
GROUP 14

ENGINE COOLING

CONTENTS

GENERAL INFORMATION	14-2	ON-VEHICLE SERVICE	14-16
SERVICE SPECIFICATIONS	14-2	ENGINE COOLANT LEAK CHECK	14-16
LUBRICANT	14-2	RADIATOR CAP VALVE OPENING PRESSURE CHECK	14-17
SEALANT OR ADHESIVE	14-2	ENGINE COOLANT REPLACEMENT	14-17
SPECIAL TOOL	14-3	CONCENTRATION MEASUREMENT	14-18
TROUBLESHOOTING	14-3	FAN CONTROLLER CHECK	14-18
INSPECTION CHART FOR TROUBLE SYMPTOMS	14-3	FAN CONTROL RELAY CONTINUITY CHECK	14-19
INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS	14-4	THERMOSTAT	14-20
INSPECTION PROCEDURE 1: Radiator Fan and Condenser Fan do not Operate	14-4	REMOVAL AND INSTALLATION	14-20
INSPECTION PROCEDURE 2: Radiator Fan and Condenser Fan do not Change Speed or Stop	14-12	INSPECTION	14-21
INSPECTION PROCEDURE 3: Radiator Fan does not Operate	14-15	WATER PUMP	14-22
INSPECTION PROCEDURE 4: Condenser Fan does not Operate	14-16	REMOVAL AND INSTALLATION	14-22
		WATER HOSE AND WATER PIPE	14-23
		REMOVAL AND INSTALLATION	14-23
		INSPECTION	14-24
		RADIATOR	14-25
		REMOVAL AND INSTALLATION	14-25

GENERAL INFORMATION

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

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

Item	Specification
Radiator	Performance kJ/h 228,240
Built-in A/T oil cooler	Performance kJ/h 5,652

SERVICE SPECIFICATIONS

M1141000300494

Item	Standard value	Limit
Fan controller V	A/C OFF 1 or less	-
	A/C ON Repeat 8.2 ± 2.6 System voltage ± 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 ± 1.5	-
	Full-opening temperature of thermostat °C 95	-
	Valve lift mm 8.5 or more	-

LUBRICANT

M1141000400435

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

M1141000500454

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 TOOL

M1141000600321

Tool	Number	Name	Use
 MB991871	MB991871	LLC changer	Coolant refilling

TROUBLESHOOTING

INSPECTION CHART FOR TROUBLE SYMPTOMS

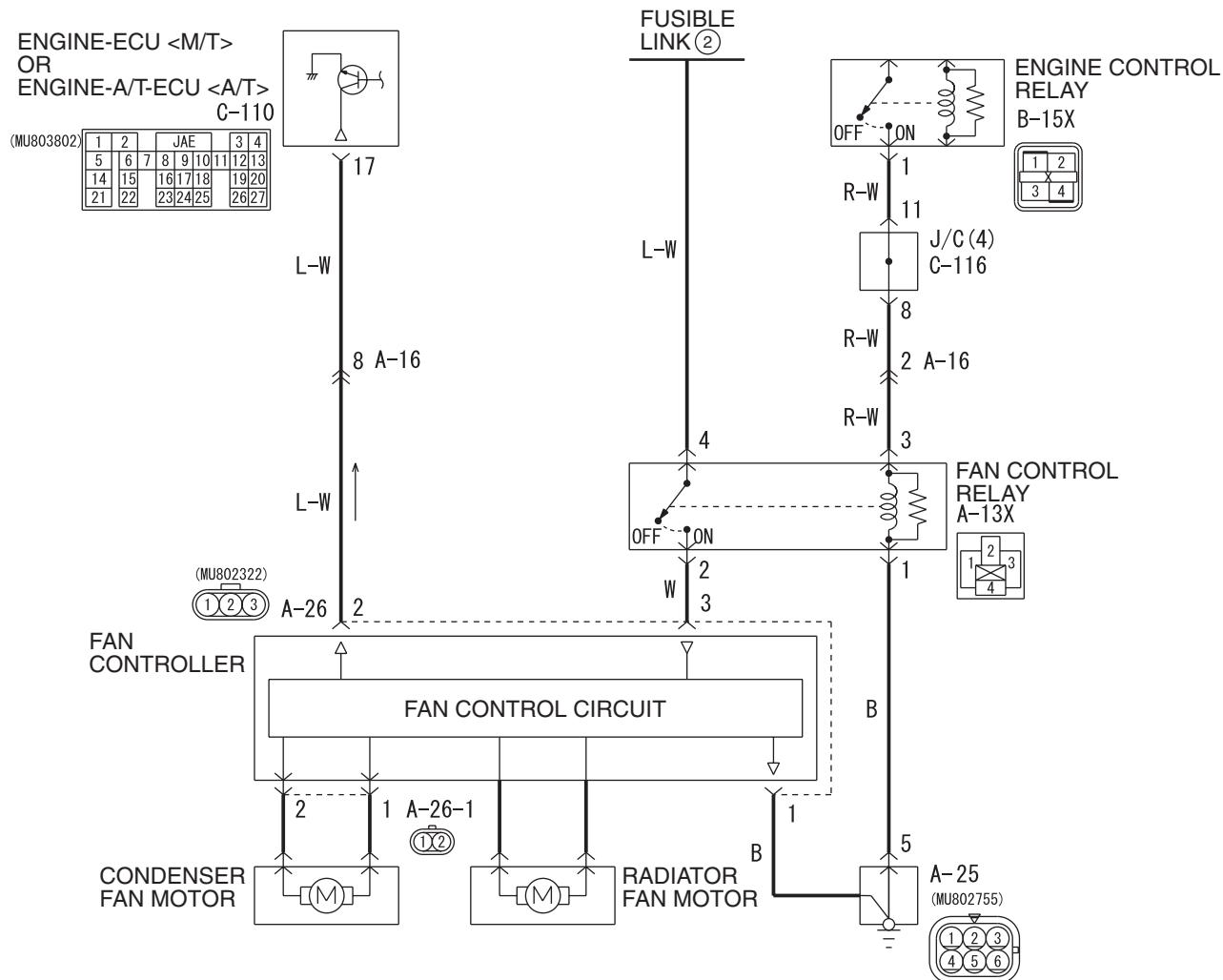
M1141005600445

Trouble symptom	Inspection procedure No.	Reference page
Radiator fan and condenser fan do not operate	1	P.14-4
Radiator fan and condenser fan do not change speed or stop	2	P.14-12
Radiator fan does not operate	3	P.14-15
Condenser fan does not operate	4	P.14-16

INSPECTION PROCEDURE FOR
TROUBLE SYMPTOMS

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

Radiator Fan and Condenser Fan Drive Circuit



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

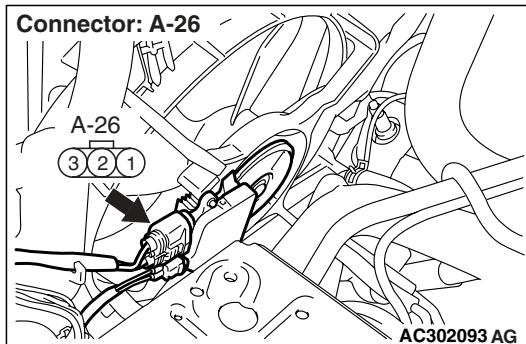
- The cause could be a malfunction of the fan controller power supply or earth circuit.
- If the communication line wiring harness between the fan controller and the engine-ECU <M/T> or engine-A/T-ECU <A/T> is short-circuited to earth, the radiator fan motor and the condenser fan motor will not rotate.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

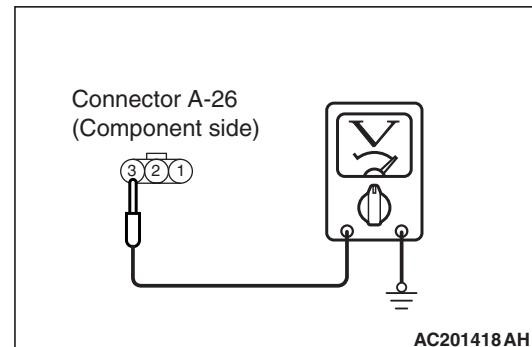
DIAGNOSIS

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



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

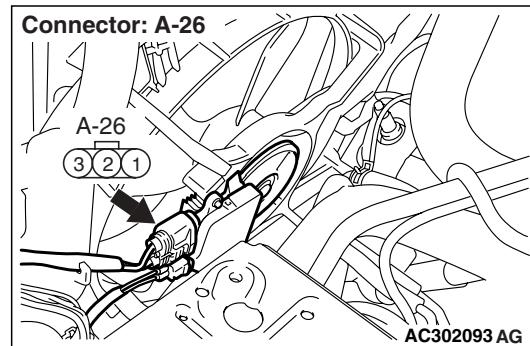
- Turn the ignition switch to the "ON" position.



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

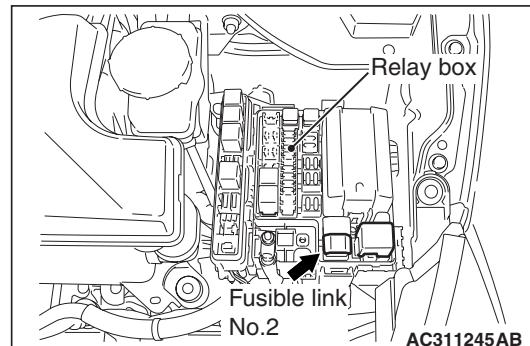
Q: Is the measured voltage system voltage?
 YES : Go to Step 17.
 NO : Go to Step 2.

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 24.

STEP 3. Check the fusible link No.2.

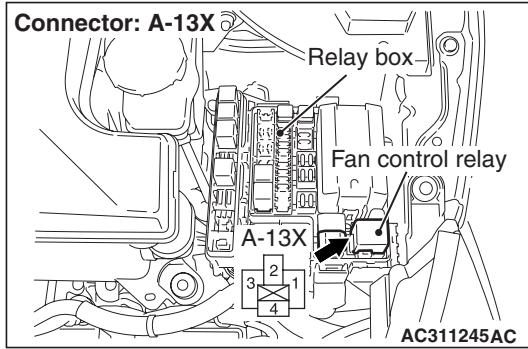


Q: Is the fusible link No.2 in good condition?

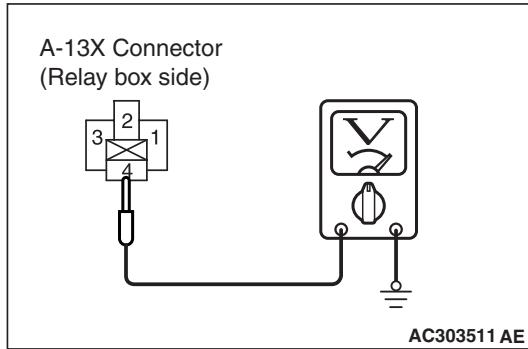
YES : Go to Step 4.

NO : Replace the fusible link No.2. Then go to Step 24.

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.



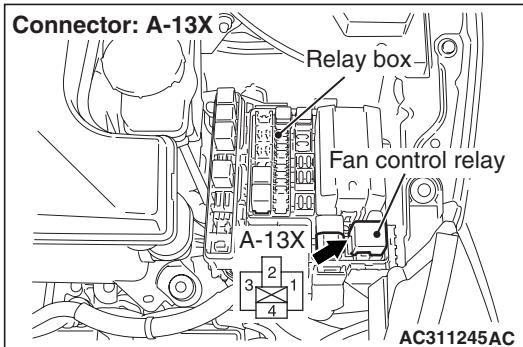
- (3) Measure the voltage between fan control relay connector A-13X terminal 4 and body earth.
 - The voltage should measure system voltage.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.
- (5) Connect fan control relay connector A-13X (install the fan control relay).

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.

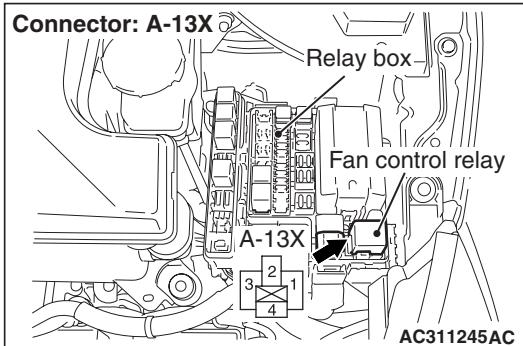
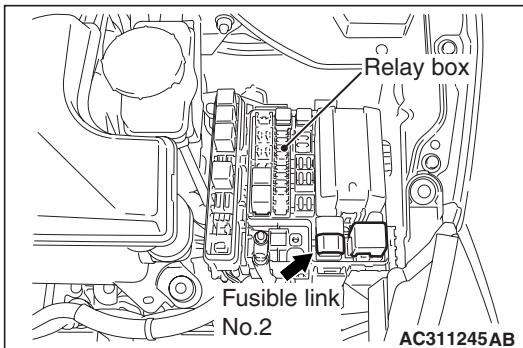


Q: Is the connector in good condition?

YES : Go to Step 6.

NO : Repair the connector or replace the relay box. Then go to Step 24.

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 P.00-5).

NO : Repair the damaged harness wire. Then go to Step 24.

STEP 7. Check the fan control relay.

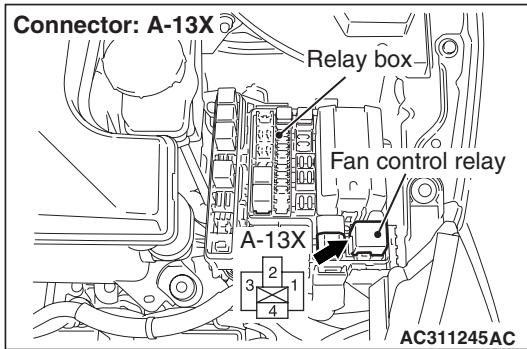
Refer to P.14-19.

Q: Is the fan control relay in good condition?

YES : Go to Step 8.

NO : Replace the fan control relay. Then go to Step 24.

STEP 8. Check the fan control relay connector A-13X.

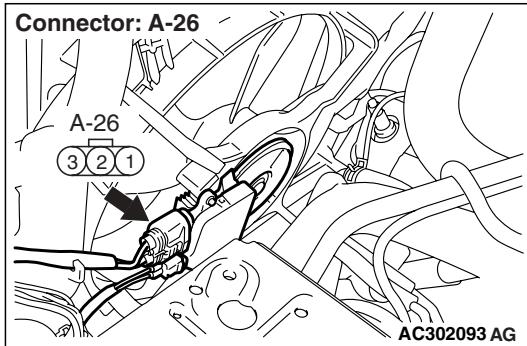
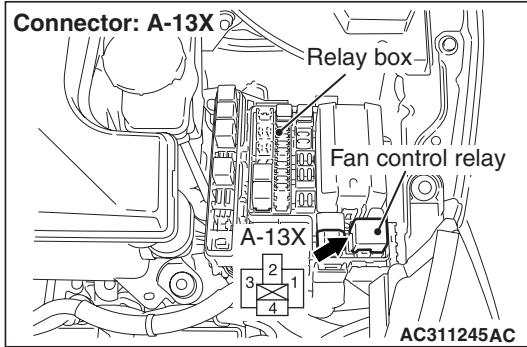


Q: Is the connector in good condition?

YES : Go to Step 9.

NO : Repair the connector or replace the relay box. Then go to Step 24.

STEP 9. Check the harness wire between fan control relay connector A-13X terminal 2 and fan controller connector A-26 terminal 3.

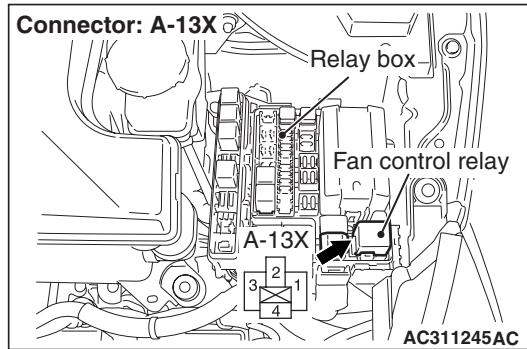


Q: Is the harness wire in good condition?

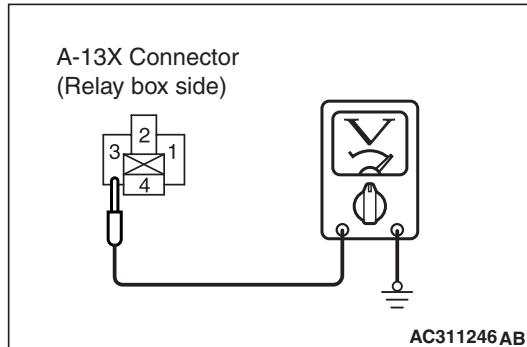
YES : Go to Step 10.

NO : Repair the damaged harness wire. Then go to Step 24.

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.



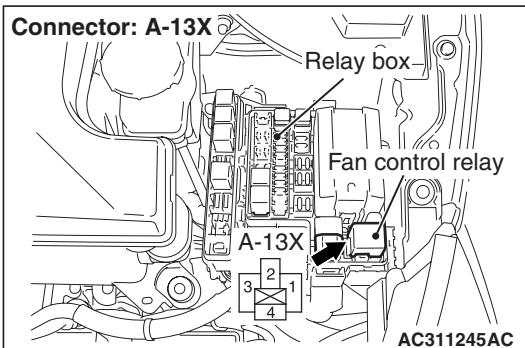
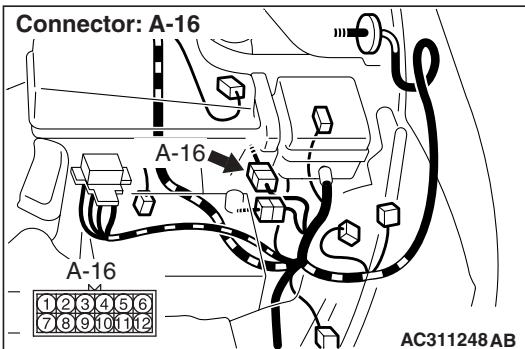
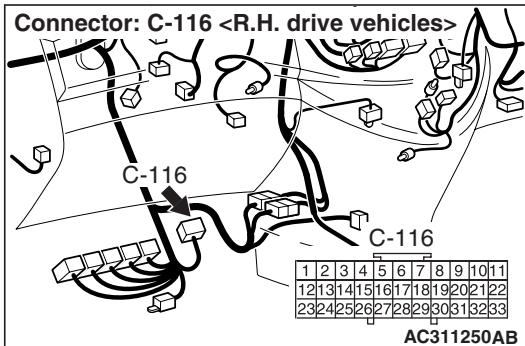
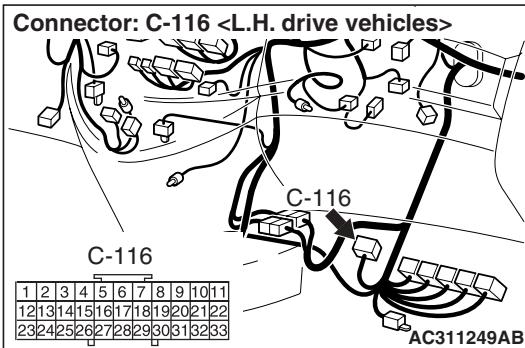
- (3) Measure the voltage between fan control relay connector A-13X terminal 3 and body earth.
 - The voltage should measure system voltage.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.
- (5) Connect fan control relay connector A-13X (install the fan control relay).

Q: Is the measured voltage system voltage?

YES : Go to Step 13.

NO : Go to Step 11.

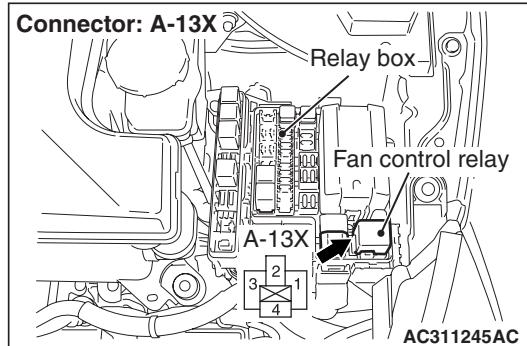
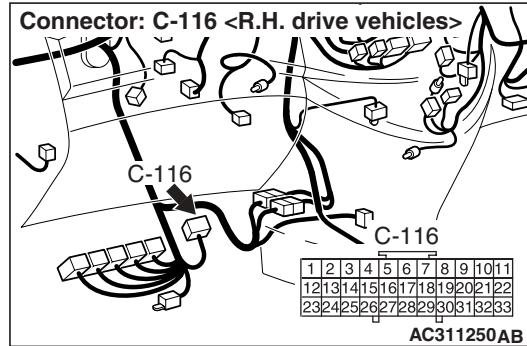
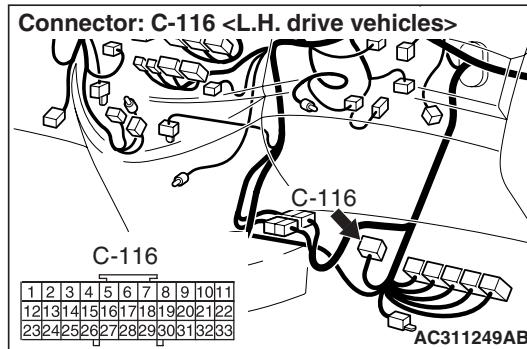
STEP 11. Check the J/C No.2 C-116, intermediate connector A-16 and fan control relay connector A-13X.



YES : Go to Step 12.

NO : Repair or replace the connector. Then go to Step 24.

STEP 12. Check the harness wire between J/C No.2 C-116 terminal 8 and fan control relay connector A-13X terminal 3.



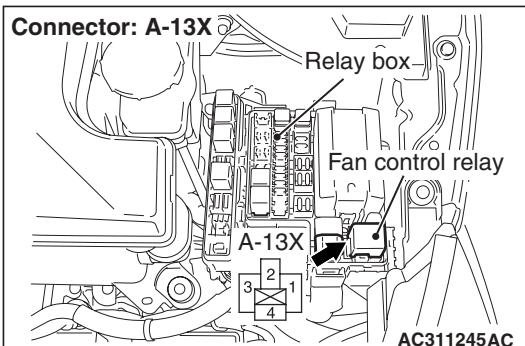
Q: Are these harness wires in good condition?

YES : An intermittent malfunction is suspected
(Refer to GROUP 00 - How to use troubleshooting P.00-5).

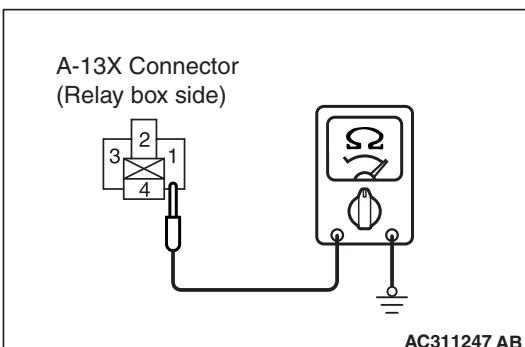
NO : Repair the damaged harness wire. Then go to Step 24.

Q: Are there connectors in good condition?

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?

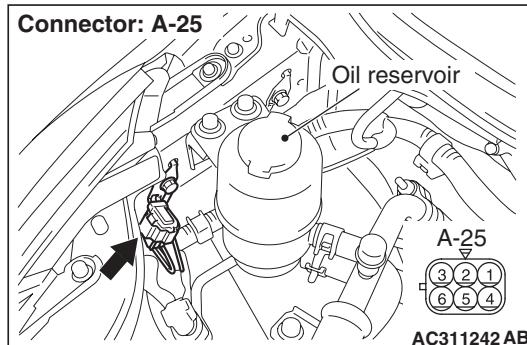
YES : An intermittent malfunction is suspected (Refer to GROUP 00 - How to use troubleshooting P.00-5).

NO : Go to Step 14.

YES : Go to Step 15.

NO : Repair the connector or replace the relay box. Then go to Step 24.

STEP 15. Check the earth connector A-25.

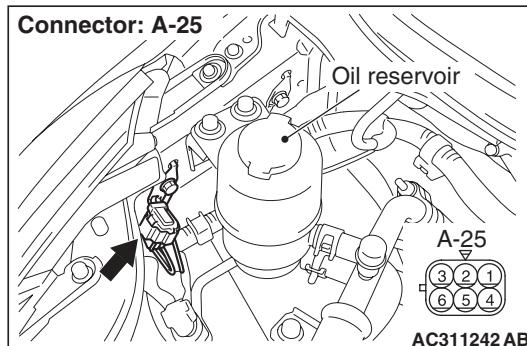
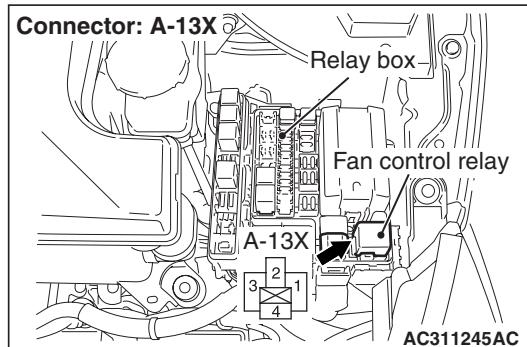


Q: Is the connector in good condition?

YES : Go to Step 16.

NO : Repair or replace the connector. Then go to Step 24.

STEP 16. Check the harness wire between fan control relay connector A-13X terminal 1 and body earth connector A-25 terminal 5.

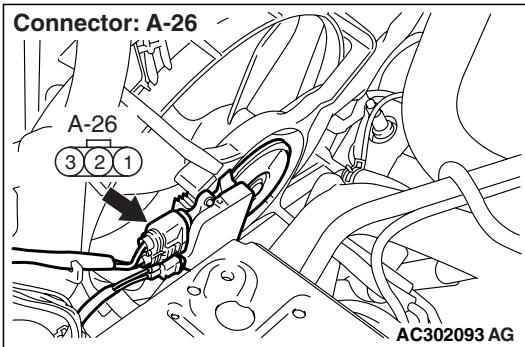


Q: Is the harness wire in good condition?

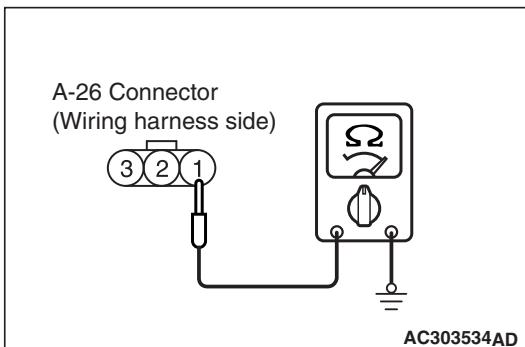
YES : An intermittent malfunction is suspected (Refer to GROUP 00 - How to use troubleshooting P.00-5).

NO : Repair the damaged harness wire. Then go to Step 24.

Q: Is the connector in good condition?

STEP 17. 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.



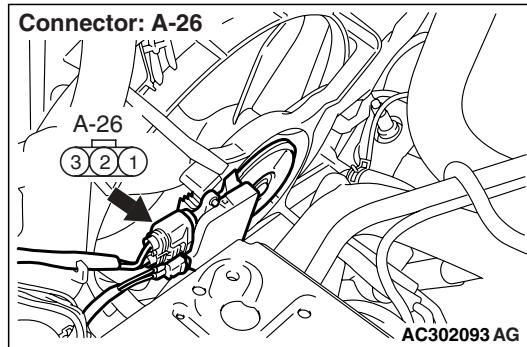
(2) Measure the resistance between fan controller connector A-26 terminal 1 and body earth.
• Continuity exists.

(3) Connect fan controller connector A-26.

Q: Does the continuity exist?

YES : Go to Step 20.

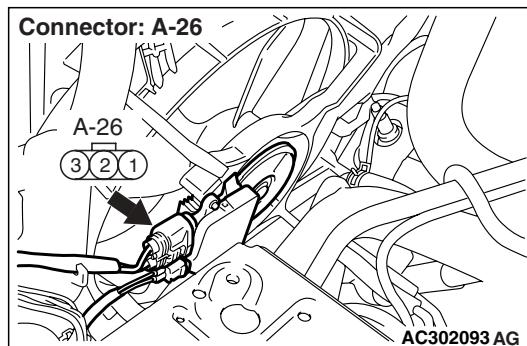
NO : Go to Step 18.

STEP 18. Check the fan controller connector A-26.

Q: Is the connector in good condition?

YES : Go to Step 19.

NO : Repair or replace the connector. Then go to Step 24.

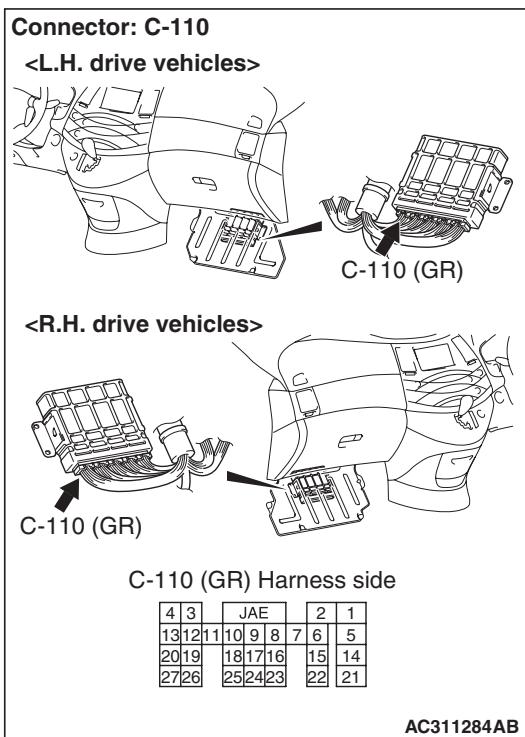
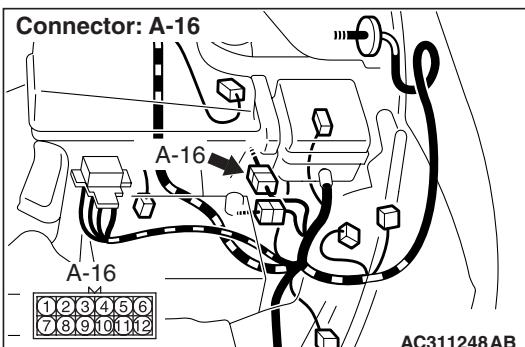
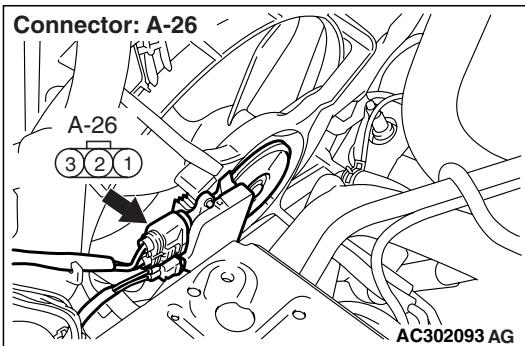
STEP 19. Check the harness wire between fan controller connector A-26 terminal 1 and body earth.

Q: Is the harness wire in good condition?

YES : An intermittent malfunction is suspected
(Refer to GROUP 00 - How to use troubleshooting P.00-5).

NO : Repair the damaged harness wire. Then go to Step 24.

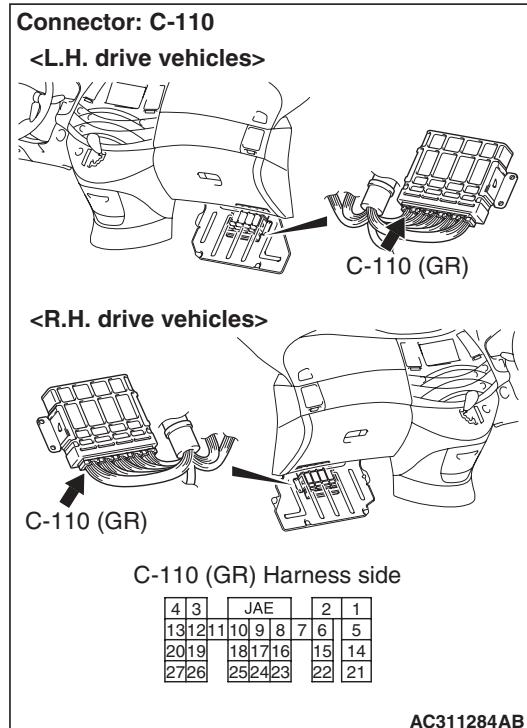
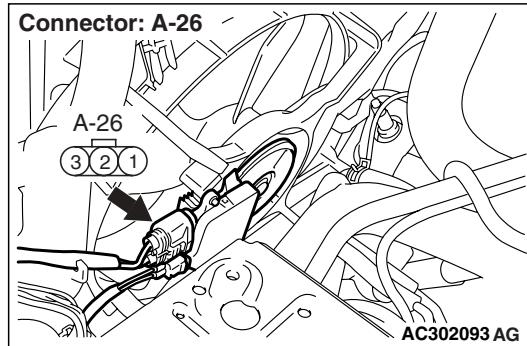
STEP 20. Check the fan controller connector A-26, intermediate connector A-16 and engine-ECU connector or engine-A/T-ECU connector C-110.



YES : Go to Step 21.

NO : Repair or replace the connector. Then go to Step 24.

STEP 21. 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.



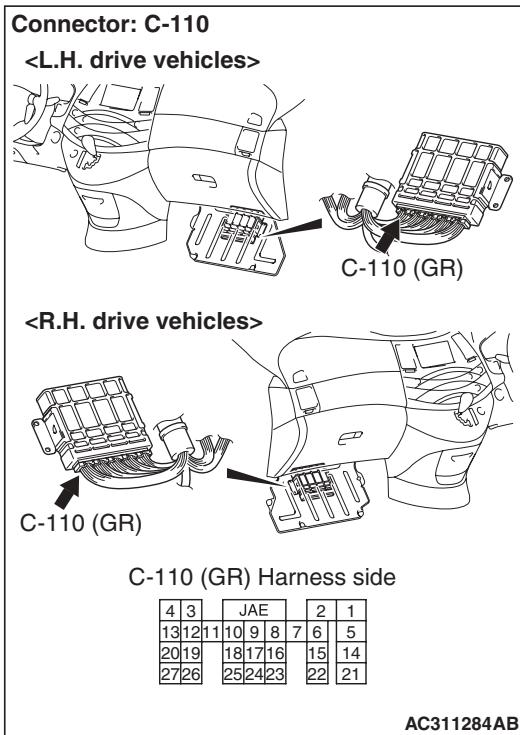
Q: Are these harness wires in good condition?

YES : Go to Step 22.

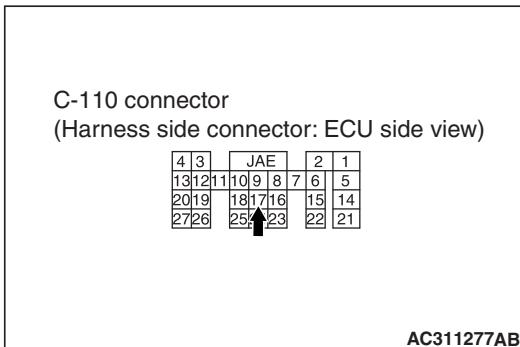
NO : Repair the damaged harness wire. Then go to Step 24.

Q: Are these connectors in good condition?

STEP 22. 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 23.

NO : Replace the fan motor and fan controller (Refer to [P.14-25](#)). Then go to Step 24.

STEP 23. MUT-III self-diag code

Check if an MPI system self-diag code is set. (Refer to GROUP 13A - Trouble shooting [P.13A-11](#)).

Q: Diagnosis code set?

YES : Inspection chart for diagnosis code (Refer to GROUP 13A - Trouble shooting [P.13A-20](#)).

NO : Replace the engine-ECU <M/T> or engine-A/T-ECU <A/T> (Refer to GROUP 13A, Engine-ECU [P.13A-399](#)). Then go to Step 24.

STEP 24. 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.14-4](#).

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>.

YES : Go to Step 3.
NO : Repair the connector or replace the relay box. Then go to Step 8.

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

STEP 1. Check the fan control relay.

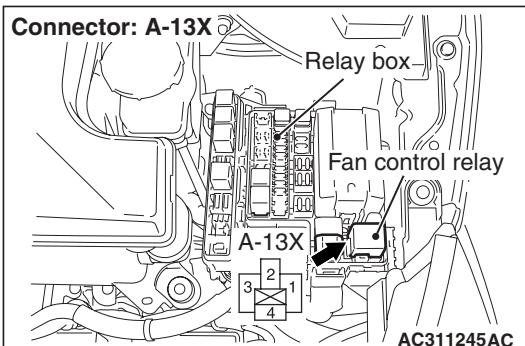
Refer to P.14-19.

Q: Is the fan control relay in good condition?

YES : Go to Step 2.

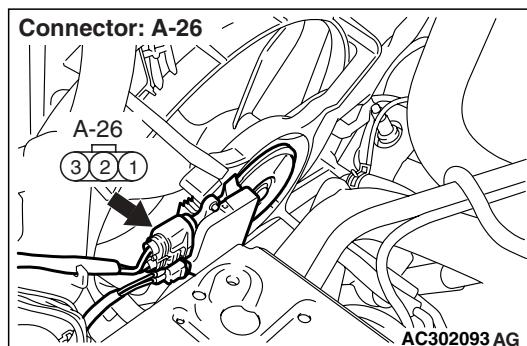
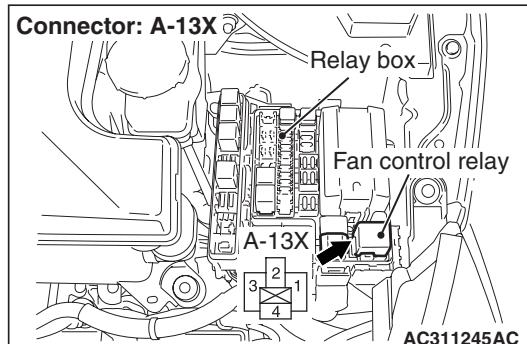
NO : Replace the fan control relay. Then go to Step 8.

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



Q: Is the connector in good condition?

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

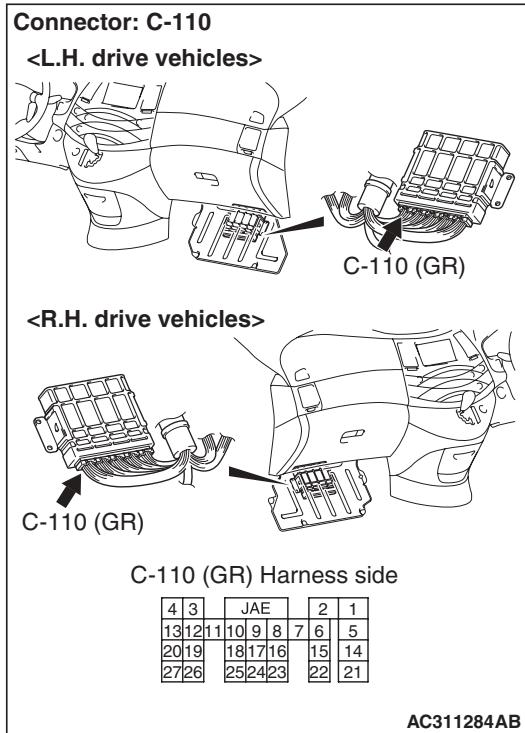
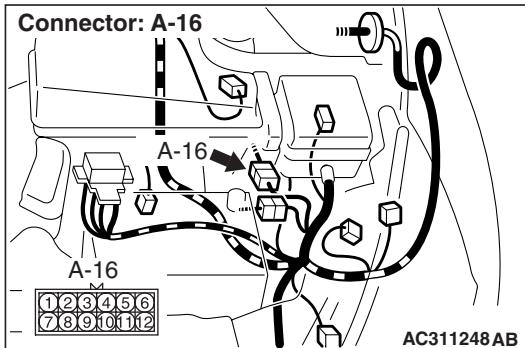
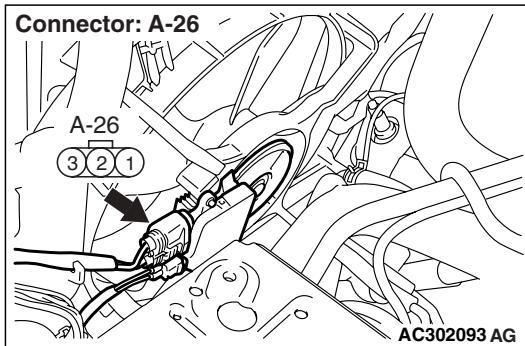


Q: Is the harness wire in good condition?

YES : Go to Step 4.

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

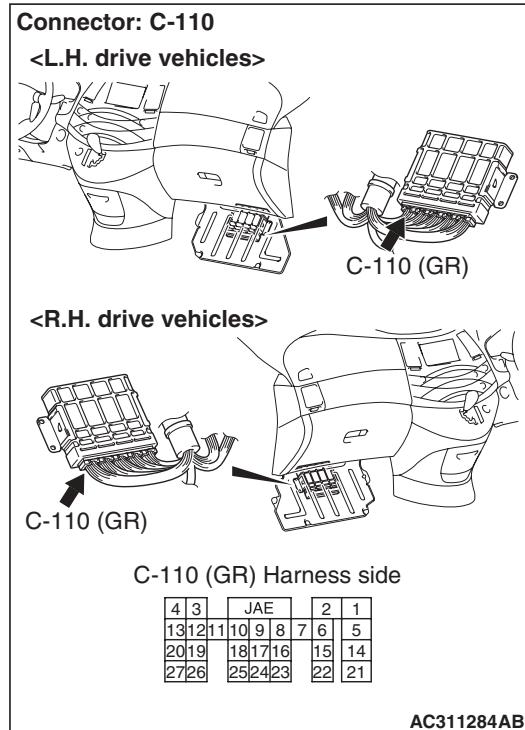
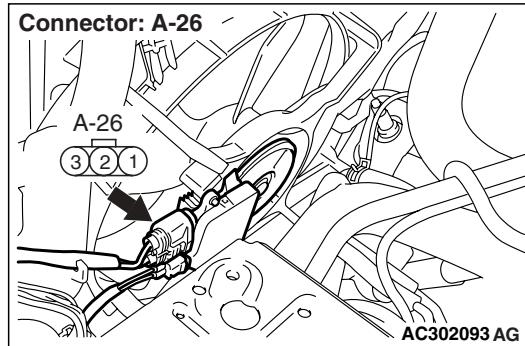
STEP 4. Check the fan controller connector A-26, intermediate connector A-16 and engine-ECU connector or engine-A/T-ECU connector C-110.



YES : Go to Step 5.

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

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.

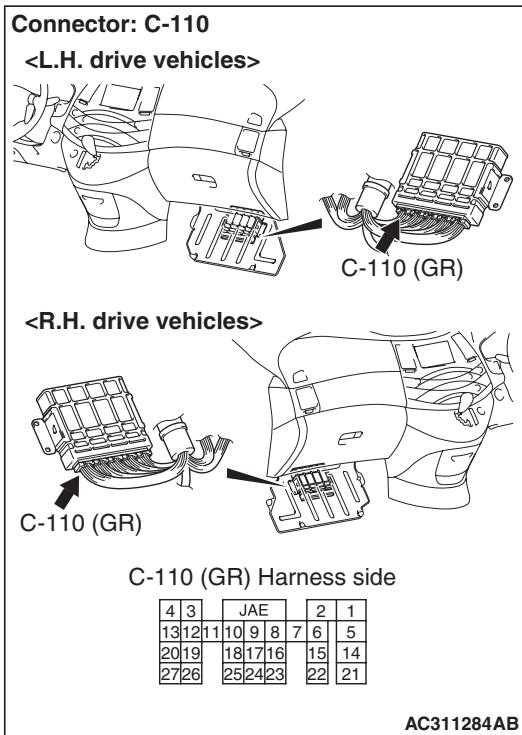


Q: Are these harness wires in good condition?

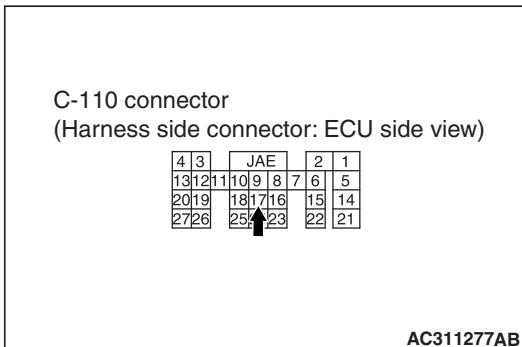
YES : Go to Step 6.

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

Q: Are these connectors in good condition?

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.14-25](#)). Then go to Step 8.

STEP 7. MUT-III self-diag code

Check if an MPI system self-diag code is set. (Refer to GROUP 13A - Trouble shooting [P.13A-11](#)).

Q: Diagnosis code set?

YES : Inspection chart for diagnosis code (Refer to GROUP 13A - Trouble shooting [P.13A-20](#)).

NO : Replace the engine-ECU <M/T> or engine-A/T-ECU <A/T> (Refer to GROUP 13A [P.13A-399](#)). 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.14-4](#).

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.14-4](#).

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.55-223](#)).

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.14-18](#).

Q: Is the fan controller in good condition?

YES : Go to Step 3.

NO : Replace the fan motor and fan controller (Refer to [P.14-25](#)). 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

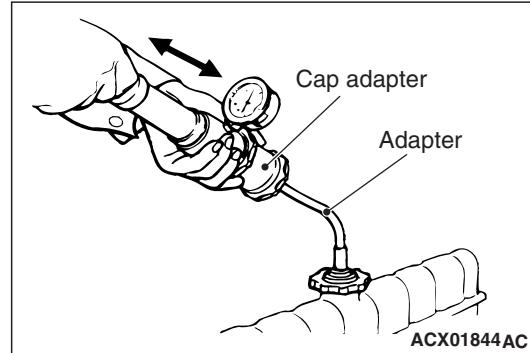
M1141001000399

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.

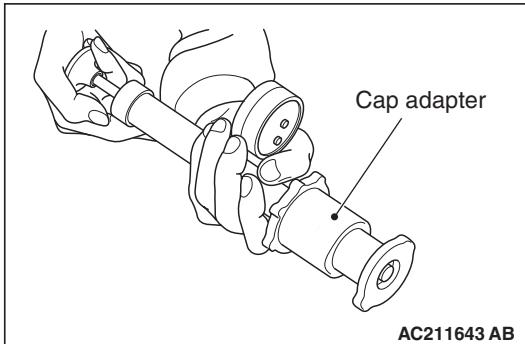


1. Check that the coolant level is up to the filler neck. Install a radiator tester and apply 160 kPa pressure, and then check for leakage from the radiator hose or connections.
2. If there is leakage, repair or replace the appropriate part.

RADIATOR CAP VALVE OPENING PRESSURE CHECK

M1141001300464

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.

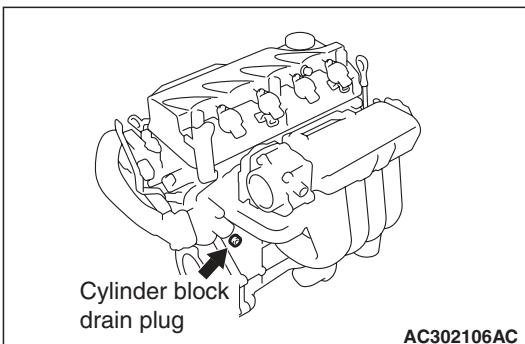
ENGINE COOLANT REPLACEMENT

M1141001200575

WARNING

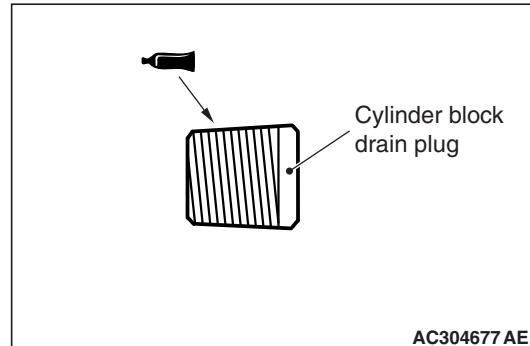
When removing the radiator cap, use care to avoid contact with hot coolant or steam. Place a shop towel over the cap and turn the cap counterclockwise a little to let the pressure escape through the vinyl tube. After relieving the steam pressure, remove the cap by slowly turning it counterclockwise.

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.

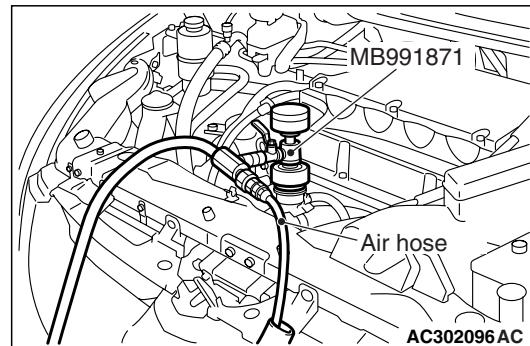
3. Remove the radiator condenser tank and drain the coolant.
4. Drain the coolant then clean the path of the coolant by injecting water into the radiator from the radiator cap area.



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: $44 \pm 5 \text{ N}\cdot\text{m}$
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: 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

M1141001100459

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

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

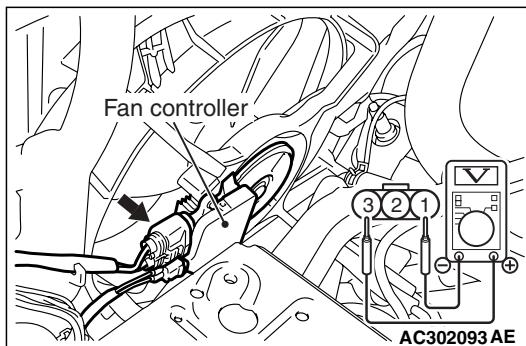
Recommended antifreeze: DIAQUEEN SUPER LONG LIFE COOLANT or equivalent

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.

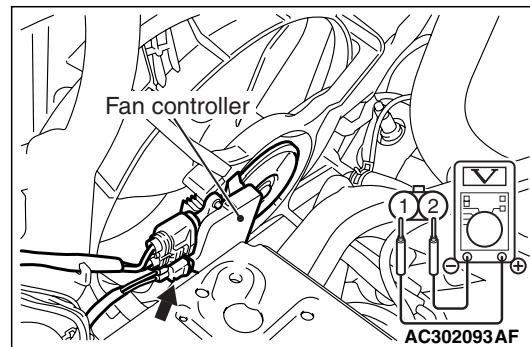
FAN CONTROLLER CHECK

M1141007400102



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:

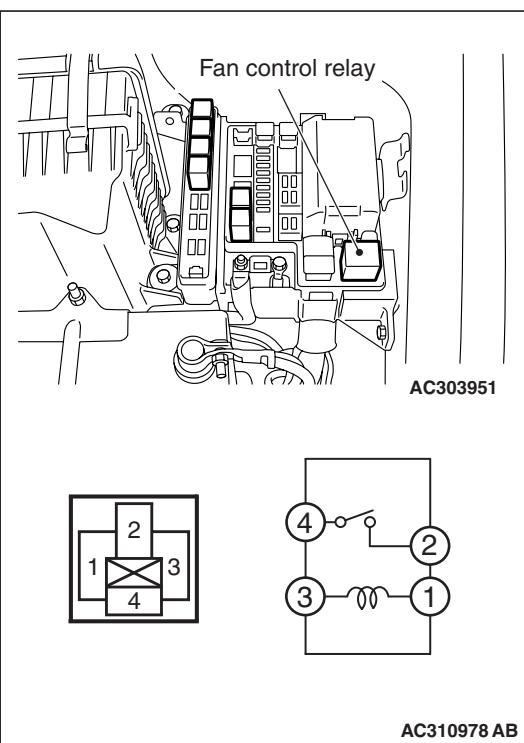
8.2 ± 2.6 V

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

M1141006200365



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

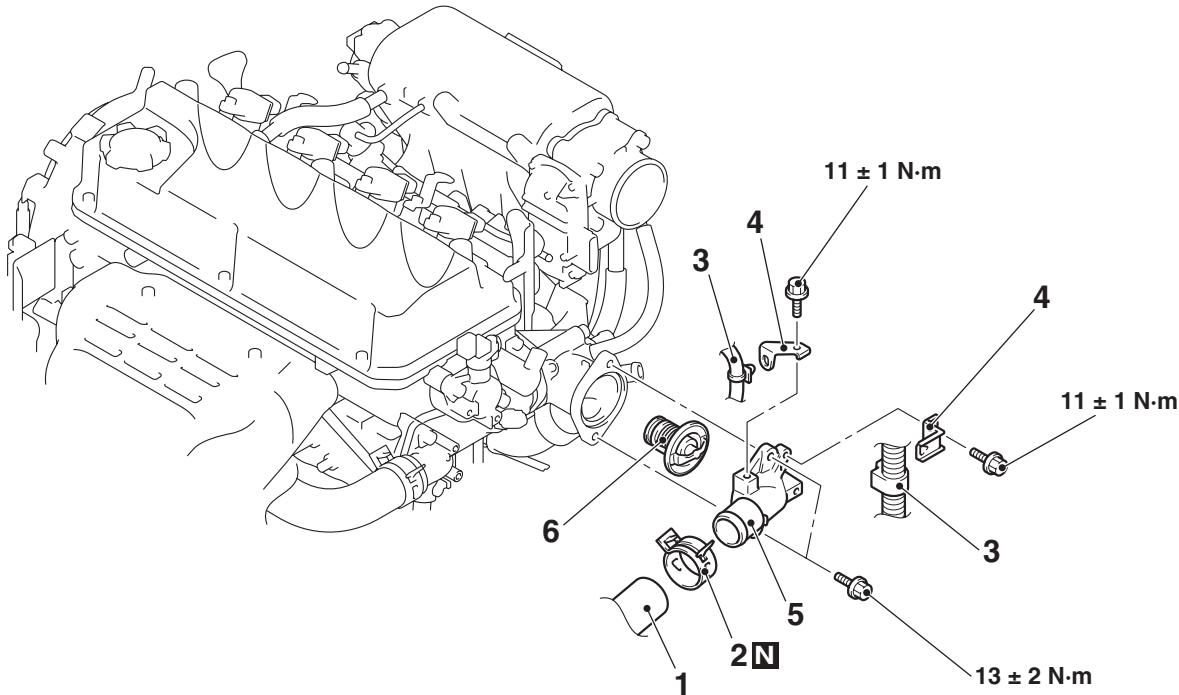
THERMOSTAT

REMOVAL AND INSTALLATION

M1141002400550

Pre-removal and Post-installation Operation

- Engine Coolant Draining and Refilling (Refer to P.14-17).
- Air Cleaner Removal and Installation (Refer to GROUP 15, Air Cleaner P.15-3).
- Battery Removal and Installation



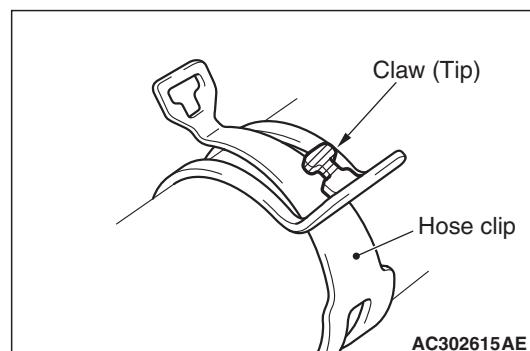
AC302092AD

Removal steps

<<A>> >>B<< 1. Radiator lower hose connection
<<A>> >>B<< 2. Hose clips
3. Engine control harness clamp
4. Engine control harness clamp bracket
5. Water inlet fitting
>>A<< 6. Thermostat

REMOVAL SERVICE POINT

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



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

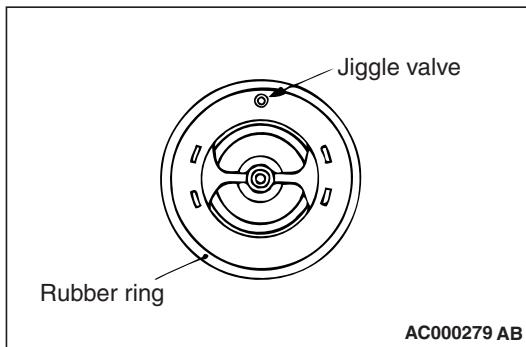
NOTE: If there is a hose clip claw, the hose clip cannot spread to capacity because the claw contacts the hose clip.

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 CLIPS/RADIATOR LOWER HOSE CONNECTION

CAUTION

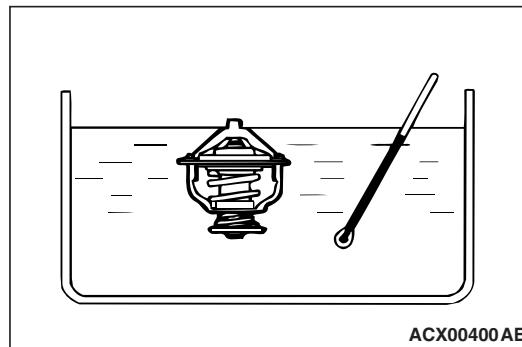
Never reuse the hose clip whose claw is broken off to prevent the rusting.

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

THERMOSTAT CHECK

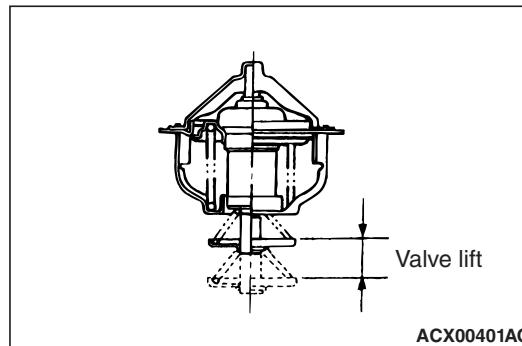
M1141002500502



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

Standard value:

Valve opening temperature: $82 \pm 1.5^{\circ}\text{C}$



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

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

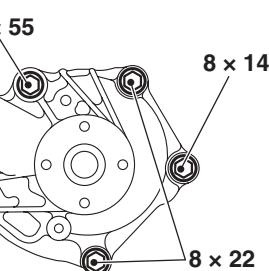
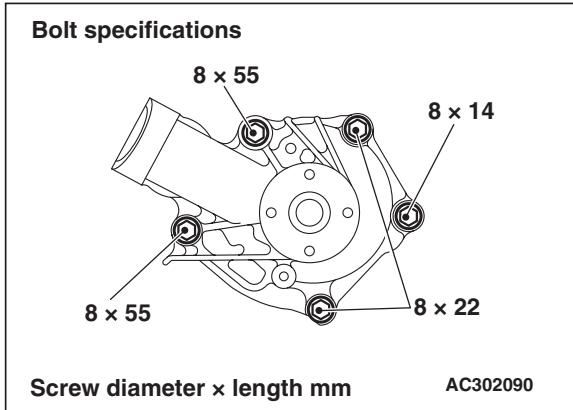
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Pre-removal Operation

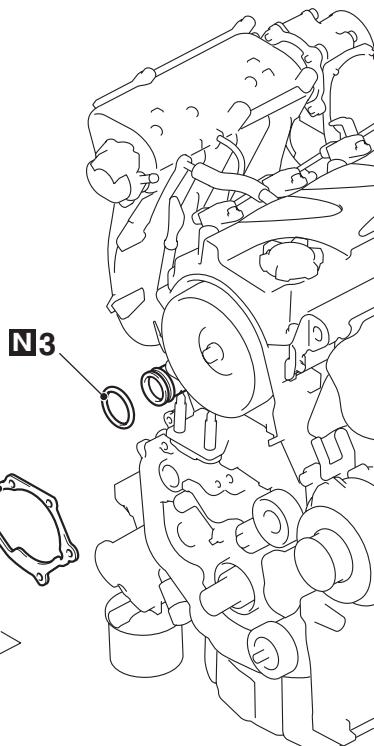
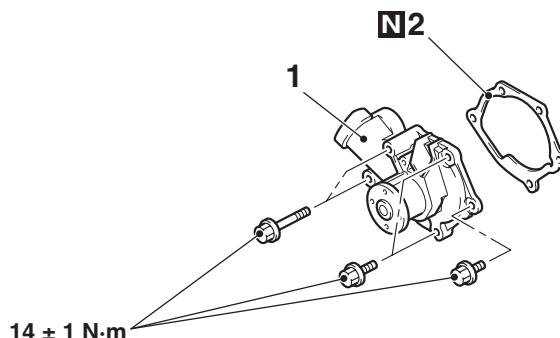
- Engine Coolant Draining (Refer to P.14-17).
- Timing Belt Removal (Refer to GROUP 11A, Timing Belt P.11A-33).

Post-installation Operation

- Timing Belt Installation (Refer to GROUP 11A, Timing Belt P.11A-33).
- Engine Coolant Refilling (Refer to P.14-17).



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AC302105AC

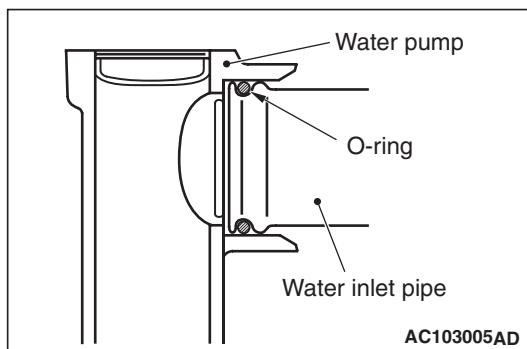
Removal steps

>>A<<

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

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.

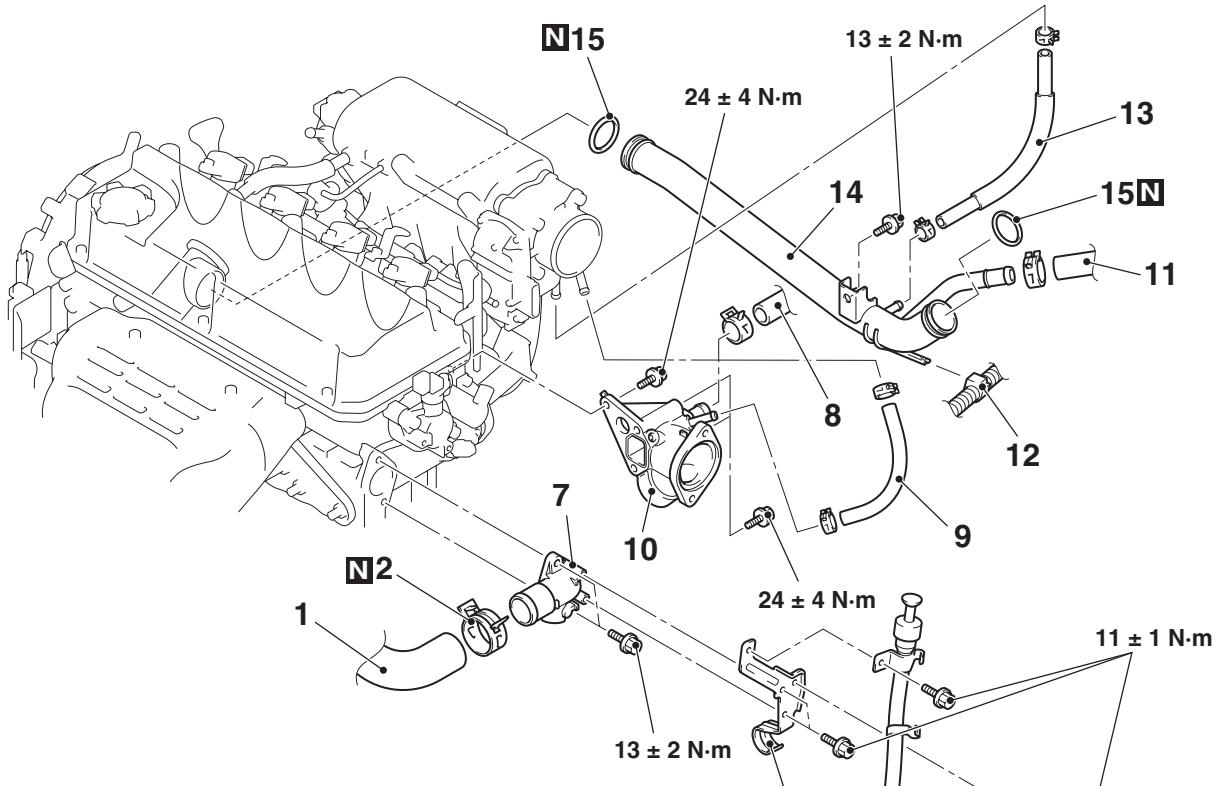
WATER HOSE AND WATER PIPE

REMOVAL AND INSTALLATION

M1141003300642

Pre-removal and Post-installation Operation

- Engine Coolant Draining and Supplying (Refer to P.14-17).
- Engine Cover Removal and Installation (Refer to GROUP 11A, Camshaft and Valve Stem Seal P.11A-16).
- Air Cleaner Assembly Removal and Installation (Refer to GROUP 15, Air Cleaner P.15-3).
- Thermostat Removal and Installation (Refer to P.14-20).



Sealant: Mitsubishi Genuine Part No. MD970389
or equivalent

Removal steps

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

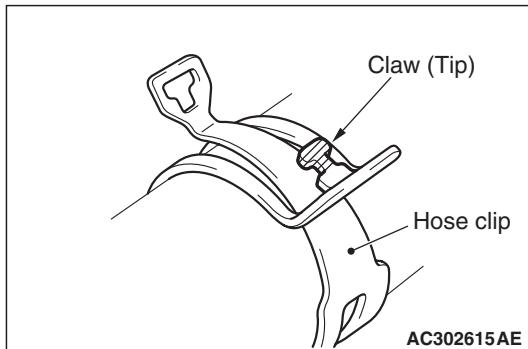
Removal steps (Continued)

>>B<< 7. Water outlet fitting
8. Heater hose connection
9. Throttle body water return hose
>>B<< 10. Thermostat case
11. Heater hose connection
12. Battery harness clamp
13. Throttle body water feed hose

Removal steps (Continued)

>>A<< 14. Water inlet pipe
15. O-ring

REMOVAL SERVICE POINT

<<A>> RADIATOR HOSE/HOSE CLIPS
DISCONNECTION

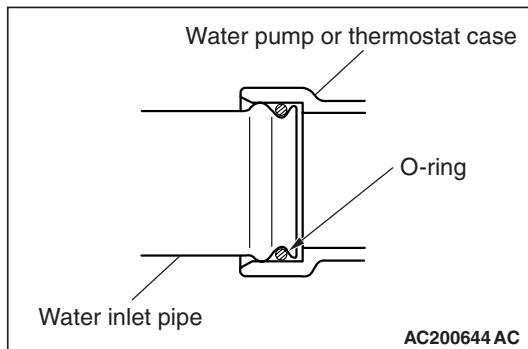
Break off the tip of hose clip claw and spread out the hose clip, then disconnect the radiator hose.

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

INSTALLATION SERVICE POINTS

>>A<< O-RING INSTALLATION

CAUTION



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

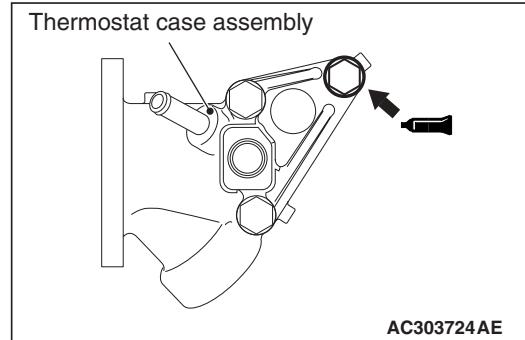
Insert the cooling water line O-ring to the water pump water inlet pipe, and coat the outer portion of the cooling water line O-ring with water or engine coolant.

>>B<< THERMOSTAT CASE
ASSEMBLY/WATER OUTLET HOSE
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.

>>C<< 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 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.

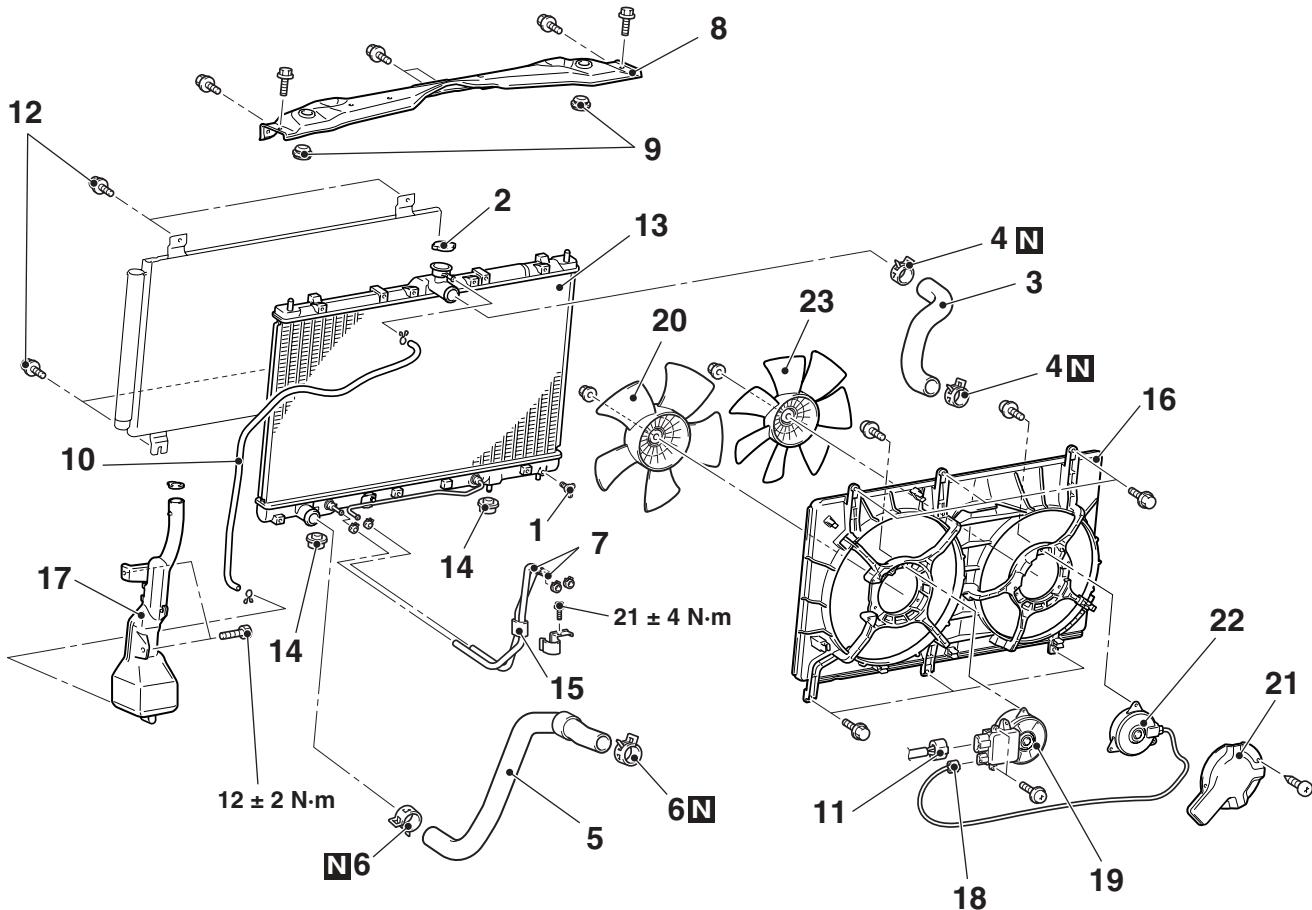
RADIATOR

REMOVAL AND INSTALLATION

M1141001500628

Pre-removal and Post-installation Operation

- Engine Coolant Draining and Supplying (Refer to P.14-17).
- Air Cleaner Assembly Removal and Installation (Refer to GROUP 15 P.15-3).



AC310381AB

Radiator removal steps

1. Drain plug
 2. Radiator cap
 3. Radiator upper hose
 4. Hose clips
 5. Radiator lower hose
 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
 12. A/C condenser connecting bolts
 13. Radiator assembly
 14. Radiator support lower insulator
 15. A/T oil cooler hose <A/T>

<>A>>A<> 3. Radiator upper hose
 <>A>>A<> 4. Hose clips
 <>A>>A<> 5. Radiator lower hose
 <>A>>A<> 6. Hose clips
 <>A>>A<> 7. A/T oil cooler hose connection
 <A/T>
 <>A>>A<> 8. Front end upper bar
 <>A>>A<> 9. Radiator support upper insulator
 <>A>>A<> 10. Radiator condenser tank hose
 <>A>>A<> 11. Fan controller connector
 <>B>> 12. A/C condenser connecting bolts
 <>B>> 13. Radiator assembly
 <>B>> 14. Radiator support lower insulator
 <>B>> 15. A/T oil cooler hose <A/T>

Radiator removal steps

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

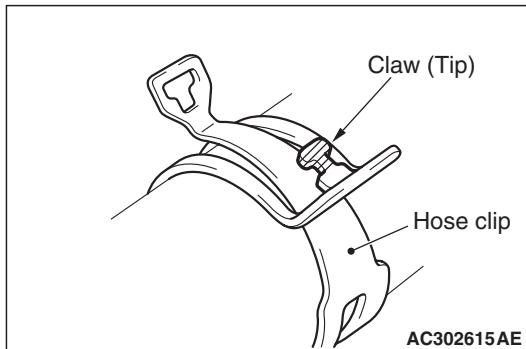
Radiator condenser tank removal steps

10. Radiator condenser tank hose
 11. Fan controller connector
 8. Front end upper bar

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

9. Radiator support upper insulator
17. Radiator condenser tank assembly

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

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.

**<> 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.