GROUP 14

ENGINE COOLING

CONTENTS

GENERAL INFORMATION

M1141000100951

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	4G63-Non-Turbo	194,000
		4G63-Turbo	237,600
		4G69	208,800
Built-in transmission fluid cooler <4G69-A/T>	Performance kJ/h		5,700

SERVICE SPECIFICATION

M1141000300461

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	-
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

M1141000400394

Item	Specified coolant	Quantity L
Engine coolant (including condense tank)	DIAQUEEN SUPER LONG LIFE COOLANT or an equivalent	7.0

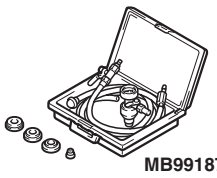
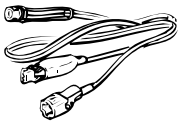
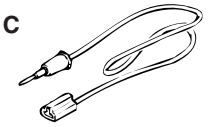
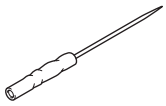
SEALANT

M1141000500391

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

M1141000600525

Tool	Number	Name	Use
 MB991871	MB991871	LLC changer	Coolant refilling
A  B  C  D  DO NOT USE MB991223AZ	MB991223 A: MB991219 B: MB991220 C: MB991221 D: MB991222	Harness set A: Test harness B: LED harness C: LED harness adapter D: Probe	Making voltage and resistance measurement during troubleshooting A: Connector pin contact pressure inspection B: Power circuit inspection C: Power circuit inspection D: Commercial tester connection
 MB992006	MB992006	Extra fine probe	Making voltage and resistance measurement during troubleshooting

TROUBLESHOOTING

INSPECTION CHART FOR TROUBLE SYMPTOMS

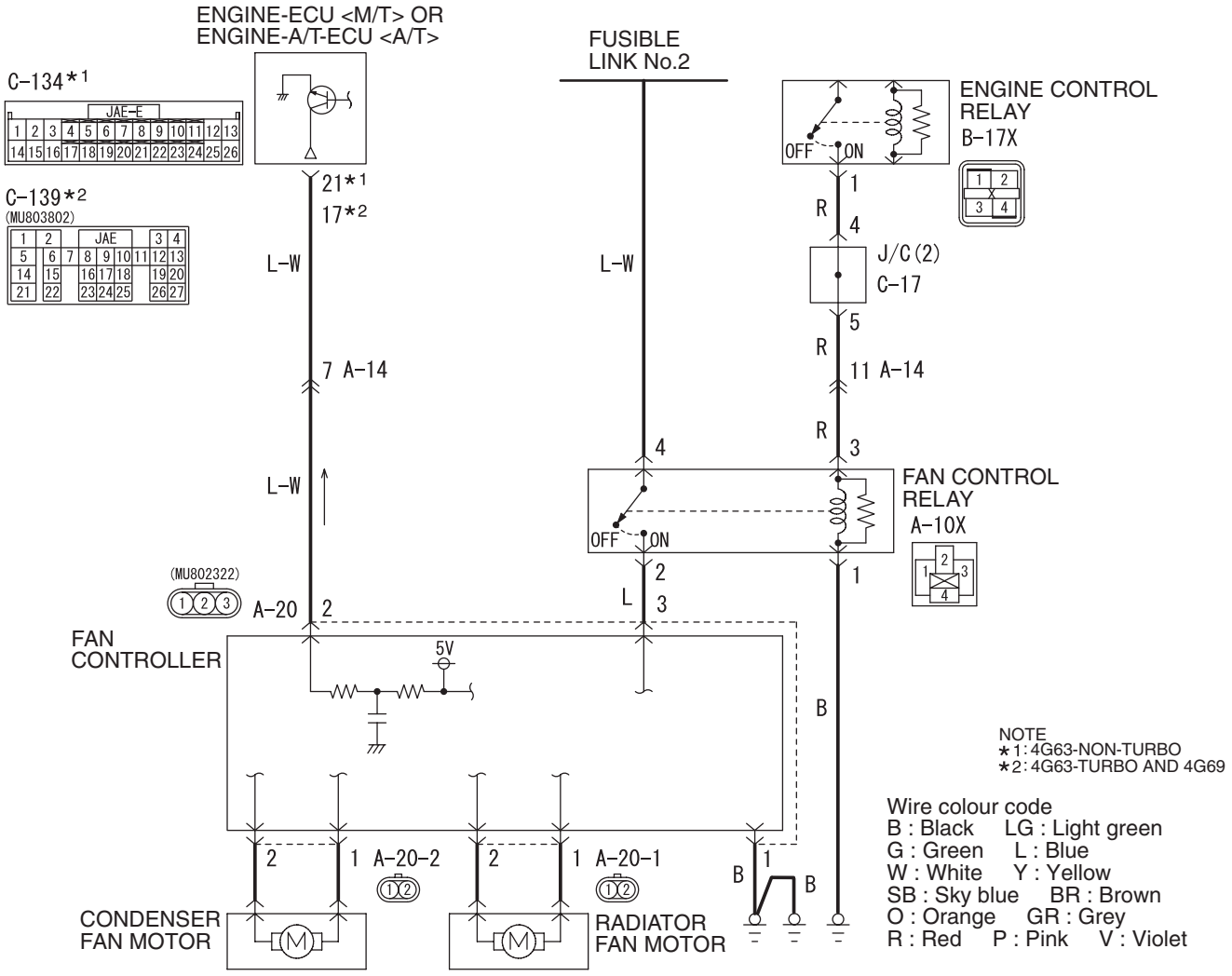
M1141005600412

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.14-13
Radiator fan does not operate	3	P.14-16
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



AC605204

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
- 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 radiator fan motor.

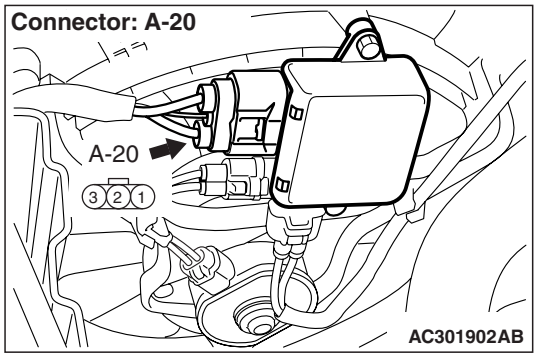
Refer to P.14-20.

Q: Is the radiator fan motor in good condition?

YES : Go to Step 2.

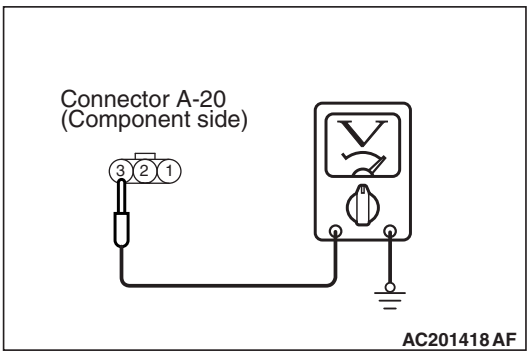
NO : Replace the radiator fan motor (Refer to P.14-35). Then go to Step 24.

STEP 2. Measure the power supply voltage at fan controller connector A-20.



(1) Disconnect fan controller connector A-20 and measure wiring harness side connector.

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



(3) Measure the voltage between fan controller connector A-20 terminal 3 and body earth.
- The voltage should measure system voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

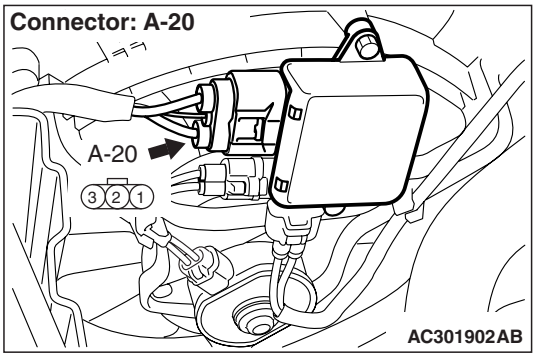
(5) Connect fan controller connector A-20.

Q: Is the measured voltage system voltage?

YES : Go to Step 17.

NO : Go to Step 3.

STEP 3. Check the fan controller connector A-20.

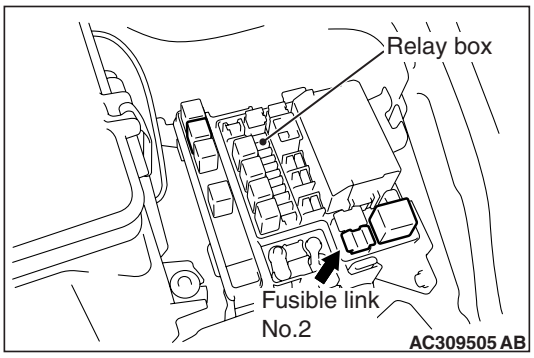


Q: Is the connector in good condition?

YES : Go to Step 4.

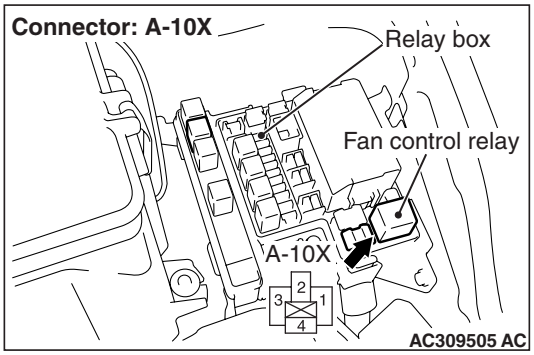
NO : Repair or replace the connector. Then go to Step 24.

STEP 4. Check the fusible link No.2.

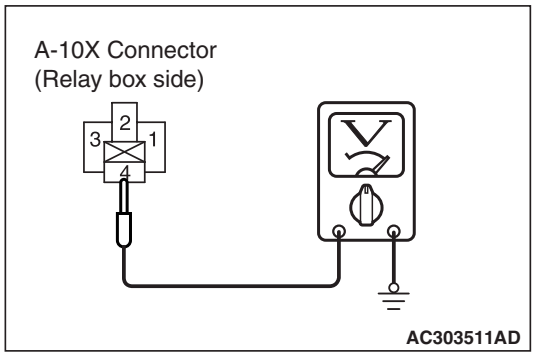


Q: Is the fusible link No.2 in good condition?
YES : Go to Step 5.
NO : Replace the fusible link No.2. Then go to Step 24.

STEP 5. Measure the power supply voltage at fan control relay connector A-10X.



(1) Disconnect fan control relay connector A-10X (remove the fan control relay) and measure relay box side connector.
(2) Turn the ignition switch to the "ON" position.

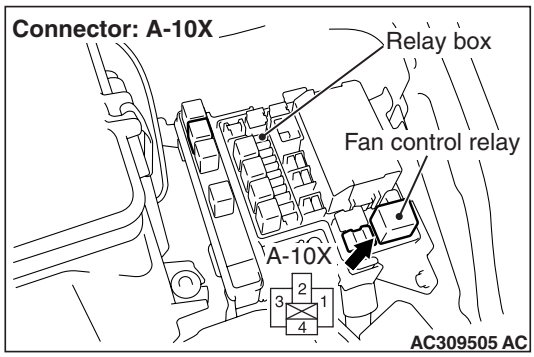


(3) Measure the voltage between fan control relay connector A-10X terminal 4 and body earth.
- The voltage should measure system voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.
(5) Connect fan control relay connector A-10X (install the fan control relay).

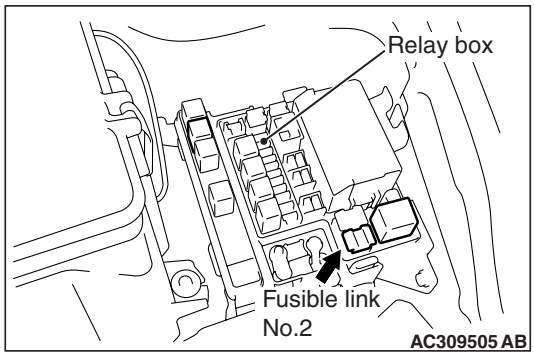
Q: Is the measured voltage system voltage?
YES : Go to Step 8.
NO : Go to Step 6.

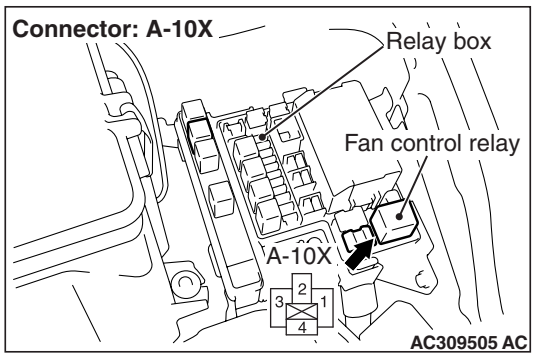
STEP 6. Check the fan control relay connector A-10X.



Q: Is the connector in good condition?
YES : Go to Step 7.
NO : Repair the connector or replace the relay box. Then go to Step 24.

STEP 7. Check the harness wire between fusible link No.2 and fan control relay connector A-10X terminal 4.



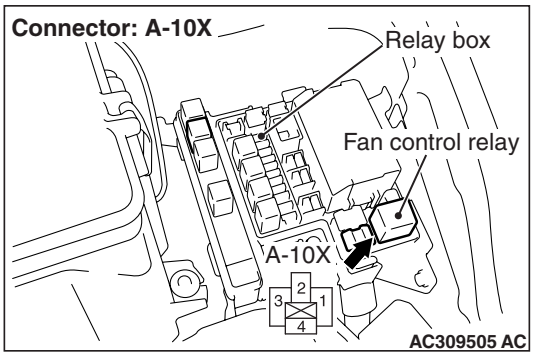


Q: Is the harness wire in good condition?
YES : An intermittent malfunction is suspected (Refer to GROUP 00 - How to use troubleshooting P.00-6).
NO : Repair the damaged harness wire. Then go to Step 24.

STEP 8. Check the fan control relay.
Refer to P.14-19.

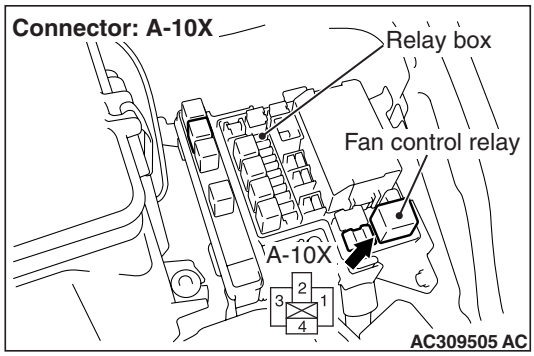
Q: Is the fan control relay in good condition?
YES : Go to Step 9.
NO : Replace the fan control relay. Then go to Step 24.

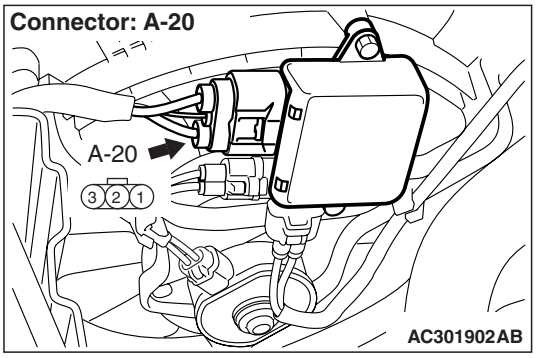
STEP 9. Check the fan control relay connector A-10X.



Q: Is the connector in good condition?
YES : Go to Step 10.
NO : Repair the connector or replace the relay box. Then go to Step 24.

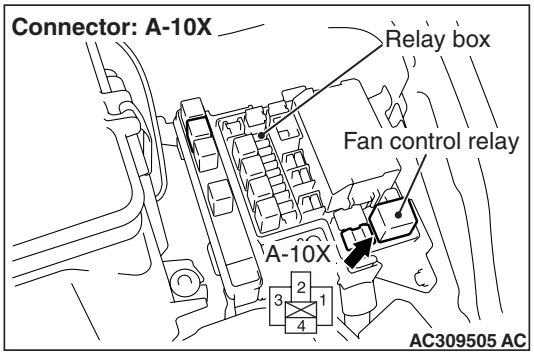
STEP 10. Check the harness wire between fan control relay connector A-10X terminal 2 and fan controller connector A-20 terminal 3.



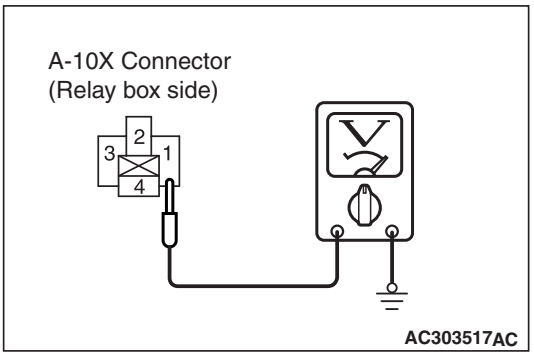


Q: Is the harness wire in good condition?
YES : Go to Step 11.
NO : Repair the damaged harness wire. Then go to Step 24.

STEP 11. Measure the terminal voltage at fan control relay connector A-10X.



(1) Disconnect fan control relay connector A-10X (remove the fan control relay) and measure relay box side connector.
(2) Turn the ignition switch to the "ON" position.

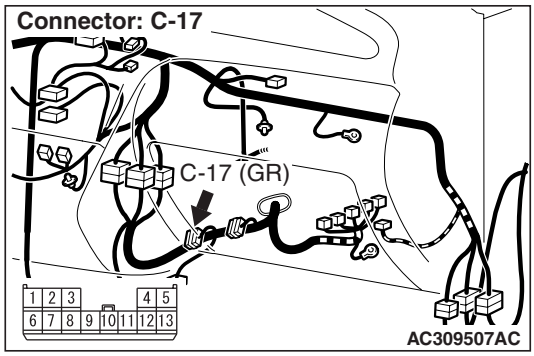


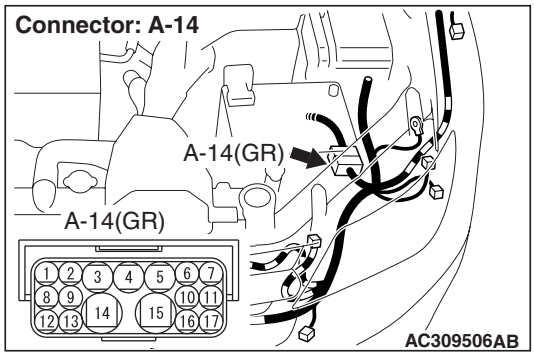
(3) Measure the voltage between fan control relay connector A-10X terminal 1 and body earth.
- The voltage should measure system voltage.

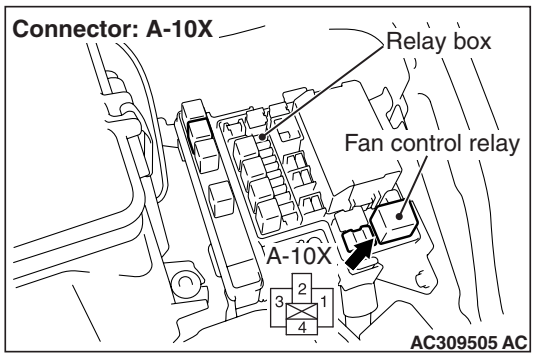
(4) Turn the ignition switch to the "LOCK" (OFF) position.
(5) Connect fan control relay connector A-10X (install the fan control relay).

Q: Is the measured voltage system voltage?
YES : Go to Step 14.
NO : Go to Step 12.

STEP 12. Check the J/C No.2 C-17, intermediate connector A-14 and fan control relay connector A-10X.

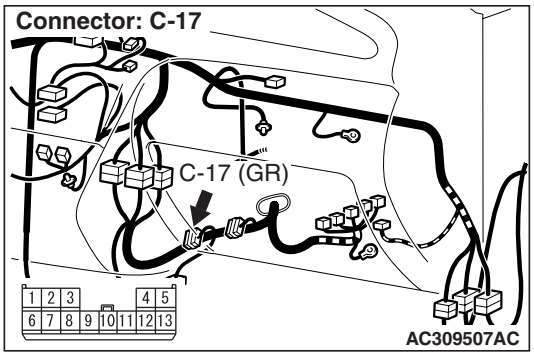


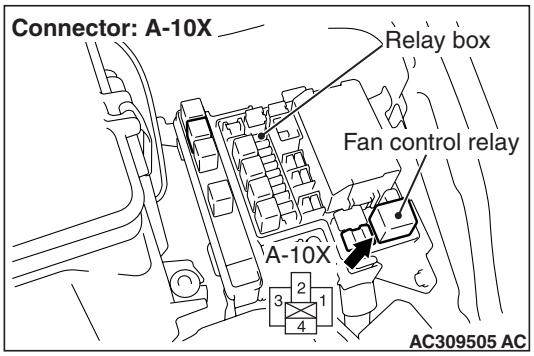




Q: Are there connectors in good condition?
YES : Go to Step 13.
NO : Repair or replace the connector. Then go to Step 24.

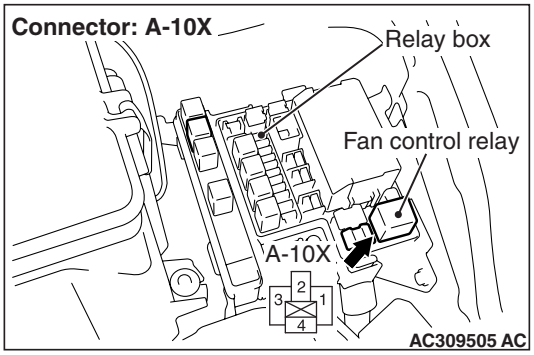
STEP 13. Check the harness wire between J/C No.2 C-17 terminal 5 and fan control relay connector A-10X terminal 1.



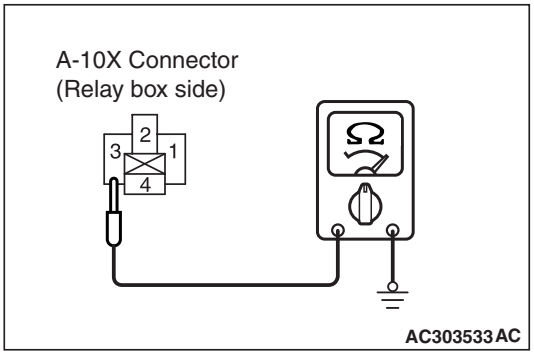


Q: Are these harness wires in good condition?
YES : An intermittent malfunction is suspected (Refer to GROUP 00 - How to use troubleshooting P.00-6).
NO : Repair the damaged harness wire. Then go to Step 24.

STEP 14. Check the continuity between fan control relay connector A-10X and body earth.



(1) Disconnect fan control relay connector A-10X (remove the fan control relay) and measure relay box side connector.

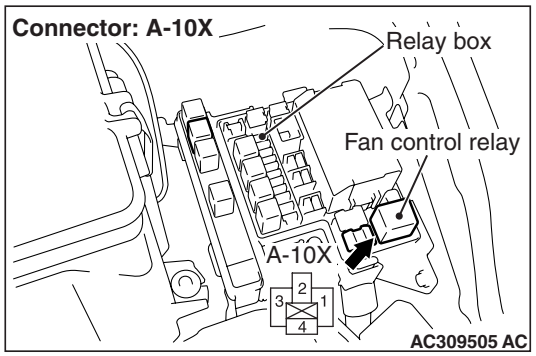


(2) Check that there is continuity between fan control relay connector A-10X terminal 3 and body earth.
- Continuity (less than 2 Ω).

(3) Connect fan control relay connector A-10X (install the fan control relay).

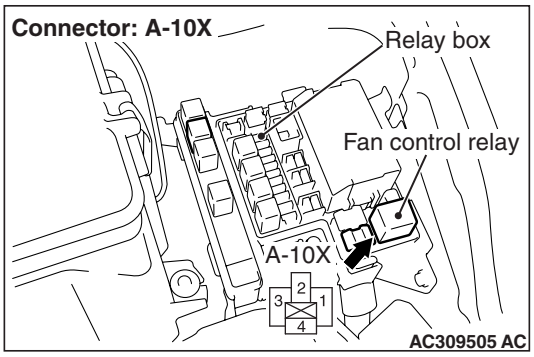
Q: Does the continuity exist?
YES : An intermittent malfunction is suspected (Refer to GROUP 00 - How to use troubleshooting P.00-6).
NO : Go to Step 15.

STEP 15. Check the fan control relay connector A-10X.



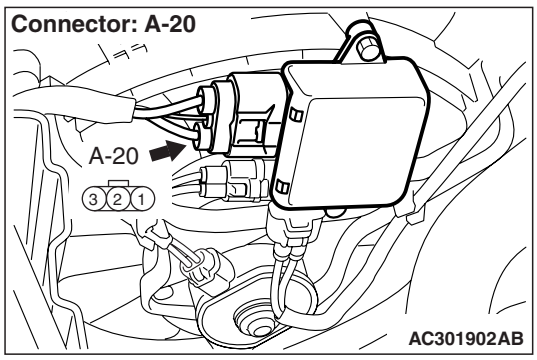
Q: Is the connector in good condition?
YES : Go to Step 16.
NO : Repair the connector or replace the relay box. Then go to Step 24.

STEP 16. Check the harness wire between fan control relay connector A-10X terminal 3 and body earth.

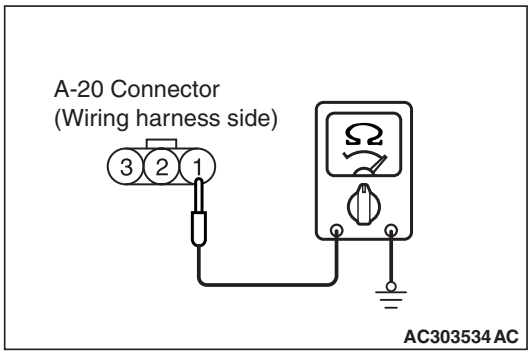


Q: Is the harness wire in good condition?
YES : An intermittent malfunction is suspected (Refer to GROUP 00 - How to use troubleshooting P.00-6).
NO : Repair the damaged harness wire. Then go to Step 24.

STEP 17. Check the continuity between fan controller connector A-20 and body earth.



(1) Disconnect fan controller connector A-20 and measure wiring harness side connector.

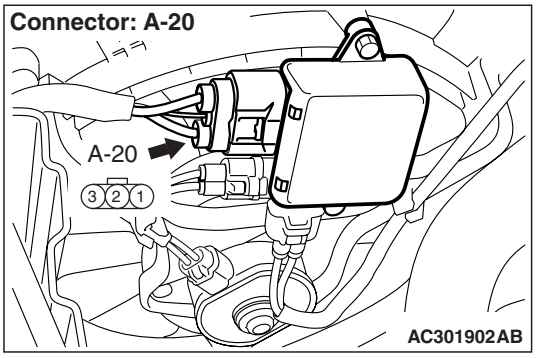


(2) Check that there is continuity between fan controller connector A-20 terminal 1 and body earth.
- Continuity (less than 2 Ω).

(3) Connect fan controller connector A-20.

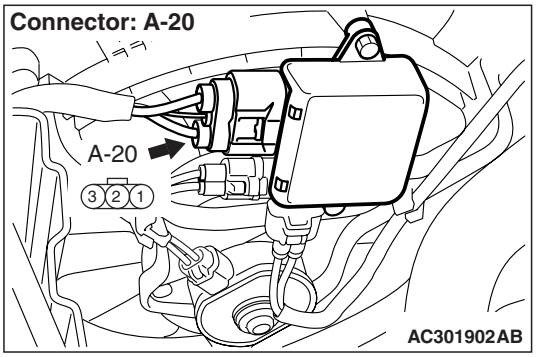
Q: Does the continuity exist?
YES : Go to Step 20.
NO : Go to Step 18.

STEP 18. Check the fan controller connector A-20.



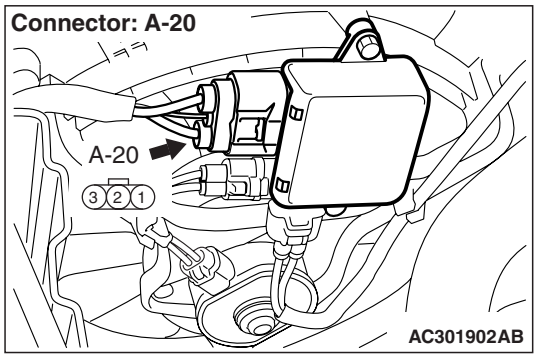
Q: Is the connector in good condition?
YES : Go to Step 19.
NO : Repair or replace the connector. Then go to Step 24.

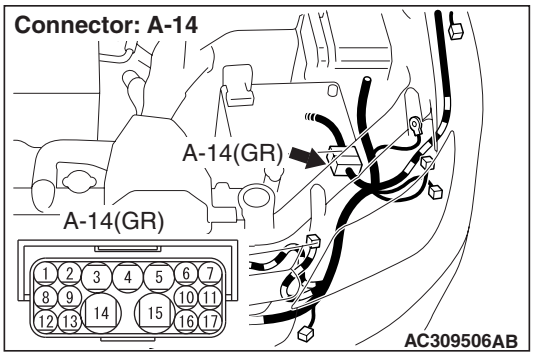
STEP 19. Check the harness wire between fan controller connector A-20 terminal 1 and body earth.

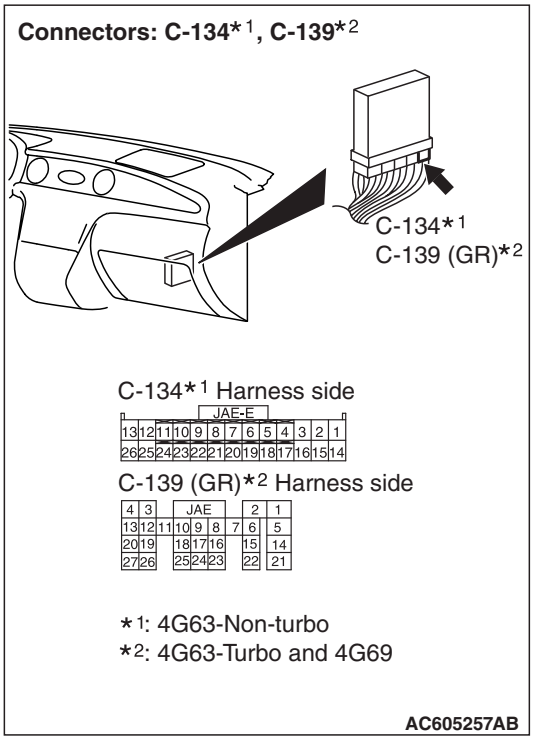


Q: Is the harness wire in good condition?
YES : An intermittent malfunction is suspected (Refer to GROUP 00 - How to use troubleshooting P.00-6).
NO : Repair the damaged harness wire. Then go to Step 24.

STEP 20. Check the fan controller connector A-20, intermediate connector A-14 and engine-ECU connector or engine-A/T-ECU connector C-134 <4G63-Non-turbo> or C-139 <4G63-Turbo and 4G69>.

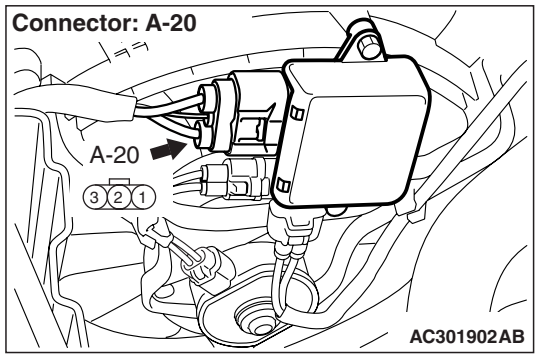


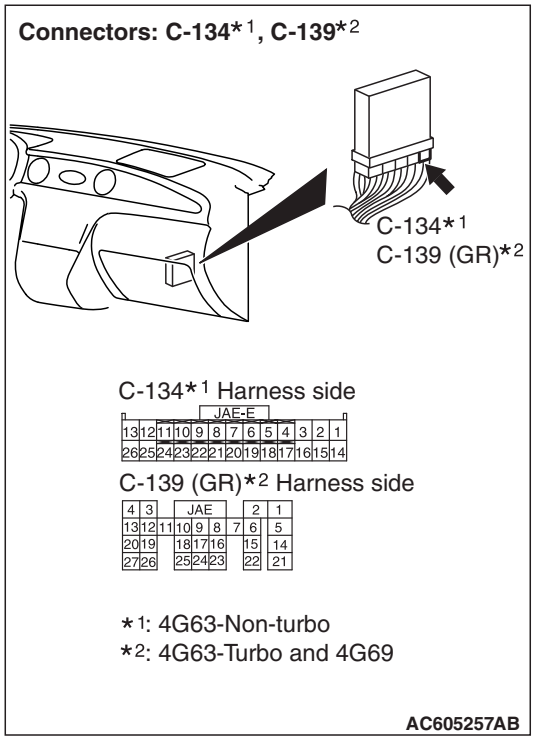




Q: Are these connectors in good condition?
YES : Go to Step 21.
NO : Repair or replace the connector. Then go to Step 24.

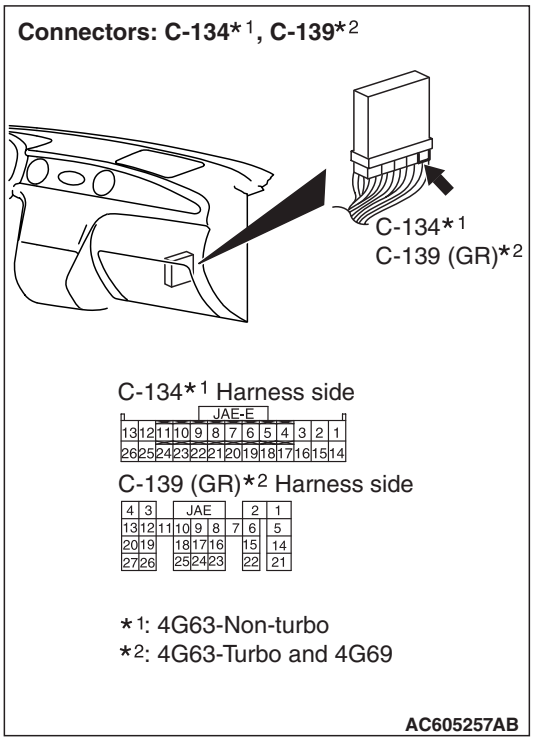
STEP 21. Check the harness wire between fan controller connector A-20 terminal 2 and engine-ECU or engine-A/T-ECU connector C-134 terminal 21 <4G63-Non-turbo> or C-139 terminal 17 <4G63-Turbo and 4G69>.



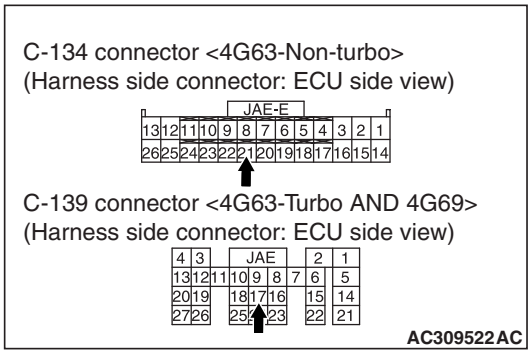


Q: Are these harness wires in good condition?
YES : Go to Step 22.
NO : Repair the damaged harness wire. Then go to Step 24.

STEP 22. Check the fan controller.



(1) Disconnect engine-ECU connector or engine-A/T-ECU connector C-134 <4G63-Non-turbo> or C-139 <4G63-Turbo and 4G69>.



(2) Pull out connector terminal pin 21 <4G63-Non-turbo> or 17 <4G63-Turbo and 4G69> 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 21 <4G63-Non-turbo> or 17 <4G63-Turbo and 4G69> disconnected)
- The cooling fan stops. (When connector terminal pin 21 <4G63-Non-turbo> or 17 <4G63-Turbo and 4G69> 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-134 <4G63-Non-turbo> or C-139 <4G63-Turbo and 4G69>, and push in connector terminal pin 21 <4G63-Non-turbo> or 17 <4G63-Turbo and 4G69> 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 controller (Refer to P.14-35). Then go to Step 24.

STEP 23. M.U.T.-II/III self-diag code

Check if an MPI system self-diag code is set. (Refer to GROUP 13A - Troubleshooting P.13A-9) <4G63-Non-Turbo>, (Refer to GROUP 13B - Troubleshooting P.13B-11) <4G63-Turbo> or (Refer to GROUP 13C - Troubleshooting P.13C-11) <4G69>.

Q: Diagnosis code set?
YES : Inspection chart for diagnosis code (Refer to GROUP 13A - Troubleshooting P.13A-15) <4G63-Non-Turbo>, (Refer to GROUP 13B - Troubleshooting P.13B-20) <4G63-Turbo> or (Refer to GROUP 13C - Troubleshooting P.13C-21) <4G69>.
NO : Replace the engine-ECU <M/T> or engine-A/T-ECU <A/T> (Refer to GROUP 13A, Engine-ECU P.13A-332) <4G63-Non-Turbo>, (Refer to GROUP 13B, Engine-ECU P.13B-406) <4G63-Turbo> or (Refer to GROUP 13C, Engine-ECU and Engine-A/T-ECU P.13C-441) <4G69>. 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>.

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.

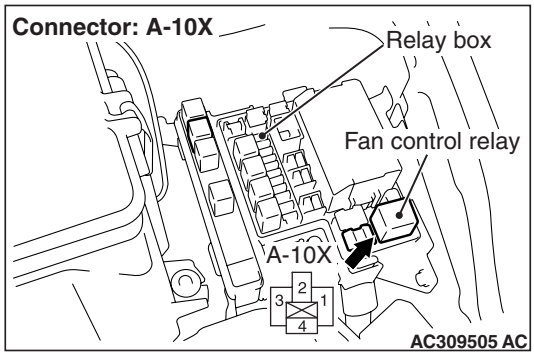
Refer to P.14-19.

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-10X.

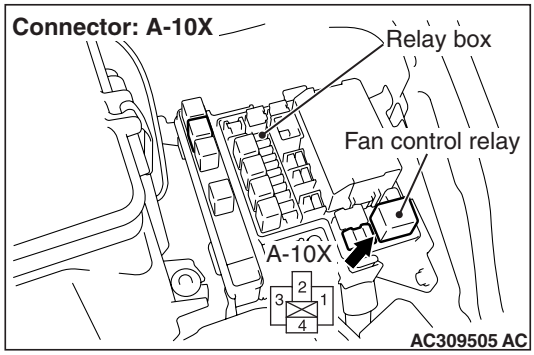


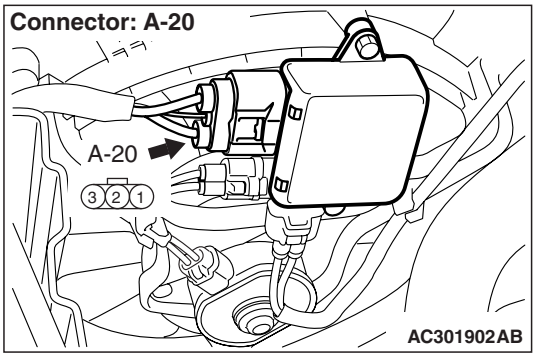
Q: Is the connector in good condition?

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-10X terminal 2 and fan controller connector A-20 terminal 3.



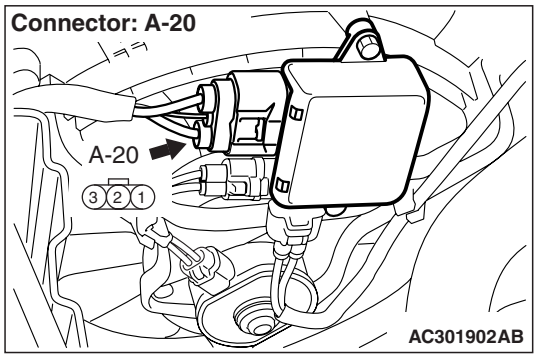


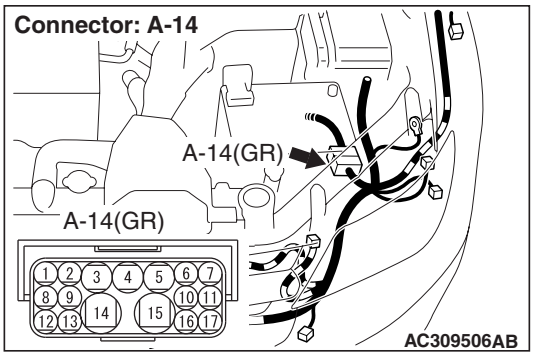
Q: Is the harness wire in good condition?

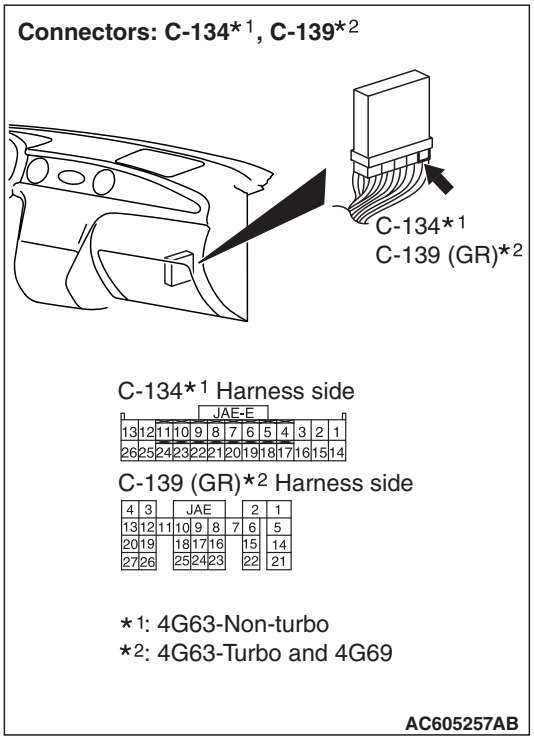
YES : Go to Step 4.

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

STEP 4. Check the fan controller connector A-20, intermediate connector A-14 and engine-ECU connector or engine-A/T-ECU connector C-134 <4G63-Non-turbo> or C-139 <4G63-turbo and 4G69>.

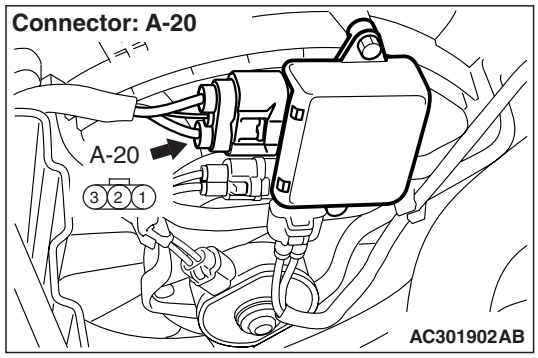


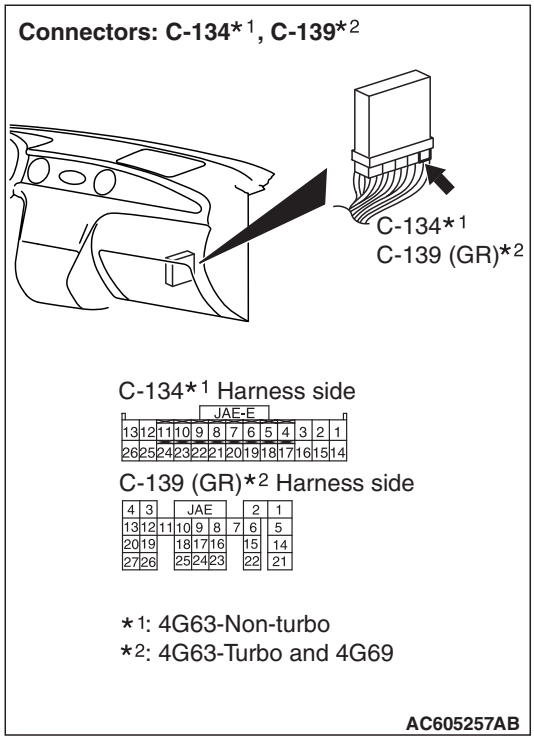




Q: Are these connectors in good condition?
YES : Go to Step 5.
NO : Repair or replace the connector. Then go to Step 8.

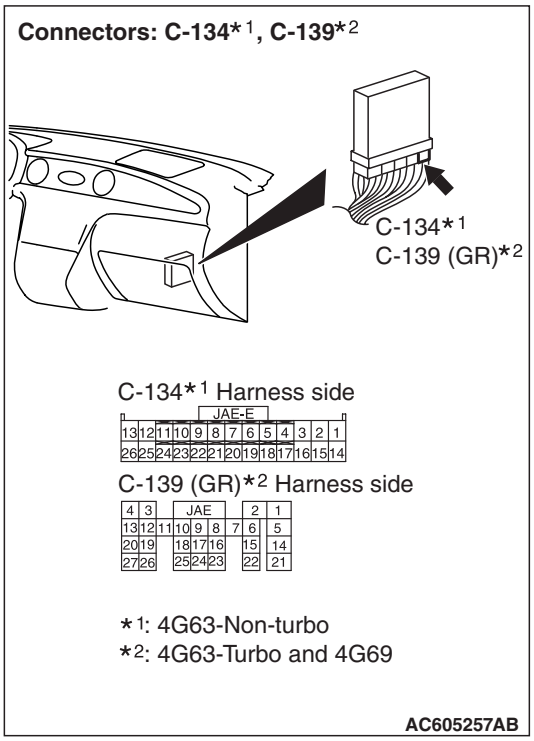
STEP 5. Check the harness wire between fan controller connector A-20 terminal 2 and engine-ECU connector or engine-A/T-ECU connector C-134 terminal 21 <4G63-Non-turbo> or C-139 terminal 17 <4G63-turbo and 4G69>.



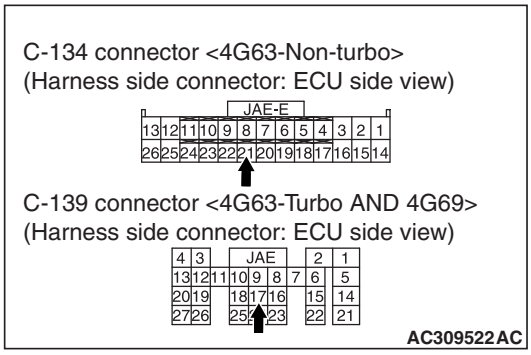


Q: Are these harness wires in good condition?
YES : Go to Step 6.
NO : Repair the damaged harness wire. Then go to Step 8.

STEP 6. Check the fan controller.



(1) Disconnect engine-ECU connector or engine-A/T-ECU connector C-134 <4G63-Non-turbo> or C-139 <4G63-Turbo and 4G69>.



(2) Pull out connector terminal pin 21 <4G63-Non-turbo> or 17 <4G63-Turbo and 4G69> 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 21 <4G63-Non-turbo> or 17 <4G63-Turbo and 4G69> disconnected)
- The cooling fan stops. (When connector terminal pin21 <4G63-Non-turbo> or 17 <4G63-Turbo and 4G69> 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-134 <4G63-Non-turbo> or C-139 <4G63-Turbo and 4G69>, and push in connector terminal pin 21 <4G63-Non-turbo> or 17 <4G63-Turbo and 4G69> 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 controller (Refer to P.14-35). Then go to Step 8.

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

Check if an MPI system self-diag code is set. (Refer to GROUP 13A - Troubleshooting P.13A-9) <4G63-Non-Turbo>, (Refer to GROUP 13B - Troubleshooting P.13B-11) <4G63-Turbo> or (Refer to GROUP 13C - Troubleshooting P.13C-11) <4G69>.

Q: Diagnosis code set?
YES : Inspection chart for diagnosis code (Refer to GROUP 13A - Troubleshooting P.13A-15) <4G63-Non-Turbo>, (Refer to GROUP 13B - Troubleshooting P.13B-20) <4G63-Turbo> or Inspection chart for diagnosis code (Refer to GROUP 13C - Troubleshooting P.13C-21) <4G69>.
NO : Replace the engine-ECU <M/T> or engine-A/T-ECU <A/T> (Refer to GROUP 13A P.13A-332) <4G63-Non-Turbo>, (Refer to GROUP 13B, Engine-ECU P.13B-406) <4G63-Turbo> or (Refer to GROUP 13C, Engine-ECU and Engine-A/T-ECU P.13C-441) <4G69>. 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

DIAGNOSIS PROCEDURE

STEP 1. Check the radiator fan motor.
Refer to P.14-20.

Q: Is the radiator fan motor in good condition?
YES : Go to Step 2.
NO : Replace the radiator fan motor (Refer to P.14-35). Then go to Step 3.

STEP 2. Check the fan controller.
Refer to P.14-19.

Q: Is the fan controller in good condition?
YES : Go to Step 3.
NO : Replace the fan controller (Refer to P.14-35). Then go to Step 3.

STEP 3. Check the symptoms.

Q: Does the radiator fan operate?
YES : This symptoms is complete.
NO : Return to Step 1.

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 PROCEDURE

STEP 1. Check the condenser fan motor.
Condenser fan motor check. (Refer to GROUP 55, Condenser and Condenser Fan Motor P.55A-76).

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.14-19.

Q: Is the fan controller in good condition?
YES : Go to Step 3.
NO : Replace the fan controller (Refer to P.14-35). Then go to Step 3.

STEP 3. Check the symptoms.

Q: Does the condenser fan operate?
YES : This symptoms is complete.
NO : Return to Step 1.

ON-VEHICLE SERVICE

ENGINE COOLANT LEAK CHECK

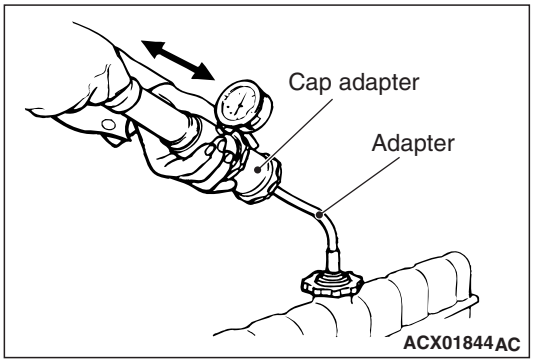
M1141001000355

⚠ ***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.**

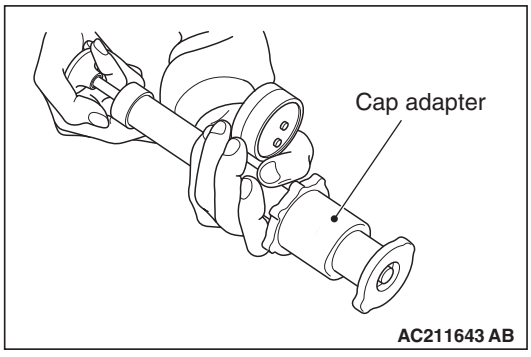


1. Check that the coolant level is up to the filler neck. Install a radiator tester and apply 160 kPa pressure, and then check for leakage from the radiator hose or connections.
2. If there is leakage, repair or replace the appropriate part.

RADIATOR CAP VALVE OPENING PRESSURE CHECK

M1141001300431

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.

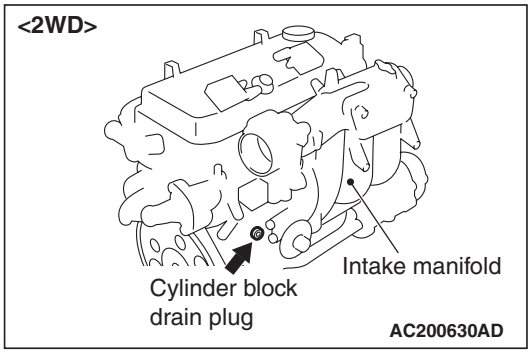
ENGINE COOLANT REPLACEMENT

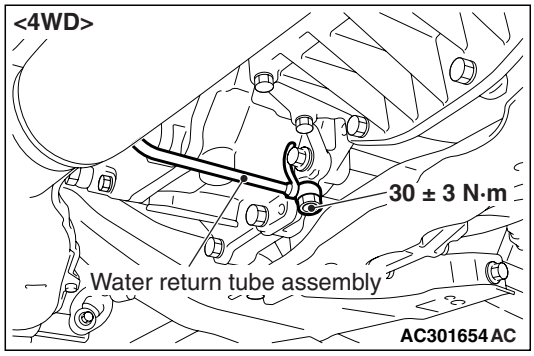
M1141001200520

⚠ ***WARNING***

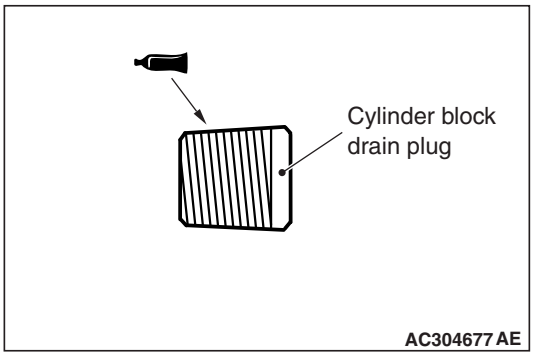
When removing the radiator cap, use care to avoid contact with hot coolant or steam. Place a shop towel over the cap and turn the cap counterclockwise a little to let the pressure escape through the vinyl tube. After relieving the steam pressure, remove the cap by slowly turning it counterclockwise.

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. On 4WD, drain engine coolant from the water return tube assembly of the transfer.
3. Remove the reserve 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.

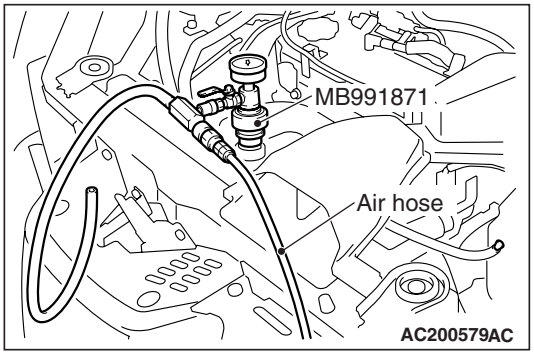


5. Apply the designated sealant to the screw area of the cylinder block drain plug, and then tighten to the standard torque.

   Specified sealant: 3M Nut Locking Part No.4171 or equivalent
   Tightening torque: 44 ± 5 N·m

6. Securely tighten the drain plug of the radiator.
7. Assemble the reserve tank.

⚠ CAUTION
Do not use alcohol or methanol anti-freeze or any engine coolants mixed with alcohol or methanol anti-freeze. The use of an improper anti-freeze can cause corrosion of the aluminium components.



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

   Recommended antifreeze: DIAQUEEN SUPER LONG LIFE COOLANT or equivalent
   Quantity: 7.0 L

   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 reserve tank.

13. Add coolant to the reserve tank between the "FULL" and "LOW" mark if necessary.

CONCENTRATION MEASUREMENT

M1141001100426

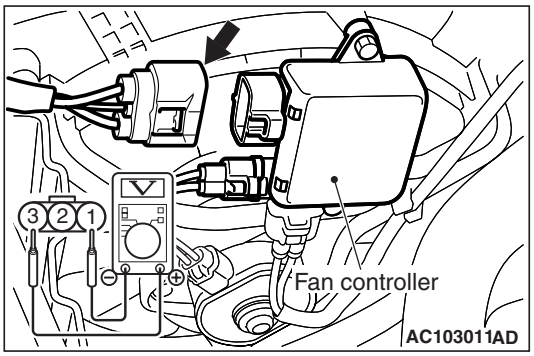
Measure the temperature and specific gravity of the engine coolant to check the antifreeze concentration.

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.

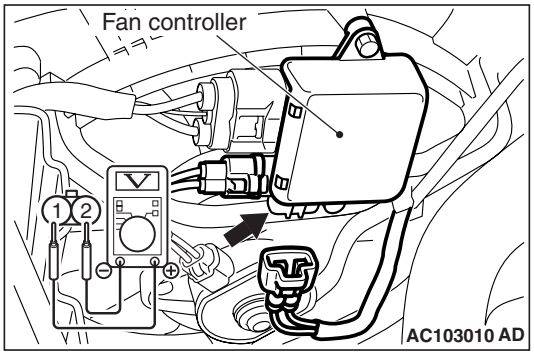
FAN CONTROLLER CHECK

M1141007400083



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.

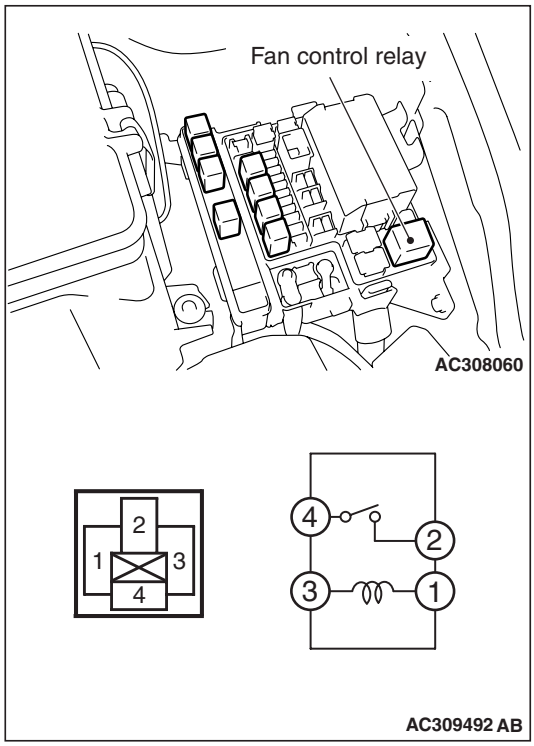
6. Turn the A/C switch to the "ON" position.
7. Measure the voltage between the fan controller-side connector terminals while the fan is running. The voltage should repeat the values below.

   Standard value:
   8.2 ± 2.6 V
   System voltage ± 2.6 V

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

FAN CONTROL RELAY CONTINUITY CHECK

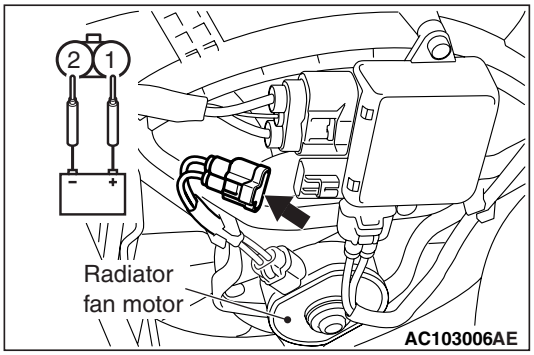
M1141006200677



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	Continuity (less than 2 Ω)

RADIATOR FAN MOTOR CHECK

M1141007100112



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

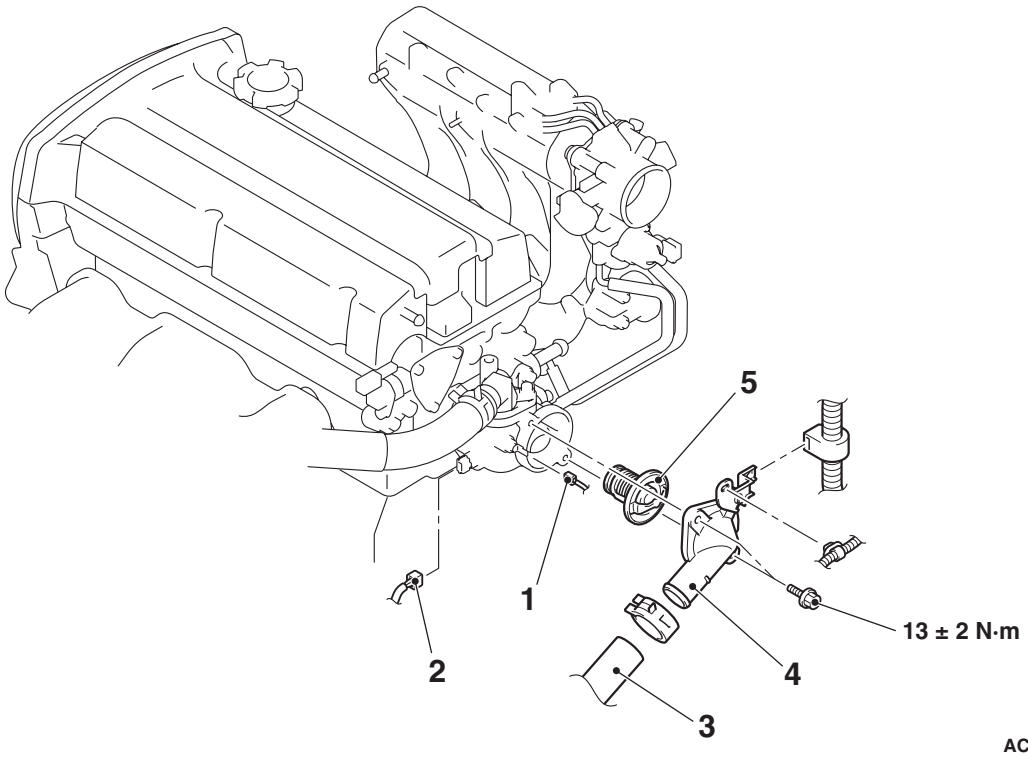
THERMOSTAT

REMOVAL AND INSTALLATION

M1141002400613

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.15-6<4G63-Non-Turbo>, P.15-7<4G63-Turbo>, P.15-8<4G69>).
- Battery Removal and Installation

<4G63-Non-Turbo>



Removal steps
1. Engine coolant temperature gauge unit connector
2. Engine coolant temperature sensor connector

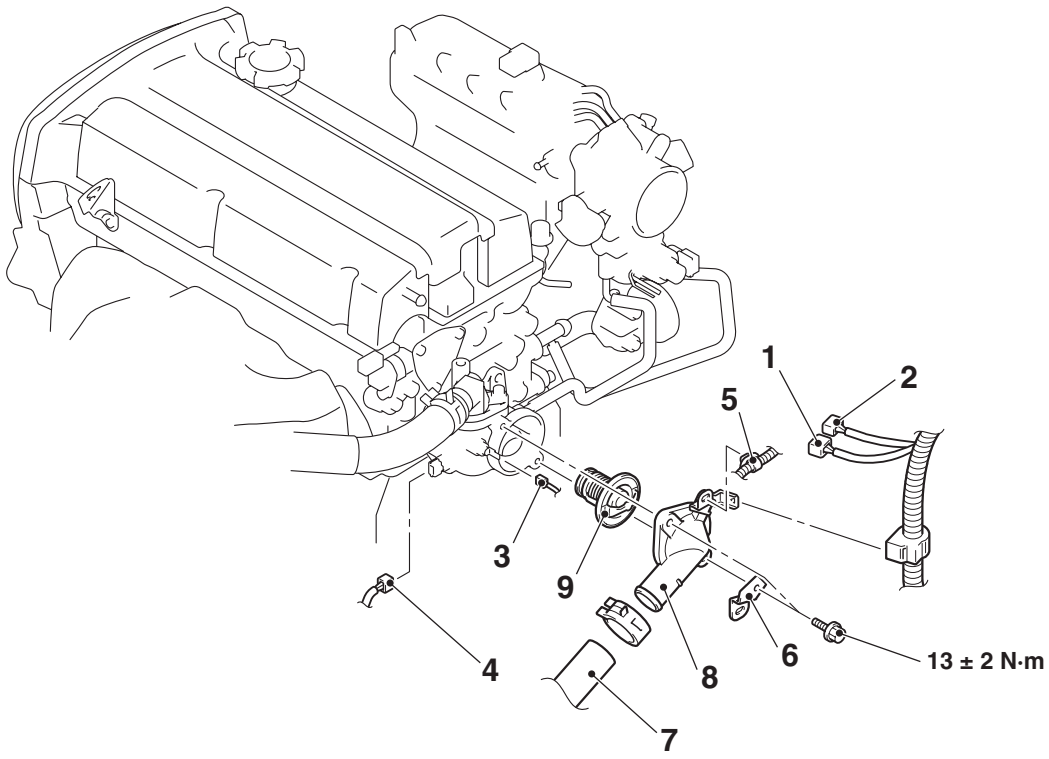
<<A>>

>B<<

>>A<<

Removal steps (Continued)
3. Radiator lower hose connection
4. Water inlet fitting
5. Thermostat

<4G63-Turbo>



AC202401 AC

Removal steps

1. Fuel pressure control solenoid valve connector
2. Waste gate solenoid valve connector
3. Engine coolant temperature gauge unit connector

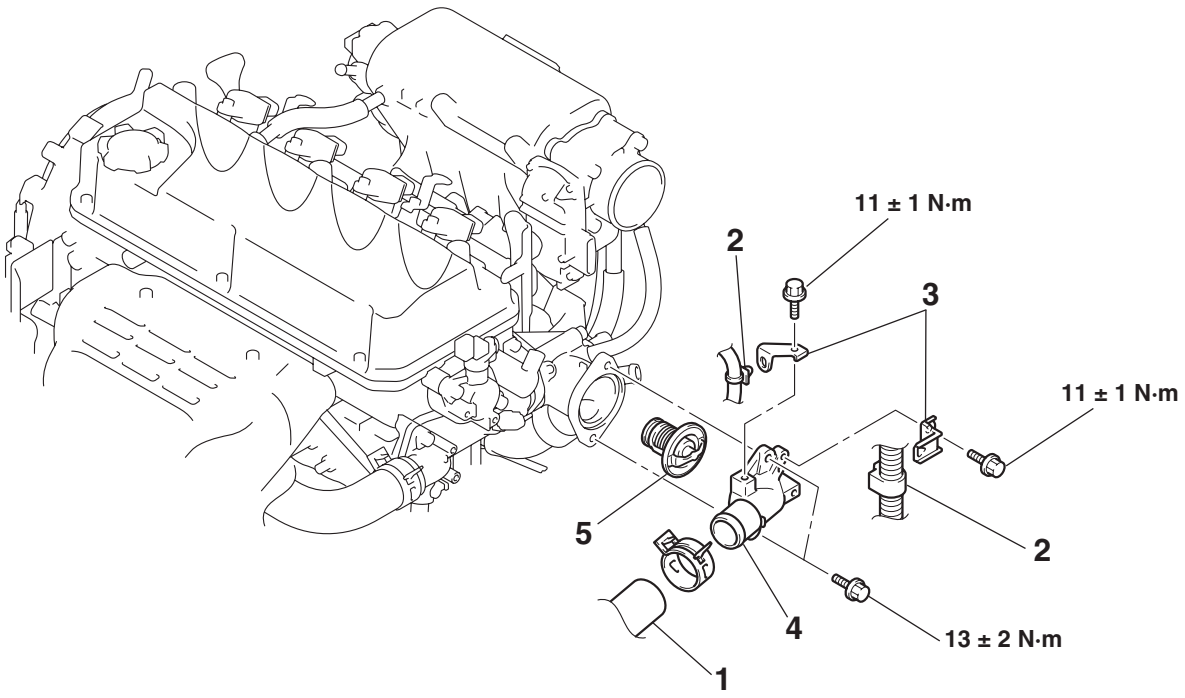
<<**A**>> >>**B**<<

>>**A**<<

Removal steps (Continued)

4. Engine coolant temperature sensor connector
5. Control wiring harness connection
6. Harness bracket
7. Radiator lower hose connection
8. Water inlet fitting
9. Thermostat

<4G69>



AC309324AB

Removal steps

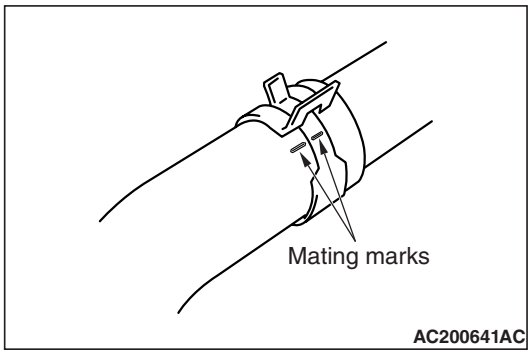
<<**A**>> >>**B**<< 1. Radiator lower hose connection
2. Control wiring harness connection
3. Control wiring harness connection bracket

Removal steps (Continued)

4. Water inlet fitting
>>**A**<< 5. Thermostat

REMOVAL SERVICE POINT

<<A>> RADIATOR LOWER HOSE DISCONNECTION



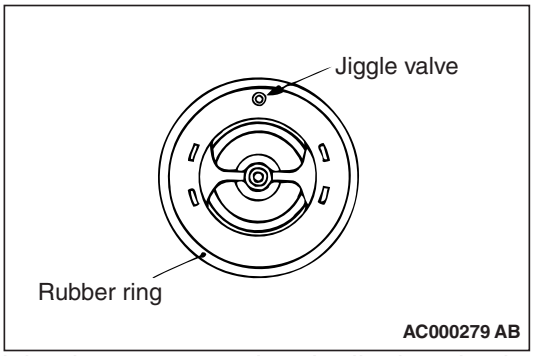
Make mating marks on the radiator hose and the hose clamp. Disconnect the radiator hose.

INSTALLATION SERVICE POINTS

>>A<< THERMOSTAT INSTALLATION

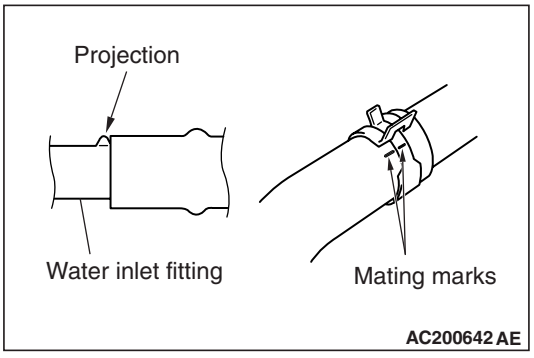
⚠ CAUTION

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



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

>>B<< RADIATOR LOWER HOSE CONNECTION

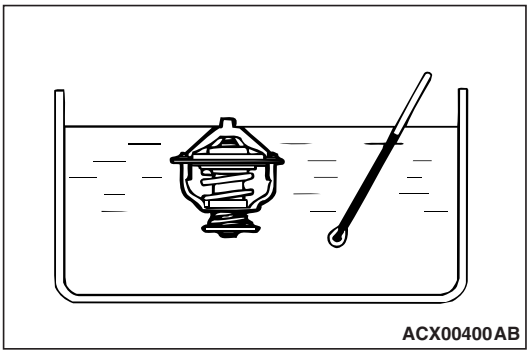


1. Insert each hose as far as the projection of the water inlet fitting.
2. Align the mating marks on the radiator hose and hose clamp, and then connect the radiator hose.

INSPECTION

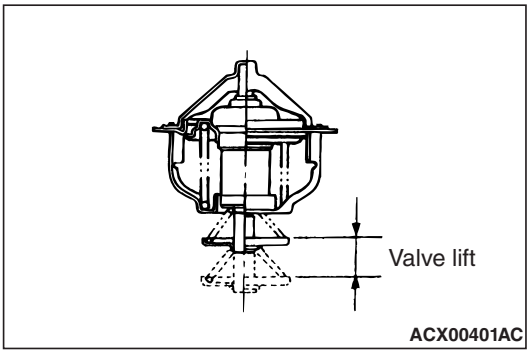
M1141002500472

THERMOSTAT CHECK



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

   Standard value:
   Valve opening temperature: 82 ± 1.5°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.

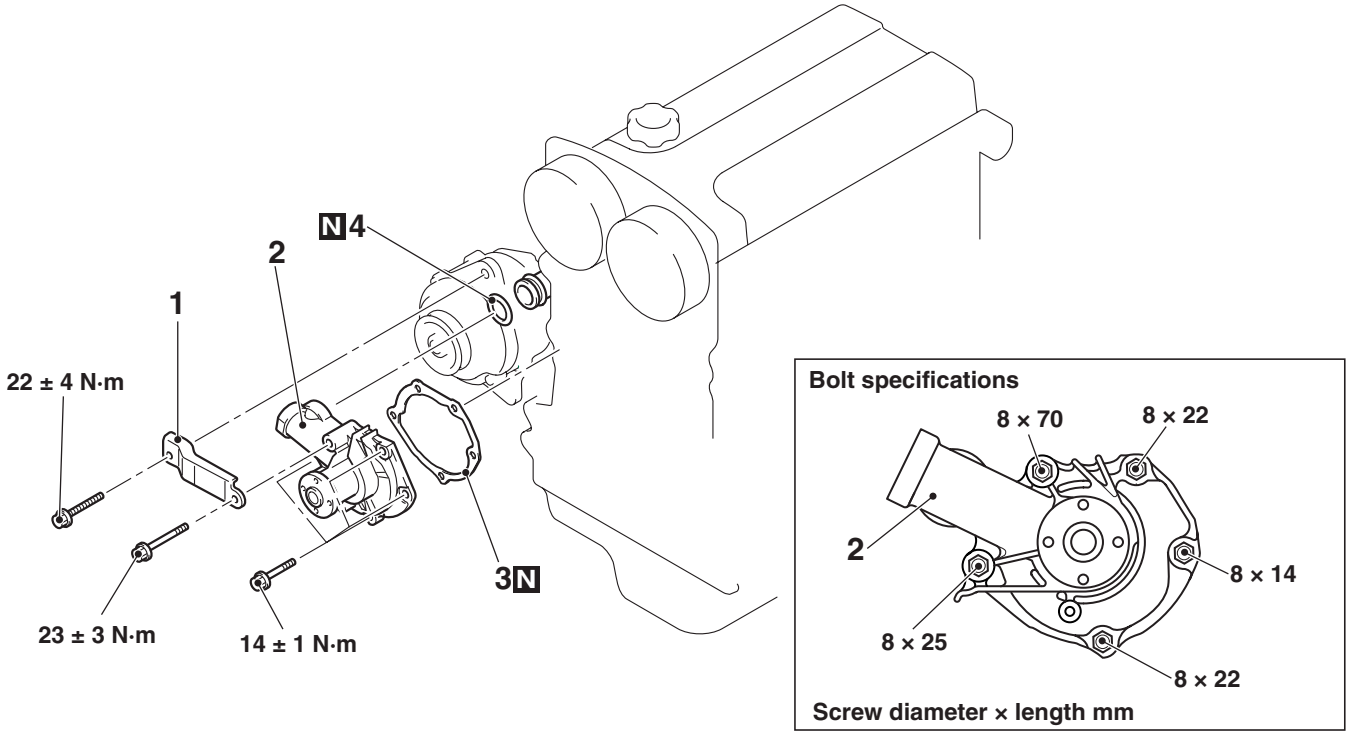
   Standard value:
   Full-opening temperature: 95°C
   Amount of valve lift: 8.5 mm or more

WATER PUMP

REMOVAL AND INSTALLATION <4G63-NON-TURBO>

M1141002700700

Pre-removal Operation	Post-installation Operation
• Engine Coolant Draining (Refer to P.14-17). • Timing Belt Removal (Refer to GROUP 11A, Timing Belt P.11A-40).	• Timing Belt Installation (Refer to GROUP 11A, Timing Belt P.11A-40). • Engine Coolant Refilling (Refer to P.14-17).



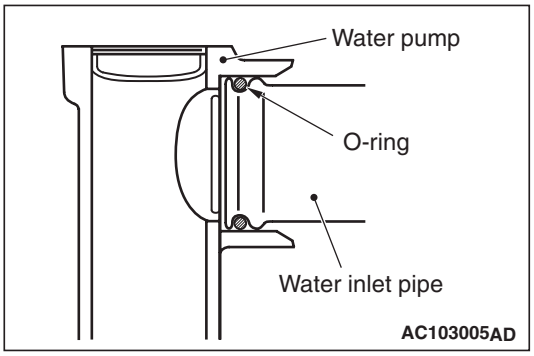
AC301467AB

Removal steps

1. Alternator brace
2. Water pump
3. Water pump gasket

>>A<< 4. O-ring

INSTALLATION SERVICE POINT >>A<< O-RING INSTALLATION

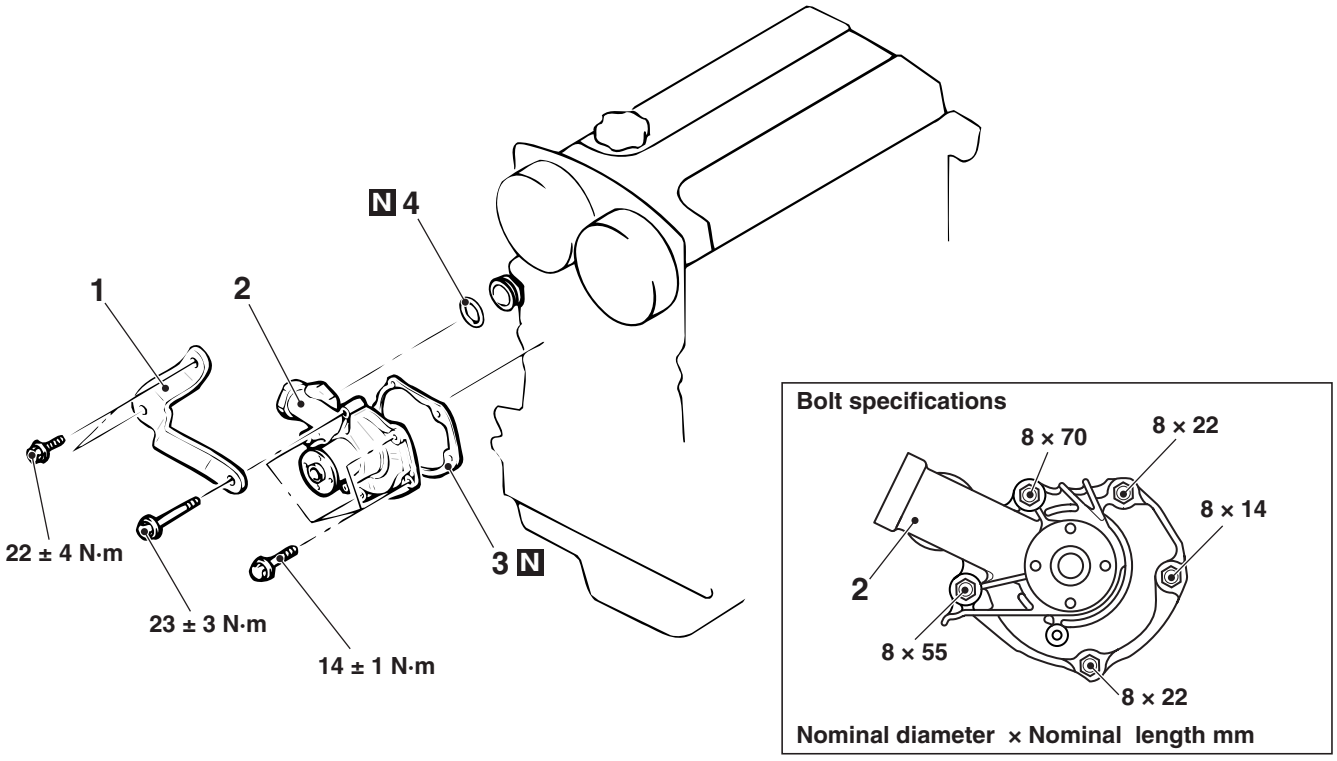


Fit the O-ring to the groove in the water inlet pipe. Then lubricate the O-ring and the inside of the water pump with water, and then insert the pipe to the water pump.

REMOVAL AND INSTALLATION <4G63-TURBO>

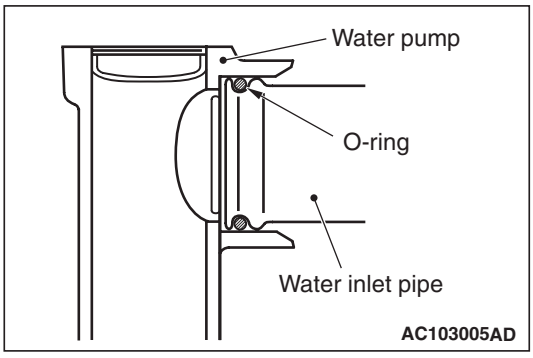
M1141002700670

Pre-removal Operation	Post-installation Operation
• Engine Coolant Draining (Refer to P.14-17). • Timing Belt Removal (Refer to GROUP 11C, Timing Belt P.11C-34).	• Timing Belt Installation (Refer to GROUP 11C, Timing Belt P.11C-34). • Engine Coolant Refilling (Refer to P.14-17).



Removal steps
1. Alternator brace
2. Water pump
3. Water pump gasket
>>A<< 4. O-ring

INSTALLATION SERVICE POINT
>>A<< O-RING INSTALLATION

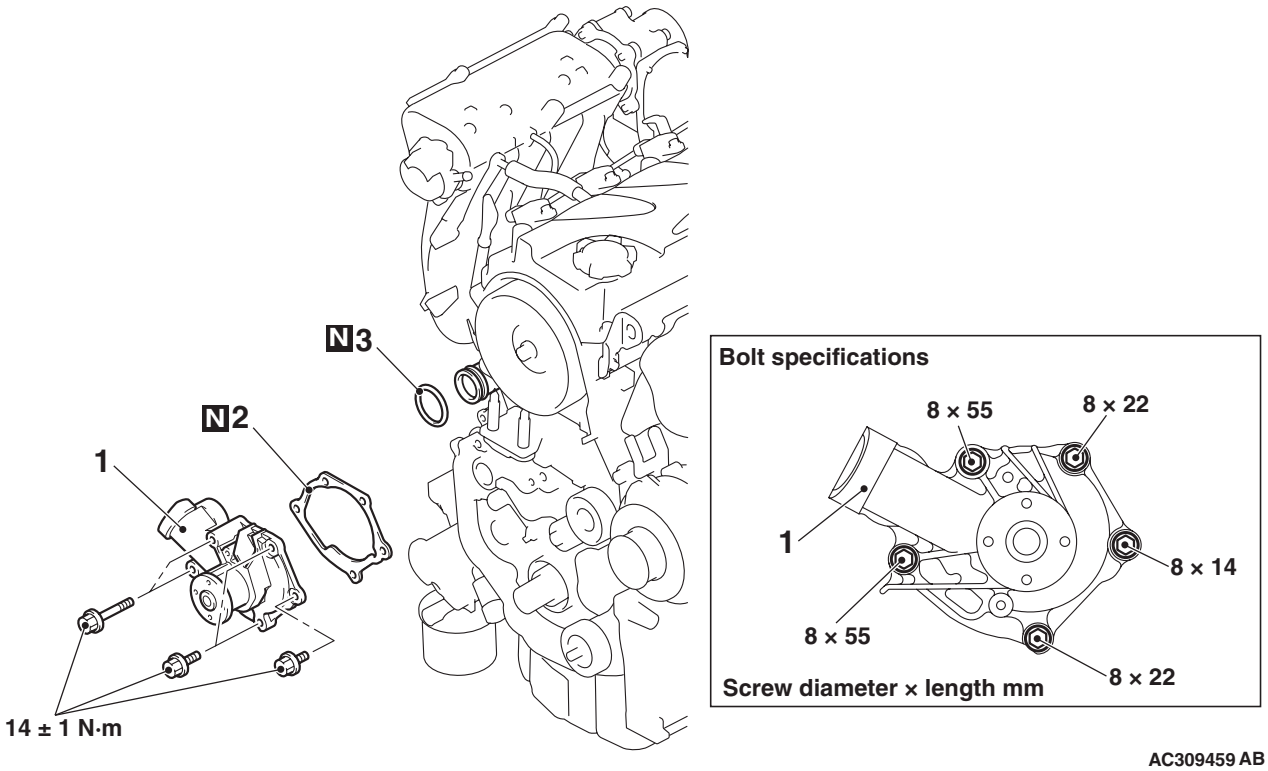


Fit the O-ring to the groove in the water inlet pipe. Then lubricate the O-ring and the inside of the water pump with water, and then insert the pipe to the water pump.

REMOVAL AND INSTALLATION <4G69>

M1141002700681

Pre-removal Operation	Post-installation Operation
• Engine Coolant Draining (Refer to P.14-17). • Timing Belt Removal (Refer to GROUP 11E, Timing Belt P.11E-36).	• Timing Belt Installation (Refer to GROUP 11E, Timing Belt P.11E-36). • Engine Coolant Refilling (Refer to P.14-17).



AC309459 AB

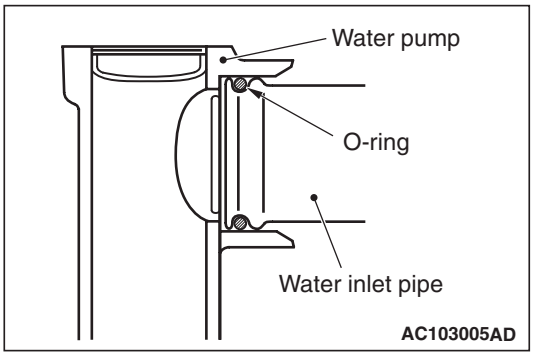
Removal steps

1. Water pump
2. Water pump gasket

>>A<< 3. O-ring

INSTALLATION SERVICE POINT

>>A<< O-RING INSTALLATION



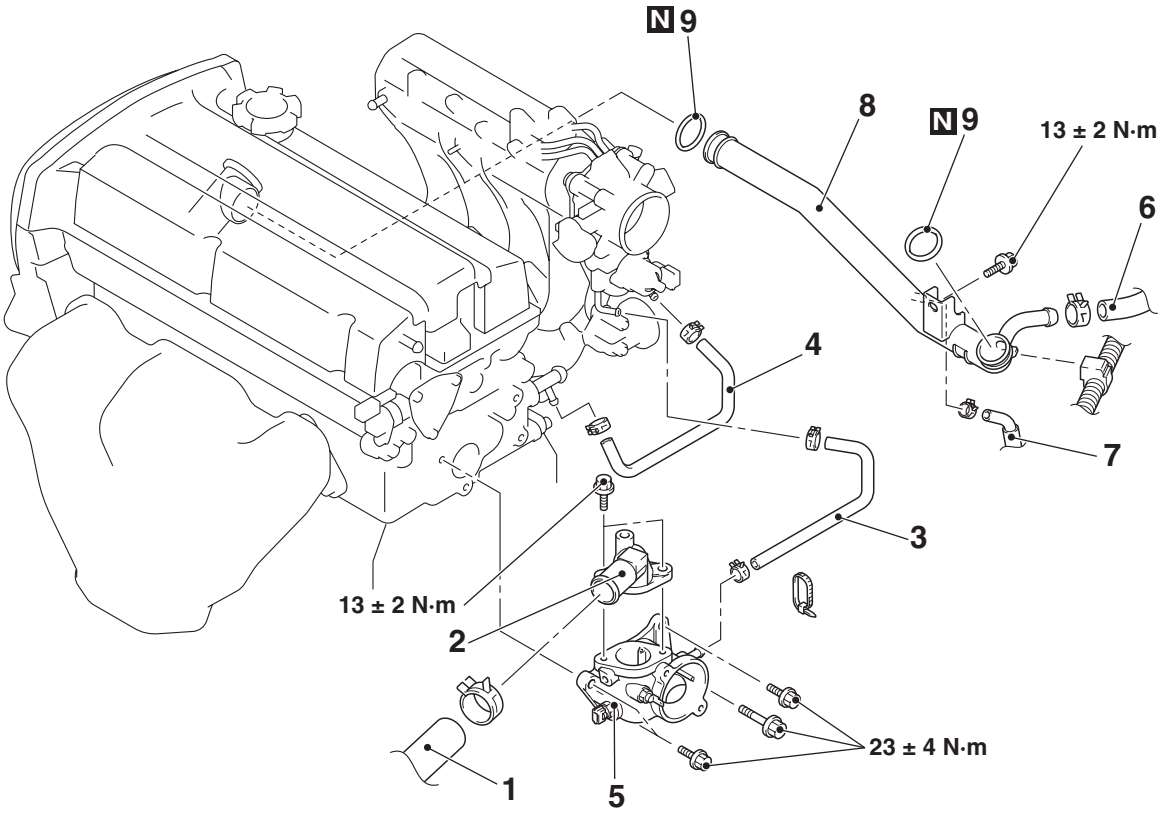
Fit the O-ring to the groove in the water inlet pipe. Then lubricate the O-ring and the inside of the water pump with water, and then insert the pipe to the water pump.

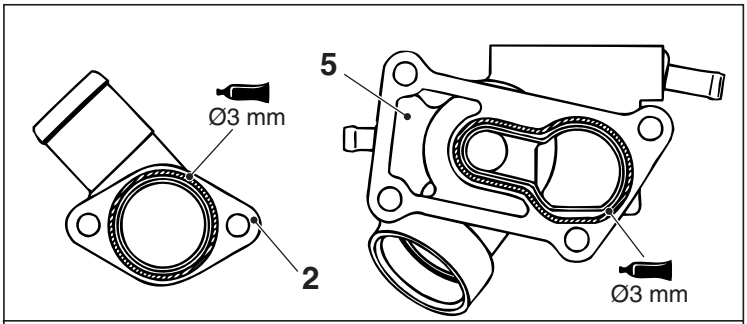
WATER HOSE AND WATER PIPE

REMOVAL AND INSTALLATION
<4G63-NON-TURBO>

M1141003300738

Pre-removal and Post-installation Operation
- Engine Coolant Draining and Supplying (Refer to P.14-17).
- Air Cleaner Removal and Installation (Refer to GROUP 15, Air Cleaner P.15-6).
- Thermostat Removal and Installation (Refer to P.14-21).





Sealant: Mitsubishi Genuine Part No. MD970839 or equivalent

AC301428 AB

Removal steps

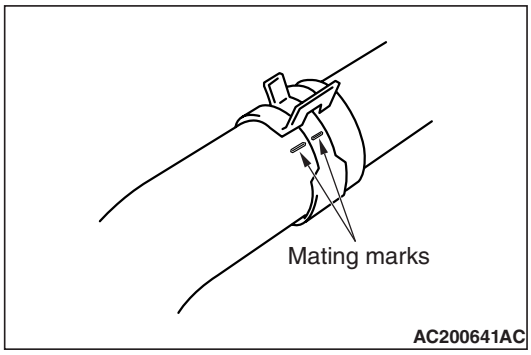
<<A>> >>C<< 1. Radiator upper hose connection
>>B<< 2. Water outlet fitting
3. Water hose
4. Water hose
>>B<< 5. Thermostat case assembly

Removal steps (Continued)

6. Heater hose connection
7. Transfer water return hose connection <4WD>
8. Water inlet pipe assembly
>>A<< 9. O-ring

REMOVAL SERVICE POINT

<<A>> RADIATOR UPPER HOSE DISCONNECTION

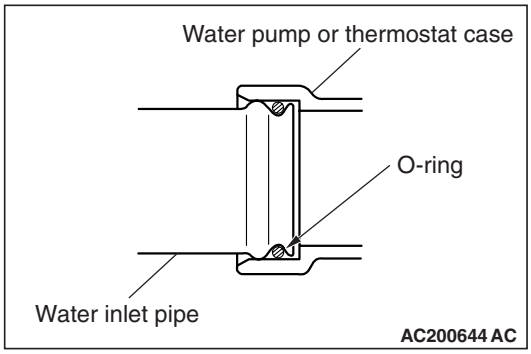


After making mating marks on the radiator hose and hose clamp, disconnect the radiator hose.

INSTALLATION SERVICE POINTS

>>A<< O-RING INSTALLATION

⚠ CAUTION



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

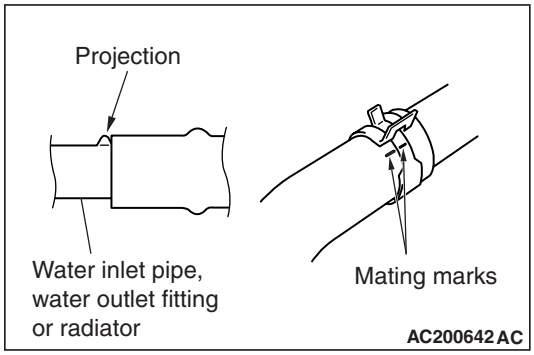
Insert the O-ring to the water pipe, and coat the outer portion of the O-ring with water or engine coolant.

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

1. Use a gasket scraper or wire brush to completely eliminate all gasket material on the gasket mounting surface.
2. Apply a bead of the specified sealant.

   Specified Sealant: MITSUBISHI GENUINE PART No.MD970389 or equivalent
3. With the sealant still wet (within 15 minutes after the sealant is applied), install the thermostat case or water outlet fitting. Do not apply the sealant in an area more than the required.

>>C<< RADIATOR UPPER HOSE CONNECTION

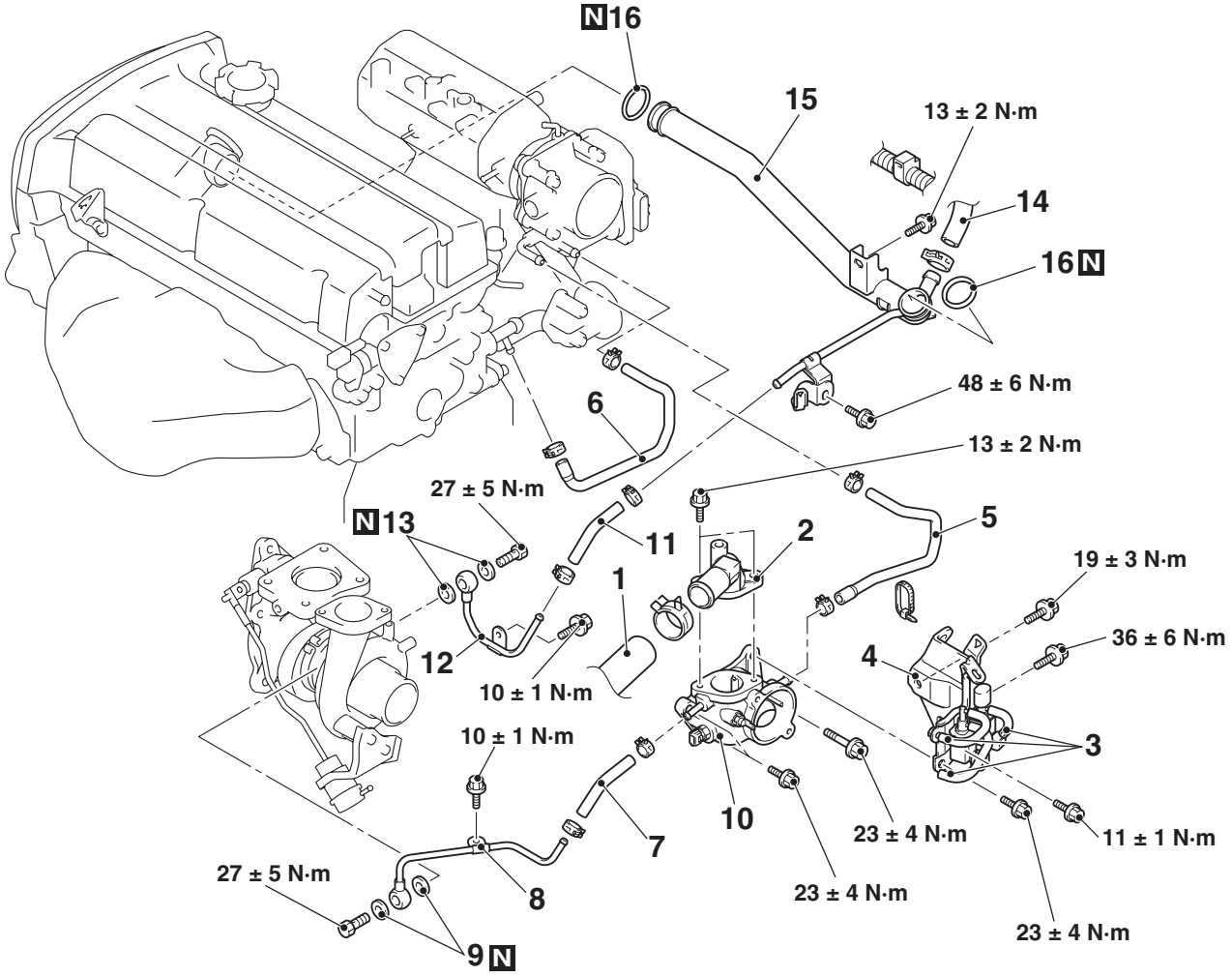


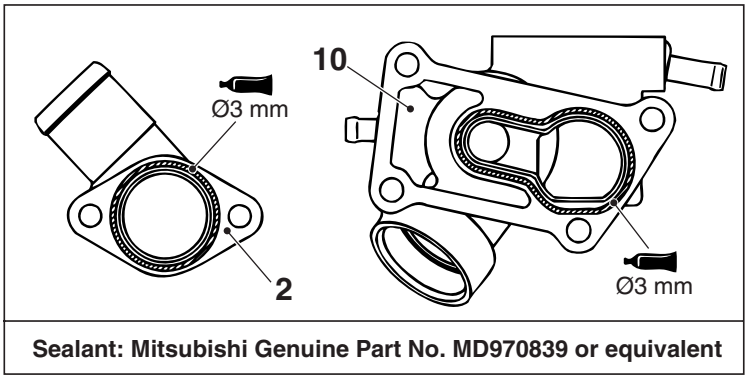
1. Insert each hose as far as the projection of the water outlet fitting.
2. Align the mating marks on the radiator hose and hose clamp, and then connect the radiator hose.

REMOVAL AND INSTALLATION <4G63-TURBO>

M1141003300716

Pre-removal and Post-installation Operation
- Engine Coolant Draining and Supplying (Refer to P.14-17).
- Intercooler Removal and Installation (Refer to GROUP 15, Intercooler P.15-9).
- Air Cleaner Removal and Installation (Refer to GROUP 15, Air Cleaner P.15-7).
- Thermostat Removal and Installation (Refer to P.14-21).





Sealant: Mitsubishi Genuine Part No. MD970839 or equivalent

AC401071AB

Removal steps

<<A>> >>C<< 1. Radiator upper hose connection
>>B<< 2. Water outlet fitting
3. Vacuum hose
4. Fuel pressure control solenoid valve and waste gate solenoid valve assembly
5. Water hose
6. Water hose
7. Water hose
8. Turbocharger water feed pipe
9. Gasket

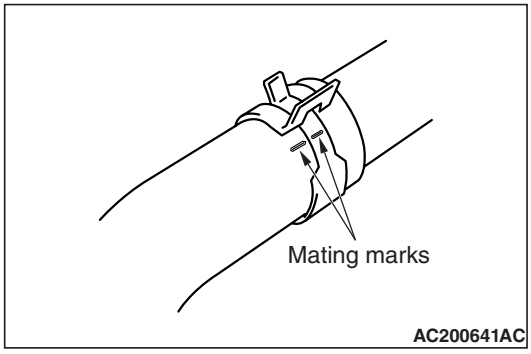
Removal steps (Continued)

>>B<< 10. Thermostat case assembly
11. Water hose
- Turbocharger assembly (Refer to GROUP 15, Exhaust manifold and turbocharger P.15-22).

12. Turbocharger water return pipe
13. Gasket
14. Heater hose connection
15. Water inlet pipe assembly
>>A<< 16. O-ring

REMOVAL SERVICE POINT

<<A>> RADIATOR UPPER HOSE DISCONNECTION

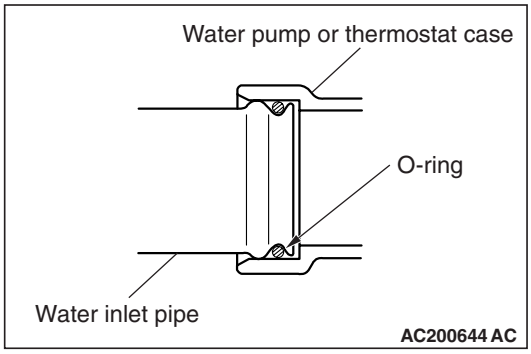


After making mating marks on the radiator hose and hose clamp, disconnect the radiator hose.

INSTALLATION SERVICE POINTS

>>A<< O-RING INSTALLATION

⚠ CAUTION



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

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

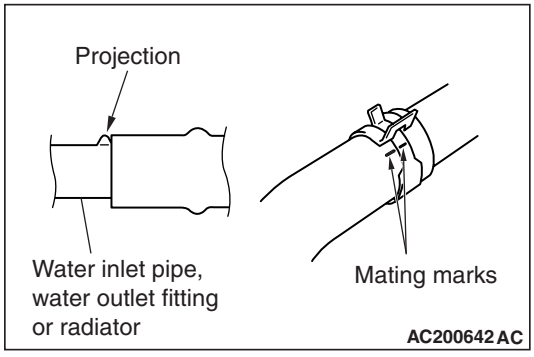
>>B<< THERMOSTAT CASE ASSEMBLY/WATER OUTLET FITTING INSTALLATION

1. Use a gasket scraper or wire brush to completely eliminate all gasket material on the gasket mounting surface.
2. Apply a bead of the specified sealant.

   Specified Sealant: MITSUBISHI GENUINE PART No.MD970389 or equivalent

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

>>C<< RADIATOR UPPER HOSE CONNECTION

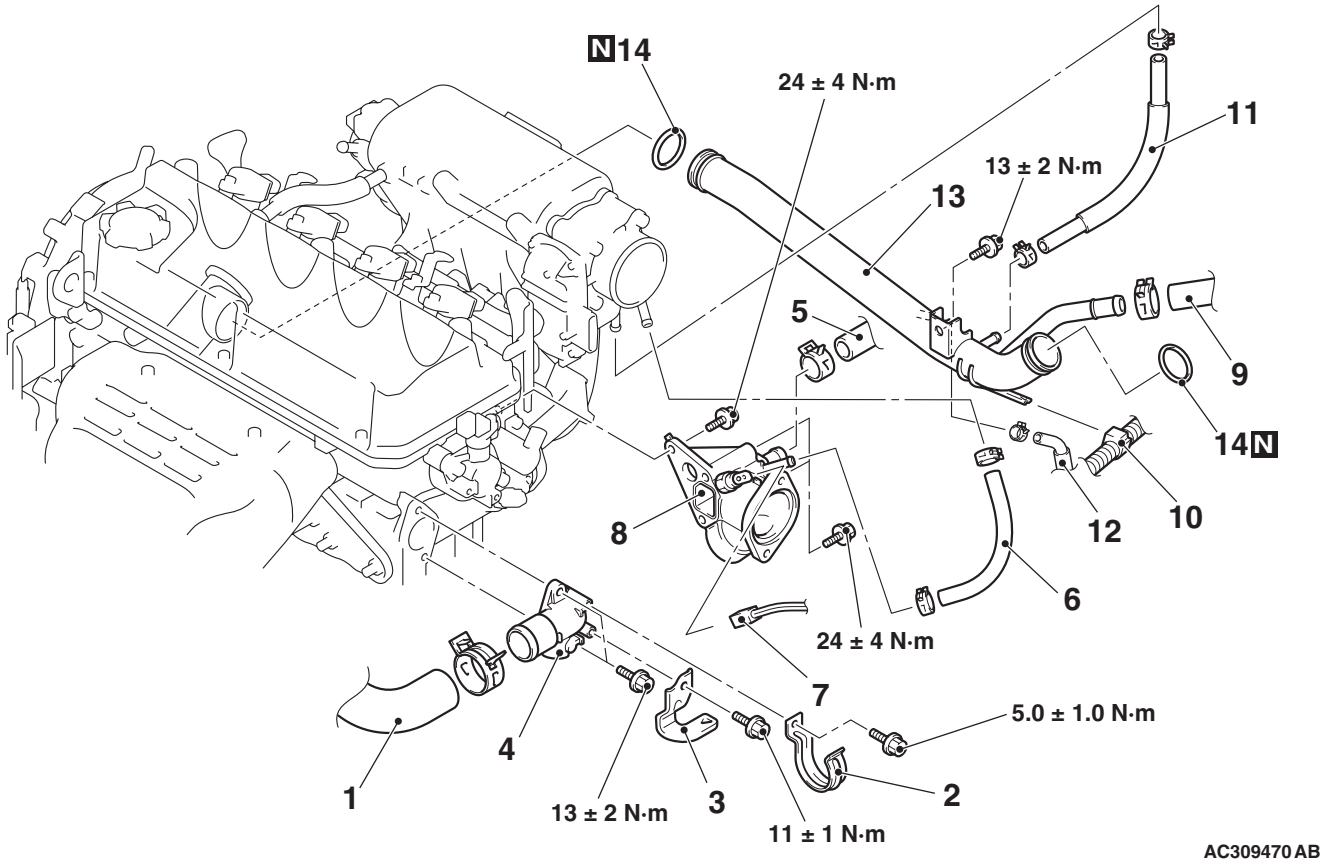


1. Insert each hose as far as the projection of the water outlet fitting.
2. Align the mating marks on the radiator hose and hose clamp, and then connect the radiator hose.

REMOVAL AND INSTALLATION <4G69>

M1141003300567

Pre-removal and Post-installation Operation
- Engine Coolant Draining and Supplying (Refer to P.14-17).
- Air Cleaner Removal and Installation (Refer to GROUP 15, Air Cleaner P.15-8).
- Thermostat Removal and Installation (Refer to P.14-21).



AC309470 AB

Removal steps

<<A>> >>C<< 1. Radiator upper hose connection
2. Radiator hose clamp
3. Control wiring harness connection bracket

>>B<< 4. Water outlet fitting
5. Heater hose connection
6. Water return hose
7. Engine coolant temperature gauge unit

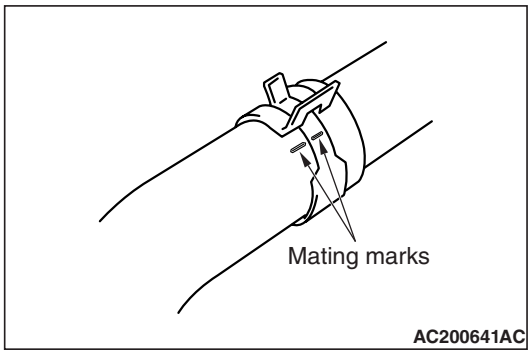
Removal steps (Continued)

>>B<< 8. Thermostat case assembly
9. Heater hose connection
10. Harness clamp
11. Water feed hose
12. Transfer water return hose connection
13. Water inlet pipe assembly

>>A<< 14. O-ring

REMOVAL SERVICE POINT

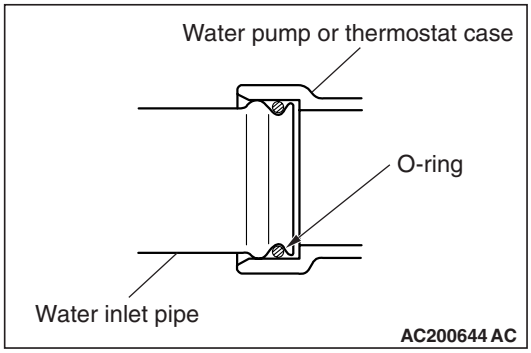
<<A>> RADIATOR UPPER HOSE DISCONNECTION



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

INSTALLATION SERVICE POINTS

>>A<< O-RING INSTALLATION



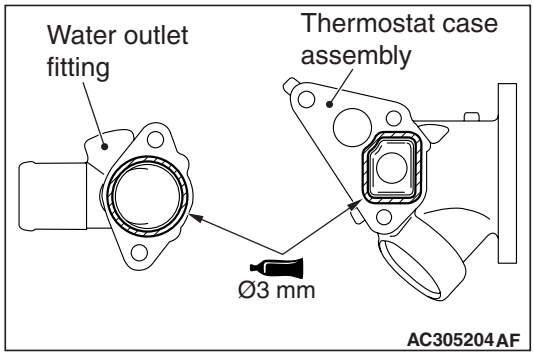
⚠ CAUTION

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

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

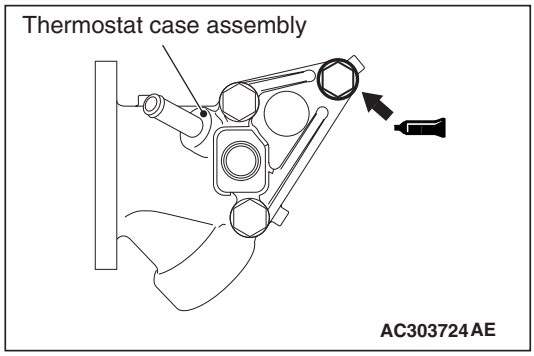
>>B<< THERMOSTAT CASE ASSEMBLY/WATER OUTLET FITTING INSTALLATION

1. Use a gasket scraper or wire brush to completely eliminate all gasket material on the gasket mounting surface.



2. Apply a bead of the sealant to the cylinder head mating surface of the thermostat case as shown.

   Specified Sealant: Mitsubishi Genuine Part No.MD970389 or equivalent

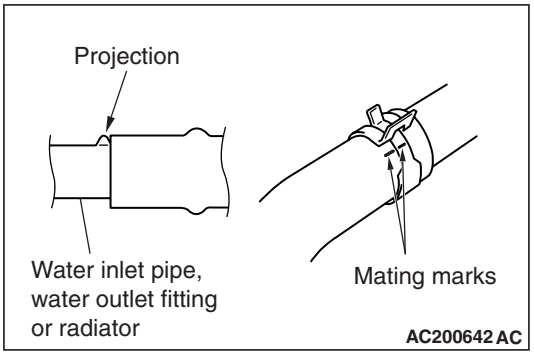


3. Apply sealant to the thread of the thermostat case assembly bolts as shown.

   Specified Sealant: 3M Stud Locking 4170 or equivalent

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

>>C<< RADIATOR UPPER HOSE CONNECTION



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

INSPECTION

M1141003400274

WATER PIPE AND HOSE CHECK

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

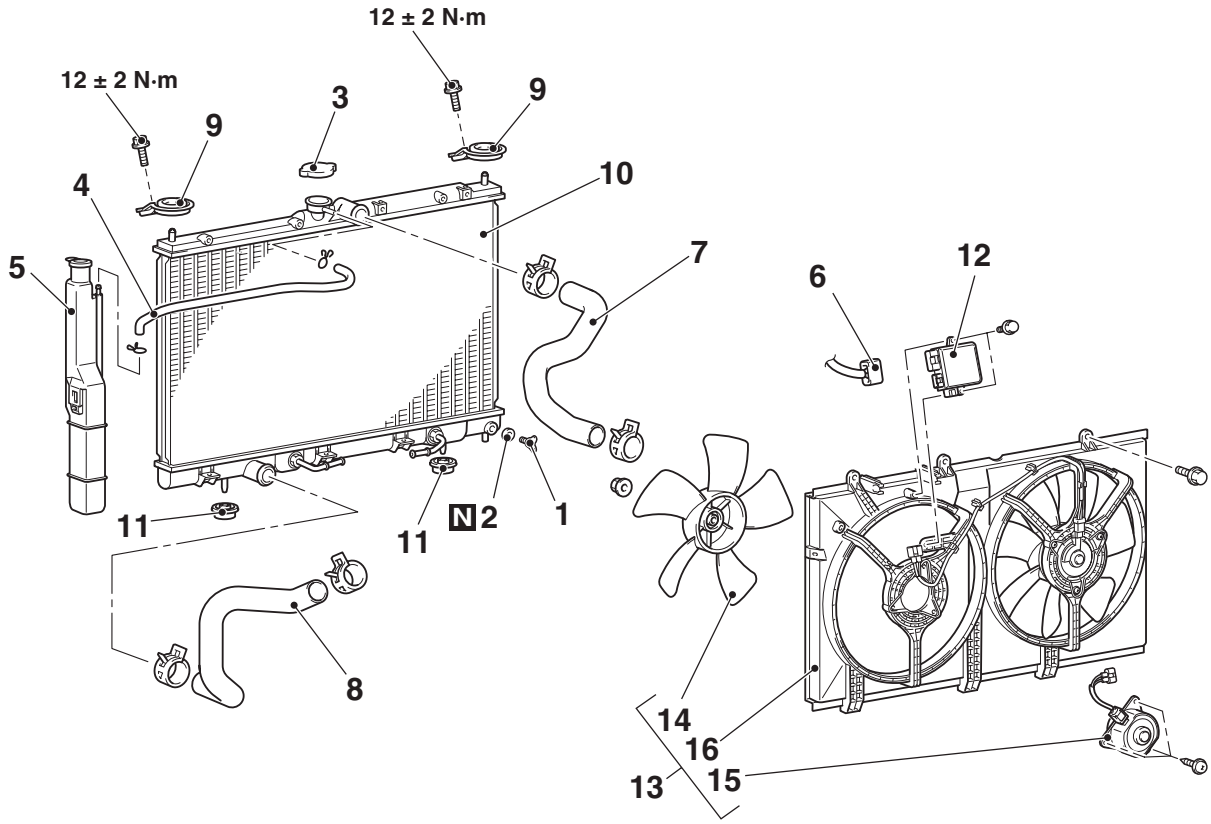
RADIATOR

REMOVAL AND INSTALLATION

M1141001501580

Pre-removal Operation	Post-installation Operation
• Engine Coolant Draining (Refer to P.14-17). • Air Cleaner Removal (Refer to GROUP 15, Air Cleaner P.15-6<4G63-Non-Turbo>, P.15-7<4G63-Turbo>, P.15-8<4G69>).	• Air Cleaner Installation (Refer to GROUP 15, Air Cleaner P.15-6<4G63-Non-Turbo>, P.15-7<4G63-Turbo>, P.15-8<4G69>). • Engine Coolant Refilling and Level Check (Refer to P.14-17).

<4G63-Non-Turbo>



AC309199AB

Radiator removal steps

1. Drain plug
2. O-ring
3. Radiator cap
4. Rubber hose
5. Reserve tank assembly
6. Fan controller connector

<<A>> >>A<< 7. Radiator upper hose

<<A>> >>A<< 8. Radiator lower hose

9. Upper insulator
10. Radiator assembly
11. Lower insulator

Radiator removal steps

12. Fan controller
13. Cooling fan assembly

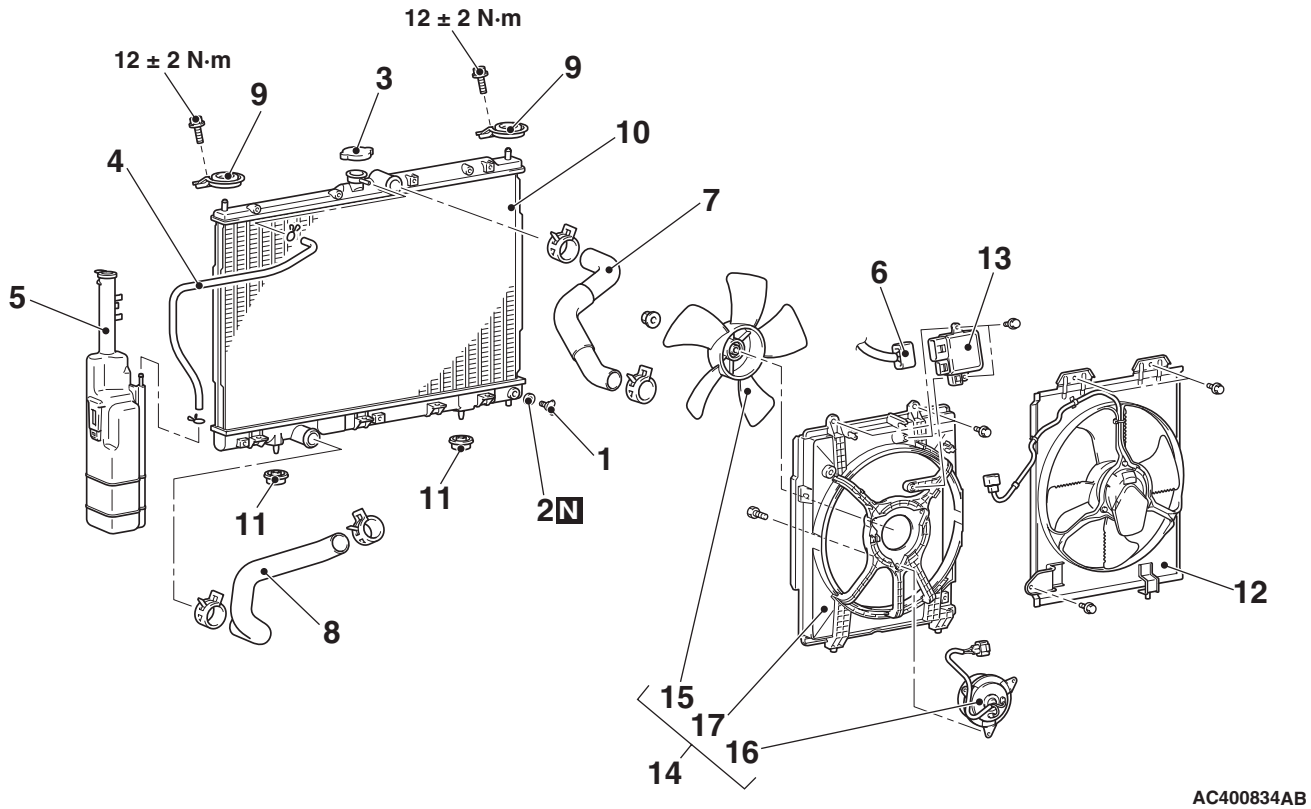
Radiator fan motor removal steps

4. Rubber hose
6. Fan controller connector

<<A>> >>A<< 7. Radiator upper hose

13. Cooling fan assembly
14. Radiator fan
15. Radiator fan motor
16. Shroud assembly

<4G63-Turbo>



Radiator removal steps

1. Drain plug
2. O-ring
3. Radiator cap
4. Rubber hose
5. Reserve tank assembly
6. Fan controller connector

<<A>> >>A<< 7. Radiator upper hose

<<A>> >>A<< 8. Radiator lower hose

9. Upper insulator
10. Radiator assembly
11. Lower insulator
12. Condenser fan assembly

Radiator removal steps

13. Fan controller
14. Radiator fan assembly

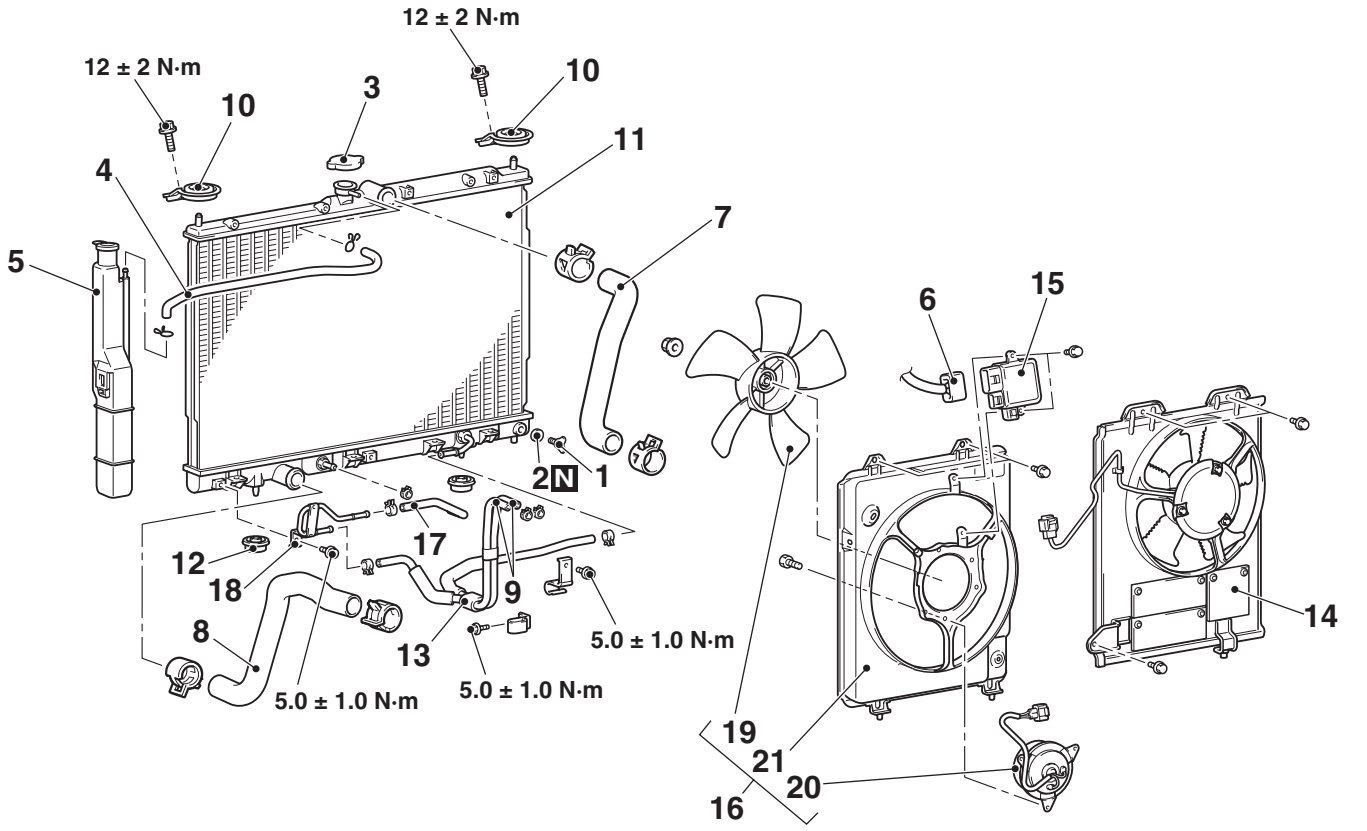
Radiator fan motor removal steps

4. Rubber hose
6. Fan controller connector

<<A>> >>A<< 7. Radiator upper hose

12. Condenser fan assembly
13. Fan controller
14. Radiator fan assembly
15. Radiator fan
16. Radiator fan motor
17. Shroud assembly

<4G69>



AC504333AB

Radiator removal steps

1. Drain plug
2. O-ring
3. Radiator cap
4. Rubber hose
5. Reserve tank assembly
6. Fan controller connector

<<**A**>> >>**A**<< 7. Radiator upper hose

<<**A**>> >>**A**<< 8. Radiator lower hose

<<**B**>> 9. Transmission fluid cooler hose connection <A/T>

10. Upper insulator
11. Radiator assembly
12. Lower insulator
13. Transmission fluid cooler hose assembly <A/T>
14. Condenser fan assembly
15. Fan controller

Radiator removal steps

16. Radiator fan assembly
17. Transmission fluid cooler hose <A/T>
18. Transmission fluid cooler tube assembly <A/T>

Radiator fan motor removal steps

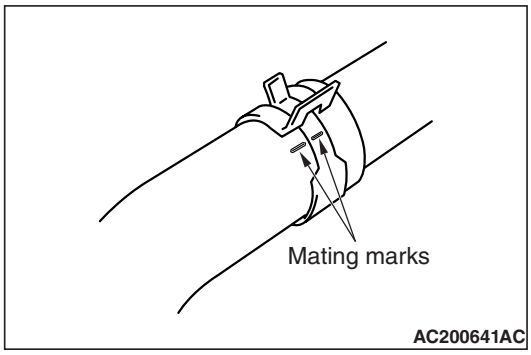
4. Rubber hose
6. Fan controller connector

<<**A**>> >>**A**<< 7. Radiator upper hose

14. Condenser fan assembly
15. Fan controller
16. Radiator fan assembly
19. Radiator fan
20. Radiator fan motor
21. Shroud assembly

REMOVAL SERVICE POINTS

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



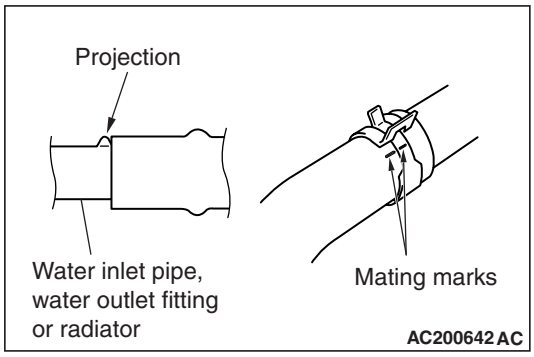
Make mating marks on the radiator hose and the hose clamp. Disconnect the radiator hose.

<<B>> TRANSMISSION FLUID COOLER HOSE DISCONNECTION

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

INSTALLATION SERVICE POINT

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



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