

## GROUP 14

# ENGINE COOLING

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## GENERAL INFORMATION

M1141000100735

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 drive belt from the crankshaft. The radiator is the corrugated fin, down flow type.

| Item   |                  |   | Specification |
|--|------------------|---|---------------|
| Radiator   | Performance kJ/h | Except vehicles for Hong Kong and Singapore | 225,400       |
|  |                  | Vehicles for Hong Kong and Singapore        | 200,900       |
| Built-in A/T oil cooler<br><Except vehicles for Hong Kong and Singapore> | Performance kJ/h |   | 5,700         |

## SERVICE SPECIFICATIONS

M1141000300502

| Item   |  | Standard value                                      | Limit      |
|--|--|---|------------|
| Fan controller V   | A/C OFF                                    | 1 or less   | -          |
|  | A/C ON                                     | Repeat<br>$8.2 \pm 2.6$<br>System voltage $\pm 2.6$ | -          |
| High-pressure valve opening pressure of radiator cap kPa |  | 93 –123   | Minimum 83 |
| Range of coolant antifreeze concentration of radiator %  |  | 30 –60  | -          |
| 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

M1141000400446

| Item  | Specified coolant                               |                     | Quantity L |
|---|---|---------------------|------------|
| Engine coolant (including radiator condense tank) | DIA QUEEN SUPER LONG LIFE COOLANT or equivalent | Without rear heater | 8.0        |
|   |   | With rear heater    | 9.5        |

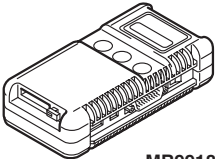
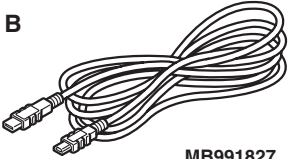
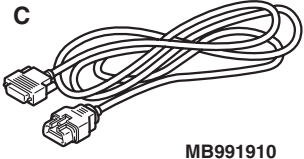
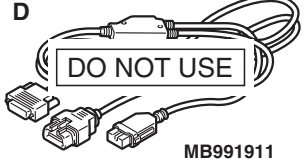
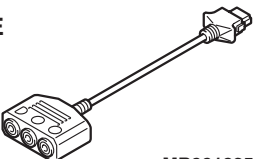

## SEALANT OR ADHESIVE


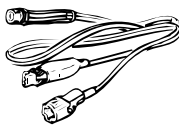
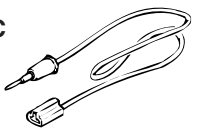
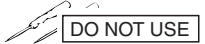
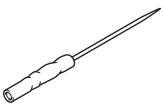
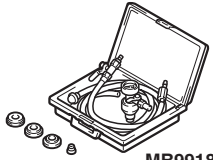
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| Item                                  | Specified sealant                                 |
|---------------------------------------|---|
| Thermostat case, Water outlet fitting | MITSUBISHI GENUINE Part No.MD970389 or equivalent |
| Thermostat case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

## SPECIAL TOOLS

M1141000600495

| Tool   | Number  | Name  | Use   |
|--|---|---|---|
| <p><b>A</b></p>  <p>MB991824</p> <p><b>B</b></p>  <p>MB991827</p> <p><b>C</b></p>  <p>MB991910</p> <p><b>D</b></p>  <p>MB991911</p> <p><b>E</b></p>  <p>MB991825</p> <p><b>F</b></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 diagnosis code</p> <p><b>CAUTION</b></p> <p><b>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 instead, the CAN communication does not function correctly.</b></p> |

| Tool  | Number  | Name  | Use  |
|---|---|---|--|
| <p><b>A</b></p>  <p><b>B</b></p>  <p><b>C</b></p>  <p><b>D</b></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: Test harness</p> <p>B: LED harness</p> <p>C: LED harness adapter</p> <p>D: Probe</p> | <p>Making voltage and resistance measurement during troubleshooting</p> <p>A: Connector pin contact pressure inspection</p> <p>B: Power circuit inspection</p> <p>C: Power circuit inspection</p> <p>D: Commercial tester connection</p> |
|  <p>MB992006</p>   | MB992006  | Extra fine probe  | Making voltage and resistance measurement during troubleshooting   |
|  <p>MB991871</p>   | MB991871  | LLC changer   | Coolant refilling  |

## TROUBLESHOOTING

### INSPECTION CHART FOR TROUBLE SYMPTOMS

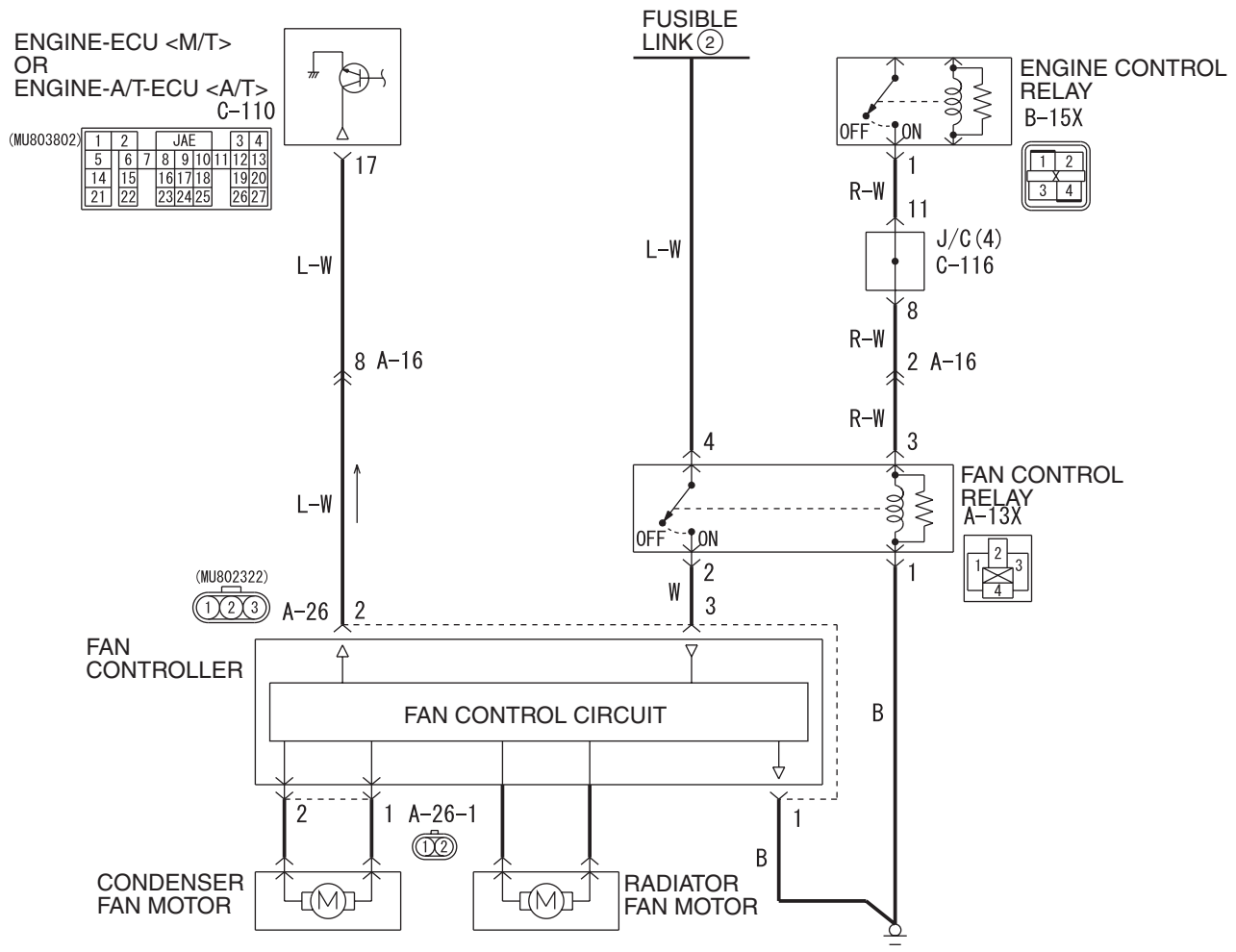
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| Trouble symptom  | Inspection procedure No. | Reference page |
|--|--------------------------|----------------|
| Radiator fan and condenser fan do not operate              | 1                        | P.14-5         |
| Radiator fan and condenser fan do not change speed or stop | 2                        | P.14-14        |
| Radiator fan does not operate                              | 3                        | P.14-17        |
| Condenser fan does not operate                             | 4                        | P.14-17        |

## INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

### Inspection Procedure 1: Radiator Fan and Condenser Fan do not Operate

Radiator Fan and Condenser Fan Drive Circuit



W6X14X000A

### CIRCUIT OPERATION

- The fan controller is powered from fusible link No.2.

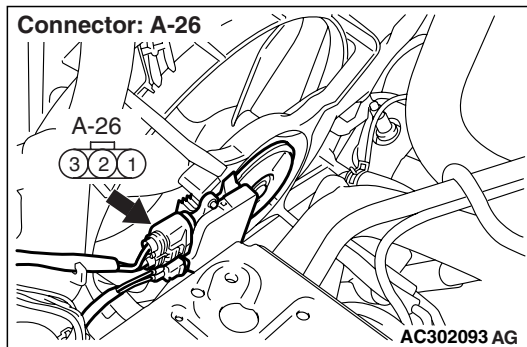
- The engine-ECU <M/T> or engine-A/T-ECU <A/T> uses input signals from the A/C switch, the water temperature sensor unit and the vehicle speed sensor <M/T> or the output shaft speed sensor <A/T> to control the speed of the radiator fan motor and the condenser fan motor.
- The engine-ECU <M/T> or engine-A/T-ECU <A/T> controls the fan controller to activate the radiator fan motor and the condenser fan motor.

**TECHNICAL DESCRIPTION**

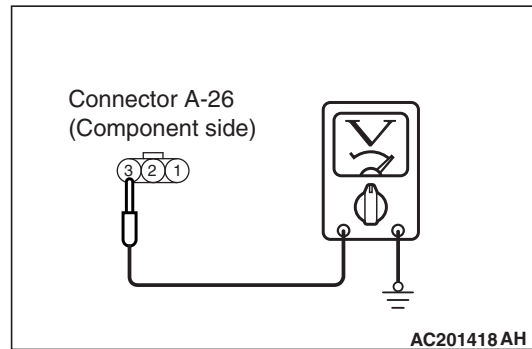
- The cause could be a malfunction of the fan controller power supply or earth circuit.
- If the communication line wiring harness between the fan controller and the engine-ECU <M/T> or engine-A/T-ECU <A/T> is short-circuited to earth, the radiator fan motor and the condenser fan motor will not rotate.
- 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 fan controller or the engine-ECU <M/T> or engine-A/T-ECU <A/T>.

**TROUBLESHOOTING HINTS**

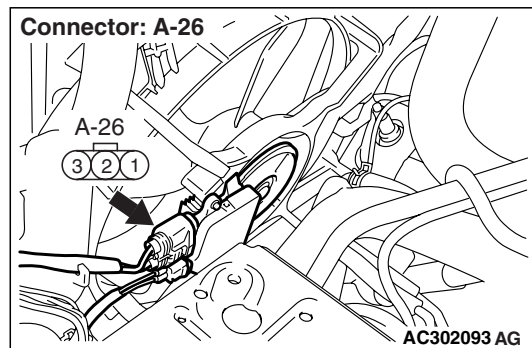
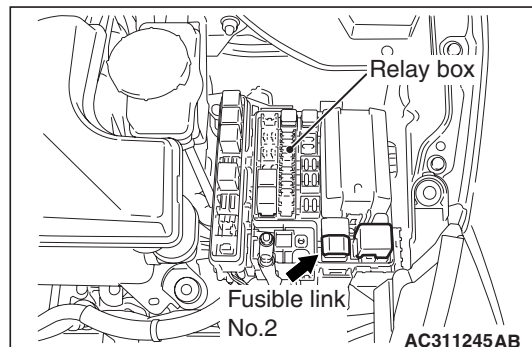
- Malfunction of fusible link No.2
- Malfunction of fan control relay
- Malfunction of cooling fan motor and fan controller
- Malfunction of engine-ECU <M/T> or engine-A/T-ECU <A/T>
- Damaged wiring harness or connector

**DIAGNOSIS PROCEDURE****STEP 1. Measure the power supply voltage at fan controller connector A-26.**

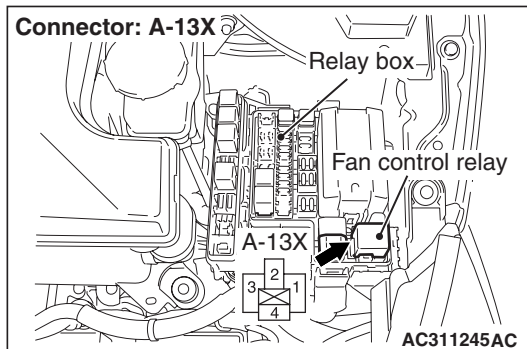
- (1) Disconnect fan controller connector A-26 and measure wiring harness side connector.
- (2) Turn the ignition switch to the "ON" position.



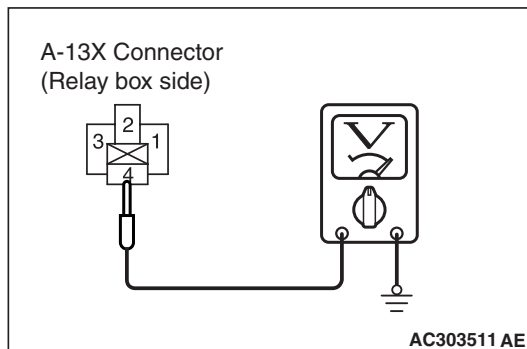
- (3) Measure the voltage between fan controller connector A-26 terminal 3 and body earth.
  - The voltage should measure system voltage.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.
- (5) Connect fan controller connector A-26.

**Q: Is the measured voltage system voltage?****YES :** Go to Step 16.**NO :** Go to Step 2.**STEP 2. Check the fan controller connector A-26.****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-13X.**



- (1) Disconnect fan control relay connector A-13X (remove the fan control relay) and measure relay box side connector.
- (2) Turn the ignition switch to the "ON" position.

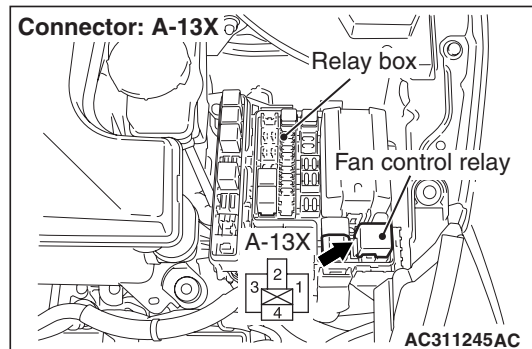


- (3) Measure the voltage between fan control relay connector A-13X terminal 4 and body earth.
  - The voltage should measure system voltage.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.
- (5) Connect fan control relay connector A-13X (install the fan control relay).

**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-13X.**

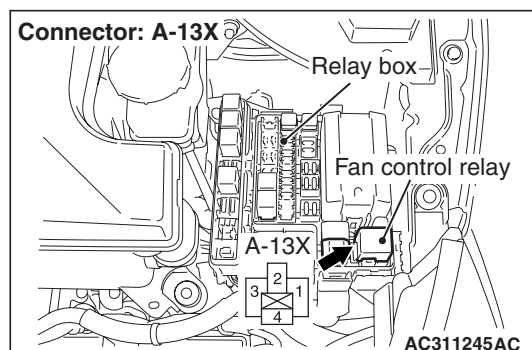
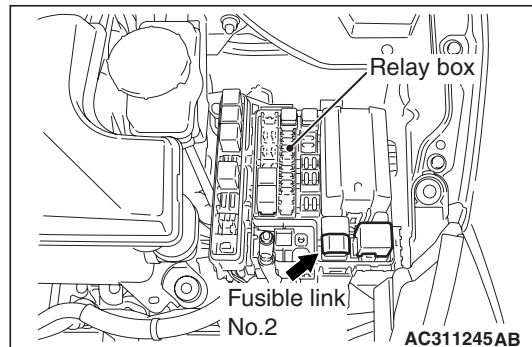


**Q: Is the connector in good condition?**

**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-13X terminal 4.**



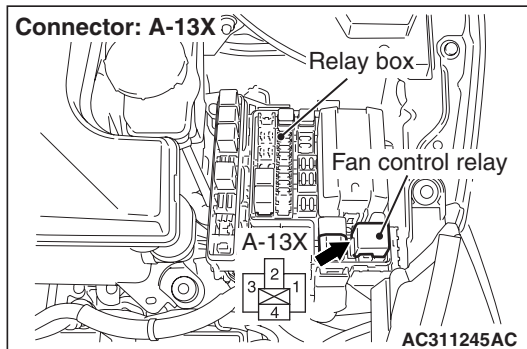
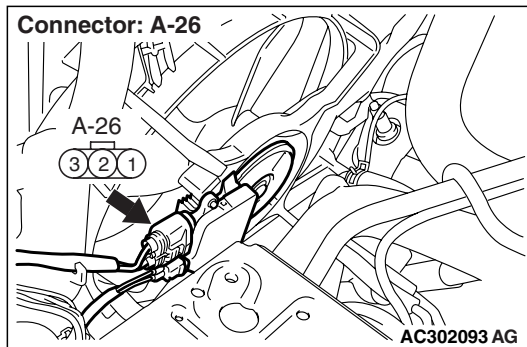
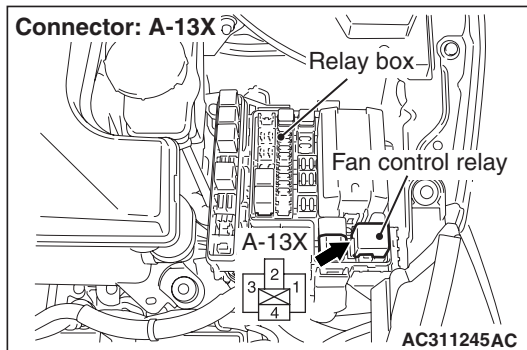
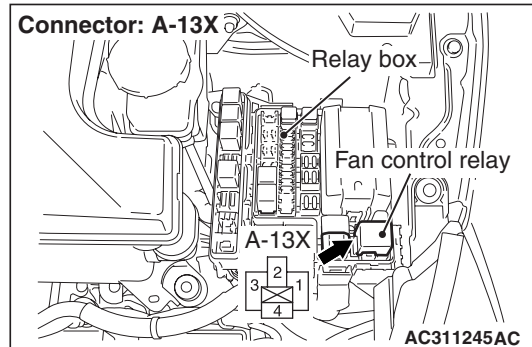
**Q: Is the harness wire in good condition?**

**YES :** An intermittent malfunction is suspected (Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points - How to Cope with Intermittent Malfunction P.00-5).

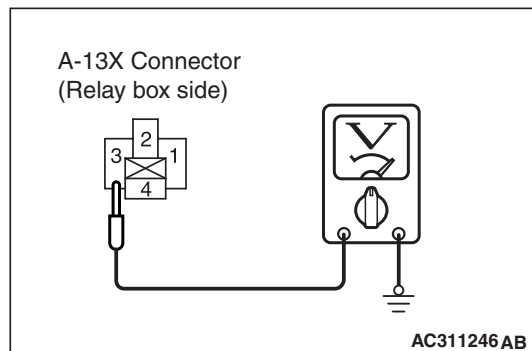
**NO :** Repair the damaged harness wire. Then go to Step 23.

**STEP 7. Check the fan control relay.**

Refer to P.14-20.

**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-13X.****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-13X terminal 2 and fan controller connector A-26 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-13X.**

- (1) Disconnect fan control relay connector A-13X (remove the fan control relay) and measure relay box side connector.
- (2) Turn the ignition switch to the "ON" position.

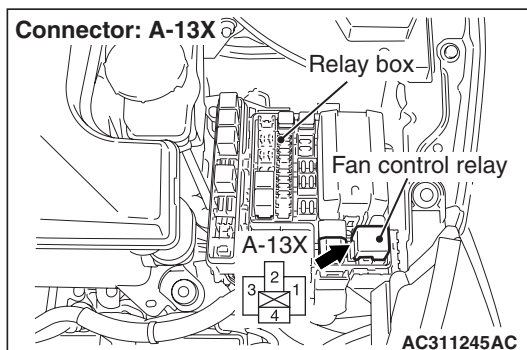
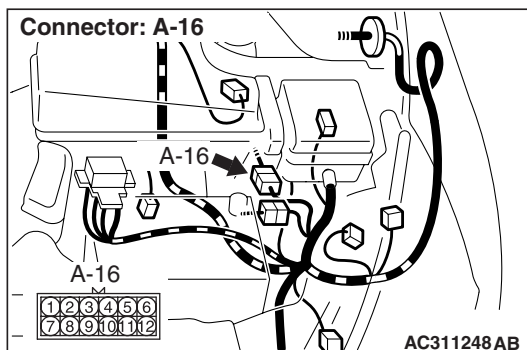
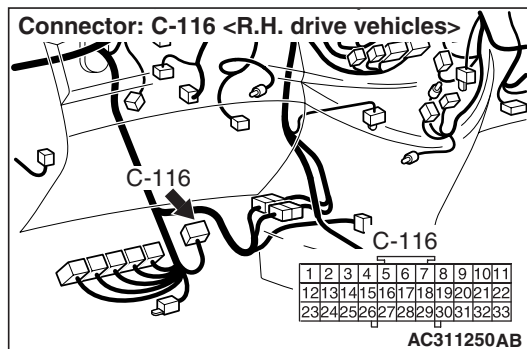
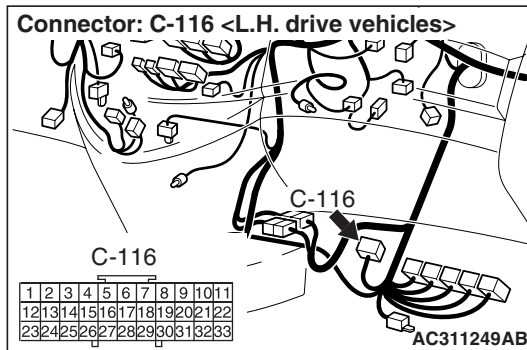


- (3) Measure the voltage between fan control relay connector A-13X terminal 3 and body earth.
  - The voltage should measure system voltage.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.
- (5) Connect fan control relay connector A-13X (install the fan control relay).

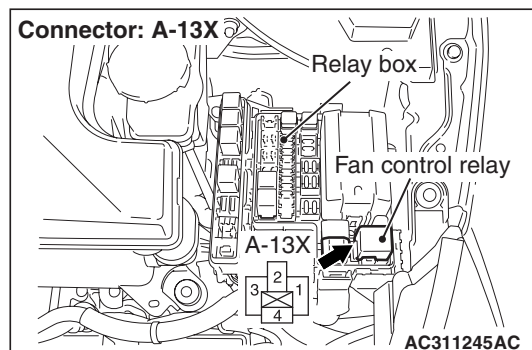
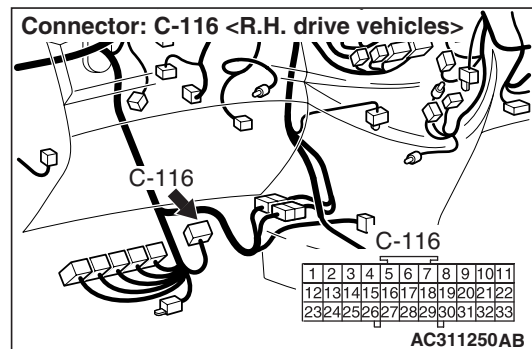
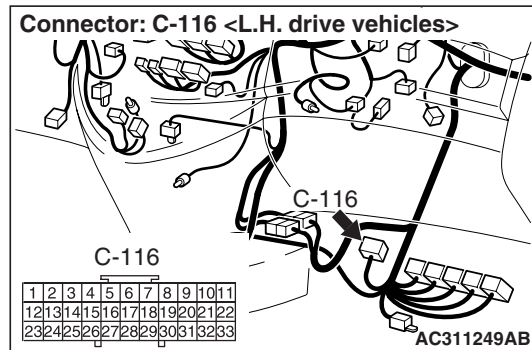
**Q: Is the measured voltage system voltage?****YES :** Go to Step 13.**NO :** Go to Step 11.



**STEP 11. Check the J/C No.4 C-116, intermediate connector A-16 and fan control relay connector A-13X.**



**STEP 12. Check the harness wire between J/C No.4 C-116 terminal 8 and fan control relay connector A-13X terminal 3.**



**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.00-5).

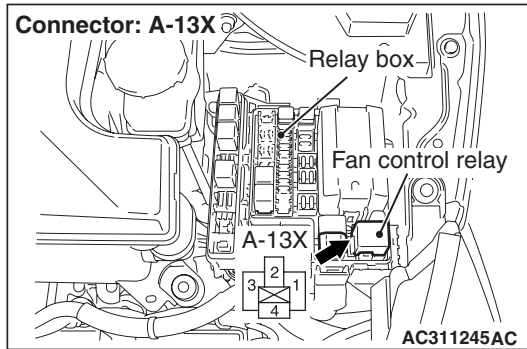
**NO :** Repair the damaged harness wire. Then go to Step 23.

**Q: Are there connectors in good condition?**

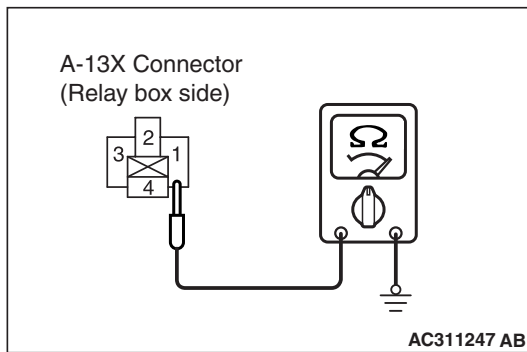
**YES :** Go to Step 12.

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

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



- (1) Disconnect fan control relay connector A-13X (remove the fan control relay) and measure relay box side connector.



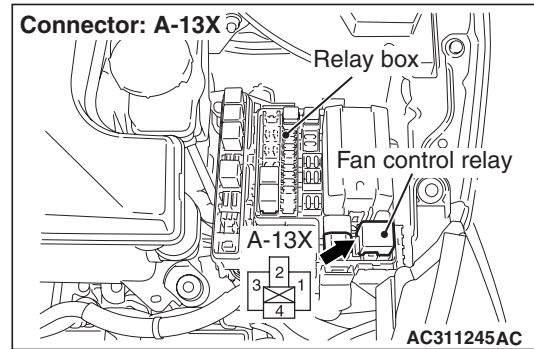
- (2) Measure the resistance between fan control relay connector A-13X terminal 1 and body earth.
- Continuity exists.
- (3) Connect fan control relay connector A-13X (install the fan control relay).

**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.00-5).

**NO :** Go to Step 14.

**STEP 14. Check the fan control relay connector A-13X.**

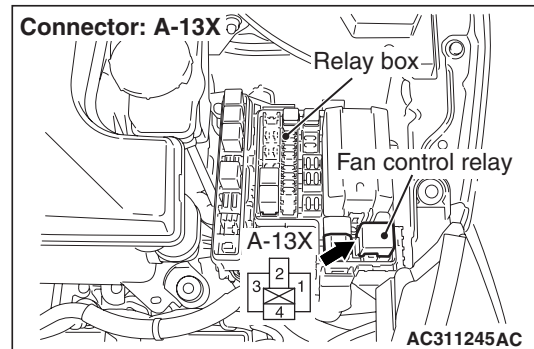


**Q: Is the connector in good condition?**

**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-13X terminal 1 and body earth.**

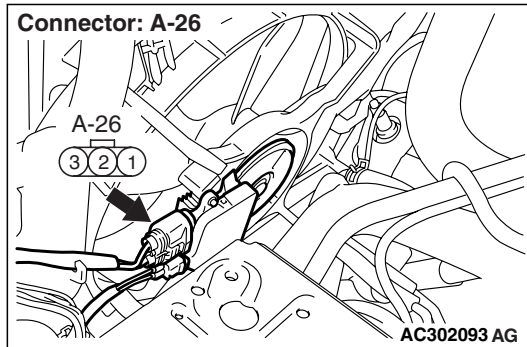


**Q: Is the harness wire in good condition?**

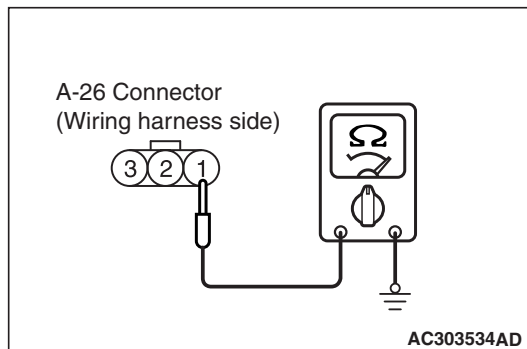
**YES :** An intermittent malfunction is suspected (Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points - How to Cope with Intermittent Malfunction P.00-5).

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

**STEP 16. Check the continuity between fan controller connector A-26 and body earth.**



- (1) Disconnect fan controller connector A-26 and measure wiring harness side connector.



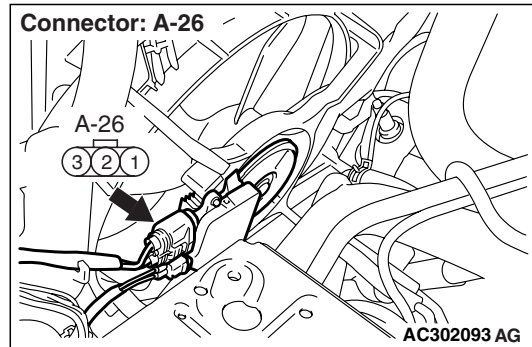
- (2) Measure the resistance between fan controller connector A-26 terminal 1 and body earth.
- Continuity exists.
- (3) Connect fan controller connector A-26.

**Q: Does the continuity exist?**

**YES :** Go to Step 19.

**NO :** Go to Step 17.

**STEP 17. Check the fan controller connector A-26.**

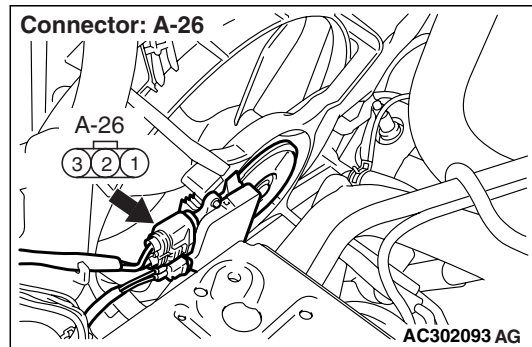


**Q: Is the connector in good condition?**

**YES :** Go to Step 18.

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

**STEP 18. Check the harness wire between fan controller connector A-26 terminal 1 and body earth.**

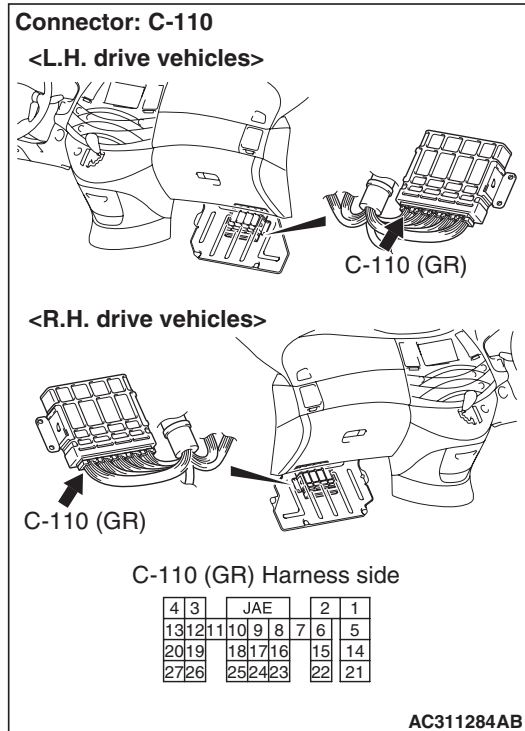
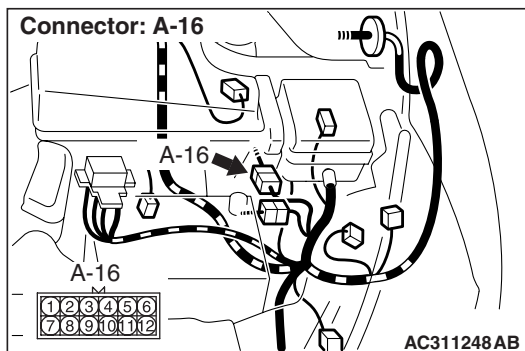
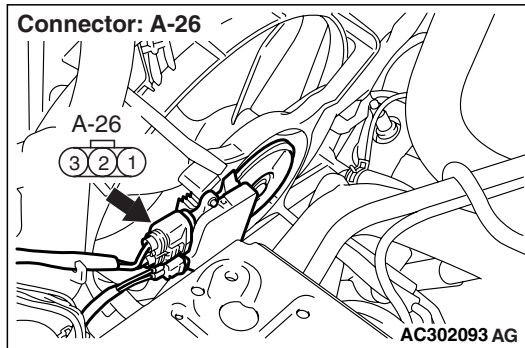


**Q: Is the harness wire in good condition?**

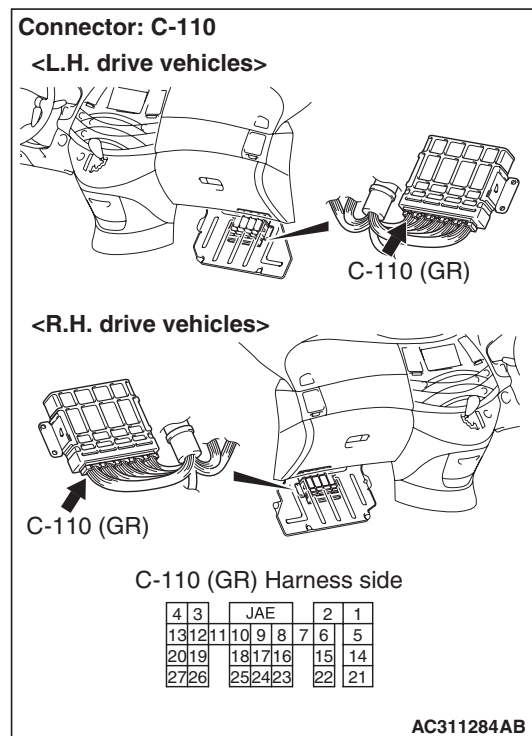
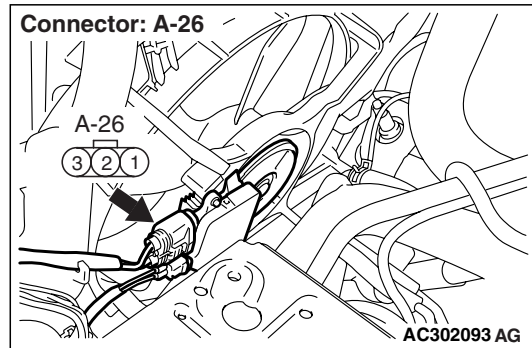
**YES :** An intermittent malfunction is suspected (Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points - How to Cope with Intermittent Malfunction [P.00-5](#)).

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

**STEP 19. Check the fan controller connector A-26, intermediate connector A-16 and engine-ECU connector or engine-A/T-ECU connector C-110.**



**STEP 20. Check the harness wire between fan controller connector A-26 terminal 2 and engine-ECU or engine-A/T-ECU connector C-110 terminal 17.**



**Q: Are these harness wires in good condition?**

**YES :** Go to Step 21.

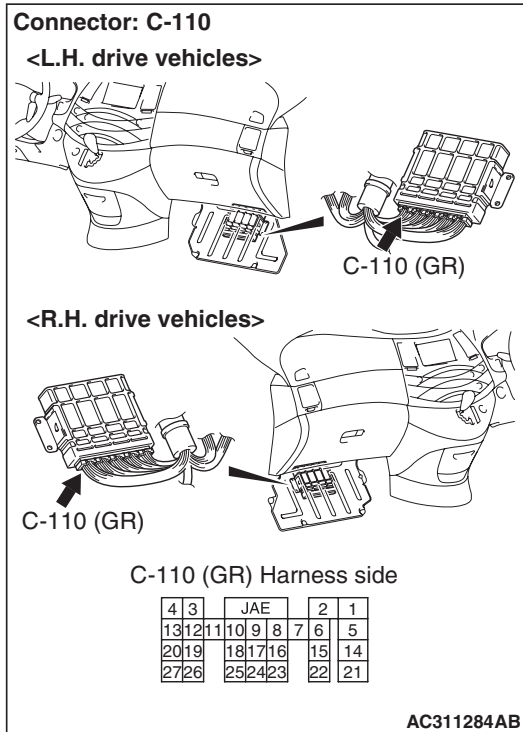
**NO :** Repair the damaged harness wire. Then go to Step 23.

**Q: Are these connectors in good condition?**

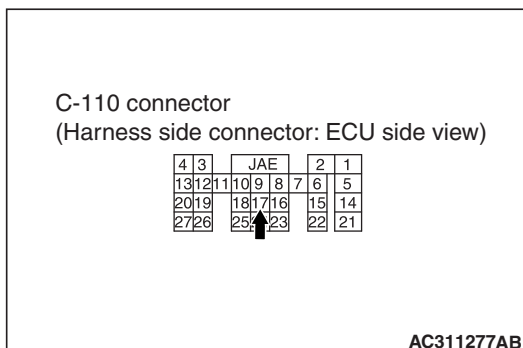
**YES :** Go to Step 20.

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

## STEP 21. Check the fan controller.



- (1) Disconnect engine-ECU connector or engine-A/T-ECU connector C-110.



- (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 connector or engine-A/T-ECU connector C-110, 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 fan motor and fan controller (Refer to P.14-27). Then go to Step 23.

## STEP 22. M.U.T.-III self-diag code

Check if an MPI system self-diag code is set. (Refer to GROUP 13A - Troubleshooting P.13A-11)<Except vehicles for Hong Kong, Singapore, Australia and New Zealand>, (Refer to GROUP 13B - Troubleshooting P.13B-11)<Vehicles for Hong Kong and Singapore>, (Refer to GROUP 13C - Troubleshooting P.13C-11)<Vehicles for Australia and New Zealand>.

**Q: Diagnosis code set?**

**YES :** Inspection chart for diagnosis code (Refer to GROUP 13A - Troubleshooting P.13A-14)<Except vehicles for Hong Kong, Singapore, Australia and New Zealand>, (Refer to GROUP 13B - Troubleshooting P.13B-15)<Vehicles for Hong Kong and Singapore>, (Refer to GROUP 13C - Troubleshooting P.13C-21)<Vehicles for Australia and New Zealand>.

**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<Except vehicles for Hong Kong, Singapore, Australia and New Zealand>P.13A-323 ), (Refer to GROUP 13B, Engine-A/T-ECU <Vehicles for Hong Kong and Singapore>P.13B-297 ), (Refer to GROUP 13C, Engine-A/T-ECU <Vehicles for Australia and New Zealand>P.13C-350 ). 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.



**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](#).

**TECHNICAL DESCRIPTION**

- The cause could be a malfunction of the fan controller power supply or earth circuit.
- If the communication line wiring harness between the fan controller 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 fan controller or the engine-ECU <M/T> or engine-A/T-ECU <A/T>.

**TROUBLESHOOTING HINTS**

- Malfunction of fusible link No.2
- Malfunction of fan control relay
- Malfunction of cooling fan motor
- Malfunction of fan controller
- Malfunction of engine-ECU <M/T> or engine-A/T-ECU <A/T>
- Damaged wiring harness or connector

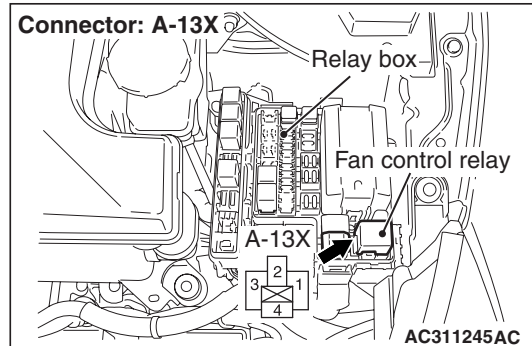
**DIAGNOSIS PROCEDURE****STEP 1. Check the fan control relay.**

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

**Q: Is the fan control relay in good condition?**

**YES :** Go to Step 2.

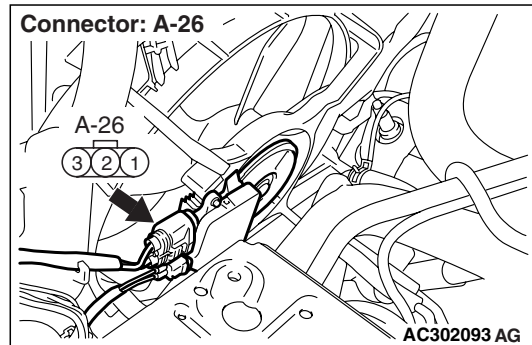
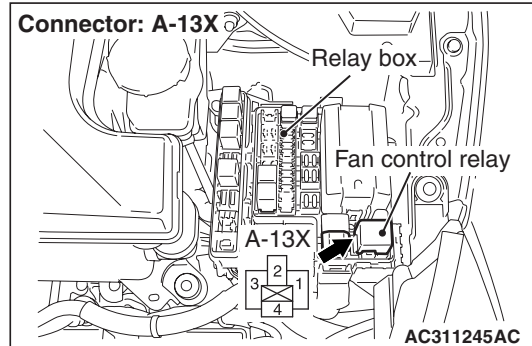
**NO :** Replace the fan control relay. Then go to Step 8.

**STEP 2. Check the fan control relay connector A-13X.**

**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.

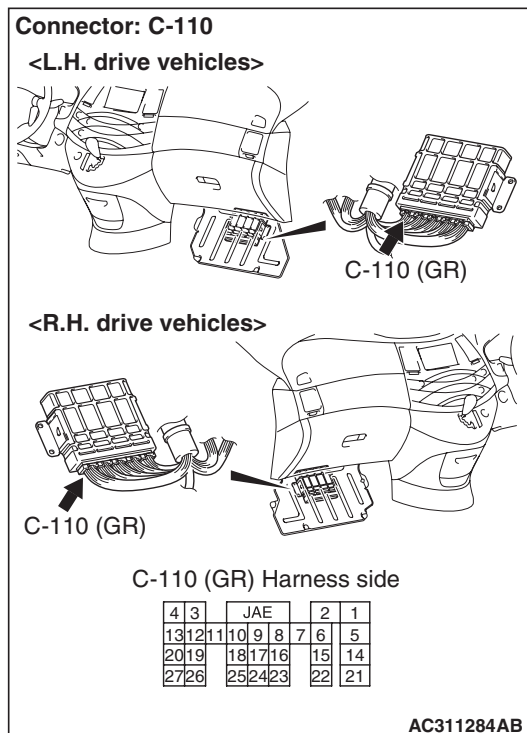
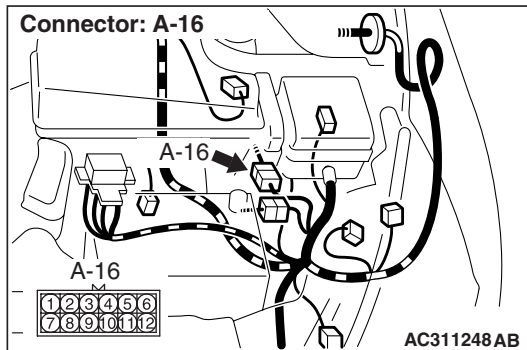
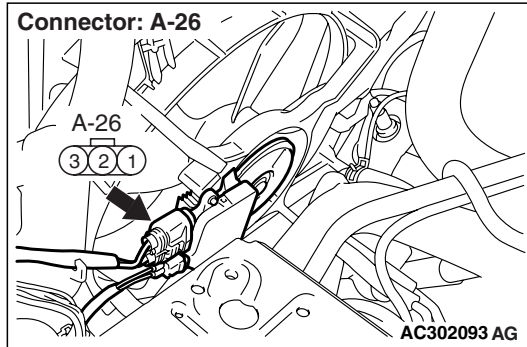
**STEP 3. Check the harness wire between fan control relay connector A-13X terminal 2 and fan controller connector A-26 terminal 3.**

**Q: Is the harness wire in good condition?**

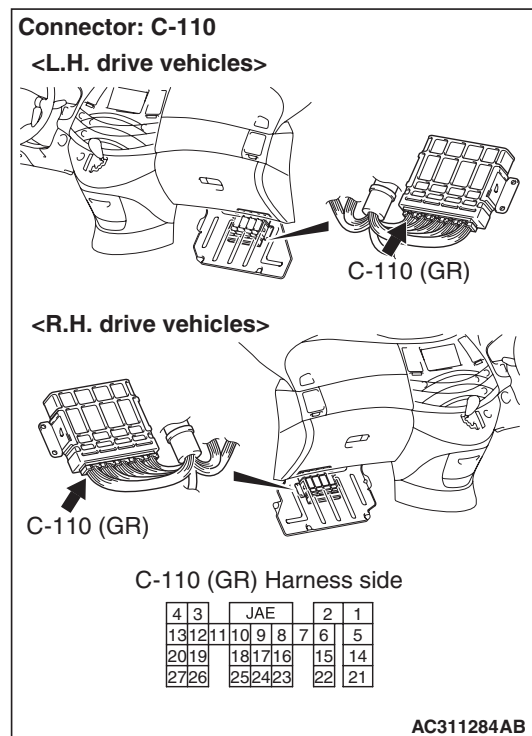
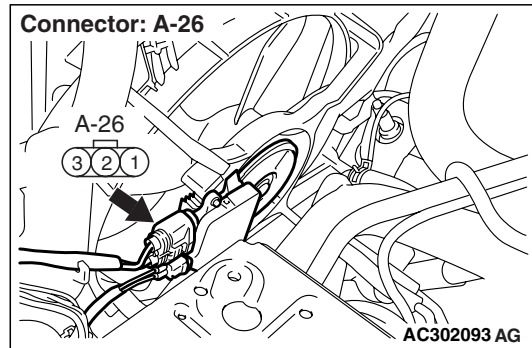
**YES :** Go to Step 4.

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

**STEP 4. Check the fan controller connector A-26, intermediate connector A-16 and engine-ECU connector or engine-A/T-ECU connector C-110.**



**STEP 5. Check the harness wire between fan controller connector A-26 terminal 2 and engine-ECU connector or engine-A/T-ECU connector C-110 terminal 17.**



**Q: Are these harness wires in good condition?**

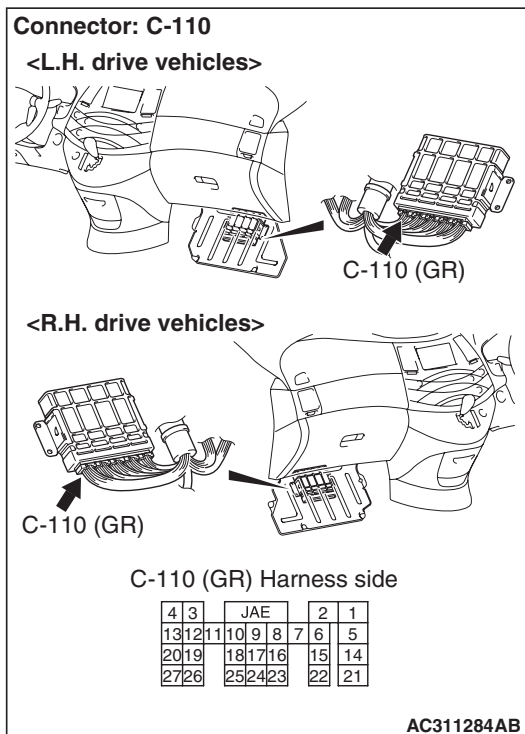
**YES :** Go to Step 6.

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

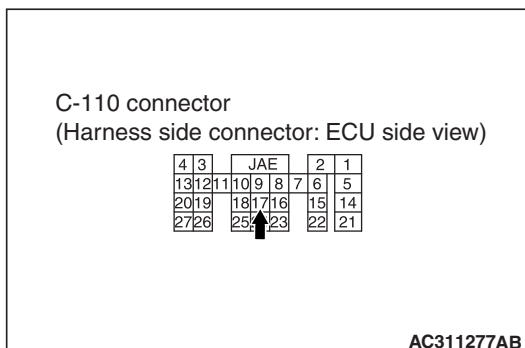
**Q: Are these connectors in good condition?**

**YES :** Go to Step 5.

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

**STEP 6. Check the fan controller.**

- (1) Disconnect engine-ECU connector or engine-A/T-ECU connector C-110.



- (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 connector or engine-A/T-ECU connector C-110, 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 fan motor and fan controller (Refer to P.14-27). Then go to Step 8.

**STEP 7. M.U.T.-III self-diag code**

Check if an MPI system self-diag code is set. (Refer to GROUP 13A - Troubleshooting P.13A-11)<Except vehicles for Hong Kong, Singapore, Australia and New Zealand>, (Refer to GROUP 13B - Troubleshooting P.13B-11)<Vehicles for Hong Kong and Singapore>, (Refer to GROUP 13C - Troubleshooting P.13C-11)<Vehicles for Australia and New Zealand>.

**Q: Diagnosis code set?**

**YES :** Inspection chart for diagnosis code (Refer to GROUP 13A - Troubleshooting P.13A-14)<Except vehicles for Hong Kong, Singapore, Australia and New Zealand>, (Refer to GROUP 13B - Troubleshooting P.13B-15)<Vehicles for Hong Kong and Singapore>, (Refer to GROUP 13C - Troubleshooting P.13C-21)<Vehicles for Australia and New Zealand>.

**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<Except vehicles for Hong Kong, Singapore, Australia and New Zealand>P.13A-323 ), (Refer to GROUP 13B, Engine-A/T-ECU <Vehicles for Hong Kong and Singapore>P.13B-297 ), (Refer to GROUP 13C, Engine-A/T-ECU <Vehicles for Australia and New Zealand>P.13C-350 ). 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.



---

**INSPECTION PROCEDURE 3: Radiator Fan does not Operate**

---

**Radiator Fan and Condenser Fan Drive Circuit**

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

**TECHNICAL DESCRIPTION**

The cause could be a malfunction of the radiator fan motor or an open circuit between the fan controller and the radiator fan motor.

**TROUBLESHOOTING HINTS**

- Malfunction of radiator fan motor
- Malfunction of fan controller

**DIAGNOSIS**

Replace the radiator fan motor and fan controller assembly.

**Q: Does the radiator fan operate correctly?**

**YES :** There is no action to be taken?

**NO :** Repair the wiring harness between the fan controller and the radiator fan motor.

---

**INSPECTION PROCEDURE 4: Condenser Fan does not Operate**

---

**Radiator Fan and Condenser Fan Drive Circuit**

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

**TECHNICAL DESCRIPTION**

The cause could be a malfunction of the condenser fan motor or fan controller.

**TROUBLESHOOTING HINTS**

- Malfunction of condenser fan motor
- Malfunction of fan controller

**DIAGNOSIS**

---

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

Condenser fan motor check. (Refer to GROUP 55, Condenser and Condenser Fan Motor [P.55-242](#)).

**Q: Is the condenser fan motor in good condition?**

**YES :** Go to Step 2.

**NO :** Replace the condenser fan motor, then go to Step 3.

---

**STEP 2. Check the fan controller.**

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

**Q: Is the fan controller in good condition?**

**YES :** Go to Step 3.

**NO :** Replace the fan motor and fan controller (Refer to [P.14-27](#)). Then go to Step 3.

---

**STEP 3. Check the symptoms.**

**Q: Do the condenser fan operate?**

**YES :** This symptoms is complete.

**NO :** Return to Step 1.

## ON-VEHICLE SERVICE

## ENGINE COOLANT LEAK CHECK

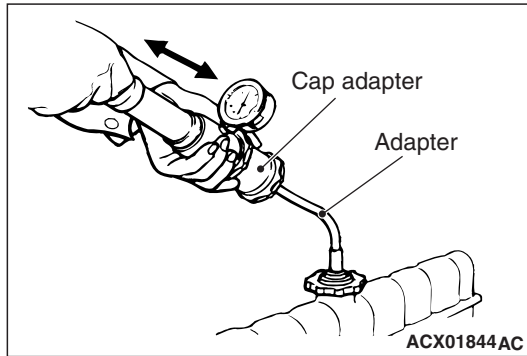
M1141001000418

**⚠ 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.

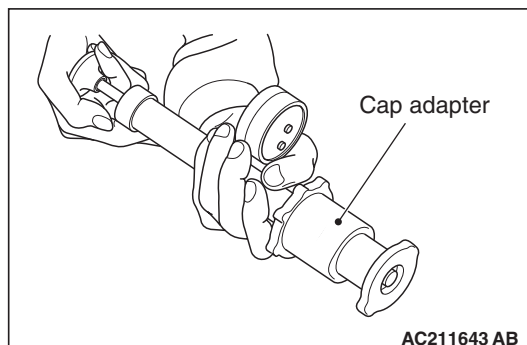


1. Check that the coolant level is up to the filler neck. Install a radiator tester and apply 160 kPa pressure, and then check for leakage from the radiator hose or connections.
2. If there is leakage, repair or replace the appropriate part.

RADIATOR CAP VALVE OPENING  
PRESSURE CHECK

M1141001300486

*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

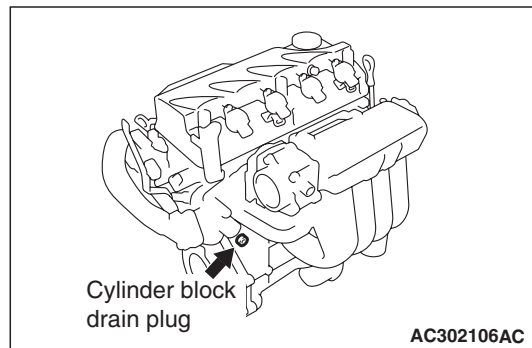
M1141001200597

**⚠ WARNING**

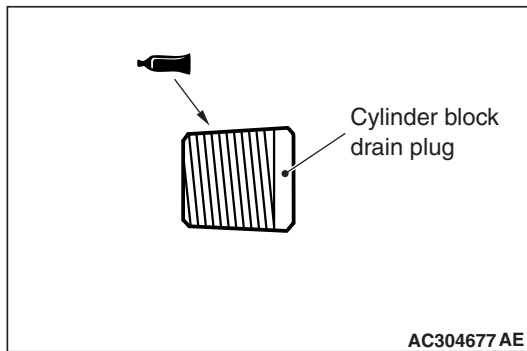
*When removing the radiator cap, use care to avoid contact with hot coolant or steam.*

*Place a shop towel over the cap and turn the cap counterclockwise a little to let the pressure escape through the vinyl tube. After relieving the steam pressure, remove the cap by slowly turning it counterclockwise.*

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



2. Drain the water in the water jacket by unplugging the drain plug of the cylinder block.
3. Remove the radiator condenser tank 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.

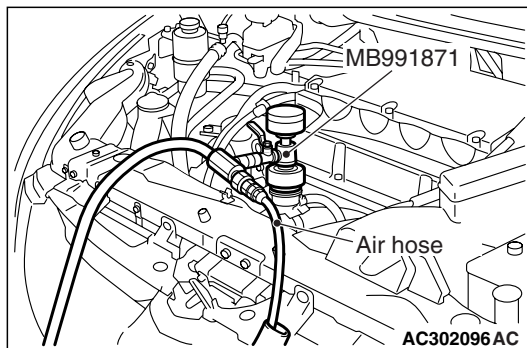
**Specified sealant: 3M Nut Locking Part No.4171 or equivalent**

**Tightening torque:  $44 \pm 5$  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:  $-31^{\circ}\text{C}$ ).

**Recommended antifreeze: DIA QUEEN SUPER LONG LIFE COOLANT or equivalent**

**Quantity:**

**<Without rear heater> 8.0 L**

**<With rear heater> 9.5 L**

**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**

M1141001100471

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

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

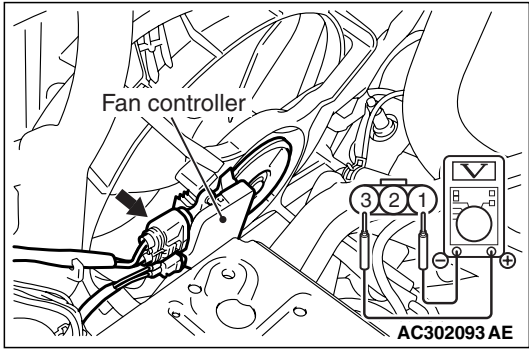
**Recommended antifreeze: DIAQUEEN SUPER LONG LIFE COOLANT or equivalent**

**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.

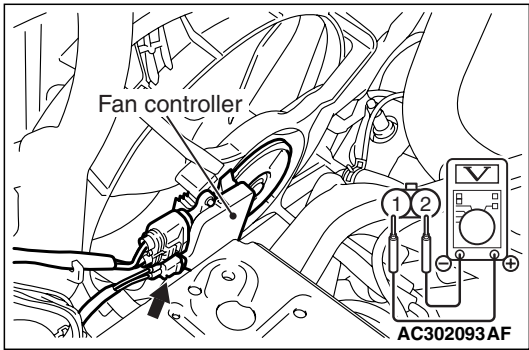
FAN CONTROLLER CHECK

M1141007400113



1. Remove the fan controller connector.
2. Turn the ignition switch to the "ON" position, and measure the voltage between the harness-side connector terminals.

**Standard value: System voltage**



3. Connect the fan controller connector, and disconnect the condenser 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 the fan controller-side connector terminals.

**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 the fan controller-side connector terminals while the fan is running. The voltage should repeat the values below.

**Standard value:**

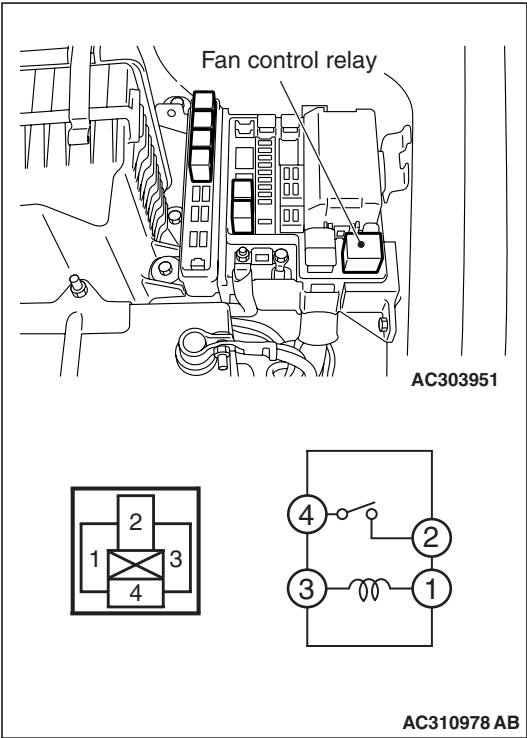
**8.2 ± 2.6 V**

**System voltage ± 2.6 V**

8. If the voltage does not repeatedly change as indicated, replace the cooling fan motor and fan controller.

FAN CONTROL RELAY CONTINUITY CHECK

M1141006200387



| 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.<br>Connect terminal No.3 and battery (+) terminal. | 4 - 2                                  | Less than 2 ohms        |

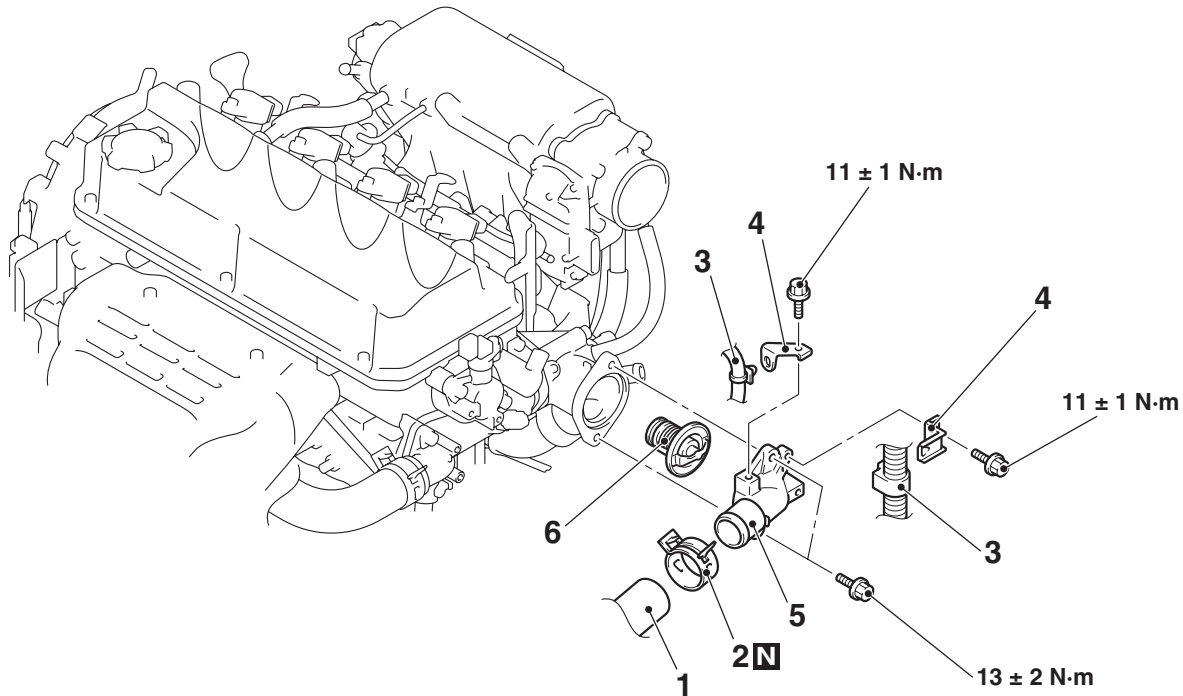
# THERMOSTAT

## REMOVAL AND INSTALLATION

M1141002400817

### Pre-removal and Post-installation Operation

- Engine Coolant Draining and Refilling (Refer to P.14-18).
- Air Cleaner Removal and Installation (Refer to GROUP 15, Air Cleaner P.15-3).
- Battery Removal and Installation



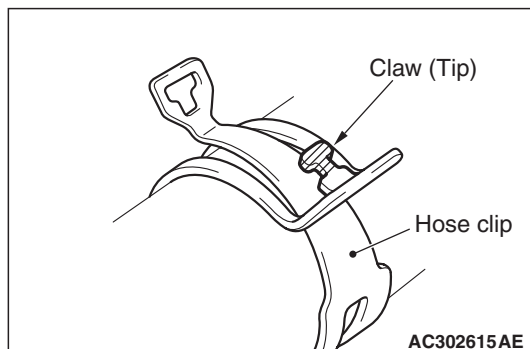
AC302092AD

### Removal steps

- <<A>> >>B<< 1. Radiator lower hose connection  
<<A>> >>B<< 2. Hose clip  
3. Engine control harness clamp

### Removal steps (Continued)

4. Engine control harness clamp bracket  
5. Water inlet fitting  
>>A<< 6. Thermostat

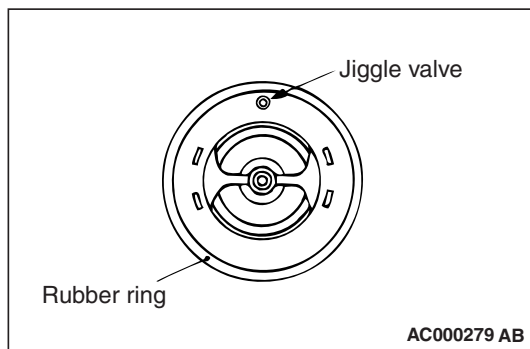
**REMOVAL SERVICE POINT****<<A>> RADIATOR LOWER HOSE/HOSE CLIP DISCONNECTION**

Break off the tip of hose clip claw and spread out the hose clip, then disconnect the radiator hose.

*NOTE: If there is a hose clip claw, the hose clip cannot spread to capacity because the claw contacts the hose clip.*

**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<< HOSE CLIP/RADIATOR LOWER HOSE CONNECTION****⚠ CAUTION**

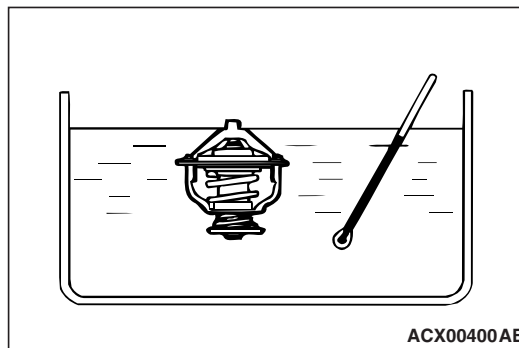
Never reuse the hose clip whose claw is broken off to prevent the rusting.

1. Insert a new hose clip into the radiator upper hose.

2. Insert the radiator upper hose until the protrusion of the water outlet fitting.
3. Remove the hose clip claw and shorten the hose clip, then install the radiator upper hose.

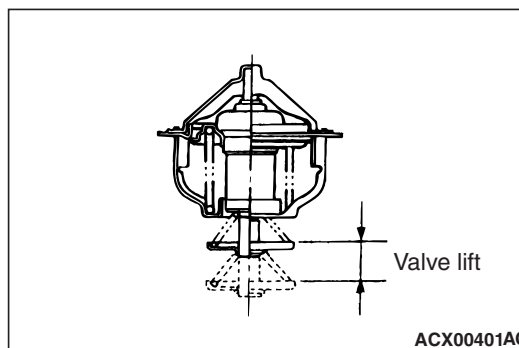
**INSPECTION**

M1141002500513

**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:  $95^\circ \text{C}$**

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

# WATER PUMP

## REMOVAL AND INSTALLATION

M1141002700614

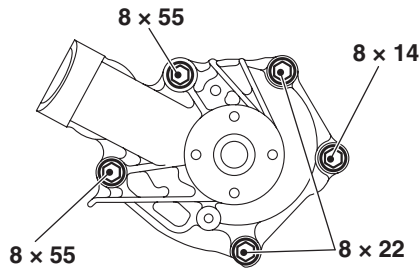
### Pre-removal Operation

- Engine Coolant Draining (Refer to [P.14-18](#)).
- Timing Belt Removal (Refer to GROUP 11A, Timing Belt [P.11A-36](#)).

### Post-installation Operation

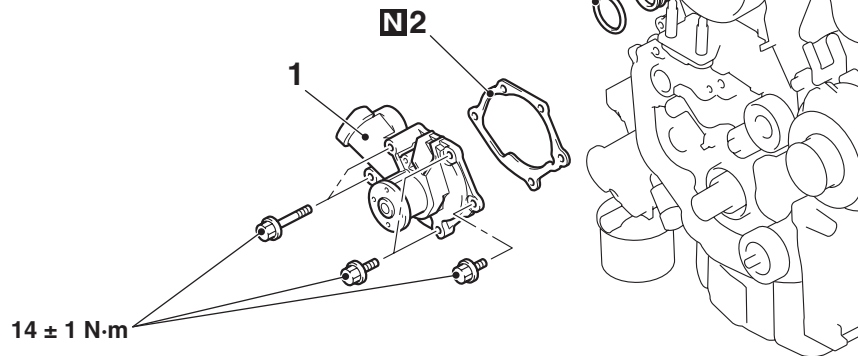
- Timing Belt Installation (Refer to GROUP 11A, Timing Belt [P.11A-36](#)).
- Engine Coolant Refilling (Refer to [P.14-18](#)).

### Bolt specifications



Screw diameter x length mm

AC302090



AC302091

AC302105AC

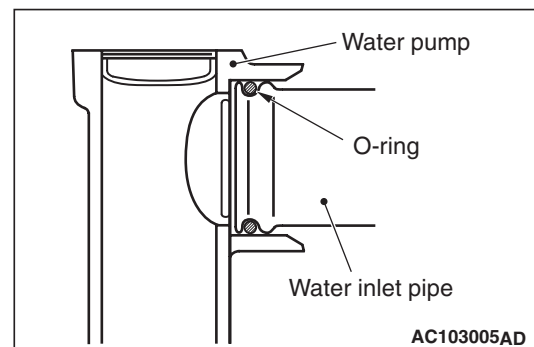
### Removal steps

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

>>A<<

## INSTALLATION SERVICE POINT

### >>A<< O-RING INSTALLATION



AC103005AD

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

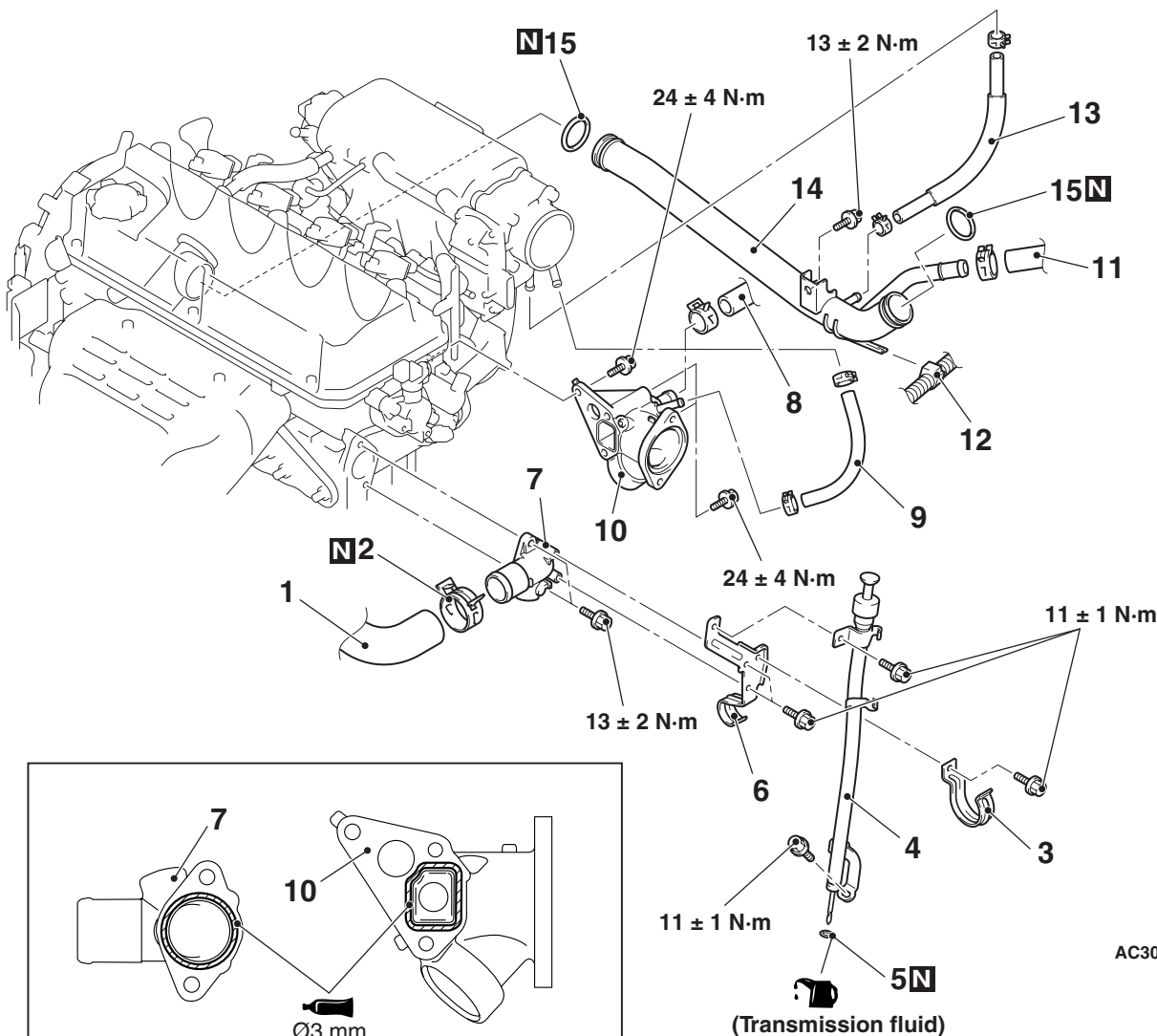
## REMOVAL AND INSTALLATION

M1141003300976

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

- Engine Coolant Draining and Supplying (Refer to [P.14-18](#)).
- Engine Cover Removal and Installation (Refer to GROUP 11A, Camshaft and Valve Stem Seal [P.11A-17](#)).
- Air Cleaner Assembly Removal and Installation (Refer to GROUP 15, Air Cleaner [P.15-3](#)).
- Thermostat Removal and Installation (Refer to [P.14-21](#)).

&lt;Except vehicles for Hong Kong and Singapore&gt;



AC302094

AC310936AB

Sealant: Mitsubishi Genuine Part No. MD970389  
or equivalent

**Removal steps**

- <<A>> >>C<< 1. Radiator upper hose connection  
<<A>> >>C<< 2. Hose clip  
3. Radiator hose clamp  
4. A/T oil level gauge guide <A/T>  
5. O-ring <A/T>

**Removal steps (Continued)**

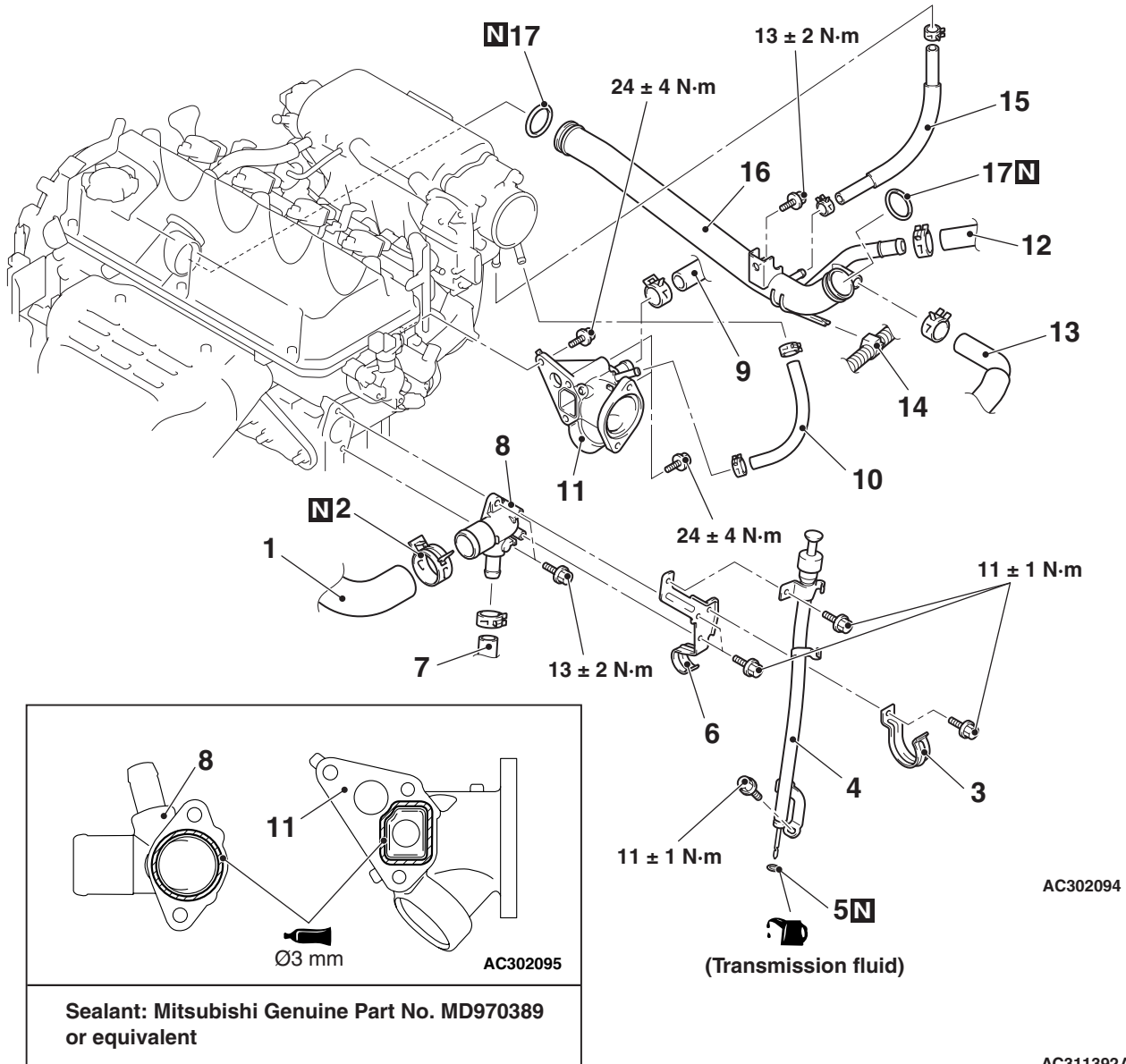
6. A/T oil level gauge guide bracket <A/T>  
>>B<< 7. Water outlet fitting  
8. Heater hose connection  
9. Throttle body water return hose



**Removal steps (Continued)**

- >>B<< 10. Thermostat case  
11. Heater hose connection  
12. Battery harness clamp  
13. Throttle body water feed hose  
14. Water inlet pipe  
>>A<< 15. O-ring

**<Vehicles for Hong Kong and Singapore>**



**Removal steps**

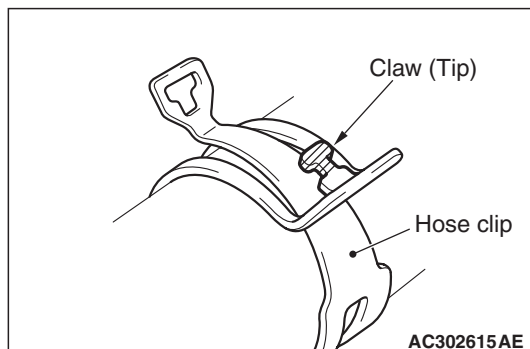
- <<A>> >>C<< 1. Radiator upper hose connection  
<<A>> >>C<< 2. Hose clip  
3. Radiator hose clamp  
4. A/T oil level gauge guide  
5. O-ring  
6. A/T oil level gauge guide bracket  
7. ATF warmer (A/T fluid cooler) water return hose connection  
>>B<< 8. Water outlet fitting  
9. Heater hose connection

**Removal steps (Continued)**

- >>B<< 10. Throttle body water return hose  
11. Thermostat case  
12. Heater hose connection  
13. ATF warmer (A/T fluid cooler) water feed hose connection  
14. Battery harness clamp  
15. Throttle body water feed hose  
16. Water inlet pipe  
>>A<< 17. O-ring

## REMOVAL SERVICE POINT

## &lt;&lt;A&gt;&gt; RADIATOR UPPER HOSE/HOSE CLIP DISCONNECTION

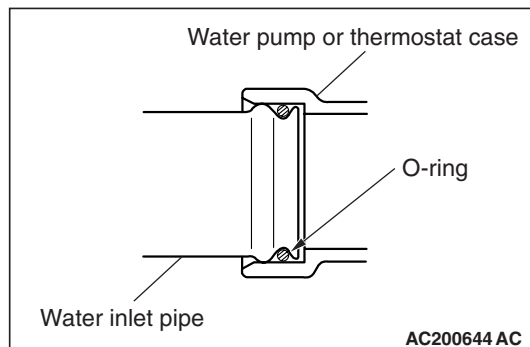


Break off the tip of hose clip claw and spread out the hose clip, then disconnect the radiator hose.

*NOTE: If there is a hose clip claw, the hose clip cannot spread to capacity because the claw contacts the hose clip.*

## INSTALLATION SERVICE POINTS

## &gt;&gt;A&lt;&lt; O-RING INSTALLATION

**CAUTION**

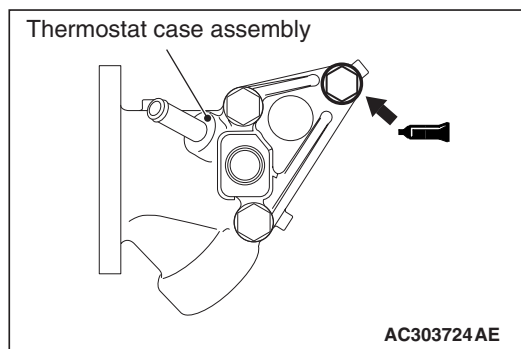
**Do not allow engine oil or other grease to adhere to the cooling water line O-ring**

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

## &gt;&gt;B&lt;&lt; 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 specified sealant.

**Specified Sealant: MITSUBISHI GENUINE PART No.MD970389 or equivalent**



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

**Specified adhesive: 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.

## &gt;&gt;C&lt;&lt; HOSE CLIP/RADIATOR UPPER HOSE CONNECTION

**CAUTION**

**Never reuse the hose clip whose claw is broken off to prevent the rusting.**

1. Insert a new hose clip into the radiator upper hose.
2. Insert the radiator upper hose until the protrusion of the water outlet fitting.
3. Remove the hose clip claw and shorten the hose clip, then install the radiator upper hose.

## INSPECTION

M1141003400371

## WATER PIPE AND HOSE CHECK

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

# RADIATOR

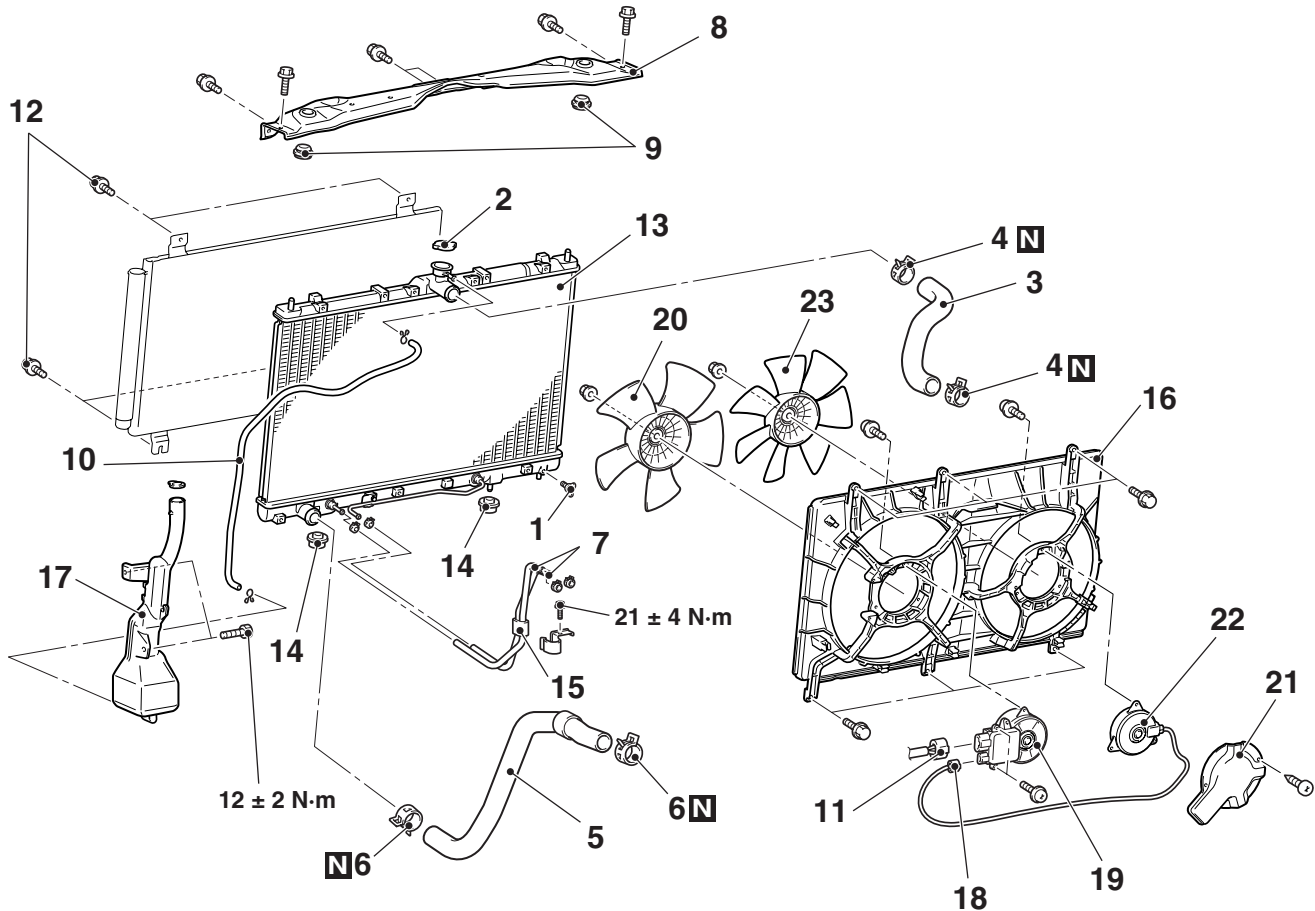
## REMOVAL AND INSTALLATION

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### Pre-removal and Post-installation Operation

- Engine Coolant Draining and Supplying (Refer to P.14-18).
- Air Cleaner Assembly Removal and Installation (Refer to GROUP 15 P.15-3).

<Except vehicles for Hong Kong and Singapore>



AC310381AB

### Radiator removal steps

1. Drain plug
2. Radiator cap
- <<A>> >>A<< 3. Radiator upper hose
- <<A>> >>A<< 4. Hose clips
- <<A>> >>A<< 5. Radiator lower hose
- <<A>> >>A<< 6. Hose clips
7. A/T oil cooler hose connection <A/T>
8. Front end upper bar
9. Radiator support upper insulator
10. Radiator condenser tank hose
11. Fan controller connector
- <<B>> 12. A/C condenser connecting bolts
13. Radiator assembly

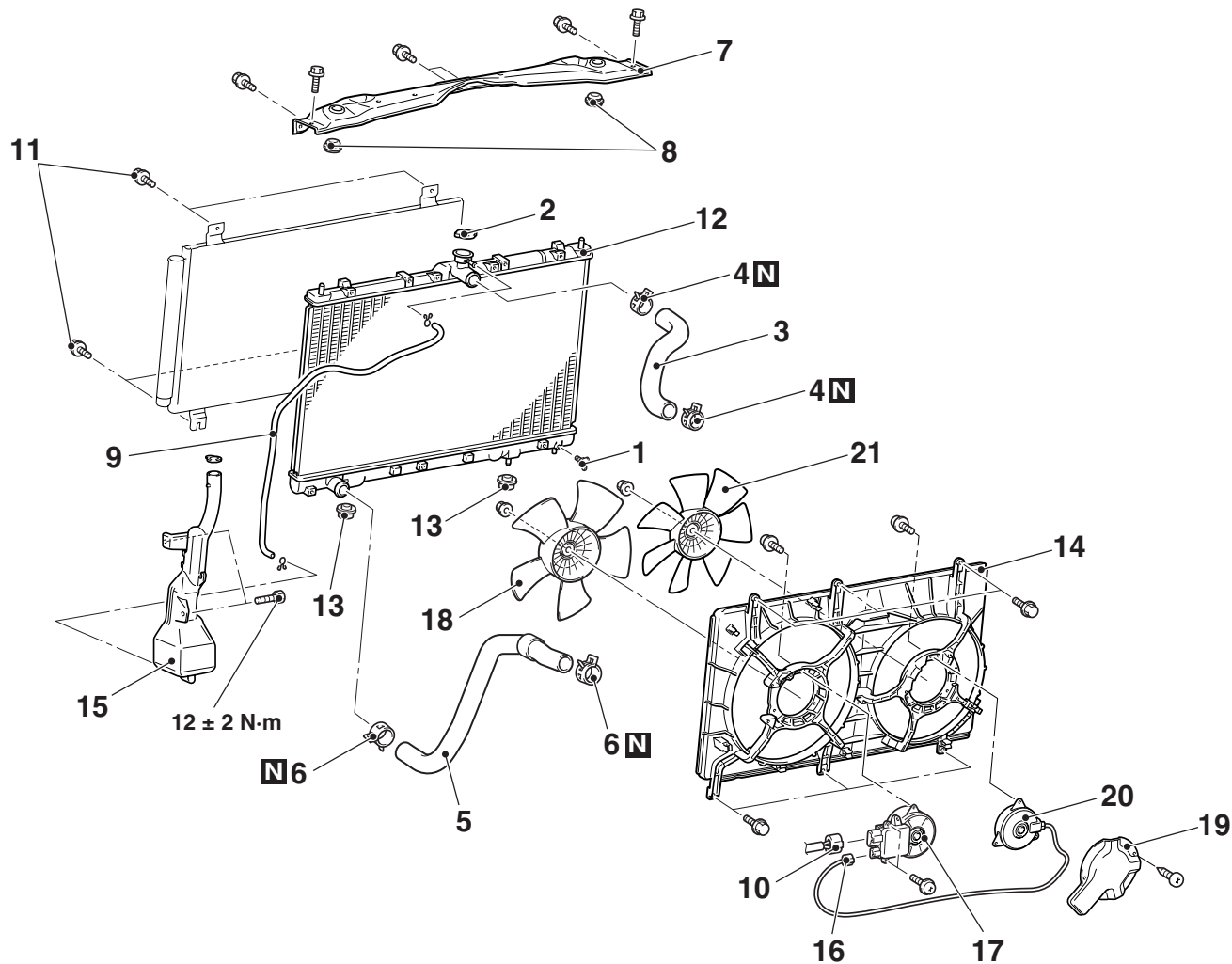
### Radiator removal steps

14. Radiator support lower insulator
15. A/T oil cooler hose <A/T>
16. Cooling fan motor and shroud assembly
17. Radiator condenser tank assembly
18. Condenser fan motor connector
19. Cooling fan motor and fan controller
20. Cooling fan
21. Cooling fan protector
22. Condenser fan motor
23. Condenser fan

**Radiator condenser tank  
removal steps**

- 10. Radiator condenser tank hose
- 11. Fan controller connector
- 8. Front end upper bar
- 9. Radiator support upper insulator
- 17. Radiator condenser tank assembly

<Vehicles for Hong Kong and Singapore>



AC302097AB

**Radiator removal steps**

- <<A>> >>A<<
- 1. Drain plug
  - 2. Radiator cap
  - 3. Radiator upper hose
  - 4. Hose clips
  - 5. Radiator lower hose
  - 6. Hose clips
  - 7. Front end upper bar
  - 8. Radiator support upper insulator
  - 9. Radiator condenser tank hose
  - 10. Fan controller connector
- <<B>>
- 11. A/C condenser connecting bolts
  - 12. Radiator assembly
  - 13. Radiator support lower insulator

**Radiator removal steps**

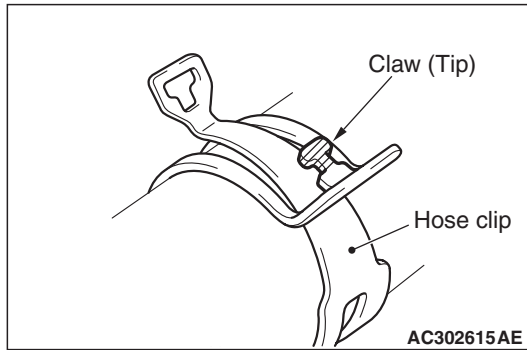
- 14. Cooling fan motor and shroud assembly
  - 15. Radiator condenser tank assembly
  - 16. Condenser fan motor connector
  - 17. Cooling fan motor and fan controller
  - 18. Cooling fan
  - 19. Cooling fan protector
  - 20. Condenser fan motor
  - 21. Condenser fan
- Radiator condenser tank  
removal steps**
- 9. Radiator condenser tank hose
  - 10. Fan controller connector

**Radiator condenser tank  
removal steps (Continued)**

7. Front end upper bar
8. Radiator support upper insulator
15. Radiator condenser tank assembly

**REMOVAL SERVICE POINTS**

**<<A>> RADIATOR HOSE/HOSE CLIPS  
DISCONNECTION**



Break off the tip of hose clip claw and spread out the hose clip, then disconnect the radiator hose.

*NOTE: If there is a hose clip claw, the hose clip cannot spread to capacity because the claw contacts the hose clip.*

**<<B>> A/C CONDENSER CONNECTING  
BOLTS REMOVAL**

After removing the A/C condenser mounting bolts, tie A/C condenser by string to secure. At this time, be careful not to load the A/C pipe, etc.

**INSTALLATION SERVICE POINT**

**>>A<< HOSE CLIPS/RADIATOR HOSE  
CONNECTION**

**⚠ CAUTION**

**Never reuse the hose clip whose claw is broken off to prevent the rusting.**

1. Insert a new hose clip into the radiator hose.
2. Insert the radiator hose until the protrusion at both radiator and engine side.
3. Remove the hose clip claw and shorten the hose clip, then install the radiator hose.