

COOLING

CO(H6DO)

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GENERAL DESCRIPTION

COOLING

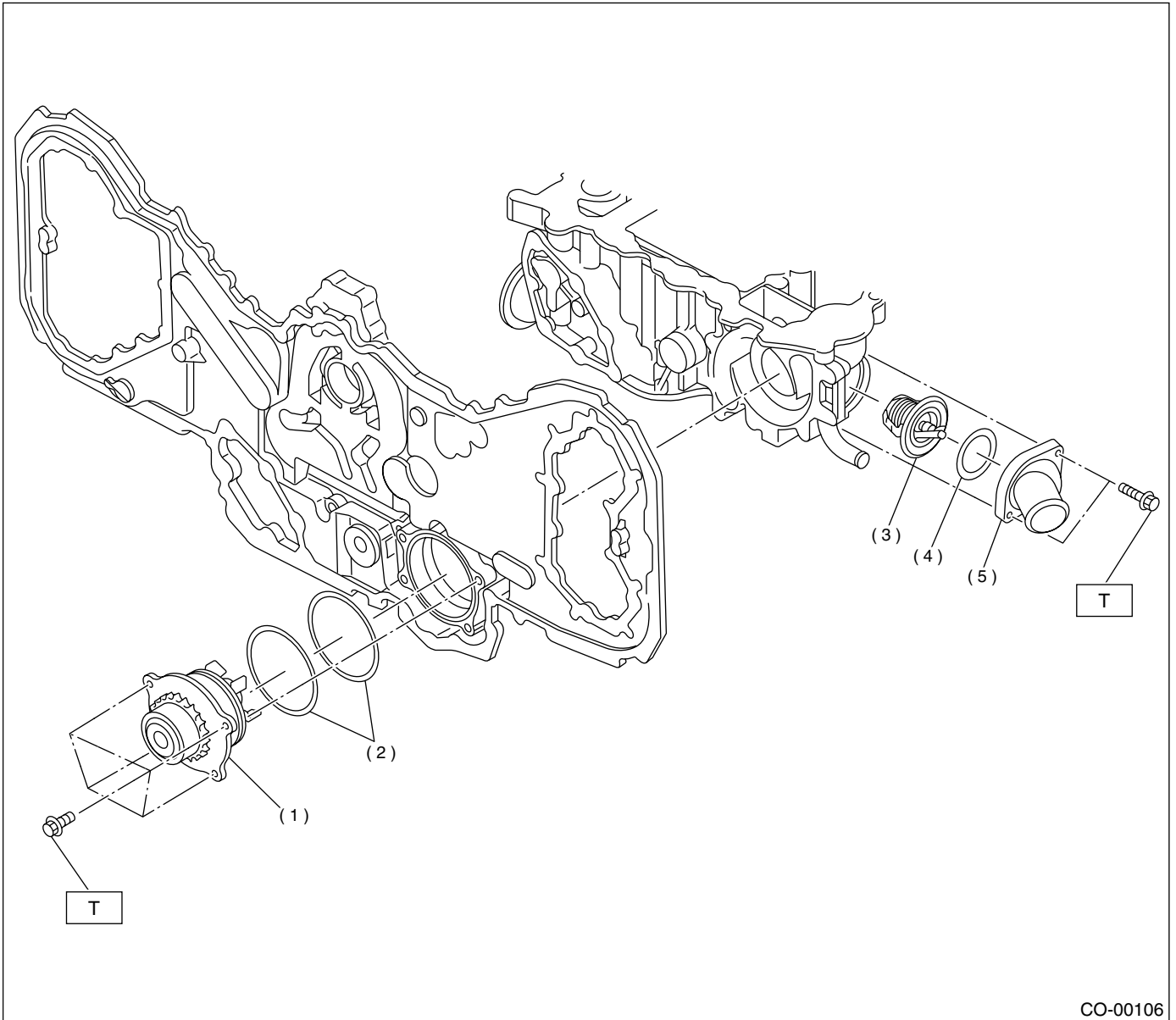
1. General Description

A: SPECIFICATIONS

Cooling system		Electric fan + Forced engine coolant circulation system	
Total engine coolant capacity		ℓ (US qt, Imp qt)	
		Approx. 7.9 (8.4, 7.0)	
Water pump	Type	Centrifugal impeller type	
	Discharge performance	Discharge	320 L (84.5 US gal, 70.4 Imp gal)/min.
		Pump speed—total engine coolant head	5,500 rpm — 18 mAq (59 ft Aq)
		Engine coolant temperature	80°C (176°F)
	Impeller diameter	73.2 mm (2.882 in)	
	Number of impeller vanes	6	
	Tooth number of pump sprocket	22 t	
Thermostat	Type	Wax pellet type	
	Start to open	76 — 80°C (169 — 176°F)	
	Fully open	91°C (196°F)	
	Valve lift	9.0 mm (0.354 in) or more	
	Valve bore	35 mm (1.38 in)	
Radiator fan	Motor	120 W (main fan) 120 W (sub fan)	
	Fan diameter × Blade	320 mm (12.60 in) × 5 (main fan) 320 mm (12.60 in) × 7 (sub fan)	
Radiator	Type	Down flow, pressure type	
	Core dimensions	699 × 349 × 27 mm (27.52 × 13.74 × 1.06 in)	
	Pressure range in which cap valve is open	Above: 108±15 kPa (1.1±0.15 kg/cm ² , 16±2 psi) Below: -1.0 to -4.9 kPa (-0.01 to -0.05 kg/cm ² , -0.1 to -0.7 psi)	
	Fins	Corrugated fin type	
Reservoir tank	Capacity	0.5 L (0.5 US qt, 0.4 Imp qt)	

B: COMPONENT

1. WATER PUMP



- (1) Water pump ASSY
- (2) O-ring
- (3) Thermostat

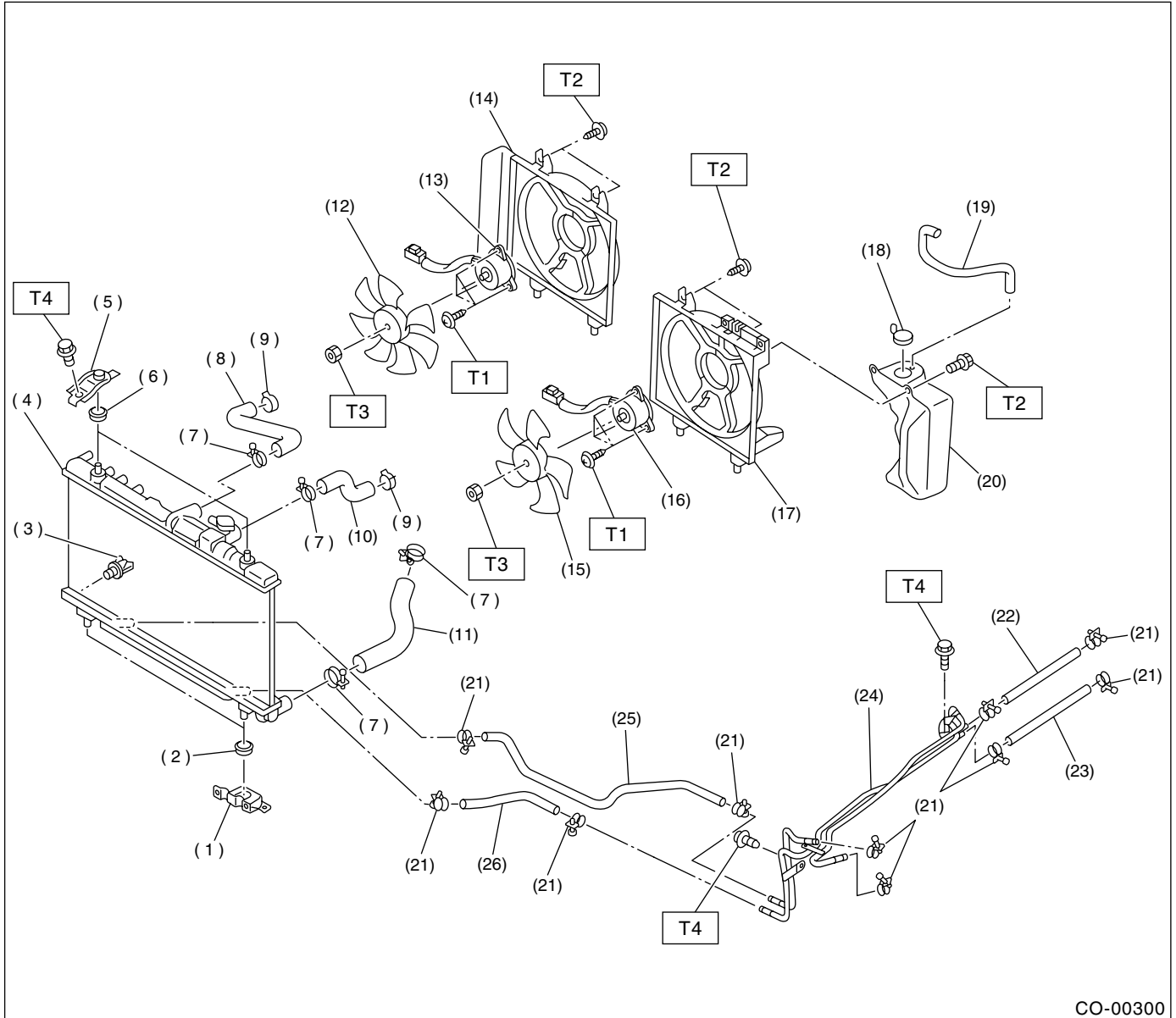
- (4) Gasket
- (5) Thermostat cover

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

GENERAL DESCRIPTION

COOLING

2. RADIATOR AND RADIATOR FAN



CO-00300

- | | | |
|----------------------------|--|------------------------|
| (1) Radiator lower bracket | (12) Radiator sub fan | (23) ATF outlet hose A |
| (2) Radiator lower cushion | (13) Radiator sub fan motor | (24) ATF pipe |
| (3) Drain cock | (14) Sub fan shroud | (25) ATF inlet hose B |
| (4) Radiator | (15) Radiator main fan | (26) ATF outlet hose B |
| (5) Radiator upper bracket | (16) Radiator main fan motor | |
| (6) Radiator upper cushion | (17) Main fan shroud | |
| (7) Clamp | (18) Engine coolant reservoir tank cap | |
| (8) Radiator inlet hose A | (19) Over flow hose | |
| (9) Clamp | (20) Engine coolant reservoir tank | |
| (10) Radiator inlet hose B | (21) ATF hose clamp | |
| (11) Radiator outlet hose | (22) ATF inlet hose A | |

Tightening torque: N·m (kgf·m, ft·lb)

T1: 4.4 (0.45, 3.3)

T2: 4.9 (0.50, 3.6)

T3: 7.5 (0.76, 5.5)

T4: 12 (1.2, 8.7)

C: CAUTION

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

D: PREPARATION TOOL

1. SPECIAL TOOLS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
<p>ST-499977100</p>	499977100	CRANK PULLEY WRENCH	Used for stopping crankshaft pulley when loosening and tightening crankshaft pulley bolts.
<p>ST18231AA000</p>	18231AA000	CAMSHAFT SPROCKET WRENCH	Used for removing and installing camshaft sprocket.

2. GENERAL PURPOSE TOOLS

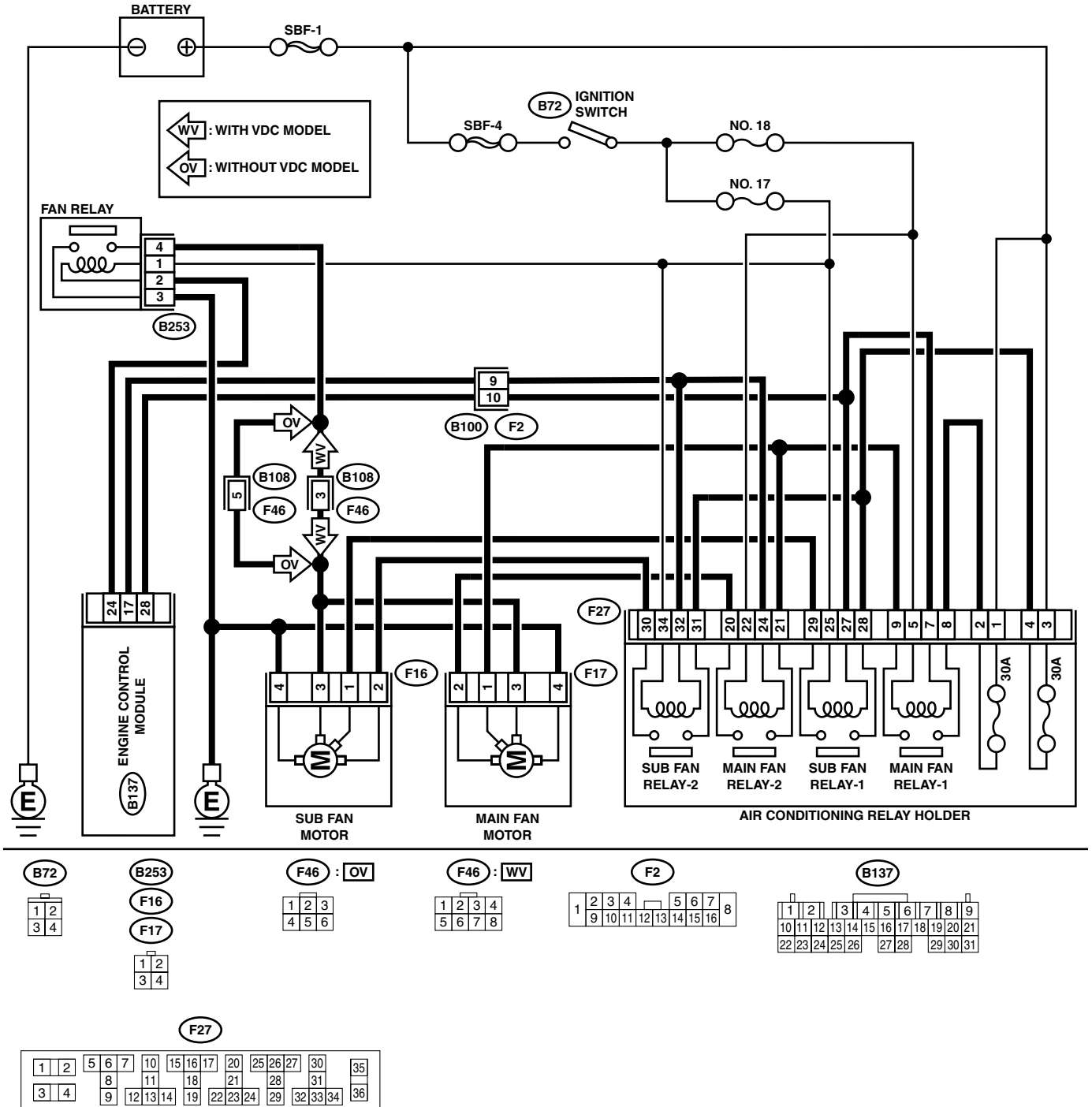
TOOL NAME	REMARKS
Radiator cap tester	Used for measuring pressure.

RADIATOR MAIN FAN SYSTEM

COOLING

2. Radiator Main Fan System

A: SCHEMATIC



EN-02175

RADIATOR MAIN FAN SYSTEM

COOLING

B: INSPECTION

TROUBLE SYMPTOM:

- Radiator main fan does not rotate in low speed under the following conditions:
 - (1) Coolant temperature 95°C (203°F) or more.
 - (2) A/C switch set to OFF.
- Radiator main fan does not rotate in middle speed under the following conditions:
 - (1) Coolant temperature 94°C (201°F) or less.
 - (2) A/C switch set to ON and A/C temperature at the lowest position.
- Radiator main fan does not rotate in high speed under the following conditions:
 - (1) Coolant temperature 95°C (203°F) or more.
 - (2) A/C switch set to ON and A/C temperature at the lowest position.

Step	Check	Yes	No
1 CHECK OPERATION OF RADIATOR FAN. 1) Run the engine at idle (Vehicle stationary) 2) Turn the A/C switch to ON, set temperature at the lowest position. 3) Inspect while coolant temperature is 94°C (201°F) or less.	When A/C compressor is operating, does the radiator main fan rotate in middle speed?	Go to step 2.	Go to step 4.
2 CHECK OPERATION OF RADIATOR FAN. 1) Turn the A/C switch to OFF. 2) Warm the engine until coolant temperature is over 95°C (203°F).	When A/C compressor is operating, does the radiator main fan rotate in low speed?	Go to step 3.	Go to step 15.
3 CHECK OPERATION OF RADIATOR FAN. Turn the A/C switch to ON, set temperature at the lowest position.	When A/C compressor is operating, does the radiator main fan rotate in high speed?	Radiator main fan system is okay.	Go to step 28.
4 CHECK POWER SUPPLY TO MAIN FAN MOTOR. CAUTION: Be careful not to overheat engine during repair. 1) Turn ignition switch to OFF. 2) Disconnect connector from main fan motor. 3) Start the engine, keep coolant temperature below 94°C (201°F). 4) Turn the A/C switch to ON, set temperature at the lowest position. 5) Measure voltage while A/C compressor is rotating. 6) Measure voltage between main fan motor connector and chassis ground. Connector & terminal (F17) No. 2 (+) — Chassis ground (-):	Is the measured value more than 10 V?	Go to step 5.	Go to step 8.
5 CHECK GROUND CIRCUIT OF MAIN FAN MOTOR. 1) Turn ignition switch to OFF. 2) Measure resistance between main fan motor connector and chassis ground. Connector & terminal (F17) No. 4 — Chassis ground:	Is the measured value less than 5 Ω?	Go to step 6.	Repair open circuit in harness between main fan motor connector and chassis ground.
6 CHECK POOR CONTACT. Check poor contact in main fan motor connector.	Is there poor contact in main fan motor connector?	Repair poor contact in main fan motor connector.	Go to step 7.
7 CHECK MAIN FAN MOTOR. Connect battery positive (+) terminal to terminal No. 2 and negative (-) terminal to terminal No. 4 of main fan motor connector.	Does the main fan rotate?	Repair poor contact in main fan motor connector.	Replace main fan motor with a new one.

RADIATOR MAIN FAN SYSTEM

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Step	Check	Yes	No
8 CHECK POWER SUPPLY TO MAIN FAN RELAY 2. 1) Turn ignition switch to ON. 2) Measure voltage between main fan relay 2 terminal and chassis ground. Connector & terminal (F27) No. 22 (+) — Chassis ground (-):	Is the measured value more than 10 V?	Go to step 10.	Go to step 9.
9 CHECK FUSE. 1) Turn ignition switch to OFF. 2) Remove fuse No. 18 from joint box. 3) Check condition of fuse.	Is the fuse blown out?	Replace fuse.	Repair open circuit in harness between main fan relay 2 and ignition switch.
10 CHECK MAIN FAN RELAY 2. 1) Turn ignition switch to OFF. 2) Remove main fan relay 2. 3) Measure resistance of main fan relay 2. Terminal No. 20 — No. 21:	Is the measured value more than 1 M Ω ?	Go to step 11.	Replace main fan relay 2.
11 CHECK MAIN FAN RELAY 2. 1) Connect battery to terminals No. 19 and No. 20 of main fan relay 2. 2) Measure resistance of main fan relay 2. Terminal No. 20 — No. 21:	Is the measured value less than 1 Ω ?	Go to step 12.	Replace main fan relay 2.
12 CHECK HARNESS BETWEEN MAIN FAN RELAY 2 TERMINAL AND MAIN FAN MOTOR CONNECTOR. Measure resistance of harness between main fan motor connector and main fan relay 2 terminal. Connector & terminal (F17) No. 2 — (F27) No. 20:	Is the measured value less than 1 Ω ?	Go to step 13.	Repair open circuit in harness between main fan motor connector and main fan relay 2 terminal.
13 CHECK HARNESS BETWEEN MAIN FAN RELAY 2 AND ECM. 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between main fan relay 2 connector and ECM connector. Connector & terminal (F27) No. 24 — (B137) No. 17:	Is the measured value less than 1 Ω ?	Go to step 14.	Repair open circuit in harness between main fan relay 2 and ECM.
14 CHECK POOR CONTACT. Check poor contact in connector between main fan and ECM.	Is there poor contact in connector between main fan motor and ECM?	Repair poor contact connector.	Contact with SOA (distributor) service.
15 CHECK POWER SUPPLY TO MAIN FAN MOTOR. CAUTION: Be careful not to overheat engine during repair. 1) Turn ignition switch to OFF. 2) Disconnect main fan motor connector. 3) Start the engine, and warm it up until engine coolant temperature increases over 95°C (203°F). 4) Measure voltage between main fan motor connector and chassis ground. Connector & terminal (F17) No. 1 (+) — Chassis ground (-):	Is the measured value more than 10 V?	Go to step 16.	Go to step 18.

RADIATOR MAIN FAN SYSTEM

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Step	Check	Yes	No
16 CHECK POOR CONTACT. Check poor contact in main fan motor connector.	Is there poor contact in main fan motor connector?	Repair poor contact in main fan motor connector.	Go to step 17.
17 CHECK MAIN FAN MOTOR. Connect battery positive (+) terminal to terminal No. 1, and negative (-) terminal to terminal No. 4 of main fan motor connector.	Does the main fan rotate?	Repair poor contact in main fan motor connector.	Replace main fan motor with a new one.
18 CHECK POWER SUPPLY TO MAIN FAN RELAY 1. 1) Turn ignition switch to OFF. 2) Remove main fan relay 1 from A/C relay holder. 3) Measure voltage between main fan relay 1 terminal and chassis ground. Connector & terminal (F27) No. 8 (+) — Chassis ground (-):	Is the measured value more than 10 V?	Go to step 19.	Go to step 20.
19 CHECK POWER SUPPLY TO MAIN FAN RELAY 1. 1) Turn ignition switch to ON. 2) Measure voltage between main fan relay 1 terminal and chassis ground. Connector & terminal (F27) No. 5 (+) — Chassis ground (-):	Is the measured value more than 10 V?	Go to step 23.	Go to step 22.
20 CHECK 30 A FUSE. 1) Remove 30 A fuse from A/C relay holder. 2) Check condition of fuse.	Is the fuse blown out?	Replace fuse.	Go to step 21.
21 CHECK POWER SUPPLY TO A/C RELAY HOLDER 30 A FUSE TERMINAL. Measure voltage of harness between A/C relay holder 30 A fuse terminal and chassis ground. Connector & terminal (F27) No. 1 (+) — Chassis ground (-):	Is the measured value more than 10 V?	Repair open circuit in harness between 30 A fuse and main fan relay terminal.	Repair open circuit in harness between main fuse box connector and 30 A fuse terminal.
22 CHECK FUSE. 1) Turn ignition switch to OFF. 2) Remove fuse No. 18 from joint box. 3) Check condition of fuse. Is the fuse blown out?	Is the fuse blown out?	Replace fuse.	Repair open circuit in harness between main fan relay 1 and ignition switch.
23 CHECK MAIN FAN RELAY 1. 1) Turn ignition switch to OFF. 2) Remove main fan relay 1. 3) Measure resistance of main fan relay 1. Terminal No. 8 — No. 9:	Is the measured value more than 1 M Ω ?	Go to step 24.	Replace main fan relay 1.
24 CHECK MAIN FAN RELAY. 1) Connect battery to terminals No. 5 and No. 6 of main fan relay 1. 2) Measure resistance of main fan relay 1. Terminal No. 8 — No. 9:	Is the measured value less than 1 Ω ?	Go to step 25.	Replace main fan relay 1.
25 CHECK HARNESS BETWEEN MAIN FAN RELAY TERMINAL AND MAIN FAN MOTOR CONNECTOR. Measure resistance of harness between main fan motor connector and main fan relay 1 terminal. Connector & terminal (F17) No. 1 — (F27) No. 9:	Is the measured value less than 1 Ω ?	Go to step 26.	Replace open circuit in harness between main fan motor connector and main fan relay 1 terminal.

RADIATOR MAIN FAN SYSTEM

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Step	Check	Yes	No
26 CHECK HARNESS BETWEEN MAIN FAN RELAY 1 AND ECM. 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between main fan relay 1 connector and ECM connector. Connector & terminal (F27) No. 7 — (B137) No. 28:	Is the measured value less than 1 Ω?	Go to step 27.	Repair open circuit in harness between main fan relay 1 and ECM.
27 CHECK POOR CONTACT. Check poor contact in connector between main fan and ECM.	Is there poor contact in connector between main fan motor and ECM?	Repair poor contact connector.	Contact with SOA (distributor) service.
28 CHECK HARNESS BETWEEN MAIN FAN MOTOR CONNECTOR AND CHASSIS GROUND. 1) Turn ignition switch to OFF. 2) Disconnect main fan motor connector. 3) Measure resistance of harness between main fan motor connector and chassis ground. Connector & terminal (F17) No. 3 — Chassis ground:	Is the measured value less than 5 Ω?	Go to step 29.	Go to step 30.
29 CHECK POOR CONTACT. Check poor contact in main fan motor connector.	Is there poor contact in main fan motor connector?	Repair poor contact in main fan motor connector.	Replace main fan motor with a new one.
30 CHECK HARNESS BETWEEN MAIN FAN AND FAN RELAY. 1) Disconnect fan relay connector. 2) Measure resistance of between main fan motor connector and fan relay connector. Connector & terminal (F17) No. 3 — (B253) No. 4:	Is the measured value less than 1 Ω?	Go to step 31.	Repair open circuit between main fan motor connector and fan relay connector.
31 CHECK POWER SUPPLY TO FAN RELAY. 1) Turn ignition switch to ON. 2) Measure voltage between fan relay terminal and chassis ground. Connector & terminal (B253) No. 1 (+) — Chassis ground (-):	Is the measured value more than 10 V?	Go to step 33.	Go to step 32.
32 CHECK FUSE. 1) Turn ignition switch to OFF. 2) Remove fuse No. 18 from joint box. 3) Check condition of fuse.	Is the fuse blown out?	Replace fuse.	Repair open circuit in harness between main fan relay and ignition switch.
33 CHECK FAN RELAY. 1) Turn ignition switch to OFF. 2) Remove fan relay. 3) Measure resistance of fan relay. Terminal No. 4 — No. 3:	Is the measured value more than 1 MΩ?	Go to step 34.	Replace fan relay.
34 CHECK FAN RELAY. 1) Connect battery to terminals No. 1 and No. 3 of fan relay. 2) Measure resistance of fan relay. Terminal No. 4 — No. 3:	Is the measured value less than 1 Ω?	Go to step 35.	Replace fan relay.

RADIATOR MAIN FAN SYSTEM

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Step	Check	Yes	No
35 CHECK HARNESS BETWEEN FAN RELAY TERMINAL AND CHASSIS GROUND. Measure resistance of harness between fan relay connector and chassis ground. <i>Connector & terminal</i> <i>(B253) No. 3 — Chassis ground:</i>	Is the measured value less than 1 Ω ?	Go to step 36 .	Repair open circuit in harness between fan relay connector and chassis ground.
36 CHECK HARNESS BETWEEN FAN RELAY AND ECM. 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between fan relay and ECM connector. <i>Connector & terminal</i> <i>(B253) No. 2 — (B137) No. 24:</i>	Is the measured value less than 1 Ω ?	Go to step 37 .	Repair open circuit in harness between fan relay connector and ECM.
37 CHECK POOR CONTACT. Check poor contact in connector between fan relay and ECM.	Is there poor contact in connector between fan relay and ECM?	Repair poor contact connector.	Contact with SOA (distributor) service.

NOTE:

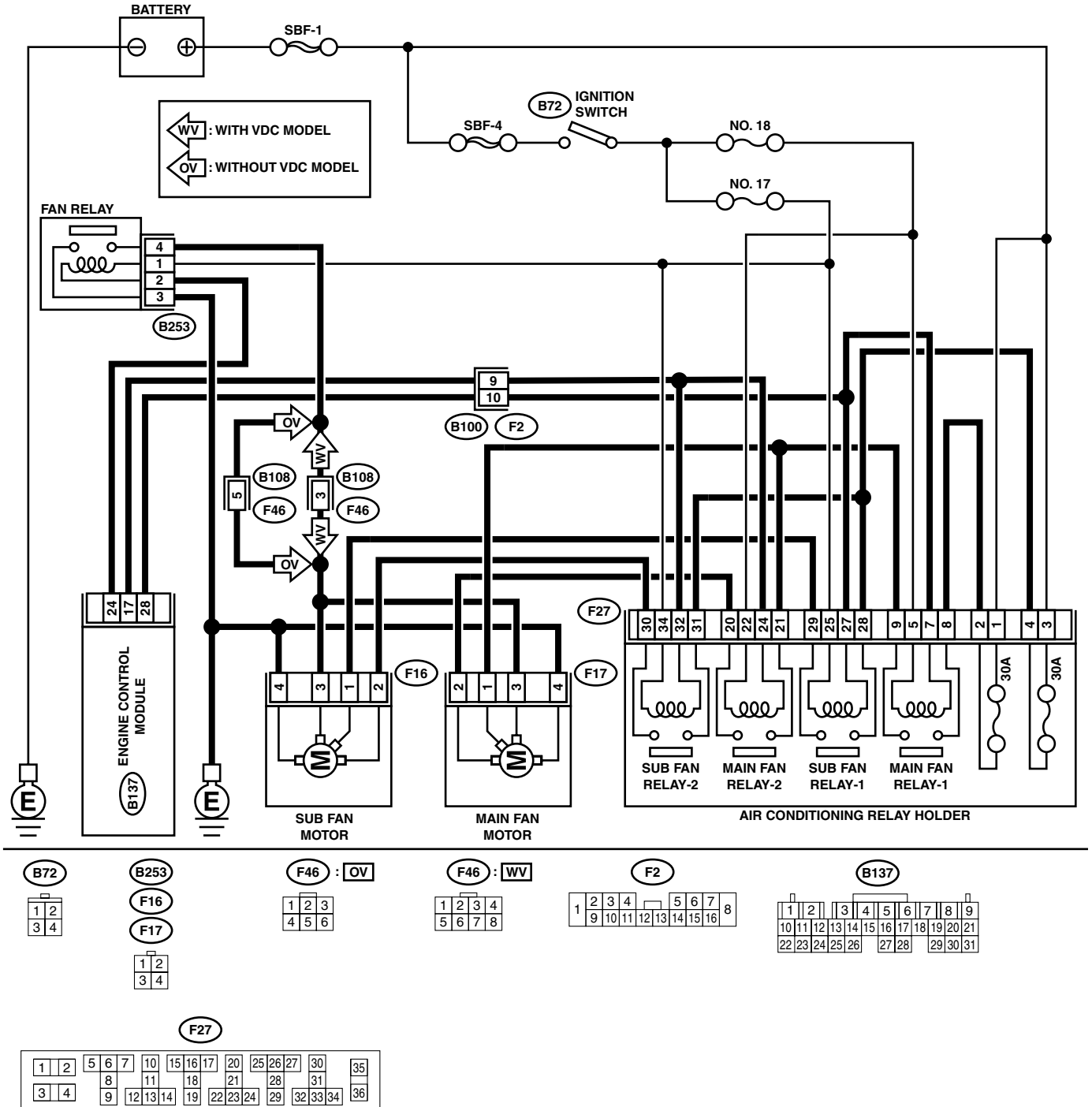
Inspection by SOA (distributor) service is required, because probable cause is deterioration of multiple parts.

RADIATOR SUB FAN SYSTEM

COOLING

3. Radiator Sub Fan System

A: SCHEMATIC



EN-02175

B: INSPECTION

TROUBLE SYMPTOM:

- Radiator sub fan does not rotate in low speed under the following conditions:
 - (1) Coolant temperature 95°C (203°F) or more.
 - (2) A/C switch set to OFF.
- Radiator sub fan does not rotate in middle speed under the following conditions:
 - (1) Coolant temperature 94°C (201°F) or less.
 - (2) A/C switch set to ON and A/C temperature at the lowest position.
- Radiator sub fan does not rotate in high speed under the following conditions:
 - (1) Coolant temperature 95°C (203°F) or more.
 - (2) A/C switch set to ON and A/C temperature at the lowest position.

Step	Check	Yes	No
1 CHECK OPERATION OF RADIATOR FAN. 1) Run the engine at idle (Vehicle stationary) 2) Turn the A/C switch to ON, set temperature at the lowest position. 3) Inspect while coolant temperature is 94°C (201°F) or less.	When A/C compressor is operating, does the radiator sub fan rotate in middle speed?	Go to step 2.	Go to step 4.
2 CHECK OPERATION OF RADIATOR FAN. 1) Turn the A/C switch to OFF. 2) Warm the engine until coolant temperature is over 95°C (203°F).	When A/C compressor is operating, does the radiator sub fan rotate in low speed?	Go to step 3.	Go to step 18.
3 CHECK OPERATION OF RADIATOR FAN. 1) Turn the A/C switch to ON, set temperature at the lowest position.	When A/C compressor is operating, does the radiator sub fan rotate in high speed?	Radiator sub fan system is okay.	Go to step 31.
4 CHECK POWER SUPPLY TO SUB FAN MOTOR. CAUTION: Be careful not to overheat engine during repair. 1) Turn ignition switch to OFF. 2) Disconnect connector from sub fan motor. 3) Start the engine, keep coolant temperature below 94°C (201°F). 4) Turn the A/C switch to ON, set temperature at the lowest position. 5) Measure voltage while A/C compressor is rotating. 6) Measure voltage between sub fan motor connector and chassis ground. Connector & terminal (F16) No. 2 (+) — Chassis ground (-):	Is the measured value more than 10 V?	Go to step 5.	Go to step 8.
5 CHECK GROUND CIRCUIT OF SUB FAN MOTOR. 1) Turn ignition switch to OFF. 2) Measure resistance between sub fan motor connector and chassis ground. Connector & terminal (F16) No. 4 — Chassis ground:	Is the measured value less than 5 Ω?	Go to step 6.	Repair open circuit in harness between sub fan motor connector and chassis ground.
6 CHECK POOR CONTACT. Check poor contact in sub fan motor connector.	Is there poor contact in sub fan motor connector?	Repair poor contact in sub fan motor connector.	Go to step 7.
7 CHECK SUB FAN MOTOR. Connect battery positive (+) terminal to terminal No. 2 and negative (-) terminal to terminal No. 4 of sub fan motor connector.	Does the sub fan rotate?	Repair poor contact in sub fan motor connector.	Replace sub fan motor with a new one.

RADIATOR SUB FAN SYSTEM

COOLING

Step	Check	Yes	No
8 CHECK POWER SUPPLY TO SUB FAN RELAY 2. 1) Turn ignition switch to OFF. 2) Remove sub fan relay 2 from A/C relay holder. 3) Measure voltage between sub fan relay 2 terminal and chassis ground. Connector & terminal (F27) No. 31 (+) — Chassis ground (-):	Is the measured value more than 10 V?	Go to step 9.	Go to step 10.
9 CHECK POWER SUPPLY TO SUB FAN RELAY 2. 1) Turn ignition switch to ON. 2) Measure voltage between sub fan relay 2 terminal and chassis ground. Connector & terminal (F27) No. 34 (+) — Chassis ground (-):	Is the measured value more than 10 V?	Go to step 13.	Go to step 12.
10 CHECK 30 A FUSE. 1) Remove 30 A fuse from A/C relay holder. 2) Check condition of fuse.	Is the fuse blown out?	Replace fuse.	Go to step 11.
11 CHECK POWER SUPPLY TO A/C RELAY HOLDER 30 A FUSE TERMINAL. Measure voltage of harness between A/C relay holder 30 A fuse terminal and chassis ground. Connector & terminal (F27) No. 3 (+) — Chassis ground (-):	Is the measured value more than 10 V?	Repair open circuit in harness between 30 A fuse and sub fan relay 2 terminal.	Repair open circuit in harness between main fuse box connector and 30 A fuse terminal.
12 CHECK FUSE. 1) Turn ignition switch to OFF. 2) Remove fuse No. 18 from joint box. 3) Check condition of fuse.	Is the fuse blown out?	Replace fuse.	Repair open circuit in harness between sub fan relay 2 and ignition switch.
13 CHECK SUB FAN RELAY 2. 1) Turn ignition switch to OFF. 2) Remove sub fan relay 2. 3) Measure resistance of sub fan relay 2. Terminal No. 30 — No. 31:	Is the measured value more than 1 M Ω ?	Go to step 14.	Replace sub fan relay 2.
14 CHECK SUB FAN RELAY 2. 1) Connect battery to terminals No. 27 and No. 28 of sub fan relay 2. 2) Measure resistance of sub fan relay 2. Terminal No. 30 — No. 31:	Is the measured value less than 1 Ω ?	Go to step 15.	Replace sub fan relay 2.
15 CHECK HARNESS BETWEEN SUB FAN RELAY 2 TERMINAL AND SUB FAN MOTOR CONNECTOR. Measure resistance of harness between sub fan motor connector and sub fan relay 2 terminal. Connector & terminal (F16) No. 2 — (F27) No. 30:	Is the measured value less than 1 Ω ?	Go to step 16.	Repair open circuit in harness between sub fan motor connector and sub fan relay 2 terminal.
16 CHECK HARNESS BETWEEN SUB FAN RELAY 2 AND ECM. 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between sub fan relay 2 connector and ECM connector. Connector & terminal (F27) No. 32 — (B137) No. 17:	Is the measured value less than 1 Ω ?	Go to step 17.	Repair open circuit in harness between sub fan relay 2 and ECM.

RADIATOR SUB FAN SYSTEM

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Step	Check	Yes	No
17 CHECK POOR CONTACT. Check poor contact in connector between sub fan and ECM.	Is there poor contact in connector between sub fan motor and ECM?	Repair poor contact connector.	Contact with SOA (distributor) service.
18 CHECK POWER SUPPLY TO SUB FAN MOTOR. CAUTION: Be careful not to overheat engine during repair. 1) Turn ignition switch to OFF. 2) Turn A/C switch to OFF. 3) Disconnect sub fan motor connector. 4) Start the engine, and warm it up until engine coolant temperature increases over 95°C (203°F). 5) Measure voltage between sub fan motor connector and chassis ground. Connector & terminal (F16) No. 1 (+) — Chassis ground (-):	Is the measured value more than 10 V?	Go to step 19.	Go to step 21.
19 CHECK POOR CONTACT. Check poor contact in sub fan motor connector.	Is there poor contact in sub fan motor connector?	Repair poor contact in sub fan motor connector.	Go to step 20.
20 CHECK SUB FAN MOTOR. Connect battery positive (+) terminal to terminal No. 1, and negative (-) terminal to terminal No. 4 of sub fan motor connector.	Does the sub fan rotate?	Repair poor contact in sub fan motor connector.	Replace sub fan motor with a new one.
21 CHECK POWER SUPPLY TO SUB FAN RELAY 1. 1) Turn ignition switch to OFF. 2) Remove sub fan relay 1 from A/C relay holder. 3) Measure voltage between sub fan relay 1 terminal and chassis ground. Connector & terminal (F27) No. 28 (+) — Chassis ground (-):	Is the measured value more than 10 V?	Go to step 22.	Go to step 23.
22 CHECK POWER SUPPLY TO SUB FAN RELAY 1. 1) Turn ignition switch to ON. 2) Measure voltage between sub fan relay 1 terminal and chassis ground. Connector & terminal (F27) No. 25 (+) — Chassis ground (-):	Is the measured value more than 10 V?	Go to step 26.	Go to step 25.
23 CHECK 30 A FUSE. 1) Remove 30 A fuse from A/C relay holder. 2) Check condition of fuse.	Is the fuse blown out?	Replace fuse.	Go to step 24.
24 CHECK POWER SUPPLY TO A/C RELAY HOLDER 30 A FUSE TERMINAL. Measure voltage of harness between A/C relay holder 30 A fuse terminal and chassis ground. Connector & terminal (F27) No. 3(+) — Chassis ground (-):	Is the measured value more than 10 V?	Repair open circuit in harness between 30 A fuse and sub fan relay 1 terminal.	Repair open circuit in harness between main fuse box connector and 30 A fuse terminal.
25 CHECK FUSE. 1) Turn ignition switch to OFF. 2) Remove fuse No. 18 from joint box. 3) Check condition of fuse.	Is the fuse blown out?	Replace fuse.	Repair open circuit in harness between sub fan relay 1 and ignition switch.

RADIATOR SUB FAN SYSTEM

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Step	Check	Yes	No
26 CHECK SUB FAN RELAY 1. 1) Turn ignition switch to OFF. 2) Remove sub fan relay 1. 3) Measure resistance of sub fan relay 1. <i>Terminal</i> <i>No. 28 — No. 29:</i>	Is the measured value more than 1 M Ω ?	Go to step 27.	Replace sub fan relay 1.
27 CHECK SUB FAN RELAY. 1) Connect battery to terminals No. 21 and No. 22 of sub fan relay 1. 2) Measure resistance of sub fan relay 1. <i>Terminal</i> <i>No. 28 — No. 29:</i>	Is the measured value less than 1 Ω ?	Go to step 28.	Replace sub fan relay 1.
28 CHECK HARNESS BETWEEN SUB FAN RELAY TERMINAL AND SUB FAN MOTOR CONNECTOR. Measure resistance of harness between sub fan motor connector and sub fan relay 1 terminal. <i>Connector & terminal</i> <i>(F16) No. 1 — (F27) No. 29:</i>	Is the measured value less than 1 Ω ?	Go to step 29.	Replace open circuit in harness between sub fan motor connector and sub fan relay 1 terminal.
29 CHECK HARNESS BETWEEN SUB FAN RELAY 1 AND ECM. 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between sub fan relay 1 connector and ECM connector. <i>Connector & terminal</i> <i>(F27) No. 27 — (B137) No. 28:</i>	Is the measured value less than 1 Ω ?	Go to step 30.	Repair open circuit in harness between sub fan relay and ECM.
30 CHECK POOR CONTACT. Check poor contact in connector between sub fan and ECM.	Is there poor contact in connector between sub fan motor and ECM?	Repair poor contact connector.	Contact with SOA (distributor) service.
31 CHECK HARNESS BETWEEN SUB FAN MOTOR CONNECTOR AND CHASSIS GROUND. 1) Turn ignition switch to OFF. 2) Disconnect sub fan motor connector. 3) Measure resistance of harness between sub fan motor connector and chassis ground. <i>Connector & terminal</i> <i>(F16) No. 3 — Chassis ground:</i>	Is the measured value less than 5 Ω ?	Go to step 32.	Go to step 33.
32 CHECK POOR CONTACT. Check poor contact in sub fan motor connector.	Is there poor contact in sub fan motor connector?	Repair poor contact in sub fan motor connector.	Replace sub fan motor with a new one.
33 CHECK HARNESS BETWEEN SUB FAN AND FAN RELAY. 1) Disconnect fan relay connector. 2) Measure resistance between sub fan motor connector and fan relay connector. <i>Connector & terminal</i> <i>(F16) No. 3 — (B253) No. 4:</i>	Is the measured value less than 1 Ω ?	Go to step 34.	Repair open circuit between sub fan motor connector and fan relay connector.
34 CHECK POWER SUPPLY TO FAN RELAY. 1) Turn ignition switch to ON. 2) Measure voltage between fan relay terminal and chassis ground. <i>Connector & terminal</i> <i>(B253) No. 1 (+) — Chassis ground (-):</i>	Is the measured value more than 10 V?	Go to step 36.	Go to step 35.

RADIATOR SUB FAN SYSTEM

COOLING

Step	Check	Yes	No
35 CHECK FUSE. 1) Turn ignition switch to OFF. 2) Remove fuse No. 18 from joint box. 3) Check condition of fuse.	Is the fuse blown out?	Replace fuse.	Repair open circuit in harness between fan relay and ignition switch.
36 CHECK FAN RELAY. 1) Turn ignition switch to OFF. 2) Remove fan relay. 3) Measure resistance of fan relay. <i>Terminal</i> <i>No. 4 — No. 3:</i>	Is the measured value more than 1 MΩ?	Go to step 37.	Replace fan relay.
37 CHECK FAN RELAY. 1) Connect battery to terminals No. 1 and No. 3 of fan relay. 2) Measure resistance of fan relay. <i>Terminal</i> <i>No. 4 — No. 3:</i>	Is the measured value less than 1 Ω?	Go to step 38.	Replace fan relay.
38 CHECK HARNESS BETWEEN FAN RELAY TERMINAL AND CHASSIS GROUND. Measure resistance of harness between fan relay connector and chassis ground. <i>Connector & terminal</i> <i>(B253) No. 3 — Chassis ground:</i>	Is the measured value less than 1 Ω?	Go to step 39.	Repair open circuit in harness between fan relay connector and chassis ground.
39 CHECK HARNESS BETWEEN FAN RELAY AND ECM. 1) Turn ignition switch to OFF. 2) Disconnect connector from ECM. 3) Measure resistance of harness between fan relay connector and ECM connector. <i>Connector & terminal</i> <i>(B253) No. 2 — (B137) No. 24:</i>	Is the measured value less than 1 Ω?	Go to step 40.	Repair open circuit in harness between fan relay connector and ECM.
40 CHECK POOR CONTACT. Check poor contact in connector between fan relay and ECM.	Is there poor contact in connector between fan relay and ECM?	Repair poor contact connector.	Contact with SOA (distributor) service.

NOTE:

Inspection by SOA (distributor) service is required, because probable cause is deterioration of multiple parts.

ENGINE COOLANT

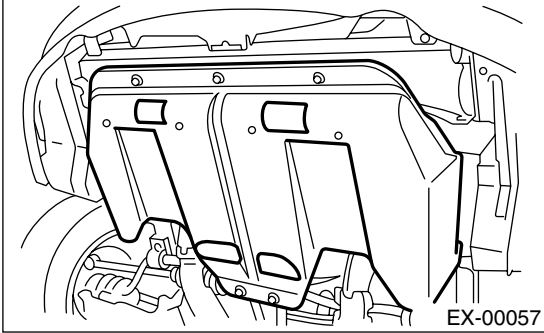
COOLING

4. Engine Coolant

A: REPLACEMENT

1. DRAINING OF ENGINE COOLANT

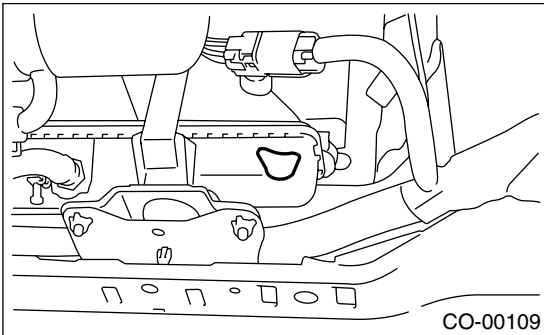
- 1) Lift-up the vehicle.
- 2) Remove under cover.



- 3) Remove drain cock to drain engine coolant into container.

NOTE:

Remove radiator cap so that engine coolant will drain faster.



2. FILLING OF ENGINE COOLANT

- 1) Fill engine coolant into radiator up to filler neck position.

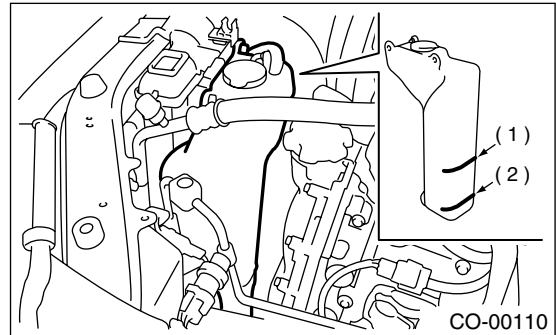
Coolant amount for refill:

Approx. 7.9 ℓ (8.4 US qt, 7.0 Imp qt)

CAUTION:

The SUBARU Genuine Coolant containing anti-freeze and anti-rust agents is especially made for SUBARU engine, which has an aluminum crankcase. Always use SUBARU Genuine Coolant, since other coolant may cause corrosion.

- 2) Fill engine coolant into reservoir tank up to upper level.



- (1) Full level
- (2) Low level

- 3) Attach radiator cap and reservoir tank cap properly.
- 4) Warm-up engine completely for more than five minutes at 2,000 to 3,000 rpm.
- 5) If engine coolant level drops in radiator, add engine coolant to filler neck position.
- 6) If engine coolant level drops from upper level of reservoir tank, add engine coolant to upper level.
- 7) Attach radiator cap and reservoir tank cap properly.

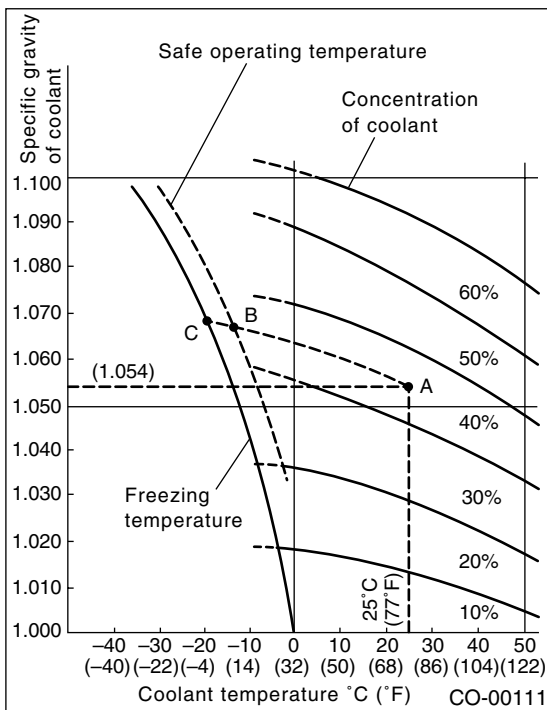
B: INSPECTION

1. RELATIONSHIP OF SUBARU COOLANT CONCENTRATION AND FREEZING TEMPERATURE

The concentration and safe operating temperature of the SUBARU coolant is shown in the diagram. Measuring the temperature and specific gravity of the coolant will provide this information.

[Example]

If the coolant temperature is 25°C (77°F) and its specific gravity is 1.054, the concentration is 35% (point A), the safe operating temperature is -14°C (7°F) (point B), and the freezing temperature is -20°C (-4°F) (point C).



2. PROCEDURE TO ADJUST THE CONCENTRATION OF THE COOLANT

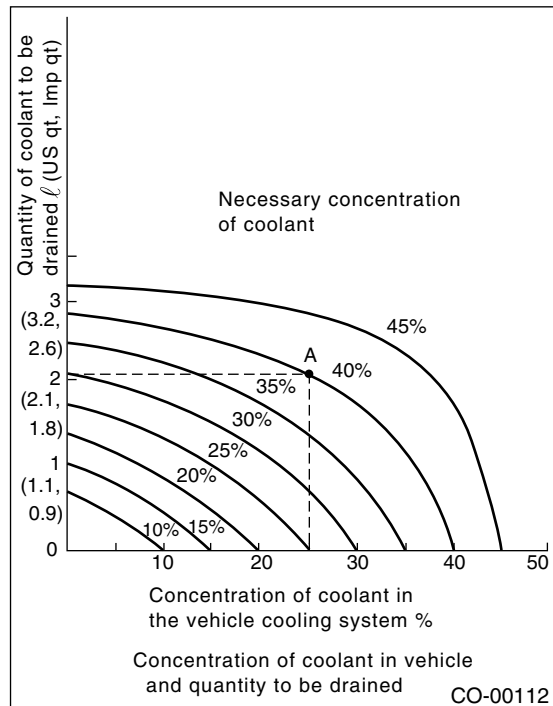
To adjust the concentration of the coolant according to temperature, find the proper fluid concentration in the above diagram and replace the necessary amount of coolant with an undiluted solution of SUBARU genuine coolant (concentration 50).

The amount of coolant that should be replaced can be determined using the diagram.

[Example]

Assume that the coolant concentration must be increased from 25% to 40%. Find point A, where the 25% line of coolant concentration intersects with the 40% curve of the necessary coolant concentration, and read the scale on the vertical axis of the graph at height A. The quantity of coolant to be drained is 2.1 liters (2.2 US qt, 1.8 Imp qt). Drain 2.1 liters (2.2 US qt, 1.8 Imp qt) of coolant from the cooling system and add 2.1 liters (2.2 US qt, 1.8 Imp qt) of the undiluted solution of SUBARU coolant.

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



WATER PUMP

COOLING

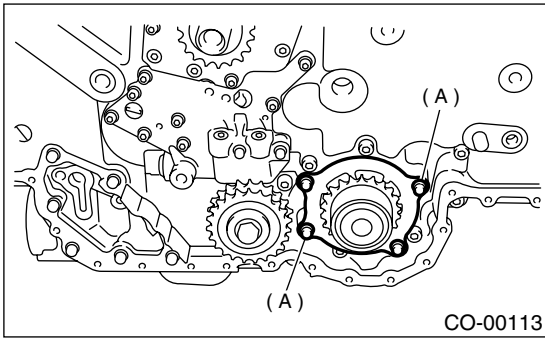
5. Water Pump

A: REMOVAL

- 1) Remove radiator. <Ref. to CO(H6DO)-23, REMOVAL, Radiator.>
- 2) Drain engine oil.
<Ref. to LU(H6DO)-10, REPLACEMENT, Engine Oil.>
- 3) Remove V-belt.
<Ref. to ME(H6DO)-28, REMOVAL, V-belt.>
- 4) Remove front chain cover.
<Ref. to ME(H6DO)-39, REMOVAL, Front Chain Cover.>
- 5) Remove timing chain.
<Ref. to ME(H6DO)-41, REMOVAL, Timing Chain Assembly.>
- 6) Remove water pump.

NOTE:

When water pump cannot be easily removed, install M8 bolt in opposing bolt holes ("A" in figure). Alternately tightening each bolt should be enough to gradually free water pump from rear chain cover.



B: INSTALLATION

- 1) Install water pump onto rear chain cover.

NOTE:

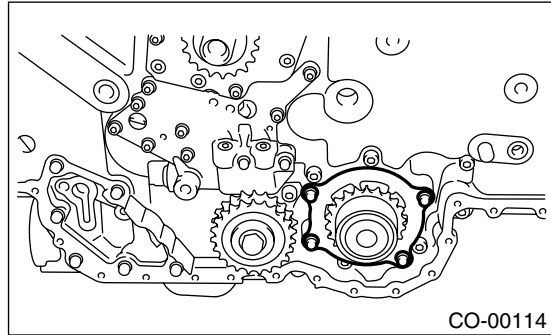
Apply engine coolant to O-ring.

Tightening torque:

6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

NOTE:

- Replace O-rings with a new one.
- Applying engine coolant to O-ring makes water pump installation easier.



- 2) Install timing chain assembly. <Ref. to ME(H6DO)-42, INSTALLATION, Timing Chain Assembly.>
- 3) Install front chain cover.
<Ref. to ME(H6DO)-39, INSTALLATION, Front Chain Cover.>
- 4) Install V-belt. <Ref. to ME(H6DO)-28, INSTALLATION, V-belt.>
- 5) Install radiator. <Ref. to CO(H6DO)-24, INSTALLATION, Radiator.>
- 6) Fill coolant. <Ref. to CO(H6DO)-18, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
- 7) Fill engine oil.
<Ref. to LU(H6DO)-10, REPLACEMENT, Engine Oil.>

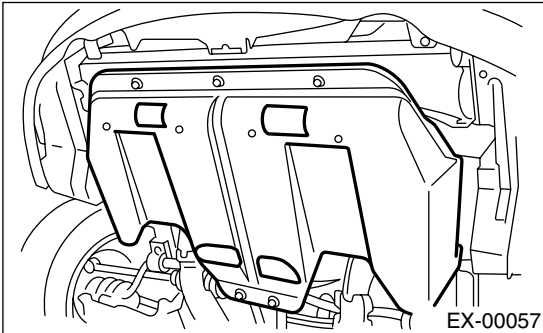
C: INSPECTION

- 1) Check water pump bearing for smooth rotation.
- 2) Check water pump sprocket for abnormalities.

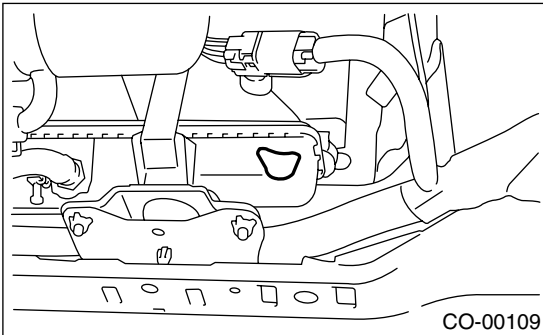
6. Thermostat

A: REMOVAL

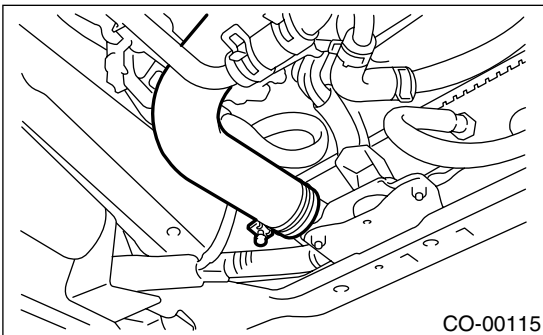
- 1) Lift-up the vehicle.
- 2) Remove under cover.



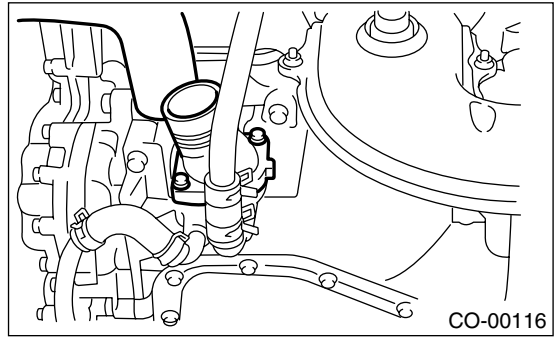
- 3) Drain engine coolant completely. <Ref. to CO(H6DO)-18, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>



- 4) Disconnect radiator outlet hose from thermostat cover.



- 5) Remove thermostat cover and gasket, and pull out the thermostat.



B: INSTALLATION

- 1) Install the thermostat to oil pan upper, and install the thermostat cover together with a gasket.

NOTE:

When reinstalling the thermostat, use a new gasket.

Tightening torque:

6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

- 2) Connect radiator outlet hose to thermostat cover.
- 3) Fill coolant. <Ref. to CO(H6DO)-18, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

C: INSPECTION

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

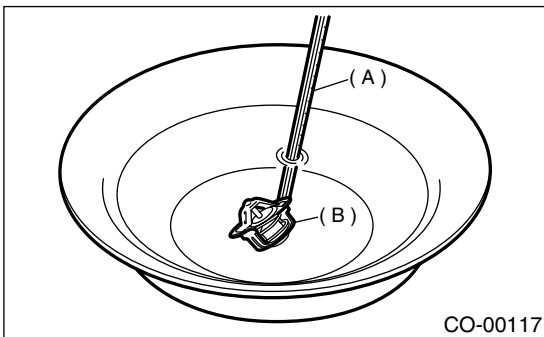
Immerse the thermostat and a thermometer in water. Raise water temperature gradually, and measure the temperature and valve lift when the valve begins to open and when the valve is fully opened. During the test, agitate the water for even temperature distribution. The measurement should be to the specification.

Starts to open:

76.0 — 80.0°C (169 — 176°F)

Fully opens:

91°C (196°F)

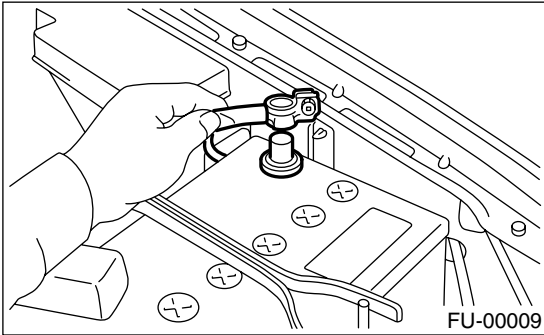


- (A) Thermometer
- (B) Thermostat

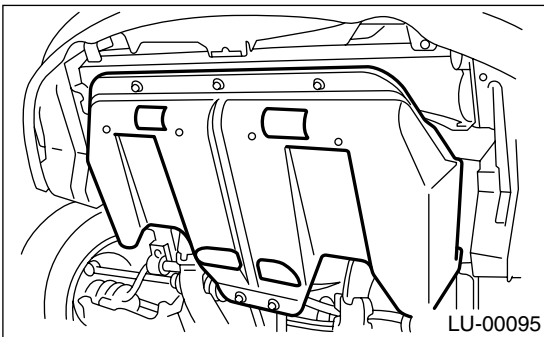
7. Radiator

A: REMOVAL

1) Disconnect battery ground cable.

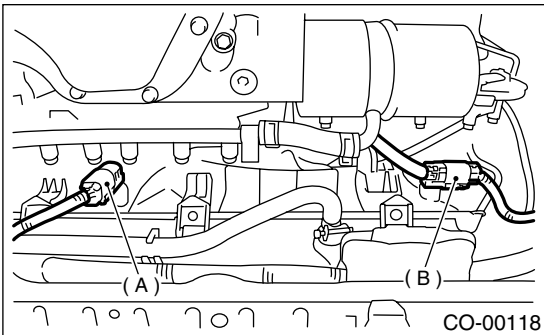


2) Lift-up the vehicle.
3) Remove under cover.

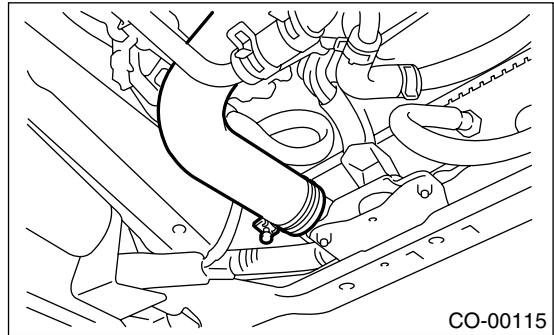


4) Drain engine coolant completely. <Ref. to CO(H6DO)-18, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

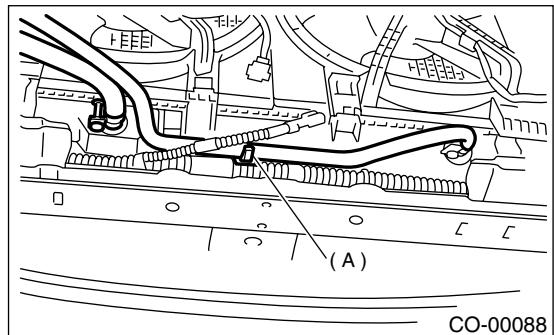
5) Disconnect connectors of radiator main fan motor (A) and sub fan motor (B).



6) Disconnect radiator outlet hose from radiator.

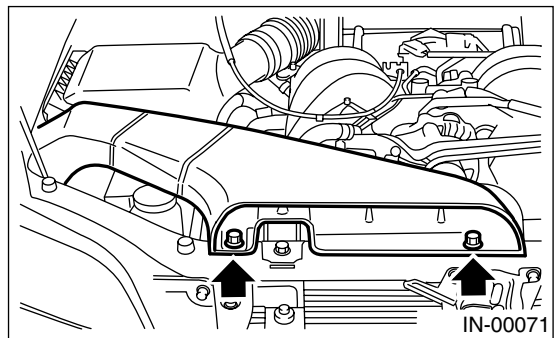


7) Disconnect ATF cooler hoses from radiator.

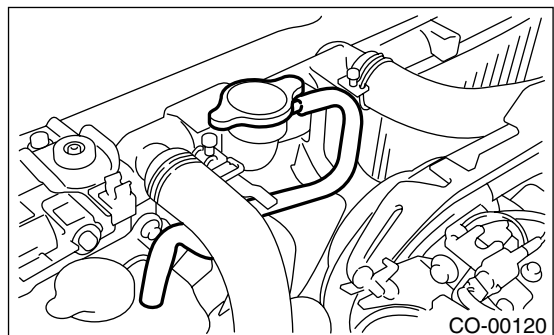


(A) Clip

8) Lower the vehicle.
9) Remove air intake duct.



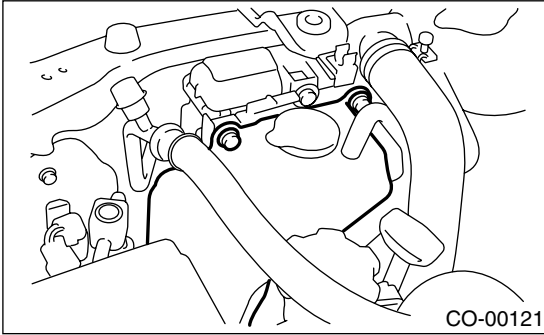
10) Disconnect over flow hose.



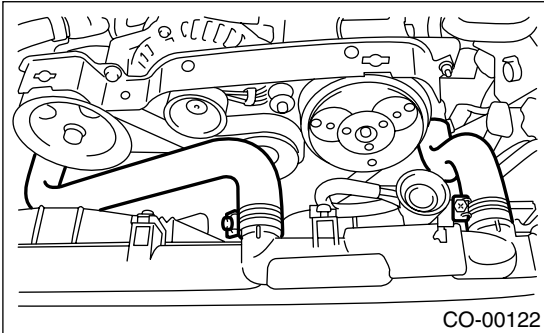
RADIATOR

COOLING

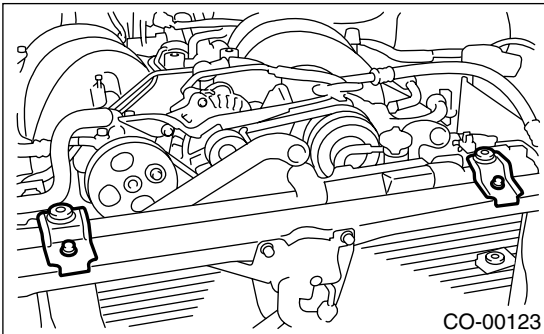
11) Remove reservoir tank.



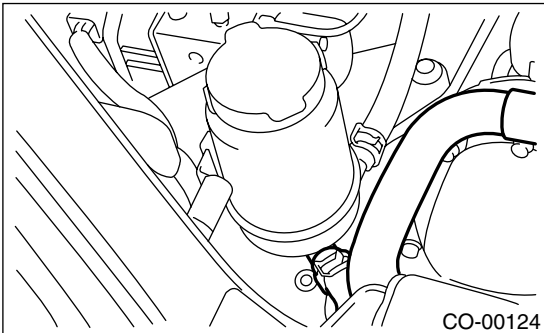
12) Disconnect radiator inlet hoses from radiator.



13) Remove radiator upper brackets.

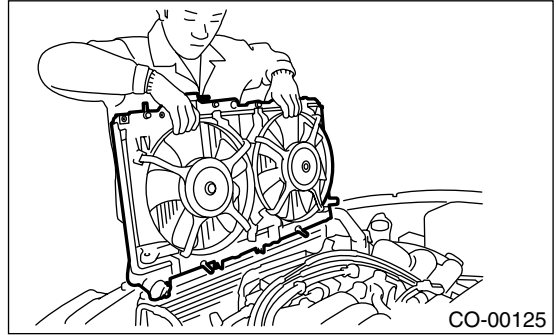


14) Detach power steering hose from the clip on the radiator.



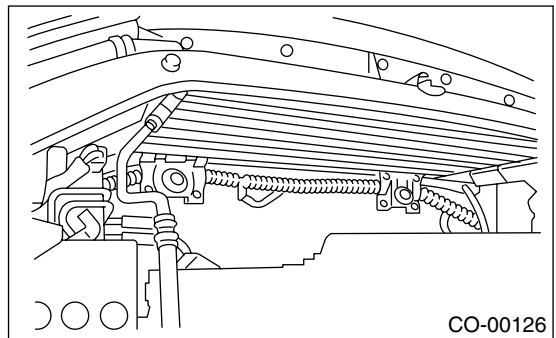
15) While slightly lifting radiator, slide it to left.

16) Lift radiator up and away from vehicle.



B: INSTALLATION

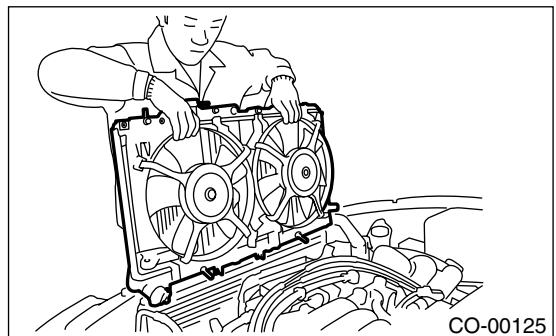
1) Attach radiator mounting cushions to holes on the vehicle.



2) Install radiator while fitting radiator pins to cushions.

NOTE:

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



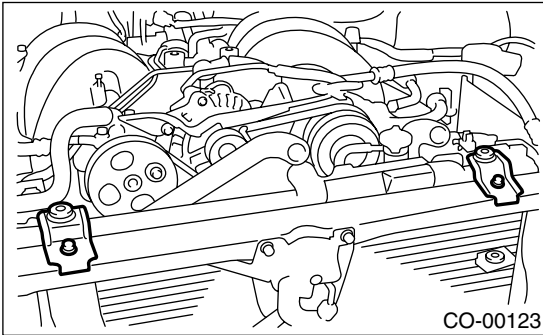
RADIATOR

COOLING

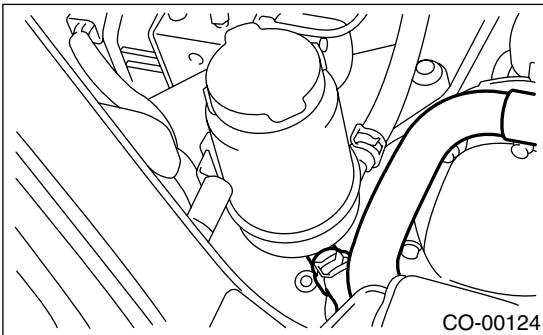
3) Install radiator brackets and tighten bolts.

Tightening torque:

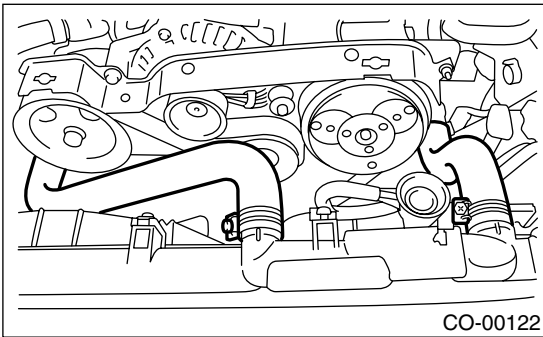
12 N·m (1.2 kgf-m, 8.7 ft-lb)



4) Attach power steering hose to the radiator.



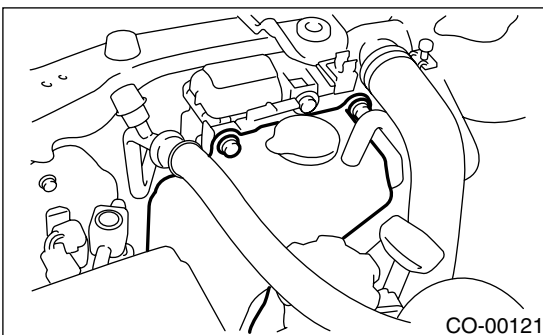
5) Connect radiator inlet hoses.



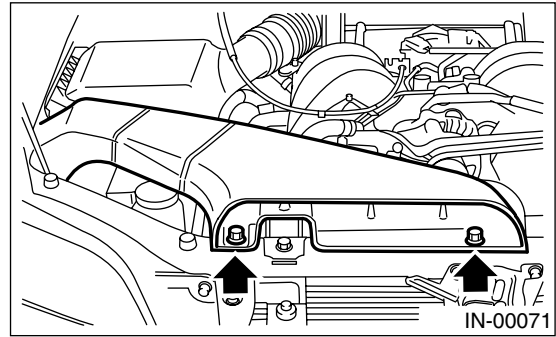
6) Install reservoir tank.

Tightening torque:

4.9 N·m (0.50 kgf-m, 3.6 ft-lb)

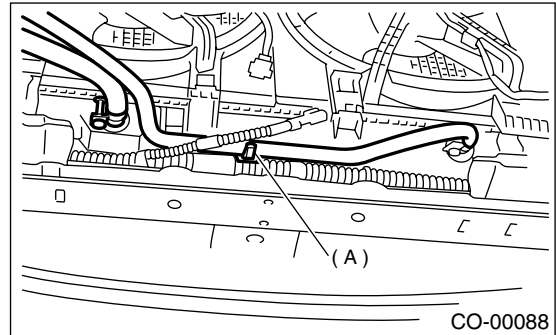


7) Install air intake duct.



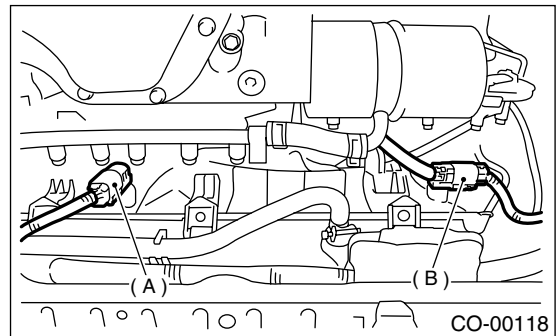
8) Lift-up the vehicle.

9) Connect ATF cooler hoses.

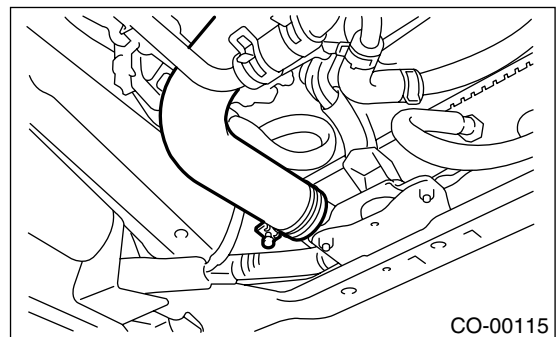


(A) Clip

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



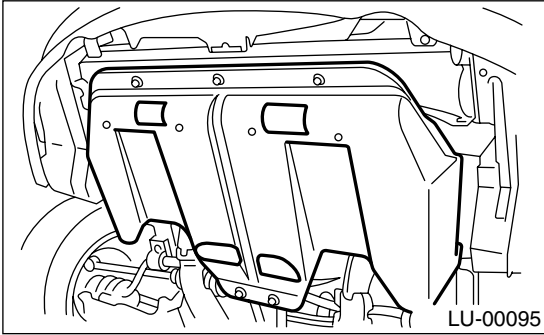
11) Connect radiator outlet hose.



RADIATOR

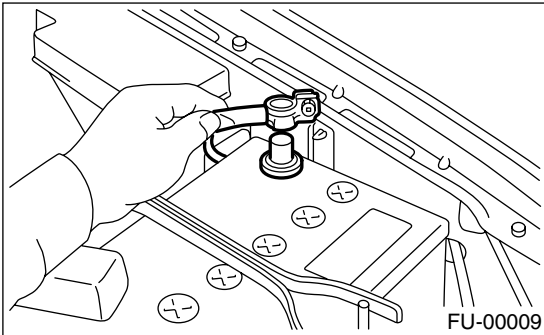
COOLING

12) Install under cover.



13) Lower the vehicle.

14) Connect battery ground cable.

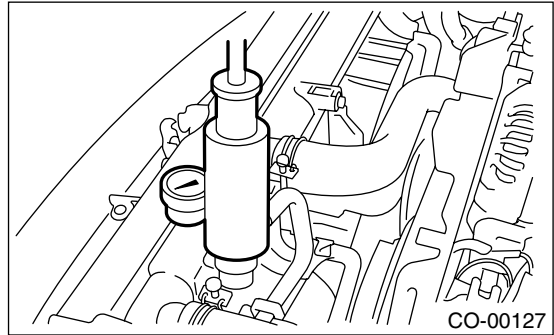


15) Fill coolant. <Ref. to CO(H6DO)-18, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

16) Check ATF level. <Ref. to 4AT-31, INSPECTION, Automatic Transmission Fluid.>

C: INSPECTION

1) Remove radiator cap, top off radiator, and attach tester to radiator in place of cap.



2) Apply a pressure of 157 kPa (1.6 kg/cm², 23 psi) to radiator to check if:

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

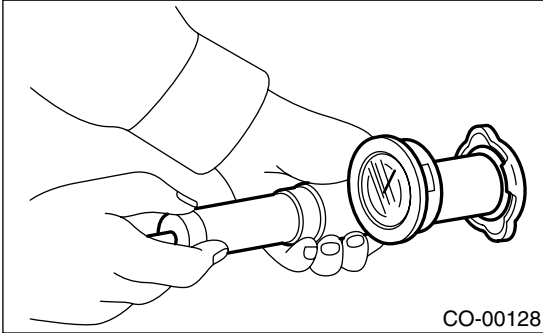
CAUTION:

- Engine should be off.
- Wipe engine coolant from check points in advance.
- Be careful to prevent engine coolant from spurting out when removing tester.
- Be careful also not to deform filler neck of radiator when installing or removing tester.

8. Radiator Cap

A: INSPECTION

1) Attach radiator cap to tester.



2) Increase pressure until tester gauge pointer stops. Radiator cap is functioning properly if it holds the service limit pressure for five to six seconds.

Standard pressure:

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

Service limit pressure:

83 kPa (0.85 kg/cm², 12 psi)

CAUTION:

Be sure to remove foreign matter and rust from the cap in advance otherwise, results of pressure test will be incorrect.

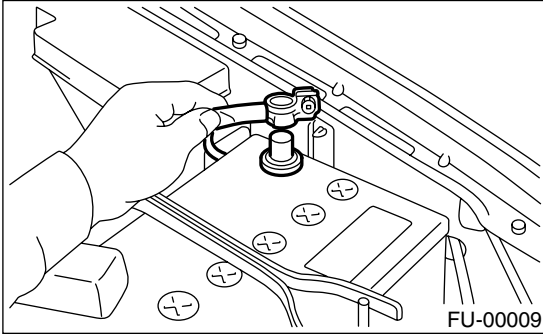
RADIATOR MAIN FAN AND FAN MOTOR

COOLING

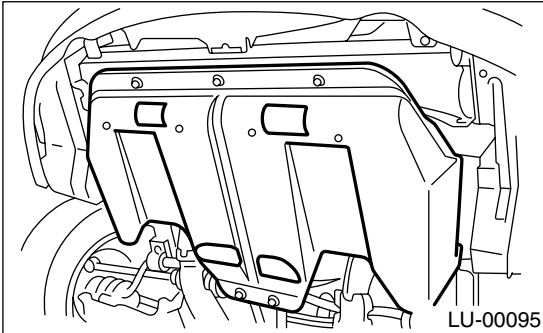
9. Radiator Main Fan and Fan Motor

A: REMOVAL

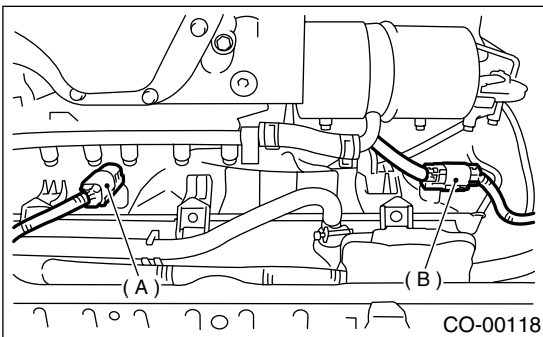
1) Disconnect battery ground cable.



2) Lift-up the vehicle.
3) Remove under cover.

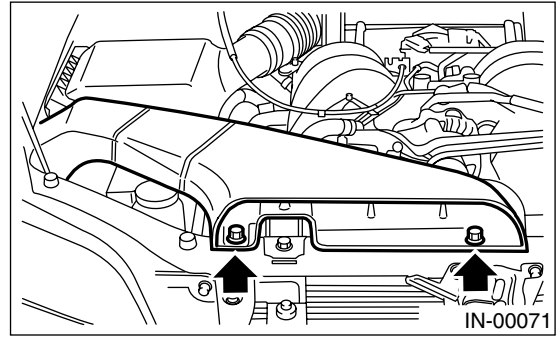


4) Drain engine coolant completely.
<Ref. to CO(H6DO)-18, Engine Coolant.>
5) Disconnect connectors of main and sub fan motor.

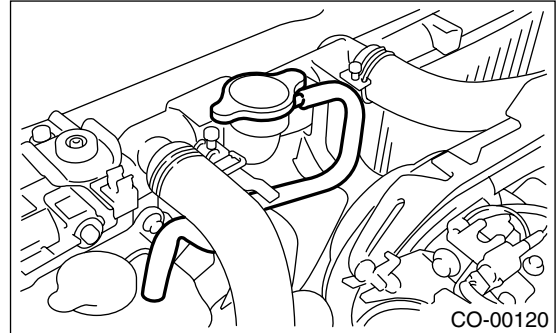


(A) Main fan motor connector
(B) Sub fan motor connector

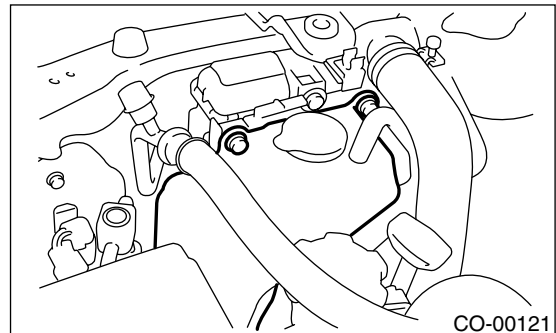
6) Lower the vehicle.
7) Remove air intake duct.



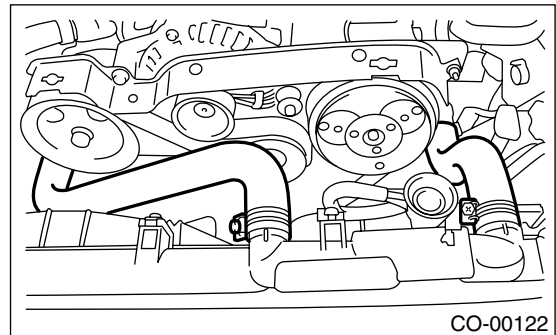
8) Disconnect over flow hose.



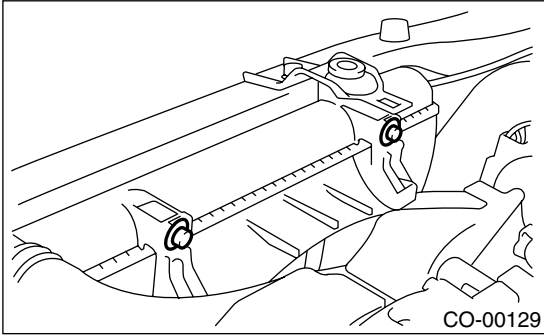
9) Remove reservoir tank.



10) Disconnect radiator inlet hoses from radiator.



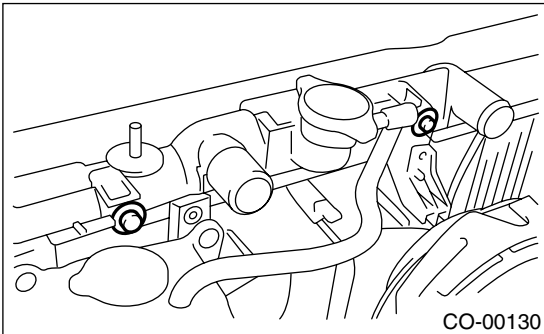
11) Remove radiator sub fan motor assembly.



12) Remove radiator main fan motor assembly.

NOTE:

When removing main fan assembly by lifting it upward, main fan shroud will cause interference with coolant suction area. In order to avoid this, shift the main fan assembly over to sub fan side before removing it.

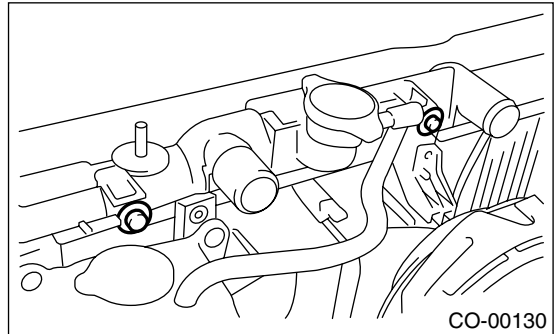


B: INSTALLATION

Install in the reverse order of removal.

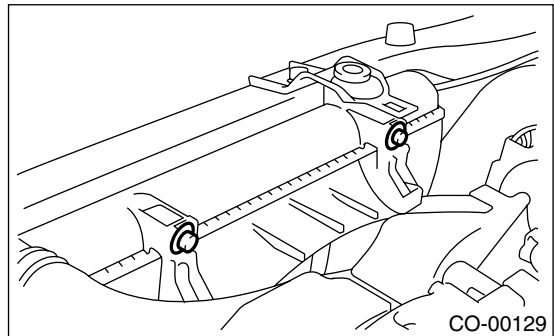
Tightening torque:

4.9 N·m (0.50 kgf-m, 3.6 ft-lb)



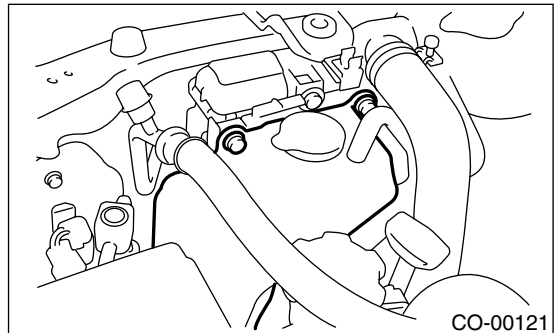
Tightening torque:

4.9 N·m (0.50 kgf-m, 3.6 ft-lb)



Tightening torque:

4.9 N·m (0.50 kgf-m, 3.6 ft-lb)

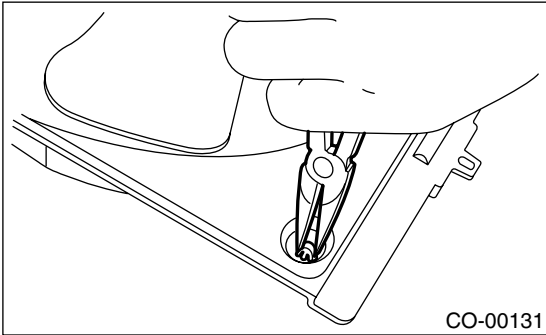


RADIATOR MAIN FAN AND FAN MOTOR

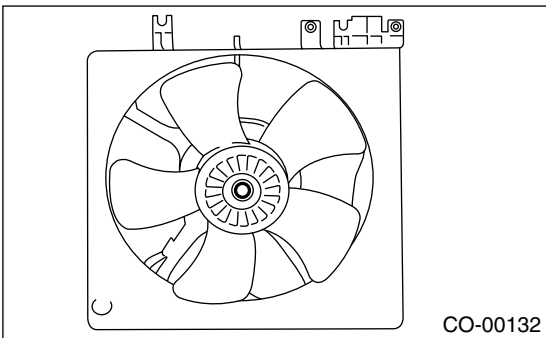
COOLING

C: DISASSEMBLY

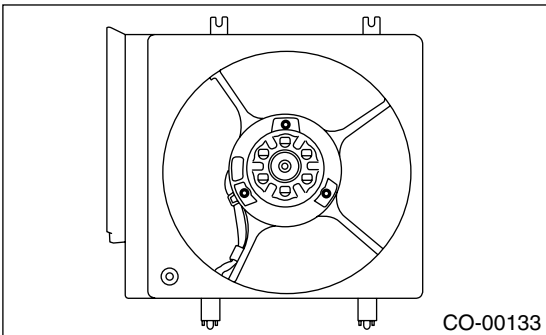
1) Remove clip which holds motor connector onto shroud.



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



3) Remove screws which install fan motor onto shroud.

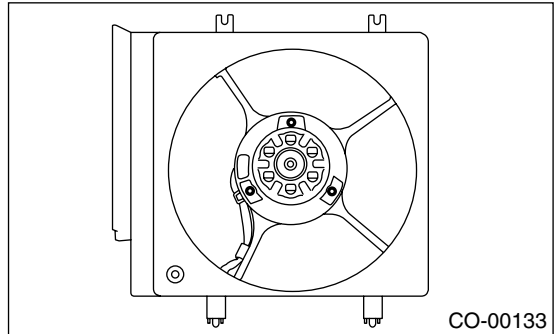


D: ASSEMBLY

Assemble in the reverse order of disassembly.

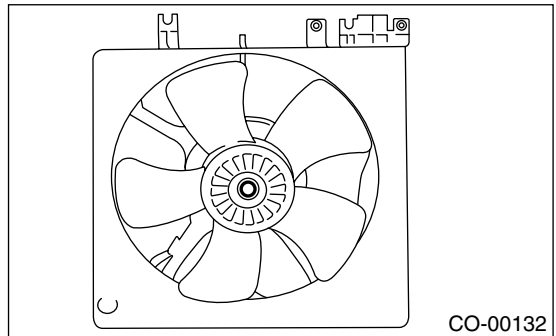
Tightening torque:

4.4 N·m (0.45 kgf·m, 3.3 ft·lb)



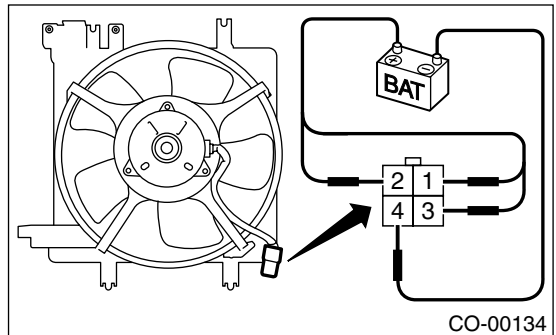
Tightening torque:

7.5 N·m (0.76 kgf·m, 5.5 ft·lb)



E: INSPECTION

1) Connect battery as shown in the figure.



Terminal

No. 1 (+) — No. 4 (–): Low speed

No. 2 (+) — No. 4 (–): Middle speed

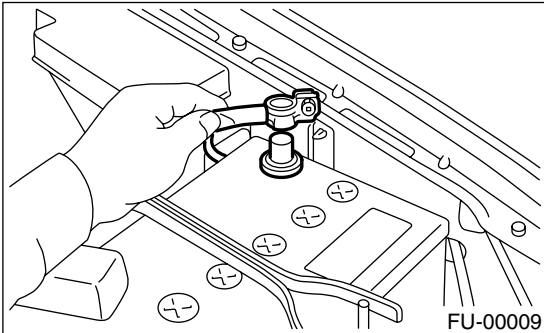
No. 3 (+) — No. 4 (–): High speed

2) Make sure the main fan motor operates properly. Replace it if it doesn't.

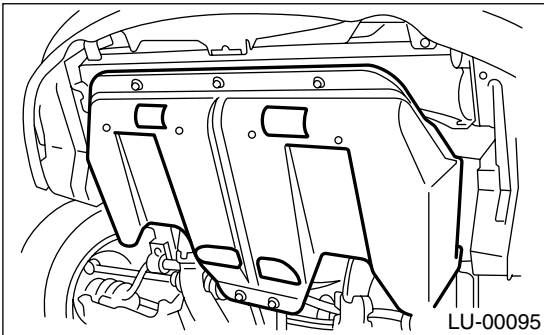
10. Radiator Sub Fan and Fan Motor

A: REMOVAL

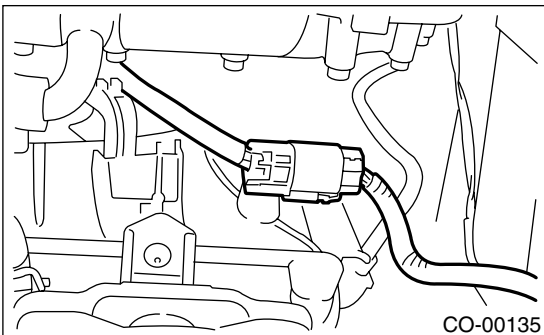
- 1) Disconnect battery ground cable.



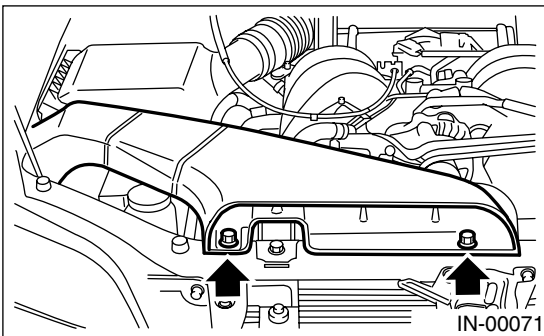
- 2) Lift-up the vehicle.
- 3) Remove under cover.



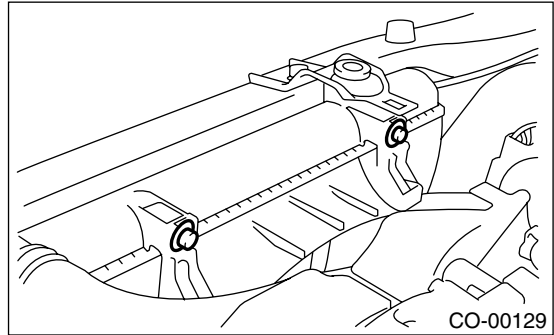
- 4) Disconnect connector of sub fan motor.



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



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

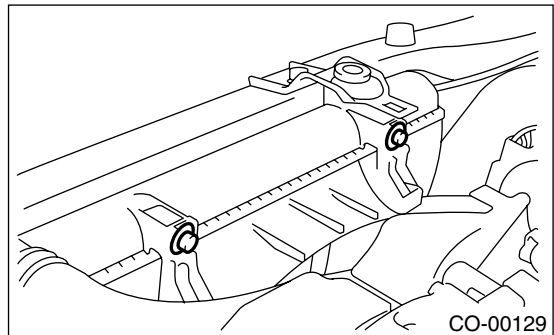


B: INSTALLATION

Install in the reverse order of removal.

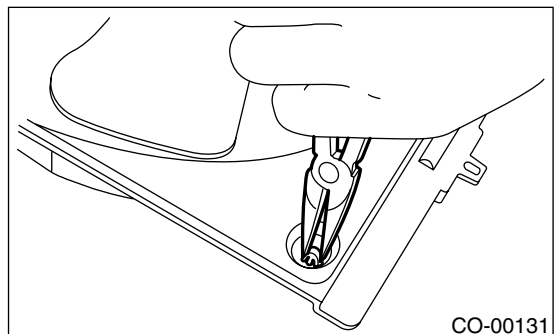
Tightening torque:

4.9 N·m (0.50 kgf-m, 3.6 ft-lb)



C: DISASSEMBLY

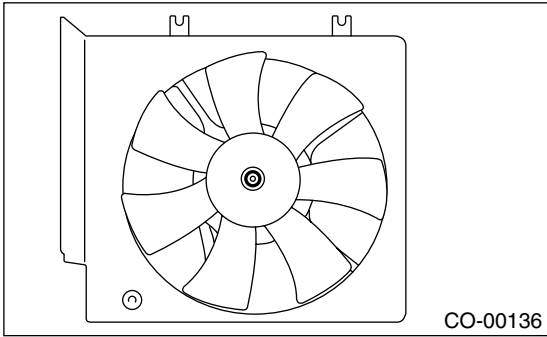
- 1) Remove clip which holds motor harness onto shroud.



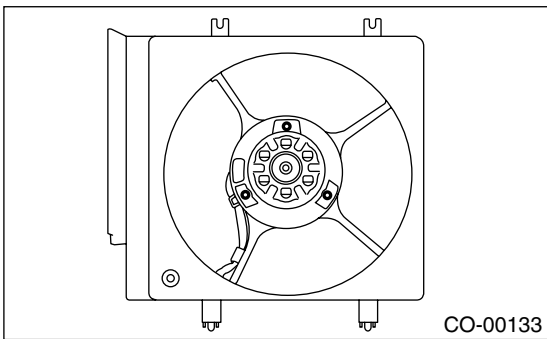
RADIATOR SUB FAN AND FAN MOTOR

COOLING

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



3) Remove screws which install fan motor onto shroud.

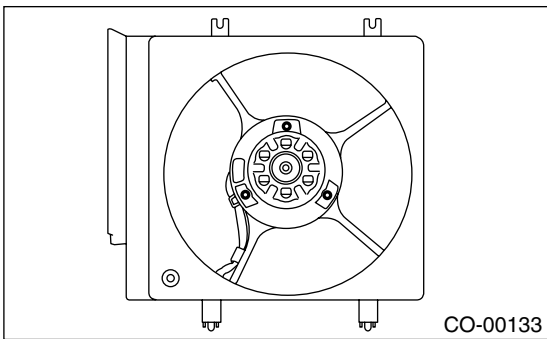


D: ASSEMBLY

Assemble in the reverse order of disassembly.

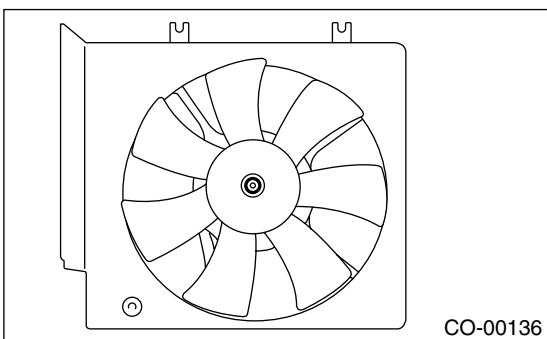
Tightening torque:

4.4 N·m (0.45 kgf·m, 3.3 ft·lb)



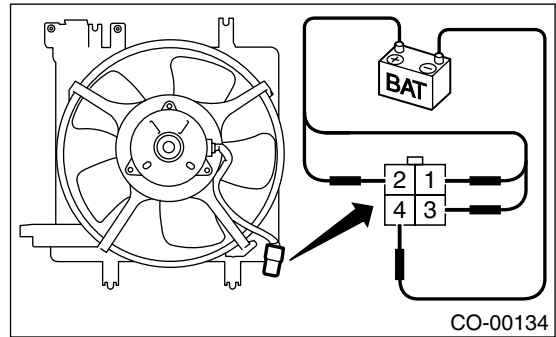
Tightening torque:

7.5 N·m (0.76 kgf·m, 5.5 ft·lb)



E: INSPECTION

1) Connect battery as shown in the figure.



Terminal

No. 1 (+) — No. 4 (-): Low speed

No. 2 (+) — No. 4 (-): Middle speed

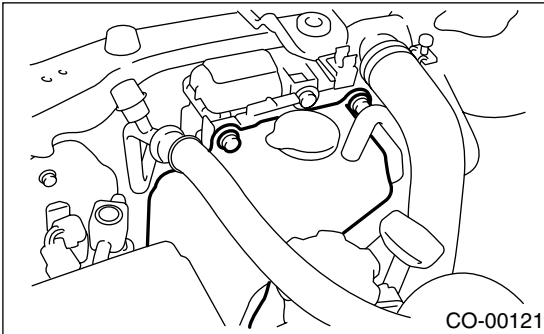
No. 3 (+) — No. 4 (-): High speed

2) Make sure the sub-fan motor operates properly. Replace it if it doesn't.

11. Reservoir Tank

A: REMOVAL

- 1) Disconnect over flow hose from radiator filler neck position.
- 2) Remove bolts which install reservoir tank onto radiator main fan shroud.
- 3) Remove reservoir tank.

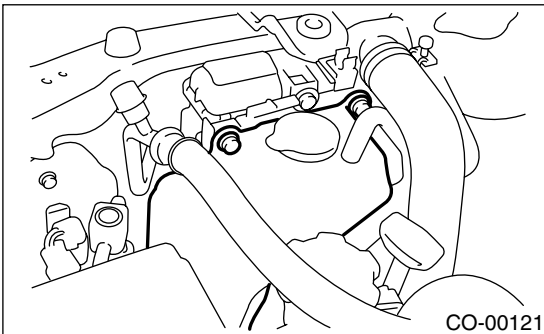


B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

4.9N·m (0.50 kgf-m, 3.6 ft-lb)



C: INSPECTION

Make sure the engine coolant level is between full and low.

ENGINE COOLING SYSTEM TROUBLE IN GENERAL

COOLING

12.Engine Cooling System Trouble in General

A: INSPECTION

Trouble		Corrective action
Over-heating	a. Insufficient engine coolant	Replenish engine coolant, inspect for leakage, and repair.
	b. Malfunction of thermostat	Replace.
	c. Malfunction of water pump	Replace.
	d. Clogged engine coolant passage	Clean.
	e. Improper ignition timing	Inspect and repair ignition control system. <Ref. to EN(H6DO)-2, Basic Diagnostic Procedure.>
	f. Clogged or leaking radiator	Clean or repair, or replace.
	g. Improper engine oil in engine coolant	Replace engine coolant.
	h. Air/fuel mixture ratio too lean	Inspect and repair fuel injection system. <Ref. to EN(H6DO)-2, 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	Repair or replace.
	l. Dragging brake	Adjust.
	m. Improper transmission oil	Replace.
	n. Defective thermostat	Replace.
o. Malfunction of electric fan	Inspect radiator fan relay, engine coolant temperature sensor or radiator motor and replace there.	
Over-cooling	a. Atmospheric temperature extremely low	Partly cover radiator front area.
	b. Defective thermostat	Replace.
Engine coolant leaks.	a. Loosened or damaged connecting units on hoses	Repair or replace.
	b. Leakage from water pump	Replace.
	c. Leakage from water pipe	Repair or replace.
	d. Leakage around cylinder head gasket	Retighten cylinder head bolts or replace gasket.
	e. Damaged or cracked cylinder head and crankcase	Repair or replace.
	f. Damaged or cracked thermostat case	Repair or replace.
	g. Leakage from radiator	Repair or replace.
Noise	a. Defective timing chain	Replace.
	b. Defective radiator fan	Replace.
	c. Defective water pump bearing	Replace water pump.
	d. Defective water pump mechanical seal	Replace water pump.