ENGINE COOLING

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GENERAL INFORMATION

The cooling system is designed to keep every part of the engine at appropriate temperature in whatever condition the engine may be operated. The cooling method is of the water-cooled, pressure forced circulation type in which the water pump pressurizes coolant and circulates it throughout the engine. If the coolant temperature exceeds the prescribed temperature, the thermostat opens to circulate the coolant through the radiator as well so that the heat absorbed by the coolant may be radiated into the air.

The water pump is of the centrifugal type and is driven by the drive belt from the crankshaft. The radiator is the corrugated fin, down flow type.

<table>
<thead>
<tr>
<th>Items</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Radiator</strong></td>
<td></td>
</tr>
<tr>
<td>Performance kJ/h</td>
<td></td>
</tr>
<tr>
<td>4G63 &lt;M/T&gt;</td>
<td>114,700</td>
</tr>
<tr>
<td>4G63 &lt;A/T&gt;</td>
<td>126,800</td>
</tr>
<tr>
<td>4G64, 4D56 &lt;2WD&gt;</td>
<td>170,000</td>
</tr>
<tr>
<td>4D56 &lt;4WD&gt;</td>
<td>227,300</td>
</tr>
<tr>
<td><strong>Automatic transmission oil cooler</strong></td>
<td></td>
</tr>
<tr>
<td>Performance kJ/h</td>
<td></td>
</tr>
<tr>
<td>4G63 &lt;A/T&gt;</td>
<td>6,400</td>
</tr>
<tr>
<td>4D56 &lt;A/T&gt;</td>
<td>6,300</td>
</tr>
</tbody>
</table>

SERVICE SPECIFICATIONS

<table>
<thead>
<tr>
<th>Items</th>
<th>Standard value</th>
<th>Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>High pressure valve opening pressure of radiator cap kPa</td>
<td>75 – 105</td>
<td>65</td>
</tr>
<tr>
<td>Range of coolant antifreeze concentration of radiator %</td>
<td>30 – 60</td>
<td>–</td>
</tr>
<tr>
<td>Thermostat</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Valve opening temperature of thermostat °C</td>
<td>82 ± 1.5</td>
<td>–</td>
</tr>
<tr>
<td>Full-opening temperature of thermostat °C</td>
<td>95</td>
<td>–</td>
</tr>
<tr>
<td>Valve lift (at 95°C) mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4G6, 4D56 &lt;4WD&gt;</td>
<td>8.5 or more</td>
<td>–</td>
</tr>
<tr>
<td>4D56 &lt;2WD&gt;</td>
<td>8 or more</td>
<td>–</td>
</tr>
</tbody>
</table>

LUBRICANT

<table>
<thead>
<tr>
<th>Items</th>
<th>Quantity ℓ</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIGH QUALITY ETHYLENE GLYCOL ANTIFREEZE COOLANT</td>
<td></td>
</tr>
<tr>
<td>4G63</td>
<td>7.4</td>
</tr>
<tr>
<td>4G64, 4D56 &lt;2WD&gt;</td>
<td>7.7</td>
</tr>
<tr>
<td>4D56 &lt;4WD&gt;</td>
<td>7.8</td>
</tr>
</tbody>
</table>

SEALANTS

<table>
<thead>
<tr>
<th>Items</th>
<th>Specified sealant</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cylinder block drain plug</td>
<td>3M Nut Locking Part No. 4171 or equivalent</td>
<td>Drying sealant</td>
</tr>
<tr>
<td>Water by-pass fitting &lt;4G6&gt;</td>
<td>Mitsubishi Genuine Parts No. MD970389 or equivalent</td>
<td>Semi-drying sealant</td>
</tr>
</tbody>
</table>
ON-VEHICLE SERVICE

ENGINE COOLANT LEAK CHECKING
1. Confirm that the coolant level is up to the filler neck. Install a radiator cap tester and apply 160 kPa pressure, and then check for leakage from the radiator hose or connections.

Caution
1. Be sure to completely clean away any moisture from the places checked.
2. When the tester is taken out, be careful not to spill any coolant from it.
3. Be careful, when installing and removing the tester and when testing, not to deform the filler neck of the radiator.

2. If there is leakage, repair or replace the appropriate part.

RADIATOR CAP VALVE OPENING PRESSURE CHECK
1. Use a cap adapter to attach the cap to the tester.
2. Increase the pressure until the indicator of the gauge stops moving.

Limit: 65 kPa
Standard value: 75 – 105 kPa

3. Replace the radiator cap if the reading does not remain at or above the limit.

NOTE
Be sure that the cap is clean before testing, since rust or other foreign material on the cap seal will cause an improper indication.

ENGINE COOLANT REPLACEMENT
1. Drain the engine coolant by removing the drain plug and then the radiator cap.
2. Remove the cylinder block drain plug from the cylinder block to drain the engine coolant.
3. Remove the reserve tank to drain the engine coolant.
4. When the engine coolant has drained, pour in water from the radiator cap to clean the engine coolant line.
5. Coat the thread of the cylinder block drain plug with the specified sealant and tighten to the specified torque.

**Specified sealant:**
3M Nut Locking Part No. 4171 or equivalent

6. Securely tighten the radiator drain plug.

7. Install the reserve tank.

8. Remove the air bleed bolt and replace the seal washer.

9. Fill the radiator until the engine coolant flows from the air bleed bolt section, and then close the air bleed bolt.

10. Slowly pour the engine coolant into the mouth of the radiator until the radiator is full, and pour also into the reserve tank up to the FULL line.

**Recommended antifreeze:**
HIGH QUALITY ETHYLENE GLYCOL ANTIFREEZE COOLANT

**Quantity:**
- <4G63> 7.4 ℓ
- <4G64, 4D56-2WD> 7.7 ℓ
- <4D56-4WD> 7.8 ℓ

**NOTE**
For Norway, the non-amine type of antifreeze should be used.

11. Install the radiator cap securely.

12. Start the engine and warm the engine until the thermostat opens. (Touch the radiator hose with your hand to check that warm water is flowing.)

13. After the thermostat opens, race the engine several times, and then stop the engine.

14. Cool down the engine, and then pour engine coolant into the reserve tank until the level reaches the FULL line. If the level is low, repeat the operation from step 11.

**CONCENTRATION MEASUREMENT**

Measure the temperature and specific gravity of the engine coolant to check the antifreeze concentration.

**Standard value:** 30 – 60 % (allowable concentration range)

**RECOMMENDED ANTIFREEZE**

<table>
<thead>
<tr>
<th>Antifreeze</th>
<th>Allowable concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIGH QUALITY ETHYLENE GLYCOL ANTIFREEZE COOLANT</td>
<td>30 – 60 %</td>
</tr>
</tbody>
</table>

**Caution**
If the concentration of the anti-freeze is below 30 %, the anti-corrosion property will be adversely affected. In addition, if the concentration is above 60 %, both the anti-freezing and engine cooling properties will decrease, affecting the engine adversely. For these reasons, be sure to maintain the concentration level within the specified range.
PRE-REMOVAL AND POST-INSTALLATION OPERATION

- Engine Coolant Draining and Supplying (Refer to P. 14-3.)
- Radiator Upper Hose Removal and Installation (Refer to P. 14-14.)

Removal steps
1. Radiator upper shroud
2. Drive belts
3. Cooling fan and fan clutch
4. Pulley
5. Fan Clutch
6. Cooling fan
INSPECTION

COOLING FAN CHECK

- Check blades for damage and cracks.
- Check for cracks and damage around bolt holes in fan hub.
- If any portion of fan is damaged or cracked, replace cooling fan.

FAN CLUTCH CHECK

- Check to ensure that fluid in fan clutch is not leaking at case joint and seals. If fluid quantity decreases due to leakage, fan speed will decrease and engine overheating might result.
- When a fan attached to an engine is turned by hand, it should give a sense of some resistance. If fan turns lightly, it is faulty.
- Check bimetal strip for damage.
**THERMOSTAT**

**REMOVAL AND INSTALLATION**

Pre-removal and Post-installation Operation

- Engine Coolant Draining and Supplying
  (Refer to P. 14-3.)

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**Removal steps**

1. Radiator lower pipe assembly
   <4G6>
2. Radiator lower hose connection
   <4D56>
3. O-ring <4G6>
4. Water inlet fitting <4D56>
5. Water inlet fitting gasket <4D56>
6. Thermostat

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**INSTALLATION SERVICE POINTS**

**THERMOSTAT INSTALLATION**

<4G6>

Install the thermostat so that the jiggle valve is facing straight up, while being careful not to fold over or scratch the rubber ring.

**Caution**
Make absolutely sure that no oil is adhering to the rubber ring of the thermostat. In addition, be careful not to fold over or scratch the rubber ring when inserting.

<4D56-2WD>

Install the thermostat so that the mark is facing straight up.
<4D56-4WD>
Hold the thermostat at the angle shown in the illustration, and install it while being careful not to wrinkle or damage the rubber ring.

Caution
Do not apply any oil or grease to the rubber ring of the thermostat under any circumstances.

O-RING INSTALLATION
Insert the O-ring into the groove in the radiator lower pipe assembly, and then apply water to the outer inside diameter of the O-ring.

Caution
1. Do not apply oil and grease to water pipe O-ring.
2. Keep the water pipe connections free of sand, dust, etc.

INSPECTION
THERMOSTAT CHECK
1. Immerse the thermostat in water, and heat the water while stirring. Check the thermostat valve opening temperature.
   Standard value:
   Valve opening temperature: $82 \pm 1.5^\circ C$

2. Check that the amount of valve lift is at the standard value when the water is at the full-opening temperature.
   Standard value:
<table>
<thead>
<tr>
<th>Items</th>
<th>4G6 and 4D56-4WD</th>
<th>4D56-2WD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full-opening temperature °C</td>
<td>95</td>
<td>95</td>
</tr>
<tr>
<td>Amount of valve lift mm</td>
<td>8.5 or more</td>
<td>8 or more</td>
</tr>
</tbody>
</table>

NOTE
Measure the valve height when the thermostat is fully closed, and use this measurement to calculate the valve height when the thermostat is fully open.
WATER PUMP
REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Engine Coolant Draining and Supplying
  (Refer to P. 14-3.)
- Timing Belt Removal and Installation
  (Refer to GROUP 11.)

Removal steps

<4G6>
1. Alternator brace
   ➤B▼
2. Water pump assembly
   ➤A▼
3. Water pump gasket
4. O-ring

<4D56>
1. Power steering oil pump
2. Power steering oil pump bracket
3. Thermostat housing
4. Thermostat housing gasket
5. Water pump assembly
6. Gasket
7. O-ring

<4G6>
(Refer to GROUP 15 – Air Cleaner.)

<4D56>
(Refer to P. 14-7.)
REMOVAL SERVICE POINT

POWER STEERING OIL PUMP REMOVAL
1. Remove the power steering oil pump from the bracket with the hose still attached.
2. Place the power steering oil pump somewhere where it will not to be a hindrance to working, being careful not to put too much strain on the hose.

INSTALLATION SERVICE POINTS

O-RING INSTALLATION
Rinse the mounting location of the O-ring and water pipe with water, and install the O-ring and water pipe.

Caution
1. Care must be taken not to permit engine oil or other greases to adhere to the O-ring.
2. When inserting the pipe, check to be sure that there is no sand, dirt, etc. on its inner surface.

WATER PUMP ASSEMBLY INSTALLATION

<table>
<thead>
<tr>
<th>No.</th>
<th>Hardness category (Head mark)</th>
<th>Bolt diameter x length mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4T</td>
<td>8 x 14</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>8 x 22</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>8 x 28</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>8 x 40</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>8 x 25</td>
</tr>
<tr>
<td>6</td>
<td>7T</td>
<td>8 x 65</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>8 x 70</td>
</tr>
</tbody>
</table>
WATER HOSE AND WATER PIPE

REMOVAL AND INSTALLATION

<4G6>

Pre-removal and Post-installation Operation
- Engine Coolant Draining and Supplying
  (Refer to P. 14-3.)
- Thermostat Removal and Installation
  (Refer to P. 14-7.)
- Exhaust Manifold Removal and Installation
  (Refer to GROUP 15.)

Removal steps
1. Water bypass fitting
2. Water hose
3. Water pipe assembly
4. Thermostat housing assembly
5. Water inlet pipe
6. O-ring
Pre-removal and Post-installation Operation
- Engine Coolant Draining and Supplying
  (Refer to P.14-3.)
- Injection Pipe Removal and Installation
  (Refer to GROUP 13E – Injection Nozzle.)
- Intake, Exhaust Manifold Removal and Installation
  (Refer to GROUP 15.)

Removal steps
1. Heater hose connection
2. Vacuum pipe installation bolt
3. Cable band
4. Water hose
5. Eye bolt
6. Gasket
7. Water pipe assembly A
8. Water hose
9. Water pipe assembly B
10. Water hose
11. Water pipe assembly C
12. Water pipe assembly
13. O-ring
INSTALLATION SERVICE POINTS

0-RING INSTALLATION
Insert the O-ring to pipe, and coat the outer circumference of the O-ring with water.

Caution
Care must be taken not to permit engine oil or other greases to adhere to the o-ring.

INSPECTION

WATER PIPE AND HOSE CHECK
Check the water pipe and hose for cracks, damage, clog and replace them if necessary.
**RADIATOR**

**REMOVAL AND INSTALLATION**

**Pre-removal Operation**
- Engine Coolant Draining (Refer to P. 14-3.)

**Post-installation Operation**
- Engine Coolant Supplying (Refer to P. 14-3.)
- A/T Fluid Supplying and Checking (Refer to GROUP 23 – On-vehicle Service.)

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**<4G6, 4D56-2WD>**

1. Rubber hose connection
2. Radiator upper hose connection
3. Radiator upper shroud
4. Radiator lower shroud
5. Radiator lower hose connection
6. Transmission fluid cooler hose connection <A/T>
7. Radiator assembly

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**<4D56-4WD>**

1. Rubber hose connection
2. Radiator upper hose connection
3. Radiator upper shroud
4. Radiator lower shroud
5. Radiator lower hose connection
6. Transmission fluid cooler hose connection <A/T>
7. Radiator assembly

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**Radiator removal steps**
- 1. Rubber hose connection
- 2. Radiator upper hose connection
- 3. Radiator upper shroud
- 4. Radiator lower shroud
- 5. Radiator lower hose connection
- 6. Transmission fluid cooler hose connection <A/T>
- 7. Radiator assembly

**Reserve tank removal steps**
- 1. Rubber hose connection
- 8. Reserve tank assembly
REMOVAL SERVICE POINT

Transmitrion Fluid Cooler Hose Removal

After removing the hose from the radiator, plug the hose and the radiator nipple to prevent dust or foreign particles from getting in.