GROUP 14

ENGINE COOLING

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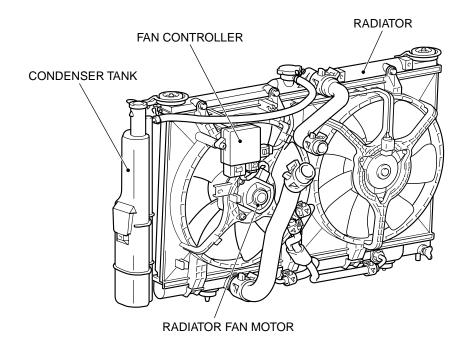
GENERAL DESCRIPTION

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

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

CONSTRUCTION DIAGRAM



AC203291 AB

SPECIAL TOOLS

M1141000600127

TOOL	TOOL NUMBER AND NAME	SUPERSSION	APPLICATION
MB991871	MB991871 LLC changer	General service tool	Coolant refilling
A B C D MB991223AG	MB991223 A: MB991219 B: MB991220 C: MB991221 D: MB991222 Harness set A: Test harness B: LED harness C: LED harness adapter D: Probe	MB991223	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

ENGINE COOLING DIAGNOSIS

INTRODUCTION

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The system cools the engine so that it does not overheat and maintains the engine at an optimum temperature. The system components are the radiator, water pump, thermostat, condenser fan assembly. Possible faults include low coolant, contamination, belt loosening and component damage.

TROUBLESHOOTING STRATEGY

Use these steps to plan your diagnostic strategy. If you follow them carefully, you will be sure to find most of the engine cooling faults.

1. Gather information from the customer.

2. Verify that the condition described by the

- customer exists.
- 3. Find and repair the malfunction by following the SYMPTOM CHART.
- 4. Verify that the malfunction is eliminated.

SYMPTOM CHART

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SYMPTOM	INSPECTION PROCEDURE	REFERENCE PAGE
Coolant Leak	1	P.14-4
Engine Overheating	2	P.14-5
Radiator Fan and Condenser Fan do not Operate	3	P.14-6
Radiator Fan and Condenser Fan do not Change Speed or Stop	4	P.14-14
Radiator Fan does not Operate	5	P.14-19
Condenser Fan does not Operate	6	P.14-19

SYMPTOM PROCEDURES

INSPECTION PROCEDURE 1: Coolant Leak

DIAGNOSIS

STEP 1. Check for coolant leaks.

MARNING

When pressure testing the cooling system, slowly release cooling system pressure to avoid getting burned by hot coolant.

⚠ CAUTION

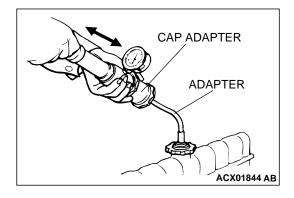
- Be sure to completely clean away any moisture from the places checked.
- When the tester is removed, be careful not to spill any coolant.
- When installing and removing the tester and when testing, be careful not to deform the filler neck of the radiator.

Check that the coolant level is up to the filler neck. Install a radiator tester and apply 160 kPa (23 psi) pressure, and then check for leakage from the radiator hose or connections.

Q: Is leakage present from the radiator hose or connections?

YES: Repair or replace the appropriate part, then go to Step 2.

NO: There is no action to be taken.



STEP 2. Retest the system.

Q: It there still coolant leakage?

YES: Return to Step 1.

NO: The procedure is complete.

INSPECTION PROCEDURE 2: Engine Overheating

DIAGNOSIS

STEP 1. Remove the radiator cap and check for coolant contamination.

Q: Is the coolant contaminated with rust and oil?

YES: Replace it. Refer to P.14-22.

NO: There is no action to be taken. Go to Step 2.

STEP 2. Check the radiator cap valve opening pressure.

NOTE: Be sure that the cap is clean before testing. Rust or other foreign material on the cap seal will cause an improper reading.

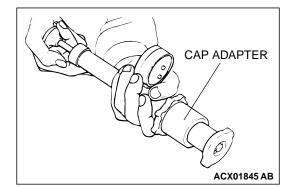
- (1) Use a cap adapter to attach the cap to the tester.
- (2) Increase the pressure until the gauge indicator stops moving.

Minimum limit: 83 kPa (12 psi) Standard value: 93 – 123 kPa (14 – 18 psi)

Q: Does the reading remain at or above the minimum limit?

YES: Go to Step 3.

NO: Replace the radiator cap. Then go to Step 5.



STEP 3. Check thermostat operation.

Refer to P.14-28.

Q: Does the thermostat operate correctly?

YES: Go to Step 4.

NO: Replace the thermostat, then go to Step 5.

STEP 4. Check the drive belt for slippage or damage.

Refer to GROUP 00, Maintenance Service – Drive Belts (Check Condition) P.00-37.

Q: Is the drive belt loose or damaged?

YES: Adjust or replace the drive belt, then go to Step 5.

NO: There is no action to be taken.

STEP 5. Retest the system.

Check the coolant temperature gauge.

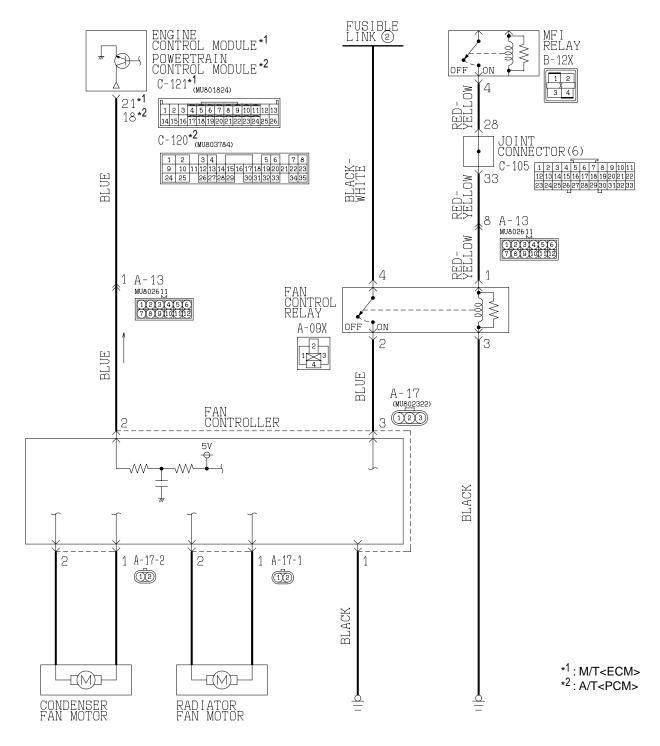
Q: Is the coolant temperature abnormally high?

YES: Return to Step 2.

NO: The procedure is complete.

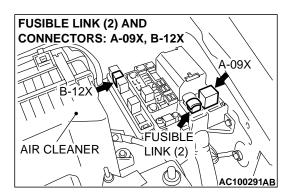
INSPECTION PROCEDURE 3: Radiator Fan and Condenser Fan do not Operate

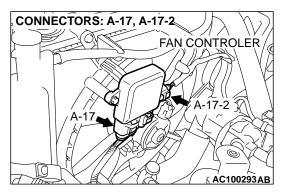
Radiator Fan and Condenser Fan Drive Circut

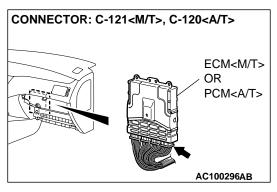


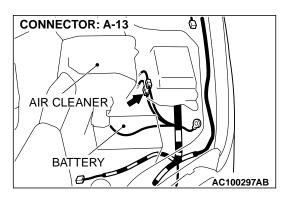
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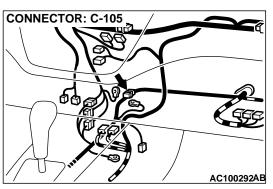
TSB Revision











CIRCUIT OPERATION

- The fan controller is powered from fusible link number 2.
- The ECM <M/T> or PCM <A/T> judges the required revolution speed of radiator fan motor and condenser fan motor using the input signals transmitted from A/C switch, automatic compressor controller, vehicle speed sensor and engine coolant temperature sensor. The ECM <M/T> or PCM <A/T> activates the fan controller to drive the radiator fan motor and condenser fan motor.

TECHNICAL DESCRIPTION

- The cause could be a malfunction of the fan controller power supply or ground circuit.
- The cause could also be a malfunction of the fan controller or the ECM <M/T> or PCM <A/T>.

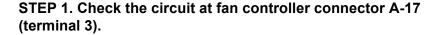
TROUBLESHOOTING HINTS

- Malfunction of fusible link
- Malfunction of fan control relay
- Malfunction of MFI relay
- Malfunction of radiator fan motor
- Malfunction of condenser fan motor
- Malfunction of fan controller
- Malfunction of ECM <M/T> or PCM <A/T>
- Damaged wiring harness or connector

DIAGNOSIS

Required Special Tool:

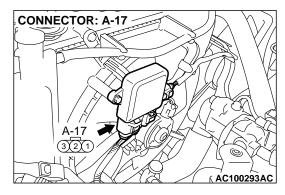
• MB991223: Harness Set

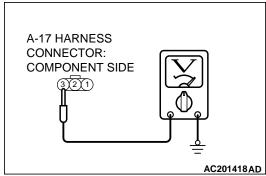


- (1) Disconnect fan controller connector A-17, and measure at the harness side connector.(2) Measure the voltage between terminal number 3 and
- (2) Measure the voltage between terminal number 3 and ground.
 - When the ignition switch is turned to the "ON" position, voltage should measure battery positive voltage.

Q: Is there voltage battery positive voltage when the ignition switch is turned to the "ON" position?

YES: Go to Step 8. **NO**: Go to Step 2.





STEP 2. Check the fan control relay.

Refer to P.14-24.

Q: Is the fan control relay in good condition?

YES: Go to Step 3.

NO: Replace it, then go to Step 1.

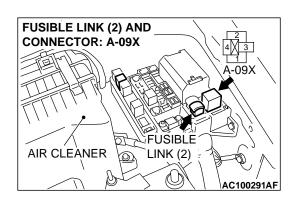
STEP 3. Check the MFI relay.

Refer to P.13Aa-18.

Q: Is the MFI relay in good condition?

YES: Go to Step 4.

NO: Replace it, then go to Step 1.

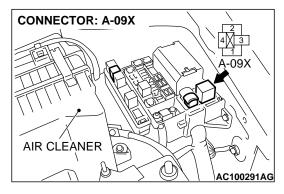


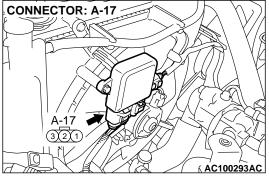
STEP 4. Check for harness damage between fusible link number 2 and fan control relay connector A-09X (terminal 4).

Q: Are the harness wires between fusible link number 2 and fan control relay connector A-10X damaged?

YES: Repair or replace them, then go to Step 13.

NO: Go to Step 5.



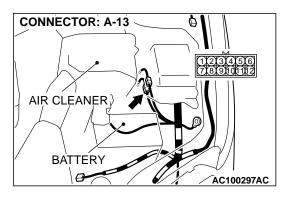


STEP 5. Check for harness damage between fan control relay connector A-09X (terminal 2) and fan controller connector A-17 (terminal 3).

Q: Are the harness wires between fan control relay connector A-09X (terminal 2) and fan controller connector A-17 (terminal 3) damaged?

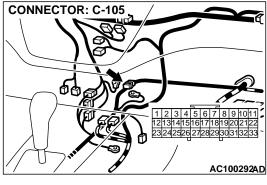
YES: Repair or replace them, then go to Step 13.

NO: Go to Step 6.



STEP 6. Check for harness damage between MFI relay connector B-12X and fan control relay connector A-09X.

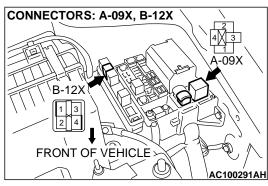
NOTE: After inspecting intermediate connector A-13 terminal 8 and joint connector C-105 terminal 33, 28 inspect the wires. If intermediate connector A-13 and joint connector C-105 are damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.



Q: Are the harness wires between MFI relay connector B-12X (terminal 4) and fan control relay connector A-09X (terminal 1) damaged?

YES: Repair or replace them, then go to Step 13.

NO: Go to Step 7.

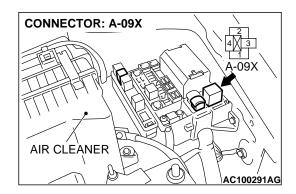


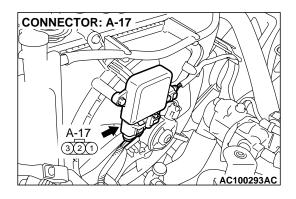
STEP 7. Check for harness damage between fan control relay connector A-09X (terminal 3) and ground.

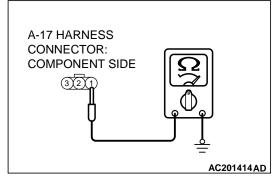
Q: Are the harness wires between fan control relay connector A-09X (terminal 3) and ground damaged?

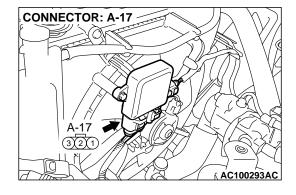
YES: Repair or replace them, then go to Step 13.

NO: Go to Step 8.









STEP 8. Check the circuit at fan controller connector A-17 (terminal 1).

- (1) Disconnect fan controller connector A-17, and measure at the harness side connector.
- (2) Measure the resistance between terminal number 1 and ground.

Q: Is the resistance less than 2 ohms?

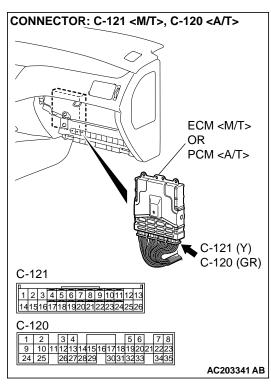
YES: Go to Step 10.
NO: Go to Step 9.

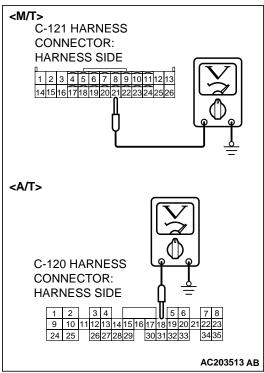
STEP 9. Check the harness wire between fan controller connector A-17 and ground.

Q: Are the harness wires between fan controller connector A-17 and ground damaged?

YES: Repair or replace them, then go to Step 13.

NO: Go to Step 10.



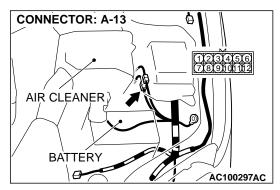


STEP 10. Measure the output circuit voltage at ECM connector C-121 <M/T> (terminal 21) or PCM connector C-120 <A/T> (terminal 18) by backprobing.

- (1) Do not disconnect ECM connector C-121 <M/T> or PCM connector C-120 <A/T>.
- (2) Start the engine and allow it to idle.
- (3) Measure the voltage between terminal number 21 <M/T> or 18 <A/T> and ground by back probing.

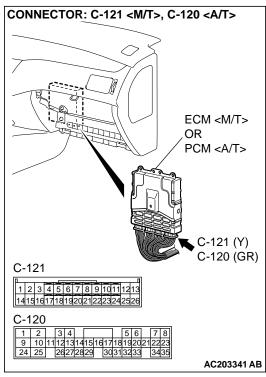
Q: Is the voltage 0.7 volt or more when the radiator fan is operating?

YES: Go to Step 12.
NO: Go to Step 11.



STEP 11. Check the harness wire between ECM connector C-121 <M/T>or PCM connector C-120 <A/T> and fan controller connector A-30.

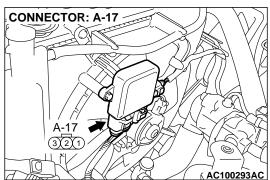
NOTE: If intermediate connector A-13 terminal 1 is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

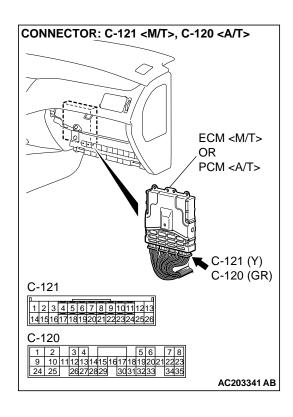


Q: Are the harness wires between ECM connector C-121 <M/T> (terminal 21) or PCM connector C-120 <A/T> (terminal 18) and fan controller connector A-17 (terminal 2) damaged?

YES: Repair or replace them, then go to Step 13.

NO: Go to Step 12.





STEP 12. Check the fan controller at ECM connector C-121 <M/T>or PCM connector C-120 <A/T>.

- (1) Disconnect ECM connector C-121 <M/T> or PCM connector C-120 <A/T>.
- (2) Turn the ignition switch to the "ON" position.
- Q: Do the radiator fan motor and condenser fan motor operate?

YES: Replace the PCM. Then go to Step 13.

NO: Replace the fan controller. Then go to Step 13.

STEP 13. Check the symptoms.

Q: Do the radiator fan and condenser fan operate correctly?

YES: The procedure is complete.

NO: Return to Step 1.

INSPECTION PROCEDURE 4: Radiator Fan and Condenser Fan do not Change Speed or Stop

NOTE: If the engine coolant temperature reaches 110° C (230° F) or higher, the radiator fan control runs the radiator fan for up to 5 minutes even after the ignition switch is turned to the "LOCK" (OFF) position [the fan stops its rotation when the engine coolant temperature decreases to 110° C (230° F) or lower.]

Radiator Fan and Condenser Fan Drive Circuit Refer to P.14-6.

CIRCUIT OPERATION

- The fan controller is powered from fusible link number 2.
- The ECM <M/T> or PCM <A/T> judges the required revolution speed of radiator fan motor and condenser fan motor using the input signals transmitted from A/C switch, automatic compressor controller, vehicle speed sensor and engine coolant temperature sensor. The ECM <M/T> or PCM <A/T> activates the fan controller to drive the radiator fan motor and condenser fan motor.

TECHNICAL DESCRIPTION

The fan controller has variable control of the radiator fan motor and the condenser fan motor speeds using signals transmitted from the ECM <M/T> or PCM <A/T>.

TROUBLESHOOTING HINTS

- Malfunction of fan control relay
- Malfunction of fan controller
- Malfunction of ECM <M/T> or PCM <A/T>

DIAGNOSIS

Required Special Tool:

• MB991223: Harness Set

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.

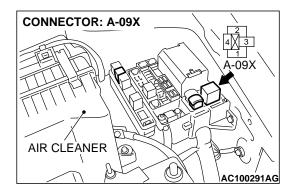
NO: Replace the part, then go to Step 6.

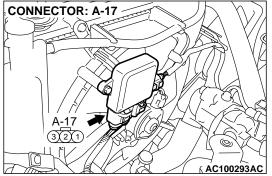
STEP 2. Check the harness wire between fan control relay connector A-09X (terminal 2) and fan controller connector A-17 (terminal 3).

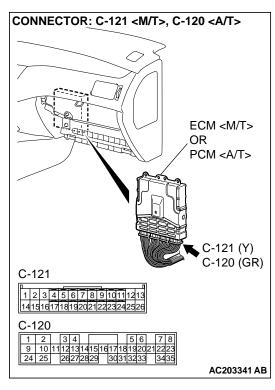
Q: Are the harness wire between fan control relay connector A-09X (terminal 2) and fan controller connector A-17 (terminal 3) damaged?

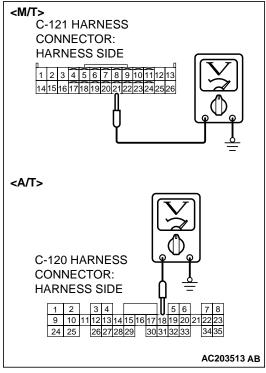
YES: Repair or replace the part, then go to Step 6.

NO: Go to Step 3.







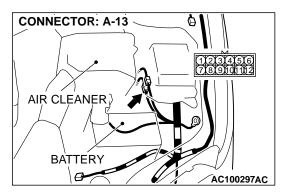


STEP 3. Measure the output circuit voltage at ECM connector C-121 <M/T> (terminal 21) or PCM connector C-120 <A/T> (terminal 18) by backprobing.

- (1) Do not disconnect ECM connector C-121 <M/T> or PCM connector C-120 <A/T>.
- (2) Start the engine and run it at idle. [Engine coolant temperature: 80°C (176°F) or less]
- (3) Measure the voltage between terminal number 21 <M/T> or 18 <A/T> and ground by backprobing.

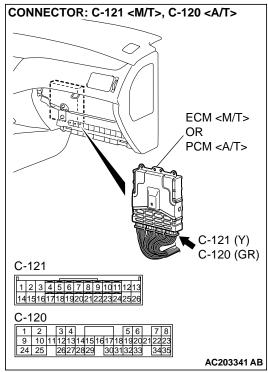
Q: Is the voltage 0 - 0.3 volt when the radiator fan is not operating?

YES: Go to Step 6. **NO**: Go to Step 4.



STEP 4. Check the harness wire between ECM connector C-121 <M/T>or PCM connector C-120 <A/T> and fan controller connector A-17.

NOTE: If intermediate connector A-13 terminal 1 is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.

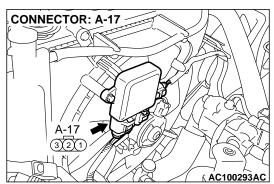


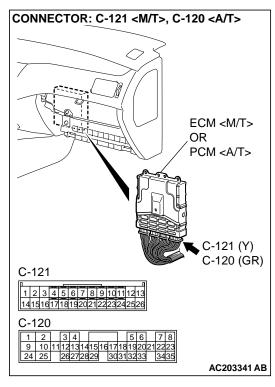
<M/T> (terminal 21) or PCM connector C-120 <A/T> (terminal 18) and fan controller connector A-17 (terminal 2) damaged?

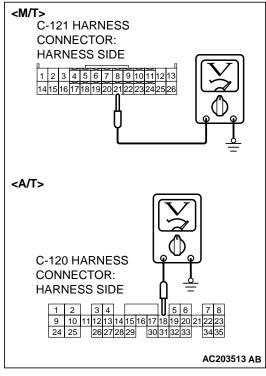
Q: Are the harness wires between ECM connector C-121

YES: Repair or replace them, then go to Step 6.

NO: Go to Step 5.







STEP 5. Check the fan controller at ECM connector C-121 <M/T>or PCM connector C-120 <A/T>.

- (1) Disconnect ECM connector C-121 <M/T> or PCM connector C-120 <A/T>.
- (2) Pull out the terminal number 21 <M/T> or 18 <A/T> and connect it to the body ground.
- (3) Reconnect ECM connector C-121 <M/T> or PCM connector C-120 <A/T> with pin 21 <M/T> or 18 <A/T> still removed.
- (4) Turn the ignition switch to the "ON" position.

Q: Do the radiator fan motor and condenser fan motor stop?

YES: Replace the ECM <M/T> or PCM <A/T>. Then go to

Step 6.

NO: Replace the fan controller. Then go to Step 6.

STEP 6. Check the symptoms.

Q: Do the radiator fan and condenser fan operate correctly?

YES: The procedure is complete.

NO: Return to Step 1.

INSPECTION PROCEDURE 5: Radiator Fan does not Operate

Radiator Fan and Condenser Fan Drive Circuit Refer to P.14-6.

CIRCUIT OPERATION

- The fan controller is powered from fusible link number 2.
- The ECM <M/T> or PCM <A/T> judges the required revolution speed of radiator fan motor and condenser fan motor using the input signals transmitted from A/C switch, automatic compressor controller, vehicle speed sensor and engine coolant temperature sensor. The ECM <M/T> or PCM <A/T> activates the fan controller to drive the radiator fan motor and condenser fan motor.

TECHNICAL DESCRIPTION

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

TROUBLESHOOTING HINTS

- Malfunction of radiator fan motor
- · Malfunction of fan controller

DIAGNOSIS

STEP 1. Check the radiator fan motor.

Refer to P.14-26.

Q: Is the radiator fan in good condition?

YES: Go to Step 2.

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

STEP 2. Check the fan controller.

Refer to P.14-23.

Q: Is the fan controller in good condition?

YES: Go to Step 3.

NO: Replace the fan controller, then go to Step 3.

STEP 3. Check the symptoms.

Q: Does the radiator fan operate correctly?

YES: The procedure is complete.

NO: Return to Step 1.

INSPECTION PROCEDURE 6: Condenser Fan does not Operate

Radiator Fan and Condenser Fan Drive Circuit Refer to P.14-6.

CIRCUIT OPERATION

- The fan controller is powered from fusible link number 2.
- The ECM <M/T> or PCM <A/T> judges the required revolution speed of radiator fan motor and condenser fan motor using the input signals transmitted from A/C switch, automatic compressor controller, vehicle speed sensor and engine coolant temperature sensor. The ECM <M/T> or PCM <A/T> activates the fan controller to drive the radiator fan motor and condenser fan motor.

TECHNICAL DESCRIPTION

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

TROUBLESHOOTING HINTS

- Malfunction of condenser fan motor
- Malfunction of fan controller

DIAGNOSIS

STEP 1. Check the condenser fan motor.

Refer to GROUP 55, Condenser and Condenser Fan Motor P.55-102.

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.14-23.

Q: Is the fan controller in good condition?

YES: Go to Step 3.

NO: Replace the fan controller, then go to Step 3.

STEP 3. Check the symptoms.

Q: Does the condenser fan operate correctly?

YES: The procedure is complete.

NO: Return to Step 1.

ON-VEHICLE SERVICE

ENGINE COOLANT LEAK CHECK

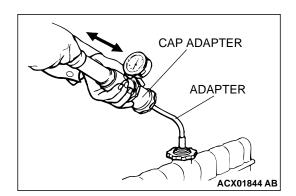
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MARNING

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.
- Check that the coolant level is up to the filler neck. Install a radiator tester and apply 160 kPa (23 psi) 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 PRESSURE CHECK

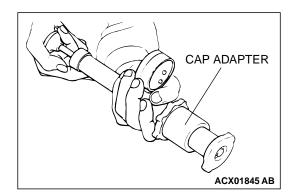
M1141001300271

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 (12 psi) Standard value: 93 – 123 kPa (14 – 18 psi)

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



ENGINE COOLANT REPLACEMENT

M1141001200304

MARNING

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.

- 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 reserve tank and drain the coolant.
- Drain the cooling water then clean the path of the cooling water 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 number 4171 or equivalent

Tightening torque: $44 \pm 5 \text{ N} \cdot \text{m} (33 \pm 3 \text{ ft-lb})$

- 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 aluminum 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 MB991871 to refill the coolant. A convenient mixture is a 50 % water and 50 % antifreeze solution [freezing point: -31°C (-32.8 °F)].

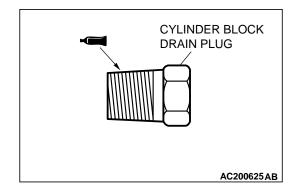
Recommended antifreeze:

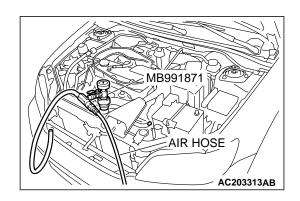
MITSUBISHI GENUINE Part number MD970389 or equivalent

Quantity: 5.0 dm³ (5.3 quarts)

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.

ENGINE COOLANT CONCENTRATION TEST

M1141001100255

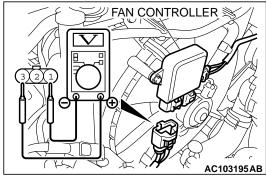
Refer to GROUP 00, RECOMMENDED LUBRICANTS AND LUBRICANT CAPACITIES TABLE P.00-31.

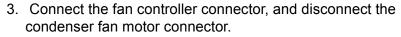
FAN CONTROLLER CHECK

M1141006100175

- 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: Battery positive voltage





- 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

6. Turn the A/C switch to the ON position.

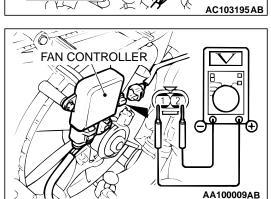


Stay clear of the fan when the fan starts running.

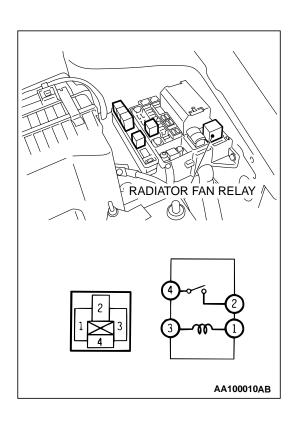
7. Measure the voltage between the fan controller-side connector terminals while the fan is running. The voltage should repeat the values 1) and 2) below.

Standard value:

- 1) 8.2 \pm 2.6 V
- 2) Battery positive voltage \pm 2.6 V
- 8. If the voltage does not repeatedly change as indicated, replace the fan controller.







BATTERY VOLTAGE	TERMINAL NO. TO BE CONNECTED TO TESTER	CONTINUITY TEST RESULTS
Not applied	4 – 2	Open circuit
 Connect terminal 1 to the positive battery terminal Connect terminal 3 to the negative battery terminal 	4 – 2	Less than 2 ohms

RADIATOR

REMOVAL AND INSTALLATION

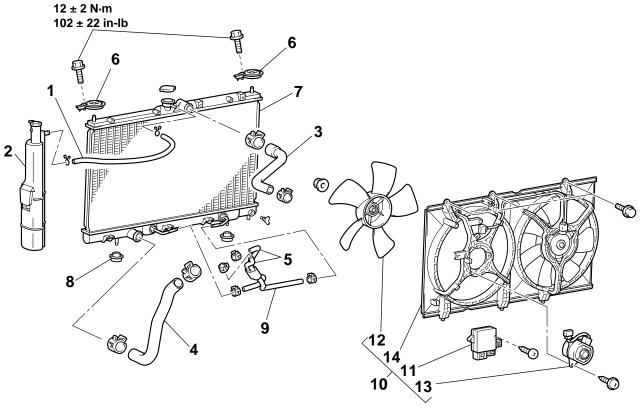
M1141001500297

Pre-removal Operation

• Engine Coolant Draining (Refer to P.14-22.)

Post-installation Operation

- A/T Fluid Refilling and Level Check (Refer to GROUP 00, Maintenance Service P.00-43.)
- Engine Coolant Refilling and Level Check (Refer to P.14-22.)



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RADIATOR REMOVAL STEPS

- 1. RUBBER HOSE
- 2. RESERVE TANK ASSEMBLY
- <<A>>> >>A<< 3. RADIATOR UPPER HOSE

<<A>>>

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>>A<<

- 4. RADIATOR LOWER HOSE
- 5. TRANSAXLE OIL COOLER HOSE CONNECTION
- 6. UPPER INSULATOR
- 7. RADIATOR ASSEMBLY
- 8. LOWER INSULATOR
- 9. TRANSAXLE OIL COOLER HOSE ASSEMBLY
- 10. FAN SHROUD ASSEMBLY

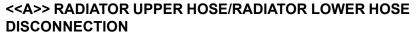
RADIATOR FAN MOTOR AND FAN CONTROLLER REMOVAL STEPS

- RESERVE TANK ASSEMBLY
- 3. RADIATOR UPPER HOSE
- 10. FAN SHROUD ASSEMBLY
- 11. FAN CONTROLLER
- 12. RADIATOR FAN

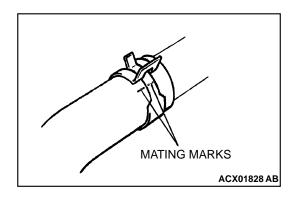
>>A<<

- 13. RADIATOR FAN MOTOR
- 14. FAN SHROUD





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



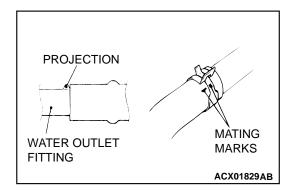
<> TRANSAXLE OIL COOLER HOSE CONNECTION

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 fitting.
- 2. Align the mating marks on the radiator hose and hose clamp, and then connect the radiator hose.

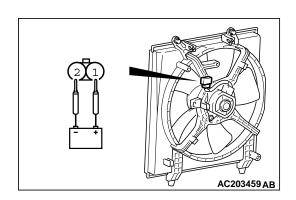


INSPECTION

M1141001900079

Radiator Fan Motor Check

Check to be sure that the radiator fan motor operates when battery voltage is applied to terminals 1 and 2.



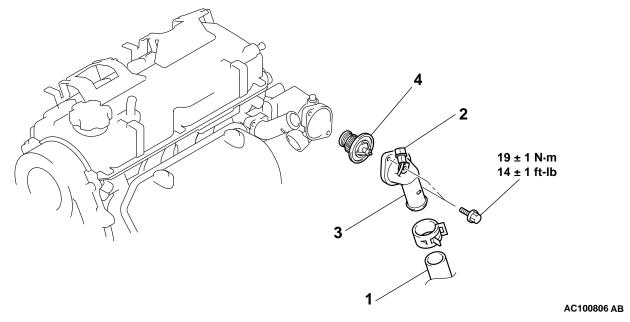
THERMOSTAT

REMOVAL AND INSTALLATION

M1141002400293

Pre-removal and Post-installation Operation

• Engine Coolant Draining and Refilling (Refer to P.14-22.)



<<**A>> >>B<<** 1.

REMOVAL STEPS

- I. RADIATOR LOWER HOSE CONNECTION
- 2. HEATED OXYGEN SENSOR CLAMP

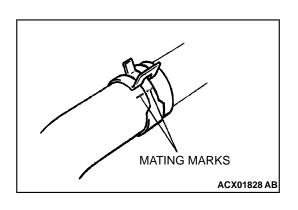
REMOVAL STEPS (Continued)

- 3. WATER INLET FITTING
- >>**A**<< 4. THERMOSTAT

REMOVAL SERVICE POINT

<<A>> RADIATOR LOWER HOSE DISCONNECTION

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



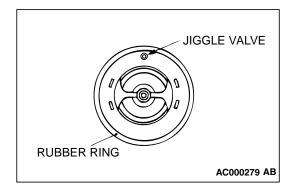
INSTALLATION SERVICE POINTS

>>A<< THERMOSTAT INSTALLATION

⚠ CAUTION

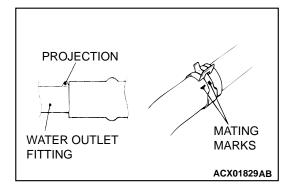
Make absolutely sure that no oil adheres to the rubber ring of the thermostat. Also do not fold or scratch the rubber ring during installation.

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 way.

- 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

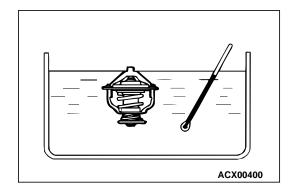
M1141002500289

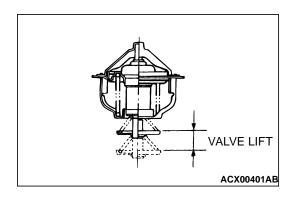


1. Immerse the thermostat in water, and heat the water while stirring. Check the thermostat valve opening temperature.

Standard value:

Valve opening temperature: $82 \pm 1.5^{\circ}$ C ($180 \pm 3^{\circ}$ F)





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 (203°F) Amount of valve lift: 8.5 mm (0.33 inch)

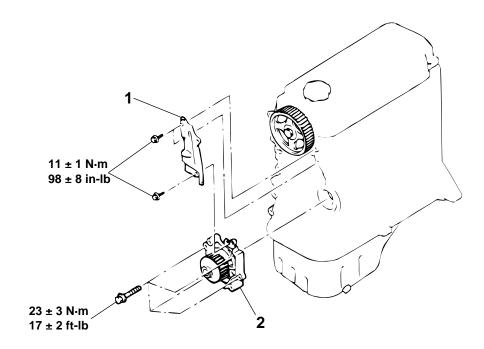
WATER PUMP

REMOVAL AND INSTALLATION

M1141002700313

Pre-removal and Post-installation Operation

- Engine Coolant Draining and Refilling (Refer to P.14-22.)
- Timing Belt Removal and Installation (Refer to GROUP 11A, Timing Belt P.11A-35.)



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REMOVAL STEPS

- TIMING BELT REAR UPPER COVER CONNECTION
- >>**A**<< 2. WATER PUMP

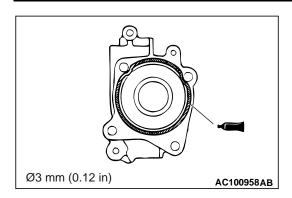
INSTALLATION SERVICE POINT

>>A<< WATER PUMP INSTALLATION

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

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ENGINE COOLING WATER PUMP



2. Apply a bead of the specified sealant.

Specified Sealant: MITSUBISHI GENUINE PART MD970389 or equivalent

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

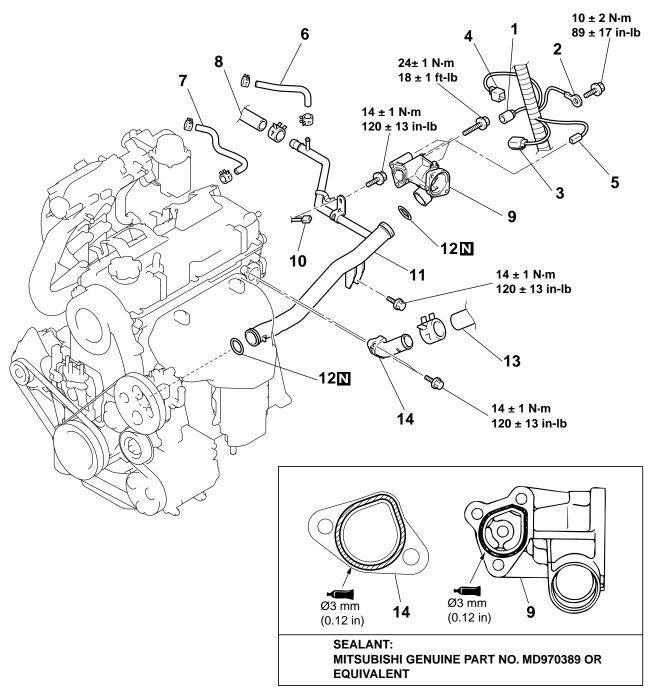
WATER HOSE AND WATER PIPE

REMOVAL AND INSTALLATION

M1141003300266

Pre-removal and Post-installation Operation

- Engine Coolant Draining and Supplying (Refer to P.14-22.)
- Air Cleaner Removal and Installation (Refer to GROUP 15, Air Cleaner P.15-4.)



AC100805AB

REMOVAL STEPS

- 1. ENGINE COOLANT TEMPERATURE SENSOR CONNECTOR
- 2. GROUND CABLE
- 3. KNOCK SENSOR CONNECTOR

REMOVAL STEPS (Continued)

- 4. CAMSHAFT POSITION SENSOR CONNECTOR
- 5. ENGINE COOLANT TEMPERATURE GAUGE UNIT CONNECTOR

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REMOVAL STEPS (Continued)

- 6. WATER HOSE
- 7. WATER HOSE
- 8. HEATER HOSE CONNECTION

>>A<< 9. THERMOSTAT CASE

ASSEMBLY

10. KNOCK SENSOR CONNECTOR

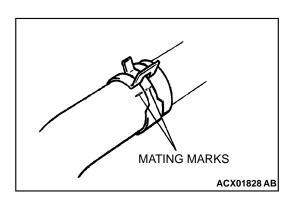
11. WATER INLET PIPE ASSEMBLY

>>C<< 12. O-RING

<<a>>> >> B<< 13. RADIATOR UPPER HOSE

CONNECTION

>>A<< 14. WATER OUTLET FITTING



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<< WATER OUTLET FITTING/THERMOSTAT CASE ASSEMBLY INSTALLATION

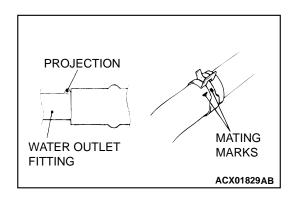
- 1. Use a gasket scraper or wire brush to completely eliminate all gasket material on the gasket mounting surface.
- 2. Apply a bead of the specified sealant.

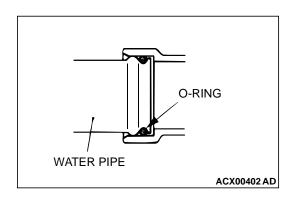
Specified Sealant: MITSUBISHI GENUINE PART MD970389 or equivalent

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

>>B<< 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.





>>C<< O-RING INSTALLATION

⚠ CAUTION

Do not allow engine oil or other grease to adhere to the Oring

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

INSPECTION

M1141003400218

Water Pipe and Hose Check

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

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

M1141005000216

ITEM	SPECIFICATION
Cylinder block drain plug	44 ± 5 N·m (33 ± 3 ft-lb)
Radiator support bolt	12 ± 2 N·m (102 ± 22 in-lb)
Thermostat case bolt	24 ± 1 N·m (18 ± 1 ft-lb)
Timing belt rear upper cover bolt	11 ± 1 N·m (98 ± 8 in-lb)
Water inlet pipe assembly bolt	14 ± 1 N·m (120 ± 13 in-lb)
Water inlet fitting bolt	19 ± 1 N·m (14 ± 1 ft-lb)
Water outlet fitting bolt	14 ± 1 N·m (120 ± 13 in-lb)
Water pump bolt	23 ± 3 N·m (17 ± 2 ft-lb)

SERVICE SPECIFICATIONS

M1141000300289

ITEM			STANDARD VALUE	LIMIT
Fan controller V	'	A/C OFF	1 or less	-
		A/C ON	Repeat steps 1) and 2). 1) 8.2 ± 2.6 2) Battery positive voltage ± 2.6	-
High-pressure valve opening pressure of radiator cap kPa (psi)		93 – 123 (14 – 18)	83 (12)	
Thermostat	Valve opening temperature of thermostat °C (°F)		82 ± 1.5 (180 ± 3)	-
	Full-opening temperature of thermostat °C (°F)		95 (203)	-
	Valve lift mm (in)		8.5 (0.33) or more	-

COOLANT

M1141000400242

ITEM	QUANTITY dm ³ (qt)
Mitsubishi Genuine Coolant or equivalent	5.0 (5.3)

SEALANT

M1141000500238

ITEM	SPECIFIED SEALANT
Thermostat case, Water outlet fitting	MITSUBISHI GENUINE Part No. MD970389 or equivalent
Cylinder block drain plug	3M™ Nut Locking Part number 4171 or equivalent

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