COOLING SYSTEM
(DIESEL)

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76G03B-001
COOLANT FLOW CHART

1. Water pump
2. Thermostat
3. Radiator
4. Coolant reservoir
5. CSD coolant passage
6. Oil cooler
## SPECIFICATIONS

<table>
<thead>
<tr>
<th>Cooling system</th>
<th>Water-cooled, forced circulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coolant capacity</td>
<td>liters (US qt, imp qt)</td>
</tr>
<tr>
<td>With heater</td>
<td>9.5 (10.0, 8.4)</td>
</tr>
<tr>
<td>Without heater</td>
<td>9.0 (9.5, 7.9)</td>
</tr>
<tr>
<td>Water pump</td>
<td>Type: Centrifugal, timing belt driven; Water seal: Unified mechanical seal</td>
</tr>
<tr>
<td>Thermostat</td>
<td>Type: Wax, two stage</td>
</tr>
<tr>
<td>Opening temperature</td>
<td>°C (°F)</td>
</tr>
<tr>
<td>Main</td>
<td>86.5—89.5 (188—193)</td>
</tr>
<tr>
<td>Sub</td>
<td>78.5—81.5 (173—179)</td>
</tr>
<tr>
<td>Full-open temperature</td>
<td>°C (°F)</td>
</tr>
<tr>
<td>Main</td>
<td>100 (212)</td>
</tr>
<tr>
<td>Sub</td>
<td>100 (212)</td>
</tr>
<tr>
<td>Full-open lift</td>
<td>mm (in)</td>
</tr>
<tr>
<td>Main</td>
<td>8.0 (0.31) min.</td>
</tr>
<tr>
<td>Sub</td>
<td>1.5 (0.06) min.</td>
</tr>
<tr>
<td>Radiator</td>
<td>Type: Corrugated fin</td>
</tr>
<tr>
<td>Cap valve opening pressure</td>
<td>kPa (kg/cm², psi)</td>
</tr>
<tr>
<td>Main</td>
<td>74—103 (0.75—1.05, 11—15)</td>
</tr>
<tr>
<td>Cooling fan</td>
<td>Type: Electric</td>
</tr>
<tr>
<td>Capacity</td>
<td>W</td>
</tr>
<tr>
<td>Main</td>
<td>120</td>
</tr>
<tr>
<td>Switching temperature</td>
<td>°C (°F)</td>
</tr>
<tr>
<td>OFF → ON</td>
<td>91 (196)</td>
</tr>
<tr>
<td>Number of blade</td>
<td>4</td>
</tr>
<tr>
<td>Outer diameter</td>
<td>mm (in)</td>
</tr>
<tr>
<td>Main</td>
<td>340 (13.4)</td>
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</table>

## TROUBLESHOOTING GUIDE

<table>
<thead>
<tr>
<th>Problem</th>
<th>Possible Cause</th>
<th>Remedy</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overheating</td>
<td>Insufficient coolant</td>
<td>Add</td>
<td>3B— 4</td>
</tr>
<tr>
<td></td>
<td>Coolant leakage</td>
<td>Repair</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Radiator fins clogged</td>
<td>Clean</td>
<td>3B— 6</td>
</tr>
<tr>
<td></td>
<td>Radiator cap malfunction</td>
<td>Replace</td>
<td>3B— 5</td>
</tr>
<tr>
<td></td>
<td>Cooling fan malfunction</td>
<td>Repair</td>
<td>3B—11</td>
</tr>
<tr>
<td></td>
<td>Thermostat malfunction</td>
<td>Replace</td>
<td>3B— 9</td>
</tr>
<tr>
<td></td>
<td>Water passage clogged</td>
<td>Clean</td>
<td>3B— 4</td>
</tr>
<tr>
<td></td>
<td>Water pump malfunction</td>
<td>Repair or replace</td>
<td>3B— 7</td>
</tr>
<tr>
<td>Corrosion</td>
<td>Impurities in coolant</td>
<td>Replace</td>
<td>3B— 4</td>
</tr>
</tbody>
</table>
COOLANT

INSPECTION

Coolant Level (Engine cold)
1. Check that the coolant level is near the radiator inlet port.
2. Check that the coolant level in the coolant reservoir is between the FULL and Low marks.
Add coolant if necessary.

Warning
a) Never remove the radiator cap while the engine is hot.
b) Wrap a thick cloth around the cap when removing it.

Coolant Quality
1. Check that there is no build-up of rust or scales around the radiator cap or radiator filler neck.
2. Check that coolant is free from oil.
3. Replace the coolant, if necessary.

Coolant Leakage
1. Connect a tester and SST to the radiator inlet port.
2. Apply 103 kPa (1.05 kg/cm², 15 psi) pressure to the system.
3. Check that the pressure is held.
   If not, check for coolant leakage.

Warning
When removing either the radiator cap or the tester, loosen it slowly until the pressure in the radiator is released, and then remove it.

REPLACEMENT
1. Remove the radiator cap and loosen the drain plug.
2. Drain the coolant into a suitable container.

Warning
a) Never open the radiator cap while the engine is hot.
b) Wrap a thick cloth around the cap when loosening.
c) Use caution when draining hot coolant.
3. Set the heater control switch to the maximum heat position.
4. Flush the cooling system with water until all traces of color are gone, then let the system drain completely.
5. Fill with the proper mixture and amount of ethylene glycol-based coolant.

**Caution**
- Do not use alcohol- or methanol-based coolant.
- Use only soft (demineralized) water in the coolant mixture.

**Anti-freeze solution mixture percentage**

<table>
<thead>
<tr>
<th>Protection</th>
<th>Volume percentage</th>
<th>Gravity at 20°C (68°F)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Solution</td>
<td>Water</td>
</tr>
<tr>
<td>Above -16°C (3°F)</td>
<td>35</td>
<td>65</td>
</tr>
<tr>
<td>Above -26°C (−15°F)</td>
<td>45</td>
<td>55</td>
</tr>
<tr>
<td>Above -40°C (−40°F)</td>
<td>55</td>
<td>45</td>
</tr>
</tbody>
</table>

6. Run the engine at idle with the radiator cap removed. Let any air bleed from the system, and add more coolant.
7. Install the radiator cap, and inspect all connections for leakage.

**RADIATOR CAP**

**INSPECTION**

**Radiator Cap Valve**
1. Remove foreign material (such as water residue) from between the radiator cap valve and the valve seat.
2. Attach the radiator cap to a tester with the SST. Apply pressure gradually to 74—103 kPa (0.75—1.05 kg/cm², 11—15 psi).
3. Wait about 10 seconds; then check that the pressure has not decreased.

**Negative Pressure Valve**
1. Pull the negative-pressure valve to open it. Check that it closes completely when released.
2. Check for damage on the contact surfaces, and for cracked or deformed seal packing.
3. Replace the radiator cap if necessary.
RADIATOR

REMOVAL AND INSTALLATION
1. Drain the engine coolant.
2. Remove in the sequence shown in the figure.
3. Install in the reverse order of removal.

Note
a) Position the hose clamp in the original location on the hose.
b) Squeeze the clamp lightly with large pliers to ensure a good fit.

1. Coolant reservoir hose
2. Fast idle solenoid
3. Coolant level sensor connector
4. Cooling fan connector
5. Upper and lower radiator hose
6. Cooling fan and radiator assembly
7. Cooling fan

INSPECTION
Check the following points. Repair or replace if necessary.
1. Cracks, damage, or water leakage
2. Bent fins (Repair with a screwdriver)
3. Distorted or bent radiator inlet
WATER PUMP

REMOVAL
1. Disconnect the negative battery cable.
2. Turn the crankshaft so that the No. 1 cylinder is at TDC of compression.
3. Drain the engine coolant.
4. Remove in the sequence shown in the figure.

59—69 N·m (6.0—7.0 m·kg, 43—51 ft·lb)

55—65 N·m (5.6—6.6 m·kg, 41—48 ft·lb)

37—52 N·m (2.8—3.3 m·kg, 27—38 ft·lb)

19—26 N·m (1.9—2.6 m·kg, 14—19 ft·lb)

8—11 N·m (80—110 cm·kg, 69—95 in·lb)

8—12 N·m (80—120 cm·kg, 69—104 in·lb)

1. Timing belt (Refer to page 1C—11)
2. Camshaft pulley (Refer to page 1C—36)
3. Injection pump pulley (Refer to page 1C—36)
4. Seal plate
5. Alternator
6. Water pipe
7. Water hose
8. Water pump body
9. Water pump inlet

Note
Do not disassemble the water pump body, if a problem is found replace it as a unit.
INSPECTION
Check the following. Replace the pump if necessary.
1. Cracks or damage
2. Abnormal noise, bearing sticking or loose

INSTALLATION
Install in the reverse order of removal referring to the installation note.

Installation Note
Water pump
1. Remove any gasket fragments, dirt or oil from the contact surfaces.
2. Install the water pump and new gasket so that the printed side of the gasket faces the water pump.

Tightening torque:
Bolt A: 31—46 N·m
(3.2—4.7 m-kg, 23—34 ft-lb)
Bolt B: 8—11 N·m
(80—110 cm-kg, 69—95 in-lb)

Water pipe
1. Apply a coat of vegetable oil to the O-ring.
2. Install the water pipe.

Tightening torque:
8—11 N·m (80—110 cm-kg, 69—95 in-lb)
3. Connect the water hose.

Alternator
1. Install the alternator.

Tightening torque:
Bolt A: 19—26 N·m
(1.9—2.6 m-kg, 14—19 ft-lb)
Bolt B: 37—52 N·m
(3.8—5.3 m-kg, 27—38 ft-lb)
2. Install the alternator drive belt and Compex supercharger drive belt, and adjust the belt deflection. (Refer to page 1C—7)
THERMOSTAT

REMOVAL
1. Drain the engine coolant.
2. Disconnect the upper radiator hose, and water thermo switch connector.
3. Remove the thermostat cover.
4. Remove the thermostat.

INSPECTION
Check the thermostat. Replace if necessary.
1. Visually check that the valve is airtight.
2. Place the thermostat and a thermometer in water.
3. Gradually heat the water and check the following:

Valve opening temperature
- Sub valve: 78.5—81.5°C (173—179°F)
- Main valve: 86.5—89.5°C (188—193°F)

Full open lift
- Sub valve: 1.5 mm (0.06 in) min. at 100°C (212°F)
- Main valve: 8 mm (0.31 in) min. at 100°C (212°F)

Valve closing temperature
- Sub valve: 75°C (167°F)
- Main valve: 83°C (181°F)

INSTALLATION
1. Install the thermostat into the thermostat case with jiggle pin at the top.
2. Install a new gasket with the seal print side facing the thermostat case.
3. Install the thermostat cover.

Tightening torque:
7—10 N·m (70—100 cm·kg, 61—87 in·lb)

4. Install the upper radiator hose and water thermo switch connector.
5. Replenish the coolant.
6. Start the engine and check for leaks.
COOLING FAN

SYSTEM CIRCUIT

CIRCUIT INSPECTION
1. Turn the ignition switch ON.
2. Disconnect the water thermo switch connector, and check that the fan begins to operate.
3. If the fan doesn’t operate, check the fuse, fan relay, fan motor, thermo switch, and wiring harness.
COOLING FAN 3B

FAN MOTOR
Removal and Installation
1. Remove in the sequence shown in the figure.
2. Install in the reverse order of removal.

1. Cooling fan assembly (Refer to page 3B—6) 3. Fan
2. Cowling 4. Fan motor

Inspection
1. Connect an ammeter and battery to the fan motor connectors.
2. Check that the fan motor operates smoothly at the specified current or less.

Current
8.0—11.0 Amperes

3. Replace the fan motor if necessary.
WATER THERMO SWITCH

1. Remove the cooling fan water thermo switch.

Note
Make sure that the ignition switch is OFF. If not, the fan will operate when the connector is removed.

2. Place the water thermo switch in water.
3. Heat the water gradually, and check for continuity of the switch with an ohmmeter. Replace if necessary.

<table>
<thead>
<tr>
<th>Temperature</th>
<th>Continuity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Above 91°C (208°F)</td>
<td>No</td>
</tr>
<tr>
<td>Below 84°C (183°F)</td>
<td>Yes</td>
</tr>
</tbody>
</table>

4. Install the water thermo switch and a new O-ring.

Tightening torque:
6—9 Nm (60—90 cm-kg, 52—78 in-lb)

Caution
Do not use sealing tape.