

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 temper-

ature, the thermostat opens to circulate the coolant through the radiator as well so that the heat absorbed by the coolant may be radiated into the air. The water pump is of the centrifugal type and is driven by the timing belt from the crankshaft. The radiator is the corrugated fin, down flow type.

| Item | | Specification |
|-------------------------------|------------------|---------------|
| Radiator | Performance kJ/h | 215,586 |
| Transmission oil cooler <A/T> | Performance kJ/h | 6,300 |

SERVICE SPECIFICATIONS

M1141000300568

| Item | | Standard value | Limit |
|--|--|--|------------|
| High-pressure valve opening pressure of radiator cap kPa | | 93 – 123 | Minimum 83 |
| Range of coolant antifreeze concentration of radiator % | | 30 – 60 | - |
| Cooling fan motor drive control unit terminal voltage | Between cooling fan motor drive control unit harness side connector terminal 1 and 3 (ignition switch: ON) V | System voltage | - |
| | Between cooling fan motor (L.H.) connector terminal 1 and 2 (A/C switch: OFF) V | 1 or less | - |
| | Between cooling fan motor (L.H.) connector terminal 1 and 2 (A/C switch: ON) V | 1 or less \Leftrightarrow 8.2 \pm 0.7 \Leftrightarrow system voltage \pm 2.6 | - |
| Thermostat | Valve opening temperature of thermostat °C | 82 \pm 1.5 | - |
| | Full-opening temperature of thermostat °C | 95 | - |
| | Valve lift mm | 8.5 or more | - |

LUBRICANT

M1141000400617

| Item | Specified coolant | Quantity L |
|----------------|---|---|
| Engine coolant | DIAQUEEN SUPER LONG LIFE COOLANT or an equivalent | 7.0 (including 0.65 L in the radiator condenser tank) |

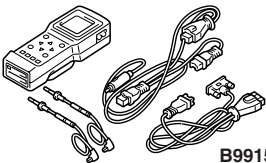
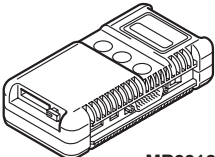
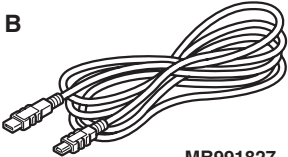

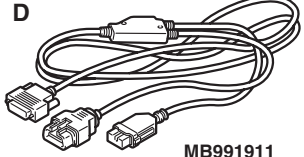
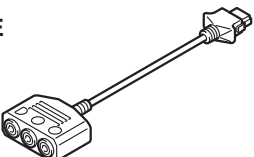

SEALANTS


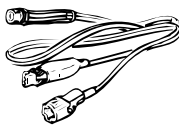
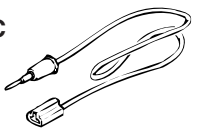
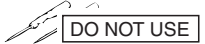
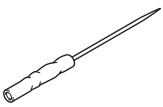
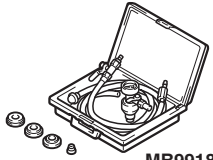
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| Item | Specified sealant |
|---------------------------------------|---|
| Cylinder block drain plug | 3M Nut Locking Part No.4171 or equivalent |
| Thermostat case, Water outlet fitting | MITSUBISHI GENUINE Part No.MD970389 or equivalent |
| Thermostat case assembly bolt | 3M Stud Locking 4170 or equivalent |

SPECIAL TOOLS

M1141000600570

| Tool | Number | Name | Use |
|--|---|---|---|
|  <p>B991502</p> | MB991502 | M.U.T.-II sub assembly | Checking the cooling system |
| <p>A</p>  <p>MB991824</p> <p>B</p>  <p>MB991827</p> <p>C</p>  <p>DO NOT USE</p> <p>MB991910</p> <p>D</p>  <p>MB991911</p> <p>E</p>  <p>MB991825</p> <p>F</p>  <p>MB991826</p> <p>MB991955</p> | <p>MB991955</p> <p>A: MB991824</p> <p>B: MB991827</p> <p>C: MB991910</p> <p>D: MB991911</p> <p>E: MB991825</p> <p>F: MB991826</p> | <p>M.U.T.-III sub assembly</p> <p>A: Vehicle communication interface (V.C.I.)</p> <p>B: M.U.T.-III USB cable</p> <p>C: M.U.T.-III main harness A (Vehicles with CAN communication system)</p> <p>D: M.U.T.-III main harness B (Vehicles without CAN communication system)</p> <p>E: M.U.T.-III measurement adapter</p> <p>F: M.U.T.-III trigger harness</p> | <p>Checking the cooling system (Diagnosis display using the M.U.T.-III)</p> |

| Tool | Number | Name | Use |
|---|---|--|--|
| <p>A</p>  <p>B</p>  <p>C</p>  <p>D</p>  <p>MB991223AZ</p> | <p>MB991223</p> <p>A: MB991219</p> <p>B: MB991220</p> <p>C: MB991221</p> <p>D: MB991222</p> | <p>Harness set</p> <p>A: Check harness</p> <p>B: LED harness</p> <p>C: LED harness adapter</p> <p>D: Probe</p> | <p>Continuity check and voltage measurement at harness wire or connector</p> <p>A: For checking connector pin contact pressure</p> <p>B: For checking power supply circuit</p> <p>C: For checking power supply circuit</p> <p>D: For connecting a locally sourced tester</p> |
|  <p>MB992006</p> | MB992006 | Extra fine probe | Continuity check and voltage measurement at harness wire or connector |
|  <p>MB991871</p> | MB991871 | LLC changer | Coolant refilling |

TROUBLESHOOTING

INSPECTION CHART FOR TROUBLE SYMPTOMS

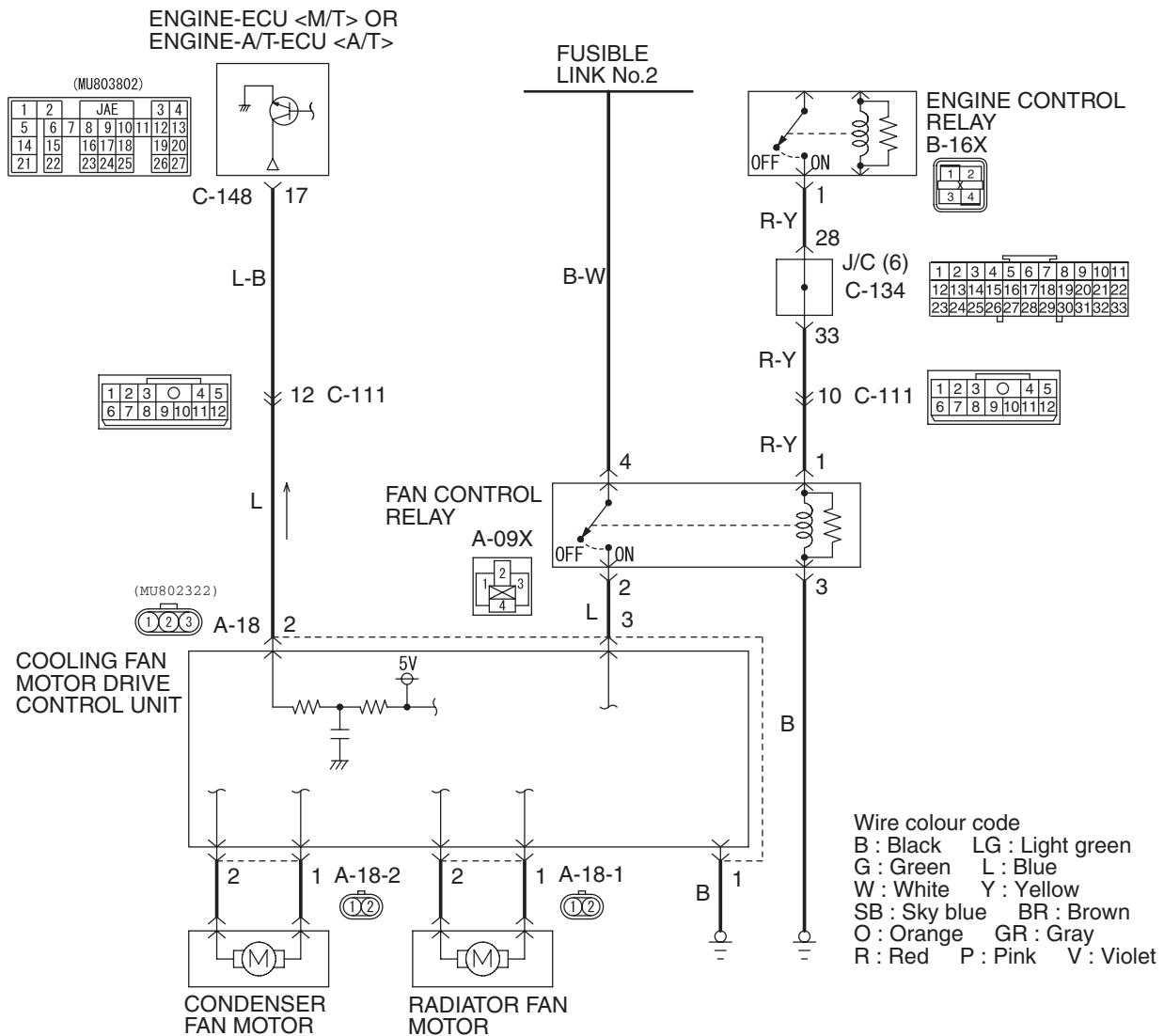
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| Trouble symptom | Inspection procedure No. | Reference page |
|--|--------------------------|----------------|
| Radiator fan and condenser fan do not operate | 1 | P.14-5 |
| Radiator fan and condenser fan do not change speed or stop | 2 | P.14-15 |
| Radiator fan does not operate (When condenser fan operate) | 3 | P.14-19 |
| Condenser fan does not operate (When Radiator fan operate) | 4 | P.14-20 |

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

INSPECTION PROCEDURE 1: Radiator Fan and Condenser Fan do not Operate

Radiator Fan and Condenser Fan Drive Circuit



AC504946AB

CIRCUIT OPERATION

- The cooling fan motor drive control unit is powered from fusible link (2).
- The engine-ECU <M/T> or engine-A/T-ECU <A/T> uses input signals from the A/C switch, the water temperature sensor unit and the vehicle speed sensor <M/T> or the output shaft speed sensor <A/T> to control the speed of the radiator fan motor and the condenser fan motor.
- The engine-ECU <M/T> or engine-A/T-ECU <A/T> controls the cooling fan motor drive control unit to activate the radiator fan motor and the condenser fan motor.

TECHNICAL DESCRIPTION

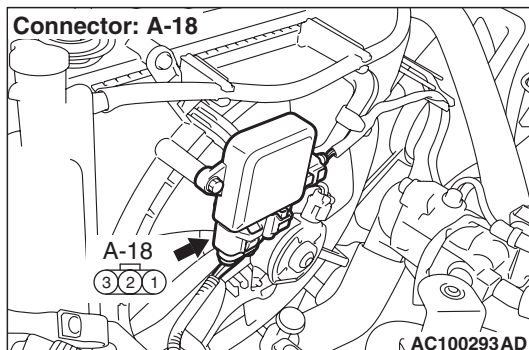
- The cause could be a malfunction of the cooling fan motor drive control unit power supply or earth circuit.
- If the communication line wiring harness between the cooling fan motor drive control unit and the engine-ECU <M/T> or engine-A/T-ECU <A/T> is short-circuited to earth, the radiator fan motor and the condenser fan motor will not rotate.
- The cause could also be a malfunction of input signal from the A/C switch, the water temperature sensor unit and the vehicle speed sensor <M/T> or the output shaft speed sensor <A/T> to the engine-ECU <M/T> or engine-A/T-ECU <A/T>.
- The cause could also be a malfunction of the cooling fan motor drive control unit or the engine-ECU <M/T> or engine-A/T-ECU <A/T>.

TROUBLESHOOTING HINTS

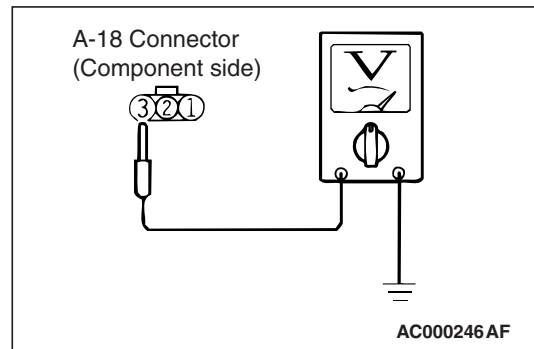
- Malfunction of fusible link (2)
- Malfunction of fan control relay
- Malfunction of cooling fan motor drive control unit
- Malfunction of engine-ECU <M/T> or engine-A/T-ECU <A/T>
- Damaged wiring harness or connector

DIAGNOSIS

STEP 1. Measure the power supply voltage at cooling fan motor drive control unit connector A-18.



- (1) Disconnect cooling fan motor drive control unit connector A-18 and measure wiring harness side connector.
- (2) Turn the ignition switch to the "ON" position.



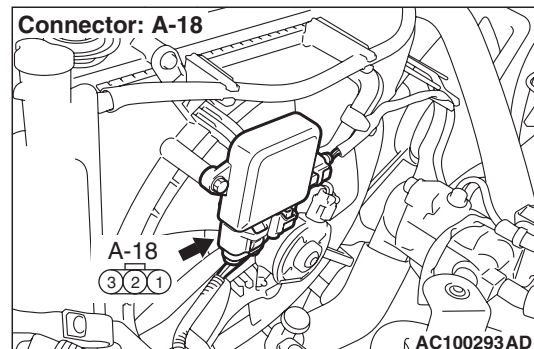
- (3) Measure the voltage between cooling fan motor drive control unit connector A-18 terminal 3 and body earth.
 - The voltage should measure system voltage.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.
- (5) Connect cooling fan motor drive control unit connector A-18.

Q: Is the measured voltage system voltage?

YES : Go to Step 16.

NO : Go to Step 2.

STEP 2. Check the cooling fan motor drive control unit connector A-18.

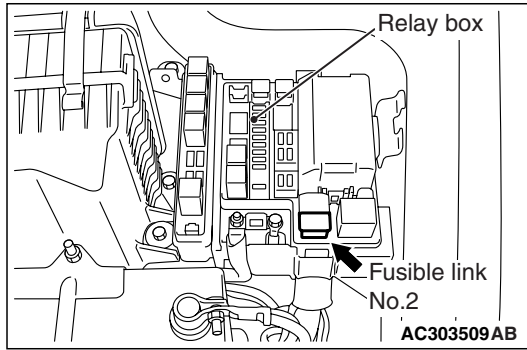


Q: Is the connector in good condition?

YES : Go to Step 3.

NO : Repair or replace the connector. Then go to Step 23.

STEP 3. Check the fusible link No.2.

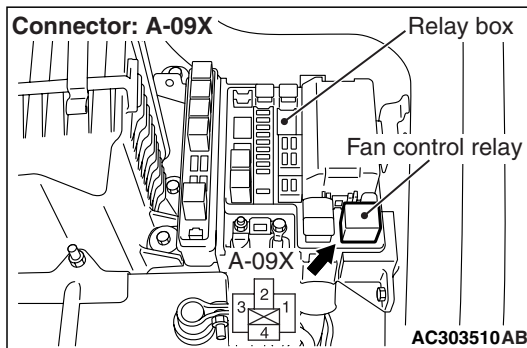


Q: Is the fusible link No.2 in good condition?

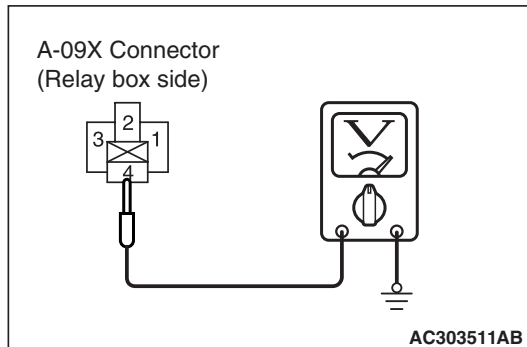
YES : Go to Step 4.

NO : Replace the fusible link No.2. Then go to Step 23.

STEP 4. Measure the power supply voltage at fan control relay connector A-09X.



- (1) Disconnect fan control relay connector A-09X (remove the fan control relay) and measure relay box side connector.
- (2) Turn the ignition switch to the "ON" position.



- (3) Measure the voltage between fan control relay connector A-09X terminal 4 and body earth.
 - The voltage should measure system voltage.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

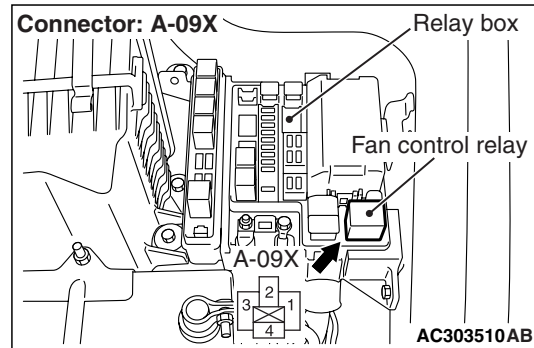
- (5) Connect fan control relay connector A-09X (install the fan control relay).

Q: Is the measured voltage system voltage?

YES : Go to Step 7.

NO : Go to Step 5.

STEP 5. Check the fan control relay connector A-09X.

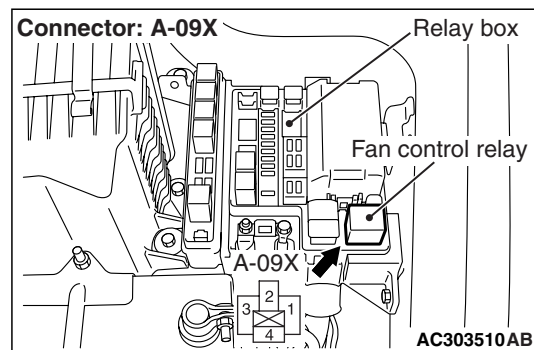
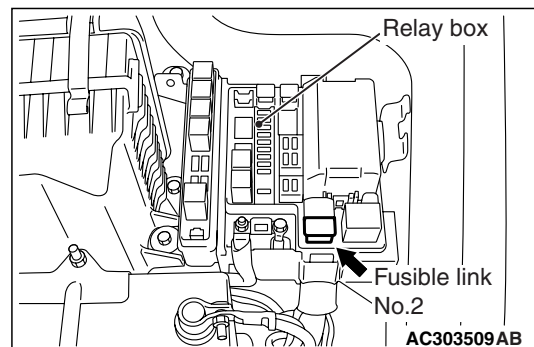


Q: Is the connector in good condition?

YES : Go to Step 6.

NO : Repair the connector or replace the relay box. Then go to Step 23.

STEP 6. Check the harness wire between fusible link No.2 and fan control relay connector A-09X terminal 4.

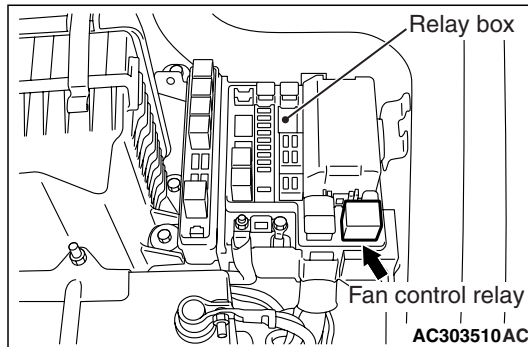


Q: Is the harness wire in good condition?

YES : An intermittent malfunction is suspected (Refer to GROUP 00 –How to use troubleshooting/inspection service points, How to cope with intermittent malfunction P.00-13).

NO : Repair the damaged harness wire. Then go to Step 23.

STEP 7. Check the fan control relay.



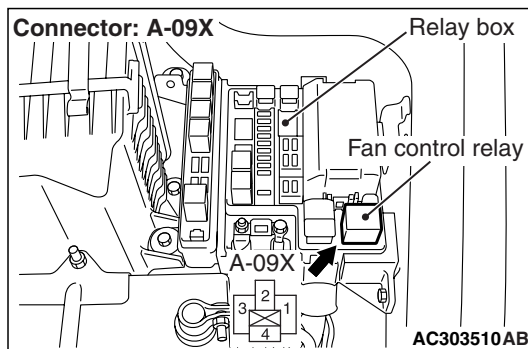
Refer to P.14-23.

Q: Is the fan control relay in good condition?

YES : Go to Step 8.

NO : Replace the fan control relay. Then go to Step 23.

STEP 8. Check the fan control relay connector A-09X.

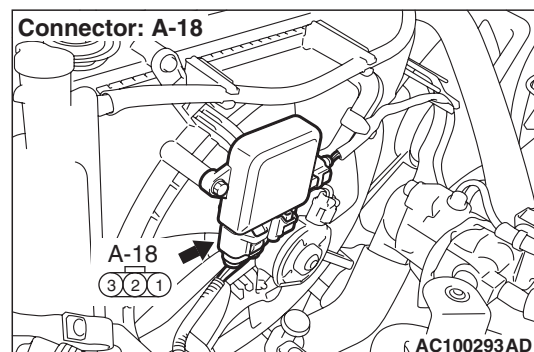
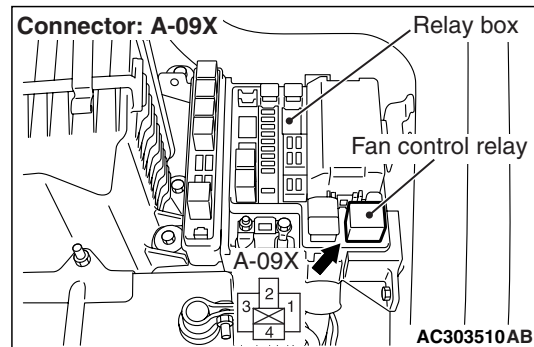


Q: Is the connector in good condition?

YES : Go to Step 9.

NO : Repair the connector or replace the relay box. Then go to Step 23.

STEP 9. Check the harness wire between fan control relay connector A-09X terminal 2 and cooling fan motor drive control unit connector A-18 terminal 3.

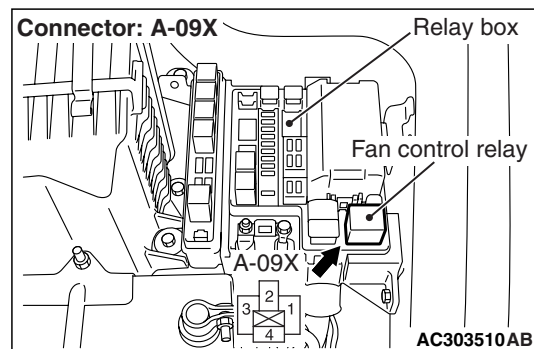


Q: Is the harness wire in good condition?

YES : Go to Step 10.

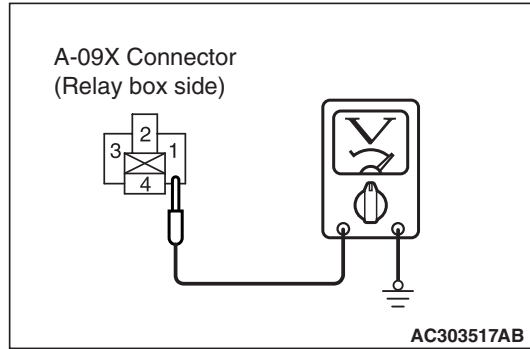
NO : Repair the damaged harness wire. Then go to Step 23.

STEP 10. Measure the terminal voltage at fan control relay connector A-09X.



- (1) Disconnect fan control relay connector A-09X (remove the fan control relay) and measure relay box side connector.

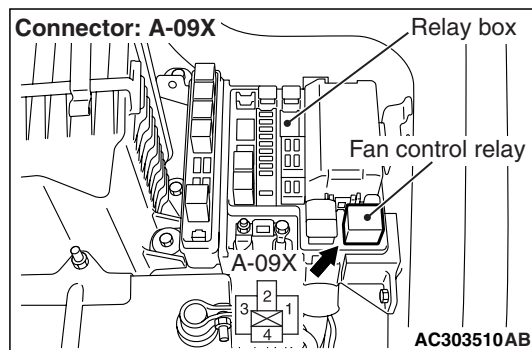
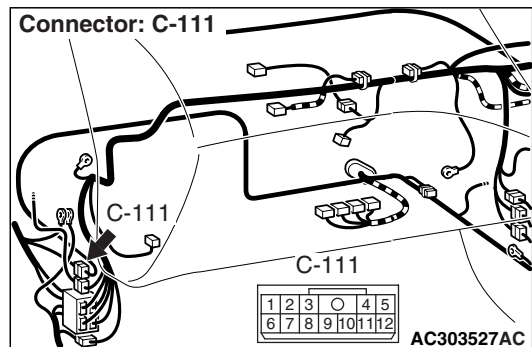
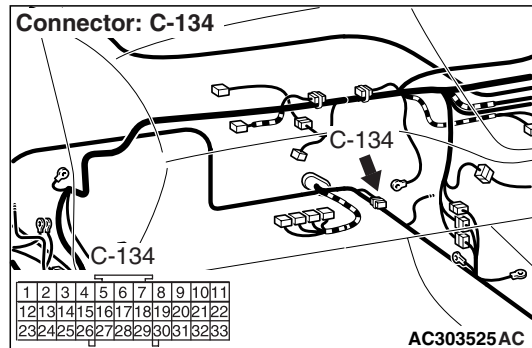
(2) Turn the ignition switch to the "ON" position.



- (3) Measure the voltage between fan control relay connector A-09X terminal 1 and body earth.
- The voltage should measure system voltage.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.
- (5) Connect fan control relay connector A-09X (install the fan control relay).

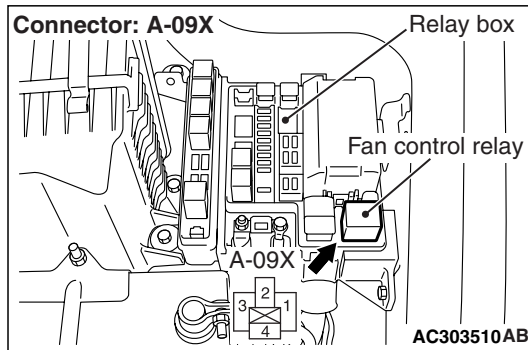
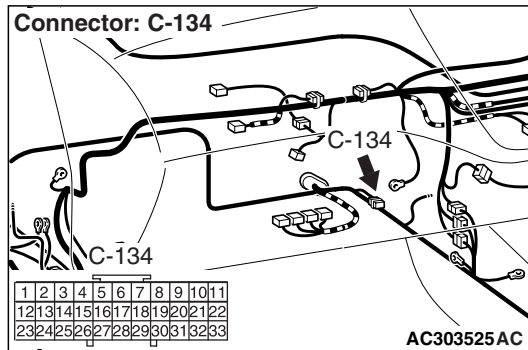
Q: Is the measured voltage system voltage?
YES : Go to Step 13.
NO : Go to Step 11.

STEP 11. Check the J/C No.6 C-134, intermediate connector C-111 and fan control relay connector A-09X.



Q: Are there connectors in good condition?
YES : Go to Step 12.
NO : Repair or replace the connector. Then go to Step 23.

STEP 12. Check the harness wire between J/C No.6 C-134 terminal 33 and fan control relay connector A-09X terminal 1.

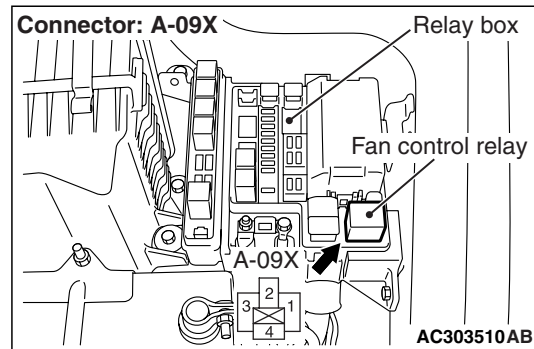


Q: Are these harness wires in good condition?

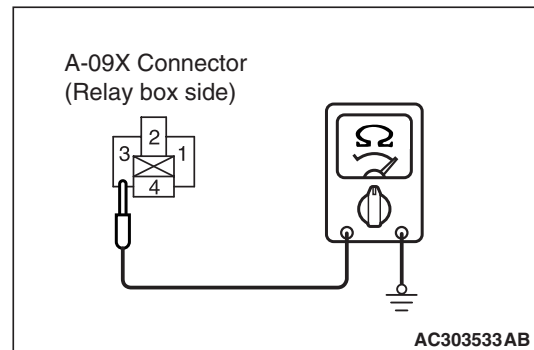
YES : An intermittent malfunction is suspected
(Refer to GROUP 00 –How to use troubleshooting/inspection service points, How to cope with intermittent malfunction P.00-13).

NO : Repair the damaged harness wire. Then go to Step 23.

STEP 13. Check the continuity between fan control relay connector A-09X and body earth.



(1) Disconnect fan control relay connector A-09X (remove the fan control relay) and measure relay box side connector.



(2) Measure the resistance between fan control relay connector A-09X terminal 3 and body earth.

- Continuity exists.

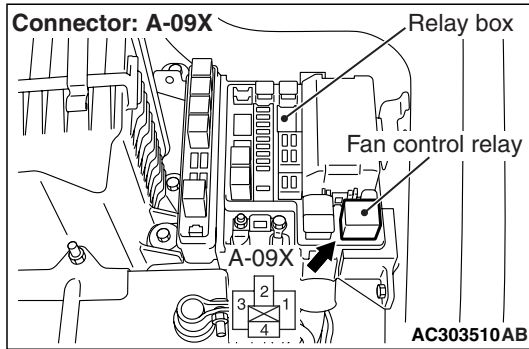
(3) Connect fan control relay connector A-09X (install the fan control relay).

Q: Does the continuity exists?

YES : An intermittent malfunction is suspected
(Refer to GROUP 00 –How to use troubleshooting/inspection service points, How to cope with intermittent malfunction P.00-13).

NO : Go to Step 14.

STEP 14. Check the fan control relay connector A-09X.

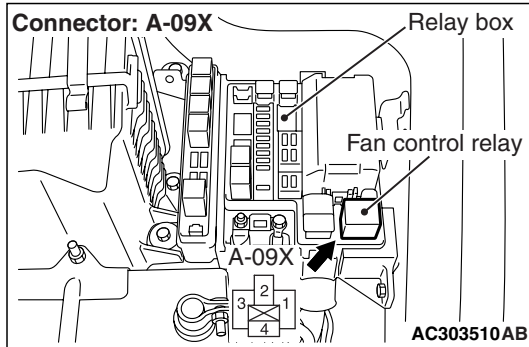


Q: Is the connector in good condition?

YES : Go to Step 15.

NO : Repair the connector or replace the relay box. Then go to Step 23.

STEP 15. Check the harness wire between fan control relay connector A-09X terminal 3 and body earth.

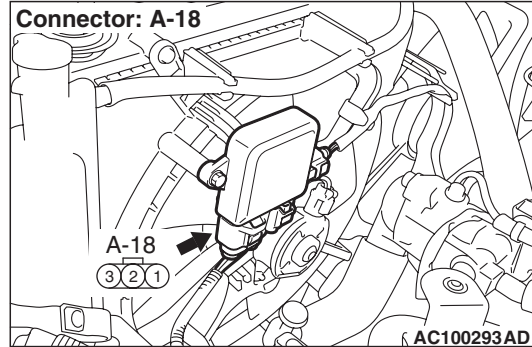


Q: Is the harness wire in good condition?

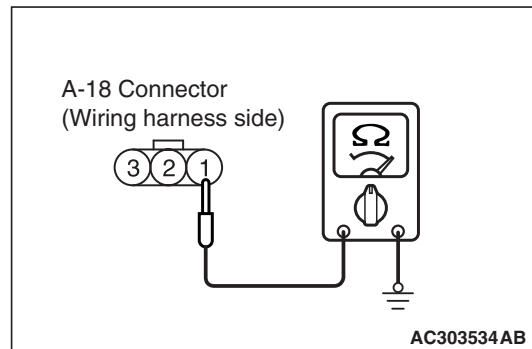
YES : An intermittent malfunction is suspected (Refer to GROUP 00 –How to use troubleshooting/inspection service points, How to cope with intermittent malfunction [P.00-13](#)).

NO : Repair the damaged harness wire. Then go to Step 23.

STEP 16. Check the continuity between cooling fan motor drive control unit connector A-18 and body earth.



- (1) Disconnect cooling fan motor drive control unit connector A-18 and measure wiring harness side connector.



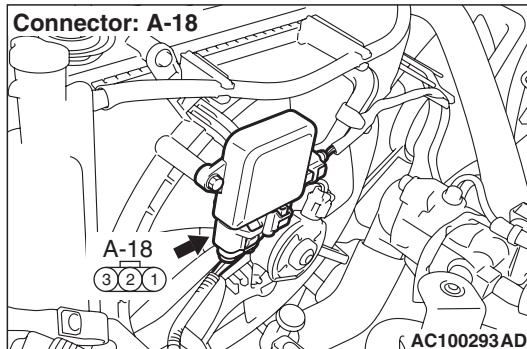
- (2) Measure the resistance between cooling fan motor drive control unit connector A-18 terminal 1 and body earth.
 - Continuity exists.
- (3) Connect cooling fan motor drive control unit connector A-18.

Q: Does the continuity exists?

YES : Go to Step 19.

NO : Go to Step 17.

STEP 17. Check the cooling fan motor drive control unit connector A-18.

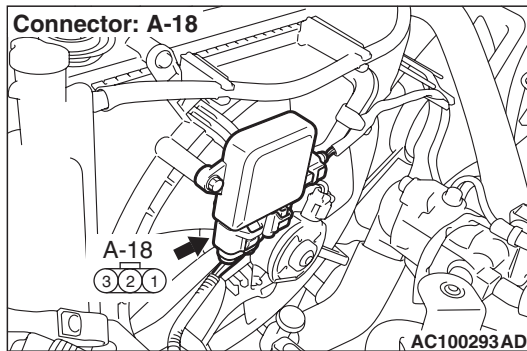


Q: Is the connector in good condition?

YES : Go to Step 18.

NO : Repair or replace the connector. Then go to Step 23.

STEP 18. Check the harness wire between cooling fan motor drive control unit connector A-18 terminal 1 and body earth.

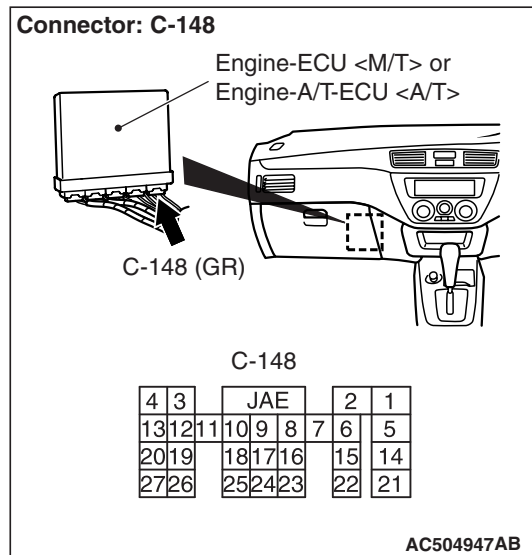
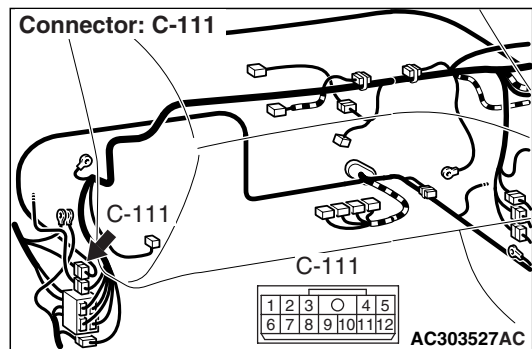
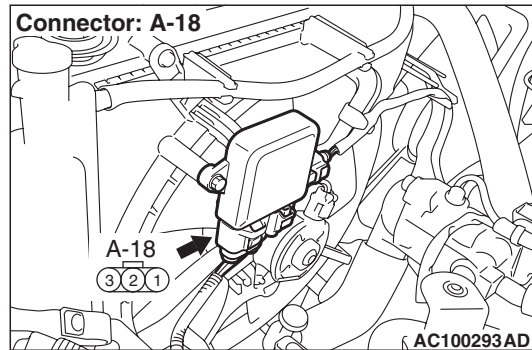


Q: Is the harness wire in good condition?

YES : An intermittent malfunction is suspected (Refer to GROUP 00 –How to use troubleshooting/inspection service points, How to cope with intermittent malfunction [P.00-13](#)).

NO : Repair the damaged harness wire. Then go to Step 23.

STEP 19. Check the cooling fan motor drive control unit connector A-18, intermediate connector C-111 and engine-ECU <M/T> or engine-A/T-ECU <A/T> connector C-148.

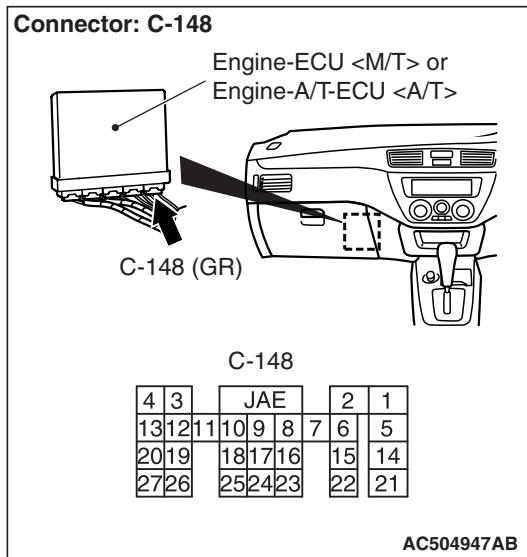
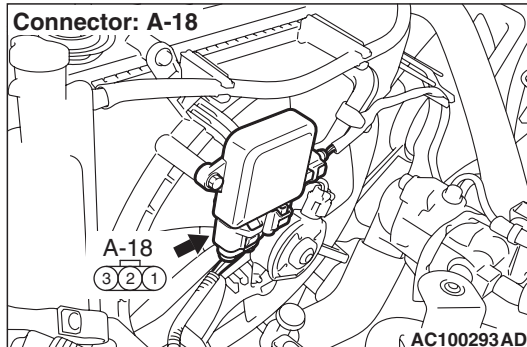


Q: Are these connectors in good condition?

YES : Go to Step 20.

NO : Repair or replace the connector. Then go to Step 23.

STEP 20. Check the harness wire between cooling fan motor drive control unit connector A-18 terminal 2 and engine-ECU <M/T> or engine-A/T-ECU <A/T> connector C-148 terminal 17 .

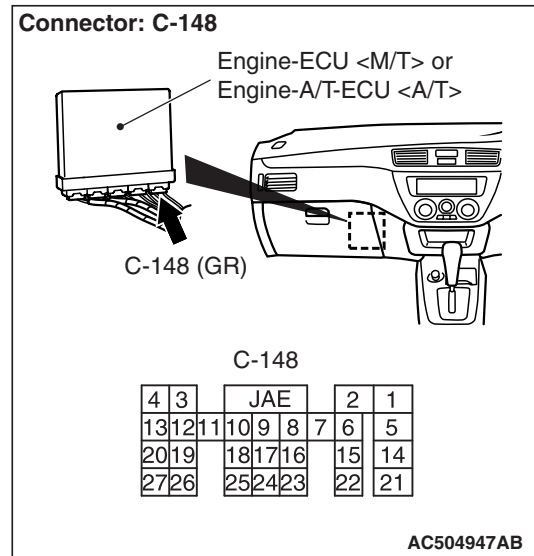


Q: Are these harness wires in good condition?

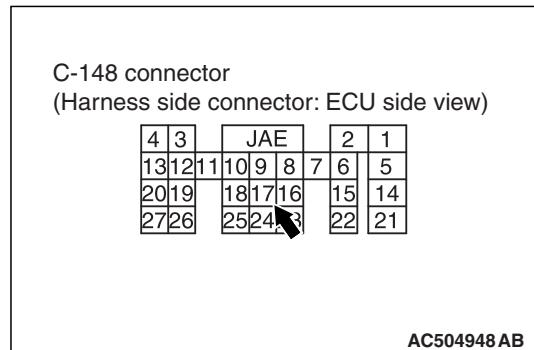
YES : Go to Step 21.

NO : Repair the damaged harness wire. Then go to Step 23.

STEP 21. Check the cooling fan motor drive control unit.



(1) Disconnect engine-ECU <M/T> or engine-A/T-ECU <A/T> connector C-148.

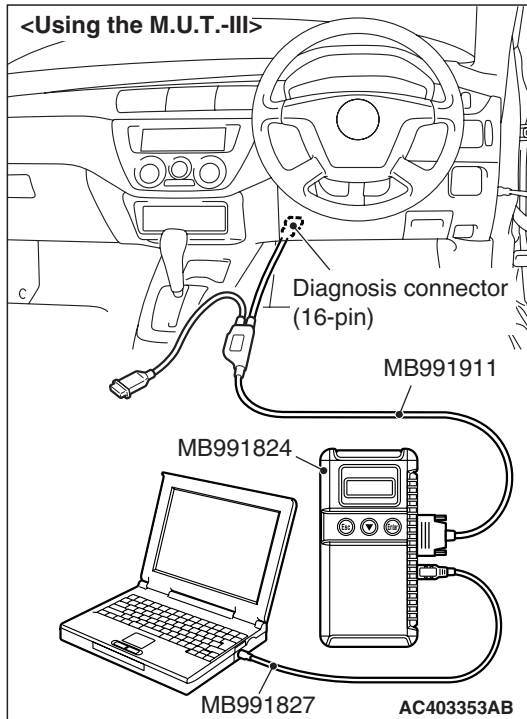
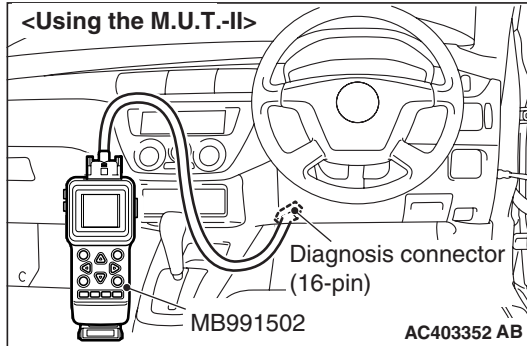


- (2) Pull out connector terminal pin 17 to disconnect connector.
- (3) Reconnect the connector with connector terminal pin still removed.
- (4) Turn the ignition switch to the "ON" position.
- (5) Check for the cooling fan operation.
 - The cooling fan rotates. (with connector terminal pin 17 disconnected)
 - The cooling fan stops. (When connector terminal pin 17 is connected to the body earth.)
- (6) Turn the ignition switch to the "OFF" position.
- (7) Disconnect engine-ECU <M/T> or engine-A/T-ECU <A/T> connector C-148, and push in connector terminal pin 17 to disconnect connector.
- (8) Reconnect the connector with connector terminal pin still installed.

- Q:** Does the cooling fan rotate? And when the connector terminal pin is connected to the body earth, does the cooling fan stop?
- YES :** Go to Step 22.
- NO :** Replace the cooling fan motor drive control unit (Refer to [P.14-30](#)). Then go to Step 23.

STEP 23. Check the symptoms.

- Q:** Does the radiator fan motor and the condenser fan motor operate correctly?
- YES :** This symptoms is complete.
- NO :** Return to Step 1.

STEP 22. M.U.T.-II/III self-diag code

Check if an MPI system self-diag code is set. (Refer to GROUP 13A –Troubleshooting, Diagnosis function [P.13A-10](#)).

Q: Diagnosis code set?

- YES :** Inspection chart for diagnosis code (Refer to GROUP 13A –Troubleshooting, inspection chart for diagnosis code [P.13A-19](#)).
- NO :** Replace the engine-ECU <M/T> or engine-A/T-ECU <A/T> (Refer to GROUP 13A –Engine-ECU and engine-A/T-ECU [P.13A-335](#)). Then go to Step 23.

INSPECTION PROCEDURE 2: Radiator Fan and Condenser Fan do not Change Speed or Stop

**RADIATOR FAN AND CONDENSER FAN
DRIVE CIRCUIT**

Refer to P.14-5.

CIRCUIT OPERATION

Refer to P.14-5.

TECHNICAL DESCRIPTION

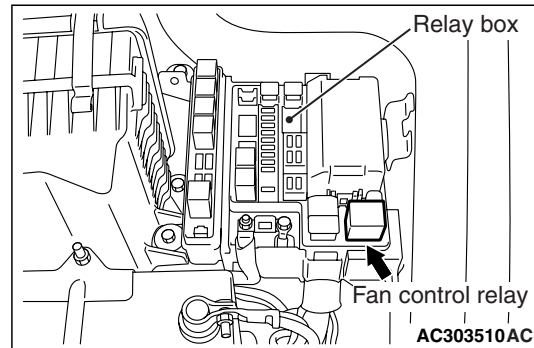
- If the communication line wiring harness between the cooling fan motor drive control unit and the engine-ECU <M/T> or the engine-A/T-ECU <A/T> is open, the radiator fan motor and the condenser fan motor rotate to prevent the engine from overheating.
- If the system voltage is continuously supplied to the cooling fan motor drive control unit by a fan motor relay malfunction and a short circuit on the cooling fan motor drive control unit power supply wiring harness, the radiator fan motor and the condenser fan motor rotate.
- The cause could also be a malfunction of input signal from the A/C switch, the water temperature sensor unit and the vehicle speed sensor <M/T> or the output shaft speed sensor <A/T> to the engine-ECU <M/T> or engine-A/T-ECU <A/T>.
- The cause could also be a malfunction of the cooling fan motor drive control unit or the engine-ECU <M/T> or engine-A/T-ECU <A/T>.

TROUBLESHOOTING HINTS

- Malfunction of fan control relay
- Malfunction of cooling fan motor drive control unit
- Malfunction of engine-ECU <M/T> or engine-A/T-ECU <A/T>
- Damaged wiring harness or connector

DIAGNOSIS

STEP 1. Check the fan control relay.



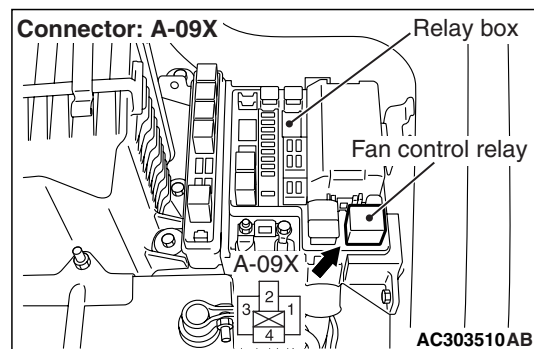
Refer to P.14-23.

Q: Is the fan control relay in good condition?

YES : Go to Step 2.

NO : Replace the fan control relay. Then go to Step 8.

STEP 2. Check the fan control relay connector A-09X.

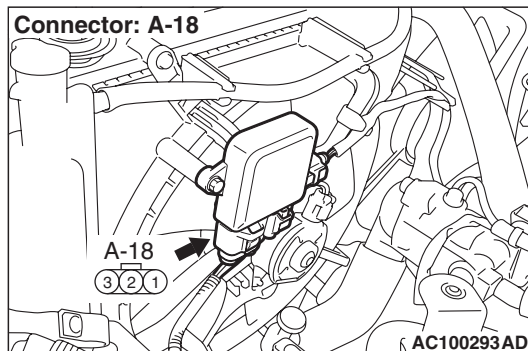
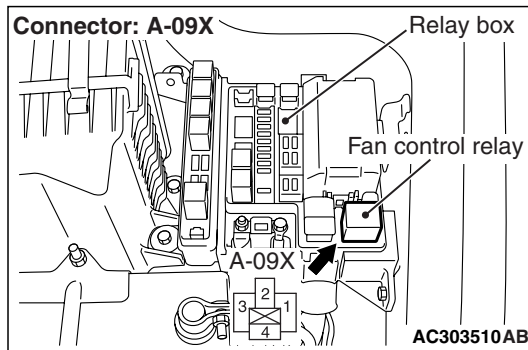


Q: Is the connector in good condition?

YES : Go to Step 3.

NO : Repair the connector or replace the relay box. Then go to Step 8.

STEP 3. Check the harness wire between fan control relay connector A-09X terminal 2 and cooling fan motor drive control unit connector A-18 terminal 3.

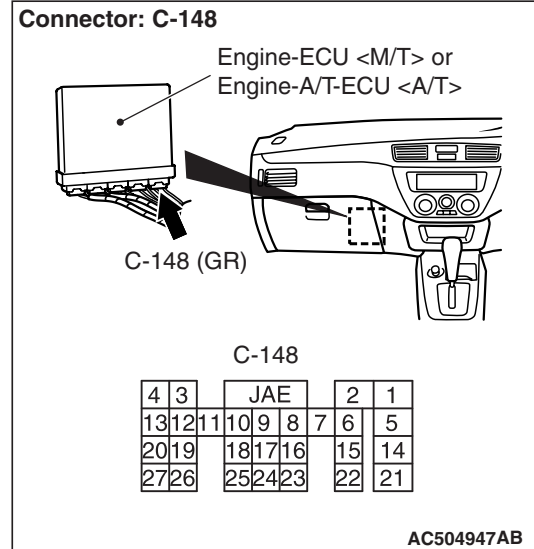
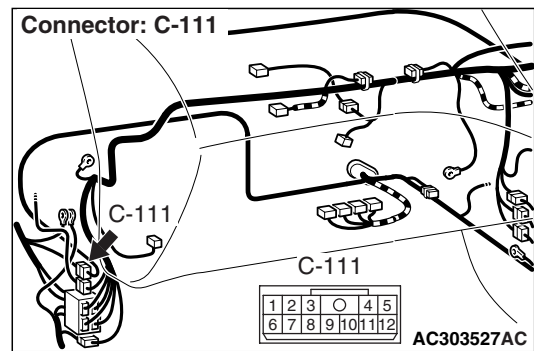
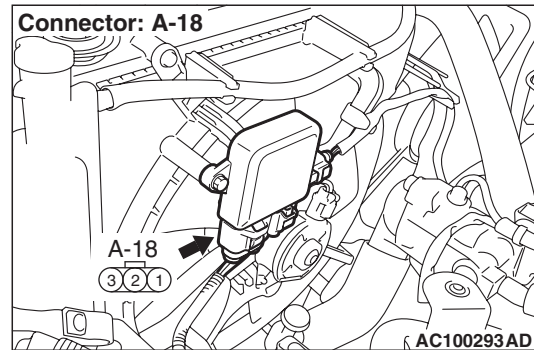


Q: Is the harness wire in good condition?

YES : Go to Step 4.

NO : Repair the damaged harness wire. Then go to Step 8.

STEP 4. Check the cooling fan motor drive control unit connector A-18, intermediate connector C-111 and engine-ECU <M/T> or engine-A/T-ECU <A/T> connector C-148.

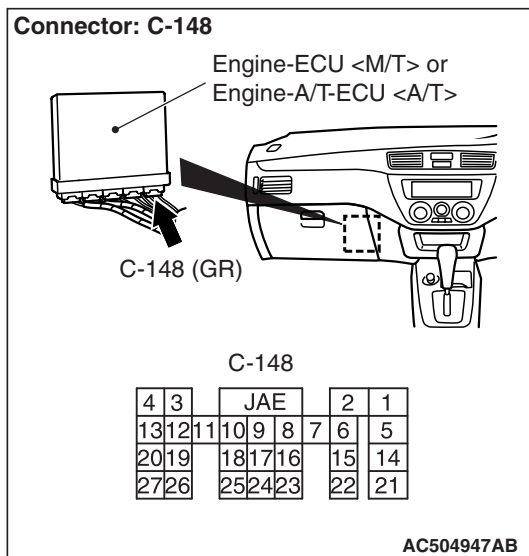
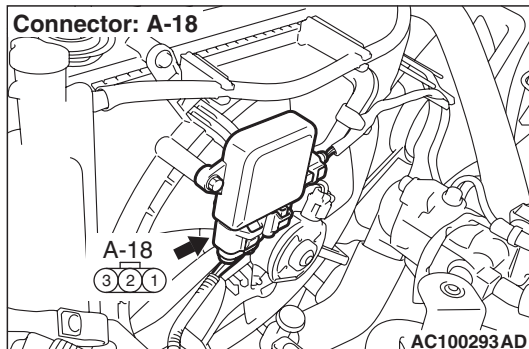


Q: Are these connectors in good condition?

YES : Go to Step 5.

NO : Repair or replace the connector. Then go to Step 8.

STEP 5. Check the harness wire between cooling fan motor drive control unit connector A-18 terminal 2 and engine-ECU <M/T> or engine-A/T-ECU <A/T> connector C-148 terminal 17.

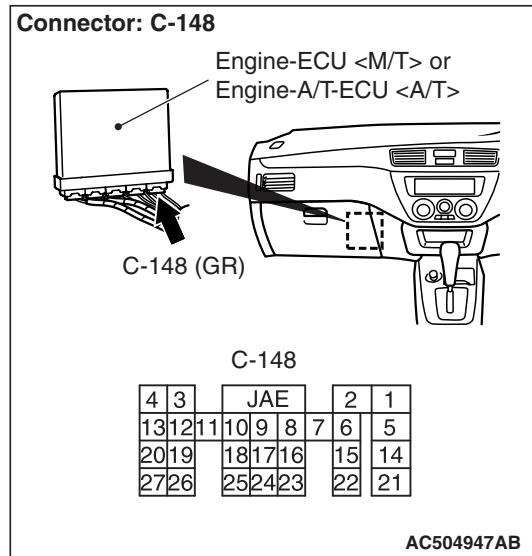


Q: Are these harness wires in good condition?

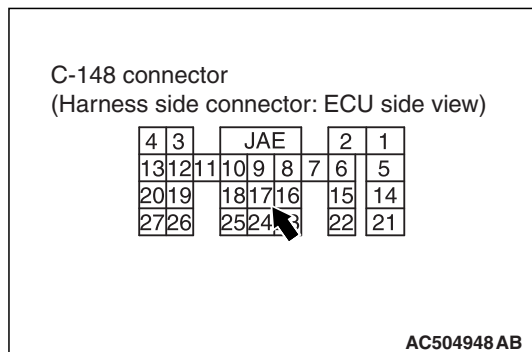
YES : Go to Step 6.

NO : Repair the damaged harness wire. Then go to Step 8.

STEP 6. Check the cooling fan motor drive control unit.



(1) Disconnect engine-ECU <M/T> or engine-A/T-ECU <A/T> connector C-148.

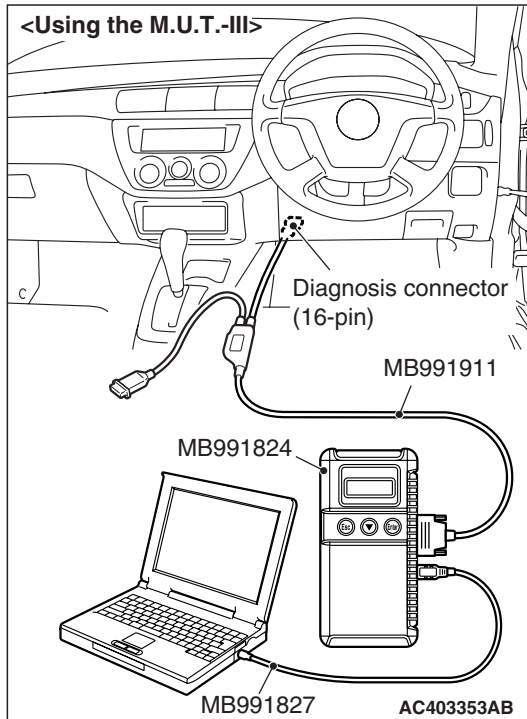
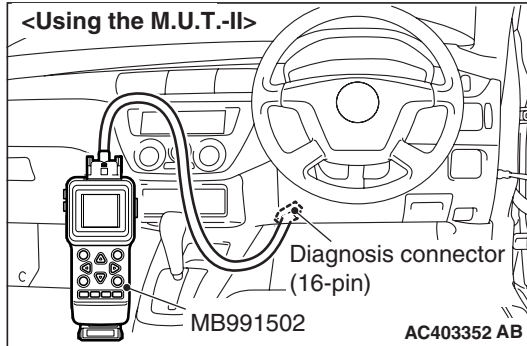


- (2) Pull out connector terminal pin 17 to disconnect connector.
- (3) Reconnect the connector with connector terminal pin still removed.
- (4) Turn the ignition switch to the "ON" position.
- (5) Check for the cooling fan operation.
 - The cooling fan rotates. (with connector terminal pin 17 disconnected)
 - The cooling fan stops. (When connector terminal pin 17 is connected to the body earth.)
- (6) Turn the ignition switch to the "OFF" position.
- (7) Disconnect engine-ECU <M/T> or engine-A/T-ECU <A/T> connector C-148, and push in connector terminal pin 17 to disconnect connector.
- (8) Reconnect the connector with connector terminal pin still installed.

- Q:** Does the cooling fan rotate? And when the connector terminal pin is connected to the body earth, does the cooling fan stop?
- YES :** Go to Step 7.
- NO :** Replace the cooling fan motor drive control unit (Refer to [P.14-30](#)). Then go to Step 8.

STEP 8. Check the symptoms.

- Q:** Does the radiator fan motor and the condenser fan motor operate correctly?
- YES :** This symptoms is complete.
- NO :** Return to Step 1.

STEP 7. M.U.T.-II/III self-diag code

Check if an MPI system self-diag code is set. (Refer to GROUP 13A –Troubleshooting, Diagnosis function [P.13A-10](#)).

Q: Diagnosis code set?

- YES :** Inspection chart for diagnosis code (Refer to GROUP 13A –Troubleshooting, inspection chart for diagnosis code [P.13A-19](#)).
- NO :** Replace the engine-ECU <M/T> or engine-A/T-ECU <A/T> (Refer to GROUP 13A –Engine-ECU and engine-A/T-ECU [P.13A-335](#)). Then go to Step 8.

INSPECTION PROCEDURE 3: Radiator Fan does not Operate (When Condenser Fan Operate)

RADIATOR FAN AND CONDENSER FAN DRIVE CIRCUIT

Refer to [P.14-5](#).

CIRCUIT OPERATION

Refer to [P.14-5](#).

TECHNICAL DESCRIPTION

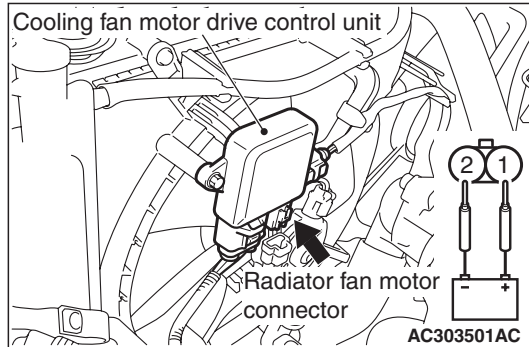
The cause could be a malfunction of the radiator fan motor or cooling fan motor drive control unit.

TROUBLESHOOTING HINTS

- Malfunction of radiator fan motor
- Malfunction of cooling fan motor drive control unit

DIAGNOSIS

STEP 1. Check the radiator fan motor.



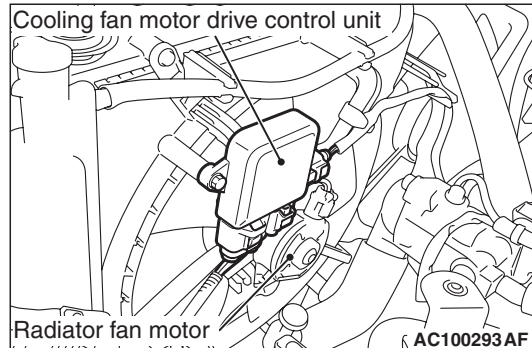
Refer to [P.14-24](#).

Q: Is the radiator fan motor in good condition?

YES : Go to Step 2.

NO : Replace the radiator fan motor (Refer to [P.14-30](#)). Then go to Step 3.

STEP 2. Check the cooling fan motor drive control unit.



Refer to [P.14-22](#).

Q: Is the cooling fan motor drive control unit in good condition?

YES : Go to Step 3.

NO : Replace the cooling fan motor drive control unit (Refer to [P.14-30](#)). Then go to Step 3.

STEP 3. Check the symptoms.

Q: Do the radiator fan operate (when the condenser fan operate)?

YES : This symptoms is complete.

NO : Return to Step 1.

INSPECTION PROCEDURE 4: Radiator Fan does not Operate (When Condenser Fan Operate)**RADIATOR FAN AND CONDENSER FAN DRIVE CIRCUIT**

Refer to [P.14-5](#).

CIRCUIT OPERATION

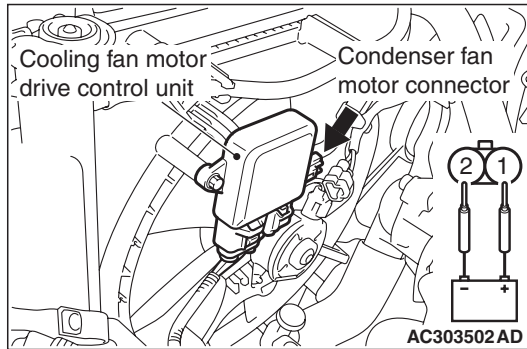
Refer to [P.14-5](#).

TECHNICAL DESCRIPTION

The cause could be a malfunction of the condenser fan motor or cooling fan motor drive control unit.

TROUBLESHOOTING HINTS

- Malfunction of condenser fan motor
- Malfunction of cooling fan motor drive control unit

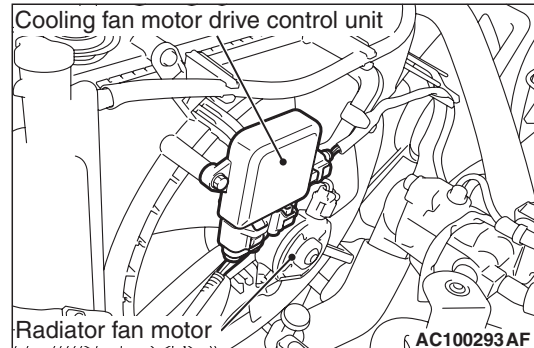
DIAGNOSIS**STEP 1. Check the condenser fan motor.**

Refer to [P.14-24](#).

Q: Is the condenser fan motor in good condition?

YES : Go to Step 2.

NO : Replace the condenser fan motor (Refer to [P.14-30](#)). Then go to Step 3.

STEP 2. Check the cooling fan motor drive control unit.

Refer to [P.14-22](#).

Q: Is the cooling fan motor drive control unit in good condition?

YES : Go to Step 3.

NO : Replace the cooling fan motor drive control unit (Refer to [P.14-30](#)). Then go to Step 3.

STEP 3. Check the symptoms.

Q: Do the condenser fan operate (when the radiator fan operate)?

YES : This symptoms is complete.

NO : Return to Step 1.

ON-VEHICLE SERVICE

ENGINE COOLANT LEAK CHECK

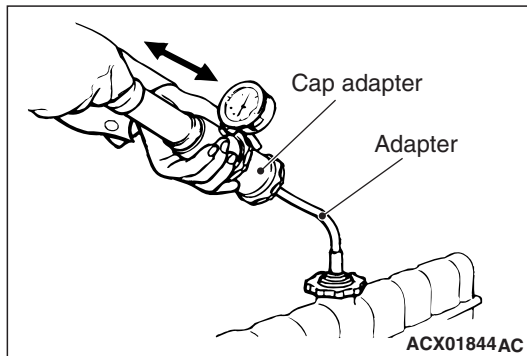
M1141001000430

⚠ 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.

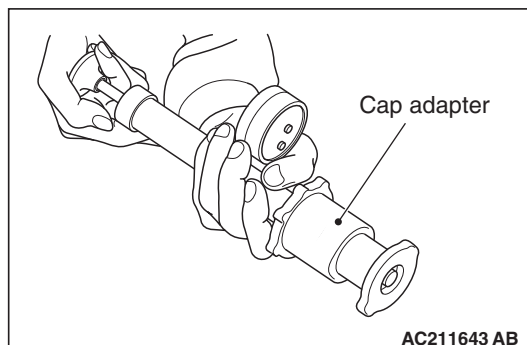


1. Check that the coolant level is up to the filler neck. Install a radiator tester and apply 160 kPa pressure, and then check for leakage from the radiator hose or connections.
2. If there is leakage, repair or replace the appropriate part.

RADIATOR CAP VALVE OPENING PRESSURE CHECK

M1141001300527

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**Standard value: 93 – 123 kPa**

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

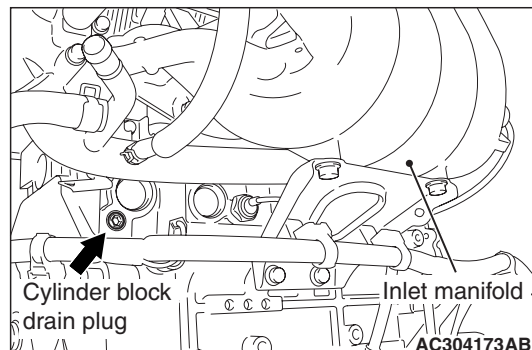
ENGINE COOLANT REPLACEMENT

M1141001200854

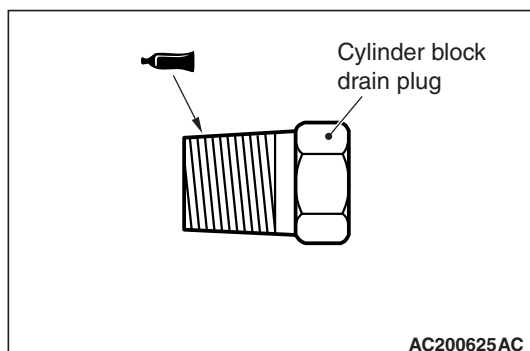
⚠ WARNING

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 anticlockwise a little to let the pressure escape through the vinyl tube. After relieving the steam pressure, remove the cap by slowly turning it anticlockwise.

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

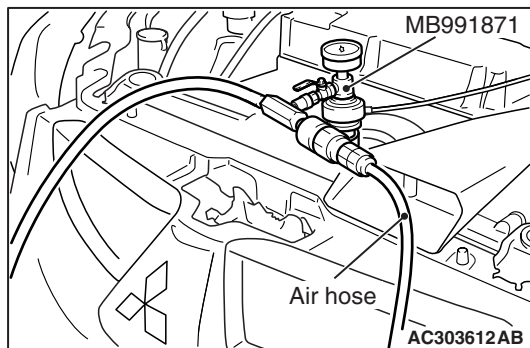
Specified sealant: 3M Nut Locking Part No.4171 or equivalent

Tightening torque: 40 ± 5 N·m

6. Securely tighten the drain plug of the radiator.
7. Reinstall the radiator condenser tank.

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 aluminium components.



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 LLC changer (MB991871) to refill the coolant. A convenient mixture is a 50% water and 50% antifreeze solution (freezing point: -31°C).

Recommended antifreeze: DIAQUEEN SUPER LONG LIFE COOLANT or equivalent

Quantity: 7.0 L (including 0.65 L in the radiator condenser tank)

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

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, then stop the engine.
12. Remove the radiator cap after the engine has become cold, and pour in coolant up to the brim. Reinstall the cap.

CAUTION

Do not overfill the radiator condenser tank.

13. Add coolant to the radiator condenser tank between the "F" and "L" mark if necessary.

CONCENTRATION MEASUREMENT

M1141001100512

Measure the temperature and specific gravity of the engine coolant to check the antifreeze concentration.

Standard value: 30 – 60% (allowable concentration range)

Recommended antifreeze: DIAQUEEN SUPER LONG LIFE COOLANT or equivalent

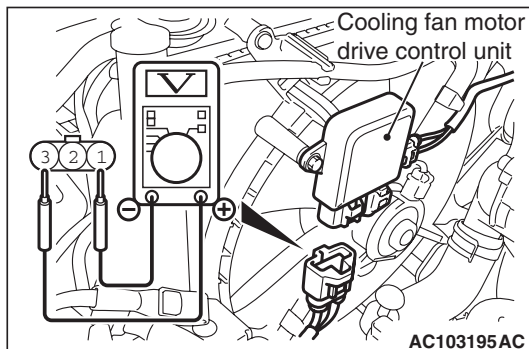
CAUTION

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

COOLING FAN MOTOR DRIVE CONTROL UNIT CHECK

M1141006100249

1. Remove the cooling fan motor drive control unit connector.

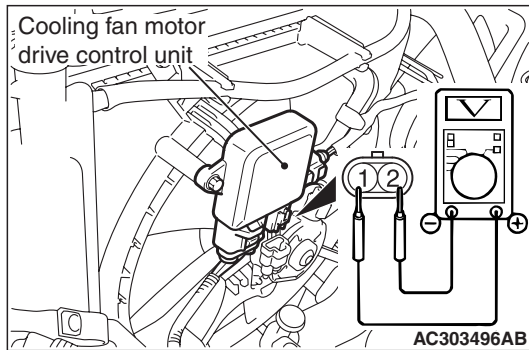


2. Turn the ignition switch to the "ON" position, and measure the voltage between terminal 1 and 3 at the harness side connector.

Standard value: system voltage

3. Connect the cooling fan motor drive control unit connector, and disconnect the radiator fan motor connector.

4. Ensure that the A/C switch is off, and start the engine and run it at idle.



5. Measure the voltage between terminal 1 and 2 at the cooling fan motor drive control unit side connector.

Standard value: 1V or less

⚠ WARNING

Stay clear of the fan when the fan starts running.

6. Turn the A/C switch to the "ON" position.
7. Measure the voltage between terminal 1 and 2 at the cooling fan motor drive control unit side connector while the fan is running. The voltage should repeat the values below.

Standard value:

1. 1 V or less

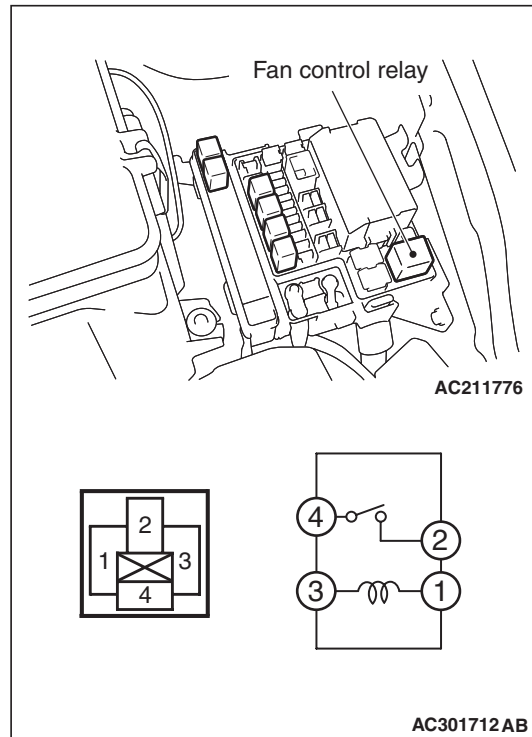
2. 8.2 ± 0.7 V

3. System voltage ± 2.6 V

8. If the voltage does not repeatedly change as indicated, replace the cooling fan motor drive control unit. (Refer to P.14-30).

FAN CONTROL RELAY CONTINUITY CHECK

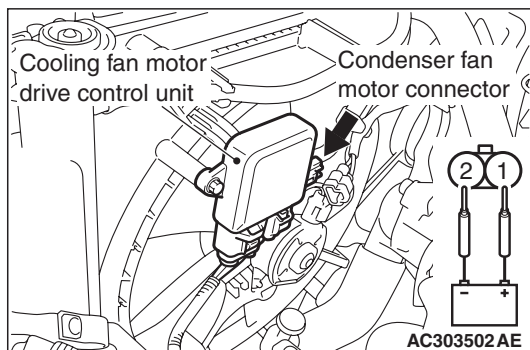
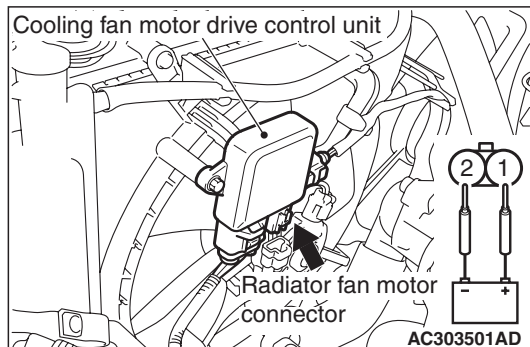
M1141006200428



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

**RADIATOR FAN MOTOR AND
CONDENSER FAN MOTOR CHECK**

M1141007100167



1. Remove the radiator fan motor and condenser fan motor connector.
2. Check to see that the radiator fan motor and condenser fan motor of the radiator turns when applying battery power between the connector terminal 1 and 2 of the radiator fan motor and condenser fan motor. Also check to see that there is no abnormal sound coming from the cooling fan motor at this time.
3. If the radiator fan motor and condenser fan motor is defective, replace it. (Refer to [P.14-30](#)).

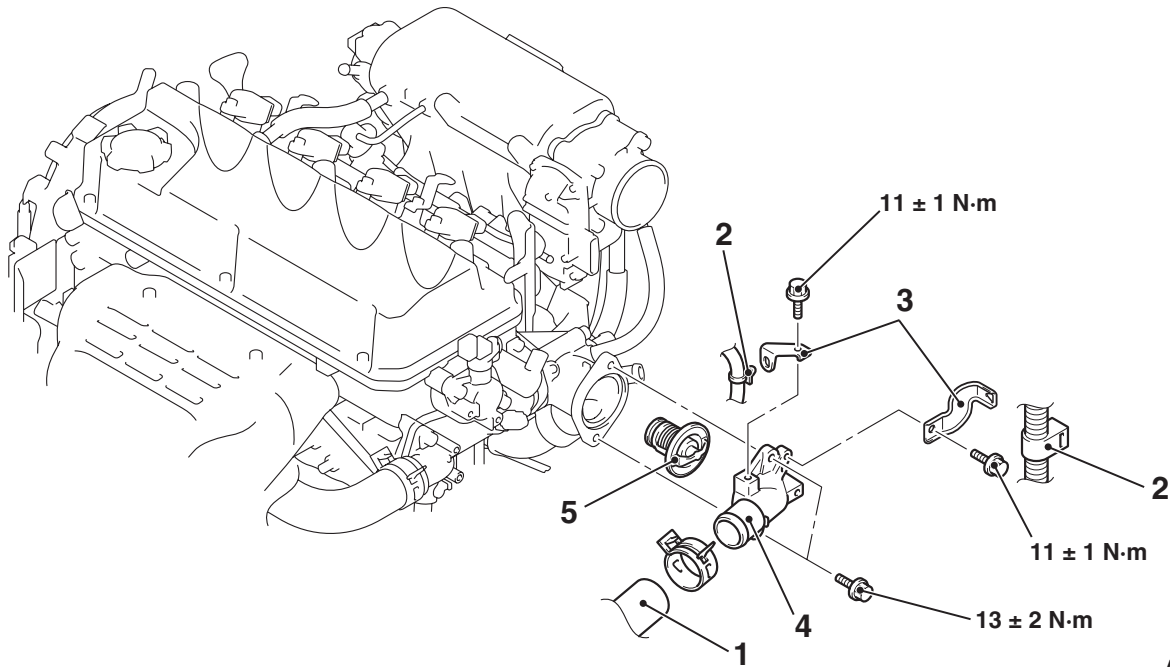
THERMOSTAT

REMOVAL AND INSTALLATION

M1141002400873

Pre-removal and Post-installation Operation

- Engine Coolant Draining and Refilling (Refer to P.14-21).
- Air Cleaner Assembly Removal and Installation (Refer to GROUP 15 –Air Cleaner P.15-3).
- Battery Removal and Installation



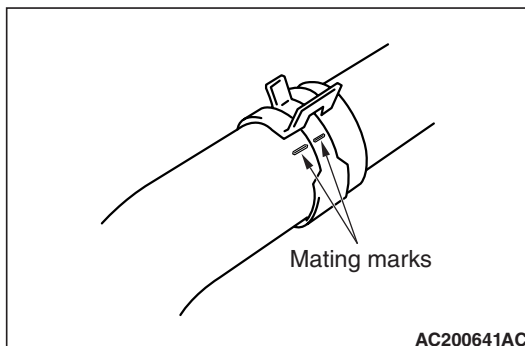
AC306256AC

Removal steps

- <<A>> >>B<<
1. Radiator lower hose connection
 2. Control wiring harness connection
 3. Control wiring harness connection bracket
 4. Water inlet fitting
 5. Thermostat
- >>A<<

REMOVAL SERVICE POINT

<<A>> RADIATOR LOWER HOSE DISCONNECTION



AC200641AC

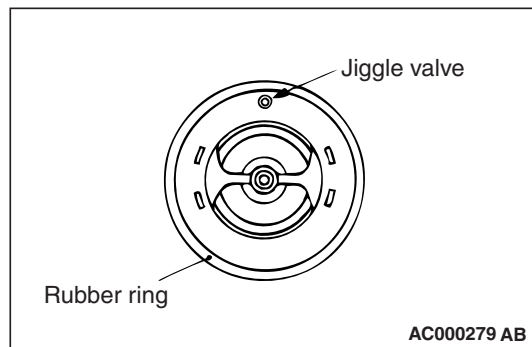
Make mating marks on the radiator lower hose and the hose clamp. Disconnect the radiator lower hose.

INSTALLATION SERVICE POINTS

>>A<< THERMOSTAT INSTALLATION

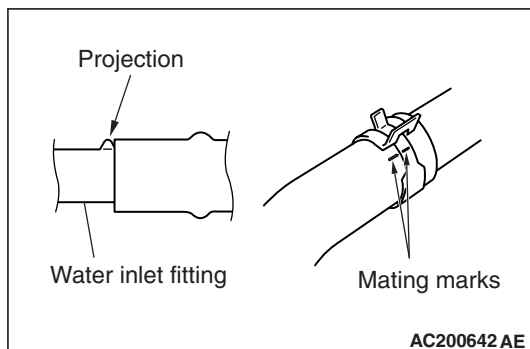
⚠ CAUTION

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.



AC000279 AB

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

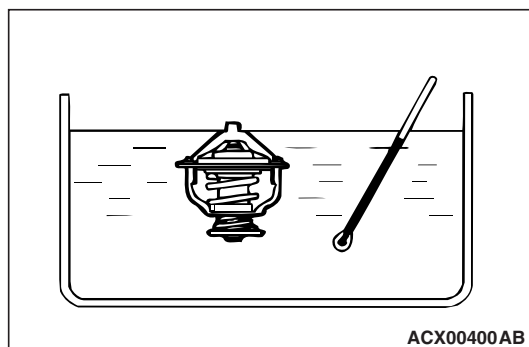
>>B<< RADIATOR LOWER HOSE
CONNECTION

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.

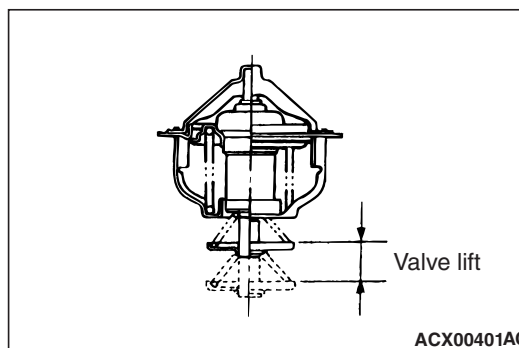
INSPECTION

M1141002500568

THERMOSTAT CHECK



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

Standard value: $82 \pm 1.5^{\circ}\text{C}$ 

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

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** **Amount of valve lift: 8.5 mm or more**

WATER PUMP

REMOVAL AND INSTALLATION

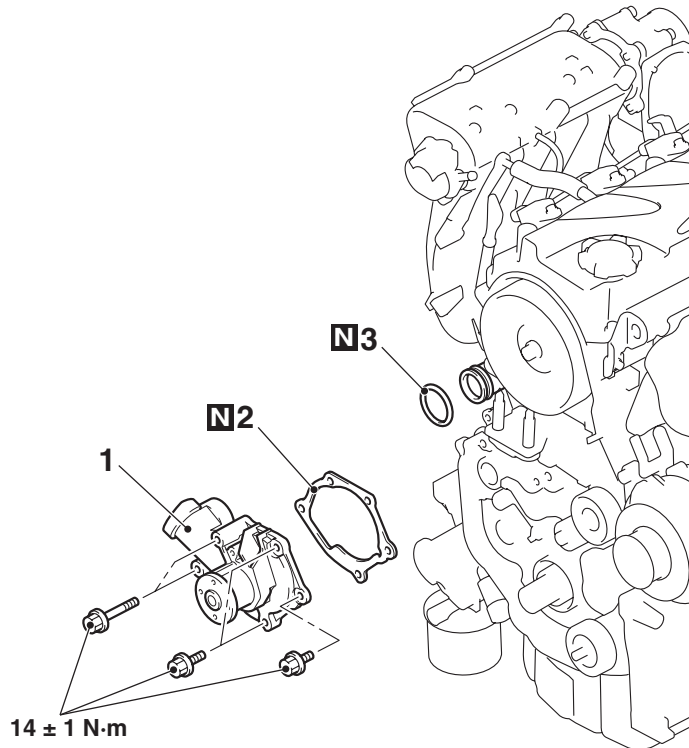
M1141002700993

Pre-removal Operation

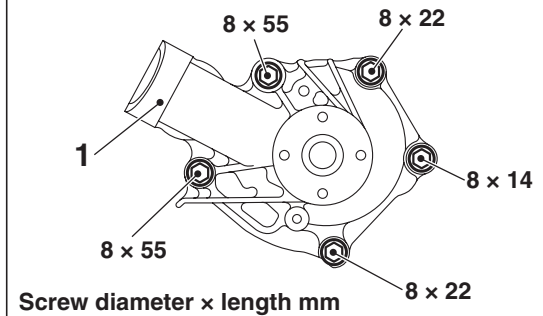
- Engine Coolant Draining (Refer to [P.14-21](#)).
- Timing Belt Removal (Refer to GROUP 11A, Timing Belt [P.11A-36](#)).

Post-installation Operation

- Timing Belt Installation (Refer to GROUP 11A, Timing Belt [P.11A-36](#)).
- Engine Coolant Refilling (Refer to [P.14-21](#)).



Bolt specifications



AC309459 AB

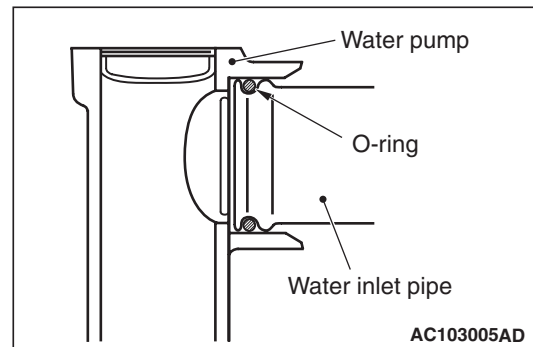
Removal steps

1. Water pump
2. Water pump gasket
3. O-ring

>>A<<

INSTALLATION SERVICE POINT

>>A<< O-RING INSTALLATION



Fit the O-ring to the groove in the water inlet pipe. Then lubricate the O-ring and the inside of the water pump with water, and then insert the pipe to the water pump.

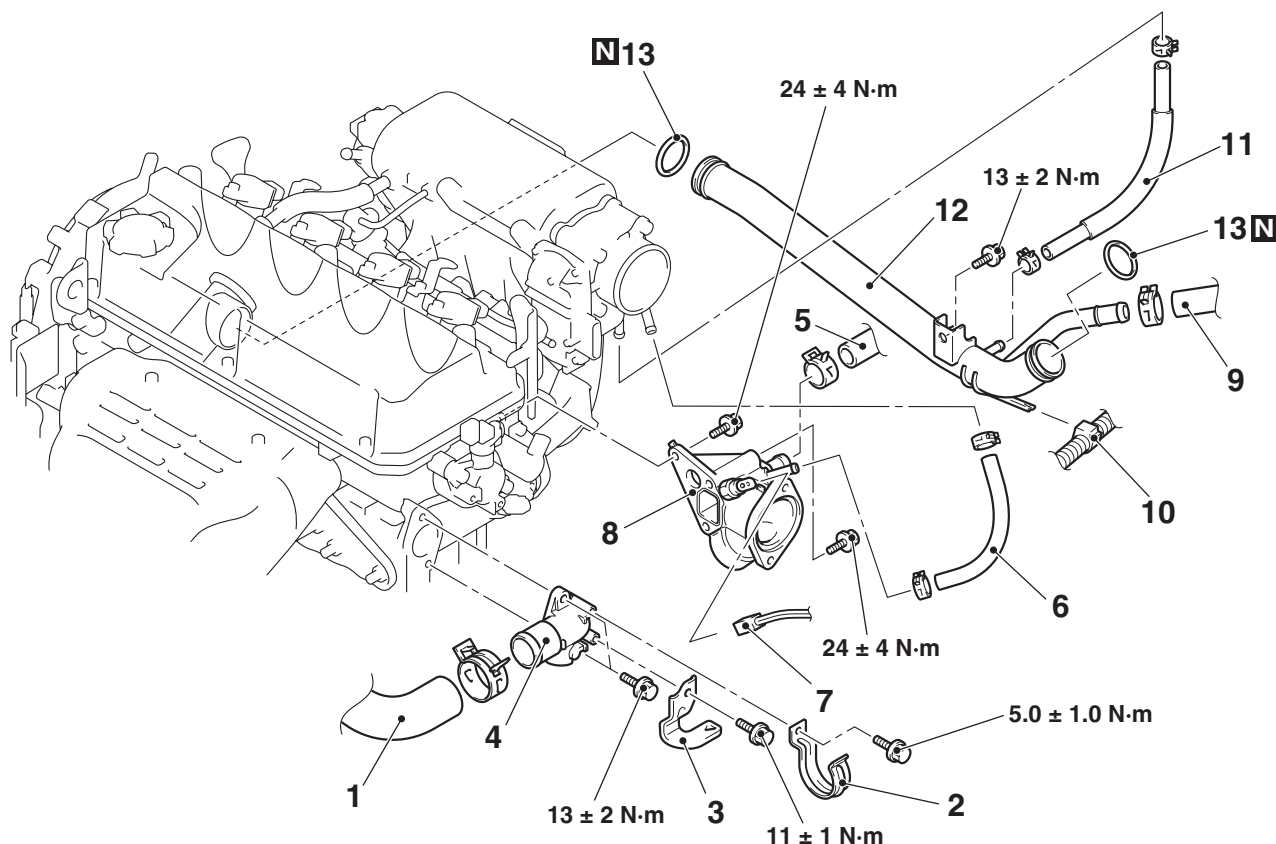
WATER HOSE AND WATER PIPE

REMOVAL AND INSTALLATION

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Pre-removal and Post-installation Operation

- Engine Coolant Draining and Supplying (Refer to [P.14-21](#)).
- Air Cleaner Assembly Removal and Installation (Refer to GROUP 15 –Air Cleaner [P.15-3](#)).
- Thermostat Removal and Installation (Refer to [P.14-25](#)).



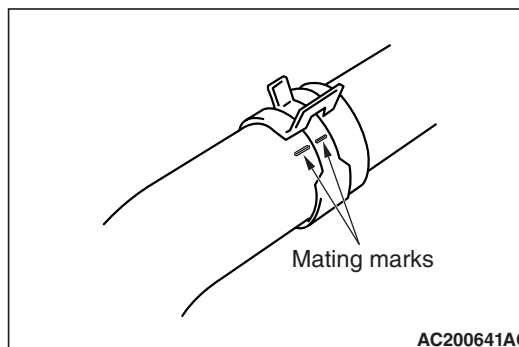
AC504952AB

Removal steps

- | | | |
|-------|-------|--|
| <<A>> | >>C<< | 1. Radiator upper hose connection |
| | | 2. Radiator hose clamp |
| | | 3. Control wiring harness connection bracket |
| | >>B<< | 4. Water outlet fitting |
| | | 5. Heater hose connection |
| | | 6. Water return hose |
| | | 7. Engine coolant temperature gauge unit connector |
| | >>B<< | 8. Thermostat case assembly |
| | | 9. Heater hose connection |
| | | 10. Harness clamp |
| | | 11. Water feed hose |
| | | 12. Water inlet pipe assembly |
| | >>A<< | 13. O-ring |

REMOVAL SERVICE POINT

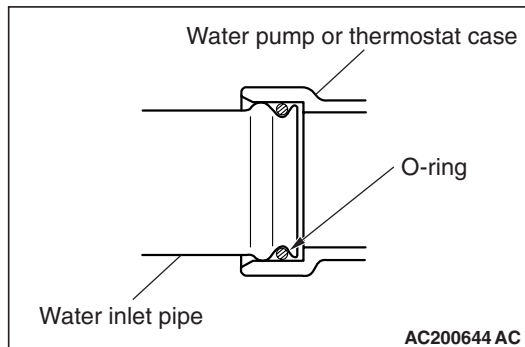
<<A>> RADIATOR UPPER HOSE DISCONNECTION



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

INSTALLATION SERVICE POINTS

>>A<< O-RING INSTALLATION



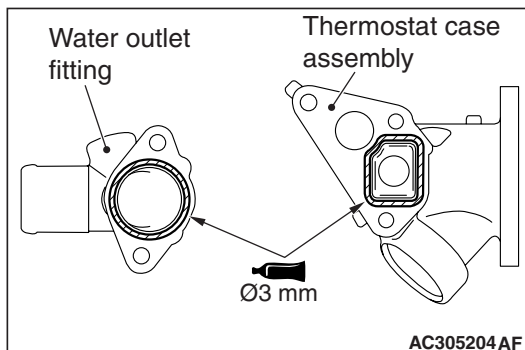
CAUTION

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.

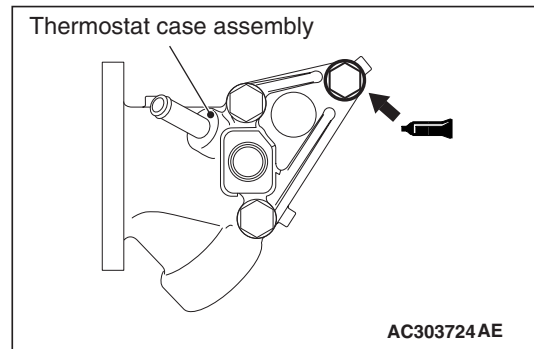
>>B<< THERMOSTAT CASE ASSEMBLY/WATER OUTLET FITTING INSTALLATION

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: Mitsubishi Genuine Part No.MD970389 or equivalent

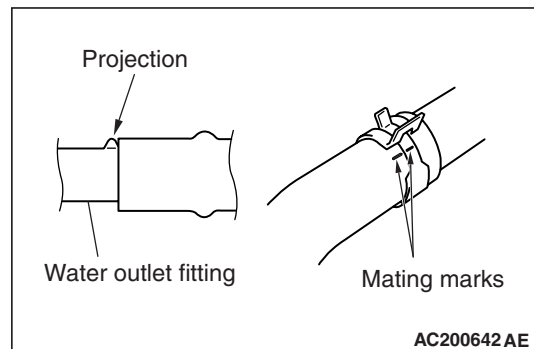


3. Apply sealant to the thread of the thermostat case assembly bolts as shown.

Specified Sealant: 3M Stud Locking 4170 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.

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

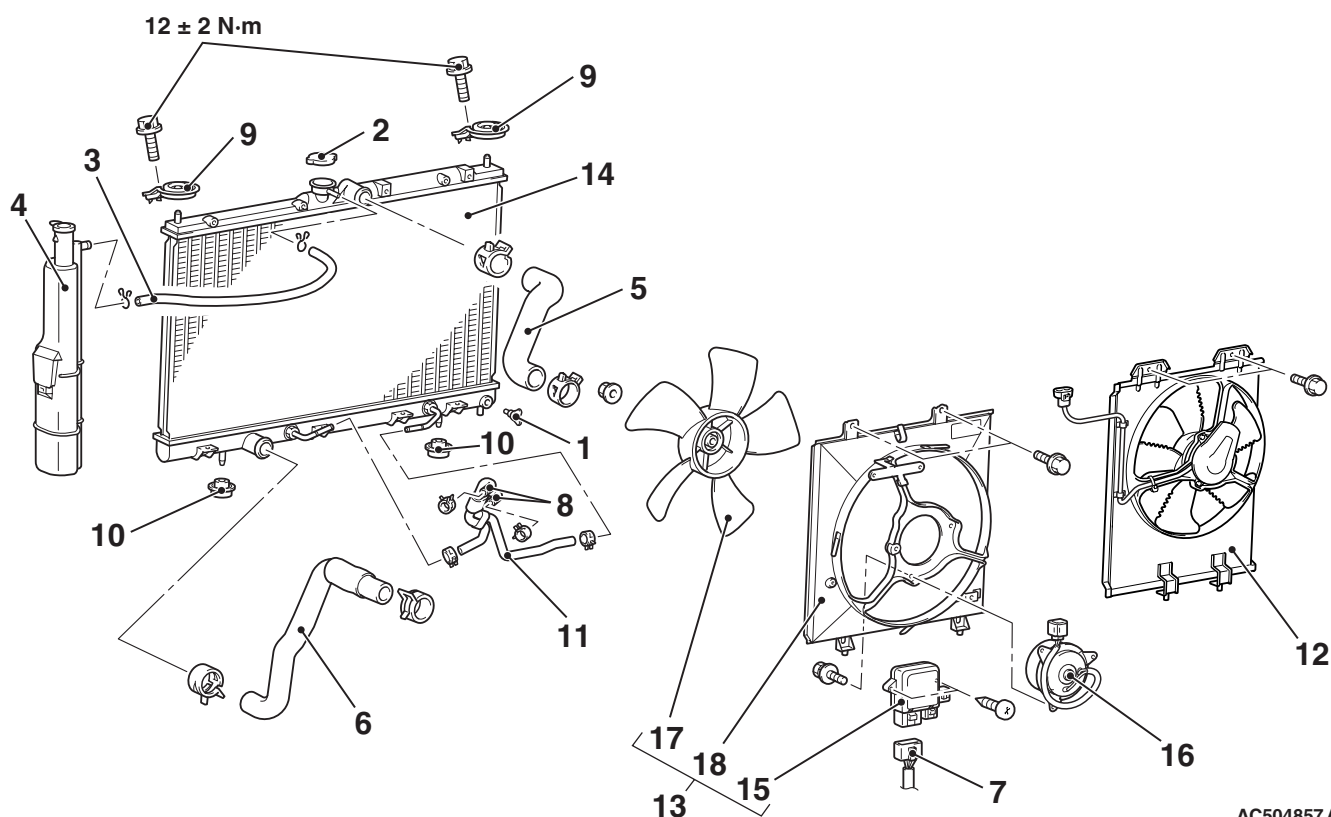
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Pre-removal Operation

- Engine Coolant Draining (Refer to P.14-21).
- Air Cleaner Intake Duct Removal (Refer to GROUP 15 – Air Cleaner P.15-3).

Post-installation Operation

- Air Cleaner Intake Duct Installation (Refer to GROUP 15 – Air Cleaner P.15-3).
- Engine Coolant Supplying (Refer to P.14-21).
- A/T Fluid Checking <A/T> (Refer to GROUP 23A – On-vehicle Service, Essential Service P.23A-106).



AC504857 AB

Radiator removal steps

- <<A>> >>A<<
<<A>> >>A<<
<>
1. Radiator drain plug
 2. Radiator cap
 3. Radiator condenser tank hose
 4. Radiator condenser tank assembly
 5. Radiator upper hose
 6. Radiator lower hose
 7. Cooling fan motor drive control unit connector
 8. Transmission oil cooler line hose connection <A/T>
 9. Radiator support upper insulator
 - Radiator, radiator fan motor, condenser fan motor and shroud assembly
 10. Radiator support lower insulator
 11. Transmission oil cooler line hose <A/T>
 12. A/C condenser fan motor and shroud assembly

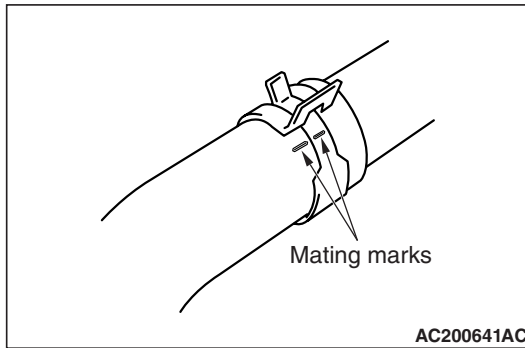
Radiator removal steps

13. Radiator fan motor and shroud assembly
 14. Radiator assembly
- Radiator fan and A/C condenser fan motor removal steps**
3. Radiator condenser tank hose
 4. Radiator condenser tank assembly
 5. Radiator upper hose
 7. Cooling fan motor drive control unit connector
 12. A/C condenser fan motor and shroud assembly
 13. Radiator fan motor and shroud assembly
 15. Cooling fan motor drive control unit
 16. Radiator fan motor
 17. Radiator fan
 18. Radiator fan shroud

<<A>> >>A<<

REMOVAL SERVICE POINTS

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



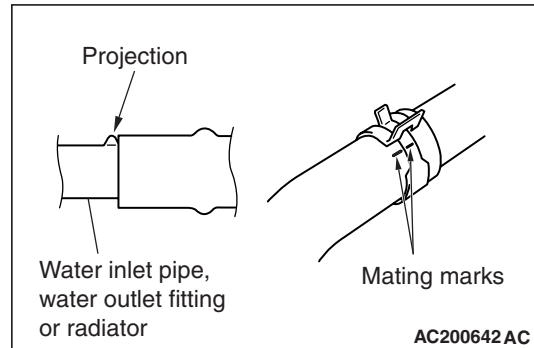
Make mating marks on the radiator hose and the hose clamp. Disconnect the radiator hose.

<> TRANSMISSION OIL COOLER LINE HOSE DISCONNECTION

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

INSTALLATION SERVICE POINT

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



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