

GROUP 14

ENGINE COOLING

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GENERAL INFORMATION

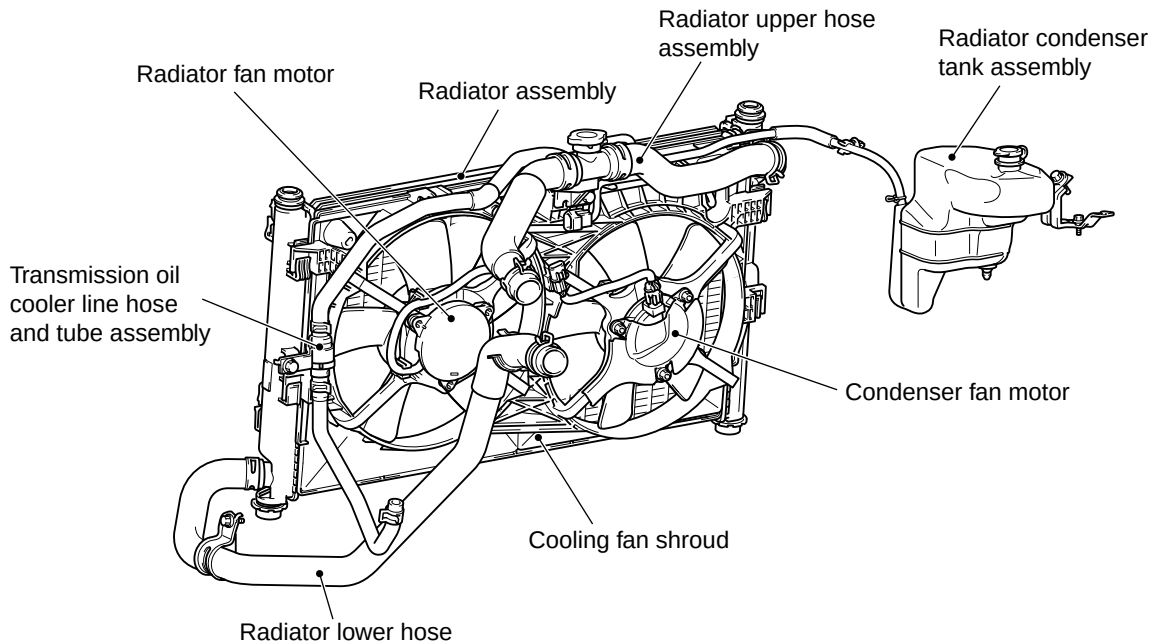
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The cooling system is designed to keep every part of the engine at appropriate temperature in whatever condition the engine may be operated. The cooling method is of the water-cooled, pressure forced circulation type in which the water pump pressurizes 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 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 (O₃) in the air has been insufflated to the radiator core.

CONSTRUCTION DIAGRAM



ZC6004250001

SERVICE SPECIFICATIONS

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Item		Standard value	Limit
Valve opening pressure of radiator cap kPa (psi)		93 - 123 (14 - 18)	Minimum 83 (12)
Thermostat	Valve opening temperature of thermostat °C (°F)	82 ± 1.5 (180 ± 3)	-
	Full-opening temperature of thermostat °C (°F)	95 (203)	-
	Valve lift mm (in)	9.0 (0.35) or more	-

COOLANT

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Item	Quantity dm ³ (qt)
Long life antifreeze coolant or an equivalent	9.5 (10.0) 10.0 (10.6) <Vehicles with Towing Package or DOR radiator>

SEALANT

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Item	Specified sealant
Engine coolant temperature sensor	3M™ AAD Part No.8731 or equivalent

ENGINE COOLING DIAGNOSIS

INTRODUCTION

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.

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TROUBLESHOOTING STRATEGY

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.

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SYMPTOM CHART

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Symptom	Inspection procedure	Reference page
Coolant leak	1	P.14-3
Engine overheating	2	P.14-4
Radiator fan and condenser fan do not operate	3	P.14-6

SYMPTOM PROCEDURES

Inspection Procedure 1: Coolant Leak

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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.

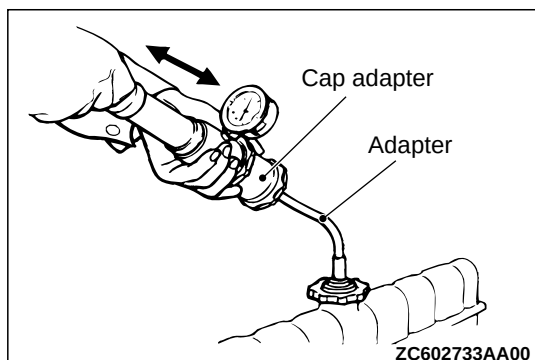
NO: There is no action to be taken.

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**

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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.14-15.

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.

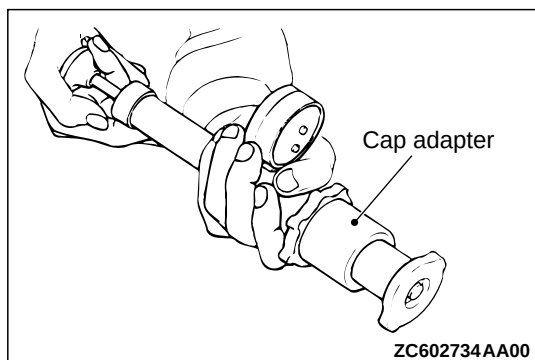
Minimum limit: 83 kPa (12 psi)

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.14-21.

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 Belt (For The Generator, Water Pump and Power Steering Pump) (Check Condition) P.00-58.

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?

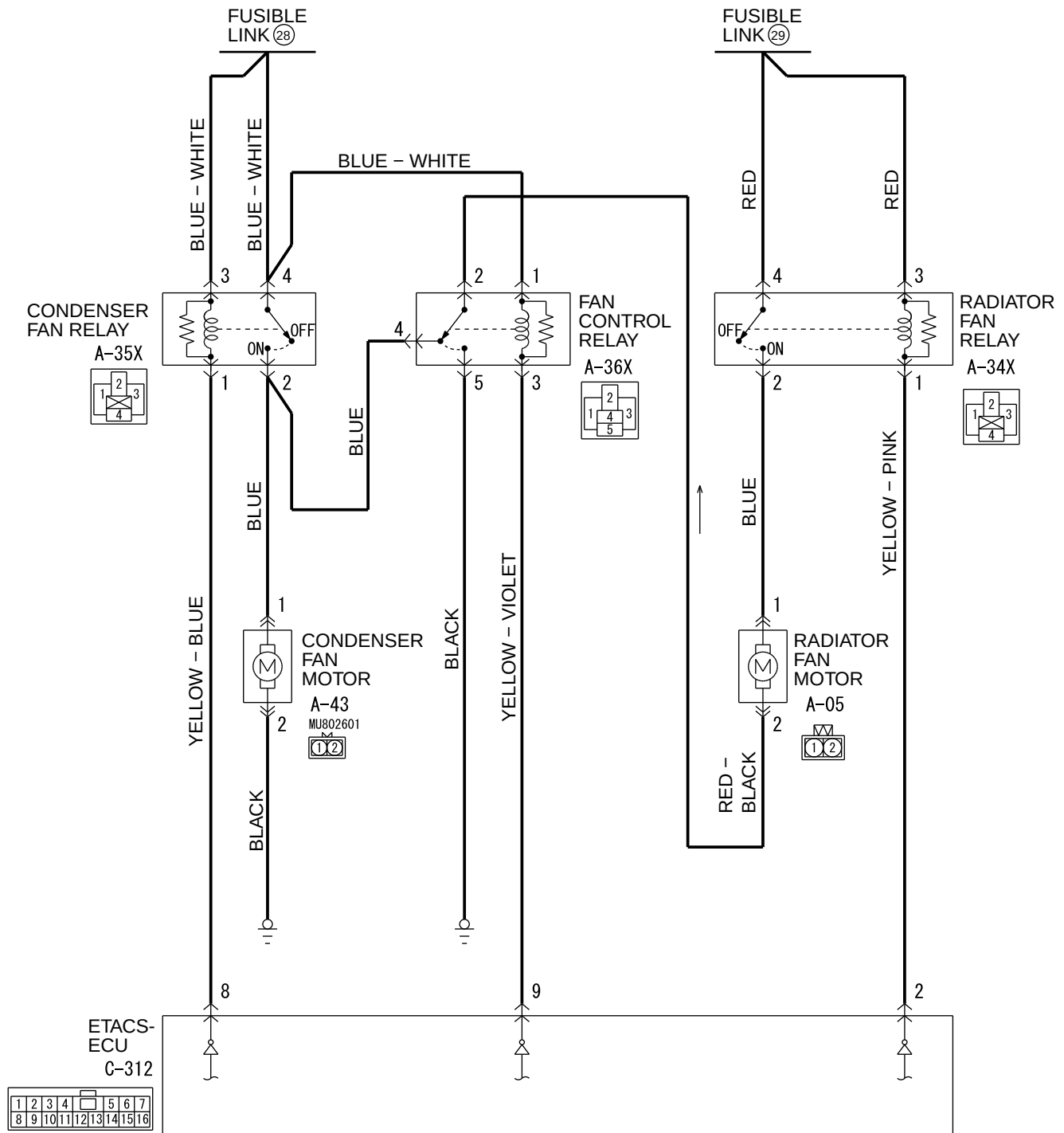
YES: Return to Step 2.

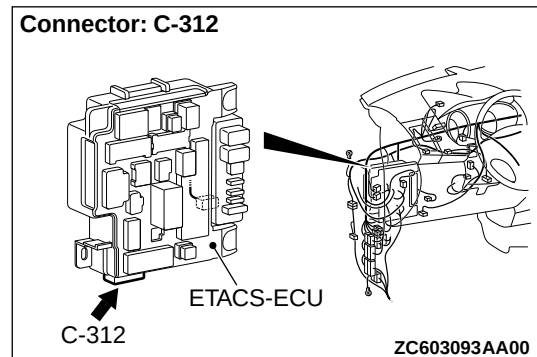
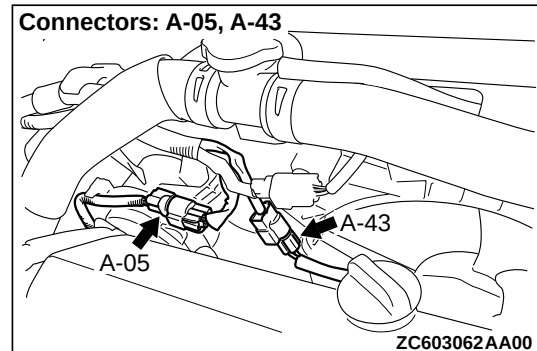
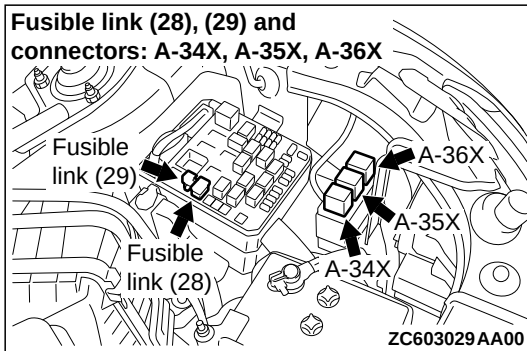
NO: The procedure is complete.

Inspection Procedure 3: Radiator Fan and Condenser Fan do not Operate

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Radiator Fan and Condenser Fan Drive Circuit





CIRCUIT OPERATION

- The cooling fan motor is energized by the fusible link number 28 and fusible link number 29.
- The ETACS-ECU controls the radiator fan relay, fan control relay, and condenser fan relay for driving the cooling fan motor by using the input signal transmitted from the A/C switch, engine coolant temperature sensor, and output shaft speed sensor.

TECHNICAL DESCRIPTION

If the cooling fan does not operate, the following cases may have occurred.

- Malfunction of power supply or ground circuit
- Malfunction of cooling fan motor
- Malfunction of fan control relay, radiator fan relay or condenser fan relay

- Malfunction of ETACS-ECU
- Abnormality of engine coolant temperature sensor input signal transmitted to ECM
- Abnormality of output shaft speed sensor input signal transmitted to TCM
- Abnormality of A/C switch input signal transmitted to A/C-ECU

TROUBLESHOOTING HINTS

- Malfunction of fusible link
- Malfunction of fan control relay
- Malfunction of radiator fan relay
- Malfunction of condenser fan relay
- Malfunction of cooling fan motor
- Damaged wiring harness or connector
- Malfunction of ETACS-ECU

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
 - MB991824: V.C.I.
 - MB991827: M.U.T.-III USB Cable
 - MB991910: M.U.T.-III Main Harness A
- MB991223: Harness Set

•MB992006: Extra Fine Probe

STEP 1. M.U.T.-III other system diagnosis codes

• Confirm whether the diagnosis codes are output from ETACS-ECU (Refer to GROUP 54Ad, Diagnosis - Diagnostic Function P.54Ad-5).

Q:Is the diagnostic trouble code output?

YES: Perform the troubleshooting of ETACS-ECU (Refer to GROUP 54Ad, Diagnosis - Diagnostic Trouble Code Chart P. 54Ad-8).

NO: Go to Step 2.

STEP 2. Check the cooling fan relay.

Refer to P.14-17.

Q:Is the check result normal?

YES: Go to Step 3.

NO: Replace the relay.

STEP 3. Check the radiator fan relay connector A-34X, condenser fan relay connector A-35X and fan control relay connector A-36X.

Check for the contact with terminals.

Q:Is the check result normal?

YES: Go to Step 4.

NO: Repair the defective connector.

STEP 4. Check the cooling fan motor.

Refer to P.14-19.

Q:Is the check result normal?

YES: Go to Step 5.

NO: Replace the cooling fan motor.

STEP 5. Check condenser fan motor connector A-43 and radiator fan motor connector A-05.

Check for the contact with terminals.

Q:Is the check result normal?

YES: Go to Step 6.

NO: Repair the defective connector.

STEP 6. Measure the voltage at radiator fan relay connector A-34X.

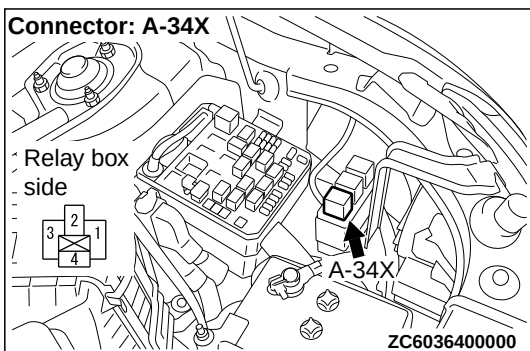
- (1) Remove the radiator fan relay, and measure at relay box side.
- (2) Measure the voltage between terminal number 3 and ground.
Measure the voltage between terminal number 4 and ground.

OK: System voltage

Q:Is the check result normal?

YES: Go to Step 8.

NO: Go to Step 7.



STEP 7. Check the harness between radiator fan relay connector A-34X (terminal 3, 4) and fusible link number 29.
*Check the power supply line for short or open circuit.

Q:Is the check result normal?

YES: An intermittent malfunction is suspected (Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P. 00-15).

NO: Repair the wiring harness.

STEP 8. Measure the voltage at fan control relay connector A-36X.

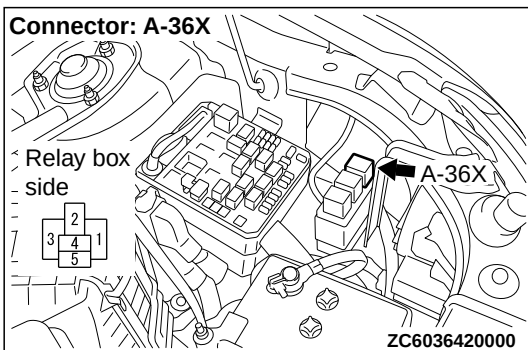
- (1) Remove the fan control relay, and measure at relay box side.
- (2) Measure the voltage between terminal number 1 and ground.

OK: System voltage

Q:Is the check result normal?

YES: Go to Step 10.

NO: Go to Step 9.



STEP 9. Check the harness between fan control relay connector A-36X (terminal 1) and fusible link number 28.
*Check the power supply line for short or open circuit.

Q:Is the check result normal?

YES: An intermittent malfunction is suspected (Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P. 00-15).

NO: Repair the relay box.

STEP 10. Measure the voltage at condenser fan relay connector A-35X.

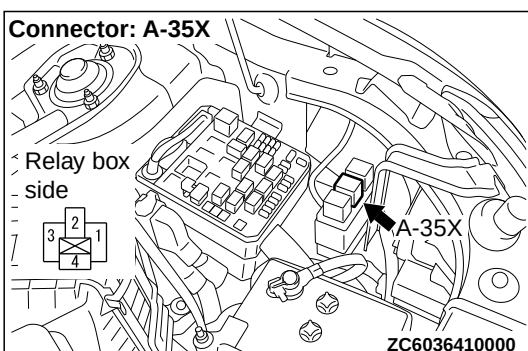
- (1) Remove the condenser fan relay, and measure at relay box side.
- (2) Measure the voltage between terminal number 3 and ground.
Measure the voltage between terminal number 4 and ground.

OK: System voltage

Q:Is the check result normal?

YES: Go to Step 12.

NO: Go to Step 11.



STEP 11. Check the harness between condenser fan relay connector A-35X (terminal 3, 4) and fusible link number 28.
*Check the power supply line for short or open circuit.

Q:Is the check result normal?

YES: An intermittent malfunction is suspected (Refer to GROUP 00, How to Use Troubleshooting/Inspection Service

Points - How to Cope with Intermittent Malfunctions P. 00-15).

NO: Repair the relay box.

STEP 12. Check the harness between radiator fan relay connector A-34X (terminal 2) and radiator fan motor connector A-05 (terminal 1).

* Check the output line for short or open circuit.

Q: Is the check result normal?

YES: Go to Step 13.

NO: Repair the wiring harness.

STEP 13. Check the harness between fan control relay connector A-36X (terminal 2) and radiator fan motor connector A-05 (terminal 2).

* Check the output line for short or open circuit.

Q: Is the check result normal?

YES: Go to Step 14.

NO: Repair the wiring harness.

STEP 14. Check for continuity at fan control relay connector A-36X.

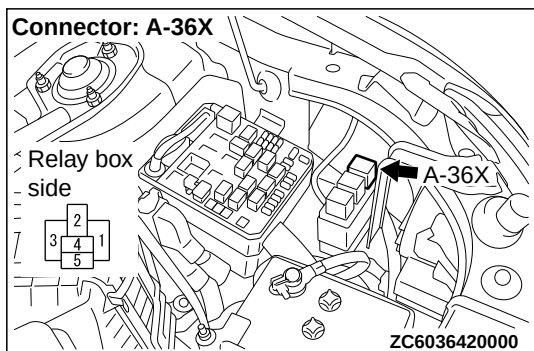
- (1) Remove the fan control relay, and measure at relay box side.
- (2) Check that there is continuity between terminal number 5 and body ground.

OK: Continuity (less than 2 ohms)

Q: Is the check result normal?

YES: Go to Step 16.

NO: Go to Step 15.



STEP 15. Check the harness between fan control relay connector A-36X (terminal 5) and ground.

* Check the ground line for open circuit.

Q: Is the check result normal?

YES: An intermittent malfunction is suspected (Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points - How to Cope with Intermittent Malfunctions P. 00-15).

NO: Repair the wiring harness.

STEP 16. Check the harness between fan control relay connector A-36X (terminal 4) and condenser fan relay connector A-35X (terminal 2).

* Check the output line for short or open circuit.

Q: Is the check result normal?

YES: Go to Step 17.

NO: Repair the wiring harness.

STEP 17. Check the harness between condenser fan relay connector A-35X (terminal 2) and condenser fan motor connector A-43 (terminal 1).

*Check the output line for short or open circuit.

Q:Is the check result normal?

YES: Go to Step 18.

NO: Repair the wiring harness.

STEP 18. Check for continuity at condenser fan motor connector A-43.

(1) Remove the condenser fan motor connector, and measure at harness side.

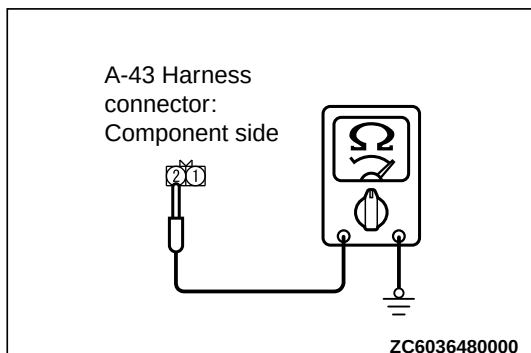
(2) Check that there is continuity between terminal number 2 and body ground.

OK: Continuity (less than 2 ohms)

Q:Is the check result normal?

YES: Go to Step 20.

NO: Go to Step 19.



STEP 19. Check the harness between condenser fan motor connector A-43 (terminal 2) and ground.

*Check the ground line for open circuit.

Q:Is the check result normal?

YES: An intermittent malfunction is suspected (Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P. 00-15).

NO: Repair the wiring harness.

STEP 20. Check the harness between ETACS-ECU connector C-312 (terminal 2) and radiator fan relay connector A-34X (terminal 1).

*Check the ETACS-ECU input line for open circuit.

Q:Is the check result normal?

YES: Go to Step 21.

NO: Repair the wiring harness.

STEP 21. Check the harness between ETACS-ECU connector C-312 (terminal 9) and fan control relay connector A-36X (terminal 3).

*Check the ETACS-ECU input line for open circuit.

Q:Is the check result normal?

YES: Go to Step 22.

NO: Repair the wiring harness.

STEP 22. Check the harness between ETACS-ECU connector C-312 (terminal 8) and condenser fan relay connector A-35X (terminal 1).

*Check the ETACS-ECU input line for open circuit.

Q: Is the check result normal?

YES: Go to Step 23.

NO: Repair the wiring harness.

STEP 23. M.U.T.-III actuator test

Conduct the MFI system actuator test to check that the fan works. (Refer to GROUP 13Ab, Actuator Test Reference Table P.13Ab-857).

*Item 14: Cooling fan

Q: Is the check result normal?

YES: An intermittent malfunction is suspected (Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points - How to Cope with Intermittent Malfunctions P. 00-15).

NO: Replace the ETACS-ECU (Refer to GROUP 54Ad, ETACS-ECU P.54Ad-93). Then go to Step 24.

STEP 24. Retest the system.

Check that the radiator fan and the condenser fan work.

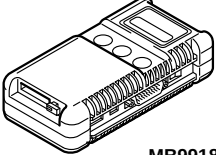
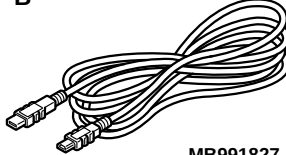
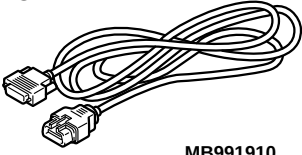
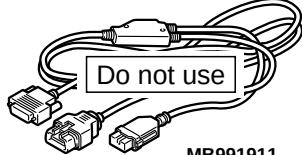
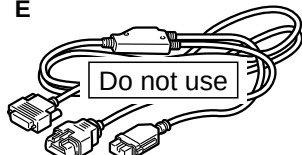
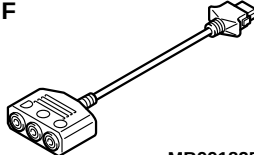
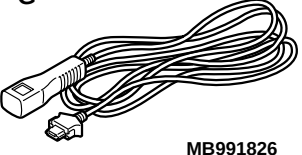
Q: Is the check result normal?

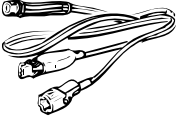
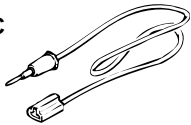
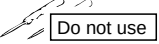
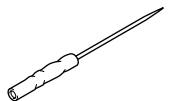
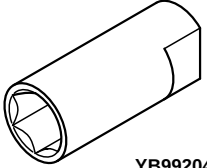
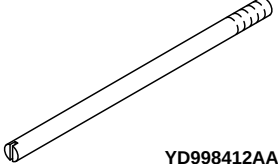
YES: The procedure is complete.

NO: Return to Step 1.

SPECIAL TOOLS

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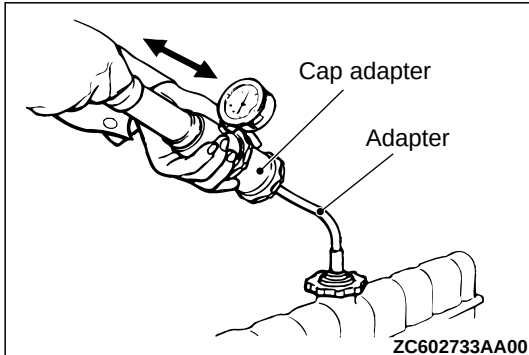
Tool	Tool number and name	Supersession	Application
A  MB991824 B  MB991827 C  MB991910 D  MB991911 E  MB991914 F  MB991825 G  MB991826 YB9919580001	MB991958 A: MB991824 B: MB991827 C: MB991910 D: MB991911 E: MB991914 F: MB991825 G: MB991826 M.U.T.-III sub assembly A: Vehicle communication interface (V.C.I.) B: M.U.T.-III USB cable C: M.U.T.-III main harness A (Vehicles with CAN communication system) D: M.U.T.-III main harness B (Vehicles without CAN communication system) E: M.U.T.-III main harness C (for Daimler Chrysler models only) F: M.U.T.-III adapter harness G: M.U.T.-III trigger harness	MB991824-KIT <i>NOTE: G: MB991826 M.U.T.-III trigger harness is not necessary when pushing V.C.I. ENTER key.</i>	CAUTION For vehicles with CAN communication, use M.U.T.-III main harness A to send simulated vehicle speed. If you connect M.U.T.-III main harness B or C instead, the CAN communication does not function correctly. Reading diagnostic trouble codes

Tool	Tool number and name	Supersession	Application
A  B  C  D  YB9912230001	MB991223 A: MB991219 B: MB991220 C: MB991221 D: MB991222 Harness set A: Test harness B: LED harness C: LED harness adaptor D: Probe	General service tools	Checking the continuity and measuring the voltage at the harness connector
 YB992006AA01	MB992006 Extra fine probe	General service tool	Continuity check and voltage measurement at harness wire or connector for loose, corroded or damaged terminals, or terminals pushed back in the connector.
 YB991871AA01	MB991871 LLC changer	General service tool	Coolant refilling
 YB992042AA00	MB992042 Engine temperature wrench coolant sensor	-	Engine coolant temperature sensor removal and installation
 YD998412AA00	MD998412 Guide	-	Thermostat housing and gasket installation

ON-VEHICLE SERVICE

ENGINE COOLANT LEAK CHECK

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⚠ WARNING

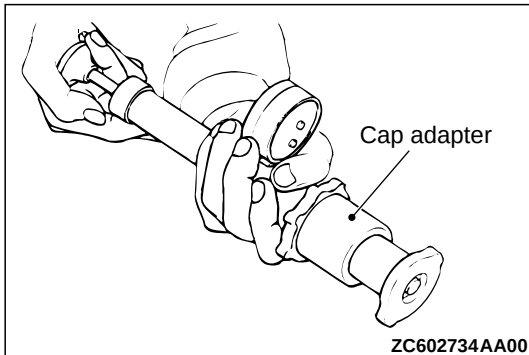
When pressure testing the cooling system, slowly release cooling system pressure to avoid getting burned by hot coolant.

⚠ 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

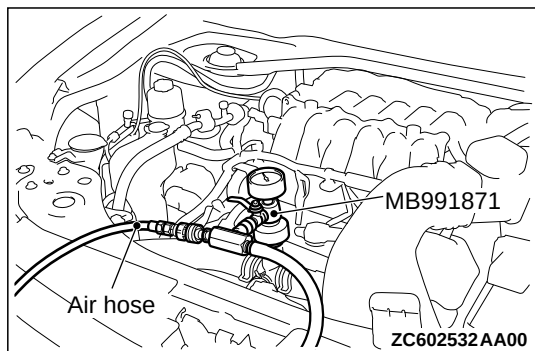
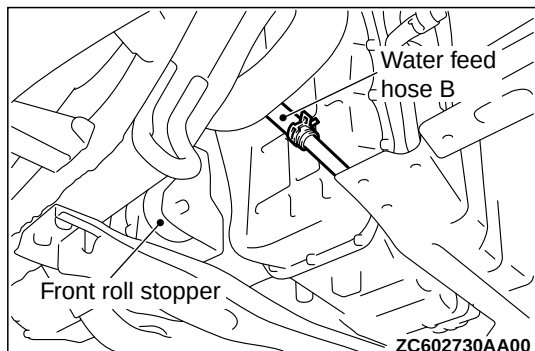
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Required Special Tool:

- MB991871: LLC Changer

⚠ 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. Remove the water feed hose B, and drain the coolant in the water jacket.
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.
5. Install the water feed hose B.
6. Securely tighten the radiator drain plug.
7. 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**
8. 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 (-24 °F)].

Recommended antifreeze: Long Life Antifreeze Coolant or an equivalent

Quantity:

9.5 dm³(10.0 quarts)

10.0 dm³(10.6 quarts) <Vehicles with Towing Package or DOR radiator>

9. Reinstall the radiator cap.
10. Start the engine and let it warm up until the thermostat opens.
11. After repeatedly revving the engine up to 3,000 r/min several times, stop the engine.
12. 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.

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

ENGINE COOLANT CONCENTRATION TEST

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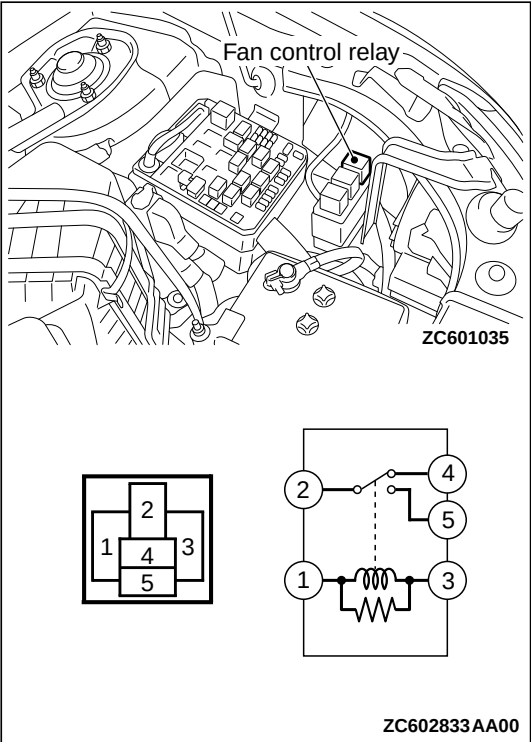
Refer to GROUP 00, Recommended Lubricants And Lubricant Capacities Table P.00-51.

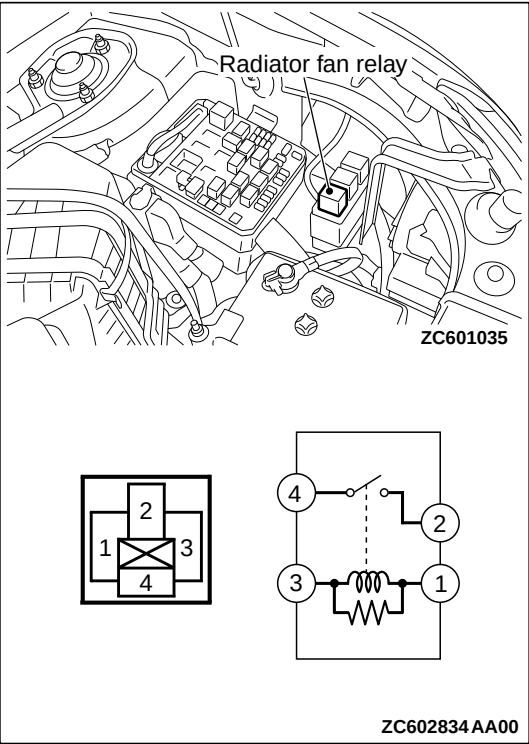
COOLING FAN RELAY CONTINUITY CHECK

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FAN CONTROL RELAY CONTINUITY CHECK

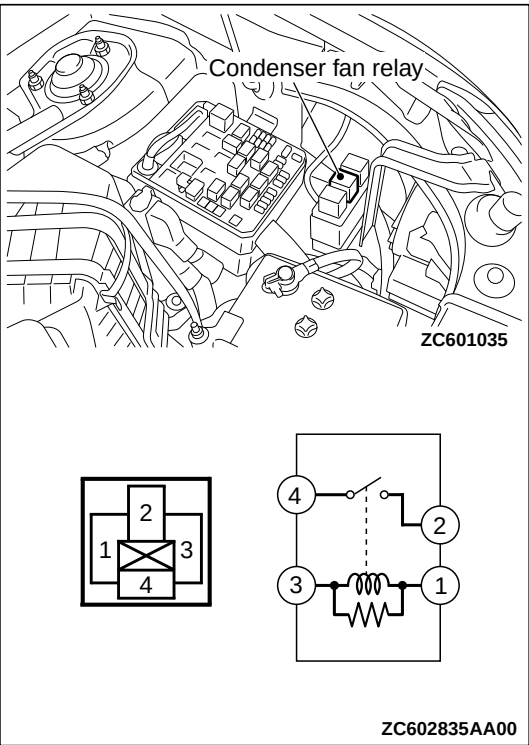
Battery voltage	Terminal No. to be connected to tester	Continuity test results
Not applied	2 - 4	Continuity (less than 2 ohms)
Not applied	2 - 5	Open circuit
Connect terminal No.3 and battery (-) terminal. Connect terminal No.1 and battery (+) terminal.		Continuity (less than 2 ohms)





RADIATOR FAN RELAY CONTINUITY CHECK

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	Continuity (less than 2 ohms)



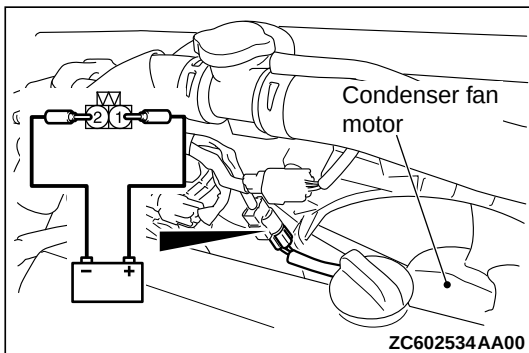
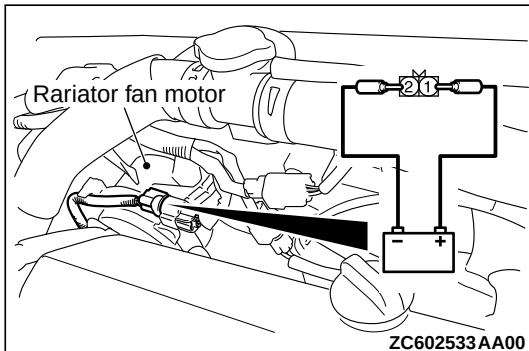
CONDENSER FAN RELAY CONTINUITY CHECK

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	Continuity (less than 2 ohms)

COOLING FAN MOTOR CHECK

M11401000019USA0000010000

1. Disconnect the fan motor connector.
2. Check that the fan motor runs when a positive battery terminal is connected to the fan motor-side connector terminal number 1, and terminal number 2 is grounded. Also check to see that there is no abnormal sound emitted from the fan motor at this time.
3. If the fan motor is defective, replace it (Refer to P.14-27).



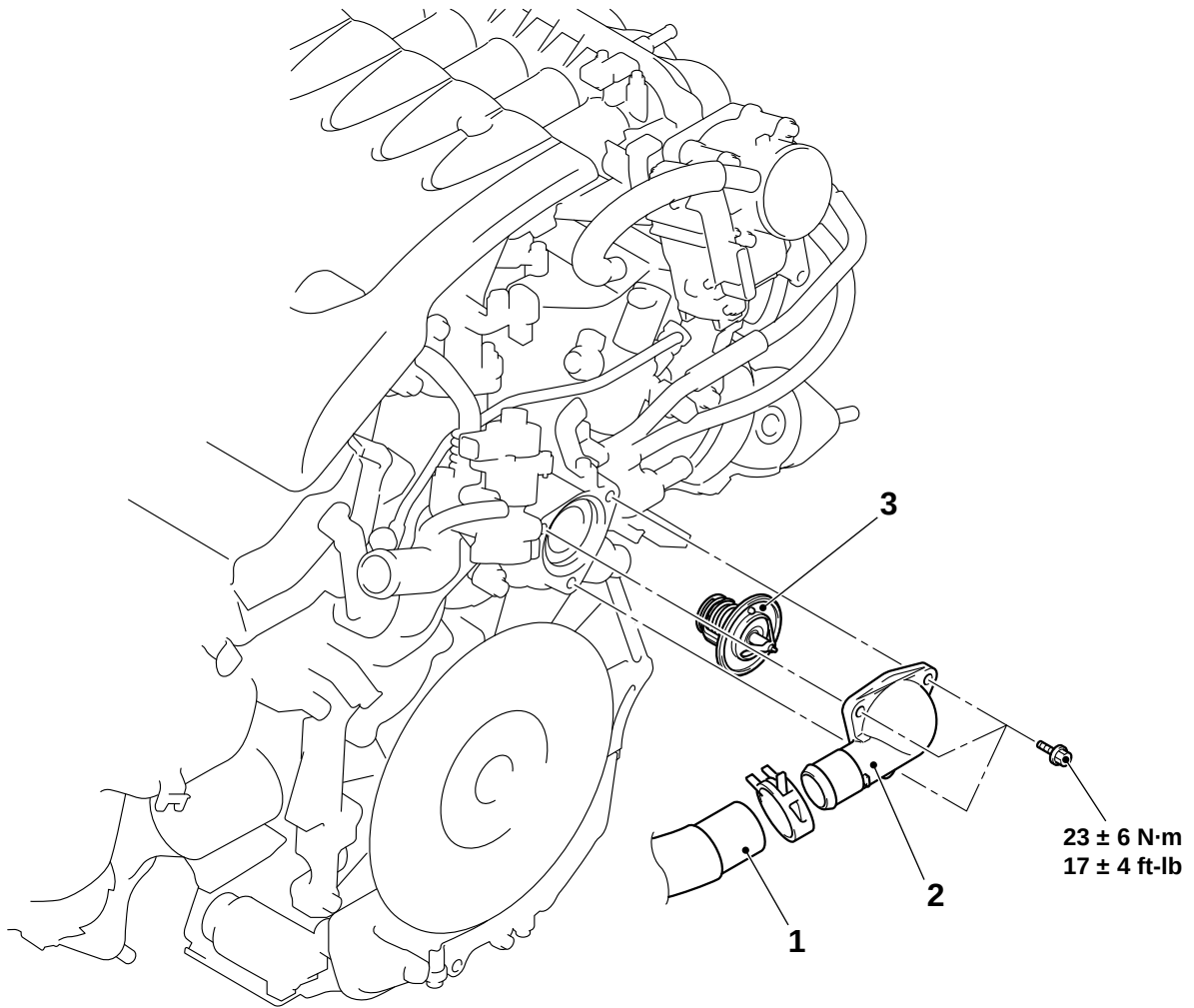
THERMOSTAT

REMOVAL AND INSTALLATION

M11401000024USA0000010000

Pre-removal and Post-installation Operation

- Engine Coolant Draining and Refilling (Refer to P.14-15).
- Air Cleaner Removal and Installation (Refer to GROUP 15, Air Cleaner P.15-6).
- Battery and Battery Tray Removal and Installation



ZC600494AA00

Removal steps

- <<A>> >>B<<
1. Radiator lower hose connection
 2. Water inlet fitting

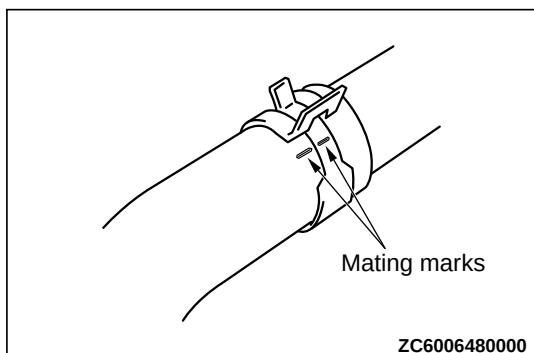
Removal steps

- >>A<<
3. Thermostat

REMOVAL SERVICE POINT

<<A>> RADIATOR LOWER HOSE DISCONNECTION

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



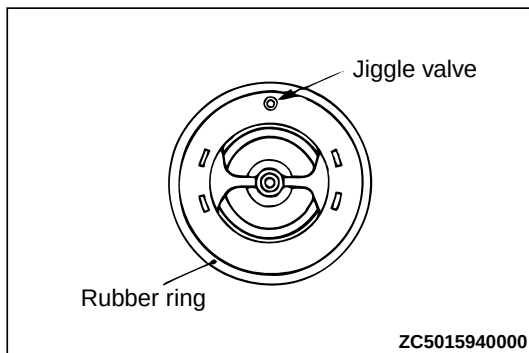
INSTALLATION SERVICE POINTS

>>A<< THERMOSTAT INSTALLATION

⚠ CAUTION

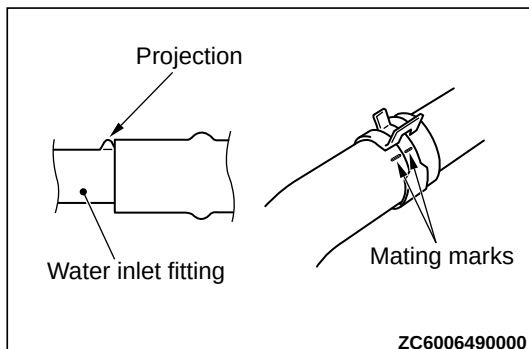
Make absolutely sure that no oil adheres to the rubber ring of the thermostat. Also do not fold or scratch the rubber ring during installation.

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 INSTALLATION

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.



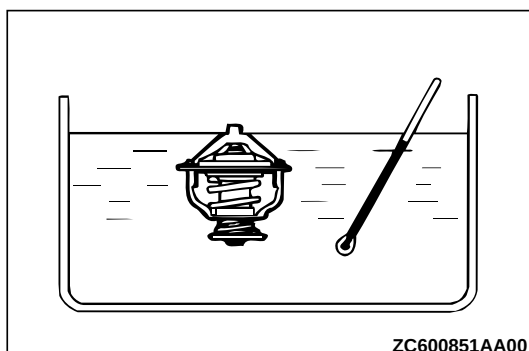
INSPECTION

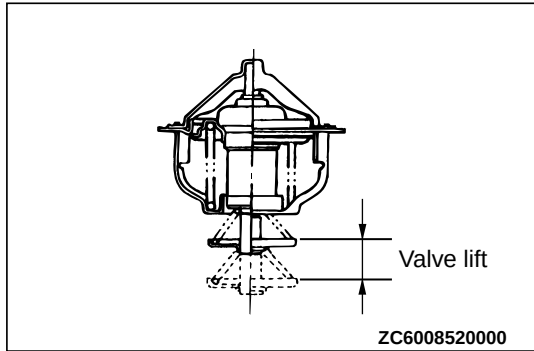
M11401000025USA0000010000

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: $82 \pm 1.5^{\circ}\text{C}$ ($180 \pm 3^{\circ}\text{F}$)





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: 95°C (203°F)

Amount of valve lift: 9.0 mm (0.35 inch)

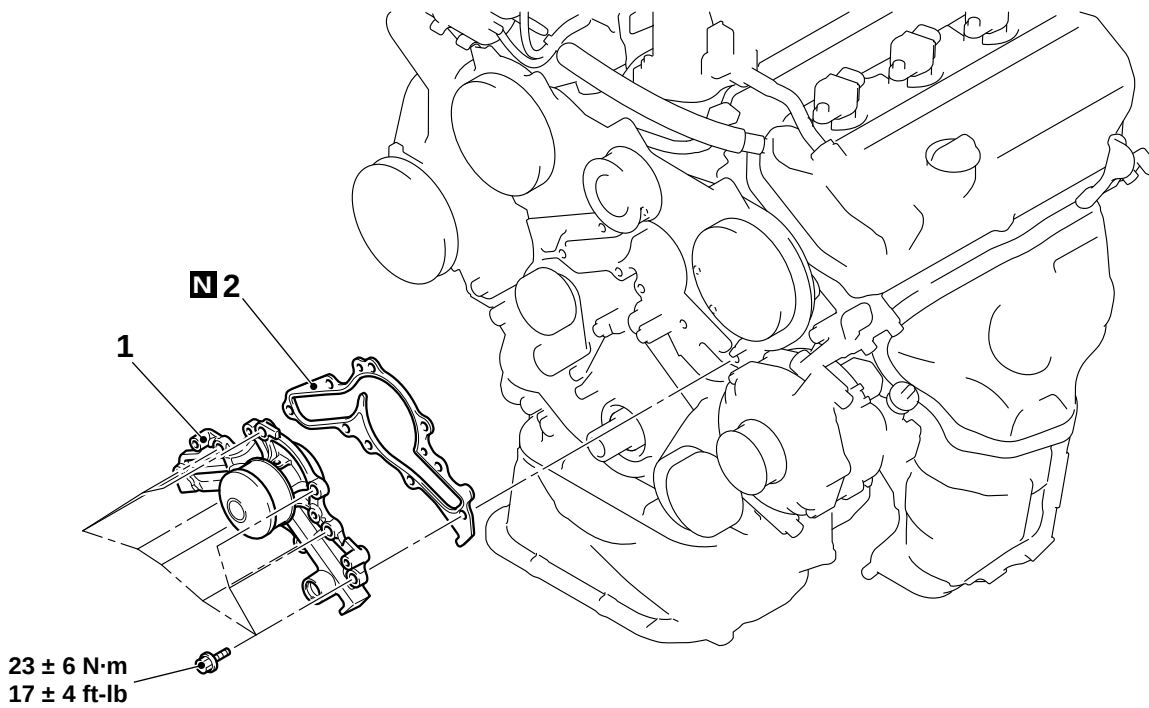
WATER PUMP

REMOVAL AND INSTALLATION

M11401000027USA0000010000

Pre-removal and Post-installation Operation

- Engine Coolant Draining and Refilling (Refer to P.14-15).
- Timing Belt Removal and Installation (Refer to GROUP 11A, Timing Belt P.11A-49).



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Removal steps

1. Water pump

Removal steps

2. Water pump gasket

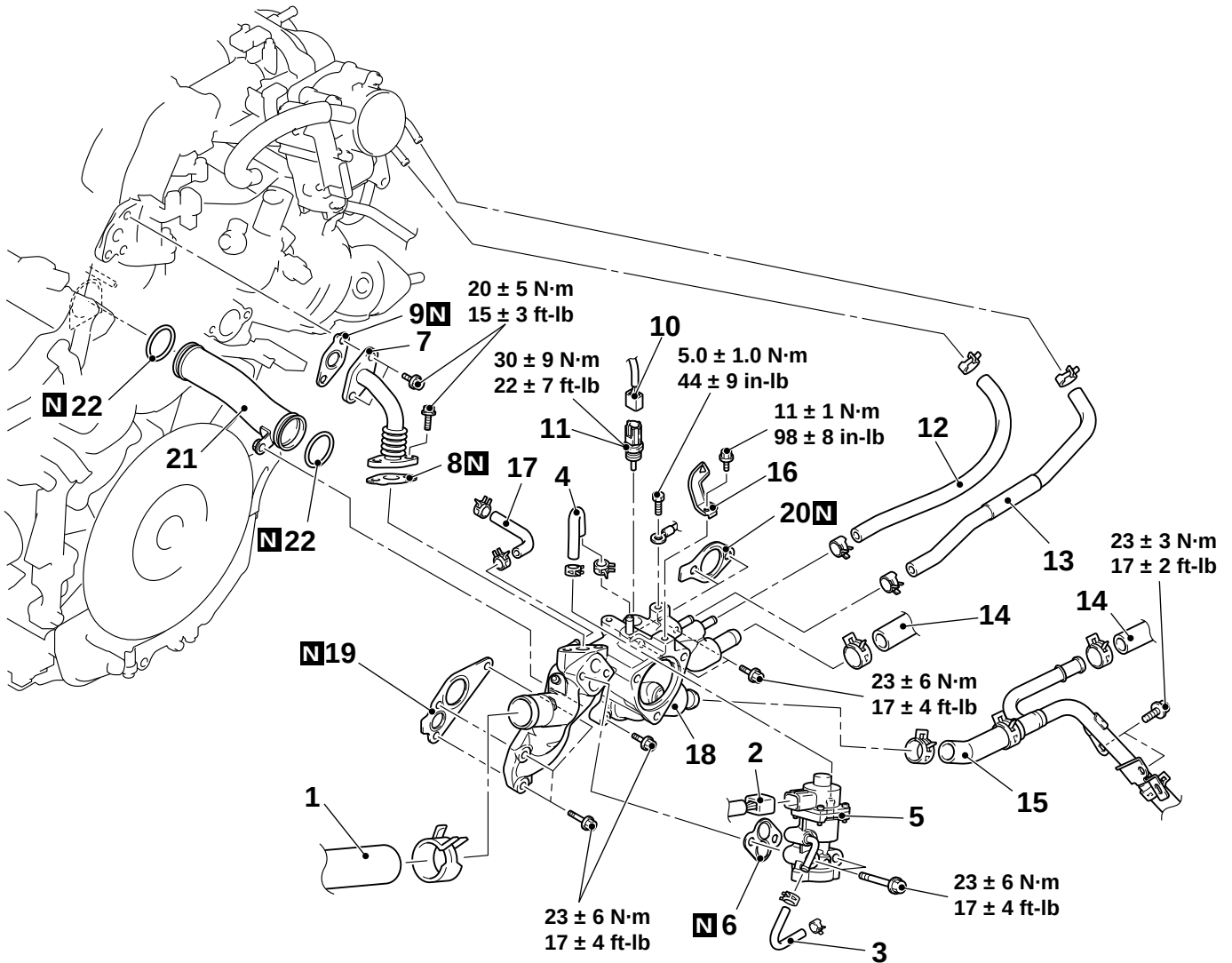
WATER HOSE AND WATER PIPE

REMOVAL AND INSTALLATION

M11401000033USA0000010000

Pre-removal and Post-installation Operation

- Thermostat Removal and Installation (Refer to P.14-19).



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Removal steps

- <<A>> >>D<<
1. Radiator upper hose connection
 2. EGR valve connector
 3. Water hose
 4. Water hose
 5. EGR valve
 6. EGR valve gasket
 7. EGR pipe
 8. EGR pipe gasket
 9. EGR pipe gasket

<> >>C<<

Removal steps

10. Engine coolant temperature sensor connector
11. Engine coolant temperature sensor
12. Water hose
13. Water hose
14. Heater hose connection
15. Water return hose and pipe assembly connection
16. Harness bracket

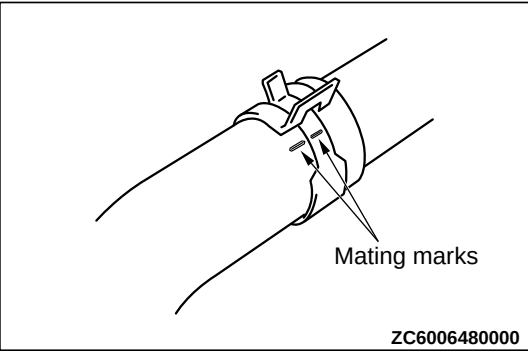
Removal steps		Removal steps		
<<C>>	>>B<<	Oil pipe clamp bolt (Refer to GROUP 11A, Cylinder Head Gasket P. 11A-45).	>>B<<	19. Gasket
			>>B<<	20. Gasket
	17.	Water hose		21. Water inlet pipe
	>>B<<	18. Thermostat housing	>>A<<	22. O-ring

Required Special Tools:

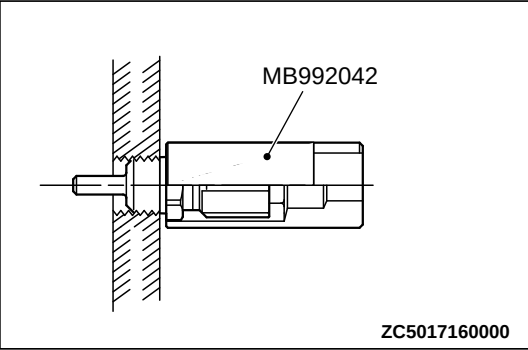
- MD998412: Guide
- MB992042: Engine Coolant Temperature Sensor Wrench

REMOVAL SERVICE POINTS

<<A>> RADIATOR UPPER HOSE DISCONNECTION
Make mating marks on the radiator hose and the hose clamp.
Disconnect the radiator hose.

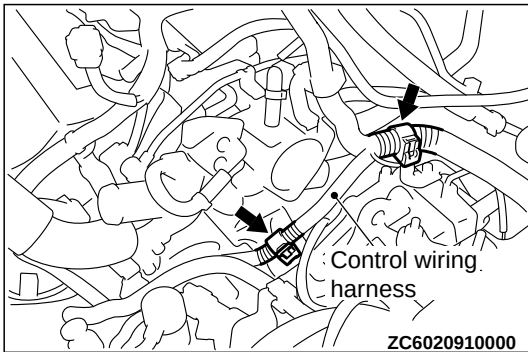


<> ENGINE COOLANT TEMPERATURE SENSOR
REMOVAL
Use special tool MB992042 to remove the engine coolant temperature sensor.



<<C>> THERMOSTAT HOUSING REMOVAL

Remove the two control wiring harness clamps, and remove the thermostat housing.



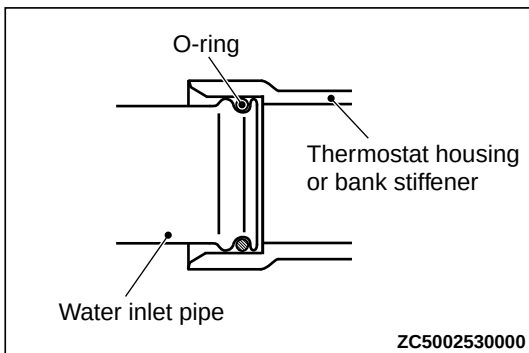
INSTALLATION SERVICE POINTS

>>A<< O-RING INSTALLATION

CAUTION

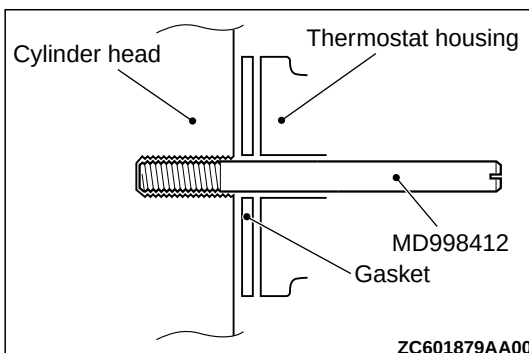
Do not allow engine oil or other grease to adhere to the O-ring

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



>>B<< GASKET/THERMOSTAT HOUSING INSTALLATION

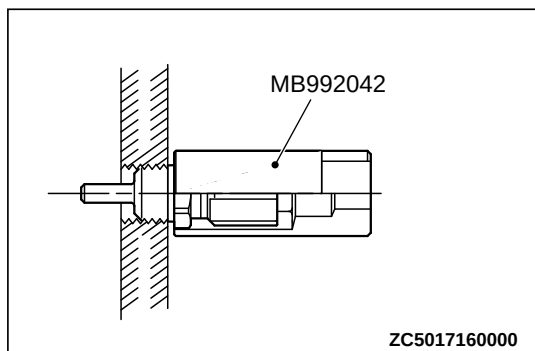
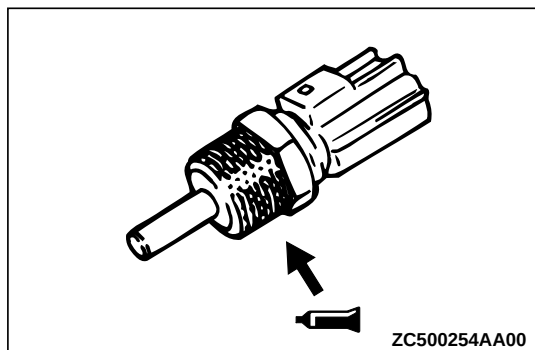
Using the special tool MD998412, install the thermostat housing while supporting the gasket.



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

1. Apply the specified sealant to the thread of the engine coolant temperature sensor.

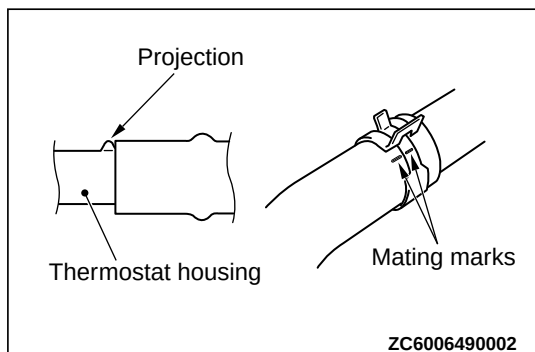
Specified Sealant: 3M™ AAD Part No. 8731 or equivalent



2. Use special tool MB992042 to install the engine coolant temperature sensor.

>>D<< RADIATOR UPPER HOSE INSTALLATION

1. Insert each hose as far as the projection of the thermostat housing.
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 and clogs. Replace them if necessary.

RADIATOR

REMOVAL AND INSTALLATION

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

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sensor is removed from the radiator, the engine control module (ECM) 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.

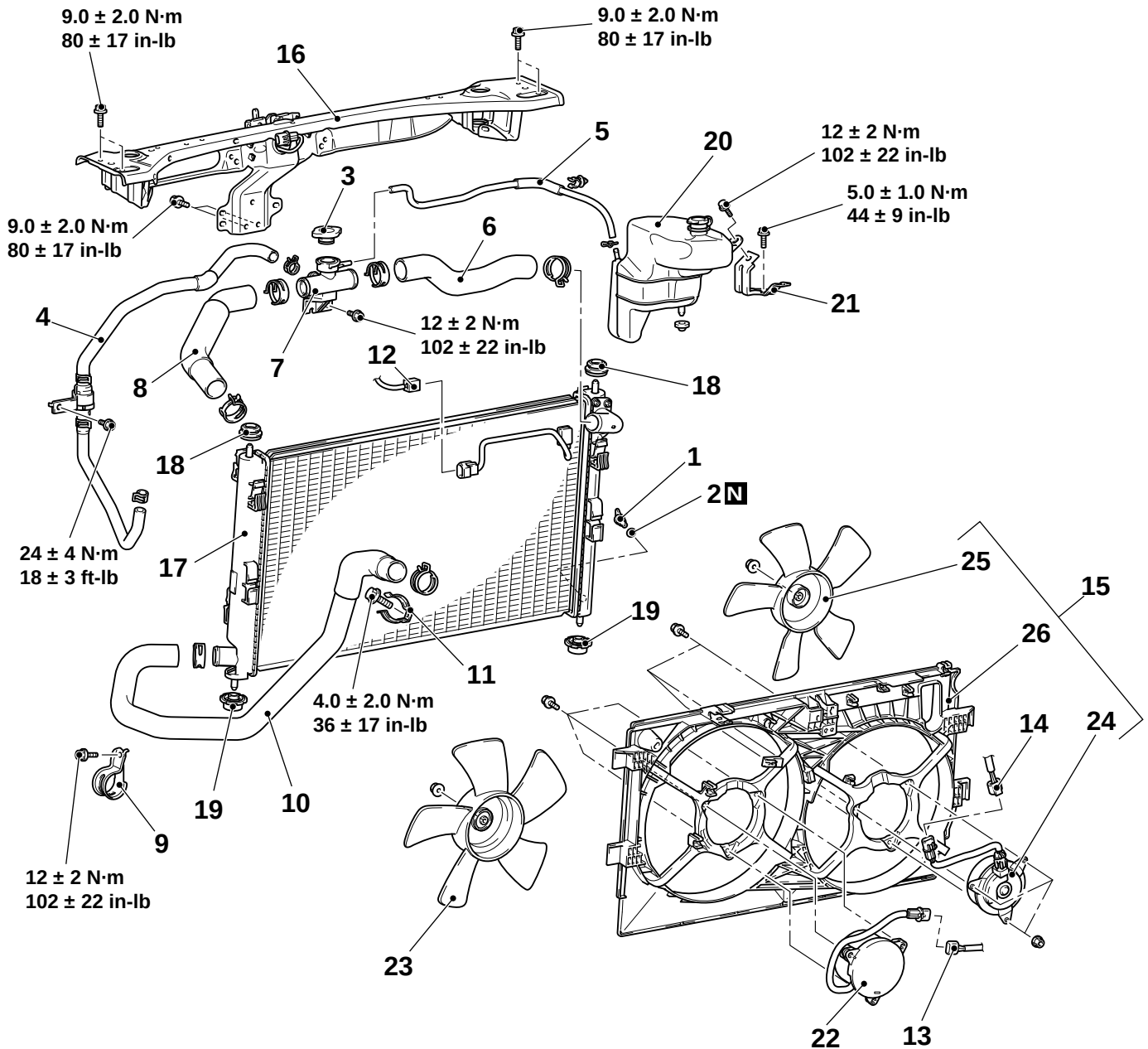
Pre-removal Operation

- Engine Coolant Draining (Refer to P.14-15).
- Air Cleaner Removal (Refer to GROUP 15, Air Cleaner P. 15-6).

Post-installation Operation

- Air Cleaner Installation (Refer to GROUP 15, Air Cleaner P. 15-6).
- Engine Coolant Refilling and Level Check (Refer to P.14-15).
- Transmission Fluid Refilling and Level Check (Refer to GROUP 00, Maintenance Service - Transmission Fluid P.00-64).

ENGINE COOLING RADIATOR



ZC600426AA00

Radiator removal steps

1. Drain plug
2. O-ring
3. Radiator cap
4. Transmission oil cooler line hose and tube assembly
5. Radiator condenser tank hose
- <<A>> >>A<< 6. Radiator upper hose
- <<A>> >>A<< 7. Radiator cap assembly
- <<A>> >>A<< 8. Radiator upper hose
9. Clamp
- <<A>> >>A<< 10. Radiator lower hose

Radiator removal steps

11. Radiator hose support
12. Radiator sensor connector <DOR radiator>
13. Radiator fan motor connector
14. Condenser fan motor connector
15. Fan, fan motor and cooling fan shroud assembly
- Radiator grille, headlight support upper panel cover (Refer to GROUP 51A, Radiator Grille P.51A-7).

Radiator removal steps

- Front impact sensor (Refer to GROUP 52B, Front Impact Sensor P. 52B-324).
- Hood lock release cable, hood latch (Refer to GROUP 42Aa, Hood P. 42Aa-5).
- 16. Front end upper bar assembly
- 17. Radiator assembly
- 18. Support upper insulator
- 19. Support lower insulator
- 20. Radiator condenser tank
- 21. Radiator condenser tank bracket

Cooling fan shroud removal steps

- 5. Radiator condenser tank hose

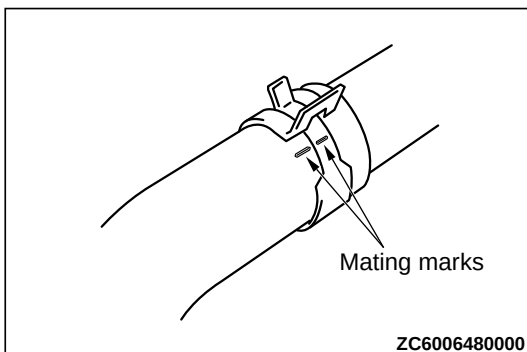
Cooling fan shroud removal steps

- 6. Radiator upper hose
- 7. Radiator cap assembly
- 12. Radiator sensor connector <DOR radiator>
- 13. Radiator fan motor connector
- 14. Condenser fan motor connector
- 15. Fan, fan motor and cooling fan shroud assembly
- 22. Radiator fan motor
- 23. Fan
- 24. Condenser fan motor
- 25. Fan
- 26. Cooling fan shroud

REMOVAL SERVICE POINT

<<A>> RADIATOR UPPER HOSE/RADIATOR LOWER HOSE DISCONNECTION

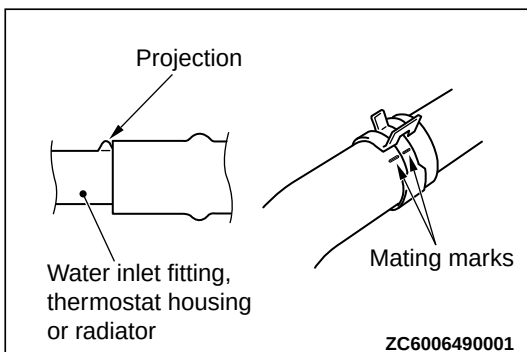
Make mating marks on the radiator hose and the hose clamp. Disconnect the radiator hose.



INSTALLATION SERVICE POINT

>>A<< RADIATOR LOWER HOSE/RADIATOR UPPER HOSE INSTALLATION

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



14-30

MEMO