

# ENGINE COOLING

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14109000208

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## GENERAL INFORMATION

14100010217

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 timing belt or drive belt from the crankshaft.

The radiator is the corrugated fin, down flow type and is cooled by the electrical radiator fan.

The cooling fans are controlled by a fan controller and the engine-ECU depending on driving conditions.

Items		Specifications
Radiator	Performance kJ/h	4G6 205,116
		4G9 171,628
A/T oil cooler	Performance kJ/h	5,860

## SERVICE SPECIFICATIONS

14100030091

Items		Standard value	Limit
Radiator cap opening pressure kPa		74 - 103	64
Range of coolant antifreeze concentration of radiator %		30 - 60	-
Thermostat	Valve opening temperature of thermostat °C	85 ± 1.5	-
	Full-opening temperature of thermostat °C	98	-
	Valve lift (at 95°C) mm	8.5 or more	-

## LUBRICANT

14100040148

Items		Quantity L
MITSUBISHI GENUINE COOLANT!or equivalent	4G6	7
	4G9	6

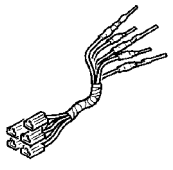
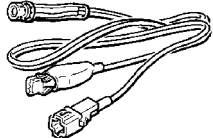
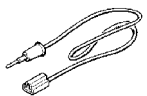

## SEALANTS

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Items	Specified sealant	Remarks
Cylinder block drain plug	3M Nut Locking Part No. 4171 or equivalent	Drying sealant
Water pump <4G9> Thermostat case assembly	Mitsubishi Genuine Parts No. MD970389 or equivalent	Semi-drying sealant

**SPECIAL TOOL**

14100060038

Tool	Number	Name	Use
<p><b>A</b></p>  <p><b>B</b></p>  <p><b>C</b></p>  <p><b>D</b></p>  <p>C991223</p>	<p>MB991223                      A: MB991219                      B: MB991220                      C: MB991221                      D: MB991222</p>	<p>Harness set                      A: Test harness                      B: LED harness                      C: LED harness adapter                      D: probe</p>	<p>Measurement of terminal voltage                      A: Connector pin contact pressure inspection                      B: Power circuit inspection                      C: Power circuit inspection                      D: Commercial tester connection</p>

**TROUBLESHOOTING**

14100560019

**INSPECTION CHART FOR TROUBLE SYMPTOMS**

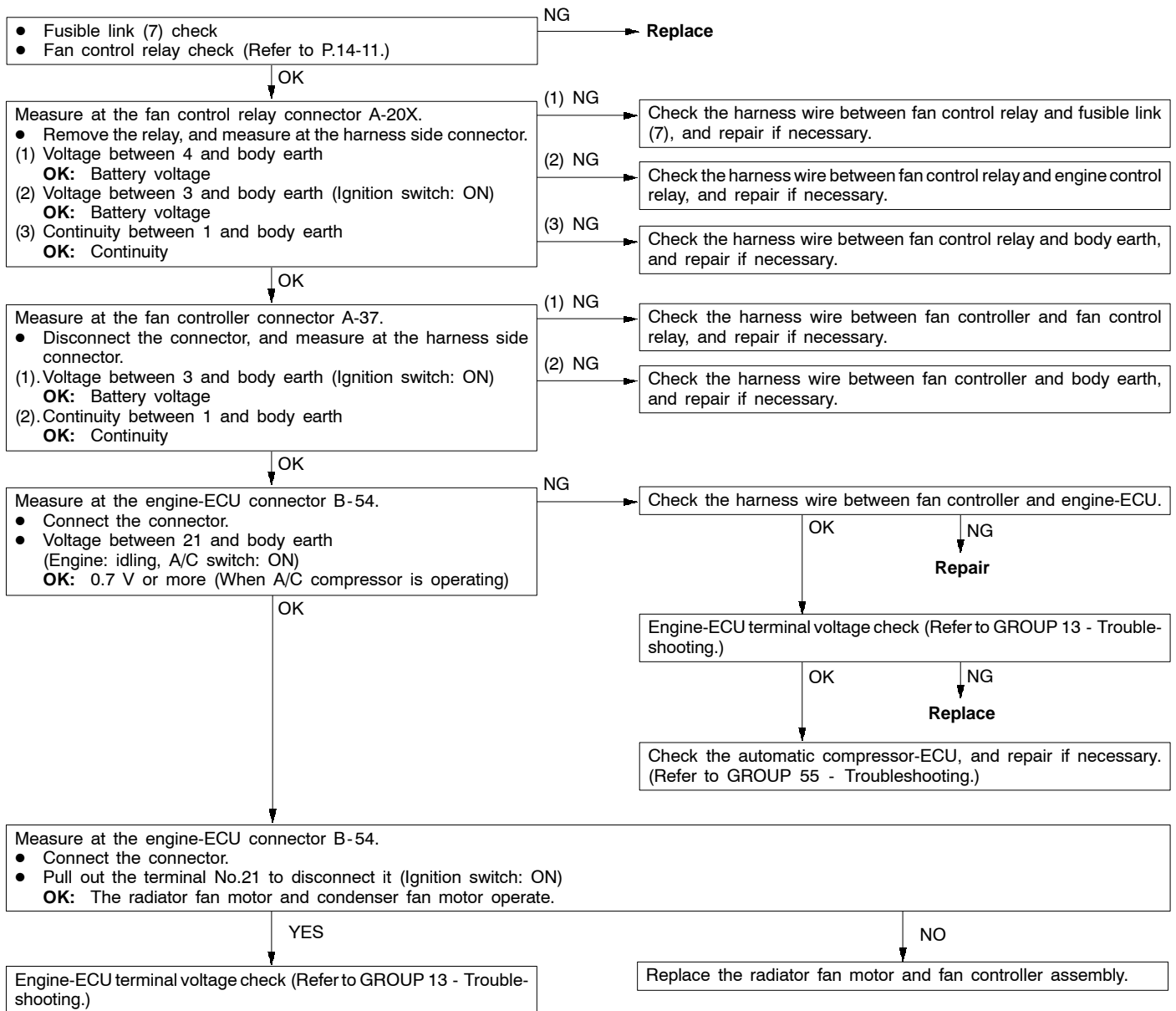
Trouble symptoms	Inspection procedure No.	Reference page
Radiator fan and condenser fan do not operate. <Vehicles with A/C> Radiator fan does not operate. <Vehicles without A/C>	1	14-3
Radiator fan and condenser fan do not change speed or stop. <Vehicles with A/C> Radiator fan does not change speed or stop. <Vehicles without A/C>	2	14-6
Radiator fan does not operate. <Vehicles with A/C>	3	14-7
Condenser fan does not operate. <Vehicles with A/C>	4	14-7

**INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS**

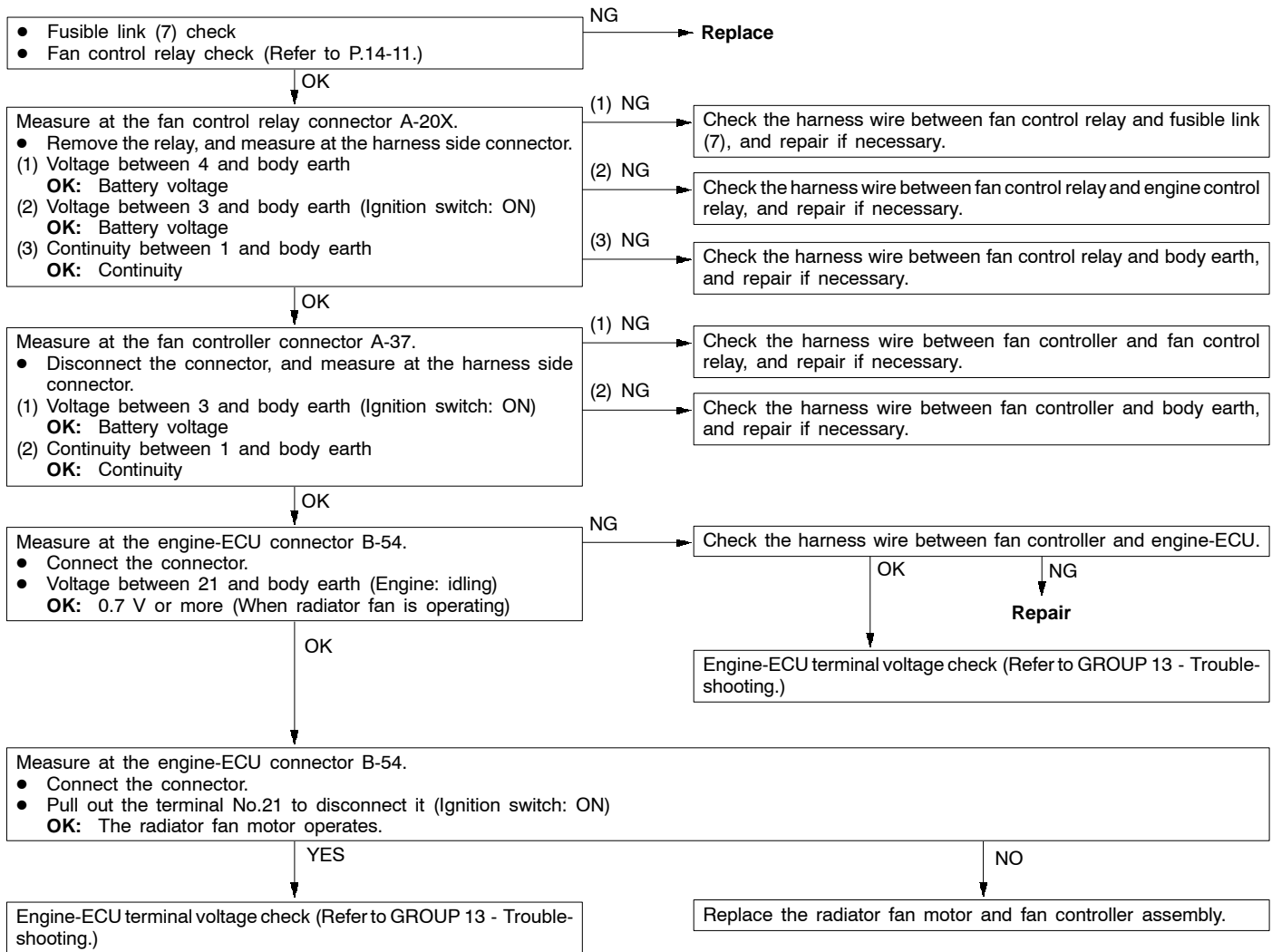
**Inspection Procedure 1**

Radiator fan and condenser fan do not operate. <Vehicles with A/C> Radiator fan does not operate. <Vehicles without A/C>	Probable cause
The cause could be a malfunction of the fan controller power supply or earth circuit. The cause could also be a malfunction of the fan controller or the engine-ECU.	<ul style="list-style-type: none"> <li>● Malfunction of fusible link</li> <li>● Malfunction of fan control relay</li> <li>● Malfunction of fan controller</li> <li>● Malfunction of engine-ECU</li> <li>● Malfunction of wiring harness or connector</li> </ul>

<Vehicles with A/C>



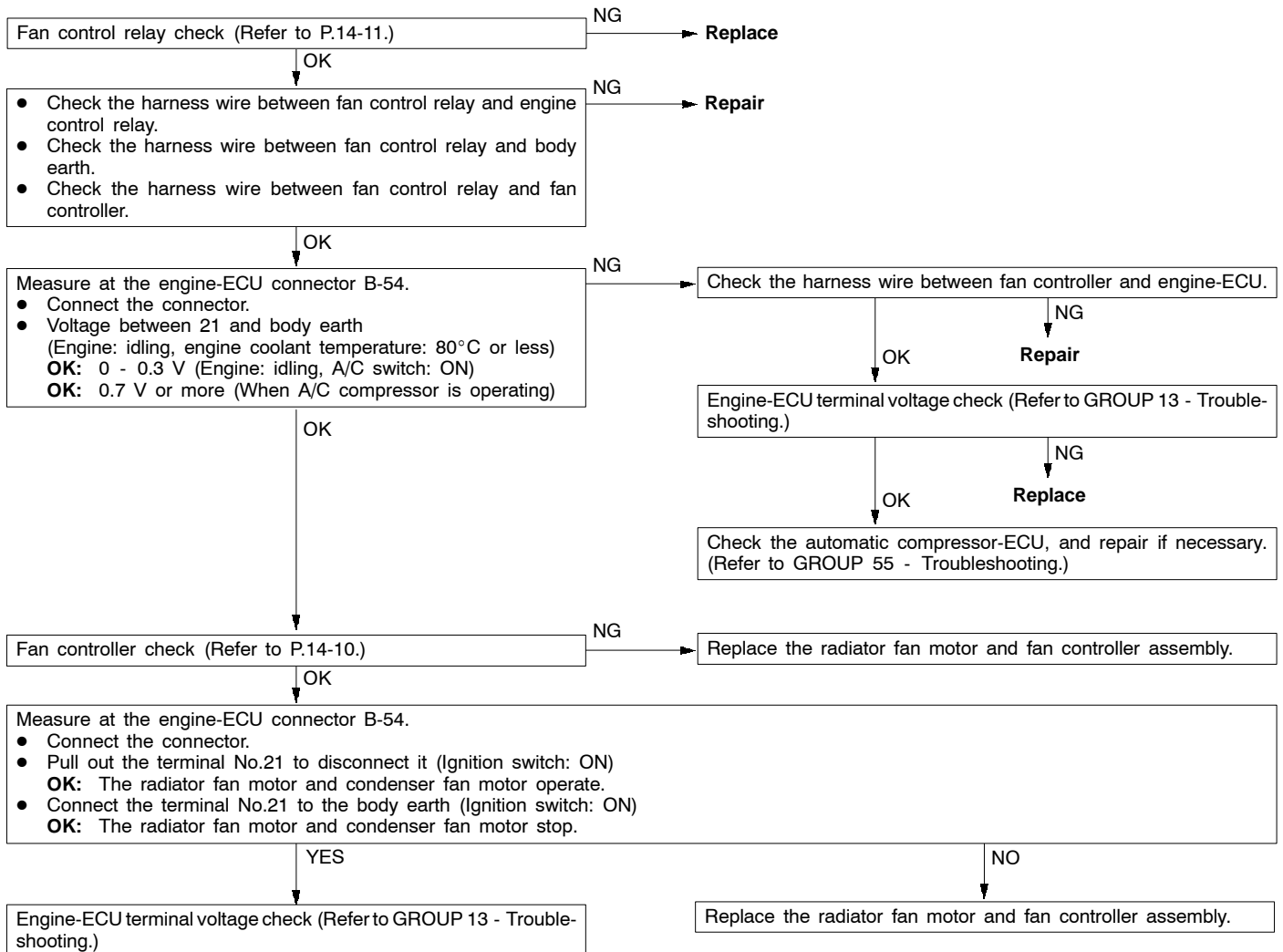
<Vehicles without A/C>



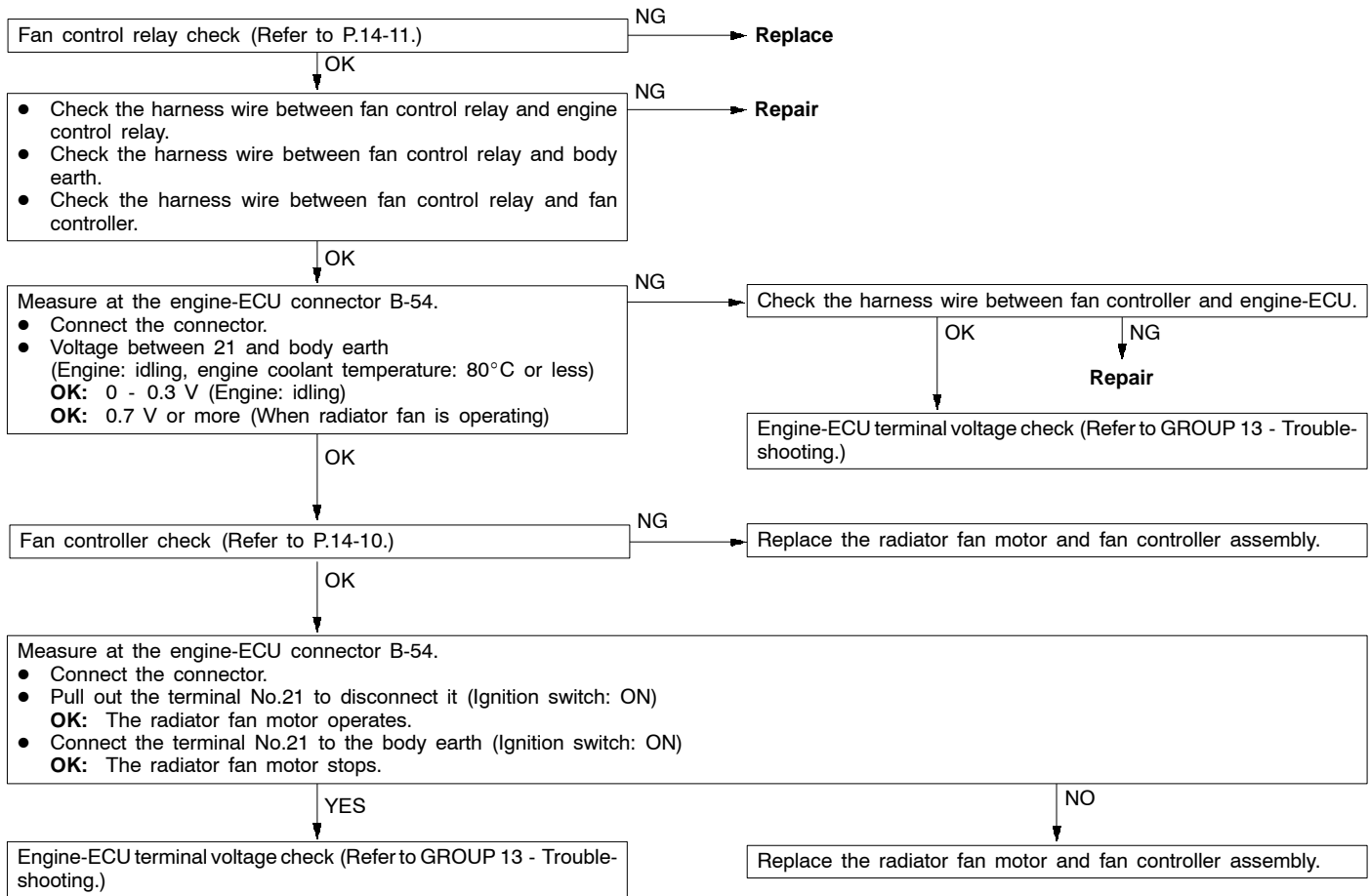
Inspection Procedure 2

<p><b>Radiator fan and condenser fan do not change speed or stop. &lt;Vehicles with A/C&gt;</b></p> <p><b>Radiator fan does not change speed or stop. &lt;Vehicles without A/C&gt;</b></p>	<p><b>Probable cause</b></p>
<p>The fan controller carries out step-free control of the radiator fan motor and the condenser fan motor speeds using signals transmitted from the engine-ECU.</p>	<ul style="list-style-type: none"> <li>● Malfunction of fan control relay</li> <li>● Malfunction of fan controller</li> <li>● Malfunction of engine-ECU</li> <li>● Malfunction of wiring harness or connector</li> </ul>

<Vehicles with A/C>



<Vehicles without A/C>



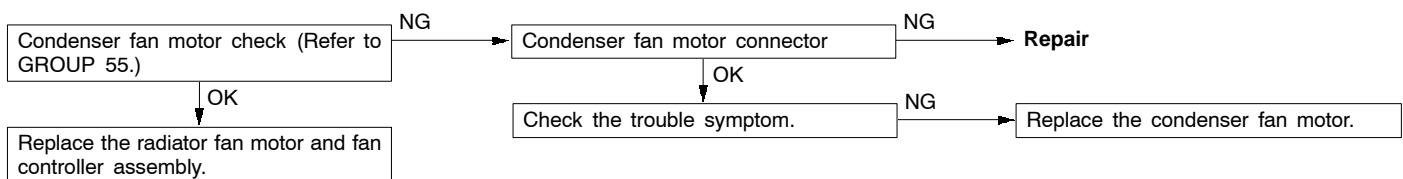
Inspection Procedure 3

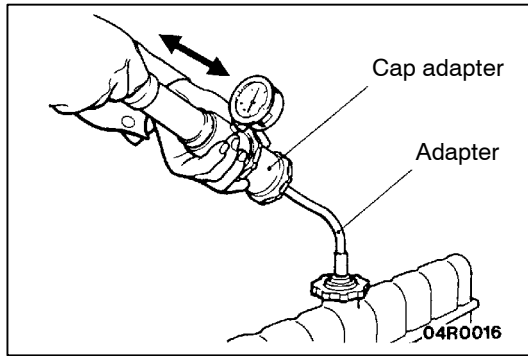
Radiator fan does not operate. <Vehicles with A/C>	Probable cause
The cause could be a malfunction of the radiator fan motor or an open circuit between the fan controller and the radiator fan motor.	<ul style="list-style-type: none"> <li>Malfunction of radiator fan motor</li> <li>Open circuit between fan controller and radiator fan motor</li> </ul>

Replace the radiator fan motor and fan controller assembly.

Inspection Procedure 4

Condenser fan does not operate. <Vehicles with A/C>	Probable cause
The cause could be a malfunction of the condenser fan motor or of the fan controller.	<ul style="list-style-type: none"> <li>Malfunction of condenser fan motor</li> <li>Malfunction of fan controller</li> <li>Malfunction of wiring harness or connector</li> </ul>





## ON-VEHICLE SERVICE

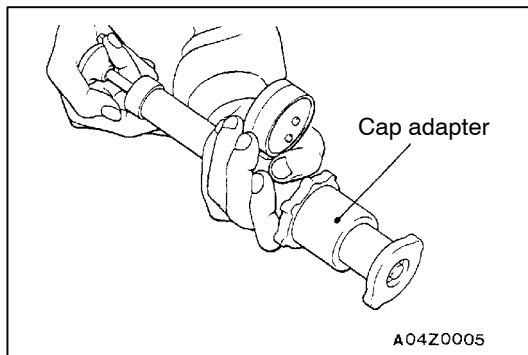
14100100136

### 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 OPENING PRESSURE CHECK

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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**

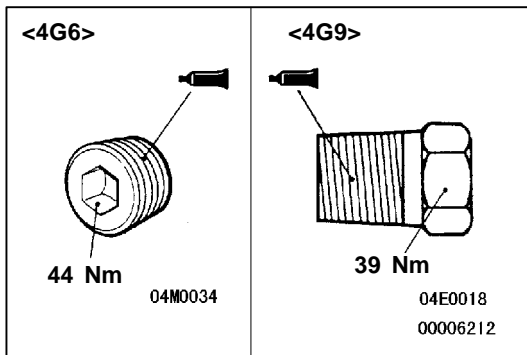
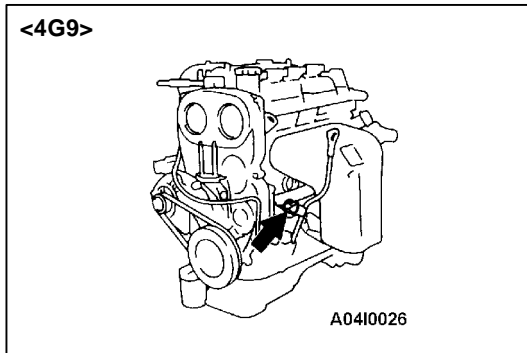
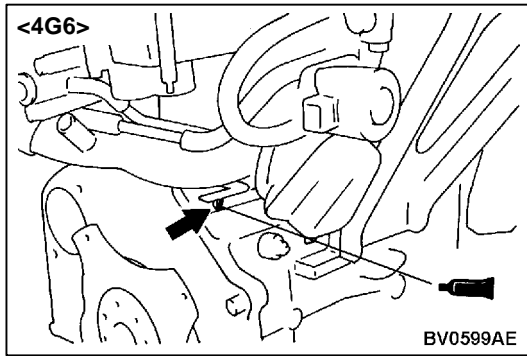
**Standard value: 74 - 103 kPa**

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**

14100120231

1. Drain the engine coolant by removing the drain plug and then the radiator cap.
2. Remove the 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. 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:****MITSUBISHI GENUINE COOLANT or equivalent****Quantity:****<4G6> 7 L****<4G9> 6 L****Caution**

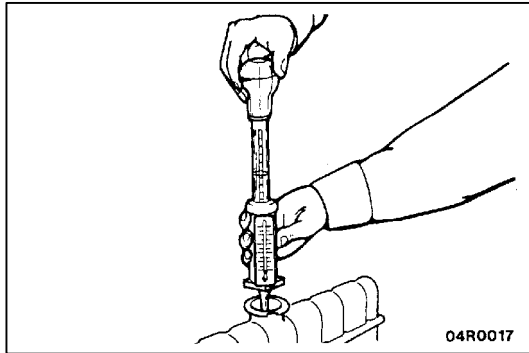
Do not use alcohol or methanol anti-freeze or any engine coolants mixed with alcohol or methanol anti-freeze. The use of an improper anti-freeze can cause the corrosion of the aluminium components.

**NOTE**

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

9. Install the radiator cap securely.

10. 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.)
11. After the thermostat opens, race the engine several times, and then stop the engine.
12. 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 9.



## CONCENTRATION MEASUREMENT

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

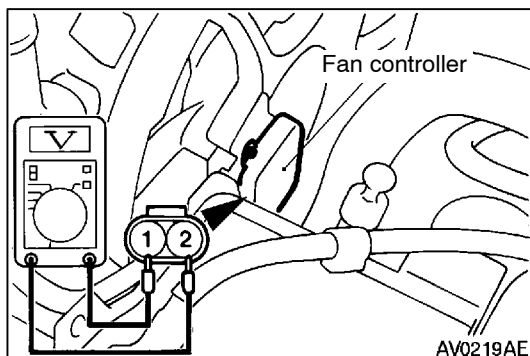
**Standard value: 30 - 60 % (allowable concentration range)**

### RECOMMENDED ANTIFREEZE

Antifreeze	Allowable concentration
MITSUBISHI GENUINE COOLANT or equivalent	30 - 60 %

### Caution

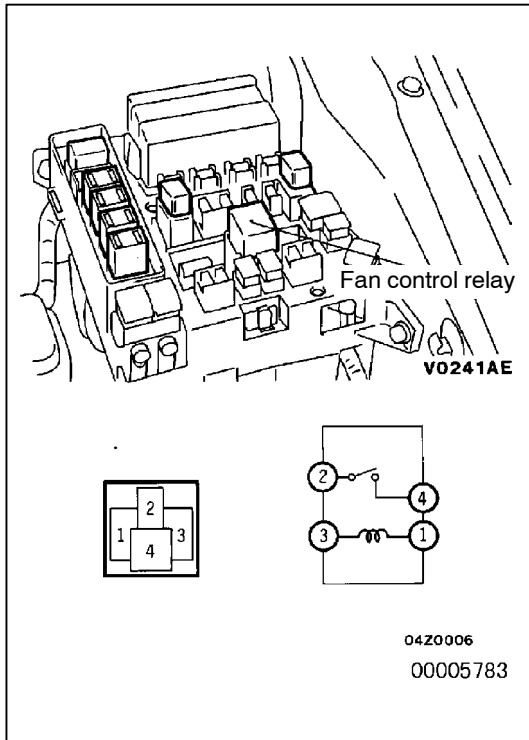
**If the concentration of the antifreeze is below 30 %, the anti-corrosion property will be adversely affected. In addition, if the concentration is above 60 %, both the anti-freezing and engine cooling properties will decrease, affecting the engine adversely. For these reasons, be sure to maintain the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



## FAN CONTROLLER CHECK

14100610011

1. Remove the fan controller mounting bolt, and then disconnect the condenser fan motor connector.
2. Start the engine and run it at idle.
3. Turn the A/C switch to ON and maintain the coolant temperature at 80°C or less.
4. When measuring the voltage between the fan controller-side connector terminals, check that the value changes repeatedly as indicated by (1) - (3) below.
  - (1) 0 V
  - (2)  $8.2 \pm 2.6$  V
  - (3) Battery voltage  $\pm 2.6$  V
5. If the voltage does not repeatedly change as indicated, replace the radiator fan motor and the fan controller assembly.



FAN CONTROL RELAY CONTINUITY CHECK

14100620014

Battery voltage	Terminal No.			
	1	2	3	4
When current is not supplied	○	—	○	
When current is supplied	⊖	○	⊕	○

## THERMOSTAT

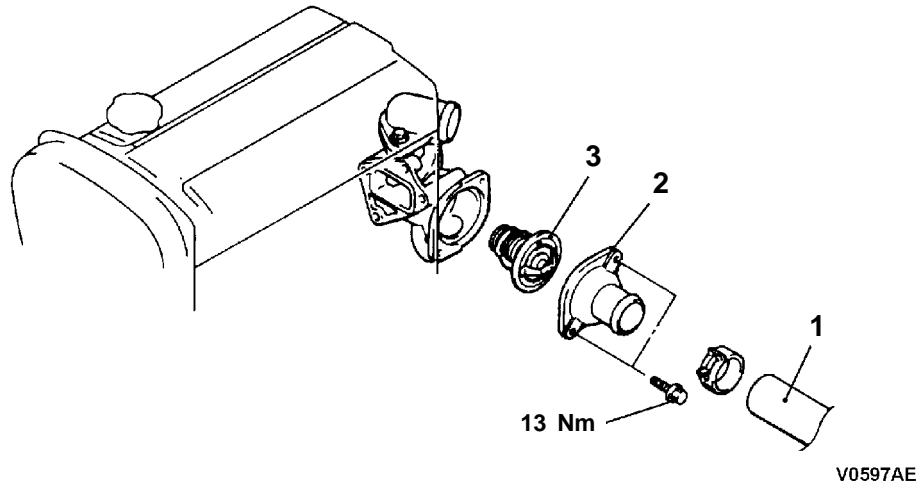
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## REMOVAL AND INSTALLATION

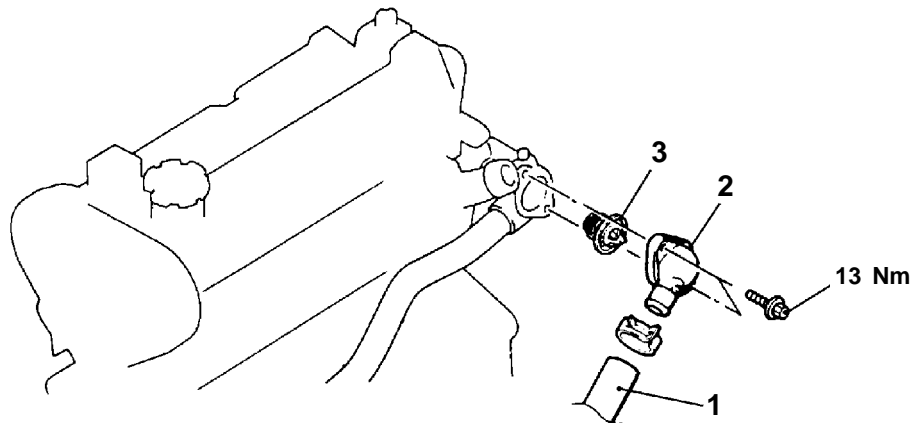
**Pre-removal and Post-installation Operation**

- Engine Coolant Draining and Supplying (Refer to P.14-9.)
- Air Intake Duct Removal and Installation

&lt;4G6&gt;



&lt;4G9&gt;

04I0024  
00009552**Removal steps**

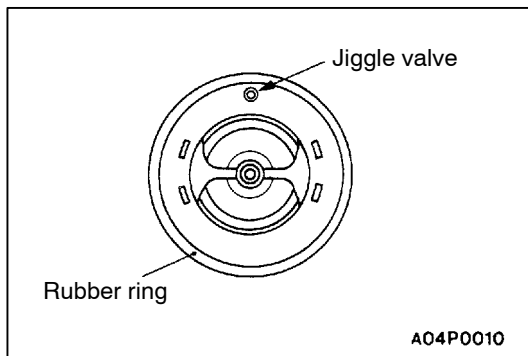
1. Radiator lower hose connection
2. Water inlet fitting



3. Thermostat

**REMOVAL SERVICE POINT****◀A▶ 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**

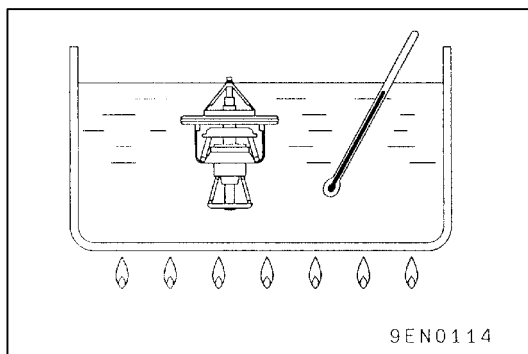
Install the thermostat so that the jiggle valve is facing straight up.

**Caution**

**Make absolutely sure that no oil is adhering 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**

14100250275

**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:  $85 \pm 1.5^{\circ}\text{C}$**

2. Check that the amount of valve lift is at the standard value when the water is at the full-opening temperature.

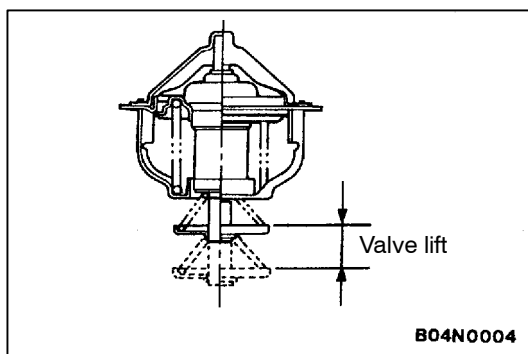
**Standard value:**

**Full-opening temperature:  $98^{\circ}\text{C}$**

**Amount of valve lift: 8.5 mm or more**

**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.

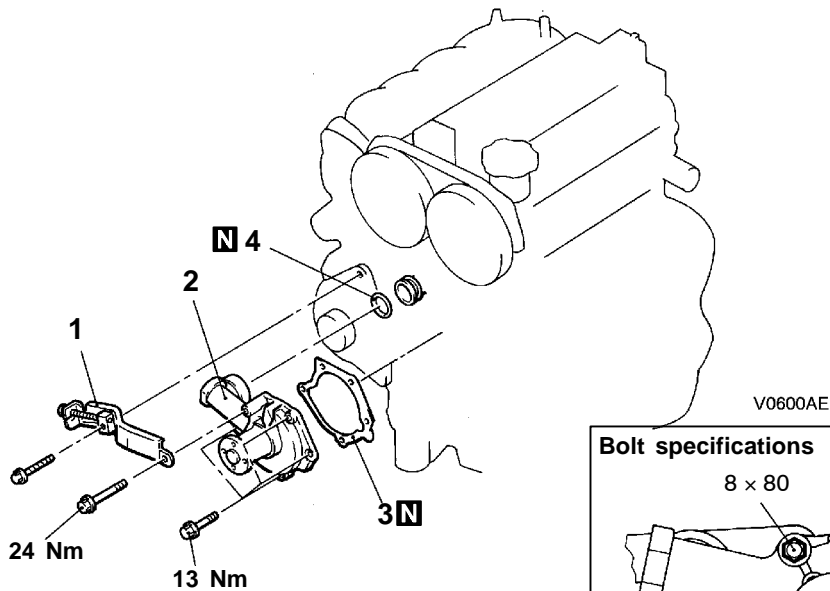


## WATER PUMP <4G6>

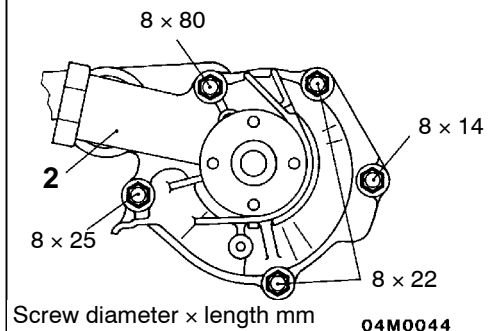
### REMOVAL AND INSTALLATION

#### Pre-removal and Post-installation Operation

- Engine Coolant Draining and Supplying (Refer to P.14-9.)
- Engine Cover Removal
- Timing Belt Removal and Installation (Refer to GROUP 11A.)



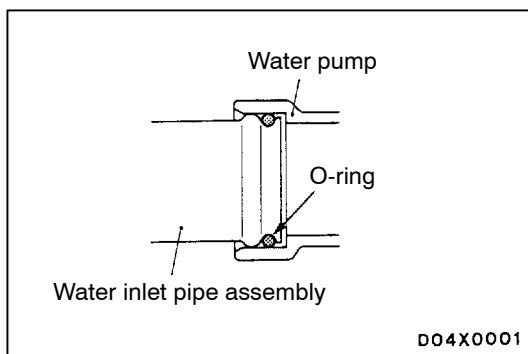
#### Bolt specifications



00007753

#### Removal steps

1. Alternator brace
2. Water pump
3. Water pump gasket
4. O-ring



### INSTALLATION SERVICE POINT

#### ▶A◀ 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

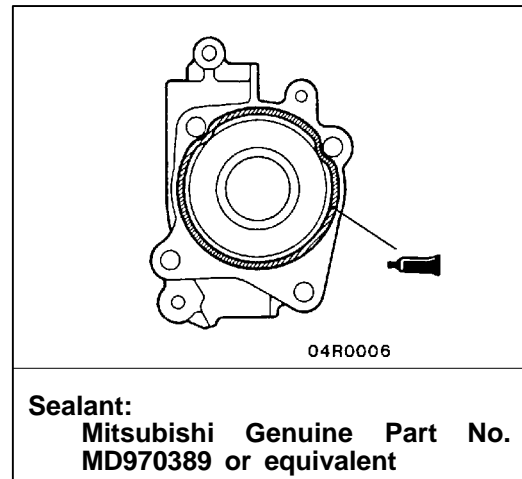
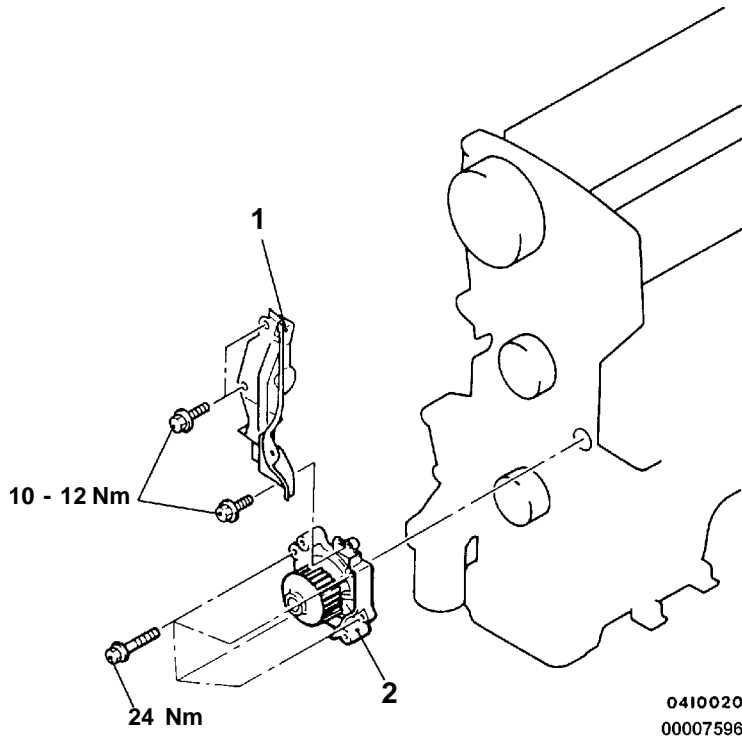
**Do not allow engine oil or other greases to adhere to the O-ring**

**WATER PUMP <4G9>**

14100270370

**REMOVAL AND INSTALLATION****Pre-removal and Post-installation Operation**

- Engine Coolant Draining and Supplying (Refer to P.14-9.)
- Timing Belt Removal and Installation (Refer to GROUP 11B.)
- Idler Pulley Removal and Installation (Refer to GROUP 11B - Timing Belt.)

**Removal steps**

- ▶◀
1. Timing belt rear left 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**

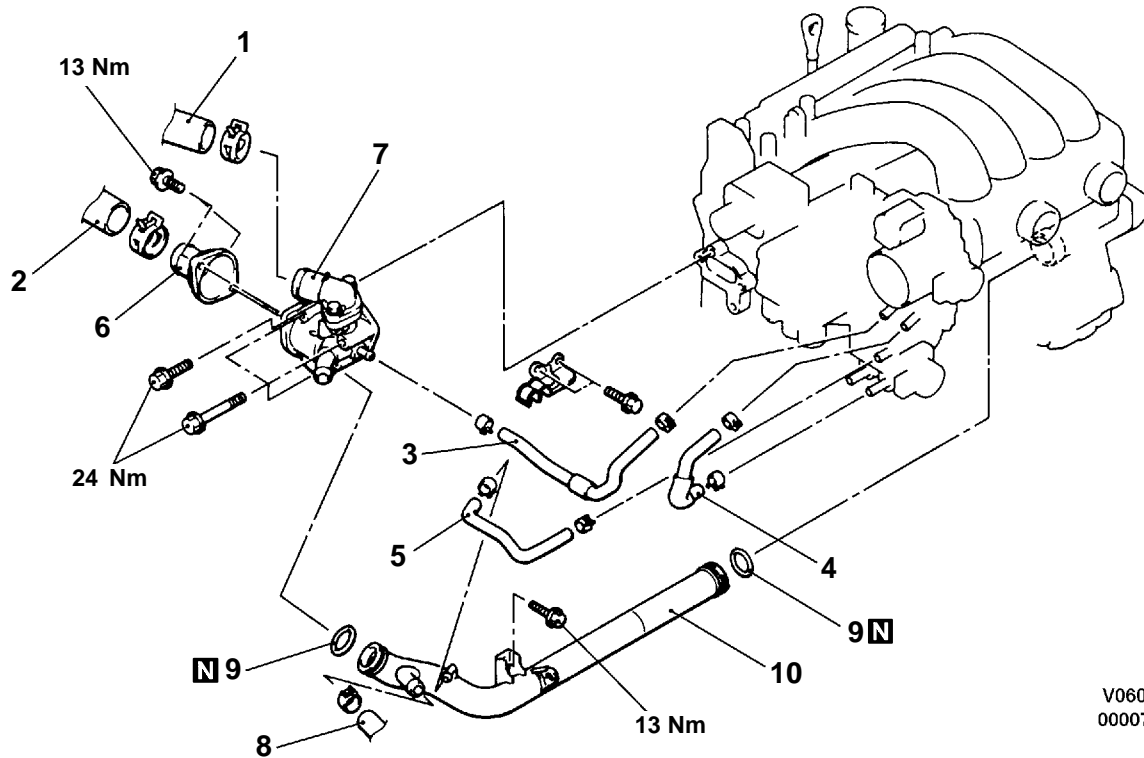
# WATER HOSE AND WATER PIPE

## REMOVAL AND INSTALLATION

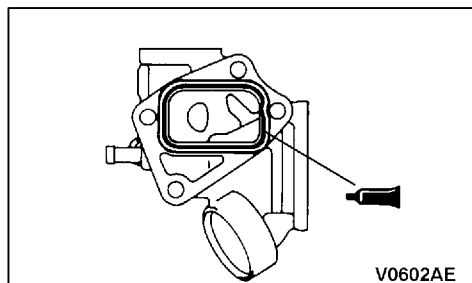
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### Pre-removal and Post-installation Operation

- Engine Coolant Draining and Supplying (Refer to P.14-9.)
- Engine Cover Removal and Installation
- Air Cleaner Assembly Removal and Installation



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### Sealant:

**Mitsubishi Genuine Part No.  
MD970389 or equivalent**

### Removal steps



1. Radiator upper hose connection
2. Radiator lower hose connection
3. Water hose
4. Water hose
5. Water hose



6. Water inlet fitting
7. Thermostat case assembly
8. Heater hose connection



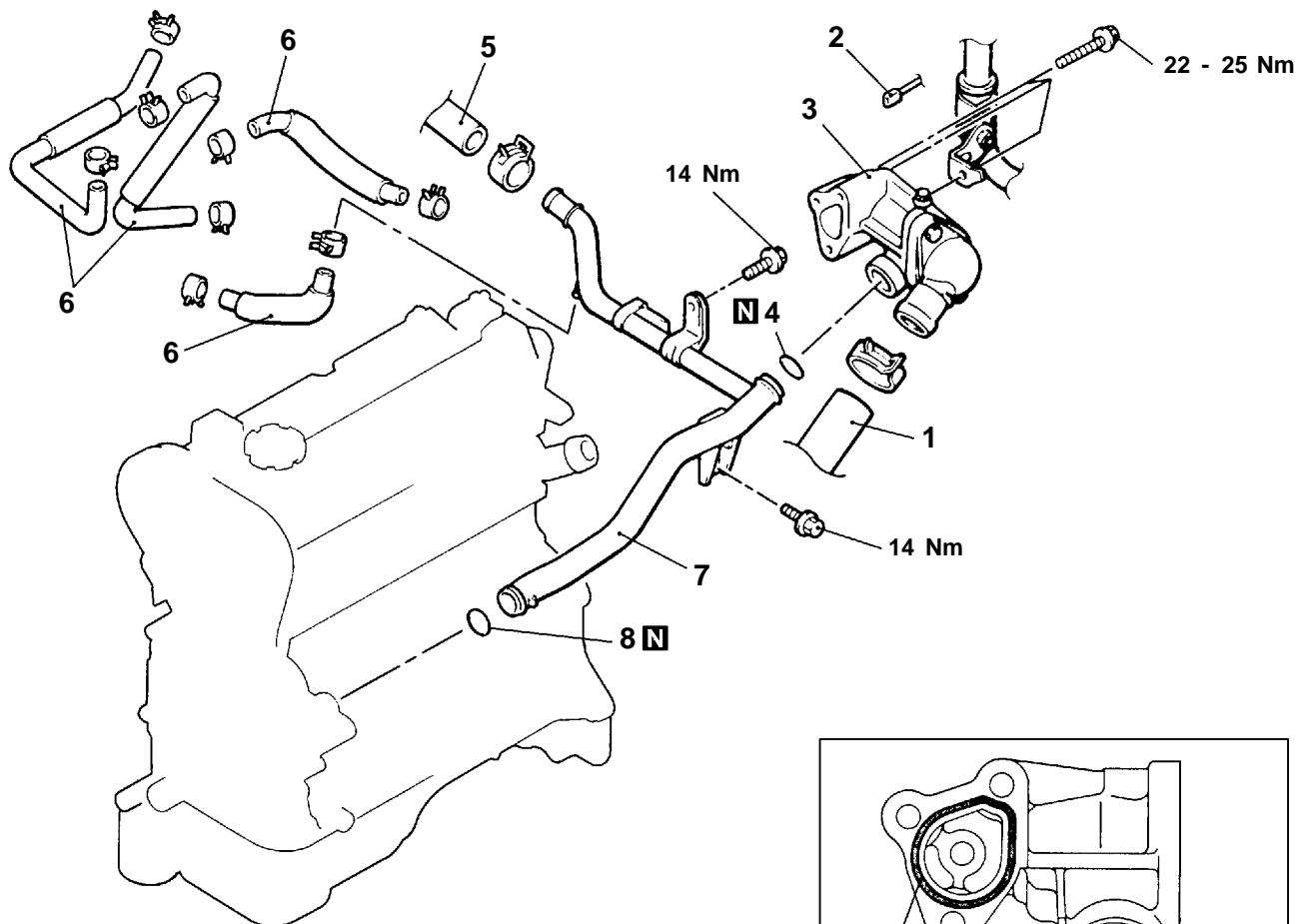
9. O-ring
10. Water inlet pipe



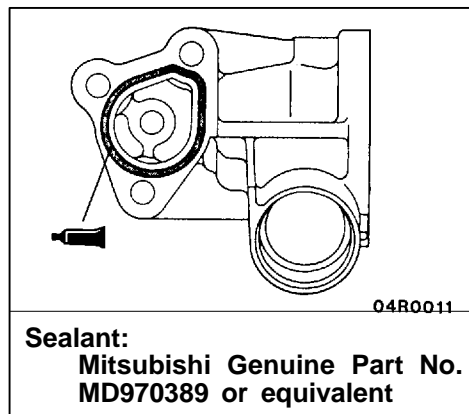
<4G9>

**Pre-removal and Post-installation Operation**

- Engine Coolant Draining and Suppling (Refer to P.14-9.)
- Engine Cover Removal and Installation
- Air Cleaner Assembly and Air Intake Hose Removal and Installation



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**Sealant:**  
Mitsubishi Genuine Part No.  
MD970389 or equivalent

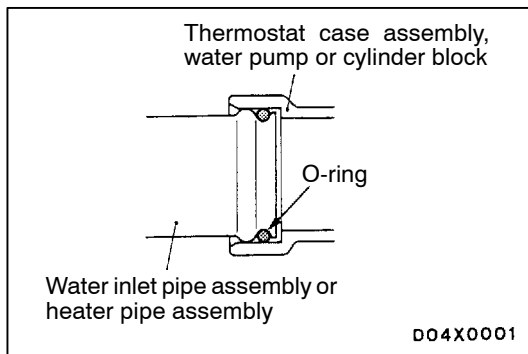
**Removal steps**

- ◀A▶ ▶C▶ 1. Radiator lower hose connection
- 2. Water temperature gauge unit connector
- ▶B▶ 3. Thermostat case assembly
- ▶A▶ 4. O-ring
- 5. Heater hose connection

- ▶A▶ ● Intake manifold (Refer to GROUP 15)
- 6. Water hose
- 7. Water inlet pipe assembly
- 8. 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 or the heater 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**

**▶B◀ 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**

**▶C◀ RADIATOR LOWER HOSE/RADIATOR UPPER HOSE CONNECTION**

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

**INSPECTION**

14100340118

**WATER PIPE AND HOSE CHECK**

Check the water pipe and hose for cracks, damage, clog and replace them if necessary.

## RADIATOR

14100150285

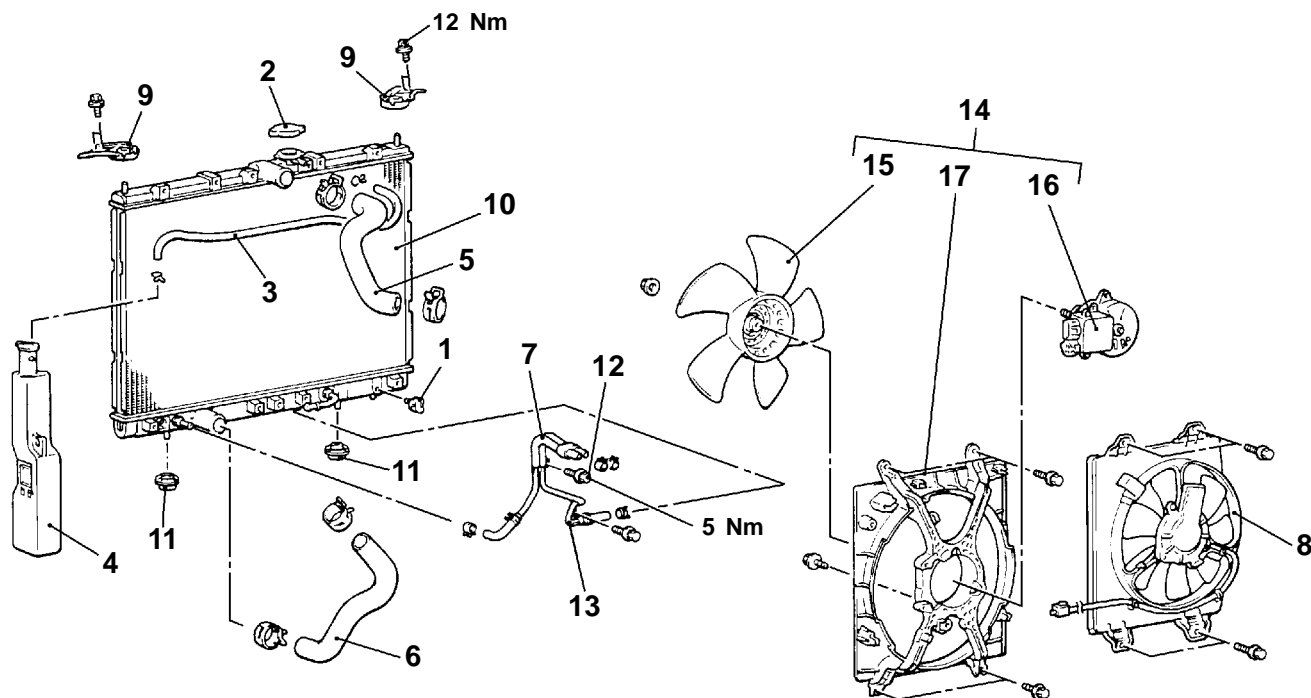
## REMOVAL AND INSTALLATION

**Pre-removal operation**

- Engine Coolant Draining (Refer to P.14-9.)
- Air Intake Duct Assembly Removal
- Battery and Battery Cover Removal

**Post-installation Operation**

- Air Intake Duct Assembly Installation
- Engine Coolant Supplying (Refer to P.14-9.)
- A/T Fluid Supplying and Checking (Refer to GROUP 23 - On-vehicle Service.)
- Battery and Battery Cover Installation



AV1130AE

**Radiator removal steps**

1. Drain plug
2. Radiator cap
3. Overflow hose
4. Reserve tank
5. Radiator upper hose
6. Radiator lower hose
7. Transmission fluid cooler hose connection <A/T>
8. Condenser fan motor assembly <Vehicle with A/C>
9. Upper insulator
10. Radiator assembly
11. Lower insulator
12. Bolt <A/T>



13. Transmission fluid cooler hose and pipe assembly <A/T>
14. Radiator fan motor assembly

**Radiator fan motor and fan controller assembly removal steps**

5. Radiator upper hose
12. Bolt <A/T>
8. Condenser fan motor assembly <Vehicle with A/C>
14. Radiator fan motor assembly
15. Fan
16. Radiator fan motor and fan controller assembly
17. Shroud

**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▶ TRANSMISSION FLUID COOLER HOSE AND PIPE ASSEMBLY REMOVAL**

After disconnecting the hoses from the radiator and the transmission, plug all of the pipes and hoses to prevent dirt and other foreign objects from getting inside.

**INSTALLATION SERVICE POINT****▶A◀ RADIATOR LOWER HOSE/RADIATOR UPPER 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.