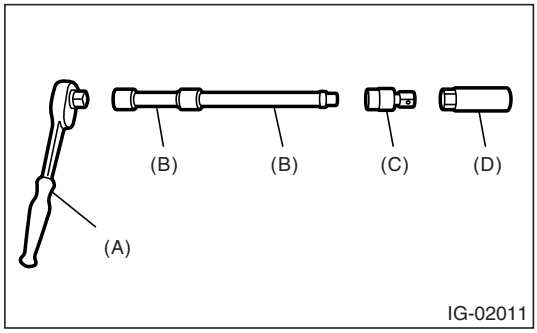
NOTE:
Turn the #5 ignition coil to remove it.



(A) Bracket
(B) Connector

7) Remove the spark plug with a spark plug socket.



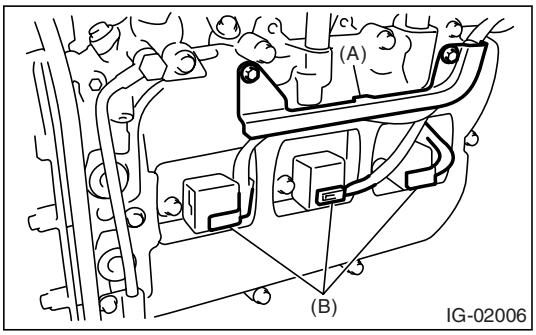


(A) Ratchet handle
(B) Extension bar
(C) Universal joint
(D) Spark plug socket

2. LH SIDE

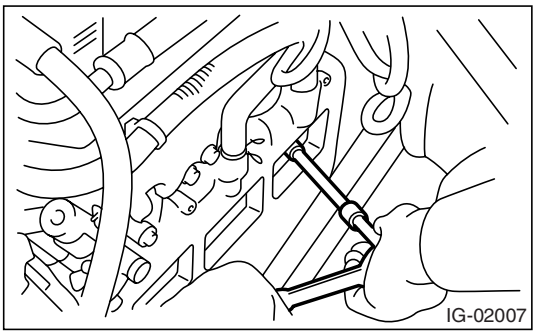
1) Remove the collector cover.
2) Remove the battery and battery carrier.
3) Remove the bracket.
4) Disconnect the connector from ignition coil.
5) Remove the ignition coil.

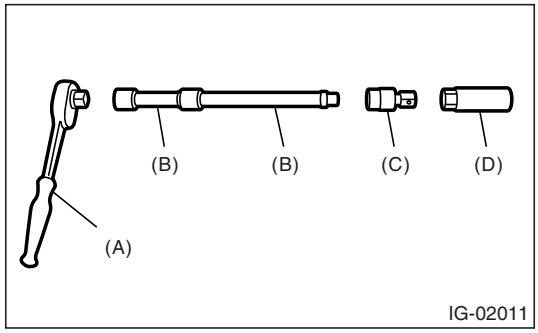
NOTE:
Turn the #6 ignition coil to remove it.



(A) Bracket
(B) Connector

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





(A) Ratchet handle
(B) Extension bar
(C) Universal joint
(D) Spark plug socket

B: INSTALLATION

1. RH SIDE

Install in the reverse order of removal.

Tightening torque (Spark plug):
21 N·m (2.1 kgf-m, 15.2 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

Install in the reverse order of removal.

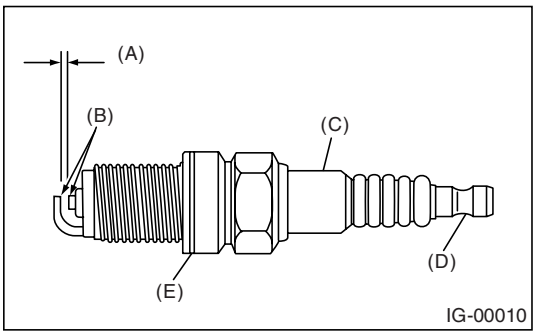
Tightening torque (Spark plug):
21 N·m (2.1 kgf-m, 15.2 ft-lb)

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

NOTE:
The above torque should be only applied to new spark plugs without oil on their threads.
In case their threads are lubricated, the torque should be reduced by approx. 1/3 of the specified torque in order to avoid over-stressing.

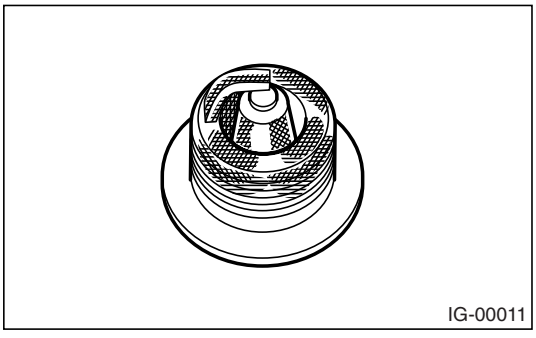
C: INSPECTION

Check the electrodes and inner and outer ceramic insulator of plugs, noting the type of deposits and the degree of electrode erosion.

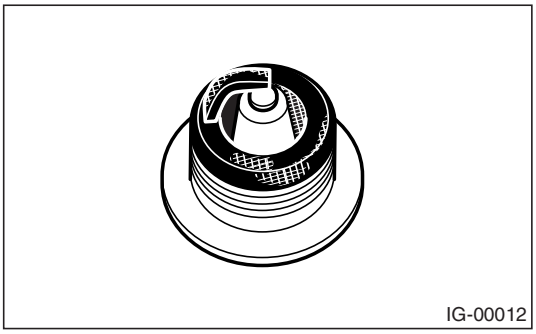


(A) Spark plug gap
(B) Carbon accumulation or wear
(C) Crack
(D) Damage
(E) Damaged gasket

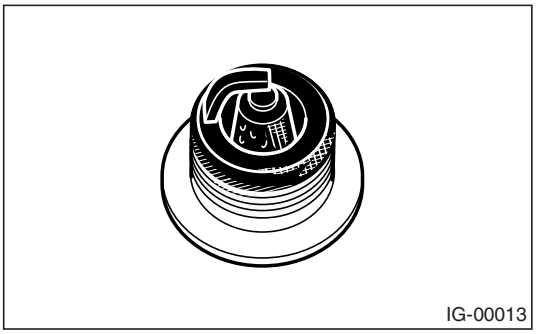
1) Normal:
Brown to grayish-tan deposits and slight electrode wear indicate correct spark plug heat range.



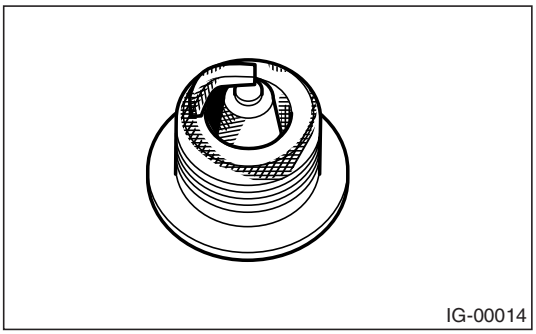
2) Carbon fouled:
Dry fluffy carbon deposits on insulator and electrode are mostly caused by slow speed driving in the city, weak ignition, too rich fuel mixture, dirty air cleaner, etc.


IG-00012

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.


IG-00013

4) Overheating:
White or light gray insulator with black or brown spots and bluish burnt electrodes indicate engine overheating. Moreover, those appearance also results from incorrect ignition timing, loose spark plugs, wrong selection of fuel, etc.

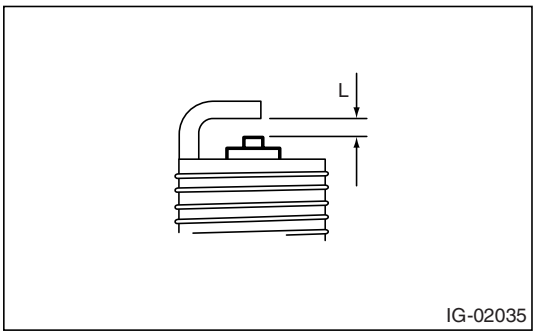

IG-00014

D: ADJUSTMENT

Clean the spark plugs using a wire brush.
Clean and remove the carbon or oxide deposits. But do not wear away ceramic insulator at this time. If deposits are too stubborn, replace the spark plugs.
After cleaning the spark plugs, correct the spark plug gap using a gap gauge.

NOTE:
Do not use a plug cleaner because the spark plugs are applied with iridium tip.

Spark plug gap L:
0.7 — 0.8 mm (0.028 — 0.031 in)



IG-02035

3. Ignition Coil

A: REMOVAL

Direct ignition type has been adopted. Refer to “Spark Plug” for removal procedure. <Ref. to IG(H6DO)-4, REMOVAL, Spark Plug.>

B: INSTALLATION

Install in the reverse order of removal.

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

C: INSPECTION

For inspection procedure, refer to “Diagnostics for Engine Starting Failure”. <Ref. to EN(H6DO)(diag)-60, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>

STARTING/CHARGING SYSTEMS

SC(H6DO)

Page

1. General Description 2

1. General Description

A: SPECIFICATION

Specifications for 3.0 L DOHC non-turbo model are included in SC(H4SO 2.0) section. <Ref. to SC(H4SO 2.0)-2, General Description.>

ENGINE (DIAGNOSTICS)

EN(H6DO)(diag)

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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 the trouble occurred using the interview check list. <Ref. to EN(H6DO)(diag)-3, CHECK, Check List for Interview.> 2) Start the engine.	Does the engine start?	Go to step **2.**	Inspection using "Diagnostics for Engine Starting Failure" <Ref. to EN(H6DO)(diag)-53, 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 Diagnostic Table". <Ref. to EN(H6DO)(diag)-269, INSPECTION, General Diagnostic Table.>
3	**CHECK INDICATION OF DTC ON DISPLAY.** 1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor or general scan tool to data link connector. 3) Turn the ignition switch to ON. 4) Read DTC using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "Read Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)(diag)-33, Read Diagnostic Trouble Code (DTC).> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is DTC displayed on the Subaru Select Monitor or general scan tool?	Record the DTC. Repair the trouble cause. <Ref. to EN(H6DO)(diag)-66, List of Diagnostic Trouble Code (DTC).> Go to step **4.**	Repair the related parts. NOTE: If DTC is not shown on display although the malfunction indicator light illuminates, perform the diagnostics of malfunction indicator light circuit or combination meter. <Ref. to EN(H6DO)(diag)-44, Malfunction Indicator Light.>
4	**PERFORM DIAGNOSIS.** 1) Perform the clear memory mode. <Ref. to EN(H6DO)(diag)-41, Clear Memory Mode.> 2) Perform the inspection mode. <Ref. to EN(H6DO)(diag)-34, Inspection Mode.>	Is DTC displayed on the Subaru Select Monitor or general scan tool?	Check on "Diagnostic Procedure with Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)(diag)-72, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

2. Check List for Interview

A: CHECK

1. CHECK LIST No. 1

Check the following items when problem has occurred.

NOTE:
Use copies of this page for interviewing customers.

Customer's name		Engine No.	
Date of sale		Fuel brand	
Date of repair		Odometer reading	km
V.I.N.			miles
Weather	❑ Fine ❑ Cloudy ❑ Rainy ❑ Snowy ❑ Various/Others:		
Ambient air 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	Audio	❑ ON / ❑ OFF
A/C compressor	❑ ON / ❑ OFF	Car phone	❑ ON / ❑ OFF
Radiator fan	❑ ON / ❑ OFF		
Front wiper	❑ ON / ❑ OFF		
Rear wiper	❑ ON / ❑ OFF		

Check List for Interview

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 diagnostic indicator light ❑ ABS warning light ❑ Oil pressure warning light
b) Fuel level
• Lack of gasoline: ❑ Yes /❑ No • Indicator position of fuel gauge: • Experience of running out of fuel: ❑ Yes /❑ No
c) Intentional connecting or disconnecting of harness connectors or spark plug cords: ❑ Yes /❑ No
• What:
d) Intentional connecting or disconnecting of hoses: ❑ Yes / ❑ No
• What:
e) Installing of other parts except 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 ❑ Does not shift. ❑ Excessive shift shock

3. General Description

A: CAUTION

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

CAUTION:
• All airbag system wiring harnesses and connectors are yellow. Do not use the electrical test equipment on these circuits.
• 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 parts will be damaged.

3) Do not disconnect the battery terminals while the engine is running.
A large counter electromotive force will be generated in the generator, and this voltage may damage electronic parts such as ECM.

4) Before disconnecting the connectors of each sensor and ECM, be sure to turn the ignition switch to OFF. Perform the clear memory mode after connecting the connectors.

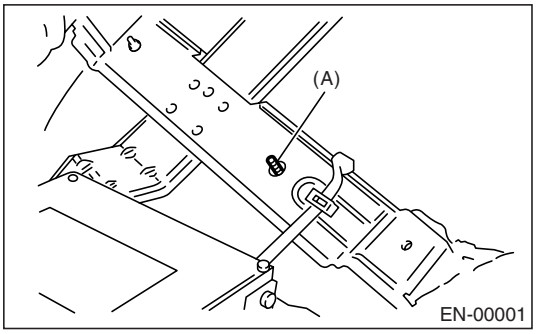
5) Poor contact has been identified as a primary cause of this problem. Measure the voltage or resistance of each sensor or all electrical control modules using a tapered pin with a diameter of less than 0.64 mm (0.025 in). Do not insert the pin more than 5 mm (0.20 in) into the parts.

6) Remove the ECM from the located position after disconnecting two cables on battery.
Otherwise, the ECM may be damaged.

CAUTION:
When replacing the ECM, be careful not to use the ECM with wrong specifications to avoid any damage on the fuel injection system.

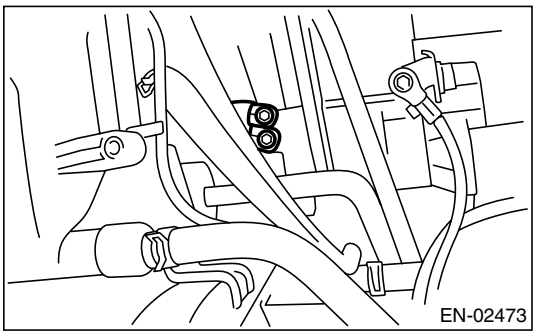
7) Connectors of each sensor in the engine compartment and the harness connectors on the engine side and body side are all designed to be waterproof. However, it is still necessary to take care not to allow water to get into the connectors when washing the vehicle, or when servicing the vehicle on a rainy day.

8) Use ECM mounting stud bolts as the grounding point to chassis when measuring voltage and resistance in the passenger compartment.



(A) Stud bolt

9) Use engine grounding terminal or engine as the grounding point to chassis when measuring voltage and resistance in the engine compartment.



10) Every MFI-related part is a precision part. Do not drop them.

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

CAUTION:
• The antenna must be kept as far apart as possible from the control module.
• The antenna feeder must be placed as far apart as possible from the ECM and MFI harness.
• Carefully adjust the antenna for correct matching.
• When mounting a large power type radio, pay special attention to the three items mentioned above.
• Incorrect installation of the radio may affect the operation of ECM.

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

13) Diagnostics should be conducted by starting with simple, easy operations then proceeding to complicate, difficult operations. The most important thing in diagnostics is to understand the customer's complaint, and distinguish the cause among engine, electrical system and transmission.
14) For the model with ABS, the ABS warning light may illuminates when performing driving test with jacked-up or lifted-up condition, but this is not a system malfunction. This is due to speed difference between the front and rear wheels. After diagnosis of engine control system, perform the ABS memory clear procedure of self-diagnosis function.

B: INSPECTION

Before performing diagnostics, check the following items which might affect engine problems.

1. BATTERY

1) Measure battery voltage and specific gravity of electrolyte.

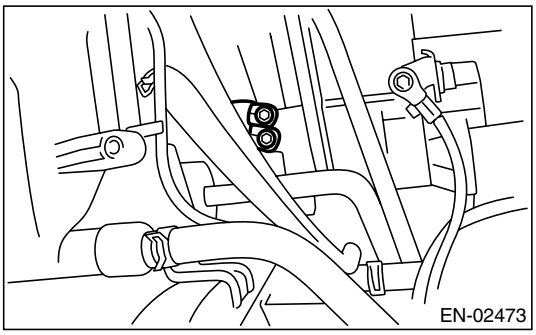
Standard voltage: 12 V

Specific gravity: Above 1.260

2) Check the condition of main and other fuses, and harnesses and connectors. Also check for proper grounding.

2. ENGINE GROUND

Make sure the engine grounding terminal is properly connected to engine.



C: NOTE

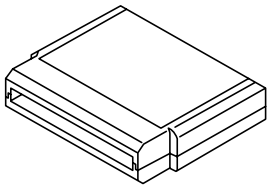
1. GENERAL DESCRIPTION

• On-board diagnostic (OBD) system detects and indicates a fault in various inputs and outputs of the complex electronic control. Malfunction indicator light in the combination meter indicates occurrence of a fault or trouble.
• Further, against such a failure or sensors as may disable the drive, the fail-safe function is provided to ensure the minimal driveability.
• The OBD system incorporated with the vehicles within this engine family complies with E-OBD 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 the malfunction indicator light illumination or blinking, the DTC and a freeze frame engine conditions are stored into on-board computer.
• The OBD system stores freeze frame engine condition data (engine load, engine coolant temperature, fuel trim, engine speed and vehicle speed, etc.) into on-board computer when it detects a malfunction first.
• If the OBD system detects the various malfunctions including the fault of fuel trim or misfire, the OBD system first stores freeze frame engine conditions about the fuel trim or misfire.
• When the malfunction does not occur again for three consecutive driving cycles, malfunction indicator light is turned off, but DTC remains at on-board computer.
• When troubleshooting the vehicles complied with E-OBD regulation, connect Subaru Select Monitor or the general scan tool to the vehicle.

2. ENGINE AND EMISSION CONTROL SYSTEM

• 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 signal 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.
  • Excellent engine start and warm-up performance by the correction of engine coolant temperature and intake air temperature.

D: PREPARATION TOOL

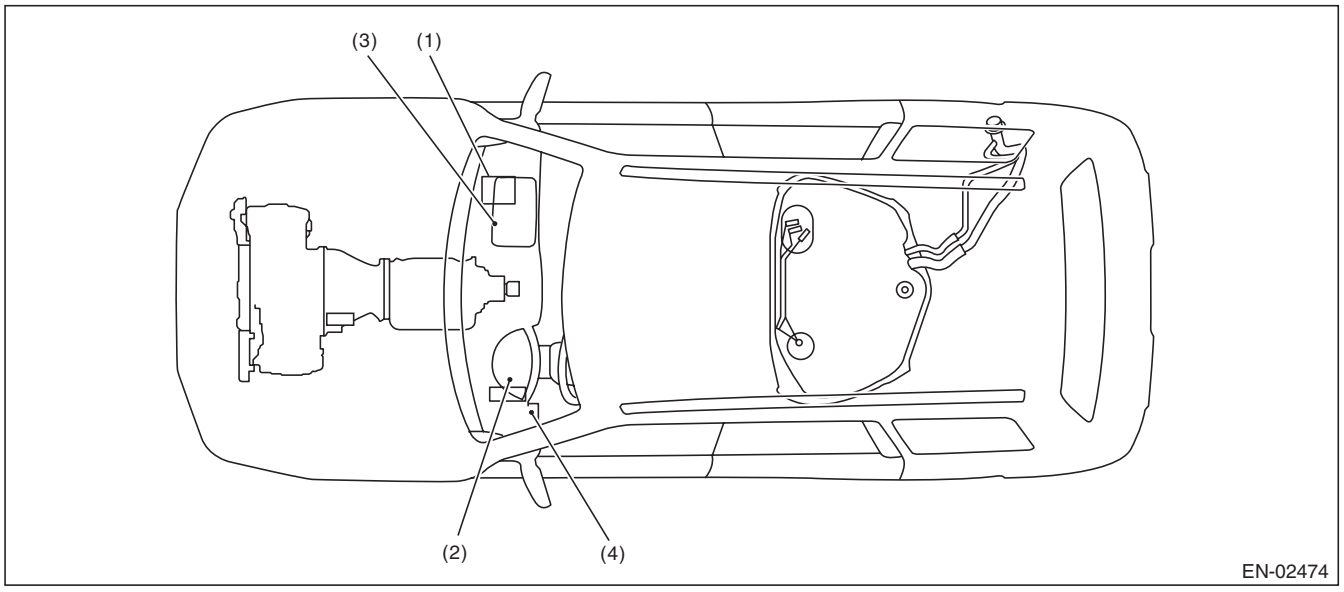
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18482AA000	18482AA000 (Newly adopted tool)	CARTRIDGE	Troubleshooting for electrical system.
ST22771AA030	22771AA030	SUBARU SELECT MONITOR KIT	Troubleshooting for electrical system. • English: 22771AA030 (Without printer) • German: 22771AA070 (Without printer) • French: 22771AA080 (Without printer) • Spanish: 22771AA090 (Without printer)

4. Electrical Component Location

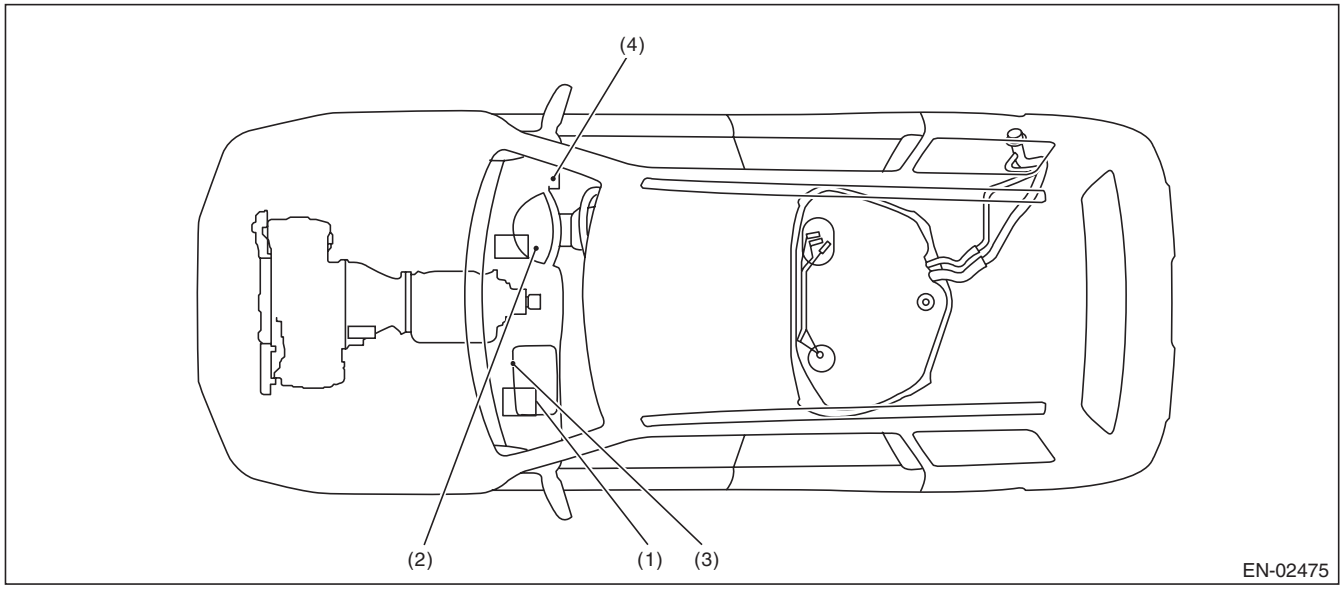
A: LOCATION

1. CONTROL MODULE

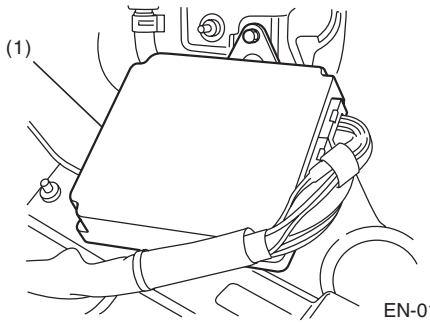
- LHD model



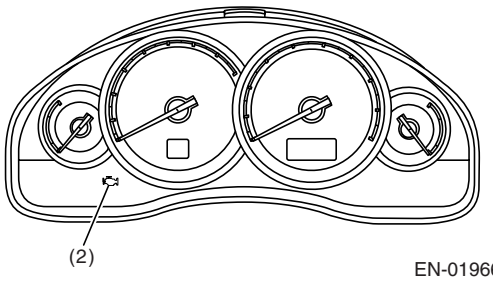
- RHD model



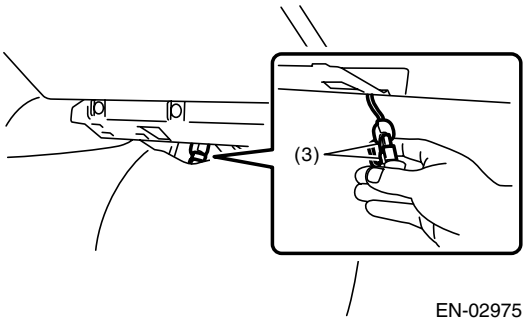
(1) Engine control module (ECM)
(2) Malfunction indicator light
(3) Test mode connector
(4) Data link connector



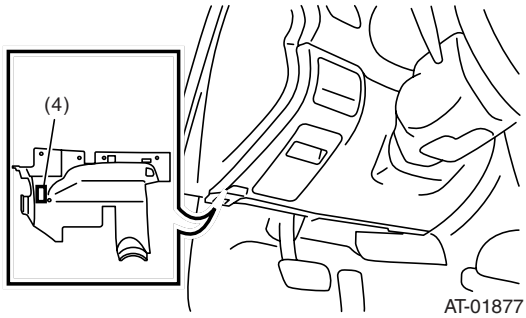
EN-01147



EN-01966

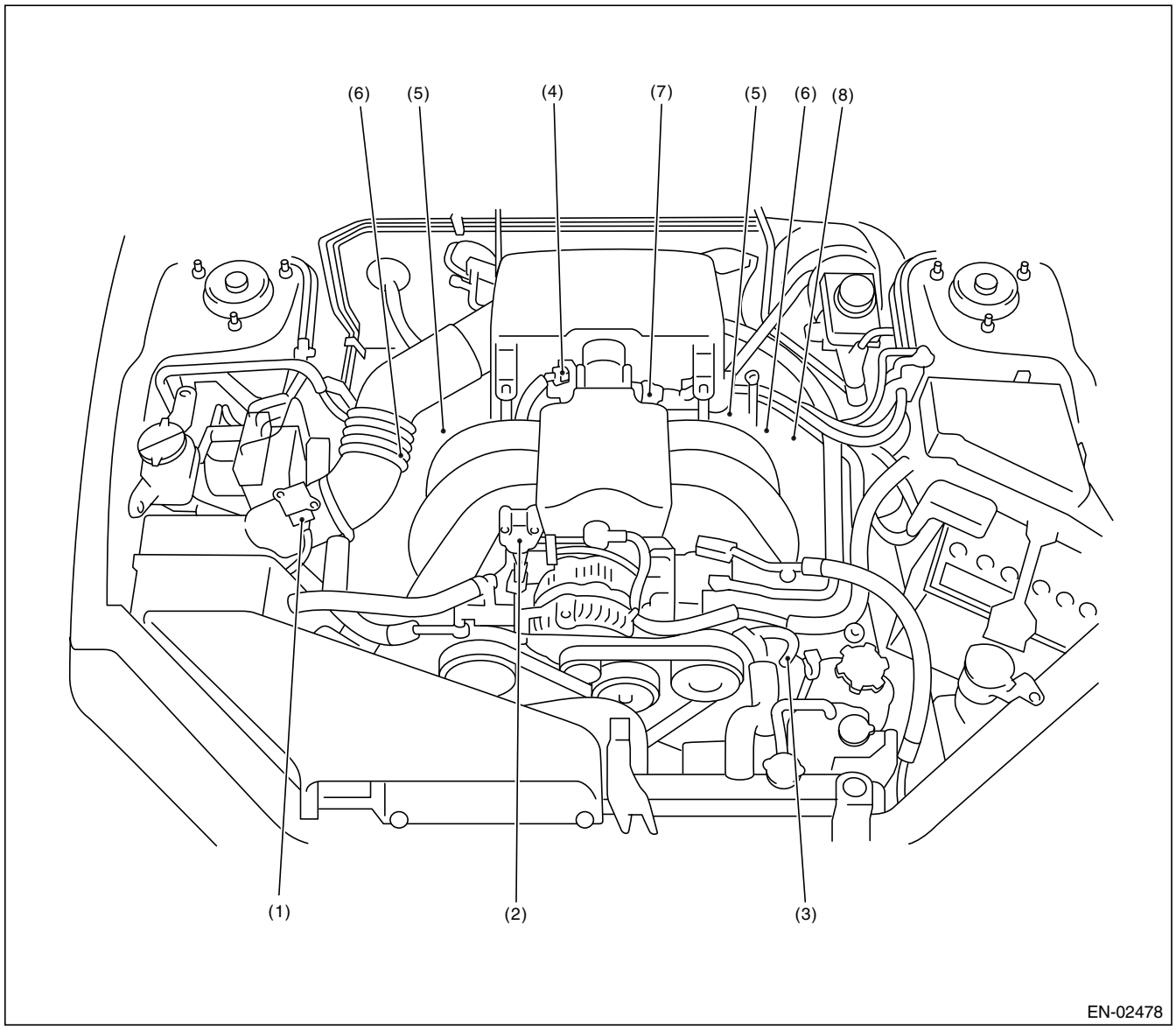


EN-02975

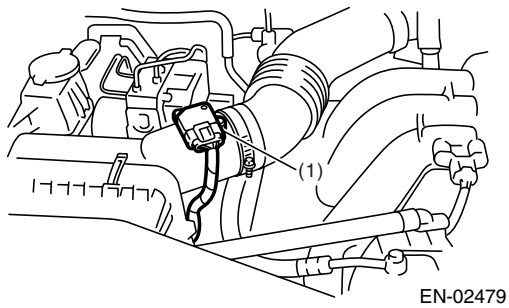


AT-01877

2. SENSOR



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



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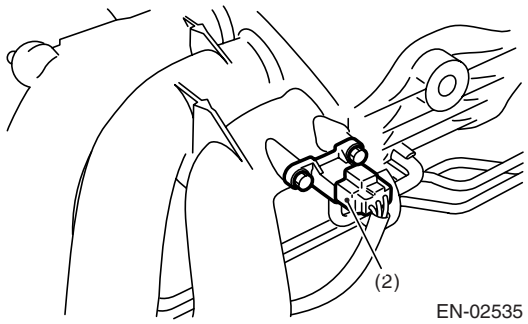
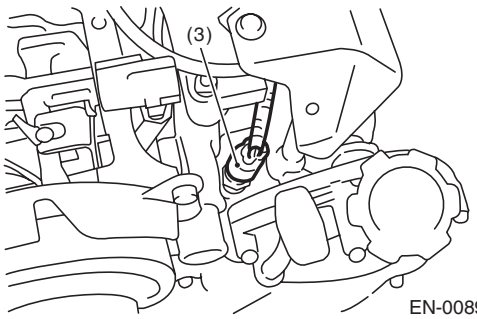


EN-02535



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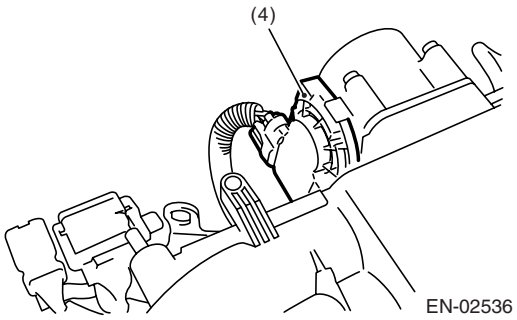

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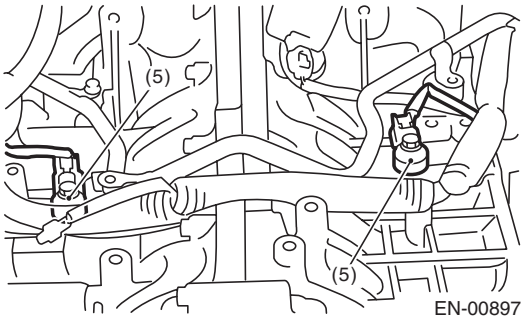

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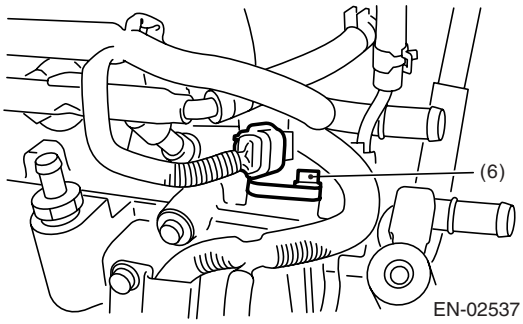
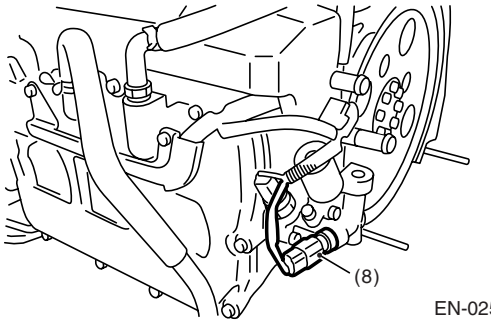


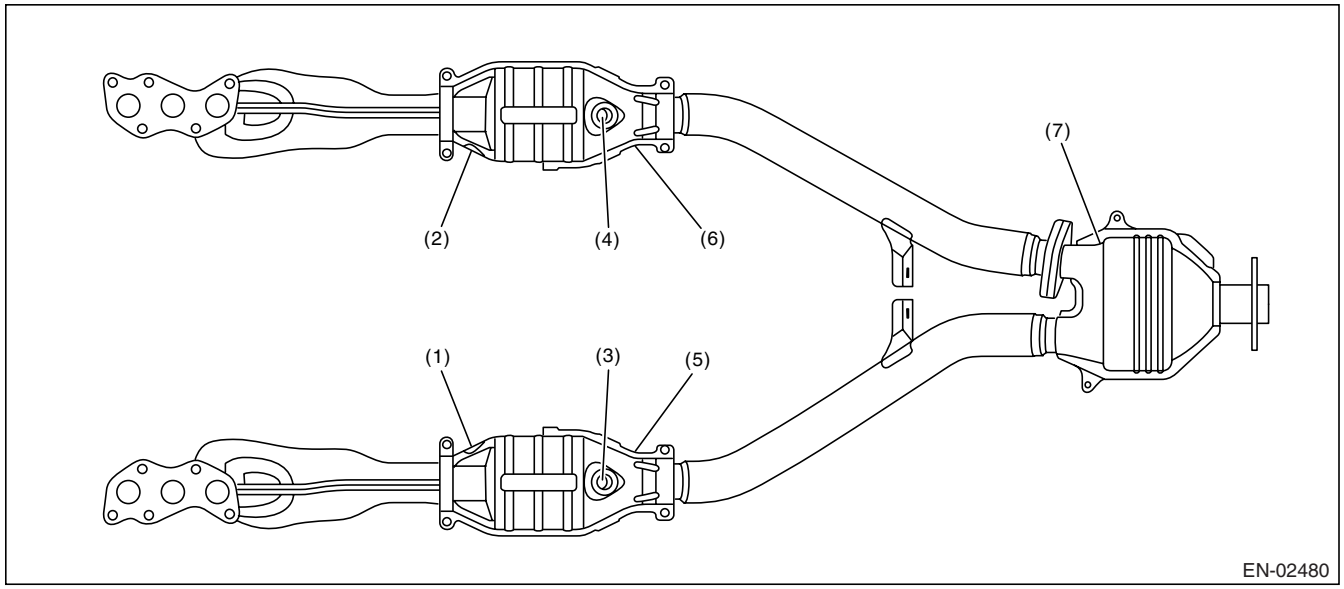
EN-02537

EN-00899

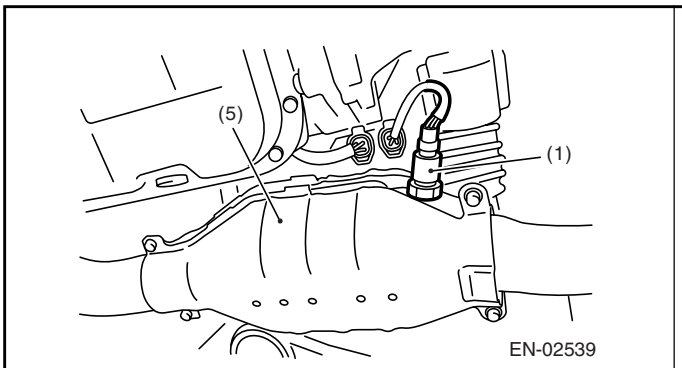


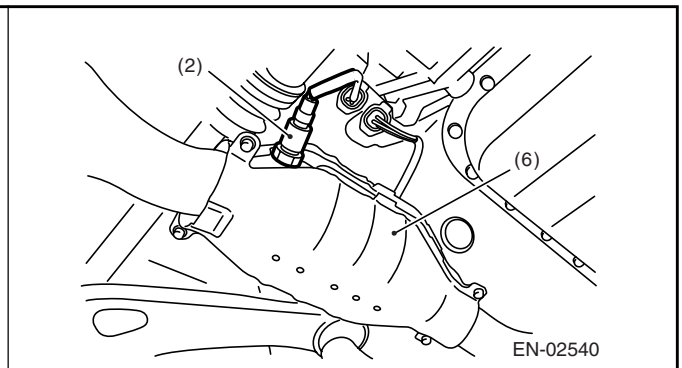
EN-02538

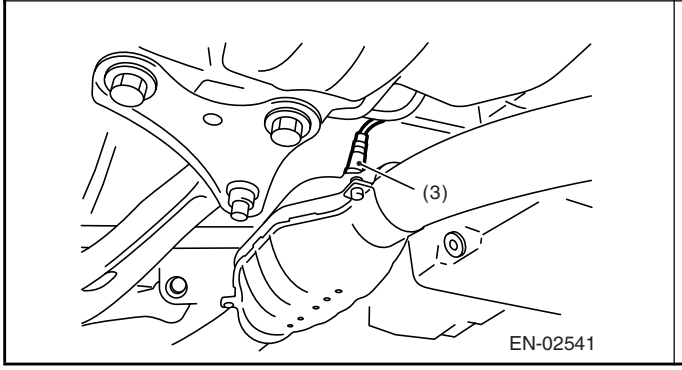
Electrical Component Location

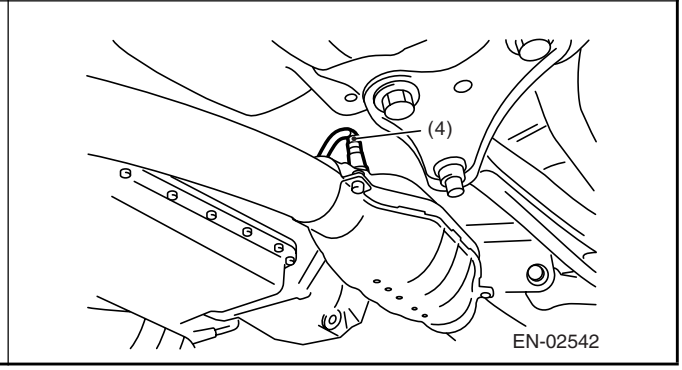


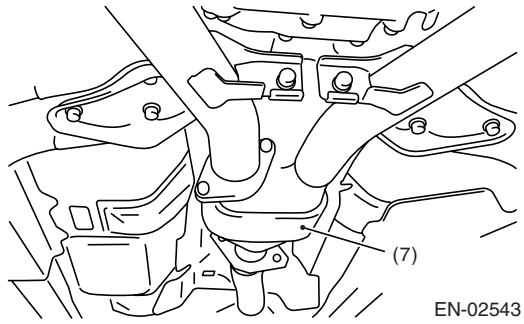
(1) Front oxygen (A/F) sensor LH
(2) Front oxygen (A/F) sensor RH
(3) Rear oxygen sensor LH
(4) Rear oxygen sensor RH
(5) Front catalytic converter LH
(6) Front catalytic converter RH
(7) Rear catalytic converter





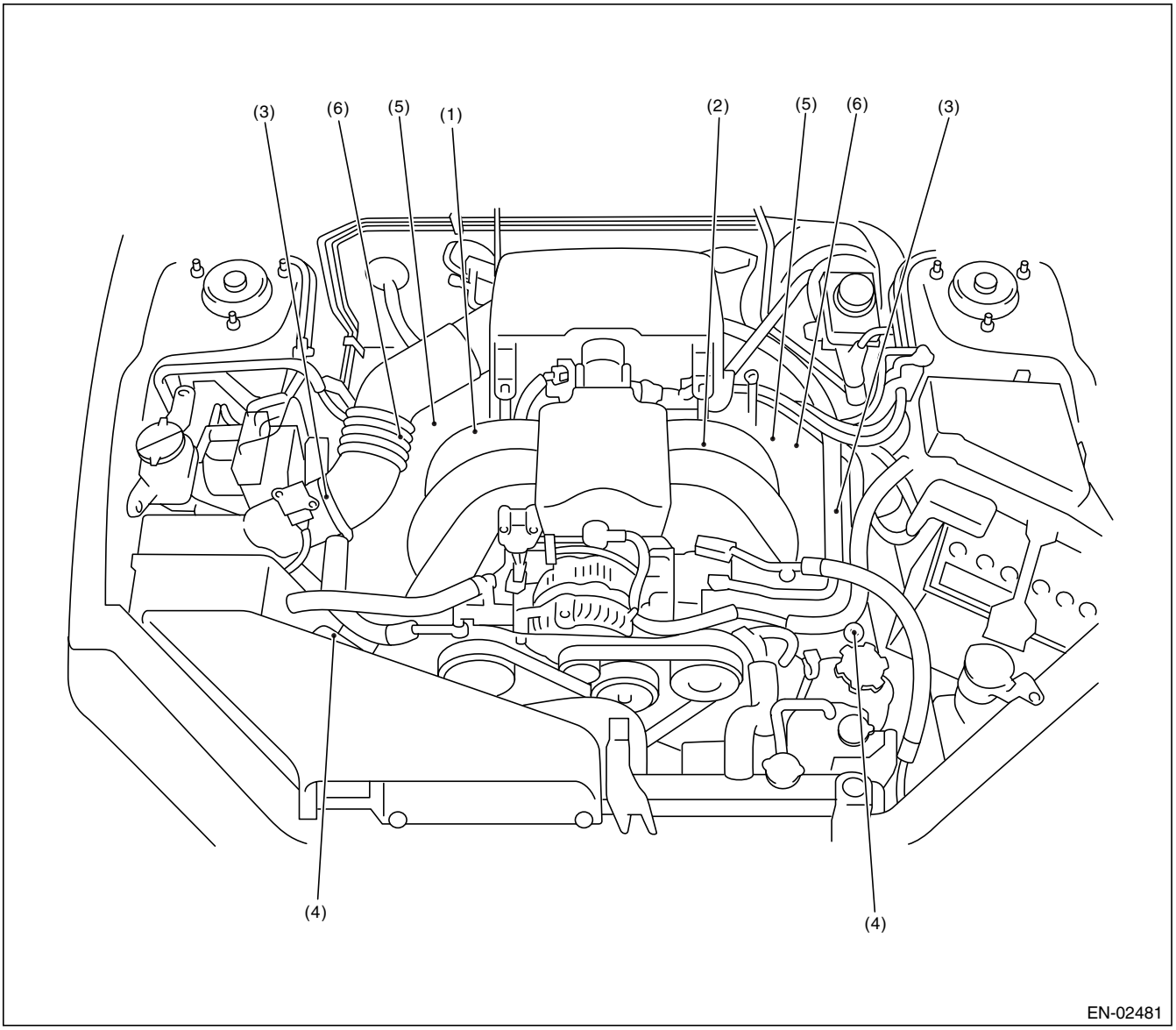






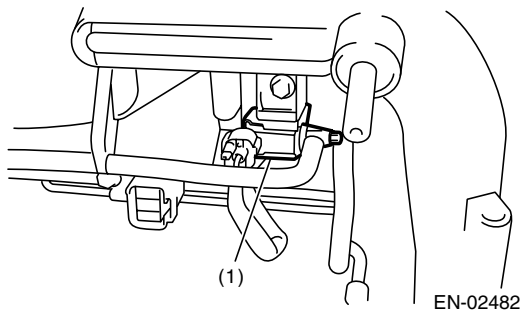
SUBARU.

3. SOLENOID VALVE, ACTUATOR, EMISSION CONTROL SYSTEM PARTS AND IGNITION SYSTEM PARTS

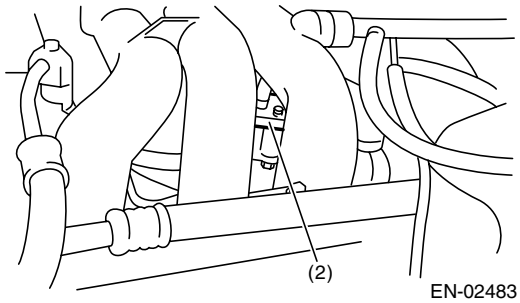


(1) Purge control solenoid valve
(2) EGR valve
(3) Ignition coil
(4) Oil flow control solenoid valve
(5) Oil switching solenoid valve
(6) Variable valve lift diagnosis oil pressure switch

Electrical Component Location



EN-02482



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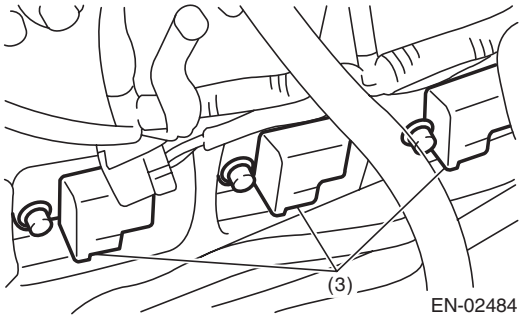

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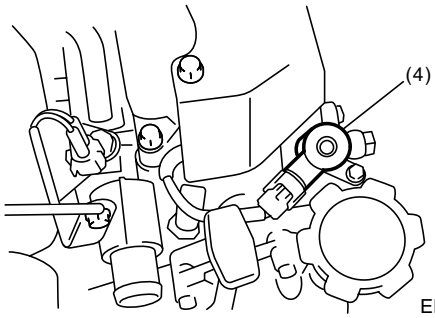

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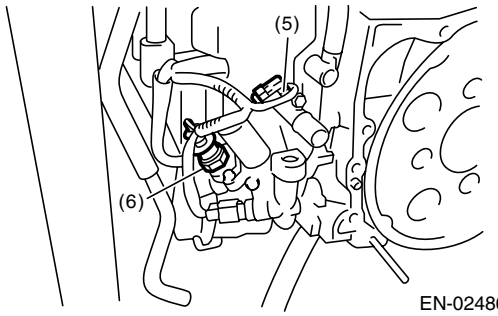
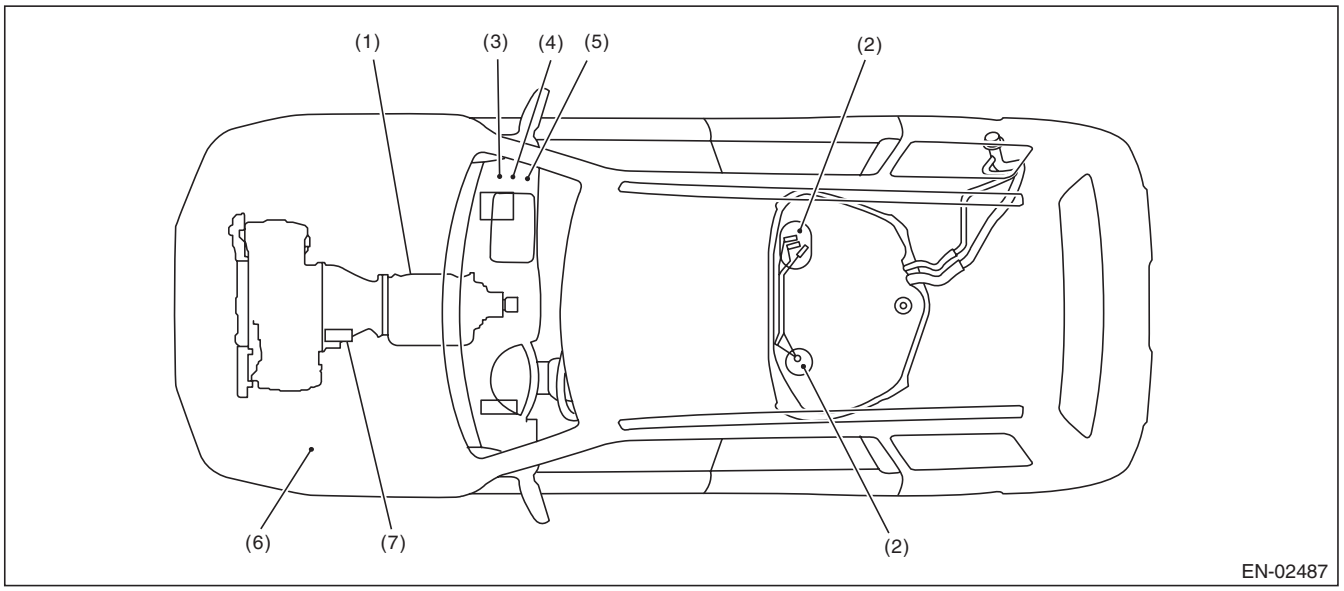
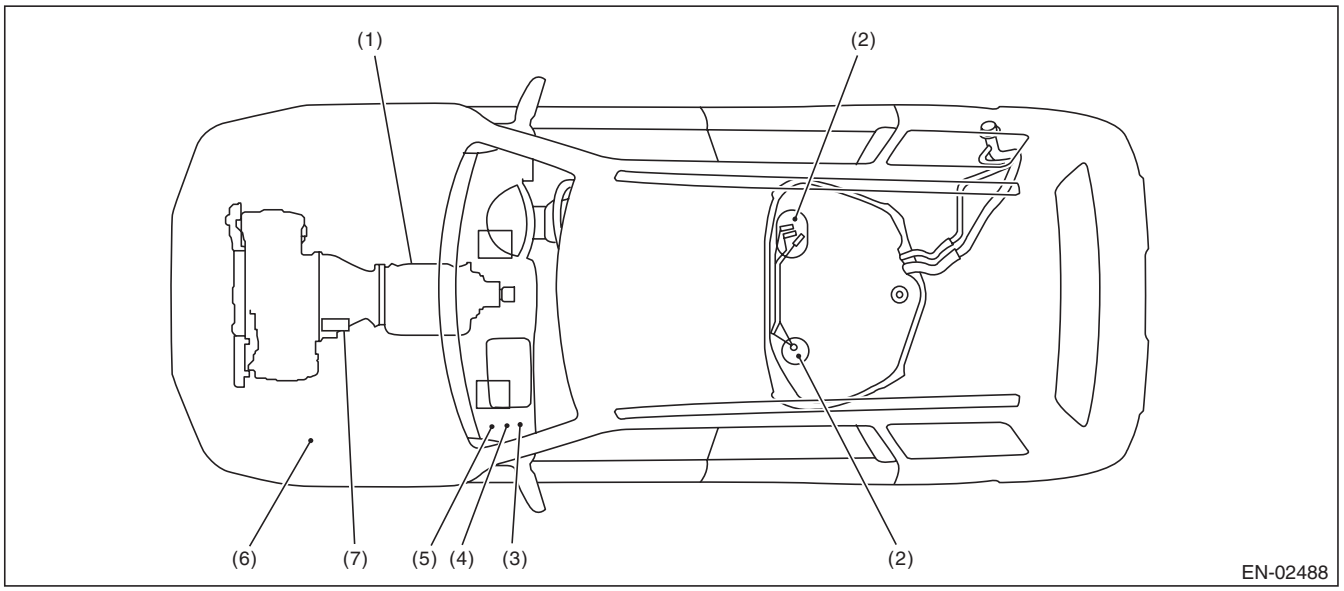


EN-02486

- LHD model

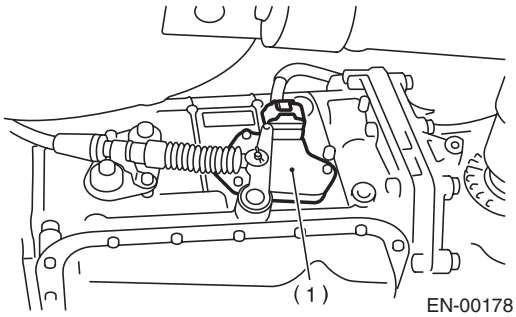


- RHD model

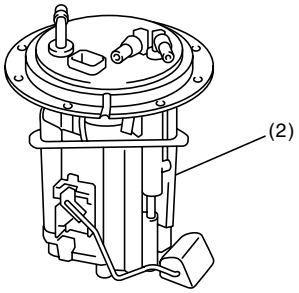


(1) Inhibitor switch
(2) Fuel pump
(3) Main relay
(4) Fuel pump relay
(5) Electronic throttle control relay
(6) Radiator fan relay
(7) Starter

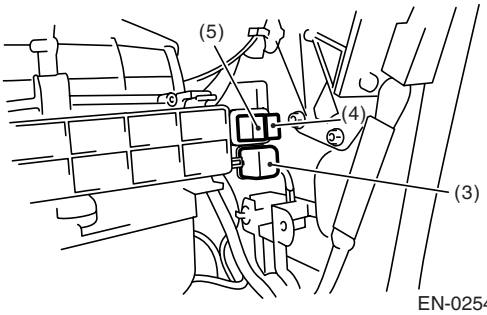
Electrical Component Location



EN-00178



EN-02093



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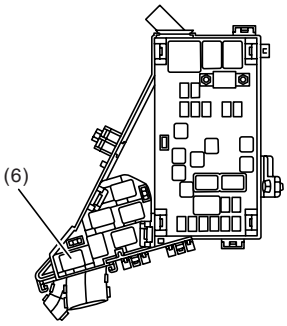

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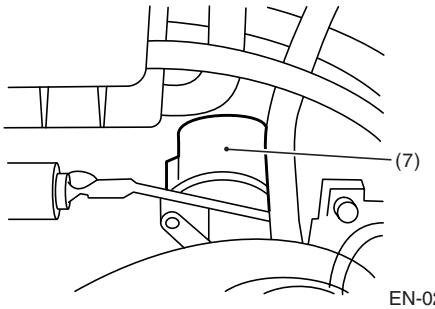
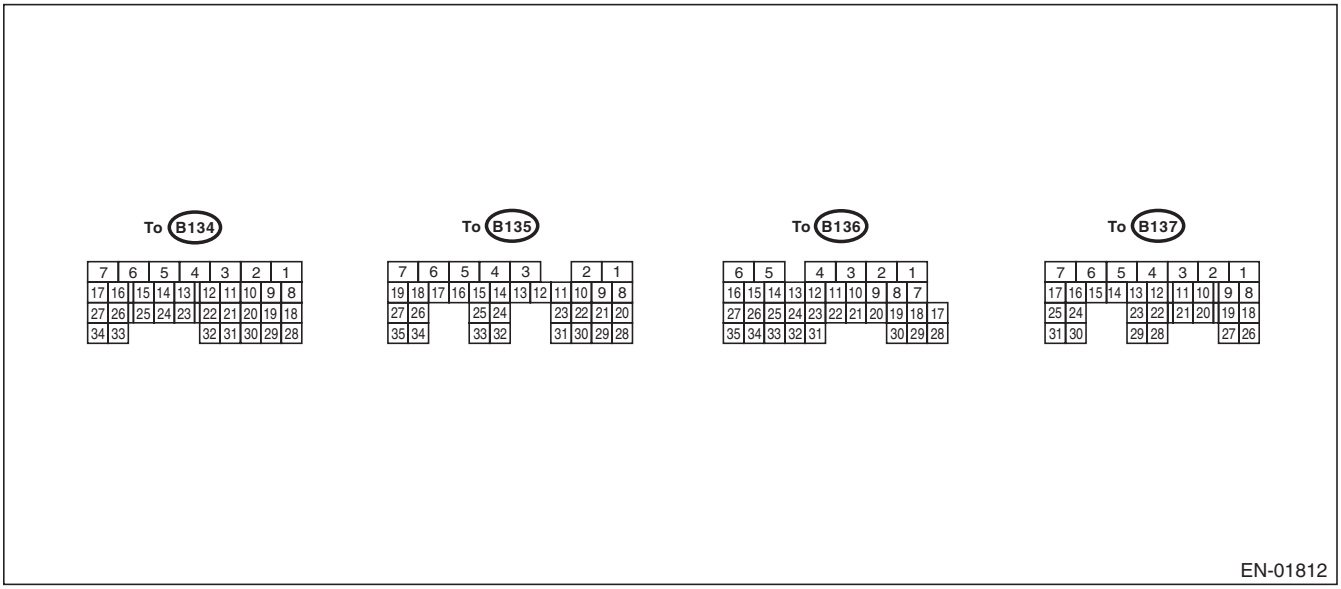


EN-02490

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

A: ELECTRICAL SPECIFICATION



Description		Connector No.	Terminal No.	Signal (V)		Reference
				Ignition SW ON (engine OFF)	Engine ON (idling)	
Crankshaft position sensor	Signal (+)	B135	10	0	–7 — +7	Waveform
	Signal (–)	B135	22	0	0	—
	Shield	B135	31	0	0	—
Camshaft position sensor (LH)		B135	8	0.275	0 or 5	Waveform
Camshaft position sensor (RH)		B135	9	0.275	0 or 5	Waveform
Electronic throttle control	Main	B136	18	0.64 — 0.94 Fully opened: 4.01	0.64 — 0.72 (After engine is warmed-up.)	Fully closed: 0.6 Fully opened: 4.01
	Sub	B136	29	1.51 — 1.76 Fully opened: 4.23	1.51 — 1.58 (After engine is warmed-up.)	Fully closed: 1.48 Fully opened: 4.23
Electronic throttle control motor (+)		B137	5	Duty waveform	Duty waveform	Drive frequency: 500 Hz
Electronic throttle control motor (–)		B137	4	Duty waveform	Duty waveform	Drive frequency: 500 Hz
Electronic throttle control motor power supply		B137	6	10 — 13	12 — 14	—
Electronic throttle control motor relay		B135	35	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	When ignition switch is turned to ON: ON
Accelerator pedal position sensor	Main	B136	17	Fully closed: 1 Fully opened: 3.6	Fully closed: 1 Fully opened: 3.3	—
	Power supply	B136	15	5	5	—
	Ground	B136	34	0	0	—
	Sub	B136	28	Fully closed: 1 Fully opened: 3.7	Fully closed: 1 Fully opened: 3.3	—
Engine coolant temperature sensor		B136	14	1.0 — 1.4	1.0 — 1.4	After engine is warmed-up.
Starter switch		B137	8	0	0	Cranking: 8 — 14

Engine Control Module (ECM) I/O Signal

Description		Connector No.	Terminal No.	Signal (V)		Reference
				Ignition SW ON (engine OFF)	Engine ON (idling)	
Starter relay		B135	32	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
A/C switch		B137	17	ON: 10 — 13 OFF: 0	ON: 13 — 14 OFF: 0	—
Ignition switch		B137	14	10 — 13	13 — 14	—
Neutral position switch		B137	9	ON: 0 OFF: 12±0.5		• Switch is ON when shifted into “P” or “N” range. (AT model) • Switch is ON when shifted into “N” range. (MT model)
Test mode connector		B137	15	12 — 14	12 — 14	When connected: 0
Knock sensor 1	Signal	B136	25	2.4	2.4	—
	Shield	B136	33	0	0	—
Knock sensor 2	Signal	B136	24	2.4	2.4	—
	Shield	B136	33	0	0	—
Backup power supply		B135	19	10 — 13	13 — 14	Ignition switch “OFF”: 10 — 13
Control module power supply		B135	6	10 — 13	13 — 14	—
		B135	5	10 — 13	13 — 14	—
Sensor power supply		B136	16	5	5	—
Ignition control	#1	B135	18	0	13 — 14	Waveform
	#2	B135	17	0	13 — 14	Waveform
	#3	B135	16	0	13 — 14	Waveform
	#4	B135	15	0	13 — 14	Waveform
	#5	B135	14	0	13 — 14	Waveform
	#6	B135	13	0	13 — 14	Waveform
Fuel injector	#1	B136	6	10 — 13	1 — 14	Waveform
	#2	B136	5	10 — 13	1 — 14	Waveform
	#3	B136	4	10 — 13	1 — 14	Waveform
	#4	B136	3	10 — 13	1 — 14	Waveform
	#5	B136	2	10 — 13	1 — 14	Waveform
	#6	B136	1	10 — 13	1 — 14	Waveform
A/C relay control		B135	33	ON: 0.5 or less OFF: 10 — 13	ON: 0.5 or less OFF: 13 — 14	—
Radiator fan control		B134	31	ON: 0.5 or less OFF: 10 — 13	ON: 0.5 or less OFF: 13 — 14	—
Radiator fan control power supply		B135	30	ON: 0.5 or less OFF: 10 — 13	ON: 0.5 or less OFF: 13 — 14	—
Self shut-off control		B137	16	0	0	—
Malfunction indicator light		B134	17	—	—	Light ON: 1 or less Light OFF: 10 — 14
Engine speed output		B134	23	—	0 — 13 or more	Waveform
Purge control solenoid valve		B134	14	ON: 1 or less OFF: 10 — 13	ON: 1 or less OFF: 13 — 14	—
EGR solenoid valve	Signal A+	B134	11	10 — 13	10 — 13	—
	Signal A–	B134	10	10 — 13	10 — 13	—
	Signal B+	B134	9	10 — 13	10 — 13	—
	Signal B–	B134	8	10 — 13	10 — 13	—
Power steering switch		B137	10	ON: 1 or less OFF: 10 — 13	ON: 1 or less OFF: 13 — 14	—

Description		Connector No.	Terminal No.	Signal (V)		Reference
				Ignition SW ON (engine OFF)	Engine ON (idling)	
A/C middle pressure switch		B136	30	ON: 0 OFF: 10 — 13	ON: 0 OFF: 13 — 14	—
Manifold absolute pressure sensor		B136	22	3.5 — 4.8	1.1 — 1.9	—
Air flow sensor	Signal	B136	23	0.74	0.3 — 4.5	—
	Shield	B136	32	0	0	—
	Ground	B136	31	0	0	—
Intake air temperature sensor		B136	13	3.15 — 3.33	3.15 — 3.33	intake air temperature: 25°C (75°F)
Front oxygen (A/F) sensor RH	Signal (+)	B134	33	2.8 — 3.2	2.8 — 3.2	—
	Signal (–)	B134	26	2.4 — 2.7	2.4 — 2.7	—
	Shield	B134	25	0	0	—
Front oxygen (A/F) sensor heater RH	Signal 1	B134	3	12 — 14	—	Waveform
	Signal 2	B134	2	12 — 14	—	Waveform
Front oxygen (A/F) sensor LH	Signal (+)	B134	34	2.8 — 3.2	2.8 — 3.2	—
	Signal (–)	B134	27	2.4 — 2.7	2.4 — 2.7	—
	Shield	B134	25	0	0	—
Front oxygen (A/F) sensor heater LH	Signal 1	B134	1	12 — 14	—	Waveform
	Signal 2	B135	7	12 — 14	—	Waveform
Rear oxygen sensor RH	Signal	B137	24	0	0 — 0.9	—
	Shield	B137	31	0	0	—
Rear oxygen sensor heater RH signal		B135	2	12 — 14	—	Waveform
Rear oxygen sensor LH	Signal	B137	25	0	0 — 0.9	—
	Shield	B137	31	0	0	—
Rear oxygen sensor heater LH signal		B135	3	12 — 14	—	Waveform
Immobilizer communication 1		B137	19	10	10	—
Immobilizer communication 2		B137	27	10	10	—
Fuel pump control unit	Signal 1	B137	28	0	13 — 14	—
	Signal 2	B135	27	0	0 or 5	—
Brake switch 1		B136	9	When brake pedal is depressed: 0 When brake pedal is released: 10 — 13	When brake pedal is depressed: 0 When brake pedal is released: 13 — 14	—
Brake switch 2		B136	8	When brake pedal is depressed: 10 — 13 When brake pedal is released: 0	When brake pedal is depressed: 13 — 14 When brake pedal is released: 0	—
Cruise control command switch		B136	11	When operating nothing: 3.5 — 4.5 When operating RES/ACC: 2.5 — 3.5 When operating SET/COAST: 0.5 — 1.5 When operating CANCEL: 0 — 0.5	When operating nothing: 3.5 — 4.5 When operating RES/ACC: 2.5 — 3.5 When operating SET/COAST: 0.5 — 1.5 When operating CANCEL: 0 — 0.5	—

Engine Control Module (ECM) I/O Signal

Description		Connector No.	Terminal No.	Signal (V)		Reference
				Ignition SW ON (engine OFF)	Engine ON (idling)	
Cruise control main switch		B136	7	ON: 0 OFF: 5	ON: 0 OFF: 5	—
Cruise control clutch switch		B136	10	When clutch pedal is depressed: 0 When clutch pedal is released: 12		MT model
Oil flow control solenoid valve RH	Signal (+)	B134	18	0	0.6	—
	Signal (–)	B134	28	0	0	—
Oil flow control solenoid valve LH	Signal (+)	B134	19	0	0.6	—
	Signal (–)	B134	29	0	0	—
Oil switching solenoid valve RH	Signal (+)	B134	21	0	1.9	—
	Signal (–)	B134	20	0	0	—
Oil switching solenoid valve LH	Signal (+)	B135	25	0	1.9	—
	Signal (–)	B135	24	0	0	—
Oil temperature sensor signal		B136	27	1.0 — 1.4	1.0 — 1.4	After engine is warmed-up.
Variable valve lift diagnosis oil pressure switch RH		B135	21	0	0	—
Variable valve lift diagnosis oil pressure switch LH		B135	29	0	0	—
Generator control		B134	22	0 — 6.5	0 — 6.5	—
SSM communication line		B137	20	Less than 1 ←→ More than 4	Less than 1 ←→ More than 4	—
GND (sensor)		B136	35	0	0	—
GND (injector)		B137	7	0	0	—
GND (ignition system)		B135	12	0	0	—
GND (power supply)		B135	4	0	0	—
		B135	1	0	0	—
GND (control system)		B137	2	0	0	—
		B137	1	0	0	—
GND (Front oxygen (A/F) sensor heater RH)		B134	7	0	0	—
GND (Front oxygen (A/F) sensor heater LH)		B134	5	0	0	—
GND (Rear oxygen sensor heater RH)		B134	6	0	0	—
GND (Rear oxygen sensor heater LH)		B134	4	0	0	—
GND (Electronic throttle control)		B137	3	0	0	—

6. Engine Condition Data

A: ELECTRICAL SPECIFICATION

Remarks	Specifications
Engine load	1.6 — 2.9 (%): Idling
	6.4 — 12.8 (%): 2,500 rpm racing

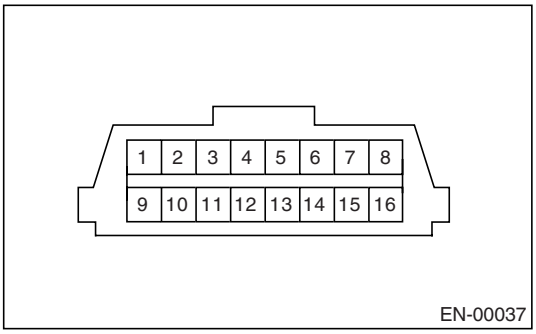
Measuring condition:
- After engine is warmed-up.
- Gear position is in N or P range.
- Turn the A/C to OFF.
- Turn all the accessory switches to OFF.

7. Data Link Connector

A: NOTE

This connector is used for connecting the Subaru Select Monitor.

CAUTION:
Do not connect any scan tools except Subaru Select Monitor or general scan tool because the circuit for Subaru Select Monitor may be damaged.



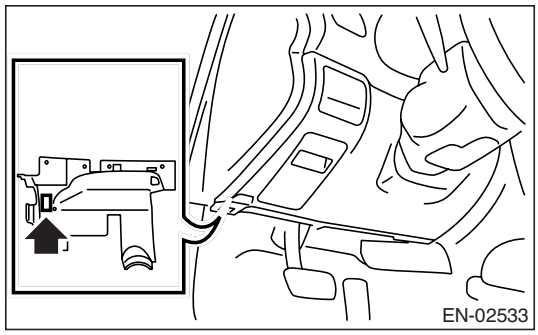
Terminal No.	Remarks	Terminal No.	Remarks
1	Power supply	9	Empty
2	Empty	10	Subaru Select Monitor signal
3	Empty	11	Empty
4	Empty	12	Ground
5	Empty	13	Ground
6	Empty	14	Empty
7	Empty	15	Empty
8	Empty	16	Empty

8. General Scan Tool

A: OPERATION

1. HOW TO USE GENERAL SCAN TOOL

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



3) Using the general scan tool, call up DTC and freeze frame data.
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 procedure, refer to the general scan tool operation manual.)

NOTE:
For details concerning DTCs, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H6DO)(diag)-66, List of Diagnostic Trouble Code (DTC).>

2. MODE $01 (CURRENT POWERTRAIN DIAGNOSTIC DATA)

Refer to data denoting the current operating condition of analog input/output, digital input/output 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 or °F
06	Short term fuel trim (bank 1)	%
07	Long term fuel trim (bank 1)	%
08	Short term fuel trim (bank 2)	%
09	Long term fuel trim (bank 2)	%
0B	Intake manifold absolute pressure	mmHg, kPa, inHg or psig
0C	Engine revolution	rpm
0D	Vehicle speed	km/h or MPH
0E	Ignition timing advance	°
0F	Intake air temperature	°C or °F
10	Air flow rate from manifold absolute pressure sensor	g/s or lb/m
11	Throttle valve opening angle	%
13	Check whether oxygen sensor is installed.	—
15	Rear oxygen sensor output and control amout (Bank 1)	V and %
19	Rear oxygen sensor output and control amout (Bank 2)	V and %
1C	On-board diagnostic system	—
21	Driving distance after malfunction indicator light illuminates	km or miles
24	Oxygen sensor output voltage and short term fuel trim associated with oxygen sensor (bank 1)	V and %
28	Oxygen sensor output voltage and short term fuel trim associated with oxygen sensor (bank 2)	V and %
34	Front oxygen (A/F) sensor lambda valve and current (Bank 1)	— and mA
38	Front oxygen (A/F) sensor lambda valve and current (Bank 2)	— and mA

NOTE:
Refer to general scan tool manufacturer's operation manual to access current powertrain diagnostic data (MODE $01).

3. MODE $02 (POWERTRAIN FREEZE FRAME DATA)

Refer to data denoting the operating condition when trouble is detected by 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 of freeze frame data	—
03	Fuel system control status	—
04	Calculated engine load value	%
05	Engine coolant temperature	°C or °F
06	Short term fuel trim (bank 1)	%
07	Long term fuel trim (bank 1)	%
08	Short term fuel trim (bank 2)	%
09	Long term fuel trim (bank 2)	%
0B	Intake manifold absolute pressure	mmHg, kPa, inHg or psig
0C	Engine revolution	rpm
0D	Vehicle speed	km/h or MPH
0E	Ignition timing advance	°
0F	Intake air temperature	°C or °F
10	Air flow rate from manifold absolute pressure sensor	g/s or lb/m
11	Throttle valve opening angle	%

NOTE:
Refer to general scan tool manufacturer's operation manual to access freeze frame data (MODE $02).

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

Refer to "Read Diagnostic Trouble Code" for information about data denoting emission-related powertrain DTC. <Ref. to EN(H6DO)(diag)-33, Read Diagnostic Trouble Code (DTC).>

5. MODE $04 (CLEAR/RESET EMISSION-RELATED DIAGNOSTIC INFORMATION)

Refer to the mode used to clear or reset emission-related diagnostic information.

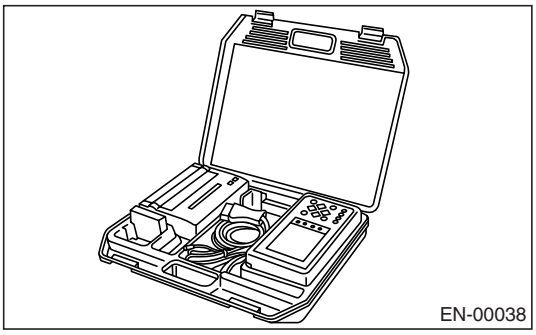
NOTE:
Refer to general scan tool manufacturer's operation manual to clear or reset emission-related diagnostic information (MODE $04).

9. Subaru Select Monitor

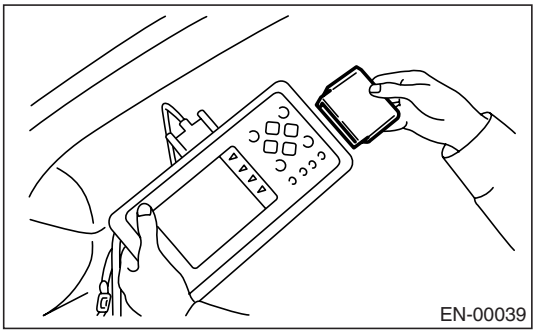
A: OPERATION

1. HOW TO USE SUBARU SELECT MONITOR

1) Prepare the Subaru Select Monitor kit. <Ref. to EN(H6DO)(diag)-7, PREPARATION TOOL, General Description.>

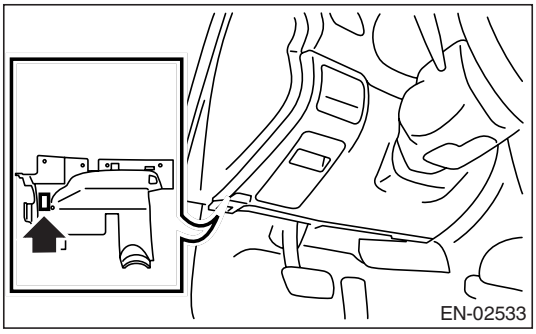


2) Connect the diagnosis cable to Subaru Select Monitor.
3) Insert the cartridge to Subaru Select Monitor. <Ref. to EN(H6DO)(diag)-7, PREPARATION TOOL, General Description.>



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

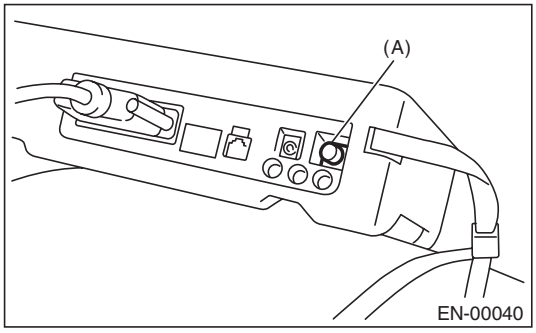
(1) Data link connector is located in the lower portion of instrument panel (on the driver's side).



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

CAUTION:
Do not connect any scan tools except Subaru Select Monitor or general scan tool.

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



(A) Power switch

6) Using the Subaru Select Monitor, call up DTC and data, 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(H6DO)(diag)-33, 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(H6DO)(diag)-33, Read Diagnostic Trouble Code (DTC).>

4. READ CURRENT DATA FOR ENGINE. (NORMAL MODE)

1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine} and press the [YES] key.
3) Press the [YES] key after the information of engine type has been displayed.
4) On the «Engine Diagnosis» display screen, select the {Current Data Display/Save}, and then press the [YES] key.
5) On the «Data Display Menu» screen, select the {Data Display} and press the [YES] key.
6) Using the scroll key, move the display screen up or down until the desired data is shown.

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

Remarks	Display	Unit of measure	Note (at idling)
Engine load	Engine load	%	2.4%
Engine coolant temperature signal	Engine coolant temperature	°C or °F	≥ 75°C or 167°F (After engine is warmed-up.)
A/F compensation 1	A/F Compensation 1	%	–5.5%
A/F learning 1	A/F learning 1	%	0.0%
A/F compensation 2	A/F Compensation 2	%	–7.8%
A/F learning 2	A/F learning 2	%	0.0%
Intake manifold absolute pressure	Intake manifold absolute pressure	mmHg, kPa, inHg or psig	200 — 300 mmHg, 26.7 — 40 kPa, 7.8 — 11.8 inHg or 3.8 — 5.8 psig
Engine speed signal	Engine speed	rpm	600 — 800 rpm
Meter vehicle speed signal	Meter vehicle Speed	km/h or MPH	0 km/h or 0 MPH
Ignition timing signal	Ignition timing	deg	13 — 15 deg
Intake air temperature signal	Intake air temperature	°C or °F	(Ambient air temperature)
Amount of intake air	Amount of intake air	g/s or lb/m	4.8 g/s or 0.63 lb/m
Throttle opening angle signal	Throttle valve angle	%	2.4%
Front oxygen sensor voltage value 1	Front oxygen sensor voltage value 1	V	0.85 V
Front oxygen sensor voltage value 2	Front oxygen sensor voltage value 2	V	0.87 V
Battery voltage	Battery Voltage	V	12 — 14 V
Mass air flow voltage	Mass air flow voltage	V	1.1 — 1.2 V
Injection 1 pulse width	Injection 1 pulse width	ms	2.82 ms
Injection 2 pulse width	Injection 2 pulse width	ms	2.82 ms
Knock sensor compensation	Knock correction	deg	0 deg
Atmospheric pressure signal	Atmospheric pressure	mmHg, kPa, inHg or psig	(Atmosphere pressure)
Intake manifold relative pressure	Intake manifold relative pressure	mmHg, kPa, inHg or psig	(Intake manifold absolute pressure — Atmospheric pressure)
Acceleration opening angle signal	Acceleration opening angle	%	0%
Radiator fan output	Radiator fan output	%	0%
Purge control solenoid valve duty ratio	CPC Duty	%	0 — 3%
EGR step number	EGR step number	STEP	0
Generator duty	ALT Duty	%	0%
Fuel pump duty	Fuel pump duty	%	33%
Variable valve timing advance angle amount R	VVT advance angle amount R	deg	0 deg
Variable valve timing advance angle amount L	VVT advance angle amount L	deg	0 deg
Oil flow control solenoid valve duty R	OCV duty R	%	9.4%

Remarks	Display	Unit of measure	Note (at idling)
Oil flow control solenoid valve duty L	OCV duty L	%	9.4%
Oil flow control solenoid valve current R	OCV current R	mA	64 mA
Oil flow control solenoid valve current L	OCV current L	mA	64 mA
Front oxygen (A/F) sensor current value 1	A/F sensor current value 1	mA	0.0 mA
Front oxygen (A/F) sensor current value 2	A/F sensor current value 2	mA	0.0 mA
Front oxygen (A/F) sensor resistance value 1	A/F sensor resistance value 1	Ω	31 Ω
Front oxygen (A/F) sensor resistance value 2	A/F sensor resistance value 2	Ω	31 Ω
Front oxygen (A/F) sensor output lambda 1	A/F sensor output lambda 1	—	1.01
Front oxygen (A/F) sensor output lambda 2	A/F sensor output lambda 2	—	1.01
A/F compensation 3	A/F Compensation 3	%	−10.47%
A/F learning 3	A/F learning 3	%	0.0%
Throttle motor duty	Throttle motor duty	%	−13%
Throttle motor voltage	Throttle power supply voltage	V	(Battery voltage)
Sub throttle sensor voltage	Sub throttle sensor voltage	V	1.56 V
Main throttle sensor voltage	Main throttle sensor voltage	V	0.70 V
Sub acceleration sensor voltage	Sub acceleration sensor voltage	V	1.10 V
Main acceleration sensor voltage	Main acceleration sensor voltage	V	1.0 V
Memory vehicle speed (AT model)	Memory vehicle speed	km/h or MPH	0 km/h or 0 MPH
A/F compensation 4	A/F compensation 4	%	0.7%
A/F learning 4	A/F learning 4	%	0.0%
Fuel level sensor resistance	Fuel level resistance	Ω	4 — 96 Ω
Engine oil temperature	Oil Temperature	°C or °F	≥ 85°C or 185°F (After engine is warmed-up.)
Oil switching solenoid valve duty R	OSV duty R	%	16.9%
Oil switching solenoid valve duty L	OSV duty L	%	16.9%
Oil switching solenoid valve current R	OSV current R	mA	192 mA
Oil switching solenoid valve current L	OSV current L	mA	192 mA
Variable valve lift lift mode	VVL Lift Mode	—	1 (at LOW lift)
#1 cylinder roughness monitor	#1 cylinder roughness monitor	—	0
#2 cylinder roughness monitor	#2 cylinder roughness monitor	—	0
#3 cylinder roughness monitor	#3 cylinder roughness monitor	—	0
#4 cylinder roughness monitor	#4 cylinder roughness monitor	—	0
#5 cylinder roughness monitor	#5 cylinder roughness monitor	—	0
#6 cylinder roughness monitor	#6 cylinder roughness monitor	—	0
Test mode terminal	Test mode terminal	—	OFF
Neutral position switch signal	Neutral SW	—	ON

Remarks	Display	Unit of measure	Note (at idling)
Idle switch signal	Soft idle SW	—	ON
Ignition switch signal	Ignition SW	—	ON
Power steering switch signal	Power steering SW input signal	—	OFF (At OFF)
Air conditioning switch signal	A/C SW	—	OFF (At OFF)
Steering wheel switch signal	Steering wheel SW	—	Hi/Low
Starter switch signal	Starter SW	—	OFF
Front oxygen monitor 1	Front oxygen monitor 1	—	Lean
Front oxygen monitor 2	Front oxygen monitor 2	—	Rich
Knocking signal	Knock signal	—	No
Crankshaft position sensor signal	Crankshaft angle signal	—	Yes
Camshaft position sensor signal	Camshaft angle signal	—	Yes
Rear defogger switch signal	Rear defogger SW	—	OFF (At OFF)
Blower fan switch signal	Blower Fan SW	—	OFF (At OFF)
Light switch signal	Light SW	—	OFF (At OFF)
Wiper switch signal	Wiper SW	—	OFF (At OFF)
A/C lock signal	A/C lock signal	—	OFF
A/C middle pressure switch signal	A/C middle pressure SW	—	OFF
A/C compressor relay signal	A/C compressor relay output	—	OFF
Variable valve lift diagnosis oil pressure switch RH	Engine oil pressure SW 1	—	ON
Variable valve lift diagnosis oil pressure switch LH	Engine oil pressure SW 2	—	ON
AT/MT identification terminal (MT model)	AT/MT identification terminal	—	MT
AT coordinate retard angle demand signal (AT model)	AT coordinate retard angle demand	—	Yes
AT coordinate fuel cut demand signal (AT model)	AT coordinate fuel cut demand	—	No
Vehicle dynamics control (VDC) torque down prohibition output	VDC torque down prohibition output	—	ON
Vehicle dynamics control (VDC) torque down demand	VDC torque down demand	—	OFF
AT coordinate permission signal (AT model)	AT coordinate permission signal	—	ON
Electronic throttle control motor relay signal	ETC motor relay	—	ON
Stop light switch signal	Stop light SW	—	OFF
SET/COAST switch signal (Model with cruise control)	SET/CST SW	—	OFF
RESUME/ACCEL switch signal (Model with cruise control)	RES/ACC SW	—	OFF
Brake switch signal	Brake SW	—	OFF
Main switch signal (Model with cruise control)	Main SW	—	OFF
Body integrated module data reception	Body Int. Unit Data	—	ON
Body integrated module counter update	Body Int. Unit Count	—	ON
Cruise control cancel switch signal (Model with cruise control)	CC Cancel SW	—	OFF
Clutch switch signal	Clutch SW	—	OFF

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} and press the [YES] key.
3) Press the [YES] key after the information of engine type has been displayed.
4) On the «Engine Diagnosis» display screen, select the {OBD System} and press the [YES] key.
5) On the «OBD Menu» display screen, select the {Current Data Display/Save}, and then press the [YES] key.
6) On the «Data Display Menu» screen, select the {Data Display} and press the [YES] key.
7) Using the scroll key, move the display screen up or down until the desired data is shown.

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

Description	Display	Unit of measure
Number of diagnosis code	Number of Diag. Code:	0
Condition of malfunction indicator light	MI (MIL)	OFF
Monitoring test of misfire	Misfire monitoring	No
Monitoring test of fuel system	Fuel system monitoring	Finish
Monitoring test of comprehensive component	Component monitoring	Finish
Test of catalyst	Catalyst Diagnosis	No
Test of heating-type catalyst	Heated catalyst	No
Test of evaporative emission purge control system	Evaporative purge system	No
Test of secondary air system	Secondary air system	No
Test of air conditioning system refrigerant	A/C system refrigerant	No
Test of oxygen sensor	Oxygen sensor	Finish
Test of oxygen sensor heater	Oxygen sensor heater	Finish
Test of EGR system	EGR system	Finish
A/F control #1	Fuel system for Bank 1	OPEN early period
A/F control #2	Fuel system for Bank 2	OPEN early period
Load	Calculated load valve	%
Engine coolant temperature	Coolant Temp.	°C or °F
A/F compensation #1	Short term fuel trim #1	%
A/F learning #1	Long term fuel trim B1	%
A/F compensation #2	Short term fuel trim #2	%
A/F learning #2	Long term fuel trim B2	%
Intake manifold absolute pressure	Mani. Absolute Pressure	mmHg, kPa, inHg or psig
Engine speed	Engine Speed	rpm
Vehicle speed	Vehicle Speed	km/h or MPH
Ignition timing #1	Ignition timing adv. #1	°
Intake air temperature	Intake Air Temp.	°C or °F
Amount of intake air	Mass Air Flow	g/s or lb/m
Throttle valve angle	Throttle Opening Angle	%
Oxygen sensor #12	Oxygen sensor #12	V
A/F compensation #12	Short term fuel trim #12	%
OBD system	OBD System	—
Oxygen sensor #11	Oxygen sensor #11	Support
Oxygen sensor #12	Oxygen sensor #12	Support
A/F sensor #11	A/F sensor #11	—
A/F sensor #11	A/F sensor #11	V
Oxygen sensor #22	Oxygen sensor #22	V
A/F compensation #22	Short term fuel trim #22	%
Oxygen sensor #21	Oxygen sensor #21	Support
Oxygen sensor #22	Oxygen sensor #22	Support
Malfunction indicator light illuminating process	MIL illuminating process	km/h or MPH
A/F sensor #21	A/F sensor #21	—

Description	Display	Unit of measure
A/F sensor #21	A/F sensor #21	V
A/F sensor #11	A/F sensor #11	—
A/F sensor #11	A/F sensor #11	A
A/F sensor #21	A/F sensor #21	—
A/F sensor #21	A/F sensor #21	A

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

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

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

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

Description	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	—
Air fuel ratio control system for bank 2	Fuel system for Bank2	—
Engine load data	Engine Load	%
Engine coolant temperature signal	Coolant Temp.	°C or °F
Short term fuel trim by front oxygen (A/F) sensor (bank 1)	Short term fuel trim B1	%
Short term fuel trim by front oxygen (A/F) sensor (bank 1)	Long term fuel trim B1	%
Short term fuel trim by front oxygen (A/F) sensor (bank 2)	Short term fuel trim B2	%
Short term fuel trim by front oxygen (A/F) sensor (bank 2)	Long term fuel trim B2	%
Intake manifold absolute pressure signal	Mani. Absolute Pressure	mmHg, kPa, inHg or psig
Engine speed signal	Engine Speed	rpm
Vehicle speed signal	Vehicle Speed	km/h or MPH
Ignition timing #1	Ignition timing adv. #1	°
Intake air temperature	Intake Air Temp.	°C or °F
Amout of intake air	Mass Air Flow	g/s or lb/m
Throttle valve angle	Throttle Opening Angle	%

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

7. LED OPERATION MODE FOR ENGINE

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

Remarks	Display	Message	LED "ON" requirements
Test mode signal	Test mode terminal	D check/U check	D check
Neutral position switch signal	Neutral SW	Neutral/Other than neutral	Neutral
Idle switch signal	Soft idle SW	Idle/Other than idle	In idle
Ignition switch signal	Ignition SW	ON Input/OFF Input	ON input
Power steering switch signal	Power steering SW	ON Input/OFF Input	ON input
Air conditioning switch signal	A/C SW	ON Input/OFF Input	ON input
Steering wheel switch signal	Steering wheel SW	Hi input/Low input	Low Input
Starter switch signal	Starter SW	ON Input/OFF Input	ON input
Front oxygen monitor 1	FtO2 monitor 1	Lean/Rich	Rich
Front oxygen monitor 2	FtO2 monitor 2	Lean/Rich	Rich
Knocking signal	Knock signal	Yes/No	Yes
Crankshaft position sensor signal	Crankshaft angle signal	Yes/No	Yes
Camshaft position sensor signal	Camshaft angle signal	Yes/No	Yes
Rear defogger switch signal	Rear defogger SW	ON Input/OFF Input	ON input
Blower fan switch signal	Blower Fan SW	ON Input/OFF Input	ON input
Light switch signal	Light SW	ON Input/OFF Input	ON input
Windshield wiper switch signal	Wiper SW	ON Input/OFF Input	ON input
Air conditioning lock signal	A/C lock signal	ON Input/OFF Input	ON input
A/C middle pressure switch signal	A/C middle pressure SW	ON Input/OFF Input	ON input
Air conditioner compressor relay signal	Compressor relay	ON output/OFF output	ON output
AT retard angle demand signal	AT retard angle demand	Yes/No	Yes
AT fuel cut signal	AT fuel cut	Yes/No	Yes
VDC torque down prohibition output	Torque down output	ON/OFF	Prohibition
VDC torque down demand	Torque down demand	Yes/No	Yes
AT coordinate permission signal	AT coordinate permission signal	ON/OFF	ON
Electronic throttle control motor relay signal	ETC motor relay	ON/OFF	ON
Stop light switch signal	Stop SW	ON Input/OFF Input	ON input
SET/COAST switch signal	SET/CST SW	ON Input/OFF Input	ON input
RESUME/ACCEL switch signal	RES/ACC SW	ON Input/OFF Input	ON input
Brake switch signal	Brake SW	ON Input/OFF Input	ON input
Main switch signal	Main SW	ON Input/OFF Input	ON input
Body integrated module data reception	Body Int. Unit Data	Yes/No	Yes
Body integrated module counter update	Body integrated module data update	Yes/No	Yes
Cruise control cancel switch signal	CC Cancel SW	ON Input/OFF Input	ON input
Clutch switch signal	Clutch SW	ON Input/OFF Input	ON input

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

10. Read Diagnostic Trouble Code (DTC)

A: OPERATION

1. SUBARU SELECT MONITOR (NORMAL MODE)

1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine} and press the [YES] key.
3) Press the [YES] key after the information of engine type has been displayed.
4) On the «Engine Diagnosis» screen, select the {DTC Display}, and then press the [YES] key.
5) On the «Diagnostic Code(s) Display» screen, select the {Current Diagnostic Code(s)} or {History Diagnostic Code(s)}, and then press the [YES] key.

NOTE:
• For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
• For details concerning DTC, refer to “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H6DO)(diag)-66, List of Diagnostic Trouble Code (DTC).>

2. SUBARU SELECT MONITOR (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} and press the [YES] key.
3) Press the [YES] key after the information of engine type has been displayed.
4) On the «Engine Diagnosis» display screen, select the {OBD System} and press the [YES] key.
5) On the «OBD Menu» display screen, select the {DTC Display} and press the [YES] key.
6) Make sure DTC is shown on the screen.

NOTE:
• For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
• For details concerning DTC, refer to “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H6DO)(diag)-66, List of Diagnostic Trouble Code (DTC).>

3. GENERAL SCAN TOOL

Refer to data denoting emission-related powertrain DTC.
For details concerning DTC, refer to “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H6DO)(diag)-66, List of Diagnostic Trouble Code (DTC).>

NOTE:
Refer to general scan tool manufacturer’s operation manual to access powertrain DTC (MODE $03).

11.Inspection Mode

A: PROCEDURE

When performing the diagnose without the “List of Diagnostic Trouble Code (DTC)”, refer the item of drive cycle. <Ref. to EN(H6DO)(diag)-39, Drive Cycle.>

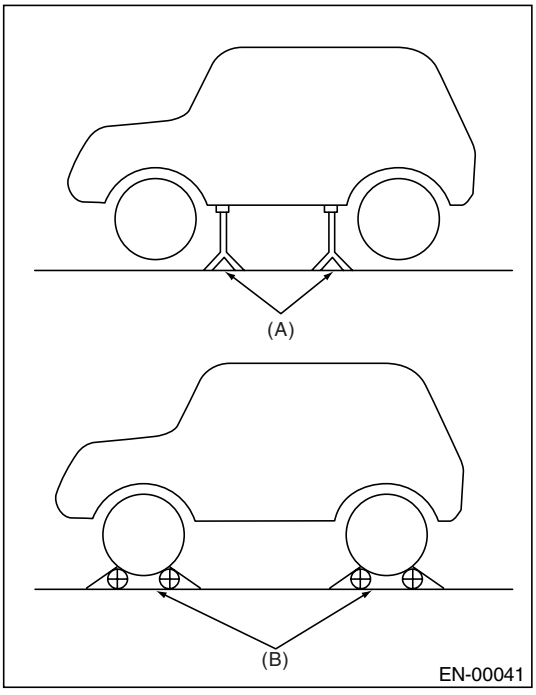
DTC	Item	On condition
P0011	Intake Camshaft Position-Timing Over-Advanced or System Performance (Bank 1)	—
P0021	Intake Camshaft Position-Timing Over-Advanced or System Performance (Bank 2)	—
P0031	HO2S Heater Control Circuit Low (Bank 1 Sensor 1)	—
P0032	HO2S Heater Control Circuit High (Bank 1 Sensor 1)	—
P0037	HO2S Heater Control Circuit Low (Bank 1 Sensor 2)	—
P0038	HO2S Heater Control Circuit High (Bank 1 Sensor 2)	—
P0051	HO2S Heater Control Circuit Low (Bank 2 Sensor 1)	—
P0052	HO2S Heater Control Circuit High (Bank 2 Sensor 1)	—
P0057	HO2S Heater Control Circuit Low (Bank 2 Sensor 2)	—
P0058	HO2S Heater Control Circuit High (Bank 2 Sensor 2)	—
P0077	Intake Valve Control Solenoid Circuit High (Bank 1)	—
P0083	Intake Valve Control Solenoid Circuit High (Bank 2)	—
P0102	Mass or Volume Air Flow Circuit Low Input	—
P0103	Mass or Volume Air Flow Circuit High Input	—
P0107	Manifold Absolute Pressure/Barometric Pressure Circuit Low Input	—
P0108	Manifold Absolute Pressure/Barometric Pressure Circuit High Input	—
P0112	Intake Air Temperature Sensor 1 Circuit Low	—
P0113	Intake Air Temperature Sensor 1 Circuit High	—
P0117	Engine Coolant Temperature Circuit Low	—
P0118	Engine Coolant Temperature Circuit High	—
P0122	Throttle/Pedal Position Sensor/Switch “A” Circuit Low	—
P0123	Throttle/Pedal Position Sensor/Switch “A” Circuit High	—
P0131	O2 Sensor Circuit Low Voltage (Bank 1 Sensor 1)	—
P0132	O2 Sensor Circuit High Voltage (Bank 1 Sensor 1)	—
P0137	O2 Sensor Circuit Low Voltage (Bank 1 Sensor 2)	—
P0138	O2 Sensor Circuit High Voltage (Bank 1 Sensor 2)	—
P0151	O2 Sensor Circuit Low Voltage (Bank 2 Sensor 1)	—
P0152	O2 Sensor Circuit High Voltage (Bank 2 Sensor 1)	—
P0157	O2 Sensor Circuit Low Voltage (Bank 2 Sensor 2)	—
P0158	O2 Sensor Circuit High Voltage (Bank 2 Sensor 2)	—
P0171	System Too Lean (Bank 1)	—
P0172	System Too Rich (Bank 1)	—
P0174	System Too Lean (Bank 2)	—
P0175	System Too Rich (Bank 2)	—
P0197	Engine Oil Temperature Sensor Low	—
P0198	Engine Oil Temperature Sensor High	—
P0222	Throttle/Pedal Position Sensor/Switch “B” Circuit Low	—
P0223	Throttle/Pedal Position Sensor/Switch “B” Circuit High	—
P0230	Fuel Pump Primary Circuit	—
P0327	Knock Sensor 1 Circuit Low (Bank 1 or Single Sensor)	—
P0328	Knock Sensor 1 Circuit High (Bank 1 or Single Sensor)	—
P0332	Knock Sensor 2 Circuit Low (Bank 2)	—
P0333	Knock Sensor 2 Circuit High (Bank 2)	—
P0335	Crankshaft Position Sensor “A” Circuit	—
P0340	Camshaft Position Sensor “A” Circuit (Bank 1 or Single Sensor)	—

DTC	Item	On condition
P0345	Camshaft Position Sensor “A” Circuit (Bank 2)	—
P0458	Evaporative Emission System Purge Control Valve Circuit Low	—
P0462	Fuel Level Sensor “A” Circuit Low	—
P0463	Fuel Level Sensor “A” Circuit High	—
P0500	Vehicle Speed Sensor “A”	—
P0512	Starter Request Circuit	—
P0519	Idle Air Control System Performance	—
P0600	Serial Communication Link	—
P0604	Internal Control Module Random Access Memory (RAM) Error	—
P0605	Internal Control Module Read Only Memory (ROM) Error	—
P0607	Control Module Performance	—
P0638	Throttle Actuator Control Range/Performance (Bank 1)	—
P0691	Fan 1 Control Circuit Low	—
P0692	Fan 1 Control Circuit High	—
P0700	Transmission Control System (MIL Request)	—
P0851	Park/Neutral Switch Input Circuit Low	—
P0852	Park/Neutral Switch Input Circuit High	—
P1160	Return Spring Failure	—
P1518	Starter Switch Circuit Low Input	—
P1560	Back-up Voltage Circuit Malfunction	—
P2088	Intake Camshaft Position Actuator Control Circuit Low (Bank 1)	—
P2089	Intake Camshaft Position Actuator Control Circuit High (Bank 1)	—
P2092	Intake Camshaft Position Actuator Control Circuit Low (Bank 2)	—
P2093	Intake Camshaft Position Actuator Control Circuit High (Bank 2)	—
P2101	Throttle Actuator Control Motor Circuit Range/Performance	—
P2102	Throttle Actuator Control Motor Circuit Low	—
P2103	Throttle Actuator Control Motor Circuit High	—
P2109	Throttle/Pedal Position Sensor “A” Minimum Stop Performance	—
P2122	Throttle/Pedal Position Sensor/Switch “D” Circuit Low Input	—
P2123	Throttle/Pedal Position Sensor/Switch “D” Circuit High Input	—
P2127	Throttle/Pedal Position Sensor/Switch “E” Circuit Low Input	—
P2128	Throttle/Pedal Position Sensor/Switch “E” Circuit High Input	—
P2135	Throttle/Pedal Position Sensor/Switch “A”/“B” Voltage Correlation	—
P2138	Throttle/Pedal Position Sensor/Switch “D”/“E” Voltage Correlation	—
P2503	Charging System Voltage Low	—

1. PREPARATION FOR THE INSPECTION MODE

1) Check that the battery voltage is more than 12 V and fuel remains half [20 — 40 ℓ (5.3 — 10.6 US gal, 4.4 — 8.8 Imp gal)].
2) Lift-up the vehicle using a garage jack and place it on rigid racks, or drive the vehicle onto free rollers.

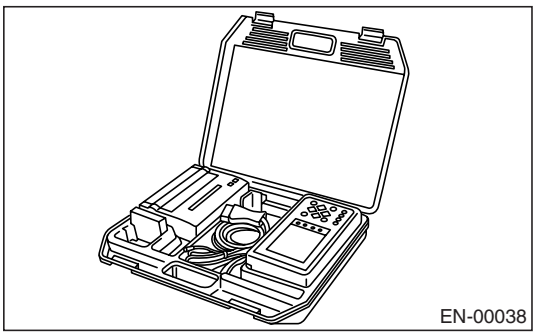
WARNING:
• Before lifting-up the vehicle, ensure parking brakes are applied.
• Do not use a pantograph jack in place of a rigid rack.
• Secure a rope or wire to the front or rear towing hooks to prevent the lateral runout of front wheels.
• Do not abruptly depress/release clutch pedal or accelerator pedal during works even when the engine is operating at low speeds since this may cause vehicle to jump off free rollers.
• In order to prevent the vehicle from slipping due to vibration, do not place any wooden blocks or similar items between the rigid racks and vehicle.
• Since the rear wheels will also rotate, do not place anything near them. Also, make sure that nobody goes in front of the vehicle.



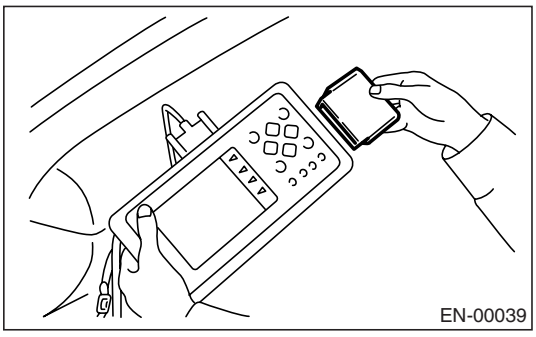
(A) Rigid racks
(B) Free rollers

2. SUBARU SELECT MONITOR

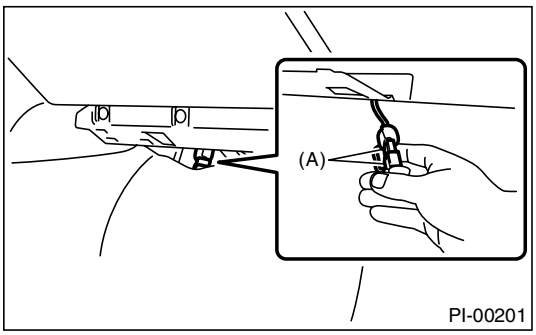
1) After clearing the memory, check for any remaining unresolved trouble data. <Ref. to EN(H6DO)(diag)-41, Clear Memory Mode.>
2) Idle the engine.
3) Prepare the Subaru Select Monitor kit. <Ref. to EN(H6DO)(diag)-7, PREPARATION TOOL, General Description.>



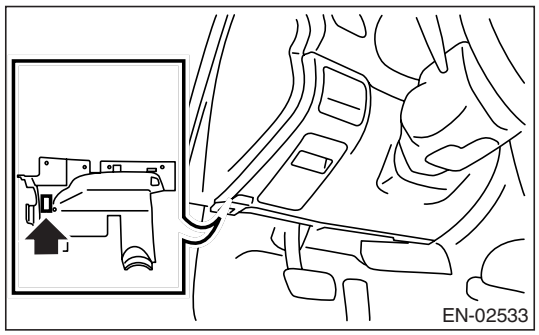
4) Connect the diagnosis cable to Subaru Select Monitor.
5) Insert the cartridge to Subaru Select Monitor. <Ref. to EN(H6DO)(diag)-7, PREPARATION TOOL, General Description.>



6) Connect the test mode connector (A) located at the lower portion of glove box.

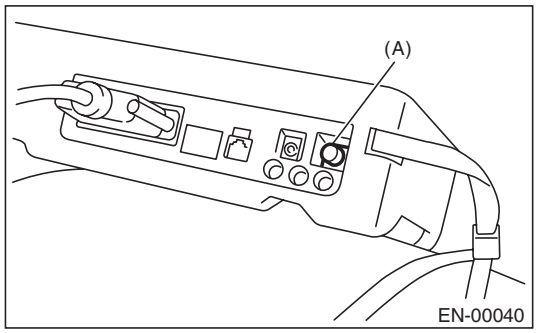


7) Connect the Subaru Select Monitor to data link connector located in the lower portion of the instrument panel (on the driver's side).



CAUTION:
Do not connect any scan tools except Subaru Select Monitor or general scan tool.

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



(A) Power switch

9) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
10) On the «System Selection Menu» display screen, select the {Engine} and press the [YES] key.
11) Press the [YES] key after the information of engine type has been displayed.
12) On the «Engine Diagnosis» screen, select the {D Check} and press the [YES] key.
13) When the "Perform D Check?" is shown on the screen, press the [YES] key.
14) Perform subsequent procedures as instructed on the display screen.

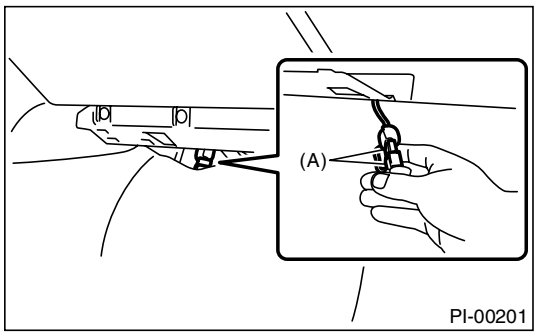
• If trouble still remains in the memory, the corresponding DTC appears on the display screen.

NOTE:
• For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.
• For details concerning DTC, refer to "List of Diagnostic Trouble Code (DTC)".
<Ref. to EN(H6DO)(diag)-66, List of Diagnostic Trouble Code (DTC).>

• Release the parking brake.
• The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunctions. When engine control diagnosis is finished, perform the ABS memory clearance procedure of self-diagnosis function.

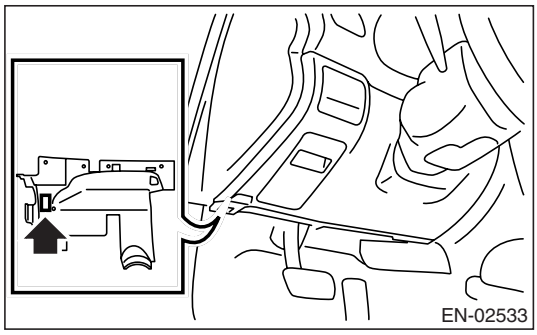
3. GENERAL SCAN TOOL

1) After performing the diagnostics and clearing the memory, check for any remaining unresolved trouble data. <Ref. to EN(H6DO)(diag)-41, Clear Memory Mode.>
2) Idle the engine.
3) Connect the test mode connector (A) located at the lower portion of glove box.



4) Connect the general scan tool to data link connector located in the lower portion of the instrument panel (on the driver's side).

CAUTION:
Do not connect any scan tools except Subaru Select Monitor or general scan tool.



5) Start the engine.

NOTE:
• Ensure the select lever is placed in "P" position before starting. (AT model)
• Depress the clutch pedal when starting the engine. (MT model)

6) Using the select lever or shift lever, turn the "P" position switch and the "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” position (AT model) or “1st” gear (MT model) and drive the vehicle at 5 to 10 km/h (3 to 6 MPH).

NOTE:
• On AWD vehicles, release the parking brake.
• The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunctions. When engine control diagnosis is finished, perform the ABS memory clearance procedure of self-diagnosis system.

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

NOTE:
• For detailed operation procedure, refer to the general scan tool operation manual.
• For details concerning DTC, refer to “List of Diagnostic Trouble Code (DTC)”.
<Ref. to EN(H6DO)(diag)-66, List of Diagnostic Trouble Code (DTC).>

12.Drive Cycle

A: PROCEDURE

There are three drive patterns for the trouble diagnosis. Driving in the specified pattern allows to diagnose malfunctioning items listed below. After the repair of the following trouble items, be sure to drive the vehicle with the specified drive patterns to check whether the function is resumed correctly.

1. PREPARATION FOR DRIVE CYCLE

1) Check that the battery voltage is more than 12 V and fuel remains half [20 — 40 ℓ (5.3 — 10.6 US gal, 4.4 — 8.8 Imp gal)].
2) After performing the diagnostics and clearing the memory, check for any remaining unresolved trouble data. <Ref. to EN(H6DO)(diag)-41, Clear Memory Mode.>
3) Separate the test mode connector.

NOTE:
• Perform the diagnosis after warming up the engine except the engine coolant temperature is specified at starting.
• Perform the diagnosis twice if the DTC marked with *. After completing the first diagnosis, stop the engine and perform second diagnosis in same condition.

2. DRIVE THE VEHICLE WITH 80 KM/H (50 MPH) FOR 20 MINUTES, AND THEN IDLE THE ENGINE FOR A MINUTE.

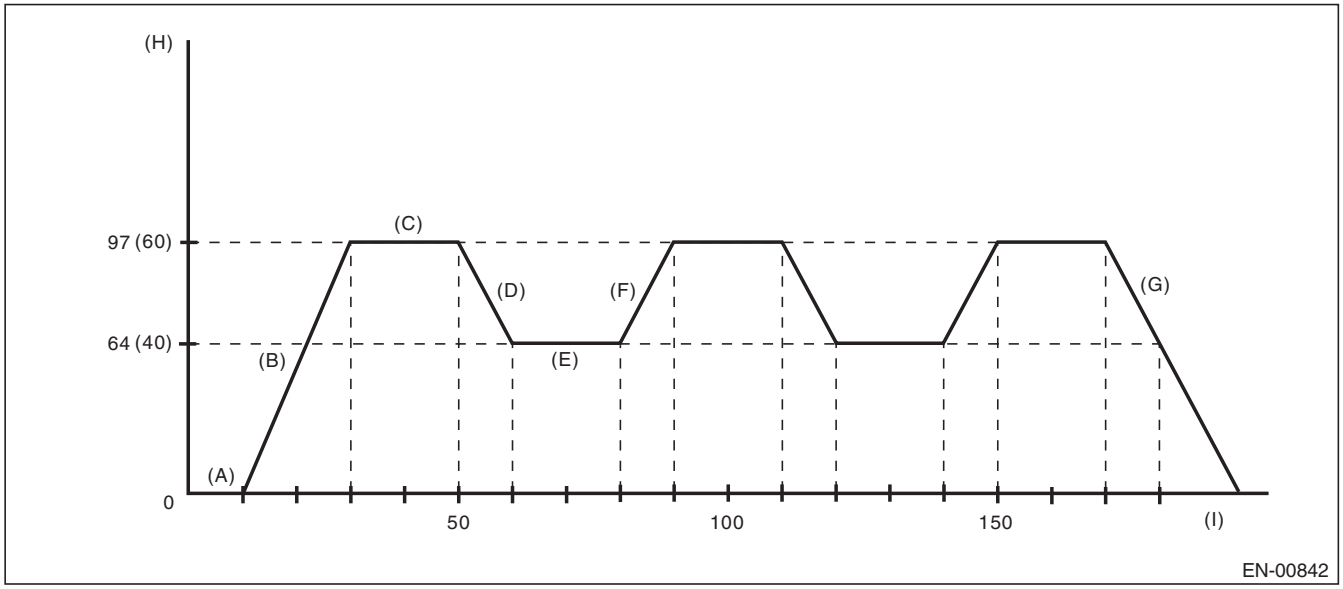
DTC	Item	On condition
*P0125	Insufficient Coolant Temperature for Closed Loop Fuel Control	Engine coolant temperature at engine start is 20°C (68°F) or less.
*P0133	O2 Sensor Circuit Slow Response (Bank 1 Sensor 1)	—
*P0153	O2 Sensor Circuit Slow Response (Bank 2 Sensor 1)	—
*P0420	Catalyst System Efficiency Below Threshold (Bank 1)	—

3. 10 MINUTES IDLING

NOTE:
Drive the vehicle in more than 10 km/h (6 MPH) before diagnosis.

DTC	Item	On condition
*P0030	HO2S Heater Control Circuit (Bank 1 Sensor 1)	—
*P0050	HO2S Heater Control Circuit (Bank 2 Sensor 1)	—
*P0459	Evaporative Emission System Purge Control Valve Circuit High	—

4. DRIVE ACCORDING TO THE FOLLOWING DRIVE PATTERN



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

DTC	Item	On condition
P0026	Intake Valve Control Solenoid Circuit Range/performance (Bank 1)	—
P0028	Intake Valve Control Solenoid Circuit Range/performance (Bank 2)	—
P0076	Intake Valve Control Solenoid Circuit Low (Bank 1)	—
P0082	Intake Valve Control Solenoid Circuit Low (Bank 2)	—
*P0101	Mass or Volume Air Flow Circuit Range/Performance	—
P0134	O2 Sensor Circuit No Activity Detected (Bank 1 Sensor 1)	—
P0154	O2 Sensor Circuit No Activity Detected (Bank 2 Sensor 1)	—
*P0301	Cylinder 1 Misfire Detected	Diagnosis may complete at once
*P0302	Cylinder 2 Misfire Detected	Diagnosis may complete at once
*P0303	Cylinder 3 Misfire Detected	Diagnosis may complete at once
*P0304	Cylinder 4 Misfire Detected	Diagnosis may complete at once
*P0305	Cylinder 5 Misfire Detected	Diagnosis may complete at once
*P0306	Cylinder 6 Misfire Detected	Diagnosis may complete at once
P0400	Exhaust Gas Recirculation Flow	—
P1492	EGR Solenoid Valve Signal #1 Circuit Malfunction (Low Input)	—
P1493	EGR Solenoid Valve Signal #1 Circuit Malfunction (High Input)	—
P1494	EGR Solenoid Valve Signal #2 Circuit Malfunction (Low Input)	—
P1495	EGR Solenoid Valve Signal #2 Circuit Malfunction (High Input)	—
P1496	EGR Solenoid Valve Signal #3 Circuit Malfunction (Low Input)	—
P1497	EGR Solenoid Valve Signal #3 Circuit Malfunction (High Input)	—
P1498	EGR Solenoid Valve Signal #4 Circuit Malfunction (Low Input)	—
P1499	EGR Solenoid Valve Signal #4 Circuit Malfunction (High Input)	—
P2504	Charging System Voltage High	—

13. Clear Memory Mode

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} and press the [YES] key.
3) Press the [YES] key after the information of engine type has been displayed.
4) On the «Engine Diagnosis» display screen, select the {Memory Clear} 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 Subaru Select Monitor power switch to OFF.

NOTE:
• Initial diagnosis of electronic throttle control is performed after memory clearance. For this reason, start the engine after 10 seconds or more have elapsed since the ignition switch was turned to ON.
• 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 {Each System Check} and press the [YES] key.
2) On the «System Selection Menu» display screen, select the {Engine} and press the [YES] key.
3) Press the [YES] key after the information of engine type has been displayed.
4) On the «Engine Diagnosis» display screen, select the {OBD System} and press the [YES] key.
5) On the «OBD Menu» display screen, select the {DTC Clear} and press the [YES] key.
6) When the “Perform Diagnostic Code(s) Clear?” is shown on the screen, press the [YES] key.
7) Turn the ignition switch to OFF and then turn the Subaru Select Monitor power switch to OFF.

NOTE:
• Initial diagnosis of electronic throttle control is performed after memory clearance. For this reason, start the engine after 10 seconds or more have elapsed since the ignition switch was turned to ON.
• For detailed operation procedure, refer to the SUBARU SELECT MONITOR OPERATION MANUAL.

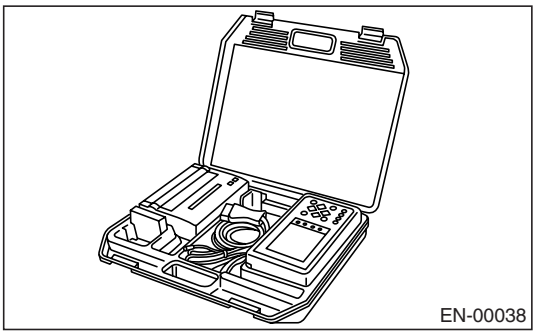
3. GENERAL SCAN TOOL

For clear memory procedures using the general scan tool, refer to the general scan tool operation manual.

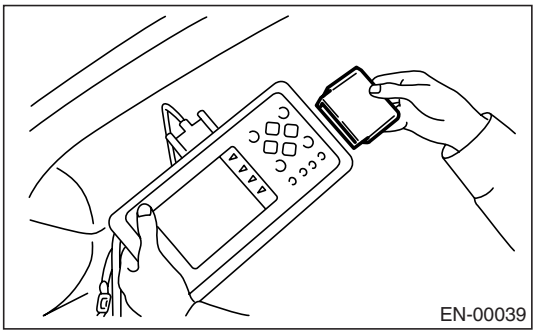
14. Compulsory Valve Operation Check Mode

A: OPERATION

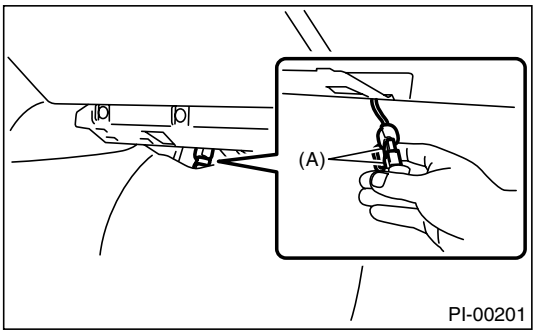
1) Prepare the Subaru Select Monitor kit. <Ref. to EN(H6DO)(diag)-7, PREPARATION TOOL, General Description.>


EN-00038

2) Connect the diagnosis cable to Subaru Select Monitor.
3) Insert the cartridge to Subaru Select Monitor. <Ref. to EN(H6DO)(diag)-7, PREPARATION TOOL, General Description.>

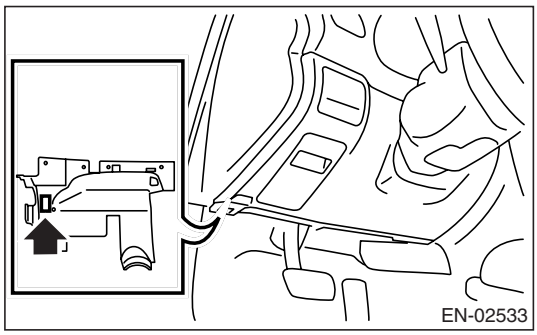

EN-00039

4) Connect the test mode connector (A) located at the lower portion of glove box.



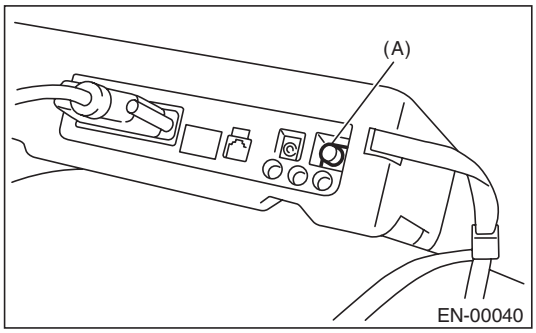
PI-00201

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


EN-02533

CAUTION:
Do not connect any scan tools except Subaru Select Monitor or general scan tool.

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



EN-00040

(A) Power switch

7) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
8) On the «System Selection Menu» display screen, select the {Engine} and press the [YES] key.
9) Press the [YES] key after the information of engine type has been 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 actuator on the «Actuator ON/OFF Operation» display screen and press the [YES] key.
13) Pressing the [NO] key completes the compulsory valve operation check mode. The display will then return to the «Actuator ON/OFF Operation» screen.

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

Description	Display
Compulsory fuel pump relay operation check	Fuel Pump
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

NOTE:
• The following parts will be displayed but not functional.

Display
EGR Solenoid
ASV Solenoid
FICD Solenoid
Pressure Switching Solenoid 1
Pressure Switching Solenoid 2
Supercharger Control Solenoid
PCV Solenoid
Vent Control Solenoid
AAI Solenoid
Atmospheric pressure switching solenoid
Exhaust Bypass Valve Control Permit Flag

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

15.Malfunction Indicator Light

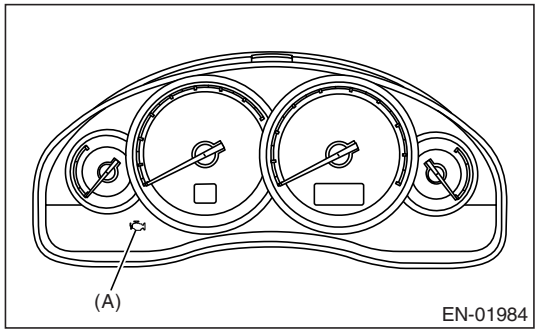
A: PROCEDURE

1. Activation of malfunction indicator light. <Ref. to EN(H6DO)(diag)-45, ACTIVATION OF MALFUNCTION INDICATOR LIGHT, Malfunction Indicator Light.>
↓
2. Check that the malfunction indicator light does not come on. <Ref. to EN(H6DO)(diag)-46, MALFUNCTION INDICATOR LIGHT DOES NOT COME ON, Malfunction Indicator Light.>
↓
3. Check that the malfunction indicator light does not go off. <Ref. to EN(H6DO)(diag)-48, MALFUNCTION INDICATOR LIGHT DOES NOT GO OFF., Malfunction Indicator Light.>
↓
4. Check that the malfunction indicator light does not blink. <Ref. to EN(H6DO)(diag)-49, MALFUNCTION INDICATOR LIGHT DOES NOT BLINK., Malfunction Indicator Light.>
↓
5. Check that the malfunction indicator light remains blinking. <Ref. to EN(H6DO)(diag)-51, MALFUNCTION INDICATOR LIGHT REMAINS BLINKING., Malfunction Indicator Light.>

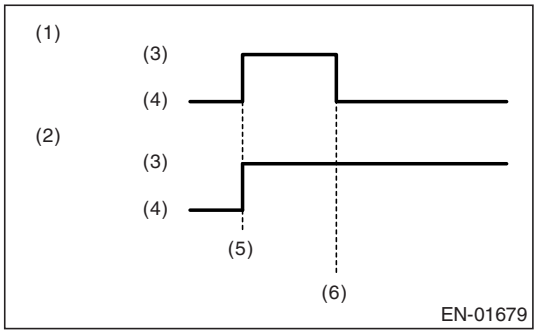
B: ACTIVATION OF MALFUNCTION INDICATOR LIGHT

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

NOTE:
If the malfunction indicator light does not illuminate, perform the diagnosis of malfunction indicator light circuit or the combination meter circuit. <Ref. to EN(H6DO)(diag)-46, MALFUNCTION INDICATOR LIGHT DOES NOT COME ON, Malfunction Indicator Light.>

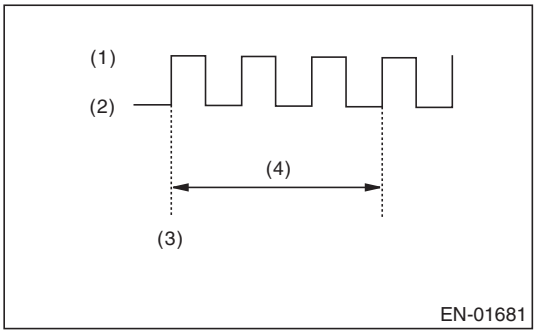


2) After starting the engine, the malfunction indicator light goes out. If it does not, either the engine or emission control system is malfunctioning.



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

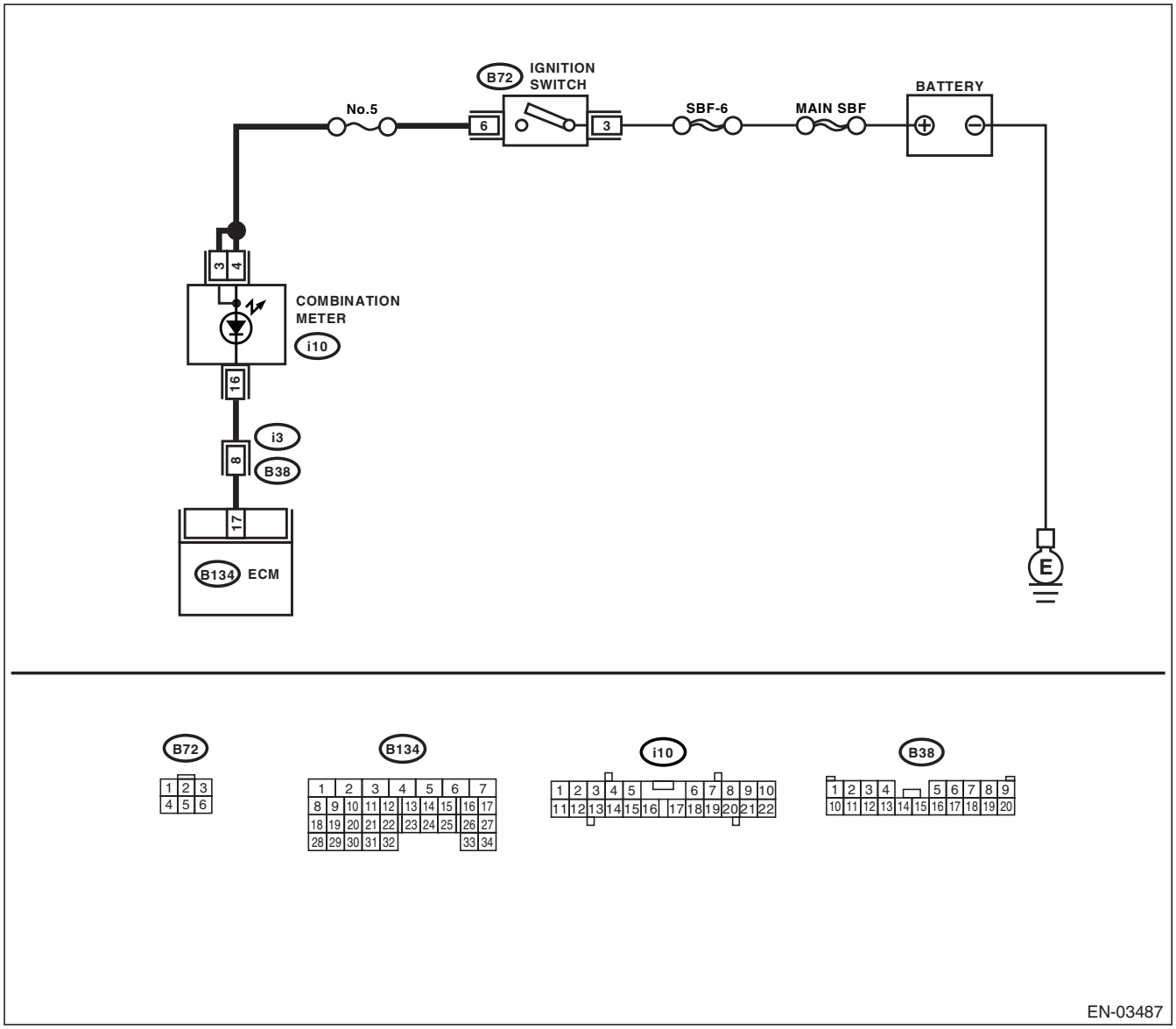
3) Turn the ignition switch to OFF and connect the test mode connector.
(1) When the ignition switch is turned to ON (engine OFF), the malfunction indicator light illuminates.
(2) After the engine starts, malfunction indicator light blinks in a cycle of 0.5 Hz. (during diagnosis)
(3) Malfunction indicator light blinks at a cycle of 3 Hz after diagnosis if there is no trouble. Malfunction indicator light illuminates if faulty.



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

C: MALFUNCTION INDICATOR LIGHT DOES NOT COME ON

DIAGNOSIS:
The malfunction indicator light circuit is open or 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*** ***(B134) No. 17 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **4.**	Go to step **2.**
2	**CHECK POOR CONTACT.** Check for poor connection by shaking or pulling ECM connector and harness.	Does the malfunction indicator light illuminate?	Repair the poor contact in ECM connector.	Go to step **3.**

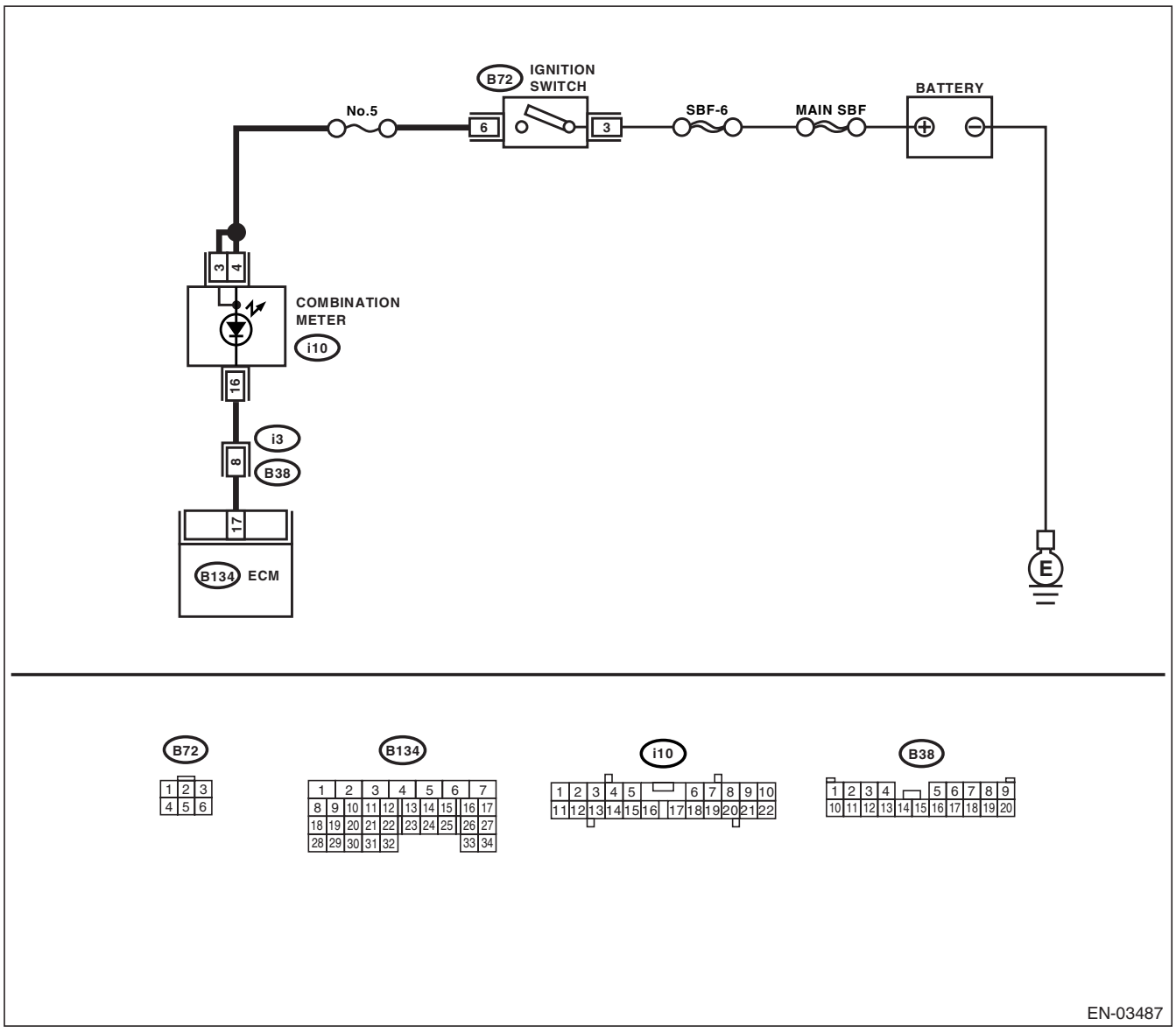
	Step	Check	Yes	No
3	**CHECK ECM CONNECTOR.** Check the connection of ECM connector.	Is the ECM connector correctly connected?	Replace the ECM. <Ref. to FU(H6DO)-34, Engine Control Module (ECM).>	Repair the connection of ECM connector.
4	**CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Remove the combination meter. <Ref. to IDI-15, Combination Meter.> 3) Disconnect the connector from ECM and combination meter. 4) Measure the resistance of harness between ECM and combination meter connector. ***Connector & terminal*** ***(B134) No. 17 — (i10) No. 16:***	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 of harness between ECM and combination meter connector • Poor contact in coupling connector
5	**CHECK POOR CONTACT.** Check poor contact in combination meter connector.	Is there poor contact in combination meter connector?	Repair poor contact in combination meter connector.	Go to step **6.**
6	**CHECK HARNESS BETWEEN COMBINATION METER AND IGNITION SWITCH CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between combination meter connector and chassis ground. ***Connector & terminal*** ***(i10) No. 3 (+) — Chassis ground (−):*** ***(i10) No. 4 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Replace the meter case assembly of combination meter. <Ref. to IDI-15, Combination Meter.>	Check the following and repair if necessary. NOTE: • Blown out fuse (No. 5) • Open or short circuit of harness between fuse (No. 5) and battery terminal • Poor contact in ignition switch connector

D: MALFUNCTION INDICATOR LIGHT DOES NOT GO OFF.

DIAGNOSIS:
The malfunction indicator light circuit is shorted.

TROUBLE SYMPTOM:
Although malfunction indicator light comes on when the engine runs, DTC is not shown on the Subaru Select Monitor 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 illuminate?	Repair short circuit of harness between combination meter and ECM connector.	Replace the ECM. <Ref. to FU(H6DO)-34, Engine Control Module (ECM).>

E: MALFUNCTION INDICATOR LIGHT DOES NOT BLINK.

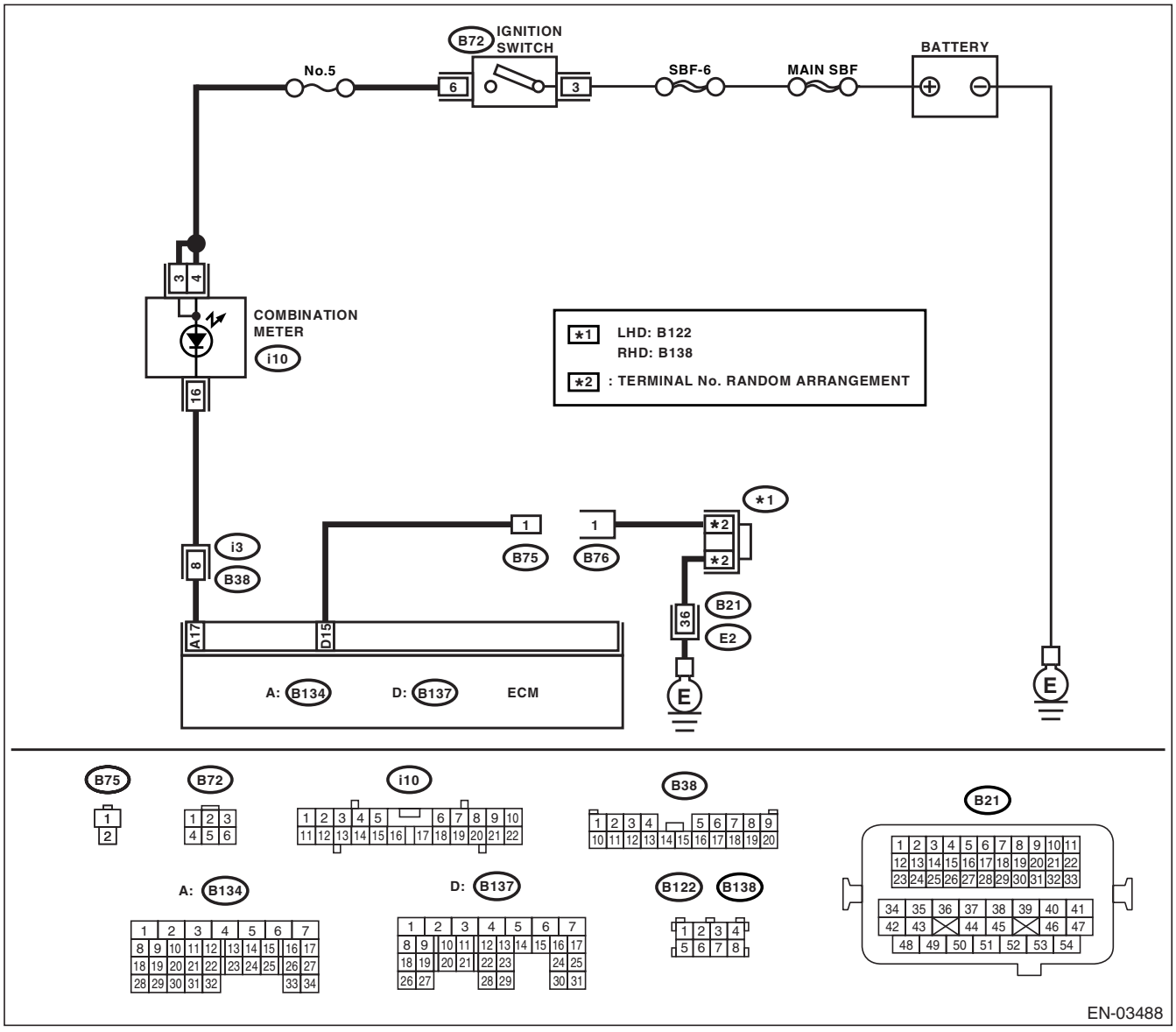
DIAGNOSIS:

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

TROUBLE SYMPTOM:

Malfunction indicator light does not blink during inspection mode.

WIRING DIAGRAM:



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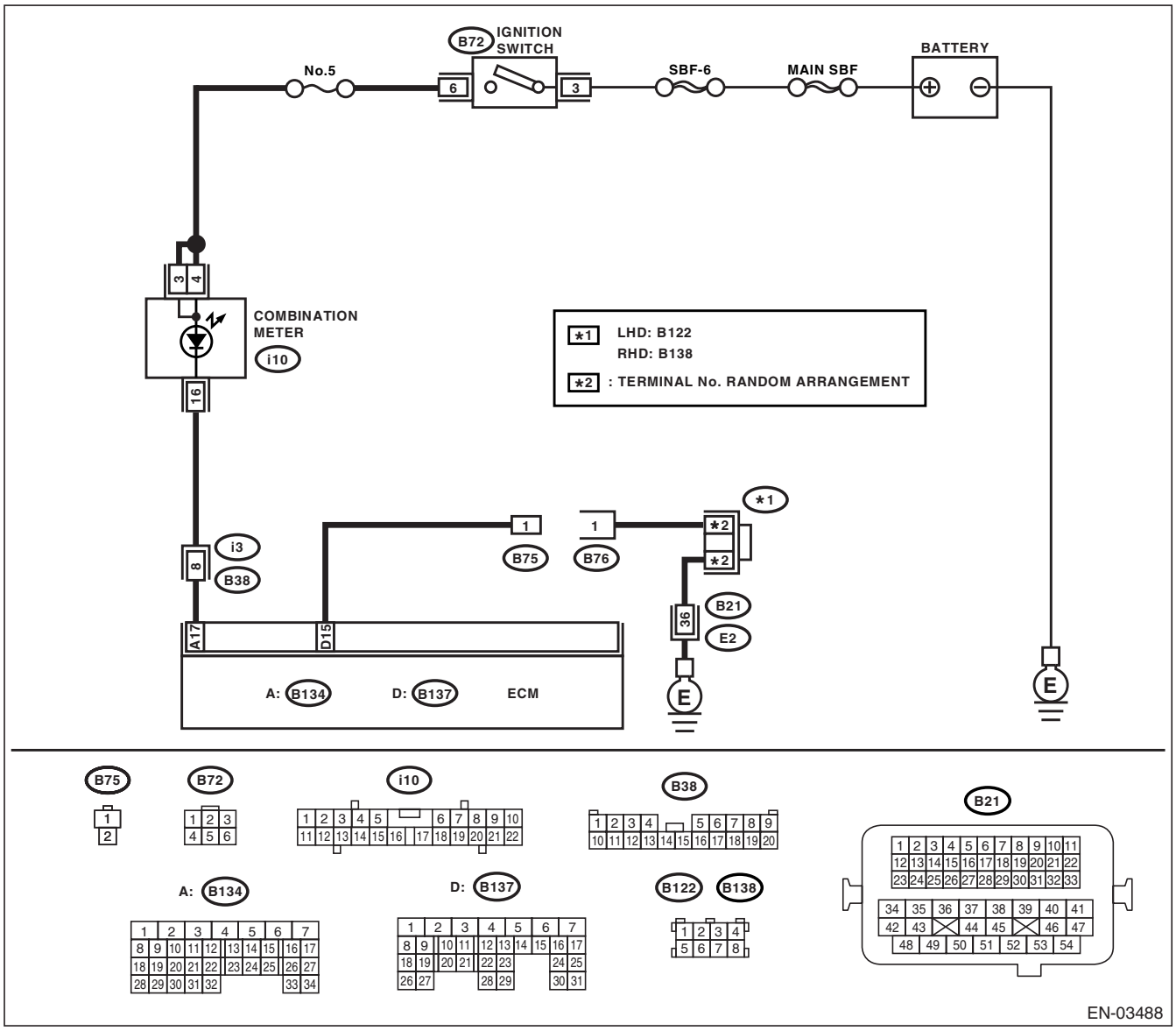
	Step	Check	Yes	No
1	**CHECK STATUS OF MALFUNCTION INDICATOR LIGHT.** 1) Turn the ignition switch to OFF. 2) Disconnect the test mode connectors. 3) Turn the ignition switch to ON. (engine OFF)	Does the malfunction indicator light illuminate?	Go to step **2.**	Repair the malfunction indictor light circuit. <Ref. to EN(H6DO)(diag)-46, 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 illuminate?	Repair short circuit of 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 of 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*** ***(B137) No. 15 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **6.**	Repair the open circuit of 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(H6DO)-34, Engine Control Module (ECM).>

F: MALFUNCTION INDICATOR LIGHT REMAINS BLINKING.

DIAGNOSIS:
Test mode connector circuit is shorted.
TROUBLE SYMPTOM:
Malfunction indicator light blinks when test mode connector is not connected.
WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK TEST MODE CONNECTOR.** 1) Disconnect the test mode connectors. 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 when test mode connector is connected.
2	**CHECK HARNESS BETWEEN ECM CONNECTOR AND CHASSIS 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*** ***(B137) No. 15 — Chassis ground:***	Is the resistance less than 5 Ω?	Repair the short circuit of harness between ECM and test mode connector.	Replace the ECM. <Ref. to FU(H6DO)-34, Engine Control Module (ECM).>

16.Diagnostics for Engine Starting Failure

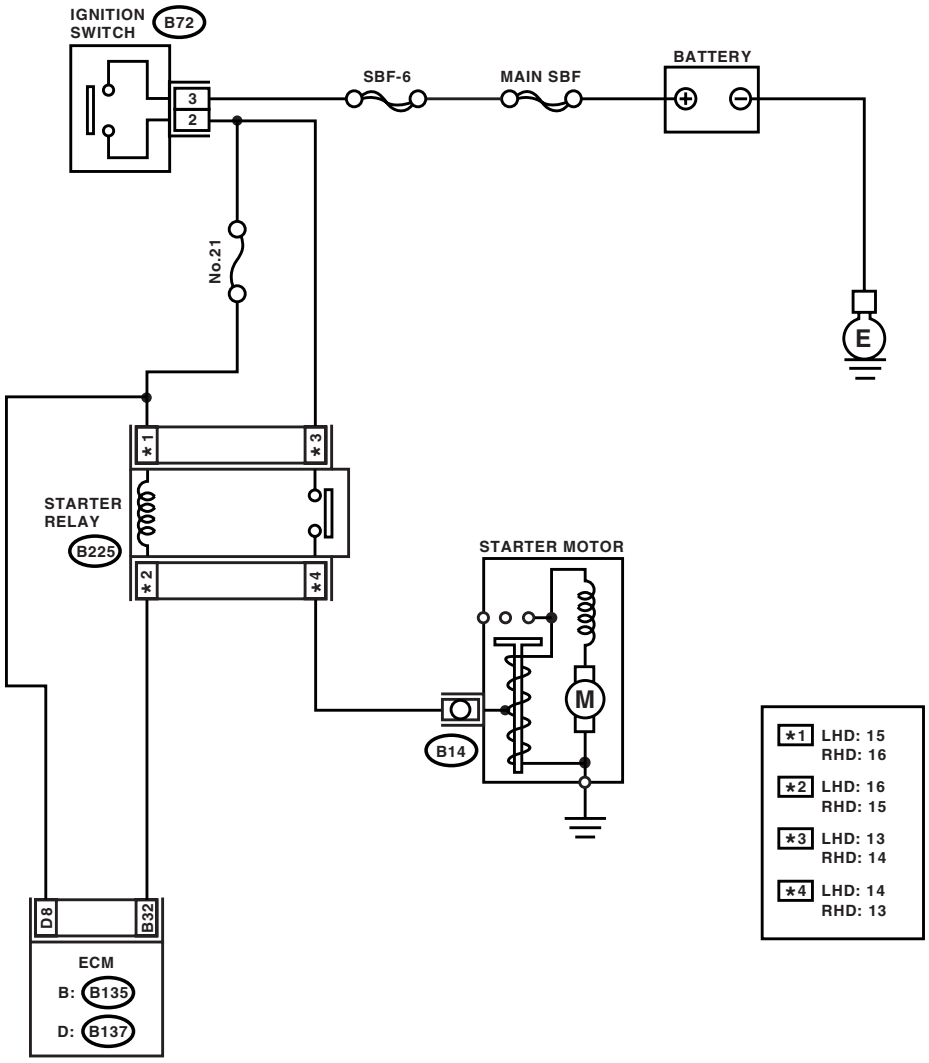
A: PROCEDURE

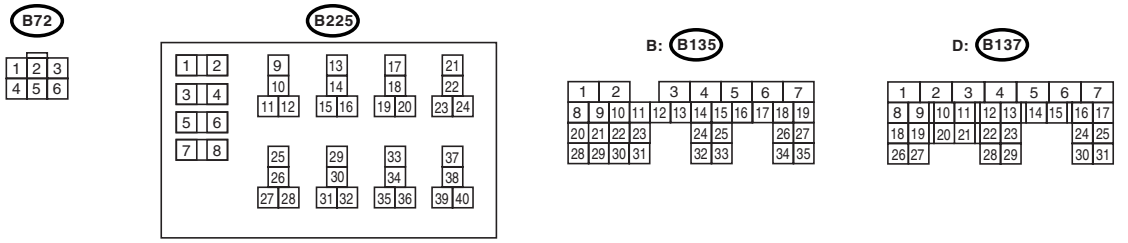
1. Check for fuel amount.
↓
2. Inspection of starter motor circuit. <Ref. to EN(H6DO)(diag)-54, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
3. Inspection of ECM power supply and ground line. <Ref. to EN(H6DO)(diag)-57, CHECK POWER SUPPLY AND GROUND LINE OF ENGINE CONTROL MODULE (ECM), Diagnostics for Engine Starting Failure.>
↓
4. Inspection of ignition control system. <Ref. to EN(H6DO)(diag)-60, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>
↓
5. Inspection of fuel pump circuit. <Ref. to EN(H6DO)(diag)-62, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
6. Inspection of fuel injector circuit. <Ref. to EN(H6DO)(diag)-64, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

B: STARTER MOTOR CIRCUIT

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





EN-03489

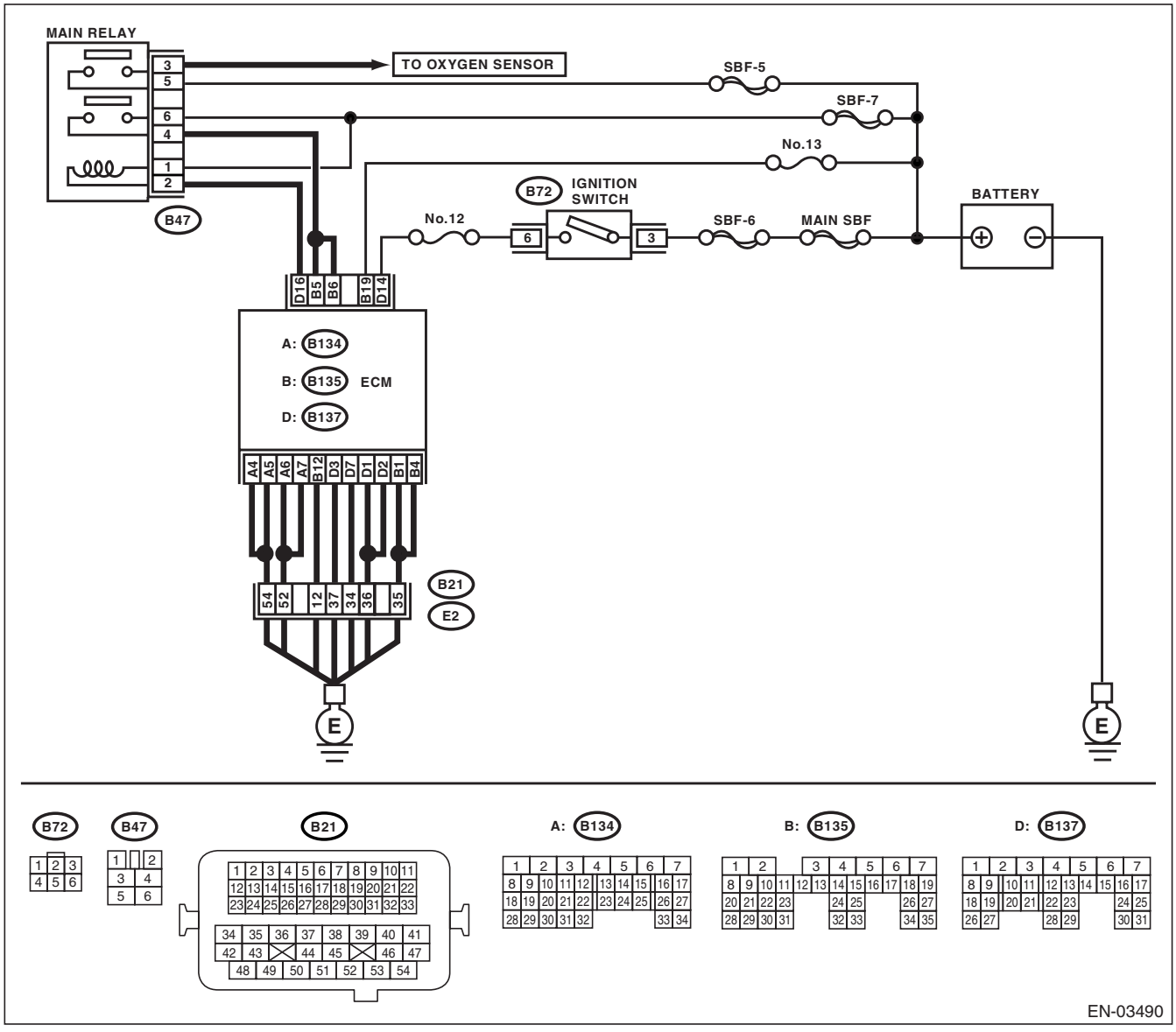
	Step	Check	Yes	No
1	**CHECK BATTERY.** Check the battery voltage.	Is the voltage more than 12 V?	Go to step **2.**	Charge or replace the battery.
2	**CHECK OPERATION OF STARTER MOTOR.**	Does the starter motor operate?	Go to step **3.**	Go to step **4.**
3	**CHECK DTC.**	Is DTC displayed? <Ref. to EN(H6DO)(diag)-33, OPERATION, Read Diagnostic Trouble Code (DTC).>	Inspect the relevant DTC using List of Diagnostic Trouble Code (DTC). <Ref. to EN(H6DO)(diag)-66, List of Diagnostic Trouble Code (DTC).>	Repair the poor contact in ECM connector.
4	**CHECK INPUT SIGNAL OF STARTER MOTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from starter motor. 3) Turn the ignition switch to START. 4) Measure the power supply voltage between starter motor connector terminal and engine ground. ***Connector & terminal*** ***(B14) No. 1 (+) — Engine ground (−):*** NOTE: • For AT model, place the select lever in "P" or "N" range. • For MT model, depress the clutch pedal.	Is the voltage more than 10 V?	Check the starter motor. <Ref. to SC(H4SO 2.0)-6, Starter.>	Go to step **5.**
5	**CHECK HARNESS BETWEEN BATTERY AND IGNITION SWITCH CONNECTOR.** 1) Disconnect the connector from ignition switch. 2) Measure the power supply voltage between ignition switch connector and chassis ground. ***Connector & terminal*** ***(B72) No. 3 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **6.**	Repair the open circuit of harness between ignition switch and battery, and check fuse SBF No. 6 and MAIN SBF.
6	**CHECK IGNITION SWITCH.** 1) Disconnect the connector from ignition switch. 2) Measure the resistance between ignition switch terminals after turning the ignition switch to START position. ***Terminal*** ***No. 2 — No. 3:***	Is the resistance less than 5 Ω?	Go to step **7.**	Replace the ignition switch.
7	**CHECK INPUT VOLTAGE OF STARTER RELAY.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from starter relay. 3) Connect the connector to ignition switch. 4) Measure the input voltage between starter relay connector and chassis ground after turning the ignition switch to START position. ***Connector & terminal*** ***LHD model*** ***(B225) No. 13 (+) — Chassis ground (−):*** ***(B225) No. 15 (+) — Chassis ground (−):*** ***RHD model*** ***(B225) No. 14 (+) — Chassis ground (−):*** ***(B225) No. 16 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **8.**	Repair the open circuit of harness between starter relay and ignition switch.

	Step	Check	Yes	No
8	**CHECK STARTER RELAY.** 1) Connect the battery to starter relay terminals No. 15 and No. 16. 2) Measure the resistance between starter relay terminals. ***Terminal*** ***No. 13 — No. 14:***	Is the resistance less than 1 Ω?	Go to step **9.**	Replace the starter relay.
9	**CHECK INPUT VOLTAGE OF ECM.** 1) Turn the ignition switch to OFF. 2) Connect the connector to starter relay. 3) Disconnect the connector from ECM. 4) Turn the ignition switch to START. 5) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 32 (+) — Chassis ground (−):*** ***(B137) No. 8 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Replace the ECM. <Ref. to FU(H6DO)-34, Engine Control Module (ECM).>	Repair the open or ground short circuit of harness between ECM and starter relay.

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

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Diagnostics for Engine Starting Failure

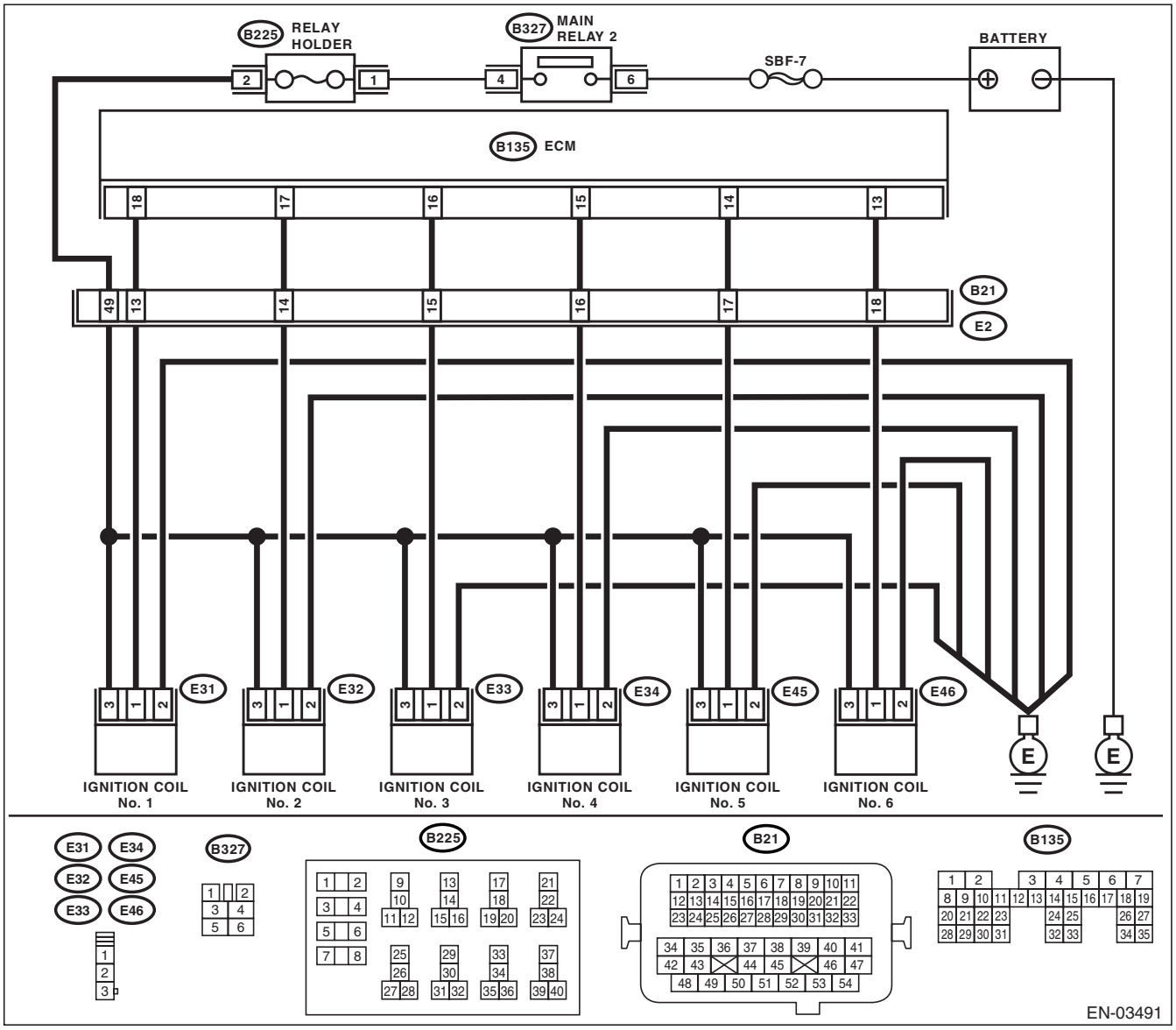
	Step	Check	Yes	No
1	**CHECK MAIN RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the main relay. 3) Connect the battery to main relay terminals No. 1 and No. 2. 4) Measure the resistance between main relay terminals. ***Terminal*** ***No. 3 — No. 5:*** ***No. 4 — No. 6:***	Is the resistance less than 10 Ω?	Go to step **2.**	Replace the main relay.
2	**CHECK GROUND CIRCUIT FOR ECM.** 1) Disconnect the connector from ECM. 2) Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 4 — Chassis ground:*** ***(B134) No. 5 — Chassis ground:*** ***(B134) No. 6 — Chassis ground:*** ***(B134) No. 7 — Chassis ground:*** ***(B135) No. 1 — Chassis ground:*** ***(B135) No. 4 — Chassis ground:*** ***(B135) No. 12 — Chassis ground:*** ***(B137) No. 1 — Chassis ground:*** ***(B137) No. 2 — Chassis ground:*** ***(B137) No. 3 — Chassis ground:*** ***(B137) No. 7 — Chassis ground:***	Is the resistance less than 5 Ω?	Go to step **3.**	Repair the open circuit of 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*** ***(B135) No. 19 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **4.**	Repair the open or ground short circuit of power supply circuit.
4	**CHECK INPUT VOLTAGE OF ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 14 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **5.**	Repair the open or ground short circuit of power supply circuit.
5	**CHECK INPUT VOLTAGE OF MAIN RELAY.** Measure the voltage between main relay connector and chassis ground. ***Connector & terminal*** ***(B47) No. 1 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **6.**	Repair the open circuit of harness between ECM connector and main relay connector.
6	**CHECK INPUT VOLTAGE OF ECM.** 1) Connect the connectors to ECM and main relay. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 16 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **7.**	Repair the open or ground short circuit of harness between ECM connector and main relay connector.
7	**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 **8.**	Repair the open or ground short circuit of harness of power supply circuit.

	Step	Check	Yes	No
8	**CHECK INPUT VOLTAGE OF ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 5 (+) — Chassis ground (−):*** ***(B135) No. 6 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Check ignition control system. <Ref. to EN(H6DO)(diag)-60, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>	Repair the open or ground short circuit of harness between ECM connector and main relay connector.

D: IGNITION CONTROL SYSTEM

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK SPARK PLUG CONDITION.** 1) Remove the spark plug. <Ref. to IG(H6DO)-4, REMOVAL, Spark Plug.> 2) Check the spark plug condition. <Ref. to IG(H6DO)-5, INSPECTION, Spark Plug.>	Is the spark plug's status OK?	Go to step **2.**	Replace the spark plug.

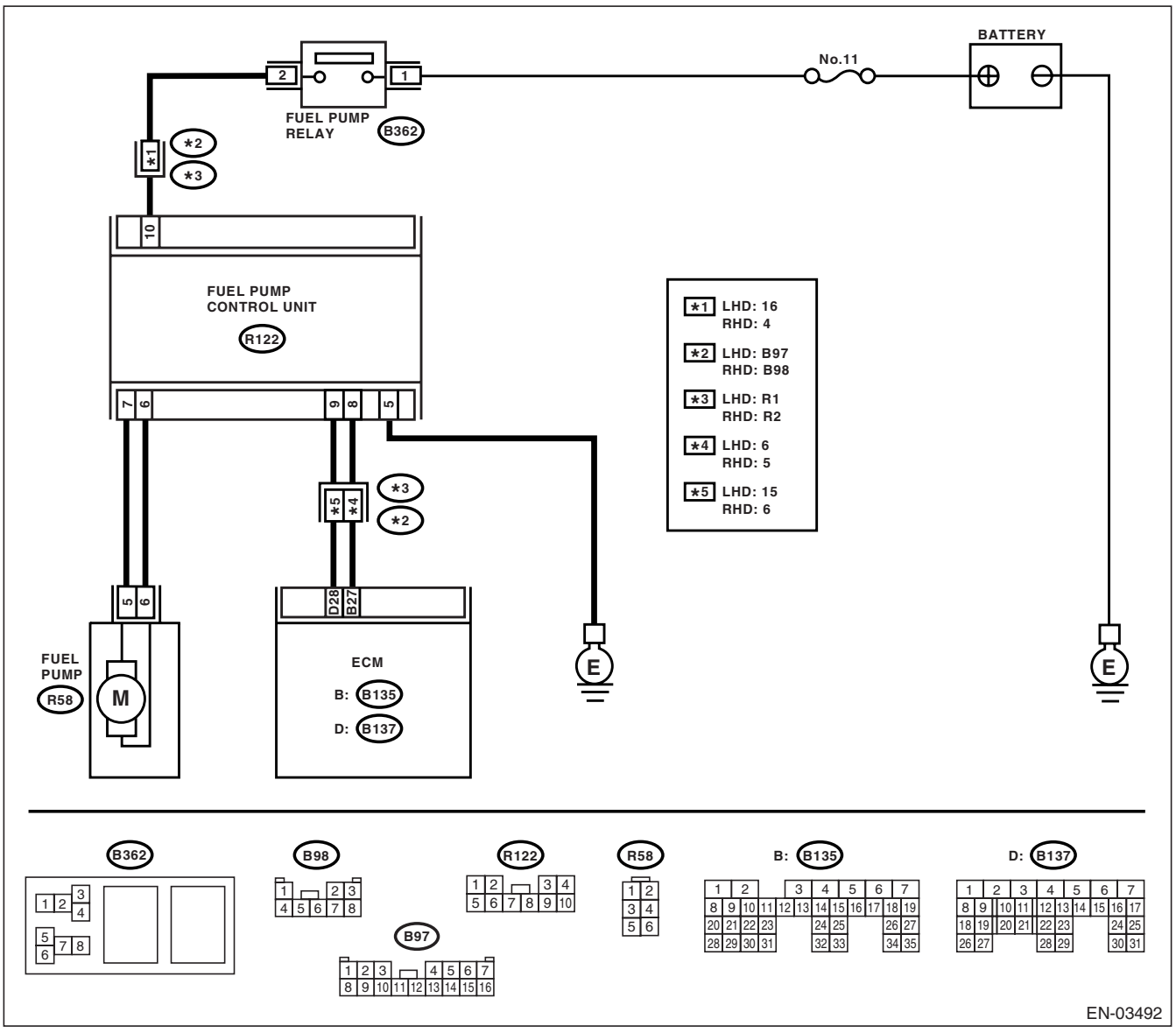
	Step	Check	Yes	No
2	**CHECK IGNITION SYSTEM FOR SPARKS.** 1) Connect the spark plug to ignition coil. 2) Release the fuel pressure. 3) Contact the spark plug's thread portion on engine. 4) While opening the throttle valve fully, start the engine to check if spark occurs at each cylinder.	Does spark occur at each cylinder?	Check fuel pump system. <Ref. to EN(H6DO)(diag)-62, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>	Go to step **3.**
3	**CHECK POWER SUPPLY CIRCUIT OF IGNITION COIL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ignition coil. 3) Turn the ignition switch to ON. 4) Measure the power supply voltage between ignition coil connector and engine ground. ***Connector & terminal*** ***(E31) No. 3 (+) — Engine ground (−):*** ***(E32) No. 3 (+) — Engine ground (−):*** ***(E33) No. 3 (+) — Engine ground (−):*** ***(E34) No. 3 (+) — Engine ground (−):*** ***(E45) No. 3 (+) — Engine ground (−):*** ***(E46) No. 3 (+) — Engine ground (−):***	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 of harness between ignition coil and ignition switch connector • Poor contact in coupling connector
4	**CHECK HARNESS OF IGNITION COIL GROUND CIRCUIT.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between ignition coil connector and engine ground. ***Connector & terminal*** ***(E31) No. 2 — Engine ground:*** ***(E32) No. 2 — Engine ground:*** ***(E33) No. 2 — Engine ground:*** ***(E34) No. 2 — Engine ground:*** ***(E45) No. 2 — Engine ground:*** ***(E46) No. 2 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **5.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit of harness between ignition coil connector and engine ground terminal
5	**CHECK HARNESS BETWEEN ECM AND IGNITION COIL CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connector from ignition coil. 4) Measure the resistance of harness between ECM and ignition coil connector. ***Connector & terminal*** ***(B135) No. 18 — (E31) No. 1:*** ***(B135) No. 17 — (E32) No. 1:*** ***(B135) No. 16 — (E33) No. 1:*** ***(B135) No. 15 — (E34) No. 1:*** ***(B135) No. 14 — (E45) No. 1:*** ***(B135) No. 13 — (E46) 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 of harness between ECM and ignition coil connector • Poor contact in coupling connector
6	**CHECK HARNESS BETWEEN ECM AND IGNITION COIL CONNECTOR.** Measure the resistance of harness between ECM and engine ground. ***Connector & terminal:*** ***(B135) No. 18 — Engine ground:*** ***(B135) No. 17 — Engine ground:*** ***(B135) No. 16 — Engine ground:*** ***(B135) No. 15 — Engine ground:*** ***(B135) No. 14 — Engine ground:*** ***(B135) No. 13 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **7.**	Repair the ground short circuit of harness between ECM and ignition coil connector.

Step		Check	Yes	No
7	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Check the fuel pump circuit. <Ref. to EN(H6DO)(diag)-62, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>

E: FUEL PUMP CIRCUIT

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:

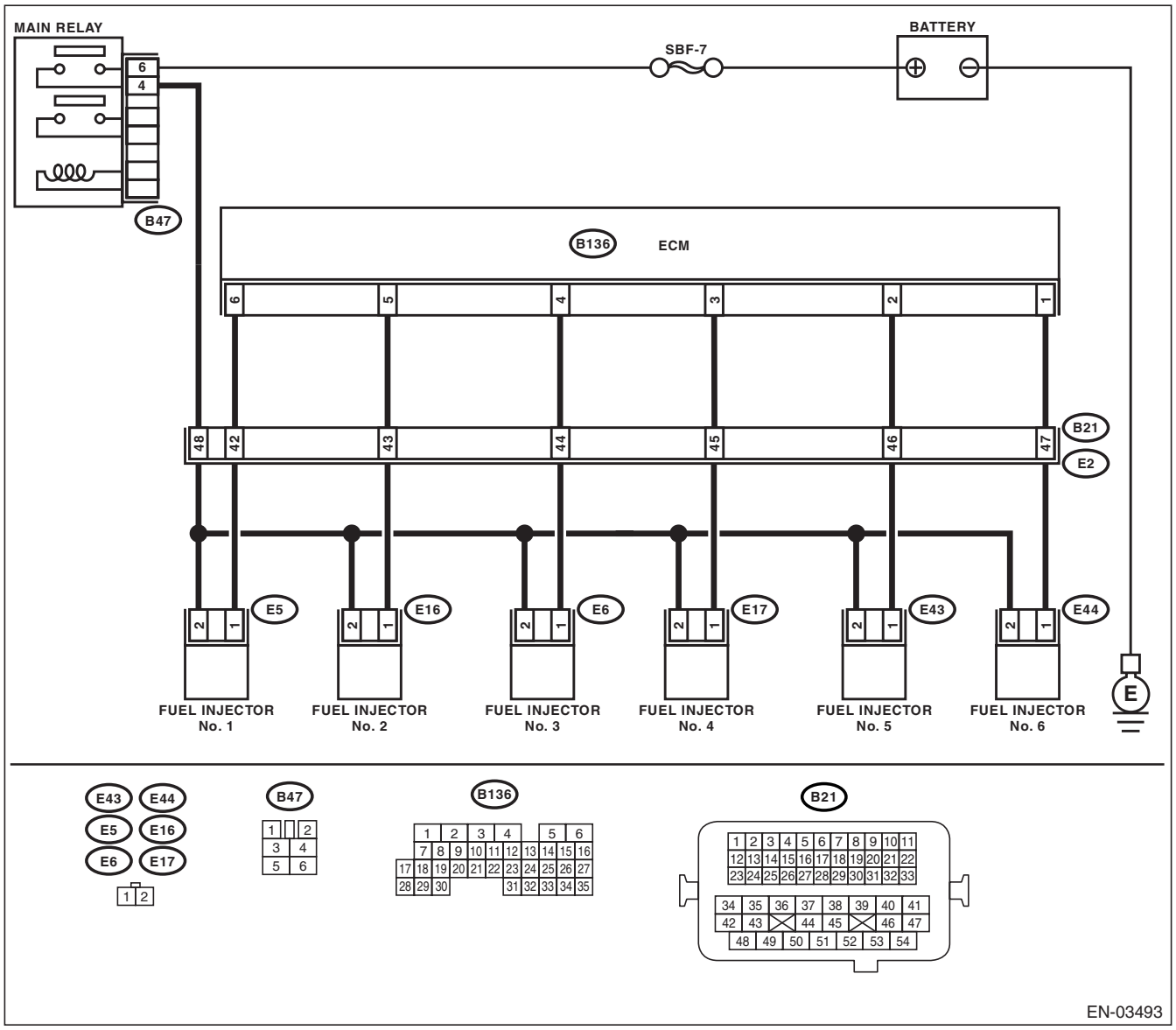


	Step	Check	Yes	No
1	**CHECK OPERATING SOUND OF FUEL PUMP.** Make sure that the fuel pump operates for two seconds when turning the ignition switch to ON. NOTE: Fuel pump operation can also be executed using Subaru Select Monitor. Refer to “Compulsory Valve Operation Check Mode” for procedures. <Ref. to EN(H6DO)(diag)-42, Compulsory Valve Operation Check Mode.>	Does the fuel pump emit operating sound?	Check the fuel injector circuit. <Ref. to EN(H6DO)(diag)-64, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>	Display DTC. <Ref. to EN(H6DO)(diag)-33, OPERATION, Read Diagnostic Trouble Code (DTC).>

F: FUEL INJECTOR CIRCUIT

CAUTION:
- **Check or repair only faulty parts.**
- **After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)(diag)-34, PROCEDURE, Inspection Mode.>.**

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OPERATION OF EACH FUEL INJECTOR.** While cranking the engine, check each fuel injector emits operating sound. Use a sound scope or attach a screwdriver to the injector for this check.	Does the fuel pump emit operating sound?	Check the fuel pressure. <Ref. to ME(H6DO)-27, INSPECTION, Fuel Pressure.>	Go to step **2.**

	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 fuel injector terminal and engine ground. ***Connector & terminal*** ***#1 (E5) No. 2 (+) — Engine ground (−):*** ***#2 (E16) No. 2 (+) — Engine ground (−):*** ***#3 (E6) No. 2 (+) — Engine ground (−):*** ***#4 (E17) No. 2 (+) — Engine ground (−):*** ***#5 (E43) No. 2 (+) — Engine ground (−):*** ***#6 (E44) No. 2 (+) — Engine ground (−):***	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 of 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*** ***#1 (B136) No. 6 — (E5) No. 1:*** ***#2 (B136) No. 5 — (E16) No. 1:*** ***#3 (B136) No. 4 — (E6) No. 1:*** ***#4 (B136) No. 3 — (E17) No. 1:*** ***#5 (B136) No. 2 — (E43) No. 1:*** ***#6 (B136) No. 1 — (E44) 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 of 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*** ***#1 (B136) No. 6 — Chassis ground:*** ***#2 (B136) No. 5 — Chassis ground:*** ***#3 (B136) No. 4 — Chassis ground:*** ***#4 (B136) No. 3 — Chassis ground:*** ***#5 (B136) No. 2 — Chassis ground:*** ***#6 (B136) No. 1 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair the ground short circuit of harness between ECM and fuel injector connector.
5	**CHECK EACH FUEL INJECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between each fuel injector terminals. ***Terminal*** ***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(H6DO)(diag)-269, INSPECTION, General Diagnostic Table.>

17.List of Diagnostic Trouble Code (DTC)

A: LIST

DTC	Item	Reference
P0011	Intake Camshaft Position-Timing Over-Advanced or System performance (Bank 1)	<Ref. to EN(H6DO)(diag)-72, DTC P0011 INTAKE CAMSHAFT POSITION-TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0021	Intake Camshaft Position-Timing Over-Advanced or System performance (Bank 2)	<Ref. to EN(H6DO)(diag)-73, DTC P0021 INTAKE CAMSHAFT POSITION-TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0026	Intake Valve Control Solenoid Circuit Range/performance (Bank 1)	<Ref. to EN(H6DO)(diag)-74, DTC P0026 INTAKE VALVE CONTROL SOLENOID CIRCUIT RANGE/PERFORMANCE (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0028	Intake Valve Control Solenoid Circuit Range/performance (Bank 2)	<Ref. to EN(H6DO)(diag)-76, DTC P0028 INTAKE VALVE CONTROL SOLENOID CIRCUIT RANGE/PERFORMANCE (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0030	HO2S Heater Control Circuit (Bank 1 Sensor 1)	<Ref. to EN(H6DO)(diag)-78, DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0031	HO2S Heater Control Circuit Low (Bank 1 Sensor 1)	<Ref. to EN(H6DO)(diag)-80, DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0032	HO2S Heater Control Circuit High (Bank 1 Sensor 1)	<Ref. to EN(H6DO)(diag)-83, DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0037	HO2S Heater Control Circuit Low (Bank 1 Sensor 2)	<Ref. to EN(H6DO)(diag)-85, DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0038	HO2S Heater Control Circuit High (Bank 1 Sensor 2)	<Ref. to EN(H6DO)(diag)-88, DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0050	HO2S Heater Control Circuit (Bank 2 Sensor 1)	<Ref. to EN(H6DO)(diag)-90, DTC P0050 HO2S HEATER CONTROL CIRCUIT (BANK 2 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0051	HO2S Heater Control Circuit Low (Bank 2 Sensor 1)	<Ref. to EN(H6DO)(diag)-92, DTC P0051 HO2S HEATER CONTROL CIRCUIT LOW (BANK 2 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0052	HO2S Heater Control Circuit High (Bank 2 Sensor 1)	<Ref. to EN(H6DO)(diag)-95, DTC P0052 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 2 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0057	HO2S Heater Control Circuit Low (Bank 2 Sensor 2)	<Ref. to EN(H6DO)(diag)-97, DTC P0057 HO2S HEATER CONTROL CIRCUIT LOW (BANK 2 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0058	HO2S Heater Control Circuit High (Bank 2 Sensor 2)	<Ref. to EN(H6DO)(diag)-100, DTC P0058 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 2 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0076	Intake Valve Control Solenoid Circuit Low (Bank 1)	<Ref. to EN(H6DO)(diag)-102, DTC P0076 INTAKE VALVE CONTROL SOLENOID CIRCUIT LOW (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0077	Intake Valve Control Solenoid Circuit High (Bank 1)	<Ref. to EN(H6DO)(diag)-104, DTC P0077 INTAKE VALVE CONTROL SOLENOID CIRCUIT HIGH (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0082	Intake Valve Control Solenoid Circuit Low (Bank 2)	<Ref. to EN(H6DO)(diag)-106, DTC P0082 INTAKE VALVE CONTROL SOLENOID CIRCUIT LOW (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0083	Intake Valve Control Solenoid Circuit High (Bank 2)	<Ref. to EN(H6DO)(diag)-108, DTC P0083 INTAKE VALVE CONTROL SOLENOID CIRCUIT HIGH (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	Reference
P0101	Mass or Volume Air Flow Circuit Range/Performance	<Ref. to EN(H6DO)(diag)-110, 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(H6DO)(diag)-112, 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(H6DO)(diag)-115, 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(H6DO)(diag)-117, DTC P0107 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0108	Manifold Absolute Pressure/Barometric Pressure Circuit High Input	<Ref. to EN(H6DO)(diag)-120, DTC P0108 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0112	Intake Air Temperature Sensor 1 Circuit Low	<Ref. to EN(H6DO)(diag)-123, DTC P0112 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0113	Intake Air Temperature Sensor 1 Circuit High	<Ref. to EN(H6DO)(diag)-125, DTC P0113 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0117	Engine Coolant Temperature Circuit Low	<Ref. to EN(H6DO)(diag)-128, DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0118	Engine Coolant Temperature Circuit High	<Ref. to EN(H6DO)(diag)-130, DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0122	Throttle/Pedal Position Sensor/ Switch “A” Circuit Low	<Ref. to EN(H6DO)(diag)-133, DTC P0122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0123	Throttle/Pedal Position Sensor/ Switch “A” Circuit High	<Ref. to EN(H6DO)(diag)-135, DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0125	Insufficient Coolant Temperature for Closed Loop Fuel Control	<Ref. to EN(H6DO)(diag)-137, DTC P0125 INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0131	O2 Sensor Circuit Low Voltage (Bank 1 Sensor 1)	<Ref. to EN(H6DO)(diag)-138, DTC P0131 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0132	O2 Sensor Circuit High Voltage (Bank 1 Sensor 1)	<Ref. to EN(H6DO)(diag)-140, DTC P0132 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0133	O2 Sensor Circuit Slow Response (Bank 1 Sensor 1)	<Ref. to EN(H6DO)(diag)-142, DTC P0133 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0134	O2 Sensor Circuit No Activity Detected (Bank 1 Sensor 1)	<Ref. to EN(H6DO)(diag)-143, DTC P0134 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0137	O2 Sensor Circuit Low Voltage (Bank 1 Sensor 2)	<Ref. to EN(H6DO)(diag)-146, DTC P0137 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0138	O2 Sensor Circuit High Voltage (Bank 1 Sensor 2)	<Ref. to EN(H6DO)(diag)-149, DTC P0138 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0151	O2 Sensor Circuit Low Voltage (Bank 2 Sensor 1)	<Ref. to EN(H6DO)(diag)-152, DTC P0151 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 2 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

List of Diagnostic Trouble Code (DTC)

DTC	Item	Reference
P0152	O2 Sensor Circuit High Voltage (Bank 2 Sensor 1)	<Ref. to EN(H6DO)(diag)-154, DTC P0152 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 2 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0153	O2 Sensor Circuit Slow Response (Bank 2 Sensor 1)	<Ref. to EN(H6DO)(diag)-156, DTC P0153 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 2 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0154	O2 Sensor Circuit No Activity Detected (Bank 2 Sensor 1)	<Ref. to EN(H6DO)(diag)-157, DTC P0154 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 2 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0157	O2 Sensor Circuit Low Voltage (Bank 2 Sensor 2)	<Ref. to EN(H6DO)(diag)-160, DTC P0157 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 2 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0158	O2 Sensor Circuit High Voltage (Bank 2 Sensor 2)	<Ref. to EN(H6DO)(diag)-163, DTC P0158 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 2 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0171	System Too Lean (Bank 1)	<Ref. to EN(H6DO)(diag)-165, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0172	System Too Rich (Bank 1)	<Ref. to EN(H6DO)(diag)-165, DTC P0172 SYSTEM TOO RICH (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0174	System Too Lean (Bank 2)	<Ref. to EN(H6DO)(diag)-165, DTC P0174 SYSTEM TOO LEAN (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0175	System Too Rich (Bank 2)	<Ref. to EN(H6DO)(diag)-166, DTC P0175 SYSTEM TOO RICH (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0197	Engine Oil Temperature Sensor Low	<Ref. to EN(H6DO)(diag)-168, DTC P0197 ENGINE OIL TEMPERATURE SENSOR LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0198	Engine Oil Temperature Sensor High	<Ref. to EN(H6DO)(diag)-170, DTC P0198 ENGINE OIL TEMPERATURE SENSOR HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0222	Throttle/Pedal Position Sensor/ Switch “B” Circuit Low	<Ref. to EN(H6DO)(diag)-172, DTC P0222 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0223	Throttle/Pedal Position Sensor/ Switch “B” Circuit High	<Ref. to EN(H6DO)(diag)-174, DTC P0223 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0230	Fuel Pump Primary Circuit	<Ref. to EN(H6DO)(diag)-176, DTC P0230 FUEL PUMP PRIMARY CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0301	Cylinder 1 Misfire Detected	<Ref. to EN(H6DO)(diag)-179, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0302	Cylinder 2 Misfire Detected	<Ref. to EN(H6DO)(diag)-179, DTC P0302 CYLINDER 2 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0303	Cylinder 3 Misfire Detected	<Ref. to EN(H6DO)(diag)-179, DTC P0303 CYLINDER 3 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0304	Cylinder 4 Misfire Detected	<Ref. to EN(H6DO)(diag)-179, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0305	Cylinder 5 Misfire Detected	<Ref. to EN(H6DO)(diag)-179, DTC P0305 CYLINDER 5 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0306	Cylinder 6 Misfire Detected	<Ref. to EN(H6DO)(diag)-180, DTC P0306 CYLINDER 6 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0327	Knock Sensor 1 Circuit Low (Bank 1 or Single Sensor)	<Ref. to EN(H6DO)(diag)-186, DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW (BANK 1 OR SINGLE SENSOR), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0328	Knock Sensor 1 Circuit High (Bank 1 or Single Sensor)	<Ref. to EN(H6DO)(diag)-188, DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH (BANK 1 OR SINGLE SENSOR), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0332	Knock Sensor 2 Circuit Low (Bank 2)	<Ref. to EN(H6DO)(diag)-190, DTC P0332 KNOCK SENSOR 2 CIRCUIT LOW (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	Reference
P0333	Knock Sensor 2 Circuit High (Bank 2)	<Ref. to EN(H6DO)(diag)-192, DTC P0333 KNOCK SENSOR 2 CIRCUIT HIGH (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0335	Crankshaft Position Sensor “A” Circuit	<Ref. to EN(H6DO)(diag)-194, DTC P0335 CRANKSHAFT POSITION SENSOR “A” CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0340	Camshaft Position Sensor “A” Circuit (Bank 1 or Single Sensor)	<Ref. to EN(H6DO)(diag)-196, DTC P0340 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0345	Camshaft Position Sensor “A” Circuit (Bank 2)	<Ref. to EN(H6DO)(diag)-198, DTC P0345 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0400	Exhaust Gas Recirculation Flow	<Ref. to EN(H6DO)(diag)-200, DTC P0400 EXHAUST GAS RECIRCULATION FLOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0420	Catalyst System Efficiency Below Threshold (Bank 1)	<Ref. to EN(H6DO)(diag)-202, DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0458	Evaporative Emission System Purge Control Valve Circuit Low	<Ref. to EN(H6DO)(diag)-205, DTC P0458 EVAPORATIVE EMISSION SYSTEM PURGE CONTROL VALVE CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0459	Evaporative Emission System Purge Control Valve Circuit High	<Ref. to EN(H6DO)(diag)-207, DTC P0459 EVAPORATIVE EMISSION SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0462	Fuel Level Sensor “A” Circuit Low	<Ref. to EN(H6DO)(diag)-209, DTC P0462 FUEL LEVEL SENSOR “A” CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0463	Fuel Level Sensor “A” Circuit High	<Ref. to EN(H6DO)(diag)-209, DTC P0463 FUEL LEVEL SENSOR “A” CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0500	Vehicle Speed Sensor “A”	<Ref. to EN(H6DO)(diag)-209, DTC P0500 VEHICLE SPEED SENSOR “A”, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0512	Starter Request Circuit	<Ref. to EN(H6DO)(diag)-209, DTC P0512 STARTER REQUEST CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0519	Idle Air Control System Performance	<Ref. to EN(H6DO)(diag)-211, DTC P0519 IDLE AIR CONTROL SYSTEM PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0600	Serial Communication Link	<Ref. to EN(H6DO)(diag)-211, DTC P0600 SERIAL COMMUNICATION LINK, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0604	Internal Control Module Random Access Memory (RAM) Error	<Ref. to EN(H6DO)(diag)-212, DTC P0604 INTERNAL CONTROL MODULE RANDAM ACCESS MEMORY (RAM) ERROR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0605	Internal Control Module Read Only Memory (ROM) Error	<Ref. to EN(H6DO)(diag)-213, DTC P0605 INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0607	Control Module Performance	<Ref. to EN(H6DO)(diag)-214, DTC P0607 CONTROL MODULE PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0638	Throttle Actuator Control Range/Performance (Bank 1)	<Ref. to EN(H6DO)(diag)-215, DTC P0638 THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0691	Fan 1 Control Circuit Low	<Ref. to EN(H6DO)(diag)-216, DTC P0691 FAN 1 CONTROL CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0692	Fan 1 Control Circuit High	<Ref. to EN(H6DO)(diag)-216, DTC P0692 FAN 1 CONTROL CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0700	Transmission Control System (MIL Request)	<Ref. to EN(H6DO)(diag)-216, DTC P0700 TRANSMISSION CONTROL SYSTEM (MIL REQUEST), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0851	Park/Neutral Switch Input Circuit Low	<Ref. to EN(H6DO)(diag)-217, DTC P0851 PARK/NEUTRAL SWITCH INPUT CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

List of Diagnostic Trouble Code (DTC)

DTC	Item	Reference
P0852	Park/Neutral Switch Input Circuit High	<Ref. to EN(H6DO)(diag)-220, DTC P0852 PARK/NEUTRAL SWITCH INPUT CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1160	Return Spring Failure	<Ref. to EN(H6DO)(diag)-222, DTC P1160 RETURN SPRING FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1492	EGR Solenoid Valve Signal #1 Circuit Malfunction (Low Input)	<Ref. to EN(H6DO)(diag)-222, DTC P1492 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1493	EGR Solenoid Valve Signal #1 Circuit Malfunction (High Input)	<Ref. to EN(H6DO)(diag)-222, DTC P1493 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1494	EGR Solenoid Valve Signal #2 Circuit Malfunction (Low Input)	<Ref. to EN(H6DO)(diag)-222, DTC P1494 EGR SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1495	EGR Solenoid Valve Signal #2 Circuit Malfunction (High Input)	<Ref. to EN(H6DO)(diag)-222, DTC P1495 EGR SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1496	EGR Solenoid Valve Signal #3 Circuit Malfunction (Low Input)	<Ref. to EN(H6DO)(diag)-222, DTC P1496 EGR SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1497	EGR Solenoid Valve Signal #3 Circuit Malfunction (High Input)	<Ref. to EN(H6DO)(diag)-222, DTC P1497 EGR SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1498	EGR Solenoid Valve Signal #4 Circuit Malfunction (Low Input)	<Ref. to EN(H6DO)(diag)-223, DTC P1498 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1499	EGR Solenoid Valve Signal #4 Circuit Malfunction (High Input)	<Ref. to EN(H6DO)(diag)-225, DTC P1499 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1518	Starter Switch Circuit Low Input	<Ref. to EN(H6DO)(diag)-226, DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1560	Back-up Voltage Circuit Malfunction	<Ref. to EN(H6DO)(diag)-229, DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2088	Intake Camshaft Position Actuator Control Circuit Low (Bank 1)	<Ref. to EN(H6DO)(diag)-231, DTC P2088 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2089	Intake Camshaft Position Actuator Control Circuit High (Bank 1)	<Ref. to EN(H6DO)(diag)-233, DTC P2089 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2092	Intake Camshaft Position Actuator Control Circuit Low (Bank 2)	<Ref. to EN(H6DO)(diag)-235, DTC P2092 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2093	Intake Camshaft Position Actuator Control Circuit High (Bank 2)	<Ref. to EN(H6DO)(diag)-237, DTC P2093 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2101	Throttle Actuator Control Motor Circuit Range/Performance	<Ref. to EN(H6DO)(diag)-239, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2102	Throttle Actuator Control Motor Circuit Low	<Ref. to EN(H6DO)(diag)-245, DTC P2102 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2103	Throttle Actuator Control Motor Circuit High	<Ref. to EN(H6DO)(diag)-247, DTC P2103 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	Reference
P2109	Throttle/Pedal Position Sensor “A” Minimum stop performance	<Ref. to EN(H6DO)(diag)-248, DTC P2109 THROTTLE/PEDAL POSITION SENSOR “A” MINIMUM STOP PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2122	Throttle/Pedal Position Sensor/ Switch “D” Circuit Low Input	<Ref. to EN(H6DO)(diag)-249, DTC P2122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2123	Throttle/Pedal Position Sensor/ Switch “D” Circuit High Input	<Ref. to EN(H6DO)(diag)-252, DTC P2123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2127	Throttle/Pedal Position Sensor/ Switch “E” Circuit Low Input	<Ref. to EN(H6DO)(diag)-254, DTC P2127 THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2128	Throttle/Pedal Position Sensor/ Switch “E” Circuit High Input	<Ref. to EN(H6DO)(diag)-257, DTC P2128 THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2135	Throttle/Pedal Position Sensor/ Switch “A”/“B” Voltage Correlation	<Ref. to EN(H6DO)(diag)-259, DTC P2135 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” / “B” VOLTAGE CORRELATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2138	Throttle/Pedal Position Sensor/ Switch “D”/“E” Voltage Correlation	<Ref. to EN(H6DO)(diag)-263, DTC P2138 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” / “E” VOLTAGE CORRELATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2503	Charging System Voltage Low	<Ref. to EN(H6DO)(diag)-266, DTC P2503 CHARGING SYSTEM VOLTAGE LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2504	Charging System Voltage High	<Ref. to EN(H6DO)(diag)-267, DTC P2504 CHARGING SYSTEM VOLTAGE HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

18. Diagnostic Procedure with Diagnostic Trouble Code (DTC)

A: DTC P0011 INTAKE CAMSHAFT POSITION-TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK1)

DTC DETECTING CONDITION:

Detects when malfunction occurs in 2 continuous driving cycles.

TROUBLE SYMPTOM:

- Engine stalls.
- Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)(diag)-34, 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(H6DO)(diag)-66, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK CURRENT DATA.** 1) Start the engine and let it idle. 2) Measure the AVCS system operating angle and oil flow control solenoid valve duty output using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-26, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the AVCS system operating angle approx. 0 deg., and oil flow control solenoid valve duty output approx. 10%?	Check the following and repair or replace if necessary. • Oil pipe (clog) • Oil flow control solenoid valve (clog or dirt of oil routing, setting of spring, clog of valve) • Intake camshaft (dirt, damage of camshaft) • Timing chain (matching of timing mark)	A temporary malfunction. Perform the following, and clean the oil routing. Replace the engine oil and idle the engine for 5 minutes, and then replace the oil filter and engine oil.

B: DTC P0021 INTAKE CAMSHAFT POSITION-TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK2)

DTC DETECTING CONDITION:

Detects when malfunction occurs in 2 continuous driving cycles.

TROUBLE SYMPTOM:

- Engine stalls.
- Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)(diag)-34, Inspection Mode.>.

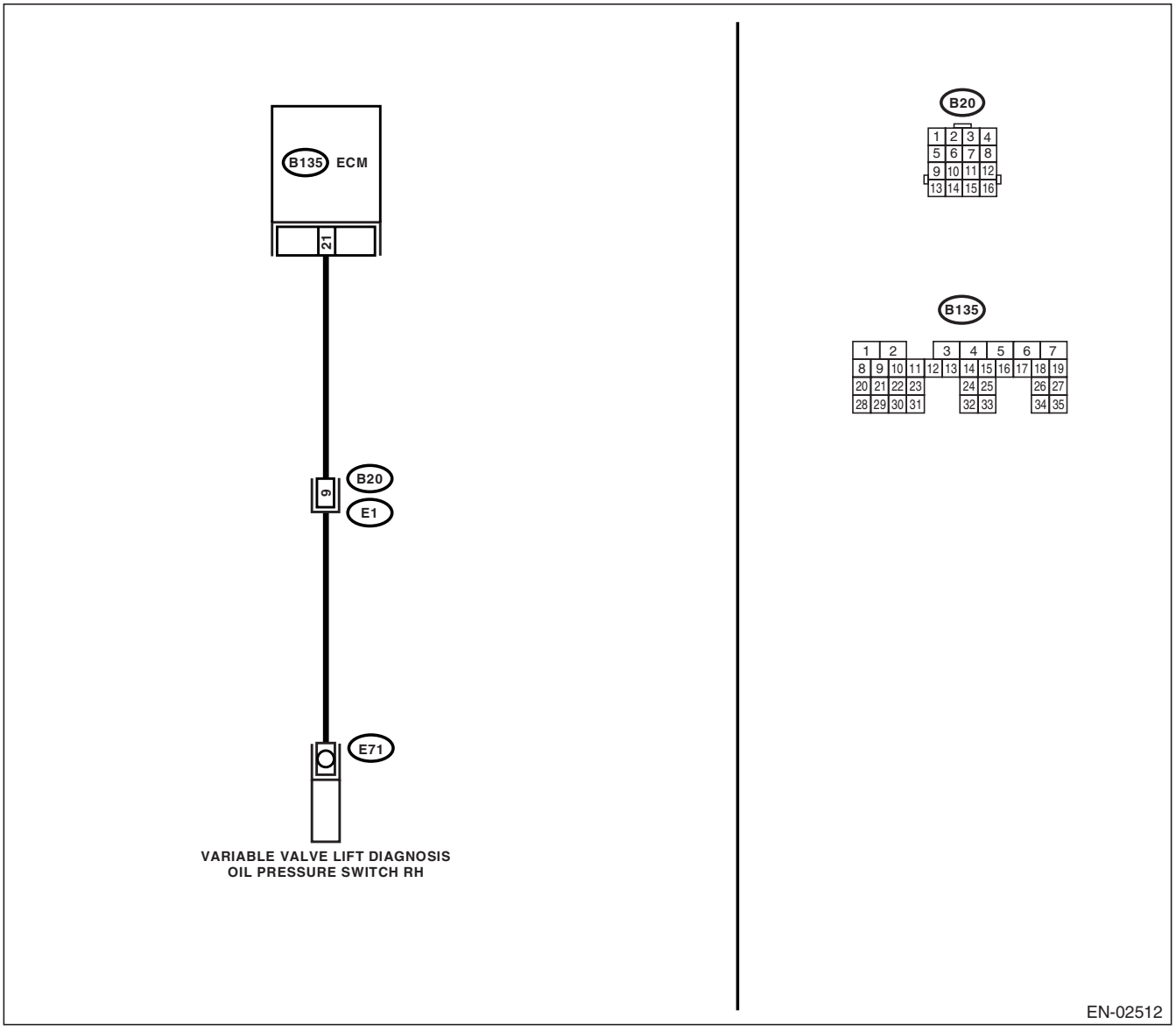
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)(diag)-66, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK CURRENT DATA.** 1) Start the engine and let it idle. 2) Check the AVCS system operating angle and oil flow control solenoid valve duty output using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-26, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the AVCS system operating angle approx. 0 deg., and oil flow control solenoid valve duty output approx. 10%?	Check the following and repair or replace if necessary. • Engine oil (amount, dirt) • Oil pipe (clog) • Oil flow control solenoid valve (clog or dirt of oil routing, setting of spring, clog of valve) • Intake camshaft (dirt, damage of camshaft) • Timing chain (matching of timing mark)	A temporary malfunction. Perform the following, and clean the oil routing. Replace the engine oil and idle the engine for 5 minutes, and then replace the oil filter and engine oil.

C: DTC P0026 INTAKE VALVE CONTROL SOLENOID CIRCUIT RANGE/PERFORMANCE (BANK 1)

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(H6DO)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



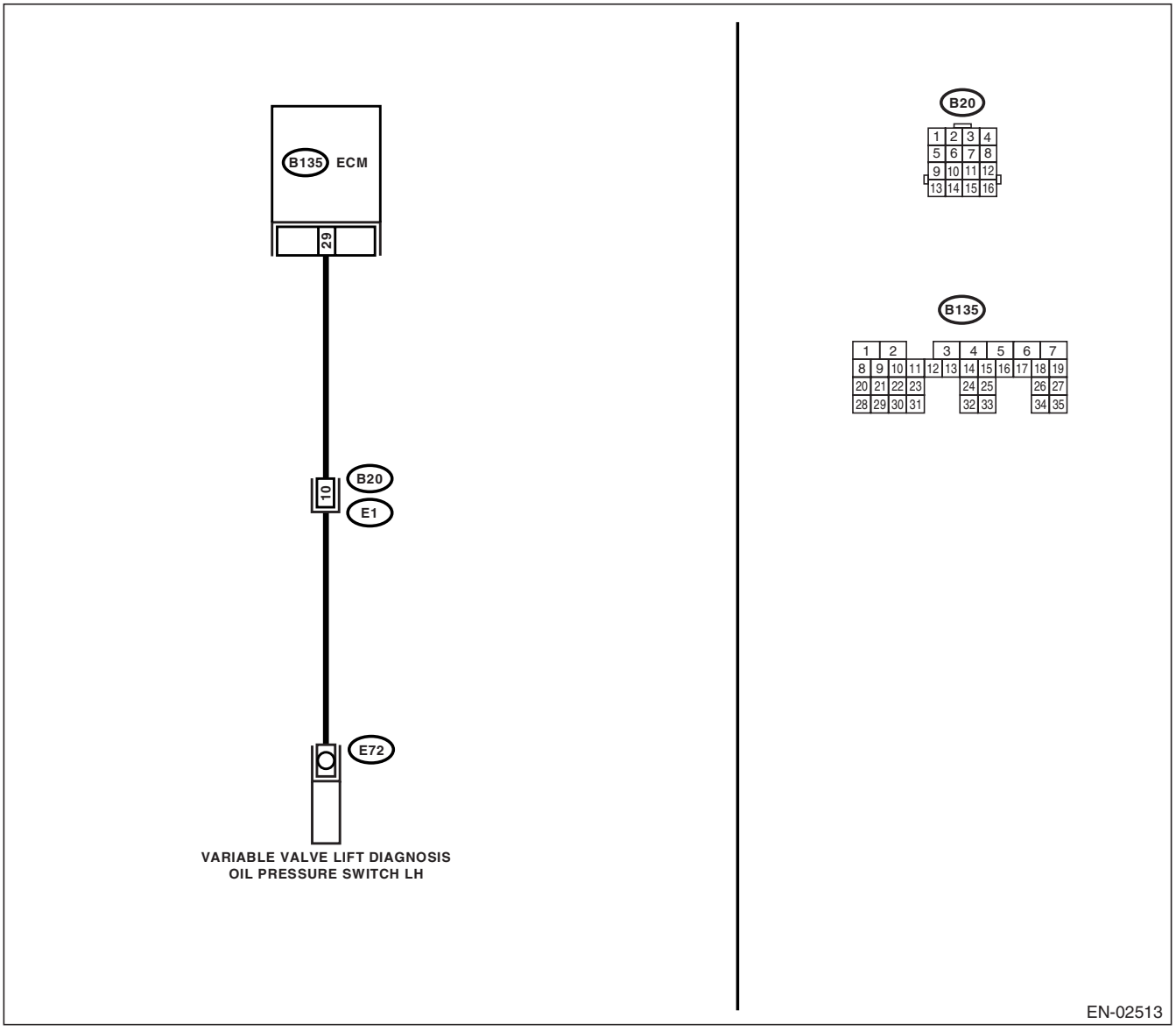
	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H6DO)(diag)-66, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK HARNESS BETWEEN ECM AND VARIABLE VALVE LIFT DIAGNOSIS OIL PRESSURE SWITCH CONNECTOR.** 1) Idle the engine. 2) Turn the ignition switch to OFF. 3) Disconnect the connectors from ECM and variable valve lift diagnosis oil pressure switch connector. 4) Measure the resistance of harness between variable valve lift diagnosis oil pressure switch connector and engine ground. ***Connector & terminal*** ***(E71) No. 1 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair the ground short circuit of harness between ECM and variable valve lift diagnosis oil pressure switch connector.
3	**CHECK HARNESS BETWEEN ECM AND VARIABLE VALVE LIFT DIAGNOSIS OIL PRESSURE SWITCH CONNECTOR.** Measure the resistance in harness between ECM and variable valve lift diagnosis oil pressure switch connector. ***Connector & terminal*** ***(B135) No. 21 — (E71) No. 1:***	Is the resistance less than 1 Ω?	Replace the variable valve lift diagnosis oil pressure switch. <Ref. to FU(H6DO)-28, Variable Valve Lift Diagnosis Oil Pressure Switch.> Go to step **4.**	Repair the open circuit of harness between ECM and variable valve lift diagnosis oil pressure switch connector.
4	**CHECK DTC.** 1) Perform the clear memory mode. <Ref. to EN(H6DO)(diag)-41, Clear Memory Mode.> 2) Check the DTC after idling the engine.	Is DTC displayed?	Replace the oil switching solenoid valve. <Ref. to ME(H6DO)-80, Oil Switching Solenoid Valve.> Go to step **5.**	Temporary poor contact occurs.
5	**CHECK DTC.** 1) Perform the clear memory mode. <Ref. to EN(H6DO)(diag)-41, Clear Memory Mode.> 2) Check the DTC after idling the engine.	Is DTC displayed?	Check for oil routing. Contact the SUBARU dealer.	Temporary poor contact occurs.

D: DTC P0028 INTAKE VALVE CONTROL SOLENOID CIRCUIT RANGE/PERFORMANCE (BANK 2)

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(H6DO)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H6DO)(diag)-66, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK HARNESS BETWEEN ECM AND VARIABLE VALVE LIFT DIAGNOSIS OIL PRESSURE SWITCH CONNECTOR.** 1) Idle the engine. 2) Turn the ignition switch to OFF. 3) Disconnect the connectors from ECM and variable valve lift diagnosis oil pressure switch connector. 4) Measure the resistance of harness between variable valve lift diagnosis oil pressure switch connector and engine ground. ***Connector & terminal*** ***(E72) No. 1 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **3.**	Repair the ground short circuit of harness between ECM and variable valve lift diagnosis oil pressure switch connector.
3	**CHECK HARNESS BETWEEN ECM AND VARIABLE VALVE LIFT DIAGNOSIS OIL PRESSURE SWITCH CONNECTOR.** Measure the resistance in harness between ECM and variable valve lift diagnosis oil pressure switch connector. ***Connector & terminal*** ***(B135) No. 29 — (E72) No. 1:***	Is the resistance less than 1 Ω?	Replace the variable valve lift diagnosis oil pressure switch. <Ref. to FU(H6DO)-28, Variable Valve Lift Diagnosis Oil Pressure Switch.> Go to step **4.**	Repair the open circuit of harness between ECM and variable valve lift diagnosis oil pressure switch connector.
4	**CHECK DTC.** 1) Perform the clear memory mode. <Ref. to EN(H6DO)(diag)-41, Clear Memory Mode.> 2) Check the DTC after idling the engine.	Is DTC displayed?	Replace the oil switching solenoid valve. <Ref. to ME(H6DO)-80, Oil Switching Solenoid Valve.> Go to step **5.**	Temporary poor contact occurs.
5	**CHECK DTC.** 1) Perform the clear memory mode. <Ref. to EN(H6DO)(diag)-41, Clear Memory Mode.> 2) Check the DTC after idling the engine.	Is DTC displayed?	Check for oil routing. Contact the SUBARU dealer.	Temporary poor contact occurs.

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

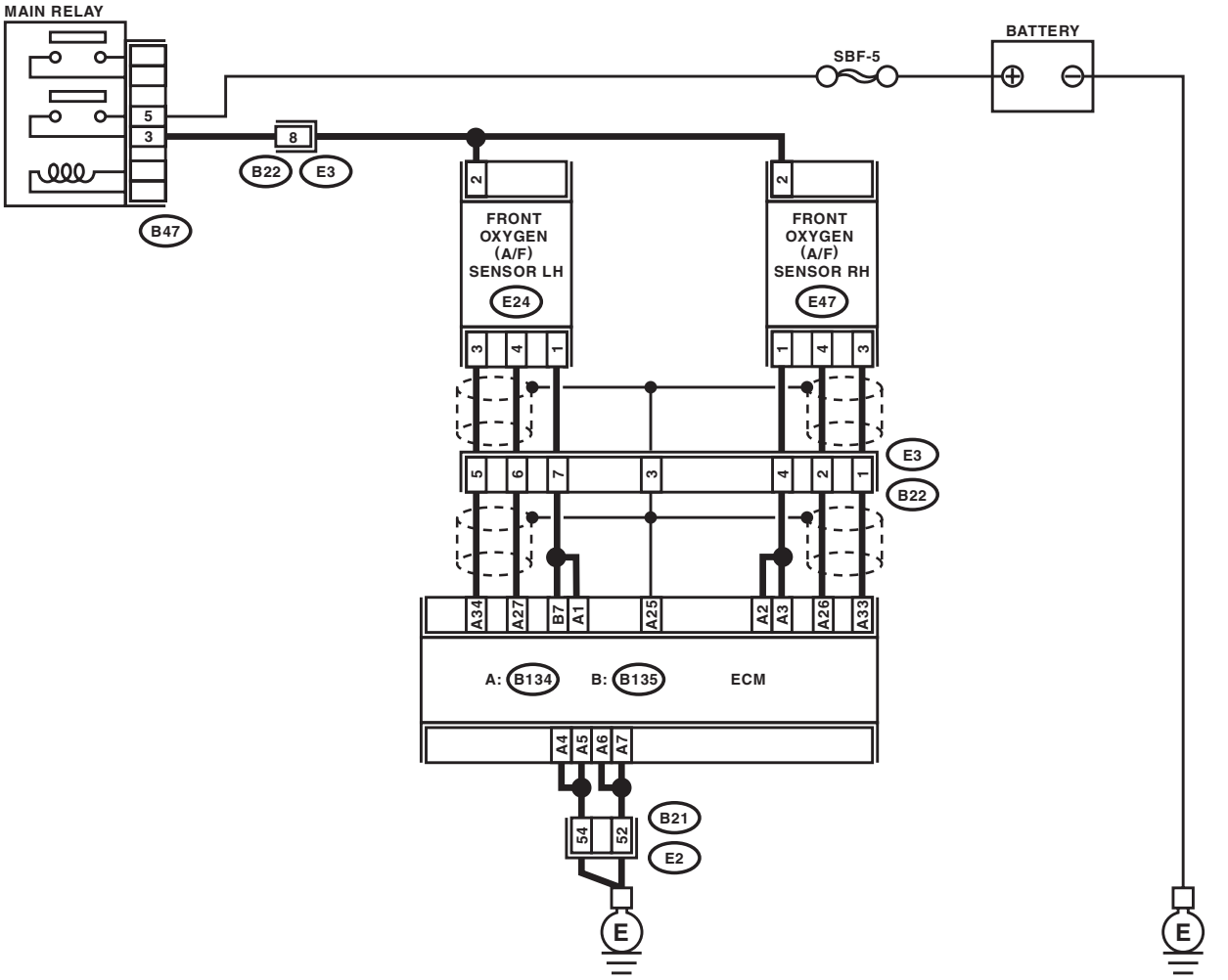
DTC DETECTING CONDITION:

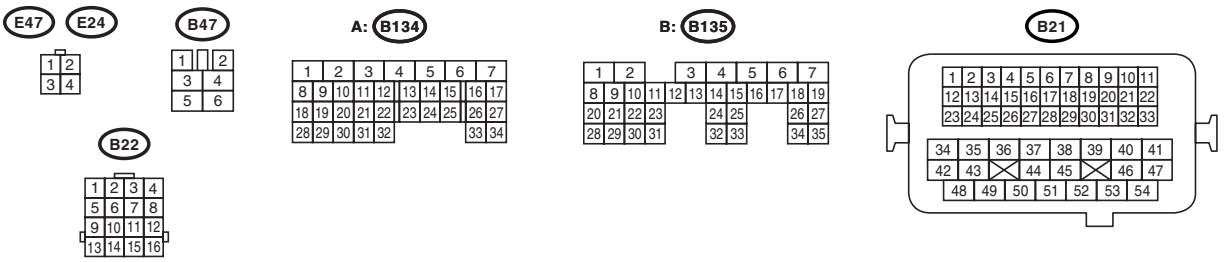
Detects when malfunction occurs in 2 continuous driving cycles.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)(diag)-34, PROCEDURE, 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 and warm-up the 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*** ***(B134) No. 2 — (E47) No. 1:*** ***(B134) No. 3 — (E47) No. 1:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit of 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*** ***(B134) No. 26 — (E47) No. 4:*** ***(B134) No. 33 — (E47) No. 3:***	Is the resistance less than 1 Ω?	Go to step **3.**	Repair the open circuit of harness between ECM and front oxygen (A/F) sensor connector.
3	**CHECK HARNESS BETWEEN MAIN RELAY 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. 3 — (E47) No. 2:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the open circuit of harness between main relay 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. ***Terminal*** ***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(H6DO)-30, Front Oxygen (A/F) Sensor.>
5	**CHECK POOR CONTACT.** Check poor contact in ECM and front oxygen (A/F) sensor connector.	Is there poor contact in ECM or front oxygen (A/F) sensor connector?	Repair the poor contact in ECM or front oxygen (A/F) sensor connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H6DO)-30, Front Oxygen (A/F) Sensor.>

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

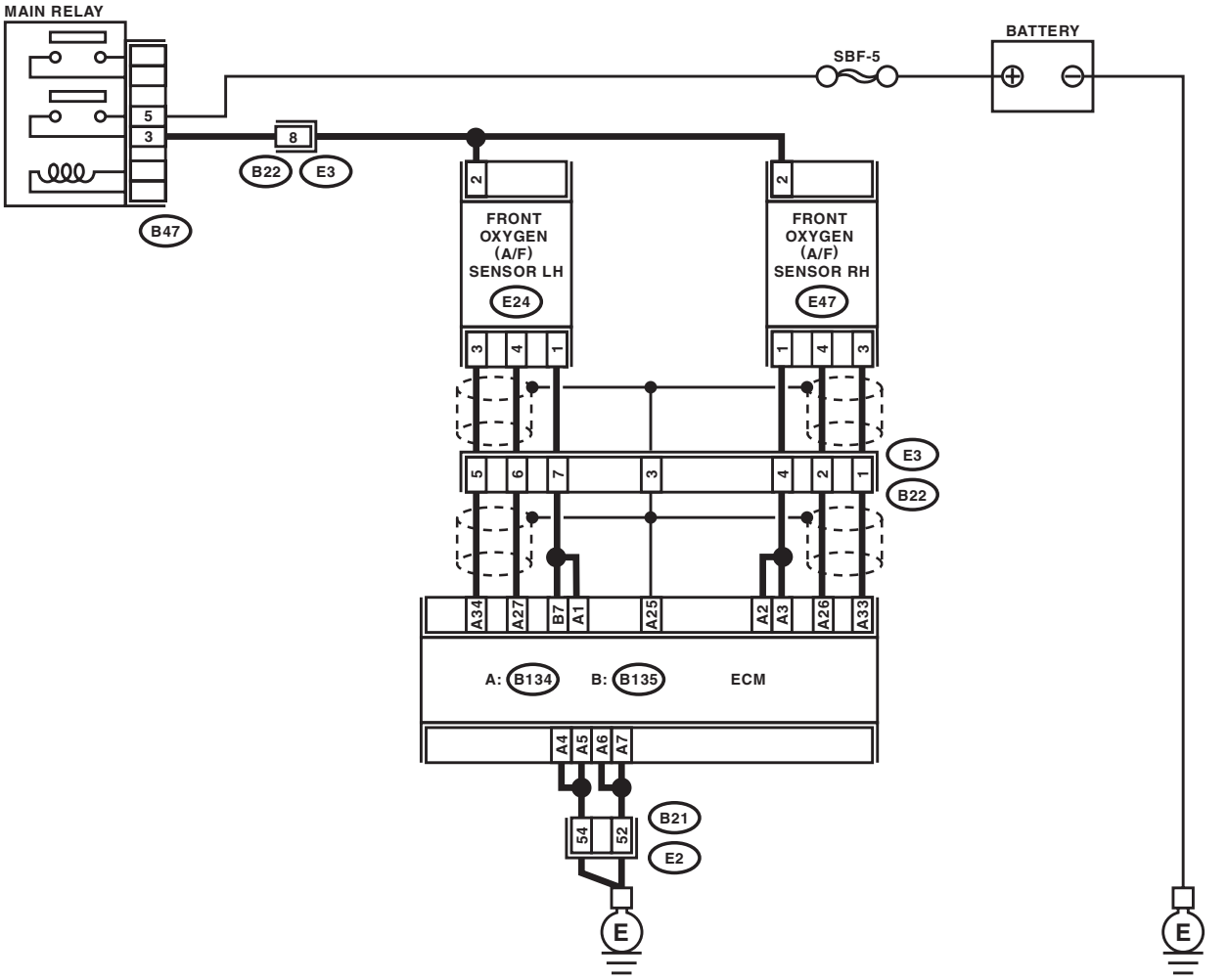
DTC DETECTING CONDITION:

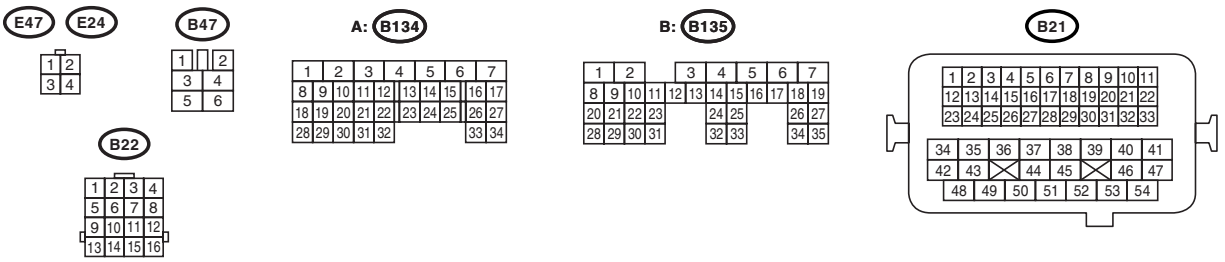
Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)(diag)-34, PROCEDURE, 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*** ***(E47) 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 of 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 FOR ECM.** Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 4 — Chassis ground:*** ***(B134) No. 5 — Chassis ground:*** ***(B134) No. 6 — Chassis ground:*** ***(B134) No. 7 — 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 of harness between ECM and engine ground terminal • Poor contact in ECM connector • Poor contact in coupling connector
3	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of front oxygen (A/F) sensor heater current using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H6DO)(diag)-26, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation 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 coupling 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*** ***(B134) No. 2 (+) — Chassis ground (−):*** ***(B134) No. 3 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **6.**	Go to step **5.**
5	**CHECK OUTPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 2 (+) — Chassis ground (−):*** ***(B134) No. 3 (+) — Chassis ground (−):***	Does the voltage change by shaking the ECM harness and connector while monitoring the value of voltage meter?	Repair the poor contact in ECM connector.	Go to step **6.**

Step		Check	Yes	No
6	**CHECK FRONT OXYGEN (A/F) SENSOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between front oxygen (A/F) sensor connector terminals. ***Terminal*** ***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 of harness between front oxygen (A/F) sensor and ECM connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector • Poor contact in coupling connector	Replace the front oxygen (A/F) sensor. <Ref. to FU(H6DO)-30, Front Oxygen (A/F) Sensor.>

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

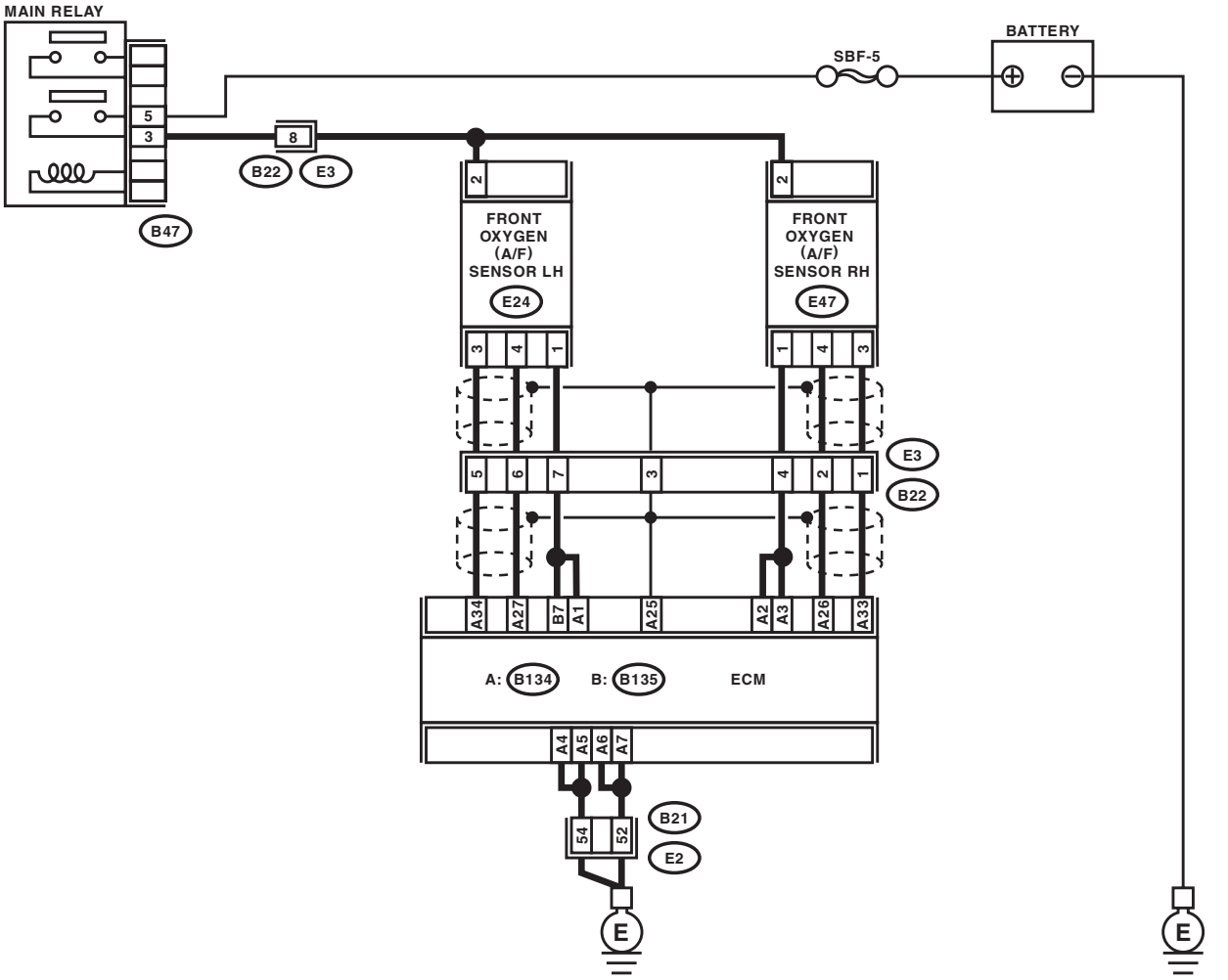
DTC DETECTING CONDITION:

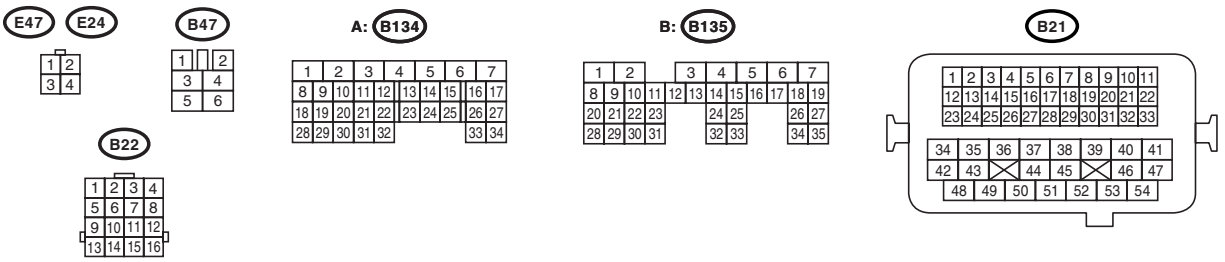
Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)(diag)-34, PROCEDURE, 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 connector and chassis ground. ***Connector & terminal*** ***(B134) No. 2 (+) — Chassis ground (–):*** ***(B134) No. 3 (+) — Chassis ground (–):***	Is the voltage more than 8 V?	Go to step **2.**	Go to step **3.**
2	**CHECK FRONT OXYGEN (A/F) SENSOR HEATER CURRENT.** 1) Turn the ignition switch to OFF. 2) Repair the battery short circuit of 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 general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-26, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the current more than 2.3 A?	Replace the ECM. <Ref. to FU(H6DO)-34, Engine Control Module (ECM).>	Finish the diagnosis.
3	**CHECK OUTPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 2 (+) — Chassis ground (–):*** ***(B134) No. 3 (+) — Chassis ground (–):***	Does the voltage change by shaking the ECM harness and connector?	Repair the battery short circuit of harness between ECM and front oxygen (A/F) sensor connector.	Finish the diagnosis.

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

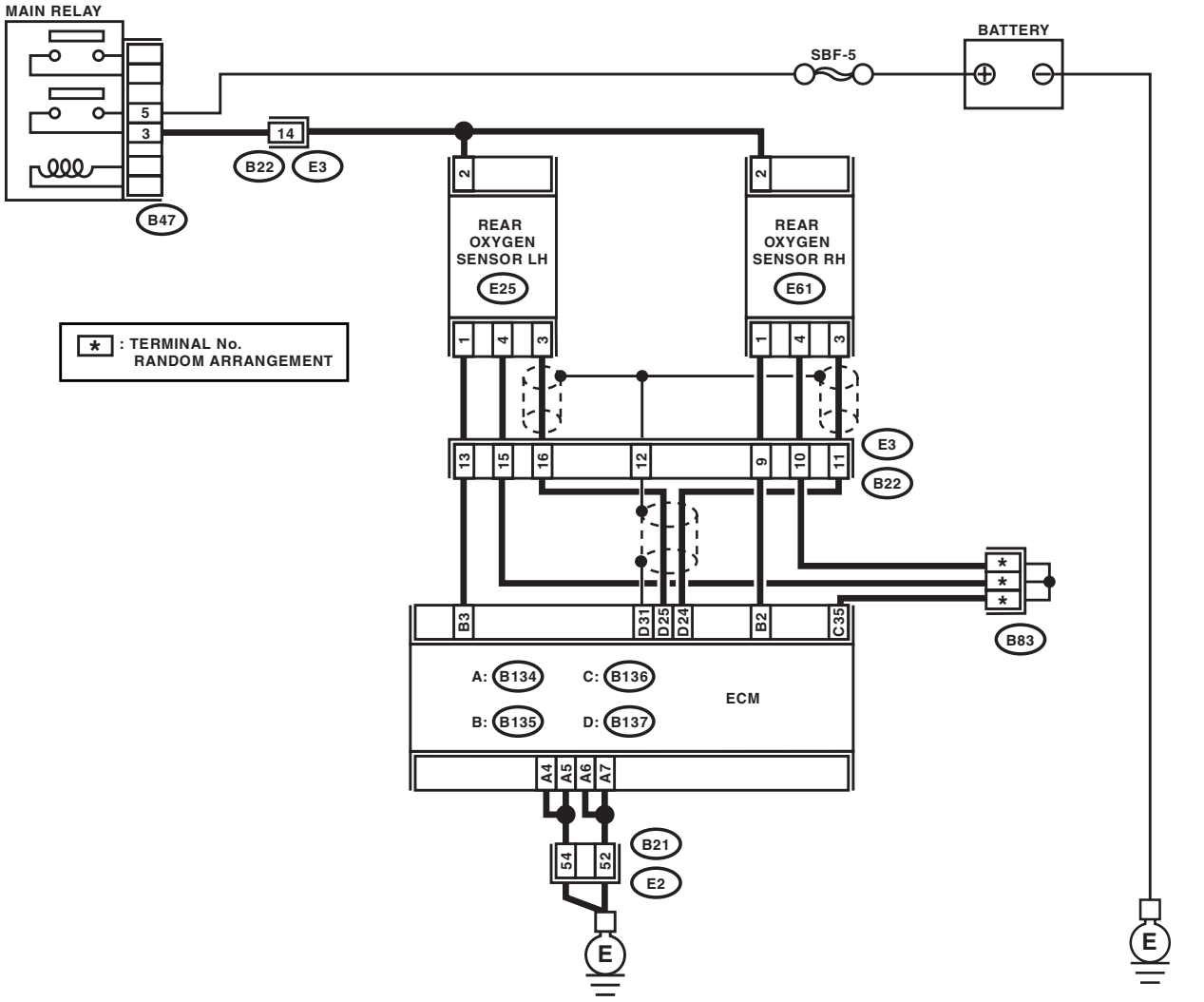
DTC DETECTING CONDITION:

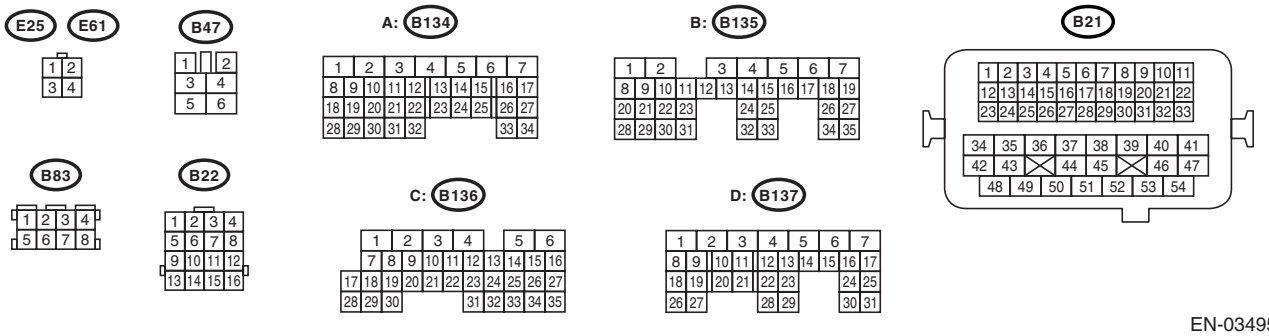
Detects when malfunction occurs in 2 continuous driving cycles.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





EN-03495

	Step	Check	Yes	No
1	**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 chassis ground. ***Connector & terminal*** ***(E61) No. 2 (+) — Chassis 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 of harness between main relay and rear oxygen sensor connector • Poor contact in rear oxygen sensor connector • Poor contact in main relay connector
2	**CHECK GROUND CIRCUIT FOR ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 4 — Chassis ground:*** ***(B134) No. 5 — Chassis ground:*** ***(B134) No. 6 — Chassis ground:*** ***(B134) No. 7 — 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 of harness between ECM and engine ground terminal • Poor contact in ECM connector • Poor contact in coupling connector
3	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of rear oxygen sensor heater current using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H6DO)(diag)-26, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation 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 coupling 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*** ***(B135) No. 2 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **7.**	Go to step **5.**
5	**CHECK OUTPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 2 (+) — Chassis ground (−):***	Does the voltage change by shaking the ECM harness and connector while monitoring the value of voltage meter?	Repair the poor contact in ECM connector.	Go to step **6.**

	Step	Check	Yes	No
6	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Disconnect the connector from rear oxygen sensor. 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 2 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Replace the ECM. <Ref. to FU(H6DO)-34, Engine Control Module (ECM).>	Repair the battery short circuit of harness between ECM and rear oxygen sensor connector. After repair, replace the ECM. <Ref. to FU(H6DO)-34, Engine Control Module (ECM).>
7	**CHECK REAR OXYGEN SENSOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between rear oxygen sensor connector terminals. ***Terminal*** ***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 of 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(H6DO)-32, Rear Oxygen Sensor.>

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

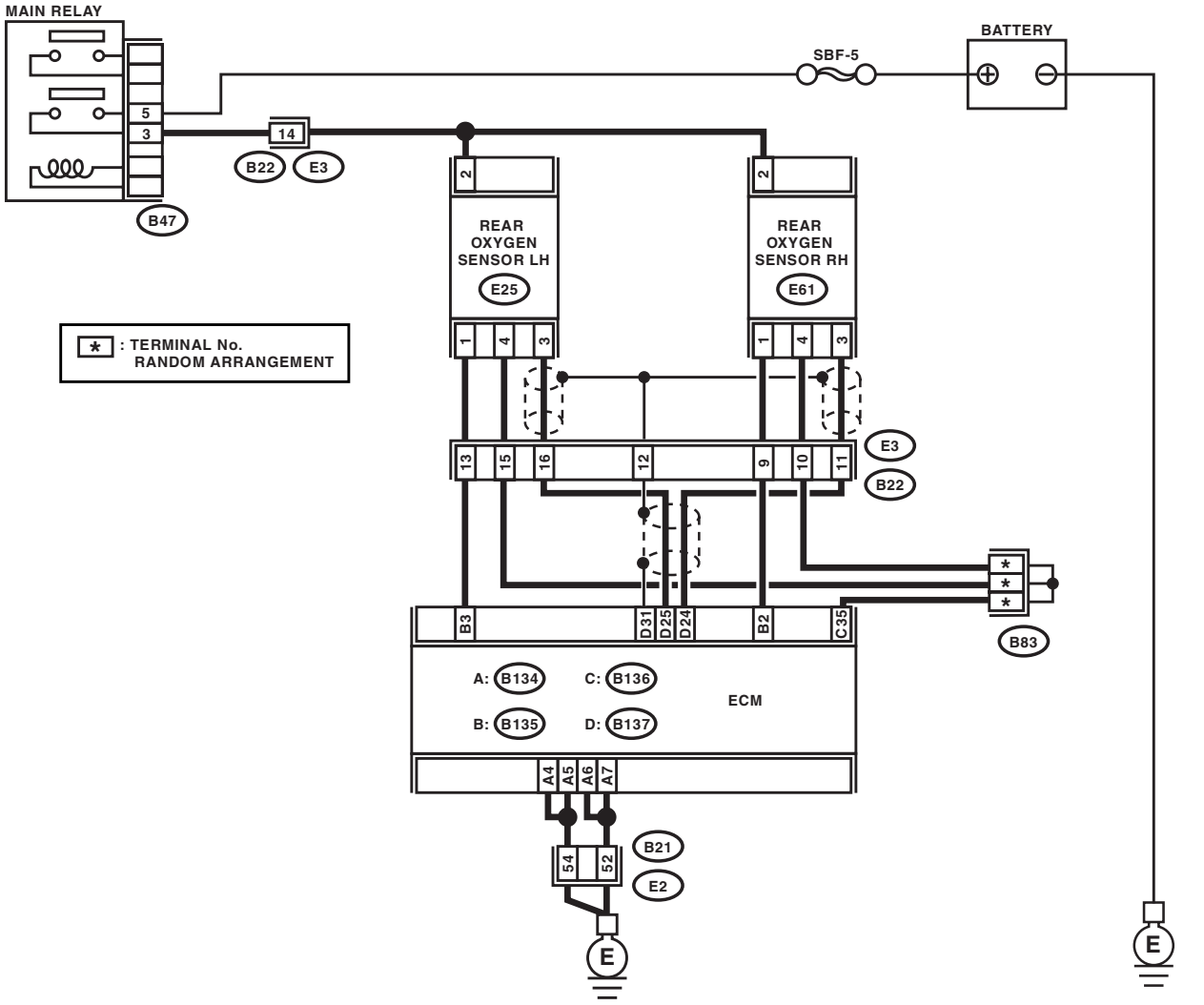
DTC DETECTING CONDITION:

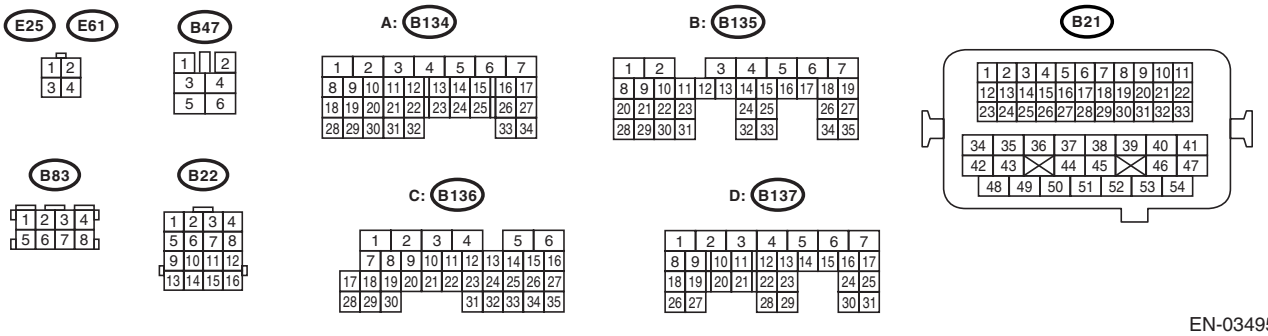
Detects when malfunction occurs in 2 continuous driving cycles.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





EN-03495

	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL OF ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 2 (+) — Chassis ground (−):***	Is the voltage more than 8 V?	Go to step **2.**	Go to step **3.**
2	**CHECK CURRENT DATA.** 1) Turn the ignition switch to OFF. 2) Repair the battery short circuit of harness between ECM and rear oxygen sensor connector. 3) Turn the ignition switch to ON. 4) Read the data of rear oxygen sensor heater current using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-26, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the current more than 7 A?	Replace the ECM. <Ref. to FU(H6DO)-34, Engine Control Module (ECM).>	Finish the diagnosis.
3	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Finish the diagnosis.

J: DTC P0050 HO2S HEATER CONTROL CIRCUIT (BANK 2 SENSOR 1)

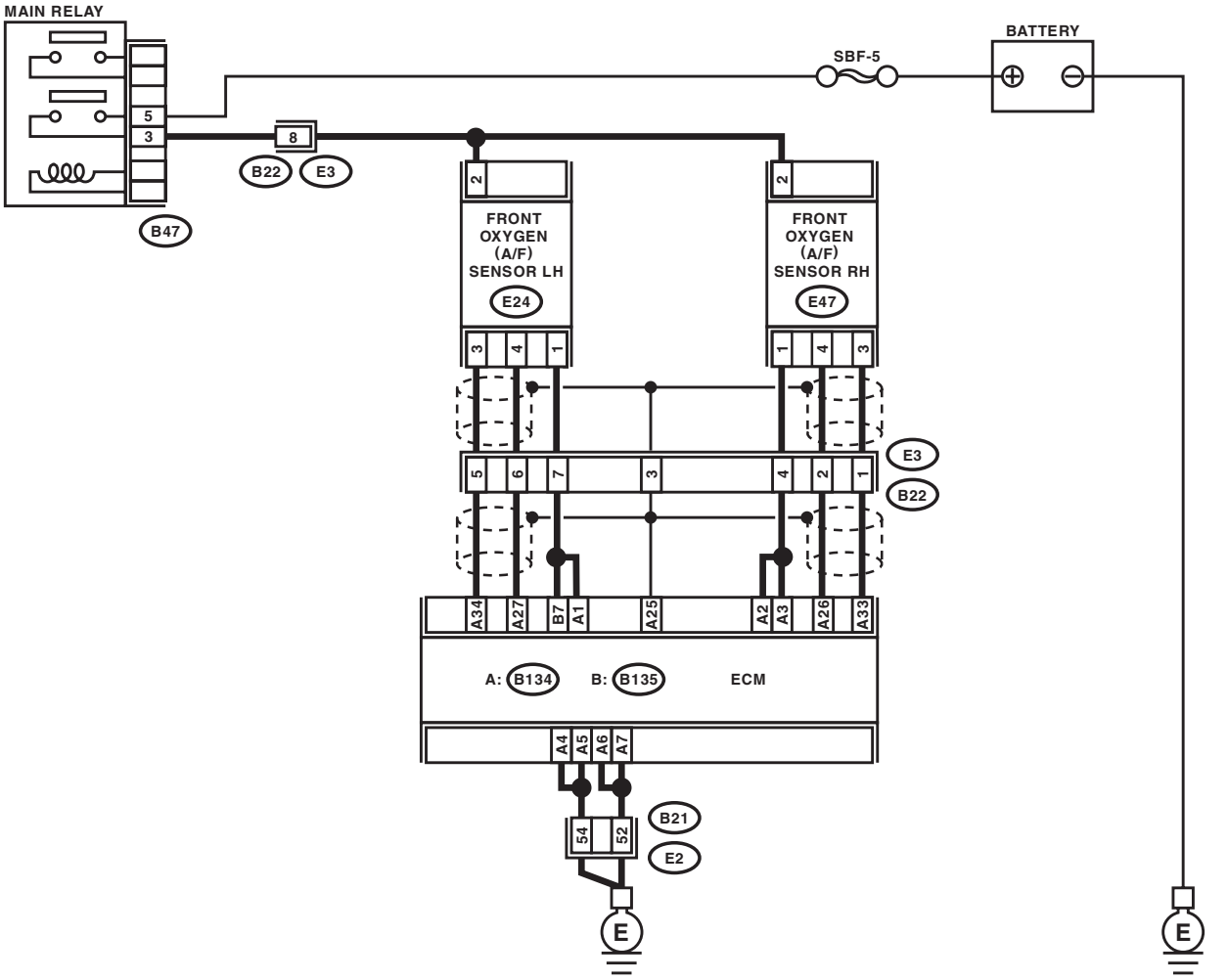
DTC DETECTING CONDITION:

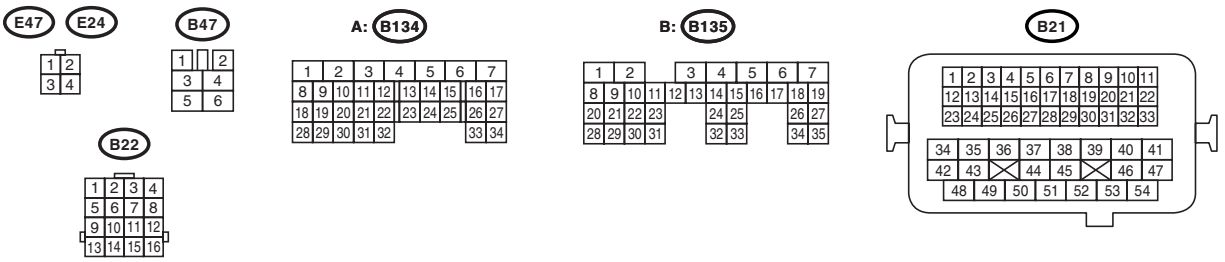
Detects when malfunction occurs in 2 continuous driving cycles.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





EN-03494

	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Start and warm-up the 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*** ***(B134) No. 1 — (E24) No. 1:*** ***(B135) No. 7 — (E24) No. 1:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit of 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*** ***(B134) No. 27 — (E24) No. 4:*** ***(B134) No. 34 — (E24) No. 3:***	Is the resistance less than 1 Ω?	Go to step **3.**	Repair the open circuit of harness between ECM and front oxygen (A/F) sensor connector.
3	**CHECK HARNESS BETWEEN MAIN RELAY 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. 3 — (E24) No. 2:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the open circuit of harness between main relay 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. ***Terminal*** ***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(H6DO)-30, Front Oxygen (A/F) Sensor.>
5	**CHECK POOR CONTACT.** Check poor contact in ECM and front oxygen (A/F) sensor connector.	Is there poor contact in ECM or front oxygen (A/F) sensor connector?	Repair the poor contact in ECM or front oxygen (A/F) sensor connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H6DO)-30, Front Oxygen (A/F) Sensor.>

K: DTC P0051 HO2S HEATER CONTROL CIRCUIT LOW (BANK 2 SENSOR 1)

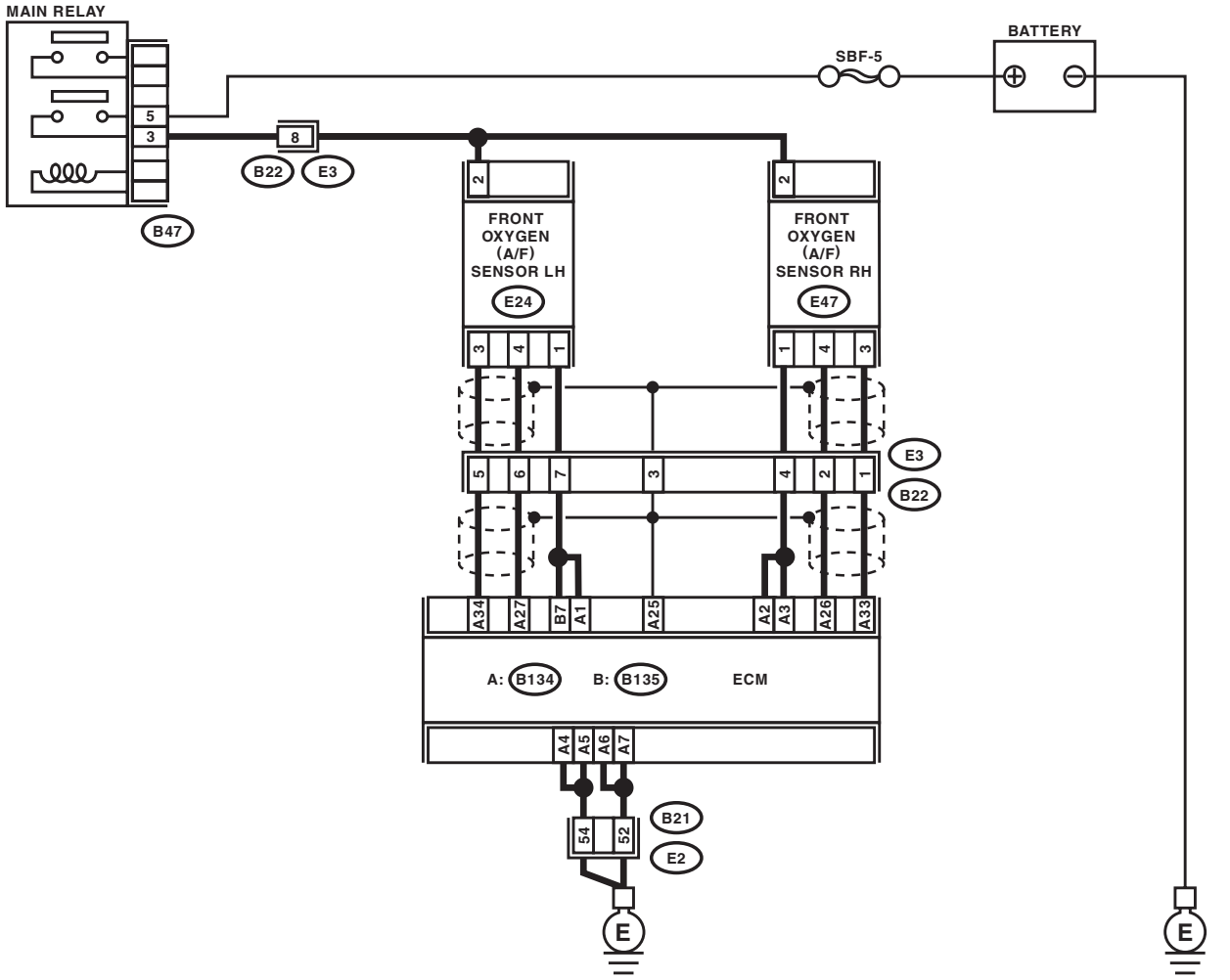
DTC DETECTING CONDITION:

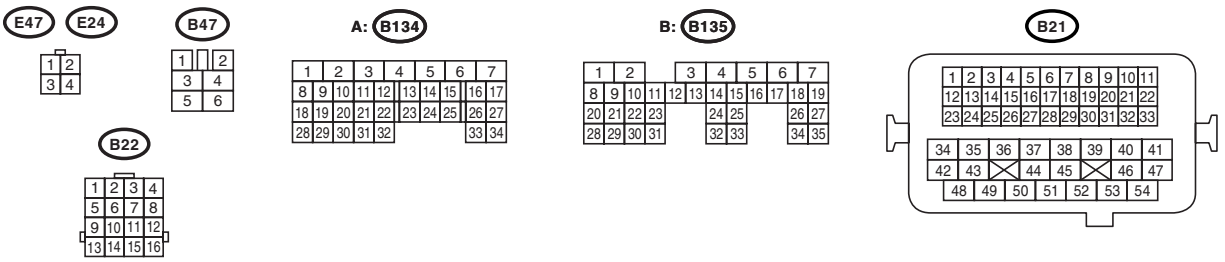
Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





EN-03494

	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*** ***(E24) 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 of 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 FOR ECM.** Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 4 — Chassis ground:*** ***(B134) No. 5 — Chassis ground:*** ***(B134) No. 6 — Chassis ground:*** ***(B134) No. 7 — 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 of harness between ECM and engine ground terminal • Poor contact in ECM connector • Poor contact in coupling connector
3	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of front oxygen (A/F) sensor heater current using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H6DO)(diag)-26, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation 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 coupling 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*** ***(B134) No. 1 (+) — Chassis ground (−):*** ***(B135) No. 7 (+) — 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*** ***(B134) No. 1 (+) — Chassis ground (−):*** ***(B135) No. 7 (+) — Chassis ground (−):***	Does the voltage change by shaking the ECM harness and connector while monitoring the value of voltage meter?	Repair the poor contact in ECM connector.	Go to step **6.**

	Step	Check	Yes	No
6	**CHECK FRONT OXYGEN (A/F) SENSOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between front oxygen (A/F) sensor connector terminals. ***Terminal*** ***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 of harness between front oxygen (A/F) sensor and ECM connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector • Poor contact in coupling connector	Replace the front oxygen (A/F) sensor. <Ref. to FU(H6DO)-30, Front Oxygen (A/F) Sensor.>

L: DTC P0052 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 2 SENSOR 1)

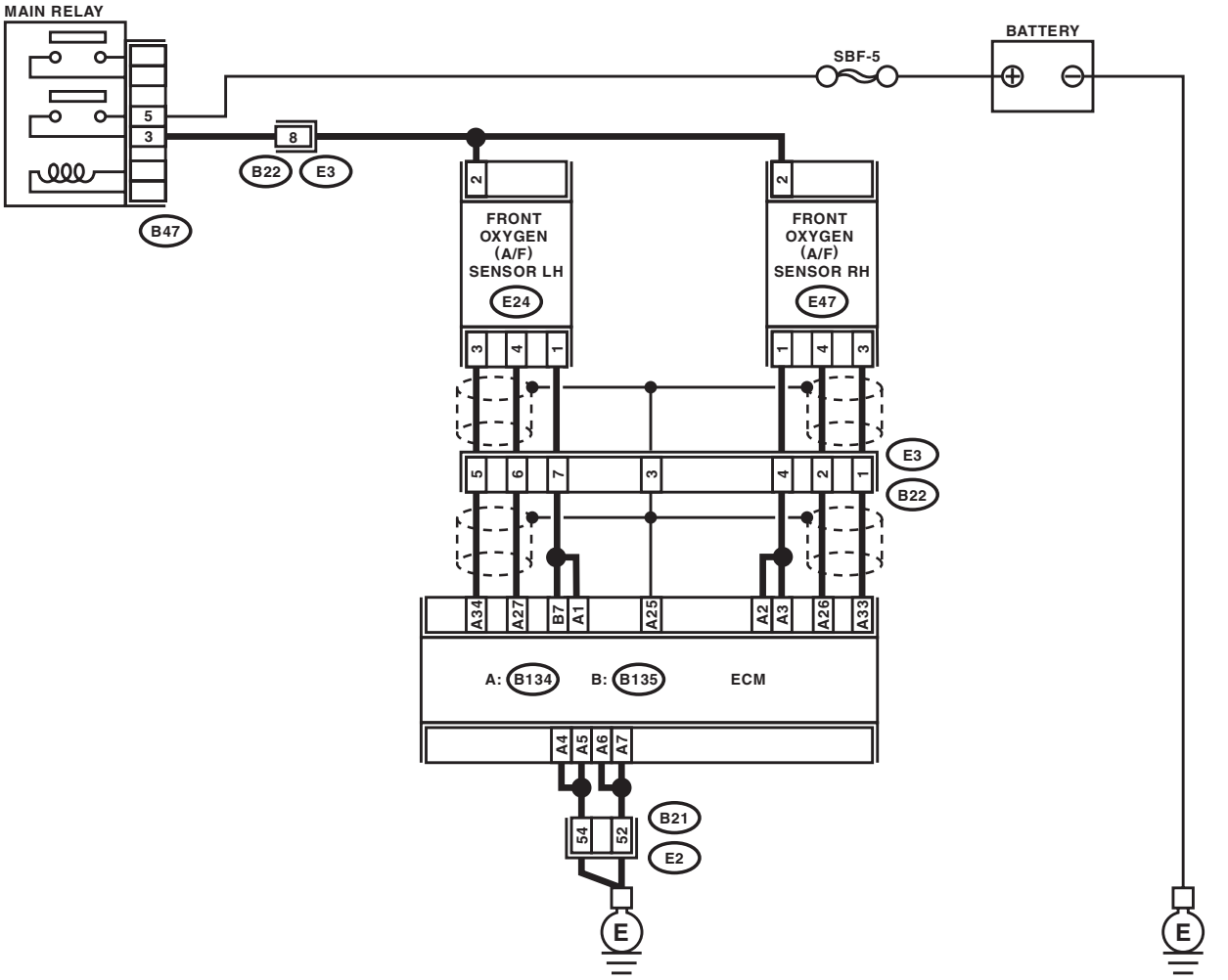
DTC DETECTING CONDITION:

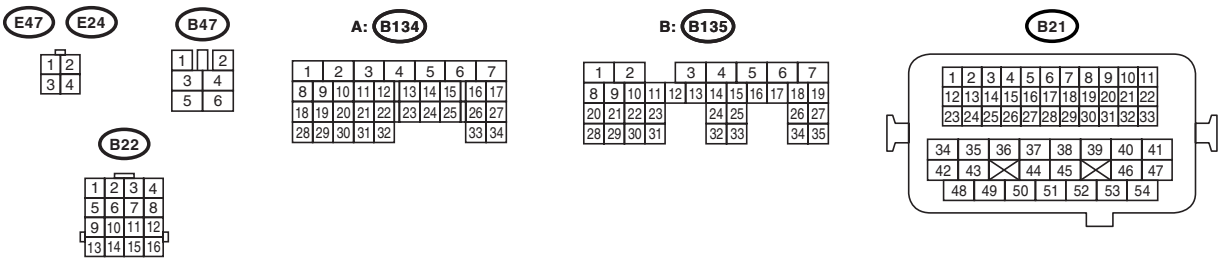
Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





EN-03494

	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 1 (+) — Chassis ground (–):*** ***(B135) No. 7 (+) — Chassis ground (–):***	Is the voltage more than 8 V?	Go to step **2.**	Go to step **3.**
2	**CHECK FRONT OXYGEN (A/F) SENSOR HEATER CURRENT.** 1) Turn the ignition switch to OFF. 2) Repair the battery short circuit of 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 general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-26, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the current more than 2.3 A?	Replace the ECM. <Ref. to FU(H6DO)-34, Engine Control Module (ECM).>	Finish the diagnosis.
3	**CHECK OUTPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 1 (+) — Chassis ground (–):*** ***(B135) No. 7 (+) — Chassis ground (–):***	Does the voltage change by shaking the ECM harness and connector?	Repair the battery short circuit of harness between ECM and front oxygen (A/F) sensor connector.	Finish the diagnosis.

M: DTC P0057 HO2S HEATER CONTROL CIRCUIT LOW (BANK 2 SENSOR 2)

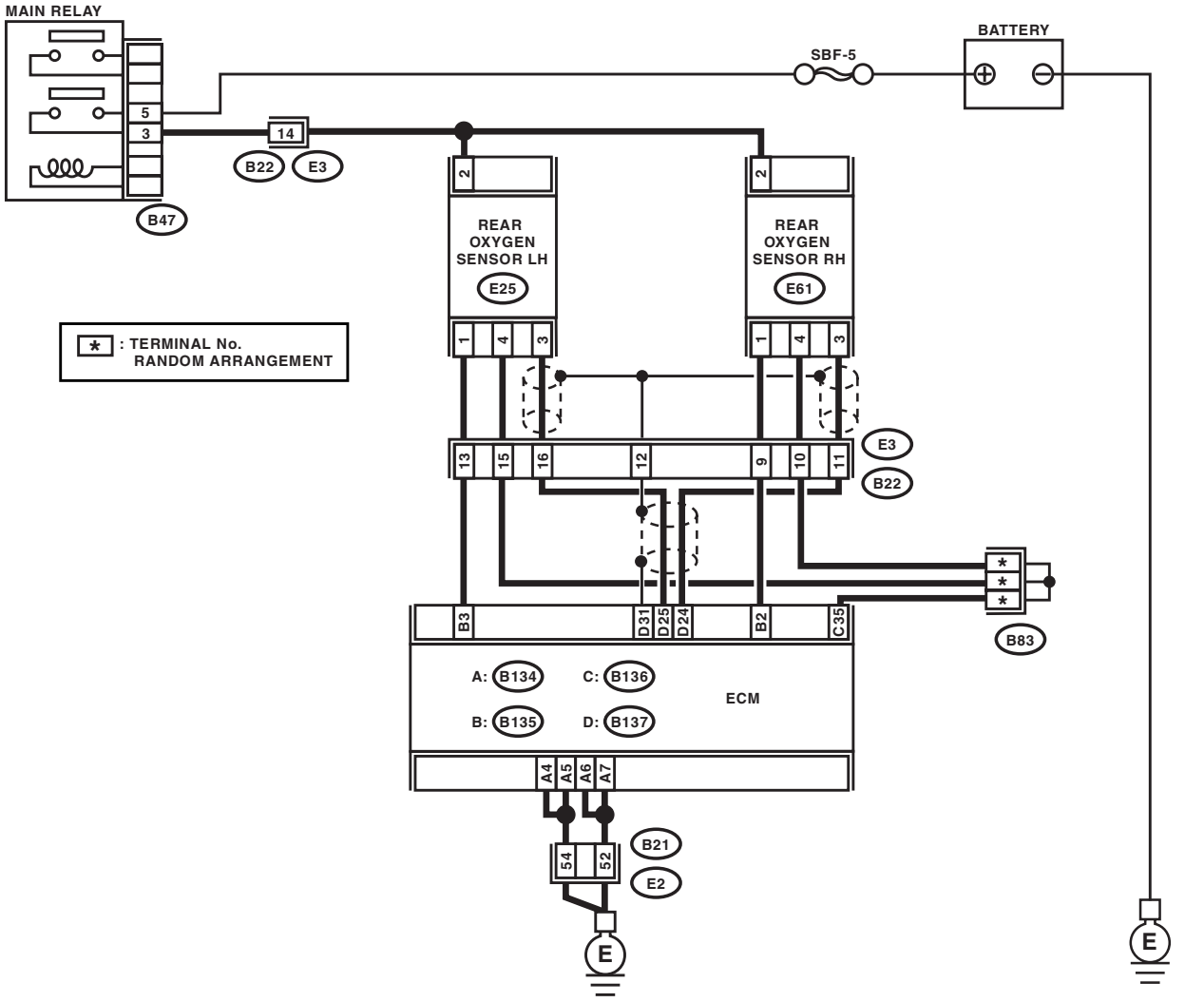
DTC DETECTING CONDITION:

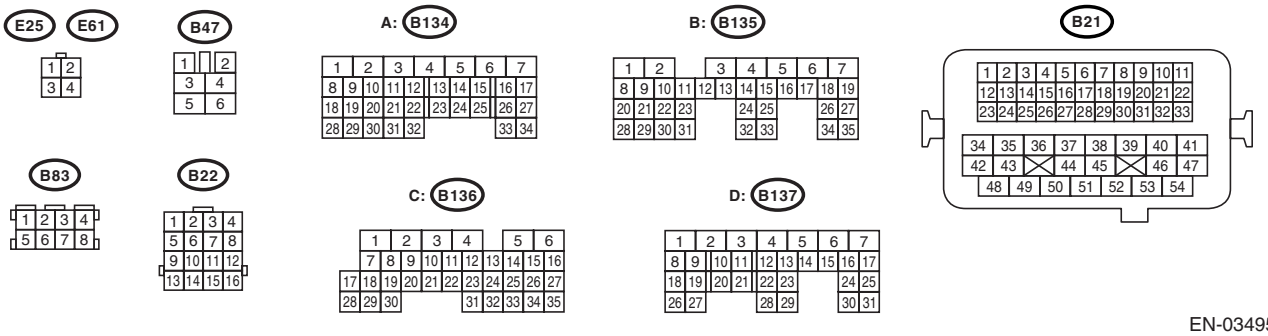
Detects when malfunction occurs in 2 continuous driving cycles.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





EN-03495

	Step	Check	Yes	No
1	**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 chassis ground. ***Connector & terminal*** ***(E25) No. 2 (+) — Chassis 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 of harness between main relay and rear oxygen sensor connector • Poor contact in rear oxygen sensor connector • Poor contact in coupling connector
2	**CHECK GROUND CIRCUIT FOR ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 4 — Chassis ground:*** ***(B134) No. 5 — Chassis ground:*** ***(B134) No. 6 — Chassis ground:*** ***(B134) No. 7 — 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 of harness between ECM and engine ground terminal • Poor contact in ECM connector • Poor contact in coupling connector
3	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of rear oxygen sensor heater current using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H6DO)(diag)-26, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation 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 coupling 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*** ***(B135) No. 3 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **7.**	Go to step **5.**
5	**CHECK OUTPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 3 (+) — Chassis ground (−):***	Does the voltage change by shaking the ECM harness and connector while monitoring the value of voltage meter?	Repair the poor contact in ECM connector.	Go to step **6.**

	Step	Check	Yes	No
6	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Disconnect the connector from rear oxygen sensor. 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 3 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Replace the ECM. <Ref. to FU(H6DO)-34, Engine Control Module (ECM).>	Repair the battery short circuit of harness between ECM and rear oxygen sensor connector. After repair, replace the ECM. <Ref. to FU(H6DO)-34, Engine Control Module (ECM).>
7	**CHECK REAR OXYGEN SENSOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between rear oxygen sensor connector terminals. ***Terminal*** ***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 of 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(H6DO)-32, Rear Oxygen Sensor.>

N: DTC P0058 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 2 SENSOR 2)

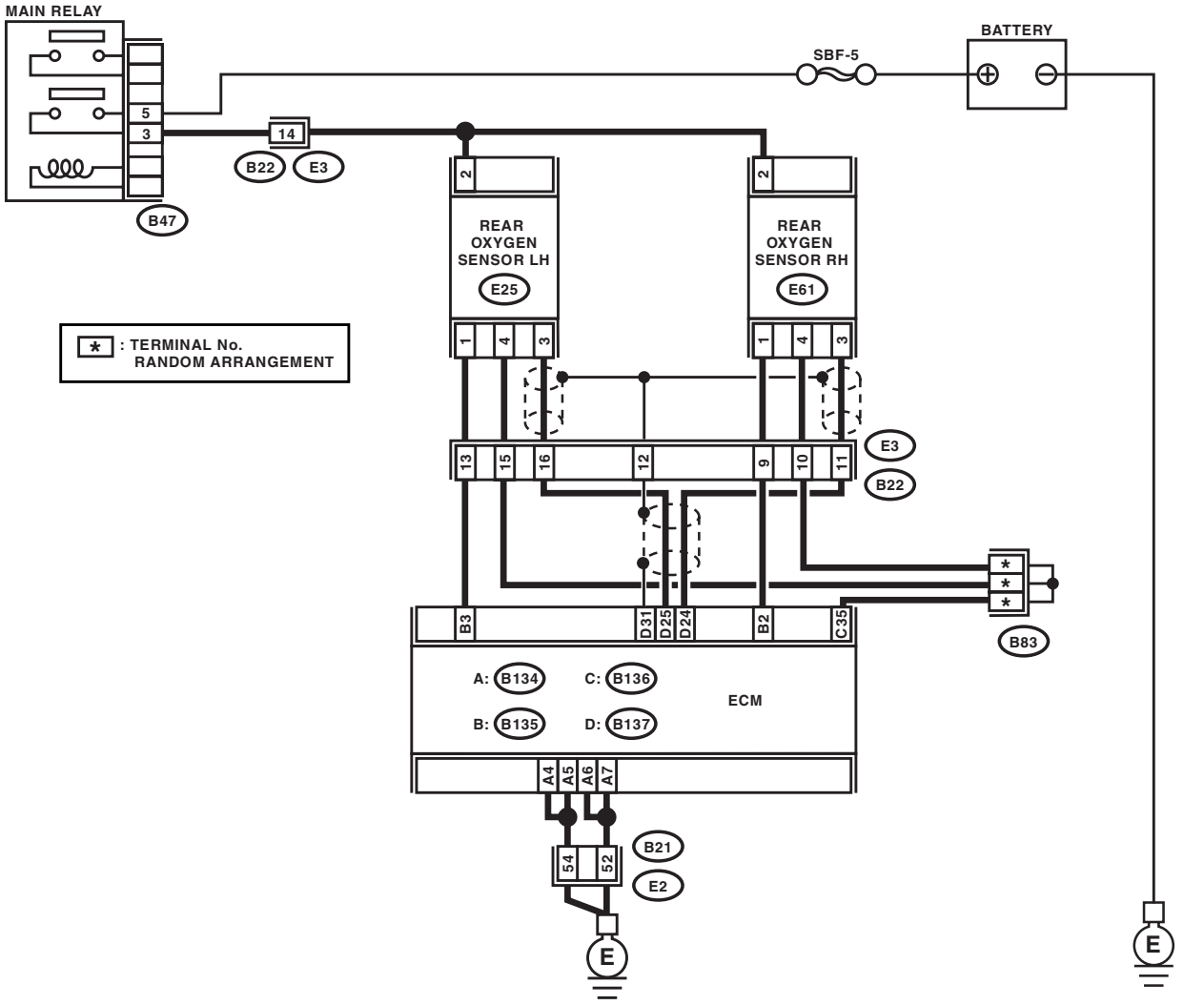
DTC DETECTING CONDITION:

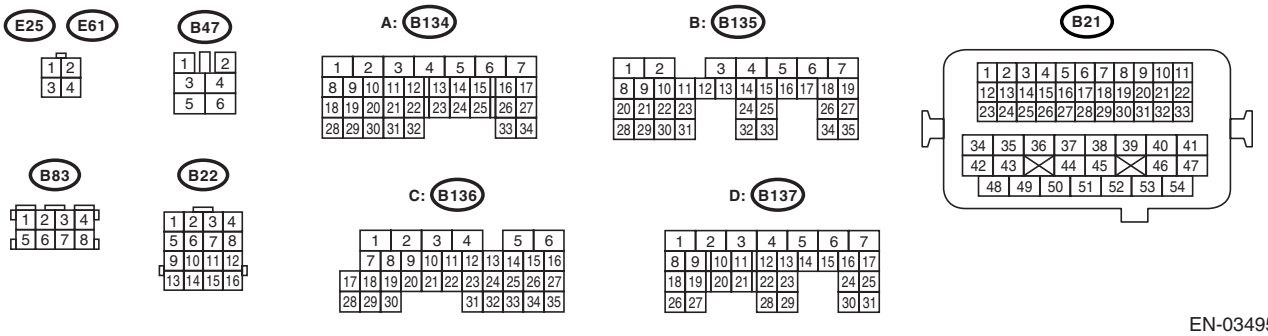
Detects when malfunction occurs in 2 continuous driving cycles.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





EN-03495

	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL OF ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 3 (+) — Chassis ground (−):***	Is the voltage more than 8 V?	Go to step **2.**	Go to step **3.**
2	**CHECK CURRENT DATA.** 1) Turn the ignition switch to OFF. 2) Repair the battery short circuit of harness between ECM and rear oxygen sensor connector. 3) Turn the ignition switch to ON. 4) Read the data of rear oxygen sensor heater current using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-26, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the current more than 7 A?	Replace the ECM. <Ref. to FU(H6DO)-34, Engine Control Module (ECM).>	Finish the diagnosis.
3	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Finish the diagnosis.

O: DTC P0076 INTAKE VALVE CONTROL SOLENOID CIRCUIT LOW (BANK 1)

DTC DETECTING CONDITION:

Immediately at fault recognition

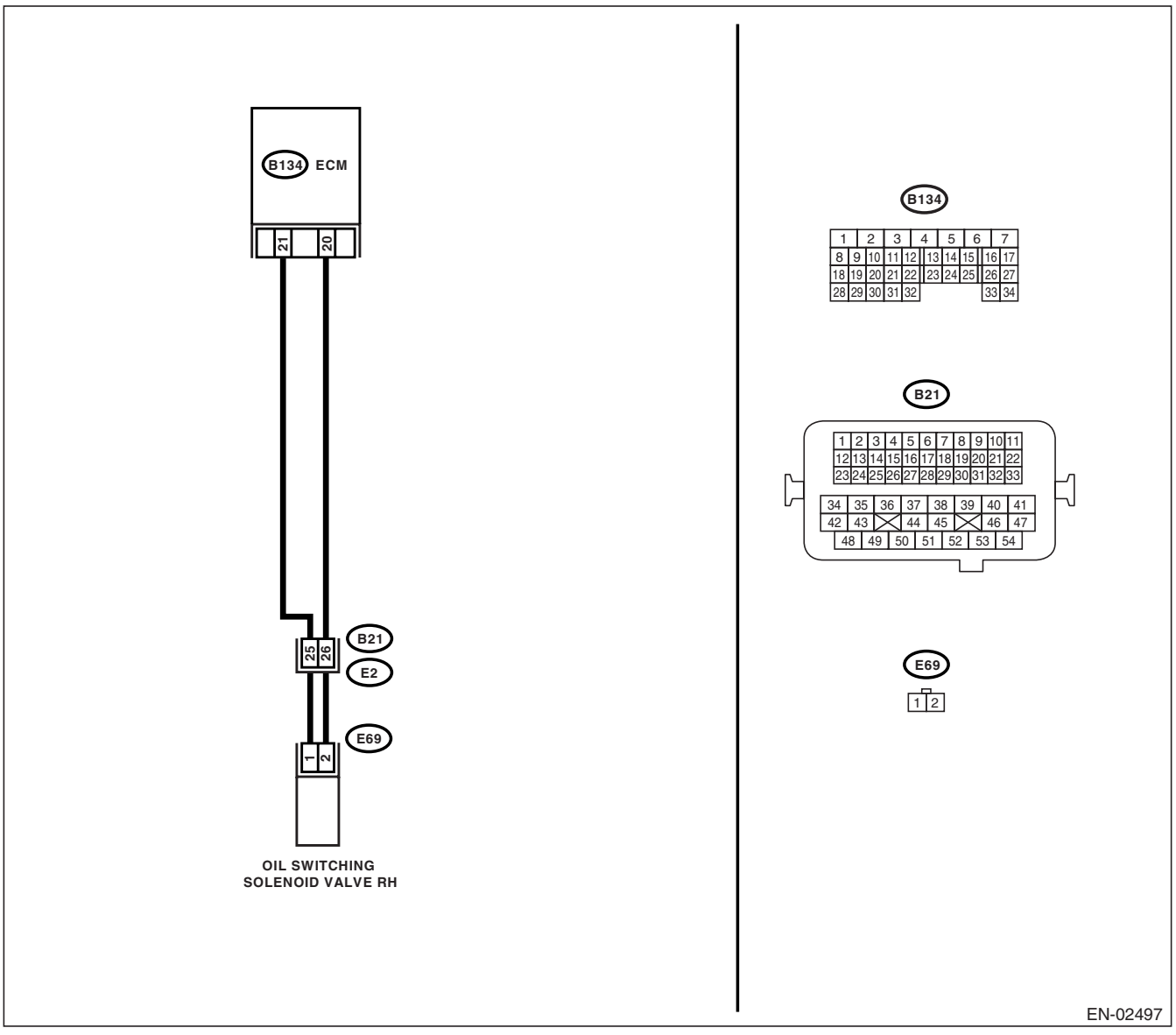
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND OIL SWITCHING SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and oil switching solenoid valve. 3) Measure the resistance between ECM and oil switching solenoid valve. ***Connector & terminal*** ***(B134) No. 21 — (E69) No. 1:*** ***(B134) No. 20 — (E69) No. 2:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit of harness between ECM and oil switching solenoid valve connector. NOTE: In this case, repair the following: • Open circuit of harness between ECM and oil switching solenoid valve connector • Poor contact in coupling connector
2	**CHECK OIL SWITCHING SOLENOID VALVE.** 1) Remove the oil switching solenoid valve connector. 2) Measure the resistance between oil switching solenoid valve terminals. ***Terminal*** ***No. 1 — No. 2:***	Is the resistance 6 — 12 Ω	Repair the poor contact in ECM and oil switching solenoid valve.	Replace the oil switching solenoid valve. <Ref. to ME(H6DO)-80, Oil Switching Solenoid Valve.>

P: DTC P0077 INTAKE VALVE CONTROL SOLENOID CIRCUIT HIGH (BANK 1)

DTC DETECTING CONDITION:

Immediately at fault recognition

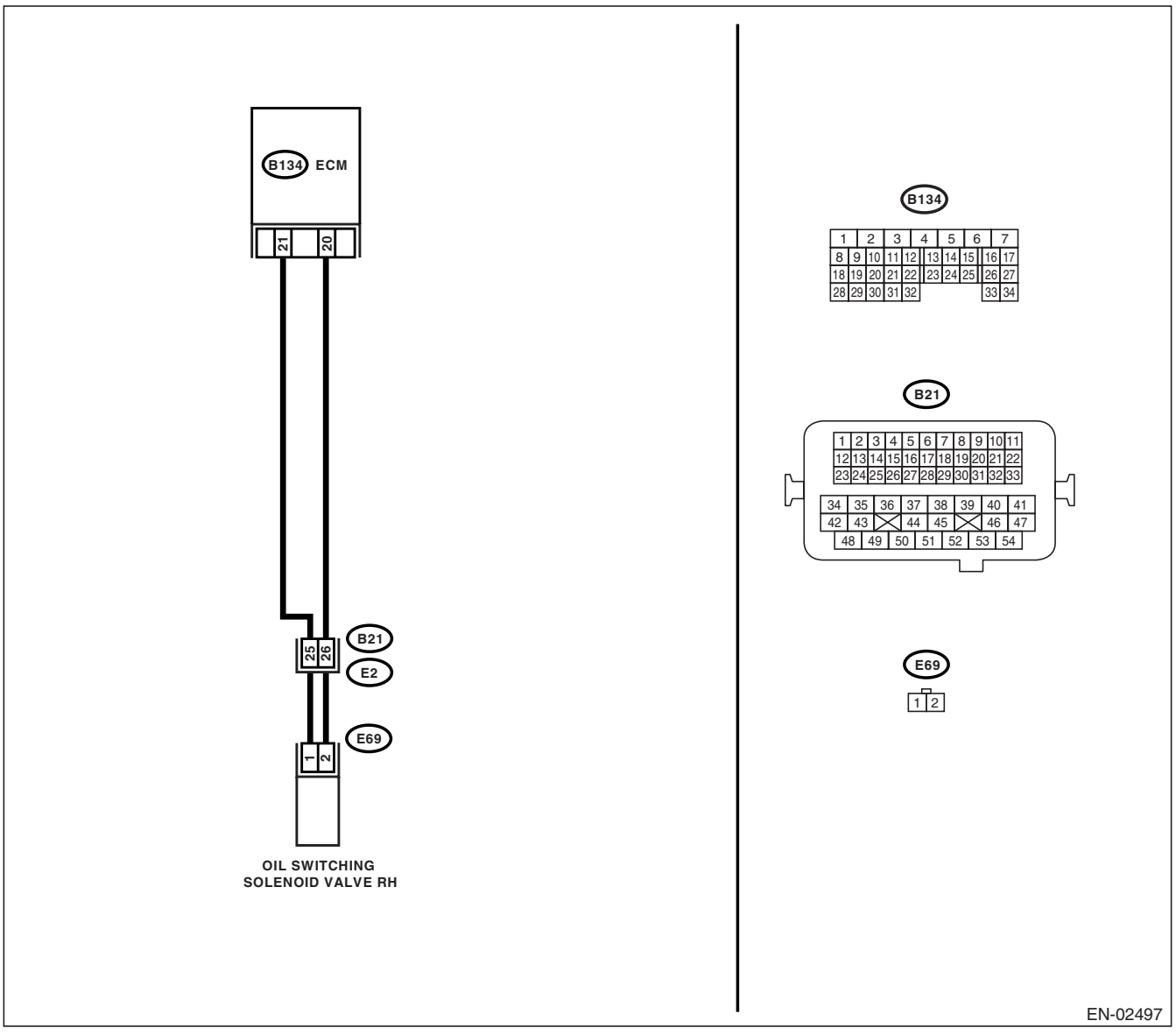
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND OIL SWITCHING SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and oil switching solenoid valve. 3) Measure the resistance between oil switching solenoid valve and engine ground. ***Connector & terminal*** ***(E69) No. 1 — Engine ground:*** ***(E69) No. 2 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **2.**	Repair the short circuit between ECM and oil switching solenoid valve connector.
2	**CHECK OIL SWITCHING SOLENOID VALVE.** 1) Remove the oil switching solenoid valve connector. 2) Measure the resistance between oil switching solenoid valve terminals. ***Terminal*** ***No. 1 — No. 2:***	Is the resistance 6 — 12 Ω	Repair the poor contact in ECM and oil switching solenoid valve.	Replace the oil switching solenoid valve. <Ref. to ME(H6DO)-80, Oil Switching Solenoid Valve.>

Q: DTC P0082 INTAKE VALVE CONTROL SOLENOID CIRCUIT LOW (BANK 2)

DTC DETECTING CONDITION:

Immediately at fault recognition

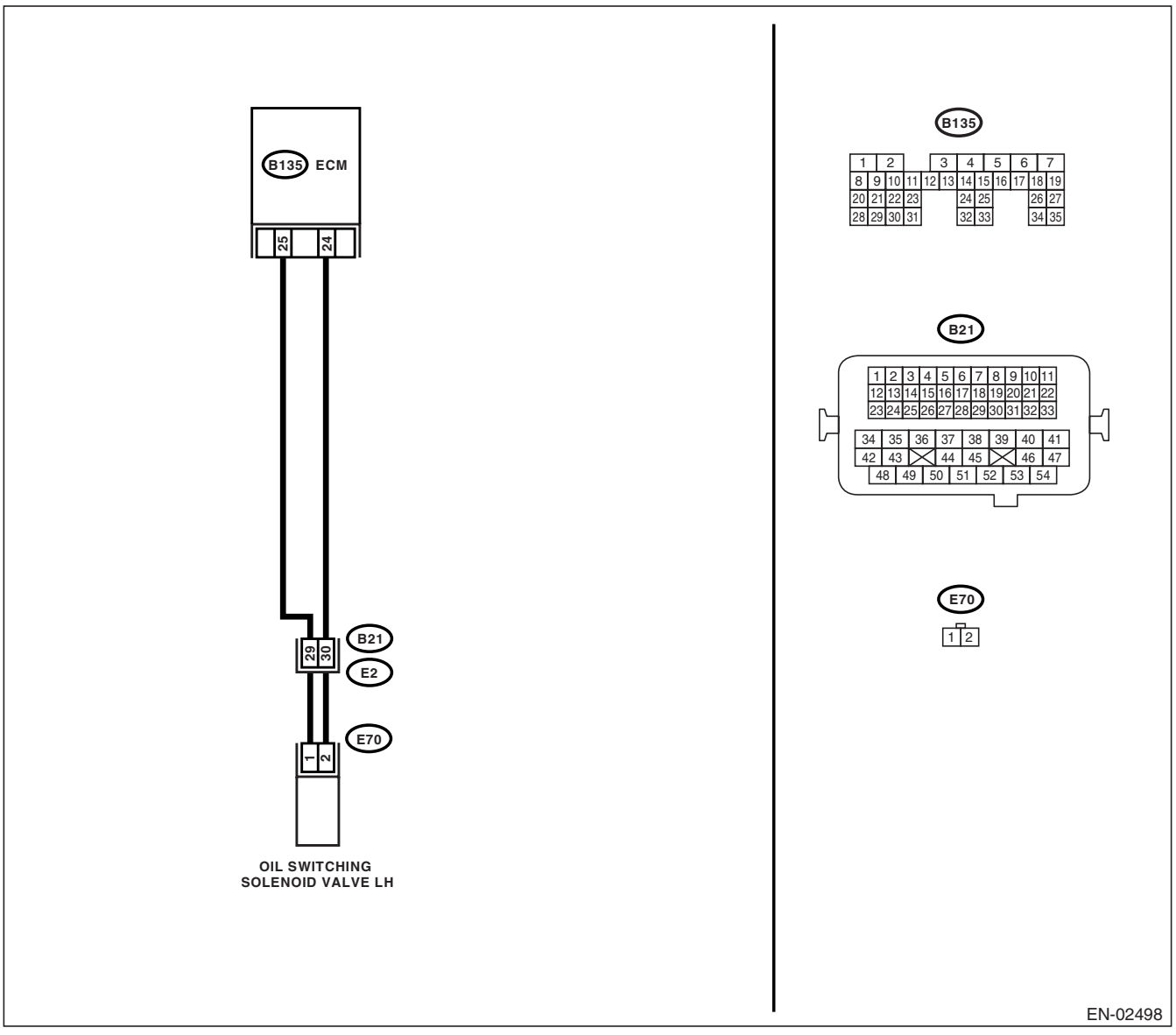
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND OIL SWITCHING SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and oil switching solenoid valve. 3) Measure the resistance between ECM and oil switching solenoid valve. ***Connector & terminal*** ***(B135) No. 25 — (E70) No. 1:*** ***(B135) No. 24 — (E70) No. 2:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit of harness between ECM and oil switching solenoid valve connector. NOTE: In this case, repair the following: • Open circuit of harness between ECM and oil switching solenoid valve connector • Poor contact in coupling connector
2	**CHECK OIL SWITCHING SOLENOID VALVE.** 1) Remove the oil switching solenoid valve connector. 2) Measure the resistance between oil switching solenoid valve terminals. ***Terminal*** ***No. 1 — No. 2:***	Is the resistance 6 — 12 Ω	Repair the poor contact in ECM and oil switching solenoid valve.	Replace the oil switching solenoid valve. <Ref. to ME(H6DO)-80, Oil Switching Solenoid Valve.>

R: DTC P0083 INTAKE VALVE CONTROL SOLENOID CIRCUIT HIGH (BANK 2)

DTC DETECTING CONDITION:

Immediately at fault recognition

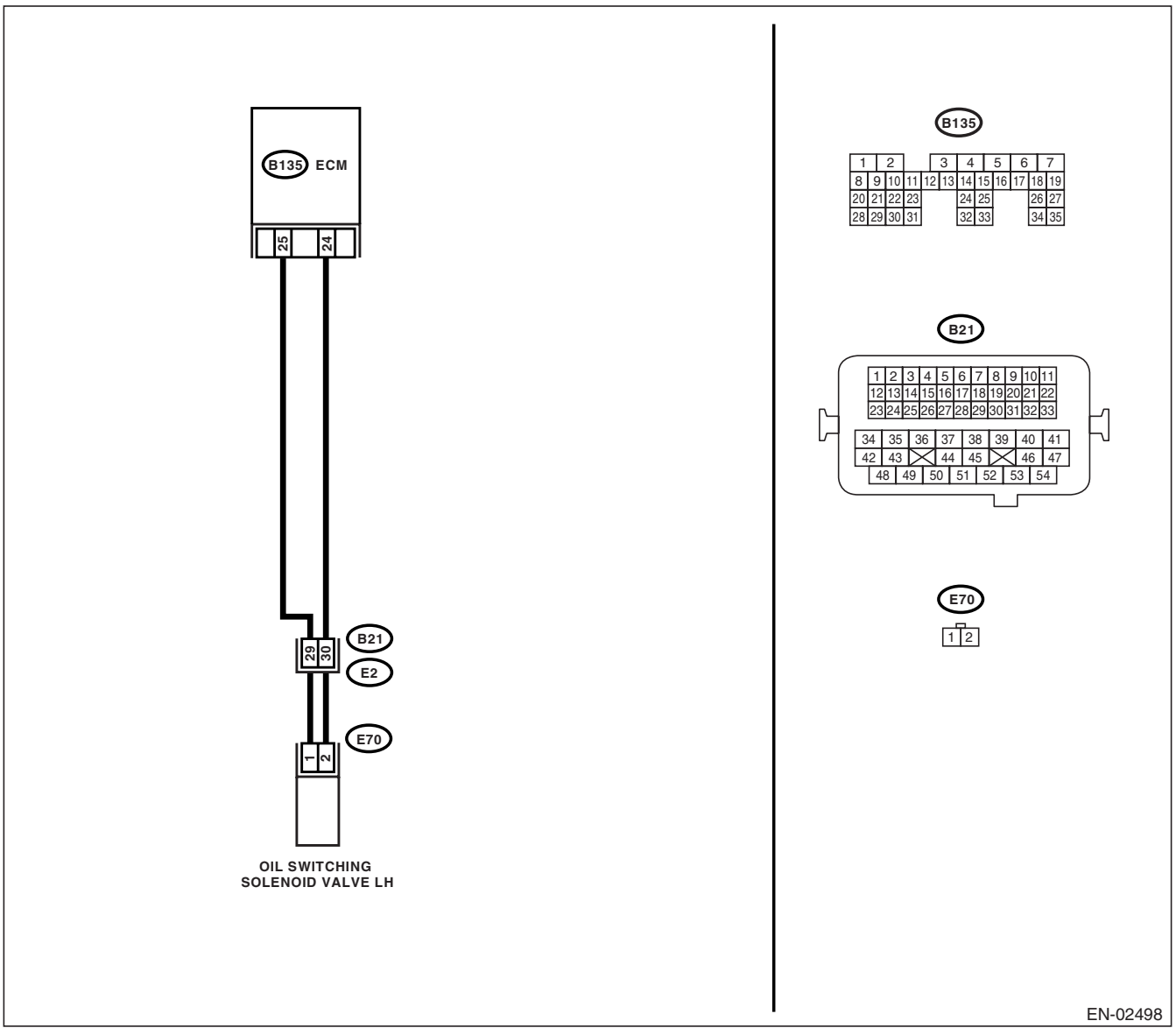
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND OIL SWITCHING SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and oil switching solenoid valve. 3) Measure the resistance between oil switching solenoid valve and engine ground. ***Connector & terminal*** ***(E70) No. 1 — Engine ground:*** ***(E70) No. 2 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **2.**	Repair the short circuit between ECM and oil switching solenoid valve connector.
2	**CHECK OIL SWITCHING SOLENOID VALVE.** 1) Remove the oil switching solenoid valve connector. 2) Measure the resistance between oil switching solenoid valve terminals. ***Terminal*** ***No. 1 — No. 2:***	Is the resistance 6 — 12 Ω	Repair the poor contact in ECM and oil switching solenoid valve.	Replace the oil switching solenoid valve. <Ref. to ME(H6DO)-80, Oil Switching Solenoid Valve.>

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

DTC DETECTING CONDITION:

Detects when malfunction occurs in 2 continuous driving cycles.

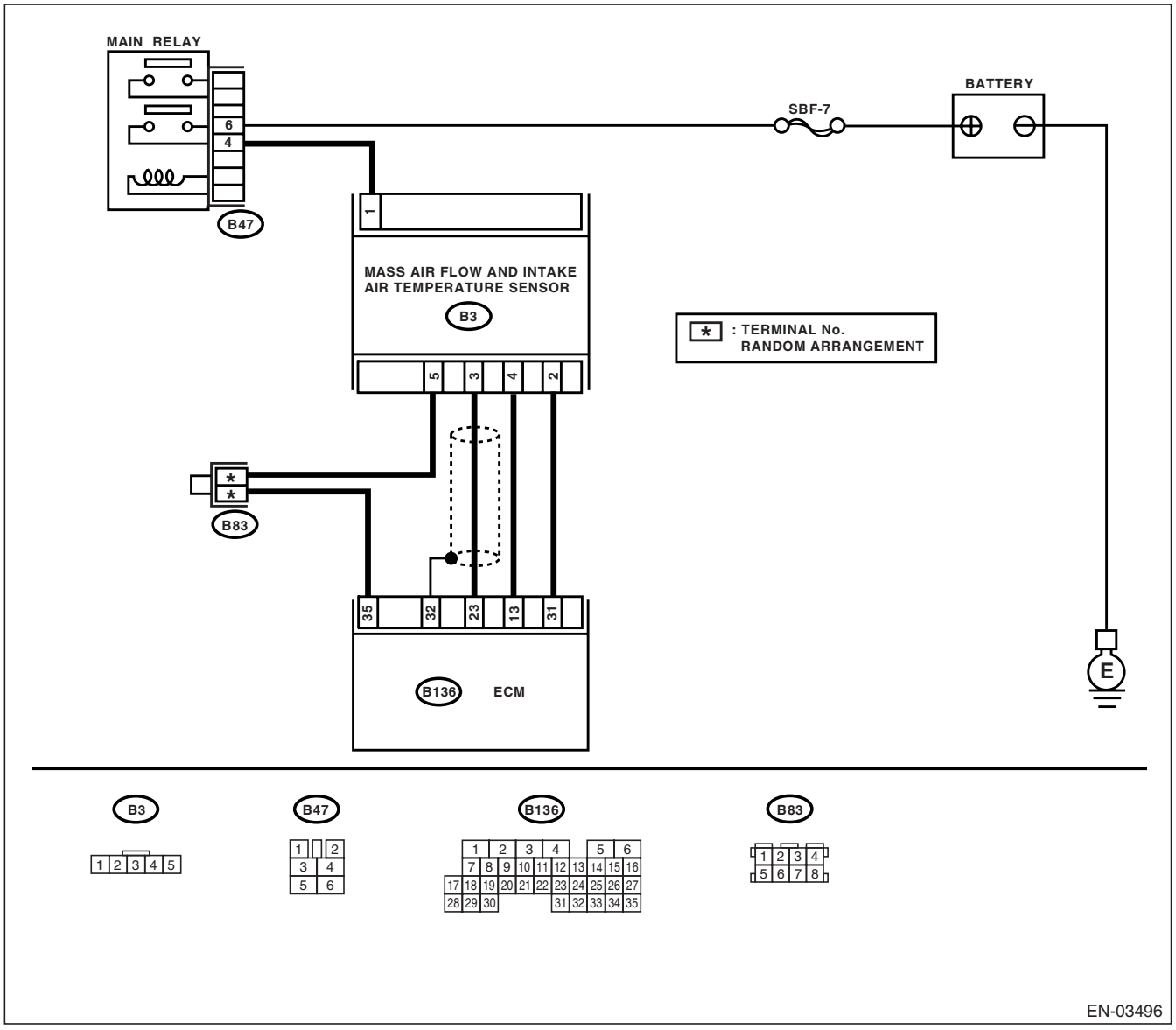
TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)(diag)-34, 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(H6DO)(diag)-66, 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(H6DO)-24, Mass Air Flow and Intake Air Temperature Sensor.>

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

DTC DETECTING CONDITION:

Immediately at fault recognition

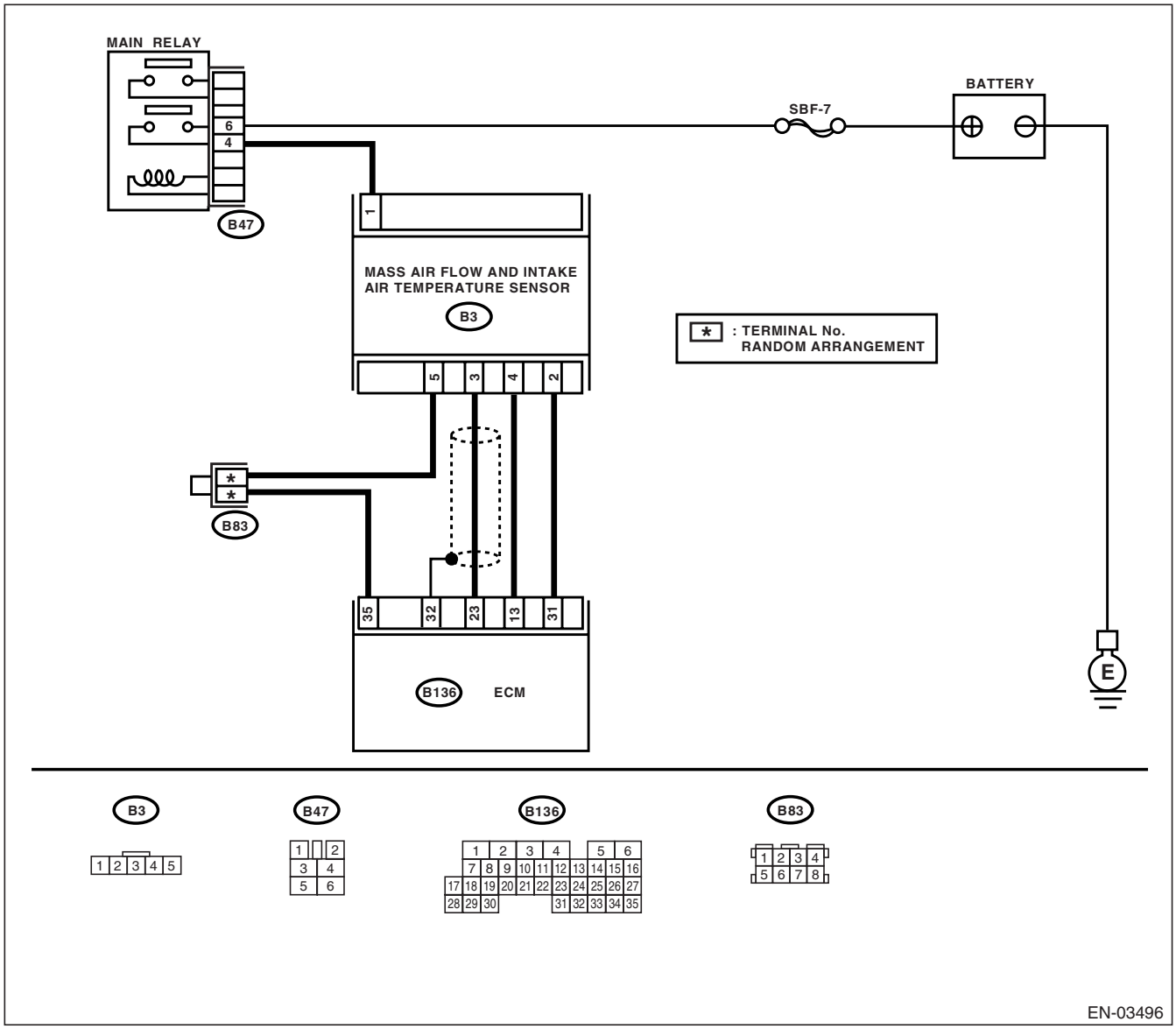
TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor or general scan tool to data link connector. 3) Turn the ignition switch to ON, and turn the power switch of Subaru Select Monitor or general scan tool to ON. 4) Start the engine. 5) Read the voltage of mass air flow sensor using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-26, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the voltage 0.2 — 4.7 V?	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact in connector or harness may be the cause. Repair harness or connector in the mass air flow sensor. NOTE: In this case, repair the following: • Open or ground short circuit of 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 OF ECM.** Measure the voltage between ECM connector and chassis ground while engine is idling. ***Connector & terminal*** ***(B136) No. 23 (+) — Chassis ground (−):***	Is the voltage more than 0.2 V?	Go to step **4.**	Go to step **3.**
3	**CHECK INPUT SIGNAL OF ECM (USING SUBARU SELECT MONITOR).** Measure the voltage between ECM connector and chassis ground while engine is idling.	Does the voltage change by shaking the harness and connector of ECM while monitoring the value with Subaru Select Monitor?	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H6DO)-34, Engine Control Module (ECM).>
4	**CHECK POWER SUPPLY TO MASS AIR FLOW SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from mass air flow sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between mass air flow sensor connector and chassis ground. ***Connector & terminal*** ***(B3) No. 1 (+) — Chassis ground (−):***	Is the voltage more than 5 V?	Go to step **5.**	Repair the open circuit between mass air flow sensor and main relay.
5	**CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between ECM and mass air flow sensor connector. ***Connector & terminal*** ***(B136) No. 23 — (B3) No. 3:*** ***(B136) No. 31 — (B3) No. 2:*** ***(B136) No. 35 — (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.

	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW SENSOR CONNECTOR** Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 23 — Chassis ground:*** ***(B136) No. 31 — Chassis ground:*** ***(B136) No. 35 — 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(H6DO)-24, Mass Air Flow and Intake Air Temperature Sensor.>

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

DTC DETECTING CONDITION:

Immediately at fault recognition

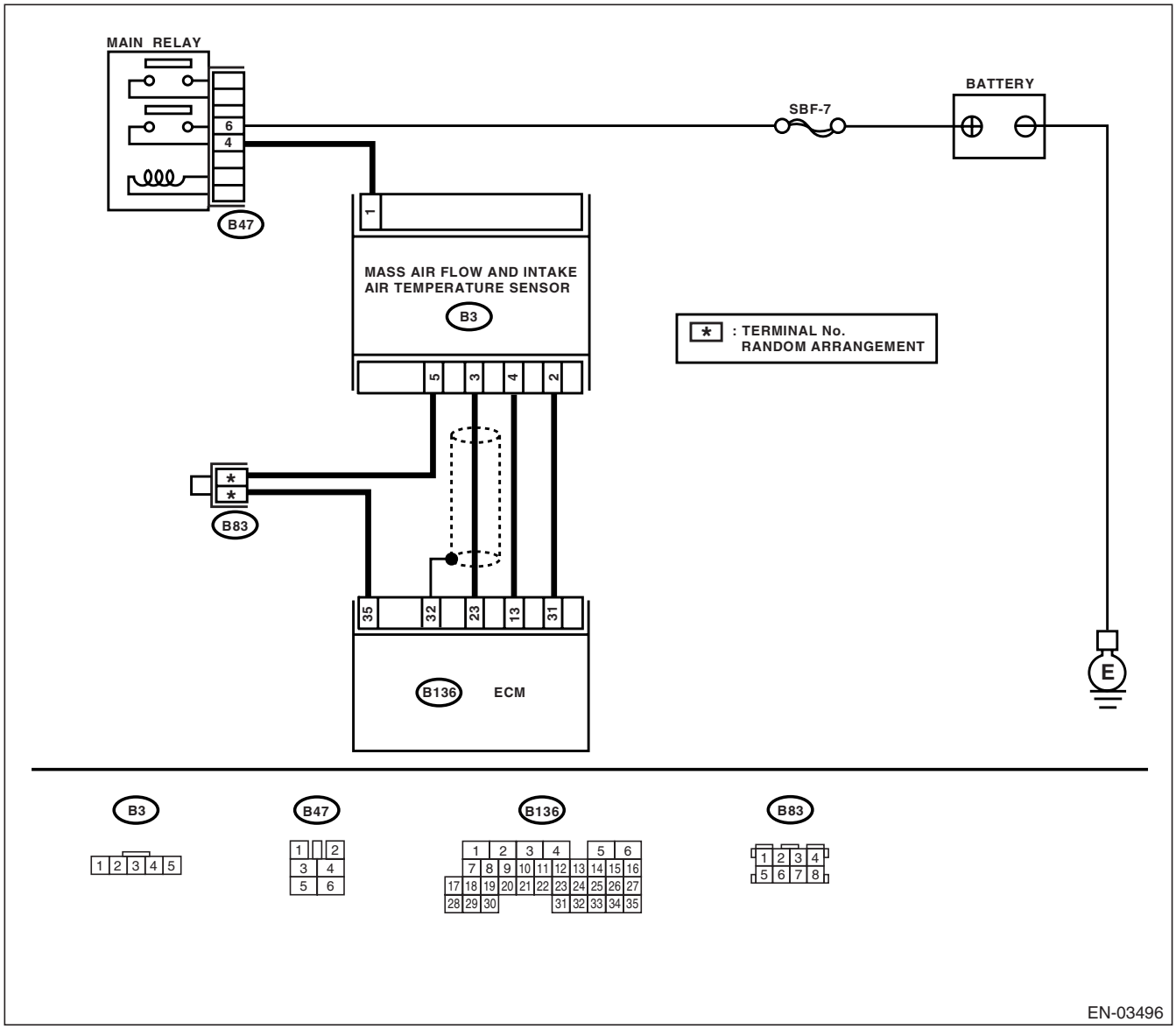
TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor or general scan tool to data link connector. 3) Turn the ignition switch to ON, and turn the power switch of Subaru Select Monitor or general scan tool to ON. 4) Start the engine. 5) Read the voltage of mass air flow sensor using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-26, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the voltage 0.2 — 4.7 V?	Even if the malfunction indicator light illuminates, 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 airflow 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 circuit 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 of harness between ECM connector and mass air flow sensor connector. ***Connector & terminal*** ***(B3) No. 2 — (B136) No. 31:***	Is the resistance less than 1 Ω?	Replace the mass air flow sensor. <Ref. to FU(H6DO)-24, Mass Air Flow and Intake Air Temperature Sensor.>	Repair the open circuit of harness between mass air flow sensor connector and ECM connector.

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

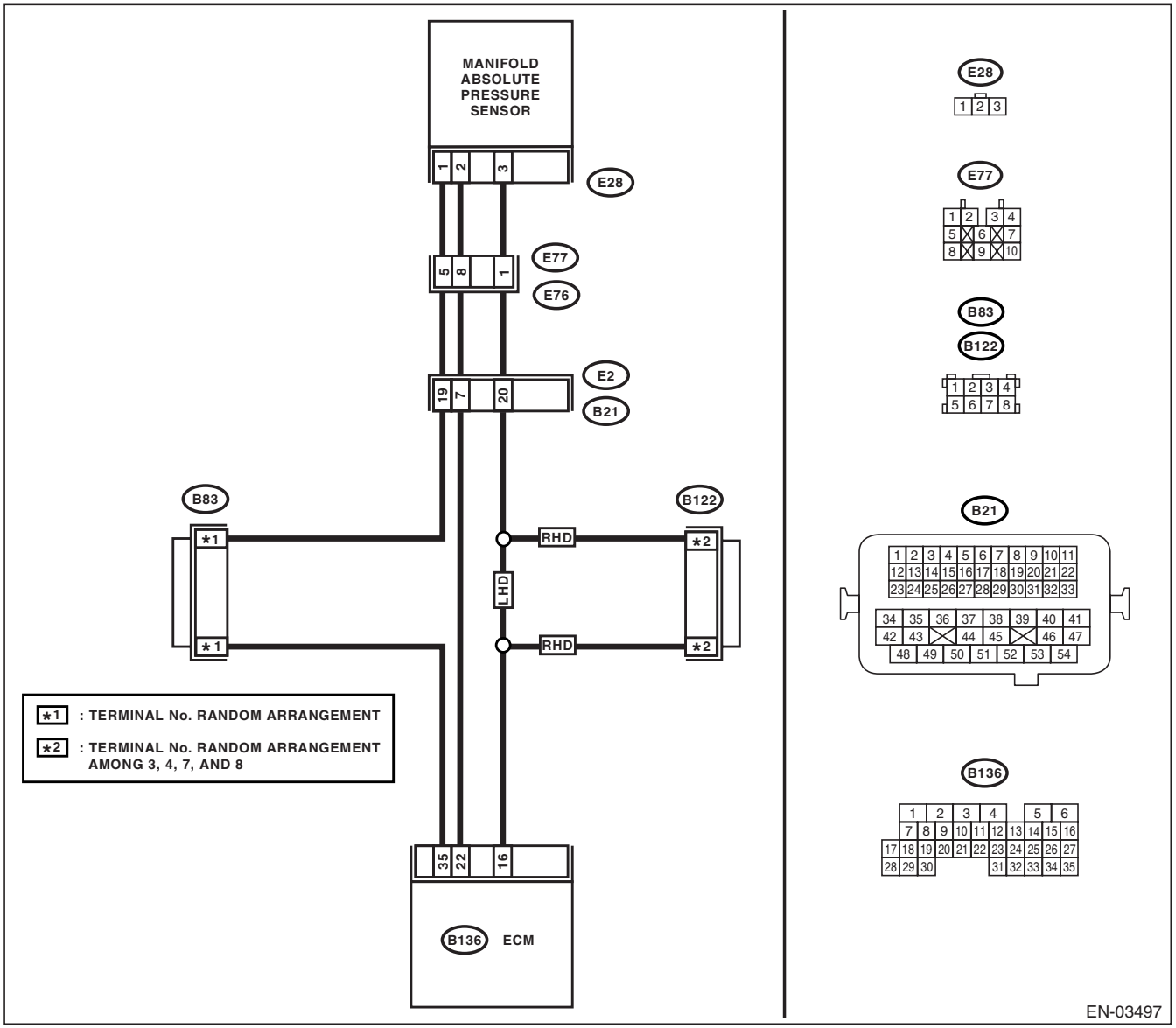
DTC DETECTING CONDITION:

Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of intake manifold absolute pressure signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-26, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the value less than 13.3 kPa (100 mmHg, 3.94 inHg)?	Go to step **3.**	Go to step **2.**
2	**CHECK POOR CONTACT.** Check poor contact in ECM and manifold absolute pressure sensor connector.	Is there poor contact in ECM or manifold absolute pressure sensor connector?	Repair the poor contact in ECM or manifold absolute pressure sensor connector.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time.
3	**CHECK OUTPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 16 (+) — Chassis ground (−):***	Is the voltage more than 4.5 V?	Go to step **5.**	Go to step **4.**
4	**CHECK OUTPUT SIGNAL OF ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 16 (+) — Chassis ground (−):***	Does the voltage change by shaking the ECM harness and connector?	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H6DO)-34, Engine Control Module (ECM).>
5	**CHECK INPUT SIGNAL OF ECM.** Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B136) No. 22 (+) — Chassis ground (−):***	Is the voltage less than 0.2 V?	Go to step **7.**	Go to step **6.**
6	**CHECK INPUT SIGNAL OF ECM (USING SUBARU SELECT MONITOR).** Read the data of atmospheric absolute pressure signal using Subaru Select Monitor. NOTE: For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-26, Subaru Select Monitor.>	Is the value more than 13.3 kPa (100 mmHg, 3.94 inHg) when shaking the ECM harness and connector?	Repair the poor contact in ECM connector.	Go to step **7.**
7	**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*** ***(E28) No. 3 (+) — Engine ground (−):***	Is the voltage more than 4.5 V?	Go to step **8.**	Repair the open circuit of harness between ECM and manifold absolute pressure sensor connector.

	Step	Check	Yes	No
8	**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*** ***(B136) No. 35 — (E28) No. 1:***	Is the resistance less than 1 Ω?	Go to step **9.**	Repair the open circuit of harness between ECM and manifold absolute pressure sensor connector.
9	**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(H6DO)-23, Manifold Absolute Pressure Sensor.>

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

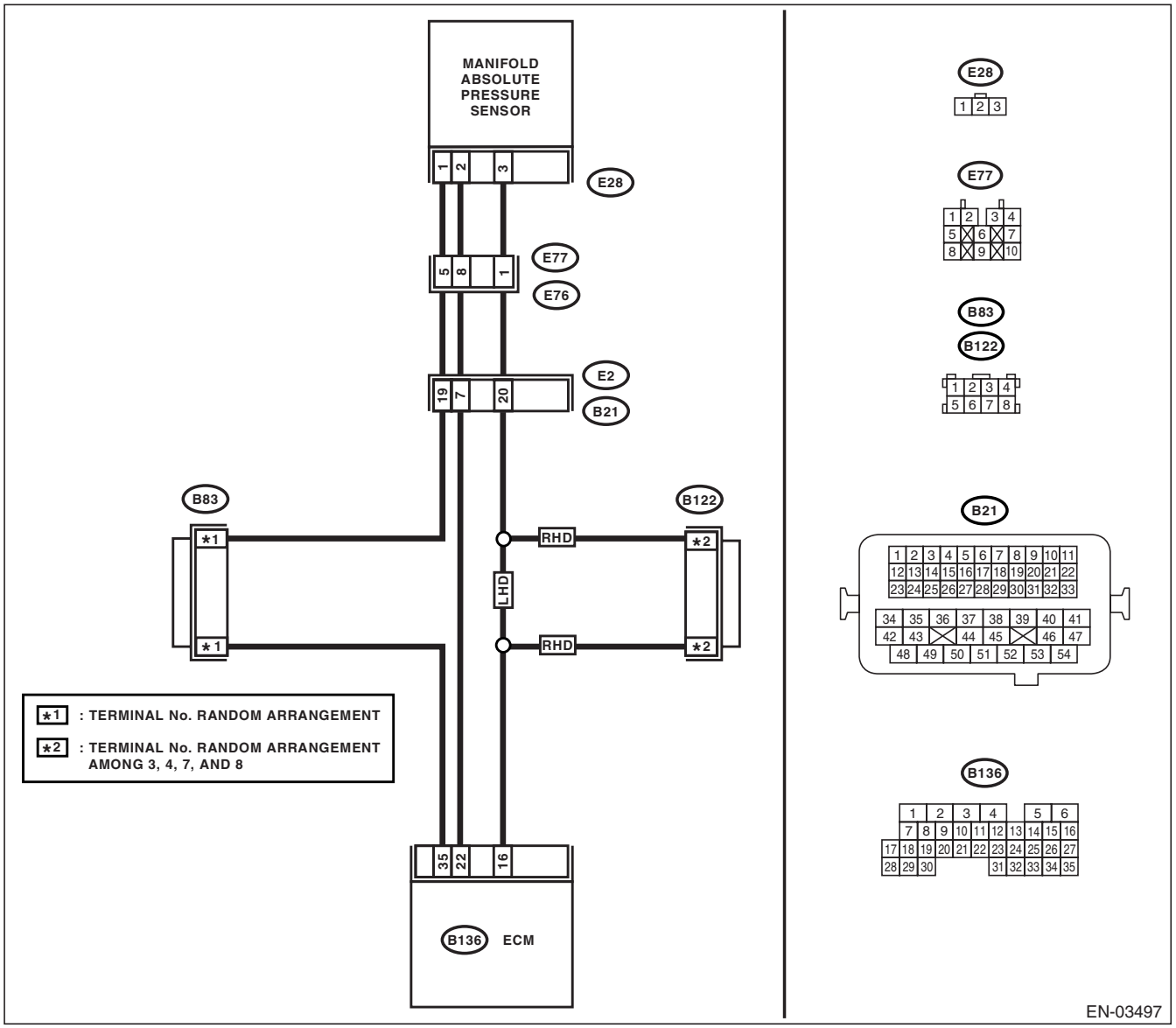
DTC DETECTING CONDITION:

Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK OUTPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 16 (+) — Chassis ground (−):***	Is the voltage more than 4.5 V?	Go to step **3.**	Go to step **2.**
2	**CHECK OUTPUT SIGNAL FROM ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 16 (+) — Chassis ground (−):***	Does the voltage change by shaking the ECM harness and connector?	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H6DO)-34, Engine Control Module (ECM).>
3	**CHECK INPUT SIGNAL OF ECM.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 22 (+) — Chassis ground (−):***	Is the voltage more than 4.5 V?	Go to step **5.**	Go to step **4.**
4	**CHECK INPUT SIGNAL OF ECM (USING SUBARU SELECT MONITOR).** Read the data of atmospheric absolute pressure signal using Subaru Select Monitor. NOTE: For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-26, Subaru Select Monitor.>	Is the value more than 13.3 kPa (100 mmHg, 3.94 inHg) when shaking the ECM harness and connector?	Repair the poor contact in ECM connector.	Go to step **5.**
5	**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*** ***(E28) No. 3 (+) — Engine ground (−):***	Is the voltage more than 4.5 V?	Go to step **6.**	Repair the open circuit of harness between ECM and manifold absolute pressure sensor connector.
6	**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*** ***(B136) No. 22 — (E28) No. 2:***	Is the resistance less than 1 Ω?	Go to step **7.**	Repair the open circuit of harness between ECM and manifold absolute pressure sensor connector.
7	**CHECK HARNESS BETWEEN MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 22 (+) — Chassis ground (−):***	Is the voltage more than 4.5 V?	Repair the battery short of harness between ECM and manifold absolute pressure sensor connector.	Go to step **8.**

	Step	Check	Yes	No
8	**CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between ECM and manifold absolute pressure sensor connector. ***Connector & terminal*** ***(B136) No. 35 — (E28) No. 1:***	Is the resistance less than 1 Ω?	Go to step **9.**	Repair the open circuit of harness between ECM and manifold absolute pressure sensor connector.
9	**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(H6DO)-23, Manifold Absolute Pressure Sensor.>

X: DTC P0112 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT LOW

DTC DETECTING CONDITION:

Immediately at fault recognition

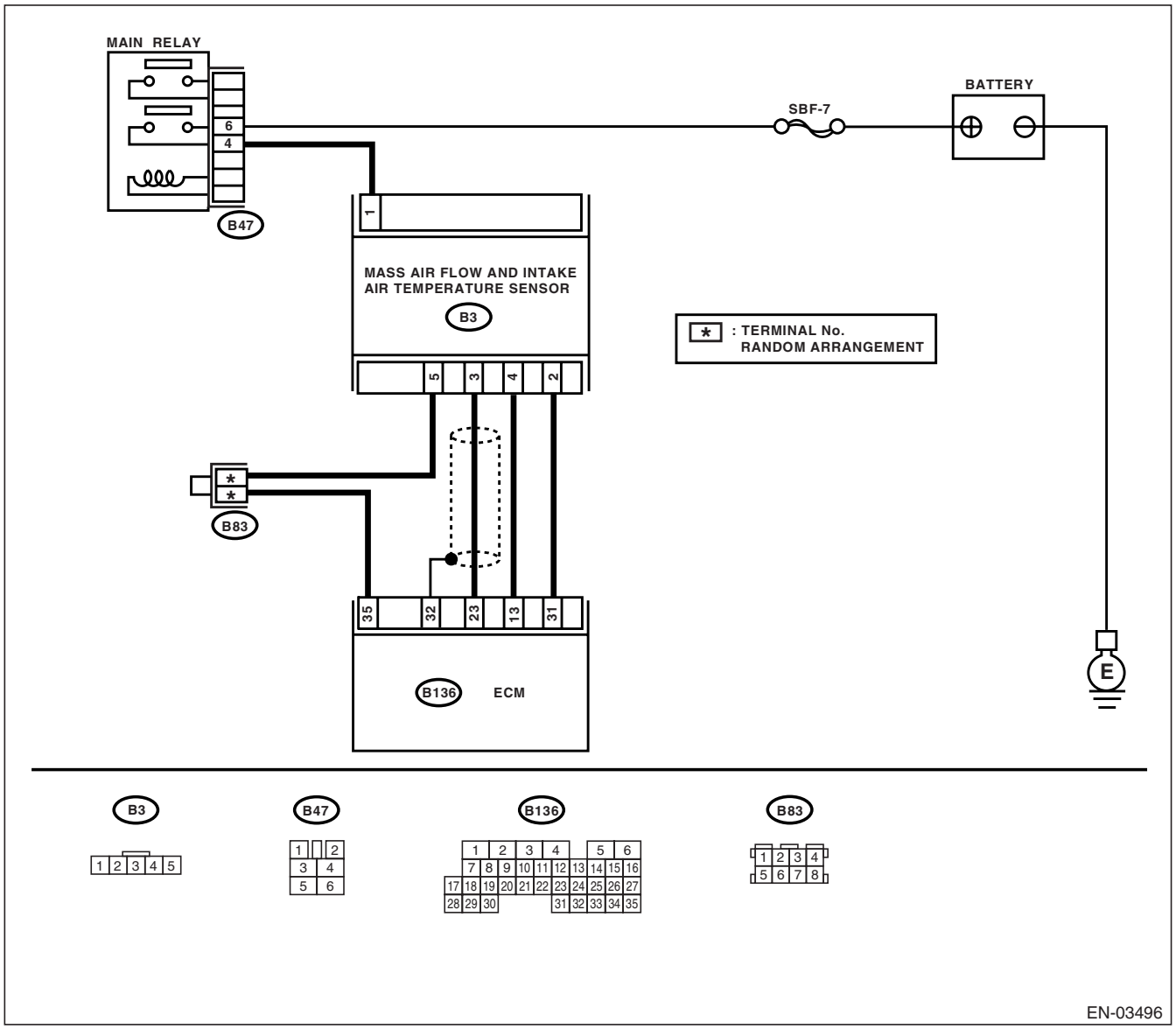
TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-26, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the intake air 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 mass air flow and intake air temperature sensor • Poor contact in ECM • Poor contact in coupling connector • 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 mass air flow and intake air temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-26, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the intake air temperature less than −40°C (−40°F)?	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H6DO)-24, Mass Air Flow and Intake Air Temperature Sensor.>	Repair the ground short circuit of harness between mass air flow and intake air temperature sensor and ECM connector.

Y: DTC P0113 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT HIGH

DTC DETECTING CONDITION:

Immediately at fault recognition

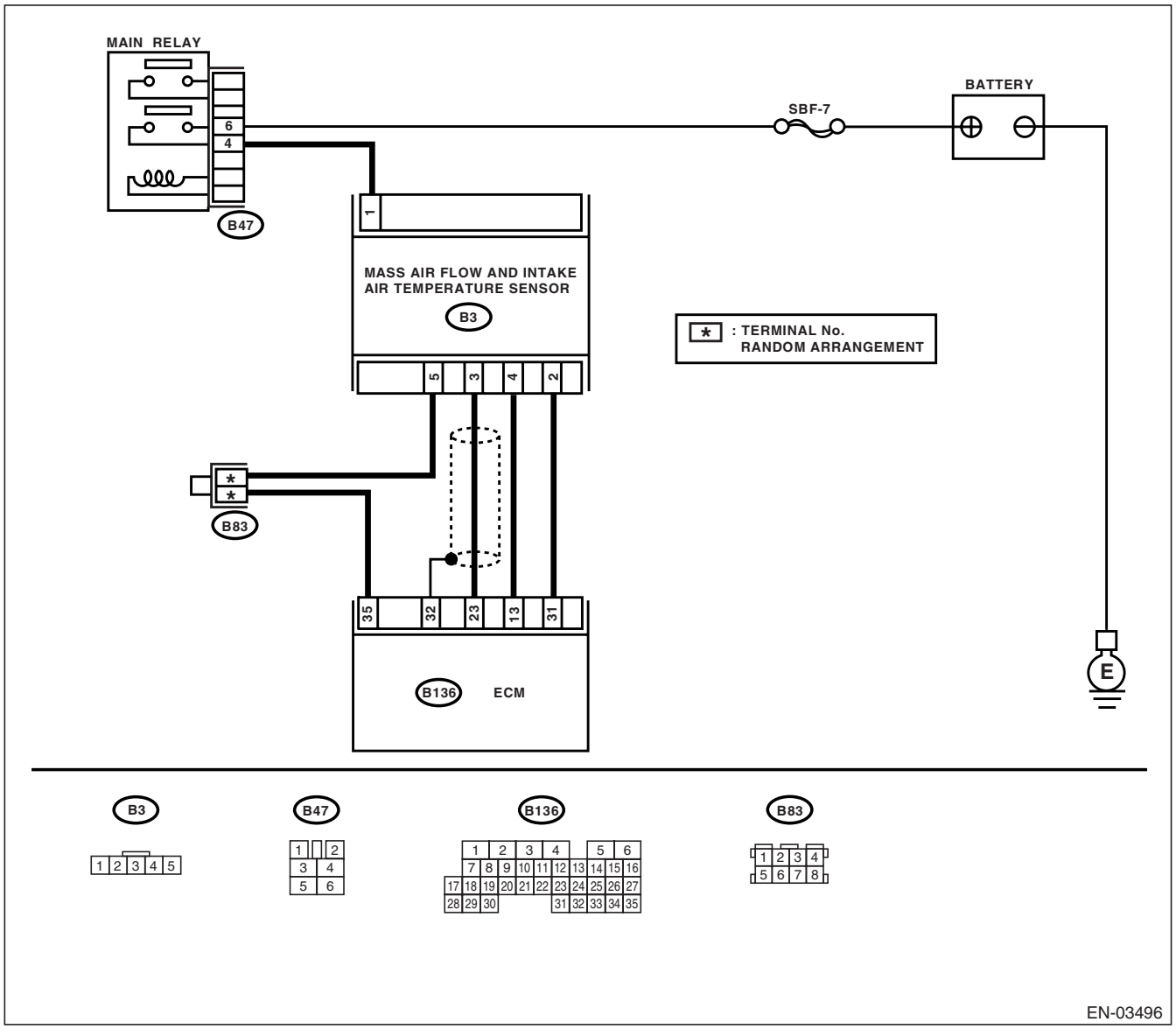
TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-26, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the intake air 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 mass air flow and intake air temperature sensor • Poor contact in ECM • Poor contact in coupling connector • 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 battery short circuit of 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 battery short circuit of 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 connector and engine ground. ***Connector & terminal*** ***(B3) No. 4 (+) — Engine ground (−):***	Is the voltage more than 3 V?	Go to step **5.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit of 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 coupling connector • Poor contact in joint connector

	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 connector 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(H6DO)-24, Mass Air Flow and Intake Air Temperature Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit of 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

Z: DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW

DTC DETECTING CONDITION:

Immediately at fault recognition

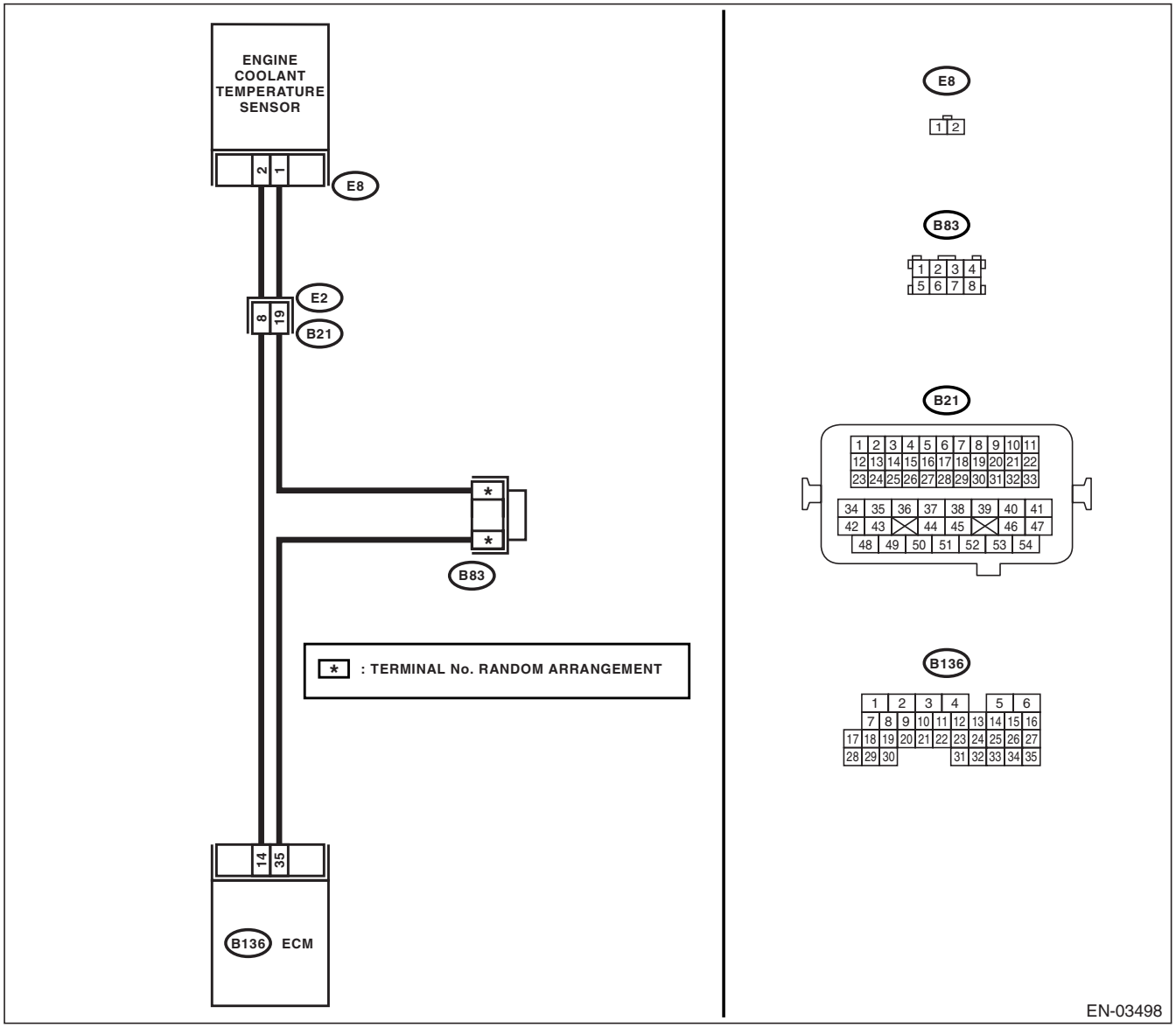
TROUBLE SYMPTOM:

- Hard to start
- Erroneous idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-26, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the engine coolant temperature more than 150°C (302°F)?	Go to step **2.**	Repair the poor contact. NOTE: In this case, repair the following: • Poor contact in engine coolant temperature sensor • Poor contact in ECM • Poor contact in coupling connector • Poor contact in joint connector
2	**CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from engine coolant temperature sensor. 3) Turn the ignition switch to ON. 4) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-26, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the engine coolant temperature less than −40°C (−40°F)?	Replace the engine coolant temperature sensor. <Ref. to FU(H6DO)-18, Engine Coolant Temperature Sensor.>	Repair the ground short circuit of harness between engine coolant temperature sensor and ECM connector.

AA:DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH

DTC DETECTING CONDITION:

Immediately at fault recognition

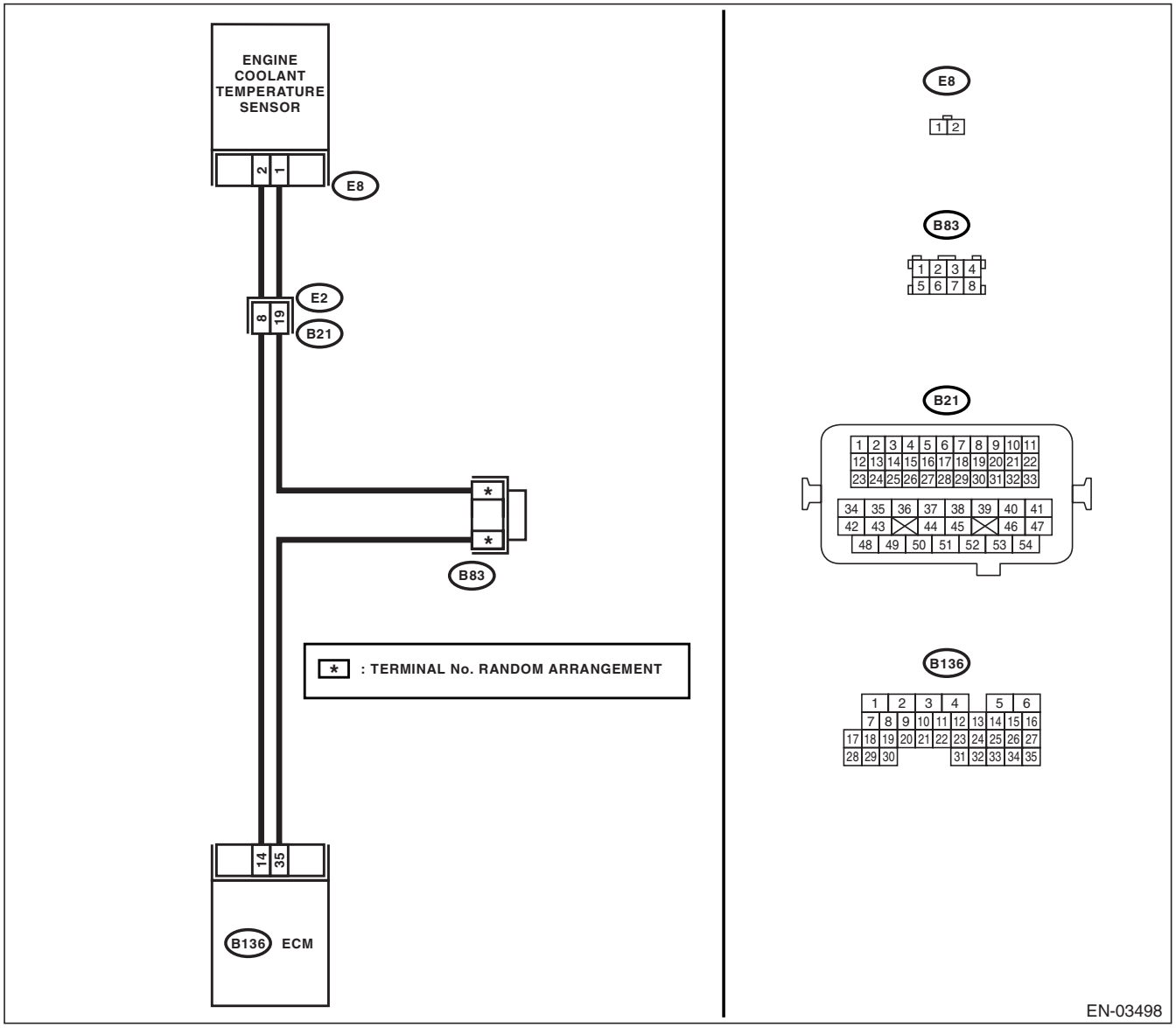
TROUBLE SYMPTOM:

- Hard to start
- Erroneous idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-26, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the engine coolant 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 of 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 of 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 of 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

	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(H6DO)-18, Engine Coolant Temperature Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit of 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

AB:DTC P0122 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT LOW

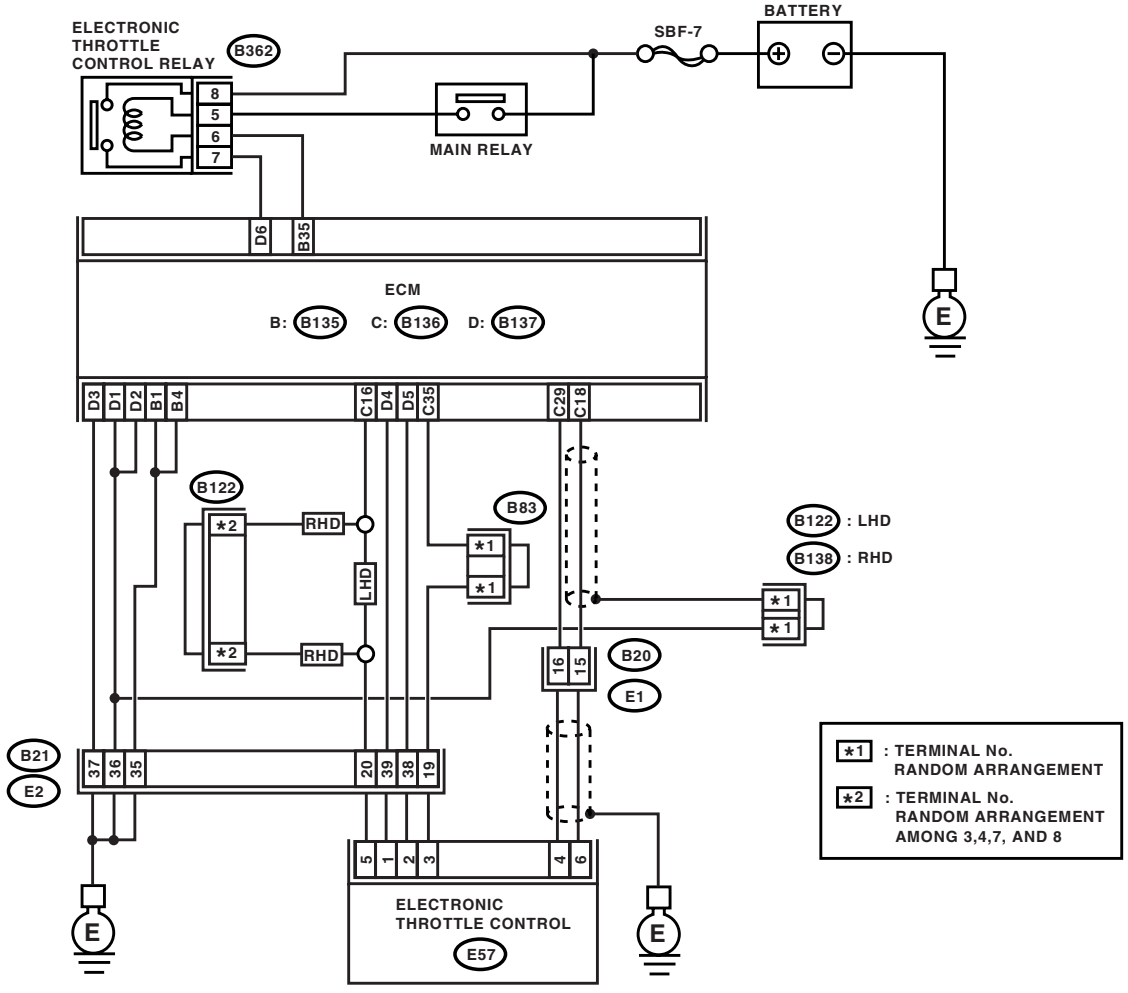
DTC DETECTING CONDITION:

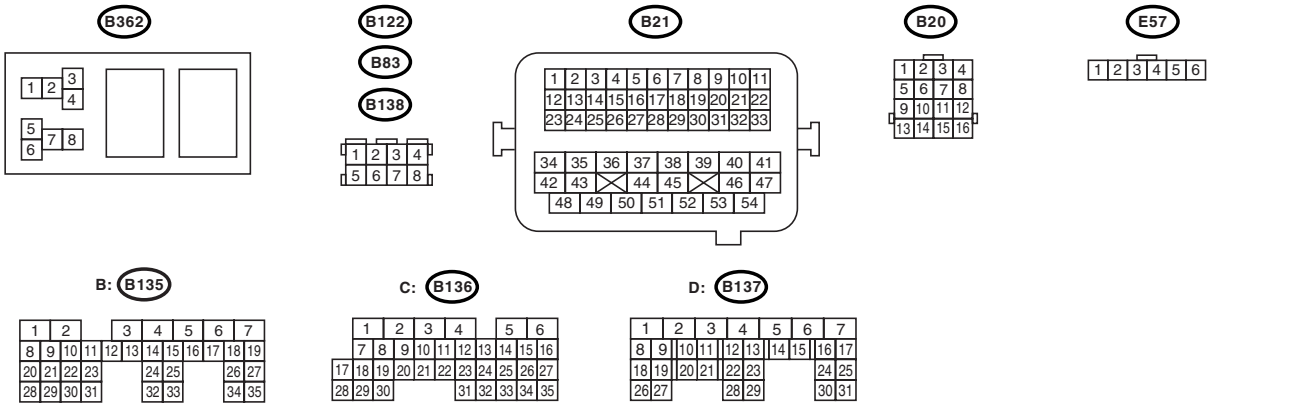
Immediately at fault recognition

TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

WIRING DIAGRAM:





EN-03499

	Step	Check	Yes	No
1	**CHECK SENSOR OUTPUT.** 1) Turn the ignition switch to ON. 2) Read the data of main throttle sensor signal using Subaru Select Monitor. NOTE: For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-26, Subaru Select Monitor.>	Is the voltage more than 0.4 V?	Go to step **2.**	Go to step **3.**
2	**CHECK POOR CONTACT.** Check poor contact in connector between ECM and electronic throttle control.	Is there poor contact in connector between ECM and electronic throttle control?	Repair the poor contact.	Temporary poor contact occurred, but it is normal at present.
3	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connectors from electronic throttle control. 4) Measure the resistance between ECM connector and electronic throttle control connector. ***Connector & terminal*** ***(B136) No. 18 — (E57) No. 6:*** ***(B136) No. 16 — (E57) No. 5:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the open circuit of harness connector.
4	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 18 — Chassis ground:*** ***(B136) No. 16 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair the chassis short circuit of harness.
5	**CHECK POWER SUPPLY OF ELECTRONIC THROTTLE CONTROL.** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 5 (+) — Engine ground (−):***	Is the voltage 4.5 — 5.5 V?	Go to step **6.**	Repair the poor contact in ECM connector. Replace the ECM if defective. <Ref. to FU(H6DO)-34, Engine Control Module (ECM).>
6	**CHECK SHORT CIRCUIT INSIDE THE ECM.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 6 — Engine ground:***	Is the resistance more than 10 Ω?	Repair the poor contact of electronic throttle control connector. Replace the accelerator pedal position sensor if defective.	Repair the poor contact in ECM connector. Replace the ECM if defective. <Ref. to FU(H6DO)-34, Engine Control Module (ECM).>

AC:DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT HIGH

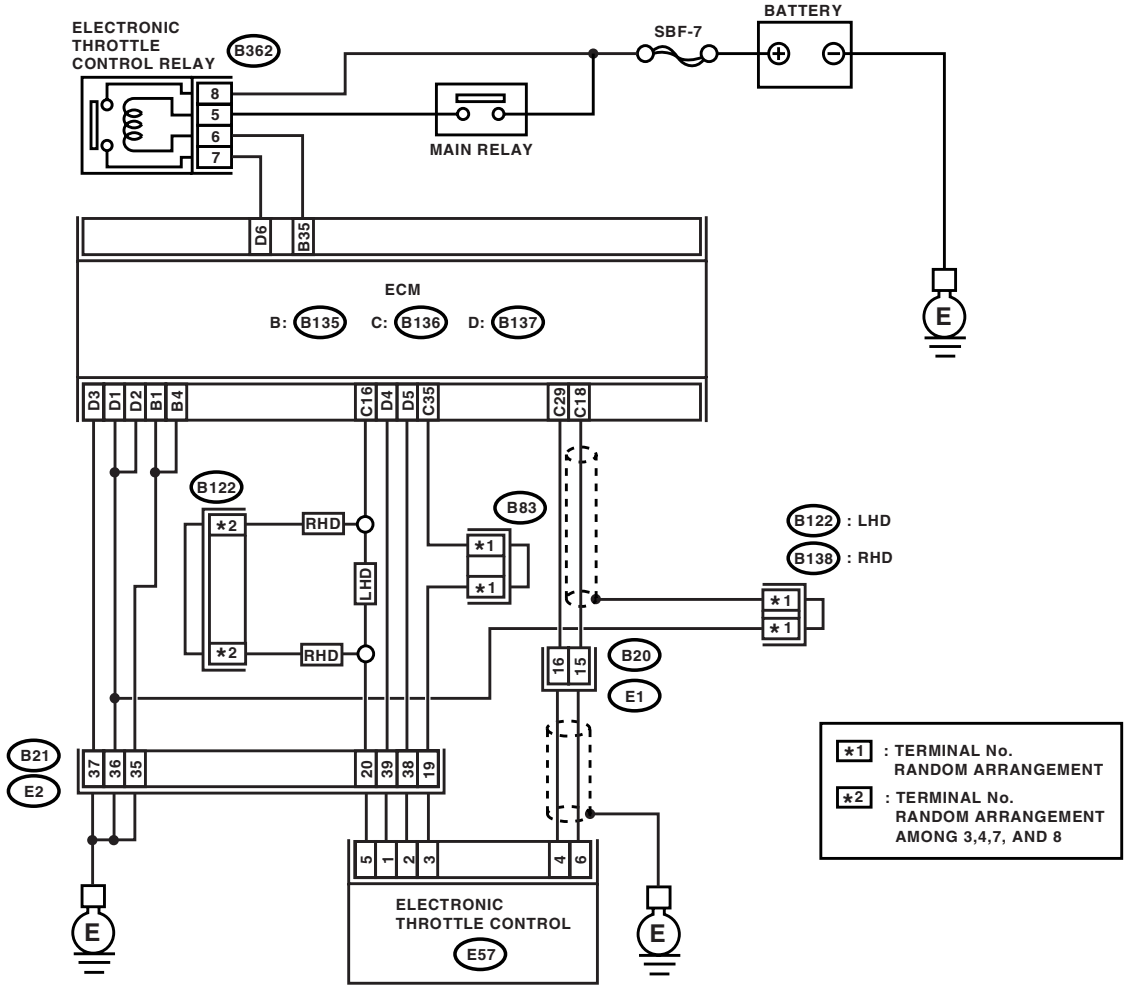
DTC DETECTING CONDITION:

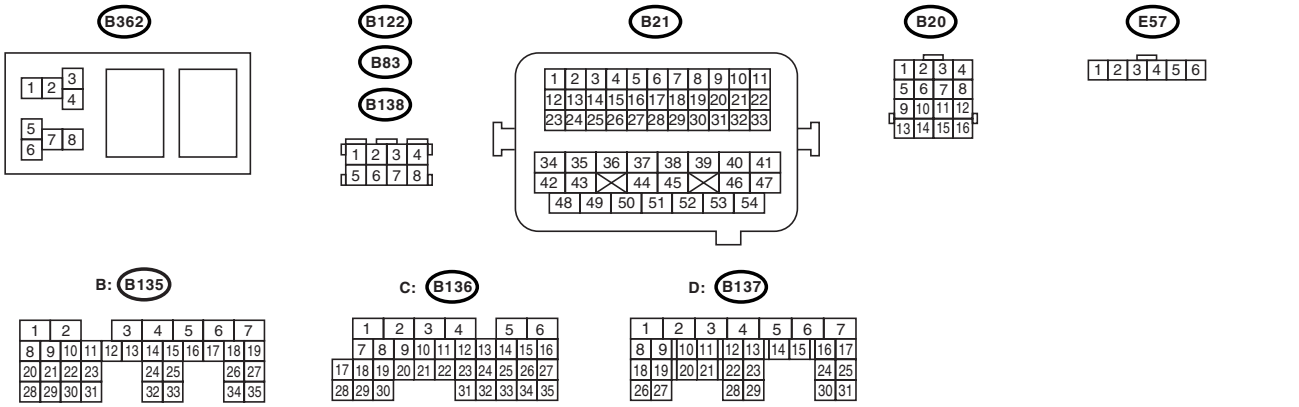
Immediately at fault recognition

TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

WIRING DIAGRAM:





EN-03499

	Step	Check	Yes	No
1	**CHECK SENSOR OUTPUT.** 1) Turn the ignition switch to ON. 2) Read the data of main throttle sensor signal using Subaru Select Monitor. NOTE: For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-26, Subaru Select Monitor.>	Is the voltage less than 4.63 V?	Go to step **2.**	Go to step **3.**
2	**CHECK POOR CONTACT.** Check poor contact in connector between ECM and electronic throttle control.	Is there poor contact in connector between ECM and electronic throttle control?	Repair the poor contact.	Temporary poor contact occurred, but it is normal at present.
3	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connectors from electronic throttle control. 4) Measure the resistance between ECM connector and electronic throttle control connector. ***Connector & terminal*** ***(B136) No. 18 — (E57) No. 6:*** ***(B136) No. 35 — (E57) No. 3:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the open circuit of harness connector.
4	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Connect the ECM connector. 2) Measure the resistance between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 3 — Engine ground:***	Is the resistance less than 1 Ω?	Go to step **5.**	Repair the poor contact in ECM connector. Replace the ECM if defective. <Ref. to FU(H6DO)-34, Engine Control Module (ECM).>
5	**CHECK SENSOR OUTPUT POWER SUPPLY.** Measure the voltage between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 6 (+) — Engine ground (−):***	Is the voltage less than 10 V?	Go to step **6.**	Repair the battery short circuit of harness between ECM connector and electronic throttle control connector.
6	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between ECM connectors. ***Connector & terminal*** ***(B136) No. 18 — (B136) No. 16:***	Is the resistance more than 1 MΩ?	Repair the poor contact in harness. Repair the electronic throttle control.	Repair the short circuit to sensor power supply.

AD:DTC P0125 INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL

DTC DETECTING CONDITION:
Detects when malfunction occurs in 2 continuous driving cycles.
TROUBLE SYMPTOM:
Engine would not return to idling.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)(diag)-34, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)(diag)-66, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0125.	Go to step **2.**
2	**CHECK TIRE SIZE.**	Is the tire specified size and one same size as other three wheels?	Go to step **3.**	Replace the tire.
3	**CHECK ENGINE COOLANT.** Check the following items: • Amount of engine coolant • Coolant freeze • Contamination of engine coolant	Is the engine coolant normal?	Go to step **4.**	Fill or replace the engine coolant. <Ref. to CO(H6DO)-12, INSPECTION, Engine Coolant.>
4	**CHECK THERMOSTAT.**	Does the thermostat remain opened?	Replace the thermostat. <Ref. to CO(H6DO)-14, Thermostat.>	Replace the engine coolant temperature sensor. <Ref. to FU(H6DO)-18, Engine Coolant Temperature Sensor.>

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

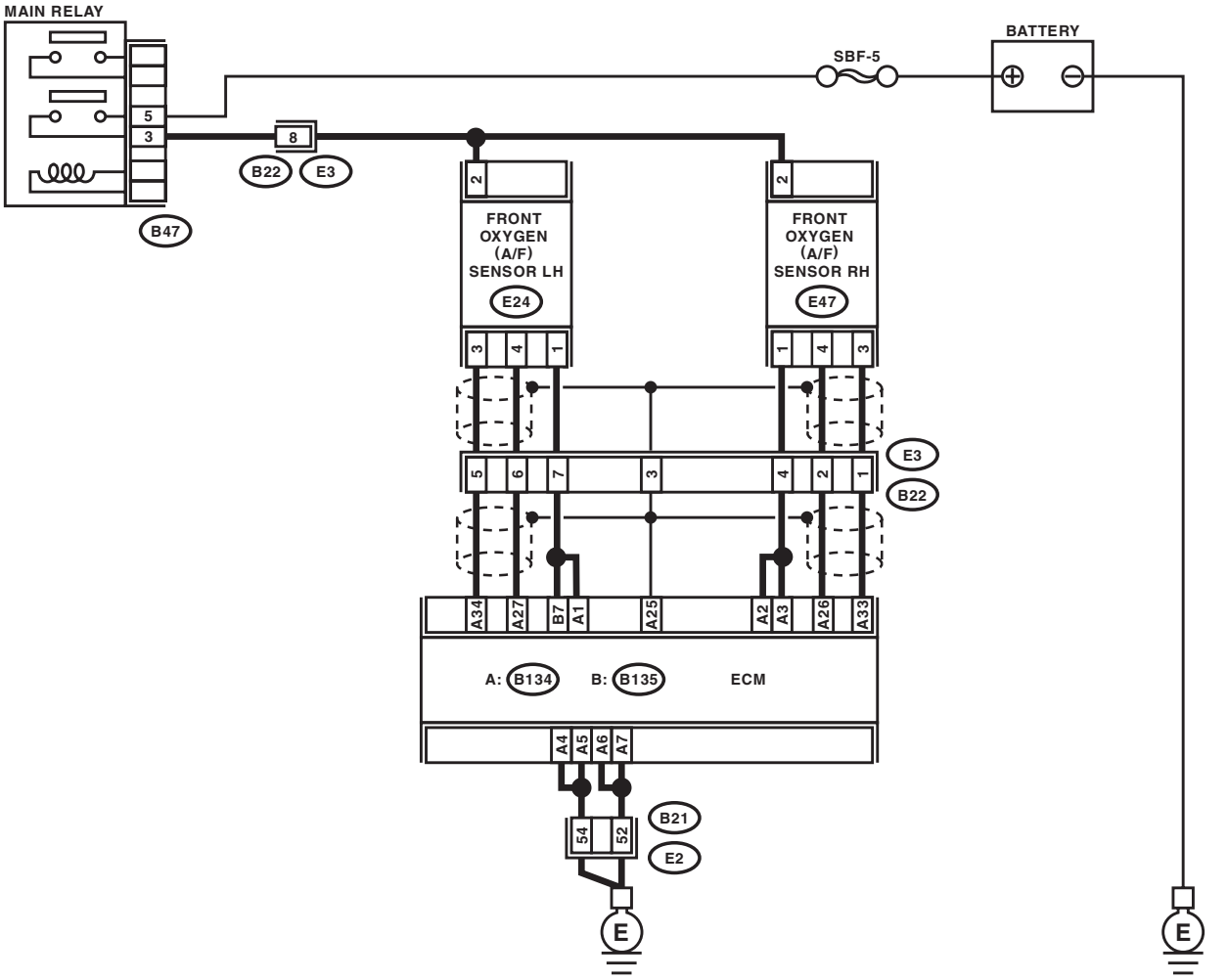
DTC DETECTING CONDITION:

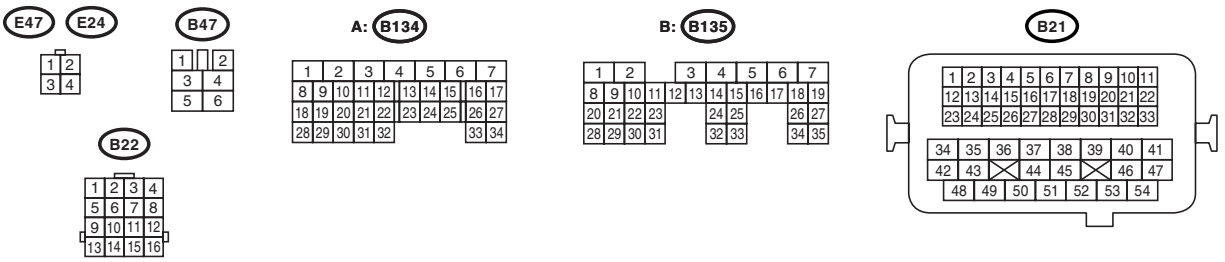
Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





EN-03494

	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 connector. 3) Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 26 — Chassis ground:*** ***(B134) No. 33 — Chassis ground:***	Is the resistance more than 1 MΩ?	Replace the front oxygen (A/F) sensor. <Ref. to FU(H6DO)-30, Front Oxygen (A/F) Sensor.>	Repair the ground short circuit of harness between ECM and front oxygen (A/F) sensor connector.

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

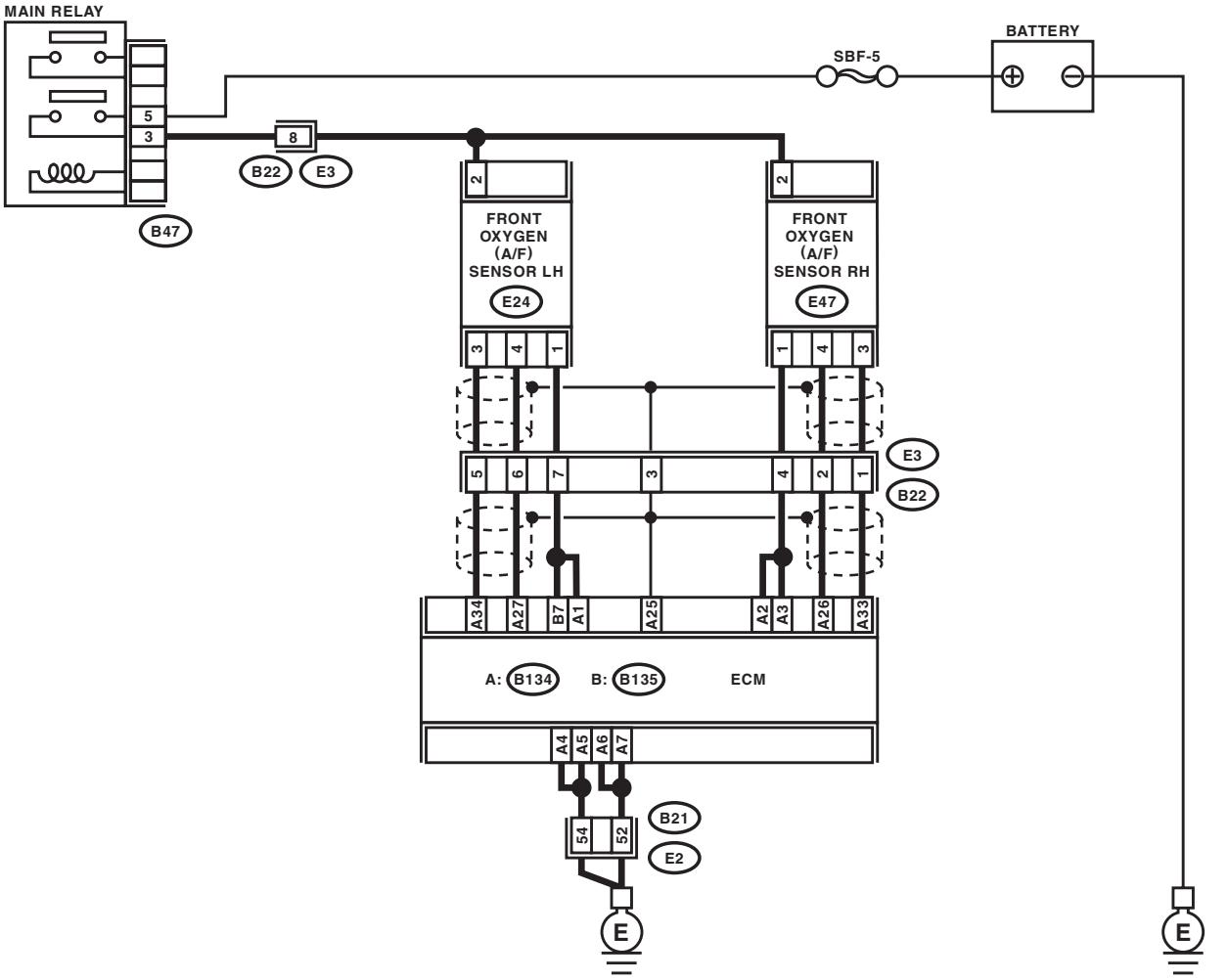
DTC DETECTING CONDITION:

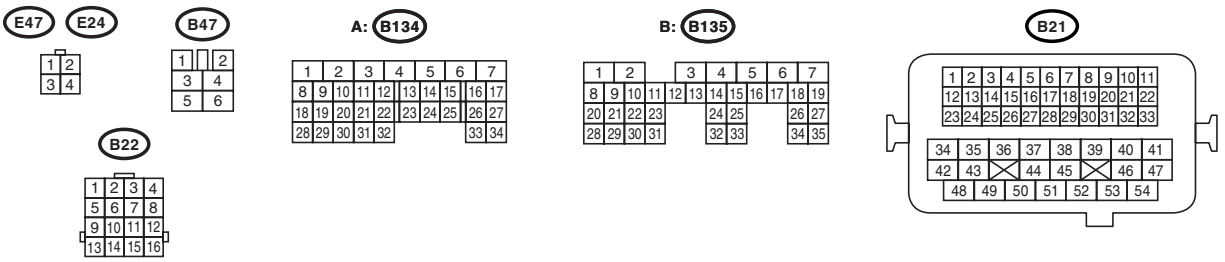
Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





EN-03494

	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to ON. 2) Disconnect the connector from front oxygen (A/F) sensor. 3) Measure the voltage of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 26 (+) — Chassis ground (−):*** ***(B134) No. 33 (+) — Chassis ground (−):***	Is the voltage more than 8 V?	Replace the front oxygen (A/F) sensor. <Ref. to FU(H6DO)-30, Front Oxygen (A/F) Sensor.>	Repair the battery short circuit of harness between ECM and front oxygen (A/F) sensor connector.

AG:DTC P0133 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1)

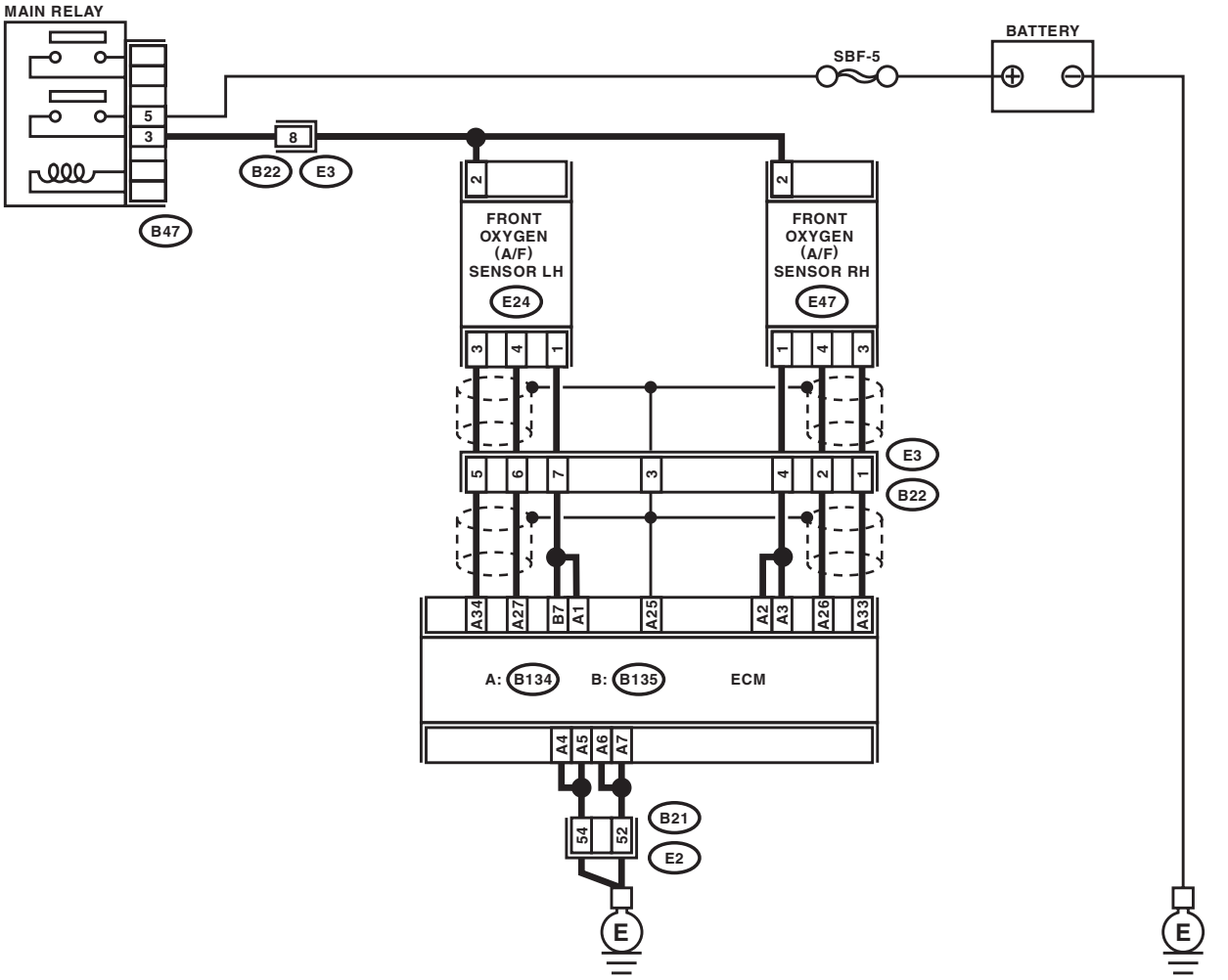
DTC DETECTING CONDITION:

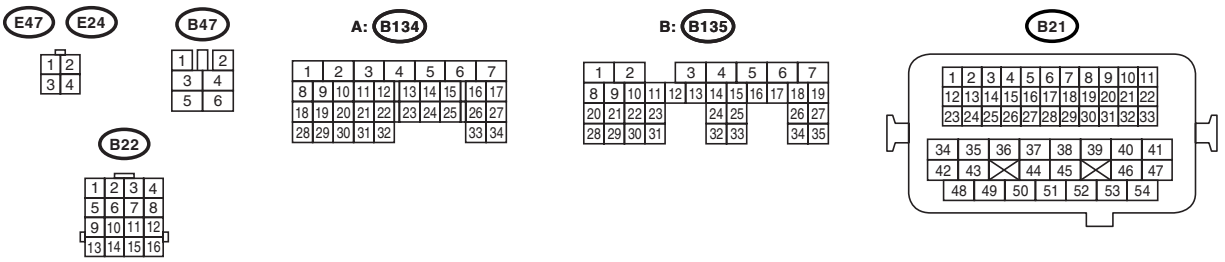
Detects when malfunction occurs in 2 continuous driving cycles.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





EN-03494

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H6DO)(diag)-66, 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 any fault in exhaust system?	Repair the exhaust system.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H6DO)-30, Front Oxygen (A/F) Sensor.>

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

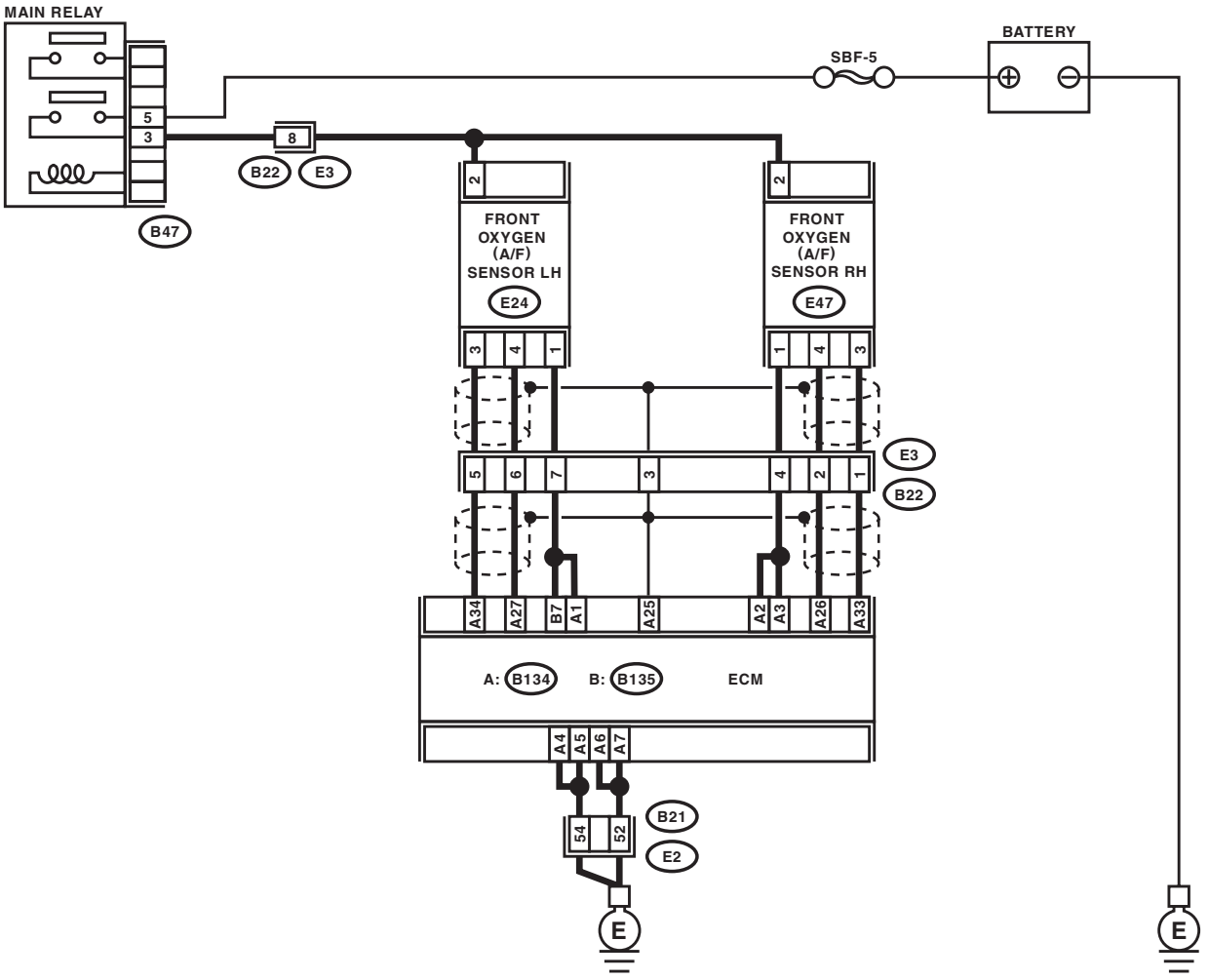
DTC DETECTING CONDITION:

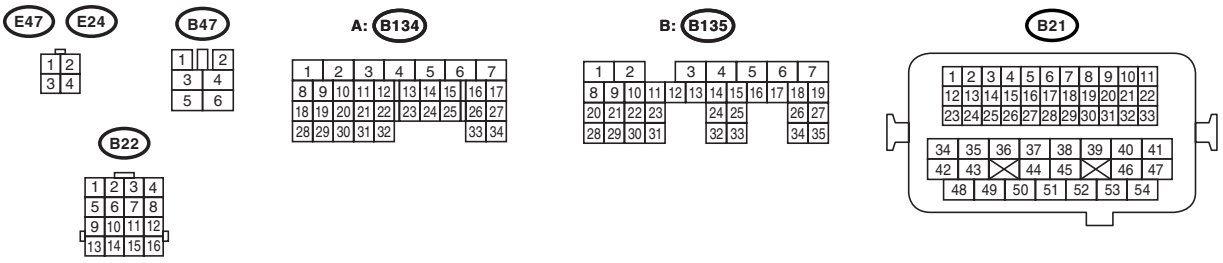
Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





EN-03494

	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 connector. 3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B134) No. 26 — (E47) No. 4:*** ***(B134) No. 33 — (E47) No. 3:***	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 of 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(H6DO)-30, Front Oxygen (A/F) Sensor.>

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

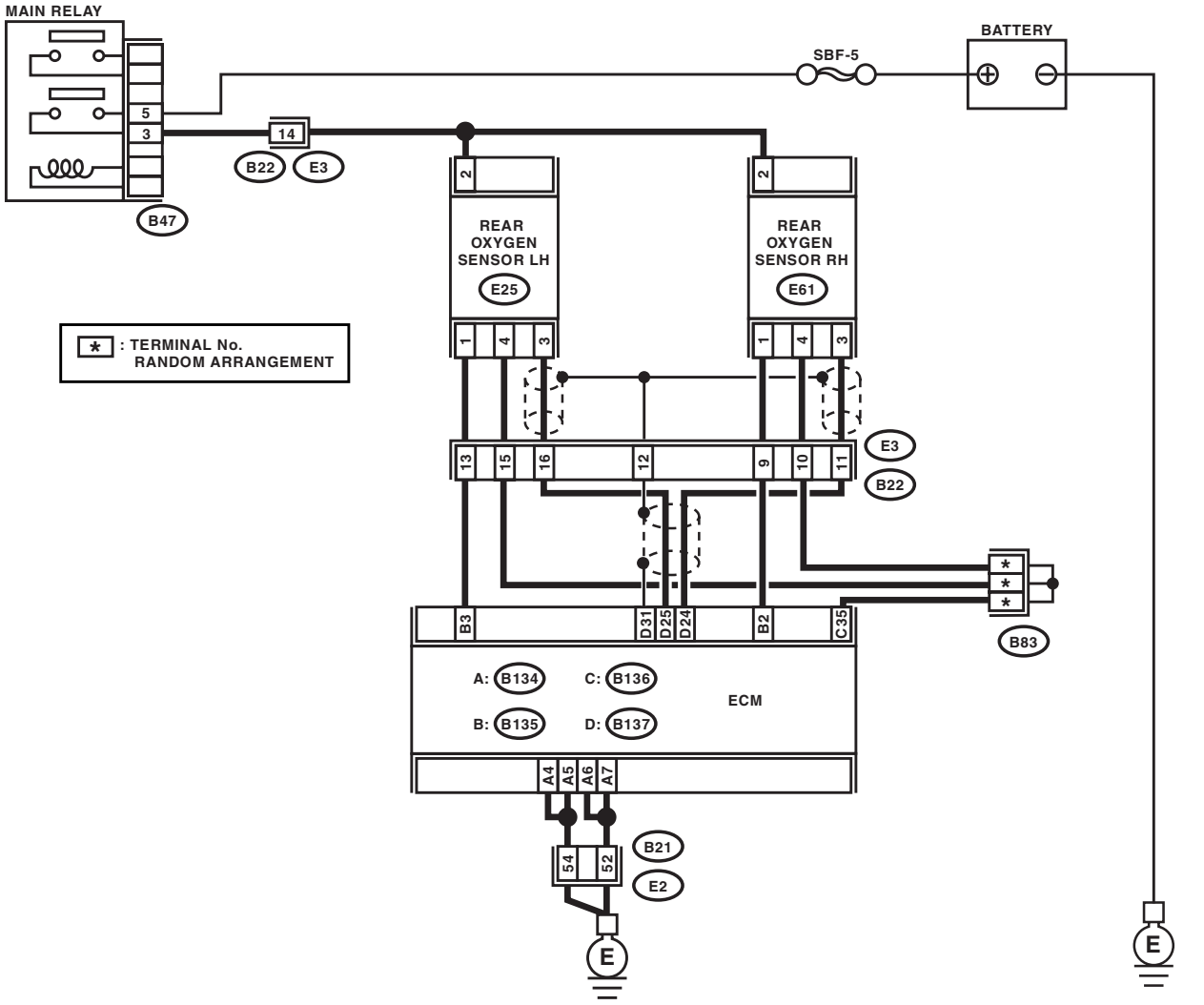
DTC DETECTING CONDITION:

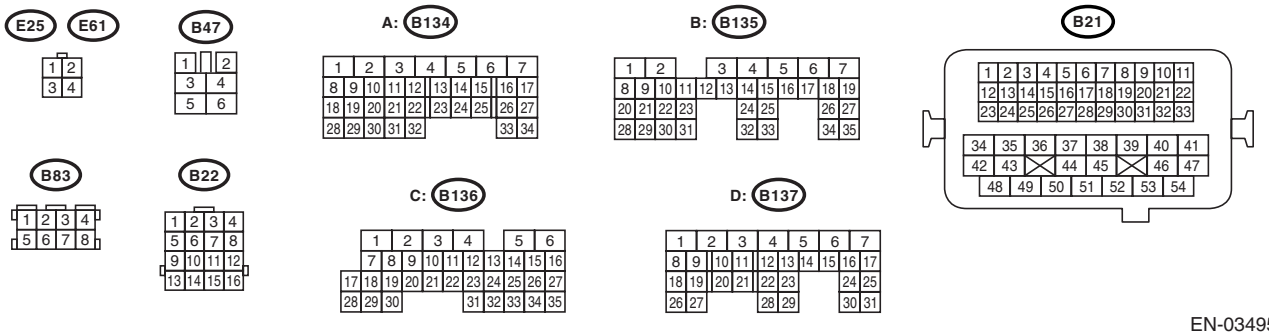
Detects when malfunction occurs in 2 continuous driving cycles.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





EN-03495

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H6DO)(diag)-66, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0137.	Go to step **2.**
2	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and keep the engine speed at 5,000 rpm. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-26, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the voltage more than 490 mV?	Go to step **5.**	Go to step **3.**
3	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and rear oxygen sensor. 3) Measure the resistance of harness between ECM and rear oxygen sensor connector. ***Connector & terminal*** ***(B137) No. 24 — (E61) No. 3:*** ***(B136) No. 35 — (E61) No. 4:***	Is the resistance more than 3 Ω?	Repair the open circuit of harness between ECM and rear oxygen sensor connector.	Go to step **4.**
4	**CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from rear oxygen sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between rear oxygen sensor harness connector and chassis ground. ***Connector & terminal*** ***(E61) No. 3 (+) — Chassis ground (−):***	Is the voltage 0.2 — 0.5 V?	Replace the rear oxygen sensor. <Ref. to FU(H6DO)-32, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit of harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor connector • Poor contact in ECM connector

Step		Check	Yes	No
5	**CHECK EXHAUST SYSTEM.** Check exhaust system parts. NOTE: Check the following items. • Loose part and incomplete installation of exhaust system • Damage (crack, hole etc.) of parts • Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor	Is there any fault in exhaust system?	Repair or replace faulty parts.	Replace the rear oxygen sensor. <Ref. to FU(H6DO)-32, Rear Oxygen Sensor.>

AJ:DTC P0138 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2)

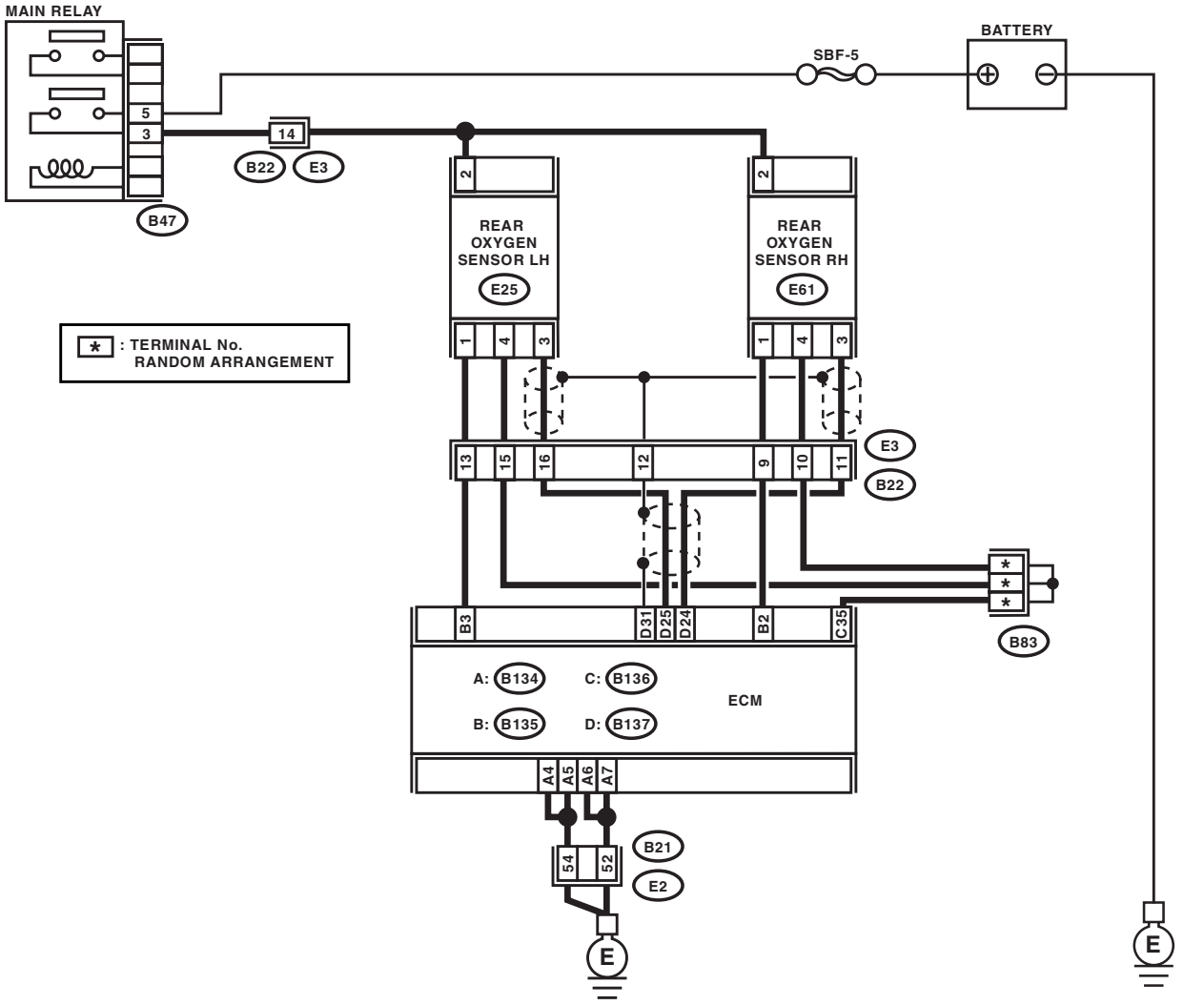
DTC DETECTING CONDITION:

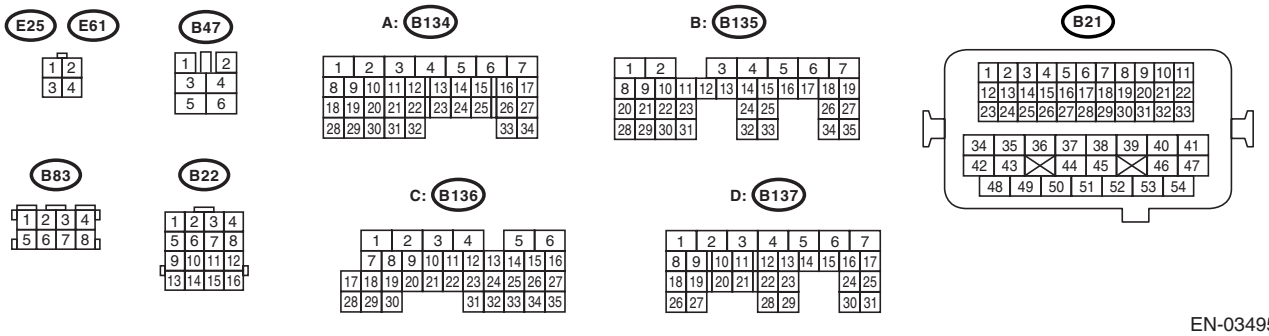
Detects when malfunction occurs in 2 continuous driving cycles.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





EN-03495

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H6DO)(diag)-66, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0138.	Go to step **2.**
2	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and lower the engine speed rapidly from 5,000 rpm. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-26, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the voltage more than 250 mV?	Go to step **5.**	Go to step **3.**
3	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and rear oxygen sensor. 3) Measure the resistance of harness between ECM and rear oxygen sensor connector. ***Connector & terminal*** ***(B137) No. 24 — (E61) No. 3:*** ***(B136) No. 35 — (E61) No. 4:***	Is the resistance more than 3 Ω?	Repair the open circuit of harness between ECM and rear oxygen sensor connector.	Go to step **4.**
4	**CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from rear oxygen sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between rear oxygen sensor harness connector and chassis ground. ***Connector & terminal*** ***(E61) No. 3 (+) — Chassis ground (−):***	Is the voltage 0.2 — 0.5 V?	Replace the rear oxygen sensor. <Ref. to FU(H6DO)-32, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit of harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor connector • Poor contact in ECM connector

	Step	Check	Yes	No
5	**CHECK EXHAUST SYSTEM.** Check exhaust system parts. NOTE: Check the following items. • Loose part and incomplete installation of exhaust system • Damage (crack, hole etc.) of parts • Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor	Is there any fault in exhaust system?	Repair or replace faulty parts.	Replace the rear oxygen sensor. <Ref. to FU(H6DO)-32, Rear Oxygen Sensor.>

AK:DTC P0151 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 2 SENSOR 1)

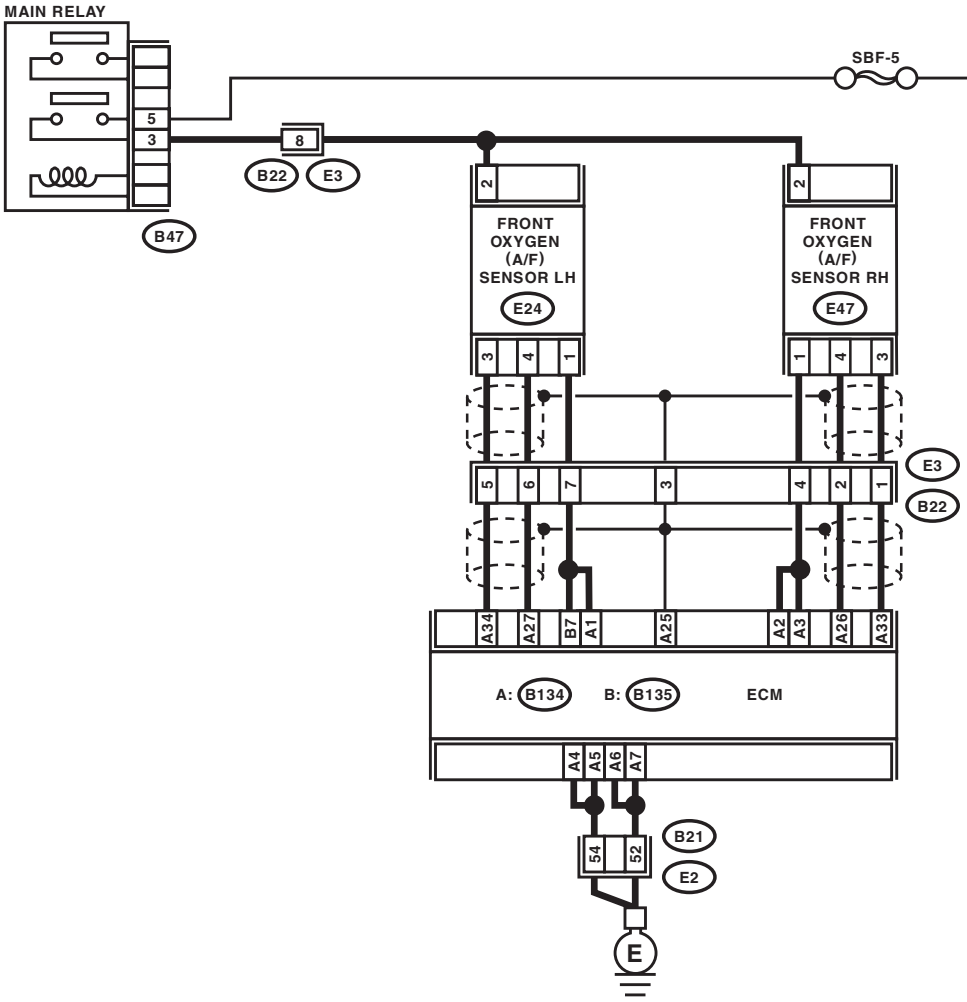
DTC DETECTING CONDITION:

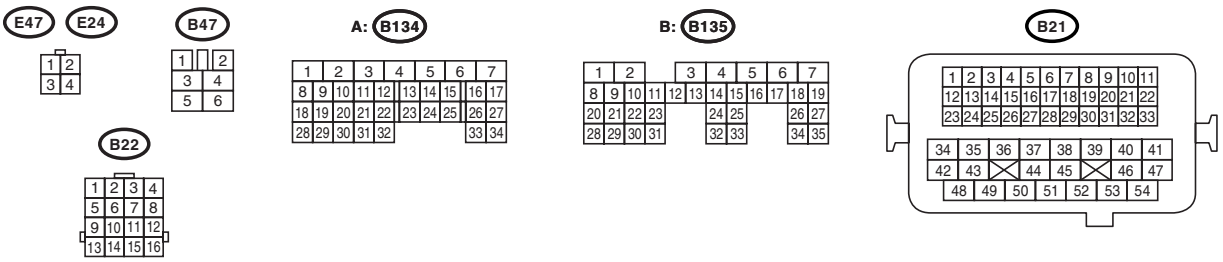
Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





EN-03494

	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 connector. 3) Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 27 — Chassis ground:*** ***(B134) No. 34 — Chassis ground:***	Is the resistance more than 1 MΩ?	Replace the front oxygen (A/F) sensor. <Ref. to FU(H6DO)-30, Front Oxygen (A/F) Sensor.>	Repair the ground short circuit of harness between ECM and front oxygen (A/F) sensor connector.

AL:DTC P0152 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 2 SENSOR 1)

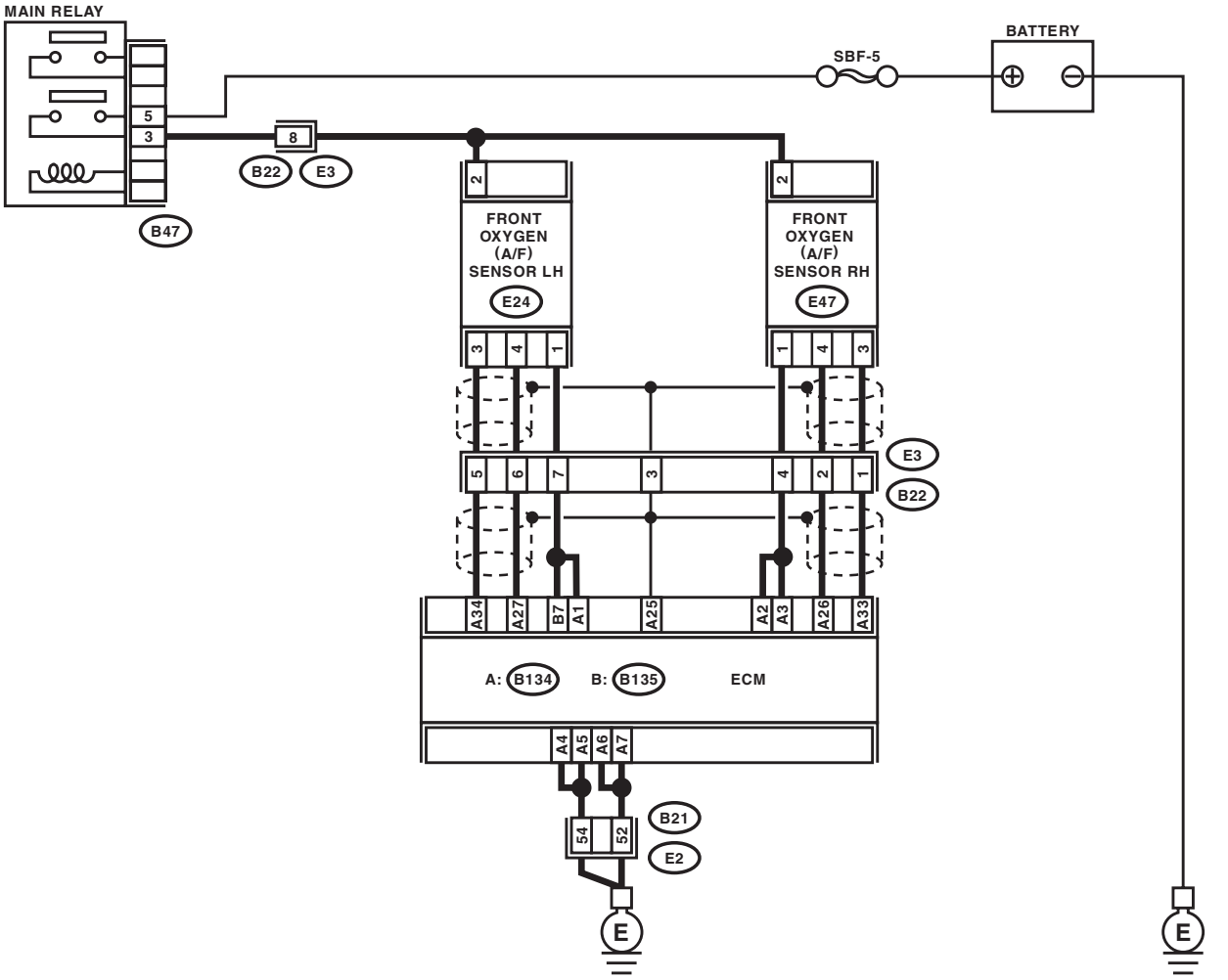
DTC DETECTING CONDITION:

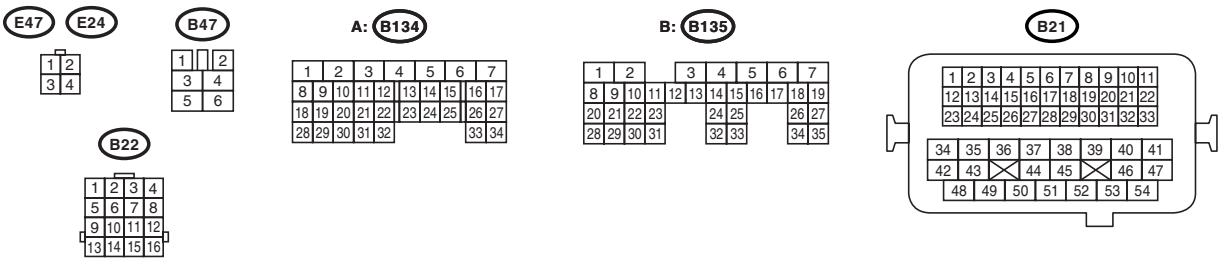
Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





EN-03494

	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.** 1) Turn the ignition switch to ON. 2) Disconnect the connector from front oxygen (A/F) sensor. 3) Measure the voltage of harness between ECM connector and chassis ground. ***Connector & terminal*** ***(B134) No. 27 (+) — Chassis ground (−):*** ***(B134) No. 34 (+) — Chassis ground (−):***	Is the voltage more than 8 V?	Replace the front oxygen (A/F) sensor. <Ref. to FU(H6DO)-30, Front Oxygen (A/F) Sensor.>	Repair the battery short circuit of harness between ECM and front oxygen (A/F) sensor connector.

AM:DTC P0153 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 2 SENSOR 1)

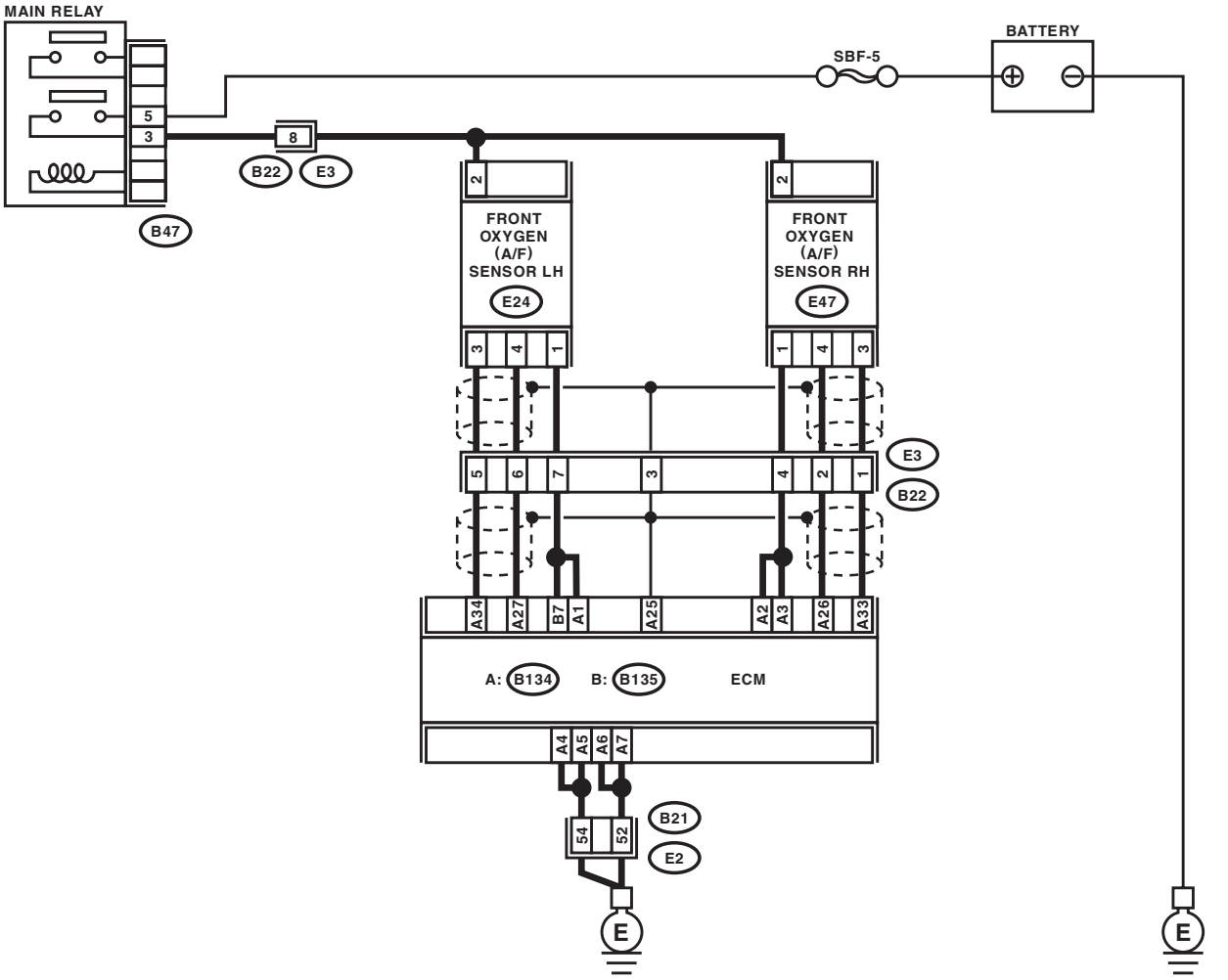
DTC DETECTING CONDITION:

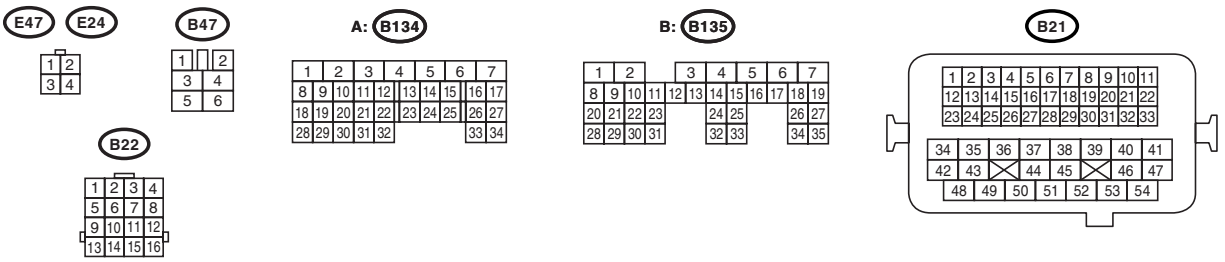
Detects when malfunction occurs in 2 continuous driving cycles.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





EN-03494

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H6DO)(diag)-66, 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 any fault in exhaust system?	Repair the exhaust system.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H6DO)-30, Front Oxygen (A/F) Sensor.>

AN:DTC P0154 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 2 SENSOR 1)

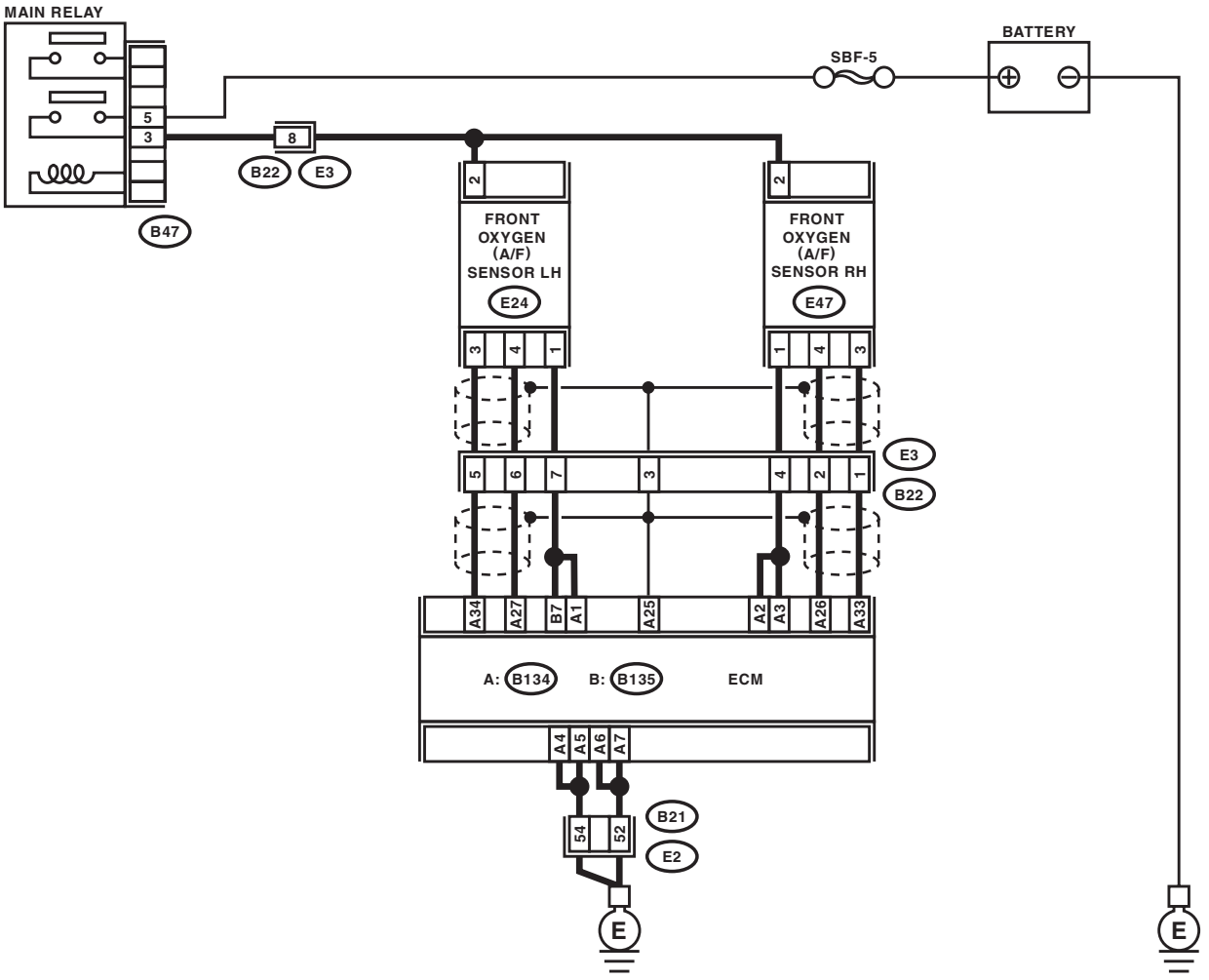
DTC DETECTING CONDITION:

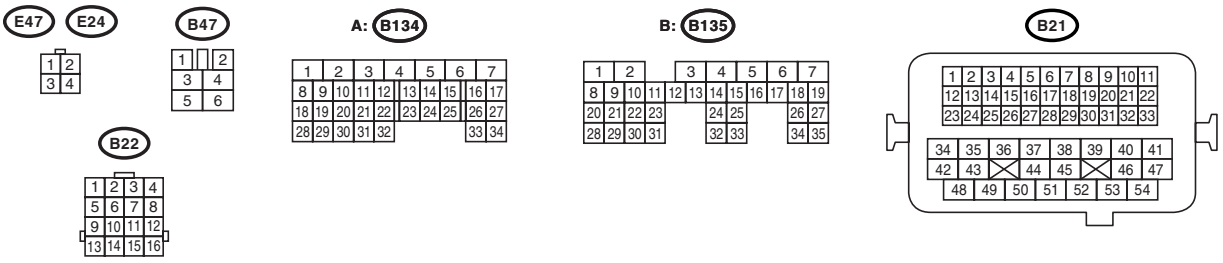
Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





EN-03494

	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 connector. 3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. ***Connector & terminal*** ***(B134) No. 27 — (E24) No. 4:*** ***(B134) No. 34 — (E24) No. 3:***	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 of 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(H6DO)-30, Front Oxygen (A/F) Sensor.>

AO:DTC P0157 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 2 SENSOR 2)

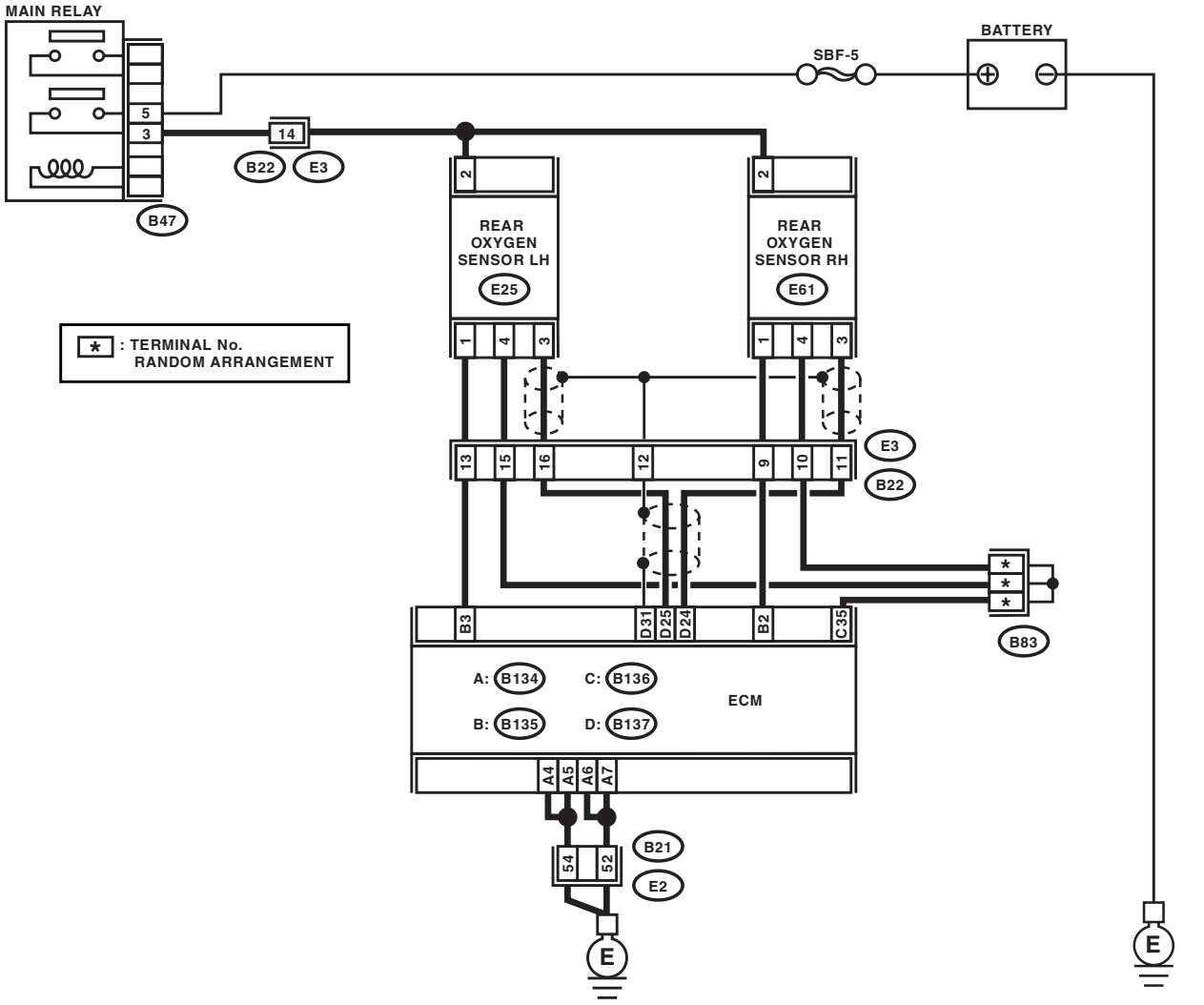
DTC DETECTING CONDITION:

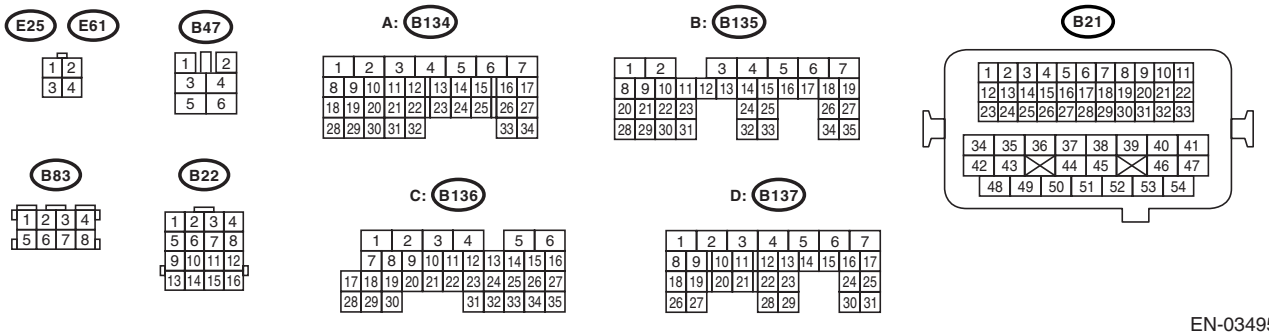
Detects when malfunction occurs in 2 continuous driving cycles.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





EN-03495

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H6DO)(diag)-66, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0137.	Go to step **2.**
2	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and keep the engine speed at 5,000 rpm. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-26, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the voltage more than 490 mV?	Go to step **5.**	Go to step **3.**
3	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and rear oxygen sensor. 3) Measure the resistance of harness between ECM and rear oxygen sensor connector. ***Connector & terminal*** ***(B137) No. 25 — (E25) No. 3:*** ***(B136) No. 35 — (E25) No. 4:***	Is the resistance more than 3 Ω?	Repair the open circuit of harness between ECM and rear oxygen sensor connector.	Go to step **4.**
4	**CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from rear oxygen sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between rear oxygen sensor harness connector and chassis ground. ***Connector & terminal*** ***(E25) No. 3 (+) — Chassis ground (−):***	Is the voltage 0.2 — 0.5 V?	Replace the rear oxygen sensor. <Ref. to FU(H6DO)-32, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit of harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor connector • Poor contact in ECM connector

Step		Check	Yes	No
5	**CHECK EXHAUST SYSTEM.** Check exhaust system parts. NOTE: Check the following items. • Loose part and incomplete installation of exhaust system • Damage (crack, hole etc.) of parts • Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor	Is there any fault in exhaust system?	Repair or replace faulty parts.	Replace the rear oxygen sensor. <Ref. to FU(H6DO)-32, Rear Oxygen Sensor.>

AP:DTC P0158 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 2 SENSOR 2)

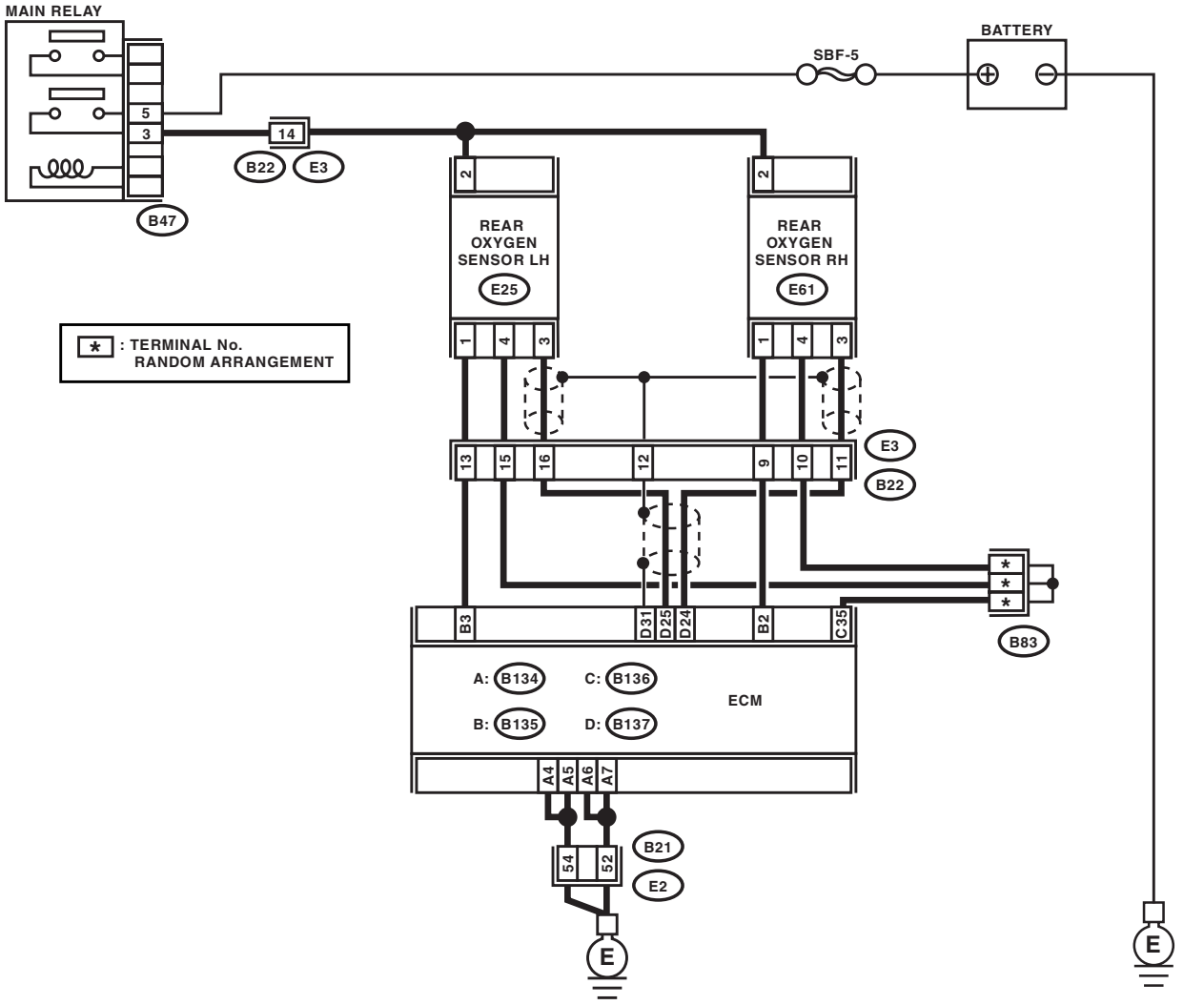
DTC DETECTING CONDITION:

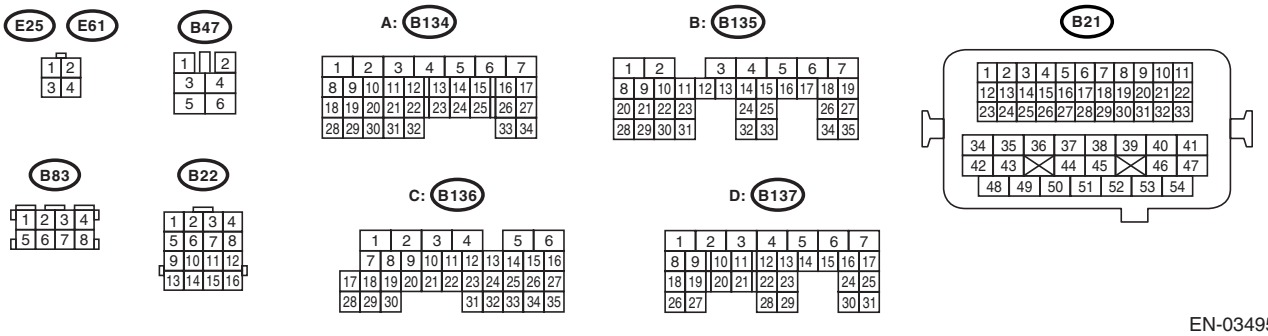
Detects when malfunction occurs in 2 continuous driving cycles.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





EN-03495

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H6DO)(diag)-66, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0138.	Go to step **2.**
2	**CHECK REAR OXYGEN SENSOR DATA.** 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and lower the engine speed rapidly from 5,000 rpm. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-26, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the voltage more than 250 mV?	Go to step **5.**	Go to step **3.**
3	**CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and rear oxygen sensor. 3) Measure the resistance of harness between ECM and rear oxygen sensor connector. ***Connector & terminal*** ***(B137) No. 25 — (E25) No. 3:*** ***(B136) No. 35 — (E25) No. 4:***	Is the resistance more than 3 Ω?	Repair the open circuit of harness between ECM and rear oxygen sensor connector.	Go to step **4.**
4	**CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from rear oxygen sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between rear oxygen sensor harness connector and chassis ground. ***Connector & terminal*** ***(E25) No. 3 (+) — Chassis ground (−):***	Is the voltage 0.2 — 0.5 V?	Replace the rear oxygen sensor. <Ref. to FU(H6DO)-32, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit of harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor connector • Poor contact in ECM connector

	Step	Check	Yes	No
5	**CHECK EXHAUST SYSTEM.** Check exhaust system parts. NOTE: Check the following items. • Loose part and incomplete installation of exhaust system • Damage (crack, hole etc.) of parts • Looseness and ill fitting of parts between front oxygen (A/F) sensor and rear oxygen sensor	Is there any fault in exhaust system?	Repair or replace faulty parts.	Replace the rear oxygen sensor. <Ref. to FU(H6DO)-32, Rear Oxygen Sensor.>

AQ:DTC P0171 SYSTEM TOO LEAN (BANK 1)

Refer to DTC P0175 for diagnostic procedure. <Ref. to EN(H6DO)(diag)-166, DTC P0175 SYSTEM TOO RICH (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AR:DTC P0172 SYSTEM TOO RICH (BANK 1)

Refer to DTC P0175 for diagnostic procedure. <Ref. to EN(H6DO)(diag)-166, DTC P0175 SYSTEM TOO RICH (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AS:DTC P0174 SYSTEM TOO LEAN (BANK 2)

Refer to DTC P0175 for diagnostic procedure. <Ref. to EN(H6DO)(diag)-166, DTC P0175 SYSTEM TOO RICH (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AT:DTC P0175 SYSTEM TOO RICH (BANK 2)

DTC DETECTING CONDITION:

Detects when malfunction occurs in 2 continuous driving cycles.

TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)(diag)-34, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK EXHAUST SYSTEM.**	Are there holes or loose bolts on exhaust system?	Repair the exhaust system.	Go to step **2.**
2	**CHECK AIR INTAKE SYSTEM.**	Are there holes, loose bolts or disconnection of hose on air intake system?	Repair the air intake system.	Go to step **3.**
3	**CHECK EGR VALVE.**	Is the EGR valve stuck?	Replace the EGR valve.	Go to step **4.**
4	**CHECK PURGE CONTROL SOLENOID VALVE.**	Is the purge control solenoid valve stuck?	Replace the purge control solenoid valve.	Go to step **5.**
5	**CHECK PCV VALVE.**	Is the PCV valve stuck?	Replace the PCV valve.	Go to step **6.**
6	**CHECK FUEL PRESSURE.** **Warning:** **• Place "NO FIRE" signs near the working area.** **• Be careful not to spill fuel.** 1) Release the fuel pressure. (1) Disconnect the connector from fuel pump relay. (2) Start the engine and run until it stalls. (3) After the engine stalls, crank it for five more seconds. (4) Turn the ignition switch to OFF. 2) Connect the connector to fuel pump relay. 3) Disconnect the fuel delivery hose, and connect the 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:** **Release fuel pressure before removing the fuel pressure gauge.** NOTE: If fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again.	Is fuel pressure 333 — 363 kPa (3.4 — 3.7 kgf/cm^2, 48 — 53 psi)?	Go to step **7.**	Repair the following items. Fuel pressure is too high: • Clogged fuel return line or bent hose Fuel pressure is too low: • Improper fuel pump discharge • Clogged fuel supply line

	Step	Check	Yes	No
7	**CHECK FUEL PRESSURE.** After connecting the pressure regulator vacuum hose, measure fuel pressure. **Warning:** **Release fuel pressure before removing the fuel pressure gauge.** NOTE: • If fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again. • If the measured value at this step is out of specifications, check or replace pressure regulator and pressure regulator vacuum hose.	Is fuel pressure 279 — 309 kPa (2.85 — 3.15 kgf/cm^2, 40 — 45 psi)?	Go to step **8.**	Repair the following items. Fuel pressure is too high: • Faulty pressure regulator • Clogged fuel return line or bent hose Fuel pressure is too low: • Faulty pressure regulator • Improper fuel pump discharge • Clogged fuel supply line
8	**CHECK ENGINE COOLANT TEMPERATURE SENSOR.** 1) Start the engine and warm-up completely. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H6DO)(diag)-26, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the engine coolant temperature 70 — 100°C (158 — 212°F)?	Go to step **9.**	Replace the engine coolant temperature sensor. <Ref. to FU(H6DO)-18, Engine Coolant Temperature Sensor.>
9	**CHECK MANIFOLD PRESSURE SENSOR SIGNAL.** 1) Start and warm-up the engine until engine coolant temperature is above 60°C (140°F). 2) Place the select lever in “N” or “P” position. 3) Turn the A/C switch to OFF. 4) Turn all the accessory switches to OFF. 5) Read the data of manifold absolute pressure sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H6DO)(diag)-26, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the measurement value 24.0 — 41.3 kPa (180 — 310 mmHg, 7.09 — 12.20 inHg) when idling and 73.3 — 106.6 kPa (550 — 800 mmHg, 21.65 — 31.50 inHg) when the ignition turns to ON?	Replace the ECM. <Ref. to FU(H6DO)-34, Engine Control Module (ECM).>	Replace the manifold absolute pressure sensor. <Ref. to FU(H6DO)-23, Manifold Absolute Pressure Sensor.>

AU:DTC P0197 ENGINE OIL TEMPERATURE SENSOR LOW

DTC DETECTING CONDITION:

Immediately at fault recognition

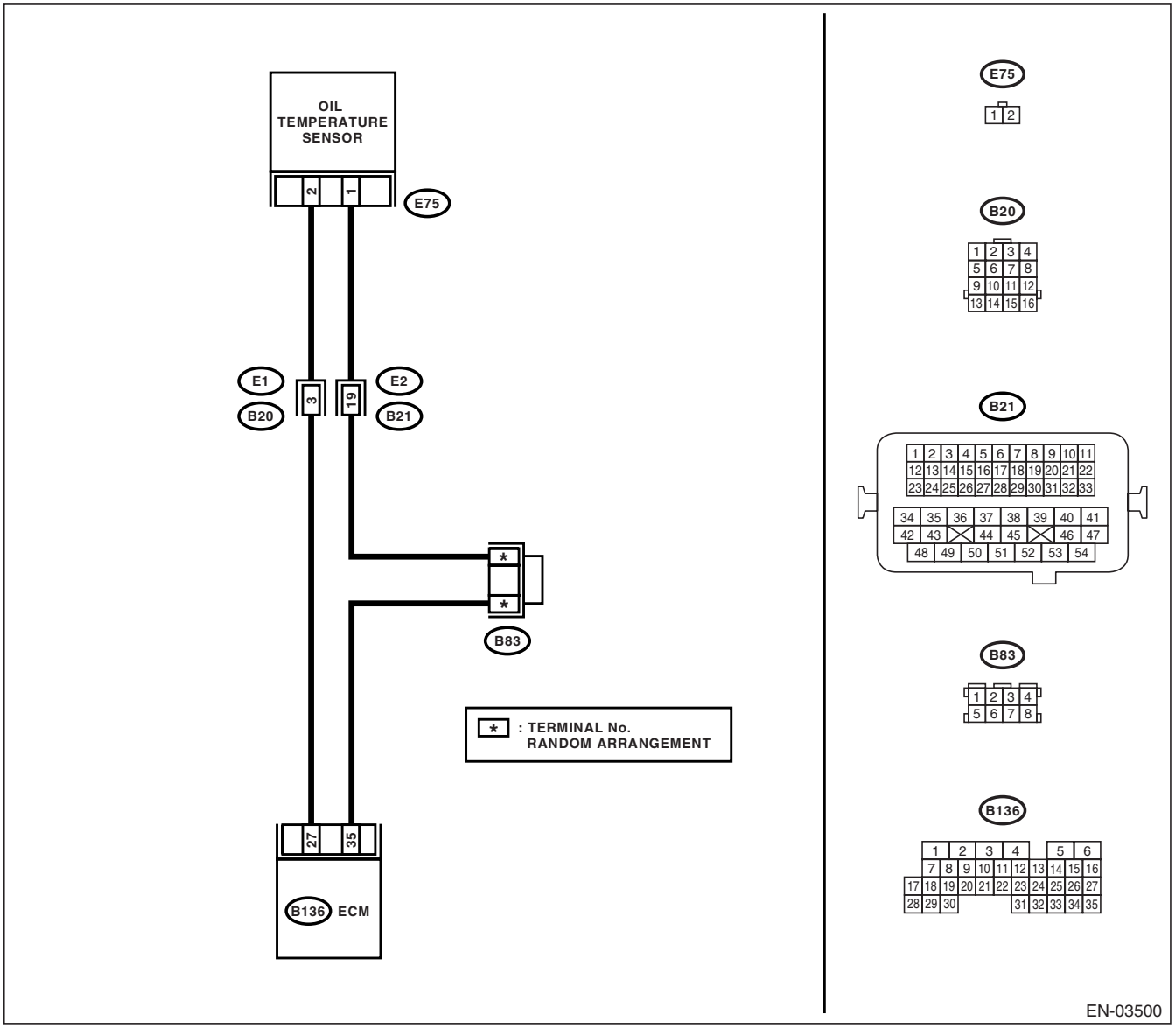
TROUBLE SYMPTOM:

- Hard to start
- Erroneous idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN OIL TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Disconnect the ECM connector and oil temperature sensor connector. 2) Measure the resistance of harness between oil temperature sensor connector and engine ground. ***Connector & terminal*** ***(B136) No. 27 — Engine ground:*** ***(B136) No. 35 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **2.**	Repair the ground short circuit between ECM and oil temperature sensor connector.
2	**CHECK POOR CONTACT.** Check poor contact in oil temperature sensor connector.	Is there poor contact in oil temperature sensor connector?	Repair the poor contact.	Replace the oil temperature sensor. <Ref. to FU(H6DO)-29, Oil Temperature Sensor.>

AV:DTC P0198 ENGINE OIL TEMPERATURE SENSOR HIGH

DTC DETECTING CONDITION:

Immediately at fault recognition

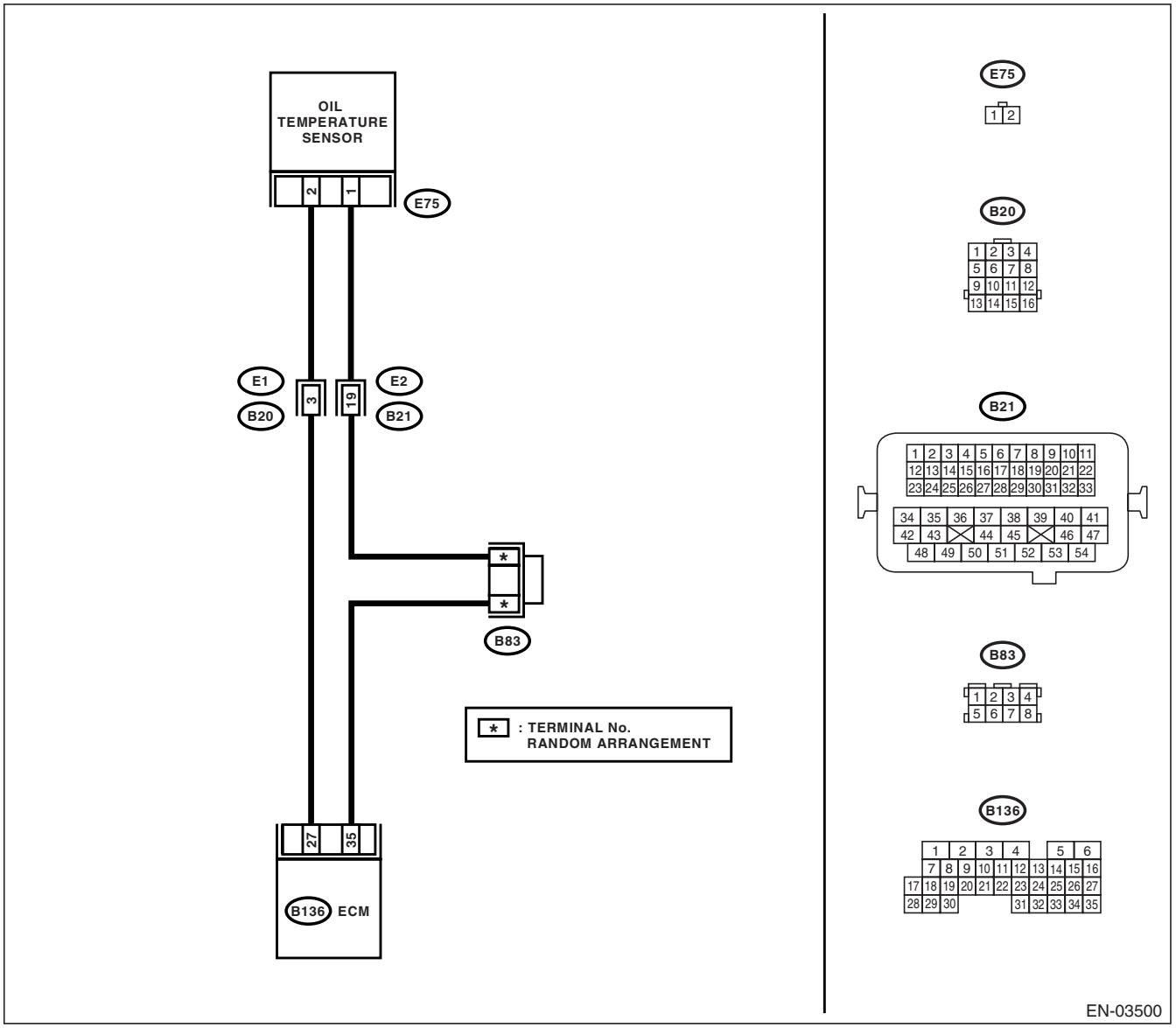
TROUBLE SYMPTOM:

- Hard to start
- Erroneous idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN OIL TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from oil temperature sensor. 3) Measure the voltage between oil temperature sensor connector and engine ground. ***Connector & terminal*** ***(E75) No. 2 (+) — Engine ground (−):***	Is the voltage more than 10 V?	Repair the battery short circuit of harness between ECM and oil temperature sensor connector.	Go to step **2.**
2	**CHECK HARNESS BETWEEN OIL TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between oil temperature sensor connector and engine ground. ***Connector & terminal*** ***(E75) No. 2 (+) — Engine ground (−):***	Is the voltage more than 10 V?	Repair the battery short circuit of harness between ECM and oil temperature sensor connector.	Go to step **3.**
3	**CHECK HARNESS BETWEEN OIL TEMPERATURE SENSOR AND ECM CONNECTOR.** Measure the voltage between oil temperature sensor connector and engine ground. ***Connector & terminal*** ***(E75) No. 2 (+) — Engine ground (−):***	Is the voltage more than 4 V?	Go to step **4.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit of harness between ECM and oil temperature sensor connector • Poor contact in oil temperature sensor connector • Poor contact in ECM connector • Poor contact in coupling connector
4	**CHECK HARNESS BETWEEN OIL TEMPERATURE SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between oil temperature sensor connector and engine ground. ***Connector & terminal*** ***(E75) No. 1 — Engine ground:***	Is the resistance less than 5 Ω?	Replace the oil temperature sensor. <Ref. to FU(H6DO)-29, Oil Temperature Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit of harness between ECM and oil temperature sensor connector • Poor contact in oil temperature sensor connector • Poor contact in ECM connector • Poor contact in coupling connector • Poor contact in joint connector

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

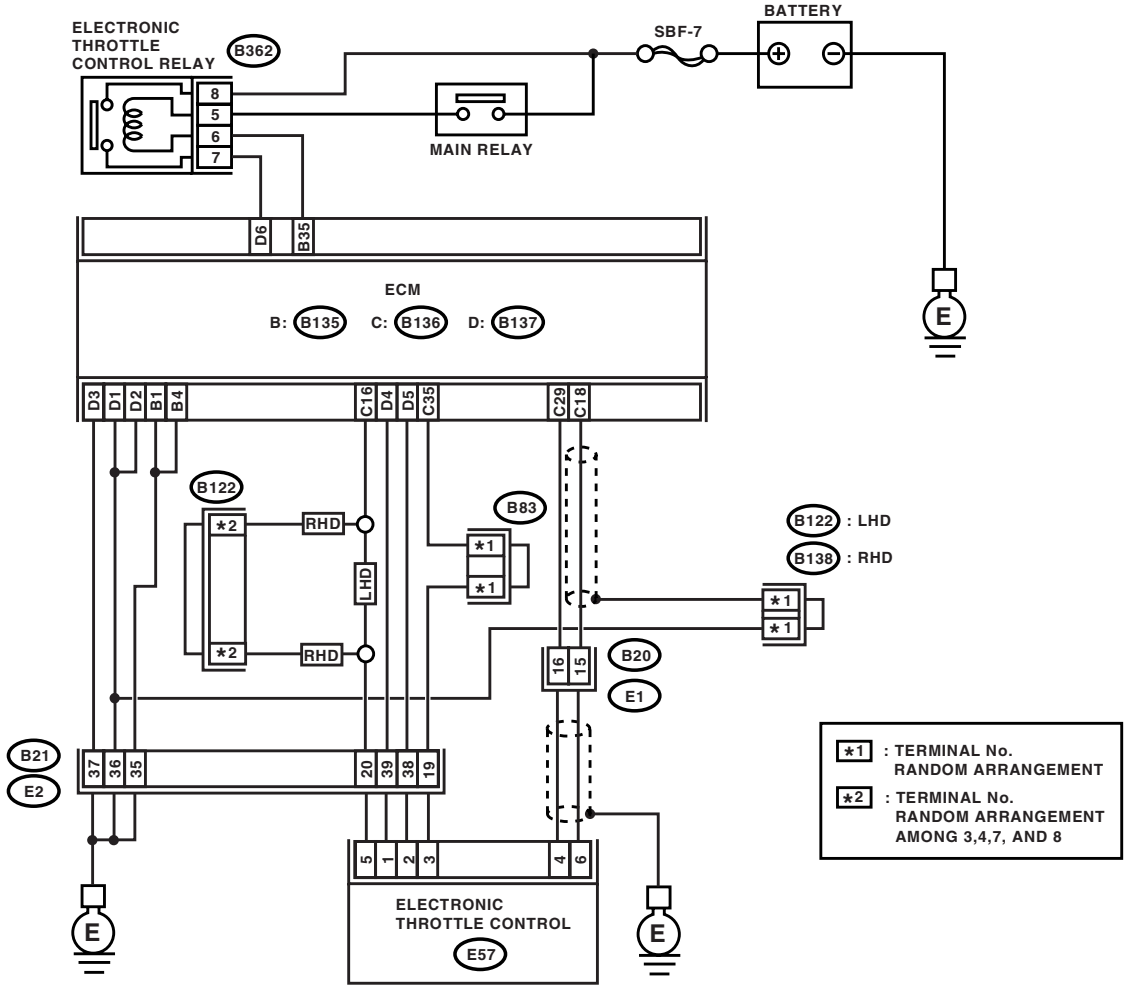
DTC DETECTING CONDITION:

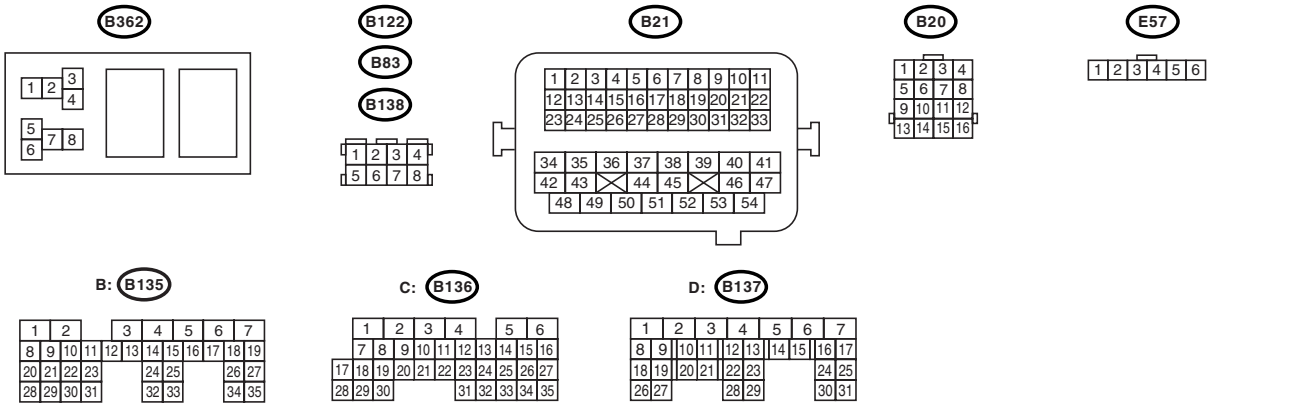
Immediately at fault recognition

TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance
- Engine stalls.

WIRING DIAGRAM:





EN-03499

	Step	Check	Yes	No
1	**CHECK SENSOR OUTPUT.** 1) Turn the ignition switch to ON. 2) Read the data of sub throttle sensor signal using Subaru Select Monitor. NOTE: For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-26, Subaru Select Monitor.>	Is the voltage more than 0.8 V?	Go to step **2.**	Go to step **3.**
2	**CHECK POOR CONTACT.** Check poor contact in connector between ECM and electronic throttle control.	Is there poor contact?	Repair the poor contact.	Temporary poor contact occurred, but it is normal at present.
3	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connectors from electronic throttle control. 4) Measure the resistance between ECM connector and electronic throttle control connector. ***Connector & terminal*** ***(B136) No. 29 — (E57) No. 4:*** ***(B136) No. 16 — (E57) No. 5:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the open circuit of harness connector.
4	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 29 — Chassis ground:*** ***(B136) No. 16 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair the chassis short circuit of harness.
5	**CHECK SENSOR POWER SUPPLY.** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 5 (+) — Engine ground (−):***	Is the voltage 4.5 — 5.5 V?	Go to step **6.**	Repair the poor contact in ECM connector. Replace the ECM if defective. <Ref. to FU(H6DO)-34, Engine Control Module (ECM).>
6	**CHECK SHORT CIRCUIT INSIDE THE ECM.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 4 — Engine ground:***	Is the resistance more than 10 Ω?	Repair the poor contact of electronic throttle control connector. Replace the electronic throttle control if defective.	Repair the poor contact in ECM connector. Replace the ECM if defective. <Ref. to FU(H6DO)-34, Engine Control Module (ECM).>

AX:DTC P0223 THROTTLE/PEDAL POSITION SENSOR/SWITCH "B" CIRCUIT HIGH

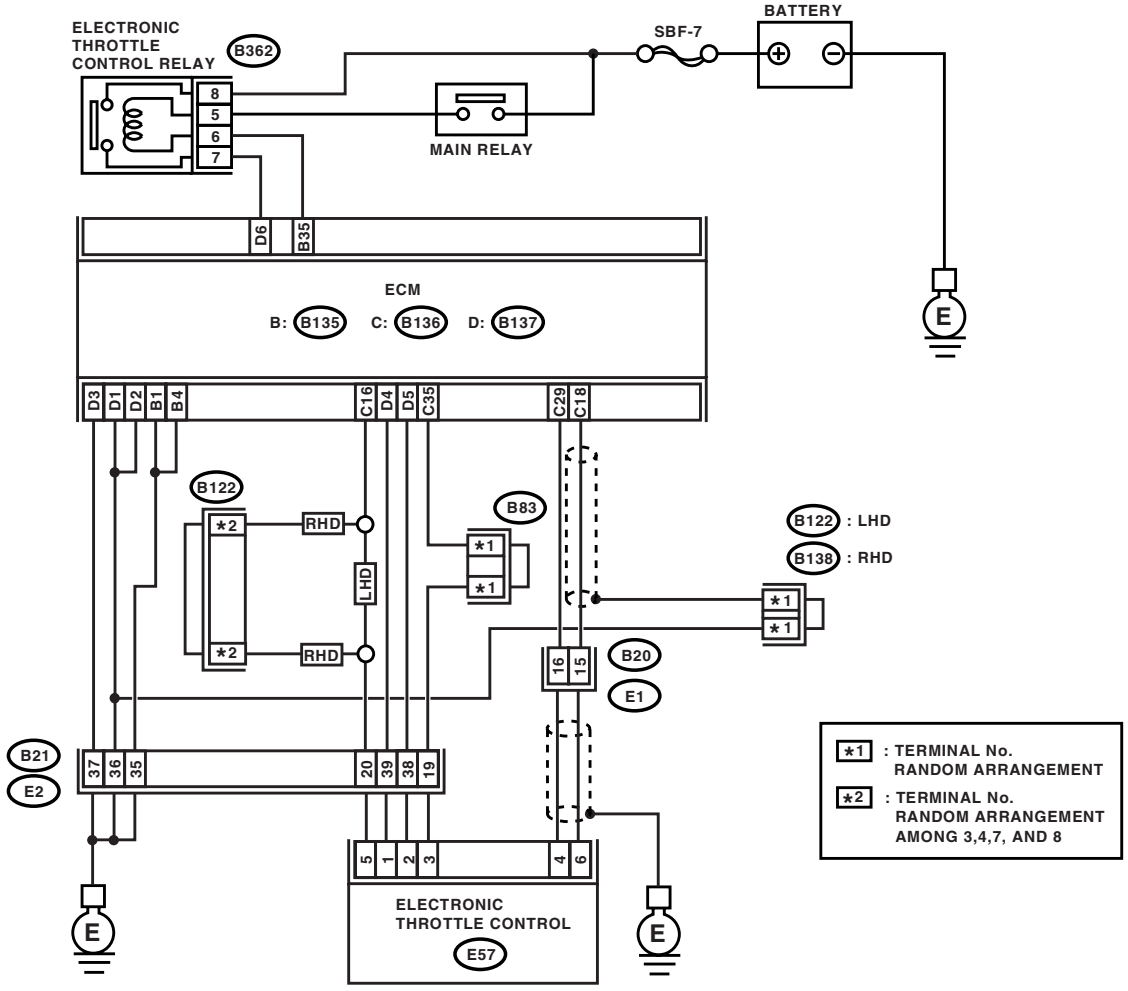
DTC DETECTING CONDITION:

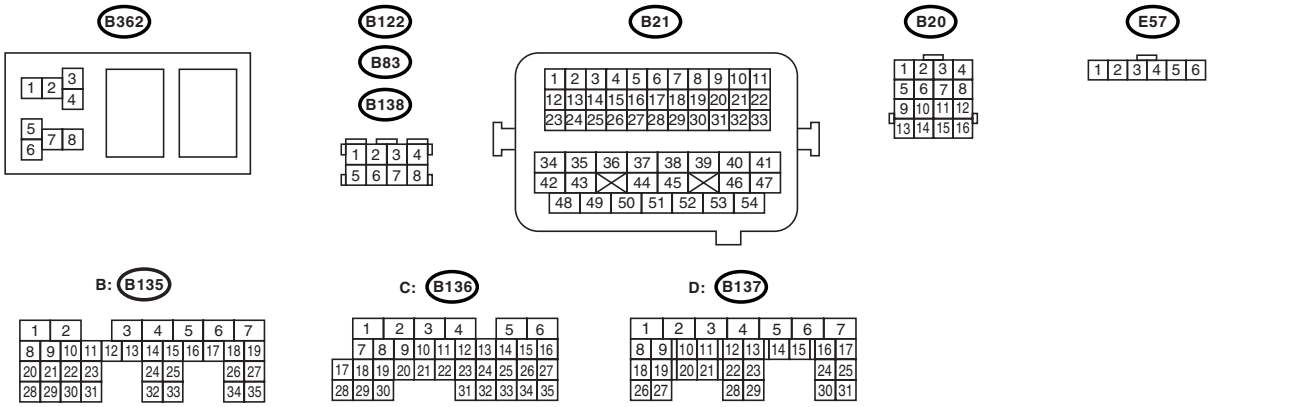
Immediately at fault recognition

TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance
- Engine stalls.

WIRING DIAGRAM:





EN-03499

	Step	Check	Yes	No
1	**CHECK SENSOR OUTPUT.** 1) Turn the ignition switch to ON. 2) Read the data of sub throttle sensor signal using Subaru Select Monitor. NOTE: For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-26, Subaru Select Monitor.>	Is the voltage less than 4.73 V?	Go to step **2.**	Go to step **3.**
2	**CHECK POOR CONTACT.** Check poor contact in connector between ECM and electronic throttle control.	Is there poor contact in connector between ECM and electronic throttle control?	Repair the poor contact.	Temporary poor contact occurred, but it is normal at present.
3	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connectors from electronic throttle control. 4) Measure the resistance between ECM connector and electronic throttle control connector. ***Connector & terminal*** ***(B136) No. 35 — (E57) No. 3:*** ***(B136) No. 29 — (E57) No. 4:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the open circuit of harness connector.
4	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Connect the ECM connector. 2) Measure the resistance between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 3 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **5.**	Repair the poor contact in ECM connector. Replace the ECM if defective. <Ref. to FU(H6DO)-34, Engine Control Module (ECM).>
5	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** Measure the voltage between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 4 (+) — Engine ground (−):***	Is the voltage less than 10 V?	Go to step **6.**	Repair the battery short circuit of harness between ECM connector and electronic throttle control connector.
6	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between connector terminals. ***Connector & terminal*** ***(B136) No. 29 — (B136) No. 16:***	Is the resistance more than 1 MΩ?	Repair the poor contact. Repair the electronic throttle control.	Sensor power supply circuit may be shorted.

AY:DTC P0230 FUEL PUMP PRIMARY CIRCUIT

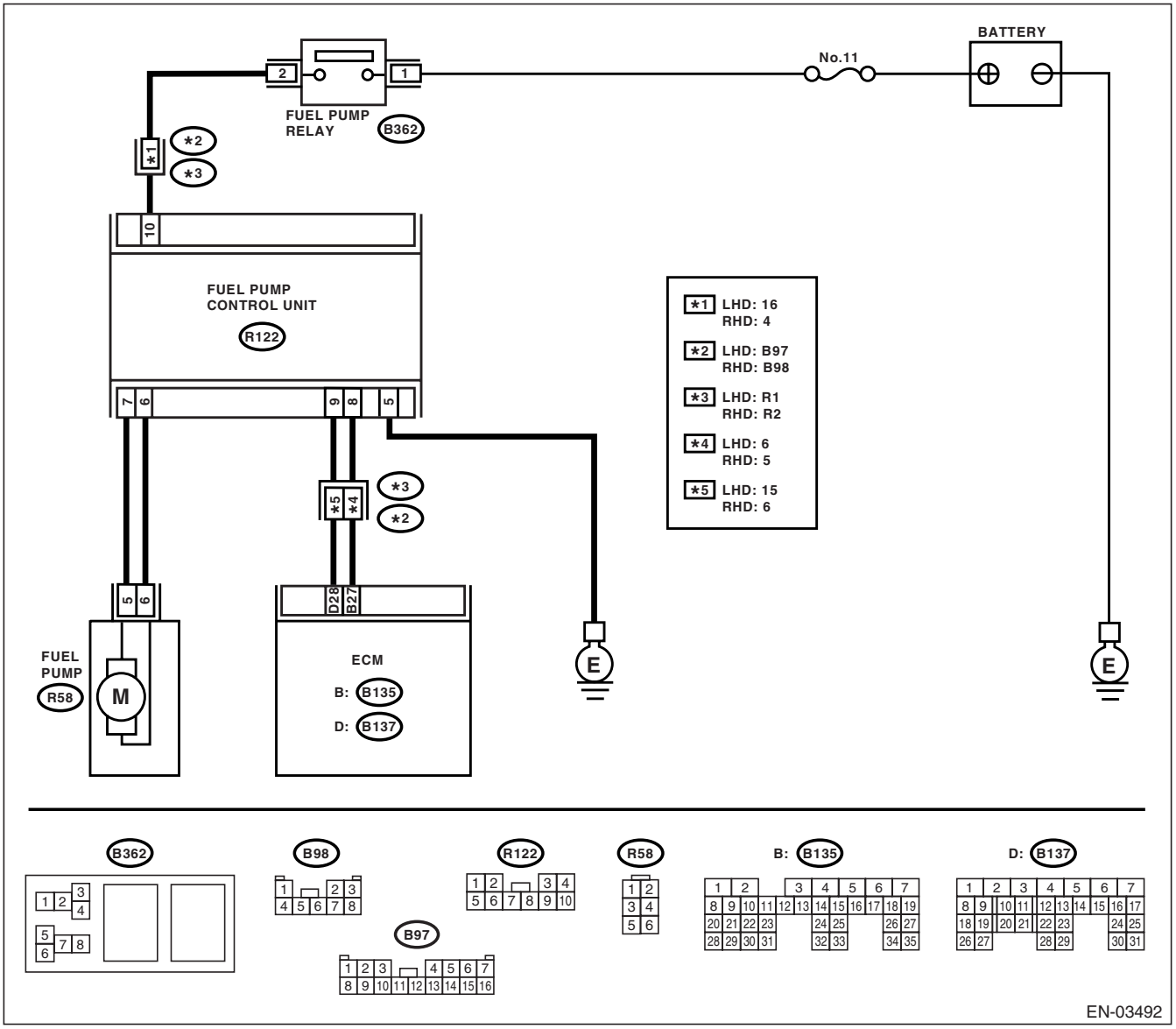
DTC DETECTING CONDITION:

Detects when malfunction occurs in 2 continuous driving cycles.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	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 of 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. 5:*** ***(R122) No. 6 — (R58) No. 6:***	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.

	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 — (B137) No. 28:*** ***(R122) No. 8 — (B135) No. 27:***	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 connector.	Go to step **8.**
8	**CHECK EXPERIENCE OF RUNNING OUT OF FUEL.**	Has the vehicle experience running out of fuel?	Finish the diagnosis. NOTE: DTC may be recorded as a result of fuel pump idling while running out of fuel.	Replace the fuel pump control unit. <Ref. to FU(H6DO)-38, Fuel Pump Control Unit.>

AZ:DTC P0301 CYLINDER 1 MISFIRE DETECTED

NOTE:
For the diagnostic procedure, refer to DTC P0306. <Ref. to EN(H6DO)(diag)-180, DTC P0306 CYLINDER 6 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BA:DTC P0302 CYLINDER 2 MISFIRE DETECTED

NOTE:
For the diagnostic procedure, refer to DTC P0306. <Ref. to EN(H6DO)(diag)-180, DTC P0306 CYLINDER 6 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BB:DTC P0303 CYLINDER 3 MISFIRE DETECTED

NOTE:
For the diagnostic procedure, refer to DTC P0306. <Ref. to EN(H6DO)(diag)-180, DTC P0306 CYLINDER 6 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BC:DTC P0304 CYLINDER 4 MISFIRE DETECTED

NOTE:
For the diagnostic procedure, refer to DTC P0306. <Ref. to EN(H6DO)(diag)-180, DTC P0306 CYLINDER 6 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BD:DTC P0305 CYLINDER 5 MISFIRE DETECTED

NOTE:
For the diagnostic procedure, refer to DTC P0306. <Ref. to EN(H6DO)(diag)-180, DTC P0306 CYLINDER 6 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BE:DTC P0306 CYLINDER 6 MISFIRE DETECTED

DTC DETECTING CONDITION:

- Detects when malfunction occurs in 2 continuous driving cycles.
- Immediately at fault recognition (A misfire which could damage catalyst occurs.)

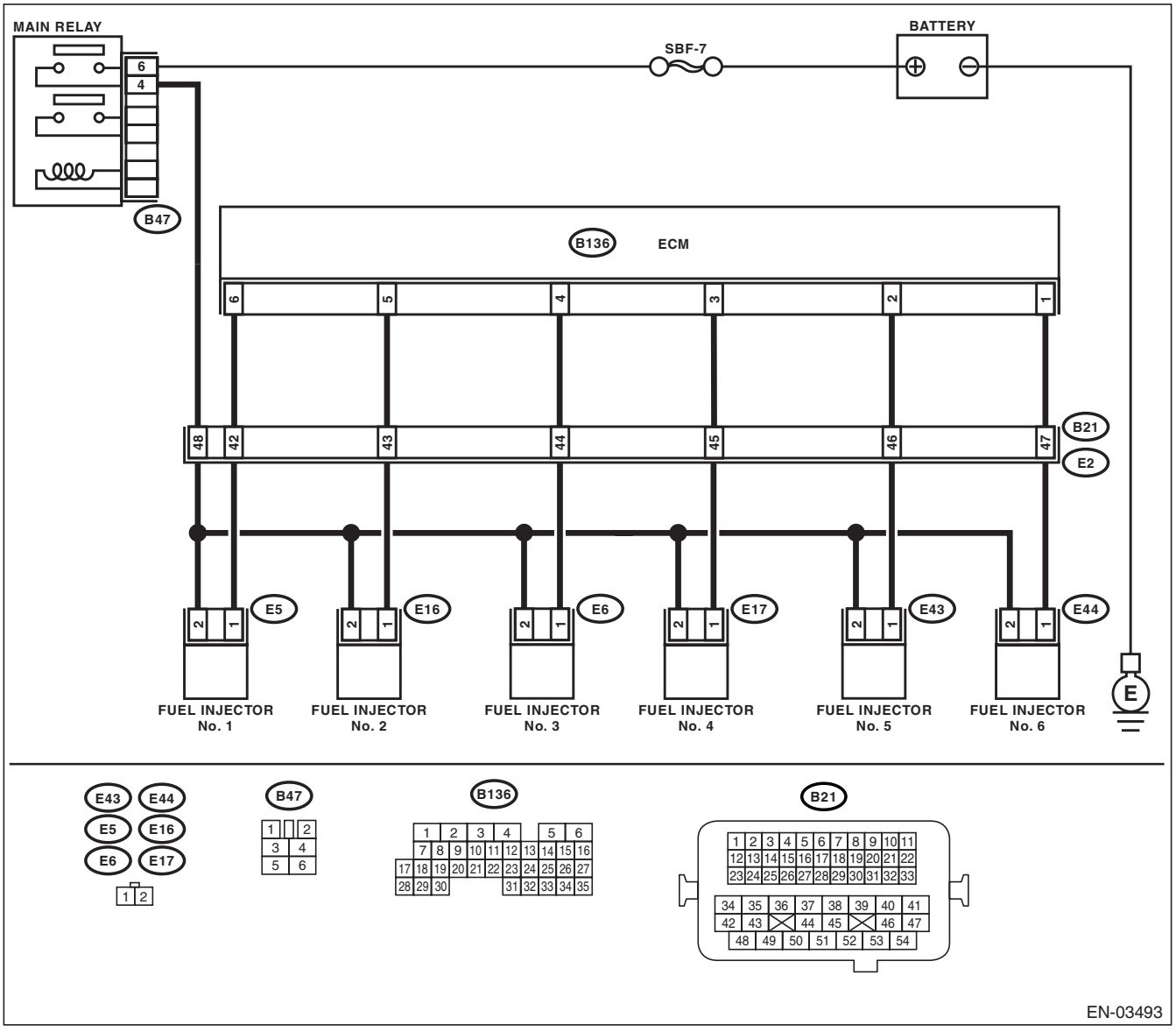
TROUBLE SYMPTOM:

- Engine stalls.
- Erroneous idling
- Rough driving

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H6DO)(diag)-66, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0301, P0302, P0303, P0304, P0305 and P0306.	Go to step **2.**
2	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector and chassis ground on faulty cylinders. ***Connector & terminal*** ***#1 (B136) No. 6 (+) — Chassis ground (−):*** ***#2 (B136) No. 5 (+) — Chassis ground (−):*** ***#3 (B136) No. 4 (+) — Chassis ground (−):*** ***#4 (B136) No. 3 (+) — Chassis ground (−):*** ***#5 (B136) No. 2 (+) — Chassis ground (−):*** ***#6 (B136) No. 1 (+) — 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) 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:*** ***#5 (E43) No. 1 — Engine ground:*** ***#6 (E44) No. 1 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Repair the ground short circuit of 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 (B136) No. 6 — (E5) No. 1:*** ***#2 (B136) No. 5 — (E16) No. 1:*** ***#3 (B136) No. 4 — (E6) No. 1:*** ***#4 (B136) No. 3 — (E17) No. 1:*** ***#5 (B136) No. 2 — (E43) No. 1:*** ***#6 (B136) No. 1 — (E44) 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 of 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. ***Terminal*** ***No. 1 — No. 2:***	Is the resistance 5 — 20 Ω	Go to step **6.**	Replace the faulty fuel injector. <Ref. to FU(H6DO)-26, Fuel Injector.>

	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 (–):*** ***#5 (E43) No. 2 (+) — Engine ground (–):*** ***#6 (E44) 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 of harness between main relay and fuel injector 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 cylinders. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM connector and chassis ground on faulty cylinders. ***Connector & terminal*** ***#1 (B136) No. 6 (+) — Chassis ground (–):*** ***#2 (B136) No. 5 (+) — Chassis ground (–):*** ***#3 (B136) No. 4 (+) — Chassis ground (–):*** ***#4 (B136) No. 3 (+) — Chassis ground (–):*** ***#5 (B136) No. 2 (+) — Chassis ground (–):*** ***#6 (B136) No. 1 (+) — Chassis ground (–):***	Is the voltage more than 10 V?	Repair the battery short circuit of harness between ECM and fuel injector. After repair, replace the ECM. <Ref. to FU(H6DO)-34, 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. ***Terminal*** ***No. 1 — No. 2:***	Is the resistance less than 1 Ω?	Replace the faulty fuel injector <Ref. to FU(H6DO)-26, Fuel Injector.> and ECM <Ref. to FU(H6DO)-34, Engine Control Module (ECM).>.	Go to step **9.**
9	**CHECK INSTALLATION OF CAMSHAFT POSITION SENSOR/CRANKSHAFT POSITION SENSOR.**	Is the camshaft position sensor or crankshaft position sensor loosely installed?	Tighten the camshaft position sensor or crankshaft position sensor.	Go to step **10.**
10	**CHECK CRANK PLATE.**	Is the crank sprocket rusted or the teeth of crank plate broken?	Replace the crank plate. <Ref. to ME(H6DO)-65, Cylinder Block.>	Go to step **11.**
11	**CHECK INSTALLATION CONDITION OF TIMING CHAIN.** Turn the crankshaft using ST, and align alignment mark on crank sprocket with alignment mark on cylinder block. ST 18252AA000 CRANKSHAFT SOCKET	Is the timing chain dislocated from its proper position?	Correct the installation condition of timing chain. <Ref. to ME(H6DO)-47, Timing Chain Assembly.>	Go to step **12.**

	Step	Check	Yes	No
12	**CHECK FUEL LEVEL.**	Is the fuel gauge indication lower than the “Lower” level?	Replenish fuel so fuel gauge indication is higher than the “Lower” level. After replenishing fuel, Go to step **13.**	Go to step **13.**
13	**CHECK STATUS OF MALFUNCTION INDICATOR LIGHT.** 1) Perform the clear memory mode using Subaru Select Monitor. <Ref. to EN(H6DO)(diag)-41, Clear Memory Mode.> 2) Start the engine, and drive the vehicle more than 10 minutes.	Does the malfunction indicator light illuminate or blink?	Go to step **15.**	Go to step **14.**
14	**CHECK CAUSE OF MISFIRE DIAGNOSED.**	Has the cause of misfire been detected while running the engine?	Finish 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 any 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 MISFIRE SYMPTOM.** 1) Turn the ignition switch to ON. 2) Read DTC. <Ref. to EN(H6DO)(diag)-33, Read Diagnostic Trouble Code (DTC).>	Does the Subaru Select Monitor or general scan tool indicate a DTC?	Go to step **22.**	Go to step **17.**
17	**CHECK ANY OTHER DTC ON DISPLAY.**	Are DTC P0301 and P0302 displayed?	Go to step **23.**	Go to step **18.**
18	**CHECK DTC ON DISPLAY.**	Are DTC P0303 and P0304 displayed?	Go to step **24.**	Go to step **19.**
19	**CHECK DTC ON DISPLAY.**	Are DTC P0305 and P0306 displayed?	Go to step **25.**	Go to step **20.**
20	**CHECK DTC ON DISPLAY.**	Are DTC P0301, P0303 and P0305 displayed?	Go to step **26.**	Go to step **21.**
21	**CHECK DTC ON DISPLAY.**	Are DTC P0302, P0304 and P0306 displayed?	Go to step **27.**	Go to step **28.**

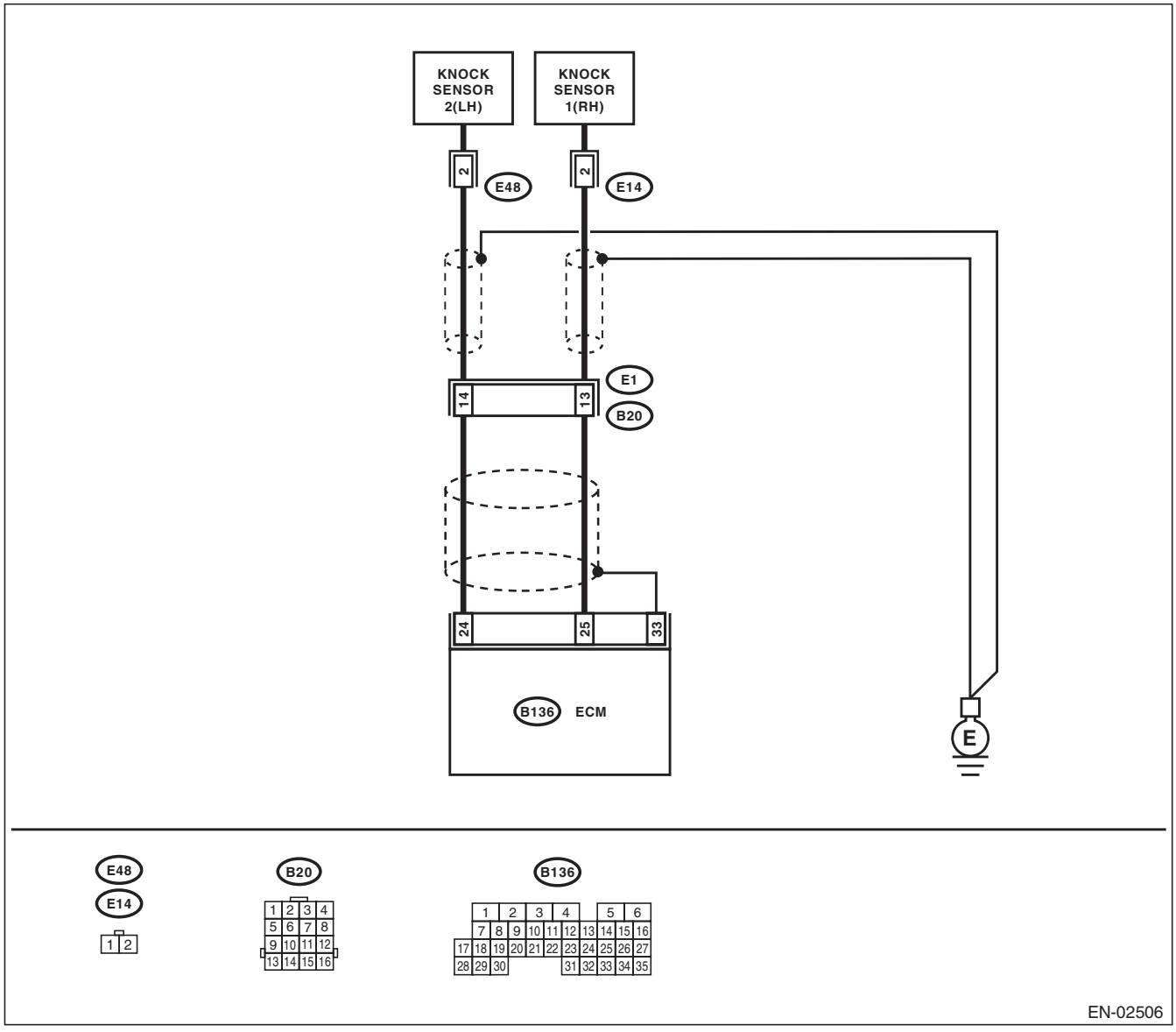
Step		Check	Yes	No
22	ONLY ONE CYLINDER	Is there any fault in that cylinder?	Repair or replace faulty parts. NOTE: Check the following items. • Spark plug • Fuel injector • Compression ratio	Inspect DTC P0171, P0172, P0174 or P0175 using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H6DO)(diag)-66, List of Diagnostic Trouble Code (DTC).>
23	GROUP OF #1 AND #2 CYLINDERS	Are there any faults in #1 and #2 cylinders?	Repair or replace faulty parts. NOTE: • Check the following items. • Spark plug • Fuel injector • Ignition coil • Compression ratio • If no abnormal is found, check for “IGNITION CONTROL SYSTEM” of #1 and #2 cylinders side. <Ref. to EN(H6DO)(diag)-60, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>	Inspect DTC P0171, P0172, P0174 or P0175 using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H6DO)(diag)-66, List of Diagnostic Trouble Code (DTC).>
24	GROUP OF #3 AND #4 CYLINDERS	Are there any faults in #3 and #4 cylinders?	Repair or replace faulty parts. NOTE: • Check the following items. • Spark plug • Fuel injector • Ignition coil • If no abnormal is found, check for “IGNITION CONTROL SYSTEM” of #3 and #4 cylinders side. <Ref. to EN(H6DO)(diag)-60, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>	Inspect DTC P0171, P0172, P0174 or P0175 using “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H6DO)(diag)-66, List of Diagnostic Trouble Code (DTC).>

Step		Check	Yes	No
25	GROUP OF #5 AND #6 CYLINDERS	Are there any faults in #5 and #6 cylinders?	Repair or replace faulty parts. NOTE: • Check the following items. • Spark plug • Fuel injector • Ignition coil • Compression ratio • If no abnormal is found, check for "IGNITION CONTROL SYSTEM" of #5 and #6 cylinders side. <Ref. to EN(H6DO)(diag)-60, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>	Inspect DTC P0171, P0172, P0174 or P0175 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)(diag)-66, List of Diagnostic Trouble Code (DTC).>
26	GROUP OF #1, #3 AND #5 CYLINDERS.	Are there any fault in #1, #3 and #5 cylinders?	Repair or replace faulty parts. NOTE: Check the following items. • Spark plug • Fuel injector • Skipping timing chain teeth	Inspect DTC P0171, P0172, P0174 or P0175 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)(diag)-66, List of Diagnostic Trouble Code (DTC).>
27	GROUP OF #2, #4 AND #6 CYLINDERS.	Are there any fault in #2, #4 and #6 cylinders?	Repair or replace faulty parts. NOTE: Check the following items. • Spark plug • Fuel injector • Compression ratio • Skipping timing chain teeth	Inspect DTC P0171, P0172, P0174 or P0175 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)(diag)-66, List of Diagnostic Trouble Code (DTC).>
28	CYLINDER AT RANDOM	Is the engine idle rough?	Inspect DTC P0171, P0172, P0174 or P0175 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)(diag)-66, List of Diagnostic Trouble Code (DTC).>	Repair or replace faulty parts. NOTE: Check the following items. • Spark plug • Fuel injector • Compression ratio

BF:DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW (BANK 1 OR SINGLE SENSOR)

DTC DETECTING CONDITION:
Immediately at fault recognition
TROUBLE SYMPTOM:
- Poor driving performance
- Knocking occurs.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)(diag)-34, PROCEDURE, Inspection Mode.>.
WIRING DIAGRAM:

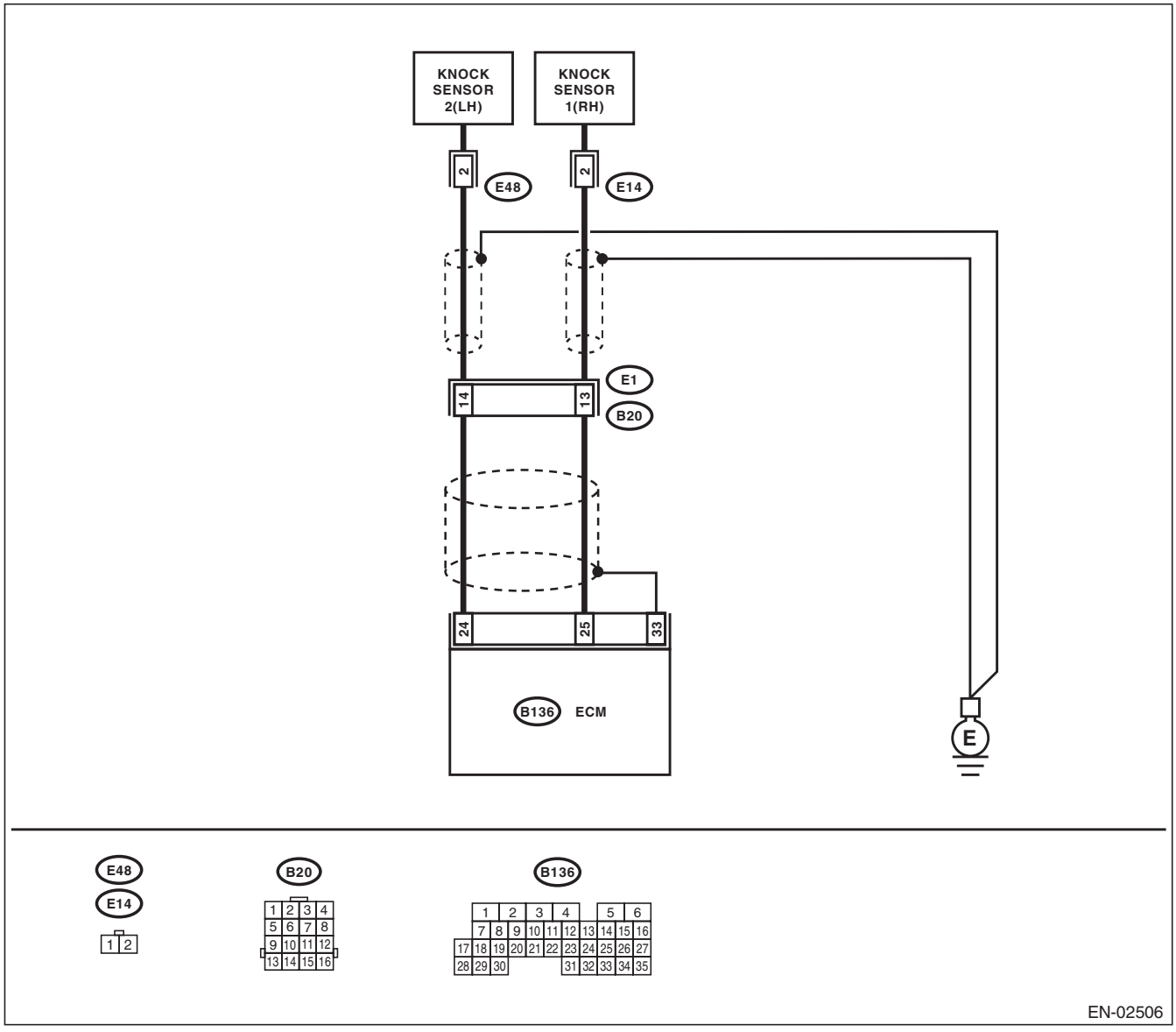


	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN KNOCK SENSOR AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between ECM harness connector and chassis ground. ***Connector & terminal*** ***(B136) No. 25 — Chassis ground:***	Is the resistance more than 700 kΩ?	Go to step **2.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit of 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. ***Terminal*** ***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
3	**CHECK CONDITION OF KNOCK SENSOR INSTALLATION.**	Is the knock sensor installation bolt tightened securely?	Replace the knock sensor. <Ref. to FU(H6DO)-21, Knock Sensor.>	Tighten the knock sensor installation bolt securely.

BG:DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH (BANK 1 OR SINGLE SENSOR)

DTC DETECTING CONDITION:
Immediately at fault recognition
TROUBLE SYMPTOM:
- Poor driving performance
- Knocking occurs.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)(diag)-34, PROCEDURE, Inspection Mode.>.
WIRING DIAGRAM:



	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*** ***(B136) No. 25 — 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. ***Terminal*** ***No. 2 — Engine ground:***	Is the resistance less than 400 kΩ?	Replace the knock sensor. <Ref. to FU(H6DO)-21, Knock Sensor.>	Repair the ground short circuit of harness between knock sensor connector and ECM connector. NOTE: The harness between both connectors are shielded. Repair the short circuit of harness covered with shield.
3	**CHECK INPUT SIGNAL OF 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*** ***(B136) No. 25 (+) — Chassis ground (−):***	Is the voltage more than 2 V?	Even if the malfunction indicator light illuminates, 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.

BH:DTC P0332 KNOCK SENSOR 2 CIRCUIT LOW (BANK 2)

DTC DETECTING CONDITION:

Immediately at fault recognition

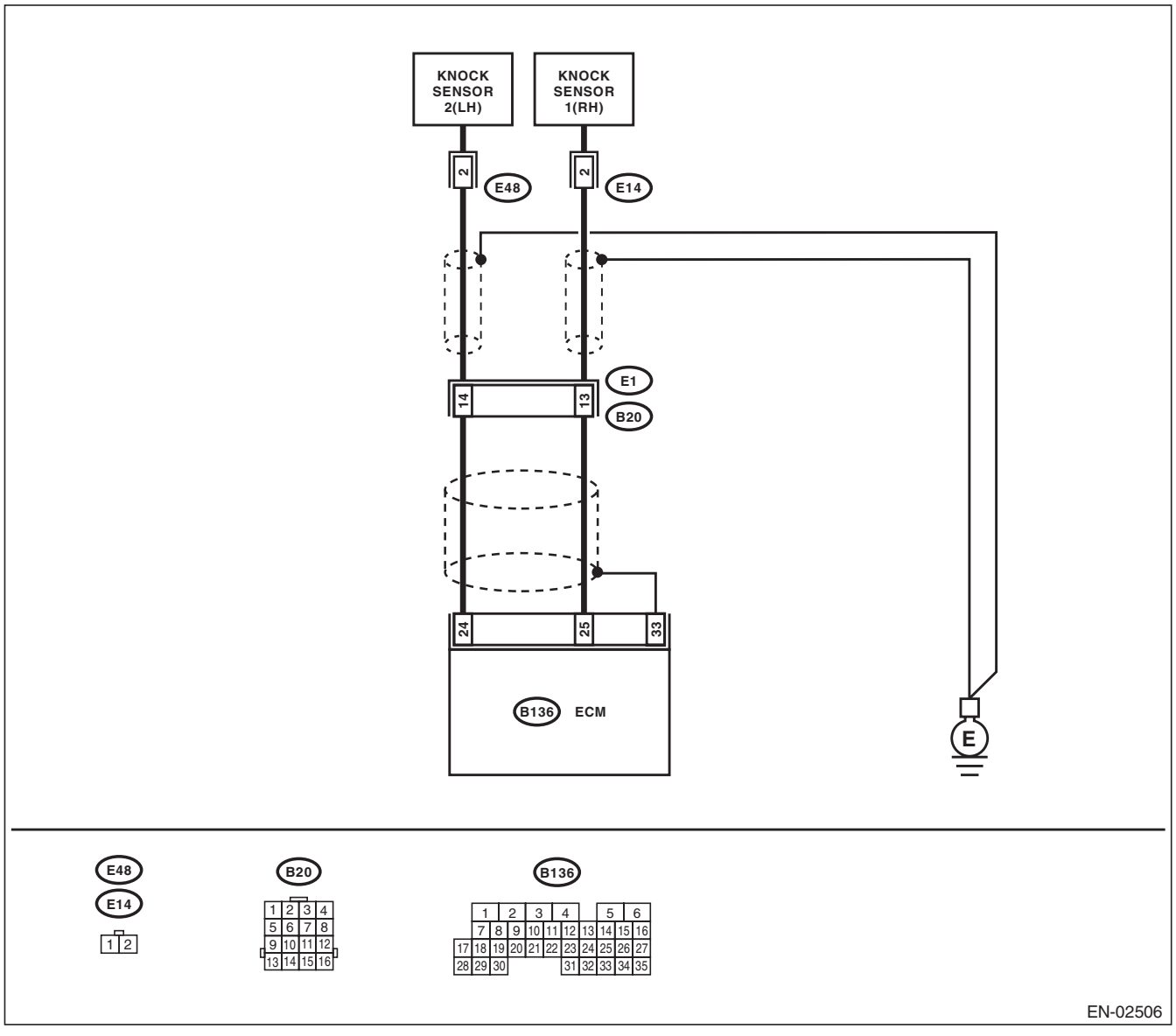
TROUBLE SYMPTOM:

- Driving performance problem
- Knocking is occurred.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	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*** ***(B136) No. 24 — 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 of 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. ***Terminal*** ***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
3	**CHECK INSTALLATION CONDITION OF KNOCK SENSOR.**	Is the knock sensor installation bolt tightened securely?	Replace the knock sensor. <Ref. to FU(H6DO)-21, Knock Sensor.>	Tighten the knock sensor installation bolt securely.

BI: DTC P0333 KNOCK SENSOR 2 CIRCUIT HIGH (BANK 2)

DTC DETECTING CONDITION:

Immediately at fault recognition

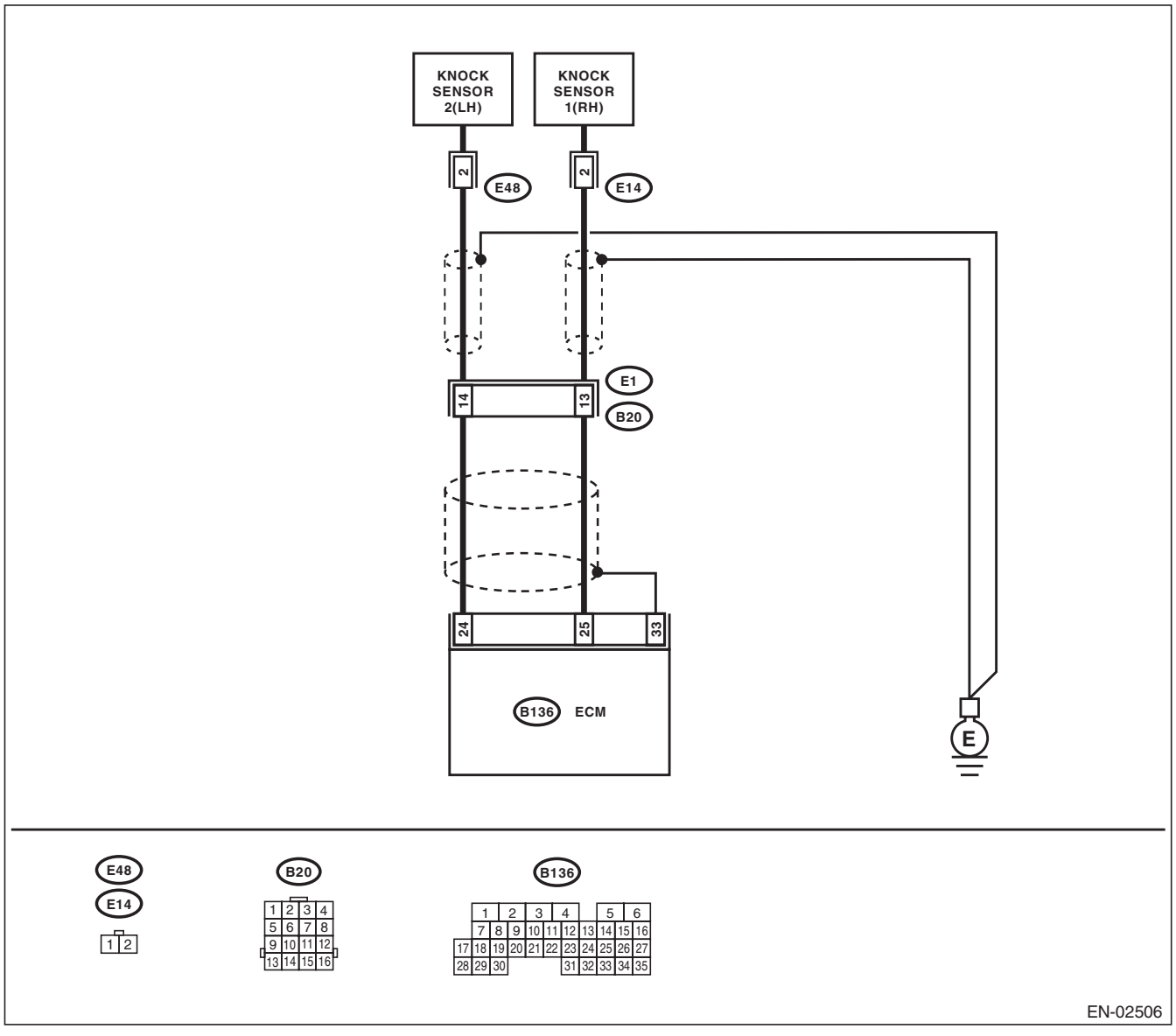
TROUBLE SYMPTOM:

- Driving performance problem
- Knocking occurs.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	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*** ***(B136) No. 24 — 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. ***Terminal*** ***No. 2 — Engine ground:***	Is the resistance less than 400 kΩ?	Replace the knock sensor. <Ref. to FU(H6DO)-21, Knock Sensor.>	Repair the ground short circuit of harness between knock sensor connector and ECM connector. NOTE: The harness between both connectors are shielded. Repair the short circuit of harness covered with shield.
3	**CHECK INPUT SIGNAL OF 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*** ***(B136) No. 24 (+) — Chassis ground (−):***	Is the voltage more than 2 V?	Even if the malfunction indicator light illuminates, 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.

BJ:DTC P0335 CRANKSHAFT POSITION SENSOR “A” CIRCUIT

DTC DETECTING CONDITION:

Immediately at fault recognition

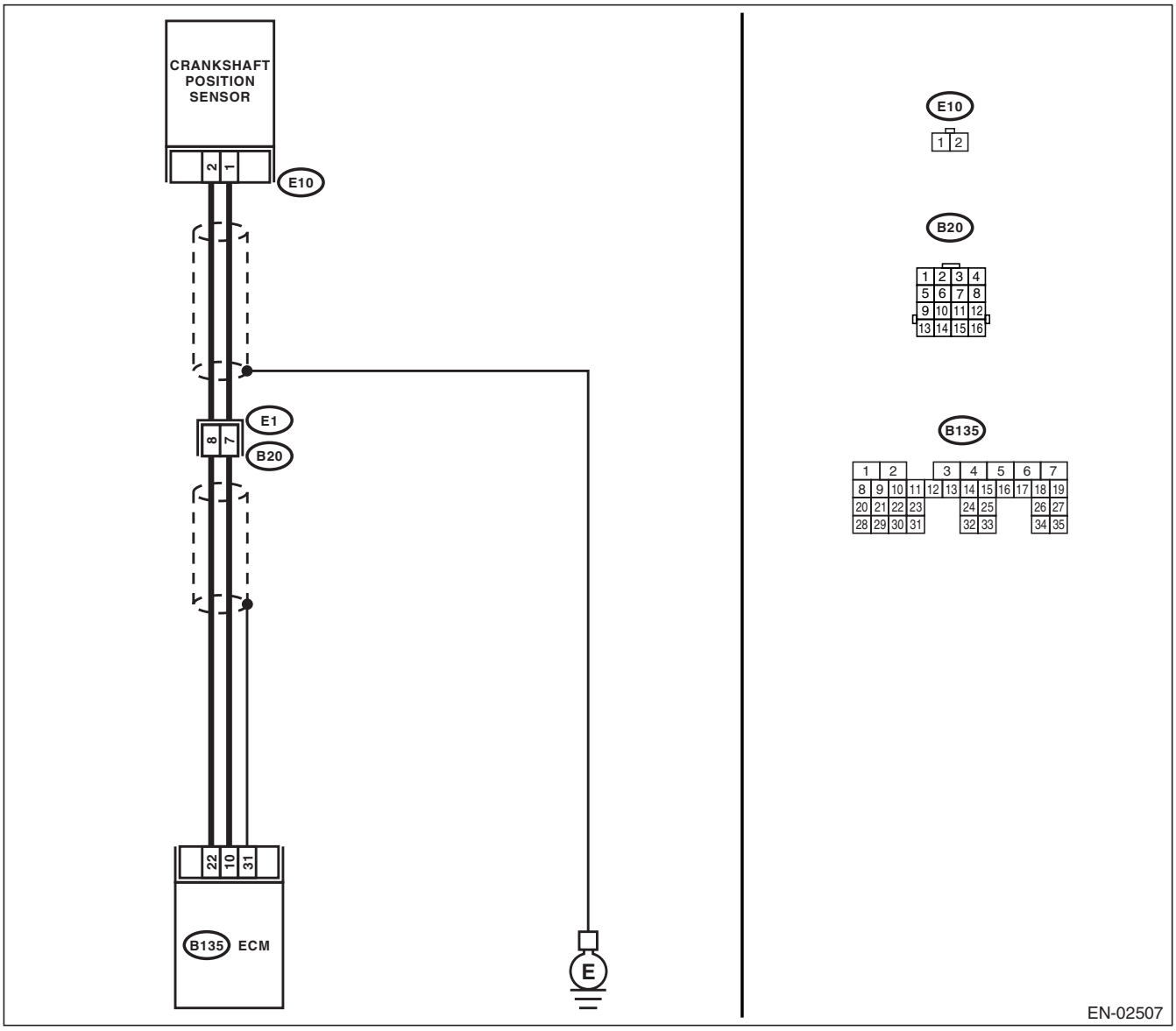
TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	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 of 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 less than 10 Ω?	Repair the ground short circuit of harness between crankshaft position sensor and ECM connector. NOTE: The harness between both connectors are shielded. Repair the ground short circuit of harness with shield.	Go to step **3.**
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 of 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. ***Terminal*** ***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(H6DO)-19, Crankshaft Position Sensor.>

BK:DTC P0340 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR)

DTC DETECTING CONDITION:

Immediately at fault recognition

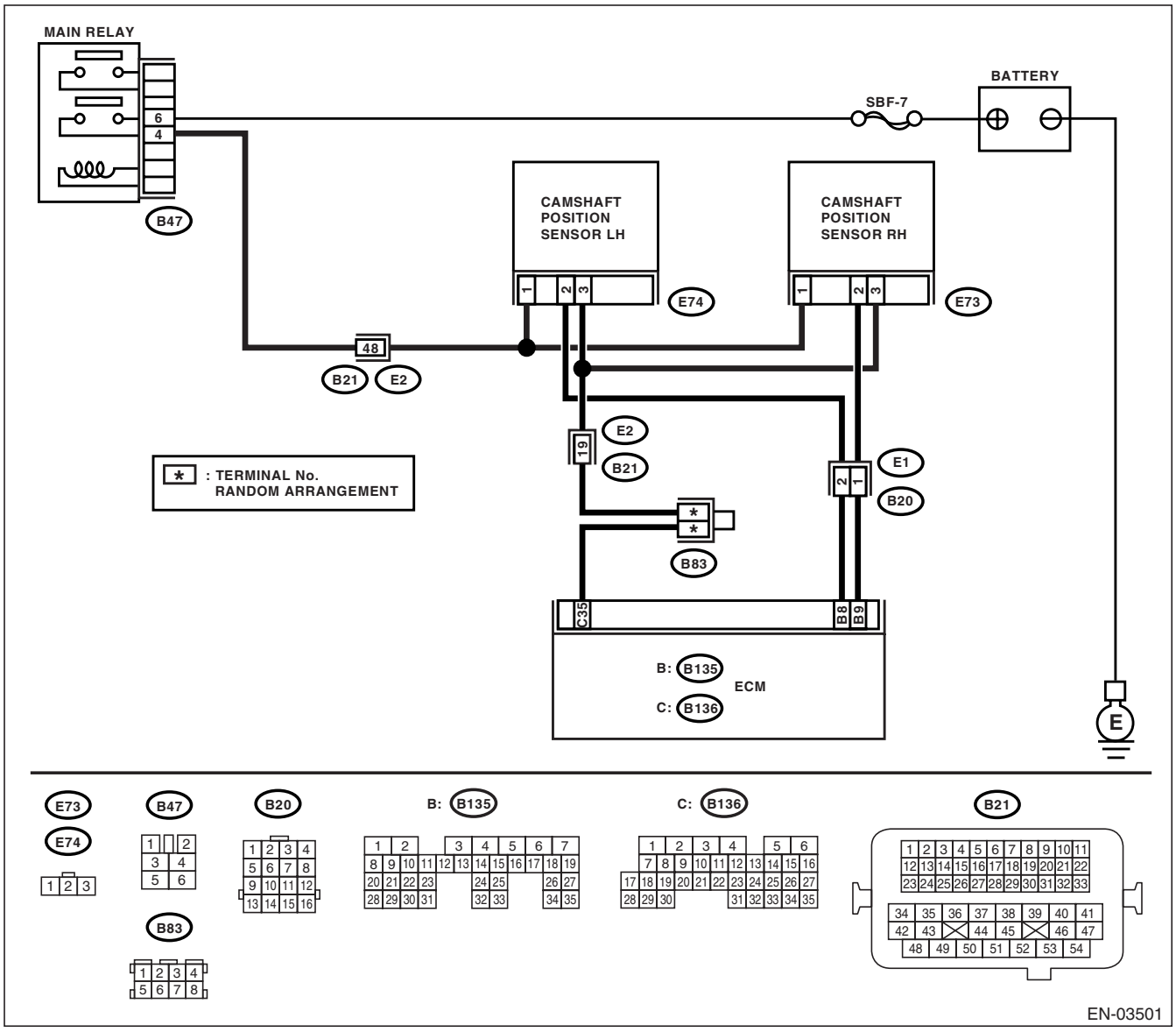
TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)(diag)-34, PROCEDURE, 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(H6DO)(diag)-66, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK POWER SUPPLY OF CAMSHAFT POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from camshaft position sensor. 3) Measure the voltage between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E73) No. 1 (+) — Engine ground (−):***	Is the voltage more than 10 V?	Repair the battery short circuit between main relay connector and camshaft position sensor connector.	Go to step **3.**
3	**CHECK POWER SUPPLY OF CAMSHAFT POSITION SENSOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E73) No. 1 (+) — Engine ground (−):***	Is the voltage more than 10 V?	Go to step **4.**	Repair the open or battery short circuit between main relay connector and camshaft position sensor connector.
4	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR CONNECTOR AND ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between camshaft position sensor connector and ECM. ***Connector & terminal*** ***(E73) No. 2 — (B135) No. 9:*** ***(E73) No. 3 — (B136) No. 35:***	Is the resistance less than 1 Ω?	Go to step **5.**	Repair the open circuit between camshaft position sensor and ECM.
5	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR CONNECTOR AND ECM.** Measure the resistance between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E73) No. 2 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **6.**	Repair the ground short circuit between camshaft position sensor and ECM.
6	**CHECK CONDITION OF CAMSHAFT POSITION SENSOR.**	Is the camshaft position sensor installation bolt tightened securely?	Go to step **7.**	Tighten the camshaft position sensor installation bolt securely.
7	**CHECK CAMSHAFT POSITION SENSOR.** Check waveform of camshaft position sensor. <Ref. to EN(H6DO)(diag)-17, Engine Control Module (ECM) I/O Signal.>	Is there any abnormality in waveform?	Replace the camshaft position sensor. <Ref. to FU(H6DO)-19, Crankshaft Position Sensor.>	Go to step **8.**
8	**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(H6DO)-34, Engine Control Module (ECM).>

BL:DTC P0345 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 2)

DTC DETECTING CONDITION:

Immediately at fault recognition

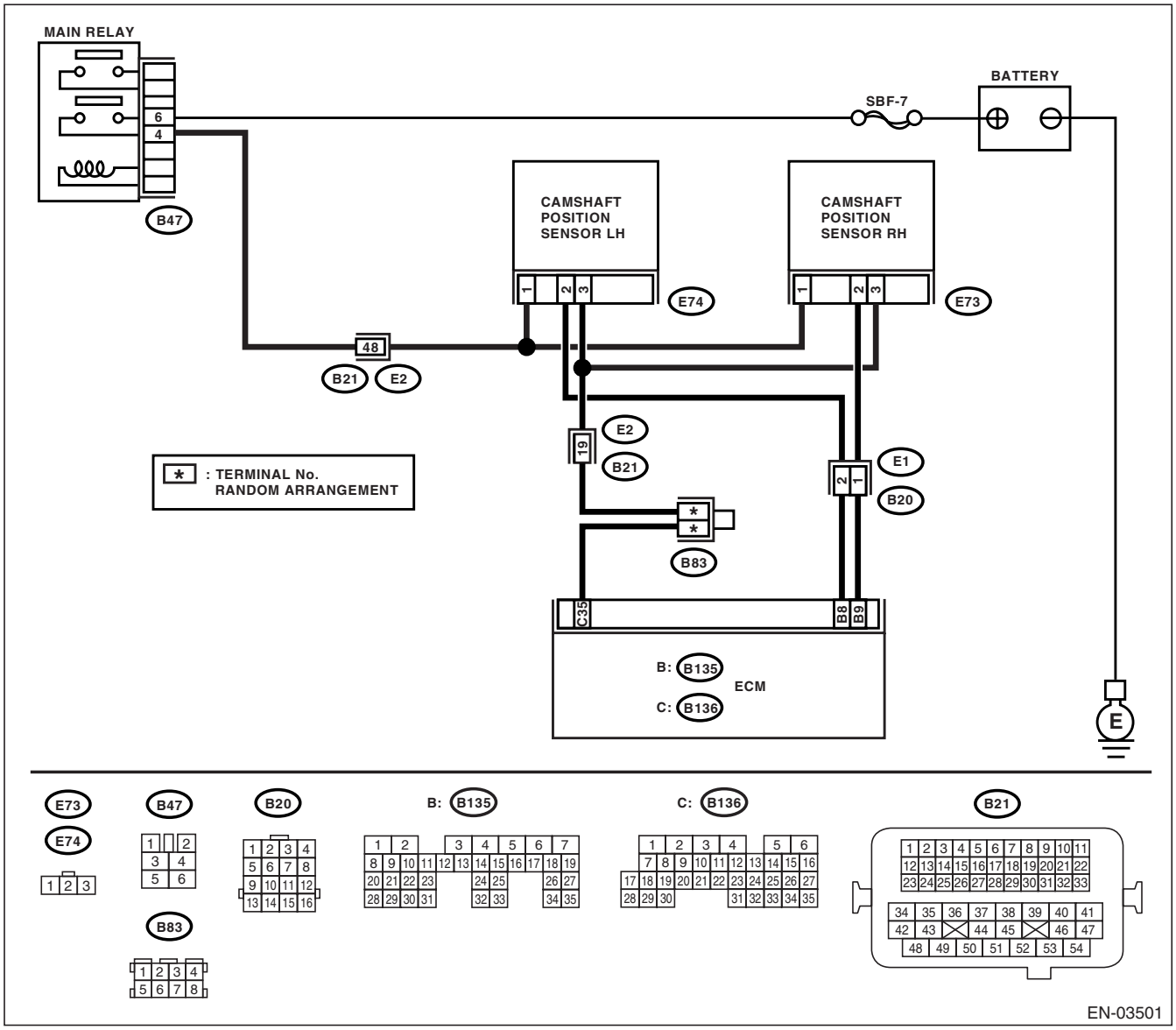
TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)(diag)-34, PROCEDURE, 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(H6DO)(diag)-66, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK POWER SUPPLY OF CAMSHAFT POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from camshaft position sensor. 3) Measure the voltage between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E74) No. 1 (+) — Engine ground (−):***	Is the voltage more than 10 V?	Repair the battery short circuit between main relay connector and camshaft position sensor connector.	Go to step **3.**
3	**CHECK POWER SUPPLY OF CAMSHAFT POSITION SENSOR.** 1) Turn the ignition switch to ON. 2) Measure the voltage between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E74) No. 1 (+) — Engine ground (−):***	Is the voltage more than 10 V?	Go to step **4.**	Repair the open or battery short circuit between main relay connector and camshaft position sensor connector.
4	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR CONNECTOR AND ECM.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between camshaft position sensor connector and ECM. ***Connector & terminal*** ***(E74) No. 2 — (B135) No. 8:*** ***(E74) No. 3 — (B136) No. 35:***	Is the resistance less than 1 Ω?	Go to step **5.**	Repair the open circuit between camshaft position sensor and ECM.
5	**CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR CONNECTOR AND ECM.** Measure the resistance between camshaft position sensor connector and engine ground. ***Connector & terminal*** ***(E74) No. 2 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **6.**	Repair the ground short circuit between camshaft position sensor and ECM.
6	**CHECK CONDITION OF CAMSHAFT POSITION SENSOR.**	Is the camshaft position sensor installation bolt tightened securely?	Go to step **7.**	Tighten the camshaft position sensor installation bolt securely.
7	**CHECK CAMSHAFT POSITION SENSOR.** Check waveform of camshaft position sensor. <Ref. to EN(H6DO)(diag)-17, Engine Control Module (ECM) I/O Signal.>	Is there any abnormality in waveform?	Replace the camshaft position sensor. <Ref. to FU(H6DO)-20, Camshaft Position Sensor.>	Go to step **8.**
8	**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(H6DO)-34, Engine Control Module (ECM).>

BM:DTC P0400 EXHAUST GAS RECIRCULATION FLOW

DTC DETECTING CONDITION:

Detects when malfunction occurs in 2 continuous driving cycles.

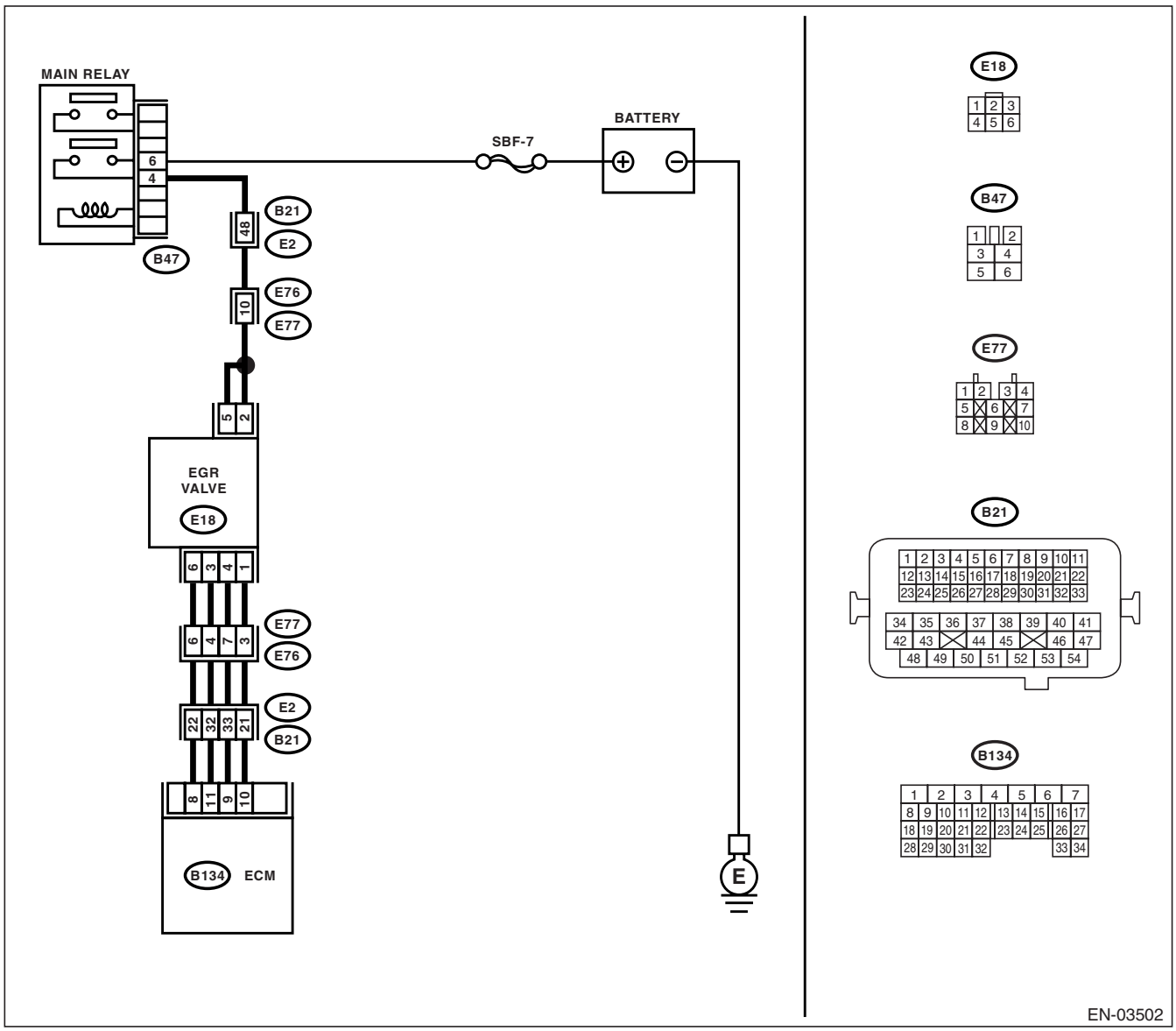
TROUBLE SYMPTOM:

- Movement performance problem when engine is low speed.
- Erroneous idling
- Movement performance problem

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H6DO)(diag)-66, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK CURRENT DATA.** 1) Start the engine. 2) Read the data of intake manifold absolute pressure signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-26, Subaru Select Monitor.> • General scan tool For detailed operation procedure, refer to the general scan tool operation manual.	Is the value 53.3 kPa (400 mmHg, 15.75 inHg) or more?	Make sure that the EGR valve, manifold absolute pressure sensor and throttle body are installed securely.	Go to step **3.**
3	**CHECK POWER SUPPLY OF EGR SOLENOID VALVE.** 1) Detach the connector from EGR solenoid valve. 2) Turn the ignition switch to ON. 3) Measure the voltage between EGR solenoid valve and engine ground. ***Connector & terminal*** ***(E18) No. 2 — Engine ground:*** ***(E18) No. 5 — Engine ground:***	Is the voltage more than 10 V?	Go to step **4.**	Repair the open circuit of harness between main relay and EGR solenoid valve connector.
4	**CHECK EGR SOLENOID VALVE.** Measure the resistance between EGR solenoid valve terminals. NOTE: Make sure there is no foreign material between EGR solenoid valve and valve seat. ***Terminal*** ***No. 1 — No. 2:*** ***No. 3 — No. 2:*** ***No. 4 — No. 5:*** ***No. 6 — No. 5:***	Is the resistance 20 — 30 Ω?	Go to step **5.**	Replace the EGR solenoid valve. <Ref. to FU(H6DO)-25, EGR Valve.>
5	**OUTPUT SIGNAL FROM ECM** 1) Turn the ignition switch to OFF. 2) Connect the connector to ECM and EGR solenoid valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 8 (+) — Chassis ground (−):*** ***(B134) No. 9 (+) — Chassis ground (−):*** ***(B134) No. 10 (+) — Chassis ground (−):*** ***(B134) No. 11 (+) — Chassis ground (−):***	Is the voltage 0 — 10 V?	Repair the poor contact in ECM connector.	Go to step **6.**

	Step	Check	Yes	No
6	**CHECK HARNESS BETWEEN EGR SOLENOID VALVE AND ECM CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Detach the connector from EGR solenoid valve and ECM. 3) Measure the resistance of harness between EGR solenoid valve and ECM connector. ***Connector & terminal*** ***(B134) No. 8 — (E18) No. 6:*** ***(B134) No. 10 — (E18) No. 1:*** ***(B134) No. 9 — (E18) No. 4:*** ***(B134) No. 11 — (E18) No. 3:***	Is the resistance less than 1 Ω?	Go to step **7.**	Repair the open circuit of harness between ECM and EGR solenoid valve connector.
7	**CHECK HARNESS BETWEEN EGR SOLENOID VALVE AND ECM CONNECTOR.** Measure the resistance of harness between EGR solenoid valve and chassis ground. ***Connector & terminal*** ***(B134) No. 8 — Chassis ground:*** ***(B134) No. 9 — Chassis ground:*** ***(B134) No. 10 — Chassis ground:*** ***(B134) No. 11 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **8.**	Repair the short circuit of harness between main relay and EGR solenoid valve connector.
8	**CHECK POOR CONTACT.** Check poor contact in ECM and EGR solenoid valve connector.	Is there poor contact in ECM or EGR solenoid valve connector?	Repair the poor contact in ECM and EGR solenoid valve connector.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time.

BN:DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK1)

DTC DETECTING CONDITION:

Detects when malfunction occurs in 2 continuous driving cycles.

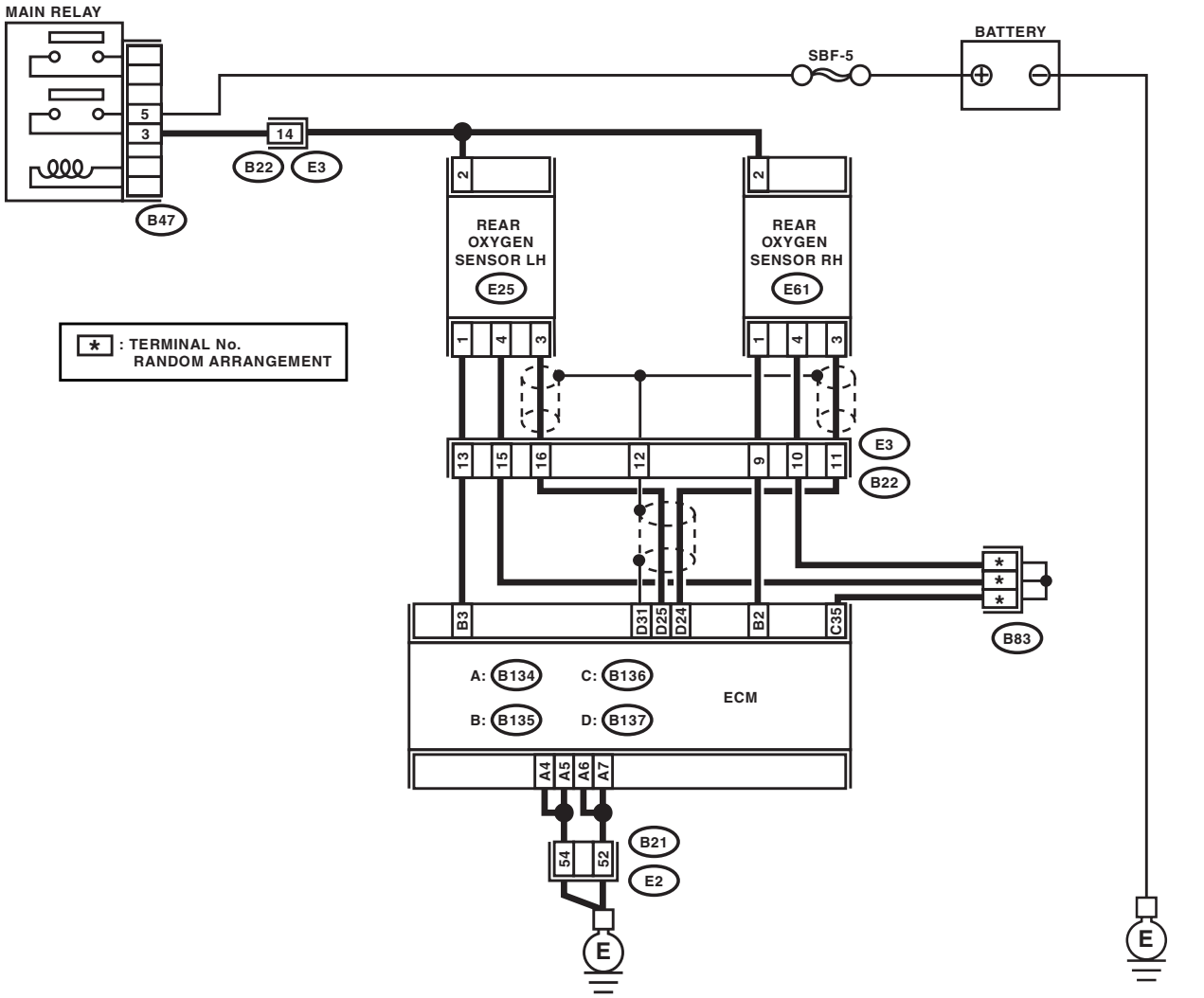
TROUBLE SYMPTOM:

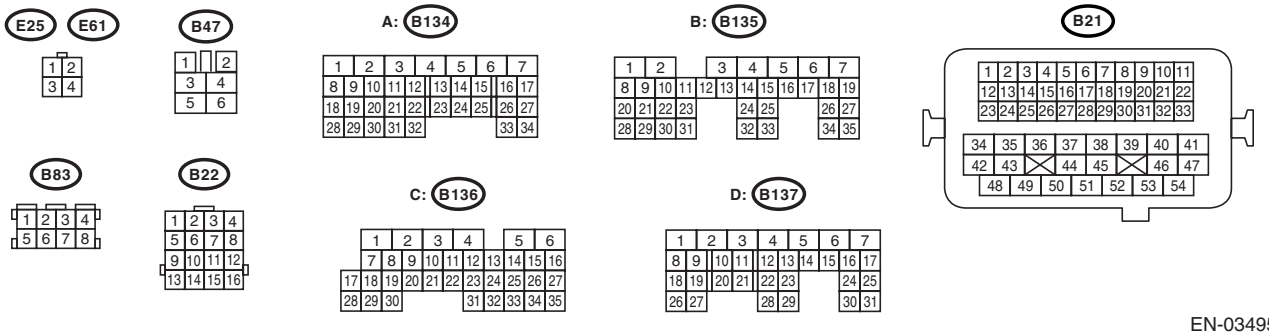
- Engine stalls.
- Idle mixture is out of specifications.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





EN-03495

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

	Step	Check	Yes	No
1	**CHECK FOR ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Inspect the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H6DO)(diag)-66, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0420.	Go to step **2.**
2	**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*** ***(B137) No. 24 — (E61) No. 3:*** ***(B136) No. 35 — (E61) No. 4:*** ***(B137) No. 25 — (E25) No. 3:*** ***(B136) No. 35 — (E25) No. 4:***	Is the resistance less than 1 Ω?	Go to step **3.**	Repair open circuit in harness between ECM and rear oxygen sensor connector.
3	**CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR.** Measure the resistance between rear oxygen sensor harness connector and chassis ground. ***Connector & terminal*** ***(B137) No. 31 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the open circuit between ECM and rear oxygen sensor connector.
4	**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 any fault in exhaust system?	Repair or replace the exhaust system. <Ref. to EX(H6DO)-2, General Description.>	Go to step **5.**
5	**CHECK CATALYTIC CONVERTER.**	Is there damage at rear face or front face of front catalytic converter?	Replace the catalytic converter. <Ref. to EC(H4SO 2.0)-3, Front Catalytic Converter.>	Contact the SUBARU dealer.

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

DTC DETECTING CONDITION:

Detects when malfunction occurs in 2 continuous driving cycles.

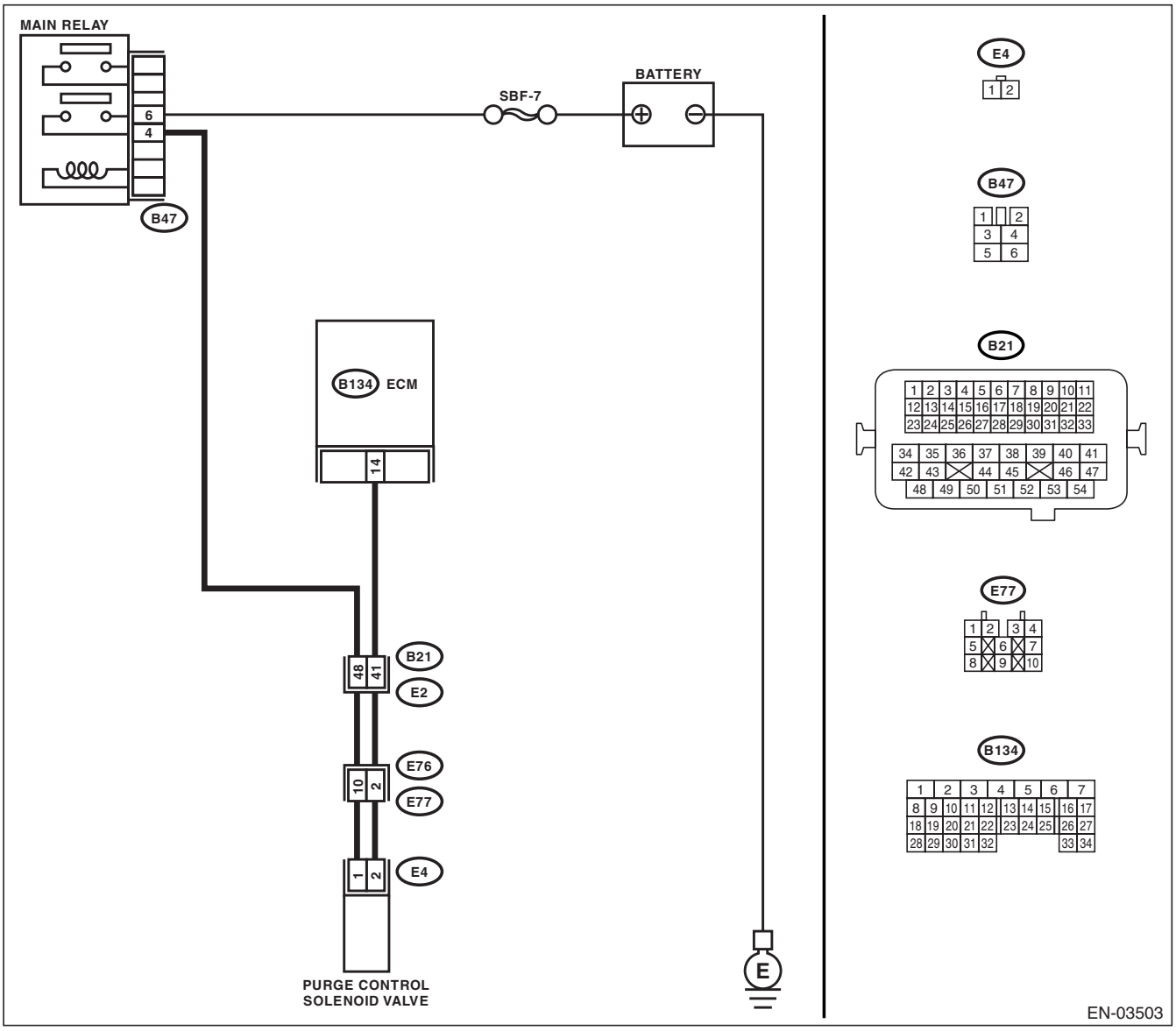
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)(diag)-34, PROCEDURE, 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 and chassis ground. ***Connector & terminal*** ***(B134) No. 14 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Even if the malfunction indicator light illuminates, 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 of 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. ***Connector & terminal*** ***(B134) No. 14 — (E4) No. 2:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the open circuit of harness between ECM and purge control solenoid valve connector. NOTE: In this case, repair the following: • Open circuit of 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. ***Terminal*** ***No. 1 — No. 2:***	Is the resistance 10 — 100 Ω?	Go to step **5.**	Replace the purge control solenoid valve. <Ref. to EC(H6DO)-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 of 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.	Replace the ECM. <Ref. to FU(H6DO)-34, Engine Control Module (ECM).>

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

DTC DETECTING CONDITION:

Detects when malfunction occurs in 2 continuous driving cycles.

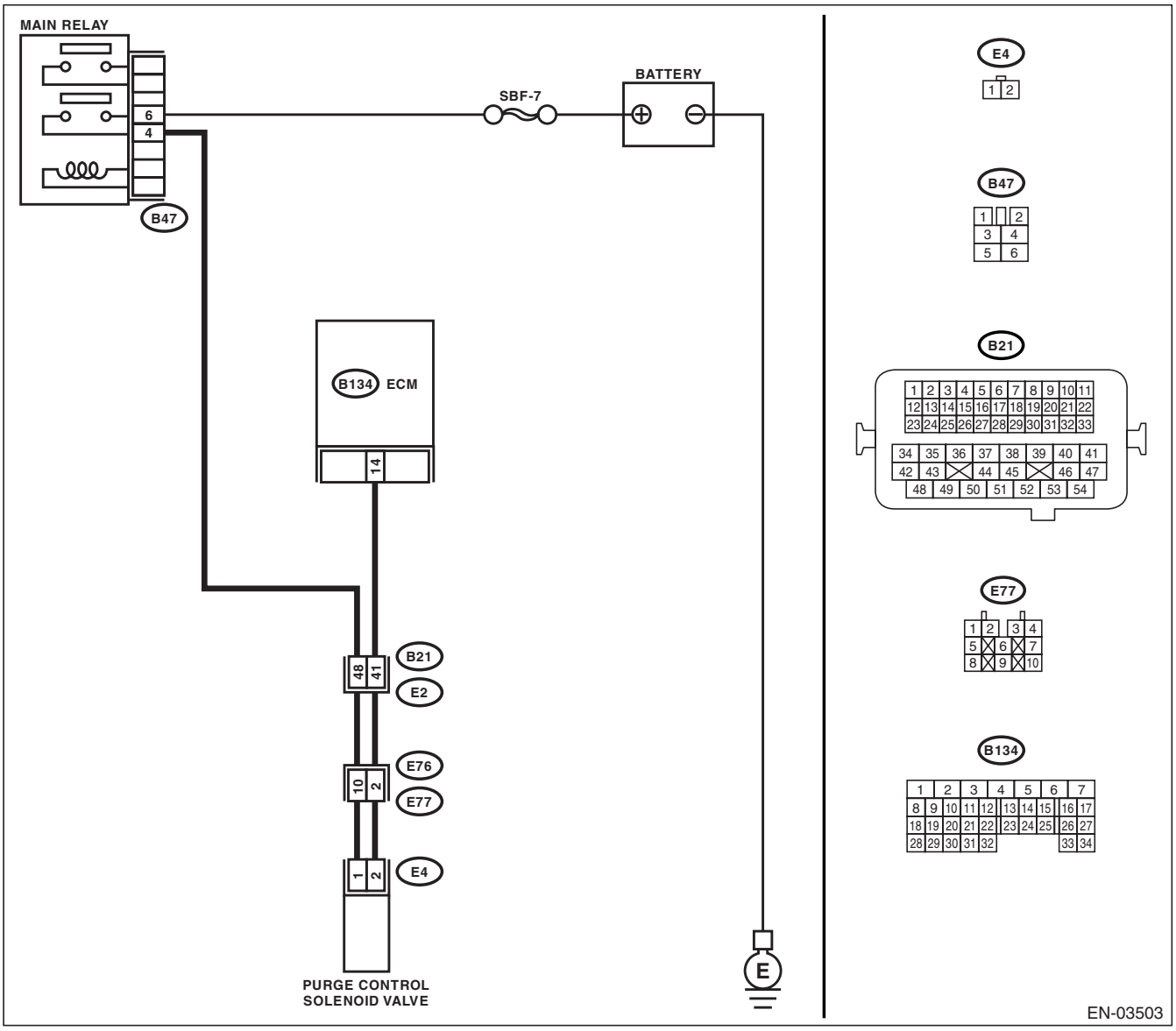
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	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 voltage between ECM and chassis ground. NOTE: Purge control solenoid valve operation can be executed using Subaru Select Monitor. Refer to "Compulsory Valve Operation Check Mode" for procedures. <Ref. to EN(H6DO)(diag)-42, Compulsory Valve Operation Check Mode.> ***Connector & terminal*** ***(B134) No. 14 (+) — Chassis ground (−):***	Is the voltage 0 — 10 V?	Go to step **2.**	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. In this case, repair the poor contact in ECM connector.
2	**CHECK OUTPUT SIGNAL FROM ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B134) No. 14 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **4.**	Go to step **3.**
3	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H6DO)-34, 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*** ***(B134) No. 14 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair the battery short circuit of harness between ECM and purge control solenoid valve connector. After repair, replace the ECM. <Ref. to FU(H6DO)-34, 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. ***Terminal*** ***No. 1 — No. 2:***	Is the resistance less than 1 Ω?	Replace the purge control solenoid valve <Ref. to EC(H6DO)-7, Purge Control Solenoid Valve.> and ECM. <Ref. to FU(H6DO)-34, 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(H6DO)-34, Engine Control Module (ECM).>

BQ:DTC P0462 FUEL LEVEL SENSOR “A” CIRCUIT LOW

NOTE:
For the diagnostic procedure, refer to DTC P0463. <Ref. to EN(H6DO)(diag)-209, DTC P0463 FUEL LEVEL SENSOR “A” CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BR:DTC P0463 FUEL LEVEL SENSOR “A” CIRCUIT HIGH

DTC DETECTING CONDITION:
Detects when malfunction occurs in 2 continuous driving cycles.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)(diag)-34, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is DTC P0462 or P0463 displayed on the Subaru Select Monitor?	Check the combination meter. <Ref. to IDI-15, Combination Meter.>	Temporary poor contact occurs.

BS:DTC P0500 VEHICLE SPEED SENSOR “A”

DTC DETECTING CONDITION:
Immediately at fault recognition

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)(diag)-34, PROCEDURE, Inspection Mode.>.

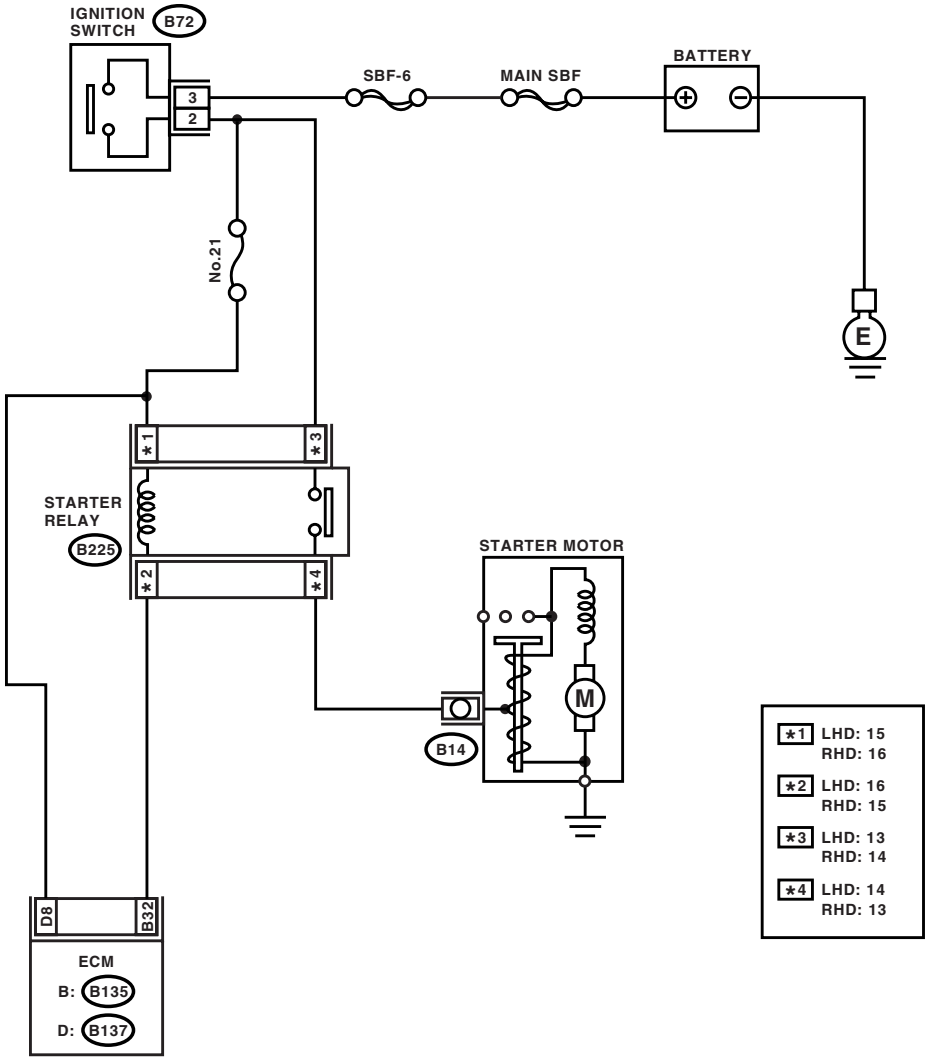
	Step	Check	Yes	No
1	**CHECK DTC OF ABS.** Check DTC of ABS.	Is DTC of ABS displayed?	Perform the diagnosis according to DTC. <Ref. to ABS(diag)-38, List of Diagnostic Trouble Code (DTC).>	Repair the poor contact in ECM.

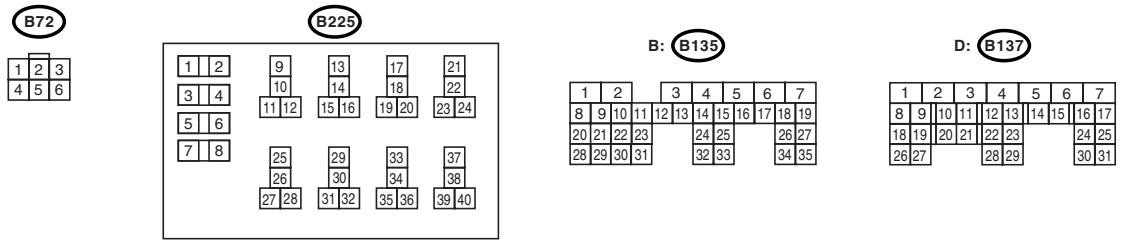
BT:DTC P0512 STARTER REQUEST CIRCUIT

DTC DETECTING CONDITION:
Detects when malfunction occurs in 2 continuous driving cycles.
TROUBLE SYMPTOM:
Failure of engine to start

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





EN-03489

Step		Check	Yes	No
1	**CHECK HARNESS BETWEEN IGNITION SWITCH AND ECM.** 1) Disconnect the connector from ECM. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 32 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair the battery short circuit of harness between ignition switch and ECM.	Repair the poor contact in ECM.

BU:DTC P0519 IDLE AIR CONTROL SYSTEM PERFORMANCE

DTC DETECTING CONDITION:
Immediately at fault recognition
TROUBLE SYMPTOM:
Engine keeps running at higher revolution than specified idling revolution.

CAUTION:
After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)(diag)-34, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H6DO)(diag)-66, 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 and idle the engine. 3) Check the following items. • Loose installation of intake manifold and throttle body • Cracks of intake manifold gasket and throttle body gasket • Disconnections of vacuum hoses	Is there any fault in air intake system?	Repair air suction and leaks.	Go to step **3.**
3	**CHECK ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Remove the electronic throttle control. 3) Check the electronic throttle control.	Are foreign matters found inside the electronic throttle control?	Remove foreign matters from the electronic throttle control.	Perform the diagnosis of DTC P2101.

BV:DTC P0600 SERIAL COMMUNICATION LINK

NOTE:
For the diagnostic procedure, refer to LAN section. <Ref. to LAN(diag)-2, Basic Diagnostic Procedure.>

BW:DTC P0604 INTERNAL CONTROL MODULE RANDAM ACCESS MEMORY (RAM) ERROR

DTC DETECTING CONDITION:

Immediately at fault recognition

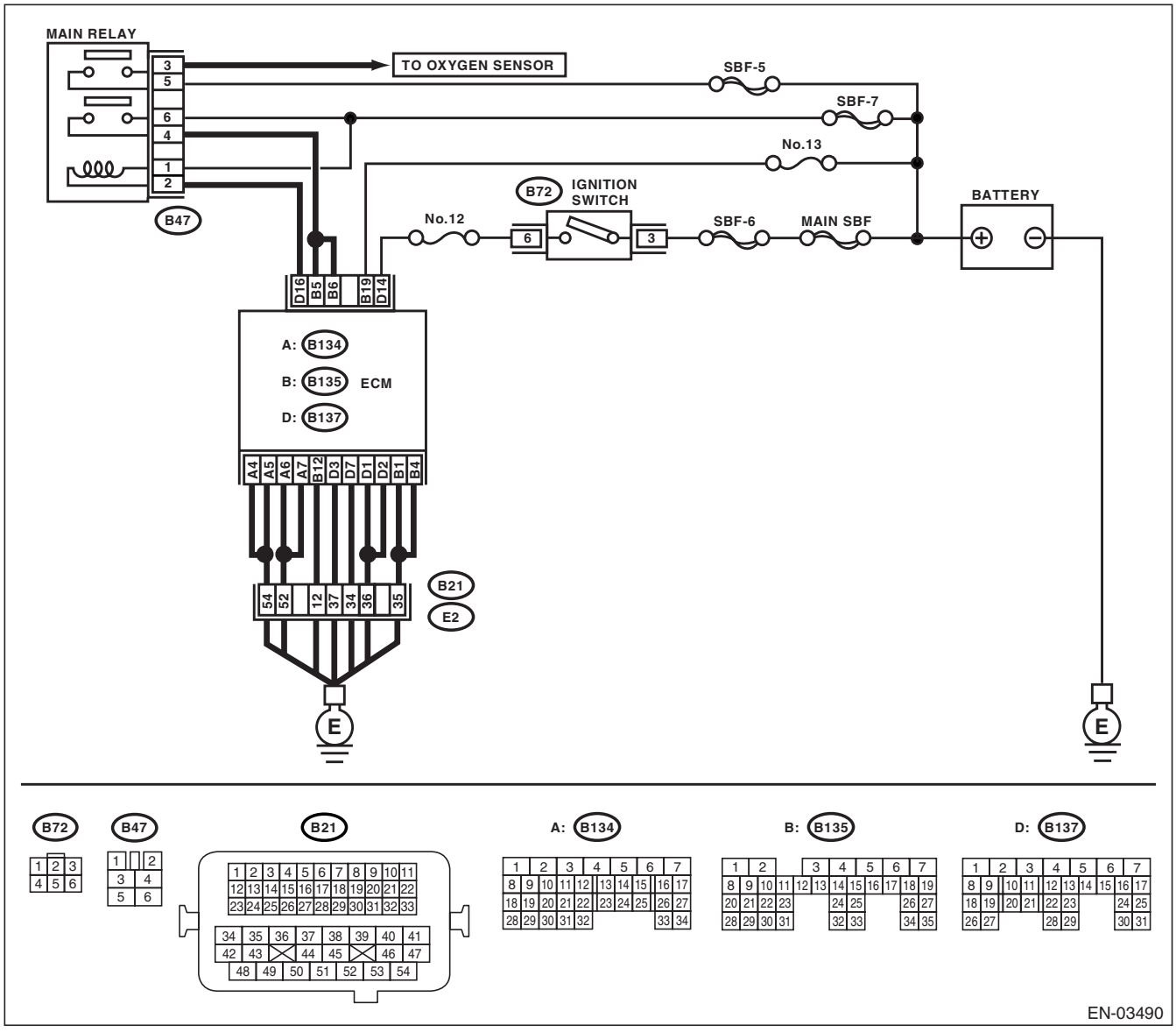
TROUBLE SYMPTOM:

- Engine does not start.
- Engine stalls.

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)(diag)-34, PROCEDURE, 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(H6DO)(diag)-66, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

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

NOTE:
For the diagnostic procedure, refer to DTC P0607. <Ref. to EN(H6DO)(diag)-214, DTC P0607 CONTROL MODULE PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

BY:DTC P0607 CONTROL MODULE PERFORMANCE

DTC DETECTING CONDITION:

Immediately at fault recognition

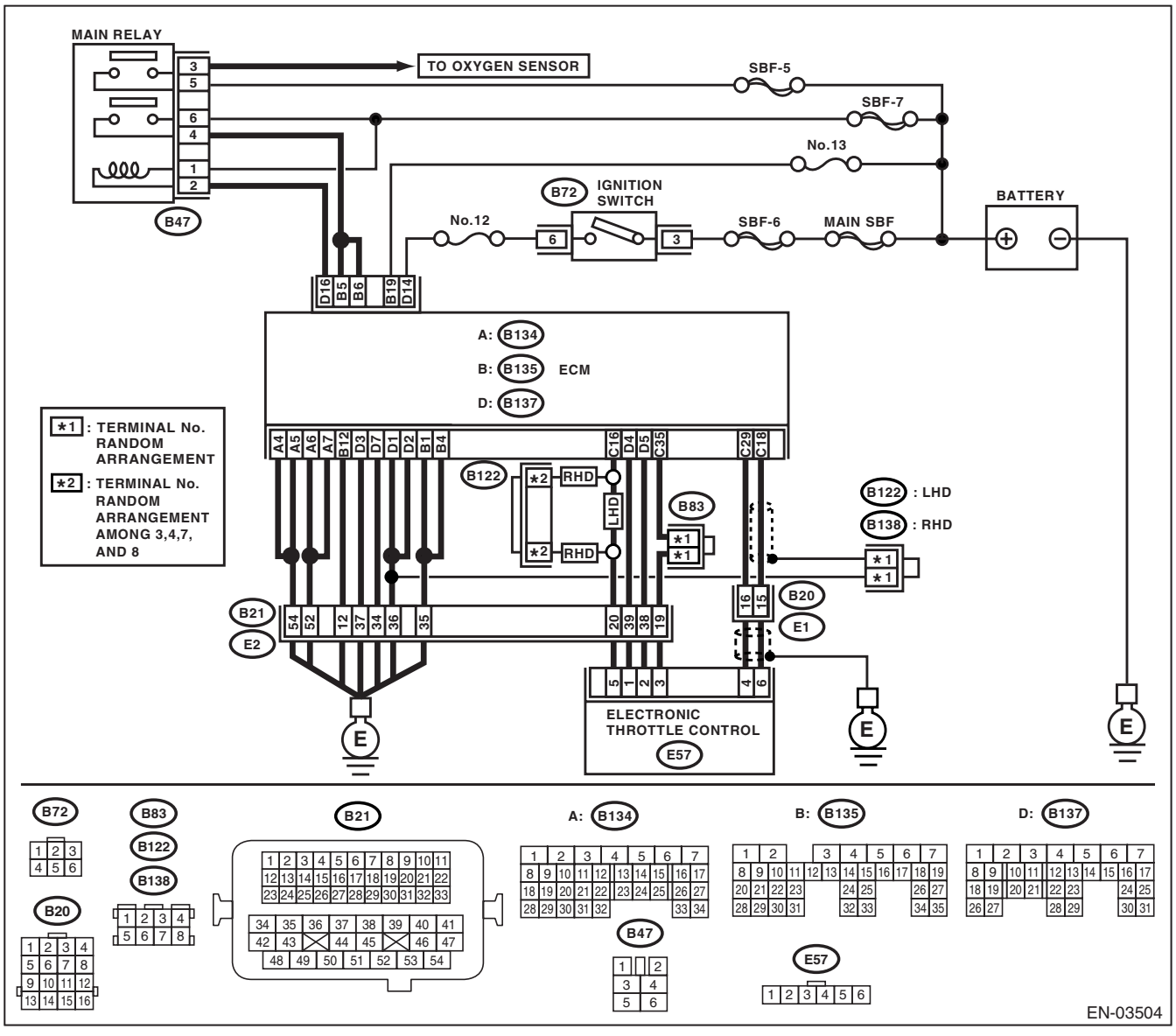
TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK INPUT VOLTAGE OF ECM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 5 (+) — Chassis ground (−):*** ***(B135) No. 6 (+) — Chassis ground (−):***	Is the voltage 10 — 13 V?	Go to step **2.**	Repair the open or ground short circuit of power supply circuit.
2	**CHECK INPUT VOLTAGE OF ECM.** 1) Start the engine. 2) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 5 (+) — Chassis ground (−):*** ***(B135) No. 6 (+) — Chassis ground (−):***	Is the voltage 13 — 15 V?	Go to step **3.**	Repair the open or ground short circuit of power supply circuit.
3	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and electronic throttle control. 3) Measure the resistance of harness between ECM and electronic throttle control connector. ***Connector & terminal*** ***(E57) No. 5 — (B136) No. 16:*** ***(E57) No. 3 — (B136) No. 35:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the open circuit of harness between ECM and electronic throttle relay.
4	**CHECK ECM GROUND HARNESS.** Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 1 (+) — Chassis ground (−):*** ***(B137) No. 2 (+) — Chassis ground (−):*** ***(B137) No. 3 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Repair the poor contact in ECM connector. Replace the ECM if defective. <Ref. to FU(H6DO)-34, Engine Control Module (ECM).>	Further tighten the engine ground terminal.

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

NOTE:
For diagnostic procedure, refer to DTC P2101. <Ref. to EN(H6DO)(diag)-239, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CA:DTC P0691 FAN 1 CONTROL CIRCUIT LOW

DTC DETECTING CONDITION:

Detects when malfunction occurs in 2 continuous driving cycles.

TROUBLE SYMPTOM:

- Radiator fan does not operate properly.
- Overheating

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)(diag)-34, PROCEDURE, Inspection Mode.>.

Step		Check	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY.	Is DTC P0691 displayed?	Check the radiator fan system. <Ref. to CO(H6DO)-8, Radiator Fan System.>	Temporary poor contact occurs.

CB:DTC P0692 FAN 1 CONTROL CIRCUIT HIGH

DTC DETECTING CONDITION:

Detects when malfunction occurs in 2 continuous driving cycles.

TROUBLE SYMPTOM:

- Radiator fan does not operate properly.
- Overheating

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)(diag)-34, PROCEDURE, Inspection Mode.>.

Step		Check	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY.	Is DTC 692 displayed?	Check the radiator fan system. <Ref. to CO(H6DO)-8, Radiator Fan System.>	Temporary poor contact occurs.

CC:DTC P0700 TRANSMISSION CONTROL SYSTEM (MIL REQUEST)

NOTE:

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

CD:DTC P0851 PARK/NEUTRAL SWITCH INPUT CIRCUIT LOW

DTC DETECTING CONDITION:

Detects when malfunction occurs in 2 continuous driving cycles.

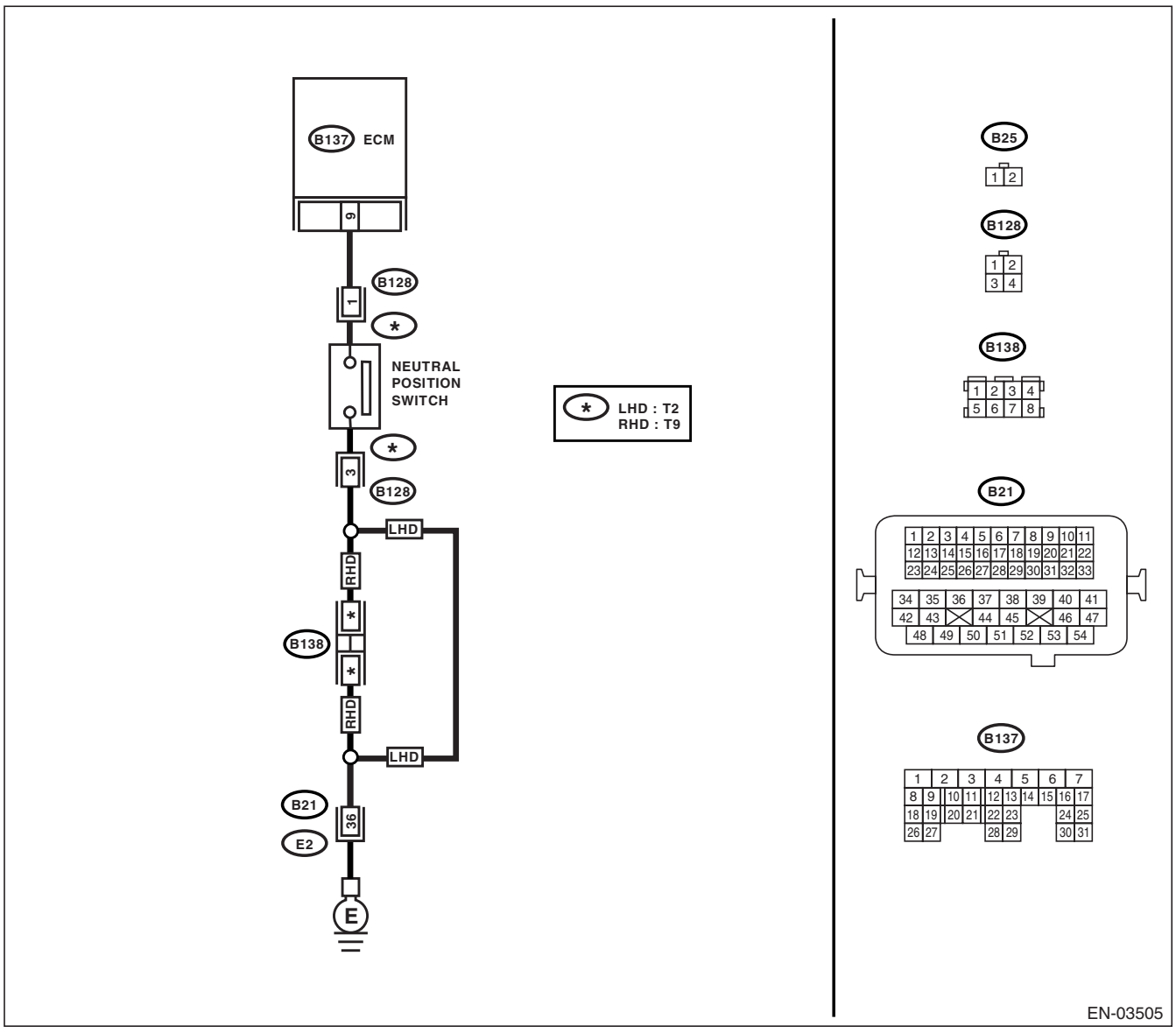
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL OF 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*** ***(B137) No. 9 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **2.**	Go to step **4.**
2	**CHECK INPUT SIGNAL OF ECM.** 1) Place the shift lever except in neutral. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 9 (+) — 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.	Replace the ECM.
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*** ***LHD model*** ***(T2) No. 1 — No. 3:*** ***RHD model*** ***(T9) No. 1 — No. 3:***	Is the resistance less than 1 Ω?	Go to step **5.**	Repair short circuit in transmission harness or replace the neutral position switch.
5	**CHECK NEUTRAL POSITION SWITCH.** 1) Place the shift lever except in neutral. 2) Measure the resistance between transmission harness connector terminals. ***Connector & terminal*** ***LHD model*** ***(T2) No. 1 — No. 3:*** ***RHD model*** ***(T9) No. 1 — No. 3:***	Is the resistance more than 1 MΩ?	Go to step **6.**	Repair short circuit in transmission harness or replace the neutral position switch.
6	**CHECK HARNESS BETWEEN ECM AND NEUTRAL POSITION SWITCH CONNECTOR.** Measure the resistance between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 9 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **7.**	Repair the ground short circuit of 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*** ***(B137) No. 9 — (B128) No. 1:***	Is the resistance less than 1 Ω?	Go to step **8.**	Repair the open circuit of harness between ECM and transmission harness connector.

	Step	Check	Yes	No
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. 3 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **9.**	Repair the open circuit between transmission harness connector and engine ground terminal.
9	**CHECK POOR CONTACT.** Check poor contact in transmission harness connector.	Is there poor contact in transmission harness connector?	Repair poor contact in transmission harness connector.	Replace the ECM.

CE:DTC P0852 PARK/NEUTRAL SWITCH INPUT CIRCUIT HIGH

DTC DETECTING CONDITION:

Detects when malfunction occurs in 2 continuous driving cycles.

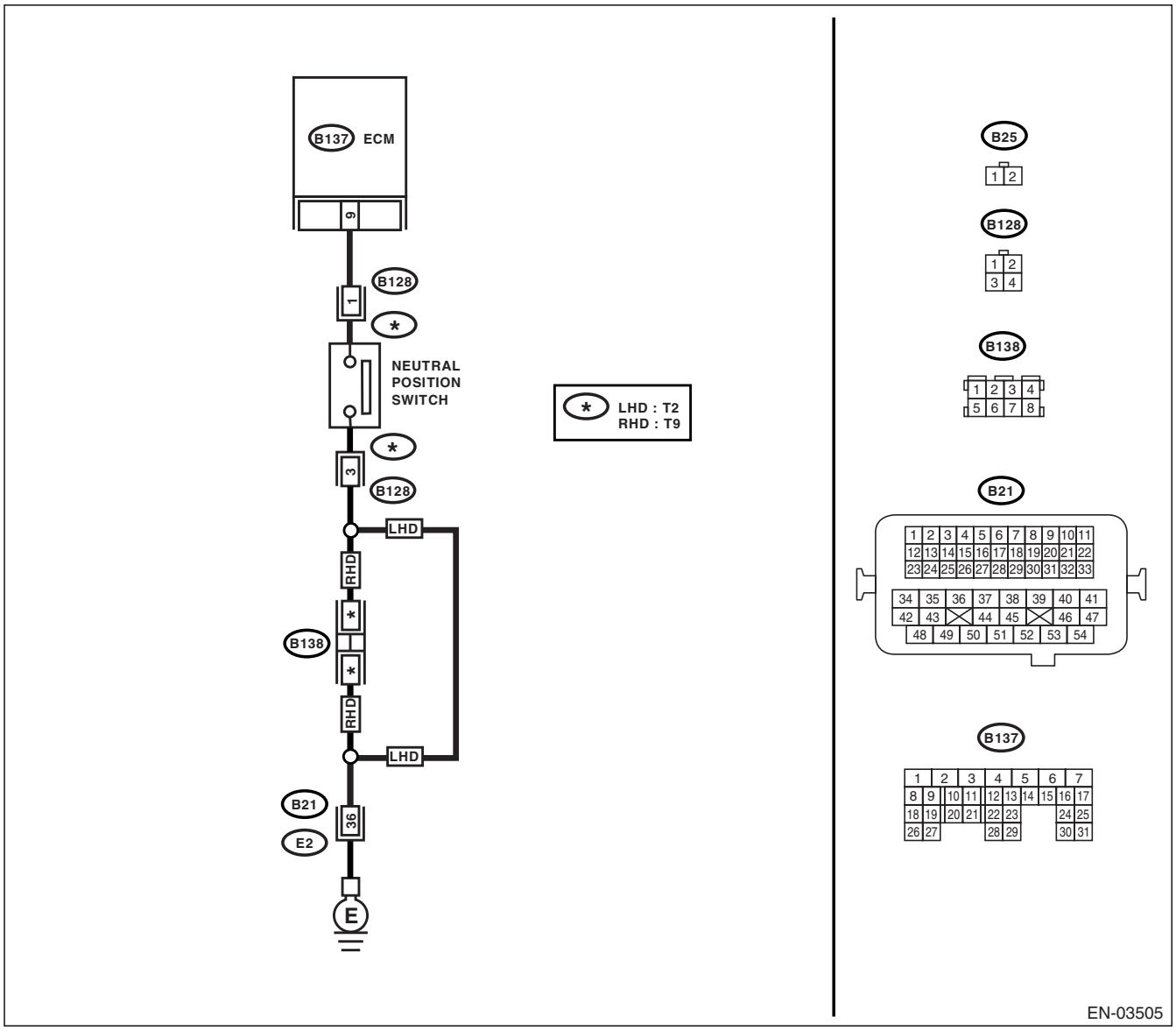
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL OF ECM.** 1) Turn the ignition switch to ON. 2) Place the shift lever except in neutral. 3) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 9 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **2.**	Go to step **4.**
2	**CHECK INPUT SIGNAL OF ECM.** 1) Place the shift lever in neutral. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B137) No. 9 (+) — Chassis ground (−):***	Is the voltage less than 1 V?	Go to step **3.**	Go to step **4.**
3	**CHECK POOR CONTACT.** Check poor contact in ECM connector.	Is there poor contact in ECM connector?	Repair the poor contact in ECM connector.	Replace the ECM.
4	**CHECK NEUTRAL POSITION SWITCH.** 1) Place the shift lever in neutral. 2) Measure the resistance between transmission harness connector terminals. ***Connector & terminal*** ***LHD model*** ***(T2) No. 1 — No. 3:*** ***LHD model*** ***(T9) No. 1 — No. 3:***	Is the resistance less than 1 Ω?	Go to step **5.**	Repair the open circuit in transmission harness or replace the neutral position switch.
5	**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*** ***(B137) No. 9 — (B128) No. 1:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair the open circuit of harness between ECM and transmission harness connector.
6	**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. 3 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **7.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit of harness between transmission harness connector and engine ground • Poor contact in coupling connector
7	**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.	Replace the ECM.

CF:DTC P1160 RETURN SPRING FAILURE

NOTE:
For diagnostic procedure, refer to DTC P2101. <Ref. to EN(H6DO)(diag)-239, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CG:DTC P1492 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (LOW INPUT)

NOTE:
For the diagnostic procedure, refer to DTC P1498. <Ref. to EN(H6DO)(diag)-223, DTC P1498 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CH:DTC P1493 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (HIGH INPUT)

NOTE:
For the diagnostic procedure, refer to DTC P1499. <Ref. to EN(H6DO)(diag)-225, DTC P1499 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CI: DTC P1494 EGR SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (LOW INPUT)

NOTE:
For the diagnostic procedure, refer to DTC P1498. <Ref. to EN(H6DO)(diag)-223, DTC P1498 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CJ:DTC P1495 EGR SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (HIGH INPUT)

NOTE:
For the diagnostic procedure, refer to DTC P1499. <Ref. to EN(H6DO)(diag)-225, DTC P1499 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CK:DTC P1496 EGR SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (LOW INPUT)

NOTE:
For the diagnostic procedure, refer to DTC P1498. <Ref. to EN(H6DO)(diag)-223, DTC P1498 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CL:DTC P1497 EGR SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (HIGH INPUT)

NOTE:
For the diagnostic procedure, refer to DTC P1499. <Ref. to EN(H6DO)(diag)-225, DTC P1499 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CM:DTC P1498 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT)

DTC DETECTING CONDITION:

Immediately at fault recognition

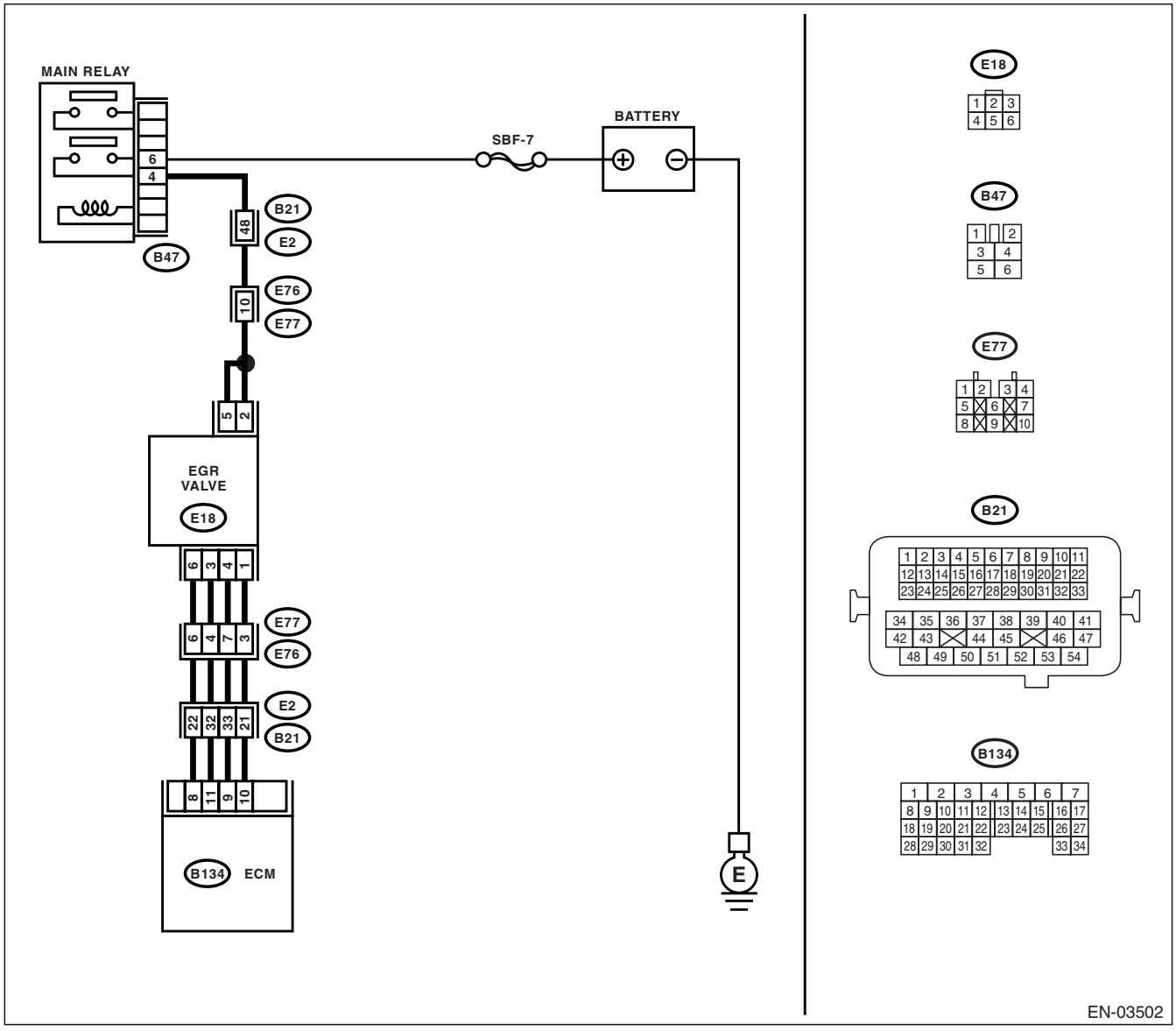
TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance
- Engine breathing

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK POWER SUPPLY TO EGR SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from EGR solenoid valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between EGR solenoid valve connector and engine ground. ***Connector & terminal*** ***(E18) No. 2 (+) — Engine ground (−):*** ***(E18) No. 5 (+) — Engine ground (−):***	Is the voltage more than 10 V?	Go to step **2.**	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit of harness between EGR solenoid valve and main relay connector • Poor contact in coupling connector
2	**CHECK HARNESS BETWEEN ECM AND EGR SOLENOID VALVE CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between ECM and EGR solenoid valve connector. ***Connector & terminal*** ***DTC P1492; (B134) No. 11 — (E18) No. 3:*** ***DTC P1494; (B134) No. 10 — (E18) No. 1:*** ***DTC P1496; (B134) No. 9 — (E18) No. 4:*** ***DTC P1498; (B134) No. 8 — (E18) No. 6:***	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 of harness between ECM and EGR solenoid valve connector • Poor contact in coupling connector
3	**CHECK HARNESS BETWEEN ECM AND EGR SOLENOID VALVE CONNECTOR.** 1) Disconnect the connector from ECM. 2) Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***DTC P1492; (B134) No. 11 — Chassis ground:*** ***DTC P1494; (B134) No. 10 — Chassis ground:*** ***DTC P1496; (B134) No. 9 — Chassis ground:*** ***DTC P1498; (B134) No. 8 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **4.**	Repair the ground short in harness between ECM and EGR solenoid valve connector.
4	**CHECK POOR CONTACT.** Check poor contact in ECM connector and EGR solenoid valve connector.	Is there poor contact in ECM connector or EGR solenoid valve connector?	Repair the poor contact in ECM connector or EGR solenoid valve connector.	Replace the EGR solenoid valve. <Ref. to FU(H6DO)-25, EGR Valve.>

CN:DTC P1499 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT)

DTC DETECTING CONDITION:

Immediately at fault recognition

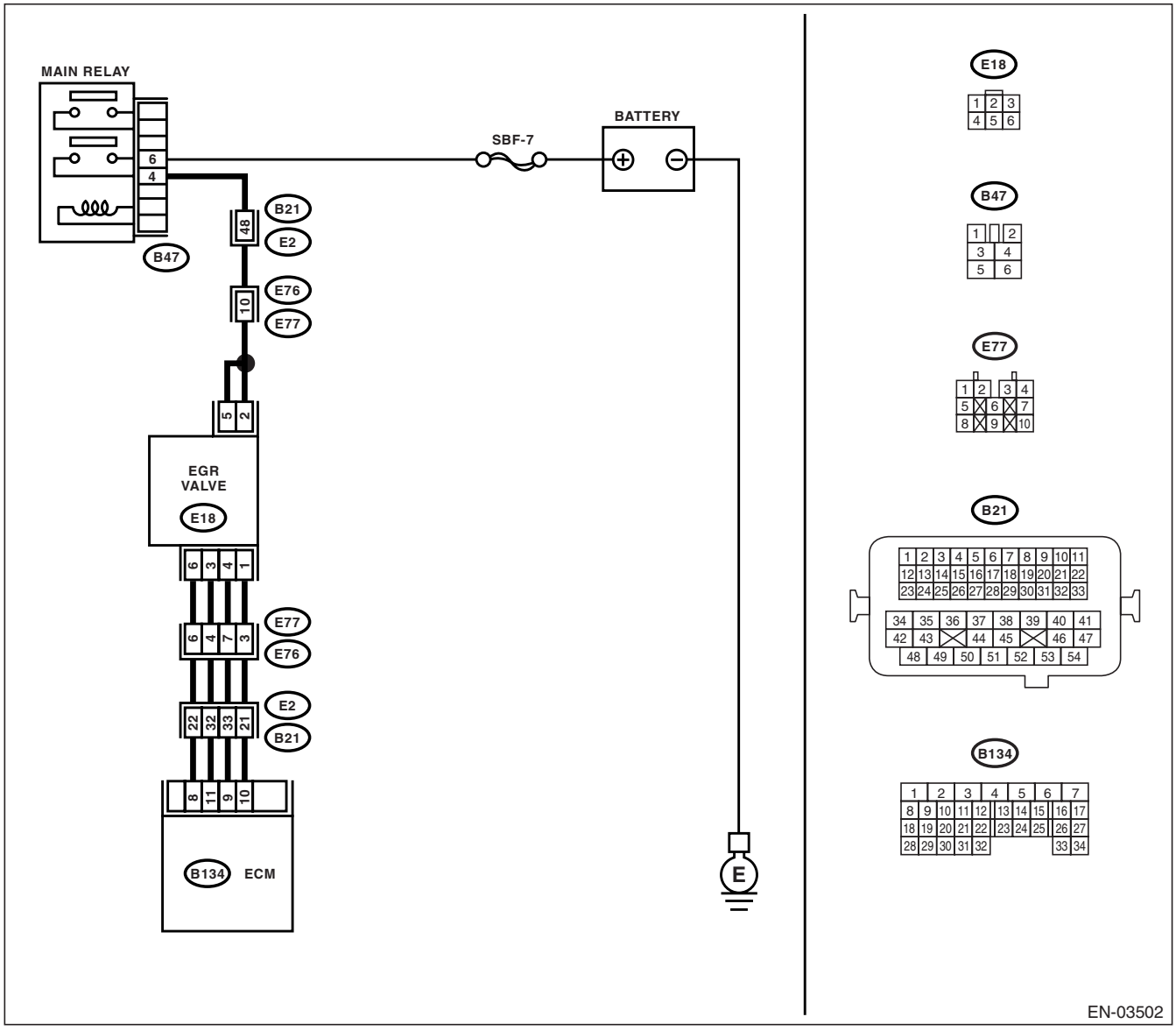
TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance
- Engine breathing

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ANY OTHER DTC ON DISPLAY.**	Is any other DTC displayed?	Check DTC using the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H6DO)(diag)-66, List of Diagnostic Trouble Code (DTC).>	Go to step **2.**
2	**CHECK HARNESS BETWEEN ECM AND EGR SOLENOID VALVE CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from EGR solenoid valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM connector and chassis ground. ***Connector & terminal*** ***DTC P1493; (B134) No. 11 (+) — Chassis ground (−):*** ***DTC P1495; (B134) No. 10 (+) — Chassis ground (−):*** ***DTC P1497; (B134) No. 9 (+) — Chassis ground (−):*** ***DTC P1499; (B134) No. 8 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair the battery short in harness between ECM and EGR solenoid valve connector. After repair, replace the ECM. <Ref. to FU(H6DO)-34, Engine Control Module (ECM).>	Replace the ECM. <Ref. to FU(H6DO)-34, Engine Control Module (ECM).>

CO:DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

Detects when malfunction occurs in 2 continuous driving cycles.

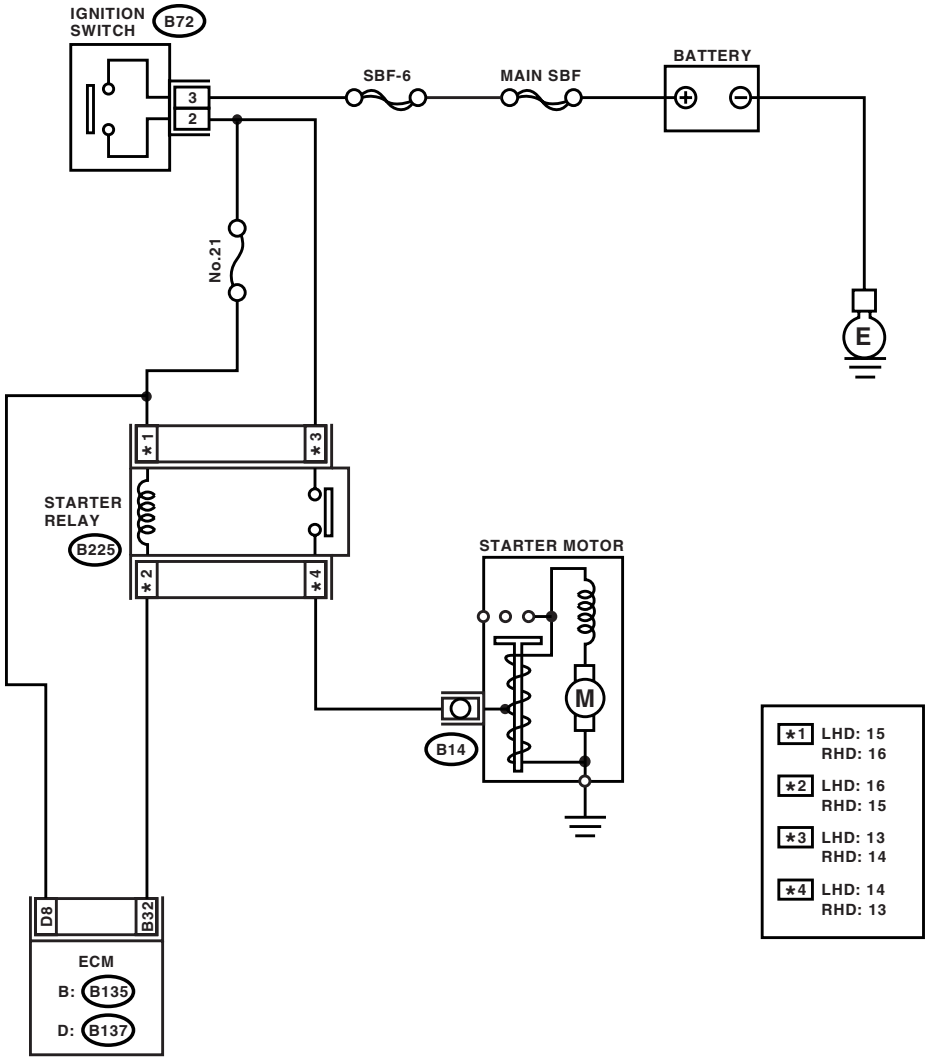
TROUBLE SYMPTOM:

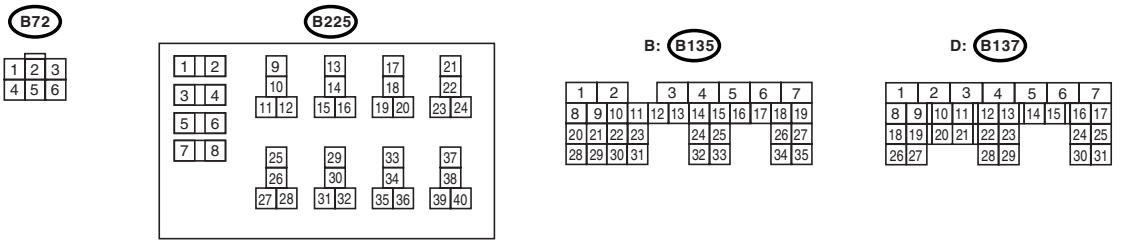
Failure of engine to start

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:





EN-03489

	Step	Check	Yes	No
1	**CHECK OPERATION OF STARTER MOTOR.** Turn the ignition switch to START. NOTE: • For AT model, place the select lever in “P” or “N” range. • For MT model, depress the clutch pedal.	Does the starter motor operate?	Repair the harness and connector. NOTE: In this case, repair the following: • Open or ground short circuit of harness between ECM and starter motor connector • Poor contact in ECM connector	Check the starter motor circuit. <Ref. to EN(H6DO)(diag)-54, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

CP:DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION

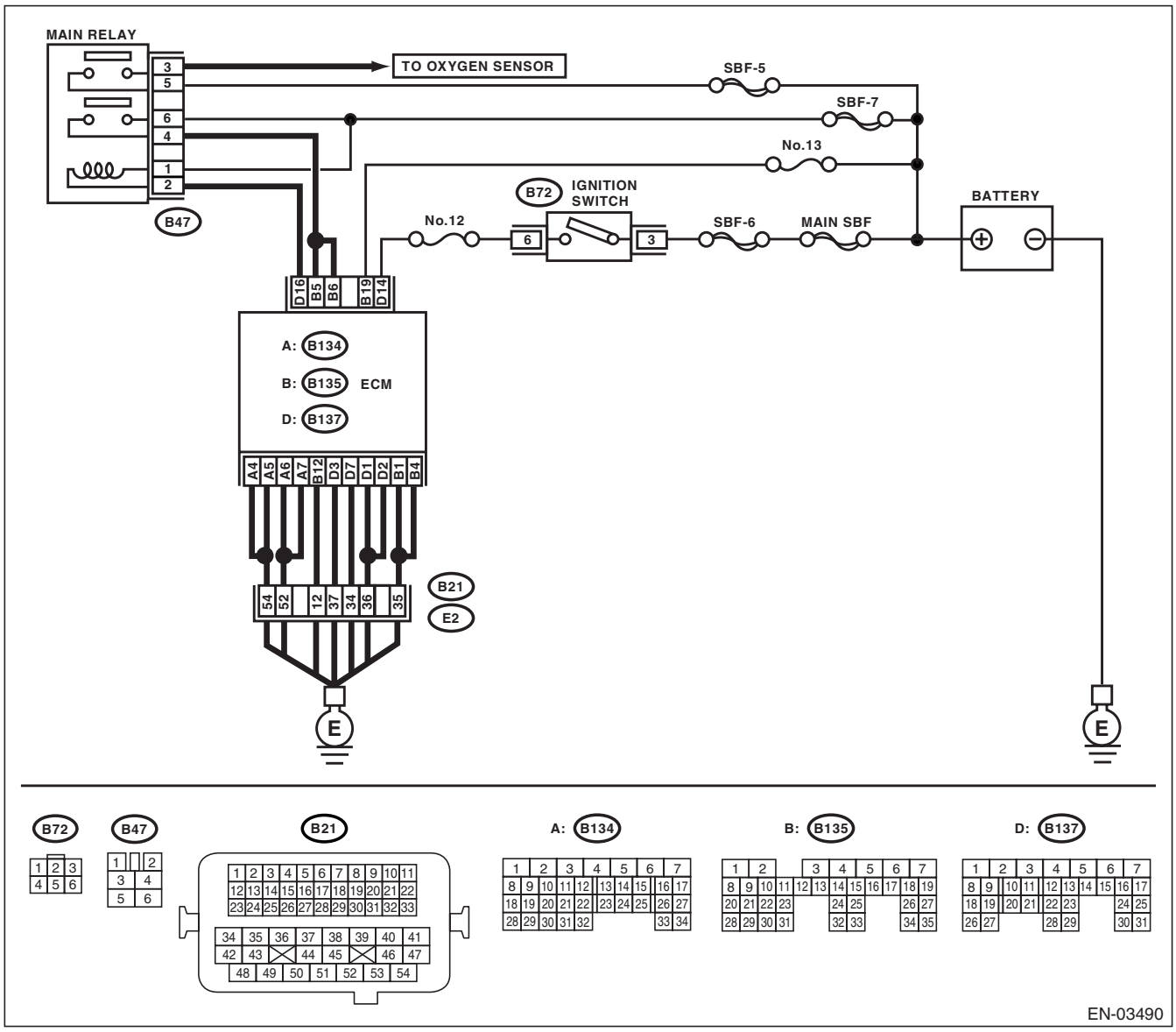
DTC DETECTING CONDITION:

Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK INPUT SIGNAL OF ECM.** 1) Turn the ignition switch to OFF. 2) Measure the voltage between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 19 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair the poor contact in ECM connector.	Go to step **2.**

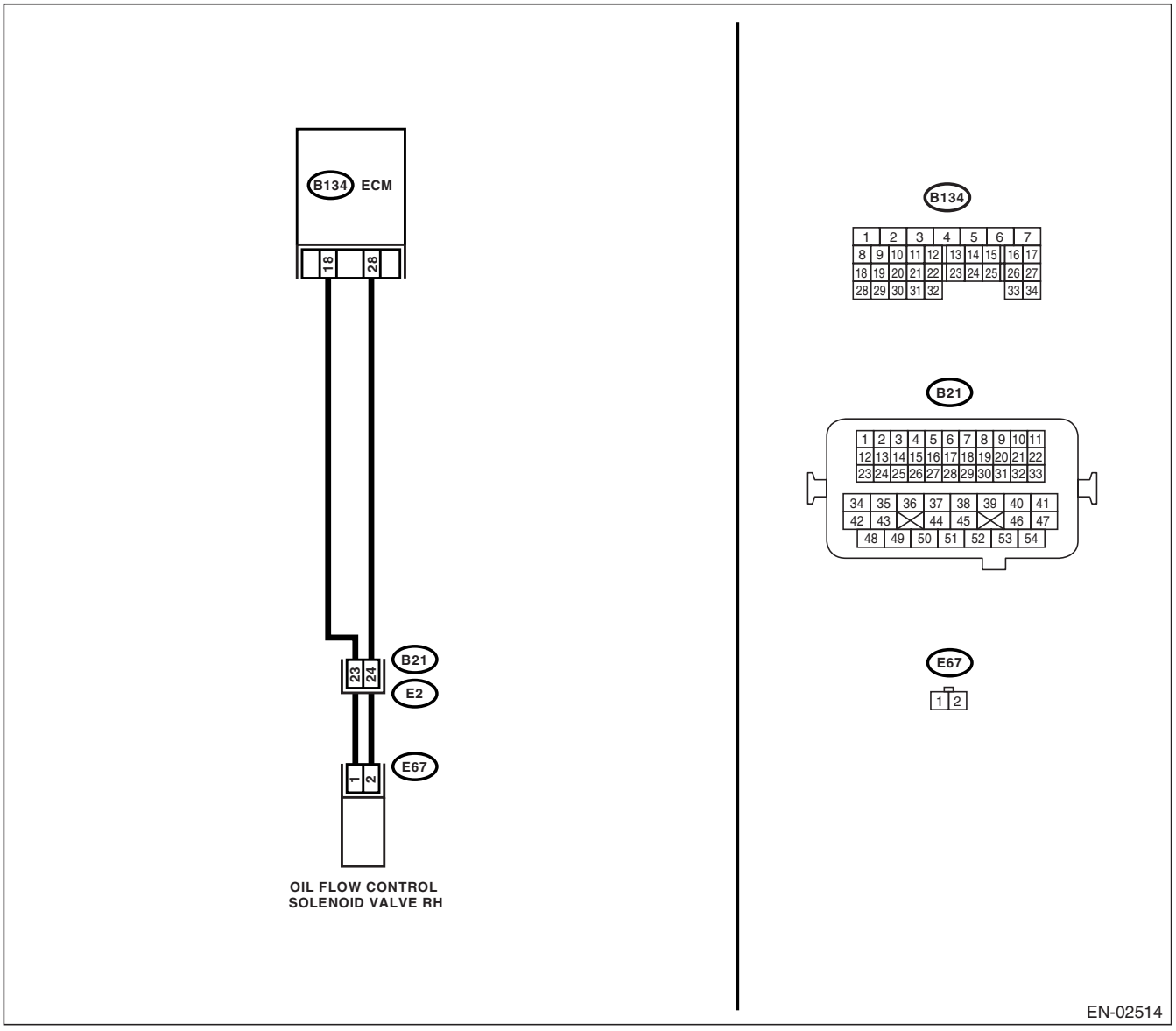
	Step	Check	Yes	No
2	**CHECK HARNESS BETWEEN ECM AND MAIN FUSE BOX CONNECTOR.** 1) Disconnect the connector from ECM. 2) Measure the resistance of harness between ECM and chassis ground. ***Connector & terminal*** ***(B135) No. 19 — Chassis ground:***	Is the resistance less than 10 Ω?	Repair the ground short circuit of harness between ECM connector and battery terminal.	Go to step **3.**
3	**CHECK FUSE No. 13.**	Is the fuse blown out?	Replace the fuse.	Repair the harness and connector. NOTE: In this case, repair the following: • Open circuit of harness between ECM and battery • Poor contact in ECM connector • Poor contact in battery terminal

CQ:DTC P2088 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 1)

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(H6DO)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



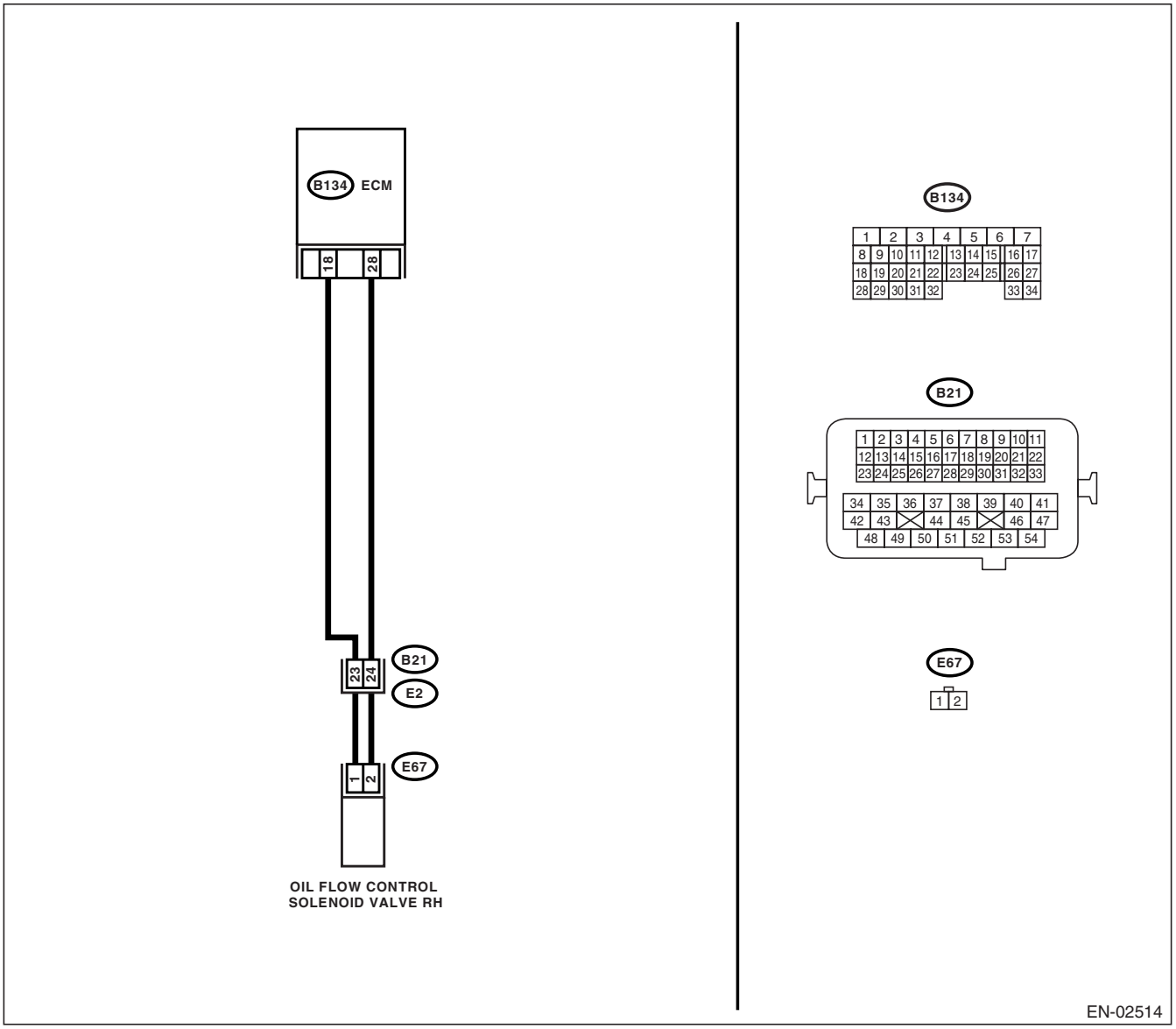
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and oil flow control solenoid valve. 3) Measure the resistance between ECM and oil flow control solenoid valve. ***Connector & terminal*** ***(B134) No. 18 — (E67) No. 1:*** ***(B134) No. 28 — (E67) No. 2:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit of harness between ECM and oil flow control solenoid valve connector. NOTE: In this case, repair the following: • Open circuit of harness between ECM and oil flow control solenoid valve connector • Poor contact in coupling connector
2	**CHECK OIL FLOW CONTROL SOLENOID VALVE.** 1) Remove the oil flow control solenoid valve connector. 2) Measure the resistance between oil flow control solenoid valve terminals. ***Terminal*** ***No. 1 — No. 2:***	Is the resistance 6 — 12 Ω?	Repair the poor contact in ECM and oil flow control solenoid valve.	Replace the oil flow control solenoid valve. <Ref. to ME(H6DO)-79, Oil Flow Control Solenoid Valve.>

CR:DTC P2089 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 1)

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(H6DO)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



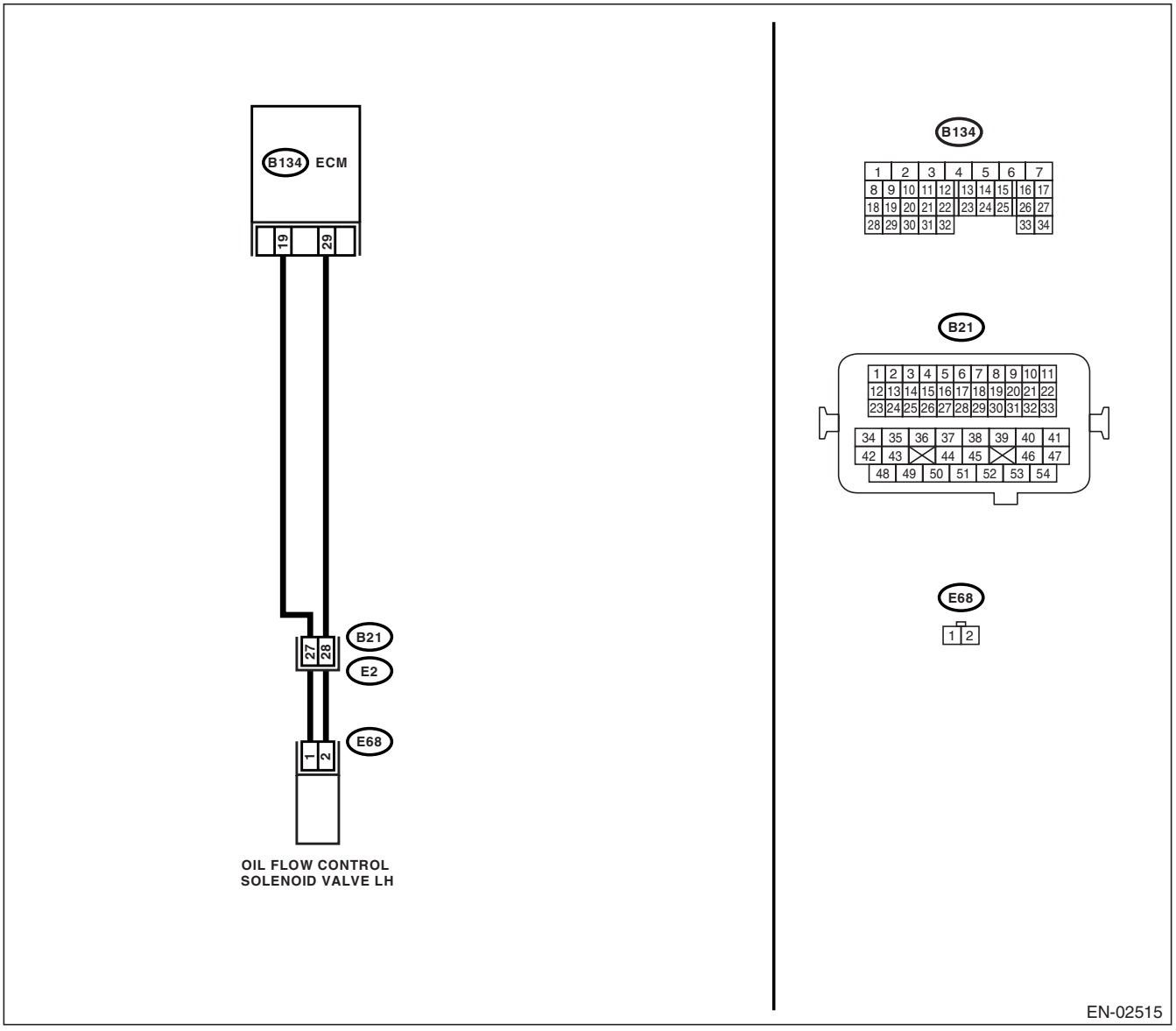
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and oil flow control solenoid valve. 3) Measure the resistance between oil flow control solenoid valve and engine ground. ***Connector & terminal*** ***(E67) No. 1 — Engine ground:*** ***(E67) No. 2 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **2.**	Repair the short circuit between ECM and oil flow control solenoid valve connector.
2	**CHECK OIL FLOW CONTROL SOLENOID VALVE.** 1) Remove the oil flow control solenoid valve connector. 2) Measure the resistance between oil flow control solenoid valve terminals. ***Terminal*** ***No. 1 — No. 2:***	Is the resistance 6 — 12 Ω?	Repair the poor contact in ECM and oil flow control solenoid valve.	Replace the oil flow control solenoid valve. <Ref. to ME(H6DO)-79, Oil Flow Control Solenoid Valve.>

CS:DTC P2092 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT LOW (BANK 2)

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(H6DO)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



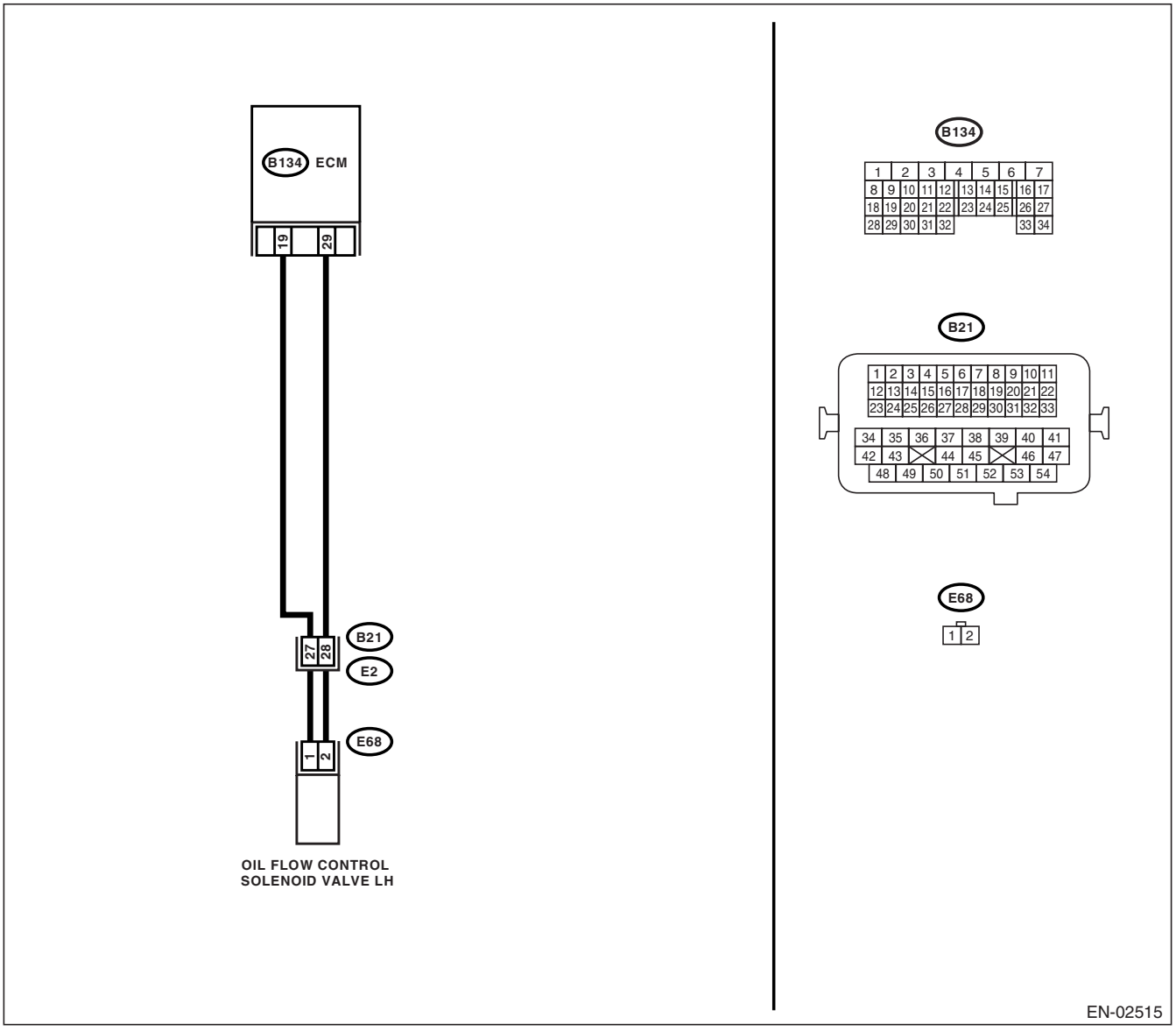
	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and oil flow control solenoid valve. 3) Measure the resistance between ECM and oil flow control solenoid valve. ***Connector & terminal*** ***(B134) No. 19 — (E68) No. 1:*** ***(B134) No. 29 — (E68) No. 2:***	Is the resistance less than 1 Ω?	Go to step **2.**	Repair the open circuit of harness between ECM and oil flow control solenoid valve connector. NOTE: In this case, repair the following: • Open circuit of harness between ECM and oil flow control solenoid valve connector • Poor contact in coupling connector
2	**CHECK OIL FLOW CONTROL SOLENOID VALVE.** 1) Remove the oil flow control solenoid valve connector. 2) Measure the resistance between oil flow control solenoid valve terminals. ***Terminal*** ***No. 1 — No. 2:***	Is the resistance 6 — 12 Ω?	Repair the poor contact in ECM and oil flow control solenoid valve.	Replace the oil flow control solenoid valve. <Ref. to ME(H6DO)-79, Oil Flow Control Solenoid Valve.>

CT:DTC P2093 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 2)

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(H6DO)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and oil flow control solenoid valve. 3) Measure the resistance between oil flow control solenoid valve and engine ground. ***Connector & terminal*** ***(E68) No. 1 — Engine ground:*** ***(E68) No. 2 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **2.**	Repair the short circuit between ECM and oil flow control solenoid valve connector.
2	**CHECK OIL FLOW CONTROL SOLENOID VALVE.** 1) Remove the oil flow control solenoid valve connector. 2) Measure the resistance between oil flow control solenoid valve terminals. ***Terminal*** ***No. 1 — No. 2:***	Is the resistance 6 — 12 Ω?	Repair the poor contact in ECM and oil flow control solenoid valve.	Replace the oil flow control solenoid valve. <Ref. to ME(H6DO)-79, Oil Flow Control Solenoid Valve.>

CU:DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/ PERFORMANCE

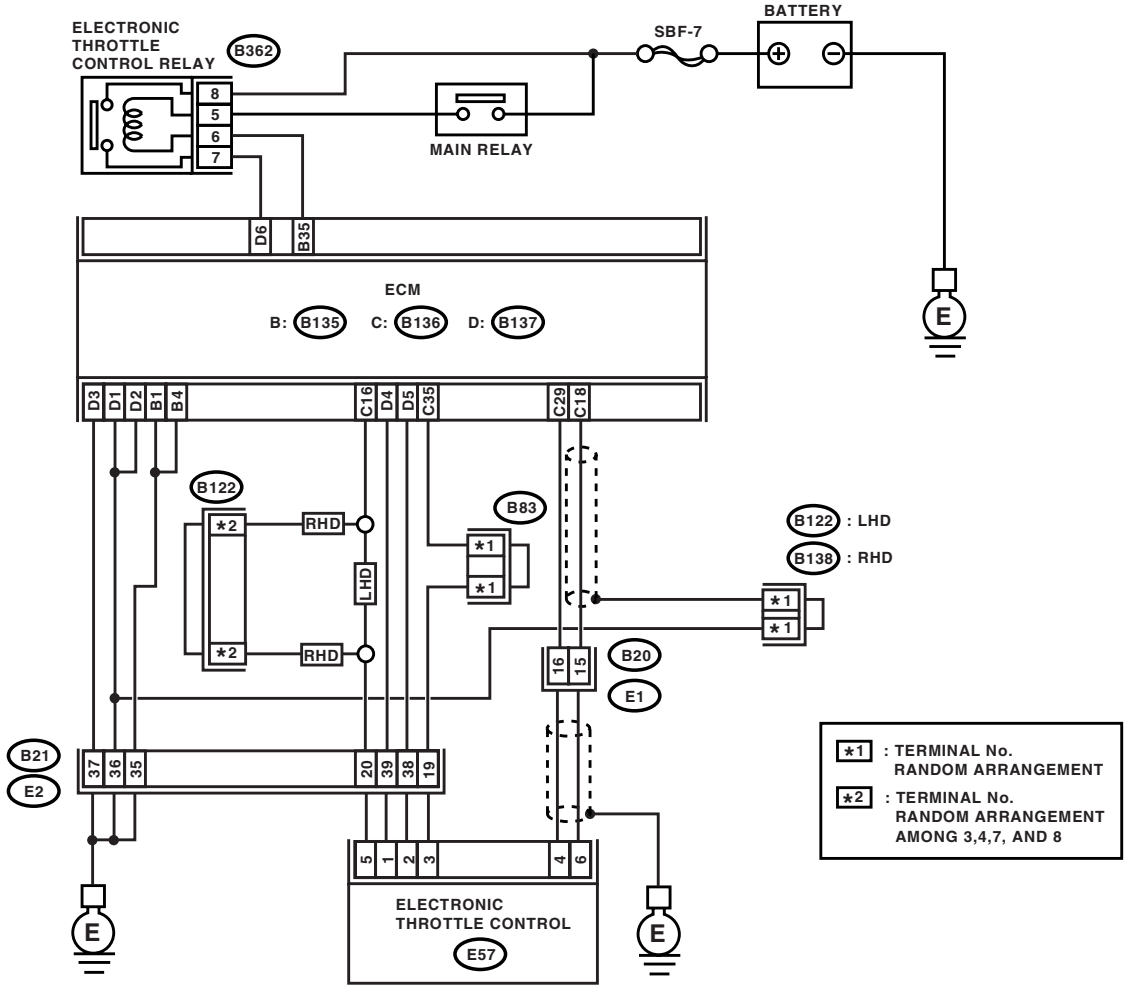
DTC DETECTING CONDITION:

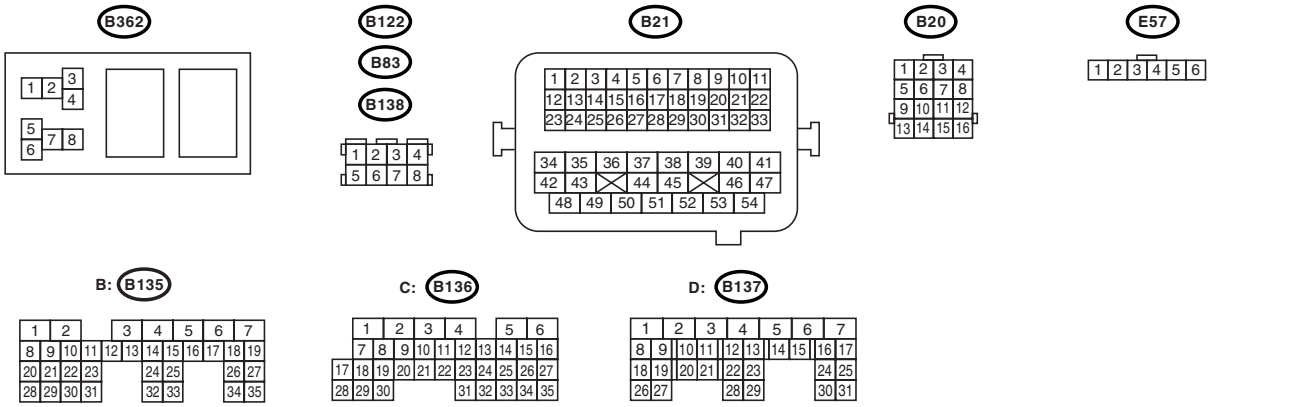
Immediately at fault recognition

TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance
- Engine stalls.

WIRING DIAGRAM:





EN-03499

	Step	Check	Yes	No
1	**CHECK ELECTRONIC THROTTLE CONTROL RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the electronic throttle control relay. 3) Connect the battery to electronic throttle control relay terminals No. 5 and No. 6. 4) Measure the resistance between electronic throttle control relay terminals. ***Terminal*** ***No. 7 — No. 8:***	Is the resistance less than 1 Ω?	Go to step **2.**	Replace the electronic throttle control relay.
2	**CHECK POWER SUPPLY OF ELECTRONIC THROTTLE CONTROL RELAY.** 1) Turn the ignition switch to ON. 2) Measure the voltage between electronic throttle control relay connector and chassis ground. ***Connector & terminal*** ***(B362) No. 5 (+) — Chassis ground (−):*** ***(B362) No. 8 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **3.**	Repair the open or ground short circuit of power supply circuit.
3	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Turn the ignition switch to ON. 4) Measure the voltage between electronic throttle control relay connector and chassis ground. ***Connector & terminal*** ***(B362) No. 6 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair the power supply short circuit of harness between ECM and electronic throttle control.	Go to step **4.**
4	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between electronic throttle control relay connector and chassis ground. ***Connector & terminal*** ***(B362) No. 6 — Chassis ground:*** ***(B362) No. 7 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair the ground short circuit of harness between ECM and electronic throttle control relay.
5	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY.** Measure the resistance between ECM connector and electronic throttle control relay connector. ***Connector & terminal*** ***(B135) No. 35 — (B362) No. 6:*** ***(B137) No. 6 — (B362) No. 7:***	Is the resistance less than 1 Ω?	Go to step **6.**	Repair the open circuit of harness between ECM and electronic throttle control relay.
6	**CHECK SENSOR OUTPUT.** 1) Connect all the connectors. 2) Turn the ignition switch to ON. 3) Read the data of main throttle sensor signal using Subaru Select Monitor. NOTE: For detailed operation procedure, refer to “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H6DO)(diag)-26, Subaru Select Monitor.>	Is the voltage more than 0.4 V?	Go to step **7.**	Go to step **9.**

	Step	Check	Yes	No
7	**CHECK SENSOR OUTPUT.** Read the data of sub throttle sensor signal using Subaru Select Monitor. NOTE: For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-26, Subaru Select Monitor.>	Is the voltage more than 0.8 V?	Go to step **8.**	Go to step **9.**
8	**CHECK POOR CONTACT.** Check poor contact in connector between ECM and electronic throttle control.	Is there poor contact?	Repair the poor contact.	Go to step **13.**
9	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connectors from electronic throttle control. 4) Measure the resistance between ECM connector and electronic throttle control connector. ***Connector & terminal*** ***(B136) No. 18 — (E57) No. 6:*** ***(B136) No. 29 — (E57) No. 4:*** ***(B136) No. 16 — (E57) No. 5:***	Is the resistance less than 1 Ω?	Go to step **10.**	Repair the open circuit of harness connector.
10	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 16 — Chassis ground:*** ***(B136) No. 18 — Chassis ground:*** ***(B136) No. 29 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **11.**	Repair the ground short circuit of harness.
11	**CHECK SENSOR POWER SUPPLY.** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 5 (+) — Engine ground (−):***	Is the voltage 4.5 — 5.5 V?	Go to step **12.**	Repair the poor contact in ECM connector. Replace the ECM if defective. <Ref. to FU(H6DO)-34, Engine Control Module (ECM).>
12	**CHECK SHORT CIRCUIT IN ECM.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 6 — Engine ground:*** ***(E57) No. 4 — Engine ground:***	Is the resistance more than 10 Ω?	Go to step **13.**	Repair the poor contact in ECM connector. Replace the ECM if defective. <Ref. to FU(H6DO)-34, Engine Control Module (ECM).>
13	**CHECK SENSOR OUTPUT.** 1) Connect all the connectors. 2) Turn the ignition switch to ON. 3) Read the data of main throttle sensor signal using Subaru Select Monitor. NOTE: For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-26, Subaru Select Monitor.>	Is the voltage less than 4.63 V?	Go to step **14.**	Go to step **16.**

	Step	Check	Yes	No
14	**CHECK SENSOR OUTPUT.** Read the data of sub throttle sensor signal using Subaru Select Monitor. NOTE: For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-26, Subaru Select Monitor.>	Is the voltage less than 4.73 V?	Go to step **15.**	Go to step **16.**
15	**CHECK POOR CONTACT.** Check poor contact in connector between ECM and electronic throttle control.	Is there poor contact?	Repair the poor contact.	Go to step **21.**
16	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connectors from electronic throttle control. 4) Measure the resistance between ECM connector and electronic throttle control connector. ***Connector & terminal*** ***(B136) No. 35 — (E57) No. 3:*** ***(B136) No. 18 — (E57) No. 6:*** ***(B136) No. 29 — (E57) No. 4:***	Is the resistance less than 1 Ω?	Go to step **17.**	Repair the open circuit of harness connector.
17	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Connect the ECM connector. 2) Measure the resistance between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 3 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **18.**	Repair the poor contact in ECM connector. Replace the ECM if defective. <Ref. to FU(H6DO)-34, Engine Control Module (ECM).>
18	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to ON. 2) Measure the voltage between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 5 (+) — Engine ground (−):***	Is the voltage less than 10 V?	Go to step **19.**	Repair the battery short circuit of harness between ECM connector and electronic throttle control connector.
19	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** Measure the voltage between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 6 (+) — Engine ground (−):*** ***(E57) No. 4 (+) — Engine ground (−):***	Is the voltage less than 10 V?	Go to step **20.**	Repair the short circuit of harness between ECM connector and electronic throttle control connector.
20	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Remove the ECM. 3) Measure the resistance between ECM connectors. ***Connector & terminal*** ***(B136) No. 18 — (B136) No. 16:*** ***(B136) No. 29 — (B136) No. 16:***	Is the resistance more than 1 MΩ?	Go to step **21.**	Repair the short circuit to sensor power supply.

	Step	Check	Yes	No
21	**CHECK SENSOR OUTPUT.** 1) Turn the ignition switch to OFF. 2) Connect the connectors except for the electronic throttle control relay. 3) Turn the ignition switch to ON. 4) Read the data of main throttle sensor signal using Subaru Select Monitor. NOTE: For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-26, Subaru Select Monitor.>	Is the voltage 0.81 — 0.87 V?	Go to step **22.**	Repair the poor contact of electronic throttle control connector. Replace the electronic throttle control if defective.
22	**CHECK SENSOR OUTPUT.** Read the data of sub throttle sensor signal using Subaru Select Monitor. NOTE: For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-26, Subaru Select Monitor.>	Is the voltage 1.64 — 1.70 V?	Go to step **23.**	Repair the poor contact in ECM connector. Replace the electronic throttle control if defective.
23	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL MOTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connectors from electronic throttle control. 4) Measure the resistance between ECM connector and electronic throttle control connector. ***Connector & terminal*** ***(B137) No. 5 — (E57) No. 2:*** ***(B137) No. 4 — (E57) No. 1:***	Is the resistance less than 1 Ω?	Go to step **24.**	Repair the open circuit of harness connector.
24	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL MOTOR.** 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 2 (+) — Engine ground (−):*** ***(E57) No. 1 (+) — Engine ground (−):***	Is the voltage less than 5 V?	Go to step **25.**	Repair the power supply short circuit of harness between ECM and electronic throttle control.
25	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL MOTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 2 — Engine ground:*** ***(E57) No. 1 — Engine ground:***	Is the resistance more than 1 MΩ?	Go to step **26.**	Repair the short circuit of harness.
26	**CHECK ELECTRONIC THROTTLE CONTROL MOTOR HARNESS.** Measure the resistance between electronic throttle control connector terminals. ***Connector & terminal*** ***(E57) No. 2 — (E57) No. 1:***	Is the resistance more than 1 MΩ?	Go to step **27.**	Repair the short circuit of harness.

Step		Check	Yes	No
27	**CHECK ELECTRONIC THROTTLE CONTROL GROUND CIRCUIT.** Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***(B137) No. 3 — Chassis ground:***	Is the resistance less than 10 Ω?	Go to step **28.**	Repair the open circuit of harness.
28	**CHECK ELECTRONIC THROTTLE CONTROL.** Measure the resistance between electronic throttle control terminals. ***Terminal*** ***No. 1 — No. 2:***	Is the resistance less than 5 Ω?	Go to step **29.**	Repair the electronic throttle control.
29	**CHECK ELECTRONIC THROTTLE CONTROL.** Move the throttle valve to the fully open and fully closed positions with fingers. Check that the valve returns to the specified position when releasing fingers.	Does the valve return to the specified position? Specification: 3 mm (0.12 in) from fully closed position	Repair the poor contact in ECM connector. Replace the ECM if defective. <Ref. to FU(H6DO)-34, Engine Control Module (ECM).>	Repair the electronic throttle control.

CV:DTC P2102 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW

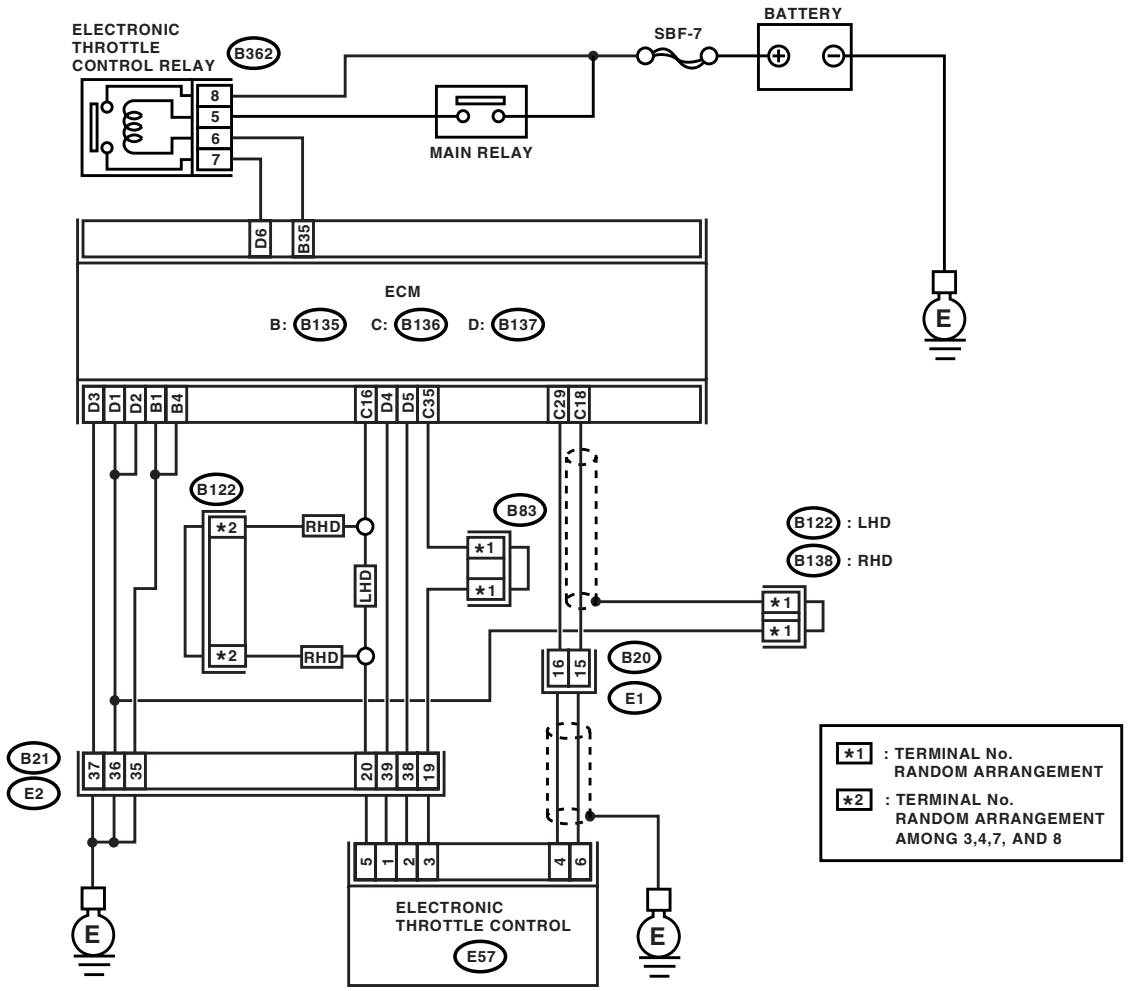
DTC DETECTING CONDITION:

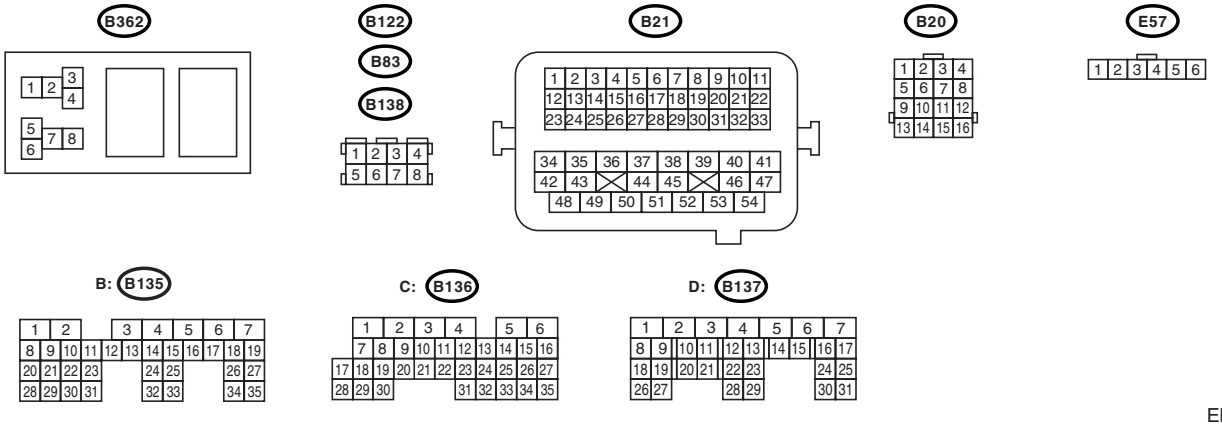
Immediately at fault recognition

TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance
- Engine stalls.

WIRING DIAGRAM:





EN-03499

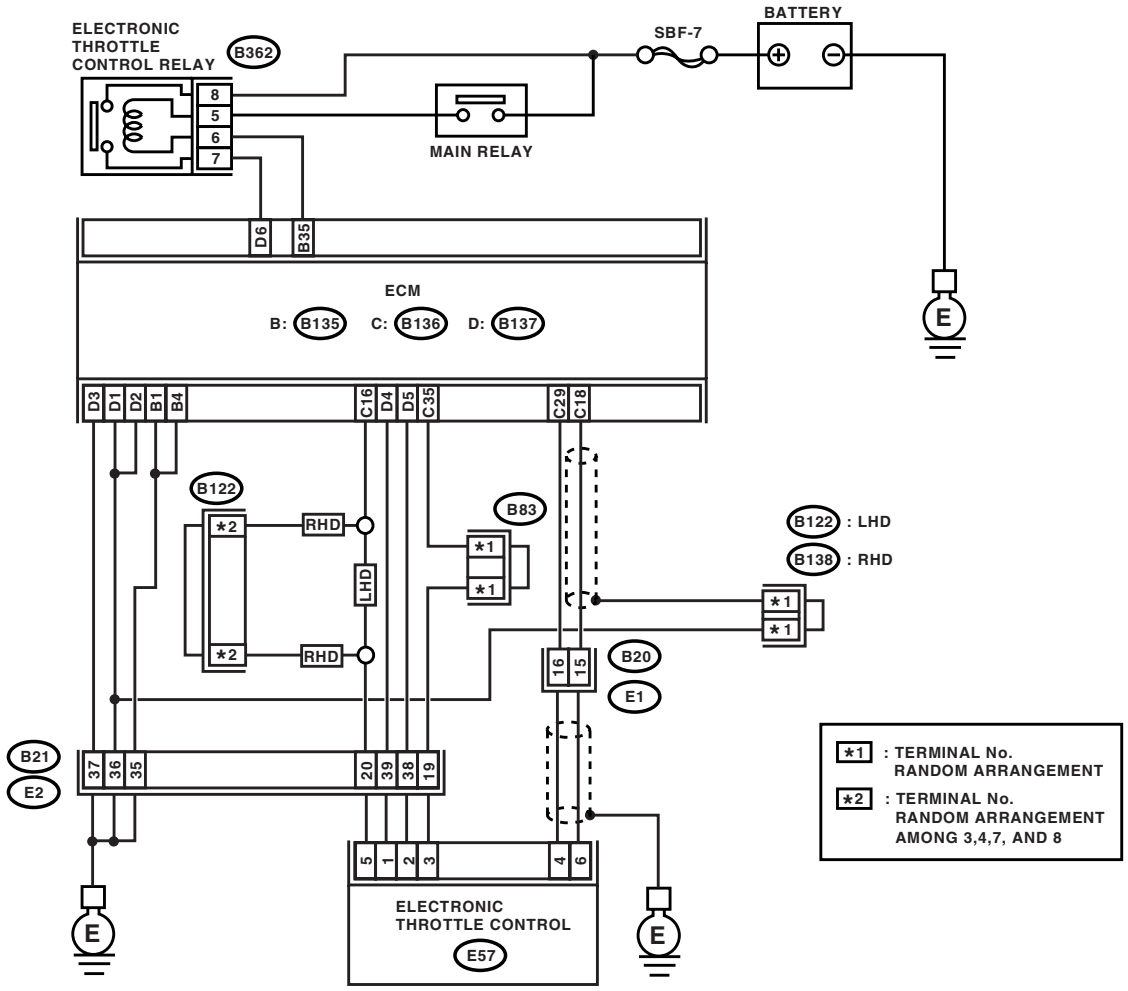
	Step	Check	Yes	No
1	**CHECK ELECTRONIC THROTTLE CONTROL RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the electronic throttle control relay. 3) Connect the battery to electronic throttle control relay terminals No. 5 and No. 6. 4) Measure the resistance between electronic throttle control relay terminals. ***Terminal*** ***No. 7 — No. 8:***	Is the resistance less than 1 Ω?	Go to step **2.**	Replace the electronic throttle control relay.
2	**CHECK POWER SUPPLY OF ELECTRONIC THROTTLE CONTROL RELAY.** 1) Turn the ignition switch to ON. 2) Measure the voltage between electronic throttle control relay connector and chassis ground. ***Connector & terminal*** ***(B362) No. 5 (+) — Chassis ground (−):*** ***(B362) No. 8 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Go to step **3.**	Repair the open or ground short circuit of power supply circuit.
3	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Turn the ignition switch to ON. 4) Measure the voltage between electronic throttle control relay connector and chassis ground. ***Connector & terminal*** ***(B362) No. 6 (+) — Chassis ground (−):***	Is the voltage more than 10 V?	Repair the power supply short circuit of harness between ECM and electronic throttle control relay.	Go to step **4.**
4	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between electronic throttle control relay connector and chassis ground. ***Connector & terminal*** ***(B362) No. 6 — Chassis ground:*** ***(B362) No. 7 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair the ground short circuit of harness between ECM and electronic throttle control relay.
5	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY.** Measure the resistance between ECM connector and electronic throttle control relay connector. ***Connector & terminal*** ***(B135) No. 35 — (B362) No. 6:*** ***(B137) No. 6 — (B362) No. 7:***	Is the resistance less than 1 Ω?	Repair the poor contact in ECM connector. Replace the ECM if defective. <Ref. to FU(H6DO)-34, Engine Control Module (ECM).>	Repair the open circuit of harness between ECM and electronic throttle control relay.

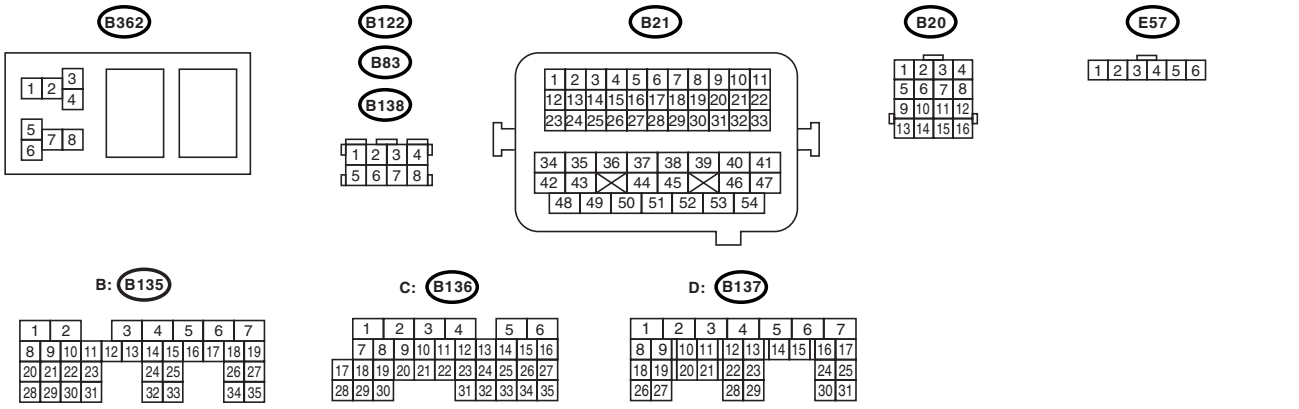
CW:DTC P2103 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH

DTC DETECTING CONDITION:

Immediately at fault recognition

WIRING DIAGRAM:





EN-03499

	Step	Check	Yes	No
1	**CHECK ELECTRONIC THROTTLE CONTROL RELAY.** 1) Turn the ignition switch to OFF. 2) Remove the electronic throttle control relay. 3) Measure the resistance between electronic throttle control relay terminals. ***Terminal*** ***No. 7 — No. 8:***	Is the resistance more than 1 MΩ?	Go to step **2.**	Replace the electronic throttle control relay.
2	**CHECK POWER SUPPLY SHORT CIRCUIT OF ELECTRONIC THROTTLE CONTROL RELAY.** 1) Turn the ignition switch to ON. 2) Measure the voltage between electronic throttle control relay connector and chassis ground. ***Connector & terminal*** ***(B362) No. 7 (+) — Chassis ground (−):***	Is the voltage more than 5 V?	Go to step **3.**	Repair the power supply short circuit of harness between ECM and electronic throttle control relay.
3	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***(B135) No. 35 — Chassis ground:***	Is the resistance more than 1 MΩ?	Repair the poor contact in ECM connector. Replace the ECM if defective. <Ref. to FU(H6DO)-34, Engine Control Module (ECM).>	Repair the ground short circuit of harness between ECM and electronic throttle control relay.

CX:DTC P2109 THROTTLE/PEDAL POSITION SENSOR “A” MINIMUM STOP PERFORMANCE

NOTE:
For diagnostic procedure, refer to DTC P2101. <Ref. to EN(H6DO)(diag)-239, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CY:DTC P2122 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" CIRCUIT LOW INPUT

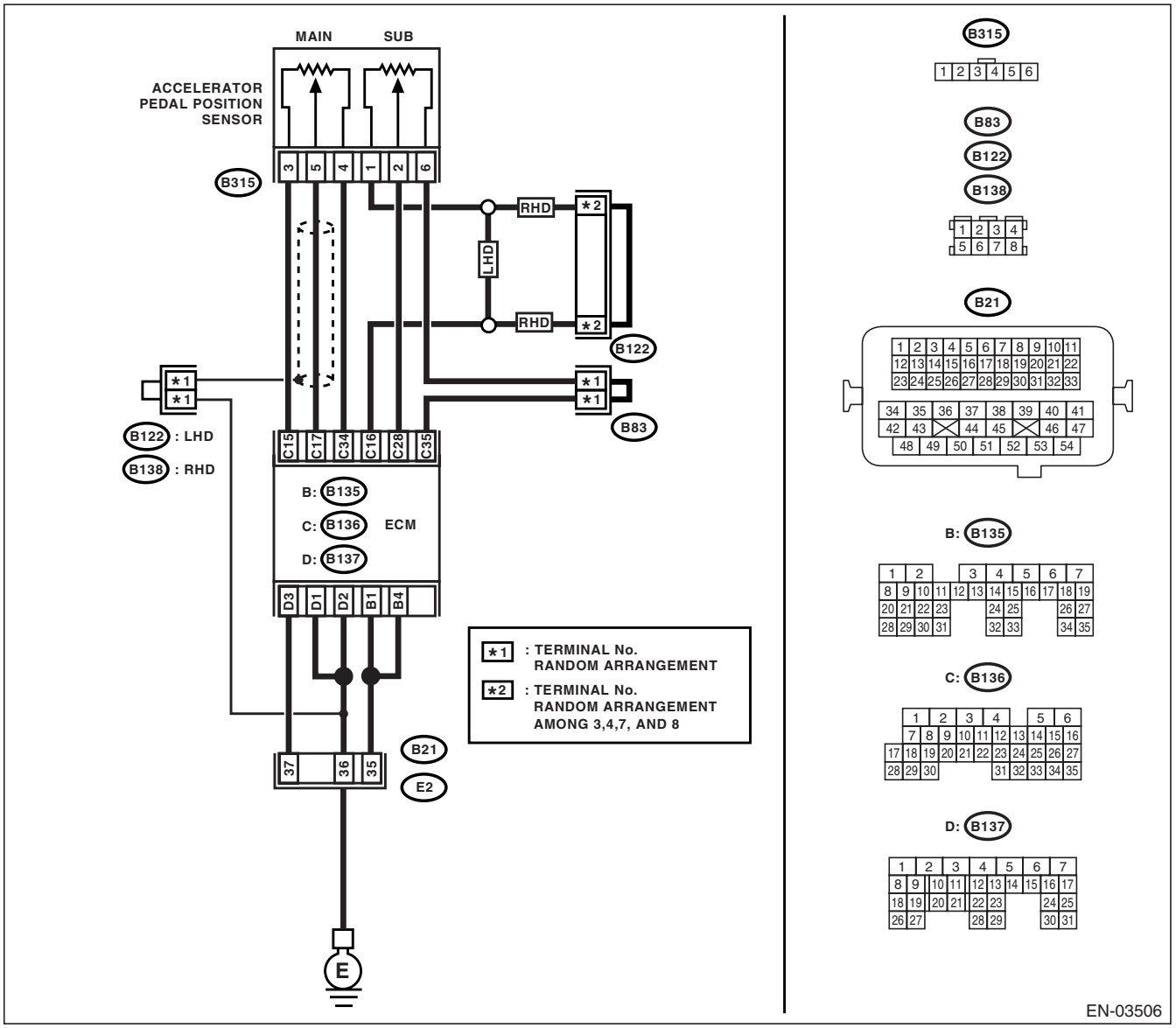
DTC DETECTING CONDITION:

Immediately at fault recognition

TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ACCELERATOR PEDAL POSITION SENSOR OUTPUT.** 1) Turn the ignition switch to ON. 2) Read the data of main accelerator pedal position sensor signal using Subaru Select Monitor. NOTE: For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-26, Subaru Select Monitor.>	Is the voltage more than 0.4 V?	Go to step **2.**	Go to step **3.**
2	**CHECK POOR CONTACT.** Check poor contact in connector between ECM and accelerator pedal position sensor.	Is there poor contact?	Repair the poor contact.	Temporary poor contact occurred, but it is normal at present.
3	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connectors from accelerator pedal position sensor. 4) Measure the resistance between ECM connector and accelerator pedal position sensor connector. ***Connector & terminal*** ***(B136) No. 17 — (B315) No. 5:*** ***(B136) No. 15 — (B315) No. 3:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the open circuit of harness connector.
4	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 17 — Chassis ground:*** ***(B136) No. 15 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair the chassis short circuit of harness.
5	**CHECK POWER SUPPLY OF ACCELERATOR PEDAL POSITION SENSOR.** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between accelerator pedal position sensor connector and engine ground. ***Connector & terminal*** ***(B315) No. 3 (+) — Engine ground (−):***	Is the voltage 4.5 — 5.5 V?	Go to step **6.**	Repair the poor contact in ECM connector. Replace the ECM if defective. <Ref. to FU(H6DO)-34, Engine Control Module (ECM).>
6	**CHECK ACCELERATOR PEDAL POSITION SENSOR.** Measure the resistance of accelerator pedal position sensor. ***Terminal*** ***No. 3 — No. 4:***	Is the resistance 1.2 — 4.8 kΩ?	Go to step **7.**	Replace the accelerator pedal position sensor.
7	**CHECK ACCELERATOR PEDAL POSITION SENSOR.** Measure the resistance of accelerator pedal position sensor. ***Terminal*** ***No. 5 — No. 4:*** Check the measured value is within the specification without depressing the accelerator pedal.	Is the resistance 0.2 — 1.0 kΩ?	Go to step **8.**	Replace the accelerator pedal position sensor.

	Step	Check	Yes	No
8	**CHECK ACCELERATOR PEDAL POSITION SENSOR.** Measure the resistance of accelerator pedal position sensor. ***Terminal*** ***No. 5 — No. 4:*** Check the measured value is within the specification with the accelerator pedal depressed.	Is the resistance 0.5 — 2.5 kΩ?	Repair the poor contact in ECM connector. Replace the ECM if defective. <Ref. to FU(H6DO)-34, Engine Control Module (ECM).>	Replace the accelerator pedal position sensor.

CZ:DTC P2123 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" CIRCUIT HIGH INPUT

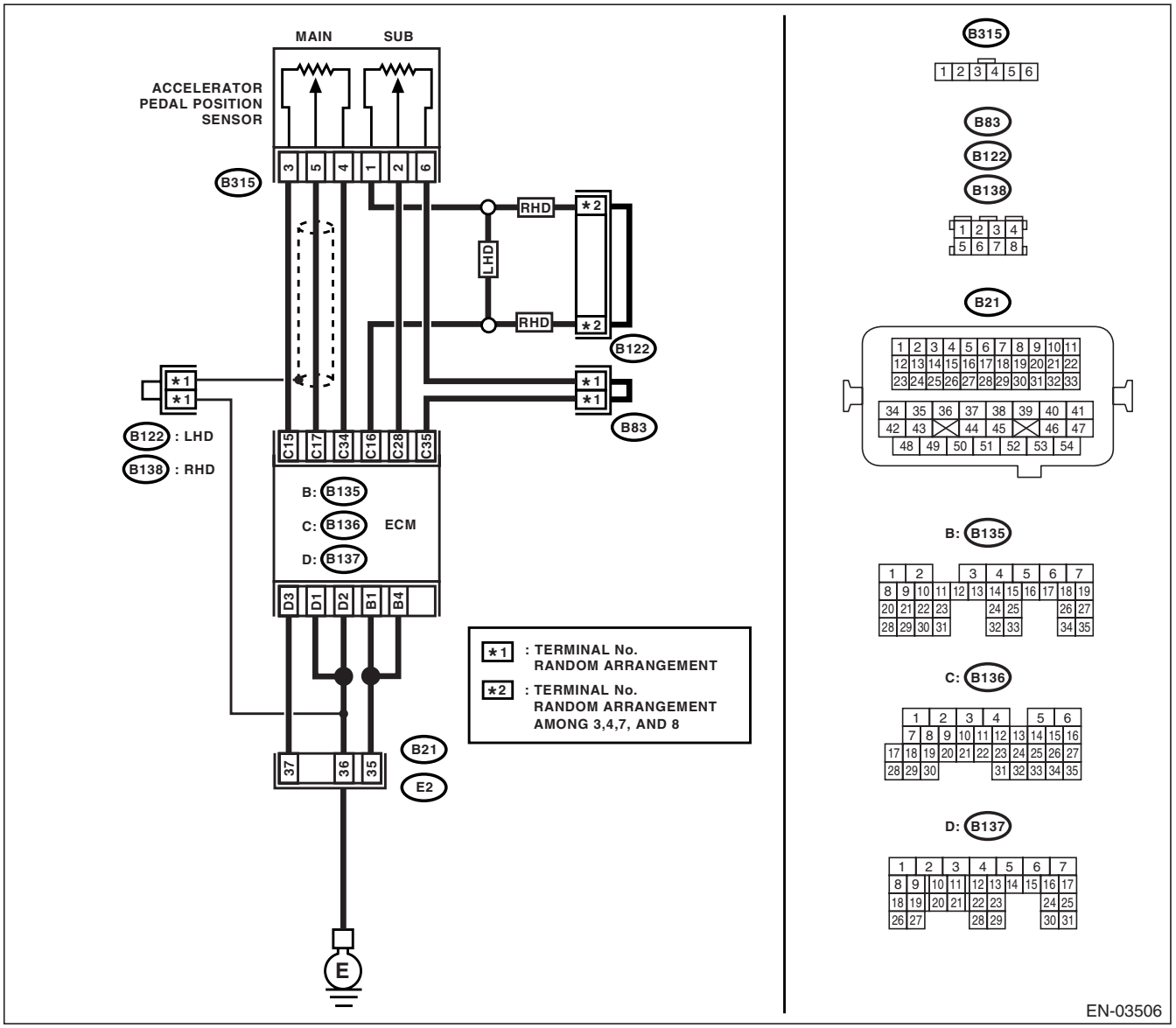
DTC DETECTING CONDITION:

Immediately at fault recognition

TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ACCELERATOR PEDAL POSITION SENSOR OUTPUT.** 1) Turn the ignition switch to ON. 2) Read the data of main accelerator pedal position sensor signal using Subaru Select Monitor. NOTE: For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-26, Subaru Select Monitor.>	Is the voltage less than 4.8 V?	Go to step **2.**	Go to step **3.**
2	**CHECK POOR CONTACT.** Check poor contact in connector between ECM and accelerator pedal position sensor.	Is there poor contact?	Repair the poor contact.	Temporary poor contact occurred, but it is normal at present.
3	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connectors from accelerator pedal position sensor. 4) Measure the resistance between ECM connector and accelerator pedal position sensor connector. ***Connector & terminal*** ***(B136) No. 34 — (B315) No. 4:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the open circuit of harness connector.
4	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Connect the ECM connector. 2) Measure the resistance between accelerator pedal position sensor connector and engine ground. ***Connector & terminal*** ***(B315) No. 4 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **5.**	Repair the poor contact in ECM connector. Replace the ECM if defective. <Ref. to FU(H6DO)-34, Engine Control Module (ECM).>
5	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between accelerator pedal position sensor connector and engine ground. ***Connector & terminal*** ***(B315) No. 5 (+) — Engine ground (−):***	Is the voltage less than 6 V?	Go to step **6.**	Repair the battery short circuit of harness between ECM connector and accelerator pedal position sensor connector.
6	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between ECM connectors. ***Connector & terminal*** ***(B136) No. 17 — (B136) No. 15:*** ***(B136) No. 17 — (B136) No. 16:***	Is the resistance more than 1 MΩ?	Repair the poor contact in accelerator pedal position sensor connector. Replace the accelerator pedal position sensor if defective.	Repair the short circuit to sensor power supply.

DA:DTC P2127 THROTTLE/PEDAL POSITION SENSOR/SWITCH "E" CIRCUIT LOW INPUT

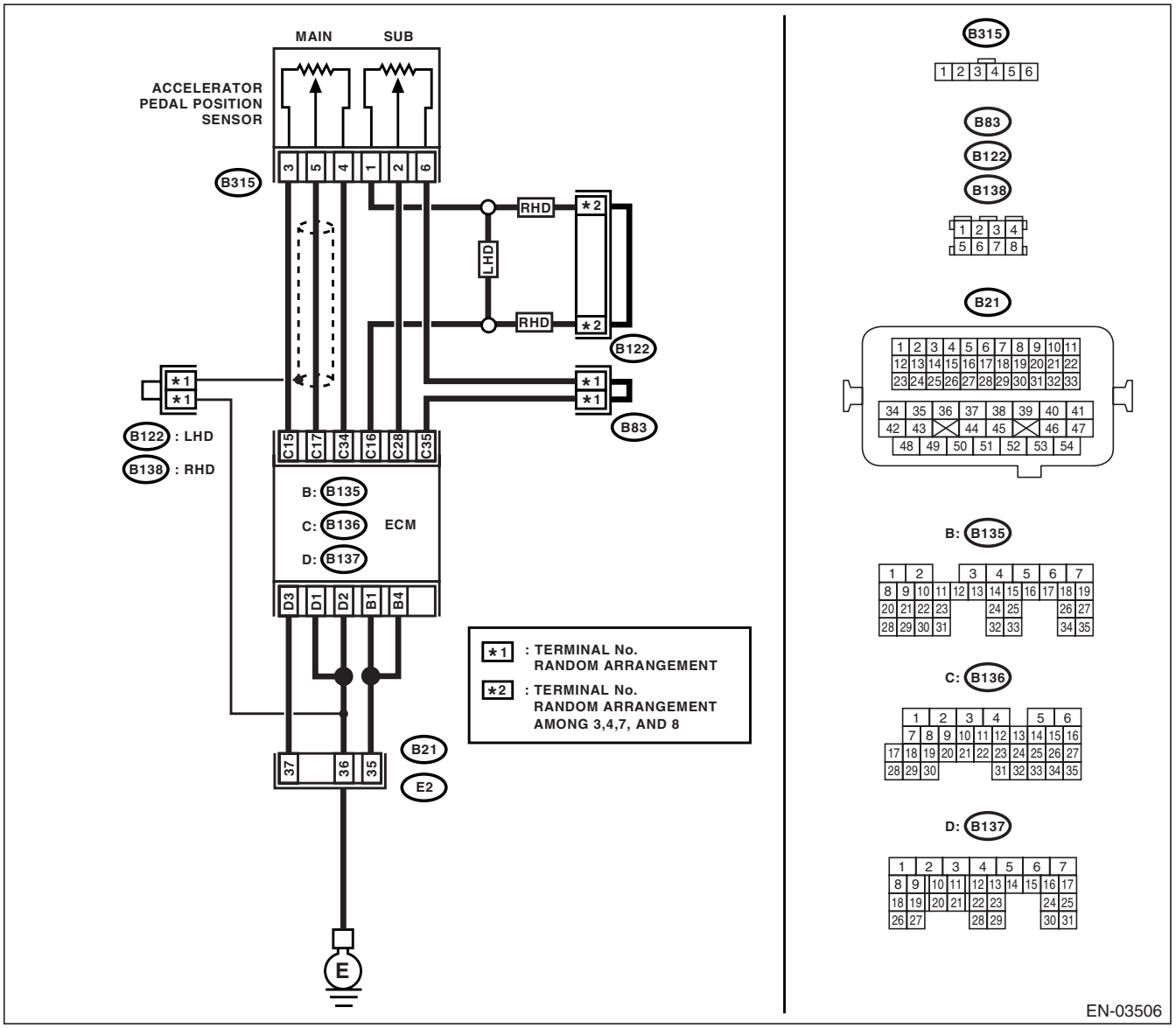
DTC DETECTING CONDITION:

Immediately at fault recognition

TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ACCELERATOR PEDAL POSITION SENSOR OUTPUT.** 1) Turn the ignition switch to ON. 2) Read the data of sub accelerator pedal position sensor signal using Subaru Select Monitor. NOTE: For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-26, Subaru Select Monitor.>	Is the voltage more than 0.4 V?	Go to step **2.**	Go to step **3.**
2	**CHECK POOR CONTACT.** Check poor contact in connector between ECM and accelerator pedal position sensor.	Is there poor contact?	Repair the poor contact.	Temporary poor contact occurred, but it is normal at present.
3	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connectors from accelerator pedal position sensor. 4) Measure the resistance between ECM connector and accelerator pedal position sensor connector. ***Connector & terminal*** ***(B136) No. 28 — (B315) No. 2:*** ***(B136) No. 16 — (B315) No. 1:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the open circuit of harness connector.
4	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 28 — Chassis ground:*** ***(B136) No. 16 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair the chassis short circuit of harness.
5	**CHECK POWER SUPPLY OF ACCELERATOR PEDAL POSITION SENSOR.** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between accelerator pedal position sensor connector and engine ground. ***Connector & terminal*** ***(B315) No. 1 (+) — Engine ground (−):***	Is the voltage 4.5 — 5.5 V?	Go to step **6.**	Repair the poor contact in ECM connector. Replace the ECM if defective. <Ref. to FU(H6DO)-34, Engine Control Module (ECM).>
6	**CHECK ACCELERATOR PEDAL POSITION SENSOR.** Measure the resistance of accelerator pedal position sensor. ***Terminal*** ***No. 1 — No. 6:***	Is the resistance 0.75 — 3.15 kΩ?	Go to step **7.**	Replace the accelerator pedal position sensor.
7	**CHECK ACCELERATOR PEDAL POSITION SENSOR.** 1) Measure the resistance of accelerator pedal position sensor. ***Terminal*** ***No. 2 — No. 6:*** 2) Check the measured value is within the specification without depressing the accelerator pedal.	Is the resistance 0.15 — 0.63 kΩ?	Go to step **8.**	Replace the accelerator pedal position sensor.

	Step	Check	Yes	No
8	**CHECK ACCELERATOR PEDAL POSITION SENSOR.** 1) Measure the resistance of accelerator pedal position sensor. ***Terminal*** ***No. 2 — No. 6:*** 2) Check the measured value is within the specification with the accelerator pedal depressed.	Is the resistance 0.28 — 1.68 kΩ?	Repair the poor contact in ECM connector. Replace the ECM if defective. <Ref. to FU(H6DO)-34, Engine Control Module (ECM).>	Replace the accelerator pedal position sensor.

DB:DTC P2128 THROTTLE/PEDAL POSITION SENSOR/SWITCH "E" CIRCUIT HIGH INPUT

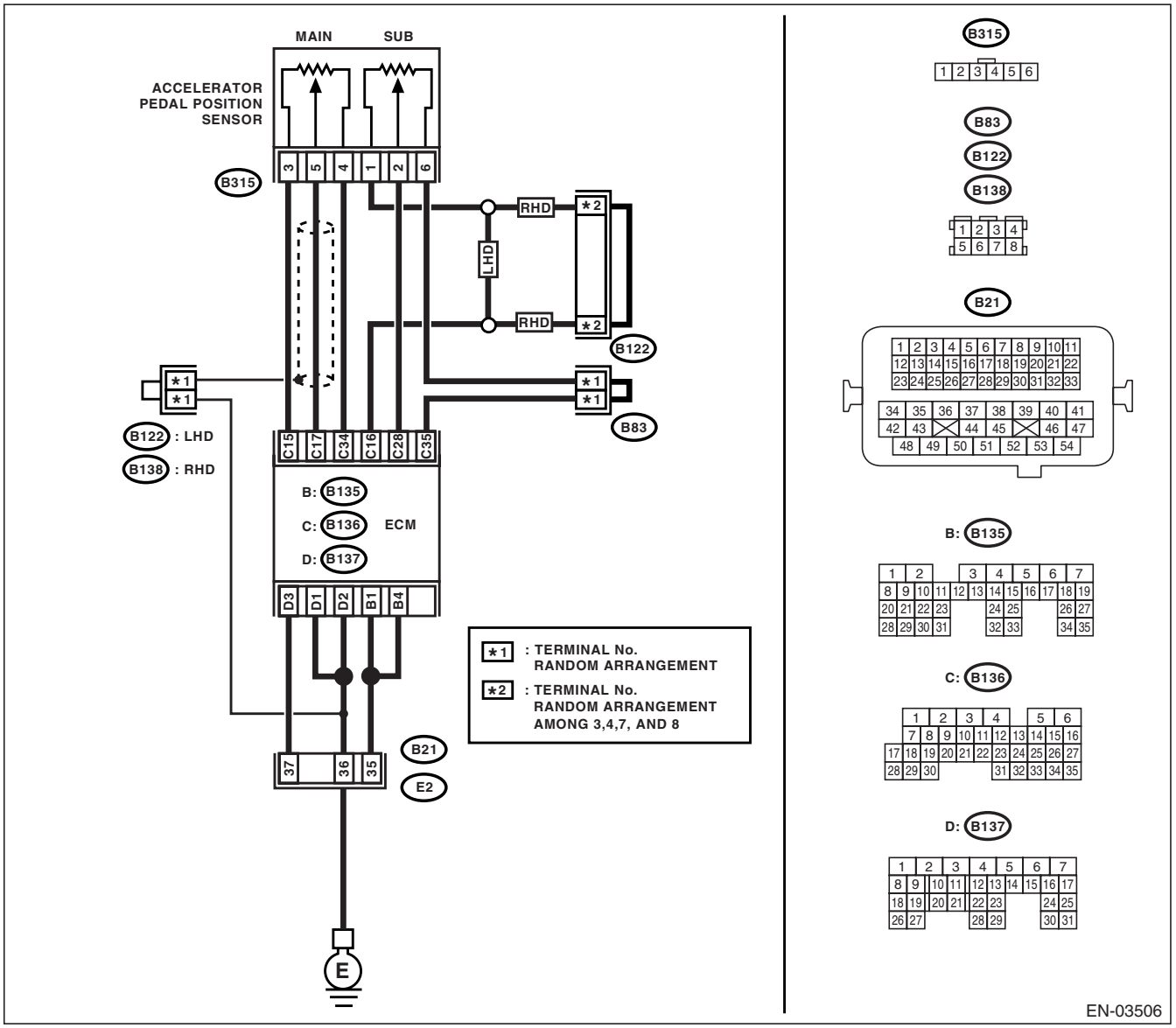
DTC DETECTING CONDITION:

Immediately at fault recognition

TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ACCELERATOR PEDAL POSITION SENSOR OUTPUT.** 1) Turn the ignition switch to ON. 2) Read the data of sub accelerator pedal position sensor signal using Subaru Select Monitor. NOTE: For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-26, Subaru Select Monitor.>	Is the voltage less than 4.8 V?	Go to step **2.**	Go to step **3.**
2	**CHECK POOR CONTACT.** Check poor contact in connector between ECM and accelerator pedal position sensor.	Is there poor contact?	Repair the poor contact.	Temporary poor contact occurred, but it is normal at present.
3	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connectors from accelerator pedal position sensor. 4) Measure the resistance between ECM connector and accelerator pedal position sensor connector. ***Connector & terminal*** ***(B136) No. 35 — (B315) No. 6:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the open circuit of harness connector.
4	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Connect the ECM connector. 2) Measure the resistance between accelerator pedal position sensor connector and engine ground. ***Connector & terminal*** ***(B315) No. 6 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **5.**	Repair the poor contact in ECM connector. Replace the ECM if defective. <Ref. to FU(H6DO)-34, Engine Control Module (ECM).>
5	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between accelerator pedal position sensor connector and engine ground. ***Connector & terminal*** ***(B315) No. 2 (+) — Engine ground (−):***	Is the voltage less than 6 V?	Go to step **6.**	Repair the battery short circuit of harness between ECM connector and accelerator pedal position sensor connector.
6	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between ECM connectors. ***Connector & terminal*** ***(B136) No. 28 — (B136) No. 15:*** ***(B136) No. 28 — (B136) No. 16:***	Is the resistance more than 1 MΩ?	Repair the poor contact in accelerator pedal position sensor connector. Replace the accelerator pedal position sensor if defective.	Repair the short circuit to sensor power supply.

DC:DTC P2135 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" / "B" VOLTAGE CORRELATION

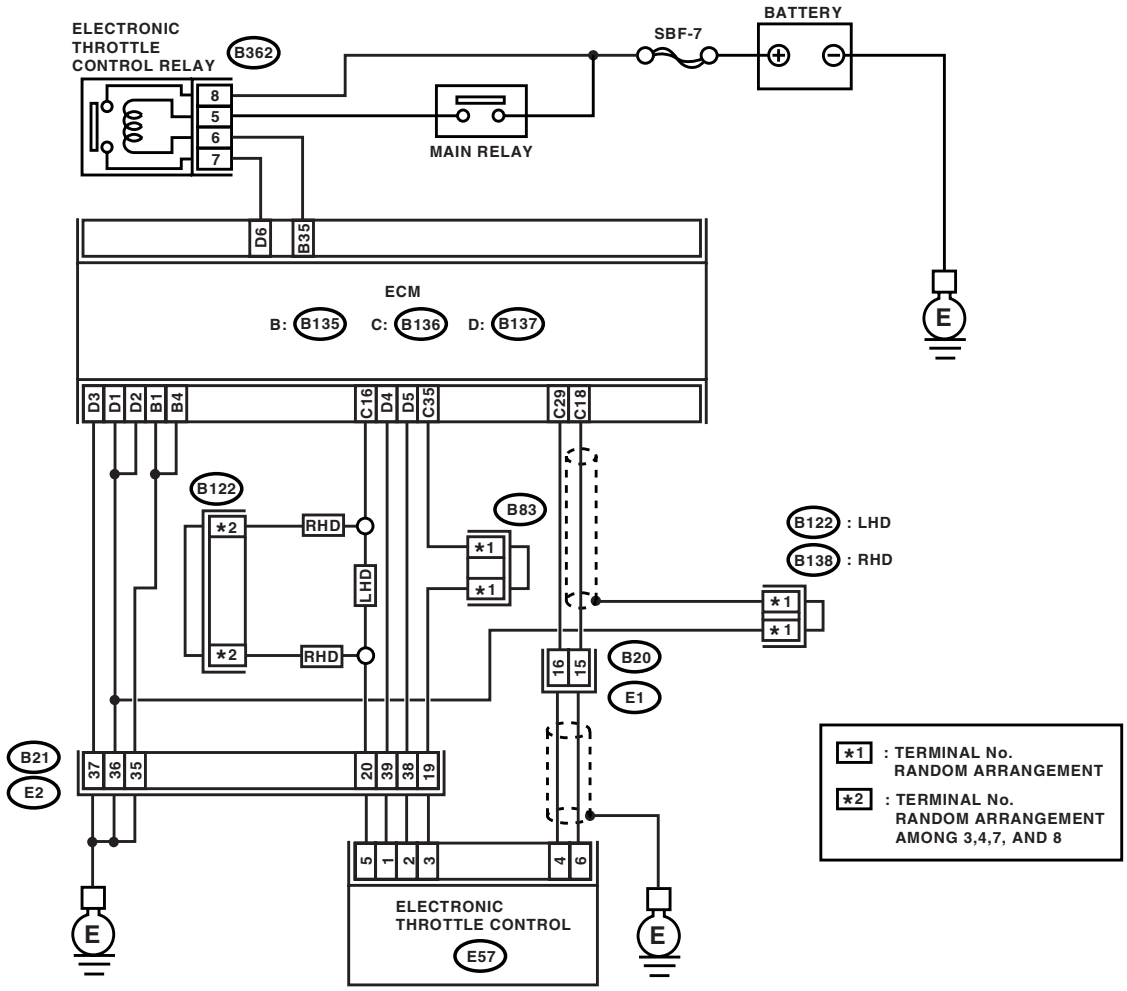
DTC DETECTING CONDITION:

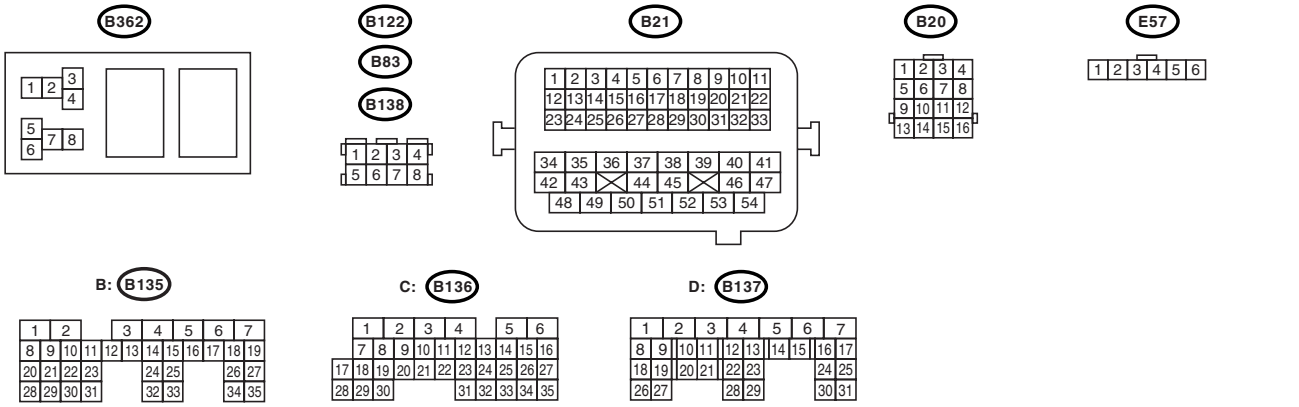
Immediately at fault recognition

TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

WIRING DIAGRAM:





EN-03499

	Step	Check	Yes	No
1	**CHECK SENSOR OUTPUT.** 1) Turn the ignition switch to ON. 2) Read the data of main throttle sensor signal using Subaru Select Monitor. NOTE: For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-26, Subaru Select Monitor.>	Is the voltage more than 0.4 V?	Go to step **2.**	Go to step **4.**
2	**CHECK SENSOR OUTPUT.** Read the data of sub throttle sensor signal using Subaru Select Monitor. NOTE: For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-26, Subaru Select Monitor.>	Is the voltage more than 0.8 V?	Go to step **3.**	Go to step **4.**
3	**CHECK POOR CONTACT.** Check poor contact in connector between ECM and electronic throttle control.	Is there poor contact?	Repair the poor contact.	Go to step **14.**
4	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connectors from electronic throttle control. 4) Measure the resistance between ECM connector and electronic throttle control connector. ***Connector & terminal*** ***(B136) No. 18 — (E57) No. 6:*** ***(B136) No. 29 — (E57) No. 4:*** ***(B136) No. 16 — (E57) No. 5:***	Is the resistance less than 1 Ω?	Go to step **5.**	Repair the open circuit of harness connector.
5	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 18 — Chassis ground:*** ***(B136) No. 29 — Chassis ground:*** ***(B136) No. 16 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **6.**	Repair the ground short circuit of harness.
6	**CHECK SENSOR POWER SUPPLY.** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 5 (+) — Engine ground (−):***	Is the voltage 4.5 — 5.5 V?	Go to step **7.**	Repair the poor contact in ECM connector. Replace the ECM if defective. <Ref. to FU(H6DO)-34, Engine Control Module (ECM).>
7	**CHECK SHORT CIRCUIT IN ECM.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 6 — Engine ground:*** ***(E57) No. 4 — Engine ground:***	Is the resistance more than 10 Ω?	Go to step **8.**	Repair the poor contact in ECM connector. Replace the ECM if defective. <Ref. to FU(H6DO)-34, Engine Control Module (ECM).>

	Step	Check	Yes	No
8	**CHECK SENSOR OUTPUT.** 1) Connect all the connectors. 2) Turn the ignition switch to ON. 3) Read the data of main throttle sensor signal using Subaru Select Monitor. NOTE: For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-26, Subaru Select Monitor.>	Is the voltage less than 4.63 V?	Go to step **9.**	Go to step **11.**
9	**CHECK SENSOR OUTPUT.** Read the data of sub throttle sensor signal using Subaru Select Monitor. NOTE: For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-26, Subaru Select Monitor.>	Is the voltage less than 4.73 V?	Go to step **10.**	Go to step **11.**
10	**CHECK POOR CONTACT.** Check poor contact in connector between ECM and electronic throttle control.	Is there poor contact?	Repair the poor contact.	Temporary poor contact occurred, but it is normal at present.
11	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connectors from electronic throttle control. 4) Measure the resistance between ECM connector and electronic throttle control connector. ***Connector & terminal*** ***(B136) No. 35 — (E57) No. 3:*** ***(B136) No. 18 — (E57) No. 6:*** ***(B136) No. 29 — (E57) No. 4:***	Is the resistance less than 1 Ω?	Go to step **12.**	Repair the open circuit of harness connector.
12	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Connect the ECM connector. 2) Measure the resistance between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 3 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **13.**	Repair the poor contact in ECM connector. Replace the ECM if defective. <Ref. to FU(H6DO)-34, Engine Control Module (ECM).>
13	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 5 (+) — Engine ground (−):***	Is the voltage less than 10 V?	Go to step **14.**	Repair the battery short circuit of harness between ECM connector and electronic throttle control connector.
14	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** Measure the voltage between electronic throttle control connector and engine ground. ***Connector & terminal*** ***(E57) No. 6 (+) — Engine ground (−):*** ***(E57) No. 4 (+) — Engine ground (−):***	Is the voltage less than 10 V?	Go to step **15.**	Repair the short circuit of harness between ECM connector and electronic throttle control connector.

	Step	Check	Yes	No
15	**CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between ECM connectors. ***Connector & terminal*** ***(B136) No. 18 — (B136) No. 16:*** ***(B136) No. 29 — (B136) No. 16:***	Is the resistance more than 1 MΩ?	Go to step **16.**	Repair the short circuit to sensor power supply.
16	**CHECK ELECTRONIC THROTTLE CONTROL HARNESS.** 1) Disconnect the connector from ECM. 2) Disconnect the connectors from electronic throttle control. 3) Measure the resistance between electronic throttle control connector terminals. ***Connector & terminal*** ***(E57) No. 6 — (E57) No. 4:***	Is the resistance more than 1 MΩ?	Repair the poor contact in ECM connector. Replace the ECM if defective. <Ref. to FU(H6DO)-34, Engine Control Module (ECM).>	Repair the short circuit of harness.

DD:DTC P2138 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" / "E" VOLTAGE CORRELATION

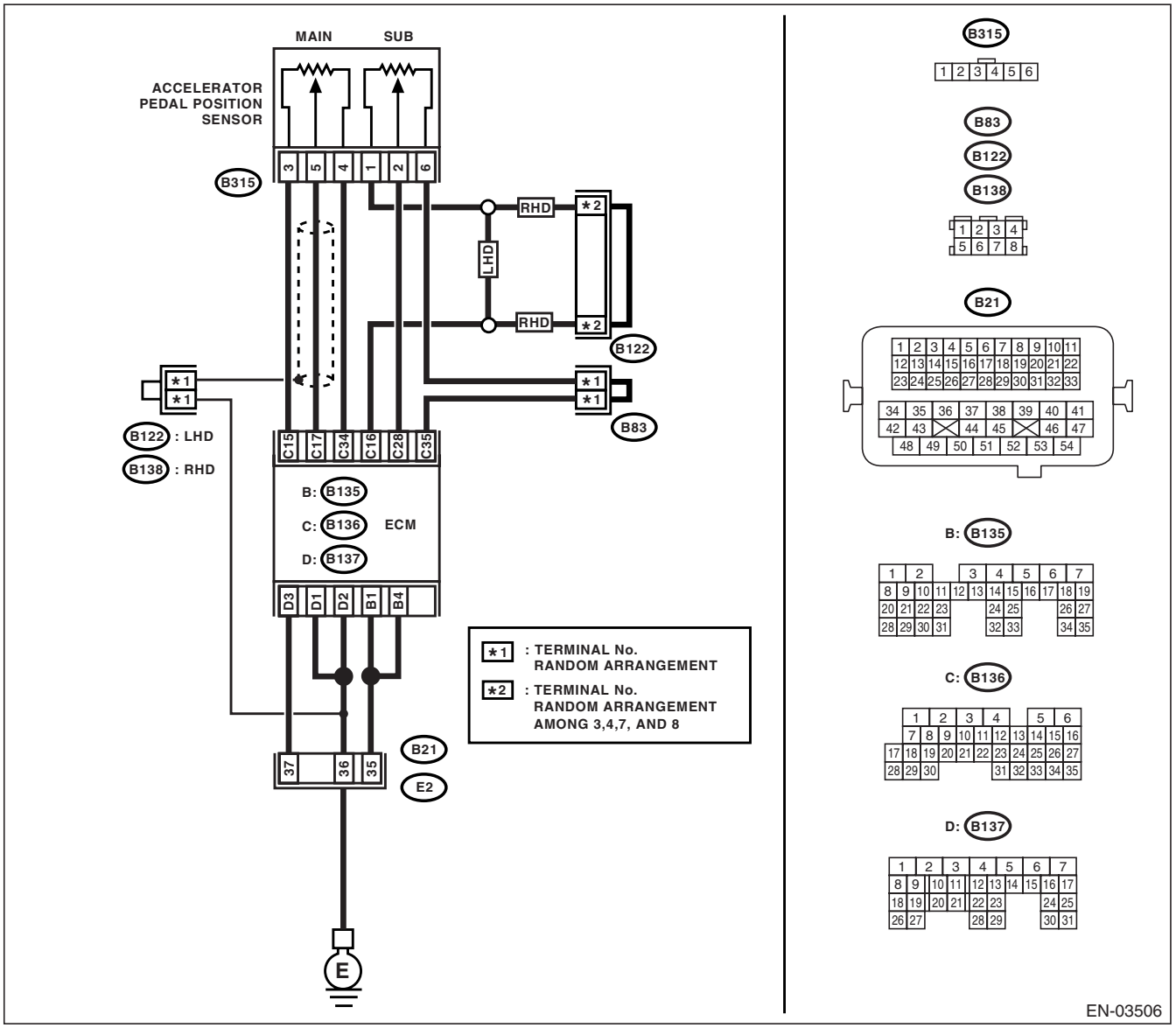
DTC DETECTING CONDITION:

Immediately at fault recognition

TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK ACCELERATOR PEDAL POSITION SENSOR OUTPUT.** 1) Turn the ignition switch to ON. 2) Read the data of main accelerator pedal position sensor signal and sub accelerator pedal position sensor signal using Subaru Select Monitor. NOTE: For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-26, Subaru Select Monitor.>	Is the voltage more than 0.4 V?	Go to step **2.**	Go to step **3.**
2	**CHECK POOR CONTACT.** Check poor contact in connector between ECM and accelerator pedal position sensor.	Is there poor contact?	Repair the poor contact.	Go to step **12.**
3	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connectors from accelerator pedal position sensor. 4) Measure the resistance between ECM connector and accelerator pedal position sensor connector. ***Connector & terminal*** ***(B136) No. 17 — (B315) No. 5:*** ***(B136) No. 15 — (B315) No. 3:*** ***(B136) No. 28 — (B315) No. 2:*** ***(B136) No. 16 — (B315) No. 1:***	Is the resistance less than 1 Ω?	Go to step **4.**	Repair the open circuit of harness connector.
4	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** Measure the resistance between ECM connector and chassis ground. ***Connector & terminal*** ***(B136) No. 17 — Chassis ground:*** ***(B136) No. 15 — Chassis ground:*** ***(B136) No. 28 — Chassis ground:*** ***(B136) No. 16 — Chassis ground:***	Is the resistance more than 1 MΩ?	Go to step **5.**	Repair the ground short circuit of harness.
5	**CHECK POWER SUPPLY OF ACCELERATOR PEDAL POSITION SENSOR.** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between accelerator pedal position sensor connector and engine ground. ***Connector & terminal*** ***(B315) No. 3 (+) — Engine ground (−):*** ***(B315) No. 1 (+) — Engine ground (−):***	Is the voltage 4.5 — 5.5 V?	Go to step **6.**	Repair the poor contact in ECM connector. Replace the ECM if defective. <Ref. to FU(H6DO)-34, Engine Control Module (ECM).>
6	**CHECK ACCELERATOR PEDAL POSITION SENSOR.** Measure the resistance of accelerator pedal position sensor. ***Terminal*** ***No. 3 — No. 4:***	Is the resistance 1.2 — 4.8 kΩ?	Go to step **7.**	Replace the accelerator pedal position sensor.
7	**CHECK ACCELERATOR PEDAL POSITION SENSOR.** Measure the resistance of accelerator pedal position sensor. ***Terminal*** ***No. 1 — No. 6:***	Is the resistance 0.75 — 3.15 kΩ?	Go to step **8.**	Replace the accelerator pedal position sensor.

	Step	Check	Yes	No
8	**CHECK ACCELERATOR PEDAL POSITION SENSOR.** Measure the resistance of accelerator pedal position sensor without depressing the accelerator pedal. ***Terminal*** ***No. 5 — No. 4:***	Is the resistance 0.2 — 0.8 kΩ?	Go to step **9.**	Replace the accelerator pedal position sensor.
9	**CHECK ACCELERATOR PEDAL POSITION SENSOR.** Measure the resistance of accelerator pedal position sensor without depressing the accelerator pedal. ***Terminal*** ***No. 2 — No. 6:***	Is the resistance 0.15 — 0.63 kΩ?	Go to step **10.**	Replace the accelerator pedal position sensor.
10	**CHECK ACCELERATOR PEDAL POSITION SENSOR.** Measure the resistance of accelerator pedal position sensor with depressing the accelerator pedal. ***Terminal*** ***No. 5 — No. 4:***	Is the resistance 0.5 — 2.5 kΩ?	Go to step **11.**	Replace the accelerator pedal position sensor.
11	**CHECK ACCELERATOR PEDAL POSITION SENSOR.** Measure the resistance of accelerator pedal position sensor with depressing the accelerator pedal. ***Terminal*** ***No. 2 — No. 6:***	Is the resistance 0.28 — 1.68 kΩ?	Go to step **12.**	Replace the accelerator pedal position sensor.
12	**CHECK ACCELERATOR PEDAL POSITION SENSOR OUTPUT.** 1) Turn the ignition switch to OFF. 2) Connect all the connectors. 3) Turn the ignition switch to ON. 4) Read the data of main throttle sensor signal and sub accelerator pedal position sensor signal using Subaru Select Monitor. NOTE: For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H6DO)(diag)-26, Subaru Select Monitor.>	Is the voltage less than 4.8 V?	Go to step **13.**	Go to step **14.**
13	**CHECK POOR CONTACT.** Check poor contact in connector between ECM and accelerator pedal position sensor.	Is there poor contact?	Repair the poor contact.	Go to step **18.**
14	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connectors from accelerator pedal position sensor. 4) Measure the resistance between ECM connector and accelerator pedal position sensor connector. ***Connector & terminal*** ***(B136) No. 34 — (B315) No. 4:*** ***(B136) No. 35 — (B315) No. 6:***	Is the resistance less than 1 Ω?	Go to step **15.**	Repair the open circuit of harness connector.

	Step	Check	Yes	No
15	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Connect the ECM connector. 2) Measure the resistance between accelerator pedal position sensor connector and engine ground. ***Connector & terminal*** ***(B315) No. 4 — Engine ground:*** ***(B315) No. 6 — Engine ground:***	Is the resistance less than 5 Ω?	Go to step **16.**	Repair the poor contact in ECM connector. Replace the ECM if defective. <Ref. to FU(H6DO)-34, Engine Control Module (ECM).>
16	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between accelerator pedal position sensor connector and engine ground. ***Connector & terminal*** ***(B315) No. 5 (+) — Engine ground (−):*** ***(B315) No. 2 (+) — Engine ground (−):***	Is the voltage less than 6 V?	Go to step **17.**	Repair the battery short circuit of harness between ECM connector and accelerator pedal position sensor connector.
17	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between ECM connectors. ***Connector & terminal*** ***(B136) No. 17 — (B136) No. 15:*** ***(B136) No. 17 — (B136) No. 16:*** ***(B136) No. 28 — (B136) No. 15:*** ***(B136) No. 28 — (B136) No. 16:***	Is the resistance more than 1 MΩ?	Go to step **18.**	Repair the short circuit to sensor power supply.
18	**CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Disconnect the connectors from accelerator pedal position sensor. 4) Measure the resistance between connector terminals of accelerator pedal position sensor. ***Connector & terminal*** ***(B315) No. 5 — (B315) No. 2:***	Is the resistance more than 1 MΩ?	Repair the poor contact in ECM connector. Replace the ECM if defective. <Ref. to FU(H6DO)-34, Engine Control Module (ECM).>	Repair the short circuit of harness between ECM connector and accelerator pedal position sensor connector.

DE:DTC P2503 CHARGING SYSTEM VOLTAGE LOW

NOTE:
For diagnostic procedure, refer to DTC P2504. <Ref. to EN(H6DO)(diag)-267, DTC P2504 CHARGING SYSTEM VOLTAGE HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DF:DTC P2504 CHARGING SYSTEM VOLTAGE HIGH

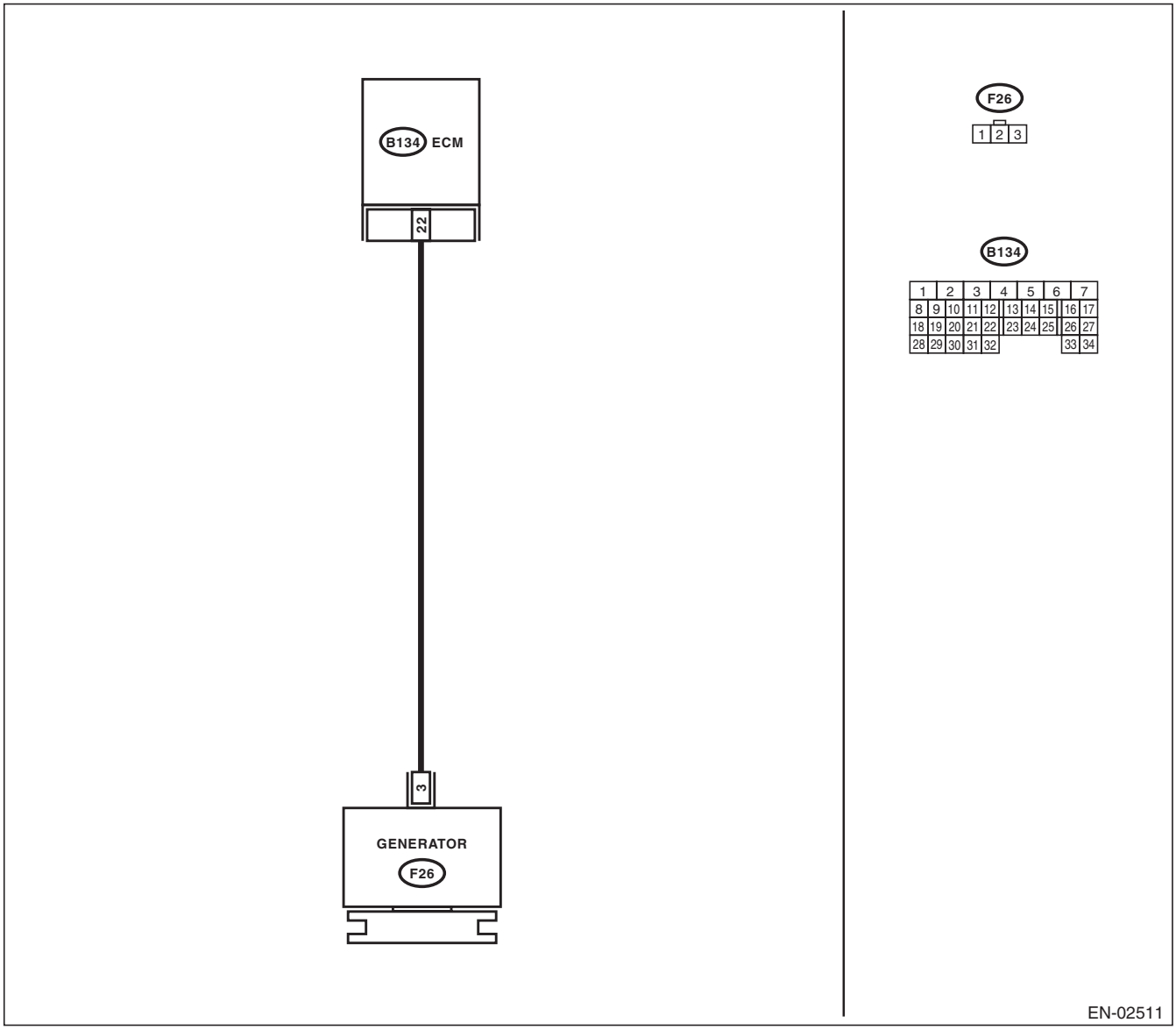
DTC DETECTING CONDITION:

Immediately at fault recognition

CAUTION:

After repair or replacement of faulty parts, conduct Clear Memory Mode <Ref. to EN(H6DO)(diag)-41, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H6DO)(diag)-34, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



	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 of harness between ECM and generator connector.
2	**CHECK HARNESS BETWEEN GENERATOR AND ECM CONNECTOR.** Measure the resistance of harness between ECM and generator. ***Connector & terminal*** ***(B136) No. 22 — (F26) No. 3:***	Is the resistance less than 1 Ω?	Repair the poor contact in connector.	Repair the open circuit of harness between ECM and generator connector. NOTE: In this case, repair the following: • Open circuit of harness between ECM and generator connector • Poor contact in coupling connector

19.General Diagnostic Table

A: INSPECTION

1. ENGINE

NOTE:
Malfunction of parts other than those listed is also possible. <Ref. to ME(H6DO)-86, Engine Trouble in General.>

Symptom	Problem parts
1. Engine stalls during idling.	1) Manifold absolute pressure sensor 2) Mass air flow and intake air temperature sensor 3) Ignition parts (*1) 4) Engine coolant temperature sensor (*2) 5) Crankshaft position sensor (*3) 6) Camshaft position sensor (*3) 7) Fuel injection parts (*4)
2. Rough idling	1) Manifold absolute pressure sensor 2) Mass air flow and intake air temperature sensor 3) Engine coolant temperature sensor (*2) 4) Ignition parts (*1) 5) Air intake system (*5) 6) Fuel injection parts (*4) 7) Electronic throttle control 8) Crankshaft position sensor (*3) 9) Camshaft position sensor (*3) 10) Oxygen sensor 11) Fuel pump and fuel pump relay 12) EGR valve
3. Engine does not return to idle.	1) Engine coolant temperature sensor 2) Electronic throttle control 3) Manifold absolute pressure sensor 4) Mass air flow and intake air temperature sensor 5) EGR valve 6) Accelerator pedal position sensor 7) Oil temperature sensor
4. Poor acceleration	1) Manifold absolute pressure sensor 2) Mass air flow and intake air temperature sensor 3) Electronic throttle control 4) Fuel injection parts (*4) 5) Fuel pump and fuel pump relay 6) Engine coolant temperature sensor (*2) 7) Crankshaft position sensor (*3) 8) Camshaft position sensor (*3) 9) A/C switch and A/C cut relay 10) Engine torque control signal circuit 11) Ignition parts (*1) 12) EGR valve 13) Accelerator pedal position sensor 14) Oil temperature sensor
5. Engine stalls, hesitates, breathes at acceleration.	1) Manifold absolute pressure sensor 2) Mass air flow and intake air temperature sensor 3) Engine coolant temperature sensor (*2) 4) Crankshaft position sensor (*3) 5) Camshaft position sensor (*3) 6) Purge control solenoid valve 7) Fuel injection parts (*4) 8) Electronic throttle control 9) Fuel pump and fuel pump relay 10) EGR valve

General Diagnostic Table

Symptom	Problem parts
6. Surging	1) Mass air flow and intake air temperature sensor 2) Manifold absolute pressure sensor 3) Engine coolant temperature sensor (*2) 4) Crankshaft position sensor (*3) 5) Camshaft position sensor (*3) 6) Fuel injection parts (*4) 7) Electronic throttle control 8) Fuel pump and fuel pump relay 9) EGR valve
7. Spark knock	1) Mass air flow and intake air temperature sensor 2) Manifold absolute pressure sensor 3) Engine coolant temperature sensor 4) Knock sensor 5) Fuel injection parts (*4) 6) Fuel pump and fuel pump relay 7) EGR valve
8. After burning in exhaust system	1) Mass air flow and intake air temperature sensor 2) Manifold absolute pressure sensor 3) Engine coolant temperature sensor (*2) 4) Fuel injection parts (*4) 5) Fuel pump and fuel pump relay

*1: Check ignition coil and spark plug.
*2: Indicate the symptom occurring only in cold temperatures.
*3: Ensure the secure installation.
*4: Check the fuel injector and fuel pressure regulator.
*5: Inspect air leak in air intake system.