

GROUP 14

ENGINE COOLING

CONTENTS

GENERAL INFORMATION	14-2	COOLING FAN MOTOR DRIVE CONTROL UNIT CHECK	14-23
SERVICE SPECIFICATIONS	14-2	FAN CONTROL RELAY CONTINUITY CHECK	14-24
LUBRICANT	14-3	COOLING FAN MOTOR CHECK	14-24
SEALANTS	14-3	THERMOSTAT	14-25
SPECIAL TOOLS	14-4	REMOVAL AND INSTALLATION	14-25
TROUBLESHOOTING	14-5	INSPECTION	14-26
INSPECTION CHART FOR TROUBLE SYMPTOMS	14-5	WATER PUMP	14-27
INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS	14-6	REMOVAL AND INSTALLATION <4G1> ..	14-27
ON-VEHICLE SERVICE	14-21	REMOVAL AND INSTALLATION <4G6> ..	14-28
ENGINE COOLANT LEAK CHECK	14-21	WATER HOSE AND WATER PIPE ..	14-29
RADIATOR CAP VALVE OPENING PRESSURE CHECK	14-21	REMOVAL AND INSTALLATION <4G1> ..	14-29
ENGINE COOLANT REPLACEMENT	14-21	REMOVAL AND INSTALLATION <4G6> ..	14-31
CONCENTRATION MEASUREMENT	14-23	INSPECTION	14-32
		RADIATOR	14-33
		REMOVAL AND INSTALLATION <4G1> ..	14-33
		REMOVAL AND INSTALLATION <4G6> ..	14-35

GENERAL INFORMATION

M1141000100371

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

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

Item			Specification		
Radiator	Performance kJ/h	4G13	Standard vehicles	137,720	
			Vehicles with capacity up radiator (option)	161,288	
		4G18	Standard vehicles	161,288	
			Vehicles with capacity up radiator (option)	181,800	
		4G63			181,800
		A/T oil cooler	Performance kJ/h		5,651

SERVICE SPECIFICATIONS

M1141000300687

Item		Standard value	Limit
Fan controller V	A/C OFF	1 or less	-
	A/C ON	Repeat 8.2 ± 0.7 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	4G1	88 ± 1.5
		4G6	82 ± 1.5
	Full-opening temperature of thermostat °C	4G1	100
		4G6	95
Valve lift mm		8.5 or more	-

LUBRICANT

M1141000400338

Item	Specified coolant		Quantity L
Engine coolant (including condense tank)	DIAQUEEN SUPER LONG LIFE COOLANT or an equivalent	4G1	5.0
		4G6	7.0

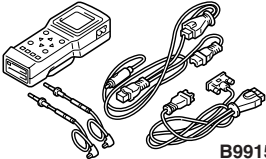
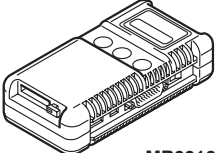


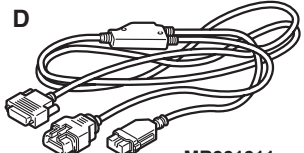
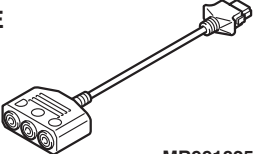
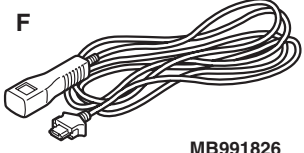
SEALANTS


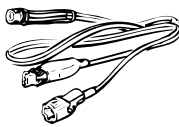
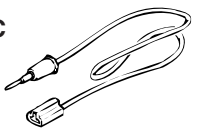
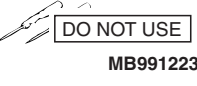
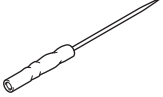
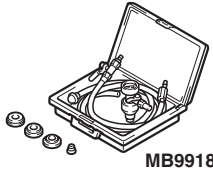
M1141000500324

Item	Specified sealant
Cylinder block drain plug	3M Nut Locking Part No.4171 or equivalent
Water pump <4G1>, Thermostat case <4G6>, Cooling water outlet hose fitting <4G6>	MITSUBISHI GENUINE Part No.MD970389 or equivalent

SPECIAL TOOLS

M1141000600729

Tool	Number	Name	Use
 <p>B991502</p>	MB991502	M.U.T.-II sub assembly	Reading diagnosis code
<p>A</p>  <p>MB991824</p> <p>B</p>  <p>MB991827</p> <p>C</p>  <p>MB991910</p> <p>D</p>  <p>MB991911</p> <p>E</p>  <p>MB991825</p> <p>F</p>  <p>MB991826</p> <p>MB991955</p>	<p>MB991955</p> <p>A: MB991824</p> <p>B: MB991827</p> <p>C: MB991910</p> <p>D: MB991911</p> <p>E: MB991825</p> <p>F: MB991826</p>	<p>M.U.T.-III sub assembly</p> <p>A: Vehicle communication interface (V.C.I.)</p> <p>B: M.U.T.-III USB cable</p> <p>C: M.U.T.-III main harness A (Vehicles with CAN communication system)</p> <p>D: M.U.T.-III main harness B (Vehicles without CAN communication system)</p> <p>E: M.U.T.-III adapter harness</p> <p>F: M.U.T.-III trigger harness</p>	<p>CAUTION</p> <p>If you connect M.U.T.-III main harness A to a vehicle without CAN communication system to use the M.U.T.-III, a pulse signal may interfere with the simulated vehicle speed lines, thus causing the M.U.T.-III inoperative. Therefore, use the M.U.T.-III main harness B (MB991911) instead.</p> <p>Reading diagnosis code</p>

Tool	Number	Name	Use
<p>A</p>  <p>B</p>  <p>C</p>  <p>D</p> 	<p>MB991223 A: MB991219 B: MB991220 C: MB991221 D: MB991222</p>	<p>Harness set A: Check harness B: LED harness C: LED harness adapter D: Probe</p>	<p>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</p>
 <p>MB992006</p>	<p>MB992006</p>	<p>Extra fine probe</p>	<p>Making voltage and resistance measurement during troubleshooting</p>
 <p>MB991871</p>	<p>MB991871</p>	<p>LLC changer</p>	<p>Coolant refilling</p>

TROUBLESHOOTING

INSPECTION CHART FOR TROUBLE SYMPTOMS

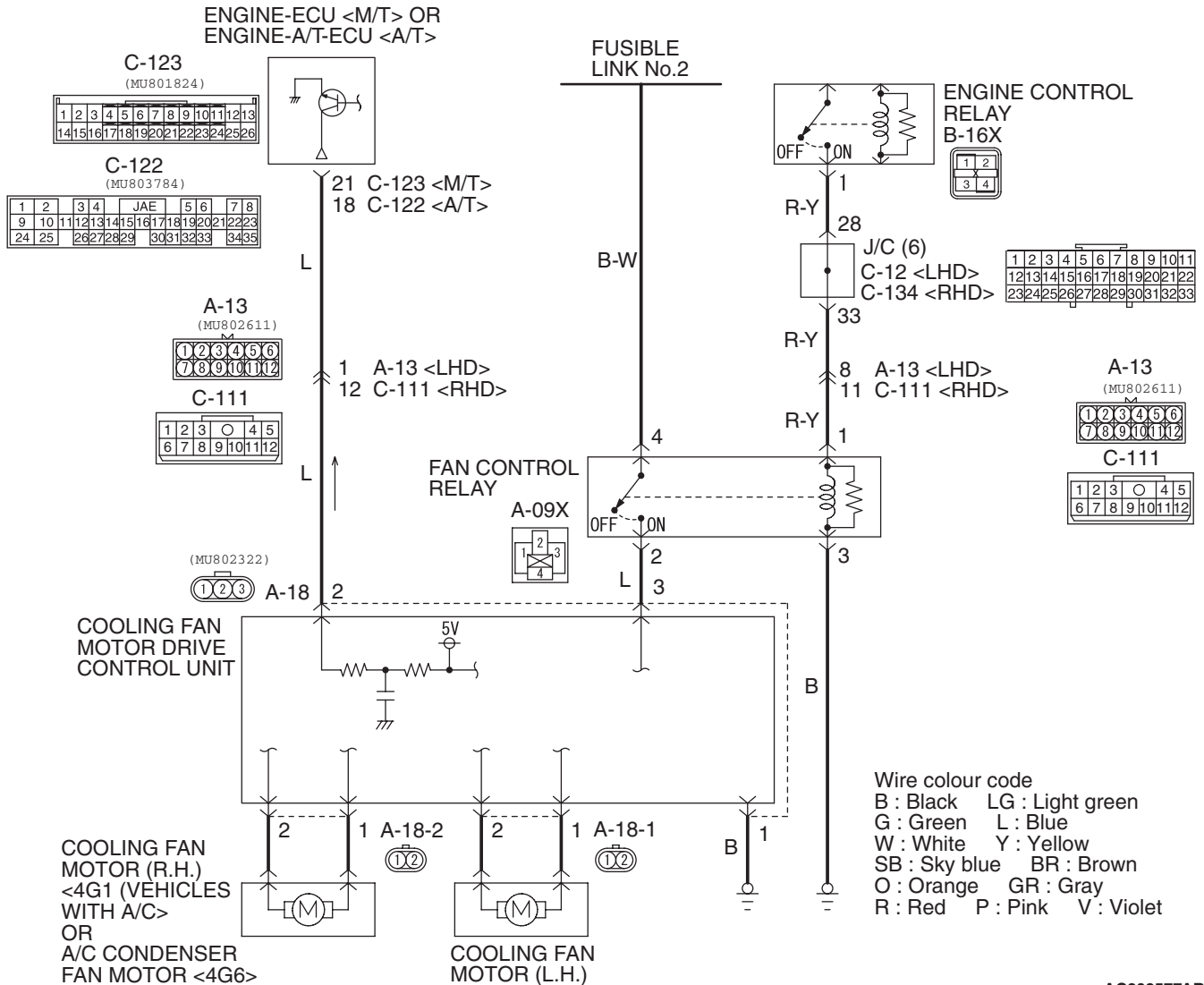
M1141005600360

Trouble symptom	Inspection procedure No.	Reference page
Cooling fan (L.H.) and Cooling fan (R.H.) <4G1 (Vehicles with A/C)> or A/C condenser fan <4G6> do not operate	1	P.14-6
Cooling fan (L.H.) and Cooling fan (R.H.) <4G1 (Vehicles with A/C)> or A/C condenser fan <4G6> do not change speed or stop	2	P.14-16
Cooling fan (L.H.) does not operate {When cooling fan (R.H.) <4G1> or A/C condenser fan <4G6> operate} <Vehicles with A/C>	3	P.14-20
Cooling fan (R.H.) <4G1> or A/C condenser fan <4G6> does not operate {When cooling fan (L.H.) operate} <Vehicles with A/C>	4	P.14-20

INSPECTION PROCEDURE FOR
TROUBLE SYMPTOMS

INSPECTION PROCEDURE 1: Cooling Fan (L.H.) and Cooling Fan (R.H.) <4G1 (Vehicles with A/C)> or A/C Condenser Fan <4G6> do not Operate

Cooling Fan (L.H.) and Cooling Fan (R.H.) or A/C Condenser Fan Drive Circuit



AC303577AB

CIRCUIT OPERATION

- The cooling fan motor drive control unit is powered from fusible link (2).
- The engine-ECU <M/T> or engine-A/T-ECU <A/T> uses input signals from the A/C switch, the water temperature sensor unit and the vehicle speed sensor <M/T> or the output shaft speed sensor <A/T> to control the speed of the cooling fan motor (L.H.) and the cooling fan motor (R.H.) <4G1 (Vehicles with A/C)> or A/C condenser fan motor <4G6>.

- The engine-ECU <M/T> or engine-A/T-ECU <A/T> controls the cooling fan motor drive control unit to activate the cooling fan motor (L.H.) and the cooling fan motor (R.H.) <4G1 (Vehicles with A/C)> or A/C condenser fan motor <4G6>.

TECHNICAL DESCRIPTION

- The cause could be a malfunction of the cooling fan motor drive control unit power supply or earth circuit.
- If the communication line wiring harness between the cooling fan motor drive control unit and the engine-ECU <M/T> or engine-A/T-ECU <A/T> is short-circuited to earth, the cooling fan motor (L.H.) and the cooling fan motor (R.H.) <4G1 (Vehicles with A/C)> or the A/C condenser fan motor <4G6> will not rotate.
- The cause could also be a malfunction of the cooling fan motor (L.H.). <Vehicles without A/C>
- The cause could also be a malfunction of input signal from the A/C switch, the water temperature sensor unit and the vehicle speed sensor <M/T> or the output shaft speed sensor <A/T> to the engine-ECU <M/T> or engine-A/T-ECU <A/T>.
- The cause could also be a malfunction of the cooling fan motor drive control unit or the engine-ECU <M/T> or engine-A/T-ECU <A/T>.

TROUBLESHOOTING HINTS

- Malfunction of fusible link (2)
- Malfunction of fan control relay
- Malfunction of cooling fan motor (L.H.) <Vehicles without A/C>
- Malfunction of cooling fan motor drive control unit
- Malfunction of engine-ECU <M/T> or engine-A/T-ECU <A/T>
- Damaged wiring harness or connector

DIAGNOSIS

STEP 1. Check the cooling fan motor (L.H.). <Vehicles without A/C>

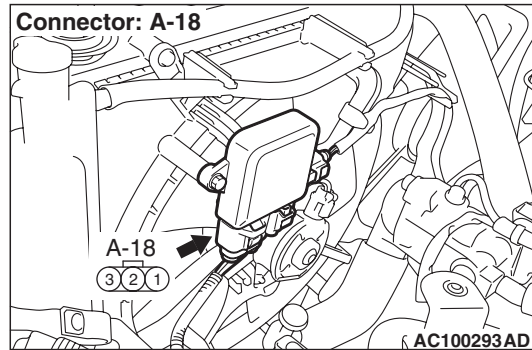
Refer to [P.14-24](#).

Q: Is the cooling fan motor (L.H.) in good condition?

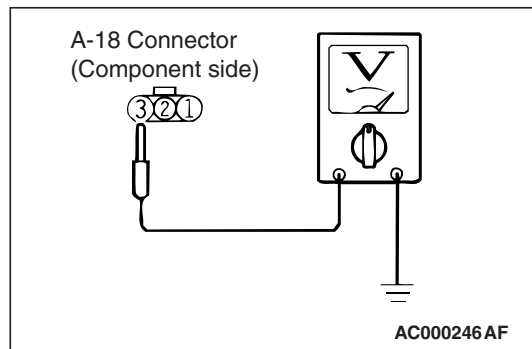
YES : Go to Step 2.

NO : Replace the cooling fan motor (L.H.) (Refer to [P.14-33](#)) <4G1> (Refer to [P.14-35](#)) <4G6>. Then go to Step 24.

STEP 2. Measure the power supply voltage at cooling fan motor drive control unit connector A-18.



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

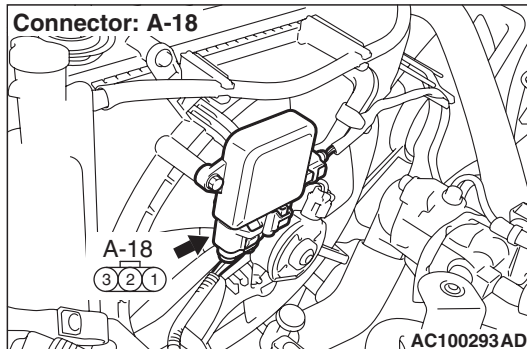


- (3) Measure the voltage between cooling fan motor drive control unit connector A-18 terminal 3 and body earth.
 - The voltage should measure system voltage.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.
- (5) Connect cooling fan motor drive control unit connector A-18.

Q: Is the measured voltage system voltage?

YES : Go to Step 17.

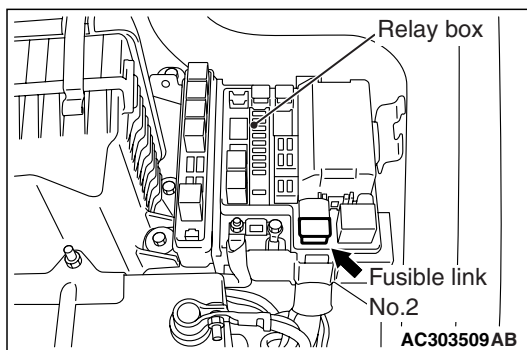
NO : Go to Step 3.

STEP 3. Check the cooling fan motor drive control unit connector A-18.

Q: Is the connector in good condition?

YES : Go to Step 4.

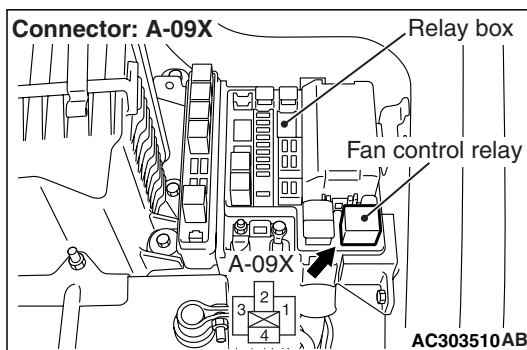
NO : Repair or replace the connector. Then go to Step 24.

STEP 4. Check the fusible link No.2.

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

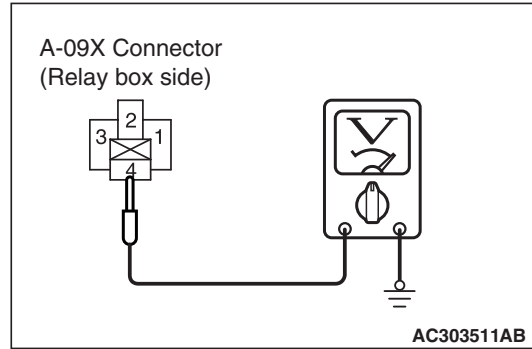
YES : Go to Step 5.

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-09X.

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

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



(3) Measure the voltage between fan control relay connector A-09X terminal 4 and body earth.

- The voltage should measure system voltage.

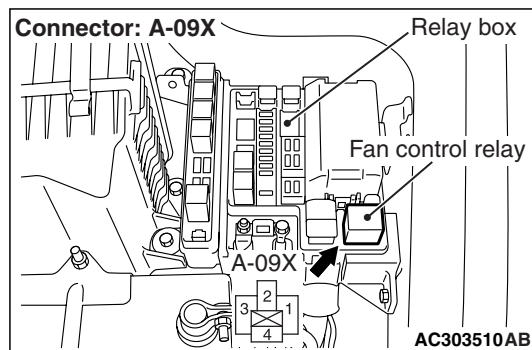
(4) Turn the ignition switch to the "LOCK" (OFF) position.

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

Q: Is the measured voltage system voltage?

YES : Go to Step 8.

NO : Go to Step 6.

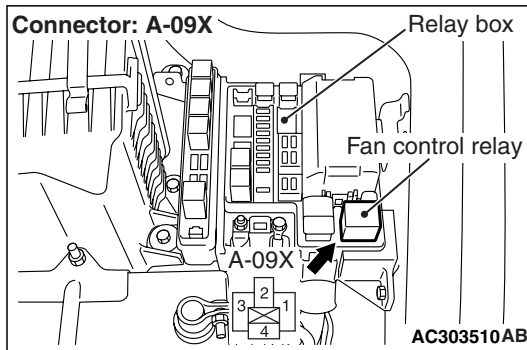
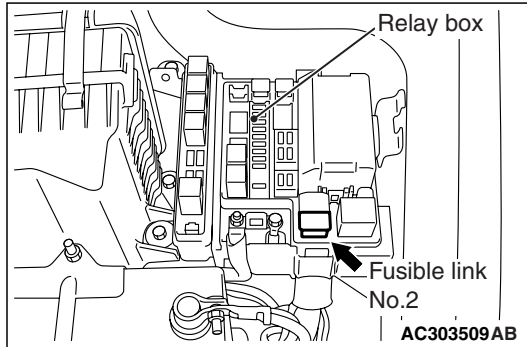
STEP 6. Check the fan control relay connector A-09X.

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-09X terminal 4.

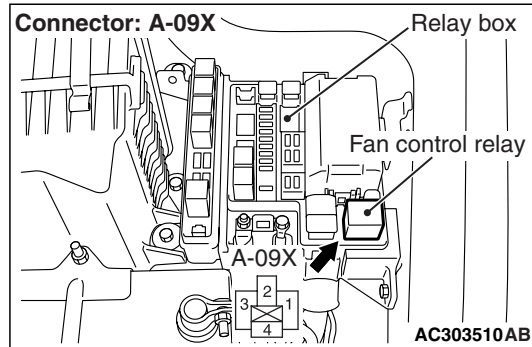


Q: Is the harness wire in good condition?
YES : An intermittent malfunction is suspected (Refer to GROUP 00 - How to use troubleshooting P.00-5).
NO : Repair the damaged harness wire. Then go to Step 24.

STEP 8. Check the fan control relay.
Refer to P.14-24.

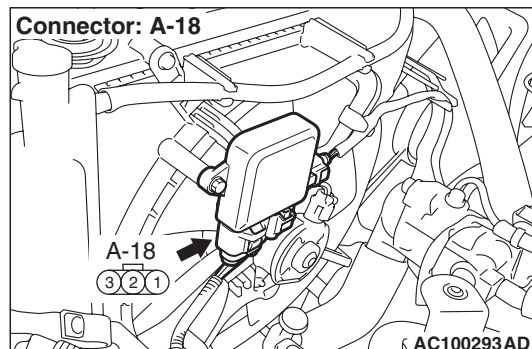
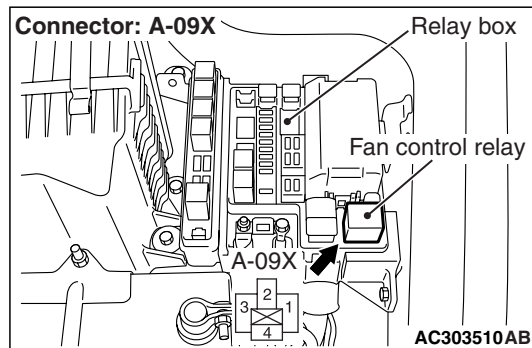
Q: Is the fan control relay in good condition?
YES : Go to Step 9.
NO : Replace the fan control relay. Then go to Step 24.

STEP 9. Check the fan control relay connector A-09X.



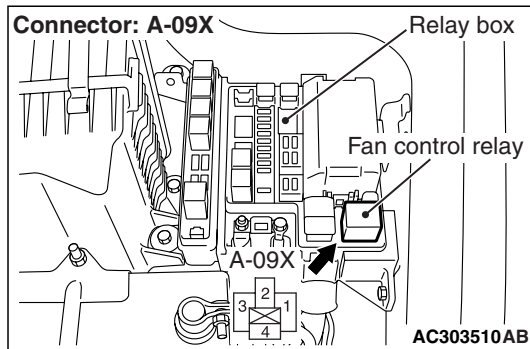
Q: Is the connector in good condition?
YES : Go to Step 10.
NO : Repair the connector or replace the relay box. Then go to Step 24.

STEP 10. Check the harness wire between fan control relay connector A-09X terminal 2 and cooling fan motor drive control unit connector A-18 terminal 3.

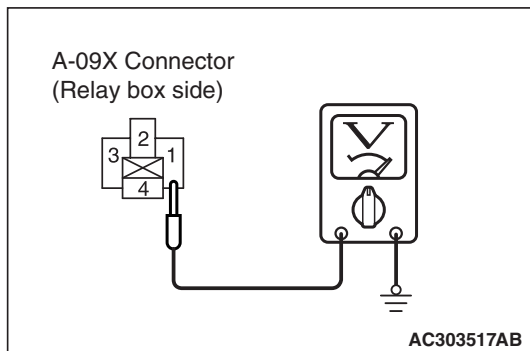


Q: Is the harness wire in good condition?
YES : Go to Step 11.
NO : Repair the damaged harness wire. Then go to Step 24.

STEP 11. Measure the terminal voltage at fan control relay connector A-09X.



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



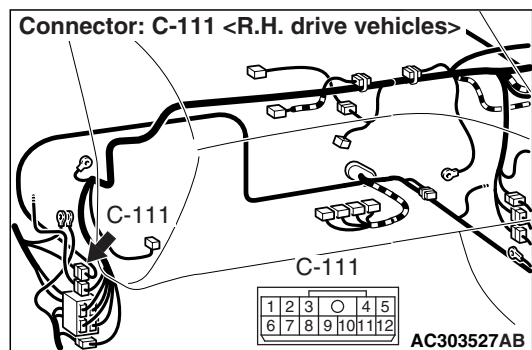
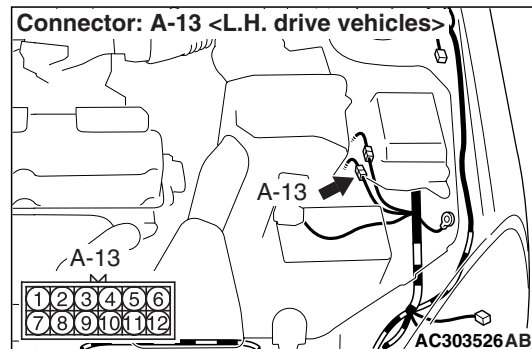
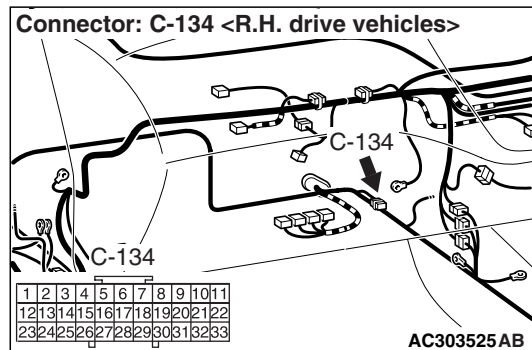
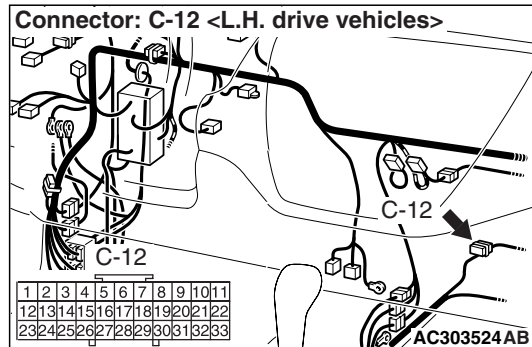
- (3) Measure the voltage between fan control relay connector A-09X terminal 1 and body earth.
 - The voltage should measure system voltage.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.
- (5) Connect fan control relay connector A-09X (install the fan control relay).

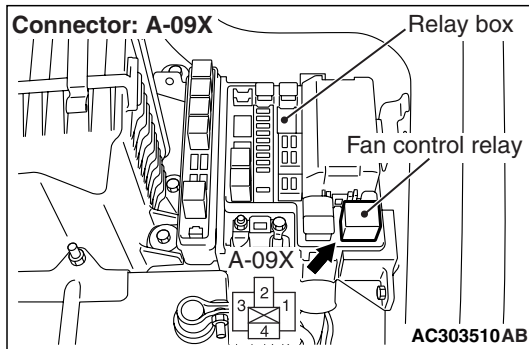
Q: Is the measured voltage system voltage?

YES : Go to Step 14.

NO : Go to Step 12.

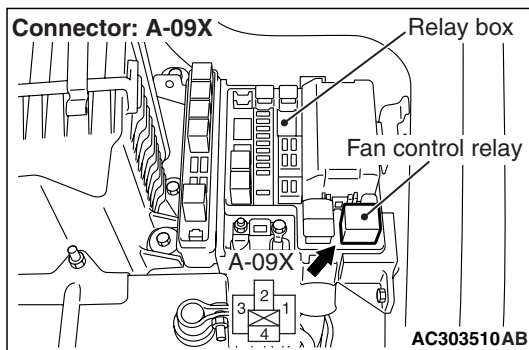
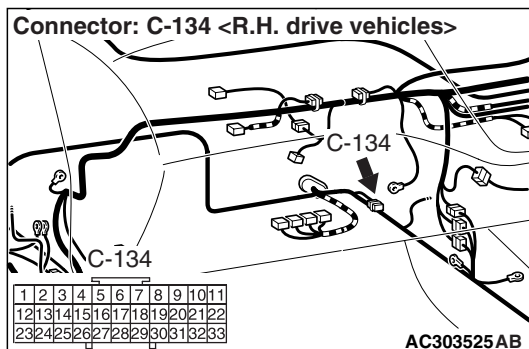
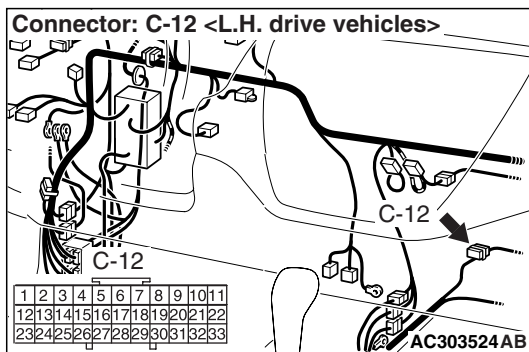
STEP 12. Check the J/C No.6 C-12 <L.H. drive vehicles> or C-134 <R.H. drive vehicles>, intermediate connector A-13 <L.H. drive vehicles> C-111 <R.H. drive vehicles> and fan control relay connector A-09X.





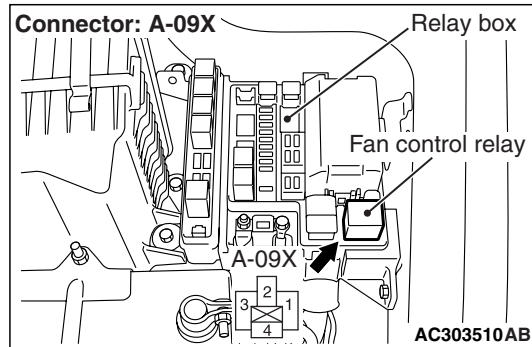
- Q: Are there connectors in good condition?**
YES : Go to Step 13.
NO : Repair or replace the connector. Then go to Step 24.

STEP 13. Check the harness wire between J/C No.6 C-12 terminal 33 <L.H. drive vehicles> or C-134 terminal 33 <R.H. drive vehicles> and fan control relay connector A-09X terminal 1.

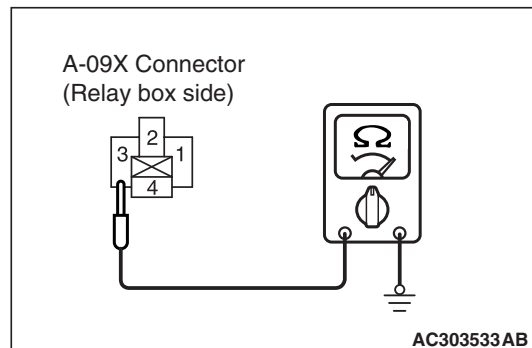


- Q: Are these harness wires in good condition?**
YES : An intermittent malfunction is suspected (Refer to GROUP 00 - How to use troubleshooting P.00-5).
NO : Repair the damaged harness wire. Then go to Step 24.

STEP 14. Check the continuity between fan control relay connector A-09X and body earth.



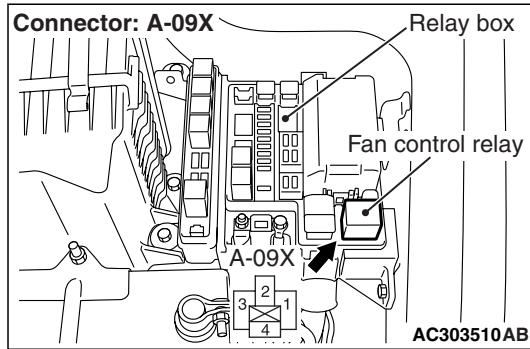
- (1) Disconnect fan control relay connector A-09X (remove the fan control relay) and measure relay box side connector.



- (2) Measure the resistance between fan control relay connector A-09X terminal 3 and body earth.
 • Continuity (less than 2 Ω).
 (3) Connect fan control relay connector A-09X (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.00-5).
NO : Go to Step 15.

STEP 15. Check the fan control relay connector A-09X.

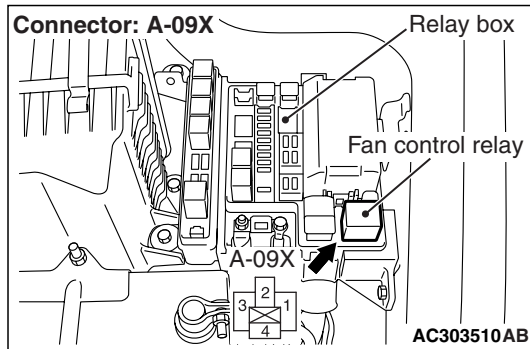


Q: Is the connector in good condition?

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-09X terminal 3 and body earth.

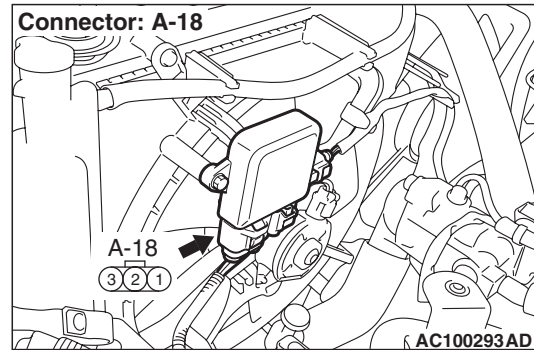


Q: Is the harness wire in good condition?

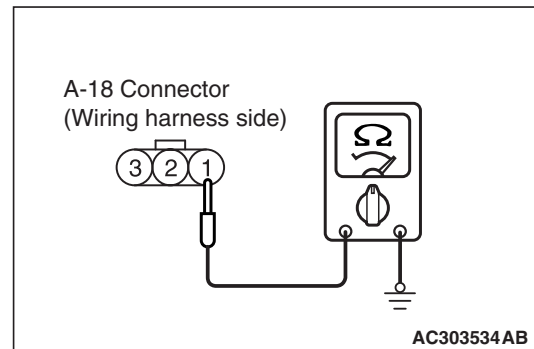
YES : An intermittent malfunction is suspected (Refer to GROUP 00 - How to use troubleshooting P.00-5).

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

STEP 17. Check the continuity between cooling fan motor drive control unit connector A-18 and body earth.



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



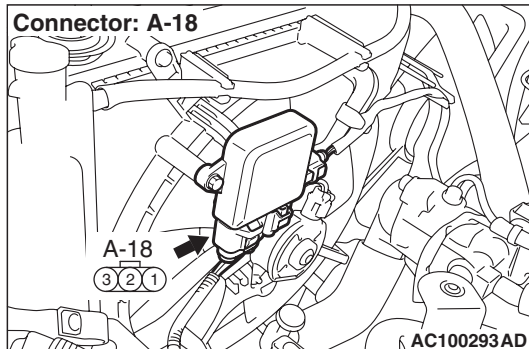
- (2) Measure the resistance between cooling fan motor drive control unit connector A-18 terminal 1 and body earth.
 - Continuity (less than 2 Ω).
- (3) Connect cooling fan motor drive control unit connector A-18.

Q: Does the continuity exist?

YES : Go to Step 20.

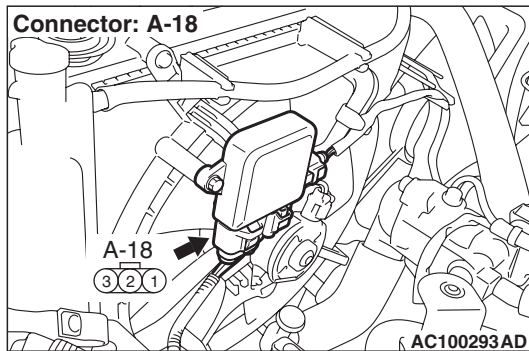
NO : Go to Step 18.

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



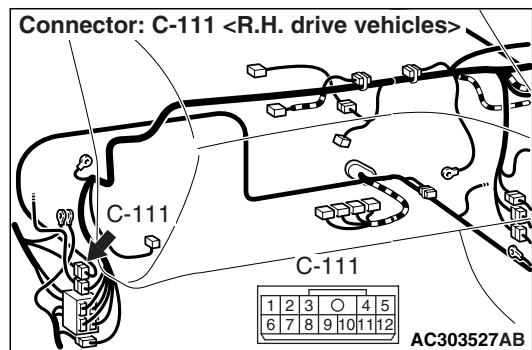
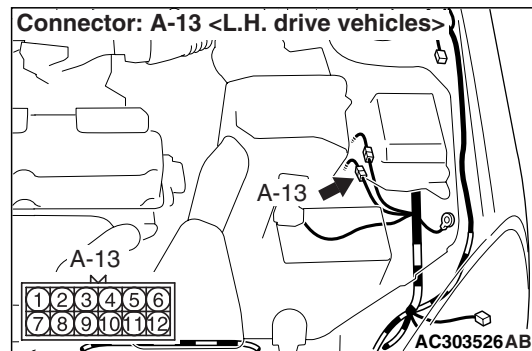
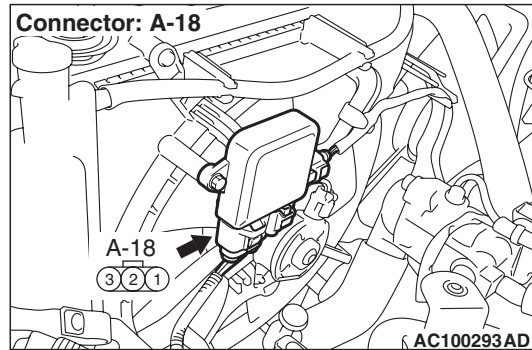
Q: Is the connector in good condition?
YES : Go to Step 19.
NO : Repair or replace the connector. Then go to Step 24.

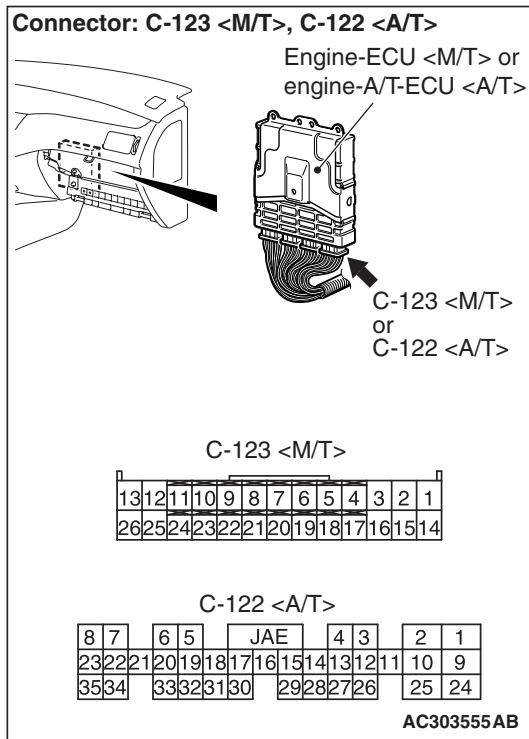
STEP 19. Check the harness wire between cooling fan motor drive control unit connector A-18 terminal 1 and body earth.



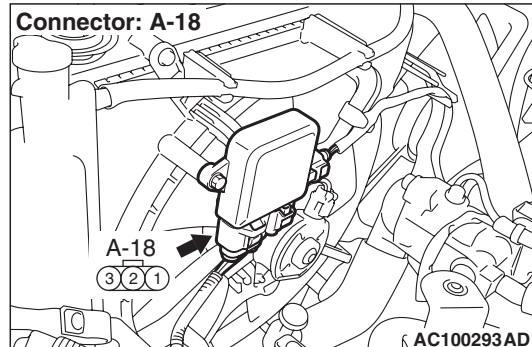
Q: Is the harness wire in good condition?
YES : An intermittent malfunction is suspected (Refer to GROUP 00 - How to use troubleshooting P.00-5).
NO : Repair the damaged harness wire. Then go to Step 24.

STEP 20. Check the cooling fan motor drive control unit connector A-18, intermediate connector A-13 <L.H. drive vehicles> or C-111 <R.H. drive vehicles> and engine-ECU connector C-123 <M/T> or engine-A/T-ECU connector C-122 <A/T>.

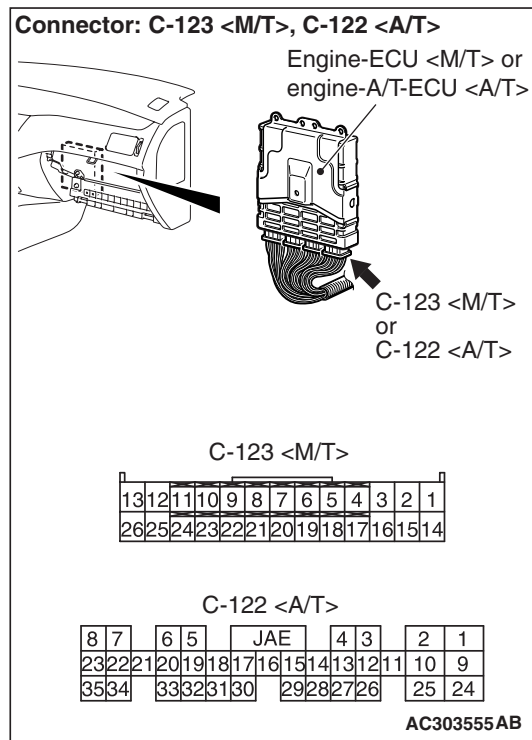




STEP 21. Check the harness wire between cooling fan motor drive control unit connector A-18 terminal 2 and engine-ECU connector C-123 terminal 21 <M/T> or engine-A/T-ECU connector C-122 terminal 18 <A/T>.

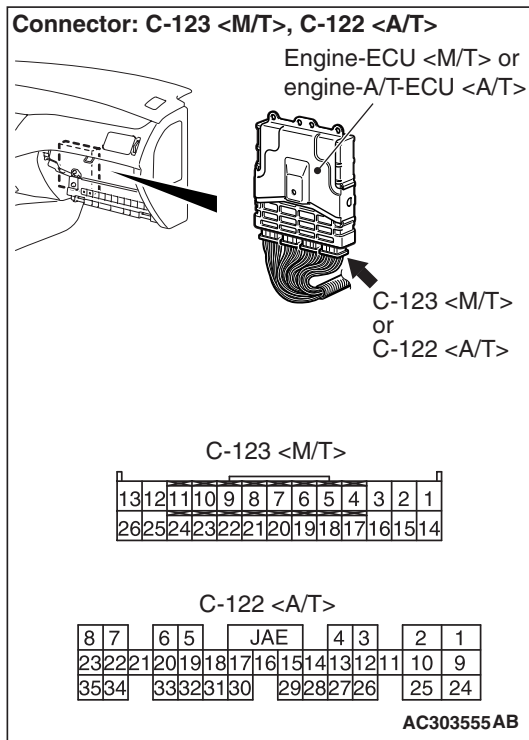


Q: Are these connectors in good condition?
YES : Go to Step 21.
NO : Repair or replace the connector. Then go to Step 24.

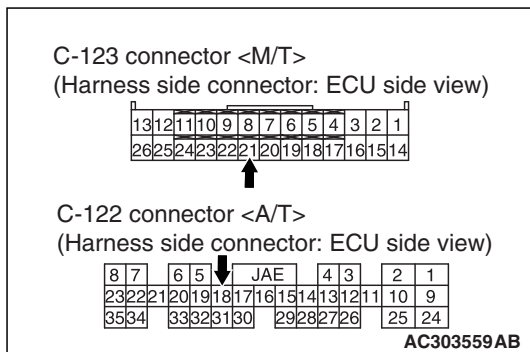


Q: Are these harness wires in good condition?
YES : Go to Step 22.
NO : Repair the damaged harness wire. Then go to Step 24.

STEP 22. Check the cooling fan motor drive control unit.



- (1) Disconnect engine-ECU connector C-123 <M/T> or engine-A/T-ECU connector C-122 <A/T>.



- (2) Pull out connector terminal pin 21 <M/T> or 18 <A/T> 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 <M/T> or 18 <A/T> disconnected)
 - The cooling fan stops. (When connector terminal pin 21 <M/T> or 18 <A/T> is connected to the body earth.)
- (6) Turn the ignition switch to the "OFF" position.
- (7) Disconnect engine-ECU connector C-123 <M/T> or engine-A/T-ECU connector C-122 <A/T>, and push in connector terminal pin 21 <M/T> or 18 <A/T> 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 cooling fan motor drive control unit (Refer to P.14-33) <4G1> (Refer to P.14-35) <4G6>. 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) <4G1> or (Refer to GROUP 13B - Troubleshooting P.13B-9) <4G6>.

Q: Is diagnosis code set?

YES : Inspection chart for diagnosis code (Refer to GROUP 13A - Troubleshooting P.13A-17) <4G1> or Inspection chart for diagnosis code (Refer to GROUP 13B - Troubleshooting P.13B-15) <4G6>.

NO : Replace the engine-ECU <M/T> or engine-A/T-ECU <A/T> (Refer to GROUP 13A P.13A-413). Then go to Step 24.

STEP 24. Check the symptoms.

Q: Does the cooling fan motor (L.H.) and the cooling fan motor (R.H.) <4G1 (Vehicles with A/C)> or A/C condenser fan motor <4G6> operate correctly?

YES : This symptom is complete.

NO : Return to Step 1.

INSPECTION PROCEDURE 2: Cooling Fan (L.H.) and Cooling Fan (R.H.) <4G1 (Vehicles with A/C)> or A/C Condenser Fan <4G6> do not Change Speed or Stop**COOLING FAN (L.H.) AND COOLING FAN (R.H.) OR A/C CONDENSER FAN DRIVE CIRCUIT**

Refer to P.14-6.

CIRCUIT OPERATION

Refer to P.14-6.

TECHNICAL DESCRIPTION

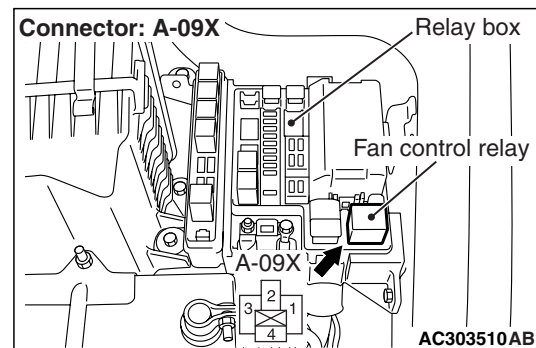
- If the communication line wiring harness between the cooling fan motor drive control unit and the engine-ECU <M/T> or the engine-A/T-ECU <A/T> is open, the cooling fan motor (L.H.) and the cooling fan motor (R.H.) <4G1 (Vehicles with A/C)>, or the A/C condenser fan motor <4G6> rotate to prevent the engine from overheating.
- If the system voltage is continuously supplied to the cooling fan motor drive control unit by a fan motor relay malfunction and a short circuit on the cooling fan motor drive control unit power supply wiring harness, the cooling fan motor (L.H.) and the cooling fan motor (R.H.) <4G1 (Vehicles with A/C)>, or the A/C condenser fan motor <4G6> rotate.
- The cause could also be a malfunction of the cooling fan motor (L.H.). <Vehicles without A/C>
- The cause could also be a malfunction of input signal from the A/C switch, the water temperature sensor unit and the vehicle speed sensor <M/T> or the output shaft speed sensor <A/T> to the engine-ECU <M/T or engine-A/T-ECU <A/T>.
- The cause could also be a malfunction of the cooling fan motor drive control unit or the engine-ECU <M/T> or engine-A/T-ECU <A/T>.

TROUBLESHOOTING HINTS

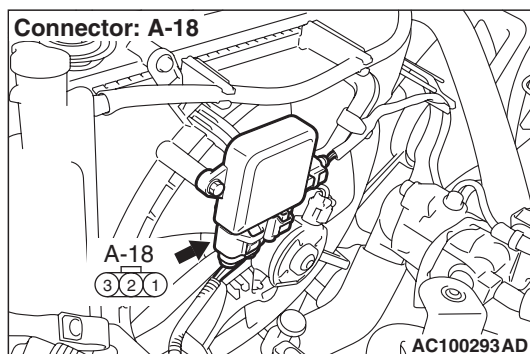
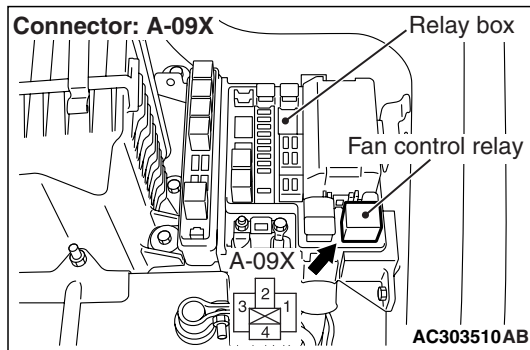
- Malfunction of fan control relay
- Malfunction of cooling fan motor (L.H.) <Vehicles without A/C>
- Malfunction of cooling fan motor drive control unit
- Malfunction of engine-ECU <M/T> or engine-A/T-ECU <A/T>
- Damaged wiring harness or connector

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

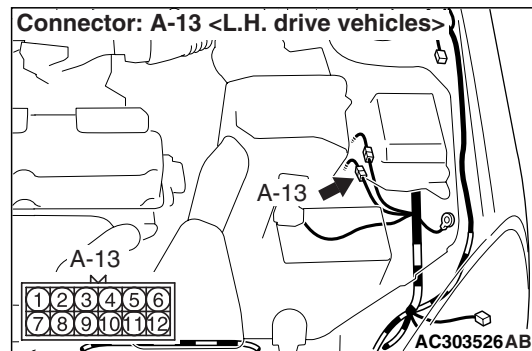
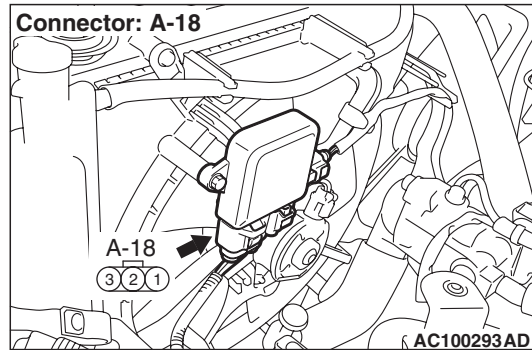
Refer to P.14-24.

Q: Is the fan control relay in good condition?**YES :** Go to Step 2.**NO :** Replace the fan control relay. Then go to Step 8.**STEP 2. Check the fan control relay connector A-09X.****Q: Is the connector in good condition?****YES :** Go to Step 3.**NO :** Repair the connector or replace the relay box. Then go to Step 8.

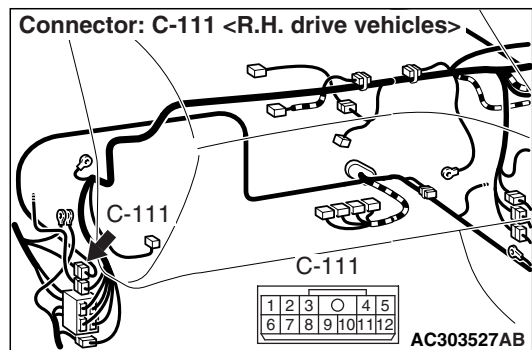
STEP 3. Check the harness wire between fan control relay connector A-09X terminal 2 and cooling fan motor drive control unit connector A-18 terminal 3.

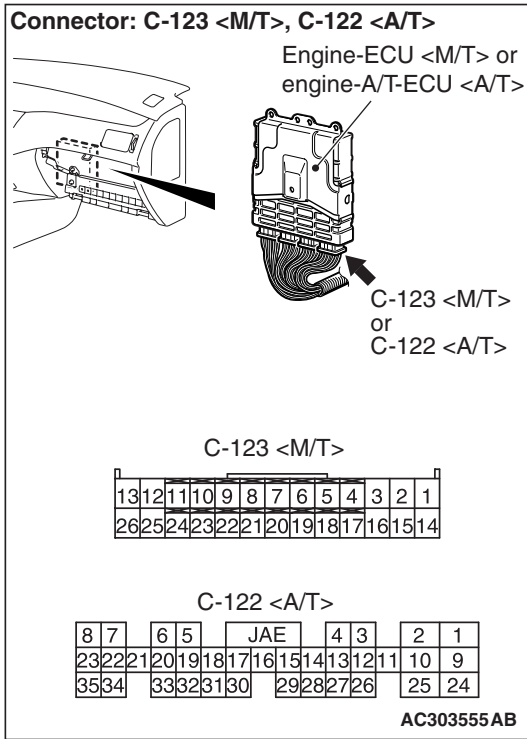


STEP 4. Check the cooling fan motor drive control unit connector A-18, intermediate connector A-13 <L.H. drive vehicles> or C-111 <R.H. drive vehicles> and engine-ECU connector C-123 <M/T> or engine-A/T-ECU connector C-122 <A/T>.

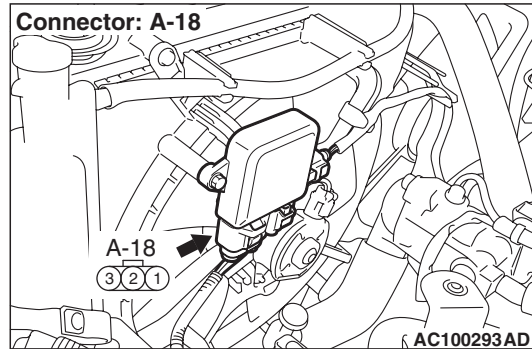


- Q: Is the harness wire in good condition?**
YES : Go to Step 4.
NO : Repair the damaged harness wire. Then go to Step 8.

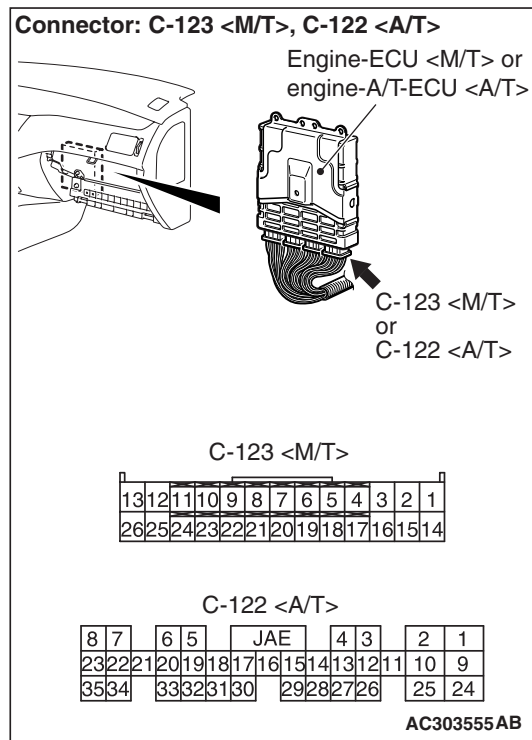




STEP 5. Check the harness wire between cooling fan motor drive control unit connector A-18 terminal 2 and engine-ECU connector C-123 terminal 21 <M/T> or engine-A/T-ECU connector C-122 terminal 18 <A/T>.

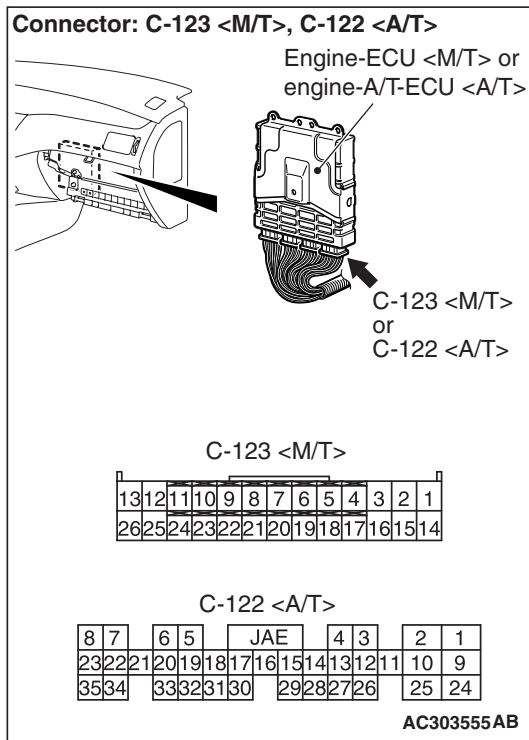


- Q: Are these connectors in good condition?**
YES : Go to Step 5.
NO : Repair or replace the connector. Then go to Step 8.

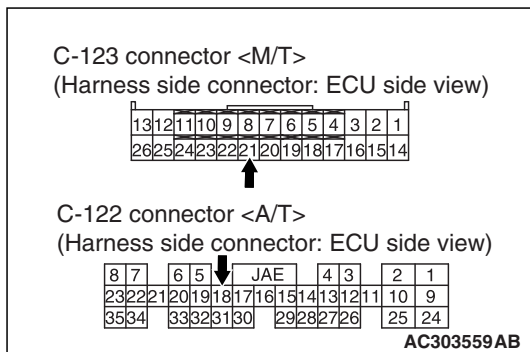


- Q: Are these harness wires in good condition?**
YES : Go to Step 6.
NO : Repair the damaged harness wire. Then go to Step 8.

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



- (1) Disconnect engine-ECU connector C-123 <M/T> or engine-A/T-ECU connector C-122 <A/T>.



- (2) Pull out connector terminal pin 21 <M/T> or 18 <A/T> 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 <M/T> or 18 <A/T> disconnected)
 - The cooling fan stops. (When connector terminal pin 21 <M/T> or 18 <A/T> is connected to the body earth.)
- (6) Turn the ignition switch to the "OFF" position.
- (7) Disconnect engine-ECU connector C-123 <M/T> or engine-A/T-ECU connector C-122 <A/T>, and push in connector terminal pin 21 <M/T> or 18 <A/T> to disconnect connector.
- (8) Reconnect the connector with connector terminal pin still installed.

Q: Does the cooling fan rotate? And when the connector terminal pin is connected to the body earth, does the cooling fan stop?

YES : Go to Step 7.

NO : Replace the cooling fan motor drive control unit (Refer to P.14-33) <4G1> (Refer to P.14-35) 4G6>. 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 - Trouble shooting P.13A-9) <4G1> or (Refer to GROUP 13B - Trouble shooting P.13B-9) <4G6>.

Q: Diagnosis code set?

YES : Inspection chart for diagnosis code (Refer to GROUP 13A - Trouble shooting P.13A-17) <4G1> or Inspection chart for diagnosis code (Refer to GROUP 13B - Trouble shooting P.13B-15) <4G6>.

NO : Replace the engine-ECU <M/T> or engine-A/T-ECU <A/T> (Refer to GROUP 13A P.13A-413). Then go to Step 8.

STEP 8. Check the symptoms.

Q: Does the cooling fan motor (L.H.) and the cooling fan motor (R.H.) <4G1 (Vehicles with A/C)> or A/C condenser fan motor <4G6> operate correctly?

YES : This symptoms is complete.

NO : Return to Step 1.

INSPECTION PROCEDURE 3: Cooling Fan (L.H.) does not Operate {When Cooling Fan (R.H.) <4G1> or A/C Condenser Fan <4G6> Operate} <Vehicles with A/C>

COOLING FAN (L.H.) AND COOLING FAN (R.H.) OR A/C CONDENSER FAN DRIVE CIRCUIT

Refer to [P.14-6](#).

CIRCUIT OPERATION

Refer to [P.14-6](#).

TECHNICAL DESCRIPTION

The cause could be a malfunction of the cooling fan motor (L.H.) or cooling fan motor drive control unit.

TROUBLESHOOTING HINTS

- Malfunction of cooling fan motor (L.H.)
- Malfunction of cooling fan motor drive control unit

DIAGNOSIS

STEP 1. Check the cooling fan motor (L.H.).

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

Q: Is the cooling fan motor (L.H.) in good condition?

YES : Go to Step 2.

NO : Replace the cooling fan motor (L.H.) (Refer to [P.14-33](#)) <4G1> (Refer to [P.14-35](#)) <4G6>. Then go to Step 3.

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

Refer to [P.14-23](#).

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

YES : Go to Step 3.

NO : Replace the cooling fan motor drive control unit (Refer to [P.14-33](#)) <4G1> (Refer to [P.14-35](#)) <4G6>. Then go to Step 3.

STEP 3. Check the symptoms.

Q: Does the cooling fan (L.H.) operate (when the cooling fan (R.H.) <4G1> or A/C condenser fan <4G6> operate)?

YES : This symptom is complete.

NO : Return to Step 1.

INSPECTION PROCEDURE 4: Cooling Fan (R.H.) <4G1> or A/C Condenser Fan <4G6> does not Operate {When Cooling Fan (L.H.) Operate} <Vehicles with A/C>

COOLING FAN (L.H.) AND COOLING FAN (R.H.) OR A/C CONDENSER FAN DRIVE CIRCUIT

Refer to [P.14-6](#).

CIRCUIT OPERATION

Refer to [P.14-6](#).

TECHNICAL DESCRIPTION

The cause could be a malfunction of the cooling fan motor (R.H.) <4G1> or A/C condenser fan motor <4G6> or cooling fan motor drive control unit.

TROUBLESHOOTING HINTS

- Malfunction of cooling fan motor (R.H.) <4G1> or A/C condenser fan motor <4G6>
- Malfunction of cooling fan motor drive control unit

DIAGNOSIS

STEP 1. Check the cooling fan motor (R.H.) <4G1> or A/C condenser fan motor <4G6>.

Cooling fan motor (R.H.) check. (Refer to [P.14-24](#)) <4G1>.

A/C condenser fan motor check. (Refer to GROUP 55 [P.55A-93](#)) <4G6>.

Q: Is the cooling fan motor (R.H.) <4G1> or A/C condenser fan motor <4G6> in good condition?

YES : Go to Step 2.

NO : Replace the cooling fan motor (R.H.) (Refer to [P.14-33](#)) <4G1> or A/C condenser fan motor (Refer to GROUP 55 [P.55A-92](#)) <4G6>. Then go to Step 3.

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

Refer to P.14-23.

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

YES : Go to Step 3.

NO : Replace the cooling fan motor drive control unit (Refer to P.14-33) <4G1> (Refer to P.14-35) <4G6>. Then go to Step 3.

STEP 3. Check the symptoms.

Q: Do the cooling fan (R.H.) <4G1> or A/C condenser fan <4G6> operate (when the cooling fan (L.H.) operate)?

YES : This symptom is complete.

NO : Return to Step 1.

ON-VEHICLE SERVICE

ENGINE COOLANT LEAK CHECK

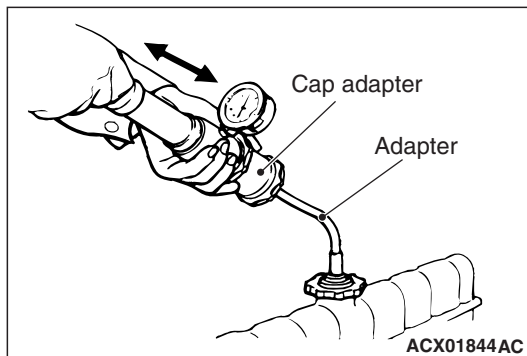
M1141001000300

⚠ 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.

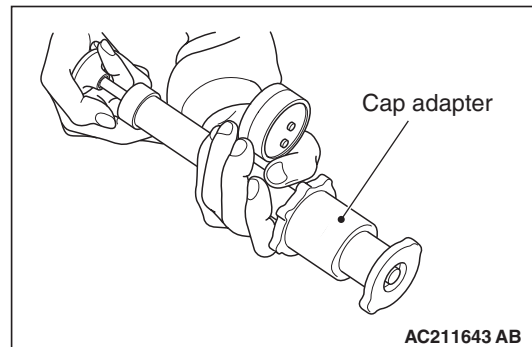


1. Check that the coolant level is up to the filler neck. Install a radiator tester and apply 160 kPa pressure, and then check for leakage from the radiator hose or connections.
2. If there is leakage, repair or replace the appropriate part.

RADIATOR CAP VALVE OPENING PRESSURE CHECK

M1141001300389

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.

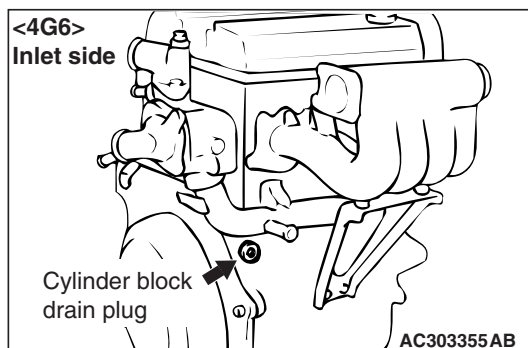
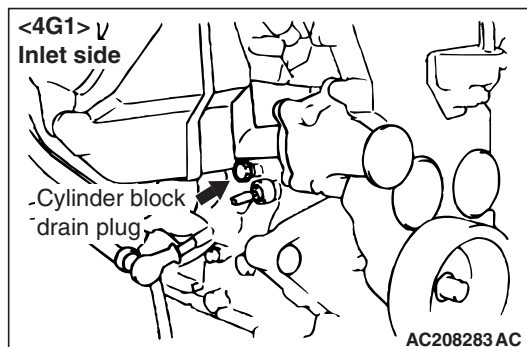
ENGINE COOLANT REPLACEMENT

M1141001200434

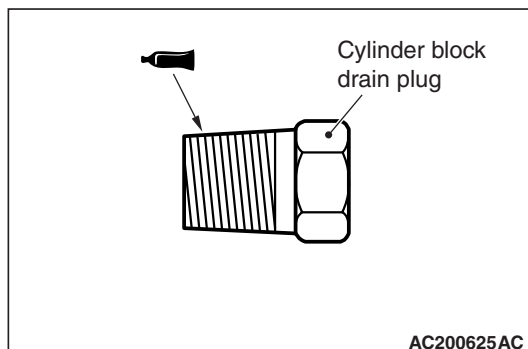
⚠ WARNING

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:

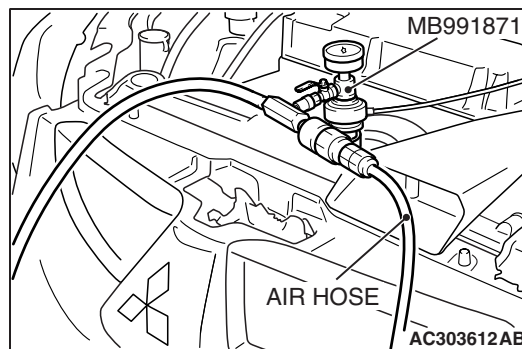
$40 \pm 5 \text{ N} \cdot \text{m}$ <4G1>

$44 \pm 5 \text{ N} \cdot \text{m}$ <4G6>

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

CAUTION

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



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

Recommended antifreeze: DIAQUEEN SUPER LONG LIFE COOLANT or equivalent

Quantity:

5.0 L <4G1>

7.0 L <4G6>

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

M1141001100352
Measure the temperature and specific gravity of the engine coolant to check the antifreeze concentration.

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

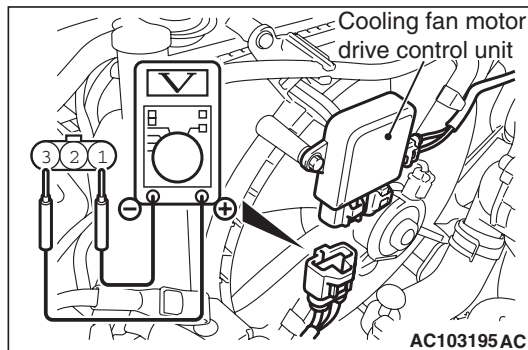
Recommended antifreeze: DIAQUEEN SUPER LONG LIFE COOLANT or equivalent

⚠ CAUTION

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

COOLING FAN MOTOR DRIVE CONTROL UNIT CHECK

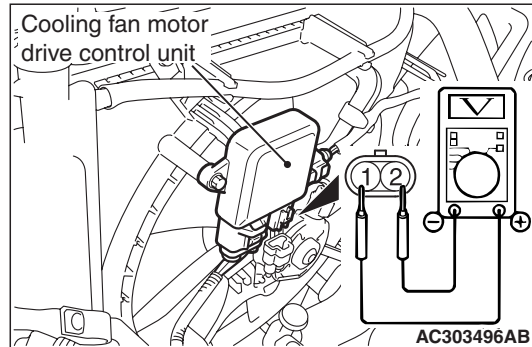
- M1141006100250
1. Remove the cooling fan motor drive control unit connector.



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

Standard value: system voltage

3. Connect the cooling fan motor drive control unit connector, and disconnect the cooling fan motor (L.H.) 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 cooling fan motor drive control unit side connector terminal 1 and 2.

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 cooling fan motor drive control unit side connector terminal 1 and 2 while the fan is running. The voltage should repeat the values below.

Standard value:

1. 1 V or less

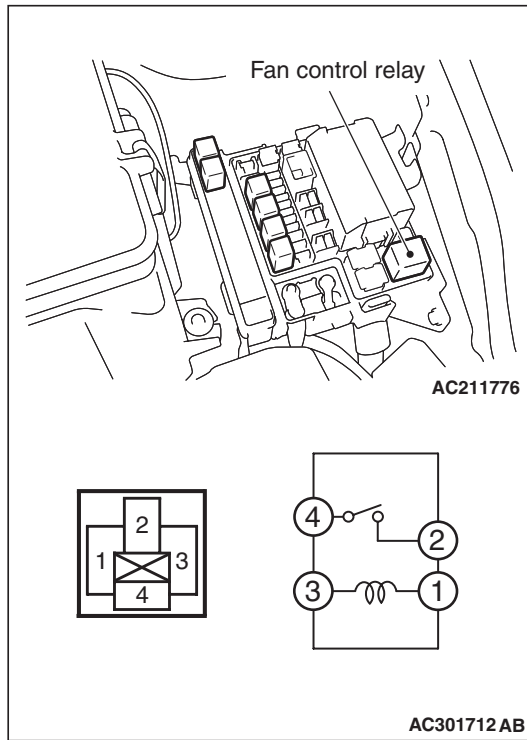
2. 8.2 ± 0.7 V

3. System voltage ± 2.6 V

8. If the voltage does not repeatedly change as indicated, replace the cooling fan motor drive control unit. (Refer to P.14-33) <4G1> (Refer to P.14-35) <4G6>.

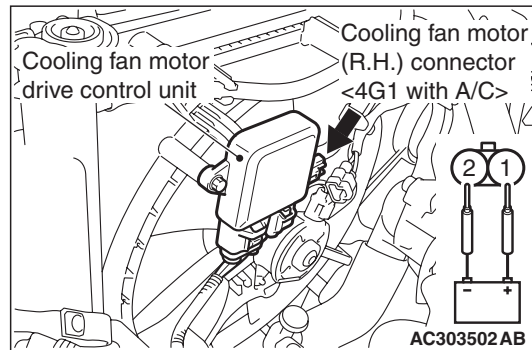
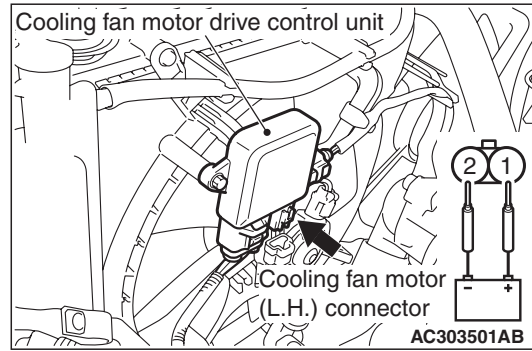
FAN CONTROL RELAY CONTINUITY CHECK

M1141006200280



COOLING FAN MOTOR CHECK

M1141007100220



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)

1. Remove the cooling fan motor connector.
2. Check to see that the cooling fan motor of the radiator turns when applying battery power between the connector terminal 1 and 2 of the cooling fan motor. Also check to see that there is no abnormal sound coming from the cooling fan motor at this time.
3. If the cooling fan motor is defective, replace it. (Refer to P.14-33) <4G1> (Refer to P.14-35) <4G6>.

THERMOSTAT

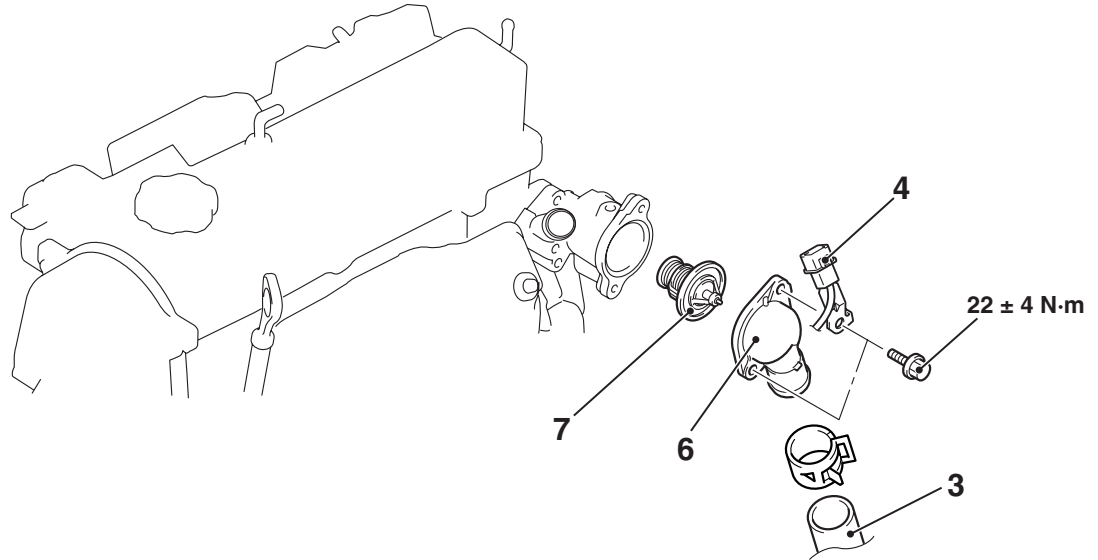
REMOVAL AND INSTALLATION

M1141002400442

Pre-removal and Post-installation Operation

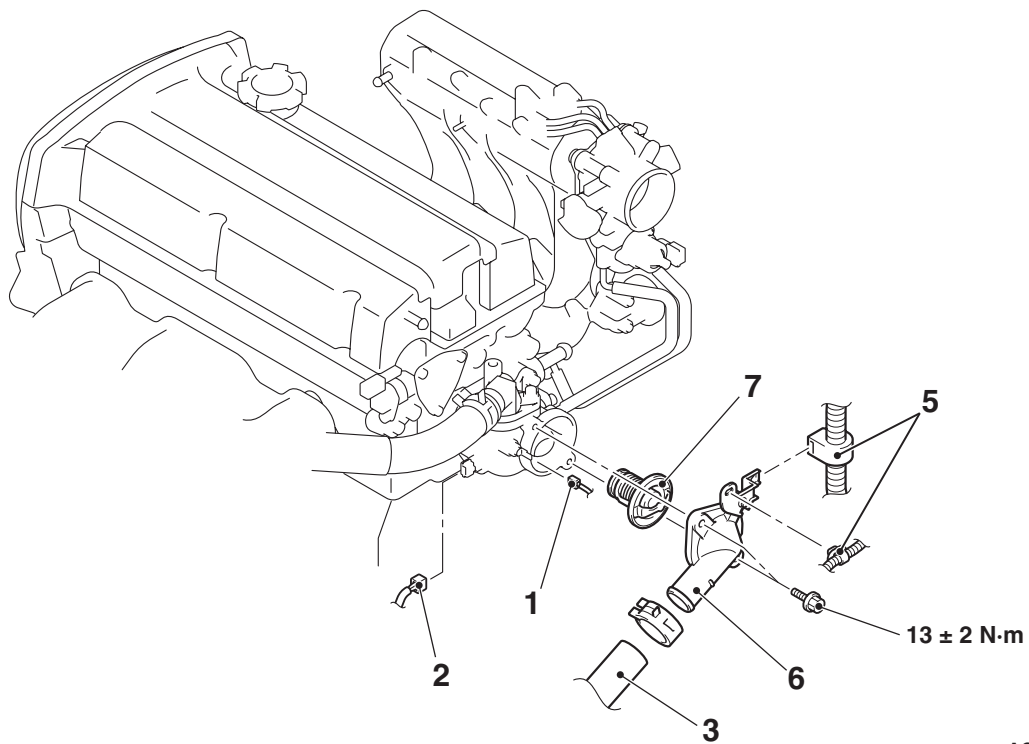
- Engine Coolant Draining and Refilling (Refer to P.14-21).
- Air Cleaner Assembly Removal and Installation (Refer to GROUP 15 P.15-3).
- Battery Removal and Installation

<4G1>



AC203409AC

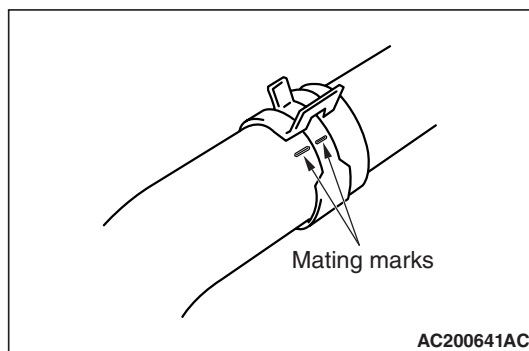
<4G6>



AC301429AD

Removal steps

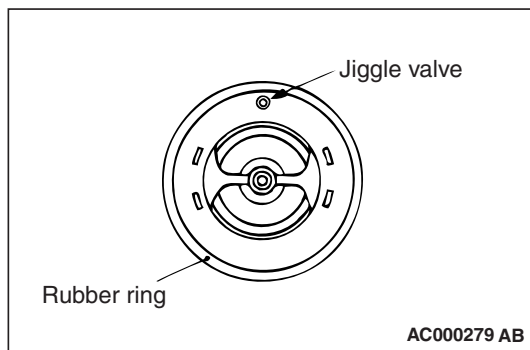
- <<A>> >B<<
1. Water temperature gauge unit connector <4G6>
 2. Water temperature sensor unit connector <4G6>
 3. Radiator lower hose connection
 4. Engine control oxygen sensor connector and connector bracket <4G1>
 5. Control wiring harness clip <4G6>
 6. Cooling water inlet hose fitting
- >>A<<
7. Thermostat

REMOVAL SERVICE POINT**<<A>> RADIATOR LOWER HOSE DIS-CONNECTION**

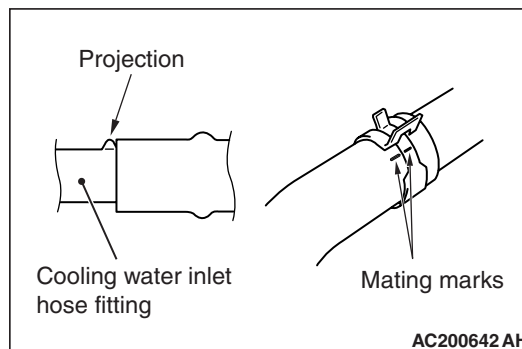
Make mating marks on the radiator lower hose and the hose clamp. Disconnect the radiator lower hose.

INSTALLATION SERVICE POINTS**>>A<< THERMOSTAT INSTALLATION****⚠ CAUTION**

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



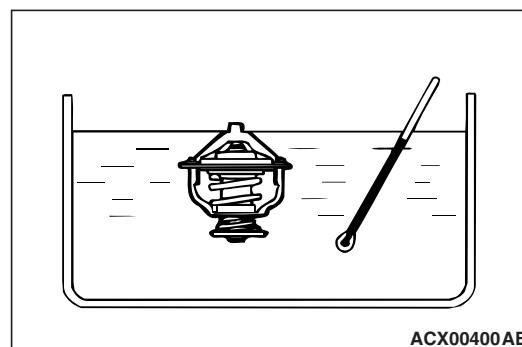
Install the thermostat so that the jiggle valve is facing straight up. Be careful not to fold or scratch the rubber ring.

>>B<< RADIATOR LOWER HOSE CONNECTION

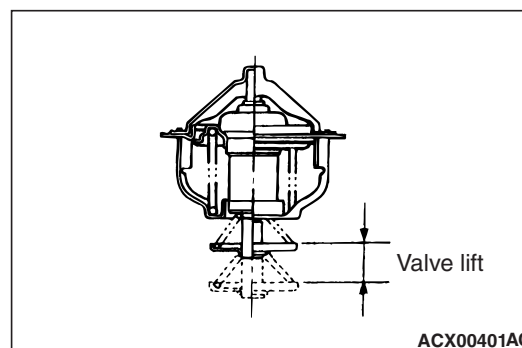
1. Insert radiator lower hose as far as the projection of the Cooling water inlet hose fitting.
2. Align the mating marks on the radiator lower hose and hose clamp, and then connect the radiator lower hose.

INSPECTION

M1141002500427

THERMOSTAT CHECK

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

Standard value:**88 ± 1.5° C <4G1>****82 ± 1.5° C <4G6>**

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:
100° C <4G1>
95° C <4G6>
Amount of valve lift: 8.5 mm or more

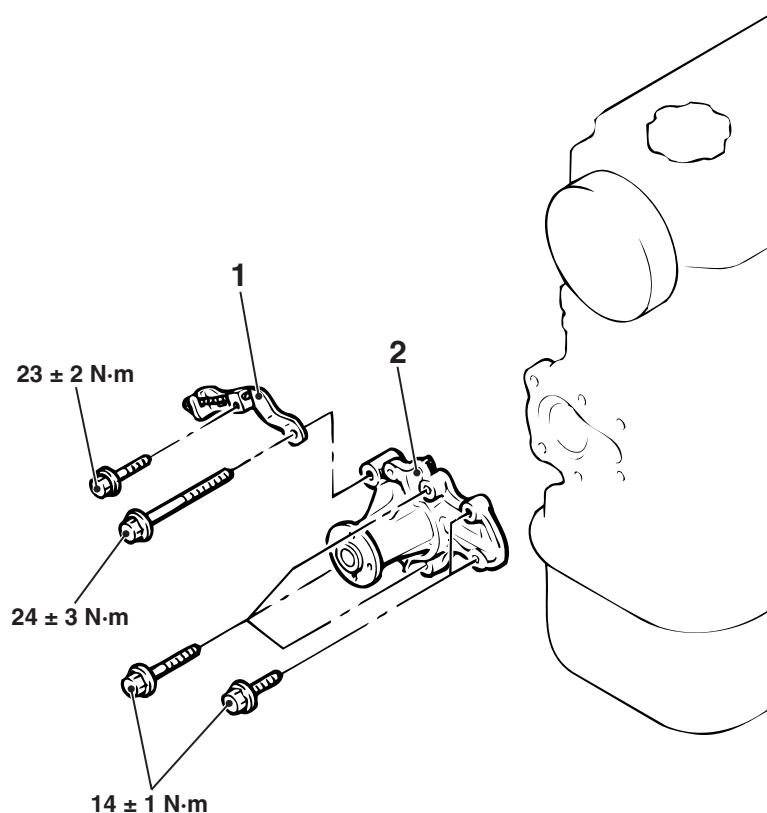
WATER PUMP

REMOVAL AND INSTALLATION <4G1>

M1141002700421

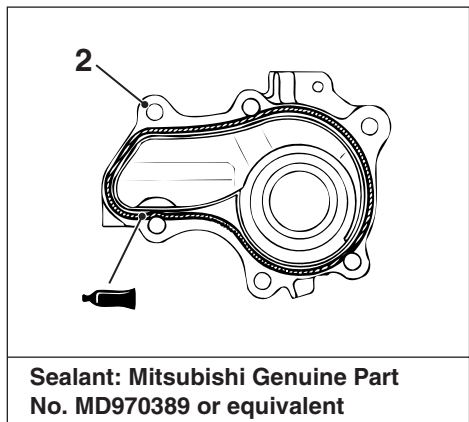
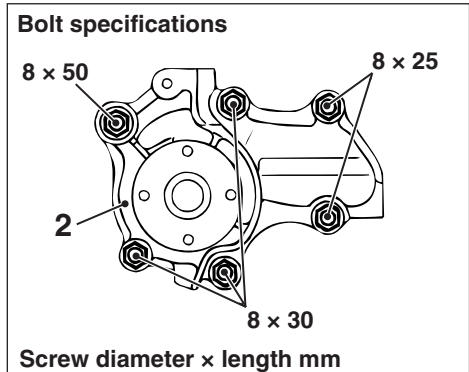
Pre-removal and Post-installation Operation

- Engine Coolant Draining and Refilling (Refer to P.14-21).
- Valve Timing Belt Removal and Installation (Refer to GROUP 11A P.11A-33).



Removal steps

1. Alternator adjusting brace
 2. Water pump assembly
- >>A<<



AC303372 AB

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 water pump assembly. Do not apply the sealant in an area more than the required.

INSTALLATION SERVICE POINT

>>A<< WATER PUMP ASSEMBLY INSTALLATION

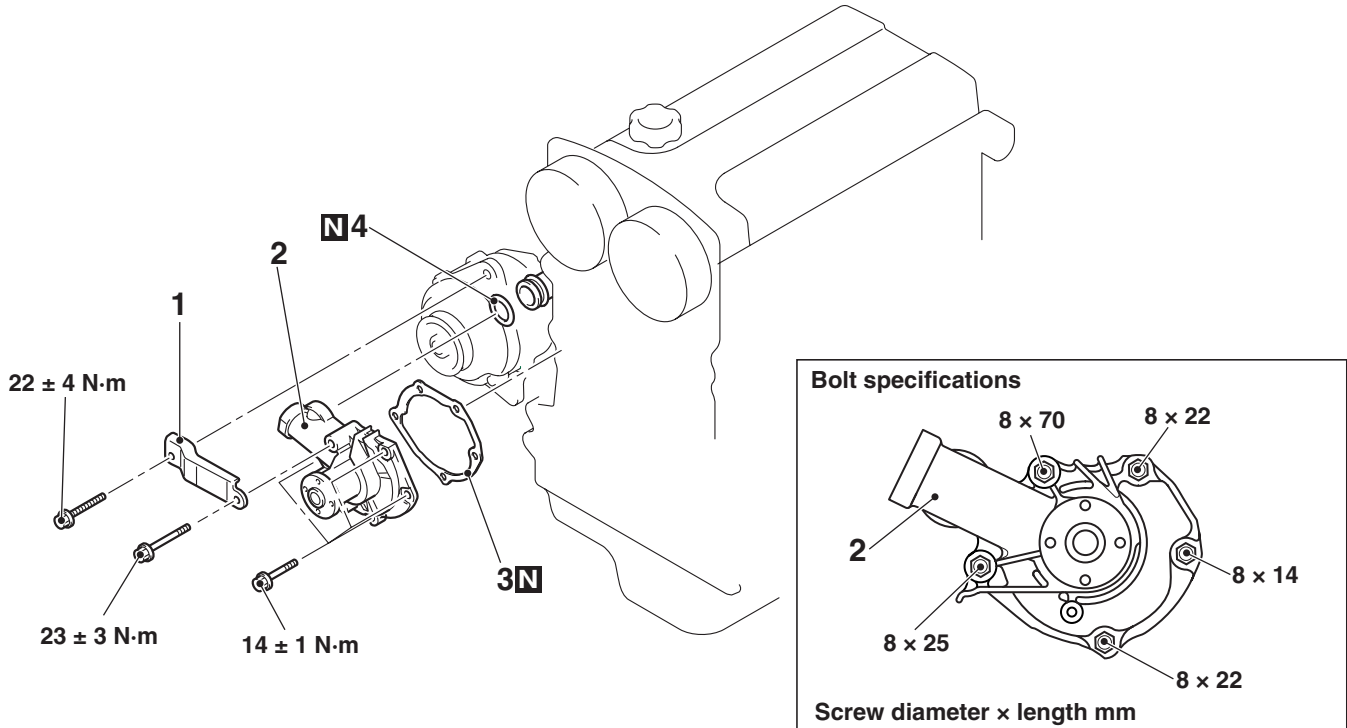
1. Use a gasket scraper or wire brush to completely eliminate all gasket material on the gasket mounting surface.

REMOVAL AND INSTALLATION <4G6>

M1141002700432

Pre-removal and Post-installation Operation

- Engine Coolant Draining and Refilling (Refer to P.14-21).
- Valve Timing Belt and Balancer Timing Belt Removal and Installation (Refer to GROUP 11C P.11C-35).



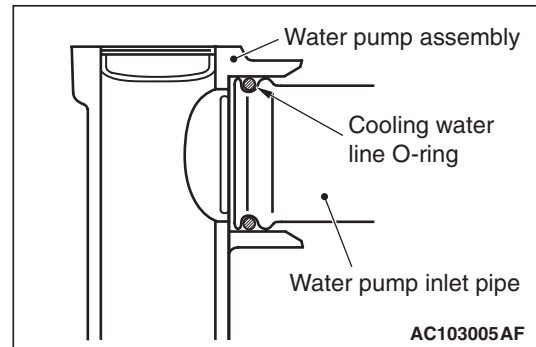
AC301467AB

Removal steps

1. Alternator adjusting brace
 2. Water pump assembly
 3. Water pump gasket
- >>A<<
4. Cooling water line O-ring

INSTALLATION SERVICE POINT

>>A<< COOLING WATER LINE O-RING INSTALLATION



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

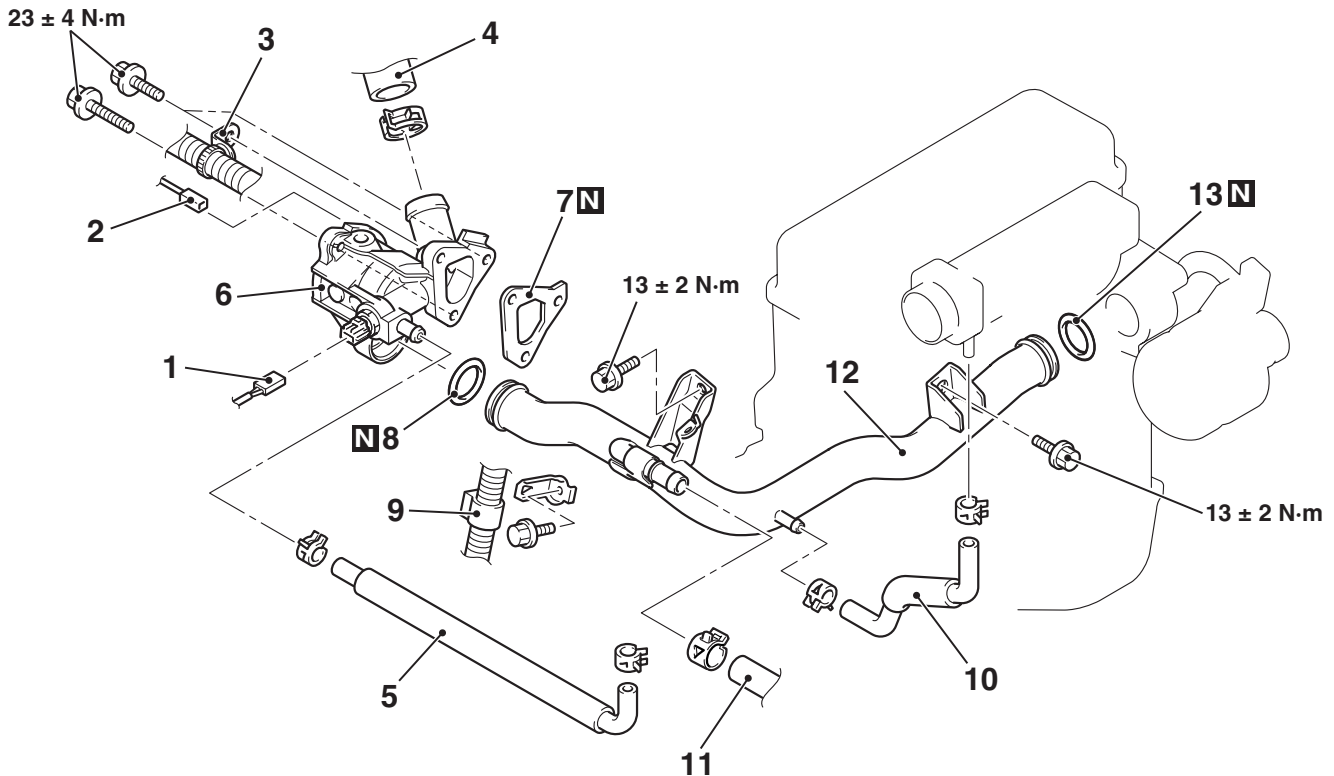
WATER HOSE AND WATER PIPE

REMOVAL AND INSTALLATION <4G1>

M1141003300415

Pre-removal and Post-installation Operation

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



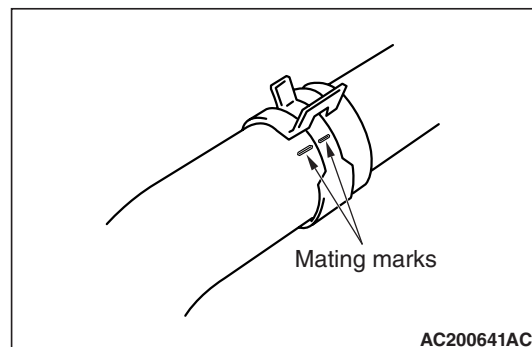
AC203411AC

Removal steps

1. Water temperature sensor unit connector
2. Water temperature gauge unit connector
3. Control wiring harness and harness bracket
- <<A>> >>B<< 4. Radiator upper hose connection
5. Throttle body water feed hose
6. Thermostat case assembly
7. Thermostat case gasket
- >>A<< 8. Cooling water line O-ring clamp
9. Control wiring harness clamp
10. Throttle body water return hose
11. Heater water hose connection
12. Water pump inlet pipe
- >>A<< 13. Cooling water line O-ring

REMOVAL SERVICE POINT

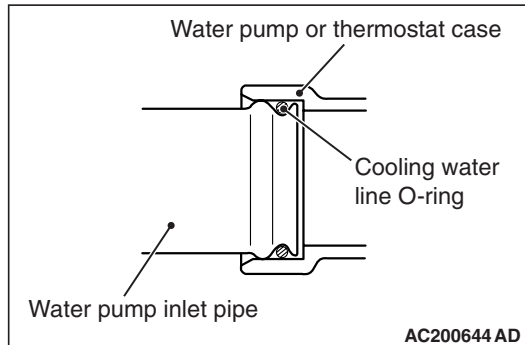
<<A>> RADIATOR UPPER HOSE DISCONNECTION



AC200641AC

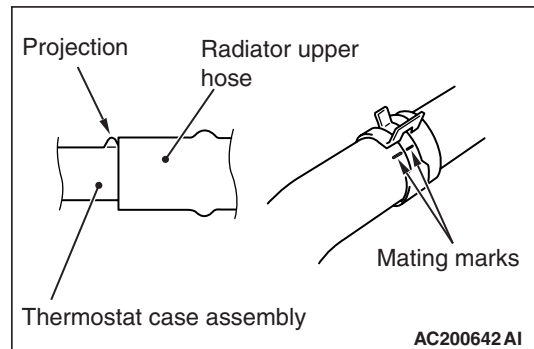
After making mating marks on the radiator upper hose and hose clamp, disconnect the radiator upper hose.

INSTALLATION SERVICE POINTS

>>A<< COOLING WATER LINE O-RING
INSTALLATION**⚠ CAUTION**

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

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

>>B<< RADIATOR UPPER HOSE
CONNECTION

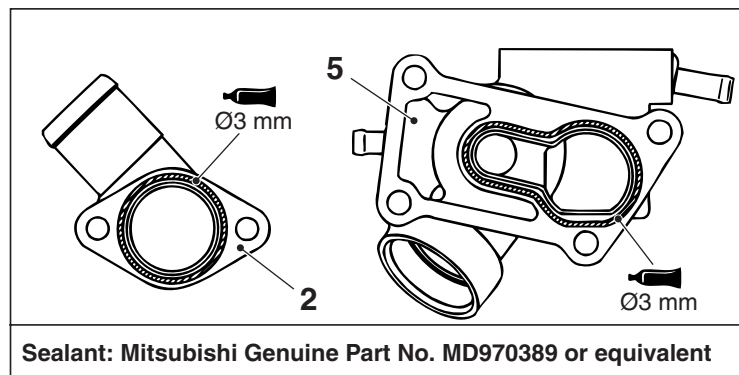
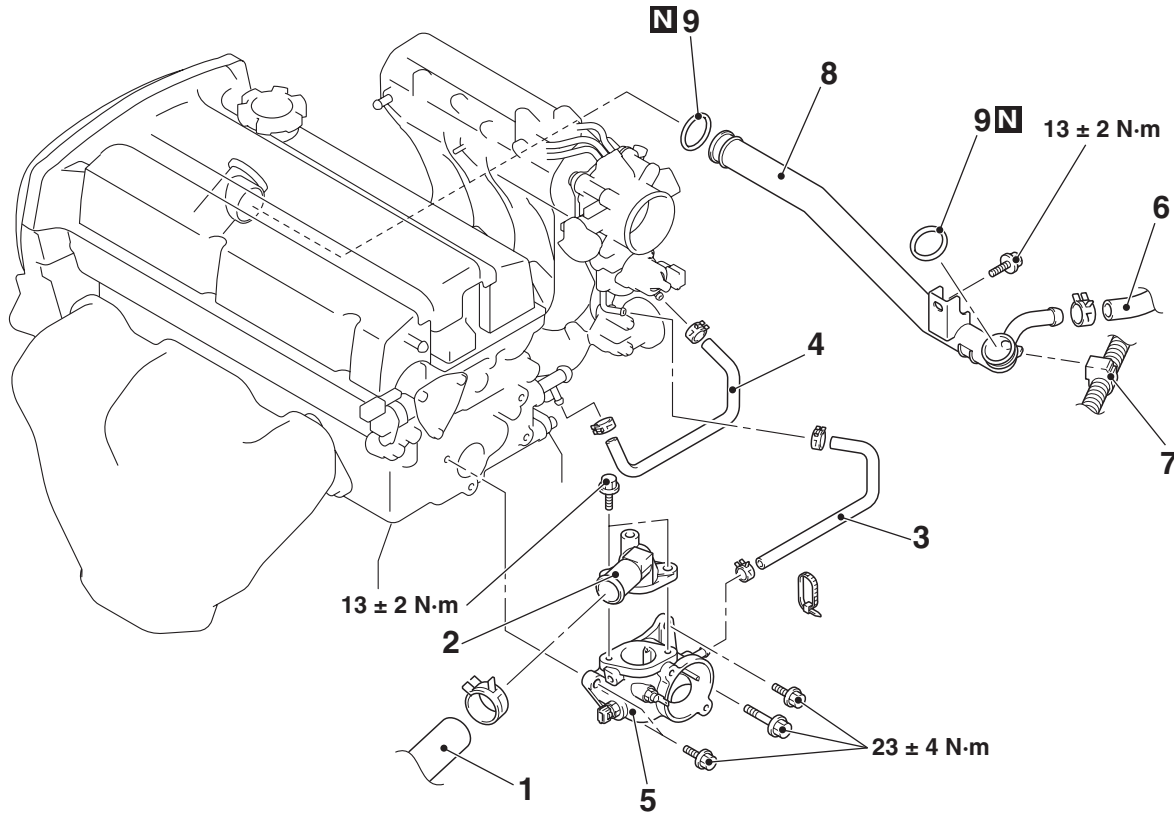
1. Insert radiator upper hose as far as the projection of the thermostat case assembly.
2. Align the mating marks on the radiator upper hose and hose clamp, and then connect the radiator upper hose.

REMOVAL AND INSTALLATION <4G6>

M1141003300426

Pre-removal and Post-installation Operation

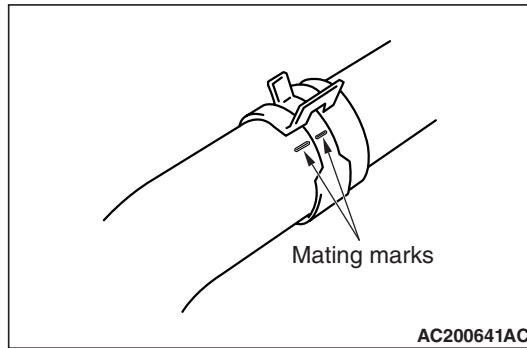
- Engine Coolant Draining and Supplying (Refer to P.14-21).
- Air Cleaner Assembly Removal and Installation (Refer to GROUP 15 P.15-3).
- Thermostat Removal and Installation (Refer to P.14-25).



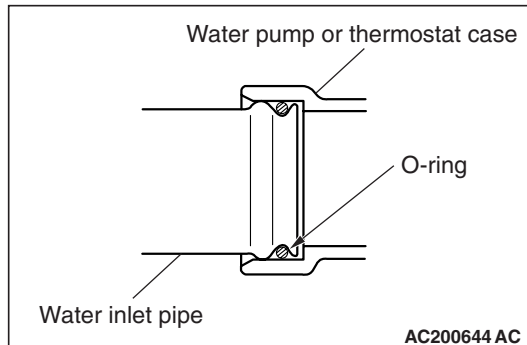
AC303471AB

- Removal steps**
- <<A>> >>C<< 1. Radiator upper hose connection
 >>B<< 2. Cooling water outlet hose fitting
 3. Throttle body water return hose
 4. Throttle body water feed hose
 >>B<< 5. Thermostat case assembly
 6. Heater water hose connection

- Removal steps (Continued)**
7. Control wiring harness clamp
 8. Water pump inlet pipe
 >>A<< 9. Cooling water line O-ring

REMOVAL SERVICE POINT**<<A>> RADIATOR UPPER HOSE DISCONNECTION**

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

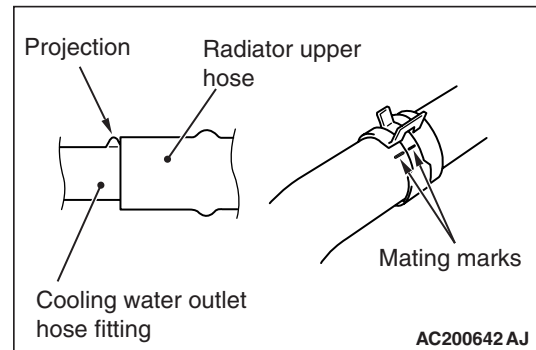
INSTALLATION SERVICE POINTS**>>A<< COOLING WATER LINE O-RING INSTALLATION****CAUTION**

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

>>C<< RADIATOR UPPER HOSE CONNECTION

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

INSPECTION**WATER PUMP INLET PIPE AND THROTTLE BODY WATER HOSES CHECK**

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

M1141003400296

RADIATOR

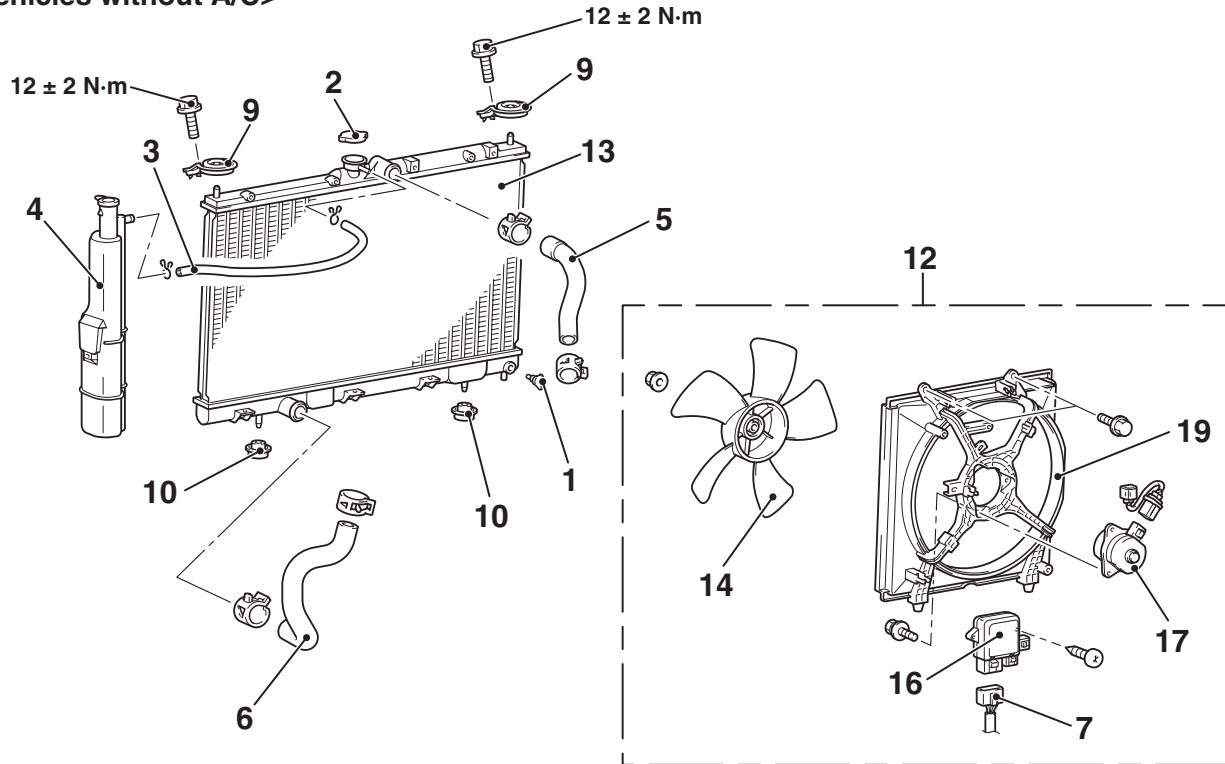
REMOVAL AND INSTALLATION <4G1>

M1141001501386

Pre-removal and Post-installation Operation

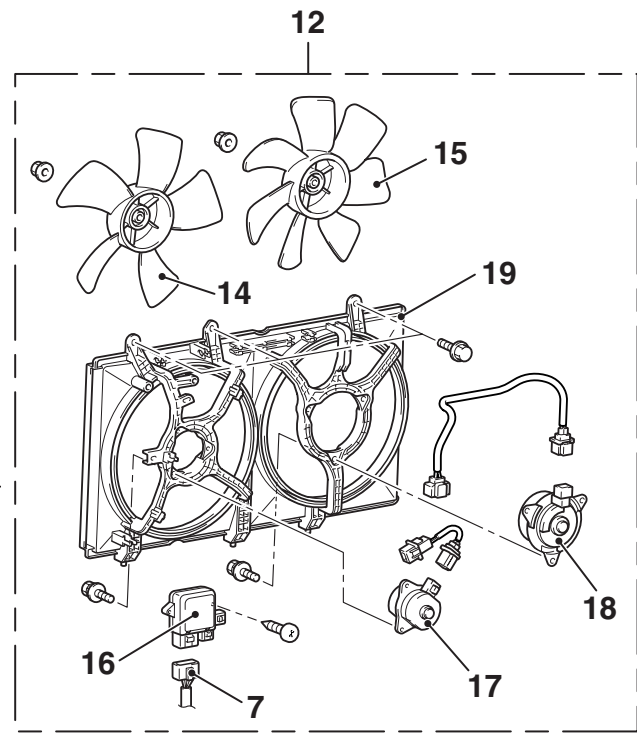
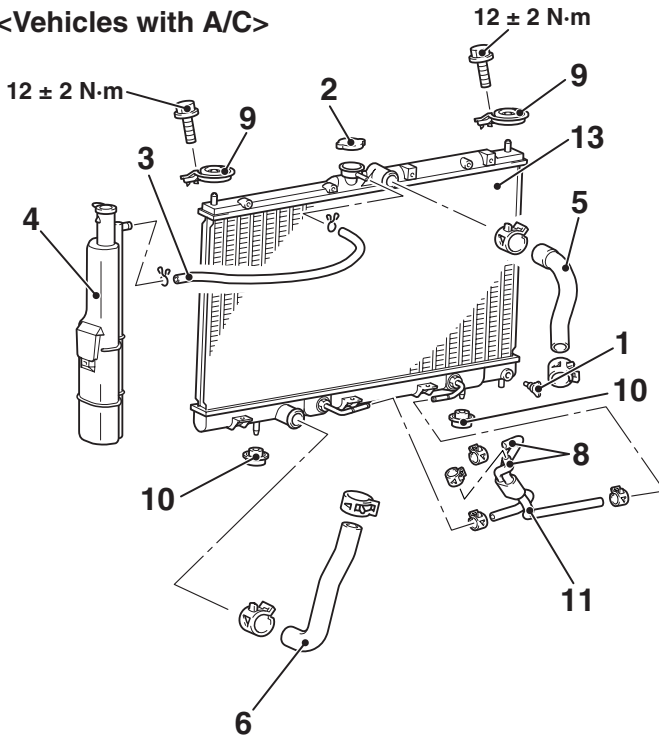
- Engine Coolant Draining and Supplying (Refer to P.14-21).
- Air Cleaner Assembly Removal and Installation (Refer to GROUP 15 P.15-3).

<Vehicles without A/C>



AC303472 AD

<Vehicles with A/C>



AC303473 AD

Radiator removal steps

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

Cooling fan motor removal steps

3. Radiator condenser tank hose
5. Radiator upper hose
7. Cooling fan motor drive control unit connector
12. Cooling fan motor & shroud assembly
14. Cooling fan (L.H.)

Cooling fan motor removal steps (Continued)

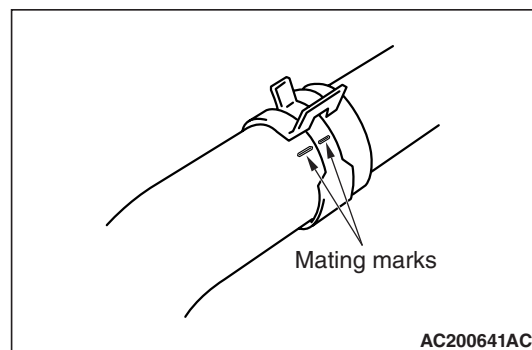
15. Cooling fan (R.H.) <Vehicles with A/C>
16. Cooling fan motor drive control unit
17. Cooling fan motor (L.H.)
18. Cooling fan motor (R.H.) <Vehicles with A/C>
19. Cooling fan shroud

<<A>> >>A<<
<<A>> >>A<<

<<A>> >>A<<

REMOVAL SERVICE POINT

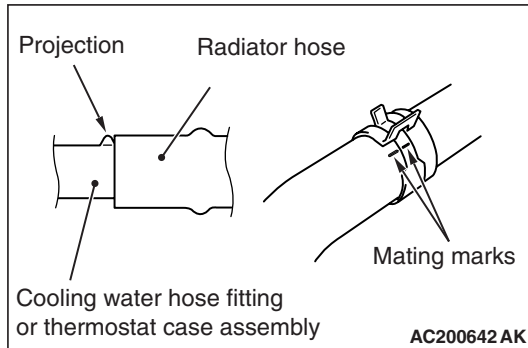
<<A>> RADIATOR UPPER HOSE/RADIATOR LOWER HOSE DISCONNECTION



AC200641AC

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

INSTALLATION SERVICE POINT
>>A<< RADIATOR LOWER HOSE/RADIA-
TOR UPPER HOSE CONNECTION



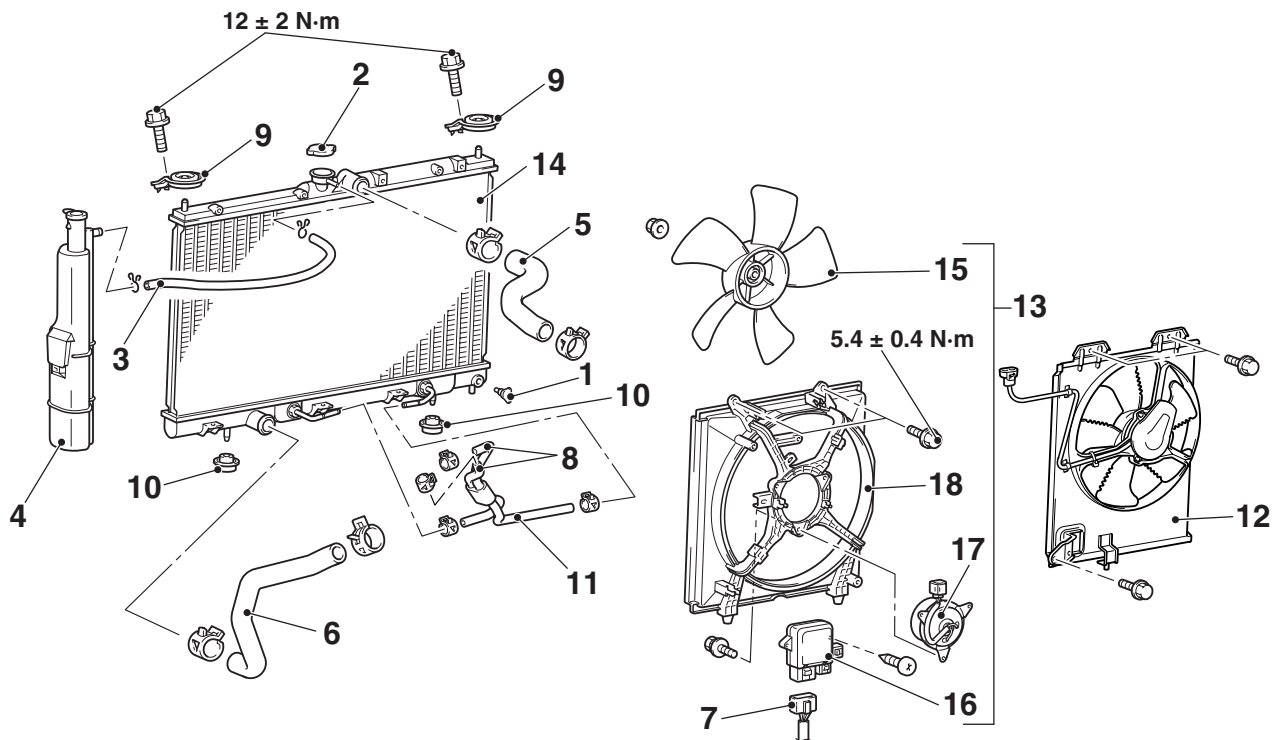
1. Insert radiator lower hose as far as the projection of the cooling water inlet hose fitting.
2. Insert radiator upper hose as far as the projection of the thermostat case assembly.
3. Align the mating marks on the radiator hose and hose clamp, and then connect the radiator hose.

REMOVAL AND INSTALLATION <4G6>

M1141001501397

Pre-removal and Post-installation Operation

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



AC504783AC

Radiator removal steps

1. Drain plug
2. Radiator cap
3. Radiator condenser tank hose
4. Radiator condenser tank assembly
5. Radiator upper hose
6. Radiator lower hose
7. Cooling fan motor drive control unit connector

Radiator removal steps

8. T/M oil cooler line hose connection <A/T>
9. Radiator support upper insulator
- Radiator and cooling fan motor & shroud assembly
10. Radiator support lower insulator
11. T/M oil cooler line hose <A/T>

<<A>> >>A<<
<<A>> >>A<<

Radiator removal steps

- 12. A/C condenser fan motor & shroud assembly
- 13. Cooling fan motor & shroud assembly
- 14. Radiator assembly

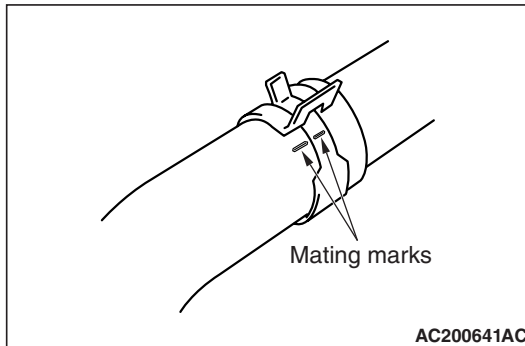
Cooling fan motor removal steps

- 3. Radiator condenser tank hose
- 5. Radiator upper hose
- 7. Cooling fan motor drive control unit connector
- 12. A/C condenser fan motor & shroud assembly
- 13. Cooling fan motor & shroud assembly
- 15. Cooling fan (L.H.)
- 16. Cooling fan motor drive control unit
- 17. Cooling fan motor (L.H.)
- 18. Cooling fan shroud

<<A>> >>A<<

REMOVAL SERVICE POINT

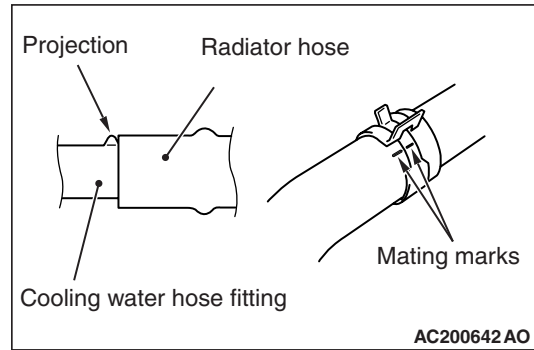
<<A>> RADIATOR UPPER HOSE/RADIATOR LOWER HOSE DISCONNECTION



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

INSTALLATION SERVICE POINT

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



- 1. Insert radiator lower hose as far as the projection of the cooling water inlet hose fitting.
- 2. Insert radiator upper hose as far as the projection of the cooling water outlet hose fitting.
- 3. Align the mating marks on the radiator hose and hose clamp, and then connect the radiator hose.