

**INSPECTION PROCEDURE 15: Hesitation, sag or stumble.****COMMENT**

- In cases such as the above, the ignition system, air/fuel mixture or compression pressure may be defective.

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

- Malfunction of the ignition system.
- Malfunction of air/fuel ratio control system.
- Malfunction of the fuel supply system.
- Malfunction of the EGR system.
- Poor compression pressure.

**DIAGNOSIS****Required Special Tools:**

- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

**STEP 1. Using scan tool MB991958, read the diagnostic trouble code (DTC).****⚠ CAUTION**

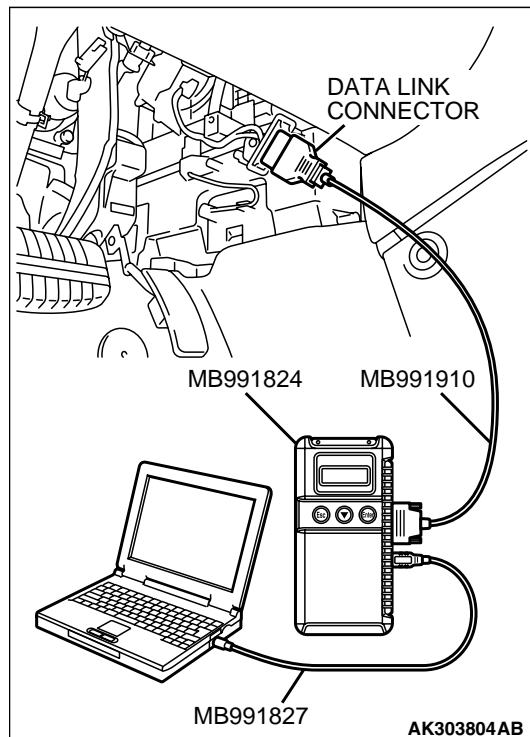
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

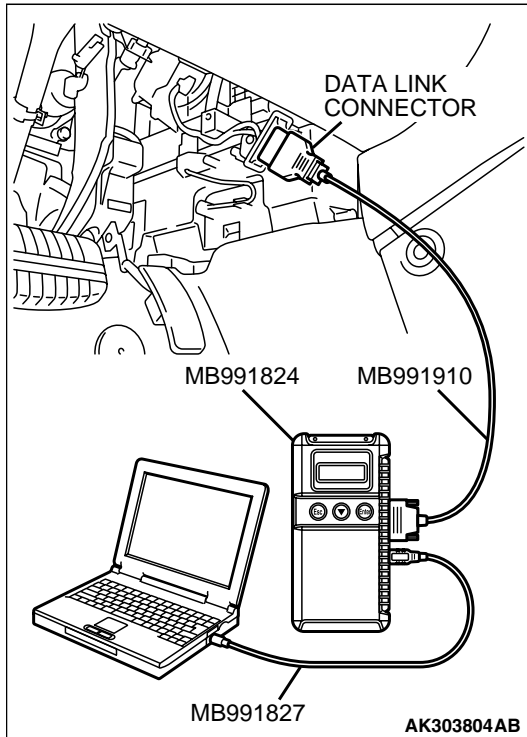
- (1) Connect scan tool MB991958 to the data link connector.
- (2) Turn the ignition switch to the "ON" position.
- (3) Read the DTC.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

**Q: Is the DTC set?**

**YES** : Refer to Diagnostic Trouble Code Chart [P.13A-33](#).

**NO** : Go to Step 2.





**STEP 2. Using scan tool MB991958, check actuator test items 01, 02, 03, 04: Injector.**

- (1) Check following items in the actuator test. Refer to Actuator Test Reference Table [P.13A-1097](#).
  - a. Item 01, 02, 03, 04: Injector.
- (2) Turn the ignition switch to the "LOCK" (OFF) position.

**Q: Are they operating properly?**

**YES :** Go to Step 3.

**NO :** Refer to DTC P0201 – Injector Circuit-cylinder 1 [P.13A-464](#), DTC P0202 – Injector Circuit-cylinder 2 [P.13A-474](#), DTC P0203 – Injector Circuit-cylinder 3 [P.13A-484](#), DTC P0204 – Injector Circuit-cylinder 4 [P.13A-494](#).

**STEP 3. Check the ignition timing.**

- (1) Refer to GROUP 11A, On-vehicle Service – Ignition Timing Check [P.11A-12](#).

**Q: Is the ignition timing normal?**

**YES :** Go to Step 4.

**NO :** Check that the crankshaft position sensor and timing belt cover are in the correct position. Then confirm that the malfunction symptom is eliminated.

**STEP 4. Using scan tool MB991958, check data list.**

**⚠ CAUTION**

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

- (1) Connect scan tool MB991958 to the data link connector.
- (2) Turn the ignition switch to the "ON" position.
- (3) Check the following items in the data list. Refer to Data List Reference Table P.13A-1083.

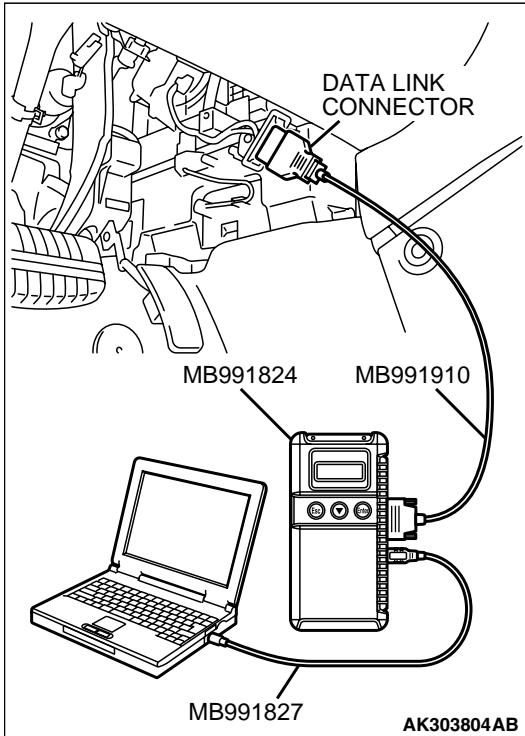
- a. Item 13: Intake Air Temperature Sensor.
- b. Item 25: Barometric Pressure Sensor.
- c. Item 21: Engine Coolant Temperature Sensor.
- d. Item 69: Cylinder 1, 4 Heated Oxygen Sensor (rear).
- e. Item 39: Cylinder 1, 4 Heated Oxygen Sensor (front).
- f. Item 59: Cylinder 2, 3 Heated Oxygen Sensor (rear).
- g. Item 11: Cylinder 2, 3 Heated Oxygen Sensor (front).

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

**Q: Are they operating properly?**

**YES** : Go to Step 5.

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



**STEP 5. Using scan tool MB991958, check data list.**

- (1) Turn the ignition switch to the "ON" position.
- (2) Check the following items of data list. Refer to Data List Reference Table P.13A-1083.

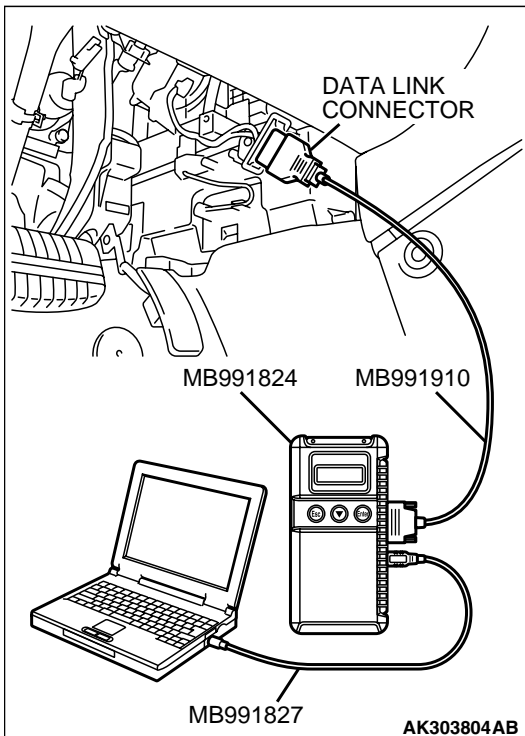
- a. Item 39: Cylinder 1, 4 Heated Oxygen Sensor (front).
- b. Item 11: Cylinder 2, 3 Heated Oxygen Sensor (front).
  - Voltage should fluctuate between 0 – 0.4 volt and 0.6 – 1.0 volt while idling after the engine has warmed-up.

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

**Q: Are they operating properly?**

**YES** : Go to Step 7.

**NO** : Go to Step 6.



**STEP 6. Check the fuel pressure.**

Refer to On-vehicle Service – Fuel Pressure Test [P.13A-1124](#).

**Q: Is the fuel pressure normal?**

**YES** : Check the following items, and repair or replace the defective items.

## a. Vacuum leak.

- Broken intake manifold gasket.
- Broken air intake hose.
- Broken vacuum hose.
- Positive crankcase ventilation valve does not operate.

## b. Injector clogged.

Then confirm that the malfunction symptom is eliminated.

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

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**STEP 7. Check the fuel pressure.**

Refer to On-vehicle Service – Fuel Pressure Test [P.13A-1124](#).

**Q: Is the fuel pressure normal?**

**YES** : Check the following items, and repair or replace the defective items.

## a. Check the ignition coil and spark plugs.

## b. Check the EGR system.

## c. Check compression pressure.

## d. Check the fuel filter or fuel line for clogging.

Then confirm that the malfunction symptom is eliminated.

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

**INSPECTION PROCEDURE 16: Acceleration shock.**

**COMMENT**

- There may be an ignition leak accompanying the increase in the spark plug demand voltage during acceleration or the electronic control throttle valve system failed.

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

- Malfunction of the ignition system.
- Malfunction of the electronic control throttle valve system.

**DIAGNOSIS**

**Required Special Tools:**

- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

**STEP 1. Using scan tool MB991958, read the diagnostic trouble code (DTC).**

**⚠ CAUTION**

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

- (1) Connect scan tool MB991958 to the data link connector.
- (2) Turn the ignition switch to the "ON" position.
- (3) Read the DTC.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

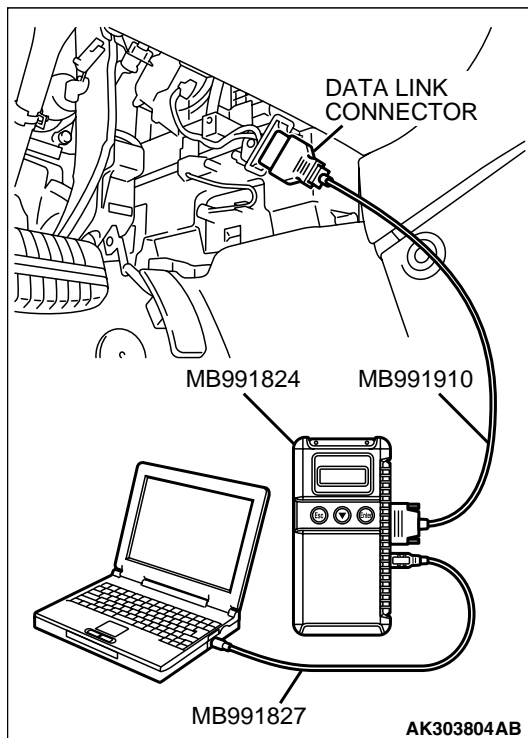
**Q: Is the DTC set?**

**YES :** Refer to Diagnostic Trouble Code Chart [P. 13A-33](#).

**NO :** Check the following items, and repair or replace the defective items.

- a. Check the ignition coil and spark plugs.
- b. Check for occurrence of ignition leak.

Then confirm that the malfunction symptom is eliminated.



## INSPECTION PROCEDURE 17: Deceleration Shock

## COMMENT

- There may be a sudden change in air flow through the throttle valve, causing the vehicle to decelerate rapidly for an instant.

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

- Malfunction of the electronic control throttle valve system.
- Dirtiness around throttle valve.

## DIAGNOSIS

## Required Special Tools:

- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

**STEP 1. Using scan tool MB991958, read the diagnostic trouble code (DTC).**

**⚠ CAUTION**

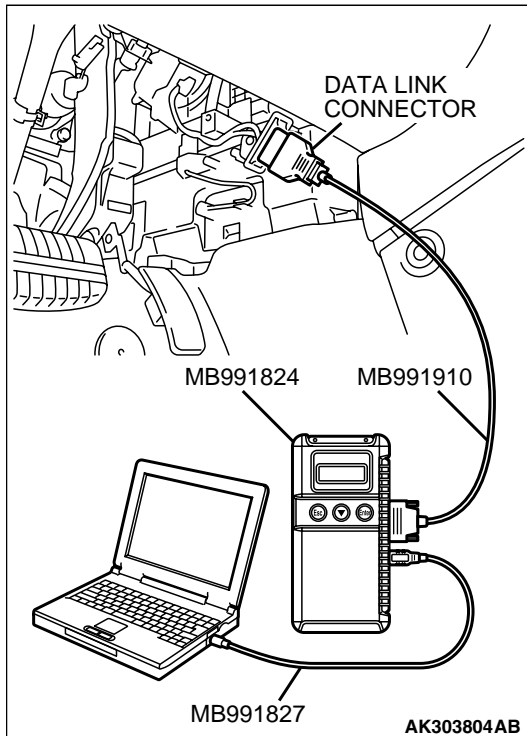
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

- (1) Connect scan tool MB991958 to the data link connector.
- (2) Turn the ignition switch to the "ON" position.
- (3) Read the DTC.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

**Q: Is the DTC set?**

**YES** : Refer to Diagnostic Trouble Code Chart [P. 13A-33](#).

**NO** : Refer to On-vehicle Service – Clean the throttle valve area.



**INSPECTION PROCEDURE 18: Poor acceleration.**

**COMMENT**

- Defective ignition system, abnormal air/fuel ratio, electronic control throttle valve system, poor compression pressure, etc. are suspected.
- Malfunction of air/fuel ratio control system.
- Malfunction of the electronic control throttle valve system.
- Malfunction of the fuel supply system.
- Poor compression pressure.
- Clogged exhaust system.

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

- Malfunction of the ignition system.

**DIAGNOSIS**

**Required Special Tools:**

- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

**STEP 1. Using scan tool MB991958, read the diagnostic trouble code (DTC).**

**CAUTION**

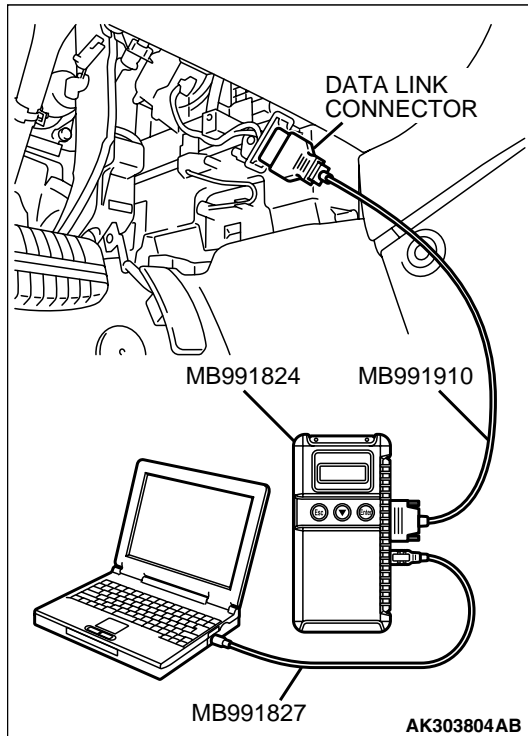
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

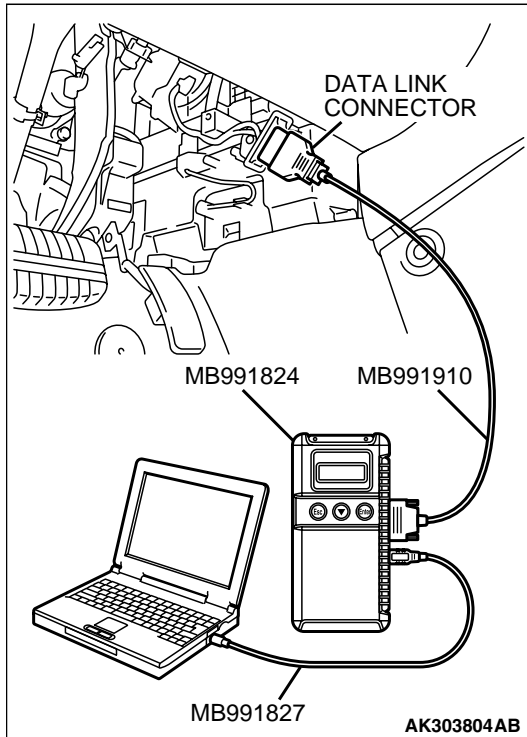
- (1) Connect scan tool MB991958 to the data link connector.
- (2) Turn the ignition switch to the "ON" position.
- (3) Read the DTC.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

**Q: Is the DTC set?**

**YES** : Refer to Diagnostic Trouble Code Chart [P.13A-33](#).

**NO** : Go to Step 2.





**STEP 2. Using scan tool MB991958, check actuator test items 01, 02, 03, 04: Injector.**

- (1) Turn the ignition switch to the "ON" position.
- (2) Check following items in the actuator test. Refer to Actuator Test Reference Table [P.13A-1097](#).
  - a. Item 01, 02, 03, 04: Injector.
- (3) Turn the ignition switch to the "LOCK" (OFF) position.

**Q: Are they operating properly?**

**YES** : Go to Step 3.

**NO** : Refer to DTC P0201 – Injector Circuit-cylinder 1 [P.13A-464](#), DTC P0202 – Injector Circuit-cylinder 2 [P.13A-474](#), DTC P0203 – Injector Circuit-cylinder 3 [P.13A-484](#), DTC P0204 – Injector Circuit-cylinder 4 [P.13A-494](#).

**STEP 3. Check the ignition timing.**

Refer to GROUP 11A, On-vehicle Service – Ignition Timing Check [P.11A-12](#).

**Q: Is the ignition timing normal?**

**YES** : Go to Step 4.

**NO** : Check that the crankshaft position sensor and timing belt cover are in the correct position. Then confirm that the malfunction symptom is eliminated.



**STEP 4. Using scan tool MB991958, check data list.**

**⚠ CAUTION**

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

- (1) Connect scan tool MB991958 to the data link connector.
- (2) Turn the ignition switch to the "ON" position.
- (3) Check the following items in the data list. Refer to Data List Reference Table P.13A-1083.

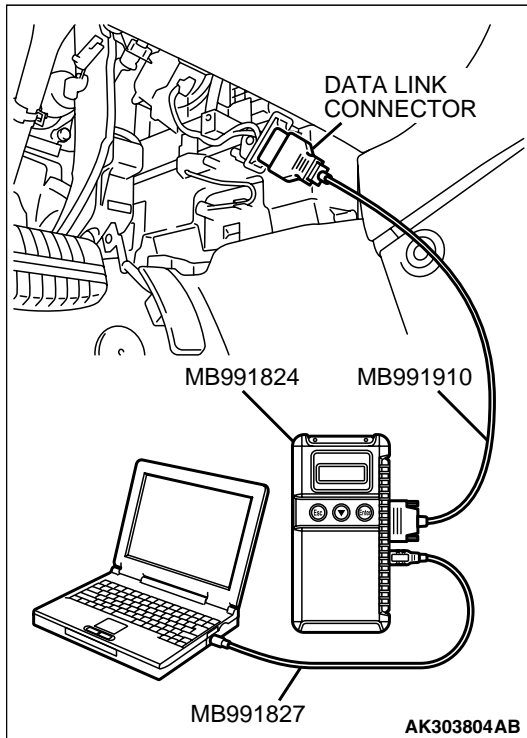
- a. Item 13: Intake Air Temperature Sensor.
- b. Item 25: Barometric Pressure Sensor.
- c. Item 21: Engine Coolant Temperature Sensor.
- d. Item 69: Cylinder 1, 4 Heated Oxygen Sensor (rear).
- e. Item 39: Cylinder 1, 4 Heated Oxygen Sensor (front).
- f. Item 59: Cylinder 2, 3 Heated Oxygen Sensor (rear).
- g. Item 11: Cylinder 2, 3 Heated Oxygen Sensor (front).

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

**Q: Are they operating properly?**

**YES** : Go to Step 5.

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



**STEP 5. Using scan tool MB991958, check data list.**

- (1) Turn the ignition switch to the "ON" position.
- (2) Check the following items of data list. Refer to Data List Reference Table P.13A-1083.

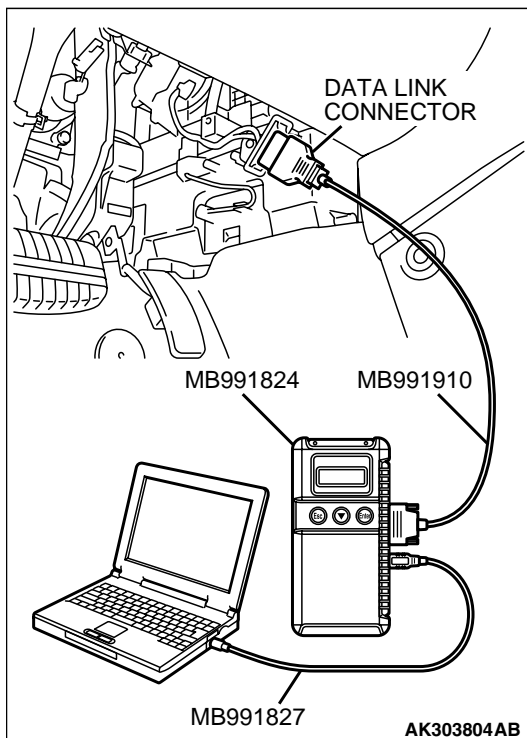
- a. Item 39: Cylinder 1, 4 Heated Oxygen Sensor (front).
- b. Item 11: Cylinder 2, 3 Heated Oxygen Sensor (front).
  - Voltage should fluctuate between 0 – 0.4 volt and 0.6 – 1.0 volt while idling after the engine has been warmed.

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

**Q: Are they operating properly?**

**YES** : Go to Step 7.

**NO** : Go to Step 6.



**STEP 6. Check the fuel pressure.**

Refer to On-vehicle Service – Fuel Pressure Test [P.13A-1124](#).

**Q: Is the fuel pressure normal?**

**YES** : Check the following items, and repair or replace the defective items.

## a. Vacuum leak.

- Broken intake manifold gasket.
- Broken air intake hose.
- Broken vacuum hose.
- Positive crankcase ventilation valve does not operate.

## b. Injector clogged.

Then confirm that the malfunction symptom is eliminated.

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

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**STEP 7. Check the fuel pressure.**

Refer to On-vehicle Service – Fuel Pressure Test [P.13A-1124](#).

**Q: Is the fuel pressure normal?**

**YES** : Check the following items, and repair or replace the defective items.

## a. Check the ignition coil and spark plugs.

## b. Check compression pressure.

## c. Check the fuel filter or fuel line for clogging.

## d. Check the EGR system.

## e. Broken air intake hose.

## f. Clogged air cleaner.

## g. Clogged exhaust system.

Then confirm that the malfunction symptom is eliminated.

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

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**INSPECTION PROCEDURE 19: Surge.**

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**COMMENT**

- Defective ignition system, abnormal air/fuel ratio, the electronic control throttle valve system failed, etc. are suspected.

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

- Malfunction of the ignition system.
- Malfunction of air/fuel ratio control system.
- Malfunction of the electronic control throttle valve system.
- Malfunction of the EGR system.

## DIAGNOSIS

### Required Special Tools:

- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

**STEP 1. Using scan tool MB991958, read the diagnostic trouble code (DTC).**

### **⚠ CAUTION**

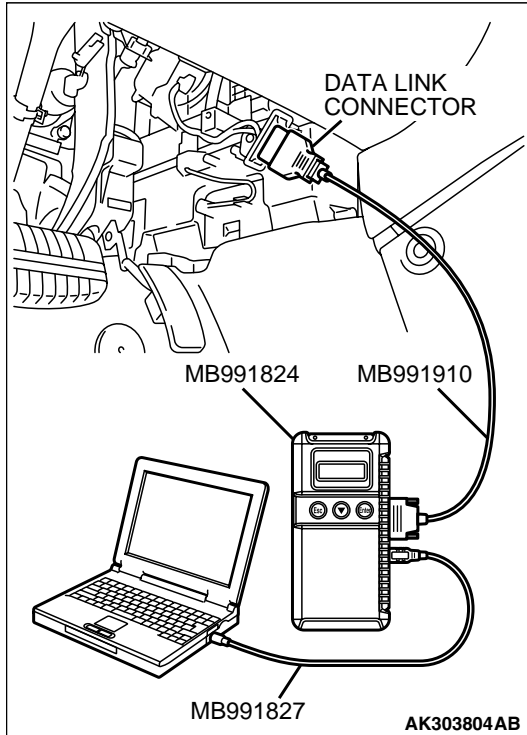
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

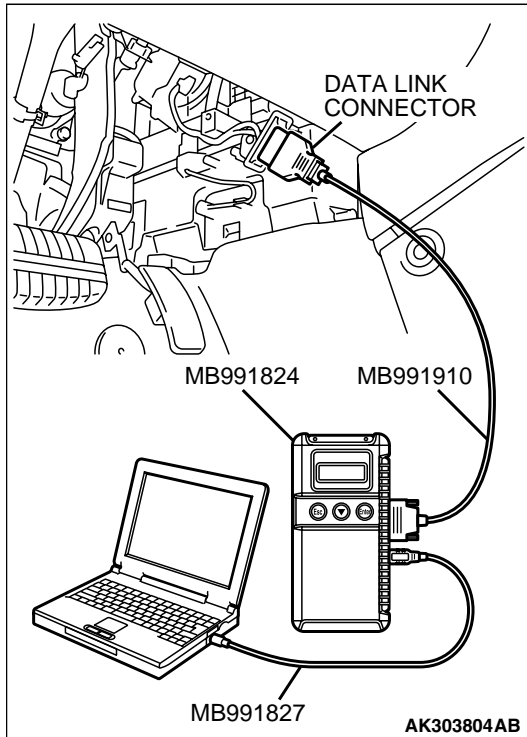
- (1) Connect scan tool MB991958 to the data link connector.
- (2) Turn the ignition switch to the "ON" position.
- (3) Read the DTC.
- (4) Turn the ignition switch to the "ON" position.

### **Q: Is the DTC set?**

**YES** : Refer to Diagnostic Trouble Code Chart [P. 13A-33](#).

**NO** : Go to Step 2.





**STEP 2. Using scan tool MB991958, check actuator test items 01, 02, 03, 04: Injector.**

- (1) Turn the ignition switch to the "ON" position.
- (2) Check following items in the actuator test. Refer to Actuator Test Reference Table [P.13A-1097](#).
  - a. Item 01, 02, 03, 04: Injector.
- (3) Turn the ignition switch to the "ON" position.

**Q: Are they operating properly?**

**YES** : Go to Step 3.

**NO** : Refer to DTC P0201 – Injector Circuit-cylinder 1 [P.13A-464](#), DTC P0202 – Injector Circuit-cylinder 2 [P.13A-474](#), DTC P0203 – Injector Circuit-cylinder 3 [P.13A-484](#), DTC P0204 – Injector Circuit-cylinder 4 [P.13A-494](#).

**STEP 3. Check the ignition timing.**

Refer to GROUP 11A, On-vehicle Service – Ignition Timing Check [P.11A-12](#).

**Q: Is the ignition timing normal?**

**YES** : Go to Step 4.

**NO** : Check that the crankshaft position sensor and timing belt cover are in the correct position. Then confirm that the malfunction symptom is eliminated.

**STEP 4. Using scan tool MB991958, check data list.**

**⚠ CAUTION**

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

- (1) Connect scan tool MB991958 to the data link connector.
- (2) Turn the ignition switch to the "ON" position.
- (3) Check the following items in the data list. Refer to Data List Reference Table P.13A-1083.

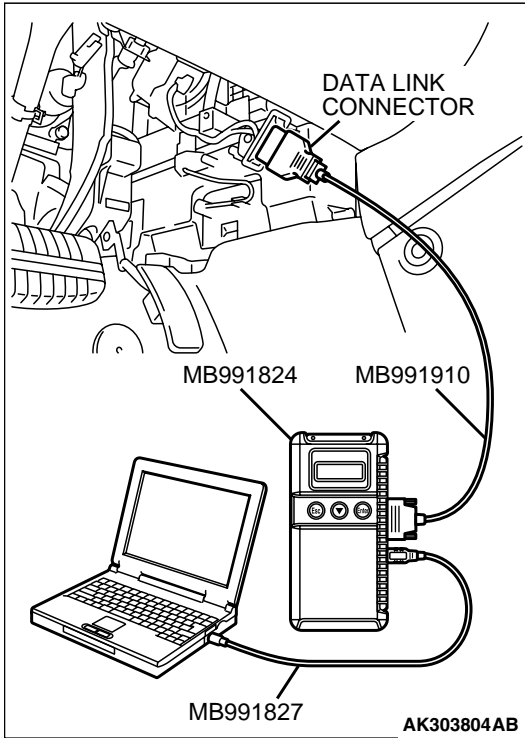
- a. Item 13: Intake Air Temperature Sensor.
- b. Item 25: Barometric Pressure Sensor.
- c. Item 21: Engine Coolant Temperature Sensor.
- d. Item 69: Cylinder 1, 4 Heated Oxygen Sensor (rear).
- e. Item 39: Cylinder 1, 4 Heated Oxygen Sensor (front).
- f. Item 59: Cylinder 2, 3 Heated Oxygen Sensor (rear).
- g. Item 11: Cylinder 2, 3 Heated Oxygen Sensor (front).

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

**Q: Are they operating properly?**

**YES** : Go to Step 5.

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



**STEP 5. Using scan tool MB991958, check data list.**

- (1) Turn the ignition switch to the "ON" position.
- (2) Check the following items of data list. Refer to Data List Reference Table P.13A-1083.

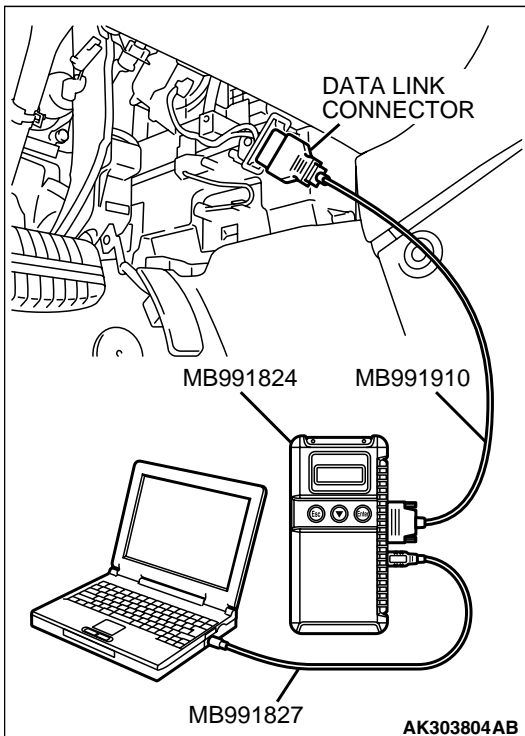
- a. Item 39: Cylinder 1, 4 Heated Oxygen Sensor (front).
- b. Item 11: Cylinder 2, 3 Heated Oxygen Sensor (front).
  - Voltage should fluctuate between 0 – 0.4 volt and 0.6 – 1.0 volt while idling after the engine has been warmed.

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

**Q: Are they operating properly?**

**YES** : Go to Step 7.

**NO** : Go to Step 6.



**STEP 6. Check the fuel pressure.**Refer to On-vehicle Service – Fuel Pressure Test [P.13A-1124](#).**Q: Is the fuel pressure normal?****YES** : Check the following items, and repair or replace the defective items.

## a. Vacuum leak.

- Broken intake manifold gasket.
- Broken air intake hose.
- Broken vacuum hose.
- Positive crankcase ventilation valve does not operate.

## b. Injector clogged.

Then confirm that the malfunction symptom is eliminated.

**NO** : Repair or replace it. Then confirm that the malfunction symptom is eliminated.**STEP 7. Check the fuel pressure.**Refer to On-vehicle Service – Fuel Pressure Test [P.13A-1124](#).**Q: Is the fuel pressure normal?****YES** : Check the following items, and repair or replace the defective items.

## a. Check the ignition coil and spark plugs.

## b. Check the EGR system.

Then confirm that the malfunction symptom is eliminated.

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

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**INSPECTION PROCEDURE 20: Knocking**

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**COMMENT**

- In case such as the above, the cause is probably that the detonation control is defective or the heat value of the spark plug is inappropriate.

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

- Defective knock sensor.
- Incorrect heat value of the spark plug.

**DIAGNOSIS****Required Special Tools:**

- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

**STEP 1.** Using the scan tool MB991958, read the diagnostic trouble code (DTC).

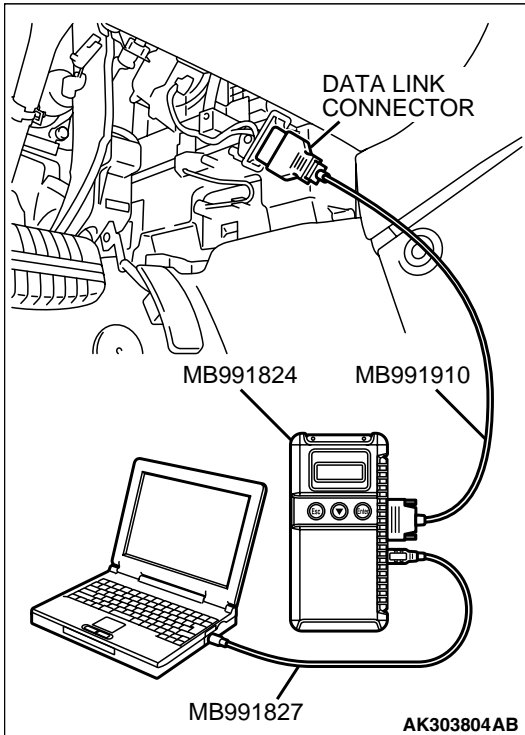
**⚠ CAUTION**

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

- (1) Connect scan tool MB991958 to the data link connector.
- (2) Turn the ignition switch to the "ON" position.
- (3) Read the DTC.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

**Q: Is the DTC set?**

- YES :** Refer to Diagnostic Trouble Code Chart [P.13A-33](#).  
**NO :** Go to Step 2.



**STEP 2. Check the ignition timing.**

- (1) The ignition timing should retard more when knock sensor connector B-120 is disconnected than when it is connected.

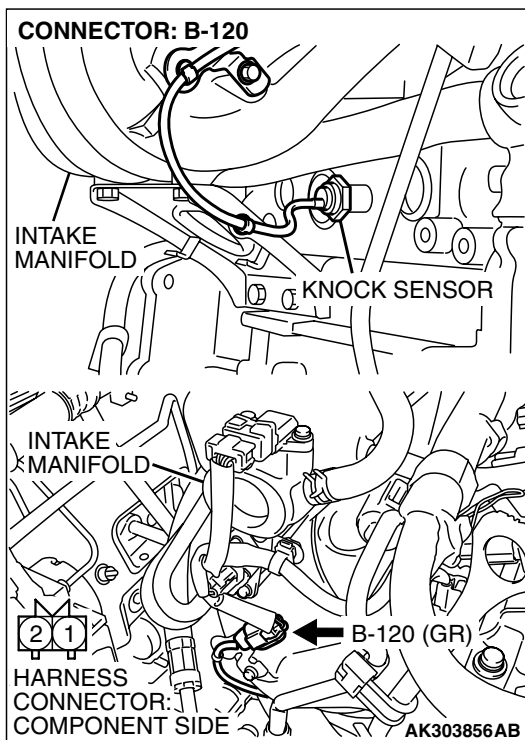
**Q: When the knock sensor connector B-120 was disconnected, was the ignition timing delayed?**

**YES :** Check the following items, and repair or replace the defective items.

- a. Check the spark plugs.
- b. Fuel quality, octane level.
- c. Check if the foreign materials (water, kerosene, etc.) got into fuel.

Then confirm that the malfunction symptom is eliminated.

**NO :** Refer to DTC P0325 – Knock Sensor Circuit [P.13A-540](#).





## INSPECTION PROCEDURE 21: Dieseling (Run-on).

## COMMENT

- Fuel leakage from injectors is suspected, or carbon build up.

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

- Fuel leakage from injectors.

## DIAGNOSIS

## STEP 1. Check the injectors for fuel leakage.

Replace the leaking injector. Then confirm that the malfunction symptom is eliminated.

## INSPECTION PROCEDURE 22: Too high CO and HC concentration when idling

## COMMENT

- Abnormal air/fuel ratio is suspected.

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

- Malfunction of air/fuel ratio control system.
- Deteriorated catalyst.

## DIAGNOSIS

## Required Special Tools:

- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

## STEP 1. Using scan tool MB991958, read the diagnostic trouble code (DTC).

**CAUTION**

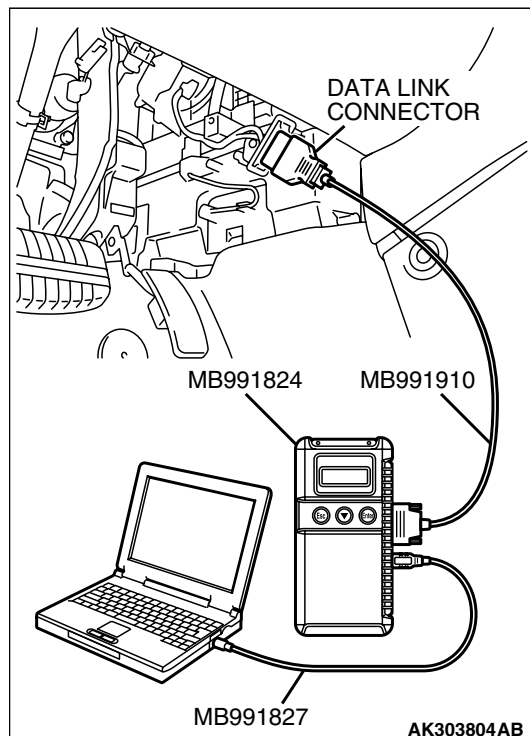
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

- Connect scan tool MB991958 to the data link connector.
- Turn the ignition switch to the "ON" position.
- Read the DTC.
- Turn the ignition switch to the "LOCK" (OFF) position.

## Q: Is the DTC set?

**YES** : Refer to Diagnostic Trouble Code Chart [P.13A-33](#).

**NO** : Go to Step 2.





**STEP 2. Check the ignition timing.**

Refer to GROUP 11A, On-vehicle Service – Ignition Timing  
Check [P.11A-12](#).

**Q: Is the ignition timing normal?**

**YES** : Go to Step 3.

**NO** : Check that the crankshaft position sensor and timing belt cover are in the correct position. Then confirm that the malfunction symptom is eliminated.

**STEP 3. Using scan tool MB991958, check data list.**

**CAUTION**

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

- (1) Connect scan tool MB991958 to the data link connector.
- (2) Turn the ignition switch to the "ON" position.
- (3) Check the following items in the data list. Refer to Data List Reference Table [P.13A-1083](#).

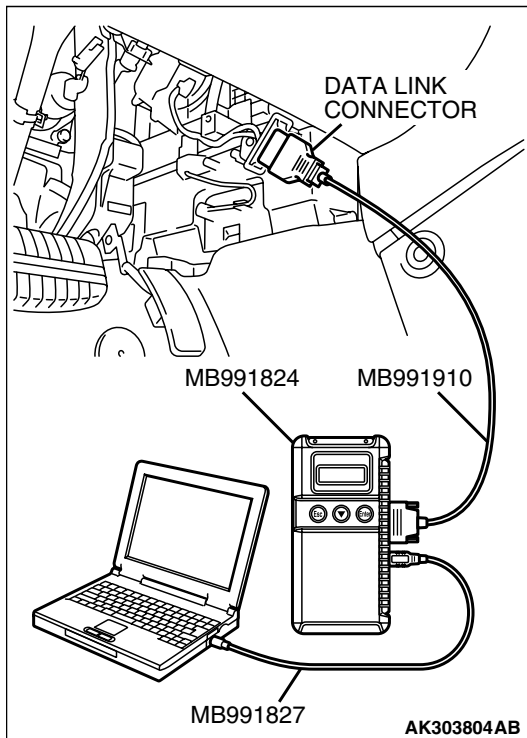
- a. Item 21: Engine Coolant Temperature Sensor.
- b. Item 13: Intake Air Temperature Sensor.
- c. Item 25: Barometric Pressure Sensor.
- d. Item 69: Cylinder 1, 4 Heated Oxygen Sensor (rear).
- e. Item 39: Cylinder 1, 4 Heated Oxygen Sensor (front).
- f. Item 59: Cylinder 2, 3 Heated Oxygen Sensor (rear).
- g. Item 11: Cylinder 2, 3 Heated Oxygen Sensor (front).

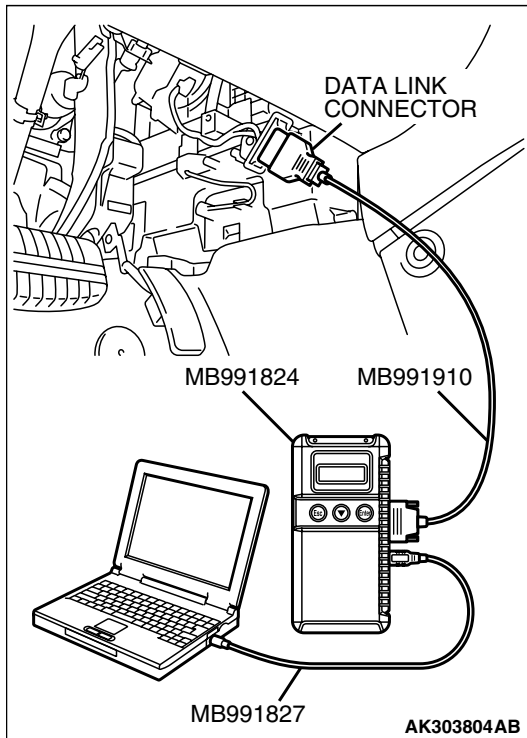
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

**Q: Are they operating properly?**

**YES** : Go to Step 4.

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



**STEP 4. Using scan tool MB991958, check data list.**

- (1) Turn the ignition switch to the "ON" position.
- (2) Check the following items of the data list. Refer to Data List Reference Table [P.13A-1083](#).
  - a. Item 39: Cylinder 1, 4 Heated Oxygen Sensor (front).
  - b. Item 11: Cylinder 2, 3 Heated Oxygen Sensor (front).
    - Voltage should fluctuate between 0 – 0.4 volt and 0.6 – 1.0 volt while idling after the engine has been warmed.
- (3) Turn the ignition switch to the "LOCK" (OFF) position.

**Q: Are they operating properly?**

**YES :** Replace the heated oxygen sensor (front). Then confirm that the malfunction symptom is eliminated. If not resolved, go to step 6.

**NO :** Go to Step 5.

**STEP 5. Check the fuel pressure.**

Refer to On-vehicle Service – Fuel Pressure Test [P.13A-1124](#).

**Q: Is the fuel pressure normal?**

**YES :** Go to Step 6.

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

**STEP 6. Check the following items.**

- (1) Check the following items, and repair or replace the defective items.
  - a. Check the injectors for fuel leakage.
  - b. Check the ignition coil and spark plugs.
  - c. Check compression pressure.
  - d. Check the positive crank case ventilation system.
  - e. Check the evaporative emission system.
  - f. Check the EGR system.
- (2) Then check the malfunction symptom.

**Q: Is the malfunction symptom eliminated?**

**YES :** The check is completed.

**NO :** Replace the catalytic converter. Then confirm that the malfunction symptom is eliminated.

---

**INSPECTION PROCEDURE 23: Transient, Mass Emission Tailpipe Test Failure.**

---

**COMMENT**

- The test is failed when the air/fuel ratio is not controlled to the ideal air/fuel ratio. This occurs due to the feedback control by heated oxygen sensor signals, insufficient EGR flow rate, or deteriorated catalyst.

*NOTE: If the three-way catalyst temperature is low when checking the exhaust gas, the three-way catalyst cannot sufficiently clean the emissions. Warm up the engine sufficiently before checking the exhaust, and check immediately.*

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

- Malfunction of air/fuel ratio control system.
- Malfunction of the EGR system.
- Deteriorated catalyst.

**DIAGNOSIS**

**Required Special Tools:**

- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

---

**STEP 1. Check the exhaust gas with the engine at normal operating temperature.**

**Q: Was the exhaust gas checked with engine warmed sufficiently?**

**YES :** Go to Step 2.

**NO :** Check it again after enough warm up.

---

**STEP 2. Check the following items.**

(1) Check the following items.

- a. Check all vacuum hoses and connectors.
- b. Check electrical wires and connectors for obvious problems.
- c. Check the exhaust system for missing or damaged parts.

**Q: Are they normal?**

**YES :** Go to Step 3.

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

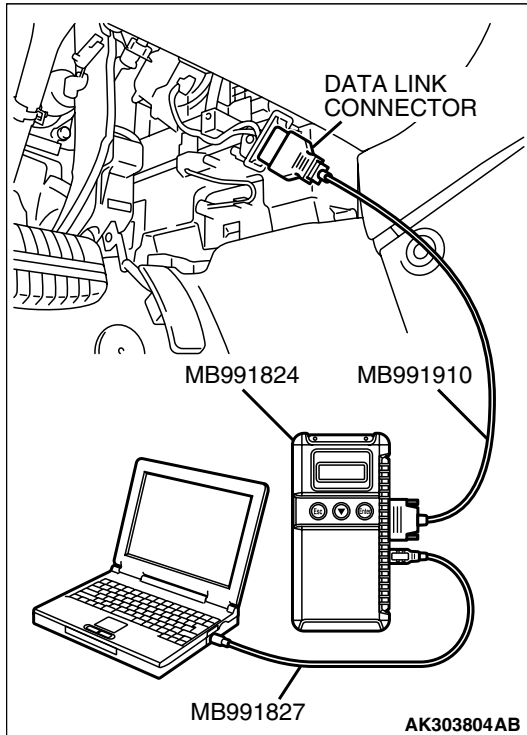
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**STEP 3. Check the driveability.**

**Q: Is the driveability normal?**

**YES :** Go to Step 4.

**NO :** Refer to Trouble Symptom Chart [P. 13A-38](#).



**STEP 4.** Using scan tool MB991958, read the diagnostic trouble code (DTC).

**⚠ CAUTION**

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

- (1) Connect scan tool MB991958 to the data link connector.
- (2) Turn the ignition switch to the "ON" position.
- (3) Read the DTC.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

**Q: Is the DTC set?**

- YES :** Refer to Diagnostic Trouble Code Chart [P.13A-33](#).  
**NO :** Go to Step 5.

**STEP 5. Check the ignition timing.**

Refer to GROUP 11A, On-vehicle Service – Ignition Timing Check [P.11A-12](#).

**Q: Is the ignition timing normal?**

- YES :** Go to Step 6.  
**NO :** Check that the crankshaft position sensor and timing belt cover are in the correct position. Then confirm that the malfunction symptom is eliminated.

**STEP 6. Using scan tool MB991958, check data list.**

**⚠ CAUTION**

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

- (1) Connect scan tool MB991958 to the data link connector.
- (2) Turn the ignition switch to the "ON" position.
- (3) Check the following items in the data list. Refer to Data List Reference Table [P.13A-1083](#).

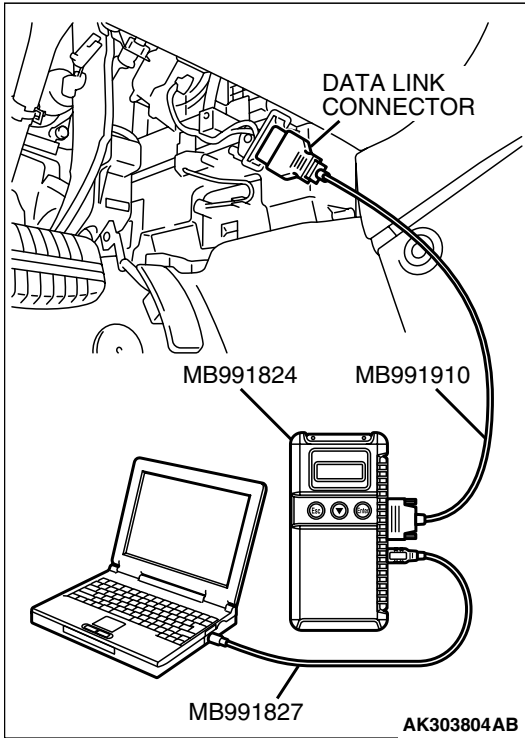
- a. Item 21: Engine Coolant Temperature Sensor.
- b. Item 13: Intake Air Temperature Sensor.
- c. Item 25: Barometric Pressure Sensor.
- d. Item 69: Cylinder 1, 4 Heated Oxygen Sensor (rear).
- e. Item 59: Cylinder 2, 3 Heated Oxygen Sensor (rear).

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

**Q: Are they operating properly?**

**YES :** Go to Step 7.

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



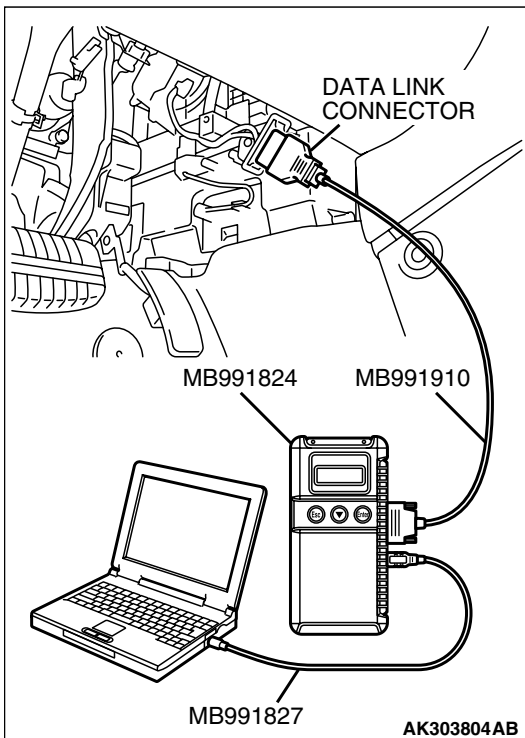
**STEP 7. Using scan tool MB991958, check data list item 39: Cylinder 1, 4 Heated oxygen sensor (front).**

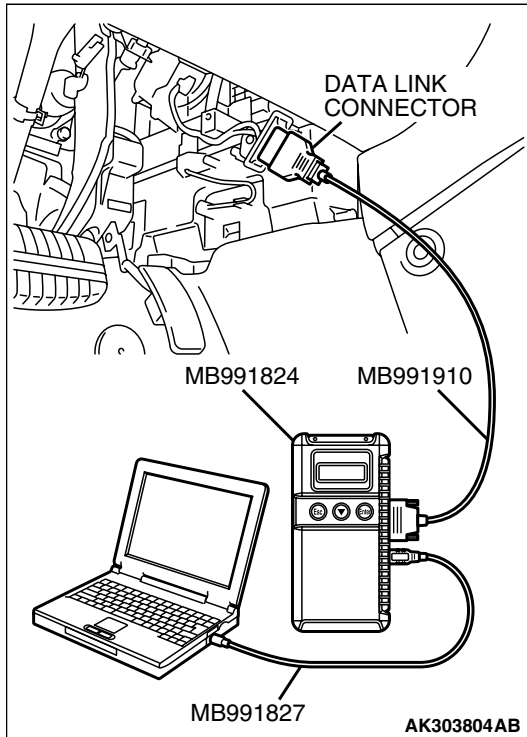
- (1) Start the engine and run at idle.
- (2) Set scan tool MB991958 to the data reading mode for item 39, Cylinder 1, 4 Heated Oxygen Sensor (front).
  - Warm up the engine. When the engine is decelerated suddenly from 4,000 r/min, the output voltage should increase from 0.2 volt or less to 0.6 – 1.0 volt in a few seconds.
- (3) Turn the ignition switch to the "LOCK" (OFF) position.

**Q: Is the sensor operating properly?**

**YES :** Go to Step 8.

**NO :** Refer to DTC P0130 – Cylinder 1, 4 Heated Oxygen Sensor Circuit (sensor 1) [P.13A-192](#), DTC P0131 – Cylinder 1, 4 Heated Oxygen Sensor Low Voltage (sensor 1) [P.13A-210](#), DTC P0132 – Cylinder 1, 4 Heated Oxygen Sensor Circuit High Voltage (sensor 1) [P.13A-217](#), DTC P0133 – Cylinder 1, 4 Heated Oxygen Sensor Circuit Slow Response (sensor 1) [P.13A-222](#), DTC P0134 – Cylinder 1, 4 Heated Oxygen Sensor Circuit No Activity Detected (sensor 1) [P.13A-228](#).





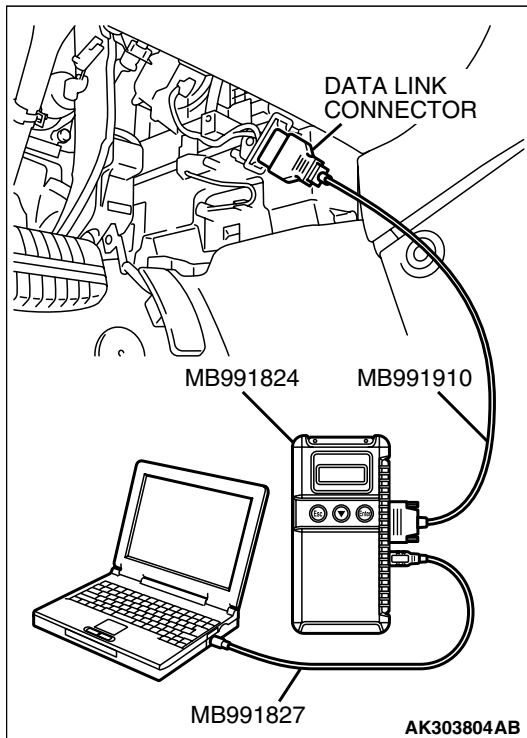
**STEP 8. Using scan tool MB991958, check data list item 11: Cylinder 2, 3 Heated oxygen sensor (front).**

- (1) Start the engine and run at idle.
- (2) Set scan tool MB991958 to the data reading mode for item 11, Cylinder 2, 3 Heated Oxygen Sensor (front).
  - Output voltage should be 0.6 – 1.0 volt at sudden engine revving.
- (3) Turn the ignition switch to the "LOCK" (OFF) position.

**Q: Is the sensor operating properly?**

**YES :** Go to Step 9.

**NO :** Refer to DTC P0150 – Cylinder 2, 3 Heated Oxygen Sensor Circuit (sensor 1) [P.13A-299](#), DTC P0151 – Cylinder 2, 3 Heated Oxygen Sensor Circuit Low Voltage (sensor 1) [P.13A-317](#), DTC P0152 – Cylinder 2, 3 Heated Oxygen Sensor Circuit High Voltage (sensor 1) [P.13A-324](#), DTC P0153 – Cylinder 2, 3 Heated Oxygen Sensor Circuit Slow Response (sensor 1) [P.13A-329](#), DTC P0154 – Cylinder 2, 3 Heated Oxygen Sensor Circuit No Activity Detected (sensor 1) [P.13A-335](#).



**STEP 9. Using scan tool MB991958, check data list item 39: Cylinder 1, 4 Heated oxygen sensor (front).**

- (1) Start the engine and run at idle.
- (2) Set scan tool MB991958 to the data reading mode for item 39, Cylinder 1, 4 Heated Oxygen Sensor (front).
  - Voltage should fluctuate between 0 – 0.4 volt and 0.6 – 1.0 volt while after the engine has been warmed.
- (3) Turn the ignition switch to the "LOCK" (OFF) position.

**Q: Is the sensor operating properly?**

**YES :** Go to Step 10.

**NO :** Go to Step 12.

**STEP 10. Check the EGR system.**

Refer to GROUP 17, Emission Control System – General Description (EGR System) P.17-89.

**Q: Is the EGR system normal?**

**YES** : Go to Step 11.

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

**STEP 11. Using scan tool MB991958, check data list item 69: Cylinder 1, 4 Heated oxygen sensor (rear).**

**CAUTION**

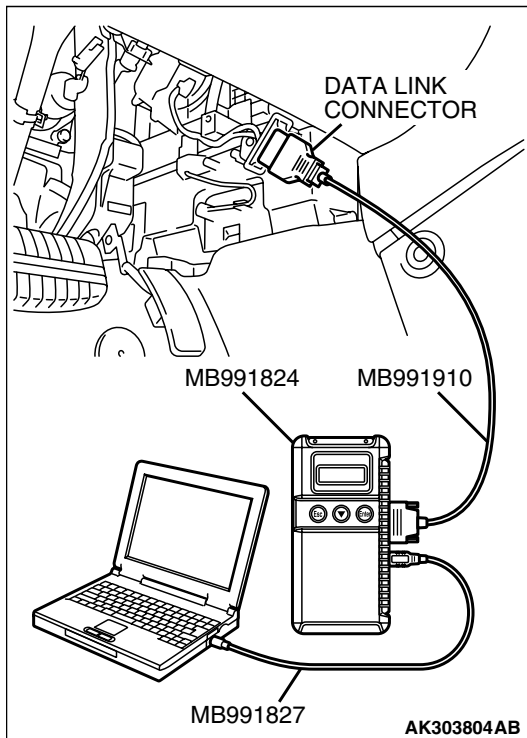
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

- (1) Connect scan tool MB991958 to the data link connector.
- (2) Start the engine and run at idle.
- (3) Set scan tool MB991958 to the data reading mode for item 69, Cylinder 1, 4 Heated Oxygen Sensor (rear).
  - Average voltage should be 0.6 volt or less, when idling.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

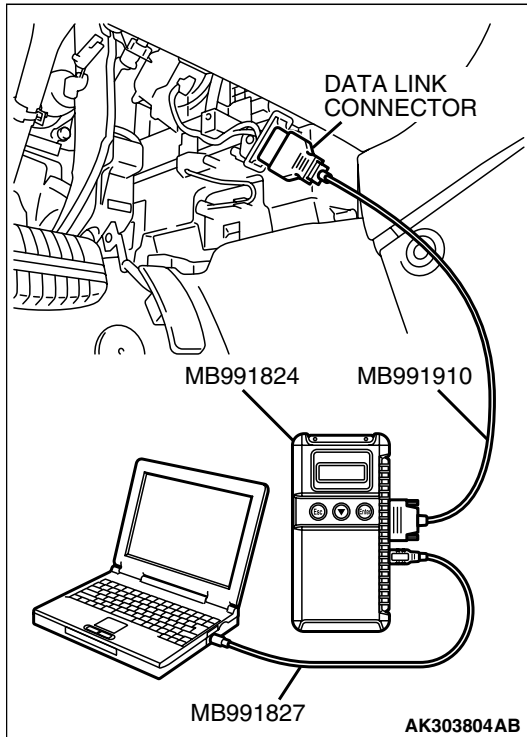
**Q: Is the sensor operating properly?**

**YES** : Go to Step 16.

**NO** : Replace the cylinder 1, 4 heated oxygen sensor (front). Then confirm that the malfunction symptom is eliminated.







**STEP 12. Using scan tool MB991958, check data list item 11: Cylinder 2, 3 Heated oxygen sensor (front).**

- (1) Start the engine and run at idle.
- (2) Set scan tool MB991958 to the data reading mode for item 11, Cylinder 2, 3 Heated Oxygen Sensor (front).
  - Warm up the engine. When the engine is decelerated suddenly from 4,000 r/min, the output voltage should increase from 0.2 volt or less to 0.6 – 1.0 volt in a few seconds.
- (3) Turn the ignition switch to the "LOCK" (OFF) position.

**Q: Is the sensor operating properly?**

**YES** : Go to Step 13.

**NO** : Go to Step 15.

**STEP 13. Check the EGR system.**

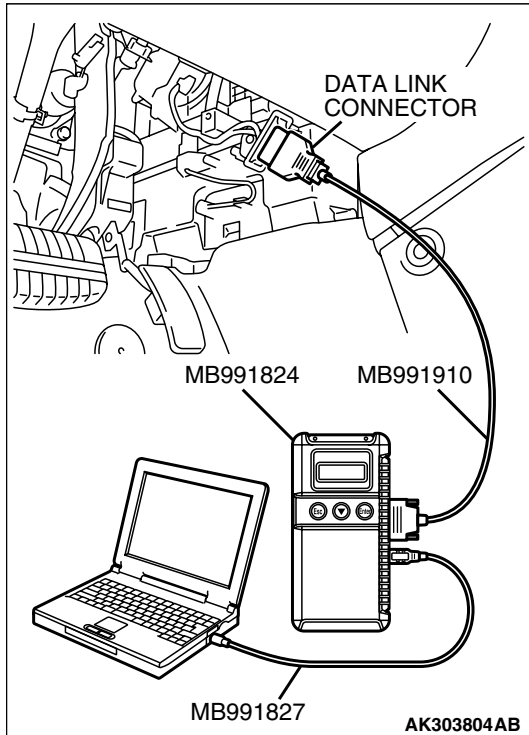
Refer to GROUP 17, Emission Control System – General Description (EGR System) [P.17-89](#).

**Q: Is the EGR system normal?**

**YES** : Go to Step 14.

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





**STEP 14. Using scan tool MB991958, check data list item 59: Cylinder 2, 3 Heated oxygen sensor (rear).**

**⚠ CAUTION**

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

- (1) Connect scan tool MB991958 to the data link connector.
- (2) Start the engine and run at idle.
- (3) Set scan tool MB991958 to the data reading mode for item 59, Cylinder 2, 3 Heated Oxygen Sensor (rear).
  - Average voltage should be 0.6 volt or less, when idling.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

**Q: Is the sensor operating properly?**

**YES :** Go to Step 16.

**NO :** Replace the cylinder 2, 3 heated oxygen sensor (front). Then confirm that the malfunction symptom is eliminated.

**STEP 15. Check the fuel pressure.**

Refer to On-vehicle Service – Fuel Pressure Test [P.13A-1124](#).

**Q: Is the fuel pressure normal?**

**YES :** Go to Step 16.

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

**STEP 16. Check the following items.**

- (1) Check the following items, and repair or replace the defective items.
  - a. Check the injectors for fuel leakage.
  - b. Check the ignition coil and spark plugs.
  - c. Check compression pressure.
  - d. Check the positive crankcase ventilation system.
  - e. Check the evaporative emission system.
- (2) Then check the malfunction symptom.

**Q: Is the malfunction symptom eliminated?**

**YES :** The check is completed.

**NO :** Replace the catalytic converter. Then confirm that the malfunction symptom is eliminated.

**INSPECTION PROCEDURE 24: Purge Flow Test of the Evaporative Emission Canister Failure.****COMMENT**

- The test fails when the purge line or purge port is clogged or if the evaporative emission purge solenoid fails.

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

- Purge line or purge port is clogged.
- Malfunction of the evaporative emission purge solenoid.
- Evaporative emission canister is clogged.

**DIAGNOSIS****Required Special Tools:**

- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

**STEP 1. Using scan tool MB991958, read the diagnostic trouble code (DTC).****⚠ CAUTION**

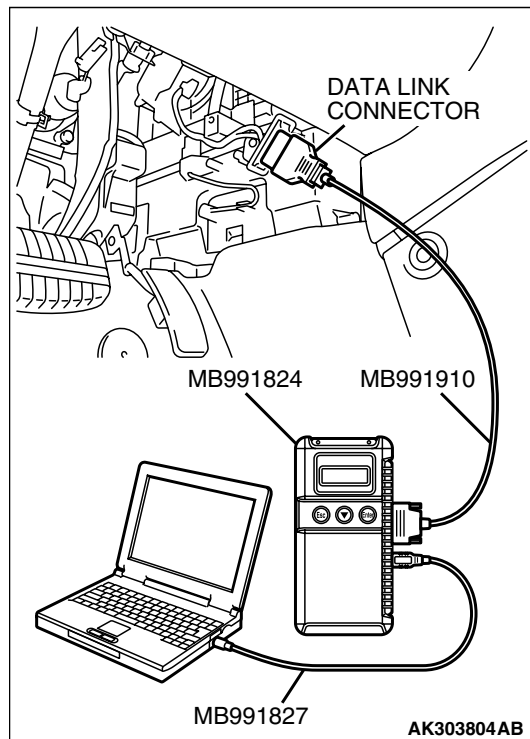
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

- (1) Connect scan tool MB991958 to the data link connector.
- (2) Turn the ignition switch to the "ON" position.
- (3) Read the DTC.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

**Q: Is the DTC set?**

**YES** : Refer to Diagnostic Trouble Code Chart [P.13A-33](#).

**NO** : Refer to GROUP 17, Emission Control System – Purge Control System Check (Purge Flow Check) [P.17-86](#).



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**INSPECTION PROCEDURE 25: Pressure Test of the Evaporative System Failure**

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**COMMENT**

- The test fails if there is a leak from the fuel tank or vapor line.

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

- Loose fuel tank filler tube cap.
- Broken seal in fuel tank, vapor line evaporative emission canister.

**DIAGNOSIS**

---

**STEP 1. Check the evaporative emission purge solenoid.**

Refer to GROUP 17, Emission Control System – Evaporative Emission Purge Solenoid Check [P.17-87](#).

**Q: Is the evaporative emission purge solenoid normal?**

**YES :** Go to Step 2.

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

---

**STEP 2. Check the evaporative emission ventilation solenoid.**

Refer to GROUP 17, Emission Control System – Evaporative Emission Ventilation Solenoid Check [P.17-88](#).

**Q: Is the evaporative emission ventilation solenoid normal?**

**YES :** Check the following items, and repair or replace the defective items.

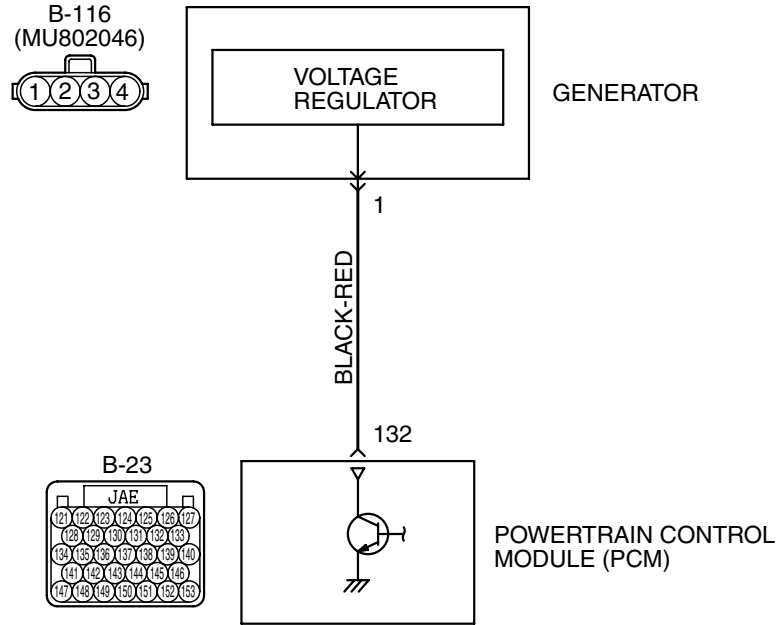
- a. Check for leaks from the vapor line or evaporative emission canister.
- b. Check for leaks from the fuel tank.

Then confirm that the malfunction symptom is eliminated.

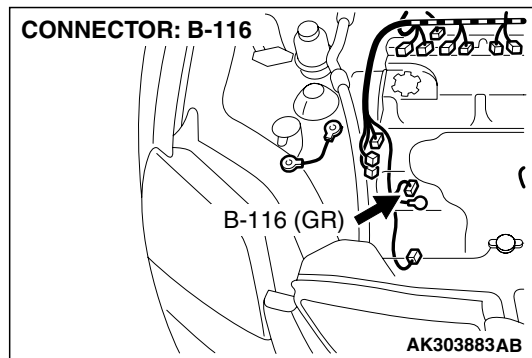
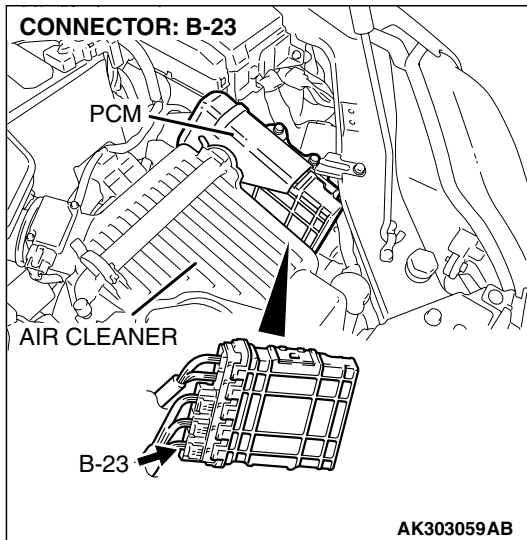
**NO :** Repair or replace it. Then confirm that the malfunction symptom is eliminated.

**INSPECTION PROCEDURE 26: Generator output voltage is low (approximately 12.3 volts).**

Generator Circuit



AK303921



**CIRCUIT OPERATION**

- The PCM controls generator out put current by duty-controlling continuity between the generator G terminal (terminal No. 1) and ground.

**TROUBLESHOOTING HINTS (The most likely causes for this charging system:)**

- Malfunction of the charging system.
- Short circuit in harness between generator G terminal and PCM.
- PCM failed.

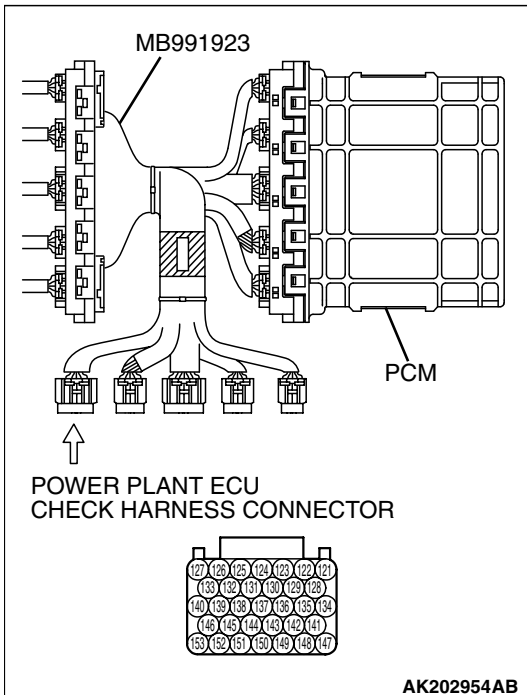
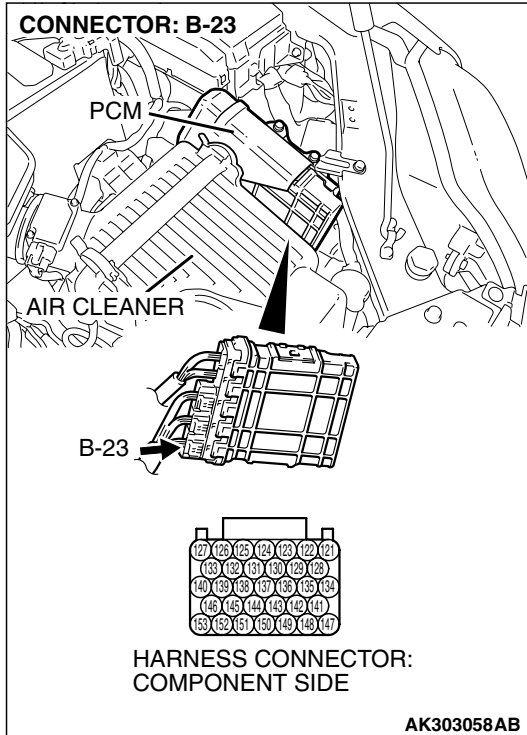
## DIAGNOSIS

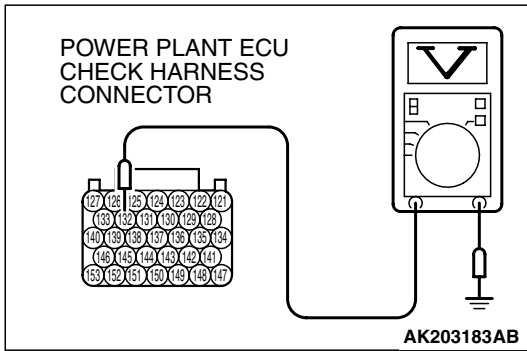
### Required Special Tool:

- MB991923: Power Train ECU Check Harness

### STEP 1. Measure the voltage at PCM connector B-23 by using check harness special tool MB991923.

- (1) Disconnect the all PCM connectors and connect check harness special tool MB991923 between the separated connectors.
- (2) Start the engine and run at idle.





(3) Measure the voltage between terminal No. 132 and ground.

*NOTE: Vehicle for Canada, the headlight, taillight, etc. remain lit even when the lighting switch is in "OFF" position but this is no problem for checks.*

- a. Engine: warming up
- b. Radiator fan: stopped
- c. Headlight switch: OFF to ON
- d. Rear defogger switch: OFF to ON
- e. Stoplight switch: OFF to ON
  - Voltage rises.

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

**Q: Is the measured voltage within the specified range?**

**YES :** Go to Step 2.

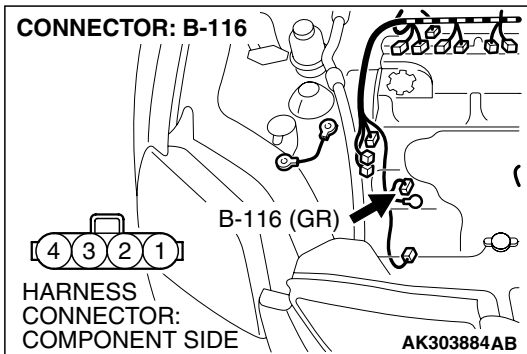
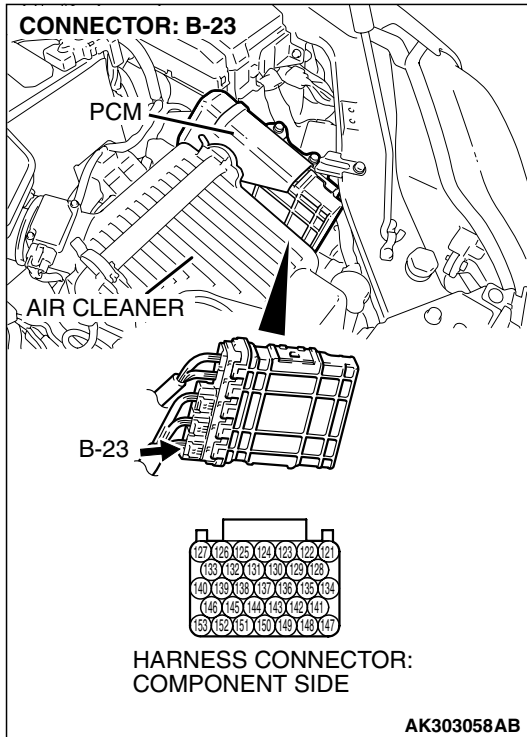
**NO :** Replace the generator. Then confirm that the malfunction symptom is eliminated.

**STEP 2. Check harness connector B-23 at PCM connector and harness connector B-116 at generator connector 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.

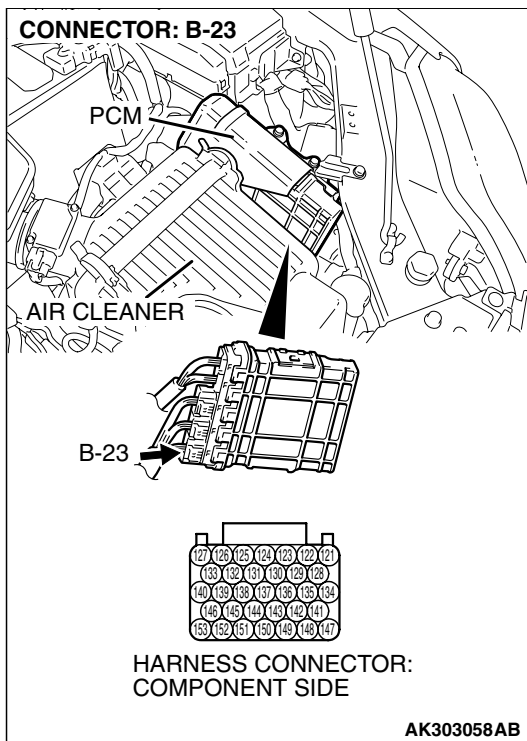
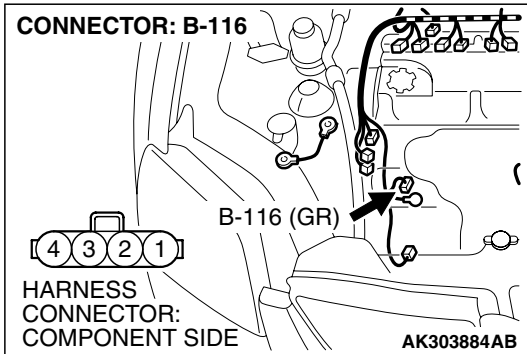


**STEP 3. Check for open circuit and short circuit to ground and harness damage between generator connector B-116 (terminal No. 1) and PCM connector B-23 (terminal No. 132).**

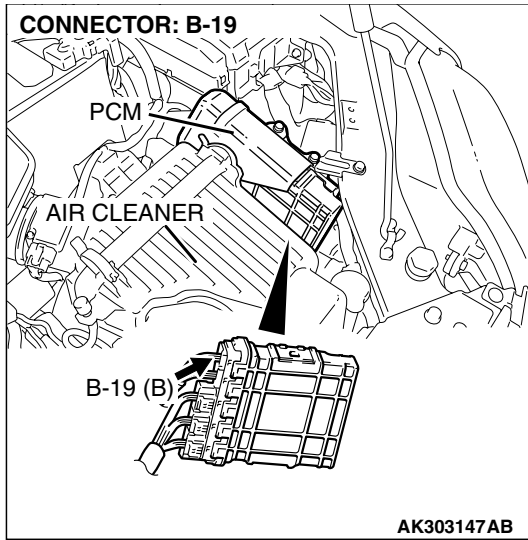
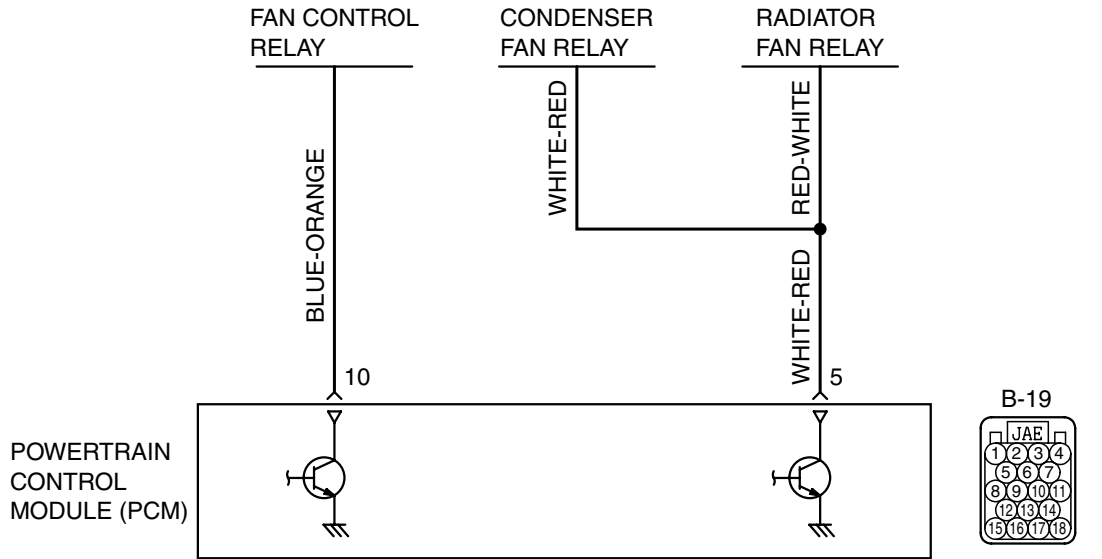
**Q: Is the harness wire in good condition?**

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

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



**INSPECTION PROCEDURE 27: Fans (radiator fan, A/C condenser fan) are inoperative**



**COMMENT**

- The fan control relay is controlled by the power transistor inside the PCM turning "ON" and "OFF".

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

- Malfunction of the fan control relay.

- Malfunction of the fan condenser fan relay.
- Malfunction of the radiator fan relay.
- Malfunction of the condenser fan motor.
- Malfunction of the radiator fan motor.
- Improper connector contact, open or shorted harness wire.
- PCM failed.



**DIAGNOSIS**

**Required Special Tools:**

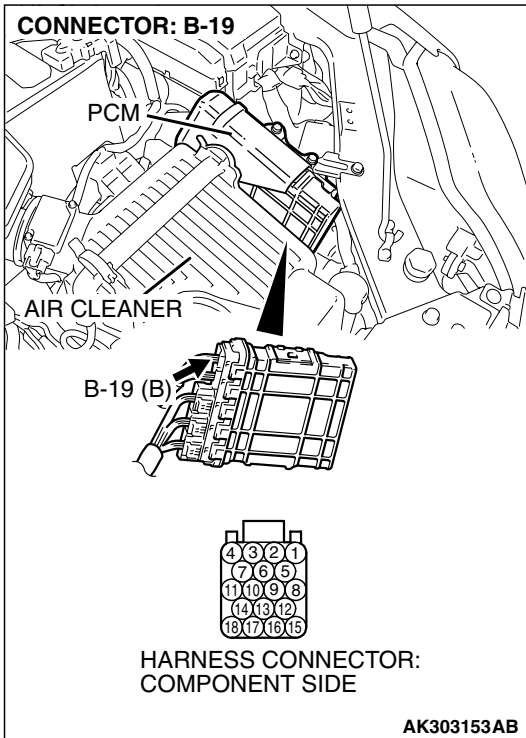
- MB991958: Scan tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

**STEP 1. Check harness connector B-19 at PCM for damage.**

**Q: Is the harness 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 fan condition.**

- (1) Disconnect the B-19 at PCM connector.
- (2) Turn the ignition switch to the "ON" position.
- (3) Check the fan condition.

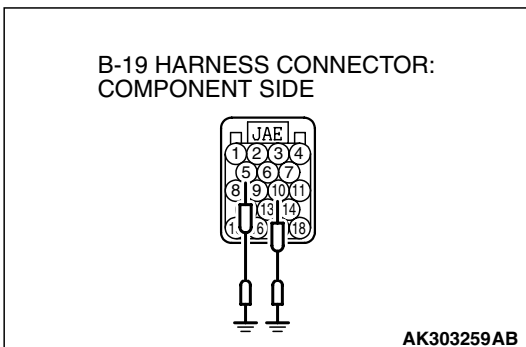
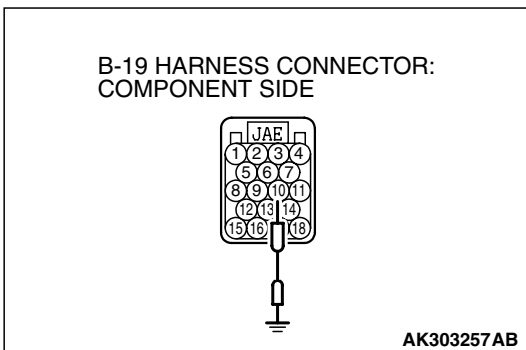
- When the terminal No.10 is grounded by the jumper cable, the radiator and condenser fans should run.
- When the terminal No.10 is grounded first and then both of the terminal No.10 and No.5 are grounded next, check that the rotation speed of fan is higher than the rotation speed when the terminal No.10 is grounded.

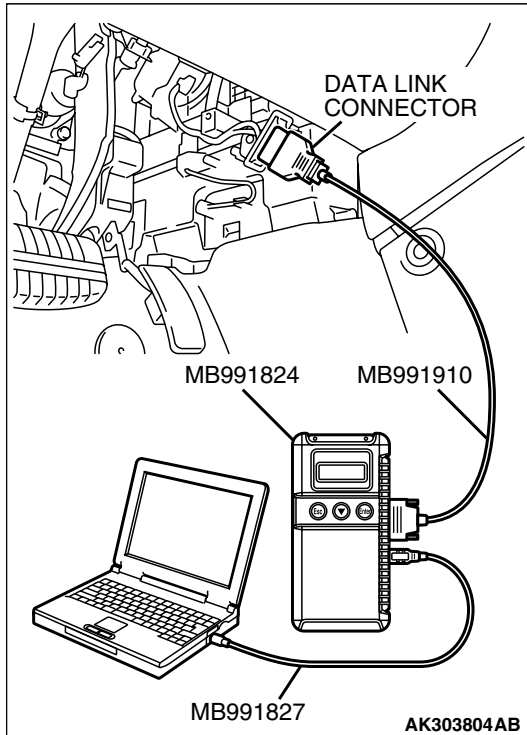
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

**Q: Is the fan condition normal?**

**YES :** Go to Step 3.

**NO :** Refer to GROUP 14, Symptom Chart [P.14-3](#).





**STEP 3. Using scan tool MB991958, check data list item 21: Engine Coolant Temperature Sensor.**

**⚠ CAUTION**

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

- (1) Connect scan tool MB991958 to the data link connector.
- (2) Start the engine and run at idle.
- (3) Check the following items in the data list. Refer to Data List Reference Table [P.13A-1083](#).
  - a. Item 21 Engine Coolant Temperature Sensor.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

**Q: Is the sensor operating properly?**

**YES** : Go to Step 4.

**NO** : Repair and replace. Then confirm that the malfunction symptom is eliminated.

**STEP 4. Check the cooling system.**

Refer to GROUP 14, Engine Cooling Diagnosis [P.143](#).

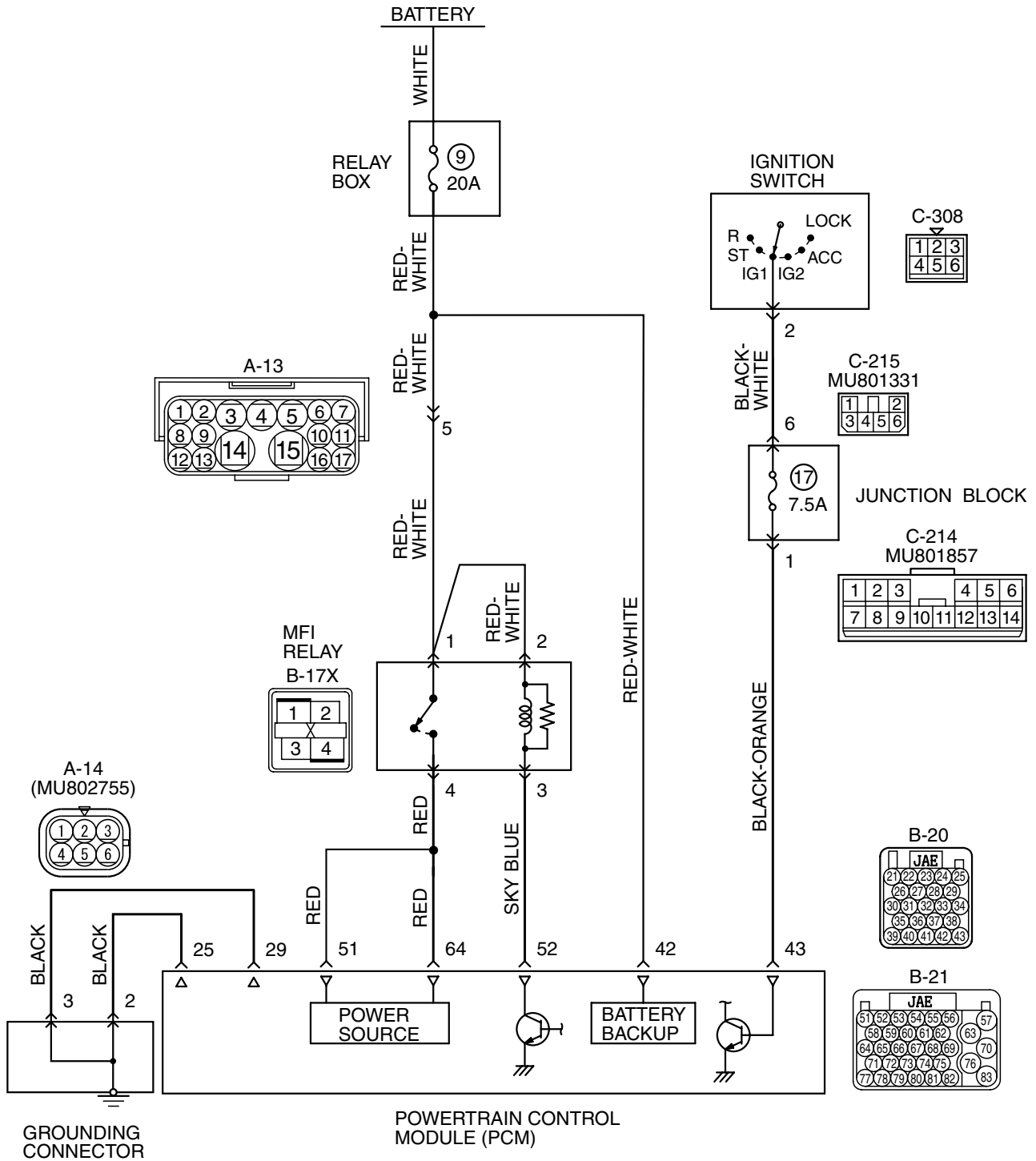
**Q: Is the cooling system normal?**

**YES** : Replace the PCM.

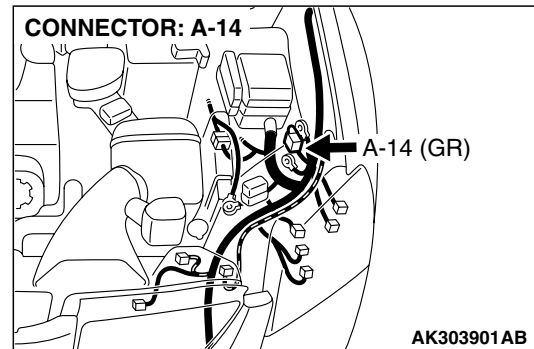
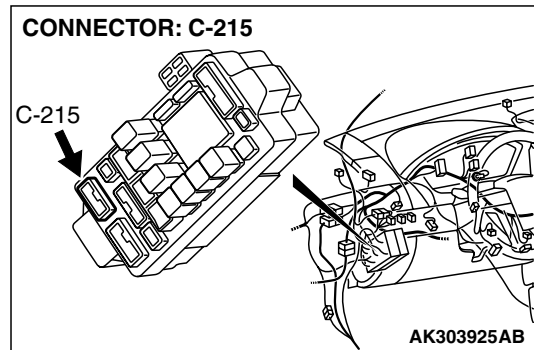
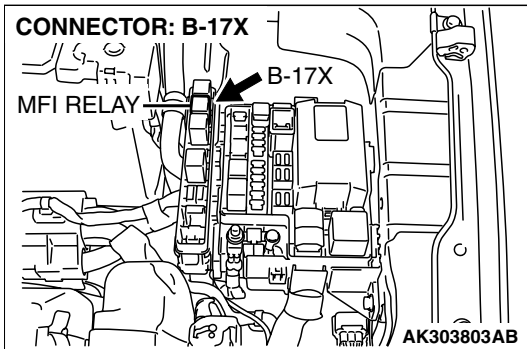
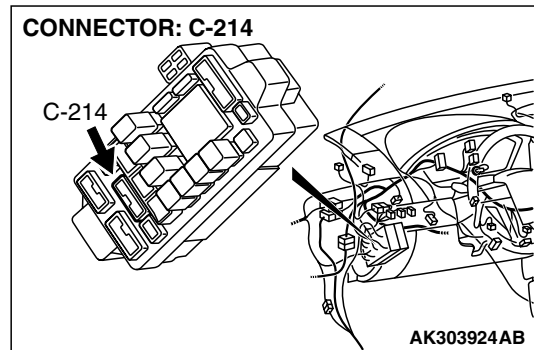
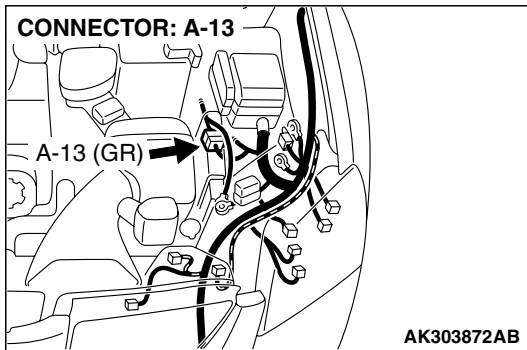
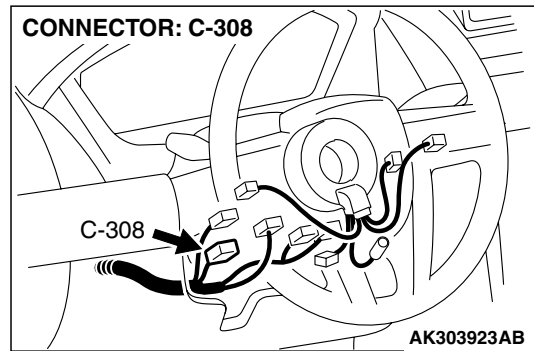
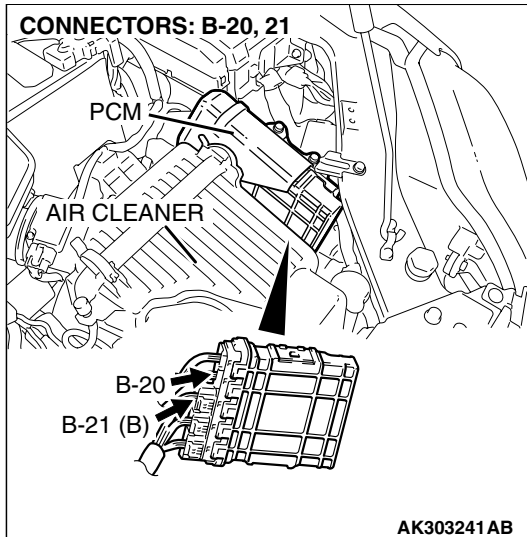
**NO** : Replace it. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 28: Power supply system and ignition switch-IG system.

Power Supply and Ignition Switch-IG Circuit



AK303922



**CIRCUIT OPERATION**

- Battery positive voltage is applied to the MFI relay (terminals No. 1, No. 2).
- A battery positive voltage is constantly supplied to the PCM (terminal No. 42) as the backup
- When the ignition switch is turned to the "ON" position, the battery positive voltage is applied to the PCM (terminal No. 43). When the battery positive voltage is applied, the PCM turns the power transistor in the PCM "ON" and grounds the MFI relay coil. With this, the MFI relay turns "ON" and the battery positive voltage is supplied to the PCM (terminals No. 51, No. 64) from the MFI relay (terminal No. 4). power.

- The PCM (terminals No. 25, No. 29) is grounded to the vehicle body.

- Malfunction of the MFI relay.
- Improper connector contact, open or shorted harness wire.
- Disconnected PCM ground wire.
- Malfunction of the PCM.

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

- Malfunction of the ignition switch.

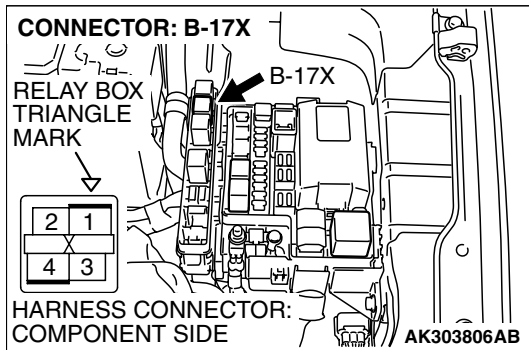
**DIAGNOSIS**

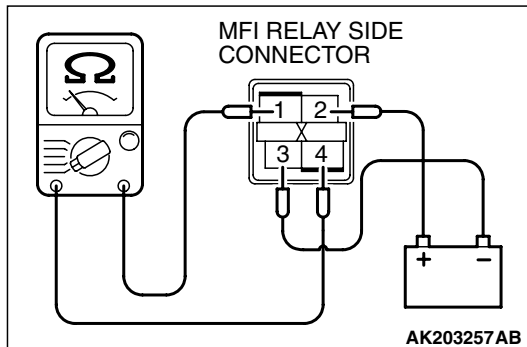
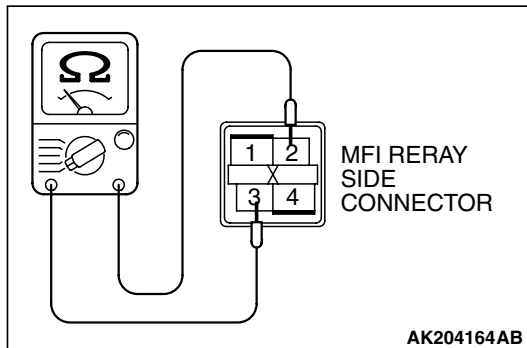
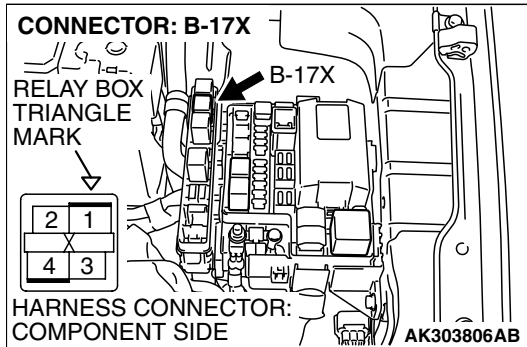
**STEP 1. Check harness connector B-17X at MFI relay for damage.**

**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 MFI relay.****⚠ CAUTION**

Because it is not possible to distinguish the top and the bottom of the MFI relay, inspect it with the triangle mark printed on the relay facing upward.

(1) Remove the MFI relay.

(2) Check for continuity between the MFI relay terminals No. 2 and No. 3.

- There should be continuity. (approximately 70 ohms)

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

(4) Check for continuity between the MFI 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 MFI relay.

**Q: Is the measured resistance within the specified range?**

**YES :** Go to Step 3.

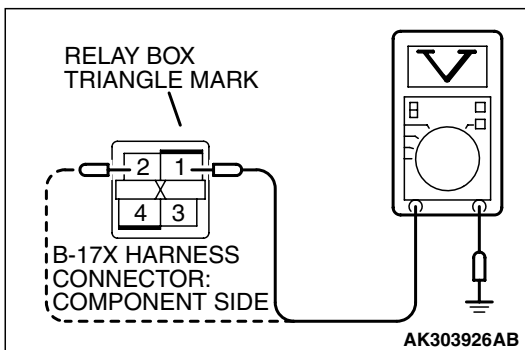
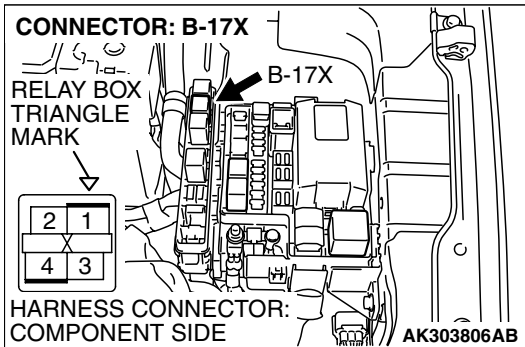
**NO :** Replace the MFI relay. Then confirm that the malfunction symptom is eliminated.

**STEP 3. Measure the power supply voltage at MFI relay harness side connector B-17X.**

**⚠ CAUTION**

Because it is difficult to distinguish the top and bottom of the MFI relay connector at the wiring harness, inspect it by using triangle mark on the junction block as a reference.

(1) Disconnect the connector B-17X and measure at the harness side.



(2) Measure the voltage between terminals No. 1, No. 2 and ground.

- Voltage should be battery positive voltage.

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

**YES :** Go to Step 4.

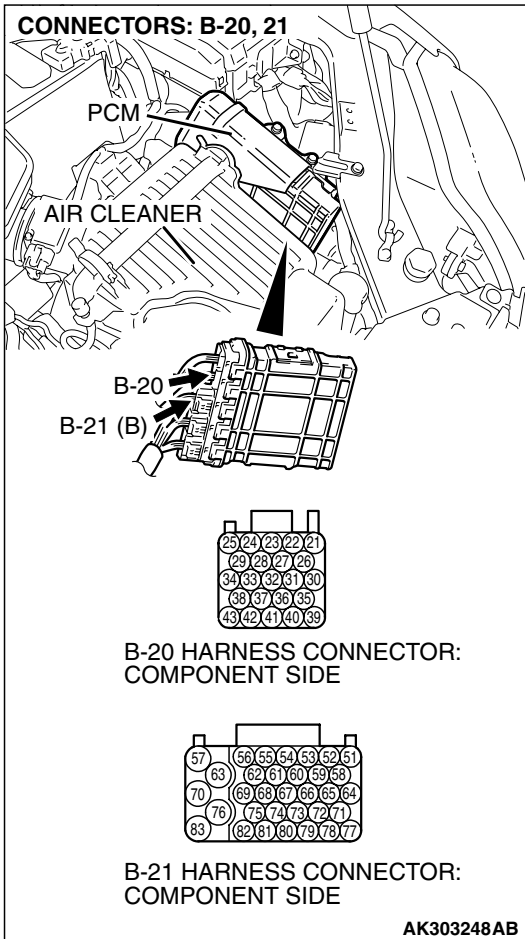
**NO :** Check harness connector A-13 at intermediate connector for damage, and repair or replace as required. Refer to, GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connector is in good condition, repair harness wire between fusible link (9) and MFI relay connector B-17X (terminals No. 1, No. 2) because of open circuit. Then confirm that the malfunction symptom is eliminated.

**STEP 4. Check harness connector B-20 and B-21 at PCM for damage.**

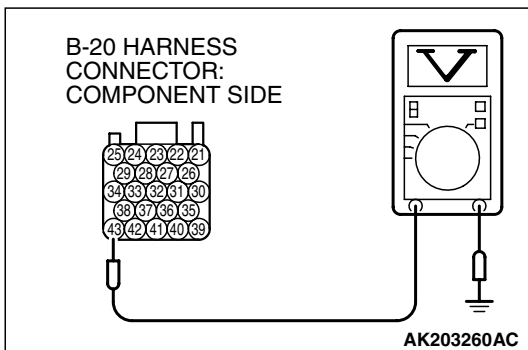
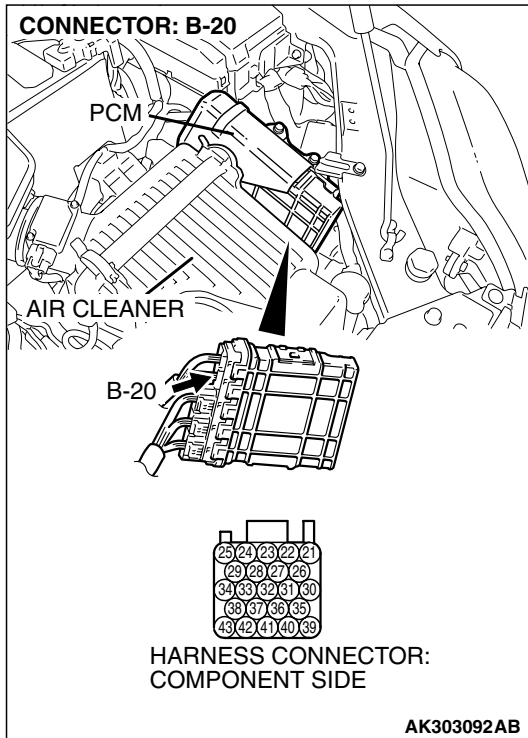
**Q: Is the harness connector in good condition?**

**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 ignition switch-IG signal voltage at PCM harness side connector B-20.**

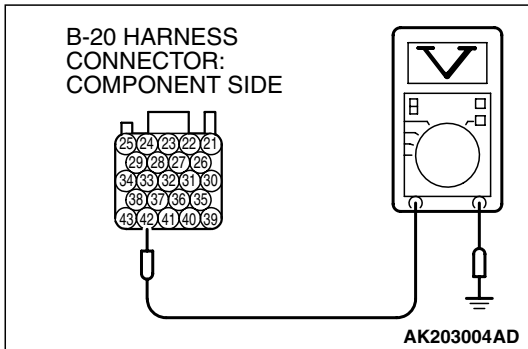
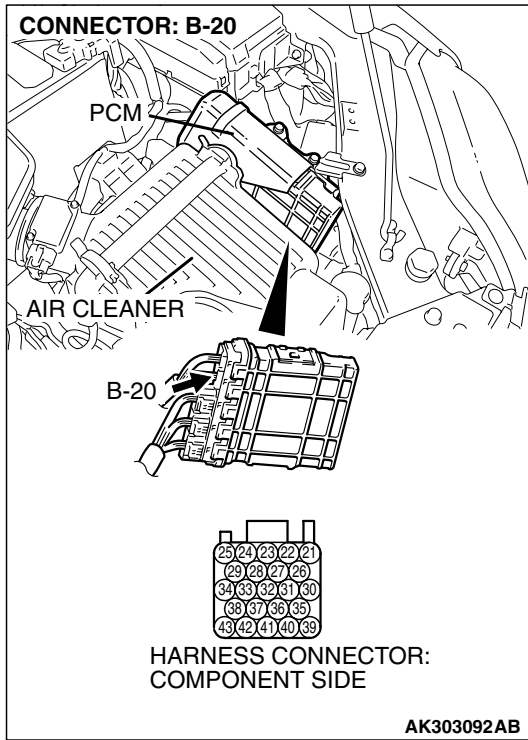
- (1) Disconnect the connector B-20 and measure at the harness side.
- (2) Turn the ignition switch to the "ON" position.

- (3) Measure the voltage between terminal No. 43 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 connector C-214 and C-215 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 ignition switch connector C-308 (terminal No. 2) and PCM connector B-20 (terminal No. 43) because of open circuit. Then confirm that the malfunction symptom is eliminated.



**STEP 6. Measure the backup power supply voltage at PCM harness side connector B-20.**

(1) Disconnect the connector B-20 and measure at the harness side.

(2) Measure the voltage between terminal No. 42 and ground.

- Voltage should be battery positive voltage.

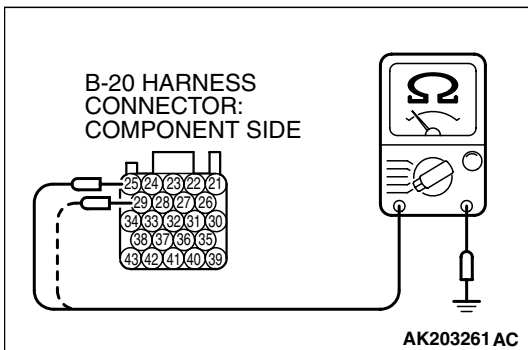
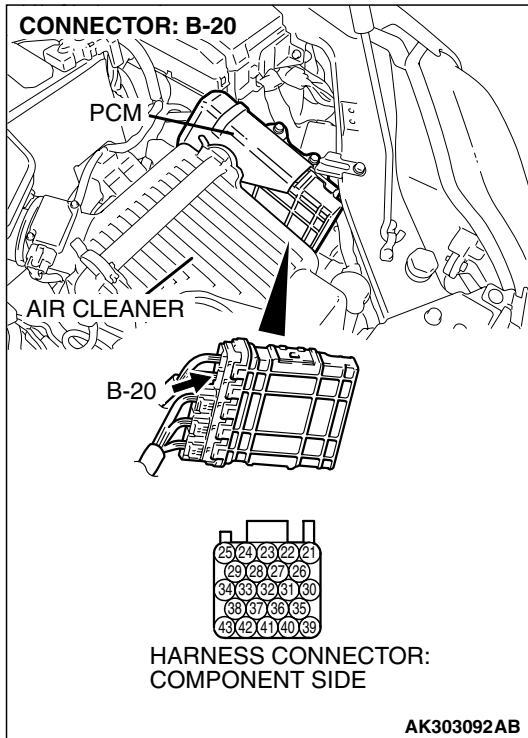
**Q: Is battery positive voltage (approximately 12 volts) present?**

**YES :** Go to Step 7.

**NO :** Repair harness wire between fusible link (9) and PCM connector B-20 (terminal No. 42) because of short circuit. Then confirm that the malfunction symptom is eliminated.

**STEP 7. Check for continuity at PCM harness side connector B-20.**

(1) Disconnect the connector B-20 and measure at the harness side.



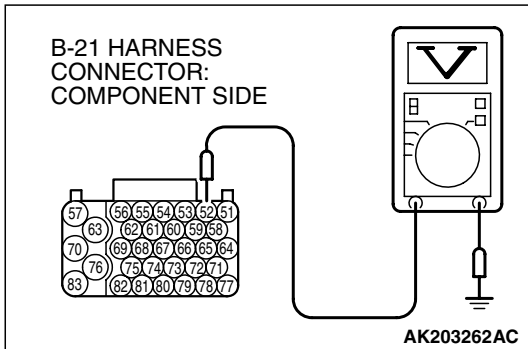
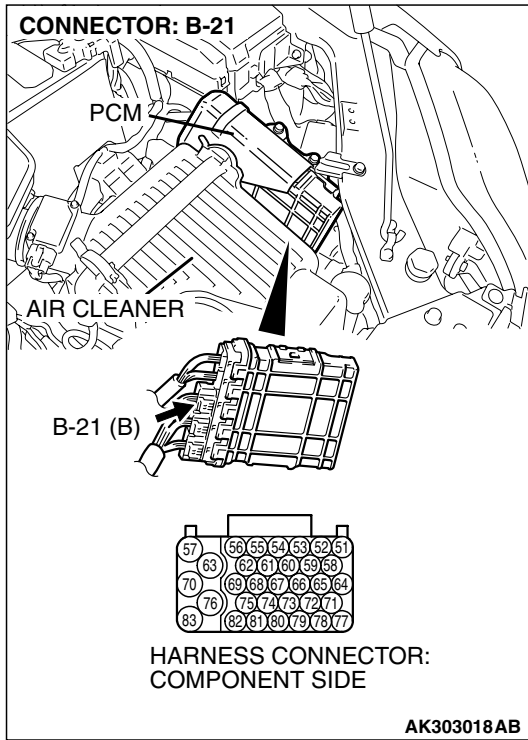
(2) Check for the continuity between terminals (No. 25, No. 29) and ground.

- Should be less than 2 ohms.

**Q: Does continuity exist?**

**YES :** Go to Step 8.

**NO :** Check harness connector A-14 at grounding connector for damage, and repair or replace as required. Refer to, GROUP 00E, Harness Connector Inspection. If grounding connector is good condition, repair harness wire between PCM connector B-20 (terminal No. 25, No. 29) and ground because of open circuit. Then confirm that the malfunction symptom is eliminated.



**STEP 8. Measure the power supply voltage at PCM harness side connector B-21.**

(1) Disconnect the connector B-21 and measure at the harness side.

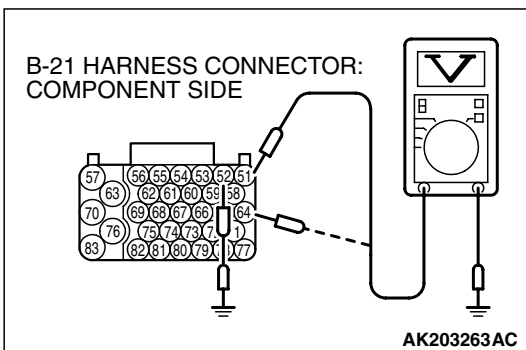
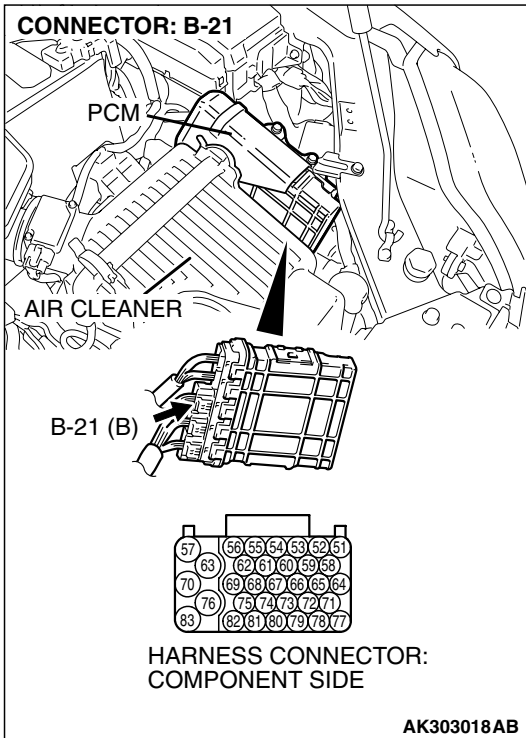
(2) Measure the voltage between terminal No. 52 and ground.

- Voltage should be battery positive voltage.

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

**YES :** Go to Step 9.

**NO :** Repair harness wire between MFI relay connector B-17X (terminal No. 3) and PCM connector B-21 (terminal No. 52) because of open circuit. Then confirm that the malfunction symptom is eliminated.



**STEP 9. Measure the power supply voltage at PCM harness side connector B-21.**

- (1) Disconnect the connector B-21 and measure at the harness side.
- (2) Using a jumper wire, connect terminal No. 52 to ground.

- (3) Measure the voltage between terminals (No. 51, No. 64) and ground.

- Voltage should be battery positive voltage.

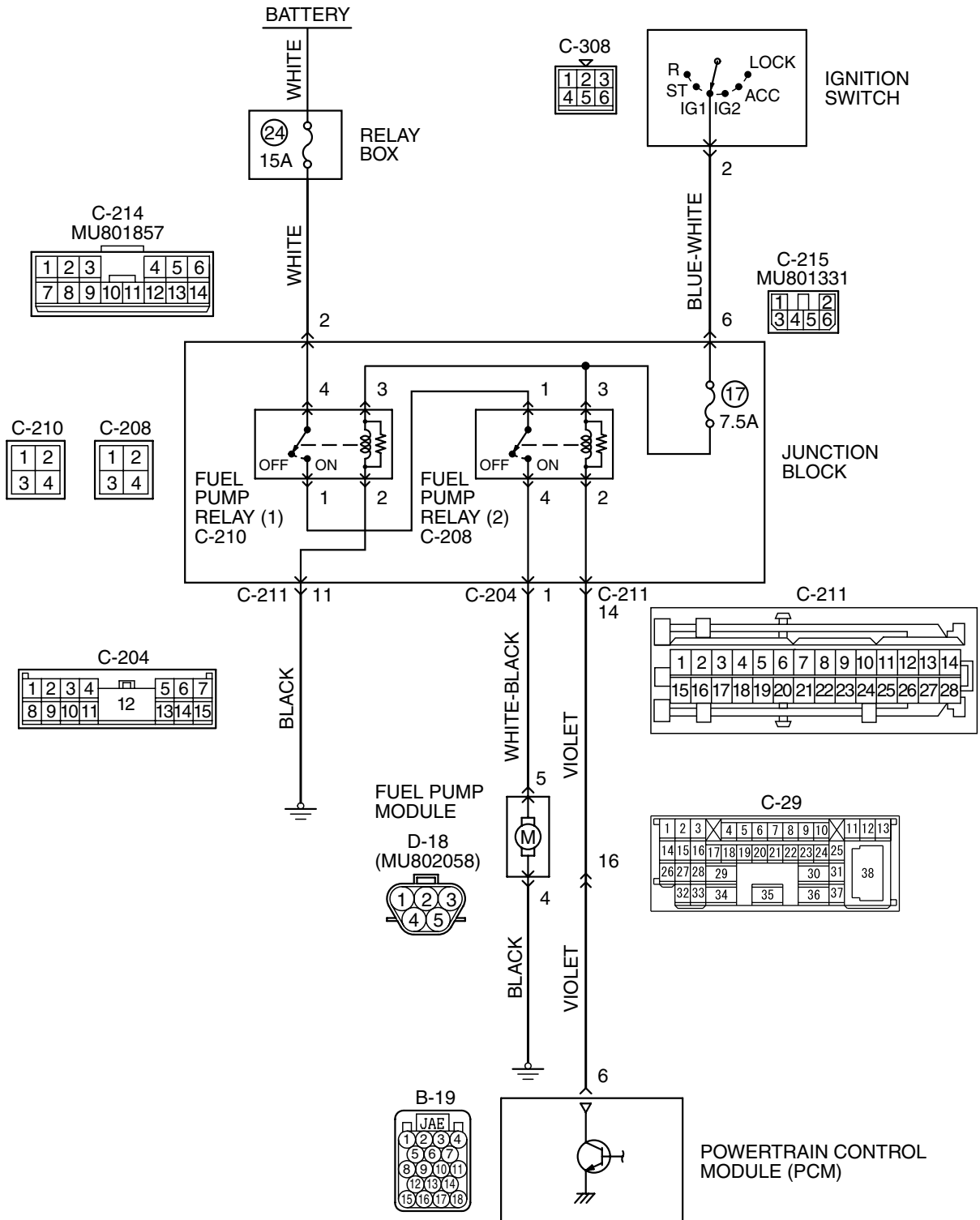
**Q: Is battery positive voltage (approximately 12 volts) present?**

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

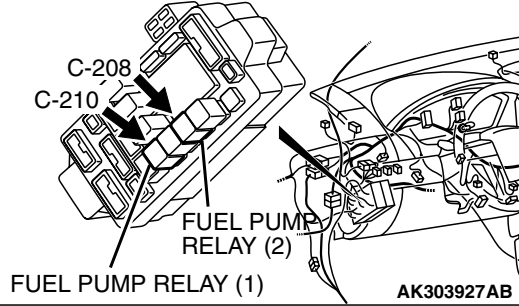
**NO :** Repair harness wire between MFI relay connector B-17X (terminal No. 4) and PCM connector B-21 (terminals No. 51, No. 64) because of open circuit. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 29: Fuel pump system

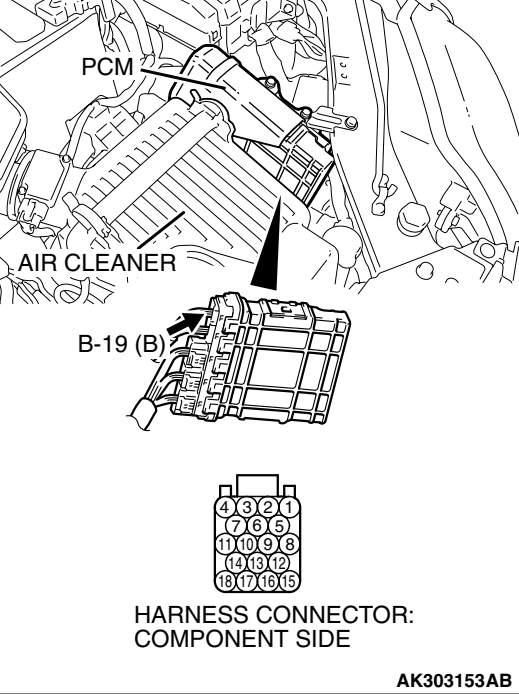
Fuel Pump Circuit



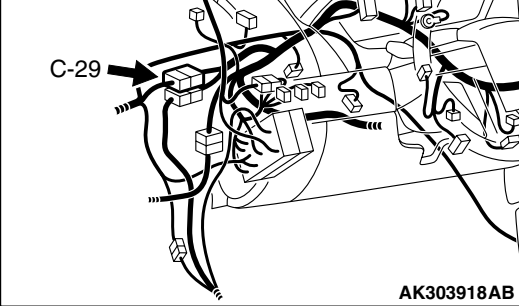
CONNECTORS: C-208, C-210



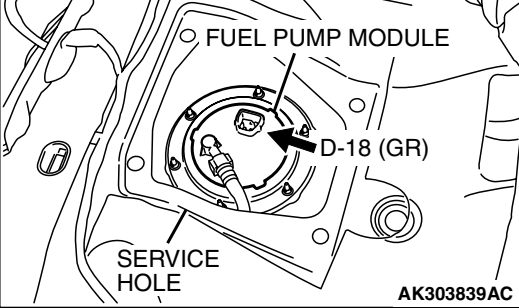
CONNECTOR: B-19



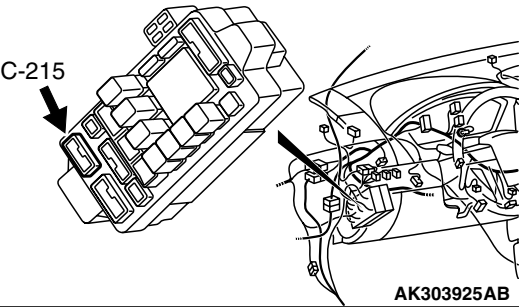
CONNECTOR: C-29



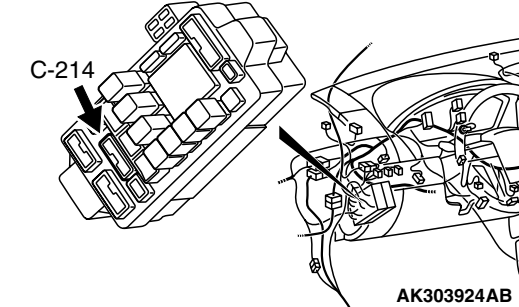
CONNECTOR: D-18



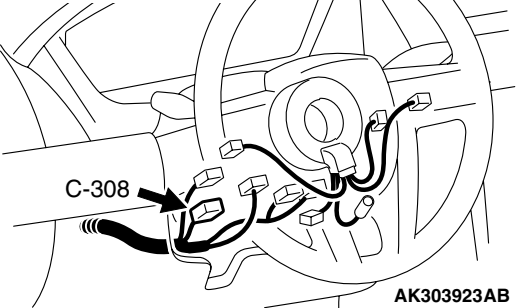
CONNECTOR: C-215



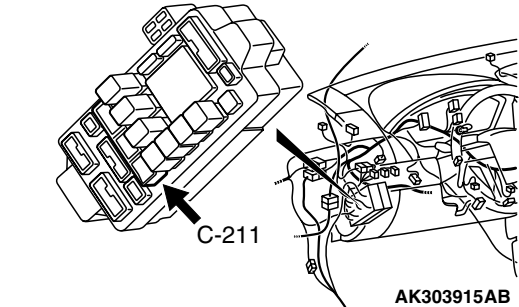
CONNECTOR: C-214

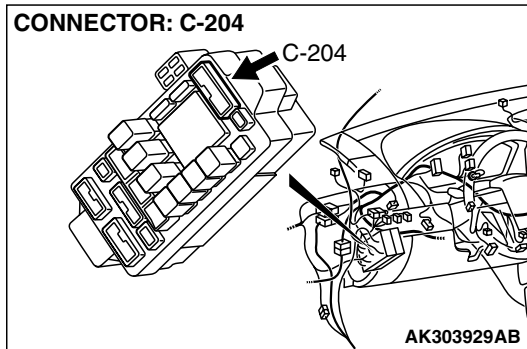


CONNECTOR: C-308



CONNECTOR: C-211





## 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 PCM turns the power transistor in the PCM ON to ground the fuel pump relay 2 coil. With this, the fuel pump relay turns ON, and the battery positive voltage is supplied to the fuel pump from the fuel pump relay 2 (terminal No. 4).

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

- Malfunction of the fuel pump relay.
- Malfunction of the fuel pump.
- Improper connector contact, open or short-circu-  
lated harness wire.
- Malfunction of the PCM.

## DIAGNOSIS

### Required Special Tools:

- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A



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

**⚠ CAUTION**

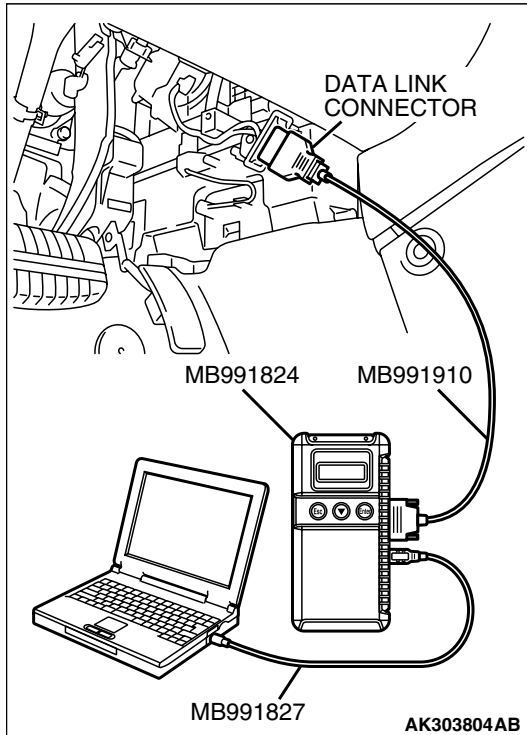
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

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

**Q: Is the fuel pump operating properly?**

**YES :** That this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions [P.00-14](#).

**NO :** Go to Step 2.

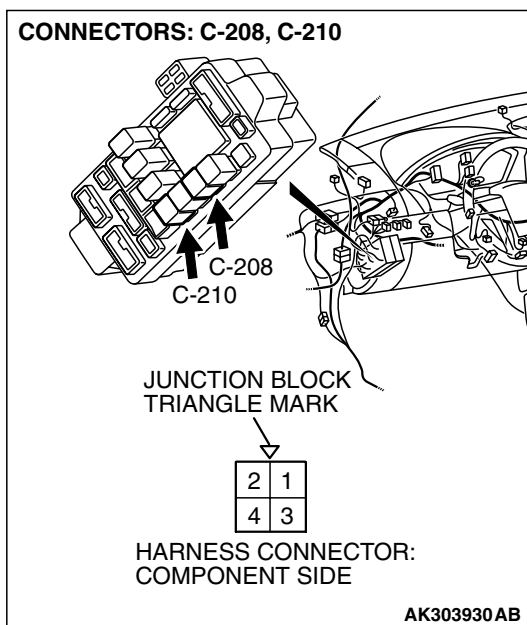


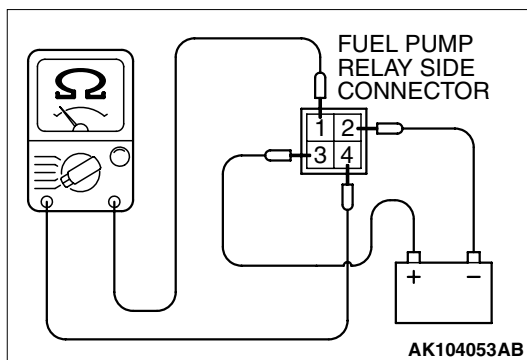
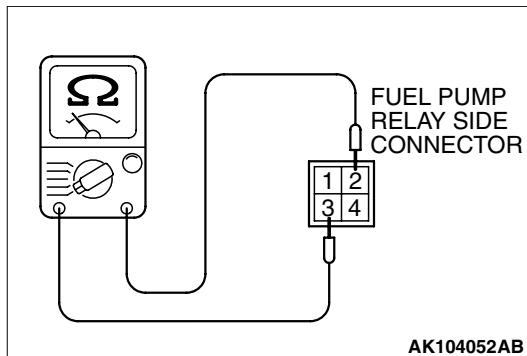
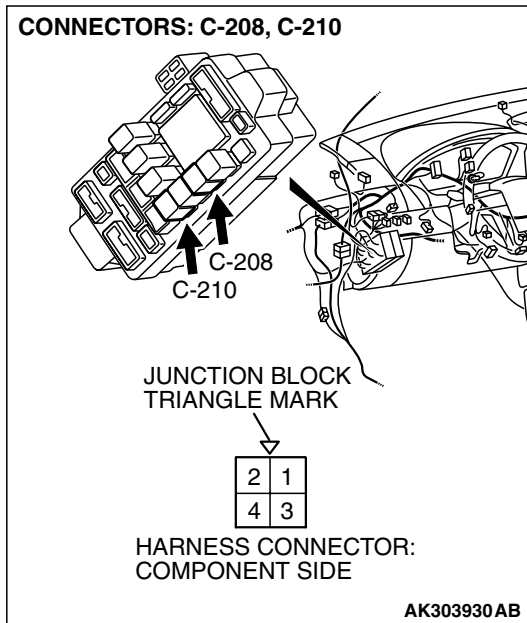
**STEP 2.** Check harness connector C-210 at fuel pump relay 1 and harness connector C-208 at fuel pump relay 2 for damage.

**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 fuel pump relay 1 and 2.****⚠ CAUTION**

Because it is not possible to distinguish the top and the bottom of the fuel pump relay, inspect it with the triangle mark printed on the relay facing upward.

(1) Remove the fuel pump relay 1 and 2.

(2) Check for continuity between the each fuel pump relay terminals No. 2 and No. 3.

- There should be continuity. (approximately 70 ohms)

(3) Use jumper wires to connect each 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 each 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 1 and 2.

**Q: Is the measured resistance normal?**

**YES** : Go to Step 4.

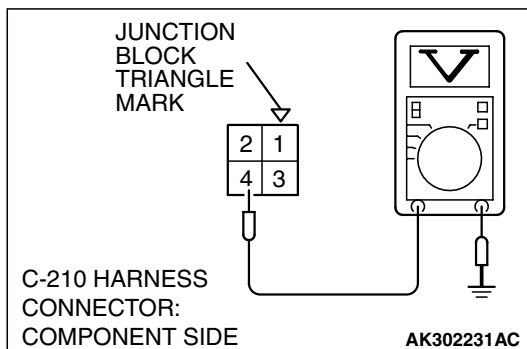
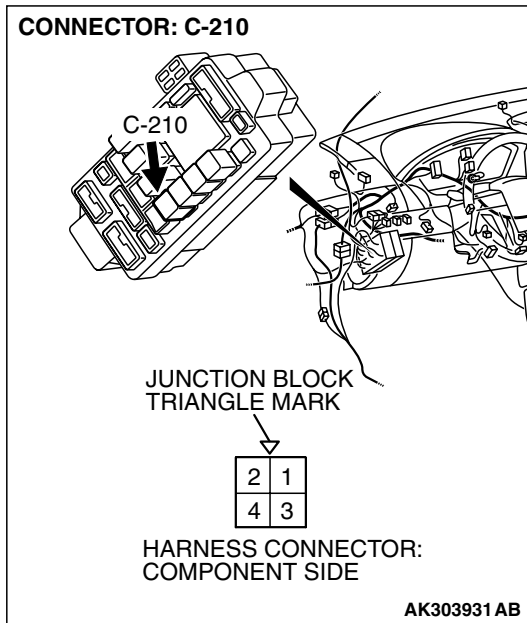
**NO** : Replace the fuel pump relay 1 and/or 2. Then confirm that the malfunction symptom is eliminated.

**STEP 4. Measure the power supply voltage at fuel pump relay 1 harness side connector C-210.**

**⚠ CAUTION**

Because it is difficult to distinguish the top and bottom of the fuel pump relay connector at the wiring harness, inspect it by using the triangle mark on the junction block as a reference.

(1) Disconnect the connector C-210 and measure at the harness side.



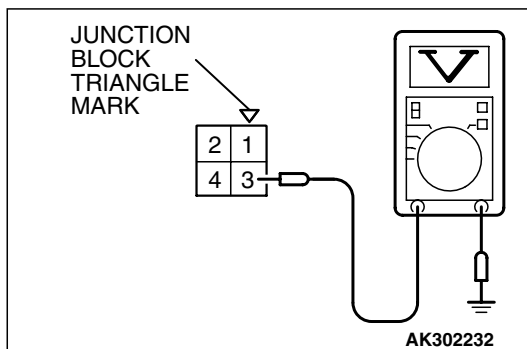
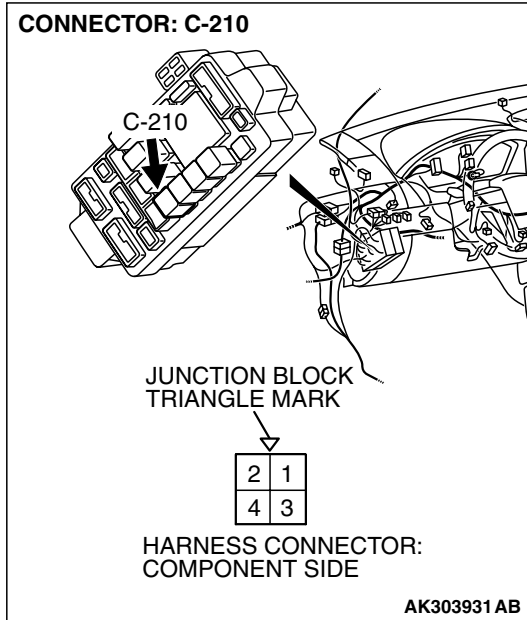
(2) Measure the voltage between terminal No. 4 and ground.

- Voltage should measure battery positive voltage.

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

**YES :** Go to Step 5.

**NO :** Check harness connector 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 connector is in good condition, repair harness wire between relay box and fuel pump relay 1 connector C-210 (terminal No. 4) because of open circuit. Then confirm that the malfunction symptom is eliminated.



**STEP 5. Measure the power supply voltage at fuel pump relay 1 harness side connector C-210.**

**⚠ CAUTION**

Because it is difficult to distinguish the top and bottom of the fuel pump relay connector at the wiring harness, inspect it by using the triangle mark on the junction block as a reference.

- (1) Disconnect the connector C-210 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 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.

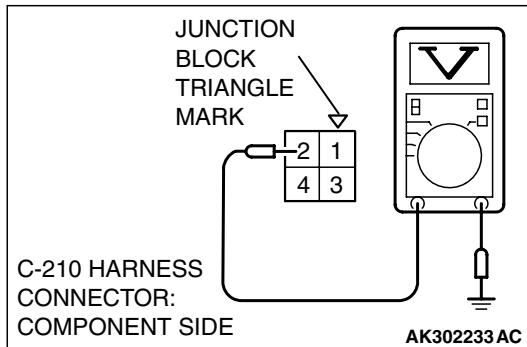
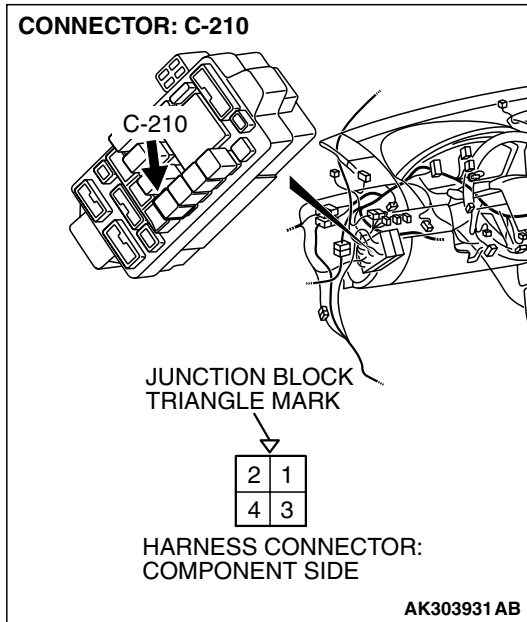
**NO :** Check harness connector C-215 at intermediate connector for damage, and repair or replace as required. Refer to, GROUP 00E, Harness Connector Inspection [P.00E-2](#). If intermediate connector is in good condition, repair harness wire between ignition switch connector C-308 (terminal No. 2) and fuel pump relay 1 connector C-210 (terminal No. 3) because of open circuit. Then confirm that the malfunction symptom is eliminated.

**STEP 6. Check for continuity at fuel pump relay 1 harness side connector C-210.**

**⚠ CAUTION**

Because it is difficult to distinguish the top and bottom of the fuel pump relay connector at the wiring harness, inspect it by using the triangle mark on the junction block as a reference.

(1) Disconnect the connector C-210 and measure at the harness side.



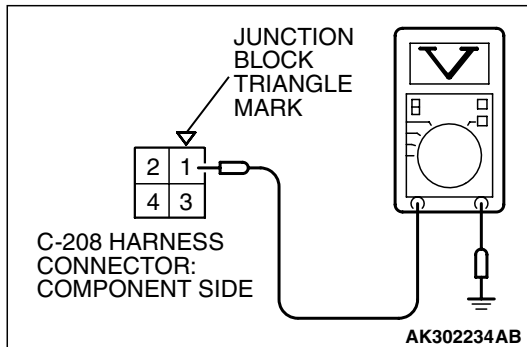
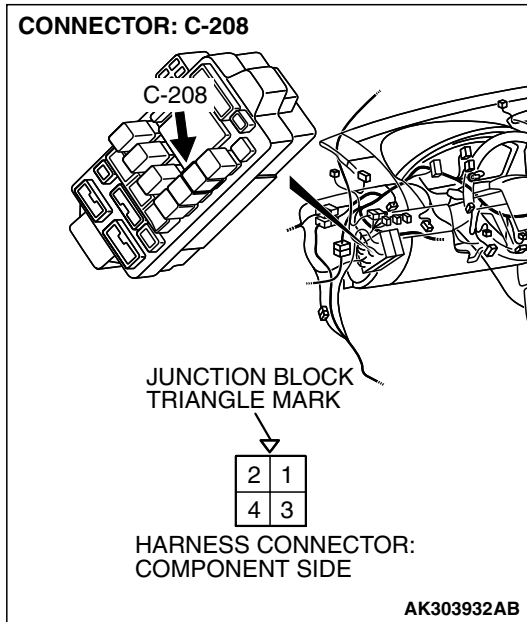
(2) Check for the continuity between terminal No. 2 and ground.

- Should be less than 2 ohms.

**Q: Does continuity exist?**

**YES :** Go to Step 7.

**NO :** Check 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 fuel pump relay 1 connector C-210 (terminal No. 2) and ground because of open circuit. Then confirm that the malfunction symptom is eliminated.



**STEP 7. Measure the power supply voltage at fuel pump relay 2 harness side connector C-208.**

**⚠ CAUTION**

Because it is difficult to distinguish the top and bottom of the fuel pump relay connector at the wiring harness, inspect it by using the triangle mark on the junction block as a reference.

- (1) Disconnect the connector C-208 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 be battery positive voltage.

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

**YES :** Go to Step 8.

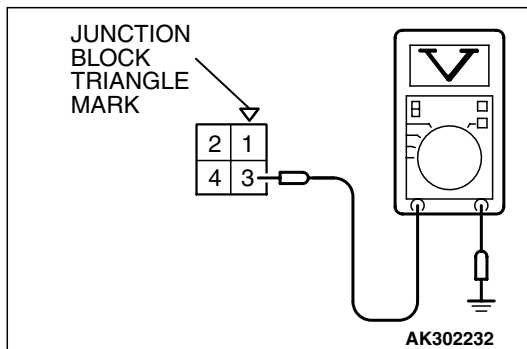
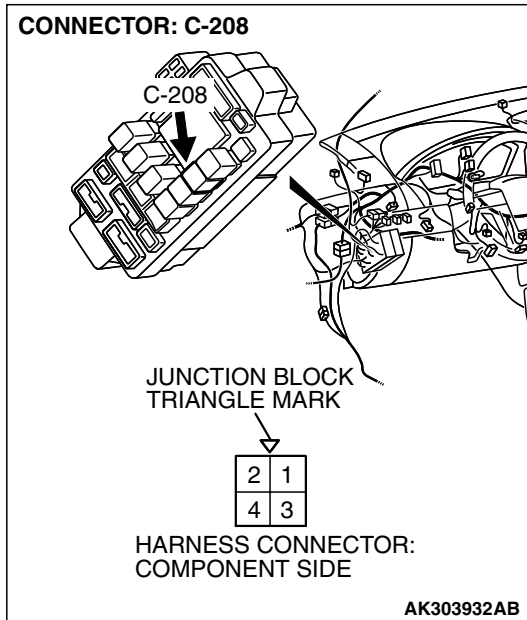
**NO :** Repair harness wire between fuel pump relay 1 connector C-210 (terminal No. 1) and fuel pump relay 2 connector C-208 (terminal No. 1) because of open circuit. Then confirm that the malfunction symptom is eliminated.

**STEP 8. Measure the power supply voltage at fuel pump relay 2 harness side connector C-208.**

**⚠ CAUTION**

Because it is difficult to distinguish the top and bottom of the fuel pump relay connector at the wiring harness, inspect it by using the triangle mark on the junction block as a reference.

- (1) Disconnect the connector C-208 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 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 9.

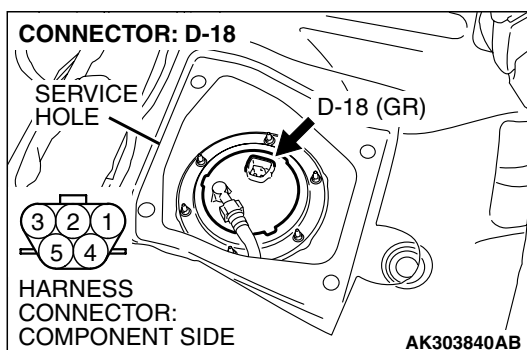
**NO :** Check harness connector C-215 at intermediate connector for damage, and repair or replace as required. Refer to, GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connector is in good condition, repair harness wire between ignition switch connector C-308 (terminal No. 2) and fuel pump relay 2 connector C-208 (terminal No. 3) because of open circuit. Then confirm that the malfunction symptom is eliminated.

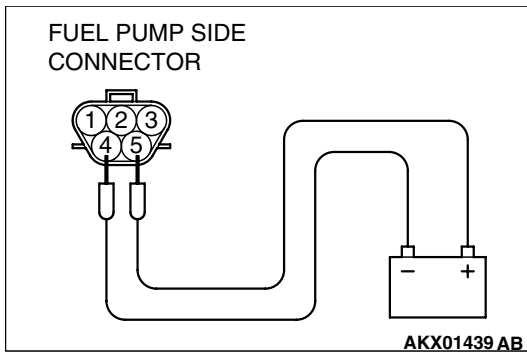
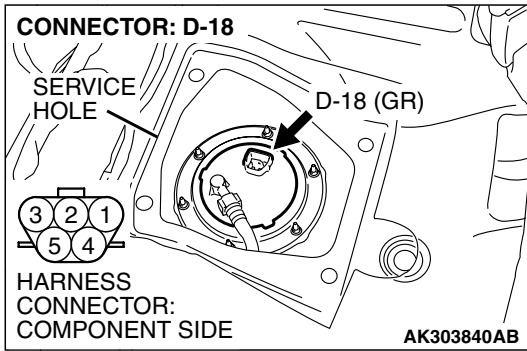
**STEP 9. Check connector D-18 at fuel pump for damage.**

**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 the fuel pump operation.**

(1) Disconnect fuel pump connector D-18.

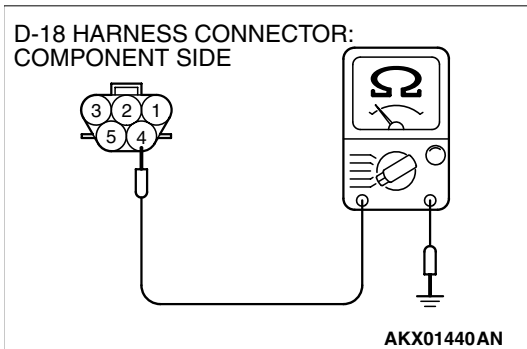
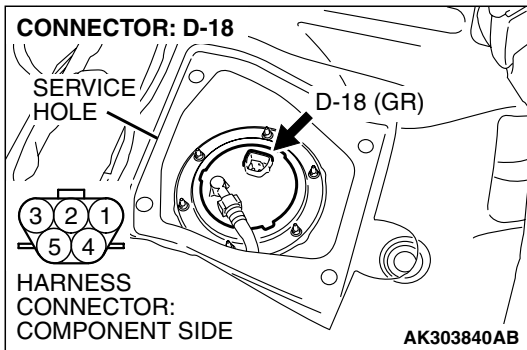
(2) Use jumper wires to connect fuel pump connector terminal No. 5 to the positive battery terminal and terminal No. 4 to the negative battery terminal.

- An operating sound of the fuel pump should be heard.

**Q: Is the fuel pump operating properly?**

**YES :** Go to Step 11.

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



**STEP 11. Check for continuity at fuel pump harness side connector D-18.**

(1) Disconnect the connector D-18 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 12.

**NO :** Repair harness wire between fuel pump connector D-18 (terminal No. 4) and ground because of open circuit. or harness damage. Then confirm that the malfunction symptom is eliminated.



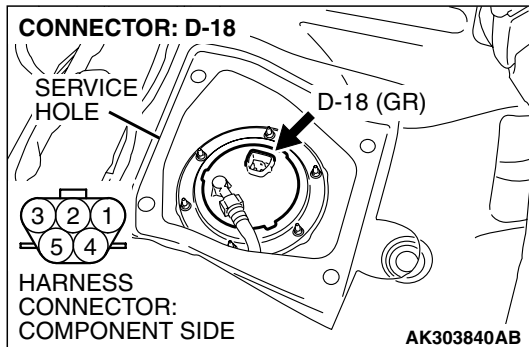
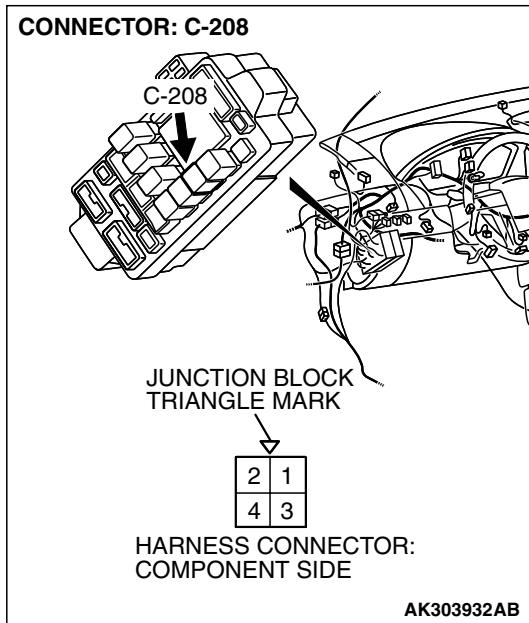
**STEP 12.** Check for open circuit and short circuit to ground and harness damage between fuel pump relay 2 connector C-208 (terminal No. 4) and fuel pump connector D-18 (terminal No. 5).

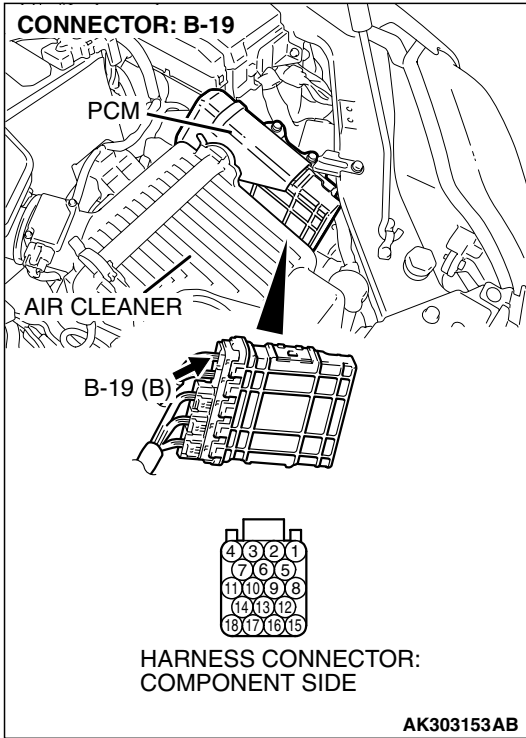
*NOTE:* Check harness after checking intermediate connector C-204. If intermediate connector is damaged, repair or replace it. After to GROUP 00E, Harness Connector Inspection P.00E-2. Then check that the malfunction is eliminated.

**Q: Is the harness wire in good condition?**

**YES :** Go to Step 13.

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



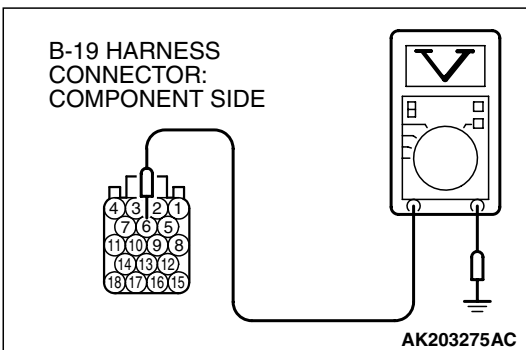
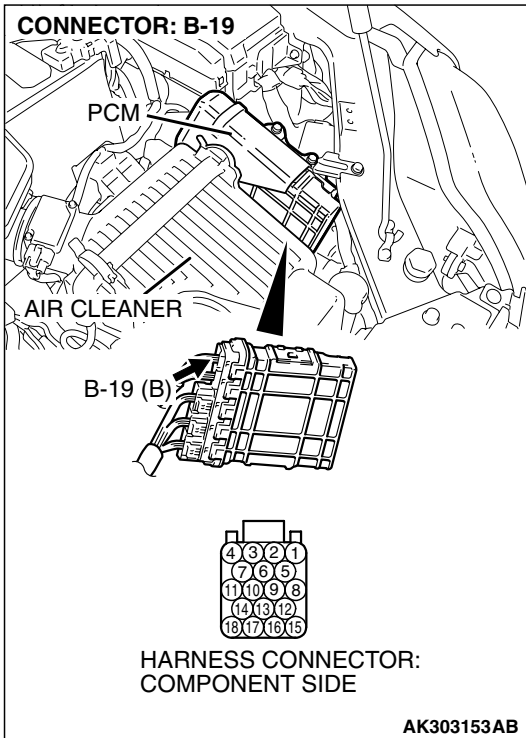


**STEP 13. Check connector B-19 at PCM for damage.**

**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. Measure the power supply voltage at PCM connector B-19.**

- (1) Disconnect the connector B-19 and measure at the harness side.
- (2) Turn the ignition switch to the "ON" position.

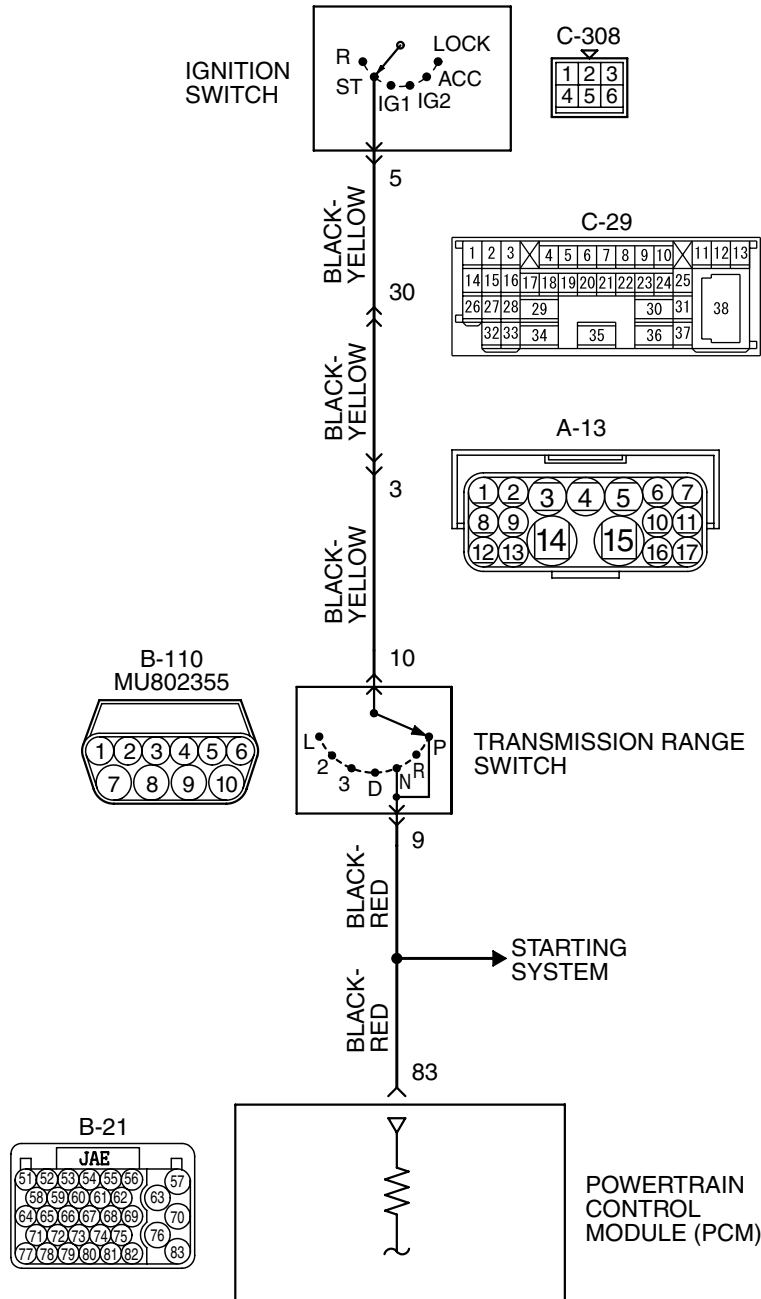
- (3) Measure the voltage between terminal No. 6 and ground.
  - Voltage should be battery positive voltage.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

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

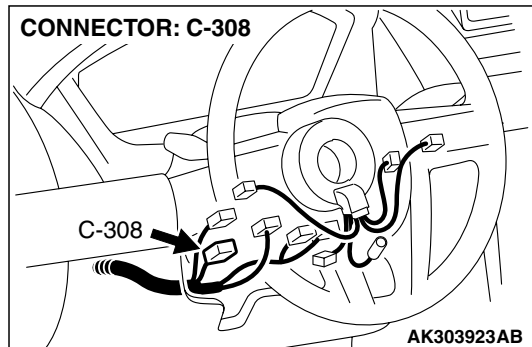
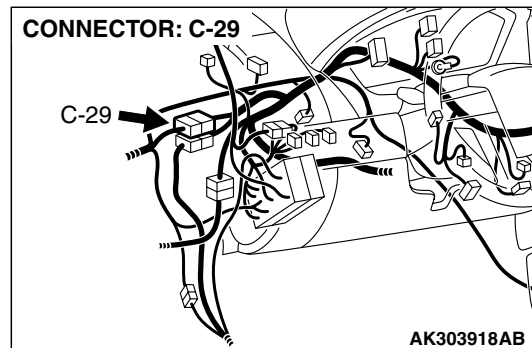
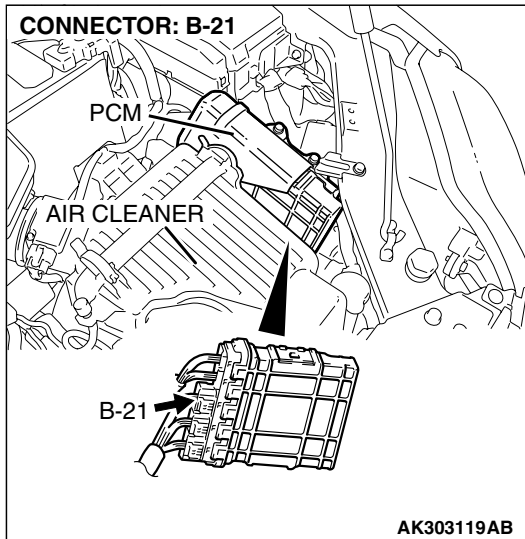
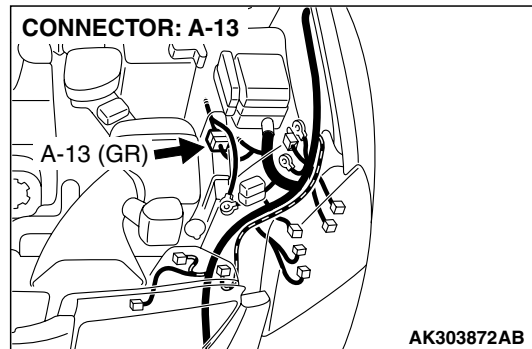
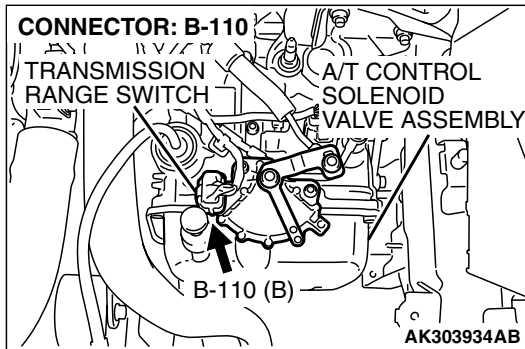
- YES :** Replace the PCM. Then confirm that the malfunction symptom is eliminated.
- NO :** Check harness connectors C-29 and C-211 at intermediate connector for damage, and repair or replace as required. Refer to, GROUP 00E, Harness Connector Inspection [P.00E-2](#). If intermediate connectors are in good condition, repair harness wire between fuel pump relay 2 connector C-208 (terminal No. 2) and PCM connector B-19 (terminal No. 6) because of open circuit. Then confirm that the malfunction symptom is eliminated.

INSPECTION PROCEDURE 30: Ignition Switch-ST System and Transmission Range Switch System

Ignition Switch-ST and Transmission Range Switch Circuit



AK400833



**COMMENT**

- If the selector lever is moved to "P" or "N" range and the ignition switch is turned to "START" position, battery positive voltage is supplied to PCM (terminal No. 83) through the ignition switch and transmission range switch. Because of this, the PCM detects that the engine is cranking.
- The transmission range switch detects the transmission range (P, N or other ranges) and converts it to a voltage signal (high or low). Then the transmission range switch sends that signal to the PCM.

If the selector lever is moved to "P" or "N" range with the ignition switch turned on (except "START" position), continuity will exist between the PCM and ground through the transmission range switch and starter motor. The terminal voltage of the PCM will become low. If the selector lever is moved to the other ranges, continuity will be lost between the PCM and ground. The terminal voltage of the PCM will become high.

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

- Malfunction of the ignition switch.
- Malfunction of the transmission range switch.
- Improper connector contact, open circuit or short-circuit in the harness wire.
- Malfunction of the PCM.

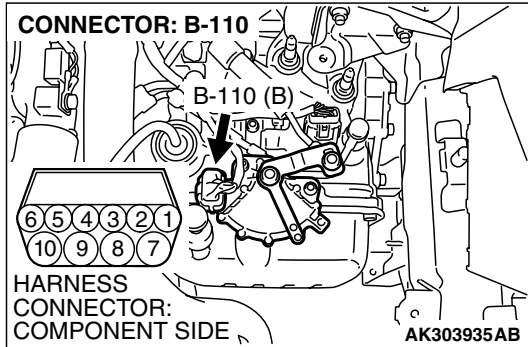
## DIAGNOSIS

**STEP 1. Check connector B-110 at transmission range switch 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 transmission range switch.**

Refer to GROUP 23A, On-vehicle Service – Essential Service – Transmission Range Switch Continuity Check [P.23A-372](#).

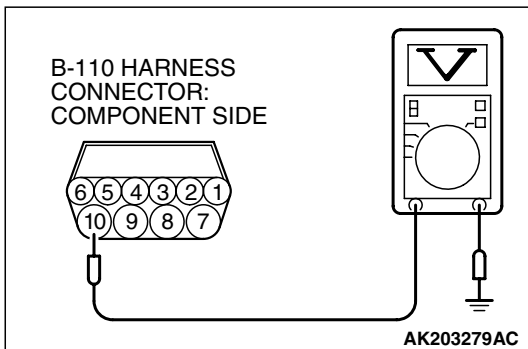
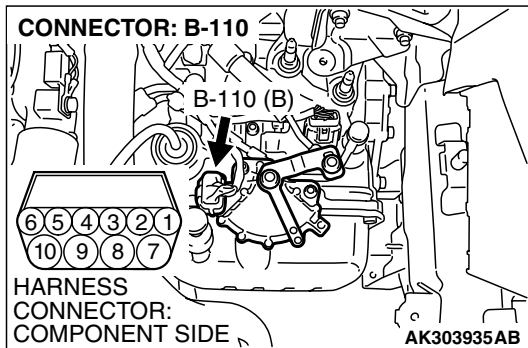
**Q: Are there any abnormalities?**

**YES :** Repair or replace it. Then confirm that the malfunction symptom is eliminated.

**NO :** Go to Step 3.

**STEP 3. Measure the power supply voltage at transmission range switch connector B-110.**

- (1) Disconnect the connector B-110 and measure at the harness side.
- (2) Turn the ignition switch to the "START" position.



- (3) Measure the voltage between terminal No. 10 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 4.

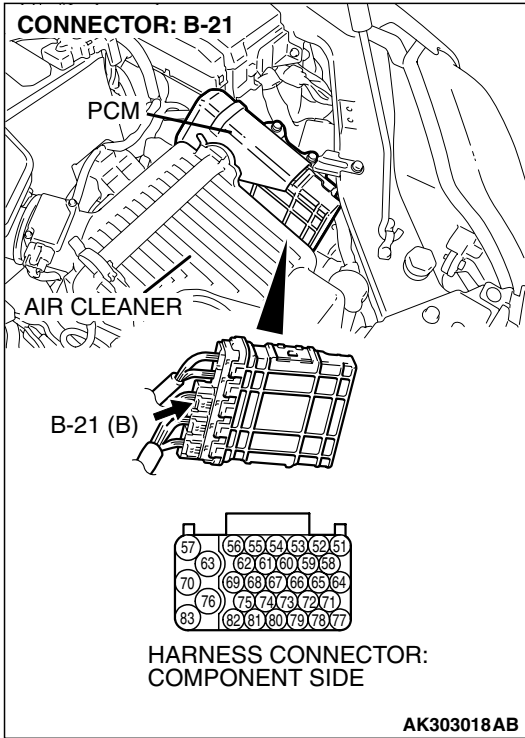
**NO :** Check connector A-13 and C-29 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection [P.00E-2](#). If intermediate connector are in good condition, repair harness wire between ignition switch connector C-308 (terminal No. 5) and transmission range switch connector B-110 (terminal No. 10) because of open circuit. Then confirm that the malfunction symptom is eliminated.

**STEP 4. Check connector B-21 at PCM 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.

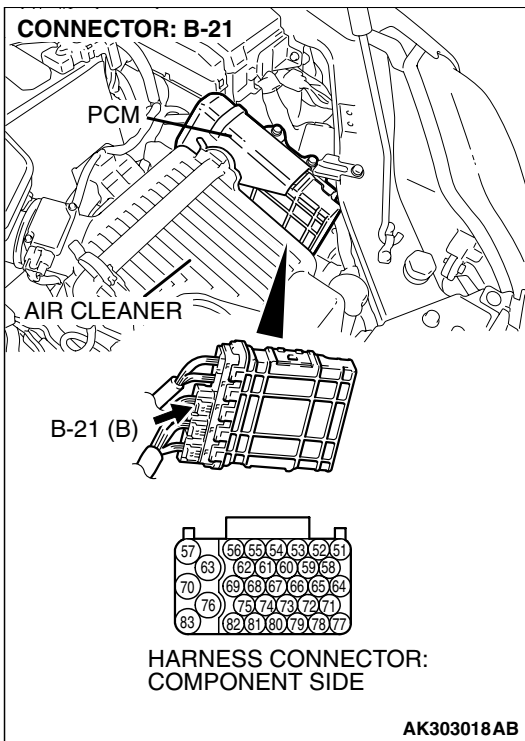
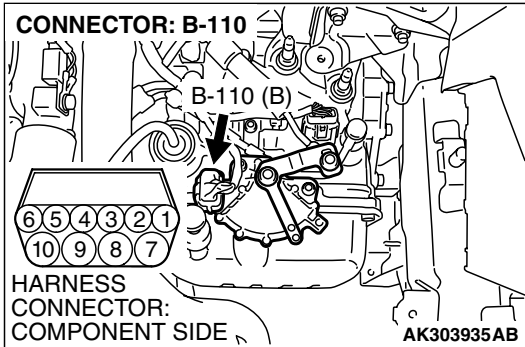


**STEP 5. Check for open circuit and short circuit to ground and harness damage between transmission range switch connector B-110 (terminal No. 9) and PCM connector B-21 (terminal No. 83).**

**Q: Is the harness wire in good condition?**

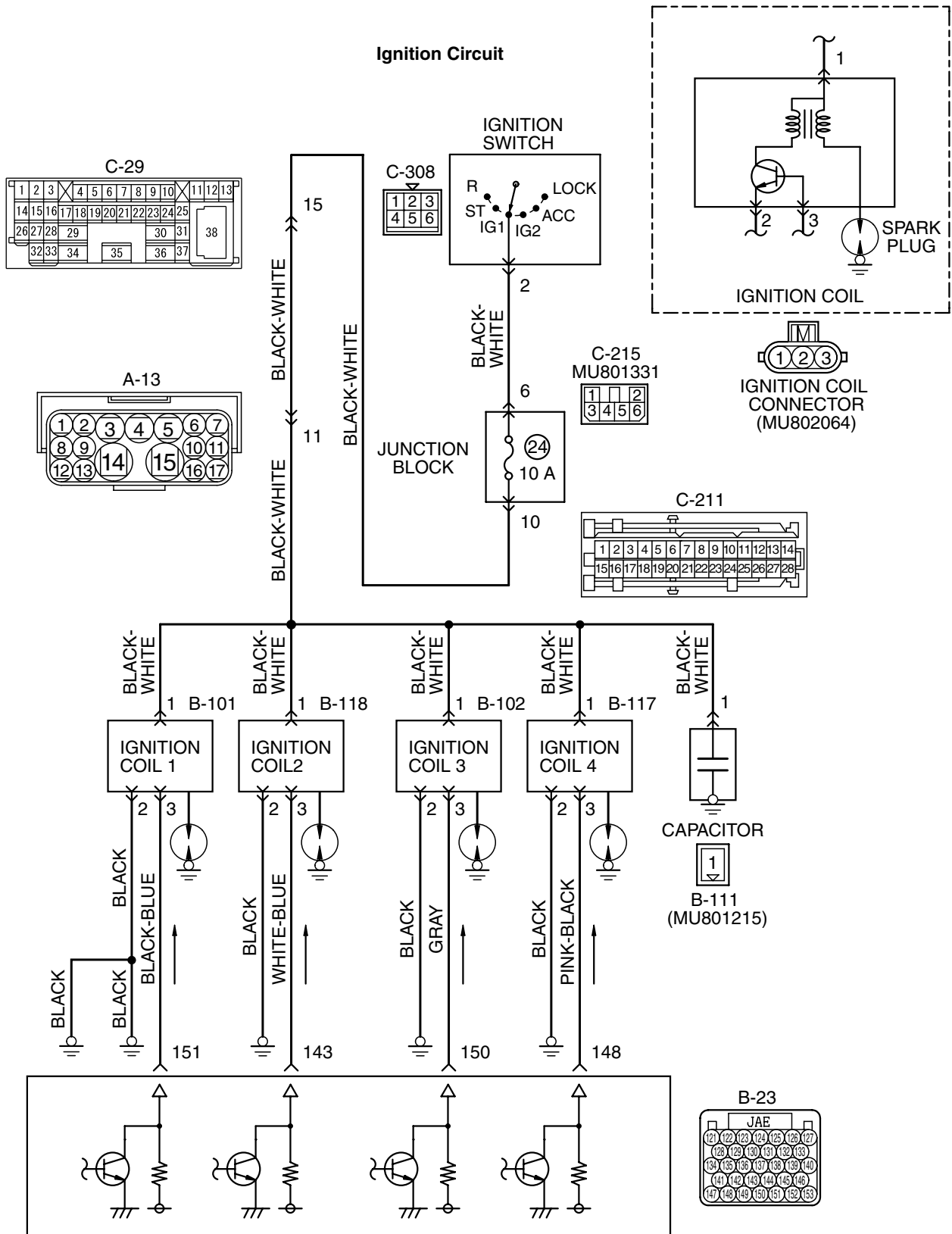
**YES :** Replace the PCM. Then confirm that the malfunction symptom is eliminated.

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

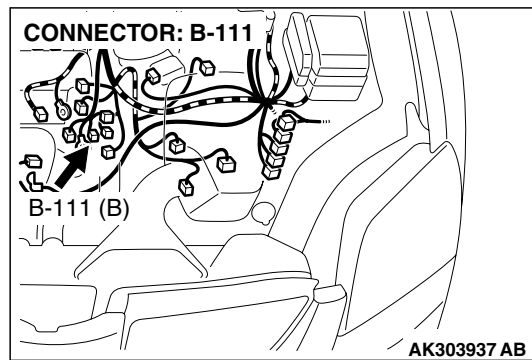
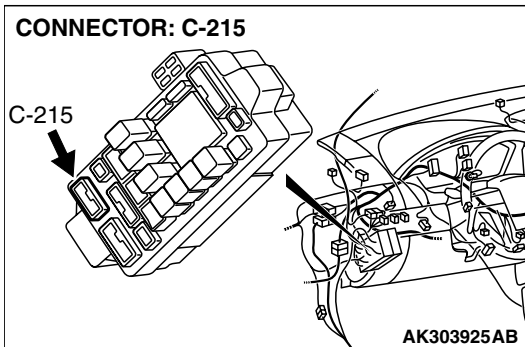
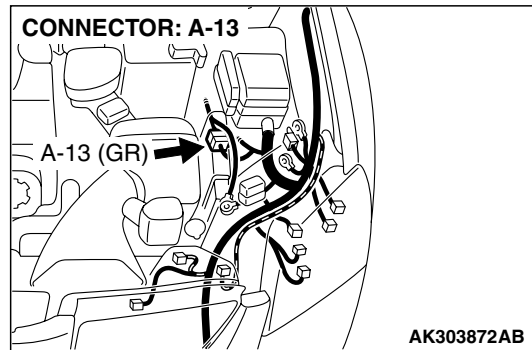
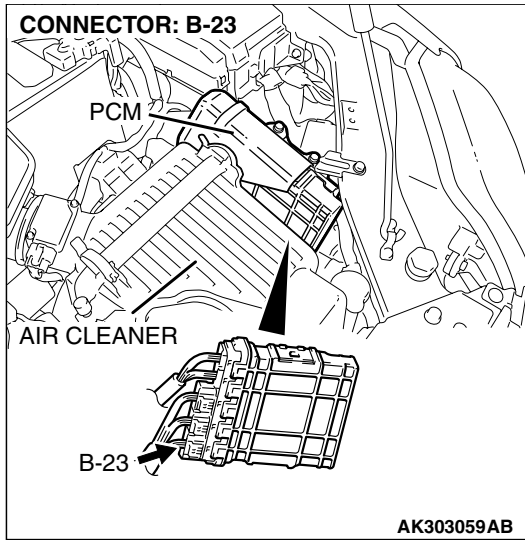
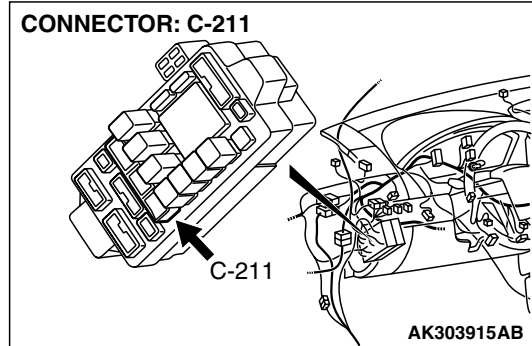
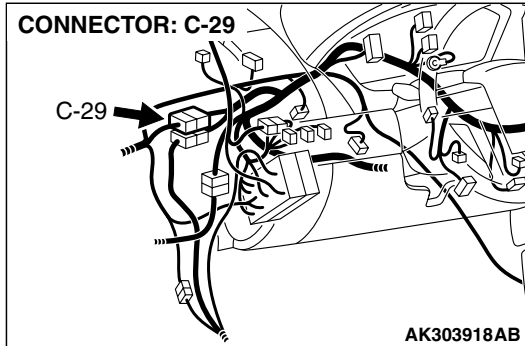
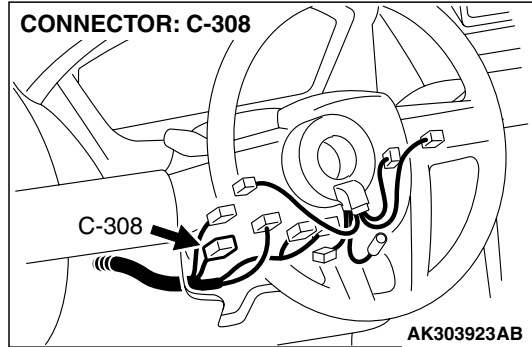
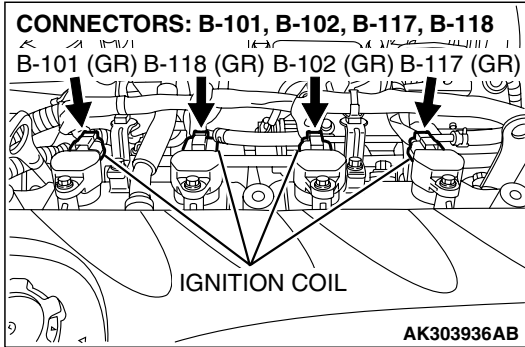




INSPECTION PROCEDURE 31: Ignition Circuit System



POWERTRAIN CONTROL MODULE (PCM)



## CIRCUIT OPERATION

- The ignition coil is energized by battery positive voltage from the ignition switch.
- When the PCM 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 shorted harness wire.
- Malfunction of the PCM.

## DIAGNOSIS

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### STEP 1. Check the ignition coil.

Refer to GROUP 16, Ignition System – On-vehicle service – Ignition Coil Check [P. 16-38](#).

#### Q: Are there any abnormalities?

**YES** : Replace the ignition coil. Then confirm that the malfunction symptom is eliminated.

**NO** : Go to Step 2.

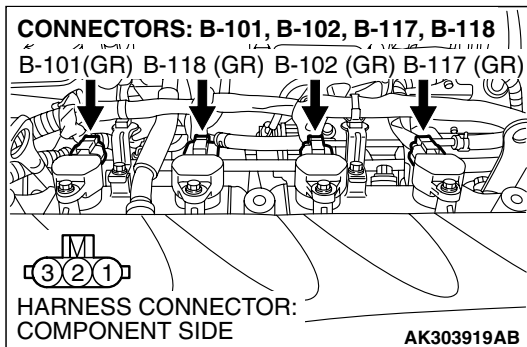
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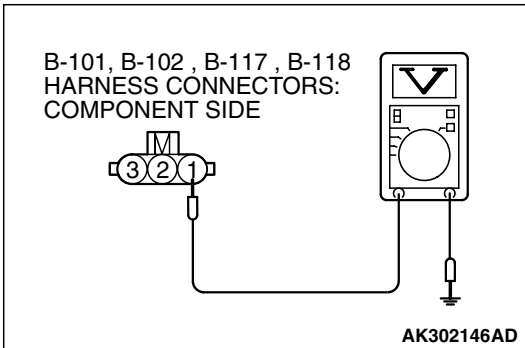
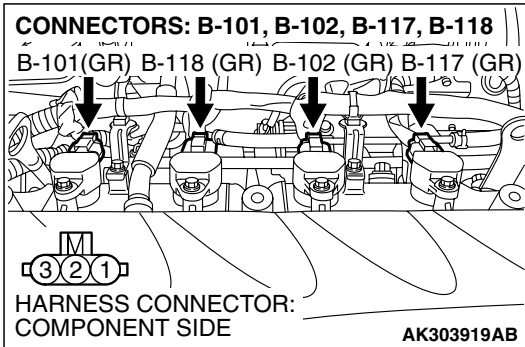
### STEP 2. Check harness connector B-101, B-102, B-117 and B-118 at ignition coil for damage.

#### 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-101, B-102, B-117 and B-118.**

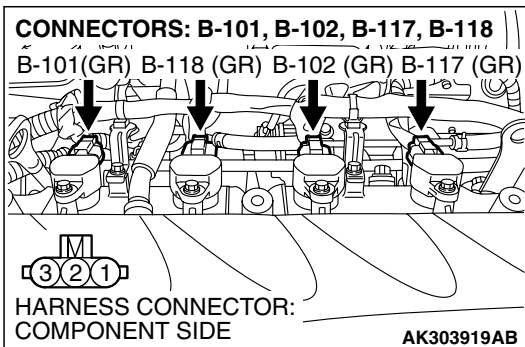
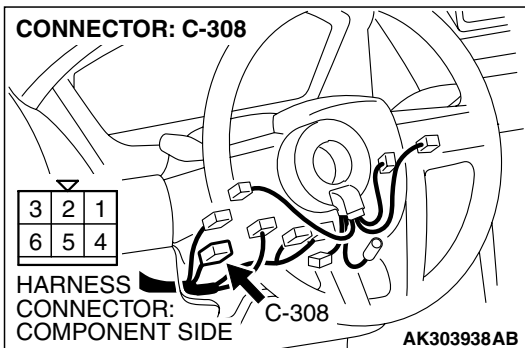
- (1) Disconnect the connector B-101, B-102, B-117 and B-118 and measure at the harness side.
- (2) Turn the ignition switch to the "ON" position.

- (3) Measure the voltage between terminal No. 1 and ground.
  - Voltage should 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 5.  
**NO :** Go to Step 4.

**STEP 4. Check for open circuit between ignition switch connector C-308 (terminal No. 2) and ignition coil connectors B-101, B-102, B-117 and B-118 (terminal No. 1).**



*NOTE: Check harness after checking intermediate connectors A-13, C-29, C-211, C-215 and C-308. 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.*

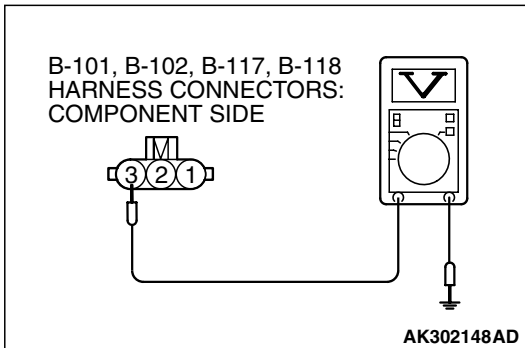
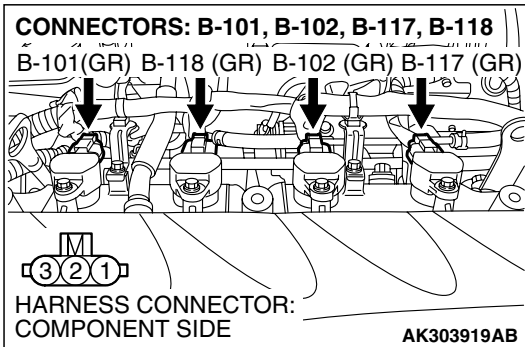
**Q: Is the harness wire in good condition?**

**YES :** Repair harness wire between ignition switch connector C-308 (terminal No. 2) and capacitor connector B-111 (terminal No. 1) because of short circuit to ground. Then confirm that the malfunction symptom is eliminated.

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

**STEP 5. Check the circuit at ignition coil harness side connector B-101, B-102, B-117 and B-118.**

- (1) Disconnect the connectors B-101, B-102, B-117 and B-118 and measure at the harness side.
- (2) Crank the engine.

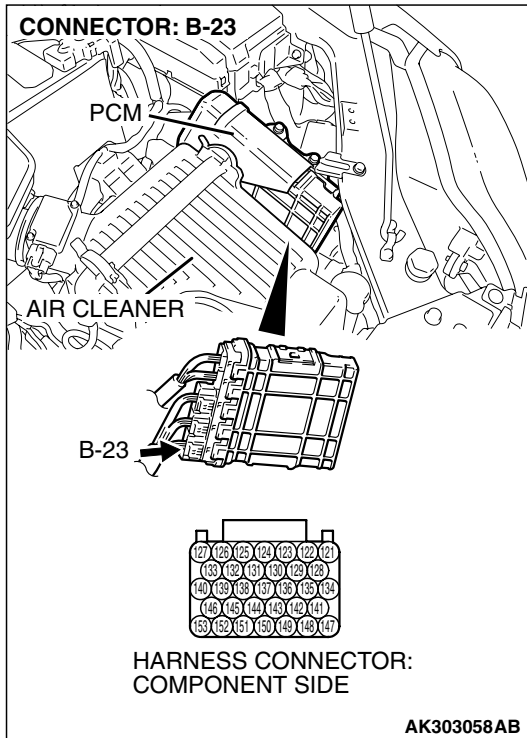


- (3) Measure the voltage between terminal No. 3 and ground.
  - Voltage should be 0.3 and 3.0 volts.
- (4) Turn the ignition switch to the "LOCK" (OFF) position.

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

**YES :** Go to Step 8.

**NO :** Go to Step 6.

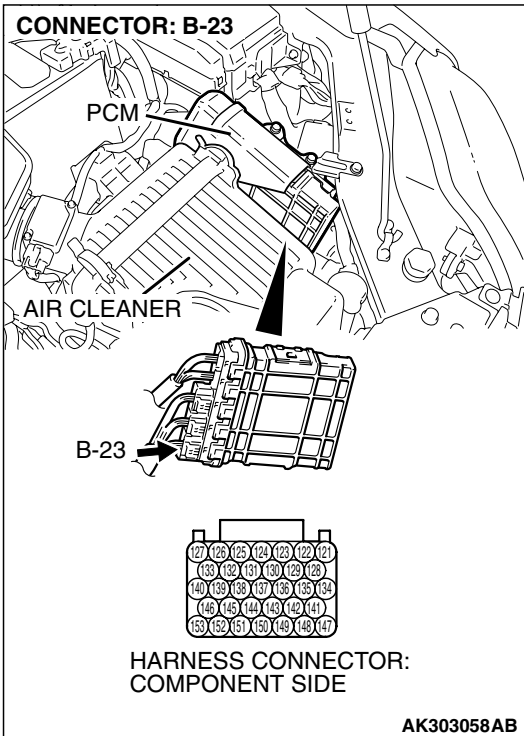
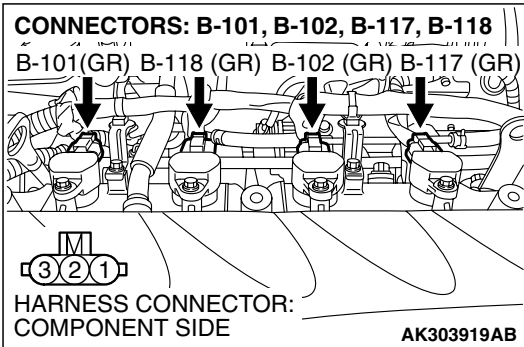


**STEP 6. Check harness connector B-23 at PCM for damage.**

**Q: Is the harness 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.



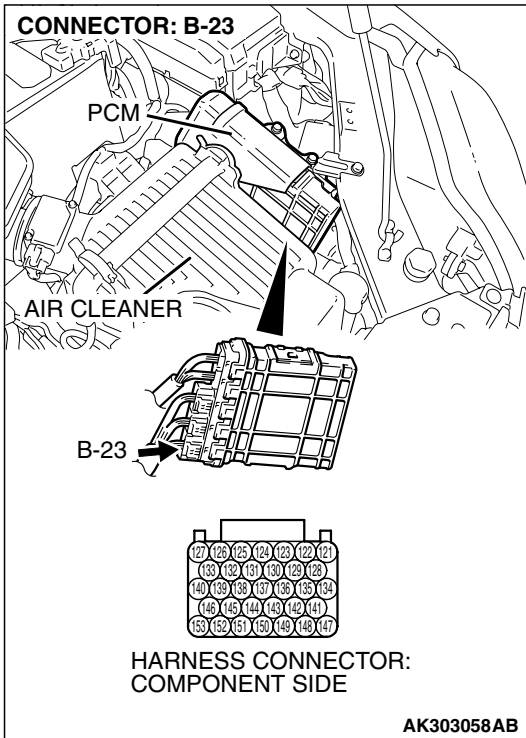
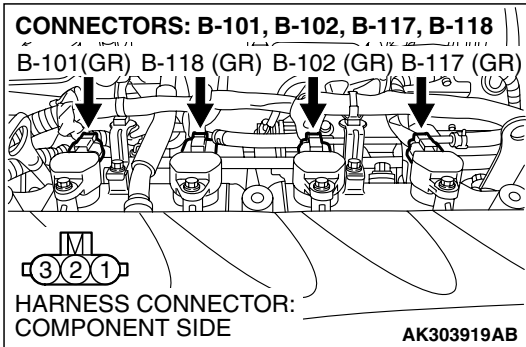
**STEP 7. Check for open circuit and short circuit to ground between ignition coil connector and PCM connector.**

- a. Check the harness wire between ignition coil connector B-101 (terminal No. 3) and PCM connector B-23 (terminal No. 151) at ignition coil 1.
- b. Check the harness wire between ignition coil connector B-118 (terminal No. 3) and PCM connector B-23 (terminal No. 143) at ignition coil 2.
- c. Check the harness wire between ignition coil connector B-102 (terminal No. 3) and PCM connector B-23 (terminal No. 150) at ignition coil 3.
- d. Check the harness wire between ignition coil connector B-117 (terminal No. 3) and PCM connector B-23 (terminal No. 148) at ignition coil 4.

**Q: Is the harness wire in good condition?**

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

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



**STEP 8. Check for harness damage between ignition coil connector and PCM connector.**

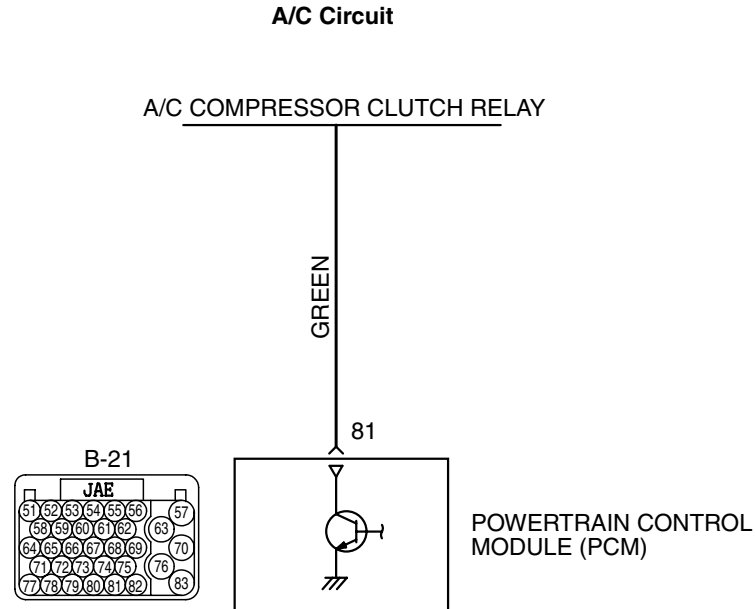
- a. Check the harness wire between ignition coil connector B-101 (terminal No. 3) and PCM connector B-23 (terminal No. 151) at ignition coil 1.
- b. Check the harness wire between ignition coil connector B-118 (terminal No. 3) and PCM connector B-23 (terminal No. 143) at ignition coil 2.
- c. Check the harness wire between ignition coil connector B-102 (terminal No. 3) and PCM connector B-23 (terminal No. 150) at ignition coil 3.
- d. Check the harness wire between ignition coil connector B-117 (terminal No. 3) and PCM connector B-23 (terminal No. 148) at ignition coil 4.

**Q: Is the harness wire in good condition?**

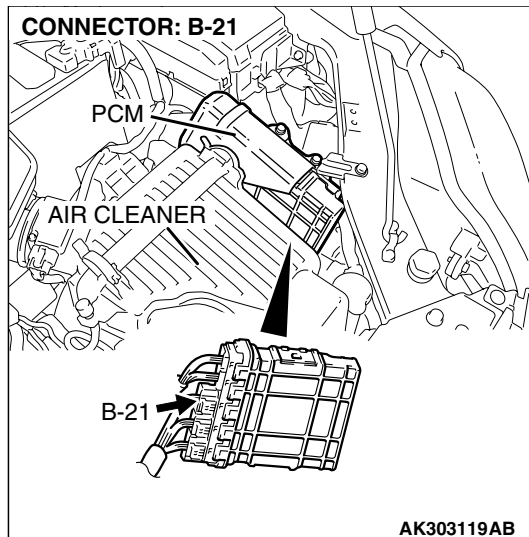
- YES :** Replace the PCM. Then confirm that the malfunction symptom is eliminated.
- NO :** Repair it. Then confirm that the malfunction symptom is eliminated.



INSPECTION PROCEDURE 32: A/C system.



AK303939



**COMMENT**

- When the A/C is "ON" the PCM turns "ON" the power transistor in the PCM. The PCM 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.
- Improper connector contact, open circuit or shorted harness wire.
- Malfunction of the PCM.

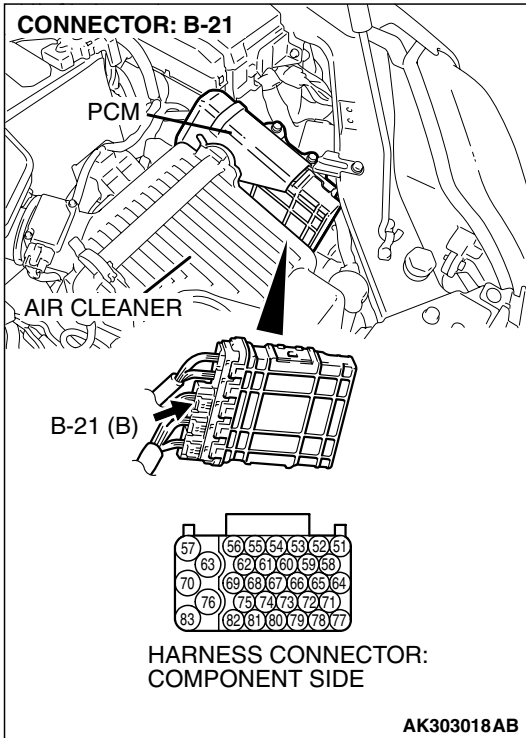
DIAGNOSIS

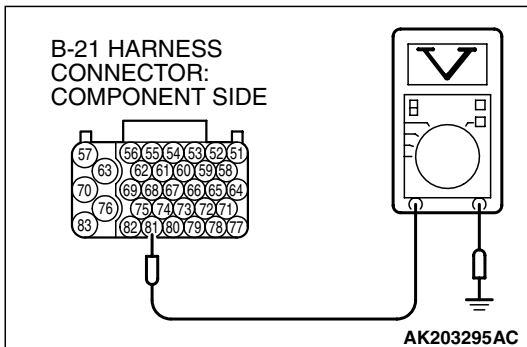
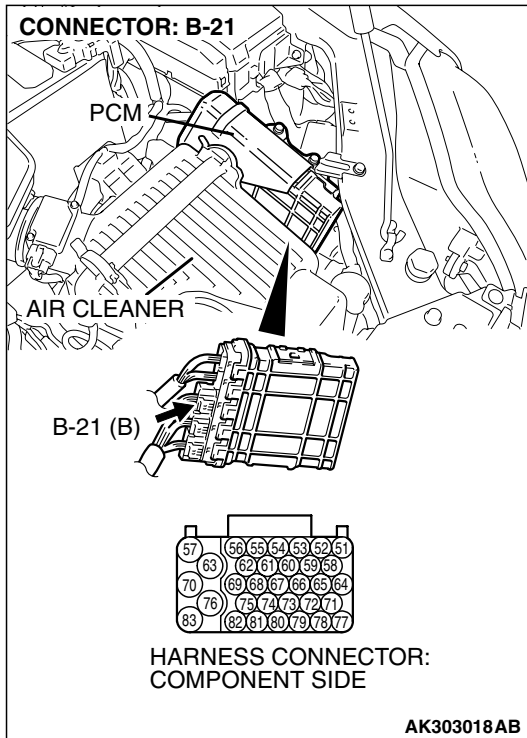
STEP 1. Check harness connector B-21 at PCM for damage.

Q: Is the harness 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 PCM connector B-21.**

- (1) Disconnect the connectors B-21 and measure at the harness side.
- (2) Turn the ignition switch to the "ON" position.

- (3) Measure the voltage between terminal No. 81 and ground.
  - Voltage should be battery positive voltage.
- (4) Using a jumper wire, connect terminal No. 81 to ground.
  - A/C compressor clutch 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 :** Replace the PCM. Then confirm that the malfunction symptom is eliminated.
- NO :** Refer to GROUP 55, Diagnosis – Introduction To Heater, Air Conditioning And Ventilation Diagnosis [P.55A-5](#). Then confirm that the malfunction symptom is eliminated.

**DATA LIST REFERENCE TABLE**

M1131152001534

**CAUTION**

- When shifting the selector 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: In a new vehicle [driven approximately 500 km (311 mile) or less], the mass airflow sensor output value is sometimes 10% higher than the standard value.*

*NOTE: \*2: 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: \*3: 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: \*4 Applicable to GST*

*NOTE: \*5: Vehicles for Canada, the headlight, taillight, etc. remain lit even when the lighting switch is in "OFF" position but this is no problem for checks.*

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	<ul style="list-style-type: none"> <li>Engine: warming up, idling</li> <li>A/C switch: "OFF"</li> </ul>	OFF	Procedure No. 32	P.13A-1081	
			<ul style="list-style-type: none"> <li>Engine: warming up, idling</li> <li>A/C switch: "ON"</li> </ul>	A/C compressor clutch is not operating			OFF
				A/C compressor clutch is operating			ON
APP SNS (MAIN)	78	Accelerator pedal position sensor (main)	Ignition switch: "ON"	Release the accelerator pedal	735 – 1,335 mV	Code No. P2122, P2123	P.13A-893, P.13A-903
				Depress the accelerator pedal gradually	Increases in response to the pedal depression stroke		
				Depress the accelerator pedal fully	4,000 mV or more		
APP SNSR (SUB)	77	Accelerator pedal position sensor (sub)	Ignition switch: "ON"	Release the accelerator pedal	435 – 1,035 mV	Code No. P2127, P2128	P.13A-910, P.13A-920
				Depress the accelerator pedal gradually	Increases in response to the pedal depression stroke		
				Depress the accelerator pedal fully	3,700 mV or more		
BARO SENSOR	25	Barometric pressure sensor	Ignition switch: "ON"	At altitude of 0 m (0 ft)	101 kPa (29.8 in. Hg)	Code No. P2228, P2229	P.13A-947, P.13A-949
				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. 28	P.13A-1043

**MULTIPOINT FUEL INJECTION (MFI) <2.4L ENGINE>  
MULTIPOINT FUEL INJECTION (MFI) DIAGNOSIS**

**13A-1085**

MUT-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT	NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE	
CKP SENSOR	22	Crankshaft position sensor	<ul style="list-style-type: none"> <li>• Engine: cranking</li> <li>• Tachometer: connected</li> </ul>	Engine speeds displayed on the scan tool and tachometer are identical.	Code No. P0335	P.13A-54 8	
			Engine: idling	Engine coolant temperature is -20°C (-40°F)			1,275 – 1,475 r/min
				Engine coolant temperature is 0°C (32°F)			1,220 – 1,420 r/min
				Engine coolant temperature is 20°C (68°F)			1,200 – 1,400 r/min
				Engine coolant temperature is 40°C (104°F)			1,150 – 1,350 r/min
				Engine coolant temperature is 80°C (176°F)			660 – 860 r/min
CRANK. SIGNAL	18	Cranking signal (ignition switch-ST)	Ignition switch: "ON"	Engine: stopped	OFF	Procedure No. 30	P.13A-10 68
				Engine: cranking	ON		
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-13 3, P.13A-14 2, P.13A-14 9
				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)		

MUT-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT	NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE		
ECT SENSOR	21*4	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-13 3, P.13A-14 2, P.13A-14 9	
				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)
EGR STEP. MTR.	68	EGR valve (stepper motor)	<ul style="list-style-type: none"> <li>• Engine coolant temperature : 80 – 95°C (176 – 203°F)</li> <li>• Lights and all accessories : "OFF"*5</li> <li>• Transaxle: "P" range</li> </ul>	Engine is idling	2 – 8 STEP	Code No. P0403	P.13A-58 5	
				2,500 r/min	2 – 8 STEP			
ENGINE LOAD	37	Engine load (volumetric efficiency)	<ul style="list-style-type: none"> <li>• Engine coolant temperature : 80 – 95°C (176 – 203°F)</li> <li>• Lights, electric cooling fan and all accessories : "OFF"*5</li> <li>• Transaxle: "P" range</li> </ul>	Engine is idling	10 – 30%	-	-	
				2,500 r/min	10 – 30%			
				Rewing engine	Volumetric efficiency increases according to amount of rewing.			
ENGINE LOAD	87*4	Calculated load value	Engine: warming up	Engine is idling	10 – 30%	-	-	
				2,500 r/min	10 – 30%			

**MULTIPOINT FUEL INJECTION (MFI) <2.4L ENGINE>  
MULTIPOINT FUEL INJECTION (MFI) DIAGNOSIS**

**13A-1087**

MUT-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT	NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE	
ENGINE SPEED	22*4	Crankshaft position sensor	<ul style="list-style-type: none"> <li>• Engine: cranking</li> <li>• Tachometer: connected</li> </ul>	Engine speeds displayed on the scan tool and tachometer are identical.	Code No. P0335	P.13A-54 8	
			Engine: idling	Engine coolant temperature is -20°C (-4°F)			1,275 – 1,475 r/min
				Engine coolant temperature is 0°C (32°F)			1,220 – 1,420 r/min
				Engine coolant temperature is 20°C (68°F)			1,200 – 1,400 r/min
				Engine coolant temperature is 40°C (104°F)			1,150 – 1,350 r/min
				Engine coolant temperature is 80°C (176°F)			660 – 860 r/min
FUEL TEMP	4A	Fuel tank temperature sensor	<ul style="list-style-type: none"> <li>• In cooled state</li> <li>• Ignition switch: "ON"</li> </ul>	Approximately the same as the outdoor temperature	Code No. P0181, P0182, P0183	P.13A-43 6, P.13A-44 8, P.13A-45 4	

MUT-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
HO2S BANK1 S1	39	Cylinder 1, 4 heated oxygen sensor (front)	Engine: Warming up (Air/fuel mixture is made leaner when decelerating, and is made richer when revving.)	When the engine is running at 4,000 r/min, decelerate suddenly.	200 mV or less	Code No. P0130, P0131, P0132, P0133, P0134	P.13A-19 2, P.13A-21 0, P.13A-21 7, P.13A-22 2, P.13A-22 8
				When engine is suddenly revved.	600 – 1,000 mV		
			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 PCM.)	Engine is idling 2500 r/min	Voltage changes repeatedly between 400 mV or less and 600 – 1,000 mV.		
HO2S BANK1 S1	A1*4	Cylinder 1, 4 heated oxygen sensor (front)	Engine: Warming up (Air/fuel mixture is made leaner when decelerating, and is made richer when revving.)	When the engine is running at 4,000 r/min, decelerate suddenly.	0.2 V or less	Code No. P0130, P0131, P0132, P0133, P0134	P.13A-19 2, P.13A-21 0, P.13A-21 7, P.13A-22 2, P.13A-22 8
				When engine is suddenly revved.	0.6 – 1 V		
			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 PCM.)	Engine is idling 2500 r/min	Voltage changes repeatedly between 0.4 V or less and 0.6 – 1 V.		



**MULTIPOINT FUEL INJECTION (MFI) <2.4L ENGINE>  
MULTIPOINT FUEL INJECTION (MFI) DIAGNOSIS**

**13A-1089**

MUT-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
HO2S BANK1 S2	69	Cylinder 1, 4 heated oxygen sensor (rear)	Engine: warming up	Rewing	0 and 600 – 1,000 mV alternate.	Code No. P0136, P0137, P0138, P0139	P.13A-25 0, P.13A-26 8, P.13A-27 5, P.13A-28 0
HO2S BANK1 S2	A2*4	Cylinder 1, 4 heated oxygen sensor (rear)	Engine: warming up	Rewing	0 and 0.6 – 1 V alternate.	Code No. P0136, P0137, P0138, P0139	P.13A-25 0, P.13A-26 8, P.13A-27 5, P.13A-28 0
HO2S BANK2 S1	11	Cylinder 2, 3 heated oxygen sensor (front)	Engine: Warming up (air/fuel mixture is made leaner when decelerating, and is made richer when rewing.)	When the engine is running at 4000 r/min, decelerate suddenly.	200 mV or less	Code No. P0150, P0151, P0152, P0153, P0154	P.13A-29 9, P.13A-31 7, P.13A-32 4, P.13A-32 9, P.13A-33 5
				When engine is suddenly revved.	600 – 1,000 mV		
			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 PCM)	Engine is idling 2,500 r/min	Voltage changes repeatedly between 400 mV or less and 600 – 1,000 mV.		

MUT-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
HO2S BANK2 S1	A3*4	Cylinder 2, 3 heated oxygen sensor (front)	Engine: Warming up (air/fuel mixture is made leaner when decelerating, and is made richer when revving.)	When the engine is running at 4,000 r/min, decelerate suddenly.	0.2 V or less	Code No. P0150, P0151, P0152, P0153, P0154	P.13A-29 9, P.13A-31 7, P.13A-32 4, P.13A-32 9, P.13A-33 5
				When engine is suddenly revved.	0.6 – 1 V		
			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 PCM)	Engine is idling 2500 r/min	Voltage changes repeatedly between 0.4 V or less and 0.6 – 1 V.		
HO2S BANK2 S2	59	Cylinder 2, 3 heated oxygen sensor (rear)	Engine: warming up	Revving	0 and 600 – 1,000 mV alternate.	Code No. P0156, P0157, P0158, P0159	P.13A-35 7, P.13A-37 5, P.13A-38 2, P.13A-38 7
HO2S BANK2 S2	A4*4	Cylinder 2, 3 heated oxygen sensor (rear)	Engine: warming up	Revving	0 and 0.6 – 1 V alternate.	Code No. P0156, P0157, P0158, P0159	P.13A-35 7, P.13A-37 5, P.13A-38 2, P.13A-38 7

**MULTIPOINT FUEL INJECTION (MFI) <2.4L ENGINE>  
MULTIPOINT FUEL INJECTION (MFI) DIAGNOSIS**

**13A-1091**

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)	Code No. P0111, P0112, P0113	P.13A-10 7, P.13A-11 6, P.13A-12 3
				Intake air temperature is 0°C (32°F)		
				Intake air temperature is 20°C (68°F)		
				Intake air temperature is 40°C (104°F)		
				Intake air temperature is 80°C (176°F)		
IAT SENSOR	13*4	Intake air temperature sensor	Ignition switch: "ON" or with engine running	Intake air temperature is -20°C (-4°F)	Code No. P0111, P0112, P0113	P.13A-10 7, P.13A-11 6, P.13A-12 3
				Intake air temperature is 0°C (32°F)		
				Intake air temperature is 20°C (68°F)		
				Intake air temperature is 40°C (104°F)		
				Intake air temperature is 80°C (176°F)		
IG. TIMING ADV	44	Ignition coils and ignition power transistor	<ul style="list-style-type: none"> <li>Engine: warming up</li> <li>Timing light is set (to check actual ignition timing)</li> </ul>	Engine is idling	-	-
				2,500 r/min		
IG. TIMING ADV	44*4	Ignition coils and ignition power transistor	<ul style="list-style-type: none"> <li>Engine: warming up</li> <li>Timing light is set (to check actual ignition timing)</li> </ul>	Engine is idling	-	-
				2,500 r/min		

MUT-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT	NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
INJECTOR	41	Injectors*2	Engine: cranking	When engine coolant temperature is 0°C (32°F)	74 – 94 ms	–
				When engine coolant temperature is 20°C (68°F)	26.9 – 46.9 ms	
				When engine coolant temperature is 80°C (176°F)	7.0 – 13.0 ms	
		Injectors*2	<ul style="list-style-type: none"> <li>• Engine coolant temperature : 80 – 95°C (176 – 203°F)</li> <li>• Lights, electric cooling fan and all accessories : "OFF"*5</li> <li>• Transaxle: "P" range</li> </ul>	Engine is idling	2.2 – 3.4 ms	
				2,500 r/min	2.2 – 3.4 ms	
When engine is suddenly revved	Increases					
LONG TRIM B1	81*4	Cylinder 1, 4 long-term fuel trim	Engine: warming up, 2,500 r/min without any load (during closed loop)	-12.5 to 12.5%	Code No. P0171, P0172	<a href="#">P.13A-406</a> , <a href="#">P.13A-415</a>
LONG TRIM B2	83*4	Cylinder 2, 3 long-term fuel trim	Engine: warming up, 2,500 r/min without any load (during closed loop)	-12.5 to 12.5%	Code No. P0174, P0175	<a href="#">P.13A-421</a> , <a href="#">P.13A-430</a>
MAF SENSOR	12	Mass airflow sensor*1	<ul style="list-style-type: none"> <li>• Engine coolant temperature : 80 – 95°C (176 – 203°F)</li> <li>• Lights, electric cooling fan and all accessories : "OFF"*5</li> <li>• Transaxle: "P" range</li> </ul>	Engine is idling	2.0 – 6.0 g/sec	–
				2,500 r/min	6.5 – 14.5 g/sec	
				Engine is revved	Mass airflow rate increases in response to rewing	

**MULTIPOINT FUEL INJECTION (MFI) <2.4L ENGINE>  
MULTIPOINT FUEL INJECTION (MFI) DIAGNOSIS**

**13A-1093**

MUT-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
MAP SENSOR	95	Manifold absolute pressure sensor	Ignition switch: "ON"	Engine stopped [At altitude of 0 m (0 ft.)]	101 kPa (29.8 in. Hg)	Code No. P0106, P0107, P0108	<a href="#">P.13A-72</a> , <a href="#">P.13A-86</a> , <a href="#">P.13A-98</a>
				Engine stopped [At altitude of 600 m (1,969 ft.)]	95 kPa (28.1 in. Hg)		
				Engine stopped [At altitude of 1,200 m (3,937 ft.)]	88 kPa (26.0 in. Hg)		
				Engine stopped [At altitude of 1,800 m (5,906 ft.)]	81 kPa (23.9 in. Hg)		
			Engine: warming up, idling		16 – 36 kPa (4.7 – 10.6 in. Hg)		
			When engine is suddenly revved		Manifold pressure varies		
MAP/MD P SNSR.	32*4	Manifold absolute pressure sensor	Ignition switch: "ON"	Engine stopped [At altitude of 0 m (0 ft.)]	101 kPa (29.8 in. Hg)	Code No. P0106, P0107, P0108	<a href="#">P.13A-72</a> , <a href="#">P.13A-86</a> , <a href="#">P.13A-98</a>
				Engine stopped [At altitude of 600 m (1,969 ft.)]	95 kPa (28.1 in. Hg)		
				Engine stopped [At altitude of 1,200 m (3,937 ft.)]	88 kPa (26.0 in. Hg)		
				Engine stopped [At altitude of 1,800 m (5,906 ft.)]	81 kPa (23.9 in. Hg)		
			Engine: warming up, idling		16 – 36 kPa (4.7 – 10.6 in. Hg)		
			When engine is suddenly revved		Manifold pressure varies		

MUT-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
MIL DISTANC E	A9*6	MIL distance	Running distance in the malfunction indicator lamp (SERVICE ENGINE SOON or Check Engine Lamp) ON			–	–
PSP SWITCH	27	Power steering pressure switch	Engine: idling	Steering wheel turning	OFF	Code No. P0551	P.13A-79 1
				Steering wheel turning	ON		
SHORT TRIM B1	82*4	Cylinder 1, 4 short-term fuel trim	Engine: warming up, 2,500 r/min without any load (during closed loop)		–10 to 10% <Federal>, –10 to 7.0% <California>	Code No. P0171, P0172	P.13A-40 6, P.13A-41 5
SHORT TRIM B2	84*4	Cylinder 2, 3 short-term fuel trim	Engine: warming up, 2,500 r/min without any load (during closed loop)		–10 to 10% <Federal>, –10 to 7.0% <California>	Code No. P0174, P0175	P.13A-42 1, P.13A-43 0
SYS. STATUS B1	88*4	Cylinder 1, 4 Fuel control system status	Engine: warming up	2,500 r/min	Closed loop	Code No. P0134	P.13A-22 8
				When engine is suddenly revved	Open loop – drive condition		
SYS. STATUS B2	89*4	Cylinder 2, 3 Fuel control system status	Engine: warming up	2,500 r/min	Closed loop	Code No. P0154	P.13A-33 5
				When engine is suddenly revved	Open loop – drive condition		
TANK PRS. SNSR	73	Fuel tank differential pressure sensor	<ul style="list-style-type: none"> <li>Ignition switch: "ON"</li> <li>Fuel cap removal</li> </ul>		–3.3 to 3.3 kPa (–0.97 to 0.97 in. Hg)	–	–
TP LEARN MID	9A	Throttle position sensor (main) mid opening learning value	Ignition switch: "ON"		600 – 1,200 mV	Code No. P0122, P0123	P.13A-15 9, P.13A-16 9

**MULTIPOINT FUEL INJECTION (MFI) <2.4L ENGINE>  
MULTIPOINT FUEL INJECTION (MFI) DIAGNOSIS**

**13A-1095**

MUT-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT	NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE		
TP SNSR (MAIN)	79	Throttle position sensor (main)	<ul style="list-style-type: none"> <li>Remove the intake air hose at the throttle body</li> <li>Disconnect the throttle position sensor connector, and then connect terminal numbers No. 3, No. 4, No. 5 and No. 6 with the use of the special tool: MB991658.</li> <li>Ignition switch: "ON"</li> </ul>	Fully close the throttle valve with your finger	300 – 700 mV	Code No. P0122, P0123	P.13A-15 9, P.13A-16 9	
				Fully open the throttle valve with your finger	4,000 mV or more			
				Engine: warming up, idling	No load			520 – 620 mV
				A/C switch: "OFF" → "ON"	Voltage varies			
			Shift lever: "N" → "D"					
TP SNSR (SUB)	14	Throttle position sensor (sub)	<ul style="list-style-type: none"> <li>Remove the intake air hose at the throttle body</li> <li>Disconnect the throttle position sensor connector, and then connect terminal numbers No. 3, No. 4, No. 5 and No. 6 with the use of the special tool: MB991658.</li> <li>Ignition switch: "ON"</li> </ul>	Fully close the throttle valve with your finger	2,200 – 2,800 mV	Code No. P0222, P0223	P.13A-50 4, P.13A-51 4	
				Fully open the throttle valve with your finger	4,000 mV or more			

MUT-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT	NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE	
TP SNSR	8A*4	Throttle position sensor	<ul style="list-style-type: none"> <li>Remove the intake air hose at the throttle body</li> <li>Disconnect the throttle position sensor connector, and then connect terminal numbers No. 3, No. 4, No. 5 and No. 6 with the use of the special MB991658 tool.</li> <li>Ignition switch: "ON"</li> </ul>	Fully close the throttle valve with your finger  Fully open the throttle valve with your finger	0 – 5%  88% or more	Code No. P0122, P0123	P.13A-15 9, P.13A-16 9
TR SWITCH	29	Transmission range switch	P or N  Except P or N	P, N  D, 2, L, R	P0705 (DTC27), P0705 (DTC28)	P.23A-12 0, P.23A-1 65	
VAF/MAF SNSR.	12*4	Mass airflow sensor*1	<ul style="list-style-type: none"> <li>Engine coolant temperature : 80 – 95°C (176 – 203°F)</li> <li>Lights, electric cooling fan and all accessories : "OFF"*5</li> <li>Transaxle: "P" range</li> </ul>	Engine is idling 2,500 r/min  Engine is revved	2.0 – 6.0 gm/s  6.5 – 14.5 gm/s  Mass airflow rate increases in response to revving	–	–
VSS	24*4	Vehicle speed signal	Drive at 40 km/h (25 mph).	Approximately 40 km/h (25 mph)	–	–	



**ACTUATOR TEST REFERENCE TABLE**

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

MUT-III 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	<ul style="list-style-type: none"> <li>• Engine: idling</li> <li>• Connect timing light</li> </ul>		5°BTDC	—	—
EVAP PURG 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	<a href="#">P.13A-62</a> 6
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	<a href="#">P.13A-63</a> 7
FUEL PUMP	07	Fuel pump	Fuel pump operates and fuel is recirculated	Ignition switch: "ON"	Listen near the fuel tank for the sound of fuel pump operation	Sound of operation is heard	Procedure No. 29	<a href="#">P.13A-10</a> 54
NO. 1 INJECTOR	01	Injectors	Cut fuel to No. 1 injector	Engine: warm up, idle (cut the fuel supply to each injector in turn and check cylinders which don't affect idling.)		Idling becomes unstable	Code No. P0201	<a href="#">P.13A-46</a> 4
NO. 2 INJECTOR	02		Cut fuel to No. 2 injector				Code No. P0202	<a href="#">P.13A-47</a> 4,
NO. 3 INJECTOR	03		Cut fuel to No. 3 injector				Code No. P0203	<a href="#">P.13A-48</a> 4,
NO. 4 INJECTOR	04		Cut fuel to No. 4 injector				Code No. P0204	<a href="#">P.13A-49</a> 4
OCV	22	Engine oil control valve	Engine oil control valve turns from OFF to ON	Engine: warming up, 2,000 r/min		The engine speed is changed.	Code No. P1021	<a href="#">P.13A-85</a> 4

MUT-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	DRIVE CONTENTS	INSPECTION REQUIREMENT	NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
RADIAT. FAN HI	20	Radiator fan, A/C condenser fan	Drive the fan motor	Ignition switch: "ON"	Radiator fan and condenser fan rotate at high speed.	Procedure No. 27	P.13A-10 40
RADIAT. FAN LO	21				Radiator fan and condenser fan rotate at low speed.		
TCA FAIL SAFE	34	Throttle actuator control system	Stop the throttle actuator control motor	Ignition switch: "ON"	Throttle valve is opened slightly	Code No. P0638	P.13A-82 3

**CHECK AT THE POWERTRAIN CONTROL MODULE (PCM)**

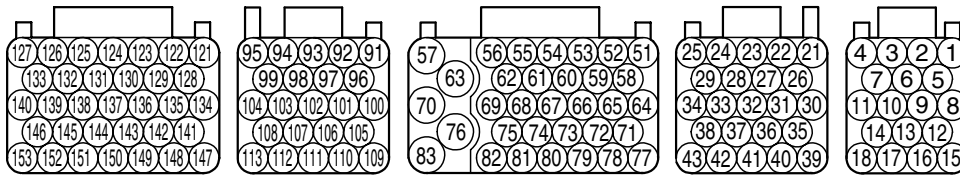
1. Disconnect the PCM connectors B-19, B-20, B-21, B-22 and B-23, and connect check harness special tool MB991923 between the PCM connectors.
2. Measure the voltage between each check harness connector terminal and check harness connector ground terminal (No. 25 or No. 29).

**TERMINAL VOLTAGE CHECK CHART**

NOTE: \*1: The average voltage through an analog voltmeter is described in this service manual (because the average voltage is too stable to be shown on a digital voltmeter).

NOTE: \*2: Vehicles for Canada, the headlight, taillight, etc. remain lit even when the lighting switch is in "OFF" position but this is no problem for checks.

Check Harness Special Tool MB991923 Connector Terminal Arrangement



AK203309AB

TERMINAL NO.	INSPECTION ITEM	INSPECTION CONDITION (ENGINE CONDITION)		NORMAL CONDITION
2	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
5	Fan control relay (high)	Ignition switch: "ON"		B+
		Carry out the actuator test to revolve the fan at high speed.		1 V or less
6	Fuel pump relay	Ignition switch: "ON"		B+
		Engine: idling		1 V or less
10	Fan control relay (low)	Ignition switch: "ON"		B+
		Carry out the actuator test to revolve the fan at low speed.		1 V or less
21 68	Sensor supplied voltage	Ignition switch: "ON"		4.9 – 5.1 V
23	Fuel tank differential pressure sensor	Engine: idling		1.2 – 3.8 V
26	Accelerator pedal position sensor (main)	Ignition switch: "ON"	Release the accelerator pedal	0.735 – 1.335 V
			Depress the accelerator pedal fully	4.0 V or more
27	Accelerator pedal position sensor (sub)	Ignition switch: "ON"	Release the accelerator pedal	0.435 – 1.035 V
			Depress the accelerator pedal fully	3.7 V or more

TERMINAL NO.	INSPECTION ITEM	INSPECTION CONDITION (ENGINE CONDITION)		NORMAL CONDITION
30	Power supply voltage applied to accelerator pedal position sensor (main)	Ignition switch: "ON"		4.9 – 5.1 V
41	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
42	Backup power supply	Ignition switch: "LOCK" (OFF)		B+
43	Ignition switch-IG	Ignition switch: "ON"		B+
51	Power supply	Ignition switch: "ON"		B+
64				
52	MFI relay (power supply)	Ignition switch: "LOCK" (OFF)		B+
		Ignition switch: "ON"		1 V or less
78	Power steering pressure switch	Engine: warming up, idling	When steering wheel is not turned	B+
			When steering wheel is turned	1V or less
81	A/C compressor clutch relay	<ul style="list-style-type: none"> <li>• Engine: idling</li> <li>• A/C switch: OFF → ON (A/C compressor is operating)</li> </ul>		B+ → 1 V or less as A/C clutch cycles
83	Ignition switch-ST	Engine: cranking		8 V or more
91	Cylinder 2, 3 heated oxygen sensor (front)	Engine: warming up, 2,500 r/min		0 ⇔ 0.8 V (changes repeatedly)
92	Cylinder 1, 4 heated oxygen sensor (front)	Engine: warming up, 2,500 r/min		0 ⇔ 0.8 V (changes repeatedly)

TERMINAL NO.	INSPECTION ITEM	INSPECTION CONDITION (ENGINE CONDITION)		NORMAL CONDITION
93	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
94	Power supply voltage applied to throttle position sensor	Ignition switch: "ON"		4.9 – 5.1 V
96	Cylinder 2, 3 heated oxygen sensor (rear)	<ul style="list-style-type: none"> <li>• Engine: warming up</li> <li>• Revving</li> </ul>		0 and 0.6 – 1.0 V alternates
97	Cylinder 1, 4 heated oxygen sensor (rear)	<ul style="list-style-type: none"> <li>• Engine: warming up</li> <li>• Revving</li> </ul>		0 and 0.6 – 1.0 V alternates
98	Throttle position sensor (sub)	<ul style="list-style-type: none"> <li>• Remove the intake air hose at the throttle body</li> <li>• Disconnect the throttle position sensor connector, and then connect terminal numbers No. 3, No. 4, No. 5 and No. 6 with the use of the special tool: MB991658.</li> <li>• Ignition switch: "ON"</li> </ul>	Fully close the throttle valve with your finger	2.2 – 2.8 V
			Fully open the throttle valve with your finger	4.0 V or more

TERMINAL NO.	INSPECTION ITEM	INSPECTION CONDITION (ENGINE CONDITION)		NORMAL CONDITION
99	Throttle position sensor (main)	<ul style="list-style-type: none"> <li>Remove the intake air hose at the throttle body</li> <li>Disconnect the throttle position sensor connector, and then connect terminal numbers No. 3, No. 4, No. 5 and No. 6 with the use of the special tool: MB991658.</li> <li>Ignition switch: "ON"</li> </ul>	Fully close the throttle valve with your finger	0.3 – 0.7 V
			Fully open the throttle valve with your finger	4.0 V or more
102	Manifold absolute pressure sensor	Ignition switch: "ON"	At altitude of 0 m (0 ft.)	3.8 – 4.2 V
			At altitude of 600 m (1,969 ft.)	3.5 – 3.9 V
			At altitude of 1,200 m (3,937 ft.)	3.3 – 3.7 V
			At altitude of 1,800 m (5,906 ft.)	3.0 – 3.4 V
		Engine: warming up, idling		0.6 – 1.4 V
		When engine is suddenly reved.		Voltage varies
103	Crankshaft position sensor	Engine: cranking		0.4 – 4.0 V <sup>*1</sup>
		Engine: idling		2.0 – 3.0 V <sup>*1</sup>
104	Camshaft position sensor	Engine: cranking		2.0 – 4.8 V <sup>*1</sup>
		Engine: idling		3.0 – 4.0 V <sup>*1</sup>
107	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

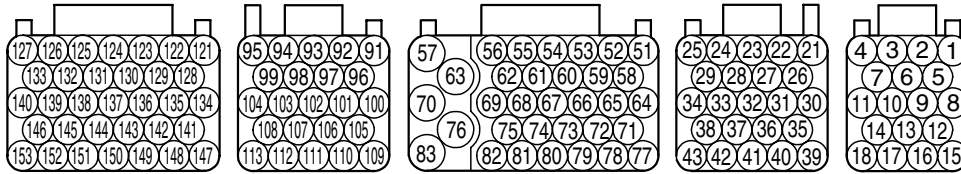
<b>TERMINAL NO.</b>	<b>INSPECTION ITEM</b>	<b>INSPECTION CONDITION (ENGINE CONDITION)</b>	<b>NORMAL CONDITION</b>
108	Mass airflow sensor	Engine: revving	Voltage increase in response to revving
110	Engine oil pressure switch	Ignition switch: "ON"	1 V or less
		Engine: warming up, 4,000 r/min	B+
122	Power supply voltage applied to throttle actuator control motor	Ignition switch: "ON"	B+
123	Throttle actuator control motor relay	Ignition switch: "ON" → "LOCK" (OFF)	1 V or less → B+ → 1 V or less
125	Cylinder 2, 3 heated oxygen sensor heater (front)	Engine: warming up, idling (15 seconds after starting engine)	9 – 11 V* <sup>1</sup>
		Engine: revving	9 – 11 V* <sup>1</sup> → B+ (momentarily)
126	Cylinder 1, 4 heated oxygen sensor heater (front)	Engine: warming up, idling (15 seconds after starting engine)	9 – 11 V* <sup>1</sup>
		Engine: revving	9 – 11 V* <sup>1</sup> → B+ (momentarily)
128	Engine oil control valve	Ignition switch: "ON"	B+
		Engine: warming up, 4,000 r/min	4.0 – 10 V* <sup>1</sup>
131	Generator FR terminal	<ul style="list-style-type: none"> <li>• Engine: warming up, idling (radiator fan: stopped)</li> <li>• Headlight: OFF to ON*<sup>2</sup></li> <li>• Rear defogger switch: OFF to ON</li> <li>• Stop light switch: OFF to ON</li> </ul>	Voltage drops
132	Generator G terminal	<ul style="list-style-type: none"> <li>• Engine: warming up, idling (radiator fan: stopped)</li> <li>• Headlight: OFF to ON*<sup>2</sup></li> <li>• Rear defogger switch: OFF to ON</li> <li>• Stop light switch: OFF to ON</li> </ul>	Voltage rises
137	Cylinder 2, 3 heated oxygen sensor heater (rear)	Engine: warming up, idling	1 V or less
		Engine: revving	B+
138	Cylinder 1, 4 heated oxygen sensor heater (rear)	Engine: warming up, idling	1 V or less
		Engine: revving	B+
141	Throttle actuator control motor (-)	<ul style="list-style-type: none"> <li>• Ignition switch: "ON"</li> <li>• Accelerator pedal: fully closed → fully opened</li> </ul>	Decreases slightly (approximately 2 V) from battery voltage.

TERMINAL NO.	INSPECTION ITEM	INSPECTION CONDITION (ENGINE CONDITION)	NORMAL CONDITION
147	Throttle actuator control motor (+)	<ul style="list-style-type: none"> <li>Ignition switch: "ON"</li> <li>Accelerator pedal: fully opened → fully closed</li> </ul>	Decreases slightly (approximately 2 V) from battery voltage.
142	EGR valve (Stepper motor coil <A1>)	Ignition switch: "LOCK" (OFF) → "ON"	5 – 8 V* <sup>1</sup> (changes about three seconds repeatedly)
136	EGR valve (Stepper motor coil <A2>)		
130	EGR valve (Stepper motor coil <B1>)		
124	EGR valve (Stepper motor coil <B2>)		
149	Evaporative emission purge solenoid	Ignition switch: "ON"	B+
		Engine: warm up, 3,000 r/min (within 3 minutes after the engine starting sequence is completed)	Voltage drops
151	Ignition coil – No. 1 (ignition power transistor)	Engine: 3,000 r/min	0.3 – 3.0 V* <sup>1</sup>
143	Ignition coil – No. 2 (ignition power transistor)		
150	Ignition coil – No. 3 (ignition power transistor)		
148	Ignition coil – No. 4 (ignition power transistor)		
153	No. 1 injector	<ul style="list-style-type: none"> <li>Engine: warming up, idling</li> <li>Suddenly depress the accelerator pedal</li> </ul>	From 9 – 13 V* <sup>1</sup> momentarily drops slightly
146	No. 2 injector		
140	No. 3 injector		
139	No. 4 injector		



**TERMINAL RESISTANCE AND CONTINUITY CHECK**

PCM Harness Side Connector Terminal Arrangement



AK203310AB

TERMINAL NO.	INSPECTION ITEM	NORMAL CONDITION (INSPECTION CONDITION)
25 – Body ground	PCM ground	Continuity (2 Ω or less)
29 – Body ground	PCM ground	
34 – Body ground	PCM ground	
38 – Body ground	PCM ground	
2 – 51	Evaporative emission ventilation solenoid	17 – 21 Ω [at 20°C (68°F)]
69 – 93	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)]
69 – 107	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 – 0.45 kΩ [when intake air temperature is 80°C (176°F)]
51 – 125	Cylinder 2, 3 heated oxygen sensor heater (front)	4.5 – 8.0 Ω [at 20°C (68°F)]

TERMINAL NO.	INSPECTION ITEM	NORMAL CONDITION (INSPECTION CONDITION)
51 – 126	Cylinder 1, 4 heated oxygen sensor heater (front)	4.5 – 8.0 Ω [at 20°C (68°F)]
51 – 128	Engine oil control valve	6.9 – 7.9 Ω [at 20°C (68°F)]
51 – 137	Cylinder 2, 3 heated oxygen sensor heater (rear)	11 – 18 Ω [at 20°C (68°F)]
51 – 138	Cylinder 1, 4 heated oxygen sensor heater (rear)	11 – 18 Ω [at 20°C (68°F)]
141 – 147	Throttle actuator control motor	0.3 – 80 Ω [at 20°C (68°F)]
51 – 142	Stepper motor coil (A1)	20 – 24 Ω [at 20°C (68°F)]
51 – 136	Stepper motor coil (A2)	
51 – 130	Stepper motor coil (B1)	
51 – 124	Stepper motor coil (B2)	
51 – 149	Evaporative emission purge solenoid	30 – 34 Ω [at 20°C (68°F)]
51 – 153	No. 1 injector	10.5 – 13.5 Ω [at 20°C (68°F)]
51 – 146	No. 2 injector	
51 – 140	No. 3 injector	
51 – 139	No. 4 injector	

**INSPECTION PROCEDURE USING AN OSCILLOSCOPE**

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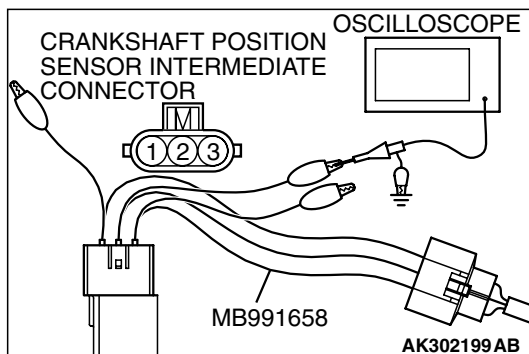
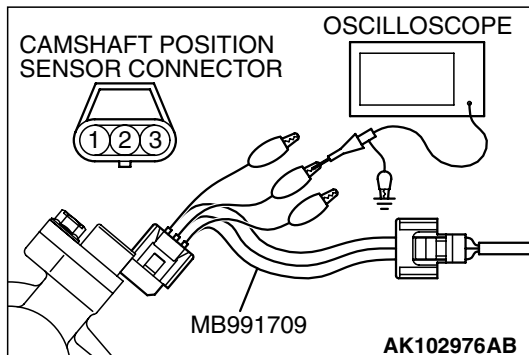
**CAMSHAFT POSITION SENSOR AND CRANKSHAFT POSITION SENSOR**

**Required Special Tools:**

- MB991709: Test Harness
- MB991658: Test Harness
- MB991923: Power Plant ECU Check Harness

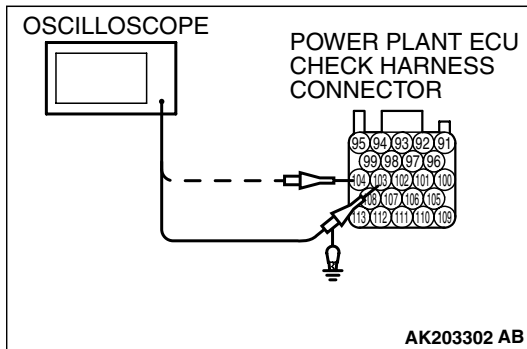
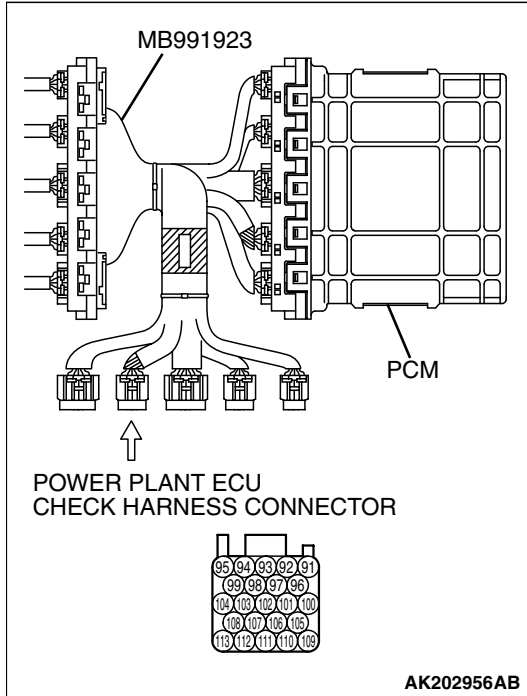
**Measurement Method**

1. Disconnect the camshaft position sensor connector, and connect the test harness special tool (MB991709) between the separated connector (All terminals should be connected).
2. Connect the oscilloscope probe to camshaft position sensor connector terminal No. 2.
3. Disconnect the crankshaft position sensor intermediate connector, and connect the test harness special tool (MB991658) between the separated connector.
4. Connect the oscilloscope probe to crankshaft position sensor intermediate connector terminal No. 2.



**Alternate method (Measure at the PCM)**

1. Disconnect the all PCM connectors, and connect check harness special tool (MB991923) between the separated connectors.

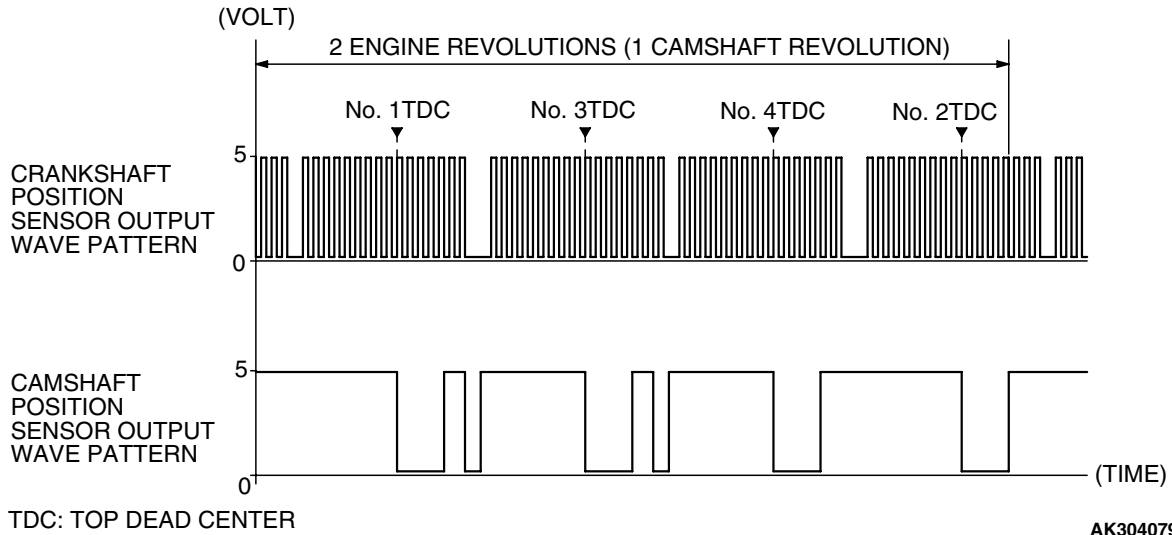


2. Connect the oscilloscope to check harness terminal No. 104. (Check the camshaft position sensor signal wave pattern.)
3. Connect the oscilloscope to check harness terminal No. 103. (Check the crankshaft position sensor signal wave pattern.)

**Standard Wave Pattern**

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

Standard wave pattern



**Wave Pattern Observation Points**

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

**Examples of Abnormal Wave Patterns**

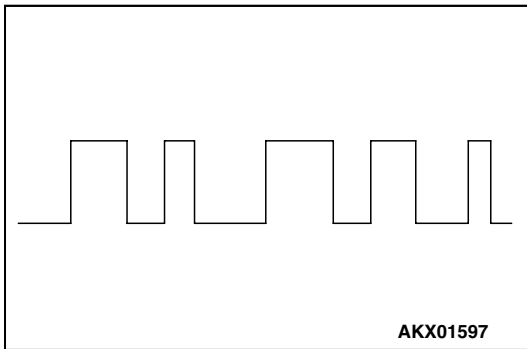
**Example 1**

Cause of problem

- Sensor interface malfunction.

Wave pattern characteristics

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



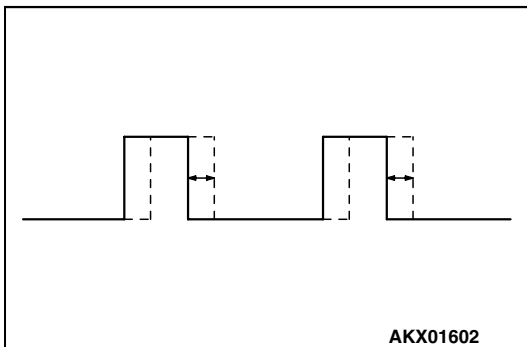
**Example 2**

Cause of problem

- Loose timing belt.
- Abnormality in sensor disc.

Wave pattern characteristics

- Wave pattern is displaced to the left or right.



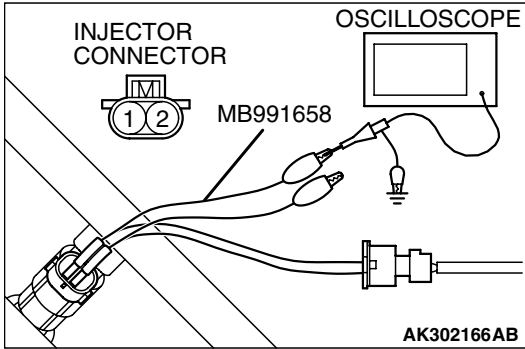
## INJECTOR

### Required Special Tools:

- MB991658: Test Harness
- MB991923: Power Plant ECU Check Harness

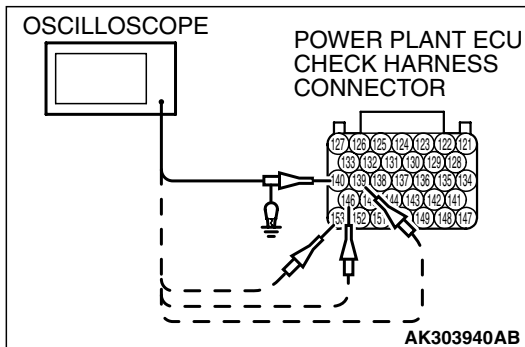
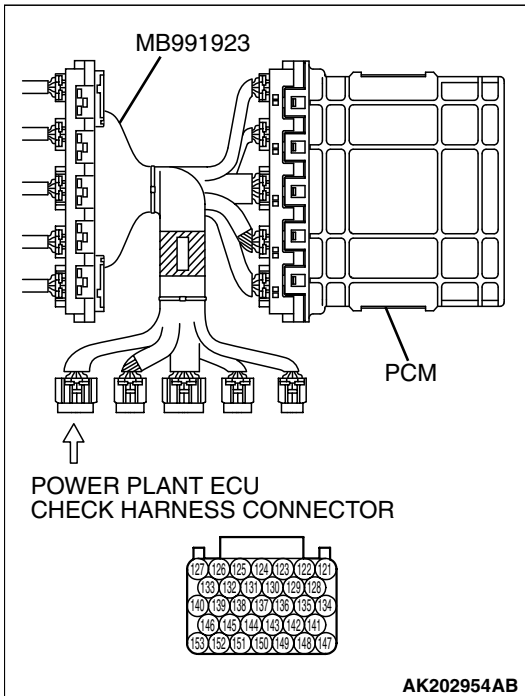
### Measurement Method

1. Disconnect the injector connector, and connect the test harness special tool (MB991658) between the separated connector. (All terminals should be connected.)
2. Connect the oscilloscope probe to injector connector terminal No. 2.



### Alternate method (Measure at the PCM)

1. Disconnect the all PCM connectors, and connect check harness special tool (MB991923) between the separated connectors.

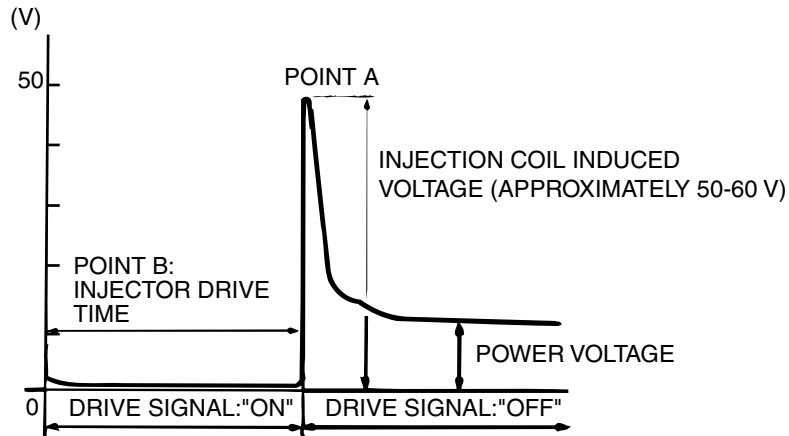


2. Connect the oscilloscope probe to each check harness connector terminal to analyze each cylinder:
  - Terminal No. 153 for the number 1 cylinder.
  - Terminal No. 146 for the number 2 cylinder.
  - Terminal No. 140 for the number 3 cylinder.
  - Terminal No. 139 for the number 4 cylinder.

### 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

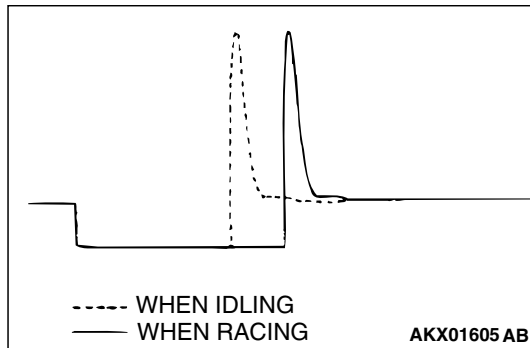
**Wave Pattern Observation Points**

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.

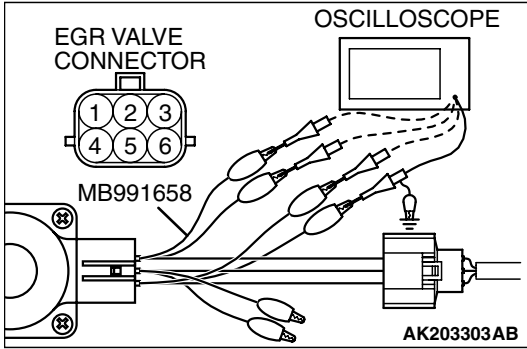


**EGR VALVE (STEPPER MOTOR)**

**Required Special Tools:**

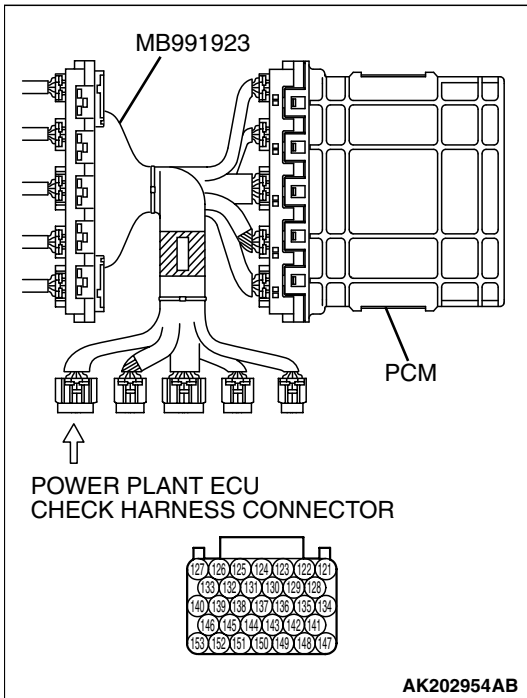
- MB991658: Test Harness
- MB991923: Power Plant ECU Check Harness

**Measurement Method**



1. Disconnect the EGR valve connector, and connect the test harness special tool (MB991658) between the separated connector (All terminals should be connected).
2. Connect the oscilloscope probe to the EGR valve connector terminal No. 1, terminal No. 3, terminal No. 4, terminal No. 6 respectively.

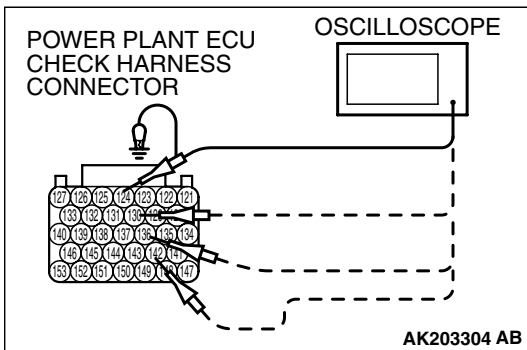
**Alternate method (Measure at the PCM)**



1. Disconnect the all PCM connectors, and connect check harness special tool (MB991923) between the separated connectors.

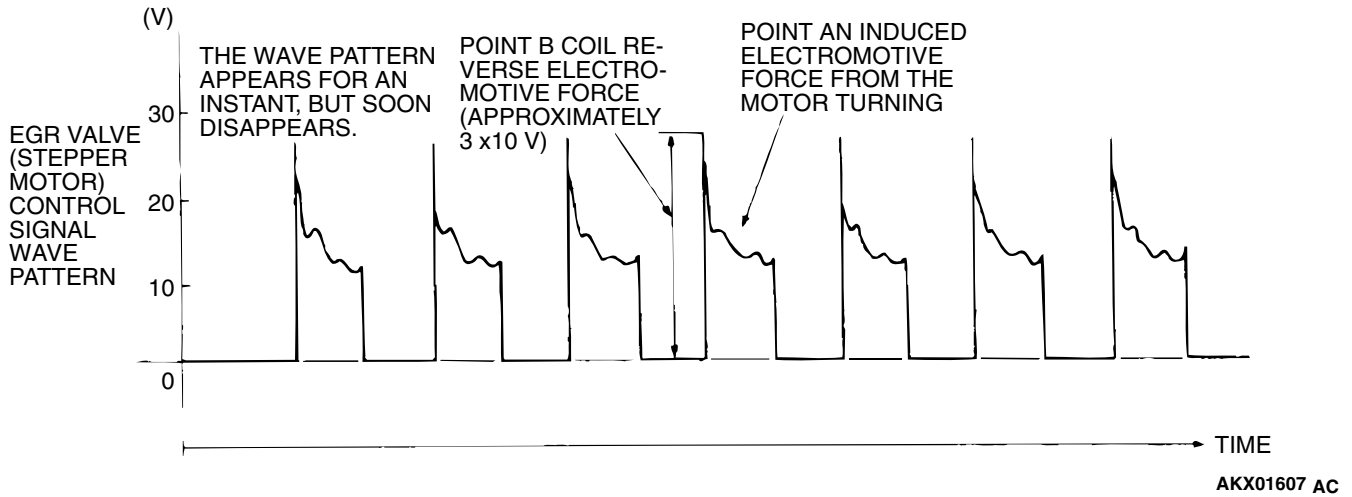
2. Connect the oscilloscope probe to check harness terminal No. 124, No. 130, No. 136 and No. 142.

**Standard Wave Pattern**



Observation condition	Special pattern
Function	Special pattern
Pattern height	High
Pattern selector	Display
Engine condition	Revving

Standard wave pattern



**Wave Pattern Observation Points**

1. Check that the standard wave pattern appears when the EGR valve 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

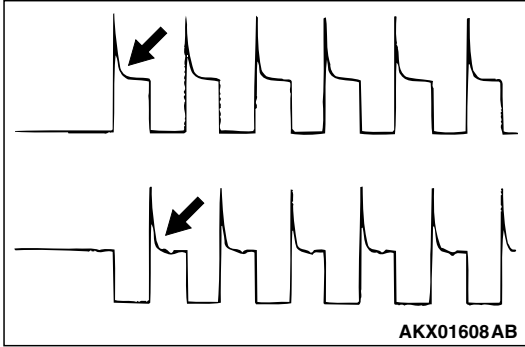
### Example 1

Cause of problem

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

Wave pattern characteristics

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



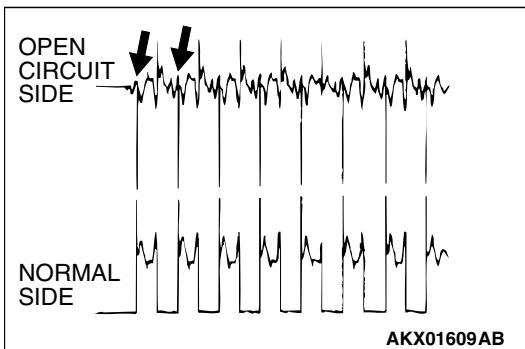
### Example 2

Cause of problem

- Open circuit in the line between the EGR valve and the PCM.

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 Tools:

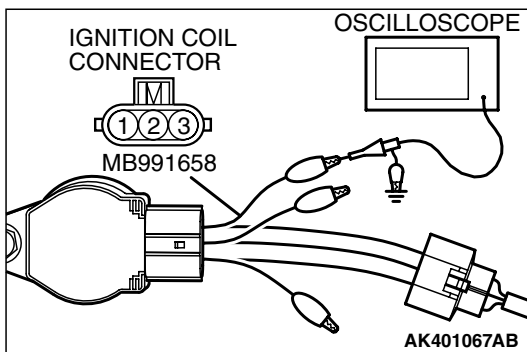
- MB991658: Test Harness
- MB991923: Power Plant ECU Check Harness

### Measurement Method

1. Disconnect the intermediate connector B-32, and connect the test harness special tool (MB991658) between the separated connector.
2. Connect the oscilloscope probe to each intermediate connector B-32 terminal to analyze each cylinder:
  - Terminal No. 2 for the number 1 cylinder.
  - Terminal No. 7 for the number 3 cylinder.
  - Terminal No. 6 for the number 5 cylinder.

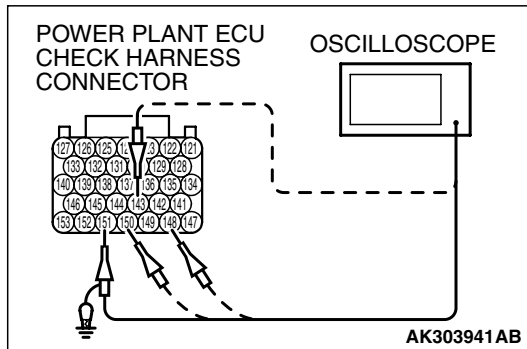
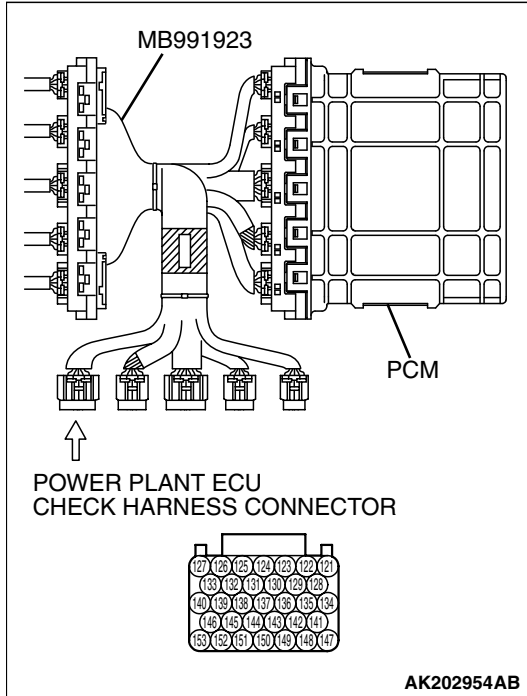
### <Measure at the left bank (number 2, 4, 6 cylinders)>

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



**Alternate method (Measure at the PCM)**

1. Disconnect the all PCM connectors, and connect check harness special tool (MB991923) between the separated connectors.

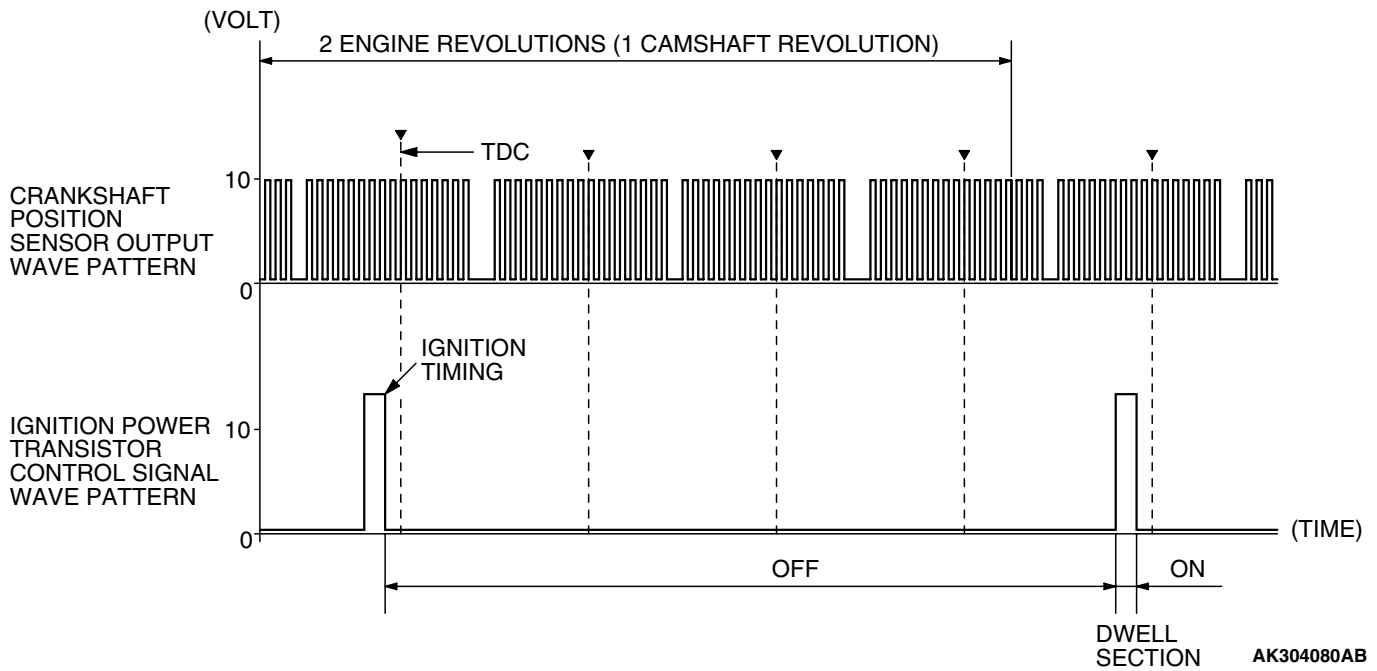


2. Connect the oscilloscope probe to each check harness connector terminal to analyze each cylinder:
  - Terminal No. 151 for the number 1 cylinder.
  - Terminal No. 143 for the number 2 cylinder.
  - Terminal No. 150 for the number 3 cylinder.
  - Terminal No. 148 for the number 4 cylinder.

**Standard Wave Pattern**

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

Standard wave pattern



**Wave Pattern Observation Points**

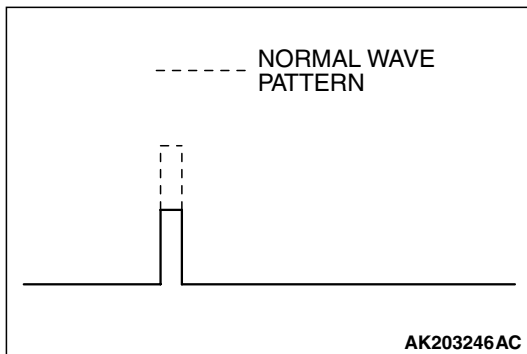
Point: The power transistor control signal (ignition timing) is advanced when the engine speed is increased.

CONDITION OF WAVE PATTERN BUILD-UP SECTION AND MAXIMUM VOLTAGE	PROBABLE CAUSE
Voltage value is too low	Open-circuit in ignition primary circuit

**Examples of Abnormal Wave Patterns**

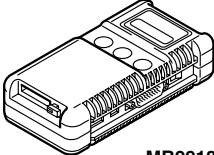
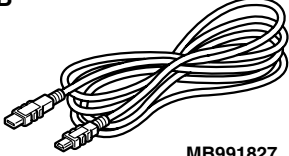
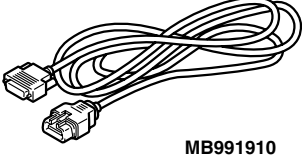
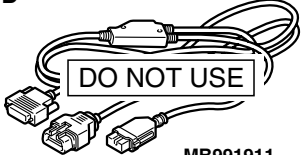
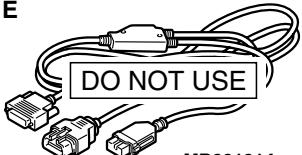
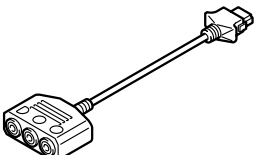
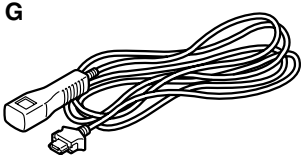
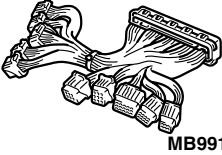
**Example 1 (Wave pattern during engine cranking)**

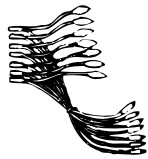
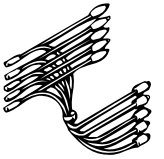



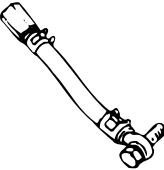

- Cause of problem  
Open-circuit in ignition primary circuit
- Wave pattern characteristics  
Voltage value is too low.



## SPECIAL TOOLS

M1131000600643

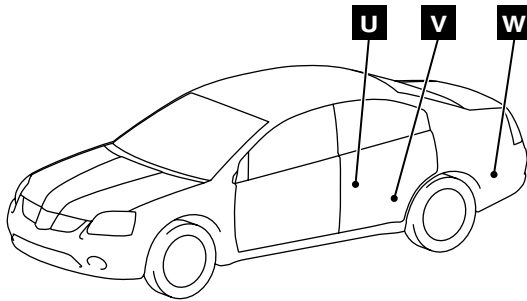
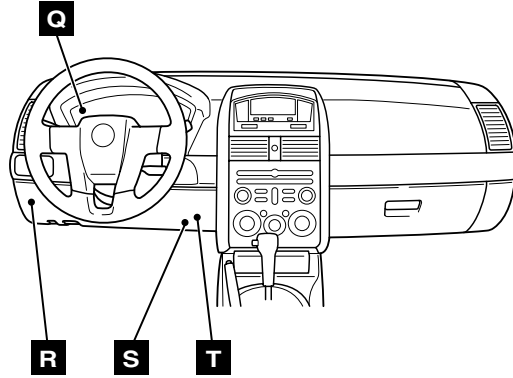
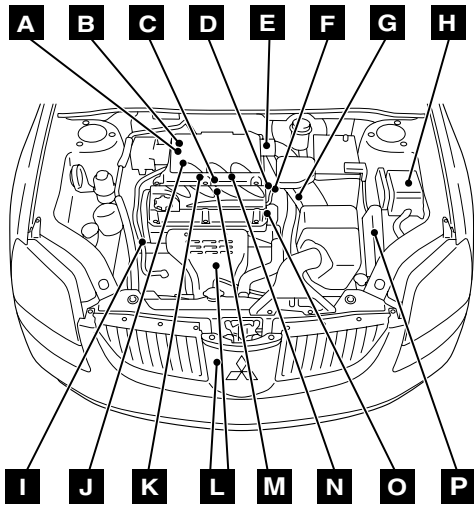
TOOL	TOOL NUMBER AND NAME	SUPERSESION	APPLICATION
<p>A</p>  <p>MB991824</p> <p>B</p>  <p>MB991827</p> <p>C</p>  <p>MB991910</p> <p>D</p>  <p>MB991911</p> <p>E</p>  <p>MB991914</p> <p>F</p>  <p>MB991825</p> <p>G</p>  <p>MB991826 MB991958</p>	<p>MB991958 A: MB991824 B: MB991827 C: MB991910 D: MB991911 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 Daimler Chrysler models only) F: MUT-III Measurement Adapter G: MUT-III Trigger Harness</p>	<p>MB991824-KIT <i>NOTE: G: MB991826 MUT-III Trigger Harness is not necessary when pushing V.C.I. ENTER key.</i></p>	<ul style="list-style-type: none"> <li>• Reading diagnostic trouble code</li> <li>• MFI system inspection</li> <li>• Measurement of fuel pressure</li> </ul> <p><b>CAUTION</b> For vehicles with CAN communication, use MUT-III main harness A to send simulated vehicle speed. If you connect MUT-III main harness B instead, the CAN communication does not function correctly.</p>
 <p>MB991923</p>	<p>MB991923 Power plant ECU check harness</p>	<p>MD998478-01</p>	<ul style="list-style-type: none"> <li>• Inspection using an oscilloscope</li> <li>• Inspection of the powertrain control module (PCM) terminal voltage check</li> </ul>

TOOL	TOOL NUMBER AND NAME	SUPERSESION	APPLICATION
	MB991709 Test harness	MB991709-01	Inspection using an oscilloscope
 <p>MB991658</p>	MB991658 Test harness	Tool not available	Inspection using an oscilloscope
	MD998464 Test harness (4 pin, square)	MD998464-01	Inspection of heated oxygen sensor
	MB991316 Test harness (4 pin, square)	Tool not available	Inspection of heated oxygen sensor
 <p>MB991637</p>	MB991637 Fuel pressure gauge set	Tool not available	Measurement of fuel pressure
	MD998709 Adaptor hose	MIT210196	Measurement of fuel pressure
	MD998742 Hose adaptor	MD998742-01	Measurement of fuel pressure

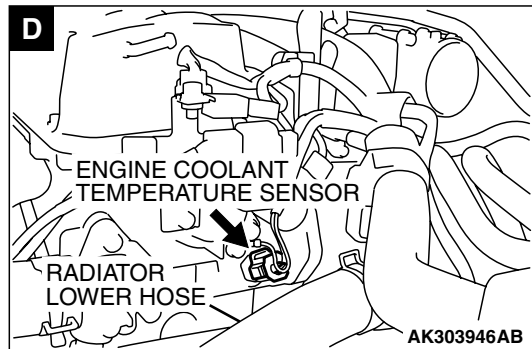
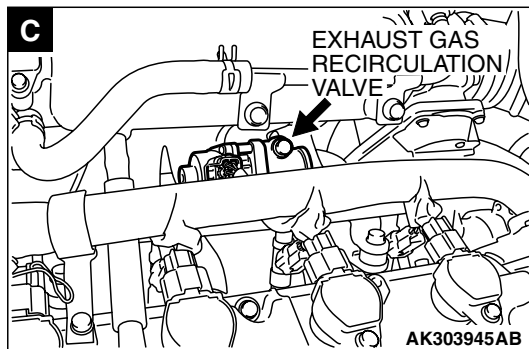
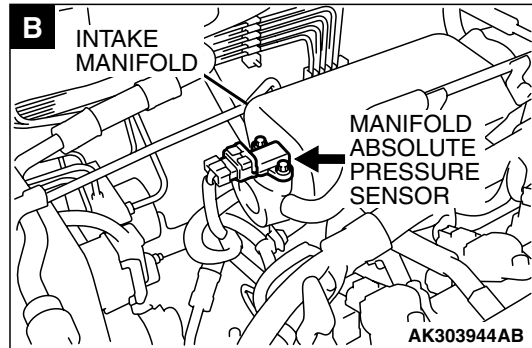
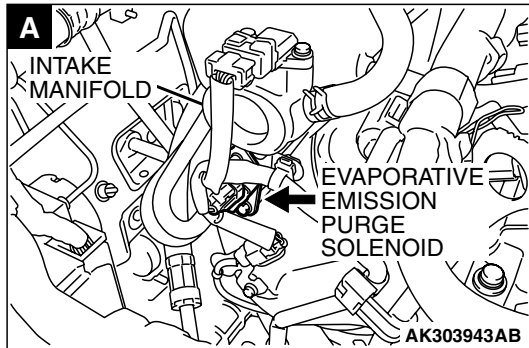
**ON-VEHICLE SERVICE****COMPONENT LOCATION**

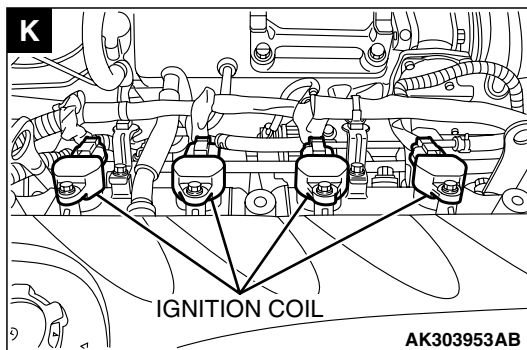
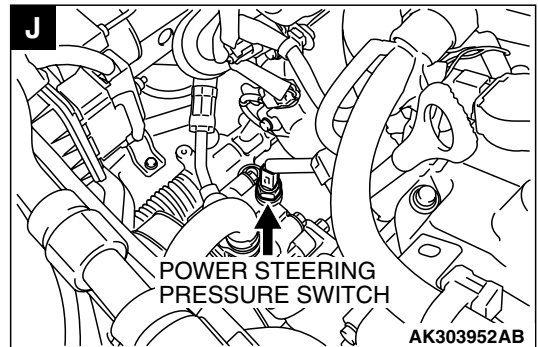
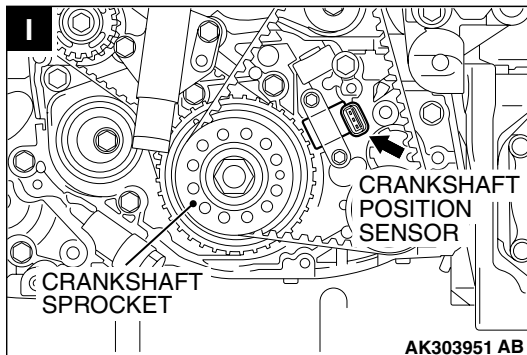
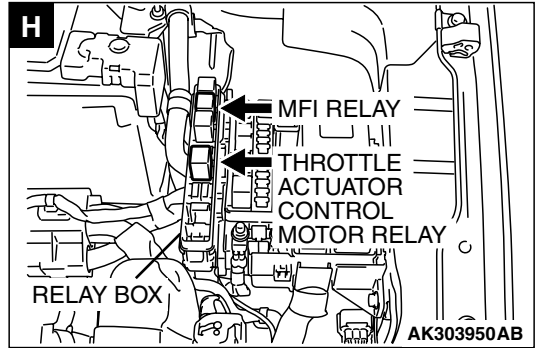
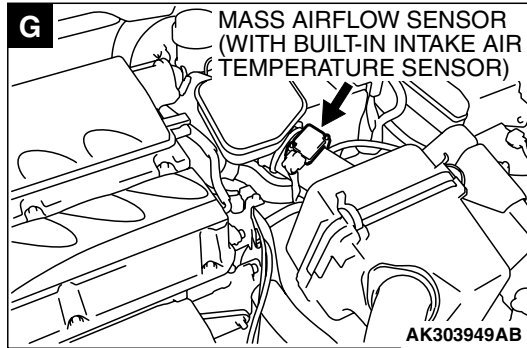
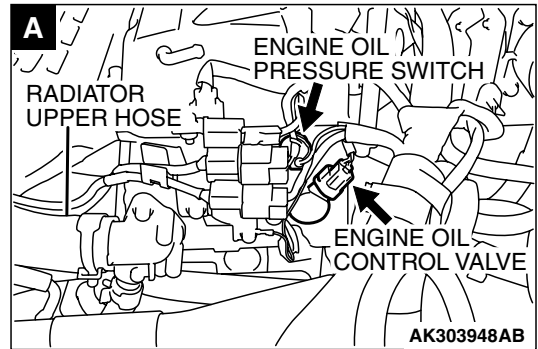
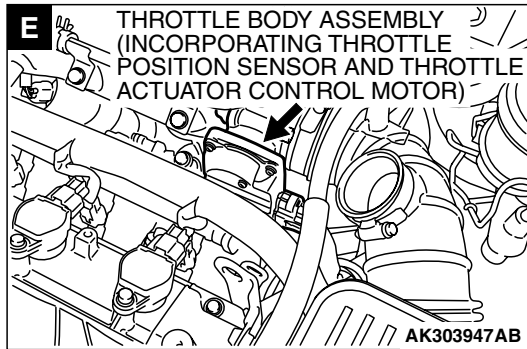
M1131002100860

NAME	SYMBOL	NAME	SYMBOL
Accelerator pedal position sensor	S	Fuel pump relay	R
Camshaft position sensor	O	Fuel tank differential pressure sensor	U
Crankshaft position sensor	I	Fuel tank temperature sensor)	V
Cylinder 1, 4 heated oxygen sensor (front)	L	Ignition coil	K
Cylinder 1, 4 heated oxygen sensor (rear)	L	Injector	N
Cylinder 2, 3 heated oxygen sensor (front)	L	Knock sensor	M
Cylinder 2, 3 heated oxygen sensor (rear)	L	Malfunction Indicator Lamp (SERVICE ENGINE SOON or Check Engine Lamp)	Q
Data link connector	T	Manifold absolute pressure sensor	B
Engine coolant temperature sensor	D	Mass airflow sensor (with built-in intake air temperature sensor)	G
Engine oil control valve	F	Multiport fuel injection (MFI) relay	H
Engine oil pressure switch	F	Powertrain control module (PCM)	P
Evaporative emission purge solenoid	A	Power steering pressure switch	J
Evaporative emission ventilation solenoid	W	Throttle actuator control motor	E
Exhaust gas recirculation (EGR) valve	C	Throttle actuator control motor relay	H
Fuel level sensor (main)	V	Throttle position sensor	E
Fuel level sensor (sub)	U		

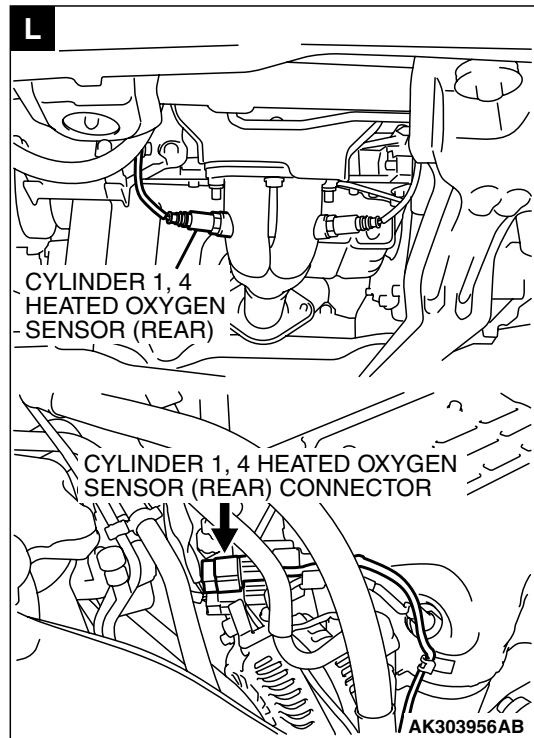
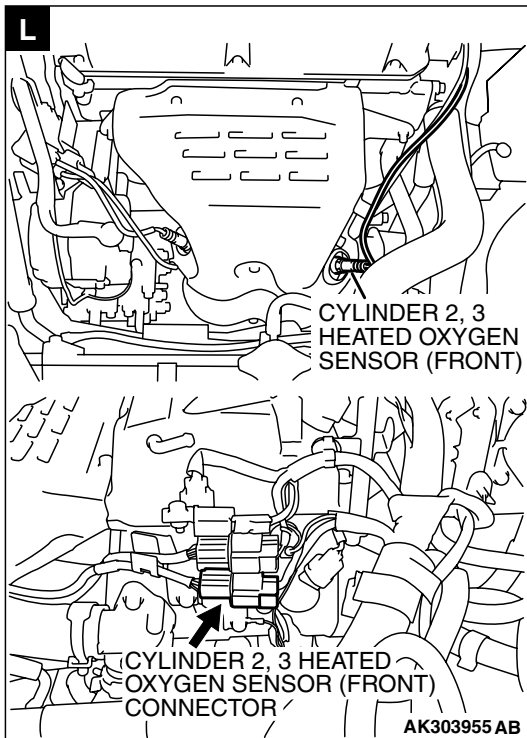
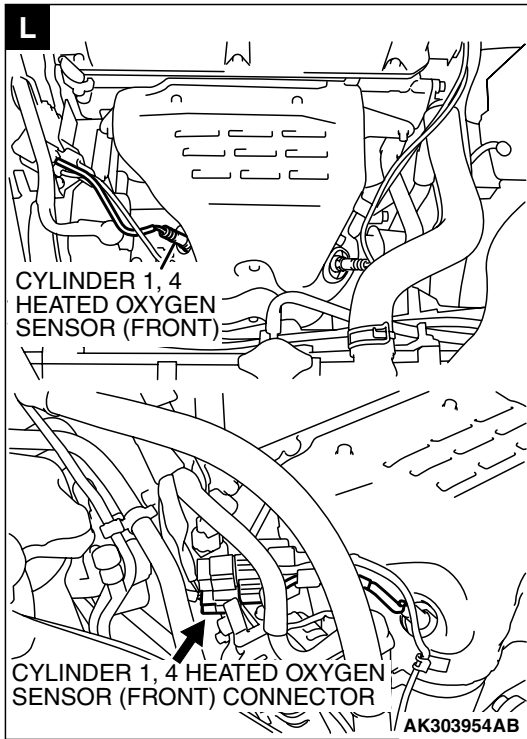


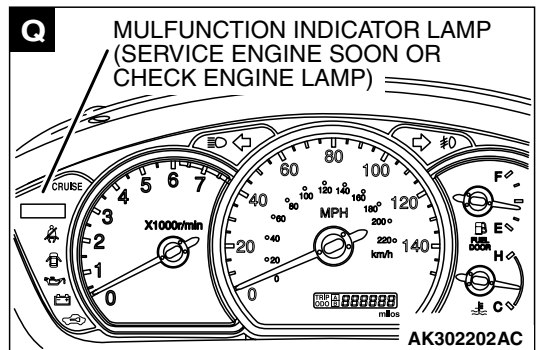
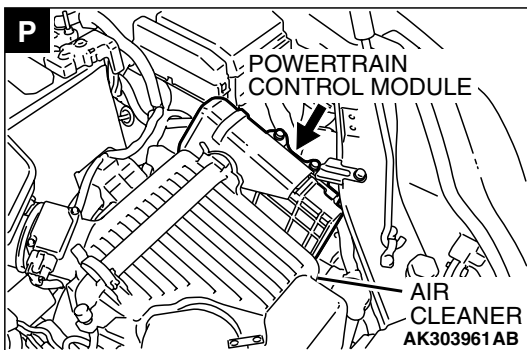
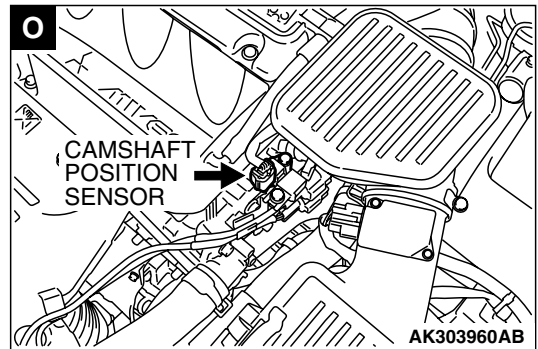
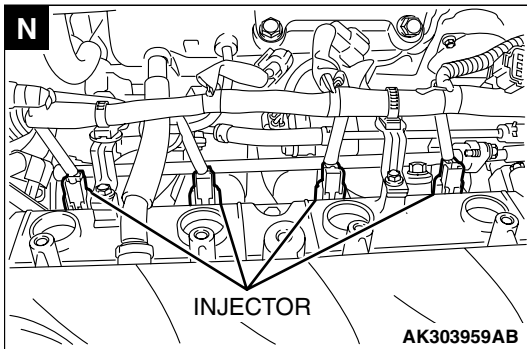
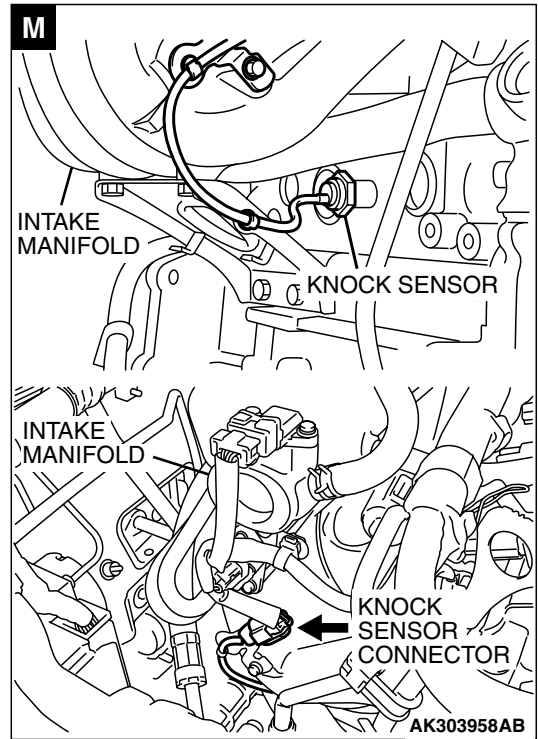
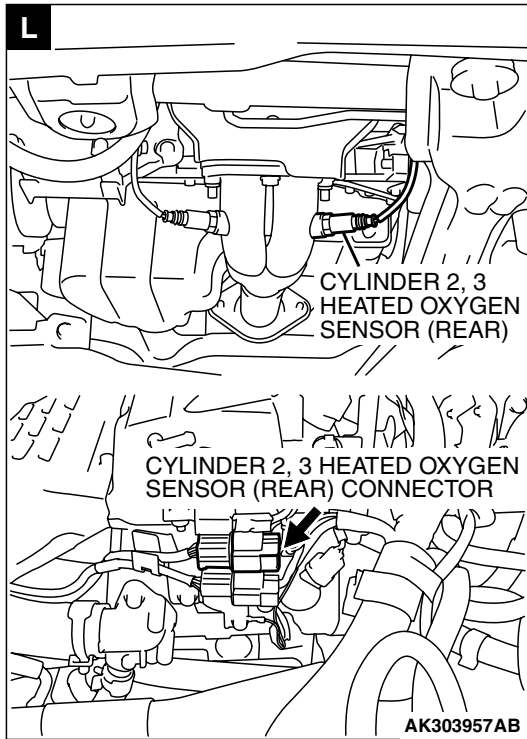
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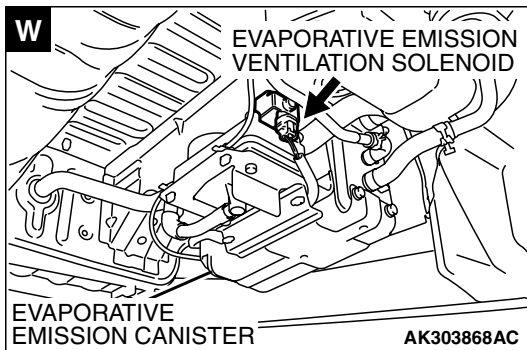
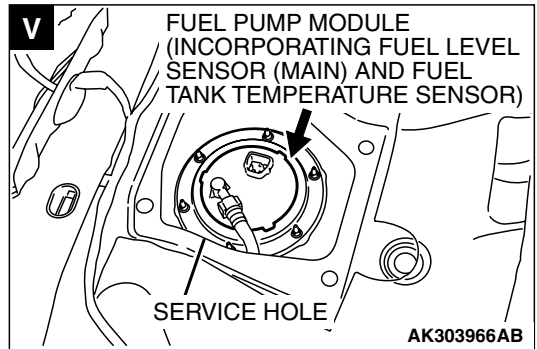
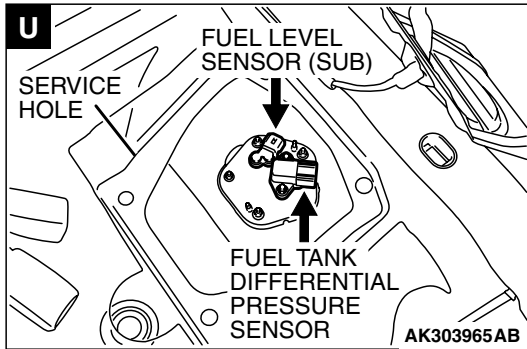
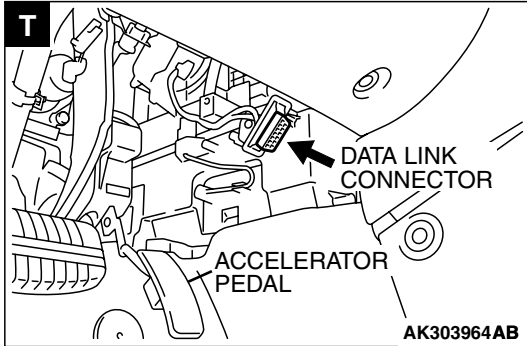
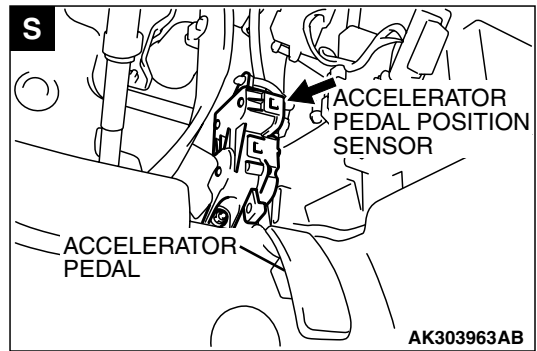
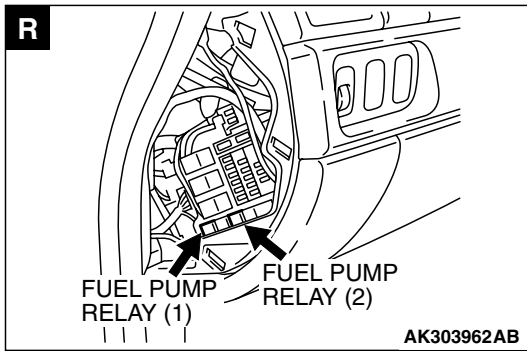












**THROTTLE BODY (THROTTLE VALVE AREA)  
CLEANING**

M1131001000547

**⚠ WARNING**

*If the throttle valve is operated in service, a finger might be injured as the result of being caught by the throttle valve. Make sure that the ignition switch is surely in "LOCK" (OFF) position before the service in order that the throttle valve cannot be operated.*

1. Remove 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 and the sensor through the shaft.
2. Spray cleaning solvent on a clean cloth.
  3. Wipe off the dirt around the throttle valve with the cloth sprayed with cleaning solvent.
  4. Attach the air intake hose.

**FUEL PRESSURE TEST**

M1131001900625

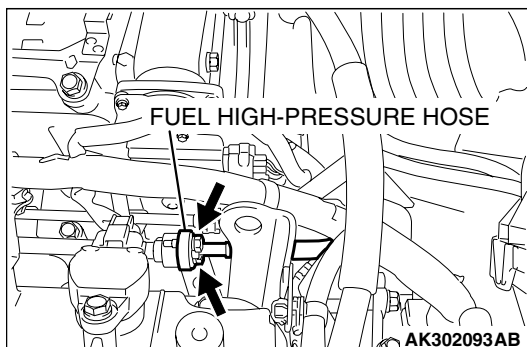
**Required Special Tools:**

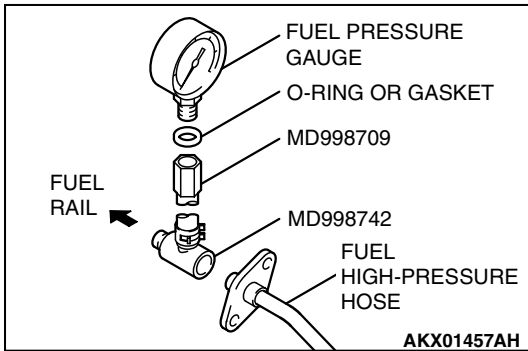
- MB991958: Scan tool (MUT-III Sub Assembly)
    - MB991824: V.C.I.
    - MB991827: USB Cable
    - MB991910: Main Harness A
  - MB991637: Fuel Pressure Gauge Set
  - MD998709: Adaptor Hose
  - MD998742: Hose Adaptor
1. Release residual pressure from the fuel line to prevent fuel spray. (Refer to [P.13A-1127.](#))

**⚠ 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.*

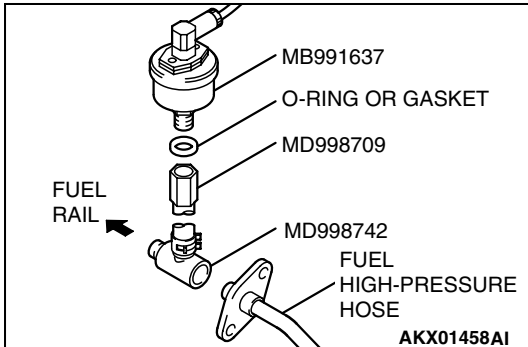
2. Disconnect the fuel high-pressure hose at the fuel rail side.
3. Assemble the fuel pressure measurement tools as follows.





<When using the fuel pressure gauge>

1. Remove the union joint and bolt from special tool MD998709 (adapter hose) and instead attach special tool MD998742 (hose adapter) to the adapter hose.
2. Place a suitable O-ring or gasket on the 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 special tool MB991637 (fuel pressure gauge set)>

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

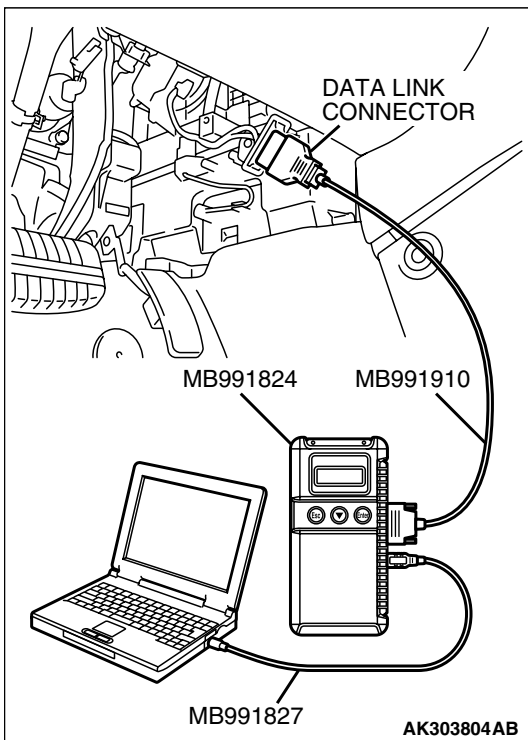
**CAUTION**

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

4. Connect scan tool MB991958 to the data link connector.
5. Use 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 324 kPa (95.7 in.Hg) at curb idle**

9. Check to see that fuel pressure at idle does not drop even after the engine has been revved several times.
10. If any of fuel pressure measured in steps 8 to 9 is out of specification, troubleshoot and repair according to the table below.

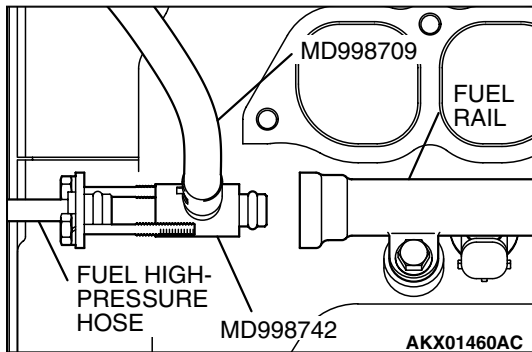


SYMPTOM	PROBABLE CAUSE	REMEDY
<ul style="list-style-type: none"> <li>Fuel pressure too low</li> <li>Fuel pressure drops after racing</li> </ul>	Clogged fuel filter	Replace fuel filter
	Fuel leaking to return side due to poor fuel regulator valve seating or settled spring	Replace fuel pressure regulator
	Low fuel pump delivery pressure	Replace fuel pump
Fuel pressure too high	Binding valve in fuel pressure regulator	Replace fuel pressure regulator

11. 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.

- Squeeze the fuel supply line closed to confirm leak-down occurs from defective fuel pump check valve.
- 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



12. Release residual pressure from the fuel pipe line. (Refer to P.13A-1127.)

**⚠ 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.**

- Remove the fuel pressure gauge, and special tools MD998709, MD998742 and MB991637 from the fuel rail.
- Replace the O-ring at the end of the fuel high-pressure hose with a new one.
- Fit the fuel high-pressure hose into the fuel rail and tighten the bolts to specified torque.  
**Tightening torque: 5.0 ± 1.0 N·m (44 ± 8 in·lb)**
- Check for fuel leaks.
  - Use scan tool MB991958 to operate the fuel pump.
  - Check the fuel line for leaks and repair as needed.
- Disconnect scan tool MB991958.

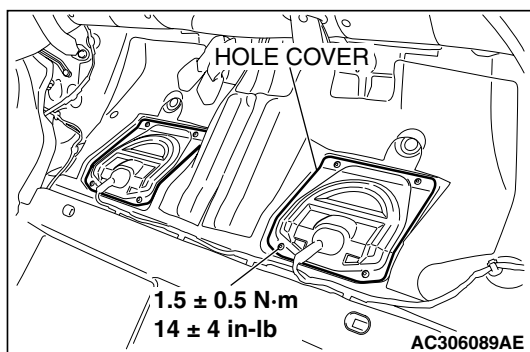
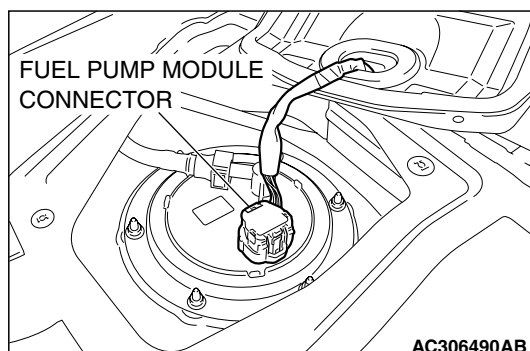
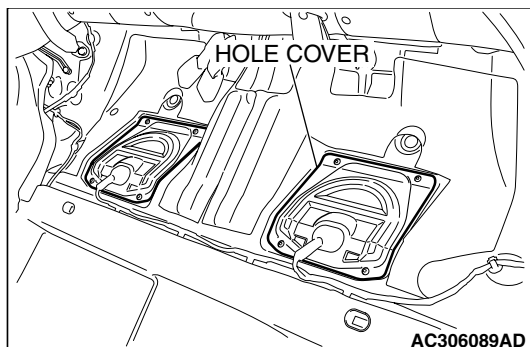
M1131000900622

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

### **WARNING**

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

1. Remove the rear seat cushion assembly (Refer to GROUP 52A, Rear Seat P.52A-29).
2. Remove the hole cover (LH).



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 hole cover (LH).

**Tightening torque:  $1.5 \pm 0.5 \text{ N}\cdot\text{m}$  ( $14 \pm 4 \text{ in}\cdot\text{lb}$ )**

7. Install the rear seat cushion assembly (Refer to GROUP 52A, Rear Seat Assembly P.52A-29).

## FUEL PUMP OPERATION CHECK

## Required Special Tool:

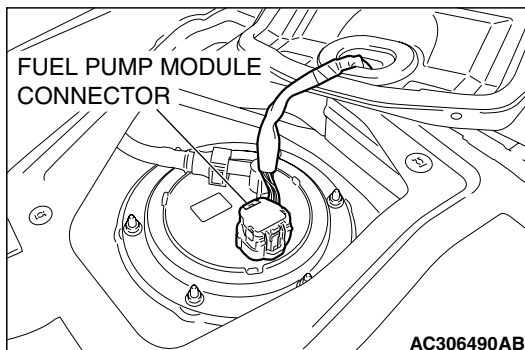
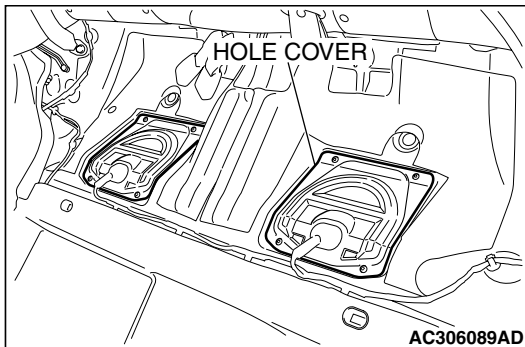
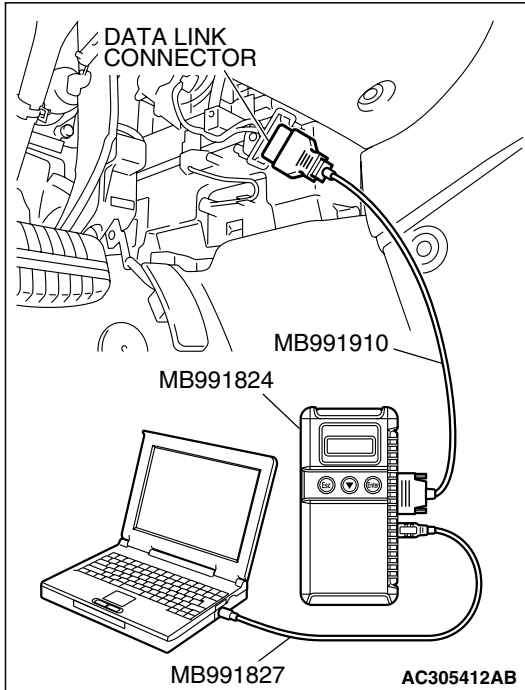
- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: MUT-III USB Cable
  - MB991910: MUT-III Main Harness A

**CAUTION**

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

1. Check the operating of the fuel pump by using scan tool 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.

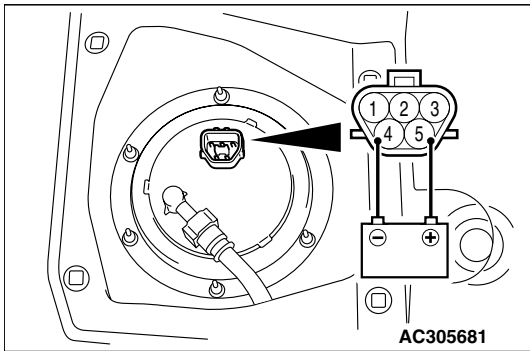
- (1) Turn the ignition switch to the "LOCK" (OFF) position.
- (2) Remove the rear seat cushion assembly (Refer to GROUP 52A, Rear Seat [P.52A-29](#)).



- (3) Remove the hole cover (LH).

- (4) Disconnect the fuel pump module connector.





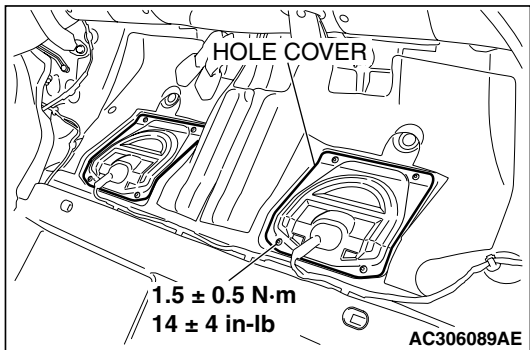
- (5) When the fuel pump drive connector is attached directly to the battery, check if the sound of the fuel pump operation can be heard. If no operating sound is heard, replace the fuel pump module (Refer to GROUP 13C, On-vehicle Service – Fuel Pump Module Replacement P.13C-7).

*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 hole cover (LH).

**Tightening torque: 1.5 ± 0.5 N·m (14 ± 4 in-lb)**

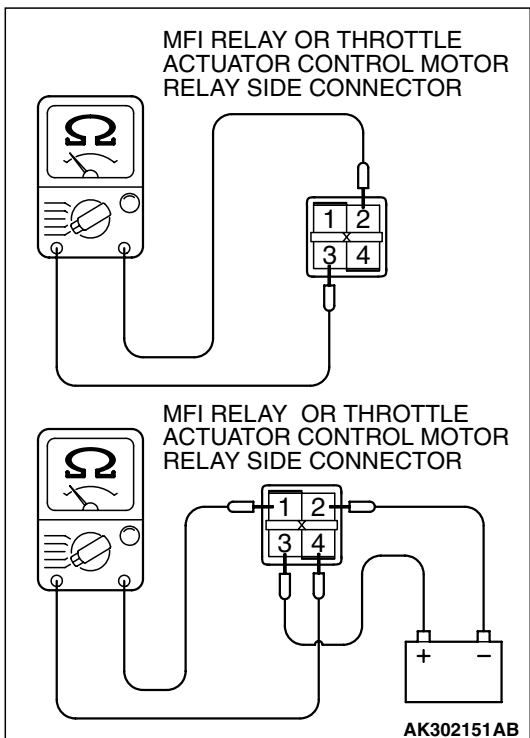
- (9) Install the rear seat cushion assembly (Refer to GROUP 52A, Rear Seat Assembly P.52A-29).



## MULTIPOINT FUEL INJECTION (MFI) RELAY AND THROTTLE ACTUATOR CONTROL MOTOR RELAY CONTINUITY CHECK

M1131050000378

Inspect the MFI relay and throttle actuator control motor relay for continuity in accordance with the chart shown below.

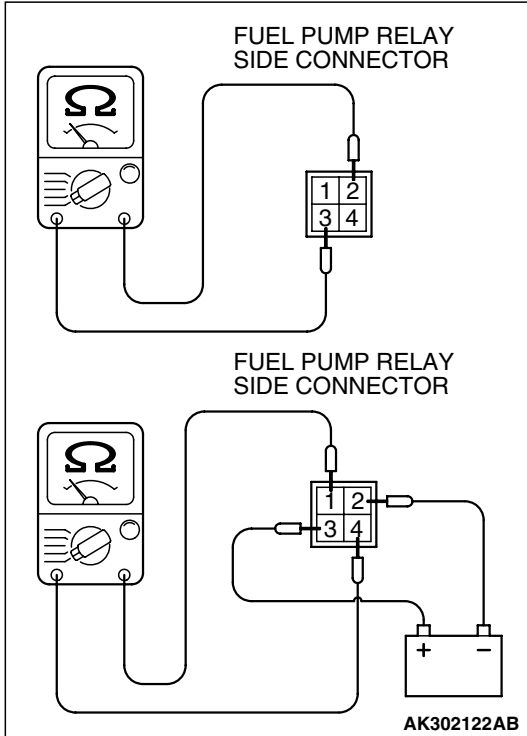


BATTERY VOLTAGE	TERMINAL NO. TO BE CONNECTED TO BATTERY	TERMINAL NO. TO BE CONDUCTED
Not supplied	–	2 – 3
Supplied	2 – 3	1 – 4

**FUEL PUMP RELAY CONTINUITY CHECK**

M1131033000386

Inspect the fuel pump relay for continuity in accordance with the chart shown below.



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

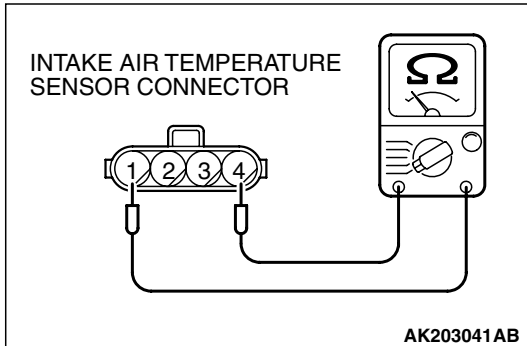
**INTAKE AIR TEMPERATURE SENSOR CHECK**

M1131002800591

1. Disconnect the mass airflow sensor connector.
2. Measure resistance between terminal No. 1 and No. 4.

**Standard value:**

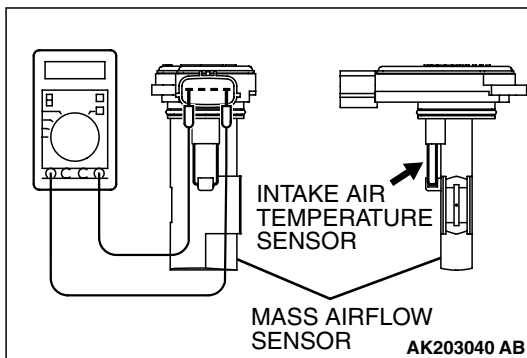
- 13 – 17 kΩ [at –20°C (–4°F)]
- 5.3 – 6.7 kΩ [at 0°C (32°F)]
- 2.3 – 3.0 kΩ [at 20°C (68°F)]
- 1.0 – 1.5 kΩ [at 40°C (104°F)]
- 0.56 – 0.76 kΩ [at 60°C (140°F)]
- 0.30 – 0.45 kΩ [at 80°C (176°F)]



3. If not within specifications, replace the mass 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 mass airflow sensor.

## ENGINE COOLANT TEMPERATURE SENSOR CHECK

M1131003100551

### 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 k $\Omega$  [at –20°C (–4°F)]

5.1 – 6.5 k $\Omega$  [at 0°C (32°F)]

2.1 – 2.7 k $\Omega$  [at 20°C (68°F)]

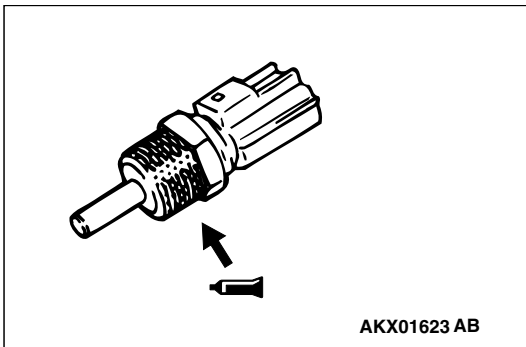
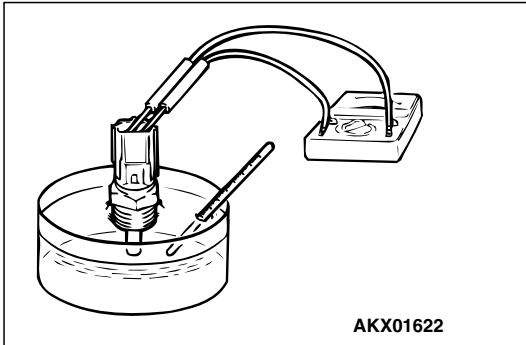
0.9 – 1.3 k $\Omega$  [at 40°C (104°F)]

0.48 – 0.68 k $\Omega$  [at 60°C (140°F)]

0.26 – 0.36 k $\Omega$  [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: 30 ± 9 N·m (22 ± 7 ft·lb)**



## HEATED OXYGEN SENSOR CHECK

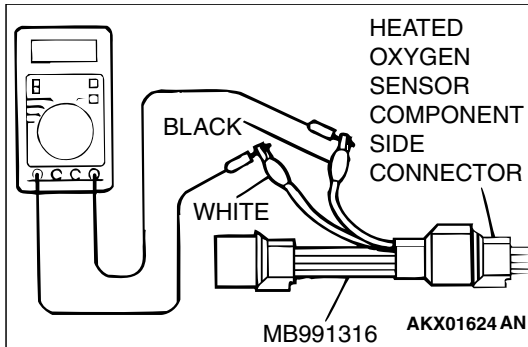
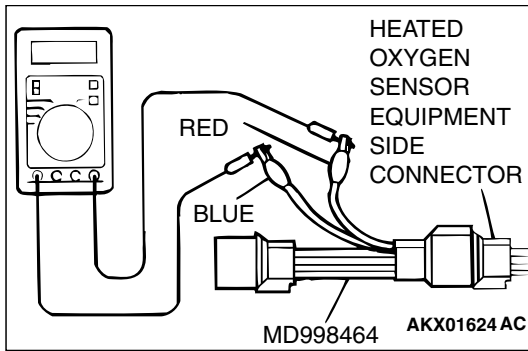
M1131005000732

### Required Special Tools:

- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MD998464: Test Harness
- MB991316: Test Harness

### <Heated oxygen sensor (rear)>

1. Using the scan tool MB991958, observe HO<sub>2</sub>S 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 [11 – 18 ohms at 20°C (68°F)] between terminal No. 1 (red clip) and terminal No. 3 (blue clip) 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.
  - (5) Perform a revving for 5 minutes or more with the engine speed of 4,500 r/min.
  - (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.

**CAUTION**

- Be very careful when connecting the jumper wire; incorrect connection can damage the heated oxygen sensor.
- Be careful the heater is broken when voltage of beyond 12 volts is applied to the heated oxygen sensor heater.

*NOTE: If the sufficiently high temperature [of approximate 400°C (752°F) or more] is not reached although the heated oxygen sensor is normal, the output voltage would be possibly low although the rich air/fuel ratio. Therefore, if the output voltage is low, use jumper wires to connect the terminal No. 1 (red clip) and the terminal No. 3 (blue clip) of the heated oxygen sensor with a (+) terminal and (-) terminal of 12 volts power supply respectively, then check again.*

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 Pipe and Main Muffler*

*P.15-20.*

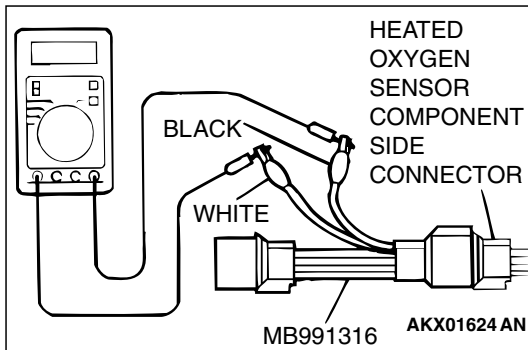
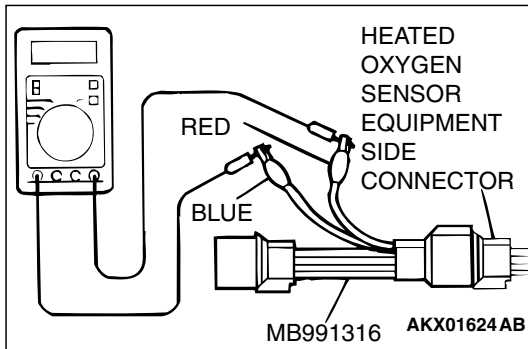
<Heated oxygen sensor (front)>

1. Using the scan tool MB991958, observe HO<sub>2</sub>S 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 MB991316 to the connector on the heated oxygen sensor side.
- (2) Make sure that there is continuity [4.5 – 8.0 ohms at 20°C (68°F)] between terminal No. 1 (red clip) and terminal No. 3 (blue clip) 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.
- (5) Perform a revving for 5 minutes or more with the engine speed of 4,500 r/min.
- (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.

**CAUTION**

- Be very careful when connecting the jumper wire; incorrect connection can damage the heated oxygen sensor.
- Be careful the heater is broken when voltage of beyond 8 volts is applied to the heated oxygen sensor heater.

*NOTE: If the sufficiently high temperature [of approximate 400°C (752°F) or more] is not reached although the heated oxygen sensor is normal, the output voltage would be possibly low although the rich air/fuel ratio. Therefore, if the output voltage is low, use jumper wires to connect the terminal No. 1 (red clip) and the terminal No. 3 (blue clip) of the heated oxygen sensor with a (+) terminal and (-) terminal of 8 volts power supply respectively, then check again.*

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 Pipe and Main Muffler P.15-20.*

## INJECTOR CHECK

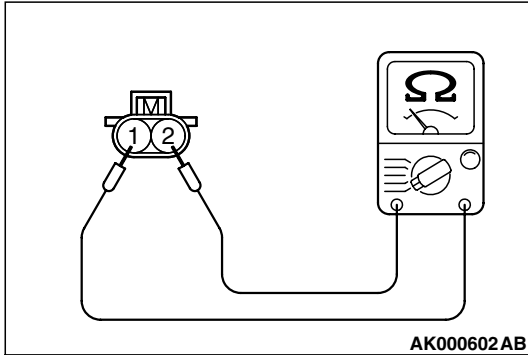
M1131005200554

### Measurement of Resistance between Terminals

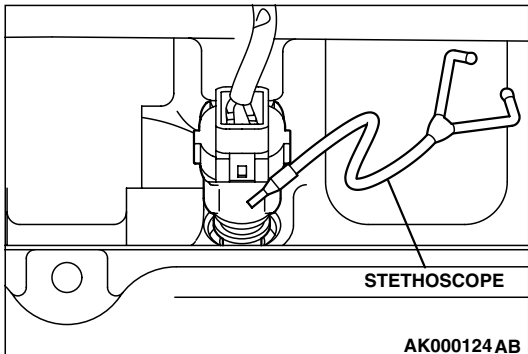
1. Disconnect the injector connector.
2. Measure resistance between terminals.

**Standard value: 10.5 – 13.5 ohms [at 20°C (68°F)]**

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



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### 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 powertrain control module (PCM) is suspected.

## THROTTLE ACTUATOR CONTROL MOTOR CHECK

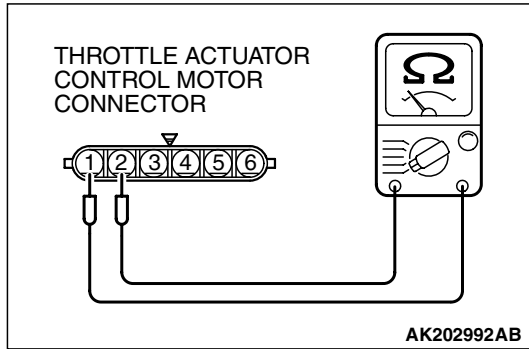
M11310051000100

### <Operation Inspection>

1. Disconnect the air intake hose from the throttle body.
2. Set the ignition switch to the "ON" position.
3. Operate the accelerator pedal and confirm that the throttle valve is opening and closing accordingly.

### <Checking the Terminal Resistance>

1. Disconnect the throttle position sensor connector.
2. Measure the resistance between terminal No. 1 and No. 2.  
**Standard value: 0.3 – 80 ohms [at 20°C (68°F)]**
3. If resistance is outside the standard value, replace the throttle body assembly.



### ENGINE OIL CONTROL VALVE CHECK

M1131053200070

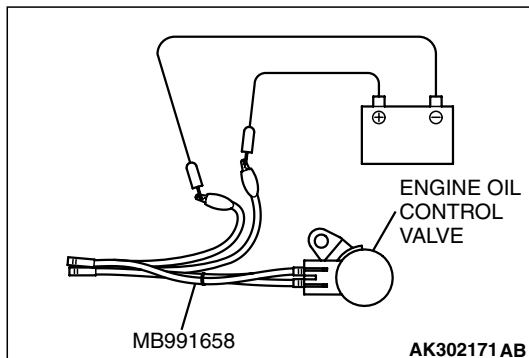
#### Checking the Operation Sound

1. Disconnect the engine oil control valve connector.

#### ⚠ CAUTION

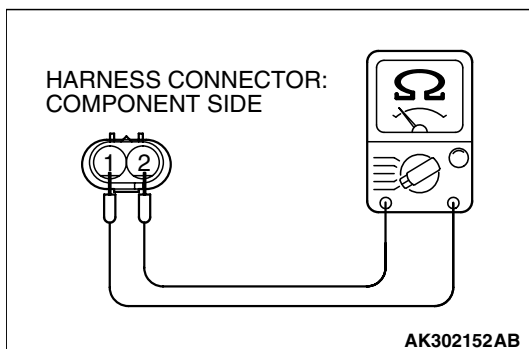
To prevent the coil from burning, keep the duration of the voltage application as short as possible.

2. Check that the operation sound of the engine oil control valve can be heard when the positive battery voltage is supplied to the engine oil control valve. (Use the jumper wires to connect terminal No. 2 of the engine oil control valve connector to the positive battery terminal and terminal No. 1 to the negative battery terminal.)
3. If the operation sound cannot be heard, replace the engine oil control valve.



#### Checking the Coil Resistance

1. Disconnect the engine oil control valve connector.
2. Measure resistance between terminal No. 1 and terminal No. 2 of the connector at the engine oil control valve side.  
**Standard value: 6.9 – 7.9 ohms [at 20°C (68°F)]**
3. If resistance is not within the standard value, replace the engine oil control valve.



### EVAPORATIVE EMISSION PURGE SOLENOID CHECK

M1131005600273

Refer to GROUP 17, Emission Control System – Evaporative Emission Control System – Evaporative Emission Purge Solenoid Check [P.17-87](#).

**EVAPORATIVE EMISSION VENTILATION SOLENOID CHECK**

M1131012800257

Refer to GROUP 17, Emission Control System – Evaporative Emission Canister and Fuel Tank Pressure Relief Valve – Evaporative Emission Canister and Fuel Tank Pressure Relief Valve Inspection [P.17-96](#).

**EGR VALVE CHECK**

M1131051500053

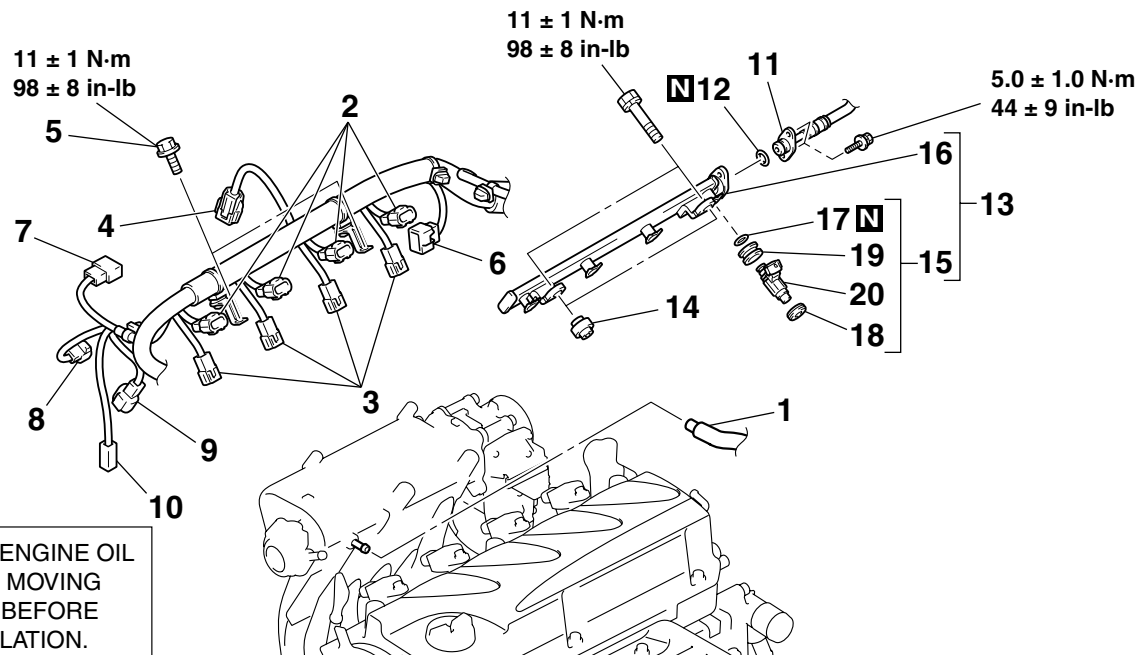
Refer to GROUP 17, Emission Control System – Exhaust Gas Recirculation (EGR) System – EGR Valve Check. [P.17-90](#)

**INJECTOR**

**REMOVAL AND INSTALLATION**

M1131007100757

<p><b>Pre-removal Operation</b></p> <ul style="list-style-type: none"> <li>Fuel Discharge Prevention (Refer to <a href="#">P.13A-1127</a>).</li> <li>Air Cleaner Cover and Air Intake Hose Removal (Refer to GROUP 15, Air Cleaner <a href="#">P.15-4</a>).</li> </ul>	<p><b>Post-installation Operation</b></p> <ul style="list-style-type: none"> <li>Air Cleaner Cover and Air Intake Hose Installation (Refer to GROUP 15, Air Cleaner <a href="#">P.15-4</a>).</li> <li>Fuel Leakage Inspection.</li> </ul>
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APPLY ENGINE OIL TO ALL MOVING PARTS BEFORE INSTALLATION.

AC308302AB

**REMOVAL STEPS**

- PCV HOSE CONNECTION
- IGNITION COIL CONNECTORS
- INJECTOR CONNECTORS
- EGR VALVE CONNECTOR
- ROCKER COVER BRACKET INSTALLATION BOLTS
- THROTTLE POSITION SENSOR CONNECTOR
- MANIFOLD ABSOLUTE PRESSURE SENSOR
- EVAPORATIVE EMISSION PURGE SOLENOID CONNECTOR
- KNOCK SENSOR CONNECTOR

**REMOVAL STEPS (Continued)**

- POWER STEERING PRESSURE SWITCH CONNECTOR
- FUEL HIGH-PRESSURE HOSE CONNECTION
- O-RING
- FUEL RAIL AND INJECTOR ASSEMBLY
- INSULATORS
- INJECTOR ASSEMBLY
- FUEL RAIL
- O-RING
- INSULATORS
- GROMMETS
- INJECTORS



## REMOVAL SERVICE POINT

### <<A>> FUEL RAIL AND INJECTOR ASSEMBLY REMOVAL

 **CAUTION**

Do not drop the injector.

Remove the fuel rail with the injectors attached to it.

## INSTALLATION SERVICE POINT

### >>A<< INJECTOR ASSEMBLY/FUEL HIGH-PRES- SURE HOSE INSTALLATION

 **CAUTION**

- Do not kink the fuel high-pressure hose as it is made of plastics.
  - Do not let the engine oil get into the fuel rail.
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 high-pressure hose. Be careful not to damage the O-ring. After installing, check that the item turns smoothly.
  3. If it does 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 high-pressure hose to the specified torque.

**Tightening torque: 5.0 ± 1.0 N·m (44 ± 9 in-lb)**

# THROTTLE BODY ASSEMBLY

## REMOVAL AND INSTALLATION

M1131007700641

**CAUTION**

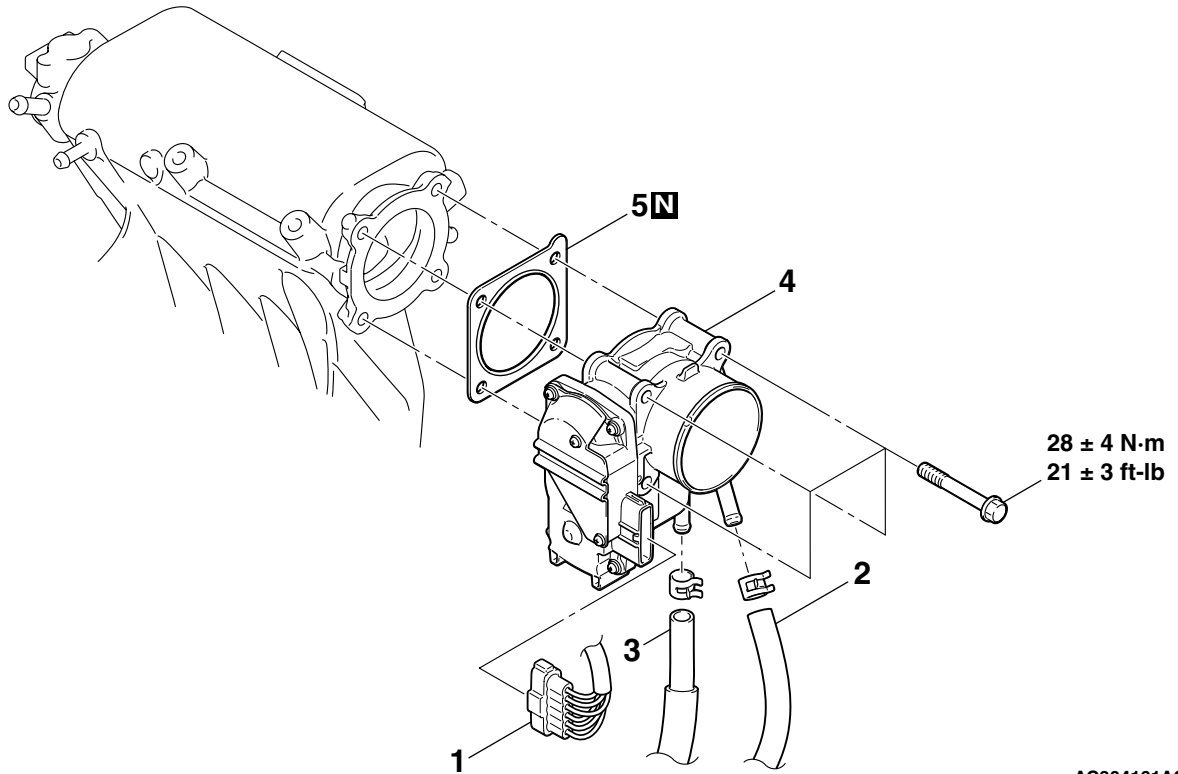
Do not loosen the fixing screws for the resin cover of throttle body assembly. If the screws are loosened, the sensor incorporated in the resin cover becomes misaligned and the throttle body can not work normally.

**Pre-removal Operation**

- Engine Coolant Draining [Refer to GROUP 00, Maintenance Service – Engine Coolant (Change) P.00-56].
- Air Cleaner Cover and Air Intake Hose Removal (Refer to GROUP 15, Air Cleaner P.15-4).
- Battery Removal

**Post-installation Operation**

- Battery Installation
- Air Cleaner Cover and Air Intake Hose Installation (Refer to GROUP 15, Air Cleaner P.15-4).
- Engine Coolant Refilling [Refer to GROUP 00, Maintenance Service – Engine Coolant (Change) P.00-56].



AC304161AC

- >>B<<
- REMOVAL STEPS**
- INITIALIZATION PROCEDURE (INSTALLATION ONLY)
  - 1. THROTTLE POSITION SENSOR CONNECTOR
  - 2. WATER RETURN HOSE CONNECTION

- >>A<<
- REMOVAL STEPS (Continued)**
- 3. WATER FEED HOSE CONNECTION
  - 4. THROTTLE BODY ASSEMBLY
  - 5. THROTTLE BODY GASKET

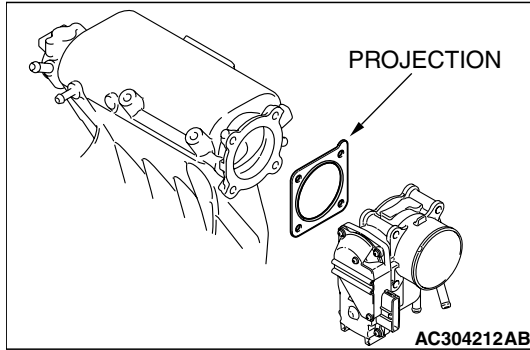
## INSTALLATION SERVICE POINT

### >>A<< THROTTLE BODY GASKET INSTALLATION

**⚠ CAUTION**

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

Install the gasket as its protrusion is in the direction shown.



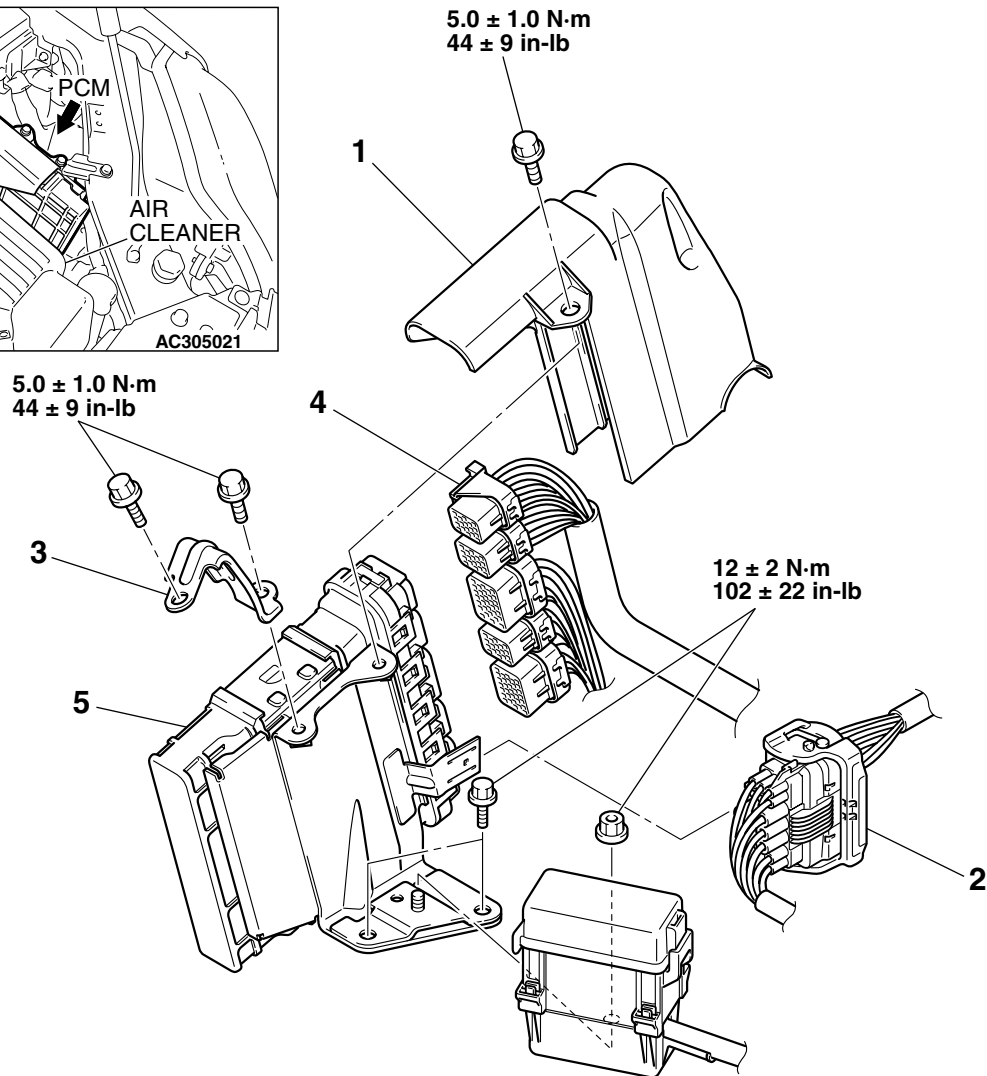
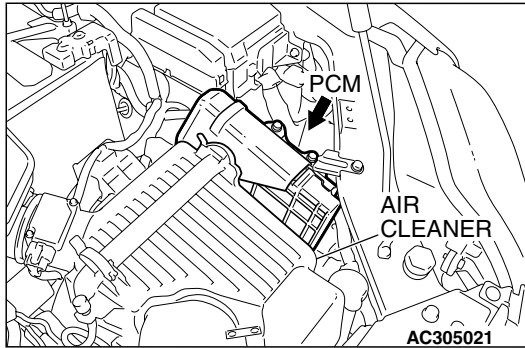
### >>B<< INITIALIZATION PROCEDURE

Turn the ignition switch on then off, and keep it off for at least 10 seconds.

**POWERTRAIN CONTROL MODULE (PCM)**

**REMOVAL AND INSTALLATION**

M1131033400232



- >>A<<**
- **REMOVAL STEPS**
  - **INITIALIZATION PROCEDURE (INSTALLATION ONLY)**
  - 1. PCM CONNECTOR COVER
  - 2. CONTROL WIRING HARNESS CONNECTOR CLAMP

- REMOVAL STEPS (Continued)**
- 3. PCM BRACKET
  - 4. PCM CONNECTORS
  - 5. PCM

**INSTALLATION SERVICE POINT**

**>>A<< INITIALIZATION PROCEDURE**

Turn the ignition switch on then off, and keep it off for at least 10 seconds.

## SPECIFICATIONS

### FASTENER TIGHTENING SPECIFICATIONS

M1131011600528

ITEM	SPECIFICATION
Fuel rail bolt	11 ± 1 N·m (98 ± 8 in-lb)
Fuel high-pressure hose bolt	5.0 ± 1.0 N·m (44 ± 9 in-lb)
Hole cover screw	1.5 ± 0.5 N·m (14 ± 4 in-lb)
PCM bracket bolt	5.0 ± 1.0 N·m (44 ± 9 in-lb)
PCM connector cover bolt	5.0 ± 1.0 N·m (44 ± 9 in-lb)
PCM mounting bolt	12 ± 2 N·m (102 ± 22 in-lb)
Relay box mounting nut	12 ± 2 N·m (102 ± 22 in-lb)
Rocker cover bracket bolt	11 ± 1 N·m (98 ± 8 in-lb)
Throttle body mounting bolt	28 ± 4 N·m (21 ± 3 ft-lb)

### GENERAL SPECIFICATIONS

M1131000200805

ITEM	SPECIFICATION	
Throttle body	Throttle bore mm (in.)	60 (2.4)
	Throttle position sensor	Hall element type
	Throttle actuator control motor	DC motor type, having brushes
Powertrain control module (PCM)	Identification model No.	E6T4 1678 <Federal> E6T4 1679 <California>
	Sensors	Mass airflow sensor
	Barometric pressure sensor	Semiconductor type
	Intake air temperature sensor	Thermistor type
	Engine coolant temperature sensor	Thermistor type
	Heated oxygen sensor	Zirconia type
	Accelerator pedal position sensor	Hall element type
	Transmission range switch	Contact switch type
	Camshaft position sensor	Magneto resistance element type
	Crankshaft position sensor	Magneto resistance element type
	Knock sensor	Piezoelectric type
	Power steering pressure switch	Contact switch type
	Manifold absolute pressure sensor	Semiconductor type
	Engine oil pressure switch	Contact switch type
Actuators	Multiport fuel injection (MFI) relay	Contact switch type
	Fuel pump relay	Contact switch type
	Throttle actuator control motor relay	Contact switch type
	Injector type and number	Electromagnetic type, 4
	Injector identification mark	IDH322S
	Engine oil control valve	Duty cycle type solenoid valve
	Exhaust gas recirculation (EGR) valve	Stepper motor type
	Evaporative emission purge solenoid	Duty cycle type solenoid valve

## SERVICE SPECIFICATIONS

M1131000300738

ITEM		STANDARD VALUE
Fuel pressure kPa (in.Hg)		Approximately 324 (95.7) at curb idle
Intake air temperature sensor resistance k $\Omega$	-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 – 0.45
Engine coolant temperature sensor resistance k $\Omega$	-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
Heated oxygen sensor output voltage V		0.6 – 1.0
Heated oxygen sensor heater resistance $\Omega$	<Front>	4.5 – 8.0 [at 20°C (68°F)]
	<Rear>	11 – 18 [at 20°C (68°F)]
Injector coil resistance $\Omega$		10.5 – 13.5 [at 20°C (68°F)]
Throttle actuator control motor coil resistance $\Omega$		0.3 – 80 [at 20°C (68°F)]
Engine oil control valve coil resistance $\Omega$		6.9 – 7.9 [at 20°C (68°F)]

## SEALANT AND ADHESIVE

M1131000500464

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