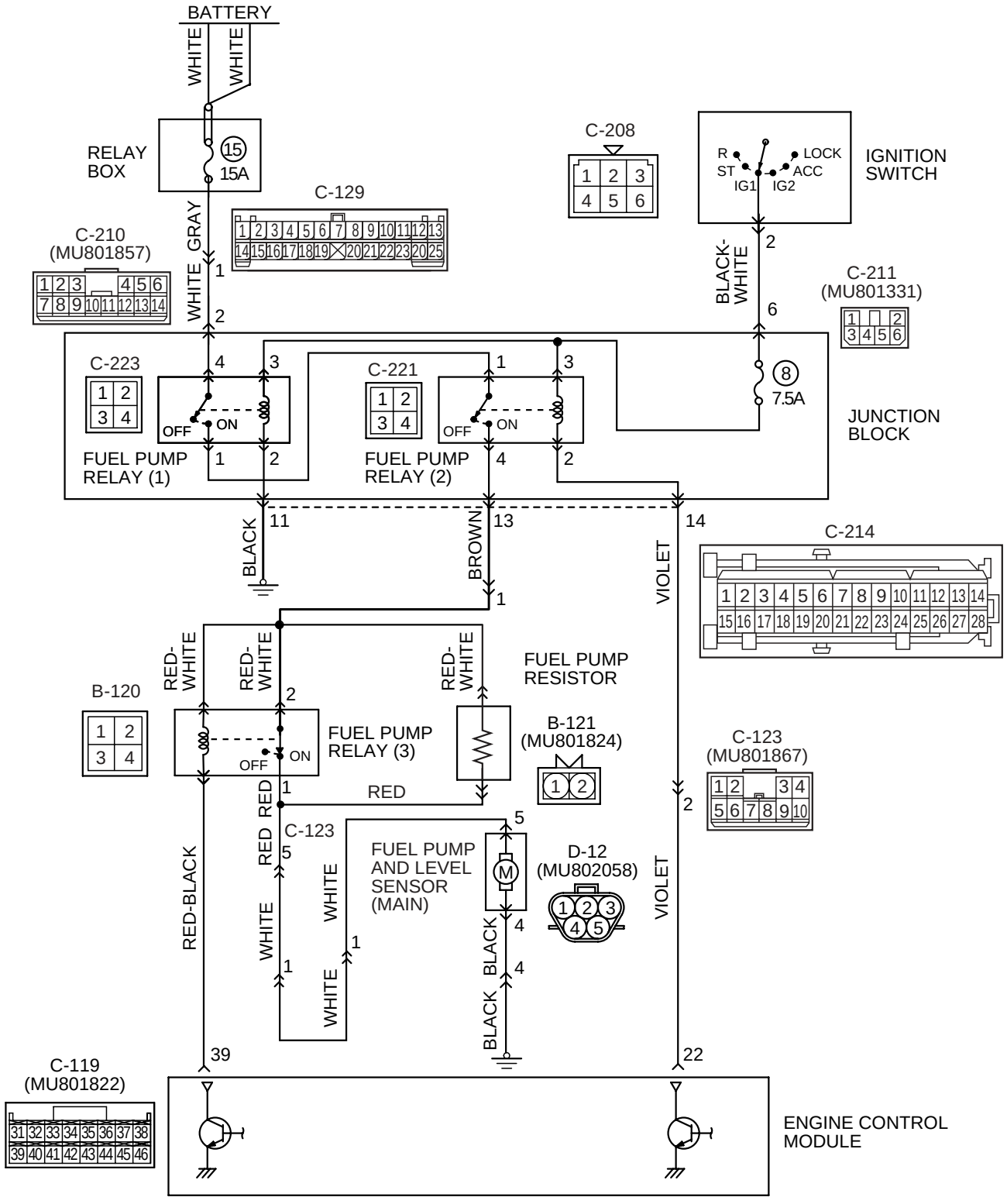
INSPECTION PROCEDURE 31: FUEL PUMP SYSTEM

Fuel Pump Circuit



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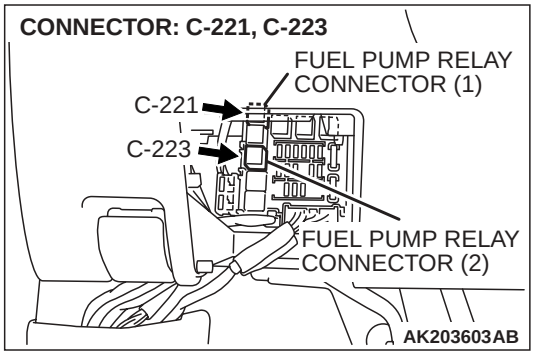

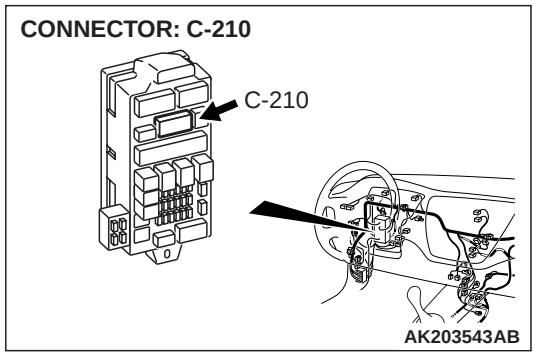

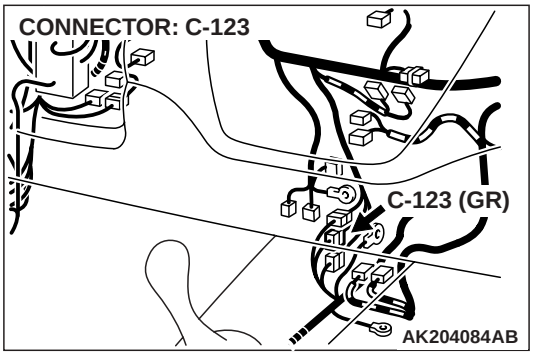

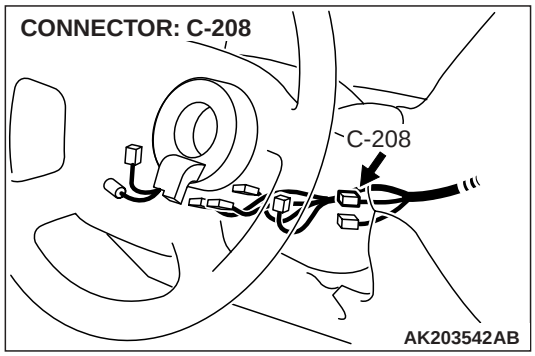

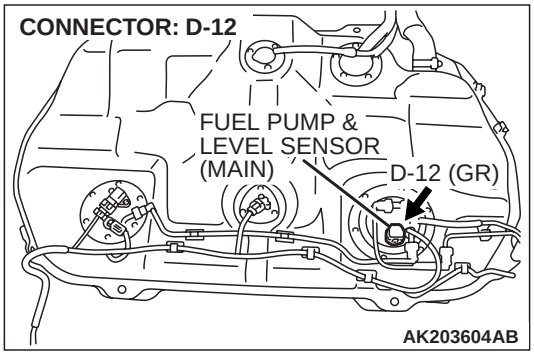

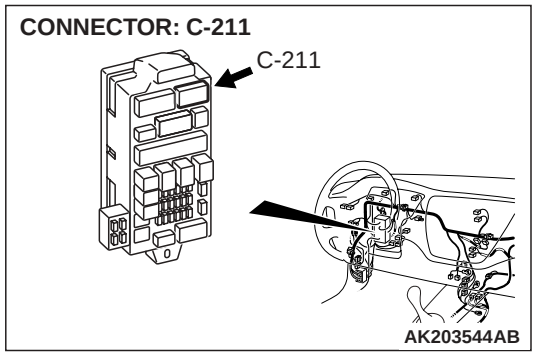

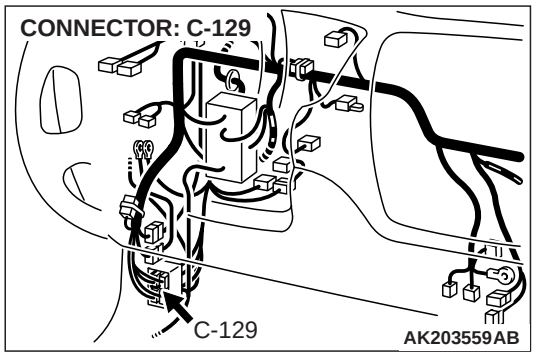

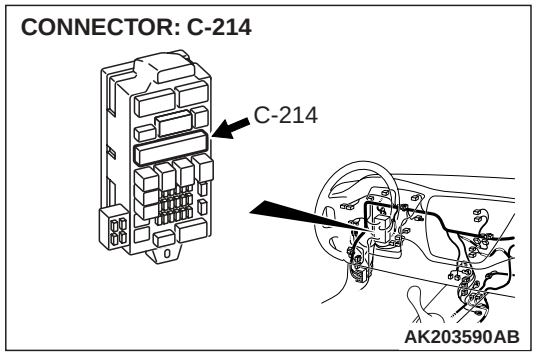

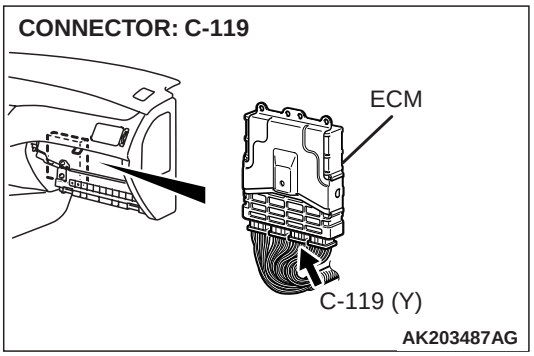

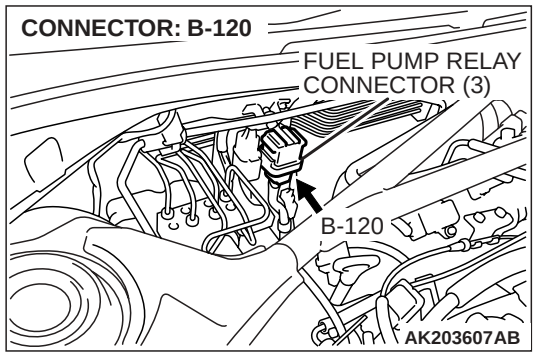

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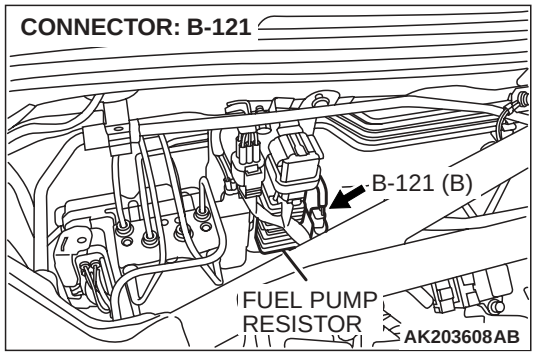


CIRCUIT OPERATION

- Battery positive voltage is applied to the fuel pump relay 1 (terminal No. 3) from the ignition switch-IG.
  Ground is provided through terminal No. 2 to chassis ground.
- When the ignition switch is turned to the "ON" position, the battery positive voltage is applied to the fuel pump relay 2 (terminal No. 1) from the fuel pump relay 1 (terminal No. 1).
- Battery positive voltage is applied to the fuel pump relay 2 (terminal No. 3) from the ignition switch-IG.
- During cranking and while the engine is running, the ECM turns ON the power transistor in the ECM in order to ground the coil of the fuel pump relay 2. Consequently, the fuel pump relay 2 turns ON, and the fuel pump relay 2 (terminal No. 4) supplies the battery positive voltage to the fuel pump and the fuel pump circuit resistor.
- While the engine operates with a light load, the ECM turns ON the power transistor in the ECM in order to ground the coil of the fuel pump relay 3. Consequently, the fuel pump relay 3 turns OFF, and the fuel pump resistor (terminal No. 2) supplies the battery positive voltage to the fuel pump (terminal No. 5).
  While the engine operates with a heavy load, the ECM turns OFF the power transistor in the ECM, causing the fuel pump relay 3 to turn ON. Consequently, the fuel pump relay 3 (terminal No. 1) supplies power directly to the fuel pump (terminal No. 5).

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Malfunction of the fuel pump relay.
- Malfunction of the fuel pump.
- Malfunction of the fuel pump resistor.
- Improper connector contact, open or short-circuited harness wire.
- Malfunction of the ECM.

DIAGNOSIS

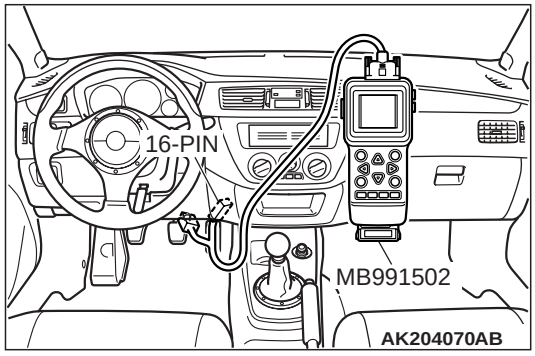
Required Special Tools:

- MB991502: Scan Tool (MUT-II)
- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991911: Main Harness B

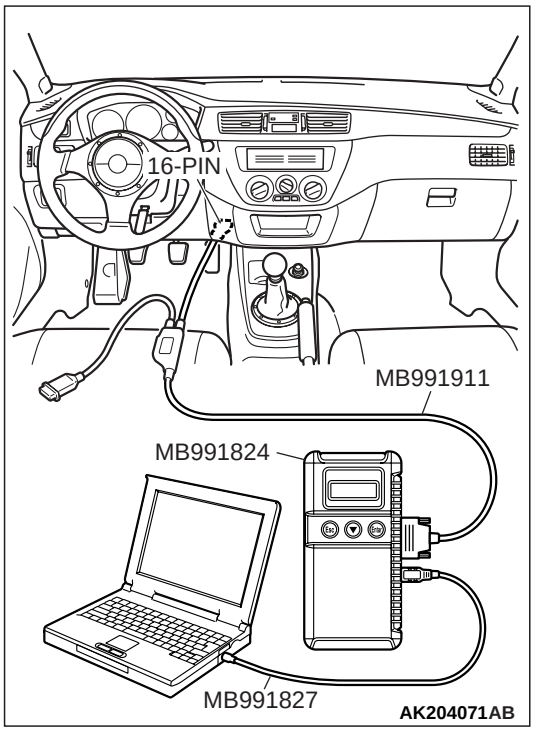
STEP 1. Using scan tool MB991502 or MB991958, check actuator test item 07: Fuel Pump.

⚠ CAUTION

To prevent damage to scan tool MB991502 or MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502 or MB991958.

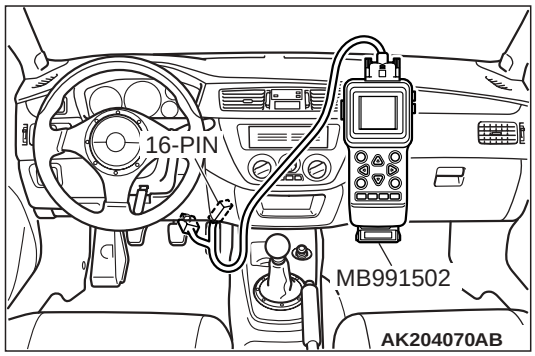


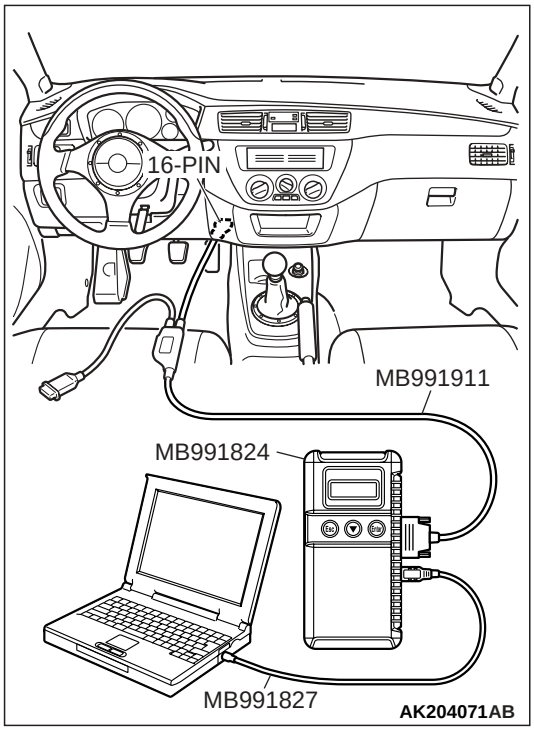
(1) Connect scan tool MB991502 or MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 or MB991958 to the actuator test mode for item 07, Fuel Pump.
  - An operation sound of the fuel pump should be heard. (fuel pump operates at a low speed)
(4) Turn the ignition switch to the "LOCK" (OFF) position.



Q: Is the fuel pump operating properly?

YES : Go to Step 2.
NO : Go to Step 3.





STEP 2. Using scan tool MB991502 or MB991958, check actuator test item 13: Fuel Pump relay 3.

⚠ CAUTION

To prevent damage to scan tool MB991502 or MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502 or MB991958.

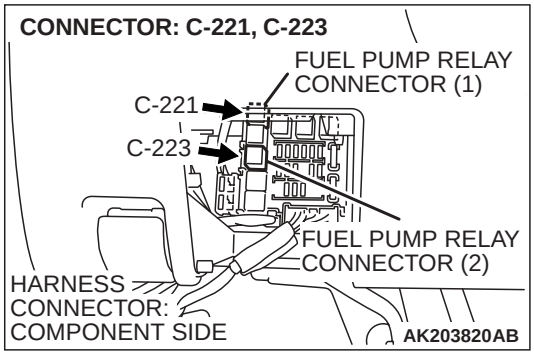
(1) Connect scan tool MB991502 or MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991502 or MB991958 to the actuator test mode for Item 13, fuel pump relay 3.
- An operation sound of the fuel pump should be heard. (fuel pump operates at a high speed)

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

Q: Is the operation sound heard at high speed?

YES : That this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points P.00-6.

NO : Go to Step 19.



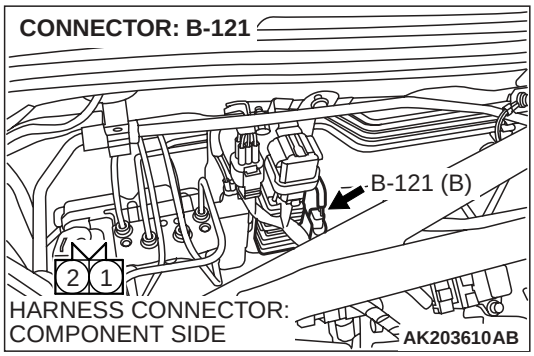
STEP 3. Check connector C-223 at fuel pump relay 1 and connector C-221 at fuel pump relay 2 for damage.

Q: Is the connector in good condition?

YES : Go to Step4.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.

STEP 4. Check connector B-121 at fuel pump resistor for damage.



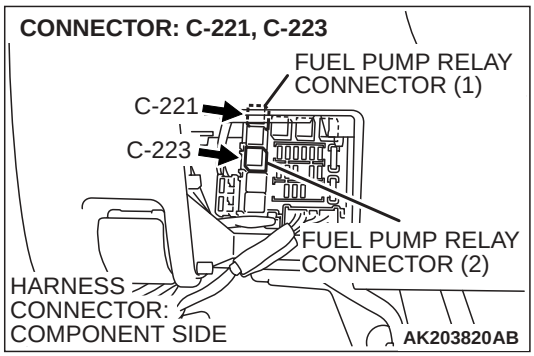
Q: Is the connector in good condition?

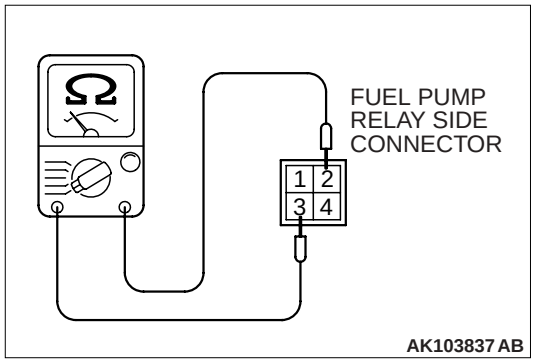
YES : Go to Step 5.

NO : Repair or Replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.

STEP 5. Check the fuel pump relay 1 and 2.

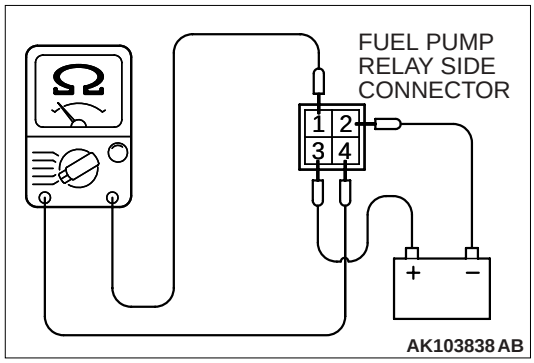
(1) Remove the fuel pump relay.





(2) Check for continuity between the fuel pump relay terminals No. 2 and No. 3.
- There should be continuity. (approximately 70 ohms)

(3) Use jumper wires to connect fuel pump relay terminal No. 3 to the positive battery terminal and terminal No. 2 to the negative battery terminal.



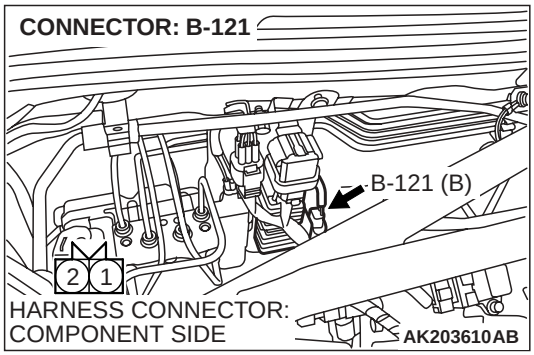
(4) Check for continuity between the fuel pump relay terminals No. 1 and No. 4 while connecting and disconnecting the jumper wire at the negative battery terminal.
- Should be less than 2 ohms. (Negative battery terminal connected)
- Should be open loop. (Negative battery terminal disconnected)

(5) Install the fuel pump relay.

Q: Is the resistance normal?

YES : Go to Step 6.

NO : Replace the fuel pump relay. Then confirm that the malfunction symptom is eliminated.



STEP 6. Check the fuel pump resistor.

(1) Disconnect the fuel pump resistor connector B-121.

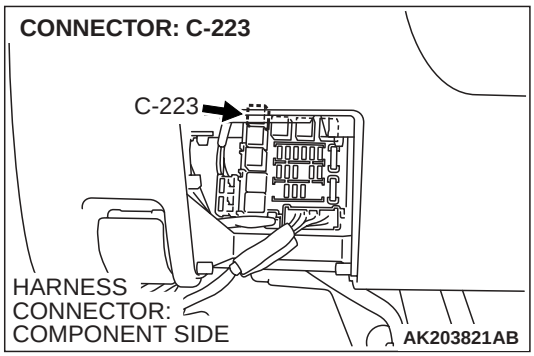
(2) Measure the resistance between fuel pump resistor side connector terminal No.1 and No.2.

Standard value: 0.45 – 0.65 ohm

Q: Is the resistance between 0.45 and 0.65 ohm [at 20°C (68°F)] ?

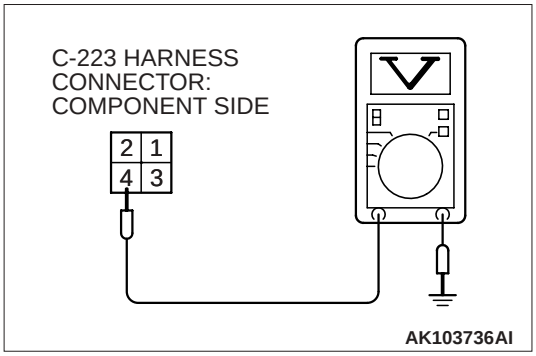
YES : Go to Step 7.

NO : Replace the fuel pump resistor. Then confirm that the malfunction symptom is eliminated.



STEP 7. Measure the power supply voltage at fuel pump relay 1 harness side connector C-223.

(1) Disconnect the connector C-223 and measure at the harness side.



(2) Measure the voltage between terminal No. 4 and ground.

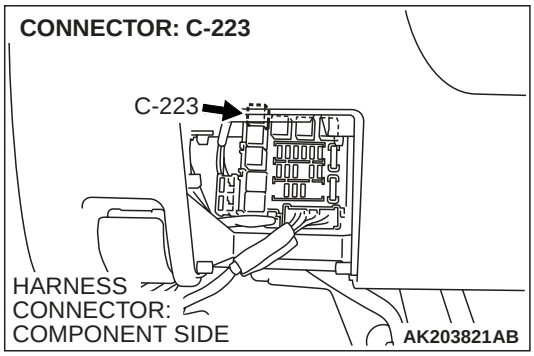
- Voltage should measure battery positive voltage.

Q: Is battery positive voltage (approximately 12 volts) present?

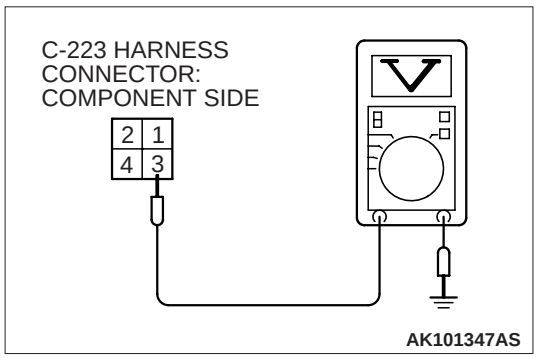
YES : Go to Step 8.

NO : Check harness connectors C-129 and C-210 at intermediate connector for damage, and repair or replace as required. Refer to, GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connectors are in good condition, repair harness wire between relay box (fuse 15) and fuel pump relay 1 connector C-223 (terminal No. 4) because of open circuit. Then confirm that the malfunction symptom is eliminated.

STEP 8. Measure the power supply voltage at fuel pump relay 1 harness side connector C-223.



(1) Disconnect the connector C-223 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.



(3) Measure the voltage between terminal No. 3 and ground.
- Voltage should measure battery positive voltage.

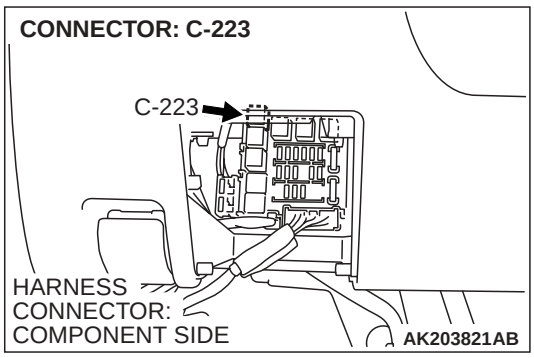
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is battery positive voltage (approximately 12 volts) present?

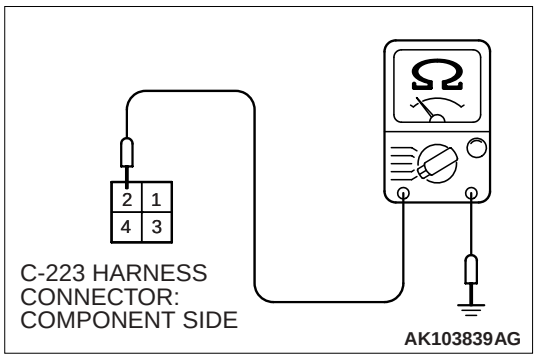
YES : Go to Step 9.

NO : Check harness connector C-211 at intermediate connector for damage, and repair or replace as required. Refer to, GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connector is in good condition, repair harness wire between ignition switch connector C-208 (terminal No. 2) and fuel pump relay 1 connector C-223 (terminal No. 3) because of open circuit. Then confirm that the malfunction symptom is eliminated.

STEP 9. Check for continuity at fuel pump relay 1 harness side connector C-223.



(1) Disconnect the connector C-223 and measure at the harness side.



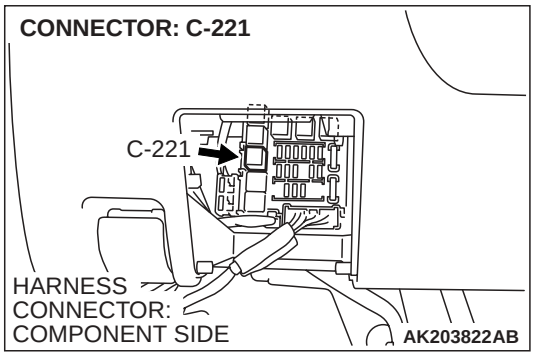
(2) Check for the continuity between terminal No. 2 and ground.
- Should be less than 2 ohms.

Q: Does continuity exist?

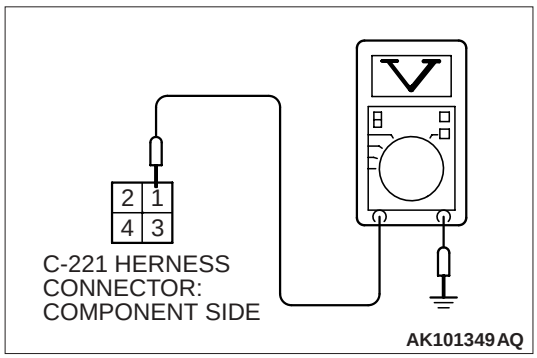
YES : Go to Step 10.

NO : Repair harness wire between fuel pump relay 1 connector C-223 (terminal No. 2) and ground because of open circuit. Then confirm that the malfunction symptom is eliminated.

STEP 10. Measure the power supply voltage at fuel pump relay 2 harness side connector C-221.



(1) Disconnect the connector C-221 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.



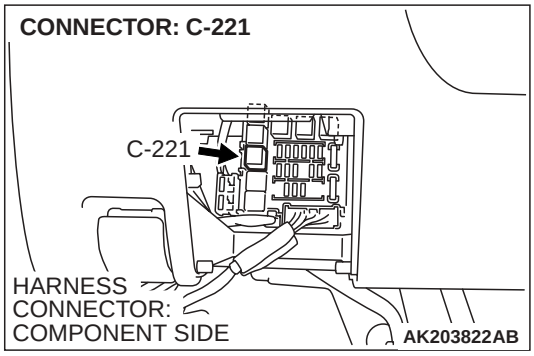
(3) Measure the voltage between terminal No. 1 and ground.
- Voltage should measure battery positive voltage.

Q: Is battery positive voltage (approximately 12 volts) present?

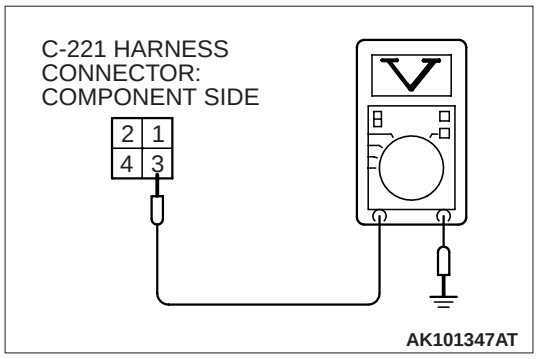
YES : Go to Step 11.

NO : Repair harness wire between fuel pump relay 1 connector C-223 (terminal No. 1) and fuel pump relay 2 connector C-221 (terminal No. 1) because of open circuit. Then confirm that the malfunction symptom is eliminated.

STEP 11. Measure the power supply voltage at fuel pump relay 2 harness side connector C-221.



(1) Disconnect the connector C-221 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.



(3) Measure the voltage between terminal No. 3 and ground.
- Voltage should measure battery positive voltage.

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

Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 12.

NO : Check harness connector C-211 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connector is in good condition, repair harness wire between ignition switch connector C-208 (terminal No. 2) and fuel pump relay 2 connector C-221 (terminal No. 3) because of open circuit. Then confirm that the malfunction symptom is eliminated.

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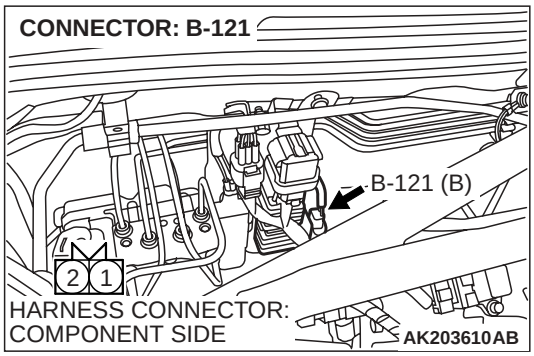
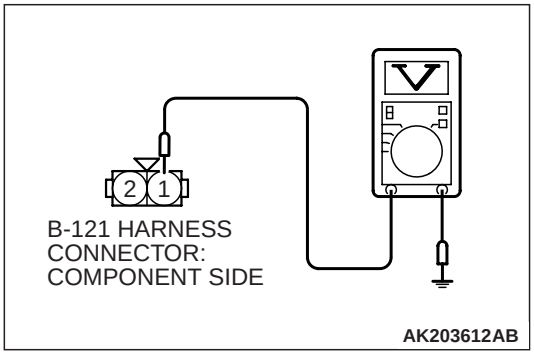
STEP 12. Measure the power supply voltage at fuel pump resistor harness side connector B-121.



(1) Disconnect the connector B-121 and measure the harness side.
(2) Turn the ignition switch to the "ON" position.



(3) Measure the voltage between terminal No.1 and ground.
- Voltage should measure battery positive voltage.

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

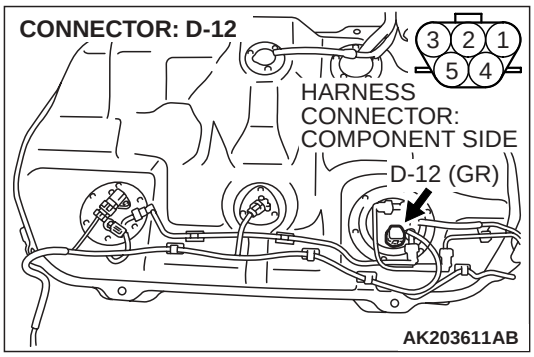
Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 13.

NO : Check harness connector C-123 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connector is in good condition, repair harness wire between fuel pump relay 2 connector C-221 (terminal No. 4) and fuel pump resistor connector B-121 (terminal No.1) because of open circuit. Then confirm that the malfunction symptom is eliminated.

STEP 13. Check connector D-12 at fuel pump for damage.

Q: Is the connector in good condition?

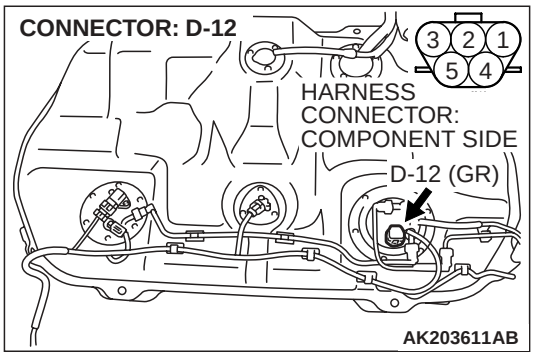


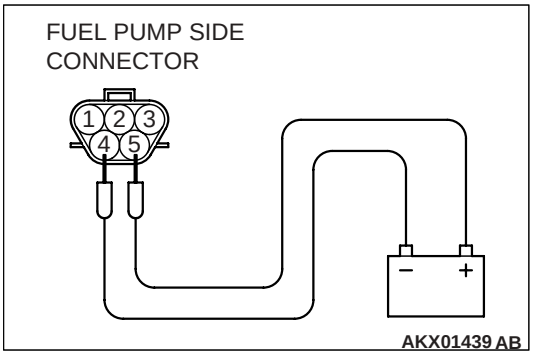
YES : Go to Step 14.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.

STEP 14. Check the fuel pump operation.

(1) Disconnect fuel pump connector D-12.





(2) Use jumper wires to connect fuel pump connector terminal No. 5 to the positive battery terminal and terminal No. 4 to the negative battery terminal.
- An operating sound of the fuel pump should be heard.

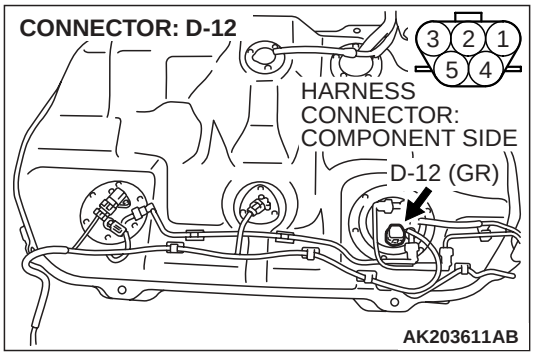
Q: Is the fuel pump operating properly?

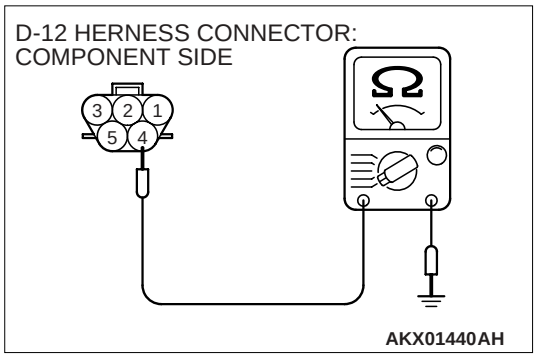
YES : Go to Step 15

NO : Replace the fuel pump. Then confirm that the malfunction symptom is eliminated.

STEP 15. Check for continuity at fuel pump harness side connector D-12.

(1) Disconnect the connector D-12 and measure at the harness side.





(2) Check for the continuity between terminal No. 4 and ground.
- Should be less than 2 ohms.

Q: Does continuity exist?

YES : Go to Step 16.

NO : Check harness connector D-34 at intermediate connector for damage, and repair or replace as required. Refer to, GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connector is in good condition, repair harness wire damage between fuel pump connector D-12 (terminal No. 4) and ground because of open circuit or harness damage. Then confirm that the malfunction symptom is eliminated.

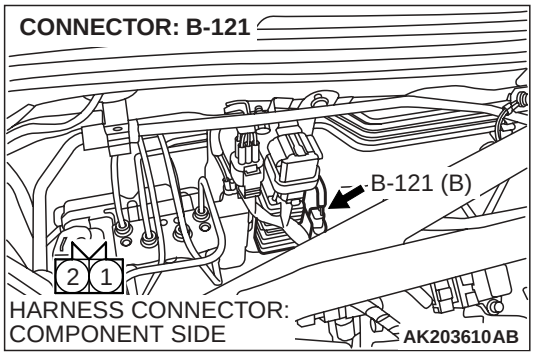
STEP 16. Check for open circuit and short circuit to ground and harness damage between fuel pump resistor connector B-121 (terminal No. 2) and fuel pump connector D-12 (terminal No. 5).

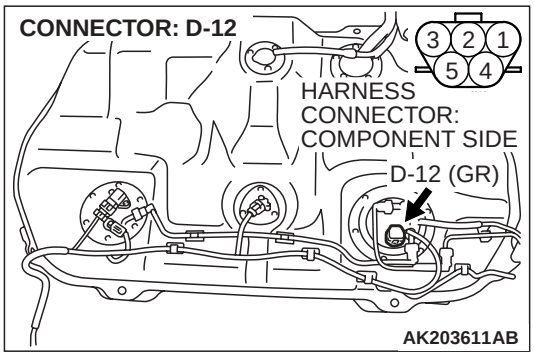
NOTE: Check harness after checking intermediate connectors C-123, C-113 and D-33. If intermediate connectors are damaged, repair or replace them. After to GROUP 00E, Harness Connector Inspection P.00E-2. Then check that the malfunction is eliminated.

Q: Is the harness wire in good condition?

YES : Go to Step 17.

NO : Repair it. Then confirm that the malfunction symptom is eliminated.



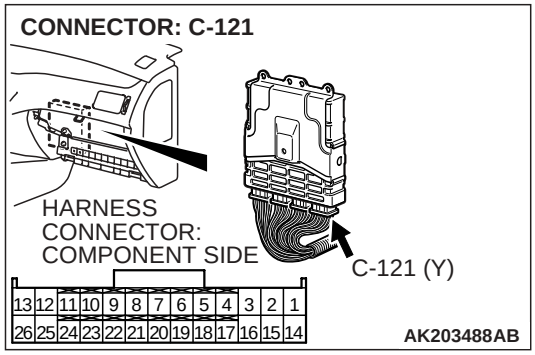


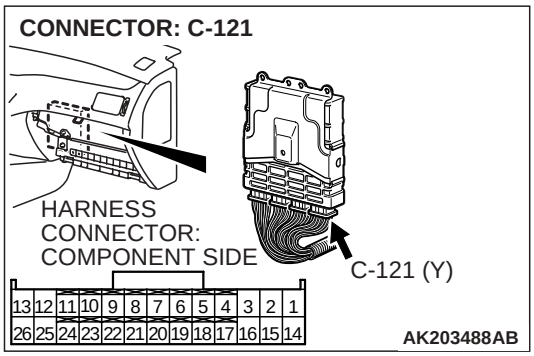
STEP 17. Check connector C-121 at ECM for damage.

Q: Is the connector in good condition?

YES : Go to Step 18.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.

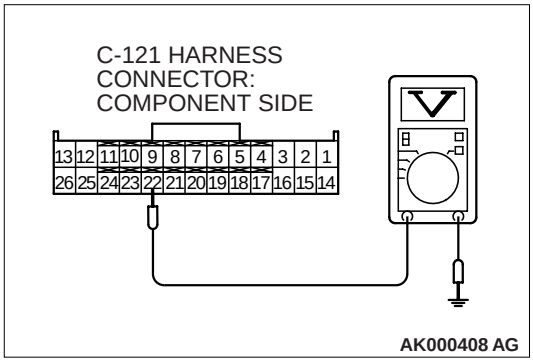




STEP 18. Measure the power supply voltage at ECM connector C-121.

(1) Disconnect the connector C-121 and measure at the harness side.

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



(3) Measure the voltage between terminal No. 22 and ground.
- Voltage should measure battery positive voltage.

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

Q: Is battery positive voltage (approximately 12 volts) present?

YES : Replace the ECM. Then confirm that the malfunction symptom is eliminated.

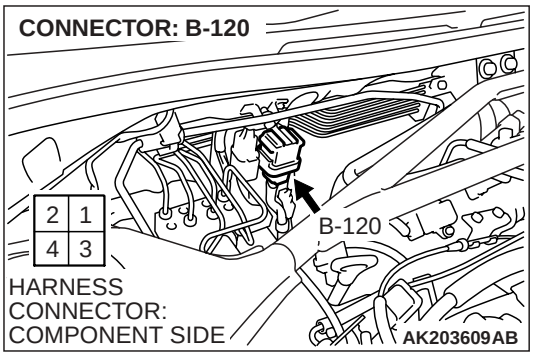
NO : Check harness connectors C-123 and C-214 at intermediate connector for damage, and repair or replace as required. Refer to, GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connectors are in good condition, repair harness wire between fuel pump relay 2 connector C-221 (terminal No. 2) and ECM connector C-121 (terminal No. 22) because of open circuit. Then confirm that the malfunction symptom is eliminated.

STEP 19. Check connector B-120 at fuel pump relay 3 for damage.

Q: Is the connector in good condition?

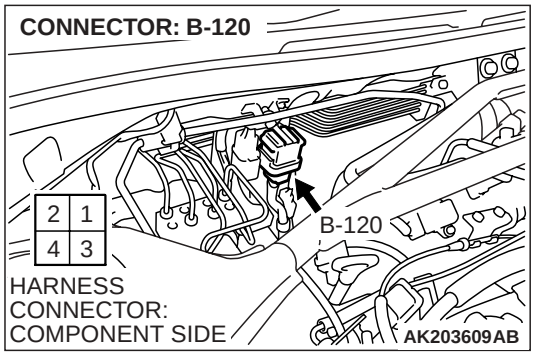
YES : Go to Step 20.

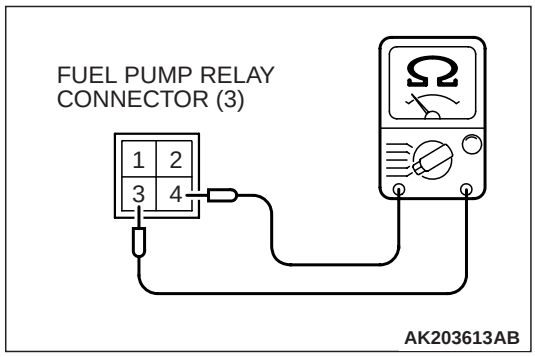
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.



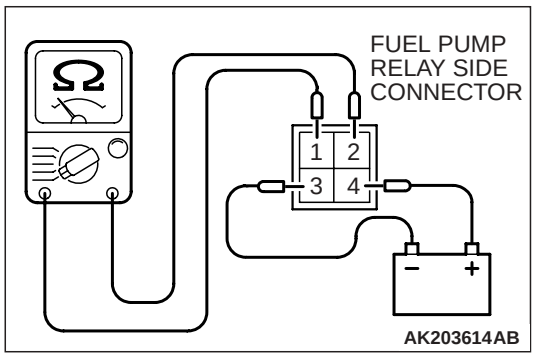
STEP 20. Check the fuel pump relay 3.

(1) Remove the fuel pump relay.





(2) Check for continuity between the fuel pump relay terminals No. 3 and No. 4.
- There should be continuity. (approximately 70 ohms)



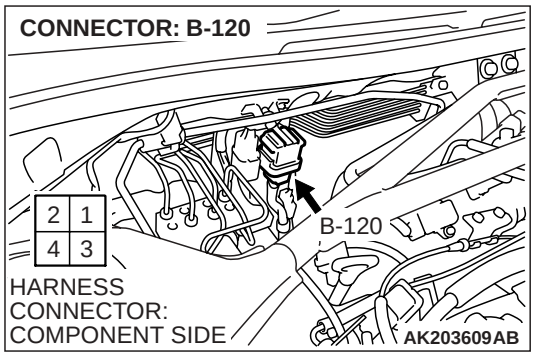
(3) Use jumper wires to connect fuel pump relay terminal No. 4 to the positive battery terminal and terminal No. 3 to the negative battery terminal.
(4) Check for continuity between the fuel pump relay terminals No. 1 and No. 2 while connecting and disconnecting the jumper wire at the negative battery terminal.
- Should be less than 2 ohms. (Negative battery terminal disconnected)
- Should be open loop. (Negative battery terminal connected)

(5) Install the fuel pump relay.

Q: Is the resistance normal?

YES : Go to Step 21.

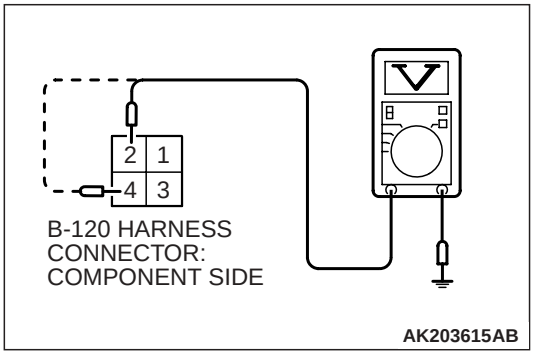
NO : Replace the fuel pump relay 3. Then confirm that the malfunction symptom is eliminated.



STEP 21. Measure the power supply voltage at fuel pump relay 3 harness side connector B-120.

(1) Disconnect the connector B-120 and measure at the harness side.

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



(3) Measure the voltage between terminals No. 2, No. 4 and ground.
- Voltage should measure battery positive voltage.

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

Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 22.

NO : Check harness connectors C-123 and C-214 at intermediate connector for damage, and repair or replace as required. Refer to, GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connectors are in good condition, repair harness wire between fuel pump relay 2 connector C-221 (terminal No. 4) and fuel pump relay 3 connector B-120 (terminals No. 2, No. 4) because of open circuit. Then confirm that the malfunction symptom is eliminated.

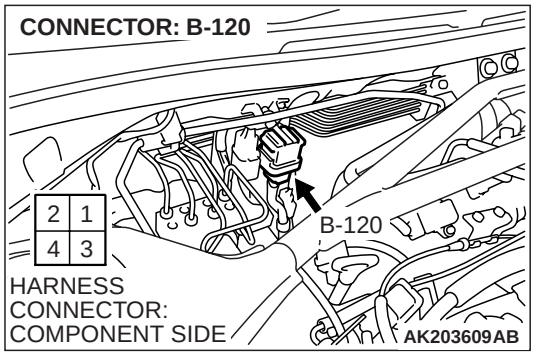
STEP 22. Check for open circuit and short circuit to ground and harness damage between fuel pump relay 3 connector B-120 (terminal No. 1) and fuel pump connector D-12 (terminal No. 5).

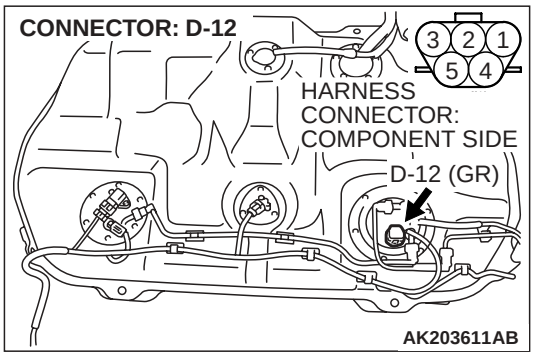
NOTE: Check harness after checking intermediate connectors C-123, C-113 and D-33. If intermediate connectors are damaged, repair or replace them. After to GROUP 00E, Harness Connector Inspection P.00E-2. Then check that the malfunction is eliminated.

Q: Is the harness wire in good condition?

YES : Go to Step 13.

NO : Repair it. Then confirm that the malfunction symptom is eliminated.



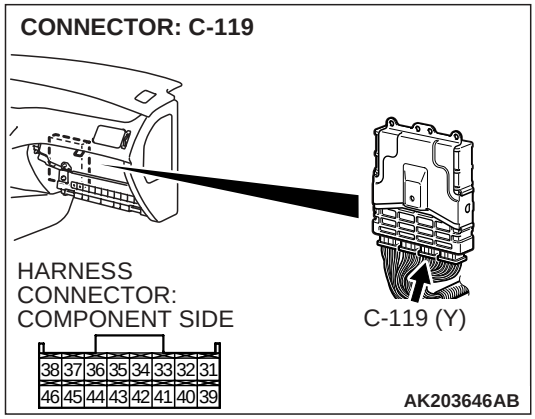


STEP 23. Check connector C-119 at ECM for damage.

Q: Is the connector in good condition?

YES : Go to Step 24.

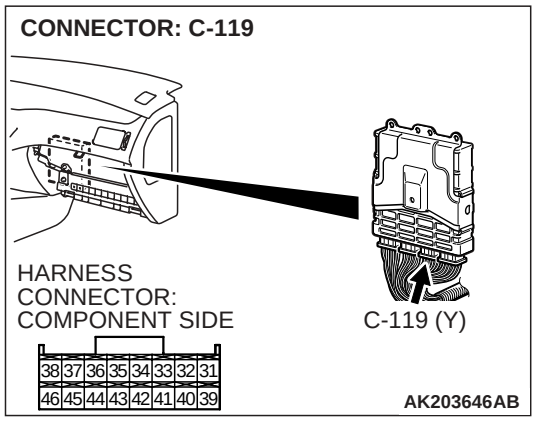
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.

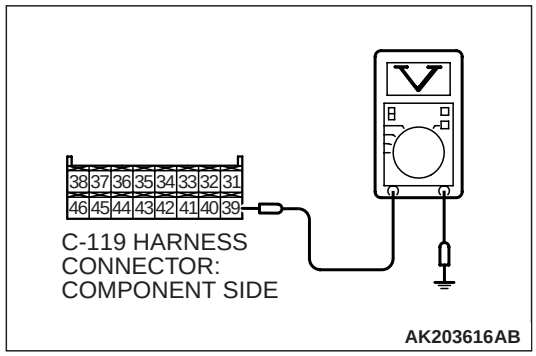


STEP 24. Measure the power supply voltage at ECM connector C-119.

(1) Disconnect the connector C-119 and measure at the harness side.

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





(3) Measure the voltage between terminal No. 39 and ground.
- Voltage should measure battery positive voltage.

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

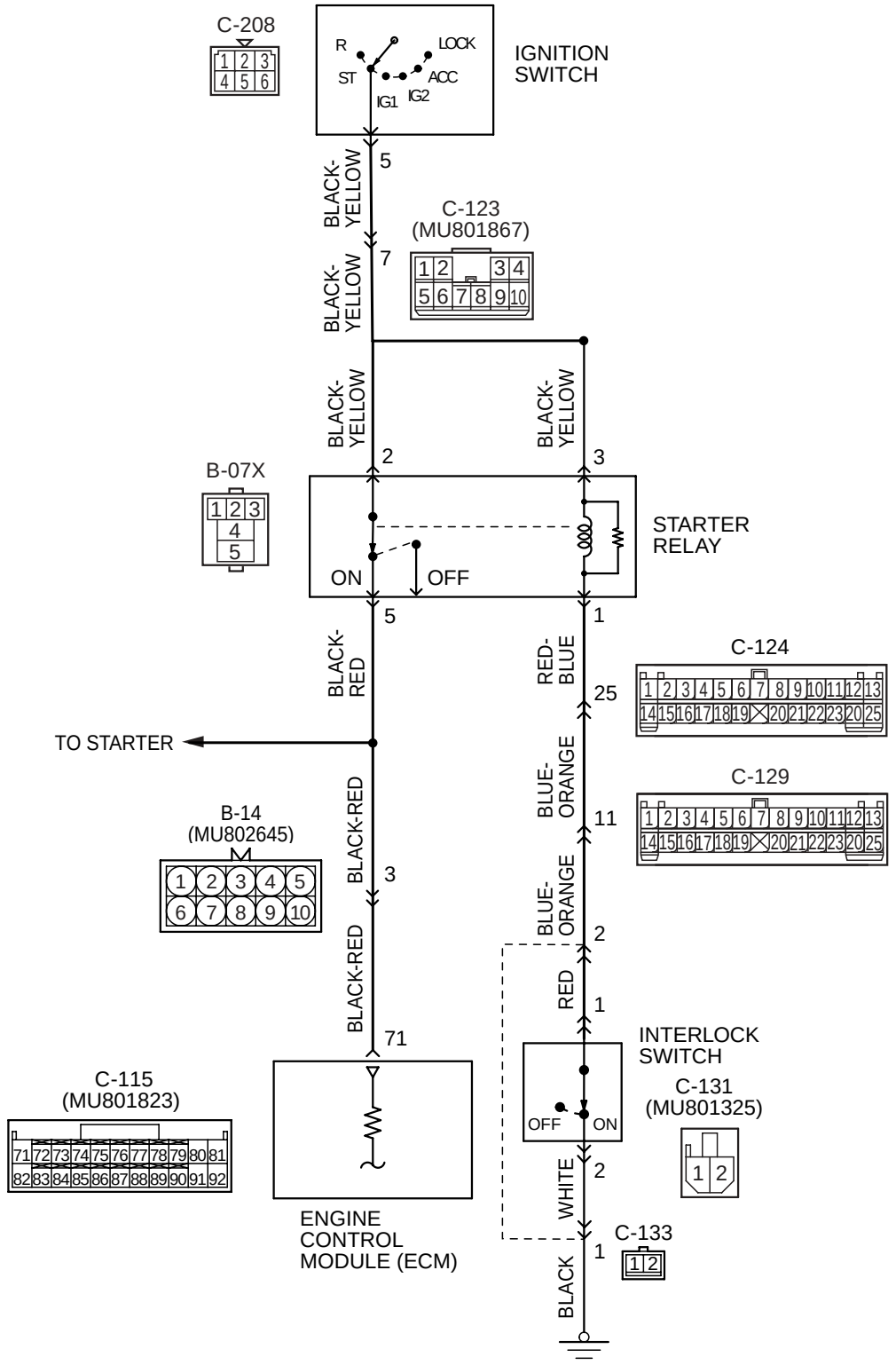
Q: Is battery positive voltage (approximately 12 volts) present?

YES : Replace the ECM. Then confirm that the malfunction symptom is eliminated.

NO : Repair harness wire between fuel pump relay 3 connector B-120 (terminal No. 3) and ECM connector C-119 (terminal No. 39) because of open circuit. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 32: IGNITION SWITCH-ST SYSTEM

Ignition Switch-ST Circuit



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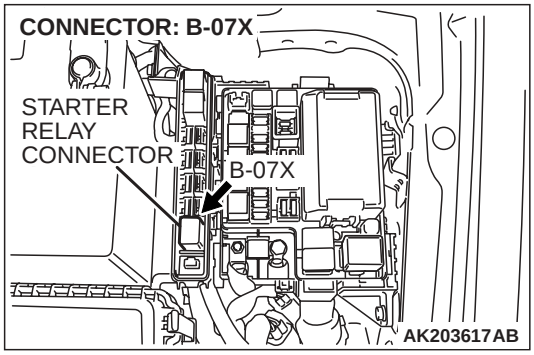
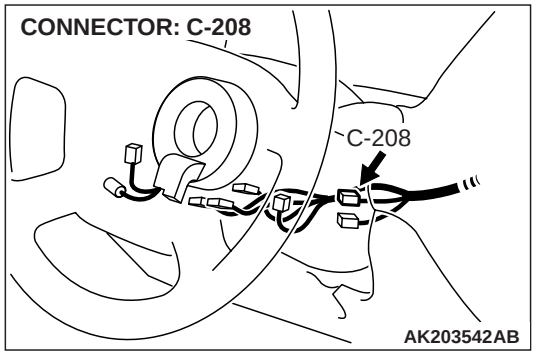
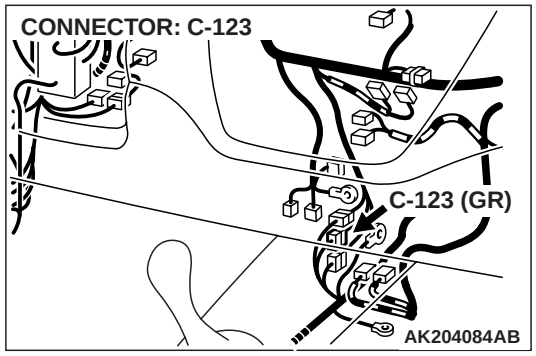
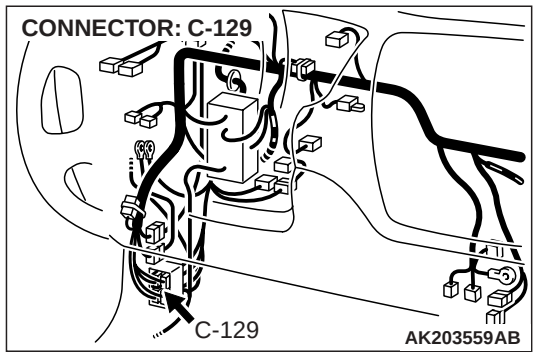
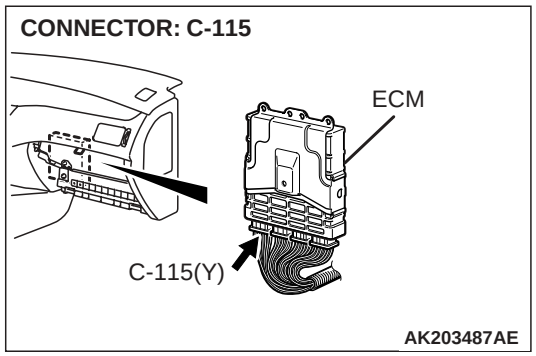
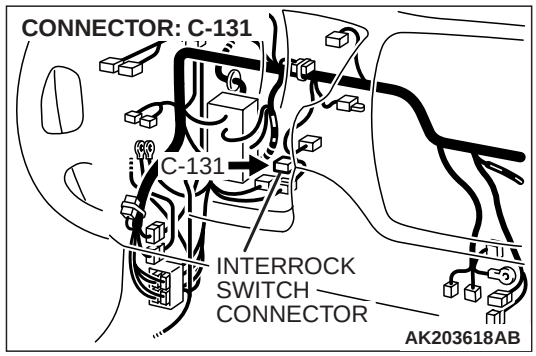

CONNECTOR: B-07X
STARTER
RELAY
CONNECTOR
B-07X
AK203617AB

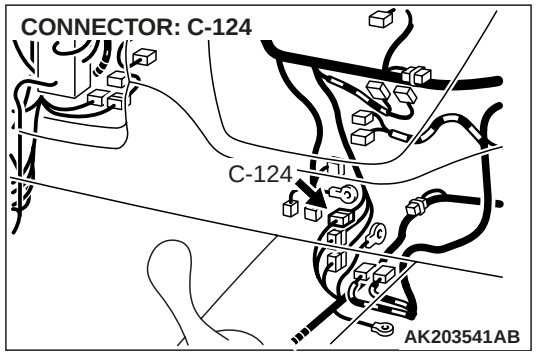

CONNECTOR: C-208
C-208
AK203542AB

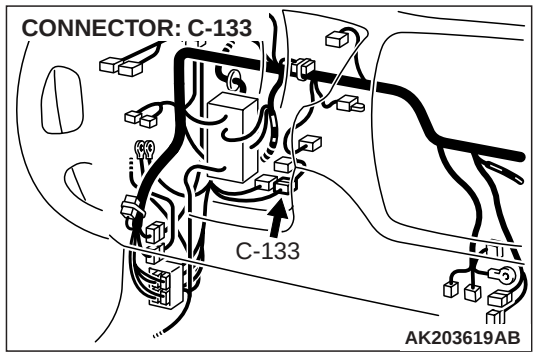

CONNECTOR: C-123
C-123 (GR)
AK204084AB

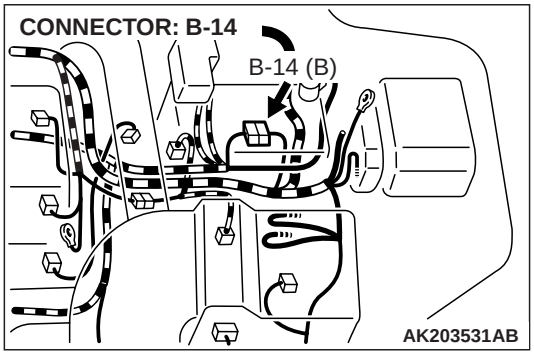

CONNECTOR: C-129
C-129
AK203559AB


CONNECTOR: C-115
ECM
C-115(Y)
AK203487AE


CONNECTOR: C-131
C-131
INTERROCK
SWITCH
CONNECTOR
AK203618AB


CONNECTOR: C-124
C-124
AK203541AB


CONNECTOR: C-133
C-133
AK203619AB


CONNECTOR: B-14
B-14 (B)
AK203531AB

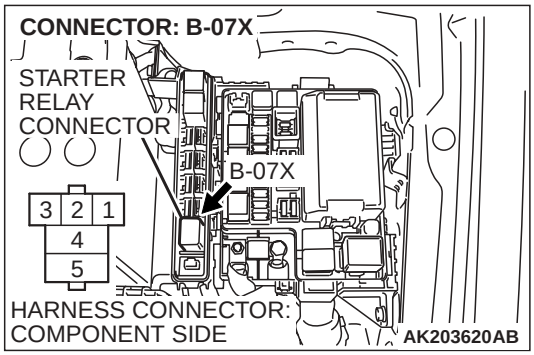
CIRCUIT OPERATION

- The battery positive voltage is supplied to the ECM (terminal No. 71) via the starter relay during engine cranking. With this, the ECM detects that the engine is being cranked.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Malfunction of the ignition switch.
- Malfunction of the starter relay.
- Improper connector contact, open circuit or short-circuited harness wire.
- Malfunction of the ECM.

DIAGNOSIS



STEP 1. Check connector B-07X at starter relay for damage.

Q: Is the connector in good condition?

YES : Go to Step 2.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.

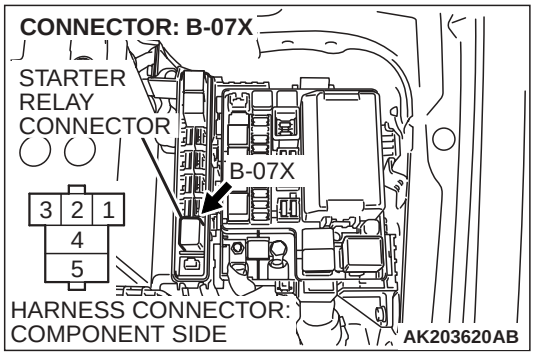
STEP 2. Check the starter relay.

Refer to GROUP 16, Starting system – On-vehicle Service – Starter relay check P.16-23

Q: Are there any abnormalities?

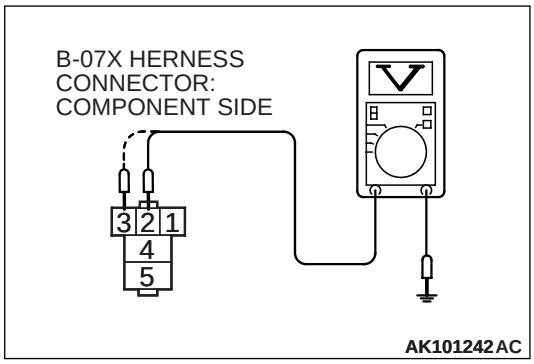
YES : Go to Step 3.

NO : Repair or replace it. Then confirm that the malfunction symptom is eliminated.



STEP 3. Measure the power supply voltage at starter relay connector B-07X.

(1) Disconnect the connector B-07X and measure at the harness side.
(2) Turn the ignition switch to the "START" position.



(3) Measure the voltage between terminals No. 2, No. 3 and ground.
- Voltage should measure battery positive voltage.

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

Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 4.

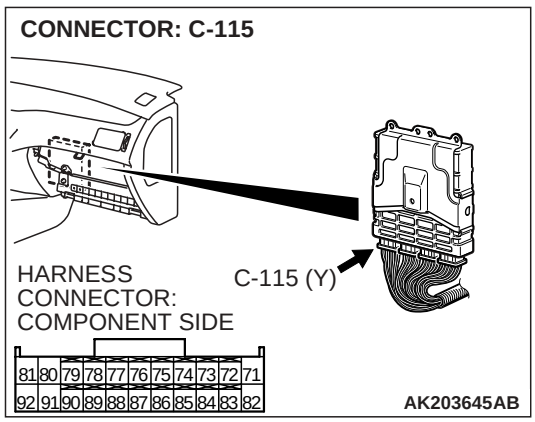
NO : Check connector C-123 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connector is in good condition, repair harness wire between ignition switch connector C-208 (terminal No. 5) and starter relay connector B-07X (terminals No. 2, No. 3) because of open circuit. Then confirm that the malfunction symptom is eliminated.

STEP 4. Check connector C-115 at ECM for damage.

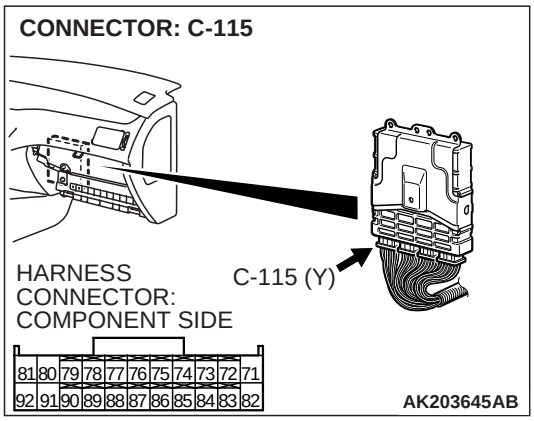
Q: Is the connector in good condition?

YES : Go to Step 5.

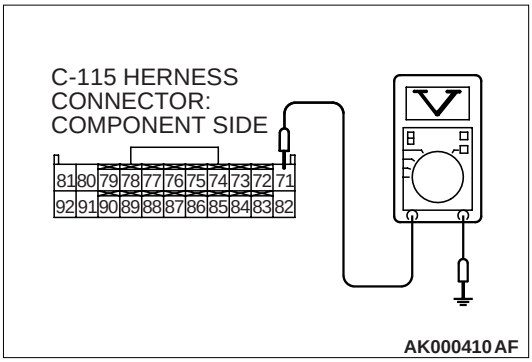
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.



STEP 5. Measure the power supply voltage at ECM connector C-115.



(1) Disconnect the connector C-115 and measure at the harness side.
(2) Turn the ignition switch to the "START" position.



(3) Measure the voltage between terminal No. 71 and ground.
- Voltage should measure battery positive voltage.

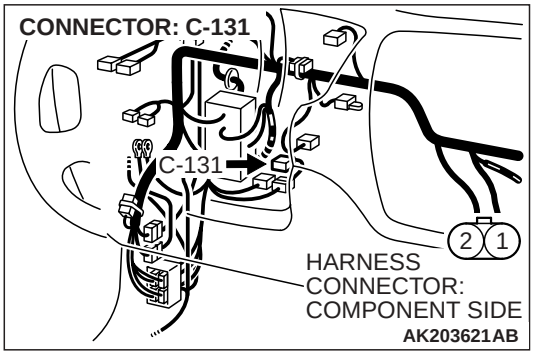
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 6.

NO : Check connector B-14 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connector is in good condition, repair harness wire between starter relay connector B-07X (terminal No. 5) and ECM connector C-115 (terminal No. 71) because of open circuit. Then confirm that the malfunction symptom is eliminated.

STEP 6. Check connector C-131 at interlock switch for damage.



Q: Is the connector in good condition?

YES : Go to Step 7.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.

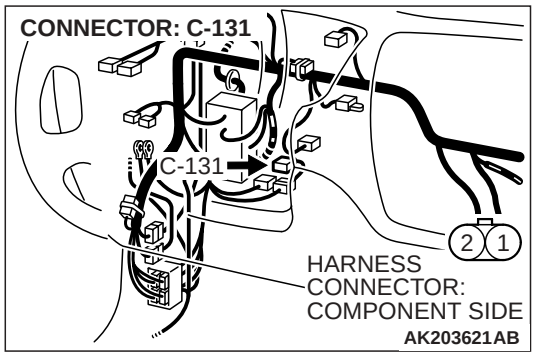
STEP 7. Check the interlock switch.

Refer to GROUP 21A, On-vehicle Service – Interlock switch check and adjustment P.21A-9

Q: Are there any abnormalities?

YES : Go to Step 8.

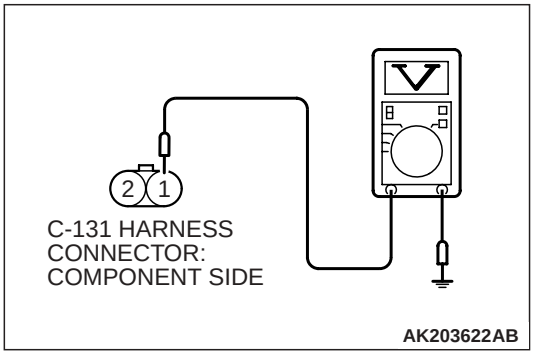
NO : Repair or replace it. Then confirm that the malfunction symptom is eliminated.



STEP 8. Measure the power supply voltage at interlock switch connector C-131.

(1) Disconnect the connector C-131 and measure at the harness side.

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



(3) Measure the voltage between terminal No. 1 and ground.
- Voltage should measure battery positive voltage.

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

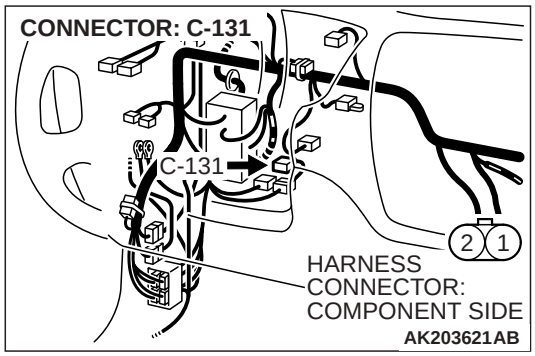
Q: Is battery positive voltage (approximately 12 volts) present?

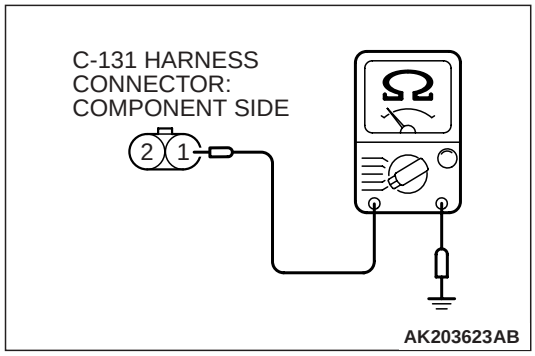
YES : Go to Step 9.

NO : Check connectors C-124, C-129 and C-133 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connectors are in good condition, repair harness wire between starter relay connector B-07X (terminal No. 1) and interlock switch connector C-131 (terminal No. 1) because of open circuit. Then confirm that the malfunction symptom is eliminated.

STEP 9. Check for continuity at interlock switch harness side connector C-131.

(1) Disconnect the connector C-131 and measure at the harness side.





(2) Check for the continuity between terminal No. 2 and ground.
- Should be less than 2 ohms.

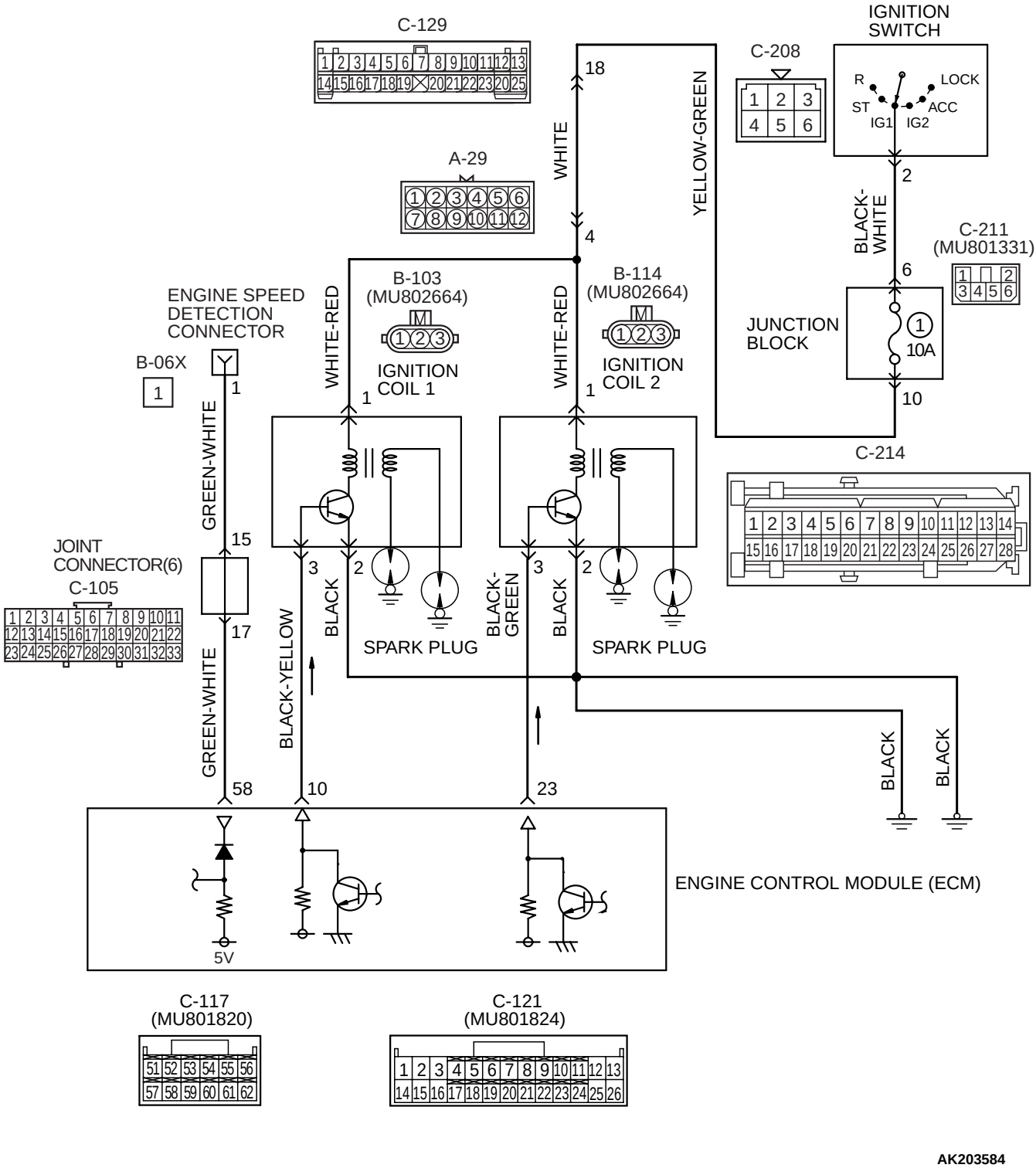
Q: Does continuity exist?

YES : Replace the ECM. Then confirm that the malfunction symptom is eliminated.

NO : Check connector C-133 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connector is in good condition, repair harness wire between interlock switch connector C-131 (terminal No. 2) and ground because of open circuit or harness damage. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 33: IGNITION CIRCUIT SYSTEM

Ignition Circuit



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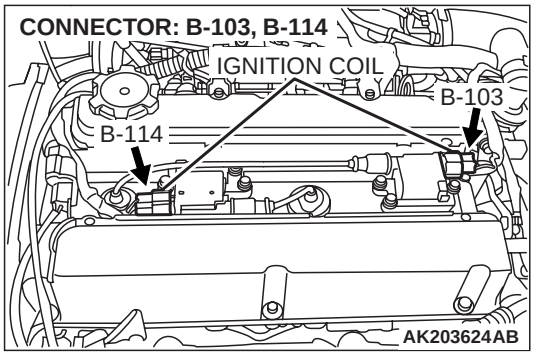
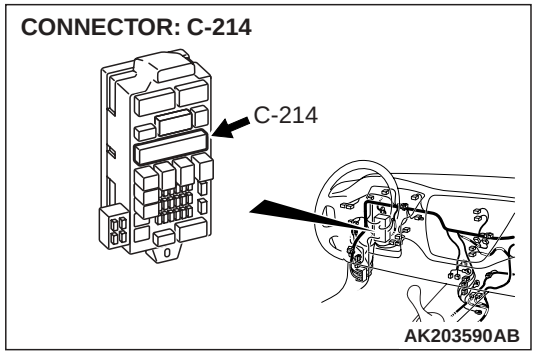
TSB Revision

CONNECTOR: B-103, B-114



CONNECTOR: C-214



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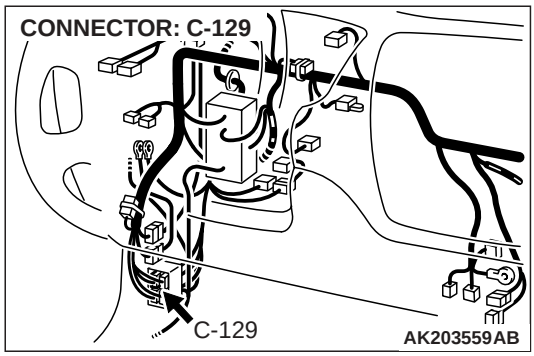

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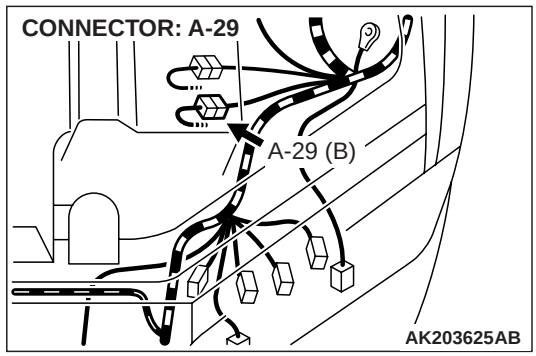
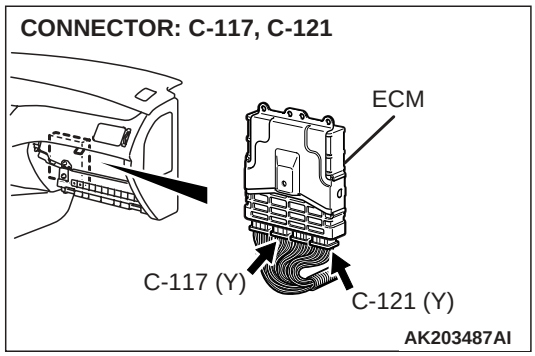
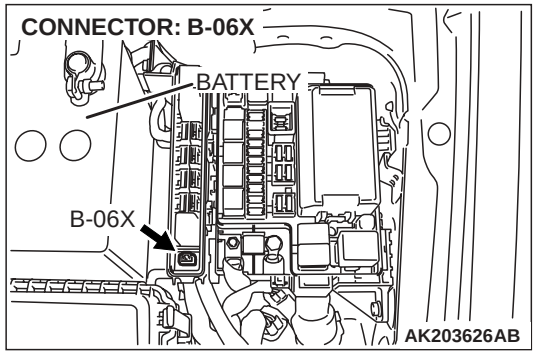


CONNECTOR: C-117, C-121



CONNECTOR: B-06X



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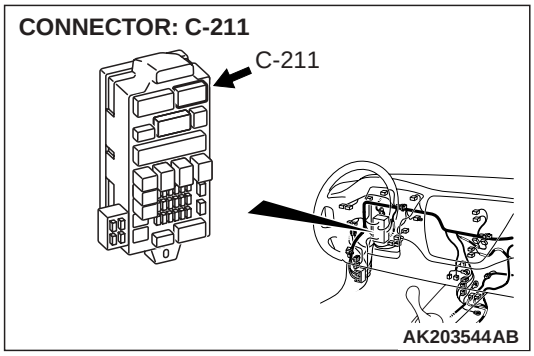

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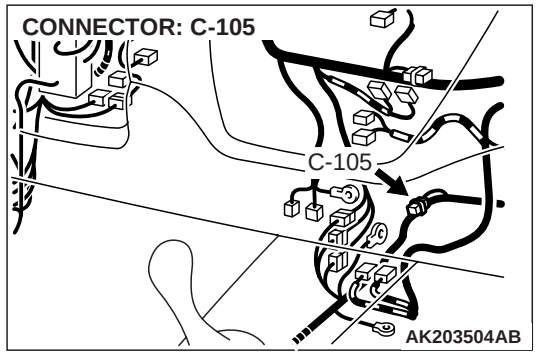
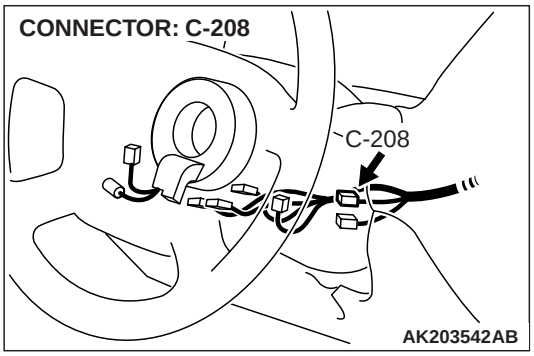


CONNECTOR: C-208



TSB Revision

CIRCUIT OPERATION

- The ignition coil is energized by Battery positive voltage from the ignition switch.
- When the ECM turns off its internal power transistor, battery positive voltage is applied to the ignition power transistor (terminal No. 3) inside the ignition coil, causing the ignition power transistor to be turned on.
- If the ignition power transistor is turned on, the primary circuit of the ignition coil is energized by grounding the ignition coil through terminal No. 2, causing the primary current to flow to the ignition coil.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Malfunction of the ignition coil.
- Malfunction of the ignition power transistor.
- Improper connector contact, open circuit or short-circuited harness wire.
- Malfunction of the ECM.

DIAGNOSIS

STEP 1. Check the ignition coil.

Refer to GROUP 16, Ignition System – On-vehicle service – Ignition Coil Check P.16-33.

Q: Are there any abnormalities?

YES : Go to Step 2.

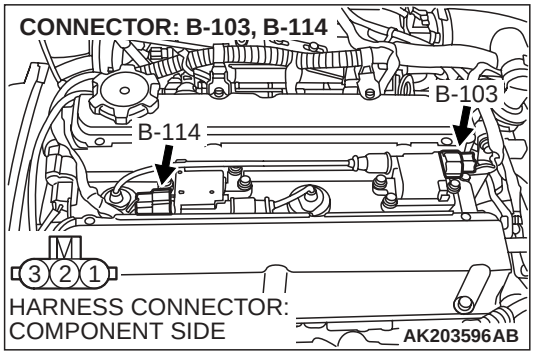
NO : Replace the ignition coil. Then confirm that the malfunction symptom is eliminated.

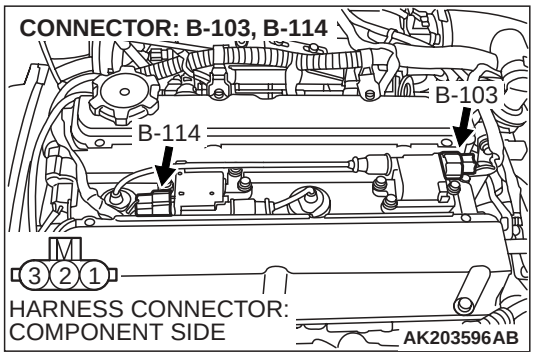
STEP 2. Check harness connectors B-103, B-114 at ignition coil for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 3.

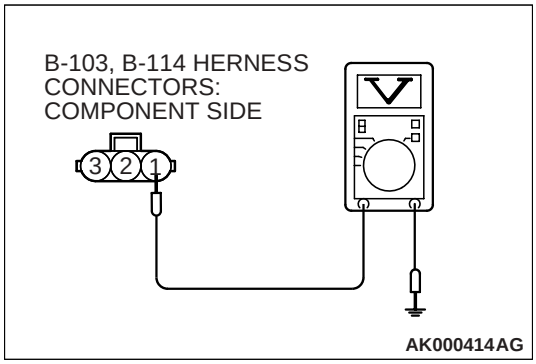
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.





STEP 3. Measure the power supply voltage at ignition coil connectors B-103, B-114.

(1) Disconnect the connectors B-103, B-114 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.



(3) Measure the voltage between terminal No. 1 and ground.
- Voltage should measure battery positive voltage.

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

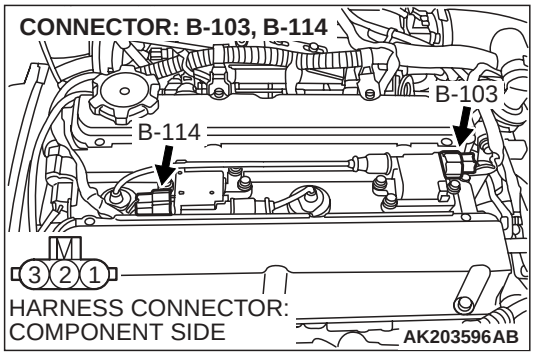
Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 4.

NO : Check the connectors A-29, C-129, C-211 and C-214 at intermediate connectors for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connector are in good condition, repair harness wire between ignition switch connector C-208 (terminal No. 2) and ignition coil connectors B-103, B-114 (terminal No. 1) because of open circuit. Then confirm that the malfunction symptom is eliminated.

STEP 4. Check the circuit at ignition coil harness side connectors B-103, B-114.

(1) Disconnect the connectors B-103, B-114 and measure at the harness side.
(2) Engine cranking.



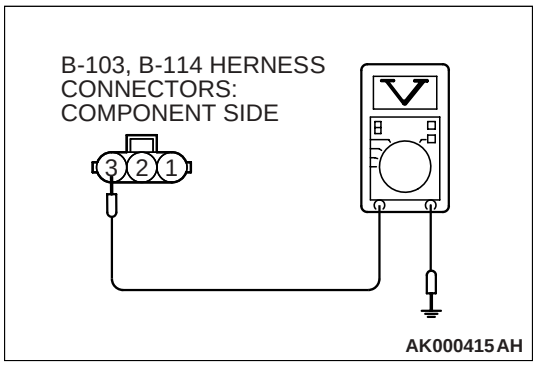
(3) Measure the voltage between terminal No. 3 and ground.
- Voltage should measure 0.3 and 3.0 volts.

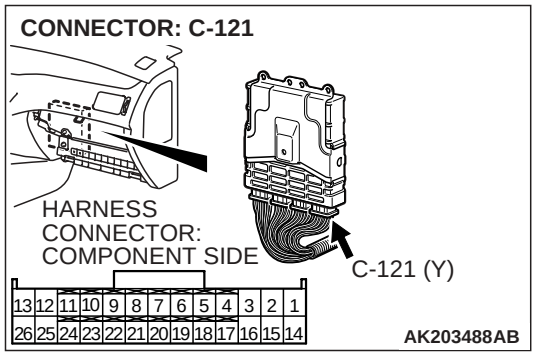
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage between 0.3 and 3.0 volts?

YES : Go to Step 7.

NO : Go to Step 5.



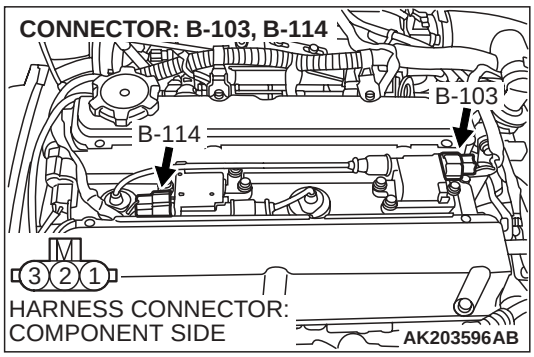


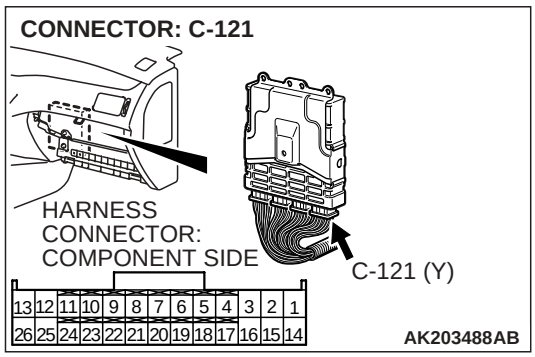
STEP 5. Check connector C-121 at ECM for damage.

Q: Is the connector in good condition?

YES : Go to Step 6.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.





STEP 6. Check for open circuit and short circuit to ground between ignition coil connector and ECM connector.

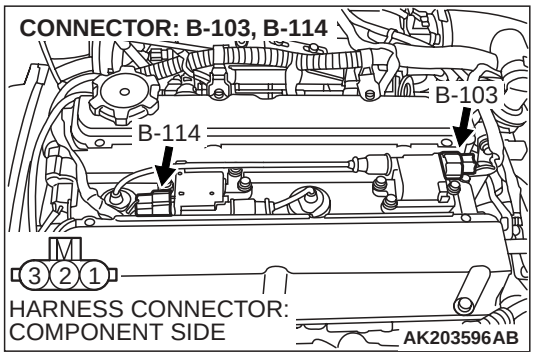
a. Check the harness wire between ignition coil connector B-103 (terminal No. 3) and ECM connector C-121 (terminal No. 10) at ignition coil 1.

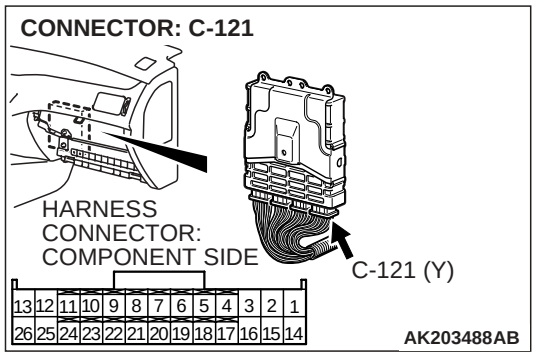
b. Check the harness wire between ignition coil connector B-114 (terminal No. 3) and ECM connector C-121 (terminal No. 23) at ignition coil 2.

Q: Is the harness wire in good condition?

YES : Replace the ECM. Then confirm that the malfunction symptom is eliminated.

NO : Repair it. Then confirm that the malfunction symptom is eliminated.





STEP 7. Check for harness damage between ignition coil connector and ECM connector.

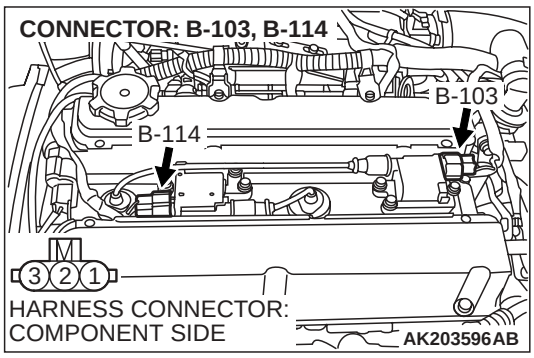
a. Check the harness wire between ignition coil connector B-103 (terminal No. 3) and ECM connector C-121 (terminal No. 10) at ignition coil 1.

b. Check the harness wire between ignition coil connector B-114 (terminal No. 3) and ECM connector C-121 (terminal No. 23) at ignition coil 2.

Q: Is the harness wire in good condition?

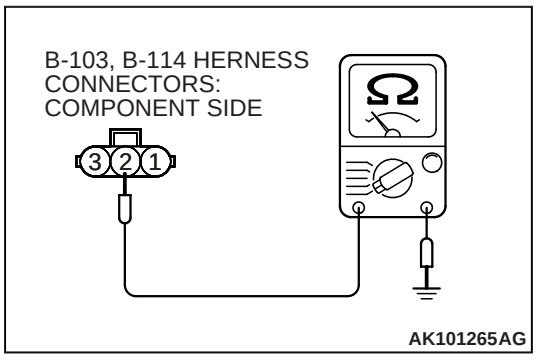
YES : Go to Step 8.

NO : Repair it. Then confirm that the malfunction symptom is eliminated.



STEP 8. Check for continuity at ignition coil harness side connectors B-103, B-114.

(1) Disconnect the connectors B-103, B-114 and measure at the harness side.



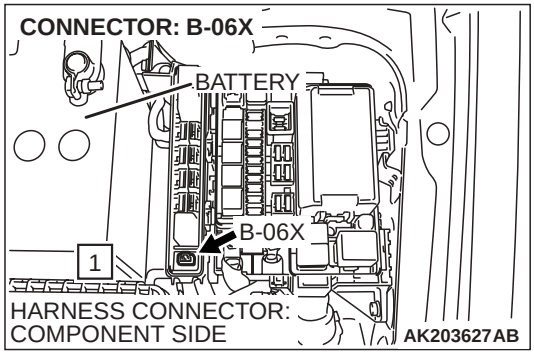
(2) Check for continuity between terminal No. 2 and ground.

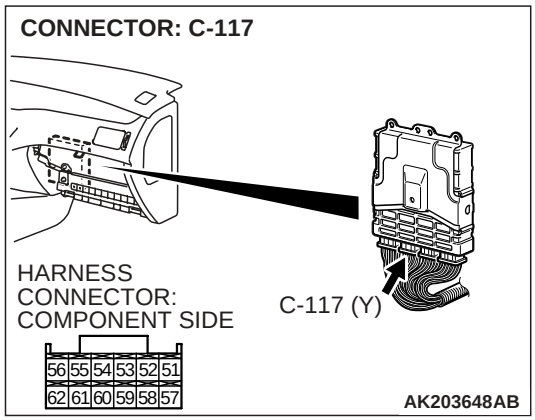
- Should be less than 2 ohms.

Q: Does continuity exist?

YES : Go to Step 9.

NO : Repair harness wire between ignition coil connectors B-103, B-114 (terminal No. 2) and ground because of open circuit or harness damage. Then confirm that the malfunction symptom is eliminated.



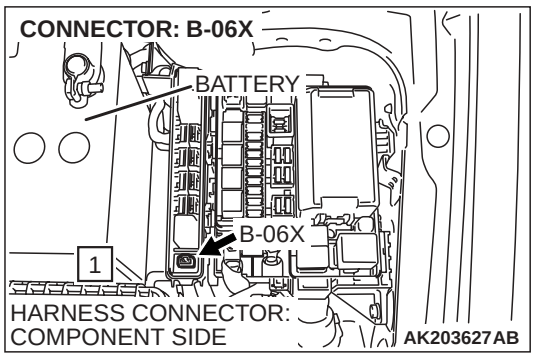


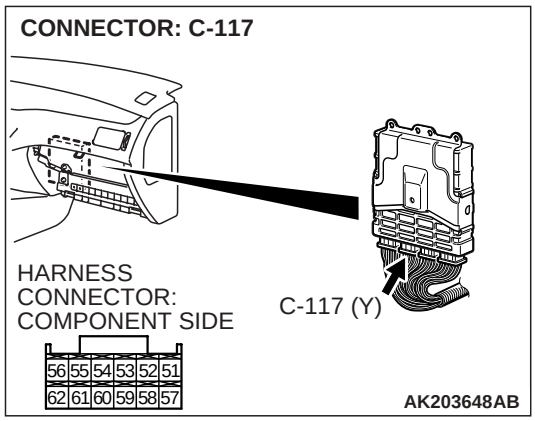
STEP 9. Check connector B-06X at engine speed detection and connector C-117 at ECM.

Q: Is the connector in good condition?

YES : Go to Step 10.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.





STEP 10. Check for open circuit and short circuit to ground and harness damage between engine speed detection connector B-06X and ECM connector C-117 (terminal No. 58).

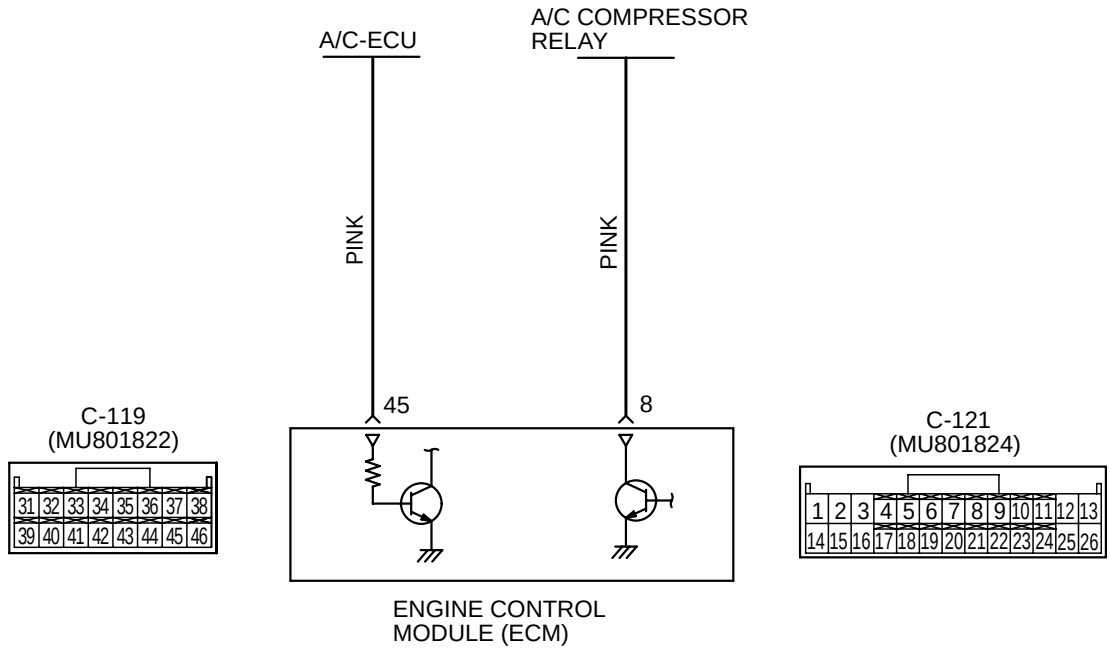
Q: Is the harness wire in good condition?

YES : Check the connector C-105 at intermediate connectors for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connector is in good condition, replace the ECM. Then confirm that the malfunction symptom is eliminated.

NO : Repair it. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 34: A/C SYSTEM

A/C Circuit



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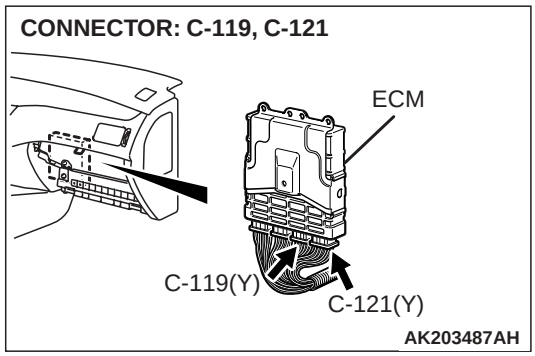


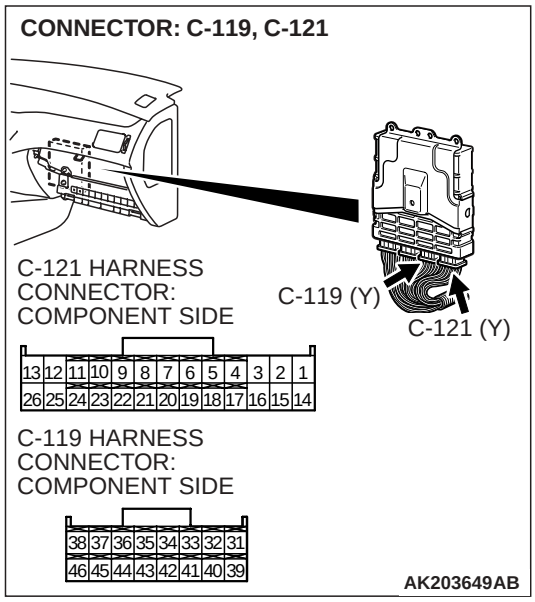
COMMENT

- When the A/C is "ON", the battery positive voltage is applied on the ECM (terminal No. 45) from the automatic compressor controller.
  When battery positive voltage is applied to the ECM, the ECM turns "ON" the power transistor in the ECM. The ECM delays A/C engagement momentarily while it increases idle r/min. Then the A/C compressor clutch relay coil will be energized.
  With this, the A/C compressor clutch relay turns "ON", and the A/C compressor clutch operates.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Malfunction of the A/C control system.
- Malfunction of the A/C switch.
- Improper connector contact, open circuit or short-circuited harness wire.
- Malfunction of the ECM.

DIAGNOSIS

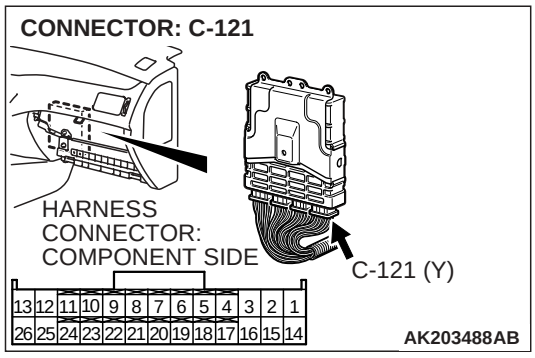


STEP 1. Check connector C-119, C-121 at ECM for damage.

Q: Is the connector in good condition?

YES : Go to Step 2.

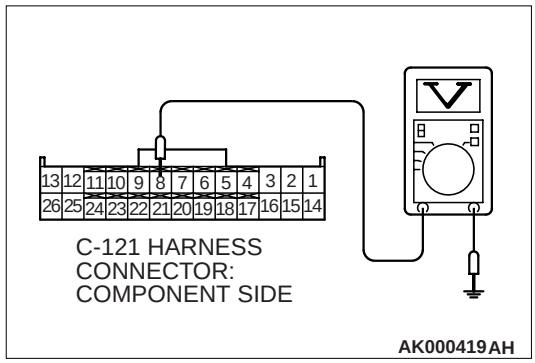
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.



STEP 2. Check the circuit at ECM connector C-121.

(1) Disconnect the connectors C-121 and measure at the harness side.

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



(3) Measure the voltage between terminal No. 8 and ground.
- Voltage should measure battery positive voltage.

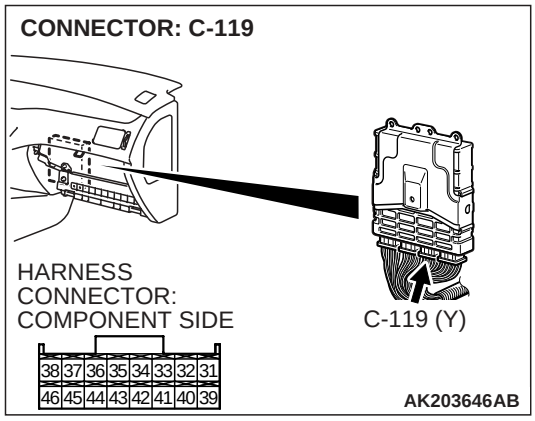
(4) Using a jumper wire, connect terminal No. 8 to ground.
- A/C compressor relay should turn "ON".

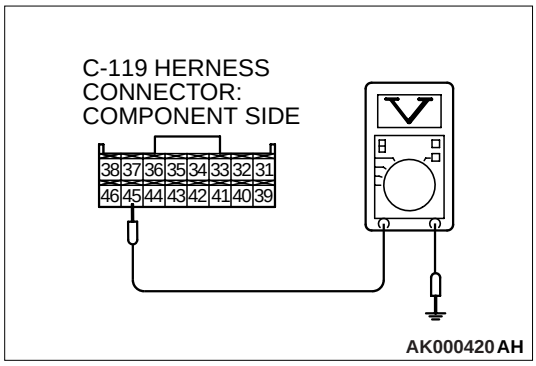
(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage and A/C compressor relay condition normal?

YES : Go to Step 3.

NO : Refer to GROUP 55A, Heater, Air Conditioning And Ventilation – Manual A/C Diagnosis – Symptom Chart P.55-5.





STEP 3. Check the circuit at ECM connector C-119.

(1) Disconnect the connectors C-119 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No. 45 and ground.
- Voltage should measure 1 volt or less when the A/C switch is "OFF".
- Voltage should measure battery positive voltage when the A/C switch is "ON".

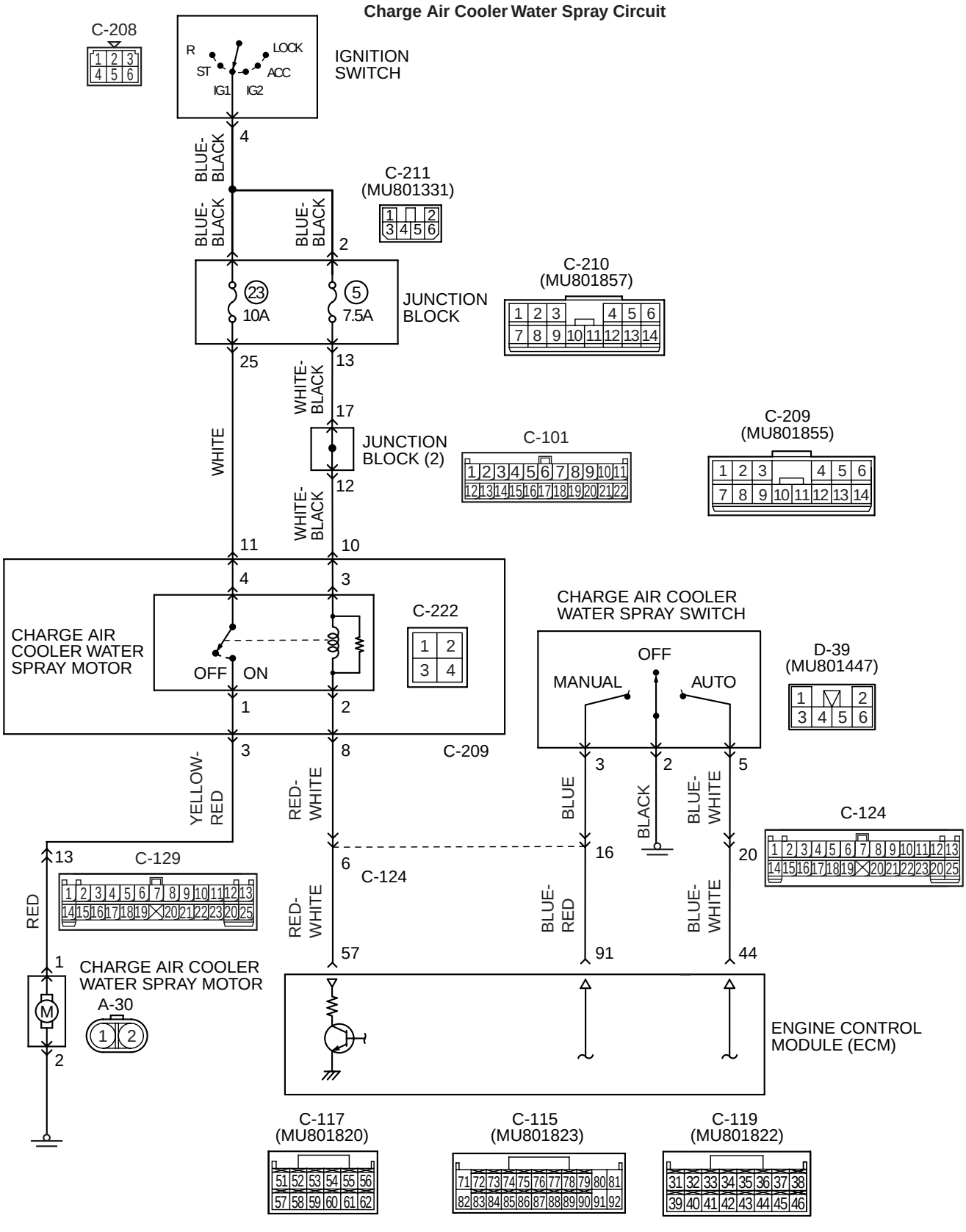
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage within the specified range?

YES : Replace the ECM. Then confirm that the malfunction symptom is eliminated.

NO : Refer to GROUP 55A, Heater, Air Conditioning And Ventilation – Manual A/C Diagnosis – Symptom Chart P.55-5.

INSPECTION PROCEDURE 35: CHARGE AIR COOLER WATER SPRAY SYSTEM



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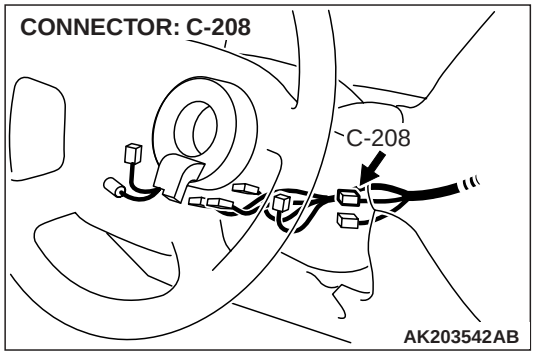
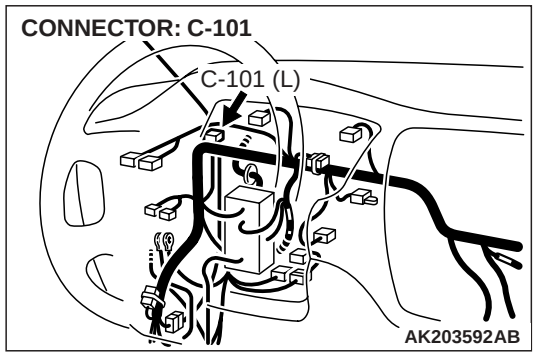
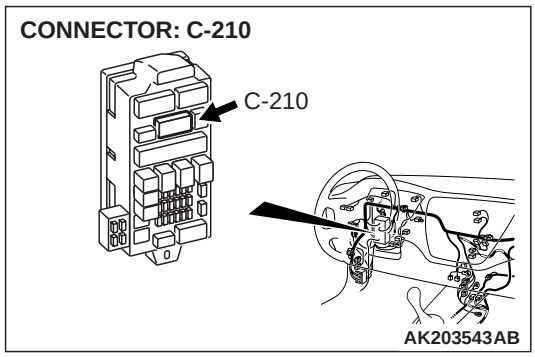
CONNECTOR: C-208



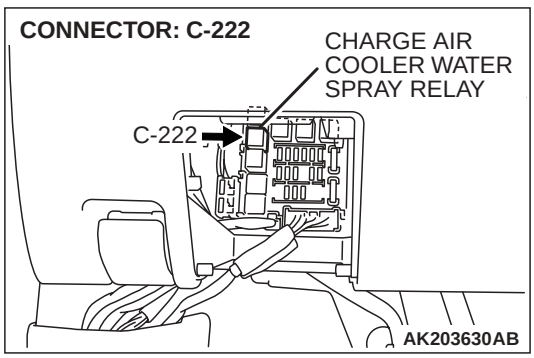
CONNECTOR: C-101



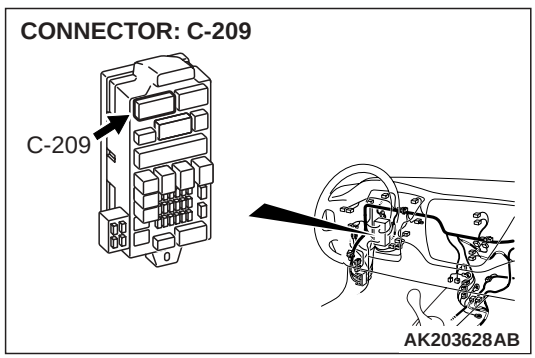
CONNECTOR: C-210



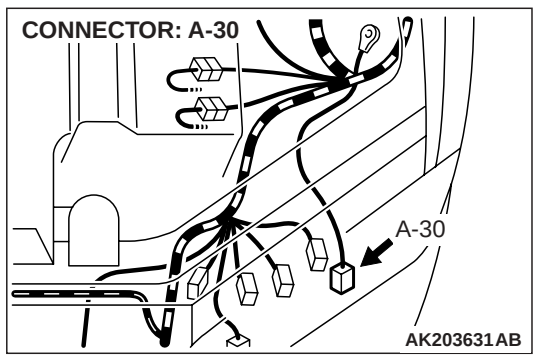
CONNECTOR: C-222



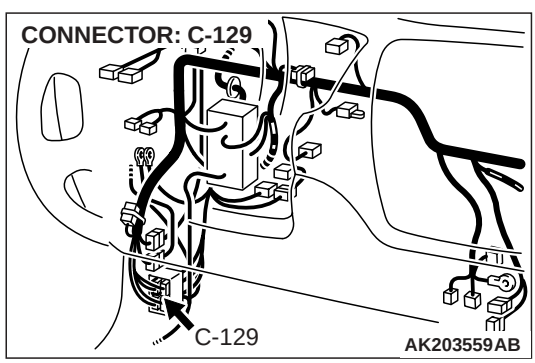
CONNECTOR: C-209



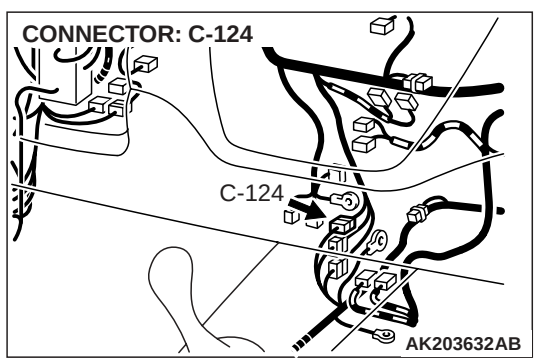
CONNECTOR: A-30



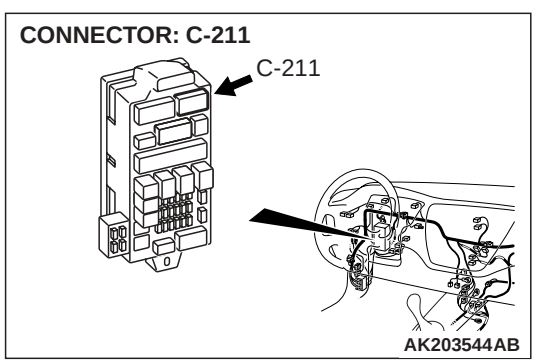
CONNECTOR: C-129



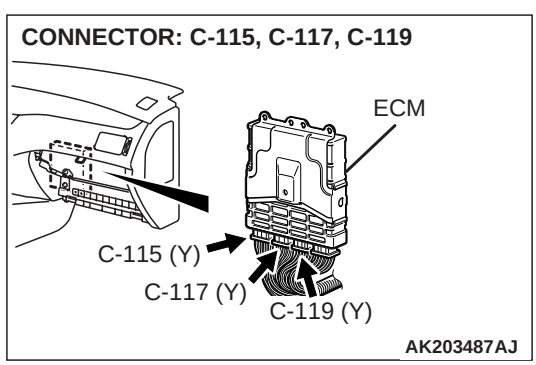
CONNECTOR: C-124



CONNECTOR: C-211



CONNECTOR: C-115, C-117, C-119



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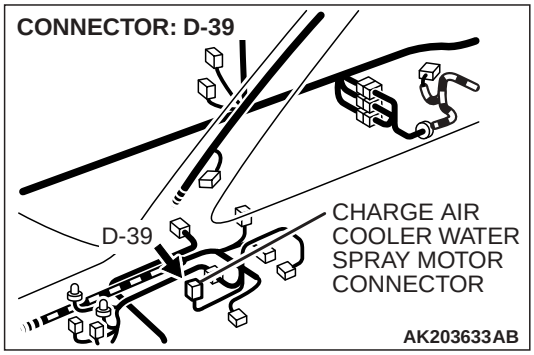


CIRCUIT OPERATION

- A battery positive voltage is applied to the charge air cooler water spray switch (MANUAL) output terminal (terminal No. 3) from the ECM (terminal No. 91) via the resistor in the ECM.
- A battery positive voltage is applied to the charge air cooler water spray switch (AUTO) output terminal (terminal No. 5) from the ECM (terminal No. 44) via the resistor in the ECM.
- A battery positive voltage is applied on the charge air cooler water spray relay (terminal 1, 3) from ignition switch-IG2.
- While the manual switch of the charge air cooler water spray switch turned ON or the engine is operating with a high load with the auto switch of the charge air cooler water spray switch turned ON, the PCM turns ON the power transistor in the ECM to ground the charge air cooler water spray relay coil. Consequently, the charge air cooler water spray relay turns ON and the charge air cooler water spray relay (terminal No. 2) supplies the battery positive voltage to the charge air cooler water spray motor.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Malfunction of charge air cooler water spray switch.
- Malfunction of charge air cooler water spray relay.
- Malfunction of charge air cooler water spray motor.
- Improper connector contact, open or short-circuited harness wire.
- Malfunction of the ECM.

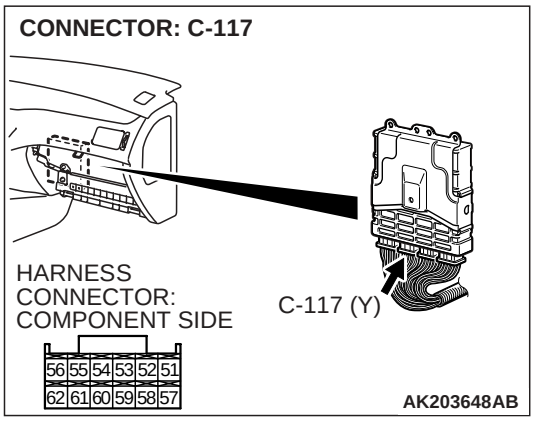
DIAGNOSIS

STEP 1. Check the operation of the charge air cooler water spray motor.

(1) Turn the ignition switch to the "ON" position.
(2) Turn ON the manual switch of the charge air cooler water spray switch.
  - An operation sound of the charge air cooler water spray motor should be heard.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the charge air cooler water spray motor operating properly?

YES : Go to Step 4.
NO : Go to Step 2.

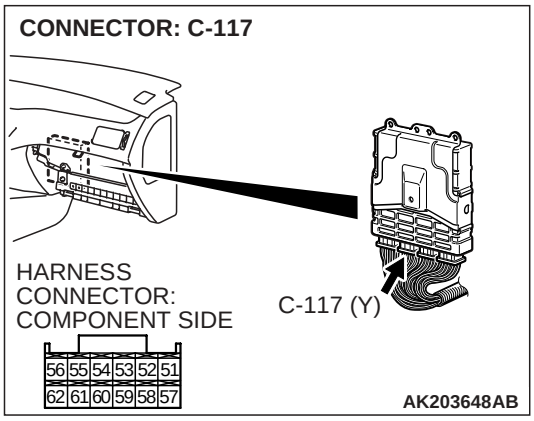


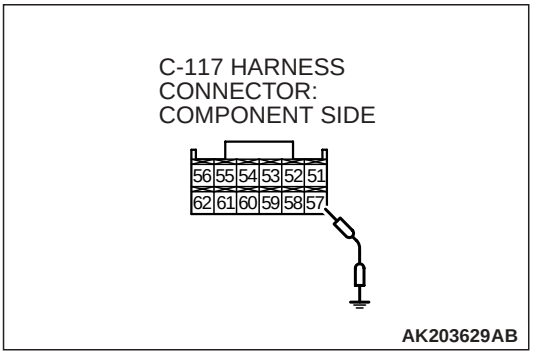
STEP 2. Check harness connector C-117 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 3.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.





STEP 3. Check the operation of the charge air cooler water spray motor.

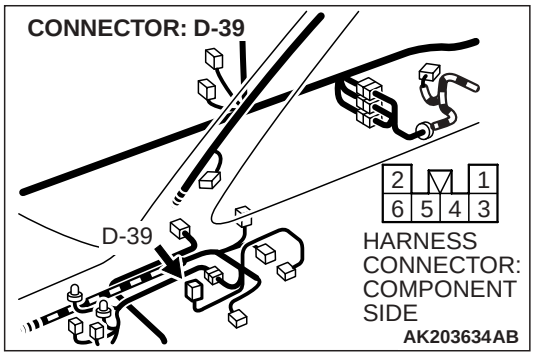
(1) Disconnect ECM connector C-117.
(2) Using the jumper wire, connect terminal No. 57 to ground.
(3) Turn the ignition switch to the "ON" position.
- An operation sound of the charge air cooler water spray motor should be heard.

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

Q: Is the charge air cooler water spray motor operating properly?

YES : Go to Step 10.

NO : Go to Step 16.

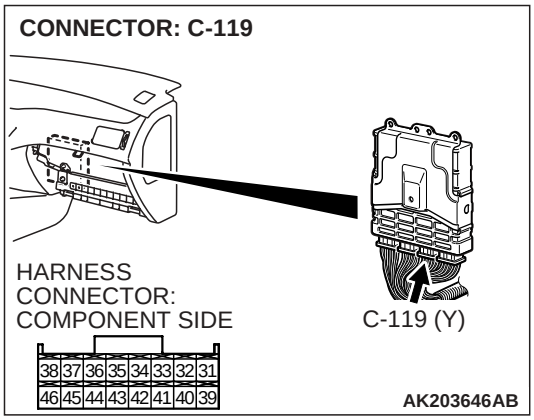


STEP 4. Check connector D-39 at charge air cooler water spray switch for damage.

Q: Is the connector in good condition?

YES : Go to Step 5.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.

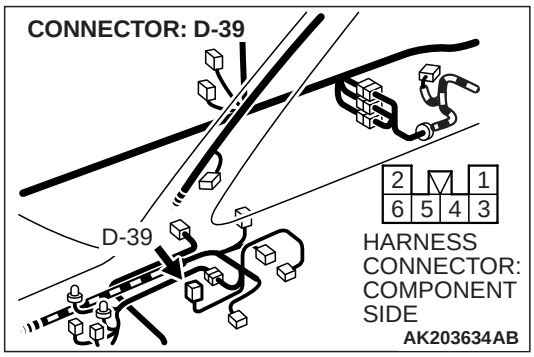


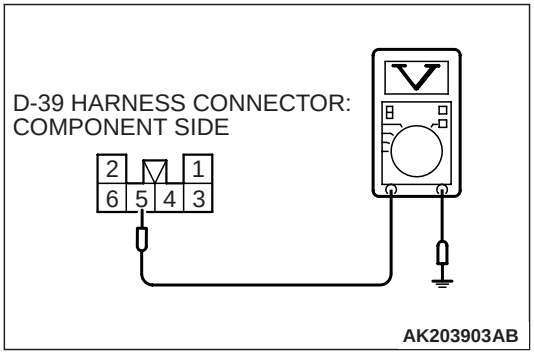
STEP 5. Check harness connector C-119 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 6.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.





STEP 6. Measure the power supply voltage at charge air cooler water spray switch harness side connector D-39.

(1) Disconnect the connector D-39 and measure the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No. 5 and ground.
- Voltage should be battery positive voltage.

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

Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 7.

NO : Go to Step 9.

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STEP 7. Charge air cooler water spray switch check.
Refer to GROUP 15, Charge Air Cooler Water Spray P.15-12.

Q: Is the charge air cooler water spray switch normal?

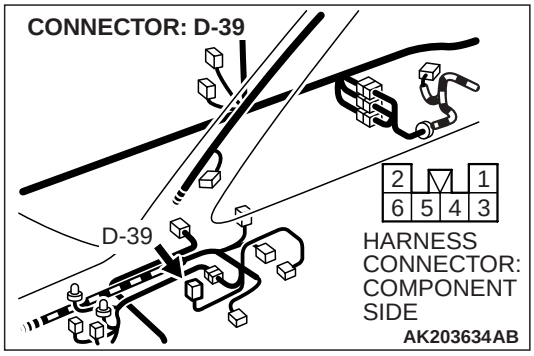
YES : Go to Step 8.
NO : Replace the charge air cooler water spray switch. Then confirm that the malfunction symptom is eliminated.

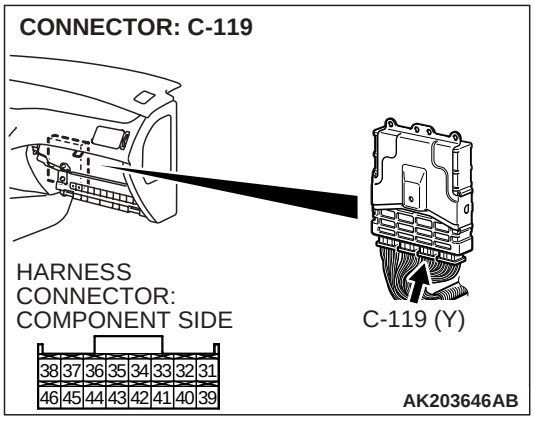
STEP 8. Check for harness damage between charge air cooler water spray switch connector D-39 (terminal No. 5) and ECM connector C-119 (terminal No. 44).

NOTE: Check harness after checking intermediate connector C-124. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.

Q: Is the harness wire in good condition?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting / Inspection Service Points P.00-6.
NO : Repair it. Then confirm that the malfunction symptom is eliminated.



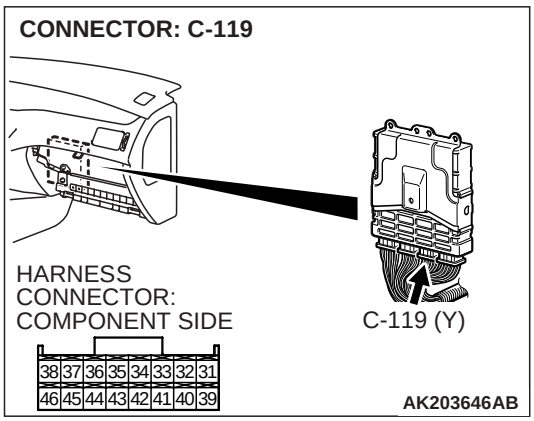


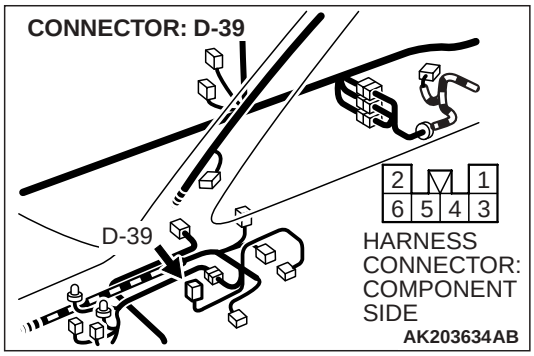
STEP 9. Check for open circuit and short circuit to ground and harness damage between charge air cooler water spray switch connector D-39 (terminal No. 5) and ECM connector C-119 (terminal No. 44).

NOTE: Check harness after checking intermediate connector C-124. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.

Q: Is the harness wire in good condition?

YES : Replace the ECM.
NO : Repair it. Then confirm that the malfunction symptom is eliminated.



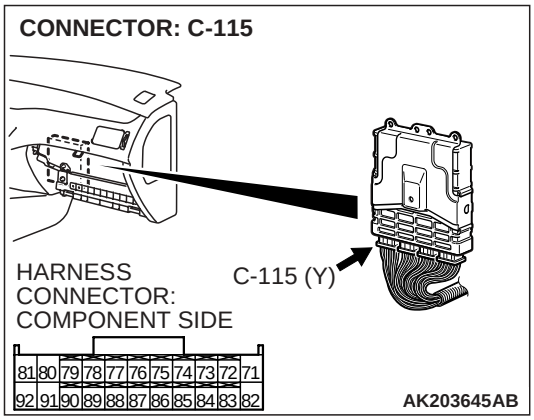


STEP 10. Check connector D-39 at charge air cooler water spray switch for damage.

Q: Is the connector in good condition?

YES : Go to Step 11.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.

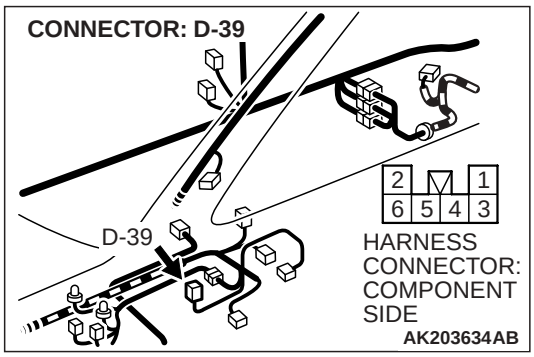


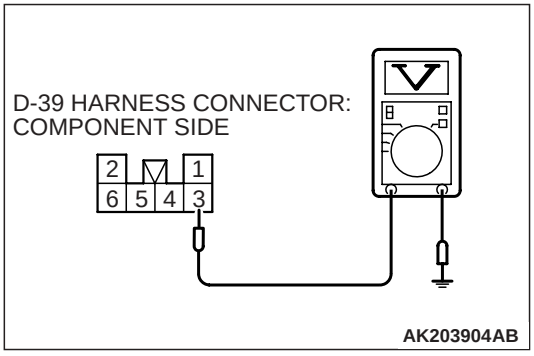
STEP 11. Check harness connector C-115 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 12.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.





STEP 12. Measure the power supply voltage at charge air cooler water spray switch harness side connector D-39.

(1) Disconnect the connector D-39 and measure the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 3 and ground.
- Voltage should be battery positive voltage.

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

Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 13.

NO : Go to Step 15.

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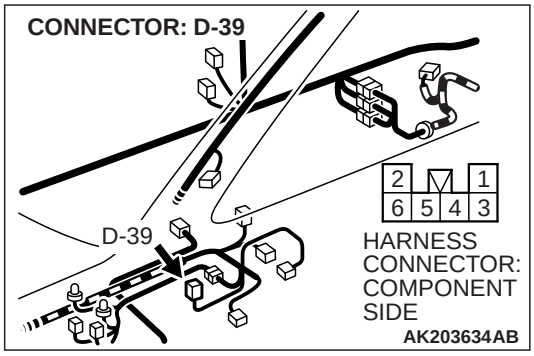
STEP 13. Charge air cooler water spray switch check.
Refer to GROUP 15, Charge Air Cooler Water Spray P.15-12.

Q: Is the charge air cooler water spray switch normal?

YES : Go to Step 14.
NO : Replace the charge air cooler water spray switch. Then confirm that the malfunction symptom is eliminated.

STEP 14. Check for open circuit and harness damage between charge air cooler water spray switch connector D-39 (terminal No. 2) and ground.

Q: Is the harness wire in good condition?

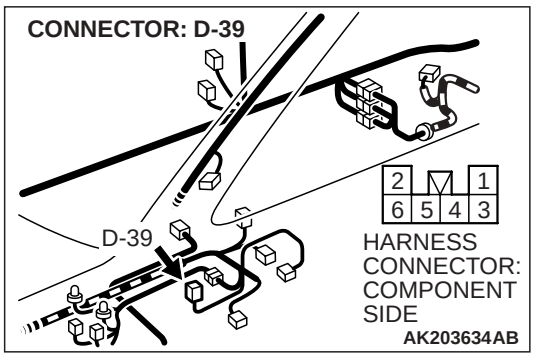


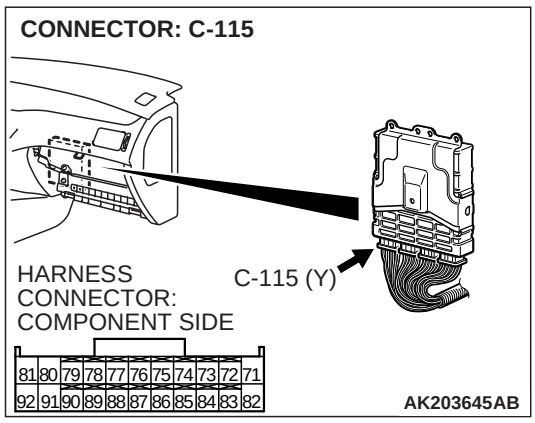
YES : Check harness connector C-124 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.If intermediate connector C-124 is in good condition, repair harness wire between charge air cooler water spray switch connector D-39 terminal No. 3 and ECM connector C-115 terminal No. 91 because of harness damage. Then confirm that the malfunction symptom is eliminated.
NO : Repair it. Then confirm that the malfunction symptom is eliminated.

STEP 15. Check for open circuit and short circuit to ground and harness damage between charge air cooler water spray switch connector D-39 (terminal No. 3) and ECM connector C-115 (terminal No. 91).

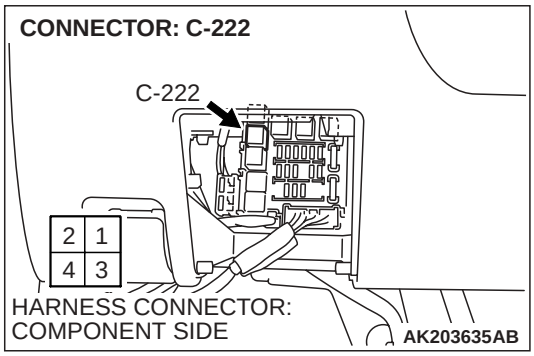
NOTE: Check harness after checking intermediate connector C-124. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.

Q: Is the harness wire in good condition?





YES : Replace the ECM.
NO : Repair it. Then confirm that the malfunction symptom is eliminated.

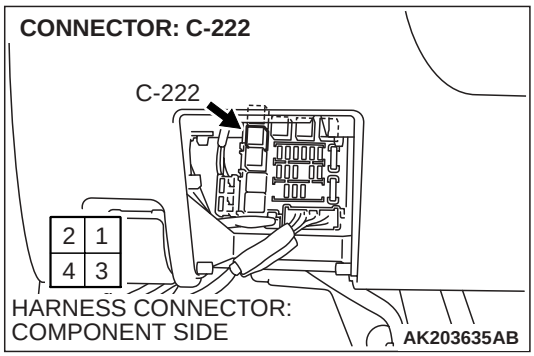


STEP 16. Check connector C-222 at charge air cooler water spray relay for damage.

Q: Is the connector in good condition?

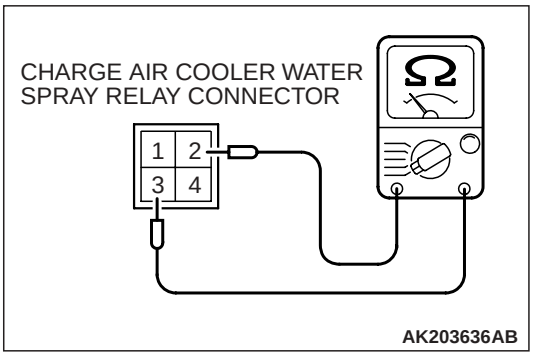
YES : Go to Step 17.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.

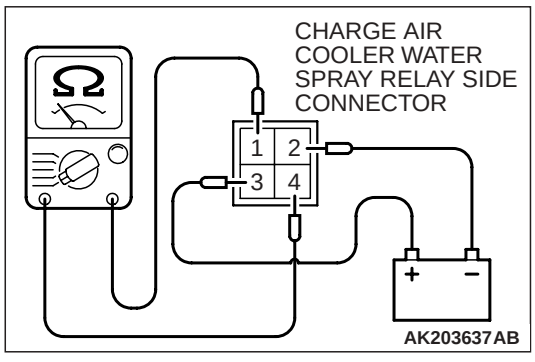


STEP 17. Charge air cooler water spray relay check.

(1) Remove the charge air cooler water spray relay.



(2) Check for continuity between the charge air cooler water spray relay terminal No. 2 and No. 3.
- There should be continuity .(Approximately 70 ohms)



(3) Use jumper wires to connect charge air cooler water spray relay terminal No. 3) to the positive battery terminal and terminal No. 2 to the negative battery terminal.

(4) Check for continuity between the charge air cooler water spray relay terminals No. 1 and No. 4 while connecting and disconnecting the jumper wire at the negative battery terminal.
- Should be less than 2 ohms. (Negative battery terminal connected)
- Should be open loop. (Negative battery terminal disconnected)

(5) Install the charge air cooler water spray relay.

Q: Are the resistance and the operation normal?

YES : Go to Step 18.

NO : Replace the charge air cooler water spray relay. Then confirm that the malfunction symptom is eliminated.

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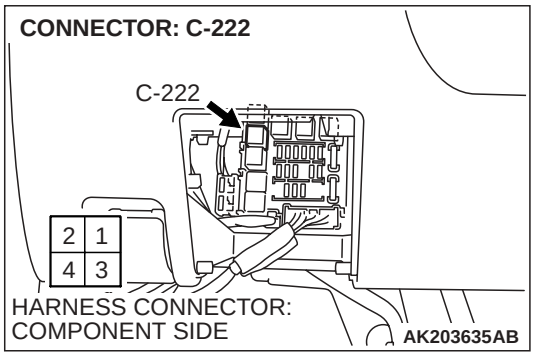
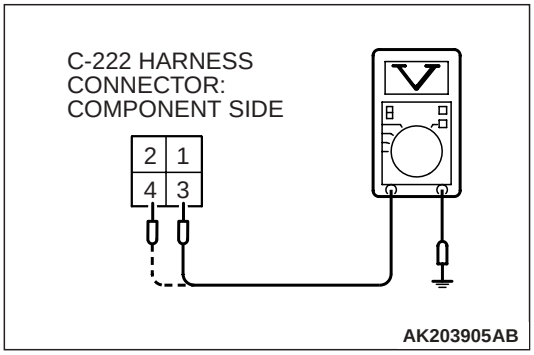




STEP 18. Measure the power supply voltage at charge air cooler water spray relay harness side connector C-222.

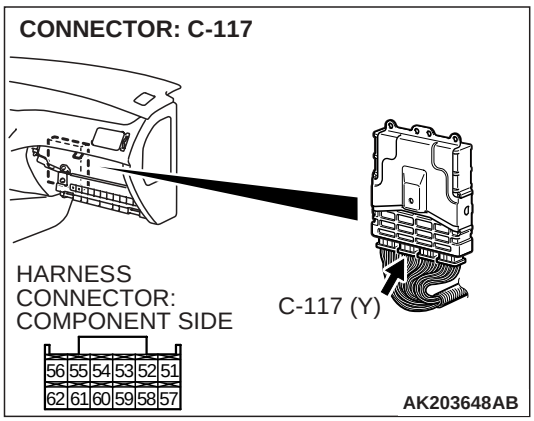
(1) Disconnect the connector C-222 and measure the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No. 3, No. 4 and ground.
- Voltage should be battery positive voltage.

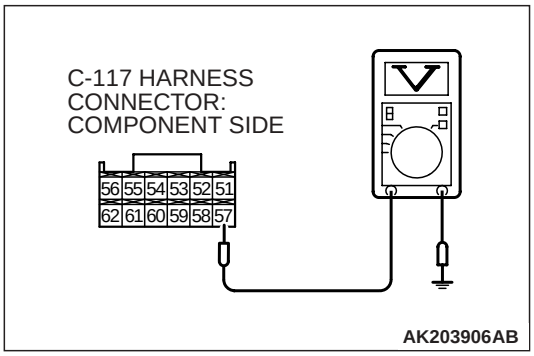
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 19.

NO : Check harness connectors C-101, C-209, C-210 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connectors C-101, C-209, C-210 are in good condition, repair an open circuit between ignition switch connector C-208 terminal No. 4 and charge air cooler water spray relay connector C-222 terminal No. 3, No. 4. Then confirm that the malfunction symptom is eliminated.





STEP 19. Measure the power supply voltage at ECM harness side connector C-117.

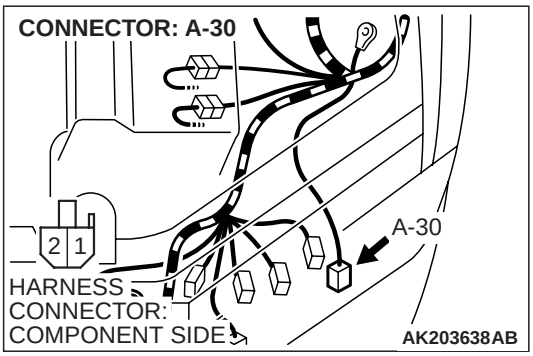
(1) Disconnect the connector C-117 and measure the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal 57 and ground.
- Voltage should be battery positive voltage.

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

Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 20.

NO : Check harness connectors C-124, C-209 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connectors C-124, C-209 are in good condition, repair an open circuit between charge air cooler water spray relay connector C-222 terminal No. 2 and ECM connector C-117 terminal No. 57. Then confirm that the malfunction symptom is eliminated.

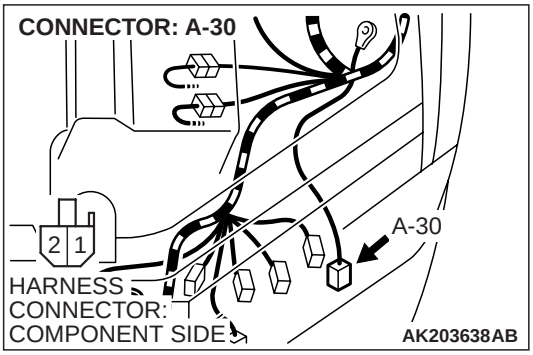


STEP 20. Check connector A-30 at charge air cooler water spray relay for damage.

Q: Is the connector in good condition?

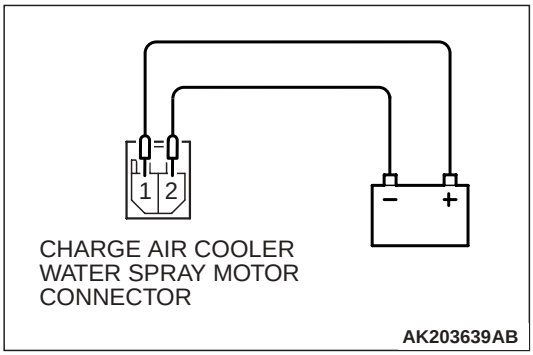
YES : Go to Step 21.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.



STEP 21. Charge air cooler water spray motor check.

(1) Disconnect the charge air cooler water spray motor connector A-30.



(2) Use jumper wires to connect fuel pump connector terminal No. 1 to the positive battery terminal and terminal No. 2 to the negative battery terminal.
- An operation sound of the charge air cooler water spray motor should be heard.

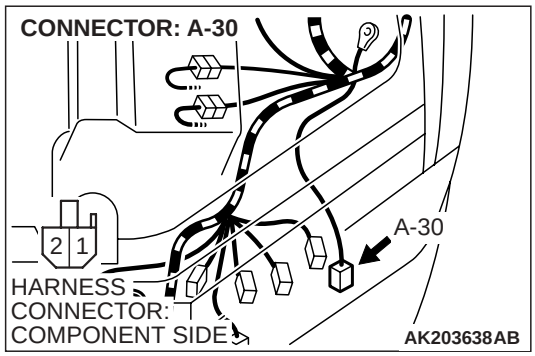
Q: Is the charge air cooler water spray motor operating properly?

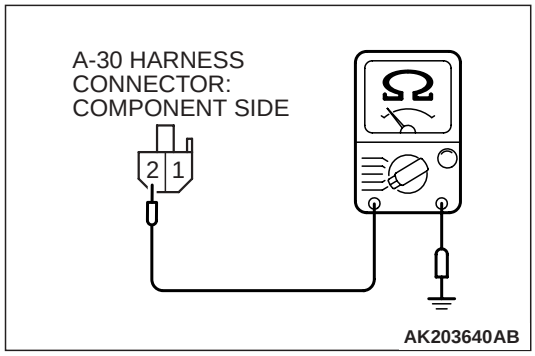
YES : Go to Step 22.

NO : Replace the charge air cooler water spray motor. Then confirm that the malfunction symptom is eliminated.

STEP 22. Check for continuity at charge air cooler water spray motor harness side connector A-30.

(1) Disconnect the connector A-30 and measure the harness side.





(2) Check for the continuity between terminal No. 2 and ground.
- Should be less than 2 ohms.

Q: Does continuity exist?

YES : Go to Step 23.

NO : Repair harness wire between charge air cooler water spray connector A-30 terminal No. 2 and ground because of open circuit or harness damage. Then confirm that the malfunction symptom is eliminated.

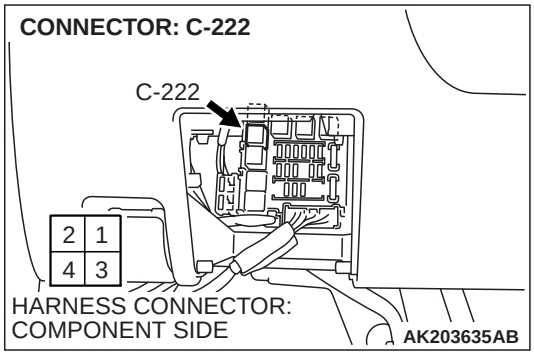
STEP 23. Check for open circuit and short circuit to ground and harness damage between charge air cooler water spray relay connector C-222 (terminal No. 1) and charge air cooler water spray motor connector A-30 (terminal No. 1).

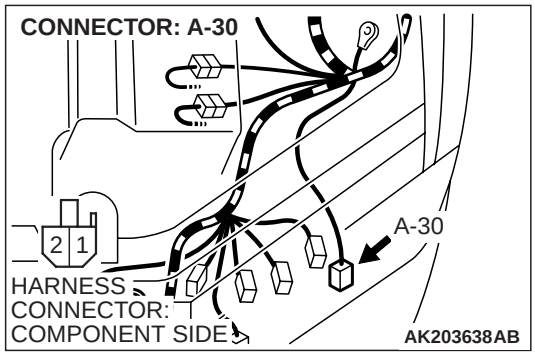
NOTE: Check harness after checking intermediate connectors C-129, C-209. If intermediate connectors are damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.

Q: Is the harness wire in good condition?

YES : Replace the ECM.

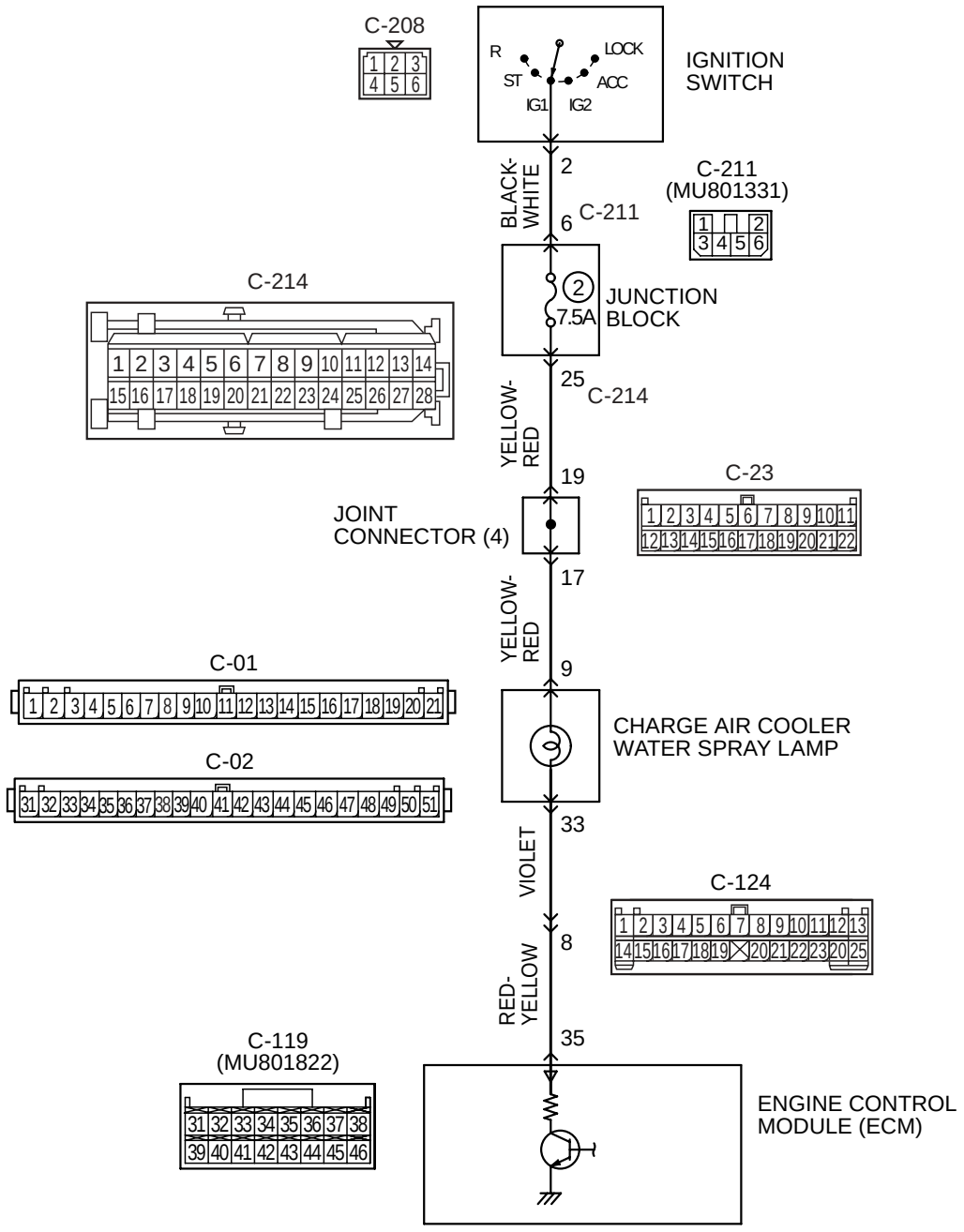
NO : Repair it. Then confirm that the malfunction symptom is eliminated.





INSPECTION PROCEDURE 36: CHARGE AIR COOLER WATER SPLAY LAMP SYSTEM

Charge Air Cooler Water Spray Lamp Circuit



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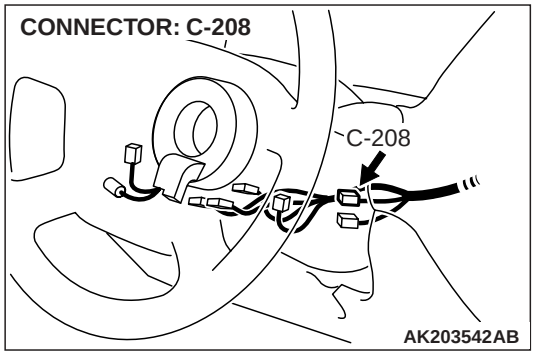
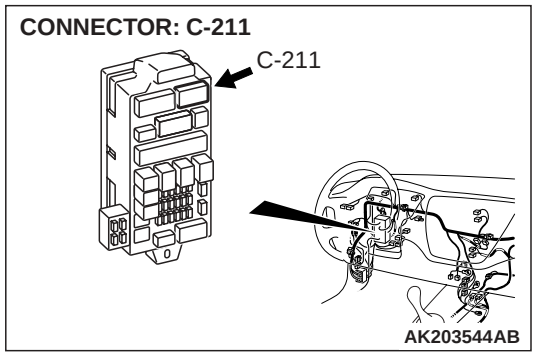
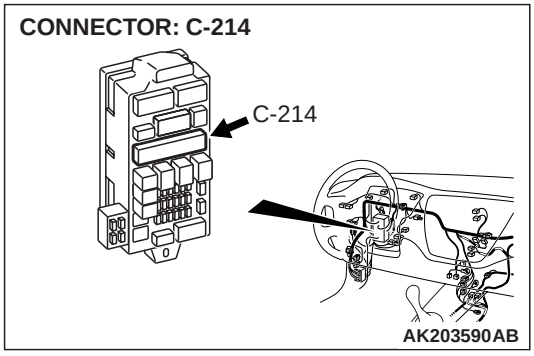
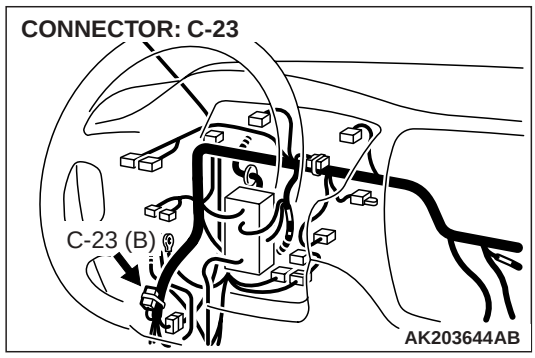
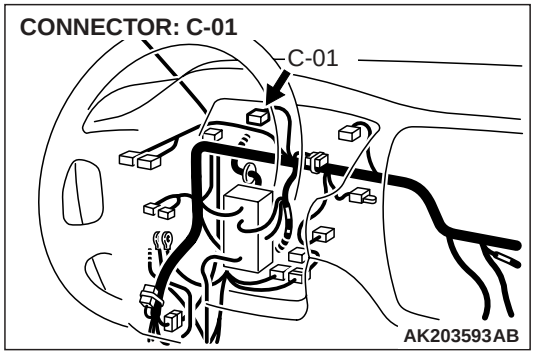
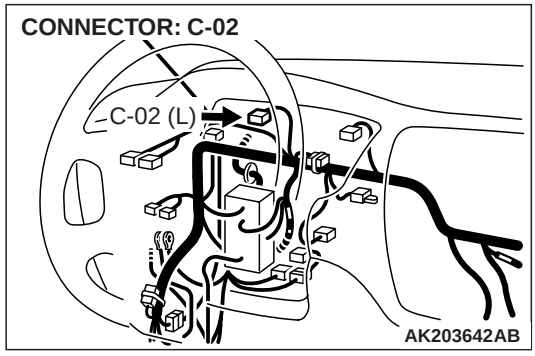


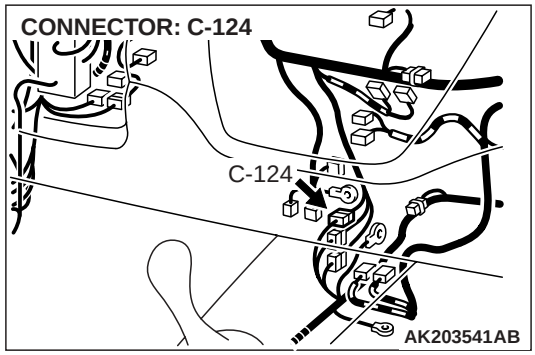


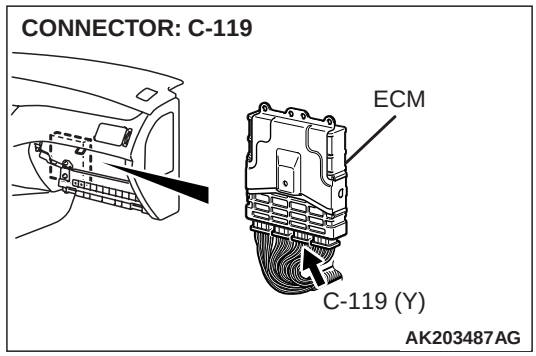












CIRCUIT OPERATION

- The charge air cooler water spray lamp power is supplied from the ignition switch.
- The ECM controls the ground of the charge air cooler water spray lamp by turning the power transistor in the ECM ON and OFF.

COMMENT

- If the auto switch of the charge air cooler water spray switch is ON, the ECM illuminates the charge air cooler water spray lamp.

TSB Revision

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Burnt-out of bulb.
- Improper connector contact, open or short-circuited harness wire.
- Malfunction of the ECM.

DIAGNOSIS

STEP 1. Check the burned-out bulb.

Q: Is the bulb normal?

YES : Go to Step 2.

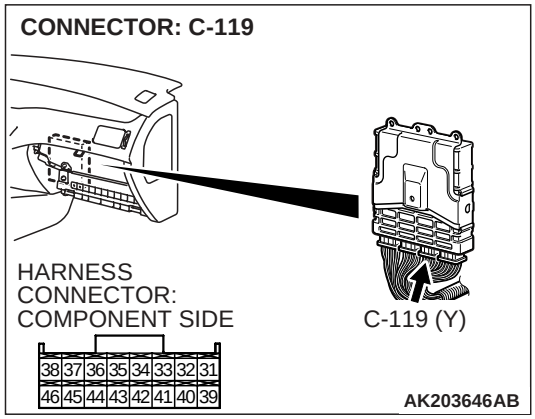
NO : Replace the bulb. Them confirm that the malfunction symptom is eliminated.

STEP 2. Check harness connector C-119 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 3.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.



STEP 3. Check whether the charge air cooler water spray lamp illuminates.

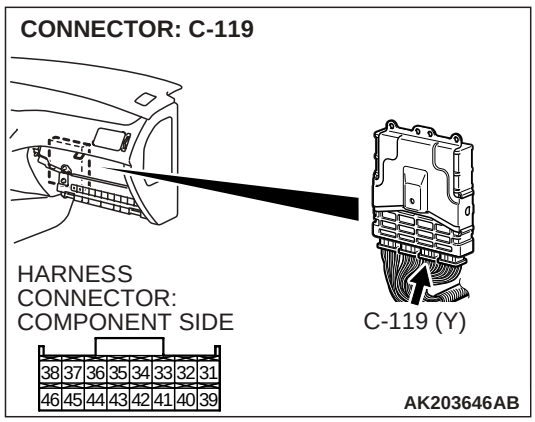
(1) Disconnect ECM connector C-119.
(2) Using the jumper wire, connect terminal 35 to ground.
(3) Turn the ignition switch to the "ON" position.
- The charge air cooler water spray lamp illuminates.

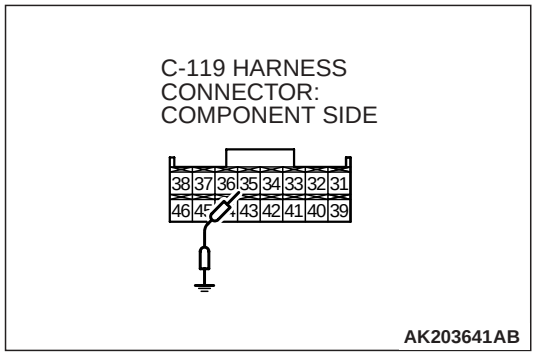
(4) Turn the ignition switch to the "LOCK" (OFF) position.

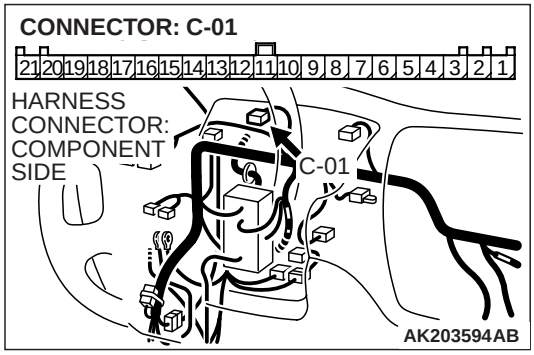
Q: Does the charge air cooler water spray lamp illuminate?

YES : Refer to Inspection Procedure 35-Charge Air Cooler Water Spray Circuit P.13A-706.

NO : Go to Step 4.





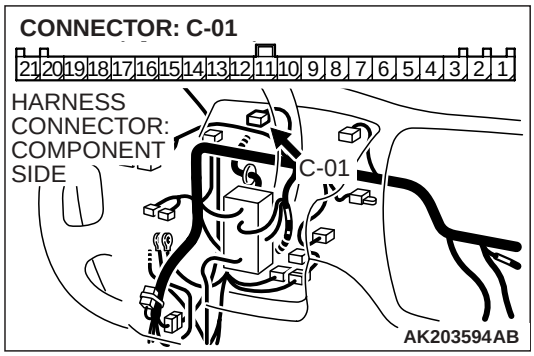


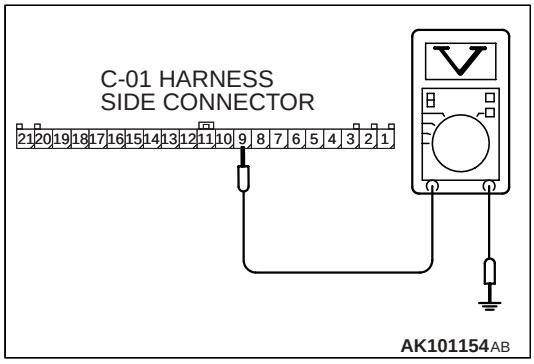
STEP 4. Check connector C-01 at combination meter for damage.

Q: Is the connector in good condition?

YES : Go to Step 5.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.





STEP 5. Measure the power supply voltage at combination meter harness side connector C-01.

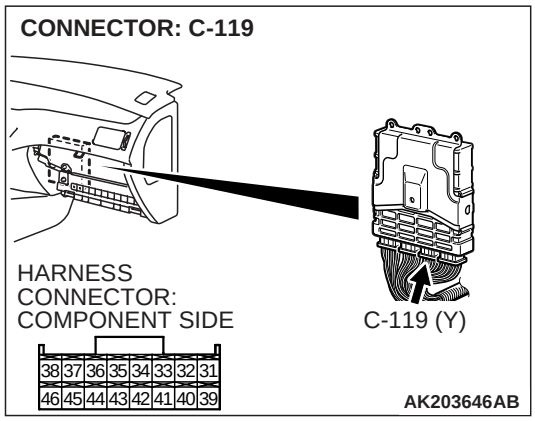
(1) Disconnect the connector C-01 and measure the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No. 9 and ground.
- Voltage should be battery positive voltage.

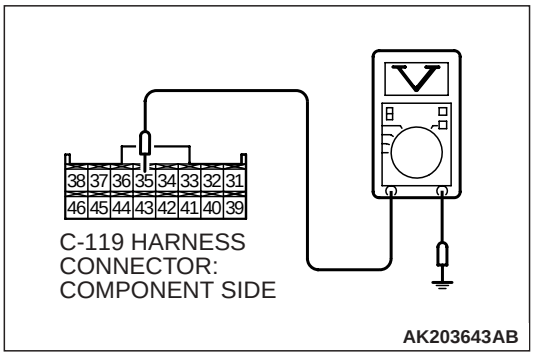
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 6.

NO : Check harness connectors C-211, C-214, C-23 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connectors C-211, C-214, C-23 are in good condition, repair harness wire between combination meter connector C-01 terminal No.9 and ignition switch connector C-208 terminal No.2 because of open circuit. Then confirm that the malfunction symptom is eliminated.





STEP 6. Measure the power supply voltage at ECM harness side connector C-119.

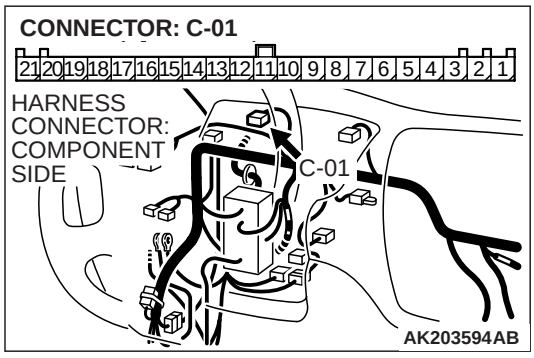
(1) Disconnect the connector C-119 and measure the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No. 35 and ground.
- Voltage should be battery positive voltage.

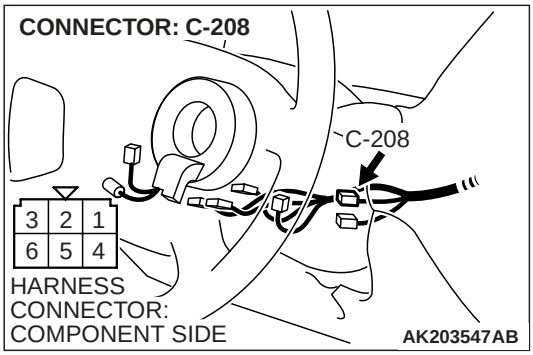
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 7.

NO : Check harness connector C-124 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.If intermediate connector C-124 is in good condition, repair harness wire between combination meter connector C-02 terminal No.33 and ECM connector C-119 terminal No.35 because of open circuit. Then confirm that the malfunction symptom is eliminated.





STEP 7. Check for harness damage between combination meter connector C-01 (terminal No.9) and ignition switch connector C-208 (terminal No.2).

NOTE: Check harness after checking intermediate connectors C-211, C-214, C-23. If intermediate connectors are damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.

Q: Is the harness wire in good condition?

YES : Check harness connector C-124 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.If intermediate connector C-124 is in good condition, repair harness wire between combination meter connector C-02 terminal No.33 and ECM connector C-119 terminal No.35 because of harness damage. Then confirm that the malfunction symptom is eliminated.

NO : Repair it. Then confirm that the malfunction symptom is eliminated.

DATA LIST REFERENCE TABLE

M1131152000638

⚠ CAUTION

- **When shifting the select lever to D range, the brakes should be applied so that the vehicle does not move forward.**
- **Driving tests always need two persons: one driver and one observer.**

*NOTE: *1: If the idle speed is lower than the standard value on a very cold engine [approximately –20°C (–4°F)] even when the IAC motor is fully opened, the air volume limiter built in the throttle body could be defective.*

*NOTE: *2: In a new vehicle [driven approximately 500 km (311 mile) or less], the step of the stepper motor is sometimes 30 steps greater than the standard value.*

*NOTE: *3: The injector drive time represents the time when the cranking speed is at 250 r/min or below when the power supply voltage is 11 volts.*

*NOTE: *4: In a new vehicle [driven approximately 500 km (311 mile) or less], the injector drive time is sometimes 10% longer than the standard time.*

*NOTE: *5: In a new vehicle [driven approximately 500 km (311 mile) or less], the volume airflow sensor output frequency is sometimes 10% higher than the standard frequency.*

*NOTE: *6: GST items. [Data list items consist of MUT-II or MUT-III items and GST items. GST items can be accessed through the use of a general scan tool (GST). When scan tool MB991502 (MUT-II) or MB991958 (MUT-III sub assembly) is used, MUT-II or MUT-III items appear alphabetically; then, GST items appear alphabetically. The black and white characters of the GST items are inverted from the MMUT-II or MUT-III items.]*

MUT-II or MUT-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
A/C RELAY	49	A/C compressor clutch relay	• Engine: idling • A/C switch: "OFF"		OFF	Procedure No. 34	P.13A-703
			• Engine: idling • A/C switch: "ON"	A/C compressor clutch is not operating	OFF		
				A/C compressor clutch is operating	ON		
A/C SWITCH	28	A/C switch	• Engine: idling • A/C switch: "OFF"		OFF	Procedure No. 34	P.13A-703
			• Engine: idling • A/C switch: "ON"	A/C compressor clutch is not operating	OFF		
				A/C compressor clutch is operating	ON		

MUT-II or MUT-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
BARO SENSOR	25	Barometric pressure sensor	Ignition switch: "ON"	At altitude of 0 m (0 ft)	101 kPa (29.8 in. Hg)	Code No. P0106, P0107, P0108	P.13A-53, P.13A-59, P.13A-73
				At altitude of 600 m (1,969 ft)	95 kPa (28.1 in. Hg)		
				At altitude of 1,200 m (3,937 ft)	88 kPa (26.0 in. Hg)		
				At altitude of 1,800 m (5,906 ft)	81 kPa (23.9 in. Hg)		
BATT VOLTAGE	16	power supply voltage	Ignition switch: "ON"		Battery positive voltage	Procedure No. 30	P.13A-663
CKP SENSOR	22	Crankshaft position sensor *1	• Engine: cranking • Tachometer: connected		Engine speeds displayed on the scan tool and tachometer are identical	Code No. P0335	P.13A-302
			Engine: idling	Engine coolant temperature is –20°C (–4°F)	1,300 – 1,500 r/min		
				Engine coolant temperature is 0°C (32°F)	1,300 – 1,500 r/min		
				Engine coolant temperature is 20°C (68°F)	1,300 – 1,500 r/min		
				Engine coolant temperature is 40°C (104°F)	1,150 – 1,350 r/min		
				Engine coolant temperature is 80°C (176°F)	750 – 950 r/min		
CRANK. SIGNAL	18	Cranking signal (ignition switch-ST)	Ignition switch: "ON"	Engine: stopped	OFF	Procedure No. 32	P.13A-688
				Engine: cranking	ON		

MUT-II or MUT-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
ECT SENSOR	21	Engine coolant temperature sensor	Ignition switch: "ON" or with engine running	Engine coolant temperature is –20°C (–4°F)	–20°C (–4°F)	Code No. P0116, P0117, P0118	P.13A-101, P.13A-111, P.13A-115
				Engine coolant temperature is 0°C (32°F)	0°C (32°F)		
				Engine coolant temperature is 20°C (68°F)	20°C (68°F)		
				Engine coolant temperature is 40°C (104°F)	40°C (104°F)		
				Engine coolant temperature is 80°C (176°F)	80°C (176°F)		
ECT SENSOR	21*6	Engine coolant temperature sensor	Ignition switch: "ON" or with engine running	Engine coolant temperature is –20°C (–4°F)	–20°C (4°F)	Code No. P0116, P0117, P0118	P.13A-101, P.13A-111, P.13A-115
				Engine coolant temperature is 0°C (32°F)	0°C (32°F)		
				Engine coolant temperature is 20°C (68°F)	20°C (68°F)		
				Engine coolant temperature is 40°C (104°F)	40°C (104°F)		
				Engine coolant temperature is 80°C (176°F)	80°C (176°F)		
ENGINE LOAD	87*6	Calculated load value	• Engine: warming up	Engine is idling	15 – 35 %	–	–
				2,500 r/min	15 – 35 %		

MUT-II or MUT-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
ENGINE SPEED	22*6	Crankshaft position sensor *1	• Engine: cranking • Tachometer: connected		Engine speeds displayed on the scan tool and tachometer are identical.	Code No. P0335	P.13A-302
			Engine: idling	Engine coolant temperature is –20°C (–40°F)	1,300 – 1,500 r/min		
				Engine coolant temperature is 0°C (32°F)	1,300 – 1,500 r/min		
				Engine coolant temperature is 20°C (68°F)	1,300 – 1,500 r/min		
				Engine coolant temperature is 40°C (104°F)	1,150 – 1,350 r/min		
				Engine coolant temperature is 80°C (176°F)	750 – 950 r/min		
FUEL TEMP	4A	Fuel tank temperature sensor	• In cooled state • Ignition switch: "ON"		Approximately the same as the outdoor temperature	Code No. P0181, P0182, P0183	P.13A-246, P.13A-254, P.13A-259

MUT-II or MUT-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
HO2S BANK1 S1	11	Heated oxygen sensor (front)	Engine: Warming up (air/fuel mixture is made leaner when decelerating, and is made richer when revving.)	When at 4000 r/min, engine is suddenly decelerated	200 mV or less → 600 – 1,000 mV (After several seconds have elapsed)	Code No. P0130, P0131, P0132, P0133, P0134	P.13A-156, P.13A-170, P.13A-176, P.13A-180, P.13A-185
			Engine: Warming up (the heated oxygen sensor signal is used to check the air/fuel mixture ratio, and control condition is also checked by the ECM	Engine is idling 2,500 r/min	Voltage changes repeatedly between 400 mV or less and 600 – 1,000 mV		
HO2S BANK1 S1	A1*6	Heated oxygen sensor (front)	Engine: Warming up (air/fuel mixture is made leaner when decelerating, and is made richer when revving.)	When at 4, 000 r/min, engine is suddenly decelerated	0.2 V or less → 0.6 – 1 V (After several seconds have elapsed)	Code No. P0130, P0131, P0132, P0133, P0134	P.13A-156, P.13A-170, P.13A-176, P.13A-180, P.13A-185
			Engine: Warming up (the heated oxygen sensor signal is used to check the air/fuel mixture ratio, and control condition is also checked by the ECM	Engine is idling 2,500 r/min	Voltage changes repeatedly between 0.4 V or less and 0.6 – 1 V		

MUT-II or MUT-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
HO2S BANK1 S2	59	Heated oxygen sensor (rear)	Engine: warming up	Revving	0 and 600 – 1,000 mV alternate.	Code No. P0136, P0137, P0138, P0139	P.13A-201, P.13A-211, P.13A-216, P.13A-220
HO2S BANK1 S2	A2*6	Heated oxygen sensor (rear)	Engine: warming up	Revving	0 and 0.6 – 1 V alternate.	Code No. P0136, P0137, P0138, P0139	P.13A-201, P.13A-211, P.13A-216, P.13A-220
IAC VALVE POS	45	Idle air control (stepper) position *2	• Engine coolant temperature: 80 – 95°C (176 – 203°F) • Lights, electric cooling fan and all accessories: "OFF" • Transaxle: neutral • Engine: idling (when A/C switch is "ON". A/C compressor should be operating)	A/C switch: "OFF"	2 – 25 STEP	–	–
				A/C switch: "OFF" → "ON"	Increases by 10 – 70 STEP		

MUT-II or MUT-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
IAT SENSOR	13	Intake air temperature sensor	Ignition switch: "ON" or with engine running	Intake air temperature is –20 °C (–4°F)	–20°C (–4°F)	Code No. P0111, P0112, P0113	P.13A-83, P.13A-90, P.13A-94
				Intake air temperature is 0°C (32°F)	0°C (32°F)		
				Intake air temperature is 20°C (68°F)	20°C (68°F)		
				Intake air temperature is 40°C (104°F)	40°C (104°F)		
				Intake air temperature is 80°C (176°F)	80°C (176°F)		
IAT SENSOR	13*6	Intake air temperature sensor	Ignition switch: "ON" or with engine running	Intake air temperature is –20 °C (–4°F)	–20°C (–4°F)	Code No. P0111, P0112, P0113	P.13A-83, P.13A-90, P.13A-94
				Intake air temperature is 0°C (32°F)	0°C (32°F)		
				Intake air temperature is 20°C (68°F)	20°C (68°F)		
				Intake air temperature is 40°C (104°F)	40°C (104°F)		
				Intake air temperature is 80°C (176°F)	80°C (176°F)		
IG. TIMING ADV	44	Ignition coils and ignition power transistor	• Engine: warming up • Timing light is set (to check actual ignition timing)	Engine is idling	0 – 13°BTDC	–	–
				2,500 r/min	20 – 40°BTDC		
IG. TIMING ADV	44*6	Ignition coils and ignition power transistor	• Engine: warming up • Timing light is set (to check actual ignition timing)	Engine is idling	0 – 13 deg	–	–
				2,500 r/min	20 – 40 deg		

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MUT-II or MUT-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
INJECTORS	41	Injectors*3	Engine: cranking	When engine coolant temperature is 0°C (32°F)	25 – 37 mS	–	–
				When engine coolant temperature is 20°C (68°F)	15 – 22 mS		
				When engine coolant temperature is 80°C (176°F)	4.2 – 6.3 mS		
		Injectors*4	• Engine coolant temperature: 80 – 95°C (176 – 203°F) • Lights, electric cooling fan and all accessories: "OFF" • Transaxle: neutral	Engine is idling	1.5 – 2.7 mS		
				2,500 r/min	1.2 – 2.4 mS		
				When engine is suddenly revved	Increases		
LONG TRIM B1	81*6	Long-term fuel trim	Engine: warming up, 2,500 r/min without any load (during closed loop)		–12.5 – 12.5%	Code No. P0171, P0172	P.13A-232, P.13A-240
MDP SENSOR	95	Manifold differential pressure sensor	Engine: warming up, idling		54 – 68 kPa (15.9 – 20.0 in.Hg)	Code No. P1400	P.13A-530
PSP SWITCH	27	Power steering pressure switch	Engine: idling	Steering wheel stationary	OFF	Code No. P0551, P0554	P.13A-500, P.13A-510
				Steering wheel turning	ON		
SHORT TRIM B1	82*6	Short-term fuel trim	Engine: warming up, 2,500 r/min without any load (during closed loop)		–20 – 20%	Code No. P0171, P0172	P.13A-232, P.13A-240
SYS. STATUS B1	88*6	Fuel system status	Engine: warming up	2,500 r/min	Closed loop	–	–
				When engine is suddenly revved	Open loop – drive condition		

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MUT-II or MUT-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
TANK PRS. SNSR	73	Fuel tank differential pressure sensor	• Ignition switch: "ON" • Fuel tank filler tube cap removal		–3.3 – 3.3 kPa (–0.97 – 0.97 in. Hg)	–	–
TP SENSOR	14	Throttle position sensor	Ignition switch: "ON"	Set to idle position	535 – 735 mV	Code No. P0121, P0122, P0123	P.13A-123, P.13A-132, P.13A-140
				Gradually open	Increases in proportion to throttle opening angle		
				Open fully	4,500 – 5,000 mV		
TP SENSOR	8A*6	Throttle position sensor	Ignition switch: "ON"	Set to idle position	0 – 10%	Code No. P0121, P0122, P0123	P.13A-123, P.13A-132, P.13A-140
				Gradually open	Increases in proportion to throttle opening angle		
				Open fully	80 – 100%		
VAF SENSOR	12	Volume airflow sensor (mass airflow rate) *5	• Engine coolant temperature: 80 – 95°C (176 – 203°F) • Lights, electric cooling fan and all accessories: "OFF" • Transaxle: neutral	Engine is idling	17 – 43 Hz	–	–
				2,500 r/min	40 – 100 Hz		
				Engine is revved	Frequency increases in response to revving		

MUT-II or MUT-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
VAF SENSOR	12*6	Volume airflow sensor (mass airflow rate) *5	• Engine coolant temperature: 80 – 95°C (176 – 203°F) • Lights, electric cooling fan and all accessories: "OFF" • Transaxle: neutral	Engine is idling	2 – 7 gm/s	–	–
				2,500 r/min	5 – 16 gm/s		
				Engine is revved	Airflow volume increases in response to revving		
VSS	24*6	Vehicle speed sensor	Drive at 40 km/h (25 mph)		Approximately 40 km/h (25 mph)	Code No. P0500	P.13A-465

ACTUATOR TEST REFERENCE TABLE

M1131152500309

MB991502 or MB991958 SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	DRIVE CONTENTS	INSPECTION REQUIREMENT	NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
BASIC TIMING	17*	Basic ignition timing	Set to ignition timing adjustment mode	• Engine: idling • Connect timing light	5°BTDC	-	-
CONDEN.FAN. HI	37	Condenser fan Relay (HI)	Drive the condenser fan motor.	Ignition switch: "ON"	Fan motor operates at a high speed.	Procedure No.29	P.13A-660
CONDEN.FAN. LO	38	Condenser fan Relay (LO)	Drive the condenser fan motor.	Ignition switch: "ON"	Fan motor operates at a low speed.		
EGR VACUUM REGULATOR SOLENOID VALVE	10	EGR vacuum regulator solenoid valve	Solenoid valve turns from OFF to ON.	Ignition switch: "ON"	Clicks when solenoid valve is driven.	Code No. P0403	P.13A-330
EVAP PURGE SOL	08	Evaporative emission purge solenoid	Solenoid valve turns from OFF to ON.	Ignition switch: "ON"	Clicks when solenoid valve is driven.	Code No. P0443	P.13A-363
EVAP VENT SOL	29	Evaporative emission ventilation solenoid	Solenoid valve turns from OFF to ON.	Ignition switch: "ON"	Clicks when solenoid valve is driven.	Code No. P0446	P.13A-371
FUEL PRSS SOL	09	Fuel pressure solenoid	Solenoid valve turns from OFF to ON.	Ignition switch: "ON"	Clicks when solenoid valve is driven.	Code No. P0090	P.13A-30

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MB991502 or MB991958 SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	DRIVE CONTENTS	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
FUEL PUMP	07	Fuel pump	Fuel pump operates and fuel is recirculated	Ignition switch: "ON"	Pinch the return hose with fingers to feel the pulse of the fuel being recirculated	Pulse is felt	Procedure No. 30	P.13A-671
					Listen near the fuel tank for the sound of fuel pump operation	Sound of operation is heard (fuel pump operates at a low speed)		
F/P SPD. CHANGE	13	Fuel pump relay 3	Fuel pump rely 3 turns from OFF to ON.	• Ignition switch: "ON" • Listen near the fuel tank for the sound of fuel pump operation		Sound of operation is heard (fuel pump operates at a high speed)	Procedure No.31	P.13A-671
NO. 1 INJECTOR	01	Injectors	Cut fuel to No.1 injector	Engine: warm, idle (cut the fuel supply to each injector in turn and check cylinders which don't affect idling.)		Idling becomes unstable	Code No. P0201, P0202, P0203, P0204	P.13A-267
NO. 2 INJECTOR	02		Cut fuel to No.2 injector					
NO. 3 INJECTOR	03		Cut fuel to No.3 injector					
NO. 4 INJECTOR	04		Cut fuel to No.4 injector					
RADIAT. FAN LO	21	Fan control module	Drive the fan motor	Ignition switch: "ON"		Radiator fan and condenser fan rotate at high speed	Procedure No. 28	P.13A-657
TC TURBO-CHARGER WASTEGATE	12	Turbo-charger wastegate solenoid	Solenoid valve turns from OFF to ON.	Ignition switch: "ON"		Clicks when solenoid valve is driven.	Code No. P0243	P.13A-279

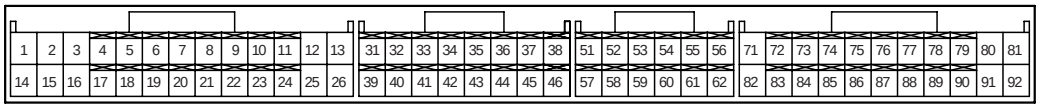
*NOTE: *: Continues for 27 minutes. Can be released by pressing the CLEAR key.*

CHECK AT THE ENGINE CONTROL MODULE (ECM)

M1131153700157

TERMINAL VOLTAGE CHECK CHART

ECM Connector Terminal Arrangement



AK202419AB

TERMINAL NO.	INSPECTION ITEM	INSPECTION CONDITION (ENGINE CONDITION)	NORMAL CONDITION
1	No. 1 injector	• Engine: warming up, idling • Suddenly depress the accelerator pedal	From 11 – 14 V momentarily drops slightly
14	No. 2 injector		
2	No. 3 injector		
15	No. 4 injector		
3	Fuel pressure solenoid	Ignition switch: "ON"	B+
		Engine: Cranking → idling (2 minutes or less)	1 V or less → B+
4	Stepper motor coil <A1>	• Engine: warming up, idling • A/C switch: OFF → ON • Headlight switch: OFF → ON	B+ ⇔ 1 V or less (changes repeatedly)
17	Stepper motor coil <A2>		
5	Stepper motor coil <B1>		
18	Stepper motor coil <B2>		
6	EGR vacuum regulator solenoid valve	Ignition switch: "ON"	B+
		• Engine: idling • Suddenly depress the accelerator pedal.	From B+, momentarily drops
8	A/C compressor clutch relay	• Engine: idling • A/C switch: OFF → ON (A/C compressor is operating)	B+ → 1 V or less as A/C clutch cycles
9	Evaporative emission purge solenoid	Ignition switch: "ON"	B+
		Engine: warm up, 3,000 r/min	3 – 13 V
10	Ignition coil – No. 1, No. 4 (Ignition power transistor)	Engine: 3,000 r/min	0.3 – 3.0 V
23	Ignition coil – No. 2, No. 3 (Ignition power transistor)		
11	Turbocharger wastegate solenoid	Ignition switch: "ON"	B+
		Engine: warming up, idling	1 V or less
12	Power supply	Ignition switch: "ON"	B+
25			

TSB Revision

TERMINAL NO.	INSPECTION ITEM	INSPECTION CONDITION (ENGINE CONDITION)		NORMAL CONDITION
19	Volume airflow sensor reset signal	Engine: idling		0 – 1 V
		Engine: 3,000 r/min		6 – 9 V
21	Fan control module	Radiator fan is not operating		0 – 0.3 V
		Radiator fan is operating		0.7 V or more
22	Fuel pump relay	Ignition switch: "ON"		B+
		Engine: idling		1 V or less
24	A/C switch 2	Engine: idling Outside air temperature: 25°C or more	when A/C is MAX. COOL condition (when the load by A/C is high)	1 V or less
			when A/C is MAX. HOT condition (when the load by A/C is low)	B+
32	Condenser fan relay (HI)	Fan is not operating [engine coolant temperature: 90°C (194°F) or less]		B+
		Fan is operating at a high speed [engine coolant temperature: 105°C (221°F) or more]		1 V or less
33	Generator G terminal	Engine: warming up, idling (radiator fan: stopped) Headlight: OFF to ON Rear defogger switch: OFF to ON Stoplight switch: OFF to ON		Voltage rises by 0.2 – 3.5 V
34	Condenser fan relay (LO)	Fan is not operating [engine coolant temperature: 90°C (194°F) or less]		B+
		Fan is operating at a low speed [engine coolant temperature: 95-100°C (203-212°F)]		1 V or less
36	Malfunction Indicator Lamp (SERVICE ENGINE SOON)	Ignition switch: "LOCK" (OFF) → "ON"		1 V or less → 9 – 13 V (after several seconds have elapsed)
37	Power steering pressure switch	Engine: warming up, idling	When steering wheel is stationary	B+
			When steering wheel is turned	1 V or less
38	MFI relay (power supply)	Ignition switch: "OFF"		B+
		Ignition switch: "ON"		1 V or less
39	Fuel pump relay 3	Engine: From idle, suddenly depress the accelerator pedal.		Voltage rises momentarily from 1V or less
41	Generator FR terminal	Engine: warming up, idling (radiator fan: stopped) Headlight: OFF to ON		Voltage drops
		Rear defogger switch: OFF to ON Stop light switch: OFF to ON		
44	Charge air cooler water spray switch (AUTO)	• Ignition switch: "ON" • Charge air cooler water spray switch (AUTO): OFF		B+
		• Ignition switch: "ON" • Charge air cooler water spray switch (AUTO): ON		1 V or less

TSB Revision

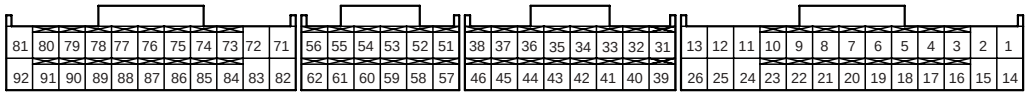
TERMINAL NO.	INSPECTION ITEM	INSPECTION CONDITION (ENGINE CONDITION)		NORMAL CONDITION
45	A/C switch	Engine: idling	Turn the A/C switch OFF	1 V or less
			Turn the A/C switch ON (A/C compressor is operating)	B+
54	Heated oxygen sensor heater (rear)	Engine: warming up, idling		1 V or less
		Engine: Revving		B+
55	Evaporative emission ventilation solenoid	Ignition switch: "ON"		B+
		Carry out the Actuator test to drive the solenoid valve		For approximately 6 seconds 1 V or less
57	Charge air cooler water spray relay	• Ignition switch: "ON" • Charge air cooler water spray switch (MANUAL): OFF		B+
		• Ignition switch: "ON" • Charge air cooler water spray switch (MANUAL): ON		1 V or less
58	Tachometer signal	Engine: 3,000 r/min		0.3 – 3.0 V
60	Heated oxygen sensor heater (front)	Engine: warming up, idling		9 – 11 V
		Engine: Revving		9 – 11 V → B+ (momentarily)
61	Fuel tank differential pressure sensor	Engine: idling		1.2 – 3.8 V
71	Ignition switch-ST	Engine: cranking		8 V or more
72	Intake air temperature sensor	Ignition switch: "ON"	When Intake air temperature is –20°C (–4°F)	3.8 – 4.4 V
			When Intake air temperature is 0°C (32°F)	3.2 – 3.8 V
			When Intake air temperature is 20°C (68°F)	2.3 – 2.9 V
			When Intake air temperature is 40°C (104°F)	1.5 – 2.1 V
			When Intake air temperature is 60°C (140°F)	0.8 – 1.4 V
			When Intake air temperature is 80°C (176°F)	0.4 – 1.0 V
73	Manifold differential pressure sensor	Engine: idling		0.8 – 2.4 V
		• Engine: idling • Suddenly depress the accelerator pedal		Rises from 0.8 – 2.4 V suddenly
75	Heated oxygen sensor (rear)	• Engine: warming up • Revving		0 and 0.6 – 1.0 V alternates
76	Heated oxygen sensor (front)	• Engine: warming, 2,500 r/min (check using a digital type voltmeter)		0 ⇔ 0.8 V (changes repeatedly)

TERMINAL NO.	INSPECTION ITEM	INSPECTION CONDITION (ENGINE CONDITION)		NORMAL CONDITION
77	Fuel tank temperature sensor	Ignition switch: "ON"	When fuel tank temperature is 0°C (32°F)	2.7 – 3.1 V
			When fuel tank temperature is 20°C (68°F)	2.1 – 2.5 V
			When fuel tank temperature is 40°C (104°F)	1.6 – 2.0 V
			When fuel tank temperature is 80°C (176°F)	0.8 – 1.2 V
80	Backup power supply	Ignition switch: "LOCK" (OFF)		B+
81	Sensor supplied voltage	Ignition switch: "ON"		4.5 – 5.5 V
82	Ignition switch-IG	Ignition switch: "ON"		B+
83	Engine coolant temperature sensor	Ignition switch: "ON"	When engine coolant temperature is –20°C (–4°F)	3.9 – 4.5 V
			When engine coolant temperature is 0°C (32°F)	3.2 – 3.8 V
			When engine coolant temperature is 20°C (68°F)	2.3 – 2.9 V
			When engine coolant temperature is 40°C (104°F)	1.3 – 1.9 V
			When engine coolant temperature is 60°C (140°F)	0.7 – 1.3 V
			When engine coolant temperature is 80°C (176°F)	0.3 – 0.9 V
84	Throttle position sensor	Ignition switch: "ON" (check for smooth voltage increase as throttle is moved from idle position to wide open throttle)	Idle	0.535 – 0.735 V
			Wide open throttle	4.5 – 5.5 V
85	Barometric pressure sensor	Ignition switch: "ON"	When altitude is 0 m (0 ft)	3.7 – 4.3 V
			When altitude is 600 m (1,969 ft)	3.4 – 4.0 V
			When altitude is 1,200 m (3,937 ft)	3.2 – 3.8 V
			When altitude is 1,800 m (5,906 ft)	2.9 – 3.5 V
86	Vehicle speed sensor	• Ignition switch: "ON" • Move the vehicle slowly forward		0 ⇔ 8 – 12 V (changes repeatedly)
87	Idle position signal	Ignition switch: "ON"	Set throttle valve to idle position	0 – 1 V
			Open throttle slightly	4 V or more

TERMINAL NO.	INSPECTION ITEM	INSPECTION CONDITION (ENGINE CONDITION)	NORMAL CONDITION
88	Camshaft position sensor	Engine: cranking	0.4 – 3.0 V
		Engine: idling	1.5 – 3.0 V
89	Crankshaft position sensor	Engine: cranking	0.4 – 4.0 V
		Engine: idling	1.5 – 2.5 V
90	Volume airflow sensor	Engine: idling	2.2 – 3.2 V
		Engine: 2,500 r/min	
91	Charge air cooler water spray switch (MANUAL)	• Ignition switch: "ON" • Charge air cooler water spray switch (MANUAL): OFF	B+
		• Ignition switch: "ON" • Charge air cooler water spray switch (MANUAL): ON	1 V or less

TERMINAL RESISTANCE AND CONTINUITY CHECK

ECM Connector Terminal Arrangement



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TERMINAL NO.	INSPECTION ITEM	NORMAL CONDITION (INSPECTION CONDITION)
1 – 12	No. 1 injector	7.8 – 9.2 Ω [at 20°C (68°F)]
14 – 12	No. 2 injector	
2 – 12	No. 3 injector	
15 – 12	No. 4 injector	
3 – 12	Fuel pressure solenoid	29 – 35 Ω [20°C (68°F)]
4 – 12	Stepper motor coil (A1)	28 – 33 Ω [at 20°C (68°F)]
17 – 12	Stepper motor coil (A2)	
5 – 12	Stepper motor coil (B1)	
18 – 12	Stepper motor coil (B2)	
6 – 12	EGR vacuum regulator solenoid valve	29 – 35 Ω [at 20°C (68°F)]
9 – 12	Evaporative emission purge solenoid	30 – 34 Ω [at 20°C (68°F)]
11 – 12	Turbocharger wastegate solenoid	29 – 35 Ω [20°C (68°F)]
13 – Body ground	ECM ground	Continuity (approximately 0 Ω)
26 – Body ground	ECM ground	
54 – 12	Heated oxygen sensor heater (rear)	11 – 18 Ω [at 20°C (68°F)]
55 – 12	Evaporative emission ventilation solenoid	17 – 21 Ω [at 20°C (68°F)]

TSB Revision

TERMINAL NO.	INSPECTION ITEM	NORMAL CONDITION (INSPECTION CONDITION)
60 – 12	Heated oxygen sensor heater (front)	4.5 – 8.0 Ω [at 20°C (68°F)]
72 – 92	Intake air temperature sensor	13 – 17 kΩ [when intake air temperature is –20°C (–4°F)]
		5.3 – 6.7 kΩ [when intake air temperature is 0°C (32°F)]
		2.3 – 3.0 kΩ [when intake air temperature is 20°C (68°F)]
		1.0 – 1.5 kΩ [when intake air temperature is 40°C (104°F)]
		0.56 – 0.76 kΩ [when intake air temperature is 60°C (140°F)]
		0.30 – 0.42 kΩ [when intake air temperature is 80°C (176°F)]
83 – 92	Engine coolant temperature sensor	14 – 17 kΩ [when engine coolant temperature is –20°C (–4°F)]
		5.1 – 6.5 kΩ [when engine coolant temperature is 0°C (32°F)]
		2.1 – 2.7 kΩ [when engine coolant temperature is 20°C (68°F)]
		0.9 – 1.3 kΩ [when engine coolant temperature is 40°C (104°F)]
		0.48 – 0.68 kΩ [when engine coolant temperature is 60°C (140°F)]
		0.26 – 0.36 kΩ [when engine coolant temperature is 80°C (176°F)]

INSPECTION PROCEDURE USING AN OSCILLOSCOPE

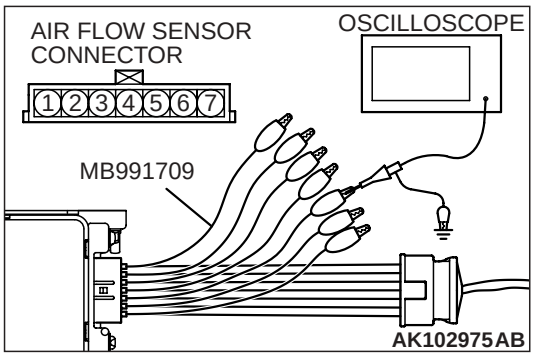
M1131154500402

VOLUME AIRFLOW SENSOR

Required Special Tool:
MB991709: Test Harness Set

Measurement Method

1. Disconnect the volume airflow sensor connector, and connect the test harness special tool (MB991709) in between. (All terminals should be connected.)



2. Connect the oscilloscope probe to volume airflow sensor connector terminal No. 3.

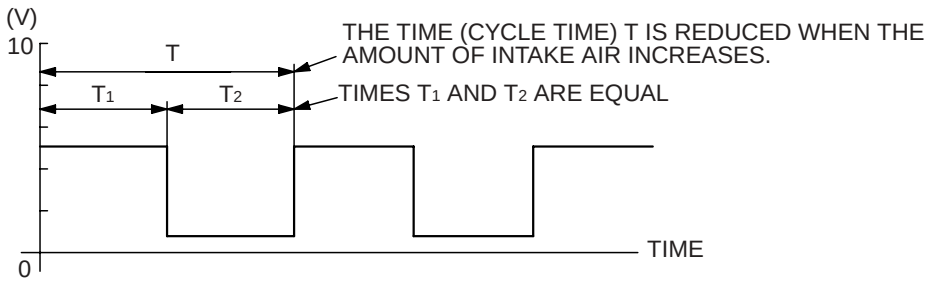
Alternate method (Test harness not available)

1. Connect the oscilloscope probe to ECM terminal No. 90.

Standard Wave Pattern

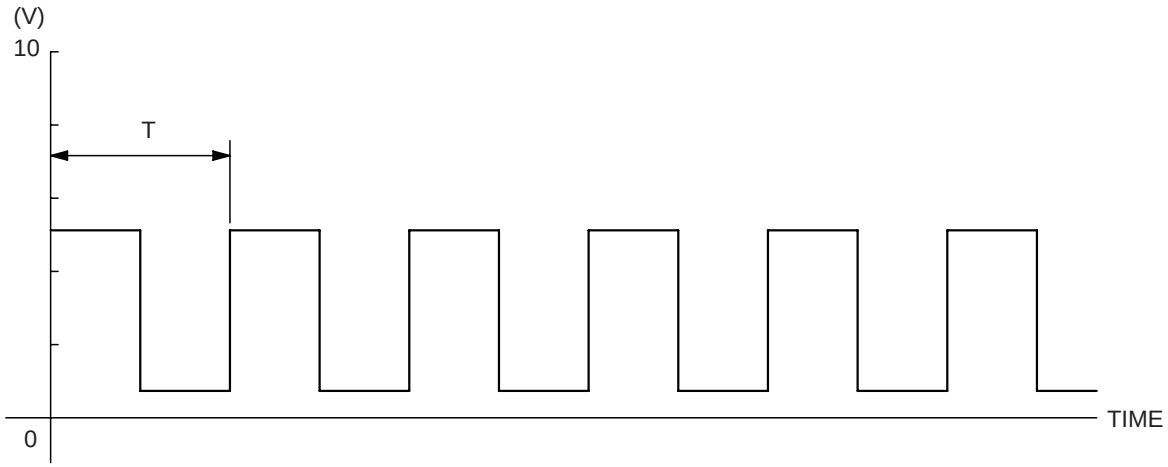
Observation conditions	
Function	**Special pattern**
Pattern height	Low
Pattern selector	Display
Engine r/min	Idle speed

Standard wave pattern



Observation conditions
Rev engine, observe T1 and T2 remain equal.

Standard wave pattern



AKX01596 AB

Wave Pattern Observation Points

Check that cycle time T becomes shorter and the frequency increases when the engine speed is increased.

Examples of Abnormal Wave Patterns

Example 1

Cause of problem

- Sensor interface malfunction.

Wave pattern characteristics

- Rectangular wave pattern is output even when the engine is not started.

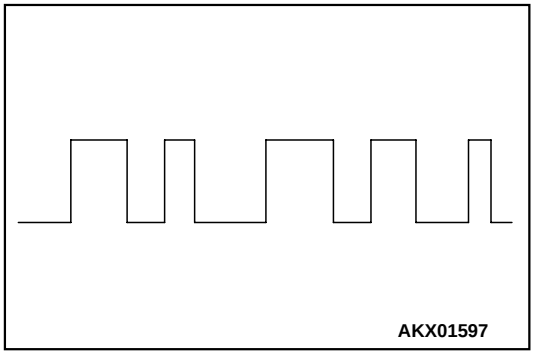
Example 2

Cause of problem

- Damaged rectifier or vortex generation column.

Wave pattern characteristics

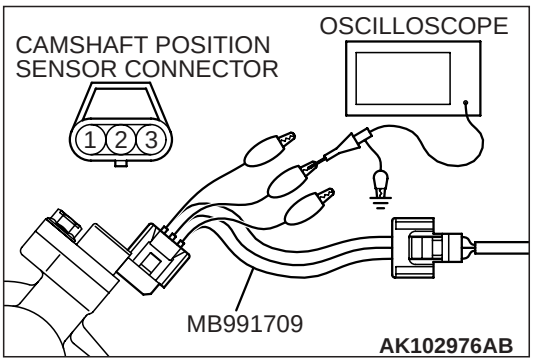
- Unstable wave pattern with non-uniform frequency. An ignition leak will distort the wave pattern temporarily, even if the volume airflow sensor is normal.



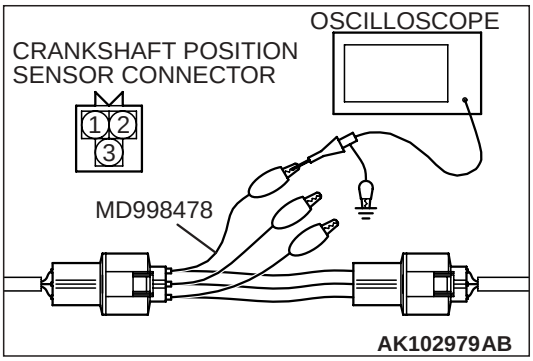
CAMSHAFT POSITION SENSOR AND CRANKSHAFT POSITION SENSOR

Required Special Tools:
MB991709: Test Harness Set
MB998478: Test Harness

Measurement Method



1. Disconnect the camshaft position sensor connector, and connect the test harness special tool (MB991709) in between. (All terminals should be connected.)
2. Connect the oscilloscope probe to camshaft position sensor connector terminal No. 2.



3. Disconnect the crankshaft position sensor connector, and connect the test harness special tool (MD998478) in between.
4. Connect the oscilloscope probe to crankshaft position sensor connector terminal No. 2. (black clip of special tool)

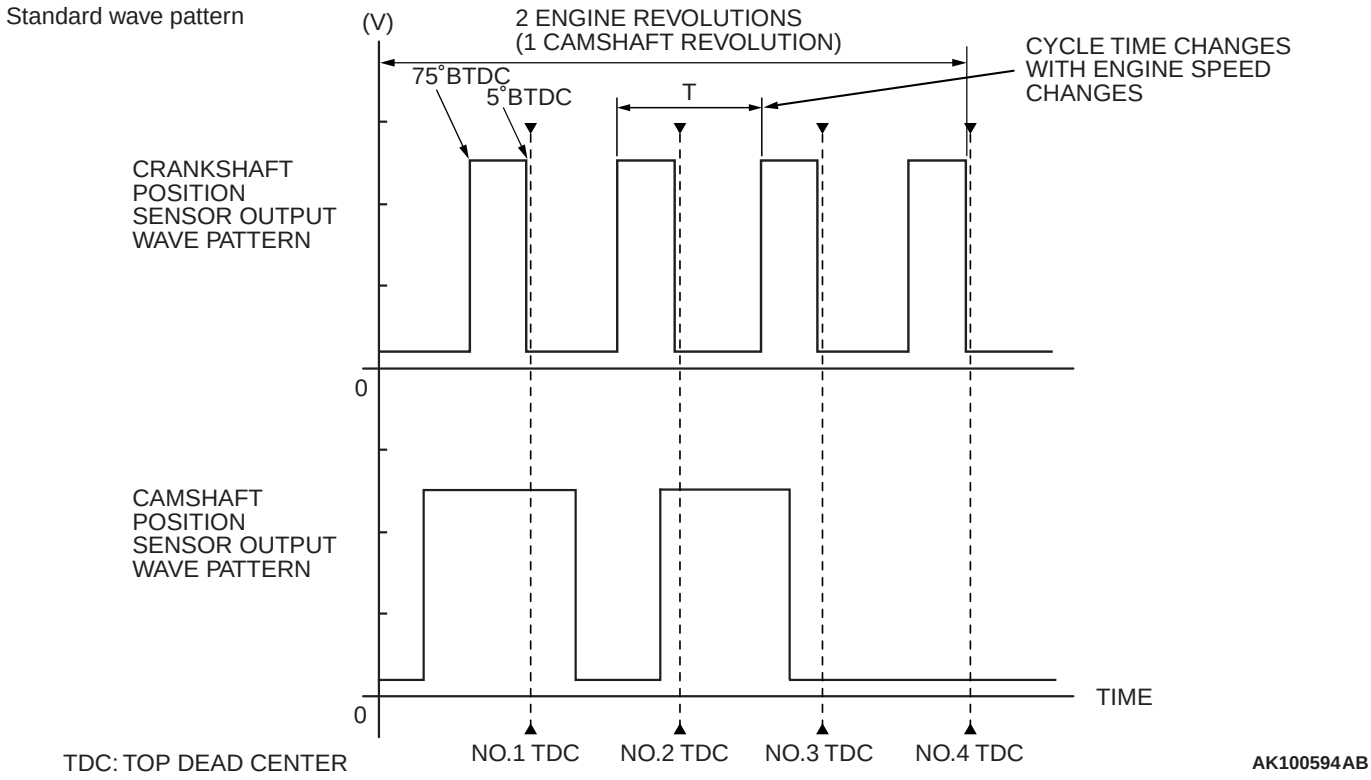
Alternate method (Test harness not available)

1. Connect the oscilloscope probe to ECM terminal No. 88. (Check the camshaft position sensor signal wave pattern.)
2. Connect the oscilloscope probe to ECM terminal No. 89. (Check the crankshaft position sensor signal wave pattern.)

Standard Wave Pattern

Observation conditions	
Function	**Special pattern**
Pattern height	Low
Pattern selector	Display
Engine r/min	Idle speed

TSB Revision



Wave Pattern Observation Points

Check that cycle time T becomes shorter when the engine speed increased.

Examples of Abnormal Wave Patterns

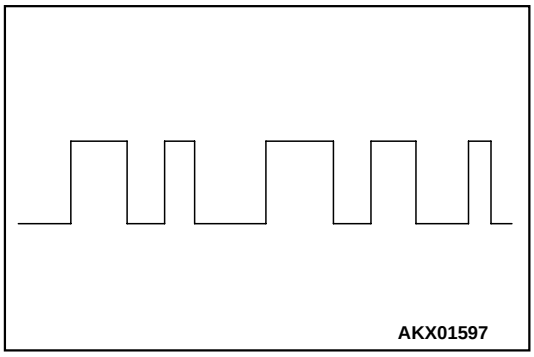
Example 1

Cause of problem

- Sensor interface malfunction.

Wave pattern characteristics

- Rectangular wave pattern is output even when the engine is not started.



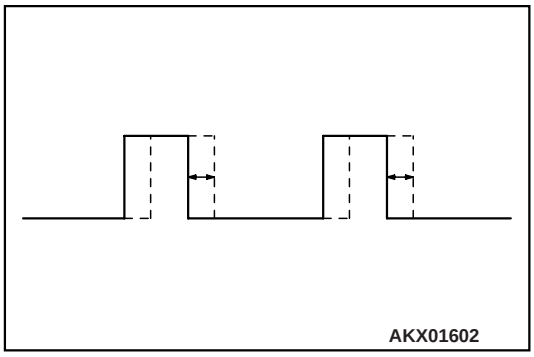
Example 2

Cause of problem

- Loose timing belt.
- Abnormality in sensor disc.

Wave pattern characteristics

- Wave pattern is displaced to the left or right.



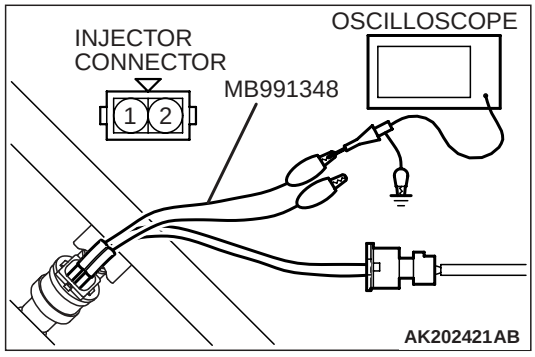
INJECTOR

Required Special Tool:

MB991348: Test Harness Set

Measurement Method

1. Disconnect the injector connector, and connect the test harness special tool (MB991348) in between. (All terminals should be connected.)
2. Connect the oscilloscope probe to injector connector terminal No. 2.



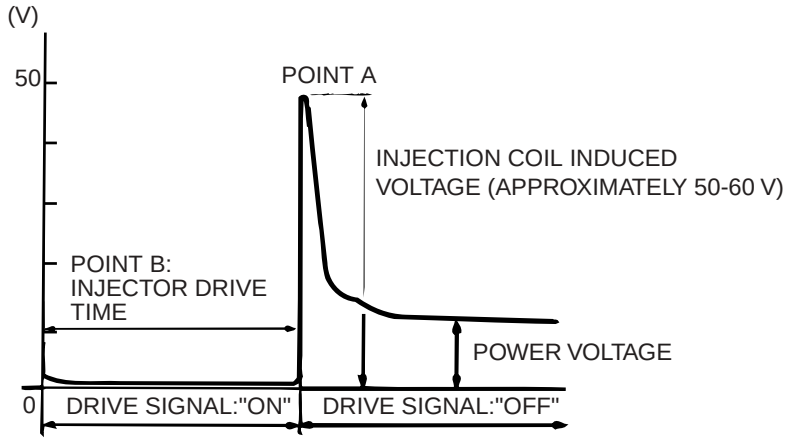
Alternate method (Test harness not available)

1. Connect the oscilloscope probe to ECM terminal No. 1. (When checking the number 1 cylinder.)
2. Connect the oscilloscope probe to ECM terminal No. 14. (When checking the number 2 cylinder.)
3. Connect the oscilloscope probe to ECM terminal No. 2. (When checking the number 3 cylinder.)
4. Connect the oscilloscope probe to ECM terminal No. 15. (When checking the number 4 cylinder.)

Standard Wave Pattern

Observation conditions	
Function	**Special pattern**
Pattern height	Variable
Variable knob	Adjust while viewing the wave pattern
Pattern selector	Display
Engine r/min	Idle speed

Standard wave pattern



AKX01604 AB

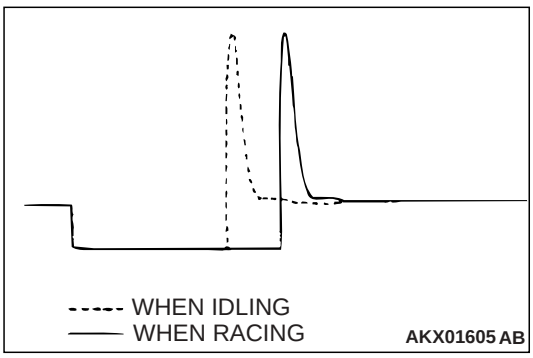
Wave Pattern Observation Points

Point A: Height of injector coil induced voltage.

CONTRAST WITH STANDARD WAVE PATTERN	PROBABLE CAUSE
Injector coil induced voltage is low or doesn't appear at all	Short in the injector solenoid

Point B: Injector drive time

1. The injector drive time should be synchronized with the scan tool tester display.
2. When the engine is suddenly revved, the drive time will be greatly extended at first, but the drive time will soon return to original length.



AKX01605 AB

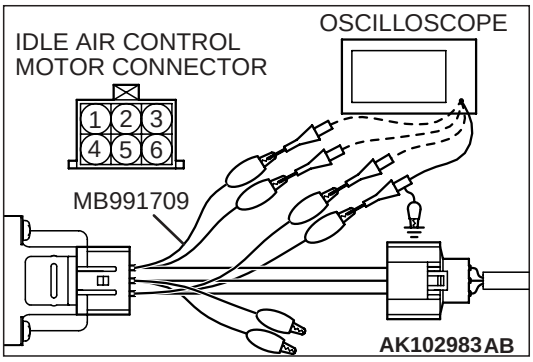
TSB Revision

IDLE AIR CONTROL MOTOR (STEPPER MOTOR)

Required Special Tool:
MB991709: Test Harness Set

Measurement Method

1. Disconnect the idle air control motor connector, and connect the test harness special tool (MB991709) in between. (All terminals should be connected.)
2. Connect the oscilloscope probe to the idle air control motor connector terminal No. 1, terminal No. 3, terminal No. 4 and terminal No. 6 respectively.



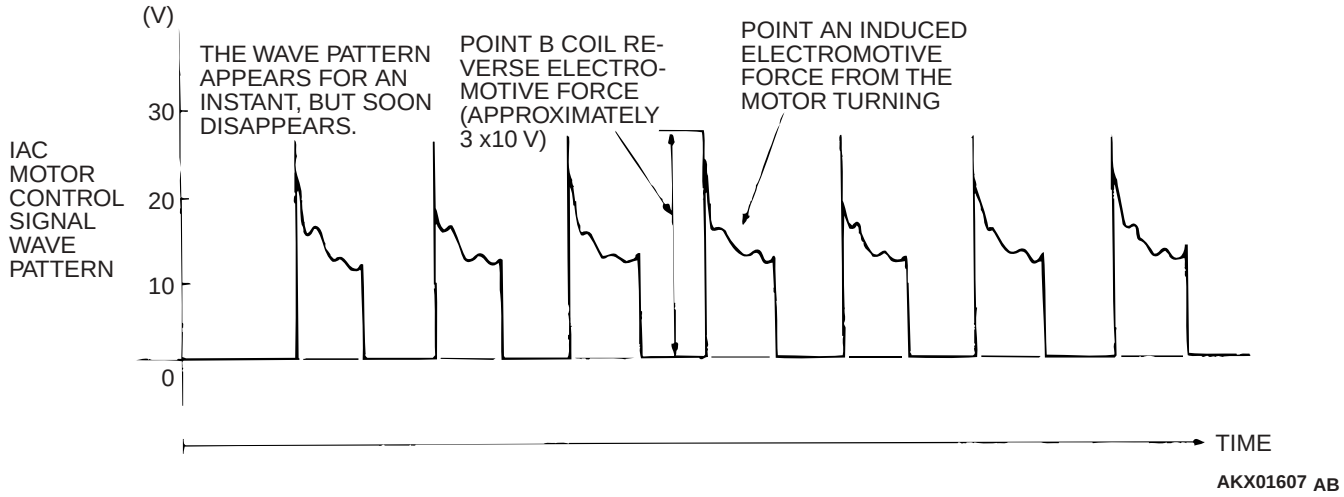
Alternate method (Test harness not available)

1. Connect the oscilloscope probe to the ECM terminal No. 4, terminal No. 5, terminal No. 17 and terminal No. 18 respectively.

Standard Wave Pattern

Observation conditions	
Function	**Special pattern**
Pattern height	High
Pattern selector	Display
Engine condition	Turn the ignition switch from "LOCK" (OFF) to "ON" (without starting the engine).
	While the engine is idling, turn the A/C switch to "ON."
	Immediately after starting the warm the engine (approximately one minute).

Standard wave pattern



Wave Pattern Observation Points

Check that the standard wave pattern appears when the idle air control motor is operating.

Point A: Presence or absence of induced electromotive force from the motor turning. (Refer to abnormal wave pattern.)

CONTRAST WITH STANDARD WAVE PATTERN	PROBABLE CAUSE
Induced electromotive force does not appear or is extremely small	Malfunction of motor

Point B: Height of coil back electromotive force

CONTRAST WITH STANDARD WAVE PATTERN	PROBABLE CAUSE
Coil reverse electromotive force does not appear or is extremely small	Short in the coil

Examples of Abnormal Wave Patterns

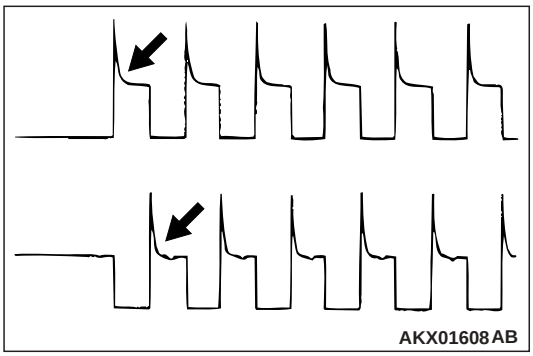
Example 1

Cause of problem

- Malfunction of motor. (Motor is not operating.)

Wave pattern characteristics

- Induced electromotive force from the motor turning does not appear.



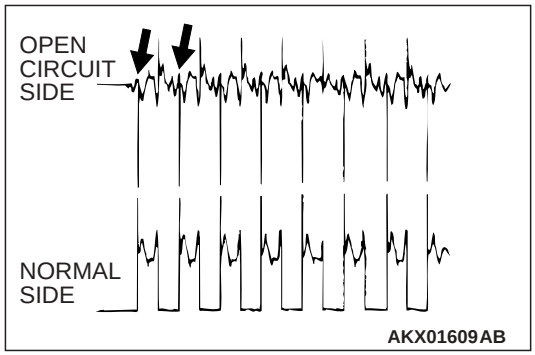
Example 2

Cause of problem

- Open circuit in the line between the idle air control motor and the ECM.

Wave pattern characteristics

- Current is not supplied to the motor coil on the open circuit side. (Voltage does not drop to 0 volt.) Furthermore, the induced electromotive force wave pattern at the normal side is slightly different from the normal wave pattern.



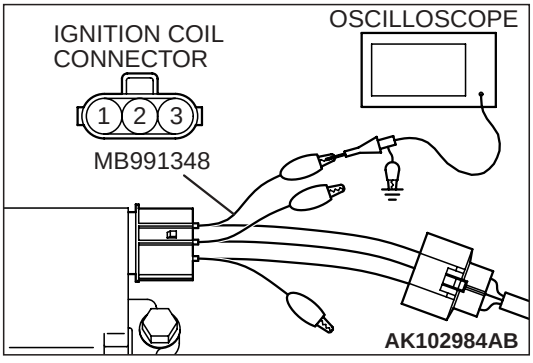
IGNITION COIL AND IGNITION POWER TRANSISTOR

Required Special Tool:

MB991348: Test Harness Set

Measurement Method

1. Disconnect the ignition coil connector, and connect test harness special tool, MB991348, in between. (All terminals should be connected.)
2. Connect the oscilloscope probe to ignition coil connector terminal No. 3.



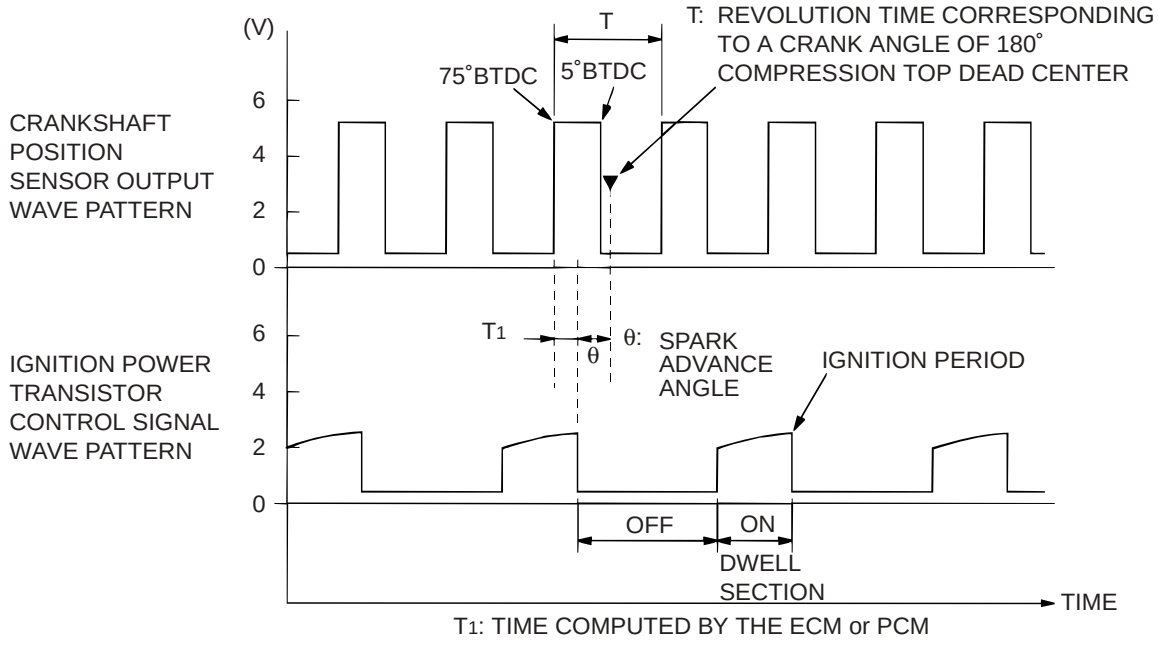
Alternate method (Test harness not available)

1. Connect the oscilloscope probe to the ECM terminal No. 10 (for number 1 – number 4), terminal No. 23 (for number 2 – number 3).

Standard Wave Pattern

Observation conditions	
Function	**Special pattern**
Pattern height	Low
Pattern selector	Display
Engine r/min	Approximately 1,200 r/min

Standard wave pattern



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Wave Pattern Observation Points

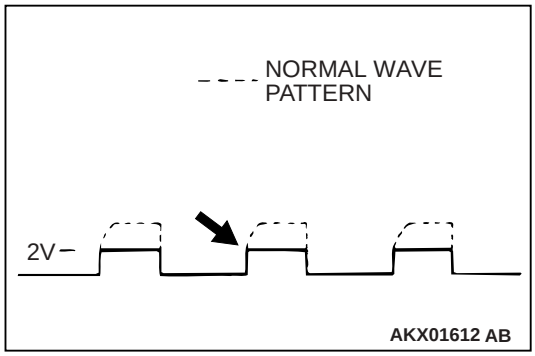
Point: Condition of wave pattern build-up section and maximum voltage (Refer to abnormal wave pattern examples 1 and 2.

CONDITION OF WAVE PATTERN BUILD-UP SECTION AND MAXIMUM VOLTAGE	PROBABLE CAUSE
Rises from approximate 2 volts to approximate 4.5 volts at the top-right	Normal
2-volt rectangular wave	Open-circuit in ignition primary circuit
Rectangular wave at power voltage	Ignition power transistor malfunction

Examples of Abnormal Wave Patterns

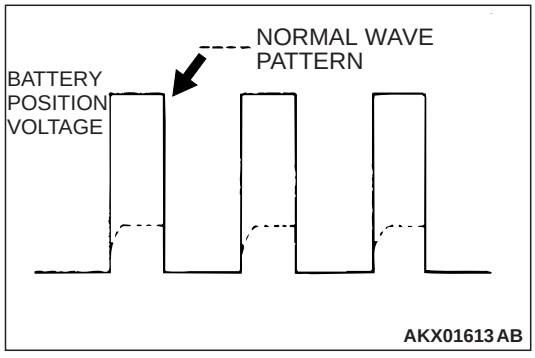
Example 1 (Wave pattern during engine cranking)
Cause of problem
- Open-circuit in ignition primary circuit

Wave pattern characteristics
- Top-right part of the build-up section cannot be seen, and voltage value is approximately 2 volts too low.



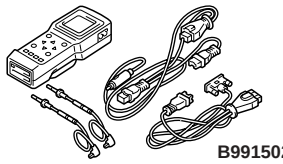
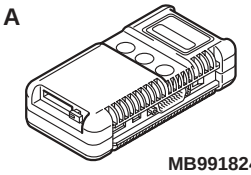
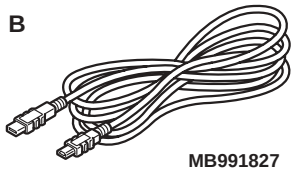
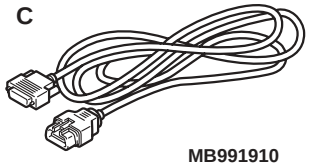
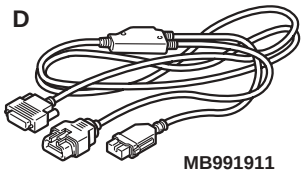
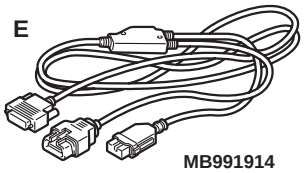
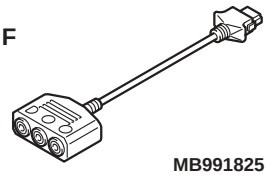
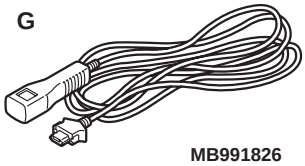
Example 2 (Wave pattern during engine cranking)
Cause of problem
- Malfunction in ignition power transistor

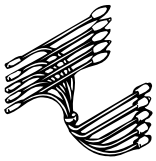
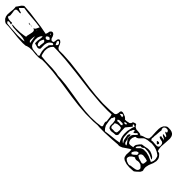
Wave pattern characteristics
- Power voltage results when the ignition power transistor is ON.



SPECIAL TOOLS

M1131000600308

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
 B991502	MB991502 Scan tool <MUT-II>	MB991496-OD	• Reading diagnostic trouble code • MFI system inspection • Measurement of fuel pressure
A  MB991824 B  MB991827 C  MB991910 D  MB991911 E  MB991914 F  MB991825 G  MB991826 MB991958	MB991958 A: MB991824 B: MB991827 C: MB991910 D: MB991911 E: MB991914 F: MB991825 G: MB991826 MUT-III sub assembly A: Vehicle Communication Interface (V.C.I.) B: MUT-III USB Cable C: MUT-III Main Harness A (Vehicles with CAN communication system) D: MUT-III Main Harness B (Vehicles without CAN communication system) E: MUT-III Main Harness C (for Chrysler models only) F: MUT-III Adapter Harness G: MUT-III Trigger Harness		• Reading diagnostic trouble code • MFI system inspection • Measurement of fuel pressure

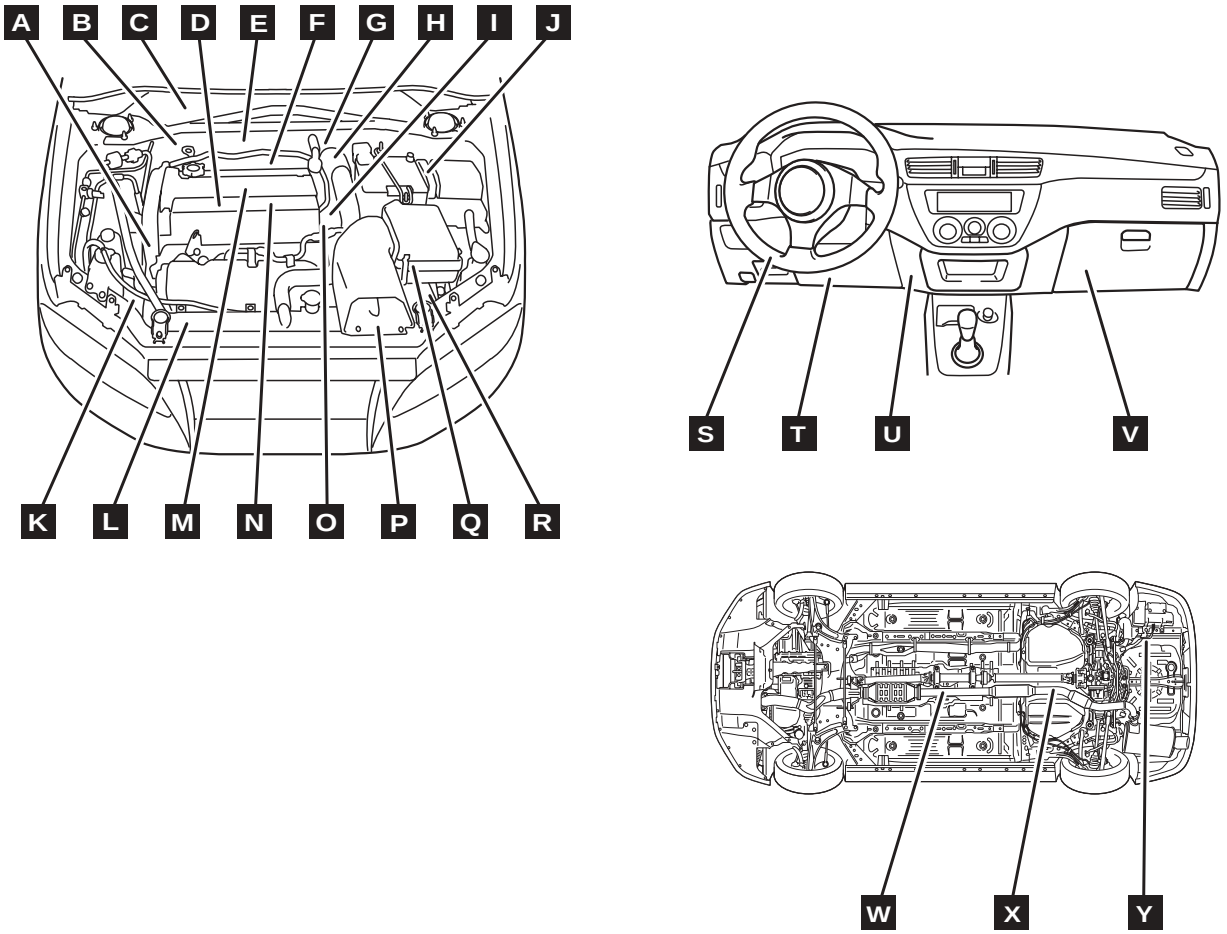
TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
 MB991348	MB991348 Test harness set	MB991348-01	• Inspection using an oscilloscope • Adjustment of throttle position sensor
	MB991709 Test harness set	MB991709-01	• Inspection using an oscilloscope • Inspection of idle air control motor
 MB991658	MB991658 Test harness SET	Tool not available	• Inspection of heated oxygen sensor (rear)
	MD998464 Test harness (4 pin, square)	MD998464-01	• Inspection of heated oxygen sensor (front) • Inspection using an oscilloscope
	MD998478 Test harness (3 pin, triangle)	MD998478-01	• Inspection using an oscilloscope
	MD998709 Adaptor hose	MIT210196	Measurement of fuel pressure
	MD998742 Hose adaptor	MD998742-01	
 MB991637	MB991637 Fuel pressure gauge set	Tool not available	

ON-VEHICLE SERVICE

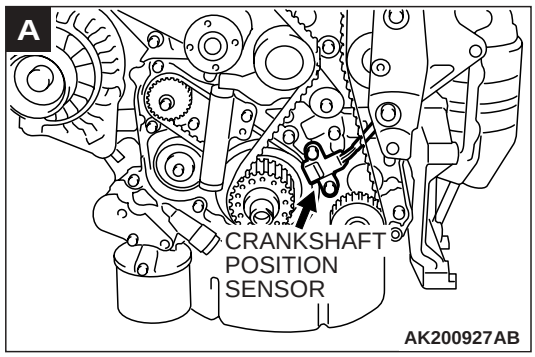
COMPONENT LOCATION

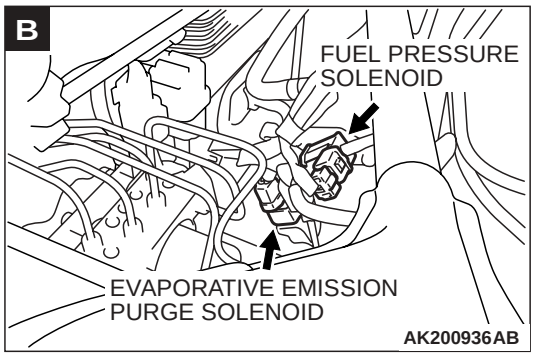
M1131002100569

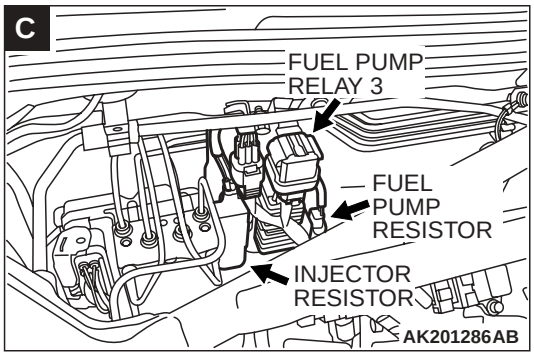
NAME	SYMBOL	NAME	SYMBOL
Air conditioning compressor clutch relay	J	Fuel pump relay 3	C
Camshaft position sensor	O	Fuel pump resistor	C
Crankshaft position sensor	A	Heated oxygen sensor (front)	L
Clutch pedal position switch	T	Heated oxygen sensor (rear)	W
Data link connector	U	Idle air control motor	H
EGR vacuum regulator solenoid valve	D	Ignition coil	M
Engine control module (ECM)	V	Injector	F
Engine coolant temperature sensor	O	Injector resistor	C
Engine speed detection connector	J	Knock sensor	N
Evaporative emission purge solenoid	B	Manifold differential pressure sensor	E
Evaporative emission ventilation solenoid	Y	Multiport fuel injection (MFI) relay	J
Fan control module	P	Power steering pressure switch	K
Fuel pressure solenoid	B	Throttle position sensor	G
Fuel tank differential pressure sensor	X	Turbocharger wastegate solenoid	R
Fuel tank temperature sensor	X	Vehicle speed sensor	I
Fuel pump relay 1, 2	S	Volume airflow sensor (with built-in intake air temperature sensor and barometric pressure sensor)	Q

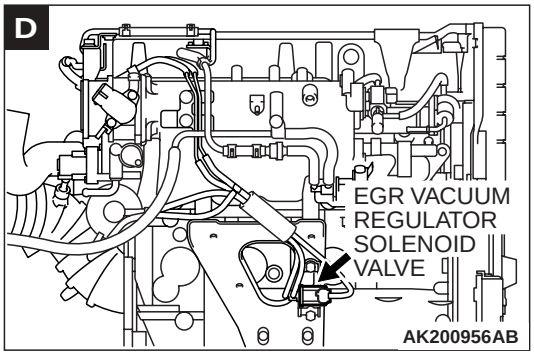


AK200517AB



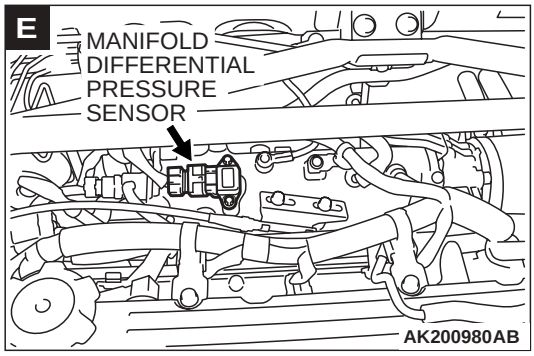






TSB Revision

E


MANIFOLD
DIFFERENTIAL
PRESSURE
SENSOR
AK200980AB

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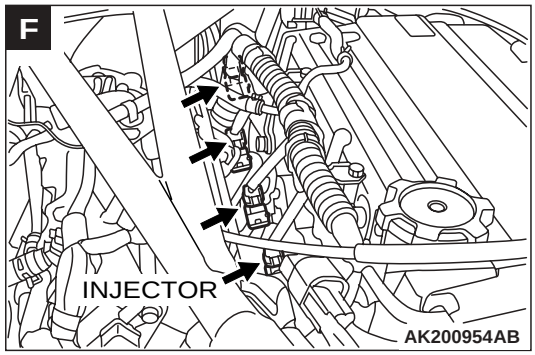
INJECTOR
AK200954AB

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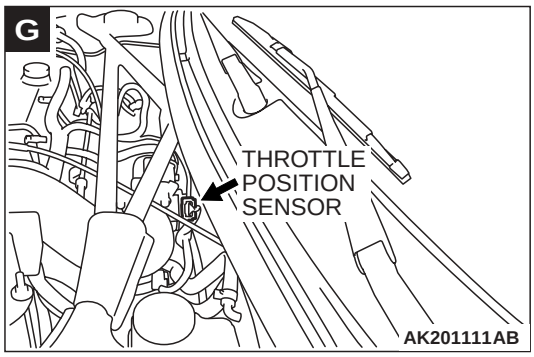
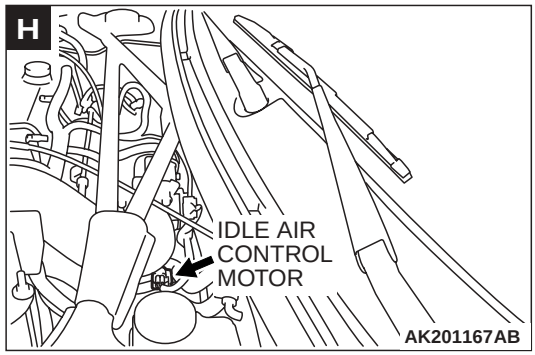

THROTTLE
POSITION
SENSOR
AK201111AB

H


IDLE AIR
CONTROL
MOTOR
AK201167AB

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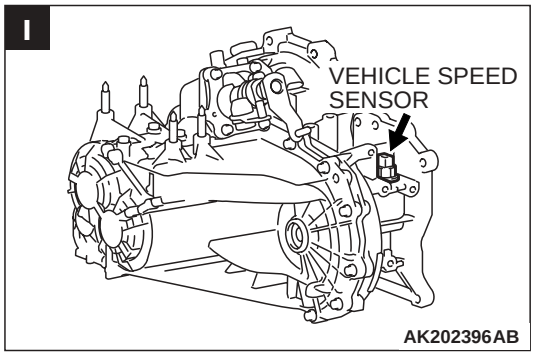
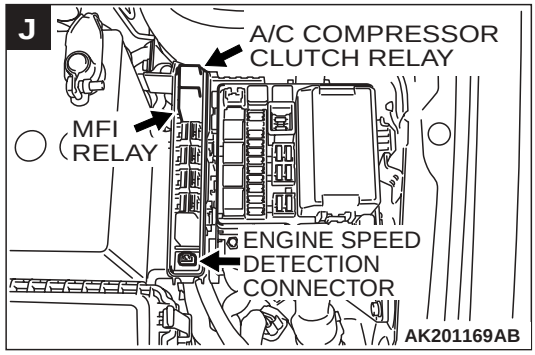
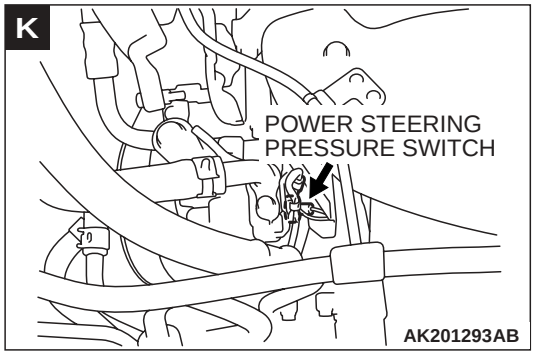

VEHICLE SPEED
SENSOR
AK202396AB

J


A/C COMPRESSOR
CLUTCH RELAY
MFI
RELAY
ENGINE SPEED
DETECTION
CONNECTOR
AK201169AB

K


POWER STEERING
PRESSURE SWITCH
AK201293AB

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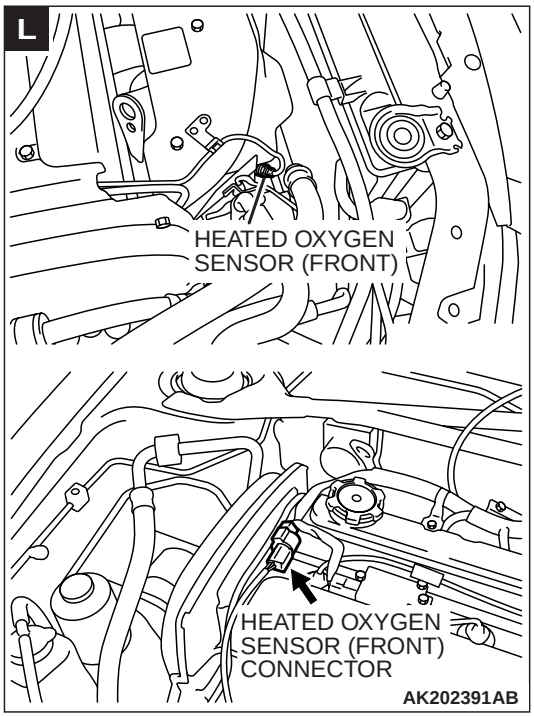
HEATED OXYGEN SENSOR (FRONT)
HEATED OXYGEN SENSOR (FRONT) CONNECTOR
AK202391AB

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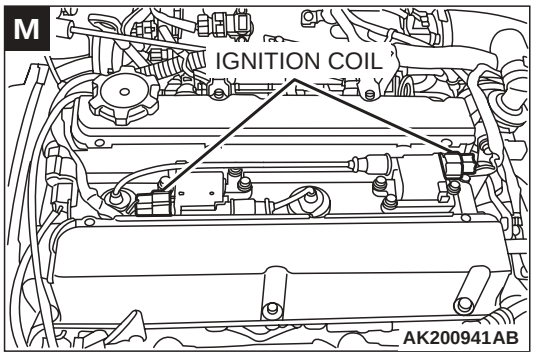
IGNITION COIL
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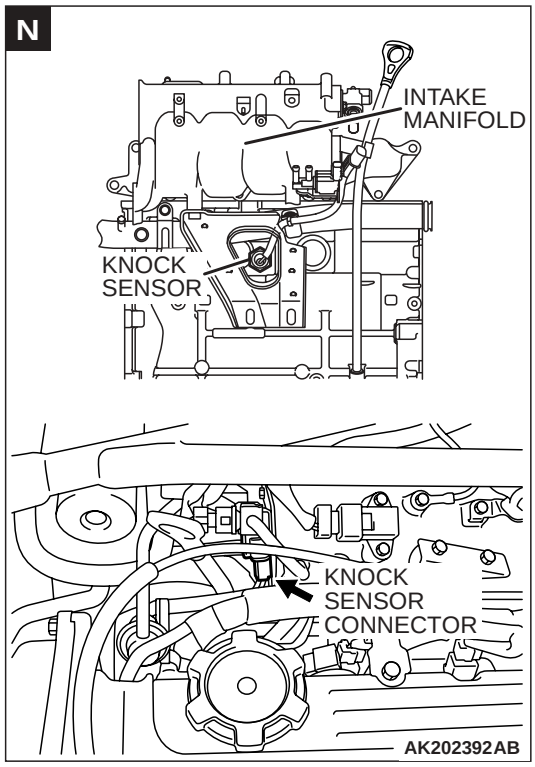
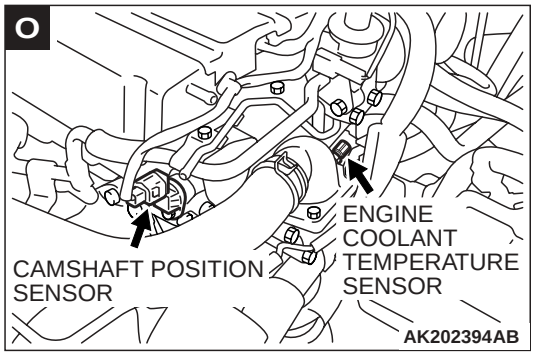
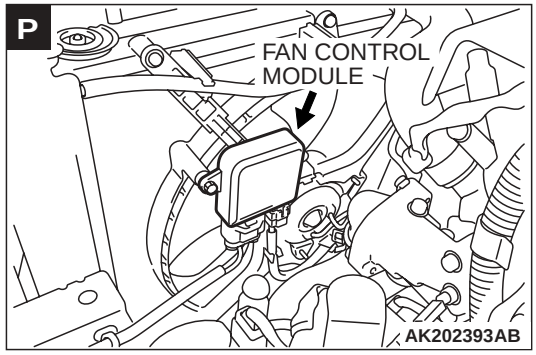

INTAKE MANIFOLD
KNOCK SENSOR
KNOCK SENSOR CONNECTOR
AK202392AB

O


CAMSHAFT POSITION SENSOR
ENGINE COOLANT TEMPERATURE SENSOR
AK202394AB

P


FAN CONTROL MODULE
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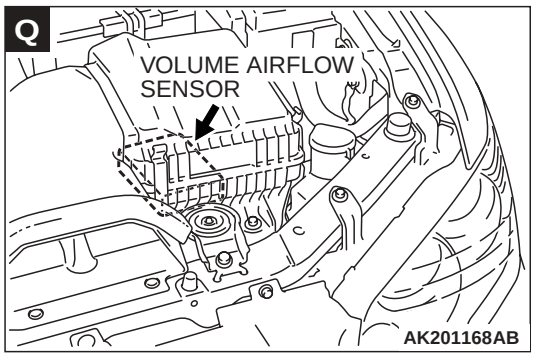
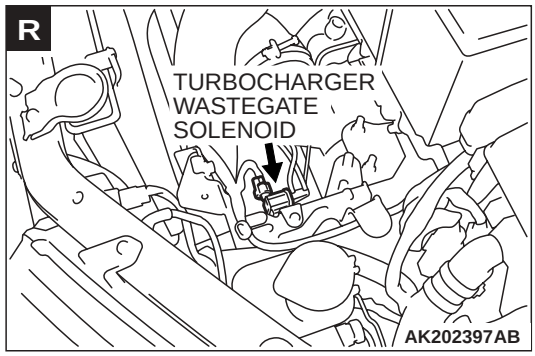
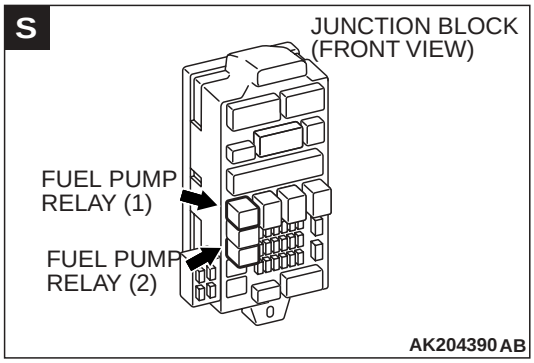
Q


VOLUME AIRFLOW SENSOR
AK201168AB

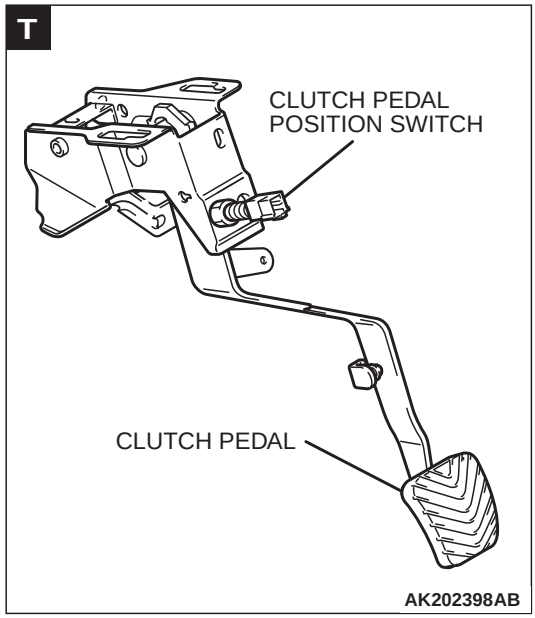
R


TURBOCHARGER WASTEGATE SOLENOID
AK202397AB

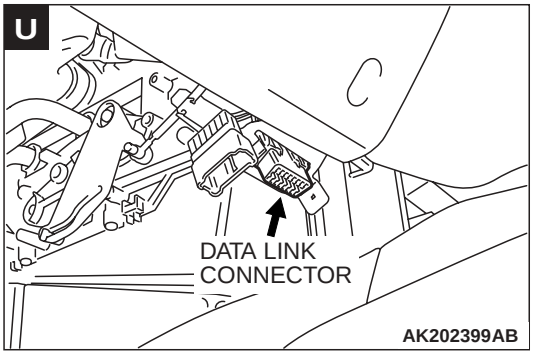
S


JUNCTION BLOCK (FRONT VIEW)
FUEL PUMP RELAY (1)
FUEL PUMP RELAY (2)
AK204390 AB

T


CLUTCH PEDAL POSITION SWITCH
CLUTCH PEDAL
AK202398AB

U


DATA LINK CONNECTOR
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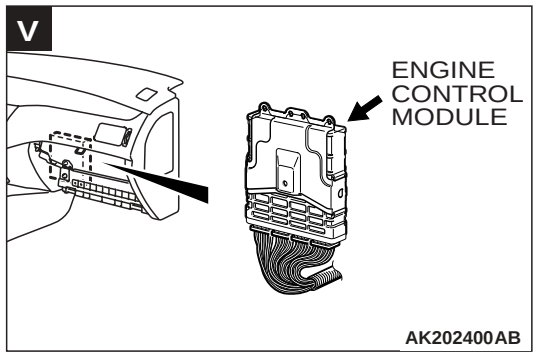
V


ENGINE CONTROL MODULE
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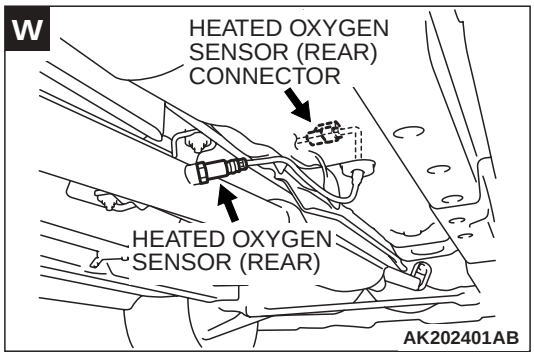
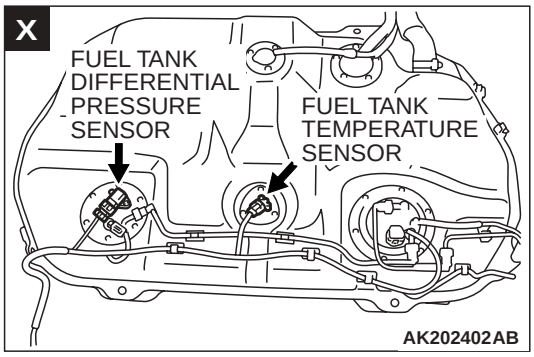
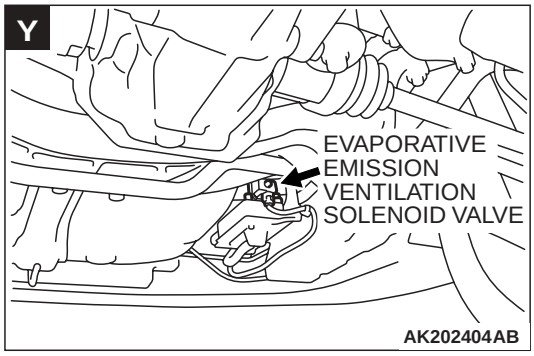


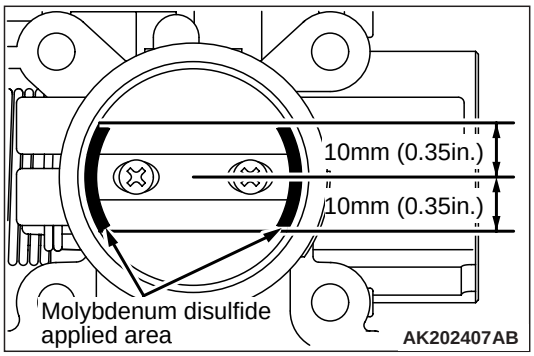




THROTTLE BODY (THROTTLE VALVE AREA) CLEANING

M1131001000279

1. Remove the air intake hose from the throttle body.



⚠ CAUTION

- **Do not spray the cleaning solvent directly to the throttle valve.**
- **Make sure the cleaning solvent does not enter the motor from the bypass line. Also make sure the cleaning solvent does not enter the sensor through the shaft.**
- **Molybdenum disulfide is applied to the area around the throttle valve shaft (as shown on the left). Therefore, do not clean this area with cleaning solvent.**

Spray cleaning solvent on a clean cloth.

2. Wipe off the dirt around the throttle valve with the cloth sprayed with cleaning solvent.
3. Attach the air intake hose.
4. Adjust the basic idle speed. (Refer to P.13A-760)

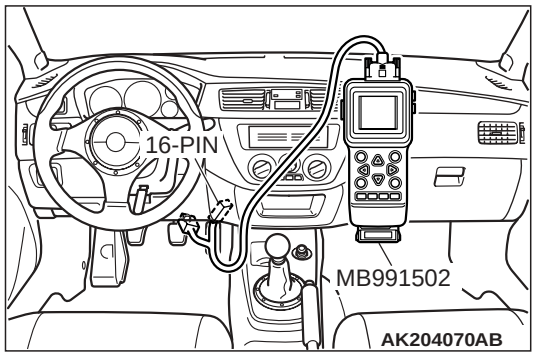
THROTTLE POSITION SENSOR ADJUSTMENT

M1131001100384

Required Special Tools:

- MB991502: Scan Tool (MUT-II)
- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991911: Main Harness B
- MB991348: Test Harness Set

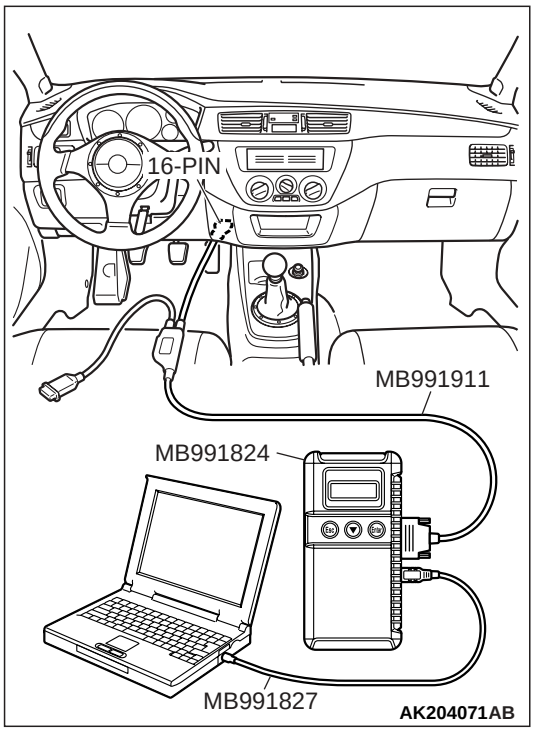
TSB Revision

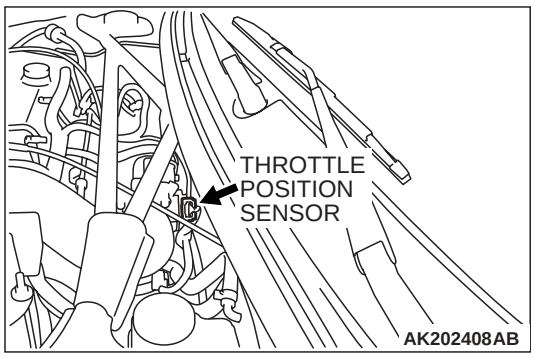


⚠ CAUTION

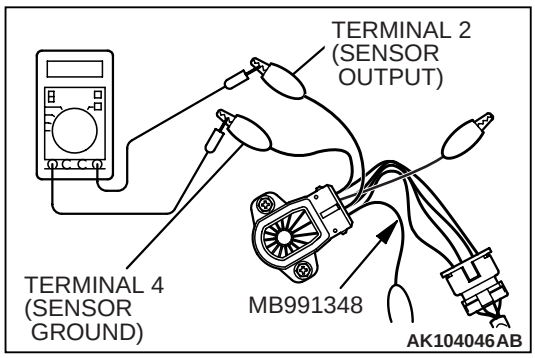
To prevent damage to scan tool MB991502 or MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting the scan tool MB991502 or MB991958.

1. Connect scan tool MB991502 or MB991958 to the data link connector. When not using scan tool follow the steps below.





(1) Disconnect the throttle position sensor connector, and connect the special tool MB991348 in between. (All terminals should be connected.)



(2) Connect a digital voltmeter between throttle position sensor terminal No. 2 (sensor output) and terminal No. 4 (sensor ground).

2. Turn the ignition switch to the "ON" position (but do not start the engine).
3. Check the throttle position sensor output voltage.

   Standard value: 535 – 735 mV

4. If not within the standard value range, adjust by loosening throttle position sensor mounting bolts and turning the throttle position sensor body. After adjusting, tighten the bolts securely.
5. Turn the ignition switch to the "LOCK" (OFF) position.
6. Disconnect scan tool MB991502 or MB991958. When the scan tool is not used, remove special tool MB991348, and connect the throttle position sensor connector.

BASIC IDLE SPEED ADJUSTMENT

M1131001800435

Required Special Tools:

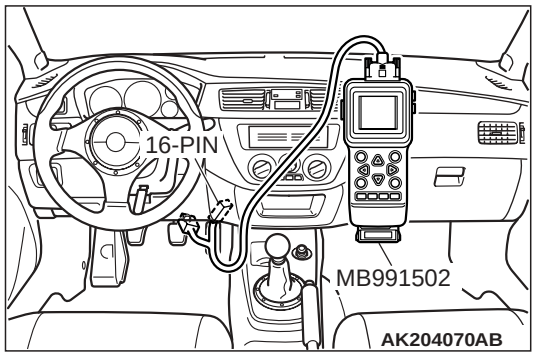
- MB991502: Scan Tool (MUT-II)
- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991911: Main Harness B

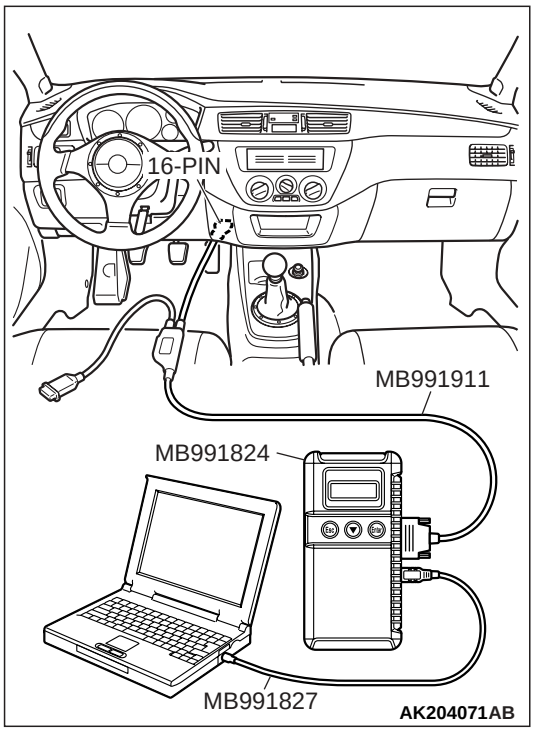
NOTE: The standard idle speed has been adjusted with the speed adjusting screw (SAS), by the manufacturer, and there should be no need for readjustment.

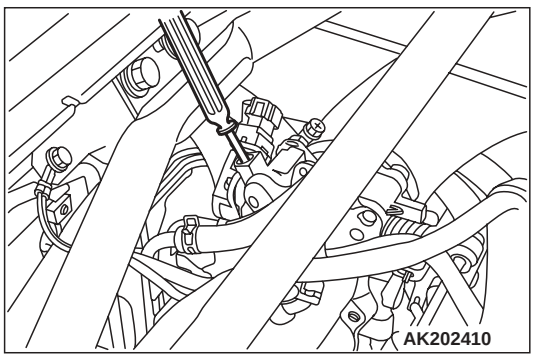
NOTE: If the adjustment has been changed by mistake, the idle speed may become too high or the idle speed may drop too low when loads A/C, defogger, etc. are placed on the engine. If this occurs, adjust by the following procedure.

NOTE: The adjustment, if made, should be made after first confirming that the spark plugs, the injectors, the idle air control motor, compression, etc., are all normal.

1. The vehicle should be prepared as follows before the inspection and adjustment.
   - Engine coolant temperature: 80 – 95°C (176 – 203°F)
   - Lights, electric cooling fan and accessories: OFF
   - Transaxle: Neutral







⚠ CAUTION
To prevent damage to scan tool MB991502 or MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502 or MB991958.

2. Connect scan tool MB991502 or MB991958 to the data link connector (16-pin).
3. Start the engine and run at idle.
4. Select the item number 30 of the scan tool Actuator test.

   NOTE: Use the scan tool to hold the IAC motor at the basic step to adjust the basic idle speed.
5. Check the idle speed.

   Standard value: 850 ± 50 r/min

   NOTE: The engine speed may be 20 to 100 r/min lower than indicated above for a new vehicle [driven approximately 500 km (300 mile) or less], but no adjustment is necessary.

   NOTE: If the engine stalls or the engine speed is low even though the vehicle has been driven approximately 500 km (300 mile) or more, it is probable that deposits are adhered to the throttle valve, so clean it. (Refer to P.13A-758.)
6. If not within the standard value range, turn the speed adjusting screw (SAS) to make the necessary adjustment.
7. Press the scan tool clear key, and release the IAC motor Actuator test mode.

   NOTE: Unless the IAC motor is released, the Actuator test mode will continue for 27 minutes.
8. Turn the ignition switch to the "LOCK" (OFF) position.
9. Disconnect scan tool MB991502 or MB991958.
10. Start the engine again and let it idle for about 10 minutes. Check that the idling condition is normal.

FUEL PRESSURE TEST

M1131001900302

Required Special Tools:

- MB991502: Scan Tool (MUT-II)
- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991911: Main Harness B
- MB991637: Fuel Pressure Gauge Set
- MD998709: Adaptor Hose
- MD998742: Hose Adaptor

1. Release residual pressure from the fuel line to prevent fuel spray. (Refer to P.13A-765.)

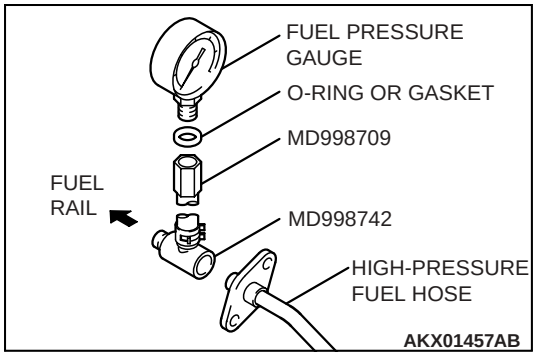
⚠ ***WARNING***

To prevent a fire, cover the hose connection with shop towels to prevent splashing of fuel that could be caused by some residual pressure in the fuel pipe line.

2. Disconnect the fuel high-pressure hose at the fuel rail side.
3. Assemble the fuel pressure measurement tools as follows.

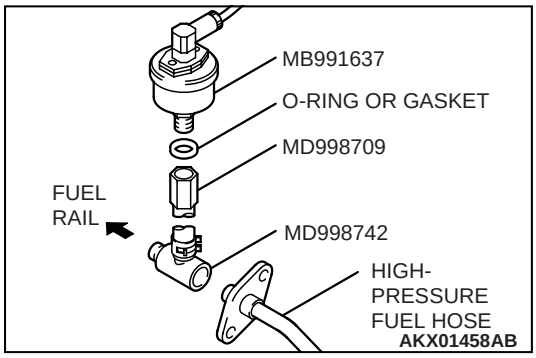
<When using the fuel pressure gauge>

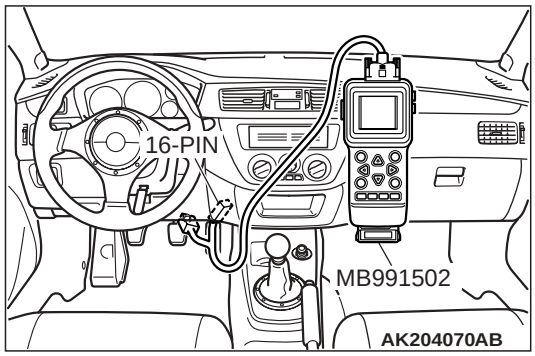
1. Remove the union joint and bolt from special tool MD998709 (adaptor hose) and instead attach special tool MD998742 (hose adaptor) to the adaptor hose.
2. Place a suitable O-ring or gasket on assembled special tools MD998709 and MD998742 and install the fuel pressure gauge.
3. Install the assembled fuel pressure measurement tools between the fuel rail and fuel high-pressure hose.

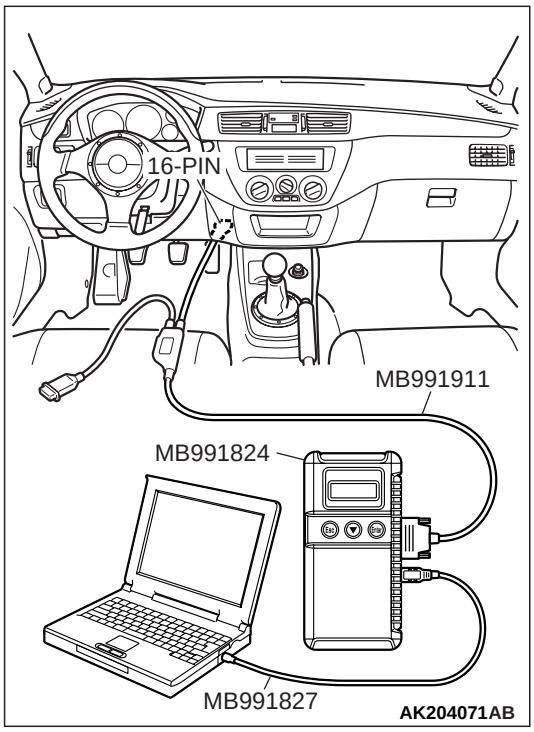


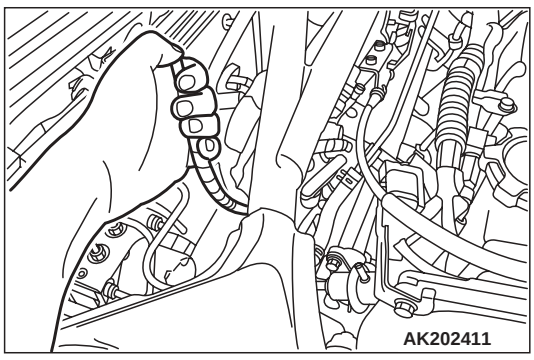
<When using the special tool MB991637 (fuel pressure gauge set)>

1. Remove the union joint and bolt from special tool MD998709 (adaptor hose) and instead attach special tool MD998742 (hose adaptor) to the adaptor hose.
2. Install special tool MB991637 (fuel pressure gauge set) to assembled special tools MD998709 and MD998742 via a gasket.
3. Install the assembled fuel pressure measurement tools between the fuel rail and the fuel high-pressure hose.









⚠ CAUTION
To prevent damage to scan tool MB991502 or MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502 or MB991958.

4. Connect scan tool MB991502 or MB991958 to the data link connector.
5. Use the Actuator test 07 to drive the fuel pump. Check that there is no fuel leaking from any section when the fuel pump is operating.
6. Stop the fuel pump.
7. Start the engine and run at idle.
8. Measure fuel pressure while the engine is running at idle.

   Standard value: Approximately 230 kPa (33 psi) at curb idle

9. Disconnect the vacuum hose from the fuel pressure regulator and measure fuel pressure with the hose end closed with your finger.

   Standard value: 289 – 309 kPa (42 – 45 psi) at curb idle

10. Check to see that fuel pressure at idle does not drop even after the engine has been revved several times.
11. Revving the engine repeatedly, hold the fuel return hose lightly with your fingers to feel that fuel pressure is present in the return hose.

    NOTE: If the fuel flow rate is low, there will be no fuel pressure in the return hose.

12. If any of fuel pressure measured in steps 8 to 11 is out of specification, troubleshoot and repair according to the table below.

SYMPTOM	PROBABLE CAUSE	REMEDY
• Fuel pressure too low • Fuel pressure drops after racing • No fuel pressure in fuel return hose	Clogged fuel filter	Replace fuel filter
	Fuel leaking to return side due to poor fuel regulator valve seating or settled spring	Replace fuel pressure regulator
	Low fuel pump delivery pressure	Replace fuel pump
Fuel pressure too high	Binding valve in fuel pressure regulator	Replace fuel pressure regulator
	Clogged fuel return hose or pipe	Clean or replace hose or pipe
Same fuel pressure when vacuum hose is connected and when disconnected	Damaged vacuum hose or clogged nipple	Replace vacuum hose or clean nipple
	Defective fuel pressure regulator	Replace fuel pressure regulator

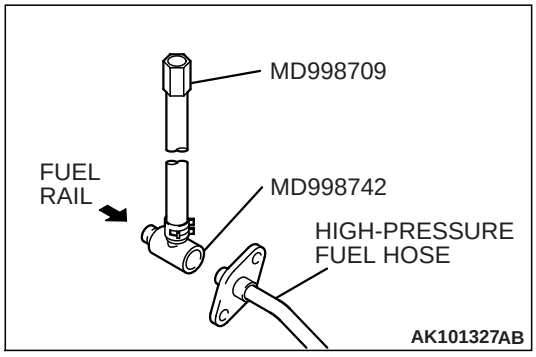
13.Stop the engine and observe fuel pressure gauge reading. It is normal if the reading does not drop within two minutes. If it does, observe the rate of drop and troubleshoot and repair according to the table below. Start, then stop the engine.
(1) Squeeze the fuel return line closed to confirm leak-down occurs from defective fuel pressure regulator.
(2) Squeeze the fuel supply line closed to confirm leak-down occurs from defective fuel pump check valve.
(3) If pressure continues to drop with both fuel lines squeezed closed, injector(s) are leaking.

SYMPTOM	PROBABLE CAUSE	REMEDY
Fuel pressure drops gradually after engine is stopped	Leaky injector	Replace injector
	Leaky fuel regulator valve seat	Replace fuel pressure regulator
Fuel pressure drops sharply immediately after engine is stopped	Check valve in fuel pump is held open	Replace fuel pump

14.Release residual pressure from the fuel pipe line. (Refer to P.13A-765.)

⚠ ***WARNING***

Cover the hose connection with shop towels to prevent splash of fuel that could be caused by some residual pressure in the fuel pipe line.



15.Remove the fuel pressure gauge or special tool MB991637, and special tools MD998709 and MD998742 from the fuel rail.

16.Replace the O-ring at the end of the fuel high-pressure hose with a new one.

17.Fit the fuel high-pressure hose into the fuel rail and tighten the bolts to specified torque.

Tightening torque: 5.0 ± 1.0 (45 ± 8 in-lb)

18.Check for fuel leaks.

TSB Revision

(1) Use scan tool MB991502 or MB991958 to operate the fuel pump.
(2) Check the fuel line for leaks, and repair as needed.

19. Disconnect scan tool MB991502 or MB991958.

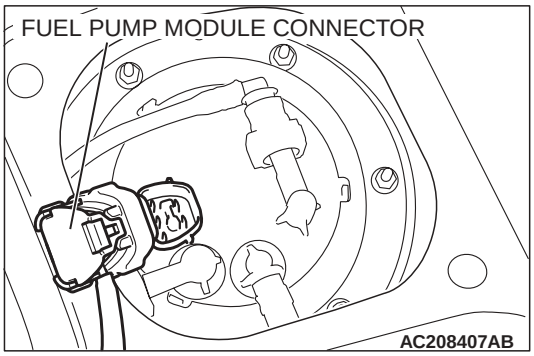
FUEL PUMP CONNECTOR DISCONNECTION (HOW TO REDUCE PRESSURIZED FUEL LINES)

M1131000900503

⚠ WARNING

When removing the fuel pipe, etc., release fuel pressure to prevent fuel spray.

1. Remove the rear seat assembly (Refer to GROUP 52A P.52A-22.)
2. Remove the protector.
3. Disconnect the fuel pump module connector.



4. After starting the engine and letting it run until it stops naturally, turn the ignition switch to the "LOCK" (OFF) position.
5. Connect the fuel pump module connector.
6. Install the protector and rear seat assembly (Refer to GROUP 52A P.52A-22.)

FUEL PUMP OPERATION CHECK

M1131002000539

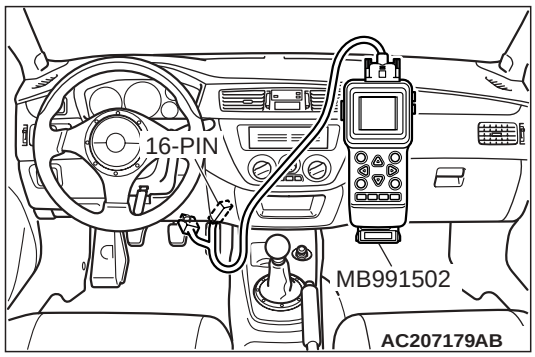
Required Special Tool:

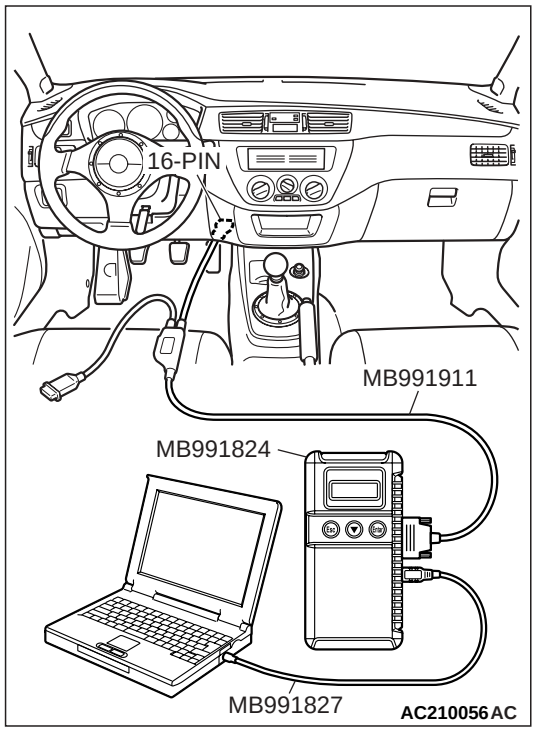
- MB991502: Scan Tool (MUT-II)
- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991911: Main Harness B

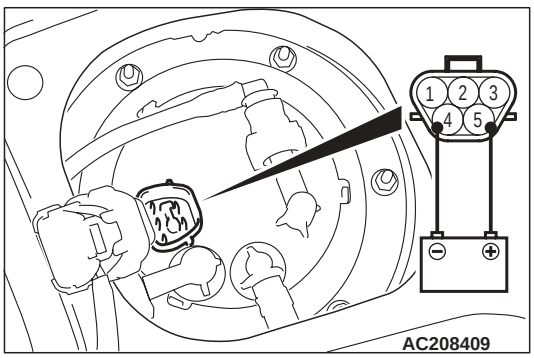
⚠ CAUTION

To prevent damage to scan tool MB991502 or MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991502 or MB991958.

1. Check the operating of the fuel pump by using scan tool MB991502 or MB991958 to force-drive the fuel pump.







2. If the fuel pump will not operate, check by using the following procedure. If normal, check the fuel pump drive circuit.
   (1) Turn the ignition switch to the "LOCK" (OFF) position.
   (2) Remove the rear seat assembly (Refer to GROUP 52A P.52A-22.)
   (3) Remove the protector.
   (4) Disconnect the fuel pump module connector.
   (5) When the fuel pump drive connector is attached directly to the battery, check if the sound of the fuel pump operation can be heard.

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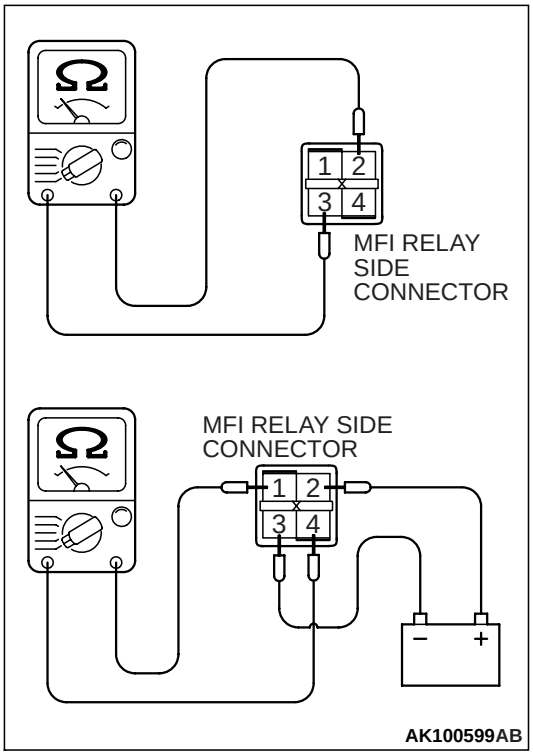
NOTE: As the fuel pump is an in-tank type, the fuel pump sound is hard to hear. Remove the fuel tank filler tube cap and check from the tank inlet.

(6) Check for fuel pressure by pinching the fuel hose with fingertips.
(7) Connect the fuel pump module connector.
(8) Install the protector and rear seat assembly (Refer to GROUP 52A P.52A-22.)

MULTIPORT FUEL INJECTION (MFI) RELAY CONTINUITY CHECK

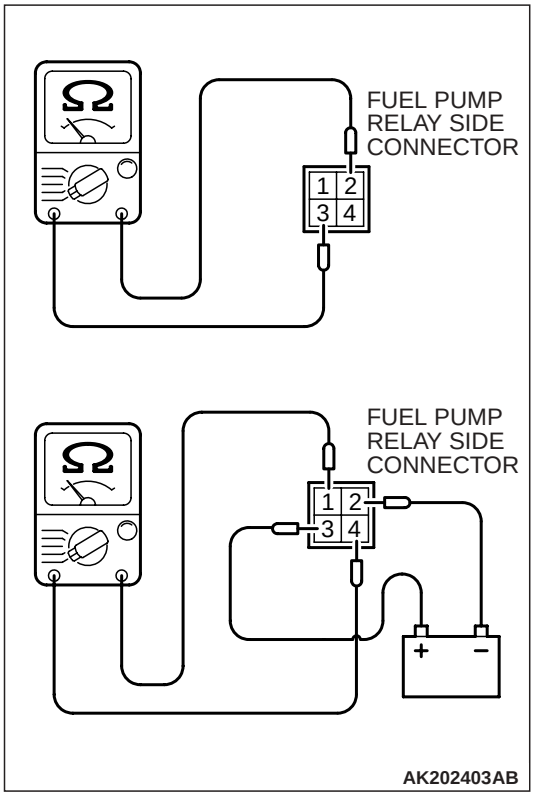
M1131050000011



BATTERY VOLTAGE	TERMINAL NO. TO BE CONNECTED TO BATTERY	TERMINAL NO. TO BE CONDUCTED
Not supplied	–	2 – 3
Supplied	2 – 3	1 – 4

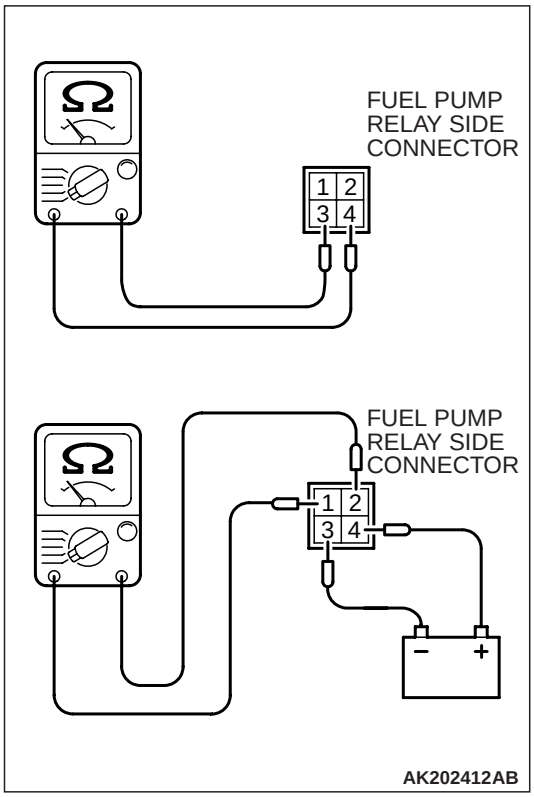
FUEL PUMP RELAY CONTINUITY CHECK

M1131033000159



<Fuel pump relay 1, 2>

BATTERY VOLTAGE	TERMINAL NO. TO BE CONNECTED TO BATTERY	TERMINAL NO. TO BE CONDUCTED
Not supplied	–	2 – 3
Supplied	2 – 3	1 – 4

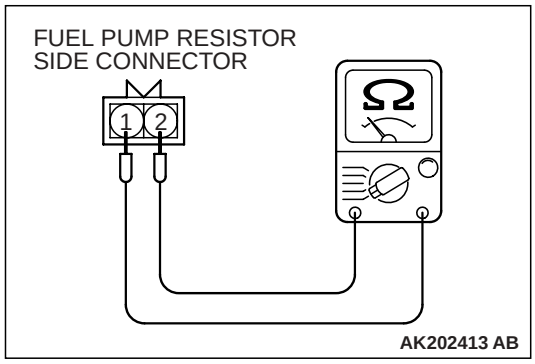


<Fuel pump relay 3>

TESTER CONNECTION TERMINALS	BATTERY VOLTAGE	NORMAL CONDITION
3 – 4	No supplied	Continuity
1 – 2	No supplied	Continuity
	Supplied (connect positive battery terminal No. 4 terminal and negative battery terminal to No. 3 terminal.	No continuity

FUEL PUMP RESISTOR CHECK

M1131052700016

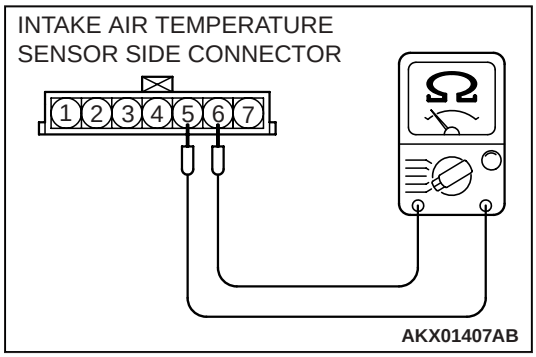


1. Disconnect the fuel pump resistor connector.
2. Measure the resistance between terminals.

   Standard value: 0.45 – 0.65 Ω [20°C (68°F)]
3. If the resistance is out of specification, replace the fuel pump resistor.

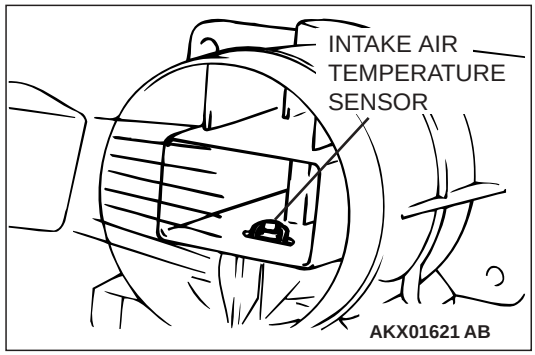
INTAKE AIR TEMPERATURE SENSOR CHECK

M1131002800319



1. Disconnect the volume airflow sensor connectors.
2. Measure resistance between terminal No. 5 and No. 6.

   Standard value:
   13 – 17 kΩ [at –20°C (–4°F)]
   5.3 – 6.7 kΩ [at 0°C (32°F)]
   2.3 – 3.0 kΩ [at 20°C (68°F)]
   1.0 – 1.5 kΩ [at 40°C (104°F)]
   0.56 – 0.76 kΩ [at 60°C (140°F)]
   0.30 – 0.42 kΩ [at 80°C (176°F)]
3. If not within specifications, replace the volume airflow sensor.



4. Measure resistance while heating the sensor using a hair dryer.

Normal condition:

TEMPERATURE	RESISTANCE (kΩ)
Higher	Smaller

5. If resistance does not decrease as heat increases, replace the volume airflow sensor assembly.

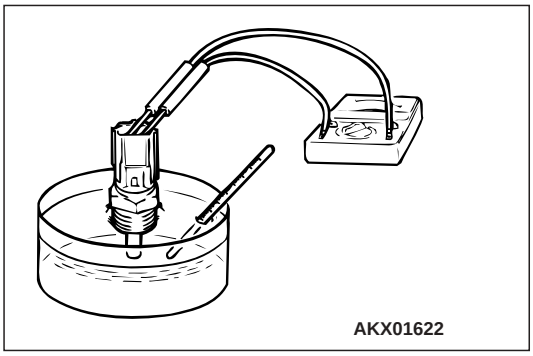
ENGINE COOLANT TEMPERATURE SENSOR CHECK

M1131003100142

⚠ CAUTION

Be careful not to touch the connector (resin section) with the tool when removing and installing.

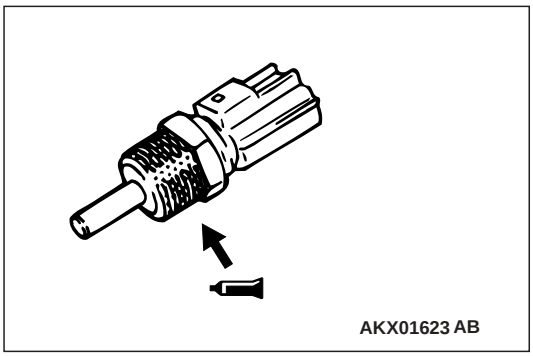
1. Drain engine coolant, then remove the engine coolant temperature sensor.



2. With the temperature sensing portion of engine coolant temperature sensor immersed in hot water, check the resistance.

   Standard value:
   14 – 17 kΩ [at –20°C (–4°F)]
   5.1 – 6.5 kΩ [at 0°C (32°F)]
   2.1 – 2.7 kΩ [at 20°C (68°F)]
   0.9 – 1.3 kΩ [at 40°C (104°F)]
   0.48 – 0.68 kΩ [at 60°C (140°F)]
   0.26 – 0.36 kΩ [at 80°C (176°F)]

3. If resistance deviates from the standard value greatly, replace the sensor.

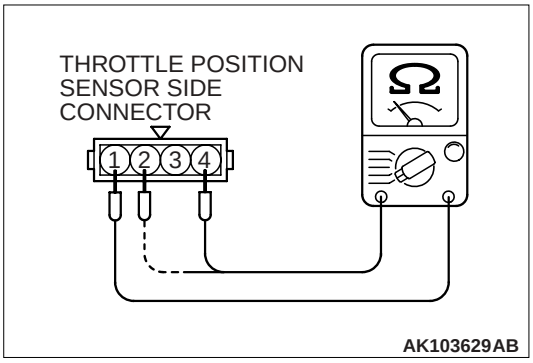


4. Apply 3M™ AAD part number 8731 or equivalent to threaded portion.
5. Install the engine coolant temperature sensor and tighten it to the specified torque.

   Tightening torque: 29 ± 10 N·m (22 ± 7 ft-lb)

THROTTLE POSITION SENSOR CHECK

M1131003200365



Required Special Tool:
- MB991348: Test Harness Set

Checking the Terminal Resistance

1. Disconnect the throttle position sensor connector.
2. Measure resistance between the throttle position sensor side connector terminal No. 1 and terminal No. 4.

   Standard value: 3.5 – 6.5 kΩ

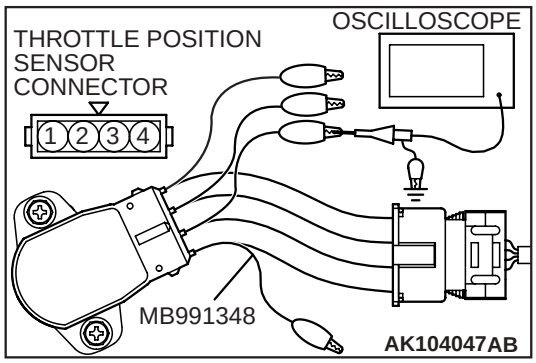
3. Measure resistance between the throttle position sensor side connector terminal No. 1 and terminal No. 2.

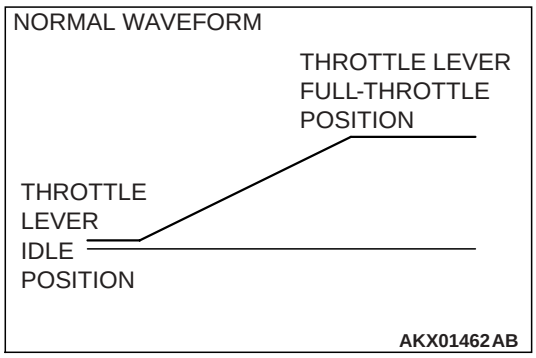
Normal condition:

Throttle valve slowly open until fully open from the idle position	Changes smoothly in proportion to the opening angle of the throttle valve

4. If resistance is outside the standard value, or if it doesn't change smoothly, replace the throttle position sensor.

   NOTE: After replacement, the throttle position sensor should be adjusted. (Refer to P.13A-758.)





Check using oscilloscope

1. Disconnect the throttle position sensor connector and connect the test harness special tool (MB991348) in between. (All terminals should be connected.)
2. Connect the oscilloscope probe to the throttle position sensor side connector terminal.
3. Turn the ignition switch "ON" position.
4. Slowly move the throttle lever from the idle position to the full-throttle position and check then if the waveform is free from any noise.
5. If any noise is recognized, replace the throttle position sensor.

   NOTE: After replacement, the throttle position sensor should be adjusted. (Refer to P.13A-758.)

HEATED OXYGEN SENSOR CHECK

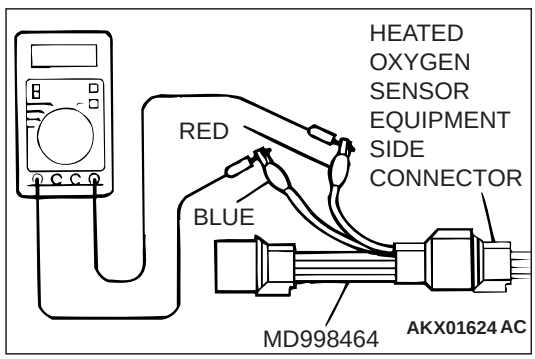
M1131005000431

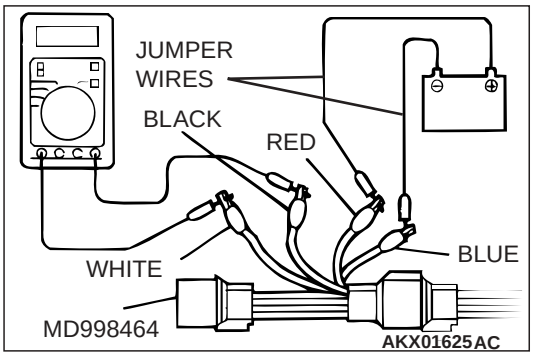
Required Special Tools:

- MB991502: Scan Tool (MUT-II)
- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991911: Main Harness B
- MB991658: Test Harness Set
- MD998464: Test Harness

<Heated oxygen sensor (front)>

1. Using the scan tool MB991502 or MB991958, observe HO_2S reading. If values are unsatisfactory, or if Scan tool is not available, use the following procedure:
   (1) Disconnect the heated oxygen sensor connector and connect special tool MD998464 to the connector on the heated oxygen sensor side.
   (2) Make sure that there is continuity [4.5 – 8.0 Ω at 20°C (68°F)] between terminal No. 1 (red clip of special tool) and terminal No. 3 (blue clip of special tool) on the heated oxygen sensor connector
   (3) If there is no continuity, replace the heated oxygen sensor.
   (4) Warm up the engine until engine coolant is 80°C (176°F) or higher.





⚠ CAUTION
Be very careful when connecting the jumper wires; incorrect connection can damage the heated oxygen sensor.

(5) Use the jumper wires to connect terminal No. 1 (red clip) of the heated oxygen sensor connector to the positive battery terminal and terminal No. 3 (blue clip) to the negative battery terminal.
(6) Connect a digital voltage meter between terminal No. 2 (black clip) and terminal No. 4 (white clip).

2. While repeatedly revving the engine, measure the heated oxygen sensor output voltage.

Standard value:

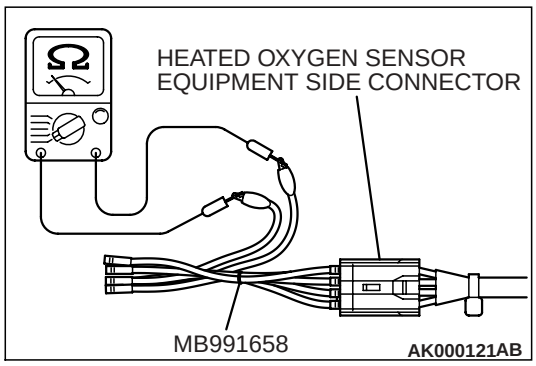
ENGINE	HEATED OXYGEN SENSOR OUTPUT VOLTAGE	REMARKS
When revving engine	0.6 – 1.0 volt	If you make the air/fuel ratio rich by revving the engine repeatedly, a normal heated oxygen sensor will output a voltage of 0.6 – 1.0 volt.

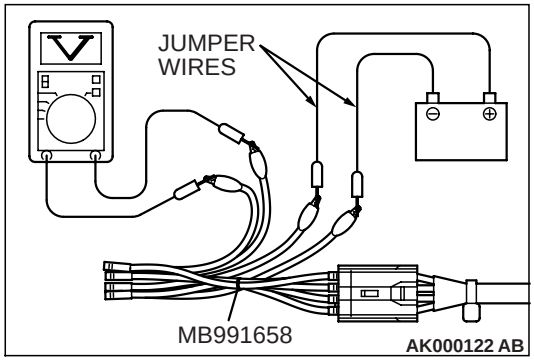
3. If the output voltage is not within the standard value, replace the heated oxygen sensor.

NOTE: For removal and installation of the heated oxygen sensor, refer to GROUP 15, Exhaust Manifold P.15-23.

<Heated oxygen sensor (rear)>

1. Using scan tool MB991502 or MB991958, observe HO_2S reading. If values are unsatisfactory, or if Scan tool is not available, use the following procedure:
(1) Disconnect the heated oxygen sensor connector and connect special tool MB991658 to the connector on the heated oxygen sensor side.
(2) Make sure that there is continuity [11 – 18 Ω at 20°C (68°F)] between terminal No. 3 and terminal No. 4 on the heated oxygen sensor connector
(3) If there is no continuity, replace the heated oxygen sensor.
(4) Warm up the engine until engine coolant is 80°C (176°F) or higher.





⚠ CAUTION
Be very careful when connecting the jumper wires; incorrect connection can damage the heated oxygen sensor.

(5) Use the jumper wires to connect terminal No. 3 of the heated oxygen sensor connector to the positive battery terminal and terminal No. 4 to the negative battery terminal.

(6) Connect a digital voltage meter between terminal No. 1 and terminal No. 2.

2. While repeatedly revving the engine, measure the heated oxygen sensor output voltage.

Standard value:

ENGINE	HEATED OXYGEN SENSOR OUTPUT VOLTAGE	REMARKS
When revving engine	0.6 – 1.0 volt	If you make the air/fuel ratio rich by revving the engine repeatedly, a normal heated oxygen sensor will output a voltage of 0.6 – 1.0 volt.

3. If the voltage is not within the standard value, replace the heated oxygen sensor.

NOTE: For removal and installation of the heated oxygen sensor, refer to GROUP 15, Exhaust Pipe and Main Muffler P.15-23.

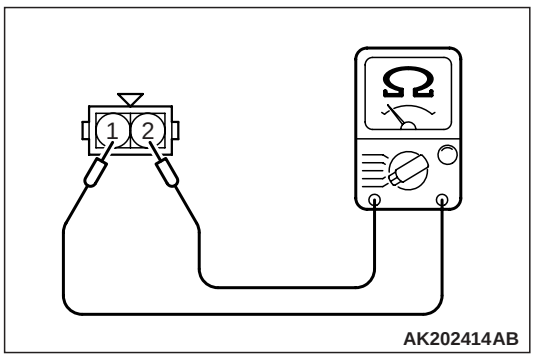
CLUTCH PEDAL POSITION SWITCH CHECK

M1131052600019

Refer to GROUP 21A, On-vehicle Service – Clutch Pedal Position Switch Check P.21A-9.

INJECTOR CHECK

M1131005200275

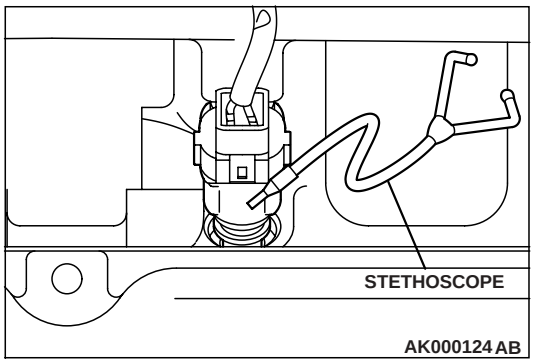


Measurement of Resistance between Terminals

1. Disconnect the injector connector.
2. Measure resistance between terminals.

Standard value: 2 – 3 ohms [at 20°C (68°F)]

3. If not within specification, replace the injector.
4. Install the injector connector



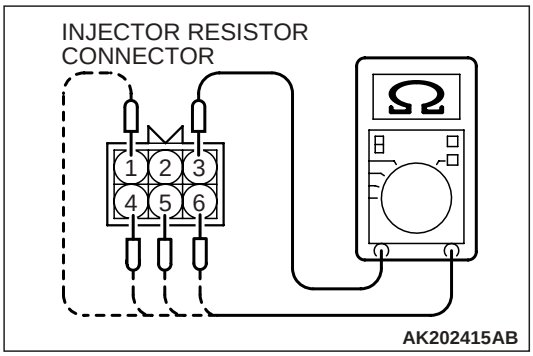
Checking operation sound

Using a stethoscope or long blade screwdriver, check the operation sound ("tick-tick-tick") of injectors during idling or during cranking. Check that as the engine speed increases, the frequency of the operating sound also increases.

1. If the injector you are checking is not operating, you may hear the operating sound of the other injectors.
2. If no operating sound is heard from the injector that is being checked, check the injector drive circuit. If there is nothing wrong with the circuit, a defective injector or engine control module (ECM) is suspected.

INJECTOR RESISTOR CHECK

M1131052800013



1. Disconnect the injector resistor connector.
2. Measure the resistance between terminals.

Measure terminals	Resistance
1 – 3 4 – 3 5 – 3 6 – 3	5.8 – 6.2 Ω [At 20°C (68°F)]

3. If the resistance is out of specification, replace the injector resistor.

IDLE AIR CONTROL MOTOR (STEPPER MOTOR) CHECK

M1131005400387

Required Special Tool:

- MB991709: Test Harness Set

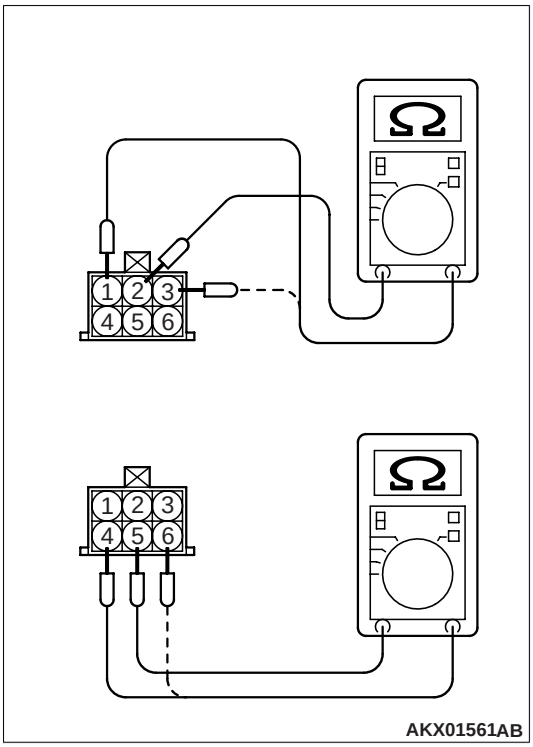
Checking the Operation Sound

1. Check that the engine coolant temperature is 20°C (68°F) or below.

   NOTE: If necessary, you can disconnect the engine coolant temperature sensor connector and connect the harness-side of the connector to another engine coolant temperature sensor that is at 20°C (68°F) or below.
2. Check that the operation sound of the stepper motor can be heard after the ignition is switched ON (but do not start the engine).
3. If the operation sound cannot be heard, check the stepper motor's activation circuit. If the circuit is normal, it is probable that there is a malfunction of the stepper motor or engine control module (ECM).

Checking the Coil Resistance

1. Disconnect the idle air control motor connector.



2. Measure resistance between terminal No. 2 and either terminal No. 1 or terminal No. 3 of the connector at the idle air control motor side.

   Standard value: 28 – 33 Ω [at 20°C (68°F)]

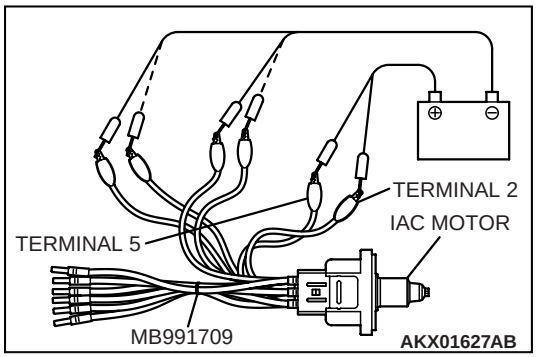
3. If resistance is not within the standard value, replace the IAC motor.
4. Measure the resistance between terminal No. 5 and either terminal No. 6 or terminal No. 4 of the connector at the idle air control motor side.

   Standard value: 28 – 33 Ω [at 20°C (68°F)]

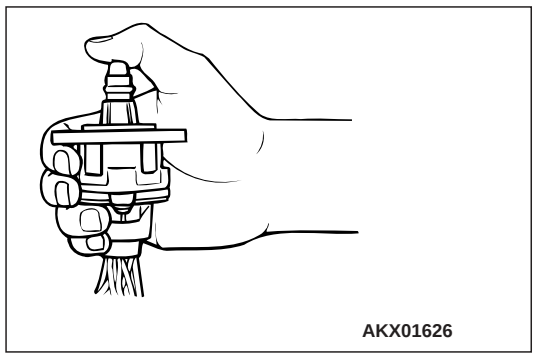
5. If resistance is not within the standard value, replace the IAC motor.

<Operation Check>

1. Remove the throttle body.
2. Remove the idle air control motor.
3. Connect special tool MB991709 to the idle air control motor connector.



4. Connect the positive battery terminal of a power supply (approximately 6 volts) to terminal No. 2 and the terminal No. 5.
5. Connect the negative battery terminal of the power supply to each clip as described in the following steps. Then check whether or not the stepper motor vibrates slightly as it operates.
   (1) Connect the negative terminal of the power supply to terminal No. 1 and terminal No. 4.
   (2) Connect the negative terminal of the power supply to terminal No. 3 and terminal No. 4.
   (3) Connect the negative terminal of the power supply to terminal No. 3 and terminal No. 6.
   (4) Connect the negative terminal of the power supply to terminal No. 1 and terminal No. 6.
   (5) Connect the negative terminal of the power supply to terminal No. 1 and terminal No. 4.
   (6) Repeat the tests in sequence from (5) to (1) to test opposite movement of the IAC.
6. If vibration is detected during the test, the stepper motor can be considered to be normal.

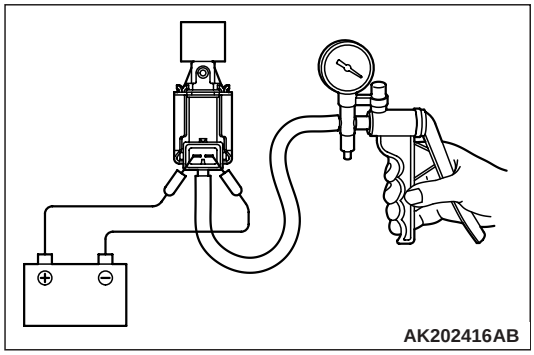


FUEL PRESSURE SOLENOID CHECK

M1131052900010

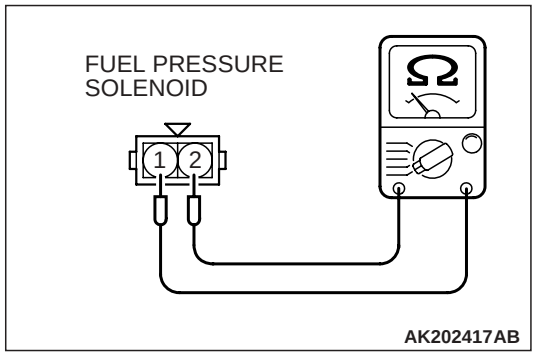
NOTE: When disconnecting the vacuum hose, always make a mark so that if can be reconnected at original position.

1. Disconnect the vacuum hose from the solenoid valve.
2. Disconnect the harness connector.
3. Connect a hand vacuum pump to the nipple.
4. Connect a battery to the solenoid valve and apply a vacuum to check air-tightness.



BATTERY VOLTAGE	B nipple	Normal condition
No applied	Open	Vacuum leak
	Close	Vacuum maintained
Applied	Open	Vacuum maintained

5. Measure the resistance between the terminals of the solenoid valve.



EVAPORATIVE EMISSION PURGE SOLENOID CHECK

M1131005600057

Refer to GROUP 17, Emission Control System – Evaporative Emission Control System – Evaporative Emission Purge Solenoid Check P.17-14.

EGR VACUUM REGULATOR SOLENOID VALVE CHECK

M1131005700140

Refer to GROUP 17, Emission Control System – Exhaust Gas Recirculation (EGR) System – EGR Vacuum Regulator Solenoid Valve Check P.17-18.

EVAPORATVE EMISSION VENTILATION SOLENOID CHECK

M1131012800031

Refer to GROUP 17, Emission Control System – Evaporative Emission Canister and Fuel Tank Pressure Relief Valve – Fuel Tank Pressure Relief Valve Inspection P.17-22.

TURBOCHARGER WASTEGATE SOLENOID CHECK

M1131053000010

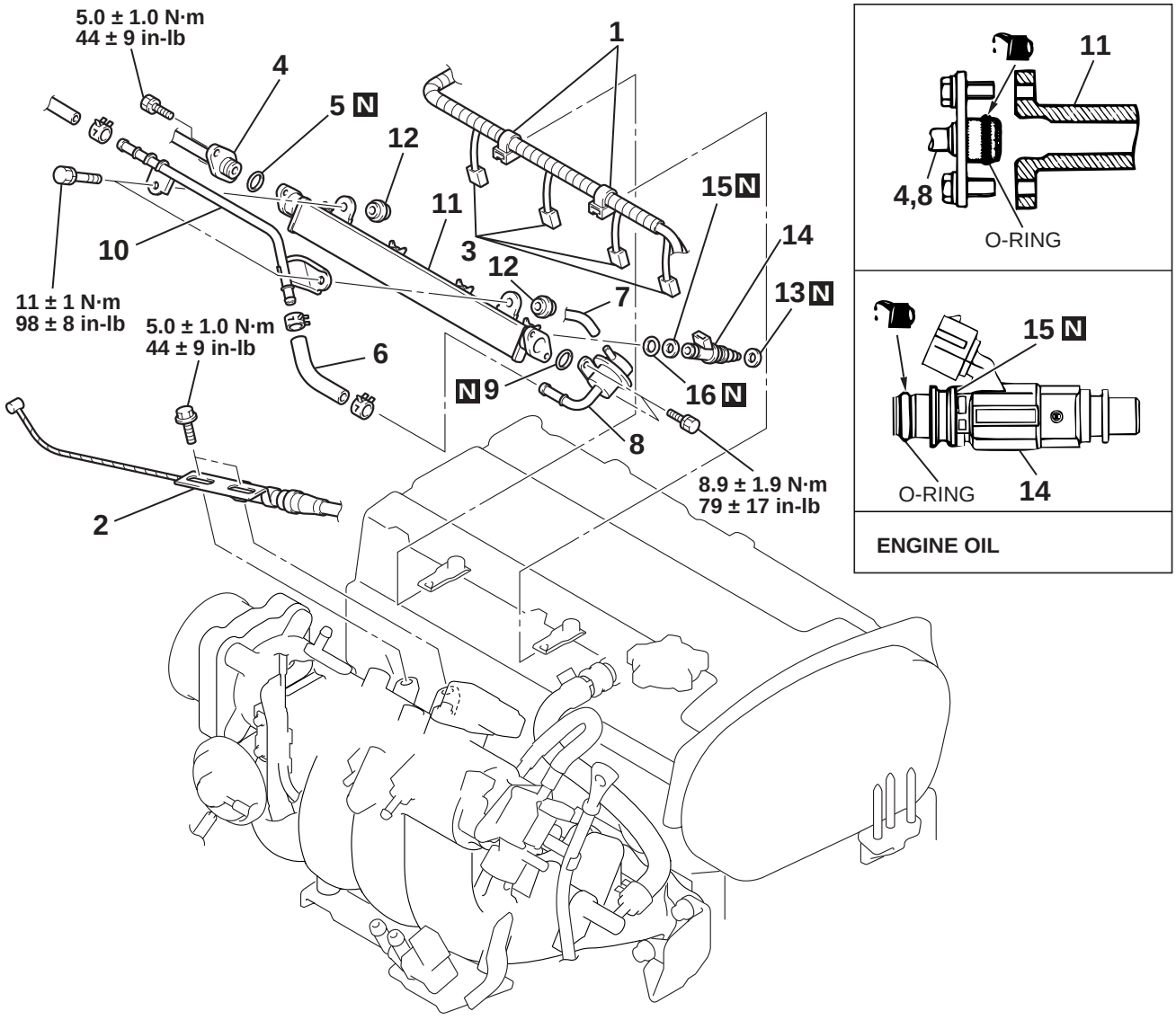
Refer to GROUP 15, On-vehicle Service – Turbocharger Wastegate Solenoid Check P.15-5.

INJECTOR

REMOVAL AND INSTALLATION

M1131007100605

Pre-removal Operation	Post-installation Operation
• Fuel Discharge Prevention (Refer to P.13A-765.) • Strut Tower Bar Removal (Refer to GROUP 42, Strut Tower Bar P.42-12.) • Air Hose E, Air By-pass Hose, Air Pipe C Removal (Refer to GROUP 15, Charge Air Cooler P.15-8.)	• Air Hose E, Air By-pass Hose, Air Pipe C Installation (Refer to GROUP 15, Charge Air Cooler P.15-8.) • Strut Tower Bar Installation (Refer to GROUP 42, Strut Tower Bar P.42-12.) • Fuel Leakage Check



AC210060AB

REMOVAL STEPS

1. CONTROL HARNESS CONNECTOR
2. ACCELERATOR CABLE ASSEMBLY CONNECTION (THROTTLE BODY SIDE)
3. INJECTOR CONNECTOR

>>A<< 4. FUEL HIGH-PRESSURE HOSE CONNECTION

5. O-RING

REMOVAL STEPS (Continued)

6. FUEL RETURN HOSE CONNECTION
7. VACUUM HOSE CONNECTION

>>A<< 8. FUEL PRESSURE REGULATOR

9. O-RING
10. FUEL RETURN PIPE

<<A>> 11. FUEL RAIL

12. INSULATORS
13. INSULATORS

<<A>> >>A<< 14 INJECTORS

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REMOVAL STEPS (Continued)

15. GROMMETS
16. O-RING

REMOVAL SERVICE POINT

<<A>> FUEL RAIL/INJECTORS REMOVAL

⚠ CAUTION

Do not drop the injector.

Remove the fuel rail with the injectors attached to it.

INSTALLATION SERVICE POINT

>>A<< INJECTORS/FUEL PRESSURE REGULATOR/FUEL HIGH-PRESSURE HOSE INSTALLATION

⚠ CAUTION

Do not let the engine oil get into the fuel rail will be damaged.

1. Apply a drop of new engine oil to the O-ring.
2. Turn the injector. To the right and left to install to the fuel rail. Repeat for fuel pressure regulator and fuel high-pressure hose. Be careful not to damage the O-ring. After installing, check that the item turns smoothly.
3. If it dose not turn smoothly, the O-ring may be trapped, remove the item, re-install it into the fuel rail and check again.
4. Tighten the fuel pressure regulator and fue high-pressure hose to the specified torque.

   Tightening torque:

   8.9 ± 1.9 N·m (79 ± 17 in-lb) <Fuel pressure regulator>

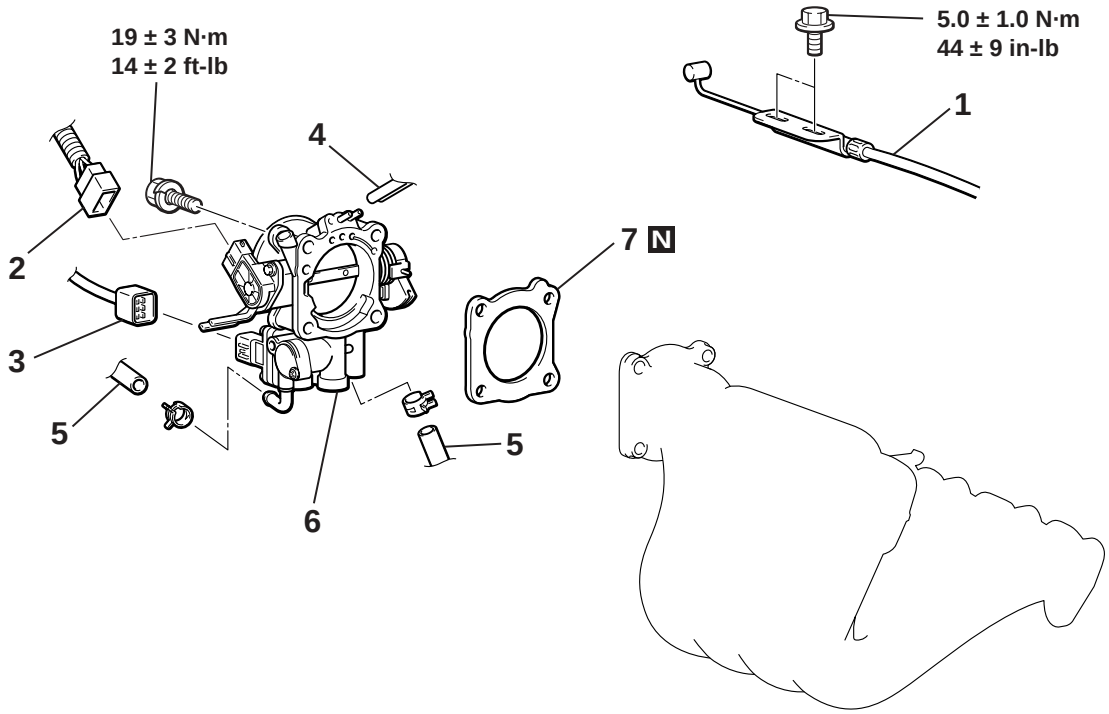
   5.0 ± 1.0 N·m (44 ± 9 in-lb) <Fuel high-pressure fuel hose>

THROTTLE BODY ASSEMBLY

REMOVAL AND INSTALLATION

M1131007700470

Pre-removal Operation	Post-installation Operation
• Under Cover Removal (Refer to GROUP 51, Front Bumper P.51-2.) • Engine Coolant Draining [Refer to GROUP 00, Maintenance Service – Engine Coolant (Change) P.00-44.] • Strut Tower Bar Removal (Refer to GROUP 41, Strut Tower Bar P.42-12.) • Air Hose E, Air By-pass Hose, Air Pipe C Removal (Refer to GROUP 15, Charge Air Cooler P.15-8.)	• Air Hose E, Air By-pass Hose, Air Pipe C Installation (Refer to GROUP 15, Charge Air Cooler P.15-8.) • Strut Tower Bar Installation Refer to GROUP 41, Strut Tower Bar P.42-12.) • Engine Coolant Refilling [Refer to GROUP 00, Maintenance Service – Engine Coolant (Change) P.00-44.] • Accelerator Cable Adjustment (Refer to GROUP 17, On-vehicle Service – Accelerator Cable Check and Adjustment P.17-4.)



AC208435AB

REMOVAL STEPS
1. ACCELERATOR CABLE CONNECTION
2. THROTTLE POSITION SENSOR CONNECTOR
3. IDLE AIR CONTROL MOTOR CONNECTOR

REMOVAL STEPS (Continued)
4. VACUUM HOSE CONNECTION
5. WATER HOSE CONNECTION
6. THROTTLE BODY

>>A<< 7. THROTTLE BODY GASKET

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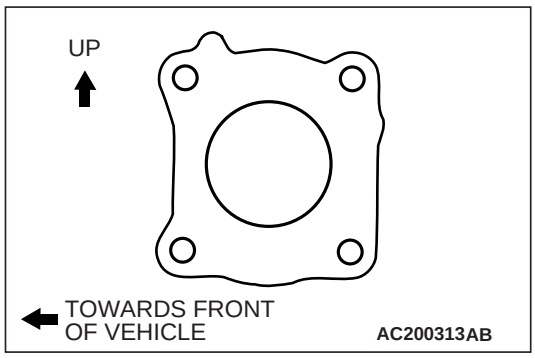
INSTALLATION SERVICE POINT

>>A<<THROTTLE BODY GASKET INSTALLATION

⚠ CAUTION

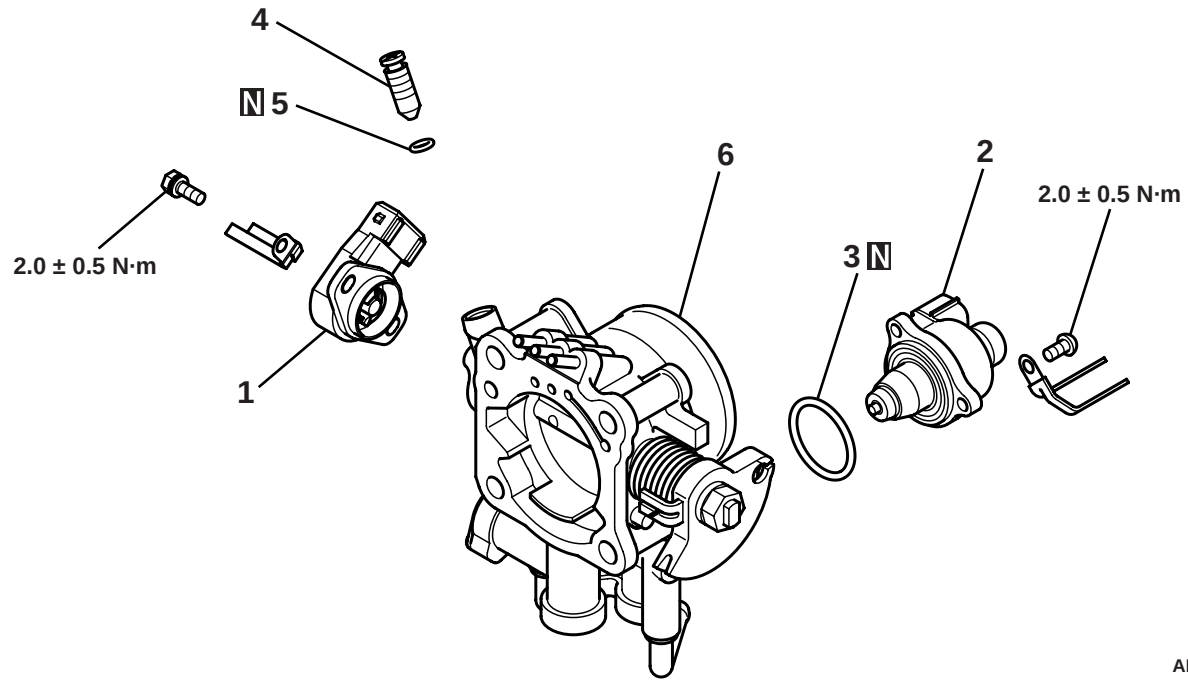
Poor idling etc. may result if the throttle body gasket is installed incorrectly.

Install the throttle body gasket as shown in the illustration.



DISASSEMBLY AND ASSEMBLY

M1131009700380



Disassembly steps

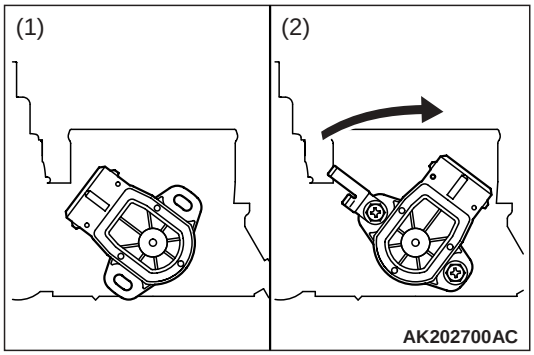
>>A<< 1. THROTTLE POSITION SENSOR (TPS)
2. IDLE SPEED CONTROL SERVO
3. O-RING

Disassembly steps (Continued)

4. FIXED SPEED ADJUSTING SCREW (SAS)
5. O-RING
6. THROTTLE BODY

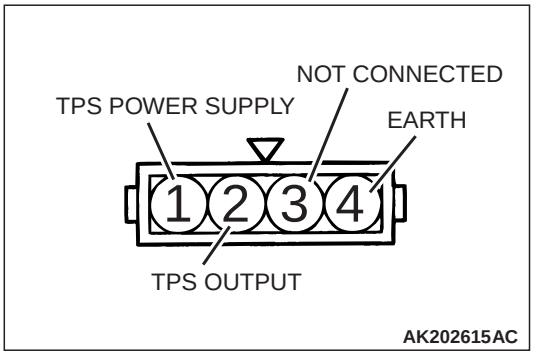
REASSEMBLY SERVICE POINTS

>>A<< THROTTLE POSITION SENSOR (TPS) INSTALLATION



1. Place the TPS in the throttle body in the position shown in (1) of the drawing.
2. Turn the TPS to the position shown in (2) of the drawing. Connect a circuit tester between terminal 2 (TPS output) and terminal 4 (earth) of the TPS to measure the output voltage. Turn the TPS to a position where the output voltage is within the standard value range, and secure the TPS there by tightening the screw.

   Standard value 0.535 – 0.735 V



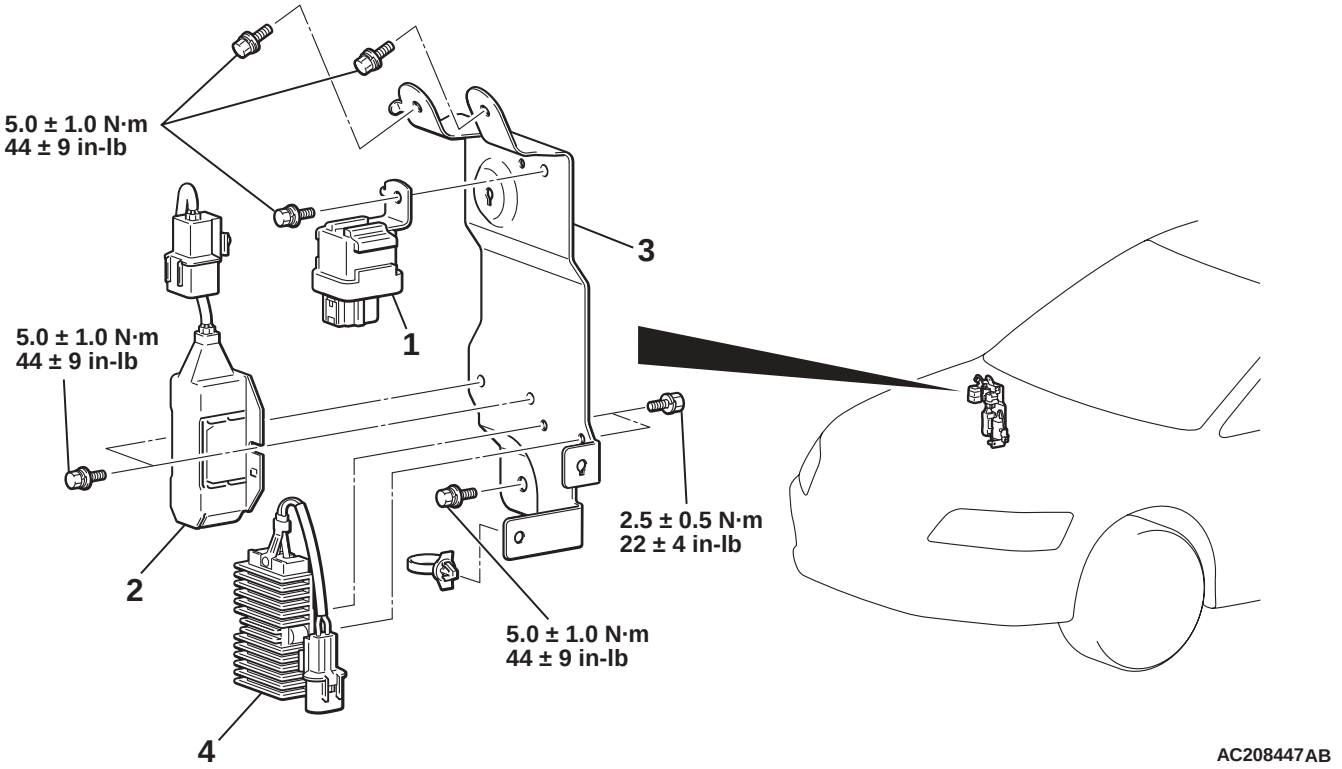
3. After tightening the screw, check the output voltage again. If the voltage is out of the standard value range, loosen the screw and adjust the TPS position for a proper output voltage, then tighten the screw. If necessary, repeat the adjustment until a correct voltage is reached.
4. Connect a circuit tester between terminal 1 (TPS power supply) and terminal 2 (TPS output). Check that the resistance reading varies smoothly as the throttle valve is moved slowly to the wide open position.

ENGINE CONTROL RESISTOR, RELAY

ENGINE CONTROL RESISTOR, RELAY REMOVAL AND INSTALLATION

M1131034600013

Pre-removal Operation	Post-installation Operation
• Strut Tower Bar Removal (Refer to GROUP 42, Strut Tower Bar P.42-12.) • Harness Connector Disconnection	• Harness Connector Connection • Strut Tower Bar Installation (Refer to GROUP 42, Strut Tower Bar P.42-12.)



AC208447AB

REMOVAL STEPS
1. FUEL PUMP RELAY
2. INJECTOR RESISTOR

REMOVAL STEPS (Continued)
3. BRACKET
4. FUEL PUMP CIRCUIT RESISTOR

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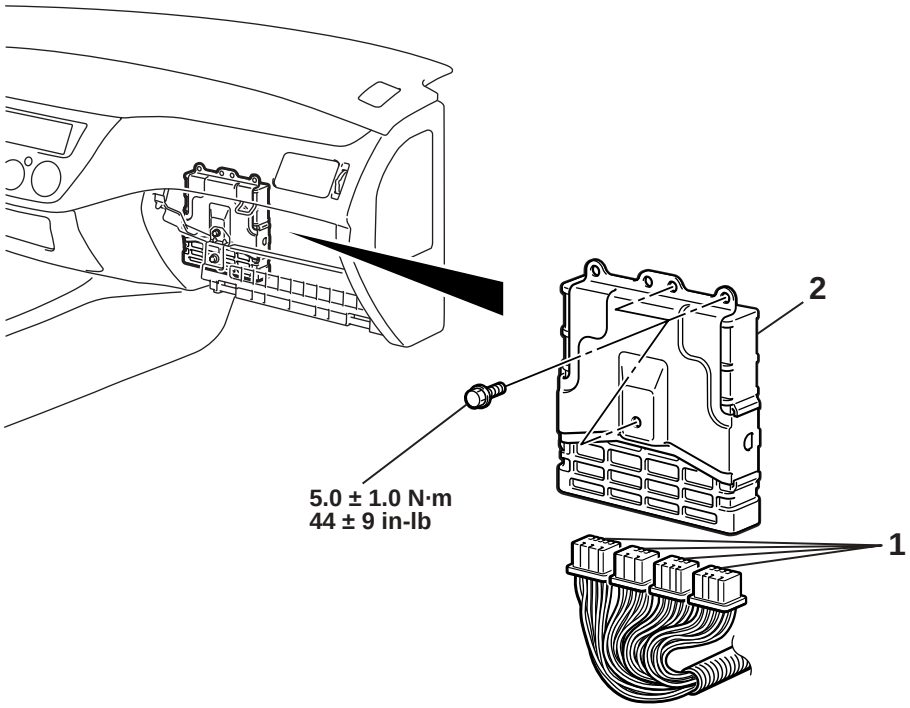
ENGINE CONTROL MODULE (ECM)

ENGINE CONTROL MODULE (ECM) REMOVAL AND INSTALLATION

M1131033800025

Pre-removal and Post-installation Operation
- Glove Box Assembly Removal and Installation (Refer to GROUP 52A, INTERIOR P.52A-3.)
- Harness Cover Removal and Installation (Refer to GROUP 52A, INTERIOR P.52A-3.)



AC208496AB

REMOVAL STEPS
1. ECM CONNECTORS
2. ECM

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

M1131011600432

ITEM	SPECIFICATION
Accelerator cable mounting bolts	5.0 ± 1.0 N·m (44 ± 9 in-lb)
Bracket mounting bolts	5.0 ± 1.0 N·m (44 ± 9 in-lb)
ECM mounting bolts	5.0 ± 1.0 N·m (44 ± 9 in-lb)
Fuel pressure regulator mounting bolts	8.9 ± 1.9 N·m (79 ± 17 in-lb)
Fuel pump relay mounting bolt	5.0 ± 1.0 N·m (44 ± 9 in-lb)
Fuel pump circuit resistor mounting bolts	2.5 ± 0.5 N·m (22 ± 4 in-lb)
Fuel rail mounting bolts	11 ± 1 N·m (98 ± 8 in-lb)
Fuel high-pressure hose mounting bolts	5.0 ± 1.0 N·m (44 ± 9 in-lb)
Injector resistor mounting bolts	5.0 ± 1.0 N·m (44 ± 9 in-lb)
Throttle body mounting bolt	19 ± 3 N·m (14 ± 2 ft-lb)

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GENERAL SPECIFICATIONS

M1131000200441

ITEMS		SPECIFICATIONS
Throttle body	Throttle bore mm (in.)	60 (2.4)
	Throttle position sensor	Variable resistor type
	Idle air control motor	Stepper motor (stepper motor type by-pass air control system)
Engine control module (ECM)	Identification model No.	E6T34880
Sensors	Volume airflow sensor	Karman vortex type
	Barometric pressure sensor	Semiconductor type
	Intake air temperature sensor	Thermistor type
	Engine coolant temperature sensor	Thermistor type
	Heated oxygen sensor	Zirconia type
	Vehicle speed sensor	Electromagnetic resistance element type
	Camshaft position sensor	Hall element type
	Crankshaft position sensor	Hall element type
	Knock sensor	Piezoelectric type
	Power steering pressure switch	Contact switch type
	Manifold differential pressure sensor	Semiconductor type
Actuators	Multiport fuel injection (MFI) relay	Contact switch type
	Fuel pump relay	Contact switch type
	Injector type and number	Electromagnetic type, 4
	Injector identification mark	MDL560P
	EGR vacuum regulator solenoid valve	Duty cycle type solenoid valve
	Evaporative emission purge solenoid	Duty cycle type solenoid valve
	Fuel pressure solenoid	ON/OFF type solenoid
	Turbocharger wastegate solenoid	Duty cycle type solenoid
Fuel pressure regulator	Regulator pressure kPa (psi)	294 (43)

SERVICE SPECIFICATIONS

M1131000300404

ITEMS		STANDARD VALUE
Throttle position sensor adjusting voltage mV		535 – 735
Basic idle speed r/min		850 ± 50
Fuel pressure kPa (psi)	Vacuum hose disconnected	289 – 309 (42 – 45) at curb idle
	Vacuum hose connected	Approximately 230 (33) at curb idle

ITEMS		STANDARD VALUE
Intake air temperature sensor resistance kΩ	–20°C (–4°F)	13 – 17
	0°C (32°F)	5.3 – 6.7
	20°C (86°F)	2.3 – 3.0
	40°C (104°F)	1.0 – 1.5
	60°C (140°F)	0.56 – 0.76
	80°C (176°F)	0.30 – 0.42
Engine coolant temperature sensor resistance kΩ	–20°C (–4°F)	14 – 17
	0°C (32°F)	5.1 – 6.5
	20°C (86°F)	2.1 – 2.7
	40°C (104°F)	0.9 – 1.3
	60°C (140°F)	0.48 – 0.68
	80°C (176°F)	0.26 – 0.36
Throttle position sensor resistance kΩ		3.5 – 6.5
Heated oxygen sensor output voltage V		0.6 – 1.0
Heated oxygen sensor heater resistance Ω	<Front>	4.5 – 8.0
	<Rear>	11 – 18
Injector coil resistance Ω		2 – 3 [at 20°C (68°F)]
Idle air control motor coil resistance Ω		28 – 33 [at 20°C (68°F)]
Fuel pressure solenoid coil resistance Ω		29 – 35 [at 20°C (68°F)]
Injector resistor resistance Ω		5.5 – 6.5 [at 20°C (68°F)]
Fuel pump resistor resistance Ω		0.45 – 0.65 [at 20°C (68°F)]

SEALANT AND ADHESIVE

M1131000500022

ITEM	SPECIFIED SEALANT
Engine coolant temperature sensor threaded portion	3M™ AAD part number 8731or equivalent

NOTES