

COOLING

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	Page
1. General Description	2
2. Radiator Main Fan System.....	9
3. Radiator Sub Fan System	17
4. Engine Coolant.....	25
5. Water Pump	27
6. Thermostat	35
7. Radiator.....	37
8. Radiator Cap	45
9. Radiator Main Fan and Fan Motor	46
10. Radiator Sub Fan and Fan Motor.....	48
11. Reservoir Tank.....	50
12. Coolant Filler Tank.....	51
13. Engine Cooling System Trouble in General	52

GENERAL DESCRIPTION

COOLING

1. General Description

A: SPECIFICATIONS

Model			Non-turbo	Turbo
Cooling system			Electric fan + Forced engine coolant circulation system	
Total engine coolant capacity			MT: Approx. 7 (7.4, 6.2) AT: Approx. 6.9 (7.29, 6.07)	MT: Approx. 7.7 (8.14, 6.78) AT: Approx. 7.6 (8.03, 6.69)
Water pump	Type		Centrifugal impeller type	
	Discharge performance I	Discharge	20 ℓ (5.3 US gal, 4.4 Imp gal)/min.	
		Pump speed—total engine coolant head	700 rpm — 0.3 mAq (1.0 ftAq)	
		Engine coolant temperature	85°C (185°F)	
	Discharge performance II	Discharge	100 ℓ (26.4 US gal, 22.0 Imp gal)/min.	
		Pump speed—total engine coolant head	3,000 rpm — 5.0 mAq (16.4 ftAq)	
		Engine coolant temperature	85°C (185°F)	
	Discharge performance III	Discharge	200 ℓ (52.8 US gal, 44.0 Imp gal)/min.	
		Pump speed—total engine coolant head	6,000 rpm — 23.0 mAq (75.5 ftAq)	
		Engine coolant temperature	85°C (185°F)	
	Impeller diameter		76 mm (2.99 in)	
	Number of impeller vanes		8	
	Pump pulley diameter		60 mm (2.36 in)	
Thermostat	Clearance between impeller and case	Standard	0.5 — 0.7 mm (0.020 — 0.028 in)	
		Limit	1.0 mm (0.039 in)	
	"Thrust" runout of impeller end		0.5 mm (0.020 in)	
Radiator fan	Type		Wax pellet type	
	Starts to open		76 — 80°C (169 — 176°F)	
	Fully opened		91°C (196°F)	
	Valve lift		9.0 mm (0.354 in) or more	
	Valve bore		35 mm (1.38 in)	
Radiator fan	Motor	Main fan	70 W	120 W
		Sub fan	70 W	120 W
	Fan diameter × 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		*1 691.5 × 340 × 16 mm (27.22 × 13.39 × 0.63 in)	*2 691.5 × 340 × 27 mm (27.22 × 13.39 × 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)	

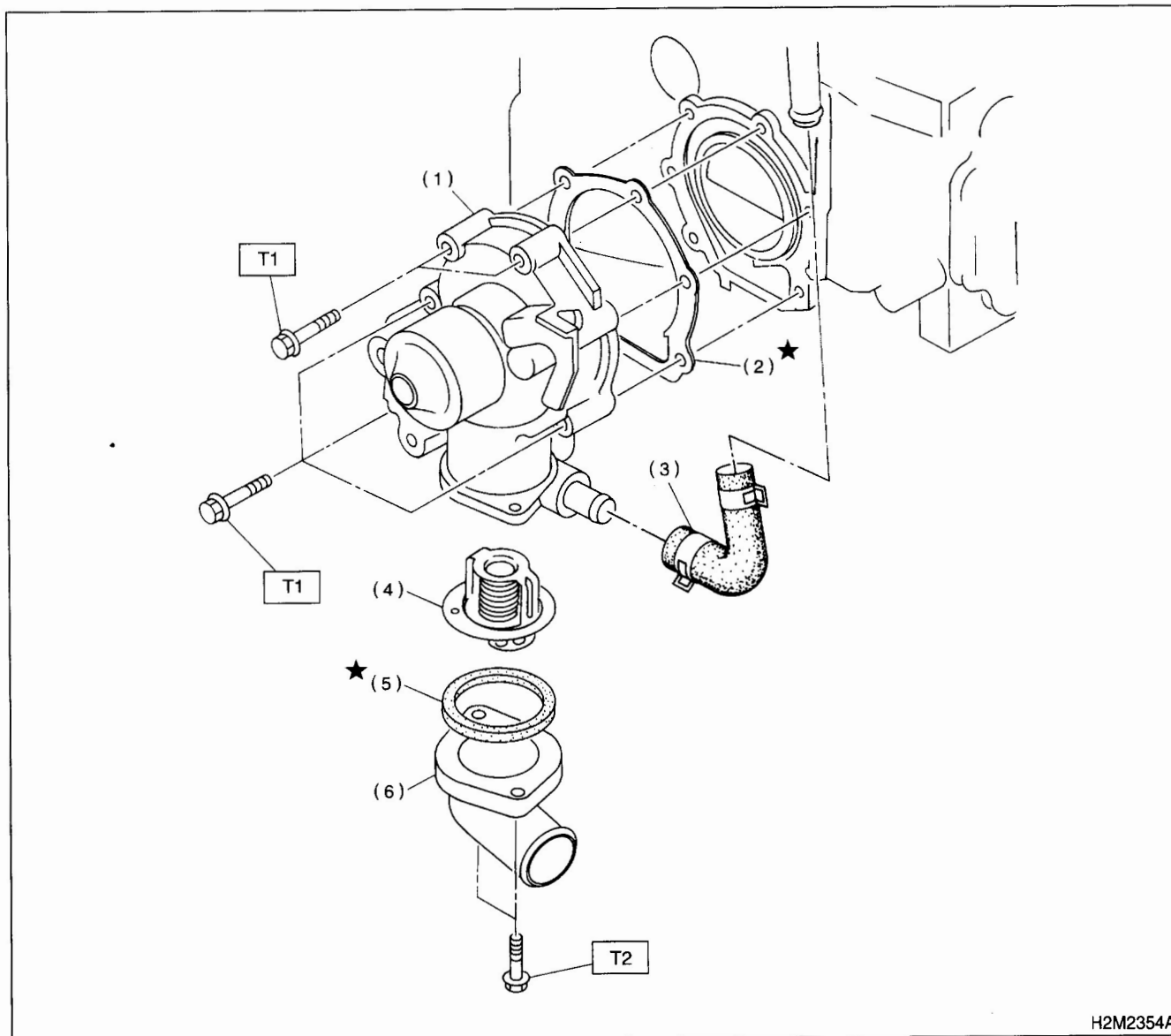
*1: Non-turbo model and turbo AT model

*2: Turbo MT model

B: COMPONENT

1. WATER PUMP

• NON-TURBO MODEL



- (1) Water pump ASSY
- (2) Gasket
- (3) Heater by-pass hose
- (4) Thermostat

- (5) Gasket
- (6) Thermostat cover

Tightening torque: N·m (kgf-m, ft-lb)

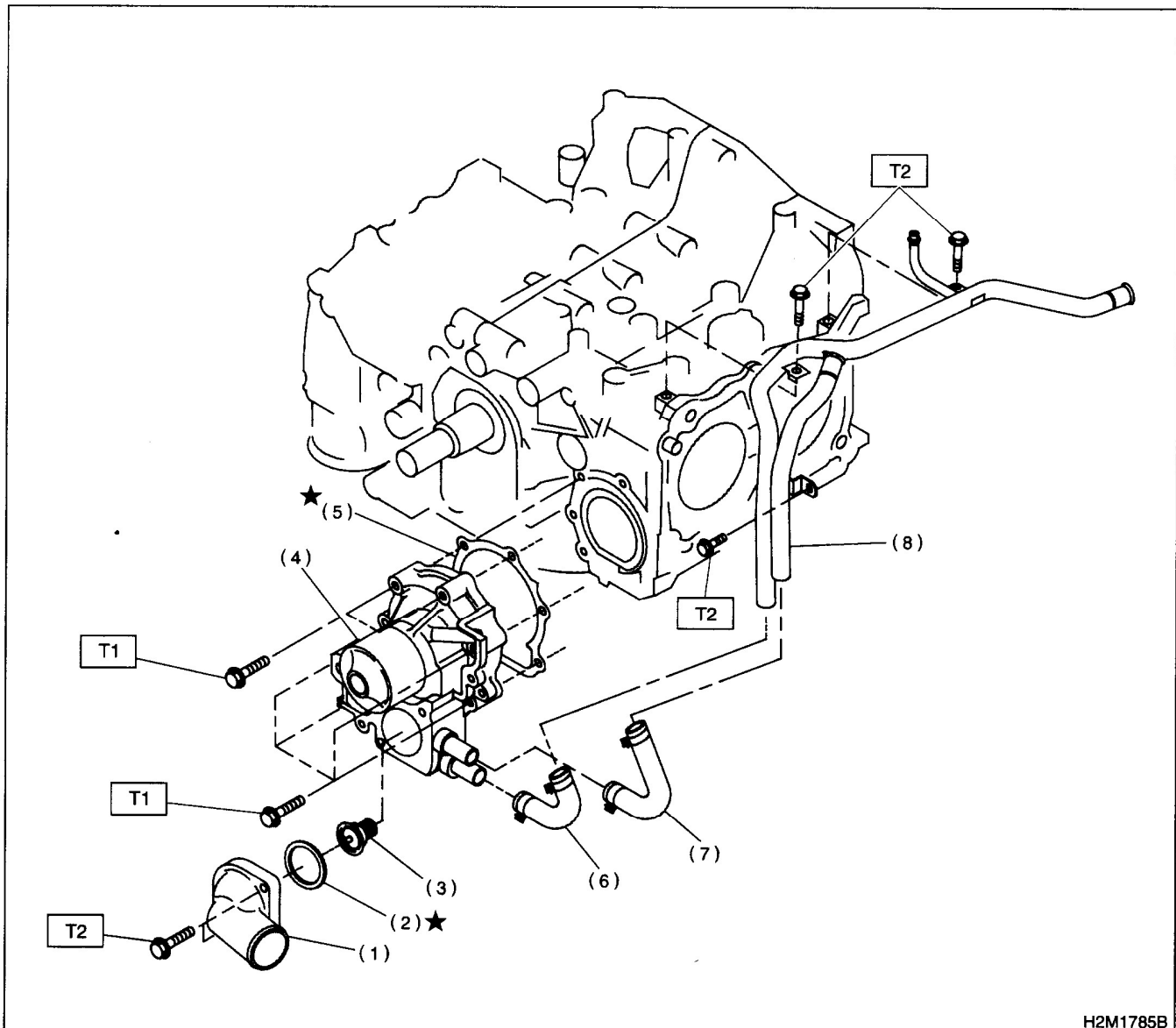
T1: First 12 (1.2, 8.7)
Second 12 (1.2, 8.7)

T2: 6.4 (0.65, 4.7)

GENERAL DESCRIPTION

COOLING

• TURBO MODEL



- (1) Thermostat case
- (2) Gasket
- (3) Thermostat
- (4) Water pump ASSY
- (5) Gasket

- (6) Header by-pass hose
- (7) Coolant filler tank by-pass hose
- (8) Water by-pass pipe

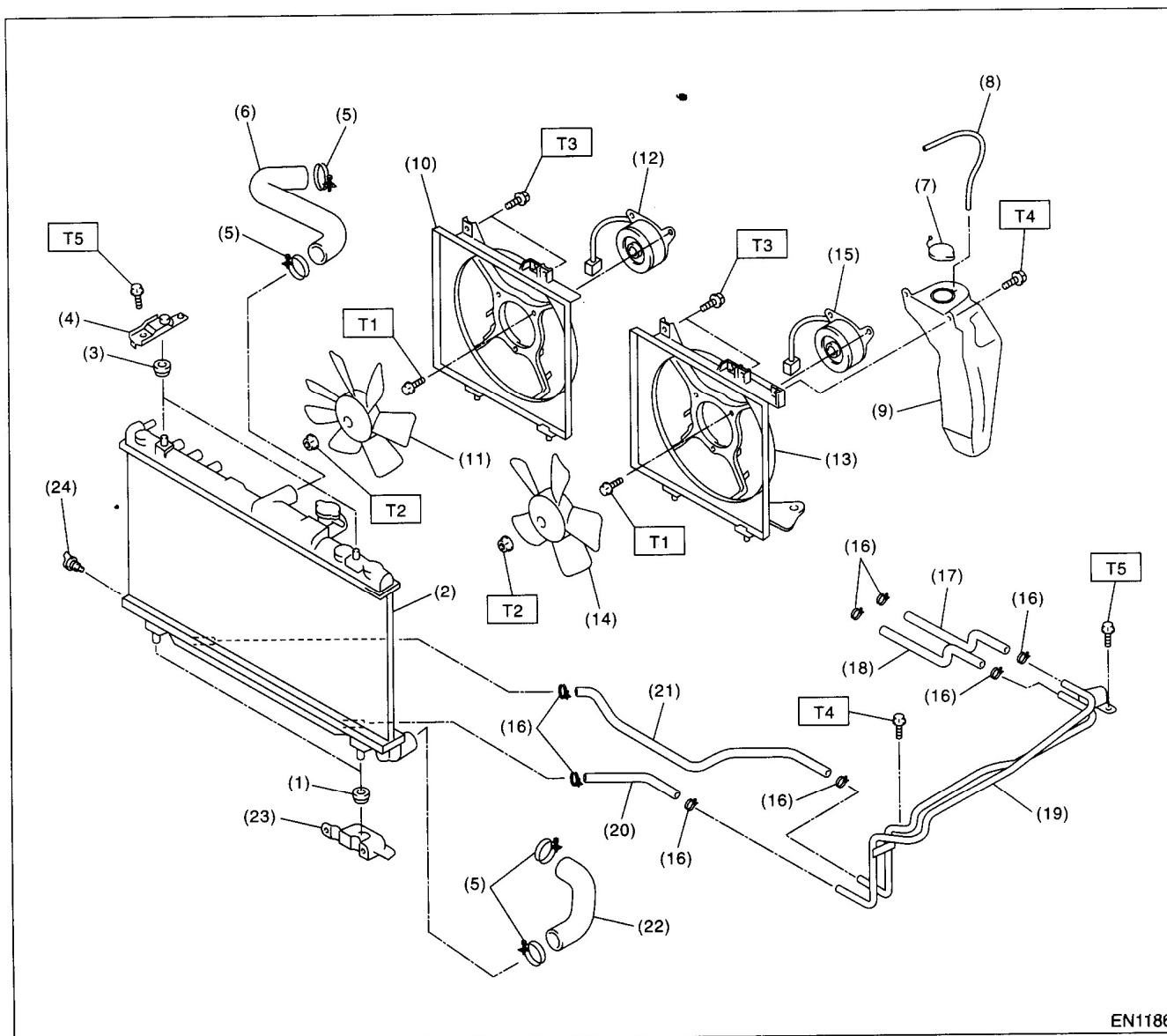
Tightening torque: N-m (kgf-m, ft-lb)

**T1: First 12 (1.2, 8.7)
Second 12 (1.2, 8.7)**

T2: 6.4 (0.65, 4.7)

2. RADIATOR AND RADIATOR FAN

•NON-TURBO MODEL



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

Tightening torque: N·m (kgf-m, ft-lb)

T1: 3.4 (0.35, 2.5)

T2: 4.5 (0.46, 3.3)

T3: 5.0 (0.51, 3.7)

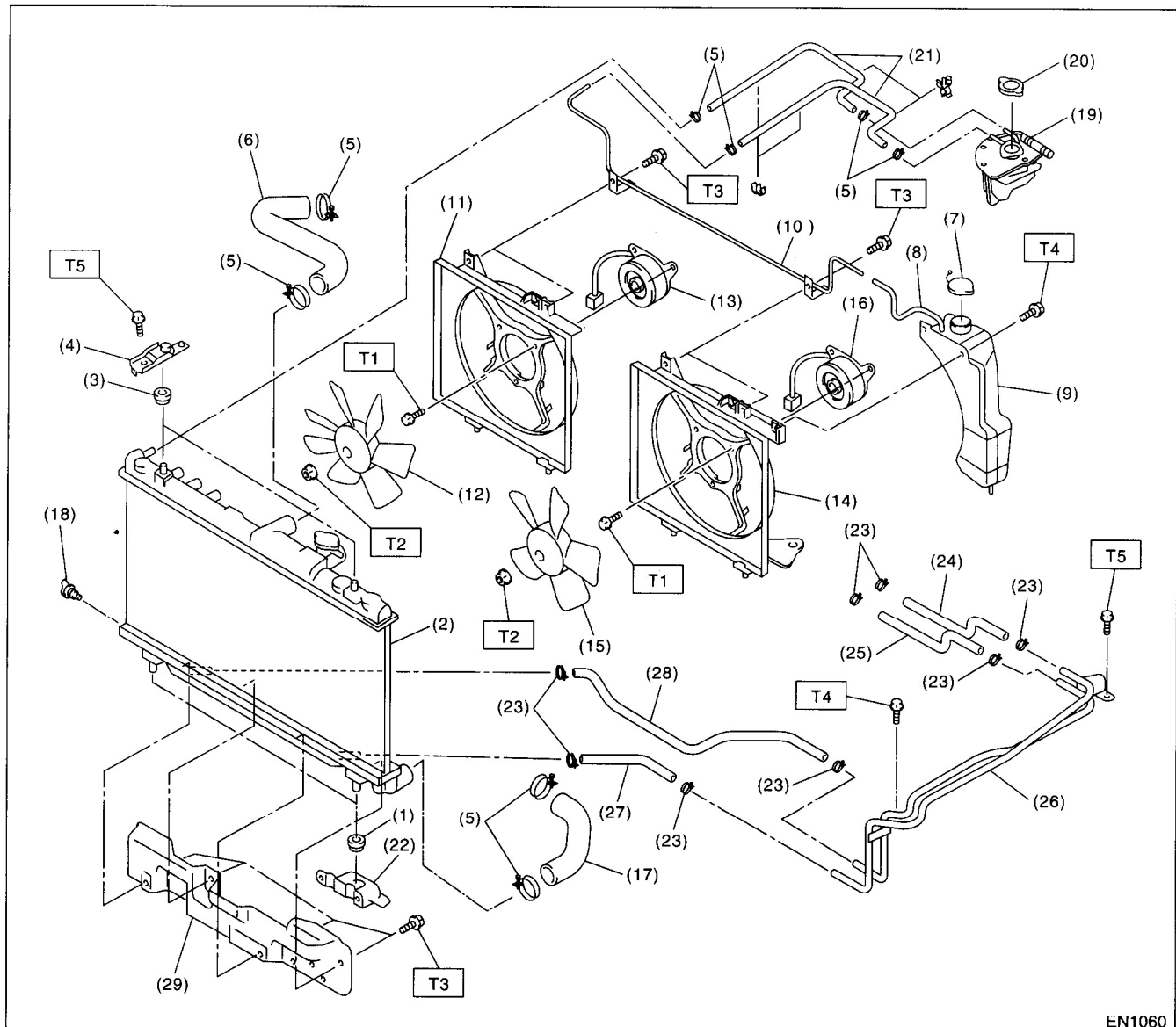
T4: 7.5 (0.76, 5.5)

T5: 12 (1.2, 8.7)

GENERAL DESCRIPTION

COOLING

• TURBO MODEL



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(1) Radiator lower cushion	(14) Main fan shroud	(26) ATF pipe (AT vehicles only)
(2) Radiator	(15) Radiator main fan	(27) ATF inlet hose B (AT vehicles only)
(3) Radiator upper cushion	(16) Radiator main fan motor	(28) ATF outlet hose B (AT vehicles only)
(4) Radiator upper bracket	(17) Radiator outlet hose	(29) Radiator under cover
(5) Clamp	(18) Radiator drain plug	
(6) Radiator inlet hose	(19) Engine coolant filler tank	
(7) Engine coolant reservoir tank cap	(20) Engine coolant filler tank cap	
(8) Over flow hose	(21) Engine coolant hose	
(9) Engine coolant reservoir tank	(22) Radiator lower bracket	
(10) Over flow pipe	(23) ATF hose clamp (AT vehicles only)	
(11) Sub fan shroud	(24) ATF inlet hose A (AT vehicles only)	
(12) Radiator sub fan	(25) ATF outlet hose A (AT vehicles only)	
(13) Radiator sub fan motor		

Tightening torque: N·m (kgf-m, ft-lb)

T1: 3.4 (0.35, 2.5)

T2: 4.5 (0.46, 3.3)

T3: 5.0 (0.51, 3.7)

T4: 7.5 (0.76, 5.5)

T5: 12 (1.2, 8.7)

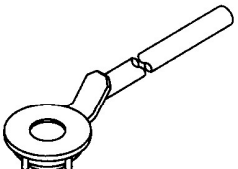
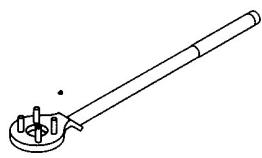
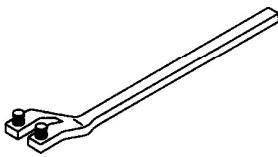
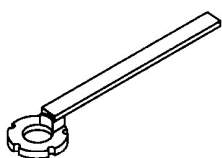
C: CAUTION

- 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 negative terminal from battery.

GENERAL DESCRIPTION

COOLING

D: PREPARATION TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 B2M4157	499977300	CRANK PULLEY WRENCH	Used for stopping crankshaft pulley when loosening and tightening crankshaft pulley bolts. (Turbo model)
 B2M3870	499977100	CRANK PULLEY WRENCH	Used for stopping crankshaft pulley when loosening and tightening crankshaft pulley bolts. (Non-turbo model)
 B2M3859	499207100	CAMSHAFT SPROCKET WRENCH	Used for removing and installing camshaft sprocket. (Non-turbo LH side only)
 B2M4158	499207400	CAMSHAFT SPROCKET WRENCH	Used for removing and installing camshaft sprocket.

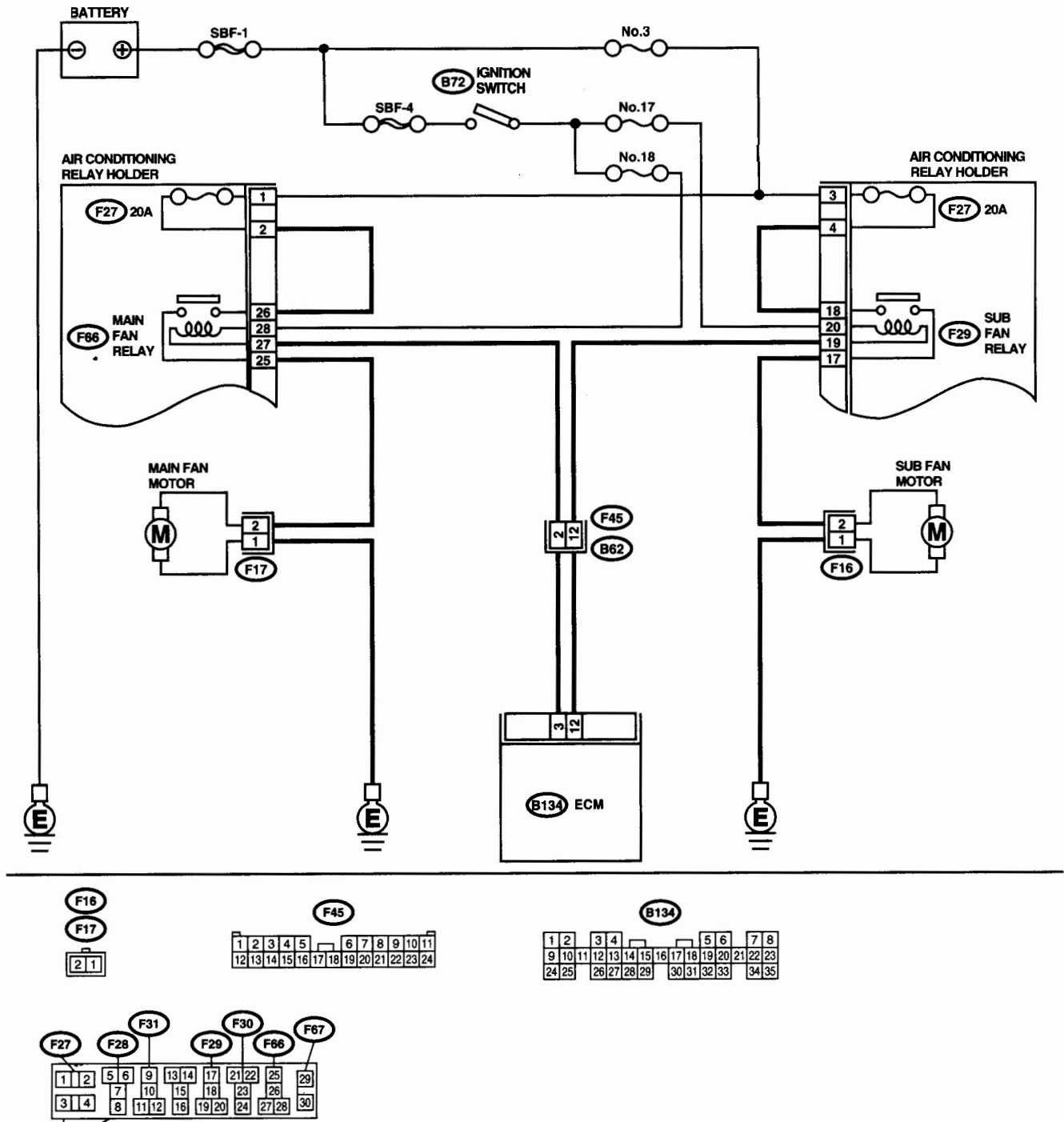
RADIATOR MAIN FAN SYSTEM

COOLING

2. Radiator Main Fan System

A: SCHEMATIC

1. NON-TURBO MODEL

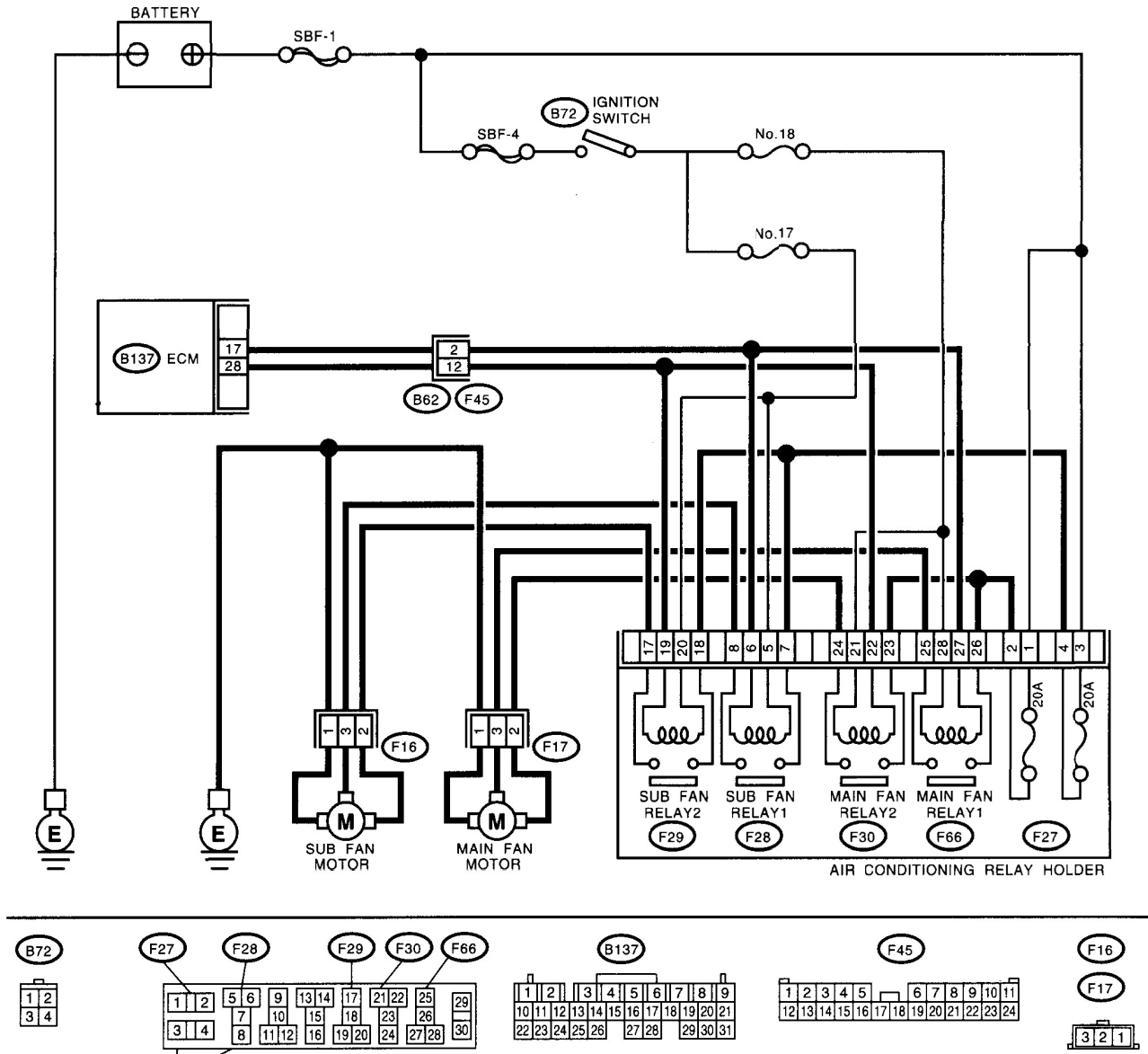


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RADIATOR MAIN FAN SYSTEM

COOLING

2. TURBO MODEL



EN1062

RADIATOR MAIN FAN SYSTEM

COOLING

B: INSPECTION

1. NON-TURBO MODEL

DETECTING CONDITION:

Condition:

- Engine coolant temperature is above 95°C (203°F).

- Vehicle speed is below 19 km/h (12 MPH).

TROUBLE SYMPTOM:

- Radiator main fan does not rotate under the above conditions.

Step	Check	Yes	No
1 CHECK POWER SUPPLY TO MAIN FAN MOTOR. CAUTION: Be careful not to overheat engine during repair. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the main fan motor. 3) Start the engine, and warm it up until engine coolant temperature increases over 95°C (203°F). 4) Stop the engine and turn the ignition switch to ON. 5) Measure the voltage between main fan motor connector and chassis ground. Connector & terminal (F17) No. 2 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 2.	Go to step 5.
2 CHECK GROUND CIRCUIT OF MAIN FAN MOTOR. 1) Turn the ignition switch to OFF. 2) Measure the resistance between main fan motor connector and chassis ground. Connector & terminal (F17) No. 1 — Chassis ground:	Is the resistance less than 5 Ω?	Go to step 3.	Repair the open circuit in harness between main fan motor connector and chassis ground.
3 CHECK POOR CONTACT. Check poor contact in main fan motor connector.	Is there poor contact in main fan motor connector?	Repair the poor contact in main fan motor connector.	Go to step 4.
4 CHECK MAIN FAN MOTOR. Connect the battery positive (+) terminal to terminal No. 2, and the negative (-) terminal to terminal No. 1 of main fan motor connector.	Does the main fan rotate?	Repair the poor contact in main fan motor connector.	Replace the main fan motor with a new one.
5 CHECK POWER SUPPLY TO MAIN FAN RELAY. 1) Turn the ignition switch to OFF. 2) Remove the main fan relay from A/C relay holder. 3) Measure the voltage between main fan relay terminal and chassis ground. Connector & terminal (F66) No. 26 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 6.	Go to step 7.
6 CHECK POWER SUPPLY TO MAIN FAN RELAY. 1) Turn the ignition switch to ON. 2) Measure the voltage between main fan relay terminal and chassis ground. Connector & terminal (F66) No. 28 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 10.	Go to step 9.
7 CHECK 20 A FUSE. 1) Remove 20 A fuse from A/C relay holder. 2) Check condition of fuse.	Is the fuse blown-out?	Replace the fuse.	Go to step 8.

RADIATOR MAIN FAN SYSTEM

COOLING

Step	Check	Yes	No
8 CHECK POWER SUPPLY TO A/C RELAY HOLDER 20 A FUSE TERMINAL. Measure the voltage of harness between A/C relay holder 20 A fuse terminal and chassis ground. <i>Connector & terminal (F27) No. 1 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Repair the open circuit in harness between 20 A fuse and main fan relay terminal.	Repair the open circuit in harness between main fuse box connector and 20 A fuse terminal.
9 CHECK FUSE. 1) Turn the ignition switch to OFF. 2) Remove the fuse No. 18 from joint box. 3) Check condition of fuse.	Is the fuse blown-out?	Replace the fuse.	Repair the open circuit in harness between main fan relay and ignition switch.
10 CHECK MAIN FAN RELAY. 1) Turn the ignition switch to OFF. 2) Remove the main fan relay. 3) Measure the resistance of main fan relay. <i>Terminal No. 26 — No. 25:</i>	Is the resistance more than 1 MΩ?	Go to step 11.	Replace the main fan relay.
11 CHECK MAIN FAN RELAY. 1) Connect the battery to terminals No. 27 and No. 28 of main fan relay. 2) Measure the resistance of main fan relay. <i>Terminal No. 26 — No. 25:</i>	Is the resistance less than 1 Ω?	Go to step 12.	Replace the main fan relay.
12 CHECK HARNESS BETWEEN MAIN FAN RELAY TERMINAL AND MAIN FAN MOTOR CONNECTOR. Measure the resistance of harness between main fan motor connector and main fan relay terminal. <i>Connector & terminal (F17) No. 2 — (F66) No. 25:</i>	Is the resistance less than 1 Ω?	Go to step 13.	Repair the open circuit in harness between main fan motor connector and main fan relay terminal.
13 CHECK HARNESS BETWEEN MAIN FAN RELAY AND ECM. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between main fan relay connector and ECM connector. <i>Connector & terminal (F66) No. 27 — (B134) No. 3:</i>	Is the resistance less than 1 Ω?	Go to step 14.	Repair the open circuit in harness between main fan relay and ECM.
14 CHECK POOR CONTACT. Check poor contact in connector between main fan and ECM.	Is there poor contact in connector between main fan motor and ECM?	Repair the poor contact connector.	Contact with SOA service.

NOTE:

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

RADIATOR MAIN FAN SYSTEM

COOLING

2. TURBO MODEL

DETECTING CONDITION:

Condition:

- Engine coolant temperature is above 96°C (205°F).
- A/C compressor is rotated.
- Vehicle speed is below 19 km/h (12 MPH).

TROUBLE SYMPTOM:

- Radiator main fan does not rotate under the above conditions.
- Radiator main fan does not rotate at high speed when the following conditions are both met:
 - (1) Engine coolant temperature is above 90°C (194°F)
 - (2) A/C is ON

Step	Check	Yes	No
1 CHECK OPERATION OF RADIATOR. 1)Run the engine at idle. (Vehicle stationary) 2)Turn the A/C switch to OFF. 3)Warm the engine coolant temperature over 96°C (205°F).	Does the main radiator fan rotate?	Go to step 2.	Go to step 3.
2 CHECK OPERATION OF RADIATOR. 1)Turn the A/C switch ON at condition of step 1.	Does the main radiator fan rotate faster when A/C compressor is operated?	Radiator main fan system is okay.	Go to step 17.
3 CHECK POWER SUPPLY TO MAIN FAN MOTOR. CAUTION: Be careful not to overheat engine during repair. 1)Turn the ignition switch to OFF. 2)Disconnect the connector from main fan motor. 3)Start the engine, and warm it up until engine coolant temperature increases over 96°C (205°F). 4)Stop the engine and turn ignition switch to ON. 5)Measure the voltage between main fan motor connector and chassis ground. Connector & terminal (F17) No. 3 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 4.	Go to step 7.
4 CHECK GROUND CIRCUIT OF MAIN FAN MOTOR. 1)Turn the ignition switch to OFF. 2)Measure the resistance between main fan motor connector and chassis ground. Connector & terminal (F17) No. 1 — Chassis ground:	Is the resistance less than 5 Ω?	Go to step 5.	Repair the open circuit in harness between main fan motor connector and chassis ground.
5 CHECK POOR CONTACT. Check poor contact in main fan motor connector.	Is there poor contact in main fan motor connector?	Repair the poor contact in main fan motor connector.	Go to step 6.
6 CHECK MAIN FAN MOTOR. Connect the battery positive (+) terminal to terminal No. 3, and the negative (-) terminal to terminal No. 1 of main fan motor connector.	Does the main fan rotate?	Repair the poor contact in main fan motor connector.	Replace the main fan motor with a new one.
7 CHECK POWER SUPPLY TO MAIN FAN RELAY1. 1)Turn the ignition switch to OFF. 2)Remove the main fan relay1 from A/C relay holder. 3)Measure the voltage between main fan relay1 terminal and chassis ground. Connector & terminal (F66) No. 26 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 8.	Go to step 9.

RADIATOR MAIN FAN SYSTEM

COOLING

Step	Check	Yes	No
8 CHECK POWER SUPPLY TO MAIN FAN RELAY1. 1) Turn the ignition switch to ON. 2) Measure the voltage between main fan relay1 terminal and chassis ground. <i>Connector & terminal</i> <i>(F66) No. 28 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Go to step 12.	Go to step 11.
9 CHECK 20 A FUSE. 1) Remove the 20 A fuse from A/C relay holder. 2) Check the condition of fuse.	Is the fuse blown-out?	Replace fuse.	Go to step 10.
10 CHECK POWER SUPPLY TO A/C RELAY HOLDER 20 A FUSE TERMINAL. Measure the voltage of harness between A/C relay holder 20 A fuse terminal and chassis ground. <i>Connector & terminal</i> <i>(F27) No. 1 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Repair the open circuit in harness between 20 A fuse and main fan relay terminal.	Repair the open circuit in harness between main fuse box connector and 20 A fuse terminal.
11 CHECK FUSE. 1) Turn the ignition switch to OFF. 2) Remove the fuse No. 18 from joint box. 3) Check the condition of fuse.	Is the fuse blown-out?	Replace the fuse.	Repair the open circuit in harness between main fan relay and ignition switch.
12 CHECK MAIN FAN RELAY1. 1) Turn the ignition switch to OFF. 2) Remove the main fan relay1. 3) Measure the resistance of main fan relay1. <i>Terminal</i> <i>No. 26 — No. 25:</i>	Is the resistance more than 1 MΩ?	Go to step 13.	Replace the main fan relay1.
13 CHECK MAIN FAN RELAY. 1) Connect the battery to terminals No. 27 and No. 28 of main fan relay1. 2) Measure the resistance of main fan relay1. <i>Terminal</i> <i>No. 26 — No. 25:</i>	Is the resistance less than 1 Ω?	Go to step 14.	Replace the main fan relay1.
14 CHECK HARNESS BETWEEN MAIN FAN RELAY1 TERMINAL AND MAIN FAN MOTOR CONNECTOR. Measure the resistance of harness between main fan motor connector and main fan relay1 terminal. <i>Connector & terminal</i> <i>(F17) No. 3 — (F66) No. 25:</i>	Is the resistance less than 1 Ω?	Go to step 15.	Repair the open circuit in harness between main fan motor connector and main fan relay1 terminal.
15 CHECK HARNESS BETWEEN MAIN FAN RELAY1 AND ECM. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between main fan relay1 connector and ECM connector. <i>Connector & terminal</i> <i>(F66) No. 27 — (B137) No. 17:</i>	Is the resistance less than 1 Ω?	Go to step 16.	Repair the open circuit in harness between main fan relay1 and ECM.
16 CHECK POOR CONTACT. Check poor contact in connector between main fan and ECM.	Is there poor contact in connector between main fan motor and ECM?	Repair the poor contact connector.	Contact with SOA service.

RADIATOR MAIN FAN SYSTEM

COOLING

Step	Check	Yes	No
17 CHECK POWER SUPPLY TO MAIN FAN MOTOR. CAUTION: Be careful not to overheat engine during repair. 1)Turn the ignition switch to OFF. 2)Disconnect the connector from main fan motor. 3)Start the engine, and warm it up until engine coolant temperature increases over 96°C (205°F). 4)Turn the A/C switch ON. 5)Measure the voltage while A/C compressor is rotating. 6)Measure the voltage between main fan motor connector and chassis ground. Connector & terminal (F17) No. 2 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 18.	Go to step 20.
18 CHECK POOR CONTACT. Check poor contact in main fan motor connector.	Is there poor contact in main fan motor connector?	Repair the poor contact in main fan motor connector.	Go to step 19.
19 CHECK MAIN FAN MOTOR. Connect the battery positive (+) terminal to terminal No. 2, and negative (-) terminal to terminal No. 1 of main fan motor connector.	Does the main fan rotate?	Repair the poor contact in main fan motor connector.	Replace the main fan motor with a new one.
20 CHECK POWER SUPPLY TO MAIN FAN RELAY2. 1)Turn the ignition switch to OFF. 2)Remove the main fan relay2 from A/C relay holder. 3)Measure the voltage between main fan relay2 terminal and chassis ground. Connector & terminal (F30) No. 23 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 21.	Go to step 22.
21 CHECK POWER SUPPLY TO MAIN FAN RELAY2. 1)Turn the ignition switch to ON. 2)Measure the voltage between main fan relay2 terminal and chassis ground. Connector & terminal (F30) No. 21 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 25.	Go to step 24.
22 CHECK 20 A FUSE. 1)Remove the 20 A fuse from A/C relay holder. 2)Check condition of fuse.	Is the fuse blown-out?	Replace the fuse.	Go to step 23.
23 CHECK POWER SUPPLY TO A/C RELAY HOLDER 20 A FUSE TERMINAL. Measure the voltage of harness between A/C relay holder 20 A fuse terminal and chassis ground. Connector & terminal (F27) No. 1 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Repair the open circuit in harness between 20 A fuse and main fan relay terminal.	Repair the open circuit in harness between main fuse box connector and 20 A fuse terminal.
24 CHECK FUSE. 1)Turn the ignition switch to OFF. 2)Remove the fuse No. 18 from joint box. 3)Check the condition of fuse.	Is the fuse blown-out?	Replace the fuse.	Repair the open circuit in harness between main fan relay and ignition switch.

RADIATOR MAIN FAN SYSTEM

COOLING

Step	Check	Yes	No
25 CHECK MAIN FAN RELAY2. 1) Turn the ignition switch to OFF. 2) Remove the main fan relay2. 3) Measure the resistance of main fan relay2. <i>Terminal</i> <i>No. 23 — No. 24:</i>	Is the resistance more than 1 MΩ?	Go to step 26.	Replace the main fan relay2.
26 CHECK MAIN FAN RELAY2. 1) Connect the battery to terminals No. 21 and No. 22 of main fan relay1. 2) Measure the resistance of main fan relay2. <i>Terminal</i> <i>No. 23 — No. 24:</i>	Is the resistance less than 1 Ω?	Go to step 27.	Replace the main fan relay2.
27 CHECK HARNESS BETWEEN MAIN FAN RELAY2 TERMINAL AND MAIN FAN MOTOR CONNECTOR. Measure the resistance of harness between main fan motor connector and main fan relay2 terminal. <i>Connector & terminal</i> <i>(F17) No. 2 — (F30) No. 24:</i>	Is the resistance less than 1 Ω?	Go to step 28.	Repair the open circuit in harness between main fan motor connector and main fan relay2 terminal.
28 CHECK HARNESS BETWEEN MAIN FAN RELAY2 AND ECM. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between main fan relay2 connector and ECM connector. <i>Connector & terminal</i> <i>(F30) No. 22 — (B134) No. 28:</i>	Is the resistance less than 1 Ω?	Go to step 29.	Repair the open circuit in harness between main fan relay2 and ECM.
29 CHECK POOR CONTACT. Check poor contact in connector between main fan and ECM.	Is there poor contact in connector between main fan motor and ECM?	Repair poor contact connector.	Contact with SOA service.

NOTE:

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

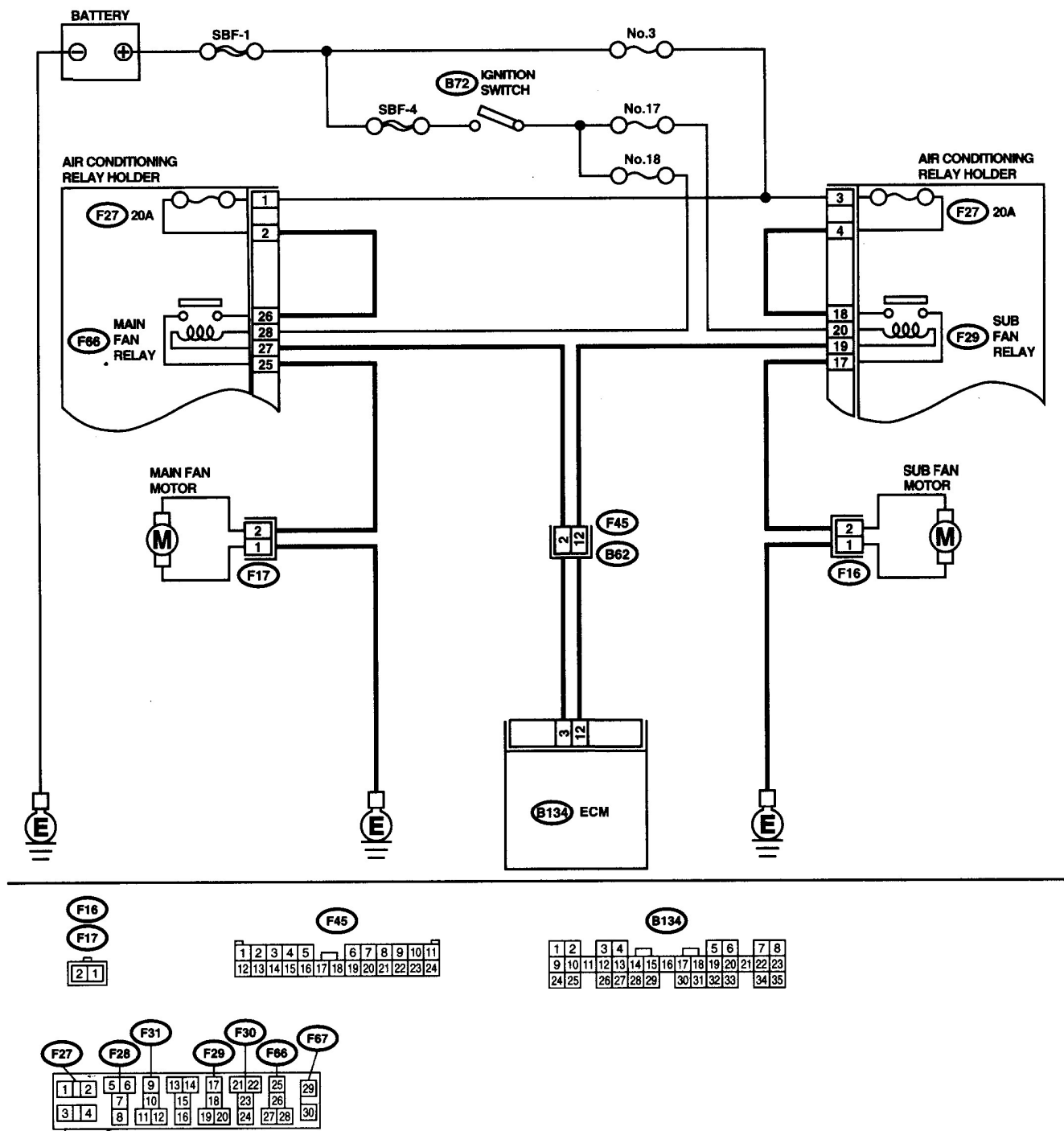
RADIATOR SUB FAN SYSTEM

COOLING

3. Radiator Sub Fan System

A: SCHEMATIC

1. NON-TURBO MODEL

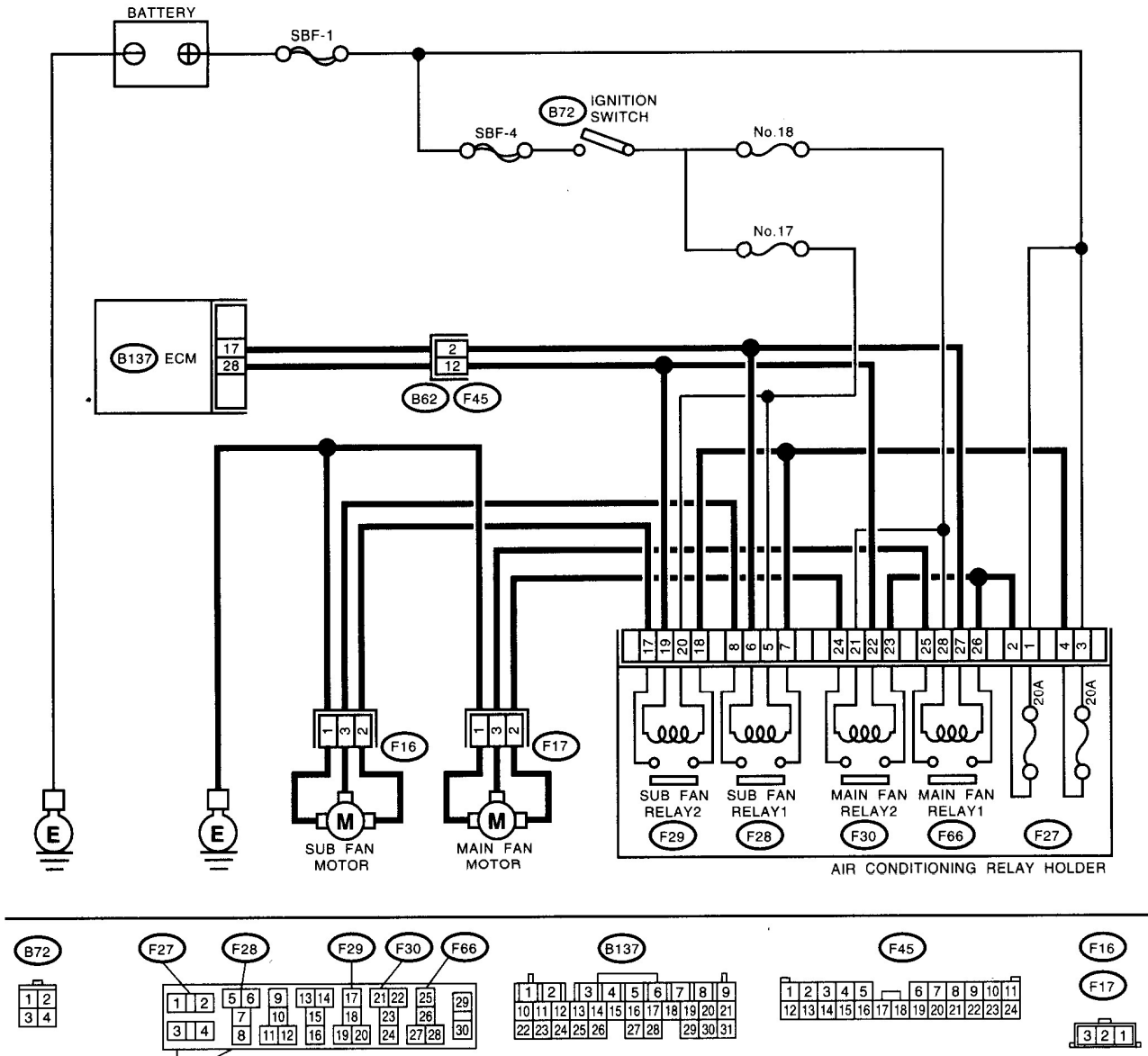


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RADIATOR SUB FAN SYSTEM

COOLING

2. TURBO MODEL



EN1062

RADIATOR SUB FAN SYSTEM

COOLING

B: INSPECTION

1. NON-TURBO MODEL

NOTE:

System for A/C equipped vehicles only.

DETECTING CONDITION:

Condition (1):

- Engine coolant temperature is below 95°C (203°F).

- A/C switch is turned ON.

- Vehicle speed is below 19 km/h (12 MPH).

Condition (2):

- Engine coolant temperature is above 100°C (212°F).

- A/C switch is turned OFF.

- Vehicle speed is below 19 km/h (12 MPH).

TROUBLE SYMPTOM:

- Radiator sub fan does not rotate under conditions (1) and (2) above.

Step	Check	Yes	No
1 CHECK POWER SUPPLY TO SUB FAN MOTOR. CAUTION: Be careful not to overheat engine during repair. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the sub fan motor and main fan motor. 3) Start the engine, and warm it up until engine coolant temperature increases over 100°C (212°F). 4) Stop the engine and turn the ignition switch to ON. 5) Measure the voltage between sub fan motor connector and chassis ground. Connector & terminal (F16) No. 2 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 2.	Go to step 5.
2 CHECK GROUND CIRCUIT OF SUB FAN MOTOR. 1) Turn the ignition switch to OFF. 2) Measure the resistance between sub fan motor connector and chassis ground. Connector & terminal (F16) No. 1 — Chassis ground:	Is the resistance less than 5 Ω?	Go to step 3.	Repair the open circuit in harness between sub fan motor connector and chassis ground.
3 CHECK POOR CONTACT. Check poor contact in sub fan motor connector.	Is there poor contact in sub fan motor connector?	Repair the poor contact in sub fan motor connector.	Go to step 4.
4 CHECK SUB FAN MOTOR. Connect the battery positive (+) terminal to terminal No. 2, and negative (-) terminal to terminal No. 1 of sub fan motor connector.	Does the sub fan rotate?	Repair the poor contact in sub fan motor connector.	Replace the sub fan motor with a new one.
5 CHECK POWER SUPPLY TO SUB FAN RELAY. 1) Turn the ignition switch to OFF. 2) Remove the sub fan relay from A/C relay holder. 3) Measure the voltage between sub fan relay terminal and chassis ground. Connector & terminal (F28) No. 18 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 6.	Go to step 7.
6 CHECK POWER SUPPLY TO SUB FAN RELAY. 1) Turn the ignition switch to ON. 2) Measure the voltage between sub fan relay terminal and chassis ground. Connector & terminal (F28) No. 20 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 10.	Go to step 9.

RADIATOR SUB FAN SYSTEM

COOLING

Step	Check	Yes	No
7 CHECK 20 A FUSE. 1) Remove the 20 A fuse from A/C relay holder. 2) Check the condition of fuse.	Is the fuse blown-out?	Replace the fuse.	Go to step 8.
8 CHECK POWER SUPPLY TO A/C RELAY HOLDER 20 A FUSE TERMINAL. Measure the voltage of harness between A/C relay holder 20 A fuse terminal and chassis ground. <i>Connector & terminal (F27) No. 3 (+) — Chassis ground (-):</i>	Is the voltage more than 10 V?	Repair the open circuit in harness between 20 A fuse and sub fan relay terminal.	Repair the open circuit in harness between main fuse box connector and 20 A fuse terminal.
9 CHECK FUSE. 1) Turn the ignition switch to OFF. 2) Remove the fuse No. 17 from joint box. 3) Check the condition of fuse.	Is the fuse blown-out?	Replace the fuse.	Repair the open circuit in harness between sub fan relay and ignition switch.
10 CHECK SUB FAN RELAY. 1) Turn the ignition switch to OFF. 2) Measure the resistance of sub fan relay. <i>Terminal No. 17 — No. 18:</i>	Is the resistance more than 1 MΩ?	Go to step 11.	Replace the sub fan relay.
11 CHECK SUB FAN RELAY. 1) Connect the battery to terminals No. 20 and No. 19 of sub fan relay. 2) Measure the resistance of sub fan relay. <i>Terminal No. 17 — No. 18:</i>	Is the resistance less than 1 Ω?	Go to step 12.	Replace the sub fan relay.
12 CHECK HARNESS BETWEEN SUB FAN RELAY TERMINAL AND SUB FAN MOTOR CONNECTOR. Measure the resistance of harness between sub fan motor connector and sub fan relay terminal. <i>Connector & terminal (F16) No. 2 — (F28) No. 17:</i>	Is the resistance less than 1 Ω?	Go to step 13.	Repair the open circuit in harness between sub fan motor and sub fan relay connector.
13 CHECK HARNESS BETWEEN SUB FAN RELAY AND ECM. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between sub fan relay connector and ECM connector. <i>Connector & terminal (F28) No. 19 — (B134) No. 12:</i>	Is the resistance less than 1 Ω?	Go to step 14.	Repair the open circuit in harness between sub fan relay and ECM.
14 CHECK POOR CONTACT. Check poor contact in connector between sub fan and ECM.	Is there poor contact in connector between sub fan motor and ECM?	Repair poor contact connector.	Contact with SOA service.

NOTE:

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

RADIATOR SUB FAN SYSTEM

COOLING

2. TURBO MODEL

DETECTING CONDITION:

Condition:

- Engine coolant temperature is above 96°C (205°F).
- A/C compressor is rotated.
- Vehicle speed is below 19 km/h (12 MPH).

TROUBLE SYMPTOM:

- Radiator sub fan does not rotate under the above conditions.
- Radiator sub fan does not rotate at high speed when the following conditions are both met:
 - (1) Engine coolant temperature is above 90°C (194°F)
 - (2) A/C is ON

Step	Check	Yes	No
1 CHECK OPERATION OF RADIATOR. 1)Run the engine at idle. (Vehicle stationary) 2)Turn the A/C switch to OFF. 3)Warm the engine coolant temperature over 96°C (205°F).	Does the radiator sub fan rotate?	Go to step 2.	Go to step 3.
2 CHECK OPERATION OF RADIATOR. 1)Turn the A/C switch ON at condition of step 1.	Does the radiator sub fan rotate faster when A/C compressor is operated?	Radiator main fan system is okay.	Go to step 17.
3 CHECK POWER SUPPLY TO SUB FAN MOTOR. CAUTION: Be careful not to overheat engine during repair. 1)Turn the ignition switch to OFF. 2)Disconnect the connector from sub fan motor. 3)Start the engine, and warm it up until engine coolant temperature increases over 96°C (205°F). 4)Stop the engine and turn the ignition switch to ON. 5)Measure the voltage between sub fan motor connector and chassis ground. Connector & terminal (F16) No. 3 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 4.	Go to step 7.
4 CHECK GROUND CIRCUIT OF SUB FAN MOTOR. 1)Turn the ignition switch to OFF. 2)Measure the resistance between sub fan motor connector and chassis ground. Connector & terminal (F16) No. 1 — Chassis ground:	Is the resistance less than 5 Ω?	Go to step 5.	Repair the open circuit in harness between sub fan motor connector and chassis ground.
5 CHECK POOR CONTACT. Check poor contact in sub fan motor connector.	Is there poor contact in sub fan motor connector?	Repair the poor contact in sub fan motor connector.	Go to step 6.
6 CHECK MAIN FAN MOTOR. Connect the battery positive (+) terminal to terminal No. 3, and negative (-) terminal to terminal No. 1 of sub fan motor connector.	Does the main fan rotate?	Repair the poor contact in sub fan motor connector.	Replace the sub fan motor with a new one.
7 CHECK POWER SUPPLY TO SUB FAN RELAY1. 1)Turn the ignition switch to OFF. 2)Remove the sub fan relay1 from A/C relay holder. 3)Measure the voltage between sub fan relay1 terminal and chassis ground. Connector & terminal (F28) No. 7 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 8.	Go to step 9.

RADIATOR SUB FAN SYSTEM

COOLING

Step	Check	Yes	No
8 CHECK POWER SUPPLY TO SUB FAN RELAY1. 1) Turn the ignition switch to ON. 2) Measure the voltage between sub fan relay1 terminal and chassis ground. Connector & terminal (F28) No. 5 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 12.	Go to step 11.
9 CHECK 20 A FUSE. 1) Remove the 20 A fuse from A/C relay holder. 2) Check the condition of fuse.	Is the fuse blown-out?	Replace the fuse.	Go to step 10.
10 CHECK POWER SUPPLY TO A/C RELAY HOLDER 20 A FUSE TERMINAL. Measure the voltage of harness between A/C relay holder 20 A fuse terminal and chassis ground. Connector & terminal (F27) No. 3 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Repair the open circuit in harness between 20 A fuse and sub fan relay terminal.	Repair the open circuit in harness between sub fuse box connector and 20 A fuse terminal.
11 CHECK FUSE. 1) Turn the ignition switch to OFF. 2) Remove the fuse No. 17 from joint box. 3) Check the condition of fuse.	Is the fuse blown-out?	Replace the fuse.	Repair the open circuit in harness between sub fan relay1 and ignition switch.
12 CHECK SUB FAN RELAY1. 1) Turn the ignition switch to OFF. 2) Remove the main fan relay1. 3) Measure the resistance of sub fan relay1. Terminal No. 7 — No. 8:	Is the resistance more than 1 MΩ?	Go to step 13.	Replace the sub fan relay1.
13 CHECK SUB FAN RELAY1. 1) Connect the battery to terminals No. 6 and No. 5 of sub fan relay1. 2) Measure the resistance of sub fan relay. Terminal No. 7 — No. 8:	Is the resistance less than 1 Ω?	Go to step 14.	Replace the sub fan relay1.
14 CHECK HARNESS BETWEEN SUB FAN RELAY1 TERMINAL AND SUB FAN MOTOR CONNECTOR. Measure the resistance of harness between sub fan motor connector and sub fan relay1 terminal. Connector & terminal (F16) No. 3 — (F28) No. 8:	Is the resistance less than 1 Ω?	Go to step 15.	Repair the open circuit in harness between sub fan motor connector and sub fan relay1 terminal.
15 CHECK HARNESS BETWEEN SUB FAN RELAY1 AND ECM. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between sub fan relay1 connector and ECM connector. Connector & terminal (F28) No. 6 — (B137) No. 17:	Is the resistance less than 1 Ω?	Go to step 16.	Repair the open circuit in harness between sub fan relay1 and ECM.
16 CHECK POOR CONTACT. Check poor contact in connector between sub fan and ECM.	Is there poor contact in connector between sub fan motor and ECM?	Repair poor contact connector.	Contact with SOA service.

RADIATOR SUB FAN SYSTEM

COOLING

Step	Check	Yes	No
17 CHECK POWER SUPPLY TO SUB FAN MOTOR. CAUTION: Be careful not to overheat engine during repair. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from sub fan motor. 3) Start the engine, and warm it up until engine coolant temperature increases over 96°C (205°F). 4) Turn the A/C switch ON. 5) Measure the voltage while A/C compressor is rotating. 6) Measure the voltage between sub fan motor connector and chassis ground. Connector & terminal (F16) No. 2 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 18.	Go to step 20.
18 CHECK POOR CONTACT. Check the poor contact in sub fan motor connector.	Is there poor contact in sub fan motor connector?	Repair the poor contact in sub fan motor connector.	Go to step 19.
19 CHECK SUB FAN MOTOR. Connect the battery positive (+) terminal to terminal No. 2, and negative (-) terminal to terminal No. 1 of sub fan motor connector.	Does the main fan rotate?	Repair the poor contact in sub fan motor connector.	Replace the sub fan motor with a new one.
20 CHECK POWER SUPPLY TO SUB FAN RELAY2. 1) Turn the ignition switch to OFF. 2) Remove the sub fan relay2 from A/C relay holder. 3) Measure the voltage between sub fan relay2 terminal and chassis ground. Connector & terminal (F29) No. 18 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 21.	Go to step 22.
21 CHECK POWER SUPPLY TO SUB FAN RELAY2. 1) Turn the ignition switch to ON. 2) Measure the voltage between sub fan relay2 terminal and chassis ground. Connector & terminal (F29) No. 20 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Go to step 23.	Go to step 24.
22 CHECK 20 A FUSE. 1) Remove the 20 A fuse from A/C relay holder. 2) Check the condition of fuse.	Is the fuse blown-out?	Replace fuse.	Go to step 23.
23 CHECK POWER SUPPLY TO A/C RELAY HOLDER 30 A FUSE TERMINAL. Measure the voltage of harness between A/C relay holder 20 A fuse terminal and chassis ground. Connector & terminal (F27) No. 3 (+) — Chassis ground (-):	Is the voltage more than 10 V?	Repair the open circuit in harness between 20 A fuse and sub fan relay terminal.	Repair the open circuit in harness between sub fuse box connector and 20 A fuse terminal.
24 CHECK FUSE. 1) Turn the ignition switch to OFF. 2) Remove the fuse No. 17 from joint box. 3) Check the condition of fuse.	Is the fuse blown-out?	Replace the fuse.	Repair the open circuit in harness between sub fan relay and ignition switch.

RADIATOR SUB FAN SYSTEM

COOLING

Step	Check	Yes	No
25 CHECK SUB FAN RELAY2. 1) Turn the ignition switch to OFF. 2) Remove the sub fan relay2. 3) Measure the resistance of sub fan relay2. <i>Terminal</i> <i>No. 18 — No. 17:</i>	Is the resistance more than 1 MΩ?	Go to step 26.	Replace the sub fan relay2.
26 CHECK MAIN FAN RELAY2. 1) Connect the battery to terminals No. 19 and No. 20 of sub fan relay2. 2) Measure the resistance of sub fan relay2. <i>Terminal</i> <i>No. 18 — No. 17:</i>	Is the resistance less than 1 Ω?	Go to step 27.	Replace the sub fan relay2.
27 CHECK HARNESS BETWEEN SUB FAN RELAY2 TERMINAL AND SUB FAN MOTOR CONNECTOR. Measure the resistance of harness between sub fan motor connector and sub fan relay2 terminal. <i>Connector & terminal</i> <i>(F16) No. 2 — (F29) No. 17:</i>	Is the resistance less than 1 Ω?	Go to step 28.	Repair the open circuit in harness between sub fan motor connector and sub fan relay2 terminal.
28 CHECK HARNESS BETWEEN SUB FAN RELAY2 AND ECM. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance of harness between sub fan relay2 connector and ECM connector. <i>Connector & terminal</i> <i>(F29) No. 19 — (B137) No. 28:</i>	Is the resistance less than 1 Ω?	Go to step 29.	Repair the open circuit in harness between sub fan relay2 and ECM.
29 CHECK POOR CONTACT. Check the poor contact in connector between sub fan and ECM.	Is there poor contact in connector between sub fan motor and ECM?	Repair the poor contact connector.	Contact with SOA service.

NOTE:

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

4. Engine Coolant

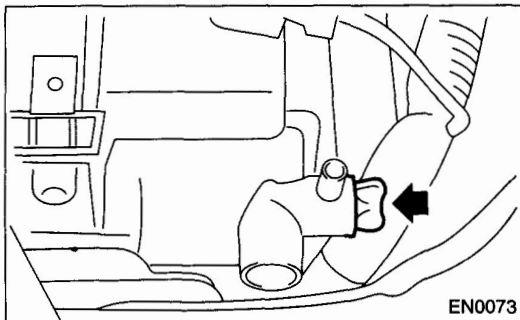
A: REPLACEMENT

1. DRAINING OF ENGINE COOLANT

- 1) Lift-up the vehicle.
- 2) Remove the under cover.
- 3) Remove the drain cock to drain engine coolant into container.

NOTE:

Remove the radiator cap so that engine coolant will drain faster.



2. FILLING OF ENGINE COOLANT

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

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

Non-turbo AT model

Approx. 6.9 ℓ (7.29 US qt, 6.07 Imp qt)

Non-turbo MT model

Approx. 7 ℓ (7.4 US qt, 6.2 Imp qt)

Turbo AT model

Approx. 7.6 ℓ (8.03 US qt, 6.69 Imp qt)

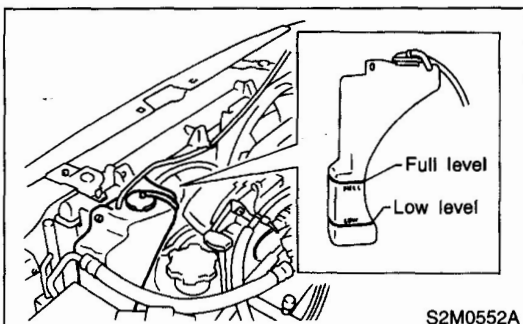
Turbo MT model

Approx. 7.7 ℓ (8.14 US qt, 6.78 Imp qt)

CAUTION:

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

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



- 3) Warm-up engine completely for more than five minutes at 2,000 to 3,000 rpm.

- 4) If the engine coolant level drops in radiator, add the engine coolant to filler neck position.

- 5) If the engine coolant level drops from upper level of reservoir tank, add the engine coolant to the upper level.

- 6) Attach the radiator cap and reservoir tank cap properly.

ENGINE COOLANT

COOLING

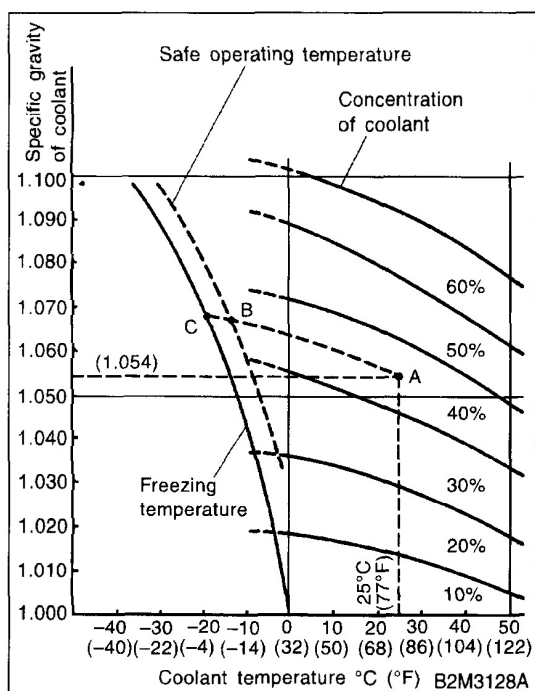
B: INSPECTION

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

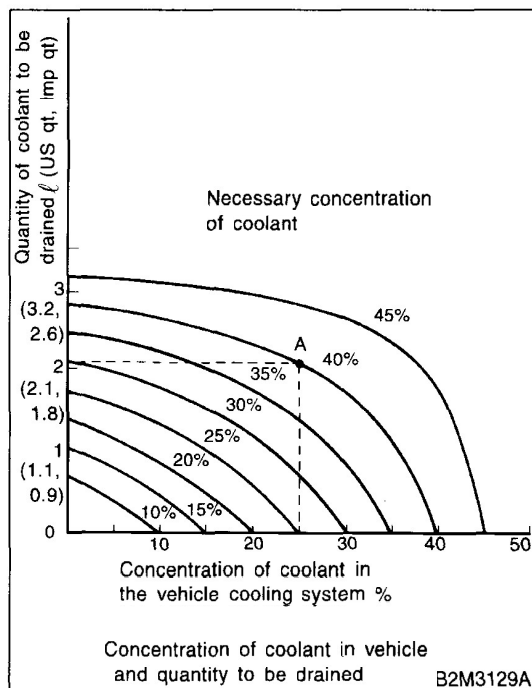
To adjust the concentration of the coolant according to temperature, find the proper fluid concentration in the above diagram and replace the necessary amount of coolant with an undiluted solution of SUBARU genuine coolant (concentration 50%).

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

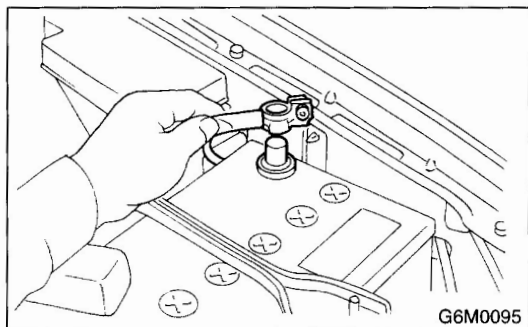
COOLING

5. Water Pump

A: REMOVAL

1. NON-TURBO MODEL

1) Disconnect the ground cable from the battery.

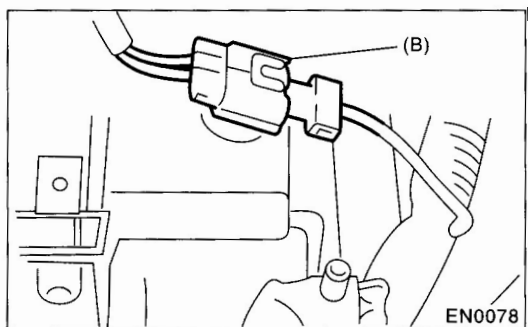
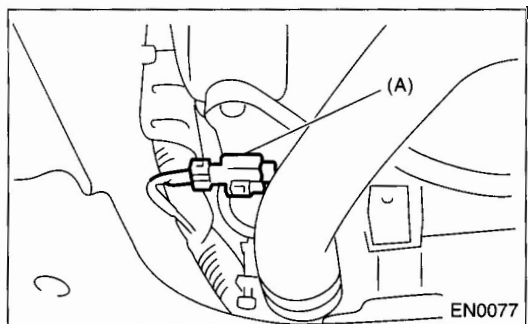


2) Lift-up the vehicle.

3) Remove the under cover.

4) Drain the engine coolant completely.
<Ref. to CO-25, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

5) Disconnect the connectors from the radiator main fan (A) and sub fan (B) motors.

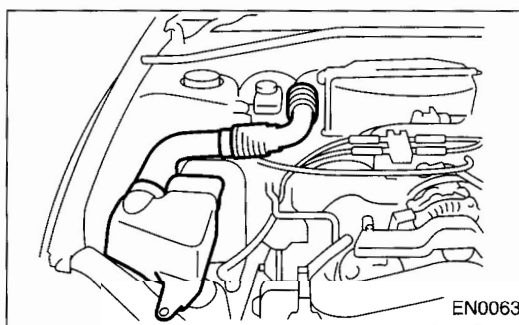


6) Disconnect the radiator outlet hose and heater hose from the water pump.

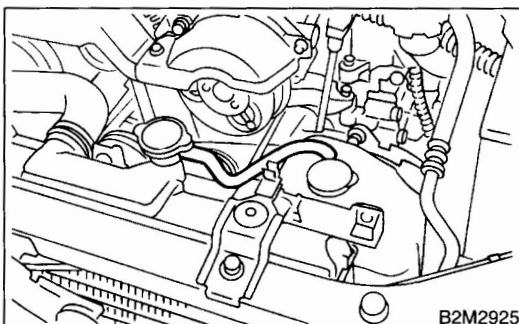


7) Lower the vehicle.

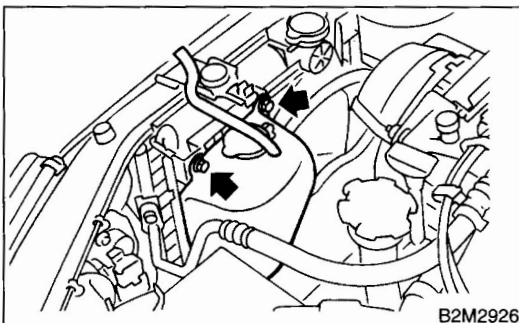
8) Remove the air intake duct.



9) Disconnect the over flow hose.



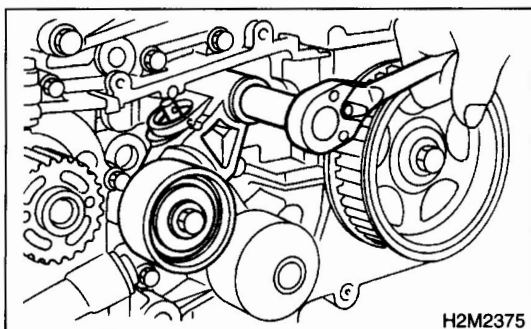
10) Remove the reservoir tank.



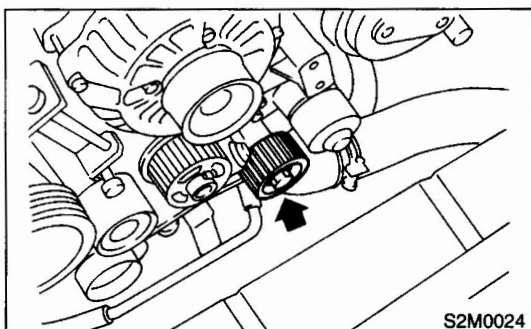
WATER PUMP

COOLING

- 11) Remove the radiator main fan and sub fan assemblies. <Ref. to CO-46, REMOVAL, Radiator Main Fan and Fan Motor.> and <Ref. to CO-48, REMOVAL, Radiator Sub Fan and Fan Motor.>
- 12) Remove V-belts.
<Ref. to ME(SOHC)-43, REMOVAL, V-belt.>
- 13) Remove the timing belt.
<Ref. to ME(SOHC)-47, TIMING BELT, REMOVAL, Timing Belt Assembly.>
- 14) Remove the automatic belt tension adjuster.

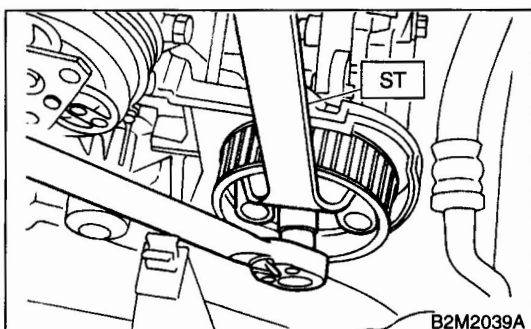


- 15) Remove the belt idler No. 2.

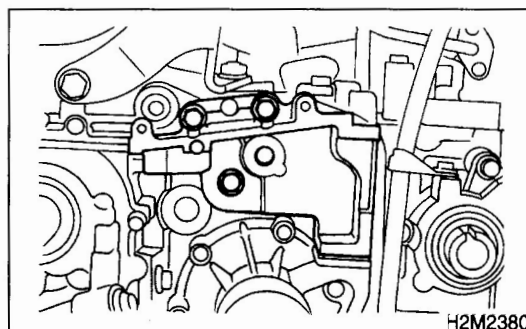


- 16) Remove the left-hand camshaft sprocket by using ST.

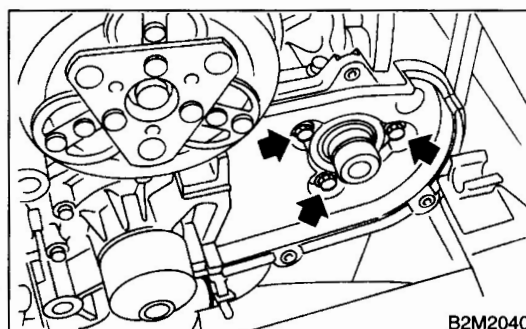
ST 499207100 CAMSHAFT SPROCKET WRENCH



- 17) Remove the tensioner bracket.

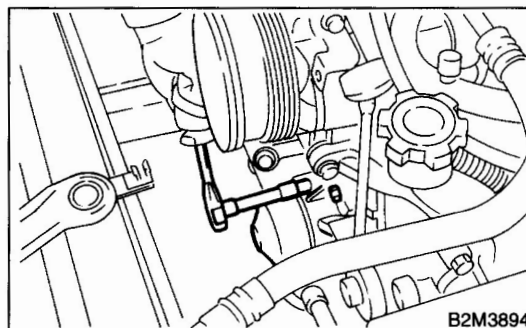


- 18) Remove the left-hand belt cover No. 2.



- 19) Disconnect the heater hose from the water pump.

- 20) Remove the water pump.



WATER PUMP

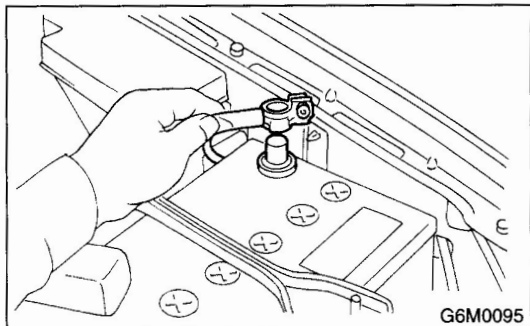
COOLING

2. TURBO MODEL

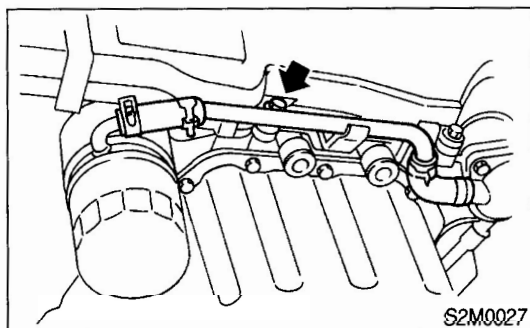
WARNING:

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

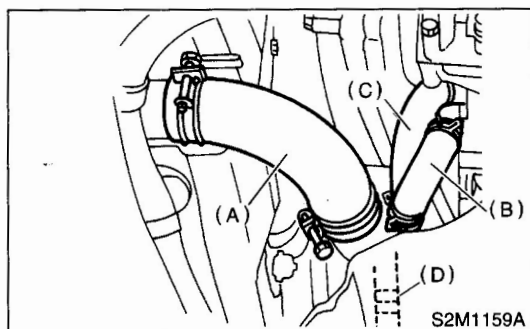
- 1) Set the vehicle on the lift.
- 2) Disconnect the ground cable from the battery.



- 3) Lift-up the vehicle.
- 4) Remove the under cover.
- 5) Drain the engine coolant completely. <Ref. to CO-25, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
- 6) Remove the radiator under cover.
- 7) Disconnect the connectors from the radiator main fan and sub fan motors.
- 8) Remove the bolt which installs water by-pass pipe of oil cooler onto oil pump.

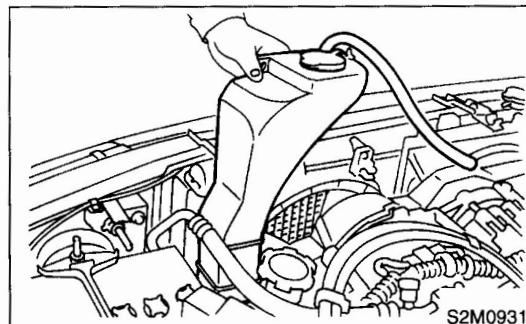


- 9) Disconnect the radiator outlet hose (A) and heater hose (B) from the water pump.
- 10) Disconnect the water by-pass hose (C) and oil cooler hose (D).

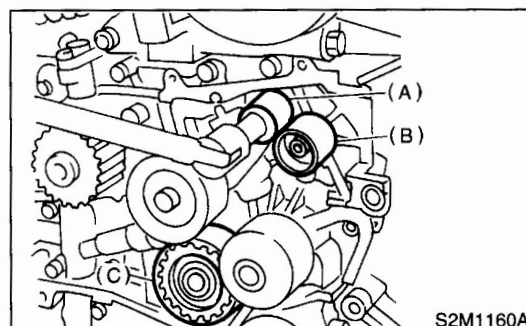


- 11) Lower the vehicle.

- 12) Disconnect the over flow hose.
- 13) Remove the reservoir tank.



- 14) Remove the radiator main fan and sub fan assemblies. <Ref. to CO-46, REMOVAL, Radiator Main Fan and Fan Motor.> and <Ref. to CO-48, REMOVAL, Radiator Sub Fan and Fan Motor.>
- 15) Remove the V-belts. <Ref. to ME(DOHC TURBO)-44, REMOVAL, V-belt.>
- 16) Remove the timing belt. <Ref. to ME(DOHC TURBO)-48, REMOVAL, Timing Belt Assembly.>
- 17) Remove the automatic belt tension adjuster (A).
- 18) Remove the belt idler (B).
- 19) Remove the belt idler No. 2 (C).



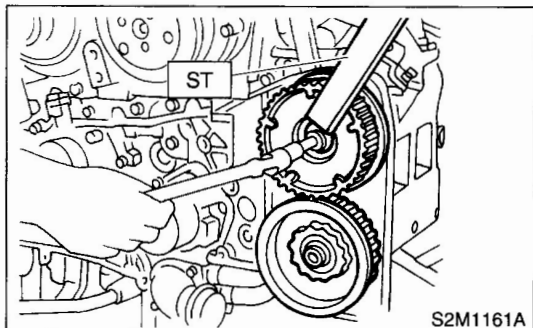
- 20) Remove the camshaft position sensor. <Ref. to FU(DOHC TURBO)-31, REMOVAL, Camshaft Position Sensor.>

WATER PUMP

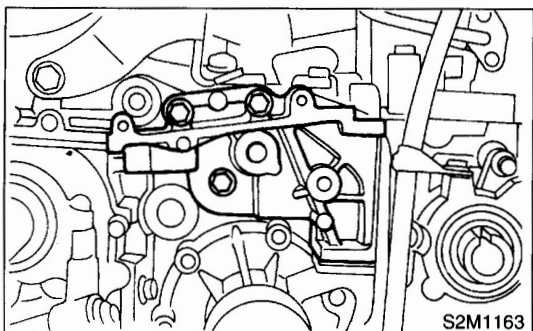
COOLING

21) Remove the left-hand camshaft sprockets by using ST.

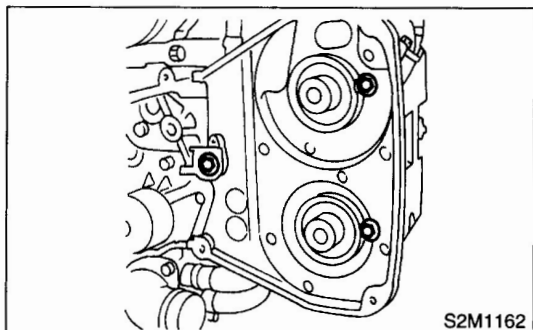
ST 499207400 CAMSHAFT SPROCKET WRENCH



22) Remove the tensioner bracket.

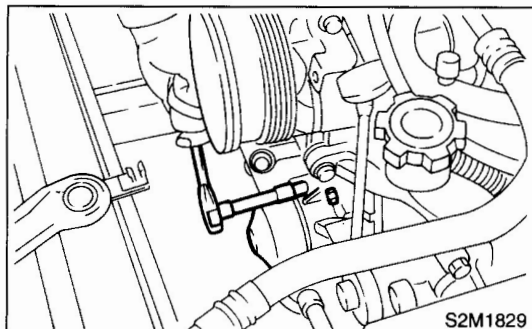


23) Remove the left-hand belt cover No. 2.



24) Disconnect the heater hose from the water pump.

25) Remove the water pump.



B: INSTALLATION

1. NON-TURBO MODEL

1) Install the water pump onto the left-hand cylinder head.

CAUTION:

- Replace gasket with a new one.
- When installing water pump, tighten bolts in two stages in alphabetical sequence as shown in figure.

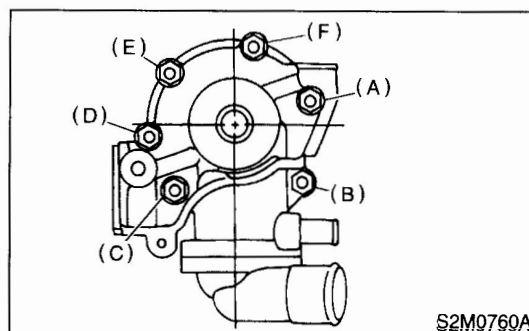
Tightening torque:

First:

12 N·m (1.2 kgf-m, 8.7 ft-lb)

Second:

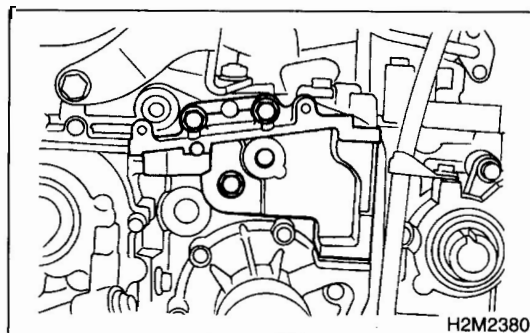
12 N·m (1.2 kgf-m, 8.7 ft-lb)



2) Install the tensioner bracket.

Tightening torque:

25 N·m (2.5 kgf-m, 18.1 ft-lb)



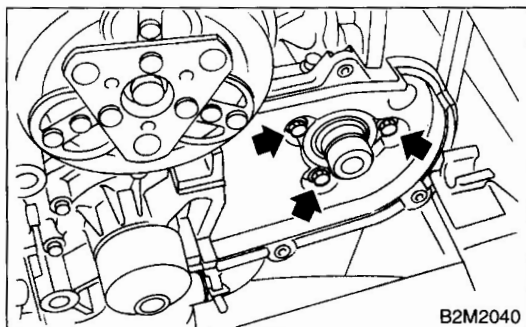
WATER PUMP

COOLING

- 3) Install the left-hand belt cover No. 2.

Tightening torque:

5 N·m (0.5 kgf-m, 3.6 ft-lb)

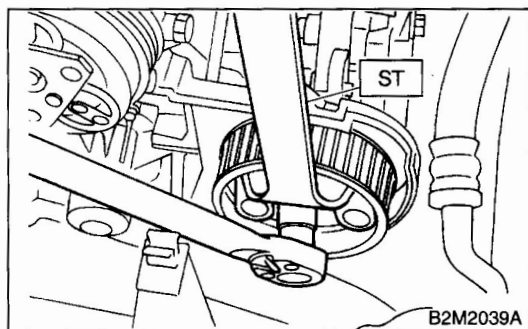


- 4) Install the left-hand camshaft sprockets by using ST.

ST 4992707100 CAMSHAFT SPROCKET WRENCH

Tightening torque:

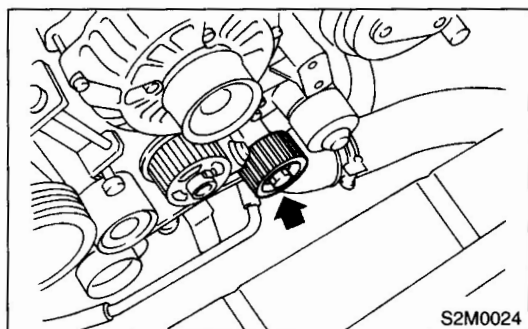
78 N·m (8.0 kgf-m, 57.9 ft-lb)



- 5) Install the belt idler No. 2.

Tightening torque:

39 N·m (4.0 kgf-m, 28.9 ft-lb)



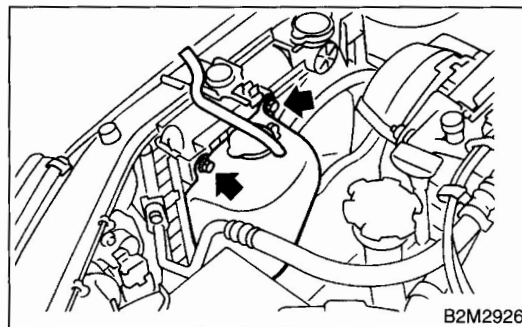
- 6) Install the automatic belt tension adjuster which tension rod is held with pin. <Ref. to ME(SOHC)-48, AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER, INSTALLATION, Timing Belt Assembly.>

- 7) Install the timing belt. <Ref. to ME(SOHC)-49, TIMING BELT, INSTALLATION, Timing Belt Assembly.>

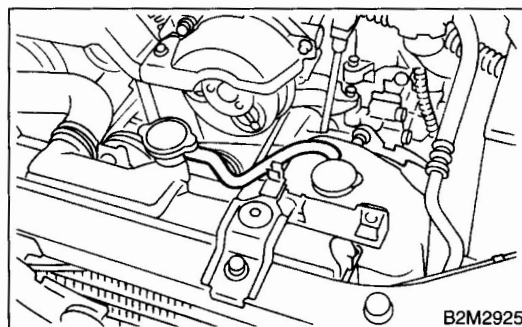
- 8) Install V-belts. <Ref. to ME(SOHC)-43, INSTALLATION, V-belt.>

- 9) Install the radiator main fan and sub fan motor assemblies. <Ref. to CO-47, INSTALLATION, Radiator Main Fan and Fan Motor.> and <Ref. to CO-48, INSTALLATION, Radiator Sub Fan and Fan Motor.>

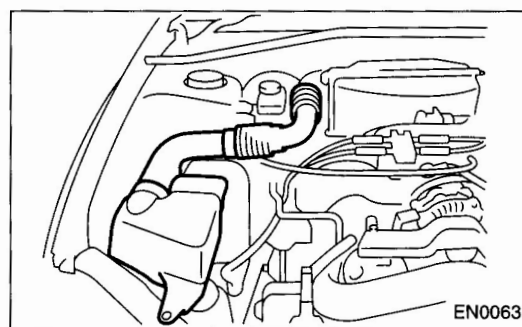
- 10) Install the reservoir tank.



- 11) Connect the over flow hose.



- 12) Install the air intake duct.

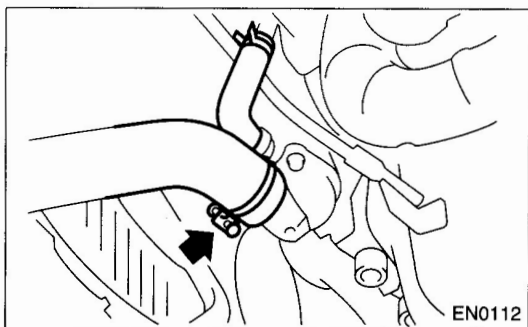


- 13) Lift-up the vehicle.

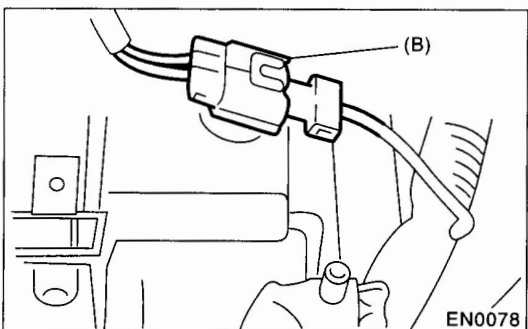
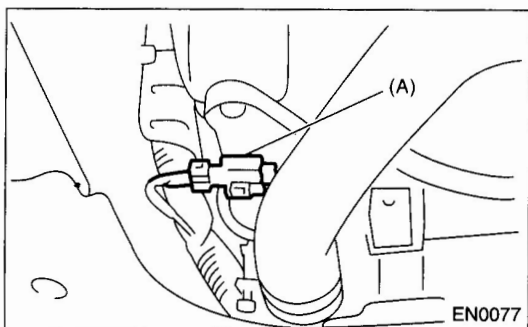
WATER PUMP

COOLING

14) Connect the radiator outlet hose and heater hose to the water pump.



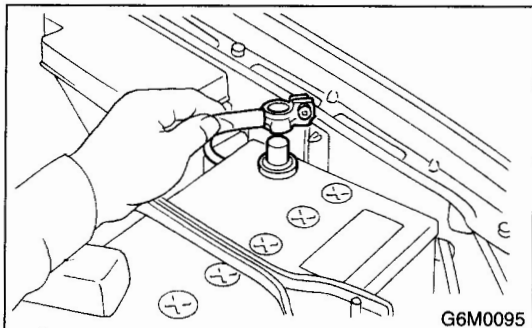
15) Connect the connectors to radiator main fan (A) and sub fan (B) motors.



16) Install the under cover.

17) Lower the vehicle.

18) Connect the battery ground cable.



19) Fill coolant. <Ref. to CO-25, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

2. TURBO MODEL

1) Install the water pump onto the left-hand cylinder head.

CAUTION:

- Replace gasket with a new one.
- When installing water pump, tighten bolts in two stages in alphabetical sequence as shown in figure.

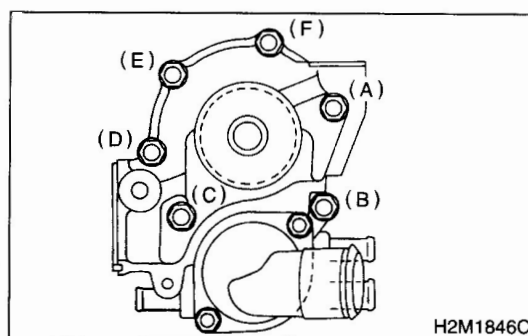
Tightening torque:

First:

12 N·m (1.2 kgf-m, 8.7 ft-lb)

Second:

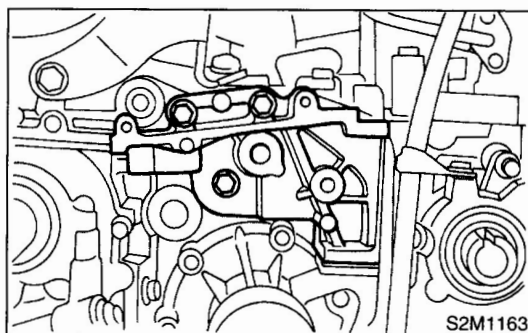
12 N·m (1.2 kgf-m, 8.7 ft-lb)



2) Install the tensioner bracket.

Tightening torque:

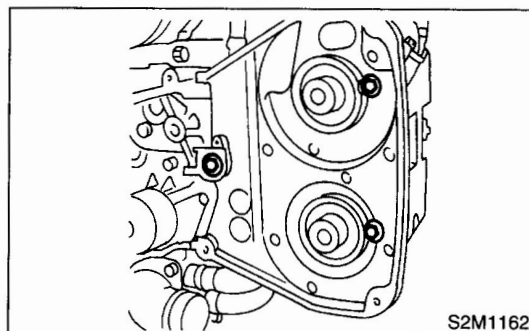
25 N·m (2.5 kgf-m, 18.1 ft-lb)



3) Install the left-hand belt cover No. 2.

Tightening torque:

5 N·m (0.5 kgf-m, 3.6 ft-lb)



WATER PUMP

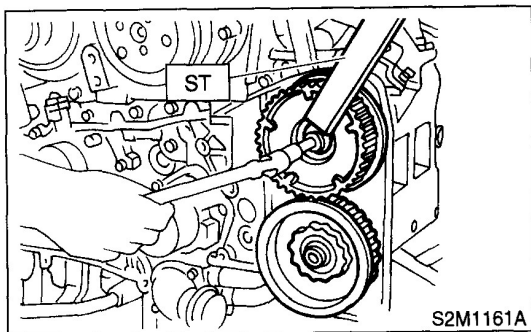
COOLING

- 4) Install the left-hand camshaft sprockets by using ST.

ST 499207400 CAMSHAFT SPROCKET
WRENCH

Tightening torque:

98 N·m (10.0 kgf-m, 72.4 ft-lb)



- 5) Install the camshaft position sensor. <Ref. to FU(DOHC TURBO)-31, INSTALLATION, Camshaft Position Sensor.>

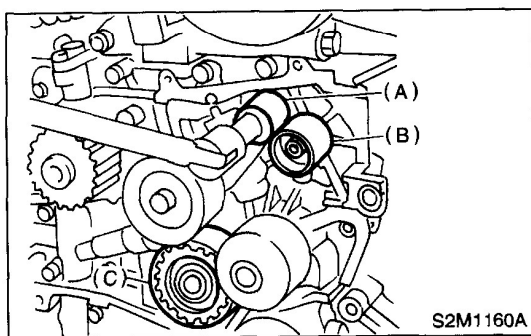
- 6) Install the belt idler No. 2 (C).

- 7) Install the belt idler (B).

- 8) Install the automatic belt tension adjuster (A) which has a tension rod held by a pin. <Ref. to ME(DOHC TURBO)-50, AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER, INSTALLATION, Timing Belt Assembly.>

Tightening torque:

39.4 N·m (4.0 kgf-m, 28.9 ft-lb)

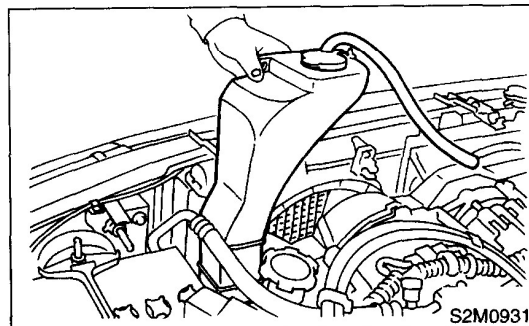


- 9) Install the timing belt. <Ref. to ME(DOHC TURBO)-51, TIMING BELT, INSTALLATION, Timing Belt Assembly.>

- 10) Install the V-belts. <Ref. to ME(DOHC TURBO)-44, INSTALLATION, V-belt.>

- 11) Install the radiator main fan and sub fan motor assemblies. <Ref. to CO-47, INSTALLATION, Radiator Main Fan and Fan Motor.> and <Ref. to CO-48, INSTALLATION, Radiator Sub Fan and Fan Motor.>

- 12) Install the reservoir tank.

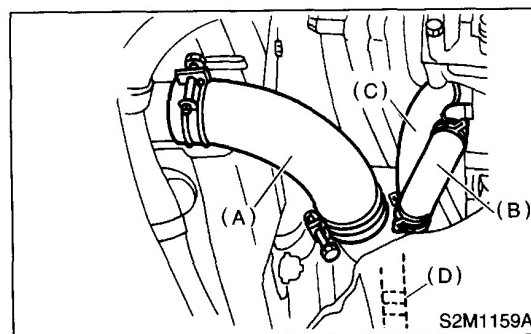


- 13) Connect the over flow hose.

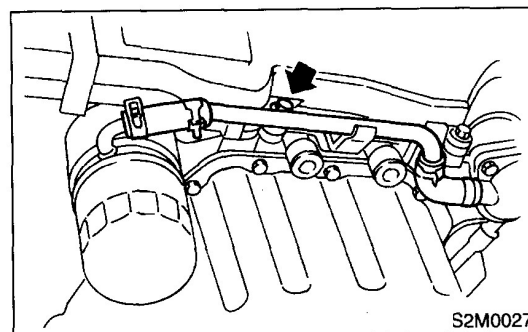
- 14) Lift-up the vehicle.

- 15) Connect the radiator outlet hose (A) and heater hose (B) to the water pump.

- 16) Connect the water by-pass hose (C) and oil cooler hose (D).



- 17) Install the bolt which installs water by-pass pipe onto the oil pump.



- 18) Connect the connectors to radiator main fan and sub fan motors.

- 19) Install the radiator under cover.

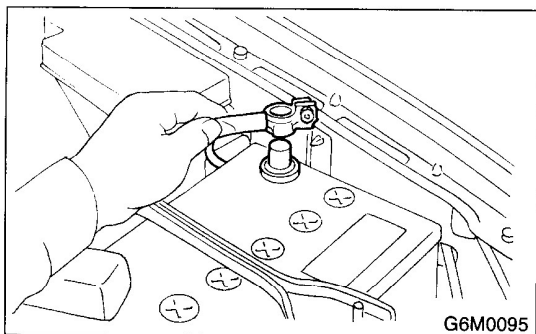
- 20) Install the under cover.

- 21) Lower the vehicle.

WATER PUMP

COOLING

22) Connect the battery ground cable.

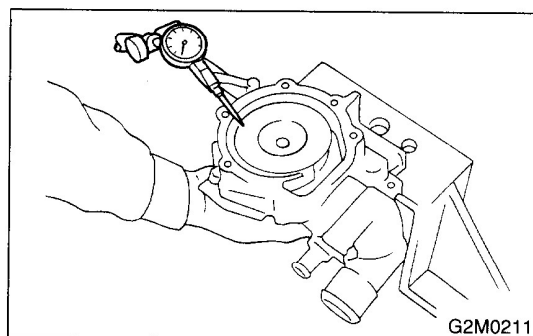


23) Fill coolant. <Ref. to CO-25, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

C: INSPECTION

- 1) Check the water pump bearing for smooth rotation.
- 2) Check the water pump pulley for abnormalities.
- 3) Using a dial gauge, measure impeller runout in thrust direction while rotating the pulley.

"Thrust" runout limit:
0.5 mm (0.020 in)



- 4) Check the clearance between impeller and pump case.

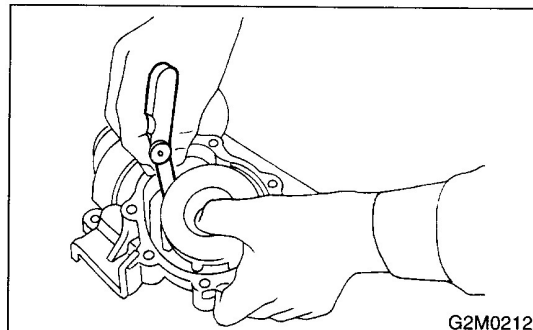
Clearance between impeller and pump case:

Standard

0.5 — 0.7 mm (0.020 — 0.028 in)

Limit

1.0 mm (0.039 in)



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

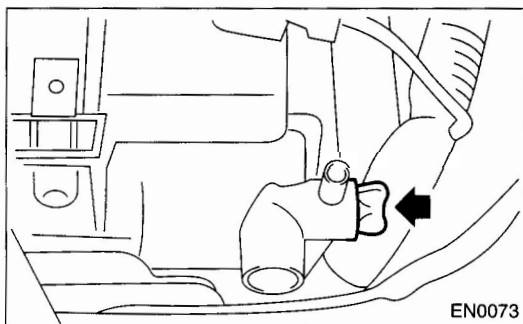
THERMOSTAT

COOLING

6. Thermostat

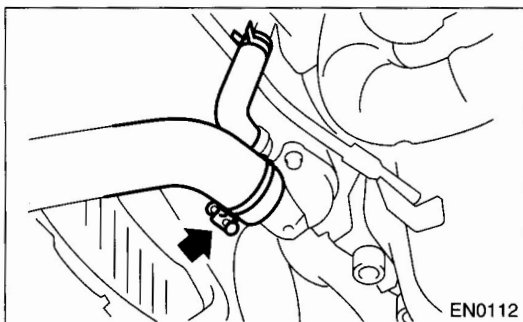
A: REMOVAL

- 1) Lift-up the vehicle.
- 2) Remove the under cover.
- 3) Drain engine coolant completely. <Ref. to CO-25, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>



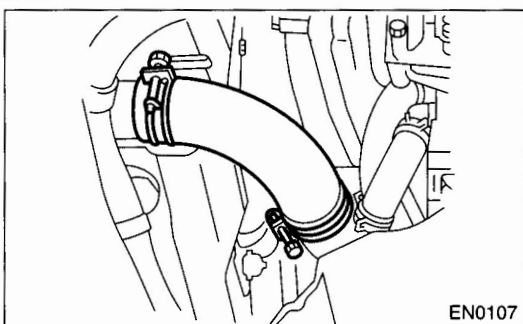
- 4) Disconnect the radiator outlet hose from the thermostat cover.

- Non-Turbo model

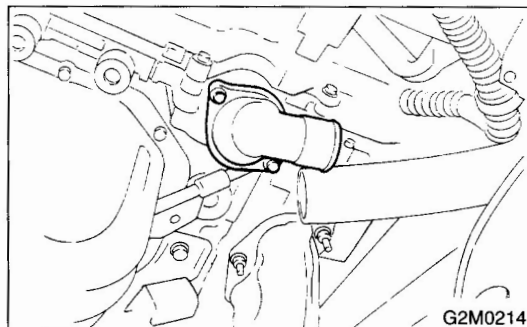


- 5) Disconnect the radiator outlet hose.

- Turbo model



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



B: INSTALLATION

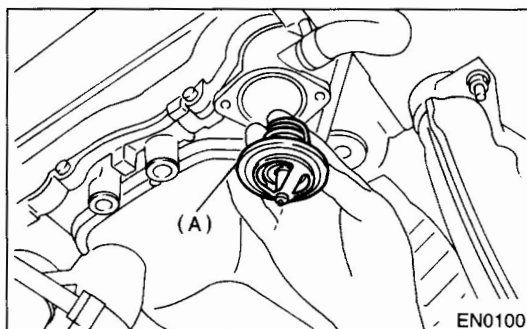
- 1) Install the thermostat in the water pump, and install the thermostat cover together with a gasket.

CAUTION:

- When reinstalling the thermostat, use a new gasket.
- The thermostat must be installed with the jiggle pin (A) facing to front side.
- At this time, set the jiggle pin of thermostat for front side.

Tightening torque:

6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



- 2) Fill coolant. <Ref. to CO-25, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

THERMOSTAT

COOLING

C: INSPECTION

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

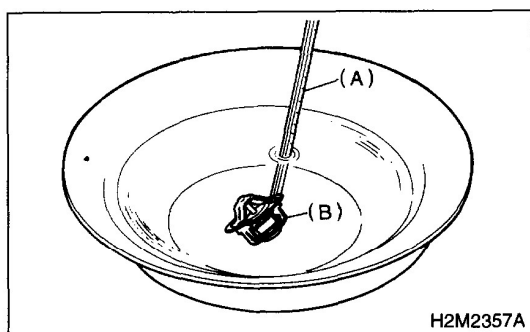
Immerse the thermostat and a thermometer in water. Raise water temperature gradually, and measure the temperature and valve lift when the valve begins to open and when the valve is fully opened. During the test, agitate the water for even temperature distribution. The measurement should be to the specification.

Starts to open:

76 — 80°C (169 — 176°F)

Fully opens:

91°C (196°F)



(A) Thermometer

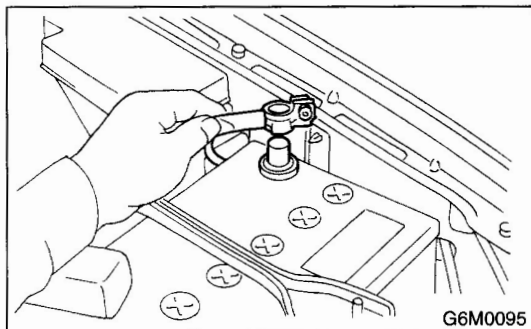
(B) Thermostat

7. Radiator

A: REMOVAL

1. NON-TURBO MODEL

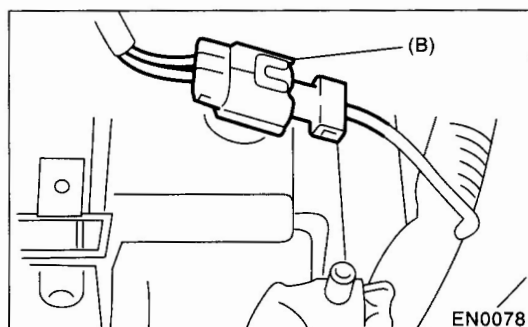
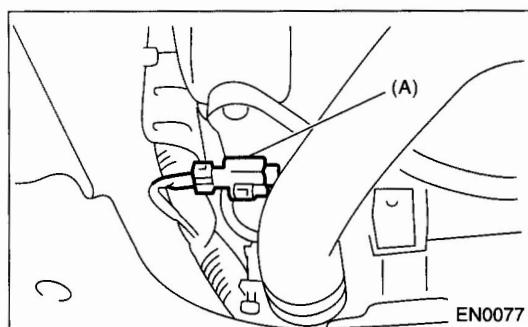
1) Disconnect the battery ground cable.



2) Lift-up the vehicle.

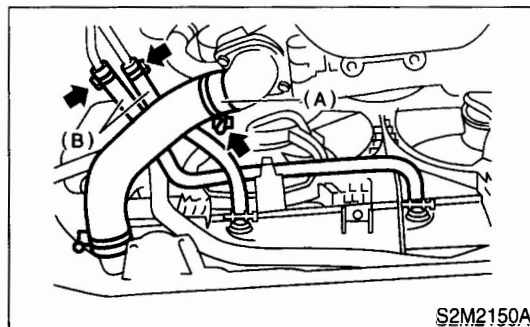
3) Drain engine coolant completely. <Ref. to CO-25, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

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



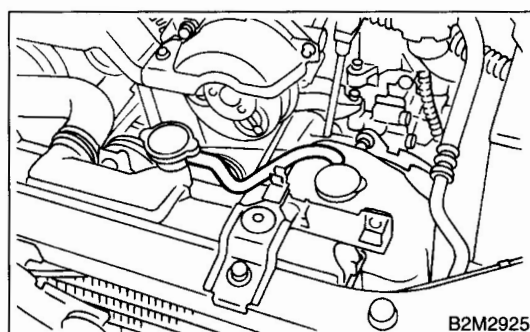
5) Disconnect the radiator outlet hose (A) from thermostat cover.

6) Disconnect the ATF cooler hoses (B) from the radiator. (AT vehicles only)

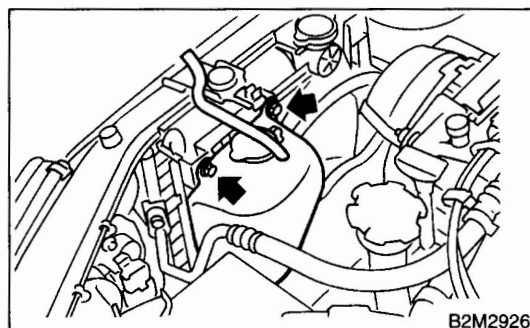


7) Lower the vehicle.

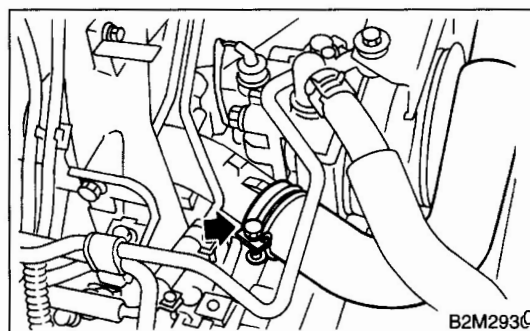
8) Disconnect the over flow hose.



9) Remove the reservoir tank.



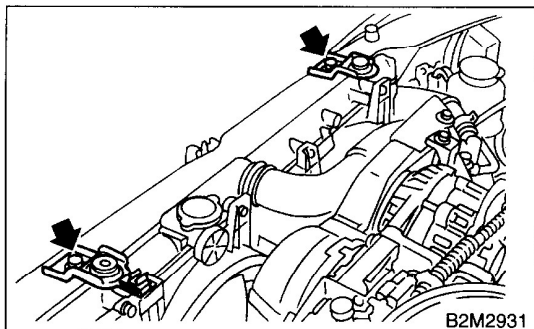
10) Disconnect the radiator inlet hose from the engine.



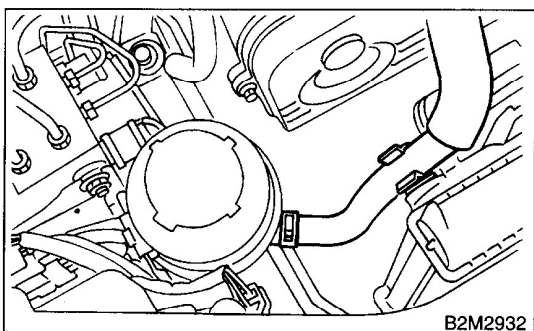
RADIATOR

COOLING

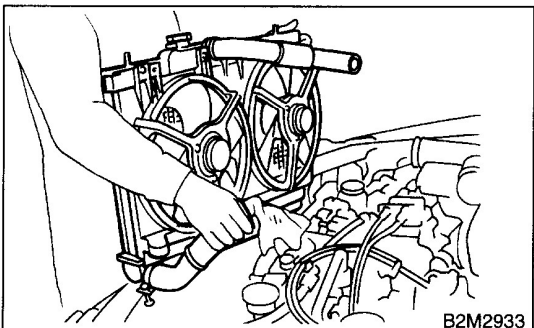
- 11) Remove the radiator upper brackets.



- 12) Detach the power steering hose from the the clip on the radiator.



- 13) While slightly lifting radiator, slide it to left.
14) Lift the radiator up and away from the vehicle.

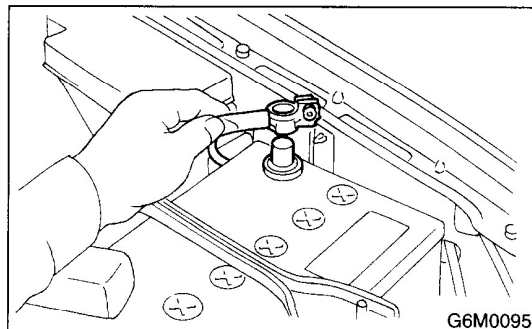


2. TURBO MODEL

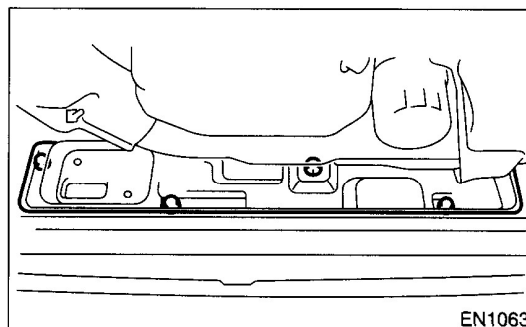
WARNING:

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

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



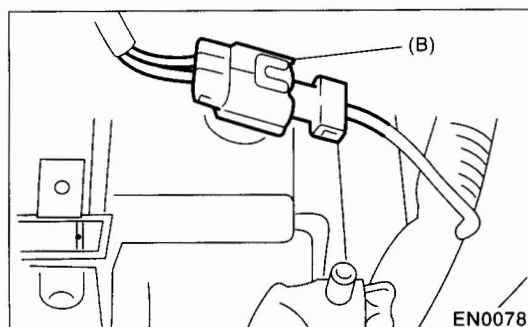
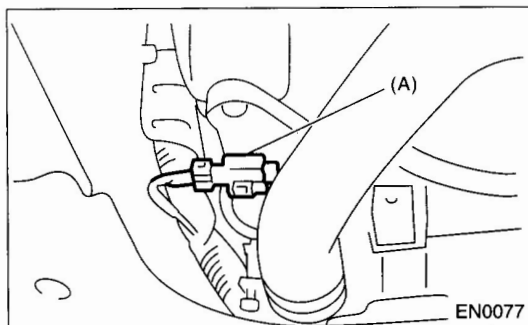
- 3) Lift-up the vehicle.
- 4) Remove the under cover.
- 5) Drain the engine coolant completely. <Ref. to CO-25, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
- 6) Remove the radiator under cover. (AT vehicles only)



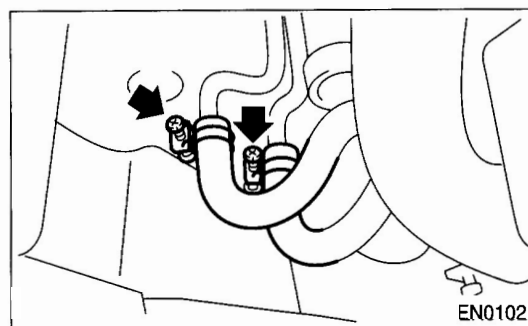
RADIATOR

COOLING

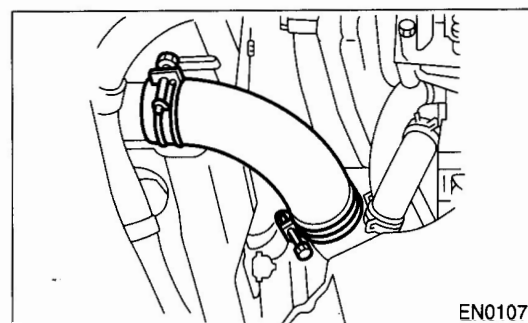
- 7) Disconnect the connectors of radiator main fan (A) and sub fan motor (B).



- 8) Disconnect the ATF cooler hoses from the radiator. (AT vehicles only)

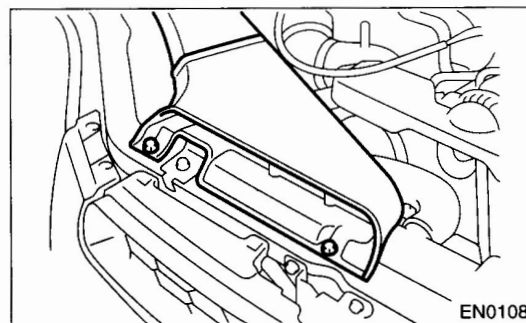


- 9) Disconnect the radiator outlet hose from the thermostat cover.



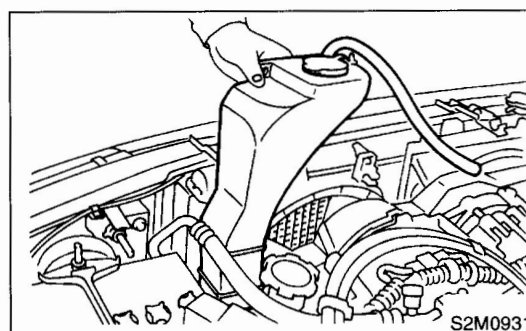
- 10) Lower the vehicle.

- 11) Remove the air intake duct.

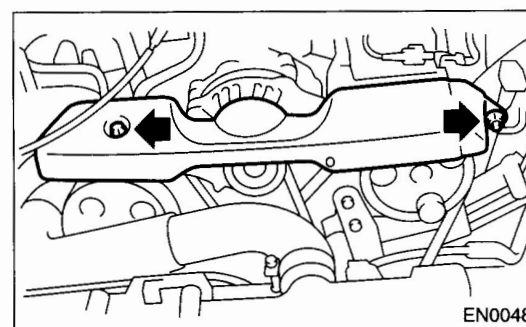


- 12) Disconnect the over flow hose.

- 13) Remove the reservoir tank.



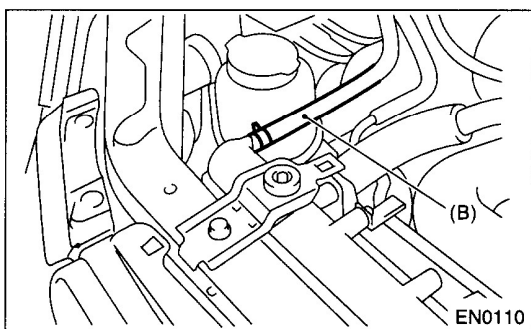
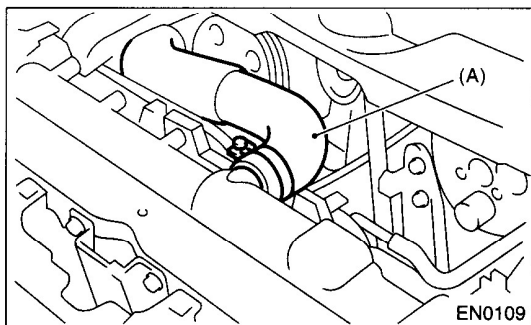
- 14) Remove the V-belt covers.



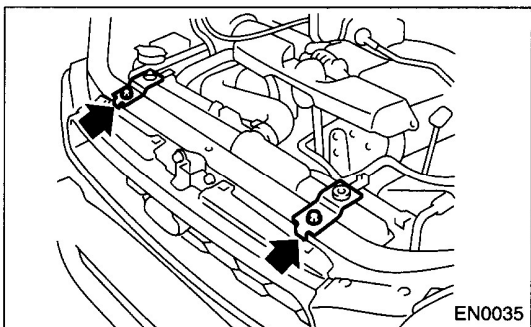
RADIATOR

COOLING

15) Disconnect the radiator inlet hose (A) and coolant filler tank hose (B) from the radiator.



16) Remove the radiator upper brackets.



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

18) Lift the radiator up and away from the vehicle.

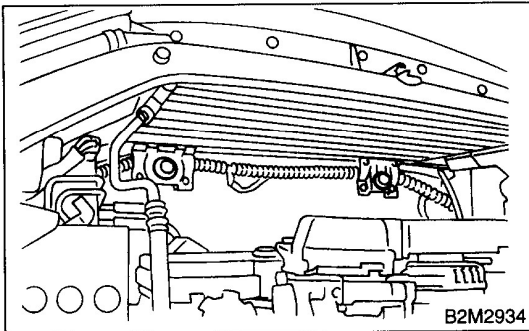
RADIATOR

COOLING

B: INSTALLATION

1. NON-TURBO MODEL

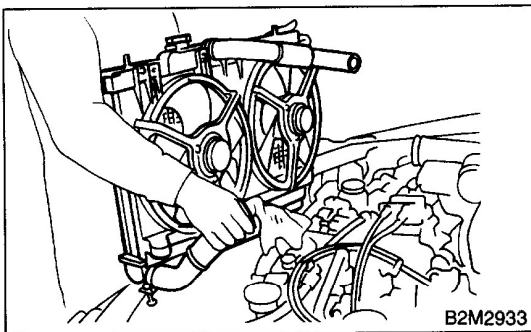
1) Attach the radiator mounting cushions to holes on the vehicle.



2) Install the radiator while fitting radiator pins to cushions.

NOTE:

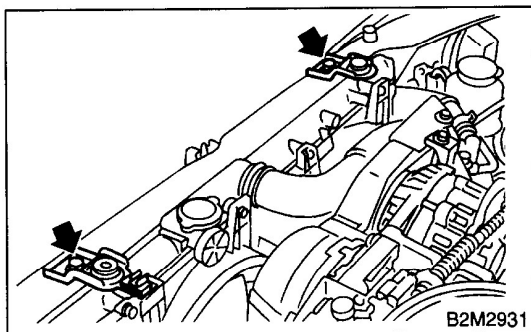
Fit pins on lower side of radiator into cushions on body side.



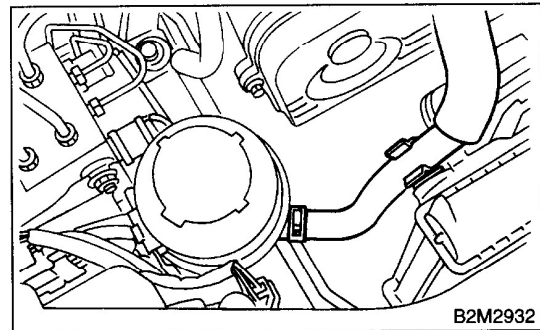
3) Install the radiator brackets and tighten the bolts.

Tightening torque:

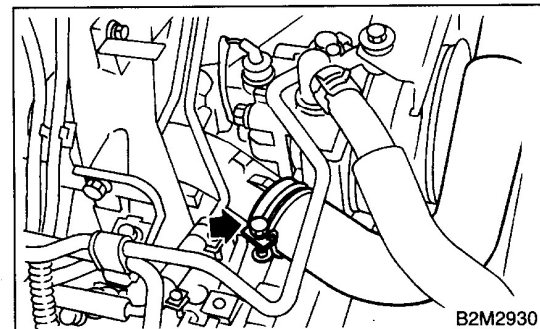
12 N·m (1.2 kgf-m, 8.7 ft-lb)



4) Attach the power steering hose to the radiator.



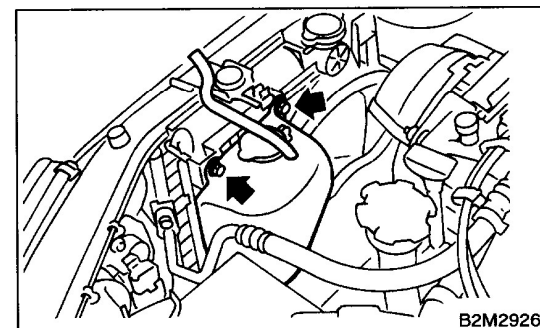
5) Connect the radiator inlet hose.



6) Install the reservoir tank.

Tightening torque:

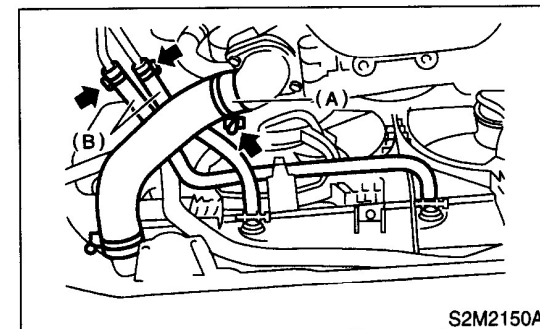
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)



7) Lift-up the vehicle.

8) Connect the radiator outlet hose (A).

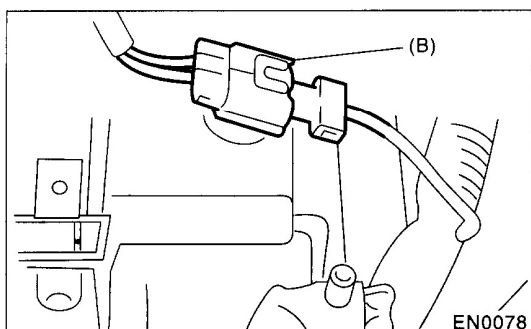
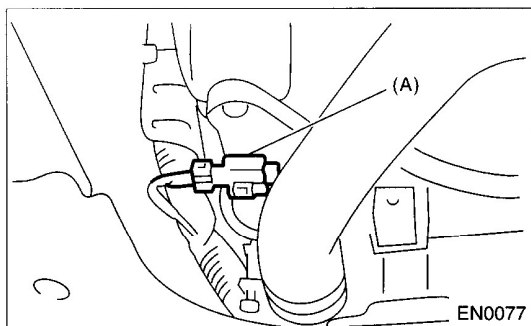
9) Connect the ATF cooler hoses (B). (AT vehicles only)



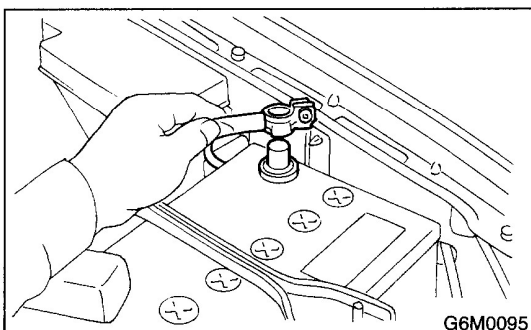
RADIATOR

COOLING

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



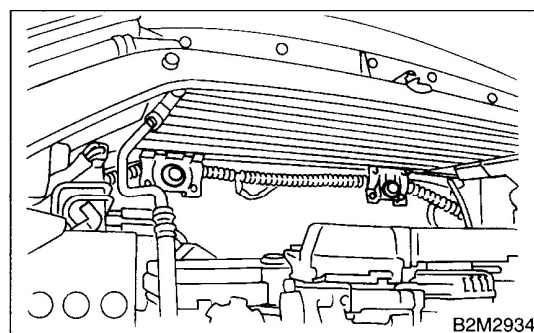
- 11) Install the under cover.
12) Lower the vehicle.
13) Connect the battery ground cable.



- 14) Fill coolant. <Ref. to CO-25, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
15) Check ATF level. <Ref. to AT-9, INSPECTION, Automatic Transmission Fluid.>

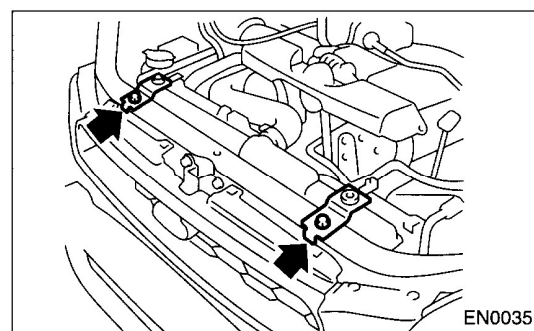
2. TURBO MODEL

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

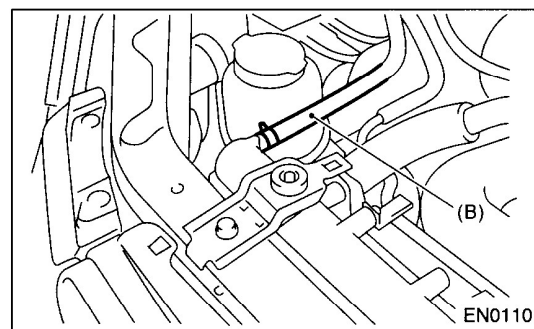
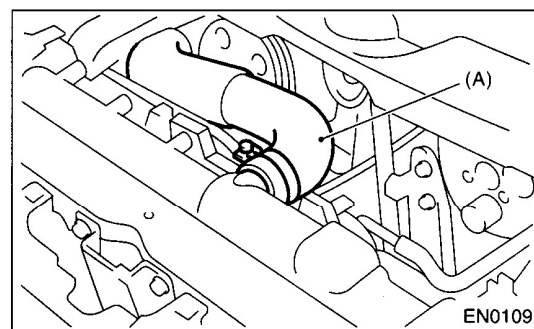


- 2) Install the radiator brackets and tighten bolts.

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



- 3) Connect the radiator inlet hose (A) and coolant filler tank hose (B).



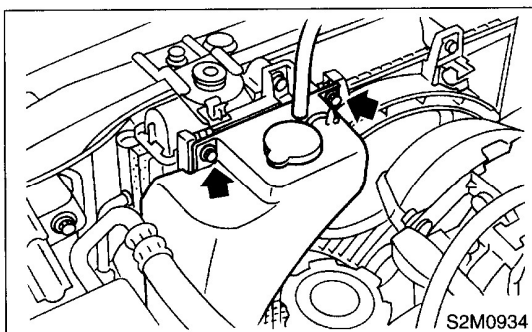
RADIATOR

COOLING

4) Install the reservoir tank.

Tightening torque:

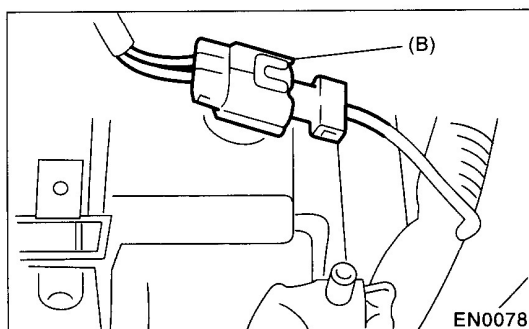
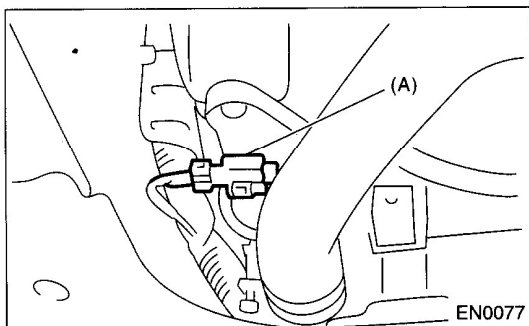
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)



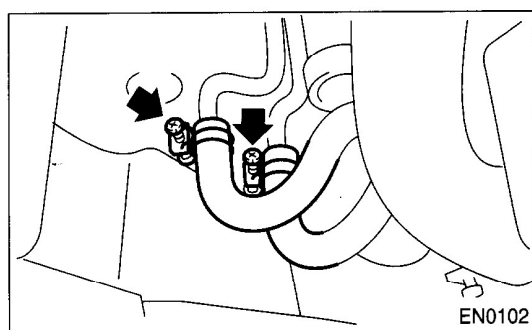
5) Connect the over flow hose.

6) Lift-up the vehicle.

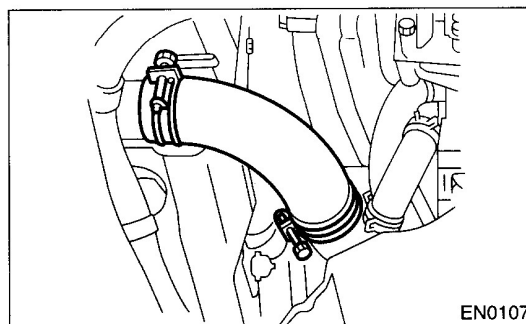
7) Connect the connectors to the radiator main fan motor(A) and sub fan motor(B).



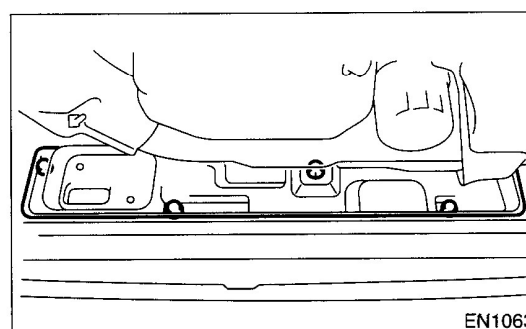
8) Connect the ATF cooler hoses. (AT vehicles only)



9) Connect the radiator outlet hose.



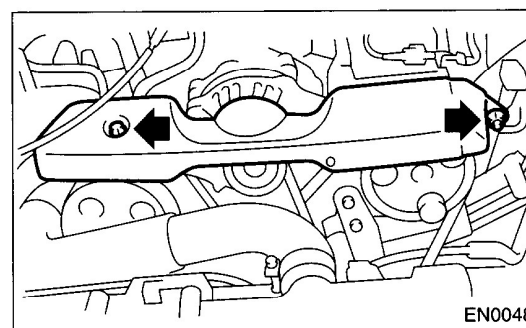
10) Install the radiator under cover. (AT vehicle only)



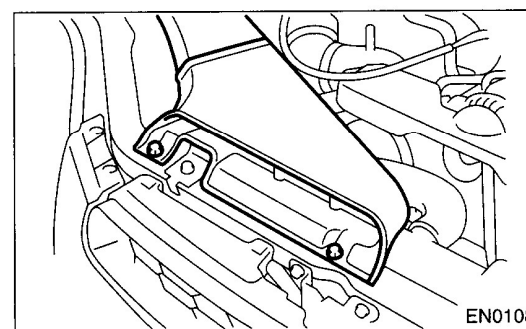
11) Install the under cover.

12) Lower the vehicle.

13) Install the V-belt covers.



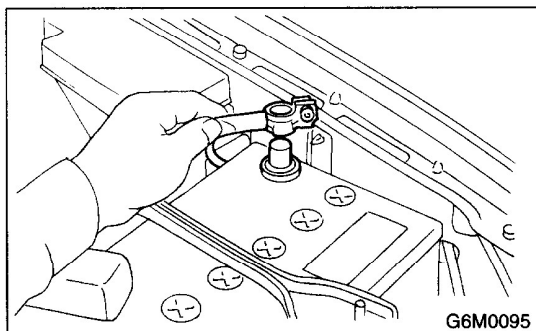
14) Install the air intake duct.



RADIATOR

COOLING

15) Connect the battery ground cable.

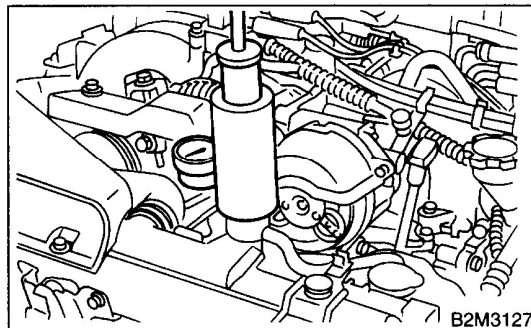


16) Fill coolant. <Ref. to CO-25, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

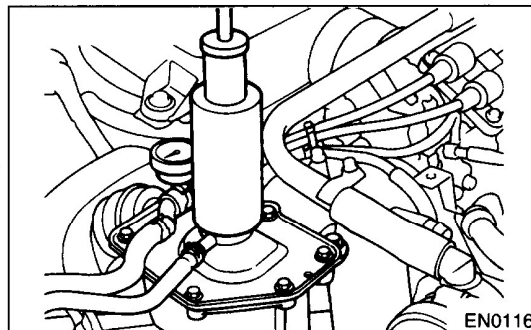
C: INSPECTION

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

- Non-Turbo model



- Turbo model



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

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

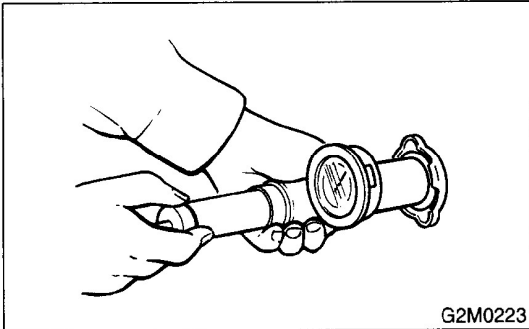
CAUTION:

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

8. Radiator Cap

A: INSPECTION

1) Attach the radiator cap to the 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.

Standard pressure:

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

Service limit pressure:

83 kPa (0.85 kg/cm², 12 psi)

CAUTION:

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

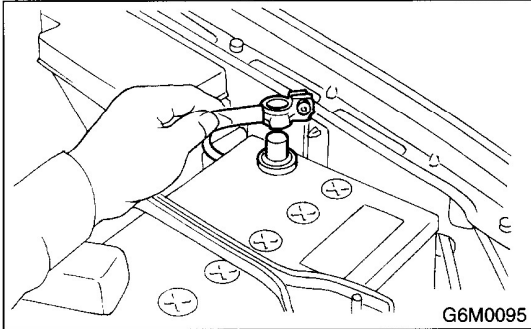
RADIATOR MAIN FAN AND FAN MOTOR

COOLING

9. Radiator Main Fan and Fan Motor

A: REMOVAL

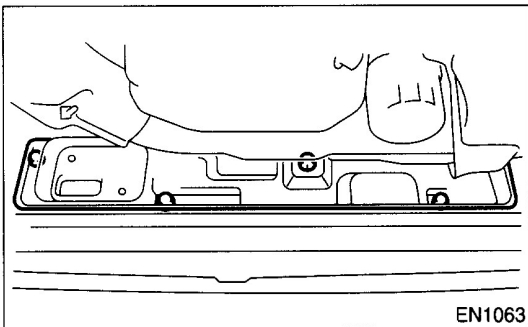
1) Disconnect the battery ground cable.



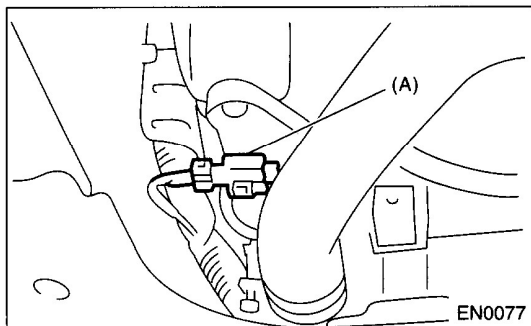
2) Lift-up the vehicle.

3) Remove the under cover.

4) Remove the radiator under cover. (AT vehicle only)

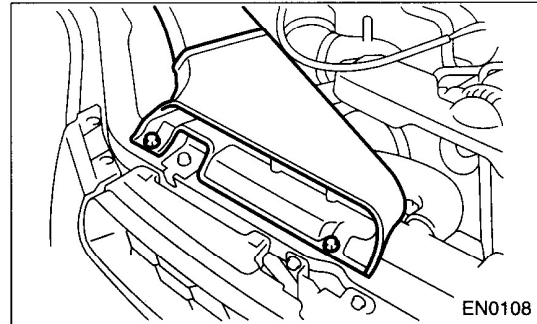


5) Disconnect the connector of main fan motor (A).

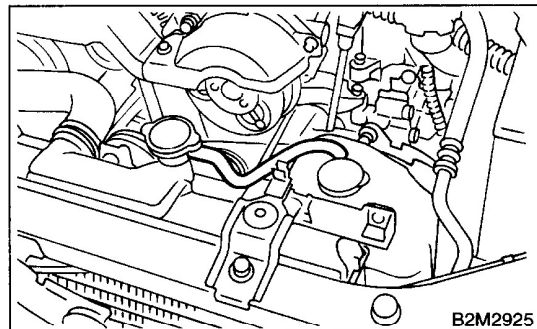


6) Lower the vehicle.

7) Remove the air intake duct. (Turbo model)

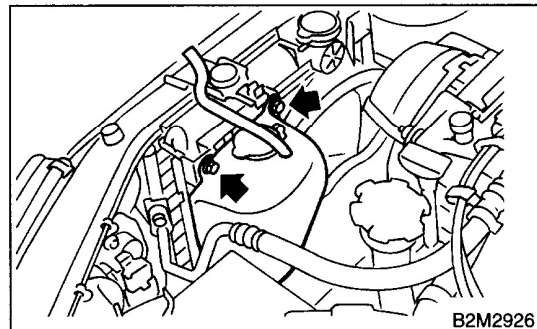


8) Disconnect the over flow hose.

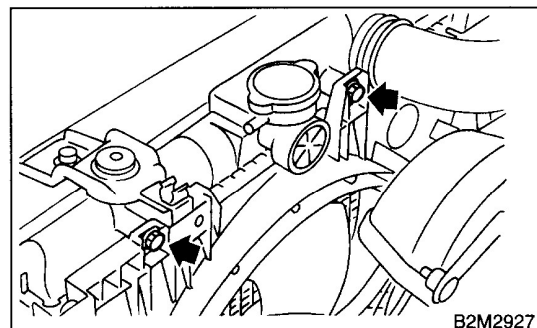


9) Remove the over flow pipe. (Turbo model)

10) Remove the reservoir tank.



11) Remove the radiator main fan motor assembly.



RADIATOR MAIN FAN AND FAN MOTOR

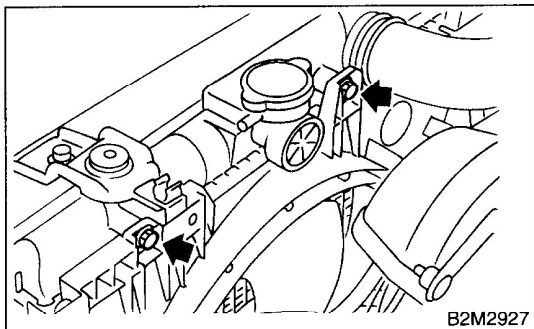
COOLING

B: INSTALLATION

Install in the reverse order of removal.

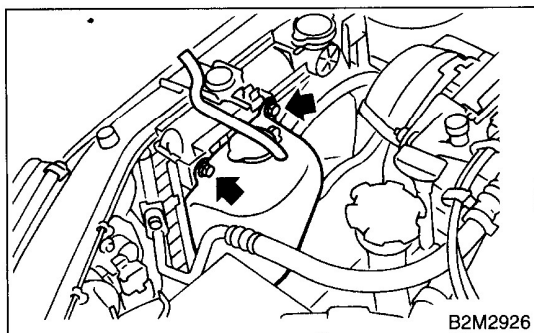
NOTE:

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



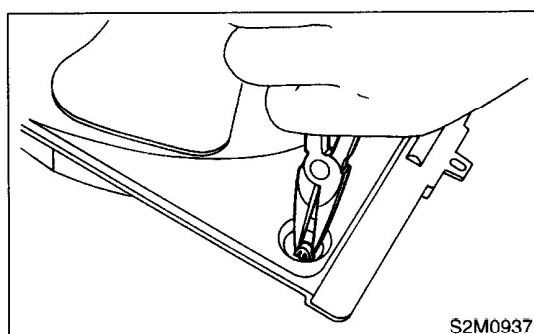
Tightening torque:

7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

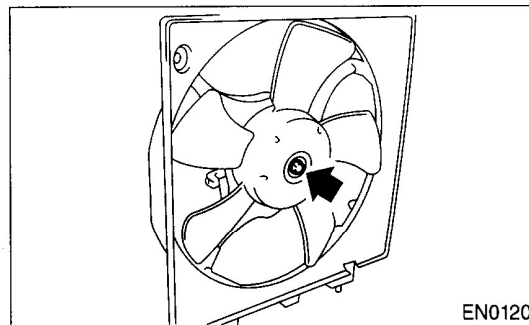


C: DISASSEMBLY

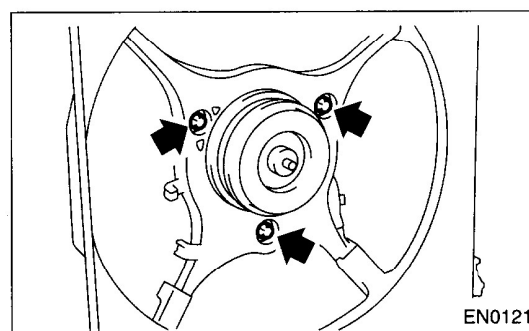
1) Remove the clip which holds motor connector onto the shroud.



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



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

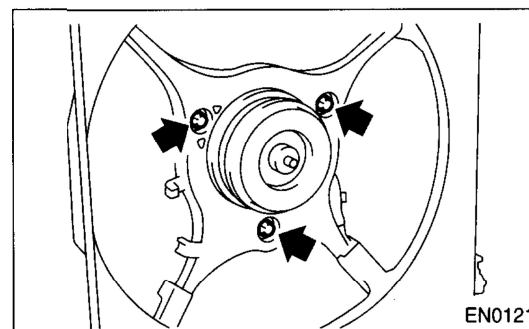


D: ASSEMBLY

Assemble in the reverse order of disassembly.

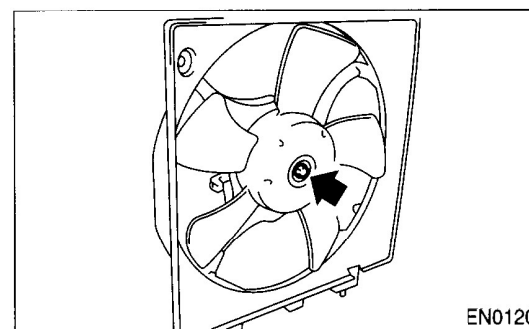
Tightening torque:

4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



Tightening torque:

3.4 N·m (0.35 kgf-m, 2.5 ft-lb)



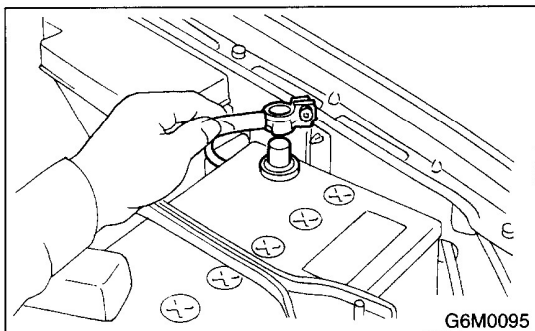
RADIATOR SUB FAN AND FAN MOTOR

COOLING

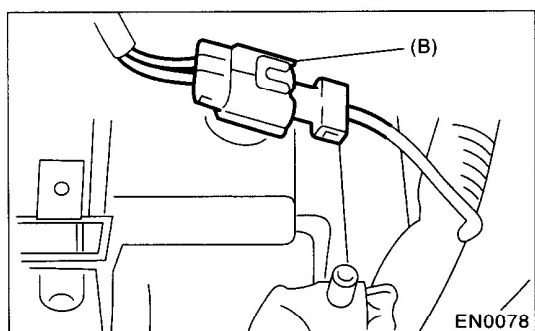
10. Radiator Sub Fan and Fan Motor

A: REMOVAL

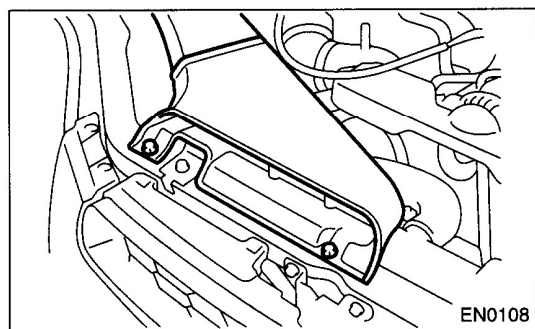
- 1) Disconnect the battery ground cable.



- 2) Lift-up the vehicle.
3) Remove the under cover.
4) Remove the radiator under cover.
5) Disconnect the connector of sub fan motor.

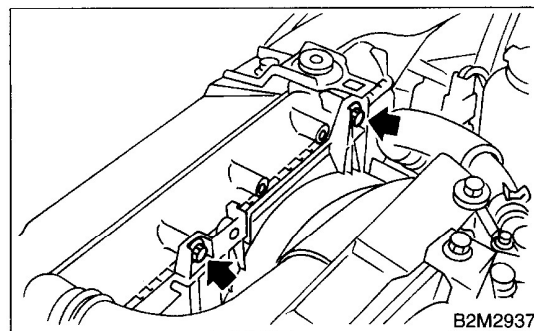


- 6) Lower the vehicle.
7) Remove the air intake duct. (Turbo model)



- 8) Remove the bolts which hold sub fan shroud to the radiator.
9) Remove the over flow pipe. (Turbo model)

- 10) Remove the radiator sub fan shroud through the under side of vehicle.

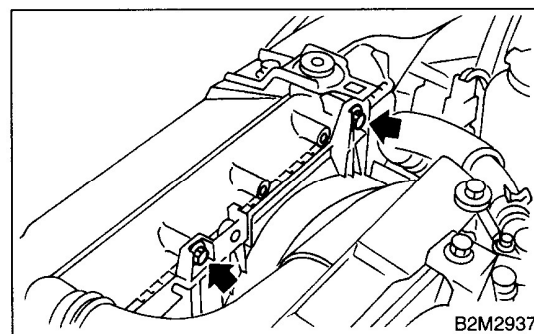


B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

4.9 N·m (0.50 kgf-m, 3.6 ft-lb)

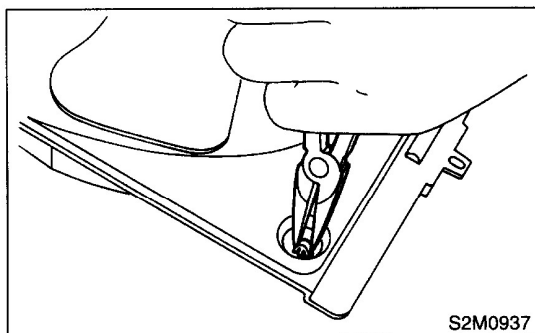


RADIATOR SUB FAN AND FAN MOTOR

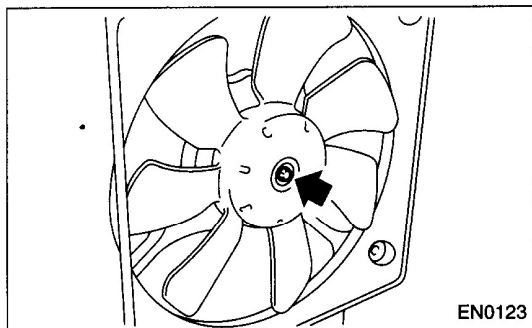
COOLING

C: DISASSEMBLY

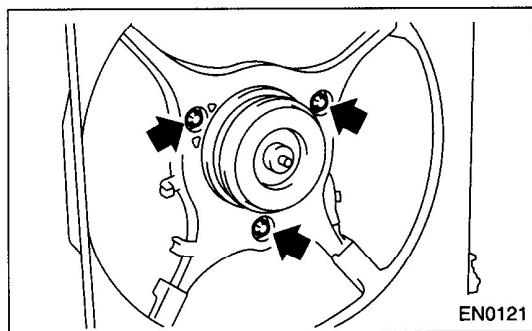
1) Remove the clip which holds motor harness onto the shroud.



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



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

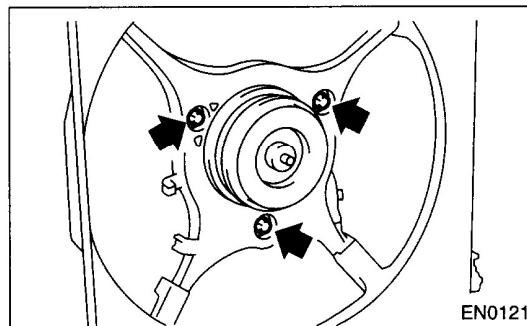


D: ASSEMBLY

Assemble in the reverse order of disassembly.

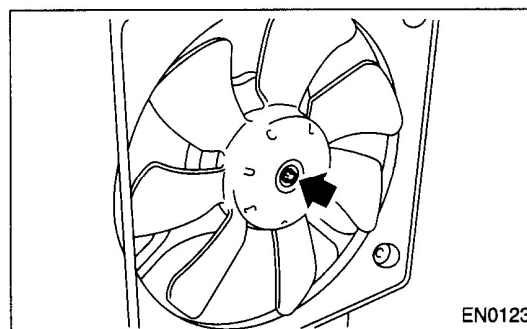
Tightening torque:

4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



Tightening torque:

3.4 N·m (0.35 kgf-m, 2.5 ft-lb)



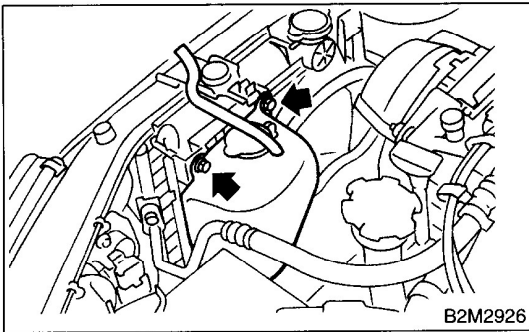
RESERVOIR TANK

COOLING

11. Reservoir Tank

A: REMOVAL

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

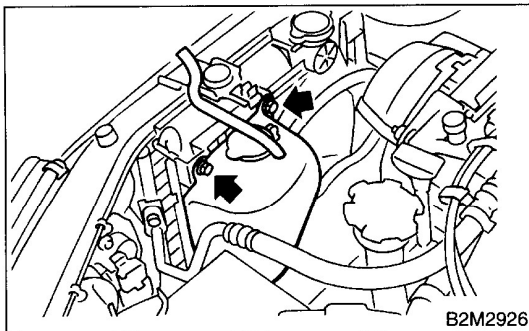


B: INSTALLATION

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 engine coolant level is between full and low.

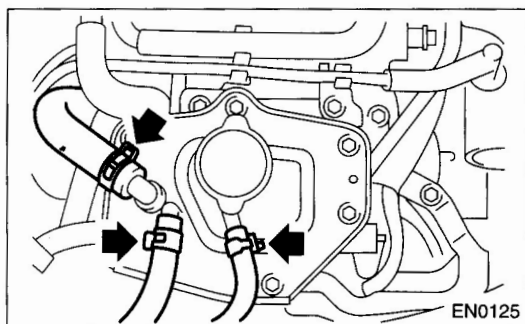
12. Coolant Filler Tank

A: REMOVAL

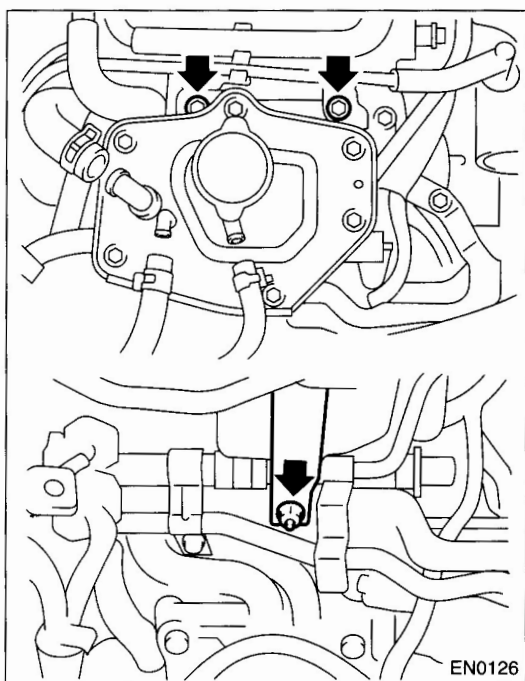
WARNING:

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

- 1) Drain the coolant about 3.0 (3.2 US qt, 2.6 Imp qt). <Ref. to CO-25, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
- 2) Remove the air cleaner upper cover and air intake boot. <Ref. to IN(DOHC TURBO)-7, REMOVAL, Air Cleaner.>
- 3) Remove the air cleaner element.
- 4) Disconnect the engine coolant hoses from the coolant filler tank.



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

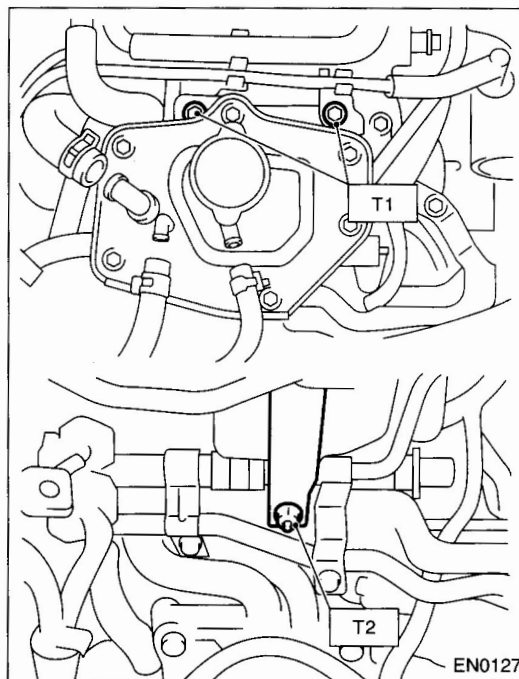


B: INSTALLATION

- 1) Install in the reverse order of removal.

Tightening torque:

- T1: 19 N·m (1.9 kgf-m, 13.7 ft-lb)
T2: 21 N·m (2.1 kgf-m, 15.2 ft-lb)



- 2) Fill engine coolant. <Ref. to CO-25, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

ENGINE COOLING SYSTEM TROUBLE IN GENERAL

COOLING

13.Engine Cooling System Trouble in General

A: INSPECTION

Trouble	Possible cause	Corrective action
Over-heating	a. Insufficient engine coolant	Replenish engine coolant, inspect for leakage, and repair.
	b. Loose timing belt	Repair or replace timing belt tensioner.
	c. Oil on drive belt	Replace.
	d. Malfunction of thermostat	Replace.
	e. Malfunction of water pump	Replace.
	f. Clogged engine coolant passage	Clean.
	g. Improper ignition timing	Inspect and repair ignition control system. <Ref. to EN(SOHC)-2, Basic Diagnostic Procedure.> or <Ref. to EN(DOHC TURBO)-2, PROCEDURE, Basic Diagnostic Procedure.>
	h. Clogged or leaking radiator	Clean or repair, or replace.
	i. Improper engine oil in engine coolant	Replace engine coolant.
	j. Air/fuel mixture ratio too lean	Inspect and repair fuel injection system.<Ref. to EN(SOHC)-2, Basic Diagnostic Procedure.> or <Ref. to EN(DOHC TURBO)-2, PROCEDURE, Basic Diagnostic Procedure.>
	k. Excessive back pressure in exhaust system	Clean or replace.
	l. Insufficient clearance between piston and cylinder	Adjust or replace.
	m. Slipping clutch	Repair or replace.
	n. Dragging brake	Adjust.
Over-cooling	o. Improper transmission oil	Replace.
	p. Defective thermostat	Replace.
Engine coolant leaks.	q. Malfunction of electric fan	Inspect radiator fan relay, engine coolant temperature sensor or radiator motor and replace there.
	a. Atmospheric temperature extremely low	Partly cover radiator front area.
	b. Defective thermostat	Replace.
	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.
Voise	f. Damaged or cracked thermostat case	Repair or replace.
	g. Leakage from radiator	Repair or replace.
	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.