ENGINE COOLING

CONTENTS

GENERAL INFORMATION .................................................. 2
LUBRICANT ........................................................................ 2
ON-VEHICLE SERVICE ....................................................... 5
  Engine Coolant Concentration Test .................................. 5
  Engine Coolant Leak Checking ........................................ 5
  Engine Coolant Replacement .......................................... 5
  Radiator Cap Valve Opening Pressure Check .................... 5
RADIATOR ........................................................................ 8
SEALANTS ......................................................................... 3
SERVICE SPECIFICATIONS ............................................... 2

THERMOSTAT .................................................................... 9
TROUBLESHOOTING .......................................................... 3
WATER HOSE AND WATER PIPE
  <1.5L ENGINE> .............................................................. 13
  <1.8L ENGINE> .............................................................. 15
WATER PUMP
  <1.5L ENGINE> .............................................................. 11
  <1.8L ENGINE> .............................................................. 12
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.

CONSTRUCTION DIAGRAM

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 (psi)</td>
<td>74 - 103 (11 - 15)</td>
<td>64.5 (9.2)</td>
</tr>
<tr>
<td>Thermostat Valve opening temperature of thermostat °C (°F)</td>
<td>82 (180)</td>
<td>-</td>
</tr>
<tr>
<td>Full-opening temperature of thermostat °C (°F)</td>
<td>95 (203)</td>
<td>-</td>
</tr>
<tr>
<td>Valve lift (at 95 °C (203 °F)) mm (in.)</td>
<td>8.5 (.33) or more</td>
<td></td>
</tr>
</tbody>
</table>

LUBRICANT

<table>
<thead>
<tr>
<th>Items</th>
<th>Quantity dm³ (qts.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIGH QUALITY ETHYLENE GLYCOL ANTIFREEZE COOLANT</td>
<td>1.5L Engine 5 (5.3)</td>
</tr>
<tr>
<td></td>
<td>1.8L Engine 6 (6.3)</td>
</tr>
</tbody>
</table>
## SEALANTS

**Hose**

Water pump/thermostat case 4.8L Engine

Specified sealant: Mitsubishi Genuine Parts No. MD970389 or equivalent

## TROUBLESHOOTING

### TROUBLE SYMPTOM

#### Overheat

<table>
<thead>
<tr>
<th>Probable cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inoperative electrical cooling fan</td>
<td>Replace</td>
</tr>
<tr>
<td>Faulty radiator fan relay</td>
<td>Replace</td>
</tr>
<tr>
<td>Damaged radiator core joint</td>
<td>Replace</td>
</tr>
<tr>
<td>Corroded or cracked hoses (radiator hose, heater hose, etc.)</td>
<td>Replace</td>
</tr>
<tr>
<td>Faulty radiator cap valve or settling of spring</td>
<td>Replace</td>
</tr>
<tr>
<td>Cracked intake manifold</td>
<td>Replace</td>
</tr>
<tr>
<td>Cracked thermostat housing</td>
<td>Replace</td>
</tr>
<tr>
<td>Loose bolts or leaking gasket in water outlet fitting</td>
<td>Torque bolts again or replace gasket</td>
</tr>
<tr>
<td>Loose water pump mounting bolts or leaking gasket</td>
<td>Torque bolts again or replace gasket</td>
</tr>
<tr>
<td>Loose thermostat housing bolts or leaking gasket</td>
<td>Torque bolts again or replace gasket</td>
</tr>
<tr>
<td>Loose or broken drive belt</td>
<td>Correct</td>
</tr>
<tr>
<td>Damaged or blocked (insufficiently ventilated) radiator fins</td>
<td>Replace</td>
</tr>
<tr>
<td>Faulty oil cooler operation</td>
<td>Replace</td>
</tr>
<tr>
<td>Others</td>
<td></td>
</tr>
<tr>
<td>Insufficient engine coolant</td>
<td>Fill</td>
</tr>
<tr>
<td>Too high an anti-freeze concentration</td>
<td>Correct anti-freeze concentration</td>
</tr>
<tr>
<td>Loose or broken drive belt</td>
<td>Replace</td>
</tr>
<tr>
<td>Damaged or blocked (insufficiently ventilated) radiator fins</td>
<td>Correct</td>
</tr>
<tr>
<td>Faulty thermostat operation</td>
<td>Replace</td>
</tr>
<tr>
<td>Faulty water pump operation</td>
<td>Replace</td>
</tr>
<tr>
<td>Water passage clogged with slime or rust deposit or foreign substance</td>
<td>Clean</td>
</tr>
</tbody>
</table>

#### No Rise in Temperature

<table>
<thead>
<tr>
<th>Probable cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Faulty thermostat</td>
<td>Replace</td>
</tr>
</tbody>
</table>
**TROUBLESHOOTING HINTS**

1. Radiator fan only does not operate
   - Check fusible link No.5.
   - Check the radiator fan motor relay.
   - Check the engine control module.
   - Check the radiator fan motor.

2. Condenser fan only does not operate.
   - Check fusible link No.2.
   - Check dedicated fuse No.1.
   - Check the condenser fan motor.
   - Check the condenser fan motor relay.
   - Check the engine control module.

**Fan Operating Mode**

<table>
<thead>
<tr>
<th>ACC switch</th>
<th>Engine coolant temperature (°C / °F)</th>
<th>Power transistor [Radiator fan]</th>
<th>Power transistor [Condenser fan]</th>
<th>Radiator fan operation</th>
<th>Condenser fan operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF</td>
<td>Approx. 95 (203) or less</td>
<td>OFF</td>
<td>OFF</td>
<td>Stopped</td>
<td>Stopped</td>
</tr>
<tr>
<td></td>
<td>Approx. 95 - 105 (203 - 221)</td>
<td>CN</td>
<td>OFF</td>
<td>Rotated</td>
<td>Rotated</td>
</tr>
<tr>
<td>OFF</td>
<td>Approx. 105 (203) or more</td>
<td>CN</td>
<td>ON</td>
<td>Stopped</td>
<td>Stopped</td>
</tr>
<tr>
<td>ON</td>
<td></td>
<td>CN</td>
<td>ON</td>
<td>Rotated</td>
<td>Rotated</td>
</tr>
</tbody>
</table>
ON-VEHICLE SERVICE

ENGINE COOLANT LEAK CHECK

1. Check that the coolant level is up to the filler neck. Install a radiator cap tester and apply 160 kPa (23 psi) 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: 64 kPa (9.2 psi)

Standard value: 74 - 103 kPa (11 - 15 psi)

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

Refer to GROUP 00 - Maintenance Service

ENGINE COOLANT CONCENTRATION TEST

Refer to GROUP 00 - RECOMMENDED LUBRICANTS AND LUBRICANT CAPACITIES TABLE.
**RADIATOR REMOVAL AND INSTALLATION**

**Pre-removal operation**
1. Drain engine coolant
(Refer to GROUP 00 - Maintenance Service.)
2. Remove and install air cleaner
3. Check engine oil level

**Post-installation Operation**
1. Engine Coolant Supplying
(Refer to GROUP 00 - Maintenance Service.)
2. Air Filter Supplying and Cleaning
(Refer to GROUP 00 - Maintenance Service.)
3. Air Cleaner Installation
(Refer to GROUP 00 - Maintenance Service.)

**Radiator removal steps**
1. Drain plug
2. Radiator cap
3. Overflow hose
4. Reserve tank
5. Radiator upper hose
6. Radiator lower hose
7. A/C oil cooler hose connection
8. Upper insulator
9. Radiator assembly
10. Lower insulator
11. A/C oil cooler hose assembly
12. Condenser fan motor assembly
13. Radiator fan motor assembly
14. Condenser fan motor assembly
15. Fan
16. Shroud

**Radiator fan motor removal steps**
1. Drain plug
2. Radiator cap
3. Overflow hose
4. Radiator upper hose
5. Radiator lower hose
6. Condenser fan motor assembly
7. A/C oil cooler hose assembly
8. Fan
9. Radiator fan motor assembly
REMOVAL SERVICE POINTS

(A) RADIATOR UPPER HOSE/RADIATOR LOWER HOSE DISCONNECTION
After making mating marks on the radiator hose and the hose clamp, disconnect the radiator hose.

(B) A/T OIL 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.

INSTALLATION SERVICE POINT

(A) RADIATOR LOWER HOSE/RADIATOR UPPER HOSE CONNNECTION
1. Insert each hose as far as the projection of the water outlet fitting.
2. Align the mating marks on the radiator hose and hose clamp, and then connect the radiator hose.

INSPECTION

RADIATOR FAN MOTOR CHECK
1. Check to be sure that the radiator fan rotates when battery voltage is applied between terminals (as shown in the figure).
2. Check to see that abnormal noises are not produced while the motor is turning.
RADIATOR FAN RELAY CONTINUITY CHECK

<table>
<thead>
<tr>
<th>Battery voltage</th>
<th>Terminal No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not supplied</td>
<td>1 2 5</td>
</tr>
<tr>
<td>Supplied</td>
<td></td>
</tr>
</tbody>
</table>
ENGINE COOLING - Thermostat

THERMOSTAT
REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
1. Engine Coolant Draining and Supplying
   Refer to GROUP 00 - Maintenance Service.
2. Air Cleaner Removal and Installation 4.5L Engine>
4.8L Engine>

Removal steps
1. Radiator lower hose connection
2. Connector bracket
   <Vehicles for California>
3. Water inlet fitting
4. Thermostat

REMOVAL SERVICE POINT

▲▲ RADIATOR LOWER HOSE DISCONNECTION
After making mating marks on the radiator hose and the hose clamp, disconnect the radiator hose.
INSTALLATION SERVICE POINTS:

A. THERMOSTAT INSTALLATION
Install the thermostat so that the jiggle valve is facing straight up.

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

B. RADIATOR LOWER HOSE CONNECTION
1. Insert each hose as far as the projection of the water inlet fitting.
2. Align the mating marks on the radiator hose and hose clamp, and then connect the radiator hose.

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±1.5°C (180±3°F)

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>Full opening temperature °C</th>
<th>Full opening temperature °F</th>
<th>Amount of valve lift mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>95 (203)</td>
<td>200 (392)</td>
<td>8.5 (0.3) 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.
ENGINE COOLING - Water Pump <1.5L Engine>

WATER PUMP <1.5L Engine>

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
(1) Engine Coolant Draining and Supplying
(Refer to GROUP 00 - Maintenance Service)
(2) Timing Belt and Timing Belt Tensioner Removal and Installation
(Refer to GROUP 11A)

Bolt specifications
8 mm x 50 mm (.31 x 1.97)
8 mm x 25 mm (.31 x .98)

Screw diameter x length mm (in.)
2 mm +3 mm (.12 in.)

Sealant:
Mitsubishi Genuine Part No. MD970389 or equivalent

Removal steps
1. Generator brace
2. Water pump

INSTALLATION SERVICE POINT

WATER PUMP INSTALLATION

Squeeze out the sealant from the tube evenly and apply it so that there is not too much sealant and no places without sealant.

Specified Sealant:
Mitsubishi Genuine Part No. MD970389 or equivalent
WATER PUMP <1.8L ENGINE>

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operations
(1) Engine Coolant Draining and Supplying
Refer to GROUP 00 - Maintenance Service.
(2) Timing Belt Removal and Installation
Refer to GROUP 11B.

Removal steps
1. Timing belt rear cover
2. Water pump

INSTALLATION SERVICE POINT

WATER PUMP INSTALLATION
Squeeze out the sealant from the tube evenly and apply it so that there is not too much sealant and no places without sealant.

Specified Sealant:
Mitsubishi Genuine Part No. MD970389 or equivalent
WATER HOSE AND WATER PIPE <1.5L ENGINE>

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation

[Refer to GROUP 00 - Maintenance Service.]

Removal steps

1. Radiator upper hose connection
2. Radiator lower hose connection
3. Water hose
4. Heater hose connection
5. Water inlet fitting
6. Thermostat case assembly
7. Gasket
8. O-ring
9. Water hose
10. Heater hose connection
11. Water inlet pipe assembly
12. O-ring

REMOVAL SERVICE POINT

[A] RADIATOR UPPER HOSE/RADIATOR LOWER HOSE DISCONNECTION

After making mating marks on the radiator hose and the hose clamp, disconnect the radiator hose.
INSTALLATION SERVICE POINTS

A O-RING INSTALLATION

Insert the O-ring to the water inlet pipe assembly and coat the outer portion of the O-ring with water or engine coolant.

Caution
Do not allow engine oil or other grease to adhere to the O-ring.

B RADIATOR UPPER HOSE/RADIATOR LOWER HOSE CONNECTION

1. Insert each hose as far as the projection of the water inlet fitting.
2. Align the mating marks on the radiator hose and hose clamp, and then connect the radiator hose.

INSPECTION

WATER PIPE AND HOSE CHECK

Check the water pipe and hose for cracks, damage and clogs. Replace them if necessary.
WATER HOSE AND WATER PIPE <1.8L ENGINE>

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
1. Engine Coolant Draining and Supplying
   Refer to GROUP 00 - Maintenance Service.
2. Air Cleaner Removal and Installation
   Refer to GROUP 16.
3. Distributor Removal and Installation

Removal steps

1. Radiator lower hose connection
2. Thermostat case assembly
3. O-ring
4. Heater hose connection
5. Water hose
6. Water hose
7. Water inlet pipe assembly

Sealant:
Mitsubishi Genuine Part No. MD970389 or equivalent
REMOVAL SERVICE POINT

RADIATOR LOWER HOSE DISCONNECTION
After making mating marks on the radiator hose and the hose clamp, disconnect the radiator hose.

INSTALLATION SERVICE POINTS

O-RING INSTALLATION
Insert the O-ring to the water inlet pipe assembly, and coat the outer circumference of the O-ring with water or engine coolant.

Caution
Do not allow engine oil or other greases to adhere to the O-ring.

THERMOSTAT CASE ASSEMBLY INSTALLATION
Squeeze out the sealant from the tube evenly and apply it so that there is not too much sealant and no places without sealant.

Specified Sealant:
Mitsubishi Genuine Parts No. MD970389 or equivalent

RADIATOR LOWER HOSE CONNECTION
1. Insert each hose as far as the projection of the water inlet fitting.
2. Align the mating marks on the radiator hose and hose clamp, and then connect the radiator hose.

INSPECTION
WATER PIPE AND HOSE CHECK
Check the water pipe and hose for cracks, damage and clogs. Replace them if necessary.