
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.

Items			Specifications
Radiator	Performance kJ/h	6G7	203,023
		4D5, 4M4	232,326

SERVICE SPECIFICATIONS

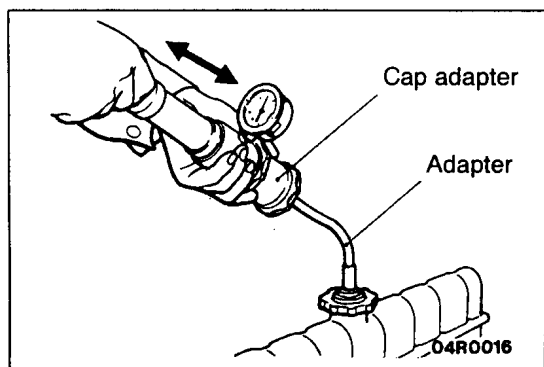
Items			Standard value	Limit
High pressure valve opening pressure of radiator cap kPa			74 – 103	64
Range of coolant antifreeze concentration of radiator %			30 – 60	–
Thermostat	Valve opening temperature of thermostat °C	6G7	88 ± 2.0	–
		4D5	82 ± 1.5	–
		4M4	76.5 ± 2.0	–
	Full-opening temperature of thermostat °C	6G7	100	–
		4D5	95	–
		4M4	90	–
	Valve lift mm	6G7	10 or more	–
		4D5, 4M4	8.5 or more	–

LUBRICANT

Item	Applicable model	Amount (including condense tank) ℓ
MITSUBISHI GENUINE COOLANT or equivalent	Vehicles without rear heater	9.0
	Vehicles with rear heater	10.5

SEALANT

Items	Specified sealant	Remarks
Cylinder block drain plug	3M Nut Locking Part No. 4171 or equivalent	Drying sealant



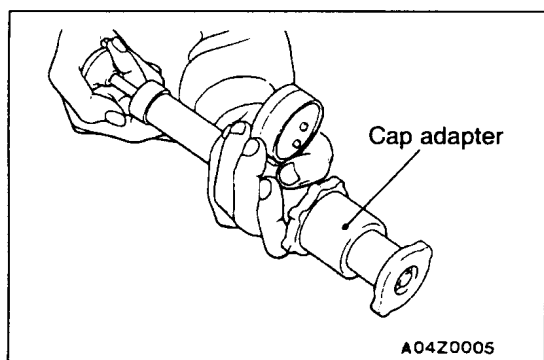
ON-VEHICLE SERVICE

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: 64 kPa

Standard value: 74 – 103 kPa

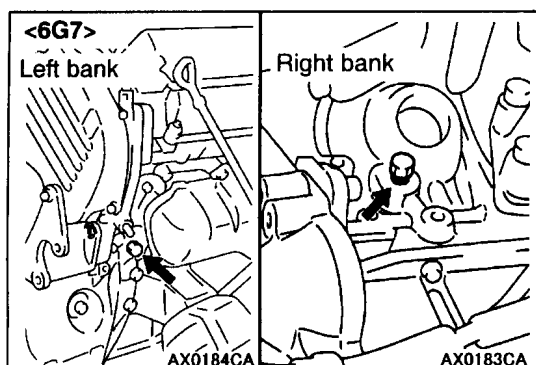
3. Replace the radiator cap if the reading does not remain at or above the limit.

NOTE

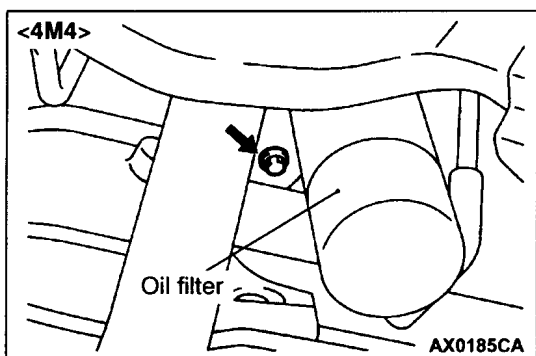
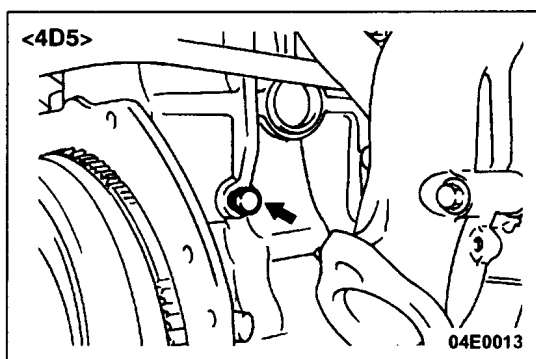
Be sure that the cap is clean before testing, since rust or other foreign material on the cap seal will cause an improper indication.

ENGINE COOLANT REPLACEMENT

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

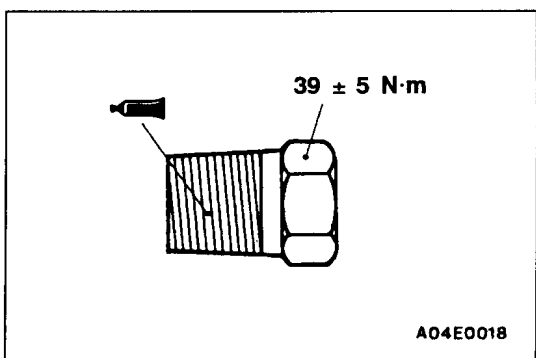
6. Securely tighten the radiator drain plug.
7. Install the reserve tank.
8. Remove the air bleed bolt and replace the seal washer.
9. Fill the radiator until the engine coolant flows from the air bleed bolt section, and then close the air bleed bolt.
10. Slowly pour the engine coolant into the mouth of the radiator until the radiator is full, and pour also into the reserve tank up to the FULL line.

Recommended anti-freeze:

MITSUBISHI GENUINE COOLANT or equivalent

Quantity:

- <Vehicles without rear heater> 9.0 ℓ
- <Vehicles with rear heater> 10.5 ℓ



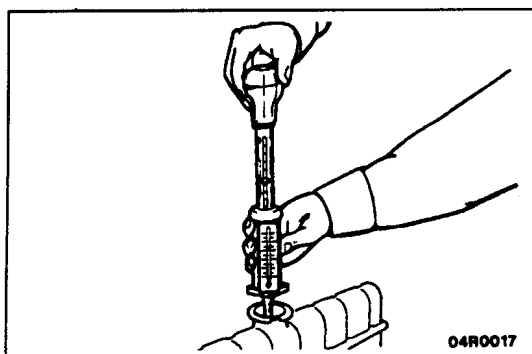
Caution

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 anti-freeze 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 ANTI-FREEZE

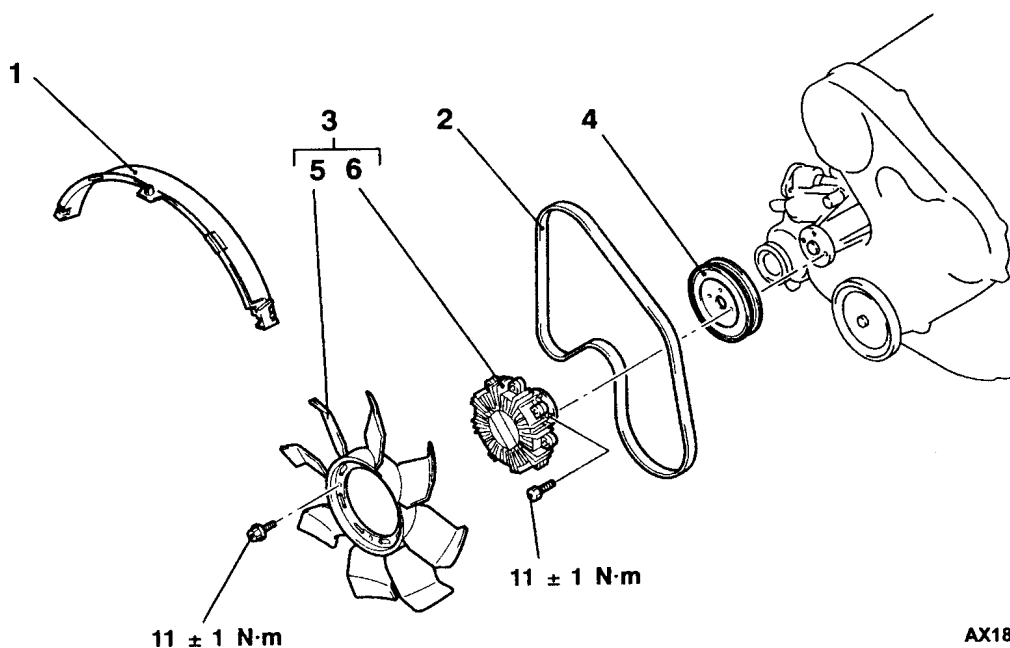
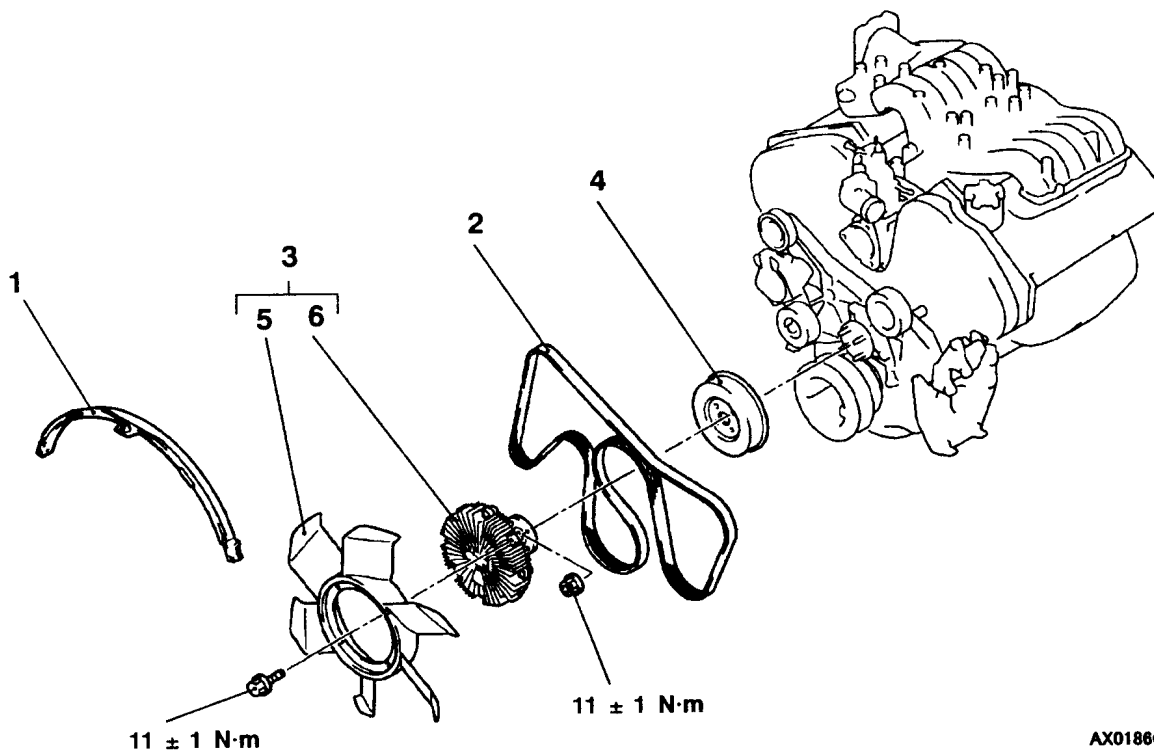
Antifreeze	Allowable concentration
MITSUBISHI GENUINE COOLANT or equivalent	30 – 60 %

Caution

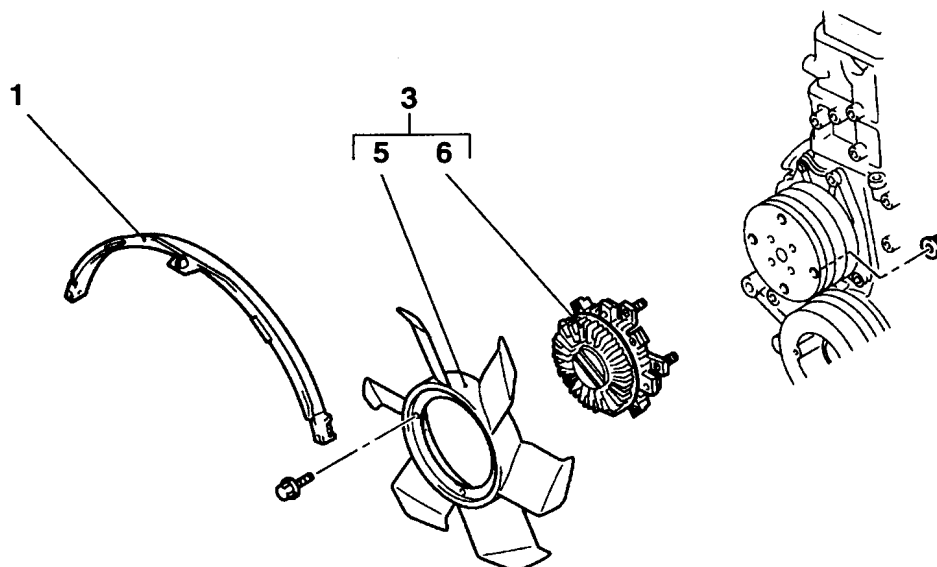
If the concentration of the anti-freeze is below 30 %, the anti-corrosion property will be adversely affected. In addition, if the concentration is above 60 %, both the anti-freezing and engine cooling properties will decrease, affecting the engine adversely. For these reasons, be sure to maintain the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

COOLING FAN**REMOVAL AND INSTALLATION**

<6G7>



<4M4>



AX0187CA

Removal steps

1. Radiator upper shroud
2. Drive belts
3. Cooling fan and fan clutch

4. Pulley
5. Cooling fan
6. Fan clutch

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.

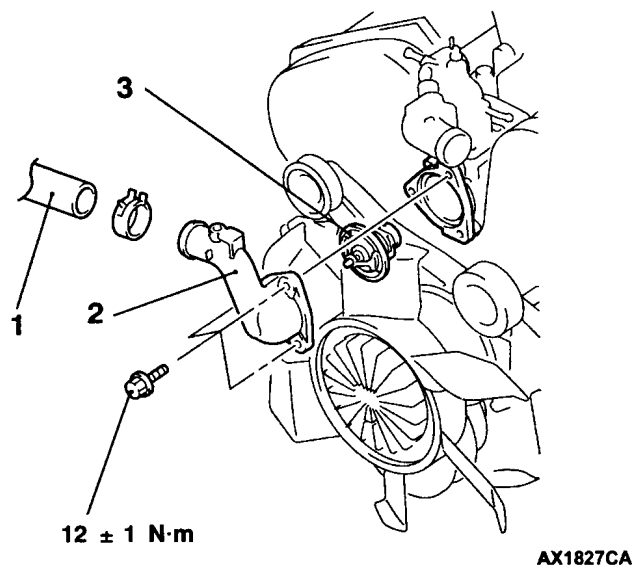
FAN CLUTCH CHECK

- 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.

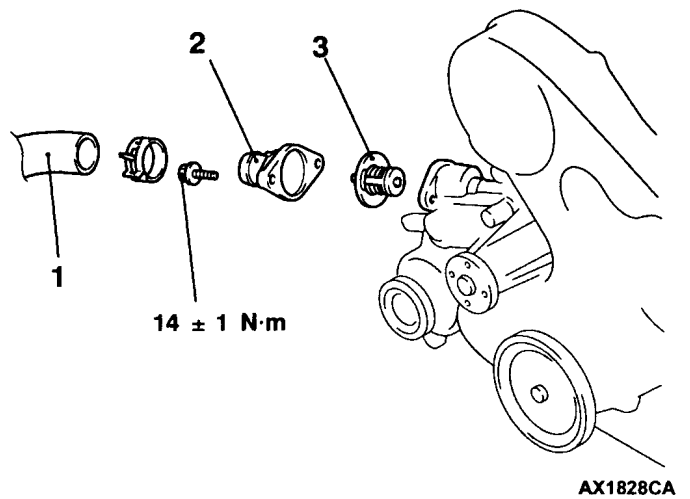
THERMOSTAT

REMOVAL AND INSTALLATION

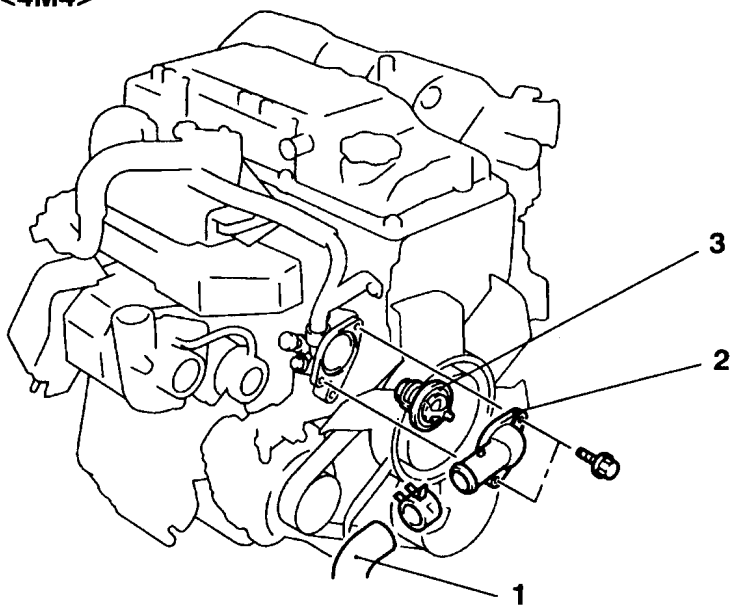
<6G7>



<4D5>



<4M4>



Removal steps

- ◀A▶ ▶B▶ 1. Radiator lower hose connection
 ▶A▶ 2. Water inlet fitting
 ▶A▶ 3. Thermostat

REMOVAL SERVICE POINT**◀A▶ RADIATOR LOWER HOSE DISCONNECTION**

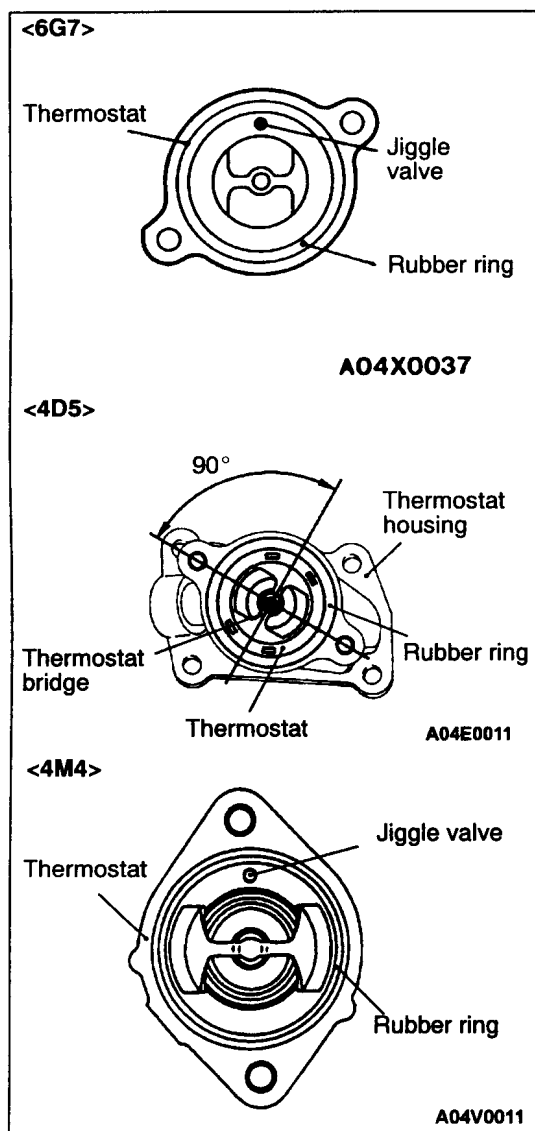
After making mating marks on the radiator hose and the hose clamp, disconnect the radiator hose.

INSTALLATION SERVICE POINTS**▶A◀ THERMOSTAT INSTALLATION**

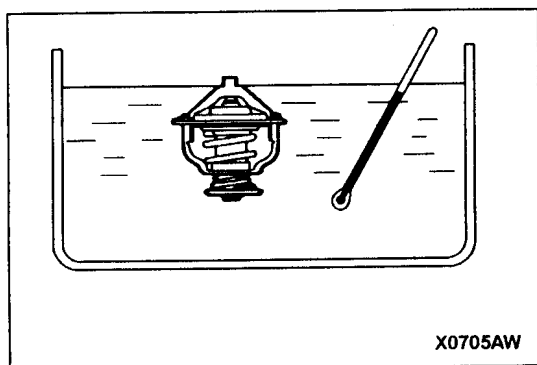
Install the thermostat so that the jiggle valve is facing straight up.

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 damage, 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:

<6G7> $88 \pm 2.0^{\circ}\text{C}$

<4D5> $82 \pm 1.5^{\circ}\text{C}$

<4M4> $76.5 \pm 2.0^{\circ}\text{C}$

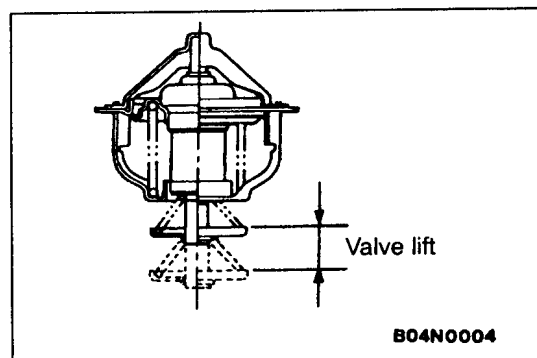
2. Check that the amount of valve lift is at the standard value when the water is at the full-opening temperature.

Standard value:

Items	6G7	4D5	4M4
Full-opening temperature °C	100	95	90
Amount of valve lift mm	10 or more	8.5 or more	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.



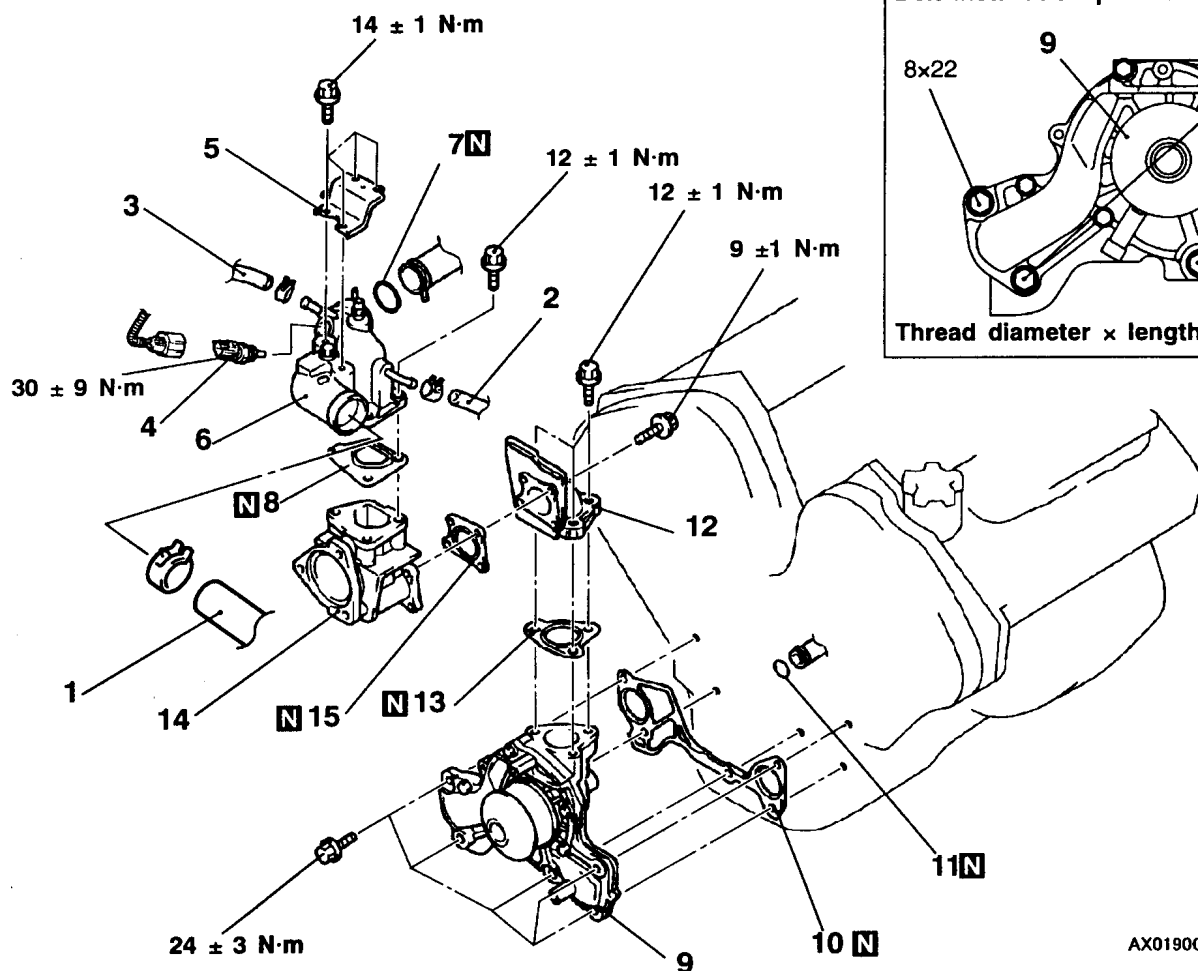
WATER PUMP

REMOVAL AND INSTALLATION

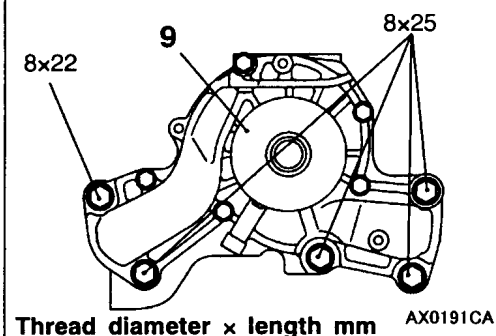
<6G7>

Pre-removal and Post-installation Operation

- Engine Coolant Draining and Supplying
(Refer to P. 14-3.)
- Timing Belt Removal and Installation
(Refer to GROUP 11A.)
- Camshaft Sprocket Removal and Installation
(Refer to GROUP 11A.)
- Thermostat Removal and Installation
(Refer to P.14-7.)



Bolt installation positions



Removal steps

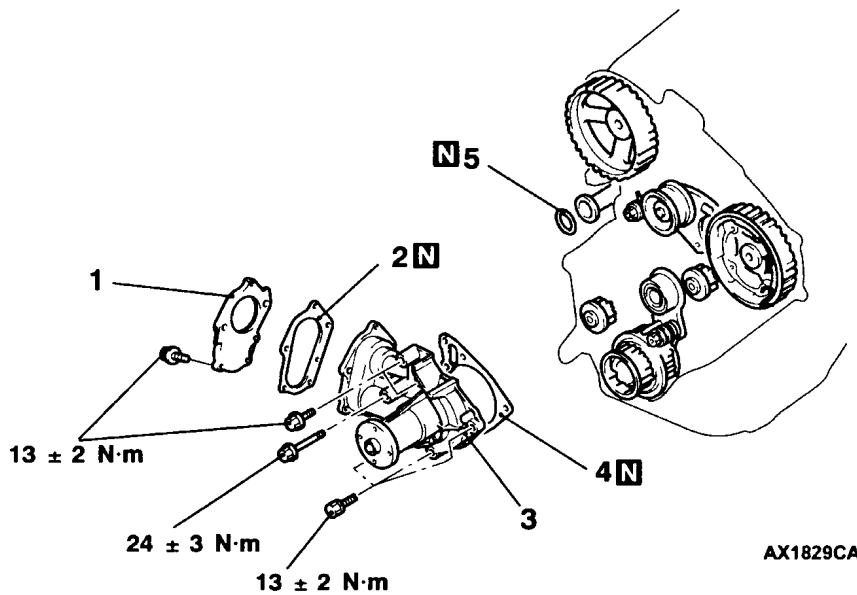
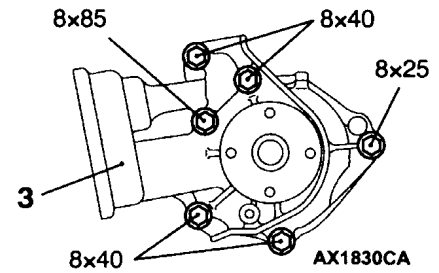
- ◀A▶ ▶C▶
1. Radiator upper hose connection
 2. Water hose
 3. Water hose
 4. Water temperature sensor
 5. Water outlet fitting bracket
 6. Water outlet fitting
- ▶A▶
7. O-ring
 8. Gasket

- ▶A▶
9. Water pump
 10. Gasket
 11. O-ring
 12. Fitting
 13. Gasket
 14. Thermostat case
 15. Gasket

<4D5>

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.)
- Thermostat Removal and Installation
(Refer to P.14-7.)

**Bolt Installation positions**

Thread diameter × length mm

Removal steps

- Air intake hose
(Refer to GROUP 15 – Air Cleaner.)
 - Power steering oil pump
(Refer to GROUP 37A.)
1. Plate

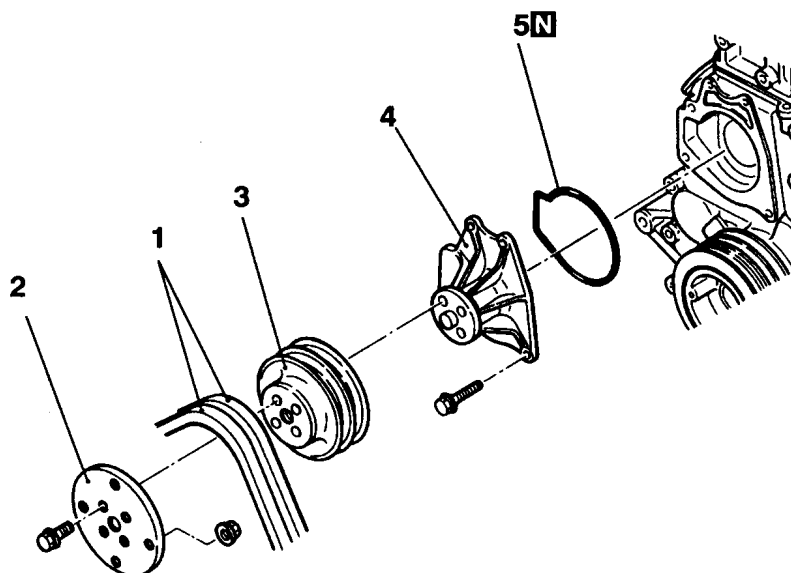


- 2. Gasket
- 3. Water pump assembly
- 4. Gasket
- 5. O-ring

<4M4>

Pre-removal and Post-installation Operation

- Engine Coolant Draining and Supplying
(Refer to P. 14-3.)
- Cooling Fan Removal and Installation
(Refer to P.14-7.)



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Removal steps

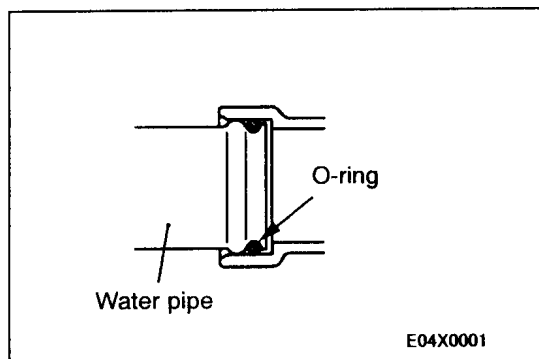
1. Drive belt
2. Coupling plate
3. Fan pulley



4. Water pump
5. O-ring

REMOVAL SERVICE POINT**◀A▶ RADIATOR UPPER 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 <6G7, 4D5>**

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.

▶B▶ O-RING INSTALLATION <4M4>

Apply water around the O-ring before installing it.

Caution

Be careful not to contaminate the O-ring with engine oil or grease.

▶C▶ 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.

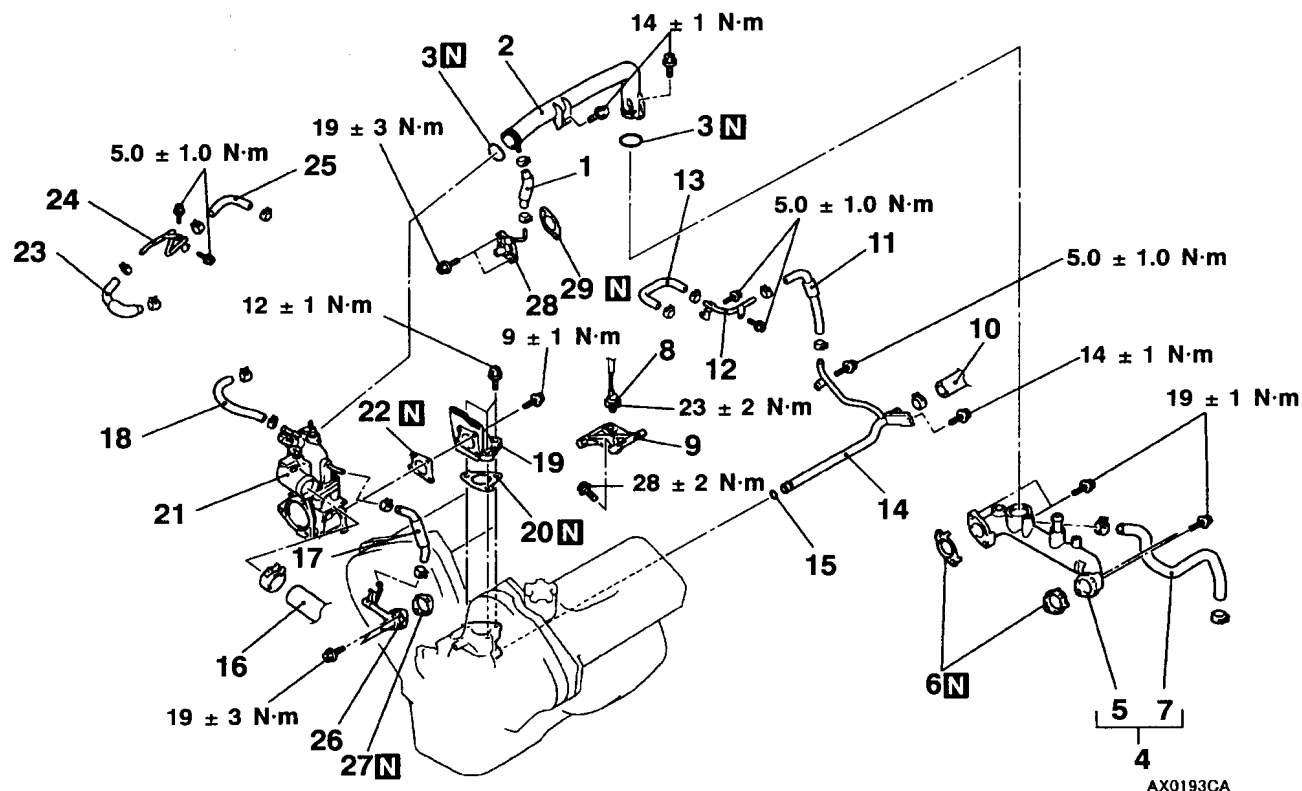
WATER HOSE AND WATER PIPE

REMOVAL AND INSTALLATION

<6G7>

Pre-removal and Post-Installation Operation

- Engine Coolant Draining and Supplying (Refer to P. 14-3.)
- Thermostat Removal and Installation (Refer to P. 14-8.)
- Intake Manifold Removal and Installation (Refer to GROUP 15.)
- Injector Removal and Installation (Refer to GROUP 13A.)
- Fuel Pump (high-pressure) Removal and Installation (Refer to GROUP 13A.)



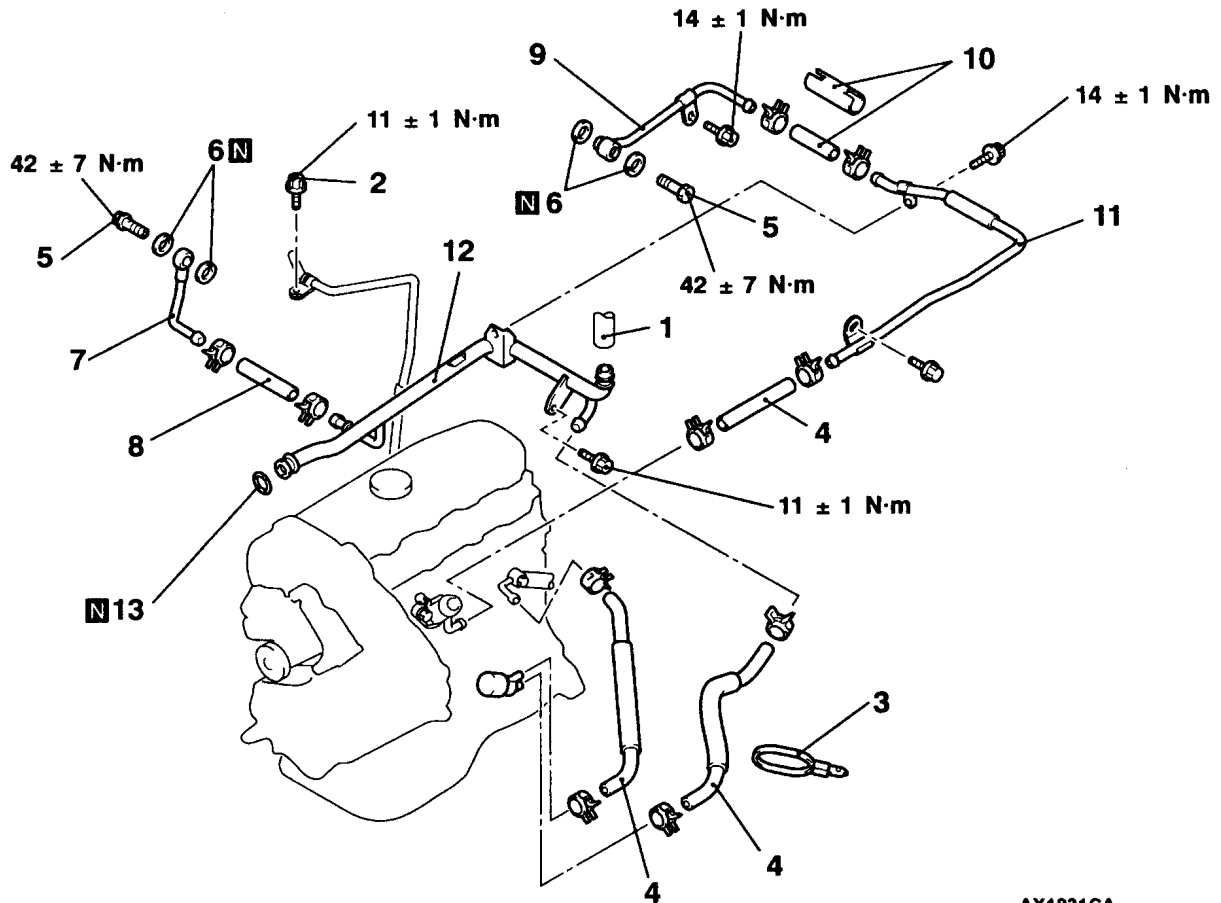
Removal steps

- | | | | |
|---------|---|---------|--|
| | 1. Water hose | | 16. Radiator upper hose connection |
| | 2. Water outlet pipe | | 17. Water hose |
| ►B◄ | 3. O-ring | ◄B► ►A◄ | 18. Water hose |
| | 4. Heater hose and water passage assembly | | 19. Fitting |
| | 5. Water passage assembly | | 20. Gasket |
| ►D◄ | 6. Gasket | | 21. Water outlet fitting and thermostat case |
| | 7. Heater hose | | 22. Gasket |
| ◄A► ►C◄ | 8. Detonation sensor | | 23. Water hose |
| | 9. Detonation sensor bracket | | 24. Water pipe |
| | 10. Heater hose connection | | 25. Water hose |
| | 11. Water hose | | 26. Left fitting |
| | 12. Water pipe | | 27. Gasket |
| | 13. Water hose | | 28. Right fitting |
| | 14. Water pipe assembly | | 29. Gasket |
| ►B◄ | 15. O-ring | | |

<4D5>

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.)



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Removal steps

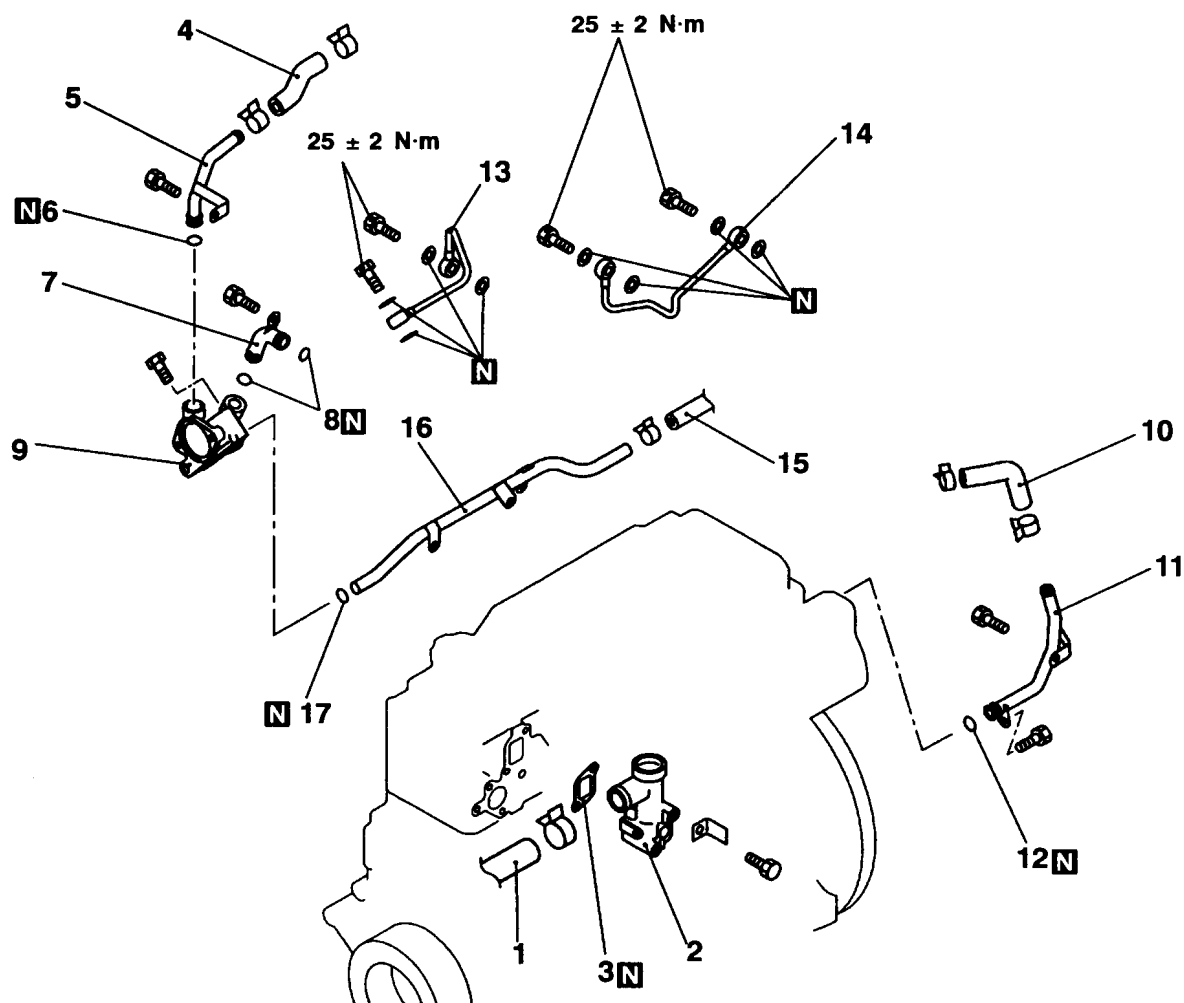
1. Heater hose connection
2. Vacuum pipe installation bolt
3. Cable ban
4. Water hose
5. Eye bolt
6. Gasket
7. Water pipe assembly A
8. Water hose
9. Water pipe assembly B
10. Water hose
11. Water pipe assembly C
12. Water pipe assembly
13. O-ring



<4M4>

Pre-removal and Post-installation Operation

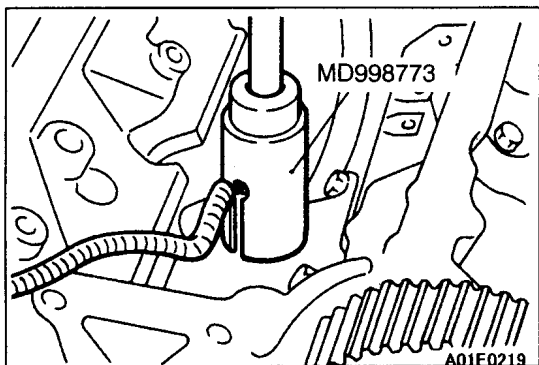
- Engine Coolant Draining and Supplying (Refer to P. 14-3.)
- Air Cleaner Removal and Installation (Refer to GROUP 15.)



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Removal steps

- | | | |
|---------|-----------------------------------|--|
| ◀B▶ ▶A▶ | 1. Radiator upper hose connection | 10. Water hose |
| | 2. Water outlet pipe | ▶B▶ 11. EGR water inlet pipe |
| | 3. Gasket | 12. O-ring |
| | 4. Water hose | ▶B▶ 13. Turbocharger water outlet pipe |
| | 5. EGR water outlet pipe | 14. Turbocharger water inlet pipe |
| ▶B▶ | 6. O-ring | 15. Heater hose connection |
| | 7. Bypass pipe | 16. Heater return pipe |
| ▶B▶ | 8. O-ring | ▶B▶ 17. O-ring |
| | 9. Thermostat case | |

**REMOVAL SERVICE POINTS****◀A▶ DETONATION SENSOR REMOVAL****◀B▶ RADIATOR UPPER HOSE DISCONNECTION**

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

INSTALLATION SERVICE POINTS**▶A◀ RADIATOR UPPER HOSE CONNECTION**

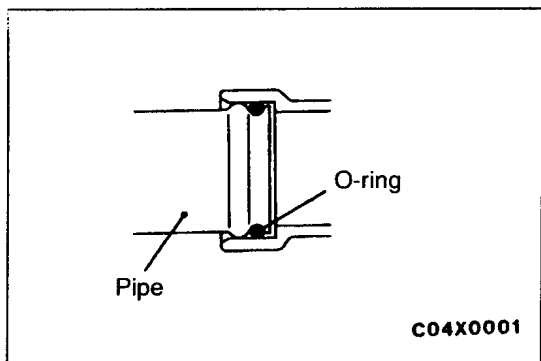
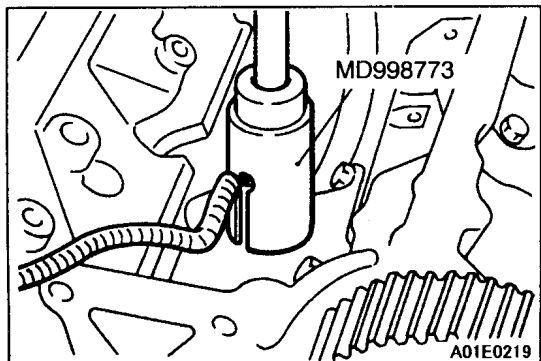
1. Insert each hose as far as the projection of the water inlet fitting.
2. Align the mating marks on the radiator hose and hose clamp, and then connect the radiator hose.

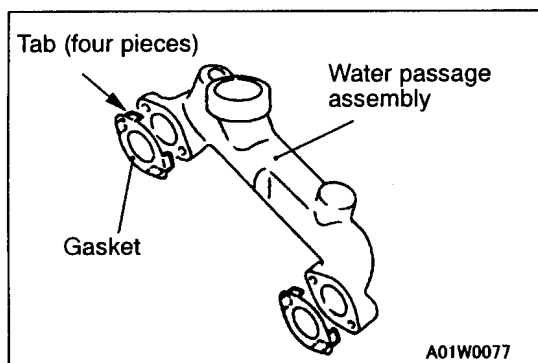
▶B◀ O-RING INSTALLATION

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.

**▶C◀ DETONATION SENSOR INSTALLATION**

**►D◄GASKET INSTALLATION <6G7>**

Engage the gasket tabs with recesses on the water passage.

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

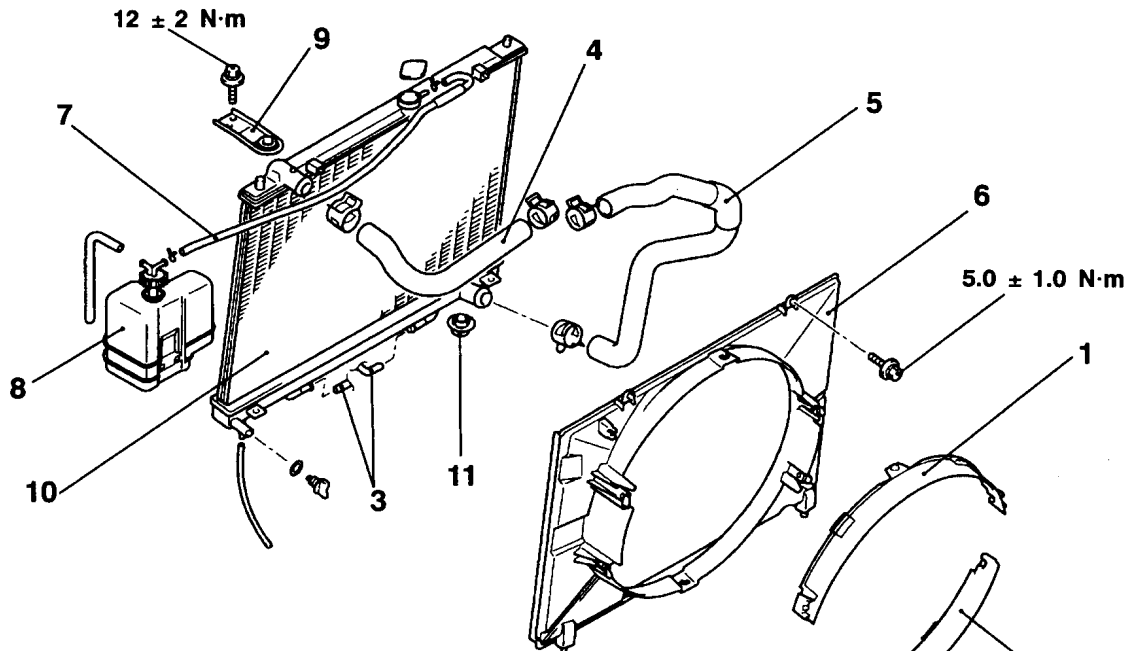
Pre-removal Operation

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

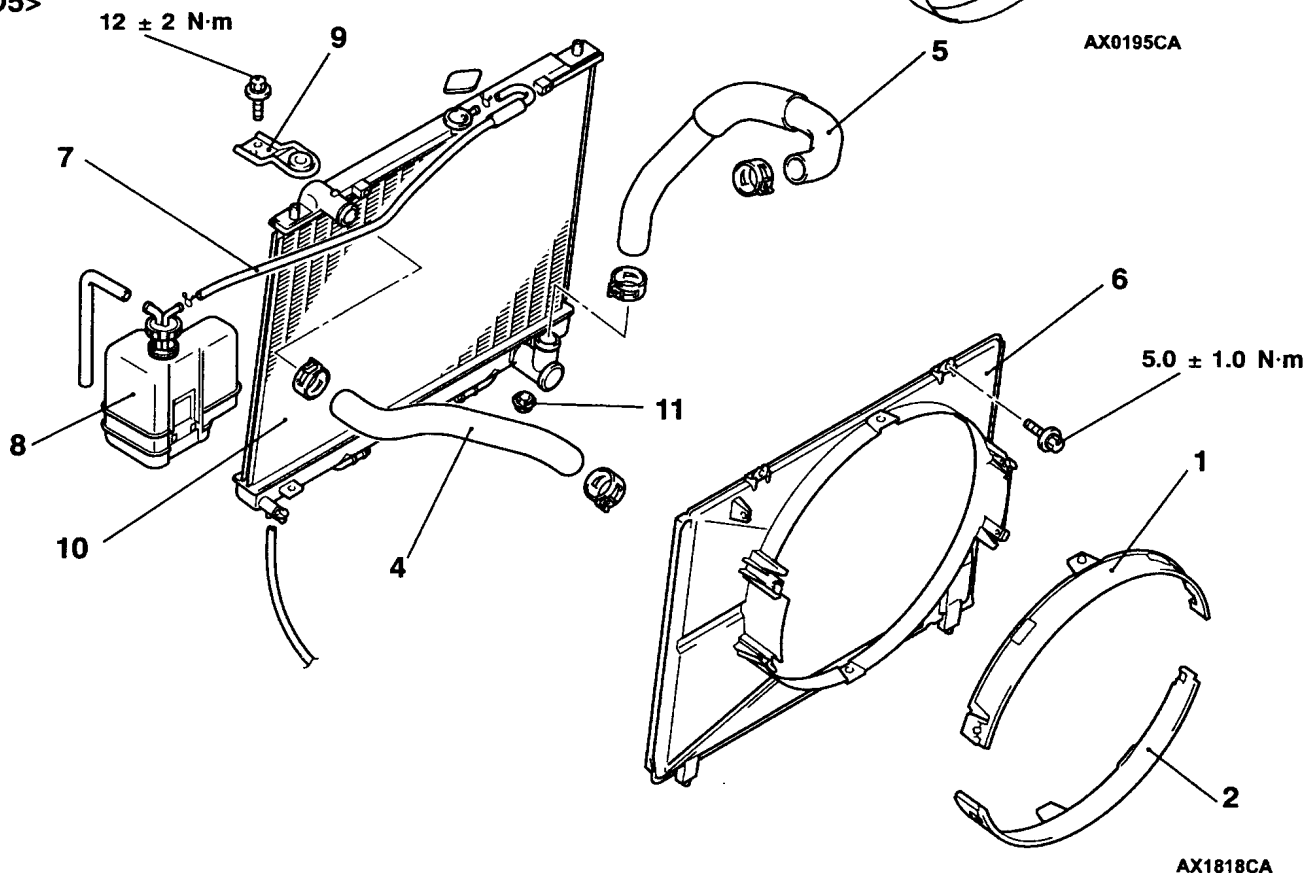
Post-installation Operation

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

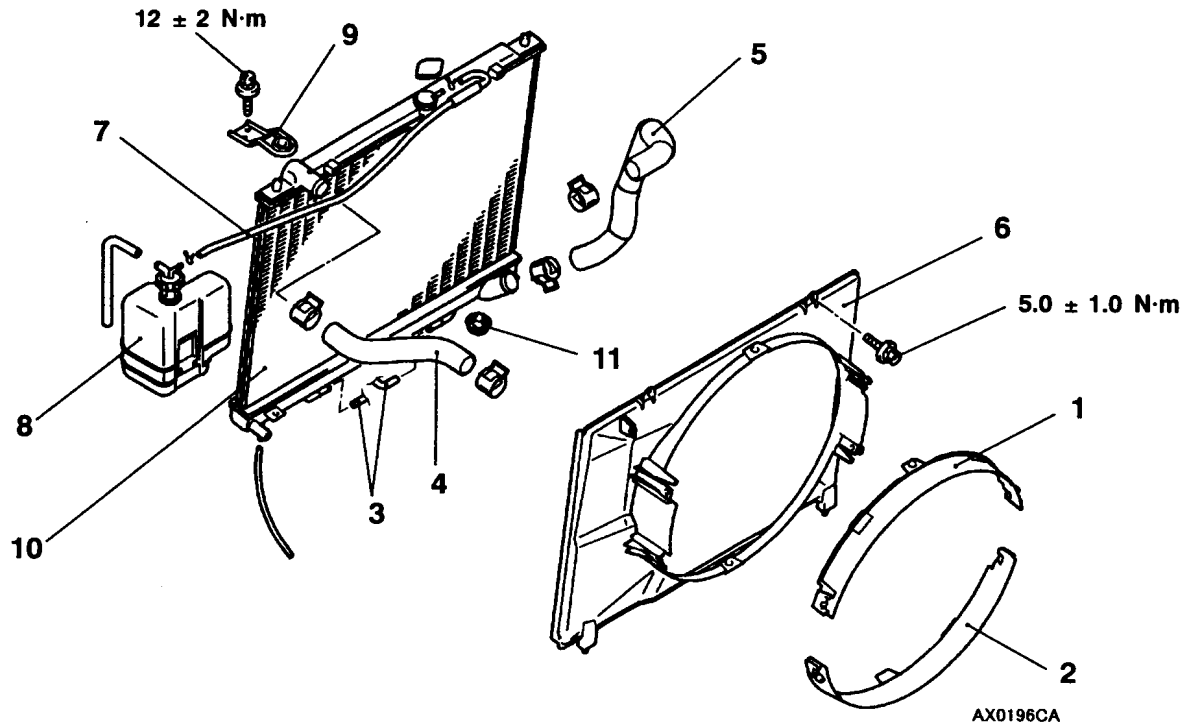
<6G7>



<4D5>



<4M4>

**Removal steps**

- | | | |
|---------|--|--------------------------|
| ◀A▶ ▶B▶ | 1. Radiator shroud upper cover | 6. Shroud |
| ◀A▶ ▶B▶ | 2. Radiator shroud lower cover | 7. Rubber hose |
| ◀B▶ | 3. Transmission fluid cooler hose connection <A/T> | 8. Reserve tank assembly |
| ◀C▶ ▶A▶ | 4. Radiator upper hose | 9. Upper insulator |
| ◀C▶ ▶A▶ | 5. Radiator lower hose | 10. Radiator |
| | | 11. Lower insulator |

REMOVAL SERVICE POINTS**◀A▶ RADIATOR SHROUD UPPER COVER/RADIATOR SHROUD LOWER COVER REMOVAL**

Tilt the lock lever at the shroud housing cover outward slightly, and remove the cover to the fan axial direction (The cover is secured at four positions).

Caution

If the lock lever is tilted too much, the lever may be damaged or deformed.

◀B▶ TRANSMISSION FLUID COOLER HOSE CONNECTION

After disconnecting the hose, plug it to avoid dust or foreign material.

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

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

▶B◀ RADIATOR SHROUD UPPER COVER/RADIATOR SHROUD LOWER COVER INSTALLATION

1. Install the shrouds securely until a click can be heard at all four positions.
2. Two tabs on each cover should protrude outside the shroud.
3. On completion, confirm that the covers are not loose.

