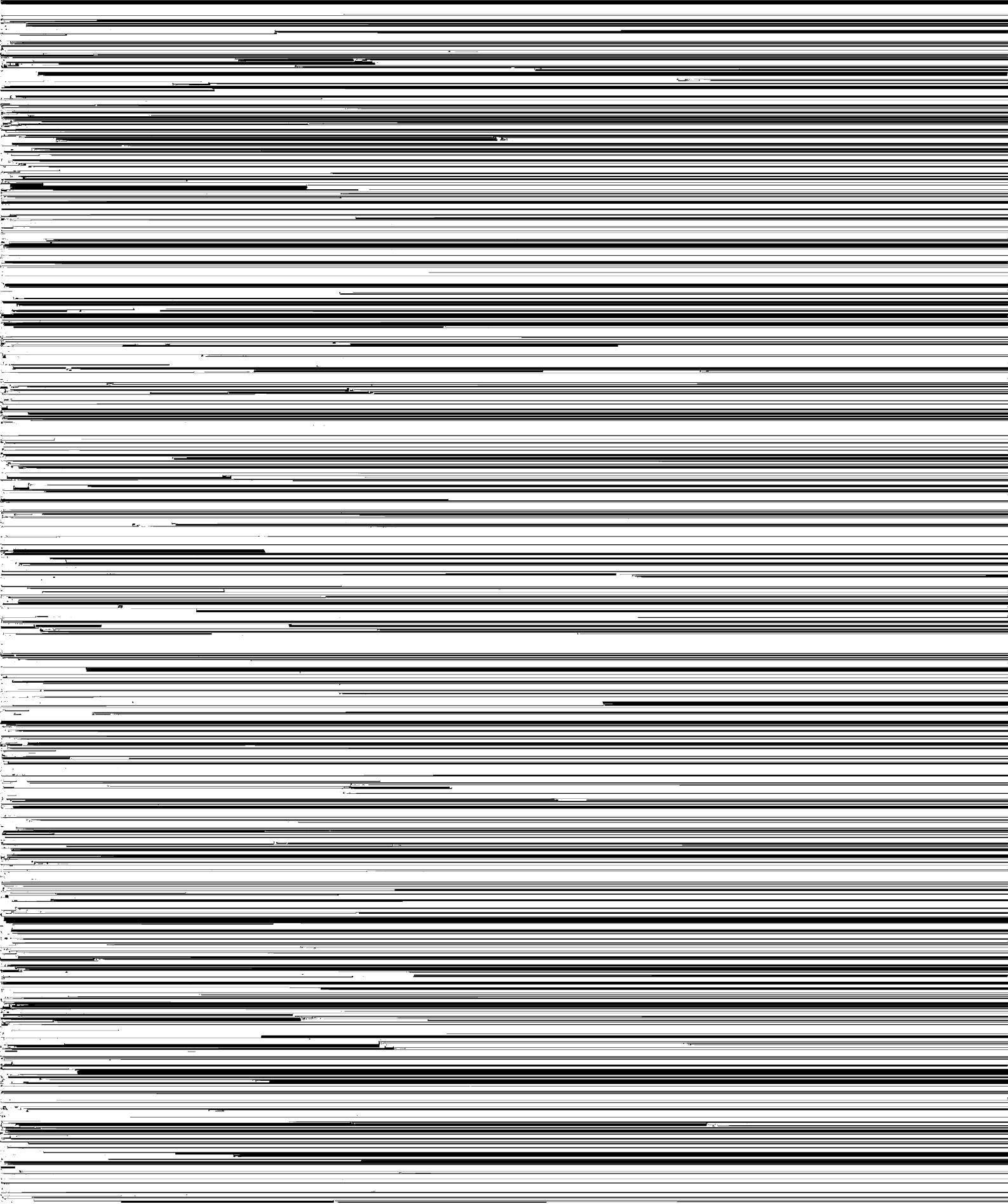


---

# **ENGINE COOLING**

# ENGINES COOLING



## 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	4G63 <M/T>	114,700
		4G63 <A/T>	126,800
		4G64, 4D56 <2WD>	170,000
		4D56 <4WD>	227,300
Automatic transmission oil cooler	Performance kJ/h	4G63 <A/T>	6,400
		4D56 <A/T>	6,300

## SERVICE SPECIFICATIONS

Items	Standard value	Limit
High pressure valve opening pressure of radiator cap kPa	75 – 105	65
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	4G6, 4D56 <4WD>	8.5 or more
	4D56 <2WD>	8 or more

## LUBRICANT

Items	Quantity ℓ
HIGH QUALITY ETHYLENE GLYCOL ANTIFREEZE COOLANT	4G63
	4G64, 4D56 <2WD>
	4D56 <4WD>

## SEALANTS

Items	Specified sealant	Remarks
Cylinder block drain plug	3M Nut Locking Part No. 4171 or equivalent	Drying sealant
Water by-pass fitting <4G6>	Mitsubishi Genuine Parts No. MD970389 or equivalent	Semi-drying sealant



Cap adapter  
Adapter

## ON-VEHICLE SERVICE

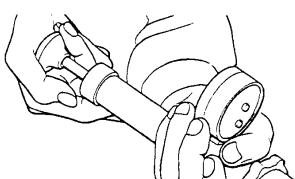
14100100082

### 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.



Cap adapter

### RADIATOR CAP VALVE OPENING PRESSURE CHECK

14100130111

1. Use a cap adapter to attach the cap to the tester.
2. Increase the pressure until the indicator of the gauge stops moving.

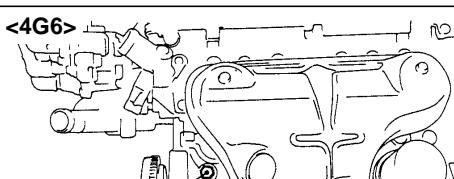
**Limit: 65 kPa**

**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.

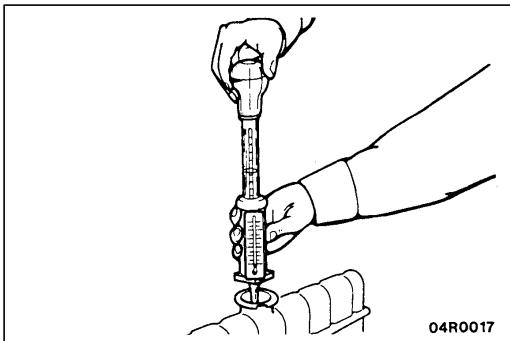
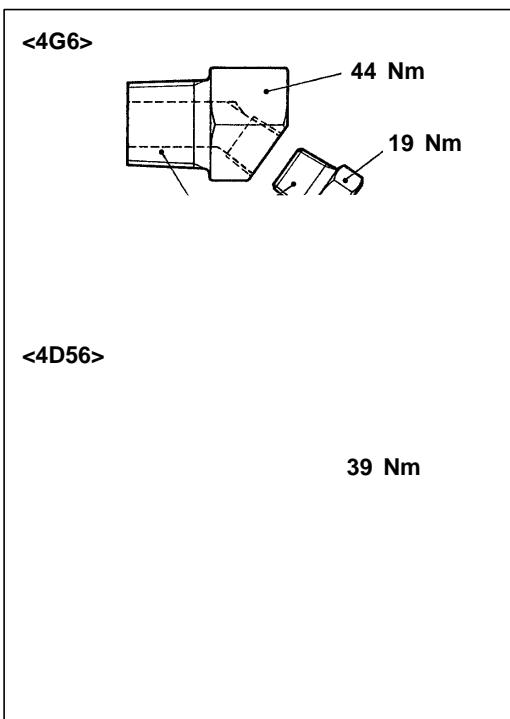
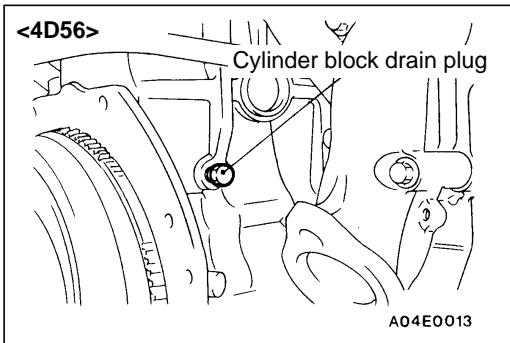


Cylinder block drain plug

### ENGINE COOLANT REPLACEMENT

14100120156

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.



- 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**

- Securely tighten the radiator drain plug.
- Install the reserve tank.
- Remove the air bleed bolt and replace the seal washer.
- Fill the radiator until the engine coolant flows from the air bleed bolt section, and then close the air bleed bolt.
- 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 ℥**  
**<4G64, 4D56-2WD> 7.7 ℥**  
**<4D56-4WD> 7.8 ℥**

**NOTE**

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

- Install the radiator cap securely.
- 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.)
- After the thermostat opens, race the engine several times, and then stop the engine.
- 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

14100110146

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 %

**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.



**INSPECTION**

14100220023

**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**

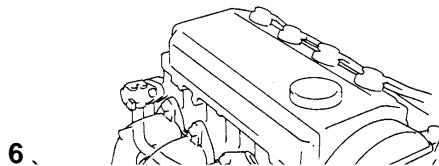
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**REMOVAL AND INSTALLATION**

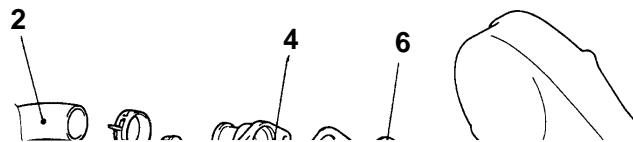
**Pre-removal and Post-installation Operation**

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

&lt;4G6&gt;



&lt;4D56&gt;



4

13 Nm **N 5**

13 Nm

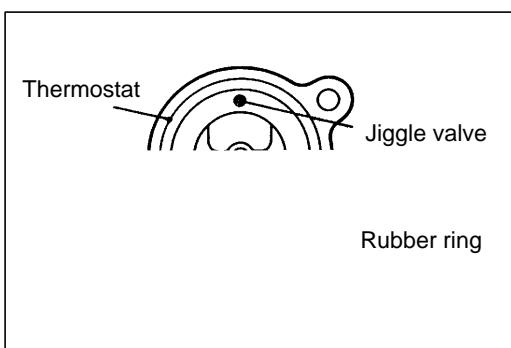
3 **N**

1

**Removal steps**

1. Radiator lower pipe assembly  
<4G6>
2. Radiator lower hose connection  
<4D56>

- B◄ 3. O-ring <4G6>  
4. Water inlet fitting  
5. Water inlet fitting gasket <4D56>  
►A◄ 6. Thermostat

**INSTALLATION SERVICE POINTS****►A◄ THERMOSTAT INSTALLATION****<4G6>**

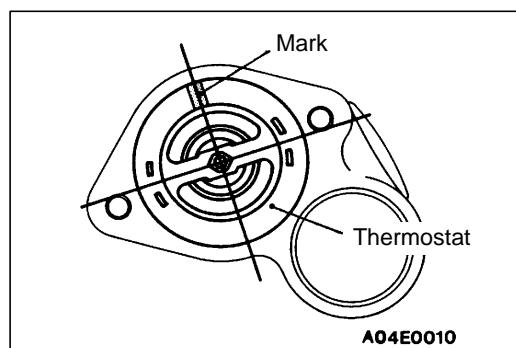
Install the thermostat so that the jiggle valve is facing straight up, while being careful not to fold over or scratch the rubber ring.

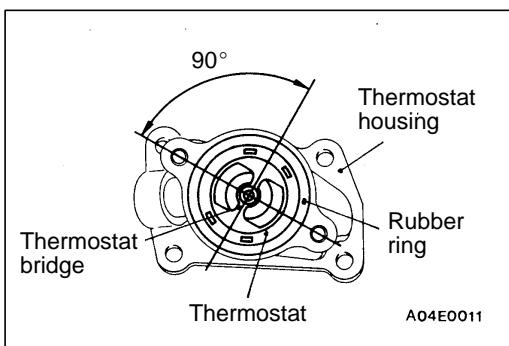
**Caution**

**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.



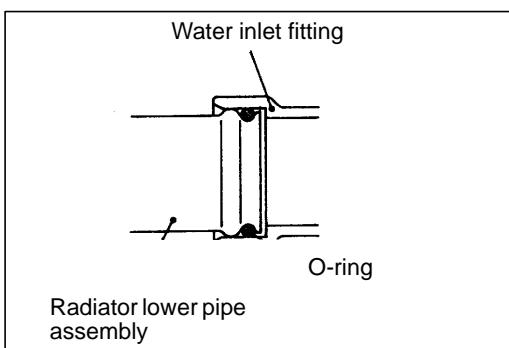


## &lt;4D56-4WD&gt;

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**

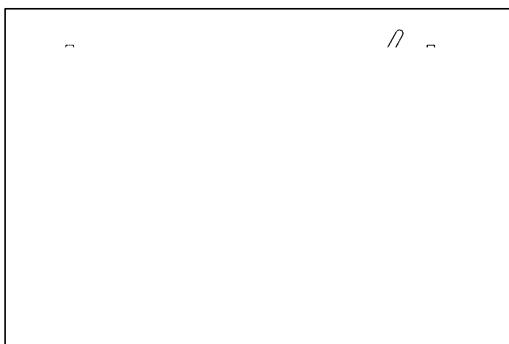
**Do not apply any oil or grease to the rubber ring of the thermostat under any circumstances.**

**►B◀ 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**

14100250190

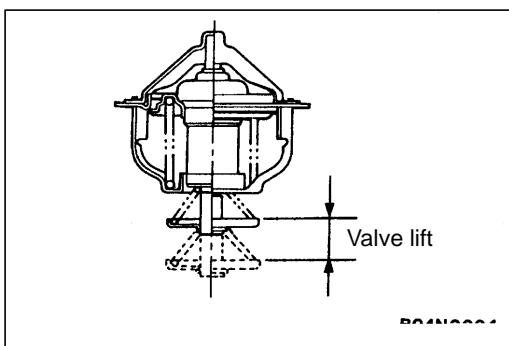
**THERMOSTAT CHECK**

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:**

Items	4G6 and 4D56-4WD	4D56-2WD
Full-opening temperature °C	95	95
Amount of valve lift mm	8.5 or more	8 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.

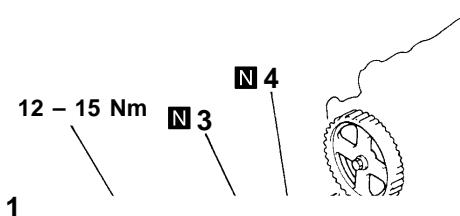
**WATER PUMP**

14100270271

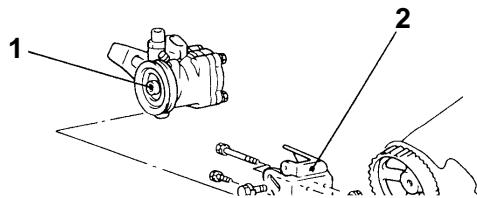
**REMOVAL AND INSTALLATION****Pre-removal and Post-installation Operation**

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

&lt;4G6&gt;



&lt;4D56&gt;



2

24 Nm

12 - 15 Nm

3

(4WD)

24 Nm

4 N

6 N

12 - 15 Nm

5

12 - 15 Nm

24 Nm

12 - 15 Nm

**Removal steps**

&lt;4G6&gt;

- B◄ 1. Alternator brace  
►A◄ 2. Water pump assembly  
3. Water pump gasket  
4. O-ring

◀A▶

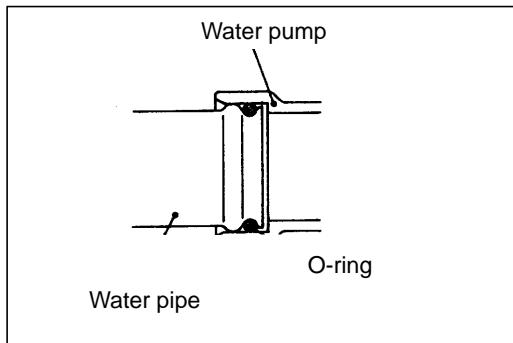
&lt;4D56&gt;

- Air intake hose  
(Refer to GROUP 15 – Air Cleaner.)
- Thermostat (Refer to P. 14-7.)
- 1. Power steering oil pump
- 2. Power steering oil pump bracket
- 3. Thermostat housing
- 4. Thermostat housing gasket
- B◄ 5. Water pump assembly
- 6. Gasket
- A◄ 7. O-ring

## REMOVAL SERVICE POINT

### ►A►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 be a hindrance to working, being careful not to put too much strain on the hose.



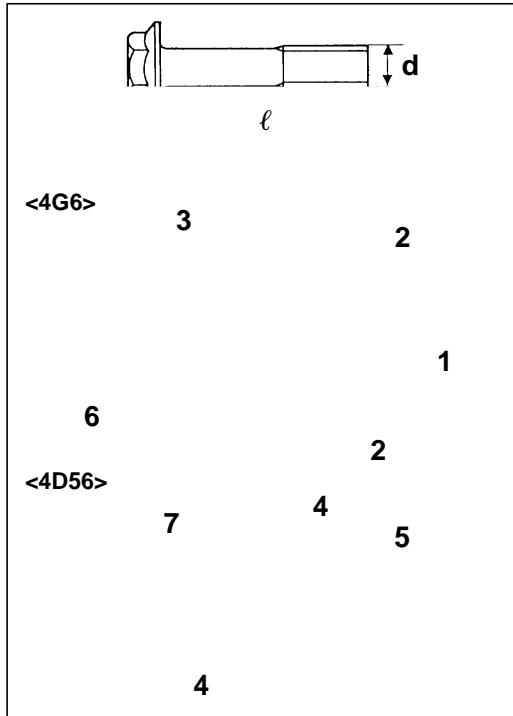
## INSTALLATION SERVICE POINTS

### ►A◄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.



### ►B◄WATER PUMP ASSEMBLY INSTALLATION

No.	Hardness category (Head mark)	Bolt diameter x length mm
1	4T	8 x 14
2		8 x 22
3		8 x 28
4		8 x 40
5		8 x 25
6	7T	8 x 65
7		8 x 70

## WATER HOSE AND WATER PIPE

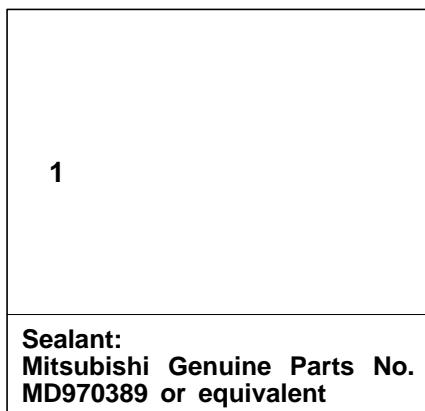
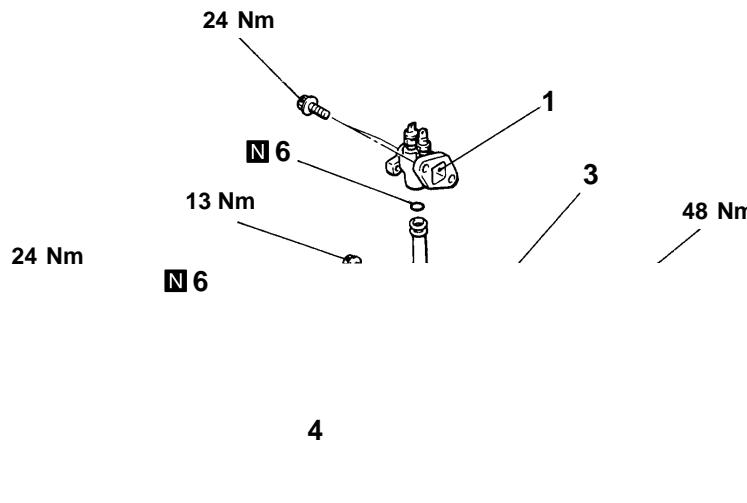
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### REMOVAL AND INSTALLATION

&lt;4G6&gt;

#### 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

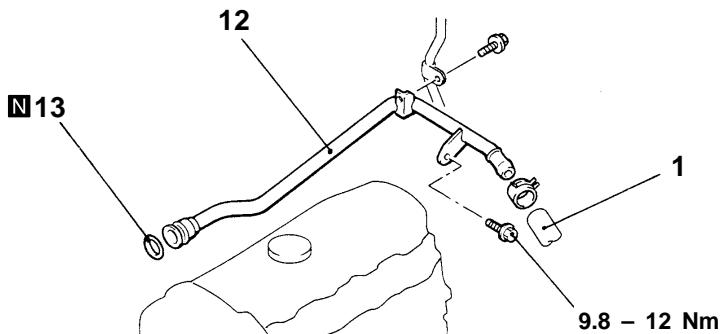


<4D56>

## **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.)

**(2WD)**



(4WD)

42 Nm

6 | N 2

12 – 15 Nm

10

12 – 15 Nm

5

7

12 □ 6

5

8

1 42 Nm

4

9.8 – 12 Nm

1

N 13

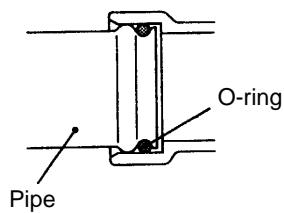
3

3

4

## Removal steps

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



C04X0001

## INSTALLATION SERVICE POINTS

### ►A◀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.

## INSPECTION

14100340132

### WATER PIPE AND HOSE CHECK

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

**RADIATOR**

14100150162

**REMOVAL AND INSTALLATION****Pre-removal Operation**

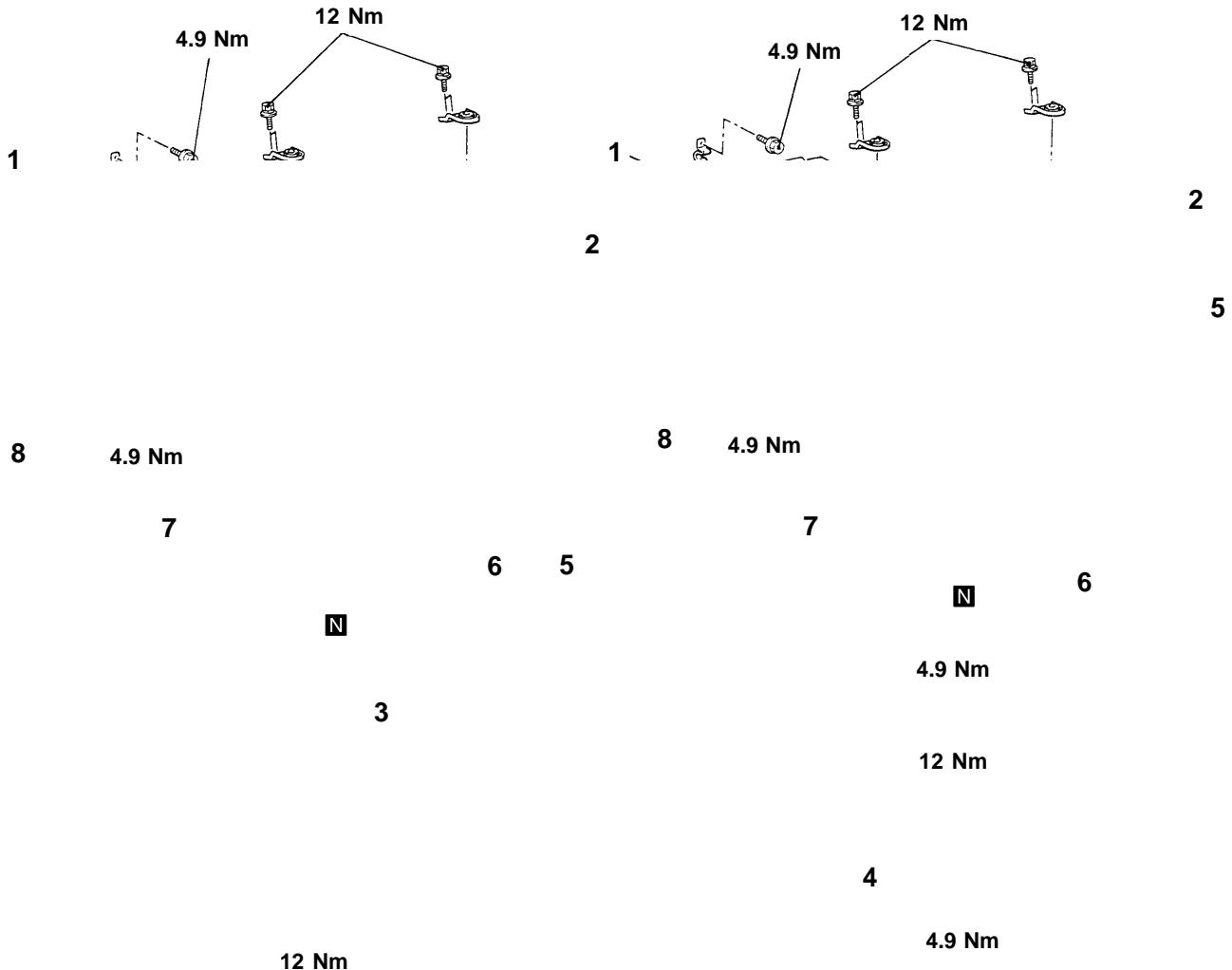
- Engine Coolant Draining (Refer to P. 14-3.)

**Post-installation Operation**

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

&lt;4G6, 4D56-2WD&gt;

&lt;4D56-4WD&gt;

**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
2. Reserve tank assembly

◀A▶

**REMOVAL SERVICE POINT****◀A► 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.

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**NOTES**

**GROUP 14**  
**ENGINE COOLING**

**GENERAL**

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# ENGINE COOLING

## CONTENTS

<b>GENERAL .....</b>	<b>2</b>	<b>THERMOSTAT &lt;4D56-Step III&gt; .....</b>	<b>4</b>
Outline of Change .....	2	WATER PUMP <4D56-Step III> .....	5
<b>GENERAL SPECIFICATIONS &lt;4D56-Step III&gt; .....</b>	<b>2</b>	<b>WATER HOSE AND WATER PIPE &lt;4D56-Step III&gt; .....</b>	<b>7</b>
<b>SERVICE SPECIFICATION &lt;4D56-Step III&gt; .....</b>	<b>2</b>	<b>RADIATOR &lt;4D56-Step III&gt; .....</b>	<b>8</b>
<b>COOLING FAN &lt;4D56-Step III&gt; .....</b>	<b>3</b>		

## GENERAL

### OUTLINE OF CHANGES

With the modification below by additional emission regulation step III compatible 4D56 engine, the service procedure of the part that is different from previous service procedure has been established.

The integrated radiator shroud of resin has been adopted for lightness.

With additional turbocharger, the thermostat of vehicle with 2WD has been modified to the thermostat of vehicle with 4WD.

With additional or modifiable turbocharger and additional EGR cooler, the water hose and pipe have been changed.

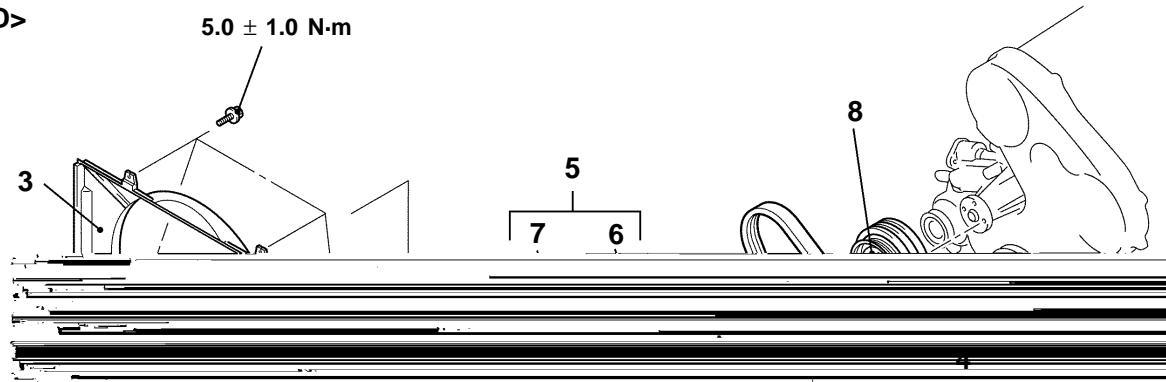
## COOLING FAN <4D56-Step III>

### REMOVAL AND INSTALLATION

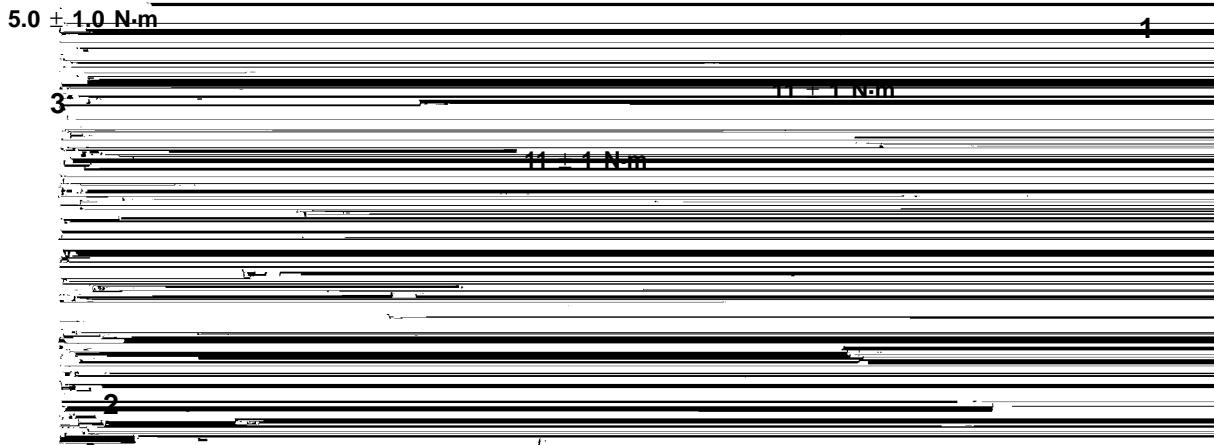
**Pre-removal Operation**  
Engine Coolant Draining

**Post-installation Operation**  
Engine Coolant Refilling  
Drive Belt Tension Adjustment

<2WD>

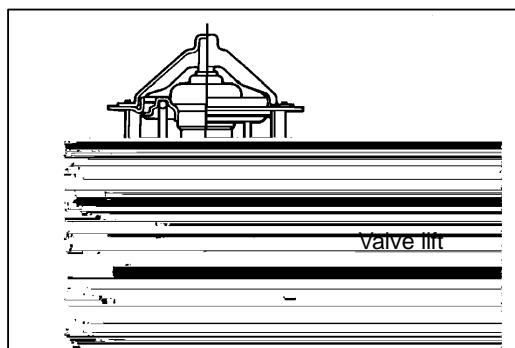
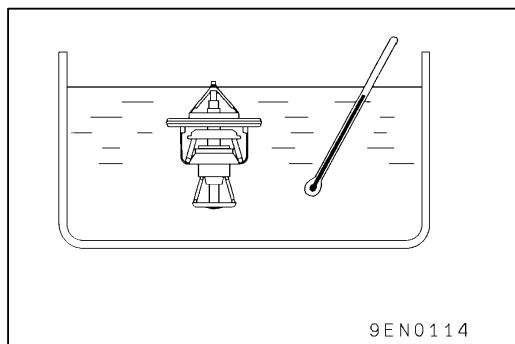


<4WD>



#### Removal steps

1. Radiator upper hose
2. Cover <4WD>
3. Radiator Shroud
4. Drive belts
5. Cooling fan and fan clutch
6. Fan clutch
7. Cooling fan
8. Pulley



## THERMOSTAT <4D56-Step III>

### INSPECTION

#### THERMOSTAT CHECK

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

#### Standard value:

Items	4D56-Step III
Full-opening temperature C	95
Amount of valve lift mm	8.5 or more

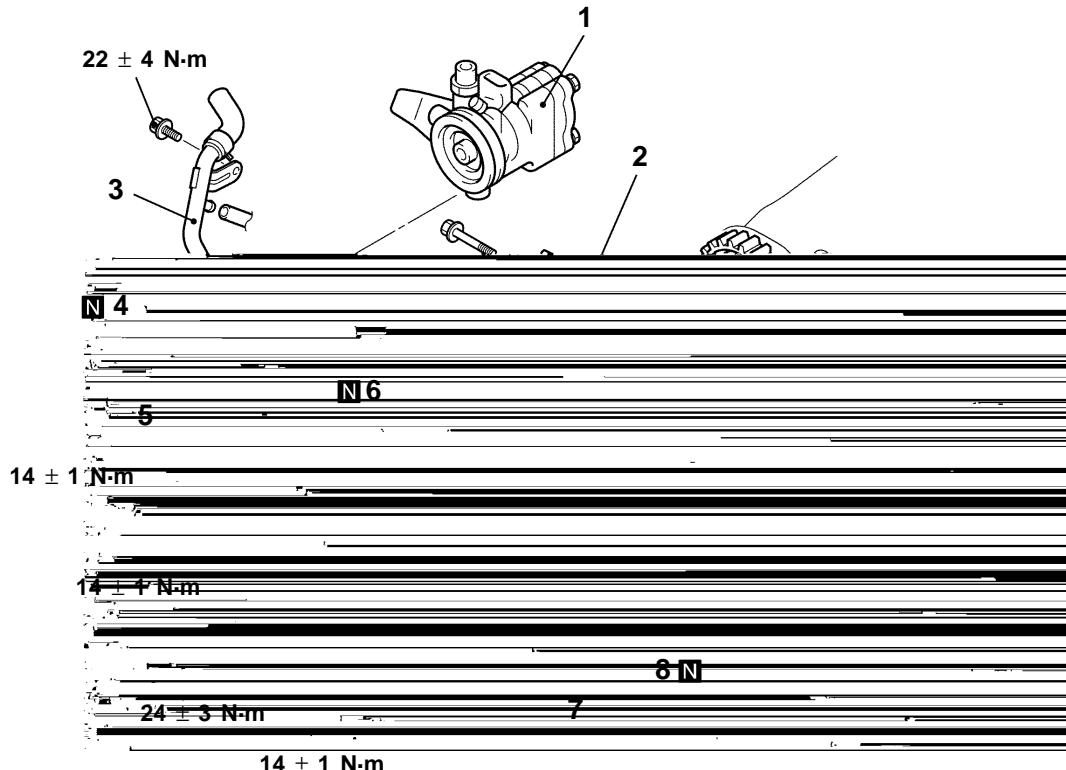
#### NOTE

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 <4D56-Step III>

### REMOVAL AND INSTALLATION

**Pre-removal and Post-installation Operation**  
 Engine Coolant Draining and Refilling  
 Thermostat Removal and Installation  
 Timing Belt Removal and Installation



#### Removal steps

- |   |   |
|---|---|
| <b>A</b> <ul style="list-style-type: none"> <li>1. Power steering oil pump</li> <li>2. Power steering oil pump bracket</li> <li>3. Water pipe E and hose assembly</li> <li>4. O-ring</li> </ul> | <b>A</b> <ul style="list-style-type: none"> <li>5. Thermostat housing</li> <li>6. Thermostat housing gasket</li> <li>7. Water pump assembly</li> <li>8. Gasket</li> </ul> |
|---|---|

### REMOVAL SERVICE POINT

#### A 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 be a hindrance to working, being careful not to put too much strain on the hose.

**INSTALLATION SERVICE POINTS****A WATER PUMP ASSEMBLY INSTALLATION**

No.	Hardness category (Head mark)	Bolt diameter (d) x length (l) mm
1	4T	INST3d231.44 r5(o01 )T

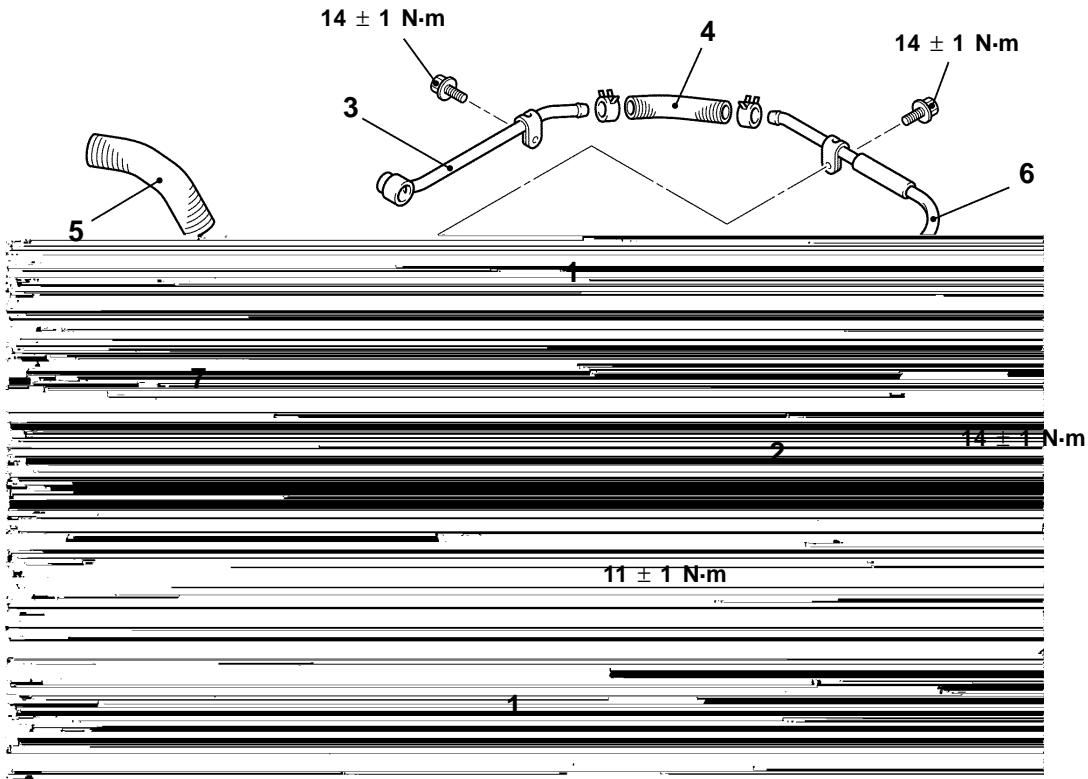
## WATER HOSE AND WATER PIPE <4D56-Step III>

### REMOVAL AND INSTALLATION

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

Engine Coolant Draining and Refilling  
Air Cleaner Removal and Installation  
(Refer to GROUP 15.)  
Intercooler Removal and Installation  
(Refer to GROUP 15.)

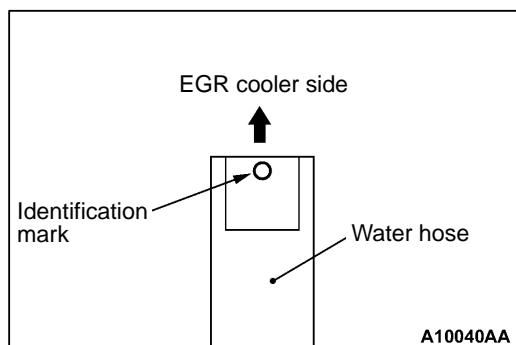
EGR Valve, EGR Cooler Removal and Installation  
(Refer to GROUP 17.)  
Intake, Exhaust Manifold Removal and Installation  
(Refer to GROUP 15.)  
Injection Pipe Removal and Installation



#### Removal steps

1. Heater hose connection
2. Water hose
3. Water pipe B
4. Water hose (turbocharger return)

- A    5. Water hose (EGR cooler return)  
       6. Water pipe C  
       7. Water pipe D



### INSTALLATION SERVICE POINT

#### A WATER HOSE INSTALLATION

Install the water hose so that its identification mark faces toward the EGR cooler.

**RADIATOR <4D56-Step III>****REMOVAL AND INSTALLATION**

**Pre-removal Operation**  
Engine Coolant Draining

**Post-installation Operation**  
Engine Coolant Refilling  
A/T Fluid Supplying and Checking

&lt;2WD&gt;

 $12 \pm 2 \text{ N}\cdot\text{m}$ 

1

2

&lt;4WD&gt;

 $12 \pm 2 \text{ N}\cdot\text{m}$ 

1

2

8  
 $5.0 \pm 1.0 \text{ N}\cdot\text{m}$ 5  
 $5.0 \pm 1.0 \text{ N}\cdot\text{m}$ 

7

7

6

6

 $5.0 \pm 1.0 \text{ N}\cdot\text{m}$  $5.0 \pm 1.0 \text{ N}\cdot\text{m}$ 

4

3

 $5.0 \pm 1.0 \text{ N}\cdot\text{m}$  $5.0 \pm 1.0 \text{ N}\cdot\text{m}$ **Radiator removal steps**

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

A

**Reserve tank removal steps**

1. Rubber hose connection
2. Reserve tank assembly

**REMOVAL SERVICE POINT****A 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.