

GROUP 14

ENGINE COOLING

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GENERAL DESCRIPTION

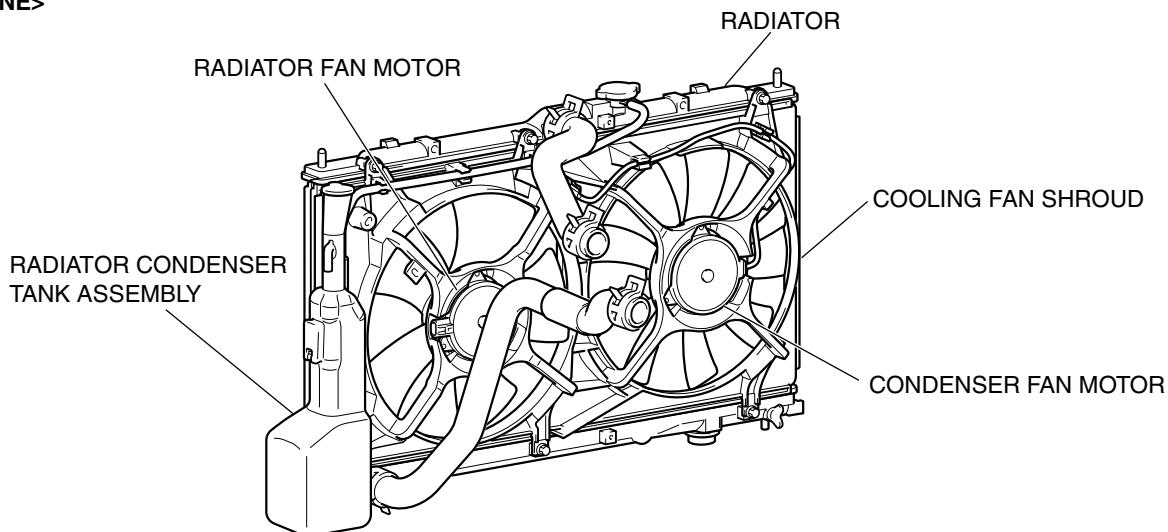
- The cooling system is designed to keep every part of the engine at appropriate temperature in whatever condition the engine may be operated. The cooling method is of the water-cooled, pressure forced circulation type in which the water pump pressurizes coolant and circulates it throughout the engine. If the coolant temperature exceeds the prescribed temperature, the thermostat opens to circulate the coolant through the

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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.

- PremAir® direct ozone reduction (DOR) radiator has been adopted to vehicle for California emission regulation. A catalyst which depollutes ozone (O_3) in the air has been insufflated to the radiator core. <2.4L Engine>

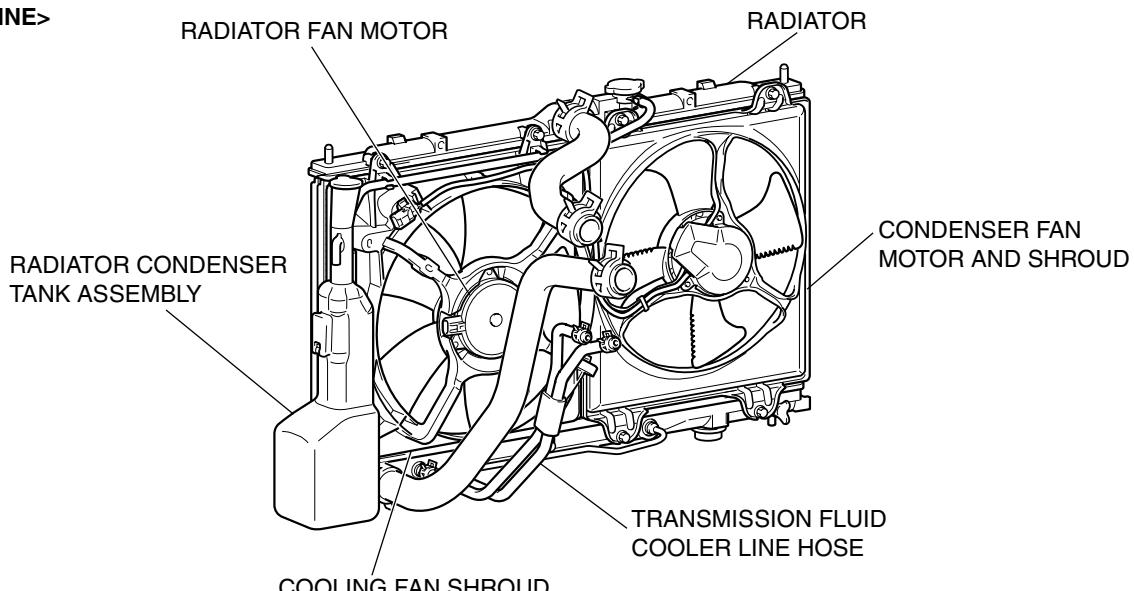
CONSTRUCTION DIAGRAM

<2.4L ENGINE>



AC305835AB

<3.8L ENGINE>



AC305836AB

SPECIAL TOOL

M1141000600279

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
 MB991871	MB991871 LLC changer	General service tool	Coolant refilling

ENGINE COOLING DIAGNOSIS**INTRODUCTION**

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The system cools the engine so that it does not overheat and maintains the engine at an optimum temperature. The system components are the radiator, water pump, thermostat, condenser fan assembly. Possible faults include low coolant, contamination, belt loosening and component damage.

TROUBLESHOOTING STRATEGY

M1141005200340

Use these steps to plan your diagnostic strategy. If you follow them carefully, you will be sure to find most of the engine cooling faults.

1. Gather information from the customer.

2. Verify that the condition described by the customer exists.
3. Find and repair the malfunction by following the SYMPTOM CHART.
4. Verify that the malfunction is eliminated.

SYMPTOM CHART

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SYMPTOM	INSPECTION PROCEDURE	REFERENCE PAGE
Coolant Leak	1	P.14-4
Engine Overheating	2	P.14-4

SYMPTOM PROCEDURES

INSPECTION PROCEDURE 1: Coolant Leak

DIAGNOSIS

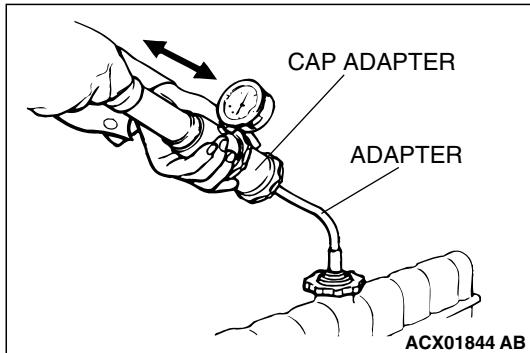
STEP 1. Check for coolant leaks.

⚠ WARNING

When pressure testing the cooling system, slowly release cooling system pressure to avoid getting burned by hot coolant.

⚠ CAUTION

- Be sure to completely clean away any moisture from the places checked.
- When the tester is removed, be careful not to spill any coolant.
- When installing and removing the tester and when testing, be careful not to deform the filler neck of the radiator.



Check that the coolant level is up to the filler neck. Install a radiator tester and apply 160 kPa (23 psi) pressure, and then check for leakage from the radiator hose or connections.

Q: Is leakage present from the radiator hose or connections?

YES : Repair or replace the appropriate part, then go to Step 2.

NO : There is no action to be taken.

STEP 2. Retest the system.

Q: Is there still coolant leakage?

YES : Return to Step 1.

NO : The procedure is complete.

INSPECTION PROCEDURE 2: Engine Overheating

DIAGNOSIS

STEP 1. Remove the radiator cap and check for coolant contamination.

Q: Is the coolant contaminated with rust and oil?

YES : Replace it. Refer to P.14-7.

NO : There is no action to be taken. Go to Step 2.

STEP 2. Check the radiator cap valve opening pressure.

NOTE: Be sure that the cap is clean before testing. Rust or other foreign material on the cap seal will cause an improper reading.

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

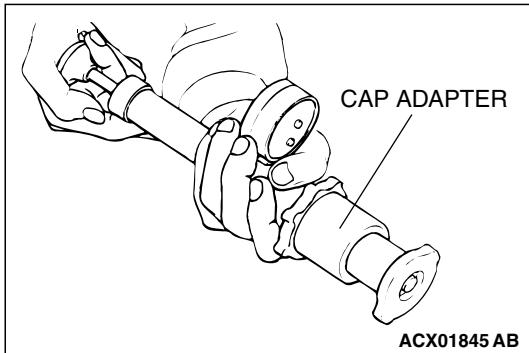
Minimum limit: 83 kPa (12 psi)

Standard value: 93 – 123 kPa (14 – 18 psi)

Q: Does the reading remain at or above the minimum limit?

YES : Go to Step 3.

NO : Replace the radiator cap. Then go to Step 5.



STEP 3. Check thermostat operation.

Refer to [P.14-20](#).

Q: Does the thermostat operate correctly?

YES : Go to Step 4.

NO : Replace the thermostat, then go to Step 5.

STEP 4. Check the drive belt for slippage or damage.

Refer to GROUP 00, Maintenance Service – Drive Belts (Check Condition). <2.4L Engine>[P.00-52](#) , <3.8L Engine>[P.00-52](#) .

Q: Is the drive belt loose or damaged?

YES : Adjust or replace the drive belt, then go to Step 5.

NO : There is no action to be taken.

STEP 5. Retest the system.

Check the engine coolant temperature.

Q: Is the engine coolant temperature abnormally high?

YES : Return to Step 2.

NO : The procedure is complete.

ON-VEHICLE SERVICE

ENGINE COOLANT LEAK CHECK

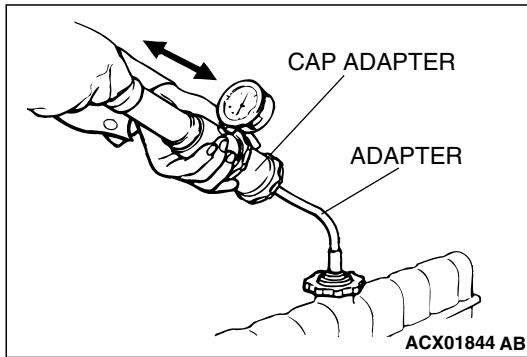
M1141001000333

⚠ WARNING

When pressure testing the cooling system, slowly release cooling system pressure to avoid getting burned by hot coolant.

⚠ CAUTION

- Be sure to completely clean away any moisture from the places checked.
 - When the tester is taken out, be careful not to spill any coolant.
 - Be careful when installing and removing the tester and when testing not to deform the filler neck of the radiator.
1. Check that the coolant level is up to the filler neck. Install a radiator tester and apply 160 kPa (23 psi) pressure, and then check for leakage from the radiator hose or connections.
 2. If there is leakage, repair or replace the appropriate part.



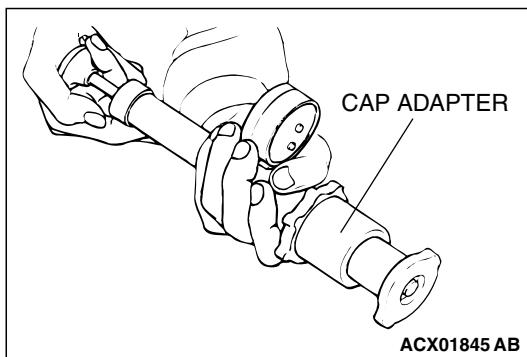
RADIATOR CAP PRESSURE CHECK

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NOTE: Be sure that the cap is clean before testing. Rust or other foreign material on the cap seal will cause an improper reading.

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

Minimum limit: 83 kPa (12 psi)
Standard value: 93 – 123 kPa (14 – 18 psi)
3. Replace the radiator cap if the reading does not remain at or above the limit.



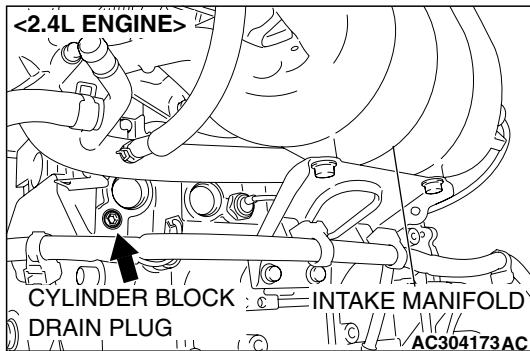
ENGINE COOLANT REPLACEMENT

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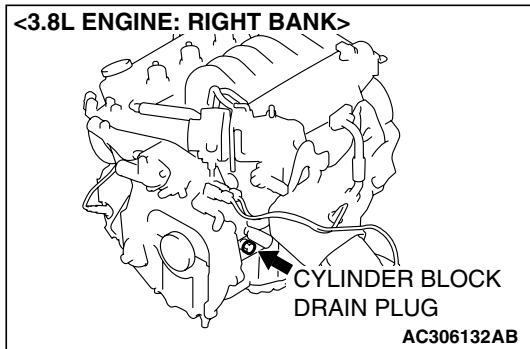
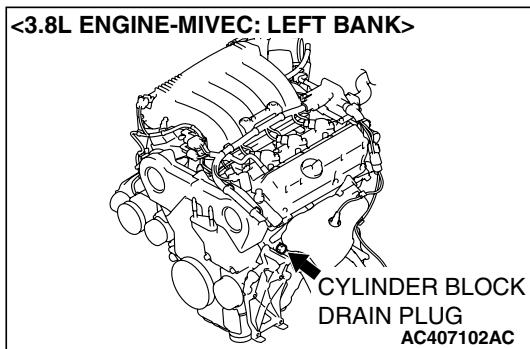
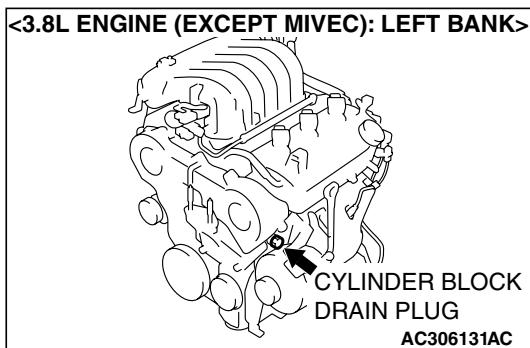
 **WARNING**

When removing the radiator cap, use care to avoid contact with hot coolant or steam. Place a shop towel over the cap and turn the cap counterclockwise a little to let the pressure escape through the vinyl tube. After relieving the steam pressure, remove the cap by slowly turning it counterclockwise.

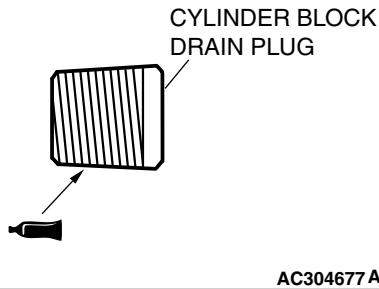
1. Drain the water from the radiator, heater core and engine after unplugging the radiator drain plug and removing the radiator cap.



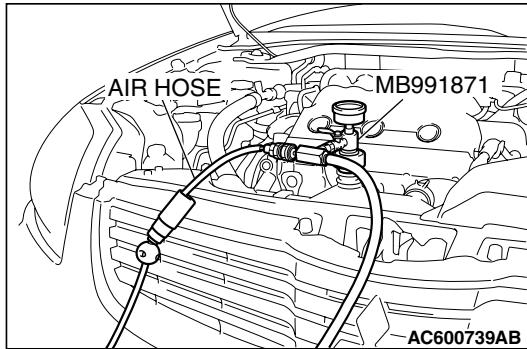
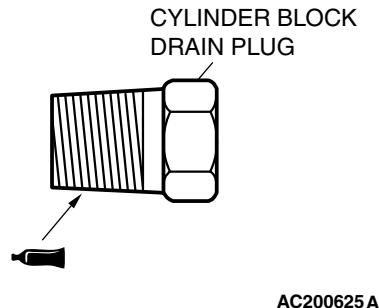
2. Drain the water in the water jacket by unplugging the drain plug of the cylinder block.
3. Remove the radiator condenser tank assembly and drain the coolant.
4. Drain the coolant then clean the path of the coolant by injecting water into the radiator from the radiator cap area.



<2.4L ENGINE, 3.8L ENGINE: RIGHT BANK>



<3.8L ENGINE: LEFT BANK>



- Apply the designated sealant to the screw area of the cylinder block drain plug, and then tighten to the standard torque.

Specified sealant: 3M™ AAD Part No.8731 or equivalent

Tightening torque:

<2.4L Engine> $44 \pm 5 \text{ N}\cdot\text{m}$ ($33 \pm 3 \text{ ft-lb}$)

<3.8L Engine> $39 \pm 5 \text{ N}\cdot\text{m}$ ($29 \pm 3 \text{ ft-lb}$)

- Securely tighten the radiator drain plug.
- Assemble the radiator condenser tank assembly.

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 corrosion of the aluminum components.
- If the coolant contact the PremAir® direct ozone reduction (DOR) radiator, wash it with water at once. <Vehicles for California emission regulation> (2.4L Engine)

- By referring to the section on coolant, select an appropriate concentration for safe operating temperature within the range of 30 to 60 %. Use special tool MB991871 to refill the coolant. A convenient mixture is a 50 % water and 50 % antifreeze solution [freezing point: -31°C (-32.8°F)].

Recommended antifreeze: Long Life Antifreeze Coolant or an equivalent

Quantity:

<2.4L Engine> 8.0 dm^3 (8.5 quarts)

<3.8L Engine> 8.7 dm^3 (9.2 quarts)

NOTE: For how to use special tool MB991871, refer to its manufacturer's instructions.

- Reinstall the radiator cap.
- Start the engine and let it warm up until the thermostat opens.
- After repeatedly revving the engine up to 3,000 r/min several times, stop the engine.
- Remove the radiator cap after the engine has cooled, and pour in coolant up to the brim. Reinstall the cap.

CAUTION

Do not overfill the radiator condenser tank assembly.

- Add coolant to the radiator condenser tank assembly between the "FULL" and "LOW" mark if necessary.

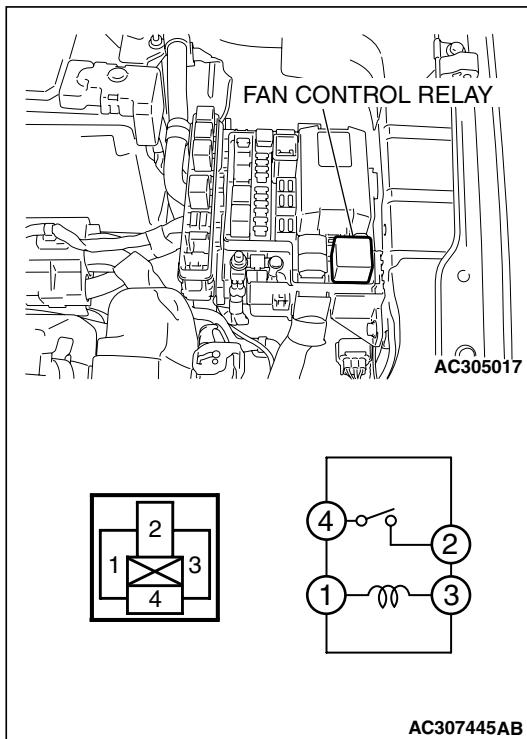
ENGINE COOLANT CONCENTRATION TEST

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Refer to GROUP 00, RECOMMENDED LUBRICANTS AND LUBRICANT CAPACITIES TABLE P.00-43.

FAN CONTROL RELAY CONTINUITY CHECK

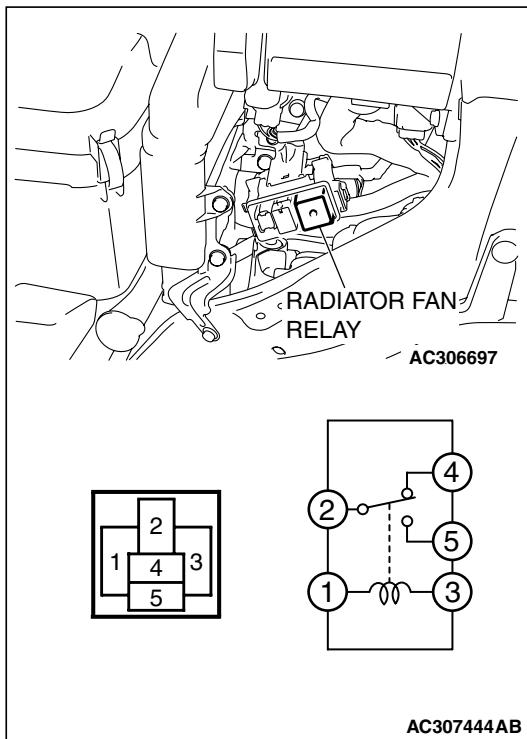
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BATTERY VOLTAGE	TERMINAL NO. TO BE CONNECTED TO TESTER	CONTINUITY TEST RESULTS
Not applied	4 – 2	Open circuit
Connect terminal No.3 and battery (–) terminal. Connect terminal No.1 and battery (+) terminal.	4 – 2	Less than 2 ohms

RADIATOR FAN RELAY CHECK

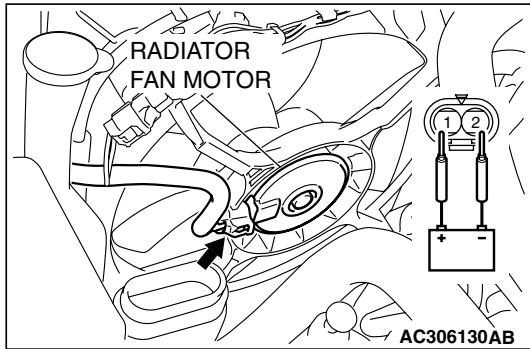
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BATTERY VOLTAGE	TERMINAL NO. TO BE CONNECTED TO TESTER	CONTINUITY TEST RESULTS
Not applied	2 – 4	Less than 2 ohms
	2 – 5	Open circuit
Connect terminal No.3 and battery (–) terminal. Connect terminal No.1 and battery (+) terminal.	2 – 5	Less than 2 ohms

RADIATOR FAN MOTOR CHECK

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1. Remove the radiator fan motor connector.
2. Check to see that the fan motor of the radiator turns when applying battery power between the connector terminals of the radiator fan motor. Also check to see that there is no abnormal sound coming from the radiator fan motor at this time.
3. If the radiator fan motor is defective, replace it.

RADIATOR

REMOVAL AND INSTALLATION

<2.4L ENGINE>

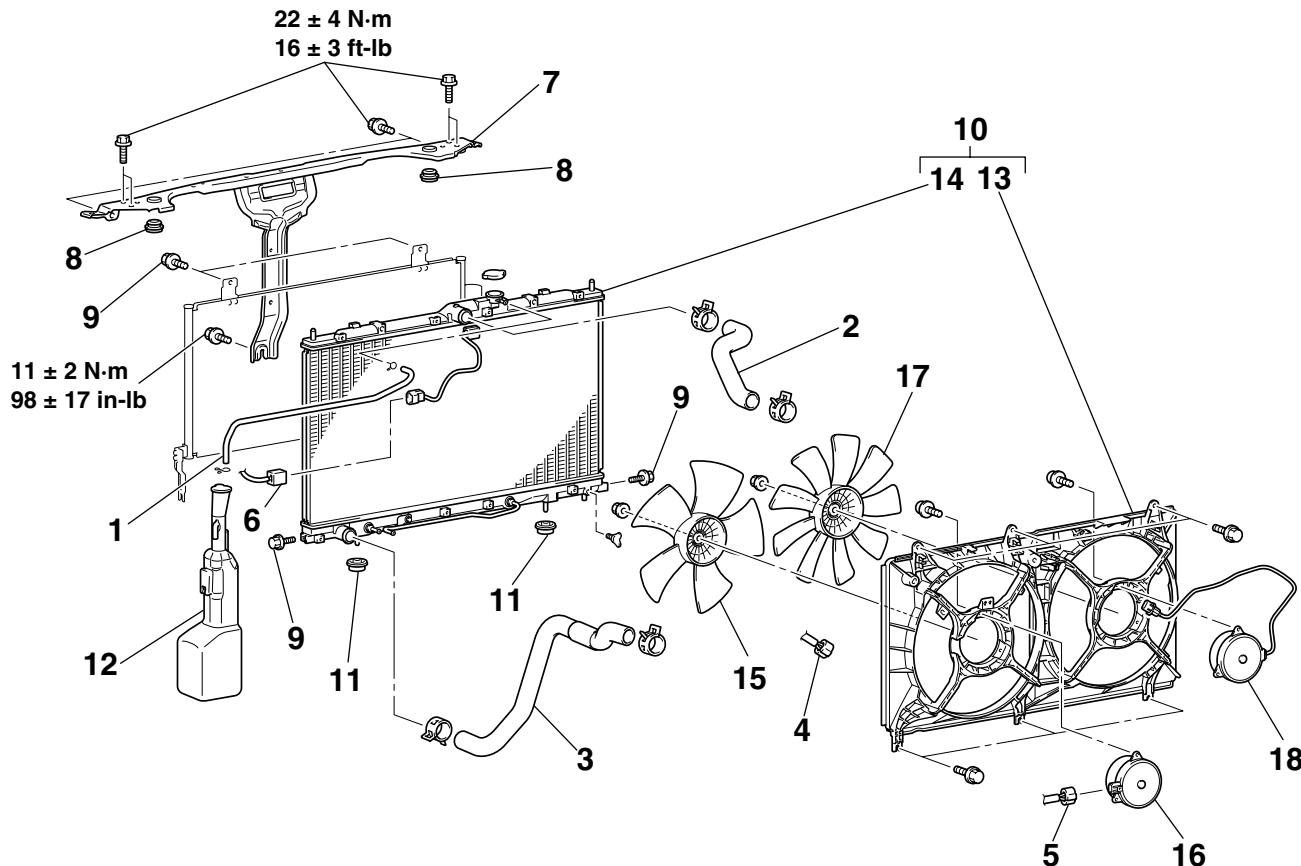
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CAUTION

<Vehicles for California emission regulation>

- Never remove the radiator sensor from the radiator because it cannot be disassembled. When replacing the radiator sensor, replace it with the radiator as a set. When the radiator sensor is removed from the radiator, the powertrain control module (PCM) detects an error and sets a diagnostic trouble code.
- Never replace the DOR radiator with the NON-DOR radiator.
- Never clean the DOR radiator with a high concentration of alkaline cleaner.

Pre-removal Operation	Post-installation Operation
<ul style="list-style-type: none"> Engine Coolant Draining (Refer to P.14-7). Air Cleaner Removal (Refer to GROUP 15, Air Cleaner P.15-4). 	<ul style="list-style-type: none"> Air Cleaner Installation (Refer to GROUP 15, Air Cleaner P.15-4). Engine Coolant Refilling and Level Check (Refer to P.14-7).



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RADIATOR REMOVAL STEPS

- RADIATOR CONDENSER TANK HOSE
 - RADIATOR UPPER HOSE
 - RADIATOR LOWER HOSE
 - CONDENSER FAN MOTOR CONNECTOR
 - FAN MOTOR CONNECTOR
- <<A>> >>A<< 2. RADIATOR UPPER HOSE
<<A>> >>A<< 3. RADIATOR LOWER HOSE
4. CONDENSER FAN MOTOR CONNECTOR
5. FAN MOTOR CONNECTOR

RADIATOR REMOVAL STEPS

- RADIATOR SENSOR CONNECTOR <DOR RADIATOR>
- HOOD LATCH (REFER TO GROUP 42, HOOD P.42-7).
- FRONT END STRUCTURE BAR
- UPPER INSULATOR
- CONDENSER BOLTS

RADIATOR REMOVAL STEPS

10. RADIATOR ASSEMBLY
11. LOWER INSULATOR
12. RADIATOR CONDENSER TANK ASSEMBLY
13. SHROUD ASSEMBLY
14. RADIATOR

FAN MOTOR REMOVAL STEPS

1. RADIATOR CONDENSER TANK HOSE
- <>A>>A<< 2. RADIATOR UPPER HOSE
4. CONDENSER FAN MOTOR CONNECTOR
5. FAN MOTOR CONNECTOR
6. RADIATOR SENSOR CONNECTOR <DOR RADIATOR>
12. RADIATOR CONDENSER TANK ASSEMBLY
13. SHROUD ASSEMBLY
15. RADIATOR FAN
16. RADIATOR FAN MOTOR
17. CONDENSER FAN
18. CONDENSER FAN MOTOR

RADIATOR CONDENSER TANK REMOVAL STEPS

- UNDER COVER (LH)
 - AIR INTAKE DUCT (REFER TO GROUP 15, AIR CLEANER P.15-4).
1. RADIATOR CONDENSER TANK HOSE
 4. CONDENSER FAN MOTOR CONNECTOR
 5. FAN MOTOR CONNECTOR
 6. RADIATOR SENSOR CONNECTOR <DOR RADIATOR>
 12. RADIATOR CONDENSER TANK ASSEMBLY

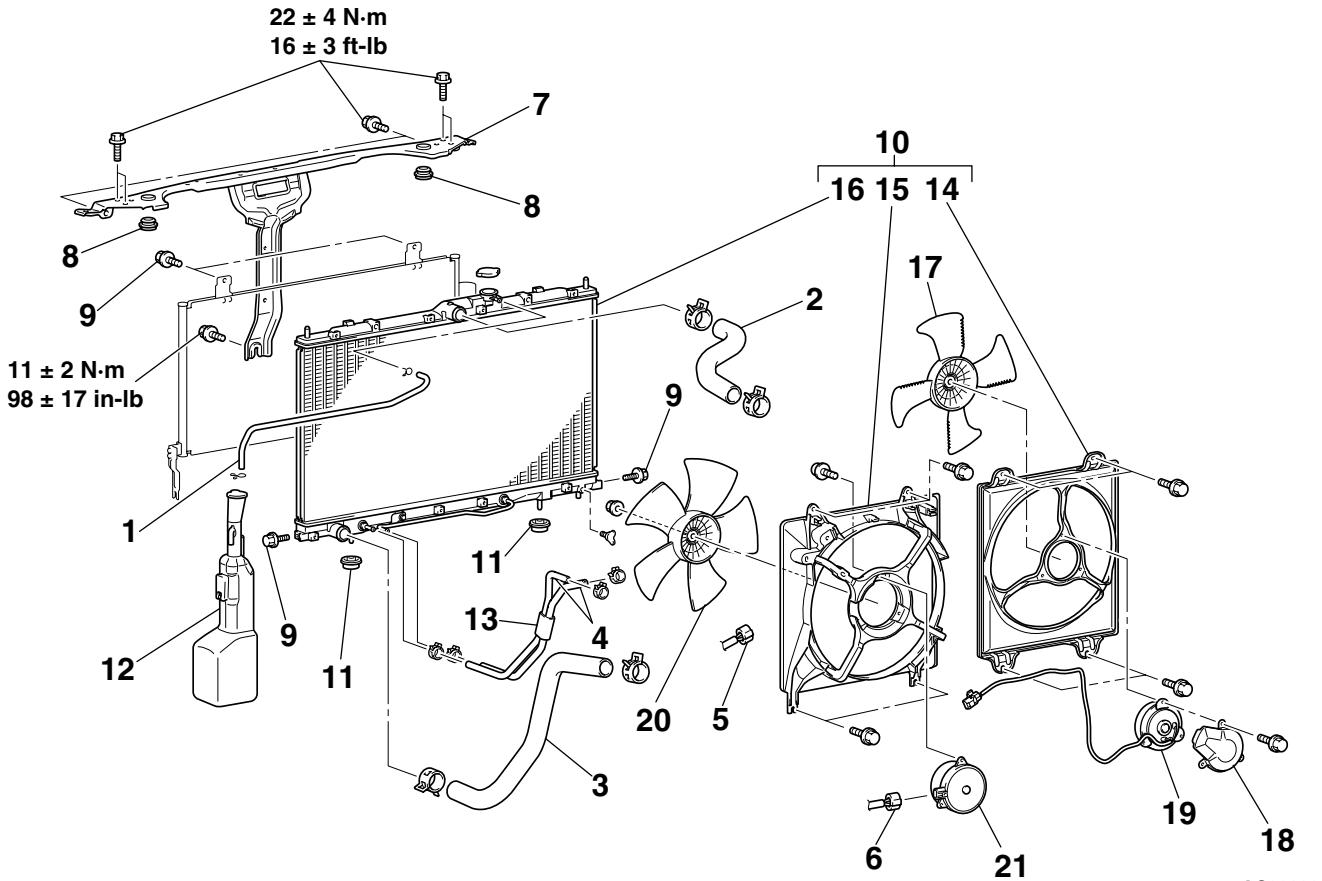
<3.8L ENGINE>

Pre-removal Operation

- Engine Coolant Draining (Refer to P.14-7).
- Air Cleaner Removal (Refer to GROUP 15, Air Cleaner P.15-4).

Post-installation Operation

- Air Cleaner Installation (Refer to GROUP 15 , Air Cleaner P.15-4).
- Engine Coolant Refilling and Level Check (Refer to P.14-7).
- A/T Fluid Refilling and Level Check (Refer to GROUP 00, Maintenance Service P.00-60).



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RADIATOR REMOVAL STEPS

1. RADIATOR CONDENSER TANK HOSE
2. RADIATOR UPPER HOSE
3. RADIATOR LOWER HOSE
4. A/T OIL COOLER HOSE CONNECTION
5. CONDENSER FAN MOTOR CONNECTOR
6. FAN MOTOR CONNECTOR
- HOOD LATCH (REFER TO GROUP 42, HOOD P.42-7).
7. FRONT END STRUCTURE BAR
8. UPPER INSULATOR
9. CONDENSER BOLTS
10. RADIATOR ASSEMBLY
11. LOWER INSULATOR
12. RADIATOR CONDENSER TANK ASSEMBLY
- <<A>> >>A<<
13. A/T OIL COOLER HOSE

RADIATOR REMOVAL STEPS

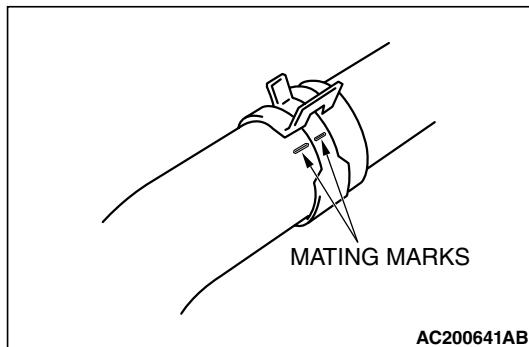
14. CONDENSER FAN SHROUD ASSEMBLY
 15. COOLING FAN SHROUD ASSEMBLY
 16. RADIATOR
- FAN MOTOR REMOVAL STEPS**
1. RADIATOR CONDENSER TANK HOSE
 5. CONDENSER FAN MOTOR CONNECTOR
 3. RADIATOR UPPER HOSE
 6. FAN MOTOR CONNECTOR
 12. RADIATOR CONDENSER TANK ASSEMBLY
 14. CONDENSER FAN SHROUD ASSEMBLY
 15. COOLING FAN SHROUD ASSEMBLY
 17. CONDENSER FAN
 18. HEAT PROTECTOR

FAN MOTOR REMOVAL STEPS

19. CONDENSER FAN MOTOR
 20. COOLING FAN
 21. COOLING FAN MOTOR
- RADIATOR CONDENSER TANK**
- REMOVAL STEPS**
- UNDER COVER (LH)
 - AIR INTAKE DUCT (REFER TO GROUP 15, AIR CLEANER P.15-4).
1. RADIATOR CONDENSER TANK HOSE
 5. CONDENSER FAN MOTOR CONNECTOR
 6. FAN MOTOR CONNECTOR
 12. RADIATOR CONDENSER TANK ASSEMBLY

REMOVAL SERVICE POINTS**<<A>> RADIATOR UPPER HOSE/RADIATOR LOWER HOSE DISCONNECTION**

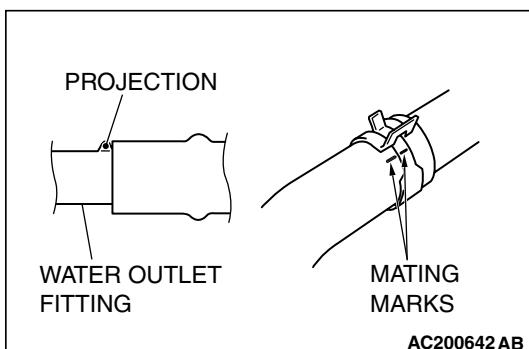
Make mating marks on the radiator hose and the hose clamp. Disconnect the radiator hose.

**<> 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 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.



THERMOSTAT

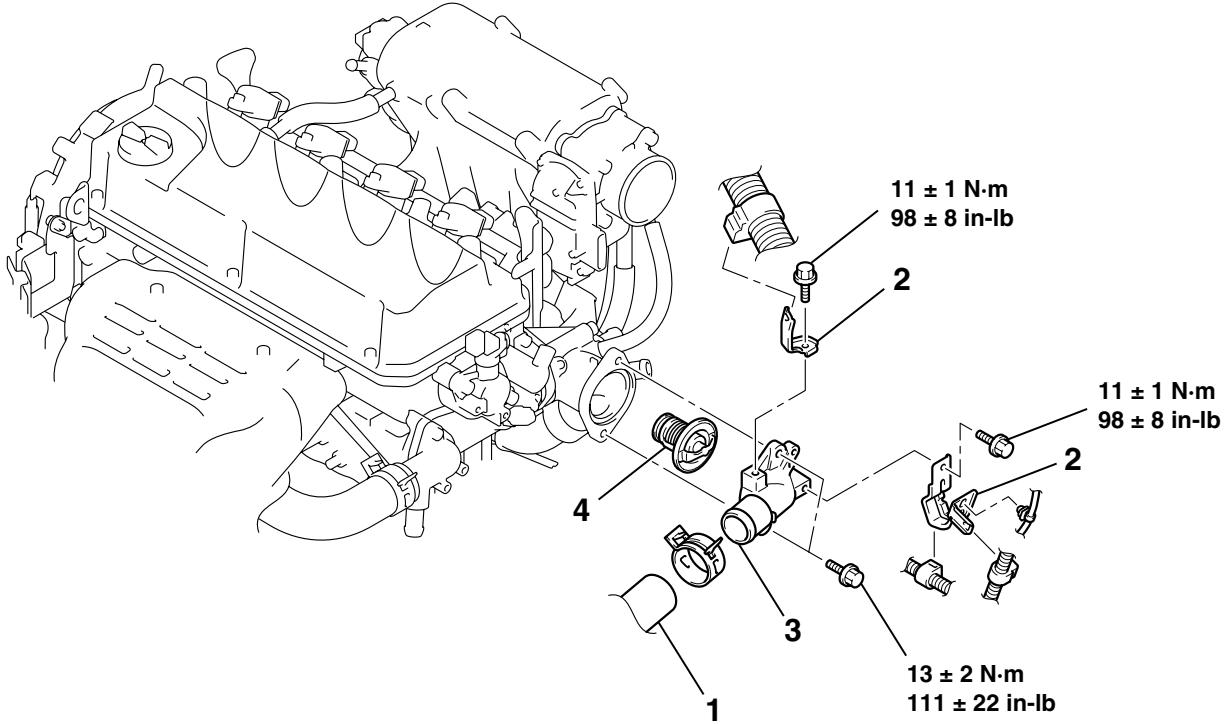
REMOVAL AND INSTALLATION

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<2.4L ENGINE>

Pre-removal and Post-installation Operation

- Engine Coolant Draining and Refilling (Refer to P.14-7).
- Powertrain Control Module (PCM) Removal and Installation (Refer to GROUP 13A, Powertrain Control Module (PCM) P.13A-1180).
- Air Cleaner Cover and Air Intake Hose Removal and Installation (Refer to GROUP 15, Air Cleaner P.15-4).
- Battery and Battery Tray Removal and Installation.



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REMOVAL STEPS

- <<A>> >>B<< 1. RADIATOR LOWER HOSE CONNECTION
2. HARNESS BRACKET

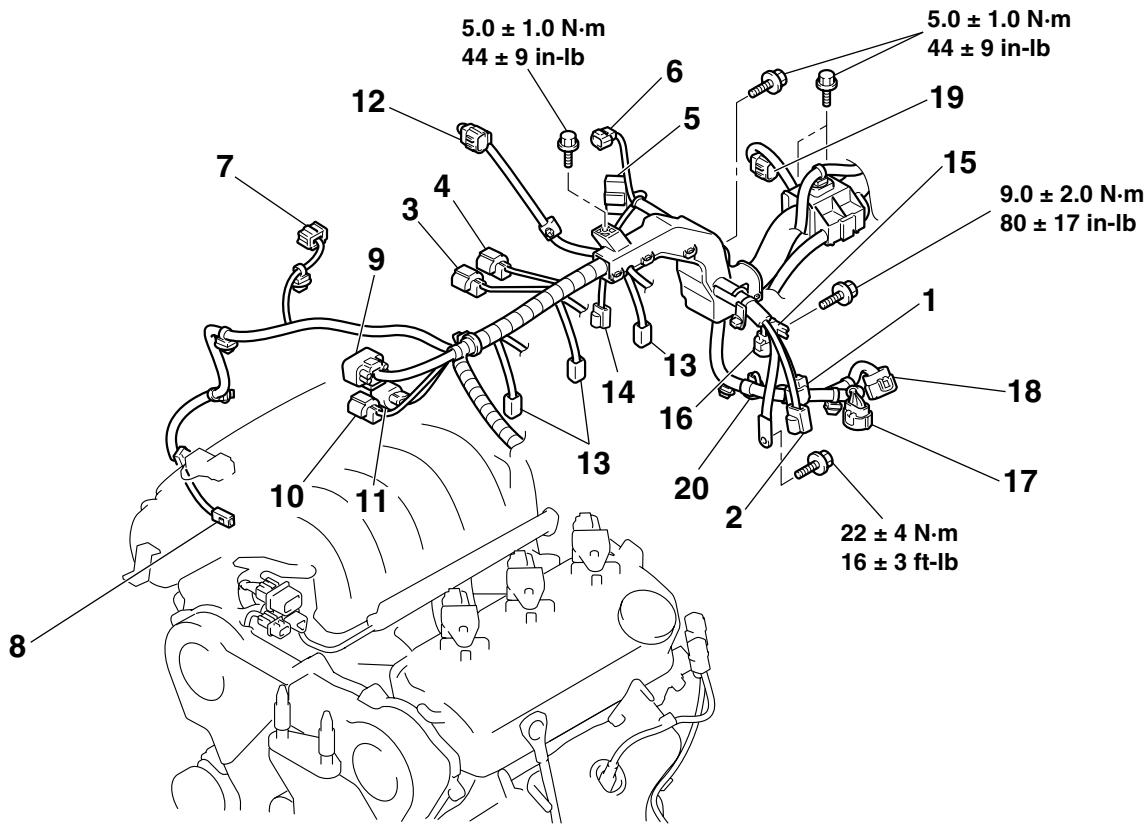
REMOVAL STEPS (Continued)

- >>A<< 3. WATER INLET FITTING
4. THERMOSTAT

<3.8L ENGINE (EXCEPT MIVEC)>

Pre-removal and Post-installation Operation

- Engine Coolant Draining and Refilling (Refer to P.14-7).
- Engine Cover Removal and Installation (Refer to GROUP 11C, Engine Assembly P.11C-22).
- Powertrain Control Module (PCM) Removal and Installation (Refer to GROUP 13B, Powertrain Control Module (PCM) P.13B-1447).
- Air Cleaner Removal and Installation (Refer to GROUP 15, Air Cleaner P.15-4).
- Strut Tower Bar Removal and Installation (Refer to GROUP 42, Strut Tower Bar P.42-11).
- Battery and Battery Tray Removal and Installation



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REMOVAL STEPS

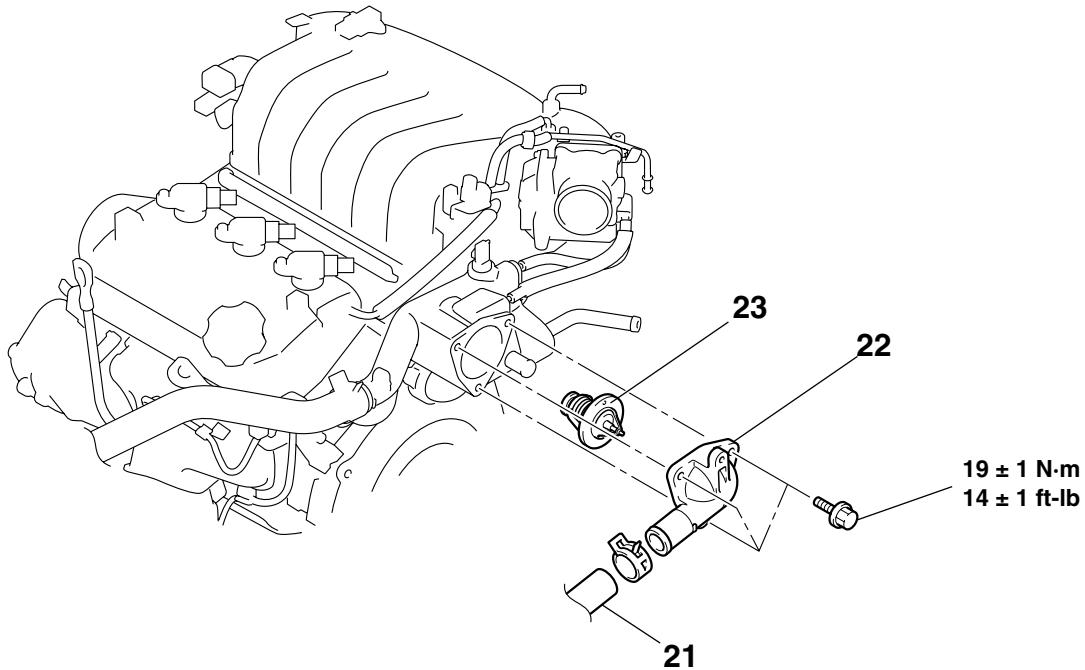
1. LEFT BANK HEATED OXYGEN SENSOR (REAR) CONNECTOR
2. LEFT BANK HEATED OXYGEN SENSOR (FRONT) CONNECTOR
3. RIGHT BANK HEATED OXYGEN SENSOR (REAR) CONNECTOR
4. RIGHT BANK HEATED OXYGEN SENSOR (FRONT) CONNECTOR
5. THROTTLE BODY ASSEMBLY CONNECTOR
6. EVAPORATIVE EMISSION PURGE SOLENOID CONNECTOR
7. MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR

REMOVAL STEPS (Continued)

8. POWER STEERING PRESSURE SWITCH CONNECTOR
9. CONTROL WIRING HARNESS AND WIRING HARNESS COMBINATION CONNECTOR
10. KNOCK SENSOR CONNECTOR
11. CRANKSHAFT POSITION SENSOR CONNECTOR
12. EXHAUST GAS RECIRCULATION VALVE CONNECTOR
13. INJECTOR CONNECTOR
14. ENGINE COOLANT TEMPERATURE SENSOR CONNECTOR
15. CAPACITOR CONNECTOR

REMOVAL STEPS (Continued)

16. CAMSHAFT POSITION SENSOR CONNECTOR
17. INHIBITOR SWITCH SENSOR CONNECTOR
18. A/T CONTROL SOLENOID VALVE ASSEMBLY CONNECTOR
19. OUTPUT SHAFT SPEED SENSOR CONNECTOR
20. INPUT SHAFT SPEED SENSOR CONNECTOR



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REMOVAL STEPS

- <<A>> >>B<< 21. RADIATOR LOWER HOSE CONNECTION

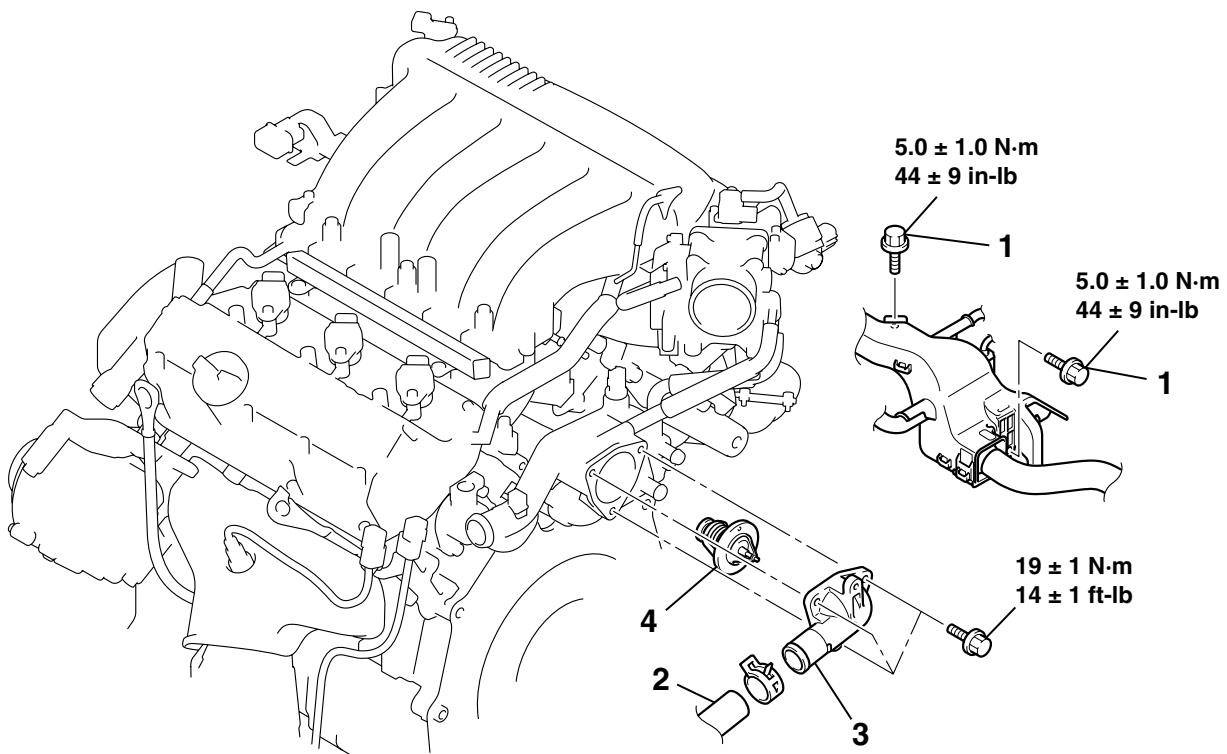
REMOVAL STEPS (Continued)

22. WATER INLET FITTING
>>A<< 23. THERMOSTAT

<3.8L ENGINE-MIVEC>

Pre-removal and Post-installation Operation

- Engine Coolant Draining and Refilling (Refer to P.14-7).
- Engine Cover Removal and Installation (Refer to GROUP 11E, Engine Assembly P.11E-25).
- Powertrain Control Module (PCM) Removal and Installation (Refer to GROUP 13B, Powertrain Control Module (PCM) P.13B-1447).
- Air Cleaner Removal and Installation (Refer to GROUP 15, Air Cleaner P.15-4).
- Strut Tower Bar Removal and Installation (Refer to GROUP 42, Strut Tower Bar P.42-11).
- Battery and Battery Tray Removal and Installation

**REMOVAL STEPS**

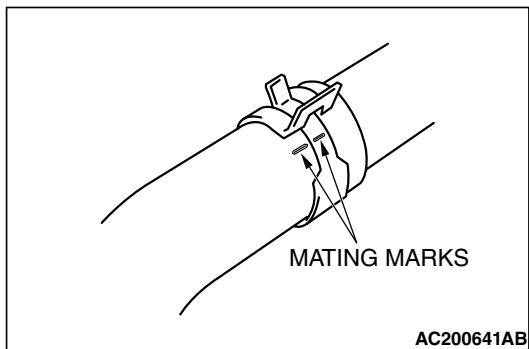
- <<A>> >>B<< 1. HARNESS CONNECTION BOLTS
2. RADIATOR LOWER HOSE CONNECTION

- >>A<< 3. WATER INLET FITTING
4. THERMOSTAT

REMOVAL STEPS (Continued)

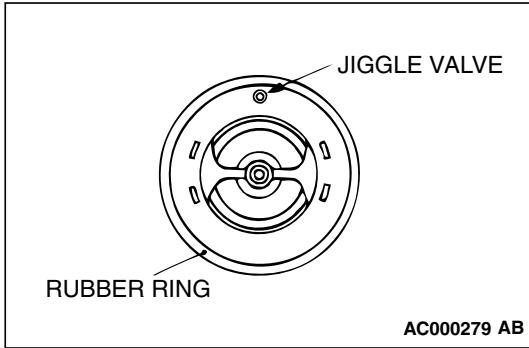
REMOVAL SERVICE POINT**<<A>> RADIATOR LOWER HOSE DISCONNECTION**

Make mating marks on the radiator hose and the hose clamp. Disconnect the radiator hose.

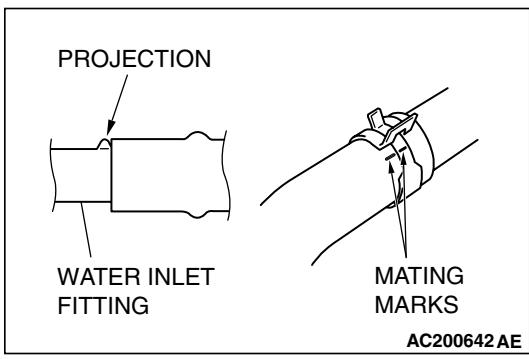
**INSTALLATION SERVICE POINTS****>>A<< THERMOSTAT INSTALLATION****⚠ CAUTION**

Make absolutely sure that no oil adheres to the rubber ring of the thermostat. Also do not fold or scratch the rubber ring during installation.

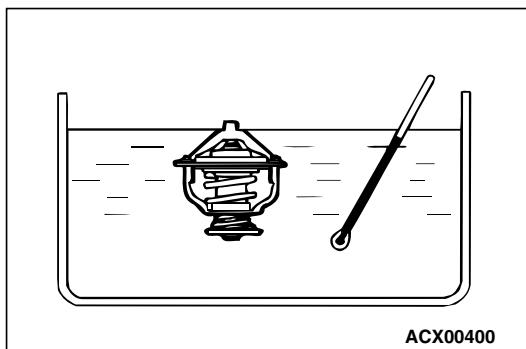
Install the thermostat so that the jiggle valve is facing straight up. Be careful not to fold or scratch the rubber ring.

**>>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**

M1141002500450

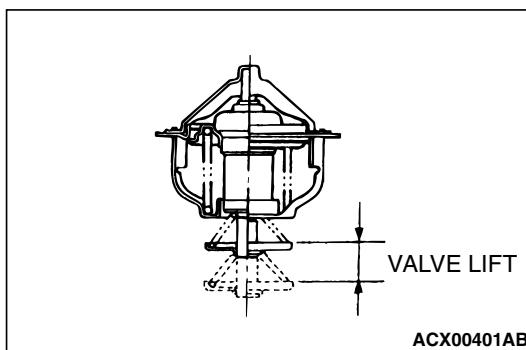
**Thermostat Check**

1. Immerse the thermostat in water, and heat the water while stirring. Check the thermostat valve opening temperature.

Standard value:**Valve opening temperature:**

<2.4L Engine> $82 \pm 1.5^{\circ}\text{C}$ ($180 \pm 3^{\circ}\text{F}$)

<3.8L Engine> $88 \pm 1.5^{\circ}\text{C}$ ($190 \pm 3^{\circ}\text{F}$)



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

NOTE: Measure the valve height when the thermostat is fully closed, and use this measurement to compare the valve height when the thermostat is fully open.

Standard value:**Full-opening temperature:**

<2.4L Engine> 95°C (203°F)

<3.8L Engine> 100°C (212°F)

Amount of valve lift:

<2.4L Engine> 8.5 mm (0.33 inch) or more

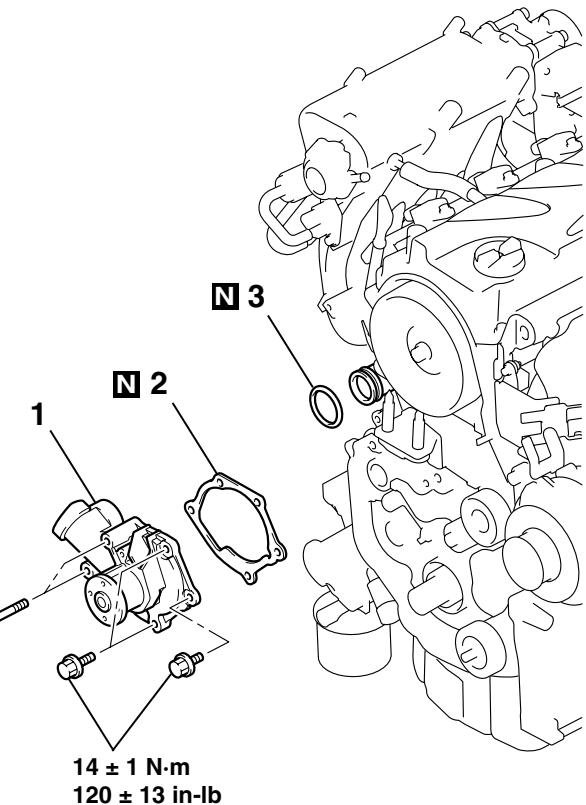
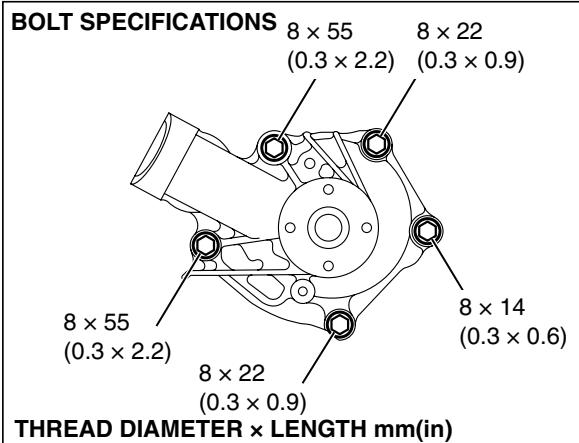
<3.8L Engine> 9.0 mm (0.35 inch) or more

WATER PUMP**REMOVAL AND INSTALLATION <2.4L ENGINE>**

M1141002700487

Pre-removal and Post-installation Operation

- Engine Coolant Draining and Refilling (Refer to P.14-7).
- Timing Belt Removal and Installation (Refer to GROUP 11A, Timing Belt P.11A-51).



AC306675AB

REMOVAL STEPS

1. WATER PUMP

REMOVAL STEPS (Continued)

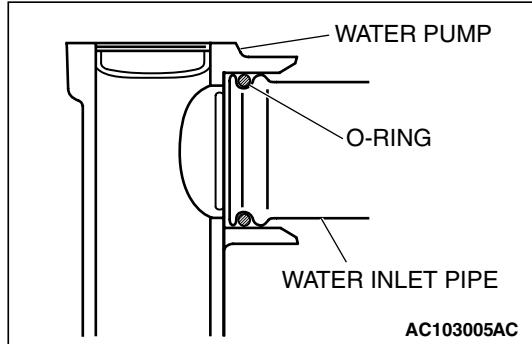
2. WATER PUMP GASKET
>>A<<
3. O-RING

INSTALLATION SERVICE POINT

>>A<< O-RING INSTALLATION

CAUTION

Do not let the O-ring get contaminated with grease or engine oil.



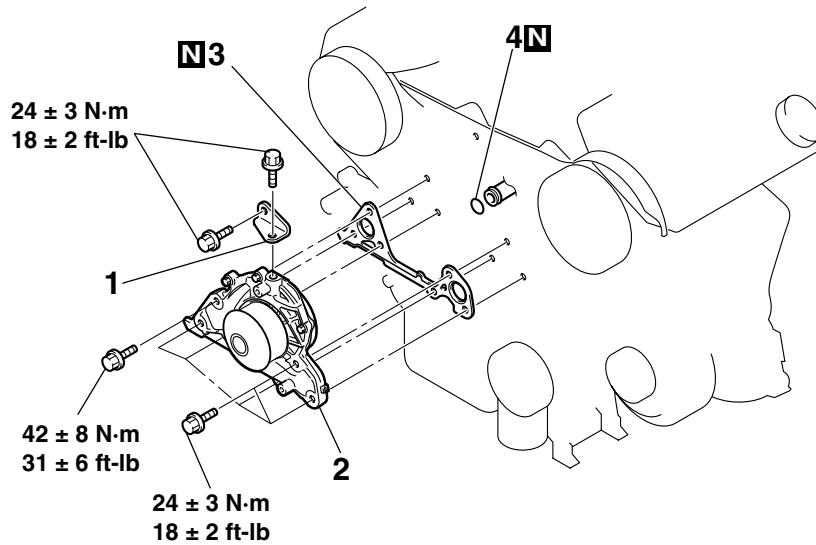
Fit an O-ring into the O-ring groove located at the end of the water inlet pipe and apply water or coolant to the O-ring or the inside of the mounting surface of the water pump for insertion.

REMOVAL AND INSTALLATION <3.8L ENGINE (EXCEPT MIVEC)>

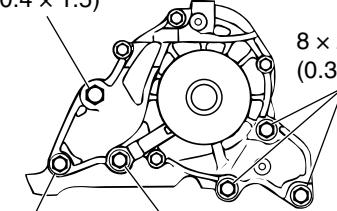
M1141002701190

Pre-removal and Post-installation Operation

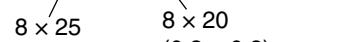
- Engine Coolant Draining and Refilling (Refer to P.14-7).
- Timing Belt Removal and Installation (Refer to GROUP 11C, Timing Belt P.11C-53).
- Crankshaft Position Sensor Removal and Installation (Refer to GROUP 16, Crankshaft Position Sensor P.16-45).

**BOLT SPECIFICATIONS**

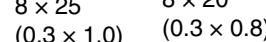
10 × 38
(0.4 × 1.5)



8 × 25
(0.3 × 1.0)



8 × 25
(0.3 × 1.0)



8 × 20
(0.3 × 0.8)

THREAD DIAMETER × LENGTH mm(in)

AC205662AB

REMOVAL STEPS

1. WATER PUMP BRACKET
2. WATER PUMP

REMOVAL STEPS (Continued)

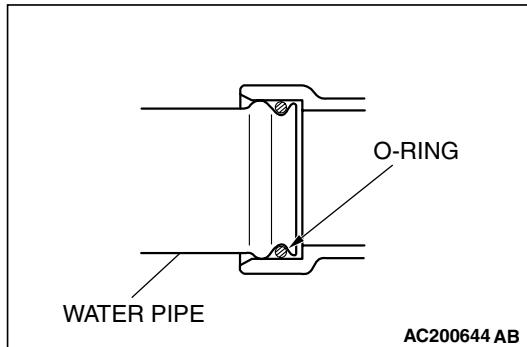
3. WATER PUMP GASKET
- >>A<< 4. O-RING

INSTALLATION SERVICE POINT

>>A<< O-RING INSTALLATION

CAUTION

Do not let the O-ring get contaminated with grease or engine oil.



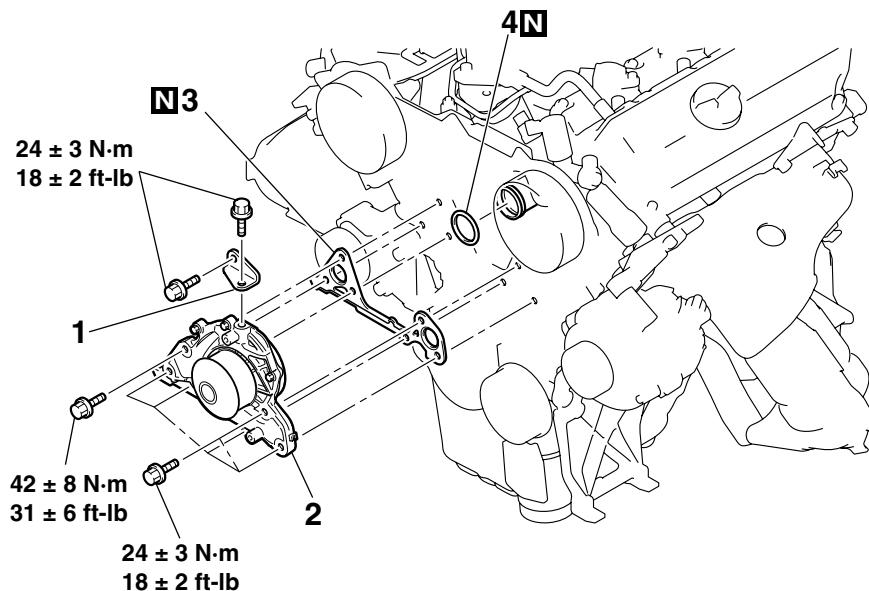
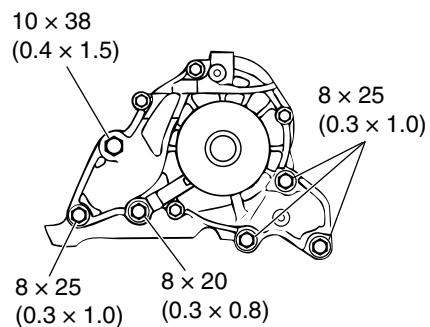
Fit the O-ring into the groove of the water pipe ends, and apply water or coolant to the circumference of the O-ring and the pipe bores to insert the pipe assembly.

REMOVAL AND INSTALLATION <3.8L ENGINE-MIVEC>

M1141002701189

Pre-removal and Post-installation Operation

- Engine Coolant Draining and Refilling (Refer to P.14-7).
- Timing Belt Removal and Installation (Refer to GROUP 11E, Timing Belt P.11E-57).
- Crankshaft Position Sensor Removal and Installation (Refer to GROUP 16, Crankshaft Position Sensor P.16-46).

**BOLT SPECIFICATIONS**

- REMOVAL STEPS**
1. WATER PUMP BRACKET
 2. WATER PUMP

- REMOVAL STEPS (Continued)**
3. WATER PUMP GASKET
 4. O-RING

>>A<<

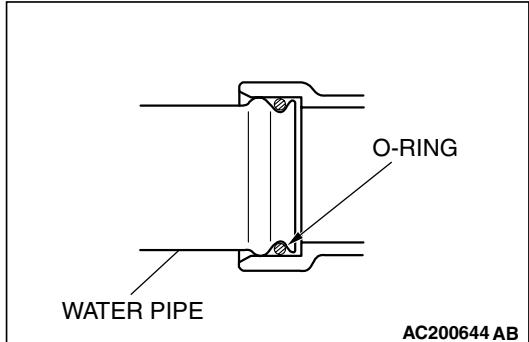
INSTALLATION SERVICE POINT

>>A<< O-RING INSTALLATION

CAUTION

Do not let the O-ring get contaminated with grease or engine oil.

Fit the O-ring into the groove of the water pipe ends, and apply water or coolant to the circumference of the O-ring and the pipe bores to insert the pipe assembly.

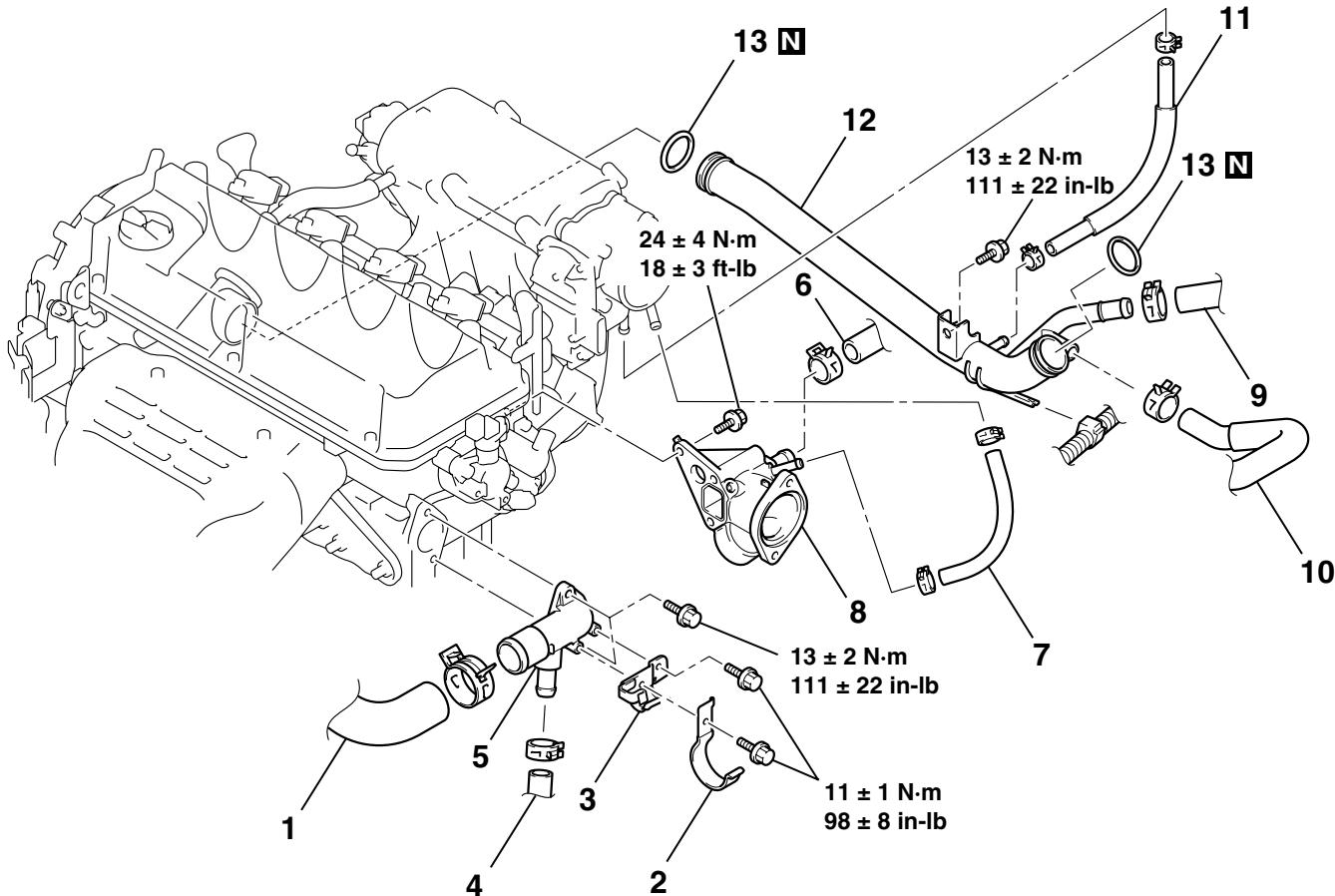


WATER HOSE AND WATER PIPE**REMOVAL AND INSTALLATION <2.4L ENGINE>**

M1141003300501

Pre-removal and Post-installation Operation

- Engine Coolant Draining and Refilling (Refer to P.14-7).
- Powertrain Control Module (PCM) Removal and Installation (Refer to GROUP 13A, Powertrain Control Module (PCM) P.13A-1180).
- Air Cleaner Removal and Installation (Refer to GROUP 15, Air Cleaner P.15-4).
- Thermostat Removal and Installation (Refer to P.14-16).



AC306676AB

REMOVAL STEPS

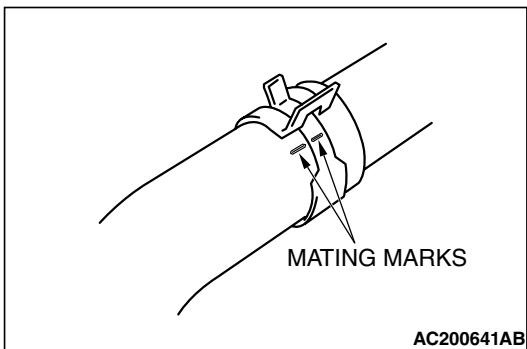
- <<A>> >>C<< 1. RADIATOR UPPER HOSE CONNECTION
2. RADIATOR LOWER HOSE CLAMP
3. WATER HOSE CLAMP
4. WATER COOLER HOSE CONNECTION
>>B<< 5. WATER OUTLET FITTING
6. HEATER WATER HOSE CONNECTION

REMOVAL STEPS (Continued)

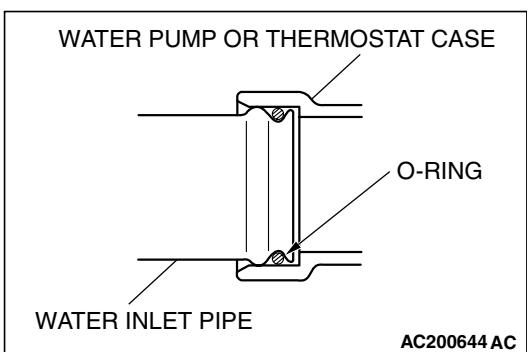
7. WATER HOSE
8. THERMOSTAT CASE
9. HEATER WATER HOSE CONNECTION
10. WATER COOLER HOSE CONNECTION
11. WATER HOSE
12. WATER INLET PIPE
>>A<< 13. O-RING

REMOVAL SERVICE POINT**<<A>> RADIATOR UPPER HOSE DISCONNECTION**

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

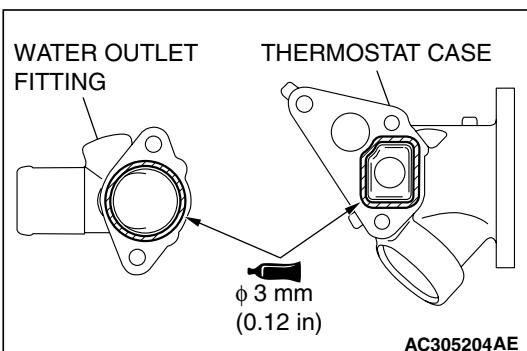
**INSTALLATION SERVICE POINTS****>>A<< O-RINGS INSTALLATION****CAUTION**

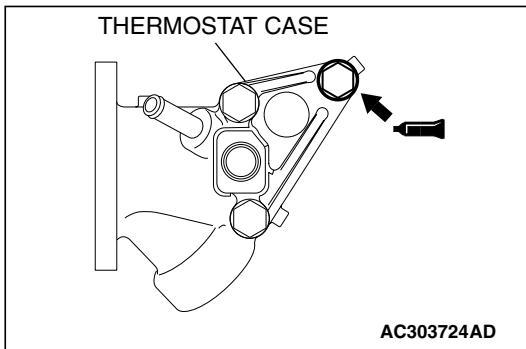
Do not let the O-ring get contaminated with grease or engine oil.

**>>B<< THERMOSTAT CASE/WATER OUTLET FITTING
INSTALLATION**

1. Use a gasket scraper or wire brush to completely eliminate all gasket material on the gasket mounting surface.
2. Apply a bead of the sealant to the cylinder head mating surface of the thermostat case as shown.

Specified Sealant: 3M™ AAD Part No.8672, 3M™ AAD Part No.8679/8678 or equivalent

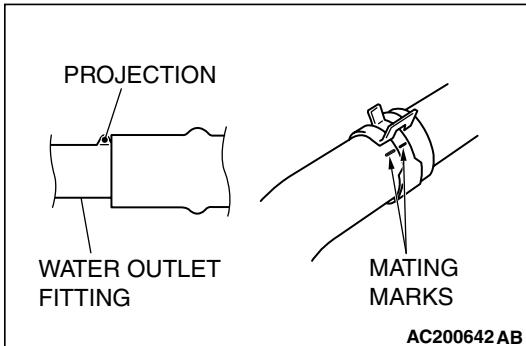




3. Apply sealant to the thread of the thermostat case bolts as shown.

Specified Sealant: 3M™ AAD Part No.8730, 8731 or equivalent

4. With the sealant still wet (within 15 minutes after the sealant is applied), install the thermostat case. Do not apply the sealant in an area more than the required.



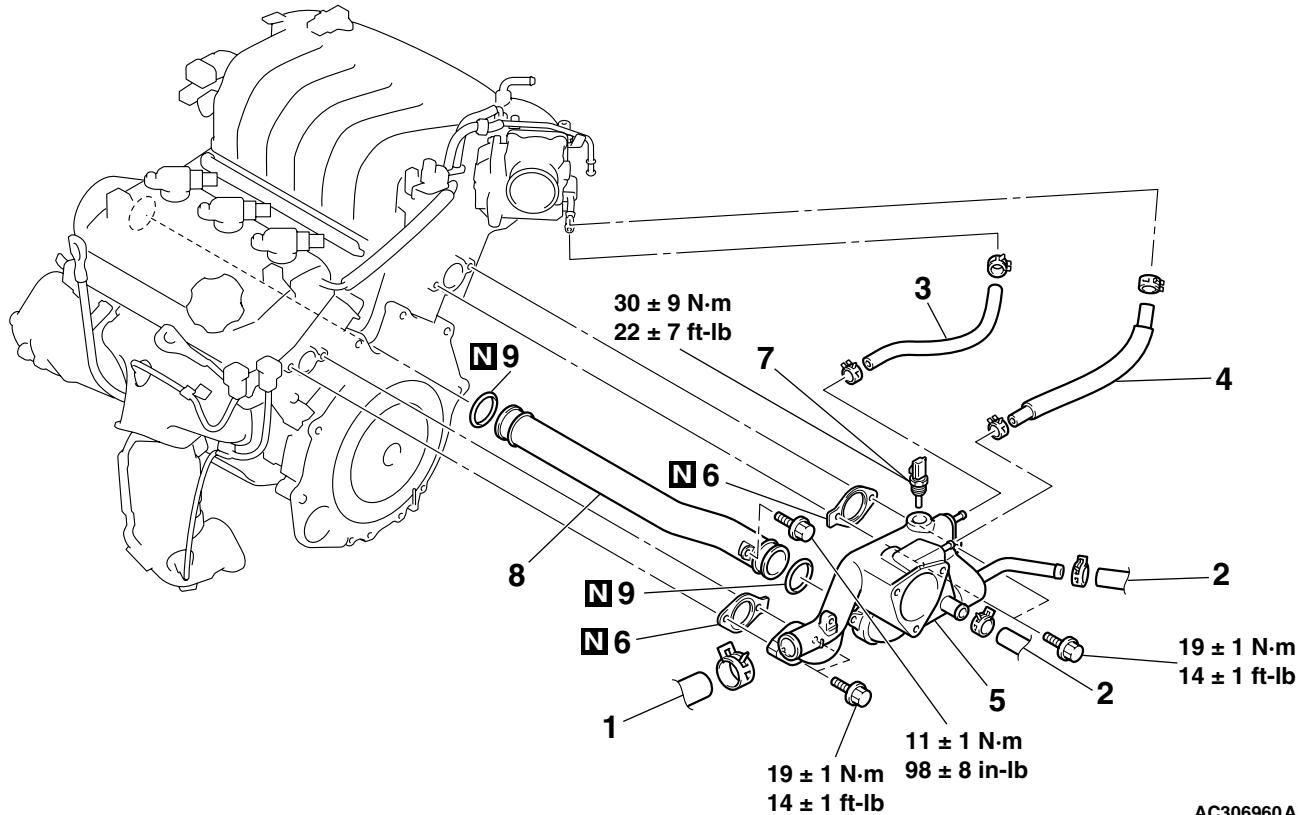
>>C<< RADIATOR UPPER HOSE CONNECTION

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.

REMOVAL AND INSTALLATION <3.8L ENGINE (EXCEPT MIVEC)>

M1141003301292

Pre-removal and Post-installation Operation
Thermostat Removal and Installation (Refer to P.14-16).



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REMOVAL STEPS

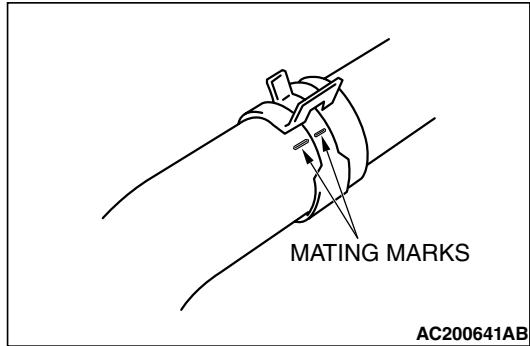
- <<A>> >>C<< 1. RADIATOR UPPER HOSE CONNECTION
2. HEATER HOSE CONNECTION
3. THROTTLE BODY WATER FEED HOSE
4. THROTTLE BODY WATER RETURN HOSE

REMOVAL STEPS (Continued)

5. THERMOSTAT HOUSING
6. GASKET
>>B<< 7. ENGINE COOLANT TEMPERATURE SENSOR
8. WATER PUMP INLET PIPE
>>A<< 9. O-RING

REMOVAL SERVICE POINT**<<A>> RADIATOR UPPER HOSE DISCONNECTION**

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

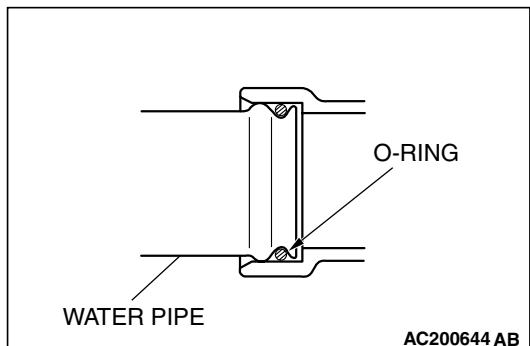


AC200641AB

INSTALLATION SERVICE POINTS**>>A<< O-RING INSTALLATION****⚠ CAUTION**

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

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

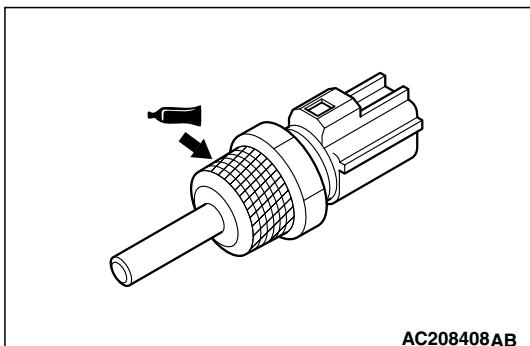


AC200644 AB

>>B<< ENGINE COOLANT TEMPERATURE SENSOR INSTALLATION

Apply the specified sealant to the thread of the engine coolant temperature sensor, and then tighten it to the specified torque.

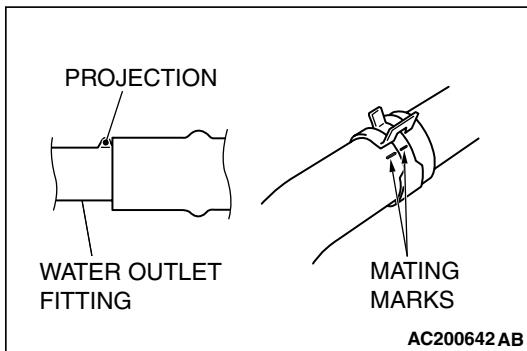
Specified Sealant: 3M™ AAD Part No. 8731 or equivalent



AC208408AB

>>C<< RADIATOR UPPER HOSE CONNECTION

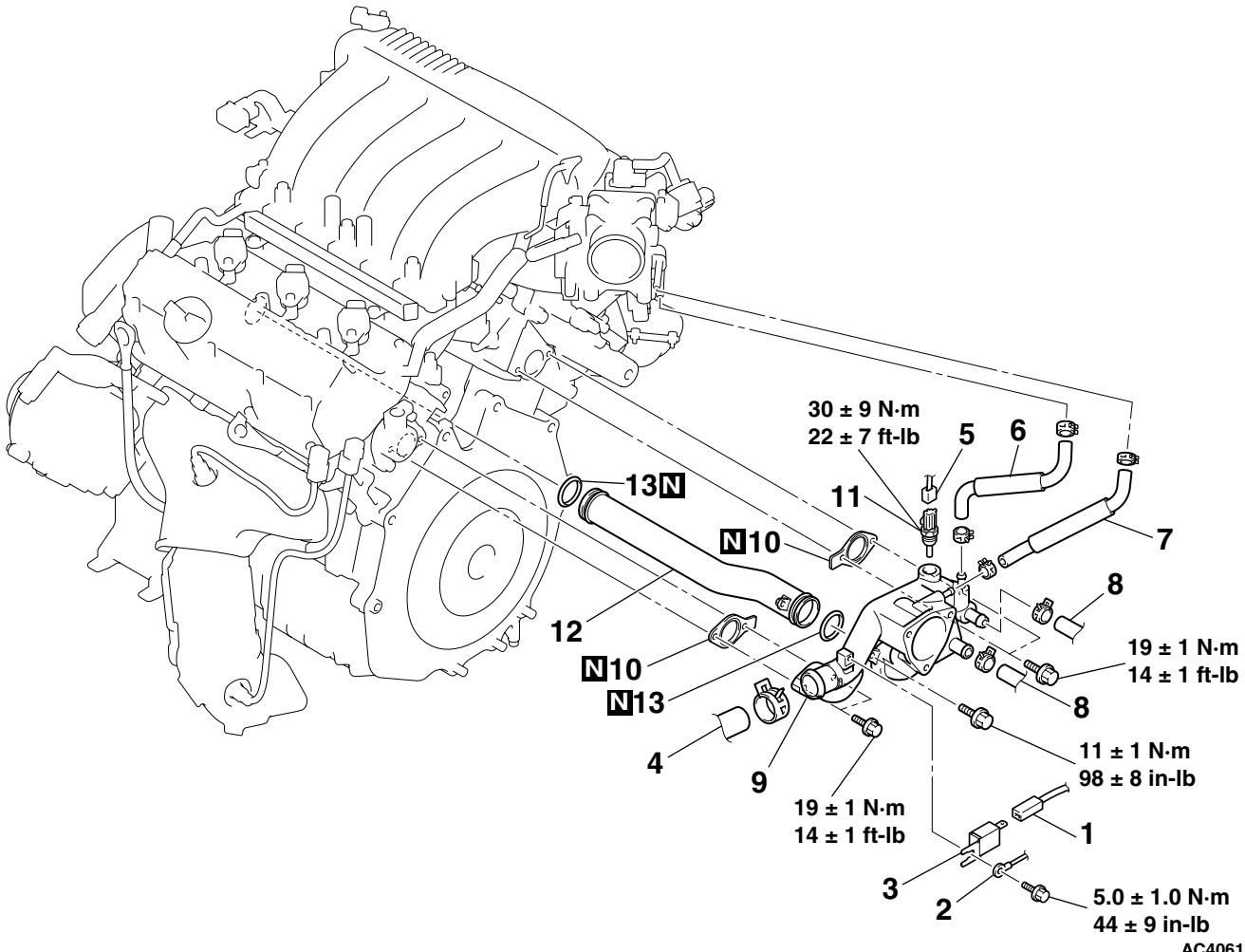
1. Insert each hose as far as the projection of the water outlet fitting.
2. Align the mating marks on the radiator hose and hose clamp, and then connect the radiator hose.



REMOVAL AND INSTALLATION <3.8L ENGINE-MIVEC>

M1141003301281

Pre-removal and Post-installation Operation
Thermostat Removal and Installation (Refer to P.14-16).

**REMOVAL STEPS**

1. CAPACITOR CONNECTOR
 2. GROUNDING CONNECTION
 3. CAPACITOR
 4. RADIATOR UPPER HOSE CONNECTION
- <<A>> >>C<<

REMOVAL STEPS (Continued)

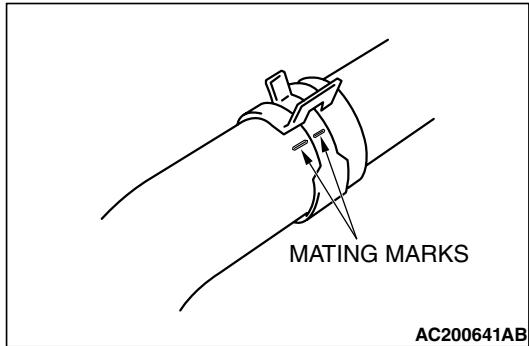
5. ENGINE COOLANT TEMPERATURE SENSOR CONNECTOR
6. HEATER HOSE CONNECTION
7. THROTTLE BODY WATER FEED HOSE

REMOVAL STEPS (Continued)

8. THROTTLE BODY WATER RETURN HOSE
9. THERMOSTAT HOUSING
10. GASKET
- >>B<< 11. ENGINE COOLANT TEMPERATURE SENSOR
- >>A<< 12. WATER INLET PIPE
13. O-RING

REMOVAL SERVICE POINT**<<A>> RADIATOR UPPER HOSE DISCONNECTION**

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

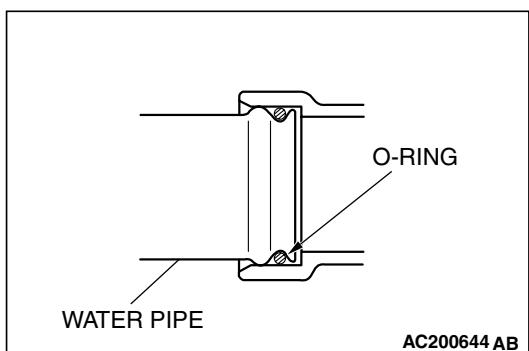


AC200641AB

INSTALLATION SERVICE POINTS**>>A<< O-RING INSTALLATION****CAUTION**

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

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

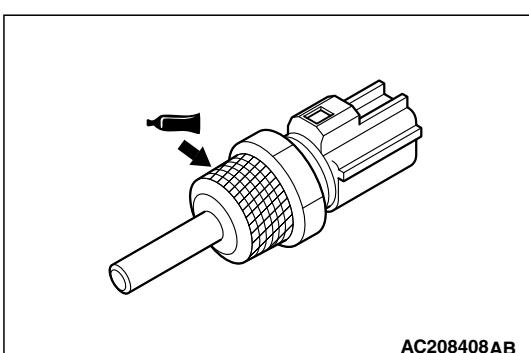


AC200644 AB

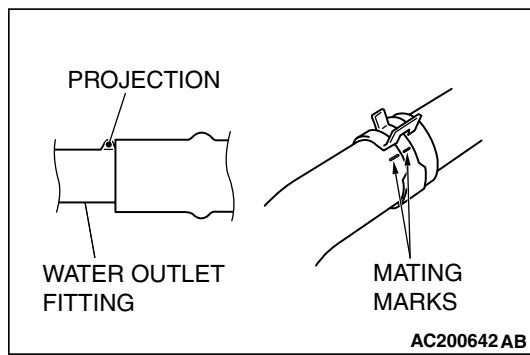
**>>B<< ENGINE COOLANT TEMPERATURE SENSOR
INSTALLATION**

Apply the specified sealant to the thread of the engine coolant temperature sensor, and then tighten it to the specified torque.

Specified Sealant: 3M™ AAD Part No. 8731 or equivalent



AC208408AB



>>C<< RADIATOR UPPER HOSE CONNECTION

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

M1141003400337

Water Pipe and Hose Check

Check the water pipe and hose for cracks, damage and clogs. Replace them if necessary.

SPECIFICATION(S)**FASTENER TIGHTENING SPECIFICATIONS**

M1141005000410

ITEM	SPECIFICATION	
Cylinder block drain plug <2.4L Engine>	$44 \pm 5 \text{ N}\cdot\text{m}$ ($33 \pm 3 \text{ ft-lb}$)	
Cylinder block drain plug <3.8L Engine>	$39 \pm 5 \text{ N}\cdot\text{m}$ ($29 \pm 3 \text{ ft-lb}$)	
Radiator		
Front end structure bar bolt	M8 × 10	$11 \pm 2 \text{ N}\cdot\text{m}$ ($98 \pm 17 \text{ in-lb}$)
	M8 × 20	$22 \pm 4 \text{ N}\cdot\text{m}$ ($16 \pm 3 \text{ ft-lb}$)
Thermostat <2.4L ENGINE>		
Harness bracket bolt	$11 \pm 1 \text{ N}\cdot\text{m}$ ($98 \pm 8 \text{ in-lb}$)	
Water inlet fitting bolt	$13 \pm 2 \text{ N}\cdot\text{m}$ ($111 \pm 22 \text{ in-lb}$)	
Thermostat <3.8L ENGINE>		
Control harness bolt	$5.0 \pm 1.0 \text{ N}\cdot\text{m}$ ($44 \pm 9 \text{ in-lb}$)	
Grounding bolt	M6	$9.0 \pm 2.0 \text{ N}\cdot\text{m}$ ($80 \pm 17 \text{ in-lb}$)
	M8	$22 \pm 4 \text{ N}\cdot\text{m}$ ($16 \pm 3 \text{ ft-lb}$)
Water inlet fitting bolt	$19 \pm 1 \text{ N}\cdot\text{m}$ ($14 \pm 1 \text{ ft-lb}$)	
Water hose and water pipe <2.4L ENGINE>		
Radiator lower hose clamp bolt	$11 \pm 1 \text{ N}\cdot\text{m}$ ($98 \pm 8 \text{ in-lb}$)	
Thermostat case bolt	$24 \pm 4 \text{ N}\cdot\text{m}$ ($18 \pm 3 \text{ ft-lb}$)	
Water hose clamp bolt	$11 \pm 1 \text{ N}\cdot\text{m}$ ($98 \pm 8 \text{ in-lb}$)	
Water inlet pipe bolt	$13 \pm 2 \text{ N}\cdot\text{m}$ ($111 \pm 22 \text{ in-lb}$)	
Water outlet fitting bolt	$13 \pm 2 \text{ N}\cdot\text{m}$ ($111 \pm 22 \text{ in-lb}$)	
Water hose and water pipe <3.8L ENGINE>		
Capacitor bolt	$5.0 \pm 1.0 \text{ N}\cdot\text{m}$ ($44 \pm 9 \text{ in-lb}$)	

ITEM	SPECIFICATION	
Engine coolant temperature sensor	$30 \pm 9 \text{ N}\cdot\text{m}$ ($22 \pm 7 \text{ ft-lb}$)	
Thermostat housing bolt	$19 \pm 1 \text{ N}\cdot\text{m}$ ($14 \pm 1 \text{ ft-lb}$)	
Water pump inlet pipe	$11 \pm 1 \text{ N}\cdot\text{m}$ ($98 \pm 8 \text{ ft-lb}$)	
Water pump <2.4L ENGINE>		
Water pump bolt	$14 \pm 1 \text{ N}\cdot\text{m}$ ($120 \pm 13 \text{ in-lb}$)	
Water pump <3.8L ENGINE>		
Water pump bolt	M10	$24 \pm 3 \text{ N}\cdot\text{m}$ ($18 \pm 2 \text{ ft-lb}$)
	M8	$42 \pm 8 \text{ N}\cdot\text{m}$ ($31 \pm 6 \text{ ft-lb}$)
Water pump bracket bolt	$24 \pm 3 \text{ N}\cdot\text{m}$ ($18 \pm 2 \text{ ft-lb}$)	

SERVICE SPECIFICATION

M1141000300449

ITEM	STANDARD VALUE		LIMIT
High-pressure valve opening pressure of radiator cap kPa (psi)	$93 - 123$ (14 – 18)		Minimum 83 (12)
Thermostat	Valve opening temperature of thermostat °C (°F)	2.4L Engine	82 ± 1.5 (180 ± 3)
		3.8L Engine	88 ± 1.5 (190 ± 3)
	Full-opening temperature of thermostat °C (°F)	2.4L Engine	95 (203)
		3.8L Engine	100 (212)
	Valve lift mm (in)	2.4L Engine	8.5 (0.33) or more
		3.8L Engine	9.0 (0.35) or more

CAPACITIES

M1141005100161

ITEM	QUANTITY dm ³ (qt)	
Long life antifreeze coolant or an equivalent	2.4L Engine	8.0 (8.5)
	3.8L Engine	8.7 (9.2)

SEALANTS

M1141000500368

<2.4L ENGINE>

ITEM	SPECIFIED SEALANT
Cylinder block drain plug	3M™ AAD Part No.8731 or equivalent
Thermostat case	3M™ AAD Part No.8672, 3M™ AAD Part No.8679/8678 or equivalent
Water outlet fitting	
Thermostat case bolt	3M™ AAD Part No. 8730, 8731 or equivalent

<3.8L ENGINE>

ITEM	SPECIFIED SEALANT
Cylinder block drain plug	3M™ AAD Part No.8731 or equivalent
Engine coolant temperature sensor	