

# ENGINE COOLING

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**GENERAL INFORMATION**

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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 electrical radiator fan is controlled by the engine-ECU in accordance with the engine running condition.

Items				Specifications
Radiator	Performance kJ/h	4G1	M/T	132,700
			A/T	172,000
		4G9	M/T	164,900
			A/T	172,000
Automatic transmission oil cooler	Performance kJ/h			5,651

**SERVICE SPECIFICATIONS**

14100030091

Items		Standard value	Limit
High pressure valve opening pressure of radiator cap kPa		74–103	64
Range of coolant antifreeze concentration of radiator %		30–60	–
Thermostat	Valve opening temperature of thermostat °C	82±1.5	–
	Full-opening temperature of thermostat °C	95	–
	Valve lift (at 95°C) mm	8.5 or more	–

**LUBRICANT**

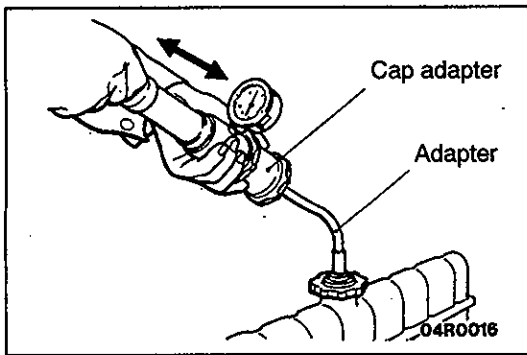
14100040087

Items		Quantity ℓ
HIGH QUALITY ETHYLENE GLYCOL ANTIFREEZE COOLANT	4G1	5
	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, Thermostat case <4G9>	Mitsubishi Genuine Parts No. MD970389 or equivalent	Semi-drying sealant



## ON-VEHICLE SERVICE

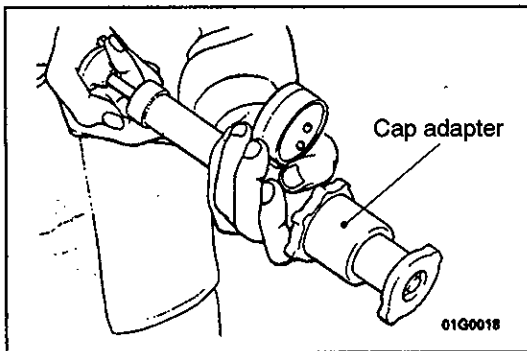
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### ENGINE COOLANT LEAK CHECKING

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

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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.

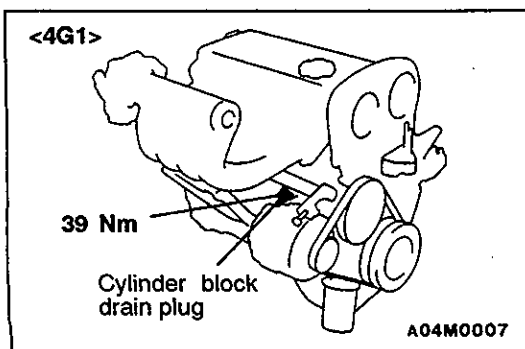
**Limit: 64 kPa**

**Standard value: 74–103 kPa**

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

#### NOTE

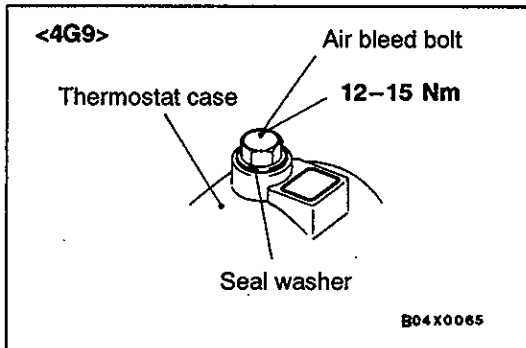
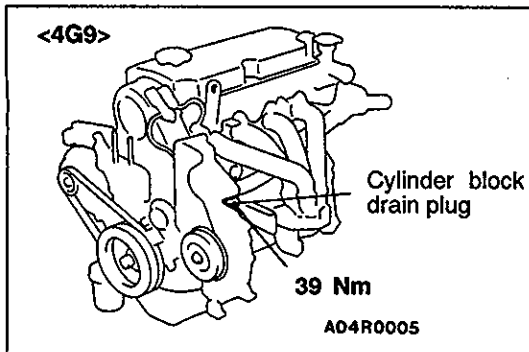
Be sure that the cap is clean before testing, since rust or other foreign material on the cap seal will cause an improper indication.



### ENGINE COOLANT REPLACEMENT

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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. 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:**

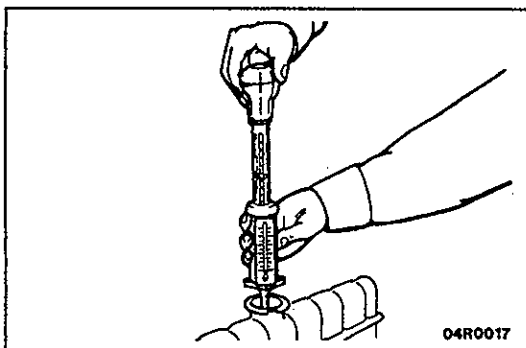
<4G1> 5 ℓ

<4G9> 6 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**

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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**

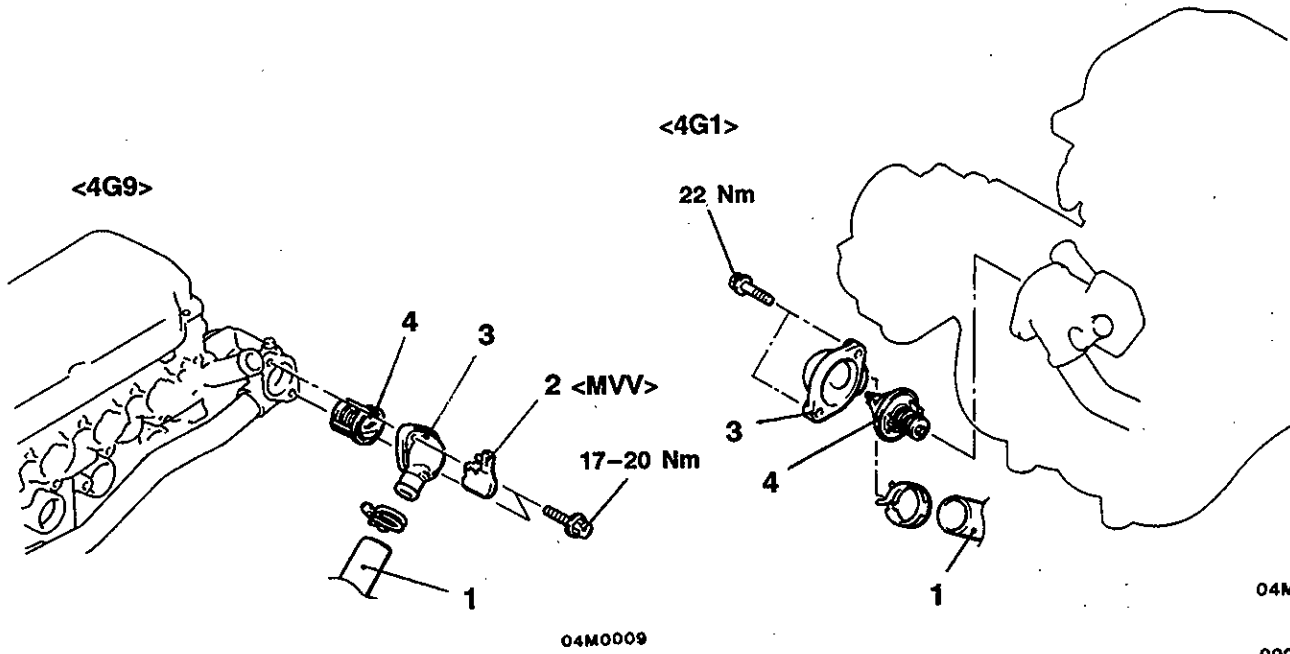
Antifreeze	Allowable concentration
HIGH QUALITY ETHYLENE GLYCOL ANTIFREEZE COOLANT	30-60%

**THERMOSTAT**

14100240128

**REMOVAL AND INSTALLATION**

- Pre-removal and Post-installation Operation**
- Engine Coolant Draining and Supplying (Refer to P.14-3.)
  - Air Cleaner Removal and Installation <4G1>



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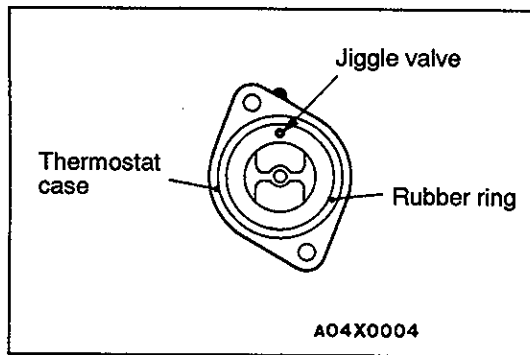
**Removal steps**

- ◀A▶ ▶B▶ 1. Radiator lower hose connection
- ▶B▶ 2. Connector bracket <MVV>
- ▶B▶ 3. Water inlet fitting
- ▶A▶ 4. 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

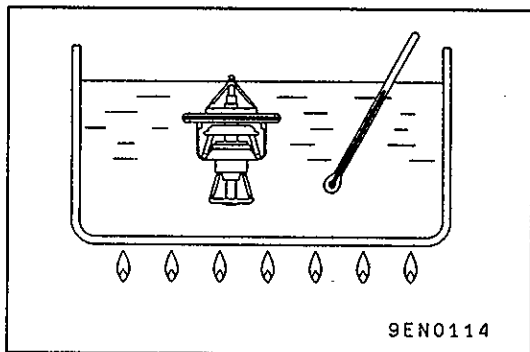
Install the thermostat so that the jiggle valve is facing straight up.

#### 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

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### 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:  $82 \pm 1.5^\circ\text{C}$**

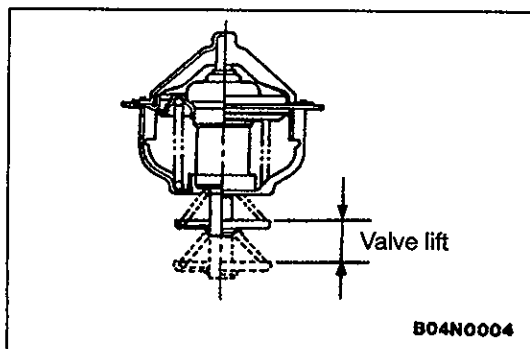
2. Check that the amount of valve lift is at the standard value when the water is at the full-opening temperature.

**Standard value:**

Full-opening temperature °C	Amount of valve lift mm
95	8.5 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.



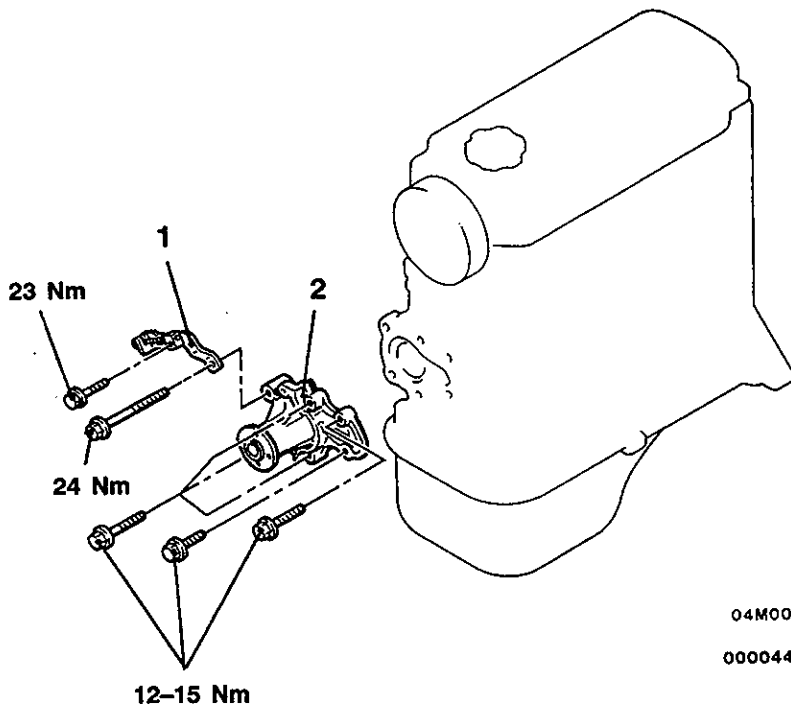
**WATER PUMP <4G1>**

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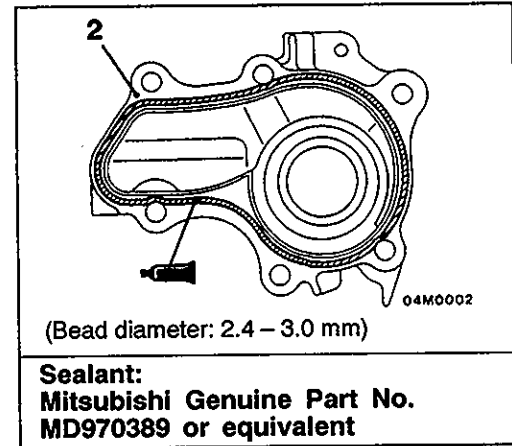
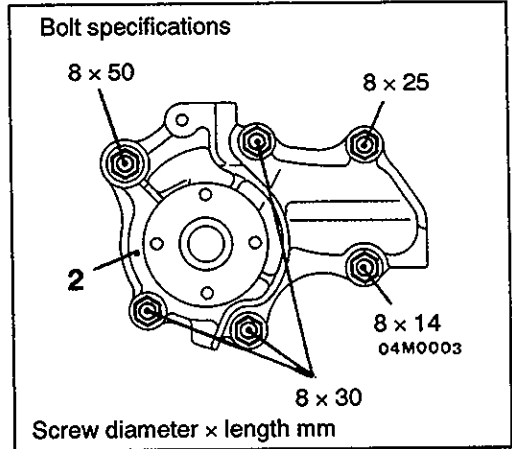
**REMOVAL AND INSTALLATION**

**Pre-removal and Post-Installation Operation**

- Engine Coolant Draining and Supplying  
(Refer to P.4-3.)
- Timing Belt Removal and Installation  
(Refer to GROUP 11A.)



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**Removal steps**

- ▶◀
1. Alternator base
  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:**

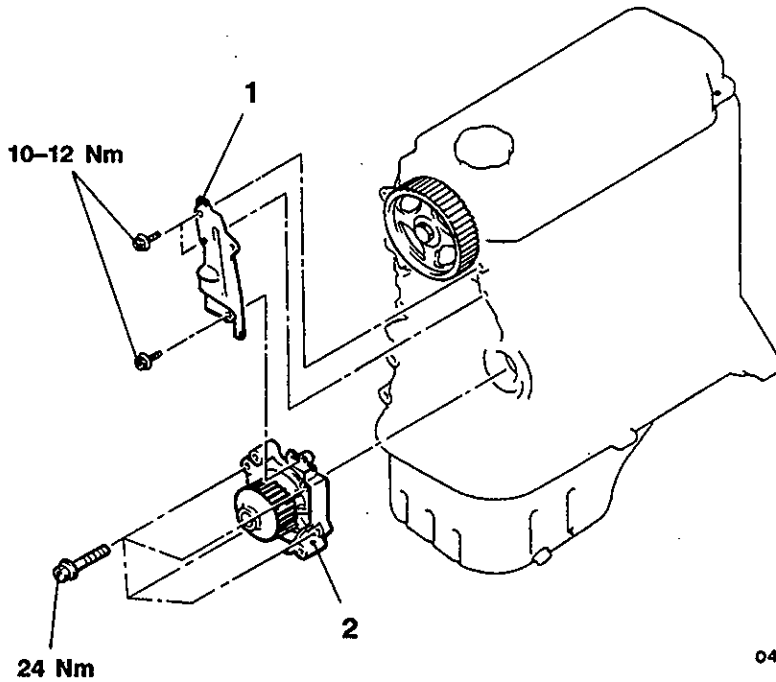
**Mitsubishi Genuine Part No. MD970389 or equivalent**

**WATER PUMP <4G9>**

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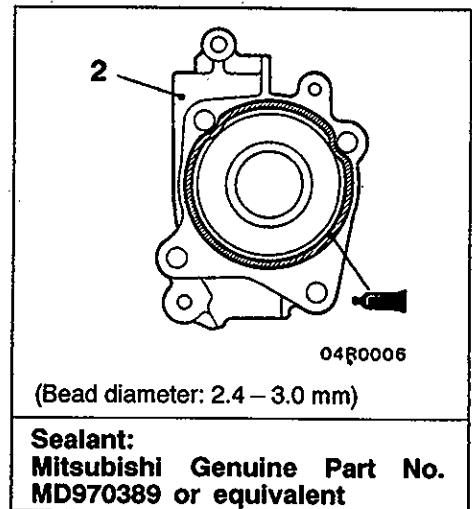
**REMOVAL AND INSTALLATION****Pre-removal and Post-installation Operation**

- Engine Coolant Draining and Supplying  
(Refer to P.14-3.)
- Timing Belt Removal and Installation  
(Refer to GROUP 11B.)



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**Removal steps**

- ▶A◀
1. Timing belt rear cover
  2. Water pump

**INSTALLATION SERVICE POINT****▶A◀ 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



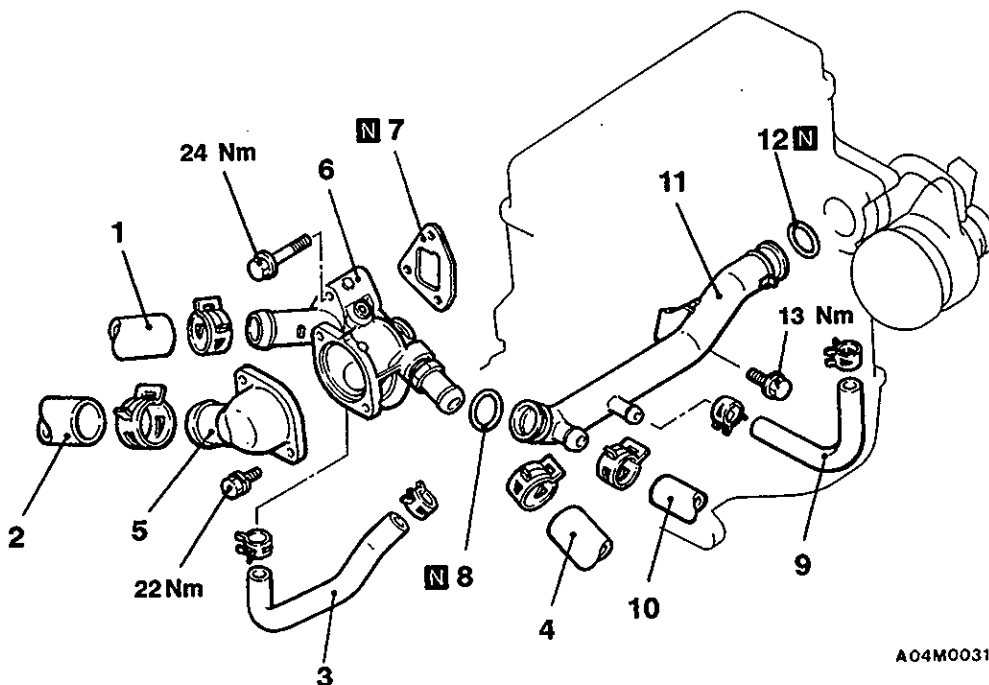
**WATER HOSE AND WATER PIPE <4G1>**

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**REMOVAL AND INSTALLATION**

**Pre-removal and Post-Installation Operation**

- Engine Coolant Draining and Suppling (Refer to P.14-3.)
- Air Cleaner Removal and Installation



**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



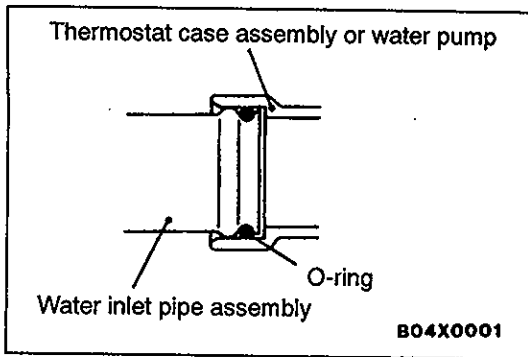
7. Gasket
8. O-ring
9. Water hose
10. Heater hose connection
11. Water inlet pipe assembly
12. O-ring



**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 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◀ 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

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### WATER PIPE AND HOSE CHECK

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

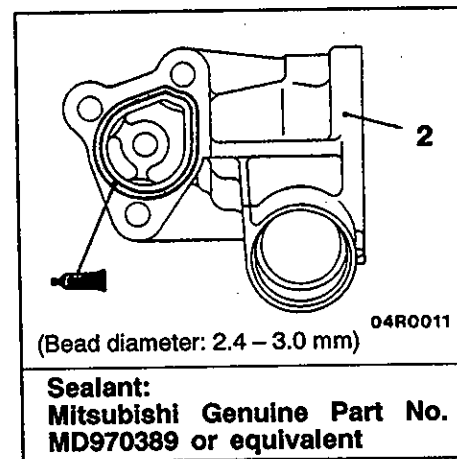
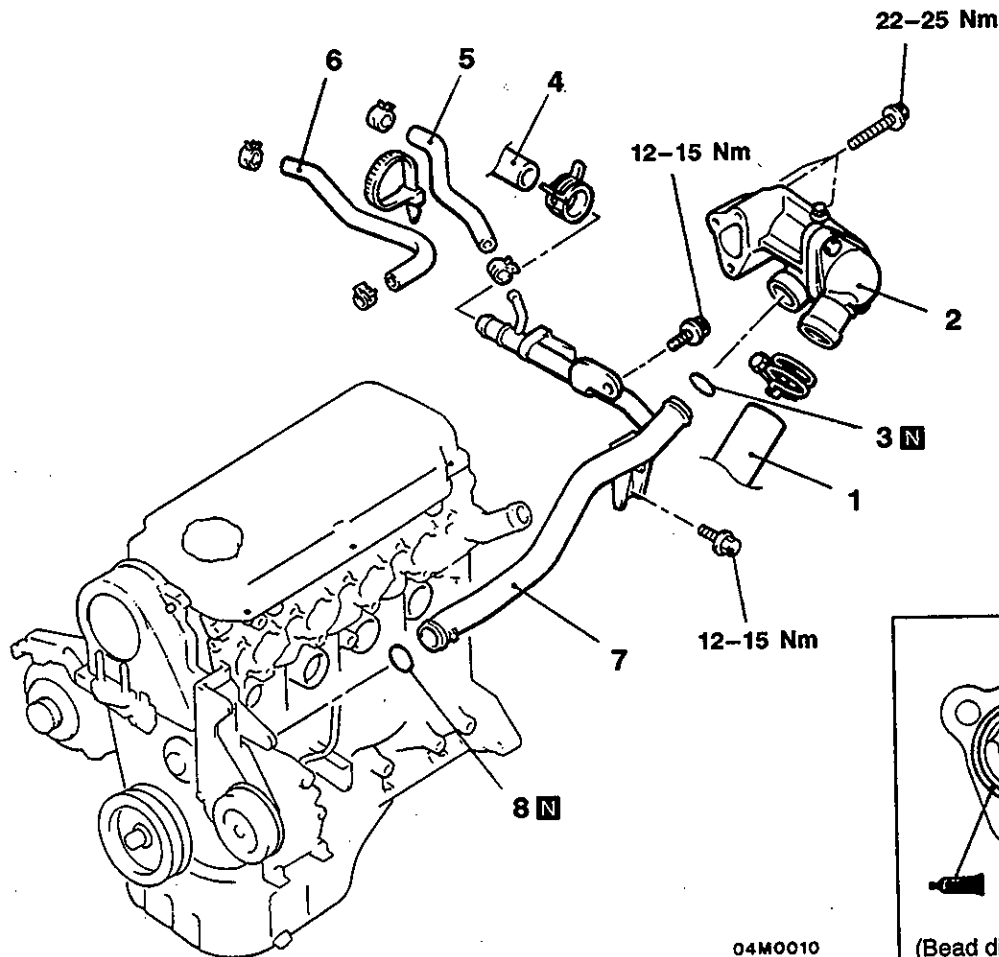
**WATER HOSE AND WATER PIPE <4G9>**

14100330177

**REMOVAL AND INSTALLATION**

**Pre-removal and Post-Installation Operation**

- Engine Coolant Draining and Supplying (Refer to P.14-3.)
- Air Cleaner Removal and Installation
- Distributor Removal and Installation (Refer to GROUP 16.)



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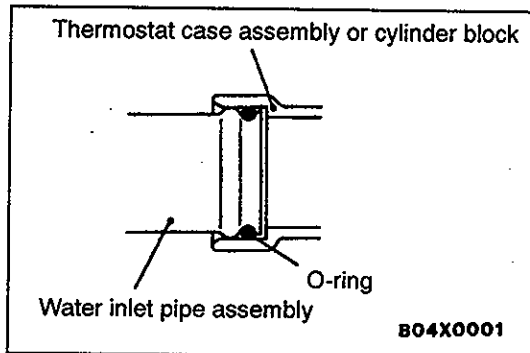
**Removal steps**

- ◀A▶ C 1. Radiator lower hose connection
- ▶B▶ 2. Thermostat case assembly
- ▶A▶ 3. O-ring
- ▶A▶ 4. Heater hose connection
- ▶A▶ 5. Water hose
- ▶A▶ 6. Water hose
- ▶A▶ 7. Water inlet pipe assembly
- ▶A▶ 8. O-ring

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

**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◀ 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**

**▶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 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**

14100340118

**WATER PIPE AND HOSE CHECK**

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

# RADIATOR

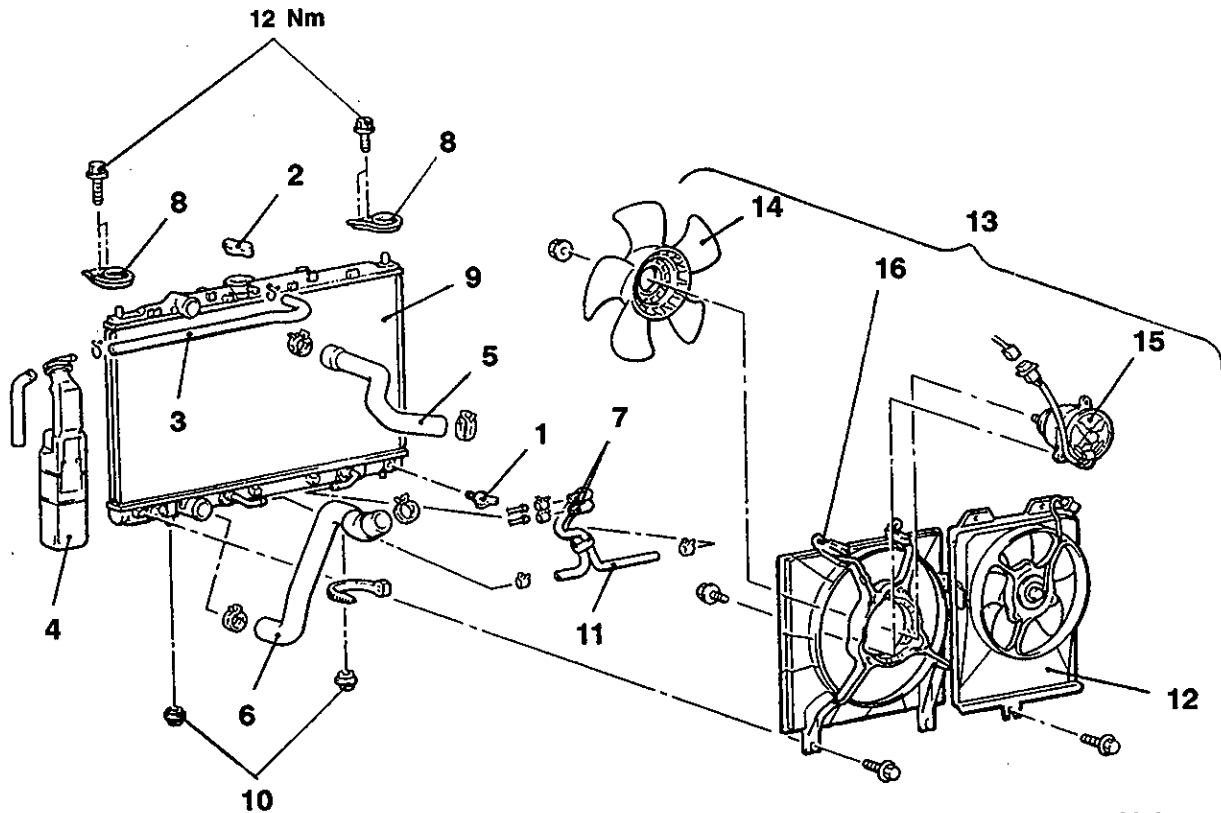
## REMOVAL AND INSTALLATION

### Pre-removal operation

- Engine Coolant Draining (Refer to P.14-3.)
- Air Cleaner Removal <4G1>

### Post-installation Operation

- Engine Coolant Supplying (Refer to P.14-3.)
- A/T Fluid Supplying and Checking (Refer to GROUP 23 – On-vehicle Service.)
- Air Cleaner Installation <4G1>



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### 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
8. Upper insulator
9. Radiator assembly
10. Lower insulator
11. Transmission fluid cooler hose assembly
12. Condenser fan motor assembly <Vehicle with A/C>
13. Radiator fan motor assembly

### Radiator fan motor removal steps

1. Drain plug
2. Radiator cap
3. Overflow hose
5. Radiator upper hose
12. Condenser fan motor assembly <Vehicles with A/C>
14. Fan
15. Radiator fan motor
16. 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.

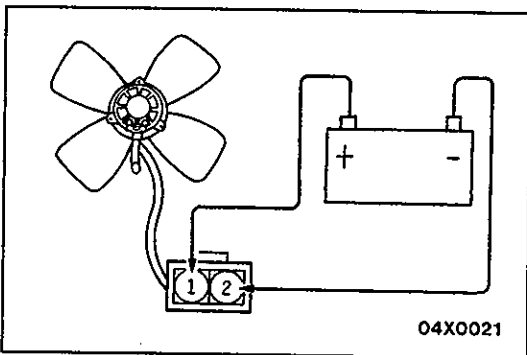
◀B▶ **TRANSMISSION FLUID COOLER HOSE REMOVAL**

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 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.

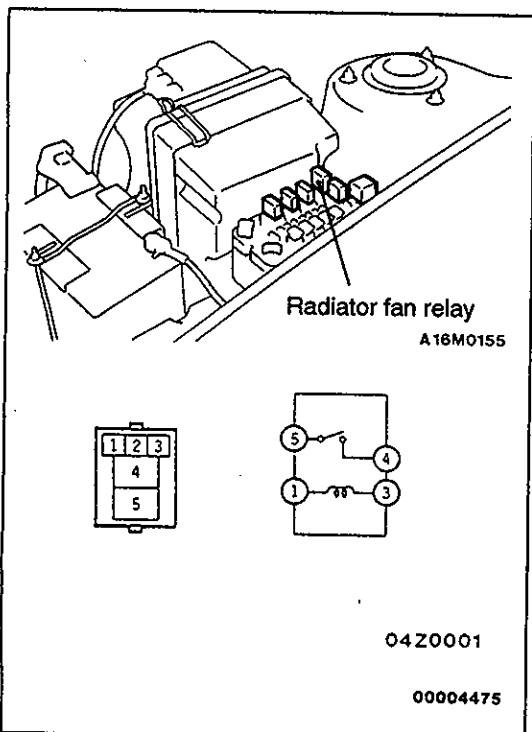


**INSPECTION**

14100190098

**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 motor is turning.



**RADIATOR FAN RELAY CONTINUITY CHECK**

14100440092

Battery voltage	Terminal No.			
	1	3	4	5
Not supplied	○	○		
Supplied	⊕	⊖	○	○